ADDENDUM NO. 4

FOR THE

CAESARS LANE
WASTEWATER TREATMENT PLANT EXPANSION
PHASE 2 PROJECT

TOWN OF NEW WINDSOR
ORANGE COUNTY, NEW YORK

PREPARED FOR:
Town of New Windsor
555 Union Avenue
New Windsor, NY 12553

PREPARED BY:
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NOTE: ANY UNAUTHORIZED ALTERATION OR ADDITION TO THIS DOCUMENT IS A VIOLATION OF SECTION 7209(2) OF THE NEW YORK STATE EDUCATION LAW.

DATE: July 10, 2025
JOB #: 18-732

THIS ADDENDUM CONSISTS OF (16) PAGES & (13) ATTACHMENTS

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Prospective bidders are advised of the following revisions, additions, deletions and/or clarifications to the contract documents:

Revisions:

1. Exhibit P: New and revised Veolia Design Submittal including Mechanical Submittal, P&ID, PFD, BOM, Cutsheets, GA, and Electrical drawings.
2. The following Construction Bid Plans have been revised:
    a. C-115: Revised location of 6" plant water line to match sheet C-250. Clarified concrete block retaining wall elevations.
    b. C-120 to C-122: Revised stormwater table
    c. C-124: Clarified influent pipe material transition from SDR-35 to DI
    d. C-126: Added pipe profiles for 4" scum and 4" filtrate line
    e. C-142: Revised typical removable bollard and concrete block retaining wall detail
    f. C-250: Added pipe supports and clarified plant water pipe material
    g. C-310: Clarified influent pipe material transition from SDR-35 to DI
    h. C-322: Clarified 4" scum line and 6" sludge line pipe material
    i. C-420: Located valve V-503C, revised radar gauge and vacuum gauge locations in Thermaer #1 and #2.
    j. C-510: Clarified 4" RDT thickener filtrate line material from PVC to DI
    k. C-530 and C-531: Clarified total number of diffusers
    l. C-542: Revisions include floor drain and associated plumbing to replicate piping layout on P-502.
    m. C-604: Clarified Plant Water Pump Station specification and design flow.
    n. CD-701: Existing sludge piping shown.
    o. CD-702: Clarified existing barrels and storage racks.
    p. C-701: Revised piping from sump pump filtrate discharge.
    q. C-704: Revised piping from sump pump filtrate discharge.
    r. S-202: Clarified filtrate line diameter from 8" to 4".
    s. S-510 and S-511: Revised location of mud valves to match revisions made on C- 530.
    t. S-500A, S-521, S-523, S-524, S-525 and S-528: Revised product and design criteria for MBR train aluminum covers
    u. Redline revisions included on Electrical Plan Sheet: E-020, E-022, E-023, E-028, E-030, E-031, E-040, E-041, E-045, E-046, E-101, E-201, E-400, E-501, E-502, E-503, E-506, E-701
    v. Redline Revisions included on Mechanical Plan Sheet: M-040
    w. Redline Revisions included on Plumbing Plan Sheet: P-400, P-501, P-502

3. The following Specifications have been revised:
    a. 042000 Unit Masonry- basis of design product included
    b. 312334 Structural Excavation, Backfill, and Compaction- Section 3.7J revised
    c. 333213 Plant Water Pump Station- revised design flow

Additional Information:

1. Pressure Gauge Schedule and Detail (Sk-2): Pressure gauges shall be added to the suction (if applicable) and discharge piping of specific pumps in the location indicated on the schedule provided.

RFI's:

1. **Question:** Can a table be provided for Pressure Gages with type, size, and Pressure Range?
   Response: See attached Pressure Gauge Schedule and Detail (SK-2) for type, size, and pressure range of each applicable pump.

2. **Question:** Lead Safe Work Practices Spec 028300 in Addendum #1 lists objects on project that contain LBP above the EPA action level (Table 1), but most of these items seem to be scheduled on plans for complete removal. If removal is total, can they be disposed of as standard construction debris?
   Response: The building materials/components with lead paint taken out intact, can be disposed of as C&D. Any paint chips generated by the work must be collected, stored in a 55 gallon drum, and the drum sampled for waste characterization (TCLP Analysis) or disposed of as lead hazardous waste if the landfill they are sending it to doesn't require the TCLP result to accept the waste.

3. **Question:** Unit Masonry Spec 042000 does not actually specify an acceptable product (including color) for the 10" insulated HI-R CMU at the Maintenance Garage Exterior Wall. Specify manufacturer, face finish, color, insulation type and thickness, etc.
   Response: The Unit Masonry specification 042000 has been revised.

4. **Question:** Based on Drawing C-103, it appears that Settling Tank #1 and Settling Tank #2 are COMPLETELY removed, they appear to be in conflict with new construction shown on C-110. CD-801 however, shows the existing concrete structure (scum pit, settling tank, and effluent box) to remain per notes on the plan. The notes on this plan conflict with Note 1 under the plan detail. Confirm scope of concrete demolition.
   Response: At minimum, concrete shall be removed in full to Elevation 0'-0". Sheet CD-801 was reissued in Addendum #2 to clarify scope of demo and provide revised tank elevations. Demo of the secondary tanks should be completed in accordance with details and notes shown on the re-issued CD-801.

5. **Question:** Will the Owner be draining the Chlor-Dechlor tank and the existing influent structure as required to be able to core the two new holes shown on S-610?
   Response: The contractor is responsible for draining the tank and providing temporary measures such as bypass pumps or barriers to install the penetration. Influent flow to chlor-dechlor can be diverted to either of the two trains. See C-602 for more information.

6. **Question:** There is a TR8 transformer at the Disinfection Building per E-601 that is not on the Transformer Schedule on E-044. Specify size and mounting.
   Response: Transformer TR8 was added to the schedule on sheet E-044 in the reissued set of electrical drawings dated 06 June 2025. Contractors to verify they are using the correct, updated, reissued set of electrical drawings.

7. **Question:** Are core bores and link seal required for the 4" pump discharge piping for Pumps P-601 and P-602?
   Response: Yes core bores and link seals are required for pumps P-601 and 602. See Detail 4 on C-604 for more information.

8. **Question:** Reference C-602. The proposed fine bubble disc diffusers (and associated piping) are shown in the two southernmost (page South) bays of the tank, but the note says typical. Is this typical assembly also required at the other 12 bays of the tank?
   Response: C-602 illustrates the full limits of the proposed diffuser grid inside the Chlor-Dechlor tanks. No additional diffuser grid and piping are necessary.

9. **Question:** Provide specification for the sluice gates required at the backpulse tank, as shown on 1/C-604.
   Response: Please refer to Section 400559.23 – Stainless Steel Gates for typical sluice gate requirements.

10. **Question:** PW-01 and PW-02 are 40 HP pumps per Detail 3/E-020, but are listed as 60 HP in Spec 333213. Which is correct? Also, pump station applicable spec is shown on C-604 as Spec 221342, confirm proper applicable Spec is 333213.
    Response: PW-01 and PW-02 are 40 HP pumps. The applicable Specification 333213 has been revised accordingly. See attached specification and sheet C-604.

11. **Question:** One of the General Demolition Notes on AD-701 indicates all loose paint be scraped and removed throughout entire building. The Hazardous Materials Report (see Table I, Exhibit C) does not list the Dewatering Building as having any lead paint. Appendix C in Exhibit B does not list the Dewatering Building either. Do paint scrapings have to be handled as hazardous material? Also, note on AD-701 indicates scraping, but Notes 1 and 2 in the Finish Schedule indicate pressure washing is possible. Which is correct?
    Response: The Town's environmental consultant inspected all of the buildings and structures of the existing facility. If it does not appear in the Hazardous material report prepared by the Town's environmental consultant, then it can be assumed to not contain lead paint and no special handling of the paint is required.

12. **Question:** There is paint scraping shown on the EXTERIOR wall (west elevation) of the Dewatering Building, is this paint lead based? This note appears ONLY on the West elevation, but indicates "typical", does the rest of the building require paint to be scraped? Can the wall be power washed to remove paint?
    Response: The west wall is the only exterior wall with painted CMU on the exterior surface of the wall. That wall specifically, and only that wall, can be low pressure power washed carefully.

13. **Question:** Drawing CD-801 shows typical secondary settling tank top of wall at Elev 29.19. This would put the existing 18" CIMJ pipe under tank at approximately Elev 12.19. Drawing C-103 shows existing grade around the tanks to be Elev 11. This would place the existing pipe above grade. Please confirm top of wall elevation at Settling Tanks.
    Response: Sheet CD-801 was re-issued as part of Addendum #2 and included a revised Top of Tank Elevation of 11.1' ±.

14. **Question:** Is the existing Stair Landing at the East Side of the Dewatering Building on grade, or is it elevated. Section 5/S-703 implies no soil. Concern is if we need to dig out existing soil to pour new frost wall footings associated with the landing, as well as the new steel column footings.
    Response: Section 5/S-703 is of the promenade, not the stairs. The promenade is existing on grade and is being replaced on grade. The stairs are also on grade. See S-702 and details 1-4 on S-703.

15. **Question:** AD-702 references 3 areas indicating "approximate extents of slab removal – see P-700's for coordination of new piping layout". But P-700 makes no reference to these slab removals, and neither does S-702. This is an elevated slab, the ceilings are open below for plumbing work. Clarify scope of removals.
    Response: The removals shown on sheet AD-702 are needed in order to cap and abandon the existing sanitary and domestic piping fed from below. The area below these removals is unexcavated partial slab. Contractor shall cap and abandon all piping shown within the unexcavated portion on P-700 (right half), currently shown as demo. Intent for replacement as shown on P-702 and P-703 is to run new sanitary piping within a chase behind the fixtures at the first floor level and drop to the basement within the open ceiling area (left half). The new domestic piping is in first floor ceiling since the water heater is getting relocated.
    Therefore, the amount of removals required is worst case as shown on AD-702, with intent to cap the existing pipes below.

16. **Question:** Can the contents of the tanks being demolished (or abandoned in place) per C-800 Series Drawings be disposed of as construction debris, or do they have to be disposed of as hazardous material, given the environment the equipment has been operating in?
    Response: The plant operator will empty the tanks through the typical plant process. The contractor will hose down the surfaces and pump the water back to the head of the plant or to the thickeners, prior to demolition. Material can be disposed of as construction debris if it has been cleaned of organic material.

17. **Question:** AD-702 indicates existing oil barrel STORAGE rack is to be relocated, but CD-702 indicates removal of an oil TANK. Which is correct? Will owner be removing the oil barrels or oil from the tank prior to removal?
    Response: The existing barrels and storage racks will be relocated by the operator during construction. The existing barrels and storage racks are correctly labeled and located on AD-702. Sheet CD-701 incorrectly located the existing oil tank inside the building but has been revised. The existing waste oil tank is located along the exterior of the Northwest corner of the building and shall be removed by the contractor as shown on Sheets C-102 and C-104. The contents of the tank can be pumped out by the operator, as is routinely done, with adequate coordination by the contractor.

18. **Question:** Confirm the abbreviation O.A.E as shown on several drawings and tables in spec stands for “or approved equal”.
    Response: Confirmed.

19. **Question:** The Bill of Material for the Veolia assigned package (see Item 9) only includes bubble diffusers for Aerobic Zone #1 and Zone #2, and the diffuser count for each zone does not match what is shown on C-530. Which is correct?
    Response: Veolia’s scope of supply includes a total of 3 diffuser grids. Each diffuser grid consists of 2 aerobic zones. There are two aerobic zones per train and a total of 3 trains which equals a total of 6 aerobic zones. The quantity of diffusers shown on the Bill of Materials is correct. See sheet C-530 for revisions.

20. **Question:** The Bill of Material for the Veolia assigned package does NOT include diffuser grids for Aerobic Zones # 3,4,5,6 as shown on C-530. Are those the responsibility of the bidding contractor to provide?
    Response: Veolia’s scope of supply includes a total of 3 diffuser grids. Each diffuser grid consists of 2 aerobic zones. There are two aerobic zones per train and a total of 3 trains which equals a total of 6 aerobic. The contractor is just responsible for installation.

21. **Question:** The Bill of Material for the Veolia assigned package does NOT include the diffuser grids for the Sludge Holding Tank (see C-410) and the Chlorine Tank (see C-602). Are these the responsibility of the bidding contractor to provide?
    Response: These diffuser grids are the responsibility of the bidding contractor for the Sludge Holding Tank and Chlorine Tank.

22. **Question:** For Veolia Item #1, Item #2, and Item #5 in their Bill of Material, confirm that all the components listed in each item (F, PSV, HV, PI, CV) come furnished and pre-installed on the blower skids.
    Response: All components are furnished and pre-installed on the blower skid assembly. Refer to Veolia's P&ID sheet DS-102 for clarification.

23. **Question:** For Veolia Item #15 in their Bill of Material, confirm that all the components listed in the item (HV, PCV, FV, E) come furnished and pre-installed with the Air Ejector Assembly.
    Response: All components come furnished and preassembled as the Air Ejector Assembly. Refer to Veolia's P&ID sheet DS-109 for clarification.

24. **Question:** For Veolia Item #33 in their Bill of Material, confirm that all the components listed (HCV, TK, HV, FV, AE/AIT, FE) come pre-assembled INSIDE the Turbidity Panel Assembly.
    Response: All components listed come pre-assembled as the Turbidity Panel, except for 20-TK-324-X, which will be shipped loose.

25. **Question:** For Veolia Item #55, Item #56, and Item #56 in their Bill of Material, do the valves listed in these items come pre-installed in the Air Supply and Air Ejector Assemblies?
    Response: All components listed come pre-assembled as the separate Air Supply Assembly and Air Ejector Assembly.

26. **Question:** For Veolia Item #69 in their Bill of Material, do all components listed (FQI, HV, PSV, PCV) come pre-installed on the Sodium Hydroxide pump skid?
    Response: All components listed come pre-assembled as the Chemical Feed Pump Assembly, except for 15-PCV-301, which will need to be field installed as close to the injection point as possible.

27. **Question:** For Veolia Item #72 in their Bill of Material, do all components listed (HCV, PSV, HV, STR, CV, PI, FIT, FV) come pre-installed on the Sodium Hypochlorite pump skid?
    Response: All components listed come pre-assembled as the Chemical Feed Pump Assembly, with the exception of 23-STR-103 which will be shipped loose.

28. **Question:** For Veolia Item #75 in their Bill of Material, do all components listed (HCV, PSV, STR, HV, CV, PI, FIT, FV) come pre-installed on the Citric Acid pump skid?
    Response: All components listed come pre-assembled as the Chemical Feed Pump Assembly, with the exception of 23-STR-303 which will be shipped loose.

29. **Question:** For Veolia Item #76 in their Bill of Material, do all components listed (PSV, HV, PSL, PI, F, FV, TK) come pre-installed with the Air Dryer?
    Response: All components listed come pre-assembled as the Tank Mounted Air Compressor Assembly.

30. **Question:** NOTE that the Veolia assigned package Bill of Material in the Contract Exhibits Spec is EMPTY on pages 20 through 32 of the Bill. Are there items missing from this list? Is it the intent for these pages to be blank?
    Response: Please see attached Veolia's updated Bill of Materials revision D. The blank pages have been removed.

31. **Question:** What is the estimated Notice to Proceed date for the project?
    Response: Currently, the Town aims to award the project in August 2025. The expectation would then be to execute a Notice to Proceed in September 2025.

32. **Question:** Please provide a complete list of the structures/components that will be subject to the concrete containment structure testing procedure.
    Response: Per Concrete Containment Structure Testing Note 1:
    1. THE FOLLOWING TESTING PROCEDURE SHALL BE PERFORMED ON ANY CONCRETE CONTAINMENT STRUCTURE WHICH DIRECTLY HOLDS OR TRANSFERS PROCESS RELATED LIQUIDS OR MATERIALS. THIS TESTING PROCEDURE IS APPLICABLE TO BOTH CAST-IN-PLACE AND PRECAST STRUCTURES.
       This includes:
       - Influent Structure and Parshall Flume
       - Influent Splitter Boxes
       - Headworks Building Channels
       - Grit Chamber and Associated Channels
       - Distribution Box
       - Primary Settling Tank #4
       - Microscreen Channels
       - Post Microscreen Wetwells
       - MBR Distribution Channel and Boxes
       - MBR Anoxic and Aerobic Tanks
       - MBR Distribution Channels/Sludge Pit
       - MBR Trains
       - Backpulse Tank
       - All ATAD Tanks Containing Liquid (Sludge Holding, Thermaer, SNDR)

33. **Question:** Please provide the sewer flows for the following existing sanitary sewer lines:
    1. Existing 24” CIP sewer tying in to proposed SMH-1
    2. Existing 30” PVC sewer tying in to proposed SMH-2
    3. Existing 24” CIP Sewer tying in to proposed SMH-3

    Response: The average monthly flow at the plant measured at the existing parshall flume is approximately 5.0 MGD. Weather has a significant impact on peak flow conditions, with influent flows recorded in excess of 12.5MGD during large storm events. The flow split between the three inlet pipes is unknown at this time. We suggest that the proposed work on the influent lines be completed during dry months with periods of low flow to minimize bypass pump demands.

34. **Question:** Reference Contract Drawing S-110 Retaining Wall, Soil Compaction, Note 3 which reads:
    1. *CRUSHED STONE: CRUSHED STONE SHALL BE PLACED IN MAXIMUM 12-INCH LOOSE LIFTS AND COMPACTED WITH A MINIMUM OF THREE (3) PASSES OF A VIBRATORY COMPACTOR (OR OTHER SUITABLE EQUIPMENT) CAPABLE OF EXERTING A MINIMUM OF 3,000 LBS OF CENTRIFUGAL FORCE AND TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER.*

    Please confirm that the Geotechnical Engineer referred to in Note 3 is provided by the Owner/CM.

    Response: The Geotechnical Engineer will be the project Special Inspector qualified to review compaction and testing per 2020 Building Code of New York State to be hired by the Owner and coordinated by the General Contractor.

35. **Question:** Sheet S-202 identifies the filtrate/supernatant line as 8’’ SDR-35 PVC, while sheet C-114 and C-115 show this line as 4’’ ductile iron (DI). Please confirm the correct size and material for this line.

    Response: Filtrate/supernatant line shall be 4” DI. See revised sheet S-202.

36. **Question:** Sheet C-114 shows the scum line as 4’’ DI and the sludge discharge as 6’’ DI. However, sheet C-322 indicates these lines as 4’’ SCH 40 PVC and 6’’ SDR-35 PVC, respectively. Please confirm the intended materials for both lines.

    Response: Primary Clarifier sludge and scum line discharge pipe shall be ductile iron. See sheet C-322 for clarification and revisions.

37. **Question:** Sheet C-115 shows a 6" water line on the south side of the existing headworks building in a different location than depicted on Sheet C-250, which also shows the line as 4" in diameter. Please clarify the correct size and alignment of this water line.

    Response: The location of the 6” DR9 plant water line has been relocated on the attached sheet C-115. The transition from DR9 to ductile iron has been clarified on the attached sheet C-250.

38. **Question:** Please provide a detail for ground-mounted pipe supports for the SCH 80 PVC pipe located between the headworks building and the existing grit system.

    Response: A ground-mounted pipe support detail is included on Sheet C-250.

39. **Question:** Sheet C-310 specifies the influent pipe to Primary Tank #4 as 18'' Class 51 ductile iron mechanical joint (DIMJ), while sheets C-116 and C124 indicate this pipe as 18'' SDR-35. Please confirm the correct material.
    Response: The gravity influent pipe to Primary Tank #4 shall be SDR-35 and transition to ductile iron 5 feet from edge of tank. See sheet C-310 and C-124 for clarification.

40. **Question:** Please provide profiles for the 4'' DI scum line and the 4'' filtrate/supernatant line.
    Response: See sheet C-126 for pipe profiles for the 4" DI scum line and 4" DI filtrate/supernatant line.

41. **Question:** Sheet C-701 shows an existing line to be cut and capped prior to the 4" DI filtrate line tee. This condition does not match what is shown on sheet C-104. Please clarify.
    Response: Sheet C-701 and Sheet C-704 have been revised to depict new piping for the entirety of the sump pump filtrate discharge.

42. **Question:** Please clarify the final connection point of the filtrate line shown on Sheet C-701.
    Response: The filtrate line shown on Sheet C-701 originates at the sump pit as shown on C-704 and runs to the influent splitter box as shown on C-202.

43. **Question:** Sheet C-602 shows flanged valves installed underground. Are the proposed ductile iron plant water and cooling lines mechanical joint? If so, can MJ valves be used in place of flanged valves?
    Response: All buried ductile iron pipe, valves, fittings etc. shall be mechanical joint.

44. **Question:** Sheet C-510 shows the 4" thickener filtrate line from the drum thickeners pump station as SCH 80 PVC, but sheets C-116 and C-117 indicate this line as 4" ductile iron (DI). Please confirm the correct pipe material.
    Response: The 4" thickener filtrate pipe material shall be ductile iron. See attached sheet C-510.

45. **Question:** Please clarify the pipe material and gate valve type to be used for the camlock connection at the splitter box, as shown on sheet C-510.
    Response: Pipe material shall be ductile iron. Gate valve type shall be typical wedge gate valves.

46. **Question:** Please clarify the requirements for achieving Substantial Completion and specify which activities may occur afterwards.
    Response: The contract's Substantial Completion date is based on a compliance date in the plant's SPDES Permit issued by NYSDEC. By 10/1/2027, the Town must certify to NYSDEC that "the disposal system has been fully completed in accordance with the approved Design Documents". After certifying, the Town will be expected to comply with new effluent limits provided in the SPDES permit. Substantial Completion will be considered completed work required to satisfy this compliance date.

47. **Question:** Can the Owner/Engineer verify the storm pipe run pipe sizing provided on sheet C-120. Storm runs in and out of WQ-3 do not match call outs on plan sheet C-118.
Response: HDPE pipe diameter in and out of WQ-3 shall be 18". See attached sheet C-120.

48. **Question:** Plan sheet CD-701 states that
    a. A. "1. EXISTING SLUDGE PUMPS TO BE CONNECTED TO NEW BELT PRESS TEMPORARILY WHEN EXISTING PRESS IS TAKEN OFF-LINE.
    2. ONCE BOTH PRESSES ARE OPERATIONAL, AN EXISTING SLUDGE PUMP SHALL BE DEDICATED TO EACH PRESS TO ALLOW FOR SIMULTANEOUS OPERATION."

    Can a drawing be provided showing the existing piping and proposed pipe layout?
    Response: The existing piping from the sludge pumps is generally shown on CD-701 and CD-702. Temporary piping shall originate at the existing sludge pumps and the existing floor penetrations shall be utilized. Contractor to field determine the exact location of the temporary sludge piping within the lower level. The piping on the upper level can be installed at proposed final locations as shown on C-702.

49. **Question:** Plan Sheet S-501 calls for Solid Precast Concrete Cover over the dry well tanks. No Specification is provided for these covers. Please provide specification.
Response: Refer to S-500A for notes pertaining to Tank Cover requirements. Refer to precast concrete Specification 034100 for information regarding Precast Structural Concrete.

50. **Question:** Bid Item C-14 is described as Bollard, contract documents refer to Detail 13 on plan sheet C-142. No detail 13 is on said plan sheet. Please clarify if these are to be removable type bollards or permanent.
Response: Contingency item C-14 has been revised to reference Detail 5 on Sheet C-142 in section 7.26 of C-410 Bid Form for Construction Contract.

51. **Question:** Plan Sheet C-119 calls out 6" removal bollards adjacent to generators shows 14 ea. Note 5 on plan sheet E-101 does not state removable bollards and a typical of 20 each. Please clarify.
Response: The correct number of bollards is 14 as shown on sheet C-119. Bollard type and diameter are specifically noted on the plans. See revised sheet E-101 for clarification.

52. **Question:** Can the Owner/Engineer please provide the insurance limits required for Professional Liability and Builders Risk policies.
Response: The limit for the Professional Liability Policy should match the GL limit which is: $2M/$5M with a $5M aggregate. The limit for the Builder's Risk should be the limit of the completed value of the project.

53. **Question:** Detail 1/C-143 shows a single layer of Link seal, plan views of pipe penetrations appear to show 2 layers of link seal. Can the Owner/Engineer clarify.
Response: Only a single layer of link seal is required for typical penetration. Link seals shall be installed on the accessible side of the wall, if possible.

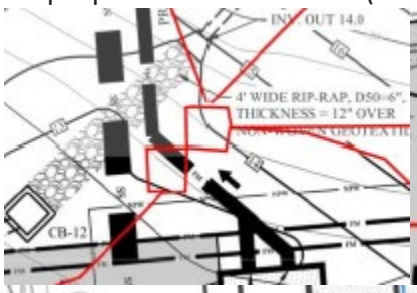
54. **Question:** In Article 3, Section 3.01-D, it states that we are required to include "Subcontractor and Supplier qualification information" with our bid. Could you please clarify what specific information is being requested? Aside from providing safety documentation for applicable subcontractors (those whose work exceeds 10% of the contract value), we have not found any other reference outlining the requirement of qualifications for subcontractors or suppliers to be submitted with the bid.
    Response: Bidders shall disregard Article 3 - Section 3.01(D) of the EJCDC C-200 Instructions to Bidders. This requirement will be removed from the contract.

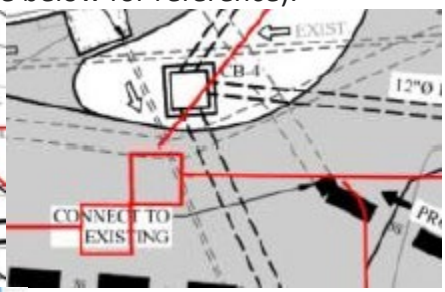
55. **Question:** Since the Wicks Law provision is exempt under the PLA, is the Wicks Law form still required to be submitted with the bid?
    Response: Yes, the Wicks Law form is still required to be filled out and submitted with bid submissions despite this project being Wicks Law exempt. The form must be submitted in a separate/sealed envelope.

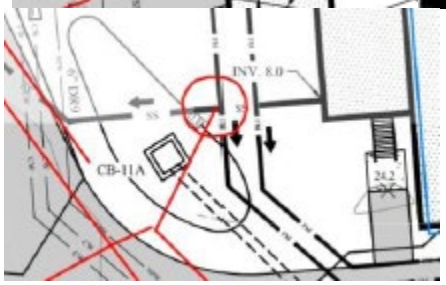
56. **Question:** On Page 2 of the Advertisement for Bids, it states that “Bidders on Contracts are required to execute a non-collusive bidding affidavit…”, but we can’t locate this form in the documents. Could you please provide?
    Response: The non-collusive bidding affidavit is incorporated into Bid Form for Construction Contract, C-410, Section 6.02.A. Bidder is not required to submit a separate affidavit form.

57. **Question:** Will there be any flood requirements for the Builder’s Risk policy? If so, please provide the amount required.
    Response: Yes, since the staging area is in a flood zone, flood insurance will be required on the Builder’s Risk Policy, the limit of which shall be no less than $1M and the contractor should be made aware, as part of this addendum, that no equipment and/or material, which exceeds the value of the flood policy, should be stored in the flood zone. If it is, it is at the contractor’s risk. Contractors should consider the anticipated value of stored material when procuring their insurance policy. For reference, please see the attached SK-3 Flood Hazard Map which overlays an approximated project site and staging area over the current FIRM Map.

58. **Question:** The current layout and size of the proposed duct banks, determined by the number of conduits and the required spacing between them, appear to create several conflicts with the proposed infrastructure (see below for reference).







A. Please review the proposed duct bank layout for any conflicts with nearby structures or utilities.
B. Please provide additional details regarding the conduit configurations and dimensions for the duct banks shown on Sheets E-040 and E-041.

Response: All duct banks, handholes, pull points, junction boxes, etc… are generically shown in nature on the electrical contract drawings to achieve design intent. Contractor may route duct banks as required and move pull points as needed to accommodate other site utilities. Close coordination between all trade contractors, utilities, owners, and engineers will be required during installation, sequencing, and construction.

Because the contractor is allowed to combine conduits, conductors, and circuitry in the field where feasible, conduit configurations and dimensions are not detailed on the electrical contract drawings and are to be coordinated and confirmed in the field from the contractor's means and methods utilized to achieve design intent.

59. **Question:** Please clarify which conduits on Sheets E-040 and E-041 are designated for power and which are for control systems.
Response: See revised sheets E-040 and E-041 for clarification.

60. **Question:** Details 2 and 4 on Sheet E-030 specify a 7.5" spacing between conduits and a 12" separation between power and control conduits. Between the MBR building and handholes HH-2E and HH-2C, there are 69 conduits, resulting in a duct bank that is over 5' high and wide. Is the 7.5" spacing required between all conduits, or only between power and control conduits?
Response: Spacing indicated on details 2 and 4 on sheet E-030 is between conduit centerlines. Please maintain 3" minimum spacing between edges of conduits and 6" minimum spacing

between edges of power and control conduits. Refer to updated details within addendum #4 drawings. Spacing can be minimized by keeping power and control circuits on opposite sides of the duct banks.

61. **Question:** Please confirm whether the duct bank between the MBR building and handholes HH-2E/HH-2C includes DB-24.
    Response: DB-24 goes from the Electrical Backboard to the Sludge Valve Pit and does not pass through Handholes HH-2E / HH-2C.

62. **Question:** Please confirm whether the duct bank between the MBR building and handholes HH-4E/HH-4C includes DB-26.
    Response: DB-26 goes from the ATAD Building to the Disinfection Tank passing through Handholes HH-4E / HH-4C.

63. **Question:** Based on the number of conduits shown in the duct banks, the handholes may not be large enough to accommodate all conduits. Please clarify.
    Response: Handhole sizes are provided for reference only. Per the typical handhole detail on Sheet E-031 and specification sections 26 0543 – Underground Electrical Work, and 26 0537 – Boxes, handholes shall meet minimum size requirements in accordance with NEC Article 314.30. Contractor to field verify and coordinate minimum size of boxes with actual installed arrangement of conduit and conductors.

    Because handholes are sized based upon the sizes and quantities of connected conduits, AND we allow contractors to combine conduit, conductors, and circuitry in the field where feasible, we leave final box sizing up to the contractors to coordinate and confirm in the field based upon their means and methods utilized to achieve design intent.

64. **Question:** Please provide specifications for the concrete block retaining walls adjacent to Settling Tanks #1 and #4 on sheets C-115 & C-116.
    Response: Additional concrete block retaining wall details were added to the attached sheet C-142.

65. **Question**: Please provide elevations for the north end of the retaining wall adjacent to Settling Tank #1 shown on Sheet C-115.
    Response: Elevations have been added to the retaining wall for Settling Tank #1. See sheet C-115 for revisions.

66. **Question**: Reference Construction Sequencing Plans C-150 to C-153:
    a. Please provide milestone dates/duration allotted to each phase.
       Response: Plan sheets C-150 to C-153 are for reference only and depict a suggested sequencing phase to allow for plant to remain fully functional. Construction sequencing is ultimately the responsibility of the contractor. Sequence to be prepared by the contractor and submitted to engineer for approval.
    b. **Question**: Does a phase need to be fully complete before advancing to the next phase?

Response: Construction sequencing is ultimately the responsibility of the contractor. The plant shall remain fully functional during construction. The Construction Sequencing sheets show generally the work involved but are not all inclusive. General tasks shown in each phase should be completed prior to proceeding with the next phase, however there are situations where phases could overlap. Contractor may deviate from the suggested sequence with prior approval from Engineer.

c. **Question**: When is the new (Phase 1) Control Building expected to be ready for the installation of furnishings and controls?
Response: The Substantial Completion date for Phase 1 is 25 July 2026, however the General Contractor expects to obtain a Certificate of Occupancy for the new control building prior to that date. For reference, the current Phase 1 construction schedule shows work in and around the new control building being substantially completed by April 2026. Of course, this is subject to change depending on construction progress.

67. **Question**: RE: DRAWING M-703 SHOWS A 1 ½" LPS LOW PRESSURE STEAM LINE FROM SECONDARY REGULATOR AT GROUND LEVEL SERVING (2) BOILERS, (1) WATER HEATER WH-700 AND (1) FURNACE F-700 IN MECH ROOM 720, WHEN YOU REFER TO DRAWING M-040 EQUIPMENT SCHEDULE, THE (2) BOILERS SCHEDULED B-700 & B-701, HOT WATER HEATER WH-700 AND THE (1) FURNACE F-700 DO NOT REQUIRE LPS LOW PRESSURE STEAM TO SERVE THEM. PLEASE ADVISE IF STEAM LINE IS REQUIRED AND IF IT IS WHAT DOES IT SERVE.
Response: "LPS" is not shown on drawing M-703. "LP" shown on drawing M-703 is a common abbreviation for propane. The (2) boilers, (1) water heater, and (1) furnace in Mech Room 720 are propane fired. There are no low pressure steam lines serving mechanical equipment.

68. **Question**: In relation to question #9 from addendum #3, during the MBR Seeding stabilization and MBR performance testing flow of influent will be required for seeding and stabilization. Is the intent to allow MBR permeate flow to discharge into the De-Chlorination tanks and subsequently outfall during this process.
Response: Yes, MBR permeate will flow through the backpulse tank, chlorination/de-chlorination tank and be discharged to the outfall during this period.

69. **Question**: Specification 055902 – Heavy-Duty Plank Aluminum Flat Panel Covers states that the covers shall be designed to support the load indicated on the project plans. The Tank Cover Design Criteria shown on Sheet S-500A specifies Flush Mounted Heavy-Duty Plank Aluminum Covers by Pleasant Mount Welding (O.A.E.) with a Live Load (LL) = 250 psf or 2500 lbs. point load at any location for the MBR Basins (see Sheet S-521). The PMWI covers specified are only good for a design LL = 100 psf and cannot meet the 250 psf live load requirement. Is it acceptable to use unpunched aluminum plank grating at a depth of 2-1/2" that can meet the 250 psf live load requirement at the required span of 8'-0"?
Response: Unpunched aluminum plank grating is acceptable for use as tank covers over the MBR Trains.

70. **Question**: If unpunched plank grating covers are acceptable in the MBR Basins, they can meet the 250 psf LL requirement, however the unpunched plank grating cannot meet the 2500 lbs. concentrated load requirement. In that case, can the 2500 lbs. concentrated load be applied over a length?

    Response: The design criteria for the MBR Train aluminum plank cover note on S-500A has been revised. The 250 psf LL shall be utilized for all design considerations for the plank grating.

Attachments:

1. Revised C-410 Bid Form for Construction Contract
2. New and Revised Veolia Design Submittal including Mechanical Submittal, P&ID, PFD, BOM, Cutsheets, GA, and Electrical drawings.
3. Revised Sheets C-115, C-120, C-121, C-122, C-124, C-126, C-142, C-250, C-310, C-322, C-420, C-510, C-530, C-531, C-542, C-604, CD-701, CD-702, C-701, C-704
4. Revised Sheets S-202, S-500A, S-510, S-511, S-521, S-523, S-524, S-525, S-528
5. Revised Sheet M-040
6. Revised Sheets E-020, E-022, E-023, E-028, E-030, E-031, E-040, E- 041, E-045, E-046, E-101, E-201, E-400, E-501, E-502, E-503, E-506, E-701
7. Revised Sheets P-400, P-501, P-502
8. Revised Specification 042000 Unit Masonry
9. Revised Specification 312334 Structural Excavation, Backfill, and Compaction
10. Revised Specification 333213 Plant Water Pump Station
11. Pressure Gauge Schedule + Detail sheet (SK-2)
12. Flood Hazard Map (SK-3)
13. Revised C-200 Instruction to Bidders for Construction Contract

ALL BIDDERS MUST SUBMIT ACKNOWLEDGEMENT OF RECEIPT OF ALL ADDENDUMS WITH BID

ACKNOWLEDGEMENT OF RECEIPT OF ALL ADDENDUMS LISTED BELOW:

ADDENDUM No. 4: July 10, 2025_____

SUBMIT THIS SHEET WITH YOUR BID

MHE Engineering, P.C.
111 Wheatfield Drive, Suite 1
Milford, PA 18337

(End of Addendum No. 4)

BID FORM FOR CONSTRUCTION CONTRACT

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders.

ARTICLE 1—OWNER AND BIDDER

1.01 This Bid is submitted to: Town of New Windsor**, 555 Union Avenue, New Windsor, NY 12553**

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2—ATTACHMENTS TO THIS BID

2.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security;

B. Required Bidder Qualification Statement with supporting data (Instructions to Bidders – Article 2);

C. Affidavit of Compliance with New York State Anti-Sexual Harassment Laws;

D. Wicks Law Form;

E. EEO Policy Statement – EFC Terms and Conditions Packet

ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

3.01 Refer to Article 7 for Description of Bid Items.

3.02 *Lump Sum Bids:*

A. Bidder will complete the Work in accordance with the Contract Documents for the following lump sum (stipulated) price(s), together with any Unit Prices indicated in Paragraph 3.02:

1. Lump Sum Price (Single Lump Sum)

Item No.	Description	Bid Amount
LS-1	Site Work (100 Series)	$
LS-2	Headworks (200 Series)	$
LS-3	Primary Settling Tanks (300 Series)	$
LS-4	Solids Handling (400 Series)	$
LS-5a	MBR (500 Series) – General Construction (Excludes LS-5b)	$

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LS-5b	Assigned Procurement Contract – Veolia Water Technologies & Solutions (F.K.A. Suez WTS USA, Inc.) (See Exhibit I)	**$3,826,000.00**
LS-6	Post-Aeration and Backpulse (600 Series)	$
LS-7	Dewatering Building (700 Series)	$
LS-8	Existing Plant Infrastructure Demolition Work (800 Series)	$
LS-9	New Workshop Garage Building (900 Series)	$
LS-10	Hazardous Material Abatement: (Excludes Demolition of Transite Pipe)	$
LS-11	Mobilization and General Conditions	$
Total of All Lump Sum Price Bid Items		$

3.03 *Contingency Items*

A. Contingency Items – These items will only be paid to the Contractor if approved by the Engineer and Owner. However, they will be used in the comparison of bids.

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
C-1	Rock Excavation	CY	200		$
C-2	Roadway Subbase Material	CY	200		$
C-3	Select Backfill	CY	200		$
C-4	Crushed Stone	CY	500		$
C-5	Additional CIP Concrete	CY	50		$
C-6	Controlled Density Fill	CY	50		$
C-7	Bituminous Concrete Pavement	SY	100		$
C-8	Stabilization Woven Geotextile Fabric	SY	100		$
C-9	Liquid Sludge Disposal	GALLON	100,000		$
C-10	Concrete Repair Type 1	SF	5000		$
C-11	Concrete Repair Type 2	SF	1500		$

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C-12	Concrete Repair Type 3	SF	500		$
C-13	Demolition of Transite Pipe	LF	500		$
C-14	Bollard	EA	5		$
Total of All Unit Price Contingency Items					$

B. Allowance - All specified cash allowance(s) are included in the price(s) set forth below, and have been computed in accordance with Paragraph 13.02 of the General Conditions.

Lump Sum for Allowance A-1: General Construction Allowance	**$350,000.00**
Lump Sum for Allowance A-2: Aqualogics Systems, Inc	**$650,000.00**
Lump Sum Allowance A-3: Veolia Contract Escalation and Additional Scope Change Order	**$500,000.00**
Lump Sum Allowance A-4: D-BEN Security Systems, Inc.	**$100,000.00**
Total for all Lump Sum for Allowance:	**$1,600,000.00**

C. Bidder acknowledges that:

1. each Bid Unit Price (Unit Price Bids and Contingency) includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and
2. estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

3.04 *Alternate Bid (Unused)*

3.05 *Total Base Bid Price (Lump Sum, Unit Price, Contingency and Allowance)*

Total Base Bid Price (Total of all Lump Sum, Unit Price, Contingency and Allowance)	$

ARTICLE 4—TIME OF COMPLETION

4.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Article 4 of the Agreement Between Owner and Contractor on or before the dates or within the number of calendar days indicated in the Agreement.

4.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

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ARTICLE 5—BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, ASSIGNMENT AND RECEIPT OF ADDENDA

5.01 *Bid Acceptance Period*

A. This Bid will remain subject to acceptance for 45 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

5.02 *Instructions to Bidders*

A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

5.03 *Receipt of Addenda*

A. Bidder hereby acknowledges receipt of the following Addenda: **[Add rows as needed. Bidder is to complete table.]**

Addendum Number	Addendum Date

5.04 *Procurement Contract Assignment*

A. Bidder acknowledges the provisions of the Agreement as to the assignment of the specified contract for procurement of goods and special services for Veolia Water Technologies & Solutions (F.K.A. Suez WTS USA, Inc.).

B. The contract between Owner as "Buyer" and Veolia Water Technologies & Solutions (F.K.A. Suez WTS USA, Inc.) as "Seller" for procurement of goods and special services ("Procurement Contract") for MBR equipment will be assigned to Contractor by Owner, and Contractor accepts such assignment. A form documenting the assignment is attached as an exhibit to this Agreement.

C. This assignment will occur on **[the Effective Date of the Agreement**] and will relieve the Owner as Buyer from all further obligations and liabilities under the Procurement Contract. Contractor, as Buyer (Contractor/Assignee) following assignment, will assume full responsibility to Owner for the performance of obligations by Seller, which will be Contractor's Subcontractor or Supplier. Notwithstanding this assignment, all performance guarantees and warranties required by the Procurement Contract will continue to run for the benefit of the Owner and, in addition, for the benefit of the Contractor. Except as noted in the Procurement Contract, all rights, duties, and obligations of Engineer to Buyer and Seller under the Procurement Contract will cease upon assignment.

D. A copy of the assigned Procurement Contract is attached as Exhibit I.

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Bidder's Representations*

A. In submitting this Bid, Bidder represents the following:

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.

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2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.

4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.

5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.

6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.

7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

6.02 *Bidder's Certifications*

A. By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of knowledge and belief:

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1. The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;
2. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and
3. No attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.
4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 6.02.A:
    a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.
    b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.
    c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.
    d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 7—DESCRIPTION OF BID ITEMS

7.01 *LS-1 – Site Work*

A. Generally, the work as shown in the 100-series project drawings, including but not limited to: clearing and grubbing, rough grading, final grading, restoration and seeding, paving and driveway install, asphalt sidewalk, perimeter fencing, guiderail, entrance gates, E&S measures, compliance with project SWPPP, stormwater piping and infrastructure, drainage improvement work, site retaining walls, relocated plant influent sewer piping and manholes, includes all site process piping (install or demo) not within 5’ of associated structures, plant water site piping, potable water site piping, all necessary piping valves, fittings, couplings, etc. for a complete system, primary electrical service, site electrical, stand-by generators, all site piping installation or demolition not included in other bid items, installation of new plant outfall, abandonment work for existing outfall system, any necessary temporary facilities, maintenance of all plant operations, shoring, and work measures for project site work sequencing, etc. New outfall construction and existing outfall abandonment work shall be completed in accordance with NYSDEC permit requirements, included as Exhibit N and Exhibit M in the contract, respectively.

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7.02 *LS-2 – Headworks*

A. Generally, the work as shown in the 200-series project drawings including, but not limited to: new influent collection box and Parshall flume structure, influent distribution boxes, new headworks building addition including all associated equipment, renovations to the existing headworks building, new grit chamber, modifications to the existing grit chamber, new primary distribution box, demolition of existing grit classifier building and existing Parshall flume and collection boxes, and any necessary temporary work measures for Headworks construction sequencing, etc. Includes all mechanical, electrical, and plumbing for completed work. Includes process piping within 5' of building and structures.

7.03 *LS-3- Primary Settling Tanks*

A. Generally, the work as shown in the 300-series project drawings, including but not limited to: furnish and install new primary settling tank mechanisms and control panels, modifications and repairs to existing primary settling tanks and scum pits, construction of a new primary settling tank (Primary Tank #4) and sludge valve vault, modifications to the existing sludge valve pit, existing sludge wet well, and existing sludge pump pit, and any necessary temporary work measures for Primary construction sequencing, etc. Includes all mechanical and electrical for completed work. Includes process piping within 5' of structures.

7.04 *LS-4- Solids Handling*

A. Generally, the work as shown in the 400-series project drawings, including but not limited to: construction of new ATAD system (new sludge holding tank, ThermAer Reactor, SDNR Reactor, biofilter tank, scrubber unit), ATAD equipment building and equipment, sludge thickening equipment, chemical feed equipment, filtrate pump station and cooling water pump system, and any necessary temporary work measures for Solids Handling construction sequencing, etc. Includes all mechanical, electrical, and plumbing for completed work. Includes process piping within 5' of building and structures.

7.05 *LS-5a- MBR - General Construction (excludes LS-5b)*

A. Generally, the work as shown in the 500-series project drawings, including but not limited to: microscreen building, influent wet well, influent dry well and pumps, bio tank splitter box, anoxic tanks, aeration tanks, MBR distribution channel, MBR Basin, MBR Basin Building Enclosure (including bridge crane system, operator space, and laydown area), MBR Control Building (including RAS Pump Room, chemical storage rooms, equipment rooms, electrical rooms, and 2nd floor), installation of all equipment furnished under the MBR procurement contract to be assigned (See LS-5b). Coordination with MBR Vendor, Owner and Operator for startup of MBR system, and any necessary temporary work measures for MBR construction sequencing, etc. Includes all mechanical, electrical, and plumbing for completed work. Includes process piping within 5' of buildings and structures.

7.06 *LS-5b- Assigned Procured Contract – Veolia Water Technologies & Solutions (F.K.A. Suez WTS USA, Inc.)*

A. Contractor shall assume the executed contract between the Town of New Windsor and Veolia Water Technologies & Solutions (F.K.A. Suez WTS USA, Inc.) for the furnishing materials and equipment, supply, start-up, commissioning, performance testing, and operator training of the proposed membrane bioreactor (MBR) system. Assumed contract is attached to this contract as Exhibit I.

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7.07 *LS-6-Post-Aeration and Backpulse*

A. Generally, the work as shown in the 600-series project drawings including, but not limited to: Modifications to existing disinfection tank (diffusers, air piping, probes and sensors, baffle wall extensions, weirs, gates, valves, etc.), install of new post-aeration platform and post-aeration blowers, construction of new backpulse tank, valve vault and associated pumps and piping, install of plant water system equipment (not inclusive of site plant water piping), and any necessary temporary work measures for Post-Aeration construction sequencing, etc. Includes all electrical for completed work. Includes process piping within 5' of structures.

7.08 *LS-7- Dewatering Building*

A. Generally, the work as shown in the 700-series project drawings, including but not limited to: Modifications and renovations to the existing plant control building for conversion to plant dewatering building, furnish and install of new dewatering belt press and associated equipment, new joint sludge conveyance system, new belt press chemical feed system, modifications to existing dewatering equipment to coordinate with new installation, ground floor demolition and slab work to accommodate second sludge storage dumpster bay, overall building interior and exterior renovations and repairs, and any necessary temporary work measures for Dewatering Building construction sequencing, etc. Includes all mechanical, electrical, and plumbing for completed work. Includes process piping within 5' of building.

7.09 *LS-8- Existing Plant Infrastructure Demolition Work*

A. Generally, the work as shown in the 800-series project drawings, including but not limited to: Complete or partial demolition work to existing secondary settling tanks, trickling filter tanks and distribution chamber, secondary pump pit, and sludge thickener tanks, any necessary temporary work measures for proposed construction sequencing, and proper disposal of all materials. Includes all associated piping within 5' of structure. Includes all mechanical, electrical, and plumbing for completed work. Includes required coordination for Engineer submission of NYSDEC Closure Report(s).

7.10 *LS-9- New Workshop Garage Building*

A. Generally, the work as shown in the 900-series project drawings including, but not limited to: Construction of a new pre-engineered metal building, associated concrete foundation, and associated site work, etc. This item also includes electrical modifications in the Plant Control Building as shown on Sheet E-900. Includes all mechanical, electrical, and plumbing for completed work.

7.11 *LS-10- Hazardous Material Abatement (Excludes Demolition of Transite Pipe)*

A. Abatement of all hazardous materials including asbestos and lead for all items identified in the Asbestos and Lead Reports which are included as part of this document. Included in this bid items are all controls for handling and disposal. Demolition and/or removal of transite pipe is not included.

7.12 *LS-11 Mobilization and General Conditions*

A. Including, but not limited to, submittals, bonds, insurance, permits and fees, coordination with Engineer, Owner, Utility Owners and private Property Owners, project layout, mark outs, maintenance and protection of traffic needed to protect the public from damage to person and property within the limits of and the duration of the contract, general restoration,

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clean up and demobilization, general conditions compliance, Division 0 & 1 Specification Contract Requirements, temporary facilities, record drawings, EFC Terms and Conditions for funding. Contractor is permitted to bill equal monthly payments based on designated contract completion time.

7.13 *C-1 – Rock Excavation*

A. Rock Excavation, including Removal, Disposal, Select Fill Backfill Material, Compaction, Compaction Testing, complete. Including:
   Minimum Bid Price - $100.00 per cubic yard
   Maximum Bid Price - $200.00 per cubic yard

7.14 *C-2 –Roadway Subbase Material*

A. Additional Roadway Subbase Material, including material, excavation, disposal, compaction, compaction testing, in-place, complete.

7.15 *C-3 – Select Backfill*

A. Additional Select Backfill material per specifications, including excavation, disposal, placement, compaction, testing, in place, complete.

7.16 *C-4 – Crushed Stone*

A. Additional crushed stone foundation material, including excavation, disposal in-place, complete.

7.17 *C-5 – Additional CIP Concrete*

A. Additional cast-in-place concrete per Specification 033000 as directed by the engineer, including removal of deleterious material, disposal, forms, steel reinforcement, curing, testing, in place, complete.

7.18 *C-6 – Controlled Density Fill*

A. Furnish and place controlled density fill as directed by engineer, in place, complete.

7.19 *C-7 – Bituminous Concrete Pavement*

A. Additional bituminous concrete pavement replacement, thickeners per pavement restoration detail, including fine grading, tack coat, in place, complete.

7.20 *C-8 –Stabilization Woven Geotextile Fabric*

A. Additional Subgrade Stabilization Woven Geosynthetic**,** including furnish and install geosynthetic fabric typical of Tencate Mirafi 1100N, or acceptable equal.

7.21 *C-9 – Liquid Sludge Disposal*

A. Contractor to pump, haul and properly dispose of sludge contained in existing secondary settling tanks and gravity thickeners prior to demolition. Coordination with operator.

7.22 *C-10 – Concrete Repair Type 1*

A. Removal and patching of unsound concrete up to a depth of 1.5” or no exposed reinforcing steel, in place, complete. Install per Detail 2 on Plan Sheet C-301. Limits as determined by Engineer.

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7.23 *C-11 – Concrete Repair Type 2*

A. Removal, reinforcing, and patching of unsound concrete in areas exceeding 1.5" depth or having exposed reinforcing steel, in place, complete. Install per Detail 3 on Plan Sheet C-301. Limits as determined by Engineer.

7.24 *C-12 – Concrete Repair Type 3*

A. Full depth concrete repairs at damaged locations along tops of existing tank walls, in place, complete. Install per Detail 4 on Plan Sheet C-301. Limits as determined by Engineer.

7.25 *C-13 – Demolition of Transite Pipe*

A. Demolition of Transite Pipe: Removal of pipe identified as containing hazardous materials, including proper handling and disposal in accordance with all Federal, State and Local Laws and Regulations, and hazardous materials specifications and drawings.

7.26 *C-14 – Bollard* *Detail 5 on Plan Sheet C-142*

A. Additional bollards installed per ~~Detail 13 on Plan Sheet C-142~~. Including excavation, concrete, bollard column sleeve installation, finishing, in place, complete.

7.27 *A-1 – Contingency Allowance: General Construction Allowance*

A. For use as directed by the Owner for unforeseen conditions related to the work.

7.28 *A-2 – Cash Allowance: Aqualogics Systems, Inc: Controls Integration and Equipment*

A. Contractor shall enter into a contract with Aqualogics Systems, Inc for the furnishing and installation of equipment in conjunction with the Town's SCADA monitoring system as called for in the Contract Documents. This would generally include the site I/O panels, main control panel, desktop computer, remote access tablet, all hardware, software, programming, screen development, integration, start-up and training services. The contract is attached to this contract as Exhibit I.

7.29 *A-3 – Cash Allowance: Veolia Contract Escalation and Additional Scope Change Order*

A. Allowance to cover anticipated escalation costs in accordance with the executed Veolia Water Technologies & Solutions (F.K.A. Suez WTS USA, Inc.) contract to be assumed by the Contractor. A cost escalation package provided by Veolia is attached to this contract as Exhibit K. This allowance will also cover anticipated scope changes to Veolia's contract. A list of additional scope items and approximate costs are attached to this contract as Exhibit J.

7.30 *A-4 – Cash Allowance:* D-BEN Security Systems, Inc.

A. Contractor shall enter into a contract with the Town's selected vendor (D-Ben Security Systems, Inc) for furnishing of equipment for security access control, cameras and fire alarm system. A list of equipment and quote is attached to this contract as Exhibit L. The allowance includes the equipment cost ONLY. Installation is to be performed by the contractor and included within their base bid. To clarify, the fire alarm system, control panel, and all associated equipment, components, and devices (horns, strobes, pull stations, smoke detectors, heat detectors, carbon monoxide detectors, annunciators, control relays, power supplies, etc.), and security system (access control equipment and cameras) as shown on the contract drawings are to be furnished (supplied) by the owner's preferred vendor (D-Ben Security Systems, Inc) thru the allowance stated above. The contractor is responsible for all circuitry (conduit and conductors) between devices as shown and specified on the contract

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drawings, as well as the installation and termination of these devices per the manufacturer's requirements and included in their base bid.

BIDDER hereby submits this Bid as set forth above:

Bidder:

_____

(typed or printed name of organization)

By: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.

Attest: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

Address for giving notices:

_____

_____

Bidder's Contact:

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Phone: _____

Email: _____

Address:

_____

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Bidder's Contractor License No.: (if applicable) _____

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VEOLIA

VEOLIA Project # : 510464
Transmittal # : CTR-0005

VEOLIA Water Technologies
& Solutions

Client Outgoing Transmittal Document

TO : msickler@mhepc.com, jzajac@mhepc.com, dsorvillo@mhepc.com, hanumanthaiah.c@veolia.com, vtc.vwts.wats.namproj.doccontrol.all@veolia.com	CC : darren.preete@veolia.com, priscilla.oloruntoba@veolia.com, robert.polo.ext@veolia.com
Transmittal Method : Insert Transmittal Method Customer PO :	Project Name : Caesars Lane WWTP Project Manager : Darren Preete Project Engineer : Priscilla Oloruntoba

Issue Date : 04-Jun-2025 **Transmittal # :** CTR-0005

Description : Mechanical Submittal, P&ID, PFD, BOM, Cutsheet, GA

Reference Notes :

Submit all returns by email to the VEOLIA Document Control Department at vtc.vwts.wats.namproj.doccontrol.all@veolia.com

VEOLIA Doc #	Rev	Document Title	Issued For	Return Date
510464-WTS-ME-667-1010-DA-001	B	General Arrangement - MEMBRANE CONCRETE TANK	FA	18-Jun-2025
510464-WTS-ME-MAT-MISC-DT-001	D	Cutsheet Package	FA	18-Jun-2025
510464-WTS-ME-SYS-EN10-BQ-001	D	Equipment BOM	FA	18-Jun-2025
510464-WTS-PR-SYS-EN11-DI-001	D	Process Flow Diagram (PFD)	FA	18-Jun-2025
510464-WTS-PR-SYS-EN21-DS-100	~~E~~ F	P&ID TITLE PAGE	FA	18-Jun-2025
510464-WTS-PR-SYS-EN21-DS-102	~~E~~ F	P&ID - Blower - Membrane Blower	FA	18-Jun-2025
510464-WTS-PR-SYS-EN21-DS-103	~~E~~ F	P&ID - Bioreactor	FA	18-Jun-2025
510464-WTS-PR-SYS-EN21-DS-104	~~E~~ F	P&ID - Primary Membrane Tank	FA	18-Jun-2025
510464-WTS-PR-SYS-EN21-DS-105	~~E~~ F	P&ID - PERMEATE SIPHON & ASSOC EQUIPMENT	FA	18-Jun-2025
510464-WTS-PR-SYS-EN21-DS-106	~~E~~ F	P&ID - CIP / BP SYSTEM	FA	18-Jun-2025
510464-WTS-PR-SYS-EN21-DS-109	~~E~~ F	P&ID - EJECTOR ASSEMBLY	FA	18-Jun-2025
510464-WTS-PR-SYS-EN21-DS-110	~~E~~ F	P&ID - RAS/WAS/DRAIN PUMP	FA	18-Jun-2025
510464-WTS-PR-SYS-EN21-DS-111	~~E~~ F	P&ID - CHEMICAL DOSING SYSTEM	FA	18-Jun-2025
510464-WTS-PR-SYS-EN21-DS-112	~~E~~ F	P&ID - AIR COMPRESSOR	FA	18-Jun-2025

Revised 07/03/25

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**********End of Transmittal**********

VEOLIA

VEOLIA Project # : 510464
Transmittal # : CTR-0006

VEOLIA Water Technologies
& Solutions

Client Outgoing Transmittal Document

TO : dsorvillo@mhepc.com, msickler@mhepc.com, jzajac@mhepc.com, hanumanthaiah.c@veolia.com, vtc.vwts.wats.namproj.doccontrol.all@veolia.com	CC : darren.preete@veolia.com, priscilla.oloruntoba@veolia.com, robert.polo.ext@veolia.com
Transmittal Method : Insert Transmittal Method Customer PO :	Project Name : Caesars Lane WWTP Project Manager : Darren Preete Project Engineer : Priscilla Oloruntoba

Issue Date : 11-Jun-2025 **Transmittal # :** CTR-0006

Description : Client submit

Reference Notes : FI-New Revised Electrical drawings

Submit all returns by email to the VEOLIA Document Control Department at vtc.vwts.wats.namproj.doccontrol.all@veolia.com

VEOLIA Doc #	Rev	Document Title	Issued For	Return Date
510464-WTS-EL-000-5100-BQ-001	C	BILL OF MATERIAL MAIN CONTROL PANEL, CP-01	FI	No return required
510464-WTS-EL-000-5100-BQ-002	A	BILL OF MATERIAL AIR COMPRESSOR PANEL	FI	No return required
510464-WTS-EL-000-5100-DC-001	C	PANEL LAYOUT MAIN CONTROL PANEL, CP-01 FRONT DOOR LAYOUT	FI	No return required
510464-WTS-EL-000-5100-DC-002	A	PANEL LAYOUT AIR COMPRESSOR PANEL	FI	No return required
510464-WTS-EL-000-5100-DI-001	C	SCHEMATIC WIRING DIAGRAM MAIN CONTROL PANEL, CP-01 NOTES LEGEND	FI	No return required
510464-WTS-EL-000-5100-DI-002	A	SCHEMETICS AIR COMPRESSOR PANEL	FI	No return required
510464-WTS-EL-SYS-EN23-DI-001	~~B~~ C	Electrical Single Line Diagram	FI	No return required
~~510464-WTS-EL-SYS-EN33-LI-001~~	C	I/O List	FI	No return required

Revised 07/03/25

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**********End of Transmittal**********

ITEM	TAGS	QTY	MFG	CATALOG	DESCRIPTION
1	ENCLOSURE	1	HOFFMAN	A727216ULP	FLOOR MOUNT ENCLOSURE, TWO-DOOR WITH FLOOR STANDS AND 3-POINT LATCH, Type 12 NEMA 12 72 x 72 x 16 IN, MILD STEEL
2	BACK PANEL	1	HOFFMAN	A72P72	ENCLOSURE PANEL PAINTED STEEL
3	GND LUG	1	HOFFMAN	AGLK2	GROUNDING LUG KIT 2-14 AWG
4	DS0313 DS0314	2	HOFFMAN	ALFSWD	DOOR SWITCH, FOR ENCLOSURE INTRUSION DETECTION DS
5	WLT0313 WLT0314	2	HOFFMAN	LEDA1S35	LED LIGHT KIT, 90VAC-260VAC, SCREW, ON/OFF SWITCH 90VAC-260VAC,
6	DISC0303	1	CUTLER HAMMER	R5A3030U/SHR00N12 /DMK	ROTARY CAM SWITCH, 30 AMP, 3 POLE, N12/ 30A
7	CB0313 CB0318 CB0401 CB0404 CB0407 CB0410 CB0413 CB0416 CB0419 CB0422 CB0425 CB0428 CB0431 CB0434 CB0437 CB0440 CB0442 CB0444 CB0446	19	AB	1489-M1C010	UL489/CSA 22.2 NO 5.1 MINIATURE CIRCUIT BREAKER, 1 POLE, TRIP CURVE C, 1 AMP 1AMPS
8	CB0316 CB0325 CB0328 CB0333 CB0338 CB0343	6	AB	1489-M1C020	UL489/CSA 22.2 NO 5.1 MINIATURE CIRCUIT BREAKER, 1 POLE, TRIP CURVE C, 2 AMP 2AMPS
9	CB0501 CB0506	2	AB	1489-M1C050	UL489/CSA 22.2 NO 5.1 MINIATURE CIRCUIT BREAKER, 1 POLE, TRIP CURVE C, 5 AMP 5AMPS
10	TB-DCCOM TB-FLD(1) TB-N TB-N(1) TB-VAC TB-VAC(1) TB-VDC(1)	50	AB	1492-EAJ35	END ANCHOR END ANCHOR
11		14	AB	1492-EBJ3	END BARRIER; 1492-J END SECTION
12	FU0537 FU0538 FU0539 FU0545 FU0546 FU0605 FU0606 FU0612 FU0613 FU0625 FU0628 FU0631 FU0634 FU0637 FU0640 FU0643 FU0646 FU0701 FU0704 FU0707 FU0710 FU0713 FU0716 FU0719	27	AB	1492-H5	TERMINAL BLOCK/STRIP 15AMPS
37	FU0722 FU0725 FU0734	27	BUSSMANN	ABC-1-R	FUSE, 1A 250V
12	FU0531	1	AB	1492-H5	TERMINAL BLOCK/STRIP 15AMPS
40		1	BUSSMANN	ABC-3-R	FUSE, 3A 250V
12	FU0516 FU0518 FU0521 FU0525 FU0528 FU0534 FU0540 FU0541 FU0542 FU0543 FU0544 FU0601 FU0602 FU0603 FU0604 FU0607 FU0608 FU0609	19	AB	1492-H5	TERMINAL BLOCK/STRIP 15AMPS
39	FU0610	19	BUSSMANN	ABC-2-R	FUSE, 2A 250V

VEOLIA WTS
CONTROLLED DOCUMENT

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS: .X - ±0.1, .XX - ±0.01, .XXX - ±0.005
ANGLES: - ±0.5°
FRAC: - ±1/64

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

BILL OF MATERIAL
MAIN CONTROL PANEL, CP-01

DRAWING NUMBER: 510464-WTS-EL-000-5100-BQ-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 01 OF 04
LAST SAVED: Tuesday, June 10, 2025 7:25:24 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-BQ-001-01.dwg

ITEM	TAGS	QTY	MFG	CATALOG	DESCRIPTION
12	FU0611 FU0614 FU0615 FU0616 FU0617 FU0618 FU0619 FU0620 FU0621 FU0622	10	AB	1492-H5	TERMINAL BLOCK/STRIP 15AMPS
39		10	BUSSMANN	ABC-2-R	FUSE, 2A 250V
12	FU0514	1	AB	1492-H5	TERMINAL BLOCK/STRIP 15AMPS
38		1	BUSSMANN	ABC-15-R	FUSE, 15A 250V
13	TB-N(1) TB-VAC(1)	2	AB	1492-J10	SCREW CONNECTION TERMINAL BLOCK; 1492-J 65AMPS
14	TB-DCCOM TB-FLD(1) TB-N TB-VAC TB-VDC(1)	195	AB	1492-J4	SCREW CONNECTION TERMINAL BLOCK; 1492-J 35AMPS
15		1	AB	1492-N37	END BARRIER END BARRIER
16	PLC RACK A	1	AB	1756-A7	1756 CONTROL LOGIX RACK I/O, 7 SLOT CHASSIS RACK
17	DN1101	1	AB	1756-EN2TR	1756 CONTROL LOGIX ETHERNET / IP MODULE SPECIAL
18	DN1102	1	AB	1756-EN2T	1756 CONTROL LOGIX ETHERNET / IP MODULE SPECIAL
19	CPU0101	1	AB	1756-L81E	CONTROLLOGIX 5580 CONTROLLER WITH 3 MB USER MEMORY PROCESSOR
20	EMPTY SLOT COVER	4	AB	1756-N2	1756 CONTROL LOGIX SLOT FILLER CARD SPECIAL
21	PWS0325	1	AB	1756-PA72	1756 CONTROL LOGIX POWER SUPPLY POWER SUPPLY
22		AR	AB	199-DR1	ZINC/STEEL DIN RAIL EN 50022 (35mm x 7.5mm x 1m) SLOTTED

ITEM	TAGS	QTY	MFG	CATALOG	DESCRIPTION
23	HMI0531	1	AB	2711P-T15C22D9P	PANELVIEW PLUS 7 PERFORMANCE TERMINAL, 15 INCHES 24VDC
47		1	KINGSTON	SD4/16GB	FLASH CARD 16GB , SD4 MEMEORY
24	ETH0518 ETH0521 ETH0525 ETH0528	4	AB	5094-AENTR	5094 COMMUNICATION ADAPTER, ETHERNET , UPTO 8 MODULES ETHERNET ADAPTER
25		4	AB	5094-ECR	TERMINAL BLOCK ASSY ACCESSORY
26	PLC0902 PLC1002 PLC1102 PLC1802 PLC1902 PLC2502 PLC2602 PLC2702 PLC3402 PLC3502 PLC3602 C	11	AB	5094-IB16	5000 FLEX I/O MODULE, 16CH DIGITAL INPUT, CHASSIS MOUNT DISCRETE INPUT
28		11	AB	5094-MB	FLEX 5000 TERMINAL BLOCK, 100mA, 15VDC, MOUNTING BASE ACCESSORY
31		11	AB	5094-RTB3	5094 RTB SCREW TERMINAL BLOCK ACCESSORY
27	PLC1402 PLC1502 PLC2202 PLC3002 PLC3102 PLC3902 PLC4002 C	7	AB	5094-IF8	5000 FLEX I/O MODULE, 8CH ANALOG INPUT ANALOG INPUT
28		7	AB	5094-MB	FLEX 5000 TERMINAL BLOCK, 100mA, 15VDC, MOUNTING BASE ACCESSORY
31		7	AB	5094-RTB3	5094 RTB SCREW TERMINAL BLOCK ACCESSORY
32			AB	5094-STB	5094 SHIELD RTB SCREW ACCESSORY
29	PLC1202 PLC1302 PLC2002 PLC2102 PLC2802 PLC2902 PLC3702 PLC3802 C	8	AB	5094-OB16	5000 FLEX I/O MODULE, 16CH DIGITAL OUTPUT, CHASSIS MOUNT DISCRETE OUTPUT
28		8	AB	5094-MB	FLEX 5000 TERMINAL BLOCK, 100mA, 15VDC, MOUNTING BASE ACCESSORY
31		8	AB	5094-RTB3	5094 RTB SCREW TERMINAL BLOCK ACCESSORY

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC
.XXX - -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

BILL OF MATERIAL
MAIN CONTROL PANEL, CP-01

DRAWING NUMBER: 510464-WTS-EL-000-5100-BQ-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 02 OF 04
LAST SAVED: Tuesday, June 10, 2025 7:25:25 PM

FILE LOCATION: C:_ADSKVault\VMA\510464 - Caesars Lane WWTP-4, Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-BQ-001-02.dwg

ITEM	TAGS	QTY	MFG	CATALOG	DESCRIPTION
30		4	AB	5094-OF8	5000 FLEX I/O MODULE, 8CH ANALOG OUTPUT ANALOG OUTPUT
28	PLC1602 PLC2302 PLC3202 PLC4102 C	4	AB	5094-MB	FLEX 5000 TERMINAL BLOCK, 100mA, 15VDC, MOUNTING BASE ACCESSORY
31		4	AB	5094-RTB3	5094 RTB SCREW TERMINAL BLOCK ACCESSORY
32			AB	5094-STB	5094 SHIELD RTB SCREW ACCESSORY
33	CR1203 CR1205 CR1207 CR1209 CR1211 CR1213 CR1215 CR1217 CR1229 CR1231 CR1309 CR1311 CR1313 CR1317 CR1327 CR1329 CR2003 CR2005 CR2007 CR2009 CR2011 CR2017 CR2027 CR2105 CR2107 CR2109 CR2113 CR2115 CR2117 CR2807 CR2809 CR2813 CR2833 CR2835 CR2837 CR2907 CR2909 CR2913 CR2933 CR2935 C	40	AB	700-HK36Z24	HK TYPE SLIM LINE RELAY WITH SOCKET 700-HN221 24VDC
		40	AB	700-HN221	SCREW TERMINAL MINIATURE SOCKET SOCKET

ITEM	TAGS	QTY	MFG	CATALOG	DESCRIPTION
33	CR2937 CR3707 CR3709 CR3713 CR3733 CR3735 CR3737 CR3807 CR3809 CR3813 CR3833 CR3835 CR3837 C	13	AB	700-HK36Z24	HK TYPE SLIM LINE RELAY WITH SOCKET 700-HN221 24VDC
		13	AB	700-HN221	SCREW TERMINAL MINIATURE SOCKET SOCKET
34	PB0935	1	AB	800HC-FRXT6A1	30MM PUSH-PULL DEVICE,MAINTAINED PUSH-PULL/TWIST PB,2-POSITION,TWIST RELEASE,NEMA 4X, STANDARD MUSHROOM HEAD,RED RED
35	LT1241	1	AB	800HC-QRH2A	30MM PILOT LIGHT,FULL V TYPE W/ INCAND LAMP,LED LAMP,12-130V AC/DC,AMBER, NEMA 4X, FINGER GUARDS ON TERMINALS,DEVICE WITH PACKAGING 12-130V AC/DC
36	LT0311	1	AB	800HC-QRH2W	WHITE PILOT LIGHT - FULL VOLTAGE/UNIVERSAL, ROUND OILTIGHT, LED,FINGER GUARDS ON TERMINALS 12-130V AC/DC
41	PWS0511	1	PHOENIX CONTACT	2320173	QUINT Redundancy Module for DIN Rail Mounting with Auto Current Balancing ACB, Input: 24V DC, OUTPUT: 24V DC QUINT SERIES, UL/CSA
42	PWS0501 PWS0506	2	PHOENIX CONTACT	2904601	QUINT POWER SUPPLY, SELECTIVE FUSE BREAKING, NFC INTERFACE, INPUT 1-PHASE, OUTPUT: 24V DC QUINT SERIES, UL/CSA
43	SPD0306	1	PHOENIX CONTACT	2907918	TYPE 3 SURGE PROTECTION DEVICE - PLT-SEC-T3-120-FM-UT 10KA
44	RECP0320	1	GRACE PORT	P-R2-K3RF3	PLC, ETHERNET, PROGRAMMING PORT, 120V 3A, GFCI GFCI
45	ETH0534	1	N-TRON	108TX	ETHERNET SWITCH, 8 PORT 10/100BASETX RJ45 UNMANAGED
46		1	ILSCO	D167-10	GROUND BAR, TO TAPS, 6-14AWG MAIN CONDUCTOR, 4-14AWG MAIN CONDUCTOR, CU N/A

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC -
.XXX - -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

BILL OF MATERIAL
MAIN CONTROL PANEL, CP-01

DRAWING NUMBER: 510464-WTS-EL-000-5100-BQ-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 03 OF 04
LAST SAVED: Tuesday, June 10, 2025 7:25:25 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4.Electrical Drawings\510464_MCP\510464-WTS-EL-000-5100-BQ-001-03.dwg

ITEM	TAGS	QTY	MFG	CATALOG	DESCRIPTION
48	1 X 4 AC WIRING DUCT	AR	PANDUIT	F1X4LG6	NARROW FINGER, SLOTTED WIRING DUCT SLOTTED
		AR	PANDUIT	C1LG6	WIRING DUCT COVER
49	2 X 4 INTERNAL WIRING DUCT	AR	PANDUIT	F2X4LG6	NARROW FINGER, SLOTTED WIRING DUCT, WITH COVER C2LG6 SLOTTED
		AR	PANDUIT	C2LG6	WIRING DUCT COVER
50	3 X 4 AC WIRING DUCT 3 X 4 DC WIRING DUCT	AR	PANDUIT	F3X4LG6	NARROW FINGER, SLOTTED WIRING DUCT SLOTTED
		AR	PANDUIT	C3LG6	WIRING DUCT COVER
51	4 X 4 DC WIRING DUCT 4 X 4 INTERNAL WIRING DUCT	AR	PANDUIT	F4X4LG6	NARROW FINGER, SLOTTED WIRING DUCT SLOTTED
		AR	PANDUIT	C4LG6	WIRING DUCT COVER
52	STAND-OFF	2	PANDUIT	UGB-IN-SO	ISOLATION STAND-OFF FOR PANDUIT GRUND BAR
53	BB-ISO	1	PANDUIT	UGB2 0-414-18	18-PORT UNIVERSAL GROUND BAR COPPER
54	L2	1	CLARION SAFETY SYSTEM	5025-61DHPK	LABEL, HAZARDOUS VOLATGE CUSTOM
55	L5	1	VEOLIA	FUSE TORQUE LABEL	LABEL, SUPPLY FUSE TORQUE CUSTOM
56	L4	1	VEOLIA	PANEL SHOP UL	UL, LABEL CUSTOM
57	NP1	1	VEOLIA	PANEL-TAG-LABEL	LABEL, FOR PANEL TAG, 10 X 2.5 CUSTOM
58	L3	1	VEOLIA	VEOLIA WATER TECHNOLOGIES	LABELS, VEOLIA, WTS, 18 X 3.75 LABEL
59	L1	1	VEOLIA	VEOLIA-MFG-LABEL	LABEL, SSCR/MFG PRODUCT INFO CUSTOM
62	NP2	4	VEOLIA	COMPONENT TAG	LABEL, FOR PANEL TAG, 2.75 X 1 CUSTOM

ITEM	TAGS	QTY	MFG	CATALOG	DESCRIPTION
60	FU0303	1	BUSSMANN	CHCC1DIU	1 POLE FUSE BLOCK - CLASS CC 600VAC
61		1	BUSSMANN	LP-CC-20	FUSE, 20A 600VAC
63	ISB0725 ISB0734	2	EATON	MTL5516C	SWITCH/ PROXIMITY DETECTOR INTERFACE 2-CHANNEL, WITH LINE FAULT DETECTION, 24VDC LED INDICATORS LINE FAULT DETECTION ZONE 0, IIC, T4 6 HAZARDOUS AREA DIV. 1, GROUP A HAZARDOUS LOCATION
64	TB-ISB	1		1492-J4-B	SCREW CONNECTION TERMINAL BLOCK; 1492-J FEED-THROUGH 35AMPS BLUE COLOR, 22-10AWG, RATED VOLTAGE 600VAC/DC STANDARD FEED-THROUGH BLOCK; SCREW CONNECT
65	TB-ISB END BARRIER	1		1492-EBJ3-B	END BARRIER; 1492-J HARDWARE END SECTION BLUE FOR SERIES 1492-J TERMINAL BLOCK 1492-J2Q
66	L8	1	-	-	L8, LABEL, GAS GROUP, BLACK LETTERS ON WHITE BACKGROUND
67	L9	1	-	-	L9, LABEL, WARNING, BLACK LETTERS ON ORANGE BACKGROUND
68	L10	1	-	-	L10, LABEL, IS FIELD WIRING TERMINALS, LAMACOID/LABEL BLACK LETTERS ON WHITE BACKGROUND
69	1 X 4 BLUE WIRING DUCT	AR	PANDUIT	F1X4IB6	NARROW FINGER, SLOTTED WIRING DUCT SLOTTED, INTRINSIC BLUE
		AR	PANDUIT	C1IB6	WIRING DUCT COVER, INTRINSIC BLUE

NOTES :
1. PROVIDE ONE (1) COMPLETE SET OF SPARE FUSES INCLUDING MINIMUM OF FIVE (5) SPARE CONTROL FUSES (IE : AGC/ABC/MDL STYLE) FOR EACH SIZE, PACKAGED TOGETHER AND AFFIXED TO THE INSIDE OF THE ENCLOSURE.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX -
ANGLES - FRAC -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

BILL OF MATERIAL
MAIN CONTROL PANEL, CP-01

DRAWING NUMBER: 510464-WTS-EL-000-5100-BQ-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 04 OF 04

LAST SAVED: Tuesday, June 10, 2025 7:25:26 PM

FILE LOCATION: C:_ASSYVault\NAM\510464 - Caesars Lane WWTP 4, Electrical Drawings\510464 - MCP-510464-WTS-EL-000-5100-BQ-001-04.dwg

ITEM	TAGS	QTY	MFG	CATALOG	DESCRIPTION
1	ENCL	1	HOFFMAN	CSD242010	CONCEPT WALL-MOUNT ENCLOSURE WALL-MOUNT ENCLOSURE NEMA 4, 12, STEEL, 24x20x10 IN, W/ SINGLE DOOR USE TO HOUSE AND PROTECT EL. COMPONENTS
2	BACKPLATE	1	HOFFMAN	CP2420	BACK PLATE, 22.2X18.2, CP2420, HOFFMAN NEMA BACK PLATE
3	DISC0301	1	ABB	OHB65J6	BLACK HANDLE - PADLOCKABLE, DEFEATABLE, w/METAL HASP HANDLE
		1	ABB	OS30FAJ12	DISCONNECT SWITCH FUSIBLE ,600V,30A ,3POLE 30AMPS
		3	BUSSMANN	LPJ-25SP	FUSE, 25A 600VAC
		1	ABB	OSS160-GG1L-3	DISCONNECT- SHROUD, ABB N/A
		1	ABB	OXP6X210	DISCONNECT SWITCH, SHAFT, 6mm DIA
		1	ABB	OZXA-24	DISCONNECT LUG KIT,14-2/0 AWG ALUMINUM
4	T0320	1	ACME ELECTRIC	CE250N007	XFMR-CNTRL, 480/600VAC, 120VAC-50/60Hz, 250VA, ACME, 250VA
5	SS0313	1	AB	800FP-SM32PX20	SELECTOR SWITCH- 3 POS MAINTAINED,A-B,2N0,MAN,SM, KNOB BLACK
6	CONTACT BLOCK	2	AB	800F-X10	SWITCH-CONTACT BLOCK, A-B,22MM, NO
7	MS0304	1	AB	100-C30D10	100-C CONTACTOR, 3-POLE 30AMPS, 110VAC 50Hz, 120VAC 60Hz
8	OL0304	1	AB	193-1EEEB	193S, E1 PLUS SOLID-STATE OVERLOAD RELAY, 3-PHASE, SCREW TYPE CONTROL TERMINALS 5.4-27AMPS (SEE NOTE 1)
9	FU0319	1	BUSSMANN	CHCC1D	1 POLE FUSE BLOCK - CLASS CC 600VAC
			BUSSMANN	LP-CC-2	FUSE, 2A 600VAC

ITEM	TAGS	QTY	MFG	CATALOG	DESCRIPTION
10	FU0308A	1	BUSSMANN	CHCC1D	1 POLE FUSE BLOCK - CLASS CC 600VAC
			BUSSMANN	LP-CC-3	FUSE, 3A 600VAC
11	FU0308	1	BUSSMANN	CHCC2DU	2 POLE FUSE BLOCK - CLASS CC 600VAC
		2	BUSSMANN	LP-CC-2	FUSE, 2A 600VAC
12	TB-FLD TB-N TB-VAC	14	AB	1492-L3T	SPRING CLAMP TERMINAL BLOCK, STANDARD FEED-THROUGH BLOCK, 1492-L 25AMPS
13	END ANCHOR	13	AB	1492-EAJ35	END ANCHOR END ANCHOR
14	END BARRIER	3	AB	1492-EBL3	END BARRIER; 1492-L END SECTION
15	BB	1	ILSCO	D167-10	BUS BAR
16	DIN RAIL	A/R	AB	199-DR1	ZINC/STEEL DIN RAIL EN 50022 (35mm x 7.5mm x 1m) SLOTTED
17	LUG	1	BURNDY	K2A25U	TERMINAL LUG ALUMINUM,14-1/0 AWG
18	L1	1	VEOLIA	VEOLIA-MFG-LABEL	LABEL, SSCR/MFG PRODUCT INFO
19	L2	1	CLARION SAFETY SYSTEM	5025-61DHPK	LABEL, HAZARDOUS VOLATGE
20	NP1	1	VEOLIA	-	NAMEPLATE 10" X 2.5"
21	L3	1	MITOGRAPHERS	-	NALABLE, VEOLIA, 7.36"X3.00" WITH BACKGROUND, RED LETTERING VEOLIA P/N 3205612
22	L5	1	VEOLIA	-	L5, LABEL, SUPPLY, FUSE, TORQUE
23	1 X 4 AC DUCT	A/R	PANDUIT	F1X4LG6	NARROW FINGER, SLOTTED WIRING DUCT 1.25 X 4.08 SLOTTED LIGHT GRAY LEAD-FREE PVC, STANDARD MOUNTING HOLES

NOTES:

1. USE THIS OVERLOAD RELAY FOR 15HP COMPRESSOR PANEL.
2. REPLACE "X" WITH "A" FOR COMPRESSOR 90-AC-001-A AND "B" FOR COMPRESSOR 90-AC-001-B

VEOLIA WTS CONTROLLED DOCUMENT

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE	-	RKP	HX	HX	05-JUN-2025

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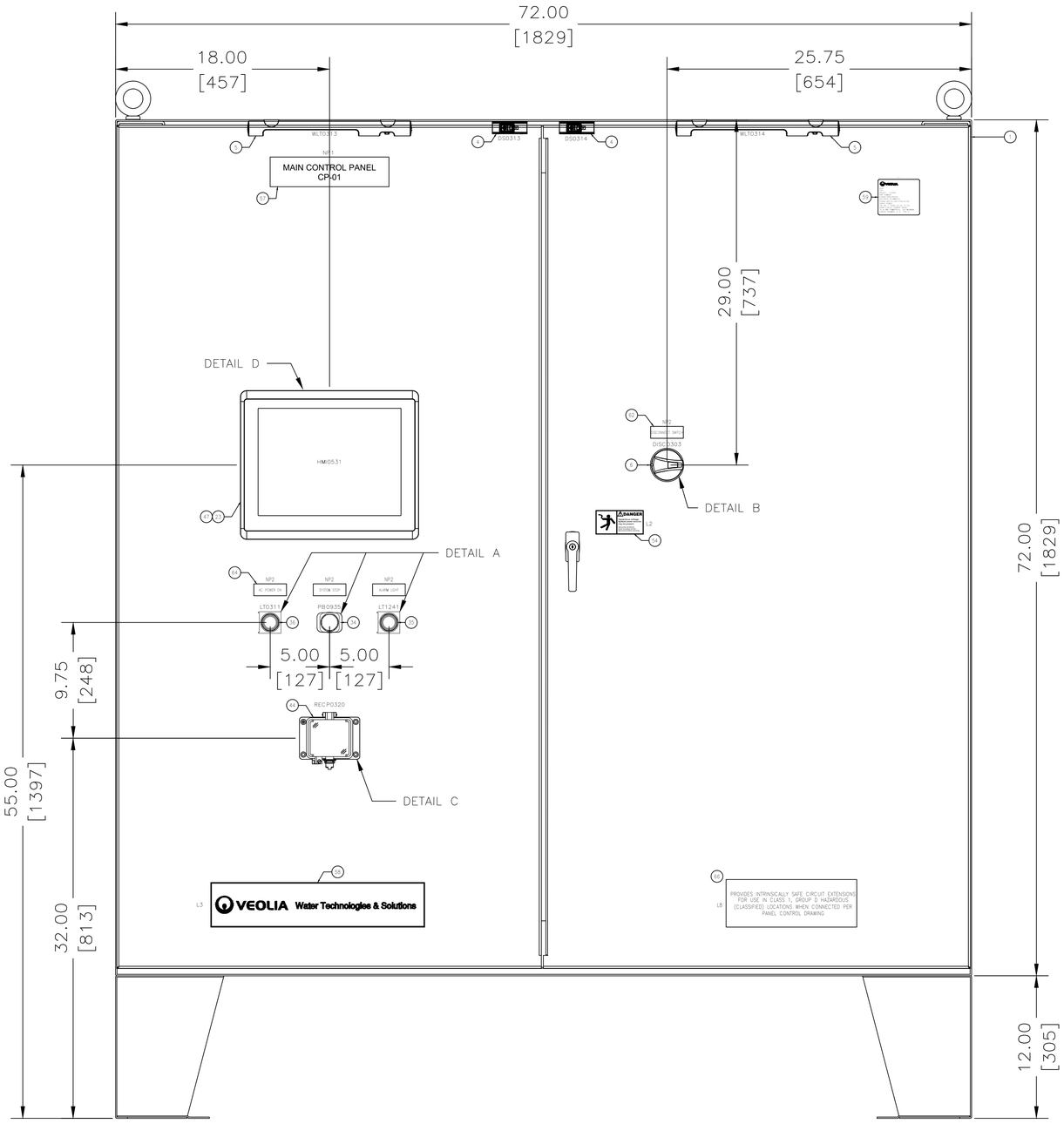
TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC
.XXX - -

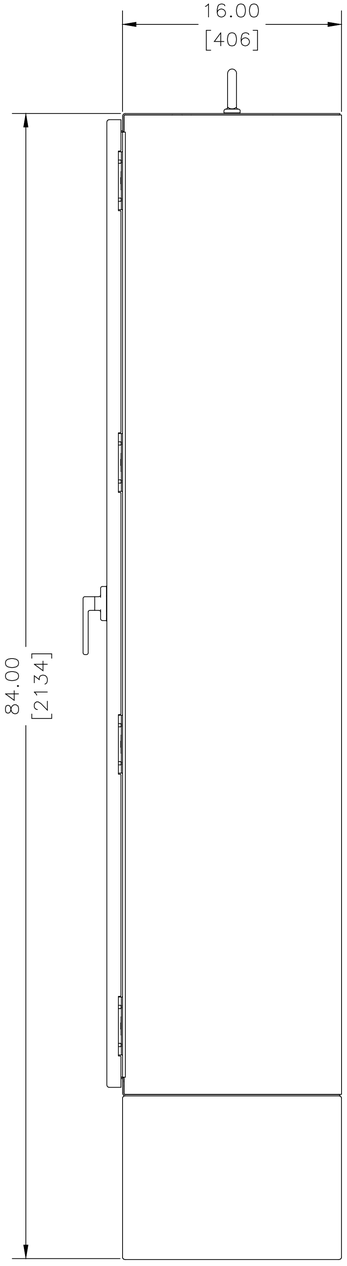
CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

AIR COMPRESSOR PANEL
BILL OF MATERIALS

DRAWING NUMBER: 510464-WTS-EL-000-5100-BQ-002
REVISION: A
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C002
SCALE: NONE
SIZE: D
SHEET: 01 OF 01
LAST SAVED: Friday, June 6, 2025 3:31:18 PM

FILE LOCATION: C:_ASSK\Vault\VAAA\510464 - Caesars Lane WWTP\4. Electrical Drawings\COMPRESSOR PANEL\510464-WTS-EL-000-5100-BQ-002-01.dwg





L1

VEOLIA

XXXX
YYYY
PROJECT – 510464
PART NUMBER:
510464–0005100C001
ELECTRICAL SCHEMATICS:
510464–WTS–EL–000–5100–DI–001
SUPPLY POWER:
120 VAC, 1 PHASE, 60 HZ, 15 FLA
SHORT–CIRCUIT CURRENT RATING
10 kA RMS SYMMETRICAL, 120V MAXIMUM
CABINET ASSEMBLY IS UL TYPE 12

SEE NOTE 1

NOTE:

1. MANUFACTURER'S PRODUCT DATA CONTAINED ON LABEL L1.
   YYYY = LOCATION OF VEOLIA WTS MANUFACTURING FACILITY. (i.e. CITY. STATE/PROVINCE, COUNTRY)
   XXXX = CONTROL PANEL MANUFACTURING FACILITY (i.e. MANUFACTURED BY: PANEL SHOP NAME, CITY, STATE/PROVINCE, COUNTRY) IF DIFFERENT FROM VEOLIA WTS MANUFACTURING FACILITY. OTHERWISE THIS LINE IS LEFT BLANK.
2. UL LABEL (L4) AND SUPPLY/FUSE TORQUE LABEL (L5) AFFIXED TO INSIDE OF FRONT DOOR.
3. GROUND DOOR IN ACCORDANCE WITH ENGINEERING PHASE III ELECTRICAL ASSEMBLY WORK INSTRUCTION 302.MTKA.200.
4. ALL DIMENSIONS ARE IN INCHES[mm]
5. REFERENCE DEVICE CUT–OUT INFORMATION ON PAGE 4 AND NAMEPLATE DETAILS ON PAGE 5
6. CABLE ENTRY IS FROM BOTTOM OF PANEL.

NAMEPLATE AND LABEL:

7. ALL INTERIOR PANEL COMPONENTS SHALL BE IDENTIFIED WITH MACHINE PRINTED/ENGRAVED ADHESIVE BACKDED PHENOLIC OR LAMCOID LABEL AFFIXED TO THE BACK PLATE.
8. EXTERIOR NAME PLATE BLACK LETTERS ON THE WHITE BACKGROUND. $\frac{1}{4}$" CHARACTER FOR CONTROL PANELS.

VEOLIA WTS
CONTROLLED DOCUMENT

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC
.XXX - -

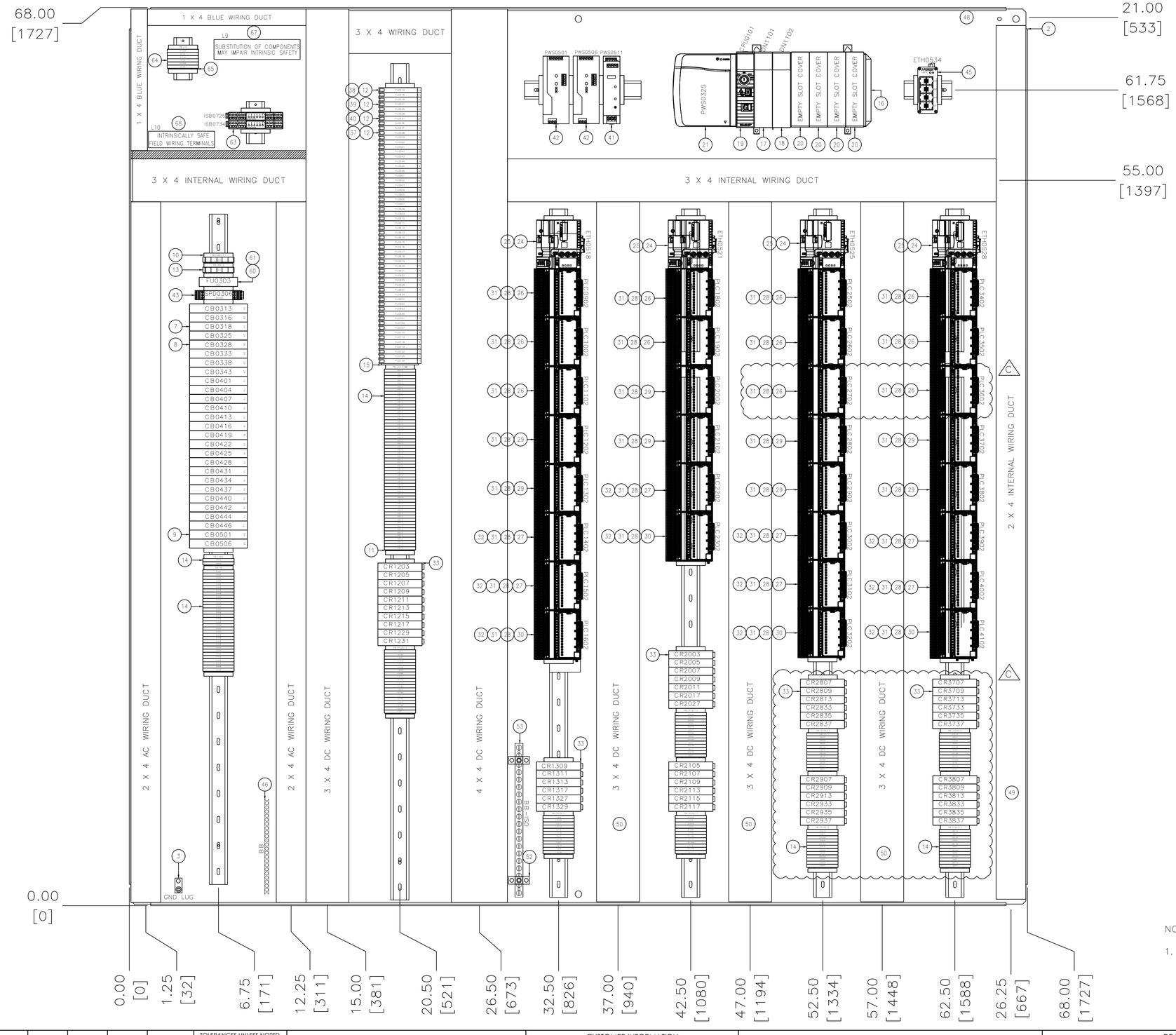
VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

PANEL LAYOUT
MAIN CONTROL PANEL, CP-01
FRONT DOOR LAYOUT

DRAWING NUMBER: 510464-WTS-EL-000-5100-DC-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 01 OF 06
LAST SAVED: Tuesday, June 10, 2025 7:24:33 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP-4, Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DC-001 (01).dwg



NOTE:

1. ALL DIMENSIONS ARE IN INCHES[mm]

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX -
ANGLES - FRAC -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

PANEL LAYOUT
MAIN CONTROL PANEL, CP-01
BACKPANEL LAYOUT

DRAWING NUMBER	REVISION
510464-WTS-EL-000-5100-DC-001	C

REF.: -
DOC. OWNER: -

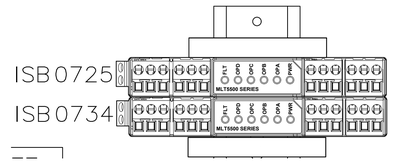
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LAST SAVED: Tuesday, June 10, 2025 7:24:34 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP 4, Electrical Drawings\510464_MCP-510464-WTS-EL-000-5100-DC-001-02.dwg

TB-IS
0726A
0726
0729A
0729
0735A
0735

ISB0725
ISB0734



TB-VAC(1)
0303

TB-N(1)
0301

FU0303 20A

SPD0306 120VAC

CB0313	1A
CB0316	2A
CB0318	1A
CB0325	2A
CB0328	2A
CB0333	2A
CB0338	2A
CB0343	2A
CB0401	1A
CB0404	1A
CB0407	1A
CB0410	1A
CB0413	1A
CB0416	1A
CB0419	1A
CB0422	1A
CB0425	1A
CB0428	1A
CB0431	1A
CB0434	1A
CB0437	1A
CB0440	1A
CB0442	1A
CB0444	1A
CB0446	1A
CB0501	5A
CB0506	5A

TB-VAC
0309
0309

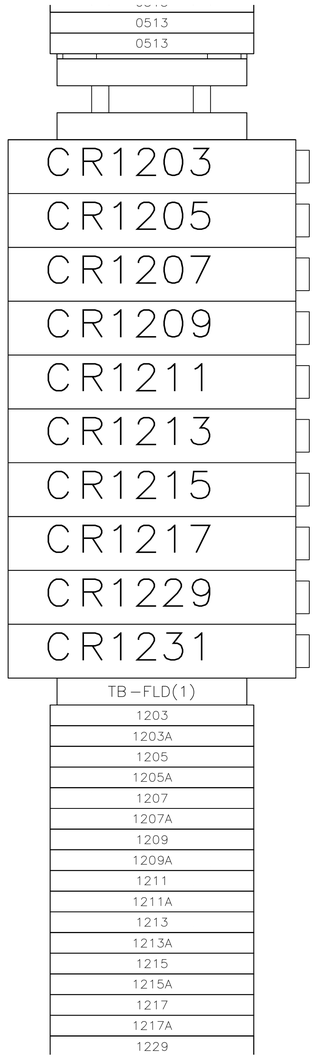
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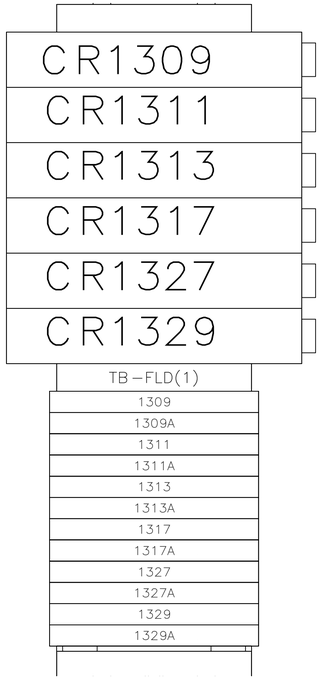
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FU0525	2A
FU0528	2A
FU0531	3A
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FU0537	1A
FU0538	1A
FU0539	1A
FU0540	2A
FU0541	2A
FU0542	2A
FU0543	2A
FU0544	2A
FU0545	1A
FU0546	1A
FU0601	2A
FU0602	2A
FU0603	2A
FU0604	2A
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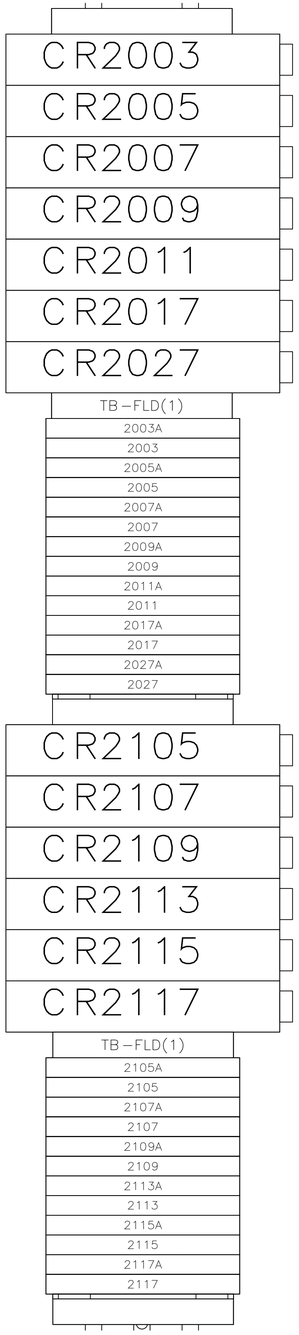
Fuse TBs continued...

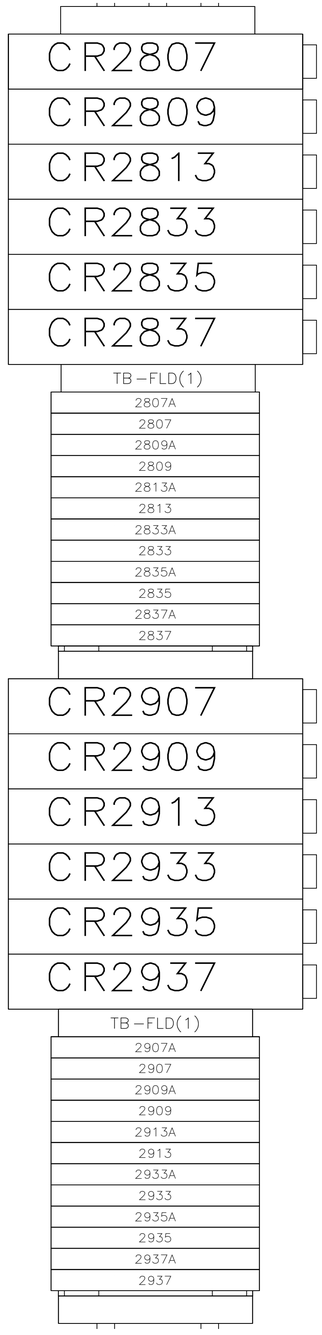
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FU0620	2A
FU0621	2A
FU0622	2A
FU0625	1A
FU0628	1A
FU0631	1A
FU0634	1A
FU0637	1A
FU0640	1A
FU0643	1A
FU0646	1A
FU0701	1A
FU0704	1A
FU0707	1A
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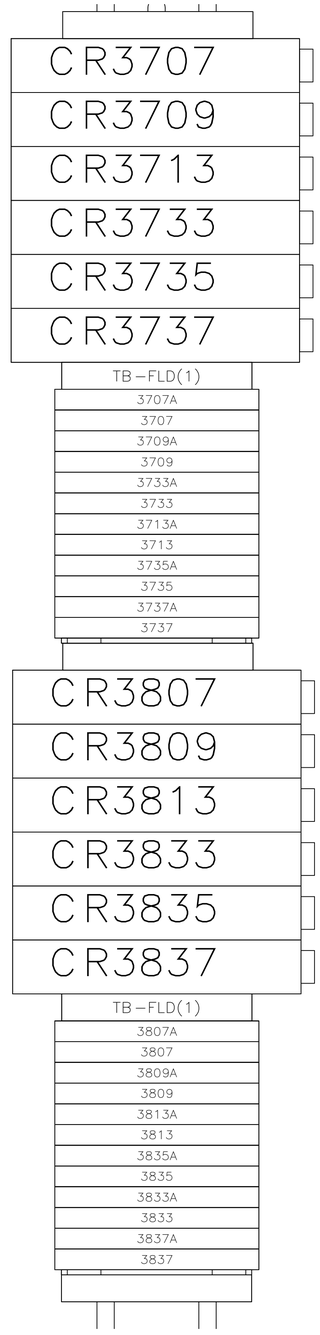
TB-DCCOM
0513
0513
0513











C

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC
.XXX - -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

PANEL LAYOUT
MAIN CONTROL PANEL, CP-01
TERMINAL BLOCK DETAILS

DRAWING NUMBER: 510464-WTS-EL-000-5100-DC-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 04 OF 06
LAST SAVED: Tuesday, June 10, 2025 7:24:38 PM

FILE LOCATION: C:_ADSKVault-NAM\510464 - Caesars Lane WWTP-4 Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DC-001-04.dwg

NAMEPLATE DETAILS

NP1 — 10.00 [254] × 2.50 [64]

MAIN CONTROL PANEL
CP-01

L8 — 11.00 [279] × 4.00 [102]

PROVIDES INTRINSICALLY SAFE CIRCUIT EXTENSIONS FOR USE IN CLASS 1, GROUP D HAZARDOUS (CLASSIFIED) LOCATIONS WHEN CONNECTED PER PANEL CONTROL DRAWING

NP2 — 2.75 [70] × 1.00 [25]

AC POWER ON

NP2 — 2.75 [70] × 1.00 [25]

SYSTEM STOP

NP2 — 2.75 [70] × 1.00 [25]

ALARM LIGHT

NP2 — 2.75 [70] × 1.00 [25]

DISCONNECT SWITCH

L2



DANGER

Hazardous voltage.
Multiple power sources may be present

Disconnect all electric power including remote disconnects before servicing.

L3

VEOLIA Water Technologies & Solutions

REV.	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC -
.XXX -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

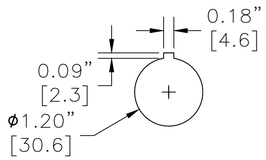
PANEL LAYOUT
MAIN CONTROL PANEL, CP-01
NAME PLATE DETAILS

DRAWING NUMBER: 510464-WTS-EL-000-5100-DC-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-00005100C001
SCALE: NONE
SIZE: D
SHEET: 05 OF 06

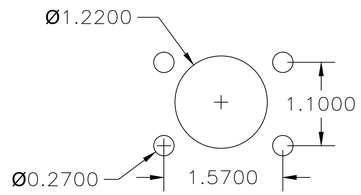
LAST SAVED: Tuesday, June 10, 2025 7:24:40 PM

FILE LOCATION: C:_ASSX\Vault\WAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DC-001-05.dwg

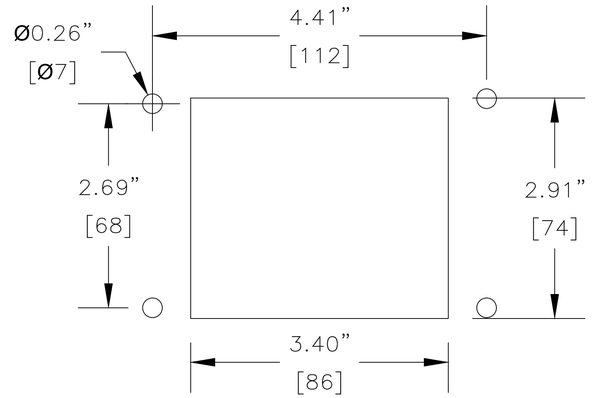
CUTOUT DETAILS FOR MANUFACTURING ONLY



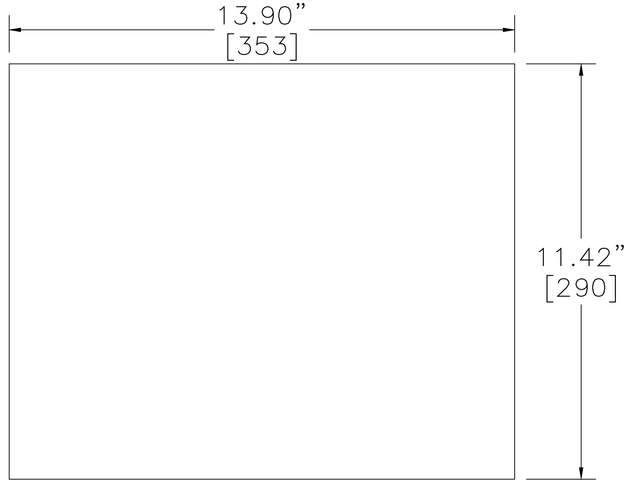
DETAIL A
AB PT#
800T



DETAIL B
PT#
SHR00N4X



DETAIL C



DETAIL D

REV.	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC -
.XXX - -

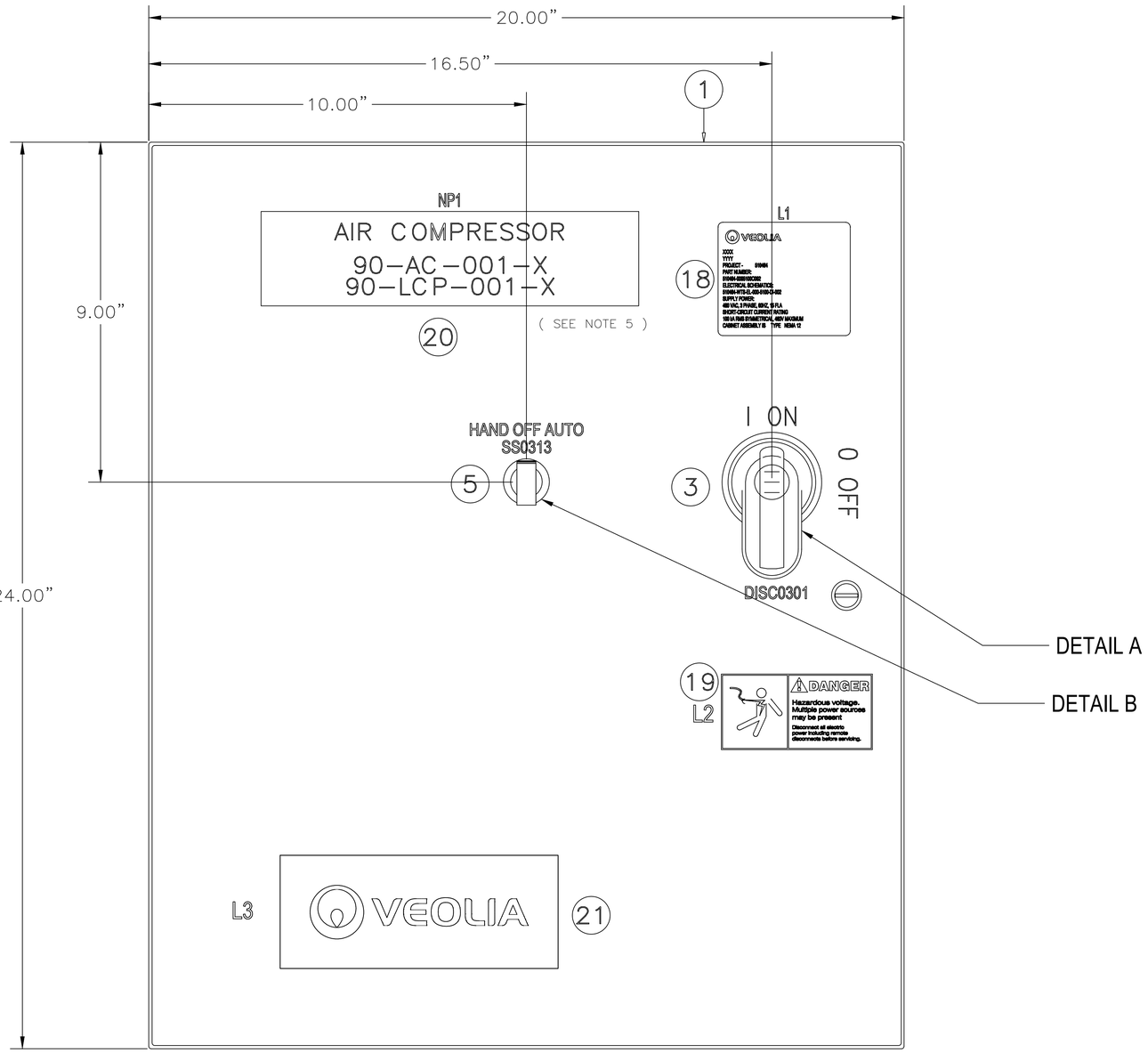
VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

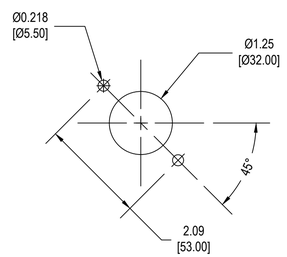
PANEL LAYOUT
MAIN CONTROL PANEL, CP-01
CUTOUT DETAILS

DRAWING NUMBER: 510464-WTS-EL-000-5100-DC-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 06 OF 06
LAST SAVED: Tuesday, June 10, 2025 7:24:41 PM

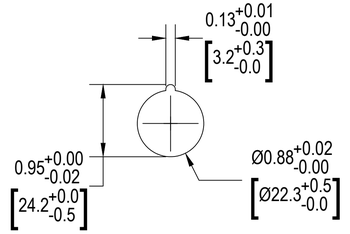
FILE LOCATION: C:_ACSX\Vault\WAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DC-001-06.dwg



CUT-OUT DETAILS



DETAIL A
(1 PLACE)



DETAIL B
(4 PLACES)

L1

VEOLIA

XXXX
YYYY
PROJECT - 510464
PART NUMBER:
510464-0005100C002
ELECTRICAL SCHEMATICS:
510464-WTS-EL-000-5100-DI-002
SUPPLY POWER:
480 VAC, 3 PHASE, 60HZ, 15 FLA
SHORT-CIRCUIT CURRENT RATING
100 kA RMS SYMMETRICAL, 480V MAXIMUM
CABINET ASSEMBLY IS TYPE NEMA 12

NOTES:

1. MANUFACTURER'S PRODUCT DATA CONTAINED ON LABEL L1. YYYY = LOCATION OF VEOLIA WTS MANUFACTURING FACILITY. (i.e. CITY. STATE/PROVINCE, COUNTRY) XXXX = CONTROL PANEL MANUFACTURING FACILITY (i.e. MANUFACTURED BY: PANEL SHOP NAME, CITY, STATE/PROVINCE, COUNTRY) IF DIFFERENT FROM VEOLIA WTS MANUFACTURING FACILITY. OTHERWISE THIS LINE IS LEFT BLANK.
2. RECOMMENDED FIELD WIRING ENTRY FROM BOTTOM.
3. ALL DIMENSIONS IN INCH.
4. PANEL BUILDERS DO NOT CUT CABLE ENTRY AREAS, FOR SITE INSTALLING REF ONLY.
5. REPLACE "X" WITH "A" FOR COMPRESSOR 90-AC-001-A AND "B" FOR COMPRESSOR 90-AC-001-B

VEOLIA WTS
CONTROLLED DOCUMENT

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE	-	RKP	HX	HX	05-JUN-2025

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TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX -
ANGLES - FRAC -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

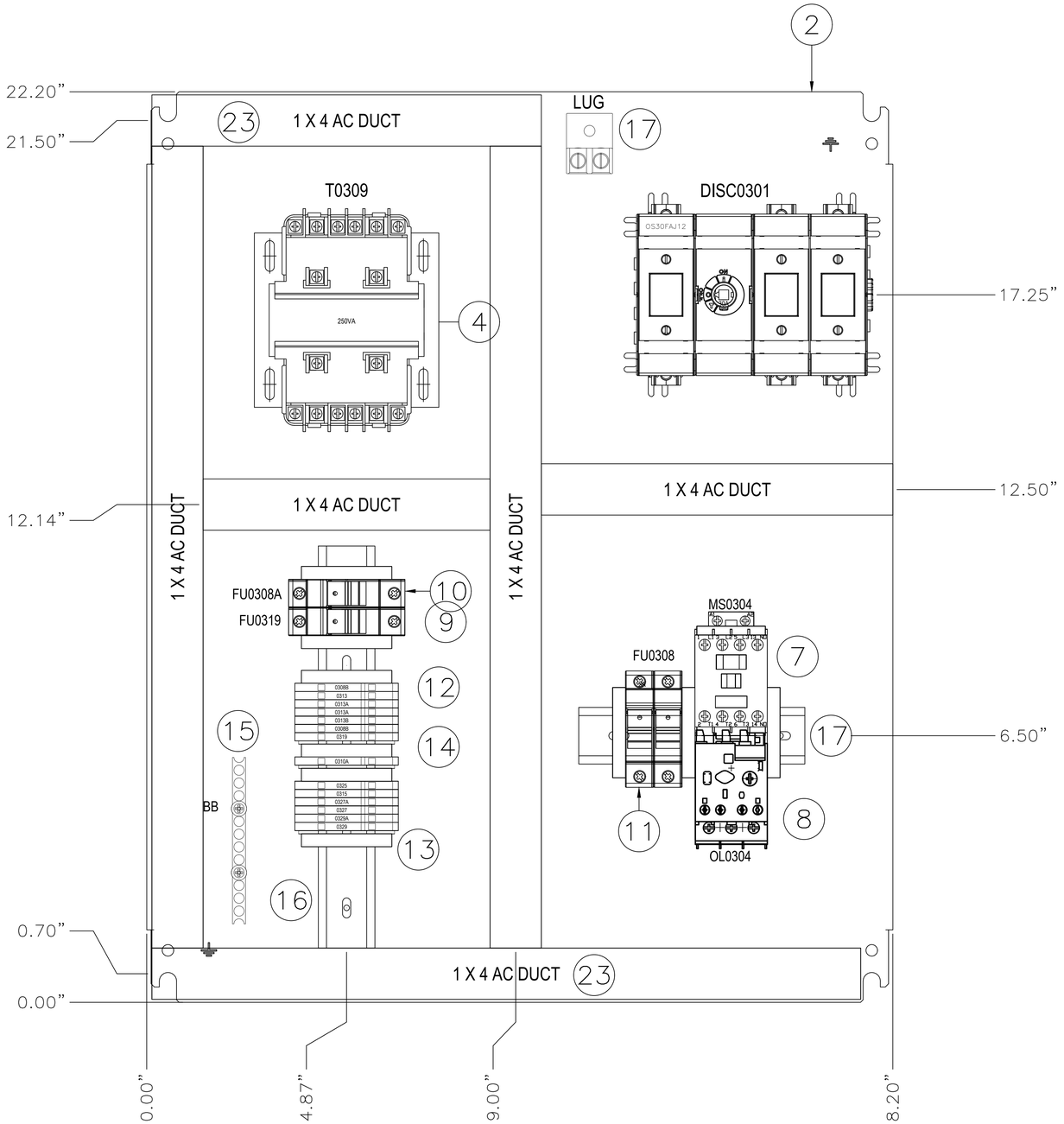
AIR COMPRESSOR PANEL
ENCLOSURE LAYOUT

DRAWING NUMBER	REVISION
510464-WTS-EL-000-5100-DC-002	A
REF.: -	DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	510464-0005100C002	NONE	D	01 OF 02

LAST SAVED: Friday, June 6, 2025 3:26:37 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\COMPRESSOR PANEL\510464-WTS-EL-000-5100-DC-002-01.dwg



REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE	-	RKP	HX	HX	05-JUN-2025

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC
.XXX - -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

AIR COMPRESSOR PANEL
ENCLOSURE LAYOUT

DRAWING NUMBER				REVISION
510464-WTS-EL-000-5100-DC-002				A
REF.: -	DOC. OWNER: -			
PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	510464-0005100C002	NONE	D	02 OF 02

LAST SAVED: Friday, June 6, 2025 3:26:53 PM

FILE LOCATION: C:_ADSKVault\VAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\COMPRESSOR PANEL\510464-WTS-EL-000-5100-DC-002.02.dwg

PREVAILING CODES AND SPECIFICATIONS

NFPA 70 – NATIONAL ELECTRICAL CODE
UL 508A – INDUSTRIAL CONTROL PANELS

CONTROL PANELS ARE TO BE UL LISTED

CONTROL PANEL CONSTRUCTION AND INTERNAL WIRING

- DESIGN, MATERIAL SELECTION, AND WORKMANSHIP SHALL RESULT IN A NEAT APPEARANCE OUTSIDE AND INSIDE, WITH NO WELDS, RIVETS OR BOLT HEADS APPARENT FROM THE FRONT FACE OF THE BOARDS AND ALL EXTERIOR SURFACES TRUE AND SMOOTH.
- ANY INSTRUMENTS, RELAYS, AND OTHER DEVICES MOUNTED ON OR WITHIN THE ENCLOSURE SHALL BE CLEARLY TAGGED WITH ENGRAVED 1/16" THICK LAMINATED PLASTIC MARKERS. MARKERS SHALL BE SECURED TO THE MOUNTING PANEL OR INSIDE OF THE ENCLOSURE WITH DOUBLE FACED TAPE. MARKERS SHALL NOT BE MOUNTED ON THE COMPONENT OR WIRE DUCT.
- ALL WIRES SHALL TERMINATE WITH FORK TYPE INSULATED WIRE COMPRESSION TYPE LUGS. UNLESS THE DEVICE IS EQUIPPED WITH A WIRE CLAMP, PRESSURE PLATE, OR TUBULAR SCREW CLAMP.
- ALL INCOMING AND OUTGOING FIELD CONTROL WIRING SHALL TERMINATE AT TERMINAL BLOCKS.
- NO MORE THAN 2 WIRES AT ANY SINGLE TERMINAL.
- ALL CONDUCTORS SHALL RUN CONTINUOUSLY, SPLICING IS NOT ACCEPTABLE.
- MOUNTING OF RELAY SOCKETS, TERMINAL BLOCKS, FUSED TERMINAL BLOCKS/SWITCHES AND THEIR MOUNTING TRACKS SHALL BE ON ONE PIECE SPACERS OR UNISTRUT. THE SPACERS SHALL BE OF A HEIGHT TO ALLOW WIRE ENTERING THESE DEVICES NOT TO BE MORE THAN 1 INCH BELOW COVERS OF THE PLASTIC WIREWAY ADJACENT TO THESE DEVICES.
- GROUND ALL PANEL METAL TO THE PANEL'S EARTH–GROUND BUS.
- WHERE WIRING CROSSES HINGED SURFACE, PROVIDE A 18" "U" SHAPE HINGE LOOP OF EXTRA FLEXIBLE WIRING
- VEOLIA WTS DESIGN GUIDE E000001–WTS–EL–T02–8533–PR–012 – ELECTRICAL DEVICE DESIGNATIONS AND ABBREVIATIONS.
- VEOLIA WTS SPECIFICATION E000001–WTS–EL–T02–8533–SP–025 – WIRING OF INDUSTRIAL CONTROL PANELS.
- VEOLIA WTS SPECIFICATION E000001–WTS–EL–SYS–EN33–SP–005 – ELECTRICAL AND CONTROL SAFETY FEATURES.
- VEOLIA WTS SPECIFICATION E000001–WTS–EL–SYS–EN33–SP–007 – ELECTRICAL PANEL MARKINGS & NAMEPLATES.
- VEOLIA WTS SPECIFICATION E000001–WTS–EL–T02–8533–PR–001 – CONTROL PANEL AND WIRING DIAGRAM.

WIRING

CONTROL WIRING SHALL BE #16 AWG STRANDED COPPER, THHN & THWN, 600 VOLT INSULATION., 90 DEG. C, ALL WIRING SHALL BE COLOR CODED AS FOLLOWS:

WIRE COLORS	CONDUCTOR TYPE
GREEN WITH YELLOW STRIPE (OR GREEN)	EQUIPMENT GROUNDING AND BONDING CONDUCTORS
WHITE	GROUNDED AC (L2/NEUTRALS) CURRENT–CARRYING CONDUCTORS
BLACK	UNGROUNDED AC (L1) OR DC POWER CIRCUITS CONDUCTORS
RED	UNGROUNDED AC CONTROL CIRCUITS CONDUCTORS
BLUE	UNGROUNDED DC CONTROL CIRCUITS CONDUCTORS
WHITE WITH BLUE STRIPE	GROUNDED DC (0VDC) CONTROL CIRCUIT CONDUCTORS
ORANGE	UNGROUNDED CONDUCTORS FOR AC AND DC REMOTE CONTROL CIRCUITS
WHITE(+), BLACK(–)	ANALOG TWISTED SHIELD PAIR CABLE
WHITE WITH ORANGE STRIPE	GROUNDED CURRENT CARRYING CONDUCTORS FOR REMOTE CONTROL CIRCUITS
LIGHT BLUE	INTRINSICALLY SAFE WIRING

TESTING

PRE–VEOLIA INSPECTION

- WHEN ALL WIRING OF ELECTRICAL SYSTEM IS COMPLETE, THE FABRICATOR SHALL TEST EACH CIRCUIT FOR CONTINUITY, SHORT CIRCUIT AND FAULT GROUNDS AND COMPLETE WIRING INSPECTION CHECKLIST E000001–WTS–EL–PRD–PHAS–DA–CHK–02.

FACILITIES

- PANEL VENDOR SHALL SUPPLY A WORK/TEST AREA FOR PANEL CHECK–OUTS. FOR WALL MOUNTED ENCLOSURES, THIS AREA SHALL INCLUDE A STAND OR PLATFORM TO MOUNT AND SUPPORT THE PANEL VERTICALLY AT BENCH HEIGHT.
- THE WORK/TEST AREA SHALL BE ISOLATED/SEPARATED FROM THE PANEL ASSEMBLY/MFG. AREA SO TESTING CAN BE DONE WITHOUT INTERRUPTION.
- THE WORK/TEST ARE SHALL BE PROVIDED WITH ADEQUATE LIGHTING COMPLETE WITH TABLE/BENCH FOR INSPECTORS USE TO WORK WITH TEST EQUIPMENT AND DRAWINGS.

VEOLIA INSPECTION

- PANEL VENDOR SHALL SUBJECT TO BACK–CHARGES, IF AFTER ARRIVAL OF VEOLIA INSPECTOR(S) FOR INSPECTION, IS DETERMINED THAT PANEL VENDOR HAS NOT PREPARED FOR VEOLIA INSPECTION AND OR NOT COMPLETED "PRE–VEOLIA INSPECTION" OR PROVIDED ITEMS NOTED UNDER "FACILITIES".
- AFTER VENDOR CIRCUIT TESTING IS COMPLETE, VEOLIA WILL PERFORM FUNCTION TESTING OF THE CONTROL PANEL COMPONENTS AS A SYSTEM TO CONFIRM OPERATION AND MAKE CALIBRATION ADJUSTMENT, IF NECESSARY. PANEL VENDOR SHALL PROVIDE TEMPORARY POWER AND/OR INSTRUMENT QUALITY AIR SUPPLY AS REQUIRED BY PANEL DESIGN. PANEL VENDOR SHALL PROVIDE TEMPORARY WIRING INCLUDING BUT NOT LIMITED TO TOGGLE SWITCHES, 120VAC AND/OR 24VDC INDICATING LIGHTS TO FACILITATE THE TESTING. THE PANEL VENDOR WILL ALSO BE RESPONSIBLE FOR CONNECTING VARIOUS WIRE JUMPERS ON THE PANEL FIELD TERMINALS. ALL TEMPORARY TEST WIRING WILL BE REMOVED BY THE VENDOR BEFORE THE PANEL IS SHIPPED.
- PANEL VENDOR TO PROVIDE QUALIFIED QUALITY CONTROL INSPECTOR/TESTER TO VEOLIA PERSONNEL WITH FUNCTION TESTING OF THE CONTROL PANEL. PANEL VENDOR'S PERSONNEL MUST BE FAMILAR WITH CONTROL PANEL FABRICATION, WIRING INSTALLATION/CIRCUITRY, AND FULLY UNDERSTAND VEOLIA SCHEMATIC WIRING DIAGRAMS. PANEL VENDOR'S PERSONNEL TO BE AVAILABLE TO ASSIST VEOLIA INSPECTOR AS NEEDED.

RUNG NUMBERS

USED WHEN A COMMON DRAWING NUMBER IS ASSIGNED FOR SEVERAL SHEETS

- FIRST CHARACTER: SYSTEM
- SECOND AND THIRD CHARACTERS: SHEET NUMBER
- FOURTH AND FIFTH CHARACTERS: RUNG IDENTIFIER

– EXAMPLE: 1 1 2 0 4

SYSTEM (OPTIONAL): 1
SHEET: 12
RUNG: 04

TERMINAL AND WIRE NUMBERS

ALL WIRE SHALL BE TAGGED AT TERMINATIONS WITH WIRE NUMBERS SHOWN ON DRAWINGS WITH ONE PIECE HEAT SHRINK TUBULAR WIRE MARKERS. MARKERS SHALL BE BRADY SLEEVE COMPUTER–PRINTED TYPE B–321 HEAT–SHRINK POLYOLEFIN STOCK NO. HCPS.9–3336W OR APPROVED EQUAL.

USE THE FOLLOWING SCHEME FOR WIRES AND TERMINALS NOT CONNECTED TO PLC I/O

- THE RUNG NUMBER IS USED TO IDENTIFY A WIRE AND IT'S CORRESPONDING TERMINALS
- WHEN THERE IS NO TERMINAL NUMBER SHOWN, THE TERMINAL NUMBER IS THE SAME AS THE WIRE NUMBER
- WHERE THERE IS MORE THEN ONE WIRE ON A RUNG, THE OTHER WIRES ARE IDENTIFIED USING THE RUNG NUMBER FOLLOWED BY A LETTER.
- USE THE FOLLOWING SCHEME FOR WIRES AND TERMINALS CONNECTED TO PLC I/O

– FIRST CHARACTER: I FOR INPUTS, O FOR OUTPUTS
– SECOND * CHARACTER: RACK NUMBER
– THIRD AND FOURTH CHARACTER: SLOT NUMBER
– FIFTH AND SIXTH CHARACTER: POINT NUMBER

– EXAMPLE: I *1 0 3 0 0

TYPE: INPUT
RACK: 1
SLOT: 03
POINT: 00

* = 2 CHARACTERS IF THERE ARE MORE THAN 9 RACKS

EQUIPMENT AND INSTRUMENT TAG NUMBERS

11–XXX–222A–3

PROCESS AREA
EQUIPMENT ABBREVIATION/INSTRUMENT FUNCTION
EQUIPMENT NUMBER/INSTRUMENT LOOP NUMBER
MULTIPLE INSTRUMENT IDENTIFIER (IF NECESSARY)
IDENTICAL SKID/TRAIN IDENTIFIER (IF NECESSARY)

DESIGNATIONS FOR ELECTRICAL PANELS OR ENCLOSURES

THE FOLLOWING DESIGNATIONS ARE USED IN THIS ELECTRICAL SCHEMATIC TO IDENTIFY THE LOCATION OF EACH TERMINAL BLOCK

DESIGNATION ON SCHEMATIC	DESCRIPTION	COMPLETE TAG NUMBER
CP–01	MAIN CONTROL PANEL	CP–01

VEOLIA WTS CONTROLLED DOCUMENT

TERMINAL BLOCKS DESIGNATIONS

TB–VAC(x)	UNGROUNDED AC POWER
TB–N(x)	GROUNDED AC POWER
TB–MCR(x)	MASTER CONTROL RELAY WIRING
TB–VDC(x)	UNGROUNDED DC CONTROL POWER
TB–DCCOM(x)	GROUNDED DC CONTROL POWER
TB–DI(YZ)	DISCRETE INPUT SIGNAL WIRING
TB–DO(YZ)	DISCRETE OUTPUT SIGNAL WIRING
TB–AI(YZ)	ANALOG INPUT SIGNAL WIRING
TB–AO(YZ)	ANALOG OUTPUT SIGNAL WIRING
TB–INT(x)	OTHER INTERNAL WIRING
TB–FLD(x)	OTHER FIELD WIRING

(x) DENOTES SUB–GROUPS
(Y) DENOTES RACK NUMBER
(Z) DENOTES SLOT NUMBER

EQUIPMENT WIRING AND RACEWAYS

- COMPLY WITH VEOLIA DESIGN GUIDE CONTROL PANEL & WIRING DIAGRAM E000001–WTS–EL–T02–8533–PR–001.
- USE RIGID GALVANIZED STEEL CONDUIT(TYPE RMC) WITH LISTED FITINGS.
- USE LIQUID–TIGHT FLEXIBLE METAL CONDUIT (TYPE LFMC) WITH LISTED FITTINGS.
- CONDUCTOR AMPACITY IS FOR A MAXIMUM AMBIENT TEMPERATURE OF 40°C (104°F).
- WITH THE FOLLOWING EXCEPTIONS:
- VEOLIA WTS SPECIFICATION E000001–WTS–EL–T02–8533–SP–002 – WIRING OF EQUIPMENT ASSEMBLIES.
- VEOLIA WTS SPECIFICATION E000001–WTS–EL–SYS–EN33–SP–009 – WIRING OF INSTRUMENTATION AND COMMUNICATION.
- VEOLIA WTS SPECIFICATION E000001–WTS–PR–T02–8521–PR–001 – EQUIPMENT AND INSTRUMENT TAGGING.

NOISELESS GROUND FOR INSTRUMENTATION

- A CONTROL PANEL MAY INCLUDE A SEPARATE NOISELESS GROUND BUS THAT PROVIDES A COMMON GROUND REFERENCE POINT FOR INSTRUMENTATION CIRCUITS AND SHIELDS. WHERE THE NOISELESS GROUND BUS IS INSTALLED FROM THE PANEL ON WHICH IS MOUNTED, THERE IS A BONDING JUMPER FROM THIS GROUND BUS TO A POINT ON THE PANEL NEAR THE GROUND BUS.

  IF POSSIBLE, THE NOISELESS GROUND BUS SHOULD BE CONNECTED TO AN EXTERNAL GROUND THAT IS FREE OF ELECTRICAL NOISE. TO PROVIDE LOW IMPEDANCE, THIS GROUND CONNECTION SHOULD USE COPPER BRAID, COPPER STRIP, OR A 6 AWG OR LARGER WIRE. IF THERE IS AN EXTERNAL GROUND CONNECTION, THE WIRE FROM THE GROUND BUS TO THE PANEL MUST BE REMOVED (THE JUMPER MAY BE LABELED "REMOVE THIS WIRE WHEN USING AN ISOLATED GROUND SYSTEM").

- VEOLIA WTS SPECIFICATION E000001–WTS–EL–T02–8533–SP–020– GROUNDING IN INDUSTRIAL CONTROL PANELS.

FIELD INTERCONNECTING WIRING

- FIELD WIRING MATERIALS AND INSTALLATION LABOR ARE NOT PROVIDED BY VEOLIA.
- ALL FIELD CONNECTIONS TO FIELD WIRING TERMINALS IN ENCLOSURES SHALL MEET ANY MARKED REQUIREMENTS FOR WIRE TYPE, TEMPERATURE RATING AND TIGHTENING TORQUE. TYPICALLY STRANDED COPPER CONDUCTORS ARE REQUIRED. TYPICALLY CONDUCTOR AMPACITIES MUST BE CALCULATED AT 60°C FOR TERMINALS RATED FOR LESS THAN 100 AMPS OR AT 75°C FOR TERMINALS RATED FOR 100 AMPS OR MORE.
- THE VEOLIA DESIGN IN THIS DRAWING SET IS FOR THE INSTALLATION CONDITIONS SPECIFIED FOR THE VEOLIA EQUIPMENT. ANY CONDUCTOR SIZE, WIRING MATERIAL OR OTHER DESIGN ELEMENT SPECIFIED IN THIS DRAWING SET IS THE MINIMUM REQUIRED BY THE VEOLIA DESIGN FOR THE SPECIFIED INSTALLATION CONDITIONS. THE INSTALLATION LOCATION MIGHT HAVE UNSPECIFIED PROBLEMATIC CONDITIONS SUCH AS ELECTROMAGNETIC INTERFERENCE, HIGH VOLTAGE DROP IN LONG CABLE RUNS OR SPECIAL ENVIRONMENTAL CONDITIONS INCLUDING ULTRAVIOLET LIGHT (UV OR SUNLIGHT), HIGH TEMPERATURE, LOW TEMPERATURE, HIGH VIBRATION, OIL, CORROSIVE SALTS, VAPORS OR FUMES. THE ELECTRICAL EQUIPMENT PRODUCED ACCORDING TO THIS DRAWING SET IS NOT DESIGNED TO BE SUITABLE FOR MANY OF THE POSSIBLE UNSPECIFIED INSTALLATION CONDITIONS.

  THE INSTALLER IS RESPONSIBLE FOR PROVIDING A FIELD ELECTRICAL INSTALLATION THAT IS SUITABLE FOR THE ACTUAL INSTALLATION CONDITIONS. THIS RESPONSIBILITY INCLUDES LOCAL CODE REQUIREMENT COMPLIANCE AND DAMAGE REPAIR DUE TO SIGNIFICANT DETERIORATION (AT LEAST FOR THE VEOLIA WARRANTY PERIOD) OR INADEQUATE PROTECTION FROM PHYSICAL DAMAGE. IF UNSPECIFIED INSTALLATION CONDITIONS OR DEFICIENT INSTALLATION WORKMANSHIP REQUIRE MODIFICATION OF THE INSTALLATION OR EQUIPMENT, VEOLIA IS NOT RESPONSIBLE FOR THE MODIFICATION COSTS WHICH CAN INCLUDE BUT ARE NOT LIMITED TO LARGER CONDUCTORS, REPLACEMENT WIRING MATERIALS, LABOR, AND LIQUIDATED DAMAGES.

ADDITIONAL NOTES

- PROVIDE ONE (1) COMPLETE SET OF SPARE FUSES INCLUDING MINIMUM OF FIVE (5) SPARE CONTROL FUSES (IE : AGC/ABC/MDL STYLE) FOR EACH SIZE, PACKAGED TOGETHER AND AFFIXED TO THE INSIDE OF THE ENCLOSURE.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC
.XXX - -

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VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
NOTES LEGEND

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 01 OF 45
LAST SAVED: Tuesday, June 10, 2025 7:23:01 PM

FILE LOCATION: C:_ASKVault\VAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-01.dwg

SWITCHES

SELECTOR SWITCH



FLOW (WATER, AIR, ETC.) SWITCH



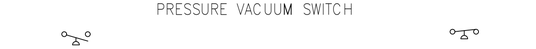
TEMPERATURE SWITCH



LIQUID LEVEL SWITCH



PRESSURE VACUUM SWITCH



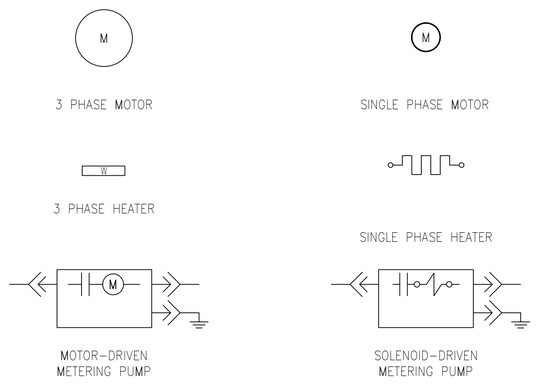
LIMIT SWITCH



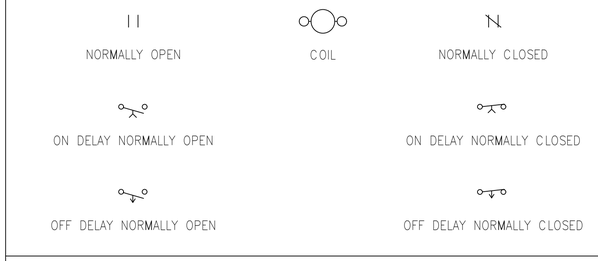
PUSH BUTTONS



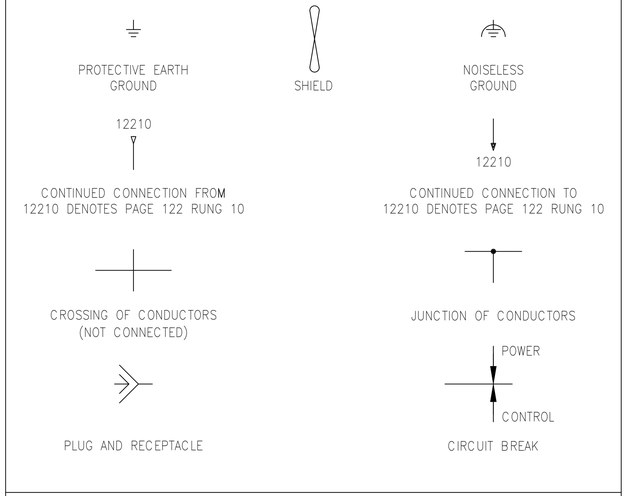
MOTORS AND HEATERS



RELAYS



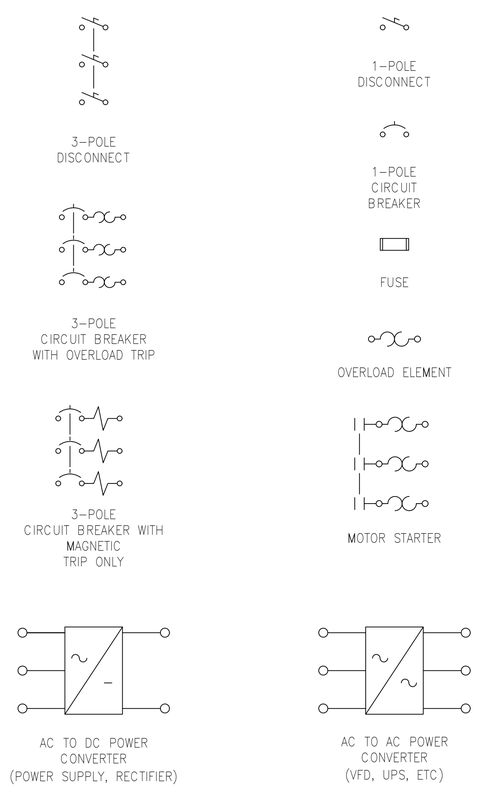
CONNECTIONS



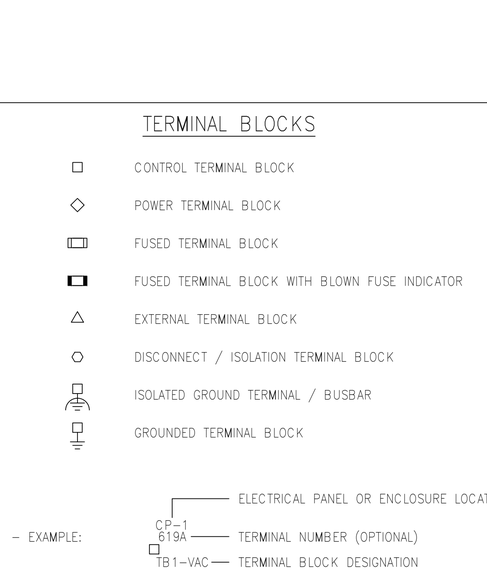
OTHER COMPONENTS



CIRCUIT PROTECTORS AND CONTROLLERS



TERMINAL BLOCKS



DESIGNATIONS AND ABBREVIATIONS

AH	ALARM HORN
AM	AMMETER
AUX	AUXILIARY CONTACT
C	CAPACITOR, CELSIUS
CB	CIRCUIT BREAKER
COM	COMMON
COMM	COMMUNICATION DEVICE
CON	CONTACTOR
CP	CONTROL PANEL
CR	CONTROL RELAY
CRM	MASTER CONTROL RELAY
CT	CURRENT TRANSFORMER
DISC	DISCONNECT SWITCH
DISP	DISPLAY
FS	FLOW SWITCH
FU	FUSE
FV	VALVE (FLOW VALVE)
FY	SOLENOID PILOT VALVE
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GND	GROUND
HM	HOUR METER
HTR	HEATER
IE	CURRENT SENSING ELEMENT
JB	JUNCTION BOX
LT	LEVEL TRANSMITTER, PILOT LIGHT
LS	LEVEL SWITCH
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MS	MOTOR STARTER
M	MOTOR
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OL	OVERLOAD RELAY
PB	PUSHBUTTON SWITCH
PBL	ILLUMINATED PUSHBUTTON SWITCH
PDB	POWER DISTRIBUTION BLOCK
PLC	PROGRAMMABLE LOGIC CONTROLLER
PWS	POWER SUPPLY
R	RESISTOR
RECP	RECEPTACLE
RECT	RECTIFIER
SB	SOLENOID BOX
SHLD	CABLE SHIELD
SPD	SURGE PROTECTIVE DEVICE
SS	SELECTOR SWITCH
SSR	SOLID STATE RELAY
T	TRANSFORMER
TB	TERMINAL BLOCK
TR	TIME DELAY RELAY, TIMER
TS	TEMPERATURE SWITCH, THERMOSTAT
UPS	UNINTERRUPTIBLE POWER SUPPLY
VFD	VARIABLE FREQUENCY DRIVE
VM	VOLTMETER
X	INDUCTOR, REACTOR
ZS	POSITION OR LIMIT SWITCH

LIGHT COLOR LEGEND

A	AMBER (YELLOW)
B	BLUE
G	GREEN
R	RED
W	WHITE

WIRE COLOR ABBREVIATIONS

BLK	BLACK
BLU	BLUE
BRN	BROWN
GRN	GREEN
GRY	GRAY
ORN	ORANGE
VIO	VIOLET
RED	RED
WHT	WHITE
YEL	YELLOW

FOR WIRES WITH COLOR STRIPES, THE FIRST ABBREVIATION IS THE BASE COLOR AND SECOND ABBREVIATION IS THE STRIPE COLOR. FOR EXAMPLE, GRN/YEL IS A GREEN WIRE WITH A YELLOW STRIPE.

———— DENOTES CONTROL PANEL AND EQUIPMENT WIRING

— — — — — DENOTES FIELD INTERCONNECTING WIRING

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX -
ANGLES - FRAC -

VEOLIA

CUSTOMER INFORMATION

CAESARS LANE WTF
MBR SYSTEM

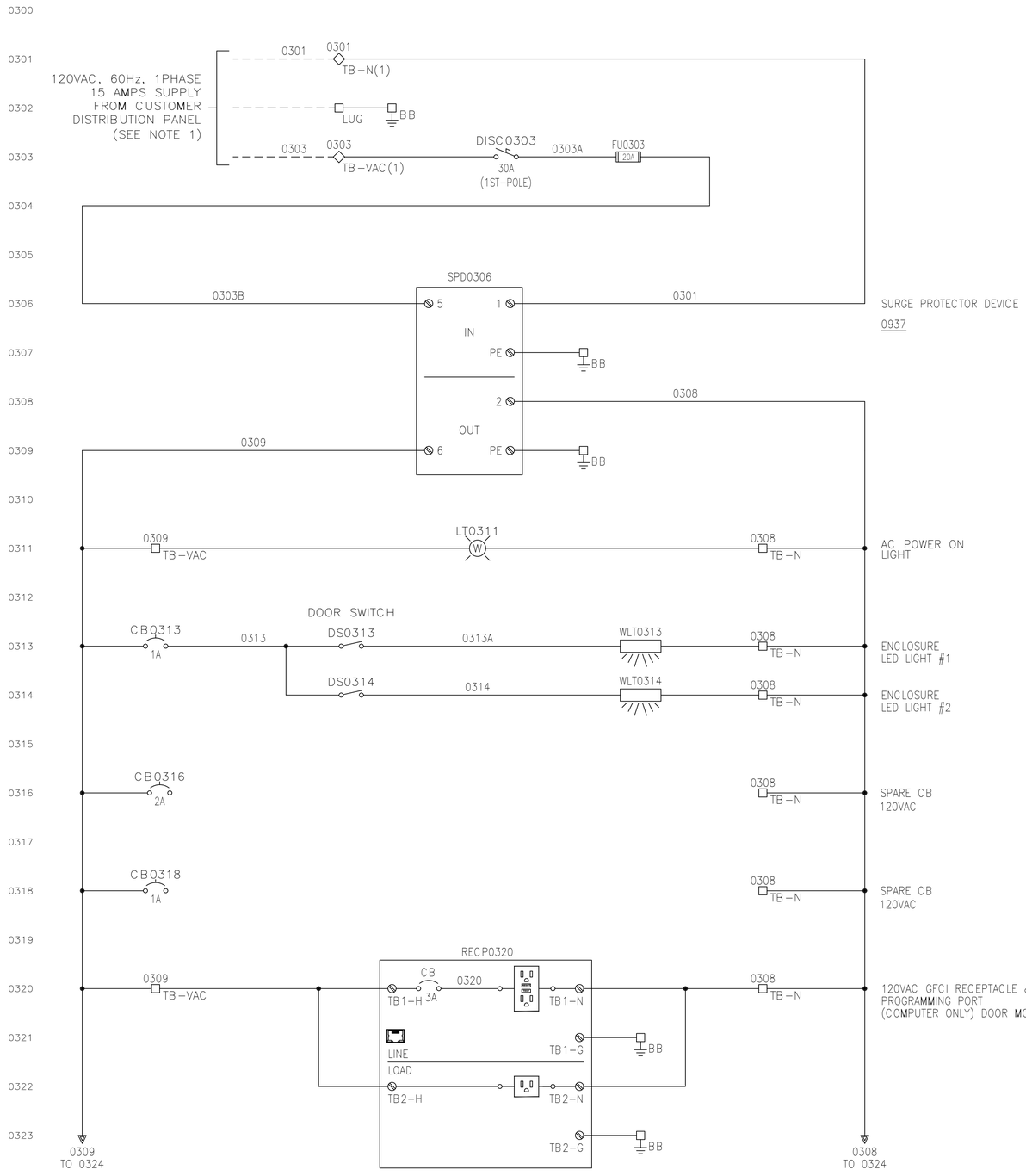
SCHEMATIC WIRING DIAGRAM

MAIN CONTROL PANEL, CP-01

SYMBOL LEGEND

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 02 OF 45
LAST SAVED: Tuesday, June 10, 2025 7:23:01 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP 4 Electrical Drawings\510464 - MCP-510464-WTS-EL-000-5100-DI-001-002.dwg



NOTES:

1. 120 VAC, 60 Hz, 1 PHASE POWER AND BRANCH CIRCUIT PROTECTION SUPPLIED AND WIRED BY OTHERS.
2. IF NOISELESS GROUND IS USED, REMOVE JUMPER FROM SHLD TO BB. CONNECT NOISELESS GROUND TO SHLD.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS: .X ±, .XX ±, .XXX ±
ANGLES ±
FRAC ±

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
120 VAC POWER DISTRIBUTION

DRAWING NUMBER	REVISION
510464-WTS-EL-000-5100-DI-001	C

REF.: -
DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
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LAST SAVED: Tuesday, June 10, 2025 7:23:01 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464_MCP\510464-WTS-EL-000-5100-DI-001-03.dwg

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FROM 0347
0309
0309
0400
0401
CB0401
1A
0401
16-FIT-707
L N PE
0308
TB-N
0308
FROM 0347
0308
16-FIT-707
WAS TO SLUDGE
FLOW TRANSMITTER
1509
AI
0402
0403
0404
CB0404
1A
0404
20-FIT-602
L N PE
0308
TB-N
20-FIT-602
BACKPULSE
FLOW TRANSMITTER
2214
AI
0405
0406
0407
CB0407
1A
0407
20-FIT-301-1
L N PE
0308
TB-N
20-FIT-301-1
PERMEATE- TRAIN 1
FLOW TRANSMITTER
2914
AI
0408
0409
0410
CB0410
1A
0410
20-AIT-320-1
L N PE
0308
TB-N
20-AIT-320-1
TURBIDITY ANALYZER- TRAIN 1
TRANSMITTER
2919
AI
0411
0412
0413
CB0413
1A
0413
20-FIT-507-1
L N PE
0308
TB-N
20-FIT-507-1
MIXED LIQUOR- TRAIN 1
FLOW TRANSMITTER
2927
AI
0414
0415
0416
CB0416
1A
0416
20-FIT-301-2
L N PE
0308
TB-N
20-FIT-301-2
PERMEATE- TRAIN 2
FLOW TRANSMITTER
3014
AI
0417
0418
0419
CB0419
1A
0419
20-AIT-320-2
L N PE
0308
TB-N
20-AIT-320-2
TURBIDITY ANALYZER- TRAIN 2
TRANSMITTER
2615,3019
AI
0420
0421
0422
CB0422
1A
0422
20-FIT-507-2
L N PE
0308
TB-N
20-FIT-507-2
MIXED LIQUOR- TRAIN 2
FLOW TRANSMITTER
3027
AI
0423
0309
TO 0424
0308
TO 0424

FROM 0423
0309
0309
0424
0425
CB0425
1A
0425
20-FIT-301-3
L N PE
0308
TB-N
0308
FROM 0423
0308
20-FIT-301-3
PERMEATE- TRAIN 3
FLOW TRANSMITTER
AI 3714
0426
0427
0428
CB0428
1A
0428
20-AIT-320-3
L N PE
0308
TB-N
20-AIT-320-3
TURBIDITY ANALYZER- TRAI
TRANSMITTER
AI 3315,3719
0429
0430
0431
CB0431
1A
0431
20-FIT-507-3
L N PE
0308
TB-N
20-FIT-507-3
MIXED LIQUOR- TRAIN 3
FLOW TRANSMITTER
AI 3727
0432
0433
0434
CB0434
1A
0434
20-FIT-301-4
L N PE
0308
TB-N
20-FIT-301-4
PERMEATE- TRAIN 4
FLOW TRANSMITTER
AI 3814
0435
0436
0437
CB0437
1A
0437
20-AIT-320-4
L N PE
0308
TB-N
20-AIT-320-4
TURBIDITY ANALYZER- TRAI
TRANSMITTER
AI 3415,3819
0438
0439
0440
CB0440
1A
0440
20-FIT-507-4
L N PE
0308
TB-N
20-FIT-507-4
MIXED LIQUOR- TRAIN 4
FLOW TRANSMITTER
AI 3827
0441
0442
CB0442
1A
0442
16-AIT-403-1
L N PE
0308
TB-N
16-AIT-403-1
AEROBIC ZONE 2
DO ANALYZER - TRAIN 1
AI 1437
0443
0444
CB0444
1A
0444
16-AIT-403-2
L N PE
0308
TB-N
16-AIT-403-2
AEROBIC ZONE 2
DO ANALYZER - TRAIN 2
AI 2232
0445
0446
CB0446
1A
0446
16-AIT-403-3
L N PE
0308
TB-N
16-AIT-403-3
AEROBIC ZONE 2
DO ANALYZER - TRAIN 3
AI 2237
0447
0309
TO 0500
0308
TO 0500

D C B A

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC
.XXX - -

VEOLIA

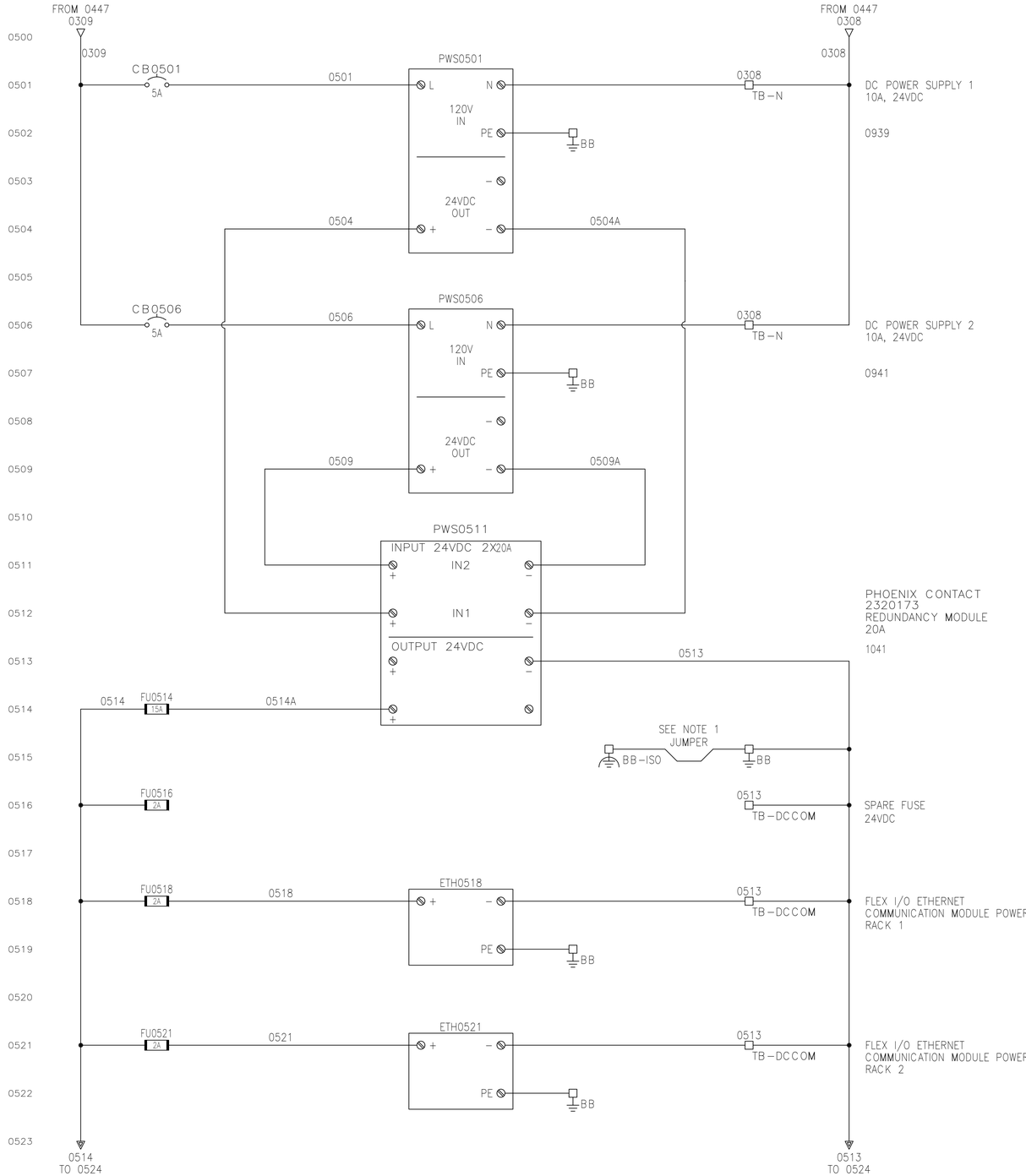
CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

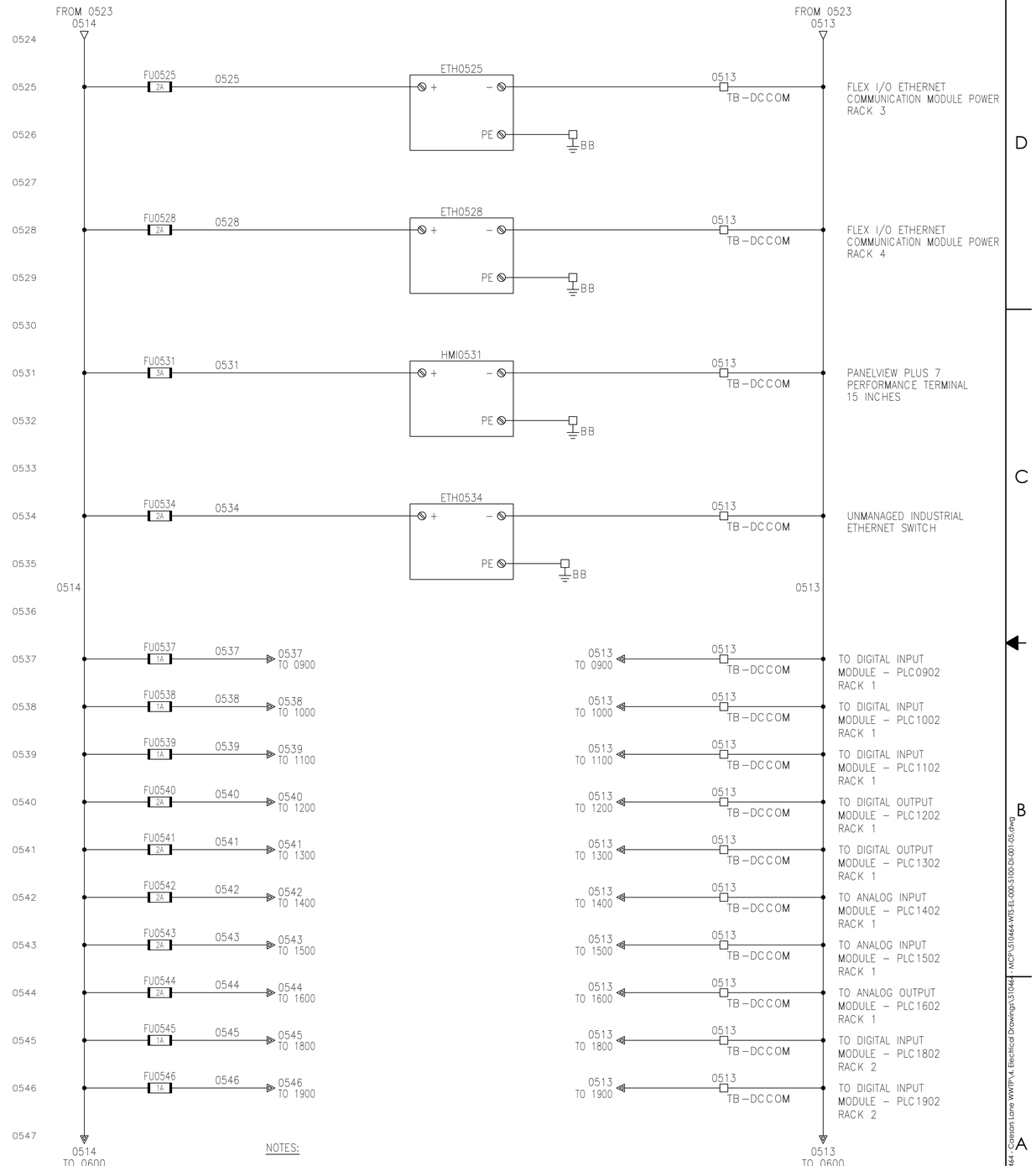
SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
120 VAC POWER DISTRIBUTION

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 04 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464-MCP\510464-WTS-EL-000-5100-DI-001-04.dwg
LAST SAVED: Tuesday, June 10, 2025 7:23:02 PM

8 7 6 5 4 3 2 1





NOTES:

1. FOR NOISELESS GROUND INSTRUMENTATION REMOVE THE JUMPER.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS
.X -
.XX -
.XXX -
ANGLES
-
FRAC
-

VEOLIA

CUSTOMER INFORMATION

CAESARS LANE WTF
MBR SYSTEM

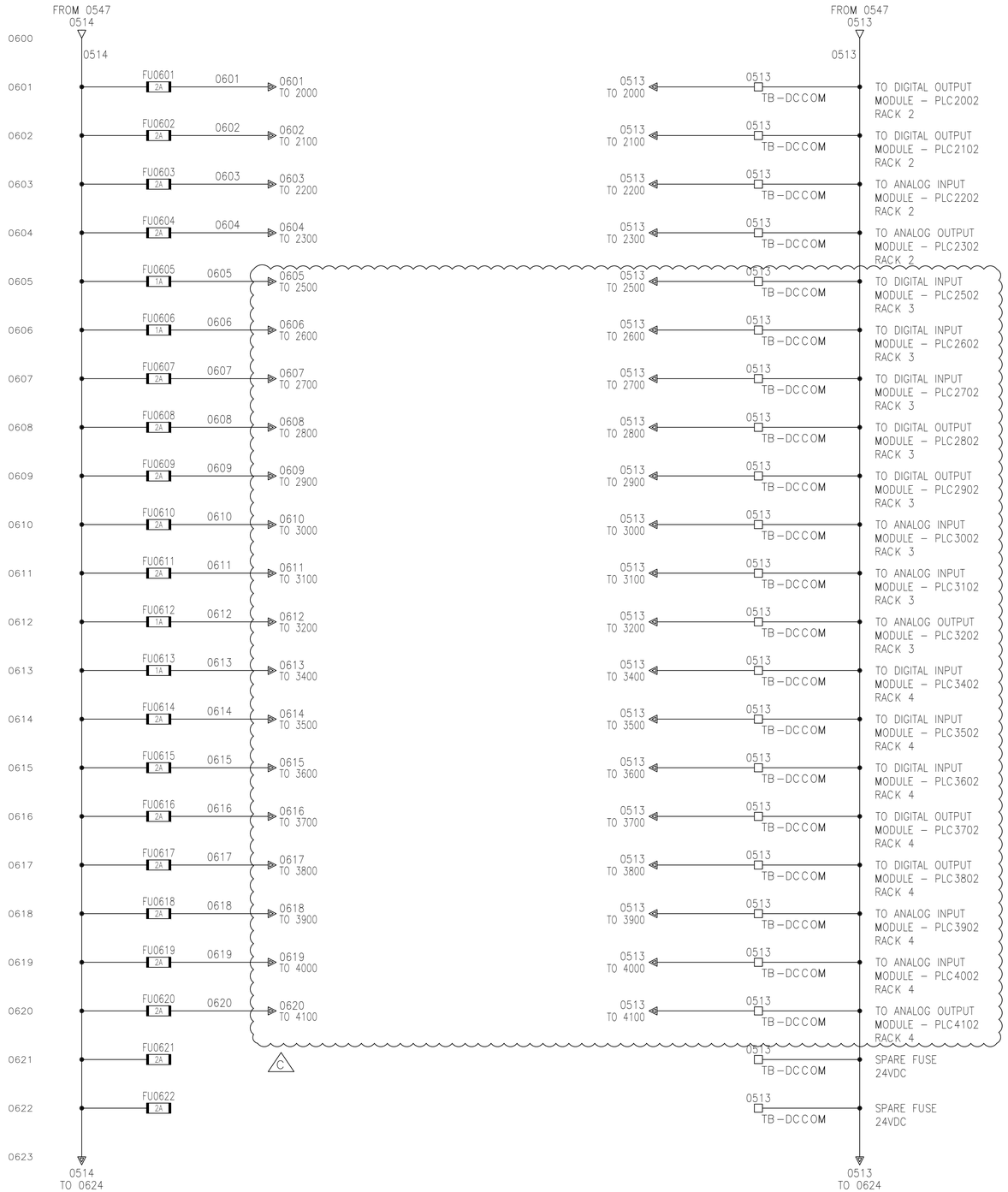
SCHEMATIC WIRING DIAGRAM

MAIN CONTROL PANEL, CP-01

24VDC POWER DISTRIBUTION

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 05 OF 45
LAST SAVED: Tuesday, June 10, 2025 7:23:02 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464_MCP\510464-WTS-EL-000-5100-DI-001-05.dwg



REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX - ANGLES - FRAC -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
24VDC POWER DISTRIBUTION

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 06 OF 45
LAST SAVED: Wednesday, June 11, 2025 3:00:32 PM

FILE LOCATION: C:_ADSKVault\MAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-06.dwg

FROM 0647
0514

0700
0701 FU0701 1A
0702
0703
0704 FU0704 1A
0705
0706
0707 FU0707 1A
0708
0709
0710 FU0710 1A
0711
0514
0712
0713 FU0713 1A
0714
0715
0716 FU0716 1A — 0716 — 23-FIT-101 (L, N, PE)
0717
0718
0719 FU0719 1A — 0719 — 23-FIT-301 (L, N, PE)
0720
0721
0722 FU0722 1A
0723
0514
TO 0724

FROM 0647
0513

0513
0513 — TB-DCCOM — SPARE FUSE 24VDC
0513 — TB-DCCOM — SPARE FUSE 24VDC
0513 — TB-DCCOM — SPARE FUSE 24VDC
0513 — TB-DCCOM — SPARE FUSE 24VDC
0513 — TB-DCCOM — SPARE FUSE 24VDC
0513 — TB-DCCOM — 23-FIT-101 SODIUM HYPOCHLORITE FLOW TRANSMITTER AI 1527
0513 — TB-DCCOM — 23-FIT-301 SODIUM HYPOCHLORITE FLOW TRANSMITTER AI 2226
0513 — TB-DCCOM — SPARE FUSE 24VDC
0513
TO 0724

FROM 0723
0514

0724
0514
0725 FU0725 1A — 0725 — ISB0725 14 Vs+ / 13 Vs−
0726 — 0726 16-LSHH-401-1 0726A — 0726A — ISB0725 1 Ch1 in-ve / 9 Ch1 NC
0727 — 0726 — ISB0725 2 Ch1 in+ve
0728 — 0538 from 1027 — 0538 — ISB0725 8 COM / 7 Ch1 NO — I10208 TO 1027
0729 — 0729 16-LSHH-401-2 0729A — 0729A — ISB0725 4 Ch2 in-ve / 10 Ch2 NO
0730 — 0729 — ISB0725 5 Ch2 in+ve
0731 — 0538 from 1029 — 0538 — ISB0725 11 COM / 12 Ch2 NC — I10209 TO 1029
0732
0733
0734 FU0734 1A — 0734 — ISB0734 14 Vs+ / 13 Vs−
0735 — 0735 16-LSHH-401-3 0735A — 0735A — ISB0734 1 Ch1 in-ve / 9 Ch1 NC
0736 — 0735 — ISB0734 2 Ch1 in+ve
0737 — 0545 from 1827 — 0545 — ISB0734 8 COM / 7 Ch1 NO — I20108 TO 1827
0738 — ISB0734 4 Ch2 in-ve / 10 Ch2 NO
0739 — ISB0734 5 Ch2 in+ve
0740 — ISB0734 11 COM / 12 Ch2 NC
0741
0742
0743
0744
0745
0746
0747

FROM 0723
0513

0513
0513 — TB-DCCOM — 16-LSHH-401-1 BIOREACTOR TANK- TRAIN 1 LEVEL SWITCH HIGH HIGH
0513 — TB-DCCOM — 16-LSHH-401-2 BIOREACTOR TANK- TRAIN 2 LEVEL SWITCH HIGH HIGH
0513 — TB-DCCOM — 16-LSHH-401-3 BIOREACTOR TANK- TRAIN 3 LEVEL SWITCH HIGH HIGH
SPARE

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS: .X - / .XX - / .XXX - ANGLES: - FRAC: -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
24VDC POWER DISTRIBUTION

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 07 OF 45
LAST SAVED: Tuesday, June 10, 2025 7:23:03 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4 Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-07.dwg

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REV.	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
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B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC -
.XXX - -

VEOLIA

CUSTOMER INFORMATION

CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM

MAIN CONTROL PANEL, CP-01

SPARE PAGE

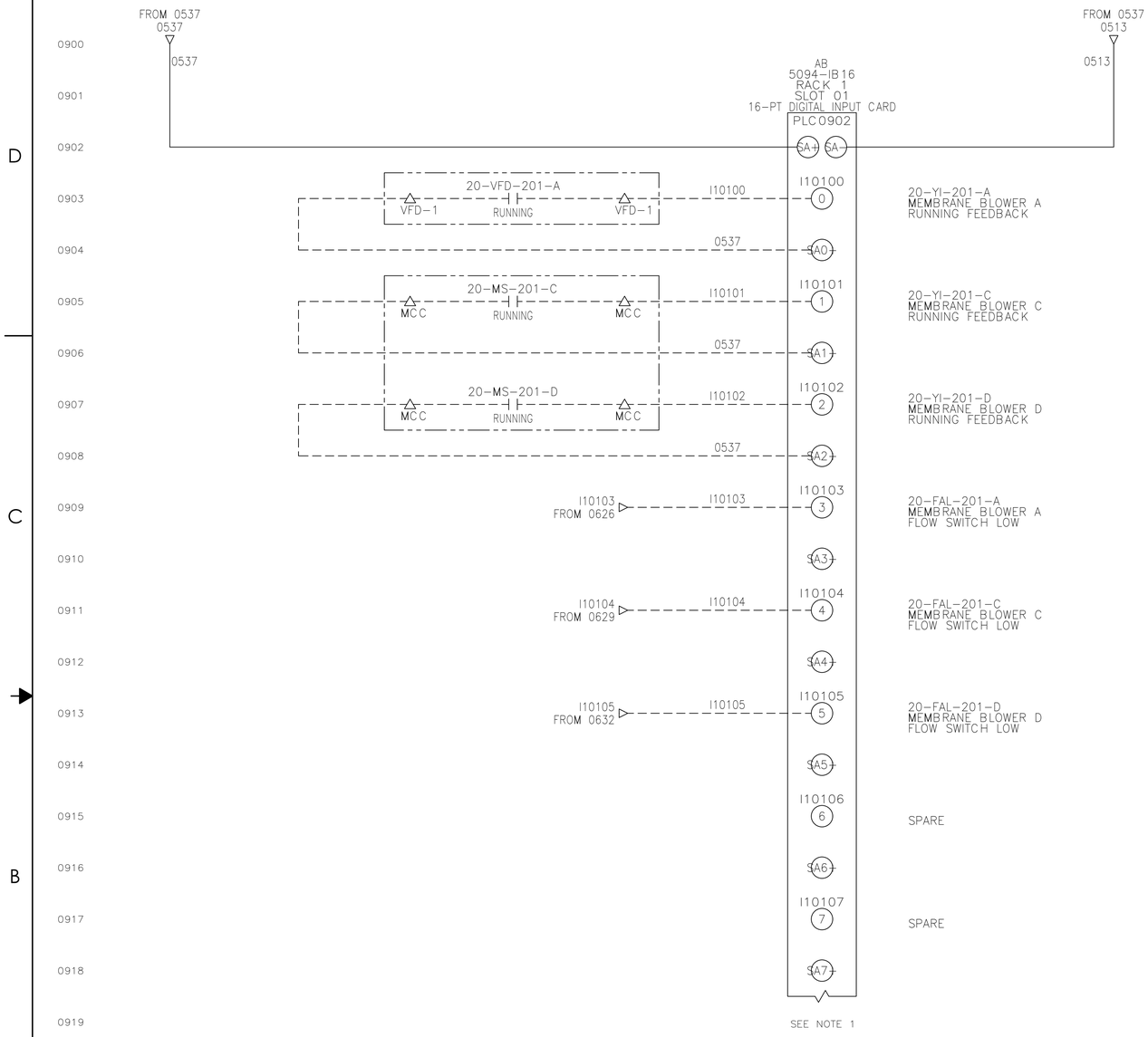
DRAWING NUMBER	REVISION
510464-WTS-EL-000-5100-DI-001	C

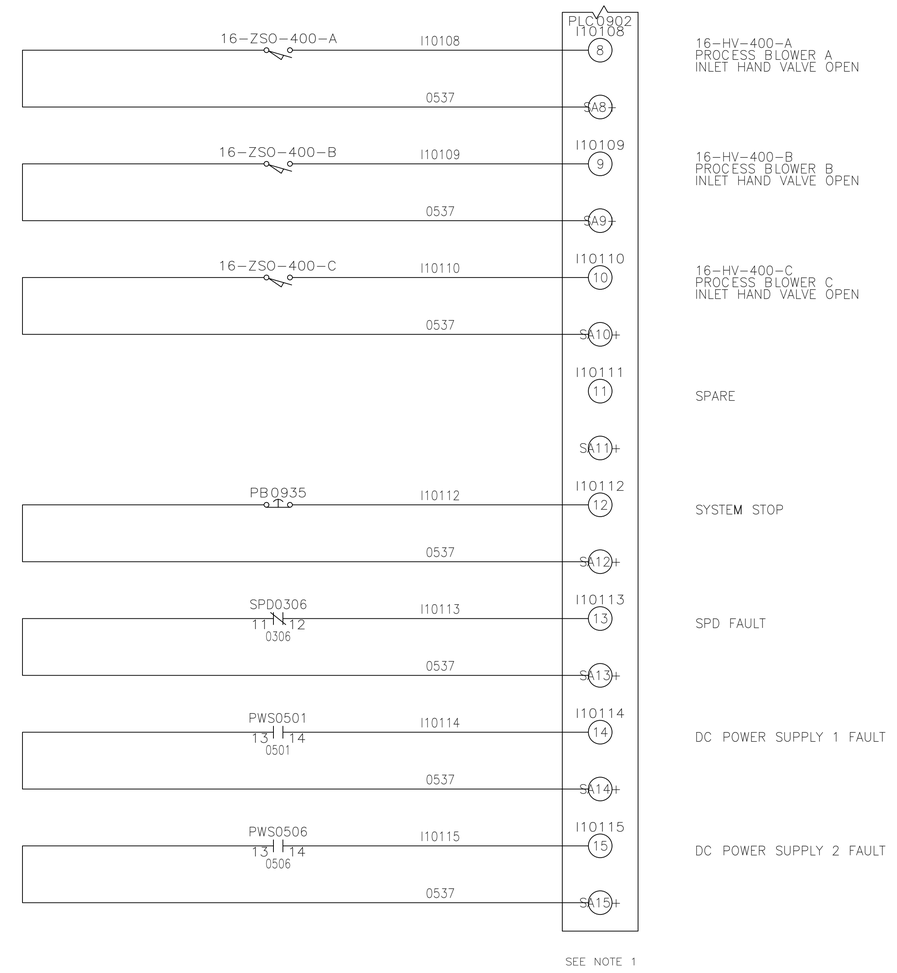
REF.: -
DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	510464-0005100C001	NONE	D	08 OF 45

LAST SAVED: Tuesday, June 10, 2025 7:23:03 PM

FILE LOCATION: C:_ADSKVault\WAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-08.dwg





NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

PROPRIETARY AND CONFIDENTIAL: THIS DRAWING AND ALL INFORMATION AND KNOWLEDGE CONTAINED OR REFERRED HEREIN ARE THE CONFIDENTIAL AND PROPRIETARY PROPERTY OF VEOLIA AND AS SUCH ARE INSTRUMENTS OF SERVICE FOR USE SOLELY WITH RESPECT TO THIS PROJECT. THESE INSTRUMENTS OF SERVICE SHALL NOT BE REPRODUCED, TRANSMITTED, DISCLOSED OR USED OTHERWISE IN WHOLE OR IN PART, WITHOUT PRIOR WRITTEN AGREEMENT BY VEOLIA AND MUST BE IMMEDIATELY RETURNED OR DESTROYED UPON REQUEST.

TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX -
ANGLES -
FRAC -

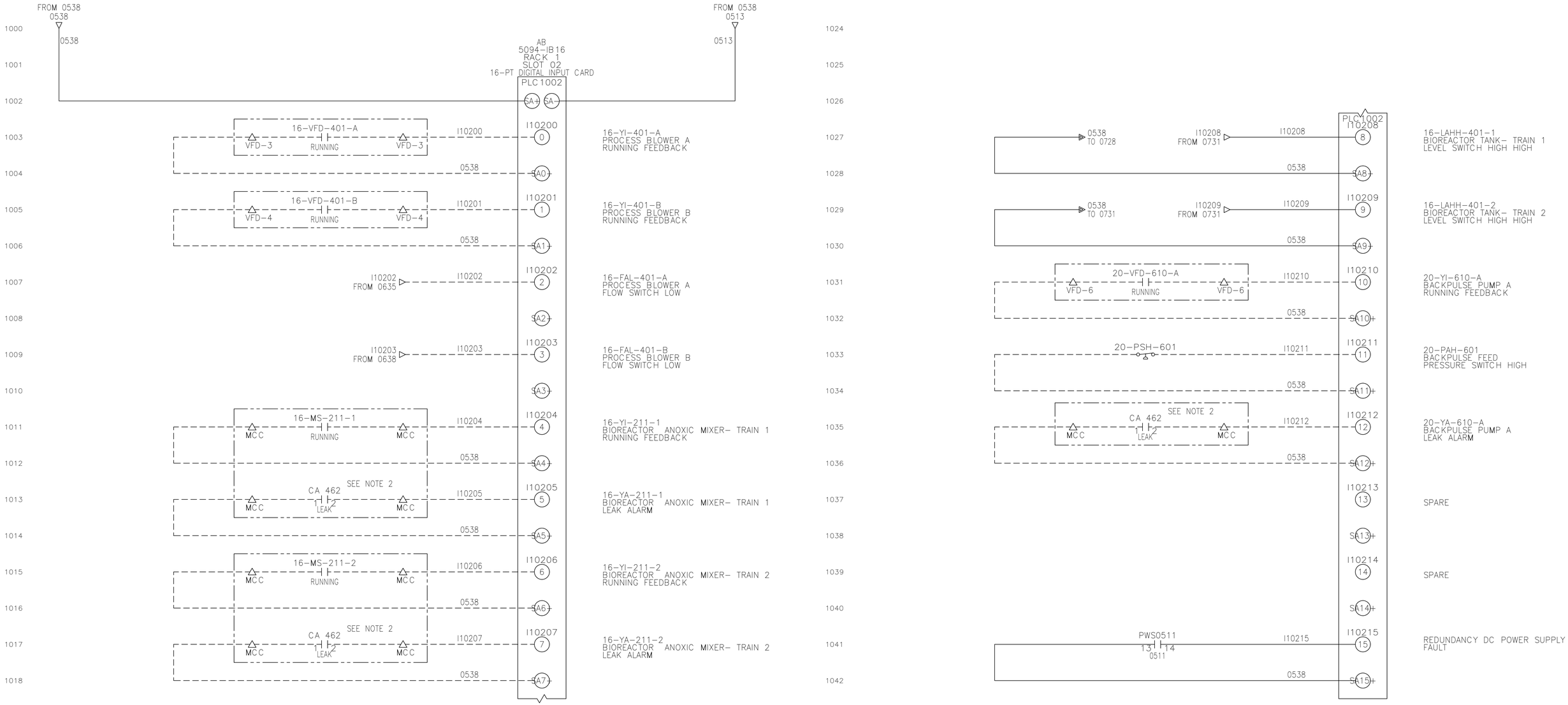
VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 1 SLOT 1, DI MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 09 OF 45
LAST SAVED: Tuesday, June 10, 2025 7:23:03 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-09.dwg



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.
2. LEAK/TEMP RELAY CA462 LOOSE SHIPPED WITH PUMPS, INSTALLED AND WIRED BY OTHERS.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX -
ANGLES - FRAC -

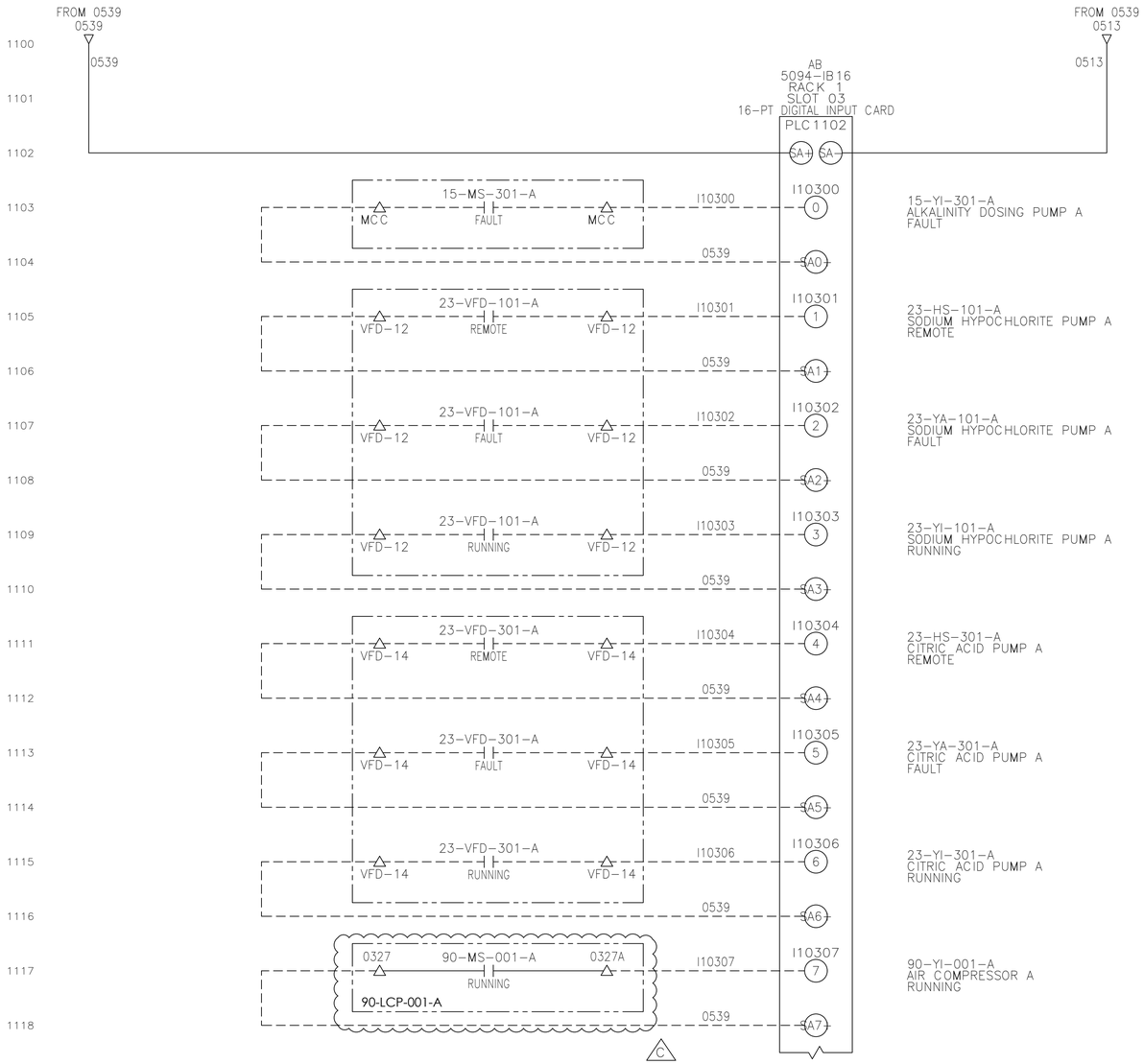
VEOLIA

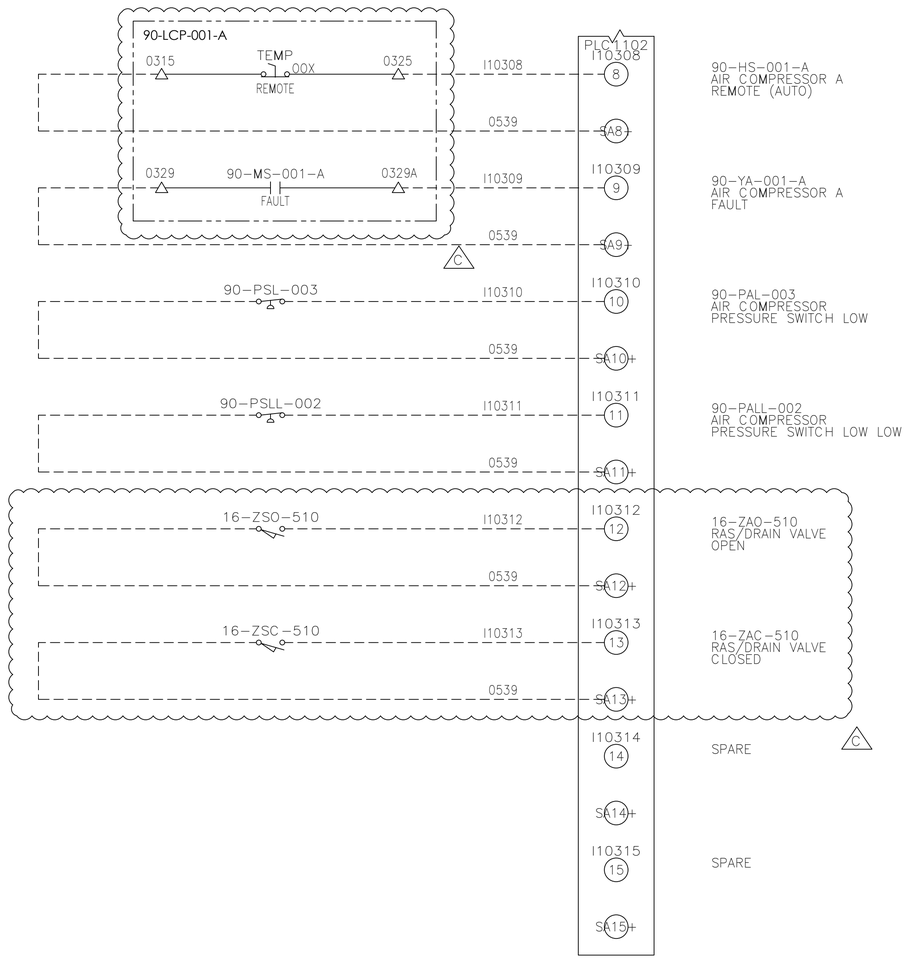
CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 1 SLOT 2, DI MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 10 OF 45
LAST SAVED: Tuesday, June 10, 2025 7:23:04 PM

FILE LOCATION: C:_ACSAVaultWork\510464 - Caesars Lane WWTP-4, Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-10.dwg





NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

PROPRIETARY AND CONFIDENTIAL: THIS DRAWING AND ALL INFORMATION AND KNOWLEDGE CONTAINED OR REFERRED HEREIN ARE THE CONFIDENTIAL AND PROPRIETARY PROPERTY OF VEOLIA AND AS SUCH ARE INSTRUMENTS OF SERVICE FOR USE SOLELY WITH RESPECT TO THIS PROJECT. THESE INSTRUMENTS OF SERVICE SHALL NOT BE REPRODUCED, TRANSMITTED, DISCLOSED OR USED OTHERWISE IN WHOLE OR IN PART, WITHOUT PRIOR WRITTEN AGREEMENT BY VEOLIA AND MUST BE IMMEDIATELY RETURNED OR DESTROYED UPON REQUEST.

TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC
.XXX - -

VEOLIA

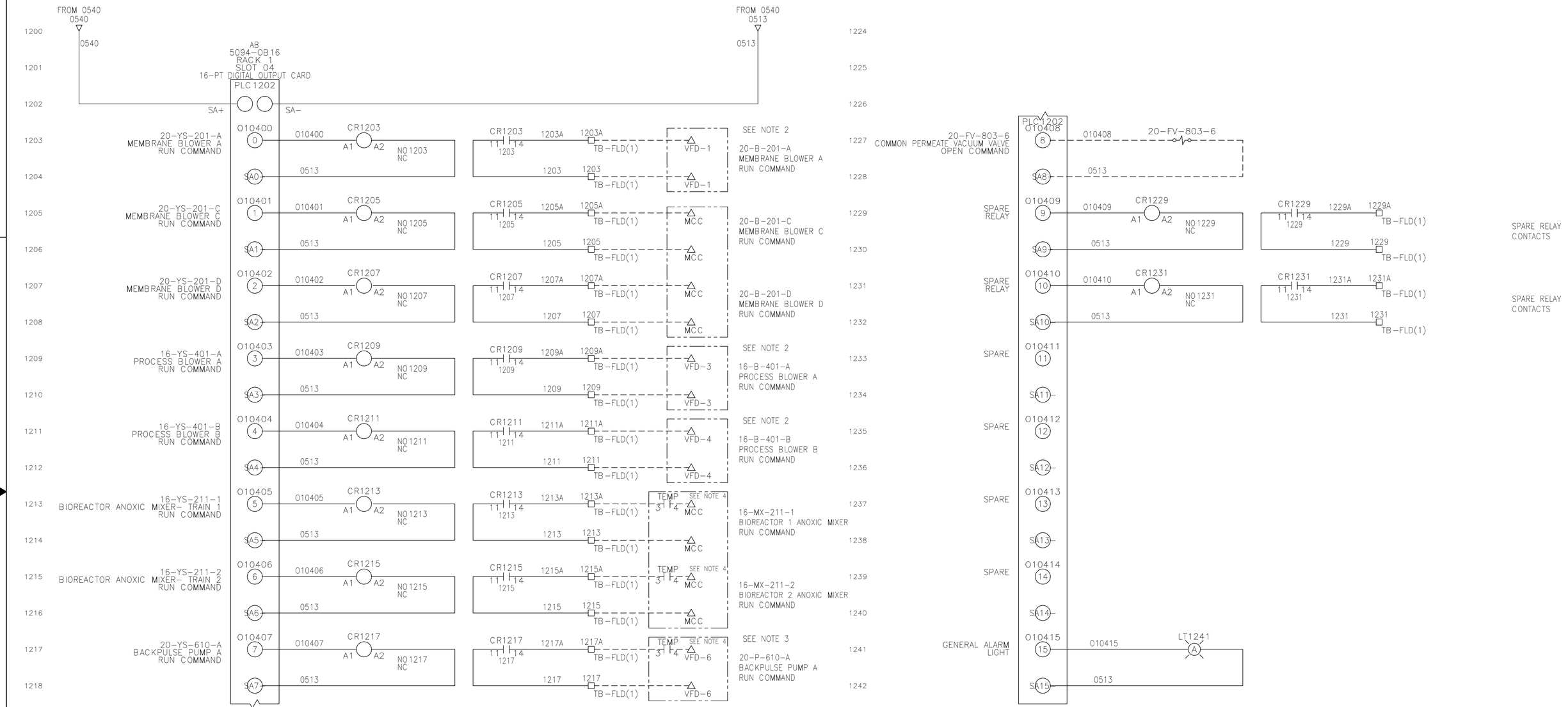
CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 1 SLOT 3, DI MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-00005100C001
SCALE: NONE
SIZE: D
SHEET: 11 OF 45

LAST SAVED: Wednesday, June 11, 2025 3:30:37 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-11.dwg



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.
2. REFER VFD DRAWING IN THE SHEET 41 OF THIS SCHEMATICS 510464-WTS-EL-000-5100-DI-001.
3. REFER VFD DRAWING IN THE SHEET 42 OF THIS SCHEMATICS 510464-WTS-EL-000-5100-DI-001.
4. LEAK/TEMP RELAY CA462 SHIPPED WITH PUMPS, INSTALLED AND WIRED BY OTHERS.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

PROPRIETARY AND CONFIDENTIAL: THIS DRAWING AND ALL INFORMATION AND KNOWLEDGE CONTAINED OR REFERRED HEREIN ARE THE CONFIDENTIAL AND PROPRIETARY PROPERTY OF VEOLIA AND AS SUCH ARE INSTRUMENTS OF SERVICE FOR USE SOLELY WITH RESPECT TO THIS PROJECT. THESE INSTRUMENTS OF SERVICE SHALL NOT BE REPRODUCED, TRANSMITTED, DISCLOSED OR USED OTHERWISE IN WHOLE OR IN PART, WITHOUT PRIOR WRITTEN AGREEMENT BY VEOLIA AND MUST BE IMMEDIATELY RETURNED OR DESTROYED UPON REQUEST.

TOLERANCES UNLESS NOTED
DECIMALS ANGLES
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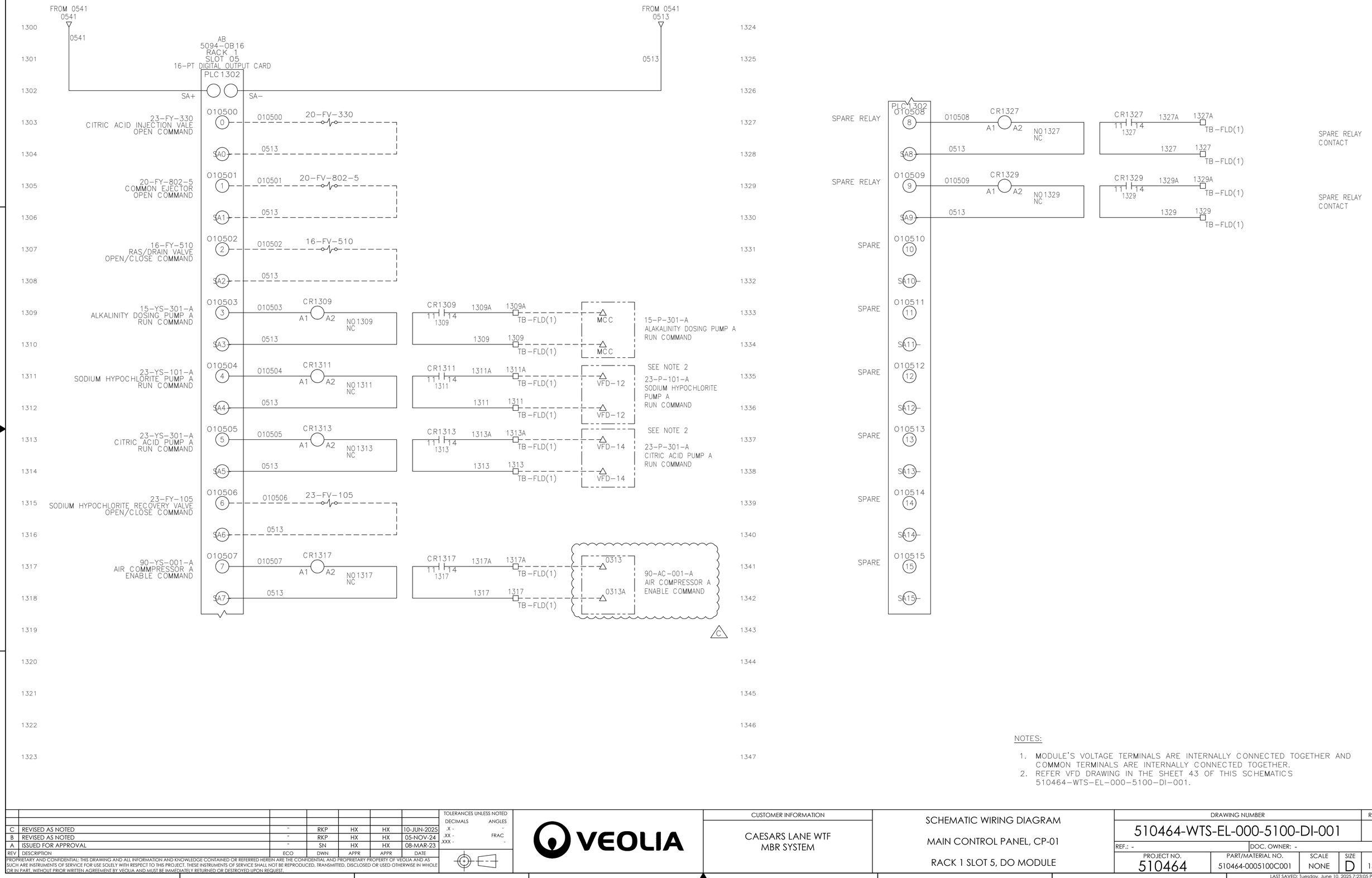
VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 1 SLOT 4, DO MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 12 OF 45
LAST SAVED: Tuesday, June 10, 2025 7:23:05 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4 Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-12.dwg



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.
2. REFER VFD DRAWING IN THE SHEET 43 OF THIS SCHEMATICS 510464-WTS-EL-000-5100-DI-001.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
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.XX - FRAC -
.XXX - -

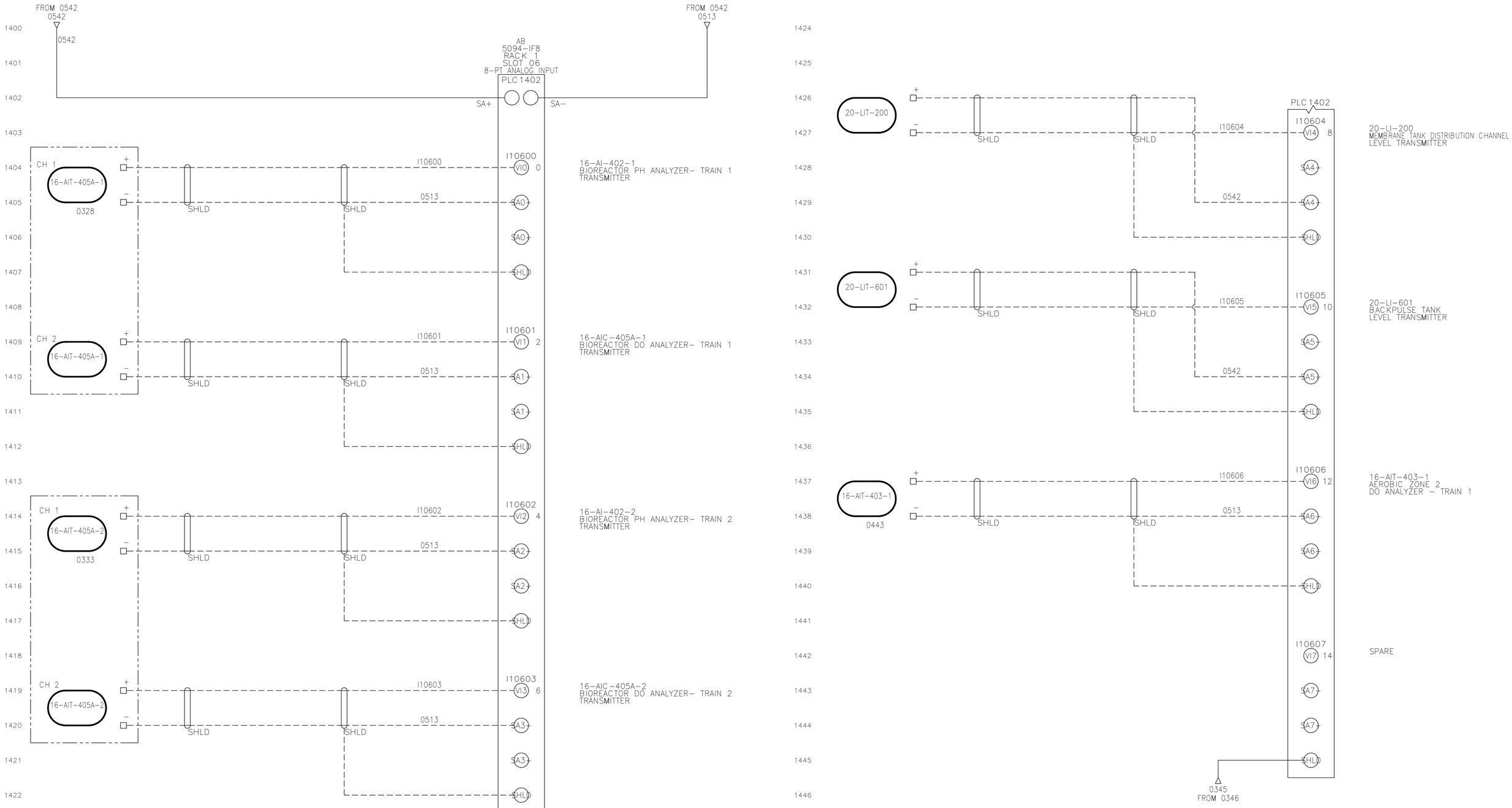
VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 1 SLOT 5, DO MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 13 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464_MCP\510464-WTS-EL-000-5100-DI-001-13.dwg
LAST SAVED: Tuesday, June 10, 2025 7:23:05 PM



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER, COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND SHIELD BAR TERMINALS ARE INTERNALLY CONNECTED TOGETHER.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC -
.XXX - -

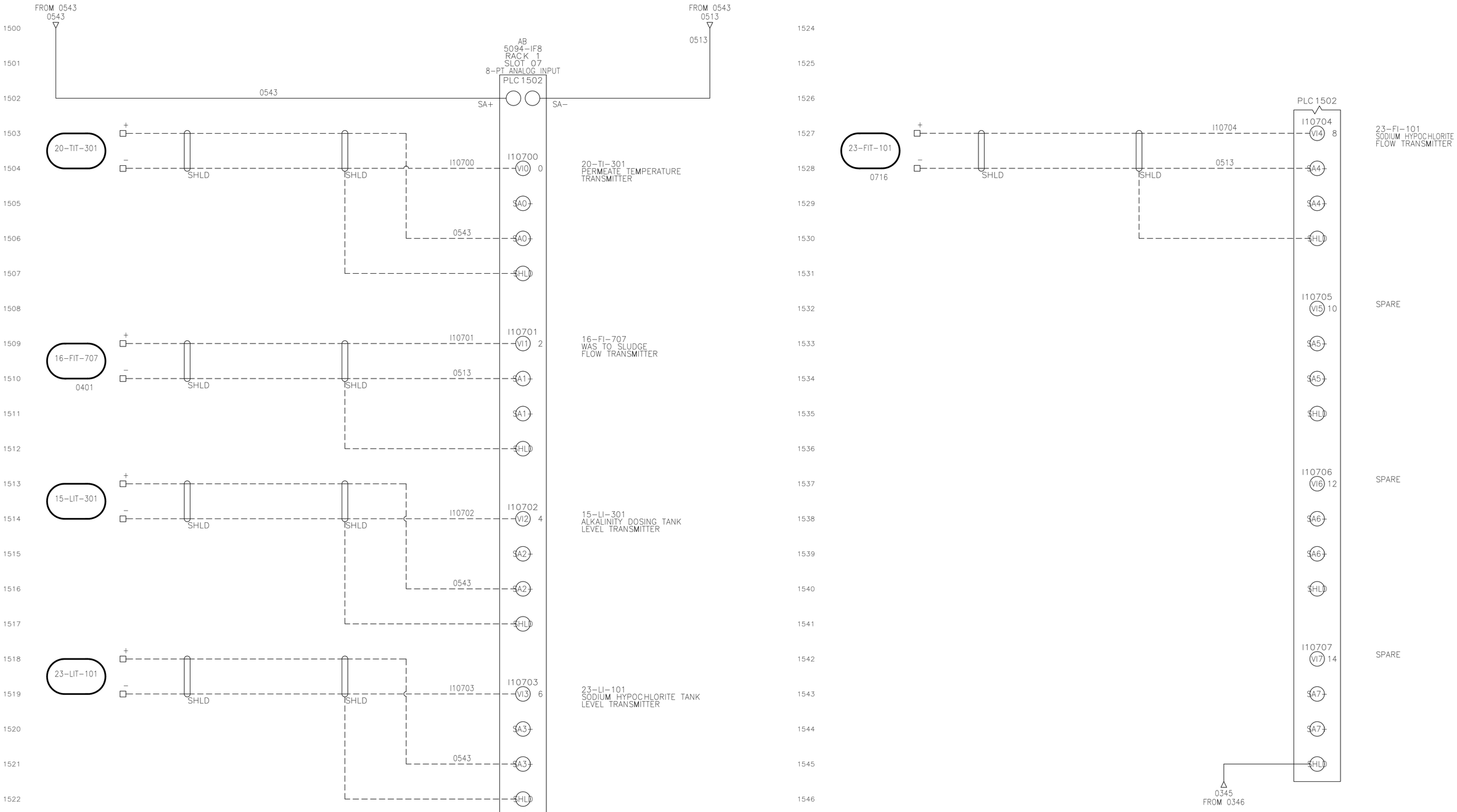
VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 1 SLOT 6, AI MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 14 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-14.dwg
LAST SAVED: Tuesday, June 10, 2025 7:23:05 PM



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER, COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND SHIELD BAR TERMINALS ARE INTERNALLY CONNECTED TOGETHER.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS: .X -, .XX -, .XXX -
ANGLES: -
FRAC: -

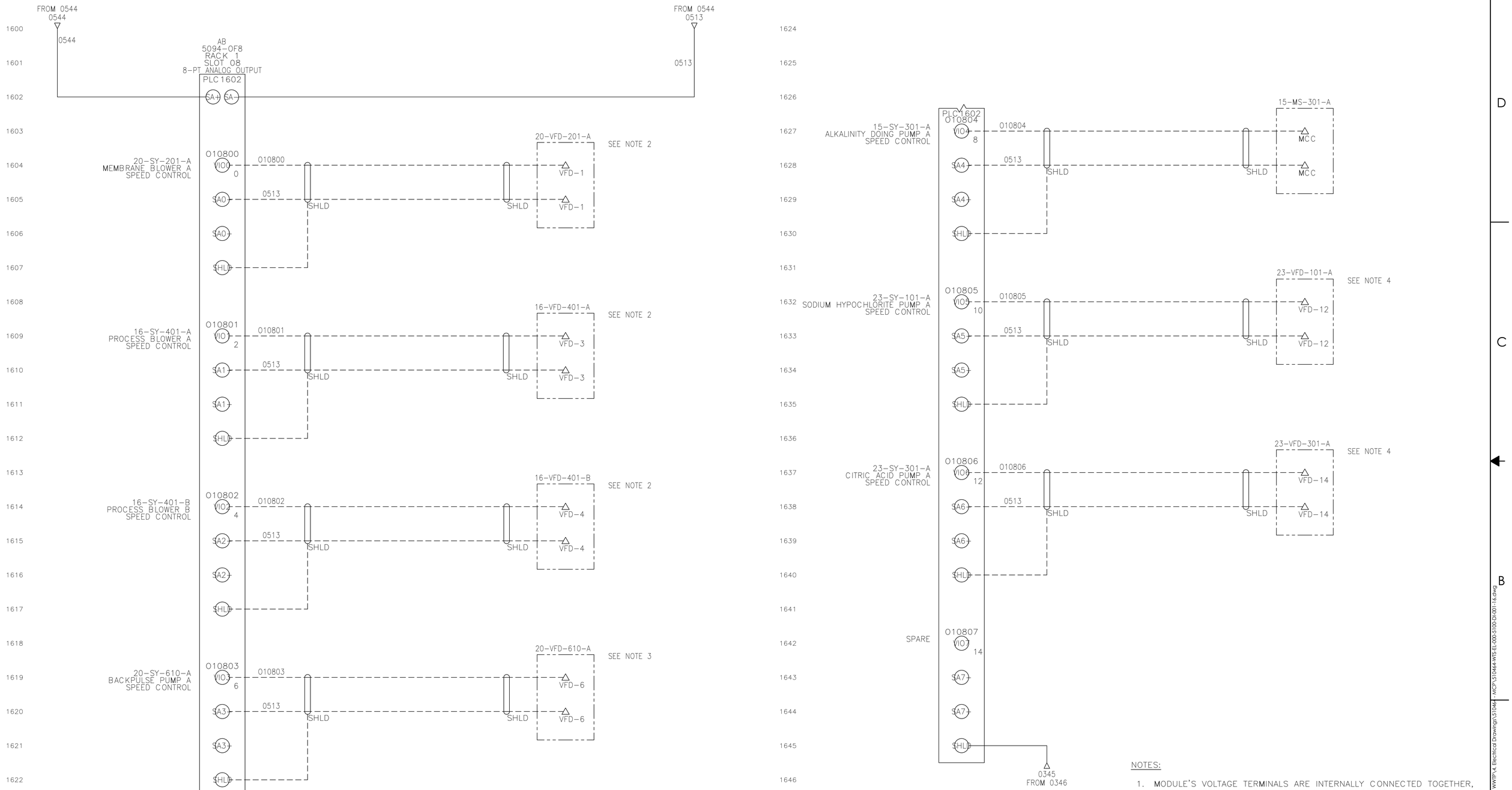
VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 1 SLOT 7, AI MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 15 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-15.dwg
LAST SAVED: Tuesday, June 10, 2025 7:23:06 PM



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER, COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND SHIELD BAR TERMINALS ARE INTERNALLY CONNECTED TOGETHER.
2. REFER VFD DRAWING IN THE SHEET 41 OF THIS SCHEMATICS 510464-WTS-EL-000-5100-DI-001.
3. REFER VFD DRAWING IN THE SHEET 42 OF THIS SCHEMATICS 510464-WTS-EL-000-5100-DI-001.
4. REFER VFD DRAWING IN THE SHEET 43 OF THIS SCHEMATICS 510464-WTS-EL-000-5100-DI-001.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
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VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 1 SLOT 8, AO MODULE

DRAWING NUMBER	REVISION
510464-WTS-EL-000-5100-DI-001	C
REF.: -	DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	510464-0005100C001	NONE	D	16 OF 45

LAST SAVED: Tuesday, June 10, 2025 7:23:06 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4 Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-16.dwg

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REV.	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
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VEOLIA

CUSTOMER INFORMATION

CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM

MAIN CONTROL PANEL, CP-01

SPARE PAGE

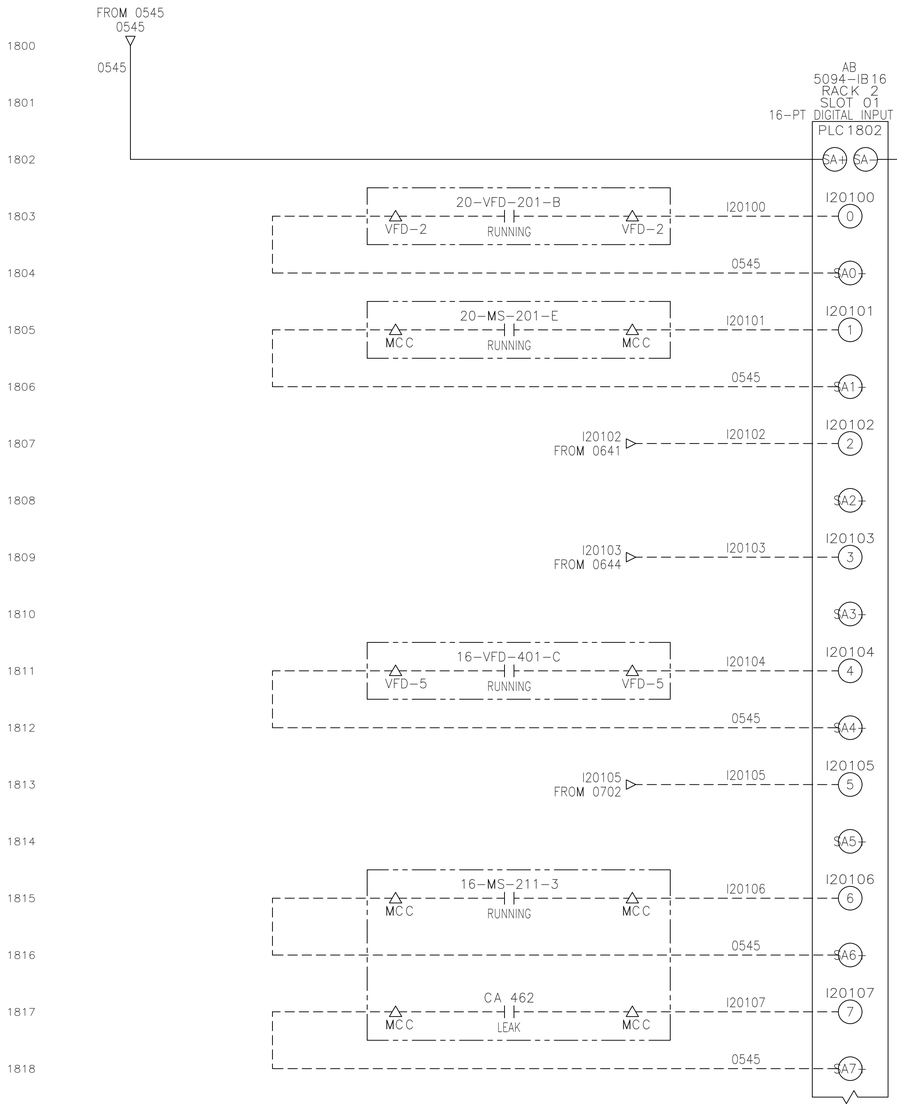
DRAWING NUMBER	REVISION
510464-WTS-EL-000-5100-DI-001	C

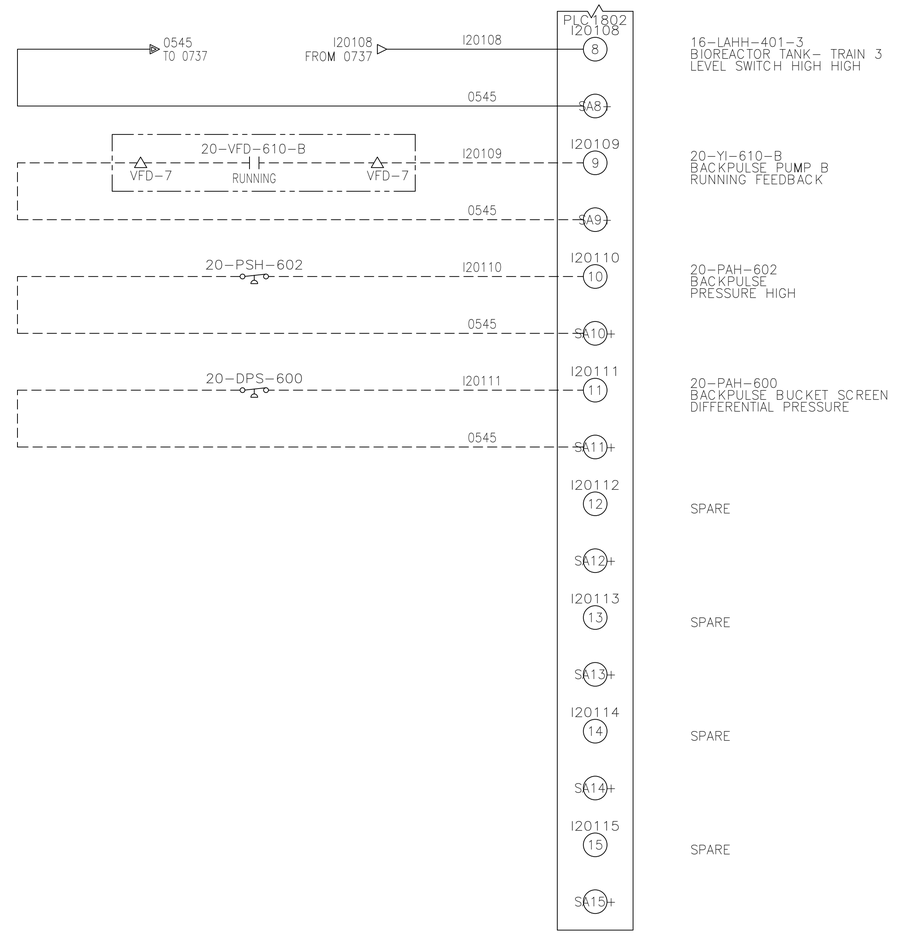
REF.: -
DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	510464-0005100C001	NONE	D	17 OF 45

LAST SAVED: Tuesday, June 10, 2025 7:23:06 PM

FILE LOCATION: C:_ADSKVault\VAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-17.dwg





NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC -
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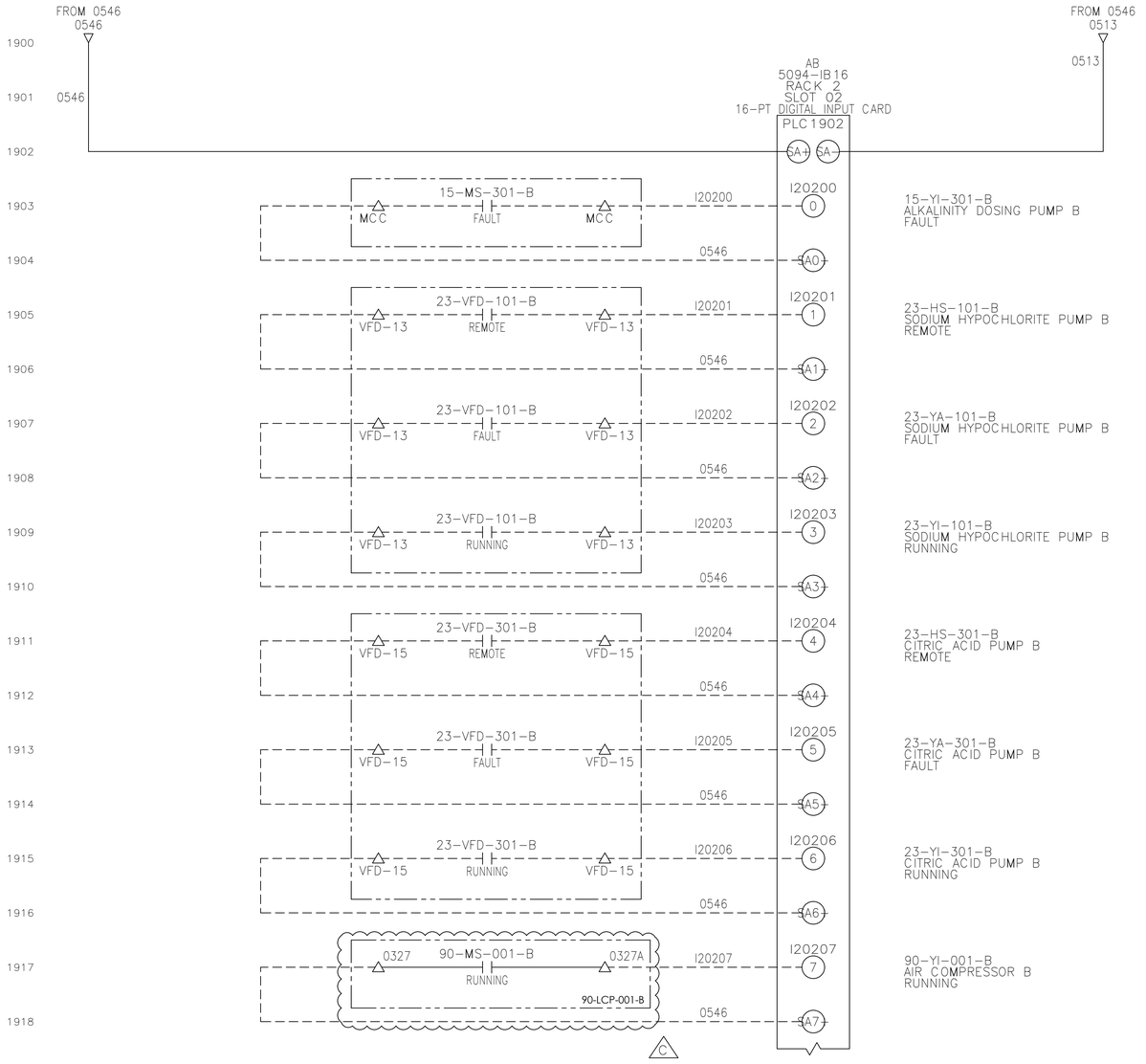
VEOLIA

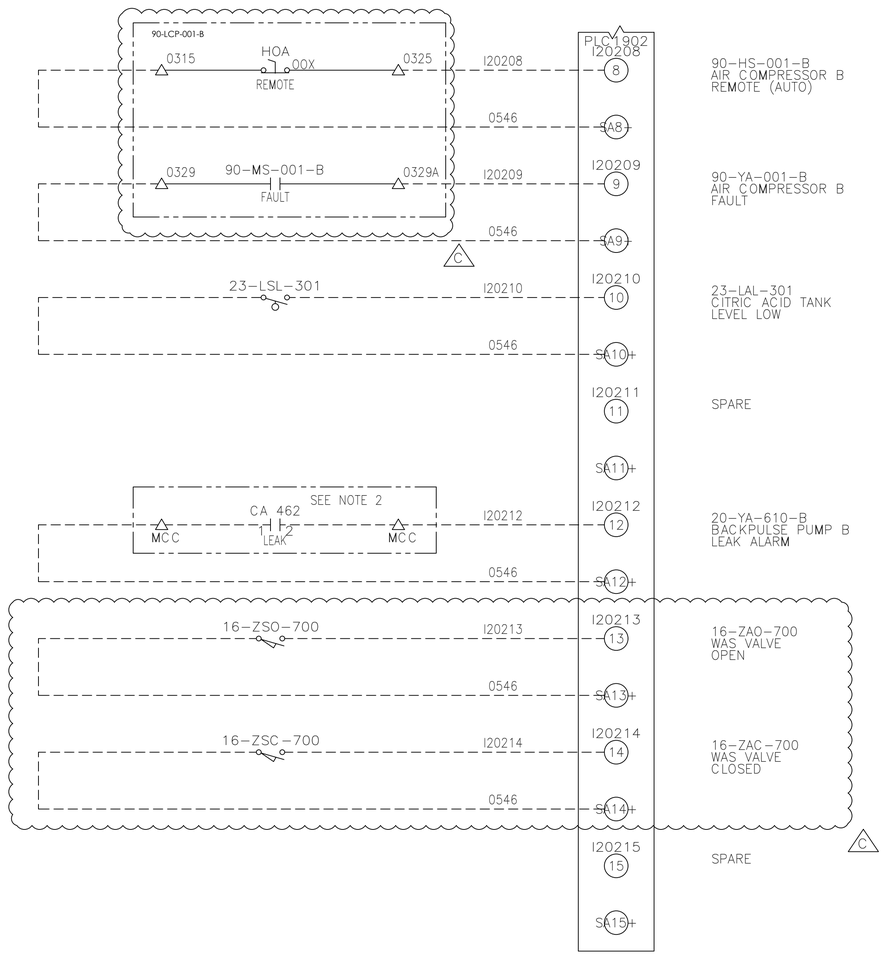
CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 2 SLOT 1, DI MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 18 OF 45
LAST SAVED: Tuesday, June 10, 2025 7:23:07 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4 Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-18.dwg





NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.
2. LEAK/TEMP RELAY CA462 LOOSE SHIPPED WITH PUMPS, INSTALLED AND WIRED BY OTHERS.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
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.XX - FRAC
.XXX - -

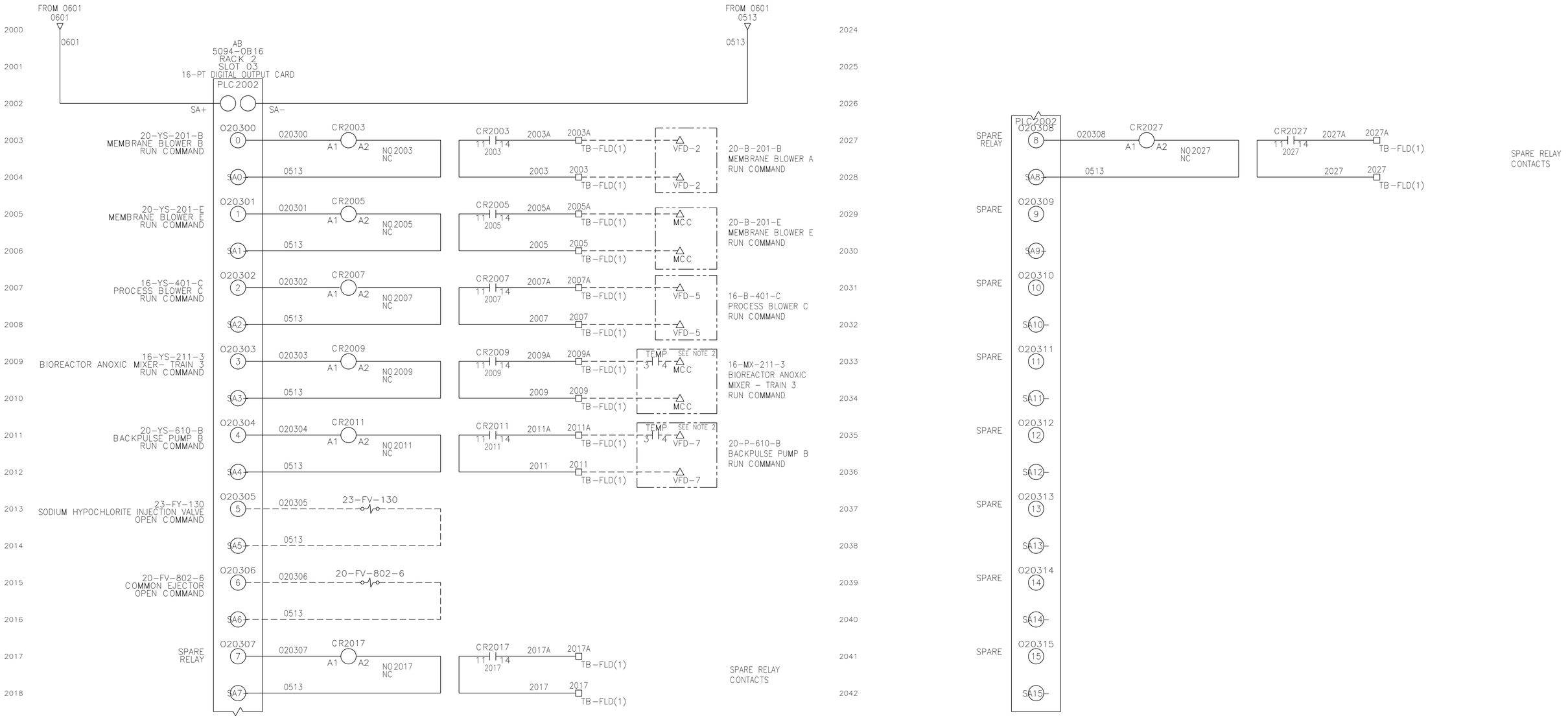
VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 2 SLOT 2, DI MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 19 OF 45
LAST SAVED: Wednesday, June 11, 2025 4:10:19 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464_MCP\510464-WTS-EL-000-5100-DI-001-19.dwg



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.
2. LEAK/TEMP RELAY CA462 SHIPPED WITH PUMPS, INSTALLED AND WIRED BY OTHERS.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

PROPRIETARY AND CONFIDENTIAL: THIS DRAWING AND ALL INFORMATION AND KNOWLEDGE CONTAINED OR REFERRED HEREIN ARE THE CONFIDENTIAL AND PROPRIETARY PROPERTY OF VEOLIA AND AS SUCH ARE INSTRUMENTS OF SERVICE FOR USE SOLELY WITH RESPECT TO THIS PROJECT. THESE INSTRUMENTS OF SERVICE SHALL NOT BE REPRODUCED, TRANSMITTED, DISCLOSED OR USED OTHERWISE IN WHOLE OR IN PART, WITHOUT PRIOR WRITTEN AGREEMENT BY VEOLIA AND MUST BE IMMEDIATELY RETURNED OR DESTROYED UPON REQUEST.

TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC -
.XXX - -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 2 SLOT 3, DO MODULE

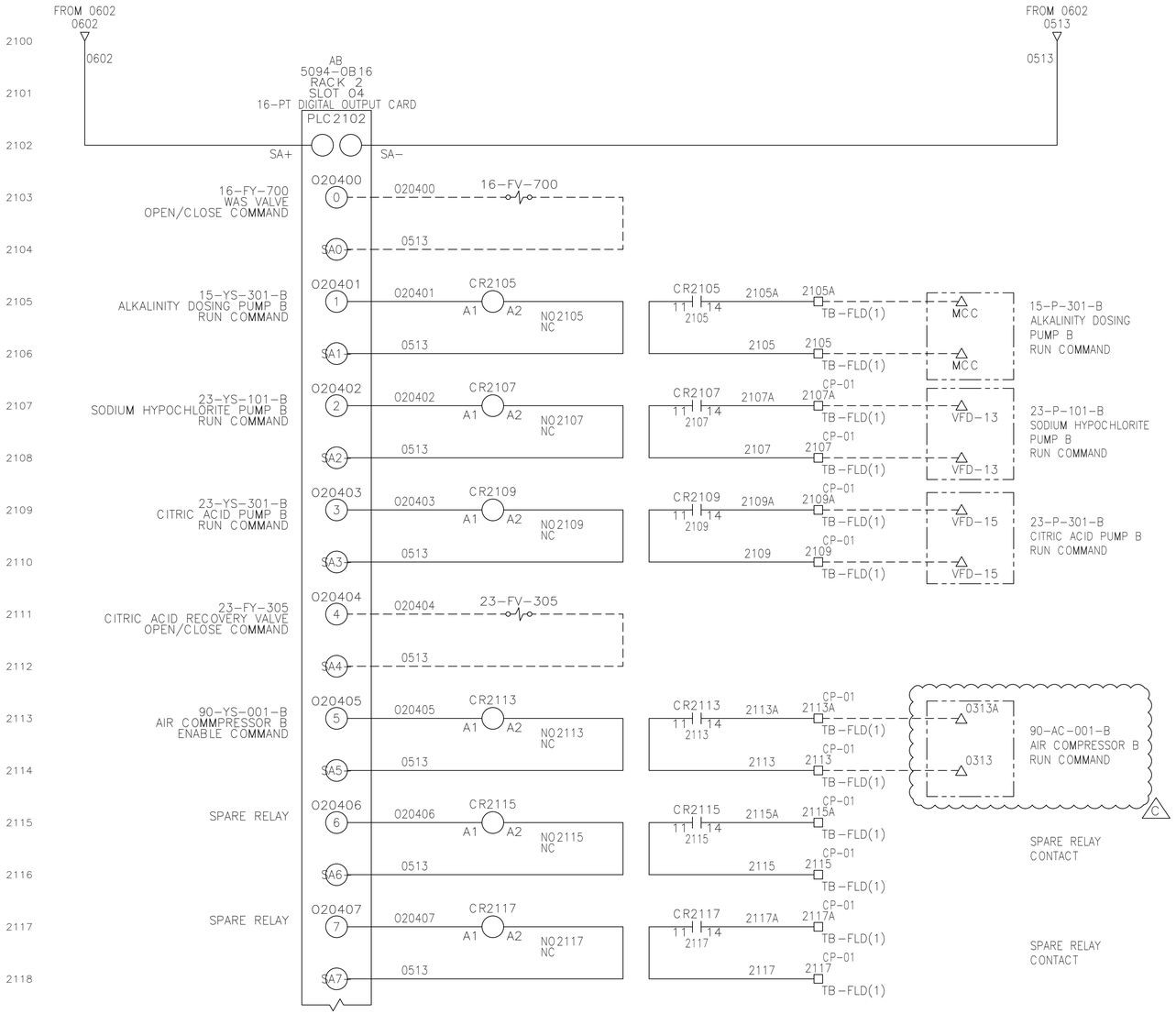
DRAWING NUMBER	REVISION
510464-WTS-EL-000-5100-DI-001	C

REF.: - DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	510464-0005100C001	NONE	D	20 OF 45

LAST SAVED: Tuesday, June 10, 2025 7:23:08 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-20.dwg



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC
.XXX - -

VEOLIA

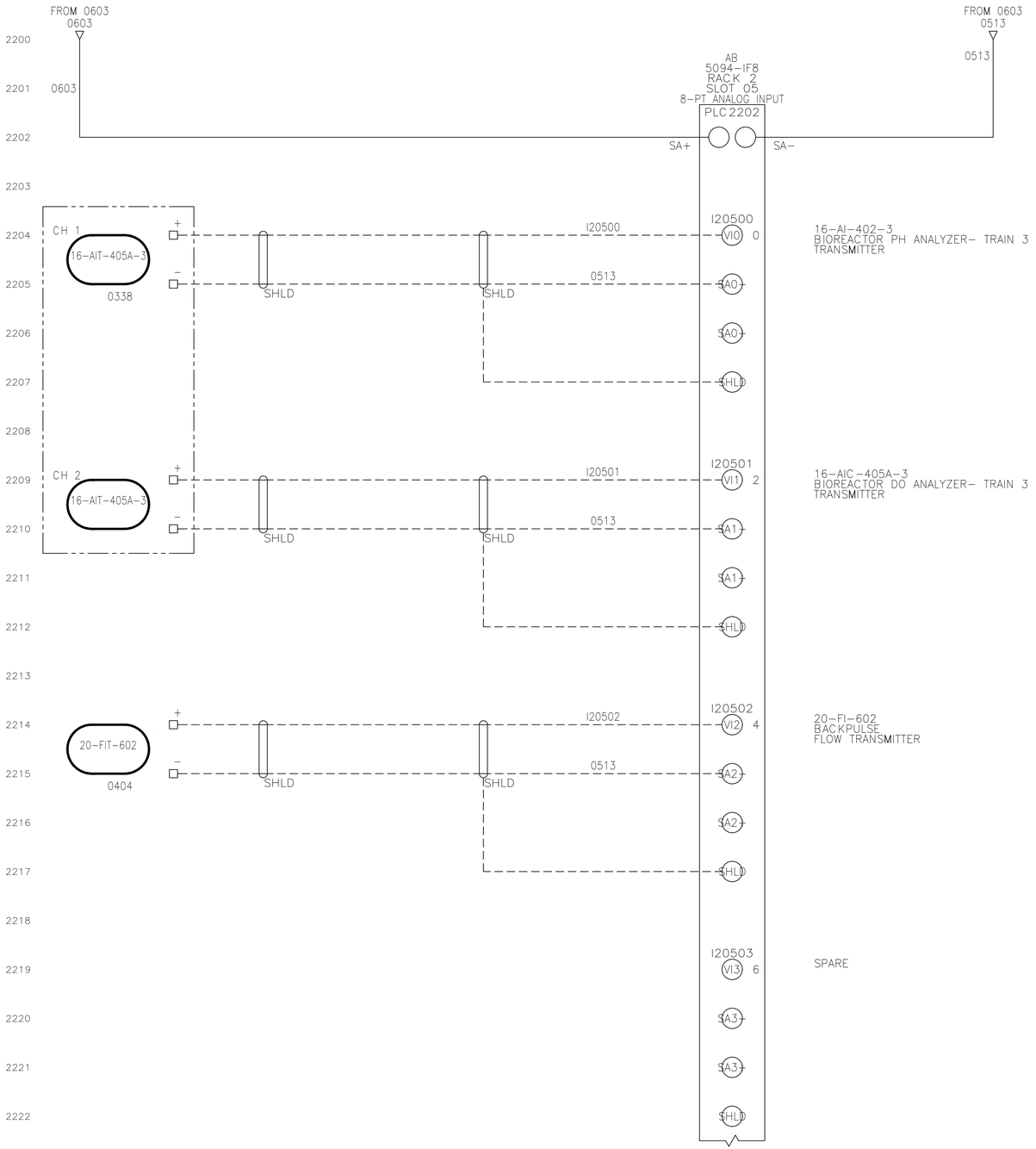
CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

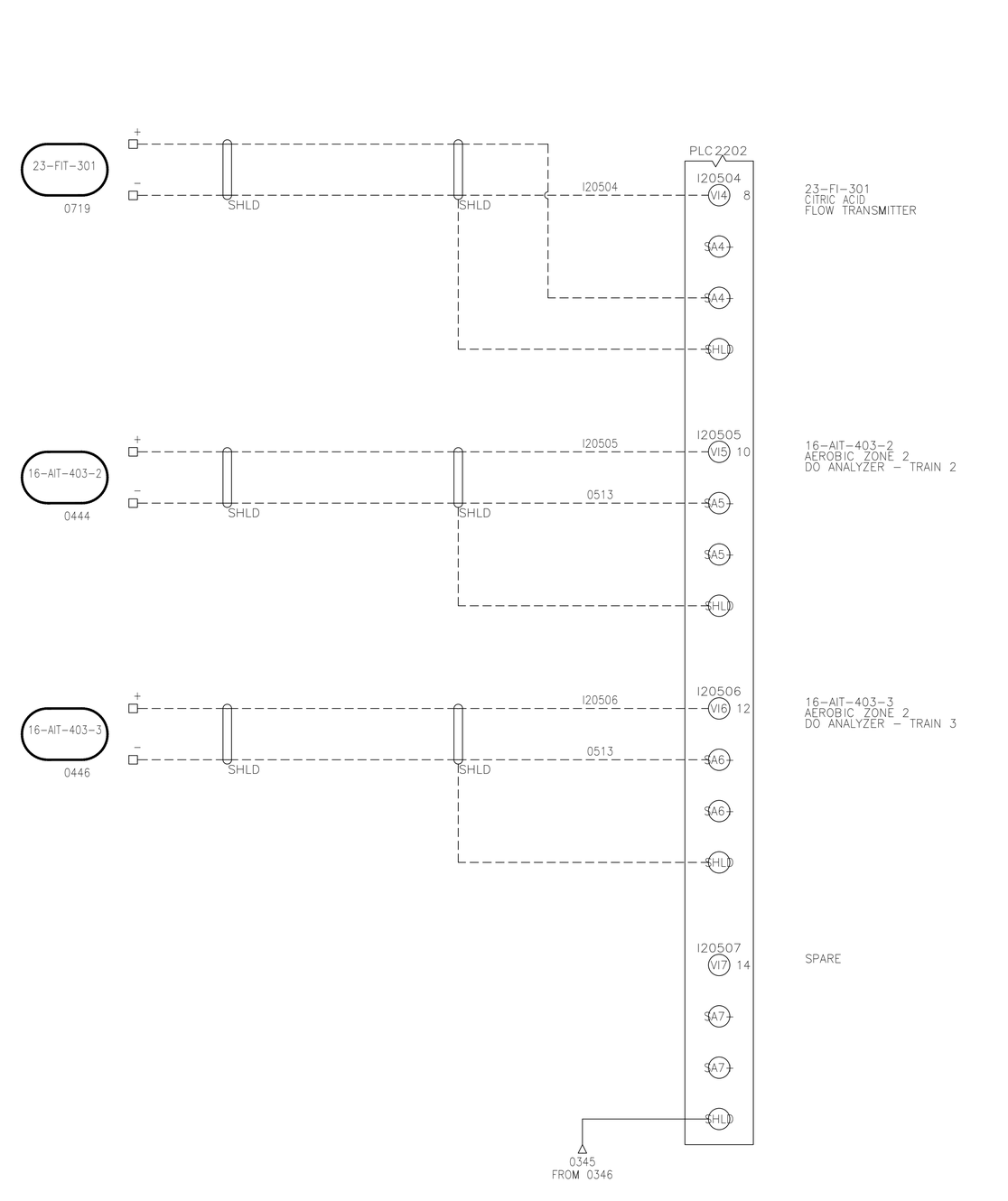
SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 2 SLOT 4, DO MODULE

DRAWING NUMBER				REVISION
510464-WTS-EL-000-5100-DI-001				C
REF.: -	DOC. OWNER: -			
PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	510464-0005100C001	NONE	D	21 OF 45

LAST SAVED: Tuesday, June 10, 2025 7:23:08 PM

FILE LOCATION: C:_ASKVault\VAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-21.dwg





NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER, COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND SHIELD BAR TERMINALS ARE INTERNALLY CONNECTED TOGETHER.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS: .X -, .XX -, .XXX -
ANGLES: -
FRAC: -

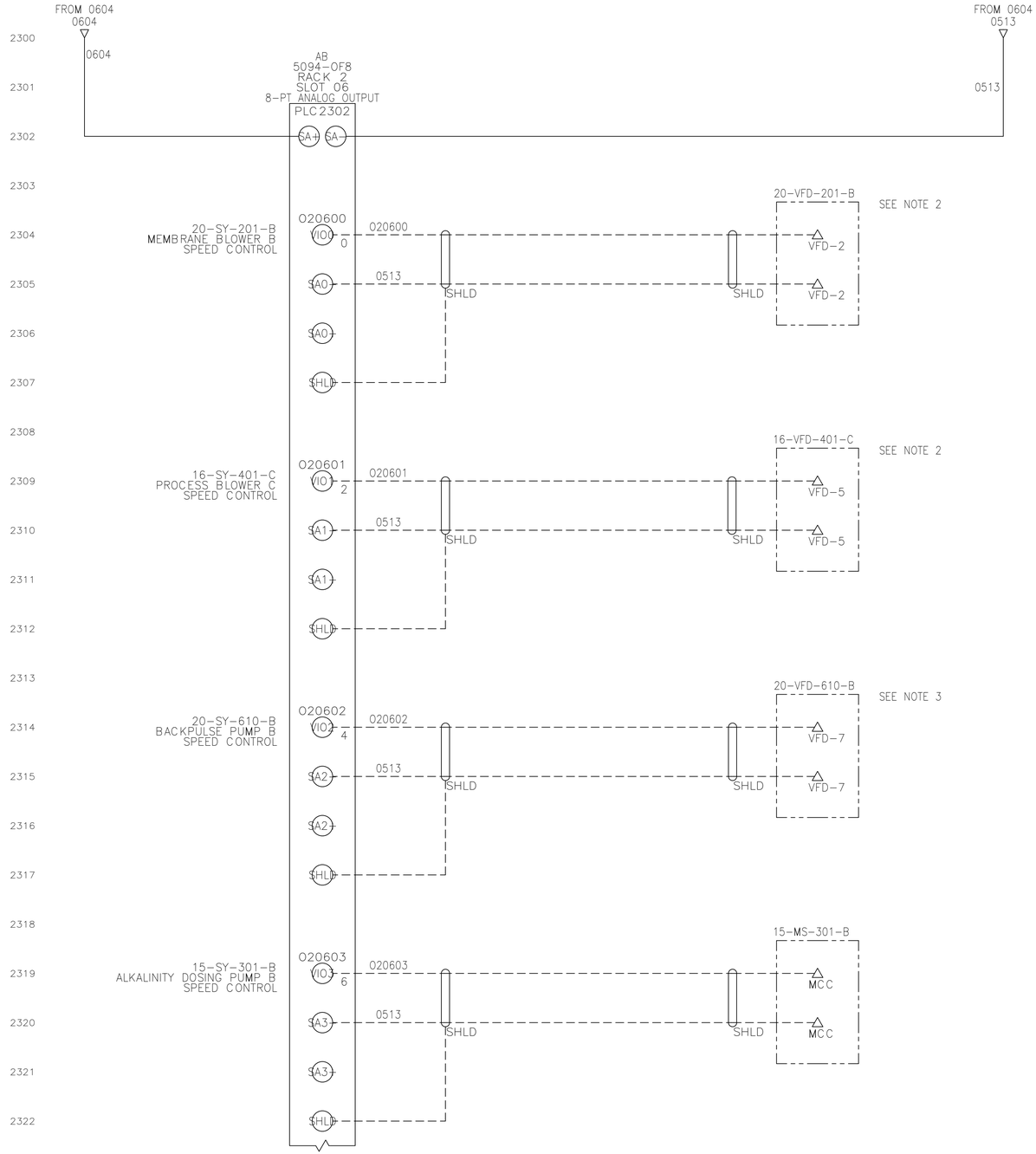
VEOLIA

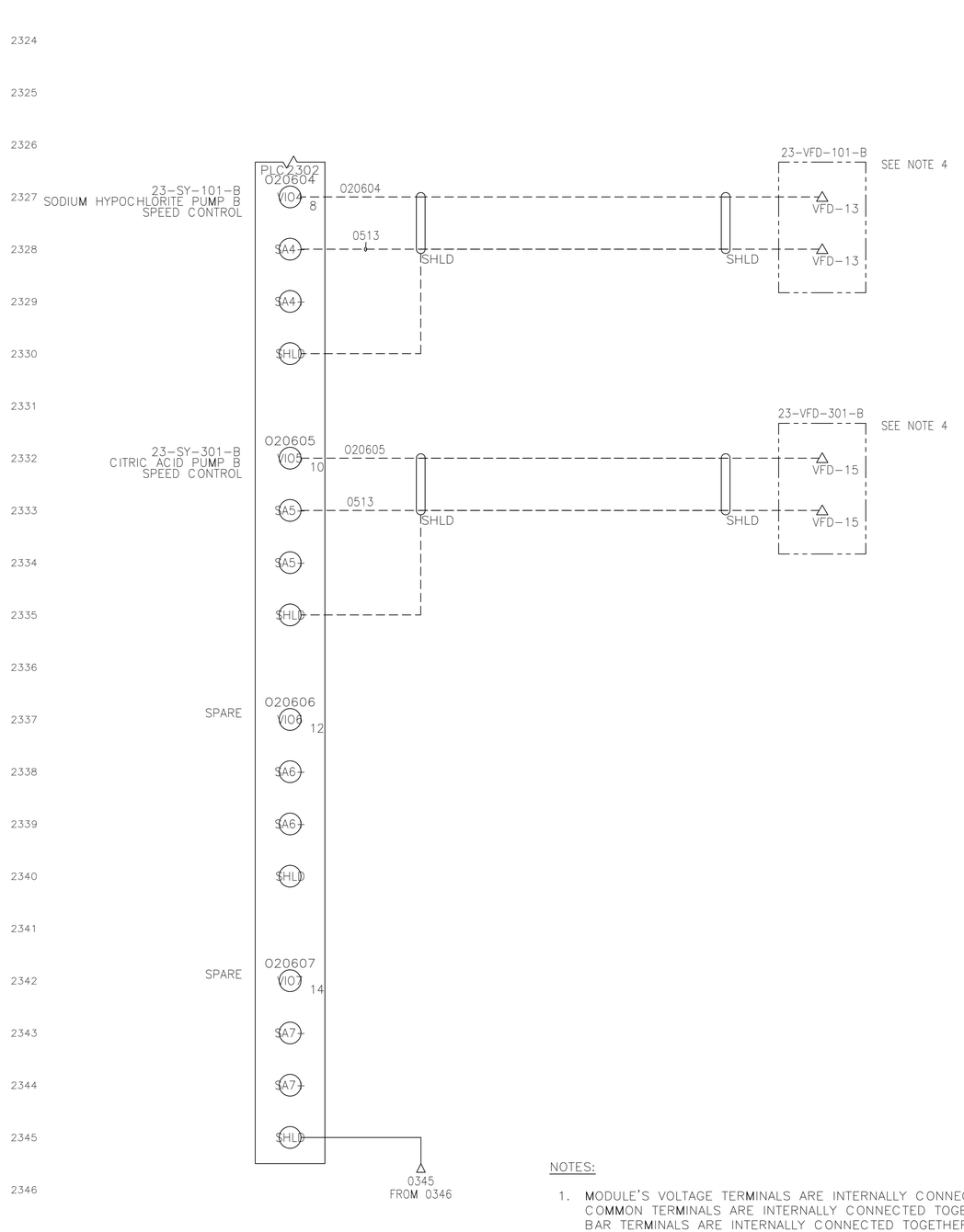
CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 2 SLOT 5, AI MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 22 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4 Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-22.dwg
LAST SAVED: Tuesday, June 10, 2025 7:23:08 PM





NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER, COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND SHIELD BAR TERMINALS ARE INTERNALLY CONNECTED TOGETHER.
2. REFER VFD DRAWING IN THE SHEET 41 OF THIS SCHEMATICS 510464-WTS-EL-000-5100-DI-001.
3. REFER VFD DRAWING IN THE SHEET 42 OF THIS SCHEMATICS 510464-WTS-EL-000-5100-DI-001.
4. REFER VFD DRAWING IN THE SHEET 43 OF THIS SCHEMATICS 510464-WTS-EL-000-5100-DI-001.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS: .X - , .XX - , .XXX - ; ANGLES - ; FRAC -

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 2 SLOT 6, AO MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 23 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-23.dwg
LAST SAVED: Tuesday, June 10, 2025 7:23:09 PM

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REV.	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC -
.XXX - -

VEOLIA

CUSTOMER INFORMATION

CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM

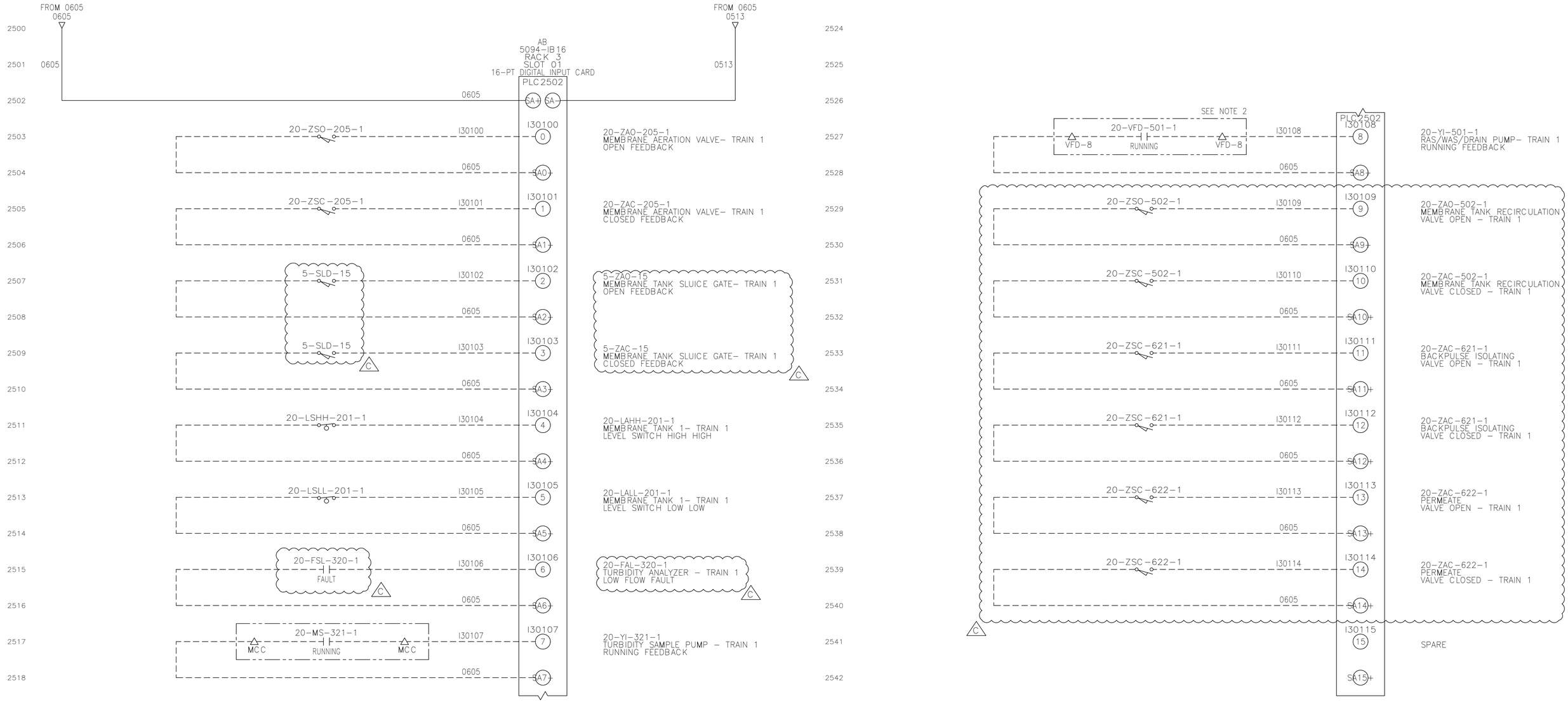
MAIN CONTROL PANEL, CP-01

SPARE PAGE

DRAWING NUMBER				REVISION
510464-WTS-EL-000-5100-DI-001				C
REF.: -	DOC. OWNER: -			
PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	510464-0005100C001	NONE	D	24 OF 45

LAST SAVED: Tuesday, June 10, 2025 7:23:09 PM

FILE LOCATION: C:_ADSKVault\VAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-24.dwg



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.
2. REFER VFD DRAWING IN THE SHEET 41 OF THIS SCHEMATICS 510464-WTS-EL-000-5100-DI-001.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC -
.XXX - -

VEOLIA

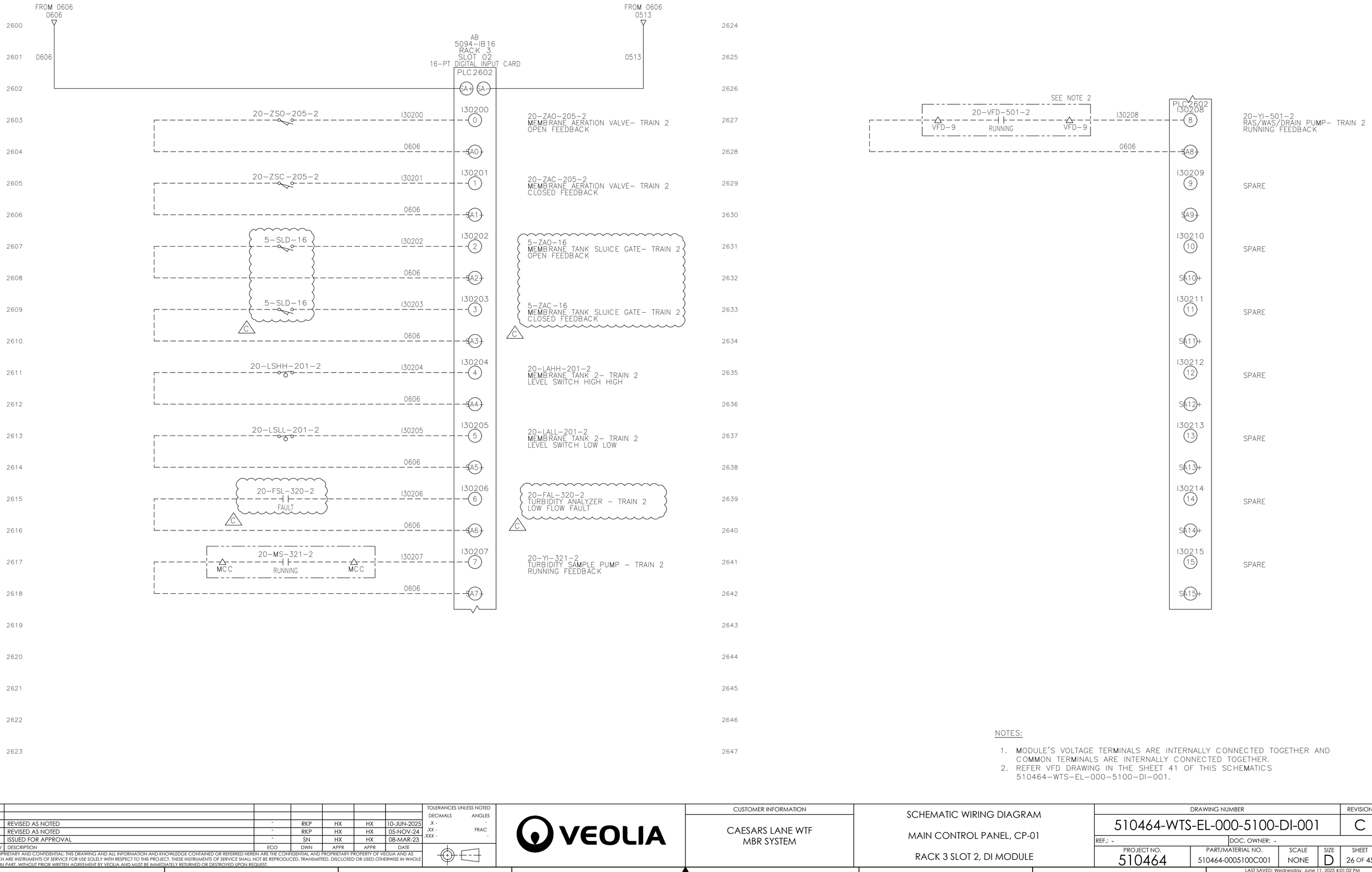
CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 3 SLOT 1, DI MODULE

DRAWING NUMBER				REVISION
510464-WTS-EL-000-5100-DI-001				C
REF.: -	DOC. OWNER: -			
PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	510464-0005100C001	NONE	D	25 OF 45

LAST SAVED: Wednesday, June 11, 2025 4:01:06 PM

FILE LOCATION: C:_ASKVault\VAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-25.dwg



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.
2. REFER VFD DRAWING IN THE SHEET 41 OF THIS SCHEMATICS 510464-WTS-EL-000-5100-DI-001.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX -
ANGLES -
FRAC -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 3 SLOT 2, DI MODULE

DRAWING NUMBER	REVISION
510464-WTS-EL-000-5100-DI-001	C

REF.: - DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	510464-0005100C001	NONE	D	26 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-26.dwg
LAST SAVED: Wednesday, June 11, 2025 4:01:02 PM

FROM 0607
0607

FROM 0607
0513

AB
5094-IB16
RACK 3
SLOT 03
16-PT DIGITAL INPUT CARD

PLC2702

2700				
2701	0607			0513
2702		SA+ SA-		
2703	20-ZSO-502-2 I30300	I30300 0	20-ZAO-502-2 MEMBRANE TANK RECIRCULATION VALVE OPEN – TRAIN 2	2727
2704	0607	SA0-		2728
2705	20-ZSC-502-2 I30301	I30301 1	20-ZAC-502-2 MEMBRANE TANK RECIRCULATION VALVE CLOSED – TRAIN 2	2729
2706	0607	SA1-		2730
2707	20-ZSO-621-2 I30302	I30302 2	20-ZAO-621-2 BACKPULSE ISOLATING VALVE OPEN – TRAIN 2	2731
2708	0607	SA2-		2732
2709	20-ZSC-621-2 I30303	I30303 3	20-ZAC-621-2 BACKPULSE ISOLATING VALVE CLOSED – TRAIN 2	2733
2710	0607	SA3-		2734
2711	20-ZSO-622-2 I30304	I30304 4	20-ZAO-622-2 MEMBRANE TANK 2– TRAIN 2	2735
2712	0607	SA4-		2736
2713	20-ZSC-622-2 I30305	I30305 5	20-ZSC-622-2 PERMEATE VALVE CLOSED – TRAIN 2	2737
2714	0607	SA5-		2738
2715		I30306 6	SPARE	2739
2716		SA6-		2740
2717		I30307 7	SPARE	2741
2718		SA7-		2742
2719				2743
2720				2744
2721				2745
2722				2746
2723				2747

PLC2702

I30308 8	SPARE	
SA8+		
I30309 9	SPARE	
SA9+		
I30310 10	SPARE	
SA10+		
I30311 11	SPARE	
SA11+		
I30312 12	SPARE	
SA12+		
I30313 13	SPARE	
SA13+		
I30314 14	SPARE	
SA14+		
I30315 15	SPARE	
SA15+		

NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.
2. REFER VFD DRAWING IN THE SHEET 41 OF THIS SCHEMATICS 510464-WTS-EL-000-5100-DI-001.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC -
.XXX - -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
C RACK 3 SLOT 3, DI MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 27 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-27.dwg
LAST SAVED: Wednesday, June 11, 2025 4:00:57 PM

FROM 0608
0608

FROM 0608
0513

AB
5094-OB16
RACK 3
SLOT 04
16-PT DIGITAL OUTPUT CARD
PLC2802

0608

0513

SA+

SA-

20-FY-205-1
MEMBRANE AERATION VALVE- TRAIN 1
OPEN COMMAND

O30400
0
030400
20-FV-205-1
SA0
0513

20-FY-502-1
MEMBRANE TANK RECIRCULATION
VALVE- TRAIN 1
OPEN COMMAND

O30401
1
030401
20-FV-502-1
SA1
0513

5-SLD-15
MEMBRANE TANK SLUICE GATE- TRAIN 1
OPEN COMMAND
C

O30402
2
030402
CR2807
A1 A2
NO2807
NC
SA2
0513

CR2807
11 14
2807
2807A
2807A
TB-FLD(1)
MCC
2807
2807
TB-FLD(1)
MCC

5-SLD-15
MEMBRANE TANK
SLUICE GATE OPEN
TRAIN 1

5-SLD-15
MEMBRANE TANK SLUICE GATE- TRAIN 1
CLOSE COMMAND
C

O30403
3
030403
CR2809
A1 A2
NO2809
NC
SA3
0513

CR2809
11 14
2809
2809A
2809A
TB-FLD(1)
MCC
2809
2809
TB-FLD(1)
MCC

5-SLD-15
MEMBRANE TANK
SLUICE GATE CLOSE
TRAIN 1
C

20-FY-802-1
MEMBRANE EJECTOR VALVE- TRAIN 1
OPEN COMMAND

O30404
4
030404
20-FV-802-1
SA4
0513

20-YS-321-1
TURBIDITY SAMPLE PUMP- TRAIN 1
RUN COMMAND

O30405
5
030405
CR2813
A1 A2
NO2813
NC
SA5
0513

CR2813
11 14
2813
2813A
2813A
TB-FLD(1)
MCC
2813
2813
TB-FLD(1)
MCC

20-P-321-1
TURBIDITY SAMPLE
PUMP- TRAIN 1
RUN COMMAND

20-FY-621-1
BACKPULSE ISOLATING VALVE- TRAIN 1
OPEN COMMAND

O30406
6
030406
20-FV-621-1
SA6
0513

20-FY-622-1
PERMEATE VALVE- TRAIN 1
OPEN COMMAND

O30407
7
030407
20-FV-622-1
SA7
0513

PLC2802
O30408
8
030408
20-FV-324-1
SA8
0513

20-FY-324-1
TURBIDITY SAMPLE
FEEDING VALVE- TRAIN 1
OPEN COMMAND

O30409
9
030409
20-FV-320-1
SA9
0513

20-FY-320-1
TURBIDITY SAMPLE
DRAINING VALVE- TRAIN 1
OPEN COMMAND

O30410
10
030410
20-FV-803-1
SA10
0513

20-FY-803-1
PERMEATE VACUUM
VALVE- TRAIN 1
OPEN COMMAND

O30411
11
030411
CR2833
A1 A2
NO2833
NC
SA11
0513

CR2833
11 14
2833
2833A
2833A
TB-FLD(1)
VFD-8
2833
2833
TB-FLD(1)
VFD-8

SEE NOTE 2

20-YS-501-1
RAS/WAS/DRAIN PUMP- TRAIN 1
RUN COMMAND

20-P-501-1
RAS/WAS/DRAIN
PUMP- TRAIN 1
RUN COMMAND

SPARE RELAY

O30412
12
030412
CR2835
A1 A2
0513
NO2835
NC
SA12
0513

CR2835
11 14
2835
2835A
2835A
TB-FLD(1)
2835
2835
TB-FLD(1)

SPARE RELAY
CONTACT

SPARE RELAY

O30413
13
030413
CR2837
A1 A2
NO2837
NC
SA13
0513

CR2837
11 14
2837
2837A
2837A
TB-FLD(1)
2837
2837
TB-FLD(1)

SPARE RELAY
CONTACT

SPARE

O30414
14
SA14

SPARE

O30415
15
SA15

NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.
2. REFER VFD DRAWING IN THE SHEET 41 OF THIS SCHEMATICS 510464-WTS-EL-000-5100-DI-001.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

PROPRIETARY AND CONFIDENTIAL: THIS DRAWING AND ALL INFORMATION AND KNOWLEDGE CONTAINED OR REFERRED HEREIN ARE THE CONFIDENTIAL AND PROPRIETARY PROPERTY OF VEOLIA AND AS SUCH ARE INSTRUMENTS OF SERVICE FOR USE SOLELY WITH RESPECT TO THIS PROJECT. THESE INSTRUMENTS OF SERVICE SHALL NOT BE REPRODUCED, TRANSMITTED, DISCLOSED OR USED OTHERWISE IN WHOLE OR IN PART, WITHOUT PRIOR WRITTEN AGREEMENT BY VEOLIA AND MUST BE IMMEDIATELY RETURNED OR DESTROYED UPON REQUEST.

TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC -
.XXX - -

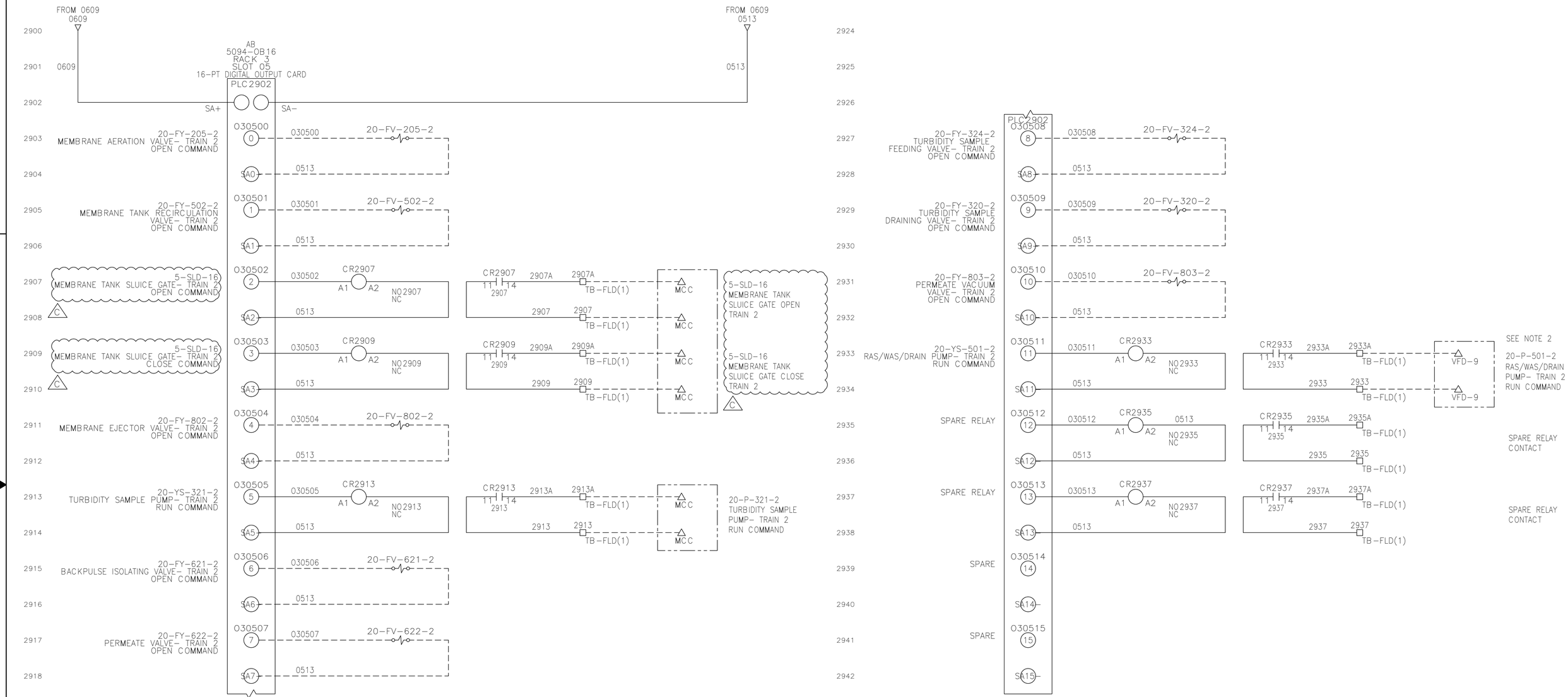
VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 3 SLOT 4, DO MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 28 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-28.dwg
LAST SAVED: Wednesday, June 11, 2025 4:00:53 PM



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.
2. REFER VFD DRAWING IN THE SHEET 41 OF THIS SCHEMATICS 510464-WTS-EL-000-5100-DI-001.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX -
ANGLES -
FRAC -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

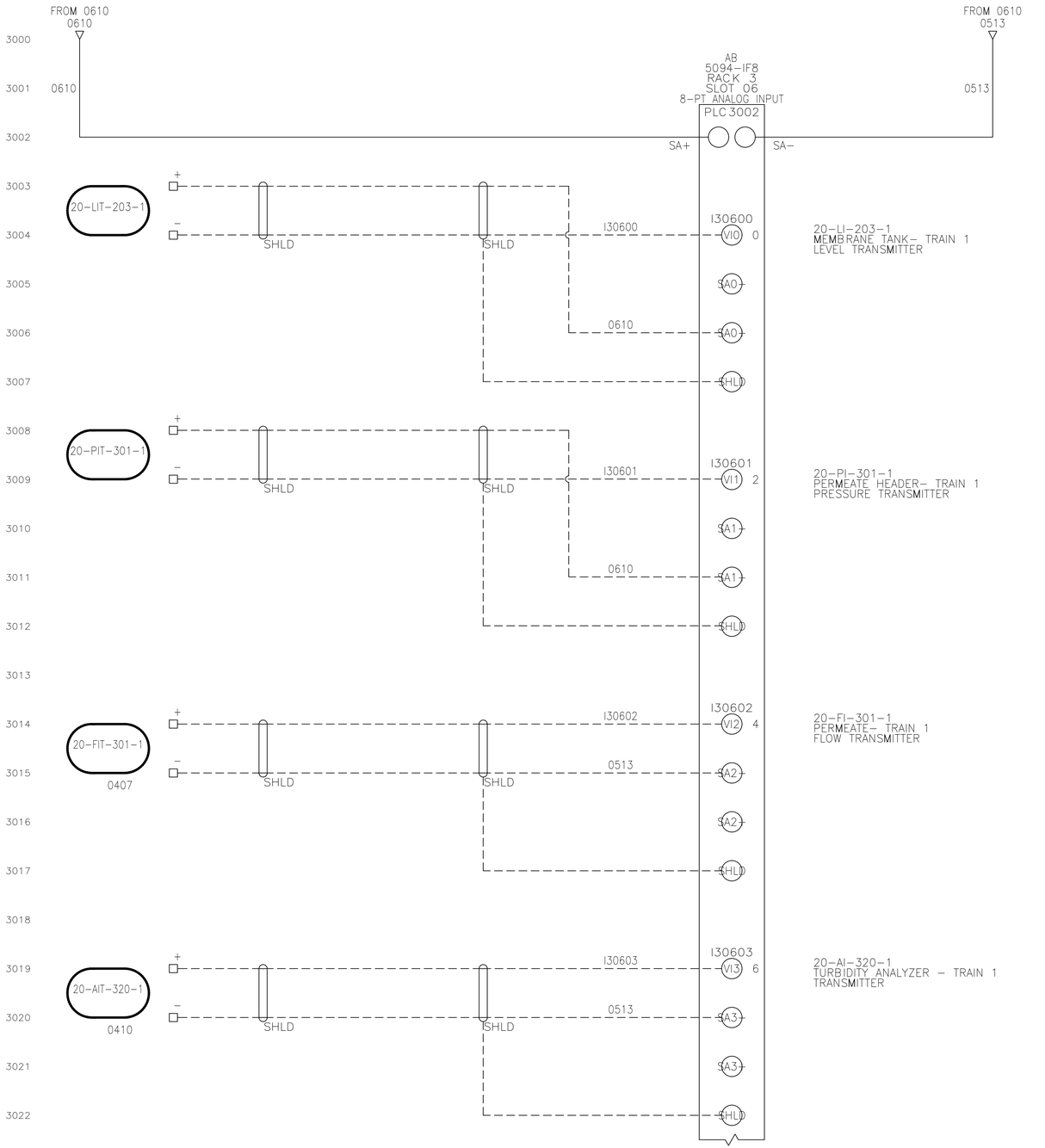
SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 3 SLOT 5, DO MODULE

DRAWING NUMBER	REVISION
510464-WTS-EL-000-5100-DI-001	C

REF.: - DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	510464-0005100C001	NONE	D	29 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-29.dwg
LAST SAVED: Wednesday, June 11, 2025 3:37:28 PM



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER, COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND SHIELD BAR TERMINALS ARE INTERNALLY CONNECTED TOGETHER.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS: .X -, .XX -, .XXX -
ANGLES -
FRAC -

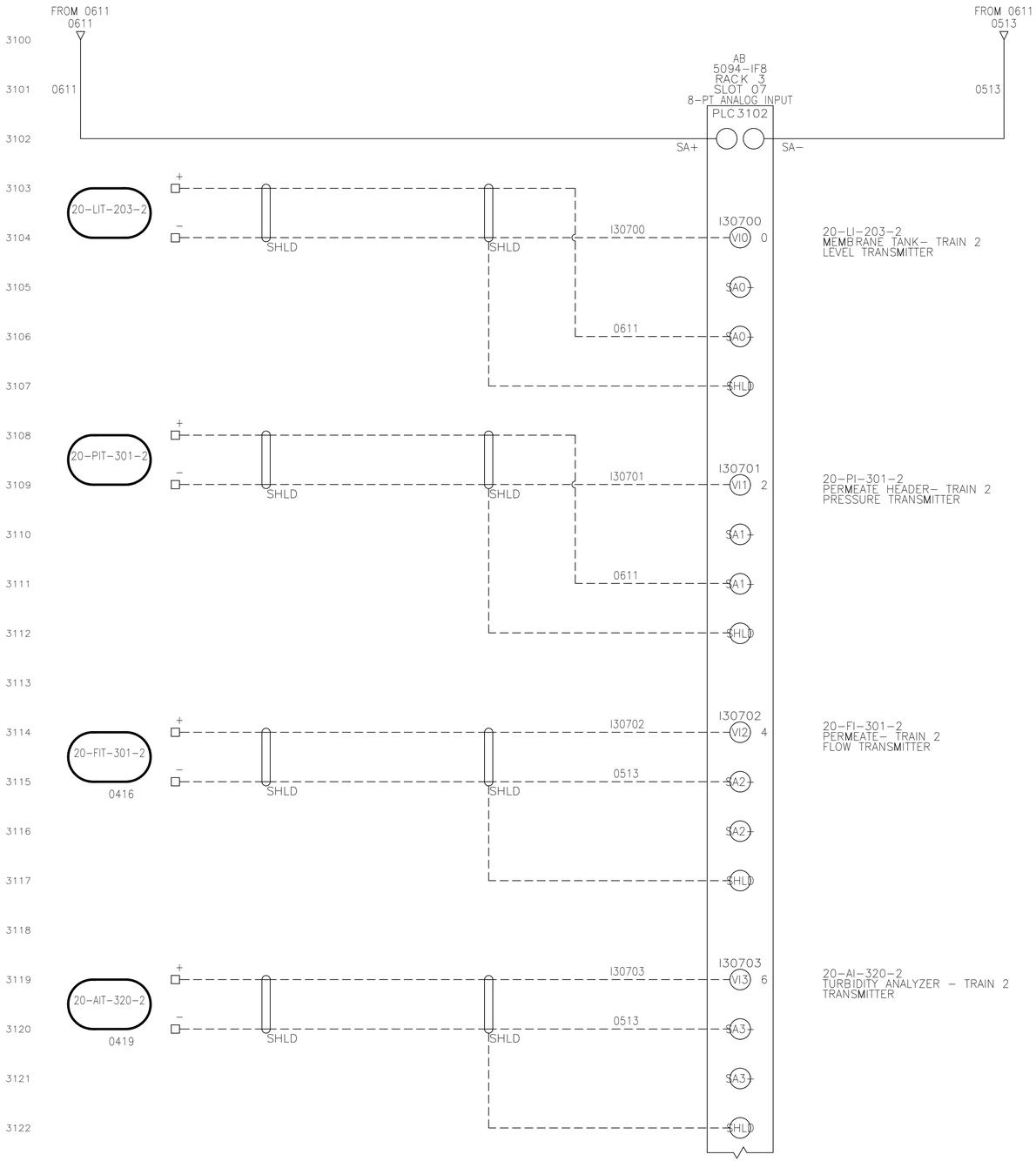
VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 3 SLOT 6, AI MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 30 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-30.dwg
LAST SAVED: Tuesday, June 10, 2025 7:23:12 PM



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER, COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND SHIELD BAR TERMINALS ARE INTERNALLY CONNECTED TOGETHER.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS: .X -, .XX -, .XXX -
ANGLES -
FRAC -

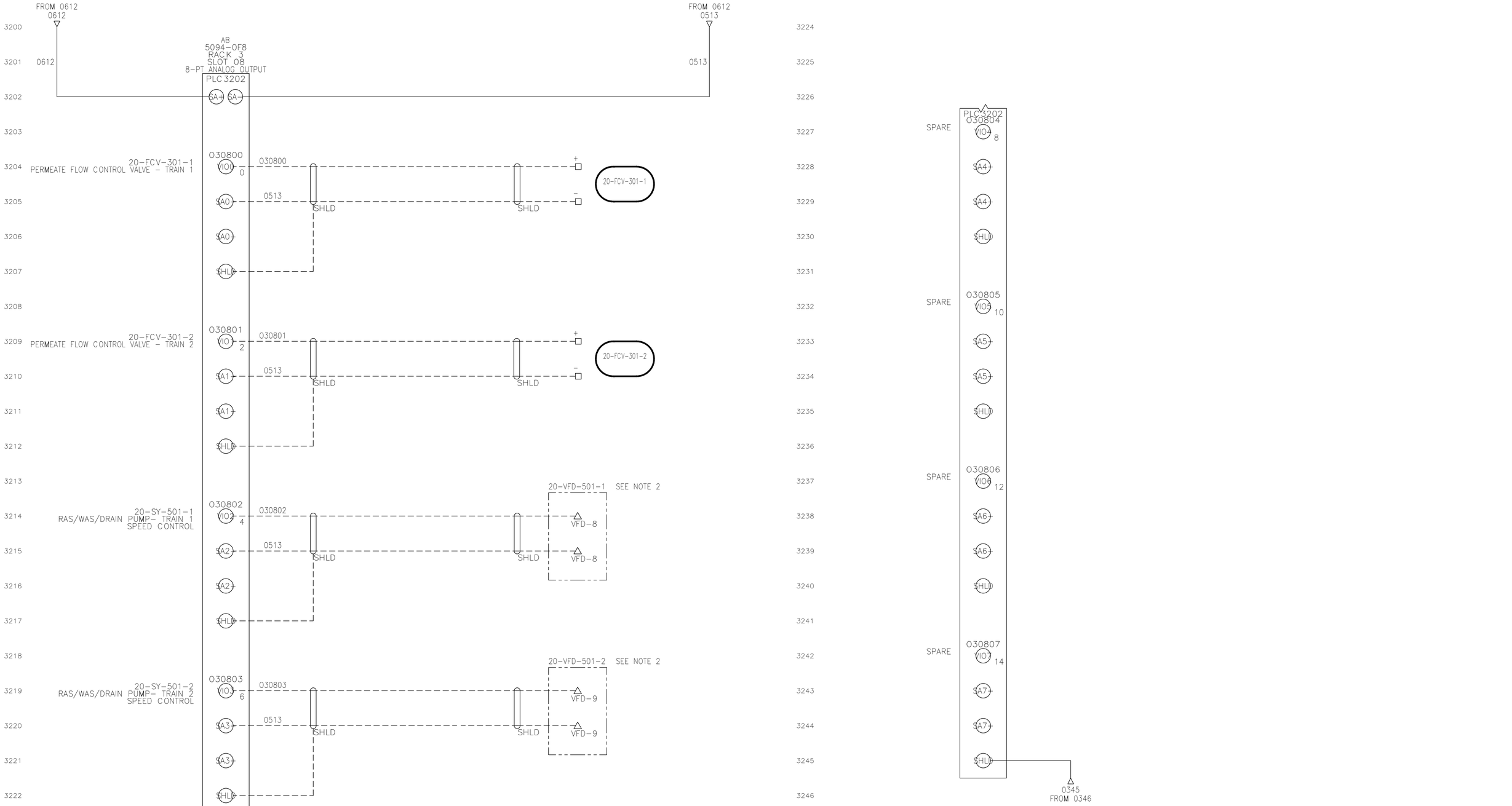
VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 3 SLOT 7, AI MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 31 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-31.dwg
LAST SAVED: Tuesday, June 10, 2025 7:23:13 PM



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER, COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND SHIELD BAR TERMINALS ARE INTERNALLY CONNECTED TOGETHER.
2. REFER VFD DRAWING IN THE SHEET 41 OF THIS SCHEMATICS 510464-WTS-EL-000-5100-DI-001.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX -
ANGLES -
FRAC -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 3 SLOT 8, AO MODULE

DRAWING NUMBER	REVISION
510464-WTS-EL-000-5100-DI-001	C

REF.: - DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	510464-0005100C001	NONE	D	32 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464_MCP\510464-WTS-EL-000-5100-DI-001-32.dwg
LAST SAVED: Tuesday, June 10, 2025 7:23:14 PM

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REV.	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC -
.XXX - -

VEOLIA

CUSTOMER INFORMATION

CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM

MAIN CONTROL PANEL, CP-01

SPARE PAGE

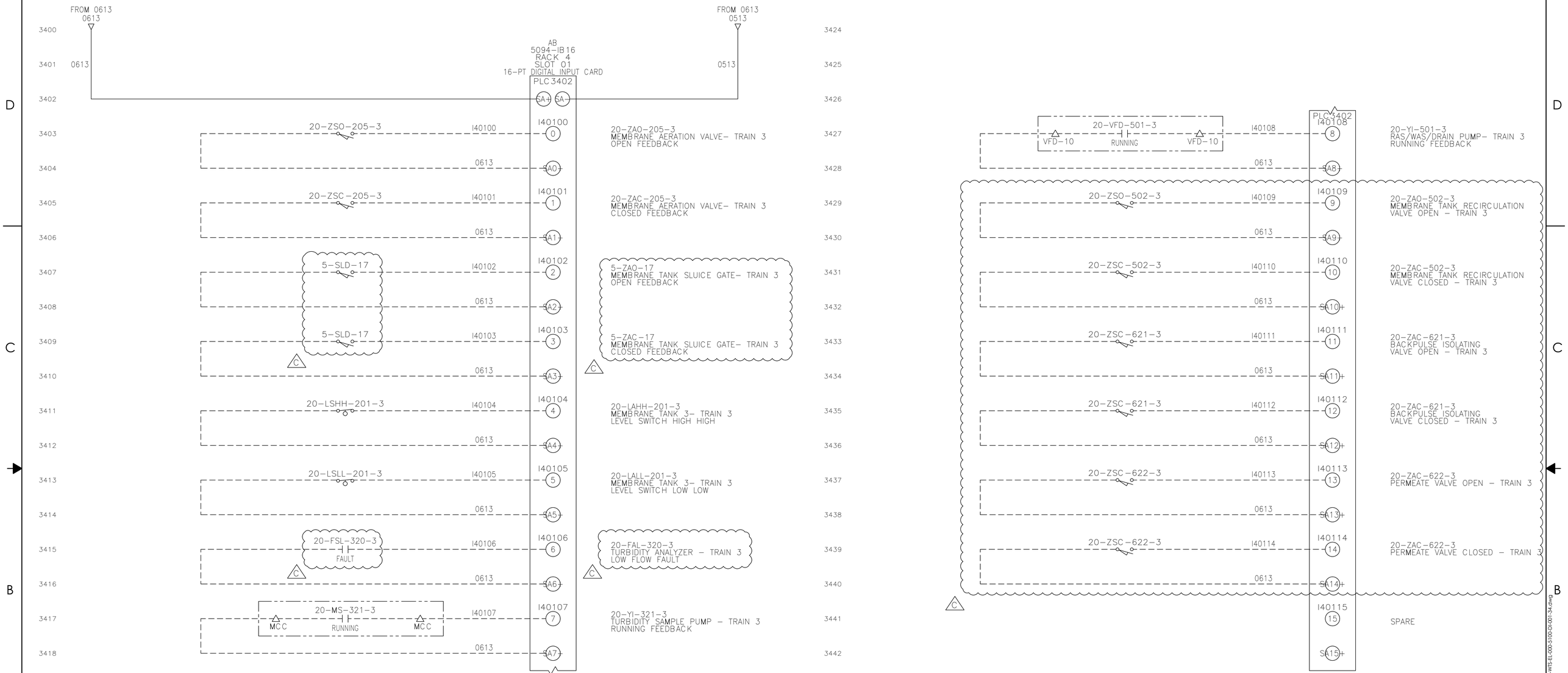
DRAWING NUMBER	REVISION
510464-WTS-EL-000-5100-DI-001	C

REF.: -
DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	510464-0005100C001	NONE	D	33 OF 45

LAST SAVED: Tuesday, June 10, 2025 7:23:14 PM

FILE LOCATION: C:_ACSX Vault\WAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-33.dwg



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC
.XXX - -

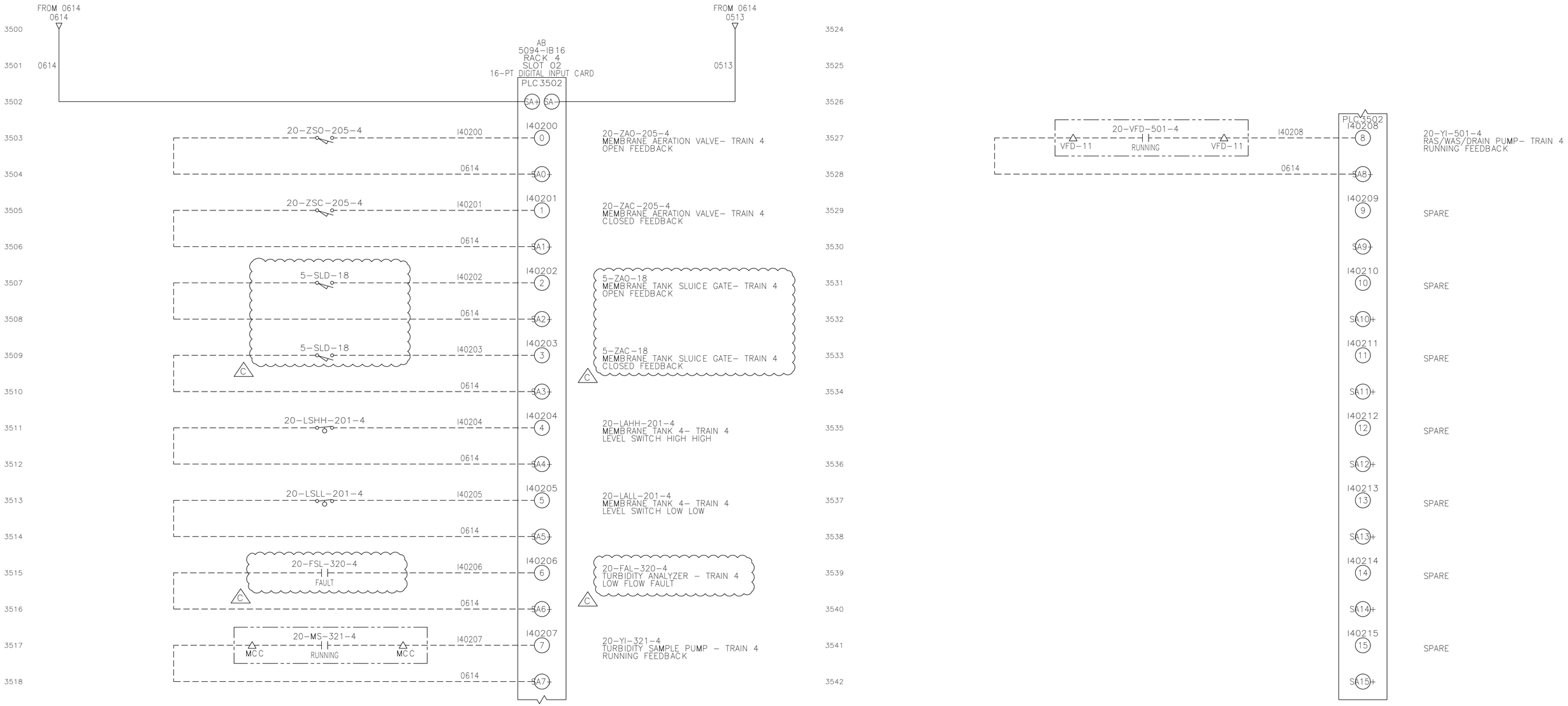
VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 4 SLOT 1, DI MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 34 OF 45
LAST SAVED: Wednesday, June 11, 2025 4:00:44 PM

FILE LOCATION: C:_ADSKVault\MAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464_MCP\510464-WTS-EL-000-5100-DI-001-34.dwg



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS: .X - , .XX - , .XXX -
ANGLES: -
FRAC: -

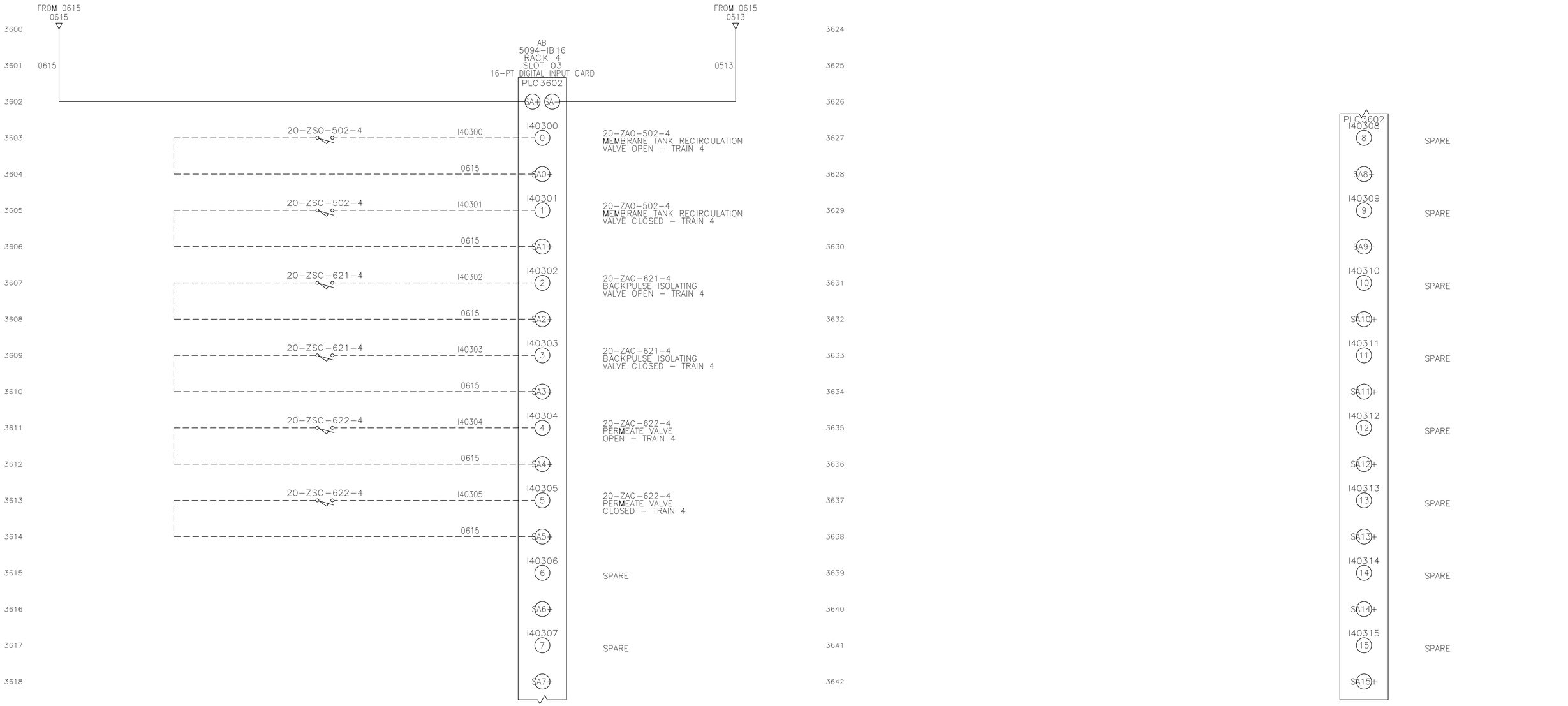
VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 4 SLOT 2, DI MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 35 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4 Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-35.dwg
LAST SAVED: Wednesday, June 11, 2025 4:00:41 PM



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC -
.XXX - -

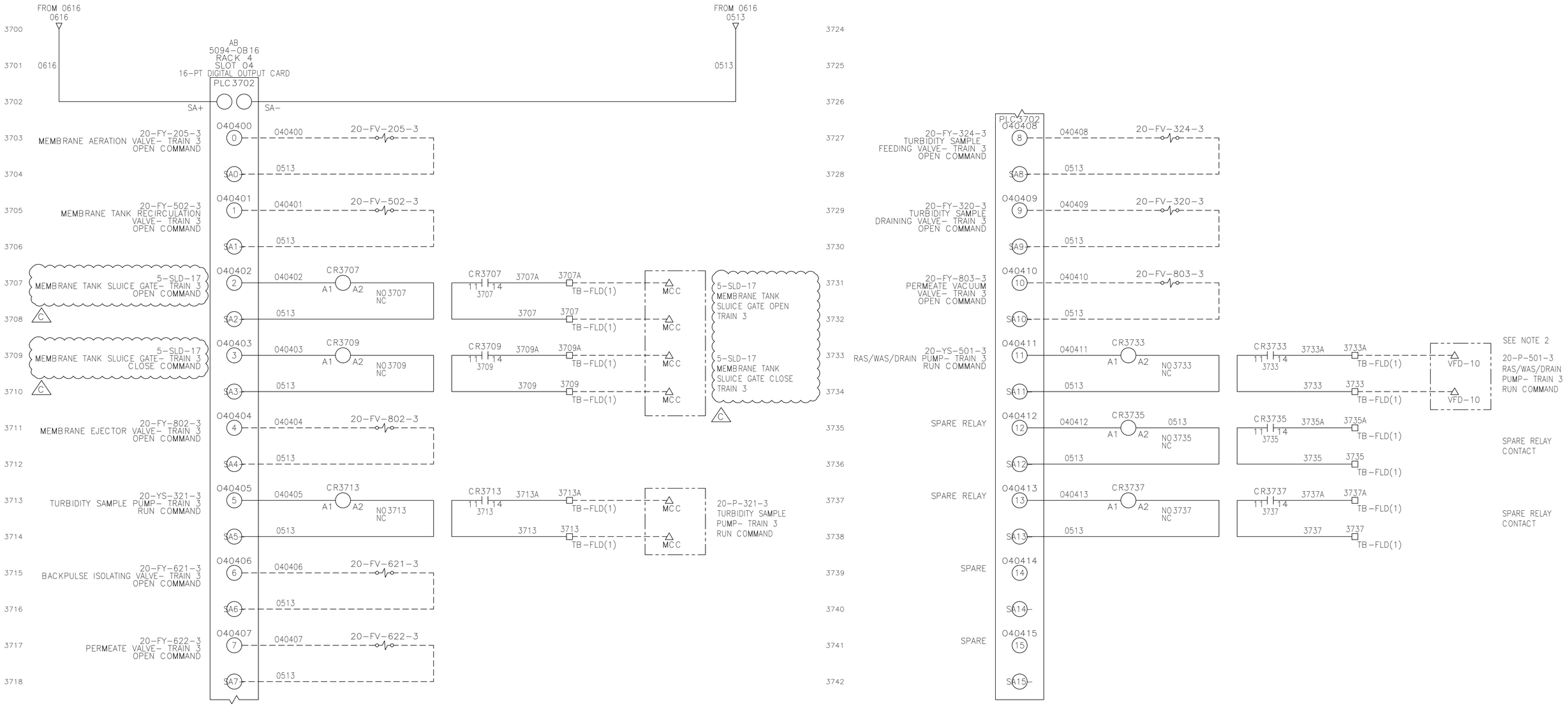
VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
C RACK 4 SLOT 3, DI MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 36 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-36.dwg
LAST SAVED: Wednesday, June 11, 2025 4:00:35 PM



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.
2. REFER VFD DRAWING IN THE SHEET 41 OF THIS SCHEMATICS 510464-WTS-EL-000-5100-DI-001.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX -
ANGLES -
FRAC -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 4 SLOT 4, DO MODULE

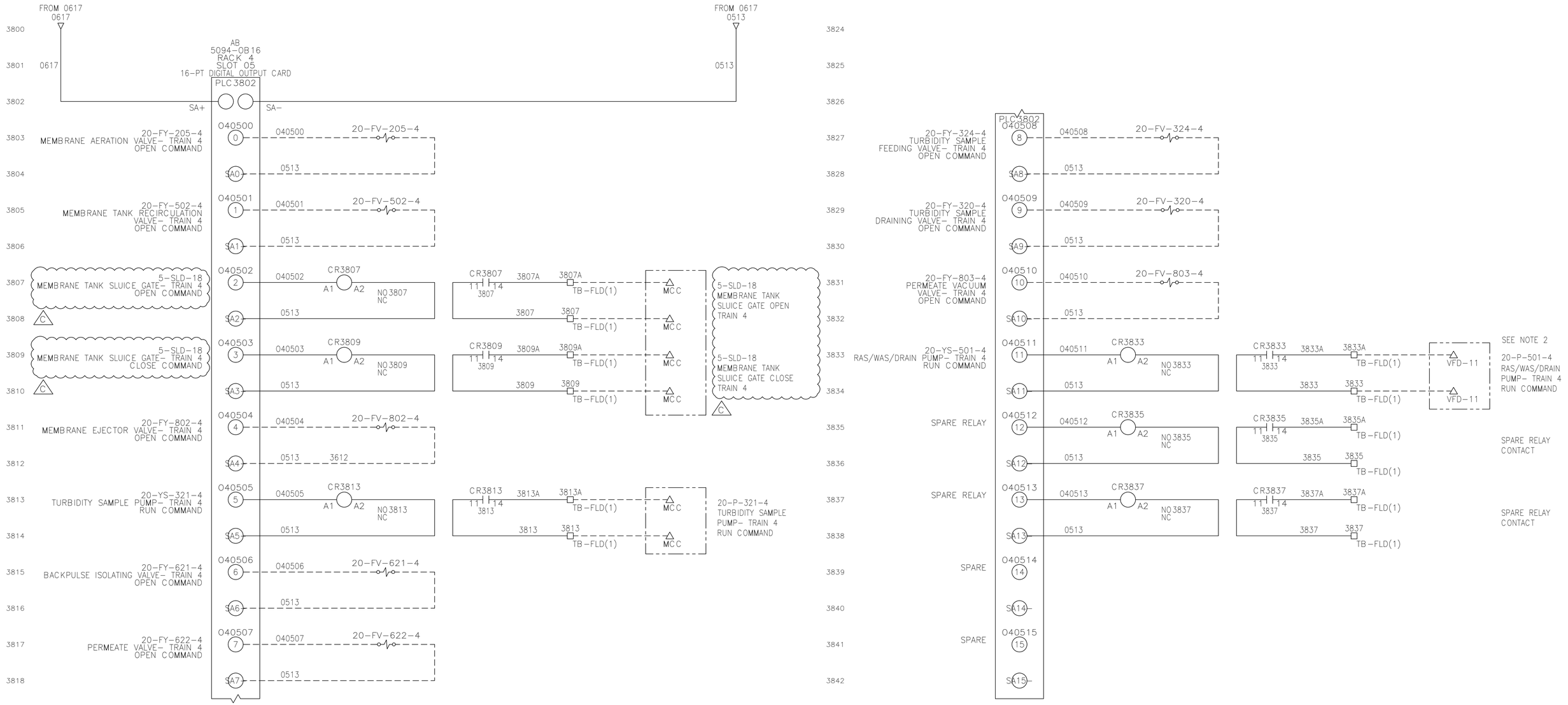
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510464-WTS-EL-000-5100-DI-001	C

REF.: - DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	510464-0005100C001	NONE	D	37 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4 Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-37.dwg

LAST SAVED: Wednesday, June 11, 2025 4:00:28 PM



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER.
2. REFER VFD DRAWING IN THE SHEET 41 OF THIS SCHEMATICS 510464-WTS-EL-000-5100-DI-001.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX -
ANGLES -
FRAC -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

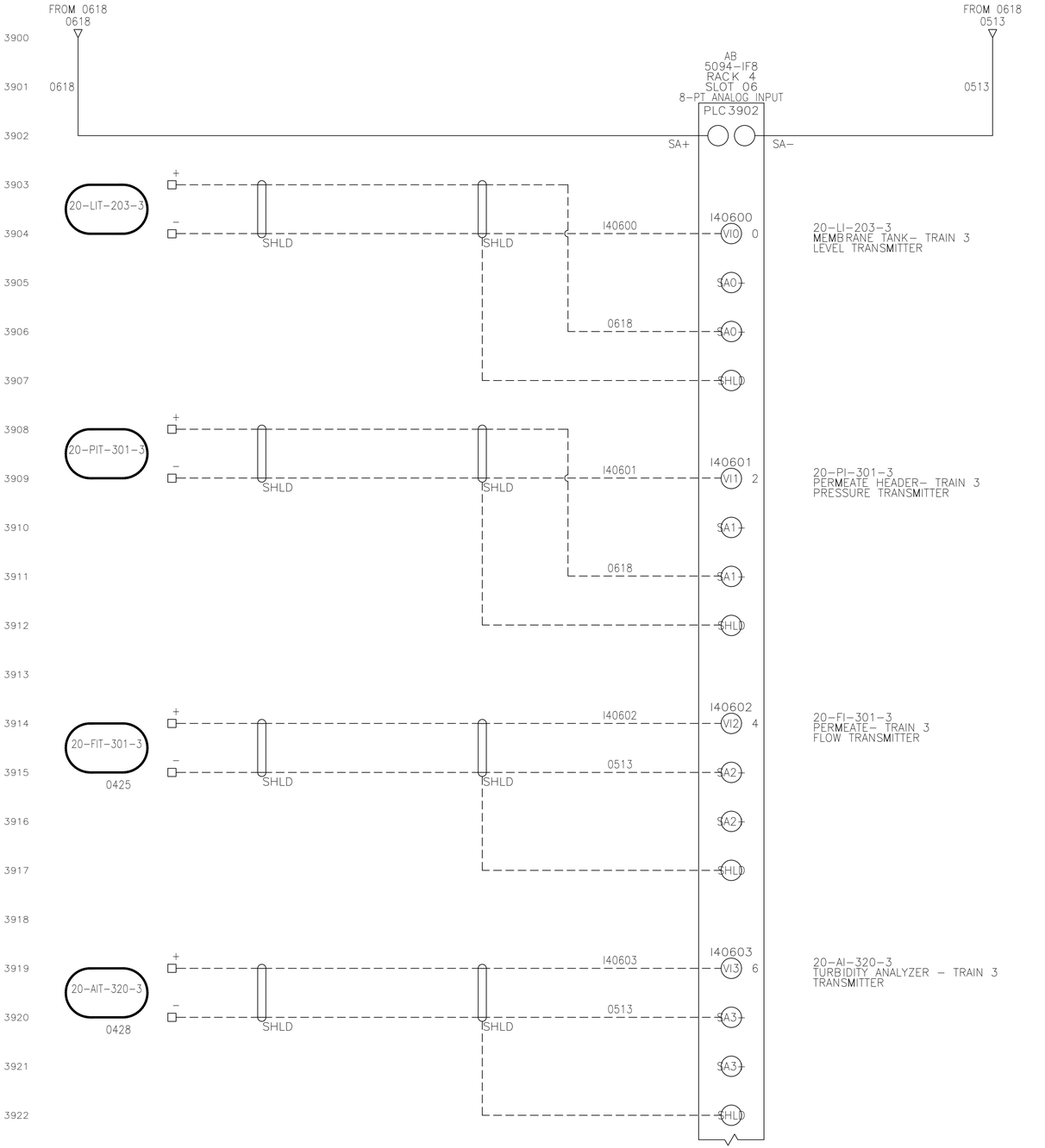
SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 4 SLOT 5, DO MODULE

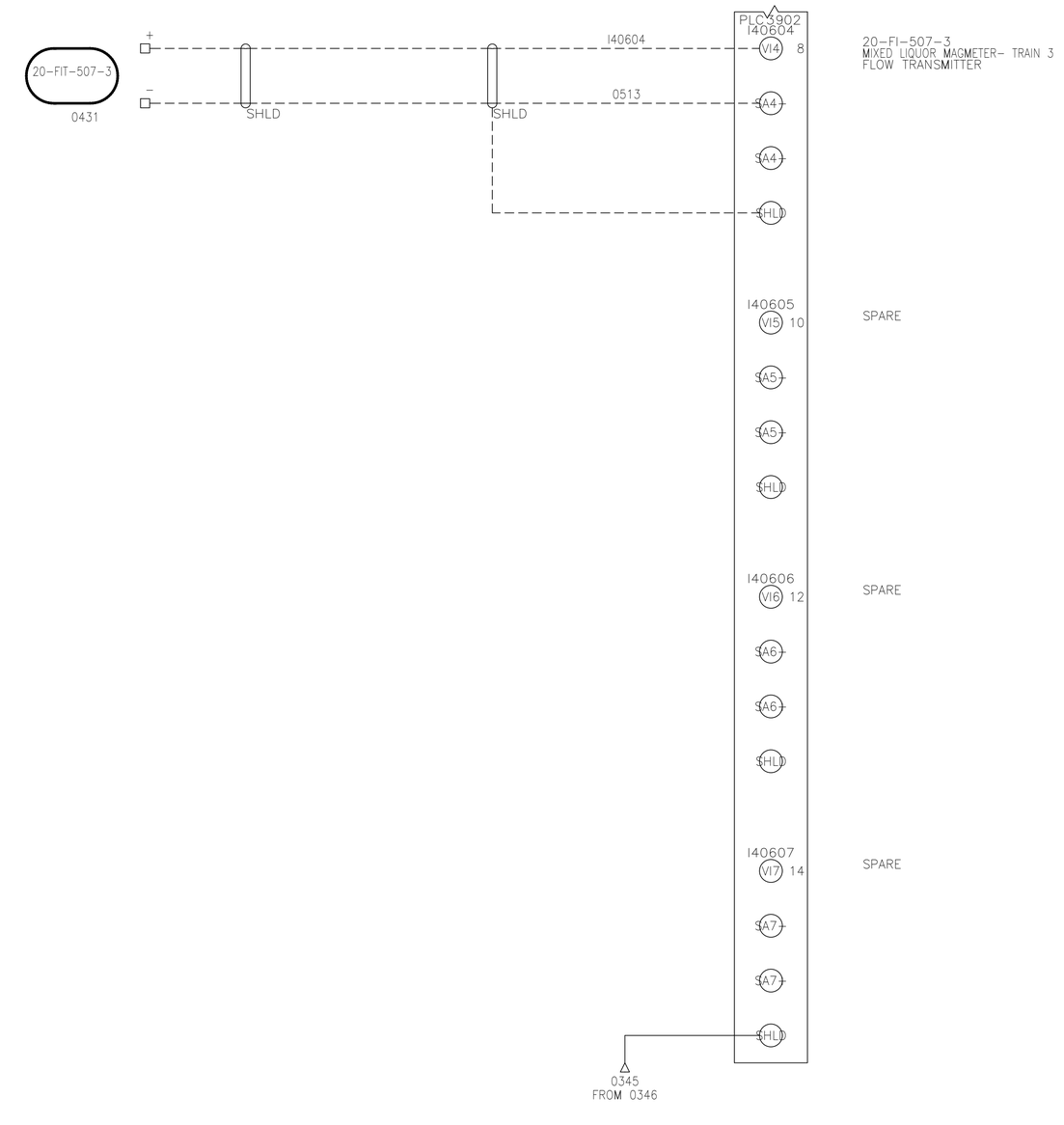
DRAWING NUMBER	REVISION
510464-WTS-EL-000-5100-DI-001	C

REF.: - DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	510464-0005100C001	NONE	D	38 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-38.dwg
LAST SAVED: Wednesday, June 11, 2025 4:00:22 PM





NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER, COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND SHIELD BAR TERMINALS ARE INTERNALLY CONNECTED TOGETHER.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX -
ANGLES -
FRAC -

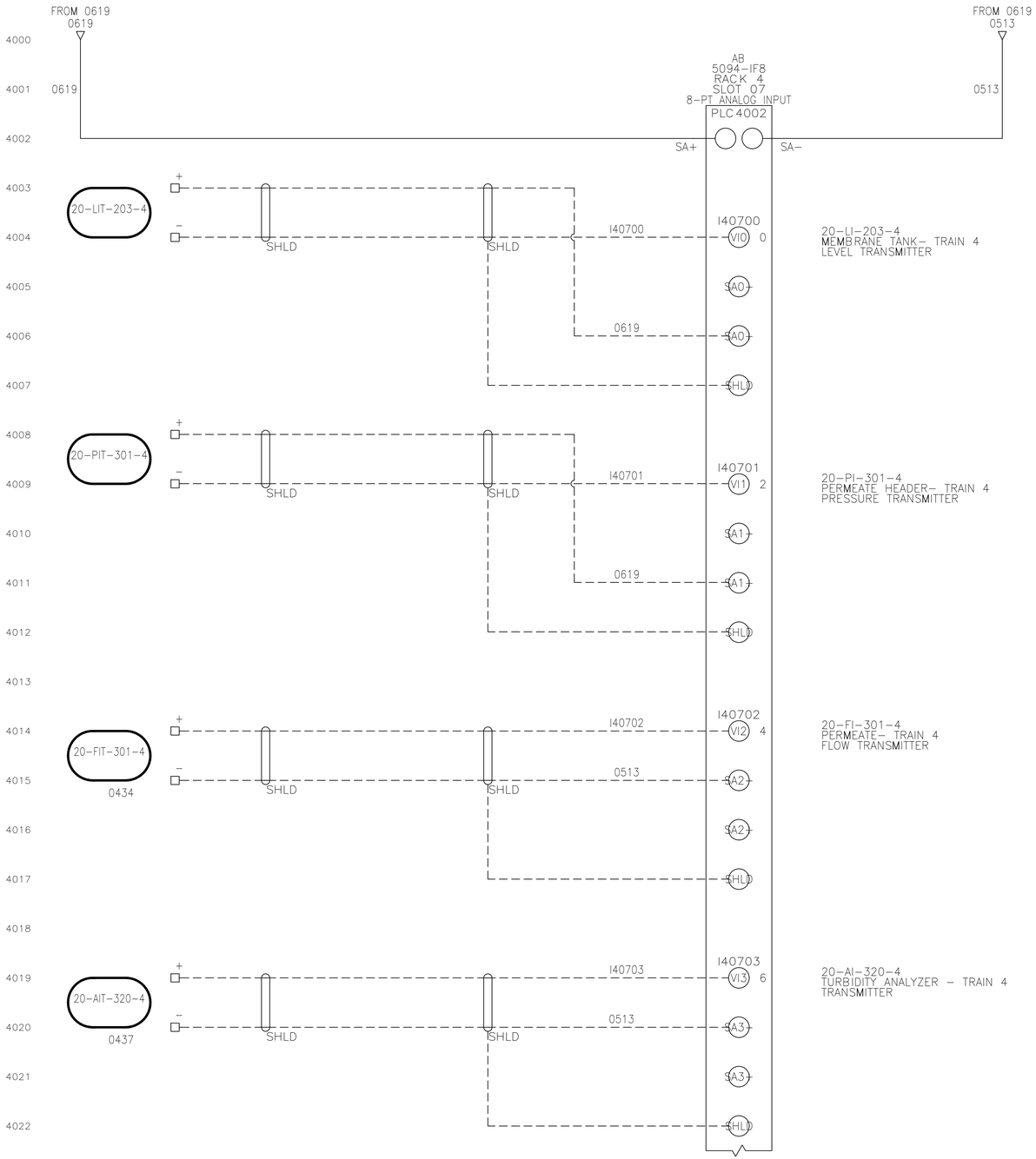
VEOLIA

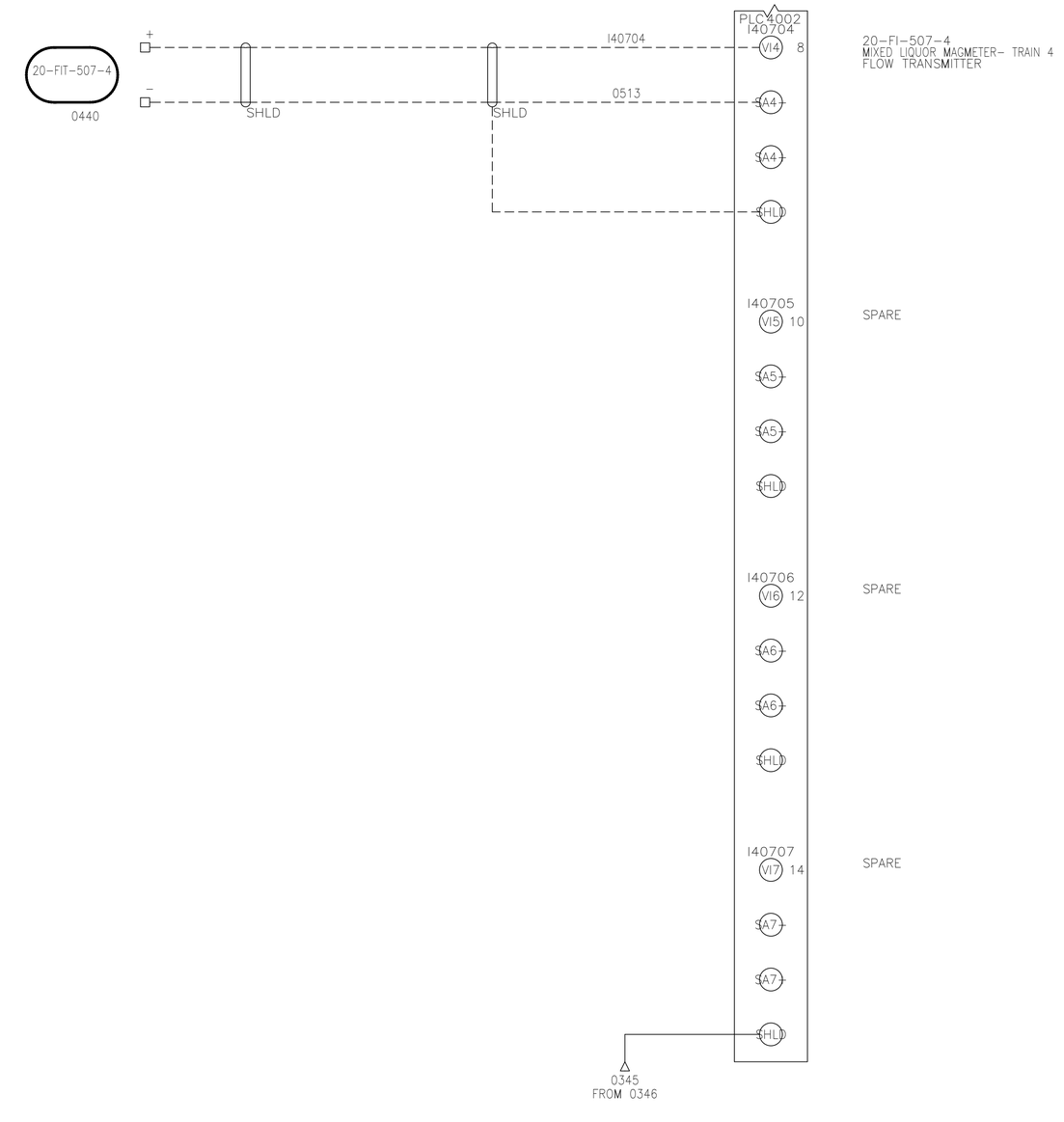
CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 4 SLOT 6, AI MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 39 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-39.dwg
LAST SAVED: Tuesday, June 10, 2025 7:23:18 PM





NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER, COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND SHIELD BAR TERMINALS ARE INTERNALLY CONNECTED TOGETHER.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS: .X -, .XX -, .XXX -
ANGLES: -
FRAC: -

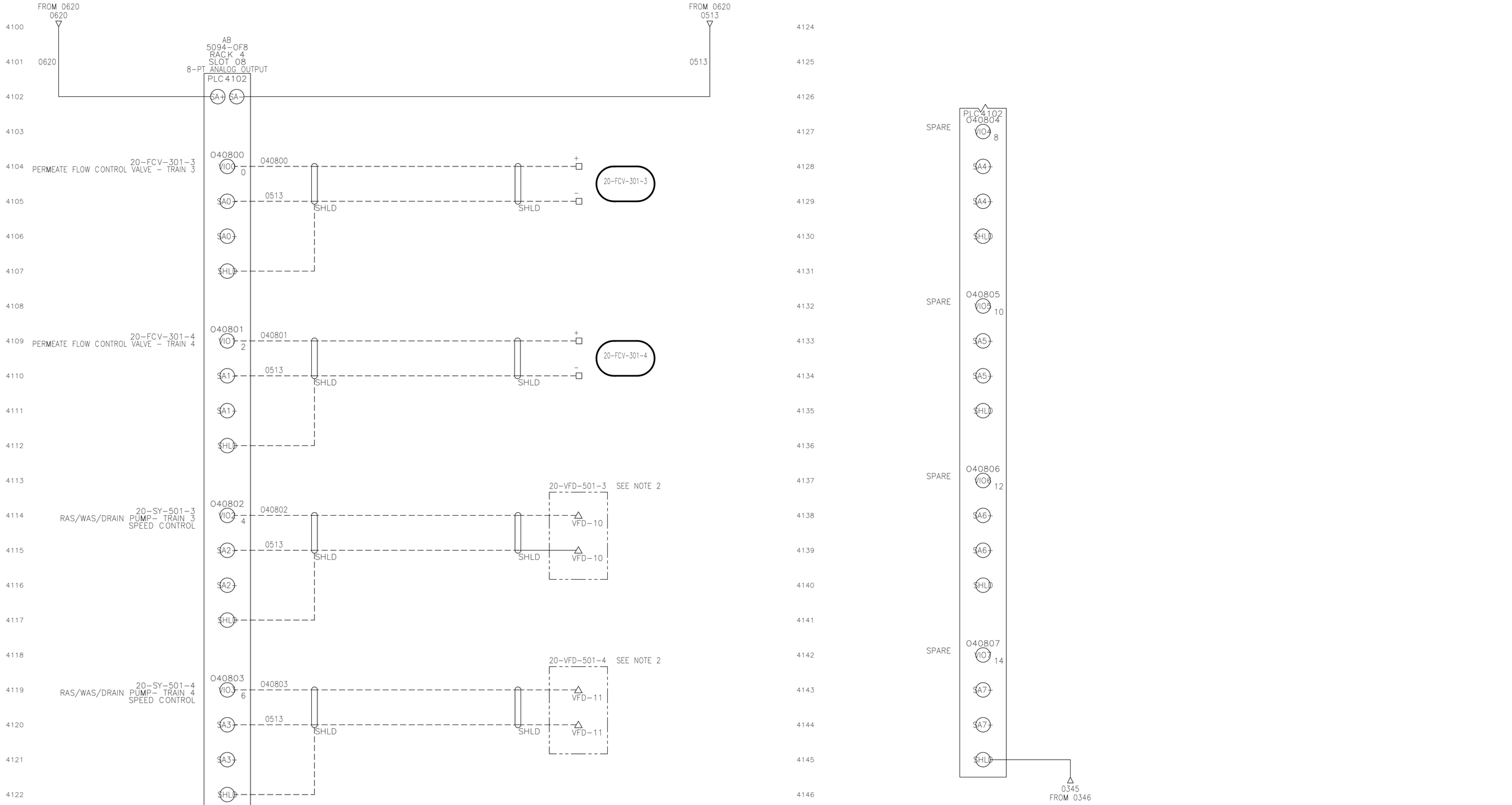
VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 4 SLOT 7, AI MODULE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 40 OF 45
LAST SAVED: Tuesday, June 10, 2025 7:23:19 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4 Electrical Drawings\510464_MCP\510464-WTS-EL-000-5100-DI-001-40.dwg



NOTES:

1. MODULE'S VOLTAGE TERMINALS ARE INTERNALLY CONNECTED TOGETHER, COMMON TERMINALS ARE INTERNALLY CONNECTED TOGETHER AND SHIELD BAR TERMINALS ARE INTERNALLY CONNECTED TOGETHER.
2. REFER VFD DRAWING IN THE SHEET 41 OF THIS SCHEMATICS 510464-WTS-EL-000-5100-DI-001.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC -
.XXX - -

VEOLIA

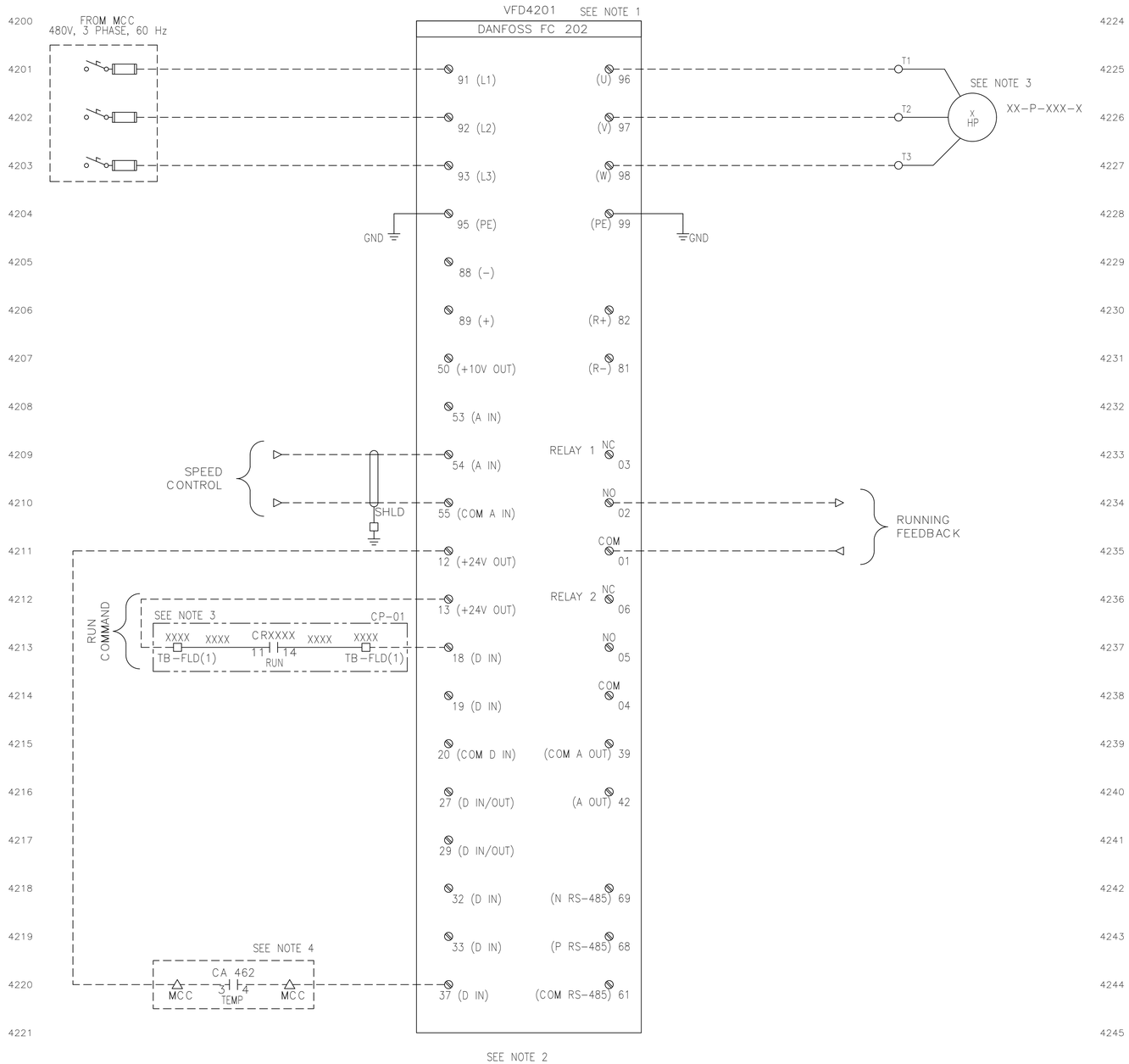
CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
RACK 4 SLOT 8, AO MODULE

DRAWING NUMBER	REVISION
510464-WTS-EL-000-5100-DI-001	C
REF.: -	DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	510464-0005100C001	NONE	D	41 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4 Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DI-001-41.dwg
LAST SAVED: Tuesday, June 10, 2025 7:23:19 PM



LIST OF LOADS CONNECTED TO VFDs				
VFD TAG	VFD-#	PUMP TAG	HP RATING	PUMP DESCRIPTION
23-VFD-610-A	VFD-6	20-P-610-A	60 HP	BACKPULSE PUMP A
23-VFD-610-B	VFD-7	20-P-610-B	60 HP	BACKPULSE PUMP B

NOTES:

1. VFD IS LOOSE SHIPPED BY VEOLIA AND IS WALL MOUNT TYPE, INSTALLED & WIRED BY THE GENERAL CONTRACTOR.
2. THIS IS TYPICAL VFD SCHEMATICS FOR PUMPS MENTIONED IN THE TABLE ABOVE. FOR RESPECTIVE VFD LOAD REFER CORRESPONDING SIGNAL WIRING FOR THE CONNECTION DETAILS.
3. "X" IN THE TAGS/RATING ARE REFERRING VARIABLES, AND SUCH DETAILS FOR EACH LOAD TO BE DETERMINED USING THE TABLE AND CORRESPONDING SHEETS OF SCHEMATICS.
4. LEAK/TEMP RELAY CA462 SHIPPED WITH PUMPS, INSTALLED AND WIRED BY OTHERS.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
A	ISSUED FOR APPROVAL	-	SN	HX	HX	08-MAR-23

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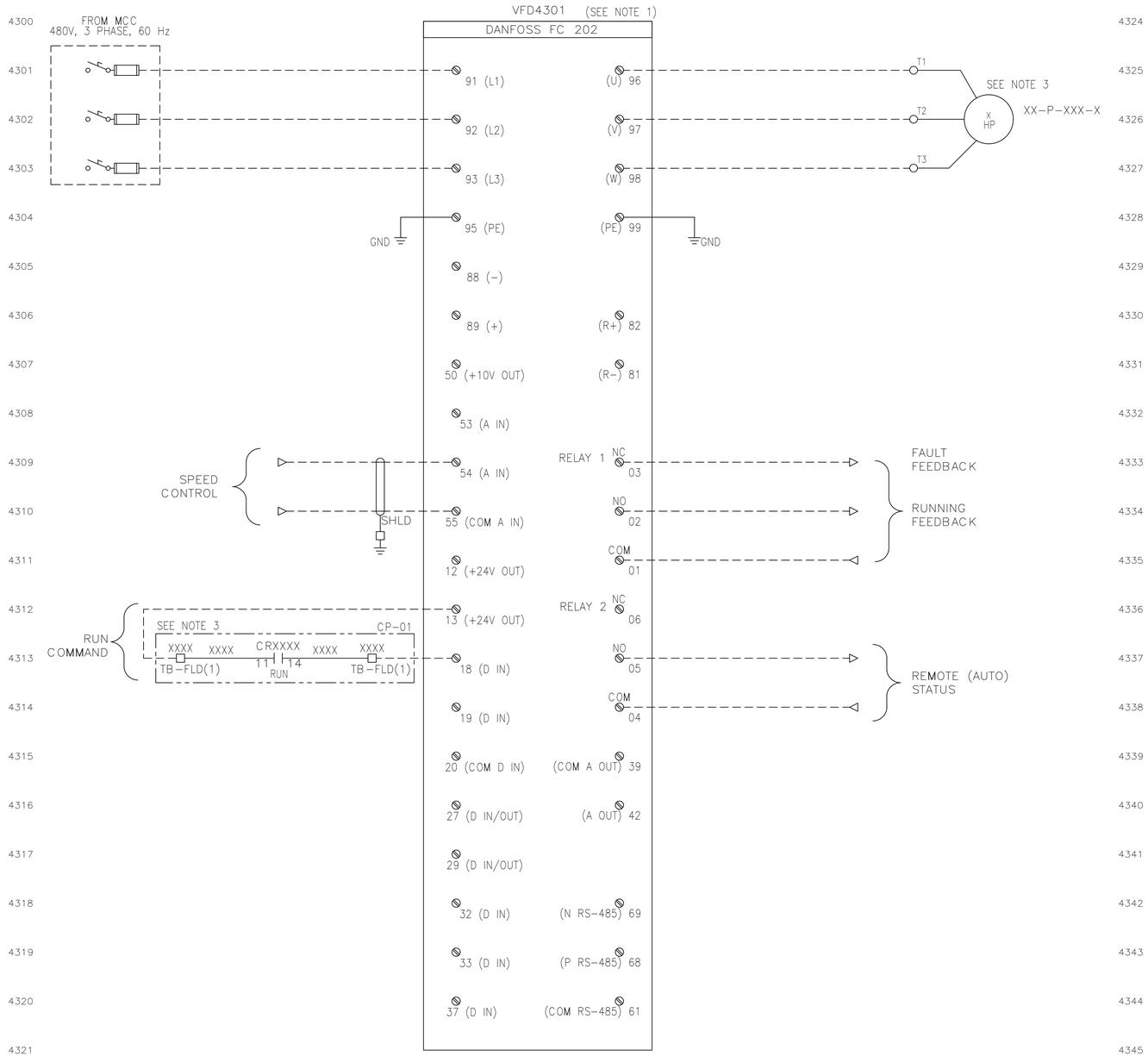
TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX - ANGLES - FRAC -

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

SCHEMATIC WIRING DIAGRAM
MAIN CONTROL PANEL, CP-01
SPARE PAGE

DRAWING NUMBER: 510464-WTS-EL-000-5100-DD-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 42 OF 45
LAST SAVED: Tuesday, June 10, 2025 7:23:20 PM

FILE LOCATION: C:_ACS\Vault\NAM\510464 - Caesars Lane WWTP-L Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DD-001-42.dwg



LIST OF LOADS CONNECTED TO VFDs				
VFD TAG	VFD-#	PUMP TAG	HP RATING	PUMP DESCRIPTION
23-VFD-101-A	VFD-12	23-P-101-A	1 HP	SODIUM HYPOCHLORITE PUMP A
23-VFD-101-B	VFD-13	23-P-101-B	1 HP	SODIUM HYPOCHLORITE PUMP B
23-VFD-301-A	VFD-14	23-P-301-A	1 HP	CITRIC ACID PUMP A
23-VFD-301-B	VFD-15	23-P-301-B	1 HP	CITRIC ACID PUMP B

NOTES:

1. VFD IS LOOSE SHIPPED BY VEOLIA AND IS WALL MOUNT TYPE, INSTALLED & WIRED BY THE GENERAL CONTRACTOR.
2. THIS IS TYPICAL VFD SCHEMATICS FOR PUMPS MENTIONED IN THE TABLE ABOVE. FOR RESPECTIVE VFD LOAD REFER CORRESPONDING SIGNAL WIRING FOR THE CONNECTION DETAILS.
3. "X" IN THE TAGS/RATING ARE REFERRING VARIABLES, AND SUCH DETAILS FOR EACH LOAD TO BE DETERMINED USING THE TABLE ABOVE AND CORRESPONDING SHEETS OF SCHEMATICS.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC
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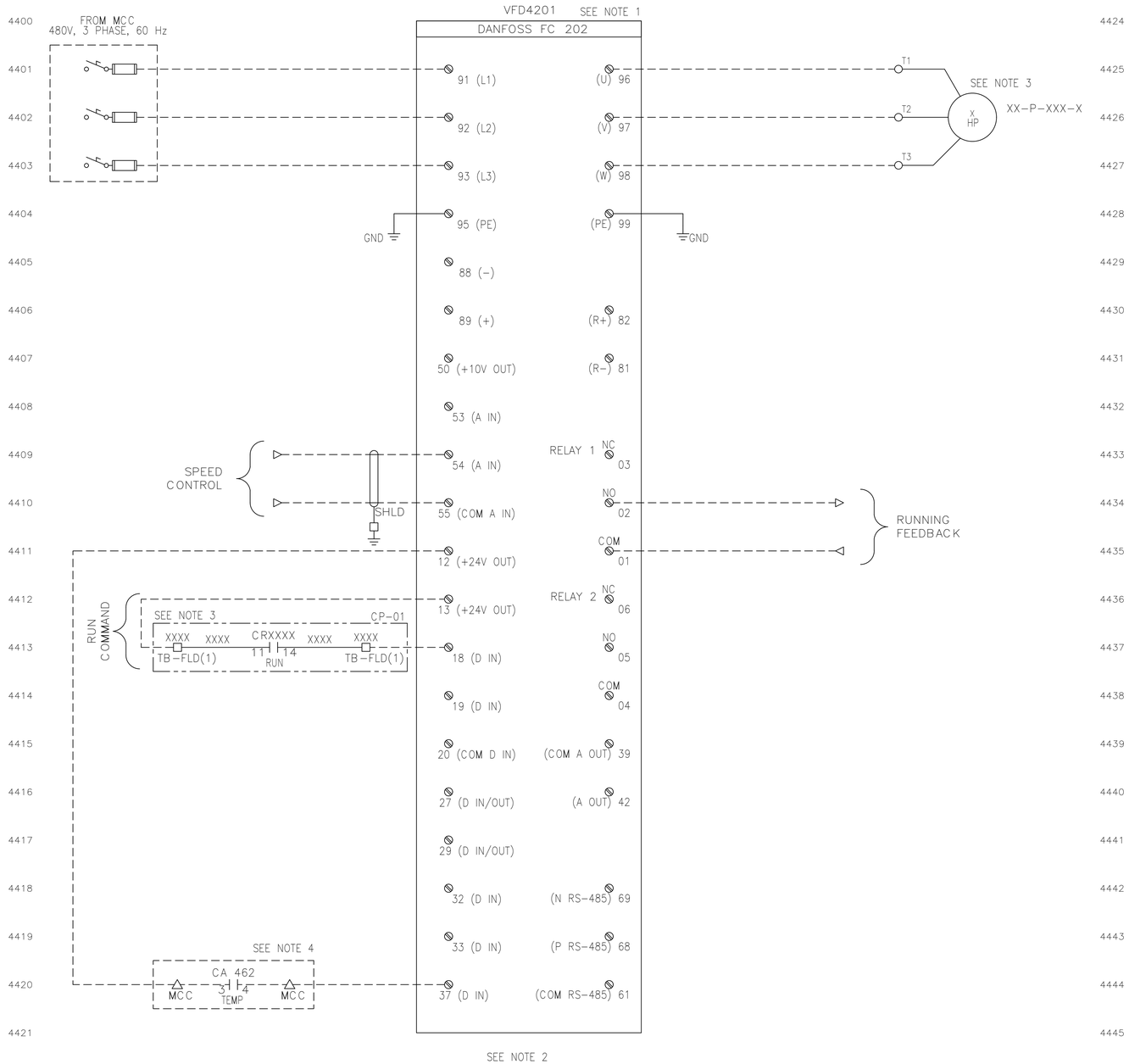
VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

DRAWING NUMBER				REVISION
510464-WTS-EL-000-5100-DD-001				C
REF.: -	DOC. OWNER: -			
PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	510464-0005100C001	NONE	D	43 OF 45

LAST SAVED: Tuesday, June 10, 2025 7:23:21 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DD-001-43.dwg



LIST OF LOADS CONNECTED TO VFDs				
VFD TAG	VFD-#	PUMP TAG	HP RATING	PUMP DESCRIPTION
23-VFD-610-A	VFD-6	20-P-610-A	60 HP	BACKPULSE PUMP A
23-VFD-610-B	VFD-7	20-P-610-B	60 HP	BACKPULSE PUMP B

NOTES:

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4. LEAK/TEMP RELAY CA462 SHIPPED WITH PUMPS, INSTALLED AND WIRED BY OTHERS.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REVISED AS NOTED	-	RKP	HX	HX	10-JUN-2025
B	REVISED AS NOTED	-	RKP	HX	HX	05-NOV-24
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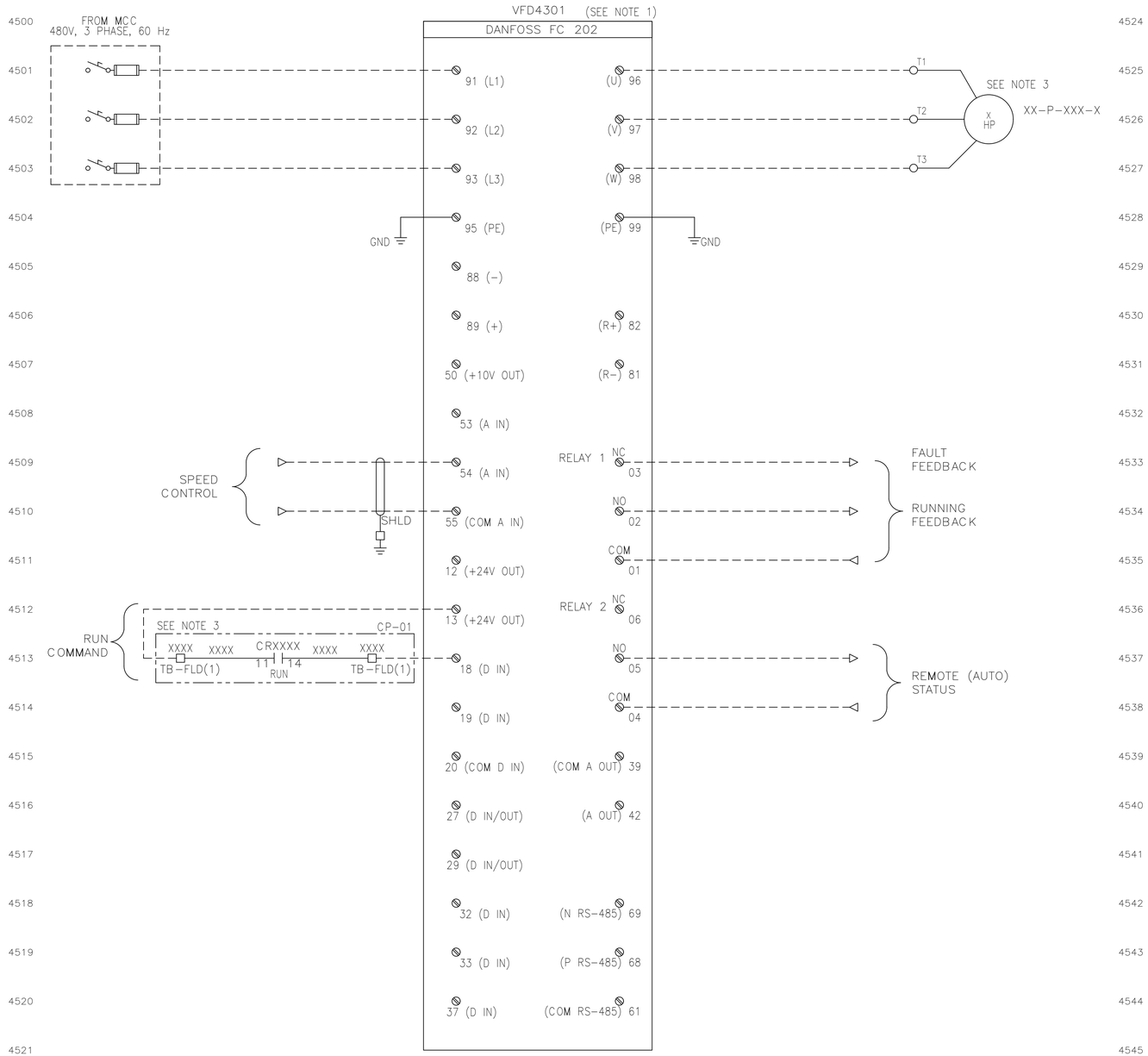
TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX - ANGLES - FRAC -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

DRAWING NUMBER: 510464-WTS-EL-000-5100-DD-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 44 OF 45
LAST SAVED: Tuesday, June 10, 2025 7:23:21 PM

FILE LOCATION: C:_ASKVault\NAM\510464 - Caesars Lane WWTP-L Electrical Drawings\510464 - MCP\510464-WTS-EL-000-5100-DD-001-44.dwg



LIST OF LOADS CONNECTED TO VFDs				
VFD TAG	VFD-#	PUMP TAG	HP RATING	PUMP DESCRIPTION
23-VFD-101-A	VFD-12	23-P-101-A	1 HP	SODIUM HYPOCHLORITE PUMP A
23-VFD-101-B	VFD-13	23-P-101-B	1 HP	SODIUM HYPOCHLORITE PUMP B
23-VFD-301-A	VFD-14	23-P-301-A	1 HP	CITRIC ACID PUMP A
23-VFD-301-B	VFD-15	23-P-301-B	1 HP	CITRIC ACID PUMP B

NOTES:

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC
.XXX - -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

DRAWING NUMBER: 510464-WTS-EL-000-5100-DD-001
REVISION: C
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C001
SCALE: NONE
SIZE: D
SHEET: 45 OF 45

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\510464-MCP\510464-WTS-EL-000-5100-DD-001-45.dwg
LAST SAVED: Tuesday, June 10, 2025 7:23:22 PM

PREVAILING CODES AND SPECIFICATIONS

NFPA 70 - NATIONAL ELECTRICAL CODE
UL 508A - INDUSTRIAL CONTROL PANELS
CONTROL PANELS ARE TO BE UL LISTED

CONTROL PANEL CONSTRUCTION AND INTERNAL WIRING

- DESIGN, MATERIAL SELECTION, AND WORKMANSHIP SHALL RESULT IN A NEAT APPEARANCE OUTSIDE AND INSIDE, WITH NO WELDS, RIVETS OR BOLT HEADS APPARENT FROM THE FRONT FACE OF THE BOARDS AND ALL EXTERIOR SURFACES TRUE AND SMOOTH.
- ANY INSTRUMENTS, RELAYS, AND OTHER DEVICES MOUNTED ON OR WITHIN THE ENCLOSURE SHALL BE CLEARLY TAGGED WITH ENGRAVED 1/16" THICK LAMINATED PLASTIC MARKERS. MARKERS SHALL BE SECURED TO THE MOUNTING PANEL OR INSIDE OF THE ENCLOSURE WITH DOUBLE FACED TAPE. MARKERS SHALL NOT BE MOUNTED ON THE COMPONENT OR WIRE DUCT.
- ALL WIRES SHALL TERMINATE WITH FORK TYPE INSULATED WIRE COMPRESSION TYPE LUGS. UNLESS THE DEVICE IS EQUIPPED WITH A WIRE CLAMP, PRESSURE PLATE, OR TUBULAR SCREW CLAMP.
- ALL INCOMING AND OUTGOING FIELD CONTROL WIRING SHALL TERMINATE AT TERMINAL BLOCKS.
- NO MORE THAN 2 WIRES AT ANY SINGLE TERMINAL.
- ALL CONDUCTORS SHALL RUN CONTINUOUSLY, SPLICING IS NOT ACCEPTABLE.
- MOUNTING OF RELAY SOCKETS, TERMINAL BLOCKS, FUSED TERMINAL BLOCKS/SWITCHES AND THEIR MOUNTING TRACKS SHALL BE ON ONE PIECE SPACERS OR UNISTRUT. THE SPACERS SHALL BE OF A HEIGHT TO ALLOW WIRE ENTERING THESE DEVICES NOT TO BE MORE THAN 1 INCH BELOW COVERS OF THE PLASTIC WIREWAY ADJACENT TO THESE DEVICES.
- GROUND ALL PANEL METAL TO THE PANEL'S EARTH-GROUND BUS.
- WHERE WIRING CROSSES HINGED SURFACE, PROVIDE A 18" "U" SHAPE HINGE LOOP OF EXTRA FLEXIBLE WIRING
- VEOLIA WTS DESIGN GUIDE E000001-WTS-EL-T02-8533-PR-012 - ELECTRICAL DEVICE DESIGNATIONS AND ABBREVIATIONS.
- VEOLIA WTS SPECIFICATION E000001-WTS-EL-T02-8533-SP-025 - WIRING OF INDUSTRIAL CONTROL PANELS.
- VEOLIA WTS SPECIFICATION E000001-WTS-EL-SYS-EN33-SP-005 - ELECTRICAL AND CONTROL SAFETY FEATURES.
- VEOLIA WTS SPECIFICATION E000001-WTS-EL-SYS-EN33-SP-007 - ELECTRICAL PANEL MARKINGS & NAMEPLATES.
- VEOLIA WTS SPECIFICATION E000001-WTS-EL-T02-8533-PR-001 - CONTROL PANEL AND WIRING DIAGRAM.

WIRING

CONTROL WIRING SHALL BE #16 AWG STRANDED COPPER, THHN & THWN, 600 VOLT INSULATION., 90 DEG. C, ALL WIRING SHALL BE COLOR CODED AS FOLLOWS:

WIRE COLORS	CONDUCTOR TYPE
GREEN WITH YELLOW STRIPE (OR GREEN)	EQUIPMENT GROUNDING AND BONDING CONDUCTORS
WHITE	GROUNDED AC (L2/NEUTRALS) CURRENT-CARRYING CONDUCTORS
BLACK	UNGROUNDED AC (L1) OR DC POWER CIRCUITS CONDUCTORS
RED	UNGROUNDED AC CONTROL CIRCUITS CONDUCTORS
BLUE	UNGROUNDED DC CONTROL CIRCUITS CONDUCTORS
WHITE WITH BLUE STRIPE	GROUNDED DC (0VDC) CONTROL CIRCUIT CONDUCTORS
ORANGE	UNGROUNDED CONDUCTORS FOR AC AND DC REMOTE CONTROL CIRCUITS
WHITE(+), BLACK(-)	ANALOG TWISTED SHIELD PAIR CABLE
WHITE WITH ORANGE STRIPE	GROUNDED CURRENT CARRYING CONDUCTORS FOR REMOTE CONTROL CIRCUITS
LIGHT BLUE	INTRINSICALLY SAFE WIRING

TESTING

PRE-VEOLIA INSPECTION

- WHEN ALL WIRING OF ELECTRICAL SYSTEM IS COMPLETE, THE FABRICATOR SHALL TEST EACH CIRCUIT FOR CONTINUITY, SHORT CIRCUIT AND FAULT GROUNDS AND COMPLETE WIRING INSPECTION CHECKLIST E000001-WTS-EL-PRD-PHAS-DA-CHK-02.

FACILITIES

- PANEL VENDOR SHALL SUPPLY A WORK/TEST AREA FOR PANEL CHECK-OUTS. FOR WALL MOUNTED ENCLOSURES, THIS AREA SHALL INCLUDE A STAND OR PLATFORM TO MOUNT AND SUPPORT THE PANEL VERTICALLY AT BENCH HEIGHT.
- THE WORK/TEST AREA SHALL BE ISOLATED/SEPARATED FROM THE PANEL ASSEMBLY/MFG. AREA SO TESTING CAN BE DONE WITHOUT INTERRUPTION.
- THE WORK/TEST ARE SHALL BE PROVIDED WITH ADEQUATE LIGHTING COMPLETE WITH TABLE/BENCH FOR INSPECTORS USE TO WORK WITH TEST EQUIPMENT AND DRAWINGS.

VEOLIA INSPECTION

- PANEL VENDOR SHALL SUBJECT TO BACK-CHARGES, IF AFTER ARRIVAL OF VEOLIA INSPECTOR(S) FOR INSPECTION, IS DETERMINED THAT PANEL VENDOR HAS NOT PREPARED FOR VEOLIA INSPECTION AND OR NOT COMPLETED "PRE-VEOLIA INSPECTION" OR PROVIDED ITEMS NOTED UNDER "FACILITIES".
- AFTER VENDOR CIRCUIT TESTING IS COMPLETE, VEOLIA WILL PERFORM FUNCTION TESTING OF THE CONTROL PANEL COMPONENTS AS A SYSTEM TO CONFIRM OPERATION AND MAKE CALIBRATION ADJUSTMENT, IF NECESSARY. PANEL VENDOR SHALL PROVIDE TEMPORARY POWER AND/OR INSTRUMENT QUALITY AIR SUPPLY AS REQUIRED BY PANEL DESIGN. PANEL VENDOR SHALL PROVIDE TEMPORARY WIRING INCLUDING BUT NOT LIMITED TO TOGGLE SWITCHES, 120VAC AND/OR 24VDC INDICATING LIGHTS TO FACILITATE THE TESTING. THE PANEL VENDOR WILL ALSO BE RESPONSIBLE FOR CONNECTING VARIOUS WIRE JUMPERS ON THE PANEL FIELD TERMINALS. ALL TEMPORARY TEST WIRING WILL BE REMOVED BY THE VENDOR BEFORE THE PANEL IS SHIPPED.
- PANEL VENDOR TO PROVIDE QUALIFIED QUALITY CONTROL INSPECTOR/TESTER TO VEOLIA PERSONNEL WITH FUNCTION TESTING OF THE CONTROL PANEL. PANEL VENDOR'S PERSONNEL MUST BE FAMILAR WITH CONTROL PANEL FABRICATION, WIRING INSTALLATION/CIRCUITRY, AND FULLY UNDERSTAND VEOLIA SCHEMATIC WIRING DIAGRAMS. PANEL VENDOR'S PERSONNEL TO BE AVAILABLE TO ASSIST VEOLIA INSPECTOR AS NEEDED.

RUNG NUMBERS

USED WHEN A COMMON DRAWING NUMBER IS ASSIGNED FOR SEVERAL SHEETS

- FIRST CHARACTER: SYSTEM
- SECOND AND THIRD CHARACTERS: SHEET NUMBER
- FOURTH AND FIFTH CHARACTERS: RUNG IDENTIFIER

- EXAMPLE: 1 12 04

SYSTEM (OPTIONAL): 1
SHEET: 12
RUNG: 04

TERMINAL AND WIRE NUMBERS

ALL WIRE SHALL BE TAGGED AT TERMINATIONS WITH WIRE NUMBERS SHOWN ON DRAWINGS WITH ONE PIECE HEAT SHRINK TUBULAR WIRE MARKERS. MARKERS SHALL BE BRADY SLEEVE COMPUTER-PRINTED TYPE B-321 HEAT-SHRINK POLYOLEFIN STOCK NO. HCPS.9-3336W OR APPROVED EQUAL.

USE THE FOLLOWING SCHEME FOR WIRES AND TERMINALS NOT CONNECTED TO PLC I/O

- THE RUNG NUMBER IS USED TO IDENTIFY A WIRE AND IT'S CORRESPONDING TERMINALS
- WHEN THERE IS NO TERMINAL NUMBER SHOWN, THE TERMINAL NUMBER IS THE SAME AS THE WIRE NUMBER
- WHERE THERE IS MORE THEN ONE WIRE ON A RUNG, THE OTHER WIRES ARE IDENTIFIED USING THE RUNG NUMBER FOLLOWED BY A LETTER.
- USE THE FOLLOWING SCHEME FOR WIRES AND TERMINALS CONNECTED TO PLC I/O

- FIRST CHARACTER: I FOR INPUTS, O FOR OUTPUTS
- SECOND * CHARACTER: RACK NUMBER
- THIRD AND FOURTH CHARACTER: SLOT NUMBER
- FIFTH AND SIXTH CHARACTER: POINT NUMBER

- EXAMPLE: I *1 03 00

TYPE: INPUT
RACK: 1
SLOT: 03
POINT: 00

* = 2 CHARACTERS IF THERE ARE MORE THAN 9 RACKS

EQUIPMENT AND INSTRUMENT TAG NUMBERS

11-XXX-222A-3

- PROCESS AREA
- EQUIPMENT ABBREVIATION/INSTRUMENT FUNCTION
- EQUIPMENT NUMBER/INSTRUMENT LOOP NUMBER
- MULTIPLE INSTRUMENT IDENTIFIER (IF NECESSARY)
- IDENTICAL SKID/TRAIN IDENTIFIER (IF NECESSARY)

DESIGNATIONS FOR ELECTRICAL PANELS OR ENCLOSURES

THE FOLLOWING DESIGNATIONS ARE USED IN THIS ELECTRICAL SCHEMATIC TO IDENTIFY THE LOCATION OF EACH TERMINAL BLOCK

DESIGNATION	DESCRIPTION	COMPLETE TAG NUMBER
CP-01	MAIN CONTROL PANEL	CP-01
CP-11	TRAIN 1 REMOTE I/O PANEL	CP-11
CP-12	TRAIN 2 REMOTE I/O PANEL	CP-12
90-LCP-001-X	AIR COMPRESSOR PANELS	90-AC-001-A & B

TERMINAL BLOCKS DESIGNATIONS

TB-VAC(x)	UNGROUNDED AC POWER
TB-N(x)	GROUNDED AC POWER
TB-MCR(x)	MASTER CONTROL RELAY WIRING
TB-VDC(x)	UNGROUNDED DC CONTROL POWER
TB-DCCOM(x)	GROUNDED DC CONTROL POWER
TB-DI(YZ)	DISCRETE INPUT SIGNAL WIRING
TB-DO(YZ)	DISCRETE OUTPUT SIGNAL WIRING
TB-AI(YZ)	ANALOG INPUT SIGNAL WIRING
TB-AQ(YZ)	ANALOG OUTPUT SIGNAL WIRING
TB-INT(x)	OTHER INTERNAL WIRING
TB-FLD(x)	OTHER FIELD WIRING

(x) DENOTES SUB-GROUPS
(Y) DENOTES RACK NUMBER
(Z) DENOTES SLOT NUMBER

EQUIPMENT WIRING AND RACEWAYS

- COMPLY WITH VEOLIA DESIGN GUIDE CONTROL PANEL & WIRING DIAGRAM E000001-WTS-EL-T02-8533-PR-001.
- USE RIGID GALVANIZED STEEL CONDUIT(TYPE RMC) WITH LISTED FITINGS.
- USE LIQUID-TIGHT FLEXIBLE METAL CONDUIT (TYPE LFMC) WITH LISTED FITTINGS.
- CONDUCTOR AMPACITY IS FOR A MAXIMUM AMBIENT TEMPERATURE OF 40°C (104°F).
- WITH THE FOLLOWING EXCEPTIONS:
- VEOLIA WTS SPECIFICATION E000001-WTS-EL-T02-8533-SP-002 - WIRING OF EQUIPMENT ASSEMBLIES.
- VEOLIA WTS SPECIFICATION E000001-WTS-EL-SYS-EN33-SP-009 - WIRING OF INSTRUMENTATION AND COMMUNICATION.
- VEOLIA WTS SPECIFICATION E000001-WTS-PR-T02-8521-PR-001 - EQUIPMENT AND INSTRUMENT TAGGING.

NOISELESS GROUND FOR INSTRUMENTATION

- A CONTROL PANEL MAY INCLUDE A SEPARATE NOISELESS GROUND BUS THAT PROVIDES A COMMON GROUND REFERENCE POINT FOR INSTRUMENTATION CIRCUITS AND SHIELDS. WHERE THE NOISELESS GROUND BUS IS INSTALLED FROM THE PANEL ON WHICH IS MOUNTED, THERE IS A BONDING JUMPER FROM THIS GROUND BUS TO A POINT ON THE PANEL NEAR THE GROUND BUS.

  IF POSSIBLE, THE NOISELESS GROUND BUS SHOULD BE CONNECTED TO AN EXTERNAL GROUND THAT IS FREE OF ELECTRICAL NOISE. TO PROVIDE LOW IMPEDANCE, THIS GROUND CONNECTION SHOULD USE COPPER BRAID, COPPER STRIP, OR A 6 AWG OR LARGER WIRE. IF THERE IS AN EXTERNAL GROUND CONNECTION, THE WIRE FROM THE GROUND BUS TO THE PANEL MUST BE REMOVED (THE JUMPER MAY BE LABELED "REMOVE THIS WIRE WHEN USING AN ISOLATED GROUND SYSTEM").

- VEOLIA WTS SPECIFICATION E000001-WTS-EL-T02-8533-SP-020– GROUNDING IN INDUSTRIAL CONTROL PANELS.

FIELD INTERCONNECTING WIRING

- FIELD WIRING MATERIALS AND INSTALLATION LABOR ARE NOT PROVIDED BY VEOLIA.

- ALL FIELD CONNECTIONS TO FIELD WIRING TERMINALS IN ENCLOSURES SHALL MEET ANY MARKED REQUIREMENTS FOR WIRE TYPE, TEMPERATURE RATING AND TIGHTENING TORQUE. TYPICALLY STRANDED COPPER CONDUCTORS ARE REQUIRED. TYPICALLY CONDUCTOR AMPACITIES MUST BE CALCULATED AT 60°C FOR TERMINALS RATED FOR LESS THAN 100 AMPS OR AT 75°C FOR TERMINALS RATED FOR 100 AMPS OR MORE.

- THE VEOLIA DESIGN IN THIS DRAWING SET IS FOR THE INSTALLATION CONDITIONS SPECIFIED FOR THE VEOLIA EQUIPMENT. ANY CONDUCTOR SIZE, WIRING MATERIAL OR OTHER DESIGN ELEMENT SPECIFIED IN THIS DRAWING SET IS THE MINIMUM REQUIRED BY THE VEOLIA DESIGN FOR THE SPECIFIED INSTALLATION CONDITIONS. THE INSTALLATION LOCATION MIGHT HAVE UNSPECIFIED PROBLEMATIC CONDITIONS SUCH AS ELECTROMAGNETIC INTERFERENCE, HIGH VOLTAGE DROP IN LONG CABLE RUNS OR SPECIAL ENVIRONMENTAL CONDITIONS INCLUDING ULTRAVIOLET LIGHT (UV OR SUNLIGHT), HIGH TEMPERATURE, LOW TEMPERATURE, HIGH VIBRATION, OIL, CORROSIVE SALTS, VAPORS OR FUMES. THE ELECTRICAL EQUIPMENT PRODUCED ACCORDING TO THIS DRAWING SET IS NOT DESIGNED TO BE SUITABLE FOR MANY OF THE POSSIBLE UNSPECIFIED INSTALLATION CONDITIONS.

  THE INSTALLER IS RESPONSIBLE FOR PROVIDING A FIELD ELECTRICAL INSTALLATION THAT IS SUITABLE FOR THE ACTUAL INSTALLATION CONDITIONS. THIS RESPONSIBILITY INCLUDES LOCAL CODE REQUIREMENT COMPLIANCE AND DAMAGE REPAIR DUE TO SIGNIFICANT DETERIORATION (AT LEAST FOR THE VEOLIA WARRANTY PERIOD) OR INADEQUATE PROTECTION FROM PHYSICAL DAMAGE. IF UNSPECIFIED INSTALLATION CONDITIONS OR DEFICIENT INSTALLATION WORKMANSHIP REQUIRE MODIFICATION OF THE INSTALLATION OR EQUIPMENT, VEOLIA IS NOT RESPONSIBLE FOR THE MODIFICATION COSTS WHICH CAN INCLUDE BUT ARE NOT LIMITED TO LARGER CONDUCTORS, REPLACEMENT WIRING MATERIALS, LABOR, AND LIQUIDATED DAMAGES.

ADDITIONAL NOTES

VEOLIA WTS
CONTROLLED DOCUMENT

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE	-	RKP	HX	HX	05-JUN-2025

TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC
.XXX - -

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VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

AIR COMPRESSOR PANEL
ELECTRICAL NOTES
LEGEND

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-002
REVISION: A
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C002
SCALE: NONE
SIZE: D
SHEET: 01 OF 03

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP-4 Electrical Drawings\COMPRESSOR PANEL\510464-WTS-EL-000-5100-DI-002-D1.dwg
LAST SAVED: Friday, June 6, 2025 3:15:56 PM

SWITCHES

SELECTOR SWITCH

SINGLE POLE 2 POSITION SELECTOR

2 POLE 2 POSITION SELECTOR

FLOW (WATER, AIR, ETC.) SWITCH

NORMALLY OPEN (LOW)

NORMALLY CLOSED (HIGH)

TEMPERATURE SWITCH

NORMALLY OPEN (LOW)

NORMALLY CLOSED (HIGH)

LIQUID LEVEL SWITCH

NORMALLY OPEN (LOW)

NORMALLY CLOSED (HIGH)

PRESSURE VACUUM SWITCH

NORMALLY OPEN (LOW)

NORMALLY CLOSED (HIGH)

LIMIT SWITCH

NORMALLY OPEN

NORMALLY CLOSED

PUSH BUTTONS

NORMALLY OPEN SINGLE CIRCUIT

EMERGENCY STOP

NORMALLY CLOSED SINGLE CIRCUIT

MOTORS AND HEATERS

3 PHASE MOTOR

SINGLE PHASE MOTOR

3 PHASE HEATER

SINGLE PHASE HEATER

MOTOR-DRIVEN METERING PUMP

SOLENOID-DRIVEN METERING PUMP

RELAYS

NORMALLY OPEN

COIL

NORMALLY CLOSED

ON DELAY NORMALLY OPEN

ON DELAY NORMALLY CLOSED

OFF DELAY NORMALLY OPEN

OFF DELAY NORMALLY CLOSED

CONNECTIONS

PROTECTIVE EARTH GROUND

SHIELD

NOISELESS GROUND

12210

CONTINUED CONNECTION FROM 12210 DENOTES PAGE 122 RUNG 10

12210

CONTINUED CONNECTION TO 12210 DENOTES PAGE 122 RUNG 10

CROSSING OF CONDUCTORS (NOT CONNECTED)

JUNCTION OF CONDUCTORS

PLUG AND RECEPTACLE

POWER

CONTROL

CIRCUIT BREAK

OTHER COMPONENTS

PUSH TO TEST

HOUR METER

GENERAL PILOT LIGHT

GENERAL SOLENOID

VOLTMETER

RECEPTACLE

SURGE PROTECTIVE DEVICE

AMMETER

DIODE

CAPACITOR

H3 H2 X1 X2

CONTROL CIRCUIT TRANSFORMER

ALARM HORN

RESISTOR

INDUCTOR, REACTOR

CIRCUIT PROTECTORS AND CONTROLLERS

3-POLE DISCONNECT

1-POLE DISCONNECT

1-POLE CIRCUIT BREAKER

3-POLE CIRCUIT BREAKER WITH OVERLOAD TRIP

FUSE

OVERLOAD ELEMENT

3-POLE CIRCUIT BREAKER WITH MAGNETIC TRIP ONLY

MOTOR STARTER

AC TO DC POWER CONVERTER (POWER SUPPLY, RECTIFIER)

AC TO AC POWER CONVERTER (VFD, UPS, ETC)

TERMINAL BLOCKS

- CONTROL TERMINAL BLOCK
- POWER TERMINAL BLOCK
- FUSED TERMINAL BLOCK
- FUSED TERMINAL BLOCK WITH BLOWN FUSE INDICATOR
- EXTERNAL TERMINAL BLOCK
- DISCONNECT / ISOLATION TERMINAL BLOCK
- ISOLATED GROUND TERMINAL / BUSBAR
- GROUNDED TERMINAL BLOCK

- EXAMPLE: CP-1 619A TB1-VAC

ELECTRICAL PANEL OR ENCLOSURE LOCATION

TERMINAL NUMBER (OPTIONAL)

TERMINAL BLOCK DESIGNATION

DESIGNATIONS AND ABBREVIATIONS

AH	ALARM HORN
AM	AMMETER
AUX	AUXILIARY CONTACT
C	CAPACITOR, CELSIUS
CB	CIRCUIT BREAKER
COM	COMMON
COMM	COMMUNICATION DEVICE
CON	CONTACTOR
CP	CONTROL PANEL
CR	CONTROL RELAY
CRM	MASTER CONTROL RELAY
CT	CURRENT TRANSFORMER
DISC	DISCONNECT SWITCH
DISP	DISPLAY
FS	FLOW SWITCH
FU	FUSE
FV	VALVE (FLOW VALVE)
FY	SOLENOID PILOT VALVE
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GND	GROUND
HM	HOUR METER
HTR	HEATER
IE	CURRENT SENSING ELEMENT
JB	JUNCTION BOX
LT	LEVEL TRANSMITTER, PILOT LIGHT
LS	LEVEL SWITCH
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MS	MOTOR STARTER
M	MOTOR
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OL	OVERLOAD RELAY
PB	PUSHBUTTON SWITCH
PBL	ILLUMINATED PUSHBUTTON SWITCH
PDB	POWER DISTRIBUTION BLOCK
PLC	PROGRAMMABLE LOGIC CONTROLLER
PWS	POWER SUPPLY
R	RESISTOR
RECP	RECEPTACLE
RECT	RECTIFIER
SB	SOLENOID BOX
SHLD	CABLE SHIELD
SPD	SURGE PROTECTIVE DEVICE
SS	SELECTOR SWITCH
SSR	SOLID STATE RELAY
T	TRANSFORMER
TB	TERMINAL BLOCK
TR	TIME DELAY RELAY, TIMER
TS	TEMPERATURE SWITCH, THERMOSTAT
UPS	UNINTERRUPTIBLE POWER SUPPLY
VFD	VARIABLE FREQUENCY DRIVE
VM	VOLTMETER
X	INDUCTOR, REACTOR
ZS	POSITION OR LIMIT SWITCH

LIGHT COLOR LEGEND

A	AMBER (YELLOW)
B	BLUE
G	GREEN
R	RED
W	WHITE

WIRE COLOR ABBREVIATIONS

BLK	BLACK
BLU	BLUE
BRN	BROWN
GRN	GREEN
GRY	GRAY
ORN	ORANGE
VIO	VIOLET
RED	RED
WHT	WHITE
YEL	YELLOW

FOR WIRES WITH COLOR STRIPES, THE FIRST ABBREVIATION IS THE BASE COLOR AND SECOND ABBREVIATION IS THE STRIPE COLOR. FOR EXAMPLE, GRN/YEL IS A GREEN WIRE WITH A YELLOW STRIPE.

——— DENOTES CONTROL PANEL AND EQUIPMENT WIRING

——— DENOTES FIELD INTERCONNECTING WIRING

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE	-	RKP	HX	HX	05-JUN-2025

TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX - ANGLES - FRAC -

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VEOLIA

CUSTOMER INFORMATION

CAESARS LANE WTF
MBR SYSTEM

AIR COMPRESSOR PANEL

ELECTRICAL NOTES

SYMBOL INDEX

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-002

REVISION: A

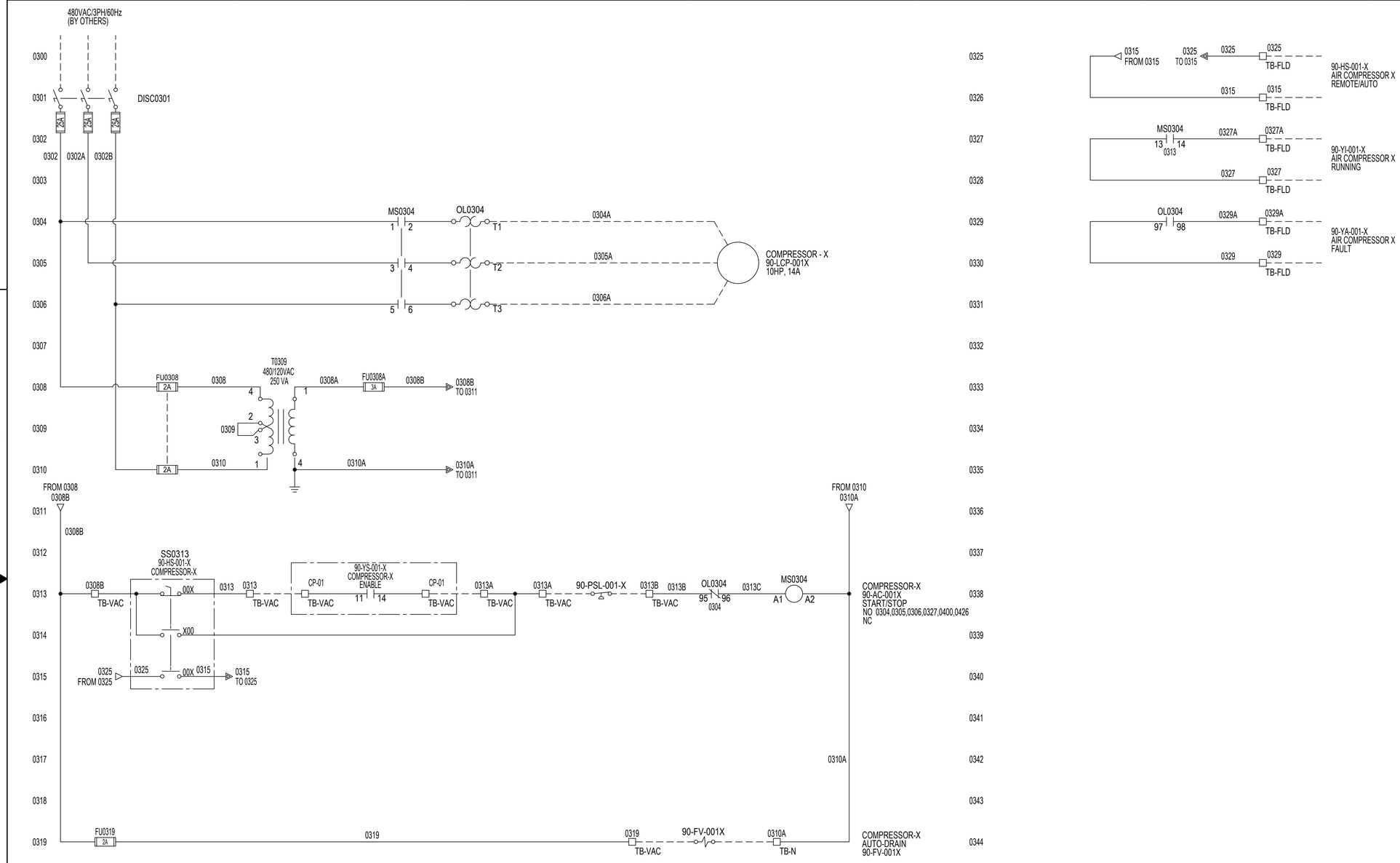
REF.: -

DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	510464-0005100C002	NONE	D	02 OF 03

LAST SAVED: Friday, June 6, 2025 3:12:12 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP-4 Electrical Drawings\COMPRESSOR PANEL\510464-WTS-EL-000-5100-DI-002-02.dwg



NOTE :

1. REPLACE "X" WITH "A" FOR COMPRESSOR 90-AC-001-A AND "B" FOR COMPRESSOR 90-AC-001-B

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE	-	RKP	HX	HX	05-JUN-2025

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC
.XXX - -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

AIR COMPRESSOR PANEL
ELECTRICAL SCHEMATICS
480VAC / 3PH / 60HZ

DRAWING NUMBER: 510464-WTS-EL-000-5100-DI-002
REVISION: A
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: 510464-0005100C002
SCALE: NONE
SIZE: D
SHEET: 03 OF 03

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\COMPRESSOR PANEL\510464-WTS-EL-000-5100-DI-002-03.dwg

LAST SAVED: Friday, June 6, 2025 3:19:28 PM

LINE/CONNECTION DESCRIPTION	LINE STYLE/ SYMBOL
PANEL AND EQUIPMENT WIRING	
FIELD INTERCONNECTING WIRING BY OTHERS	
ELECTRICAL ASSEMBLY BOUNDARY	
CROSSING OF CONDUCTORS (NOT CONNECTED)	
INTERLOCK	
JUNCTION OF CODUCTORS	
UPWARD POWER FLOW	
CIRCUIT NUMBER	2
CONTINUATION ARROW	SHEET
CIRCUIT BREAK	POWER / CONTROL
IEC 2–WIRE CIRCUIT	
IEC 3–WIRE CIRCUIT	
IEC 4–WIRE CIRCUIT	
–	VEOLIA WTS CONTROLLED DOCUMENT

SYMBOL DESCRIPTION	SYMBOL ANSI	SYMBOL IEC
INDUCTION MOTOR	30HP	M 3~
HEATER LOAD	36kW	
ELECTRODIALYSIS STACK	EDR STACK	
TRANSFORMER		
CURRENT TRANSFORMER		
POTENTIAL TRANSFORMER		
TRANSFORMER WITH MULTIPLE WINDINGS		
3–PHASE, DELTA		
3–PHASE, WYE, UNGROUNDED		
3–PHASE, WYE, GROUNDED NEUTRAL		
INDUCTOR, REACTOR	3%	
CAPACITOR		
EARTH GROUND		

SYMBOL DESCRIPTION	SYMBOL ANSI	SYMBOL IEC
NON–FUSED DISCONNECT		
FUSE	3A	3A
① SUPPLEMENTARY PROTECTOR ② CIRCUIT BREAKER	①	②
OVERLOAD		
CONTACTOR		
OPERATING COIL		
AC/DC POWER SUPPLY, RECTIFIER, DC DRIVE		
VARIABLE FREQUENCY DRIVE, UNINTERRUPTIBLE POWER SUPPLY		
KEY INTERLOCK		
REFLECTED WAVE TRAP		
TERMINAL BLOCK		
RECEPTACLE, FEMALE CONNECTOR		
PLUG, MALE CONNECTOR		
SEPARABLE CONNECTOR		

SYMBOL DESCRIPTION	SYMBOL ANSI	SYMBOL IEC
CIRCUIT BREAKER WITH THERMAL OVERCURRENT TRIP	30AT 60AF	30AT 60AF
CIRCUIT BREAKER WITH MAGNETIC OVERCURRENT TRIP	30AT 60AF	30AT 60AF 1 >
FUSED DISCONNECT SWITCH ① IEC: ON–LOAD ISOLATING	3A	3A
MAGNETIC STARTER WITH OVERLOAD DEVICE		
SELF–PROTECTED MAGNETIC MOTOR CONTROLLER		

NOTES AND WARNINGS:

1. WHERE A SYSTEM INCLUDES ONE OR MORE VFD'S THE WIRING FROM EACH MOTOR TO ITS VFD MUST BE SEPARATED FROM OTHER WIRING (BY DISTANCE OR BY METAL CONDUIT) TO PREVENT INTERFERENCE WITH OTHER ELECTRICAL CIRCUIT. ALSO EXCESSIVE VFD TO MOTOR WIRING DISTANCE MAY REQUIRE ADDITIONAL EQUIPMENT TO PREVENT MOTOR/WIRE DAMAGE DUE TO REFLECTED WAVES. TO PREVENT BOTH OF THESE POSSIBLE PROBLEMS, FOLLOW THE INSTALLATION RECOMMENDATIONS IN THE VFD MANUFACTURER'S MANUAL OR LITERATURE.
2. THE CONDUCTOR SIZES WHEN SHOWN ARE MINIMUM SIZES. LARGER SIZES MIGHT BE NEEDED TO MEET REQUIREMENTS FOR THE INSTALLATION CONDITIONS (SUCH AS HIGH AMBIENT TEMPERATURE OR LONG RUN VOLTAGE DROP).
3. REFER LOAD LIST (506444–WTS–EL–T02–8513–LI–001) ALONG WITH THE SLD

DESIGNATIONS AND ABBREVIATIONS

A	AMPERE	kVA	KILO VOLT AMPERE
AF	AMPERES FRAME	kW	KILO WATT
AT	AMPERES TRIP	MCC	MOTOR CONTROL CENTER
AWG	AMERICAN WIRE GAUGE	Ω	OHM
C	CAPACITOR	RMS	ROOT MEAN SQUARE
cos•	POWER FACTOR	RPM	REVOLUTIONS PER MINUTE
FLA	FULL LOAD AMPERES	SCCR	SHORT–CIRCUIT CURRENT RATING
GND	GROUND	THD	TOTAL HARMONIC DISTORTION
icc	SHORT CIRCUIT CURRENT	UPS	UNINTERRUPTIBLE POWER SUPPLY
ics	SERVICE SHORT CIRCUIT BREAKING CAPACITY	V	VOLTS
icu	SHORT CIRCUIT BREAKING CAPACITY	VA	VOLTS AMPERE
in	NOMINAL CURRENT	VAC	VOLT, ALTERNATING CURRENT
kA	KILO AMPERE	VDC	VOLT, DIRECT CURRENT
kAIC	KILO AMPERES INTERRUPTING CAPACITY	VFD	VARIABLE FREQUENCY DRIVE
kVAR	KILO VOLT AMPERE REACTIVE	W	WATTS

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
B	REVISED AS NOTED	-	RKP	HX	HX	05-JUN-2025
A	INITIAL RELEASE	-	SG	HX	HX	08-FEB-2023

TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX -
ANGLES - FRAC -

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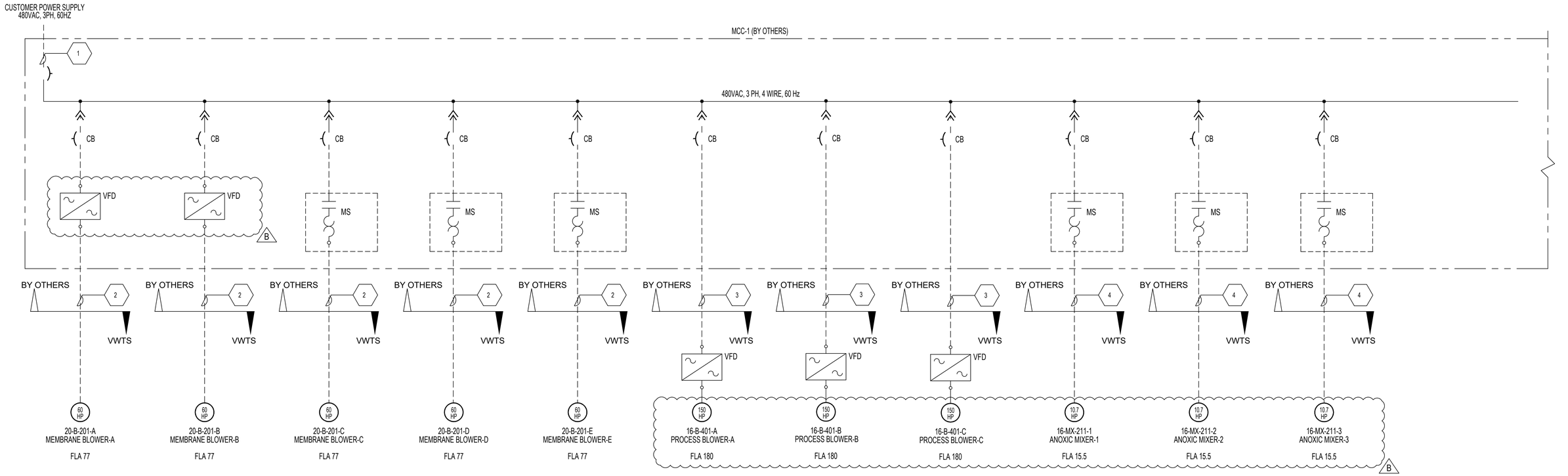
VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

ELECTRICAL SINGLE LINE DIAGRAM
LEGEND

DRAWING NUMBER: 510464-WTS-EL-SYS-EN23-DI-001
REVISION: B
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.: -
SCALE: NONE
SIZE: D
SHEET: 01 OF 05
LAST SAVED: Wednesday, June 11, 2025 6:58:02 PM

FILE LOCATION: C:_ACSX\Vault\NAM\510464 - Caesars Lane WWTP-4, Electrical Drawings\3.ENG\[LINE DIAGRAM\510464-WTS-EL-SYS-EN23-DI-001.01.dwg



NOTES :

1. 480VAC, 60HZ, 3 PHASE CIRCUIT BREAKER AND BRANCH CIRCUIT PROTECTION SUPPLIED BY OTHERS.
2. MOTOR STARTERS SUPPLIED BY OTHERS.
3. VFD'S SUPPLIED BY VEOLIA

REV.	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
B	REVISED AS NOTED	-	RKP	HX	HX	05-JUN-2025
A	INITIAL RELEASE	-	SG	HX	HX	08-FEB-2023

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TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX -
ANGLES - FRAC -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

ELECTRICAL SINGLE LINE DIAGRAM
MCC

DRAWING NUMBER	REVISION
510464-WTS-EL-SYS-EN23-DI-001	B
REF.: -	DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	-	NONE	D	02 OF 05

LAST SAVED: Wednesday, June 11, 2025 6:49:01 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP-4, Electrical Drawings\SINGLE LINE DIAGRAM\510464-WTS-EL-SYS-EN23-DI-001-02.dwg



NOTES :

1. 480VAC, 60HZ, 3 PHASE CIRCUIT BREAKER AND BRANCH CIRCUIT PROTECTION SUPPLIED BY OTHERS.
2. MOTOR STARTERS SUPPLIED BY OTHERS.
3. VFD'S SUPPLIED BY VEOLIA

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
B	REVISED AS NOTED	-	RKP	HX	HX	05-JUN-2025
A	INITIAL RELEASE	-	SG	HX	HX	08-FEB-2023

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TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX -
ANGLES - FRAC -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

ELECTRICAL SINGLE LINE DIAGRAM
MCC

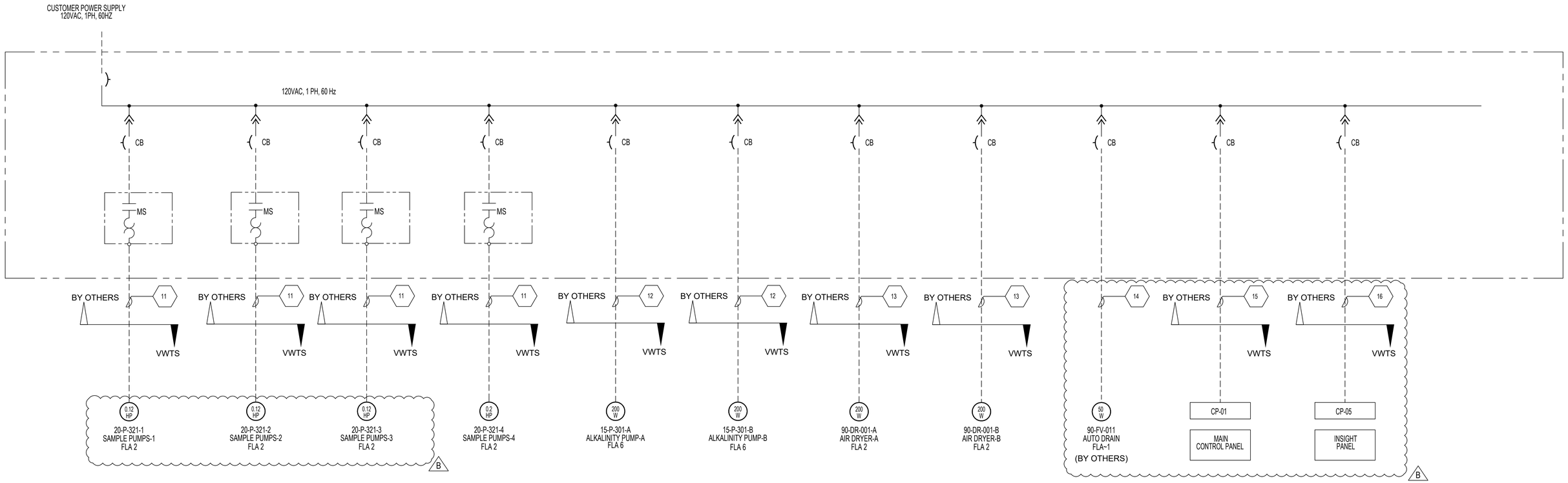
DRAWING NUMBER	REVISION
510464-WTS-EL-SYS-EN23-DI-001	B

REF.: -
DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	-	NONE	D	03 OF 05

LAST SAVED: Wednesday, June 11, 2025 6:49:02 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\4. Electrical Drawings\SINGLE LINE DIAGRAM\510464-WTS-EL-SYS-EN23-DI-001-03.dwg



NOTES :

1. 120VAC, 60HZ, 1 PHASE CIRCUIT BREAKER AND BRANCH CIRCUIT PROTECTION SUPPLIED BY OTHERS.
2. MOTOR STARTERS SUPPLIED BY OTHERS.
3. VFD'S SUPPLIED BY VEOLIA

REV.	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
B	REVISED AS NOTED	-	RKP	HX	HX	05-JUN-2025
A	INITIAL RELEASE	-	SG	HX	HX	08-FEB-2023

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X - -
.XX - FRAC
.XXX - -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

ELECTRICAL SINGLE LINE DIAGRAM
MCC

DRAWING NUMBER				REVISION
510464-WTS-EL-SYS-EN23-DI-001				B
REF.: -	DOC. OWNER: -			
PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464	-	NONE	D	04 OF 05

LAST SAVED: Wednesday, June 11, 2025 6:49:02 PM

FILE LOCATION: C:_ACSX\Vault\VAM\510464 - Caesars Lane WWTP-A Electrical Drawings\SINGLE LINE DIAGRAM\510464-WTS-EL-SYS-EN23-DI-001.04.dwg

CIRCUIT INFORMATION

NO	TYPE	QTY	MCC-1 LOAD DESCRIPTION	VOLTAGE	LOAD	FLA
1	FEEDER	1	INCOMING POWER MOTOR CONTROL ENCLOSURE	460/3/60		
2	BRAN	5	MEMBRANE BLOWERS	480/3/60	60HP	77
3	BRAN	3	PROCESS AERATION BLOWERS	480/3/60	150HP	180
4	BRAN	3	ANOXIC TANK MIXER	480/3/60	10.7HP	15.5
5	BRAN	2	BACKPULSE PUMP	460/3/60	60 HP	77
6	BRAN	4	RAS/WAS/DRAIN PUMP	460/3/60	30HP	40
7	BRAN	2	SODIUM HYPOCHLORITE PUMP	460/3/60	1HP	2.1
8	BRAN	2	CITRIC ACID PUMP	460/3/60	1HP	2.1
9	BRAN	2	COMPRESSOR A/B	460/3/60	10HP	14
10	BRAN	2	AIR DRYER	120/1/60	200W	2
11	BRAN	4	SAMPLE PUMPS	120/1/60	0.12HP	2
12	BRAN	2	ALKANITY PUMP	120/1/60	200W	2
13	BRAN	2	AIR DRYER	120/1/60	200W	2
14	BRAN	1	AUTO DRAIN (BY OTHERS)	120/1/60	50W	1
15	BRAN	1	PLC MAIN CONTROL PANEL CP-01	120/1/60	-	15
16	BRAN	1	INSIGHT COMMUNICATION PANEL CP-05	120/1/60	-	5

INSTALLATION INFORMATION

OVERCURRENT PROTECTION	CONTROLLER OR TRANSFORMER	TERM TEMP	AMB TEMP	WIRING	CONDUIT	LENGTH	NOTES
CIRCUIT BREAKER							
CIRCUIT BREAKER	VFD, CT (BY CLIENT) FVNR (BY CLIENT)						
CIRCUIT BREAKER	VFD, CT (BY CLIENT)						
CIRCUIT BREAKER	FVNR (BY CLIENT)						
CIRCUIT BREAKER	VFD, VT (BY VWTS)						
CIRCUIT BREAKER	VFD, VT (BY VWTS)						
CIRCUIT BREAKER	VFD, VT (BY VWTS)						
CIRCUIT BREAKER	VFD, VT (BY VWTS)						
CIRCUIT BREAKER	FVNR (BY VWTS)						
CIRCUIT BREAKER	-						
CIRCUIT BREAKER	FVNR (BY CLIENT)						
CIRCUIT BREAKER	-						
CIRCUIT BREAKER	-						
CIRCUIT BREAKER							
CIRCUIT BREAKER							
CIRCUIT BREAKER							

ABREVIATIONS" "NO" -CIRCUIT NUMBER; "QTY" - QUANTITY; "TERM TEMP" - TERMINAL TEMPERTURE RATING; "AMB. TEMP" - AMBIENT TEMPERATURE; "NA" - NOT APPLICABLE
CIRCUIT TYPES: "BRAN" - BRANCH; "FEED" *- "FEEDER; "SERV" - "SERVICE" "CTRL" - CONTROL; INST - "INSTRUMENTATION
ALL FIELD WIRING CONDUCTORS SHALL BE STRANDED COPPER ELECTRICAL DESIGN IS FOR NFPA 70 - NATIONAL ELECTRIC CODE

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
B	REVISED AS NOTED	-	RKP	HX	HX	05-JUN-2025
A	INITIAL RELEASE	-	SG	HX	HX	08-FEB-2023

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TOLERANCES UNLESS NOTED
DECIMALS .X - .XX - .XXX - ANGLES - FRAC -

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

ELECTRICAL SINGLE LINE DIAGRAM
MCC

DRAWING NUMBER				REVISION
510464-WTS-EL-SYS-EN23-DI-001				B
REF.: -	DOC. OWNER: -			
PROJECT NO. 510464	PART/MATERIAL NO. -	SCALE NONE	SIZE D	SHEET 05 OF 05

LAST SAVED: Wednesday, June 11, 2025 6:49:02 PM

FILE LOCATION: C:_ADSKVault\VAAA\510464 - Caesars Lane WWTP\4. Electrical Drawings\SINGLE LINE DIAGRAM\510464-WTS-EL-SYS-EN23-DI-001.05.dwg

VEOLIA WTS
CONTROLLED DOCUMENT

VEOLIA

CUSTOMER INFORMATION

CEASERS LANE WTF
MBR SYSTEM

I/O LIST

CUSTOMER DOCUMENT NUMBER

VEOLIA DOCUMENT NUMBER: **510464-WTS-EL-SYS-EN33-LI-001**

CONTRACT	ISSUER	DISCIPLINE	PRODUCT	PHASE	TYPE	CHRONO
510464	WTS	EL	SYS	EN33	LI	001

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REV	DESCRIPTION	CREATED BY	CHECKED BY	APPROVED BY	DATE (DD-MMM-YY)
C	REVISED AS NOTED	HX	HX	HX	6-Jun-25
B	REVISED AS NOTED	HX	HX	HX	30-Oct-24
A	INITIAL RELEASE	AH	HX	HX	14-02-2023

ROW NO.	REV	P&ID	DEVICE TAG	DESCRIPTION	SIGNAL TAG	I/O TYPE	PANEL TAG	PLC NUMBER	RACK	SLOT	CHANNEL	ADDRESS	IO MODULE PART NUMBER	IO ENERGIZED ACTION	POWER SUPPLY	SIGNAL TYPE	NOTES / REMARKS
1	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 1 OF 2	20-B-201-A	MEMBRANE BLOWER A RUNNING		DI	CP-01	1	1	1	0	I:1:1.0	5094-IB16	RUNNING	24VDC	24 VDC	
2	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 1 OF 2	20-B-201-C	MEMBRANE BLOWER C RUNNING		DI	CP-01	1	1	1	1	I:1:1.1	5094-IB16	RUNNING	24VDC	24 VDC	
3	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 1 OF 2	20-B-201-D	MEMBRANE BLOWER D RUNNING		DI	CP-01	1	1	1	2	I:1:1.2	5094-IB16	RUNNING	24VDC	24 VDC	
4	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 1 OF 2	20-FSL-201-A	MEMBRANE BLOWER A FLOW SWITCH LOW		DI	CP-01	1	1	1	3	I:1:1.3	5094-IB16	ALARM	24VDC	24 VDC	
5	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 1 OF 2	20-FSL-201-C	MEMBRANE BLOWER C FLOW SWITCH LOW		DI	CP-01	1	1	1	4	I:1:1.4	5094-IB16	ALARM	24VDC	24 VDC	
6	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 1 OF 2	20-FSL-201-D	MEMBRANE BLOWER D FLOW SWITCH LOW		DI	CP-01	1	1	1	5	I:1:1.5	5094-IB16	ALARM	24VDC	24 VDC	
7	A			SPARE		DI	CP-01	1	1	1	6	I:1:1.6	5094-IB16				
8	A			SPARE		DI	CP-01	1	1	1	7	I:1:1.7	5094-IB16				
9	B	510464-WTS-PR-SYS-EN21-DS-102-SHT 2 OF 2	16-ZSO-400-A	PROCESS BLOWER A INLET HAND VALVE OPEN		DI	CP-01	1	1	1	8	I:1:1.8	5094-IB16	NORMAL	24VDC	24 VDC	
10	B	510464-WTS-PR-SYS-EN21-DS-102-SHT 2 OF 2	16-ZSO-400-B	PROCESS BLOWER B INLET HAND VALVE OPEN		DI	CP-01	1	1	1	9	I:1:1.9	5094-IB16	NORMAL	24VDC	24 VDC	
11	B	510464-WTS-PR-SYS-EN21-DS-102-SHT 2 OF 2	16-ZSO-400-C	PROCESS BLOWER C INLET HAND VALVE OPEN		DI	CP-01	1	1	1	10	I:1:1.10	5094-IB16	NORMAL	24VDC	24 VDC	
12	A			SPARE		DI	CP-01	1	1	1	11	I:1:1.11	5094-IB16				
13	A			SYSTEM STOP		DI	CP-01	1	1	1	12	I:1:1.12	5094-IB16	NORMAL	24VDC	24 VDC	
14	A			SPD FAULT		DI	CP-01	1	1	1	13	I:1:1.13	5094-IB16	ALARM	24VDC	24 VDC	
15	A			DC POWER SUPPLY 1 FAULT		DI	CP-01	1	1	1	14	I:1:1.14	5094-IB16	ALARM	24VDC	24 VDC	
16	A			DC POWER SUPPLY 2 FAULT		DI	CP-01	1	1	1	15	I:1:1.15	5094-IB16	ALARM	24VDC	24 VDC	
17	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 2 OF 2	16-B-401-A	PROCESS BLOWER A RUNNING		DI	CP-01	1	1	2	0	I:1:2.0	5094-IB16	RUNNING	24VDC	24 VDC	
18	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 2 OF 2	16-B-401-B	PROCESS BLOWER B RUNNING		DI	CP-01	1	1	2	1	I:1:2.1	5094-IB16	RUNNING	24VDC	24 VDC	
19	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 2 OF 2	16-FSL-401-A	PROCESS BLOWER A FLOW SWITCH LOW		DI	CP-01	1	1	2	2	I:1:2.2	5094-IB16	ALARM	24VDC	24 VDC	
20	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 2 OF 2	16-FSL-401-B	PROCESS BLOWER B FLOW SWITCH LOW		DI	CP-01	1	1	2	3	I:1:2.3	5094-IB16	ALARM	24VDC	24 VDC	
21	A	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-MX-211-1	BIOREACTOR ANOXIC MIXER RUNNING - TRAIN 1		DI	CP-01	1	1	2	4	I:1:2.4	5094-IB16	RUNNING	24VDC	24 VDC	
22	A	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-MX-211-1	BIOREACTOR ANOXIC MIXER LEAK - TRAIN 1		DI	CP-01	1	1	2	5	I:1:2.5	5094-IB16	ALARM	24VDC	24 VDC	
23	A	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-MX-211-2	BIOREACTOR ANOXIC MIXER RUNNING - TRAIN 2		DI	CP-01	1	1	2	6	I:1:2.6	5094-IB16	RUNNING	24VDC	24 VDC	
24	A	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-MX-211-2	BIOREACTOR ANOXIC MIXER LEAK - TRAIN 2		DI	CP-01	1	1	2	7	I:1:2.7	5094-IB16	ALARM	24VDC	24 VDC	
25	A	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-LSHH-401-1	BIOREACTOR TANK LEVEL SWITCH HIGH HIGH - TRAIN 1		DI	CP-01	1	1	2	8	I:1:2.8	5094-IB16	ALARM	24VDC	24 VDC	
26	A	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-LSHH-401-2	BIOREACTOR TANK LEVEL SWITCH HIGH HIGH - TRAIN 2		DI	CP-01	1	1	2	9	I:1:2.9	5094-IB16	ALARM	24VDC	24 VDC	
27	A	510464-WTS-PR-SYS-EN21-DS-106-SHT 1 OF 1	20-P-610-A	BACKPULSE PUMP A RUNNING		DI	CP-01	1	1	2	10	I:1:2.10	5094-IB16	RUNNING	24VDC	24 VDC	
28	A	510464-WTS-PR-SYS-EN21-DS-106-SHT 1 OF 1	20-PSH-601	BACKPULSE PRESSURE HIGH		DI	CP-01	1	1	2	11	I:1:2.11	5094-IB16	ALARM	24VDC	24 VDC	
29	B	510464-WTS-PR-SYS-EN21-DS-106-SHT 1 OF 1	20-P-610-A	BACKPULS PUMP LEAK ALARM		DI	CP-01	1	1	2	12	I:1:2.12	5094-IB16	ALARM	24VDC	24 VDC	

CUSTOMER INFORMATION

CEASERS LANE WTF
MBR SYSTEM

I/O LIST

CUSTOMER DOCUMENT NUMBER

VEOLIA DOCUMENT NUMBER: **510464-WTS-EL-SYS-EN33-LI-001**

CONTRACT	ISSUER	DISCIPLINE	PRODUCT	PHASE	TYPE	CHRONO
510464	WTS	EL	SYS	EN33	LI	001

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C	REVISED AS NOTED	HX	HX	HX	6-Jun-25
B	REVISED AS NOTED	HX	HX	HX	30-Oct-24
A	INITIAL RELEASE	AH	HX	HX	14-02-2023

ROW NO.	REV	P&ID	DEVICE TAG	DESCRIPTION	SIGNAL TAG	I/O TYPE	PANEL TAG	PLC NUMBER	RACK	SLOT	CHANNEL	ADDRESS	IO MODULE PART NUMBER	IO ENERGIZED ACTION	POWER SUPPLY	SIGNAL TYPE	NOTES / REMARKS
30	A			SPARE		DI	CP-01	1	1	2	13	I:1:2.13	5094-IB16				
31	A			SPARE		DI	CP-01	1	1	2	14	I:1:2.14	5094-IB16				
32	A			SPARE		DI	CP-01	1	1	2	15	I:1:2.15	5094-IB16				
33	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 1 OF 2	15-P-301-A	ALKALINITY DOSING PUMP A FAULT		DI	CP-01	1	1	3	0	I:1:3.0	5094-IB16	ALARM	24VDC	24 VDC	
34	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-101-A	SODIUM HYPOCHLORITE PUMP A REMOTE		DI	CP-01	1	1	3	1	I:1:3.1	5094-IB16	NORMAL	24VDC	24 VDC	
35	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-101-A	SODIUM HYPOCHLORITE PUMP A FAULT		DI	CP-01	1	1	3	2	I:1:3.2	5094-IB16	ALARM	24VDC	24 VDC	
36	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-101-A	SODIUM HYPOCHLORITE PUMP A RUNNING		DI	CP-01	1	1	3	3	I:1:3.3	5094-IB16	RUNNING	24VDC	24 VDC	
37	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-301-A	CITRIC ACID PUMP A REMOTE		DI	CP-01	1	1	3	4	I:1:3.4	5094-IB16	NORMAL	24VDC	24 VDC	
38	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-301-A	CITRIC ACID PUMP A FAULT		DI	CP-01	1	1	3	5	I:1:3.5	5094-IB16	ALARM	24VDC	24 VDC	
39	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-301-A	CITRIC ACID PUMP A RUNNING		DI	CP-01	1	1	3	6	I:1:3.6	5094-IB16	RUNNING	24VDC	24 VDC	
40	A	510464-WTS-PR-SYS-EN21-DS-112-SHT 1 OF 1	90-AC-001-A	AIR COMPRESSOR A RUNNING		DI	CP-01	1	1	3	7	I:1:3.7	5094-IB16	RUNNING	24VDC	24 VDC	
41	A	510464-WTS-PR-SYS-EN21-DS-112-SHT 1 OF 1	90-AC-001-A	AIR COMPRESSOR A REMOTE (AUTO)		DI	CP-01	1	1	3	8	I:1:3.8	5094-IB16	NORMAL	24VDC	24 VDC	
42	A	510464-WTS-PR-SYS-EN21-DS-112-SHT 1 OF 1	90-AC-001-A	AIR COMPRESSOR A FAULT		DI	CP-01	1	1	3	9	I:1:3.9	5094-IB16	ALARM	24VDC	24 VDC	
43	A	510464-WTS-PR-SYS-EN21-DS-112-SHT 1 OF 1	90-PSL-003	AIR COMPRESSOR PRESSURE SWITCH LOW		DI	CP-01	1	1	3	10	I:1:3.10	5094-IB16	ALARM	24VDC	24 VDC	
44	A	510464-WTS-PR-SYS-EN21-DS-112-SHT 1 OF 1	90-PSLL-002	AIR COMPRESSOR PRESSURE SWITCH LOW LOW		DI	CP-01	1	1	3	11	I:1:3.11	5094-IB16	ALARM	24VDC	24 VDC	
45	C	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	16-ZSO-510	RAS/DRAIN VALVE OPEN		DI	CP-01	1	1	3	12	I:1:3.12	5094-IB16	OPEN	24VDC	24 VDC	
46	C	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	16-ZSC-510	RAS/DRAIN VALVE CLOSED		DI	CP-01	1	1	3	13	I:1:3.13	5094-IB16	CLOSED	24VDC	24 VDC	
47	A			SPARE		DI	CP-01	1	1	3	14	I:1:3.14	5094-IB16				
48	A			SPARE		DI	CP-01	1	1	3	15	I:1:3.15	5094-IB16				
49	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 1 OF 2	20-B-201-A	MEMBRANE BLOWER A RUN COMMAND		DO	CP-01	1	1	4	0	O:1:4.0	5094-OB16	NORMAL	24VDC	RELAY	
50	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 1 OF 2	20-B-201-C	MEMBRANE BLOWER C RUN COMMAND		DO	CP-01	1	1	4	1	O:1:4.1	5094-OB16	NORMAL	24VDC	RELAY	
51	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 1 OF 2	20-B-201-D	MEMBRANE BLOWER D RUN COMMAND		DO	CP-01	1	1	4	2	O:1:4.2	5094-OB16	NORMAL	24VDC	RELAY	
52	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 2 OF 2	16-B-401-A	PROCESS BLOWER A RUN COMMAND		DO	CP-01	1	1	4	3	O:1:4.3	5094-OB16	NORMAL	24VDC	RELAY	
53	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 2 OF 2	16-B-401-B	PROCESS BLOWER B RUN COMMAND		DO	CP-01	1	1	4	4	O:1:4.4	5094-OB16	NORMAL	24VDC	RELAY	
54	A	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-MX-211-1	BIOREACTOR ANOXIC MIXER RUN COMMAND - TRAIN 1		DO	CP-01	1	1	4	5	O:1:4.5	5094-OB16	NORMAL	24VDC	RELAY	
55	A	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-MX-211-2	BIOREACTOR ANOXIC MIXER RUN COMMAND - TRAIN 2		DO	CP-01	1	1	4	6	O:1:4.6	5094-OB16	NORMAL	24VDC	RELAY	
56	A	510464-WTS-PR-SYS-EN21-DS-106-SHT 1 OF 1	20-P-610-A	BACKPULSE PUMP A RUN COMMAND		DO	CP-01	1	1	4	7	O:1:4.7	5094-OB16	NORMAL	24VDC	RELAY	
57	A	510464-WTS-PR-SYS-EN21-DS-106-SHT 1 OF 1	20-FV-803-6	COMMON PERMEATE VACCUM VALVE		DO	CP-01	1	1	4	8	O:1:4.8	5094-OB16	OPEN	24VDC	SOLENOID	
58	A			SPARE RELAY		DO	CP-01	1	1	4	9	O:1:4.9	5094-OB16		24VDC	RELAY	

CUSTOMER INFORMATION

CEASERS LANE WTF
MBR SYSTEM

I/O LIST

CUSTOMER DOCUMENT NUMBER

VEOLIA DOCUMENT NUMBER: **510464-WTS-EL-SYS-EN33-LI-001**

CONTRACT	ISSUER	DISCIPLINE	PRODUCT	PHASE	TYPE	CHRONO
510464	WTS	EL	SYS	EN33	LI	001

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ROW NO.	REV	P&ID	DEVICE TAG	DESCRIPTION	SIGNAL TAG	I/O TYPE	PANEL TAG	PLC NUMBER	RACK	SLOT	CHANNEL	ADDRESS	IO MODULE PART NUMBER	IO ENERGIZED ACTION	POWER SUPPLY	SIGNAL TYPE	NOTES / REMARKS
59	A			SPARE RELAY		DO	CP-01	1	1	4	10	O:1:4.10	5094-OB16		24VDC	RELAY	
60	A			SPARE		DO	CP-01	1	1	4	11	O:1:4.11	5094-OB16				
61	A			SPARE		DO	CP-01	1	1	4	12	O:1:4.12	5094-OB16				
62	A			SPARE		DO	CP-01	1	1	4	13	O:1:4.13	5094-OB16				
63	A			SPARE		DO	CP-01	1	1	4	14	O:1:4.14	5094-OB16				
64	A		LT1XXXX	GENERAL ALARM LIGHT		DO	CP-01	1	1	4	15	O:1:4.15	5094-OB16	ALARM	24VDC		
65	A	510464-WTS-PR-SYS-EN21-DS-106-SHT 1 OF 1	23-FV-330	CITRIC ACID INJECTION VALVE		DO	CP-01	1	1	5	0	O:1:5.0	5094-OB16	OPEN	24VDC	SOLENOID	
66	A	510464-WTS-PR-SYS-EN21-DS-109-SHT 1 OF 2	20-FV-802-5	COMMON EJECTOR		DO	CP-01	1	1	5	1	O:1:5.1	5094-OB16	OPEN	24VDC	SOLENOID	
67	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	16-FV-510	RAS/DRAIN VALVE		DO	CP-01	1	1	5	2	O:1:5.2	5094-OB16	OPEN	24VDC	SOLENOID	
68	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 1 OF 2	15-P-301-A	ALKALINITY DOSING PUMP A RUN COMMAND		DO	CP-01	1	1	5	3	O:1:5.3	5094-OB16	NORMAL	24VDC	RELAY	
69	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-101-A	SODIUM HYPOCHLORITE PUMP A RUN COMMAND		DO	CP-01	1	1	5	4	O:1:5.4	5094-OB16	NORMAL	24VDC	RELAY	
70	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-301-A	CITRIC ACID PUMP A RUN COMMAND		DO	CP-01	1	1	5	5	O:1:5.5	5094-OB16	NORMAL	24VDC	RELAY	
71	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-FV-105	SODIUM HYPOCHLORITE RECOVERY VALVE		DO	CP-01	1	1	5	6	O:1:5.6	5094-OB16	OPEN	24VDC	SOLENOID	
72	A	510464-WTS-PR-SYS-EN21-DS-112-SHT 1 OF 1	90-AC-001-A	AIR COMPRESSOR A ENABLE		DO	CP-01	1	1	5	7	O:1:5.7	5094-OB16	NORMAL	24VDC	RELAY	
73	A			SPARE RELAY		DO	CP-01	1	1	5	8	O:1:5.8	5094-OB16		24VDC	RELAY	
74	A			SPARE RELAY		DO	CP-01	1	1	5	9	O:1:5.9	5094-OB16		24VDC	RELAY	
75	A			SPARE		DO	CP-01	1	1	5	10	O:1:5.10	5094-OB16				
76	A			SPARE		DO	CP-01	1	1	5	11	O:1:5.11	5094-OB16				
77	A			SPARE		DO	CP-01	1	1	5	12	O:1:5.12	5094-OB16				
78	A			SPARE		DO	CP-01	1	1	5	13	O:1:5.13	5094-OB16				
79	A			SPARE		DO	CP-01	1	1	5	14	O:1:5.14	5094-OB16				
80	A			SPARE		DO	CP-01	1	1	5	15	O:1:5.15	5094-OB16				
81	A	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-AIT-405A-1	BIOREACTOR pH ANALYZER - TRAIN 1		AI	CP-01	1	1	6	0	I:1:6.0	5094-IF8	N/A	120VAC	4-20 mA	
82	A	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-AIT-405A-1	AEROBIC ZONE 1 DO ANALYZER - TRAIN 1		AI	CP-01	1	1	6	1	I:1:6.1	5094-IF8	N/A		4-20 mA	
83	A	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-AIT-405A-2	BIOREACTOR pH ANALYZER - TRAIN 2		AI	CP-01	1	1	6	2	I:1:6.2	5094-IF8	N/A	120VAC	4-20 mA	
84	A	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-AIT-405A-2	AEROBIC ZONE 1 DO ANALYZER - TRAIN 2		AI	CP-01	1	1	6	3	I:1:6.3	5094-IF8	N/A		4-20 mA	
85	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-LIT-200	MEMBRANE TANK DISTRIBUTION CHANNEL LEVEL TRANSMITTER		AI	CP-01	1	1	6	4	I:1:6.4	5094-IF8	N/A	LOOP-POWERED	4-20 mA	
86	A	510464-WTS-PR-SYS-EN21-DS-106-SHT 1 OF 1	20-LIT-601	BACKPULSE TANK LEVEL TRANSMITTER		AI	CP-01	1	1	6	5	I:1:6.5	5094-IF8	N/A	LOOP-POWERED	4-20 mA	
87	B	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-AIT-403-1	AEROBIC ZONE 2 DO ANALYZER - TRAIN 1		AI	CP-01	1	1	6	6	I:1:6.6	5094-IF8	N/A	120VAC	4-20 mA	

CUSTOMER INFORMATION

CEASERS LANE WTF
MBR SYSTEM

I/O LIST

CUSTOMER DOCUMENT NUMBER

VEOLIA DOCUMENT NUMBER: **510464-WTS-EL-SYS-EN33-LI-001**

CONTRACT	ISSUER	DISCIPLINE	PRODUCT	PHASE	TYPE	CHRONO
510464	WTS	EL	SYS	EN33	LI	001

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REV	DESCRIPTION	CREATED BY	CHECKED BY	APPROVED BY	DATE (DD-MMM-YY)
C	REVISED AS NOTED	HX	HX	HX	6-Jun-25
B	REVISED AS NOTED	HX	HX	HX	30-Oct-24
A	INITIAL RELEASE	AH	HX	HX	14-02-2023

ROW NO.	REV	P&ID	DEVICE TAG	DESCRIPTION	SIGNAL TAG	I/O TYPE	PANEL TAG	PLC NUMBER	RACK	SLOT	CHANNEL	ADDRESS	IO MODULE PART NUMBER	IO ENERGIZED ACTION	POWER SUPPLY	SIGNAL TYPE	NOTES / REMARKS
88	A			SPARE		AI	CP-01	1	1	6	7	I:1:6.7	5094-IF8				
89	A	510464-WTS-PR-SYS-EN21-DS-106-SHT 1 OF 1	20-TIT-301	PERMEATE TEMPERATURE TRANSMITTER		AI	CP-01	1	1	7	0	I:1:7.0	5094-IF8	N/A	LOOP-POWERED	4-20 mA	
90	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	16-FIT-707	WAS TO SLUDGE FLOW TRANSMITTER		AI	CP-01	1	1	7	1	I:1:7.1	5094-IF8	N/A	120VAC	4-20 mA	
91	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 1 OF 2	15-LIT-301	ALKALINITY DOSING TANK LEVEL TRANSMITTER		AI	CP-01	1	1	7	2	I:1:7.2	5094-IF8	N/A	LOOP-POWERED	4-20 mA	
92	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-LIT-101	SODIUM HYPOCHLORITE TANK LEVEL TRANSMITTER		AI	CP-01	1	1	7	3	I:1:7.3	5094-IF8	N/A	LOOP-POWERED	4-20 mA	
93	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-FIT-101	SODIUM HYPOCHLORITE FLOW TRANSMITTER		AI	CP-01	1	1	7	4	I:1:7.4	5094-IF8	N/A	24VDC	4-20 mA	
94	A			SPARE		AI	CP-01	1	1	7	5	I:1:7.5	5094-IF8				
95	A			SPARE		AI	CP-01	1	1	7	6	I:1:7.6	5094-IF8				
96	A			SPARE		AI	CP-01	1	1	7	7	I:1:7.7	5094-IF8				
97	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 1 OF 2	20-B-201-A	MEMBRANE BLOWER A SPEED REFERENCE		AO	CP-01	1	1	8	0	O:1:8.0	5094-OF8	N/A	24VDC	4-20 mA	
98	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 2 OF 2	16-B-401-A	PROCESS BLOWER A SPEED REFERENCE		AO	CP-01	1	1	8	1	O:1:8.1	5094-OF8	N/A	24VDC	4-20 mA	
99	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 2 OF 2	16-B-401-B	PROCESS BLOWER B SPEED REFERENCE		AO	CP-01	1	1	8	2	O:1:8.2	5094-OF8	N/A	24VDC	4-20 mA	
100	A	510464-WTS-PR-SYS-EN21-DS-106-SHT 1 OF 1	20-P-610-A	BACKPULSE PUMP A SPEED REFERENCE		AO	CP-01	1	1	8	3	O:1:8.3	5094-OF8	N/A	24VDC	4-20 mA	
101	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 1 OF 2	15-P-301-A	ALKALINITY DOSING PUMP A SPEED REFERENCE		AO	CP-01	1	1	8	4	O:1:8.4	5094-OF8	N/A	24VDC	4-20 mA	
102	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-101-A	SODIUM HYPOCHLORITE PUMP A SPEED REFERENCE		AO	CP-01	1	1	8	5	O:1:8.5	5094-OF8	N/A	24VDC	4-20 mA	
103	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-301-A	CITRIC ACID PUMP A SPEED REFERENCE		AO	CP-01	1	1	8	6	O:1:8.6	5094-OF8	N/A	24VDC	4-20 mA	
104	A			SPARE		AO	CP-01	1	1	8	7	O:1:8.7	5094-OF8				
105	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 1 OF 2	20-B-201-B	MEMBRANE BLOWER B RUNNING		DI	CP-01	1	2	1	0	I:2:1.0	5094-IB16	RUNNING		24 VDC	
106	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 1 OF 2	20-B-201-E	MEMBRANE BLOWER E RUNNING		DI	CP-01	1	2	1	1	I:2:1.1	5094-IB16	RUNNING	24VDC	24 VDC	
107	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 1 OF 2	20-FSL-201-B	MEMBRANE BLOWER B FLOW SWITCH LOW		DI	CP-01	1	2	1	2	I:2:1.2	5094-IB16	ALARM	24VDC	24 VDC	
108	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 1 OF 2	20-FSL-201-E	MEMBRANE BLOWER E FLOW SWITCH LOW		DI	CP-01	1	2	1	3	I:2:1.3	5094-IB16	ALARM	24VDC	24 VDC	
109	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 2 OF 2	16-B-401-C	PROCESS BLOWER C RUNNING		DI	CP-01	1	2	1	4	I:2:1.4	5094-IB16	RUNNING	24VDC	24 VDC	
110	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 2 OF 2	16-FSL-401-C	PROCESS BLOWER C FLOW SWITCH LOW		DI	CP-01	1	2	1	5	I:2:1.5	5094-IB16	ALARM	24VDC	24 VDC	
111	A	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-MX-211-3	BIOREACTOR ANOXIC MIXER RUNNING - TRAIN 3		DI	CP-01	1	2	1	6	I:2:1.6	5094-IB16	RUNNING	24VDC	24 VDC	
112	A	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-MX-211-3	BIOREACTOR ANOXIC MIXER LEAK - TRAIN 3		DI	CP-01	1	2	1	7	I:2:1.7	5094-IB16	ALARM	24VDC	24 VDC	
113	A	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-LSHH-401-3	BIOREACTOR TANK LEVEL SWITCH HIGH HIGH - TRAIN 3		DI	CP-01	1	2	1	8	I:2:1.8	5094-IB16	ALARM	24VDC	24 VDC	
114	A	510464-WTS-PR-SYS-EN21-DS-106-SHT 1 OF 1	20-P-610-B	BACKPULSE PUMP B RUNNING		DI	CP-01	1	2	1	9	I:2:1.9	5094-IB16	RUNNING	24VDC	24 VDC	
115	A	510464-WTS-PR-SYS-EN21-DS-106-SHT 1 OF 1	20-PSH-602	BACKPULSE PRESSURE HIGH		DI	CP-01	1	2	1	10	I:2:1.10	5094-IB16	ALARM	24VDC	24 VDC	
116	A			SPARE		DI	CP-01	1	2	1	11	I:2:1.11	5094-IB16				

CUSTOMER INFORMATION

CEASERS LANE WTF
MBR SYSTEM

I/O LIST

CUSTOMER DOCUMENT NUMBER

VEOLIA DOCUMENT NUMBER: **510464-WTS-EL-SYS-EN33-LI-001**

CONTRACT	ISSUER	DISCIPLINE	PRODUCT	PHASE	TYPE	CHRONO
510464	WTS	EL	SYS	EN33	LI	001

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REV	DESCRIPTION	CREATED BY	CHECKED BY	APPROVED BY	DATE (DD-MMM-YY)
C	REVISED AS NOTED	HX	HX	HX	6-Jun-25
B	REVISED AS NOTED	HX	HX	HX	30-Oct-24
A	INITIAL RELEASE	AH	HX	HX	14-02-2023

ROW NO.	REV	P&ID	DEVICE TAG	DESCRIPTION	SIGNAL TAG	I/O TYPE	PANEL TAG	PLC NUMBER	RACK	SLOT	CHANNEL	ADDRESS	IO MODULE PART NUMBER	IO ENERGIZED ACTION	POWER SUPPLY	SIGNAL TYPE	NOTES / REMARKS
117	A			SPARE		DI	CP-01	1	2	1	12	I:2:1.12	5094-IB16				
118	A			SPARE		DI	CP-01	1	2	1	13	I:2:1.13	5094-IB16				
119	A			SPARE		DI	CP-01	1	2	1	14	I:2:1.14	5094-IB16				
120	A			SPARE		DI	CP-01	1	2	1	15	I:2:1.15	5094-IB16				
121	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 1 OF 2	15-P-301-B	ALKALINITY DOSING PUMP B FAULT		DI	CP-01	1	2	2	0	I:2:2.0	5094-IB16	ALARM	24VDC	24 VDC	
122	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-101-B	SODIUM HYPOCHLORITE PUMP B REMOTE		DI	CP-01	1	2	2	1	I:2:2.1	5094-IB16	NORMAL	24VDC	24 VDC	
123	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-101-B	SODIUM HYPOCHLORITE PUMP B FAULT		DI	CP-01	1	2	2	2	I:2:2.2	5094-IB16	ALARM	24VDC	24 VDC	
124	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-101-B	SODIUM HYPOCHLORITE PUMP B RUNNING		DI	CP-01	1	2	2	3	I:2:2.3	5094-IB16	RUNNING	24VDC	24 VDC	
125	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-301-B	CITRIC ACID PUMP B REMOTE		DI	CP-01	1	2	2	4	I:2:2.4	5094-IB16	NORMAL	24VDC	24 VDC	
126	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-301-B	CITRIC ACID PUMP B FAULT		DI	CP-01	1	2	2	5	I:2:2.5	5094-IB16	ALARM	24VDC	24 VDC	
127	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-301-B	CITRIC ACID PUMP B RUNNING		DI	CP-01	1	2	2	6	I:2:2.6	5094-IB16	RUNNING	24VDC	24 VDC	
128	A	510464-WTS-PR-SYS-EN21-DS-112-SHT 1 OF 1	90-AC-001-B	AIR COMPRESSOR B RUNNING		DI	CP-01	1	2	2	7	I:2:2.7	5094-IB16	RUNNING	24VDC	24 VDC	
129	A	510464-WTS-PR-SYS-EN21-DS-112-SHT 1 OF 1	90-AC-001-B	AIR COMPRESSOR B REMOTE (AUTO)		DI	CP-01	1	2	2	8	I:2:2.8	5094-IB16	NORMAL	24VDC	24 VDC	
130	A	510464-WTS-PR-SYS-EN21-DS-112-SHT 1 OF 1	90-AC-001-B	AIR COMPRESSOR B FAULT		DI	CP-01	1	2	2	9	I:2:2.9	5094-IB16	ALARM	24VDC	24 VDC	
131	B	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-LSL-301	CITRIC ACID TANK LEVEL LOW		DI	CP-01	1	2	2	10	I:2:2.10	5094-IB16	ALARM	24VDC	24 VDC	
132	A			SPARE		DI	CP-01	1	2	2	11	I:2:2.11	5094-IB16				
133	B	510464-WTS-PR-SYS-EN21-DS-106-SHT 1 OF 1	20-P-610-B	BACKPULSE PUMP B LEAK ALARM		DI	CP-01	1	2	2	12	I:2:2.12	5094-IB16	ALARM	24VDC	24 VDC	
134	C	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	16-ZSO-700	WAS VALVE OPEN		DI	CP-01	1	2	2	13	I:2:2.13	5094-IB16	OPEN	24VDC	24 VDC	
135	C	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	16-ZSC-700	WAS VALVE CLOSED		DI	CP-01	1	2	2	14	I:2:2.14	5094-IB16	CLOSED	24VDC	24 VDC	
136	A			SPARE		DI	CP-01	1	2	2	15	I:2:2.15	5094-IB16				
137	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 1 OF 2	20-B-201-B	MEMBRANE BLOWER B RUN COMMAND		DO	CP-01	1	2	3	0	O:2:3.0	5094-OB16	NORMAL	24VDC	RELAY	
138	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 1 OF 2	20-B-201-E	MEMBRANE BLOWER E RUN COMMAND		DO	CP-01	1	2	3	1	O:2:3.1	5094-OB16	NORMAL	24VDC	RELAY	
139	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 2 OF 2	16-B-401-C	PROCESS BLOWER C RUN COMMAND		DO	CP-01	1	2	3	2	O:2:3.2	5094-OB16	NORMAL	24VDC	RELAY	
140	A	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-MX-211-3	BIOREACTOR ANOXIC MIXER RUN COMMAND - TRAIN 3		DO	CP-01	1	2	3	3	O:2:3.3	5094-OB16	NORMAL	24VDC	RELAY	
141	A	510464-WTS-PR-SYS-EN21-DS-106-SHT 1 OF 1	20-P-610-B	BACKPULSE PUMP B RUN COMMAND		DO	CP-01	1	2	3	4	O:2:3.4	5094-OB16	NORMAL	24VDC	RELAY	
142	A	510464-WTS-PR-SYS-EN21-DS-106-SHT 1 OF 1	23-FV-130	SODIUM HYPOCHLORITE INJECTION VALVE		DO	CP-01	1	2	3	5	O:2:3.5	5094-OB16	OPEN	24VDC	SOLENOID	
143	A	510464-WTS-PR-SYS-EN21-DS-109-SHT 2 OF 2	20-FV-802-6	COMMON EJECTOR		DO	CP-01	1	2	3	6	O:2:3.6	5094-OB16	OPEN	24VDC	SOLENOID	
144	A			SPARE RELAY		DO	CP-01	1	2	3	7	O:2:3.7	5094-OB16		24VDC	RELAY	
145	A			SPARE RELAY		DO	CP-01	1	2	3	8	O:2:3.8	5094-OB16		24VDC	RELAY	

CUSTOMER INFORMATION

CEASERS LANE WTF
MBR SYSTEM

I/O LIST

CUSTOMER DOCUMENT NUMBER

VEOLIA DOCUMENT NUMBER: **510464-WTS-EL-SYS-EN33-LI-001**

CONTRACT	ISSUER	DISCIPLINE	PRODUCT	PHASE	TYPE	CHRONO
510464	WTS	EL	SYS	EN33	LI	001

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C	REVISED AS NOTED	HX	HX	HX	6-Jun-25
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A	INITIAL RELEASE	AH	HX	HX	14-02-2023

ROW NO.	REV	P&ID	DEVICE TAG	DESCRIPTION	SIGNAL TAG	I/O TYPE	PANEL TAG	PLC NUMBER	RACK	SLOT	CHANNEL	ADDRESS	IO MODULE PART NUMBER	IO ENERGIZED ACTION	POWER SUPPLY	SIGNAL TYPE	NOTES / REMARKS
146	A			SPARE		DO	CP-01	1	2	3	9	O:2:3.9	5094-OB16				
147	A			SPARE		DO	CP-01	1	2	3	10	O:2:3.10	5094-OB16				
148	A			SPARE		DO	CP-01	1	2	3	11	O:2:3.11	5094-OB16				
149	A			SPARE		DO	CP-01	1	2	3	12	O:2:3.12	5094-OB16				
150	A			SPARE		DO	CP-01	1	2	3	13	O:2:3.13	5094-OB16				
151	A			SPARE		DO	CP-01	1	2	3	14	O:2:3.14	5094-OB16				
152	A			SPARE		DO	CP-01	1	2	3	15	O:2:3.15	5094-OB16				
153	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	16-FV-700	WAS VALVE		DO	CP-01	1	2	4	0	O:2:4.0	5094-OB16	OPEN	24VDC	SOLENOID	
154	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 1 OF 2	15-P-301-B	ALKALINITY DOSING PUMP B RUN COMMAND		DO	CP-01	1	2	4	1	O:2:4.1	5094-OB16	NORMAL	24VDC	RELAY	
155	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-101-B	SODIUM HYPOCHLORITE PUMP B RUN COMMAND		DO	CP-01	1	2	4	2	O:2:4.2	5094-OB16	NORMAL	24VDC	RELAY	
156	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-301-B	CITRIC ACID PUMP B RUN COMMAND		DO	CP-01	1	2	4	3	O:2:4.3	5094-OB16	NORMAL	24VDC	RELAY	
157	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-FV-305	CITRIC ACID RECOVERY VALVE		DO	CP-01	1	2	4	4	O:2:4.4	5094-OB16	OPEN	24VDC	SOLENOID	
158	A	510464-WTS-PR-SYS-EN21-DS-112-SHT 1 OF 1	90-AC-001-B	AIR COMPRESSOR B ENABLE		DO	CP-01	1	2	4	5	O:2:4.5	5094-OB16	NORMAL	24VDC	RELAY	
159	A			SPARE RELAY		DO	CP-01	1	2	4	6	O:2:4.6	5094-OB16		24VDC	RELAY	
160	A			SPARE RELAY		DO	CP-01	1	2	4	7	O:2:4.7	5094-OB16		24VDC	RELAY	
161	A			SPARE		DO	CP-01	1	2	4	8	O:2:4.8	5094-OB16				
162	A			SPARE		DO	CP-01	1	2	4	9	O:2:4.9	5094-OB16				
163	A			SPARE		DO	CP-01	1	2	4	10	O:2:4.10	5094-OB16				
164	A			SPARE		DO	CP-01	1	2	4	11	O:2:4.11	5094-OB16				
165	A			SPARE		DO	CP-01	1	2	4	12	O:2:4.12	5094-OB16				
166	A			SPARE		DO	CP-01	1	2	4	13	O:2:4.13	5094-OB16				
167	A			SPARE		DO	CP-01	1	2	4	14	O:2:4.14	5094-OB16				
168	A			SPARE		DO	CP-01	1	2	4	15	O:2:4.15	5094-OB16				
169	A	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-AIT-405A-3	BIOREACTOR pH SENSOR ANALYZER - TRAIN 3		AI	CP-01	1	2	5	0	I:2:5.0	5094-IF8	N/A	120VAC	4-20 mA	
170	A	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-AIT-405A-3	AEROBIC ZONE 1 DO ANALYZER - TRAIN 3		AI	CP-01	1	2	5	1	I:2:5.1	5094-IF8	N/A	120VAC	4-20 mA	
171	A	510464-WTS-PR-SYS-EN21-DS-106-SHT 1 OF 1	20-FIT-602	BACKPULSE FLOW TRANSMITTER		AI	CP-01	1	2	5	2	I:2:5.2	5094-IF8	N/A	120VAC	4-20 mA	
172	B			SPARE		AI	CP-01	1	2	5	3	I:2:5.3	5094-IF8	N/A	LOOP-POWERED	4-20 mA	
173	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-FIT-301	CITRIC ACID FLOW TRANSMITTER		AI	CP-01	1	2	5	4	I:2:5.4	5094-IF8	N/A	24VDC	4-20 mA	
174	B	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-AIT-403-2	AEROBIC ZONE 2 DO ANALYZER - TRAIN 2		AI	CP-01	1	2	5	5	I:2:5.5	5094-IF8	N/A	120VAC	4-20 mA	

CUSTOMER INFORMATION

CEASERS LANE WTF
MBR SYSTEM

I/O LIST

CUSTOMER DOCUMENT NUMBER

VEOLIA DOCUMENT NUMBER: **510464-WTS-EL-SYS-EN33-LI-001**

CONTRACT	ISSUER	DISCIPLINE	PRODUCT	PHASE	TYPE	CHRONO
510464	WTS	EL	SYS	EN33	LI	001

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REV	DESCRIPTION	CREATED BY	CHECKED BY	APPROVED BY	DATE (DD-MMM-YY)
C	REVISED AS NOTED	HX	HX	HX	6-Jun-25
B	REVISED AS NOTED	HX	HX	HX	30-Oct-24
A	INITIAL RELEASE	AH	HX	HX	14-02-2023

ROW NO.	REV	P&ID	DEVICE TAG	DESCRIPTION	SIGNAL TAG	I/O TYPE	PANEL TAG	PLC NUMBER	RACK	SLOT	CHANNEL	ADDRESS	IO MODULE PART NUMBER	IO ENERGIZED ACTION	POWER SUPPLY	SIGNAL TYPE	NOTES / REMARKS
175	B	510464-WTS-PR-SYS-EN21-DS-103-SHT 1 OF 1	16-AIT-403-3	AEROBIC ZONE 2 DO ANALYZER - TRAIN 3		AI	CP-01	1	2	5	6	I:2:5.6	5094-IF8	N/A	120VAC	4-20 mA	
176	A			SPARE		AI	CP-01	1	2	5	7	I:2:5.7	5094-IF8				
177	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 1 OF 2	20-B-201-B	MEMBRANE BLOWER B SPEED REFERENCE		AO	CP-01	1	2	6	0	O:2:6.0	5094-OF8	N/A	24VDC	4-20 mA	
178	A	510464-WTS-PR-SYS-EN21-DS-102-SHT 2 OF 2	16-B-401-C	PROCESS BLOWER C SPEED REFERENCE		AO	CP-01	1	2	6	1	O:2:6.1	5094-OF8	N/A	24VDC	4-20 mA	
179	A	510464-WTS-PR-SYS-EN21-DS-106-SHT 1 OF 1	20-P-610-B	BACKPULSE PUMP B SPEED REFERENCE		AO	CP-01	1	2	6	2	O:2:6.2	5094-OF8	N/A	24VDC	4-20 mA	
180	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 1 OF 2	15-P-301-B	ALKALINITY DOSING PUMP B SPEED REFERENCE		AO	CP-01	1	2	6	3	O:2:6.3	5094-OF8	N/A	24VDC	4-20 mA	
181	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-101-B	SODIUM HYPOCHLORITE PUMP B SPEED REFERENCE		AO	CP-01	1	2	6	4	O:2:6.4	5094-OF8	N/A	24VDC	4-20 mA	
182	A	510464-WTS-PR-SYS-EN21-DS-111-SHT 2 OF 2	23-P-301-B	CITRIC ACID PUMP B SPEED REFERENCE		AO	CP-01	1	2	6	5	O:2:6.5	5094-OF8	N/A	24VDC	4-20 mA	
183	A			SPARE		AO	CP-01	1	2	6	6	O:2:6.6	5094-OF8				
184	A			SPARE		AO	CP-01	1	2	6	7	O:2:6.7	5094-OF8				

Notes:
1.
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CUSTOMER INFORMATION

CEASERS LANE WTF
MBR SYSTEM

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CUSTOMER DOCUMENT NUMBER

VEOLIA DOCUMENT NUMBER: **510464-WTS-EL-SYS-EN33-LI-001**

CONTRACT	ISSUER	DISCIPLINE	PRODUCT	PHASE	TYPE	CHRONO
510464	WTS	EL	SYS	EN33	LI	001

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ROW NO.	REV	P&ID	DEVICE TAG	DESCRIPTION	SIGNAL TAG	I/O TYPE	PANEL TAG	PLC NUMBER	RACK	SLOT	CHANNEL	ADDRESS	IO MODULE PART NUMBER	IO ENERGIZED ACTION	POWER SUPPLY	SIGNAL TYPE	NOTES / REMARKS
1	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-205-1	MEMBRANE AERATION VALVE OPEN - TRAIN 1		DI	CP-01	1	3	1	0	I:3:1.0	5094-IB16	OPEN	24VDC	24 VDC	
2	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-205-1	MEMBRANE AERATION VALVE CLOSED - TRAIN 1		DI	CP-01	1	3	1	1	I:3:1.1	5094-IB16	CLOSED	24VDC	24 VDC	
3	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	5-SLD-15	MEMBRANE TANK SLUICE GATE OPEN - TRAIN 1		DI	CP-01	1	3	1	2	I:3:1.2	5094-IB16	OPEN	24VDC	24 VDC	
4	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	5-SLD-15	MEMBRANE TANK SLUICE GATE CLOSED - TRAIN 1		DI	CP-01	1	3	1	3	I:3:1.3	5094-IB16	CLOSED	24VDC	24 VDC	
5	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-LSHH-201-1	MEMBRANE TANK 1 LEVEL SWITCH HIGH HIGH - TRAIN 1		DI	CP-01	1	3	1	4	I:3:1.4	5094-IB16	ALARM	24VDC	24 VDC	
6	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-LSLL-201-1	MEMBRANE TANK 1 LEVEL SWITCH LOW LOW - TRAIN 1		DI	CP-01	1	3	1	5	I:3:1.5	5094-IB16	ALARM	24VDC	24 VDC	
7	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FSL-320-1	TURBIDITY ANALYZER LOW FLOW FAULT - TRAIN 1		DI	CP-01	1	3	1	6	I:3:1.6	5094-IB16	ALARM	24VDC	24 VDC	
8	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-P-321-1	TURBIDITY SAMPLE PUMP RUNNING - TRAIN 1		DI	CP-01	1	3	1	7	I:3:1.7	5094-IB16	RUNNING	24VDC	24 VDC	
9	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	20-P-501-1	RAS/WAS/DRAIN PUMP RUNNING - TRAIN 1		DI	CP-01	1	3	1	8	I:3:1.8	5094-IB16	RUNNING	24VDC	24 VDC	
10	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-ZSO-502-1	MEMBRANE TANK RECIRCULATION VALVE OPEN - TRAIN 1		DI	CP-01	1	3	1	9	I:3:1.9	5094-IB16	OPEN	24VDC	24 VDC	
11	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-ZSC-502-1	MEMBRANE TANK RECIRCULATION VALVE CLOSED - TRAIN 1		DI	CP-01	1	3	1	10	I:3:1.10	5094-IB16	CLOSED	24VDC	24 VDC	
12	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-ZSC-621-1	BACKPULSE ISOLATING VALVE OPEN - TRAIN 1		DI	CP-01	1	3	1	11	I:3:1.11	5094-IB16	OPEN	24VDC	24 VDC	
13	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-ZSC-621-1	BACKPULSE ISOLATING VALVE CLOSED - TRAIN 1		DI	CP-01	1	3	1	12	I:3:1.12	5094-IB16	CLOSED	24VDC	24 VDC	
14	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-ZSC-622-1	PERMEATE VALVE OPEN - TRAIN 1		DI	CP-01	1	3	1	13	I:3:1.13	5094-IB16	OPEN	24VDC	24 VDC	
15	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-ZSC-622-1	PERMEATE VALVE CLOSED - TRAIN 1		DI	CP-01	1	3	1	14	I:3:1.14	5094-IB16	CLOSED	24VDC	24 VDC	
16	A			SPARE		DI	CP-01	1	3	1	15	I:3:1.15	5094-IB16				
17	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-205-2	MEMBRAN AERATION VALVE OPEN - TRAIN 2		DI	CP-01	1	3	2	0	I:3:2.0	5094-IB16	OPEN	24VDC	24 VDC	
18	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-205-2	MEMBRANE AERATION VALVE CLOSED - TRAIN 2		DI	CP-01	1	3	2	1	I:3:2.1	5094-IB16	CLOSED	24VDC	24 VDC	
19	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	5-SLD-16	MEMBRANE TANK SLUICE GATE OPEN - TRAIN 2		DI	CP-01	1	3	2	2	I:3:2.2	5094-IB16	OPEN	24VDC	24 VDC	
20	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	5-SLD-16	MEMBRANE TANK SLUICE GATE CLOSED - TRAIN 2		DI	CP-01	1	3	2	3	I:3:2.3	5094-IB16	CLOSED	24VDC	24 VDC	
21	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-LSHH-201-2	MEMBRANE TANK 2 LEVEL SWITCH HIGH HIGH - TRAIN 2		DI	CP-01	1	3	2	4	I:3:2.4	5094-IB16	ALARM	24VDC	24 VDC	
22	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-LSLL-201-2	MEMBRANE TANK 2 LEVEL SWITCH LOW LOW - TRAIN 2		DI	CP-01	1	3	2	5	I:3:2.5	5094-IB16	ALARM	24VDC	24 VDC	
23	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FSL-320-2	TURBIDITY ANALYZER LOW FLOW FAULT - TRAIN 2		DI	CP-01	1	3	2	6	I:3:2.6	5094-IB16	ALARM	24VDC	24 VDC	
24	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-P-321-2	TURBIDITY SAMPLE PUMP RUNNING - TRAIN 2		DI	CP-01	1	3	2	7	I:3:2.7	5094-IB16	RUNNING	24VDC	24 VDC	
25	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	20-P-501-2	RAS/WAS/DRAIN PUMP RUNNING - TRAIN 2		DI	CP-01	1	3	2	8	I:3:2.8	5094-IB16	RUNNING	24VDC	24 VDC	
26	A			SPARE		DI	CP-01	1	3	2	9	I:3:2.9	5094-IB16				
27	A			SPARE		DI	CP-01	1	3	2	10	I:3:2.10	5094-IB16				
28	A			SPARE		DI	CP-01	1	3	2	11	I:3:2.11	5094-IB16				
29	A			SPARE		DI	CP-01	1	3	2	12	I:3:2.12	5094-IB16				
30	A			SPARE		DI	CP-01	1	3	2	13	I:3:2.13	5094-IB16				
31	A			SPARE		DI	CP-01	1	3	2	14	I:3:2.14	5094-IB16				
32	A			SPARE		DI	CP-01	1	3	2	15	I:3:2.15	5094-IB16				

CUSTOMER INFORMATION

CEASERS LANE WTF
MBR SYSTEM

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CUSTOMER DOCUMENT NUMBER

VEOLIA DOCUMENT NUMBER: **510464-WTS-EL-SYS-EN33-LI-001**

CONTRACT	ISSUER	DISCIPLINE	PRODUCT	PHASE	TYPE	CHRONO
510464	WTS	EL	SYS	EN33	LI	001

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ROW NO.	REV	P&ID	DEVICE TAG	DESCRIPTION	SIGNAL TAG	I/O TYPE	PANEL TAG	PLC NUMBER	RACK	SLOT	CHANNEL	ADDRESS	IO MODULE PART NUMBER	IO ENERGIZED ACTION	POWER SUPPLY	SIGNAL TYPE	NOTES / REMARKS
33	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-ZSO-502-2	MEMBRANE TANK RECIRCULATION VALVE OPEN - TRAIN 2		DI	CP-01	1	3	3	0	I:3:2.0	5094-IB16	OPEN	24VDC	24 VDC	
34	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-ZSO-502-2	MEMBRANE TANK RECIRCULATION VALVE CLOSED - TRAIN 2		DI	CP-01	1	3	3	1	I:3:2.1	5094-IB16	CLOSED	24VDC	24 VDC	
35	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-ZSO-621-2	BACKPULSE ISOLATING VALVE OPEN - TRAIN 2		DI	CP-01	1	3	3	2	I:3:2.2	5094-IB16	OPEN	24VDC	24 VDC	
36	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-ZSC-621-2	BACKPULSE ISOLATING VALVE CLOSED - TRAIN 2		DI	CP-01	1	3	3	3	I:3:2.3	5094-IB16	CLOSED	24VDC	24 VDC	
37	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-ZSO-622-2	PERMEATE VALVE OPEN - TRAIN 2		DI	CP-01	1	3	3	4	I:3:2.4	5094-IB16	OPEN	24VDC	24 VDC	
38	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-ZSC-622-2	PERMEATE VALVE CLOSED - TRAIN 2		DI	CP-01	1	3	3	5	I:3:2.5	5094-IB16	CLOSED	24VDC	24 VDC	
39	C			SPARE		DI	CP-01	1	3	3	6	I:3:2.6	5094-IB16				
40	C			SPARE		DI	CP-01	1	3	3	7	I:3:2.7	5094-IB16				
41	C			SPARE		DI	CP-01	1	3	3	8	I:3:2.8	5094-IB16				
42	C			SPARE		DI	CP-01	1	3	3	9	I:3:2.9	5094-IB16				
43	C			SPARE		DI	CP-01	1	3	3	10	I:3:2.10	5094-IB16				
44	C			SPARE		DI	CP-01	1	3	3	11	I:3:2.11	5094-IB16				
45	C			SPARE		DI	CP-01	1	3	3	12	I:3:2.12	5094-IB16				
46	C			SPARE		DI	CP-01	1	3	3	13	I:3:2.13	5094-IB16				
47	C			SPARE		DI	CP-01	1	3	3	14	I:3:2.14	5094-IB16				
48	C			SPARE		DI	CP-01	1	3	3	15	I:3:2.15	5094-IB16				
49	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-205-1	MEMBRANE AERATION VALVE - TRAIN 1		DO	CP-01	1	3	4	0	O:3:3.0	5094-OB16	NORMAL	24VDC	SOLENOID	
50	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-502-1	MEMBRANE TANK RECIRCULATION VALVE - TRAIN 1		DO	CP-01	1	3	4	1	O:3:3.1	5094-OB16	NORMAL	24VDC	SOLENOID	
51	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	5-SLD-15	MEMBRANE TANK SLUICE GATE OPEN - TRAIN 1		DO	CP-01	1	3	4	2	O:3:3.2	5094-OB16	NORMAL	24VDC	RELAY	
52	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	5-SLD-15	MEMBRANE TANK SLUICE GATE CLOSED - TRAIN 1		DO	CP-01	1	3	4	3	O:3:3.3	5094-OB16	NORMAL	24VDC	RELAY	
53	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-802-1	MEMBRANE EJECTOR VALVE - TRAIN 1		DO	CP-01	1	3	4	4	O:3:3.4	5094-OB16	NORMAL	24VDC	SOLENOID	
54	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-P-321-1	TURBIDITY SAMPLE PUMP RUN COMMAND - TRAIN 1		DO	CP-01	1	3	4	5	O:3:3.5	5094-OB16	NORMAL	24VDC	RELAY	
55	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-621-1	BACKPULSE ISOLATING VALVE - TRAIN 1		DO	CP-01	1	3	4	6	O:3:3.6	5094-OB16	NORMAL	24VDC	SOLENOID	
56	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-622-1	PERMEATE VALVE - TRAIN 1		DO	CP-01	1	3	4	7	O:3:3.7	5094-OB16	NORMAL	24VDC	SOLENOID	
57	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-324-1	TURBIDITY SAMPLE FEEDING VALVE - TRAIN 1		DO	CP-01	1	3	4	8	O:3:3.8	5094-OB16	NORMAL	24VDC	SOLENOID	
58	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-320-1	TURBIDITY SAMPLE DRAINING VALVE - TRAIN 1		DO	CP-01	1	3	4	9	O:3:3.9	5094-OB16	NORMAL	24VDC	SOLENOID	
59	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-803-1	PERMEATE HEADER VACUUM VALVE - TRAIN 1		DO	CP-01	1	3	4	10	O:3:3.10	5094-OB16	NORMAL	24VDC	SOLENOID	
60	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	20-P-501-1	RAS/WAS/DRAIN PUMP RUN COMMAND -TRAIN 1		DO	CP-01	1	3	4	11	O:3:3.11	5094-OB16	NORMAL	24VDC	RELAY	
61	A			SPARE RELAY		DO	CP-01	1	3	4	12	O:3:3.12	5094-OB16		24VDC	RELAY	
62	A			SPARE RELAY		DO	CP-01	1	3	4	13	O:3:3.13	5094-OB16		24VDC	RELAY	
63	A			SPARE		DO	CP-01	1	3	4	14	O:3:3.14	5094-OB16				
64	A			SPARE		DO	CP-01	1	3	4	15	O:3:3.15	5094-OB16				

CUSTOMER INFORMATION

CEASERS LANE WTF
MBR SYSTEM

I/O LIST

CUSTOMER DOCUMENT NUMBER

VEOLIA DOCUMENT NUMBER: **510464-WTS-EL-SYS-EN33-LI-001**

CONTRACT	ISSUER	DISCIPLINE	PRODUCT	PHASE	TYPE	CHRONO
510464	WTS	EL	SYS	EN33	LI	001

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REV	DESCRIPTION	CREATED BY	CHECKED BY	APPROVED BY	DATE (DD-MMM-YY)
C	REVISED AS NOTED	HX	HX	HX	6-Jun-25
B	REVISED AS NOTED	HX	HX	HX	30-Oct-24
A	INITIAL RELEASE	AH	HX	HX	14-02-2023

ROW NO.	REV	P&ID	DEVICE TAG	DESCRIPTION	SIGNAL TAG	I/O TYPE	PANEL TAG	PLC NUMBER	RACK	SLOT	CHANNEL	ADDRESS	IO MODULE PART NUMBER	IO ENERGIZED ACTION	POWER SUPPLY	SIGNAL TYPE	NOTES / REMARKS
65	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-205-2	MEMBRANE AERATION VALVE - TRAIN 2		DO	CP-01	1	3	5	0	O:3:4.0	5094-OB16	NORMAL	24VDC	SOLENOID	
66	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-502-2	MEMBRANE TANK RECIRCULATION VALVE - TRAIN 2		DO	CP-01	1	3	5	1	O:3:4.1	5094-OB16	NORMAL	24VDC	SOLENOID	
67	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	5-SLD-16	MEMBRANE TANK SLUICE GATE OPEN - TRAIN 2		DO	CP-01	1	3	5	2	O:3:4.2	5094-OB16	NORMAL	24VDC	RELAY	
68	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	5-SLD-16	MEMBRANE TANK SLUICE GATE CLOSED - TRAIN 2		DO	CP-01	1	3	5	3	O:3:4.3	5094-OB16	NORMAL	24VDC	RELAY	
69	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-802-2	MEMBRANE EJECTOR VALVE - TRAIN 2		DO	CP-01	1	3	5	4	O:3:4.4	5094-OB16	NORMAL	24VDC	SOLENOID	
70	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-P-321-2	TURBIDITY SAMPLE PUMP RUN COMMAND - TRAIN 2		DO	CP-01	1	3	5	5	O:3:4.5	5094-OB16	NORMAL	24VDC	RELAY	
71	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-621-2	BACKPULSE ISOLATING VALVE - TRAIN 2		DO	CP-01	1	3	5	6	O:3:4.6	5094-OB16	NORMAL	24VDC	SOLENOID	
72	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-622-2	PERMEATE VALVE - TRAIN 2		DO	CP-01	1	3	5	7	O:3:4.7	5094-OB16	NORMAL	24VDC	SOLENOID	
73	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-324-2	TURBIDITY SAMPLE FEEDING VALVE - TRAIN 2		DO	CP-01	1	3	5	8	O:3:4.8	5094-OB16	NORMAL	24VDC	SOLENOID	
74	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-320-2	TURBIDITY SAMPLE DRAINING VALVE - TRAIN 2		DO	CP-01	1	3	5	9	O:3:4.9	5094-OB16	NORMAL	24VDC	SOLENOID	
75	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-803-2	PERMEATE HEADER VACUUM VALVE - TRAIN 2		DO	CP-01	1	3	5	10	O:3:4.10	5094-OB16	NORMAL	24VDC	SOLENOID	
76	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	20-P-501-2	RAS/WAS/DRAIN PUMP RUN COMMAND -TRAIN 2		DO	CP-01	1	3	5	11	O:3:4.11	5094-OB16	NORMAL	24VDC	RELAY	
77	A			SPARE RELAY		DO	CP-01	1	3	5	12	O:3:4.12	5094-OB16		24VDC	RELAY	
78	A			SPARE RELAY		DO	CP-01	1	3	5	13	O:3:4.13	5094-OB16		24VDC	RELAY	
79	A			SPARE		DO	CP-01	1	3	5	14	O:3:4.14	5094-OB16				
80	A			SPARE		DO	CP-01	1	3	5	15	O:3:4.15	5094-OB16				
81	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-LIT-203-1	MEMBRANE TANK LEVEL TRANSMITTER - TRAIN 1		AI	CP-01	1	3	6	0	I:3:5.0	5094-IF8	N/A	LOOP-POWERED	4-20 mA	
82	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-PIT-301-1	PERMEATE HEADER PRESSURE TRANSMITTER - TRAIN 1		AI	CP-01	1	3	6	1	I:3:5.1	5094-IF8	N/A	LOOP-POWERED	4-20 mA	
83	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FIT-301-1	PERMEATE FLOW TRANSMITTER - TRAIN 1		AI	CP-01	1	3	6	2	I:3:5.2	5094-IF8	N/A	120VAC	4-20 mA	
84	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-AIT-320-1	TURBIDITY ANALYZER - TRAIN 1		AI	CP-01	1	3	6	3	I:3:5.3	5094-IF8	N/A	120VAC	4-20 mA	
85	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	20-FIT-507-1	MIXED LIQUOR MAGMETER FLOW TRANSMITTER - TRAIN 1		AI	CP-01	1	3	6	4	I:3:5.4	5094-IF8	N/A	120VAC	4-20 mA	
86	A			SPARE		AI	CP-01	1	3	6	5	I:3:5.5	5094-IF8				
87	A			SPARE		AI	CP-01	1	3	6	6	I:3:5.6	5094-IF8				
88	A			SPARE		AI	CP-01	1	3	6	7	I:3:5.7	5094-IF8				
89	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-LIT-203-2	MEMBRANE TANK LEVEL TRANSMITTER - TRAIN 2		AI	CP-01	1	3	7	0	I:3:6.0	5094-IF8	N/A	LOOP-POWERED	4-20 mA	
90	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-PIT-301-2	PERMEATE HEADER PRESSURE TRANSMITTER - TRAIN 2		AI	CP-01	1	3	7	1	I:3:6.1	5094-IF8	N/A	LOOP-POWERED	4-20 mA	
91	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FIT-301-2	PERMEATE FLOW TRANSMITTER - TRAIN 2		AI	CP-01	1	3	7	2	I:3:6.2	5094-IF8	N/A	120VAC	4-20 mA	
92	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-AIT-320-2	TURBIDITY ANALYZER - TRAIN 2		AI	CP-01	1	3	7	3	I:3:6.3	5094-IF8	N/A	120VAC	4-20 mA	
93	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	20-FIT-507-2	MIXED LIQUOR MAGMETER FLOW TRANMITTER - TRAIN 2		AI	CP-01	1	3	7	4	I:3:6.4	5094-IF8	N/A	120VAC	4-20 mA	
94	A			SPARE		AI	CP-01	1	3	7	5	I:3:6.5	5094-IF8				
95	A			SPARE		AI	CP-01	1	3	7	6	I:3:6.6	5094-IF8				
96	A			SPARE		AI	CP-01	1	3	7	7	I:3:6.7	5094-IF8				

CUSTOMER INFORMATION

CEASERS LANE WTF
MBR SYSTEM

I/O LIST

CUSTOMER DOCUMENT NUMBER

VEOLIA DOCUMENT NUMBER: **510464-WTS-EL-SYS-EN33-LI-001**

CONTRACT	ISSUER	DISCIPLINE	PRODUCT	PHASE	TYPE	CHRONO
510464	WTS	EL	SYS	EN33	LI	001

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A	INITIAL RELEASE	AH	HX	HX	14-02-2023

ROW NO.	REV	P&ID	DEVICE TAG	DESCRIPTION	SIGNAL TAG	I/O TYPE	PANEL TAG	PLC NUMBER	RACK	SLOT	CHANNEL	ADDRESS	IO MODULE PART NUMBER	IO ENERGIZED ACTION	POWER SUPPLY	SIGNAL TYPE	NOTES / REMARKS
97	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FCV-301-1	PERMEATE FLOW CONTROL VALVE - TRAIN 1		AO	CP-01	1	3	8	0	O:3:7.0	5094-OF8	N/A	24VDC	4-20 mA	
98	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FCV-301-2	PERMEATE FLOW CONTROL VALVE - TRAIN 2		AO	CP-01	1	3	8	1	O:3:7.1	5094-OF8	N/A	24VDC	4-20 mA	
99	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	20-P-501-1	RAS/WAS/DRAIN PUMP SPEED - TRAIN 1		AO	CP-01	1	3	8	2	O:3:7.2	5094-OF8	N/A	24VDC	4-20 mA	
100	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	20-P-501-2	RAS/WAS/DRAIN PUMP SPEED - TRAIN 2		AO	CP-01	1	3	8	3	O:3:7.3	5094-OF8	N/A	24VDC	4-20 mA	
101	A			SPARE		AO	CP-01	1	3	8	4	O:3:7.4	5094-OF8		24VDC		
102	A			SPARE		AO	CP-01	1	3	8	5	O:3:7.5	5094-OF8				
103	A			SPARE		AO	CP-01	1	3	8	6	O:3:7.6	5094-OF8				
104	A			SPARE		AO	CP-01	1	3	8	7	O:3:7.7	5094-OF8				

Notes:
1.
2.

CUSTOMER INFORMATION

CEASERS LANE WTF
MBR SYSTEM

I/O LIST

CUSTOMER DOCUMENT NUMBER

VEOLIA DOCUMENT NUMBER: **510464-WTS-EL-SYS-EN33-LI-001**

CONTRACT	ISSUER	DISCIPLINE	PRODUCT	PHASE	TYPE	CHRONO
510464	WTS	EL	SYS	EN33	LI	001

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B	REVISED AS NOTED	HX	HX	HX	30-Oct-24
A	INITIAL RELEASE	AH	HX	HX	14-02-2023

ROW NO.	REV	P&ID	DEVICE TAG	DESCRIPTION	SIGNAL TAG	I/O TYPE	PANEL TAG	PLC NUMBER	RACK	SLOT	CHANNEL	ADDRESS	IO MODULE PART NUMBER	IO ENERGIZED ACTION	POWER SUPPLY	SIGNAL TYPE	NOTES / REMARKS
1	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-205-3	MEMBRANE AERATION VALVE OPEN - TRAIN 3		DI	CP-01	1	4	1	0	I:4:1.0	5094-IB16	OPEN	24VDC	24 VDC	
2	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-205-3	MEMBRANE AERATION VALVE CLOSED - TRAIN 3		DI	CP-01	1	4	1	1	I:4:1.1	5094-IB16	CLOSED	24VDC	24 VDC	
3	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	5-SLD-17	MEMBRANE TANK SLUICE GATE OPEN - TRAIN 3		DI	CP-01	1	4	1	2	I:4:1.2	5094-IB16	OPEN	24VDC	24 VDC	
4	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	5-SLD-17	MEMBRANE TANK SLUICE GATE CLOSED - TRAIN 3		DI	CP-01	1	4	1	3	I:4:1.3	5094-IB16	CLOSED	24VDC	24 VDC	
5	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-LSHH-201-3	MEMBRANE TANK 1 LEVEL SWITCH HIGH HIGH - TRAIN 3		DI	CP-01	1	4	1	4	I:4:1.4	5094-IB16	ALARM	24VDC	24 VDC	
6	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-LSLL-201-3	MEMBRANE TANK 1 LEVEL SWITCH LOW LOW - TRAIN 3		DI	CP-01	1	4	1	5	I:4:1.5	5094-IB16	ALARM	24VDC	24 VDC	
7	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FSL-320-3	TURBIDITY ANALYZER LOW FLOW FAULT - TRAIN 3		DI	CP-01	1	4	1	6	I:4:1.6	5094-IB16	ALARM	24VDC	24 VDC	
8	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-P-321-3	TURBIDITY SAMPLE PUMP RUNNING - TRAIN 3		DI	CP-01	1	4	1	7	I:4:1.7	5094-IB16	RUNNING	24VDC	24 VDC	
9	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	20-P-501-3	RAS/WAS/DRAIN PUMP RUNNING - TRAIN 3		DI	CP-01	1	4	1	8	I:4:1.8	5094-IB16	RUNNING	24VDC	24 VDC	
10	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-ZSO-502-3	MEMBRANE TANK RECIRCULATION VALVE OPEN - TRAIN 3		DI	CP-01	1	4	1	9	I:4:1.9	5094-IB16	OPEN	24VDC	24 VDC	
11	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-ZSO-502-3	MEMBRANE TANK RECIRCULATION VALVE OPEN - TRAIN 3		DI	CP-01	1	4	1	10	I:4:1.10	5094-IB16	CLOSED	24VDC	24 VDC	
12	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-ZSC-621-3	BACKPULSE ISOLATING VALVE OPEN - TRAIN 3		DI	CP-01	1	4	1	11	I:4:1.11	5094-IB16	OPEN	24VDC	24 VDC	
13	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-ZSC-621-3	BACKPULSE ISOLATING VALVE CLOSED - TRAIN 3		DI	CP-01	1	4	1	12	I:4:1.12	5094-IB16	CLOSED	24VDC	24 VDC	
14	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-ZSC-622-3	PERMEATE VALVE OPEN - TRAIN 3		DI	CP-01	1	4	1	13	I:4:1.13	5094-IB16	OPEN	24VDC	24 VDC	
15	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-ZSC-622-3	PERMEATE VALVE CLOSED - TRAIN 3		DI	CP-01	1	4	1	14	I:4:1.14	5094-IB16	CLOSED	24VDC	24 VDC	
16	A			SPARE		DI	CP-01	1	4	1	15	I:4:1.15	5094-IB16				
17	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-205-4	MEMBRAN AERATION VALVE OPEN - TRAIN 4		DI	CP-01	1	4	2	0	I:4:2.0	5094-IB16	OPEN	24VDC	24 VDC	
18	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-205-4	MEMBRANE AERATION VALVE CLOSED - TRAIN 4		DI	CP-01	1	4	2	1	I:4:2.1	5094-IB16	CLOSED	24VDC	24 VDC	
19	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	5-SLD-18	MEMBRANE TANK SLUICE GATE OPEN - TRAIN 4		DI	CP-01	1	4	2	2	I:4:2.2	5094-IB16	OPEN	24VDC	24 VDC	
20	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	5-SLD-18	MEMBRANE TANK SLUICE GATE CLOSED - TRAIN 4		DI	CP-01	1	4	2	3	I:4:2.3	5094-IB16	CLOSED	24VDC	24 VDC	
21	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-LSHH-201-4	MEMBRANE TANK 2 LEVEL SWITCH HIGH HIGH - TRAIN 4		DI	CP-01	1	4	2	4	I:4:2.4	5094-IB16	ALARM	24VDC	24 VDC	
22	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-LSLL-201-4	MEMBRANE TANK 2 LEVEL SWITCH LOW LOW - TRAIN 4		DI	CP-01	1	4	2	5	I:4:2.5	5094-IB16	ALARM	24VDC	24 VDC	
23	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FSL-320-4	TURBIDITY ANALYZER LOW FLOW FAULT - TRAIN 4		DI	CP-01	1	4	2	6	I:4:2.6	5094-IB16	ALARM	24VDC	24 VDC	
24	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-P-321-4	TURBIDITY SAMPLE PUMP RUNNING - TRAIN 4		DI	CP-01	1	4	2	7	I:4:2.7	5094-IB16	RUNNING	24VDC	24 VDC	
25	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	20-P-501-4	RAS/WAS/DRAIN PUMP RUNNING - TRAIN 4		DI	CP-01	1	4	2	8	I:4:2.8	5094-IB16	RUNNING	24VDC	24 VDC	
26	A			SPARE		DI	CP-01	1	4	2	9	I:4:2.9	5094-IB16				
27	A			SPARE		DI	CP-01	1	4	2	10	I:4:2.10	5094-IB16				
28	A			SPARE		DI	CP-01	1	4	2	11	I:4:2.11	5094-IB16				
29	A			SPARE		DI	CP-01	1	4	2	12	I:4:2.12	5094-IB16				
30	A			SPARE		DI	CP-01	1	4	2	13	I:4:2.13	5094-IB16				
31	A			SPARE		DI	CP-01	1	4	2	14	I:4:2.14	5094-IB16				
32	A			SPARE		DI	CP-01	1	4	2	15	I:4:2.15	5094-IB16				

CUSTOMER INFORMATION

CEASERS LANE WTF
MBR SYSTEM

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CUSTOMER DOCUMENT NUMBER

VEOLIA DOCUMENT NUMBER: **510464-WTS-EL-SYS-EN33-LI-001**

CONTRACT	ISSUER	DISCIPLINE	PRODUCT	PHASE	TYPE	CHRONO
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A	INITIAL RELEASE	AH	HX	HX	14-02-2023

ROW NO.	REV	P&ID	DEVICE TAG	DESCRIPTION	SIGNAL TAG	I/O TYPE	PANEL TAG	PLC NUMBER	RACK	SLOT	CHANNEL	ADDRESS	IO MODULE PART NUMBER	IO ENERGIZED ACTION	POWER SUPPLY	SIGNAL TYPE	NOTES / REMARKS
33	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-ZSO-502-4	MEMBRANE TANK RECIRCULATION VALVE OPEN - TRAIN 4		DI	CP-01	1	4	3	0	I:4:2.9	5094-IB16	OPEN	24VDC	24 VDC	
34	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-ZSO-502-4	MEMBRANE TANK RECIRCULATION VALVE CLOSED - TRAIN 4		DI	CP-01	1	4	3	1	I:4:2.10	5094-IB16	CLOSED	24VDC	24 VDC	
35	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-ZSC-621-4	BACKPULSE ISOLATING VALVE OPEN - TRAIN 4		DI	CP-01	1	4	3	2	I:4:2.11	5094-IB16	OPEN	24VDC	24 VDC	
36	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-ZSC-621-4	BACKPULSE ISOLATING VALVE CLOSED - TRAIN 4		DI	CP-01	1	4	3	3	I:4:2.12	5094-IB16	CLOSED	24VDC	24 VDC	
37	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-ZSC-622-4	PERMEATE VALVE OPEN - TRAIN 4		DI	CP-01	1	4	3	4	I:4:2.13	5094-IB16	OPEN	24VDC	24 VDC	
38	C	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-ZSC-622-4	PERMEATE VALVE CLOSED - TRAIN 4		DI	CP-01	1	4	3	5	I:4:2.14	5094-IB16	CLOSED	24VDC	24 VDC	
39	C			SPARE		DI	CP-01	1	4	3	6	I:4:2.6	5094-IB16				
40	C			SPARE		DI	CP-01	1	4	3	7	I:4:2.7	5094-IB16				
41	C			SPARE		DI	CP-01	1	4	3	8	I:4:2.8	5094-IB16				
42	C			SPARE		DI	CP-01	1	4	3	9	I:4:2.9	5094-IB16				
43	C			SPARE		DI	CP-01	1	4	3	10	I:4:2.10	5094-IB16				
44	C			SPARE		DI	CP-01	1	4	3	11	I:4:2.11	5094-IB16				
45	C			SPARE		DI	CP-01	1	4	3	12	I:4:2.12	5094-IB16				
46	C			SPARE		DI	CP-01	1	4	3	13	I:4:2.13	5094-IB16				
47	C			SPARE		DI	CP-01	1	4	3	14	I:4:2.14	5094-IB16				
48	C			SPARE		DI	CP-01	1	4	3	15	I:4:2.15	5094-IB16				
49	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-205-3	MEMBRANE AERATION VALVE - TRAIN 3		DO	CP-01	1	4	4	0	O:4:3.0	5094-OB16	NORMAL	24VDC	SOLENOID	
50	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-502-3	MEMBRANE TANK RECIRCULATION VALVE - TRAIN 3		DO	CP-01	1	4	4	1	O:4:3.1	5094-OB16	NORMAL	24VDC	SOLENOID	
51	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	5-SLD-17	MEMBRANE TANK SLUICE GATE OPEN - TRAIN 3		DO	CP-01	1	4	4	2	O:4:3.2	5094-OB16	NORMAL	24VDC	RELAY	
52	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	5-SLD-17	MEMBRANE TANK SLUICE GATE CLOSED - TRAIN 3		DO	CP-01	1	4	4	3	O:4:3.3	5094-OB16	NORMAL	24VDC	RELAY	
53	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-802-3	MEMBRANE EJECTOR VALVE - TRAIN 3		DO	CP-01	1	4	4	4	O:4:3.4	5094-OB16	NORMAL	24VDC	SOLENOID	
54	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-P-321-3	TURBIDITY SAMPLE PUMP RUN COMMAND - TRAIN 3		DO	CP-01	1	4	4	5	O:4:3.5	5094-OB16	NORMAL	24VDC	RELAY	
55	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-621-3	BACKPULSE ISOLATING VALVE - TRAIN 3		DO	CP-01	1	4	4	6	O:4:3.6	5094-OB16	NORMAL	24VDC	SOLENOID	
56	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-622-3	PERMEATE VALVE - TRAIN 3		DO	CP-01	1	4	4	7	O:4:3.7	5094-OB16	NORMAL	24VDC	SOLENOID	
57	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-324-3	TURBIDITY SAMPLE FEEDING VALVE - TRAIN 3		DO	CP-01	1	4	4	8	O:4:3.8	5094-OB16	NORMAL	24VDC	SOLENOID	
58	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-320-3	TURBIDITY SAMPLE DRAINING VALVE - TRAIN 3		DO	CP-01	1	4	4	9	O:4:3.9	5094-OB16	NORMAL	24VDC	SOLENOID	
59	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-803-3	PERMEATE HEADER VACUUM VALVE - TRAIN 3		DO	CP-01	1	4	4	10	O:4:3.10	5094-OB16	NORMAL	24VDC	SOLENOID	
60	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	20-P-501-3	RAS/WAS/DRAIN PUMP RUN COMMAND - TRAIN 3		DO	CP-01	1	4	4	11	O:4:3.11	5094-OB16	NORMAL	24VDC	RELAY	
61	A			SPARE RELAY		DO	CP-01	1	4	4	12	O:4:3.12	5094-OB16		24VDC	RELAY	
62	A			SPARE RELAY		DO	CP-01	1	4	4	13	O:4:3.13	5094-OB16		24VDC	RELAY	
63	A			SPARE		DO	CP-01	1	4	4	14	O:4:3.14	5094-OB16				
64	A			SPARE		DO	CP-01	1	4	4	15	O:4:3.15	5094-OB16				

CUSTOMER INFORMATION

CEASERS LANE WTF
MBR SYSTEM

I/O LIST

CUSTOMER DOCUMENT NUMBER

VEOLIA DOCUMENT NUMBER: **510464-WTS-EL-SYS-EN33-LI-001**

CONTRACT	ISSUER	DISCIPLINE	PRODUCT	PHASE	TYPE	CHRONO
510464	WTS	EL	SYS	EN33	LI	001

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REV	DESCRIPTION	CREATED BY	CHECKED BY	APPROVED BY	DATE (DD-MMM-YY)
C	REVISED AS NOTED	HX	HX	HX	6-Jun-25
B	REVISED AS NOTED	HX	HX	HX	30-Oct-24
A	INITIAL RELEASE	AH	HX	HX	14-02-2023

ROW NO.	REV	P&ID	DEVICE TAG	DESCRIPTION	SIGNAL TAG	I/O TYPE	PANEL TAG	PLC NUMBER	RACK	SLOT	CHANNEL	ADDRESS	IO MODULE PART NUMBER	IO ENERGIZED ACTION	POWER SUPPLY	SIGNAL TYPE	NOTES / REMARKS
65	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-205-4	MEMBRANE AERATION VALVE - TRAIN 4		DO	CP-01	1	4	5	0	O:4:4.0	5094-OB16	NORMAL	24VDC	SOLENOID	
66	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-502-4	MEMBRANE TANK RECIRCULATION VALVE - TRAIN 4		DO	CP-01	1	4	5	1	O:4:4.1	5094-OB16	NORMAL	24VDC	SOLENOID	
67	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	5-SLD-18	MEMBRANE TANK SLUICE GATE OPEN - TRAIN 4		DO	CP-01	1	4	5	2	O:4:4.2	5094-OB16	NORMAL	24VDC	RELAY	
68	C	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	5-SLD-18	MEMBRANE TANK SLUICE GATE CLOSED - TRAIN 4		DO	CP-01	1	4	5	3	O:4:4.3	5094-OB16	NORMAL	24VDC	RELAY	
69	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-FV-802-4	MEMBRANE EJECTOR VALVE - TRAIN 4		DO	CP-01	1	4	5	4	O:4:4.4	5094-OB16	NORMAL	24VDC	SOLENOID	
70	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-P-321-4	TURBIDITY SAMPLE PUMP RUN COMMAND - TRAIN 4		DO	CP-01	1	4	5	5	O:4:4.5	5094-OB16	NORMAL	24VDC	RELAY	
71	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-621-4	BACKPULSE ISOLATING VALVE - TRAIN 4		DO	CP-01	1	4	5	6	O:4:4.6	5094-OB16	NORMAL	24VDC	SOLENOID	
72	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-622-4	PERMEATE VALVE - TRAIN 4		DO	CP-01	1	4	5	7	O:4:4.7	5094-OB16	NORMAL	24VDC	SOLENOID	
73	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-324-4	TURBIDITY SAMPLE FEEDING VALVE - TRAIN 4		DO	CP-01	1	4	5	8	O:4:4.8	5094-OB16	NORMAL	24VDC	SOLENOID	
74	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-320-4	TURBIDITY SAMPLE DRAINING VALVE - TRAIN 4		DO	CP-01	1	4	5	9	O:4:4.9	5094-OB16	NORMAL	24VDC	SOLENOID	
75	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FV-803-4	PERMEATE HEADER VACUUM VALVE - TRAIN 4		DO	CP-01	1	4	5	10	O:4:4.10	5094-OB16	NORMAL	24VDC	SOLENOID	
76	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	20-P-501-4	RAS/WAS/DRAIN PUMP RUN COMMAND -TRAIN 4		DO	CP-01	1	4	5	11	O:4:4.11	5094-OB16	NORMAL	24VDC	RELAY	
77	A			SPARE RELAY		DO	CP-01	1	4	5	12	O:4:4.12	5094-OB16		24VDC	RELAY	
78	A			SPARE RELAY		DO	CP-01	1	4	5	13	O:4:4.13	5094-OB16		24VDC	RELAY	
79	A			SPARE		DO	CP-01	1	4	5	14	O:4:4.14	5094-OB16				
80	A			SPARE		DO	CP-01	1	4	5	15	O:4:4.15	5094-OB16				
81	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-LIT-203-3	MEMBRANE TANK LEVEL TRANSMITTER - TRAIN 3		AI	CP-01	1	4	6	0	I:4:5.0	5094-IF8	N/A	LOOP-POWERED	4-20 mA	
82	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-PIT-301-3	PERMEATE HEADER PRESSURE TRANSMITTER - TRAIN 3		AI	CP-01	1	4	6	1	I:4:5.1	5094-IF8	N/A	LOOP-POWERED	4-20 mA	
83	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FIT-301-3	PERMEATE FLOW TRANSMITTER - TRAIN 3		AI	CP-01	1	4	6	2	I:4:5.2	5094-IF8	N/A	120VAC	4-20 mA	
84	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-AIT-320-3	TURBIDITY ANALYZER - TRAIN 3		AI	CP-01	1	4	6	3	I:4:5.3	5094-IF8	N/A	120VAC	4-20 mA	
85	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	20-FIT-507-3	MIXED LIQUOR MAGMETER FLOW TRANSMITTER - TRAIN 3		AI	CP-01	1	4	6	4	I:4:5.4	5094-IF8	N/A	120VAC	4-20 mA	
86	A			SPARE		AI	CP-01	1	4	6	5	I:4:5.5	5094-IF8				
87	A			SPARE		AI	CP-01	1	4	6	6	I:4:5.6	5094-IF8				
88	A			SPARE		AI	CP-01	1	4	6	7	I:4:5.7	5094-IF8				
89	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-LIT-203-4	MEMBRANE TANK LEVEL TRANSMITTER - TRAIN 4		AI	CP-01	1	4	7	0	I:4:6.0	5094-IF8	N/A	LOOP-POWERED	4-20 mA	
90	A	510464-WTS-PR-SYS-EN21-DS-104-SHT 1 OF 1	20-PIT-301-4	PERMEATE HEADER PRESSURE TRANSMITTER - TRAIN 4		AI	CP-01	1	4	7	1	I:4:6.1	5094-IF8	N/A	LOOP-POWERED	4-20 mA	
91	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FIT-301-4	PERMEATE FLOW TRANSMITTER - TRAIN 4		AI	CP-01	1	4	7	2	I:4:6.2	5094-IF8	N/A	120VAC	4-20 mA	
92	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-AIT-320-4	TURBIDITY ANALYZER - TRAIN 4		AI	CP-01	1	4	7	3	I:4:6.3	5094-IF8	N/A	120VAC	4-20 mA	
93	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	20-FIT-507-4	MIXED LIQUOR MAGMETER FLOW TRANMITTER - TRAIN 4		AI	CP-01	1	4	7	4	I:4:6.4	5094-IF8	N/A	120VAC	4-20 mA	
94	A			SPARE		AI	CP-01	1	4	7	5	I:4:6.5	5094-IF8				
95	A			SPARE		AI	CP-01	1	4	7	6	I:4:6.6	5094-IF8				
96	A			SPARE		AI	CP-01	1	4	7	7	I:4:6.7	5094-IF8				

CUSTOMER INFORMATION

CEASERS LANE WTF
MBR SYSTEM

I/O LIST

CUSTOMER DOCUMENT NUMBER

VEOLIA DOCUMENT NUMBER: **510464-WTS-EL-SYS-EN33-LI-001**

CONTRACT	ISSUER	DISCIPLINE	PRODUCT	PHASE	TYPE	CHRONO
510464	WTS	EL	SYS	EN33	LI	001

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REV	DESCRIPTION	CREATED BY	CHECKED BY	APPROVED BY	DATE (DD-MMM-YY)
C	REVISED AS NOTED	HX	HX	HX	6-Jun-25
B	REVISED AS NOTED	HX	HX	HX	30-Oct-24
A	INITIAL RELEASE	AH	HX	HX	14-02-2023

ROW NO.	REV	P&ID	DEVICE TAG	DESCRIPTION	SIGNAL TAG	I/O TYPE	PANEL TAG	PLC NUMBER	RACK	SLOT	CHANNEL	ADDRESS	IO MODULE PART NUMBER	IO ENERGIZED ACTION	POWER SUPPLY	SIGNAL TYPE	NOTES / REMARKS
97	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FCV-301-3	PERMEATE FLOW CONTROL VALVE - TRAIN 3		AO	CP-01	1	4	8	0	O:4:7.0	5094-OF8	N/A	24VDC	4-20 mA	
98	A	510464-WTS-PR-SYS-EN21-DS-105-SHT 1 OF 1	20-FCV-301-4	PERMEATE FLOW CONTROL VALVE - TRAIN 4		AO	CP-01	1	4	8	1	O:4:7.1	5094-OF8	N/A	24VDC	4-20 mA	
99	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	20-P-501-3	RAS/WAS/DRAIN PUMP SPEED - TRAIN 3		AO	CP-01	1	4	8	2	O:4:7.2	5094-OF8	N/A	24VDC	4-20 mA	
100	A	510464-WTS-PR-SYS-EN21-DS-110-SHT 1 OF 1	20-P-501-4	RAS/WAS/DRAIN PUMP SPEED - TRAIN 4		AO	CP-01	1	4	8	3	O:4:7.3	5094-OF8	N/A	24VDC	4-20 mA	
101	A			SPARE		AO	CP-01	1	4	8	4	O:4:7.4	5094-OF8				
102	A			SPARE		AO	CP-01	1	4	8	5	O:4:7.5	5094-OF8				
103	A			SPARE		AO	CP-01	1	4	8	6	O:4:7.6	5094-OF8				
104	A			SPARE		AO	CP-01	1	4	8	7	O:4:7.7	5094-OF8				

Notes:
1.
2.

	CUSTOMER INFORMATION		CUSTOMER DOCUMENT NUMBER
suez	CONTRACT TITLE CUSTOMER NAME LOCATION CITY STATE, COUNTY	# I/O LIST	ABC-123-DEFGHI-XXXX-EE-XXXXX

SUEZ DOCUMENT NUMBER: **E000001-WTS-EL-T02-8533-LI-001**

CONTRACT	ISSUER	DISCIPLINE	PRODUCT	PHASE	TYPE	CHRONO
E000001	WTS	EL	T02	8533	LI	001

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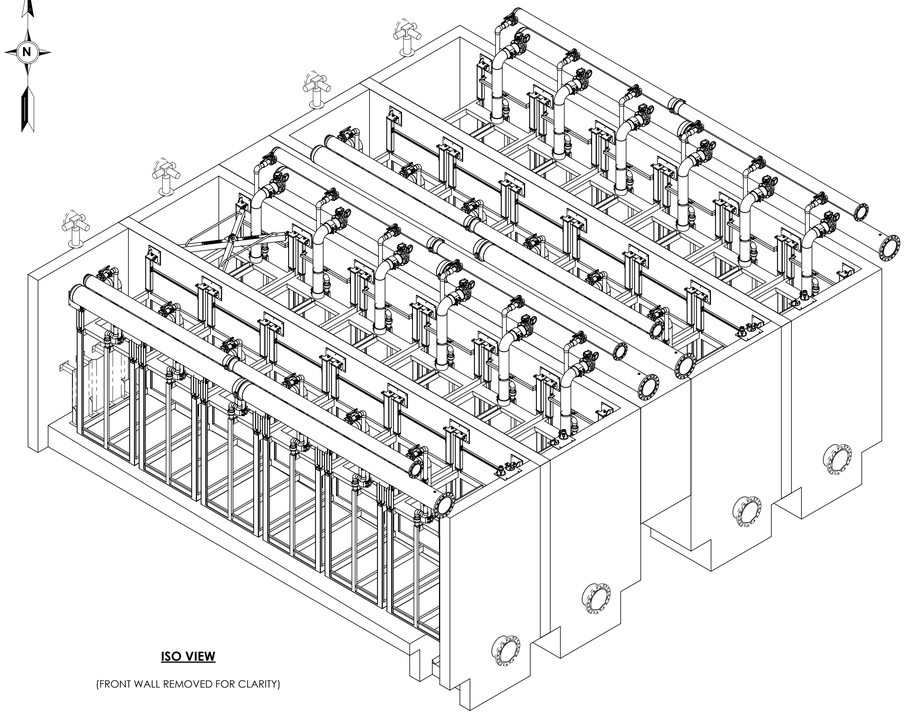
REV	DESCRIPTION	CREATED BY	CHECKED BY	APPROVED BY	DATE (DD-MMM-YY)

ROW NO.	REV	P&ID	DEVICE TAG	DESCRIPTION	SIGNAL TAG	I/O TYPE	PANEL TAG	PLC NUMBER	RACK	SLOT	CHANNEL	ADDRESS	IO MODULE PART NUMBER	IO ENERGIZED ACTION	POWER SUPPLY	SIGNAL TYPE	NOTES / REMARKS
1	A	P&ID NUMBER	DEVICE TAG ASSOCIATED WITH THE IO (VALVE, MOTOR, INSTRUMENT)	SERVICE, FUNCTION. SHALL MATCH WITH THE DESCRIPTION ON THE INSTRUMENT LIST / VALVE LIST AND ELECTRICAL DIAGRAMS	IO TAG	USE THE ABBREVIATION DI, DO, AI, AO	PANEL TAG WHERE THE IO IS INSTALLED (MAIN PANEL TAG / RIO PANEL TAG)	IN CASE OF MULTIPLE PLC, CORRESPOND TO THE PLC ASSOCIATED WITH THE IO	PLC RACK NUMBER 1, 2,3	PLC SLOT NUMBER 1, 2,3	PLC CHANNEL NUMBER 1, 2,3	IO ADDRESS ON THE FORMAT:	VENDOR PART NUMBER	DESCRIBE THE ACTION WHEN DI OR DO ARE ENERGIZED (OPENED/CLOSED/RUNNING)	24 VDC 120 VAC LOOP-POWERED	4-20 mA / 0 - 10 V 24 VDC / RELAY	GENERAL COMMENTS
												IOTYPE:RACK:SLOT.CHANNEL					

Notes:

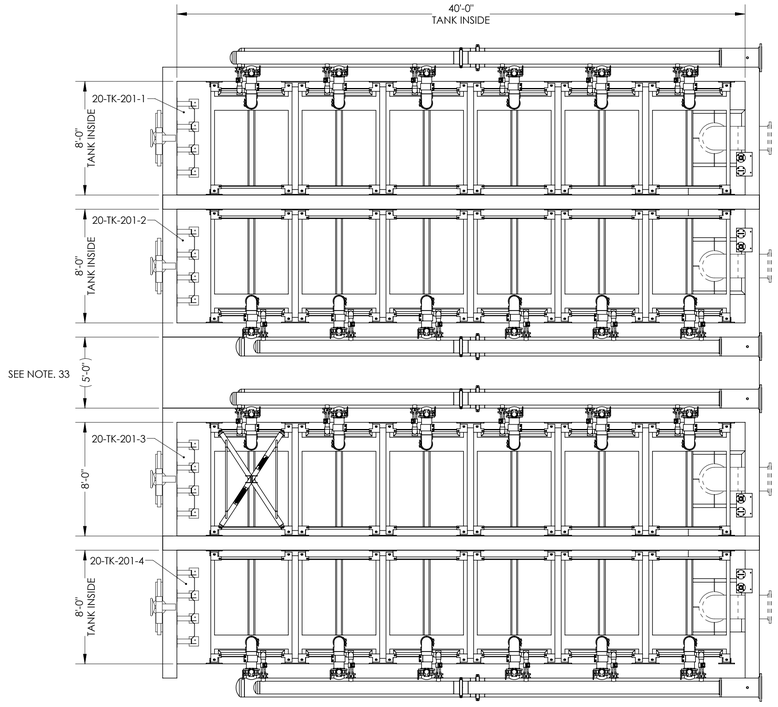
1.
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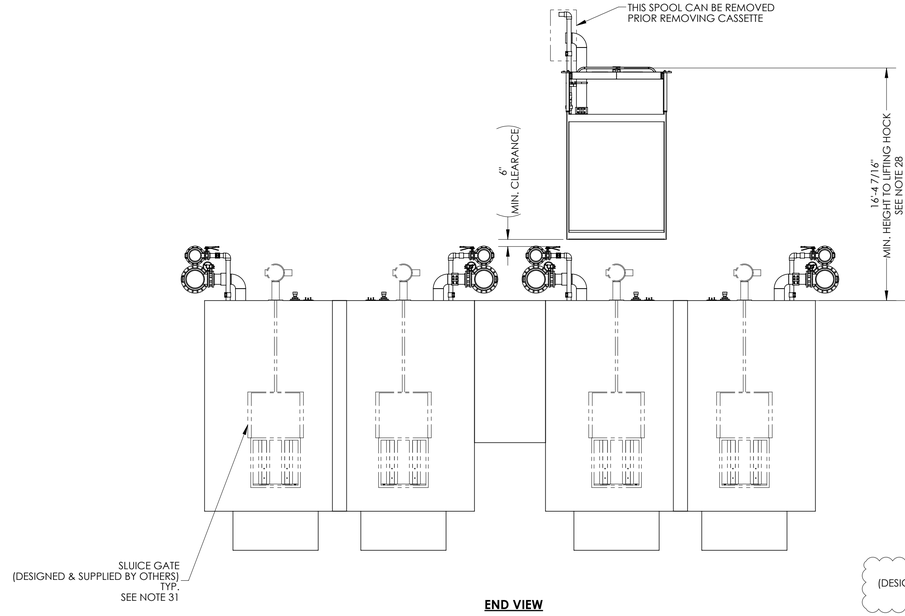
INSTRUCTIONS ONLY - DO NOT INCLUDE IN FINAL PRINT



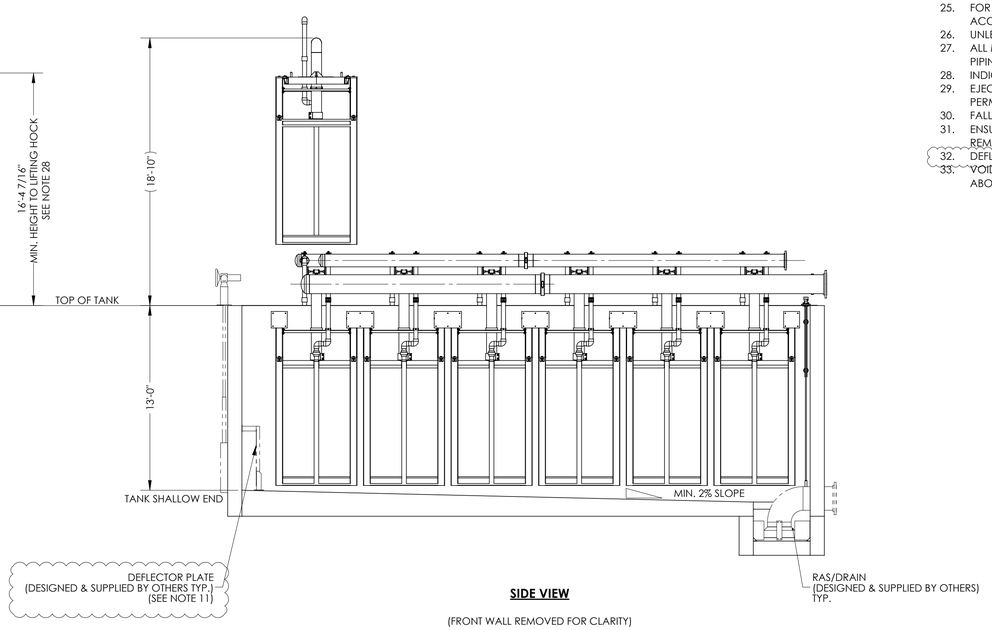
ISO VIEW

(FRONT WALL REMOVED FOR CLARITY)





END VIEW



SIDE VIEW

(FRONT WALL REMOVED FOR CLARITY)

NOTES:

1. UNLESS NOTED OTHERWISE, DIMENSIONS GIVEN FOR INSTALLATION HAVE THE FOLLOWING TOLERANCES: DIMENSIONS TO INTERFACE/NOZZLES: ± 3/8"; ANGLES: ± 0.5°. ALL DIMENSIONS SHOWN ARE FINAL DIMENSIONS INSIDE THE TANK.
2. DESIGN DATA:
   - EST. CASSETTE SHIPPING WEIGHT: 5,313 LBS [2,410 KG]
   - EST. CASSETTE MAX. WEIGHT (SLUDGED): 9,537 LBS [4,326 KG] (INCLUDING LIFTING MODULE)
   - RECOMMENDED CRANE LIFTING CAPACITY: 10,000 LBS [4,535 KG]. THE VEOLIA DESIGN GUIDELINE LISTED BELOW.
3. USE CRANE SCALE IF CASSETTE'S WEIGHT IS UNKNOWN. THE VEOLIA CRANE SCALE USE GUIDE LISTED BELOW.
4. CRANE HOIST CHAINFALL SHOULD BE IN LINE WITH CASSETTE CENTERLINE, FOR BOTH ALONG AND ACROSS THE TANK, BEFORE LIFTING CASSETTE.
5. LIFTING MODULE IS NOT TO BE LEFT INSIDE MEMBRANE TANK DURING OPERATION. A STORAGE SPACE WILL BE REQUIRED WHEN LIFTING MODULE IS NOT IS USE.
6. FOR SCOPE OF VEOLIA SUPPLIED EQUIPMENT AND TECHNICAL DATA REFER TO THE P&IDS AND EQUIPMENT BILL OF MATERIAL.
7. DESIGN, SUPPLY AND INSTALLATION OF MEMBRANE TANK DISTRIBUTION CHANNEL, SLUICE AND WEIR GATES, EMERGENCY OVERFLOW, AND HANDRAILS ON TOP OF THE TANKS ARE BY OTHERS. THESE ARE NOT SHOWN FOR CLARITY.
8. DESIGN AND SUPPLY OF MEMBRANE TANK COVERS ARE BY OTHERS (TANK MUST BE VENTED). THE VEOLIA DESIGN GUIDELINE IS LISTED BELOW. WALL BRACKET'S ELEVATION SHOULD BE COORDINATED WITH TANK COVER'S THICKNESS.
9. DO NOT PUT THE CASSETTE ON TOP OF TANK COVER UNLESS THE TANK COVER WAS DESIGNED TO TAKE SLUDGED CASSETTE WEIGHT.
10. DESIGN AND SUPPLY OF PIPE SUPPORTS BY OTHERS.
11. INFLUENT DEFLECTOR PLATE IS REQUIRED TO PREVENT DIRECT IMPACT OF FEED WATER ON CASSETTES. THE VEOLIA DESIGN GUIDELINE IS LISTED BELOW.
12. MEMBRANE TANK COVERS DESIGN TO BE COORDINATED WITH VEOLIA TEAM FROM INITIAL STAGES OF COVER DESIGN. THE VEOLIA DESIGN GUIDELINE IS LISTED BELOW.
13. THE FOLLOWING DESIGN GUIDELINES ARE AVAILABLE FROM VEOLIA UPON REQUEST:
    - E000001-WTS-ME-T02-8522-SG-001 - MEMBRANE TOLERANCES.
    - E000001-WTS-ME-T02-8522-SG-016 - ZEEWEED 500D SERIES MEMBRANE LIFTING EQUIPMENT GUIDELINE
    - E000001-WTS-ME-T02-8522-SG-013 - BAFFLE DESIGN
    - CRANE SCALE INSTALLATION AND USE (IN SERV-0083 ZW500 CASSETTE SOLIDS REMOVAL PROCEDURE).
    - E000001-WTS-ME-SYS-EN22-SG-017 - MEMBRANE TANK COVERS DESIGN GUIDELINE.
14. ANY ANCHOR BOLT TO BE MINIMUM 4" AWAY FROM CONCRET EDGES.
15. FOR INTERIOR TANK WALLS THAT HAVE BRACKETS ON BOTH SIDES, IF THE ANCHOR EMBEDMENT PLUS TWO TIMES THE ANCHOR DIAMETER IS GREATER THAN HALF OF TANK WALL THICKNESS, THEN THRU-WALL THREADED RODS MUST BE USED TO FIT 0.6875" DIA. HOLE (RODS TO BE SUPPLIED BY OTHERS)
16. PIPING MATERIAL:
    - AIR: SCH. 10, 316L SS AND SCH. 80, CPVC
    - PERMEATE: SCH. 10, 316L SS
17. GASKET MATERIAL:
    - SS LINES: EPDM
18. FASTENER MATERIAL:
    - 316SS
19. ALL DIMENSIONS IN INCHES.
20. DIMENSION SHOWN IN PARENTHESIS (XX) ARE FOR REFERENCE ONLY.
21. CONTRACTOR/SHOP SHALL VERIFY ALL DIMENSIONS PRIOR TO INSTALLING PIPING/EQUIPMENT.
22. REFERENCE - PIPING & INSTRUMENTATION DIAGRAM: 510464-WTS- PR-SYS-EN21-DS-104
23. SUMP DESIGN IS BY OTHERS, DIMENSIONS ARE SHOWN FOR REFERENCE ONLY. TO ENSURE FULL TANK DRAIN, VORTEX BREAKER IS RECOMMENDED. FOR SUCTION LOSSES REDUCTION, A BELLMOUTH FITTING CAN BE USED. LONG RADIUS ELBOW IS RECOMMENDED IF FEASIBLE. INTRODUCTION OF ANY OF THESE FEATURES MAY REQUIRE THE SUMP SIZE TO INCREASE.
24. THIS SPOOL IS A PLACEHOLDER FOR RECOMENDED VORTEX BREAKER AND OPTIONAL FLAIR (BELLMOUTH). *SYSTEM INTEGRATOR* TO DETERMINE DESIGN AND DIMENSIONS OF ANY OF THESE COMPONENTS, AS APPLICABLE.
25. FOR THE SCENARIO OF RAS PIPE PASSING BETWEEN CASSETTE FRAME AND TANK WALL, TANK LENGTH WILL INCREASE ACCORDINGLY. LEAVE A MINIMUM OF 4" BETWEEN CASSETTE FRAME AND VERTICAL PIPE SECTION.
26. UNLESS NOTED OTHERWISE, ALL FLANGE BOLT HOLES TO BE STRADDLE MAJOR CENTERLINES.
27. ALL MATING FLANGES SHALL HAVE PARALLEL FACE WITH NO OFFSET BETWEEN PIPE CENTERLINES. COLD SPRINGING OF PIPING DURING INSTALLATION IS NOT ALLOWED.
28. INDICATED LIFTING HEIGHT IS BASED ONLY ON COMPONENTS SHOWN ON THIS DRAWING.
29. EJECTOR TO BE CONNECTED TO A PIPE OVERT AT PIPE'S HEIGHEST POINT BETWEEN PERMEATE HEADER TIE POINT AND PERMEATE PUMP SUCTION.
30. FALL PROTECTION PROVISIONS ARE IN SCOPE OF OTHERS.
31. ENSURE SLUICE GATE VALVE DOES NOT INTERFERE WITH THE CASSETTE TRAVELING IN BOTH DIRECTIONS WHILE BEING REMOVED FROM INSIDE THE TANK.
32. DEFLECTOR PLATE AND SLUICE GATE VALVES AND RAS/DRAIN INLET ELBOWS ARE BY OTHERS.
33. VOID SPACE (OR A THICKER WALL) IS REQUIRED IN BETWEEN PAIRS OF TANKS TO ACCOMMODATE TWO SETS OF HEADERS ABOVE, DIMENSION (5 FEET) IN PLANE VIEW IS FOR REFERENCE ONLY AND CAN BE REDUCED.

VEOLIA WTS CONTROLLED DOCUMENT

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
B	ISSUED FOR APPROVAL		JSK	JS	RP	09 MAY 25
A	INITIAL DESIGN		XC	JS	RP	08 FEB 23

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TOLERANCES UNLESS NOTED
DECIMALS .X .XX .XXX
ANGLES °
FRAC

VEOLIA

CUSTOMER INFORMATION: CAESARS LANE WWTP

GENERAL ARRANGEMENT
MEMBRANE CONCRETE TANK
(4 TRAINS - ZW500EV)

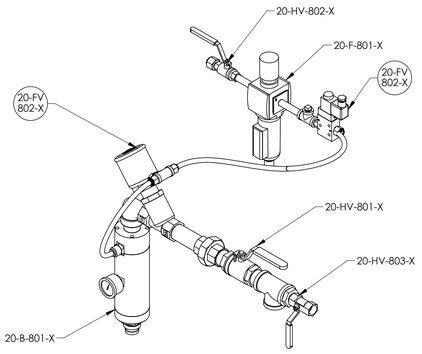
DRAWING NUMBER				REVISION
510464-WTS-ME-667-1010-DA-001				B
REF.:	DOC. OWNER:			
PROJECT NO. 510464	PART/MATERIAL NO.	SCALE 1:64	SIZE D	SHEET 1 OF 2

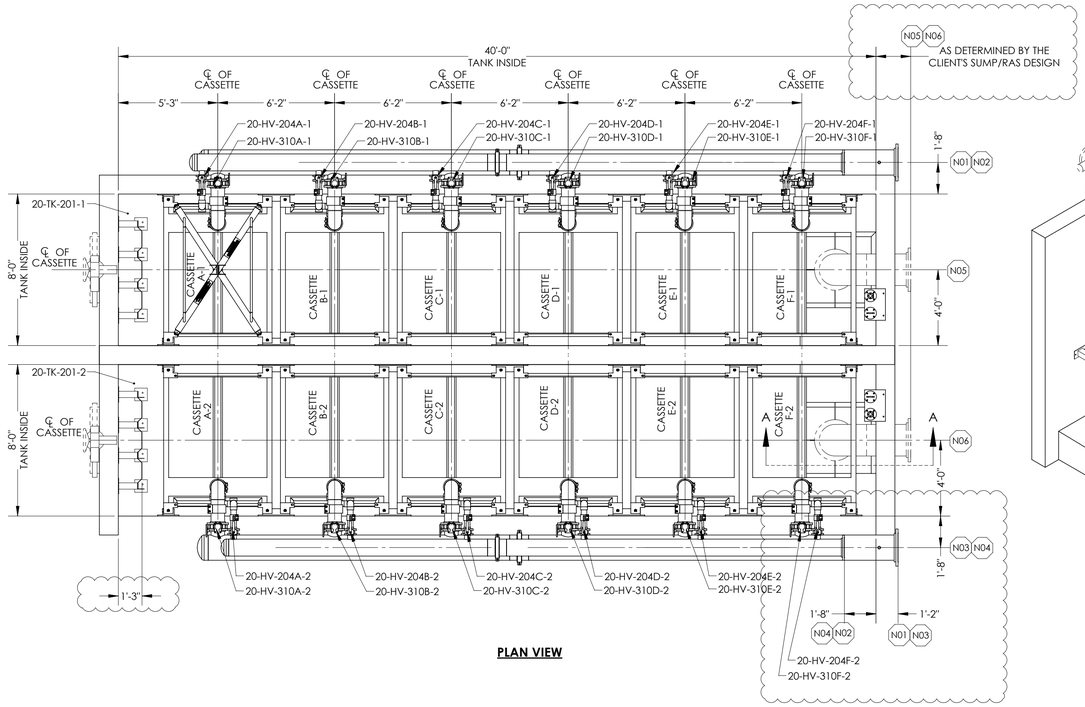
FILE LOCATION: C:\SWPDM\MAM\510464 - CAESARS LANE WWTP\2. Mechanical Drawings\
LAST SAVED: Wednesday, May 14, 2025 8:00:59 PM

EJECTOR ASSEMBLY

ONE PER TRAIN
TYP. FOR ALL OF FOUR (4) TRAINS
TAG "X" = 1, 2, 3, 4

EJECTOR ARE LOOSE SHIPED
SEE NOTE 29 ON SHT. 1 FOR INSTALLATION POSITION

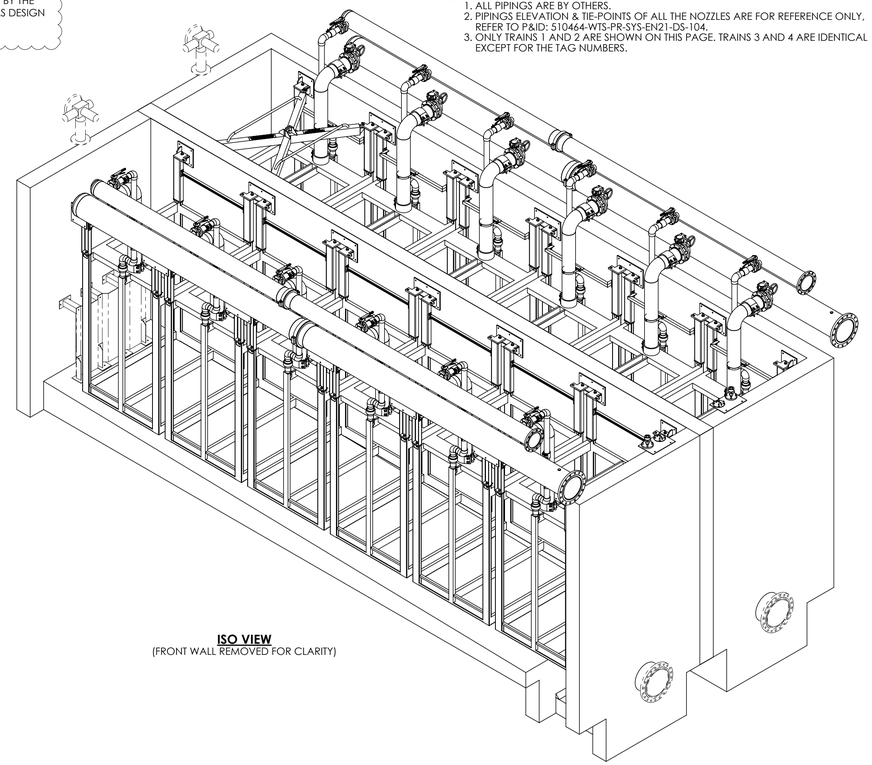




PLAN VIEW

NOZZLE SCHEDULE			
NOZZLE	DESCRIPTION	TYPE	SIZE
N01	PERMEATE/BACKPULSE TO/FROM PUMP (TRAIN1)	150# RF FLG	16"
N02	AIR FROM MEMBRANE BLOWERS (TRAIN1)	150# RF FLG	10"
N03	PERMEATE/BACKPULSE TO/FROM PUMP (TRAIN2)	150# RF FLG	16"
N04	AIR FROM MEMBRANE BLOWERS (TRAIN2)	150# RF FLG	10"
N05	RAS/TANK DRAIN (TRAIN1)	150# RF FLG	20"
N06	RAS/TANK DRAIN (TRAIN2)	150# RF FLG	20"

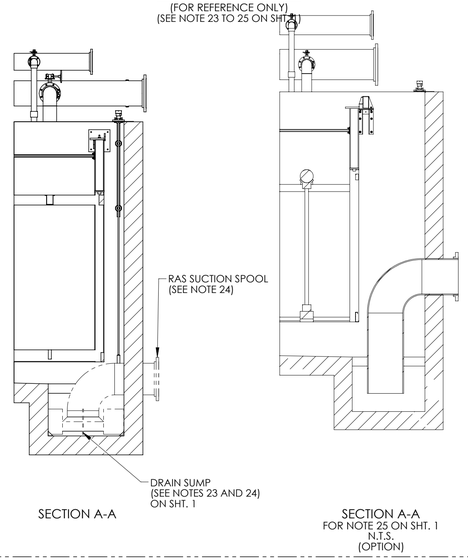
NOTE:
1. ALL PIPINGS ARE BY OTHERS.
2. PIPINGS ELEVATION & TIE-POINTS OF ALL THE NOZZLES ARE FOR REFERENCE ONLY, REFER TO P&ID: 510464-WTS-PR-SYS-EN21-DS-104.
3. ONLY TRAINS 1 AND 2 ARE SHOWN ON THIS PAGE. TRAINS 3 AND 4 ARE IDENTICAL EXCEPT FOR THE TAG NUMBERS.



ISO VIEW
(FRONT WALL REMOVED FOR CLARITY)

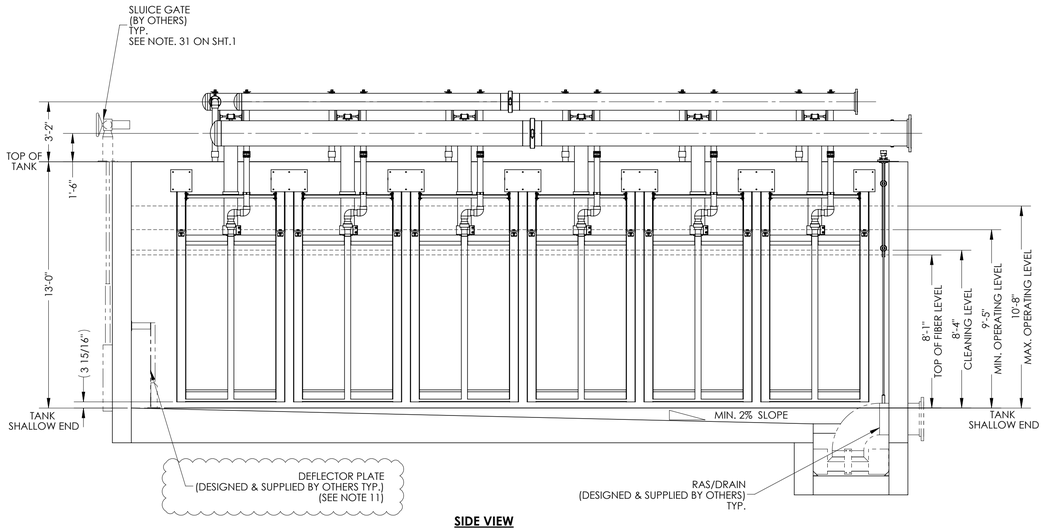
SUMP & RAS PIPE DETAIL

(FOR REFERENCE ONLY)
(SEE NOTE 23 TO 25 ON SHT. 1)



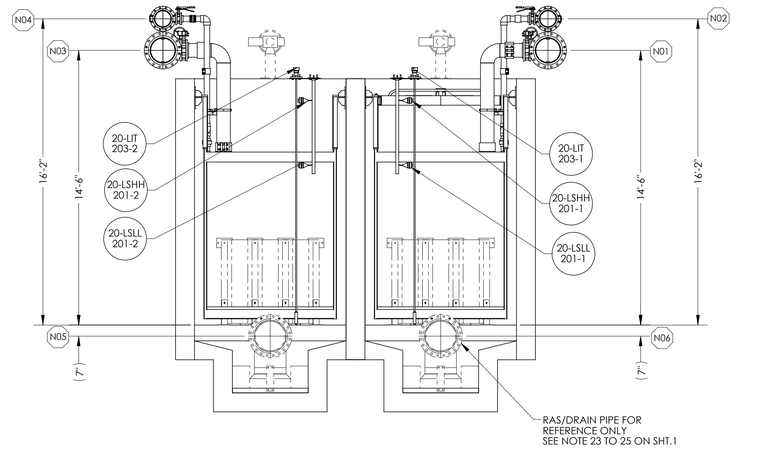
SECTION A-A

SECTION A-A
FOR NOTE 25 ON SHT. 1
N.T.S.
(OPTION)



SIDE VIEW

(FRONT WALL REMOVED FOR CLARITY)



END VIEW

(SIDE WALL REMOVED FOR CLARITY)

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
B	ISSUED FOR APPROVAL		JSK	JS	RP	09 MAY 25
A	INITIAL DESIGN		XC	JS	RP	08 FEB 23

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TOLERANCES UNLESS NOTED
DECIMALS .X .XX .XXX
ANGLES °
FRAC

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WWTP

GENERAL ARRANGEMENT
MEMBRANE CONCRETE TANK
(4 TRAINS - ZW500EV)

DRAWING NUMBER: 510464-WTS-ME-667-1010-DA-001
REVISION: B
REF.:
DOC. OWNER:
PROJECT NO.: 510464
PART/MATERIAL NO.:
SCALE: 1:48
SIZE: D
SHEET: 2 OF 2

FILE LOCATION: C:\SWPDM\MAM\510464 - CAESARS LANE WWTP\2. Mechanical Drawings\
LAST SAVED: Wednesday, May 14, 2025 8:00:59 PM

VEOLIA WTS
CONTROLLED DOCUMENT

REV	DESCRIPTION	WRITTEN BY	CHECKED BY	APPROVED BY	DATE DD-MM-YY
D	ISSUED FOR APPROVAL	RP	RP	RP	30-05-2025
C	ISSUED FOR APPROVAL	RP	RP	RP	01-12-2024
B	ISSUED FOR APPROVAL	RP	RP	RP	30-01-2024
A	ISSUED FOR APPROVAL	RP	RP	RP	28-03-2023

DOCUMENT TYPE:	VEOLIA DOCUMENT NUMBER:					
	CONTRACT	ISSUER	DISCIPLINE	PRODUCT	PHASE	TYPE	CHRONO
CUTSHEET PACKAGE	**510464**	**WTS**	**ME**	**MAT**	**MICS**	**DT**	**001**

MECHANICAL TRANSMITTAL

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VEOLIA WTS
CONTROLLED DOCUMENT

REV	DESCRIPTION	WRITTEN BY	CHECKED BY	APPROVED BY	DATE DD-MM-YY
D	ISSUED FOR CONTRACT BID	RP	RP	RP	30-05-2025
C	ISSUED FOR APPROVAL	RP	RP	RP	28-03-2023
B	ISSUED FOR APPROVAL	RP	RP	RP	30-01-2024
A	ISSUED FOR APPROVAL	RP	RP	RP	28-03-2023

DOCUMENT TYPE:	VEOLIA DOCUMENT NUMBER:					
	CONTRACT	ISSUER	DISCIPLINE	PRODUCT	PHASE	TYPE	CHRONO
EQUIPEMNT BILL OF MATERIAL	**510464**	**WTS**	**ME**	**SYS**	**EN10**	**BQ**	**001**

MECHANICAL TRANSMITTAL

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510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
P&ID MEMBRANE BLOWERS POSITIVE DISPLACEMENT TYPE						**510464-DS-102**	
1	2	CFO	BLOWER-MEMBRANE,AERZEN, GM 50L, 60 HP (WITH VFD BY OTHERS)	Membrane Aeration Blowers (With VFD By others) Aerzen Generation 5 Blower Package -Pressure - including: Aerzen GM 50L , DN200 Blower Drive Motor - Teco: 60hp, 1800rpm, TEFC, 460V/60Hz Design flow: 1,611 ICFM @ 5.5 Psig Motor protection: 1 Thermistor/ph Base with integrated reactive type discharge silencer Intake filter silencer Hinged motor support as automatic belt tensioning device Set of vibration isolation mounts Narrow v-belt drive with guard - 1 set Spring loaded relief valve Discharge manifold with externally accessible integrated check valve Flexible connector with clamps for schedule 40 pipe, discharge Acoustic Enclosure - Indoor/Outdoor Inlet flexible sleeve -DN 200 (8") for piped air inlet Instruments: Pressure gauge c/w isolation ball valve Dirty filter indicator	20-B-201-A/B 20-F-201-A/B 20-PSV-201-A/B 20-HV-203-A/B 20-PI-203-A/B 20-CV-201-A/B	510464-DS-102 Sheet 1	A03
2	3	CFO	BLOWER-MEMBRANE,AERZEN, GM 50L, 60 HP WITHOUT VFD	Membrane Aeration Blowers (Without VFD) Aerzen Generation 5 Blower Package -Pressure - including: Aerzen GM 50L , DN200 Blower Drive Motor - Teco: 60hp, 1800rpm, TEFC, 460V/60Hz Design flow: 1,611 ICFM @ 5.5 Psig Motor protection: 1 Thermistor/ph Base with integrated reactive type discharge silencer Intake filter silencer Hinged motor support as automatic belt tensioning device Set of vibration isolation mounts Narrow v-belt drive with guard - 1 set Spring loaded relief valve Discharge manifold with externally accessible integrated check valve Flexible connector with clamps for schedule 40 pipe, discharge Acoustic Enclosure - Indoor/Outdoor Inlet flexible sleeve -DN 200 (8") for piped air inlet Instruments: Pressure gauge c/w isolation ball valve Dirty filter indicator	20-B-201-C/D/E 20-F-201-C/D/E 20-PSV-201-C/D/E 20-HV-203-C/D/E 20-PI-203-C/D/E 20-CV-201-C/D/E	510464-DS-102 Sheet 1	A03
3	5	3090315	VALVE-BTFLY,SS,8.00,MAN,LG,150,EPDM,BR	BUTTERFLY VALVE MANUFACTURER: BRAY SERIES: 31-375 VALVE SIZE: 8 IN. MATERIAL: BODY- DUCTILE IRON DISC- 316SS STEM- 416SS SEAT- EPDM CONTROL: MANUAL LEVER CONNECTION: LUG PRESSURE RATING: 150 PSI	20-HV-201-A/B/C/D/E	510464-DS-102 Sheet 1	B03
4	5	3054067	SWITCH-FLOW,Ni-BRS,24VDC,N4,3.3-66ft/s	THERMAL AIR SWITCH FLOW KOBOLD US PN# KAL-8115-C KOBOLD EU PN# KAL-L81N1WKN4 3.3-66 FT/SEC VELOCITY RANGE, 0.5"MNPT PROC.CONNECTION, Ni-PLATED BRASS WETTED PARTS, NYLON HOUSING, 8-LED FLOW TREND, 2-COLOUR LED SWITCH STATUS, NEMA 4, 0.5"NPT CONDUIT CONNECTION, 24V DC POWER SUPPLY, 1-SPDT SWITCH, 120 PSIG MAX. OPERATING PRESSURE, -10 TO +250 DEGREE F. PROCESS TEMPERATURE, +/-1% REPRODUCIBILITY, UP TO 60 SEC. TIME DELAY START UP, UL, CE & CSA APPROVAL IS REQUIRED.	20-FSL-201-A/B/C/D/E	510464-DS-102 Sheet 1	C01

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
P&ID PROCESS BLOWERS POSITIVE DISPLACEMENT TYPE						510464-DS-102	
5	3	CFO	BLOWER-PROCESS,AERZEN, GM 90S, 150 HP (WITH VFD BY OTHERS)	Process Aeration Blowers (With VFD by others) Aerzen Generation 5 Blower Package -Pressure - including: Aerzen GM 90S , DN250 Blower Drive Motor - Teco: 150 hp, 1800rpm, TEFC, 460V/60Hz Design flow: 2,038 SCFM @ 9.74 Psig Motor protection: 1 Thermistor/ph Base with integrated reactive type discharge silencer Intake filter silencer Hinged motor support as automatic belt tensioning device Set of vibration isolation mounts Narrow v-belt drive with guard - 1 set Spring loaded relief valve Discharge manifold with externally accessible integrated check valve Flexible connector with clamps for schedule 40 pipe, discharge Acoustic Enclosure - Indoor/Outdoor Inlet flexible sleeve - DN 250 (10") For piped air inlet Instruments: Pressure gauge c/w isolation ball valve Dirty filter indicator	16-B-401-A/B/C 16-F-401-A/B/C 16-PSV-401-A/B/C 16-HV-403-A/B/C 16-PI-403-A/B/C 16-CV-401-A/B/C	510464-DS-102 Sheet 2	A03
6	3	3090316	VALVE-BTFLY,SS,10.0,MAN,LG,150,EPDM,BR	BUTTERFLY VALVE MANUFACTURER: BRAY SERIES: 31-375 VALVE SIZE: 10 IN. MATERIAL: BODY- DUCTILE IRON DISC- 316SS STEM- 416SS SEAT- EPDM CONTROL: GEAR CONNECTION: LUG PRESSURE RATING: 150 PSI	16-HV-401-A/B/C	510464-DS-102 Sheet 2	B03
7	3	3054067	SWITCH-FLOW,Ni-BRS,24VDC,N4,3.3-66ft/s	THERMAL AIR SWITCH FLOW KOBOLD US PN# KAL-8115-C KOBOLD EU PN# KAL-L81N1WKN4 3.3-66 FT/SEC VELOCITY RANGE, 0.5"MNPT PROC.CONNECTION, Ni-PLATED BRASS WETTED PARTS, NYLON HOUSING, 8-LED FLOW TREND, 2-COLOUR LED SWITCH STATUS, NEMA 4, 0.5"NPT CONDUIT CONNECTION, 24V DC POWER SUPPLY, 1-SPDT SWITCH, 120 PSIG MAX. OPERATING PRESSURE, -10 TO +250 DEGREE F. PROCESS TEMPERATURE, +/-1% REPRODUCIBILITY, UP TO 60 SEC. TIME DELAY START UP, UL, CE & CSA APPROVAL IS REQUIRED.	16-FSL-401-A/B/C	510464-DS-102 Sheet 2	C01
	3	3090316 + Limit switch on the open CFO to be created	VALVE-BTFLY,SS,10.0,MAN,LG,150,EPDM,BR PLUS LIMIT SWITCH ON THE OPEN	BUTTERFLY VALVE MANUFACTURER: BRAY SERIES: 31-375 VALVE SIZE: 10 IN. MATERIAL: BODY- DUCTILE IRON DISC- 316SS STEM- 416SS SEAT- EPDM CONTROL: GEAR CONNECTION: LUG PRESSURE RATING: 150 PSI FEATURE: ADDED LIMIT SWITCH ON THE OPEN POSITION	16-HV-400	510464-DS-102 Sheet 2	B03

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
P&ID BIOREACTORS						**510464-DS-103**	
8	3	CFO	ANOXIC MIXER	Sulzer Submersible Mixer,Model #RW6521-A60/12EC (Cast Iron,for Non Classified Area),6kW-571RPM,460/60/3,complete with 580mm propeller,double mechanical seals, bi-metal switches on stator plus Di seal probe,10m Cable. Accessories Included: *Mast Assy /w Floor/Inter/Upper Brkts,304SS (4"x4"SQ Guide Tube by Others) *Shock Absorber *Support Bracket,Shock Absorber,304SS *Power Cable Support Kit,20ft 304SS *Lifting Cable Assy,40ft 316SS *Relay,Heat Seal CA462,115V Accessories: 1 Portable 24"-36" Adjustable Reach 60"H,1000LB Capacity /w Manual Handwinch 3 Socket,Platform,304SS	16-MX-211-1/2/3	510464-DS-103	A13
9	3	CFO	FINE BUBBLE DIFFUSER GRID	SSI, Aeration diffuser grids with AFD270-E Fine Bubble Disc Diffusers with EPDM Membranes. A. Each aeration train consists of two Aerobic zones, zone 1 and zone 2 and each zone is 44.75' (L) X 24' (W) X 20.5' SWD. Aeration Equipment include the following items per each zone: Scope of supply complete with all components from the downstream of air supply line connection (±6" above water level) starting with SS Vanstone and loose follower flange including the drop pipe, which includes the following items: Aerobic zone 1: - 8" Dia. 304SS, Sch. 10 drop pipe (+/-20') c/w (3) 304SS supports and (1) 304SS couplings - 8" Dia. PVC, Sch. 40, Manifold (+/-25') c/w (5) 304SS supports and (1) PVC couplings - 4" Dia. PVC headers (+/- 440') c/w (440) factory installed diffusers (77) 304SS supports and (33) PVC unions - Quantity of 440 of POD270-E diffusers Aerobic zone 2: - 6" Dia. 304SS, Sch. 10 drop pipe (+/-20') c/w (3) 304SS supports and (1) 304SS couplings - 6" Dia. PVC, Sch. 40, Manifol (+/-25') c/w (5) 304SS supports and (1) PVC couplings - 4" Dia. PVC headers (+/- 320') c/w (312) factory installed diffusers (56) 304SS supports and (24) PVC unions - Quantity of 312 of POD270-E diffusers B-The spare parts included are: ●AFD270-E Diffuser Assemblies – 9 ●4" 304SS Supports - 5 ●4" Repair Couplings – 2 ●Special Tools Set – 1	NO TAG	510464-DS-103	B27
10	3	3090315	VALVE-BTFLY,SS,8.00,MAN,LG,150,EPDM,BR	BUTTERFLY VALVE MANUFACTURER: BRAY SERIES: 31-375 VALVE SIZE: 8 IN. MATERIAL: BODY- DUCTILE IRON DISC- 316SS STEM- 416SS SEAT- EPDM CONTROL: MANUAL LEVER CONNECTION: LUG PRESSURE RATING: 150 PSI	16-HV-405-1/2/3	510464-DS-103	B03
11	3	3090314	VALVE-BTFLY,SS,6.00,MAN,LG,150,EPDM,BR	BUTTERFLY VALVE MANUFACTURER: BRAY SERIES: 31-375 VALVE SIZE: 6 IN. MATERIAL: BODY- DUCTILE IRON DISC- 316SS STEM- 416SS SEAT- EPDM CONTROL: MANUAL LEVER CONNECTION: LUG PRESSURE RATING: 150 PSI BRAY ASSEMBLY ID 9C060LF169L BRAY 310600-13010375 / 010500-21100007	16-HV-406-1/2/3	510464-DS-103	B03

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D							
S. No	**Qty**	**SAP Part No. OR CFO**	**Primary Description**	**Complete Description**	**Tags**	**Drawing No.**	**Cutsheet Binder Tab #**
10	6	3195051	CONTROLLER,DUAL,4-20MA,HACH,SC4500,120V	CONTROLLER, UNIVERSAL, HACH MODEL SC4500 LXV525.99A11551 - DUAL DIGITAL SENSOR INPUTS (SC CONECTORS) - 5) 4-20 mA OUTPUTS - 2) SPDT RELAY OUTPUTS - NEMA 4X/IP66 ENCLOSURE - 100-240 VAC 50/60HZ - MOUNTING HARDWARE FOR CONTROLLER INCLUDED CE. ETL certified to UL and CSA safety standards (with all sensor types), FCC, ISED, KC, RCM, EAC, UKCA, SABS, C (Morocco)	16-AIT-405-1 16-AIT-405-2 16-AIT-405-3 16-AIT-403-1 16-AIT-403-2 16-AIT-403-3	510464-DS-103	C16

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
11	6	3184179	SENSOR-DO,CPVC,2.00,SOC,20PPM,LDO2,HACH	"Hach LDO® Model 2 , DO Probe with Luminescent Dissolved Oxygen Technology Accuracy: ± 0.05 ppm Below 5 ppm Accuracy 2: ± 0.1 ppm Above 5 ppm Accuracy 3: Temperature: ± 0.2 Accuracy 4: 0.2 °C Body material: Stainless Cable Length: 10 m (33 ft) Calibration Method: All Probes are factory calibrated and ready to use Air Calibration: one point, 100% water saturated air Sample Calibration: comparison to standard instrument, or comparison to Winkler Titration method Communication: Modbus Diameter: 48.25 mm Dimensions (D x L): 48.25 mm x 254 mm Flow: no flow required Flow Rate: None required Hazardous Location Ratings: ETL listed (cETLus marked) to Canadian and US General Safety and Hazardous (Class I, Div. 2) Locations Interferences: No Interferences from the following: H2S, pH, K+, Na+, Mg2+, Ca2+, NH4+, Al3+, Pb2+, Cd2+, Zn2+, Cr (total), Fe2+, Fe3+, Mn2+, Cu2+, Ni2+, Co2+, CN-, NO3-, SO42-, S2-, PO43-, Cl-, anion active surfactants, crude oils, Cl2 < 4 ppm Length: 254 mm Measurement Range 2: 0 - 20.00 mg/L Measurement Range 3: 0 - 200 % saturation Operating Temperature Range: 0 - 50 °C Options: None Pressure Range: max 3.5 bar Range: 0 - 20.00 ppm Region: US Repeatability: ± 0.1 ppm (mg/L) Resolution: 0.01 ppm (mg/L) Response Time: at 20 ºC: To 60 s To 40 s Sensor Cable: 10 m (31 ft.) terminated with quick-disconnect plug Sensor Immersion Depth: Pressure Limits at 345 kPa 345 kPa (50 psi), maximum; accuracy may not be maintained at this depth Sensor Thread: Outer thread Storage Conditions: -20 °C to 70 °C Transmission Distance: 1000 m (3280 ft.) maximum when used with a termination box 100 m (328 ft.) maximum Warranty: Probe body: 3 years Sensor cap: 2 years in standard applications Weight: 1 kg Wetted Materials: Sensor Cap: Acrylic; Probe Body: CPVC, Polyurethane, Viton, Noryl, 316 Stainless Steel"	16-AE-405-1 16-AE-405-2 16-AE-405-3 16-AE-403-1 16-AE-403-2 16-AE-403-3	510464-DS-103	C16
12	3	3184186	SENSOR-PH,GLASS,1.00,MNPT,14,DPD1P1,HACH	pHD sc: Digital pH sensor with glass differential electrode, sc compatibility, PEEK®, Convertible Mount Accuracy: ± 0.02 pH Body material: PEEK® Cable Connection: Digital Cable Length: 10m (33 ft.) Calibration Method: Two point automatic, one point automatic, two point manual, one point manual Communication: Modbus Drift: 0.03 pH per 24 hours, non-cumulative Electrode Type: General Purpose Flow Rate: 3 m (10 ft.) per second, maximum Length: 271.3 mm Mounting: Convertible Operating Temperature Range: Analog Sensor with Digital Gateway: -5 - 105 °C Digital Sensor: 0 - 50 °C pH Range: 0 - 14 pH Pressure Range: Maximum 10.7 bar . 6.9 bar for Digital Sensor at 70°C, and 6.9 bar for Analog Sensor at 105°C. Range: -2.0 - 14.0 pH Region: Global	16-AE-402-1, 16-AE-402-2, 16-AE-402-3	510464-DS-103	C16

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
13	9	3109286	BRACKET-PROBE,FLOAT,1.00,NPT,SENSOR	KTO: FLOAT MOUNT, HACH, ITEM# 9253100, 1" NPT SENSOR	Mounting kit for: 16-AE-405-1/2/3 16-AE-403-1/2/3 16-AE-402-1/2/3	510464-DS-103	C16
14	3	3087034	SWITCH-FLOAT,PP,120/220VAC,4"FLT	SWITCH, LEVEL, MJK PT# 202810, MODEL 7030, CABLE SUSPENDED 4" Ø FLOAT, POLYPROPYLENE HOUSING, 39 FT LONG OIL RESISTANT PVC CABLE, 120VAC OR 220VAC, 1PH/60Hz, -20oC to 60oC OPERATING TEMPERATURE	16-LSHH-401-1/2/3	510464-DS-103	C08
P&ID MEMBRANE TANK						**510464-DS-104**	
15	4	3178110	ASSY-EJECTOR,316,24VDC,SS TUBE	ASSEMBLY EJECTOR (AIR ASSEMBLY AND WATER ASSEMBLY)	20-HV-802-1/2/3/4 20-PCV-801-1/2/3/4 20-FV-802-1/2/3/4 20-FV-801-1/2/3/4 20-E-801-1/2/3/4 20-HV-801-1/2/3/4 20-HV-803-1/2/3/4	510464-DS-104	A06
16	20	3193012	M/C-ZW500EV,64/64,316L,LEAP,8IN	ZW500EV CASSETTE, POPULATED WITH 64/64 MODULES, EACH MODULE HAS 530 FT2 OF SURFACE AREA	A-1/2/3/4 B-1/2/3/4 C-1/2/3/4 D-1/2/3/4 E-1/2/3/4	510464-DS-104	A01
	24	3090317	VALVE-BTFLY,316,8.00,GEAR,LG,BR	BUTTERFLY VALVE MANUFACTURER: BRAY SERIES: 31-375 VALVE SIZE: 8 IN. MATERIAL: BODY: DUCTILE IRON DISC: 316SS STEM: 416SS SEAT: EPDM CONTROL: MANUAL-GEAR CONNECTION: LUG PRESSURE RATING: 150 PSI ADDITIONAL MANUF. INFORMATION: P/N: 310800-13010375 - S31 8" DI,316,416,EPDM BONDED P/N: 040300-21202002 - GEAR	20-HV-310A-1/2/3/4 20-HV-310B-1/2/3/4 20-HV-310C-1/2/3/4 20-HV-310D-1/2/3/4 20-HV-310E-1/2/3/4 20-HV-310F-1/2/3/4	510464-DS-104	B03
	24	3090312	VALVE-BTFLY,SS,3.00,MAN,LG,150,EPDM,BR	BUTTERFLY VALVE MANUFACTURER: BRAY SERIES: 31-375 VALVE SIZE: 3 IN. MATERIAL: BODY- DUCTION IRON DISC- 316SS STEM- 416SS SEAT- EPDM CONTROL: LEVER OPERATOR CONNECTION: LUG PRESSURE RATING: VACUUM TO 150 PSI ADDITIONAL MANUF. INFORMATION: VALVE# 31-0300-13010-375	20-HV-204A-1/2/3/4 20-HV-204B-1/2/3/4 20-HV-204C-1/2/3/4 20-HV-204D-1/2/3/4 20-HV-204E-1/2/3/4 20-HV-204F-1/2/3/4	510464-DS-104	B03

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
	4	3196525	VALVE-BTFLY,316,10.0,A/A 24V,LG,LS,BR	BUTTERFLY VALVE MANUFACTURER: BRAY SERIES: 31-375 VALVE SIZE: 10 IN. MATERIAL: BODY: DUCTILE IRON DISC: 316SS STEM: 416SS SEAT: EPDM CONTROL: DOUBLE ACTING W/ 24VDC SOLENOID, LIMIT SWITCHES CONNECTION: LUG PRESSURE RATING: 150 PSI ADDITIONAL MANUF. INFORMATION: P/N: 311000-13010375 - S31 10" DI,316,416,EPDM BONDED P/N: 921600-11300532 - S92/160 PNEU ACT-30mm DD P/N: 630250-21401536 - S63 SOL VLV,N4,24VDC P/N: 630250-22504536 - S63 MTG CHARGE N4,7,9 4-WAY P/N: 550250-23010536 - SPEED CONTROL,SINGLEWAY,1/4NPT P/N: 5A0000-126A2536 - S5A STS MON, 2 MECH SW P/N: 5B0000-22601534 - S5A/B/C 3PC BRACKET ASSY, IMP	20-FV-205-1/2/3/4	510464-DS-104	B04
17	4	3197282	M/C-ZW500EV,32/64,316L,LEAP,8IN	ZW500EV CASSETTE, POPULATED WITH 32/64 MODULES, EACH MODULE HAS 530 FT2 OF SURFACE AREA	F-1/2/3/4	510464-DS-104	A01
18	5	3136677	TRANS-LEVEL,316,3.00,FLG,156",E+H	"ENDRESS+HAUSER Transmitter, Level. Deltapilot M FMB51 FMB51-CD21JD1FGK85AGJB3U [CD] Approval: CSA C/US General Purpose [2] Output: 4-20mA HART [1] Display, Operation: LCD, push button on display/electronics [J] Housing: F31 Alu, Glass window [D] Electrical Connection: Thread NPT1/2, IP66/68 NEMA4X/6P [1F] Sensor Range: 400mbar/40kPa/6psi gauge,4mH2O/13ftH2O/160inH2Ooverload: 8bar/800kPa/120psi [G] Reference Accuracy: Standard [K] Calibration; Unit: Customised level; see additional spec.. > Additional text: 0...0156 "" H2O [85] Probe Connection: 156 in rod, 316L [AGJ] Process Connection: 3"" 150lbs RF, 316/316Lflange ANSI B16.5 [B] Membrane Material: Alloy C [3] Fill Fluid: Synthetic oil, FDA [U] Seal: None, cell welded "	20-LIT-200 20-LIT-203-1/2/3/4 RANGE: 0 - 156 INCHES	510464-DS-104	C09
19	4	3083238	TRANS-PRESS,316,0.50,NPT,-15-15,4-20,E+H	ENDRESS+HAUSER, Cerabar S PMC71 P/N: PMC71-UAC1KBRAAAA PRESSURE, CAPACITIVE COMPACT. LOW RANGE VALUE -15.000 psi UPEER RANGE VALUE 15.000 psi DISPLAY AT 4mA DISPLAY AT 20mA [U] APPROVAL: CSA C/US IS Cl.I,II,III Div.1 Gr.A-G, Cl.I Div.2 Gr.A-D, Ex ia, C: zone 0,1,2/ US: zone 0,1,2,20,21,22 [A] OUTPUT; OPERATING: 4-20mA HART; extern + LCD [C] HOUSING; COVER SEALING; CABLE ENTRY: T14 Alu IP66/67 NEMA6P; EPDM; NPT1/2 thread, T14 = side cover [1K] SENSOR RANGE; SENSOR OVERLOAD LIMIT: 2bar/200kPa/30psi gauge; 18bar/1800kPa/270psi [B] CALIBRATION; UNIT: **Customised; see additional spec. [RA] PROCESS CONNECTION: Thread ANSI MNPT1/2 FNPT1/4, 316L [A] SEAL: FKM [A] ADDITIONAL OPTION 1: NOT SELECTED [A] ADDITIONAL OPTION 2: NOT SELECTED	20-PIT-301-1/2/3/4 RANGE : -15 to +15 PSIG	510464-DS-104	C07

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
20	8	3087034	SWITCH-FLOAT,PP,120/220VAC,4"FLT	SWITCH, LEVEL, MJK PT# 202810, MODEL 7030, CABLE SUSPENDED 4" Ø FLOAT, POLYPROPYLENE HOUSING, 39 FT LONG OIL RESISTANT PVC CABLE, 120VAC OR 220VAC, 1PH/60Hz, -20oC to 60oC OPERATING TEMPERATURE	20-LSHH-201-1/2/3/4 20-LSLL-201-1/2/3/4	510464-DS-104	C08
	4	CFO	VALVE-KNIFEGATE,316,20.0,A/A SV,LG,24,UD,LS	20" Orbinox Series 20, P/N: 20-3636RE-20.0-DARDC-SOL-PROX KNIFEGATE V. SERIES 20 DN500 (20") ASME-150 Unidirectional Body CF8M Gate AISI 316 Seat EPDM Packing ST (Synth. fib.) Reinforced Yoke AISI 304 Actuator Pneumatic RDC Double Acting Pmin 6.0 bar / Pmax 8.0 bar Solenoid Valve NUMATICS 153SA43CM000030 NPT 3/8 24 V DC Monostable (1 Coil) Valve Electrical Failure Position Close 2x Inductive Switch TELEMECANIQUE XS618B1MAL2 , 2 wire, NO, (24...240) Vac/dc, LED, IP68, (-25...70) °C, cable 2 m CYLRDC-12X21 Media Liquid PS 10.0 bar 150.0 psi TS -20.0 / 80.0 °C; -4.0 / 176.0 °F DP Act 4.0 bar	20-FV-502-1/2/3/4	510464-DS-104	B18
P&ID PERMEATE SIPHON & ASSOCIATED EQUIPMENT						**510464-DS-105**	
21	8	3067260	VALVE-BALL,316,0.50,1PC THD	VALVE, BALL, PINACLE, 1/2", 1-PC REDUCED PORT, P/N 13TBV105, NPT, 316SS BODY & TRIM, PTFE SEAT & SEAL, CV = 5.5, 800# WOG, WITH LEVER LOCKING HANDLE	20-HV-302-1/2/3/4 20-HV-301-1/2/3/4	510464-DS-105	B01
22	4	3067264	VALVE,BALL,2",316SS,1PC,THD	VALVE, BALL, PINACLE, 2", 1-PC REDUCED PORT, P/N 13TBV12, NPT,316SS BODY & TRIM, PTFE SEAT & SEAL, CV = 60, 1000# WOG, WITHLEVER LOCKING HANDLE.	20-HV-305-1/2/3/4	510464-DS-105	B01
23	4	CFO	DEZURIC, 16", V-PORT MODULATING BALL VALVE	DEZURIK 16" V-PORT ball valve with CS body Style: V-Port Ball Valve (VPB) Size: 16 Inch (400mm) End Flanged Drilling; Class 150, ISA 75.08.02 and IEC 534-3-2F-F Body Material: Carbon Steel Packing: PTFE Chevron; Temperature to 500° F. (250° C.) Ball Material: 317 SST; Heat Treated; Electroless Nickel Overlay to 700 Degree F. Shaft Material: 2205 Duplex Stainless Steel Seat: Rigid 317 Stainless Steel; Heat Treated; Electroless Nickel Overlay; Temperature to 450 Degree F. Bushing: 317 SST Wire Mesh Encapsulated in PTFE Liner to 500 Degree F. Coating: SB0 - Exterior: 4 mils minimum of Blue Epoxy DeZURIK with Standard (SP10) surface prep Actuator: PowerRac Cylinder; 8 In Dia VAC V200P – 3-15 PSI Pneumatic Positioner, NEMA 4X and IP66, Double/Single Acting, with Arrow Indicator Weight (Approx): 777 lbs/ 353 kgs Max Temperature: 450 Degrees F.	20-FCV-301-1/2/3/4	510464-DS-105	B05
24	4	3090321	VALVE-BTFLY,316,16.0,GEAR,LG,BR	BUTTERFLY VALVE MANUFACTURER: BRAY SERIES: 31-375 VALVE SIZE: 16 IN. MATERIAL: BODY: DUCTILE IRON DISC: 316SS STEM: 416SS SEAT: EPDM CONTROL: MANUAL-GEAR CONNECTION: LUG PRESSURE RATING: 150 PSI ADDITIONAL MANUF. INFORMATION: P/N: 311600-11010375 - S31 16" DI,316,416,EPDM BONDED P/N: 040500-21202002 - GEAR	20-HV-303-1/2/3/4	510464-DS-105	B03

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
25	4	3090313	VALVE-BTFLY,SS,4.00,MAN,LG,150,EPDM,BR	BUTTERFLY VALVE MANUFACTURER: BRAY SERIES: 31-375 VALVE SIZE: 4 IN. MATERIAL: BODY- DUCTILE IRON DISC- 316SS STEM- 416SS SEAT- EPDM CONTROL: MANUAL LEVER CONNECTION: LUG PRESSURE RATING: 150 PSI	20-HV-304-1/2/3/4	510464-DS-105	B03
26	8	3196528	VALVE-BTFLY,316,16.0,A/A 24V,LG,LS,BR	BUTTERFLY VALVE MANUFACTURER: BRAY SERIES: 31-375 VALVE SIZE: 16 IN. MATERIAL: BODY: DUCTILE IRON DISC: 316SS STEM: 416SS SEAT: EPDM CONTROL: DOUBLE ACTING W/ 24VDC SOLENOID, LIMIT SWITCHES CONNECTION: LUG PRESSURE RATING: 150 PSI ADDITIONAL MANUF. INFORMATION: P/N: 311600-13010375 - S31 16" DI,316,416,EPDM BONDED P/N: 922100-11300532 - S92/210 PNEU ACT-50mm DD P/N: 630250-21401536 - S63 SOL VLV,N4,24VDC P/N: 630250-22504536 - S63 MTG CHARGE N4,7,9 4-WAY P/N: 550250-23010536 - SPEED CONTROL,SINGLEWAY,1/4NPT P/N: 5A0000-126A2536 - S5A STS MON, 2 MECH SW P/N: 5B0000-22601534 - S5A/B/C 3PC BRACKET ASSY, IMP	20-FV-621-1/2/3/4 20-FV-622-1/2/3/4	510464-DS-105	B04
27	4	CFO	TRANS-FLOW,MAG,16.0FLG,0-4500GPM,PROMAG 400,E+H	Electromagnetic Flow meter Promag E 400, 5W4C3F, DN400 16” Manufacturer: E+H Tags: 20-FIT-301-1, 20-FIT-301-2, 20-FIT-301-3, 20-FIT-301-4 Model: 5W4C3F-C6ILHA0DUA1K0A+DAZ1 C6 Approval: CSA C/US NI Cl.I Div.2 Gr. ABCD I Design: Fixed flange, 0 x DN inlet/ outlet runs L Power Supply: 100-240VAC/24VAC/DC H Output; Input: 4-20mA HART, pulse/freq., switch output A Housing: Compact, alu, coated 0 Cable, Not used D Electrical Connection: Thread NPT1/2 U Liner: Polyurethane A1K Process Connection: Cl.150, carbon steel, flange ASME B16.5 0 Electrodes: 1.4435/316L A Calibration Flow: 0.5% DA >>Customized Parameterization: Output 1 Z1 >>Marking: Tagging (TAG), see additional spec. Details Curr. output 1 Volume flow Current span 4...20 mA NAMUR Value 0/4 mA: 0 USgal/min Value 20 mA: 4500 USgal/min Failsafe mode current output: Max. Damping output 1: 1 s Device 1 1x TAG stainless steel label (50105107)	20-FIT-301-1/2/3/4 RANGE: 0-4500 GPM	510464-DS-105	C10
28	8	3083677	GAUGE-PRESS,SS,4.5,BTM,15PSI,AS	PRESSURE GAUGE (COMPOUND), ASHCROFT PT# 45-1279SSL-4L 30"Hg/15PSI, SS BURDON TUBE AND SOCKET, 4.5"" DIAL, 30" MERCURY/15 PSI 1/2" LOWER CONNECTIONS, GLYCERINE FILLED, +/-0.5% ASME GR 2A ACCURACY, SOLID FRONT BLACK PHENOLIC CASE.	20-PI-302-1/2/3/4 20-PI-301-1/2/3/4 RANGE: 30" Mercury - 15 psi	510464-DS-105	C04
29	4	3089342	VALVE-BALL,FV,1",PVC/FPM,SRFC,24V	VALVE, BALL, 1", TRUE UNION, PVC BODY, TEFLON SEATS, FPM O-RINGS, SOCKETWELD, GEORGE FISCHER TYPE 546, C/W PA11 SPRING RETURN FAIL CLOSE PNEUMATIC RACK AND PINION ACTUATOR PT# 199 233 075, ASSEMBLY PT# S199 233 075 C/W CSA/UL APPROVED SOLENOID PILOT VALVE 24 V/DC TYPE PV95 PT#199190554CSA	20-FV-803-1/2/3/4	510464-DS-105	B02

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D							
S. No	**Qty**	**SAP Part No. OR CFO**	**Primary Description**	**Complete Description**	**Tags**	**Drawing No.**	**Cutsheet Binder Tab #**
30	4	3088951	VLVE,BALL,0.375",316SS,2PC,THD	VALVE, BALL, PINACLE, 3/8", 2-PC FULL PORT, P/N 13TBV20375,NPT, 316SS BODY & TRIM, PTFE SEAT & SEAL, CV = 16, 1000#WOG, WITH LEVER LOCKING HANDLE.	20-HV-321-1/2/3/4	510464-DS-105	B01

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
31	4	CFO	SAMPLE FEED PUMP FOR TURBIDITY METER ASSEMBLY	Material description: 1103629 - S1CBH07065PVTS070UD11001EN Ident.Code: S1CBH07065PVTS070UD11001EN Flow: 16.6GPH / 63L/H Pressure: 100PSI / 7BAR Options Included: dosing head material PV PVDF seal material T st.diaphragm / PTFE seal displacement material S Mult.-diaphragm detector opt execution of dosing head 0 w/o.vent valve, w/o. valvespr hydraulic connection 7 PVDF MNPT Connection execution 0 w. PM-Logo El power supply U 100 - 240 V cable and plug D 2m USA relay function 1 fault indicating rel.(power) control version 1 Manual+cont.+p.c+Analog.+d overpressure shut-off 0 w./o. overpressure shut-off control unit 0 HMI w.Click Wheel (0,5m ca access code 1 w. contr. access contr. dyn languages EN english approval 07 MET (USA) 1001300 Universal Control Cable: 6 ft. (2m), 5 wire, 5 pole	20-P-321-1/2/3/4	510464-DS-105	A09
32	4	3196454	VALVE-BALL,PP,0.25X.38,MAN,MPTXTB,PARKER	POLYPROPYLENE BALL VALVES MFG: PARKER PART NUMBER: PP6VMC4-MG SHAPE: CONNECTOR STYLE: TUBE TO PIPE CONNECTION TYPE: COLLET CONNECTION 1 TUBE O.D. (INCH): 3/8 CONNECTION 1 STYLE: PUSH-TO-CONNECT CONNECTION 2 THREAD SIZE (INCH): 1/4 CONNECTION 2 STYLE: MALE PIPE PERFORMANCE CHARACTERISTICS MINIMUM OPERATING TEMPERATURE: 35 °F (2 °C) MAXIMUM OPERATING TEMPERATURE: 200 °F (93 °C) MAXIMUM OPERATING PRESSURE: 150 psi (10 bar) CONNECTION TYPE: NPTF SPECIFICATIONS MET: FDA, NSF-51, NSF-61 BODY MATERIAL: POLYPROPYLENE BALL MATERIAL: POLYSULFONE SEAT MATERIAL: EPDM	20-HV-320-1/2/3/4	510464-DS-105	B01
33	4	3178030	ASSY-TURBID,W/COLM,24V,SGL,HACH,TU5300	TURBIDITY PANEL ASSEMBLY C/W CLEANING MODULE ANF DEGASSING COLUMN	20-FV-324-1/2/3/4 20-HCV-324-1/2/3/4 20-TK-324-1/2/3/4 20-HV-324-1/2/3/4 20-FV-320-1/2/3/4 20-HCV-320-1/2/3/4 20-AE/AIT-320-1/2/3/4 20-FE-320-1/2/3/4	510464-DS-105	C15
34	4	3195051	CONTROLLER,DUAL,4-20MA,HACH,SC4500,120V	CONTROLLER, UNIVERSAL, HACH MODEL SC4500 LXV525.99A11551 - DUAL DIGITAL SENSOR INPUTS (SC CONECTORS) - 5) 4-20 mA OUTPUTS - 2) SPDT RELAY OUTPUTS - NEMA 4X/IP66 ENCLOSURE - 120 VAC 50/60HZ - MOUNTING HARDWARE FOR CONTROLLER INCLUDED	20-AIT-320-1/2/3/4	510464-DS-105	C15

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
35	4	3196221	ANALYZER-TURB,HACH,TU5300,W/CLEANER	MANUFACTURER: HACH P/N: LXV445.99.53112 MODEL: TU5300SC LOW RANGE LASER TURBIIDIMETER WITH FLOW SENSOR, AUTOMATIC CLEANING, RFID, AND SYSTEM CHECK, EPA VERSION MODEL: TU5300SC SPECIFICATIONS ACCURACY: ±2% OR 0.01 NTU FROM 0 - 40 NTU ±10% OF READING FROM 40 - 1000 NTU BASED ON FORMAZIN PRIMARY STD CABLE LENGTH:1.6 M (5.25 FT) CALIBRATION METHOD: FOR FORMAZIN AND STABLCAL®: 20 NTU FROM 0 TO 40 NTU; AT 20 FNU AND 600 NTU FOR FULL RANGE CUSTOM CALIBRATION FOR UP TO 6-POINT CALIBRATIONS CERTIFICATIONS: CE COMPLIANT US FDA ACCESSION NUMBER: 1420493-000 EPA VERSION, 1420492-000 ISO VERSION AUSTRALIAN ACMA MARKING COMMUNICATION: SYSTEM CHECK & RFID CONTROLLER: SENSOR ONLY DIMENSIONS (H X W X D):249 MM X 268 MM X 190 MM ENCLOSURE RATING: ELECTRONIC COMPARTMENT IP55; ALL OTHER FUNCTIONAL UNITS IP65 WITH PROCESS HEAD/ACM ATTACHED TO THE TU5300SC/TU5400SC INSTRUMENT FITTING TYPE: SAMPLE QUICK CONNECTOR: ¼-IN. FOR ¼-IN. TUBING INSTRUMENT: WITH FLOW SENSOR AND AUTOMATIC CLEANING MODULE LIGHT SOURCE: CLASS 2 LASER PRODUCT, WITH EMBEDDED 650 NM (EPA 0.43 MW) OR CLASS 1 LASER PRODUCT, WITH EMBEDDED 850 NM (ISO), MAX. 0.55 MW (COMPLIES WITH IEC/EN 60825-1 AND TO 21 CFR 1040.10 IN ACCORDANCE WITH LASER NOTICE NO. 50)		510464-DS-105	C15
36				LOWER LIMIT OF DETECTION (LOD): 0.002 NTU MATERIAL: ASA S 777K / RAL7000, TPE RESIN ELASTOCON® STK40, THERMOPLASTIC ELASTOMER TPS-SEBS MODEL: TU5300SC MOUNTING CONFIGURATIONS: WALL MOUNT OPERATING HUMIDITY: RELATIVE HUMIDITY: 5 - 95% AT DIFFERENT TEMPERATURES, NON-CONDENSING OPERATING TEMPERATURE RANGE: 0 - 50 °C OPTIONS: PROCESS HEAD WITH FLOW SENSOR AND AUTOMATIC CLEANING MODULE POWER REQUIREMENTS (VOLTAGE): NONE RANGE: EPA: 0 - 700 NTU / FNU / TE/F / FTU 0 - 175 EBC REGULATORY: EPA REPEATABILITY: BETTER THAN 1% OF READING OR ±0.002 NTU ON FORMAZIN AT 25 °C (77 °F), WHICHEVER IS GREATER RESOLUTION: 0.0001 NTU / FNU / TE/F / FTU / EBC RESPONSE TIME: T90 <45 SECONDS AT 100 ML/MIN SAMPLE FLOW RATE: 100 - 1000 ML/MIN; OPTIMAL FLOW RATE: 200 - 500 ML/MIN SAMPLE PRESSURE: 6 BAR (87 PSI) MAXIMUM, COMPARED TO AIR AT SAMPLE TEMPERATURE RANGE FROM 2 - 40 °C (35.6 - 104 °F) SAMPLE TEMPERATURE: 2 - 60 °C (35 - 140 °F) SIGNAL AVERAGE TIME: 30 - 90 SECONDS STORAGE CONDITIONS: -40 - 60 °C (-40 - 140 °F) STRAY LIGHT: <10 MNTU SYSTEM CHECK: YES UNITS: NTU, FNU, TE/F, FTU, EBC VERIFICATION: LIQUID: STABLCAL®, FORMAZIN (0.1 - 40 NTU) DRY: GLASS ROD AT <0.1 NTU WARRANTY: 12 MONTHS			
P&ID BACKPULSE TANK/PUMP						510464-DS-106	
37	2	CFO	SULZER SUBMERSIBLE BACKPULSE PUMP	Backpulse Pump - Maximum Duty Point 3703 GPM @ 44ft TDH (22ft Static) Sulzer Submersible Pump (Wet Pit),Model #XFP255J-CB2-PE430/6,43kW-1190RPM,460/60/3,complete with contrabock impeller,double mechanical seals,bi-metal switches plus Di seal probe,15m CSA Cable and DN250 Discharge. Accessories Included: *Guide Rail Assy /w Elbow and Upper Brkt DN250 (2"Dia Guide Pipe by Others) *Hardware Kit,SS *Lifting Chain 30ft Galv *Relay CA462 Heat/Seal 115V	20-P-610-A/B	510464-DS-106	A04
38	2	3083502	CV,WFR,16"CENTERLINE,DI/SS	VALVE, CHECK, WAFER, CENTERLINE PT# 16R1644D5X, DUCTILE IRON BODY, EPDMRESILIENT SEAT, 316SS PLATE, SHAFT AND SPRINGS, 16", 150# RATING.	20-CV-602-1/2	510464-DS-106	B10

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
39	2	3090321	VALVE-BTFLY,HV,16",LUG,SS,GEAR	VALVE, BUTTERFLY, BRAY SERIES 31-169, 16" CAST IRON LUG STYLE BODY, RATED VACUUM TO 150 PSI, SS DISC AND SHAFT, EPDM SEAT, GEAR OPERATOR; BRAY ASSEMBLY ID 9C160LF169G.	20-HV-610-1/2	510464-DS-106	B03
40	1	3089342	VALVE-BALL,PVC,1.00,A/S SV,SOC,FPM,24V	VALVE, BALL, 1", TRUE UNION, PVC BODY, TEFLON SEATS, FPM O-RINGS, SOCKETWELD, GEORGE FISCHER TYPE 546, C/W PA11 SPRING RETURN FAIL CLOSE PNEUMATIC RACK AND PINION ACTUATOR PT# 199 233 075, ASSEMBLY PT# S199 233 075 C/W CSA/UL APPROVED SOLENOID PILOT VALVE 24 V/DC TYPE PV95 PT#199190554CSA	23-FV-130	510464-DS-106	B02
41	1	3089339	VALVE-BALL,FV,0.5",PVC/EPDM,SRFC,24V	VALVE, BALL, 0.5", TRUE UNION, PVC BODY, TEFLON SEATS, EPDM O-RINGS, SOCKETWELD, GEORGE FISCHER TYPE 546, C/W PA11 SPRING RETURN FAIL CLOSE PNEUMATIC RACK AND PINION ACTUATOR PT# 199 233 063, ASSEMBLY PT# S199 233 063 C/W TYPE PV95 24 V/DC SOLENOID VALVE PT# 199 190 554CSA WITH MANUAL OVERRIDE, CSA/UL APPROVED.	23-FV-330	510464-DS-106	B02
42	1	3090241	VALVE-CHK,PVC,1.00,CONE,SOC,GF,VTN	VALVE, CONE CHECK, 1" TRUE UNION, GEORGE FISCHER, PT# 161 561 114,PVC BODY, FPM SEAL, SOCKET END CONNECTIONS. CV:32 MF: 18 L/m	23-CV-130	510464-DS-106	B15
43	1	1258023	VALVE-CHK,PVC,0.50,CONE,TU,EPDM,GF	CONE CHECK VALVE MANUFACTURER: GEORG FISCHER PART NUMBER: 161 561 102 SIZE: 0.50" TYPE: 561 BODY MATERIAL: PVC SEAL MATERIAL: EPDM PRESSURE RATING: 150 psig END CONNECTIONS: TRUE UNION (SOCKET/NPT) CV:13 MF:9 L/m	23-CV-330	510464-DS-106	B15
44	1	3087944	VALVE-BALL,PVC,1.00,GF,COMBO,VENTED	VALVE, BALL, TRUE UNION, GEORGE FISCHER TYPE 546 VENTED BALL VALVE, OLD PT# V161546354, NEW PT#151546354, 1", PVC BODY, TEFLON SEATS, VITON O-RINGS, SOCKET/THREADED COMBO END CONNECTIONS.	23-HV-130	510464-DS-106	B01
45	1	3087942	VALVE-BALL,PVC,0.50,COMBO,VENTED,GF	VALVE, BALL, TRUE UNION, GEORGE FISCHER TYPE 546 VENTED BALL VALVE, PT# V161546352, 0.5", PVC BODY, TEFLON SEATS, VITON O-RINGS, SOCKET/THREADED COMBO END CONNECTIONS.	23-HV-330	510464-DS-106	B01
46	1	3067260	VALVE-BALL,0.5",316SS,1PC,THD	VALVE, BALL, PINACLE, 1/2", 1-PC REDUCED PORT, P/N 13TBV105, NPT, 316SS BODY & TRIM, PTFE SEAT & SEAL, CV = 5.5, 800# WOG, WITH LEVER LOCKING HANDLE	20-HV-602	510464-DS-106	B01

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
#REF!	1	CFO	TEMPERATURE TRANSMITTER	Temperature sensor/Transmitter RTD assembly TH13, TW type US style Manufacturer: E+H Tags: 20-TIT-301 Model: TH13-6A23X2EBA1EC 6 Thermowell Immersion length U: 16.50 Inch 16.5 inch A2 Process Connection; Material: NPT3/4 male thread; 316 3 Thermowell Shape: Tapered X Thermowell Lag T: 1.00 Inch 2 Extension: Nipple+union+nipple 316 E=4" E Sensor Type: 1xPt100 class B, 4-wire, -50-200oC B Enclosure; Cable Entry: Alu, E+H blue; NPT1/2 A Electrical Connection: **Programmable RTD TMT180 1 Additional Option 1: Not selected 2 Additional Option:E Calibration certificate 1x RTD + EN10204-3.1 material certificate incl. MTR + NACE MR0175 and MR0103, 0oC + 2 points variable, as specified C Version: Acc. to ASME PTC 19.3 TW2016,certificate for passed thermowell calculation Details: Low range value: 32 °F Upper range value: 90 °F Failure mode(1=low<3.6mA,2=high>21mA): 2 Calibration point 2: 45 °F Calibration point 3: 90 °F Medium: LIQUID Fluid type: Liquid (water) Max. temperature: 150 °F Max. pressure: 20 psi g Density: 1 lb/USgal Viscosity: 0.01 cP	20-TIT-301 RANGE: 0 - 50 DEG C	510464-DS-106	C03
#REF!	1	3136674	TRANS-LEVEL,316,3.00,FLG,118",E+H	"ENDRESS+HAUSER Transmitter, Level. Deltapilot M FMB51-CD21JD1FGK85AGJB3U [CD] Approval: CSA C/US General Purpose [2] Output: 4-20mA HART [1] Display, Operation: LCD, push button on display/electronics [J] Housing: F31 Alu, Glass window [D] Electrical Connection: Thread NPT1/2, IP66/68 NEMA4X/6P [1F] Sensor Range: 400mbar/40kPa/6psi gauge,4mH2O/13ftH2O/160inH2Ooverload: 8bar/800kPa/120psi [G] Reference Accuracy: Standard [K] Calibration; Unit: Customised level; see additional spec.. > Additional text: 0...118"" H2O [85] Probe Connection: 118 in rod, 316L [AGJ] Process Connection: 3"" 150lbs RF, 316/316Lflange ANSI B16.5 [B] Membrane Material: AlloyC [3] Fill Fluid: Synthetic oil, FDA [U] Seal: None, cell welded"	20-LIT-601 118" rod length to be finalized	510464-DS-106	C09
#REF!	1	3023463	GAUGE-PRESS,316,4.5,BCK,0.50M,30PSI,AS	PRESSURE INDICATOR ASHCROFT 45-1279SS-04B-0/30PSI DIAL SIZE: 4.5" CASE MATERIAL: PHENOLIC WINDOW MATERIAL: GLASS PROCESS CONNECTION: 1/2" NPTM, BACK WETTED PARTS MATERIAL: 316SS RANGE: 0-30 PSIG	20-PI-602	510464-DS-106	C04

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
#REF!	1	CFO	TRANS-FLOW,MAG,14.0FLG,0-4500GPM,PROMAG 400,E+H	Electromagnetic Flow meter Promag E 400, 5W4C3F, DN350 14” Manufacturer: E+H Tags: 20-FIT-602 Model: 5W4C3F-C6ILHA0DUA1K0A+DAZ1 C6 Approval: CSA C/US NI Cl.I Div.2 Gr. ABCD I Design: Fixed flange, 0 x DN inlet/ outlet runs L Power Supply: 100-240VAC/24VAC/DC H Output; Input: 4-20mA HART, pulse/freq., switch output A Housing: Compact, alu, coated 0 Cable, Not used D Electrical Connection: Thread NPT1/2 U Liner: Polyurethane A1K Process Connection: Cl.150, carbon steel, flange ASME B16.5 0 Electrodes: 1.4435/316L A Calibration Flow: 0.5% DA >>Customized Parameterization: Output 1 Z1 >>Marking: Tagging (TAG), see additional spec. Details Curr. output 1 Volume flow Current span 4...20 mA NAMUR Value 0/4 mA: 0 USgal/min Value 20 mA: 4500 USgal/min Failsafe mode current output: Max. Damping output 1: 1 s Device 1 1x TAG-stainless steel label (50105107)	20-FIT-602 RANGE: 0-4500 GPM	510464-DS-106	C10
#REF!		3104114	SWITCH-PRESS,UE,0-50PSI,J6-354	PRESSURE SWITCH, 0-50 PSI ADJUSTABLE RANGE, 1/4" NPT, 100107 UNITED ELECTRIC CONTROLS, J6-354	20-PSH-601 20-PSH-602 SET POINT: 30 PSIG	510464-DS-106	C02
#REF!	1	CFO	16" BASKET STRAINER	IFC Model: 16-B125FIB1 Strainer type: Cast Iron Basket Strainer Inlet/Outlet Connection: 16”, 125#. FF Flanges per ASME B16.1 Body, Cover & Manifold Material: A126-B CAST IRON Basket filtration: 0.41 mm perforated screen. Option for 2mm at no extra cost. Basket Material: 304 Stainless Steel Cover Type: Bolted Flange Cover Gasket: Graphite DP Connections: ¾” NPT Instrumentation: Differential Pressure Switch with 2.5” dial, isolation valves and line filters. Drain Connection: 2” NPT c/w Plug Design Pressure: 150 PSI @ 150°F	20-SCN-600 C/W 20-DPS-600	510464-DS-106	B13
	1	3067264	VALVE,BALL,2",316SS,1PC,THD	VALVE, BALL, PINACLE, 2", 1-PC REDUCED PORT, P/N 13TBV12, NPT,316SS BODY & TRIM, PTFE SEAT & SEAL, CV = 60, 1000# WOG, WITHLEVER LOCKING HANDLE.	20-HV-600	510464-DS-106	B01
P&ID EJECTOR FOR PERMEATE UPSTREAM LINES						**510464-DS-109 SHEET 1**	
55	1	3178110	ASSY-EJECTOR,316,24VDC,SS TUBE	ASSEMBLY EJECTOR (AIR ASSEMBLY AND WATER ASSEMBLY)	20-HV-802-5 20-PCV-801-5 20-FV-802-5 20-FV-801-5 20-E-801-5 20-HV-801-5 20-HV-803-5	510464-DS-109 SHEET 1	A06
56	1	3178110	ASSY-EJECTOR,316,24VDC,SS TUBE	ASSEMBLY EJECTOR (AIR ASSEMBLY AND WATER ASSEMBLY)	20-HV-802-6 20-PCV-801-6 20-FV-802-6 20-FV-801-6 20-E-801-6 20-HV-801-6 20-HV-803-6	510464-DS-109 SHEET 1	A06
P&ID EJECTOR FOR COMMON PERMEATE HEADER						**510464-DS-109 SHEET 2**	
56	1	3178110	ASSY-EJECTOR,316,24VDC,SS TUBE	ASSEMBLY EJECTOR (AIR ASSEMBLYAND WATER ASSEMBLY)	20-HV-802-7 20-PCV-801-7 20-FV-802-7 20-FV-801-7 20-E-801-7 20-HV-801-7 20-HV-803-7	510464-DS-109 SHEET 2	A06
P&ID - RAS/DRAIN PUMP AND ACCESSORIES						**510464-DS-110**	

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
57	4	CFO	SULZER RAS/DRAIN PUMP	Sulzer End Suction Centrifugal Pump Model #APT52-16 (SO) /w Open Impeller,Cast Iron Volute/Stainless Steel Impeller,JC 5610 Cartridge Seal (SiC/SiC/EPDM,No Flush),Standard Baseplate,Severe duty 590RPM 30HP TEFC T 460/60/3 Foot-mounted,Inverter Duty Electric Motor Designed for Max Ras flow of 6,302GPM @ 12ft TD, Minimum RAS Flow : 3,125 GPM Minimum flow (For Drain cycle): 1,900 GPM Minimum continuos stable flow: 1,550 GPM	20-P-501-1/2/3/4	510464-DS-110	A04
58	8	3023136 C/W Diaphragm seal by the vendor	GAUGE-PRESS,316,4.5,BTM,0.5M,15PSI,AS	PRESSURE INDICATOR ASHCROFT 45-1279SS-04L-0/15PSI DIAL SIZE: 4.5" CASE MATERIAL: PHENOLIC WINDOW MATERIAL: GLASS PROCESS CONNECTION: 1/2" NPTM, LOWER WETTED PARTS MATERIAL: 316SS RANGE: 0-15 PSIG Costomized with diaphragm seal by the vendor	20-PI-503-1/2/3/4 20-PI-504-1/2/3/4 RANGE: 0-15 PSIG C/W diaphragm seal by the vendor	510464-DS-110	C04
59	4	CFO	TRANS-FLOW,MAG,16.0FLG,0-7000GPM,PROMAG 400,E+H	Electromagnetic Flow meter Promag E 400, 5W4C4H, DN400 16” Manufacturer: E+H Tags: 20-FIT-507-1, 20-FIT-507-2, 20-FIT-507-3, 20-FIT-507-4 Model: 5W4C4H-C6ILHA0DUA1K0A+DAZ1 C6 Approval: CSA C/US NI Cl.I Div.2 Gr. ABCD I Design: Fixed flange, 0 x DN inlet/ outlet runs L Power Supply: 100-240VAC/24VAC/DC H Output; Input: 4-20mA HART, pulse/freq., switch output A Housing: Compact, alu, coated 0 Cable, Not used D Electrical Connection: Thread NPT1/2 U Liner: Polyurethane A1K Process Connection: Cl.150, carbon steel, flange ASME B16.5 0 Electrodes: 1.4435/316L A Calibration Flow: 0.5% DA >>Customized Parameterization: Output 1 Z1 >>Marking: Tagging (TAG), see additional spec. Details Curr. output 1 Volume flow Current span 4...20 mA NAMUR Value 0/4 mA: 0 USgal/min Value 20 mA: 6500 USgal/min Failsafe mode current output: Max. Damping output 1: 1 s Device 1 1x TAG-stainless steel label (50105107)	20-FIT-507-1/2/3/4 RANGE: 0-7000 GPM	510464-DS-110	C10
60	16	3067262	VALVE-BALL,1",316SS,1PC,THD	VALVE, BALL, PINACLE, 1", 1-PC REDUCED PORT, P/N 13TBV11,NPT, 316SS BODY & TRIM, PTFE SEAT & SEAL, CV = 15.5,800# WOG, WITH LEVER LOCKING HANDLE.	20-HV-503-1/2/3/4 20-HV-504-1/2/3/4 20-HV-506-1/2/3/4 20-HV-505-1/2/3/4	510464-DS-110	B01
61	4	CFO	CV,WFR,18"CENTERLINE,DI/SS	VALVE, CHECK, WAFER, CENTERLINE PT# 18R1644D5X, DUCTILE IRON BODY, EPDMRESILIENT SEAT, 316SS PLATE, SHAFT AND SPRINGS, 18", 150# RATING.	20-CV-501-1/2/3/4	510464-DS-110	B10
62	4	CFO	VALVE-KNIFEGATE,316,18.0, SV,LG,24,UD	18" Orbinox Series 22, P/N: 22-3636RE-18.0-HW KNIFEGATE V. SERIES 22 DN450 (18") ASME-150 Bidirectional Body CF8M Gate AISI 316 Seat EPDM Packing ST (Synth. fib.) Yoke AISI 304 Actuator Manual Handwheel Rising Stem Media Liquid PS 10.0 bar 150.0 psi TS -20.0 / 80.0 °C; -4.0 / 176.0 °F DP Act 5.0 bar	20-HV-501-1/2/3/4	510464-DS-110	B17

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
	1	CFO	VALVE-KNIFEGATE,316,36.0,A/A SV,LG,24,UD/LS	36" Orbinox Series 20 P/N: 20-3636RE-36.0-DARDC-SOL-TRSTOP-PROX KNIFEGATE V. SERIES 20 DN900 (36") ASME-150A Unidirectional Body CF8M Gate AISI 316 Seat EPDM Packing ST (Synth. fib.) Yoke AISI 304 Actuator Pneumatic RDC Double Acting Pmin 6.0 bar / Pmax 8.0 bar Solenoid Valve NUMATICS 153SA43CM000030 NPT 3/8 24 V DC Monostable (1 Coil) Valve Electrical Failure Position Close 2x Inductive Switch TELEMECANIQUE XS618B1MAL2 , 2 wire, NO, (24...240) Vac/dc, LED, IP68, (-25...70) °C, cable 2 m Standard DA CYLRDC-16X37 TRAVEL STOP Installed - When the valve is opened, it will open to 95% (remain 5% closed) Media Liquid PS 7.0 bar 100.0 psi TS -20.0 / 80.0 °C; -4.0 / 176.0 °F DP Act 2.0 bar	16-FV-510	510464-DS-110	B18
63	1	CFO	HV,KNIFEGATE,4",LUG,UNI-DIR	4" Manual Orbinox Knife Gate Series 20 P/N: 20-3636RE-04.0-HW KNIFEGATE V. SERIES 20 DN100 (4") ASME-150 Unidirectional Body CF8M Gate AISI 316 Seat EPDM Packing ST (Synth. fib.) Yoke AISI 304 Actuator Manual Handwheel Rising Stem Media Liquid PS 10.0 bar 150.0 psi TS -20.0 / 80.0 °C; -4.0 / 176.0 °F	16-HV-705	510464-DS-110	B17
64	1	3090263	HV,DIA,4",FLG,PVC/TFE	VALVE, DIAPHRAGM, MANUAL, GEORGE FISCHER TYPE 317, PART# 161 317 340, 4", PVC BODY, TEFLON DIAPHRAGM, FLANGED CONNECTIONS.	16-HV-700	510464-DS-110	B22
65	1	CFO	VALVE-KNIFEGATE,316,4.0,A/A SV,LG,24,UD/LS	4" Orbinox Knife Gate Series 20, P/N: 20-3636RE-04.0-DARDC-SOL-PROX KNIFEGATE V. SERIES 20 DN100 (4") ASME-150 Unidirectional Body CF8M Gate AISI 316 Seat EPDM Packing ST (Synth. fib.) Yoke AISI 304 Actuator Pneumatic RDC Double Acting Pmin 6.0 bar / Pmax 8.0 bar Solenoid Valve NUMATICS 082SA43CM000030 NPT 1/4 24 V DC Monostable (1 Coil) Valve Electrical Failure Position Close Junction Box 2x Inductive Switch TELEMECANIQUE XS618B1MAL2 , 2 wire, NO, (24...240) Vac/dc, LED, IP68, (-25...70) °C, cable 2 m CYLRDC-04X05 Media Liquid PS 10.0 bar 150.0 psi TS -20.0 / 80.0 °C; -4.0 / 176.0 °F	16-FV-700	510464-DS-110	B18

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
66	1	CFO	TRANS-FLOW,MAG,3.0FLG,0-130GPM,PROMAG 400,E+H	Electromagnetic Flow meter Promag E 400, 5W4C80, DN80 3” Manufacturer: E+H Tags: 16-FIT-707 Model: 5W4C80-C6ILHA0DUA1K0A+AADAZ1 C6 Approval: CSA C/US NI Cl.I Div.2 Gr. ABCD I Design: Fixed flange, 0 x DN inlet/ outlet runs L Power Supply: 100-240VAC/24VAC/DC H Output; Input: 4-20mA HART, pulse/freq., switch output A Housing: Compact, alu, coated 0 Cable, Not used D Electrical Connection: Thread NPT1/2 U Liner: Polyurethane A1K Process Connection: Cl.150, carbon steel, flange ASME B16.5 0 Electrodes: 1.4435/316L A Calibration Flow: 0.5% DA >>Customized Parameterization: Output 1 Z1 >>Marking: Tagging (TAG), see additional spec. Details Curr. output 1 Volume flow Current span 4...20 mA NAMUR Value 0/4 mA: 0 USgal/min Value 20 mA: 130 USgal/min Failsafe mode current output: Max. Damping output 1: 1 s Device 1 1x TAG-stainless steel label (50105107)	16-FIT-707 RANGE: 0-130 GPM	510464-DS-110	C10
P&ID - NaOH CHEMICAL SKID						**510464-DS-111 SHEET 1**	
69	1	CFO	Floor mounted, Dual metering pump, Chemical injection skid For NaOH (Sodium Hydroxide)	See the drawing 1061538-200 for Unit General arrangment Motor-DrivenMeteringPumpSigmaXControlType#Sigma3-S3Cb Design for two pumps to operate in a Duty/Stand-by configuration with only one pump operating at a time. As standard, the package includes a 0-160 PSI pressure gauge, a calibration column, back pressure valve and a pressure relief valve. Designed for use with ProMinent DN32 sized Sigma pumps. Line Size: 1.5 Inch Piping Material: PVC Seal Materials: EPDM Design Pressure: 150psi Flow: 132.1GPH / 500L/H Pressure: 100PSI / 7BAR	15-P-301-A/B 15-FQI-301 15-HV-300 15-HV-313 15-HV-312 15-HV-322 15-HV-323 15-HV-311 15-HV-321 15-PSV-310 15-PSV-320 15-HV-302 15-HV-320 15-HV-301 15-PCV-301	510464-DS-111 SHEET 1	A09
P&ID - CITRIC ACID AND SODIUMHYPOCHLORITE SKIDS						**510464-DS-111 SHEET 2**	
72	1	CFO	PUMP-CENT,DB9V,MAG,1HP,FKM,460/3/60,FT	SYSTEM1.SodiumHypochloriteDosingSkid Chemical: Sodium Hypochlorite 12% Viscosity (at operating temperature): 2.5 cPs Operating flow rate: -Maintenance Clean: 0.52 USGPM-0.62 USGPM -Recovery Clean: 2.88 USGPM-3.41 USGPM Discharge pressure: 20 psig (customer to specify) Operating temperature: 20 °C Ambient temperature: 10-25 °C Area classification: non-hazardous area Location: Indoor heated *Please, see pump performance curve to determine flow capacity and discharge pressure. SCOPE OF SUPPLY Dual-pump (duty/back-up) floor-mounted skid. The system is designed as per attached drawing# 1122683-200 R0-System 1 List of main components: Pump (Qty:2) -Tags: 23-P-101-A/B -Pump type: MAG Drive Pump -Model: DB9V-R-FF-M219 -Body:PVDF -Impeller Bushing: Ceramic -O-Ring: FKM -Connection: FRP ANSI150# -Impeller Size: 4.18" -Magnet Set: 8-Pole -Motor: 1.0 HP, 3 ph/60 Hz/208-230/460V, 3450 rpm, TEFC	23-P-101-A/B 23-CV-105-A/B 23-HCV-105 23-HCV-106 23-PSV-101 23-STR-103 23-HV-101 23-HV-102 23-HV-103-A/B 23-HV-104-A/B 23-HV-107-A/B 23-HV-106-A/B 23-CV-105-A/B 23-HV-108 23-PI-101 23-PI-102 23-FIT-101 23-FV-105	510464-DS-111 SHEET 2	A09

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

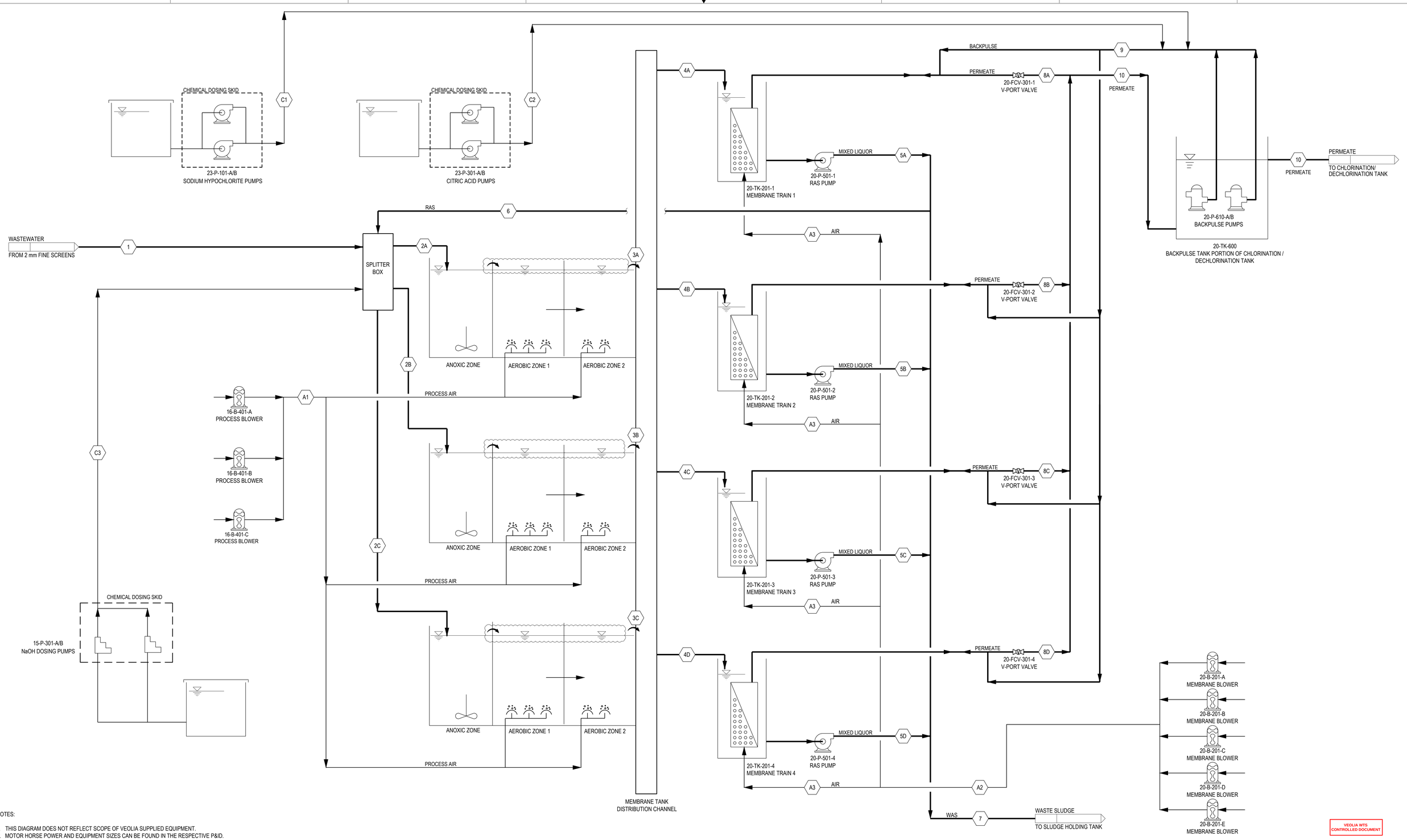
S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
75	1	CFO	PUMP-CENT,DB9V,MAG,1HP,EPDM,460/3/60,FT	SYSTEM2.CitricAcidDosingSkid Chemical: Citric Acid 50% Viscosity (at operating temperature): 20 cPs Operating flow rate: -Maintenance Clean: 1.02 USGPM-1.2 USGPM -Recovery Clean: 1.12 USGPM-1.32 USGPM Discharge pressure: 20 psig (customer to specify) Operating temperature: 20 °C Ambient temperature: 10-25 °C Area classification: non-hazardous area Location: Indoor heated *Please, see pump performance curve to determine flow capacity and discharge pressure. SCOPE OF SUPPLY Dual-pump (duty/back-up) floor-mounted skid. The system is designed as per attached drawing# 1122685-200 R0-System 2. List of main components: Pump (Qty:2) -Tags: 23-P-301-A/B -Pump type: MAG Drive Pump -Model: DB9V-R-E-FF-M219 -Body:PVDF -Impeller Bushing: Ceramic -O-Ring: EPDM -Connection: FRP ANSI150# -Impeller Size: 4.18" -Magnet Set: 8-Pole -Motor: 1.0 HP, 3 ph/60 Hz/208-230/460V, 3450 rpm, TEFC	23-P-301-A/B 23-CV-305-A/B 23-HCV-305 23-HCV-306 23-PSV-301 23-STR-303 23-HV-301 23-HV-302 23-HV-303-A/B 23-HV-304-A/B 23-HV-307-A/B 23-HV-306-A/B 23-CV-305-A/B 23-HV-308 23-PI-301 23-PI-302 23-FIT-301 23-FV-305	510464-DS-111 SHEET 2	A09
	1	3084450	SWITCH-FLOAT,KYNAR,240VAC/VDC,KO,20FT	LEVEL SWITCH FLOAT, KOBOLD PT# NCK-2554, 20' CALBE W/ PVC JACKET, 1/8" NPT TOP MOUNTED CONNECTION, 1" X 1" FLOAT. KYNAR, 240 VAC AC/DC @ 0.5 AMPS.	23-LSL-301	510464-DS-111 SHEET 2	C09

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
			P&ID, AIR COMPRESSOR			**510464-DS-112**	
76	2	CFO	COMPRESSOR-AIR,10 HP,120 GAL,V,ATLAS COPCO	CR10-TSP-120 Gal Vertical 460/3/60-PS,TN4 Atlas Copco 10 HP two-stage pressure lubricated packaged piston air compressor mounted on 120 gallon vertical air vessel. Key feature: • Cast iron design to ensure durability and reliability for all demanding applications • Fully enclosed belt guard for additional equipment safety • ASME safety valves • Stainless steel valves • Aftercooler included for lower compressed air outlet temperature • Start/Stop pressure switch control - Magnetic motor startr with NEMA 4 panel (To be removed from the compressor by the vendor) • Loose timed drain • Comes equipped with head unloaders • TEFC motor • 1-year bumper-to-bumper warranty Characteristics • Maximum air pressure: 175 psig • Free air delivery:23.8 cfm @ 150 psig • Connection: 1" NPT • Voltage: 480V / 3Ph / 60Hz • Dimensions: 40" x 30" x 77" (L x W x H) • Weight: 599 lbs UD15+ COALESCENT FILTER • 2-in-1 combination coalescing filter • Oil removal down to 0.0009 ppm • Particle removal down to 0.01 µm • Pressure drop indicator on filter	90-AC-001-A/B 90-PSV-001-A/B 90-HV-001-A/B 90-PSL-001-A/B 90-PI-001-A/B 90-F-001-A/B 90-FV-001-A/B 90-TK-001-A/B	**510464-DS-112**	A07
	2	CFO	Compressor Local Control/Starter Panel (By Veolia)	Compressor Local Control/Starter Panel (By Veolia)	90-LCP-001A 90-LCP-001B	**510464-DS-112 (BY ELECTRICAL)**	
77	2	CFO	DRYER-AIR,FX15,30CFM,ATLAS COPCO	Atlas Copco FX15 refrigerant air dryer. Removes any condensate from the compressed air and provides a steady pressure dew point as low as +4°C. Characteristics • Maximum working pressure: 232 psig • Inlet capacity: 30 cfm • Pressure drop at full flow: 3.63 psi • Connections: 3/4 " NPT • Voltage: 115V / 1Ph / 60Hz • Dimensions: 19.4 x 13.8 x 17.7 inches (L x W x H) • Weight: 44 lbs	90-DR-001-A/B	510464-DS-112	A08
78	4	3088952	VALVE-BALL,316,0.75,2PC THD	VALVE, BALL, 3/4", 2-PC FULL PORT,NPT, 316SS BODY & TRIM, PTFE SEAT & SEAL, CV = 55, 1000#WOG, WITH LEVER LOCKING HANDLE. PINACLE P/N 13TBV2075	90-HV-002-A/B 90-HV-003-A/B	510464-DS-112	B01

510464- CAESAR LANES- EQUIPMENT BILL OF MATERIAL- REV D

S. No	Qty	SAP Part No. OR CFO	Primary Description	Complete Description	Tags	Drawing No.	Cutsheet Binder Tab #
79	1	3148892	ASSY-INSTR,AIR,30CFM,NUM,W/ PNL	MAIN AIR COMPONENT KIT FOR AIR COMPRESSOR INSTRUMENT AIR ASSEMBLY (MOUNTED ON PANEL) MANUFACTURER: ASCO/NUMATICS (EMERSON) MFR. P/N: 1NCS22-118012-2 QTY 1 - P/N: A652A0000012901, 652 AIR PREP ASSEMBLY QTY 1 - P/N: 8652AD004TA0000, 652 DIVERTER BLOCK QTY 1 - P/N: 8652A3M04011100, 652 SHUT-OFF QTY 1 - P/N: 8652AFML4HA000N, 652 COAL FILTER QTY 1 - P/N: 8652A2M040A0000, 652 SHUT-OFF QTY 1 - P/N: 8652AD004TA0000, 652 DIVERTER BLOCK QTY 1 - P/N: 8652AK004N122G0, 652 REGULATOR QTY 2 - P/N: P699AT502467001, SUPPORT BRACKET QTY 1 - P/N: A652A0000012584, 652 AIR PREP ASSEMBLY QTY 1 - P/N: 8652A2M040A0000, 652 SHUT-OFF QTY 1 - P/N: 8652AD004TA0000, 652 DIVERTER BLOCK QTY 1 - P/N: P699AT502467001, SUPPORT BRACKET QTY 1 - P/N: 129-197, 1/2 NPT S.S. PIPE PLUG QTY 4 - P/N: INB103-102-023, MALE CONNECTOR QTY 1 - P/N: NS5752, MOUNTING PLATE QTY 6 - P/N: NS3878, 1/4-20 X 1 1/4 SS SHCS QTY 6 - P/N: NS2621, 1/4-20 SS HEX NUT QTY 2 - P/N: NS4276 or AP25P-04-F2-QD, PRESSURE SWITCH QTY 2 - P/N: NS5751, 5M CABLE QTY 1 - P/N: NS3567, REDUCER BUSHING QTY 3 - P/N: QRTU50BL-1, 1/2 OD BLUE TUBING _____ MAX. FLOW: 30.5 SCFM (864 L/min), P1 = 91 PSI (6.3 bar) w/ ΔP = 5 PSI	90-HV-005 90-HV-006 90-HV-004 90-F-002 90-PDI-001 90-PCV-001 90-PSLL-002 90-PSL-003	510464-DS-112	C18



NOTES:

1. THIS DIAGRAM DOES NOT REFLECT SCOPE OF VEOLIA SUPPLIED EQUIPMENT.
2. MOTOR HORSE POWER AND EQUIPMENT SIZES CAN BE FOUND IN THE RESPECTIVE P&ID.

VEOLIA WTS CONTROLLED DOCUMENT

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
D	ISSUED FOR APPROVAL		MA	JK	RP	02 DEC 24
C	ISSUED FOR APPROVAL		MA	RP	RP	14 NOV 24
B	ISSUED FOR APPROVAL		PT	-	-	20 MAR 23
A	INITIAL RELEASE		SRP	-	-	10 MAR 23

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TOLERANCES UNLESS NOTED
DECIMALS: .X, .XX, .XXX
ANGLES
FRAC

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE
WTF MBR SYSTEM

PROCESS FLOW DIAGRAM

DRAWING NUMBER: 510464-WTS-PR-SYS-EN11-DI-001
REVISION: D
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.:
SCALE: NONE
SIZE: D
SHEET: 1 OF 2
LAST SAVED: Monday, December 2, 2024 8:57:34 PM

FILE LOCATION: C:\Users\YSA746\AppData\Local\Temp\AcPublish_23888\510464-WTS-PR-SYS-EN11-DI-001.dwg

PFD Flow Data

Caesar's Lane

510464

Stream ID	Stream Description		Type of Flow	Units	MIN Minimum Equipment Sizing	Init ADF Initial Flow	ADF Average Day Flow	MMF Maximum Month Flow	MMF-1 Maximum Month Flow With One Train Offline	MDF Maximum Day Flow	MDF N-1 Maximum Day Flow With One Train Offline	PHF Peak Hour Flow	Buildout Maximum Equipment Sizing
	Plant Capacity			**MGD**	**1.00**	**3.00**	**5.00**	**8.00**	**8.00**	**11.00**	**11.00**	**16.50**	**16.50**
	Number of Bio Trains				**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
-	**Number of membrane trains running**		-	*n*	**1**	**2**	**4**	**4**	**3**	**4**	**3**	**4**	**4**
-	**Modules per Train**		-	*n*	*352*	352	352	352	352	352	352	352	384
1	Plant Raw Influent Flow (Total)		Continuous	gpm	694	2,083	3,472	5,556	5,556	7,639	7,639	11,458	11,458
2A/B/C	Bioreactor Influent Flow (Per Bio Train)		Continuous	gpm	231	694	1,157	1,852	1,852	2,546	2,546	3,819	3,819
3A/B/C	Bioreactor Overflow (Per Bio Train)		Continuous	gpm	231	694	1,157	1,852	1,852	2,546	2,546	3,819	3,819
-	Membrane Recycle Ratio [R]		-	-	4.5	7.0	4.0	4.0	3.0	3.0	2.3	2.2	2.2
-	Membrane Feed Activated Sludge Flow (Total) [(R+1) × Q]		Continuous	gpm	3,819	16,667	17,361	27,778	22,222	30,556	25,208	36,667	36,667
4A/B/C/D	Membrane Feed Activated Sludge Flow (Per Train) [(R+1) × Q]		Continuous	gpm	3,819	8,333	4,340	6,944	7,407	7,639	8,403	9,167	9,167
5A/B/C/D	Membrane Recirculated Activated Sludge (RAS) Flow (Per Train) [R × Q]		Continuous	gpm	3,125	7,292	3,472	5,556	5,556	5,729	5,856	6,302	6,302
	Membrane Tank Drain Flow		Intermittent	gpm					1,995				1,995
6	Membrane Recirculated Activated Sludge (RAS) Flow (Total) [R × Q]		Continuous	gpm	3,125	14,583	13,889	22,222	16,667	22,917	17,569	25,208	25,208
7	Waste Activated Sludge (WAS)	Volume	Daily Average	gpd	4,900	11,000	28,500	50,500	50,500	70,000	70,000	70,000	70,000
		Wasting Duration Per Day	-	hours	8	8	8	8	8	8	8	8	8
		Flow	Intermittent	gpm	10	23	59	105	105	146	146	146	146
8A/B/C/D	Permeate Flow (Per Train)	Net [Q]	Net	gpm	694	1,042	868	1,389	1,852	1,910	2,546	2,865	2,865
		Instantaneous	Instantaneous	gpm	736	1,104	920	1,625	2,167	2,234	2,979	3,352	3,438
9	Backpulse Flow	Backpulse	Intermittent	gpm					3,394				3,703
		Maintenance Clean	Intermittent	gpm					1,555				1,696
		Recovery Clean	Intermittent	gpm					1,555				1,696
10	Permeate Flow (Total)	Net [Q]	Net	gpm	694	2,083	3,472	5,556	5,556	7,639	7,639	11,458	11,458
		Instantaneous	Instantaneous	gpm	736	2,208	3,681	6,500	6,500	8,938	8,938	13,406	13,750
Chemical Flows													
C1	Sodium Hypochlorite (12% w/v) (10.3% w/w solution)	Maintenance Clean	Intermittent	gpm					2.58				2.82
		Recovery Clean	Intermittent	gpm					14.22				15.51
C2	Citric Acid (50% w/w solution)	Maintenance Clean	Intermittent	gpm					5.02				5.47
		Recovery Clean	Intermittent	gpm					5.52				6.02
C3	NaOH (25%)		Continuous	gpm					TBD				1.67
Air Flows													
A1	Process Air to Aerobic Tank		Continuous	scfm	4,076	4,076	4,076	4,076	4,076	4,076	4,076	4,076	4,076
A2	Membrane Air (Total)	Leap Low	Continuous	icfm	740	1,480	2,961	2,961	2,221	2,961	2,221	2,961	3,221
		Leap High	Continuous	icfm	1,480	2,961	5,922	5,922	4,441	5,922	4,441	5,922	6,442
A3	Membrane Air (Per Train)	Leap Low	Continuous	icfm					740				805
		Leap High	Continuous	icfm					1,480				1,611

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
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C	ISSUED FOR APPROVAL		MA	RP	RP	14 NOV 24
B	ISSUED FOR APPROVAL		PT	-	-	20 MAR 23
A	INITIAL RELEASE		SRP	-	-	10 MAR 23

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TOLERANCES UNLESS NOTED
DECIMALS .X .XX .XXX
ANGLES
FRAC

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE
WTF MBR SYSTEM

PROCESS FLOW TABLE

DRAWING NUMBER: 510464-WTS-PR-SYS-EN11-DI-001
REVISION: D
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.:
SCALE: NONE
SIZE: D
SHEET: 2 OF 2
LAST SAVED: Monday, December 2, 2024 8:57:34 PM

FILE LOCATION: C:\Users\YSA7A6\AppData\Local\Temp\AcPublish_23888\510464-WTS-PR-SYS-EN11-DI-001.dwg

VEOLIA
Water Technologies & Solutions

CAESARS LANE WASTEWATER TREATMENT FACILITY (WTF) MBR SYSTEM

PIPING & INSTRUMENTATION DIAGRAMS

VEOLIA WTS
CONTROLLED DOCUMENT

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
E	REVISED AS NOTED	-	NE	MR	KK	08 MAY 25
D	REVISED AS NOTED	-	SBN	MR	KK	25 NOV 24
C	REVISED AS NOTED	-	AS	MR	KK	23 JAN 24
B	REVISED AS NOTED	-	PT	MR	KK	23 MAR 23
A	INITIAL RELEASE	-	PT	MR	KK	17 FEB 23

TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X
.XX FRAC
.XXX

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VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

P&ID
TITLE PAGE

DRAWING NUMBER: 510464-WTS-PR-SYS-EN21-DS-100
REVISION: E
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.:
SCALE: NONE
SIZE: D
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CONTROL VALVE ACTUATORS

ACTUATED VALVE OPERATION IS NORMALLY CLOSED UNLESS MARKED OTHERWISE

- PISTON DOUBLE ACTING
- PISTON SPRING TO OPEN
- PISTON SPRING TO CLOSE
- DIAPHRAGM DOUBLE ACTING
- DIAPHRAGM SPRING TO OPEN
- DIAPHRAGM SPRING TO CLOSE
- DIAPHRAGM DOUBLE BALANCING
- BACK PRESSURE CONTROL (EXTERNAL REGULATING)
- BACK PRESSURE CONTROL (INTERNAL REGULATING)
- PRESSURE REDUCING (EXTERNAL REGULATING)
- PRESSURE REDUCING (INTERNAL REGULATING)
- (M) ROTARY MOTOR ANALOG
- M ROTARY MOTOR DIGITAL
- I/P CONVERTER
- POSITIONER
- TRAVEL STOP
- GEAR MANUAL GEAR WHEEL
- CHAIN MANUAL CHAIN WHEEL
- S, A, B SOLENOID
- S, A, B, C SOLENOID 3 WAY
- S, A, B, C, D SOLENOID 4 WAY

VALVE SYMBOLS

OPEN DURING NORMAL PROCESS OPERATION — CLOSED DURING NORMAL PROCESS OPERATION

- GATE (OR GENERIC)
- BALL
- BUTTERFLY
- NEEDLE
- GLOBE
- DIAPHRAGM
- ANGLE
- PLUG
- PINCH
- V–BALL
- K KNIFE GATE K
- UPWARD OPENING SLIDING GATE
- DOWNWARD OPENING SLIDING GATE
- MANUAL BLAST GATE
- BACKFLOW PREVENTER
- CHECK
- INJECTION QUILL
- FOOT
- FLOAT
- MUD
- 3 WAY
- 4 WAY
- 5 WAY
- 6 WAY
- 2 VALVE MANIFOLD
- 3 VALVE MANIFOLD
- 5 VALVE MANIFOLD
- SAMPLE

RELIEF

- PRESSURE SAFETY
- VACUUM SAFETY
- MULTIFUNCTION
- PRESSURE RUPTURE DISK
- VACUUM RUPTURE DISK
- AIR RELEASE
- VACUUM BREAKER
- VENT VENT
- GROUND
- DRAIN DRAIN

PUMPS, BLOWERS, & COMPRESSORS

- CENTRIFUGAL PUMP
- CENTRIFUGAL/ REGENERATIVE BLOWER
- PROPELLER PUMP
- ROTARY LOBE COMPRESSOR BLOWER
- METERING PUMP
- AIR OPERATED DOUBLE DIAPHRAGM PUMP
- VACUUM PUMP (DRY)
- POSITIVE DISPLACEMENT PUMP
- VACUUM PUMP LIQUID RING
- VERTICAL TURBINE PUMP
- AIR COMPRESSOR PISTON
- CAN PUMP
- AIR COMPRESSOR ROTARY SCREW
- WELL PUMP
- REFRIGERATED AIR DRYER
- DRUM PUMP
- FAN
- HP LP ERI PRESSURE EXCHANGER
- SUBMERSIBLE SUMP PUMP
- M MOTOR
- HP LP HYDRAULIC PRESSURE BOOSTER
- PROGRESSIVE CAVITY PUMP

FLOW ELEMENT

- PADDLE WHEEL
- ANNUBAR
- FLOW NOZZLE
- FLUME
- M MAGNETIC
- PITOT
- SONIC/ ULTRASONIC
- TURBINE
- VENTURI TUBE
- VORTEX
- MASS FLOW/ CORIOLIS
- ROTAMETER
- FG IN–LINE FLOW GLASS
- FLOW STRAIGHTENER
- FIXED ORIFICE
- ADJUSTABLE ORIFICE
- RESTRICTED ORIFICE
- RESTRICTED ORIFICE ANGLE
- ORIFICE PLATE QUICK–CHANGE

CONNECTIONS

- FLANGE
- FLANGE BLIND
- MECHANICAL COUPLING OR VICTAULIC
- MECHANICAL COUPLING OR VICTAULIC PLUG
- SANITARY
- SANITARY PLUG
- THREADED
- THREADED PLUG
- SOCKET
- UNION
- CAMLOCK
- CAMLOCK PLUG
- HOSE BARB
- WELDED PIPE CAP
- PLAIN END PIPE COUPLING
- REDUCER
- COMPRESSION FITTING
- COMPRESSION FITTING PLUG
- SPECTACLE BLIND OPEN
- SPECTACLE BLIND CLOSED

HEATING

- TANK HEATER
- HEAT EXCHANGER
- IN–LINE HEATER
- PLATE & FRAME HEAT EXCHANGER
- DESUPERHEATER

FILTERS

- FIXED SCREEN
- TOP HAT STRAINER
- BAR SCREEN
- HEPA FILTER
- Y STRAINER
- CONICAL STRAINER
- F FILTER
- PUMP SCREEN
- ST STEAM TRAP
- R/T RESIN TRAP

RO/UF

- FOUR PORT HOUSING
- TWO PORT HOUSING
- END PORT HOUSING
- MEMBRANE MODULE

VESSELS/TRIM

- CONICAL BOTTOM TANK
- TANK (CLOSED TOP)
- TANK (OPEN TOP)
- DOMED TANK
- PRESSURE VESSEL HORIZONTAL/ VERTICAL OR RECEIVER
- M PROPELLER AGITATOR
- VB VORTEX BREAKER
- VESSEL INSULATION
- LEVEL GLASS
- ELLIPTICAL MANWAY
- MANHOLE
- MANHOLE W/ DAVIT ARM
- VESSEL SIGHT GLASS
- WATER LEVEL
- LADDER/ PLATFORM

MISCELLANEOUS

- MUFFLER
- EDUCTOR
- STATIC MIXER
- EXPANSION JOINT
- SILENCER
- VIBRATION ISOLATOR
- HIGH PRESSURE FLEXIBLE CONNECTOR
- INJECTION SPARGER
- DIAPHRAGM SEAL/ GAUGE GUARD
- PULSATION DAMPENER
- SPRAYER NOZZLE
- DESICCANT AIR DRYER
- HYDROMETER POT
- COARSE BUBBLE DIFFUSER ELEVATION VIEW
- FINE BUBBLE DIFFUSER ELEVATION VIEW
- THERMOWELL
- TOP MOUNT LEVEL SWITCH
- ULTRASONIC LEVEL
- CALIBRATION COLUMN
- XXX XXX PIG TAIL
- ION EXCHANGE BOTTLE

SCOPE BREAK

CLIENT/OTHER — VEOLIA

MATERIAL BREAK

MATERIAL A — MATERIAL B

PIPE INSULATION/ DOUBLE CONTAINMENT

PP 2"

("PP" INDICATES PERSONNEL PROTECTION –OPTIONAL)

LINE TYPES

- PRIMARY PROCESS
- SECONDARY PROCESS
- SAMPLE/DRAINS/ VENTS/ETC
- PRIMARY PROCESS (BY OTHERS)
- SECONDARY PROCESS (BY OTHERS)
- FUTURE
- EQUIPMENT LIMIT OR BOUNDARY LINE
- EQUIPMENT
- EQUIPMENT (BY OTHERS)
- FLEX HOSE/TUBING
- SOFTWARE–LINK
- ELECTRICAL
- ELECTROMAGNETIC OR SONIC SIGNAL (WIRELESS)
- PNEUMATIC
- HYDRAULIC SIGNAL
- CAPILLARY TUBING
- HEAT–TRACING
- STEAM–TRACE
- ELECTRICAL–TRACE

MISCELLANEOUS LINE OBJECTS

- SLOPE
- CONTINUATION SYMBOL
- CONTINUATION SYMBOL
- CROSSOVER LINE
- REVISION CLOUD
- A REVISION TRIANGLE

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
E	REVISED AS NOTED	-	NE	MR	KK	08 MAY 25
D	REVISED AS NOTED	-	SBN	MR	KK	25 NOV 24
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B	REVISED AS NOTED	-	PT	MR	KK	23 MAR 23
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VEOLIA

CUSTOMER INFORMATION

CAESARS LANE WTF
MBR SYSTEM

P&ID

LEGENDS & SYMBOLS

DRAWING NUMBER: 510464-WTS-PR-SYS-EN21-DS-100
REVISION: E
REF.: -
DOC. OWNER: -
PROJECT NO.: 510464
PART/MATERIAL NO.:
SCALE: NONE
SIZE: D
SHEET: 2 OF 3

FILE LOCATION: C:\Users\130139747\AppData\Local\Temp\AcPublish_48\130139747.AppData.Local.Temp.AcPublish_48\130139747.510464-WTS-PR-SYS-EN21-DS-100.dwg

LAST SAVED: Thursday, May 8, 2025 10:02:39 PM

INSTRUMENT FUNCTIONS

FIRST LETTER	MEASURED OR INITIATING VARIABLE	A: ALARM	A: HIGH– HIGH ALARM	A: HIGH ALARM	A: LOW ALARM	A: LOW–LOW ALARM	A: SENSOR FAULT ALARM	C: BLIND CONTROLLER	C: INDICATING CONTROLLER	E: SENSOR (PRIMARY ELEMENT)	G: GLASS	I: INDICATOR	K: CONTROL STATION	L: PILOT LIGHT	Q: TOTALIZER	R: RECORD	S: SWITCH	S: HIGH–HIGH SWITCH	S: HIGH SWITCH	S: LOW SWITCH	S: LOW–LOW SWITCH	T: BLIND TRANSMITTER	T: INDICATING TRANSMITTER	Y: SOLENOID VALVE (PILOT), RELAY, COMPUTATION, CONVERTER	V,Z: CONTROL VALVE	V,Z: VALVE	V,Z: FINAL CONTROL ELEMENT	SPECIAL IDENTIFICATION: SYMBOL	SPECIAL IDENTIFICATION: DESCRIPTION
A	ANALYSIS	AA	AAHH	AAH	AAL	AALL	AAT	AC	AIC	AE		AI		AL		AR	AS	ASHH	ASH	ASL	ASLL	AT	AIT	AY	ACV	AV	AZ		
B	BURNER, COMBUSTION																												
C	USER'S CHOICE																												
D	USER'S CHOICE																												
E	VOLTAGE	EA	EAHH	EAH	EAL	EALL	EAT	EC	EIC	EE		EI	EK	EL		ER	ES	ESHH	ESH	ESL	ESLL	ET	EIT	EY			EZ		
F	FLOW	FA	FAHH	FAH	FAL	FALL	FAT	FC	FIC	FE	FG	FI		FL	FQI	FR	FS	FSHH	FSH	FSL	FSLL	FT	FIT	FY	FCV	FV		FO	ORIFICE PLATE
FF	FLOW RATIO	FFA	FFAHH	FFAH	FFAL	FFALL		FFC	FFIC			FFI				FFR	FFS	FFSHH	FFSH	FFSL	FFSLL			FFY	FFCV				
G	USER'S CHOICE																												
H	HAND	HA						HC	HIC					HL			HS								HCV	HV		HMS	PUSHBUTTON SWITCH
I	CURRENT (ELECTRICAL)	IA	IAHH	IAH	IAL	IALL	IAT	IC	IIC	IE		II	IK	IL		IR	IS	ISHH	ISH	ISL	ISLL	IT	IIT	IY			IZ		
J	POWER	JA	JSHH	JAH	JAL	JALL	JAT	JC	JIC	JE		JI	JK	JL	JQI	JR	JS	JSHH	JSH	JSL	JSLL	JT	LIT	JY			JZ		
K	TIME SCHEDULE	KA										KI		KL			KS							KY					
KQ	TIME TOTAL	KQA	KQAHH	KQAH	KQAL	KQALL						KQI		KQL		KQR	KQS	KQSHH	KQSH	KQSL	KQSLL								
L	LEVEL	LA	LAHH	LAH	LAL	LALL	LAT	LC	LIC	LE	LG	LI		LL		LR	LS	LSHH	LSH	LSL	LSLL	LT	LIT	LY	LCV	LV		LKx	LEVEL RATE–OF–CHANGE
M	MOTOR CONTROL												MK				MS												
N	USER'S CHOICE																												
O	USER'S CHOICE																												
P	PRESSURE OR VACUUM	PA	PAHH	PAH	PAL	PALL	PAT	PC	PIC			PI		PL		PR	PS	PSHH	PSH	PSL	PSLL	PT	PIT	PIT	PY	PV		PSV	PRESSURE SAFETY VALVE
PD	PRESSURE DIFFERENTIAL	PDA	PDAHH	PDAH	PDAL	PDALL	PDAT	PDC	PDIC			PDI		PDL		PDR	PDS	PDSHH	PDSH	PDSL	PDSLL	PDT	PDIT	PDY	PDCV				
Q	QUANTITY														QQI														
R	RADIATION																												
S	SPEED OR FREQUENCY	SA	SAHH	SAH	SAL	SALL	SAT	SC	SIC	SE		SI	SK	SL		SR	SS	SSHH	SSH	SSL	SSLL	ST	SIT	SY	SCV		SZ		
T	TEMPERATURE	TA	TAHH	TAH	TAL	TALL	TAT	TC	TIC	TE		TI		TL		TR	TS	TSHH	TSH	TSL	TSLL	TT	TIT	TY	TCV	TV	TZ	TW	THERMOWELL
U	MULTI–VARIABLE																					UT	UIT						
V	VIBRATION OR MECH. ANALYSIS	VA	VAHH	VAH			VAT			VE		VI		VL		VR	VS	VSHH	VSH			VT	VIT	VY					
W	WEIGHT OR FORCE	WA	WAHH	WAH	WAL	WALL	WAT	WC	WIC	WE		WI		WL	WQI	WR	WS	WSHH	WSH	WSL	WSLL	WT	WIT	WY	WCV	WV	WZ		
X	UNCLASSIFIED																												
Y	EVENT, STATE OR PRESENCE	YA										YI	YK	YL		YR	YS							YY					
Z	POSITION OR DIMENSION	ZA	ZAO=OPEN		ZAC=CLOSE		ZAT	ZC	ZIC	ZE	ZG	ZI	ZK	ZL		ZR	ZS	ZSO=OPEN		ZSC=CLOSE		ZT	ZIT	ZY	ZCV	ZV	ZZ	ZKx	POSITION RATE–OF–CHANGE

INSTRUMENT SYMBOLS

- PANEL MOUNT INSTRUMENT
- FIELD MOUNT OR PRIMARY INSTRUMENT
- BEHIND PANEL INSTRUMENT
- PILOT LIGHT
- PLC FUNCTION WITH DISPLAY
- PLC FUNCTION, BLIND
- PLC INPUT/OUTPUT

DI _ DISCRETE INPUT
DO _ DISCRETE OUTPUT
AI _ ANALOG INPUT
AO _ ANALOG OUTPUT

FUNCTIONS

- I — UNDEFINED INTERLOCK LOGIC
- Σ — SUMMING

CONTINUATION ARROWS

SERVICE
A | SHEET X
FLOW:
PRESSURE:
TEMP:
FLOW–SINGLE DIRECTION

SERVICE
A | SHEET X
FLOW:
PRESSURE:
TEMP:
FLOW–BOTH DIRECTIONS

A — TRANSFER ARROW TO SAME SHEET

1 | PID NUMBER SHEET X — ELECTRICAL TRANSFER ARROW TO DIFFERENT PID DOCUMENT

1 — ELECTRICAL TRANSFER ARROW TO SAME PID DOCUMENT

EQUIPMENT / INSTRUMENT TAGGING SCHEME

11–XXX–222A–3

- 11 — IDENTICAL SKID/TRAIN IDENTIFIER (IF NECESSARY)
- XXX — MULTIPLE INSTRUMENT IDENTIFIER (IF NECESSARY)
- 222 — EQUIPMENT NUMBER/ INSTRUMENT LOOP NUMBER
- A — EQUIPMENT ABBREVIATION/ INSTRUMENT FUNCTION
- 3 — PROCESS AREA

LINE IDENTIFIER

X"–XXPPPA–SNN

- X" — LINE CLASS SPECIFICATION
- PPP — SCHEDULE (OPTIONAL)
- A — SERVICE DIFFERNTIATOR (OPTIONAL)
- S — PR CODE (OPTIONAL)
- NN — MATERIAL CODE
- NN — PIPE SIZE

MATERIAL CODE	MATERIAL
CC	CONCRETE
	METALLIC
AUST	AUSTENITIC STAINLESS STEEL
AY	ALLOY 20
CI	CAST IRON
CS	CARBON STEEL
CU	COPPER
DI	DUCTILE IRON
DL	PVDF LINED
DUPL	DUPLEX STAINLESS STEEL
HC	HASTELLOY C
PL	POLYPROPYLENE LINED
SA	304, 304L STAINLESS STEEL
SB	AL–6XN
SC	254–SMO
SD	2205
SE	2507
SF	904L
SG	ZERON 100
SS	316, 316L STAINLESS STEEL
SUAU	SUPER AUSTENITIC STAINLESS STEEL
TL	PTFE LINED
	PLASTIC
CP	CPVC
FR	FIBER REINFORCED PLASTIC
PE	POLYETHYLENE
PP	POLYPROPYLENE
PV	PVC
PD	PVDF
PT	PTFE

PR CODE	CLASS
	METALLIC
125	ANSI CLASS 125
150	ANSI CLASS 150
300	ANSI CLASS 300
400	ANSI CLASS 400
600	ANSI CLASS 600
900	ANSI CLASS 900
	PLASTIC
040	SCHEDULE 40
080	SCHEDULE 80
120	SCHEDULE 120
D64	SDR 64
D41	SDR 41
D32	SDR 32.5
D26	SDR 26
D21	SDR 21
D17	SDR 17
D13	SDR 13.5
	MULTIPLE
P06	PN6
P10	PN10
P16	PN16
P20	PN20
P50	PN50
P68	PN68
P100	PN100
A00	ATMOSPHERIC
V00	VACUUM

EQUIPMENT ABBREVIATIONS

AB	ABSORBER
AC	AIR COMPRESSOR
ACF	ACTIVATED CARBON FILTER
AER	AERATOR
ARV	AIR RELEASE VALVE
B	BLOWER
BF	BAG FILTER
C	CENTRIFUGE, CYCLONE
CD	CONDENSER
CDM	CATALYTIC DESTRUCT MODULE
CF	CARTRIDGE FILTER
CH	CHILLER
CHL	CHLORINATOR
CIP	CLEAN–IN–PLACE
CL	CLARIFIER
CONV	CONVEYOR
CORS	CATALYTIC OXYGEN REMOVAL SYSTEM
CP	CONTROL PANEL
CR	CRYSTALIZER
CS	CHEMICAL SYSTEM
CT	COOLING TOWER, CARBON TOWER
CV	CHECK VALVE
DAF	DISSOLVED AIR FLOATATION
DO	DISSOLVED OXYGEN
DMF	DUAL MEDIA FILTER
DR	AIR DRIER
E	EDUCTOR
EAF	ENTRAPPED AIR FLOATATION
ED	ELECTRODIALYSIS
EDI	ELECTRODEIONIZATION
EDR	ELECTRODIALYSIS REVERSAL
EV	EVAPORATOR
F	FILTER
FAN	FAN
F.C.	FAIL CLOSE
FDA	FORCED DRAFT AERATOR, DEGASIFIER
F.O.	FAIL OPEN
F.L.	FAIL LAST
FP	FILTER PRESS
GF	GRAVITY FILTER
H	HEATER
HF	HEPA FILTER
HMI	HUMAN–MACHINE INTERFACE
HOA	HAND–OFF–AUTO
HPB	HYDRAULIC PRESSURE BOOSTER
HX	HEAT EXCHANGER
IAS	INSTRUMENT AIR SUPPLY
IQ	INJECTION QUILL, INJECTION CHECK VALVE
IX	ION EXCHANGER
LS	LIME SOFTENER
M	MOTOR
MBR	MEMBRANE BIOREACTOR
MCC	MOTOR CONTROL CENTER
MD	MEMBRANE DEGASIFIER
MF	MICROFILTRATION
ML	MUFFLER, SILENCER
MMF	MULTIMEDIA FILTER
MX	MIXER
NF	NANOFILTRATION
N.O.	NORMALLY OPEN
OC	OXYGEN CONCENTRATOR
ORP	OXYGEN–REDUCTION POTENTIAL
OZ	OZONATOR
OZG	OZONE GENERATOR
P	PUMP
PD	PULSATION DAMPENER
PLC	PROGRAMMABLE LOGIC CONTROLLER
PSE	RUPTURE DISC
PUV	MULTIFUNCTION VALVE
PX	PRESSURE EXCHANGER
RO	REVERSE OSMOSIS
RP	ROTARY PRESS
RT	RESIN TRAP
SC	SCRUBBER
SCP	SCRAPER
SCR	SCREEN
SFT	SOFTENER
SKM	SKIMMER
SM	STATIC MIXER, INLINE MIXER
ST	STEAM TRAP
STK	MEMBRANE STACK (ED, EDR, EDI, E–CELL)
STR	STRAINER
SV	SAMPLE VALVE
TK	TANK
TOC	TOTAL ORGANIC CARBON
TRB	TURBINE
UF	ULTRAFILTRATION
UPS	UNINTERRUPTIBLE POWER SUPPLY
UV	ULTRAVIOLET IRRADIATOR
VB	VACUUM BREAKER
VD	VACUUM DEGASIFIER
VFD	VARIABLE FREQUENCY DRIVE

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
E	REVISED AS NOTED	-	NE	MR	KK	08 MAY 25
D	REVISED AS NOTED	-	SBN	MR	KK	25 NOV 24
C	REVISED AS NOTED	-	AS	MR	KK	23 JAN 24
B	REVISED AS NOTED	-	PT	MR	KK	23 MAR 23
A	INITIAL RELEASE	-	PT	MR	KK	17 FEB 23

TOLERANCES UNLESS NOTED
DECIMALS .X .XX .XXX
ANGLES
FRAC

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VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

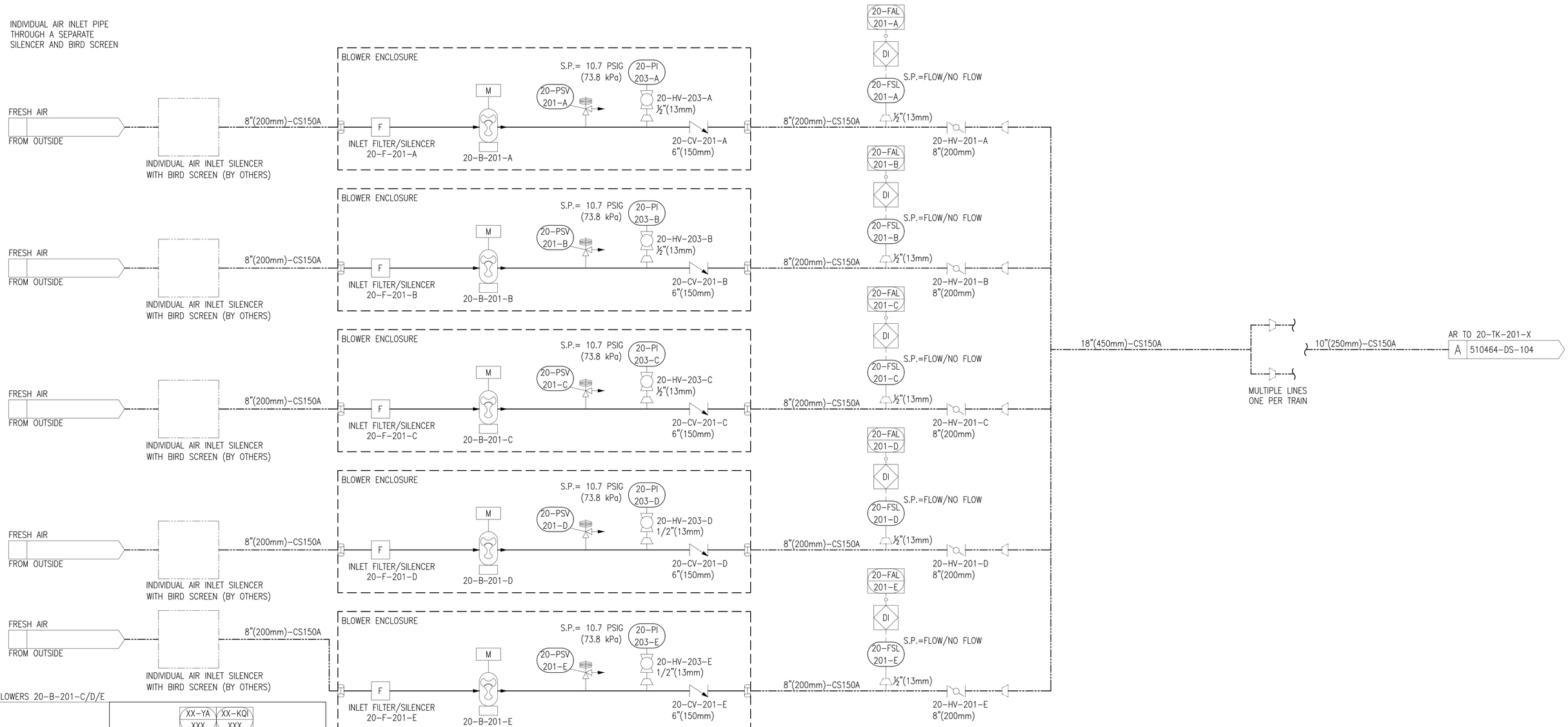
P&ID
LEGENDS & SYMBOLS

DRAWING NUMBER	REVISION
510464-WTS-PR-SYS-EN21-DS-100	E
REF.: -	DOC. OWNER: -

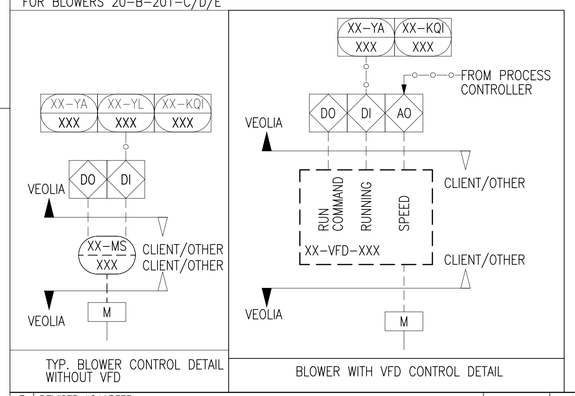
PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464		NONE	D	3 OF 3

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INDIVIDUAL AIR INLET PIPE
THROUGH A SEPARATE
SILENCER AND BIRD SCREEN



FOR BLOWERS 20-B-201-C/D/E



MEMBRANE BLOWER DATA	
NO OF DUTY BLOWERS	4
NO OF STANDBY BLOWER	1
TOTAL NO OF BLOWERS	5
TAG NUMBERS	20-B-201-A/B/C/D/E
LEAP HI FLOW PER TRAIN (DESIGN)	1481 ICFM @ 5.5 PSIG
LEAP LO FLOW PER TRAIN (DESIGN)	741 ICFM @ 5.5 PSIG
LEAP HI FLOW PER TRAIN (BUILD-OUT)	1611 ICFM @ 5.5 PSIG
LEAP LO FLOW PER TRAIN (BUILD-OUT)	806 ICFM @ 5.5 PSIG
TYPE OF BLOWER	POSITIVE DISPLACEMENT
BLOWER ENCLOSURE INCLUDED	YES, NO SPACE HEATER
SPEED CONTROL	YES FOR 20-B-201 A/B NO FOR 20-B-201 C/D/E
ELECTYRIC MOTOR	TEFC, 60 HP AT 1800 RPM
VOLTAGE	480V/3PH/60HZ

VEOLIA WTS CONTROLLED DOCUMENT

NOTES:

1. ALL DOTTED-LINE EQUIPMENT TO BE SUPPLIED BY OTHERS. ---------- VERIFICATION OF ANY POSTED VALUES IS THE RESPONSIBILITY OF THE SYSTEM INTEGRATOR.
2. THE ACTUAL BLOWER DISCHARGE PRESSURE IS DETERMINED BASED ON MAXIMUM POSSIBLE LIQUID LEVEL IN TANKS BEING AERATED.
3. SYSTEM INTEGRATOR IS RESPONSIBLE FOR HOT AIR PIPE THERMO-INSULATION AS APPLICABLE.
4. BLOWER DISCHARGE FLEXIBLE SLEEVE.
5. ALL EQUIPMENT ON THIS SHEET IS DESIGNED TO BE INSTALLED IN A NON-CLASSIFIED AREA (PER NFPA 820).
6. EQUIPMENT IS PROVIDED BY VEOLIA (UNLESS OTHERWISE NOTED). INTERCONNECTING PIPING/WIRING AND INSTALLATION BY OTHERS.
7. A PORTION OF THE AIR LINE NEEDS TO BE ROUTED A MINIMUM OF 2 FT HIGHER THAN THE MAXIMUM TANK LEVEL TO PREVENT WATER BACKFLOW.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
E	REVISED AS NOTED	-	NE	MR	KK	08 MAY 25
D	REVISED AS NOTED	-	SBN	MR	KK	25 NOV 24
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TOLERANCES UNLESS NOTED
DECIMALS .X .XX .XXX
ANGLES
FRAC

VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

P&ID
BLOWER - MEMBRANE BLOWER

DRAWING NUMBER	REVISION
510464-WTS-PR-SYS-EN21-DS-102	E

REF.: -
DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464		NONE	D	1 OF 2

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FRESH AIR
FROM OUTSIDE

COMMON INLET SILENCER
WITH BIRD SCREEN
(BY OTHERS)

16"(400mm)–CS150A

DETAIL 'A'
L.S
16–HV–400–A
10"(250mm)–CS150A

BLOWER ENCLOSURE
S.P.= 15 PSIG
(103.4 kPa)
16–PI
403–A
M
16–PSV
401–A
16–HV–403–A
½"(13mm)
F
INLET FILTER/SILENCER
16–F–401–A
16–B–401–A
16–CV–401–A
3"(75mm)

10"(250mm)–CS150A
16–FAL
401–A
DI
S.P.=FLOW/NO FLOW
16–FSL
401–A
½"(13mm)
16–HV–401–A
10"(250mm)

DETAIL 'A'
L.S
16–HV–400–B
10"(250mm)–CS150A

BLOWER ENCLOSURE
S.P.= 15 PSIG
(103.4 kPa)
16–PI
403–B
M
16–PSV
401–B
16–HV–403–B
½"(13mm)
F
INLET FILTER/SILENCER
16–F–401–B
16–B–401–B
16–CV–401–B
3"(75mm)

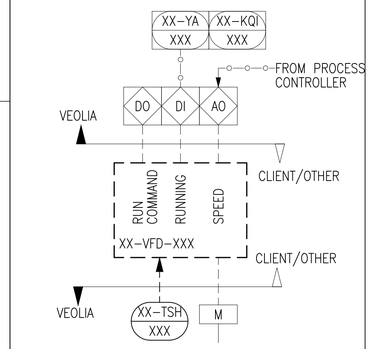
10"(250mm)–CS150A
16–FAL
401–B
DI
S.P.=FLOW/NO FLOW
16–FSL
401–B
½"(13mm)
16–HV–401–B
10"(250mm)

16"(400mm)–CS150A
AIR TO 16–TK–1/2/3
B 510464–DS–103

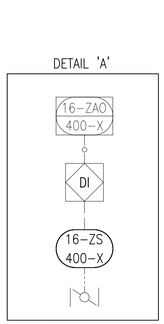
DETAIL 'A'
L.S
16–HV–400–C
10"(250mm)–CS150A

BLOWER ENCLOSURE
S.P.= 15 PSIG
(103.4 kPa)
16–PI
403–B
M
16–PSV
401–C
16–HV–403–C
½"(13mm)
F
INLET FILTER/SILENCER
16–F–401–C
16–B–401–C
16–CV–401–C
3"(75mm)

10"(250mm)–CS150A
16–FAL
401–C
DI
S.P.=FLOW/NO FLOW
16–FSL
401–C
½"(13mm)
16–HV–401–C
10"(250mm)



BLOWER WITH VFD CONTROL DETAIL



BLOWER MANUAL AIR INLET VALVE WITH
LIMIT SWITCH ON THE OPEN POSITION

PROCESS BLOWER INFO	
NO OF DUTY BLOWERS	2
NO OF STANDBY BLOWER	1
TOTAL NO OF BLOWERS	3
TAG NUMBERS	16–B–401–A/B/C
BLOWER RATED CAPACITY	2038 SCFM AT 9.74 PSIG
TYPE OF BLOWER	POSITIVE DISPLACEMENT
BLOWER ENCLOSURE INCLUDED	YES, NO SPACE HEATER
SPEED CONTROL	VFD
ELECTYRIC MOTOR	TEFC, 150 HP AT 1800 RPM
VOLTAGE	480V/3PH/60HZ

NOTES:

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6. EQUIPMENT IS PROVIDED BY VEOLIA (UNLESS OTHERWISE NOTED). INTERCONNECTING PIPNG/WIRING AND INSTALLATION BY OTHERS.
7. A PORTION OF THE AIR LINE NEEDS TO BE ROUTED A MINIMUM OF 2 FT HIGHER THAN THE MAXIMUM TANK LEVEL TO PREVENT WATER BACKFLOW.

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TOLERANCES UNLESS NOTED
DECIMALS .X .XX .XXX
ANGLES
FRAC

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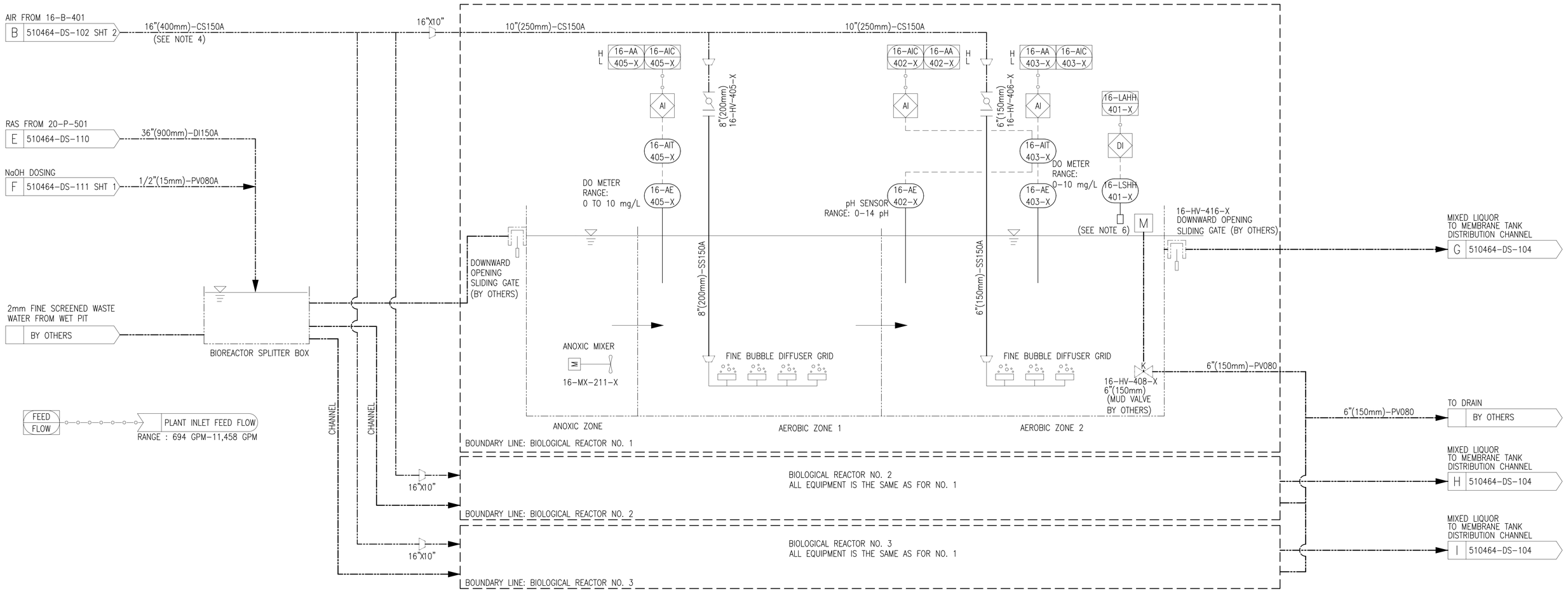
VEOLIA

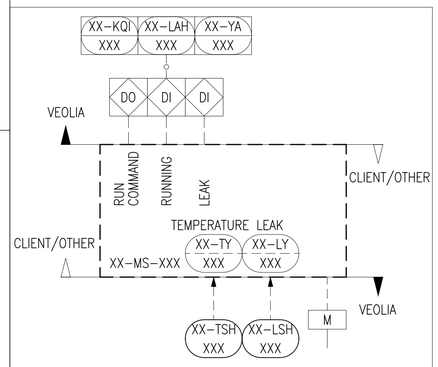
CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

P&ID,
BLOWER - PROCESS BLOWER

DRAWING NUMBER: 510464-WTS-PR-SYS-EN21-DS-102
REVISION: E
REF.: -
DOC. OWNER:
PROJECT NO.: 510464
PART/MATERIAL NO.:
SCALE: NONE
SIZE: D
SHEET: 2 OF 2
LAST SAVED: Thursday, May 8, 2025 10:02:39 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\1. PFD and P&ID\510464-WTS-PR-SYS-EN21-DS-102.dwg





TYP. SUBMERSIBLE MIXER CONTROL DETAIL

EQUIPMENT	
ANOXIC ZONE PER TRAIN	
MIXER	MECHANICAL, SUBMERSIBLE
NUMBER OF DUTY MIXERS	1
MIXER TAG	16-MX-211-1/2/3
MIXER MOTOR	TEFC, 10.7 HP AT 571 RPM
VOLTAGE	480 V/3 ph/ 60 Hz
AEROBIC ZONE 1, PER TRAIN	
DIFFUSERS	FINE-BUBBLE
TYPE OF DIFFUSERS	DISC DIFFUSER
# OF GRIDS	1 (FULL FLOOR COVERAGE)
# OF DIFFUSERS PER GRID	440
AEROBIC ZONE 2, PER TRAIN	
DIFFUSERS	FINE-BUBBLE
TYPE OF DIFFUSERS	DISC DIFFUSER
# OF GRIDS	1 (FULL FLOOR COVERAGE)
# OF DIFFUSERS PER GRID	312

BIOREACTOR TANK DATA	
NO OF TRAINS	3
TANK MATERIAL	CONCRETE
TAG NUMBER	
ANOXIC ZONE	16-TK-201-1/2/3
AEROBIC ZONE	16-TK-401-1/2/3
OPERATING VOLUME, GALLONS	
ANOXIC ZONE, TOTAL	209,244
AEROBIC ZONE 1, TOTAL	506,145
AEROBIC ZONE 2, TOTAL	506,145
TANK INTERNAL DIMENSIONS, FT	
ANOXIC ZONE, FEET	
LENGTH	18.0
WIDTH	24
SIDE WATER DEPTH	19.87 TO 20.27
AEROBIC ZONE 1 , FEET	
LENGTH	44.75
WIDTH	24
SIDE WATER DEPTH	19.87 TO 20.27
AEROBIC ZONE 2, FEET	
LENGTH	44.75
WIDTH	24
SIDE WATER DEPTH	19.87 TO 20.27

VEOLIA WTS CONTROLLED DOCUMENT

NOTES:

1. ALL DOTTED-LINE EQUIPMENT TO BE SUPPLIED BY OTHERS. VERIFICATION OF ANY POSTED VALUES IS THE RESPONSIBILITY OF THE SYSTEM INTEGRATOR.
2. SCOPE BY OTHERS: ALL CONCRETE WORKS, CHANNELS, SLUICE GATES, EMERGENCY OVERFLOW, TANK COVERS, HANDRAILS, ANY DRAINS, ETC.
3. DRAWING TYPICAL FOR EVERY BIOLOGICAL TRAINS, WITH EXCEPTION OF COMMON CHANNELS.
4. A PORTION OF THE AIR LINE NEEDS TO BE ROUTED A MINIMUM OF 2 FT (60 CM) ABOVE MAXIMUM LIQUID LEVEL IN TANK BEING AERATED TO PREVENT WATER BACK FLOW.
5. 16-LSHH-401 IS PLACED 1 FT (30 CM) BELOW THE TOP OF TANK.
6. ALL EQUIPMENT ON THIS SHEET INSIDE THE BIOLOGICAL TANKS TO 18 INCH ABOVE THE TOP OF THE TANKS ARE CLASS 1 DIVISION 2 RATED (PER NFPA 820).
7. FOR CLARITY, DRAIN LINES FOR BIOLOGICAL TANKS ARE NOT SHOWN.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
E	REVISED AS NOTED	-	NE	MR	KK	08 MAY 25
D	REVISED AS NOTED	-	SBN	MR	KK	25 NOV 24
C	REVISED AS NOTED	-	AS	MR	KK	23 JAN 24
B	REVISED AS NOTED	-	PT	MR	KK	23 MAR 23
A	INITIAL RELEASE	-	TP	MR	KK	17 FEB 23

TOLERANCES UNLESS NOTED
DECIMALS .X .XX .XXX
ANGLES
FRAC

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VEOLIA

CUSTOMER INFORMATION

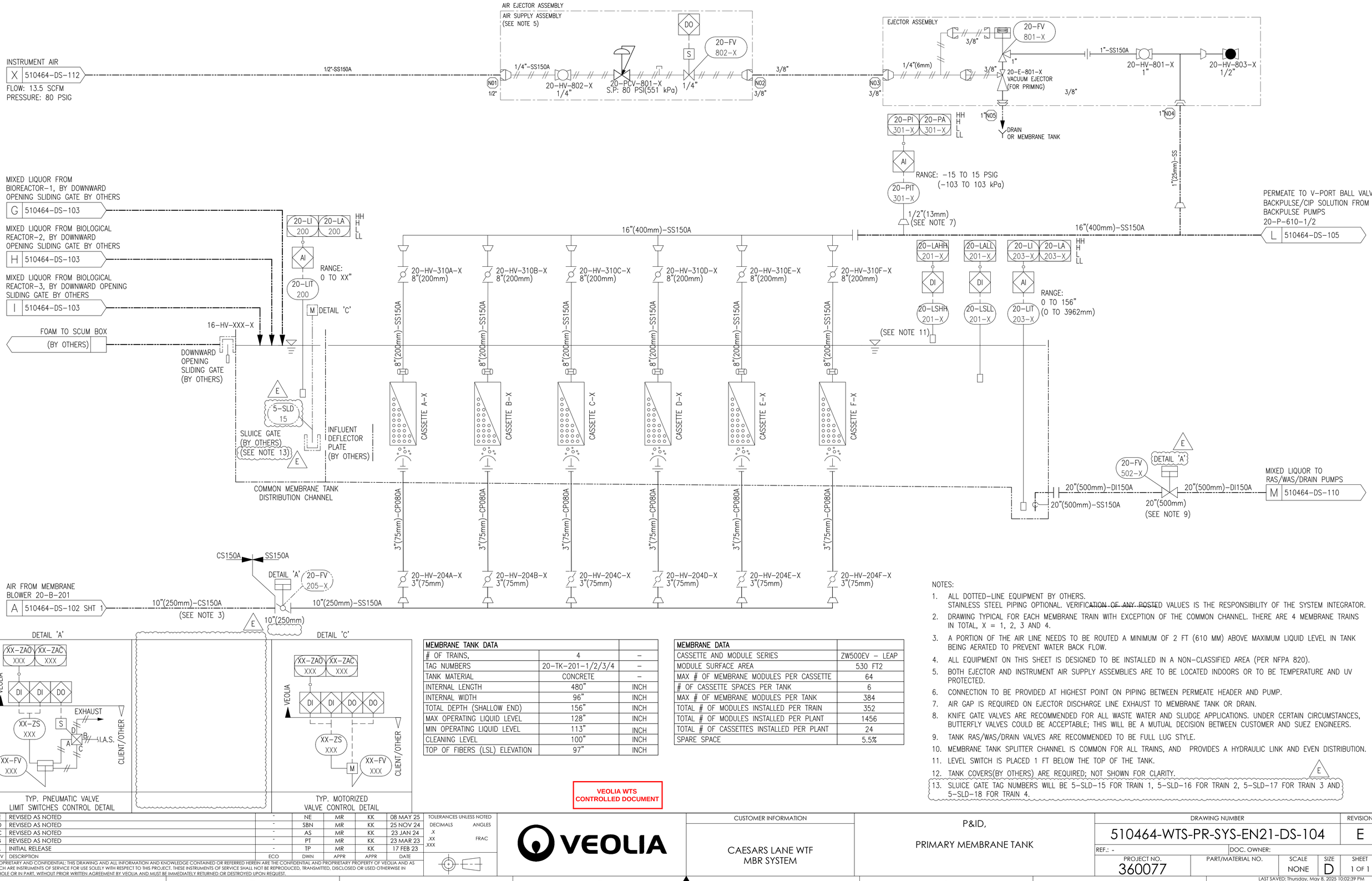
CAESARS LANE WTF
MBR SYSTEM

P&ID

BIOREACTOR

DRAWING NUMBER: 510464-WTS-PR-SYS-EN21-DS-103
REVISION: E
REF.: -
DOC. OWNER:
PROJECT NO.: 510464
PART/MATERIAL NO.:
SCALE: NONE
SIZE: D
SHEET: 1 OF 1
LAST SAVED: Thursday, May 8, 2025 10:02:39 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\1. PID and P&ID\510464-WTS-PR-SYS-EN21-DS-103.dwg



MEMBRANE TANK DATA		
# OF TRAINS,	4	–
TAG NUMBERS	20-TK-201-1/2/3/4	–
TANK MATERIAL	CONCRETE	–
INTERNAL LENGTH	480"	INCH
INTERNAL WIDTH	96"	INCH
TOTAL DEPTH (SHALLOW END)	156"	INCH
MAX OPERATING LIQUID LEVEL	128"	INCH
MIN OPERATING LIQUID LEVEL	113"	INCH
CLEANING LEVEL	100"	INCH
TOP OF FIBERS (LSL) ELEVATION	97"	INCH

MEMBRANE DATA	
CASSETTE AND MODULE SERIES	ZW500EV – LEAP
MODULE SURFACE AREA	530 FT2
MAX # OF MEMBRANE MODULES PER CASSETTE	64
# OF CASSETTE SPACES PER TANK	6
MAX # OF MEMBRANE MODULES PER TANK	384
TOTAL # OF MODULES INSTALLED PER TRAIN	352
TOTAL # OF MODULES INSTALLED PER PLANT	1456
TOTAL # OF CASSETTES INSTALLED PER PLANT	24
SPARE SPACE	5.5%

NOTES:

1. ALL DOTTED-LINE EQUIPMENT BY OTHERS.
   STAINLESS STEEL PIPING OPTIONAL. VERIFICATION OF ANY POSTED VALUES IS THE RESPONSIBILITY OF THE SYSTEM INTEGRATOR.
2. DRAWING TYPICAL FOR EACH MEMBRANE TRAIN WITH EXCEPTION OF THE COMMON CHANNEL. THERE ARE 4 MEMBRANE TRAINS IN TOTAL, X = 1, 2, 3 AND 4.
3. A PORTION OF THE AIR LINE NEEDS TO BE ROUTED A MINIMUM OF 2 FT (610 MM) ABOVE MAXIMUM LIQUID LEVEL IN TANK BEING AERATED TO PREVENT WATER BACK FLOW.
4. ALL EQUIPMENT ON THIS SHEET IS DESIGNED TO BE INSTALLED IN A NON-CLASSIFIED AREA (PER NFPA 820).
5. BOTH EJECTOR AND INSTRUMENT AIR SUPPLY ASSEMBLIES ARE TO BE LOCATED INDOORS OR TO BE TEMPERATURE AND UV PROTECTED.
6. CONNECTION TO BE PROVIDED AT HIGHEST POINT ON PIPING BETWEEN PERMEATE HEADER AND PUMP.
7. AIR GAP IS REQUIRED ON EJECTOR DISCHARGE LINE EXHAUST TO MEMBRANE TANK OR DRAIN.
8. KNIFE GATE VALVES ARE RECOMMENDED FOR ALL WASTE WATER AND SLUDGE APPLICATIONS. UNDER CERTAIN CIRCUMSTANCES, BUTTERFLY VALVES COULD BE ACCEPTABLE; THIS WILL BE A MUTUAL DECISION BETWEEN CUSTOMER AND SUEZ ENGINEERS.
9. TANK RAS/WAS/DRAIN VALVES ARE RECOMMENDED TO BE FULL LUG STYLE.
10. MEMBRANE TANK SPLITTER CHANNEL IS COMMON FOR ALL TRAINS, AND PROVIDES A HYDRAULIC LINK AND EVEN DISTRIBUTION.
11. LEVEL SWITCH IS PLACED 1 FT BELOW THE TOP OF THE TANK.
12. TANK COVERS(BY OTHERS) ARE REQUIRED; NOT SHOWN FOR CLARITY.
13. (E) SLUICE GATE TAG NUMBERS WILL BE 5-SLD-15 FOR TRAIN 1, 5-SLD-16 FOR TRAIN 2, 5-SLD-17 FOR TRAIN 3 AND 5-SLD-18 FOR TRAIN 4.

VEOLIA WTS CONTROLLED DOCUMENT

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
E	REVISED AS NOTED	-	NE	MR	KK	08 MAY 25
D	REVISED AS NOTED	-	SBN	MR	KK	25 NOV 24
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A	INITIAL RELEASE	-	TP	MR	KK	17 FEB 23

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X
.XX FRAC
.XXX

VEOLIA

CUSTOMER INFORMATION

CAESARS LANE WTF
MBR SYSTEM

P&ID,

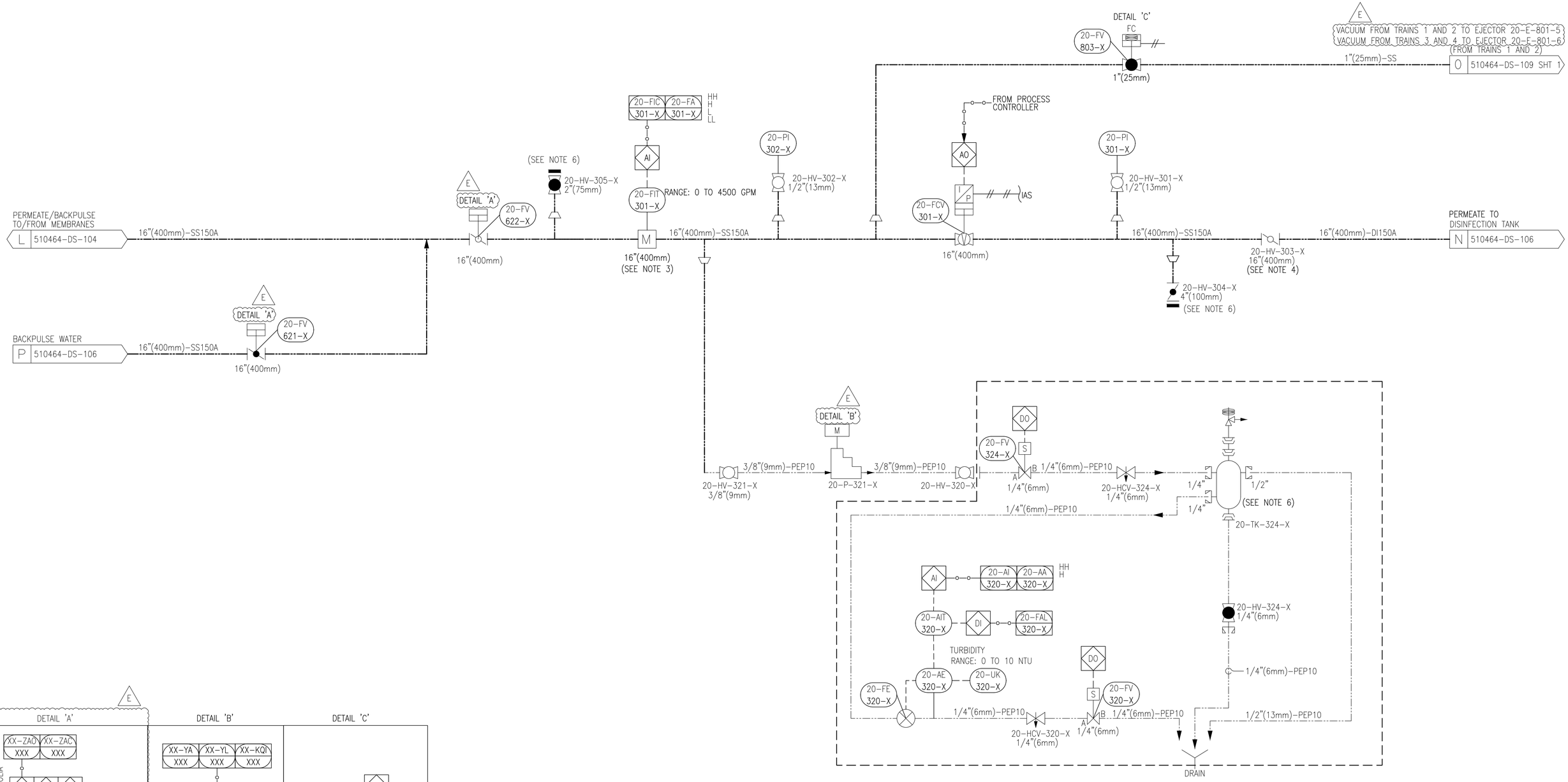
PRIMARY MEMBRANE TANK

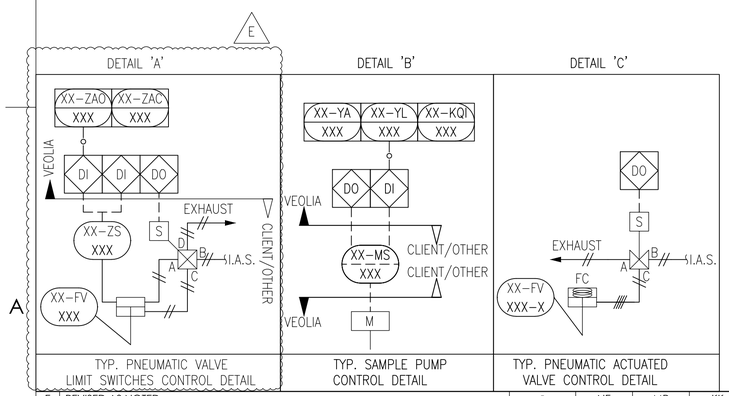
DRAWING NUMBER	REVISION
510464-WTS-PR-SYS-EN21-DS-104	E
REF.: -	DOC. OWNER:

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
360077		NONE	D	1 OF 1

LAST SAVED: Thursday, May 8, 2025 10:02:39 PM

FILE LOCATION:C:_ADSKVault\NAM\510464 - Caesars Lane WWIP\1. PFD and P&ID\510464-WTS-PR-SYS-EN21-DS-104.dwg





SAMPLE PUMP DATA	
NO OF DUTY PUMPS	4
TAG NUMBERS (INSTALLED)	20-P-321-1/2/3/4
TYPE OF PUMP	METERING
PUMP CAPACITY	0.1 GPM
ELECTRIC MOTOR	TEFC, (0.12) HP AT 1,775 RPM
VOLTAGE	120V/1PH/60HZ

FLOW CONTROL V-PORT BALL VALVE- 20-FCV-301-1/2/3/4	
FLOW RANGE (GPM)	736 - 3438
VALVE PRESSURE DROP RANGE (PSI)	0.22 TO 10.1

NOTES:

1. ALL DOTTED LINES/EQUIPMENT BY OTHERS ----------
2. DRAWING TYPICAL FOR EACH TRAIN. THERE ARE 4 TRAINS IN TOTAL, X=1,2,3 AND 4
3. 5 PIPE DIAMETERS UPSTREAM, 3 PIPE DIAMETERS DOWNSTREAM, STRAIGHT PIPE RUN RECOMMENDED FOR MAXIMUM ACCURACY.
4. VALVE 20-HV-303-X TO BE CLOSED DURING GLYCERINE REMOVAL.
5. DEGASSING COLUMN FOR STABLE TURBIDITY ANALYSIS, 3 INCH IN DIAMETER X 30.5' LENGTH.
6. BLIND FLANGES OR CAP TO BE INSTALLED TO PREVENT AIR ENTERING THE PIPE IN CASE OF A LEAKY VALVE.

VEOLIA WTS CONTROLLED DOCUMENT

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TOLERANCES UNLESS NOTED
DECIMALS .X .XX .XXX
ANGLES
FRAC

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VEOLIA

CUSTOMER INFORMATION

CAESARS LANE WTF
MBR SYSTEM

P&ID,

PERMEATE SIPHON & ASSOC EQUIPMENT

DRAWING NUMBER	REVISION
510464-WTS-PR-SYS-EN21-DS-105	E
REF.: -	DOC. OWNER:

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464		NONE	D	1 OF 1

LAST SAVED: Tuesday, May 13, 2025 9:03:39 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\1. PFD and P&ID\510464-WTS-PR-SYS-EN21-DS-105.dwg

VACUUM TO EJECTOR 20-E-801-7
(FROM COMMON PERMEATE HEADER)
Q 510464-DS-109 SHT 2

1"(25mm)-SS

CITRIC ACID SOLUTION
FROM 23-P-301-1/2
R 510464-DS-111, SHT 2
1/2"(12mm)-PVC080

23-FV 330 — DETAIL 'B'
23-HV-330 1/2"(12mm)
23-CV-330 1/2"(12mm)
1/2"(12mm)

SODIUM HYPOCHLORITE SOLUTION
FROM 23-P-101-1/2
S 510464-DS-111, SHT 2
1"(25mm)-CPVC080

23-FV 130 — DETAIL 'B'
23-HV-130 1"(25mm)
23-CV-130 1"(25mm)
1"(25mm)

20-FI 602 / 20-FA 602 (HH H L LL)
AI
RANGE: 0-4500 GPM
20-FIT 602
20-PI 602
20-HV-602 1/2"(13mm)

20-PAH 601
DI
S.P.= 30PSIG INCREASING
20-PSH 601

20-PAH 602
DI
S.P.= 30 PSIG INCREASING
20-PSH 602

20-PAH 600
DI
20-DPS 600

20-TI 301
AI
RANGE: 0-50°C (38-90°F)
20-TIT 301
20-TW 301
3/4"

PERMEATE FROM PERMEATE SIPHON SYSTEMS
N 510464-DS-105
16"(400mm)-DI150A

(SEE NOTE 1)

16"(400mm)-DIMJ
M
14"(350mm)
DIMJ
DI

1/4" 14"(350mm)-DI 1/4"
DI
SS

16" 16"
2"(50mm)
20-HV-600 2"(50mm)
DRAIN
20-SCN-600 BASKET STRAINER (0.41mm OPENING)
E

16"(400mm)-SS150A
16"(400mm)-SS150A
BACKPULSE WATER TO TRAIN' S PERMEATE HEADERS
P 510464-DS-105

20-HV-610-1 16"(400mm)
20-HV-610-2 16"(400mm)
20-LI 601 / 20-LA 601 (HH H L LL)
AI
RANGE: TBD
20-LIT 601
16"(400mm)
20-CV-602-1 16"(400mm)
20-CV-602-2 16"(400mm)
16"(400mm)
16"(400mm)

TEMPORARY POTABLE WATER SOURCE
(BY OTHERS) (BY OTHERS)

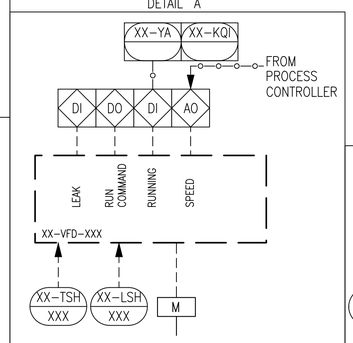
30"(750MM)-DI150A

DETAIL 'A'
M
E
20-P-610-A/B
BACKPULSE PUMPS

20-TK-600
BACKPULSE TANK (BY OTHERS)
PORTION OF CHLORINATION/DECHLORINATION TANK

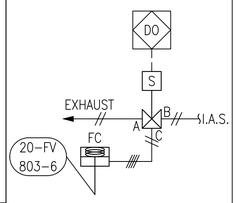
TO CHLORINATION/
DECHLORINATION TANK

DETAIL 'A'



TYP. BACKPULSE PUMPS CONTROL DETAIL

DETAIL 'B'



TYP. PNEUMATIC ACTUATED VALVE CONTROL DETAIL

BACKPULSE PUMP DATA	
NO OF DUTY PUMP	1
NO OF STANDBY PUMP	1
TAG NUMBERS	20-P-610-A/B
TYPE OF PUMP	SUBMERSIBLE PUMP
INSTALLATION	VERTICAL
SPEED CONTROL	VFD
ELECTRIC MOTOR	60 HP/460V/3 PH/1,180 RPM
PUMP CAPACITY - DESIGN	3,510 GPM @ 44' FT TDH
PUMP CAPACITY - BUILDOUT	3,703 GPM @ 44' TDH
RECOVERY CLEAN FLOW	1,608 GPM @ 44' TDH
MAINTENANCE CLEAN FLOW	1,608 GPM @ 44' TDH

VEOLIA WTS CONTROLLED DOCUMENT

NOTES:
1. THE LOCATION OF THE EJECTOR CONNECTION TO BE DETERMINED
2. ALL DOTTED-LINE EQUIPMENT TO BE SUPPLIED BY OTHERS. VERIFICATION OF ANY POSTED VALUES IS THE RESPONSIBILITY OF THE SYSTEM INTEGRATOR.
3. ALL EQUIPMENT ON THIS SHEET IS DESIGNED TO BE INSTALLED IN A NON-CLASSIFIED AREA (PER NFPA 820).
4. EQUIPMENT IS PROVIDED BY VEOLIA (UNLESS OTHERWISE NOTED). INTERCONNECTING PIPNG/WIRING AND INSTALLATION BY OTHERS.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
E	REVISED AS NOTED	-	NE	MR	KK	08 MAY 25
D	REVISED AS NOTED	-	SBN	MR	KK	25 NOV 24
C	REVISED AS NOTED	-	AS	MR	KK	23 JAN 24
B	REVISED AS NOTED	-	PT	MR	KK	23 MAR 23
A	INITIAL RELEASE	-	TP	MR	KK	17 FEB 23

TOLERANCES UNLESS NOTED
DECIMALS .X .XX .XXX
ANGLES
FRAC

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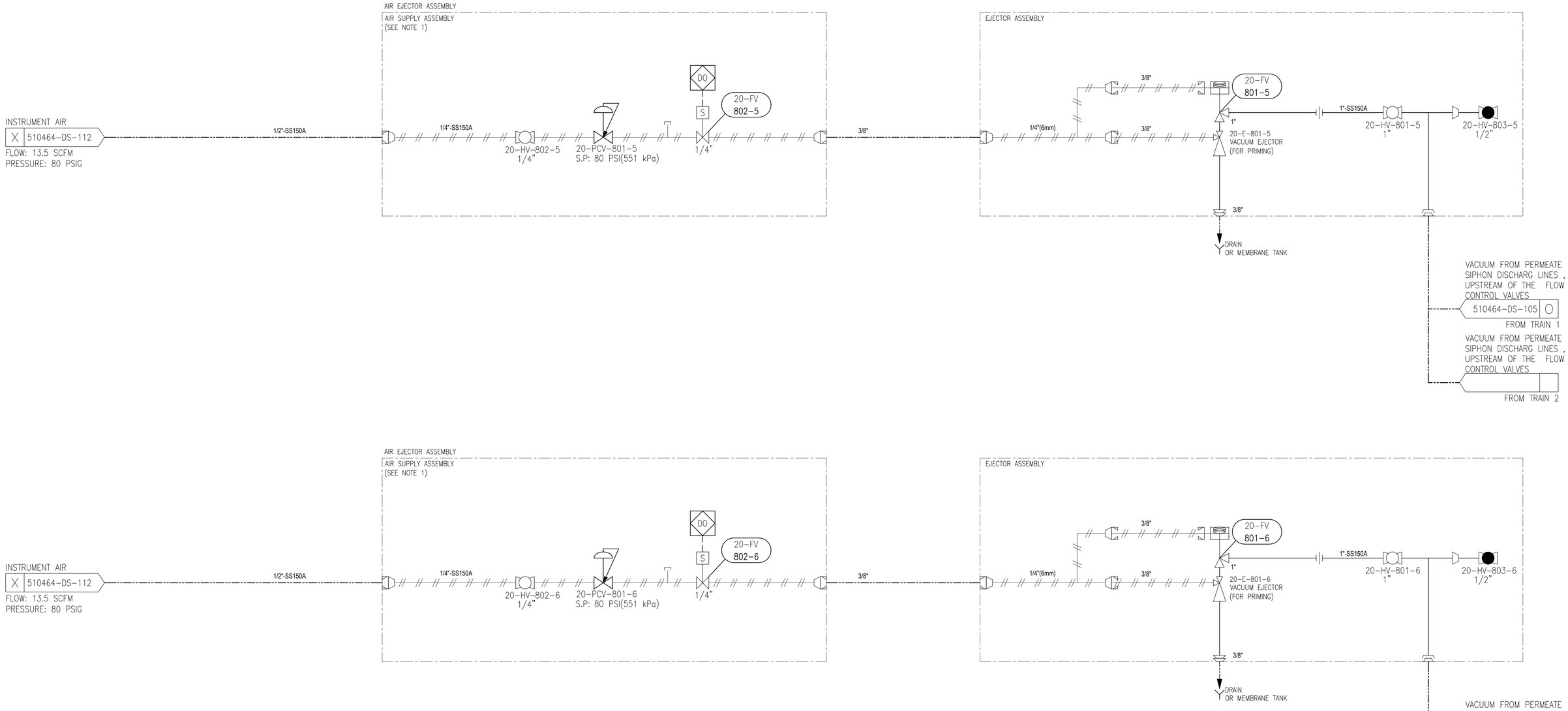
VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

P&ID,
CIP / BP SYSTEM

DRAWING NUMBER: 510464-WTS-PR-SYS-EN21-DS-106
REVISION: E
REF.: -
DOC. OWNER:
PROJECT NO.: 510464
PART/MATERIAL NO.:
SCALE: NONE
SIZE: D
SHEET: 1 OF 1
LAST SAVED: Thursday, May 8, 2025 10:02:39 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWIP\1. PFD and P&ID\510464-WTS\PR-SYS-EN21-DS-106.dwg



NOTE:

1. BOTH EJECTOR AND INSTRUMENT AIR SUPPLY ASSEMBLIES ARE TO BE LOCATED INDOORS OR TO BE TEMPERATURE AND UV PROTECTED.
2. SEE ELECTRICAL DRAWINGS DURING DETAILED ENGINNERING FOR ELECTRICAL WIRING AND INSULATION.
3. AIR GAP IS REQUIRED ON ELECTOR DISCHARGE LINE EXHAUST TO MEMBRANE TANK OR DRAIN.
4. THE 3/8" TUBING THAT CONNECTS THE TWO SPOOLS TOGETHER IS TO BE PROVIDED AND INSTALLED ONSITE BY OTHERS.
5. 20-HV-803-X IS FOR MEMBRANE PRESSURE DECAY TESTING.VALVE TO REMAINED CLOSED AND LOCKED AT ALL OTHER TIMES.
6. REFER TO TIE POINTS ON EQUIPMENT ARRANGEMENT DRAWINGS.
7. ALL EQUIPMENT ON THIS SHEET ARE DESGINED TO BE INSTALLED IN A NON-CLASSIFIED AREA (PER NFPA 820).

VEOLIA WTS
CONTROLLED DOCUMENT

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
E	REVISED AS NOTED	-	NE	MR	KK	08 MAY 25
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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X
.XX FRAC
.XXX

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VEOLIA

CUSTOMER INFORMATION

CAESARS LANE WTF
MBR SYSTEM

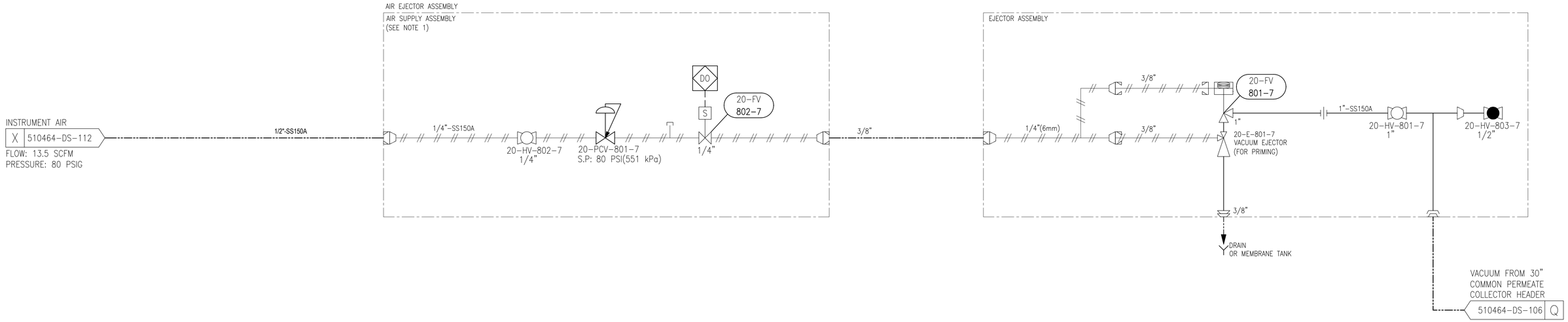
P&ID,

EJECTOR ASSEMBLY

DRAWING NUMBER: 510464-WTS-PR-SYS-EN21-DS-109
REVISION: E
REF.: -
DOC. OWNER:
PROJECT NO.: 510464
PART/MATERIAL NO.:
SCALE: NONE
SIZE: D
SHEET: 1 OF 2

LAST SAVED: Thursday, May 8, 2025 10:02:39 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\1- PFD and P&ID\510464-WTS-PR-SYS-EN21-DS-109.dwg



NOTE:

1. BOTH EJECTOR AND INSTRUMENT AIR SUPPLY ASSEMBLIES ARE TO BE LOCATED INDOORS OR TO BE TEMPERATURE AND UV PROTECTED.
2. SEE ELECTRICAL DRAWINGS DURING DETAILED ENGINNERING FOR ELECTRICAL WIRING AND INSULATION.
3. AIR GAP IS REQUIRED ON ELECTOR DISCHARGE LINE EXHAUST TO MEMBRANE TANK OR DRAIN.
4. THE 3/8" TUBING THAT CONNECTS THE TWO SPOOLS TOGETHER IS TO BE PROVIDED AND INSTALLED ONSITE BY OTHERS.
5. 20-HV-803-X IS FOR MEMBRANE PRESSURE DECAY TESTING.VALVE TO REMAINED CLOSED AND LOCKED AT ALL OTHER TIMES.
6. REFER TO TIE POINTS ON EQUIPMENT ARRANGEMENT DRAWINGS.
7. ALL EQUIPMENT ON THIS SHEET ARE DESGINED TO BE INSTALLED IN A NON-CLASSIFIED AREA (PER NFPA 820).

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
E	REVISED AS NOTED	-	NE	MR	KK	08 MAY 25
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TOLERANCES UNLESS NOTED
DECIMALS .X .XX .XXX
ANGLES
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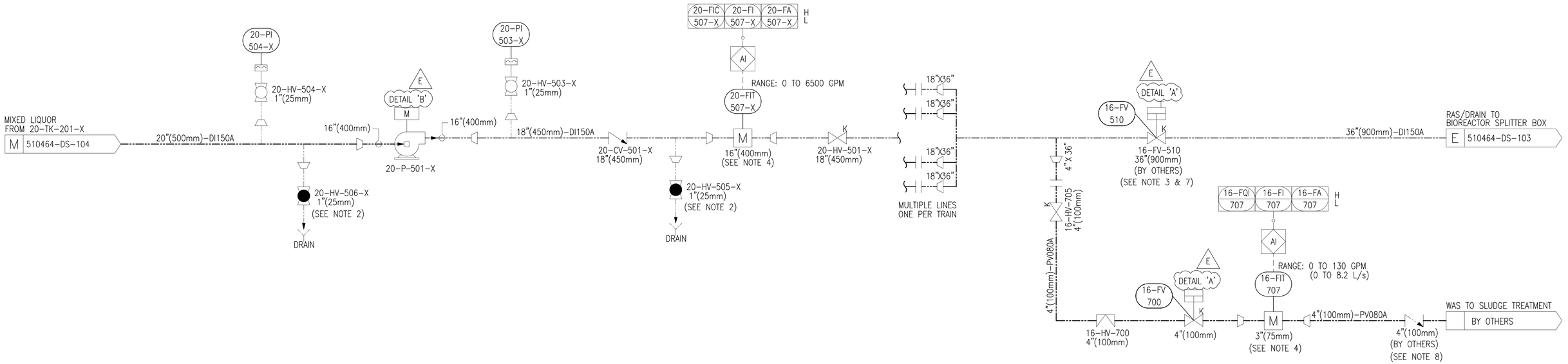
VEOLIA

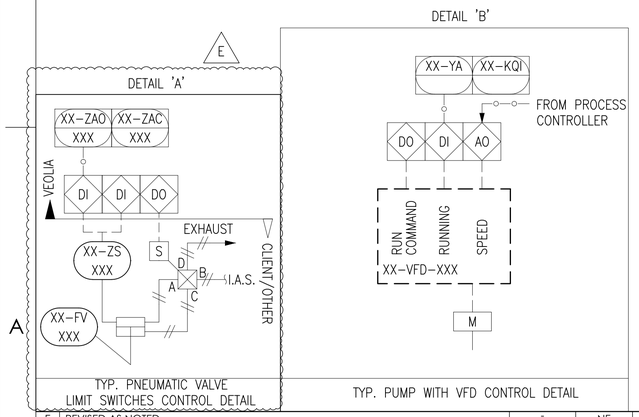
CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

P&ID,
EJECTOR ASSEMBLY

DRAWING NUMBER: 510464-WTS-PR-SYS-EN21-DS-109
REVISION: E
REF.: -
DOC. OWNER:
PROJECT NO.: 510464
PART/MATERIAL NO.:
SCALE: NONE
SIZE: D
SHEET: 2 OF 2
LAST SAVED: Thursday, May 8, 2025 10:02:39 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\1. PFD and P&ID\510464-WTS-PR-SYS-EN21-DS-109.dwg





TYP. PNEUMATIC VALVE LIMIT SWITCHES CONTROL DETAIL

TYP. PUMP WITH VFD CONTROL DETAIL

RAS/WAS/DRAIN PUMP DATA	
NO OF DUTY PUMP	4
NO OF STANDBY PUMP	0
TAG NUMBER	20-P-501-1/2/3/4
TYPE OF PUMP	END-SUCTION CENTRIFUGAL
PUMP MAX. RAS FLOW	6,302 GPM @ 12' TDH
PUMP MIN. RAS FLOW	3,125 GPM @ 12' TDH
PUMP DRAIN CYCLE FLOW	1,900 GPM @ 12' TDH
PUMP MIN. CONTINUOS FLOW	1,550 GPM
SPEED CONTROL	VFD
ELECTRIC MOTOR	TEFC, 30.0 HP AT 590 RPM
VOLTAGE	480V/3PH/60HZ

VEOLIA WTS CONTROLLED DOCUMENT

NOTES:

1. ALL DOTTED-LINE EQUIPMENT BY OTHERS. ---------- STAINLESS STEEL PIPING OPTIONAL.VERIFICATION OF ANY POSTED VALUES IS THE RESPONSIBILITY OF THE SYSTEM INTEGRATOR
2. FLOOR DRAINS TO BE PROVIDED AND PIPED INTO BY GENERAL CONTRACTOR, AS REQUIRED.
3. SUFFICIENT BACK-PRESSURE MUST BE AVAILABLE ON THE COMMON RAS LINE TO ALLOW FOR PREFERENTIAL FLOW TO WAS DESTINATION IF REQUIRED, AN AUTOMATICALLY ACTUATED VALVE CAN BE ADDED TO THE COMMON RAS LINE FOR THIS PURPOSE.
4. FOLLOW MANUFACTURER'S RECOMMENDATION REGARDING INSTALLATION REQUIREMENTS, INCLUDING NUMBER OF STRAIGHT PIPE RUNS. PIPING MUST BE ARRANGED SO MAG IS ALWAYS FLOODED.
5. ALL EQUIPMENT ON THIS SHEET IS DESIGNED TO BE INSTALLED IN A NON-CLASSIFIED AREA (PER NFPA 820).
6. FINAL SIZING AND DESIGN TO BE VERIFIED DURING DETAILED PROJECT ENGINEERING.
7. THE ACTUATED VALVE WITH EXTENDED TRAVEL STOP (TO BE SUPPLIED BY OTHERS)
8. BALL CHECK VALVES TO PREVENT BACK FLOW FROM SCUM DISCHARGE PUMPS (TO BE SUPPLIED BY OTHERS)

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
E	REVISED AS NOTED	-	NE	MR	KK	08 MAY 25
D	REVISED AS NOTED	-	SBN	MR	KK	25 NOV 24
C	REVISED AS NOTED	-	AS	MR	KK	23 JAN 24
B	REVISED AS NOTED	-	PT	MR	KK	23 MAR 23
A	INITIAL RELEASE	-	TP	MR	KK	17 FEB 23

TOLERANCES UNLESS NOTED
DECIMALS .X .XX .XXX
ANGLES
FRAC

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VEOLIA

CUSTOMER INFORMATION

CAESARS LANE WTF
MBR SYSTEM

P&ID,

RAS/WAS/DRAIN PUMP

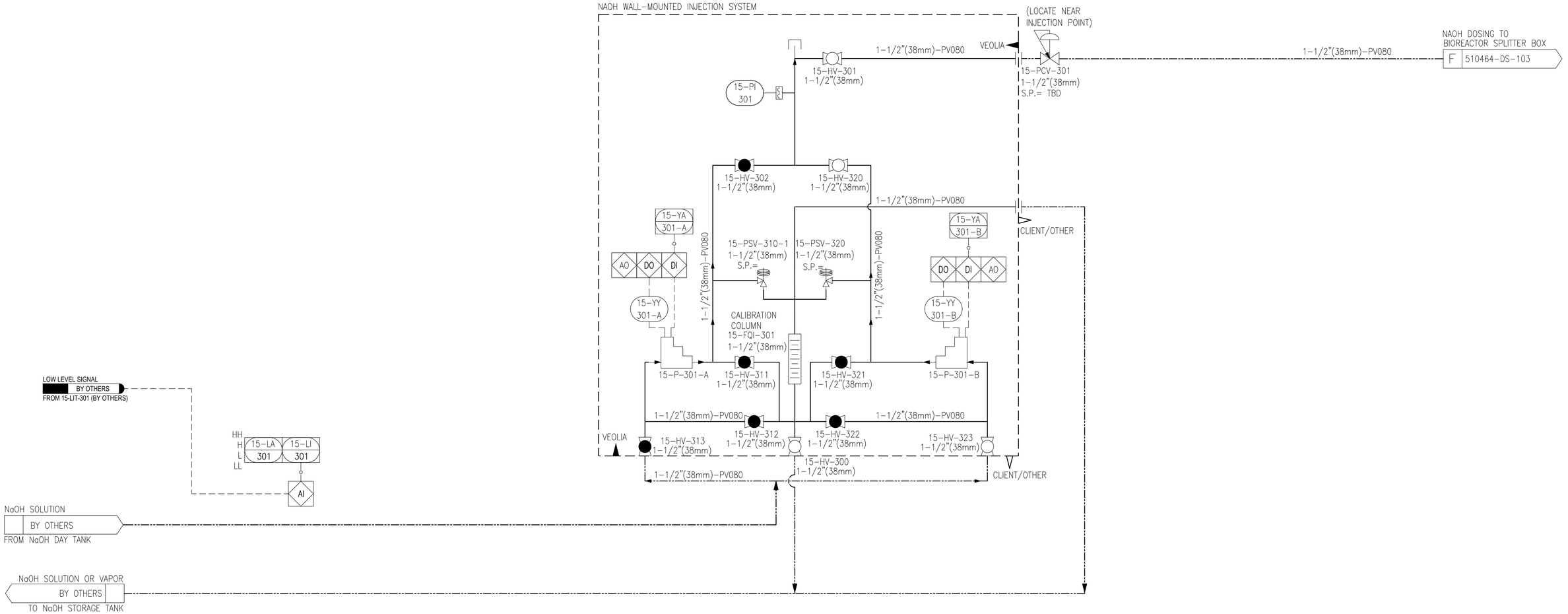
DRAWING NUMBER	REVISION
510464-WTS-PR-SYS-EN21-DS-110	E

REF.: -
DOC. OWNER:

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464		NONE	D	1 OF 1

LAST SAVED: Thursday, May 8, 2025 10:02:39 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\1. PFD and P&ID\510464-WTS[PR-SYS-EN21-DS-110.dwg



ALKALINITY PUMP DATA	
TAG NUMBERS	15-P-301-A/B
# OF PUMPS	1 DUTY / 1 STANDBY
DESIGN FLOW AND PRESSURE	TBD
MAX. FLOW AND PRESSURE	2.2 GPM @ 100 PSIG
VOLTAGE	120 VAC/ 1 ph/ 60 Hz
SUPPLIER, MODEL	PROMINENT

VEOLIA WTS CONTROLLED DOCUMENT

NOTES:

1. ALL DOTTED LINES/EQUIPMENT BY OTHERS ----------
2. ALL SYSTEM COMPONENTS PRESENTED ON THIS DRAWING ARE WALL MOUNTED.
3. ALL EQUIPMENT DESIGNED TO BE INSTALLED IN NON-CLASSIFIED AREA (PER NFPA 820).
4. VENT ALL CHEMICAL TANKS APPROPRIATELY.
5. CHEMICAL CONTAINMENT BY OTHERS.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
E	REVISED AS NOTED	"	NE	MR	KK	08 MAY 25
D	REVISED AS NOTED	"	SBN	MR	KK	25 NOV 24
C	REVISED AS NOTED	"	AS	MR	KK	23 JAN 24
B	REVISED AS NOTED	"	PT	MR	KK	23 MAR 23
A	INITIAL RELEASE	"	TP	MR	KK	17 FEB 23

TOLERANCES UNLESS NOTED
DECIMALS .X .XX .XXX
ANGLES
FRAC

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VEOLIA

CUSTOMER INFORMATION

CAESARS LANE WTF
MBR SYSTEM

P&ID,

CHEMICAL DOSING SYSTEM

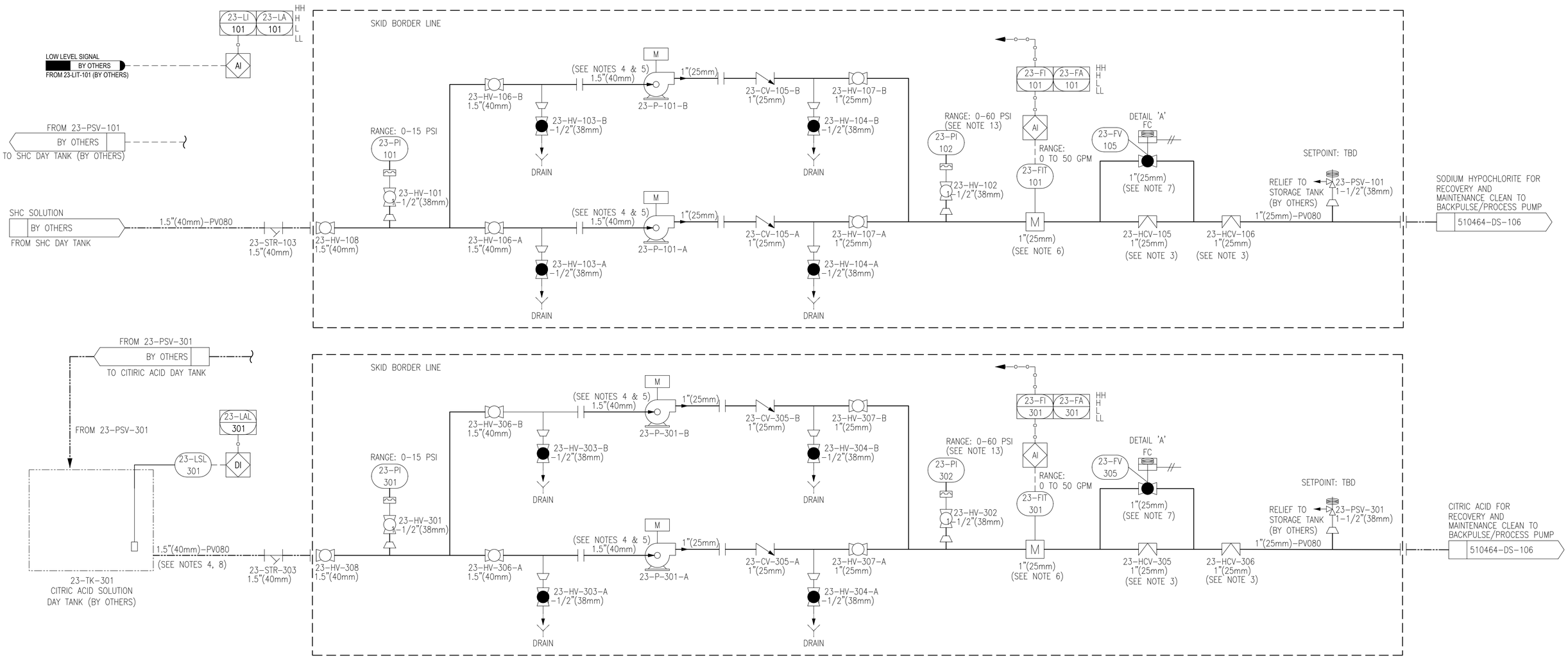
BIOLOGICAL PROCESS

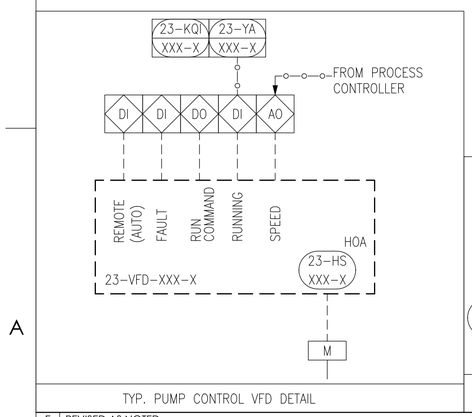
DRAWING NUMBER	REVISION
510464-WTS-PR-SYS-EN21-DS-111	E
REF.: -	DOC. OWNER:

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510464		NONE	D	1 OF 2

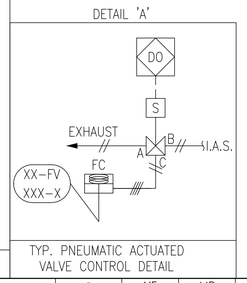
LAST SAVED: Thursday, May 8, 2025 10:02:38 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWIP\1. PID and P&ID\510464-WTS-PR-SYS-EN21-DS-111.dwg





TYP. PUMP CONTROL VFD DETAIL



TYP. PNEUMATIC ACTUATED
VALVE CONTROL DETAIL

GENERAL PUMP INFO	
SODIUM HYPOCHLORITE	12.0% w/w
NO. OF DUTY PUMPS	1
NO. OF STANDBY PUMPS	1
NO. OF SHELF SPARE PUMPS	1 (SEE NOTE 11)
TYPE OF PUMP	END-SUCTION CENTRIFUGAL
TAG NUMBERS (INSTALLED)	23-P-101-A/B
SPEED CONTROL	VFD
ELECTRIC MOTOR	1.0HP @ 3450RPM
VOLTAGE	460 V/3 ph/60 Hz
PUMP MODEL	DB9V-R-FF-M219

INSTALLED	DESIGN FLOW	TDH
MC	2.67 GPM	25 PSIG
RC	14.70 GPM	25 PSIG

BUILDOUT	MAX FLOW	TDH
MC	2.82 GPM	25 PSIG
RC	15.51 GPM	25 PSIG

GENERAL PUMP INFO	
CITRIC ACID	50% w/w
NO. OF DUTY PUMPS	1
NO. OF STANDBY PUMPS	1
NO. OF SHELF SPARE PUMPS	1 (SEE NOTE 11)
TYPE OF PUMP	END-SUCTION CENTRIFUGAL
TAG NUMBERS (INSTALLED)	23-P-301-A/B
SPEED CONTROL	VFD
ELECTRIC MOTOR	1.0HP @ 3450RPM
VOLTAGE	460 V/3 ph/60 Hz
PUMP MODEL	DB9V-R-FF-M219

INSTALLED	DESIGN FLOW	TDH
MC	5.19 GPM	25 PSIG
RC	5.72 GPM	25 PSIG

BUILDOUT	MAX FLOW	TDH
MC	5.47 GPM	25 PSIG
RC	6.02 GPM	25 PSIG

NOTES: (REVIEW AND REMOVE BEFORE EXTERNAL RELEASE)

1. ALL DOTTED-LINE EQUIPMENT NOT SUPPLIED BY VWTS. _____ VERIFICATION OF ANY POSTED VALUES IS THE RESPONSIBILITY OF THE SYSTEM INTEGRATOR.
2. DRAINS FROM SODIUM HYPOCHLORITE SOLUTION AND ANY ACID SOLUTION SHOULD NOT BE MIXED.
3. 23-HCV-105/305 TO BE ADJUSTED FOR MAINTENANCE CLEAN FLOW. 23-HCV-106/306 TO BE ADJUSTED FOR RECOVERY CLEAN FLOW. IF THERE IS ONLY RECOVERY CLEAN FLOW THEN 23-HCV-105/305 AND 23-FV-105/305 CAN BE REMOVED.
4. BOTTOM CONNECTION FROM THE TANK IS MANDATORY. FLOODED SUCTION SETUP REQUIRED FOR PUMP OPERATION.
5. REFER TO MANUFACTURER'S I&O MANUAL FOR PIPING AND INSTALLATION REQUIREMENTS.
6. ALL EQUIPMENT ON THIS SHEET IS DESIGNED TO BE INSTALLED IN A NON-CLASSIFIED AREA (PER NFPA 820).
7. VALVE TO OPEN ONLY FOR RECOVERY CLEAN PROCESS.
8. TANK DESIGN, INCLUDING SECONDARY CONTAINMENT AND VENTING IF REQUIRED, IS BY OTHERS.
9. FLOOR DRAINS TO BE PROVIDED AND PIPED INTO BY GENERAL CONTRACTOR, AS REQUIRED.
10. OUTDOOR PIPING/EQUIPMENT TO BE HEAT-TRACED AND INSULATED BY OTHERS.
11. EQUIPMENT AND ENVIRONMENTAL PROTECTION, IF REQUIRED, IS BY OTHERS.
12. GASKETS AND HARDWARE SHOULD BE COMPATIBLE WITH SELECTED CHEMICAL, (NOT PROVIDED BY VWTS).
13. ALL BALL VALVES SUPPLIED FOR CHEMICALS ARE TO BE VENTED WITH VITON SEALS.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
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TOLERANCES UNLESS NOTED
DECIMALS .X .XX .XXX
ANGLES
FRAC

VEOLIA

CUSTOMER INFORMATION

CAESARS LANE WTF
MBR SYSTEM

P&ID,

MEMBRANE CLEANING CHEM. SYSTEMS

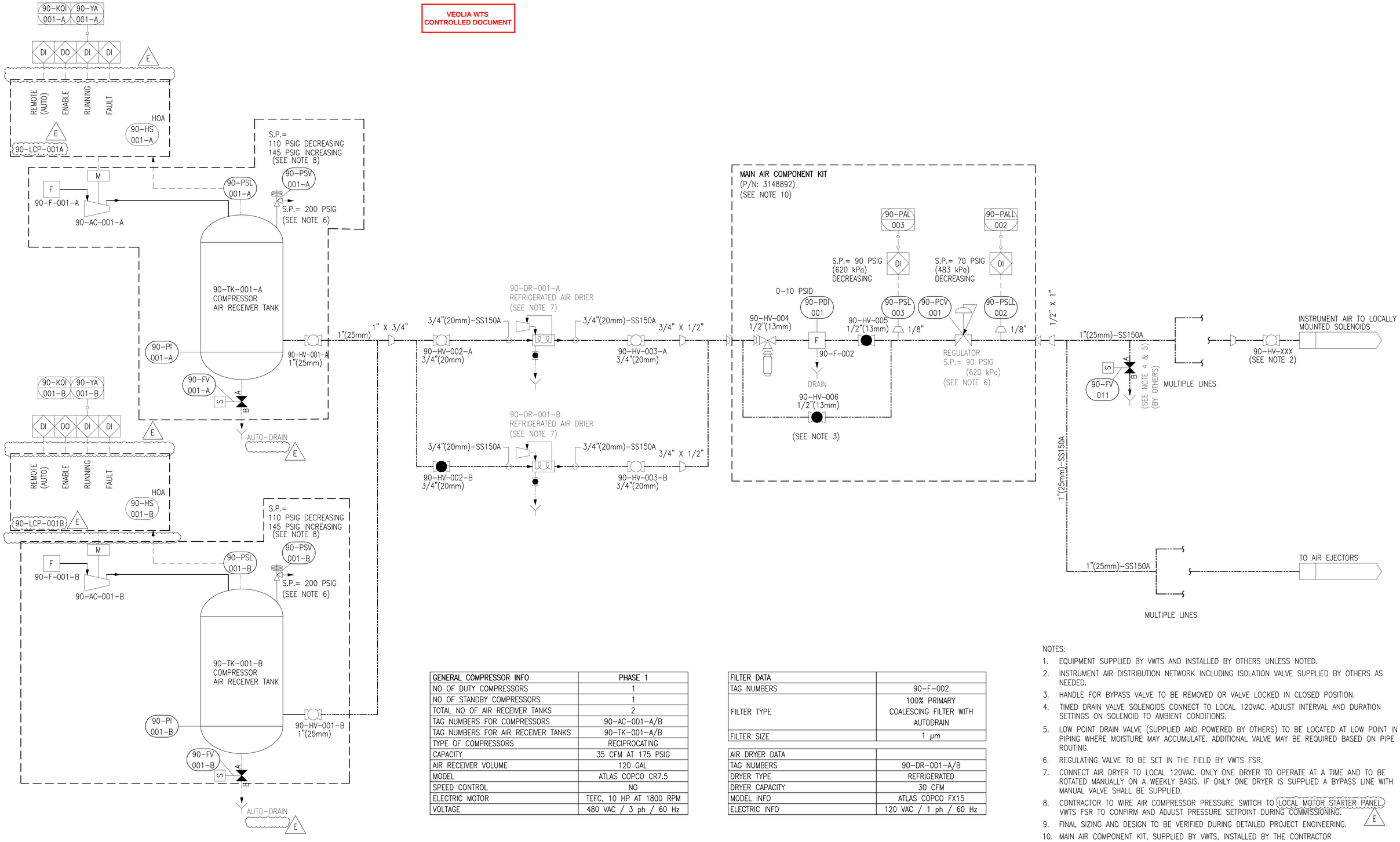
CENTRIFUGAL, MAG DRIVE PUMP

DRAWING NUMBER				REVISION
510464-WTS-PR-SYS-EN21-DS-111				E
REF.: -	DOC. OWNER:			
PROJECT NO. 510464	PART/MATERIAL NO.	SCALE NONE	SIZE D	SHEET 2 OF 2

LAST SAVED: Thursday, May 8, 2025 10:02:38 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWTP\1. PFD and P&ID\510464-WTSPR-SYS-EN21-DS-111.dwg

VEOLIA WTS
CONTROLLED DOCUMENT



MULTIPLE LINES

GENERAL COMPRESSOR INFO	PHASE 1
NO OF DUTY COMPRESSORS	1
NO OF STANDBY COMPRESSORS	1
TOTAL NO OF AIR RECEIVER TANKS	2
TAG NUMBERS FOR COMPRESSORS	90-AC-001-A/B
TAG NUMBERS FOR AIR RECEIVER TANKS	90-TK-001-A/B
TYPE OF COMPRESSORS	RECIPROCATING
CAPACITY	35 CFM AT 175 PSIG
AIR RECEIVER VOLUME	120 GAL
MODEL	ATLAS COPCO CR7.5
SPEED CONTROL	NO
ELECTRIC MOTOR	TEFC, 10 HP AT 1800 RPM
VOLTAGE	480 VAC / 3 ph / 60 Hz

FILTER DATA	
TAG NUMBERS	90-F-002
FILTER TYPE	100% PRIMARY COALESCING FILTER WITH AUTODRAIN
FILTER SIZE	1 µm

AIR DRYER DATA	
TAG NUMBERS	90-DR-001-A/B
DRYER TYPE	REFRIGERATED
DRYER CAPACITY	30 CFM
MODEL INFO	ATLAS COPCO FX15
ELECTRIC INFO	120 VAC / 1 ph / 60 Hz

NOTES:

1. EQUIPMENT SUPPLIED BY VWTS AND INSTALLED BY OTHERS UNLESS NOTED.
2. INSTRUMENT AIR DISTRIBUTION NETWORK INCLUDING ISOLATION VALVE SUPPLIED BY OTHERS AS NEEDED.
3. HANDLE FOR BYPASS VALVE TO BE REMOVED OR VALVE LOCKED IN CLOSED POSITION.
4. TIMED DRAIN VALVE SOLENOIDS CONNECT TO LOCAL 120VAC. ADJUST INTERVAL AND DURATION SETTINGS ON SOLENOID TO AMBIENT CONDITIONS.
5. LOW POINT DRAIN VALVE (SUPPLIED AND POWERED BY OTHERS) TO BE LOCATED AT LOW POINT IN PIPING WHERE MOISTURE MAY ACCUMULATE. ADDITIONAL VALVE MAY BE REQUIRED BASED ON PIPE ROUTING.
6. REGULATING VALVE TO BE SET IN THE FIELD BY VWTS FSR.
7. CONNECT AIR DRYER TO LOCAL 120VAC. ONLY ONE DRYER TO OPERATE AT A TIME AND TO BE ROTATED MANUALLY ON A WEEKLY BASIS. IF ONLY ONE DRYER IS SUPPLIED A BYPASS LINE WITH MANUAL VALVE SHALL BE SUPPLIED.
8. CONTRACTOR TO WIRE AIR COMPRESSOR PRESSURE SWITCH TO LOCAL MOTOR STARTER PANEL VWTS FSR TO CONFIRM AND ADJUST PRESSURE SETPOINT DURING COMMISSIONING. E
9. FINAL SIZING AND DESIGN TO BE VERIFIED DURING DETAILED PROJECT ENGINEERING.
10. MAIN AIR COMPONENT KIT, SUPPLIED BY VWTS, INSTALLED BY THE CONTRACTOR

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
E	REVISED AS NOTED	-	NE	MR	KK	08 MAY 25
D	REVISED AS NOTED	-	SBN	MR	KK	25 NOV 24
C	REVISED AS NOTED	-	AS	MR	KK	23 JAN 24
B	REVISED AS NOTED	-	PT	MR	KK	23 MAR 23
A	INITIAL RELEASE	-	TP	MR	KK	17 FEB 23

TOLERANCES UNLESS NOTED
DECIMALS .X .XX .XXX
ANGLES
FRAC

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VEOLIA

CUSTOMER INFORMATION
CAESARS LANE WTF
MBR SYSTEM

P&ID,
AIR COMPRESSOR

DRAWING NUMBER: 510464-WTS-PR-SYS-EN21-DS-112
REVISION: E
REF.: -
DOC. OWNER:
PROJECT NO.: 510464
PART/MATERIAL NO.:
SCALE: NONE
SIZE: D
SHEET: 1 OF 1
LAST SAVED: Thursday, May 8, 2025 9:58:40 PM

FILE LOCATION: C:_ADSKVault\NAM\510464 - Caesars Lane WWIP\1. PFD and P&ID\510464-WTSPR-SYS-EN21-DS-112.dwg

FOR CONTINUATION SEE SHEET C-116

FOR CONTINUATION SEE SHEET C-118

FOR CONTINUATION SEE SHEET C-114

FOR CONTINUATION SEE SHEET C-113

ANOXIC ZONE 1 TOP OF TANK 40.75

PROPOSED INFLUENT DRY WELL TOP OF TANK 33.0

PROPOSED WET WELL & DIST. CHANNEL TOP OF TANK 33.0

PROPOSED FINE SCREENS F.F. 30.0

INV. IN 32.5

INV. OUT 17.17

INV. 24.67'

PROP. 18"Ø SDR35 PVC, TYP. OF 4, INV. 22.52, TYP.

CB-5C

8"Ø HDPE

CONNECT TO EXISTING, TYP.

PROP. 18"Ø SDR35 PVC

PROP. 18"Ø SDR35 PVC OVERFLOW

PROP. TEMP. 4"Ø DI W.A.S.

PROP. 6"Ø DI SLUDGE DISCHARGE

CONNECT PRIMARY #4 - 4"Ø SCUM LINE TO TEMP. W.A.S. LINE, DISCONNECT 4" TEMP. W.A.S. LINE UPSTREAM OF PROPOSED CONNECTION

EXISTING PRIMARY SETTLING TANK #2 (TO BE UPGRADED (SEE 300-SERIES DWGS.)

INV. 12.13

INV. 24.32

EXISTING PRIMARY SLUDGE VALVE VAULT (SEE C-320 FOR IMPROVEMENTS)

EXIST. 8"Ø CI VENT

EXIST. 6"Ø CI

INV. 24.67

EXISTING PRIMARY SETTLING TANK #1 (TO BE UPGRADED (SEE 300-SERIES DWGS.)

EXIST. 6" PVC VENT

EXISTING PRIMARY SLUDGE PIT (SEE C-321)

INV. 12.13

PROP. MODIFICATIONS TO EXIST. GRIT SYSTEM (SEE 200-SERIES DWGS.)

INV. 24.67

EXIST. 18"Ø DI TO PRIMARY SETTLING TANK #4 (TO REMAIN)

EXIST. 18"Ø DI TO PRIMARY SETTLING TANK #1 (TO REMAIN)

PROP. SLUDGE VAULT W/ VALVE, RIM. 28.5, SEE C-320

INV. IN 24

INV. IN 12.18

INV. IN 24

INV. OUT 24

6"Ø DI PRIMARY SLUDGE TO SLUDGE HOLDING

TW=25.5 BW=25.0

TW=25.0 BW=24.0

TW=26.0 BW=24.0

TW=26.0 BW=25.0

TW=26.5 BW=26.0

4"Ø PVC INV. IN 20.5

4"Ø PERF. PIPE BEHIND WALL, DISCHARGE TO BASIN CB-13C

GRASS-LINED EMERGENCY SPILLWAY, EL. 32.5, L=10'

EXIST. 6"Ø SLUDGE RETURN LINES CAN BE ABANDONED IN PLACE OR REMOVED WHERE REQUIRED FOR PROPOSED UTILITIES

CB-13C

12"Ø HDPE

CONNECT PROPOSED 4" SCUM LINE TO EXISTING

6"Ø HDPE

6" DR9

CB-2

PROP. 4"Ø DI SCUM

PROP. CUT & CAP

PROP. CONCRETE BLOCK RETAINING WALL

PROP. 4"Ø DI FILTRATE/ SUPERNATANT

18"Ø HDPE

EXIST. 12" VENTS

NTROL BUILDING
ONVERTED TO
DEWATERING
SERIES DWGS.)

T.O.W. 44.25

T.O.W. 42.75

BEND

2+50

2+00

1+50

1+00

0+50

0+00

RETAINING WALL

WATER MAIN PHASE 2B - PROPOSED 8" DI CONNECTION TO BLIND FLANGE @ STA. 1+92± (TO BE CONSTRUCTED DURING THE CONSTRUCTION OF THE MBR BLDG. - 500 SERIES), SEE SHEET C-127

HYD

8x6 TEE

GATE VALVE, TYP.

8"Ø DI W.M.

45° BEND

CB-5B

CB-5A

CB-5

CB-6

12"Ø HDPE

X'ING 26.0'

T.O.W. 39.75

T.O.W. 38.25

T.O.W. 36.75

T.O.W. 35.25

RIP-RAP CHANNEL, D_{50} = 6", THICKNESS = 18" OVER NON-WOVEN GEOTEXTILE

GRASS-LINED BYPASS SWALE

EXIST. S.M.H. RIM ELEV. 43.01 INV. IN 33.02 INV. OUT 32.89

EXIST. 24"Ø CIP SEWER PIPE

PROPOSED MODULAR BLOCK RETAINING WALL (SEE STRUCTURAL PLANS FOR DETAILS)

PROPOSED GUIDE RAIL, 2' CLEAR FROM E.O.P. TO FACE

EXISTING PRIMARY SETTLING TANK #3 (TO BE UPGRADED (SEE 300-SERIES DWGS.)

INV. 12.13

INV. 24.32

PROP. PRECAST CONC. PRIMARY DISTRIBUTION BOX (SEE 200-SERIES DWGS.)

EXIST. GRATE

INV. 24.67

PROP. 18"Ø SDR-35 PVC SEWER TO PRIMARY SETTLING TANK #3

CB-4

CB-4A

CB-4B

12"Ø HDPE

INV. 26.35

CONNECT TO EXISTING

INV. 29.40

TOP OF TANK 33.15

PROP. 30"Ø SDR35 PVC

EXIST. GRIT SYSTEM

INV. 29.48

TOP OF TANK 33.56

PROP. 4"Ø DI 11.2%

CB-3

PROP. INSULATED SCH80 PVC TO BE SUPPORTED FROM GROUND, SEE C-250

NON-FREEZE HOSE BIBB

4"Ø DI TO GRIT WASHER #2, SEE SHEET C-210

EXISTING 8" WATER MAIN GATE VALVE & BLIND FLANGE CONSTRUCTED IN PHASE 1 (CONNECT NEW 8"Ø DI WATER MAIN - PHASE 2A)

PROP. GRIT SYSTEM (SEE 200-SERIES DWGS.)

PROP. HEADWORKS BLDG. (SEE 200-SERIES DWGS.)

F.F. 32.73

ELEC. PANEL

EXIST. INFLUENT STRUCTURE

BYPASS

PROP. INV. IN 30.41

SPLASHBLOCK, TYP.

CONNECT EXIST. 24"Ø CI SEWER INTO PROPOSED INFLUENT SPLITTER BOX, INV. 31.04

PROP. INFLUENT SPLITTER BOXES (SEE 200-SERIES DWGS.)

T.O.W. 36.0, 30" INV. IN 31.05, 24" INVS. OUT 31.04

PROP. 24"Ø SDR35 PVC

PROPOSED 5'Ø SMH-3 RIM. 36.4 EX. 24" INV. IN 32.06 PR. 24" INV. OUT 31.86

PROP. 30"Ø SDR35 PVC

INV. 31.08

PROP. INFLUENT PARSHALL FLUME (SEE 200-SERIES DWGS.)

INV. 31.68

INV. IN 33.0

INV. 31.34

T.O.W. 36.5

PROP. 24"Ø SDR35 PVC

EXIST. 24"Ø CIP SEWER TO BE CUT AND CONNECTED TO PROPOSED 5'Ø CONC. MANHOLE

INV. 31.16

END CAP

C.O. TO EL. 33.0'

Q_{100} EL. 31.59

6"Ø UNDERDRAIN

BIO-BASIN 2

PROPOSED 6' HIGH PERIMETER CHAIN LINK FENCE TO MEET EXISTING FENCE

EXIST. OUTLET STRUCTURE BB1 RIM. 35.0 24" INV. IN 29.0 INV. OUT 28.0

EXIST. CB RIM. 36.0 INV. IN 32.5 INV. OUT 30.0

INV. IN 32.5

INV. IN 35.0

15"Ø HDPE

18"Ø HDPE

C.O. TO EL. 35.0'

EXISTING 24"Ø HDPE

6"Ø UNDERDRAIN

END CAP

INV. 30.0

BIO-BASIN 1

Q_{100} EL. 34.79

PROPOSED PAVEMENT, SEE SHEET C-153

EXIST. LAWN

EXIST. 8"Ø CLASS 52 DI WATER MAIN

EXIST. 8"Ø DI SCUM

EXIST. 6"Ø DI SCUM

EXIST. 18"Ø DI

EXIST. 8"Ø CLASS 52 DI WATER MAIN

EXISTING 30"Ø HDPE

EXIST. 8"Ø SEWER

BIO-BASIN 1 NOTES :

1. EXCAVATE AND REMOVE THE EXISTING BOTTOM OF BIO-BASIN 1 TO INSTALL NON-WOVEN GEOTEXTILE, CRUSHED STONE, 6" UNDERDRAIN, BIO-BASIN SOIL, HARDWOOD MULCH AND PLANTINGS AS SHOWN IN THE DETAILS.
2. CONTRACTOR IS TO CAREFULLY EXCAVATE AROUND THE 24"Ø HDPE PIPE.
3. THE CONSTRUCTION IS TO TAKE PLACE AFTER THE ENTIRE DRAINAGE AREA TO THE BIO-BASIN IS STABILIZED.

NOTES :

1. REFER TO STORMWATER STRUCTURE SCHEDULE ON SHEET C-120 FOR DESIGN INFORMATION.
2. REFER TO PROCESS PIPE PROFILE SHEETS C-123, C-124, C-125 AND C-126.
3. REFER TO WATER MAIN PROFILE SHEET C-127.

GRAPHIC SCALE

10 0 5 10 20 40

1 inch = 10 feet

1 / C-115 PARTIAL SITE PIPING / UTILITY PLAN #3

SCALE: 1" = 10'

MHE ENGINEERING

33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100

111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID SET

HAZARDOUS MATERIAL NOTE:

THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE CALL 811

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2

145 CAESARS LN.
NEW WINDSOR, NY 12553

FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

PARTIAL SITE PIPING / UTILITY PLAN #3

REVISIONS

NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

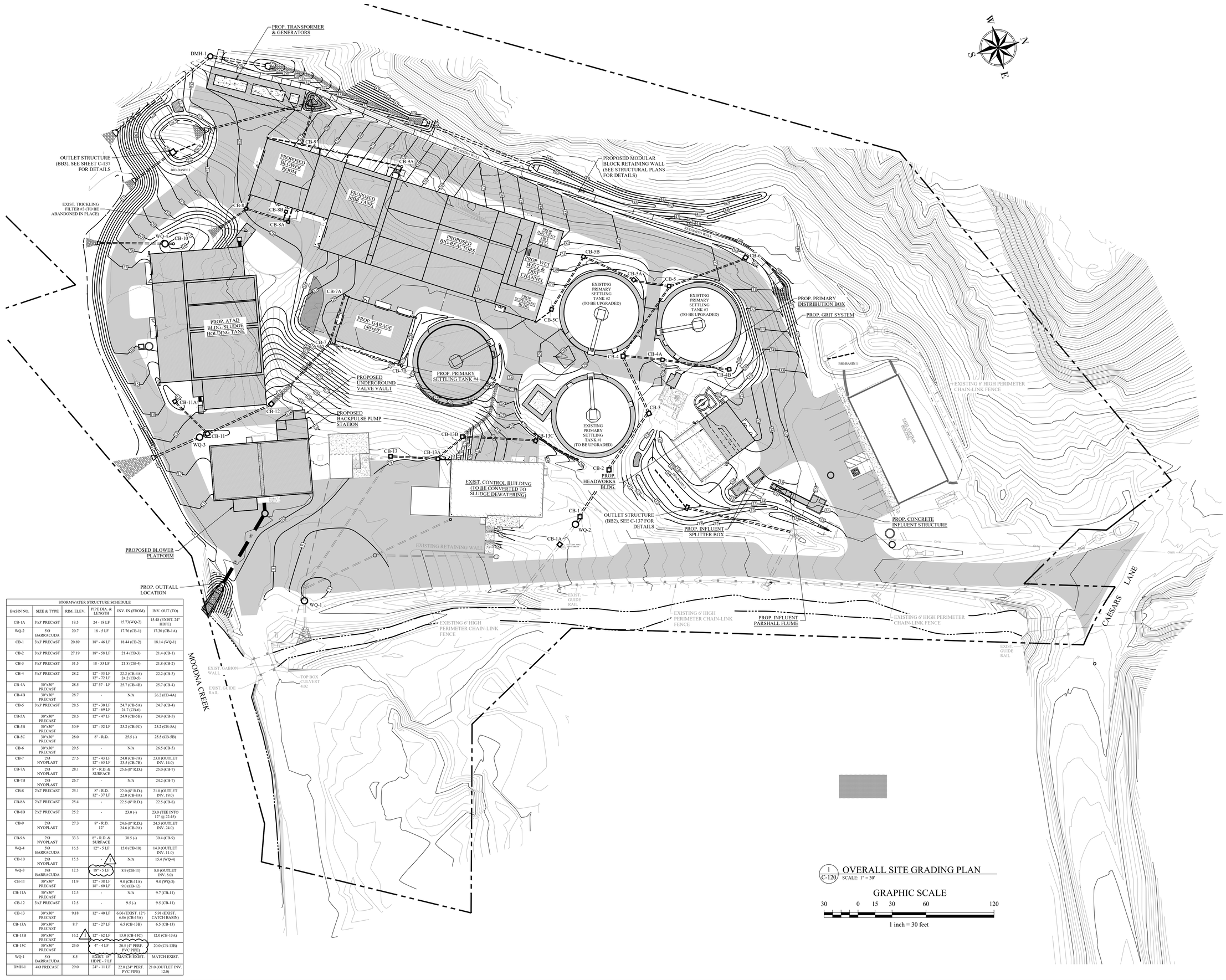
ISSUED DATE:	18 APR, 2025
DESIGN BY:	SMQ, JTW
DRAWN BY:	HPBJr
CHECKED BY:	MWW
REVIEWED BY:	MJS, JZ

SHEET NO.

C-115

PROJECT # 18-732 PHASE #

F:\2018\18-732 Caesar Lane WWTP Improvements\Expansion Phase\Drafting\1 - Site Work & Outfall\Addendum 4\18-732 Caesars Lane WWTP Site Plan Phase 2.dwg, C-115, 7/9/2025 2:16:14 PM



STORMWATER STRUCTURE SCHEDULE					
BASIN NO.	SIZE & TYPE	RIM. ELEV.	PIPE DIA. & LENGTH	INV. IN (FROM)	INV. OUT (TO)
CB-1A	3'x3' PRECAST	19.5	24 - 18 LF	15.73(WQ-2)	15.48 (EXIST. 24" HDPE)
WQ-2	5'Ø BARRACUDA	20.7	18 - 5 LF	17.76 (CB-1)	17.30 (CB-1A)
CB-1	3'x3' PRECAST	20.89	18" - 46 LF	18.44 (CB-2)	18.14 (WQ-1)
CB-2	3'x3' PRECAST	27.19	18" - 58 LF	21.4 (CB-3)	21.4 (CB-1)
CB-3	3'x3' PRECAST	31.5	18 - 53 LF	21.8 (CB-4)	21.8 (CB-2)
CB-4	3'x3' PRECAST	28.2	12" - 33 LF 12" - 72 LF	22.2 (CB-4A) 24.2 (CB-5)	22.2 (CB-3)
CB-4A	30"x30" PRECAST	28.5	12" 57 - LF	25.7 (CB-4B)	25.7 (CB-4)
CB-4B	30"x30" PRECAST	28.7	-	N/A	26.2 (CB-4A)
CB-5	3'x3' PRECAST	28.5	12" - 30 LF 12" - 69 LF	24.7 (CB-5A) 24.7 (CB-6)	24.7 (CB-4)
CB-5A	30"x30" PRECAST	28.5	12" - 47 LF	24.9 (CB-5B)	24.9 (CB-5)
CB-5B	30"x30" PRECAST	30.9	12" - 52 LF	25.2 (CB-5C)	25.2 (CB-5A)
CB-5C	30"x30" PRECAST	28.0	8" - R.D.	25.5 (-)	25.5 (CB-5B)
CB-6	30"x30" PRECAST	29.5	-	N/A	26.5 (CB-5)
CB-7	2'Ø NYOPLAST	27.5	12" - 43 LF 12" - 65 LF	24.0 (CB-7A) 23.5 (CB-7B)	23.0 (OUTLET INV. 14.0)
CB-7A	2'Ø NYOPLAST	28.1	8" - R.D. & SURFACE	25.6 (8" R.D.)	25.0 (CB-7)
CB-7B	2'Ø NYOPLAST	26.7	-	N/A	24.2 (CB-7)
CB-8	2'x2' PRECAST	25.1	8" - R.D. 12" - 37 LF	22.0 (8" R.D.) 22.0 (CB-8A)	21.0 (OUTLET INV. 19.0)
CB-8A	2'x2' PRECAST	25.4	-	22.5 (8" R.D.)	22.5 (CB-8)
CB-8B	2'x2' PRECAST	25.2	-	23.0 (-)	23.0 (TEE INTO 12" @ 22.45)
CB-9	2'Ø NYOPLAST	27.3	8" - R.D. 12"	24.6 (8" R.D.) 24.6 (CB-9A)	24.5 (OUTLET INV. 24.0)
CB-9A	2'Ø NYOPLAST	33.3	8" - R.D. & SURFACE	30.5 (-)	30.4 (CB-9)
WQ-4	5'Ø BARRACUDA	16.5	12" - 5 LF	15.0 (CB-10)	14.9 (OUTLET INV. 11.0)
CB-10	2'Ø NYOPLAST	15.5	1 18" - 5 LF	N/A	15.4 (WQ-4)
WQ-3	5'Ø BARRACUDA	12.5		8.9 (CB-11)	8.8 (OUTLET INV. 8.0)
CB-11	30"x30" PRECAST	11.9	12" - 38 LF 18" - 60 LF	9.0 (CB-11A) 9.0 (CB-12)	9.0 (WQ-3)
CB-11A	30"x30" PRECAST	12.5	-	N/A	9.7 (CB-11)
CB-12	3'x3' PRECAST	12.5	-	9.5 (-)	9.5 (CB-11)
CB-13	30"x30" PRECAST	9.18	12" - 40 LF	6.06 (EXIST. 12") 6.06 (CB-13A)	5.91 (EXIST. CATCH BASIN)
CB-13A	30"x30" PRECAST	8.7	12" - 27 LF	6.5 (CB-13B)	6.5 (CB-13)
CB-13B	30"x30" PRECAST	16.2	1 12" - 62 LF	13.0 (CB-13C)	12.0 (CB-13A)
CB-13C	30"x30" PRECAST	23.0	4" - 4 LF	20.5 (4" PERF. PVC PIPE)	20.0 (CB-13B)
WQ-1	5'Ø BARRACUDA	8.5	EXIST. 18" HDPE - 7 LF	MATCH EXIST.	MATCH EXIST.
DMH-1	4'Ø PRECAST	29.0	24" - 11 LF	22.0 (24" PERF. PVC PIPE)	21.0 (OUTLET INV. 12.0)

1 C-120 OVERALL SITE GRADING PLAN
SCALE: 1" = 30'

GRAPHIC SCALE
30 0 15 30 60 120
1 inch = 30 feet

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID SET

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UDIG·NY SAFE DIGGING STARTS HERE
CALL 811

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

OVERALL SITE GRADING PLAN & STORMWATER SCHEDULE

REVISIONS

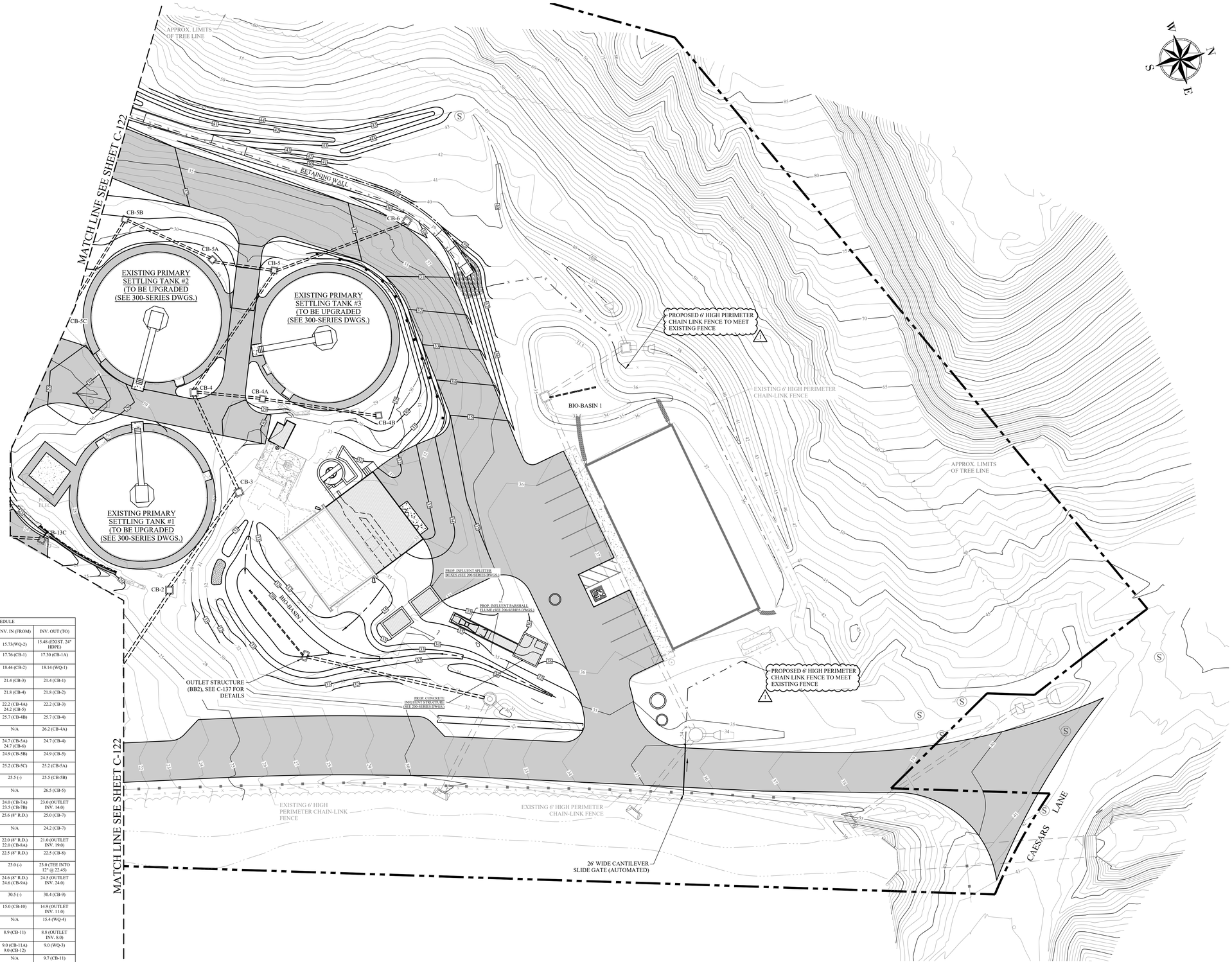
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	SMQ, JTW
DRAWN BY:	HPBJr
CHECKED BY:	MWW
REVIEWED BY:	MJS, JZ

SHEET NO.
C-120

PROJECT # 18-732 PHASE #

F:\2018\18-732 Caesar Lane WWTP Improvements\Expansion Phase\Drafting\1 - Site Work & Outfall\Addendum 4\18-732 Caesars Lane WWTP Site Plan Phase 2.dwg, C-120, 7/9/2025 2:18:14 PM



STORMWATER STRUCTURE SCHEDULE					
BASIN NO.	SIZE & TYPE	RIM. ELEV.	PIPE DIA. & LENGTH	INV. IN (FROM)	INV. OUT (TO)
CB-1A	3'x3' PRECAST	19.5	24 - 18 LF	15.73(WQ-2)	15.48 (EXIST. 24" HDPE)
WQ-2	5'Ø BARRACUDA	20.7	18 - 5 LF	17.76 (CB-1)	17.30 (CB-1A)
CB-1	3'x3' PRECAST	20.89	18" - 46 LF	18.44 (CB-2)	18.14 (WQ-1)
CB-2	3'x3' PRECAST	27.19	18" - 58 LF	21.4 (CB-3)	21.4 (CB-1)
CB-3	3'x3' PRECAST	31.5	18 - 53 LF	21.8 (CB-4)	21.8 (CB-2)
CB-4	3'x3' PRECAST	28.2	12" - 33 LF 12" - 72 LF	22.2 (CB-4A) 24.2 (CB-5)	22.2 (CB-3)
CB-4A	30"x30" PRECAST	28.5	12" 57 - LF	25.7 (CB-4B)	25.7 (CB-4)
CB-4B	30"x30" PRECAST	28.7	-	N/A	26.2 (CB-4A)
CB-5	3'x3' PRECAST	28.5	12" - 30 LF 12" - 69 LF	24.7 (CB-5A) 24.7 (CB-6)	24.7 (CB-4)
CB-5A	30"x30" PRECAST	28.5	12" - 47 LF	24.9 (CB-5B)	24.9 (CB-5)
CB-5B	30"x30" PRECAST	30.9	12" - 52 LF	25.2 (CB-5C)	25.2 (CB-5A)
CB-5C	30"x30" PRECAST	28.0	8" - R.D.	25.5 (-)	25.5 (CB-5B)
CB-6	30"x30" PRECAST	29.5	-	N/A	26.5 (CB-5)
CB-7	2'Ø NYOPLAST	27.5	12" - 43 LF 12" - 65 LF	24.0 (CB-7A) 23.5 (CB-7B)	23.0 (OUTLET INV. 14.0)
CB-7A	2'Ø NYOPLAST	28.1	8" - R.D. & SURFACE	25.6 (8" R.D.)	25.0 (CB-7)
CB-7B	2'Ø NYOPLAST	26.7	-	N/A	24.2 (CB-7)
CB-8	2'x2' PRECAST	25.1	8" - R.D. 12" - 37 LF	22.0 (8" R.D.) 22.0 (CB-8A)	21.0 (OUTLET INV. 19.0)
CB-8A	2'x2' PRECAST	25.4	-	22.5 (8" R.D.)	22.5 (CB-8)
CB-8B	2'x2' PRECAST	25.2	-	23.0 (-)	23.0 (TEE INTO 12" @ 22.45)
CB-9	2'Ø NYOPLAST	27.3	8" - R.D. 12"	24.6 (8" R.D.) 24.6 (CB-9A)	24.5 (OUTLET INV. 24.0)
CB-9A	2'Ø NYOPLAST	33.3	8" - R.D. & SURFACE	30.5 (-)	30.4 (CB-9)
WQ-4	5'Ø BARRACUDA	16.5	12" - 5 LF	15.0 (CB-10)	14.9 (OUTLET INV. 11.0)
CB-10	2'Ø NYOPLAST	15.5	-	N/A	15.4 (WQ-4)
WQ-3	5'Ø BARRACUDA	12.5	18" - 5 LF	8.9 (CB-11)	8.8 (OUTLET INV. 8.0)
CB-11	30"x30" PRECAST	11.9	12" - 38 LF 18" - 60 LF	9.0 (CB-11A) 9.0 (CB-12)	9.0 (WQ-3)
CB-11A	30"x30" PRECAST	12.5	-	N/A	9.7 (CB-11)
CB-12	3'x3' PRECAST	12.5	-	9.5 (-)	9.5 (CB-11)
CB-13	30"x30" PRECAST	9.18	12" - 40 LF	6.06 (EXIST. 12") 6.06 (CB-13A)	5.91 (EXIST. CATCH BASIN)
CB-13A	30"x30" PRECAST	8.7	12" - 27 LF	6.5 (CB-13B)	6.5 (CB-13)
CB-13B	30"x30" PRECAST	16.2	12" - 62 LF	13.0 (CB-13C)	12.0 (CB-13A)
CB-13C	30"x30" PRECAST	23.0	4" - 4 LF	20.5 (4" PERF. PVC PIPE)	20.0 (CB-13B)
WQ-1	5'Ø BARRACUDA	8.5	EXIST.-18" HDPE - 7 LF	MATCH EXIST.	MATCH EXIST.
DMH-1	4'Ø PRECAST	29.0	24" - 11 LF	22.0 (24" PERF. PVC PIPE)	21.0 (OUTLET INV. 12.0)

1 C-121 PARTIAL SITE GRADING PLAN #1
SCALE: 1" = 20'

GRAPHIC SCALE
20 0 10 20 40 80
1 inch = 20 feet

BIO-BASIN 1 NOTES :
1. EXCAVATE AND REMOVE THE EXISTING BOTTOM OF BIO-BASIN 1 TO INSTALL NON-WOVEN GEOTEXTILE, CRUSHED STONE, 6" UNDERDRAIN, BIO-BASIN SOIL, HARDWOOD MULCH AND PLANTINGS AS SHOWN IN THE DETAILS.
2. CONTRACTOR IS TO CAREFULLY EXCAVATE AROUND THE 24"Ø HDPE PIPE.
3. THE CONSTRUCTION IS TO TAKE PLACE AFTER THE ENTIRE DRAINAGE AREA TO THE BIO-BASIN IS STABILIZED.

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID SET

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

PARTIAL SITE GRADING PLAN #1

REVISIONS

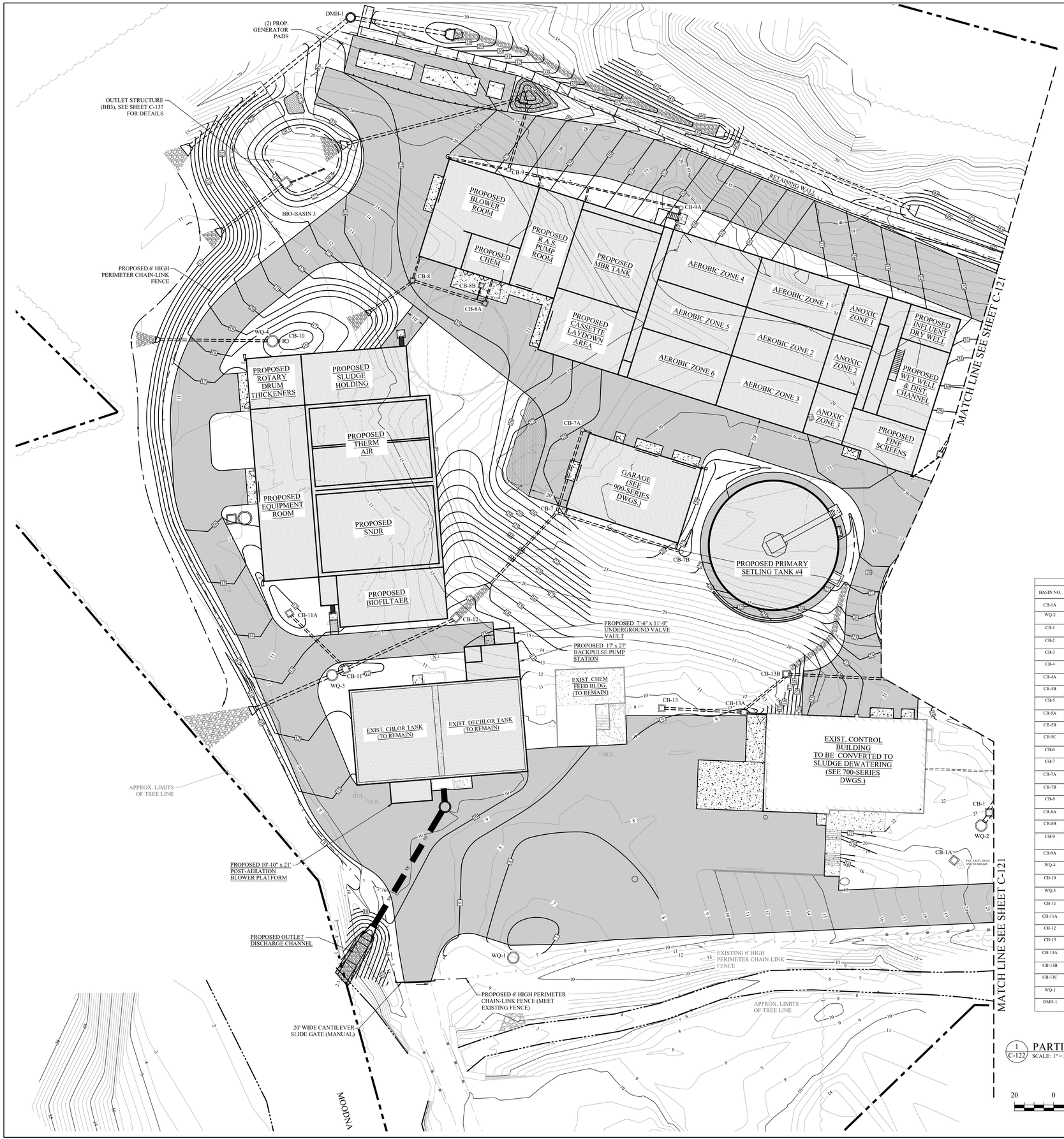
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	SMQ, JTW
DRAWN BY:	HPBJr
CHECKED BY:	MWW
REVIEWED BY:	MJS, JZ

SHEET NO.
C-121

PROJECT # 18-732 PHASE #

F:\2018\18-732 Caesar Lane WWTP Improvements\Expansion Phase\Drafing\1 - Site Work & Outfall\Addendum 4\18-732 Caesars Lane WWTP Site Plan Phase 2.dwg, C-121, 7/9/2025 2:18:14 PM



1 C-122 PARTIAL SITE GRADING PLAN #2
SCALE: 1" = 20'

GRAPHIC SCALE
20 0 10 20 40 80
1 inch = 20 feet

STORMWATER STRUCTURE SCHEDULE

BASIN NO.	SIZE & TYPE	RIM. ELEV.	PIPE DIA. & LENGTH	INV. IN (FROM)	INV. OUT (TO)
CB-1A	3'x3' PRECAST	19.5	24 - 18 LF	15.73(WQ-2)	15.48 (EXIST. 24" HDPE)
WQ-2	5'Ø BARRACUDA	20.7	18 - 5 LF	17.76 (CB-1)	17.30 (CB-1A)
CB-1	3'x3' PRECAST	20.89	18" - 46 LF	18.44 (CB-2)	18.14 (WQ-1)
CB-2	3'x3' PRECAST	27.19	18" - 58 LF	21.4 (CB-3)	21.4 (CB-1)
CB-3	3'x3' PRECAST	31.5	18 - 53 LF	21.8 (CB-4)	21.8 (CB-2)
CB-4	3'x3' PRECAST	28.2	12" - 33 LF 12" - 72 LF	22.2 (CB-4A) 24.2 (CB-5)	22.2 (CB-3)
CB-4A	30"x30" PRECAST	28.5	12" 57 - LF	25.7 (CB-4B)	25.7 (CB-4)
CB-4B	30"x30" PRECAST	28.7	-	N/A	26.2 (CB-4A)
CB-5	3'x3' PRECAST	28.5	12" - 30 LF 12" - 69 LF	24.7 (CB-5A) 24.7 (CB-6)	24.7 (CB-4)
CB-5A	30"x30" PRECAST	28.5	12" - 47 LF	24.9 (CB-5B)	24.9 (CB-5)
CB-5B	30"x30" PRECAST	30.9	12" - 52 LF	25.2 (CB-5C)	25.2 (CB-5A)
CB-5C	30"x30" PRECAST	28.0	8" - R.D.	25.5 (-)	25.5 (CB-5B)
CB-6	30"x30" PRECAST	29.5	-	N/A	26.5 (CB-5)
CB-7	7'Ø NYOPLAST	27.5	12" - 43 LF 12" - 65 LF	24.0 (CB-7A) 23.5 (CB-7B)	23.0 (OUTLET INV. 14.0)
CB-7A	7'Ø NYOPLAST	28.1	8" - R.D. & SURFACE	25.6 (8" R.D.)	25.0 (CB-7)
CB-7B	7'Ø NYOPLAST	26.7	-	N/A	24.2 (CB-7)
CB-8	2'x2' PRECAST	25.1	8" - R.D. 12" - 37 LF	22.0 (8" R.D.) 22.0 (CB-8A)	21.0 (OUTLET INV. 19.0)
CB-8A	2'x2' PRECAST	25.4	-	22.5 (8" R.D.)	22.5 (CB-8)
CB-8B	2'x2' PRECAST	25.2	-	23.0 (-)	23.0 (TEE INTO 12" @ 22.45)
CB-9	7'Ø NYOPLAST	27.3	8" - R.D. 12"	24.6 (8" R.D.) 24.6 (CB-9A)	24.5 (OUTLET INV. 24.0)
CB-9A	7'Ø NYOPLAST	33.3	8" - R.D. & SURFACE	30.5 (-)	30.4 (CB-9)
WQ-4	5'Ø BARRACUDA	16.5	12" - 5 LF	15.0 (CB-10)	14.9 (OUTLET INV. 11.0)
CB-10	7'Ø NYOPLAST	15.5	1	N/A	15.4 (WQ-4)
WQ-3	5'Ø BARRACUDA	12.5	18" - 5 LF	8.9 (CB-11)	8.8 (OUTLET INV. 8.0)
CB-11	30"x30" PRECAST	11.9	12" - 38 LF 18" - 60 LF	9.0 (CB-11A) 9.0 (CB-12)	9.0 (WQ-3)
CB-11A	30"x30" PRECAST	12.5	-	N/A	9.7 (CB-11)
CB-12	3'x3' PRECAST	12.5	-	9.5 (-)	9.5 (CB-11)
CB-13	30"x30" PRECAST	9.18	12" - 40 LF	6.06 (EXIST. 12") 6.06 (CB-13A)	5.91 (EXIST. CATCH BASIN)
CB-13A	30"x30" PRECAST	8.7	12" - 27 LF	6.5 (CB-13B)	6.5 (CB-13)
CB-13B	30"x30" PRECAST	16.2	1 12" - 62 LF	13.0 (CB-13C)	12.0 (CB-13A)
CB-13C	30"x30" PRECAST	23.0	1 4" - 4 LF	20.5 (4" PERF. PVC PIPE)	20.0 (CB-13B)
WQ-1	5'Ø BARRACUDA	8.5	EXIST. 18" HDPE - 7 LF	MATCH EXIST.	MATCH EXIST.
DMH-1	4'Ø PRECAST	29.0	24" - 11 LF	22.0 (24" PERF. PVC PIPE)	21.0 (OUTLET INV. 12.0)

MHE ENGINEERING

33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100

111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID SET

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UDIG·NY SAFE DIGGING STARTS HERE
CALL 811

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NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

PARTIAL SITE GRADING PLAN #2

REVISIONS

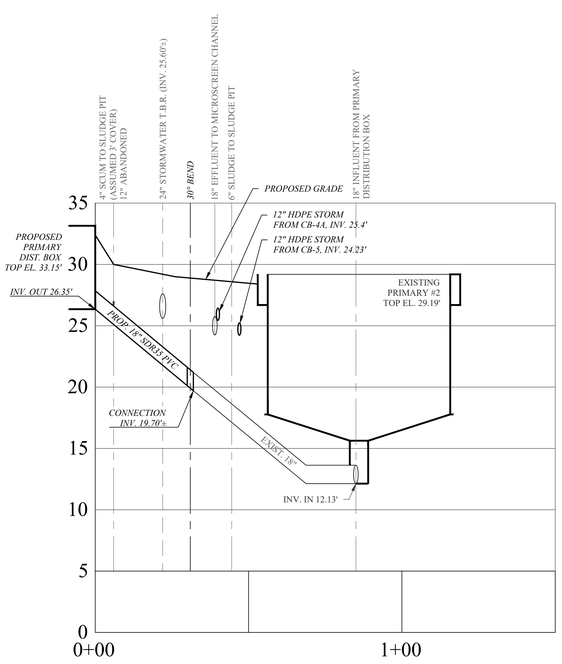
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE: 18 APR, 2025
DESIGN BY: SMQ, JTW
DRAWN BY: HPBJr
CHECKED BY: MWW
REVIEWED BY: **MJS, JZ**

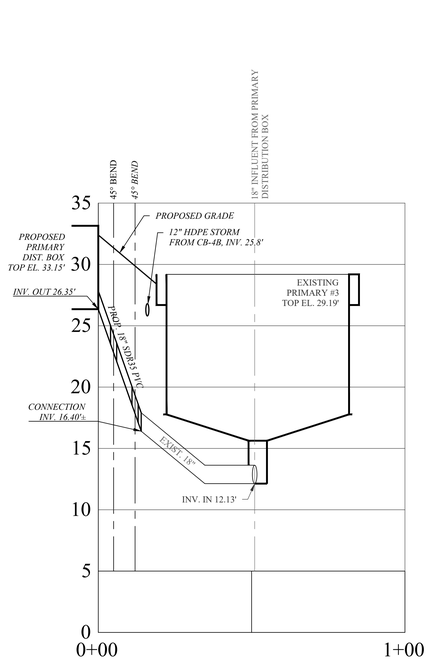
SHEET NO.
C-122

PROJECT # 18-732 PHASE #

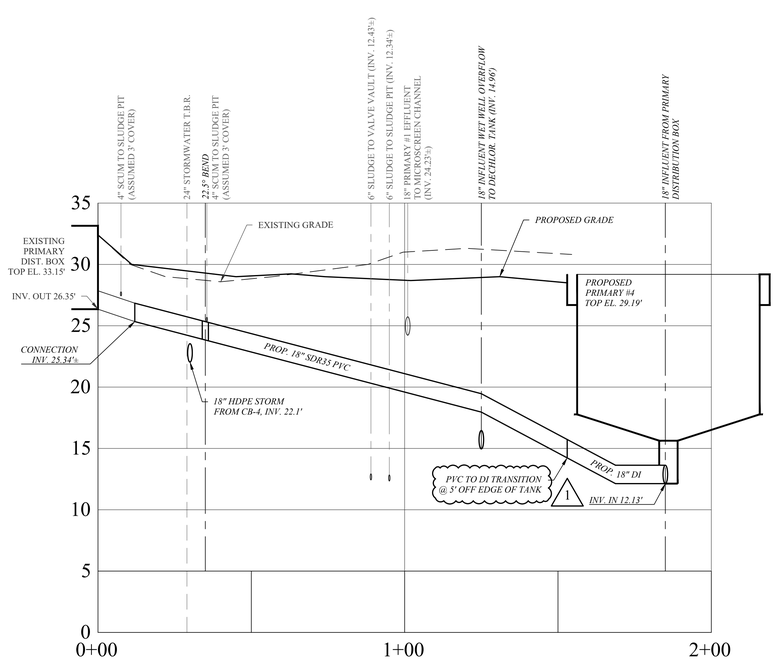
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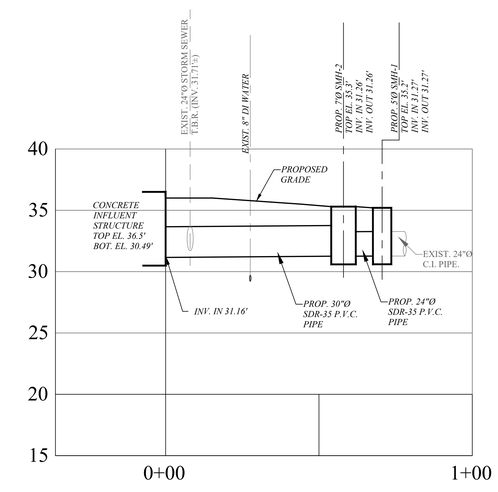
18" SDR35 PVC INFLUENT
TO PRIMARY #2



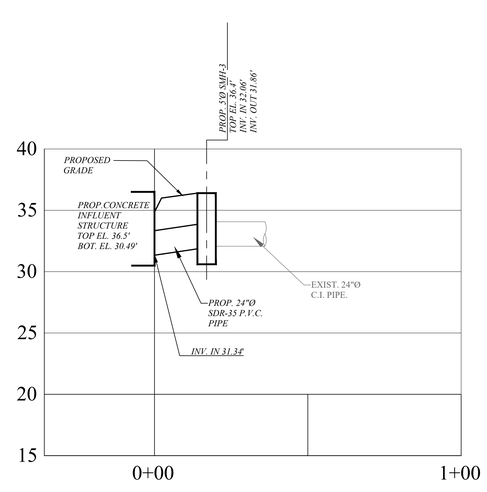
18" SDR35 PVC INFLUENT
TO PRIMARY #3



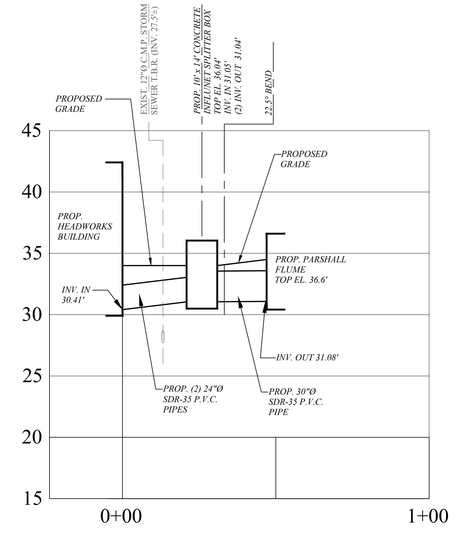
18" SDR35 PVC INFLUENT
TO PRIMARY #4



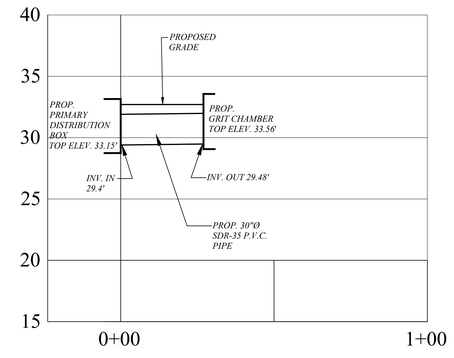
24" SDR35 PVC - SMH-1 TO SMH-2 AND
30" SDR35 PVC - SHM-2 TO INFLUENT STRUCTURE



24" SDR35 PVC - SMH-3
TO INFLUENT STRUCTURE



30" SDR35 PVC - PARSHALL FLUME
EFFLUENT TO INFLUENT SPLITTER BOX
AND 24" SDR35 PVC SPLITTER BOX
EFFLUENT TO HEADWORKS BUILDING



30" SDR35 PVC - GRIT CHAMBER
TO PRIMARY DISTRIBUTION BOX

SHADED TEXT = EXISTING PIPING
ITALICIZED TEXT = PROPOSED PIPING

NOTE: PIPE CROSSINGS ARE SHOWN FOR INFORMATIONAL PURPOSES. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PIPE LOCATIONS AND DEPTHS VIA. TEST PITS PRIOR TO ANY REMOVAL OR PLACEMENT OF NEW PIPING.

1 / C-124 YARD PIPING PROFILES
SCALE: HORIZ. 1" = 20', VERT. 1"=5'

MHE ENGINEERING
33 Airport Center Drive, Suite 202, New Windsor, NY 12553, (845) 567-3100
111 Wheatfield Drive, Suite 1, Milford, PA 18337, (570) 296-2765

BID SET

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PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

PROCESS PIPE PROFILES

REVISIONS

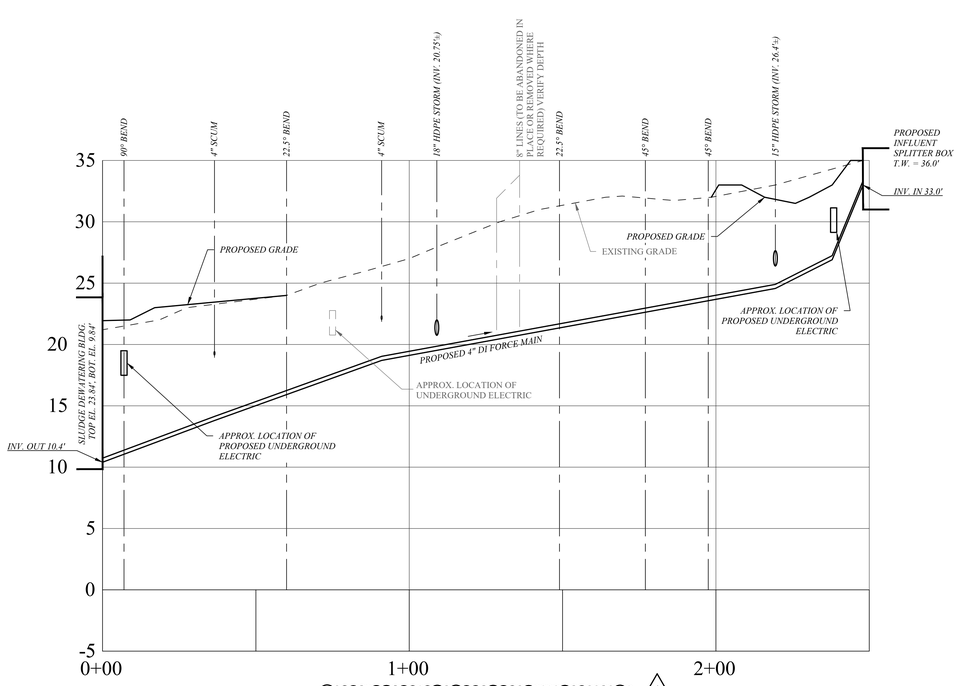
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1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	SMQ, JTW
DRAWN BY:	HPBJr
CHECKED BY:	MWW
REVIEWED BY:	**MJS, JZ**

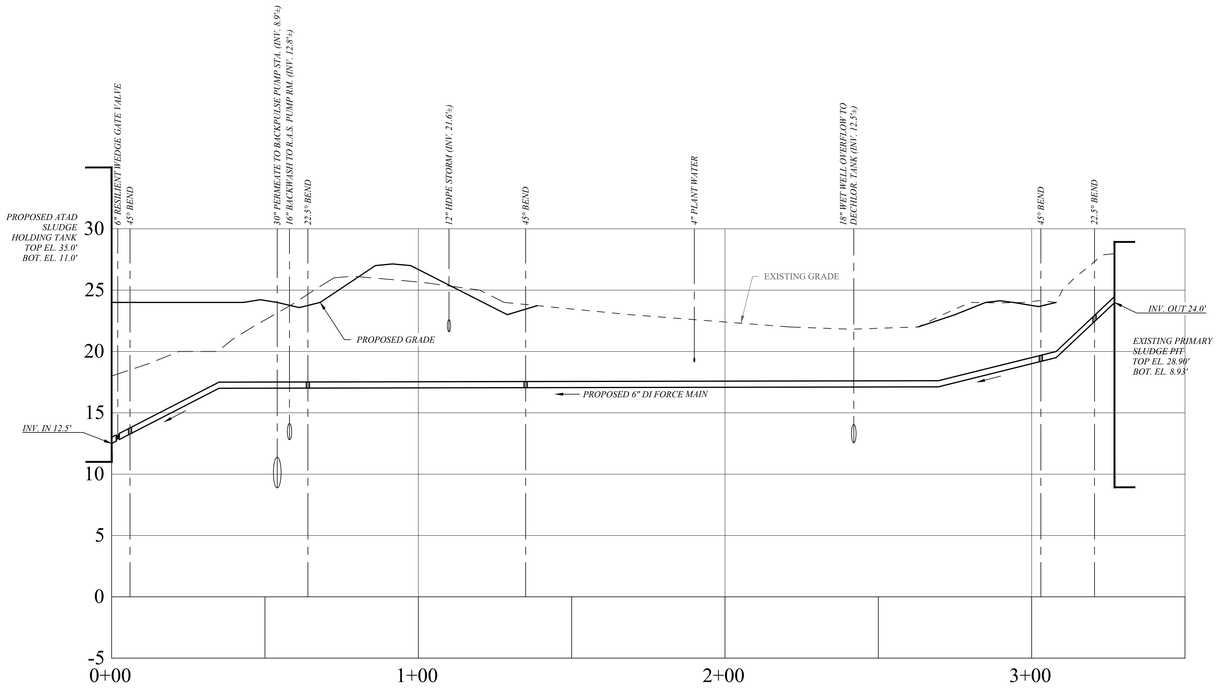
SHEET NO.
C-124

PROJECT # 18-732 PHASE #

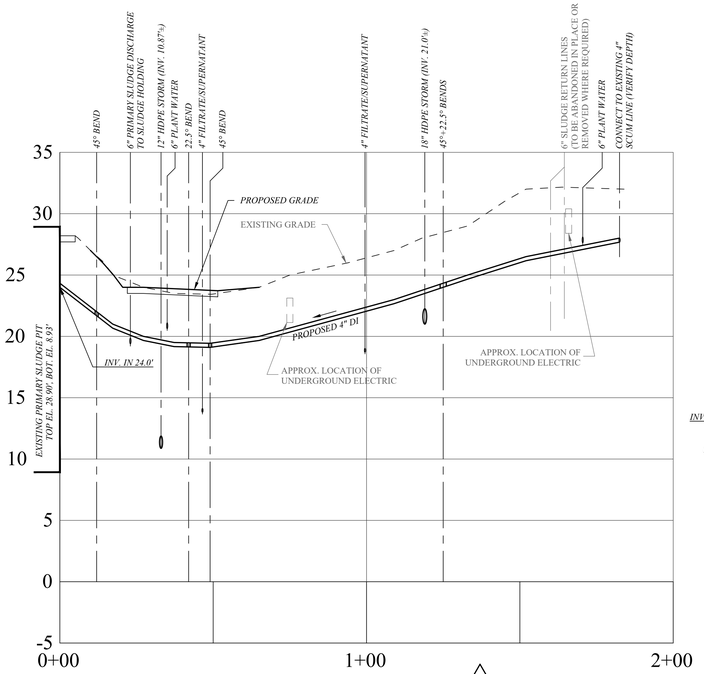
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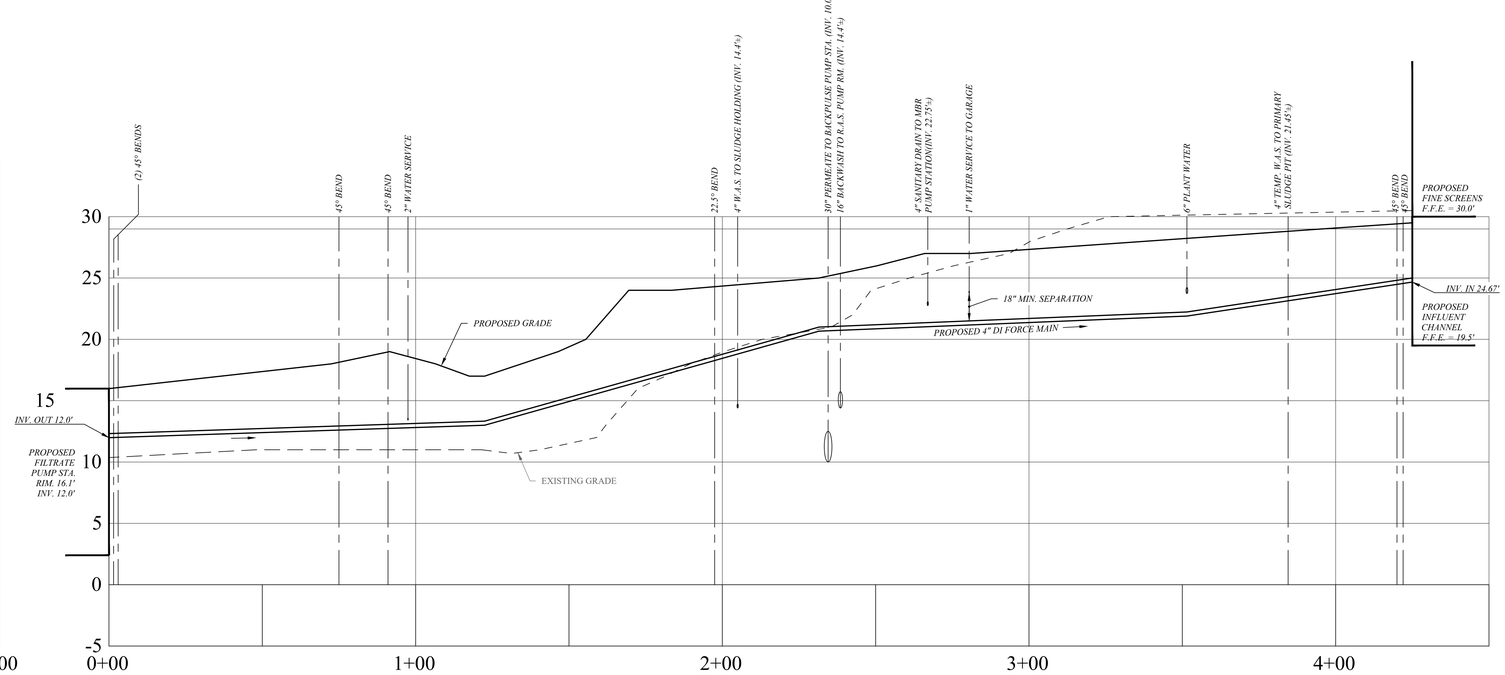
4" DI FILTRATE/SUPERNATANT 1



6" DI PRIMARY SLUDGE FEED LINE



4" DI SCUM LINE 1



4" DI RDT FILTRATE LINE

SHADED TEXT = EXISTING PIPING
ITALICIZED TEXT = PROPOSED PIPING

NOTE: PIPE CROSSINGS ARE SHOWN FOR INFORMATIONAL PURPOSES. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PIPE LOCATIONS AND DEPTHS VIA. TEST PITS PRIOR TO ANY REMOVAL OR PLACEMENT OF NEW PIPING.

1 / C-126 YARD PIPING PROFILES
SCALE: HORIZ. 1" = 20', VERT. 1"=5'

MHE ENGINEERING
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New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

PROCESS PIPE PROFILES

REVISIONS

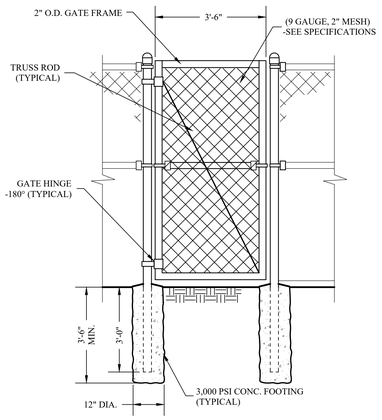
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	SMQ, JTW
DRAWN BY:	HPBJr
CHECKED BY:	MWW
REVIEWED BY:	**MJS, JZ**

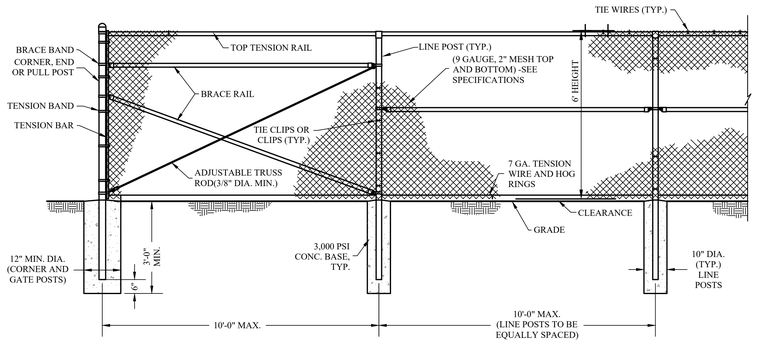
SHEET NO.
C-126

PROJECT # 18-732 PHASE #

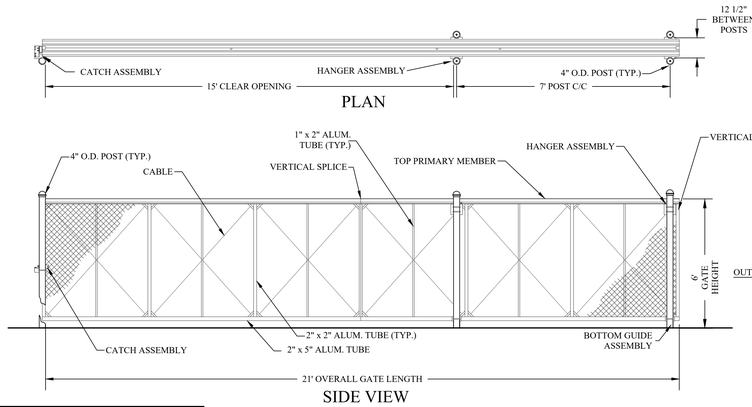
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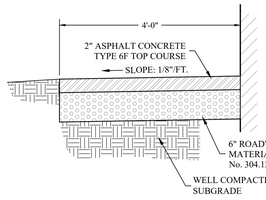
1 C-142 CHAIN LINK MAN GATE DETAIL
SCALE: NONE



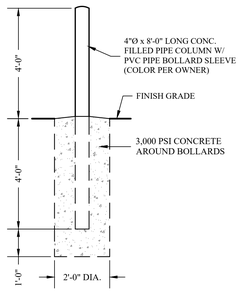
2 C-142 CHAIN LINK FENCE DETAIL
SCALE: NONE



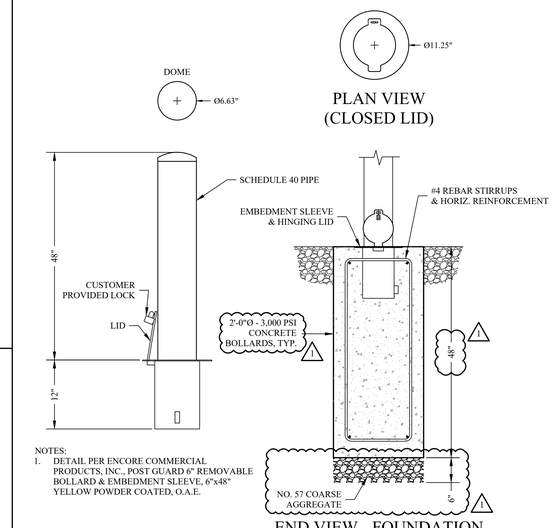
3 C-142 TYP. SLIDING GATE DETAIL
SCALE: NONE



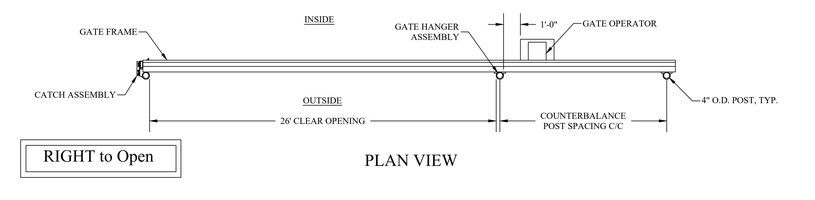
4 C-142 TYP. ASPHALT PAVEMENT WALKWAY SECTION
SCALE: NONE



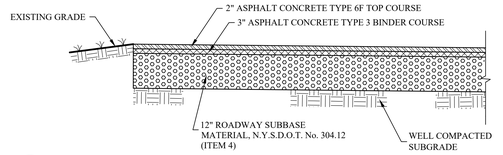
5 C-142 CONCRETE BOLLARD DETAIL
SCALE: NONE



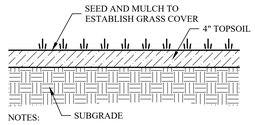
6 C-142 REMOVABLE BOLLARD DETAIL
SCALE: NONE



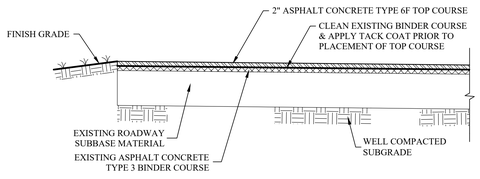
7 C-142 HEAVY DUTY CANTILEVER SLIDE GATE DETAILS
SCALE: NONE



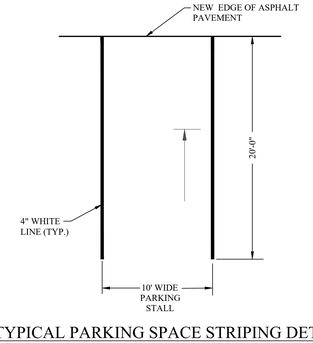
8 C-142 TYPICAL FULL DEPTH ASPHALT PAVEMENT SECTION
SCALE: NONE



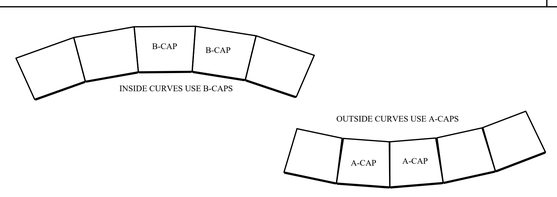
9 C-142 TOPSOIL RESTORATION DETAIL
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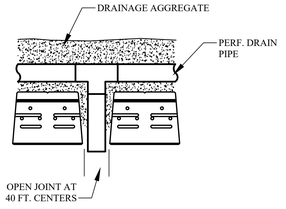
10 C-142 TYPICAL FINAL PAVEMENT ACCESS DRIVE SECTION
SCALE: NONE



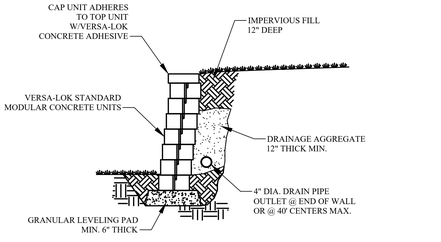
11 C-142 TYPICAL PARKING SPACE STRIPING DETAIL
SCALE: N.T.S.



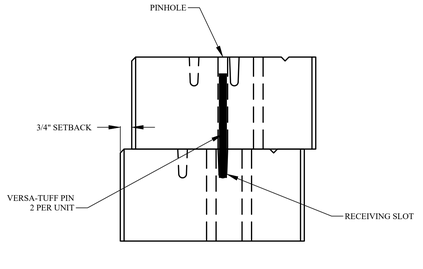
CAPPING DETAIL-PLAN VIEW
CURVES
SCALE: NONE



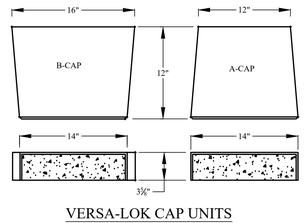
DRAIN DETAIL
SCALE: NONE



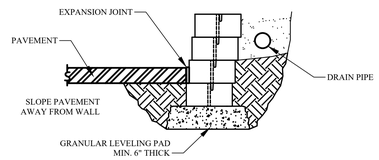
TYPICAL SECTION-UNREINFORCED RETAINING WALL
SCALE: NONE



PINNING DETAIL
CROSS SECTION
SCALE: NONE



VERSA-LOK CAP UNITS
UNIT DIMENSIONS
SCALE: NONE



PAVEMENT AT BASE OF WALL
SCALE: NONE

NOTE:
1. DETAILS PER VERSA-LOK RETAINING WALL SYSTEMS, O.A.E.

12 C-142 CONCRETE BLOCK RETAINING WALL DETAILS
SCALE: N.T.S.

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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

SITE DETAILS

REVISIONS

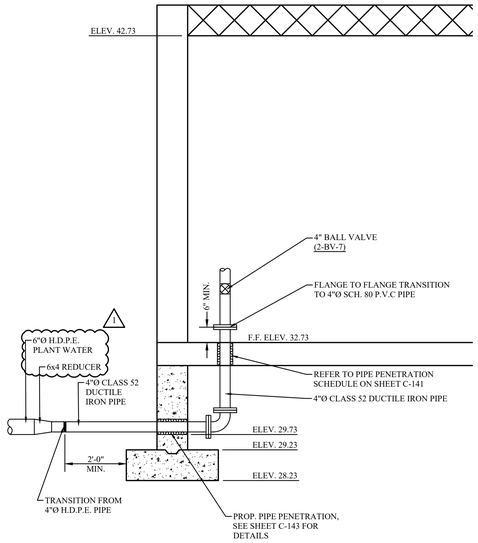
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	SMQ, JTW
DRAWN BY:	HPBJr
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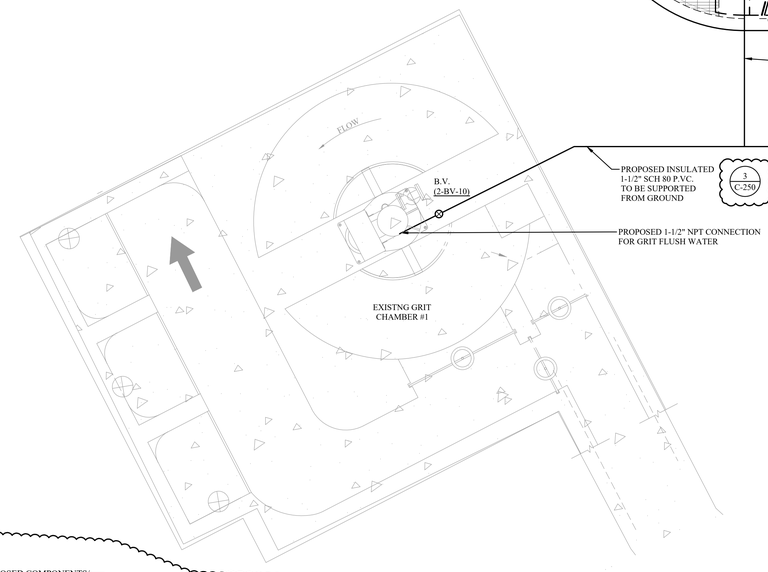
SHEET NO.
C-142

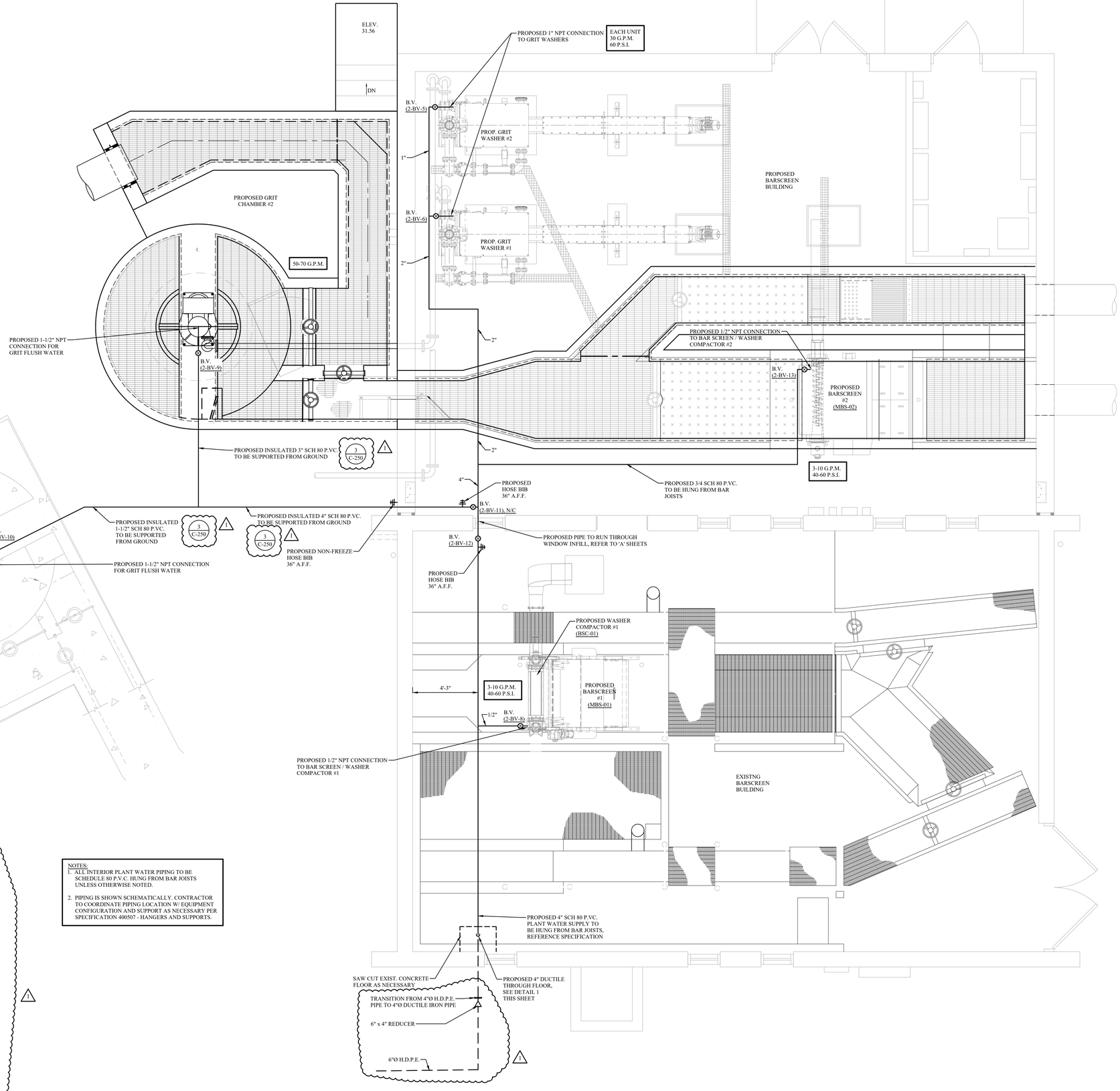
PROJECT # 18-732 PHASE #

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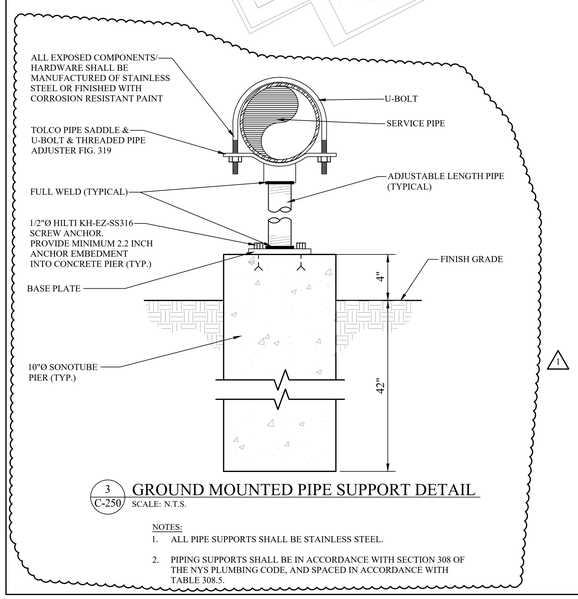


1 C-250 PLANT WATER FLOOR PENETRATION DETAIL
SCALE: 1/2" = 1'-0"





2 C-250 PROPOSED HEADWORKS PLANT WATER SUPPLY - PLAN VIEW
SCALE: 3/8" = 1'-0"



3 C-250 GROUND MOUNTED PIPE SUPPORT DETAIL
SCALE: N.T.S.

NOTES:
1. ALL PIPE SUPPORTS SHALL BE STAINLESS STEEL.
2. PIPING SUPPORTS SHALL BE IN ACCORDANCE WITH SECTION 308 OF THE NYS PLUMBING CODE, AND SPACED IN ACCORDANCE WITH TABLE 308.5.

NOTES:
1. ALL INTERIOR PLANT WATER PIPING TO BE SCHEDULE 80 P.V.C. HUNG FROM BAR JOISTS UNLESS OTHERWISE NOTED.
2. PIPING IS SHOWN SCHEMATICALLY. CONTRACTOR TO COORDINATE PIPING LOCATION W/ EQUIPMENT CONFIGURATION AND SUPPORT AS NECESSARY PER SPECIFICATION 400507 - HANGERS AND SUPPORTS.

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

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EXPANSION PROJECT:
PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

PROPOSED
HEADWORKS
PLANT WATER SUPPLY -
PLAN VIEW

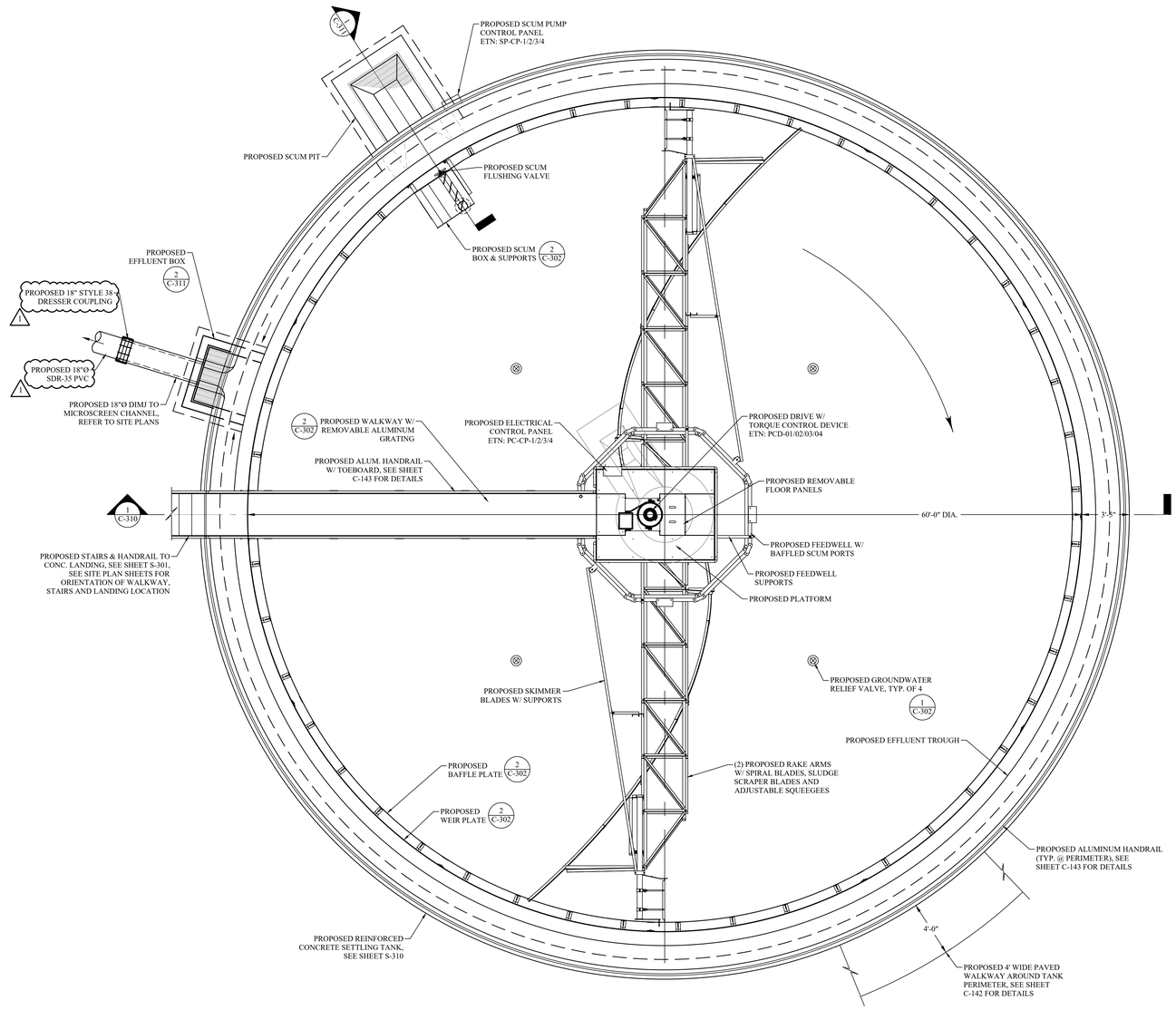
REVISIONS

NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

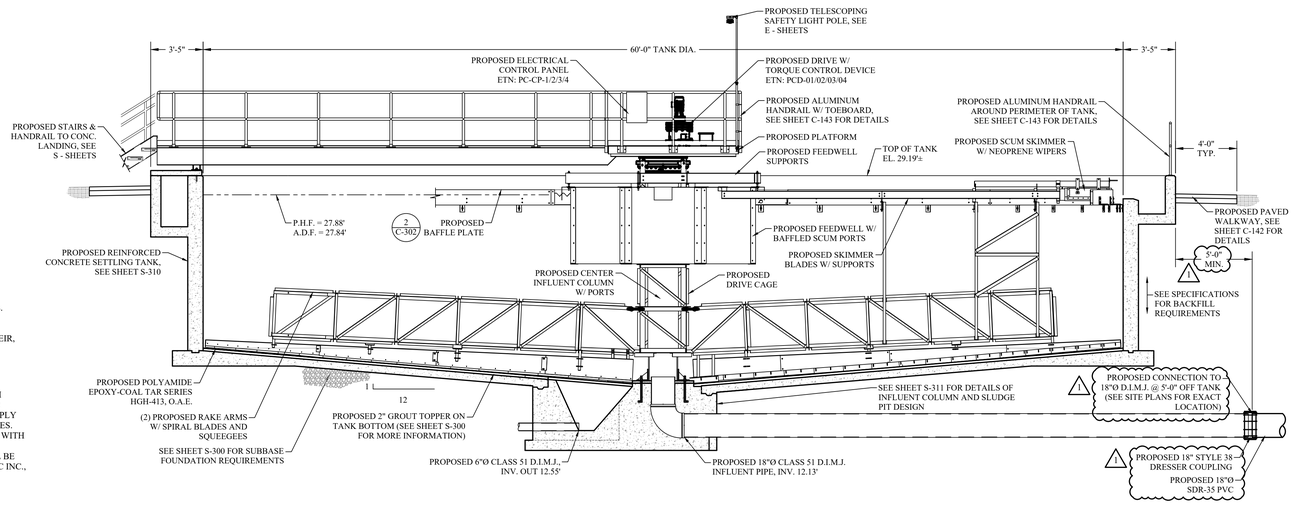
ISSUED DATE:	18 APR, 2025
DESIGN BY:	QMM
DRAWN BY:	JRJ
CHECKED BY:	MJS
REVIEWED BY:	MJS, JZ

SHEET NO.
C-250

PROJECT # 18-732 PHASE #



A C-310 PROPOSED PRIMARY SETTLING TANK #4 PLAN
SCALE: 1/4" = 1'-0"



1 C-310 PROPOSED PRIMARY SETTLING TANK #4 ELEVATION/SECTION
SCALE: 1/4" = 1'-0"

GENERAL NOTES:

1. FOR PIPE CONFIGURATION OF ALL SETTLING TANKS REFER TO SITE PLANS.
2. FOR SPECIFICATIONS REGARDING DIMENSIONS AND LAYOUT OF ALL CLARIFIER EQUIPMENT, REFER TO SPECIFICATION SECTION 464321.
3. CONTRACTOR SHALL FIELD VERIFY AND MATCH ALL ELEVATIONS FOR WEIR, BAFFLES, INVERTS AND TANK ETC. WITH EXISTING PRIMARY TANKS.

COATING NOTES:

1. ALL CONCRETE SURFACES OF THE PRIMARY CLARIFIER IN CONTACT WITH WASTEWATER SHALL BE COATED WITH 2 COATS OF HI-BUILD TNEME-TAR (SERIES 46H-413) POLYAMIDE EPOXY-COAL TAR, OR APPROVED EQUAL. APPLY COATINGS IN STRICT ADHERENCE WITH THE MANUFACTURER'S GUIDELINES.
2. SURFACE PREPARATION FOR COATINGS SHALL BE DONE IN ACCORDANCE WITH SSPC-SP13/NACE 6 AND THE MANUFACTURER'S RECOMMENDATIONS.
3. CORED OR CUT CONCRETE SURFACES WITH EXPOSED REINF. STEEL SHALL BE PRIMED WITH OMNITHANE SERIES 1 POLYURETHANE PRIMER BY TENEMEC INC., OR APPROVED EQUAL, PRIOR TO COATING WITH EPOXY-COAL TAR.

ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
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111 Wheatfield Drive, Suite 1
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FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

PROPOSED PRIMARY SETTLING TANK #4 PLAN & SECTION

REVISIONS

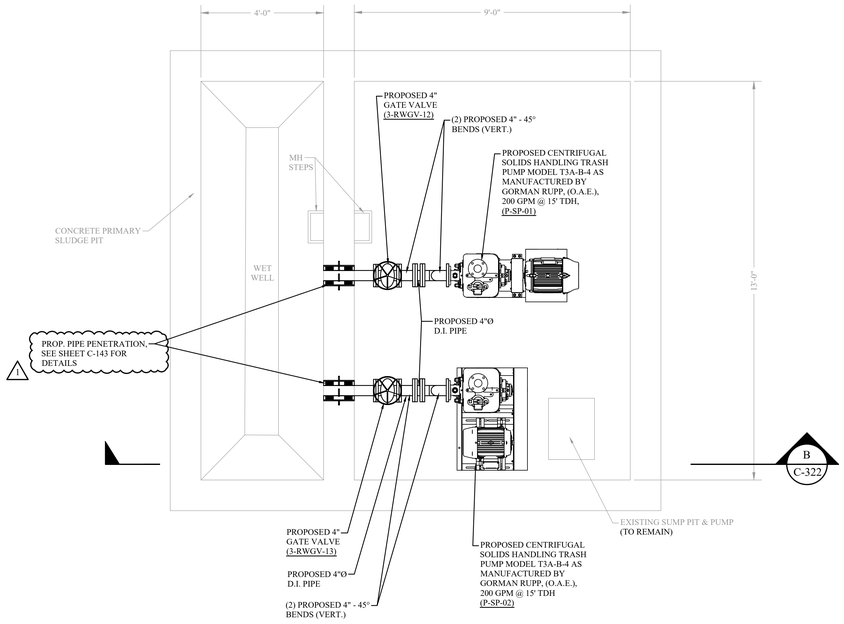
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	JTW
DRAWN BY:	HPBJr
CHECKED BY:	MWW
REVIEWED BY:	MJS, JZ

SHEET NO.
C-310

PROJECT # 18-732 PHASE #

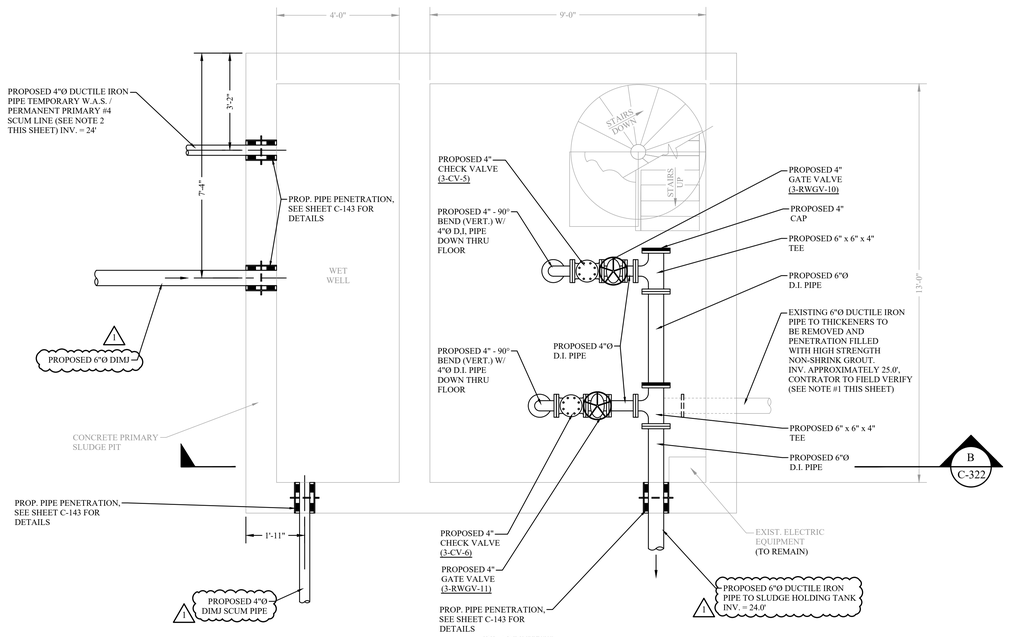
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PLAN VIEW

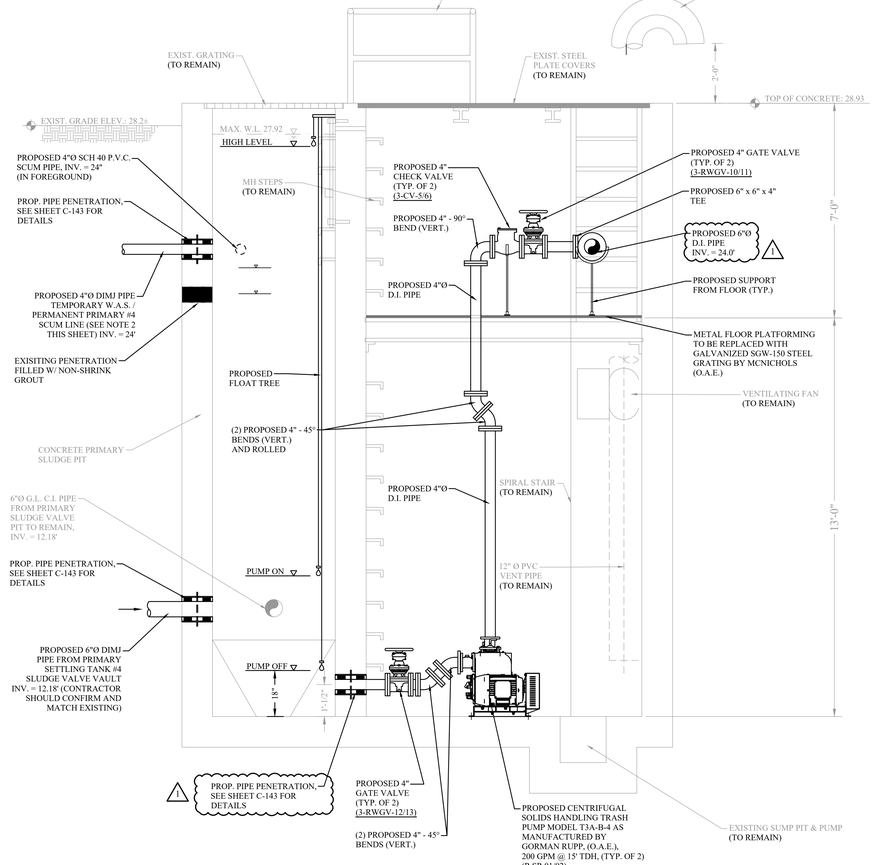
1 C-322 EXISTING PRIMARY SLUDGE PIT LOWER LEVEL MODIFICATIONS
SCALE: 1/2" = 1'-0"

NOTES:
1. NEW SLUDGE PUMPS AND PIPING TO BE REPLACED PRIOR TO M.B.R. STARTUP. SLUDGE DISCHARGE TO REMAIN TO GRAVITY THICKENERS UNTIL A.T.A.D. STARTUP, AT WHICH TIME THE PIPING SHALL BE TIED INTO DISCHARGE TO SLUDGE HOLDING TANK.
2. TEMPORARY 4"Ø DUCTILE W.A.S. LINE TO BE OPERATIONAL UPON INITIAL MBR STARTUP. ONCE PROPOSED A.T.A.D. SYSTEM IS OPERATIONAL, LINE TO BE REUSED AS PRIMARY #4 SCUM LINE. REFER TO SITE PLAN FOR TIE IN LOCATION.
3. ITEMS NOTED AS "T.B.R." SHALL BE TOTALLY REMOVED AND PROPERLY DISPOSED OF BY THE CONTRACTOR.
4. REFER TO SHEET E-031 FOR CONTROL PANEL MOUNTING.



PLAN VIEW

2 C-322 EXISTING PRIMARY SLUDGE PIT UPPER LEVEL MODIFICATIONS
SCALE: 1/2" = 1'-0"



SECTION B

3 C-322 EXISTING PRIMARY SLUDGE PIT LOWER / UPPER LEVEL MODIFICATIONS
SCALE: 1/2" = 1'-0"

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EXISTING PRIMARY SLUDGE PIT MODIFICATIONS

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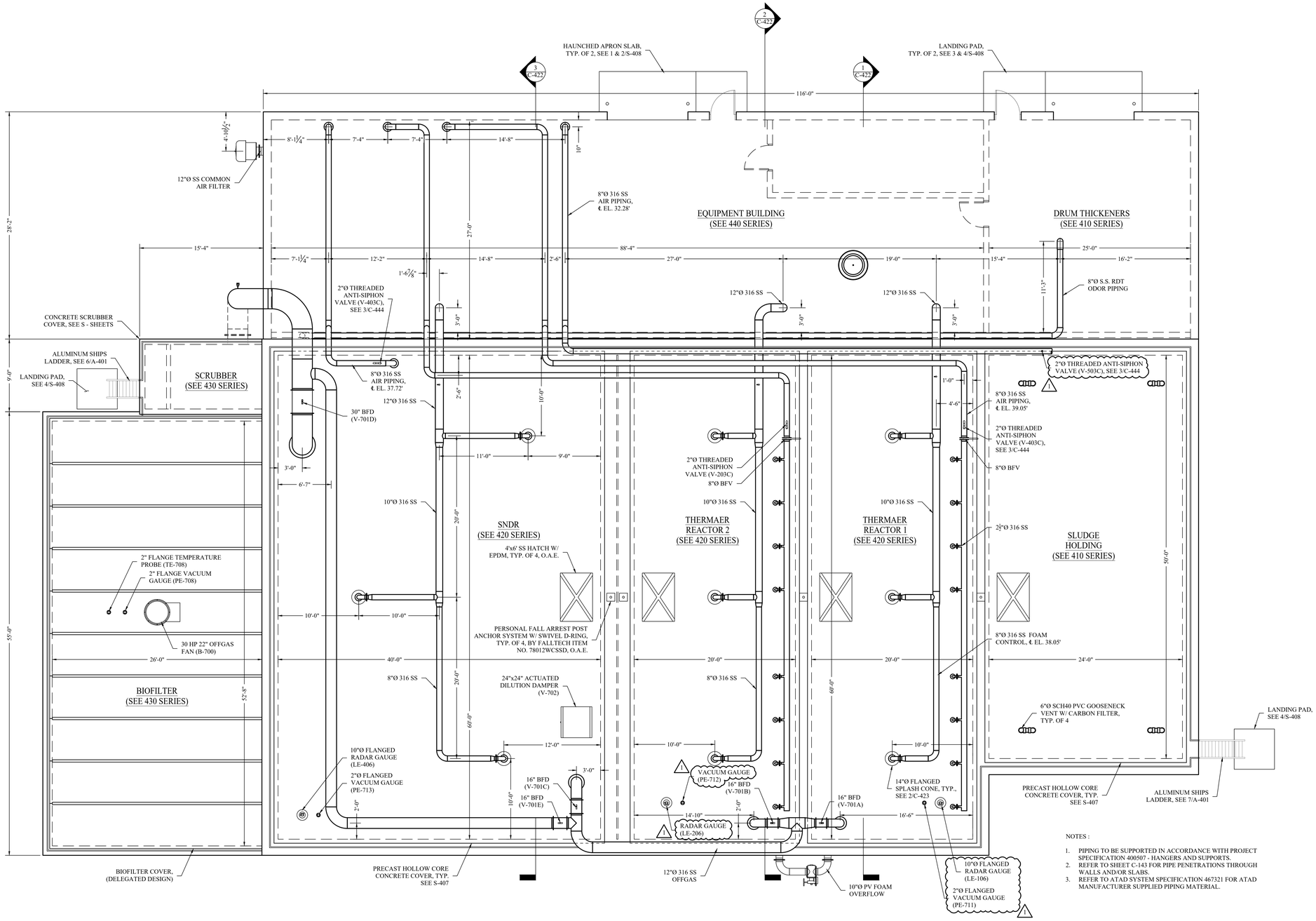
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SHEET NO.
C-322

PROJECT # 18-732 PHASE #

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NOTES :

1. PIPING TO BE SUPPORTED IN ACCORDANCE WITH PROJECT SPECIFICATION 400507 - HANGERS AND SUPPORTS.
2. REFER TO SHEET C-143 FOR PIPE PENETRATIONS THROUGH WALLS AND/OR SLABS.
3. REFER TO ATAD SYSTEM SPECIFICATION 467321 FOR ATAD MANUFACTURER SUPPLIED PIPING MATERIAL.

A C-420 A.T.A.D. BioSolid SYSTEM PLAN
SCALE: $\frac{3}{16}$" = 1'-0"

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A.T.A.D.
OVERALL PLAN

REVISIONS

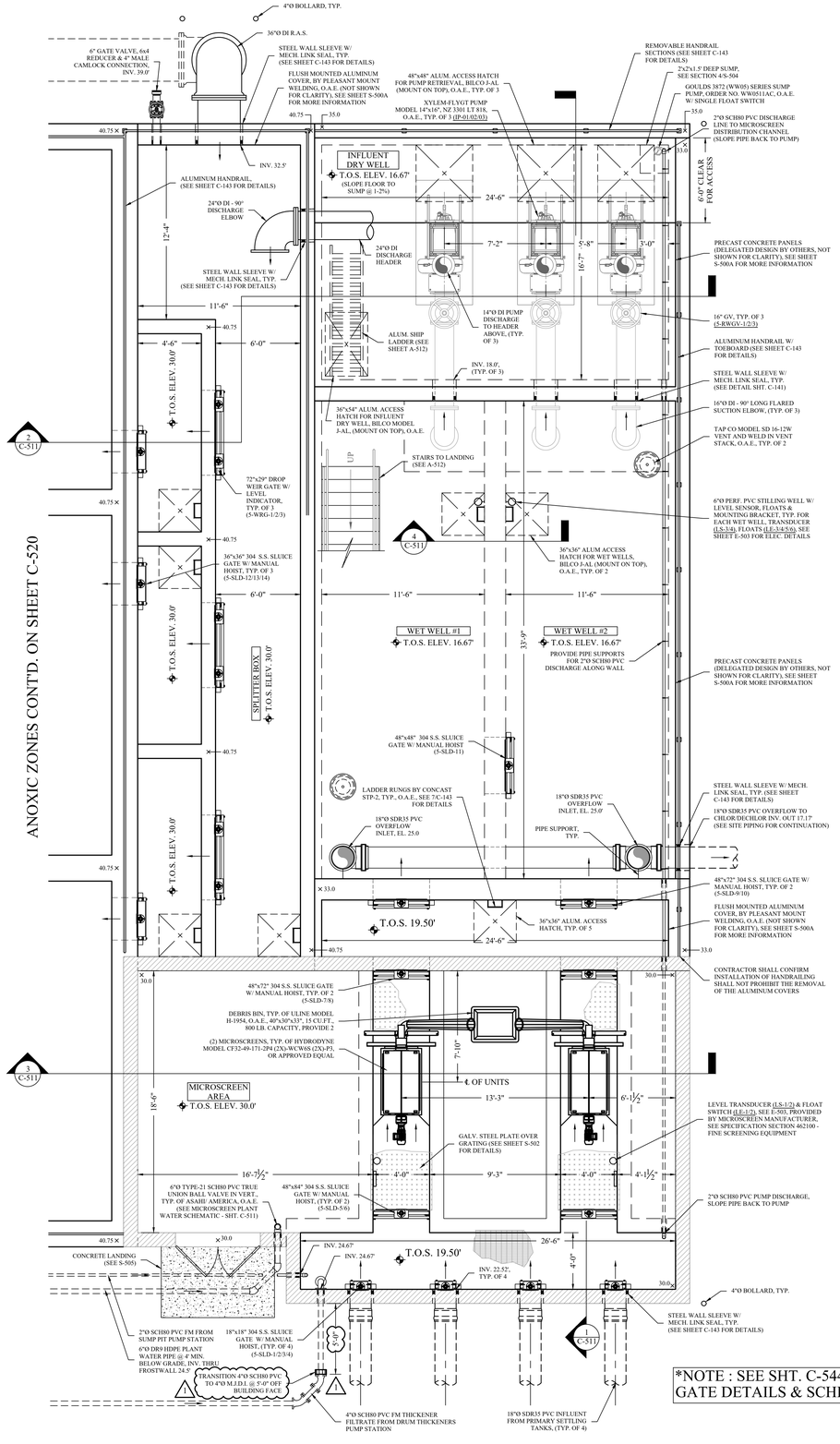
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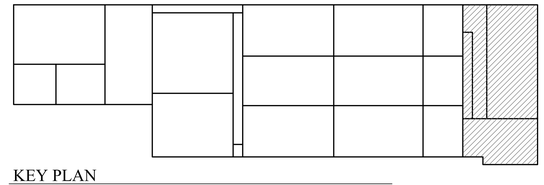
SHEET NO.
C-420

PROJECT # 18-732 PHASE #

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A C-510 MBR - INFLUENT PUMPS & MICROSCREEN PLAN
SCALE: 1/4" = 1'-0"



KEY PLAN
SCALE: 1/32" = 1'-0"

MHE ENGINEERING
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MBR - INFLUENT PUMPS & MICROSCREEN PLAN

REVISIONS

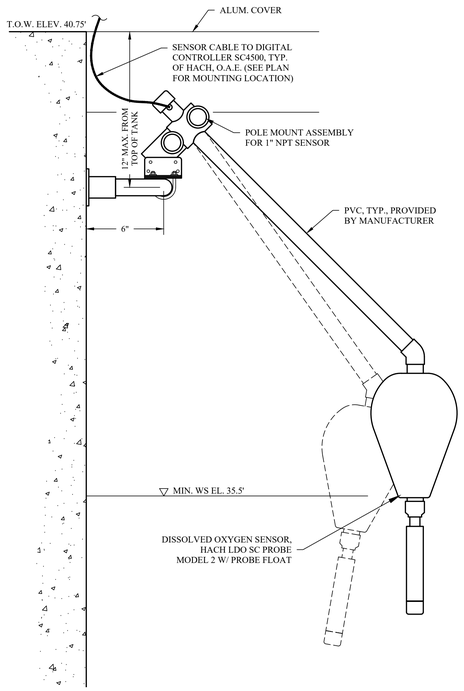
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C-510

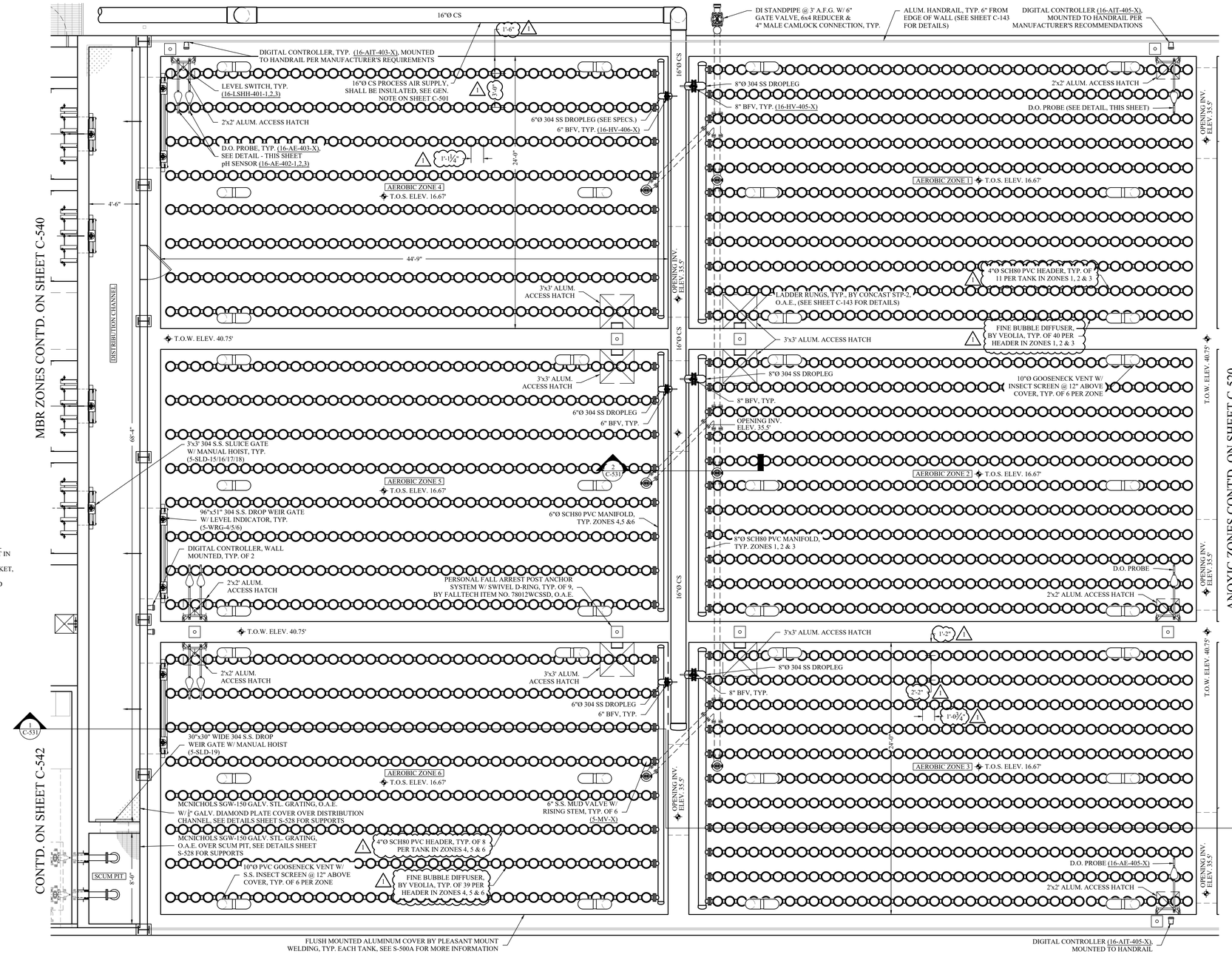
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1 / C-530 D.O. PROBE/pH SENSOR FLOAT MOUNT DETAIL
SCALE: NONE (PROVIDED BY VEOLIA)

NOTE: CONTRACTOR TO INSTALL AND MOUNT IN ACCORDANCE WITH MANUFACTURER'S MOUNTING INSTALLATION. MOUNTING BRACKET, ANCHORS AND HARDWARE SUPPLIED BY MANUFACTURER. FURNISHED BY VEOLIA AND SUPPLIED BY MANUFACTURER.

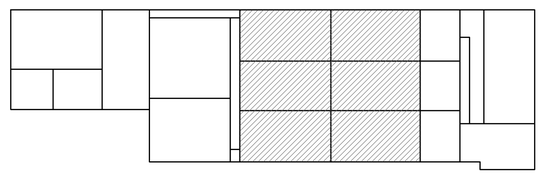


A / C-530 MBR - AEROBIC ZONE TANK PLAN
SCALE: 1/4" = 1'-0"

NOTES :

1. ALL CARBON STEEL AND STAINLESS STEEL PIPE SHALL COMPLY WITH ASTM A53.
2. ALL CARBON STEEL AND STAINLESS STEEL PIPE SHALL BE WELDED.
3. ALL FITTINGS SHALL COMPLY WITH ASTM A234-WPB.

*NOTE : SEE SHT. C-544 FOR GATE DETAILS & SCHEDULE)



KEY PLAN
SCALE: 1/32" = 1'-0"

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MBR - AEROBIC ZONE TANK PLAN

REVISIONS

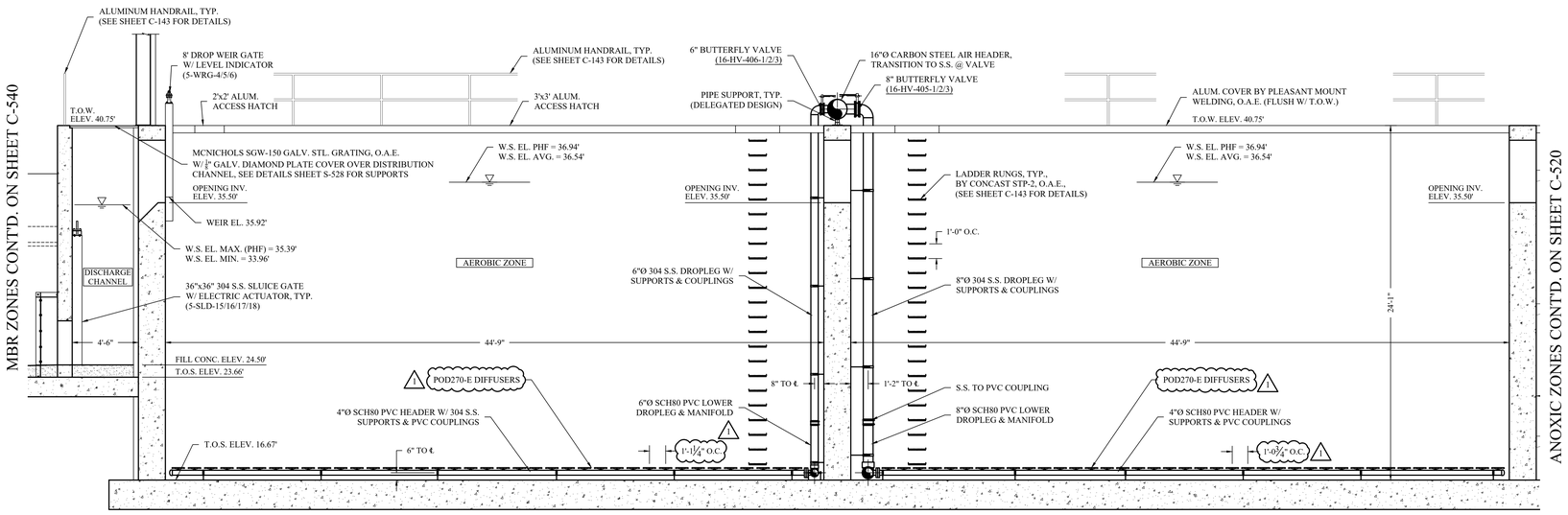
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SHEET NO.
C-530

PROJECT # 18-732 PHASE #

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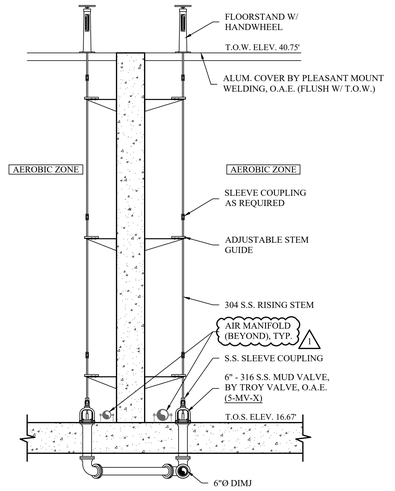


1 / C-531 MBR - AEROBIC ZONE TANK SECTION

SCALE: 1/4" = 1'-0"

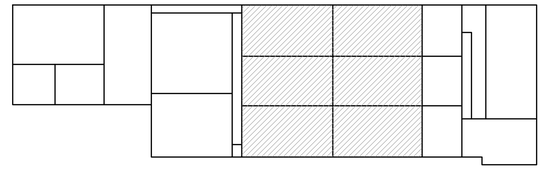
NOTE : CONTRACTOR TO REFER TO VEOLIA'S P&ID AND BILL OF MATERIALS TO CONFIRM SCOPE OF SUPPLY FOR THE FINE BUBBLE DIFFUSER GRIDS.

*NOTE : SEE SHT. C-544 FOR GATE DETAILS & SCHEDULE)



2 / C-531 TYP. TANK WALL SECTION @ MUD VALVES

SCALE: 1/4" = 1'-0"



KEY PLAN

SCALE: 1/32" = 1'-0"

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FOR TOWN OF NEW WINDSOR
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NEW WINDSOR, NY 12553

MBR - AEROBIC ZONE TANK SECTIONS

REVISIONS

NO.	DESCRIPTION	DATE
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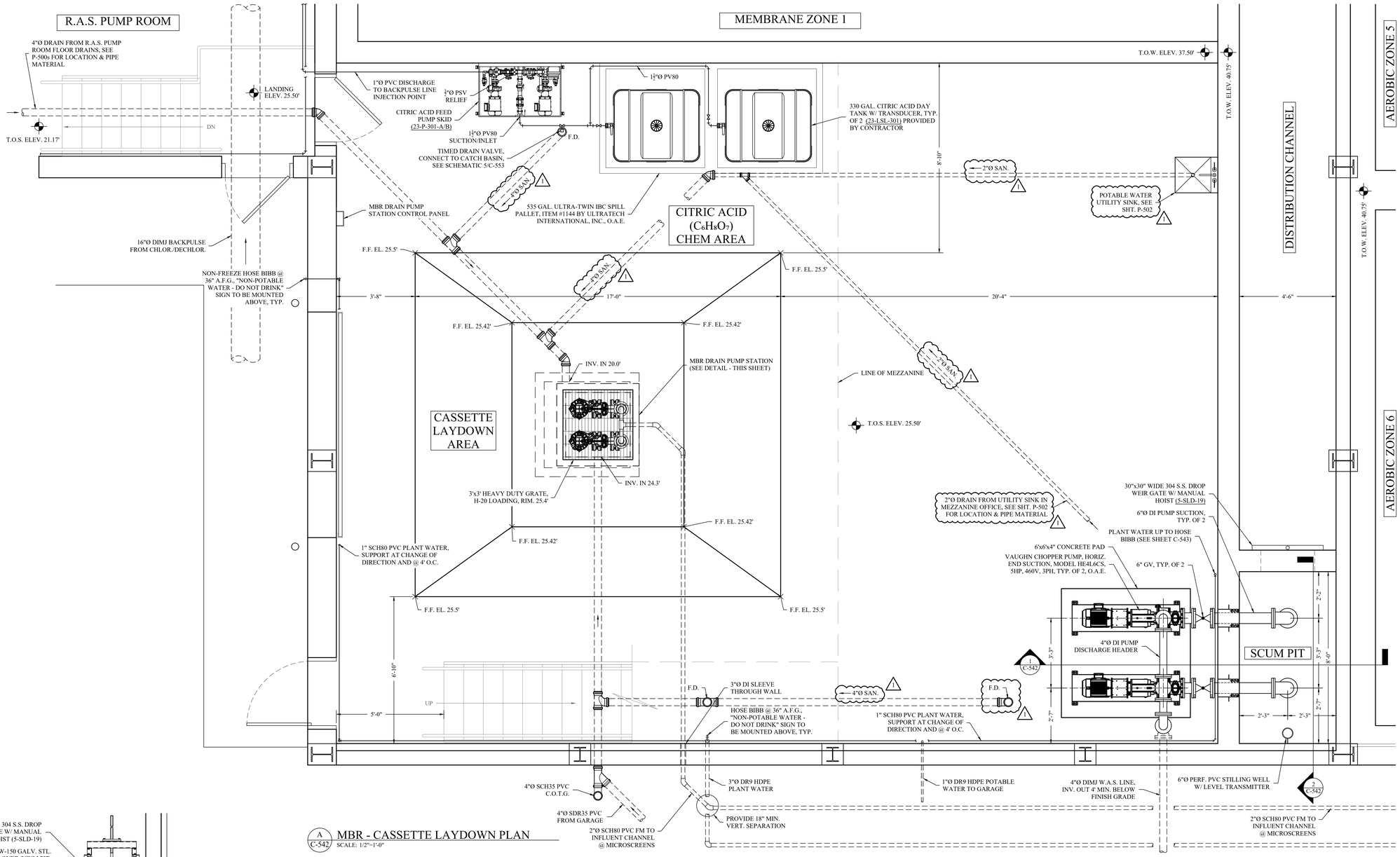
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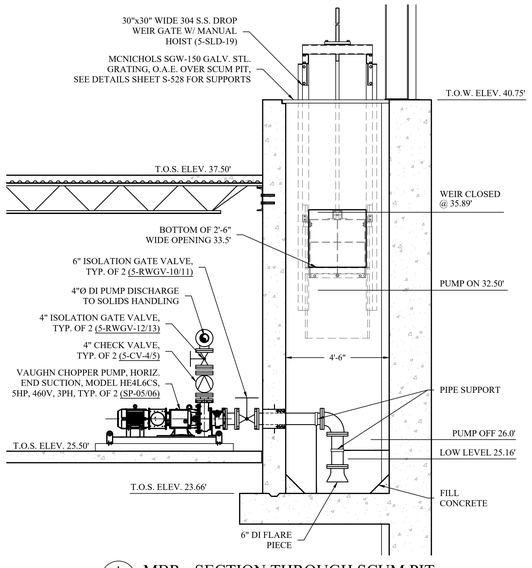
C-531

PROJECT # 18-732 PHASE #

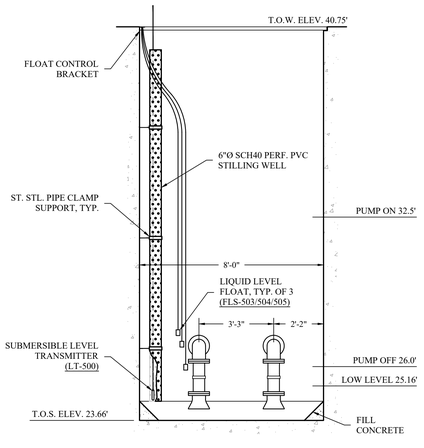
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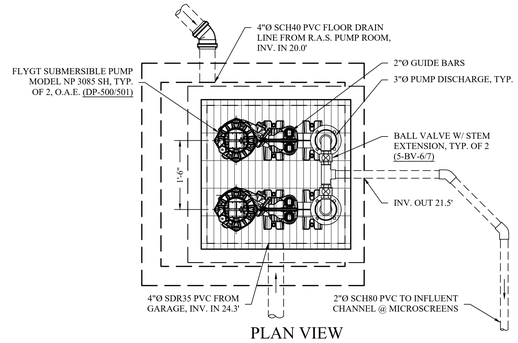
A C-542 MBR - CASSETTE LAYDOWN PLAN
SCALE: 1/2"=1'-0"



1 C-542 MBR - SECTION THROUGH SCUM PIT
SCALE: 3/8"=1'-0"



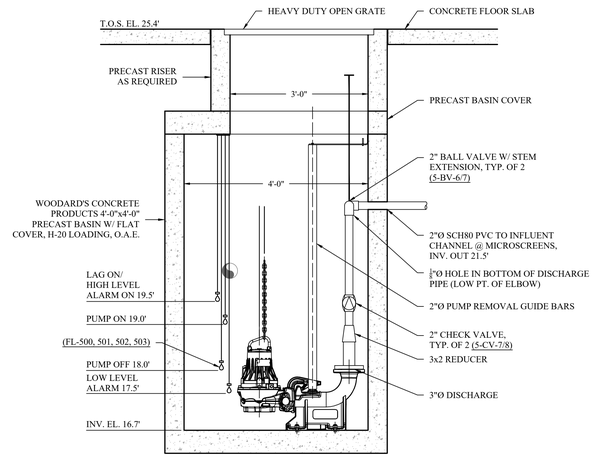
2 C-542 MBR - SECTION THROUGH SCUM PIT
SCALE: 3/8"=1'-0"



PLAN VIEW

NOTES:

1. ALL CONSTRUCTION JOINTS AND PIPE CONNECTIONS SHALL BE WATERTIGHT.
2. PUMPS TO ALTERNATE AND ALARM TO SOUND IF EITHER PUMP FAILS TO CYCLE PROPERLY.
3. ALL APPLICABLE N.E.C. REQUIREMENTS MUST BE MET.



SECTION VIEW

3 C-542 MBR - PRECAST DRAIN PUMP STATION
SCALE: N.T.S.

MHE ENGINEERING

33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100

111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

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FOR TOWN OF NEW WINDSOR
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NEW WINDSOR, NY 12553

MBR - CASSETTE LAYDOWN AREA, CHEM AREA & SCUM PIT SECTIONS

REVISIONS

NO.	DESCRIPTION	DATE
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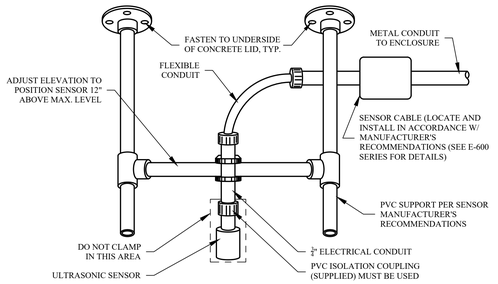
ISSUED DATE:	18 APR. 2025
DESIGN BY:	JTW
DRAWN BY:	HPBJr
CHECKED BY:	MWW
REVIEWED BY:	MJS, JZ

SHEET NO.

C-542

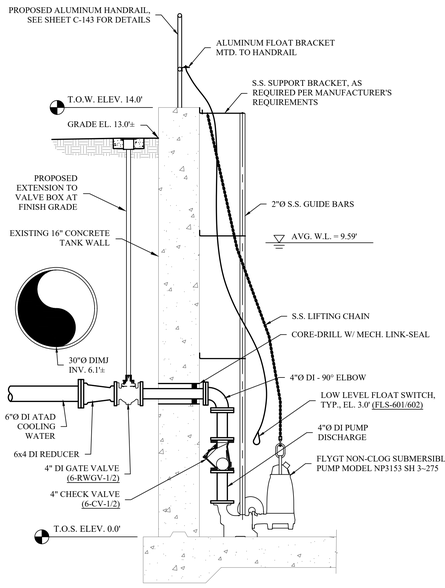
PROJECT # 18-732 PHASE #

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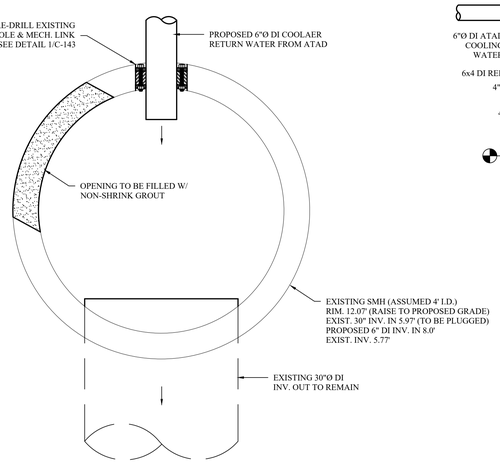


3 C-604 ULTRASONIC FLOW SENSOR MOUNTING DETAIL
SCALE: NONE

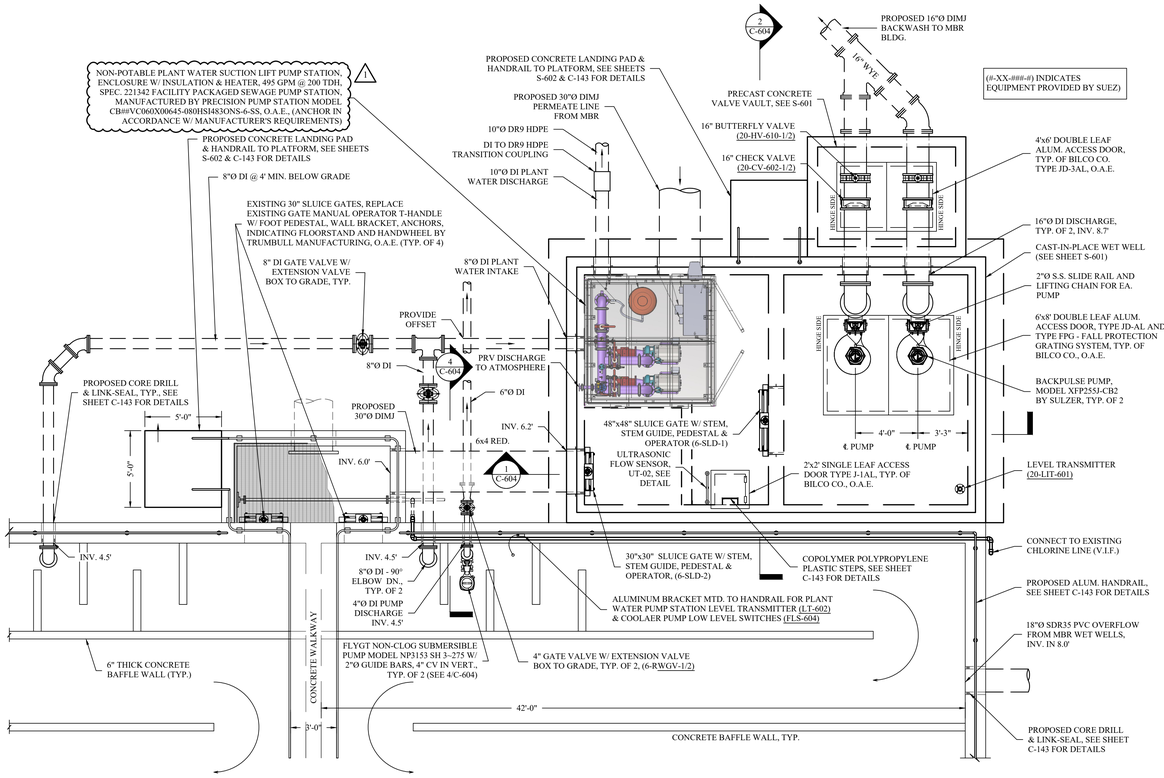
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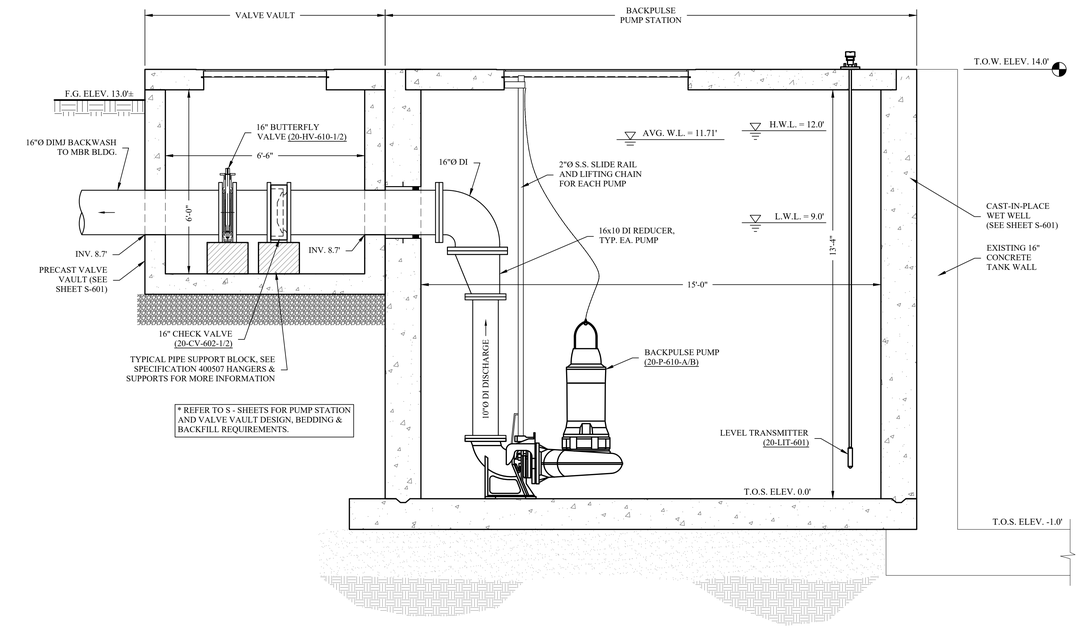
4 C-604 SECTION
SCALE: 1/2" = 1'-0"



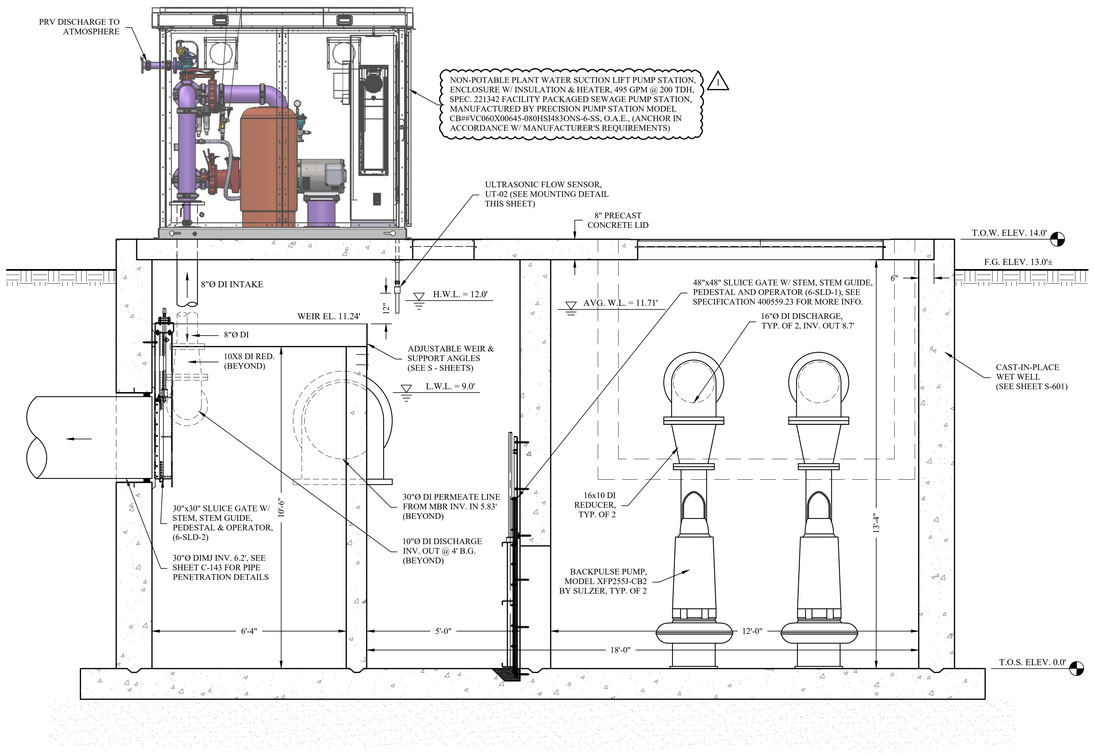
5 C-604 COOLAER RETURN WATER MANHOLE CONNECTION DETAIL
SCALE: NONE



A C-604 PROPOSED PLAN VIEW
SCALE: 1/4" = 1'-0"



2 C-604 SECTION
SCALE: 1/2" = 1'-0"



1 C-604 SECTION
SCALE: 1/2" = 1'-0"

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BACKPULSE PUMP STATION AND VALVE VAULT

REVISIONS

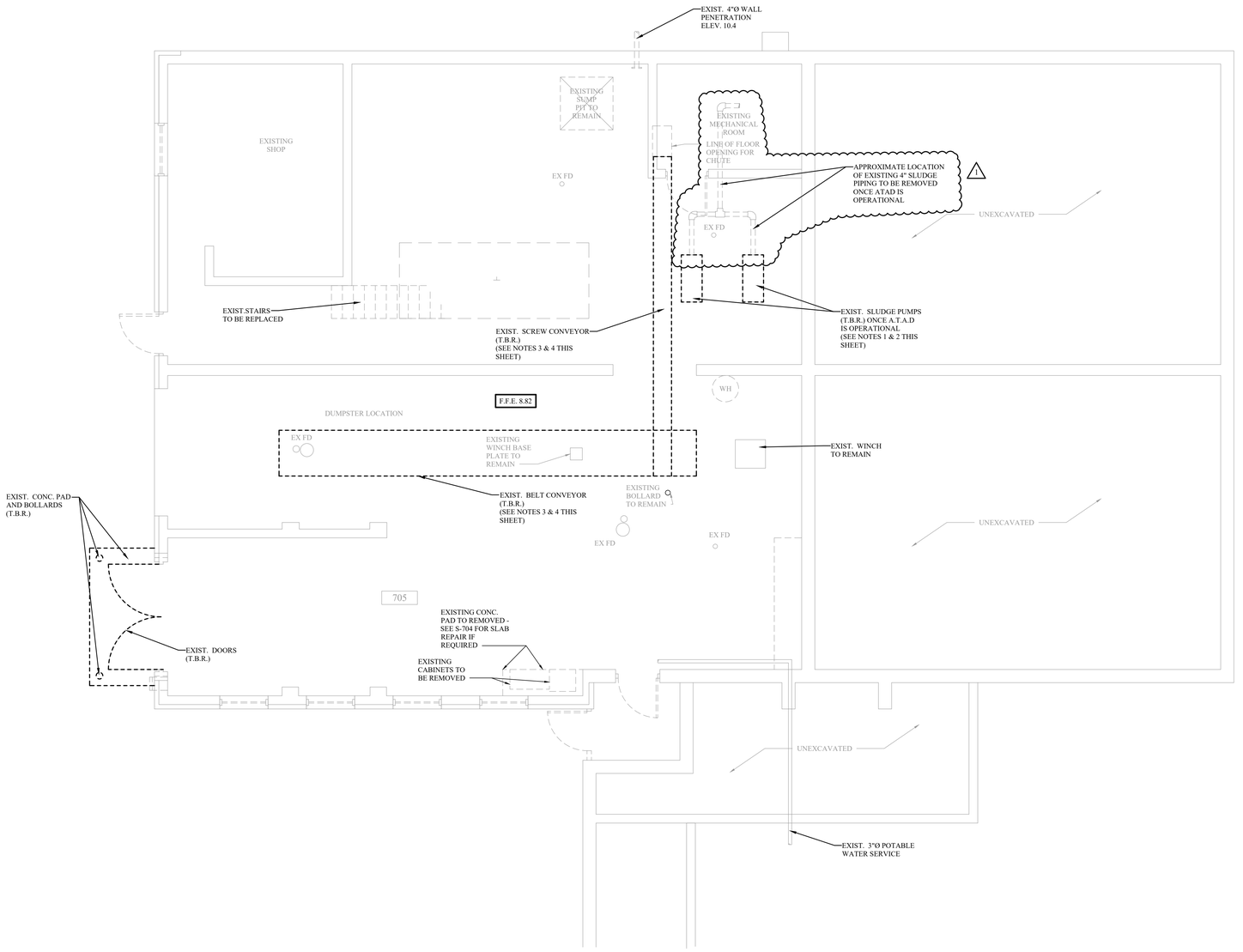
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE: 18 APR, 2025
DESIGN BY: JTW
DRAWN BY: HPBJr
CHECKED BY: MWW
REVIEWED BY: MJS, JZ

SHEET NO.
C-604

PROJECT # 18-732 PHASE #

F:\2018\18-732 Caesar Lane WWTP Improvements\Expansion Phase\Drafting\6 - Post Aeration\Civ4-Process\Addendum 4\POST AERATION REVISIONS.dwg, C-604, 7/9/2025 2:39:03 PM



1 CD-701 EXISTING CONDITIONS / DEMO PLAN DEWATERING BUILDING - LOWER LEVEL
SCALE: 1/4" = 1'-0"

NOTES:

1. EXISTING SLUDGE PUMPS TO BE CONNECTED TO NEW BELT PRESS TEMPORARILY WHEN EXISTING PRESS IS TAKEN OFF-LINE.
2. ONCE BOTH PRESSES ARE OPERATIONAL, AN EXISTING SLUDGE PUMP SHALL BE DEDICATED TO EACH PRESS TO ALLOW FOR SIMULTANEOUS OPERATION.
3. CONTRACTOR TO PROVIDE AT A MINIMUM TWO WEEKS NOTICE TO ENGINEER AND OPERATOR PRIOR TO REMOVING THE EXISTING CONVEYOR. NEW CONVEYOR SHALL BE INSTALLED AND OPERATIONAL NO MORE THAN FOUR WEEKS AFTER EXISTING CONVEYOR IS TAKEN OFF-LINE.
4. CONTRACTOR IS RESPONSIBLE FOR PROVIDING A TEMPORARY CONVEYOR FROM THE EXISTING DISCHARGE CHUTE OF THE EXISTING PRESS. CONTRACTOR TO PROVIDE A MINIMUM OF THREE 1 C.Y. DUMPING CARTS (THAT CAN BE HANDLED BY THE OPERATOR) FOR USE WHEN THE EXISTING CONVEYOR SYSTEM IS TAKEN OFFLINE UNTIL THE NEW CONVEYOR IS COMPLETELY OPERATIONAL.
5. ITEMS NOTED AS "T.B.R." SHALL BE TOTALLY REMOVED AND PROPERLY DISPOSED OF BY THE CONTRACTOR.

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(845) 567-3100
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EXISTING CONDITIONS / DEMO PLAN DEWATERING BUILDING - LOWER LEVEL

REVISIONS

NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	QMM
DRAWN BY:	JRJ
CHECKED BY:	MJS
REVIEWED BY:	MJS, JZ

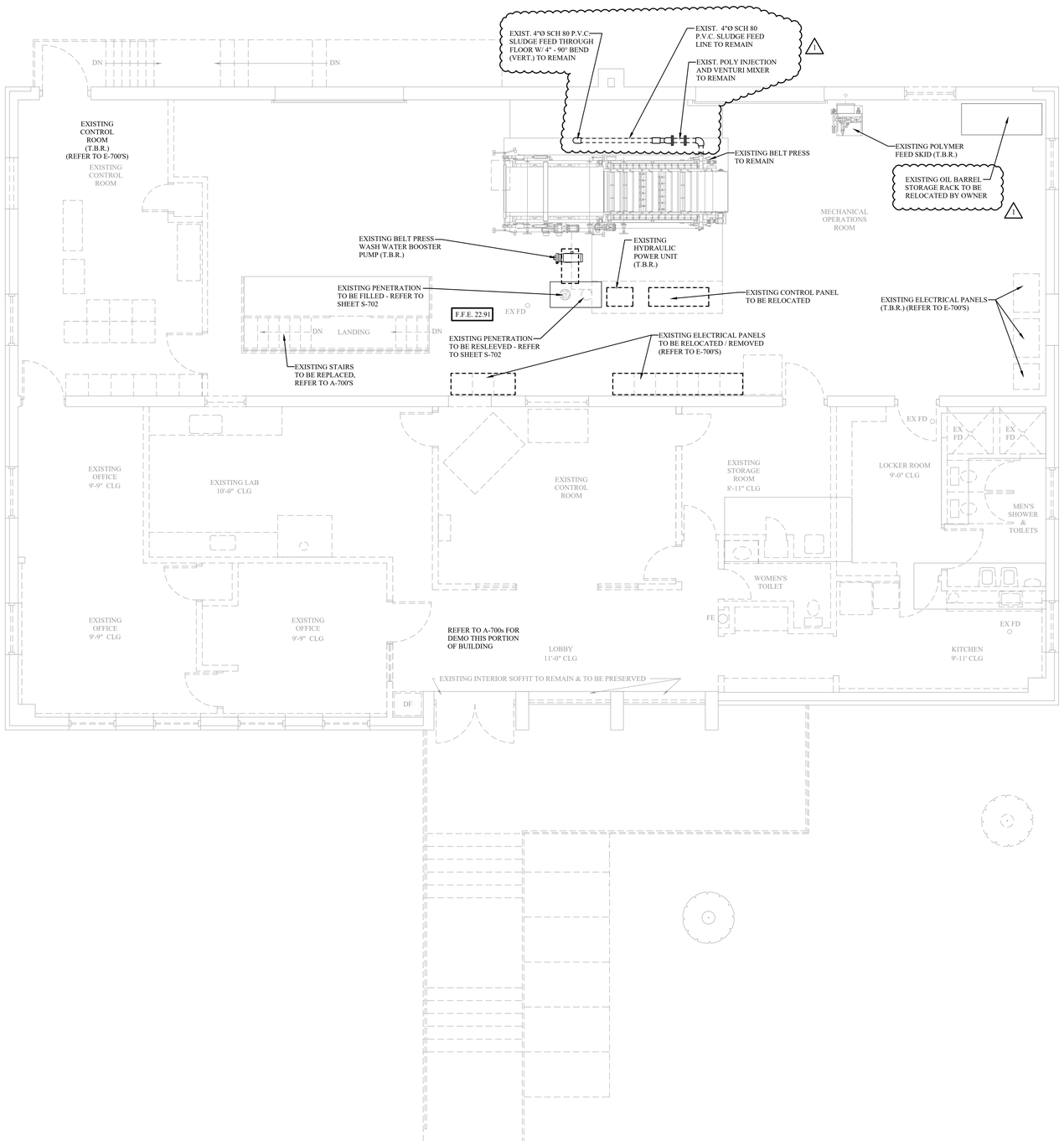
SHEET NO.
CD-701

PROJECT # 18-732 PHASE #

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NOTES:

1. ALL DEMO / RELOCATION IDENTIFIED ON THIS SHEET SHALL BE COMPLETED AFTER NEW BELT PRESS IS OPERATIONAL.
2. ITEMS NOTED AS "T.B.R." SHALL BE TOTALLY REMOVED AND PROPERLY DISPOSED OF BY THE CONTRACTOR.



1 CD-702 EXISTING CONDITIONS / DEMO PLAN DEWATERING BUILDING - UPPER LEVEL
SCALE: 1/4" = 1'-0"

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EXISTING CONDITIONS / DEMO PLAN DEWATERING BUILDING - UPPER LEVEL

REVISIONS

NO.	DESCRIPTION	DATE
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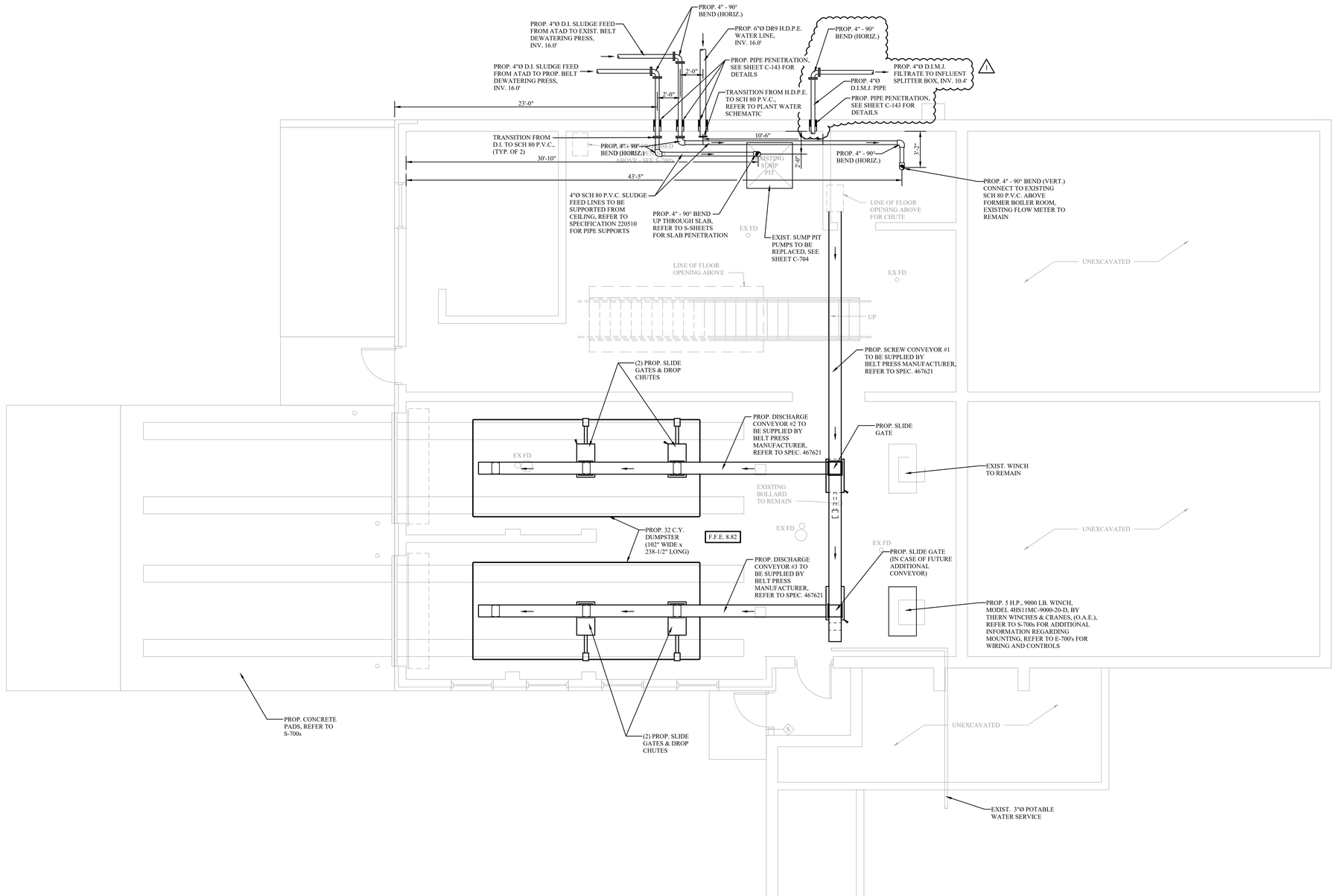
ISSUED DATE:	18 APR, 2025
DESIGN BY:	QMM
DRAWN BY:	JRJ
CHECKED BY:	MJS
REVIEWED BY:	MJS, JZ

SHEET NO.

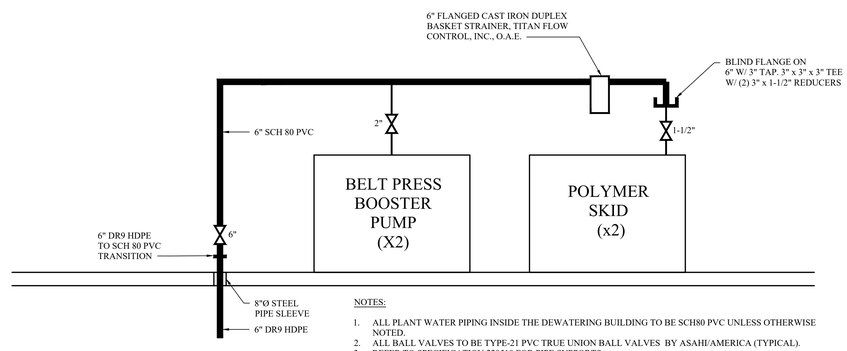
CD-702

PROJECT # 18-732 PHASE #

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1 C-701 PROPOSED LAYOUT PLAN DEWATERING BUILDING - LOWER LEVEL
SCALE: 1/4" = 1'-0"



NOTES:
1. ALL PLANT WATER PIPING INSIDE THE DEWATERING BUILDING TO BE SCH80 PVC UNLESS OTHERWISE NOTED.
2. ALL BALL VALVES TO BE TYPE-21 PVC TRUE UNION BALL VALVES BY ASAHI/AMERICA (TYPICAL).
3. REFER TO SPECIFICATION 220510 FOR PIPE SUPPORTS.

2 C-701 DEWATERING BUILDING WATER PROCESS SCHEMATIC
SCALE: NONE

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PROPOSED LAYOUT PLAN DEWATERING BUILDING - LOWER LEVEL

REVISIONS

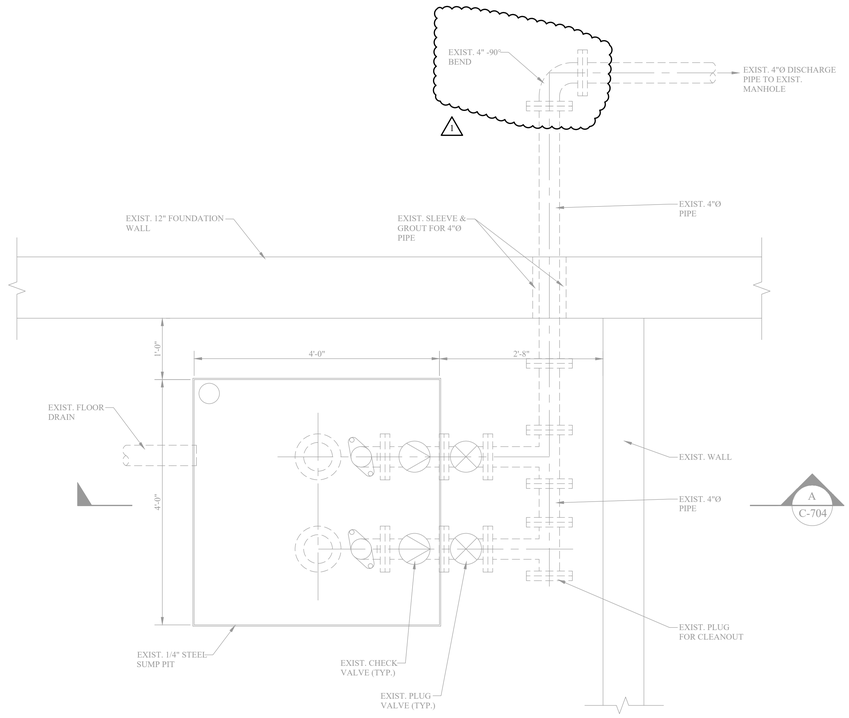
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

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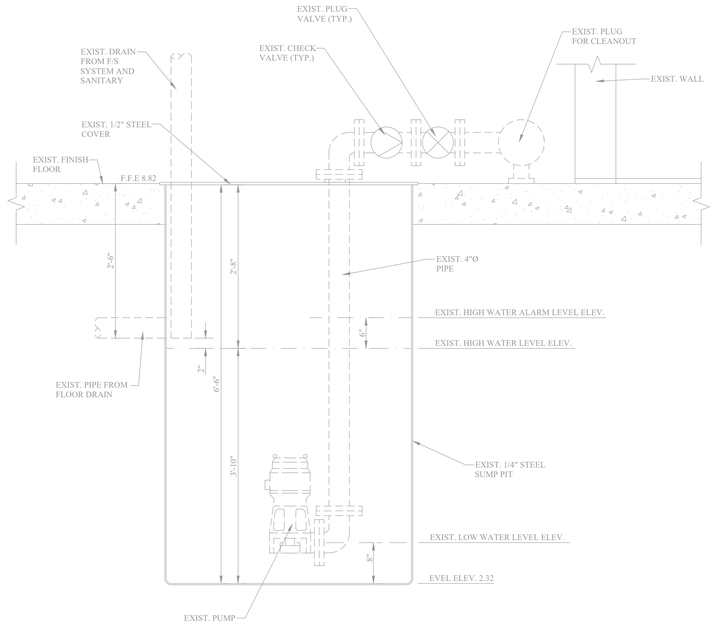
SHEET NO.
C-701

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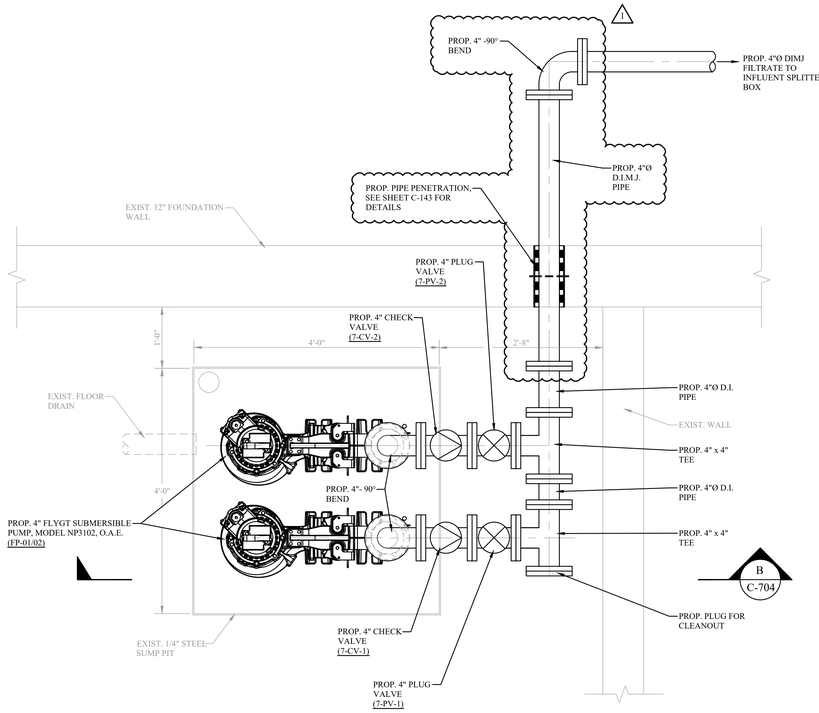


PLAN VIEW

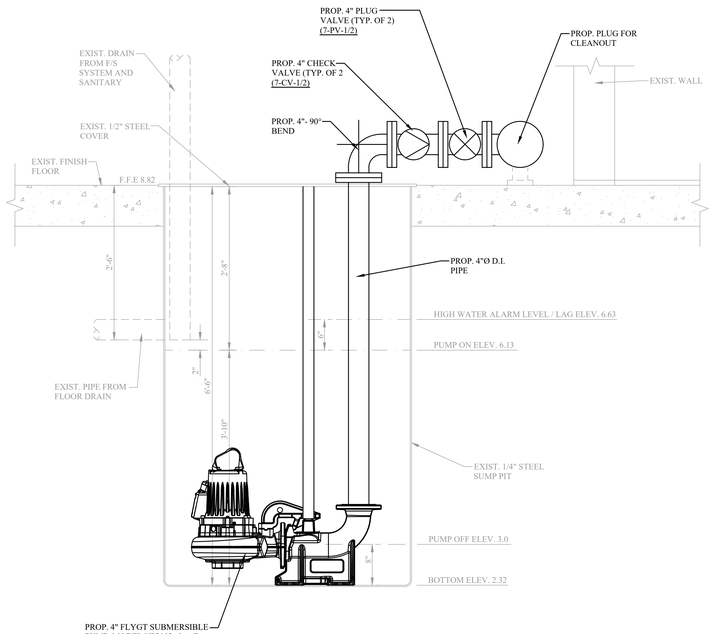


SECTION 'A'

1 C-704 DEWATERING BUILDING EXISTING SUMP PIT
SCALE: 1" = 1'-0"



PLAN VIEW



SECTION 'B'

2 C-704 DEWATERING BUILDING EXISTING SUMP PIT MODIFICATIONS
SCALE: 1" = 1'-0"

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DEWATERING BUILDING EXISTING SUMP PIT DETAIL

REVISIONS

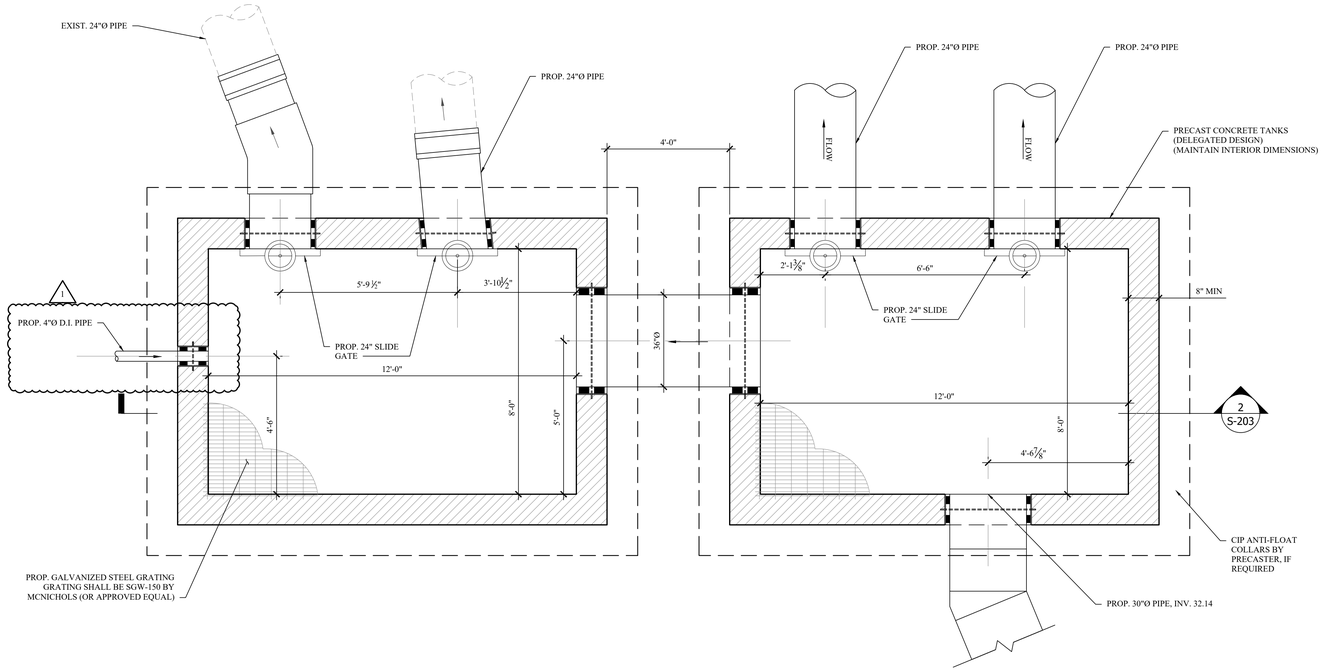
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	QMM
DRAWN BY:	JRJ
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C-704

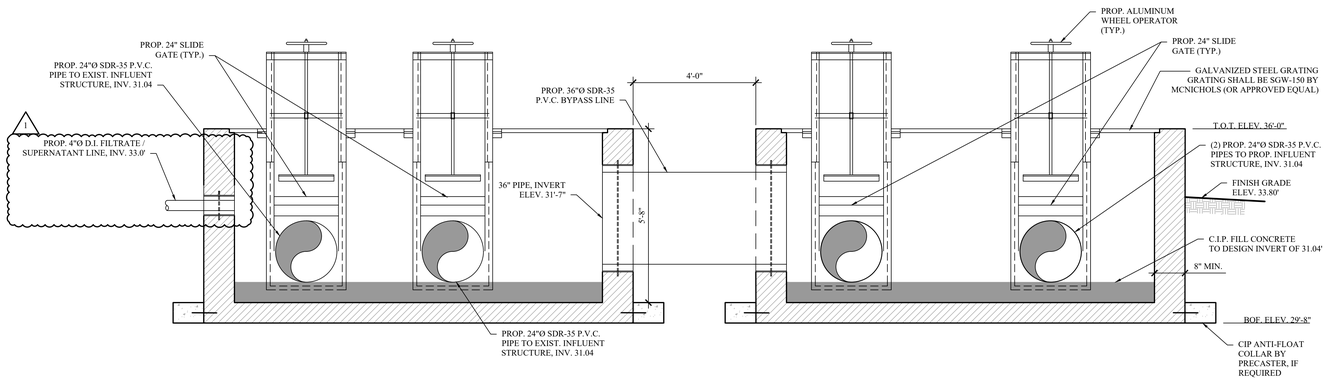
PROJECT # 18-732 PHASE #

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1 S-202 PROPOSED INFLUENT COLLECTION BOX WALL AND FOUNDATION PLAN

SCALE: 1/2" = 1'-0"



2 S-202 PROPOSED INFLUENT COLLECTION BOX / SPLITTER STATION SECTION

SCALE: 1/2" = 1'-0"

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INFLUENT SPLITTER BOX PLAN AND SECTION

REVISIONS

NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	WPG, NEM, PJW
DRAWN BY:	WPG, NEM, PJW
CHECKED BY:	PJW
REVIEWED BY:	JSS

SHEET NO.

S-202

PROJECT # 18-732 PHASE #

GENERAL NOTES (STRUCTURAL):

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE CAUSED BY THE CONTRACTOR OR HIS AGENTS TO STRUCTURES OR SURROUNDING AREAS. DAMAGE WILL BE REPAIRED OR REPLACED AS DIRECTED BY THE ENGINEER OF RECORD (E.O.R.) AT NO ADDITIONAL COST TO THE OWNER.

2. EXCAVATION SUPPORT, IF REQUIRED, IS THE RESPONSIBILITY OF THE CONTRACTOR, INCLUDING THE STABILITY OF THE EXCAVATION AND ITS INFLUENCE ON ADJACENT PROPERTIES AND STRUCTURES. EXCAVATION SUPPORT MAY ALSO BE UTILIZED TO MINIMIZE EXCAVATION LIMITS. THE CONTRACTOR SHALL SUBMIT SIGNED AND SEALED CALCULATIONS BY A NEW YORK STATE LICENSED PROFESSIONAL ENGINEER TO THE E.O.R. PRIOR TO INSTALLATION OF EXCAVATION SUPPORT MEASURES.

3. ALL ITEMS NOT INDICATED TO BE EXISTING SHALL BE PROVIDED AND INSTALLED UNDER THE REQUIREMENTS OF THIS CONTRACT.

4. THE STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH THE CIVIL, ARCHITECTURAL, PROCESS, MECHANICAL AND ELECTRICAL DRAWINGS. THE CONTRACTOR SHALL VERIFY THE REQUIREMENTS OF OTHER TRADES REGARDING SLEEVES, CHASES, HANGERS, INSERTS, ANCHORS, HOLES, AND ADDITIONAL ITEMS TO BE PLACED OR SET IN STRUCTURAL WORK.

5. THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS PRIOR TO BEGINNING CONSTRUCTION. ANY DISCREPANCIES BETWEEN FIELD CONDITIONS AND THE CONTRACT DRAWINGS SHALL BE BROUGHT TO THE ATTENTION OF THE E.O.R.

6. ANY ITEMS INDICATED TO BE REPLACED-IN-KIND SHALL BE INSTALLED TO MATCH EXISTING LOCATIONS, CONFIGURATIONS, AND ELEVATIONS UNLESS OTHERWISE NOTED.

7. ALL MATERIALS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS. IF MANUFACTURER'S SPECIFICATIONS CONFLICT WITH CONTRACT DRAWINGS OR SPECIFICATIONS, THE E.O.R. SHALL BE NOTIFIED IMMEDIATELY.

8. THE CONTRACTOR SHALL PROVIDE TEMPORARY SHORING AND BRACING REQUIRED TO ERECT AND HOLD THE STRUCTURE IN PROPER ALIGNMENT. NEITHER THE STRUCTURE NOR INDIVIDUAL STRUCTURAL ELEMENTS SUCH AS WALLS, BEAMS, JOISTS, AND COLUMNS WILL BE LATERALLY STABLE UNTIL ALL WORK INDICATED ON THE STRUCTURAL DRAWINGS IS COMPLETE.

9. ALL SUBSURFACE UTILITIES SHALL BE IDENTIFIED PRIOR TO EXCAVATION. THE CONTRACTOR SHALL EXERCISE EXTREME CAUTION DURING EXCAVATION. IF UNIDENTIFIED UTILITIES ARE ENCOUNTERED, THE E.O.R. SHALL BE NOTIFIED IMMEDIATELY.

10. ALL ITEMS SHOWN TO BE REMOVED SHALL BE PROPERLY HANDLED AND DISPOSED OF OFF SITE.

11. NO BACKFILLING OF THE STRUCTURE SHALL OCCUR UNTIL CONCRETE BREAKS SATISFACTORY TO THE E.O.R. ARE OBTAINED OR UNTIL THE CONTAINMENT STRUCTURE HAS SUCCESSFULLY PASSED HYDROSTATIC TESTING IF APPLICABLE.

12. ALL ITEMS INDICATED TO BE A DELEGATED DESIGN SHALL BE SUBMITTED TO THE E.O.R. PRIOR TO ORDERING MATERIALS. SUBMITTALS SHALL INCLUDE PLANS AND CALCULATIONS SIGNED AND SEALED BY A NEW YORK STATE LICENSED PROFESSIONAL ENGINEER.

13. ELEVATIONS SHOWN ARE BASED ON SURVEY BY CTMALE DATED APRIL 3, 2023.

SPECIAL INSPECTIONS:

ALL SPECIAL INSPECTIONS LISTED ARE IN ADDITION TO ALL INSPECTION REQUIRED BY STATE AND LOCAL BUILDING CODES. ALL SPECIAL INSPECTIONS SHALL BE PERFORMED BY AN AGENCY RETAINED AND PAID BY THE OWNER OR OWNER'S REPRESENTATIVE. THE APPROVED AGENCY SHALL PROVIDE ALL INFORMATION AS NECESSARY FOR THE BUILDING OFFICIAL TO DETERMINE THAT THE AGENCY MEETS THE APPLICABLE REQUIREMENTS. COPIES OF NECESSARY TEST AND INSPECTION RECORDS SHALL BE FILED WITH THE BUILDING OFFICIAL AND REGISTERED DESIGN PROFESSIONAL. ALL SPECIAL INSPECTIONS AND REPORTS SHALL BE IN ACCORDANCE WITH CHAPTER 17 OF THE 2020 NEW YORK STATE BUILDING CODE LATEST REVISION.

CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH OWNER'S DESIGNATED INSPECTOR FOR SCHEDULING OF ALL SPECIAL INSPECTIONS. CONTRACTOR SHALL NOTIFY INSPECTOR MINIMUM 48 HOURS PRIOR TO NEED OF INSPECTION.

THE OWNER RESERVES THE RIGHT TO BACK CHARGE THE CONTRACTOR FOR ANY COSTS ASSOCIATED WITH ADDITIONAL SPECIAL INSPECTIONS REQUIRED DUE TO CANCELLATION OF SCHEDULED INSPECTIONS AND RE-INSPECTION OF PREVIOUSLY FAILED INSPECTIONS.

SPECIAL INSPECTIONS REQUIRED INCLUDE BUT ARE NOT LIMITED TO:

STEEL:

1. STRUCTURAL STEEL:
   - 1.1. SPECIAL INSPECTIONS AND NONDESTRUCTIVE TESTING OF STRUCTURAL STEEL ELEMENTS IN BUILDINGS, STRUCTURES AND PORTIONS THEREOF SHALL BE IN ACCORDANCE WITH THE QUALITY ASSURANCE INSPECTION REQUIREMENTS OF AISC 360-16.
2. COLD-FORMED STEEL DECK:
   - 2.1. SPECIAL INSPECTIONS AND QUALIFICATION OF WELDING SPECIAL INSPECTORS FOR COLD-FORMED STEEL FLOOR AND ROOF DECK SHALL BE IN ACCORDANCE WITH THE QUALITY ASSURANCE INSPECTION REQUIREMENTS OF SDI QA/QC.
3. INSTALLATION OF OPEN-WEB STEEL JOISTS AND JOIST GIRDERS:
   - 3.1. PERIODIC SPECIAL INSPECTION OF END CONNECTIONS - WELDED OR BOLTED.
   - 3.2. PERIODIC SPECIAL INSPECTION OF BRIDGING - HORIZONTAL OR DIAGONAL

CONCRETE:

1. PERIODIC INSPECTION OF REINFORCING STEEL.
2. PERIODIC INSPECTION OF ANCHORS CAST IN CONCRETE.
3. INSPECTION OF ANCHORS POST-INSTALLED IN HARDENED CONCRETE.
   - 3.1. CONTINUOUS INSPECTION OF ADHESIVE ANCHORS INSTALLED IN HORIZONTALLY OR UPWARDLY INCLINED ORIENTATIONS TO RESIST SUSTAINED TENSION LOADS.
   - 3.2. PERIODIC INSPECTION OF MECHANICAL ANCHORS AND ADHESIVE ANCHORS NOT DEFINED IN 3.1.
4. PERIODIC VERIFICATION OF DESIGN MIX.
5. PRIOR TO CONCRETE PLACEMENT, FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP, AIR, AND TEMPERATURE TESTS; CONTINUOUS.
6. CONTINUOUS INSPECTION OF PLACEMENT & FOR PROPER APPLICATION TECHNIQUES.
7. PERIODIC INSPECTION OF ERECTION OF PRECAST CONCRETE MEMBERS.
8. PERIODIC INSPECTION FOR MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES.
9. PERIODIC VERIFICATION OF IN-SITU CONCRETE STRENGTH, PRIOR TO STRESSING OF TENDONS IN POST-TENSIONED CONCRETE AND PRIOR TO REMOVAL OF SHORES AND FORMS FROM BEAMS AND STRUCTURAL SLABS.
10. PERIODIC INSPECTION OF FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS, OF THE CONCRETE MEMBER BEING FORMED.

MASONRY:

1. SPECIAL INSPECTIONS AND TESTS OF MASONRY CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH THE QUALITY ASSURANCE PROGRAM REQUIREMENTS OF TMS 402 AND TMS 602.

SOILS:

1. CONTINUOUS INSPECTION OF
   - 1.1. PROPER MATERIALS
   - 1.2. DENSITIES
   - 1.3. LIFT THICKNESSES DURING PLACEMENT
   - 1.4. COMPACTION OF CONTROLLED FILL
2. PERIODIC INSPECTION OF
   - 2.1. MATERIALS BELOW FOOTINGS ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY
   - 2.2. EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL
   - 2.3. CLASSIFICATION AND TESTING OF CONTROLLED FILL MATERIALS
   - 2.4. SUBGRADE PRIOR TO PLACEMENT OF COMPACTED FILL
3. THE APPROVED SOILS REPORT, IF ANY EXISTS, SHALL BE USED TO DETERMINE COMPLIANCE.

CONCRETE NOTES:

1. CONCRETE SHALL CONFORM TO ACI 211.1, ACI 301, ACI 304R (WHEN PUMPING), AND ACI 318-14. AGGREGATE SHALL CONFORM TO ASTM C33. COMPRESSIVE STRENGTH, RANGE OF SLUMP, WATER-TO-CEMENT RATIO, AND AIR ENTRAINMENT SHALL BE PER THE CONCRETE CLASS SPECIFIED HEREIN AND IN ACCORDANCE WITH CAST-IN-PLACE CONCRETE SPECIFICATION 033000. SUBMIT COPIES OF TEST REPORTS SHOWING THAT THE MIX HAS BEEN SUCCESSFULLY TESTED TO PRODUCE CONCRETE WITH THE PROPERTIES SPECIFIED. TEST REPORTS SHALL BE SUBMITTED TO THE ENGINEER OF RECORD (E.O.R.) FOR APPROVAL PRIOR TO CONCRETE PLACEMENT.
   - 1.1. CONCRETE CLASSIFICATIONS PER SPECIFICATION SECTION 033000:
     - 1.1.1. FOOTINGS & FROST WALLS: CLASS A
     - 1.1.2. ABOVE GRADE WALLS, EXPOSED FOUNDATION WALLS, TANK AND CHANNEL WALLS: CLASS B
     - 1.1.3. INTERIOR SLABS-ON-GROUND: CLASS C
     - 1.1.4. TANK AND CHANNEL FOUNDATIONS: CLASS D
     - 1.1.5. INTERIOR SUSPENDED SLABS: CLASS E
     - 1.1.6. L.W. CONCRETE INTERIOR SUSPENDED SLABS: CLASS F
     - 1.1.7. APRONS, LANDINGS, EQUIPMENT PADS, SIDEWALKS & CURBS: CLASS H
     - 1.1.8. FILL CONCRETE: CLASS G
   - 1.2. CONCRETE FINISHES PER SPECIFICATION SECTION 033000:
     - 1.2.1. FOUNDATIONS BELOW GRADE: AS-CAST SF-2.0 FINISH
     - 1.2.2. EXPOSED FOUNDATION WALLS: GROUT-CLEANED FINISH
     - 1.2.3. TANK WALLS & SLABS: AS-CAST SF-3.0 FINISH
     - 1.2.4. EXTERIOR SLABS: FINE BROOM FINISH
     - 1.2.5. INTERIOR SLABS: TROWEL FINISH
2. CEMENT SHALL CONFORM TO ASTM C150, TYPE I/II AND SHALL HAVE A CURING PERIOD OF NOT LESS THAN 7 DAYS.
3. CONCRETE SHALL BE WET CURED, USING BURLAP OR COTTON CURING MATS, OR CURED USING ASTM D4397 POLYETHYLENE SHEETING IN ACCORDANCE WITH ASTM C171. WET THE ENTIRE EXPOSED SURFACE OF THE CONCRETE THOROUGHLY WITH A FINE SPRAY OF WATER AND COVER WITH SHEETING THROUGHOUT THE CURING PERIOD. LAY SHEETING DIRECTLY ON CONCRETE SURFACE. PROVIDE SHEETING NOT LESS THAN 18 INCHES WIDER THAN CONCRETE SURFACE. OVERLAP EDGES 12 INCHES AND CONTINUOUSLY TAPE JOINTS.
4. PUMPING SHALL NOT RESULT IN SEPARATION OR LOSS OF MATERIALS NOR CAUSE INTERRUPTIONS SUFFICIENT TO PERMIT LOSS OF PLASTICITY BETWEEN SUCCESSIVE INCREMENTS. LOSS OF SLUMP IN PUMPING EQUIPMENT SHALL NOT EXCEED 2 INCHES. CONCRETE SHALL NOT BE CONVEYED THROUGH PIPE MADE OF ALUMINUM OR ALUMINUM ALLOY. RAPID CHANGES IN PIPE SIZES SHALL BE AVOIDED. MAXIMUM SIZE OF COURSE AGGREGATE SHALL BE LIMITED TO 33 PERCENT OF THE DIAMETER OF THE PIPE. MAXIMUM SIZE OF WELL ROUNDED AGGREGATE SHALL BE LIMITED TO 40 PERCENT OF THE PIPE DIAMETER. SAMPLES FOR TESTING SHALL BE TAKEN AT BOTH THE POINT OF DELIVERY TO THE PUMP AND AT THE DISCHARGE END.
5. CONCRETE SHALL NOT BE PLACED WHEN WEATHER CONDITIONS PREVENT PROPER PLACEMENT AND CONSOLIDATION INCLUDING PERIODS OF PRECIPITATION. TRANSPORT CONCRETE AS RAPIDLY AS PRACTICABLE TAKING PRECAUTION TO PREVENT SEGREGATION OR LOSS OF INGREDIENTS. PUMPING IN ACCORDANCE WITH ACI 304 SHALL BE PERMITTED. DO NOT EXCEED A FREE VERTICAL DROP OF 3 FEET FROM THE POINT OF DISCHARGE. PLACE CONCRETE IN ONE CONTINUOUS OPERATIONS FROM ONE SIDE OF SLAB TO THE OTHER. POSITION GRADE STAKES AT 12 FEET ON CENTER MAXIMUM IN EACH DIRECTION.
6. UNLESS OTHERWISE NOTED, REINFORCEMENT BARS SHALL BE BLACK STEEL. REINFORCING BARS SHALL CONFORM TO ASTM A615 AND SHALL HAVE A MINIMUM YIELD STRENGTH OF 60 KSI. WELDED WIRE FABRIC REINFORCEMENT SHALL CONFORM TO ASTM A1064. REINFORCEMENT SHALL NOT CONTAIN RUST, SCALE, OIL, GREASE, CLAY, OR FOREIGN SUBSTANCES THAT WOULD REDUCE THE CONCRETE BONDING STRENGTH. REMOVE LOOSE RUST PRIOR TO PLACEMENT OF REINFORCEMENT.
7. REINFORCEMENT SPLICES SHALL BE KEPT TO A PRACTICAL MINIMUM. SEE THE LAP SLICE TABLE ON THIS SHEET FOR MINIMUM LAP SPLICE LENGTHS.
8. PROVIDE MINIMUM 2" OF CONCRETE COVER FOR ALL REINFORCING STEEL WHEN CAST AGAINST FORMS OR 3" OF CONCRETE COVER FOR ALL REINFORCING STEEL WHEN CAST AGAINST EARTH, UNLESS OTHERWISE INDICATED.
9. CONCRETE FOOTINGS AND MAT FOUNDATIONS SHALL BE PLACED MONOLITHICALLY WITH THE EXCEPTION THAT VERTICAL CONSTRUCTION JOINTS WILL BE ALLOWED IF EPOXY BONDING COMPOUND IS APPLIED TO THE ROUGHENED SURFACE OF THE HARDENED CONCRETE.
10. INTERIOR SLABS: THE CONTRACTOR SHALL PROVIDE CONTRACTION JOINTS AS INDICATED. JOINTS MAY BE SAWCUT OR CUT WITH A JOINTING TOOL. SAWED JOINTS SHALL BE COMPLETED WITHIN 4 TO 12 HOURS AFTER PLACEMENT OF CONCRETE. JOINTS SHALL INTERSECT WITH THE CORNERS OF ISOLATION JOINT AT COLUMN LOCATIONS, IF ANY ARE PRESENT, AND BE SPACED A MAXIMUM OF 15 FEET ON CENTER, UNLESS NOTED OTHERWISE.
11. REINFORCEMENT SUPPORTS SHALL BE CONCRETE OR OTHER NON-CORRODIBLE MATERIAL HAVING A COMPRESSIVE STRENGTH EQUAL TO OR GREATER THAN THE COMPRESSIVE STRENGTH OF THE CONCRETE BEING PLACED.
12. PROVIDE A ½" ROUNDED EDGE ON ALL EXPOSED SLAB EDGES. PROVIDE A ¾" CHAMFER ON ALL OTHER EXPOSED CONCRETE CORNERS.
13. EPOXY BONDING COMPOUND SHALL BE USED ON ALL CONTACTING SURFACES BETWEEN EXISTING CONCRETE AND NEW CONCRETE. EPOXY BONDING COMPOUND SHALL CONFORM TO ASTM C881, TYPE AND GRADE TO BE IN ACCORDANCE WITH APPROPRIATE USE INDICATED IN SPECIFICATION 033000 CAST-IN-PLACE CONCRETE. DO NOT ALLOW COMPOUND TO HARDEN PRIOR TO CONCRETE PLACEMENT. BONDING AGENT USED SHALL BE NSF 61 APPROVED.
14. PLACE, CONSOLIDATE AND IMMEDIATELY STRIKE OFF CONCRETE TO OBTAIN PROPER CONTOUR GRADE AND ELEVATION BEFORE BLEEDWATER APPEARS. PERMIT CONCRETE TO ATTAIN A SET SUFFICIENT FOR FLOATING AND SUPPORTING THE WEIGHT OF THE FINISHER AND EQUIPMENT. IF BLEEDWATER IS PRESENT PRIOR TO FLOATING THE SURFACE, DRAG THE EXCESS WATER OFF OR REMOVE BY ABSORPTION WITH POROUS MATERIALS. DO NOT USE DRY CEMENT TO ABSORB BLEEDWATER.
15. UNLESS OTHERWISE NOTED, ALL CONCRETE CONSTRUCTION SHALL MEET THE SPECIFIED TOLERANCES OF ACI 117. TOP ELEVATIONS SHALL MATCH THE SPECIFIED ELEVATIONS WITHIN A TOLERANCE OF ±¼"
16. THE REQUIREMENTS OF ACI 302.1R CLASS 4 SHALL BE IN EFFECT FOR THE CONSTRUCTION OF ALL FLOORS AND SLABS. THE REQUIREMENTS OF ACI 360.R-10 SHALL BE IN EFFECT FOR THE CONSTRUCTION OF ALL SLABS-ON-GROUND.
    - 16.1. SLABS-ON-GRADE: FF = 25 AND FL = 20
    - 16.2. SUSPENDED SLABS: FF = 25 AND FL = 20
17. NO CONCRETE SHALL BE PLACED UNTIL ALL EMBEDDED ITEMS (I.E. PROCESS, ELECTRICAL, MECHANICAL, ETC) HAVE BEEN SET. CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL TRADES.
18. ALL BAR PLACING AND BENDING SHALL BE IN ACCORDANCE WITH ACI 315.
19. PERFORM COMPRESSIVE TESTS IN ACCORDANCE WITH ASTM C39. OBTAIN ONE COMPOSITE SAMPLE FOR EACH DAY'S POUR OF EACH CONCRETE MIXTURE EXCEEDING 5 CU. YD., BUT LESS THAN 25 CU. YD., PLUS ONE SET FOR EACH ADDITIONAL 50 CU. YD. OR FRACTION THEREOF. TAKE PRECAUTIONS TO PREVENT EVAPORATION AND LOSS OF WATER FROM SPECIMENS. TEST ONE CYLINDER AT 3 DAYS, ONE CYLINDER AT 7 DAYS, AND TWO (THREE FOR 4"x8" CYLINDERS) CYLINDERS AT 28 DAYS AND HOLD ONE IN RESERVE. PERFORM SLUMP TESTS IN ACCORDANCE WITH ASTM C143. PERFORM AIR CONTENT TESTS IN ACCORDANCE WITH ASTM C173 OR ASTM C231. SUBMIT ALL TEST DATA TO THE E.O.R.
20. CONSOLIDATE CONCRETE WITH HIGH FREQUENCY, INTERNAL, MECHANICAL VIBRATING EQUIPMENT SUPPLEMENTED BY HAND SPADING AND TAMPING. FURNISH A SPARE VIBRATOR ON THE JOB SITE WHENEVER CONCRETE IS PLACED. OPERATE VIBRATORS WITH VIBRATORY ELEMENT SUBMERGED IN THE CONCRETE, WITH A MINIMUM FREQUENCY OF NOT LESS THAN 6000 IMPULSES PER MINUTE WHEN SUBMERGED. INSERT AND WITHDRAW VIBRATORS AT INTERVALS APPROXIMATELY 18 INCHES APART.
21. ELASTOMERIC JOINT SEALANT SHALL CONFORM TO ASTM C920, TYPE S, GRADE P, CLASS 25. JOINT SEALANT IN CONTACT WITH POTABLE WATER SHALL BE NSF 61 APPROVED.
22. CONTROLLED DENSITY FILL SHALL BE IN ACCORDANCE WITH SPECIFICATION 033110.
23. CRYSTALLINE WATERPROOFING ADMIXTURES SHALL BE IN ACCORDANCE WITH CAST-IN-PLACE CONCRETE SPECIFICATION 033000 AND THE CRYSTALLINE WATERPROOFING SPECIFICATION 071616.
    APPLICABLE LOCATIONS (EXCLUDING FILL CONCRETE):
    - MICROSCREEN CHANNELS
    - WET WELLS
    - DRY WELL
    - SPLITTER BOX
    - ANOXIC TANKS
    - AEROBIC TANKS
    - DISTRIBUTION CHANNEL
    - MBR TRAINS

STRUCTURAL STEEL NOTES:

1. STRUCTURAL STEEL SYSTEMS INCLUDING MATERIALS, INSTALLATION, WORKMANSHIP, FABRICATION, ASSEMBLY, ERECTION, INSPECTION, QUALITY CONTROL, AND TESTING SHALL BE PROVIDED IN ACCORDANCE WITH AISC MANUAL OF STEEL CONSTRUCTION, LATEST EDITION.
2. ALL STEEL SHALL CONFORM TO THE FOLLOWING UNLESS OTHERWISE NOTED:
   - W SHAPES: ASTM A992, Fy = 50KSI
   - HSS: ASTM A500 GR. C, Fy = 50KSI
   - PLATES AND OTHER STEEL SHAPES: ASTM A36, Fy = 36KSI
3. ALL HOLES IN STEEL SHALL BE STANDARD SIZE 1/16" LARGER THAN BOLT DIAMETER UNLESS OTHERWISE NOTED. ALL HOLES SHALL BE DRILLED OR PUNCHED. BURNING IS NOT ALLOWED. COLUMN BASEPLATE HOLES FOR ANCHOR BOLTS ARE PERMITTED TO BE OVERSIZED.
4. COPES SHALL BE PROVIDED WITH 1/2" RADIUS MINIMUM, SMOOTH CORNERS, AND FREE OF NOTCHES. DEPTH AND LENGTH OF COPES SHALL BE AS INDICATED.
5. UNLESS OTHERWISE NOTED, ALL BOLTS SHALL CONFORM TO ASTM A325, EXCEPT ANCHOR BOLTS SHALL CONFORM TO ASTM F1554. ALL NUTS SHALL CONFORM TO ASTM A563, GRADE AND STYLE FOR APPLICABLE ASTM BOLT STANDARD. ALL WASHERS SHALL CONFORM TO ASTM F436 FOR ASTM A325 BOLTS AND F1554 ANCHOR BOLTS.
6. UNLESS OTHERWISE NOTED, ALL BOLTS SHALL BE SNUG-TIGHT. BOLTS SPECIFIED AS PRE-TENSIONED (PT) SHALL BE PRE-TENSIONED USING THE TURN-OF-NUT METHOD. CONNECTIONS SPECIFIED AS SLIP-CRITICAL (SC) SHALL HAVE BOLTS PRE-TENSIONED USING THE TURN-OF-NUT METHOD AND FAYING SURFACES PREPARED IN ACCORDANCE WITH THE CLASSIFICATION INDICATED. BOLTS INDICATED TO USE A JAM NUT SHALL BE INSTALLED USING THE FOLLOWING SEQUENCE:
   - INSTALL THIN NUT (JAM NUT) FIRST AND TORQUE TO 50% OF TORQUE VALUE
   - INSTALL THICK NUT (STANDARD HEX) SECOND AND TORQUE TO 100% OF TORQUE VALUE WHILE HOLDING THE JAM NUT TO PREVENT ROTATION
7. STEEL DETAILER SHALL PROVIDE CONNECTION DESIGN IN ACCORDANCE WITH ANSI/AISC 303. DETAILER SHALL SELECT AND COMPLETE CONNECTIONS USING SCHEMATIC DETAILS INDICATED ON PLANS AND ANSI/AISC 360.
8. UNLESS NOTED OTHERWISE, ALL STRUCTURAL STEEL MEMBERS SHALL BE HOT DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A123 AND ALL STRUCTURAL STEEL FASTENERS (INCLUDING NUTS, BOLTS, WASHERS, ETC.) SHALL BE HOT DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A153. REPAIR AREAS OF DAMAGED GALVANIZATION IN ACCORDANCE WITH ASTM A780.
9. UNLESS NOTED OTHERWISE, ALL MBR ENCLOSURE COLUMNS SHALL BE PROVIDED WITH A ½" THICK CAP PLATE.
10. STEEL GRATING SHALL BE GALVANIZED SGW-150 BY MCNICHOLS OR APPROVED EQUAL.

STEEL JOISTS NOTES:

1. STEEL JOISTS SHALL BE DESIGNED, FABRICATED, AND INSTALLED IN ACCORDANCE WITH STEEL JOIST INSTITUTE (SJI) "STANDARD SPECIFICATIONS LOAD TABLES AND WEIGHT TABLES FOR STEEL JOISTS AND JOIST GIRDERS" LATEST EDITION AND SJI "CODE OF STANDARD PRACTICE" LATEST EDITION.
2. STEEL JOIST FABRICATOR SHALL SUPPLY AN AFFIDAVIT STATING COMPLIANCE WITH ALL APPLICABLE AISC, SJI AND AISI REQUIREMENTS.
3. STEEL JOIST SUPPLIER MUST BE A MEMBER OF SJI.
4. ALL STEEL JOISTS SHALL BE BRACED IN ACCORDANCE WITH SJI. JOIST BRIDGING SHALL BE FURNISHED BY THE JOIST MANUFACTURER.
5. JOIST LAYOUTS SHOWN ON PLANS ARE CONCEPTUAL, WITH MAXIMUM SPACING AS INDICATED, ACTUAL JOIST LAYOUT SHALL BE PER APPROVED SHOP DRAWINGS.
6. UNLESS NOTED OTHERWISE ALL STEEL JOISTS SHALL BE HOT DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A123.
7. UNLESS OTHERWISE NOTED, ALL M.E.P. FIXTURES SUPPORTED BELOW JOISTS SHALL BE SUPPORTED BY A MINIMUM OF TWO JOISTS.

WELDING NOTES:

1. ALL WELDING SHALL BE CONDUCTED BY CERTIFIED WELDERS IN ACCORDANCE WITH AWS D1.1, LATEST EDITION FOR STRUCTURAL STEEL AND AWS D1.3, LATEST EDITION FOR STRUCTURAL SHEET STEEL.
2. THE CONTRACTOR SHALL BEAR FULL RESPONSIBILITY FOR PROTECTING EXISTING EQUIPMENT, MATERIALS, BUILDING STRUCTURES, AND BUILDING COMPONENTS DURING ANY FIELD WELDING OPERATIONS.
3. WELDS OF HEADED STUDS SHALL MATCH STRENGTH OF STUDS.

GEOTECHNICAL NOTES:

1. THE FOLLOWING BEARING PRESSURE VALUES WERE RECOMMENDED PER THE GEOTECHNICAL REPORT PREPARED BY TECTONIC ENGINEERING CONSULTANTS, GEOLOGISTS & LAND SURVEYORS, D.P.C. DATED JANUARY 15, 2020:
   - MAX NET ALLOWABLE BEARING OF UNDISTURBED NATIVE SOIL: 4000PSF
   - MAX NET ALLOWABLE BEARING OF SHALE OR SANDSTONE BEDROCK: 8000PSF
2. BOTTOM OF EXCAVATION IS DEFINED AS THE ELEVATION BENEATH THE SUBBASE. SUBBASE PREPARATION SHALL BE AS FOLLOWS:
   - BENEATH SLABS-ON-GRADE: 6" COMPACTED LIFT OF CLEAN STONE
   - BENEATH FOUNDATIONS/MAT SLABS: 6" COMPACTED LIFT OF CRUSHED STONE
3. IF UNSUITABLE MATERIAL IS ENCOUNTERED AT OR UNDER THE PROPOSED BOTTOM OF EXCAVATION, THE UNSUITABLE MATERIAL SHALL BE REMOVED FROM WITHIN THE ZONE OF INFLUENCE OF THE BEARING ELEMENT AND REPLACED IN ACCORDANCE WITH NOTE 4.
4. ZONE OF INFLUENCE IS DEFINED AS A 1V:1H PLANE EXTENDING DOWNWARD FROM THE BOTTOM PERIMETER OF THE FOUNDATION ELEMENT TO WITHIN A SUITABLE DISTANCE BELOW, TO BE DETERMINED BY THE ENGINEER OF RECORD (E.O.R.) BASED ON FIELD CONDITIONS AND MATERIAL TYPE.
5. OVER EXCAVATION IS DEFINED AS ANY EXCAVATION BELOW THE PROPOSED BOTTOM OF EXCAVATION IDENTIFIED ON THE PLANS OR AS DESCRIBED WITHIN THE PROJECT SPECIFICATIONS; OVER EXCAVATION SHALL BE RE-ESTABLISHED AS FOLLOWS:
   - BENEATH FOUNDATIONS AND SLABS-ON-GRADE: COMPACTED SELECT FILL
   - BENEATH TANKS: CONTROLLED DENSITY FILL
6. SELECT FILL SHALL BE UTILIZED FOR BACKFILL OF ALL STRUCTURES (UNLESS OTHERWISE NOTED).
7. THE MINIMUM SELECT FILL PROPERTIES LISTED BELOW WERE RECOMMENDED PER THE GEOTECHNICAL REPORT PREPARED BY TECTONIC ENGINEERING CONSULTANTS, GEOLOGISTS & LAND SURVEYORS, D.P.C. DATED JANUARY 15, 2020:
   - UNIT WEIGHT = 130 PSF
   - FRICTION ANGLE = 35°
   - Ka = 0.27
   - Ko = 0.43
   - Kp = 3.69
8. THE CONTRACTOR SHALL SUBMIT DESIRED BACKFILL MATERIAL SPECIFICATION MEETING ALL DESIGN CRITERIA LISTED ABOVE, AT A MINIMUM, TO THE ENGINEER OF RECORD PRIOR TO USE ON SITE. ALTERNATIVELY, THE CONTRACTOR SHALL ELECT TO PERFORM A FIELD PROCTOR OF THE EXISTING SITE SOILS TO VERIFY THAT EXISTING SOILS MEET THE MINIMUM DESIGN VALUES STATED ABOVE.
9. IN-SITU COMPACTION TESTING OF SUBGRADE AND BACKFILL MATERIAL SHALL BE PERFORMED BY THE OWNER'S SPECIAL INSPECTOR.
10. FOR ADDITIONAL GEOTECHNICAL INFORMATION, SEE THE SITE SPECIFIC GEOTECHNICAL REPORT PREPARED BY TECTONIC PROVIDED IN THE CONTRACT.

TRUSS NOTES:

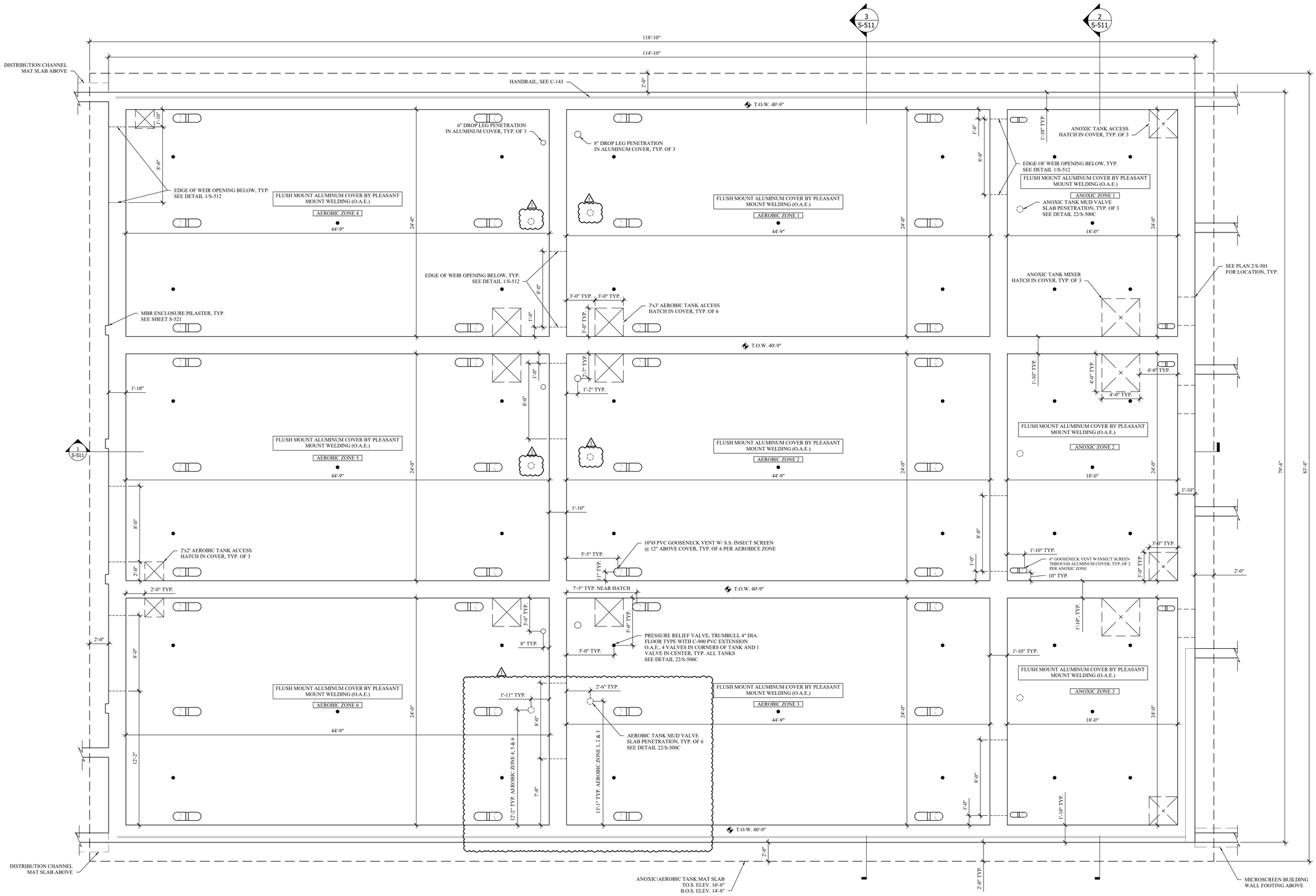
1. ALL TRUSSES SHALL BE DESIGNED AND SEALED BY A REGISTERED PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW YORK. ROOF TRUSSES SHALL BE DESIGNED FOR THE FOLLOWING LOADS:

   GROUND SNOW LOAD = 30 PSF
   FLAT ROOF SNOW LOAD = 22 PSF
   UNBALANCED SNOW LOAD SHALL BE PER ASCE-7, LATEST EDITION
   DEAD LOAD TOP CHORD = 10 PSF
   LIVE LOAD BOTTOM CHORD = 10 PSF
   DEAD LOAD BOTTOM CHORD = 10 PSF
   UPLIFT FROM WIND = 26 PSF
   CARBON STEEL PIPE LOAD = 60PLF

2. LOADS DO NOT INCLUDE TRUSS SELF WEIGHT. LOADS DO NOT INCLUDE NON-UNIFORM OR UNBALANCED SNOW LOADS. CARBON STEEL PIPE LOADS WILL BE MODELED AS POINT LOADS SUPPORTED BY THE TRUSS VIA HANGERS. EACH HANGER SHALL BE SUPPORTED BY A MINIMUM OF 3 TRUSSES. TRUSSES SHALL BE DESIGNED UTILIZING THE REQUIREMENTS OF ASCE-7; LATEST ADDITION FOR UNBALANCED SNOW LOADS.
3. EACH TRUSS SHALL BE RESTRAINED AGAINST UPLIFT UTILIZING AN APPROVED CLIP WITH A MINIMUM CAPACITY OF 500 LBS.
4. UNLESS NOTED OTHERWISE ALL TRUSSES AND THEIR CONNECTIONS SHALL BE GALVANIZED AND SHALL COMPLY WITH THE REQUIREMENTS OF AISI SPECIFICATION FOR THE DESIGN OF COLD FORM STEEL STRUCTURAL MEMBERS, LATEST EDITION.
5. TRUSS LAYOUTS SHOWN ON PLANS ARE CONCEPTUAL, WITH MAXIMUM SPACING AS INDICATED, ACTUAL TRUSS LAYOUT SHALL BE PER APPROVED SHOP DRAWINGS.

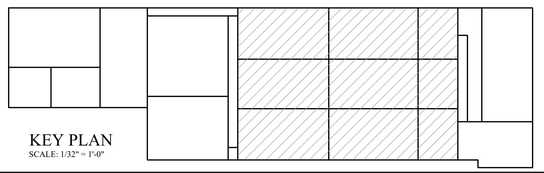
AISI COLD FORMED FRAMING NOTES:

1. METAL STUD SIZES SHOWN ON PLANS AND DETAILS ARE BASED ON CLARKDIETRICH GALVANIZED STEEL STUDS. ALL FRAMING MATERIALS AND CONNECTIONS SHALL BE EQUIVALENT TO THOSE MANUFACTURED BY CLARKDIETRICH. ALL STUDS AND THEIR CONNECTIONS SHALL BE GALVANIZED AND SHALL COMPLY WITH THE REQUIREMENTS OF AISI SPECIFICATION FOR THE DESIGN OF COLD FORM STEEL STRUCTURAL MEMBERS, LATEST EDITION.
2. METAL PURLIN AND GIRT SIZES SHOWN ON PLANS AND DETAILS ARE BASED ON FLEXOSPAN GALVANIZED STEEL FRAMING. ALL FRAMING MATERIALS AND CONNECTIONS SHALL BE EQUIVALENT TO THOSE MANUFACTURED BY FLEXOSPAN. ALL ROOF FRAMING MEMBERS AND THEIR CONNECTIONS SHALL BE GALVANIZED OR PAINTED AND SHALL COMPLY WITH THE REQUIREMENTS OF AISI SPECIFICATION FOR THE DESIGN OF COLD FORM STEEL STRUCTURAL MEMBERS, LATEST EDITION.
3. ALL METAL STUDS SHALL HAVE A MINIMUM YIELD STRENGTH OF 50 KSI. METAL PURLINS SHALL HAVE A MINIMUM YIELD STRENGTH OF 55 KSI.
4. STEEL STUDS: MANUFACTURER'S STANDARD C-SHAPED STEEL STUDS, OF WEB DEPTHS INDICATED, PUNCHED, WITH STIFFENED FLANGES, AND AS FOLLOWS:
   - MINIMUM BASE-MTAL THICKNESS: 16 GA. (54 MILS)
   - MINIMUM FLANGE WIDTH: 1-5/8 INCHES
5. INSTALL CONTINUOUS U-SHAPED STEEL TRACKS SIZED TO MATCH STUDS. ALIGN TRACKS ACCURATELY AND SECURELY ANCHOR TO SUPPORTING STRUCTURE AT EACH STUD LOCATION. TRACKS SHALL BE UNPUNCHED WITH STRAIGHT FLANGES AND MATCH MINIMUM BASE METAL THICKNESS OF STUDS.
6. FASTEN BOTH FLANGES OF STUDS TO BOTTOM TRACK UNLESS OTHERWISE INDICATED. SPACE STUDS AS FOLLOWS:
   - STUD SPACING: 24" O.C. MAX
7. SET STUDS PLUMB, EXCEPT AS NEEDED FOR DIAGONAL BRACING OR REQUIRED FOR NON-PLUMB WALLS O



1 S-510 SLAB, WALL AND COVER PLAN

SCALE: 1/4" = 1'-0"



KEY PLAN

SCALE: 1/32" = 1'-0"

MHE ENGINEERING

33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100

111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID SET

HAZARDOUS MATERIAL NOTE:

THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

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145 CAESARS LN.
NEW WINDSOR, NY 12553

FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ANOXIC AND AEROBIC TANK PLAN

REVISIONS

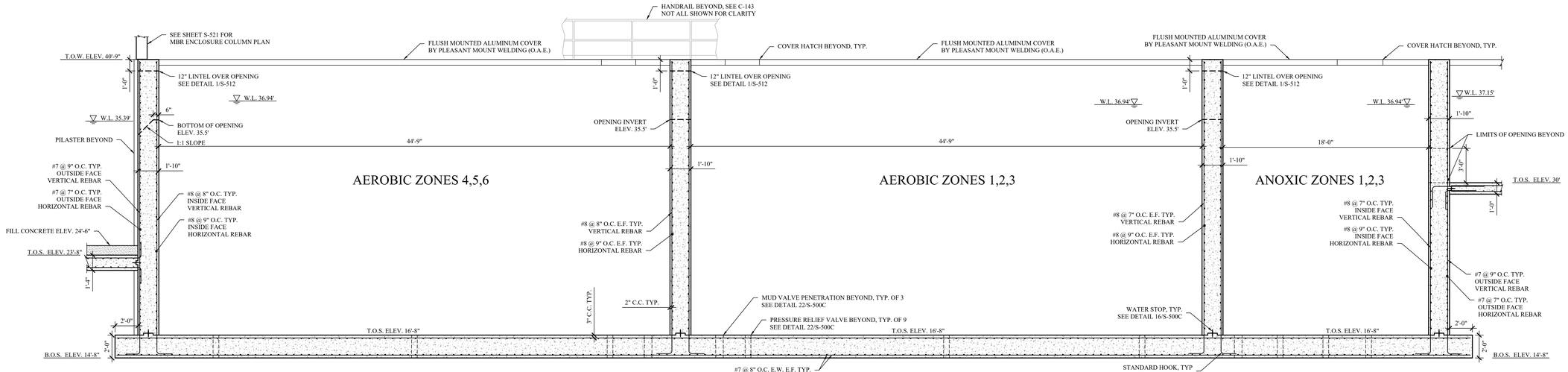
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	WPG, NEM, PJW
DRAWN BY:	WPG, NEM, PJW
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REVIEWED BY:	JSS

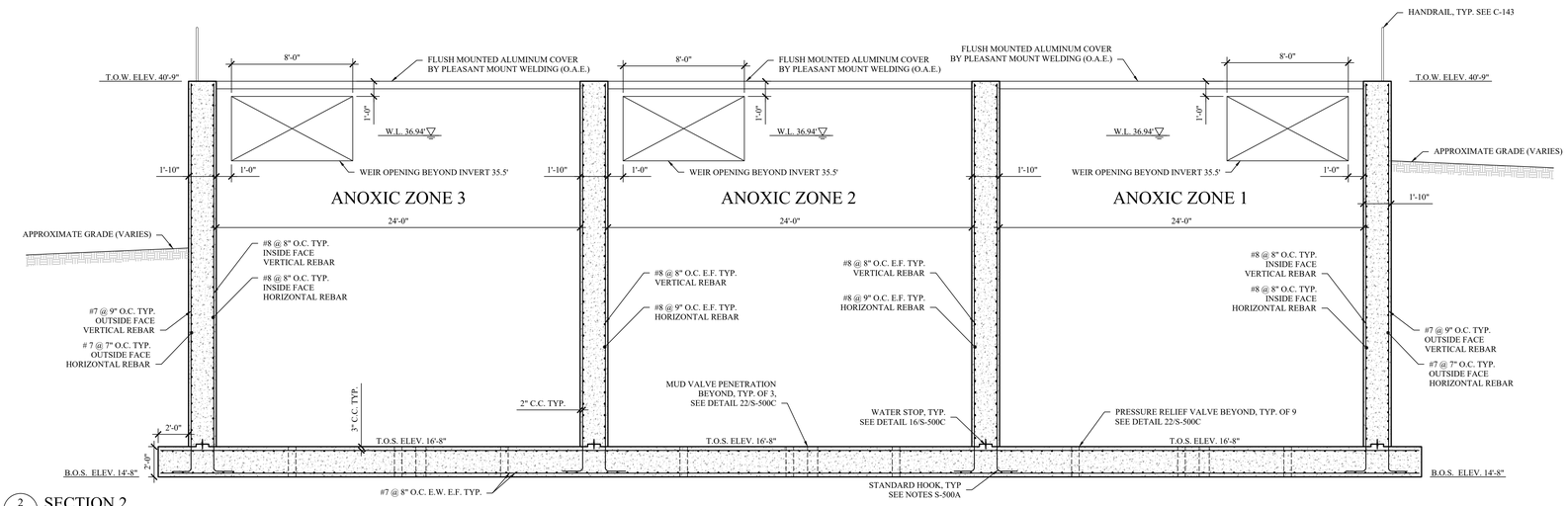
SHEET NO.

S-510

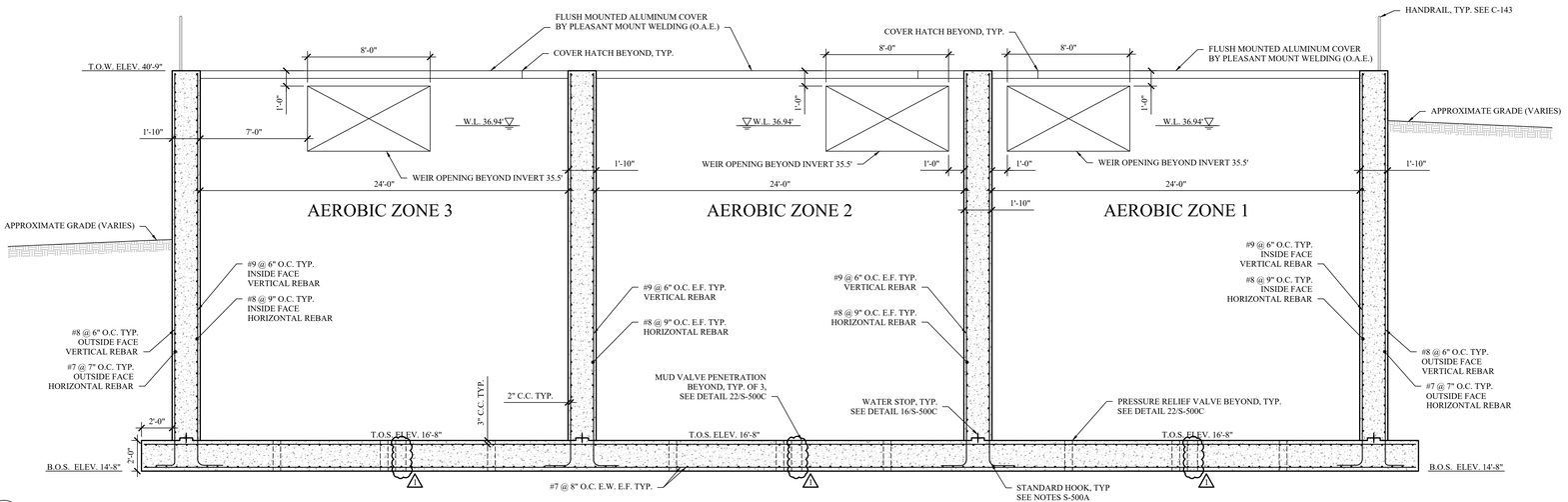
PROJECT # 18-732 PHASE #



1 S-511 SECTION 1
SCALE: 1/4" = 1'-0"



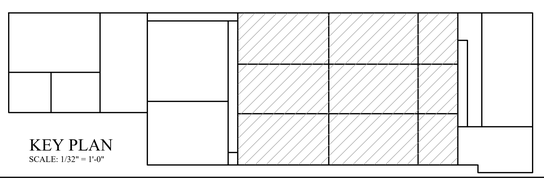
2 S-511 SECTION 2
SCALE: 1/4" = 1'-0"



3 S-511 SECTION 3 (AEROBIC ZONES 4,5,6 SIMILAR TO ABOVE, WEIR OPENINGS VARY SEE SHEET S-510 FOR LOCATIONS)
SCALE: 1/4" = 1'-0"

SUBBASE AND BACKFILL NOTES:

1. SUBBASE PREPARATION SHALL BE AS FOLLOWS:
   - BENEATH SLABS-ON-GRADE: 6" COMPACTED LIFT OF CLEAN STONE
   - BENEATH FOUNDATIONS/MAT SLABS: 6" COMPACTED LIFT OF CRUSHED STONE
2. BACKFILL ALL STRUCTURES WITH SOIL THAT MEETS MINIMUM PROPERTIES IDENTIFIED IN THE GEOTECHNICAL NOTES AND PROJECT GEOTECHNICAL REPORT.



KEY PLAN
SCALE: 1/32" = 1'-0"

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID SET

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FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ANOXIC AND AEROBIC TANK SECTIONS

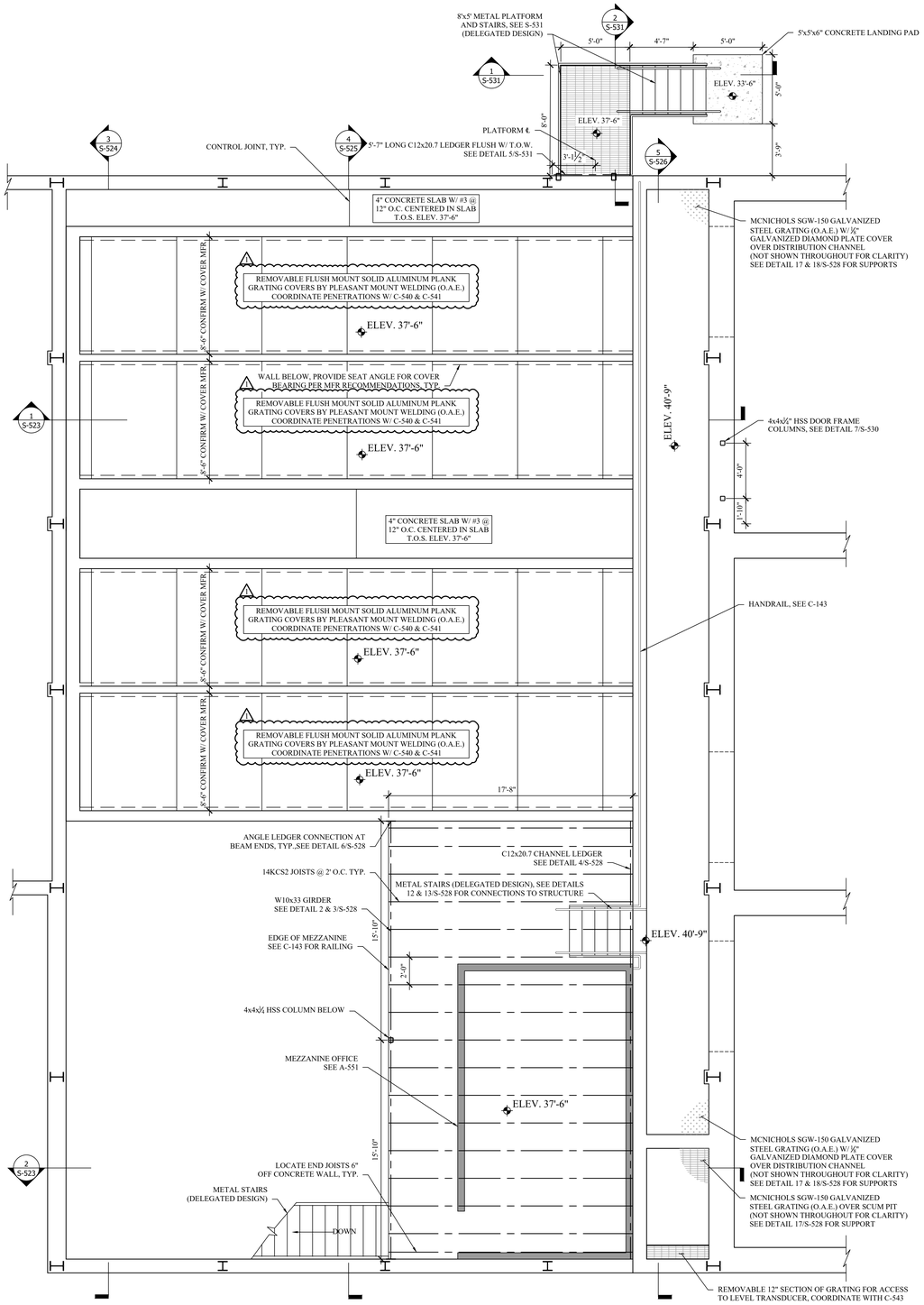
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NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
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REVIEWED BY:	JSS

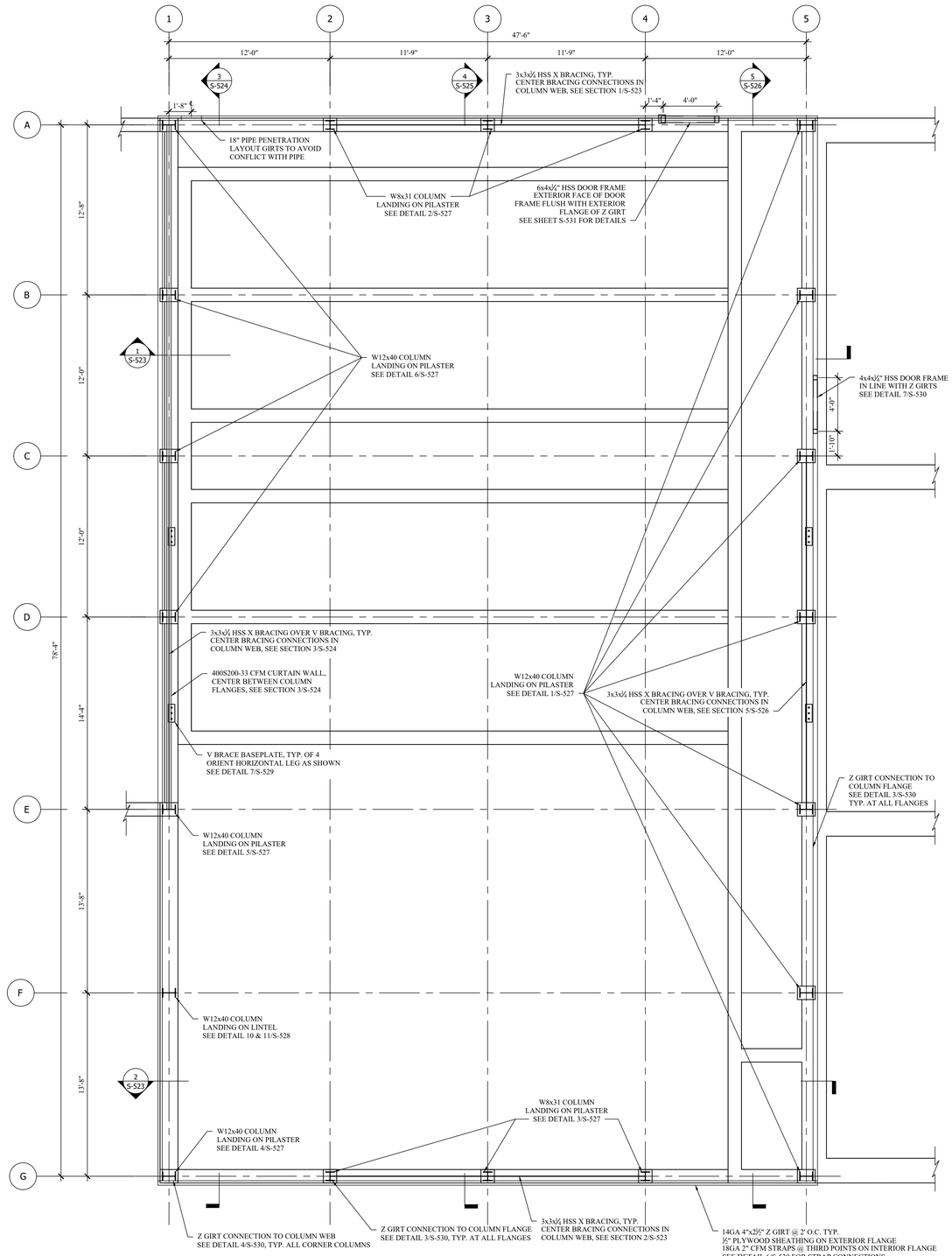
SHEET NO.
S-511

PROJECT # 18-732 PHASE #

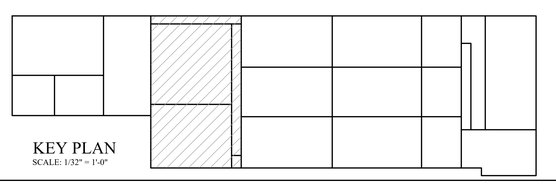


3 S-521 MBR BASIN GRATING, COVERS AND MEZZANINE FRAMING PLAN
SCALE: 1/4" = 1'-0"

NOTE: ALL M.E.P. FIXTURES SUPPORTED BY JOISTS SHALL BE SUPPORTED BY A MINIMUM OF TWO JOISTS



4 S-521 MBR ENCLOSURE COLUMN, BRACING AND WALL FRAMING PLAN
SCALE: 1/4" = 1'-0"



KEY PLAN
SCALE: 1/32" = 1'-0"

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

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NEW WINDSOR, NY 12553

MBR BASIN AND ENCLOSURE PLANS

REVISIONS

NO.	DESCRIPTION	DATE
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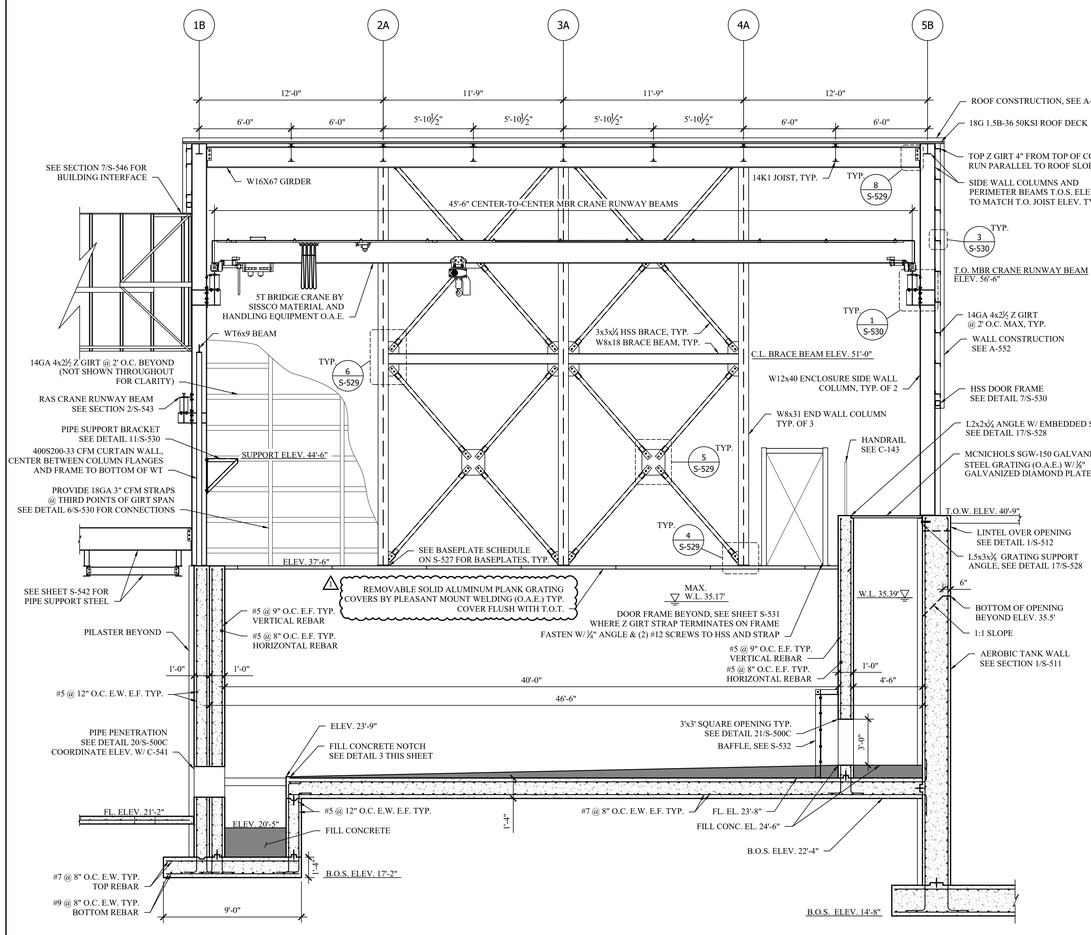
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REVIEWED BY:	JSS

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S-521

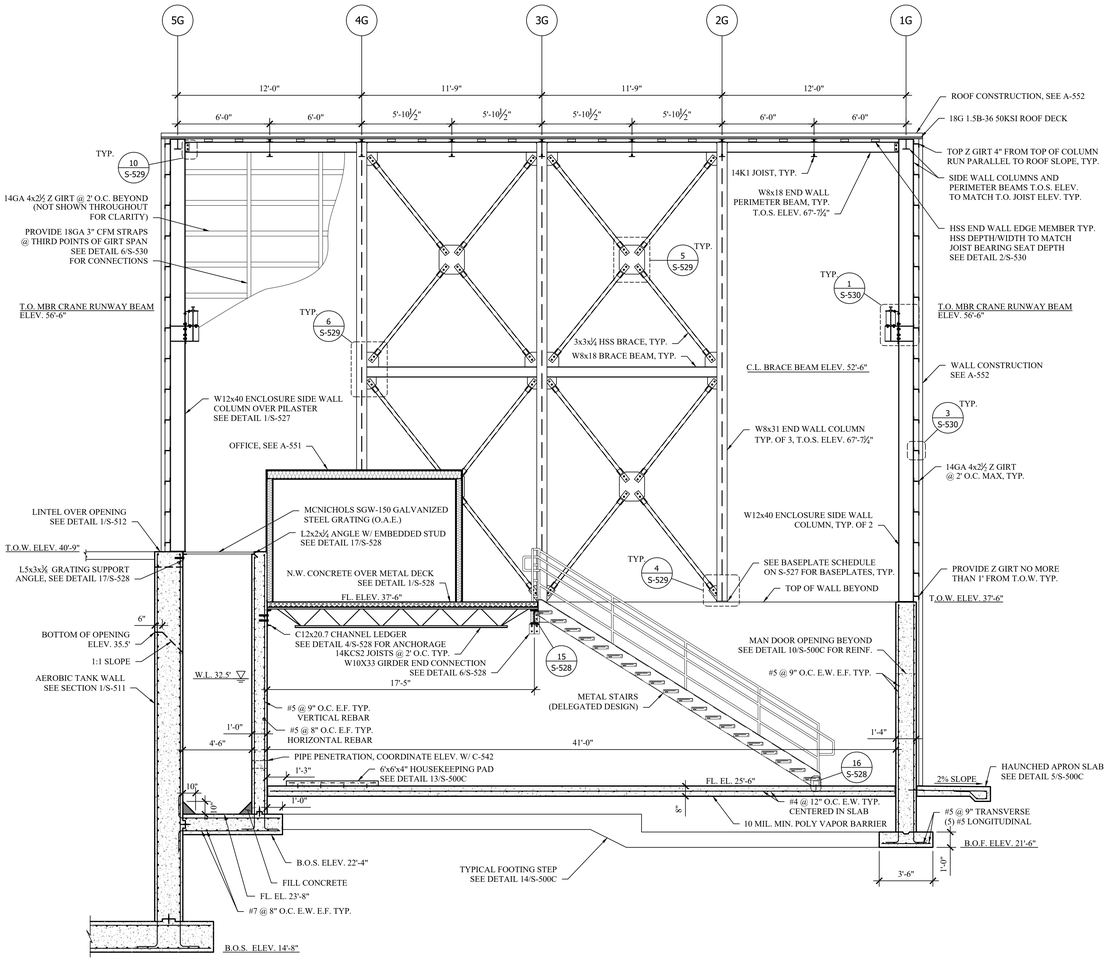
PROJECT # 18-732 PHASE #

SUBBASE AND BACKFILL NOTES:

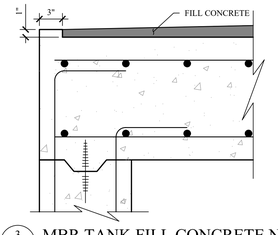
1. SUBBASE PREPARATION SHALL BE AS FOLLOWS:
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   - BENEATH FOUNDATIONS/MAT SLABS: 6" COMPACTED LIFT OF CRUSHED STONE
2. BACKFILL ALL STRUCTURES WITH SOIL THAT MEETS MINIMUM PROPERTIES IDENTIFIED IN THE GEOTECHNICAL NOTES AND PROJECT GEOTECHNICAL REPORT.



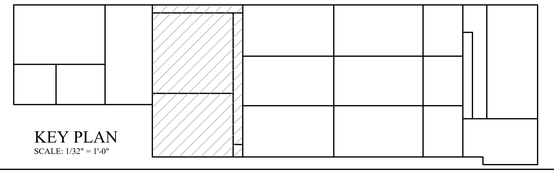
1 S-523 SECTION 1
SCALE: 1/4" = 1'-0"



2 S-523 SECTION 2
SCALE: 1/4" = 1'-0"



3 S-523 MBR TANK FILL CONCRETE NOTCH
SCALE: 3" = 1'-0"



KEY PLAN
SCALE: 1/32" = 1'-0"

MHE ENGINEERING
33 Airport Center Drive, Suite 202
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(845) 567-3100
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Milford, PA 18337
(570) 296-2765

BID SET

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NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

MBR BASIN AND ENCLOSURE SECTIONS

REVISIONS

NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

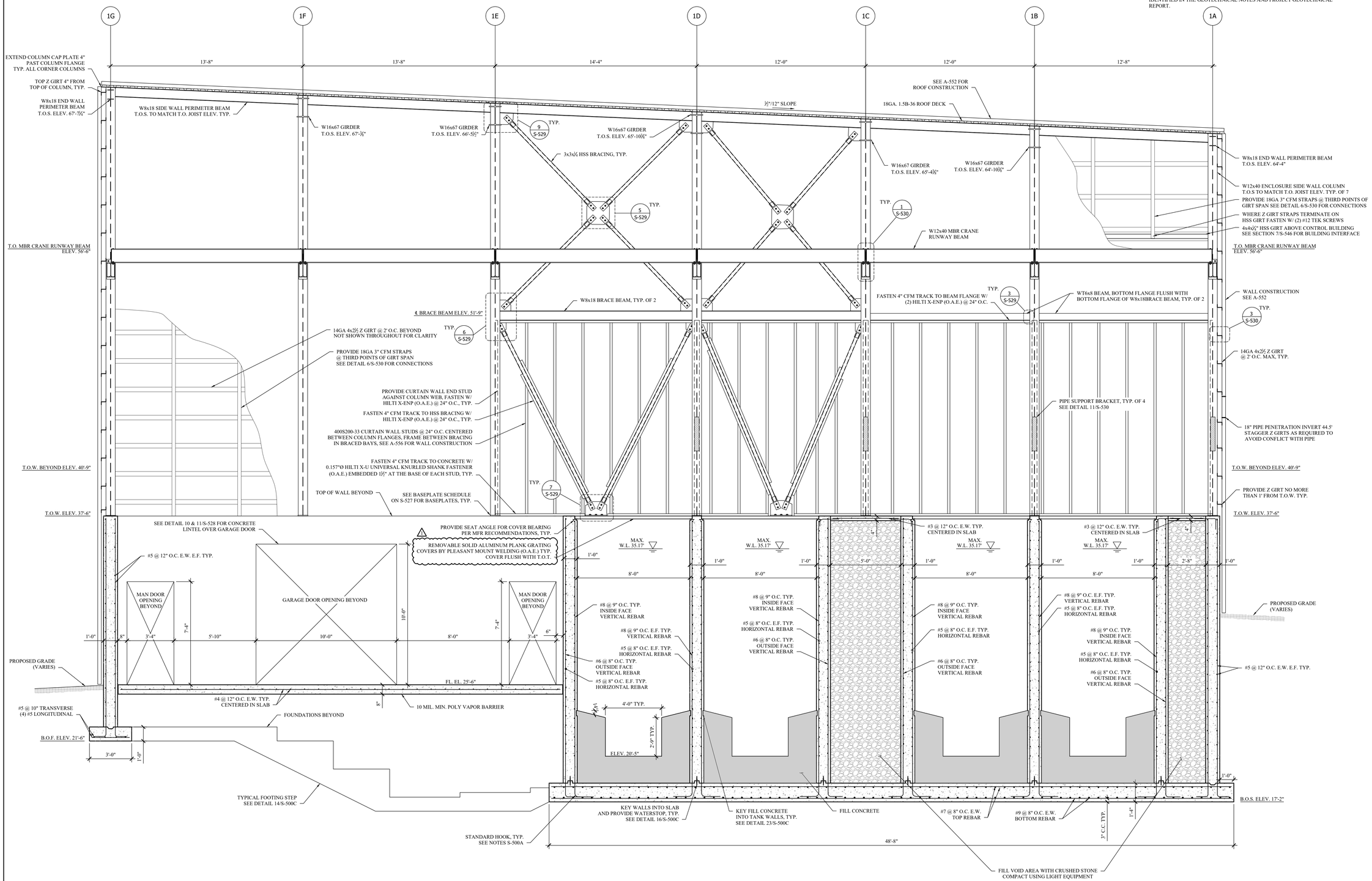
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REVIEWED BY:	JSS

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S-523

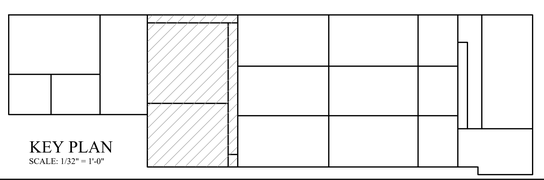
PROJECT # 18-732 PHASE #

SUBBASE AND BACKFILL NOTES:

1. SUBBASE PREPARATION SHALL BE AS FOLLOWS:
   - BENEATH SLABS-ON-GRADE: 6" COMPACTED LIFT OF CLEAN STONE
   - BENEATH FOUNDATIONS/MAT SLABS: 6" COMPACTED LIFT OF CRUSHED STONE
2. BACKFILL ALL STRUCTURES WITH SOIL THAT MEETS MINIMUM PROPERTIES IDENTIFIED IN THE GEOTECHNICAL NOTES AND PROJECT GEOTECHNICAL REPORT.



3 / S-524 SECTION 3
SCALE: 3/8" = 1'-0"



KEY PLAN
SCALE: 1/32" = 1'-0"

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID SET

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NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

MBR BASIN AND ENCLOSURE SECTIONS CONTINUED

REVISIONS

NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

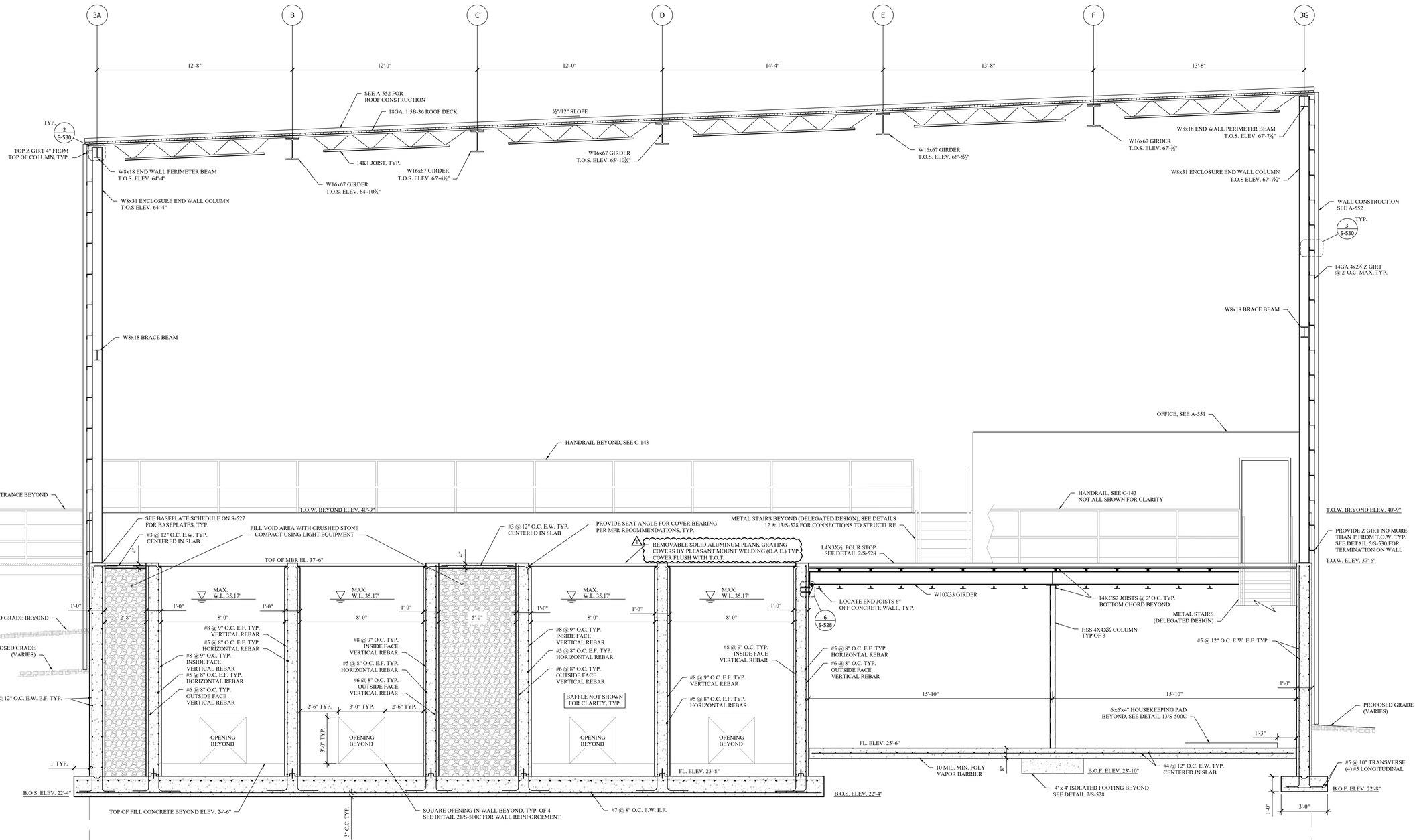
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DESIGN BY:	WPG, NEM, PJW
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REVIEWED BY:	JSS

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S-524

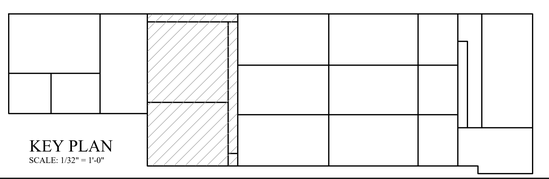
PROJECT # 18-732 PHASE #

SUBBASE AND BACKFILL NOTES:

1. SUBBASE PREPARATION SHALL BE AS FOLLOWS:
   - BENEATH SLABS-ON-GRADE: 6" COMPACTED LIFT OF CLEAN STONE
   - BENEATH FOUNDATIONS/MAT SLABS: 6" COMPACTED LIFT OF CRUSHED STONE
2. BACKFILL ALL STRUCTURES WITH SOIL THAT MEETS MINIMUM PROPERTIES IDENTIFIED IN THE GEOTECHNICAL NOTES AND PROJECT GEOTECHNICAL REPORT.



4 S-525 SECTION 4
SCALE: 3/8" = 1'-0"



KEY PLAN
SCALE: 1/32" = 1'-0"

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID SET

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NEW WINDSOR, NY 12553

MBR BASIN AND ENCLOSURE SECTIONS CONTINUED

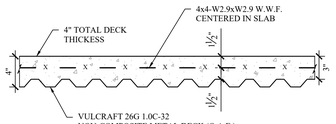
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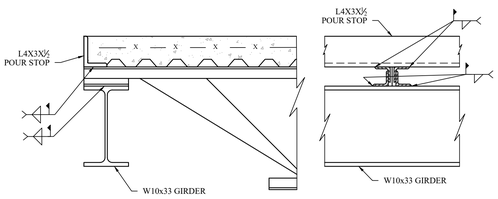
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CHECKED BY:	PJW
REVIEWED BY:	JSS

SHEET NO.
S-525

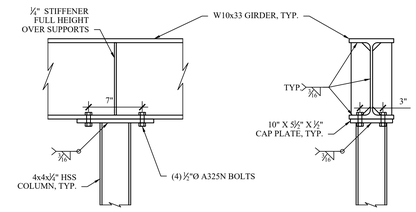
PROJECT # 18-732 PHASE #



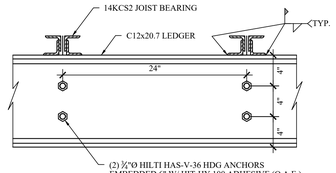
1 S-528 MEZZANINE SLAB REINFORCEMENT
SCALE: 1-1/2" = 1'-0"



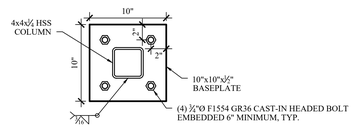
2 S-528 MEZZANINE POUR STOP AND GIRDER TO JOIST CONNECTION
SCALE: 1-1/2" = 1'-0"



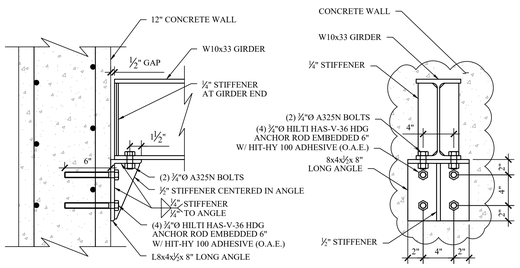
3 S-528 MEZZANINE GIRDER TO COLUMN CONNECTION
SCALE: 1-1/2" = 1'-0"



4 S-528 MEZZANINE CHANNEL LEDGER CONNECTIONS
SCALE: 1-1/2" = 1'-0"

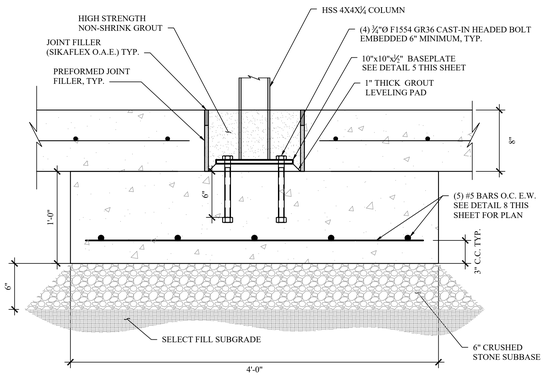


5 S-528 MEZZANINE COLUMN BASEPLATE
SCALE: 1-1/2" = 1'-0"

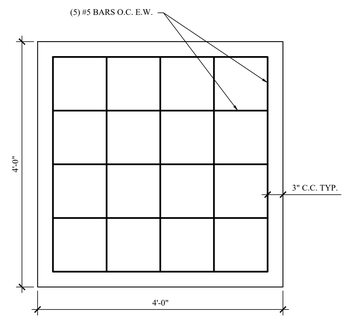


NOTE: METAL DECK, POUR STOP AND SUSPENDED SLAB NOT SHOWN FOR CLARITY

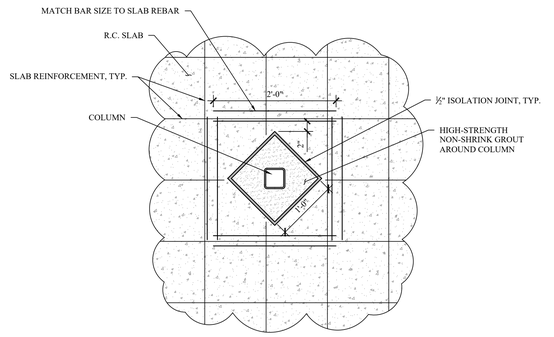
6 S-528 MEZZANINE GIRDER END CONNECTION
SCALE: 1-1/2" = 1'-0"



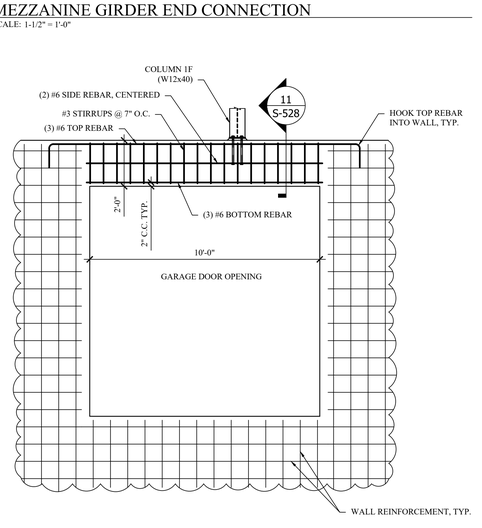
7 S-528 MEZZANINE CENTER COLUMN AND 4'x4' ISOLATED FOOTING
SCALE: 1-1/2" = 1'-0"



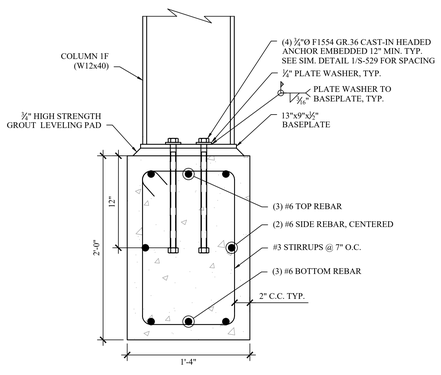
8 S-528 4'x4' ISOLATED FOOTING REINF. PLAN
SCALE: 1" = 1'-0"



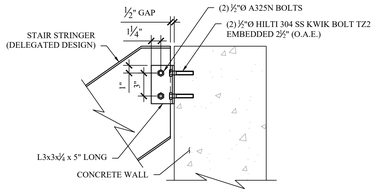
9 S-528 SLAB REINFORCEMENT AROUND COLUMN PENETRATION
SCALE: 1" = 1'-0"



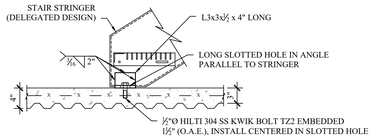
10 S-528 CONCRETE LINTEL OVER GARAGE DOOR
SCALE: 3/8" = 1'-0"



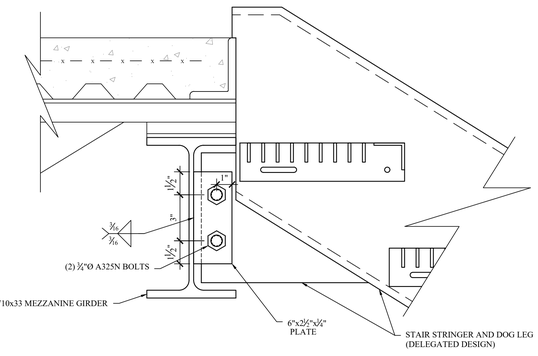
11 S-528 CONCRETE LINTEL OVER GARAGE DOOR
SCALE: 1-1/2" = 1'-0"



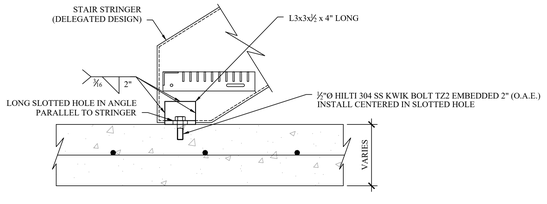
12 S-528 STAIR TO CONCRETE WALL CONN.
SCALE: 1-1/2" = 1'-0"



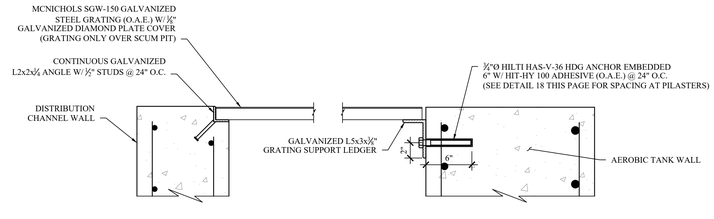
13 S-528 STAIR TO SUSPENDED SLAB CONN.
SCALE: 1-1/2" = 1'-0"



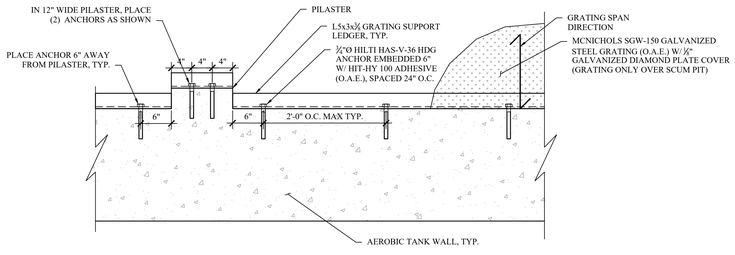
15 S-528 STAIR TO MEZZANINE GIRDER CONNECTION
SCALE: 3" = 1'-0"



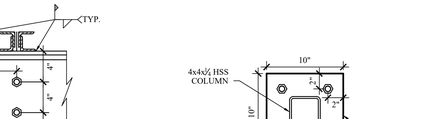
16 S-528 TYPICAL METAL STAIR CONNECTION TO SLAB-ON-GRADE
SCALE: 1-1/2" = 1'-0"



17 S-528 DISTRIBUTION CHANNEL/SCUM PIT GRATING SUPPORTS
SCALE: 1-1/2" = 1'-0"



18 S-528 GRATING SUPPORT ANGLE LEDGER ALONG AEROBIC TANK WALL DETAILS
SCALE: 1" = 1'-0"



14 S-528 MBR TANK REINFORCEMENT AT COVER BEARING
SCALE: 1-1/2" = 1'-0"

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID SET

HAZARDOUS MATERIAL NOTE:
THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE CALL 811

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

MBR BASIN AND ENCLOSURE DETAILS

REVISIONS

NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	WPG, NEM, PJW
DRAWN BY:	WPG, NEM, PJW
CHECKED BY:	PJW
REVIEWED BY:	JSS

SHEET NO.
S-528

PROJECT # 18-732 PHASE #

BOILER SCHEDULE

UNIT TAG	LOCATION	SYSTEM FLUID	NATURAL GAS		OUTPUT MBH	BOILER HP	% EFF	RELIEF VALVE (PSI)	ELECTRICAL		FLUE OUTLET CONNECTION	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
			INPUT (MBH)	RATE (CFH)					VOLTS/ PH	MOP (AMPS)				
B-700	MECHANICAL	WATER	399	399	383	N/A	95	12	120/1	20	4"	WEIL-MCLAIN	EVG-399	1 2
B-701	MECHANICAL	WATER	399	399	383	N/A	95	12	120/1	20	4"	WEIL-MCLAIN	EVG-399	1 2

1. PROVIDE WITH CONCENTRIC VENT AND CONDENSATE NEUTRALIZER KIT.
2. PROVIDE WITH BOILER CONTROLS/PUMP CONTROLLERS AS NECESSARY FOR OPERATION OF CIRCULATING PUMPS.

PUMP SCHEDULE

UNIT TAG	LOCATION	SERVICE	SYSTEM FLUID	GPM	HEAD FT. WG.	RPM	ELECTRICAL			BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
							HP	VOLTS	PHASE			
P-700	MECHANICAL	HWS&R LOOP	WATER	56	40	1578	2	460	3	BELL&GOSSETT	E-90	1 2
P-701	MECHANICAL	HWS&R LOOP	WATER	56	40	1579	2	460	3	BELL&GOSSETT	E-90	1 2
BP-700	MECHANICAL	B-700	WATER	29	25	1725	1/2	460	3	TACO	0013	3
BP-701	MECHANICAL	B-701	WATER	29	25	1725	1/2	460	3	TACO	0013	3

1. PROVIDE W/ VFD.
2. PUMPS TO OPERATE AS DUTY/STANDBY.
3. BOILER PUMPS TO BE PROVIDED BY BOILER MANUFACTURER.

EXPANSION TANK SCHEDULE

UNIT TAG	SERVICE	TYPE	ACCEPTANCE VOLUME (GAL)	TANK VOLUME (GAL)	DIAMETER (IN)	LENGTH (IN)	FILL PRESSURE (PSI)	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
EXT-700	BOILER SYSTEM	DIAPHRAGM	6.3	7.8	12	19	12	BELL & GOSSETT	D-15	

AIR SEPARATOR SCHEDULE

UNIT TAG	LOCATION	SERVICE	TYPE	GPM	WPD FT-H_2O	CONN. SIZE (IN)	VELOCITY FPM	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
AS-700	MECHANICAL	BOILER SYSTEM	TANGENTIAL	56	0.2	3	144	BELL&GOSSETT	ROLAIRTROL RL-3F	

STATIONARY ROOF VENTILATOR SCHEDULE

UNIT TAG	LOCATION	SERVICE	CFM	THROAT DIMENSIONS	FREE AREA (SQ. FT.)	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
SRV-300	SLUDGE PIT	SLUDGE PIT	250	8X8	0.44	GREENHECK	FGI	1
SRV-400	ATAD BUILDING	EQUIPMENT ROOM	3000	30X30	6.25	GREENHECK	FGI	1
SRV-500	MBR BUILDING	INFLUENT DRY WELL	675	14X14	1.36	GREENHECK	FGI	1

1. PROVIDE WITH 14" HIGH INSULATED ALUMINUM ROOF CURB AND 120V AAD (NEMA 4X ACTUATOR/ENCLOSURE).

AIR INLET AND OUTLET SCHEDULE

TYPE	DESCRIPTION	SERVICE	FACE SIZE (NECK SIZE)	MOUNTING TYPE	BASIS OF DESIGN MANUFACTURER AND MODEL	REMARKS
S1	DIFFUSER	SUPPLY	24X24	LAY-IN	PRICE SCD	1
S2	GRILLE	SUPPLY	SEE PLANS	TO DUCT	PRICE 720 SERIES	1
R1	GRILLE	RETURN	24X24/12X12	LAY-IN	PRICE 80 SERIES	1
E1	GRILLE	EXHAUST	SEE PLANS	TO DUCT	PRICE 730 SERIES	1

1. PROVIDE WITH BALANCING DAMPER

DUCTLESS SPLIT SYSTEM SCHEDULE

INDOOR UNIT												OUTDOOR UNIT									
UNIT TAG	LOCATION	ARRANGEMENT	INSTALLATION HEIGHT AFF (APPROX)	TOTAL COOLING (BTUH)	MIN SEER	HEATING CAPACITY (BTUH)	SUPPLY CFM HIGH/LOW	ELECTRICAL			REMARKS	UNIT TAG	LOCATION	INSTALLATION HEIGHT AFG (APPROX)	SERVICE	ELECTRICAL			BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER INDOOR UNIT	BASIS OF DESIGN MODEL NUMBER OUTDOOR UNIT	REMARKS
								VOLTS	PHASE	MOP						VOLTS	PHASE	MOP				
HWU-400	ATAD BUILDING	HIGH WALL MOUNT	7'-0"	33,000	18.5	35,200	883/601	208	1	30	1	DSCU-400	ROOF	-	HWU-400	208	1	30	LG	LSN36HLV3	LSU36HLV3	1 3
HWU-500	MBR BUILDING	HIGH WALL MOUNT	7'-0"	12,000	22.7	13,600	282/177	208	1	20	1	DSCU-500	EXTERIOR WALL	8'-0"	HWU-500	208	1	20	LG	LSN120HSVR	LSU120HSV5	1 2
HWU-700	DEWATERING BUILDING	HIGH WALL MOUNT	7'-0"	12,000	22.7	13,600	282/177	208	1	20	1	DSCU-700	ROOF	-	HWU-700	208	1	20	LG	LSN120HSVR	LSU120HSV5	1 2
HWU-701	DEWATERING BUILDING	HIGH WALL MOUNT	7'-0"	12,000	22.7	13,600	282/177	208	1	20	1	DSCU-701	ROOF	-	HWU-700	208	1	20	LG	LSN120HSVR	LSU120HSV5	1 2
F-700 CC	DEWATERING BUILDING	CASED COIL	-	60,000	13	-	1575	-	-	-	1	DSCU-702	ROOF	-	F-700 CC	208	1	50	COMFORTAIRE	-	RSG1360S1M	1 3

1. PROVIDE WITH LOW AMBIENT WIND BAFFLE KIT, REMOTE CONTROLLER, BASE PAN HEATER, AND HIGH LIFT CONDENSATE PUMP.
2. MOUNT EXTERIOR DUCTLESS SPLIT CONDENSING UNIT ON WALL MOUNT BRACKET/STAND PER MANUFACTURER RECOMMENDATIONS.
3. MOUNT EXTERIOR DUCTLESS SPLIT CONDENSING UNIT ON ROOF MOUNT QUICKSLING (NON-PENETRATING) STAND AND INSTALL PER MANUFACTURER RECOMMENDATIONS.

FURNACE SCHEDULE

UNIT TAG	LOCATION	SERVICE	SA CFM	OA CFM (MIN)	ESP (IN WG)	ELECTRICAL				DX COOLING COIL	GAS HEATING				SEER	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
						MOP	VOLTS	PHASE	FLA	NOMINAL TONNAGE	INPUT MBH	OUTPUT MBH	RISE (°F)	AFUE				
F-700	DEWATERING BUILDING	OFFICE/LOCKER AREA	1575	175	0.8	20	120	1	12.8	5	110	106	80	97	14	COMFORT-AIRE	GUH97M	1

1. PROVIDE WITH LP CONVERSION KIT, LOW VOLTAGE HONEYWELL PRESTIGE 2.0 THERMOSTAT, AND CONCENTRIC VENT KIT.

EXHAUST FAN SCHEDULE

UNIT TAG	LOCATION	SERVICE	ARRANGEMENT	DRIVE	CFM	SP (IN WG)	FAN RPM	MAX SONES	WALL / ROOF OPENING SIZE (MAX)	BOTTOM OF FAN HEIGHT AFF (APPROX)	ELECTRICAL			BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
											HP (W)	VOLTS	PHASE			
EF-200	HEADWORKS BUILDING	BAR SCREEN ROOM	IN-LINE	BELT	2650	0.3	1235	-	-	8'-4"	1/2	120	1	GREENHECK	QEI-15	1
EF-201	HEADWORKS BUILDING	ELECTRICAL ROOM	IN-LINE	DIRECT	500	0.3	1522	-	-	9'-4"	1/10	120	1	GREENHECK	SQ-90-VG	2 5
EF-300	SLUDGE PIT	SLUDGE PIT	ROOF MOUNT	DIRECT	250	0.3	1569	5	13.5"X13.5"	-	1/15	120	1	GREENHECK	G-070-VG	7
EF-301	SLUDGE VALVE PIT	SLUDGE VALVE PIT	IN-LINE	DIRECT	400	0.3	1379	-	-	2'-0"	1/10	120	1	GREENHECK	SQ-90-VG	10
EF-400	ATAD BUILDING	EQUIPMENT ROOM	IN-LINE	DIRECT	3000	0.3	1139	-	-	9'-0"	3/4	208	1	GREENHECK	SQ-160-VG	4 3
EF-401	ATAD BUILDING	THICKENING ROOM	IN-LINE	DIRECT	925	0.3	1318	-	-	9'-4"	1/4	120	1	GREENHECK	SQ-100-VG	5
EF-500	MBR BUILDING	CHEMICAL ROOMS	IN-LINE	DIRECT	600	0.5	1689	-	-	8'-6"	1/6	120	1	GREENHECK	SQ-95-VG	5
EF-501	MBR BUILDING	RAS PUMP ROOM	WALL MOUNT	DIRECT	3900	0.3	1434	21	18"X18"	25'-0"	2	208	1	GREENHECK	CUE-160-VG	6
EF-502	MBR BUILDING	BLOWER ROOM	WALL MOUNT	DIRECT	5000	0.3	982	19	26"X26"	13'-0"	2	208	1	GREENHECK	CUE-200-VG	6 3
EF-503	MBR BUILDING	BLOWER ROOM	WALL MOUNT	DIRECT	5000	0.3	982	19	26"X26"	13'-0"	2	208	1	GREENHECK	CUE-200-VG	6 3
EF-504	MBR BUILDING	ELECTRICAL ROOM	CEILING	DIRECT	500	0.3	1212	7	-	8'-0"	(121)	120	1	GREENHECK	SP-A510-VG	9 3
EF-505	MBR BUILDING	MEMBRANE AREA	WALL MOUNT	DIRECT	2500	0.3	1479	16	18"X18"	24'-0"	3/4	208	1	GREENHECK	CUE-140-VG	6 3
EF-506	MBR BUILDING	MEMBRANE AREA	WALL MOUNT	DIRECT	2500	0.3	1479	16	18"X18"	24'-0"	3/4	208	1	GREENHECK	CUE-140-VG	6 3
EF-507	MBR BUILDING	MEMBRANE AREA	WALL MOUNT	DIRECT	2500	0.3	1479	16	18"X18"	24'-0"	3/4	208	1	GREENHECK	CUE-140-VG	6 3
EF-508	MBR BUILDING	MEMBRANE AREA	WALL MOUNT	DIRECT	2500	0.3	1479	16	18"X18"	24'-0"	3/4	208	1	GREENHECK	CUE-140-VG	6 3
EF-509	MBR BUILDING	FINE SCREEN ROOM	IN-LINE	DIRECT	1100	0.3	1488	-	-	9'-0"	1/4	120	1	GREENHECK	SQ-100-VG	4
EF-510	MBR BUILDING	INFLUENT DRY WELL	ROOF MOUNT	DIRECT	675	0.3	1670	9	13"X13"	-	1/10	120	1	GREENHECK	G-090-VG	7
EF-700	DEWATERING BUILDING	DUMPSTER AREA & MECHANICAL	IN-LINE	DIRECT	2700	0.6	1147	-	-	8'-0"	3/4	208	1	GREENHECK	SQ-160-VG	4
EF-701	DEWATERING BUILDING	MECHANICAL OPERATIONS ROOM	IN-LINE	DIRECT	2600	0.3	1019	-	-	8'-0"	3/4	208	1	GREENHECK	SQ-160-VG	4
EF-702	DEWATERING BUILDING	LOCKER ROOMS	ROOF MOUNT	DIRECT	445	0.6	1550	-	12.5"X12.5"	-	1/8	120	1	GREENHECK	G-095-VG	7
EF-950	GARAGE	GARAGE	WALL MOUNT	DIRECT	1800	0.3	1107	-	27.38"X27.38"	8'-0"	1/2	120	1	GREENHECK	AER-20-03-0615-VG	8

1. PROVIDE WITH ALUMINUM/SPARK RESISTANT CONSTRUCTION, EXPLOSION PROOF MOTOR, EXPLOSION PROOF DISCONNECT SWITCH (NEMA-7), ALUMINUM MOTOR COVER, MOUNTING RAIL/VIBRATION ISOLATORS, EPOXY COATING, AND SPARE BELT. EQUIPMENT AND ACCESSORIES TO BE RATED FOR USE IN A CLASS 1, DIV 1 SPACE.
2. PROVIDE WITH ALUMINUM CONSTRUCTION, SPEED CONTROLLER (VG MOTOR), UNIT MOUNTED DISCONNECT SWITCH, INLET GUARD, AND VIBRATION ISOLATORS.
3. CONTROL BY LINE VOLTAGE REVERSE-ACTING (COOLING) THERMOSTAT. UPON A RISE IN TEMPERATURE ABOVE 85°F (ADJUSTABLE), FAN SHALL ENABLE.
4. PROVIDE WITH ALUMINUM CONSTRUCTION, SPEED CONTROLLER (VG MOTOR), UNIT MOUNTED DISCONNECT SWITCH (NEMA-4X), INLET GUARD, VIBRATION ISOLATORS, AND EPOXY COATING.
5. PROVIDE WITH ALUMINUM CONSTRUCTION, SPEED CONTROLLER (VG MOTOR), UNIT MOUNTED DISCONNECT SWITCH (NEMA-4X), VIBRATION ISOLATORS, AND EPOXY COATING.
6. PROVIDE WITH ALUMINUM CONSTRUCTION, SPEED CONTROLLER (VG MOTOR), UNIT MOUNTED DISCONNECT SWITCH (NEMA-4X), WALL BRACKET, AND 120V AAD (NEMA 4X ACTUATOR/ENCLOSURE).
7. PROVIDE WITH ALUMINUM CONSTRUCTION, SPEED CONTROLLER (VG MOTOR), UNIT MOUNTED DISCONNECT SWITCH (NEMA-4X), 12" HIGH ROOF CURB, AND 120V ADD (NEMA 4X ACTUATOR/ENCLOSURE).
8. PROVIDE WITH ALUMINUM CONSTRUCTION, SPEED CONTROLLER (VG MOTOR), UNIT MOUNTED DISCONNECT SWITCH (NEMA-4X), WALL HOUSING/SLEEVE, OSHA APPROVED MOTOR/FAN GUARD, 120V AAD (NEMA 4X ACTUATOR/ENCLOSURE), AND 45° WEATHERHOOD.
9. PROVIDE WITH SPEED CONTROLLER, DISCONNECT SWITCH, AND VIBRATION ISOLATORS.
10. PROVIDE WITH ALUMINUM CONSTRUCTION, SPEED CONTROLLER (VG MOTOR), UNIT MOUNTED DISCONNECT SWITCH (NEMA-4X), INLET GUARD, VIBRATION ISOLATORS, GRAVITY BACKDRAFT DAMPER, AND EPOXY COATING.

SUPPLY FAN SCHEDULE

UNIT TAG	LOCATION	SERVICE	ARRANGEMENT	DRIVE	CFM	SP (IN WG)	FAN RPM	MAX SONES	WALL OPENING SIZE	BOTTOM OF FAN HEIGHT AFF (APPROX)	ELECTRICAL			BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
											HP (W)	VOLTS	PHASE			
SF-200	HEADWORKS BUILDING	BAR SCREEN ROOM	IN-LINE	BELT	2525	0.5	1270	-	-	7'-10"	1/2	120	1	GREENHECK	QEI-15	1
SF-400	ATAD BUILDING	THICKENING ROOM	IN-LINE	DIRECT	875	0.3	1270	-	-	9'-4"	1/4	120	1	GREENHECK	SQ-100-VG	2
SF-500	MBR BUILDING	RAS PUMP ROOM	WALL	DIRECT	3700	0.3	1655	-	27.38"X27.38"	16'-4"	3/4	120	1	GREENHECK	AER-20-03-0320-VG	3
SF-700	DEWATERING BUILDING	DUMPSTER AREA & MECHANICAL	WALL	DIRECT	2700	0.3	1710	-	27.33"X27.33"	9'-0"	1/2	120	1	GREENHECK	AER-20-03-0315-VG	3
SF-701	DEWATERING BUILDING	MECHANICAL OPERATIONS ROOM	WALL	DIRECT	2600	0.3	1674	-	27.33"X27.33"	4'-0"	1/2	120	1	GREENHECK	AER-20-03-0315-VG	3

1. PROVIDE WITH ALUMINUM/SPARK RESISTANT CONSTRUCTION, EXPLOSION PROOF INSULATED MOTOR, EXPLOSION PROOF DISCONNECT SWITCH (NEMA-7), ALUMINUM MOTOR COVER, MOUNTING RAIL/VIBRATION ISOLATORS, DRAIN WITH PLUG, AND EPOXY COATING. EQUIPMENT AND ACCESSORIES TO BE RATED FOR USE IN A CLASS 1, DIV 1 SPACE.
2. PROVIDE WITH ALUMINUM CONSTRUCTION, DISCONNECT SWITCH (NEMA-4X), SPEED CONTROLLER (VG MOTOR), INSULATED HOUSING, MOTOR COVER, EPOXY COATING, AND VIBRATION ISOLATORS.
3. PROVIDE WITH ALUMINUM CONSTRUCTION, OSHA APPROVED MOTOR GUARD/HOUSING, DISCONNECT SWITCH (NEMA-4X), SPEED CONTROLLER (VG MOTOR), 120V AAD (NEMA 4X ACTUATOR/ENCLOSURE), ALUMINUM 90° WEATHERHOOD KIT WITH BIRD SCREEN, AND EPOXY COATING.

LOUVER SCHEDULE

UNIT TAG	LOCATION	SERVICE	WIDTH	HEIGHT	BOTTOM OF LOUVER HEIGHT AFF (APPROX)	CFM	FREE AREA (SQ FT)	FACE VELOCITY (FPM)	BIRD SCREEN	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
LV-200	HEADWORKS BUILDING	INTAKE	40	32	7'-4"	2525	4.52	559	YES	GREENHECK	ESD-435	2
LV-201	HEADWORKS BUILDING	EXHAUST	40	32	8'-0"	2525	4.52	559	YES	GREENHECK	ESD-435	2
LV-202	HEADWORKS BUILDING	INTAKE	24	16	8'-0"	500	0.99	504	YES	GREENHECK	ESD-435	1 2
LV-203	HEADWORKS BUILDING	EXHAUST	24	16	9'-4"	500	0.99	504	YES	GREENHECK	ESD-435	1 2
LV-400	ATAD BUILDING	EXHAUST	36	40	8'-0"	3000	5.28	568	YES	GREENHECK	ESD-435	1 2
LV-401	ATAD BUILDING	INTAKE	24	24	9'-4"	875	1.75	502	YES	GREENHECK	ESD-435	1 2
LV-402	ATAD BUILDING	EXHAUST	24	24	9'-4"	875	1.75	502	YES	GREENHECK	ESD-435	1 2
LV-500	MBR BUILDING	INTAKE	18	18	8'-6"	510	0.84	608	YES	GREENHECK	ESD-435	2
LV-501	MBR BUILDING	EXHAUST	18	18	8'-6"	510	0.84	608	YES	GREENHECK	ESD-435	2
LV-502	MBR BUILDING	INTAKE	42	48	12'-0"	5000	7.74	646	YES	GREENHECK	ESD-435	1 2
LV-503	MBR BUILDING	INTAKE	42	48	12'-0"	5000	7.74	646	YES	GREENHECK	ESD-435	1 2
LV-504	MBR BUILDING	INTAKE	18	18	2'-0"	500	0.84	596	YES	GREENHECK	ESD-435	1 2
LV-505	MBR BUILDING	EXHAUST	18	18	8'-0"	500	0.84	596	YES	GREENHECK	ESD-435	1 2
LV-506	MBR BUILDING	INTAKE	42	48	2'-0"	5000	7.74	646	YES	GREENHECK	ESD-435	1 2
LV-507	MBR BUILDING	INTAKE	42	48	2'-0"	5000	7.74	646	YES	GREENHECK	ESD-435	1 2
LV-508	MBR BUILDING	INTAKE	24	24	5'-4"	1100	1.81	609	YES	GREENHECK	ESD-435	1 2
LV-509	MBR BUILDING	EXHAUST	24	24	8'-8"	1100	1.81	609	YES	GREENHECK	ESD-435	1 2
LV-700	DEWATERING BUILDING	EXHAUST	45	32	6'-4 1/2"	2700	5.10	498	YES	GREENHECK	ESD-435	1 2
LV-701	DEWATERING BUILDING	EXHAUST	45	32	3'-4 1/2"	2600	5.10	480	YES	GREENHECK	ESD-435	1 2
LV-950	GARAGE	INTAKE	32	32	3'-0"	1800	3.55	507	YES	GREENHECK	ESD-435	1 2

1. WITH FACTORY PROVIDED 120V AAD (NEMA 4X ACTUATOR/ENCLOSURE).
2. PROVIDE WITH 1-1/2" EXTERIOR PERIMETER FLANGE AND MOUNTING CLIPS.

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK · RYAN J. KEEFER · LICENSED PROFESSIONAL ENGINEER · 093390

HAZARDOUS MATERIAL NOTE:

THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE CALL 811

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

MECHANICAL SCHEDULES

REVISIONS

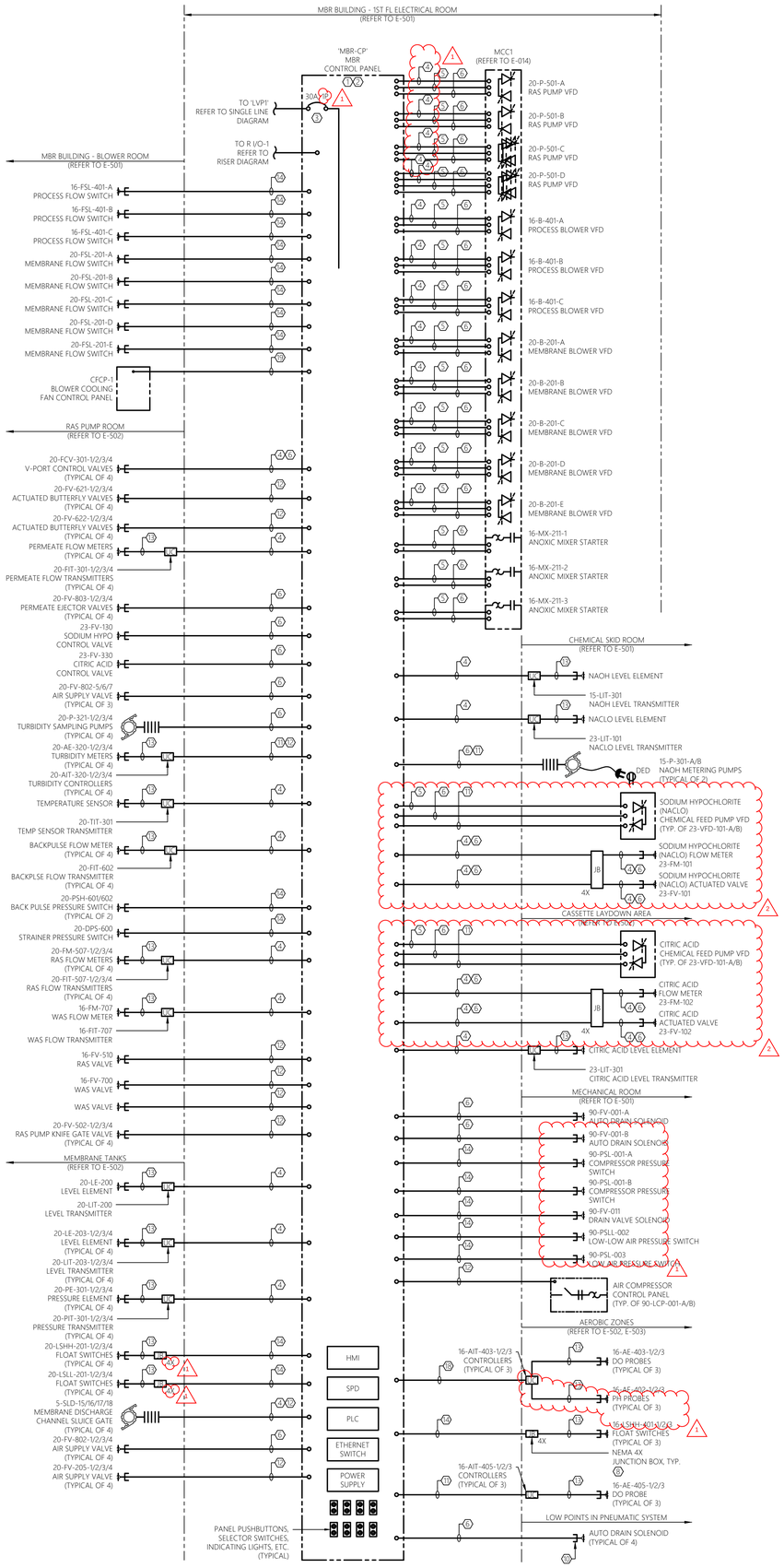
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CHECKED BY:	RJK
REVIEWED BY:	RJK

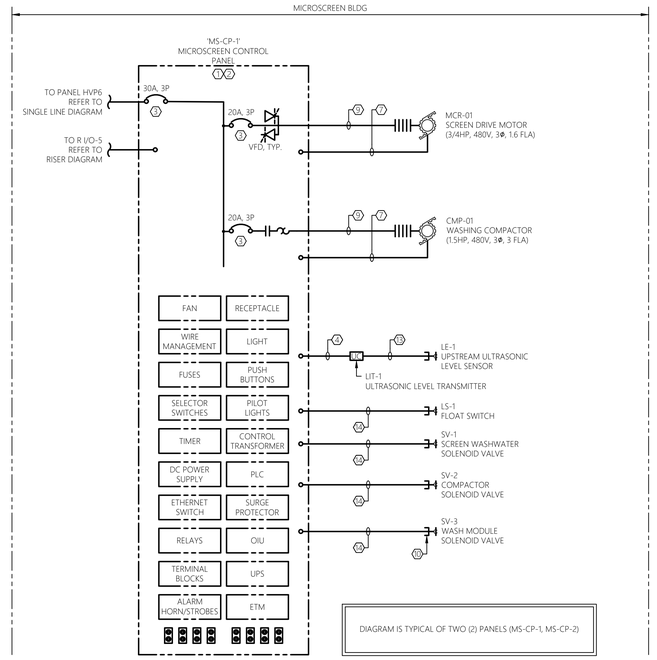
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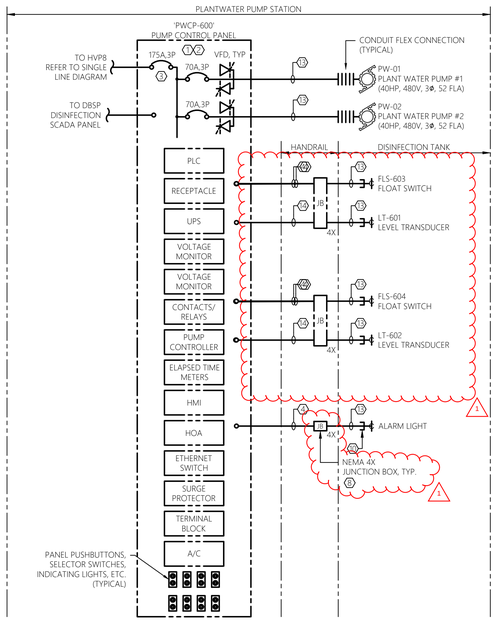
PROJECT # 18-732 PHASE #



1 E-020 SCALE: NTS — MBR CONTROL PANEL RISER DIAGRAM



2 E-020 SCALE: NTS — MICROSCREEN CONTROL PANEL RISER DIAGRAM — MICROSCREEN BUILDING



3 E-020 SCALE: NTS — PLANT WATER SYSTEM CONTROL PANEL — PLANTWATER PUMP STATION

GENERAL SHEET NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE GROUNDING PER NEC FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT.
3. ALL CONDUCTORS NOT SHOWN FOR CLARITY. COORDINATE WITH ALL PRIME CONTRACTORS AND PROVIDE COMPLETE ELECTRICAL CIRCUITING FOR ALL INSTALLED EQUIPMENT. ALL REQUIREMENTS TO BE PER NEC.
4. REFER TO FLOOR PLANS FOR GENERAL DEVICE/EQUIPMENT LOCATIONS. COORDINATE FINAL LOCATIONS WITH PROCESS MECHANICAL DRAWINGS. REFER TO SITE PLAN FOR DUCT BANK INFORMATION.
5. REFER TO SINGLE LINE DIAGRAMS, SPECIFICATIONS, AND SUBMITTAL DOCUMENTATION FOR ADDITIONAL INFORMATION/REQUIREMENTS.
6. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH OWNER ALL OTHER TRADE CONTRACTORS.
7. CIRCUITS SHOWN ARE POWER, CONTROL, INSTRUMENTATION, AND CONTROL CIRCUIT POWER. REFER TO SINGLE LINE DIAGRAMS, SCHEDULES, AND DETAILS FOR ADDITIONAL CIRCUITS.
8. ALL WIRING REQUIREMENTS INCLUDING BUT NOT LIMITED TO WIRE SIZE, TYPE, AND QUANTITY OF CONDUCTORS TO BE VERIFIED WITH EQUIPMENT MANUFACTURER.
9. QUANTITY OF CONDUCTORS CALLED FOR MAY INCLUDE SPARE CONDUCTORS. PROVIDE CONDUCTORS SHOWN OR MINIMUM NUMBER REQUIRED PER MANUFACTURERS WRITTEN INSTRUCTIONS. ALL REQUIREMENTS TO BE PER NEC.
10. CONTRACTOR TO PROVIDE ARC FLASH WARNING LABELS FOR ALL NEW OR MODIFIED ELECTRICAL EQUIPMENT. REFER TO SPECIFICATIONS FOR REQUIREMENTS.
11. REFER TO ELECTRICAL DETAIL SHEETS AND SCHEDULE SHEETS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
12. CONTRACTOR TO COORDINATE MOUNTING LOCATIONS OF ALL PANELS WITH OWNER AND ALL OTHER TRADE CONTRACTORS. PROVIDE ALL NECESSARY MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC..
13. PROVIDE INTRINSICALLY SAFE BARRIERS AS REQUIRED INTERNAL TO CONTROL PANELS. ALL REQUIREMENTS TO BE PER NEC.
14. NOT ALL REQUIRED CLASSIFIED SPACE WIRING METHODS INCLUDING, BUT NOT LIMITED TO SEAL-OFFS MAY BE SHOWN. PROVIDE WIRING METHODS PER NEC (LATEST EDITION). PROVIDE CONDUIT UNION WITHIN 6" OF EACH SEAL-OFF AT CONTROL PANELS, DISTRIBUTION PANELS, VFDS, STARTERS, DISCONNECTS, OR SOURCE OF SUPPLY WHERE FEASIBLE.
15. NOT ALL REQUIRED THRU-WALL, WATERTIGHT, CONDUIT PENETRATIONS SHOWN FOR CLARITY. CONTRACTOR TO PROVIDE A THRU-WALL, WATERTIGHT, CONDUIT PENETRATION FOR ALL CONDUIT PENETRATIONS WITHIN BUILDING INTERIOR/EXTERIOR WALLS AND FLOORS. REFER TO ELECTRICAL DETAILS FOR ADDITIONAL INFORMATION. COORDINATE WITH OWNER AND ALL OTHER TRADE CONTRACTORS PRIOR TO ROUGH-IN
16. CONTRACTOR TO COORDINATE ALL CONDUIT PENETRATIONS AND CONDUIT ROUTING WITH ALL OTHER TRADE CONTRACTORS AND OWNER PRIOR TO ROUGH-IN.
17. ALL CONDUCTORS TO BE COPPER AND CONTAIN THWN OR XHHW INSULATION.
18. ALL CONTROL/COMMUNICATION WIRING REQUIREMENTS INCLUDING BUT NOT LIMITED TO WIRE SIZE, TYPE, AND QUANTITY OF CONDUCTORS TO BE VERIFIED WITH EQUIPMENT MANUFACTURER.
19. ALL PROPOSED EQUIPMENT LOCATIONS/INSTALLATIONS TO COMPLY WITH NEC ARTICLE 110.26 'SPACES ABOUT ELECTRICAL EQUIPMENT'.

SHEET KEY NOTES:

1. NOT ALL INTERNAL COMPONENTS SHOWN FOR CLARITY. DIAGRAM IS INTENDED TO SHOW ALL REQUIRED FIELD CIRCUITING REQUIRED UNDER THIS CONTRACT. REFERENCE SUBMITTAL DOCUMENTATION FOR ALL PANEL INTERNAL COMPONENTS. CONTRACTOR TO PROVIDE ADDITIONAL INTERNAL CONTACTS AND JUMPERS PER CONTROL PANEL MANUFACTURERS RECOMMENDATIONS FOR AN OVERALL COMPLETE AND OPERABLE SYSTEM.
2. CONTROL PANEL AND ALL INTERNAL COMPONENTS ARE BY THIS CONTRACT. THIS CONTRACT IS RESPONSIBLE FOR ALL FIELD WIRING BETWEEN DEVICES, TERMINATIONS, AND MOUNTING/INSTALLATION OF PANEL AS SHOWN/INDICATED. REFER TO SUBMITTAL DOCUMENTATION AND COORDINATE WITH ALL OTHER TRADE CONTRACTORS TO PROVIDE COMPLETE SYSTEM FIELD CIRCUITRY AND TERMINATIONS AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
3. DISCONNECT SIZE SHOWN FOR BIDDING PURPOSES ONLY. COORDINATE DISCONNECT SIZE WITH EQUIPMENT MANUFACTURERS RECOMMENDATIONS. COORDINATE CONDUCTOR/CONDUIT SIZE WITH MANUFACTURERS RECOMMENDED DISCONNECT SIZE. ALL REQUIREMENTS TO BE PER NEC.
4. (2)#18STP, 3/4"C.
5. (1) CAT 6A PREMIUM ETHERNET CABLE, 1"C. PROVIDE AS PLENUM RATED WITH 4 BONDED PAIRS. TO BE BELDEN #3633 OR APPROVED EQUAL.
6. (12)#14, 1"C.
7. (4)#14, 3/4"C. CIRCUIT TO BE UTILIZED FOR THE ASSOCIATED MOTOR THERMAL SAFETY SWITCH. CIRCUIT TO CONTROL TERMINALS OF PROPOSED VFD. IN THE EVENT OF A MOTOR HIGH TEMPERATURE, THE UNIT IS TO BE SHUT DOWN TO PREVENT DAMAGE. NOTE: TWO CONDUCTORS TO BE UTILIZED AS SPARES.
8. CONTRACTOR TO PROVIDE JUNCTION/PULL BOXES AS REQUIRED. COORDINATE FINAL LOCATIONS WITH OTHER TRADE CONTRACTORS (NOTE, JUNCTION BOXES ARE NOT ALWAYS SHOWN ON FLOOR PLANS. CONTRACTOR TO FIELD LOCATE AS NECESSARY). JUNCTION BOXES ARE TO BE RATED FOR ENVIRONMENT INSTALLED, INCLUDING BUT NOT LIMITED TO HAZARDOUS ENVIRONMENTS, CORROSIVE AREAS AND OUTDOORS INSTALLATIONS. CONTRACTOR TO SIZE JUNCTION BOXES PER NEC ARTICLE 314, TYPICAL OF ALL JUNCTION BOXES SHOWN ON THIS DRAWING.
9. (3)#12, 1"C. PROVIDE AS VFD SHIELDED CABLE. CONDUIT SIZE IS LISTED AS MINIMUM. PROVIDE LARGER DIAMETER AS REQUIRED PER MANUFACTURER. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION. ALL REQUIREMENTS TO BE PER NEC.
10. PROVIDE CONDUIT BUSHING, FITTING, OR FLEX CONNECTION AS REQUIRED FOR PROPER CONNECTION OF DEVICE. ALL BUSHINGS, FITTINGS, OR FLEX CONNECTIONS TO BE SUITED FOR ENVIRONMENT INSTALLED WITHIN. COORDINATE WITH EQUIPMENT MANUFACTURER. FLEX CONNECTION LENGTHS TO BE MINIMIZED TO GREATEST EXTENT POSSIBLE. TYPICAL
11. (4)#18STP, 3/4"C.
12. (20)#14, 1"C.
13. FACTORY CABLE BY THIS CONTRACT. THIS CONTRACT RESPONSIBLE FOR ALL TERMINATIONS PER MANUFACTURERS RECOMMENDATIONS. PROVIDE 3/4" CONDUIT WHERE EXPOSED TO PHYSICAL DAMAGE AND RECOMMENDED BY THE EQUIPMENT MANUFACTURER. CONDUIT SIZE IS LISTED AS MINIMUM. PROVIDE LARGER AS REQUIRED PER MANUFACTURER. COORDINATE FINAL INSTALLATION REQUIREMENTS WITH ALL OTHER TRADE CONTRACTORS.
14. (4)#14, 3/4"C.

CONTROL DIAGRAMS ARE SCHEMATIC IN NATURE AND SHOWS ALL INTERCONNECTIONS. CONTRACTOR MAY GROUP POWER CIRCUITS INTO LARGER CONDUIT AND GROUP CONTROL CIRCUITS INTO SEPARATE LARGER CONDUIT. GROUPING OF CIRCUITS INTO LARGER CONDUITS MUST COMPLY WITH NEC FILL AND DERATING REQUIREMENTS. VFD INPUT & OUTPUT CONDUCTORS MUST BE RUN INDEPENDENT OF OTHER CONDUCTORS.

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BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK
JEFFREY E. ROBINSON
098896
LICENSED PROFESSIONAL ENGINEER

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CAESARS LANE WWTP
EXPANSION PROJECT:
PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL
RISER DIAGRAMS

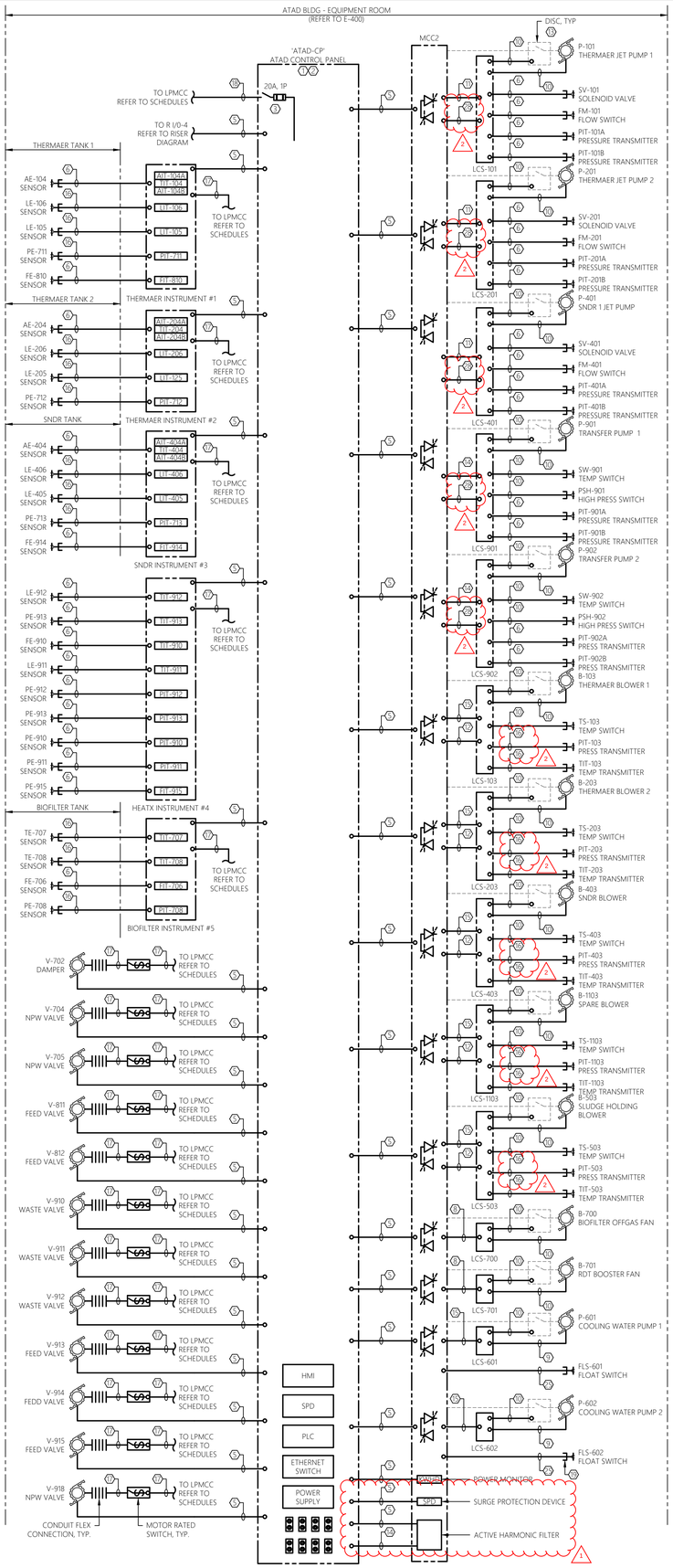
REVISIONS

NO.	DESCRIPTION	DATE
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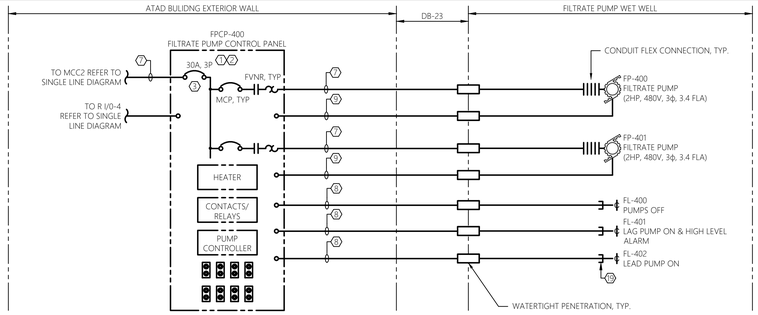
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REVIEWED BY:	JER

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E-020

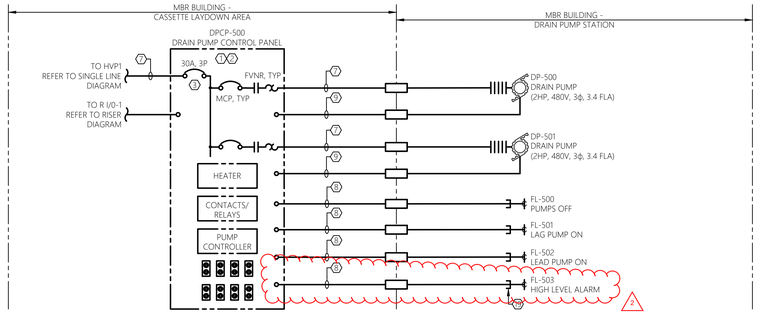
PROJECT # 18-732 PHASE #



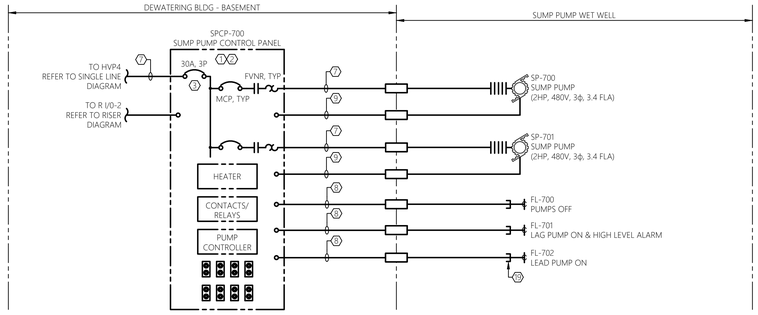
1 E-022 SCALE: NTS — ATAD CONTROL PANEL RISER DIAGRAM — ATAD EQUIPMENT ROOM



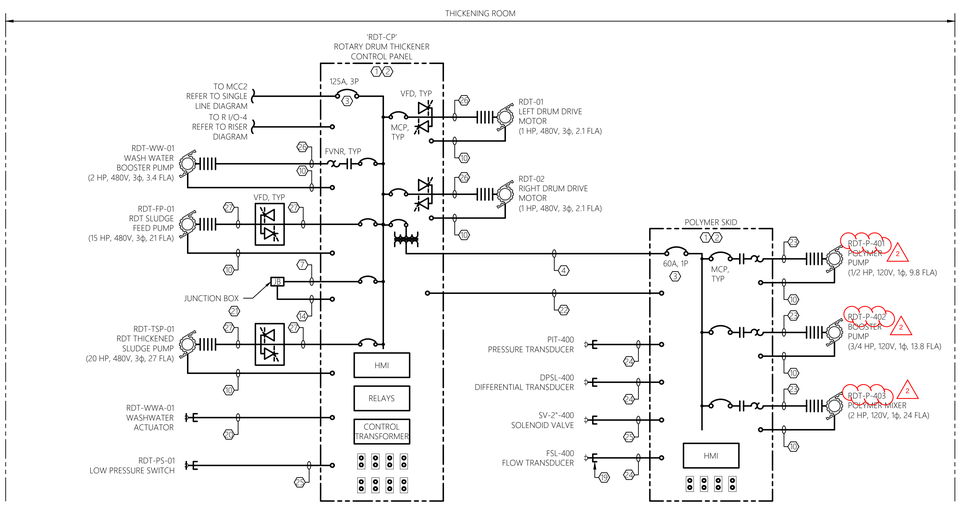
2 E-022 SCALE: NTS — FILTRATE PUMP CONTROL PANEL RISER DIAGRAM — ATAD BULIDING



3 E-022 SCALE: NTS — DRAIN PUMP CONTROL PANEL RISER DIAGRAM — MBR BUILDING



4 E-022 SCALE: NTS — SUMP PUMP CONTROL PANEL RISER DIAGRAM — DEWATERING BUILDING



5 E-022 SCALE: NTS — RDT CONTROL PANEL RISER DIAGRAM — RDT ROOM

GENERAL SHEET NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE GROUNDING PER NEC FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT.
3. ALL CONDUCTORS NOT SHOWN FOR CLARITY. COORDINATE WITH ALL PRIME CONTRACTORS AND PROVIDE COMPLETE ELECTRICAL CIRCUITING FOR ALL INSTALLED EQUIPMENT. ALL REQUIREMENTS TO BE PER NEC.
4. REFER TO FLOOR PLANS FOR GENERAL DEVICE/EQUIPMENT LOCATIONS. COORDINATE FINAL LOCATIONS WITH PROCESS MECHANICAL DRAWINGS. REFER TO SITE PLAN FOR DUCT BANK INFORMATION.
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8. ALL WIRING REQUIREMENTS INCLUDING BUT NOT LIMITED TO WIRE SIZE, TYPE, AND QUANTITY OF CONDUCTORS TO BE VERIFIED WITH EQUIPMENT MANUFACTURER.
9. QUANTITY OF CONDUCTORS CALLED FOR MAY INCLUDE SPARE CONDUCTORS. PROVIDE CONDUCTORS SHOWN OR MINIMUM NUMBER REQUIRED PER MANUFACTURERS WRITTEN INSTRUCTIONS. ALL REQUIREMENTS TO BE PER NEC.
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15. NOT ALL REQUIRED THRU-WALL, WATERTIGHT, CONDUIT PENETRATIONS SHOWN FOR CLARITY. CONTRACTOR TO PROVIDE A THRU-WALL, WATERTIGHT, CONDUIT PENETRATION FOR ALL CONDUIT PENETRATIONS WITHIN BUILDING INTERIOR/EXTERIOR WALLS AND FLOORS. REFER TO ELECTRICAL DETAILS FOR ADDITIONAL INFORMATION. COORDINATE WITH OWNER AND ALL OTHER TRADE CONTRACTORS PRIOR TO ROUGH-IN
16. CONTRACTOR TO COORDINATE ALL CONDUIT PENETRATIONS AND CONDUIT ROUTING WITH ALL OTHER TRADE CONTRACTORS AND OWNER PRIOR TO ROUGH-IN.
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18. ALL CONTROL/COMMUNICATION WIRING REQUIREMENTS INCLUDING BUT NOT LIMITED TO WIRE SIZE, TYPE, AND QUANTITY OF CONDUCTORS TO BE VERIFIED WITH EQUIPMENT MANUFACTURER.
19. ALL PROPOSED EQUIPMENT LOCATIONS/INSTALLATIONS TO COMPLY WITH NEC ARTICLE 110.26 'SPACES ABOUT ELECTRICAL EQUIPMENT'.

SHEET KEY NOTES:

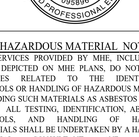
1. NOT ALL INTERNAL COMPONENTS SHOWN FOR CLARITY. DIAGRAM IS INTENDED TO SHOW ALL REQUIRED FIELD CIRCUITING REQUIRED UNDER THIS CONTRACT. REFERENCE SUBMITTAL DOCUMENTATION FOR ALL PANEL INTERNAL COMPONENTS. CONTRACTOR TO PROVIDE ADDITIONAL INTERNAL CONTACTS AND JUMPERS PER CONTROL PANEL MANUFACTURERS RECOMMENDATIONS FOR AN OVERALL COMPLETE AND OPERABLE SYSTEM.
2. CONTROL PANEL AND ALL INTERNAL COMPONENTS ARE BY THIS CONTRACT. THIS CONTRACT IS RESPONSIBLE FOR ALL FIELD WIRING BETWEEN DEVICES, TERMINATIONS, AND MOUNTING/INSTALLATION OF PANEL AS SHOWN/INDICATED. REFER TO SUBMITTAL DOCUMENTATION AND COORDINATE WITH ALL OTHER TRADE CONTRACTORS TO PROVIDE COMPLETE SYSTEM FIELD CIRCUITRY AND TERMINATIONS AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
3. DISCONNECT SIZE SHOWN FOR BIDDING PURPOSES ONLY. COORDINATE DISCONNECT SIZE WITH EQUIPMENT MANUFACTURERS RECOMMENDATIONS. COORDINATE CONDUCTOR/CONDUIT SIZE WITH MANUFACTURERS RECOMMENDED DISCONNECT SIZE. ALL REQUIREMENTS TO BE PER NEC.
4. (2)#8 & #10G, 1-1/2"C.
5. (1) CAT 6A PREMIUM ETHERNET CABLE, 1"C. PROVIDE AS PLENUM RATED WITH 4 BONDED PAIRS. TO BE BELDEN #3633 OR APPROVED EQUAL.
6. FACTORY CABLE. THIS CONTRACT RESPONSIBLE FOR ALL TERMINATIONS PER MANUFACTURERS RECOMMENDATIONS. PROVIDE 1" CONDUIT WHERE EXPOSED TO PHYSICAL DAMAGE AND RECOMMENDED BY THE EQUIPMENT MANUFACTURER. CONDUIT SIZE IS LISTED AS MINIMUM. PROVIDE LARGER AS REQUIRED PER MANUFACTURER. COORDINATE FINAL INSTALLATION REQUIREMENTS WITH MANUFACTURER.
7. (3)#10 & #10G, 1"C.
8. (4)#14, 3/4"C.
9. (6)#14, 3/4"C. CIRCUIT TO BE UTILIZED FOR THE ASSOCIATED MOTOR THERMAL SAFETY AND SEAL LEAK SWITCH. CIRCUIT TO CONTROL TERMINALS OF PROPOSED VFD. IN THE EVENT OF A MOTOR HIGH TEMPERATURE OR SEAL LEAKAGE, THE UNIT IS TO BE SHUT DOWN TO PREVENT DAMAGE. NOTE, TWO CONDUCTORS TO BE UTILIZED AS SPARES.
10. (4)#14, 3/4"C.
11. (10)#14, 1"C
12. (3)#18STP, 3/4"C
13. REFER TO SINGLE LINE DIAGRAM SHEET E-015 FOR POWER AND DISCONNECT INFORMATION/DETAILS.
14. (12)#14, 1"C
15. (8)#14, 1"C
16. (3)#18STP, 3/4"C
17. (2)#12 & #12G, 3/4"C.
18. (2)#10 & #10G, 1"C.
19. PROVIDE CONDUIT BUSHING, FITTING, OR FLEX CONNECTION AS REQUIRED FOR PROPER CONNECTION OF DEVICE. ALL BUSHINGS, FITTINGS, OR FLEX CONNECTIONS TO BE SUITED FOR ENVIRONMENT INSTALLED WITHIN. COORDINATE WITH OTHER TRADE CONTRACTORS AND EQUIPMENT MANUFACTURER. FLEX CONNECTIONS TO BE MINIMIZED TO THE GREATEST EXTENT POSSIBLE. TYPICAL.
20. (8)#14, 3/4"C.
21. JUNCTION BOX BY EQUIPMENT MANUFACTURER. COORDINATE FINAL LOCATION WITH EQUIPMENT MANUFACTURER. JUNCTION BOX FACTORY WIRED TO RDT SYSTEM CONTROL INSTRUMENTATION/DEVICES. THIS CONTRACT RESPONSIBLE FOR PROVIDING CIRCUITRY (CONDUIT & CONDUCTORS) AND TERMINATIONS AS SHOWN/SPECIFIED AS A MINIMUM. PROVIDE ADDITIONAL CIRCUITRY AS REQUIRED PER MANUFACTURERS RECOMMENDATIONS. REFER TO SUBMITTAL DOCUMENTATION FOR ADDITIONAL INFORMATION AND COORDINATE FINAL REQUIREMENTS WITH EQUIPMENT MANUFACTURER. REFER TO FLOOR PLAN FOR GENERAL LOCATION.
22. (10)#14, (2)#18STP, 1"C
23. (3)#12 & #12G, 3/4"C
24. (2)#18STP, 3/4"C.
25. (4)#14, 3/4"C
26. (3)#10 & #10G, 3/4"C. PROVIDE AS VFD SHIELDED CABLE. CONDUIT SIZE IS LISTED AS MINIMUM, PROVIDE LARGER DIAMETER AS REQUIRED PER MANUFACTURER. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION. ALL REQUIREMENTS TO BE PER NEC.
27. (3)#8 & #10G, 3/4"C. PROVIDE AS VFD SHIELDED CABLE. CONDUIT SIZE IS LISTED AS MINIMUM, PROVIDE LARGER DIAMETER AS REQUIRED PER MANUFACTURER. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION. ALL REQUIREMENTS TO BE PER NEC.
28. (3)#18STT, 3/4"C.

CONTROL DIAGRAMS ARE SCHEMATIC IN NATURE AND SHOWS ALL INTERCONNECTIONS. CONTRACTOR MAY GROUP POWER CIRCUITS INTO LARGER CONDUIT AND GROUP CONTROL CIRCUITS INTO SEPARATE LARGER CONDUIT. GROUPING OF CIRCUITS INTO LARGER CONDUITS MUST COMPLY WITH NEC FILL AND DERATING REQUIREMENTS. VFD INPUT & OUTPUT CONDUCTORS MUST BE RUN INDEPENDENT OF OTHER CONDUCTORS.

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JSE
JADE STONE ENGINEERING



HAZARDOUS MATERIAL NOTE:
THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL RISER DIAGRAMS

REVISIONS

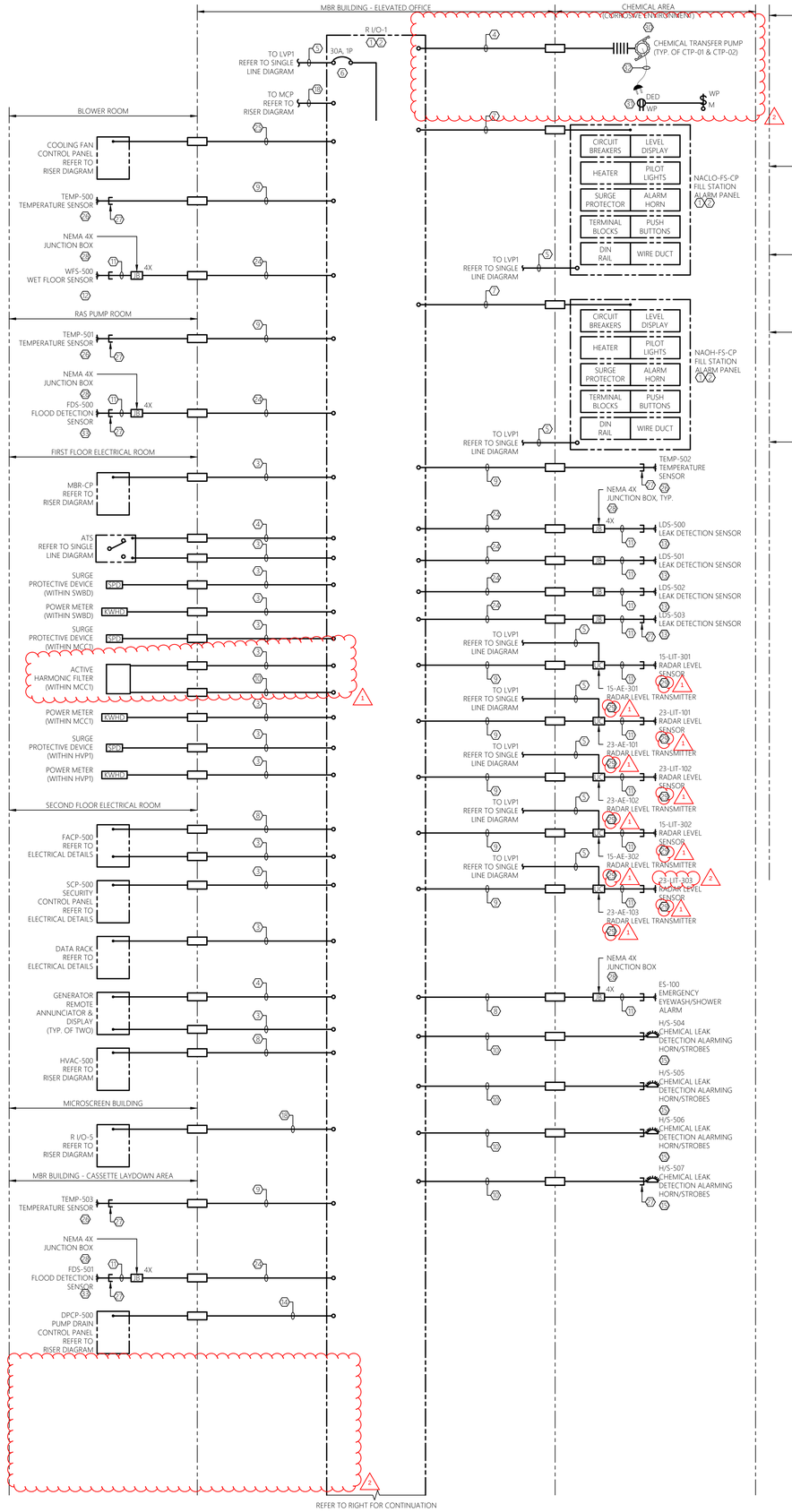
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1	BID ADDENDUM	06/27/2025

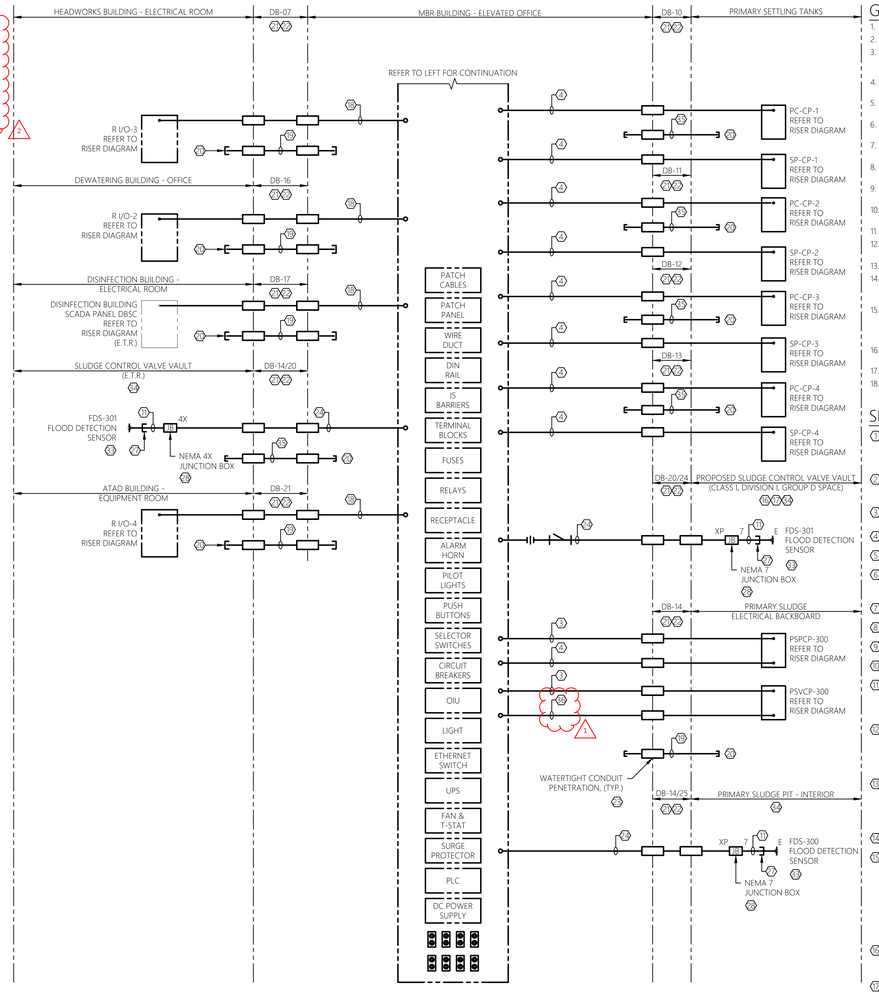
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DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.

E-022

PROJECT # 18-732 PHASE #





GENERAL SHEET NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE GROUNDING PER NEC FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT.
3. ALL CONDUCTORS, EQUIPMENT, COMPONENTS, AND DEVICES NOT SHOWN FOR CLARITY. COORDINATE WITH ALL PRIME CONTRACTORS AND PROVIDE COMPLETE ELECTRICAL CIRCUITING FOR ALL INSTALLED EQUIPMENT. ALL REQUIREMENTS TO BE PER NEC.
4. REFER TO ELECTRICAL PLANS FOR GENERAL DEVICE/EQUIPMENT LOCATIONS. COORDINATE FINAL LOCATIONS WITH ALL PRIME CONTRACT DRAWINGS. REFER TO ELECTRICAL SITE PLAN FOR DUCT BANK INFORMATION
5. REFER TO SINGLE LINE DIAGRAMS, SPECIFICATIONS, AND SUBMITTAL DOCUMENTATION FOR ADDITIONAL INFORMATION/REQUIREMENTS.
6. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH OWNER AND ALL OTHER TRADE CONTRACTORS.
7. CIRCUITS SHOWN ARE POWER, CONTROL, INSTRUMENTATION, AND CONTROL CIRCUIT POWER. REFER TO SINGLE LINE DIAGRAMS, SCHEDULES, AND DETAILS FOR ADDITIONAL CIRCUITS.
8. ALL WIRING REQUIREMENTS INCLUDING BUT NOT LIMITED TO WIRE SIZE, TYPE, AND QUANTITY OF CONDUCTORS TO BE VERIFIED WITH EQUIPMENT MANUFACTURER.
9. QUANTITY OF CONDUCTORS CALLED FOR MAY INCLUDE SPARE CONDUCTORS. PROVIDE CONDUCTORS SHOWN OR MINIMUM NUMBER REQUIRED PER MANUFACTURERS WRITTEN INSTRUCTIONS. ALL REQUIREMENTS TO BE PER NEC.
10. CONTRACTOR TO PROVIDE ARC FLASH WARNING LABELS FOR ALL NEW OR MODIFIED ELECTRICAL EQUIPMENT. REFER TO SPECIFICATIONS FOR REQUIREMENTS.
11. REFER TO ELECTRICAL DETAIL SHEETS AND SCHEDULE SHEETS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
12. CONTRACTOR TO COORDINATE MOUNTING LOCATIONS OF ALL PANELS WITH OWNER AND ALL OTHER TRADE CONTRACTORS. PROVIDE ALL NECESSARY MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC..
13. PROVIDE INTRINSICALLY SAFE BARRIERS AS REQUIRED INTERNAL TO CONTROL PANELS. ALL REQUIREMENTS TO BE PER NEC.
14. NOT ALL REQUIRED CLASSIFIED SPACE WIRING METHODS INCLUDING, BUT NOT LIMITED TO SEAL-OFFS MAY BE SHOWN. PROVIDE WIRING METHODS PER NEC (LATEST EDITION). PROVIDE CONDUIT UNION WITHIN 6" OF EACH SEAL-OFF AT CONTROL PANELS, DISTRIBUTION PANELS, VFDS, STARTERS, DISCONNECTS, OR SOURCE OF SUPPLY WHERE FEASIBLE.
15. NOT ALL REQUIRED THRU-WALL, WATERTIGHT, CONDUIT PENETRATIONS SHOWN FOR CLARITY. CONTRACTOR TO PROVIDE A THRU-WALL, WATERTIGHT, CONDUIT PENETRATION FOR ALL CONDUIT PENETRATIONS WITHIN BUILDING INTERIOR/EXTERIOR WALLS AND FLOORS. REFER TO ELECTRICAL DETAILS FOR ADDITIONAL INFORMATION. COORDINATE WITH OWNER AND ALL OTHER TRADE CONTRACTORS PRIOR TO ROUGH-IN
16. CONTRACTOR TO COORDINATE ALL CONDUIT PENETRATIONS AND CONDUIT ROUTING WITH ALL OTHER TRADE CONTRACTORS AND OWNER PRIOR TO ROUGH-IN.
17. ALL CONDUCTORS TO BE COPPER AND CONTAIN XHHW-2 INSULATION.
18. ALL PROPOSED EQUIPMENT LOCATIONS/INSTALLATIONS TO COMPLY WITH NEC ARTICLE 110.26 'SPACES ABOUT ELECTRICAL EQUIPMENT'.

SHEET KEY NOTES:

1. CONTROL PANEL AND ALL INTERNAL COMPONENTS TO BE FURNISHED BY CONTRACTOR THRU BID ALLOWANCE. THIS CONTRACT IS RESPONSIBLE FOR ALL FIELD WIRING BETWEEN DEVICES, AND MOUNTING/INSTALLATION/WIRING OF PANEL AS SHOWN/INDICATED. REFER TO SUBMITTAL DOCUMENTATION AND COORDINATE WITH OWNER AND ENGINEER TO PROVIDE COMPLETE SYSTEM FIELD CIRCUITRY AND TERMINATIONS AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
2. NOT ALL INTERNAL COMPONENTS SHOWN FOR CLARITY. DIAGRAM IS INTENDED TO SHOW ALL REQUIRED FIELD CIRCUITING REQUIRED UNDER THIS CONTRACT. REFERENCE SUBMITTAL DOCUMENTATION AND SPECIFICATION SECTION 260912 CONTROL PANELS AND INTEGRATION FOR ALL PANEL INTERNAL COMPONENTS.
3. (1) CAT 6A PREMIUM ETHERNET CABLE, 1"C. PROVIDE AS PLENUM RATED WITH 4 BONDED PAIRS. TO BE BELDEN #3633 OR APPROVED EQUAL.
4. (12)#14 & (2)#18STP, 1"C.
5. (2)#10 & #10G, 1"C.
6. DISCONNECT SIZE SHOWN FOR BIDDING PURPOSES ONLY. COORDINATE DISCONNECT SIZE WITH EQUIPMENT MANUFACTURERS RECOMMENDATIONS. COORDINATE CONDUCTOR/CONDUIT SIZE WITH MANUFACTURERS RECOMMENDED DISCONNECT SIZE. ALL REQUIREMENTS TO BE PER NEC.
7. (24)#14 & (4)#18STP, 1-1/2"C.
8. (4)#14, 1"C
9. (2)#18STP, 1"C
10. (12)#14, 1"C
11. FACTORY CABLE. THIS CONTRACT RESPONSIBLE FOR ALL TERMINATIONS PER MANUFACTURERS RECOMMENDATIONS. PROVIDE 1" CONDUIT WHERE EXPOSED TO PHYSICAL DAMAGE AND RECOMMENDED BY THE EQUIPMENT MANUFACTURER. CONDUIT SIZE IS LISTED AS MINIMUM. PROVIDE LARGER AS REQUIRED PER MANUFACTURER. COORDINATE FINAL INSTALLATION REQUIREMENTS WITH MANUFACTURER.
12. WET FLOOR SENSOR TO BE PROVIDED FINDER MODEL 07.2.2.0 OR APPROVED EQUAL THRU BID ALLOWANCE. PROVIDE ALL REQUIRED MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC... AND CIRCUITRY (CONDUIT AND CONDUCTORS) FOR AN OVERALL COMPLETE AND OPERABLE LEAK DETECTION SYSTEM. REFER TO SPECIFICATION SECTION 260912 CONTROL PANELS AND INTEGRATION FOR ADDITIONAL INFORMATION/REQUIREMENTS. PROVIDE LABEL PER SPECIFICATION SECTION 260553 INDENTIFICATION FOR ELECTRICAL SYSTEMS. 1
13. LEAK DETECTION SENSOR TO BE PROVIDED AS PAINTEK CLS200 CAPACITANCE PROBE AS MANUFACTURED BY SIEMENS, OR APPROVED EQUAL THRU BID ALLOWANCE. PROVIDE ALL REQUIRED MOUNTING HARDWARE, BRACKETTS, ACCESSORIES, ETC... AND CIRCUITRY (CONDUIT AND CONDUCTORS) FOR AN OVERALL COMPLETE AND OPERABLE LEAK DETECTION SYSTEM. REFER TO SPECIFICATION SECTION 260912 CONTROL PANELS AND INTEGRATION FOR ADDITIONAL INFORMATION/REQUIREMENTS. PROVIDE LABEL PER SPECIFICATION SECTION 260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS.
14. (6)#14, 3/4"C.
15. CHEMICAL LEAK DETECTION ALARMING LIGHTS AND HORNS (HORN/STROBE) TO BE PROVIDED AS FEDERAL SIGNAL GLOBAL SERIES CUSTOM CONFIGURED FIXTURES MODEL #C-MSC-3A-120-NN-LG-SR OR APPROVED EQUAL THRU BID ALLOWANCE. TO BE 3 POSITION VERTICAL STACK, SOUNDER HORN, GREEN 'OK' LED LIGHT, & RED 'LEAK DETECTED' LED LIGHT), RATED NEMA 4X, AND POWERED BY 120V AC CONTACT CLOSURES WITHIN CONTROL PANEL. PROVIDE ALL REQUIRED POWER SUPPLIES, CONTROL TRANSFORMERS, AND RELAYS, AS WELL AS, DOME GUARDS TO PROTECT LED LIGHTS FROM PHYSICAL DAMAGE, CONDUIT ADAPTORS, INDICATOR RINGS AND LEGEND PLATE KITS AS NECESSARY. PROVIDE ALL REQUIRED MOUNTING HARDWARE, BRACKETTS, ACCESSORIES, ETC... AND CIRCUITRY (CONDUIT AND CONDUCTORS) FOR AN OVERALL COMPLETE AND OPERABLE LEAK DETECTION SYSTEM. REFER TO SPECIFICATION SECTION 260912 CONTROL PANELS AND INTEGRATION FOR ADDITIONAL INFORMATION/REQUIREMENTS. PROVIDE LABEL PER SPECIFICATION SECTION 260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS.
16. AREA IS A CLASS I, DIVISION I, GROUP D SPACE. ALL WIRING METHODS WITHIN THIS SPACE TO COMPLY WITH NEC ARTICLE 501. ALL ELECTRICAL EQUIPMENT AND DEVICES WITHIN THIS SPACE TO BE EXPLOSION PROOF RATED FOR USE IN A CLASS I, DIVISION I, GROUP D ENVIRONMENT. NOTE, NOT ALL REQUIRED SEAL-OFFS SHOWN FOR CLARITY. PROVIDE PER NEC.
17. ALL ELECTRICAL EQUIPMENT, COMPONENTS, DEVICES, AND RACEWAY SYSTEMS TO BE KEPT OUT OF CLASSIFIED AREAS TO GREATEST EXTENT POSSIBLE.
18. 8-STRAND, MULTI-MODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C. PROVIDE MAXCELL FABRIC INNERDUCT WITHIN 4" CONDUIT. PROVIDE AS MAXCELL 4" 3-CELL PRODUCT. INSTALL PROPOSED FIBER OPTIC CABLE WITHIN 1-CELL OF THE PROPOSED INNERDUCT AND A PULL STRING THROUGH THE OTHER TWO (2) CELLS. FIBER OPTIC CABLE TO BE CONTINUOUS (NO SPLICE) AND SUITABLE FOR INDOOR/OUTDOOR APPLICATIONS ALONG WITH SUITABLE FOR DIRECT BURIAL APPLICATIONS. FIBER OPTIC CABLE TO BE MODEL CLEARCURVE AS MANUFACTURED BY CORNING OR APPROVED EQUAL. SUBMIT PRODUCT DATA TO ENGINEER FOR REVIEW DURING SUBMITTAL PHASE. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
19. SPARE 4"C.
20. PROVIDE SPARE CONDUIT AS SHOWN. STUB CONDUIT ADJACENT TO EQUIPMENT, OR AS DIRECTED BY THE OWNER. PROVIDE PULL ROPE AND CAP BOTH ENDS. CONTRACTOR TO PROVIDE LABEL FOR ALL SPARE CONDUITS INDICATING CONDUIT DESTINATION. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
21. CONTRACTOR RESPONSIBLE TO RESTORE ALL DISTURBED SURFACES AS PART OF THIS CONTRACT. COORDINATE FINAL REQUIREMENTS WITH THE OWNER AND ENGINEER. REFER TO TYPICAL DUCT BANK SECTION DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
22. CONTRACTOR TO COORDINATE FINAL DUCT BANK ROUTING/REQUIREMENTS WITH EXISTING FIELD CONDITIONS, PROPOSED WORK, OWNER AND ENGINEER PRIOR TO ROUGH-IN TO AVOID CONFLICTS.
23. REFER TO ELECTRICAL DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS. CLOSELY COORDINATE FINAL PENETRATION LOCATIONS/REQUIREMENTS WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER. TYPICAL.
24. (2)#18STP & (4)#14, 1"C
25. (64)#14, 1-1/2"C.
26. TEMPERATURE SENSOR TO BE PROVIDED AS OMEGA EWS-TX SERIES WALL MOUNT SENSOR, OR APPROVED EQUAL THRU BID ALLOWANCE #1. PROVIDE ELECTRICAL BOX, 24V OC POWER SUPPLY, CIRCUITRY (CONDUIT AND CONDUCTORS), WALL PLATE, AND MOUNTING BRACKETS AS REQUIRED FOR AN OVERALL COMPLETE AND OPERABLE ROOM TEMPERATURE SENSING DEVICE PER MANUFACTURER'S RECOMMENDATIONS. REFER TO SPECIFICATION SECTION 260912 CONTROL PANELS AND INTEGRATION FOR ADDITIONAL INFORMATION/REQUIREMENTS. PROVIDE LABEL PER SPECIFICATION SECTION 260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS.
27. PROVIDE CONDUIT BUSHING, FITTING, OR FLEX CONNECTION AS REQUIRED FOR PROPER CONNECTION OF DEVICE. ALL BUSHINGS, FITTINGS, OR FLEX CONNECTIONS TO BE SUITED FOR ENVIRONMENT INSTALLED WITHIN, INCLUDING BUT NOT LIMITED TO, HAZARDOUS ENVIRONMENTS, CORROSIVE ENVIRONMENTS, AND OUTDOOR INSTALLATIONS. COORDINATE WITH APPLICABLE CONTRACTOR AND EQUIPMENT MANUFACTURER. FLEX CONNECTION LENGTHS TO BE MINIMIZED TO GREATEST EXTENT POSSIBLE. TYPICAL.
28. CONTRACTOR TO PROVIDE JUNCTION/PULL BOXES FOR SPLICING, OR EXTENDING CIRCUITRY AS REQUIRED. PROVIDE NECESSARY TERMINAL STRIPS, OR SPLICE KITS WITHIN JUNCTION BOX TO EXTEND CIRCUITRY AS SHOWN. (NOTE, JUNCTION BOXES ARE NOT ALWAYS SHOWN ON FLOOR PLANS. CONTRACTOR TO FIELD LOCATE AS NECESSARY). JUNCTION BOXES ARE TO BE RATED FOR ENVIRONMENT INSTALLED, INCLUDING BUT NOT LIMITED TO HAZARDOUS ENVIRONMENTS, CORROSIVE ENVIRONMENTS, AND OUTDOOR INSTALLATIONS. CONTRACTOR TO FIELD VERIFY AND COORDINATE CONDUIT ARRANGEMENT ENTERING/LEAVING JUNCTION BOX AS REQUIRED. CONTRACTOR TO SIZE JUNCTION BOXES PER NEC ARTICLE 314. JUNCTION BOXES TO BE MANUFACTURED BY EATON, OR APPROVED EQUAL. TYPICAL OF ALL JUNCTION BOXES SHOWN ON THIS DRAWING.
29. RADAR LEVEL SENSOR TO BE PROVIDED AS VEGAPLUS 31, OR APPROVED EQUAL THRU BID ALLOWANCE. PROVIDE REQUIRED MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC... AND CIRCUITRY (CONDUIT AND CONDUCTORS) FOR AN OVERALL COMPLETE AND OPERABLE LIQUID LEVEL MEASURING SYSTEM. REFER TO SPECIFICATIONS SECTION 260912 CONTROL PANELS AND INTEGRATION FOR ADDITIONAL INFORMATION/REQUIREMENTS. PROVIDE LABEL PER SPECIFICATION SECTION 260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS. 1
30. ROOM INTERIOR IS A CORROSIVE ENVIRONMENT. ALL WIRING METHODS, EQUIPMENT, AND DEVICES WITHIN THIS SPACE ARE TO BE OF CORROSION RESISTANT MATERIALS/METHODS. ALL RACEWAY TO BE PVC COATED RGS BY PLASTI-BOND, OR APPROVED EQUAL. ALL MOUNTING HARDWARE, BRACKETS, SUPPORTS, CHANNELS, FITTINGS, CLAMPS, ETC... TO BE A CORROSION RESISTANT PRODUCT LINE AS MANUFACTURED BY POWER-STRUT DEFENDER, OR APPROVED EQUAL. SUBMIT PRODUCT DATA TO ENGINEER DURING SUBMITTAL PHASE FOR APPROVAL. REFER TO RACEWAY SCHEDULE FOR ADDITIONAL INFORMATION. UTILIZE NEMA 4X (NON-METALLIC) ENCLOSURES FOR ALL ELECTRICAL EQUIPMENT, SWITCHES, RECEPTACLES, DISCONNECTS, BOXES, ETC...
31. CONTRACTOR TO PROVIDE 125-VOLT, 2-POLE, 3-WIRE, 20-AMP, HEAVY DUTY, DUPLEX WEATHERPROOF RECEPTACLE EQUIPPED WITH INTEGRAL GROUND FAULT CIRCUIT INTERRUPTER (GFI) MOUNTED ADJACENT TO EQUIPMENT. PROVIDE ALL REQUIRED MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC...PROVIDE DEDICATED CIRCUIT FROM PROPOSED PANEL 'LVP1'. PROVIDE AS SWITCHED RECEPTACLE.
32. EQUIPMENT WHIP (CORD) AND PLUG PROVIDED BY EQUIPMENT MANUFACTURER. CONTRACTOR TO SUBSTITUTE HARD WIRED CONNECTION IN LIEU OF RECEPTACLE (CORD & PLUG) PER MANUFACTURERS RECOMMENDATIONS. COORDINATE FINAL REQUIREMENTS WITH EQUIPMENT MANUFACTURER, OWNER, AND ENGINEER. REFER TO EQUIPMENT CONNECTION SCHEDULE FOR ADDITIONAL INFORMATION/REQUIREMENTS.
33. FLOAT SWITCH TO BE PROVIDED AS SJE RHOMBUS MIL-AMP-MASTER, OR APPROVED EQUAL THRU BID ALLOWANCE. PROVIDE REQUIRED MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC... AND CIRCUITRY (CONDUIT AND CONDUCTORS) FOR AN OVERALL COMPLETE AND OPERABLE FLOAT SWITCH SYSTEM. REFER TO SPECIFICATIONS SECTION 260912 CONTROL PANELS AND INTEGRATION FOR ADDITIONAL INFORMATION/REQUIREMENTS. PROVIDE LABEL PER SPECIFICATION SECTION 260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS. 1
34. ROUTING AND ATTACHMENT METHODS OF ALL CONDUITS WITHIN STRUCTURE ARE TO BE CLOSELY COORDINATED WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER TO AVOID CONFLICTS. ALL RACEWAY TO BE PVC COATED RGS BY PLASTI-BOND, OR APPROVED EQUAL. ALL MOUNTING HARDWARE, BRACKETS, SUPPORTS, CHANNELS, FITTINGS, CLAMPS, ETC... TO BE A CORROSION RESISTANT PRODUCT LINE AS MANUFACTURED BY POWER-STRUT DEFENDER, OR APPROVED EQUAL. SUBMIT PRODUCT DATA TO ENGINEER DURING SUBMITTAL PHASE FOR APPROVAL. REFER TO RACEWAY SCHEDULE FOR ADDITIONAL INFORMATION.
35. SPARE 2"C.
36. (48)#14 & (8)#18STP, 2"C. 1

CONTROL DIAGRAMS ARE SCHEMATIC IN NATURE AND SHOWS ALL INTERCONNECTIONS. CONTRACTOR MAY GROUP POWER CIRCUITS INTO LARGER CONDUIT AND GROUP CONTROL CIRCUITS INTO SEPARATE LARGER CONDUIT. GROUPING OF CIRCUITS INTO LARGER CONDUITS MUST COMPLY WITH NEC FILL AND DERATING REQUIREMENTS. VFD INPUT & OUTPUT CONDUCTORS MUST BE RUN INDEPENDENT OF OTHER CONDUCTORS.

1 E-023 REMOTE I/O PANEL #1 RISER DIAGRAM
SCALE: NTS — MBR BUILDING

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JADE STONE ENGINEERING

HAZARDOUS MATERIAL NOTE:
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FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL RISER DIAGRAMS

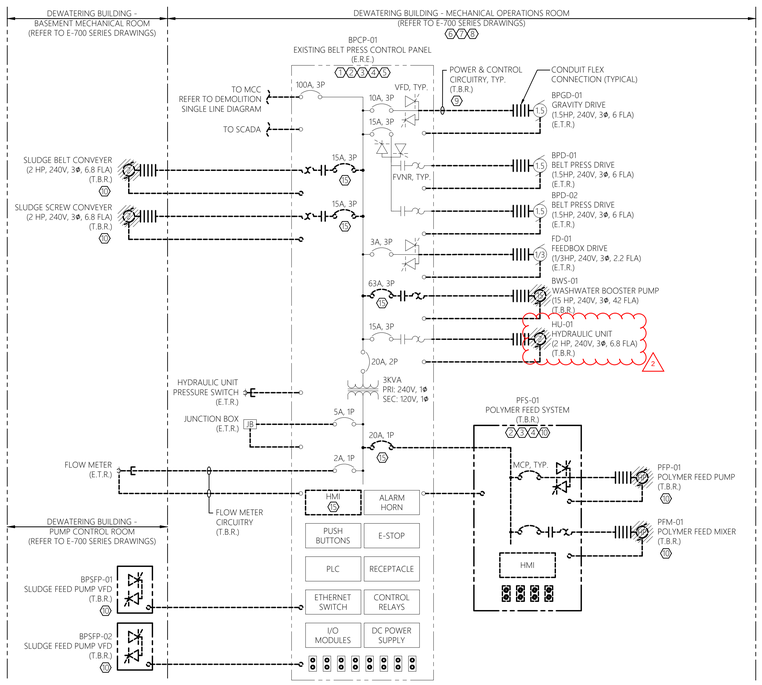
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2	BID ADDENDUM	07/10/2025
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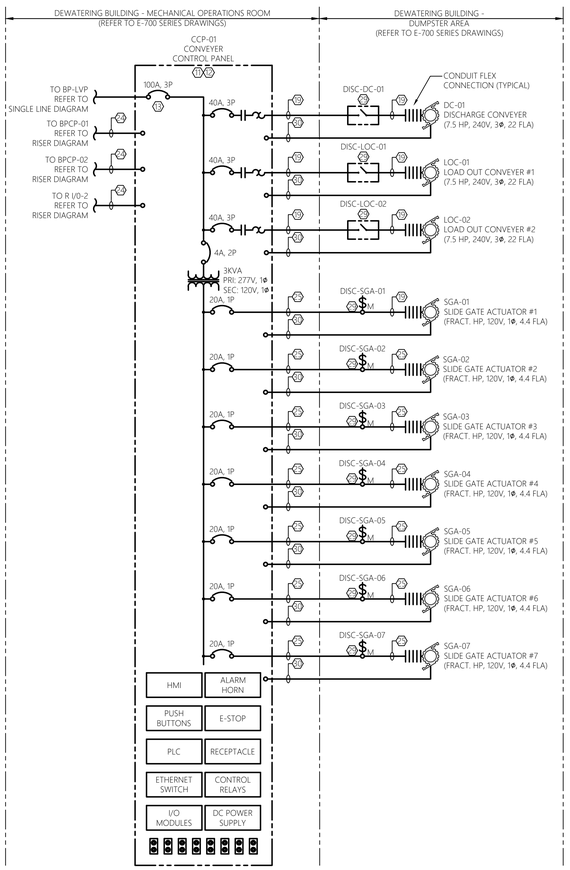
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E-023

PROJECT # 18-732 PHASE #



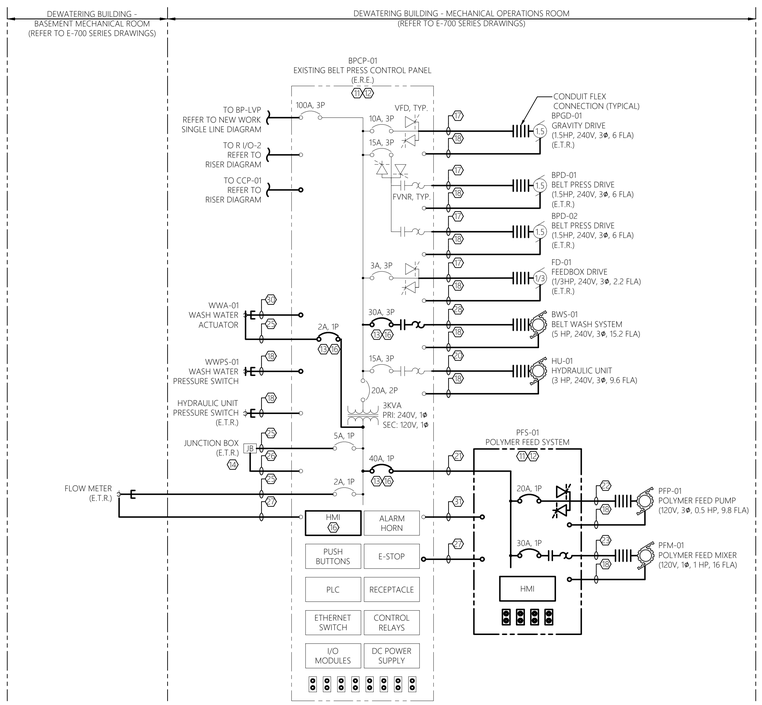
1 / E-028 — EXISTING BELT FILTER PRESS CONTROL PANEL RISER DIAGRAM - DEMOLITION

SCALE: NTS — DEWATERING BLDG



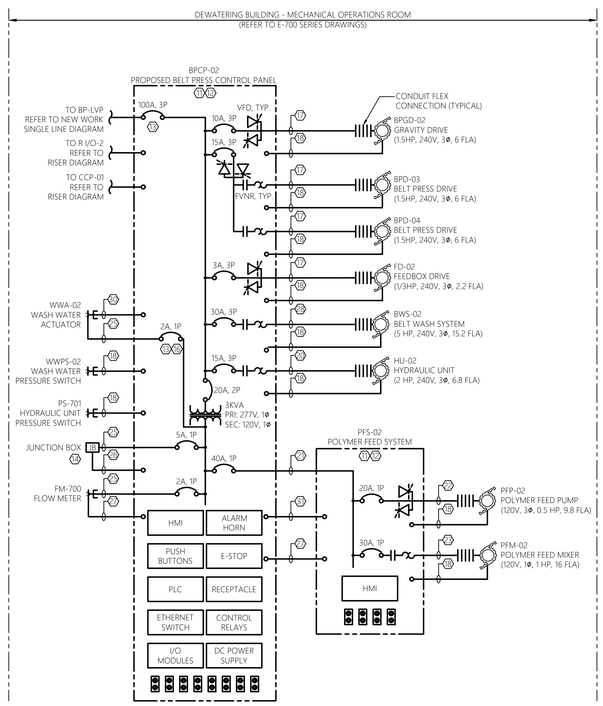
2 / E-028 — CONVEYER CONTROL PANEL RISER DIAGRAM

SCALE: NTS — DEWATERING BLDG



2 / E-028 — EXISTING BELT FILTER PRESS CONTROL PANEL RISER DIAGRAM - NEW WORK

SCALE: NTS — DEWATERING BLDG



4 / E-028 — PROPOSED BELT FILTER PRESS CONTROL PANEL RISER DIAGRAM

SCALE: NTS — DEWATERING BLDG

GENERAL SHEET NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE GROUNDING PER NEC FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT.
3. ALL CONDUCTORS NOT SHOWN FOR CLARITY. COORDINATE WITH OTHER TRADE CONTRACTORS AND PROVIDE COMPLETE ELECTRICAL CIRCUITING FOR ALL INSTALLED EQUIPMENT. ALL REQUIREMENTS TO BE PER NEC.
4. REFER TO FLOOR PLANS FOR GENERAL DEVICE/EQUIPMENT LOCATIONS. COORDINATE FINAL LOCATIONS WITH PROCESS MECHANICAL DRAWINGS. REFER TO SITE PLAN FOR DUCT BANK INFORMATION AS REQUIRED.
5. REFER TO SINGLE LINE DIAGRAMS, SPECIFICATIONS, AND SUBMITTAL DOCUMENTATION FOR ADDITIONAL INFORMATION/REQUIREMENTS.
6. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH OWNER ALL OTHER TRADE CONTRACTORS.
7. CIRCUITS SHOWN ARE POWER, CONTROL, INSTRUMENTATION, AND CONTROL CIRCUIT POWER. REFER TO SINGLE LINE DIAGRAMS, SCHEDULES, AND DETAILS FOR ADDITIONAL CIRCUITS.
8. ALL WIRING REQUIREMENTS INCLUDING BUT NOT LIMITED TO WIRE SIZE, TYPE, AND QUANTITY OF CONDUCTORS TO BE VERIFIED WITH EQUIPMENT MANUFACTURER.
9. QUANTITY OF CONDUCTORS CALLED FOR MAY INCLUDE SPARE CONDUCTORS. PROVIDE CONDUCTORS SHOWN OR MINIMUM NUMBER REQUIRED PER MANUFACTURERS WRITTEN INSTRUCTIONS. ALL REQUIREMENTS TO BE PER NEC.
10. CONTRACTOR TO PROVIDE ARC FLASH WARNING LABELS FOR ALL NEW OR MODIFIED ELECTRICAL EQUIPMENT. REFER TO SPECIFICATIONS FOR REQUIREMENTS.
11. REFER TO ELECTRICAL DETAIL SHEETS AND SCHEDULE SHEETS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
12. CONTRACTOR TO COORDINATE MOUNTING LOCATIONS OF ALL PANELS WITH OWNER AND ALL OTHER TRADE CONTRACTORS. PROVIDE ALL NECESSARY MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC..
13. PROVIDE INTRINSICALLY SAFE BARRIERS AS REQUIRED INTERNAL TO CONTROL PANELS. ALL REQUIREMENTS TO BE PER NEC.
14. NOT ALL REQUIRED CLASSIFIED SPACE WIRING METHODS INCLUDING, BUT NOT LIMITED TO SEAL-OFFS MAY BE SHOWN. PROVIDE WIRING METHODS PER NEC (LATEST EDITION). PROVIDE CONDUIT UNION WITHIN 6" OF EACH SEAL-OFF AT CONTROL PANELS, DISTRIBUTION PANELS, VFDS, STARTERS, DISCONNECTS, OR SOURCE OF SUPPLY WHERE FEASIBLE.
15. NOT ALL REQUIRED THRU-WALL, WATERTIGHT, CONDUIT PENETRATIONS SHOWN FOR CLARITY. CONTRACTOR TO PROVIDE A THRU-WALL WATERTIGHT, CONDUIT PENETRATION FOR ALL CONDUIT PENETRATIONS WITHIN BUILDING INTERIOR/EXTERIOR WALLS AND FLOORS. REFER TO ELECTRICAL DETAILS FOR ADDITIONAL INFORMATION. COORDINATE WITH OWNER AND ALL OTHER TRADE CONTRACTORS PRIOR TO ROUGH-IN
16. CONTRACTOR TO COORDINATE ALL CONDUIT PENETRATIONS AND CONDUIT ROUTING WITH ALL OTHER TRADE CONTRACTORS AND OWNER PRIOR TO ROUGH-IN.
17. ALL CONDUCTORS TO BE COPPER AND CONTAIN XHHW INSULATION.
18. ALL CONTROL/COMMUNICATION WIRING REQUIREMENTS INCLUDING BUT NOT LIMITED TO WIRE SIZE, TYPE, AND QUANTITY OF CONDUCTORS TO BE VERIFIED WITH EQUIPMENT MANUFACTURER.
19. ALL PROPOSED EQUIPMENT LOCATIONS/INSTALLATIONS TO COMPLY WITH NEC ARTICLE 110.26 'SPACES ABOUT ELECTRICAL EQUIPMENT'.

SHEET KEY NOTES:

1. CONTRACTOR TO DISCONNECT FROM POWER SOURCE AND ALL CONNECTED EQUIPMENT, MAKE ELECTRICALLY SAFE, AND RELOCATE EXISTING BELT PRESS CONTROL PANEL "BPCP-01" AS SHOWN ON E-700 SERIES DRAWINGS. EQUIPMENT TO BE REMOVED IS TO BECOME PROPERTY OF THE CONTRACTOR AND REMOVED FROM THE SITE IN ITS ENTIRETY. OWNER HAS THE RIGHT TO MAINTAIN ANY EQUIPMENT, COMPONENTS, DEVICES, CONTROLS, ETC... SCHEDULED FOR REMOVAL. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION AND COORDINATE FINAL REQUIREMENTS WITH APPLICABLE TRADE CONTRACTOR, OWNER, BELT PRESS CONTROL PANEL MANUFACTURE, AND ENGINEER.
2. NOT ALL ASSOCIATED CONTROLS, STARTERS, DISCONNECTS & CIRCUITRY MAY BE SHOWN FOR CLARITY. CONTRACTOR TO FIELD VERIFY AND COMPLETELY REMOVE ALL ASSOCIATED CONTROLS, STARTERS, DISCONNECTS, CONTROLS, CONTROLS CIRCUITRY (CONDUIT & CONDUCTORS), ALL MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC... ASSOCIATED WITH EQUIPMENT/CIRCUITING SCHEDULED FOR REMOVAL. COORDINATE FINAL REQUIREMENTS WITH APPLICABLE TRADE CONTRACTOR, OWNER, BELT PRESS CONTROL PANEL MANUFACTURE, AND ENGINEER.
3. NOT ALL INTERNAL COMPONENTS SHOWN FOR CLARITY. DIAGRAM IS INTENDED TO SHOW ALL REQUIRED FIELD CIRCUITING AND EQUIPMENT TO BE REMOVED AS REQUIRED BY THE CONTRACTOR. CONTRACTOR TO REMOVE ANY EXISTING CIRCUITING ASSOCIATED WITH THE BELT PRESS SYSTEM. CLOSELY COORDINATE ALL REQUIREMENTS WITH APPLICABLE TRADE CONTRACTOR, OWNER, BELT PRESS CONTROL PANEL MANUFACTURE, AND ENGINEER.
4. REFER TO ELECTRICAL DEMOLITION PLANS, SCHEDULES AND DETAILS FOR ADDITIONAL DEMOLITION INFORMATION/REQUIREMENTS. CONTRACTOR TO COORDINATE ALL EQUIPMENT/CIRCUITING SCHEDULED FOR REMOVAL AND FINAL SEQUENCE OF REMOVAL REQUIREMENTS WITH APPLICABLE TRADE CONTRACTOR, OWNER, BELT PRESS CONTROL PANEL MANUFACTURE, AND ENGINEER PRIOR TO COMMENCEMENT OF DEMOLITION. CONTRACTOR TO FIELD VERIFY AND PROVIDE AS REQUIRED.
5. FOR EXISTING TO REMAIN EQUIPMENT, CONTRACTOR TO DISCONNECT, MAKE ELECTRICALLY SAFE, AND LABEL TO BE RECONNECTED AS SHOW ON NEW WORK.
6. WWTP IS TO BE OPERATIONAL AT ALL TIMES. PROVIDE TEMPORARY POWER PROVISIONS AS REQUIRED TO FACILITATE WWTP OPERATION DURING ELECTRICAL DEMOLITION AND INSTALLATION. PROVIDE ALL NECESSARY EQUIPMENT, DEVICES, CABLING, ETC... AS REQUIRED FOR AN OVERALL COMPLETE AND OPERABLE TEMPORARY POWER SYSTEM. CONTRACTOR TO MINIMIZE DOWN TIMES TO THE GREATEST EXTENT POSSIBLE. COORDINATE ALL REQUIREMENTS WITH APPLICABLE TRADE CONTRACTOR, OWNER, AND ENGINEER. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION REGARDING TEMPORARY POWER.
7. CONTRACTOR TO PROVIDE TEMPORARY POWER PLAN IN WRITING TO ENGINEER FOR APPROVAL PRIOR TO PERFORMING ELECTRICAL SERVICE DISRUPTIONS.
8. CONTRACTOR TO NOT COMMENCE ELECTRICAL DEMOLITION UNTIL TEMPORARY POWER PROVISIONS HAVE BEEN ESTABLISHED AND APPROVED BY THE ENGINEER. NOTE, IT IS THE INTENTION THAT THE NEW ELECTRICAL SERVICE BE INSTALLED, TESTED, AND OPERATIONAL BEFORE THE EXISTING ELECTRICAL SERVICE BE REMOVED.
9. CONTRACTOR TO REMOVE ALL POWER AND CONTROL CIRCUITRY (CONDUIT AND CONDUCTORS) IN IT'S ENTIRETY AS SHOWN. CONTRACTOR TO FIELD VERIFY.
10. CONTRACTOR TO DISCONNECT/REMOVE ALL POWER AND CONTROL CIRCUITRY (CONDUIT & CONDUCTORS) IN ITS ENTIRETY BACK TO SOURCE AS WELL AS DEMOLISH ASSOCIATED JUNCTION BOXES, DISCONNECTS, STARTERS, ASSOCIATED CONTROL DEVICES, ALL MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC... ALL ITEMS REMOVED TO BECOME PROPERTY OF THE CONTRACTOR AND REMOVED FROM THE PROJECT SITE. CONTRACTOR TO FIELD VERIFY.
11. NOT ALL INTERNAL COMPONENTS SHOWN FOR CLARITY. DIAGRAM IS INTENDED TO SHOW ALL REQUIRED FIELD CIRCUITING AND TERMINATION REQUIRED BY THE CONTRACTOR. REFERENCE SUBMITTAL DOCUMENTATION FOR ALL PANEL INTERNAL COMPONENTS. CONTRACTOR TO PROVIDE ADDITIONAL INTERNAL COMPONENTS, CONTACTS, AND JUMPERS PER CONTROL PANEL MANUFACTURERS RECOMMENDATIONS FOR AN OVERALL COMPLETE AND OPERABLE SYSTEM. CLOSELY COORDINATE ALL REQUIREMENTS WITH ALL OTHER TRADE CONTRACTORS AND PANEL MANUFACTURE.
12. CONTROL PANEL AND ALL INTERNAL COMPONENTS (IF NOT EXISTING) ARE BY TO BE PROVIDED BY THE CONTRACTOR. CONTRACTOR IS RESPONSIBLE FOR ALL FIELD WIRING BETWEEN DEVICES, AND MOUNTING/INSTALLATION OF PANEL AS SHOWN/INDICATED. REFER TO SUBMITTAL DOCUMENTATION AND COORDINATE WITH APPLICABLE TRADE CONTRACTOR, OWNER, CONTROL PANEL MANUFACTURE, AND ENGINEER TO PROVIDE COMPLETE SYSTEM FIELD CIRCUITRY AND TERMINATIONS AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
13. DISCONNECT SIZE SHOWN FOR BIDDING PURPOSES ONLY. COORDINATE DISCONNECT SIZE WITH EQUIPMENT MANUFACTURERS RECOMMENDATIONS. COORDINATE CONDUCTOR/CONDUIT SIZE WITH MANUFACTURERS RECOMMENDED DISCONNECT SIZE. ALL REQUIREMENTS TO BE PER NEC. TYPICAL.
14. COORDINATE TERMINATIONS OF CIRCUITRY AT BELT PRESS MANUFACTURE PROVIDED (IF NOT EXISTING) JUNCTION BOX CLOSELY WITH MANUFACTURER & OTHER TRADE CONTRACTORS.
15. COMPONENT INTERNAL TO CONTROL PANEL IS TO BE REMOVED BY BELT PRESS CONTROL PANEL MANUFACTURE. NOT ALL PROPOSED COMPONENTS INTERNAL TO CONTROL PANEL MAY BE SHOWN FOR CLARITY. COORDINATE WITH BELT PRESS CONTROL PANEL MANUFACTURE AS NEEDED.
16. COMPONENT INTERNAL TO CONTROL PANEL IS TO BE INSTALLED BY BELT PRESS CONTROL PANEL MANUFACTURE. NOT ALL PROPOSED COMPONENTS INTERNAL TO CONTROL PANEL MAY BE SHOWN FOR CLARITY. COORDINATE WITH BELT PRESS CONTROL PANEL MANUFACTURE AS NEEDED.
17. (3)#12 & #12G, 3/4"C. PROVIDE AS VFD SHIELDED CABLE. CONDUIT SIZE IS LISTED AS MINIMUM, PROVIDE LARGER DIAMETER AS REQUIRED PER MANUFACTURER. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION. ALL REQUIREMENTS TO BE PER NEC.
18. (4)#14, 3/4"C.
19. (3)#8 & #10G, 1"C.
20. (3)#12 & #12G, 3/4"C.
21. (2)#8 & #10G, 3/4"C.
22. (2)#12 & #12G, 3/4"C. PROVIDE AS VFD SHIELDED CABLE. CONDUIT SIZE IS LISTED AS MINIMUM, PROVIDE LARGER DIAMETER AS REQUIRED PER MANUFACTURER. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION. ALL REQUIREMENTS TO BE PER NEC.
23. (2)#10 & #10G, 3/4"C.
24. (1) CAT 6A PREMIUM ETHERNET CABLE, 1"C. PROVIDE AS PLENUM RATED WITH 4 BONDED PAIRS. TO BE BELDEN #3633 OR APPROVED EQUAL.
25. (2)#12 & #12G, 3/4"C.
26. (20)#14, 1"C.
27. (2)#18STP, 3/4"C.
28. (3)#10 & #10G, 3/4"C.
29. REFER TO EQUIPMENT CONNECTION SCHEDULE FOR ADDITIONAL INFORMATION/REQUIREMENTS. TYPICAL.
30. (6)#14, 3/4"C.
31. (10)#14, 3/4"C.

CONTROL DIAGRAMS ARE SCHEMATIC IN NATURE AND SHOWS ALL INTERCONNECTIONS. CONTRACTOR MAY GROUP POWER CIRCUITS INTO LARGER CONDUIT AND GROUP CONTROL CIRCUITS INTO SEPARATE LARGER CONDUIT. GROUPING OF CIRCUITS INTO LARGER CONDUITS MUST COMPLY WITH NEC FILL AND DERATING REQUIREMENTS. VFD INPUT & OUTPUT CONDUCTORS MUST BE RUN INDEPENDENT OF OTHER CONDUCTORS.

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JSE JADE STONE ENGINEERING

STATE OF NEW YORK — JEFFREY E. ROBINSON — 095896 — LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:

THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE CALL 811

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL RISER DIAGRAMS

REVISIONS

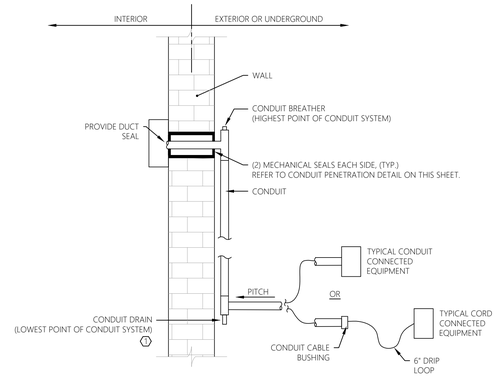
NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

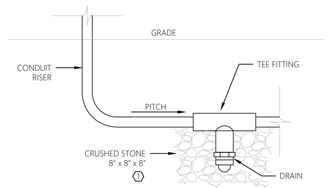
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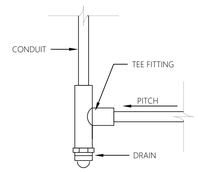
PROJECT # 18-732 — PHASE #



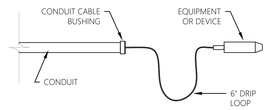
DRAIN ABOVE GRADE



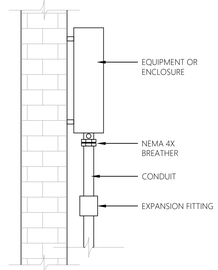
DRAIN BELOW GRADE



DRAIN ABOVE GRADE



CORD/CABLE CONNECTED EQUIPMENT



CONDUIT CONNECTED EQUIPMENT

GENERAL NOTES:

1. ALL CONDUIT SYSTEMS EXPOSED TO TEMPERATURE DIFFERENTIALS, IN POTENTIAL CONDENSING ATMOSPHERES, EXTERIOR INSTALLED, OR INSTALLED UNDERGROUND SHALL HAVE PROVISIONS FOR DRAINING WATER OUT OF CONDUIT SYSTEMS. PROVIDE DRAIN IN CONDUIT SYSTEMS AT LOW POINTS, LOW POINT SHALL NOT BE AT EQUIPMENT OR DEVICE. A BREATHER SHALL BE PROVIDED AT THE HIGH POINT OF THE SYSTEM.
2. ALL DRAIN FITTINGS TO BE STAINLESS STEEL AND ALL TEE FITTINGS TO BE OF RIGID GALVANIZED STEEL MATERIAL.
3. CONDENSATION PREVENTION - WHERE CONDUITS CROSS BARRIERS BETWEEN AREAS OF POTENTIAL SUBSTANTIAL TEMPERATURE DIFFERENTIAL, PROVIDE SEALING FITTING OR APPROVED SEALING COMPOUND AT AN ACCESSIBLE POINT NEAR THE PENETRATION TO PREVENT CONDENSATION. THIS INCLUDES, BUT IS NOT LIMITED TO:
   3.1. WHERE CONDUITS PASS FROM OUTDOORS INTO CONDITIONED INTERIOR SPACES.
   3.2. WHERE CONDUITS PASS FROM UNCONDITIONED INTERIOR SPACES INTO CONDITIONED INTERIOR SPACES.
4. CONTRACTOR TO FIELD VERIFY ALL UNDERGROUND CONDUIT DRAINS AND COORDINATE WITH THE OWNER/ENGINEER. ELEVATIONS TO BE COORDINATED SO THAT CONDUIT SYSTEMS DO NOT DRAIN TO EQUIPMENT/BUILDINGS.

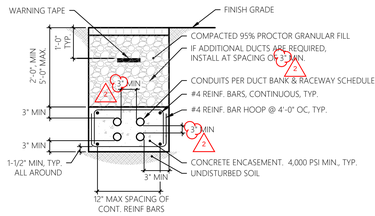
KEY NOTES:

1 PROVIDE CRUSHED STONE (MIN. 8" x 8" x 8") WHERE LOWEST POINT IS LOCATED BENEATH GRADE.

1 E-030 SCALE: NTS — TYPICAL CONDUIT DRAIN DETAILS

GENERAL NOTES:

1. COORDINATE DUCT BANK REQUIREMENTS (IF ANY) FOR NEW SERVICE WITH THE UTILITY.
2. POWER AND CONTROL CONDUITS TO HAVE SEPARATION OF 6" MINIMUM
3. DETAIL IS TYPICAL AND MAY REFLECT CONDUITS NOT REQUIRED FOR PROJECT.
4. FINISHED SURFACE TO MATCH SURFACE BEING DISTURBED.
   - IN AREA OF GRASS: USE 4" TOP SOIL & SEEDING, AND COVER WITH MULCH.
   - IN ROADWAY OR NON-GRASS: USE COMPACTED 95% PROCTOR GRANULAR FILL.
5. CONTRACTOR TO UTILIZE CONDUIT SPACERS FOR ALL DUCT BANKS, NOT SHOWN ON DETAIL FOR CLARITY.



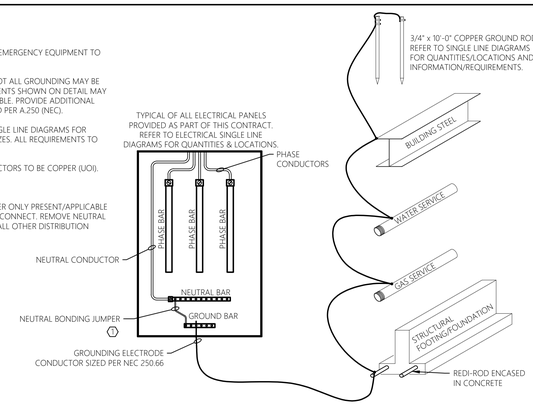
2 E-030 SCALE: NTS — TYPICAL REINFORCED CONCRETE DUCT BANK SECTION DETAIL

GENERAL NOTES:

1. BOND ALL NORMAL AND EMERGENCY EQUIPMENT TO GROUND SYSTEM.
2. DETAIL IS TYPICAL AND NOT ALL GROUNDING MAY BE SHOWN. SOME COMPONENTS SHOWN ON DETAIL MAY NOT BE PRESENT/APPLICABLE. PROVIDE ADDITIONAL GROUNDING AS REQUIRED PER A.250 (NEC).
3. REFER TO ELECTRICAL SINGLE LINE DIAGRAMS FOR GROUND CONDUCTOR SIZES. ALL REQUIREMENTS TO BE PER NEC.
4. ALL GROUNDING CONDUCTORS TO BE COPPER (UOI).

KEY NOTES:

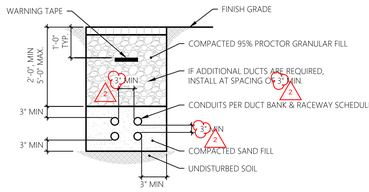
1. NEUTRAL BONDING JUMPER ONLY PRESENT/APPLICABLE WITHIN MAIN SERVICE DISCONNECT. REMOVE NEUTRAL BONDING JUMPER FROM ALL OTHER DISTRIBUTION PANELS.



3 E-030 SCALE: NTS — TYPICAL PANEL GROUNDING DETAIL

GENERAL NOTES:

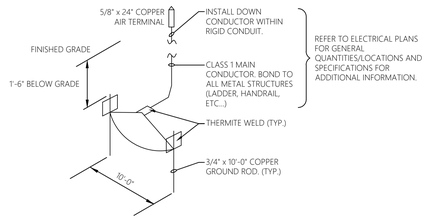
1. COORDINATE DUCT BANK REQUIREMENTS (IF ANY) FOR NEW SERVICE WITH THE UTILITY.
2. POWER AND COMMUNICATION CONDUITS TO HAVE SEPARATION OF 6" MINIMUM
3. DETAIL IS TYPICAL AND MAY REFLECT CONDUITS NOT REQUIRED FOR PROJECT.
4. FINISHED SURFACE TO MATCH SURFACE BEING DISTURBED.
   - IN AREA OF GRASS: USE 4" TOP SOIL & SEEDING, AND COVER WITH MULCH.
   - IN ROADWAY OR NON-GRASS: USE COMPACTED 95% PROCTOR GRANULAR FILL.
5. CONTRACTOR TO UTILIZE CONDUIT SPACERS FOR ALL DUCT BANKS, NOT SHOWN ON DETAIL FOR CLARITY.



4 E-030 SCALE: NTS — TYPICAL SAND FILL DUCT BANK SECTION DETAIL

GENERAL NOTES:

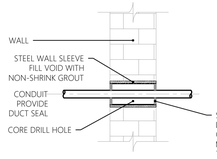
1. REFER TO ELECTRICAL PLANS FOR GENERAL QUANTITIES/LOCATIONS. COORDINATE FINAL QUANTITIES/LOCATIONS WITH OWNER, ENGINEER, AND EQUIPMENT MANUFACTURER.
2. BOND ALL NORMAL AND EMERGENCY EQUIPMENT TO GROUND SYSTEM.
3. DETAIL IS TYPICAL AND NOT ALL GROUNDING MAY BE SHOWN. SOME COMPONENTS SHOWN ON DETAIL MAY NOT BE PRESENT/APPLICABLE. PROVIDE ADDITIONAL GROUNDING AS REQUIRED PER A.250 (NEC).
4. ALL GROUND CONDUCTORS SHALL BE IN ACCORDANCE WITH THE NEC.
5. INSTALL AIR TERMINAL/DOWN CONDUCTOR PER MANUFACTURERS RECOMMENDATIONS.
6. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS.



5 E-030 SCALE: NTS — TYPICAL LIGHTNING PROTECTION GROUNDING DETAIL

GENERAL NOTES:

1. ALL CONDUIT MOVEMENT PROVISIONS - WHERE CONDUITS ARE SUBJECT TO MOVEMENT, PROVIDE EXPANSION AND EXPANSION/DEFLECTIONS FITTINGS TO PREVENT DAMAGE TO ENCLOSED CONDUCTORS OR CONNECTED EQUIPMENT. THIS INCLUDES, BUT IS NOT LIMITED TO:
   1.1. WHERE CONDUITS CROSS STRUCTURAL JOINTS INTENDED FOR EXPANSION, CONTRACTION, OR DEFLECTION.
   1.2. WHERE CONDUITS ARE SUBJECT TO EARTH MOVEMENT BY SETTLEMENT OR FROST.
3. CONDENSATION PREVENTION - WHERE CONDUITS CROSS BARRIERS BETWEEN AREAS OF POTENTIAL SUBSTANTIAL TEMPERATURE DIFFERENTIAL, PROVIDE SEALING FITTING OR APPROVED SEALING COMPOUND AT AN ACCESSIBLE POINT NEAR THE PENETRATION TO PREVENT CONDENSATION. THIS INCLUDES, BUT IS NOT LIMITED TO:
   3.1. WHERE CONDUITS PASS FROM OUTDOORS INTO CONDITIONED INTERIOR SPACES.
   3.2. WHERE CONDUITS PASS FROM UNCONDITIONED INTERIOR SPACES INTO CONDITIONED INTERIOR SPACES.

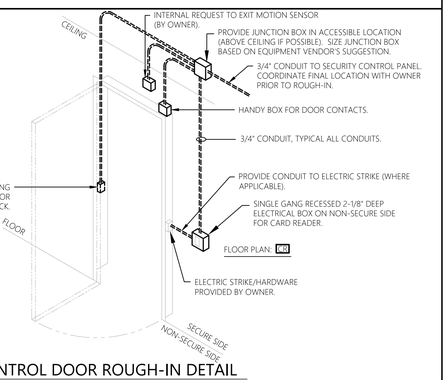


TYPICAL BLOCK/BRICK/CAST-IN PLACE CONDUIT PENETRATION DETAIL

6 E-030 SCALE: NTS

CARD ACCESS CONTROL PROJECT REQUIREMENTS:

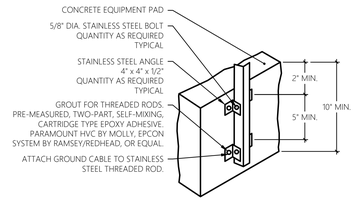
1. GENERIC ROUGH-IN REQUIREMENTS ARE ILLUSTRATED IN THE ADJACENT DETAIL. CONTRACTOR SHALL COORDINATE WITH OWNER TO PROVIDE ACTUAL ROUGH-IN REQUIRED FOR EACH SPECIFIC DOOR INSTALLATION. THIS DETAIL IS NOT INTENDED TO SHOW ALL CONDITIONS/INSTALLATION REQUIREMENTS.
2. ACCESS CONTROL SYSTEM AND ASSOCIATED EQUIPMENT, CABLING, COMPONENTS, AND DEVICES ARE PROVIDED BY THE OWNER. THIS CONTRACT TO PROVIDE ALL REQUIRED RACEWAY AND BOXES FOR AN OVERALL COMPLETE AND OPERABLE SYSTEM. COORDINATE FINAL REQUIREMENTS CLOSELY WITH THE OWNER.



7 E-030 SCALE: NTS — TYPICAL ACCESS CONTROL DOOR ROUGH-IN DETAIL

GENERAL NOTES

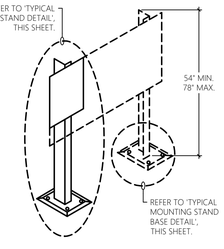
EQUIPMENT/ENCLOSURES LARGER THAN 4" x 4" SHALL BE INSTALLED ON A 1/4" THICK STAINLESS STEEL MOUNTING PLATE. TWO POSTS ARE REQUIRED FOR EQUIPMENT/ENCLOSURES WIDER THAN 8". MOUNTING PLATE SHALL BE 2" GREATER ON EACH SIDE THAN DIMENSION OF EQUIPMENT/ENCLOSURE TO BE MOUNTED. ROUND AND GRIND ALL CORNERS AND EDGES OF PLATE. FASTEN EQUIPMENT/ENCLOSURE TO PLATE AND FASTEN PLATE TO SUPPORT ANGLES WITH 3/8" STAINLESS STEEL FASTENERS. QUANTITY AS REQUIRED. PROVIDE #6 GROUND TO GROUND GRID.



SIDE MOUNTED ON CONCRETE EQUIPMENT PAD

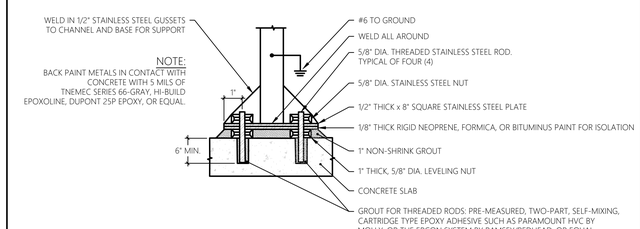
GENERAL NOTES:

1. BACK PAINT METALS IN CONTACT WITH CONCRETE WITH 5 MILS OF TNEMEC SETIES 66-GRAY, HIGH BUILD EPOXOLINE, DUPONT 25P EPOXY, OR EQUAL.
2. ALL MOUNTING HARDWARE TO BE STAINLESS STEEL.
3. COORDINATE REQUIREMENTS CLOSELY WITH OWNER, ENGINEER, AND APPLICABLE TRADE CONTRACTOR.



FREE STANDING

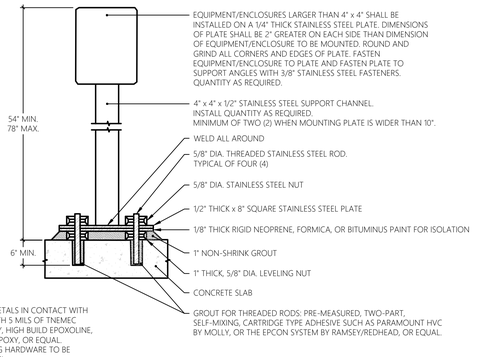
8 E-030 SCALE: NTS — TYPICAL MOUNTING STAND INSTALLATION DETAIL



GENERAL NOTES:

1. BACK PAINT METALS IN CONTACT WITH CONCRETE WITH 5 MILS OF TNEMEC SETIES 66-GRAY, HIGH BUILD EPOXOLINE, DUPONT 25P EPOXY, OR EQUAL.
2. ALL MOUNTING HARDWARE TO BE STAINLESS STEEL.
3. COORDINATE REQUIREMENTS CLOSELY WITH OWNER, ENGINEER, AND APPLICABLE TRADE CONTRACTOR.

9 E-030 SCALE: NTS — TYPICAL MOUNTING STAND BASE DETAIL



GENERAL NOTES:

1. BACK PAINT METALS IN CONTACT WITH CONCRETE WITH 5 MILS OF TNEMEC SETIES 66-GRAY, HIGH BUILD EPOXOLINE, DUPONT 25P EPOXY, OR EQUAL.
2. ALL MOUNTING HARDWARE TO BE STAINLESS STEEL.
3. COORDINATE REQUIREMENTS CLOSELY WITH OWNER, ENGINEER, AND APPLICABLE TRADE CONTRACTOR.

10 E-030 SCALE: NTS — TYPICAL MOUNTING STAND DETAIL

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK — JEFFREY E ROBINSON — 095896 — LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:
THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE CALL 811

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL DETAILS

REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

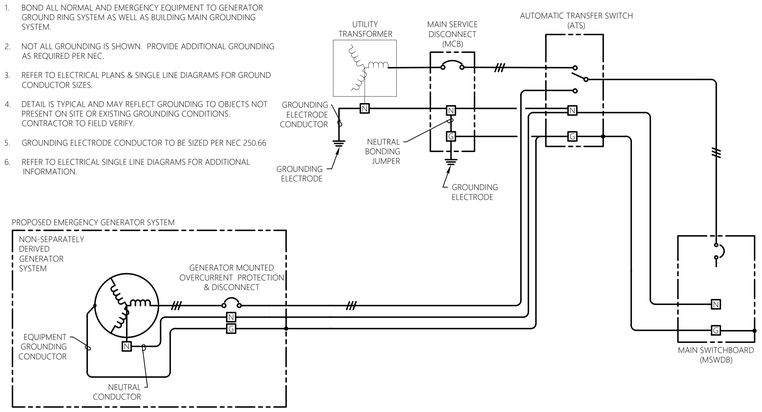
ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.
E-030

PROJECT # 18-732 PHASE #

GENERAL NOTES:

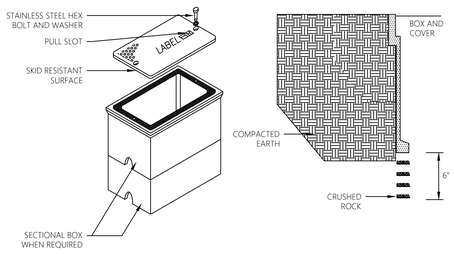
1. BOND ALL NORMAL AND EMERGENCY EQUIPMENT TO GENERATOR GROUND RING SYSTEM AS WELL AS BUILDING MAIN GROUNDING SYSTEM.
2. NOT ALL GROUNDING IS SHOWN. PROVIDE ADDITIONAL GROUNDING AS REQUIRED PER NEC.
3. REFER TO ELECTRICAL PLANS & SINGLE LINE DIAGRAMS FOR GROUND CONDUCTOR SIZES.
4. DETAIL IS TYPICAL AND MAY REFLECT GROUNDING TO OBJECTS NOT PRESENT ON SITE OR EXISTING GROUNDING CONDITIONS. CONTRACTOR TO FIELD VERIFY.
5. GROUNDING ELECTRODE CONDUCTOR TO BE SIZED PER NEC 250.66
6. REFER TO ELECTRICAL SINGLE LINE DIAGRAMS FOR ADDITIONAL INFORMATION.



1 E-031 SCALE: NTS — TYPICAL NON-SEPERATELY DERIVED GENERATOR SYSTEM DETAIL

GENERAL NOTES:

1. CONSTRUCTION SHALL BE A POLYMER CONCRETE.
2. HAND HOLE TO HAVE A MINIMUM TIER 15 RATING.
3. ALL HARDWARE SHALL BE STAINLESS STEEL. PROVIDE SLEEVES AND SEALS FOR ALL PENETRATIONS.
4. BOTTOM SHALL BE OPEN FOR DRAINAGE.
5. PROVIDE LOGO ON COVER 'ELECTRIC', OR 'COMMUNICATIONS'. COVER TO BE SECURED WITH STAINLESS STEEL PENTA BOLTS AND BE GASKETED.
6. HAND HOLES MUST MEET ALL APPLICABLE REQUIREMENTS OF ANSI/SCTE 77-2013 PER TIER 15 (2)
7. PROVIDE HAND HOLE AS 60" x 60" x 60". HAND HOLES SHALL MEET MINIMUM SIZE REQUIREMENTS IN ACCORDANCE WITH NEC ARTICLE 314.30. CONTRACTOR TO FIELD VERIFY.
8. PROVIDE AS SPLIT HANDHOLE SEPARATING VOLTAGE, OR SIGNAL TYPE.
9. HAND HOLE TO BE AS MANUFACTURED BY QUAZITE (HUBBELL POWER SYSTEMS), OLDCASTLE, OR APPROVED EQUAL.
10. PROVIDE HEAVY DUTY FIBERGLASS CABLE RACKS AND SUPPORTS ON EACH INTERIOR WALL OF HANDHOLE.

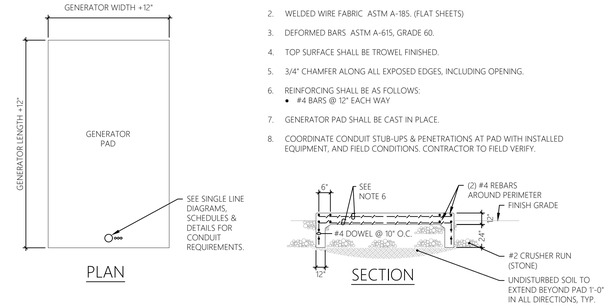


2 E-031 SCALE: NTS — TYPICAL HANDHOLE DETAIL

REFER TO SHEET C-142 FOR CONCRETE BOLLARD DETAIL 2

GENERAL NOTES:

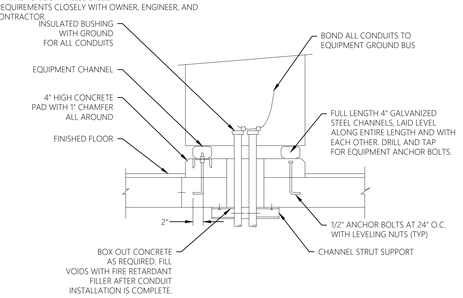
1. CONCRETE 4,000 PSI @ 28 DAYS.
2. WELDED WIRE FABRIC ASTM A-185. (FLAT SHEETS)
3. DEFORMED BARS ASTM A-615, GRADE 60.
4. TOP SURFACE SHALL BE TROWEL FINISHED.
5. 3/4" CHAMFER ALONG ALL EXPOSED EDGES, INCLUDING OPENING.
6. REINFORCING SHALL BE AS FOLLOWS:
   - #4 BARS @ 12" EACH WAY
7. GENERATOR PAD SHALL BE CAST IN PLACE.
8. COORDINATE CONDUIT STUB-UPS & PENETRATIONS AT PAD WITH INSTALLED EQUIPMENT, AND FIELD CONDITIONS. CONTRACTOR TO FIELD VERIFY.



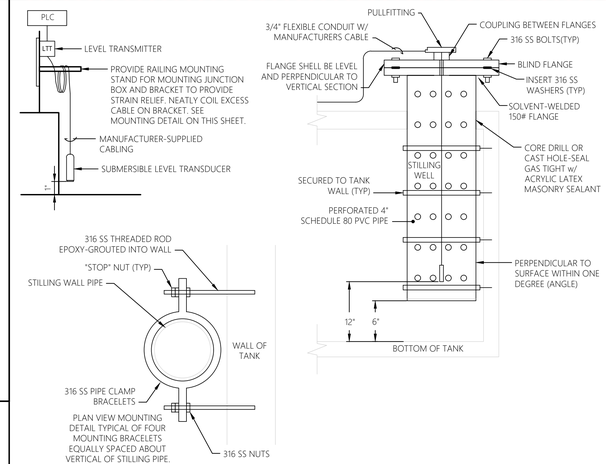
4 E-031 SCALE: NTS — TYPICAL GENERATOR PAD DETAIL

GENERAL NOTES:

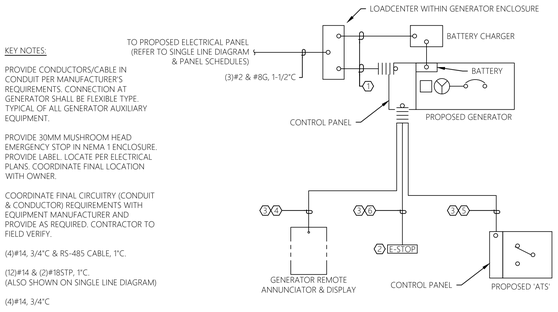
1. BACK PAINT METALS IN CONTACT WITH CONCRETE WITH 5 MILS OF TNEMEC SERIES 66-GRAY, HIGH BUILD EPOXOLINE, DUPONT 25P EPOXY, OR EQUAL.
2. ALL MOUNTING HARDWARE TO BE STAINLESS STEEL.
3. COORDINATE FINAL REQUIREMENTS CLOSELY WITH OWNER, ENGINEER, AND APPLICABLE TRADE CONTRACTOR.



5 E-031 SCALE: NTS — TYPICAL MOTOR CONTROL CENTER EQUIPMENT PAD DETAIL



6 E-031 SCALE: NTS — SUBMERSIBLE LEVEL TRANSDUCER WIRING DETAIL



KEY NOTES:

1. PROVIDE CONDUCTORS/CABLE IN CONDUIT PER MANUFACTURER'S REQUIREMENTS. CONNECTION AT GENERATOR SHALL BE FLEXIBLE TYPE. TYPICAL OF ALL GENERATOR AUXILIARY EQUIPMENT.
2. PROVIDE 30MM MUSHROOM HEAD EMERGENCY STOP IN NEMA 1 ENCLOSURE. PROVIDE LABEL. LOCATE PER ELECTRICAL PLANS. COORDINATE FINAL LOCATION WITH OWNER.
3. COORDINATE FINAL CIRCUITRY (CONDUIT & CONDUCTOR) REQUIREMENTS WITH EQUIPMENT MANUFACTURER AND PROVIDE AS REQUIRED. CONTRACTOR TO FIELD VERIFY.
4. (4)#14, 3/4"C & RS-485 CABLE, 1"C.
5. (12)#14 & (2)#18STP, 1"C. (ALSO SHOWN ON SINGLE LINE DIAGRAM)
6. (4)#14, 3/4"C

TYPICAL GENERATOR CONTROL AND AUXILIARY EQUIPMENT RISER DIAGRAM

7 E-031 SCALE: NTS

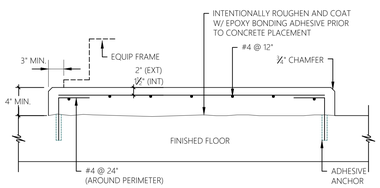
GENERAL NOTES:

1. BACKBOARD TO BE FABRICATED/CONSTRUCTED OF STEEL MATERIALS.
2. ALL DISCONNECTS, PANELBOARDS, AND ELECTRICAL EQUIPMENT SHALL BE LOCATED FIVE (5) FEET ABOVE GRADE (ON CENTER) AND COMPLY WITH NEC REQUIREMENTS, UNLESS OTHERWISE INDICATED.
3. CONDUIT AND ELECTRICAL EQUIPMENT TO BE SUPPORTED/BRACED (UNISTRUT CROSS MEMBER) AT MINIMUM EVERY 12".
4. NOT ALL ELECTRICAL EQUIPMENT MOUNTED TO BACKBOARD MAY BE SHOWN. DETAIL IS DIAGRAMMATIC IN NATURE. SIZE AND ARRANGE PANELS AND ELECTRICAL EQUIPMENT TO FIT BACKBOARD. UTILIZE BOTH SIDES OF ELECTRICAL BACKBOARD AS REQUIRED.
5. ALL REQUIREMENTS TO BE PER NEC.
6. QUANTITY OF CONDUITS/CIRCUITS SHOWN IN DETAIL IS DIAGRAMMATIC IN NATURE. REFER TO ELECTRICAL SITE PLAN, SCHEDULES, AND SINGLE LINE DIAGRAMS FOR SPECIFIC QUANTITIES.
7. COORDINATE ALL ELECTRICAL EQUIPMENT MOUNTED TO ELECTRICAL BACKBOARD AND FINAL LOCATION WITH THE OWNER/ENGINEER.
8. CONTRACTOR TO PROVIDE NAMEPLATE FOR ALL EQUIPMENT MOUNTED TO BACKBOARD.
9. ALL EQUIPMENT TO BE RATED NEMA 4X AND PAD LOCKABLE.

CONTRACTOR TO SIZE AND ARRANGE ELECTRICAL EQUIPMENT TO FIT BACKBOARD.

GENERAL NOTES:

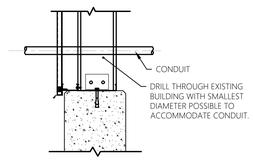
1. CONCRETE 4,000 PSI @ 28 DAYS.
2. PROVIDE AS 4" MIN. PAD UNLESS OTHERWISE NOTED.
3. DEFORMED BARS ASTM A-615, GRADE 60.
4. TOP SURFACE SHALL BE TROWEL FINISHED.
5. 3/4" CHAMFER ALONG ALL EXPOSED EDGES, INCLUDING OPENING.
6. REINFORCING SHALL BE AS FOLLOWS:
   - #4 BARS @ 12" EACH WAY
7. COORDINATE CONDUIT PENETRATIONS AT PAD WITH INSTALLED EQUIPMENT, AND FIELD CONDITIONS. CONTRACTOR TO FIELD VERIFY.



8 E-031 SCALE: NTS — TYPICAL INTERIOR EQUIPMENT PAD DETAIL

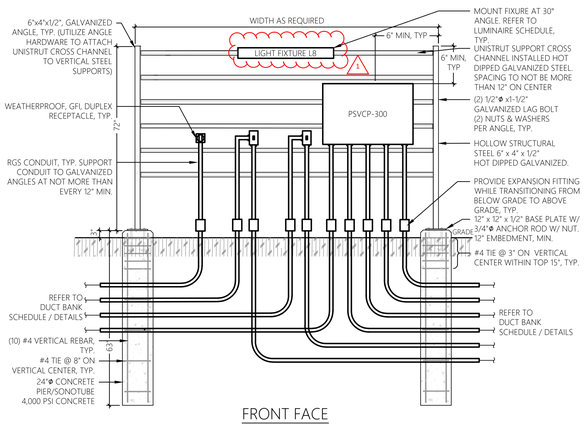
GENERAL NOTES:

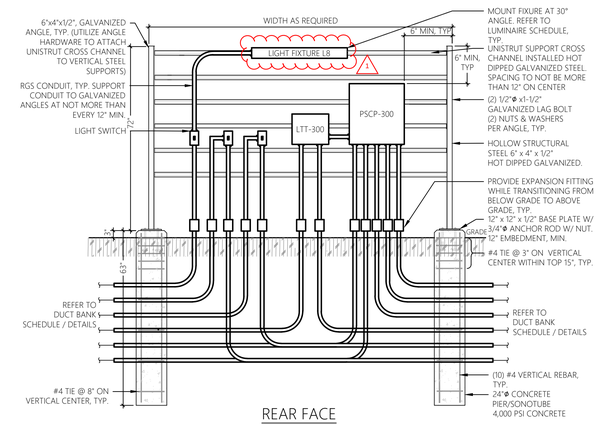
1. WHEN BORING THROUGH BUILDING, USE SMALLEST DIAMETER POSSIBLE TO ACCOMMODATE CONDUIT.
2. SEAL PENETRATIONS WITH POLYURETHANE CAULK. PATCH & MATCH DISTURBED SURFACES.



TYPICAL METAL BUILDING CONDUIT PENETRATION DETAIL

9 E-031 SCALE: NTS





10 E-031 SCALE: NTS — SLUDGE CONTROL ELECTRICAL BACKBOARD DETAIL

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK — JEFFREY E ROBINSON — 095896 — LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:

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UDIG·NY SAFE DIGGING STARTS HERE CALL 811

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL DETAILS

REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.

E-031

PROJECT # 18-732 PHASE #

DUCT BANK SCHEDULE (1 OF 4)

DESIGNATION [DB-XX]	TYPE	ORIGIN	DESTINATION	CIRCUIT				REMARKS
				CONDUCTORS/CONDUIT	ORIGIN	DESTINATION	POWER/CONTROL	
DB-01	REINFORCED CONCRETE	PRIMARY METERING RISER POLE	PAD-MOUNTED TRANSFORMER	(4)#4/0, 4"C 15KV PRIMARY ALUMINUM FEEDER	PRIMARY METERING RISER POLE	PAD-MOUNTED TRANSFORMER	POWER	
				4"C. SPARE	PRIMARY METERING RISER POLE	PAD-MOUNTED TRANSFORMER	POWER	2
				4"C. SPARE	PRIMARY METERING RISER POLE	MBR BUILDING DATA RACK	CONTROL	
DB-02	REINFORCED CONCRETE	PAD-MOUNTED TRANSFORMER	MBR BUILDING	EIGHT (8) SETS OF [(4)#500, 4"C.]	PAD-MOUNTED TRANSFORMER	MAIN CIRCUIT BREAKER MCB	POWER	
				4"C. SPARE	PAD-MOUNTED TRANSFORMER	ADJACENT TO MCB	POWER	2
				4"C. SPARE	PRIMARY METERING RISER POLE	MBR BUILDING DATA RACK	CONTROL	
DB-03	REINFORCED CONCRETE	MBR BUILDING	EMERGENCY GENERATOR #1	4 SETS OF [(4)#500 & #4/0G, 4" C]	AUTOMATIC TRANSFER SWITCH ATS	EMERGENCY GENERATOR #1	POWER	
				(12)#14 & (2)#18STP, 1"C.	AUTOMATIC TRANSFER SWITCH ATS	EMERGENCY GENERATOR #1	CONTROL	
				(3)#2 & #8G, 1-1/2"C.	PANEL LVP1	EMERGENCY GENERATOR #1 LOAD CENTER	POWER	2
				BELDEN 9729, 1"C. (4)#14, 3/4"C.	REMOTE ANNUNCIATOR & DISPLAY	EMERGENCY GENERATOR #1	CONTROL	
				(4)#14, 3/4"C.	EMERGENCY STOP	EMERGENCY GENERATOR #1	CONTROL	
				4"C. SPARE	ADJACENT TO ATS	EMERGENCY GENERATOR #1	POWER	
DB-04	REINFORCED CONCRETE	MBR BUILDING	EMERGENCY GENERATOR #2	4 SETS OF [(4)#500 & #4/0G, 4" C]	AUTOMATIC TRANSFER SWITCH ATS	EMERGENCY GENERATOR #2	POWER	
				(12)#14 & (2)#18STP, 1"C.	AUTOMATIC TRANSFER SWITCH ATS	EMERGENCY GENERATOR #2	CONTROL	
				(3)#2 & #8G, 1-1/2"C.	PANEL LVP1	EMERGENCY GENERATOR #2 LOAD CENTER	POWER	2
				BELDEN 9729, 1"C. (4)#14, 3/4"C.	REMOTE ANNUNCIATOR & DISPLAY	EMERGENCY GENERATOR #2	CONTROL	
				(4)#14, 3/4"C.	EMERGENCY STOP	EMERGENCY GENERATOR #2	CONTROL	
				4"C. SPARE	ADJACENT TO ATS	EMERGENCY GENERATOR #2	POWER	
DB-05	REINFORCED CONCRETE	EMERGENCY GENERATOR #1	EMERGENCY GENERATOR #2	(12)#14 & (2)#18STP, 1"C.	EMERGENCY GENERATOR #1	EMERGENCY GENERATOR #2	CONTROL	
				BELDEN 9729, 1"C.	EMERGENCY GENERATOR #1	EMERGENCY GENERATOR #2	CONTROL	2
				4"C. SPARE	EMERGENCY GENERATOR #1	EMERGENCY GENERATOR #2	CONTROL	
DB-06	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	CONTROL BUILDING	8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	R I/O-1	MCP	CONTROL	
				4" C. SPARE	ADJACENT TO R I/O-1	ADJACENT TO MCP	CONTROL	
				8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	DATA RACK	DATA RACK	CONTROL	1 2
				(4)#4/0 & #4G, 4"C.	SWBD	HVP2	POWER	
				4" C. SPARE	ADJACENT TO SWBD	ADJACENT TO HVP2	POWER	
DB-07	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	HEADWORKS BUILDING	8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	R I/O-1	R I/O-3	CONTROL	
				4" C. SPARE	ADJACENT TO R I/O-1	ADJACENT TO R I/O-3	CONTROL	
				8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	DATA RACK	DATA RACK	CONTROL	1 2
				(4)#4/0 & #4G, 4"C.	SWBD	HVP3	POWER	
				4" C. SPARE	ADJACENT TO SWBD	ADJACENT TO HVP3	POWER	
DB-08	SAND FILL	HEADWORKS BUILDING	INFLUENT STRUCTURE/PARSHALL FLUME	(2)#18STP & (4)#14, 1"C.	R I/O-3	PARSHALL FLUME FLOW METER	CONTROL	
				(2)#10 & #10G, 1"C.	LVP3	PARSHALL FLUME FLOW METER	POWER	2
				2" C. SPARE	ADJACENT TO R I/O-3	ADJACENT TO PARSHALL FLUME	CONTROL	
DB-09	SAND FILL	HEADWORKS BUILDING	GRIT CHAMBER	(3)#10 & #10G, 1"C.	DISCONNECT SWITCH	GRIT PROPELLER DRIVE GRTPD-01	POWER	
				(4)#14, 3/4"C.	DISCONNECT SWITCH	GRIT PROPELLER DRIVE GRTPD-01	CONTROL	
				(3)#10 & #10G, 1"C.	DISCONNECT SWITCH	GRIT PUMP GRTP-01	POWER	
				(4)#14, 3/4"C.	DISCONNECT SWITCH	GRIT PUMP GRTP-01	CONTROL	
				(4)#14, 3/4"C.	GRIT CONTROL PANEL GRT-CP-01	SOLENOID VALVE SOL-203	CONTROL	2 3
				(24)#14, 1"C.	GRIT CONTROL PANEL GRT-CP-01	VACUUM PRIME CONTROL PANEL	CONTROL	
				(3)#10 & #10G, 1"C.	LVP3	VACUUM PRIME CONTROL PANEL	POWER	
				2" C. SPARE	ADJACENT TO GRT-CP-01	GRIT CHAMBER	CONTROL	
DB-10	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	PRIMARY SETTLING TANK NO. 1	(4)#10 & #10G, 1"C.	HVP1	PC-CP-1	POWER	
				(4)#10 & #10G, 1"C.	HVP1	SP-CP-1	POWER	
				2" C. SPARE	ADJACENT TO HVP1	ADJACENT TO PC-CP-1	POWER	
				(12)#14 & (2)#18STP, 1"C.	R I/O-1	PC-CP-1	CONTROL	1 2 3
				(12)#14 & (2)#18STP, 1"C.	R I/O-1	SP-CP-1	CONTROL	
				2" C. SPARE	ADJACENT TO R I/O-1	ADJACENT TO PC-CP-1	CONTROL	
				(2)#10 & #10G, 1"C.	LVP1	RECEPTACLES	POWER	
				(2)#10 & #10G, 1"C.	LVP1	LIGHTS	POWER	
DB-11 (CONTINUED ON RIGHT)	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	PRIMARY SETTLING TANK NO. 2	(4)#10 & #10G, 1"C.	HVP1	PC-CP-2	POWER	
				(4)#10 & #10G, 1"C.	HVP1	SP-CP-2	POWER	
				2" C. SPARE	ADJACENT TO HVP1	ADJACENT TO PC-CP-2	POWER	1 2 3
				(12)#14 & (2)#18STP, 1"C.	R I/O-1	PC-CP-2	CONTROL	
				(12)#14 & (2)#18STP, 1"C.	R I/O-1	SP-CP-2	CONTROL	2

DUCT BANK SCHEDULE (2 OF 4)

DESIGNATION [DB-XX]	TYPE	ORIGIN	DESTINATION	CIRCUIT				REMARKS
				CONDUCTORS/CONDUIT	ORIGIN	DESTINATION	POWER/CONTROL	
DB-11 (CONTINUED)	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	PRIMARY SETTLING TANK NO. 2	2" C. SPARE	ADJACENT TO R I/O-1	ADJACENT TO PC-CP-2	CONTROL	
				(2)#10 & #10G, 1"C.	LVP1	RECEPTACLES	POWER	1 2 3
				(2)#10 & #10G, 1"C.	LVP1	LIGHTS	POWER	
DB-12	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	PRIMARY SETTLING TANK NO. 3	(4)#10 & #10G, 1"C.	HVP1	PC-CP-3	POWER	
				(4)#10 & #10G, 1"C.	HVP1	SP-CP-3	POWER	
				2" C. SPARE	ADJACENT TO HVP1	ADJACENT TO PC-CP-3	POWER	
				(12)#14 & (2)#18STP, 1"C.	R I/O-1	PC-CP-3	CONTROL	1 2 3
				(12)#14 & (2)#18STP, 1"C.	R I/O-1	SP-CP-3	CONTROL	
				2" C. SPARE	ADJACENT TO R I/O-1	ADJACENT TO PC-CP-3	CONTROL	
				(2)#10 & #10G, 1"C.	LVP1	RECEPTACLES	POWER	
				(2)#10 & #10G, 1"C.	LVP1	LIGHTS	POWER	
DB-13	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	PRIMARY SETTLING TANK NO. 4	(4)#10 & #10G, 1"C.	HVP1	PC-CP-4	POWER	
				(4)#10 & #10G, 1"C.	HVP1	SP-CP-4	POWER	
				2" C. SPARE	ADJACENT TO HVP1	ADJACENT TO PC-CP-4	POWER	
				(12)#14 & (2)#18STP, 1"C.	R I/O-1	PC-CP-4	CONTROL	1 2 3
				(12)#14 & (2)#18STP, 1"C.	R I/O-1	SP-CP-4	CONTROL	
				2" C. SPARE	ADJACENT TO R I/O-1	ADJACENT TO PC-CP-4	CONTROL	
				(2)#10 & #10G, 1"C.	LVP1	RECEPTACLES	POWER	
				(2)#10 & #10G, 1"C.	LVP1	LIGHTS	POWER	
DB-14	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	ELECTRICAL BACKBOARD	(3)#8 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE VALVE CONTROL PANEL	POWER	
				(48)#14 & (8)#18STP, 2"C. CAT 6 CABLE, 1"C.	R I/O-1	PRIMARY SLUDGE VALVE CONTROL PANEL	CONTROL	
				(2)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE CONTROL VALVE VAULT LIGHT	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE CONTROL VALVE VAULT SUMP PUMP	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE CONTROL VALVE VAULT EXHAUST FAN	POWER	
				(3)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE CONTROL VALVE VAULT UNIT HEATER	POWER	
				(4)#14 & (2)#18STP, 1"C.	R I/O-1	SLUDGE CONTROL VALVE VAULT FLOOD DETECTION	CONTROL	
				(2)#10 & #10G, 1"C.	PANEL HVP1	SLUDGE VALVE PIT SUMP PUMP	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE VALVE PIT LIGHT	POWER	
				(4)#14 & (2)#18STP, 1"C.	R I/O-1	SLUDGE VALVE PIT FLOOD DETECTION	CONTROL	
				(4)#6 & #10G, 2"C.	PANEL HVP1	PRIMARY SLUDGE PUMP CONTROL PANEL	POWER	
				(12)#14 & (2)#18STP, 1"C. CAT 6 CABLE, 1"C.	R I/O-1	PRIMARY SLUDGE PUMP CONTROL PANEL	CONTROL	1 2 3
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT LIGHT	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT SUMP PUMP	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT EXHAUST FAN	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT SRV	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT DEHUMIDIFIER	POWER	
				(3)#10 & #10G, 1"C.	PANEL HVP1	PRIMARY SLUDGE PIT UNIT HEATER	POWER	
				(4)#14 & (2)#18STP, 1"C.	R I/O-1	PRIMARY SLUDGE PIT FLOOD DETECTION	CONTROL	
				(2)#10 & #10G, 1"C.	PANEL LVP1	ELECTRICAL BACKBOARD LIGHT	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	ELECTRICAL BACKBOARD RECEPTACLE	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	LEVEL TRANSDUCER TRANSMITTER	POWER	
				2"C. SPARE	ADJACENT TO LVP1	ELECTRICAL BACKBOARD	POWER	
				2"C. SPARE	ADJACENT TO R I/O-1	ELECTRICAL BACKBOARD	CONTROL	
DB-15	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	GARAGE	8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	DATA RACK	DATA RACK	CONTROL	
				(4)#4/0 & #4G, 4"C.	SWBD	HVP7	POWER	1 2
				4" C. SPARE	ADJACENT TO SWBD	ADJACENT TO HVP7	POWER	
DB-16	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	DEWATERING BUILDING	8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	R I/O-1	R I/O-2	CONTROL	
				4" C. SPARE	ADJACENT TO R I/O-1	ADJACENT TO R I/O-2	CONTROL	
				8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	DATA RACK	DATA RACK	CONTROL	1 2
				TWO (2) SETS OF [(4)#4/0 & #2G, 4"C.]	SWBD	HVP4	POWER	
				4" C. SPARE	ADJACENT TO SWBD	ADJACENT TO HVP4	POWER	2

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BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK
JEFFREY E. ROBINSON
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LICENSED PROFESSIONAL ENGINEER

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NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL SCHEDULES

REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.

E-040

PROJECT # 18-732 PHASE #

DUCT BANK SCHEDULE (3 OF 4)

DESIGNATION DB-XX	TYPE	ORIGIN	DESTINATION	CIRCUIT				REMARKS
				CONDUCTORS/CONDUIT	ORIGIN	DESTINATION	POWER/CONTROL	
DB-17	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	DISINFECTION BUILDING	8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	R I/O-1	DBSP	CONTROL	
				4" C. SPARE	ADJACENT TO R I/O-1	ADJACENT TO DBSP	CONTROL	
				TWO (2) SETS OF [(4)#4/0 & #2G, 4"C.]	SWBD	HVP8	POWER	1 2
				4" C. SPARE	ADJACENT TO SWBD	ADJACENT TO HVP8	POWER	
DB-18	SAND FILL	DISINFECTION BUILDING	DISINFECTION TANK	(2)#10 & #10G, 1"C.	PANEL PP1	BLOWER PLATFORM LIGHTS	POWER	
				(2)#10 & #10G, 1"C.	PANEL PP1	BLOWER PLATFORM RECEPTACLES	POWER	
				(2)#10 & #10G, 1"C.	PANEL PP1	BACK PULSE PUMP STATION RECEPTACLES	POWER	
				(2)#10 & #10G, 1"C.	PANEL PP1	DISSOLVED OXYGEN DOA-01	POWER	
				(2)#10 & #10G, 1"C.	PANEL PP1	DISSOLVED OXYGEN DOA-02	POWER	
				(2)#10 & #10G, 1"C.	PANEL PP1	ULTRASONIC TRANSMITTER UTT-02	POWER	
				(2)#10 & #10G, 1"C.	PANEL PP1	ULTRASONIC TRANSMITTER UTT-03	POWER	
				(2)#10 & #10G, 1"C.	PANEL PP1	ULTRASONIC TRANSMITTER UTT-04	POWER	
				(2)#10 & #10G, 1"C.	PANEL PP1	BACK PULSE TANK LEVEL TRANSDUCER	POWER	
				CAT 6 CABLE, 1"C. (4)#14, 1"C. & (4)#18STP, 1"C.	DISINFECTION BUILDING SCADA PANEL	DISSOLVED OXYGEN DOA-01	CONTROL	
				CAT 6 CABLE, 1"C. (4)#14, 1"C. & (4)#18STP, 1"C.	DISINFECTION BUILDING SCADA PANEL	DISSOLVED OXYGEN DOA-02	CONTROL	
				CAT 6 CABLE, 1"C. (4)#14, 1"C. & (4)#18STP, 1"C.	DISINFECTION BUILDING SCADA PANEL	ULTRASONIC TRANSMITTER UTT-02	CONTROL	
				CAT 6 CABLE, 1"C. (4)#14, 1"C. & (4)#18STP, 1"C.	DISINFECTION BUILDING SCADA PANEL	ULTRASONIC TRANSMITTER UTT-03	CONTROL	
				CAT 6 CABLE, 1"C. (4)#14, 1"C. & (4)#18STP, 1"C.	DISINFECTION BUILDING SCADA PANEL	ULTRASONIC TRANSMITTER UTT-04	CONTROL	
				CAT 6 CABLE, 1"C. (4)#14, 1"C. & (4)#18STP, 1"C.	DISINFECTION BUILDING SCADA PANEL	BACK PULSE TANK LEVEL TRANSDUCER	CONTROL	
				CAT 6 CABLE, 1"C. (4)#14, 1"C. & (4)#18STP, 1"C.	DISINFECTION BUILDING SCADA PANEL	PLANT WATER CONTROL PANEL PWCP-600	CONTROL	
				(3)#6 & #10G, 2"C.	VFD-BL1	BLOWER NO. 1	POWER	
				(4)#14, 3/4"C.	VFD-BL1	BLOWER NO. 1 DISCONNECT	CONTROL	2 3
				(12)#14 & (4)#18STP, 1"C.	VFD-BL1	BLOWER NO. 1	CONTROL	
				(3)#6 & #10G, 2"C.	VFD-BL2	BLOWER NO. 2	POWER	
				(4)#14, 3/4"C.	VFD-BL2	BLOWER NO. 2 DISCONNECT	CONTROL	
				(12)#14 & (4)#18STP, 1"C.	VFD-BL2	BLOWER NO. 2	CONTROL	
				(3)#1/0 & #6G, 3"C.	VFD-BP1	BACK PULSE PUMP NO. 1	POWER	
				(4)#14, 3/4"C.	VFD-BP1	BACK PULSE PUMP NO. 1 DISCONNECT	CONTROL	
				(12)#14 & (4)#18STP, 1"C.	VFD-BP1	BACK PULSE PUMP NO. 1	CONTROL	
				(12)#14 & (2)#18STP, 1"C.	VFD-BP1	BACK PULSE PUMP NO. 1 LOCAL CONTROL STATION	CONTROL	
				(4)#14, 3/4"C.	VFD-BP1	BACK PULSE PUMP NO. 1 PRESSURE SWITCH	CONTROL	
				(3)#1/0 & #6G, 3"C.	VFD-BP2	BACK PULSE PUMP NO. 2	POWER	
				(4)#14, 3/4"C.	VFD-BP2	BACK PULSE PUMP NO. 2 DISCONNECT	CONTROL	
				(12)#14 & (4)#18STP, 1"C.	VFD-BP2	BACK PULSE PUMP NO. 2	CONTROL	
				(12)#14 & (2)#18STP, 1"C.	VFD-BP2	BACK PULSE PUMP NO. 2 LOCAL CONTROL STATION	CONTROL	
				(4)#14, 3/4"C.	VFD-BP2	BACK PULSE PUMP NO. 2 PRESSURE SWITCH	CONTROL	
				(4)#4/0 & #4G, 4"C.	PANEL HVP8	PLANT WATER CONTROL PANEL PWCP-600	POWER	
				4"C. SPARE	ADJACENT TO HVP8	DISINFECTION TANK	POWER	
				4"C. SPARE	ADJACENT TO DBSP	DISINFECTION TANK	CONTROL	
DB-19	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	SITE LIGHTING	(2)#8 & #10G, 1"C.	PANEL HVP1	POLE-MOUNTED SITE LIGHTS	POWER	1
DB-20 (CONTINUED ON RIGHT)	SAND FILL/ REINFORCED CONCRETE	ELECTRICAL BACKBOARD	SLUDGE CONTROL VALVE VAULT	(2)#10 & #10G, 1"C.	PRIMARY SLUDGE VALVE CONTROL PANEL	PRIMARY SLUDGE VALVE NO. 1	POWER	
				(12)#14 & (2)#18STP, 1"C. CAT 6 CABLE, 1"C.	PRIMARY SLUDGE VALVE CONTROL PANEL	PRIMARY SLUDGE VALVE NO. 1	CONTROL	
				(2)#10 & #10G, 1"C.	PRIMARY SLUDGE VALVE CONTROL PANEL	PRIMARY SLUDGE VALVE NO. 2	POWER	
				(12)#14 & (2)#18STP, 1"C. CAT 6 CABLE, 1"C.	PRIMARY SLUDGE VALVE CONTROL PANEL	PRIMARY SLUDGE VALVE NO. 2	CONTROL	
				(2)#10 & #10G, 1"C.	PRIMARY SLUDGE VALVE CONTROL PANEL	PRIMARY SLUDGE VALVE NO. 3	POWER	
				(12)#14 & (2)#18STP, 1"C. CAT 6 CABLE, 1"C.	PRIMARY SLUDGE VALVE CONTROL PANEL	PRIMARY SLUDGE VALVE NO. 3	CONTROL	
				(2)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE CONTROL VALVE VAULT LIGHT	POWER	1 2 3
				(2)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE CONTROL VALVE VAULT SUMP PUMP	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE CONTROL VALVE VAULT EXHAUST FAN	POWER	
				(3)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE CONTROL VALVE VAULT UNIT HEATER	POWER	
				(4)#14 & (2)#18STP, 1"C.	R I/O-1	SLUDGE CONTROL VALVE VAULT FLOOD DETECTION	CONTROL	
				2"C. SPARE	ELECTRICAL BACKBOARD	SLUDGE CONTROL VALVE VAULT	POWER	
				2"C. SPARE	ELECTRICAL BACKBOARD	SLUDGE CONTROL VALVE VAULT	CONTROL	

DUCT BANK SCHEDULE (4 OF 4)

DESIGNATION DB-XX	TYPE	ORIGIN	DESTINATION	CIRCUIT				REMARKS
				CONDUCTORS/CONDUIT	ORIGIN	DESTINATION	POWER/CONTROL	
DB-21	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	ATAD BUILDING	8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	R I/O-1	R I/O-4	CONTROL	
				4" C. SPARE	ADJACENT TO R I/O-1	ADJACENT TO R I/O-4	CONTROL	
				8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	DATA RACK	DATA RACK	CONTROL	1 2
				FOUR (4) SETS OF [(4)#500 & #4/0G, 4"C.]	SWBD	MCC2	POWER	
				4" C. SPARE	ADJACENT TO SWBD	ADJACENT TO MCC2	POWER	
DB-22	SAND FILL/ REINFORCED CONCRETE	CONTROL BUILDING	MOTORIZED ENTRANCE GATE	(3)#6 & #10G, 1"C.	PANEL LVP2	MOTORIZED ENTRANCE GATE	POWER	
				CAT 6 CABLE, 1"C.	DATA RACK	MOTORIZED ENTRANCE GATE	CONTROL	1 2
				2"C. SPARE	ADJACENT TO DATA RACK	MOTORIZED ENTRANCE GATE	CONTROL	
DB-23	REINFORCED CONCRETE	ATAD BUILDING	FILTRATE PUMP WET WELL	(3)#10 & #10G, 1"C.	FILTRATE PUMP CONTROL PANEL	FILTRATE PUMP FP-400	POWER	
				(6)#14, 3/4"C.	FILTRATE PUMP CONTROL PANEL	FILTRATE PUMP FP-400	CONTROL	
				(3)#10 & #10G, 1"C.	FILTRATE PUMP CONTROL PANEL	FILTRATE PUMP FP-401	POWER	
				(6)#14, 3/4"C.	FILTRATE PUMP CONTROL PANEL	FILTRATE PUMP FP-401	CONTROL	
				(4)#14, 3/4"C.	FILTRATE PUMP CONTROL PANEL	FLOAT FL-400	CONTROL	2 3
				(4)#14, 3/4"C.	FILTRATE PUMP CONTROL PANEL	FLOAT FL-401	CONTROL	
				(4)#14, 3/4"C.	FILTRATE PUMP CONTROL PANEL	FLOAT FL-402	CONTROL	
				2"C. SPARE	ADJACENT TO CONTROL PANEL	FILTRATE PUMP WET WELL	POWER	
DB-24	SAND FILL/ REINFORCED CONCRETE	ELECTRICAL BACKBOARD	SLUDGE VALVE PIT	(2)#10 & #10G, 1"C.	PRIMARY SLUDGE VALVE CONTROL PANEL	PRIMARY SLUDGE VALVE NO. 4	POWER	
				(12)#14 & (2)#18STP, 1"C. CAT 6 CABLE, 1"C.	PRIMARY SLUDGE VALVE CONTROL PANEL	PRIMARY SLUDGE VALVE NO. 4	CONTROL	
				(2)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE VALVE PIT SUMP PUMP	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE VALVE PIT LIGHT	POWER	1 2 3
				(4)#14 & (2)#18STP, 1"C.	R I/O-1	SLUDGE VALVE PIT FLOOD DETECTION	CONTROL	
				2"C. SPARE	ELECTRICAL BACKBOARD	SLUDGE VALVE PIT	POWER	
				2"C. SPARE	ELECTRICAL BACKBOARD	SLUDGE VALVE PIT	CONTROL	
DB-25	SAND FILL	ELECTRICAL BACKBOARD	PRIMARY SLUDGE PUMP PIT	(3)#10 & #10G, 1"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	PRIMARY SLUDGE PUMP NO. 1	POWER	
				(6)#14, 1"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	PRIMARY SLUDGE PUMP NO. 1	CONTROL	
				(3)#10 & #10G, 1"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	PRIMARY SLUDGE PUMP NO. 2	POWER	
				(6)#14, 1"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	PRIMARY SLUDGE PUMP NO. 2	CONTROL	
				(4)#14, 3/4"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	PRESSURE SWITCH PS-SP-01	CONTROL	
				(4)#14, 3/4"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	PRESSURE SWITCH PS-SP-02	CONTROL	
				(4)#14, 3/4"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	BACKUP FLOAT FLS-300	CONTROL	
				(4)#14, 3/4"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	BACKUP FLOAT FLS-301	CONTROL	
				(4)#14, 3/4"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	BACKUP FLOAT FLS-302	CONTROL	
				(4)#14, 3/4"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	BACKUP FLOAT FLS-303	CONTROL	2 3
				(2)#18STP, 3/4"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	LEVEL TRANSDUCER LT-300	CONTROL	
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT LIGHT	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT SUMP PUMP	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT EXHAUST FAN	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT SRV	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT DEHUMIDIFIER	POWER	
				(3)#10 & #10G, 1"C.	PANEL HVP1	PRIMARY SLUDGE PIT UNIT HEATER	POWER	
				(4)#14 & (2)#18STP, 1"C.	R I/O-1	PRIMARY SLUDGE PIT FLOOD DETECTION	CONTROL	
				2"C. SPARE	ELECTRICAL BACKBOARD	PRIMARY SLUDGE PIT	POWER	
				2"C. SPARE	ELECTRICAL BACKBOARD	PRIMARY SLUDGE PIT	CONTROL	
DB-26	SAND FILL / REINFORCED CONCRETE	ATAD BUILDING	DISINFECTION TANK	(3)#6 & #10G, 2"C.	MCC2	COOLING WATER PUMP NO. 1	POWER	
				(8)#14, 1"C.	MCC2	COOLING WATER PUMP NO. 1	CONTROL	
				(4)#14, 3/4"C.	MCC2	FLOAT SWITCH FLS-601	CONTROL	
				(3)#6 & #10G, 2"C.	MCC2	COOLING WATER PUMP NO. 1	POWER	1 2 3
				(8)#14, 1"C.	MCC2	COOLING WATER PUMP NO. 1	CONTROL	
				(4)#14, 3/4"C.	MCC2	FLOAT SWITCH FLS-602	CONTROL	
				2"C. SPARE	ADJACENT TO MCC2	DISINFECTION TANK	POWER	
				2"C. SPARE	ADJACENT TO MCC2	DISINFECTION TANK	CONTROL	

GENERAL SCHEDULE NOTES:

1. VERIFY CIRCUIT REQUIREMENTS WITH APPLICABLE EQUIPMENT MANUFACTURERS. PROVIDE CONDUCTORS AND CONDUIT AS REQUIRED.
2. COORDINATE DUCT BANK LOCATIONS AND INSTALLATIONS WITH EXISTING AND PROPOSED STRUCTURES, EQUIPMENT, PIPING SYSTEMS, AND WITH OWNER / ENGINEER.
3. REFER TO THE TYPICAL DUCT BANK DETAILS FOR ADDITIONAL REQUIREMENTS.
4. REFER TO THE ELECTRICAL SITE PLANS FOR GENERAL LOCATIONS, ROUTING AND ADDITIONAL INFORMATION.
5. REFER TO THE ELECTRICAL SINGLE LINE DIAGRAMS AND RISER DIAGRAMS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
6. CONTRACTOR RESPONSIBLE FOR ALL ASPHALT REPAIR (IF ANY). COORDINATE FINAL REQUIREMENTS WITH THE OWNER AND ENGINEER.
7. CONTRACTOR TO CLOSELY COORDINATE FINAL DUCT BANK REQUIREMENTS WITH OWNER / ENGINEER AND SHARE A COMMON TRENCH WHERE FEASIBLE/PRACTICAL. WHERE A COMMON TRENCH BETWEEN UTILITIES IS USED CONTRACTOR TO MAINTAIN NESC SEPARATION BETWEEN UTILITIES AT ALL TIMES.
8. REFER TO ELECTRICAL SITE PLAN FOR PROPOSED HAND HOLE LOCATIONS (IF ANY). WHERE HAND HOLES ARE REQUIRED, LOCATE IN GRASSY AREAS NOT SUBJECT TO VEHICLE LOADING. REFER TO ELECTRICAL SINGLE LINE DIAGRAMS, RISER DIAGRAMS, SPECIFICATIONS, & DETAILS FOR ADDITIONAL INFORMATION. COORDINATE FINAL REQUIREMENTS WITH OVERALL SITE PLANS AND WITH OWNER / ENGINEER.
9. DUCT BANK SCHEDULES ARE NOT INTENDED TO INDICATE ALL REQUIRED UNDERGROUND CIRCUITRY, BUT RATHER A GENERAL IDEA/MAGNITUDE OF OVERALL DUCT BANK SIZE. REFER TO ELECTRICAL SINGLE LINE DIAGRAMS, RISER DIAGRAMS, DETAILS, AND FLOOR PLANS FOR ADDITIONAL INFORMATION/REQUIREMENTS.

REMARKS:

1. PROVIDE AS SAND FILLED DUCT BANK WHERE BENEATH GRASSY AREAS, OR AREAS NOT SUBJECT TO VEHICLE LOADING. PROVIDE AS REINFORCED CONCRETE DUCT BANK WHERE BENEATH PAVED AREAS, OR AREAS SUBJECT TO VEHICLE LOADING. COORDINATE FINAL REQUIREMENTS WITH THE OVERALL SITE PLANS AND WITH OWNER / ENGINEER
2. FINAL SPARE CONDUIT STUB-UP LOCATION TO BE COORDINATED WITH THE OWNER AND ENGINEER. PROVIDE PULL STRING AND CAP BOTH ENDS. CONTRACTOR TO PROVIDE LABEL FOR ALL SPARE CONDUITS INDICATING CONDUIT DESTINATION. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
3. CONTRACTOR MAY GROUP POWER CIRCUITS INTO LARGER CONDUIT AND GROUP CONTROL CIRCUITS INTO SEPARATE LARGER CONDUIT. GROUPING OF CIRCUITS INTO LARGER CONDUITS MUST COMPLY WITH NEC FILL AND DERATING REQUIREMENTS. REFER TO ELECTRICAL RISER DIAGRAMS FOR ADDITIONAL INFORMATION/REQUIREMENTS.

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JSE
JADE STONE ENGINEERING

STATE OF NEW YORK
JEFFREY E. ROBINSON
095896
LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:

THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE
CALL 811

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL SCHEDULES

REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.

E-041

PROJECT # 18-732 PHASE #

INDICATED BY ⊘ ON PLAN SHEETS

EQUIPMENT CONNECTION SCHEDULE (SHEET 1 OF 4)

SPECIFIC NOTES:

1. WHEN LOCATION IS NOT REFERENCED ON 'E' SHEETS, REFER TO ASSOCIATED CONTRACT DRAWINGS.
2. LOCATIONS SHOWN ARE GENERAL IN NATURE. COORDINATE WITH ALL TRADE CONTRACTORS PRIOR TO ROUGH-IN.

TYPES:
A: NON-FUSED
B: FUSED
M: MOTOR RATED SWITCH
R: RECEPTACLE/CORD/PLUG
N: NOT REQUIRED
C: CKT BREAKER WITHIN SIGHT

SIZES:
AF: AMPERE FRAME
NF: NON-FUSED
AT: FUSE SIZE (RK5, UON)

TYPES:
VFD: VARIABLE FREQUENCY DRIVE
CMS: COMBINATION MOTOR STARTER WITH DISCONNECT
ATL: ACROSS THE LINE, FVNR MAGNETIC STARTER
M: MOTOR RATED SWITCH - MANUAL STARTER
P: PACKAGED CONTROLLER BY MANUFACTURER
LVT: THERMOSTAT

EQUIPMENT			ELECTRICAL LOAD				POWER CONNECTION			CONTROL CONNECTION		DISCONNECT/SAFETY SWITCH		STARTER		REMARKS
EQUIPMENT TAG	EQUIPMENT TYPE	LOCATION ON PLAN	FLA	HP (KW)	V	PH	HOMERUN TO	CIRCUIT BREAKER	CONDUCTORS & CONDUIT	HOMERUN / INTERLOCK TO	CONDUCTORS & CONDUIT	DISCONNECT TYPE/SIZE	NEMA ENCLOSURE TYPE	STARTER TYPE	NEMA ENCLOSURE TYPE	
PCD-01	PRIMARY DRIVE #1	PRIMARY SETTLING TANK #1	2.1	1	480	3	PC-CP-1	REFER TO RISER DIAGRAM		PC-CP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
PCD-02	PRIMARY DRIVE #2	PRIMARY SETTLING TANK #2	2.1	1	480	3	PC-CP-2	REFER TO RISER DIAGRAM		PC-CP-2	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
PCD-03	PRIMARY DRIVE #3	PRIMARY SETTLING TANK #3	2.1	1	480	3	PC-CP-3	REFER TO RISER DIAGRAM		PC-CP-3	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
PCD-04	PRIMARY DRIVE #4	PRIMARY SETTLING TANK #4	2.1	1	480	3	PC-CP-4	REFER TO RISER DIAGRAM		PC-CP-4	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
PC-CP-1	CLARIFIER CONTROL PANEL #1	PRIMARY SETTLING TANK #1	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
PC-CP-2	CLARIFIER CONTROL PANEL #2	PRIMARY SETTLING TANK #2	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
PC-CP-3	CLARIFIER CONTROL PANEL #3	PRIMARY SETTLING TANK #3	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
PC-CP-4	CLARIFIER CONTROL PANEL #4	PRIMARY SETTLING TANK #4	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
SP-01	SCUM PUMP #1	PRIMARY SETTLING TANK #1	7.6	5	480	3	SP-CP-1	REFER TO RISER DIAGRAM		SP-CP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
SP-02	SCUM PUMP #2	PRIMARY SETTLING TANK #2	7.6	5	480	3	SP-CP-1	REFER TO RISER DIAGRAM		SP-CP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
SP-03	SCUM PUMP #3	PRIMARY SETTLING TANK #3	7.6	5	480	3	SP-CP-1	REFER TO RISER DIAGRAM		SP-CP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
SP-04	SCUM PUMP #4	PRIMARY SETTLING TANK #4	7.6	5	480	3	SP-CP-1	REFER TO RISER DIAGRAM		SP-CP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
SP-CP-1	SCUM PUMP CONTROL PANEL #1	PRIMARY SETTLING TANK #1	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
SP-CP-2	SCUM PUMP CONTROL PANEL #2	PRIMARY SETTLING TANK #2	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
SP-CP-3	SCUM PUMP CONTROL PANEL #3	PRIMARY SETTLING TANK #3	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
SP-CP-4	SCUM PUMP CONTROL PANEL #4	PRIMARY SETTLING TANK #4	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
P-SP-01	PRIMARY CLARIFIER SLUDGE PUMP #1	PRIMARY SLUDGE PUMP PIT	3	4.8	480	3	PSPCP-300	REFER TO RISER DIAGRAM		PSPCP-300	REFER TO RISER DIAGRAM	-	-	ATL	-	1
P-SP-02	PRIMARY CLARIFIER SLUDGE PUMP #2	PRIMARY SLUDGE PUMP PIT	3	4.8	480	3	PSPCP-300	REFER TO RISER DIAGRAM		PSPCP-300	REFER TO RISER DIAGRAM	-	-	ATL	-	1
PSPCP-300	PRIMARY SLUDGE PUMP CONTROL PANEL	PRIMARY SLUDGE ELECTRICAL BACKBOARD	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
PS-AV-01	PRIMARY SLUDGE VALVE #1	SLUDGE CONTROL VALVE VAULT	4.4	FRACT.	120	1	PSVCP-300	REFER TO RISER DIAGRAM		PSVCP-300	REFER TO RISER DIAGRAM	-	-	ATL	-	1
PS-AV-02	PRIMARY SLUDGE VALVE #2	SLUDGE CONTROL VALVE VAULT	4.4	FRACT.	120	1	PSVCP-300	REFER TO RISER DIAGRAM		PSVCP-300	REFER TO RISER DIAGRAM	-	-	ATL	-	1
PS-AV-03	PRIMARY SLUDGE VALVE #3	SLUDGE CONTROL VALVE VAULT	4.4	FRACT.	120	1	PSVCP-300	REFER TO RISER DIAGRAM		PSVCP-300	REFER TO RISER DIAGRAM	-	-	ATL	-	1
PS-AV-04	PRIMARY SLUDGE VALVE #4	PROPOSED SLUDGE VALVE PIT	4.4	FRACT.	120	1	PSVCP-300	REFER TO RISER DIAGRAM		PSVCP-300	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
PSVCP-300	PRIMARY SLUDGE VALVE CONTROL PANEL	PRIMARY SLUDGE ELECTRICAL BACKBOARD	-	-	120	1	LVP1	20A/1P	(2)#10 & #10G, 1"C.	R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
SP-300	SUMP PUMP	PRIMARY SLUDGE PUMP PIT	9.8	1/2	120	1	LVP1	20A/1P	(2)#10 & #10G, 1"C.	LOCAL CONTROL ONLY		R	WP	M	4X	3,4,5
SP-301	SUMP PUMP	SLUDGE CONTROL VALVE VAULT	9.8	1/2	120	1	LVP1	20A/1P	(2)#10 & #10G, 1"C.	LOCAL CONTROL ONLY		R	WP	M	4X	3,4,5
SP-302	SUMP PUMP	PROPOSED SLUDGE VALVE PIT	9.8	1/2	120	1	LVP1	20A/1P	(2)#10 & #10G, 1"C.	LOCAL CONTROL ONLY		R	WP	M	7	2,3,4,5
SP-05	SCUM PUMP #5	MBR BUILDING - SCUM PUMP AREA	7.6	5	480	3	SP-CP-5	REFER TO RISER DIAGRAM		SP-CP-5	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
SP-06	SCUM PUMP #6	MBR BUILDING - SCUM PUMP AREA	7.6	5	480	3	SP-CP-5	REFER TO RISER DIAGRAM		SP-CP-5	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
SP-CP-5	SCUM PUMP CONTROL PANEL #5	MBR BUILDING - SCUM PUMP AREA	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
20-B-201-A	MEMBRANE BLOWER #1	MBR BUILDING - BLOWER ROOM	77	60	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	-	-	VFD	-	6
20-B-201-B	MEMBRANE BLOWER #2	MBR BUILDING - BLOWER ROOM	77	60	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	-	-	VFD	-	6
20-B-201-C	MEMBRANE BLOWER #3	MBR BUILDING - BLOWER ROOM	77	60	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	-	-	VFD	-	6
20-B-201-D	MEMBRANE BLOWER #4	MBR BUILDING - BLOWER ROOM	77	60	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	-	-	VFD	-	6
20-B-201-E	MEMBRANE BLOWER #5	MBR BUILDING - BLOWER ROOM	77	60	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	-	-	VFD	-	6
20-P-501-A	RAS PUMP #1	MBR BUILDING - RAS PUMP ROOM	40	30	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
20-P-501-B	RAS PUMP #2	MBR BUILDING - RAS PUMP ROOM	40	30	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
20-P-501-C	RAS PUMP #3	MBR BUILDING - RAS PUMP ROOM	40	30	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
20-P-501-D	RAS PUMP #4	MBR BUILDING - RAS PUMP ROOM	40	30	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
16-B-401-A	PROCESS BLOWER #1	MBR BUILDING - BLOWER ROOM	180	150	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	-	-	VFD	-	6
16-B-401-B	PROCESS BLOWER #2	MBR BUILDING - BLOWER ROOM	180	150	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	-	-	VFD	-	6
16-B-401-C	PROCESS BLOWER #3	MBR BUILDING - BLOWER ROOM	180	150	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	-	-	VFD	-	6
16-MX-211-1	ANOXIC SUBMERSIBLE MIXER #1	ANOXIC ZONE #1	16	10.7	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	A (30AF/NF)	4X	ATL	-	7
16-MX-211-2	ANOXIC SUBMERSIBLE MIXER #2	ANOXIC ZONE #2	16	10.7	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	A (30AF/NF)	4X	ATL	-	7
16-MX-211-3	ANOXIC SUBMERSIBLE MIXER #3	ANOXIC ZONE #3	16	10.7	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	A (30AF/NF)	4X	ATL	-	7
90-AC-001-A	AIR COMPRESSOR #1	MBR BUILDING - MECHANICAL ROOM	14	10	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		MBR-CP	REFER TO RISER DIAGRAM	-	-	CMS	-	1
90-AC-001-B	AIR COMPRESSOR #2	MBR BUILDING - MECHANICAL ROOM	14	10	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		MBR-CP	REFER TO RISER DIAGRAM	-	-	CMS	-	1
90-DR-001-A	REFRIGERATED DRYER #1	MBR BUILDING - MECHANICAL ROOM	3.4	-	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5
90-DR-001-B	REFRIGERATED DRYER #2	MBR BUILDING - MECHANICAL ROOM	3.4	-	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5
15-P-301-A	NAOH METERING PUMP	MBR BUILDING - CHEMICAL SKID ROOM	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5,14
15-P-301-B	NAOH METERING PUMP	MBR BUILDING - CHEMICAL SKID ROOM	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5,14
23-P-101-A	NACLO METERING PUMP	MBR BUILDING - CHEMICAL SKID ROOM	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5,14
23-P-101-B	NACLO METERING PUMP	MBR BUILDING - CHEMICAL SKID ROOM	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5,14
23-P-301-A	CITRIC ACID METERING PUMPS	MBR BUILDING - CASSETTE LAYDOWN AREA	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5,14
23-P-301-B	CITRIC ACID METERING PUMPS	MBR BUILDING - CASSETTE LAYDOWN AREA	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5,14
20-P-321-1	TURBIDITY SAMPLING PUMPS #1	MBR BUILDING - RAS PUMP ROOM	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5
20-P-321-2	TURBIDITY SAMPLING PUMPS #2	MBR BUILDING - RAS PUMP ROOM	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5
20-P-321-3	TURBIDITY SAMPLING PUMPS #3	MBR BUILDING - RAS PUMP ROOM	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5
20-P-321-4	TURBIDITY SAMPLING PUMPS #4	MBR BUILDING - RAS PUMP ROOM	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5
CTP-01	NAOH CHEMICAL TRANSFER PUMP	MBR BUILDING - CHEMICAL SKID ROOM	9.8	0.5	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	LOCAL CONTROL ONLY		R	WP	M	4X	3,4,5,14
CTP-02	NACLO CHEMICAL TRANSFER PUMP	MBR BUILDING - CHEMICAL SKID ROOM	9.8	0.5	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	LOCAL CONTROL ONLY		R	WP	M	4X	3,4,5,14
F-1	COOLING FAN #1	MBR BUILDING - BLOWER ROOM	4.4	FRACTIONAL	120	1	CFCP-1	REFER TO RISER DIAGRAM		CFCP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1
F-2	COOLING FAN #2	MBR BUILDING - BLOWER ROOM	4.4	FRACTIONAL	120	1	CFCP-1	REFER TO RISER DIAGRAM		CFCP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1
F-3	COOLING FAN #3	MBR BUILDING - BLOWER ROOM	4.4	FRACTIONAL	120	1	CFCP-1	REFER TO RISER DIAGRAM		CFCP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1
F-4	COOLING FAN #4	MBR BUILDING - BLOWER ROOM	4.4	FRACTIONAL	120	1	CFCP-1	REFER TO RISER DIAGRAM		CFCP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1
F-5	COOLING FAN #5	MBR BUILDING - BLOWER ROOM	4.4	FRACTIONAL	120	1	CFCP-1	REFER TO RISER DIAGRAM		CFCP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1
F-6	COOLING FAN #6	MBR BUILDING - BLOWER ROOM	4.4	FRACTIONAL	120	1	CFCP-1	REFER TO RISER DIAGRAM		CFCP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1
F-7	COOLING FAN #7	MBR BUILDING - BLOWER ROOM	4.4	FRACTIONAL	120	1	CFCP-1	REFER TO RISER DIAGRAM		CFCP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1
F-8	COOLING FAN #8	MBR BUILDING - BLOWER ROOM	4.4	FRACTIONAL	120	1	CFCP-1	REFER TO RISER DIAGRAM		CFCP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1
CFCP-1	BLOWER COOLING FAN CONTROL PANEL	MBR BUILDING - BLOWER ROOM	-	-	120	1	LVP1	30A/1P	(2)#10 & #10G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	-	-	-	-	-
DP-500	DRAIN PUMP #1	MBR BUILDING - MBR DRAIN PUMP STATION	3.4	2	480	3	DPCP-500	REFER TO RISER DIAGRAM		DPCP-500	REFER TO RISER DIAGRAM	-	-	ATL	-	1
DP-501	DRAIN PUMP #2	MBR BUILDING - MBR DRAIN PUMP STATION	3.4	2	480	3	DPCP-500	REFER TO RISER DIAGRAM		DPCP-500	REFER TO RISER DIAGRAM	-	-	ATL	-	1
DPCP-500	DRAIN PUMP CONTROL PANEL	MBR BUILDING - CASSETTE LAYDOWN AREA	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
HST-1	BRIDGE CRANE HOIST	MBR BUILDING - RAS ROOM	11	7.2	480	3	BCCP-1	REFER TO RISER DIAGRAM		BCCP-1	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
TRLY-1	BRIDGE CRANE TROLLEY	MBR BUILDING - RAS ROOM	2.1	0.6	480	3	BCCP-1	REFER TO RISER DIAGRAM		BCCP-1	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
TRVL-1L	BRIDGE CRANE END TRUCK	MBR BUILDING - RAS ROOM	1.1	0.4	480	3	BCCP-1	REFER TO RISER DIAGRAM		BCCP-1	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
TRVL-1R	BRIDGE CRANE END TRUCK	MBR BUILDING - RAS ROOM	1.1	0.4	480	3	BCCP-1	REFER TO RISER DIAGRAM		BCCP-1	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
BCCP-1	BRIDGE CRANE CONTROL PANEL	MBR BUILDING - RAS ROOM	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		LOCAL CONTROL ONLY		-	-	-	-	-
HST-2	BRIDGE CRANE HOIST	MBR BUILDING - CASSETTE LAYDOWN AREA	11	7.2	480	3	BCCP-2	REFER TO RISER DIAGRAM		BCCP-2	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
TRLY-2	BRIDGE CRANE TROLLEY	MBR BUILDING - CASSETTE LAYDOWN AREA	2.1	0.6	480	3	BCCP-2	REFER TO RISER DIAGRAM		BCCP-2	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
TRVL-2L	BRIDGE CRANE END TRUCK	MBR BUILDING - CASSETTE LAYDOWN AREA	1.1	0.4	480	3	BCCP-2	REFER TO RISER DIAGRAM		BCCP-2	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
TRVL-2R	BRIDGE CRANE END TRUCK	MBR BUILDING - CASSETTE LAYDOWN AREA	1.1	0.4	480	3	BCCP-2	REFER TO RISER DIAGRAM		BCCP-2	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
BCCP-2	BRIDGE CRANE CONTROL PANEL	MBR BUILDING - CASSETTE LAYDOWN AREA	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		LOCAL CONTROL ONLY		-	-	-	-	-
HVAC-500	HVAC MONITORING CONTROL PANEL	MBR BUILDING - 2ND FLOOR ELECTRICAL ROOM	-	-	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
R I/O-1	REMOTE I/O PANEL #1	MBR BUILDING - ELEVATED OFFICE	-	-	120	1	LVP1	30A/1P	(2)#10 & #10G, 1"C.	MCP	REFER TO RISER DIAGRAM	-	-	-	-	-
5-SLD-15	SLUICE GATE #1	MBR BUILDING - MEMBRANE DISCHARGE CHANNEL	5	-	480	3	HVP1	20A/3P	(3)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	A (30AF/NF)	4X	P	-	-
5-SLD-16	SLUICE GATE #2	MBR BUILDING - MEMBRANE DISCHARGE CHANNEL	5	-	480	3	HVP1	20A/3P	(3)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	A (30AF/NF)	4X	P	-	-
5-SLD-17	SLUICE GATE #3	MBR BUILDING - MEMBRANE DISCHARGE CHANNEL	5	-	480	3	HVP1	20A/3P	(3)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	A (30AF/NF)	4X	P	-	-
5-SLD-18	SLUICE GATE #4	MBR BUILDING - MEMBRANE DISCHARGE CHANNEL	5	-	480	3	HVP1	20A/3P	(3)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	A (30AF/NF)	4X	P	-	-

REFER TO SHEET E-046 FOR SCHEDULE CONTINUATION

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK · JEFFREY E ROBINSON · 095896 · LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:
THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE
CALL 811

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL SCHEDULES

REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE: 10 JULY, 2025
DESIGN BY: RRM
DRAWN BY: CDJ
CHECKED BY: MGR
REVIEWED BY: JER

SHEET NO.
E-045

PROJECT # 18-732 PHASE #

INDICATED BY ⟨1⟩ ON PLAN SHEETS

EQUIPMENT CONNECTION SCHEDULE (SHEET 2 OF 4)

SPECIFIC NOTES:

1. WHEN LOCATION IS NOT REFERENCED ON 'E' SHEETS, REFER TO ASSOCIATED CONTRACT DRAWINGS.
2. LOCATIONS SHOWN ARE GENERAL IN NATURE. COORDINATE WITH ALL TRADE CONTRACTORS PRIOR TO ROUGH-IN.

TYPES:
A: NON-FUSED
B: FUSED
M: MOTOR RATED SWITCH
R: RECEPTACLE/CORD/PLUG
N: NOT REQUIRED
C: CKT BREAKER WITHIN SIGHT

SIZES:
AF: AMPERE FRAME
NF: NON-FUSED
AT: FUSE SIZE (RK5, UON)

TYPES:
VFD: VARIABLE FREQUENCY DRIVE
CMS: COMBINATION MOTOR STARTER WITH DISCONNECT
ATL: ACROSS THE LINE, FVNR MAGNETIC STARTER
M: MOTOR RATED SWITCH - MANUAL STARTER
P: PACKAGED CONTROLLER BY MANUFACTURER
LVT: THERMOSTAT

EQUIPMENT			ELECTRICAL LOAD				POWER CONNECTION			CONTROL CONNECTION		DISCONNECT/SAFETY SWITCH		STARTER		REMARKS
EQUIPMENT TAG	EQUIPMENT TYPE	LOCATION ON PLAN	FLA	HP (KW)	V	PH	HOMERUN TO	CIRCUIT BREAKER	CONDUCTORS & CONDUIT	HOMERUN / INTERLOCK TO	CONDUCTORS & CONDUIT	DISCONNECT TYPE/SIZE	NEMA ENCLOSURE TYPE	STARTER TYPE	NEMA ENCLOSURE TYPE	
IP-01	INFLUENT PUMP #1	INFLUENT DRY WELL	77	60	480	3	HVP6	150A/3P	(3)#1/0 & #6G, 2" C.	R I/O-5	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
IP-02	INFLUENT PUMP #2	INFLUENT DRY WELL	77	60	480	3	HVP6	150A/3P	(3)#1/0 & #6G, 2" C.	R I/O-5	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
IP-03	INFLUENT PUMP #3	INFLUENT DRY WELL	77	60	480	3	HVP6	150A/3P	(3)#1/0 & #6G, 2" C.	R I/O-5	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
ISP-01	SUMP PUMP	INFLUENT DRY WELL	9.8	1/2	120	1	LVP6	20A/1P	(2)#10 & #10G, 1"C.	LOCAL CONTROL ONLY		R	WP	M	4X	3,4,5
MAS-801	PUMP MONITORING SYSTEM	MICROSCREEN BUILDING - ELECTRICAL AREA	-	-	120	1	LVP6	30A/1P	(2)#10 & #10G, 1"C.	R I/O-5	REFER TO RISER DIAGRAM	-	-	-	-	-
R I/O-5	INFLUENT PUMP CONTROL PANEL	MICROSCREEN BUILDING - ELECTRICAL AREA	-	-	120	1	LVP6	30A/1P	(2)#10 & #10G, 1"C.	R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
MCR-01	SCREEN DRIVE MOTOR #1	MICROSCREEN BUILDING - FINE SCREEN AREA	1.6	3/4	480	3	MS-CP-1		REFER TO RISER DIAGRAM	MC-CP-1	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
CMP-01	WASHING COMPACTOR #1	MICROSCREEN BUILDING - FINE SCREEN AREA	3	1.5	480	3	MS-CP-1		REFER TO RISER DIAGRAM	MC-CP-1	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
MS-CP-1	MICROSCREEN CONTROL PANEL #1	MICROSCREEN BUILDING - ELECTRICAL AREA	-	-	480	3	HVP6		REFER TO SINGLE LINE DIAGRAM	R I/O-5	REFER TO RISER DIAGRAM	-	-	-	-	-
MCR-02	SCREEN DRIVE MOTOR #2	MICROSCREEN BUILDING - FINE SCREEN AREA	1.6	3/4	480	3	MS-CP-2		REFER TO RISER DIAGRAM	MS-CP-2	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
CMP-02	WASHING COMPACTOR #2	MICROSCREEN BUILDING - FINE SCREEN AREA	3	1.5	480	3	MS-CP-2		REFER TO RISER DIAGRAM	MS-CP-2	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
MS-CP-2	MICROSCREEN CONTROL PANEL #2	MICROSCREEN BUILDING - ELECTRICAL AREA	-	-	480	3	HVP6		REFER TO SINGLE LINE DIAGRAM	R I/O-5	REFER TO RISER DIAGRAM	-	-	-	-	-
AC-1	AIR COMPRESSOR	GARAGE	44	7.5	208	1	LVP7	60A/2P	(2)#6 & 10G, 1"C.	LOCAL CONTROL ONLY		-	-	-	-	-
EHS-1	ELECTRONIC HOIST SYSTEM	GARAGE	16.7	5	208	3	LVP7	40A/3P	(4)#8 & 10G, 1"C.	LOCAL CONTROL ONLY		-	-	-	-	-
LMM-1	LATHE MILLING MACHINE	GARAGE	13.2	2	208	1	LVP7	30A/2P	(2)#10 & #10G, 1"C.	LOCAL CONTROL ONLY		-	-	-	-	-
ASBC-1	ABRASIVE SAND BLASTING CABINET	GARAGE	10	(1.2KW)	120	1	LVP7	20A/1P	(2)#12 & #12G, 3/4"C.	LOCAL CONTROL ONLY		-	-	-	-	-
PAB-01	BLOWER #1	POST-AERATION PLATFORM & CANOPY	27	20	480	3	HVP8		REFER TO SINGLE LINE DIAGRAM	DBSP	REFER TO RISER DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
PAB-02	BLOWER #2	POST-AERATION PLATFORM & CANOPY	27	20	480	4	HVP8		REFER TO SINGLE LINE DIAGRAM	DBSP	REFER TO RISER DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
20-P-610-A	BACKPULSE PUMP #1	DECHLORINATION BUILDING	77	60	480	3	HVP8		REFER TO SINGLE LINE DIAGRAM	DBSP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
20-P-610-B	BACKPULSE PUMP #2	DECHLORINATION BUILDING	77	60	480	3	HVP8		REFER TO SINGLE LINE DIAGRAM	DBSP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
PW-01	PLANT WATER PUMP #1	PREFAB NON-POTABLE WATER SUCTION LIFT STATION	52	40	480	3	PWCP-600		REFER TO RISER DIAGRAM	PWCP-400	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
PW-02	PLANT WATER PUMP #2	PREFAB NON-POTABLE WATER SUCTION LIFT STATION	52	40	480	3	PWCP-600		REFER TO RISER DIAGRAM	PWCP-400	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
PWCP-600	PUMP CONTROL PANEL	PREFAB NON-POTABLE WATER SUCTION LIFT STATION	-	-	480	3	HVP8		REFER TO SINGLE LINE DIAGRAM	DBSP	REFER TO RISER DIAGRAM	-	-	-	-	-
P-601	COOLING WATER PUMP #1	DISINFECTION TANK	40	30	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
P-602	COOLING WATER PUMP #2	DISINFECTION TANK	40	30	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
RDT-01	LEFT DRUM DRIVE MOTOR	ATAD BUILDING - THICKENING ROOM	2.1	1	480	3	RDT-CP		REFER TO RISER DIAGRAM	RDT-CP	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
RDT-02	LEFT DRUM DRIVE MOTOR	ATAD BUILDING - THICKENING ROOM	2.1	1	480	3	RDT-CP		REFER TO RISER DIAGRAM	RDT-CP	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
RDT-WW-01	WASH WATER BOOSTER PUMP	ATAD BUILDING - THICKENING ROOM	3.4	2	480	3	RDT-CP		REFER TO RISER DIAGRAM	RDT-CP	REFER TO RISER DIAGRAM	-	-	ATL	-	1
RDT-FP-01	RTD SLUDGE FEED PUMP	ATAD BUILDING - THICKENING ROOM	21	15	480	3	RDT-CP		REFER TO RISER DIAGRAM	RDT-CP	REFER TO RISER DIAGRAM	-	-	VFD	-	6
RTD-TSP-01	RTD THICKENED SLUDGE PUMP	ATAD BUILDING - THICKENING ROOM	27	20	480	3	RDT-CP		REFER TO RISER DIAGRAM	RDT-CP	REFER TO RISER DIAGRAM	-	-	VFD	-	6
RDT-P-401	POLYMER PUMP	ATAD BUILDING - THICKENING ROOM	9.8	0.5	120	1	RDT-CP		REFER TO RISER DIAGRAM	RDT-CP	REFER TO RISER DIAGRAM	-	-	ATL	-	1
RDT-P-402	BOOSTER PUMP	ATAD BUILDING - THICKENING ROOM	13.8	0.75	120	2	RDT-CP		REFER TO RISER DIAGRAM	RDT-CP	REFER TO RISER DIAGRAM	-	-	ATL	-	1
RDT-P-403	POLYMER MIXER	ATAD BUILDING - THICKENING ROOM	24	2	120	3	RDT-CP		REFER TO RISER DIAGRAM	RDT-CP	REFER TO RISER DIAGRAM	-	-	ATL	-	1
RDT-CP	ROTARY DRUM THICKENER CONTROL PANEL	ATAD BUILDING - THICKENING ROOM	-	-	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	R I/O-2	REFER TO RISER DIAGRAM	-	-	-	-	-
R-101	THERMAER JET PUMP 1	ATAD BUILDING - EQUIPMENT ROOM	124	100	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
P-201	THERMAER JET PUMP 2	ATAD BUILDING - EQUIPMENT ROOM	125	100	480	4	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
P-401	SNDR JET PUMP	ATAD BUILDING - EQUIPMENT ROOM	77	60	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
B-103	THERMAER 1 BLOWER	ATAD BUILDING - EQUIPMENT ROOM	52	40	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
B-203	THERMAER 2 BLOWER	ATAD BUILDING - EQUIPMENT ROOM	52	40	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
B-403	SNDR BLOWER	ATAD BUILDING - EQUIPMENT ROOM	52	40	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
B-503	SLUDGE HOLDING BLOWER	ATAD BUILDING - EQUIPMENT ROOM	77	60	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
B-1103	SPARE BLOWER	ATAD BUILDING - EQUIPMENT ROOM	77	60	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
P-901	TRANSFER PUMP 1	ATAD BUILDING - EQUIPMENT ROOM	14	10	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (30AF/NF)	4X	VFD	-	6,7
P-902	TRANSFER PUMP	ATAD BUILDING - EQUIPMENT ROOM	14	10	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (30AF/NF)	4X	VFD	-	6,7
B-700	BIOFILTER OFFGAS FAN	BIOFILTER - EXTERIOR	40	30	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
B-701	RDT BOOSTER FAN	BIOFILTER - EXTERIOR	2.1	1	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (30AF/NF)	4X	VFD	-	6,7
P-601	COOLING WATER PUMP 1	ATAD BUILDING - EQUIPMENT ROOM	40	30	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
P-601	COOLING WATER PUMP 2	ATAD BUILDING - EQUIPMENT ROOM	40	30	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
V-702	DAMPER	SNDR TANK	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-704	NPW VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-705	NPW VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-811	FEED VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-812	FEED VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-910	WASTE VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-911	WASTE VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-912	WASTE VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-913	FEED VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-914	FEED VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-915	FEED VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-918	NPW VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
-	THERMAER INSTRUMENT CABINET #1	ATAD BUILDING - EQUIPMENT ROOM	-	-	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	-	-	-	-	-
-	THERMAER INSTRUMENT CABINET #2	ATAD BUILDING - EQUIPMENT ROOM	-	-	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	-	-	-	-	-
-	SNDR INSTRUMENT CABINET #3	ATAD BUILDING - EQUIPMENT ROOM	-	-	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	-	-	-	-	-
-	HEATX INSTRUMENT CABINET #4	ATAD BUILDING - EQUIPMENT ROOM	-	-	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	-	-	-	-	-
-	BIOFILTER INSTRUMENT CABINET #5	ATAD BUILDING - EQUIPMENT ROOM	-	-	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	-	-	-	-	-
ATAD-CP	ATAD CONTROL PANEL	ATAD BUILDING - ELECTRICAL ROOM	-	-	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	R I/O-4	REFER TO RISER DIAGRAM	-	-	-	-	-
FP-400	FILTRATE PUMP 1	FILTRATE PUMP WET WELL	3.4	2	480	3	FPCP-400		REFER TO RISER DIAGRAM	FPCP-400	REFER TO RISER DIAGRAM	-	-	ATL	-	1
FP-401	FILTRATE PUMP 2	FILTRATE PUMP WET WELL	3.4	2	480	3	FPCP-400		REFER TO RISER DIAGRAM	FPCP-400	REFER TO RISER DIAGRAM	-	-	ATL	-	1
FPCP-400	FILTRATE PUMP CONTROL PANEL	ATAD BUILDING - EXTERIOR WALL	-	-	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	R I/O-4	REFER TO RISER DIAGRAM	-	-	-	-	-
BPSFP-03	BELT PRESS #1 SLUDGE FEED PUMP	ATAD BUILDING - EQUIPMENT ROOM	21	15	480	3	HVP5		REFER TO SINGLE LINE DIAGRAM	R I/O-4	REFER TO RISER DIAGRAM	-	-	VFD	-	6
BPSFP-04	BELT PRESS #2 SLUDGE FEED PUMP	ATAD BUILDING - EQUIPMENT ROOM	21	15	480	3	HVP5		REFER TO SINGLE LINE DIAGRAM	R I/O-4	REFER TO RISER DIAGRAM	-	-	VFD	-	6
FP-01	FERRIC PUMP/SKID #1	ATAD BUILDING - EQUIPMENT ROOM	1.1	0.5	480	3	HVP5		REFER TO SINGLE LINE DIAGRAM	R I/O-4	REFER TO RISER DIAGRAM	-	-	VFD	-	6
FP-02	FERRIC PUMP/SKID #2	ATAD BUILDING - EQUIPMENT ROOM	1.1	0.5	480	3	HVP5		REFER TO SINGLE LINE DIAGRAM	R I/O-4	REFER TO RISER DIAGRAM	-	-	VFD	-	6
HVAC-AC-1	HVAC AIR CONDITIONING CONDENSER	ATAD BUILDING - ELECTRICAL ROOM	-	-	208	3	LVP5	30A/3P	(3)#10 & #10G, 1"C.	R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
R I/O-4	REMOTE I/O PANEL #4	ATAD BUILDING - ELECTRICAL ROOM	-		120	1	LVP5	30A/1P	(2)#10 & #10G, 1"C.	R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
BPGD-01	GRAVITY DRIVE #1 (E.T.R.)	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	6	1.5	240	3	BPCP-01		REFER TO RISER DIAGRAM	BPCP-01	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
BDP-01	BELT PRESS DRIVE #1 (E.T.R.)	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	6	1.5	240	3	BPCP-01		REFER TO RISER DIAGRAM	BPCP-01	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
BDP-02	BELT PRESS DRIVE #2 (E.T.R.)	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	6	1.5	240	3	BPCP-01		REFER TO RISER DIAGRAM	BPCP-01	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
FD-01	FEEDBOX DRIVE #1 (E.T.R.)	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	2.2	1/3	240	3	BPCP-01		REFER TO RISER DIAGRAM	BPCP-01	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
BWS-01	BELT WASH SYSTEM #1	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	15.2	5	240	3	BPCP-01		REFER TO RISER DIAGRAM	BPCP-01	REFER TO RISER DIAGRAM	-	-	ATL	-	1
HU-01	HYDRAULIC UNIT #1 (E.T.R.)	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	6.8	2	240	3	BPCP-01		REFER TO RISER DIAGRAM	BPCP-01	REFER TO RISER DIAGRAM	-	-	ATL	-	1
PFP-01	POLYMER FEED PUMP #1	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	9.8	0.5	120	1	PFS-01		REFER TO RISER DIAGRAM	PFS-01	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
PFM-01	POLYMER FEED MIXER #1	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	16	1	120	1	PFS-01		REFER TO RISER DIAGRAM	PFS-01	REFER TO RISER DIAGRAM	-	-	ATL	-	1
PFS-01	POLYMER FEED SYSTEM #1	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	-	-	120	1	BPCP-01		REFER TO RISER DIAGRAM	BPCP-01	REFER TO RISER DIAGRAM	-	-	ATL	-	1
BPCP-01	BELT PRESS CONTROL PANEL #1 (E.R.E.)	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	-	-	240	3	BP-LVP	100A/3P	(4)1/0 & #6G, 2"C.	R I/O -2	REFER TO RISER DIAGRAM	-	-	-	-	-

REFER TO SHEET E-047 FOR SCHEDULE CONTINUATION

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BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK · JEFFREY E ROBINSON · 095690 · LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:
THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE CALL 811

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL SCHEDULES

REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE: 10 JULY, 2025
DESIGN BY: RRM
DRAWN BY: CDJ
CHECKED BY: MGR
REVIEWED BY: JER

SHEET NO.
E-046

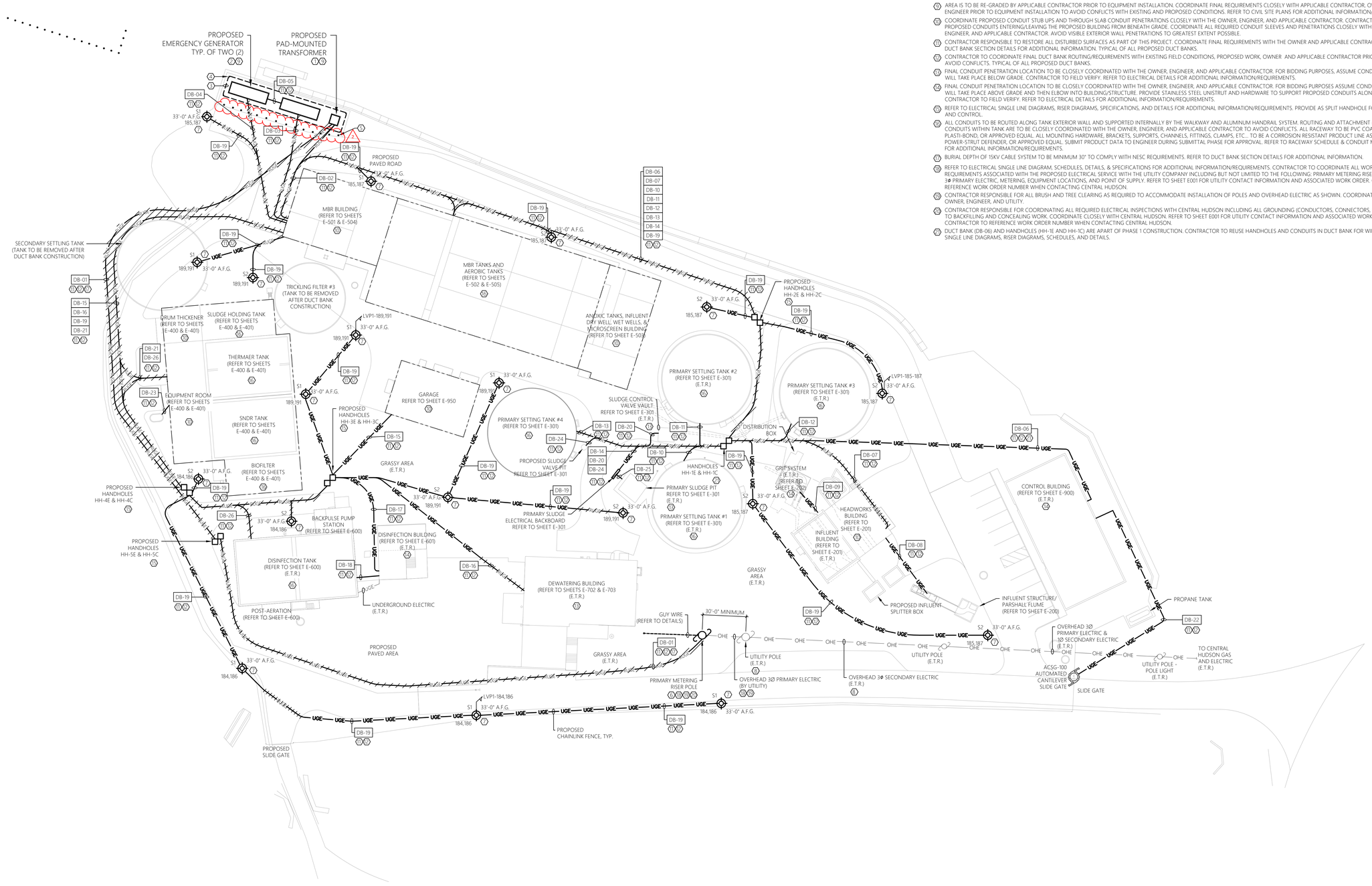
PROJECT # 18-732 PHASE #

GENERAL NEW WORK NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROPOSED UG DUCT BANKS AND STRUCTURES SHOWN ARE APPROXIMATE IN LOCATION. ROUTE UG DUCT BANKS WITH GENERAL ROUTING AS SHOWN ON PLANS. ROUTE DUCT BANKS AS NECESSARY TO AVOID CONFLICTS WITH SITE CONDITIONS AND PROPOSED PIPING SYSTEMS.
3. DUCT BANKS SHALL NOT BE LOCATED ABOVE OTHER PIPING SYSTEMS EXCEPT WHERE CROSSING. MAINTAIN NESC SEPARATION BETWEEN UTILITIES.
4. REFER TO UNDERGROUND UTILITIES (GENERAL NOTES) ON SHEET E-001 FOR ADDITIONAL INFORMATION.
5. COORDINATE FINAL DUCT BANK LOCATIONS (PRIOR TO ROUGH-IN) WITH APPLICABLE CONTRACTOR AND THE OWNER TO AVOID CONFLICT WITH PROPOSED WORK AND EXISTING CONDITIONS.
6. REFER TO DUCT BANK SCHEDULE FOR ADDITIONAL INFORMATION REGARDING DUCT BANK ROUTING, PURPOSE, AND CONTENTS.
7. PROVIDE A DEDICATED GROUNDING CONDUCTOR FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT/DEVICES.
8. EQUIPMENT AND DEVICE LOCATIONS ARE SHOWN AS GENERAL IN NATURE. REFER TO GENERAL SHEETS AND COORDINATE WITH APPLICABLE CONTRACTOR FOR EXACT LOCATIONS.
9. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH THE OWNER AND APPLICABLE CONTRACTOR.
10. REFER TO ELECTRICAL SINGLE LINE DIAGRAMS, FLOOR PLANS, RISER DIAGRAMS, SCHEDULES, DETAILS, & SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
11. REFER TO OVERALL SITE PLANS ON CIVIL/GENERAL SHEETS FOR ADDITIONAL SITE INFORMATION.
12. NOT ALL EXISTING/PROPOSED SITE UTILITIES SHOWN FOR CLARITY. REFER TO GENERAL/CIVIL SHEETS FOR ADDITIONAL SITE INFORMATION.
13. CONTRACTOR IS RESPONSIBLE FOR ALL SITE RESTORATION. REFER TO TYPICAL DUCT BANK SECTION DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
14. CONTRACTOR TO COORDINATE PARKING & LAYDOWN AREA WITH THE OWNER AND APPLICABLE CONTRACTOR.
15. CONTRACTOR TO ADJUST FINAL AIMING ANGLE OF EXTERIOR LIGHT FIXTURES TO LIGHT DESIRED AREAS AND MINIMIZE LIGHT POLLUTION. COORDINATE WITH THE OWNER AND APPLICABLE CONTRACTOR. REFER TO THE LUMINAIRE SCHEDULE FOR ADDITIONAL INFORMATION/REQUIREMENTS.
16. NOT ALL HAND-HOLES AND PULL POINTS SHOWN FOR CLARITY. CONTRACTOR TO PROVIDE HAND-HOLES AND PULL POINTS AS REQUIRED AND PER NEC. CONTRACTOR TO FIELD VERIFY. REFER TO TYPICAL HANDHOLE DETAIL FOR ADDITIONAL INFORMATION/REQUIREMENTS.
17. ALL UTILITY CHARGES RESULTING FROM THE PROPOSED SERVICE ENTRANCE DESIGN SHALL BE BILLED DIRECTLY TO THE OWNER FROM THE UTILITY COMPANY.

SHEET KEY NOTES:

1. PROPOSED PAD-MOUNTED TRANSFORMER BY THIS CONTRACT. THIS CONTRACT RESPONSIBLE FOR THE TRANSFORMER, CONCRETE PAD, CONCRETE VAULT, AND GROUNDING AS SHOWN. REFER TO 'TYPICAL UTILITY TRANSFORMER PAD AND VAULT DETAIL' FOR ADDITIONAL INFORMATION. TRANSFORMER TO BE KEPT A MINIMUM OF 10'-0" FROM ALL STRUCTURES, ACCESS DRIVES, BUILDINGS, UNDERGROUND UTILITIES, AND ALL OTHER ABOVE GRADE EQUIPMENT. IN ADDITION, TRANSFORMER TO BE KEPT A MINIMUM OF 25'-0" FROM ABOVE GRADE EXPOSED GAS LINES, GAS METERS, WATER LINES, AND SEWER LINES. FINAL LOCATION TO BE COORDINATED IN THE FIELD WITH THE UTILITY, OWNER, ENGINEER AND APPLICABLE CONTRACTOR TO AVOID CONFLICT WITH EXISTING SITE CONDITIONS AND PROPOSED WORK, AS WELL AS COMPLY WITH ALL UTILITY REQUIREMENTS. REFER TO THE ELECTRICAL SINGLE LINE DIAGRAM & SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
2. PROPOSED EMERGENCY GENERATOR, ENCLOSURE AND CONCRETE EQUIPMENT PAD. TYPICAL OF TWO (2). GENERATORS TO BE KEPT A MINIMUM OF 10'-0" FROM ALL STRUCTURES, ACCESS DRIVES, BUILDINGS, AND EQUIPMENT. FINAL LOCATION TO BE ADJUSTED TO AVOID CONFLICT AND COMPLY WITH NEC ARTICLE 110.26 'SPACE ABOUT ELECTRICAL EQUIPMENT'. COORDINATE FINAL LOCATION AND ORIENTATION IN THE FIELD WITH THE OWNER, ENGINEER, AND APPLICABLE CONTRACTOR. REFER TO THE ELECTRICAL SINGLE LINE DIAGRAM, SPECIFICATIONS AND 'TYPICAL GENERATOR PAD DETAIL' FOR ADDITIONAL INFORMATION/REQUIREMENTS.
3. EQUIPMENT GROUND RING. GROUND RING TO BE BURIED AT MINIMUM 3 FEET BELOW FINISHED GRADE. GROUND RING TO BE KEPT AT MINIMUM OF 3 FEET AWAY FROM EQUIPMENT (GENERATORS & TRANSFORMER) AT ALL TIMES. PROVIDE AND INSTALL 3/4" Ø X 10' GROUND RODS AT EACH CORNER OF GROUND RING FOR A TOTAL OF FOUR (4) GROUND RODS. BOND ALL PROPOSED EQUIPMENT (GENERATORS & TRANSFORMER) TO GROUND RING. ALL GROUND CONDUCTORS SHALL BE #4/0 COPPER, U.O.N.
4. 3/4"Ø x 10'-0" COPPER GROUND ROD. TYPICAL OF 4. ONE AT EACH CORNER OF THE GROUND RING.
5. PROTECTIVE BOLLARD. TYPICAL OF FOURTEEN (14). DISTANCE FROM BOLLARD TO EQUIPMENT PAD (GENERATOR AND TRANSFORMER) TO BE 5'-0" MINIMUM TO COMPLY WITH NEC REQUIRED WORKING CLEARANCES AND ALLOW FOR ROUTINE MAINTENANCE. BOLLARDS TO BE SPACED 6'-0" APART ON CENTER. REFER TO TYPICAL BOLLARD DETAIL ON SHEET C-142 FOR ADDITIONAL INFORMATION/REQUIREMENTS. COORDINATE FINAL QUANTITIES / LOCATIONS IN THE FIELD WITH THE OWNER, UTILITY, ENGINEER, AND APPLICABLE CONTRACTOR PRIOR TO ROUGH-IN. 2
6. PROVIDE GROUND ROD AT EACH HANDHOLE, PULL BOX, OR ELECTRICAL EQUIPMENT ENCLOSURE. REFER TO SHEET E-001 FOR ADDITIONAL INFORMATION. GROUND ROD IS NOT REQUIRED BY THE UTILITY. GROUND ROD TO BE BURIED AT MINIMUM 3 FEET BELOW FINISHED GRADE. GROUND RING TO BE KEPT AT MINIMUM OF 3 FEET AWAY FROM POLES AT ALL TIMES. ALL GROUND CONDUCTORS SHALL BE #1/0 COPPER, U.O.N.
7. CONTRACTOR TO COORDINATE FINAL LOCATION WITH OWNER, ENGINEER, AND APPLICABLE CONTRACTOR TO AVOID POTENTIAL CONFLICTS WITH EXISTING AND PROPOSED CONDITIONS. ADJUST FIXTURE TO LIGHT DESIRED AREAS AND MINIMIZE LIGHT POLLUTION. REFER TO ELECTRICAL DETAILS AND SCHEDULES FOR ADDITIONAL INSTALLATION, CONTROL, AND WIRING INFORMATION/REQUIREMENTS.
8. CONTRACTOR TO COMPLY WITH THE HIGH VOLTAGE PROXIMITY ACT AND ALL NESC REQUIREMENTS WHEN ERECTING STRUCTURES NEAR ENERGIZED UTILITY LINES. ALL EQUIPMENT, CRANES, ETC. TO BE KEPT A MINIMUM OF 10'-0" FROM ENERGIZED UTILITY LINES. COORDINATE WITH UTILITY PRIOR TO COMMENCING WORK. TYPICAL.
9. AREA IS TO BE RE-GRADED BY APPLICABLE CONTRACTOR PRIOR TO EQUIPMENT INSTALLATION. COORDINATE FINAL REQUIREMENTS CLOSELY WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER PRIOR TO EQUIPMENT INSTALLATION TO AVOID CONFLICTS WITH EXISTING AND PROPOSED CONDITIONS. REFER TO CIVIL SITE PLANS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
10. COORDINATE PROPOSED CONDUIT STUB UPS AND THROUGH SLAB CONDUIT PENETRATIONS CLOSELY WITH THE OWNER, ENGINEER, AND APPLICABLE CONTRACTOR. CONTRACTOR TO ROUTE ALL PROPOSED CONDUITS ENTERING/LEAVING THE PROPOSED BUILDING FROM BENEATH GRADE. COORDINATE ALL REQUIRED CONDUIT SLEEVES AND PENETRATIONS CLOSELY WITH THE OWNER, ENGINEER, AND APPLICABLE CONTRACTOR. AVOID VISIBLE EXTERIOR WALL PENETRATIONS TO GREATEST EXTENT POSSIBLE.
11. CONTRACTOR RESPONSIBLE TO RESTORE ALL DISTURBED SURFACES AS PART OF THIS PROJECT. COORDINATE FINAL REQUIREMENTS WITH THE OWNER AND APPLICABLE CONTRACTOR. REFER TO DUCT BANK SECTION DETAILS FOR ADDITIONAL INFORMATION. TYPICAL OF ALL PROPOSED DUCT BANKS.
12. CONTRACTOR TO COORDINATE FINAL DUCT BANK ROUTING/REQUIREMENTS WITH EXISTING FIELD CONDITIONS, PROPOSED WORK, OWNER AND APPLICABLE CONTRACTOR PRIOR TO ROUGH-IN TO AVOID CONFLICTS. TYPICAL OF ALL PROPOSED DUCT BANKS.
13. FINAL CONDUIT PENETRATION LOCATION TO BE CLOSELY COORDINATED WITH THE OWNER, ENGINEER, AND APPLICABLE CONTRACTOR. FOR BIDDING PURPOSES, ASSUME CONDUIT PENETRATIONS WILL TAKE PLACE BELOW GRADE. CONTRACTOR TO FIELD VERIFY. REFER TO ELECTRICAL DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
14. FINAL CONDUIT PENETRATION LOCATION TO BE CLOSELY COORDINATED WITH THE OWNER, ENGINEER, AND APPLICABLE CONTRACTOR. FOR BIDDING PURPOSES ASSUME CONDUIT PENETRATIONS WILL TAKE PLACE ABOVE GRADE AND THEN ELBOW INTO BUILDING/STRUCTURE. PROVIDE STAINLESS STEEL UNISTRUT AND HARDWARE TO SUPPORT PROPOSED CONDUITS ALONG EXTERIOR WALL. CONTRACTOR TO FIELD VERIFY. REFER TO ELECTRICAL DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
15. REFER TO ELECTRICAL SINGLE LINE DIAGRAMS, RISER DIAGRAMS, SPECIFICATIONS, AND DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS. PROVIDE AS SPLIT HANDHOLE FOR BOTH POWER AND CONTROL.
16. ALL CONDUITS TO BE ROUTED ALONG TANK EXTERIOR WALL AND SUPPORTED INTERNALLY BY THE WALKWAY AND ALUMINUM HANDRAIL SYSTEM. ROUTING AND ATTACHMENT METHODS OF ALL CONDUITS WITHIN TANK ARE TO BE CLOSELY COORDINATED WITH THE OWNER, ENGINEER, AND APPLICABLE CONTRACTOR TO AVOID CONFLICTS. ALL RACEWAY TO BE PVC COATED RGS BY PLASTI-BOND, OR APPROVED EQUAL. ALL MOUNTING HARDWARE, BRACKETS, SUPPORTS, CHANNELS, FITTINGS, CLAMPS, ETC., TO BE A CORROSION RESISTANT PRODUCT LINE AS MANUFACTURED BY POWER-STRUT DEFENDER, OR APPROVED EQUAL. SUBMIT PRODUCT DATA TO ENGINEER DURING SUBMITTAL PHASE FOR APPROVAL. REFER TO RACEWAY SCHEDULE & CONDUIT MOUNTING DETAIL FOR ADDITIONAL INFORMATION/REQUIREMENTS.
17. BURIAL DEPTH OF 15KV CABLE SYSTEM TO BE MINIMUM 30" TO COMPLY WITH NESC REQUIREMENTS. REFER TO DUCT BANK SECTION DETAILS FOR ADDITIONAL INFORMATION.
18. REFER TO ELECTRICAL SINGLE LINE DIAGRAM, SCHEDULES, DETAILS, & SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS. CONTRACTOR TO COORDINATE ALL WORK AND REQUIREMENTS ASSOCIATED WITH THE PROPOSED ELECTRICAL SERVICE WITH THE UTILITY COMPANY INCLUDING BUT NOT LIMITED TO THE FOLLOWING: PRIMARY METERING RISER POLE, OVERHEAD 3Ø PRIMARY ELECTRIC, METERING, EQUIPMENT LOCATIONS, AND POINT OF SUPPLY. REFER TO SHEET E001 FOR UTILITY CONTACT INFORMATION AND ASSOCIATED WORK ORDER. CONTRACTOR TO REFERENCE WORK ORDER NUMBER WHEN CONTACTING CENTRAL HUDSON.
19. CONTRACTOR RESPONSIBLE FOR ALL BRUSH AND TREE CLEARING AS REQUIRED TO ACCOMMODATE INSTALLATION OF POLES AND OVERHEAD ELECTRIC AS SHOWN. COORDINATE CLOSELY WITH OWNER, ENGINEER, AND UTILITY.
20. CONTRACTOR RESPONSIBLE FOR COORDINATING ALL REQUIRED ELECTRICAL INSPECTIONS WITH CENTRAL HUDSON INCLUDING ALL GROUNDING (CONDUCTORS, CONNECTORS, RODS, ETC...) PRIOR TO BACKFILLING AND CONCEALING WORK. COORDINATE CLOSELY WITH CENTRAL HUDSON. REFER TO SHEET E001 FOR UTILITY CONTACT INFORMATION AND ASSOCIATED WORK ORDER. CONTRACTOR TO REFERENCE WORK ORDER NUMBER WHEN CONTACTING CENTRAL HUDSON.
21. DUCT BANK (DB-06) AND HANDHOLES (HH-1E AND HH-1C) ARE APART OF PHASE 1 CONSTRUCTION. CONTRACTOR TO REUSE HANDHOLES AND CONDUITS IN DUCT BANK FOR WIRING SHOWN ON SINGLE LINE DIAGRAMS, RISER DIAGRAMS, SCHEDULES, AND DETAILS.



0 30' 60'
SCALE: 1" = 30'-0"

1 E-101 ELECTRICAL SITE PLAN - NEW WORK
SCALE: 1" = 30'-0" CAESARS LANE WASTEWATER TREATMENT PLANT

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BID ADDENDUM

JADE STONE ENGINEERING

HAZARDOUS MATERIAL NOTE:
THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE CALL 811

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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL SITE PLAN - NEW WORK

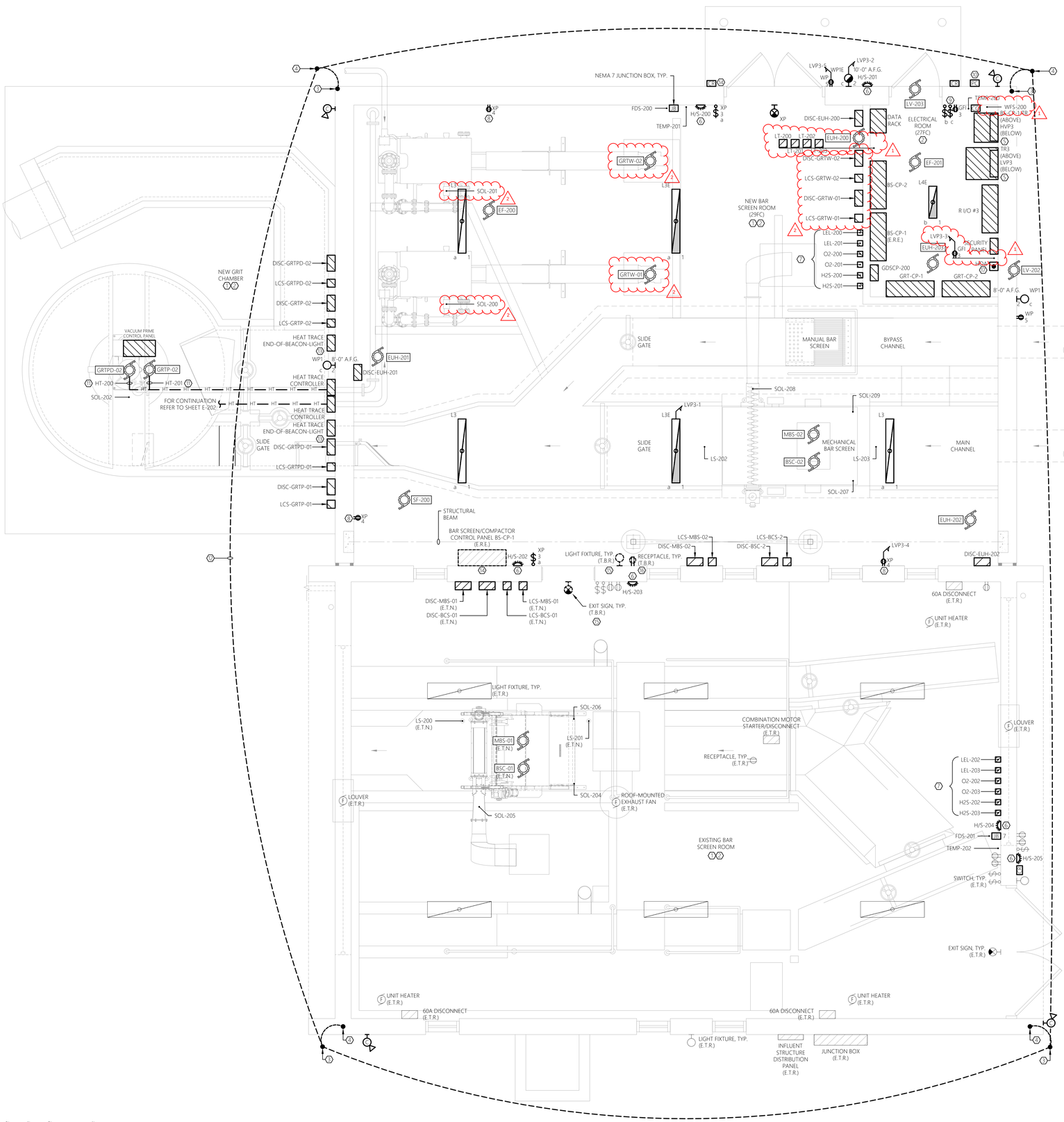
REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.
E-101

PROJECT # 18-732 PHASE #



0' 1' 2' 4'
SCALE: 1/2" = 1'-0"

1 E-201 ELECTRICAL POWER, SYSTEMS, & LGHTING PLAN
SCALE: 1/2" = 1'-0"
HEADWORKS BUILDING

GENERAL DEMOLITION NOTES:

MECHANICAL EQUIPMENT & MISC. ELECTRICAL EQUIPMENT:
WHERE INDICATED TO BE DEMOLISHED:
- REFER TO GENERAL CONTRACT DRAWINGS FOR AN ACCURATE DEPICTION OF ALL DEMOLITION REQUIRED AS PART OF THIS CONTRACT.
- REMOVE ALL WIRE (POWER & CONTROLS) & EXPOSED CONDUIT BACK TO SOURCE PANEL, UNLESS OTHERWISE INDICATED (UOI).
- REMOVE ANY ASSOCIATED MOTOR STARTERS, CONTROL STATIONS, &/OR DISCONNECTS, UOI.
- REMOVE CIRCUIT WIRING FROM SOURCE PANEL AND REMOVE ASSOCIATED SOURCE CIRCUIT BREAKER; UOI.
- REMOVE ALL INTERLOCK CIRCUITRY, UOI.
- PROVIDE REVISED TYPED PANELBOARD DIRECTORIES FOR ALL EXISTING TO REMAIN PANELS WHERE CIRCUITS ARE TO BE REMOVED.
- REMOVE ALL ASSOCIATED MOUNTING HARDWARE, BRACKETS, AND EQUIPMENT, UOI.

RECEPTACLES:
WHERE INDICATED TO BE DEMOLISHED:
- REMOVE ALL RECEPTACLES IMPACTED BY WALL MODIFICATIONS AND OVERALL PROJECT IMPROVEMENTS. **NOTE** ALL EXISTING RECEPTACLES MAY NOT BE SHOWN ON THESE DEMOLITION PLANS. MINOR FIELD VERIFICATION REQUIRED.
- REMOVE DEVICE, AND ALL ASSOCIATED WIRE & CONDUIT BACK TO SOURCE OR NEAREST ACTIVE JUNCTION BOX, UOI.

LIGHTING:
WHERE INDICATED TO BE DEMOLISHED:
- REMOVE ALL FIXTURES THROUGHOUT SPACE. **NOTE** ALL EXISTING LIGHTING FIXTURES MAY NOT BE SHOWN ON THESE DEMOLITION PLANS. MINOR FIELD VERIFICATION REQUIRED.
- REMOVE ALL ASSOCIATED WIRING BACK TO SOURCE, UOI.
- REMOVE SWITCHING AND CONTROL DEVICES, UOI.
- REMOVE CONTACTORS ASSOCIATED WITH LOW VOLTAGE SWITCHING DEVICES, UOI.
- DISPOSE OF ALL LAMPS IN ACCORDANCE WITH STATE/FEDERAL AND EPA REQUIREMENTS.

PANELBOARD REMOVAL AND REPLACEMENT:
- REFER TO SINGLE LINE DIAGRAMS FOR SCOPE OF WORK.

CIRCUIT AND FEEDER REMOVAL AND REPLACEMENT:
- MAINTAIN ANY EXISTING NON-IMPACTED PANELBOARDS AND ANY NON-IMPACTED CIRCUITS WHICH ARE EXISTING TO REMAIN.
- WHERE CIRCUITS ARE AFFECTED BY MODIFICATION/REMOVAL ACTIVITIES, PROVIDE NECESSARY CIRCUIT EXTENSIONS AND ALL NECESSARY LABOR/MATERIALS AS NECESSARY TO REPAIR AND RE-CONNECT CIRCUIT(S).
- ANY CIRCUITS/FEEDERS WHICH REQUIRE SHUTDOWN TO ACCOMMODATE WORK SHALL BE COORDINATED WITH THE OWNER WELL IN ADVANCE.

BUILDING/STRUCTURE GROUND SYSTEM:
- CONTRACTOR TO CAREFULLY PROTECT AND MAINTAIN ALL GROUND SYSTEMS ASSOCIATED WITH BUILDINGS/STRUCTURES EXISTING TO REMAIN.
- CONTRACTOR TO REMOVE ALL GROUND SYSTEMS ASSOCIATED WITH BUILDING/STRUCTURES TO BE REMOVED.
- GROUND SYSTEM COMPONENTS MAY INCLUDE, BUT ARE NOT LIMITED TO, GROUNDING CONDUCTORS, JUMPERS, TERMINATIONS, RODS, AND AIR TERMINALS. CONTRACTOR TO FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCEMENT OF DEMOLITION.

HAZARDOUS MATERIAL REMOVAL:
PERFORM WORK FOR REMOVAL AND DISPOSAL OF EQUIPMENT AND MATERIALS CONTAINING TOXIC SUBSTANCES REGULATED UNDER THE FEDERAL TOXIC SUBSTANCES CONTROL ACT (TSCA) IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS. APPLICABLE EQUIPMENT AND MATERIALS INCLUDE, BUT ARE NOT LIMITED TO:
- PCB-CONTAINING ELECTRICAL EQUIPMENT, INCLUDING TRANSFORMERS, CAPACITORS, AND SWITCHES.
- PCB- AND DEHP-CONTAINING LIGHTING BALLASTS.
- MERCURY-CONTAINING LAMPS AND TUBES, INCLUDING FLUORESCENT LAMPS, HIGH INTENSITY DISCHARGE (HID), ARC LAMPS, ULTRA-VIOLET, HIGH PRESSURE SODIUM, MERCURY VAPOR, IGNITRON TUBES, NEON, AND INCANDESCENT.
- CONTRACTOR TO COORDINATE ANY REQUIRED HAZARDOUS MATERIAL REMOVAL WITH THE OWNER, ENGINEER, AND APPLICABLE TRADE CONTRACTOR.

GENERAL SHEET NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS, AND GENERAL PROJECT NOTES.
2. ITEMS INDICATED TO BE REMOVED:
2.1. REMOVE ALL CONDUCTORS AND EXPOSED CONDUIT BACK TO SOURCE (UOI).
2.2. REMOVE CIRCUIT WIRING AND CIRCUIT BREAKER FROM SOURCE PANEL (UOI).
2.3. REMOVE ALL ASSOCIATED CONTROL CONDUCTORS, CONDUITS, AND DEVICES (UOI).
2.4. REMOVE ASSOCIATED STARTERS, DISCONNECTS, AND ASSOCIATED CIRCUITRY (UOI).
2.5. REMOVE EQUIPMENT PADS & MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC... (UOI).
2.6. REVISE PANELBOARD AND MOTOR CONTROL CENTER DIRECTORIES/NAME PLATES AS CHANGES OCCUR (UOI).
3. THESE DEMOLITION DRAWINGS ARE SCHEMATIC IN NATURE AND ARE BASED ON CURSORY FIELD OBSERVATION AND EXISTING DRAWINGS. IT IS NOT THE INTENTION OF THESE DRAWINGS TO INDICATE EVERY DEVICE/FIXTURE REQUIRING REMOVAL/DEMO RATHER GENERAL SYSTEMS WHICH ARE TO BE REMOVED.
4. CIRCUITS NOT IN AREA OF WORK THAT ARE AFFECTED BY WORK SHALL BE OPERATIONAL DURING PROJECT. PROVIDE TEMPORARY CIRCUITS AS NECESSARY.
5. CIRCUIT, EQUIPMENT, AND DEVICE REMOVAL SHALL NOT AFFECT THE INTEGRITY OR FUNCTIONALITY OF CIRCUITS TO REMAIN. ALL CIRCUITS TO REMAIN SHALL BE MAINTAINED. PROVIDE ALL NECESSARY CIRCUIT MODIFICATIONS AND EXTENSIONS.
6. WHERE REMOVALS LEAVE HOLES AND DAMAGED SURFACES EXPOSED IN THE FINISHED WORK, PATCH AND REPAIR THESE HOLES AND DAMAGED SURFACES TO MATCH ADJACENT FINISHED SURFACES. WHERE NEW WORK IS TO BE APPLIED TO EXISTING SURFACES, PERFORM REMOVALS, AND PATCHING IN A MANNER TO PRODUCE SURFACES SUITABLE FOR RECEIVING NEW WORK. COORDINATE ALL WORK WITH APPLICABLE TRADE CONTRACTOR, OWNER, AND ENGINEER.
7. COORDINATE WITH ALL CONTRACT DRAWINGS AND TRADE CONTRACTORS FOR ADDITIONAL EQUIPMENT THAT IS TO BE DEMOLISHED. FOR ALL EQUIPMENT DOWNGRADED FOR REMOVAL, DISCONNECT AND REMOVE ELECTRICAL CIRCUIT INCLUDING CONDUCTORS AND CONDUIT BACK TO SOURCE.
8. NOT ALL EQUIPMENT/DEVICES ARE SHOWN FOR CLARITY. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS AND REPORT DISCREPANCIES TO ENGINEER PRIOR TO COMMENCEMENT OF DEMOLITION.
9. REFER TO THE ELECTRICAL SINGLE LINE DIAGRAMS, SCHEDULES & DETAILS FOR ADDITIONAL DEMOLITION INFORMATION/REQUIREMENTS.
10. COORDINATE ALL ASPECTS OF SEQUENCE OF REMOVAL WITH THE OWNER, ENGINEER, AND APPLICABLE TRADE CONTRACTOR. REFER TO SPECIFICATIONS AND DEMOLITION SINGLE LINE DIAGRAM FOR ADDITIONAL INFORMATION.
11. WHERE REMOVAL OF CONDUIT SYSTEM IS NOT FEASIBLE, REMOVE ALL CONDUCTORS FROM CONDUIT SYSTEM, CUT FLUSH, CAP CONDUIT SYSTEM, AND ABANDON IN PLACE. FEASIBLE IS DEFINED AS BEING LOCATED WITHIN A CONCRETE DUCT BANK OR CONCRETE SLAB. ALL OTHER INSTANCES TO HAVE THE CONDUIT & CIRCUITRY TO BE REMOVED IN THERE ENTIRETY. FIELD VERIFY AND COORDINATE FINAL REQUIREMENTS WITH THE OWNER, TYPICAL.

GENERAL NEW WORK NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE A DEDICATED GROUNDING CONDUCTOR FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT/DEVICES.
3. EQUIPMENT & DEVICE LOCATIONS ARE SHOWN AS GENERAL IN NATURE. REFER TO ALL TRADE CONTRACT DRAWINGS AND COORDINATE WITH ALL TRADE CONTRACTORS FOR EXACT LOCATIONS. CLOSE CONTRACTOR COORDINATION REQUIRED.
4. ALL PROPOSED EQUIPMENT LOCATIONS/INSTALLATIONS TO COMPLY WITH NEC ARTICLE 110.26 'SPACES ABOUT ELECTRICAL EQUIPMENT'.
5. CONTRACTOR TO PROVIDE ALL REQUIRED MOUNTING HARDWARE, EQUIPMENT, BRACKETS, SUPPORTS, ACCESSORIES, ETC... PROVIDE AS STAINLESS STEEL IN CORROSIVE ENVIRONMENTS, EXTERIOR APPLICATIONS, OR WHERE INDICATED ON THE CONTRACT DRAWINGS.
6. NOT ALL EQUIPMENT/DEVICES MAY BE SHOWN FOR CLARITY. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING AND PROPOSED CONDITIONS PRIOR TO COMMENCEMENT OF CONSTRUCTION. COORDINATE WITH ALL TRADES, OWNER, AND ENGINEER.
7. CONTRACTOR RESPONSIBLE FOR MOUNTING OF ALL PANELS FURNISHED BY OTHERS. COORDINATE WITH OWNER, ENGINEER, AND APPLICABLE TRADE CONTRACTOR AND PROVIDE ALL NECESSARY MOUNTING HARDWARE/EQUIPMENT.
8. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH THE OWNER, ENGINEER, AND ALL TRADE CONTRACTORS.
9. CONTRACTOR TO ADJUST FINAL INTERIOR LIGHT FIXTURE LOCATIONS TO AVOID CONFLICTS WITH EQUIPMENT, PIPING SYSTEMS, AND DUCTWORK. COORDINATE WITH ALL TRADES.
10. CONTRACTOR TO ADJUST FINAL AIMING ANGLE OF EXTERIOR LIGHT FIXTURES TO LIGHT DESIRED AREAS AND MINIMIZE LIGHT POLLUTION. COORDINATE WITH THE OWNER. REFER TO THE LUMINAIRE SCHEDULE FOR ADDITIONAL INFORMATION/REQUIREMENTS.
11. ALL WEATHERPROOF RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 36" A.F.G.
12. CONTRACTOR TO COORDINATE ALL CONDUIT PENETRATIONS AND CONDUIT ROUTING WITH ALL TRADES, OWNER, AND ENGINEER PRIOR TO ROUGH-IN.
13. REFER TO ELECTRICAL SINGLE LINE DIAGRAMS, SPECIFICATIONS, RISER DIAGRAMS, SCHEDULES & DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
14. CONTRACTOR TO PROVIDE LABEL FOR ALL PROPOSED ELECTRICAL EQUIPMENT. REFER TO SPECIFICATIONS FOR LABELING INFORMATION/REQUIREMENTS. PROVIDE LABEL FOR ALL LIGHT SWITCHES/TIME SWITCHES INDICATING LOAD SERVED, AS WELL AS ALARM LIGHTS/HORNS.
15. ALL EQUIPMENT/DEVICES INSTALLED ON EXTERIOR WALLS OF THE HEADWORKS ROOM TO BE INSTALLED 3'-0" MINIMUM FROM ANY OPENINGS (DOORS, LOUVERS, ETC.). FINAL REQUIREMENTS TO BE IN COMPLIANCE WITH THE LATEST EDITION OF NFPA 820.

SHEET KEY NOTES:

1. AREA IS A CLASS I, DIVISION II, GROUP D SPACE. ALL WIRING METHODS TO COMPLY WITH NEC ARTICLE 501. ALL ELECTRICAL EQUIPMENT AND DEVICES INTERIOR TO THIS AREA ARE TO BE EXPLOSION PROOF RATED FOR USE IN A CLASS I, DIVISION II, GROUP D ENVIRONMENT. ALL RACEWAY AND BOXES TO BE PVC COATED RGS BY PLASTI-BOND, OR APPROVED EQUAL. ALL MOUNTING HARDWARE, BRACKETS, SUPPORTS, CHANNELS, FITTINGS, CLAMPS, ETC., TO BE A CORROSION RESISTANT PRODUCT LINE AS MANUFACTURED BY POWER-STRUT DEFENDER, OR APPROVED EQUAL. SUBMIT PRODUCT DATA TO ENGINEER DURING SUBMITTAL PHASE FOR APPROVAL. REFER TO RACEWAY SCHEDULE FOR ADDITIONAL INFORMATION/REQUIREMENTS.
2. ROUTING & ATTACHMENT METHODS OF ALL CONDUITS TO BE CLOSELY COORDINATED WITH APPLICABLE TRADE CONTRACTOR & OWNER PRIOR TO ROUGH-IN AND VERIFIED IN FIELD TO AVOID POTENTIAL CONFLICTS WITH PROPOSED EQUIPMENT, DUCT WORK, AND PIPING SYSTEMS.
3. CONTRACTOR TO PROVIDE 3/4"ø x 10' COPPER GROUND ROD. BOND ALL METAL STRUCTURES, EQUIPMENT, AND LIGHTING PROTECTION DOWN CONDUCTOR TO GROUND ROD USING #2 COPPER CONDUCTOR WITHIN RGS CONDUIT. REFER TO 'TYPICAL LIGHTNING PROTECTION GROUNDING DETAIL' AND 'TYPICAL PANEL GROUNDING DETAIL' FOR ADDITIONAL INFORMATION/REQUIREMENTS.
4. LIGHTNING PROTECTION DOWN CONDUCTOR. CONCEAL IN RGS CONDUIT AND ATTACH TO EXTERIOR WALL. CONTRACTOR TO WORK WITH CERTIFIED LIGHTNING PROTECTION INSTALLER TO PROVIDE COMPLETE BUILDING LIGHTNING PROTECTION SYSTEM IN ACCORDANCE WITH NFPA. UPON COMPLETION PROVIDE UL MASTER LABEL. REFER TO LIGHTNING PROTECTION FOR STRUCTURES SPECIFICATIONS FOR REQUIREMENTS AND ADDITIONAL INFORMATION.
5. CONTRACTOR TO PROVIDE WALL MOUNT BRACKETS FOR INSTALLATION OF TRANSFORMER ON WALL ABOVE PANEL.
6. GAS DETECTION SYSTEM MONITORING ALARM HORN/STROBES. INSTALL DEVICES (HORN/STROBES) AT 8'-0" ABOVE FINISHED FLOOR/GRADE, TYPICAL OF SIX (6). REFER TO SPECIFICATIONS AND RISER DIAGRAM FOR ADDITIONAL INFORMATION/REQUIREMENTS.
7. GAS DETECTION SYSTEM SENSORS AND TRANSMITTERS. INSTALL SENSORS PER MANUFACTURER'S RECOMMENDATIONS. INSTALL TRANSMITTERS AT 48" A.F.F. ON CENTER. REFER TO RISER DIAGRAM AND SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
8. CONTRACTOR TO PROVIDE 20 AMP, 125 VOLT RECEPTACLE (NEMA 5-20R) SUITABLE FOR USE IN A CLASS I DIVISION I GROUP D SPACE. PROVIDE AS CATALOG # ENR21201 M4 AS MANUFACTURED BY CROUSE-HINDS OR APPROVED EQUAL. IN ADDITION, CONTRACTOR TO PROVIDE CORRESPONDING PLUG CATALOG # ENPS201 AS MANUFACTURED BY CROUSE-HINDS, OR APPROVED EQUAL. TURN PLUG OVER TO OWNER. MOUNT RECEPTACLE AT 36" A.F.F.
9. CONTRACTOR TO PROVIDE AS WATTSTOPPER RT-200 ASTRONOMICAL TIME SWITCH OR APPROVED EQUAL WITHIN NEMA 1 ENCLOSURE. SWITCH TO CONTROL PROPOSED EXTERIOR WALL MOUNTED LIGHT FIXTURES TYPES 'WP1' & 'WP1E'. PROGRAM TIME SWITCH FOR LIGHTING 'ON' AT ASTRONOMICAL SUNSET AND 'OFF' AT ASTRONOMICAL SUNRISE. FINAL ON/OFF PROGRAMMING PARAMETERS TO BE COORDINATED WITH THE OWNER.
10. CONTRACTOR TO PROVIDE ONE (1) 120V, 20A PHOTO CONTROL WITH ADJUSTABLE SHIELD FOR CONTROL OF EXTERIOR LIGHTING CIRCUIT. INTERLOCK WITH ASTRONOMICAL TIME SWITCH. CONFIRM FINAL LOCATION WITH THE OWNER PRIOR TO ROUGH-IN. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
11. EXTERIOR 4" DUCTILE DISCHARGE AND EXTERIOR 1-1/2" POTABLE FLUSH WATER BETWEEN THE BUILDING AND GRIT CHAMBER TO HAVE HEAT TRACE SYSTEM APPLIED. PROVIDE HEAT TRACING CABLES, INSULATION, AND JACKET. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS. THIS CONTRACT RESPONSIBLE FOR ALL HEATING CABLES, PIPE INSULATION/JACKET, AND ANCILLARY EQUIPMENT AS SHOWN/SPECIFIED FOR AN OVERALL COMPLETE AND OPERABLE HEAT TRACE SYSTEM. PROVIDE 30A, 208V/1P DEDICATED CIRCUIT (2)#10 & #10G, 3/4"C) FROM PANEL 'LVP3' AS SHOWN ON PANEL SCHEDULE. NOTE, THE PIPING WILL BE PROVIDED/INSTALLED BY APPLICABLE CONTRACTOR. COORDINATE ALL EFFORTS AND FINAL REQUIREMENTS CLOSELY WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER.
12. GROUND RING. GROUND RING TO BE BURIED AT MINIMUM 3 FEET BELOW FINISHED GRADE. GROUND RING TO BE KEPT AT MINIMUM OF 3 FEET AWAY FROM BUILDING AT ALL TIMES. PROVIDE AND INSTALL 3/4"Ø x 10' GROUND RODS AT EACH CORNER OF GROUND RING FOR A TOTAL OF FOUR (4) GROUND RODS. ALL GROUND CONDUCTORS SHALL BE #2 COPPER, U.O.N.
13. CONTRACTOR TO INSTALL END OF BEACON LIGHT ASSOCIATED WITH HEAT TRACE SYSTEM ON BUILDING EXTERIOR WALL (VISIBLE TO OWNER). COORDINATE FINAL LOCATIONS IN FIELD WITH THE OWNER (PRIOR TO ROUGH-IN) AND PROVIDE ALL NECESSARY STAINLESS STEEL MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC... REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS. TYPICAL OF FOUR (4).
14A. PANEL TO BE RELOCATED TO ELECTRICAL ROOM BY THIS CONTRACT. DISCONNECT ELECTRICAL PANEL, MAKE ELECTRICALLY SAFE AND REMOVE ALL CIRCUITRY (CONDUIT & CONDUCTORS) BACK TO SOURCE.
15. CONTRACTOR TO DISCONNECT & REMOVE LIGHT FIXTURE IN ITS ENTIRETY. REMOVE CONDUIT AND CONDUCTORS BACK TO SOURCE. CONTRACTOR TO FIELD VERIFY.
16. CONTRACTOR TO DISCONNECT & REMOVE RECEPTACLE IN ITS ENTIRETY. REMOVE CONDUIT AND CONDUCTORS BACK TO SOURCE. CONTRACTOR TO FIELD VERIFY.
17. CONTRACTOR TO PROVIDE HAND-OFF-AUTO (H-O-A) SWITCH FOR CONTROL OF EXHAUST FAN 'EF-201' AND LOUVERS 'LV-202', 'LV-203'. IN HAND MODE FAN IS TO BE ON. IN OFF MODE FAN IS TO BE OFF. IN AUTO MODE FAN IS TO OPERATE VIA REVERSE ACTING THERMOSTAT. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL NECESSARY INTERLOCK CIRCUITRY. PROVIDE CONTROL POWER TRANSFORMER AND ENCLOSURE AS REQUIRED TO OBTAIN NECESSARY VOLTAGE FOR THERMOSTAT. REFER TO HVAC DRAWINGS AND COORDINATE WITH APPLICABLE TRADE CONTRACTORS FOR THERMOSTAT LOCATIONS AND FINAL REQUIREMENTS. REFER TO VENTILATION SYSTEM INTERLOCK DETAIL FOR ADDITIONAL INFORMATION.

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JADE STONE ENGINEERING

STATE OF NEW YORK JEFFREY E. ROBINSON 095896 LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:

THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
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ELECTRICAL FLOOR PLANS - HEADWORKS BUILDING

REVISIONS

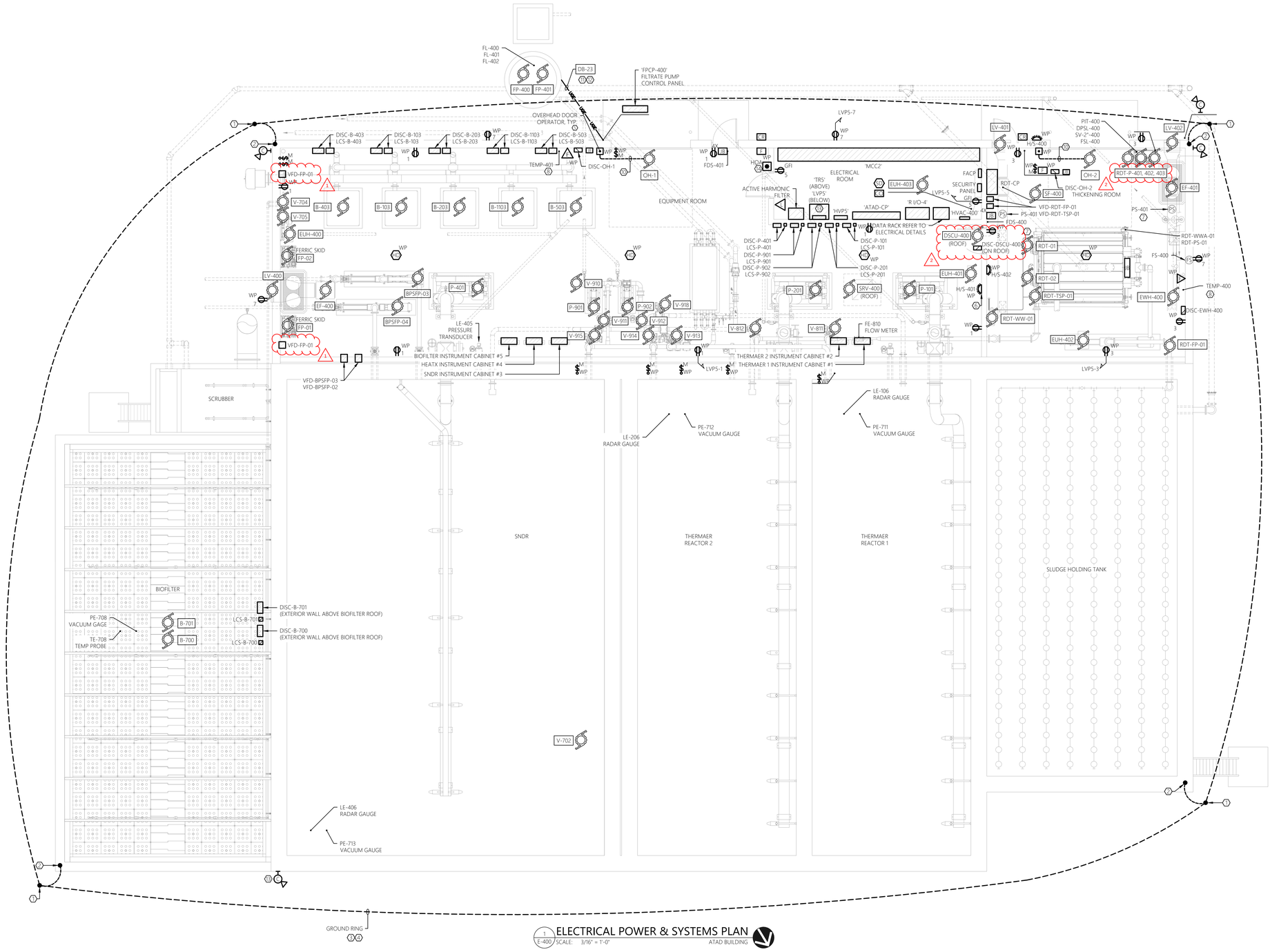
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DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.

E-201

PROJECT # 18-732 PHASE #



ELECTRICAL POWER & SYSTEMS PLAN

1 / E-400 SCALE: 3/16" = 1'-0" — ATAD BUILDING

GENERAL NEW WORK NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE A DEDICATED GROUNDING CONDUCTOR FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT AND DEVICES.
3. EQUIPMENT & DEVICE LOCATIONS ARE SHOWN AS GENERAL IN NATURE. REFER TO MECHANICAL, PROCESS AND HVAC DRAWINGS FOR EXACT LOCATIONS.
4. ALL PROPOSED EQUIPMENT LOCATIONS/INSTALLATIONS TO COMPLY WITH NEC ARTICLE 110.26 'SPACES ABOUT ELECTRICAL EQUIPMENT'. CONTRACTOR TO COORDINATE INSTALLATION LOCATIONS OF ALL EQUIPMENT WITH ALL OTHER TRADE CONTRACTORS PRIOR TO ROUGH IN.
5. CONTRACTOR RESPONSIBLE FOR MOUNTING OF ALL CONTROL PANELS, CONTROLLERS, TRANSMITTERS, ETC... THAT ARE FURNISHED AS PART OF THIS PROJECT (INCLUDING GENERAL CONTRACTOR). PROVIDE ALL NECESSARY MOUNTING HARDWARE/EQUIPMENT. ALL MOUNTING HARDWARE/EQUIPMENT TO BE STAINLESS STEEL. REFERENCE TYPICAL MOUNTING DETAILS FOR ADDITIONAL INFORMATION.
6. REFER TO ELECTRICAL SINGLE LINE DIAGRAM, SCHEDULES, AND DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
7. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH OWNER AND GENERAL CONTRACTOR.
8. ALL EXTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 36" A.F.G. ALL INTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 24" A.F.F. UNLESS NOTED OTHERWISE.
9. CONTRACTOR TO PROVIDE LABEL FOR ALL PROPOSED ELECTRICAL EQUIPMENT AND DEVICES. COORDINATE FINAL LABELING REQUIREMENTS WITH THE OWNER AND ALL OTHER TRADE CONTRACTORS.
10. COORDINATE CONDUIT PENETRATION LOCATIONS THRU EXTERIOR BUILDING WALLS CLOSELY WITH GENERAL CONTRACTOR PRIOR TO PERFORMING WORK.
11. REFER TO DATA DETAILS FOR COMMUNICATION SCOPE OF WORK.

0' 2' 4' 8' 16'
SCALE: 3/16" = 1'-0"

SHEET KEY NOTE:

1. CONTRACTOR TO PROVIDE 3/4"Ø x 10' COPPER GROUND ROD. BOND ALL METAL STRUCTURES AND LIGHTING PROTECTION DOWN CONDUCTOR TO GROUND ROD USING #2/0 COPPER CONDUCTOR WITHIN RGS CONDUIT. REFER TO TYPICAL LIGHTNING PROTECTION GROUNDING DETAILS AND TYPICAL PANEL GROUNDING DETAIL FOR ADDITIONAL INFORMATION/REQUIREMENTS.
2. LIGHTNING PROTECTION DOWN CONDUCTOR. CONCEAL IN RGS CONDUIT WITHIN EXTERIOR WALL CONSTRUCTION. CONTRACTOR TO WORK WITH CERTIFIED LIGHTNING PROTECTION INSTALLER TO PROVIDE COMPLETE BUILDING LIGHTNING PROTECTION SYSTEM IN ACCORDANCE WITH NFPA. UPON COMPLETION PROVIDE UL MASTER LABEL. REFER TO LIGHTNING PROTECTION FOR STRUCTURES SPECIFICATIONS FOR REQUIREMENTS AND ADDITIONAL INFORMATION.
3. GROUND RING. GROUND RING TO BE BURIED AT MINIMUM 3 FEET BELOW FINISHED GRADE. GROUND RING TO BE KEPT AT MINIMUM OF 3 FEET AWAY FROM BUILDING AT ALL TIMES. PROVIDE AND INSTALL 3/4"Ø x 10' GROUND RODS AT EACH CORNER OF GROUND RING FOR A TOTAL OF SIX (6) GROUND RODS. ALL GROUND CONDUCTORS SHALL BE #2/0 COPPER, U.O.N.
4. CONTRACTOR TO ADDITIONALLY BOND GROUND RING TO ADJACENT BUILDING GROUND SYSTEM. UTILIZE #2/0 COPPER GROUND CONDUCTOR.
5. REFER TO EQUIPMENT CONNECTION SCHEDULE AND 'TYPICAL OVERHEAD DOOR RISER DIAGRAM' FOR ADDITIONAL INFORMATION/REQUIREMENTS.
6. HVAC MONITORING SYSTEM ALARM HORN/STROBES. INSTALL DEVICES (HORN/STROBES) AT 8'-0" ABOVE FINISHED FLOOR/GRADE. TYPICAL OF TWO (2). REFER TO RISER DIAGRAM FOR ADDITIONAL INFORMATION/REQUIREMENTS.
7. PRESSURE SENSOR FOR MONITORING. COORDINATE FINAL CIRCUITRY REQUIREMENTS WITH THE HVAC CONTRACTOR. CONNECT TO 'HVAC-400'.
8. TEMPERATURE SENSOR FOR MONITORING. COORDINATE FINAL CIRCUITRY REQUIREMENTS WITH THE APPLICABLE TRADE CONTRACTOR. CONNECT TO 'R I/O-4'. TYPICAL OF TWO (2)
9. CONTRACTOR TO PROVIDE COMBINATION CARBON MONOXIDE/SMOKE DETECTOR MODEL GN-503F AS MANUFACTURED BY GENTEX OR APPROVED EQUAL. DETECTOR TO BE 120V POWERED BY BUILDING ELECTRICAL SYSTEM, CONTAIN BATTERY BACKUP, AND BE UL LISTED. DETECTOR TO FEATURE ONE (1) SET OF CONTACTS THAT ACTIVATE UPON DETECTION OF SMOKE, OR CARBON MONOXIDE. INSTALL ON WALL PER MANUFACTURER'S RECOMMENDATIONS AND IN ACCORDANCE WITH NFPA 720.
10. PROVIDE LOW VOLTAGE CONDUCTORS IN 1/2" CONDUIT PER MANUFACTURERS RECOMMENDATIONS FOR AN OVERALL COMPLETE AND OPERABLE SYSTEM. COORDINATE FINAL REQUIREMENTS WITH ALL OTHER TRADE CONTRACTORS AND THE OWNER.
11. CONTRACTOR RESPONSIBLE TO RESTORE ALL DISTURBED SURFACES AS PART OF THIS PROJECT. COORDINATE FINAL REQUIREMENTS WITH THE OWNER AND APPLICABLE CONTRACTOR. REFER TO DUCT BANK SECTION DETAILS FOR ADDITIONAL INFORMATION. TYPICAL OF ALL PROPOSED DUCT BANKS.
12. CONTRACTOR TO COORDINATE FINAL DUCT BANK ROUTING/REQUIREMENTS WITH EXISTING FIELD CONDITIONS, PROPOSED WORK, OWNER AND APPLICABLE CONTRACTOR PRIOR TO ROUGH-IN TO AVOID CONFLICTS. TYPICAL OF ALL PROPOSED DUCT BANKS.
13. CONTRACTOR TO PROVIDE WALL MOUNT BRACKETS FOR INSTALLATION ON WALL ABOVE PANEL LVP5.
14. CONTRACTOR TO PROVIDE HAND-OFF-AUTO (H-O-A) SWITCH FOR CONTROL OF EXHAUST FAN 'EF-400' AND LOUVER 'LV-400'. IN HAND MODE FAN IS TO BE ON. IN OFF MODE FAN IS TO BE OFF. IN AUTO MODE FAN IS TO OPERATE VIA REVERSE ACTING THERMOSTAT. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL NECESSARY INTERLOCK CIRCUITRY. PROVIDE CONTROL POWER TRANSFORMER AND ENCLOSURE AS REQUIRED TO OBTAIN NECESSARY VOLTAGE FOR THERMOSTAT. REFER TO HVAC DRAWINGS AND COORDINATE WITH APPLICABLE TRADE CONTRACTORS FOR THERMOSTAT LOCATIONS AND FINAL REQUIREMENTS. REFER TO VENTILATION SYSTEM INTERLOCK DETAIL FOR ADDITIONAL INFORMATION.

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HAZARDOUS MATERIAL NOTE:
THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

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NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
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NEW WINDSOR, NY 12553

ELECTRICAL POWER & SYSTEMS PLAN - ATAD BUILDING

REVISIONS

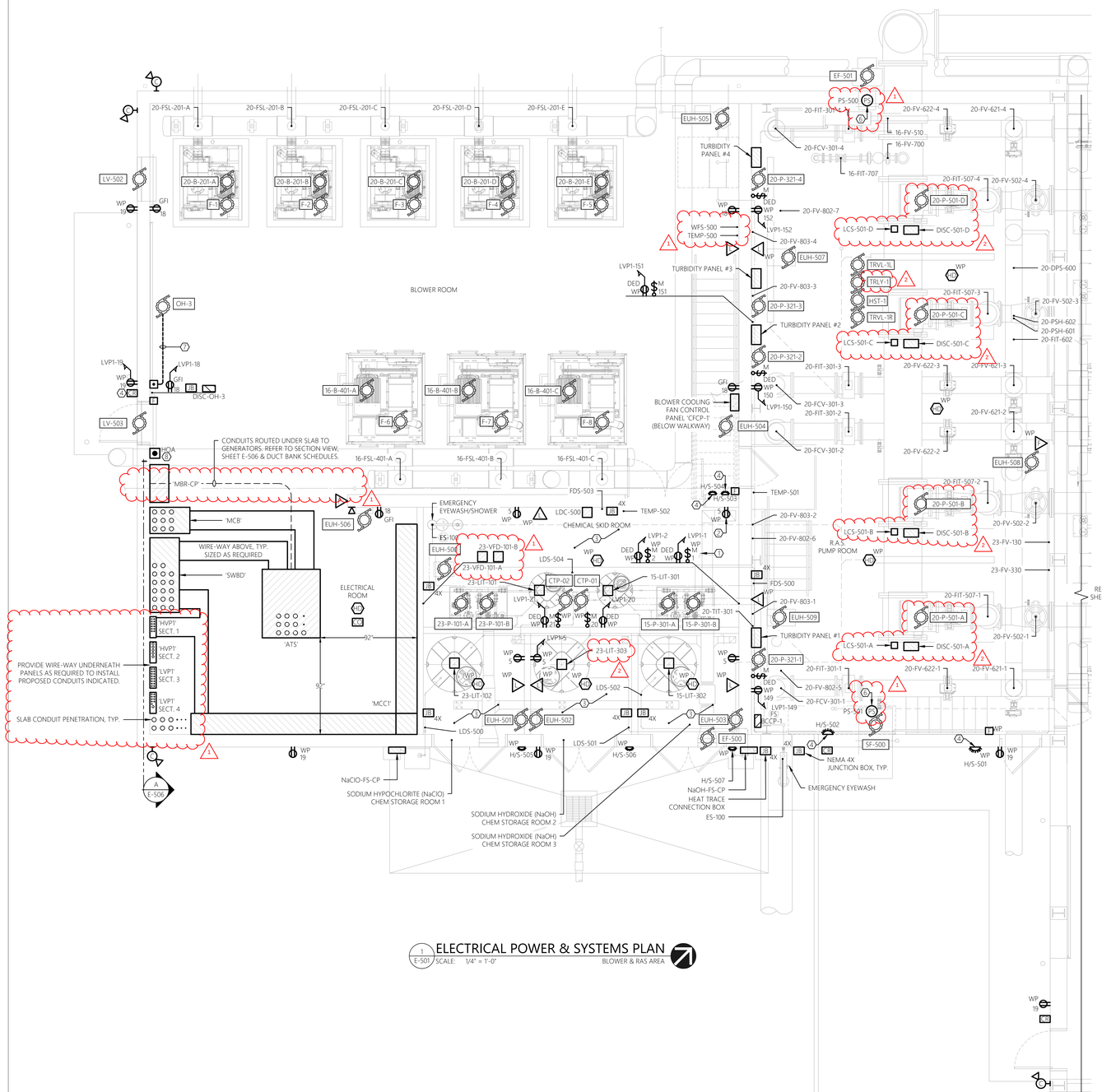
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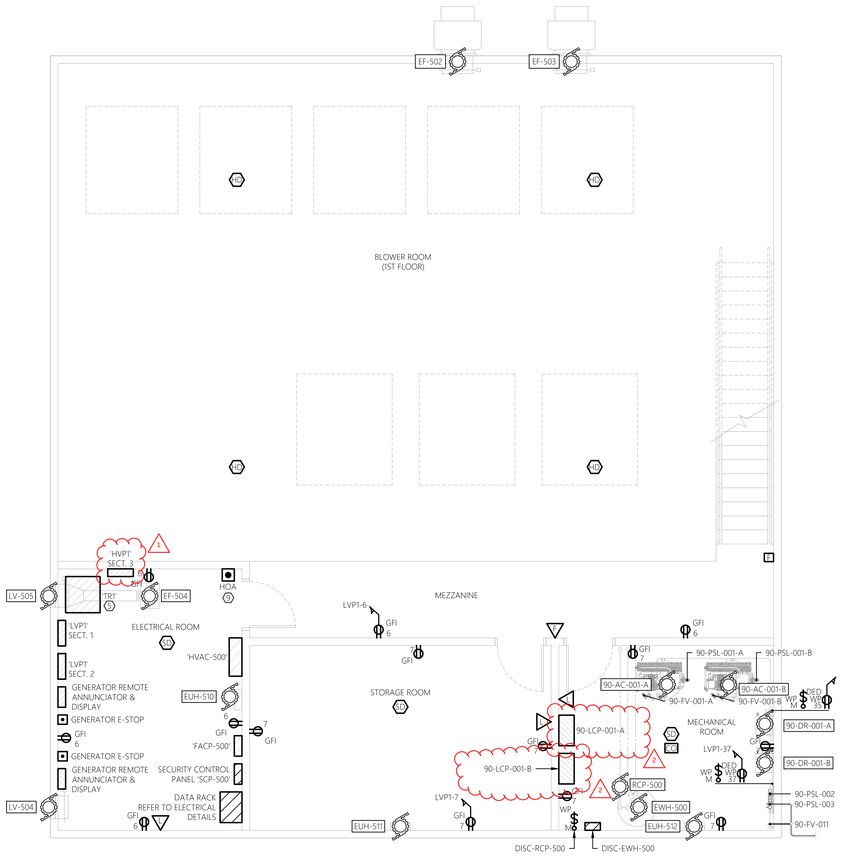
SHEET NO.

E-400

PROJECT # 18-732 PHASE #



1 ELECTRICAL POWER & SYSTEMS PLAN
E-501 SCALE: 1/4" = 1'-0" BLOWER & RAS AREA



2 ELECTRICAL POWER & SYSTEMS PLAN
E-501 SCALE: 1/4" = 1'-0" 2ND FLOOR



3 OVERALL PLAN KEY
E-501 SCALE: NTS MBR BUILDING

GENERAL NEW WORK NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE A DEDICATED GROUNDING CONDUCTOR FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT AND DEVICES.
3. EQUIPMENT & DEVICE LOCATIONS ARE SHOWN AS GENERAL IN NATURE. REFER TO MECHANICAL, PROCESS AND HVAC DRAWINGS FOR EXACT LOCATIONS.
4. ALL PROPOSED EQUIPMENT LOCATIONS/INSTALLATIONS TO COMPLY WITH NEC ARTICLE 110.26 'SPACES ABOUT ELECTRICAL EQUIPMENT'. CONTRACTOR TO COORDINATE INSTALLATION LOCATIONS OF ALL EQUIPMENT WITH ALL OTHER TRADE CONTRACTORS PRIOR TO ROUGH IN.
5. CONTRACTOR RESPONSIBLE FOR MOUNTING OF ALL CONTROL PANELS, CONTROLLERS, TRANSMITTERS, ETC., THAT ARE FURNISHED AS PART OF THIS PROJECT (INCLUDING GENERAL CONTRACTOR). PROVIDE ALL NECESSARY MOUNTING HARDWARE/EQUIPMENT. ALL MOUNTING HARDWARE/EQUIPMENT TO BE STAINLESS STEEL. REFERENCE TYPICAL MOUNTING DETAILS FOR ADDITIONAL INFORMATION.
6. REFER TO ELECTRICAL SINGLE LINE DIAGRAM, SCHEDULES, AND DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
7. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH OWNER AND ALL OTHER TRADE CONTRACTORS.
8. ALL EXTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 36" A.F.G. ALL INTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 24" A.F.F. UNLESS NOTED OTHERWISE.
9. CONTRACTOR TO PROVIDE LABEL FOR ALL PROPOSED ELECTRICAL EQUIPMENT AND DEVICES. COORDINATE FINAL LABELING REQUIREMENTS WITH THE OWNER AND ALL OTHER TRADE CONTRACTORS.
10. COORDINATE CONDUIT PENETRATION LOCATIONS THRU EXTERIOR BUILDING WALLS CLOSELY WITH GENERAL CONTRACTOR PRIOR TO PERFORMING WORK.
11. REFER TO DATA DETAILS FOR COMMUNICATION SCOPE OF WORK.

0' 2' 4' 8'
SCALE: 1/4" = 1'-0"

SHEET KEY NOTES:

1. EACH CHEMICAL PUMP TO BE PROVIDED WITH A SWITCHED RECEPTACLE FOR ON/OFF CONTROL OF CHEMICAL PUMP. REFER TO EQUIPMENT CONNECTION SCHEDULE FOR ADDITIONAL INFORMATION. TYPICAL.
2. ALL RECEPTACLES WITHIN CHEMICAL ROOM TO BE PROVIDED WITH PVC COATED BOX AND COVER SYSTEM. TYPICAL.
3. CHEMICAL ROOM INTERIOR IS A CORROSIVE ENVIRONMENT. ALL ELECTRICAL EQUIPMENT, WIRING METHODS, AND DEVICES INTERIOR TO THE CHEMICAL ROOM TO BE OF CORROSION RESISTANT MATERIALS/METHODS. UTILIZE NEMA 4X (NON-METALLIC) ENCLOSURES FOR DISCONNECTS AND LOCAL CONTROL STATIONS. UTILIZED TITANIUM FOR ALL SUPPORTS, ANCHORS, AND FASTENERS.
4. HVAC MONITORING SYSTEM ALARM HORN/STROBES. INSTALL DEVICES (HORN/STROBES) AT 8'-0" ABOVE FINISHED FLOOR/GRADE. REFER TO RISER DIAGRAM FOR ADDITIONAL INFORMATION/REQUIREMENTS.
5. CONTRACTOR TO PROVIDE CONCRETE EQUIPMENT PAD. REFER TO TYPICAL EQUIPMENT PAD DETAIL.
6. AIRFLOW PROVING SWITCH/PRESSURE SENSOR TO BE PROVIDED AND INSTALLED IN DUCTWORK FOR AIRFLOW MONITORING PER MANUFACTURER RECOMMENDATIONS. REFER TO RISER HVAC MONITORING CONTROL PANEL FOR ADDITIONAL INFORMATION/REQUIREMENTS.
7. ANOKA OVERHEAD DOOR SYSTEM SHALL BE FURNISHED, INSTALLED, AND TESTED AS AN OVERALL COMPLETE AND OPERABLE SYSTEM. COORDINATE FINAL REQUIREMENTS WITH ALL OTHER TRADE CONTRACTORS AND THE OWNER.
8. CONTRACTOR TO PROVIDE HAND-OFF-AUTO (H-O-A) SWITCH FOR CONTROL OF EXHAUST FANS 'EF-502' AND 'EF-503' AND LOUVERS 'LV-502' AND 'LV-503'. IN HAND MODE FAN IS TO BE ON. IN OFF MODE FAN IS TO BE OFF. IN AUTO MODE FAN IS TO OPERATE VIA REVERSE ACTING THERMOSTAT. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL NECESSARY INTERLOCK CIRCUITRY. PROVIDE CONTROL POWER TRANSFORMER AND ENCLOSURE AS REQUIRED TO OBTAIN NECESSARY VOLTAGE FOR THERMOSTAT. REFER TO HVAC DRAWINGS AND COORDINATE WITH APPLICABLE TRADE CONTRACTORS FOR THERMOSTAT LOCATIONS AND FINAL REQUIREMENTS.
9. CONTRACTOR TO PROVIDE HAND-OFF-AUTO (H-O-A) SWITCH FOR CONTROL OF EXHAUST FAN 'EF-504' AND LOUVERS 'LV-504' AND 'LV-505'. IN HAND MODE FAN IS TO BE ON. IN OFF MODE FAN IS TO BE OFF. IN AUTO MODE FAN IS TO OPERATE VIA REVERSE ACTING THERMOSTAT. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL NECESSARY INTERLOCK CIRCUITRY. PROVIDE CONTROL POWER TRANSFORMER AND ENCLOSURE AS REQUIRED TO OBTAIN NECESSARY VOLTAGE FOR THERMOSTAT. REFER TO HVAC DRAWINGS AND COORDINATE WITH APPLICABLE TRADE CONTRACTORS FOR THERMOSTAT LOCATIONS AND FINAL REQUIREMENTS.

MHE ENGINEERING
33 Airport Center Drive, Suite 202
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(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK JEFFREY E ROBINSON 095896 LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:

THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL POWER & SYSTEMS PLAN - BLOWER & RAS AREA

REVISIONS

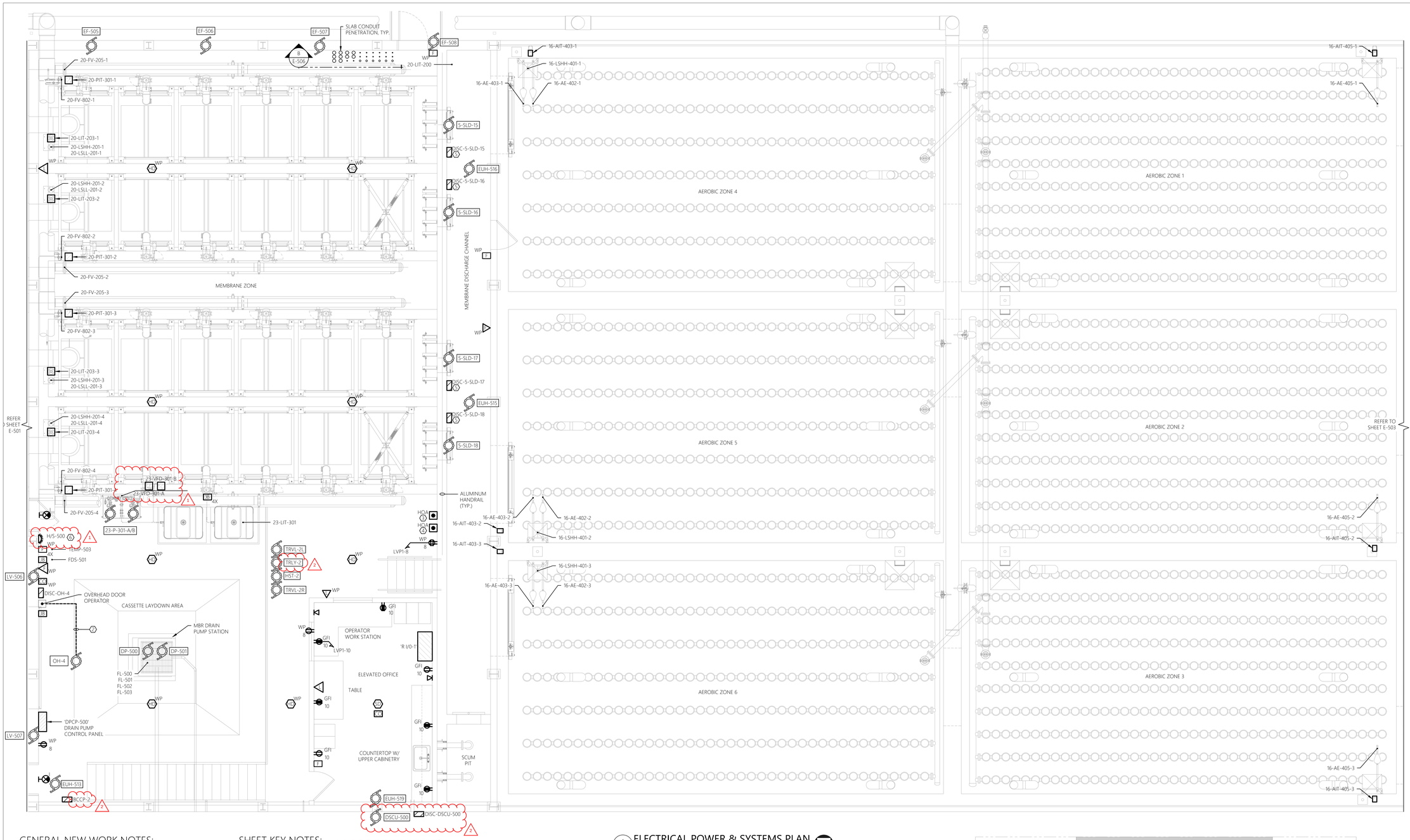
NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.

E-501

PROJECT # 18-732 PHASE #



1 E-502 ELECTRICAL POWER & SYSTEMS PLAN — MEMBRANE & AEROBIC ZONES
SCALE: 1/4" = 1'-0"

GENERAL NEW WORK NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE A DEDICATED GROUNDING CONDUCTOR FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT AND DEVICES.
3. EQUIPMENT & DEVICE LOCATIONS ARE SHOWN AS GENERAL IN NATURE. REFER TO MECHANICAL, PROCESS AND HVAC DRAWINGS FOR EXACT LOCATIONS.
4. ALL PROPOSED EQUIPMENT LOCATIONS/INSTALLATIONS TO COMPLY WITH NEC ARTICLE 110.26 'SPACES ABOUT ELECTRICAL EQUIPMENT'. CONTRACTOR TO COORDINATE INSTALLATION LOCATIONS OF ALL EQUIPMENT WITH ALL OTHER TRADE CONTRACTORS PRIOR TO ROUGH IN.
5. CONTRACTOR RESPONSIBLE FOR MOUNTING OF ALL CONTROL PANELS, CONTROLLERS, TRANSMITTERS, ETC., THAT ARE FURNISHED AS PART OF THIS PROJECT (INCLUDING GENERAL CONTRACTOR). PROVIDE ALL NECESSARY MOUNTING HARDWARE/EQUIPMENT. ALL MOUNTING HARDWARE/EQUIPMENT TO BE STAINLESS STEEL. REFERENCE TYPICAL MOUNTING DETAILS FOR ADDITIONAL INFORMATION.
6. REFER TO ELECTRICAL SINGLE LINE DIAGRAM, SCHEDULES, AND DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
7. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH OWNER AND ALL OTHER TRADE CONTRACTORS.
8. ALL EXTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 36" A.F.G. ALL INTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 24" A.F.F. UNLESS NOTED OTHERWISE.
9. CONTRACTOR TO PROVIDE LABEL FOR ALL PROPOSED ELECTRICAL EQUIPMENT AND DEVICES. COORDINATE FINAL LABELING REQUIREMENTS WITH THE OWNER AND ALL OTHER TRADE CONTRACTORS.
10. COORDINATE CONDUIT PENETRATION LOCATIONS THRU EXTERIOR BUILDING WALLS CLOSELY WITH GENERAL CONTRACTOR PRIOR TO PERFORMING WORK.
11. REFER TO DATA DETAILS FOR COMMUNICATION SCOPE OF WORK.

SHEET KEY NOTES:

1. HVAC MONITORING SYSTEM ALARM HORN/STROBE SERVING RAS PUMP ROOM. INSTALL DEVICE (HORN/STROBE) AT 8'-0" ABOVE FINISHED FLOOR/GRADE. REFER TO RISER DIAGRAM FOR ADDITIONAL INFORMATION/REQUIREMENTS.
2. CONTRACTOR TO PROVIDE ALL REQUIRED STAINLESS STEEL UNISTRUT AND ASSOCIATED MOUNTING BRACKETS, ACCESSORIES, ETC., TO MOUNT ELECTRICAL EQUIPMENT TO HANDRAIL. COORDINATE FINAL LOCATION WITH OWNER AND APPLICABLE TRADE CONTRACTORS. ALL REQUIREMENTS TO BE PER NEC.
3. CONTRACTOR TO PROVIDE HAND-OFF-AUTO (H-O-A) SWITCH FOR CONTROL OF EXHAUST FANS 'EF-505' AND 'EF-506' AND LOUVER 'LV-506'. IN HAND MODE FAN IS TO BE ON. IN OFF MODE FAN IS TO BE OFF. IN AUTO MODE FAN IS TO OPERATE VIA REVERSE ACTING THERMOSTAT. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL NECESSARY INTERLOCK CIRCUITRY. PROVIDE CONTROL POWER TRANSFORMER AND ENCLOSURE AS REQUIRED TO OBTAIN NECESSARY VOLTAGE FOR THERMOSTAT. REFER TO HVAC DRAWINGS AND COORDINATE WITH APPLICABLE TRADE CONTRACTORS FOR THERMOSTAT LOCATIONS AND FINAL REQUIREMENTS.
4. CONTRACTOR TO PROVIDE HAND-OFF-AUTO (H-O-A) SWITCH FOR CONTROL OF EXHAUST FANS 'EF-507' AND 'EF-508' AND LOUVER 'LV-507'. IN HAND MODE FAN IS TO BE ON. IN OFF MODE FAN IS TO BE OFF. IN AUTO MODE FAN IS TO OPERATE VIA REVERSE ACTING THERMOSTAT. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL NECESSARY INTERLOCK CIRCUITRY. PROVIDE CONTROL POWER TRANSFORMER AND ENCLOSURE AS REQUIRED TO OBTAIN NECESSARY VOLTAGE FOR THERMOSTAT. REFER TO HVAC DRAWINGS AND COORDINATE WITH APPLICABLE TRADE CONTRACTORS FOR THERMOSTAT LOCATIONS AND FINAL REQUIREMENTS.
5. CONTRACTOR TO PROVIDE ALL REQUIRED STAINLESS STEEL UNISTRUT AND ASSOCIATED MOUNTING BRACKETS, ACCESSORIES, ETC., TO MOUNT ELECTRICAL EQUIPMENT TO HANDRAIL. COORDINATE FINAL LOCATION WITH OWNER AND APPLICABLE TRADE CONTRACTORS. ALL REQUIREMENTS TO BE PER NEC.



2 E-502 OVERALL PLAN KEY — MBR BUILDING
SCALE: NTS

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33 Airport Center Drive, Suite 202
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111 Wheatfield Drive, Suite 1
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(570) 296-2765

BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK
JEFFREY E ROBINSON
098896
LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:

THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL POWER & SYSTEMS PLAN - MEMBRANE & AEROBIC AREA

REVISIONS

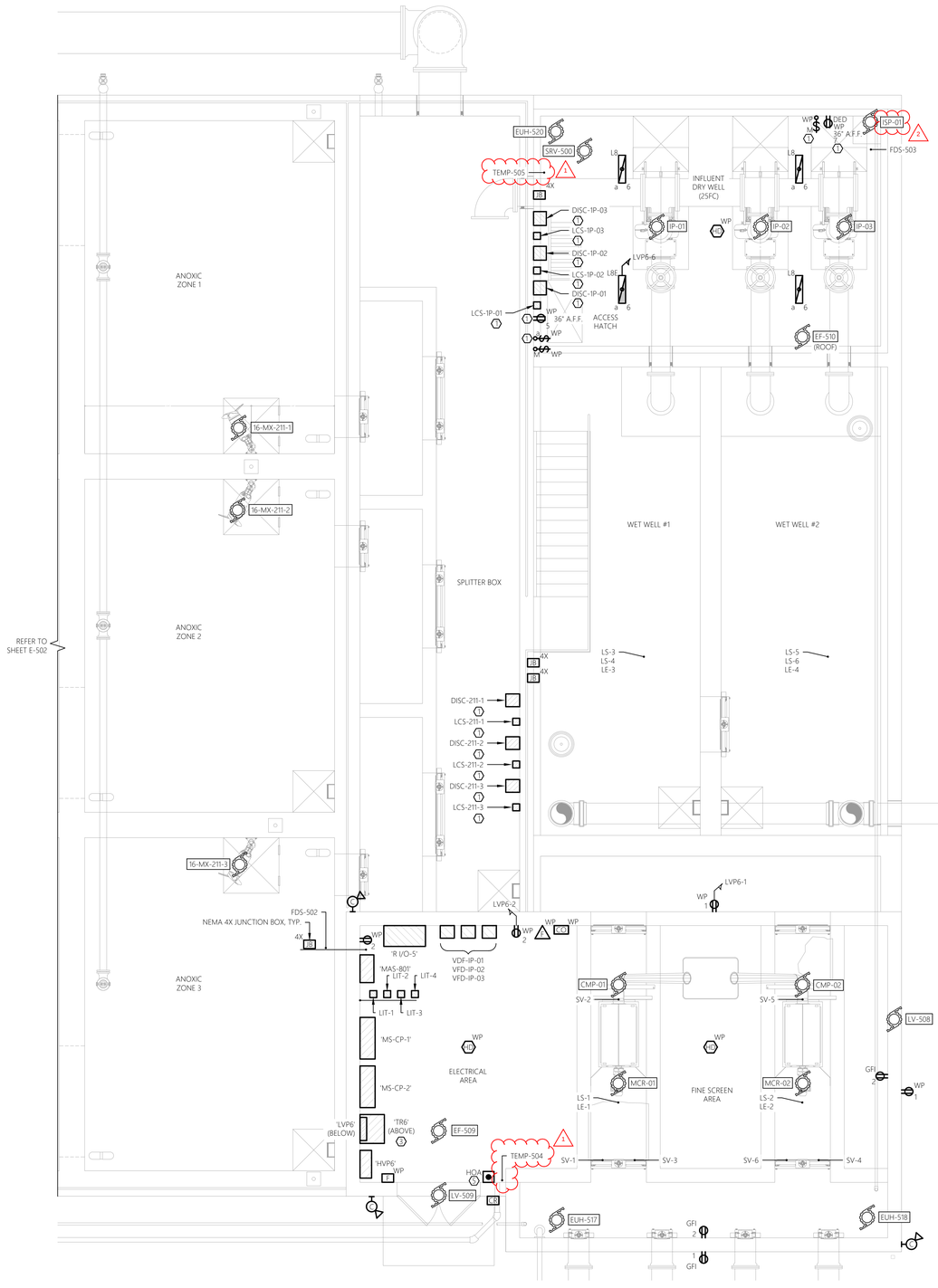
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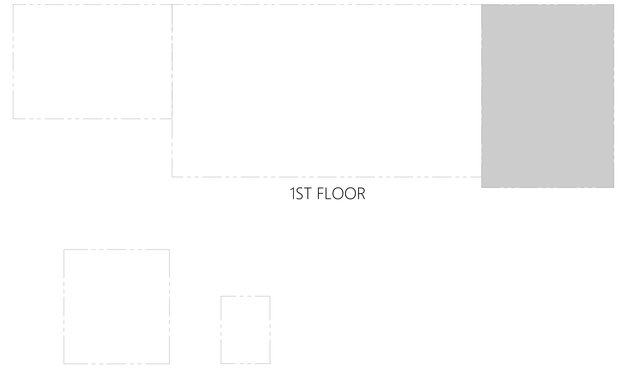
SHEET NO.

E-502

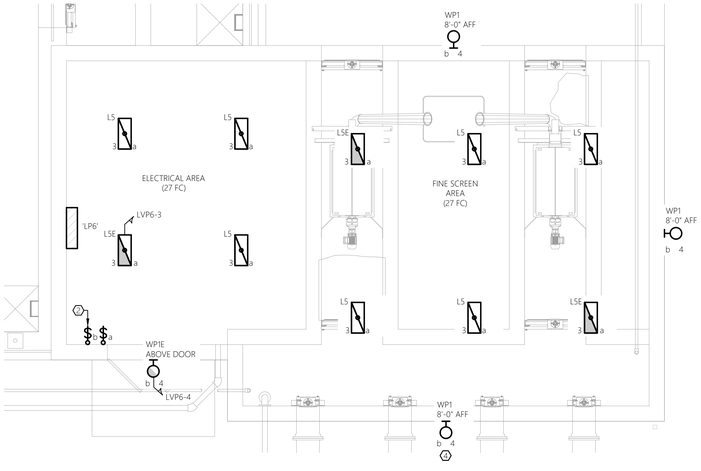
PROJECT # 18-732 PHASE #



1 E-503 ELECTRICAL POWER & SYSTEMS PLAN
SCALE: 1/4" = 1'-0" SCREENING & INFLUENT AREA



2 E-503 OVERALL PLAN KEY
SCALE: NTS MBR BUILDING



3 E-503 ELECTRICAL LIGHTING PLAN
SCALE: 1/4" = 1'-0" SCREENING & INFLUENT AREA

0' 2' 4' 8'
SCALE: 1/4" = 1'-0"

GENERAL NEW WORK NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE A DEDICATED GROUNDING CONDUCTOR FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT AND DEVICES.
3. EQUIPMENT & DEVICE LOCATIONS ARE SHOWN AS GENERAL IN NATURE. REFER TO MECHANICAL, PROCESS AND HVAC DRAWINGS FOR EXACT LOCATIONS.
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6. REFER TO ELECTRICAL SINGLE LINE DIAGRAM, SCHEDULES, AND DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
7. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH OWNER AND APPLICABLE TRADE CONTRACTORS.
8. ALL EXTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 36" A.F.G. ALL INTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 24" A.F.F. UNLESS NOTED OTHERWISE.
9. CONTRACTOR TO PROVIDE LABEL FOR ALL PROPOSED ELECTRICAL EQUIPMENT AND DEVICES. COORDINATE FINAL LABELING REQUIREMENTS WITH THE OWNER AND ALL OTHER TRADE CONTRACTORS.
10. COORDINATE CONDUIT PENETRATION LOCATIONS THRU EXTERIOR BUILDING WALLS CLOSELY WITH GENERAL CONTRACTOR PRIOR TO PERFORMING WORK.
11. REFER TO DATA DETAILS FOR COMMUNICATION SCOPE OF WORK.
12. CONTRACTOR TO ADJUST FINAL PROPOSED INTERIOR LIGHT FIXTURE LOCATIONS TO AVOID CONFLICTS WITH PROPOSED EQUIPMENT, AND PIPING SYSTEMS.
13. CONTRACTOR TO ADJUST FINAL AIMING ANGLE OF EXTERIOR LIGHT FIXTURES TO LIGHT DESIRED AREAS AND MINIMIZE LIGHT POLLUTION. COORDINATE WITH ALL OTHER TRADE CONTRACTORS. REFER TO THE LUMINAIRE SCHEDULE FOR ADDITIONAL INFORMATION/REQUIREMENTS.

SHEET KEY NOTES:

1. PROVIDE ALL REQUIRED STAINLESS STEEL UNISTRUT, MOUNTING HARDWARE, BRACKETS, SUPPORTS, ACCESSORIES, ETC... FOR STANCHION MOUNTING ABOVE TANK WALKWAY AS SHOWN/INDICATED. COORDINATE WITH ALL OTHER TRADE CONTRACTORS AND INSTALL TO HANDRAIL SYSTEM. TYPICAL.
2. CONTRACTOR TO PROVIDE TIME SWITCH AS WATTSTOPPER RT-200 ASTRONOMICAL TIME SWITCH OR APPROVED EQUAL. TIME SWITCH TO CONTROL PROPOSED EXTERIOR LIGHTING FIXTURES TYPE WP1/WP1E. PROGRAM THE SWITCH FOR LIGHTING 'ON' AT ASTRONOMICAL SUNSET AND 'OFF' AT ASTRONOMICAL SUN RISE. FINAL ON/OFF PARAMETERS TO BE COORDINATED WITH THE OWNER.
3. CONTRACTOR TO PROVIDE WALL MOUNT BRACKETS FOR INSTALLATION ON WALL ABOVE PANEL LVP6.
4. COORDINATE FINAL INSTALLATION LOCATION WITH OWNER AND ALL OTHER TRADE CONTRACTORS PRIOR TO ROUGH-IN. TYPICAL OF FOUR (4) WALL PACK LIGHTING FIXTURES.

CONTRACTOR TO PROVIDE HAND-OFF-AUTO (H-O-A) SWITCH FOR CONTROL OF EXHAUST FAN 'EF-509' AND LOUVERS 'LV-508' AND 'LV-509'. IN HAND MODE FAN IS TO BE ON. IN OFF MODE FAN IS TO BE OFF. IN AUTO MODE FAN IS TO OPERATE VIA REVERSE ACTING THERMOSTAT. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL NECESSARY INTERLOCK CIRCUITRY. PROVIDE CONTROL POWER TRANSFORMER AND ENCLOSURE AS REQUIRED TO OBTAIN NECESSARY VOLTAGE FOR THERMOSTAT. REFER TO HVAC DRAWINGS AND COORDINATE WITH APPLICABLE TRADE CONTRACTORS FOR THERMOSTAT LOCATIONS AND FINAL REQUIREMENTS.

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BID SET

JADE STONE ENGINEERING

STATE OF NEW YORK JEFFREY E ROBINSON 095896 LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:
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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL POWER, SYSTEMS, & LIGHTING PLAN - SCREENING & INFLUENT AREA

REVISIONS

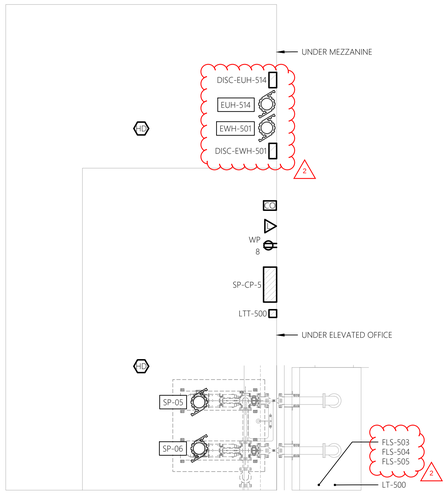
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CHECKED BY:	RJK
REVIEWED BY:	RJK

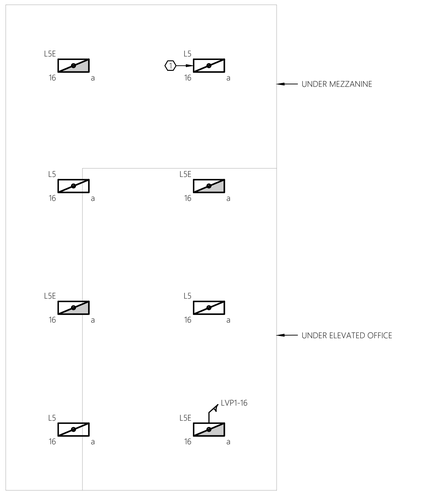
SHEET NO.

E-503

PROJECT # 18-732 PHASE #



1 E-506 ELECTRICAL - POWER & SYSTEMS PLAN
SCALE: 1/4" = 1'-0" SCUM PUMP AREA AND SCUM PIT

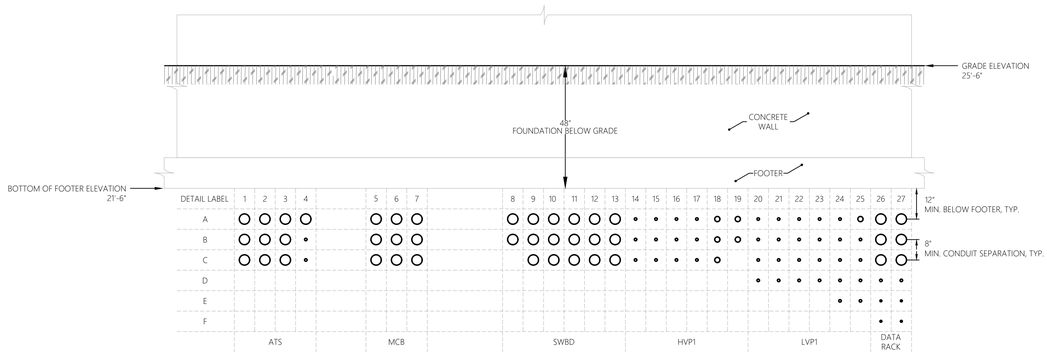


2 E-506 ELECTRICAL - LIGHTING PLAN
SCALE: 1/4" = 1'-0" SCUM PUMP AREA AND SCUM PIT

0' 2' 4' 8'
SCALE: 1/4" = 1'-0"



3 E-501 OVERALL PLAN KEY
SCALE: NTS MBR BUILDING



1ST FLOOR ELECTRICAL ROOM
UNDERGROUND CONDUIT ROUTING SCHEDULE

DETAIL LABLE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
	DUCT BANK (REFER TO DUCT BANK SCHEDULE)																										
A	DB-03	DB-03	DB-04	DB-04	DB-02	DB-02	DB-02	DB-21	DB-21	DB-17	DB-16	DB-06	DB-06	DB-10	DB-11	DB-12	DB-13	DB-10	DB-11	DB-10	DB-11	DB-12	DB-13	DB-14	DB-14	DB-06	DB-02
B	DB-03	DB-03	DB-04	DB-3	DB-02	DB-02	DB-02	DB-21	DB-21	DB-17	DB-16	DB-07	DB-07	DB-10	DB-11	DB-12	DB-13	DB-12	DB-13	DB-10	DB-11	DB-12	DB-13	DB-14	DB-14	DB-07	DB-21
C	DB-03	DB-04	DB-04	DB-04	DB-02	DB-02	DB-02	-	DB-21	DB-17	DB-16	DB-15	DB-15	DB-19	DB-19	DB-19	DB-14	DB-14	-	DB-14	DB-14	DB-14	DB-14	DB-14	DB-14	DB-16	DB-15
D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DB-14	DB-14	DB-14	DB-14	DB-14	DB-14	DB-04	DB-03
E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DB-03	DB-04	DB-04	DB-03
F	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DB-04	DB-03
	ATS				MCB			SWBD						HVP1						LVP1						DATA RACK	

A E-506 ELECTRICAL WALL SECTION DETAIL
SCALE: 1/2" = 1'-0" 1ST FLOOR ELECTRICAL ROOM

MEMBRANE ZONE
UNDERGROUND CONDUIT ROUTING SCHEDULE

DETAIL LABLE	1	2	3	4	5	6	7	8	9	10
	DUCT BANK (REFER TO DUCT BANK SCHEDULE)									
A	DB-06	DB-06	DB-16	DB-16	DB-14	DB-14	DB-13	DB-12	DB-11	DB-10
B	DB-07	DB-07	DB-17	DB-17	DB-14	DB-14	DB-13	DB-12	DB-11	DB-10
C	DB-21	DB-21	DB-14	DB-14	DB-14	DB-14	DB-13	DB-12	DB-11	DB-10
	R I/O-1									

B E-506 ELECTRICAL WALL SECTION DETAIL
SCALE: 1/2" = 1'-0" MEMBRANE ZONE

0' 1' 2' 4'
SCALE: 1/2" = 1'-0"

GENERAL SHEET NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE A DEDICATED GROUNDING CONDUCTOR FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT AND DEVICES.
3. EQUIPMENT & DEVICE LOCATIONS ARE SHOWN AS GENERAL IN NATURE. REFER TO MECHANICAL, PROCESS AND HVAC DRAWINGS FOR EXACT LOCATIONS.
4. ALL PROPOSED EQUIPMENT LOCATIONS/INSTALLATIONS TO COMPLY WITH NEC ARTICLE 110.26 'SPACES ABOUT ELECTRICAL EQUIPMENT'. CONTRACTOR TO COORDINATE INSTALLATION LOCATIONS OF ALL EQUIPMENT WITH ALL OTHER TRADE CONTRACTORS PRIOR TO ROUGH IN.
5. CONTRACTOR RESPONSIBLE FOR MOUNTING OF ALL CONTROL PANELS, CONTROLLERS, TRANSMITTERS, ETC., THAT ARE FURNISHED AS PART OF THIS PROJECT (INCLUDING GENERAL CONTRACTOR). PROVIDE ALL NECESSARY MOUNTING HARDWARE/EQUIPMENT. ALL MOUNTING HARDWARE/EQUIPMENT TO BE STAINLESS STEEL. REFERENCE TYPICAL MOUNTING DETAILS FOR ADDITIONAL INFORMATION.
6. REFER TO ELECTRICAL SINGLE LINE DIAGRAM, SCHEDULES, AND DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
7. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH OWNER AND GENERAL CONTRACTOR.
8. ALL EXTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 36" A.F.G. ALL INTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 24" A.F.F. UNLESS NOTED OTHERWISE.
9. CONTRACTOR TO PROVIDE LABEL FOR ALL PROPOSED ELECTRICAL EQUIPMENT AND DEVICES. COORDINATE FINAL LABELING REQUIREMENTS WITH THE OWNER AND ALL OTHER TRADE CONTRACTORS.
10. COORDINATE CONDUIT PENETRATION LOCATIONS THRU EXTERIOR BUILDING WALLS CLOSELY WITH GENERAL CONTRACTOR PRIOR TO PERFORMING WORK.

SHEET KEY NOTE:

1. CONTROLLED BY SWITCH ON SHEET E-505.

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JADE STONE ENGINEERING

STATE OF NEW YORK
JEFFREY E ROBINSON
095896
LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:
THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE
CALL 811

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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL FLOOR PLANS - SCUM PUMP AREA, 1ST FLOOR ELECTRICAL ROOM, & MEMBRANE ZONE

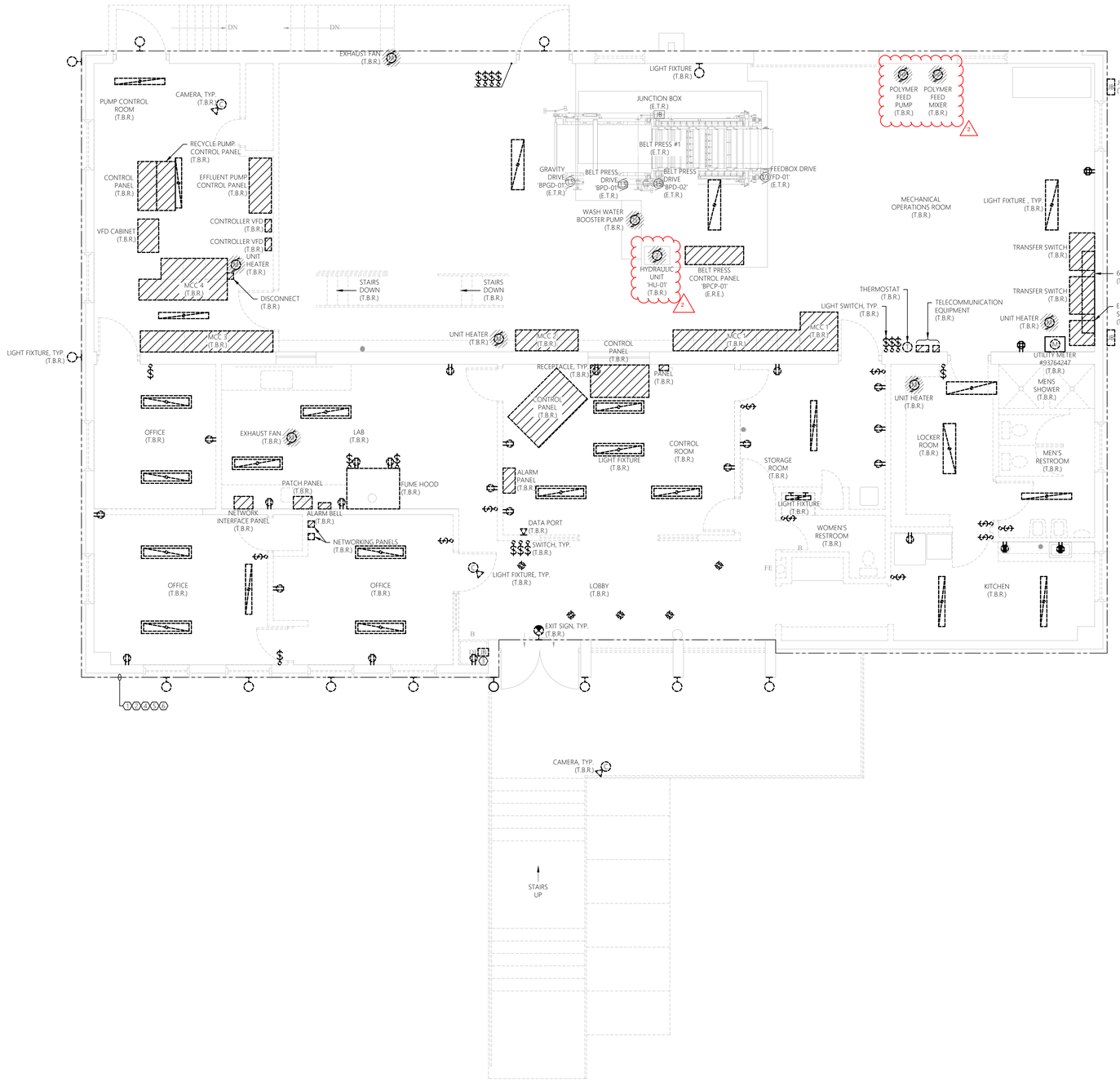
REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.
E-506

PROJECT # 18-732 PHASE #



0' 2' 4' 8'
SCALE: 1/4" = 1'-0"

1 E-701 ELECTRICAL DEMOLITION PLAN
SCALE: 1/4" = 1'-0" DEWATERING BUILDING - UPPER LEVEL

GENERAL DEMOLITION NOTES:

MECHANICAL EQUIPMENT & MISC. ELECTRICAL EQUIPMENT:
WHERE INDICATED TO BE DEMOLISHED:
- REFER TO GENERAL CONTRACT DRAWINGS FOR AN ACCURATE DEPICTION OF ALL DEMOLITION REQUIRED AS PART OF THIS CONTRACT.
- REMOVE ALL WIRE (POWER & CONTROLS) & EXPOSED CONDUIT BACK TO SOURCE PANEL, UNLESS OTHERWISE INDICATED, UOI.
- REMOVE ANY ASSOCIATED MOTOR STARTERS, CONTROL STATIONS, &/OR DISCONNECTS, UOI.
- REMOVE CIRCUIT WIRING FROM SOURCE PANEL AND REMOVE ASSOCIATED SOURCE CIRCUIT BREAKER; UOI.
- REMOVE ALL INTERLOCK CIRCUITRY, UOI.
- PROVIDE REVISED TYPED PANELBOARD DIRECTORIES FOR ALL EXISTING TO REMAIN PANELS WHERE CIRCUITS ARE TO BE REMOVED.
- REMOVE ALL ASSOCIATED MOUNTING HARDWARE, BRACKETS, AND EQUIPMENT, UOI.

RECEPTACLES:
WHERE INDICATED TO BE DEMOLISHED:
- REMOVE ALL RECEPTACLES IMPACTED BY WALL MODIFICATIONS AND OVERALL PROJECT IMPROVEMENTS. **NOTE** ALL EXISTING RECEPTACLES MAY NOT BE SHOWN ON THESE DEMOLITION PLANS. MINOR FIELD VERIFICATION REQUIRED.
- REMOVE DEVICE, AND ALL ASSOCIATED WIRE & CONDUIT BACK TO SOURCE OR NEAREST ACTIVE JUNCTION BOX, UOI.

LIGHTING:
WHERE INDICATED TO BE DEMOLISHED:
- REMOVE ALL FIXTURES THROUGHOUT SPACE. **NOTE** ALL EXISTING LIGHTING FIXTURES MAY NOT BE SHOWN ON THESE DEMOLITION PLANS. MINOR FIELD VERIFICATION REQUIRED.
- REMOVE ALL ASSOCIATED WIRING BACK TO SOURCE, UOI.
- REMOVE SWITCHING AND CONTROL DEVICES, UOI.
- REMOVE CONTACTORS ASSOCIATED WITH LOW VOLTAGE SWITCHING DEVICES, UOI.
- DISPOSE OF ALL LAMPS IN ACCORDANCE WITH STATE/FEDERAL AND EPA REQUIREMENTS.

PANELBOARD REMOVAL AND REPLACEMENT:
- REFER TO SINGLE LINE DIAGRAMS FOR SCOPE OF WORK.

CIRCUIT AND FEEDER REMOVAL AND REPLACEMENT:
- MAINTAIN ANY EXISTING NON-IMPACTED PANELBOARDS AND ANY NON-IMPACTED CIRCUITS WHICH ARE EXISTING TO REMAIN.
- WHERE CIRCUITS ARE AFFECTED BY MODIFICATION/REMOVAL ACTIVITIES, PROVIDE NECESSARY CIRCUIT EXTENSIONS AND ALL NECESSARY LABOR/MATERIALS AS NECESSARY TO REPAIR AND RE-CONNECT CIRCUIT(S).
- ANY CIRCUITS/FEEDERS WHICH REQUIRE SHUTDOWN TO ACCOMMODATE WORK SHALL BE COORDINATED WITH THE OWNER WELL IN ADVANCE.

BUILDING/STRUCTURE GROUND SYSTEM:
- CONTRACTOR TO CAREFULLY PROTECT AND MAINTAIN ALL GROUND SYSTEMS ASSOCIATED WITH BUILDINGS/STRUCTURES EXISTING TO REMAIN.
- CONTRACTOR TO REMOVE ALL GROUND SYSTEMS ASSOCIATED WITH BUILDING/STRUCTURES TO BE REMOVED.
- GROUND SYSTEM COMPONENTS MAY INCLUDE, BUT ARE NOT LIMITED TO, GROUNDING CONDUCTORS, JUMPERS, TERMINATIONS, RODS, AND AIR TERMINALS. CONTRACTOR TO FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCEMENT OF DEMOLITION.

HAZARDOUS MATERIAL REMOVAL:
PERFORM WORK FOR REMOVAL AND DISPOSAL OF EQUIPMENT AND MATERIALS CONTAINING TOXIC SUBSTANCES REGULATED UNDER THE FEDERAL TOXIC SUBSTANCES CONTROL ACT (TSCA) IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS. APPLICABLE EQUIPMENT AND MATERIALS INCLUDE, BUT ARE NOT LIMITED TO:
- PCB-CONTAINING ELECTRICAL EQUIPMENT, INCLUDING TRANSFORMERS, CAPACITORS, AND SWITCHES.
- PCB- AND DEHP-CONTAINING LIGHTING BALLASTS.
- MERCURY-CONTAINING LAMPS AND TUBES, INCLUDING FLUORESCENT LAMPS, HIGH INTENSITY DISCHARGE (HID), ARC LAMPS, ULTRA-VIOLET, HIGH PRESSURE SODIUM, MERCURY VAPOR, IGNITRON TUBES, NEON, AND INCANDESCENT.
- CONTRACTOR TO COORDINATE ANY REQUIRED HAZARDOUS MATERIAL REMOVAL WITH THE APPLICABLE CONTRACTOR, OWNER, AND ENGINEER.

GENERAL SHEET NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS, AND GENERAL PROJECT NOTES.
2. ITEMS INDICATED TO BE REMOVED:
   2.1. REMOVE ALL CONDUCTORS AND EXPOSED CONDUIT BACK TO SOURCE (UOI).
   2.2. REMOVE CIRCUIT WIRING AND CIRCUIT BREAKER FROM SOURCE PANEL (UOI).
   2.3. REMOVE ALL ASSOCIATED CONTROL CONDUCTORS, CONDUITS, AND DEVICES (UOI).
   2.4. REMOVE ASSOCIATED STARTERS, DISCONNECTS, AND ASSOCIATED CIRCUITRY (UOI).
   2.5. REMOVE EQUIPMENT PADS & MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC... (UOI).
   2.6. REVISE PANELBOARD AND MOTOR CONTROL CENTER DIRECTORIES/NAME PLATES AS CHANGES OCCUR (UOI).
3. THESE DEMOLITION DRAWINGS ARE SCHEMATIC IN NATURE AND ARE BASED ON CURSORY FIELD OBSERVATION AND EXISTING DRAWINGS. IT IS NOT THE INTENTION OF THESE DRAWINGS TO INDICATE EVERY DEVICE/FIXTURE REQUIRING REMOVAL/DEMO RATHER GENERAL SYSTEMS WHICH ARE TO BE REMOVED.
4. CIRCUITS NOT IN AREA OF WORK THAT ARE AFFECTED BY WORK SHALL BE OPERATIONAL DURING PROJECT. PROVIDE TEMPORARY CIRCUITS AS NECESSARY.
5. CIRCUIT, EQUIPMENT, AND DEVICE REMOVAL SHALL NOT AFFECT THE INTEGRITY OR FUNCTIONALITY OF CIRCUITS TO REMAIN. ALL CIRCUITS TO REMAIN SHALL BE MAINTAINED. PROVIDE ALL NECESSARY CIRCUIT MODIFICATIONS AND EXTENSIONS.
6. WHERE REMOVALS LEAVE HOLES AND DAMAGED SURFACES EXPOSED IN THE FINISHED WORK, PATCH AND REPAIR THESE HOLES AND DAMAGED SURFACES TO MATCH ADJACENT FINISHED SURFACES. WHERE NEW WORK IS TO BE APPLIED TO EXISTING SURFACES, PERFORM REMOVALS, AND PATCHING IN A MANNER TO PRODUCE SURFACES SUITABLE FOR RECEIVING NEW WORK. COORDINATE ALL WORK WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER.
7. COORDINATE WITH ALL CONTRACT DRAWINGS AND TRADE CONTRACTORS FOR ADDITIONAL EQUIPMENT THAT IS TO BE DEMOLISHED. FOR ALL EQUIPMENT SHOWN/INDICATED FOR REMOVAL, DISCONNECT AND REMOVE ELECTRICAL CIRCUIT INCLUDING CONDUCTORS AND CONDUIT BACK TO SOURCE.
8. NOT ALL EQUIPMENT/DEVICES ARE SHOWN FOR CLARITY. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS AND REPORT DISCREPANCIES TO ENGINEER PRIOR TO COMMENCEMENT OF DEMOLITION.
9. REFER TO THE ELECTRICAL SINGLE LINE DIAGRAMS, SCHEDULES & DETAILS FOR ADDITIONAL DEMOLITION INFORMATION/REQUIREMENTS.
10. COORDINATE ALL ASPECTS OF SEQUENCE OF REMOVAL WITH THE OWNER AND APPLICABLE CONTRACTOR. REFER TO SPECIFICATIONS AND DEMOLITION SINGLE LINE DIAGRAM FOR ADDITIONAL INFORMATION.
11. WHERE REMOVAL OF CONDUIT SYSTEM IS NOT FEASIBLE, REMOVE ALL CONDUCTORS FROM CONDUIT SYSTEM, CUT FLUSH, CAP CONDUIT SYSTEM, AND ABANDON IN PLACE. FEASIBLE IS DEFINED AS BEING LOCATED WITHIN A CONCRETE DUCT BANK OR CONCRETE SLAB. ALL OTHER INSTANCES TO HAVE THE CONDUIT & CIRCUITRY TO BE REMOVED IN THERE ENTIRETY. FIELD VERIFY AND COORDINATE FINAL REQUIREMENTS WITH THE OWNER, TYPICAL.

SHEET KEY NOTES:

1. CONTRACTOR TO PROVIDE COMPLETE ELECTRICAL DEMOLITION FOR THIS AREA (UNLESS OTHERWISE INDICATED); REMOVE THE FOLLOWING DEVICES INCLUDING BUT NOT LIMITED TO; ALL ELECTRICAL DISTRIBUTION EQUIPMENT, CONTROLLERS, CONTROL PANELS, DISCONNECTS, MOTOR STARTERS, RECEPTACLES, INTERIOR/EXTERIOR LIGHTING, JUNCTION BOXES, BONDING/GROUNDING EQUIPMENT, ELECTRIC VALVES, MOTORS (DISCONNECT & REMOVE BRANCH CIRCUITRY), AND INSTRUMENTATION/CONTROLS. REMOVE ALL ASSOCIATED CIRCUITRY (CONDUIT & CONDUCTORS) BACK TO SOURCE. COORDINATE REMOVAL EFFORTS CLOSELY WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER.
2. CONTRACTOR TO CLOSELY COORDINATE THE REMOVAL EFFORTS OF ALL PLANT PROCESS EQUIPMENT/DEVICES SCHEDULED FOR REMOVAL WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER. CONTRACTOR TO CLOSELY COORDINATE THE REMOVAL EFFORTS OF ALL HVAC EQUIPMENT SCHEDULED FOR REMOVAL WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER. CONTRACTOR TO CLOSELY COORDINATE THE REMOVAL EFFORTS OF ALL PLUMBING EQUIPMENT SCHEDULED FOR REMOVAL WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER.
3. JUNCTION BOX IS TO BE REMOVED. NOTE, ALL BOXES AND RACEWAY SYSTEMS ASSOCIATED WITH EQUIPMENT SCHEDULED FOR REMOVAL ARE TO BE REMOVED IN THEIR ENTIRETY.
4. CONTRACTOR TO DISCONNECT & REMOVE ALL EXISTING LIGHT FIXTURES, LIGHT SWITCHES, LIGHTING CONTROL DEVICES, MOUNTING HARDWARE, AND ASSOCIATED COMPONENTS IN THEIR ENTIRETY. REMOVE CIRCUITRY (CONDUIT & CONDUCTORS) BACK TO SOURCE. CONTRACTOR TO FIELD VERIFY.
5. CONTRACTOR TO PROVIDE TEMPORARY LIGHTING INCLUDING ALL CIRCUITING AND CONTROLS FOR A COMPLETE AND OPERABLE TEMPORARY LIGHTING SYSTEM THROUGHOUT THE DURATION OF PROJECT. CONTRACTOR TO COORDINATE FINAL TEMPORARY LIGHTING REQUIREMENTS WITH THE OWNER AND PROVIDE AS NECESSARY. TEMPORARY LIGHTING SYSTEMS TO BE PROVIDED FOR ALL AREAS IN WHICH THE EXISTING LIGHTING SYSTEMS ARE DISTURBED AS PART OF THIS PROJECT.
6. NOTE, CONTRACTOR TO ENSURE ALL ELECTRICAL BRANCH CIRCUITS AND CONDUITS ARE REMOVED IN THIS AREA ASSOCIATED WITH EQUIPMENT SCHEDULED FOR REMOVAL, TO AVOID CONFLICT WITH PROPOSED EQUIPMENT, DUCT WORK, AND PIPING SYSTEMS. COORDINATE ALL EFFORTS CLOSELY WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER.

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STATE OF NEW YORK
JEFFREY E ROBINSON
098696
LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:

THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

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NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL DEMOLITION PLAN - DEWATERING BUILDING UPPER LEVEL

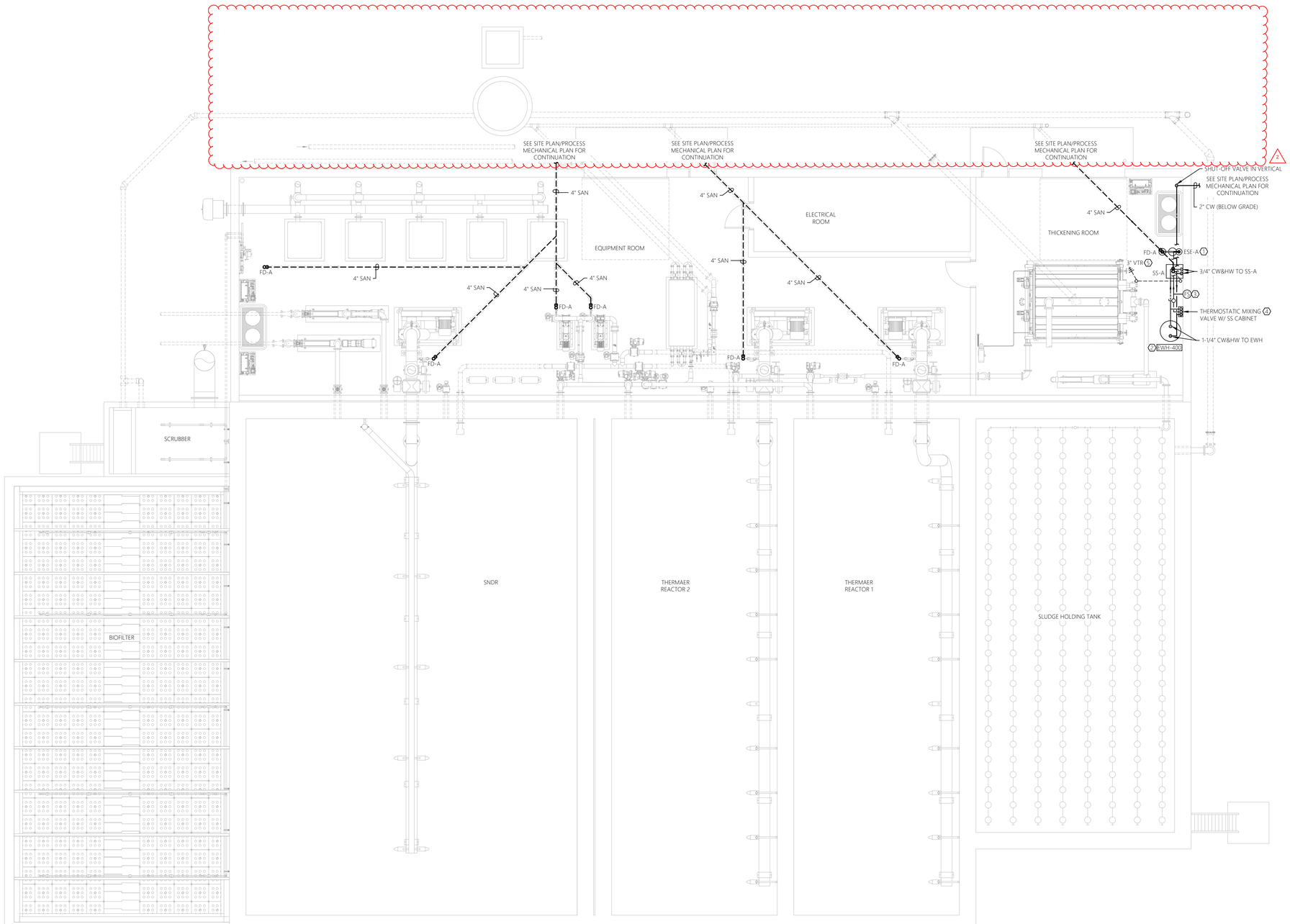
REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.
E-701

PROJECT # 18-732 PHASE #



1 P-400 PLUMBING FLOOR PLAN - NEW WORK
SCALE: 3/16" = 1'-0"
ATAD BUILDING

0' 2' 4' 8' 16'
SCALE: 3/16" = 1'-0"

GENERAL SHEET NOTES:

1. REFER TO P-001 FOR PLUMBING LEGEND, ABBREVIATIONS, AND GENERAL PROJECT NOTES.
2. UNLESS OTHERWISE NOTED, PLUMBING ITEMS SHOWN HEAVY SOLID (▬) SHALL BE NEW.
3. COORDINATE PLUMBING PIPING/FIXTURE/EQUIPMENT/ETC. LAYOUT WITH ALL OTHER TRADES TO AVOID CONFLICT.
4. AVOID ROUTING WATER PIPING OVER ELECTRICAL EQUIPMENT WHRE POSSIBLE. PROVIDE DRIP SHIELD IN LOCATIONS WHERE WATER PIPING IS ROUTED ABOVE ELECTRICAL EQUIPMENT.
5. ALL HANGERS AND SUPPORTS SHALL BE TYPE 316 STAINLESS STEEL.

SHEET KEY NOTES:

1. NEW EMERGENCY EYEWASH/SHOWER TO BE INSTALLED AT LOCATION SHOWN PER DETAIL ON SHEET P-030 AND PER MANUFACTURER RECOMMENDATIONS. COORDINATE FINAL LOCATION WITH OWNER AND ALL OTHER TRADES TO AVOID CONFLICT. PROVIDE ALL FITTINGS/ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
2. NEW ELECTRIC WATER HEATER TO BE INSTALLED AT LOCATION SHOWN PER DETAIL ON SHEET P-030 AND PER MANUFACTURER RECOMMENDATIONS. COORDINATE FINAL LOCATION WITH OWNER AND ALL OTHER TRADES TO AVOID CONFLICT. PROVIDE 4" HIGH HOUSEKEEPING PAD. PROVIDE ALL FITTINGS/ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
3. PROVIDE NEW FLOW SWITCH (GUARDIAN AP275-615 OR EQUAL) AND INSTALL PER MANUFACTURER RECOMMENDATIONS. PROVIDE ALL FITTINGS/ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
4. NEW THERMOSTATIC MIXING VALVE (GUARDIAN 6040 OR EQUAL) TO PROVIDE TEPID WATER (85°F) TO EMERGENCY FIXTURE
5. FIELD ROUTE PLUMBING VENT AND EXTEND THOUGH ROOF.

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JADE STONE ENGINEERING

STATE OF NEW YORK · RYAN J. KEEFER · LICENSED PROFESSIONAL ENGINEER · 093390

HAZARDOUS MATERIAL NOTE:

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FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

PLUMBING FLOOR PLAN - ATAD BUILDING

REVISIONS

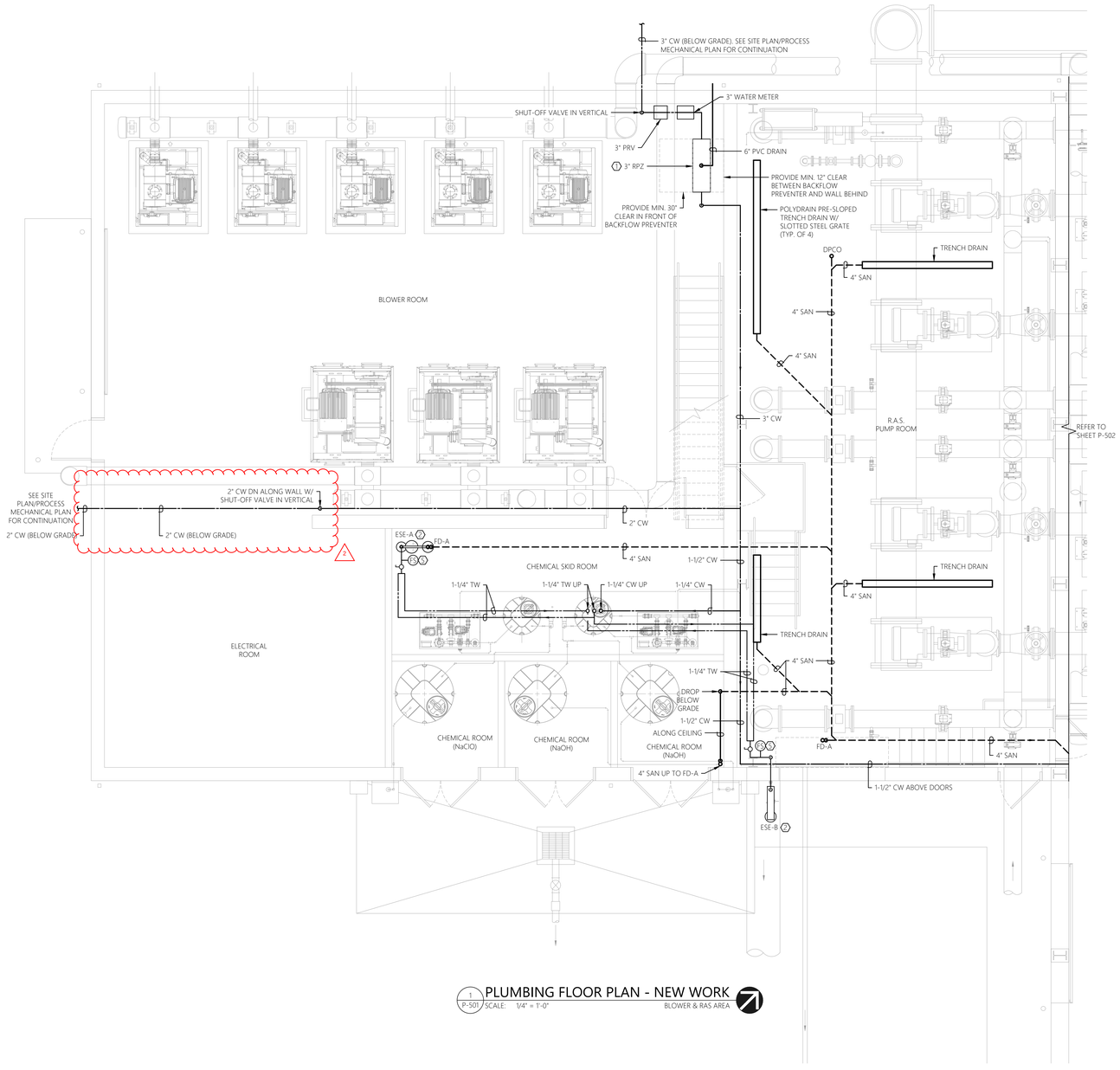
NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025

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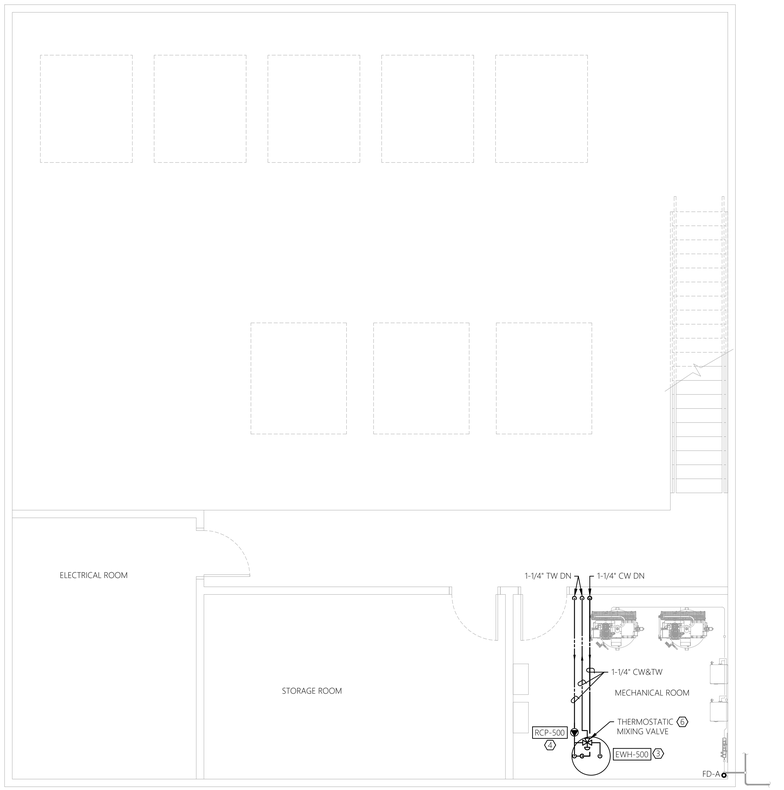
SHEET NO.

P-400

PROJECT # 18-732 PHASE #



1 P-501 PLUMBING FLOOR PLAN - NEW WORK
SCALE: 1/4" = 1'-0" BLOWER & RAS AREA



2 P-501 PLUMBING FLOOR PLAN - NEW WORK
SCALE: 1/4" = 1'-0" 2ND FLOOR

GENERAL SHEET NOTES:

1. REFER TO P-001 FOR PLUMBING LEGEND, ABBREVIATIONS, AND GENERAL PROJECT NOTES.
2. UNLESS OTHERWISE NOTED, PLUMBING ITEMS SHOWN HEAVY SOLID (▬) SHALL BE NEW.
3. COORDINATE PLUMBING PIPING/FIXTURE/EQUIPMENT/ETC. LAYOUT WITH ALL OTHER TRADES TO AVOID CONFLICT.
4. AVOID ROUTING WATER PIPING OVER ELECTRICAL EQUIPMENT WHRE POSSIBLE. PROVIDE DRIP SHIELD IN LOCATIONS WHERE WATER PIPING IS ROUTED ABOVE ELECTRICAL EQUIPMENT.
5. ALL HANGERS AND SUPPORTS IN THE R.A.S. PUMP ROOM SHALL BE TYPE 316 STAINLESS STEEL. ALL HANGERS AND SUPPORTS IN THE CHEMICAL SKID ROOM AND CHEMICAL ROOMS SHALL BE PVC COATED.

SHEET KEY NOTES:

1. NEW RPZ BACKFLOW PREVENTER (WATTS LF009) TO BE INSTALLED AT LOCATION SHOWN PER SECTION VIEW ON THIS SHEET AND PER MANUFACTURER RECOMMENDATIONS. COORDINATE FINAL LOCATION WITH OWNER AND ALL OTHER TRADES TO AVOID CONFLICT. PROVIDE ALL FITTINGS/ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM. PROVIDE AIR GAP AND FUNNEL DRAIN CONNECTION BELOW RPZ AND ROUTE PVC DRAIN PIPE OUT EXTERIOR WALL WITH FLAP VALVE.
2. NEW EMERGENCY EYEWASH/SHOWER TO BE INSTALLED AT LOCATION SHOWN PER DETAIL ON SHEET P-030 AND PER MANUFACTURER RECOMMENDATIONS. COORDINATE FINAL LOCATION WITH OWNER AND ALL OTHER TRADES TO AVOID CONFLICT. PROVIDE ALL FITTINGS/ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
3. NEW ELECTRIC WATER HEATER TO BE INSTALLED AT LOCATION SHOWN PER DETAIL ON SHEET P-030 AND PER MANUFACTURER RECOMMENDATIONS. COORDINATE FINAL LOCATION WITH OWNER AND ALL OTHER TRADES TO AVOID CONFLICT. PROVIDE 4" HIGH HOUSEKEEPING PAD. PROVIDE ALL FITTINGS/ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.

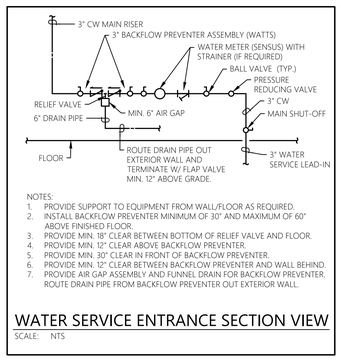
0' 2' 4' 8'
SCALE: 1/4" = 1'-0"

SHEET KEY NOTES:

4. NEW IN-LINE CIRCULATING PUMP TO BE INSTALLED AT LOCATION SHOWN PER DETAIL ON SHEET P-030 AND PER MANUFACTURER RECOMMENDATIONS. COORDINATE FINAL LOCATION WITH OWNER AND ALL OTHER TRADES TO AVOID CONFLICT. PROVIDE ALL FITTINGS/ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
5. NEW FLOW SWITCH (GUARDIAN AP275-615) AND INSTALL PER MANUFACTURER RECOMMENDATIONS. PROVIDE ALL FITTINGS/ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
6. NEW THERMOSTATIC MIXING VALVE (GUARDIAN 6040) TO PROVIDE TEPID WATER (85°F) TO EMERGENCY FIXTURE.

BACKFLOW PREVENTER NOTES:

1. NEW AND REPLACEMENT DEVICES MUST BE TESTED AFTER INSTALLATION AND BEFORE ENTERING SERVICE. DEVICES MUST BE TESTED ANNUALLY THEREAFTER.
2. STRAINERS ARE RECOMMENDED PRIOR TO EACH BACKFLOW DEVICE ON NON-FIRE FIGHTING LINES ONLY. NO STRAINER IS TO BE USED ON A FIRE LINE WITHOUT INSURANCE UNDERWRITER APPROVAL.
3. ASSEMBLIES SHOULD BE SPECIFIED AND INSTALLED WITH MANUFACTURER SUPPLIED VALVES.
4. WATER LINES SHOULD BE THOROUGHLY FLUSHED BEFORE INSTALLATION OF DEVICE TO PREVENT DEBRIS FOULING THE DEVICE CHECK VALVES.
5. DEVICES MUST BE MOUNTED HORIZONTALLY UNLESS APPROVED FOR VERTICAL INSTALLATION.
6. ASSEMBLIES SHOULD NOT BE INSTALLED IN AREAS CONTAINING CORROSIVE OR TOXIC GASES WHICH COULD RENDER THE DEVICE INOPERABLE.
7. DUE TO INHERENT DESIGN OF RPZ ASSEMBLIES, FLUCTUATING SUPPLY PRESSURE ON A LOW FLOW CONDITION MAY CAUSE NUISANCE DRIPPING. INSTALLATION OF A SOFT SEATED CHECK VALVE AHEAD OF THE RPZ WILL OFTEN HOLD PRESSURE CONSTANT DURING PERIODS OF LOW FLOW.
8. WHERE THE DISTANCE BETWEEN THE WATER METER AND DEVICE IS GREATER THAN 10 FEET, ALL EXPOSED PIPING SHOULD BE MARKED "FEED LINE TO BACKFLOW PREVENTER - DO NOT TAP" AT 5-FOOT INTERVALS.
9. ORANGE COUNTY DEPARTMENT OF HEALTH PLAN APPROVAL IS LIMITED TO 5 YEARS. TIME EXTENSIONS FOR PLAN APPROVAL MAY BE GRANTED BY THE ORANGE COUNTY DEPARTMENT OF HEALTH BASED UPON DEVELOPMENT FACTS AND ANY NEW REGULATIONS, OR GUIDANCE, IN EFFECT AT THAT TIME. A NEW PLAN SUBMISSION MAY BE REQUIRED TO OBTAIN A TIME EXTENSION.
10. ADEQUATE HEAT WILL BE PROVIDED TO PREVENT FREEZING AND ADEQUATE LIGHTING WILL BE PROVIDED TO FACILITATE SERVICING OF THE DEVICE.

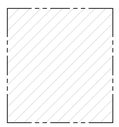


NOTES:
1. PROVIDE SUPPORT TO EQUIPMENT FROM WALL/FLOOR AS REQUIRED.
2. INSTALL BACKFLOW PREVENTER MINIMUM OF 30" AND MAXIMUM OF 60" ABOVE FINISHED FLOOR.
3. PROVIDE MIN. 18" CLEAR BETWEEN BOTTOM OF RELIEF VALVE AND FLOOR.
4. PROVIDE MIN. 12" CLEAR ABOVE BACKFLOW PREVENTER.
5. PROVIDE MIN. 30" CLEAR IN FRONT OF BACKFLOW PREVENTER.
6. PROVIDE MIN. 12" CLEAR BETWEEN BACKFLOW PREVENTER AND WALL BEHIND.
7. PROVIDE AIR GAP ASSEMBLY AND FUNNEL DRAIN FOR BACKFLOW PREVENTER. ROUTE DRAIN PIPE FROM BACKFLOW PREVENTER OUT EXTERIOR WALL.

WATER SERVICE ENTRANCE SECTION VIEW
SCALE: NTS

SHADED AREA SIGNIFIES CURRENT VIEW IN THE MBR BUILDING





2ND FLOOR

3 P-501 OVERALL PLAN KEY
SCALE: NTS MBR BUILDING

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK · RYAN J. KEEFER · LICENSED PROFESSIONAL ENGINEER · 093390

HAZARDOUS MATERIAL NOTE:

THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE CALL 811

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

BACKFLOW PREVENTION DEVICE (DOMESTIC) TO SERVE MBR, ATAD, AND MAINTENANCE GARAGE

REVISIONS

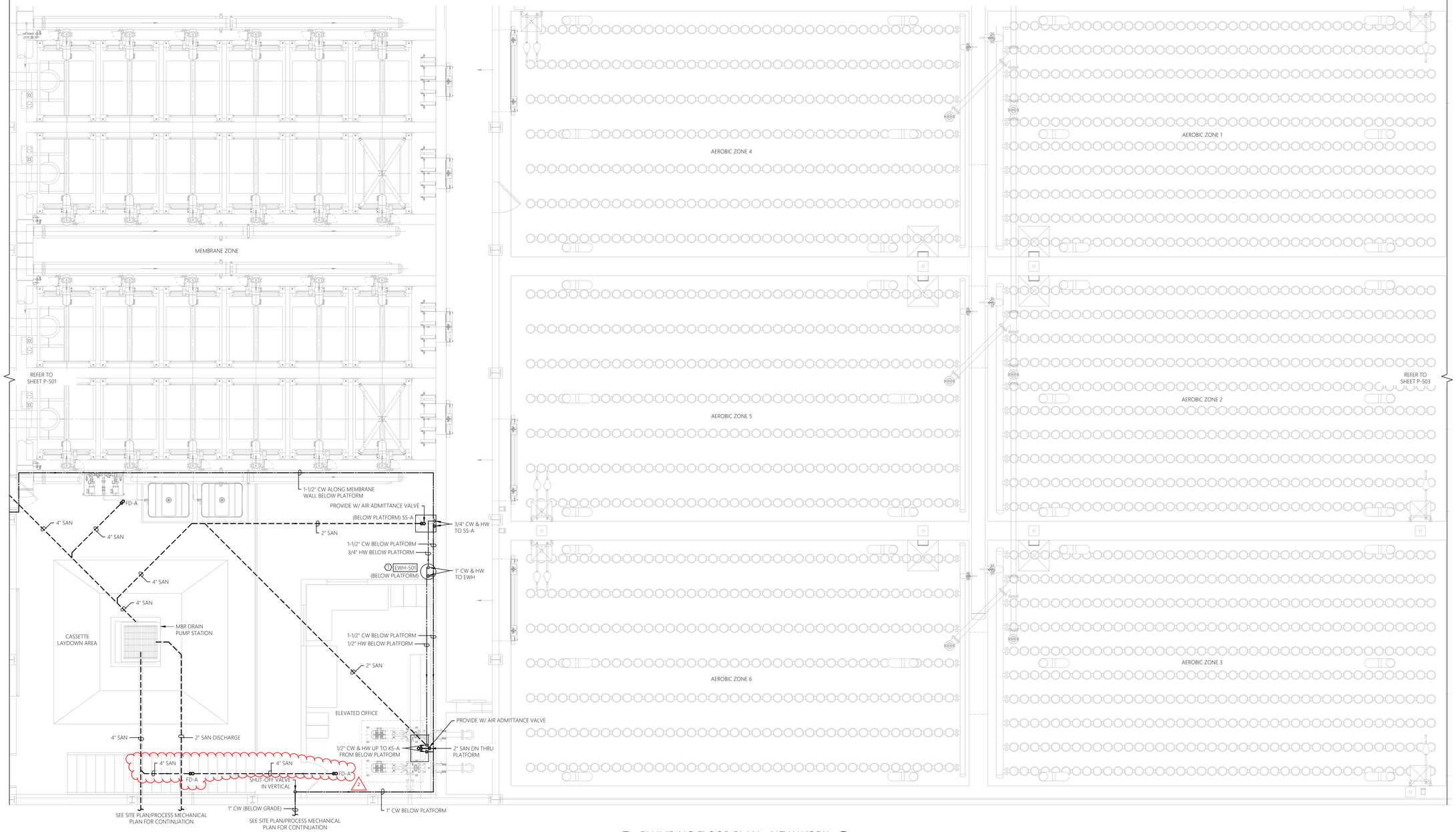
NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	RJK
REVIEWED BY:	RJK

SHEET NO.

P-501

PROJECT # 18-732 PHASE #



1 P-502 PLUMBING FLOOR PLAN - NEW WORK
SCALE: 1/4" = 1'-0" MEMBRANE & AEROBIC ZONES

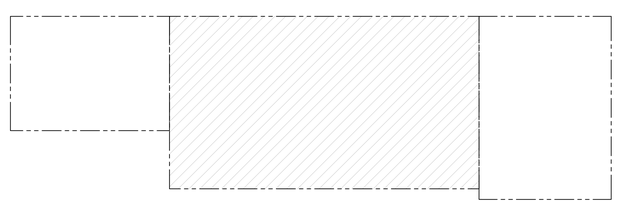
GENERAL SHEET NOTES:

1. REFER TO P-001 FOR PLUMBING LEGEND, ABBREVIATIONS, AND GENERAL PROJECT NOTES.
2. UNLESS OTHERWISE NOTED, PLUMBING ITEMS SHOWN HEAVY SOLID (▬) SHALL BE NEW.
3. COORDINATE PLUMBING PIPING/FIXTURE/EQUIPMENT/ETC. LAYOUT WITH ALL OTHER TRADES TO AVOID CONFLICT.
4. AVOID ROUTING WATER PIPING OVER ELECTRICAL EQUIPMENT WHRE POSSIBLE. PROVIDE DRIP SHIELD IN LOCATIONS WHERE WATER PIPING IS ROUTED ABOVE ELECTRICAL EQUIPMENT.
5. ALL HANGERS AND SUPPORTS IN THE CASSETTE LAYDOWN AREA AND BELOW THE ELEVATED OFFICE/BELOW PLATFORM SHALL BE TYPE 316 STAINLESS STEEL.

SHEET KEY NOTES:

(1) NEW ELECTRIC WATER HEATER TO BE INSTALLED AT LOCATION SHOWN PER DETAIL ON SHEET P-030 AND PER MANUFACTURER RECOMMENDATIONS. COORDINATE FINAL LOCATION WITH OWNER AND ALL OTHER TRADES TO AVOID CONFLICT. PROVIDE 4" HIGH HOUSEKEEPING PAD. PROVIDE ALL FITTINGS/ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.

0' 2' 4' 8'
SCALE: 1/4" = 1'-0"



2ND FLOOR

SHADED AREA SIGNIFIES CURRENT VIEW IN THE MBR BUILDING

2 P-502 OVERALL PLAN KEY
SCALE: NTS MBR BUILDING

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JADE STONE ENGINEERING



HAZARDOUS MATERIAL NOTE:

THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
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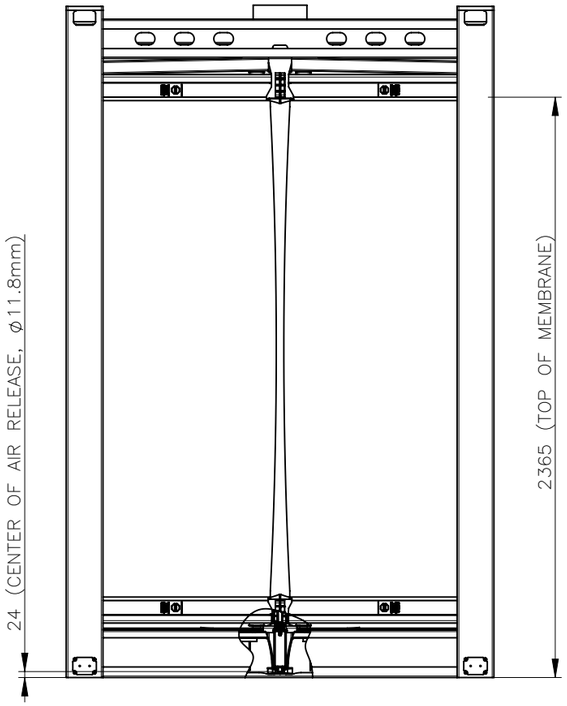
REVISIONS

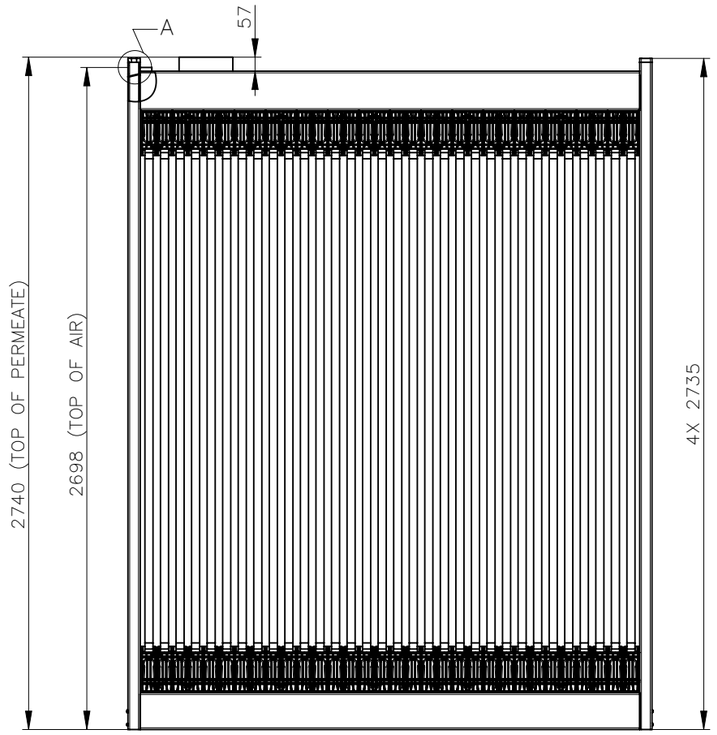
NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025

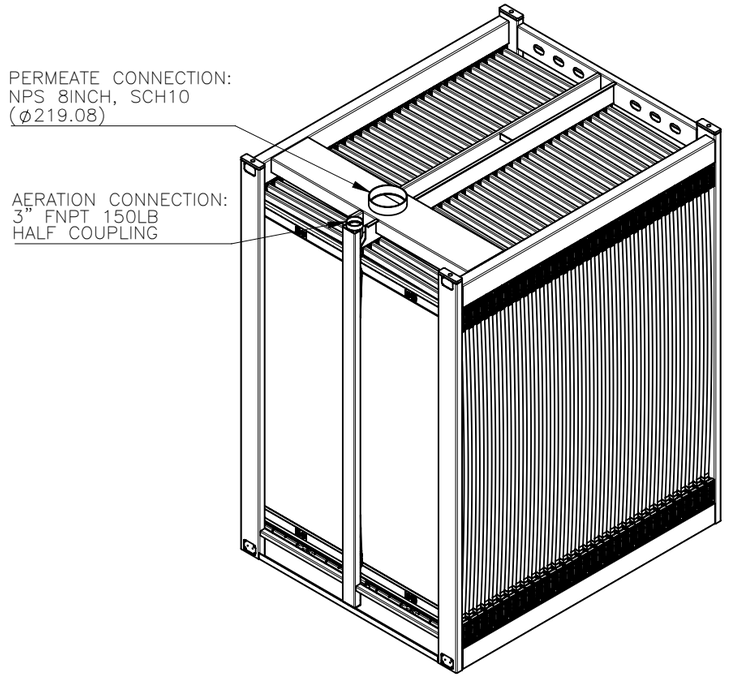
ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	RJK
REVIEWED BY:	RJK

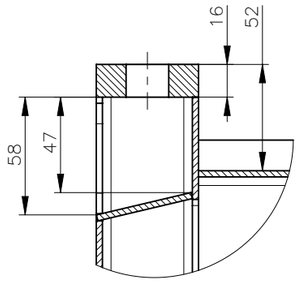
SHEET NO.
P-502

PROJECT # 18-732 PHASE #

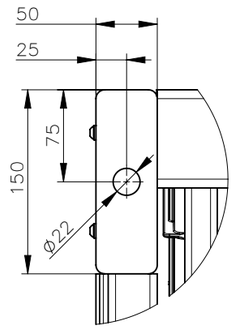




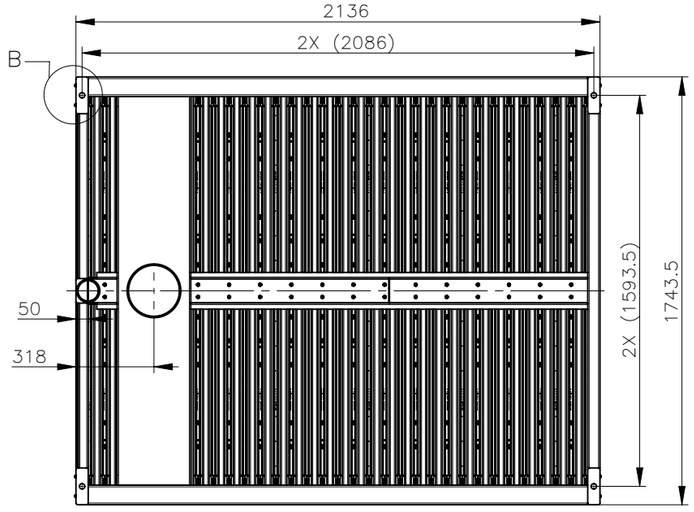




4X DETAIL A
SCALE 1 : 3



4X DETAIL B
SCALE 1 : 5



#	DESCRIPTION	–	INIT	INIT	INIT	YYMMDD
REV.	REVISION DESCRIPTION	ECO	DRWN	CHKD	APVD	DATE (YYMMDD)

suez Water Technologies & Solutions

GLOBAL HEADQUARTERS: TREVOSE, PA USA +1-215-355-3300 SUEZWATERTECHNOLOGIES.COM

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	PROJECTION	APPROVALS		DATE (YYMMDD)
GEOMETRICAL PRODUCT SPECIFICATION ACCORDING TO ISO 1101:2005.		DRWN	IA	220316
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED	SCALE 1:25	CHKD	RB	220316
GENERAL TOLERANCES ACCORDING TO ISO 2768:1989-mK-E.	SIZE A3	APVD	GB	220316

MATERIAL: –

SIZE: –

STANDARD: –

FINISH: –

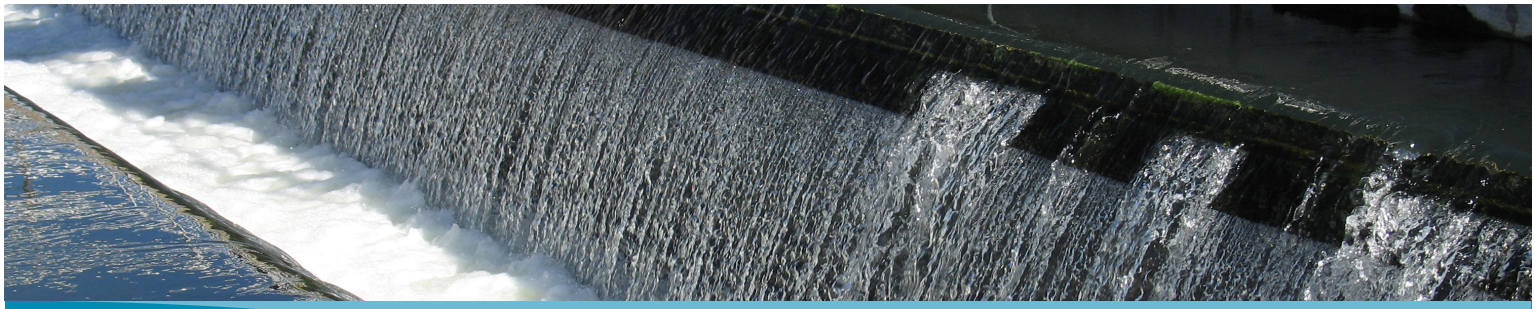
ZW500EV CASSETTE ASSEMBLY – TX64 SYSTEM CONNECTION

DWG. NO. ZW500EV-CAS-A-100

REV. R0

PART NO. –

SHEET 1 of 1



TAG:
16-LSHH-401-1/2/3
20-LSHH-201-1/2/3/4
20-LSLL-201-1/2/3/4

2.71

MJK Float Switch 7030

MERCURY FREE WITH BREAK RESISTANT CABLE

General

The exceptional reliability of the MJK Float Switch 7030 makes it very suitable for many highly automated systems to provide additional protection against control system failures, preventing pumps from running dry, etc.

MJK uses only up-to-date, environmentally friendly materials in the Float Switch 7030. The extra durability of the potted switching components - strong multi-fiber flexible cable and rugged polypropylene enclosure - allows the Float Switch 7030 to deliver reliable results where other float switches fail.

5 YEAR WARRANTY

Features

- Environmental friendly - no mercury
- Unmatched rugged construction for durability
- Riable electromechanical contact system - guaranteed for up to 20 million operations
- Unique counterweight system
- UL approved 250 VAC/16 A switch
- 39, 65, 100 or 150 ft. oil resistant PVC cable and polypropylene cable bracket
- SPDT relay allowing normally open or normally closed configurations - selected based on how it is wired.



Applications

- Waste water pumping stations
- Sewage treatment plants
- Drinking water reservoirs.

Functions

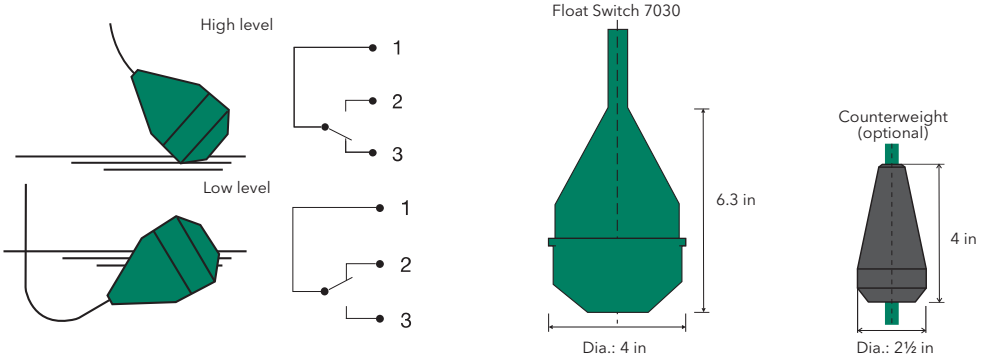
A hermetically sealed microswitch is activated by a moving counterweight when the float changes its position in the fluid. The changeover hysteresis can be adjusted by means of a counterweight placed on the cable. The counterweight also ensures that Float Switch 7030 is always correctly positioned and makes the bend of the cable less sharp.

mjk
a xylem brand

Datasheet
US 2.71 Float Switch 7030 datasheet 1811

MJK Float Switch 7030

Connections and Dimensions



Specifications

Float Switch 7030	
Contact system	Mechanical change-over switch (SPDT)
Max. load	16 A @ 200 VAC, 0.5 A @ 220 VDC
Temperature	- 5 to + 150 °F
Materials	Polypropylene/Oil resistant PVC (float housing/cable)
Cable	3 X AWG 17, oil resistant PVC insulation. Dia. 1/3 in.
Approvals	Switch UL U83 161 3 (16A 125VAC). CE: EN61000-6-4 2007/EN61000-6-2 2005

Order Numbers

Float Switch 7030	
MJK202810	Float Switch 7030 with 12m/39 ft. cable
MJK202811	Float Switch 7030 with 20m/65 ft. cable
MJK202811-100	Float Switch 7030 with 30,5m/100 ft. cable
MJK202811-150	Float Switch 7030 with 46m/150 ft. cable
Float Switch 7030 incl. counter weight	
MJK202814	Float Switch 7030 202810 incl. 560917 with 12m/39ft cable
MJK202814-65	Float Switch 7030 202811 incl. 560917 with 20m/65ft cable
MJK202814-100	Float Switch 7030 202810 incl. 560917 with 30,5m/100ft cable
Float Switch 7030 acessories	
MJK560914	Plastic mounting bracket for cable Ø6-10mm
MJK560917	Counter weight f. level switch 400 gr.

For support in North Americas, please contact:

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1700/1725 Brannum Lane
Yellow Springs, Ohio 45387
Tel. +1 937 767 7241 x 768

environmental@ysi.com
www.YSI.com

MJK Automation
Blokken 9
DK-3460 Birkerød
Denmark

Tel. +45 45 56 06 56
www.mjk.com

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TU5 Series Turbidimeters

TAG: 20-AE-320-1/2/3/4

Applications
- Drinking Water
- Power
- Beverage
- Pharmaceutical



Service Protected

The next standard in the evolution of turbidity

Only the new TU5 Series® Lab & Process Turbidimeters with 360° x 90° Detection® deliver unprecedented confidence that a change in your reading is a change in your water.

Groundbreaking 360° x 90° Detection Technology

The TU5 Series employs a patented optical design that sees more of your sample than any other turbidimeter, delivering the best low level precision and sensitivity while minimizing variability from test to test.

Matching lab and online results

For the first time you will be able to remove the uncertainty of which measurement to trust, thanks to identical 360° x 90° Detection Technology in both instruments.

Everything about turbidity – faster

The TU5 Series dramatically reduces the time needed to get a turbidity measurement you can rely on, with 98% less online sample surface area to clean, sealed vials for calibration, and the elimination of the need for indexing and silicone oil in the lab. Not to mention, a smaller online sample volume means you will detect events almost immediately.

No surprises

Prognosys™ monitors your TU5 Series online instrument, proactively alerting you to maintenance needs before your measurement becomes questionable. And a Hach Service Agreement protects your investment and helps ensure that you stay in compliance and on budget.

USEPA and ISO 7027 reporting: The TU5 Series Turbidimeters apply the instrument design and meet performance criteria established by EPA Approved Hach Method 10258 and ISO 7027-1:2016, making them suitable for regulatory reporting.

HACH®
Be Right™

Technical Data*

TU5200

Light Source	Class 2 laser product, with embedded 650 nm (EPA 0.43 mW) or Class 1 laser product, with embedded 850 nm (ISO), max. 0.55 mW (complies with IEC/EN 60825-1 and to 21 CFR 1040.10 in accordance with Laser Notice No. 50)
Range	EPA: 0 - 700 NTU / FNU / TE/F / FTU 0 - 100 mg/L 0 - 175 EBC ISO: 0 - 1000 NTU / FNU / TE/F / FTU 0 - 100 mg/L 0 - 250 EBC
Accuracy	±2 % plus 0.01 NTU from 0 - 40 NTU; ±10 % of reading from 40 - 1000 NTU based on Formazin primary standard (at 25 °C)
Resolution	0.0001 NTU / FNU / TE/F / FTU / EBC / mg/L
Repeatability	<40 NTU: Better than 1% of reading or ±0.002 NTU on Formazin at 25 °C, whichever is greater >40 NTU: Better than 3.5% of reading on Formazin at 25 °C
Stray Light	<10 mNTU
Units	NTU, FNU, TE/F, FTU, EBC; mg/L if calibrated with Degrees calibration curve
Operating Temperature Range	10 - 40 °C (50 - 104 °F)
Operating Humidity	80% at 30 °C (non condensing)
Sample Temperature	4 - 70 °C (39 - 158 °F)
Storage Conditions	-30 - 60 °C (-22 - 140 °F)
Power Requirements (Voltage)	100 - 240 VAC
Power Requirements (Hz)	50/60 Hz
Certifications	CE compliant US FDA accession number: 1420493-000 EPA version, 1420492-000 ISO version Complies with IEC/EN 60825-1 and to 21 CFR 1040.10 in accordance with Laser Notice No. 50) Australian ACMA Marking
Dimensions (H x W x D)	195 mm x 409 mm x 278 mm
Weight	2.4 kg (5.29 lbs.)
Warranty	1 year

TU5300sc / TU5400sc

Light Source	Class 2 laser product, with embedded 650 nm (EPA 0.43 mW) or Class 1 laser product, with embedded 850 nm (ISO), max. 0.55 mW (complies with IEC/EN 60825-1 and to 21 CFR 1040.10 in accordance with Laser Notice No. 50)
Range	EPA: 0 - 700 NTU / FNU / TE/F / FTU 0 - 100 mg/L 0 - 175 EBC ISO: 0 - 1000 NTU / FNU / TE/F / FTU 0 - 100 mg/L 0 - 250 EBC
Accuracy	±2% or 0.01 NTU from 0 - 40 NTU ±10% of reading from 40 - 1000 NTU based on Formazin primary standard
Resolution	0.0001 NTU / FNU / TE/F / FTU / EBC
Repeatability	Better than 1% of reading or ±0.002 NTU (TU5300) or ±0.0006 NTU (TU5400) on Formazin at 25 °C (77 °F), whichever is greater
Stray Light	<10 mNTU
Units	NTU, FNU, TE/F, FTU, EBC
Signal Average Time	TU5300sc: 30 - 90 seconds TU5400sc: 1 - 90 seconds
Response Time	TU5300sc: T90 <45 seconds at 100 mL/min TU5400sc: T90 <30 seconds at 100 mL/min
Sample Temperature	2 - 60 °C (35 - 140 °F)
Sample Pressure	6 bar (87 psi) maximum, compared to air at sample temperature range from 2 - 40 °C (35.6 - 104 °F)
Sample Flow Rate	100 - 1000 mL/min; optimal flow rate: 200 - 500 mL/min
Operating Temperature Range	0 - 50 °C (32 - 122 °F)
Operating Humidity	Relative humidity: 5 - 95% at different temperatures, non-condensing
Storage Conditions	-40 - 60 °C (-40 - 140 °F)
Enclosure Rating	Electronic compartment IP55; all other functional units IP65 with process head/ACM attached to the TU5300sc/TU5400sc instrument
Certifications	CE compliant US FDA accession number: 1420493-000 EPA version, 1420492-000 ISO version Australian ACMA Marking
Dimensions (H x W x D)	249 mm x 268 mm x 190 mm
Weight	5.95 lbs. (2.7 kg); 11 lbs. (5.0 kg) with all accessories
Warranty	1 year

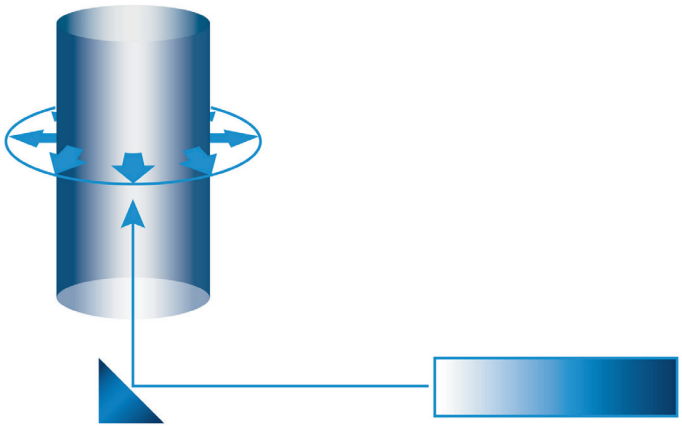
Subject to change without notice.

Principle of Operation

The TU5 Series turbidimeters measure turbidity by directing a laser into a sample to scatter off suspended particles. The light that is scattered at a 90° angle from the incident beam is reflected through a conical mirror in a 360° ring around the sample before it is captured by a detector.

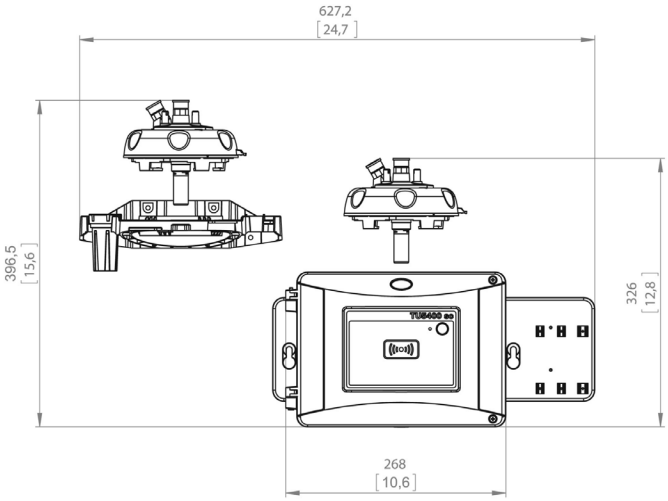
The amount of light scattered is proportional to the turbidity of the sample. If the turbidity of the sample is negligible, little light will be scattered and detected by the photocell and the turbidity reading will be low. High turbidity, on the other hand, will cause a high level of light scattering and result in a high reading.

The 360° x 90° optics of the TU5 series were optimized for high accuracy at low turbidity ranges and therefore the TU5 does not include ratio technology. Ratio technology is only applicable for high turbidity applications which have interference from color and large particles.

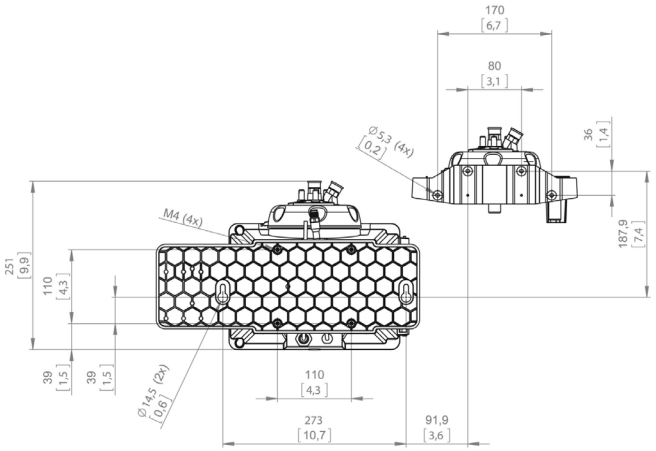


Dimensions

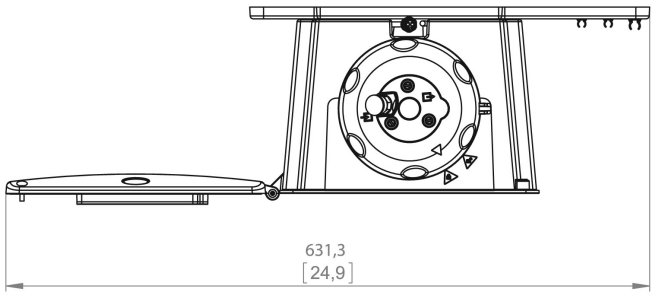
TU5300sc and TU5400sc front view



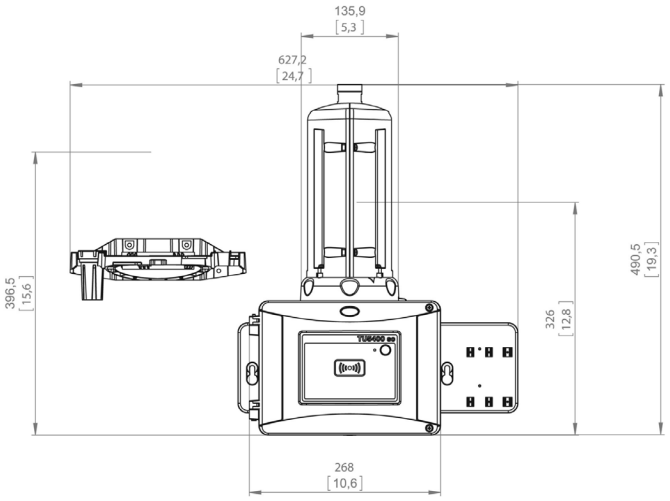
TU5300sc and TU5400sc rear view



TU5300sc and TU5400sc top view



TU5300sc and TU5400sc with automatic cleaning module



Order Information

TU5200 Benchtop Laser Turbidimeters

LPV442.99.03012	TU5200 Benchtop Laser Turbidimeter with RFID, EPA Version
LPV442.99.01012	TU5200 Benchtop Laser Turbidimeter without RFID, EPA Version
LPV442.99.03022	TU5200 Benchtop Laser Turbidimeter with RFID, ISO Version
LPV442.99.01022	TU5200 Benchtop Laser Turbidimeter without RFID, ISO Version



TU5300sc/TU5400sc Online Laser Turbidimeters

LXV445.99.10112	TU5300sc Low Range Laser Turbidimeter, EPA Version
LXV445.99.10212	TU5400sc Ultra-High Precision Low Range Laser Turbidimeter, EPA Version
LXV445.99.53112	TU5300sc with Flow Sensor, Automatic Cleaning, RFID, and System Check, EPA Version
LXV445.99.53212	TU5400sc with Flow Sensor, Automatic Cleaning, RFID, and System Check, EPA Version

Please note: Other turbidimeter configurations are available and RFID may not be available in all areas. Please contact your local Hach representative.

Please note: An SC controller is required for operation of the TU5300sc or TU5400sc.



Calibration and Verification

LZY835	StablCal® Calibration Set with RFID
LZY898	StablCal® Calibration Set without RFID
LZY901	Glass Rod Secondary Turbidity Standard <0.1 NTU/FNU
LZY834	Replacement Vial for TU5300sc and TU5400sc
LZV946	Sample Vials for TU5200

TU5 Series Accessories

LQV159.97.00002	Automatic Cleaning Module for TU5300sc and TU5400sc
LQV160.99.00002	Flow Sensor for TU5300sc and TU5400sc
LZY876	Desiccant Cartridge for TU5300sc and TU5400sc
LZY907.97.00002	Maintenance Kit for TU5300sc and TU5400sc
LQV157.99.50002	SIP10 Sipper Unit for TU5200
LZY903	Manual Vial Wiper for TU5200, TU5300sc, and TU5400sc

Service Protected

With Hach Service, you have a global partner who understands your needs and cares about delivering timely, high-quality service you can trust. Our Service Team brings unique expertise to help you maximise instrument uptime, ensure data integrity, maintain operational stability, and reduce compliance risk.

DOC050.53.10053.Mar23

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HACH® Be Right™

TAG:
15-LIT-301
23-LIT-101
23-LIT-301

Technical Information
Micropilot FMR50

Free space radar





Level measurement in liquids

Application

- Continuous, non-contact level measurement of liquids, pastes and slurries
- Encapsulated PVDF or PP cladded horn antenna
- Maximum measuring range: 40 m (131 ft)
- Temperature: −40 to +130 °C (−40 to +266 °F)
- Pressure: −1 to +3 bar (−14.5 to +43.5 psi)
- Accuracy: ± 2 mm
- International explosion protection certificates; WHG; marine approvals
- Linearity protocol (3-point, 5-point)

Your benefits

- Reliable measurement even for changing product and process conditions
- HistoROM data management for easy commissioning, maintenance and diagnostics
- Highest reliability due to Multi-Echo Tracking
- SIL2 according to IEC 61508, SIL3 in case of homogeneous or heterogeneous redundancy
- Seamless integration into control or asset management systems
- Intuitive user interface in national languages
- Easy proof test for SIL and WHG

Endress+Hauser
People for Process Automation

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Important document information

Symbols

Safety symbols

Symbol	Meaning
DANGER	**DANGER!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
WARNING	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
CAUTION	**CAUTION!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
NOTICE	**NOTE!** This symbol contains information on procedures and other facts which do not result in personal injury.

Electrical symbols

Symbol	Meaning	Symbol	Meaning
⎓	Direct current	~	Alternating current
⎓ ~	Direct current and alternating current	⏚	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
⊜	**Protective ground connection** A terminal which must be connected to ground prior to establishing any other connections.	⏚	**Equipotential connection** A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.

Symbols for certain types of information

Symbol	Meaning
✓	**Permitted** Procedures, processes or actions that are permitted.
✓✓	**Preferred** Procedures, processes or actions that are preferred.
✗	**Forbidden** Procedures, processes or actions that are forbidden.
ℹ	**Tip** Indicates additional information.
📖	Reference to documentation
📄	Reference to page
🖼	Reference to graphic
👁	Visual inspection

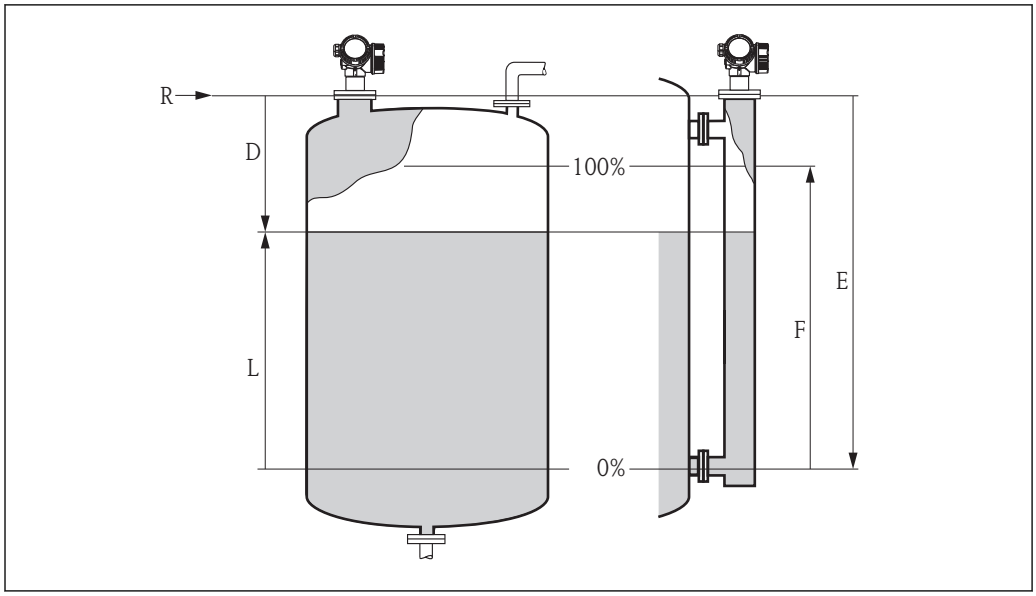
Symbols in graphics

Symbol	Meaning
1, 2, 3 ...	Item numbers
1. , 2. , 3. ...	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections
	**Hazardous area** Indicates a hazardous area.
	**Safe area (non-hazardous area)** Indicates the non-hazardous area.

Function and system design

Measuring principle

The Micropilot is a "downward-looking" measuring system, operating based on the time-of-flight method (ToF). It measures the distance from the reference point (process connection) to the product surface. Radar impulses are emitted by an antenna, reflected off the product surface and received again by the radar system.



1 *Setup parameters of the Micropilot*

R Reference point of the measurement (lower edge of the flange or threaded connection)
E Empty calibration (= zero)
F Full calibration (= span)
D Measured distance
L Level (L = E - D)

Input

The reflected radar impulses are received by the antenna and transmitted into the electronics. A microprocessor evaluates the signal and identifies the level echo caused by the reflection of the radar impulse at the product surface. The unambiguous signal identification is accomplished by the PulseMaster® eXact software together with the Multi-echo tracking algorithms, based on many years of experience with time-of-flight technology.

The distance D to the product surface is proportional to the time of flight t of the impulse:

$D = c \cdot t/2$,

with c being the speed of light.

Based on the known empty distance E, the level L is calculated:

$L = E - D$

The reference point R of the measurement is located at the process connection. For details see the dimensional drawing:
FMR50: → 51

The Micropilot is equipped with functions to suppress interference echoes. The user can activate these functions. Together with the multi-echo tracking algorithms they ensure that interference echoes (i.e. from edges and weld seams) are not interpreted as level echo.

Output

The Micropilot is commissioned by entering an empty distance "E" (=zero), a full distance "F" (=span) and application parameters which automatically adapt the instrument to the process conditions. For models with a current output, the factory adjustment for zero point "E" and span "F" is 4 mA and 20 mA. For digital outputs and the display module, the factory adjustment for zero point "E" and span "F" is 0 % and 100 %.

A linearization with max. 32 points, based on a table entered either manually or semi-automatically, can be activated locally or remotely. This function provides a measurement in engineering units and a linear output signal for spheres, horizontal cylindrical tanks and vessels with conical outlet.

Life cycle of the product

Engineering
- Universal measuring principle
- Measurement unaffected by medium properties
- Hardware and software developed according to SIL IEC 61508

Procurement
- Endress+Hauser being the world market leader in level measurement guarantees asset protection
- Worldwide support and service

Installation
- Special tools are not required
- Reverse polarity protection
- Modern, detachable terminals
- Main electronics protected by a separate connection compartment

Commissioning
- Fast, menu-guided commissioning in only a few steps on site or from the control room
- Plain text display in national languages reduces the risk of error or confusion
- Direct local access of all parameters
- Short instruction manual at the device

Operation
- Multi-echo tracking: Reliable measurement through self-learning echo-search algorithms taking into account the short-term and long-term history in order to check the found echoes for plausibility and to suppress interference echoes.
- Diagnostics in accordance with NAMUR NE107

Maintenance
- HistoROM: Data backup for instrument settings and measured values
- Exact instrument and process diagnosis to assist fast decisions with clear details concerning remedies
- Intuitive, menu-guided operating concept in national languages saves costs for training, maintenance and operation
- Cover of the electronics compartment can be opened in hazardous areas

Retirement
- Order code translation for subsequent models
- RoHS-conforming (Restriction of certain Hazardous Substances), unleaded soldering of electronic components
- Environmentally sound recycling concept

Input

Measured variable

The measured variable is the distance between the reference point and the product surface.

The level is calculated from this distance, taking into account the empty distance "E" entered by the user.

If required, the level can be converted into other variables (volume, mass) by means of a linearization (up to 32 points).

Measuring range

Maximum measuring range

Device	Maximum measuring range
FMR50 - standard version	30 m (98 ft)
FMR50 - with "Advanced dynamics" application package	40 m (131 ft)

Usable measuring range

The usable measuring range depends on the size of the antenna, the reflectivity of the medium, the mounting location and eventual interference reflections.

The following tables describe the groups of media as well as the achievable measuring range as a function of application and media group. If the dielectric constant of a medium is unknown, it is recommended to assume media group B to ensure a reliable measurement.

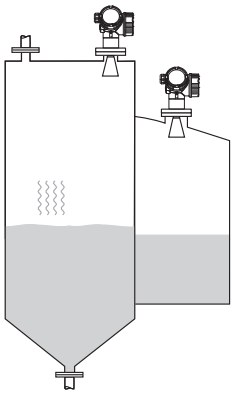
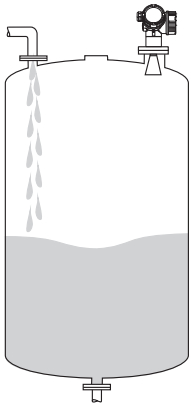
Media groups

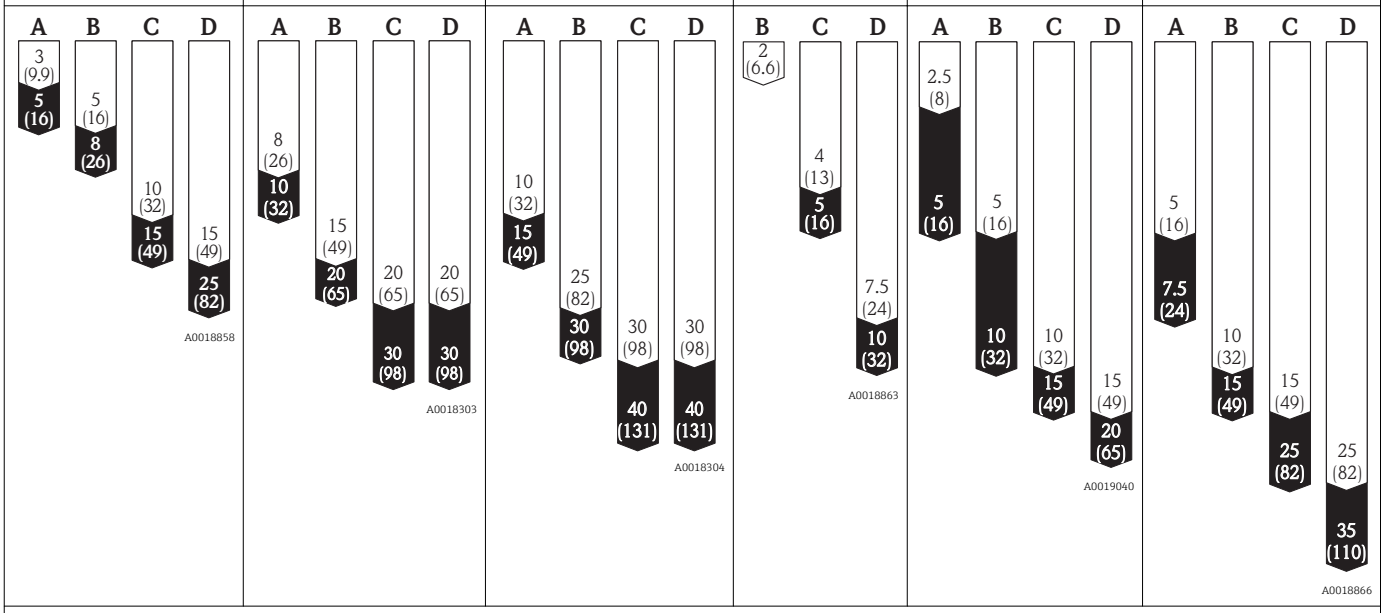
Media groups	DK (ε_r)	Example
A	1.4 to 1.9	non-conducting liquids, e.g. liquefied gas [1]
B	1.9 to 4	non-conducting liquids, e.g. benzene, oil, toluene, ...
C	4 to 10	e.g. concentrated acids, organic solvents, esters, aniline, alcohol, acetone, ...
D	> 10	conducting liquids, e.g. aqueous solutions, dilute acids and alkalis

1) Treat Ammonia NH_3 as a medium of group A.

Dielectric constants (DC values) for many important media are summarized in

For dielectric constants (DC values) of many important media refer to:
- the **DC Manual** by Endress+Hauser (CP01076F) by Endress+Hauser
- the **DC Values** App by Endress+Hauser (available for Android and iOS)

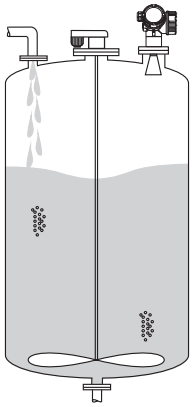
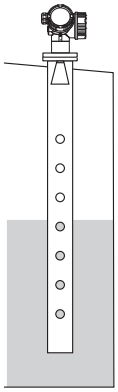
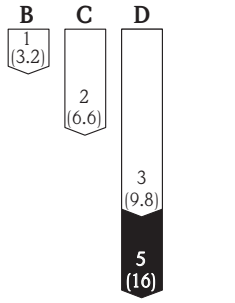
Storage tank	Buffer tank
 A0018833	 A0018835
Calm product surface (e.g. intermittent filling, filling from bottom, immersion tubes)	Moving surfaces (e.g. continuous filling, from above, mixing jets)
Antenna size	Antenna size

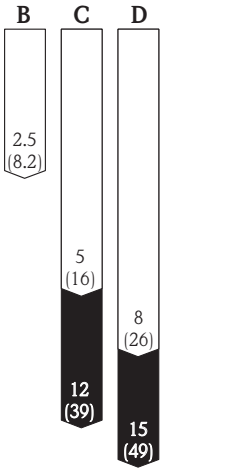


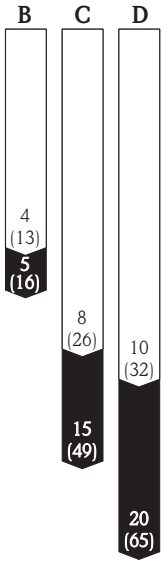
Measuring range [m (ft)]

Legend

▯	Measuring range of the standard version
▮	Measuring range for the "Advanced dynamics" application package (product structure: feature 540: "Application Package", Option EM: "Advanced dynamics")

<table>
<tr><th colspan="3">Process tank with agitator</th><th>Stilling well</th></tr>
<tr><td colspan="3"> 
A0018837
Turbulent surface (e.g. filling from above, agitators, baffles)</td><td> 
A0018842</td></tr>
<tr><td colspan="3">Antenna size</td><td>Antenna size</td></tr>
<tr><td>40 mm (1½ in)</td><td>80 mm (3 in)</td><td>100 mm (4 in)</td><td>40 to 100 mm (1½ to 4 in)</td></tr>
<tr><td> 

A0018867</td><td> 

A0018869</td><td> 

A0018870</td><td> 

A0018851</td></tr>
<tr><td colspan="4">Measuring range [m (ft)]</td></tr>
</table>

Legend

▯	Measuring range of the standard version
▮	Measuring range for the "Advanced dynamics" application package (product structure: feature 540: "Application Package", Option EM: "Advanced dynamics")

Operating frequency

K-band (~ 26 GHz)

Up to 8 Micropilot transmitters can be installed in the same tank because the transmitter pulses are statistically coded.

Transmitting power

Distance	Average energy density in beam direction	
	Standard version	With "Advanced dynamics" application package [1]
1 m (3.3 ft)	< 12 nW/cm^2	< 64 nW/cm^2
5 m (16 ft)	< 0.4 nW/cm^2	< 2.5 nW/cm^2

1) Product structure, feature 540: "Application package", option EM: "Advanced dynamics"

Output

Output signal

HART

Signal coding	FSK ±0.5 mA over current signal
Data transmission rate	1200 Bit/s
Galvanic isolation	Yes

PROFIBUS PA

Signal coding	Manchester Bus Powered (MBP)
Data transmission rate	31.25 kBit/s, voltage mode
Galvanic isolation	Yes

FOUNDATION Fieldbus

Signal coding	Manchester Bus Powered (MBP)
Data transmission rate	31.25 kBit/s, voltage mode
Galvanic isolation	Yes

Switch output

For HART devices, the switch output is available as an option. See product structure, feature 20: "Power Supply, Output", option B: "2-wire; 4-20mA HART, switch output"

Devices with PROFIBUS PA and FOUNDATION Fieldbus always have a switch output.

Switch output	
Function	Open collector switching output
Switching behavior	Binary (conductive or non-conductive), switches when the programmable switch point is reached
Failure mode	non-conductive
Electrical connection values	U = 10.4 to 35 V_{DC}, I = 0 to 40 mA
Internal resistance	R_i < 880 Ω The voltage drop at this internal resistance has to be taken into account on planning the configuration. For example, the resulting voltage at a connected relay must be sufficient to switch the relay.
Insulation voltage	floating, Insulation voltage 1350 V_{DC} to power supply aund 500 V_{AC} to ground
Switch point	freely programmable, separately for switch-on and switch-off point
Switching delay	freely programmable from 0 to 100 sec. , separately for switch-on and switch-off point
Number of switching cycles	corresponds to the measuring cycle
Signal source device variables	▪ Level linearized ▪ Distance ▪ Terminal voltage ▪ Electronic temperature ▪ Relative echo amplitude ▪ Diagnostic values, Advanced diagnostics
Number of switching cycles	unlimited

Signal on alarm

Depending on the interface, failure information is displayed as follows:
- Current output (for HART devices)
  - Failsafe mode selectable (in accordance with NAMUR Recommendation NE 43):
    Minimum alarm: 3.6 mA
    Maximum alarm (= factory setting): 22 mA
  - Failsafe mode with user-selectable value: 3.59 to 22.5 mA
- Local display
  - Status signal (in accordance with NAMUR Recommendation NE 107)
  - Plain text display
- Operating tool via digital communication (HART, PROFIBUS PA, FOUNDATION Fieldbus) or service interface (CDI)
  - Status signal (in accordance with NAMUR Recommendation NE 107)
  - Plain text display

Linearization

The linearization function of the device allows the conversion of the measured value into any unit of length or volume. Linearization tables for calculating the volume in cylindrical tanks are pre-programmed. Other tables of up to 32 value pairs can be entered manually or semi-automatically.

Galvanic isolation

All circuits for the outputs are galvanically isolated from each other.

Protocol-specific data

HART

Manufacturer ID	17 (0x11)
Device type ID	41 (0x28)
HART specification	6.0
Device description files (DTM, DD)	Information and files under: ▪ www.endress.com ▪ www.hartcomm.org
HART load	Min. 250 Ω
HART device variables	The measured values can be freely assigned to the device variables. **Measured values for PV (primary variable)** ▪ Level linearized ▪ Distance ▪ Electronic temperature ▪ Relative echo amplitude ▪ Analog output adv. diagnostics **Measured values for SV, TV, FV (second, third and fourth variable)** ▪ Level linearized ▪ Distance ▪ Terminal voltage ▪ Electronic temperature ▪ Absolute echo amplitude ▪ Relative echo amplitude ▪ Area of incoupling
Supported functions	▪ Burst mode ▪ Additional transmitter status

Wireless HART data

Minimum start-up voltage	16 V
Start-up current	3.6 mA
Start-up time	40 s
Minimum operating voltage	12.3 V
Multidrop current	3.6 mA
Set-up time	1 s

PROFIBUS PA

Manufacturer ID	17 (0x11)
Ident number	0x1559
Profile version	3.02
GSD file GSD file version	Information and files under: ▪ www.endress.com ▪ www.profibus.org
Output values	**Analog Input:** ▪ Level linearized ▪ Distance ▪ Terminal voltage ▪ Electronic temperature ▪ Absolute echo amplitude ▪ Relative echo amplitude ▪ Analog output advanced diagnostics 1/2 **Digital Input:** ▪ Advanced diagnostic blocks ▪ Status output switch block
Input values	**Analog Output:** ▪ Analog value from PLC (for sensor block external pressure to compensate gas phase effects) ▪ Analog value from PLC to be indicated on the display **Digital Output:** ▪ Extended diagnostic block ▪ Level limiter ▪ Sensor block measurement on ▪ Sensor block save history on ▪ Status output
Supported functions	▪ Identification & Maintenance Einfachste Geräteidentifizierung seitens des Leitsystems und des Typenschildes ▪ Automatic Ident Number Adoption GSD compatibility mode with respect to the preceding product Micropilot M FMR2xx ▪ Physical Layer Diagnostics Installation check of the PRFIBUS segment and the Micropilot FMR5x via the terminal voltage and telegram surveillance. ▪ PROFIBUS Up-/Download Up to 10 times faster writing and reading of parameters via PROFIBUS up-/download ▪ Condensed Status Simple and self-explanatory diagnostic information by categorization of occurring diagnostic messages.

FOUNDATION Fieldbus

Manufacturer ID	0x452B48
Device type	0x1028
Device Revision	0x01
DD Revision CFF Revision	Information and files can be found: ▪ www.endress.com ▪ www.fieldbus.org
Device Tester Version (ITK Version)	6.0.1
ITK Test Campaign Number	IT085300
Link Master (LAS) capable	yes
Link Master / Basic Device selectable	yes; default: Basic Device

Node address	Default: 247 (0xF7)
Features supported	Following methods are supported: ▪ Restart ▪ ENP Restart ▪ Setup ▪ Linearization ▪ Self Check
Virtual Communication Relationships (VCRs)	
Number of VCRs	44
Number of Link Objects in VFD	50
Permanent entries	1
Client VCRs	0
Server VCRs	10
Source VCRs	43
Sink VCRs	0
Subscriber VCRs	43
Publisher VCRs	43
Device Link Capabilities	
Slot time	4
Min. inter PDU delay	8
Max. response delay	20

Transducer Blocks

Block	Content	Output values
Setup Transducer Block	Contains all parameters for a standard commissioning procedure	▪ Level or volume [1] (Channel 1) ▪ Distance (Channel 2)
Advanced Setup Transducer Block	Contains all parameters for a more detailed configuration of the device	no output values
Display Transducer Block	Contains all parameters for the configuration of the display module	no output values
Diagnostic Transducer Block	Contains diagnostic information	no output values
Advanced Diagnostic Transducer Block	Contains parameters for the Advanced Diagnostic	no output values
Expert Configuration Transducer Block	Contains parameters which require detailed knowledge of the functionalities of the device	no output values
Expert Information Transducer Block	Contains information about the state of the device	no output values
Service Sensor Transducer Block	Contains parameters which can only be operated by Endress+Hauser service personnel	no output values
Service Information Transducer Block	Contains information on the state of device which is relevant for service operations	no output values
Data Transfer Transducer Block	Contains parameters which allow to backup the device configuration in the display module and to restore it into the device. Access to these parameters is restricted to the Endress+Hauser service.	no output values

1) depending on the configuration of the block

Function Blocks

Block	Content	Number of permanent blocks	Number of instantiable blocks	Execution time	Functionality
Resource Block	The Resource Block contains all the data that uniquely identifies the field device. It is an electronic version of a nameplate of the device.	1	0	-	enhanced
Analog Input Block	The AI block takes the manufacturer's input data, selected by channel number, and makes it available to other function blocks at its output.	2	3	25 ms	enhanced
Discrete Input Block	The DI block takes a discrete input value (e.g. indication of an level limit), and makes it available to other function blocks at its output.	1	2	20 ms	standard
Mutiple Analog Output Block	This block is used to transfer analog data from the bus into the device	1	0	20 ms	standard
Mutiple Discrete Output Block	This block is used to transfer discrete data from the bus to the device.	1	0	20 ms	standard
PID Block	The PID block serves as proportional-integralderivative controller and is used almost universally to do closed-loop-control in the field including cascade and feedforward.	1	1	25 ms	standard
Arithmetic Block	This block is designed to permit simple use of popular measurement math functions. The user does not have to know how to write equations. The math algorithm is selected by name, chosen by the user for the function to be done.	1	1	25 ms	standard
Signal Characterizer Block	The signal characterizer block has two sections, each with an output that is a non-linear function of the respective input. The non-linear function is determined by a single look-up table with 21 arbitrary x-y pairs.	1	1	25 ms	standard
Input Selector Block	The input selector block provides selection of up to four inputs and generates an output based on the configured action. This block normally receives its inputs from AI blocks. The block performs maximum, minimum, middle, average and 'first good' signal selection.	1	1	25 ms	standard

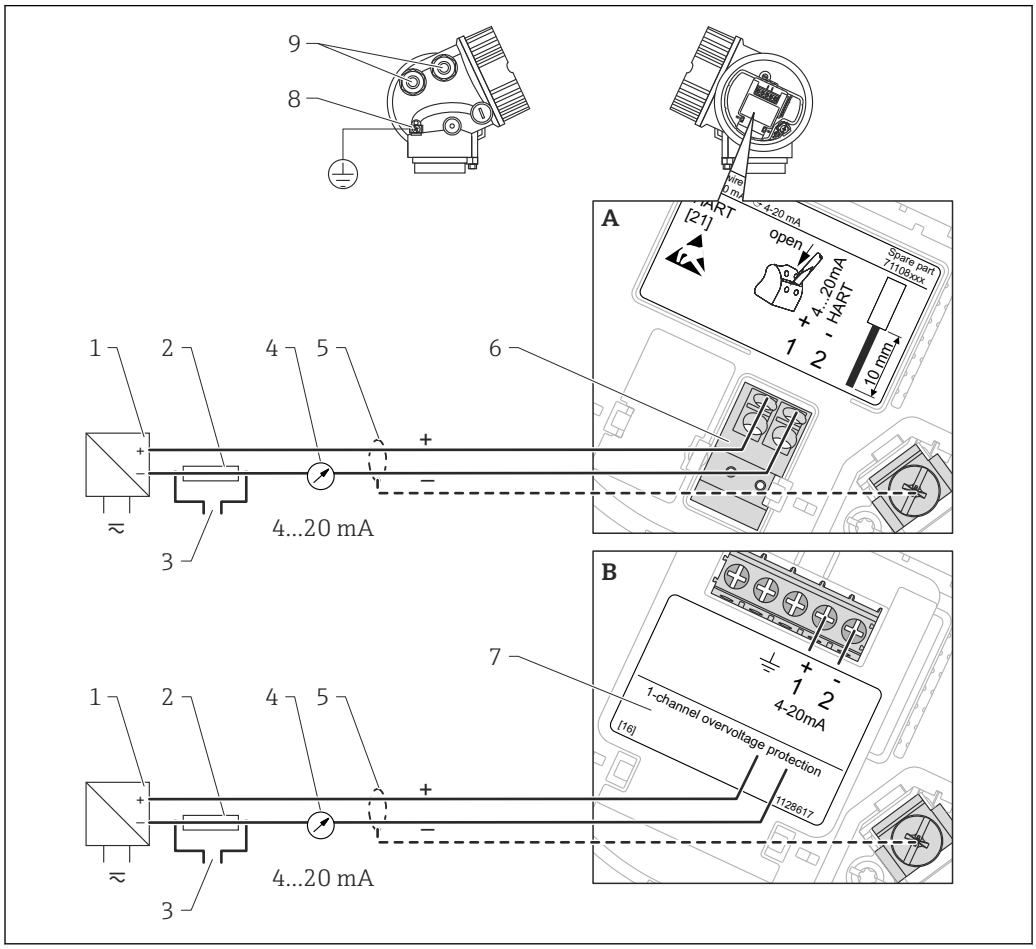
Block	Content	Number of permanent blocks	Number of instantiable blocks	Execution time	Functionality
Integrator Block	The Integrator Function Block integrates a variable as a function of the time or accumulates the counts from a Pulse Input block. The block may be used as a totalizer that counts up until reset or as a batch totalizer that has a setpoint, where the integrated or accumulated value is compared to pre-trip and trip settings, generating discrete signals when these settings are reached.	1	1	25 ms	standard
Analog Alarm Block		1	1	25 ms	standard

Up to 20 blocks can be instantiated in the device altogether, including the blocks already instantiated on delivery.

Power supply

Terminal assignment

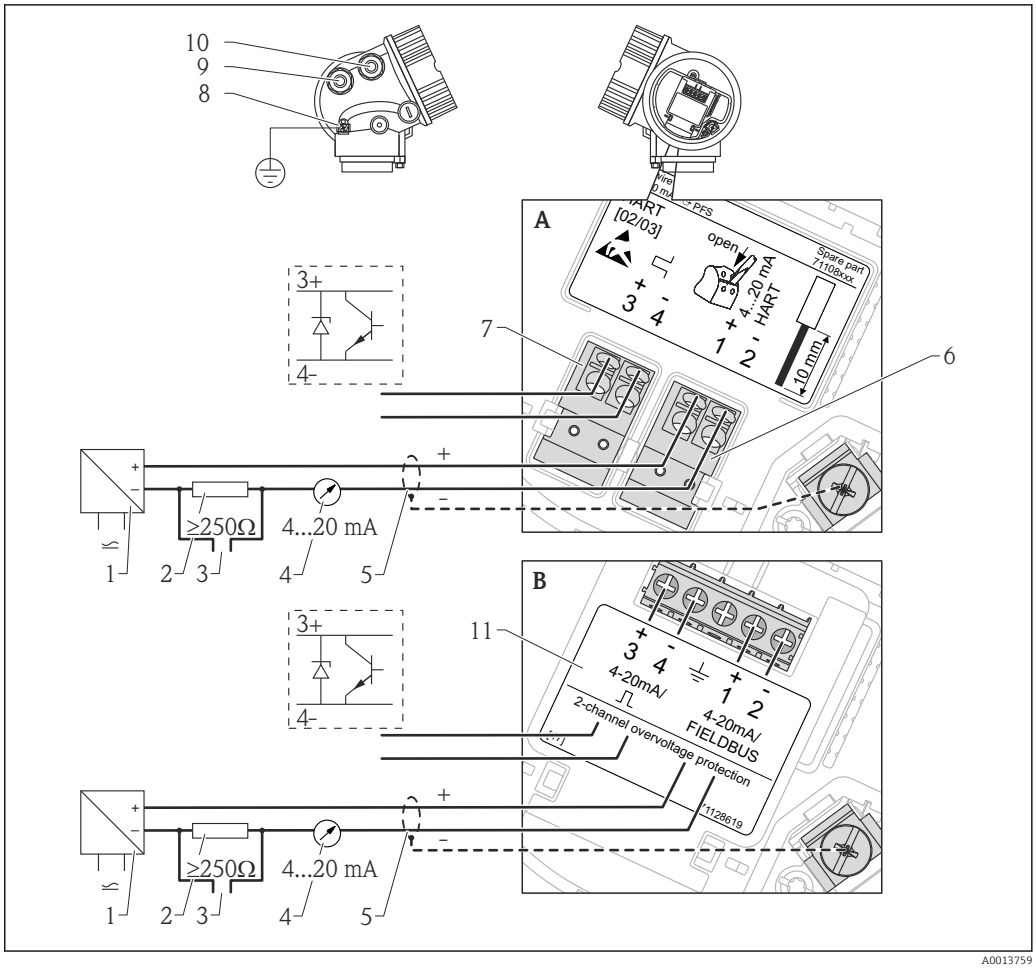
2-wire: 4-20mA HART



2 Terminal assignment 2-wire; 4-20mA HART

A Without integrated overvoltage protection
B With integrated overvoltage protection
1 Active barrier with power supply (e.g. RN221N): Observe terminal voltage
2 HART communication resistor (≥250 Ω): Observe maximum load
3 Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)
4 Analog display device: Observe maximum load
5 Cable screen; observe cable specification
6 4-20mA HART (passive): Terminals 1 and 2
7 Overvoltage protection module
8 Terminal for potential equalization line
9 Cable entry

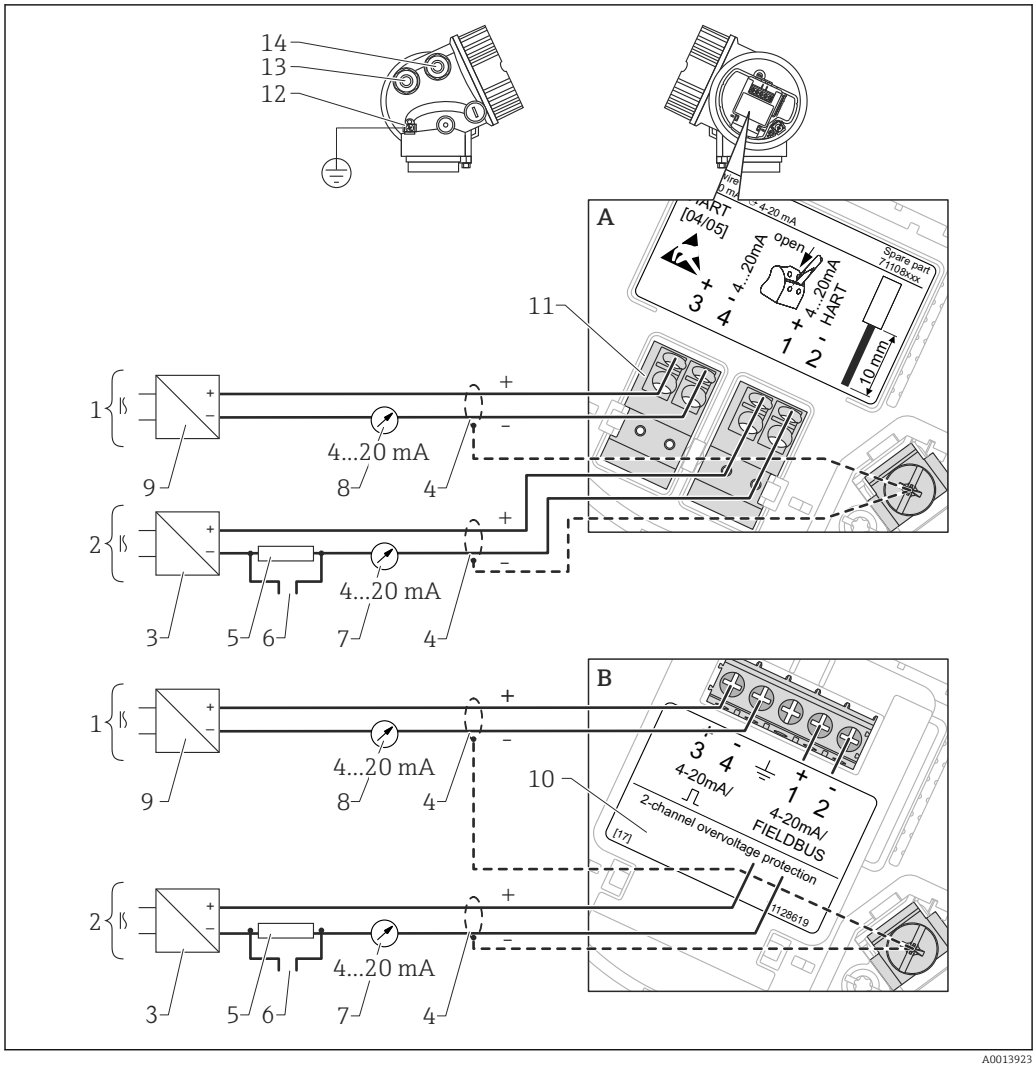
2-wire: 4-20mA HART, switch output



3 Terminal assignment 2-wire; 4-20mA HART, switch output

A Without integrated overvoltage protection
B With integrated overvoltage protection
1 Active barrier with power supply (e.g. RN221N): Observe terminal voltage
2 HART communication resistor (≥250 Ω): Observe maximum load
3 Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)
4 Analog display device: Observe maximum load
5 Cable screen; observe cable specification
6 4-20mA HART (passive): Terminals 1 and 2
7 Switch output (open collector): Terminals 3 and 4
8 Terminal for potential equalization line
9 Cable entry for 4-20mA HART line
10 Cable entry for switch output line
11 Overvoltage protection module

2-wire: 4-20mA HART, 4-20mA

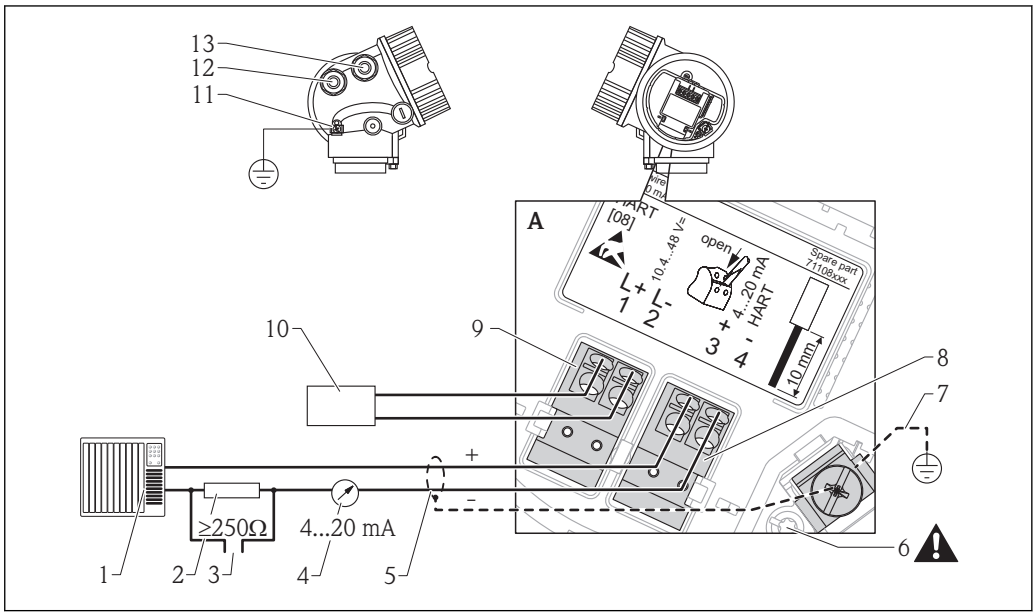


4 *Terminal assignment 2-wire, 4-20 mA HART, 4...20mA*

A Without integrated overvoltage protection
B With integrated overvoltage protection
1 Connection current output 2
2 Connection current output 1
3 Supply voltage for current output 1 (e.g. RN221N); Observe terminal voltage
4 Cable screen; observe cable specification
5 HART communication resistor (≥250 Ω): Observe maximum load
6 Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)
7 Analog display device ; observe maximum load
8 Analog display device ; observe maximum load
9 Supply voltage for current output 2 (e.g. RN221N); Obeserve terminal voltage
10 Overvoltage protection module
11 Current output 2: Terminals 3 and 4
12 Terminal for the potential equalization line
13 Cable entry for current output 1
14 Cable entry for current output 2

This version is also suited for single-channel operation. In this case, current output 1 (terminals 1 and 2) must be used.

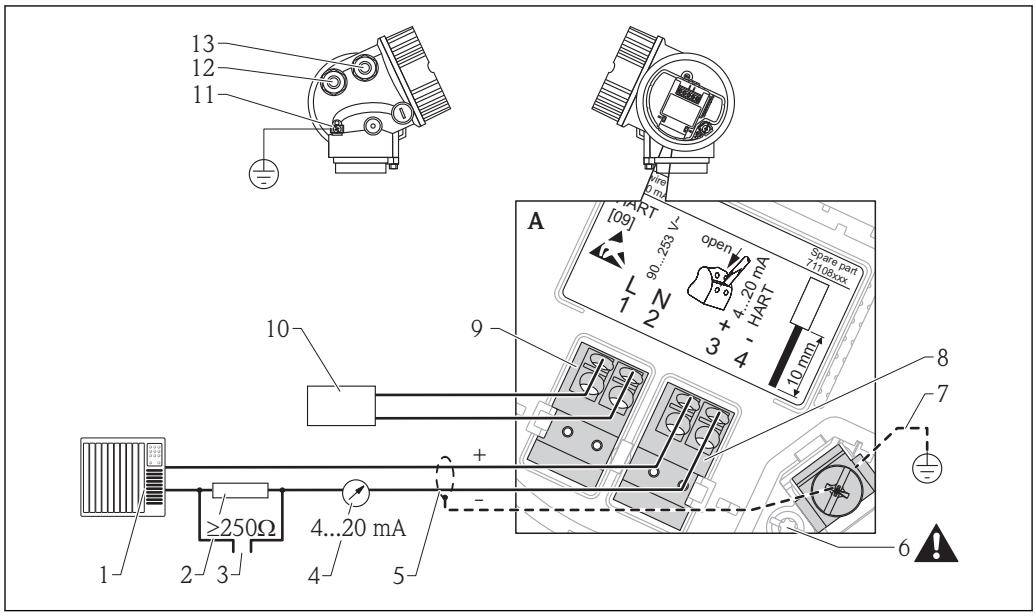
4-wire: 4-20mA HART (10.4 to 48 V_{DC})



5 *Terminal assignment 4-wire; 4-20mA HART (10.4 to 48 VDC)*

1 *Evaluation unit, e.g. PLC*
2 *HART communication resistor (≥250 Ω): Observe maximum load*
3 *Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)*
4 *Analog display device: Observe maximum load*
5 *Signal cable including screening (if required), observe cable specification*
6 *Protective connection; do not disconnect!*
7 *Protective earth, observe cable specification*
8 *4...20mA HART (active): Terminals 3 and 4*
9 *Supply voltage: Terminals 1 and 2*
10 *Supply voltage: Observe terminal voltage, observe cable specification*
11 *Terminal for potential equalization*
12 *Cable entry for signal line*
13 *Cable entry for power supply*

4-wire: 4-20mA HART (90 to 253 V_{AC})



6 *Terminal assignment 4-wire; 4-20mA HART (90 to 253 VAC)*

1 *Evaluation unit, e.g. PLC*
2 *HART communication resistor (≥250 Ω): Observe maximum load*
3 *Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)*
4 *Analog display device: Observe maximum load*
5 *Signal cable including screening (if required), observe cable specification*
6 *Protective connection; do not disconnect!*
7 *Protective earth, observe cable specification*
8 *4...20mA HART (active): Terminals 3 and 4*
9 *Supply voltage: Terminals 1 and 2*
10 *Supply voltage: Observe terminal voltage, observe cable specification*
11 *Terminal for potential equalization*
12 *Cable entry for signal line*
13 *Cable entry for power supply*

⚠ CAUTION

To ensure electrical safety:

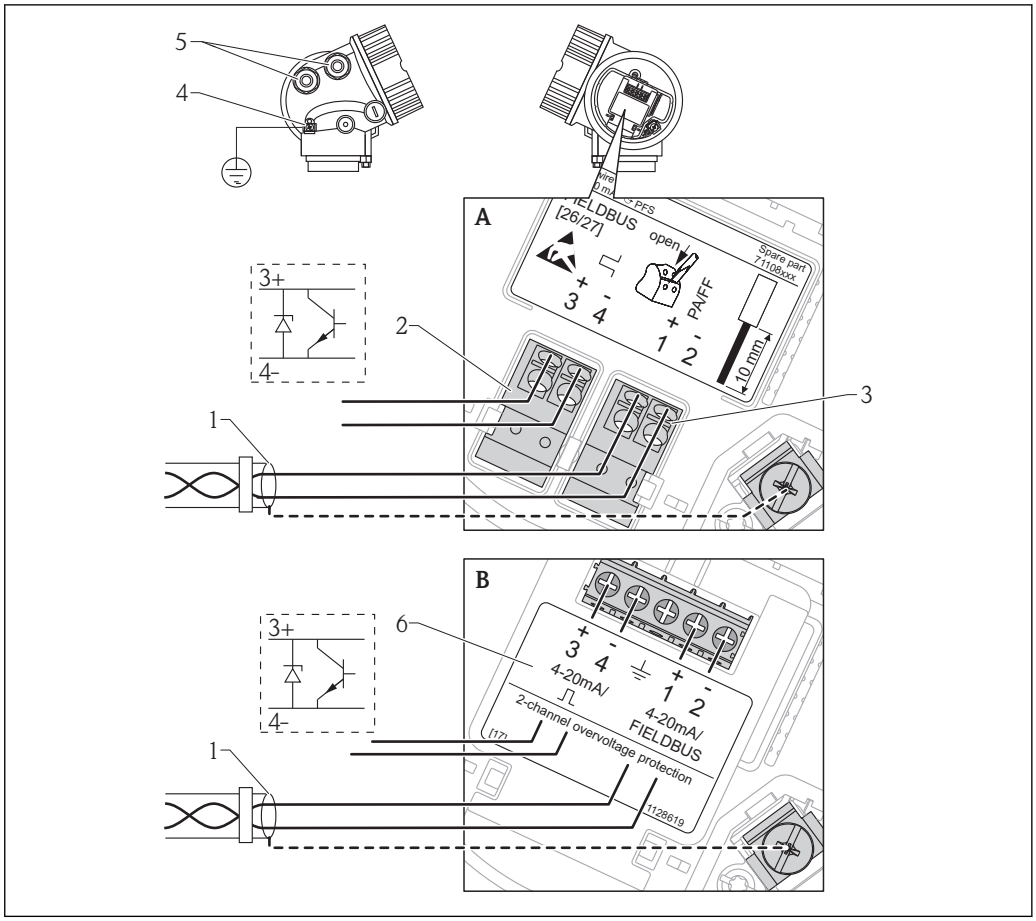
- ▶ Do not disconnect the protective connection (6).
- ▶ Disconnect the supply voltage before disconnecting the protective earth (7).

Connect protective earth to the internal ground terminal (7) before connecting the supply voltage. If necessary, connect the potential matching line to the external ground terminal (11).

In order to ensure electromagnetic compatibility (EMC): Do not only ground the device via the protective earth conductor of the supply cable. Instead, the functional grounding must also be connected to the process connection (flange or threaded connection) or to the external ground terminal.

An easily accessible power switch must be installed in the proximity of the device. The power switch must be marked as a disconnector for the device (IEC/EN61010).

PROFIBUS PA / FOUNDATION Fieldbus



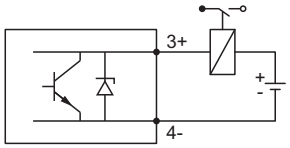
7 *Terminal assignment PROFIBUS PA / FOUNDATION Fieldbus*

A Without integrated overvoltage protection
B With integrated overvoltage protection
1 Cable screen: Observe cable specifications
2 Switch output (open collector): Terminals 3 and 4
3 PROFIBUS PA / FOUNDATION Fieldbus: Terminals 1 and 2
4 Terminal for potential equalization line
5 Cable entries
6 Overvoltage protection module

Connection examples for the switch output

For HART devices, the switch output is available as an option. See product structure, feature 20: "Power Supply, Output", option B: "2-wire; 4-20mA HART, switch output"

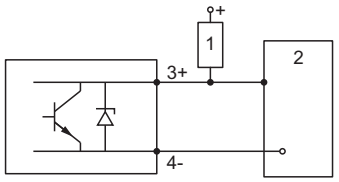
Devices with PROFIBUS PA and FOUNDATION Fieldbus always have a switch output.



A0015909

8 Connection of a relay

Suitable relays (examples):
- Solid-state relay: Phoenix Contact OV-24DC/480AC/5 with mounting rail connector UMK-1 OM-R/AMS
- Electromechanical relay: Phoenix Contact PLC-RSC-12DC/21



A0015910

9 Connection of a digital input

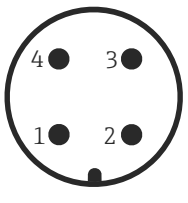
1 Pull-up resistor
2 Digital input

For optimum interference immunity we recommend to connect an external resistor (internal resistance of the relay or Pull-up resistor) of < 1 000 Ω.

Device plug connectors

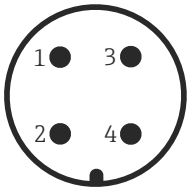
For the versions with fieldbus plug connector (M12 or 7/8"), the signal line can be connected without opening the housing.

Pin assignment of the M12 plug connector



Pin	Meaning
1	Signal +
2	not connected
3	Signal -
4	Ground

Pin assignment of the 7/8" plug connector



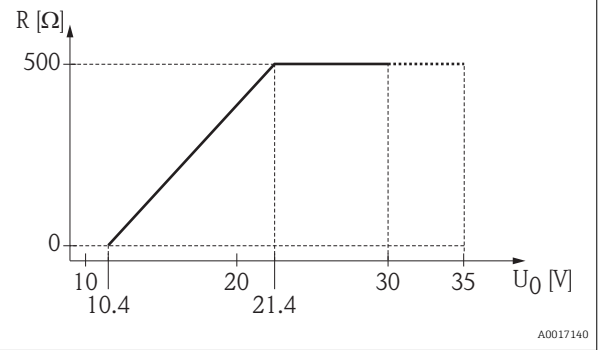
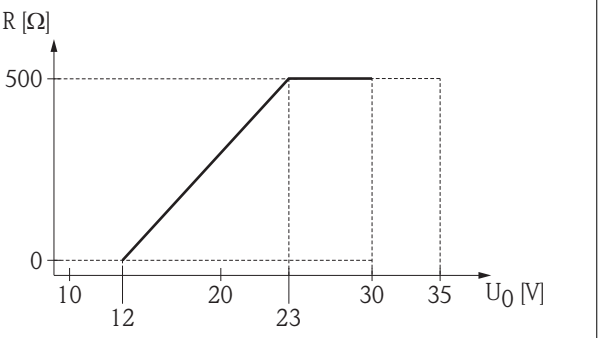
Pin	Meaning
1	Signal -
2	Signal +
3	Not connected
4	Screen

Supply voltage

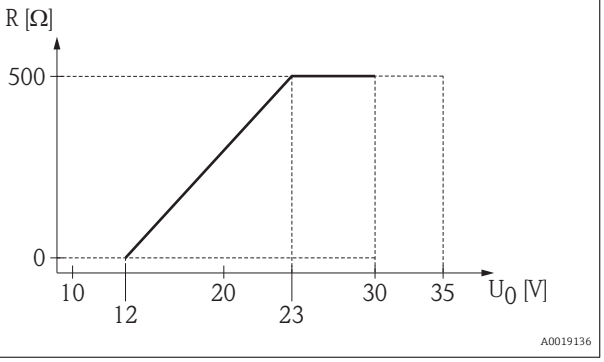
An external power supply is required.

Various supply units can be ordered from Endress+Hauser: see "Accessories" section → 82

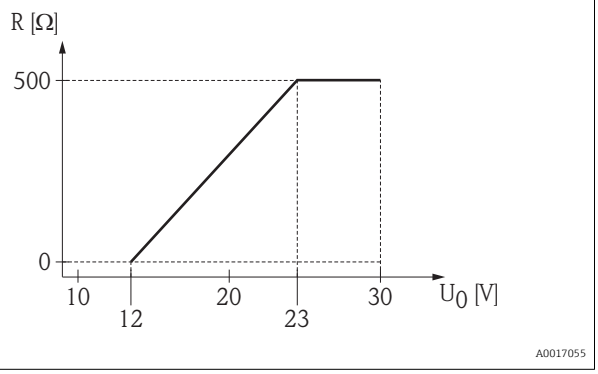
2-wire, 4-20mA HART, passive

"Power Supply, Output" [1]	"Approval" [2]	Terminal voltage U at the device	Maximum load R, depending on the supply voltage U_0 at the supply unit
A: 2-wire; 4-20mA HART	▪ Non-Ex ▪ Ex nA ▪ Ex ic ▪ CSA GP	10.4 to 35 V [3]	
	Ex ia / IS	10.4 to 30 V [3]	
	▪ Ex d(ia) / XP ▪ Ex ic(ia) ▪ Ex nA(ia) ▪ Ex ta / DIP	12 to 35 V [4]	
	Ex ia + Ex d(ia) / IS + XP	12 to 30 V [4]	

1) Feature 020 of the product structure
2) Feature 010 of the product structure
3) For ambient temperatures $T_a \leq$ -20 °C (-4 °F) a minimum voltage of 15 V is required for the sartup of the device at the MIN error current (3,6 mA). The startup current can be parametrized. If the device is operated with a fixed current I ≥ 5,5 mA (HART multidrop mode), a voltage of U ≥ 10,4 V is sufficient throughout the entire range of ambient temperatures.
4) For ambient temperatures $T_a \leq$ -20 °C (-4 °F) a minimum voltage of 16 V is required for the startup of the device at the MIN error current (3.6 mA).

"Power Supply, Output" [1]	"Approval" [2]	Terminal voltage U at the device	Maximum load R, depending on the supply voltage U_0 at the supply unit
B: 2-wire; 4-20 mA HART, switch output	▪ Non-Ex ▪ Ex nA ▪ Ex nA(ia) ▪ Ex ic ▪ Ex ic(ia) ▪ Ex d(ia) / XP ▪ Ex ta / DIP ▪ CSA GP	12 to 35 V [3]	
	▪ Ex ia / IS ▪ Ex ia + Ex d(ia) / IS + XP	12 to 30 V [3]	

1) Feature 020 of the product structure
2) Feature 010 of the product structure
3) For ambient temperatures $T_a \leq$ -30 °C (-22 °F) a minimum voltage of 16 V is required for the startup of the device at the MIN error current (3.6 mA).

"Power Supply, Output" [1]	"Approval" [2]	Terminal voltage U at the device	Maximum load R, depending on the supply voltage U_0 at the supply unit
C: 2-wire; 4-20mA HART, 4-20mA	any	12 to 30 V [3]	

1) Feature 020 of the product structure
2) Feature 010 of the product structure
3) For ambient temperatures $T_a \leq$ -30 °C (-22 °F) a minimum voltage of 16 V is required for the startup of the device at the MIN error current (3.6 mA).

Polarity reversal protection	Yes
Admissible residual ripple at f = 0 to 100 Hz	U_{SS} < 1 V
Admissible residual ripple at f = 100 to 10000 Hz	U_{SS} < 10 mV

4-wire, 4-20mA HART, active

"Power supply; Output" [1]	Terminal voltage	Maximum load R_{max}
K: 4-wire 90-253VAC; 4-20mA HART	90 to 253 V_{AC} (50 to 60 Hz), overvoltage category II	500 Ω
L: 4-wire 10,4-48VDC; 4-20mA HART	10.4 to 48 V_{DC}	

1) Feature 020 of the product structure

PROFIBUS PA, FOUNDATION Fieldbus

"Power supply; Output" [1]	"Approval" [2]	Terminal voltage
E: 2-wire; FOUNDATION Fieldbus, switch output **G:** 2-wire; PROFIBUS PA, switch output	▪ Non-Ex ▪ Ex nA ▪ Ex nA(ia) ▪ Ex ic ▪ Ex ic(ia) ▪ Ex d(ia) / XP ▪ Ex ta / DIP ▪ CSA GP	9 to 32 V [3]
	▪ Ex ia / IS ▪ Ex ia + Ex d(ia) / IS + XP	9 to 30 V [3]

1) Feature 020 of the product structure
2) Feature 010 of the product structure
3) Input voltages up to 35 V will not spoil the device.

Polarity sensitive	No
FISCO/FNICO compliant according to IEC 60079-27	Yes

Power consumption

"Power supply; Output" [1]	Power consumption
A: 2-wire; 4-20mA HART	< 0.9 W
B: 2-wire; 4-20mA HART, switch output	< 0.9 W
C: 2-wire; 4-20mA HART, 4-20mA	< 2 x 0.7 W
K: 4-wire 90-253VAC; 4-20mA HART	6 VA
L: 4-wire 10,4-48VDC; 4-20mA HART	1.3 W

1) Feature 020 of the product structure

Current consumption

HART

Nominal current	3.6 to 22 mA, the start-up current for multidrop mode can be parametrized (is set to 3.6 mA on delivery)
Breakdown signal (NAMUR NE43)	adjustable: 3.59 to 22.5 mA

PROFIBUS PA

Nominal current	14 mA
Error current FDE (Fault Disconnection Electronic)	0 mA

FOUNDATION Fieldbus

Device basic current	15 mA
Error current FDE (Fault Disconnection Electronic)	0 mA

FISCO

U_i	17.5 V
I_i	550 mA
P_i	5.5 W
C_i	5 nF
L_i	10 µH

Power supply failure

- Configuration is retained in the HistoROM (EEPROM).
- Error messages (incl. value of operated hours counter) are stored.

Potential equalization

No special measures for potential equalization are required.

If the device is designed for hazardous areas, observe the information in the documentation "Safety Instructions" (XA, ZD).

Terminals

- **Without integrated overvoltage protection**
  Plug-in spring terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)
- **With integrated overvoltage protection**
  Screw terminals for wire cross-sections 0.2 to 2.5 mm² (24 to 14 AWG)

Cable entries

Connection of power supply and signal line

To be selected in feature 050 "Electrical connection"

- Gland M20; Material dependent on the approval:
  - For Non-Ex, ATEX, IECEx, NEPSI Ex ia/ic:
    Plastics M20x1.5 for cable Φ 5 to 10 mm (0.2 to 0.39 in)
  - For Dust-Ex, FM IS, CSA IS, CSA GP, Ex nA:
    Metal M20x1.5 for cable Φ 7 to 10 mm (0.28 to 0.39 in) [1)]
  - For Ex d:
    No gland available
- Thread
  - ½" NPT
  - G ½"
  - M20 × 1.5
- Plug M12 / Plug 7/8"
  Only available for Non-Ex, Ex ic, Ex ia

Connection of remote display FHX50

Dependent on feature 030: "Display, Operation":

- "Prepared for display FHX50 + M12 connection":
  M12 socket
- "Prepared for display FHX50 + custom connection":
  Thread M16

Cable specification

- Minimum cross-section: dependent on terminals → 🖹 29
- For ambient temperature $T_U \geq 60$ °C (140 °F): use cable for temperature T_U +20 K.

1) The material of the gland is dependent on the housing type; GT18 (stainless steel housing): 316L (1.4404); GT19 (plastic housing) and GT20 (aluminum housing): nickel-coated brass (CuZn).

HART

- A normal device cable suffices if only the analog signal is used.
- A shielded cable is recommended if using the HART protocol. Observe grounding concept of the plant.
- For 4-wire devices: Standard device cable is sufficient for the power line.

PROFIBUS

Use a twisted, screened two-wire cable, preferably cable type A.

For further information on the cable specifications, see Operating Instructions BA00034S "Guidelines for planning and commissioning PROFIBUS DP/PA", PNO Guideline 2.092 "PROFIBUS PA User and Installation Guideline" and IEC61158-2 (MBP).

FOUNDATION Fieldbus

Endress+Hauser recommends using twisted, shielded two-wire cables.

For further information on the cable specifications, see Operating Instructions BA00013S "FOUNDATION Fieldbus Overview", FOUNDATION Fieldbus Guideline and IEC 61158-2 (MBP).

Overvoltage protection

If the measuring device is used for level measurement in flammable liquids which requires the use of overvoltage protection according to DIN EN 60079-14, standard for test procedures 60060-1 (10 kA, pulse 8/20 µs), overvoltage protection has to be ensured by an integrated or external overvoltage protection module.

Integrated overvoltage protection

An integrated overvoltage protection module is available for 2-wire HART as well as PROFIBUS PA and FOUNDATION Fieldbus devices.

Product structure: Feature 610 "Accessory mounted", option NA "Overvoltage protection".

Technical data	
Resistance per channel	2 * 0.5 Ω max
Threshold DC voltage	400 to 700 V
Threshold impulse voltage	< 800 V
Capacitance at 1 MHz	< 1.5 pF
Nominal arrest impulse voltage (8/20 µs)	10 kA

External overvoltage protection

HAW562 or HAW569 from Endress+Hauser are suited as external overvoltage protection.

For detailed information please refer to the following documents:
- HAW562: TI01012K
- HAW569: TI01013K

Performance characteristics

Reference operating conditions

- Temperature = +24 °C (+75 °F) ±5 °C (±9 °F)
- Pressure = 960 mbar abs. (14 psia) ±100 mbar (±1.45 psi)
- Humidity = 60 % ±15 %
- Reflector: metal plate with a minimum diameter of 1 m (40 in)
- No major interference reflections inside the signal beam

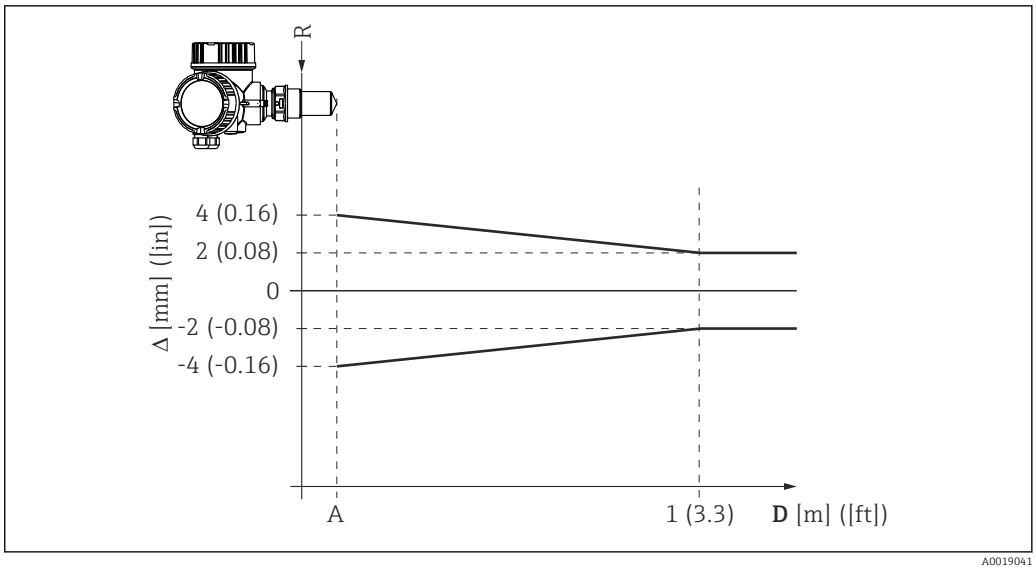
Maximum measured error

Typical data under reference operating conditions: DIN EN 61298-2, percentage values in relation to the span.

Device	Value	Output	
		digital	analog [1]
FMR50 Standard version	Sum of non-linearity, nonrepeatability and hysteresis	± 2 mm (0.08 in)	± 0.02 %
	Offset/Zero	± 4 mm (0.2 in)	± 0.03 %
FMR50 Version with application package "Advanced dynamics" [2]	Sum of non-linearity, nonrepeatability and hysteresis	± 3 mm (0.12 in)	± 0.02 %
	Offset/Zero	± 4 mm (0.2 in)	± 0.03 %

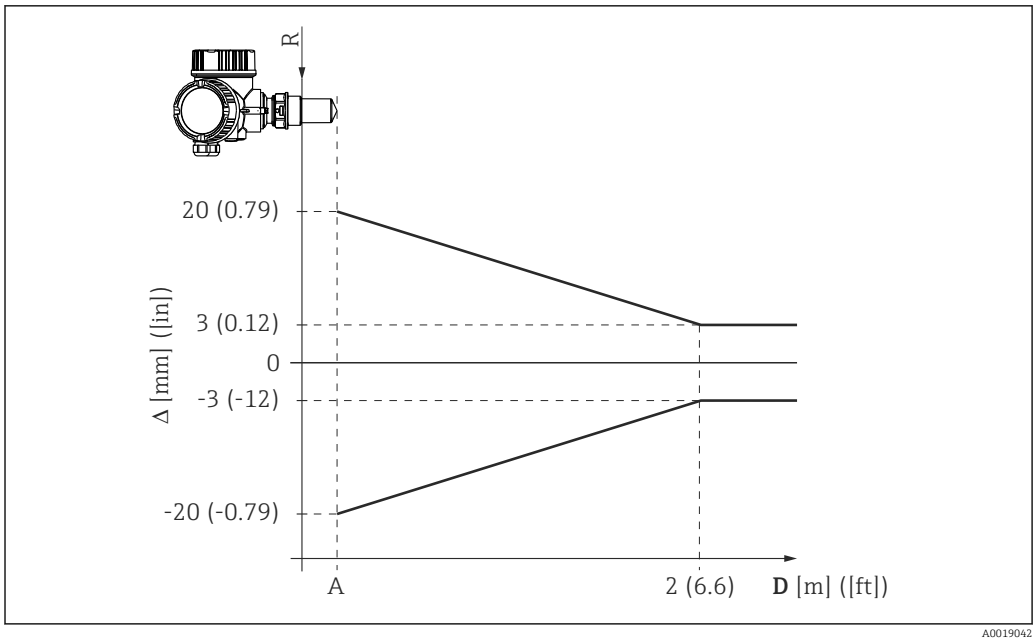
1) Only relevant for 4-20mA current output; add error of the analog value to the digital value.
2) Product structure: Feature 540 "Application Package", Option EM "Advanced dynamics"

Differing values in near-range applications



10 Maximum measured error in near-range applications; values for standard version

Δ Maximum measured error
A Lower edge of the antenna
D Distance from the lower edge A of the antenna
R Reference point of the distance measurement



11 Maximum measured error in near-range applications; values for version with the "Advanced dynamics" application package

Δ Maximum measured error
A Lower edge of the antenna
D Distance from the lower edge A of the antenna
R Reference point of the distance measurement

Measured value resolution

Dead band according to EN61298-2:

- digital: 1 mm
- analog: 1 µA

Reaction time

The reaction time can be parametrized. The following step response times (as per DIN EN 61298-2) [2] are valid if the damping is switched off:

Tank height	Sampling rate	Step response time
< 10 m (33 ft)	≥ 3.6 s^{-1}	< 0.8 s
< 40 m (132 ft)	≥ 2.7 s^{-1}	< 1 s

Influence of ambient temperature

The measurements are carried out in accordance with EN 61298-3

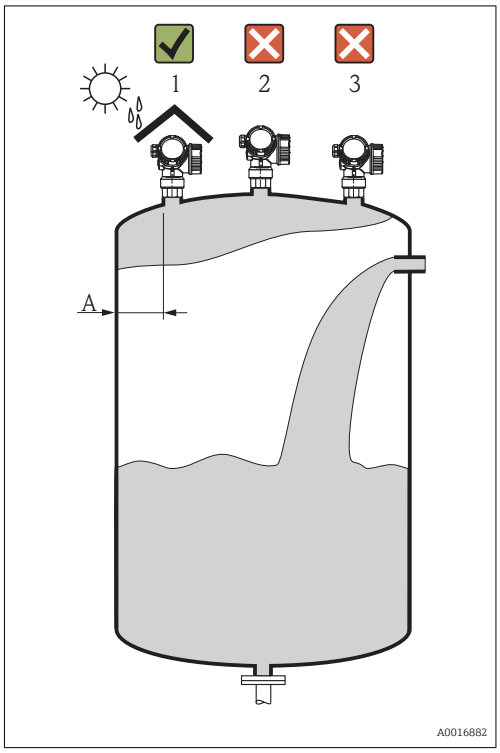
- Digital (HART, PROFIBUS PA, FOUNDATION Fieldbus):
  - Standard version: average T_K = 2 mm/10 K; maximum 5 mm
  - Version with advanced dynamics [3]: average T_K = 5 mm/10 K; maximum 15 mm
- Analog (current output):
  - zero point (4 mA): average T_K = 0.02 %/10 K
  - span (20 mA): average T_K = 0.05 %/10 K

2) According to DIN EN 61298-2 the response time is the time which passes after a sudden change of the input signal until the output signal for the first time assumes 90% of the steady-state value.
3) Feature 540 "Application Package", option EM

Installation

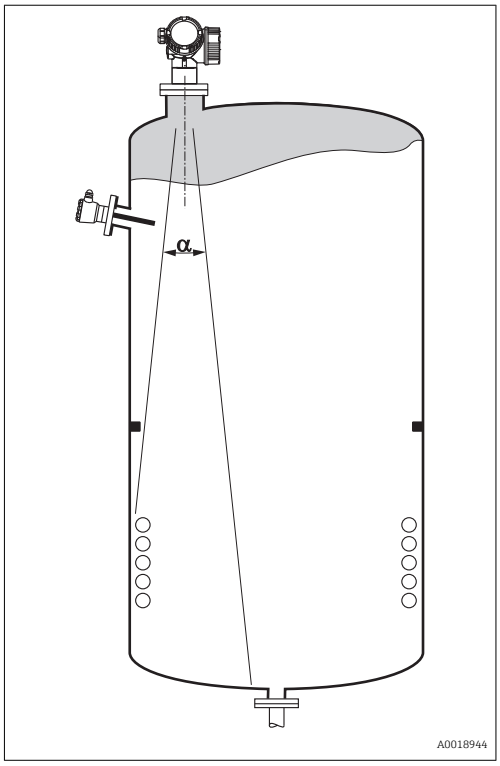
Installation conditions

Mounting position



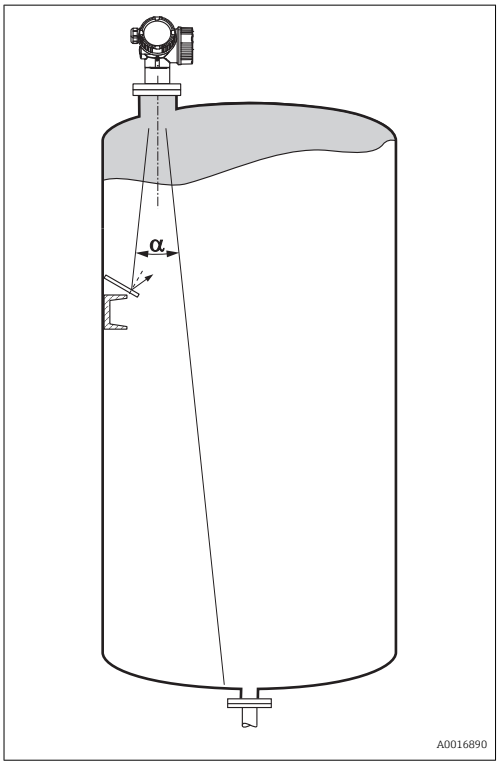
- Recommended distance **A** from wall to outer edge of nozzle: ~ 1/6 of tank diameter. Nevertheless the device should not be installed closer than 15 cm (5.91 in) to the tank wall.
- Not in the center (2), as interference can cause signal loss.
- Not above the fill stream (3).
- It is recommended to us a weather protection cover (1) in order to protect the device from direct sun or rain.

Vessel installations



Avoid any installations (point level switches, temperature sensors, braces, vacuum rings, heating coils, baffles etc.) inside the signal beam. Take into account the beam angle → 35.

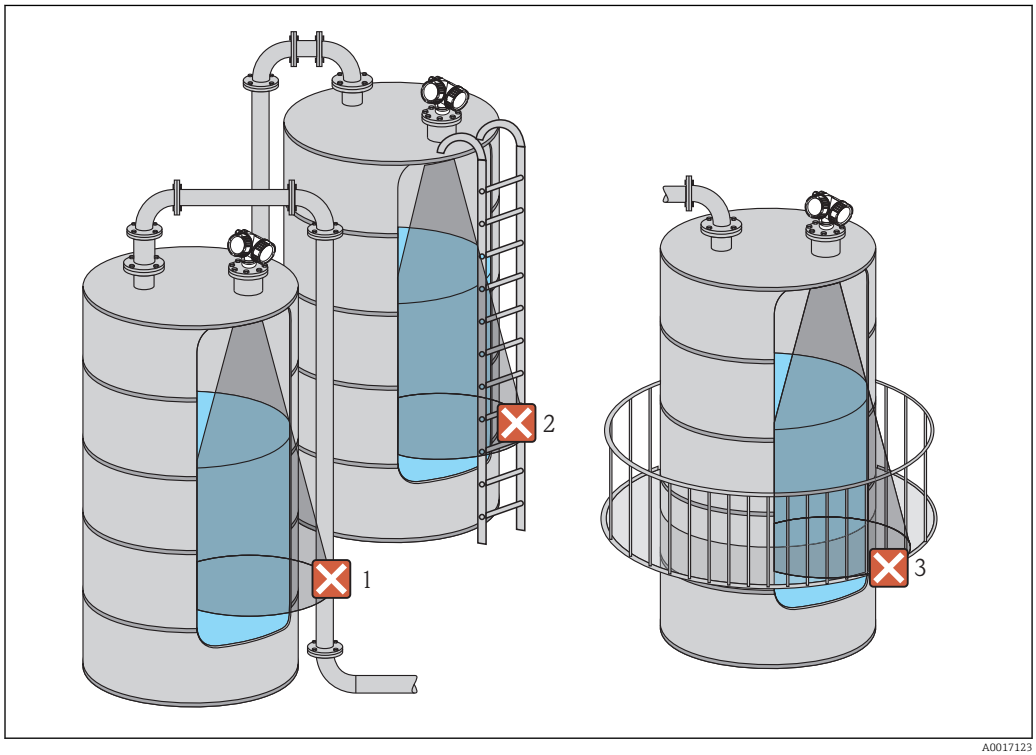
Reduction of interference echoes



Metallic screens mounted at a slope spread the radar signal and can, therefore, reduce interference echoes.

Measurement in a plastic vessel

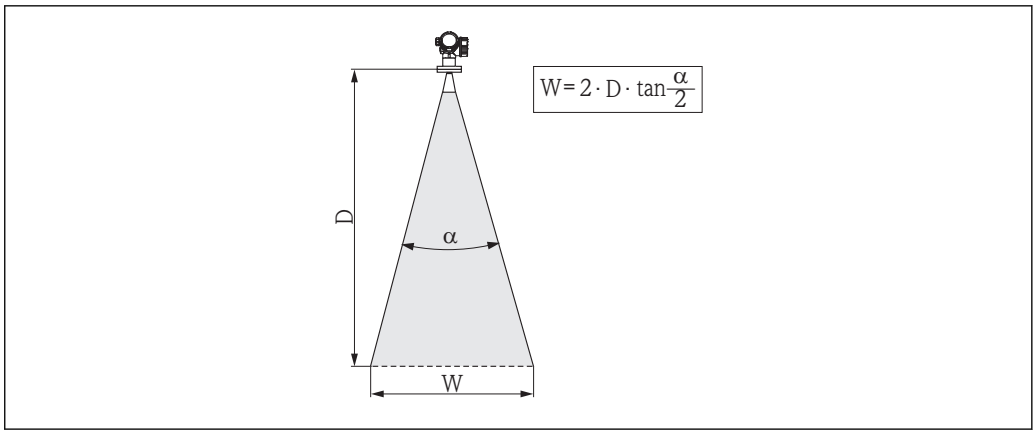
If the outer wall of the vessel is made of a non-conductive material (e.g. GRP), microwaves can also be reflected off interfering installations outside the signal beam (e.g. metallic pipes (1), ladders (2), grates (3), ...). Therefore, there should be no such interfering installations in the signal beam. Please contact Endress+Hauser for further information.



Optimization options

- Antenna size
  The bigger the antenna, the smaller the beam angle α and the fewer interference echoes → 📄 35.
- Mapping
  The measurement can be optimized by means of electronic suppression of interference echoes.
- Antenna alignment
  Take into account the marker on the flange or threaded connection → 📄 37 → 📄 38 .
- Stilling well
  A stilling well can be applied to avoid interferences → 📄 41.
- Metallic screens mounted at a slope
  They spread the radar signals and can, therefore, reduce interference echoes.

Beam angle



12 Relationship between beam angle α, distance D and beamwidth diameter W

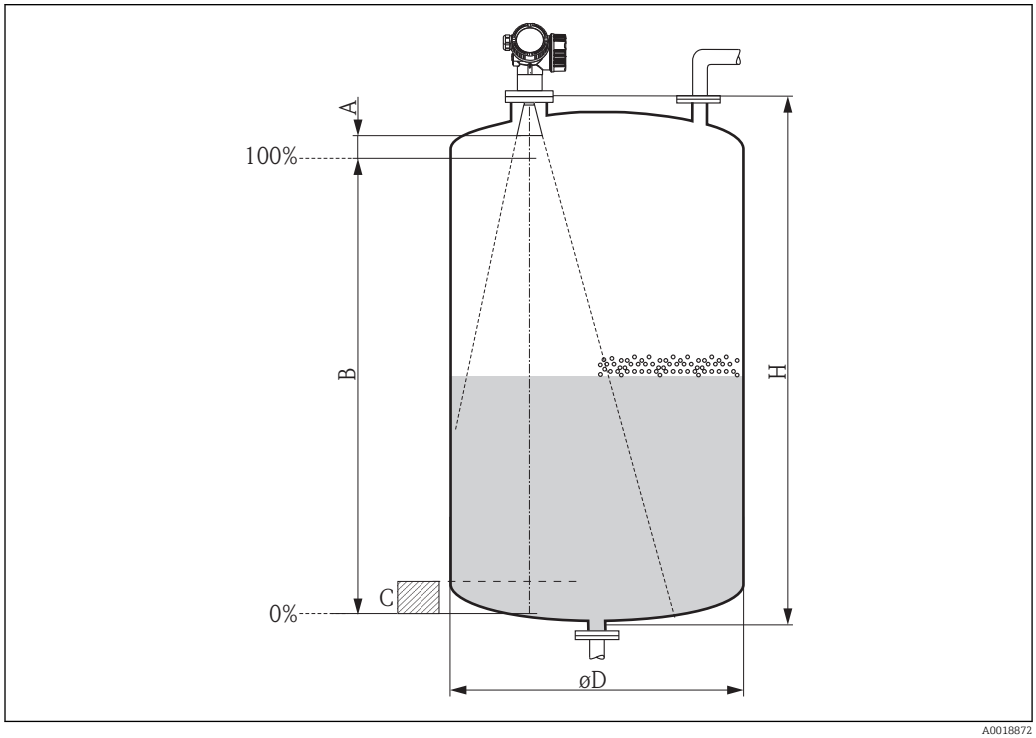
The beam angle is defined as the angle α where the energy density of the radar waves reaches half the value of the maximum energy density (3-dB-width). Microwaves are also emitted outside the signal beam and can be reflected off interfering installations.

Beam diameter **W** as a function of beam angle **α** and measuring distance **D**:

FMR50			
Antenna size	40 mm (1½ in)	80 mm (3 in)	100 mm (4 in)
Beam angle α	23°	10°	8°
Measuring distance (D)	**Beamwidth diameter W**		
3 m (9.8 ft)	1.22 m (4 ft)	0.53 m (1.7 ft)	0.42 m (1.4 ft)
6 m (20 ft)	2.44 m (8 ft)	1.05 m (3.4 ft)	0.84 m (2.8 ft)
9 m (30 ft)	3.66 m (12 ft)	1.58 m (5.2 ft)	1.26 m (4.1 ft)
12 m (39 ft)	4.88 m (16 ft)	2.1 m (6.9 ft)	1.68 m (5.5 ft)
15 m (49 ft)	6.1 m (20 ft)	2.63 m (8.6 ft)	2.10 m (6.9 ft)
20 m (66 ft)	8.14 m (27 ft)	3.50 m (11 ft)	2.80 m (9.2 ft)
25 m (82 ft)	10.17 m (33 ft)	4.37 m (14 ft)	3.50 m (11 ft)
30 m (98 ft)	-	5.25 m (17 ft)	4.20 m (14 ft)
35 m (115 ft)	-	6.12 m (20 ft)	4.89 m (16 ft)
40 m (131 ft)	-	7.00 m (23 ft)	5.59 m (18 ft)

Measuring conditions

- In case of **boiling surfaces**, **bubbling** or tendency for **foaming** use FMR53 or FMR54. Depending on its consistence, foam can either absorb microwaves or reflect them off the foam surface. Measurement is possible under certain conditions. For FMR50, FMR51 and FMR52, the additional option "Advanced dynamics" is recommended in these cases (feature 540: "Application Package", option EM).
- In case of heavy **steam development** or **condensate**, the maximum measuring range of FMR50, FMR51 and FMR52 may decrease depending on density, temperature and composition of the steam → use FMR53 or FMR54.
- For the measurement of absorbing gases such as **ammonia NH_3** or some **fluorocarbons** [4], please use Levelflex or Micropilot FMR54 in a stilling well.
- The measuring range begins, where the beam hits the tank bottom. Particularly with dish bottoms or conical outlets the level cannot be detected below this point.
- For stilling well applications, the zero should be positioned at the end of the tube, as the electromagnetic waves do not propagate completely outside the tube. It must be taken into account that the accuracy may be reduced in the area **C**. In order to guarantee the required accuracy in these cases, it is recommended to position the zero-point at a distance **C** above the end of the tube (see figure).
- In case of media with a low dielectric constant (ε_r = 1.5 to 4) [5] the tank bottom can be visible through the medium at low levels (low height **C**). Reduced accuracy has to be expected in this range. If this is not acceptable, we recommend positioning the zero point at a distance **C** (see figure) above the tank bottom in these applications.
- In principle it is possible to measure up to the tip of the antenna with FMR51, FMR53 and FMR54. However, due to considerations regarding corrosion and build-up, the end of the measuring range should not be chosen any closer than **A** (see figure) to the tip of the antenna.
- When using FMR54 with planar antenna, especially for media with low dielectric constants, the end of the measuring range should not be closer than **A: 1 m (3.28 ft)** to the flange.
- The smallest possible measuring range **B** depends on the antenna version (see figure).
- The tank height should be at least **H** (see table).



A0018872

Device	A [mm (in)]	B [m (ft)]	C [mm (in)]	H [m (ft)]
FMR50	150 (5.91)	> 0.2 (0.7)	50 to 250 (1.97 to 9.84)	> 0.3 (1.0)

4) Affected compounds are e.g. R134a, R227, Dymel 152a.

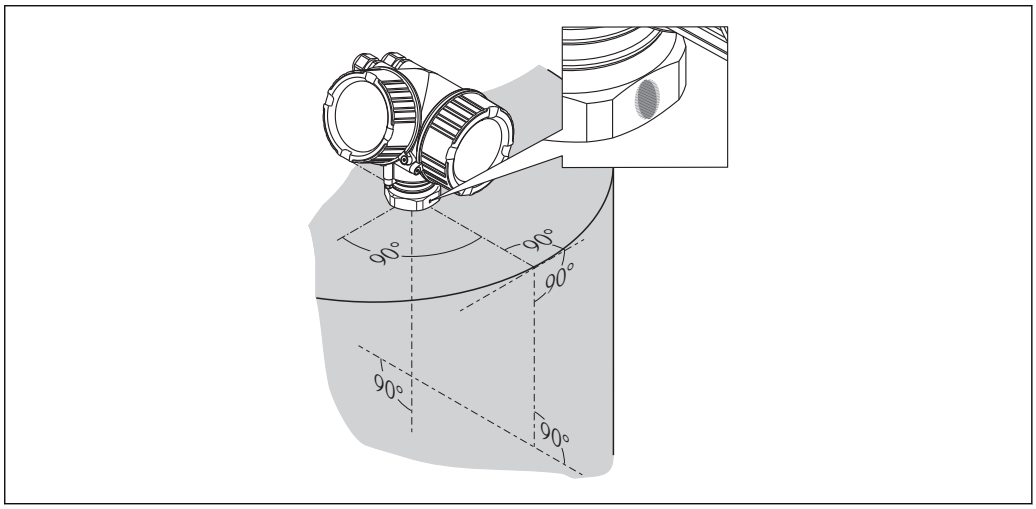
5) Dielectric constants of important media commonly used in various industries are summarized in the DC manual (CP01076F) and in the Endress +Hauser "DC Values App" (available for Android and iOS).

Installation in vessel (free space)

Horn antenna encapsulated (FMR50)

Alignment

- Align the antenna vertically to the product surface.
- A marking at the threaded connection enables alignment of the antenna. This marking must be aligned towards the tank wall as well as possible.

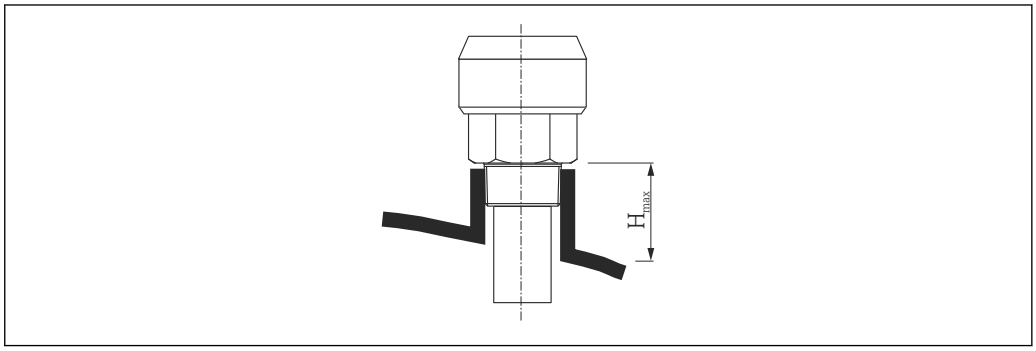


A0019434

Depending on the device version the marking may be a circle or two short parallel lines.

Nozzle mounting

For optimum measurement, the tip of the antenna should extend below the nozzle. This is achieved by a nozzle height up to H_{max} = 60 mm (2.36 in).

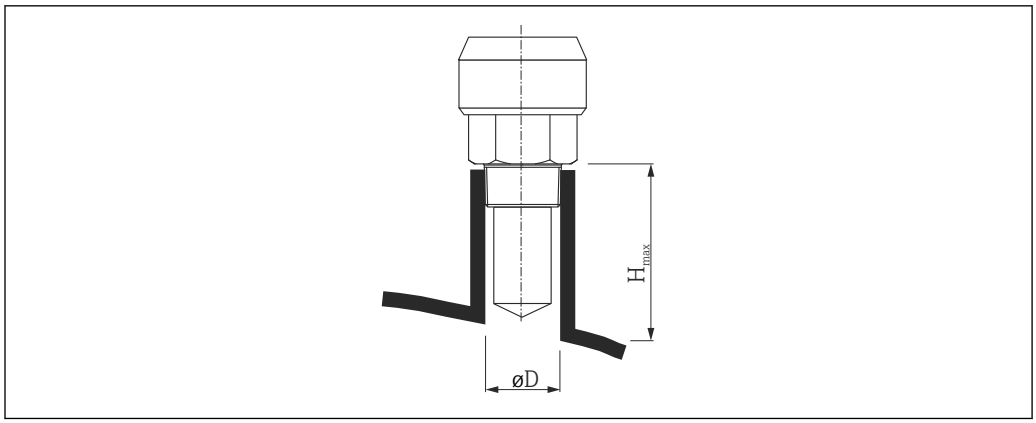


A0016806

13 *Nozzle height for horn antenna, encapsulated (FMR50); H_{max} = 60 mm (2.36 in)*

Conditions for longer nozzles

If the medium has good reflective properties, higher nozzles can be accepted. In this case the maximum nozzle height, H_{max}, is dependent on the nozzle diameter, D:



A0023612

Nozzle diameter *D*	Maximum nozzle height H_{max}
40 mm (1.5 in)	200 mm (7.9 in)
50 mm (2 in)	250 mm (9.9 in)
80 mm (3 in)	300 mm (11.8 in)
100 mm (4 in)	400 mm (15.8 in)
150 mm (6 in)	500 mm (19.7 in)

If the antenna doesn't extend below the nozzle, observe the following:
- The nozzle end must be smooth and free of burrs. If possible its edge should be rounded.
- An interference echo suppression must be performed.
- Please contact Endress+Hauser for applications with higher nozzles than those indicated in the table.

Threaded connection

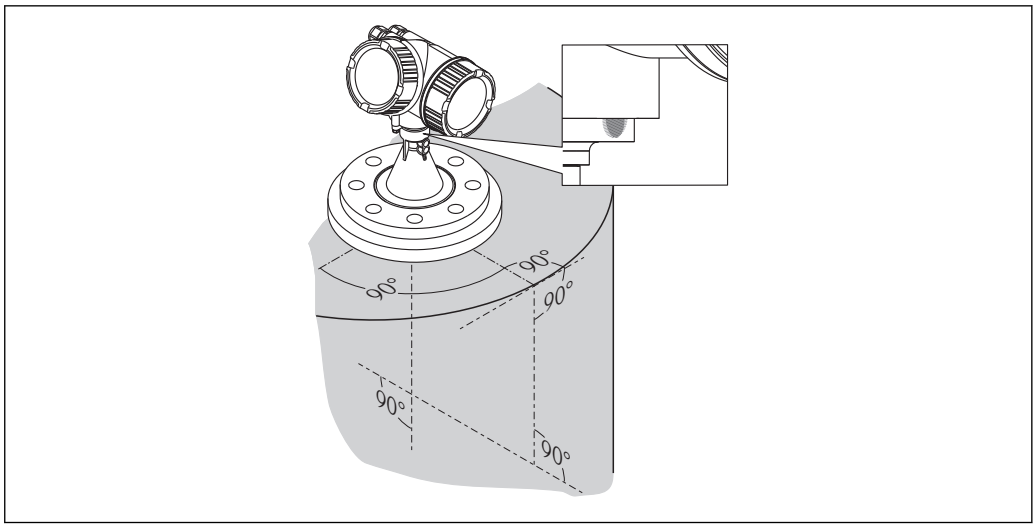
- Tighten with the hexagonal nut only.
- Tool : 50 mm hexagonal wrench
- Maximum permissible torque: 35 Nm (26 lbf ft)

Horn antenna with slip-on flange (FMR50)

Alignment

When using the Micropilot with a slip-on flange in explosion-hazardous areas, strictly observe all specifications in the relevant Safety Instructions (XA).

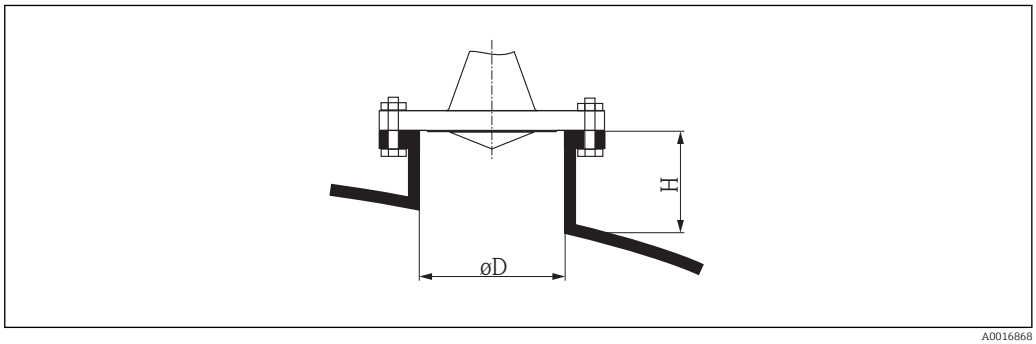
- Align the antenna vertically to the product surface.
  Optionally, a variable flange seal, which is available as an accessory, can be used for alignment (see Technical Information BA01048F, chapter "Accessories").
- A marking at the feedthrough enables alignment of the antenna. This marking must be aligned towards the tank wall as well as possible.



A0019439

Depending on the device version the marking may be a circle or two short parallel lines.

Nozzle mounting

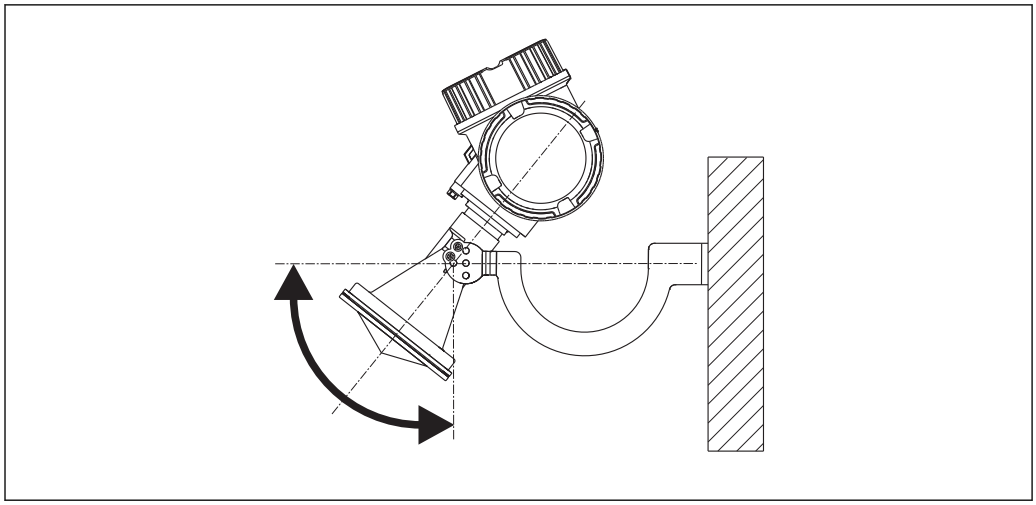


A0016868

14 *Nozzle height and diameter for horn antenna with slip-on flange*

Nozzle diameter *D*	**Maximum nozzle height** H_{max}
80 mm (3 in)	300 mm (11.8 in)
100 mm (4 in)	400 mm (15.8 in)
150 mm (6 in)	500 mm (19.7 in)

Horn antenna with mounting bracket (FMR50)



15 *Installation of the horn antenna with mounting bracket*

Align the antenna vertically to the product surface using the mounting bracket.

NOTICE

The mounting bracket has no conductive connection to the transmitter housing.
Danger of electrostatic charge
► Connect the mounting bracket to the local potential equalization system.

Mesurement from the outside through plastic walls (FMR50/FMR51)

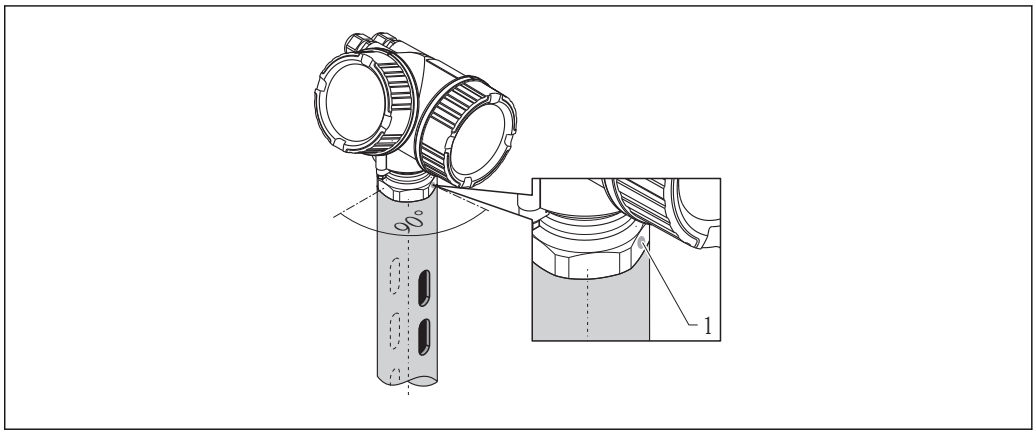
- Dielectric constant of the medium: $\varepsilon_r > 10$
- If possible, use an antenna 100 mm (4 in).
- The distance from the lower edge of the antenna to the tank ceiling should be about 100 mm (4 in).
- If possible, avoid mounting locations where condensation or build-up might occur.
- In case of outdoor mounting, the space between antenna and vessel has to be protected from the elements.
- Do not mount any potential reflectors (e.g. pipes) outside the tank in the signal beam.

Suitable thickness of the tank ceiling:

Penetrated material	PE	PTFE	PP	Perspex
DK / ε_r	2.3	2.1	2.3	3.1
Optimum thickness [1)]	3.8 mm (0.15 in)	4.0 mm (0.16 in)	3.8 mm (0.15 in)	3.3 mm (0.13 in)

1) Other possible values for the thickness are multiples of the values listed (e.g. for PE: 7,6 mm (0.3 in), 11,4 mm (0.45 in)

Installation in stilling well



16 *Installation in stilling well*

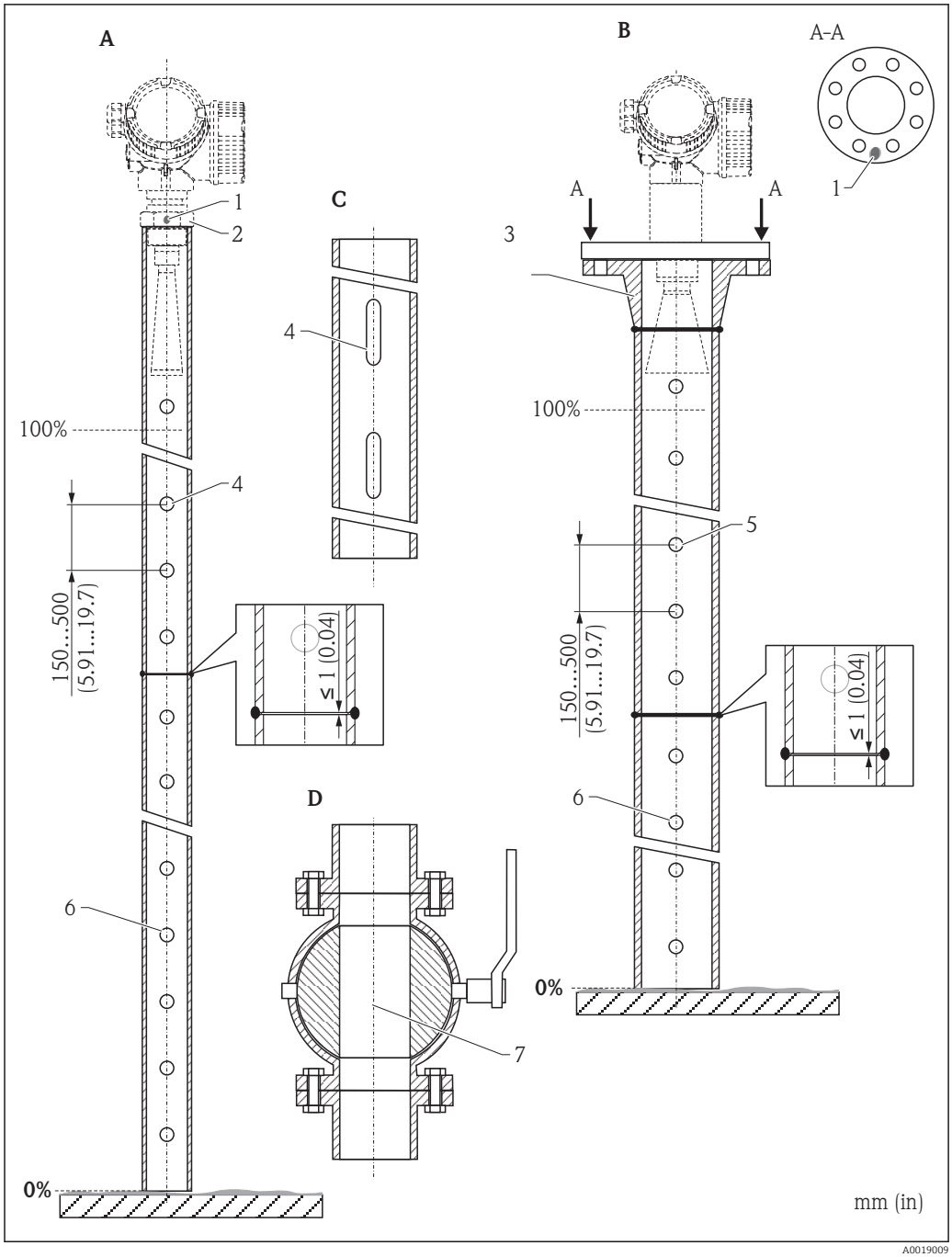
1 Marking for antenna alignment

- For horn antenna: Align the marking towards the slots of the stilling well.
- Measurements can be performed through an open full bore ball valve without any problems.
- After mounting, the housing can be turned 350° in order to facilitate access to the display and the terminal compartment.

Recommendations for the stilling well

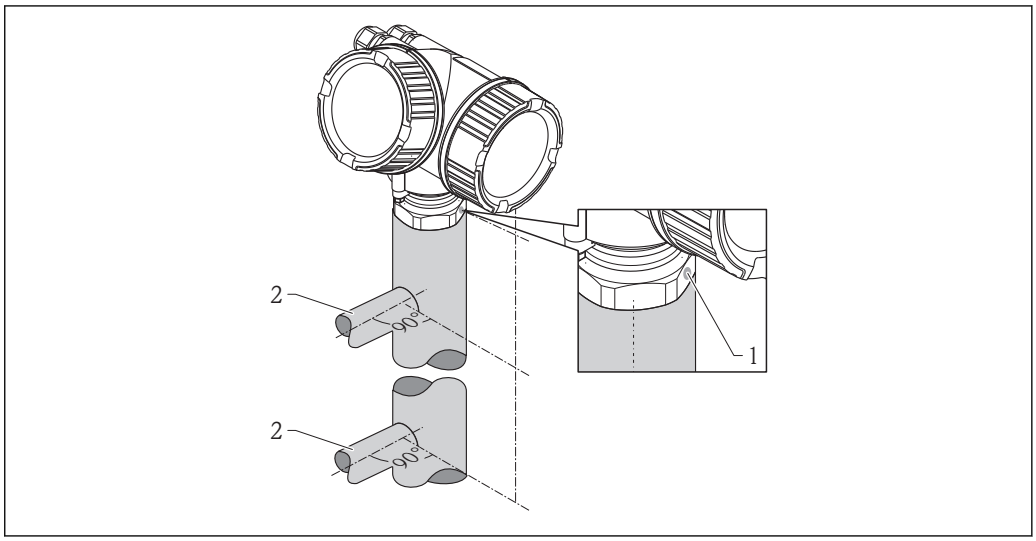
- Metal (no enamel coating; plastic on request).
- Constant diameter.
- Diameter of stilling well not larger than antenna diameter.
- Diameter difference between horn antenna and inner diameter of the stilling well as small as possible.
- Weld seam as smooth as possible and on the same axis as the slots.
- Slots offset 180° (not 90°).
- Slot width or diameter of holes max. 1/10 of pipe diameter, de-burred. Length and number do not have any influence on the measurement.
- Select horn antenna as big as possible. For intermedaite sizes (e.g. 180 mm (7 in)) select next larger antenna and adapt it mechanically (for horn antennas)
- At any transition (i.e. when using a ball valve or mending pipe segments), no gap may be left exceeding 1 mm (0.04 in).
- The stilling well must be smooth on the inside (average roughness $R_z \leq 6.3$ µm (248 µin)). Use extruded or parallel welded metal pipe. An extension of the pipe is possible with welded flanges or pipe sleeves. Flange and pipe have to be properly aligned at the inside.
- Do not weld through the pipe wall. The inside of the stilling well must remain smooth. In case of unintentional welding through the pipe, the weld seam and any unevenness on the inside need to be carefully removed and smoothened. Otherwise, strong interference echoes will be generated and material build-up will be promoted.
- In the case of smaller nominal widths flanges must be welded to the pipe such that they allow for a correct orientation (marker aligned toward slots).

Examples for the construction of stilling wells



A Micropilot FMR50/FMR51: Horn 40mm(1½")
B Micropilot FMR50/FMR51/FMR52/FMR54: Horn 80mm(3")
C Stilling well with slots
D Full bore ball valve
1 Marking for axial alignment
2 Threaded connection
3 e.g. welding neck flange DIN2633
4 Φ hole max. 1/10 Φ stilling well
5 Φ hole max. 1/10 Φ stilling well; single sided or drilled through
6 Inside of holes deburred
7 Diameter of opening of ball valve must always be equivalent to pipe diameter; avoid edges and constrictions.

Installation in bypass



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17 *Installation in bypass*

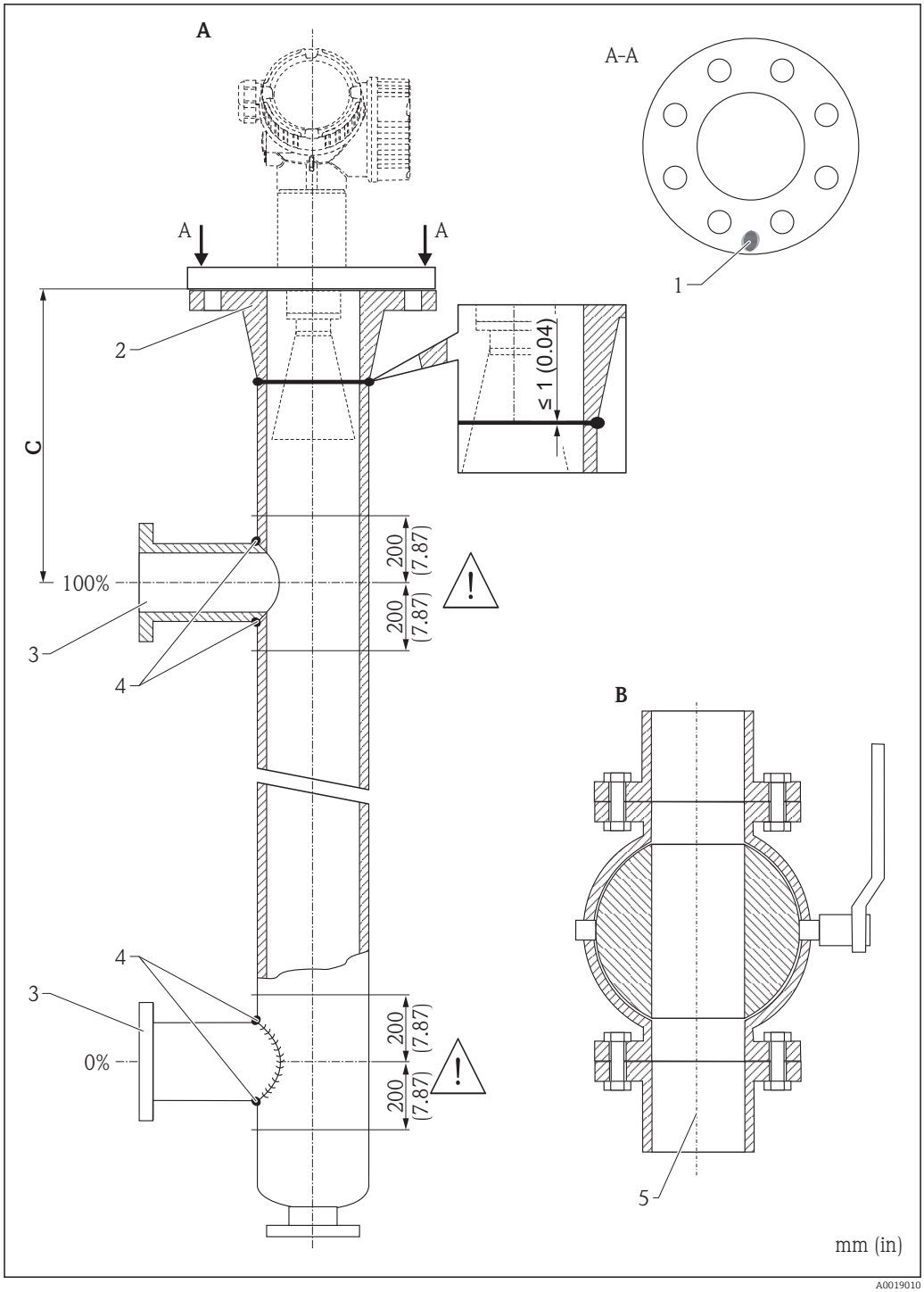
1 Marking for antenna alignment
2 Tank connectors

- Alighn the marker perpendicular (90°) to the tank connectors.
- Measurements can be performed through an open full bore ball valve without any problems.
- After mounting, the housing can be turned 350° in order to simplify access to the display and the terminal compartment.

Recommendations for the bypass pipe

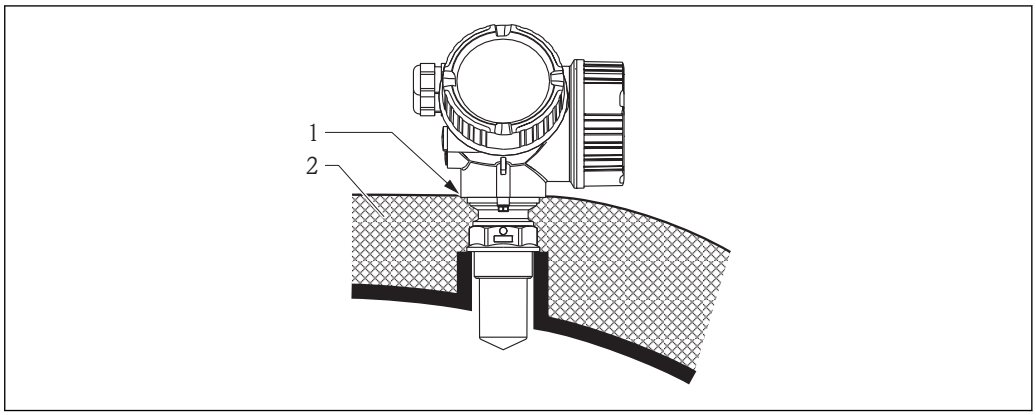
- Metal (no plastic or enamel coating).
- Constant diameter.
- Select horn antenna as big as possible. For intermediate sizes (e.g. 95 mm (3.5 in)) select next larger antenna and adapt it mechanically (for horn antennas).
- Diameter difference between horn antenna and inner diameter of the bypass as small as possible.
- At any transition (i.e. when using a ball valve or mending pipe segments), no gap may be created exceeding 1 mm (0.04 in).
- In the area of the tank connections (~ ±20 cm (7.87 in)) a reduced accuracy of the measurement has to be expected.

Example for the construction of a bypass



A Micropilot FMR50/FMR51/FMR52/FMR54: Horn 80mm(3")
B Full bore ball valve
C Minimum distance to upper connection pipe: 400 mm (15,7 in)
1 Marking for axial alignment
2 e.g. welding neck flange DIN2633
3 Diameter of the connection pipes as small as possible
4 Do not weld through the pipe wall; the inside of the bypass must remain smooth.
5 Diameter of opening of ball valve must always be equivalent to pipe diameter. Avoid edges and constrictions.

Vessels with heat insulation



A0019141

If process temperatures are high, the device must be included in normal tank insulation to prevent the electronics heating up as a result of heat radiation or convection. The insulation may not exceed beyond the neck of the housing.

Environment

Ambient temperature range

Measuring device	−40 to +80 °C (−40 to +176 °F); −50 °C (−58 °F) with manufacturer declaration on request
Local display	−20 to +70 °C (−4 to +158 °F), the readability of the display may be impaired at temperatures outside the temperature range.

When operating the device in the open with strong sunlight:
- Mount the device in a shady position.
- Avoid direct sunlight, especially in warmer regions.
- Use a weather protection cover (see accessories).

Ambient temperature limits

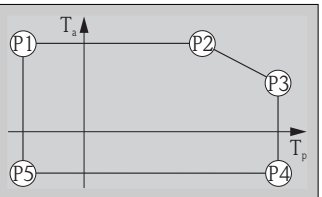
The following diagrams take into account only functional aspects. There may be further restrictions for certified device versions. Please refere to the separate Safety Instructions → 83.

With a temperature (T_p) at the process connection the admissible ambient temperature (T_a) is reduced according to the following diagram (temperature derating):

Information concerning the derating tables

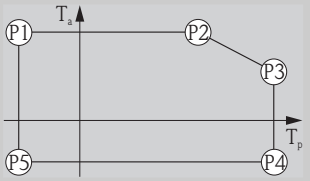
Option	Meaning
A	2-wire; 4-20 mA HART
B	2-wire; 4-20 mA HART, switch output
C	2-wire; 4-20 mA HART, 4-20 mA
E	2-wire; FF, switch output
G	2-wire; PA, switch output
K	4-wire 90-253VAC; 4-20 mA HART
L	4-wire 10, 4-48VDC; 4-20 mA HART

FMR50
Housing: GT19 (Plastics PBT)
Temperature unit: °C (°F)



Power Supply; Output (Pos. 2 of the product structure)	P1		P2		P3		P4		P5		P6	
	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
A	-40 (-40)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	-40 (-40)	-40 (-40)	-40 (-40)	-	-
B Switch output not used	-40 (-40)	76 (169)	76 (169)	76 (169)	80 (176)	75 (167)	80 (176)	-40 (-40)	-40 (-40)	-40 (-40)	-	-
B Switch output used	-40 (-40)	60 (140)	60 (140)	60 (140)	80 (176)	58 (136)	80 (176)	-40 (-40)	-40 (-40)	-40 (-40)	-	-
C Channel 2 not used	-40 (-40)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	-40 (-40)	-40 (-40)	-40 (-40)	-	-
C Channel 2 used	-40 (-40)	74 (165)	74 (165)	74 (165)	80 (176)	73 (163)	80 (176)	-40 (-40)	-40 (-40)	-40 (-40)	-	-
E, G Switch output not used	-40 (-40)	79 (174)	79 (174)	79 (174)	80 (176)	79 (174)	80 (176)	-40 (-40)	-40 (-40)	-40 (-40)	-	-
E, G Switch output used	-40 (-40)	63 (145)	63 (145)	63 (145)	80 (176)	60 (140)	80 (176)	-40 (-40)	-40 (-40)	-40 (-40)	-	-

FMR50
Housing: GT20 (Alu, coated)
Temperature unit: °C (°F)



A0019351

Power Supply; Output (Pos. 2 of the product structure)	P1		P2		P3		P4		P5		P6	
	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
A	-40 (-40)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	-40 (-40)	-40 (-40)	-40 (-40)	-	-
B Switch output not used	-40 (-40)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	-40 (-40)	-40 (-40)	-40 (-40)	-	-
B Switch output used	-40 (-40)	77 (171)	77 (171)	77 (171)	80 (176)	76 (169)	80 (176)	-40 (-40)	-40 (-40)	-40 (-40)	-	-
C Channel 2 not used	-40 (-40)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	-40 (-40)	-40 (-40)	-40 (-40)	-	-
C Channel 2 used	-40 (-40)	79 (174)	79 (174)	79 (174)	80 (176)	79 (174)	80 (176)	-40 (-40)	-40 (-40)	-40 (-40)	-	-
E, G Switch output not used	-40 (-40)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	-40 (-40)	-40 (-40)	-40 (-40)	-	-
E, G Switch output used	-40 (-40)	78 (172)	78 (172)	78 (172)	80 (176)	78 (172)	80 (176)	-40 (-40)	-40 (-40)	-40 (-40)	-	-
K, L	-40 (-40)	77 (171)	77 (171)	77 (171)	80 (176)	77 (171)	80 (176)	-40 (-40)	-40 (-40)	-40 (-40)	-	-

Storage temperature

−40 to +80 °C (−40 to +176 °F)

−50 °C (−58 °F) with manufacturer declaration on request

Climate class

DIN EN 60068-2-38 (test Z/AD)

Altitude according to IEC61010-1 Ed.3

Up to 2 000 m (6 600 ft) above MSL.

Degree of protection

- With closed housing tested according to:
  - IP68, NEMA6P (24 h at 1.83 m under water surface) [6)]
  - For plastic housing with transparent cover (display module): IP68 (24 h at 1.00 m under water surface) [7)]
  - IP66, NEMA4X
- With open housing: IP20, NEMA1
- Display module: IP22, NEMA2

Degree of protection IP68 NEMA6P applies for M12 PROFIBUS PA plugs only when the PROFIBUS cable is plugged in and is also rated IP68 NEMA6P.

Vibration resistance

DIN EN 60068-2-64 / IEC 60068-2-64: 20 to 2 000 Hz, 1 $(m/s^2)^2/Hz$

Cleaning the antenna

The antenna can get contaminated, depending on the application. The emission and reception of microwaves can thus eventually be hindered. The degree of contamination leading to an error depends on the medium and the reflectivity, mainly determined by the dielectric constant ε_r.

If the medium tends to cause contamination and deposits, cleaning on a regular basis is recommended. Care has to be taken not to damage the antenna in the process of a mechanical or hose-down cleaning. The material compatibility has to be considered if cleaning agents are used! The maximum permitted temperature at the flange should not be exceeded.

6) also valid for the "Sensor remote" version
7) This restriction is valid if the following options of the product structure have been selected at the same time: 030("Display, Operation") = C("SD02") or E("SD03"); 040("Housing") = A("GT19").

Electromagnetic compatibility (EMC)

Electromagnetic compatibility to all relevant requirements of the EN 61326- series and NAMUR recommendation EMC (NE21). For details see declaration of conformity. [8)].

If only the analogue signal is used, unshielded interconnection lines are sufficient for the installation. In case of using the digital signal (HART/ PA/ FF) use shielded interconnection lines.

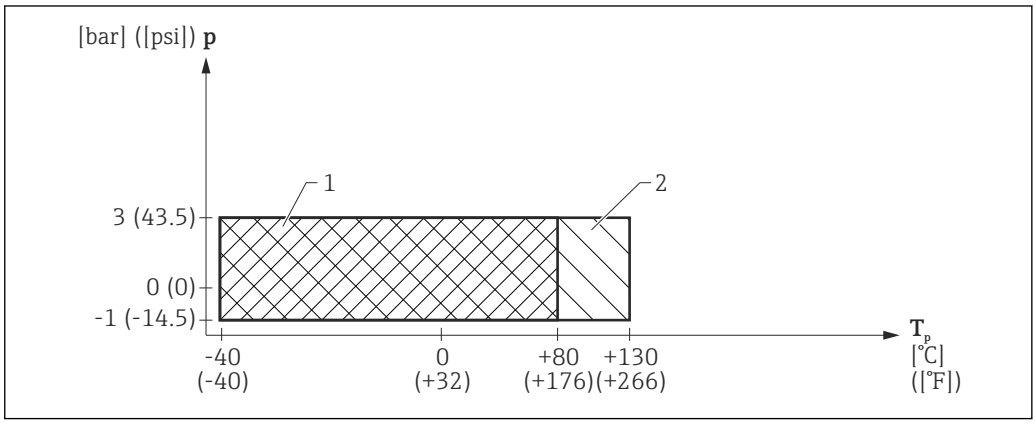
Max. fluctuations during EMC- tests: < 0.5 % of the span. As an exception to this, the maximum fluctuations may amount to 2 % of the span for devices with plastic housing and see-through lid (integrated display SD02 or SD03) if strong electromagnetic interferences in the frequenency range of 1 to 2 GHz are present.

8) Can be downloaded from www.endress.com.

Process

Process temperature, Process pressure

FMR50



18 *FMR50: Admissible range of process temperature and process pressure*

1 Process connection: Flange
2 Process connection: Thread

Feature 100 "Process Connection"	Admissible process temperature	Admissible process pressure
▪ GGF: Thread ISO228 G1-1/2 ▪ RGF: Thread ANSI MNPT1-1/2	−40 to +130 °C (−40 to +266 °F)	p_{rel} = −1 to 3 bar (−14.5 to 43.5 psi) p_{abs} < 4 bar (58 psi) [1].
▪ XWG: UNI slip-on flange 3"/DN80/80 ▪ XZG: UNI slip-on flange 4"/DN100/100 X0G: UNI slip-on flange 6"/DN150/150	−40 to +80 °C (−40 to +176 °F)	

1) For devices with CRN approval the pressure range may be reduced → 69

Dielectric constant

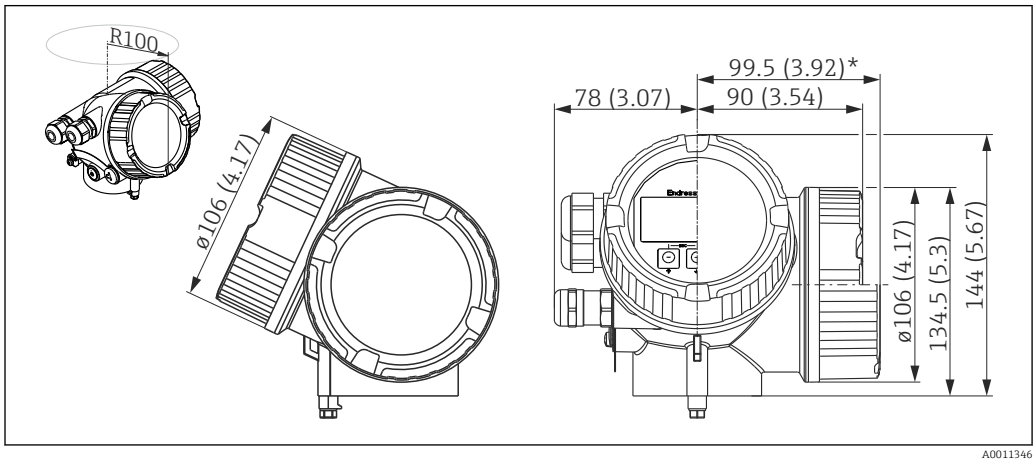
- **For liquids**
  - $\varepsilon_r \geq 1.9$ in free-field applications
  - $\varepsilon_r \geq 1.4$ in stilling well
- **For bulk solids**
  $\varepsilon_r \geq 1.6$

For dielectric constants (DC values) of many media commonly used in various industries refer to:
- the Endress+Hauser DC manual (CP01076F)
- the Endress+Hauser "DC Values App" (available for Android and iOS)

Mechanical construction

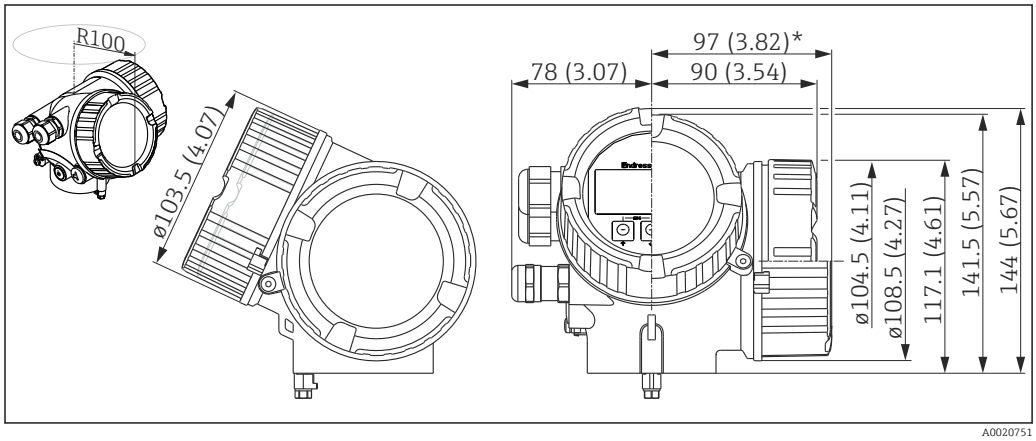
Dimensions

Dimensions of the electronics housing



19 Housing GT19 (Plastics PBT); Dimensions in mm (in)

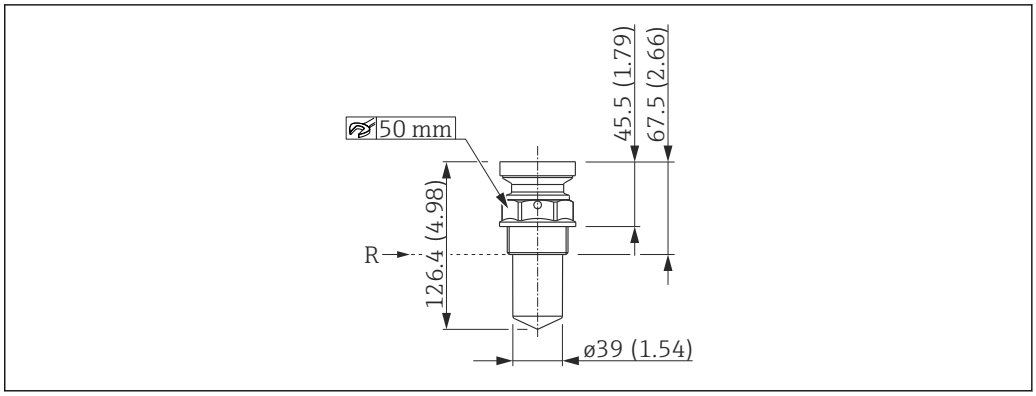
**for devices with integrated overvoltage protection.*



20 Housing GT20 (Alu coated); Dimensions in mm (in)

**for devices with integrated overvoltage protection.*

FMR50 with thread



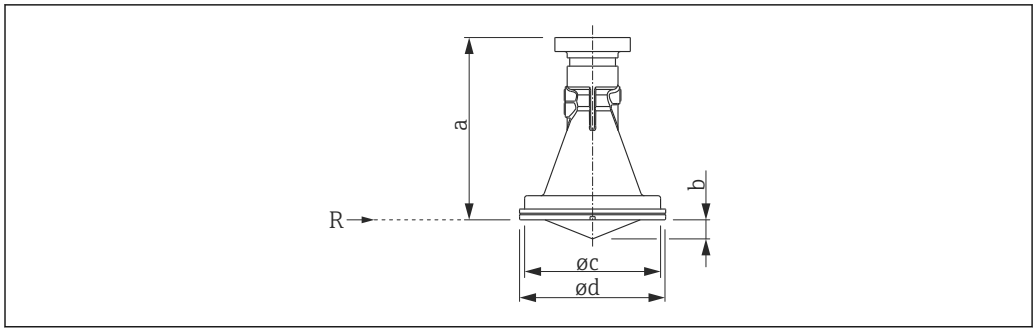
21 FMR50 with thread; dimensions: mm (in)

R Reference point of the measurement

Valid for the following device versions

- **Feature 100 "Process connection"**
  - GGF: Thread ISO228 G1-1/2, PVDF
  - RGF: Thread ANSI MNPT1-1/2, PVDF
- **Feature 070 "Antenna"**
  BM: Horn 40mm/1-1/2", PVDF encapsulated

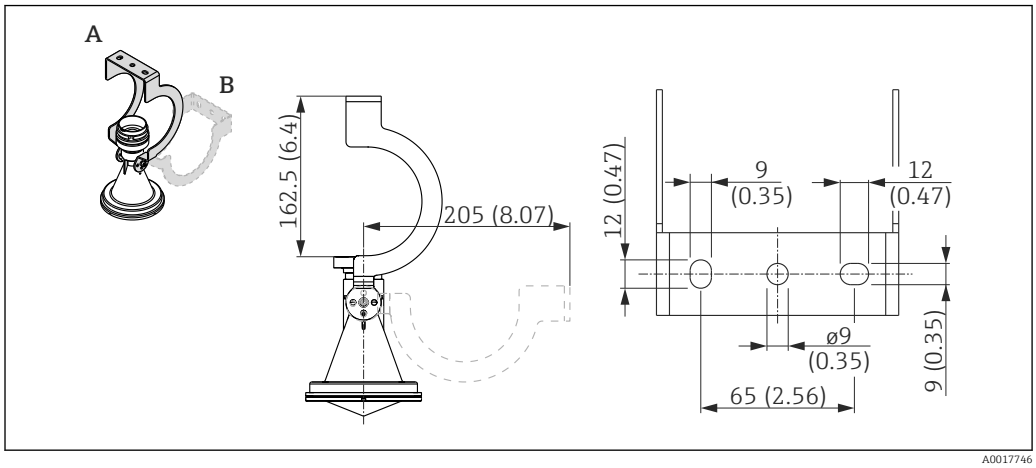
FMR50 with mounting bracket or customer side connection



22 *FMR50 without process connection; dimensions: mm (in)*

R Reference point of the measurement

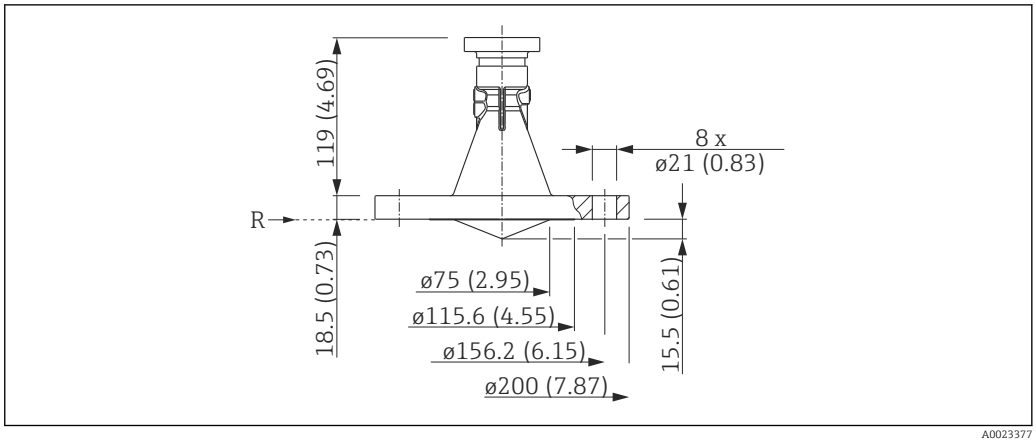
	Feature 100 "Process connection" ▪ **UAE Mounting bracket** ▪ **XRO: Customer side connection**	
	Feature 070 "Antenna" **BN: Horn 80mm/3"**	**Feature 070 "Antenna"** **BR: Horn 100mm/4"**
a	137.9 mm (5.43 in)	150.5 mm (5.93 in)
b	15 mm (0.59 in)	20 mm (0.79 in)
Φc	107 mm (4.21 in)	127 mm (5 in)
Φd	115 mm (4.53 in)	135 mm (5.31 in)



23 *Mounting bracket for FMR50/FMR56; dimensions: mm (in)*

A Mounting bracket aligned for roof mounting
B Mounting bracket aligned for wall mounting

FMR50 with slip-on flange 3"/DN80



24 FMR50 with slip-on flange 3"/DN80; dimensions: mm (in)

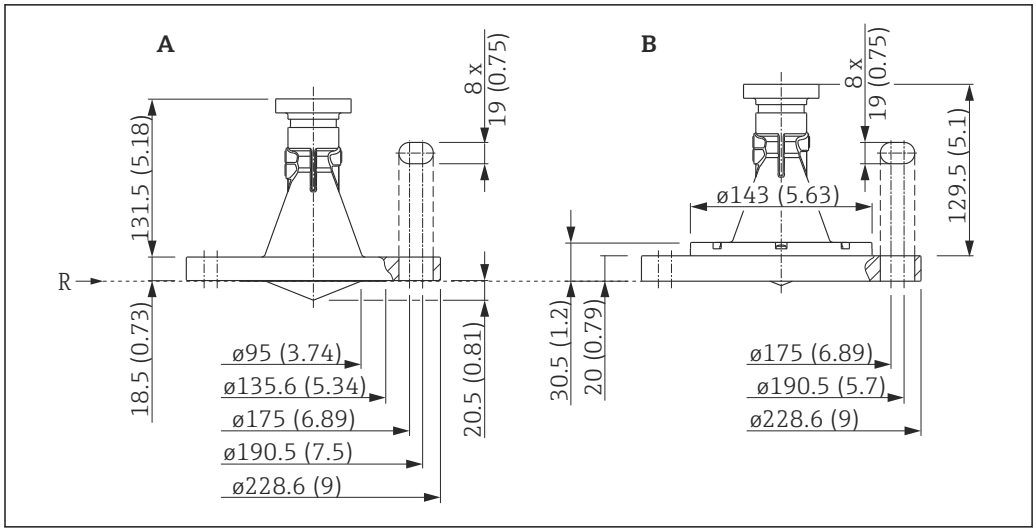
R Reference point of the measurement

Valid for the following device versions

- **Feature 100 "Process connection"**
  XWG: UNI slip-on flange 3"/DN80, PP
- **Feature 070 "Antenna"**
  BN: Horn 80mm/3", PP cladded

The UNI slip-on flange is suitable for:
- ASME: NPS 3" Cl.150
- EN: DN80 PN16
- JIS: 10K 80

FMR50 with slip-on flange 4"/DN100



25 FMR50 mit slip-on flange 4"/DN100; dimensions: mm (in)

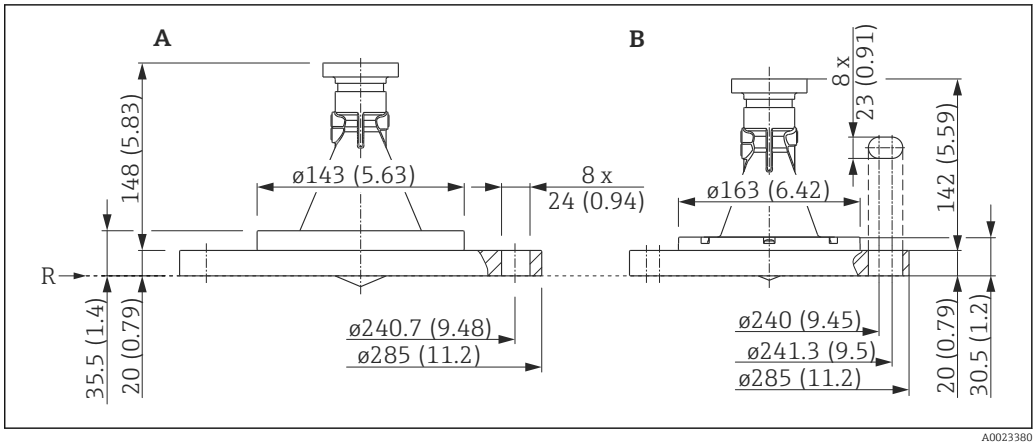
A Horn antenna 100mm/4" (without adapter ring)
B Horn antenna 80mm/3" (with adapter ring)
R Reference point of the measurement

Valid for the following device versions

- **Feature 100 "Process connection":**
  XZG: UNI slip-on flange 4"/DN100
- **Feature 070 "Antenna":**
  - BR: Horn 100mm/4", PP cladded (diagram A)
  - BN: Horn 80mm/3", PP cladded (diagram B)

The UNI slip-on flange is suitable for:
- ASME: NPS 4" Cl.150
- EN: DN100 PN16
- JIS: 10K 100

FMR50 with slip-on flange 6"/DN150



26 FMR50 with slip-on flange 6"/DN150; dimensions: mm (in)

A Horn antenna 100mm/4"
B Horn antenna 80mm/3"
R Reference point of the measurement

Valid for the following device versions

- **Feature 100 "Process connection":**
  X0G: UNI slip-on flange 6"/DN150, PP
- **Feature 070 "Antenna":**
  - BR: Horn 100mm/4", PP cladded (Diagramm A)
  - BN: Horn 80mm/3", PP cladded (Diagramm B)

The UNI slip-on flange is suitable for:
- ASME: NPS 6" Cl.150
- EN: DN150 PN16
- JIS: 10K 150

Weight

Housing

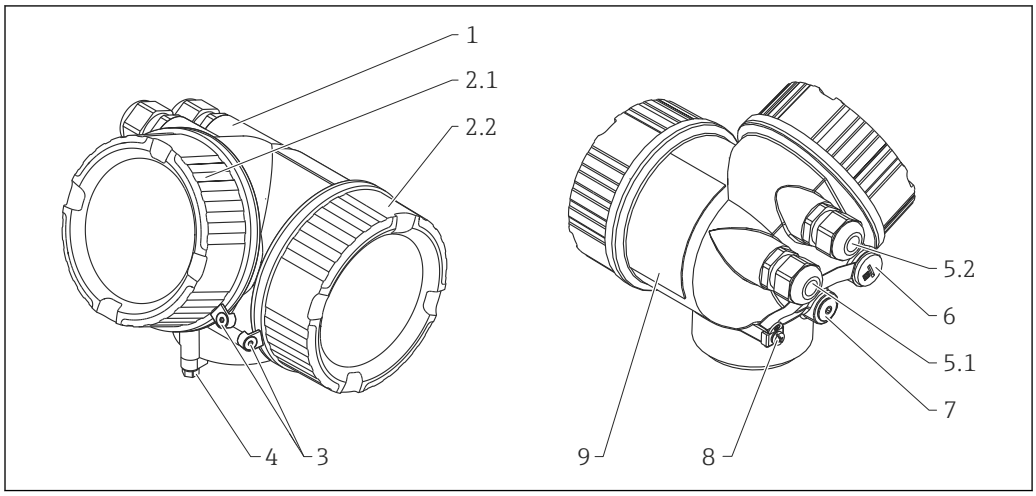
Part	Weight
Housing GT19 - plastic	approx. 1.2 kg (2.7 lb)
Housing GT20 - aluminium	approx. 1.9 kg (4.2 lb)

Antenna and process connection

Device	Weight of antenna and process connection
FMR50	max. 1.5 kg (3.3 lb) + weight of flange [1)]

1) For the weight of the flange refer to Technical Information TI00426F.

Materials: GT19 housing

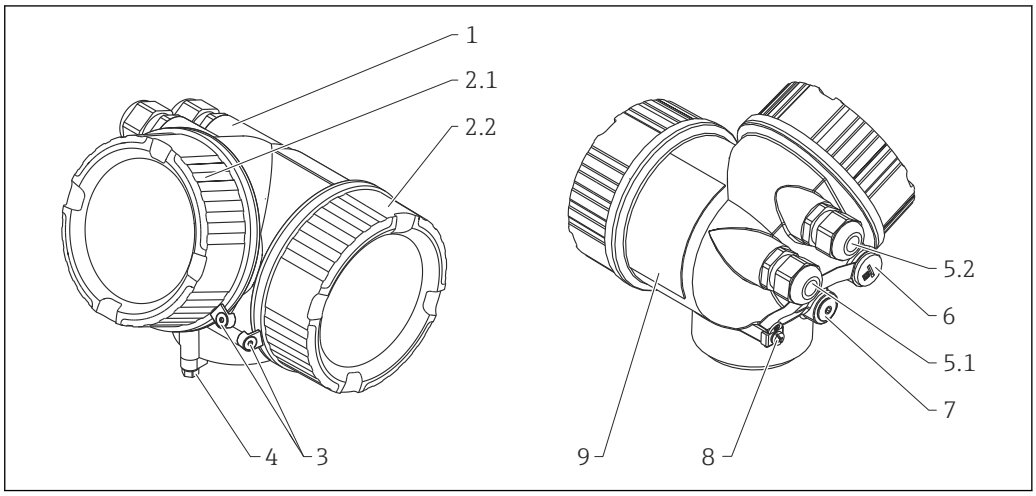


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No.	Part	Material
1	Housing	PBT
2.1	Cover of the electronics compartment	▪ Cover, depending on the device version: – PA (see-through cover) – PBT (non-transparent cover) ▪ Cover seal: EPDM ▪ Thread-coating: Graphite-based lubricant varnish
2.2	Cover of the terminal compartment	▪ Cover: PBT ▪ Cover seal: EPDM ▪ Thread-coating: Graphite-based lubricant varnish
4	Lock at the housing neck	▪ Screw: A4-70 ▪ Clamp: 316L (1.4404)
5.1	Dummy plug, cable gland, adapter or plug (depending on the device version)	▪ Dummy plug, depending on the device version: – PE – PBT-GF ▪ Cable gland, depending on the device version: – Nickel-plated brass (CuZn) – PA ▪ Adapter: 316L (1.4404/1.4435) ▪ Seal: EPDM ▪ M12 plug: Nickel-plated brass [1)] ▪ 7/8" plug: 316 (1.4401) [2)]
5.2	Dummy plug, cable gland or adapter (depending on the device version)	▪ Dummy plug, depending on the device version: – PE – PBT-GF – Nickel-plated steel ▪ Cable gland, depending on the device version: – Nickel-plated brass (CuZn) – PA ▪ Adapter: 316L (1.4404/1.4435) ▪ Seal: EPDM
6	Dummy plug or M12 socket (depending on the device version)	▪ Dummy plug: Nickel-plated brass (CuZn) ▪ M12 socket: Nickel-plated GD-Zn
7	Pressure relief stopper	Nickel-plated brass (CuZn)
8	Ground terminal	▪ Screw: A2 ▪ Spring washer: A4 ▪ Clamp: 304 (1.4301) ▪ Holder: 304 (1.4301)
9	Nameplate	Sticker

1) For the version with M12 plug the sealing material is Viton.
2) For the version with 7/8" plug, the sealing material is NBR.

Materials: GT20 housing



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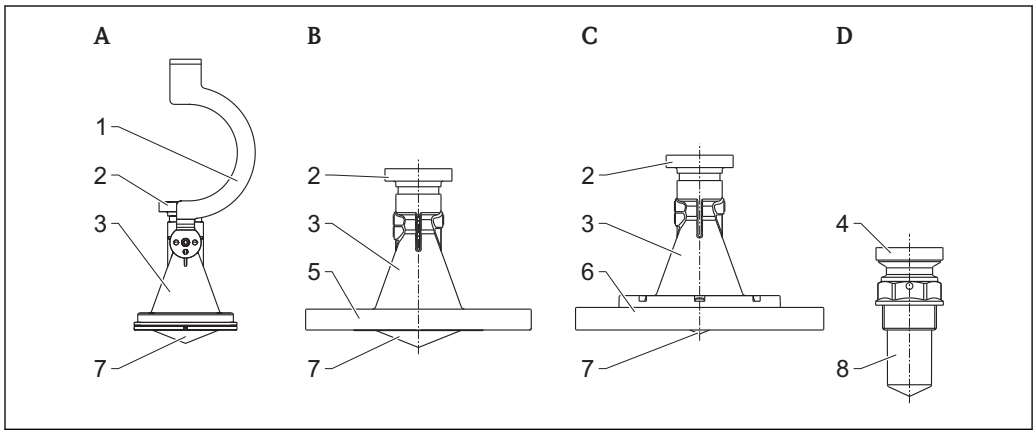
Nr.	Part	Material
1	Housing, RAL 5012 (blue)	▪ Housing: AlSi10Mg(<0,1% Cu) ▪ Coating: Polyester
2.1	Cover of the electronics compartment; RAL 7035 (gray)	▪ Cover: AlSi10Mg(<0,1% Cu) ▪ Window: Glass ▪ Cover seal: EPDM ▪ Seal of the window: NBR ▪ Thread-coating: Graphite-based lubricant varnish
2.2	Cover of the terminal compartment; RAL 7035 (gray)	▪ Cover: AlSi10Mg(<0,1% Cu) ▪ Cover seal: EPDM ▪ Thread-coating: Graphite-based lubricant varnish
3	Cover lock	▪ Screw: A4 ▪ Clamp: 316L (1.4404)
4	Lock at the housing neck	▪ Screw: A4-70 ▪ Clamp: 316L (1.4404)
5.1	Dummy plug, cable gland, adapter or plug (depending on the device version)	▪ Dummy plug, depending on the device version: – PE – PBT-GF ▪ Cable gland, depending on the device version: – Nickel-plated brass (CuZn) – PA ▪ Adapter: 316L (1.4404/1.4435) ▪ Seal: EPDM ▪ M12 plug: Nickel-plated brass [1)] ▪ 7/8" plug: 316 (1.4401) [2)]
5.2	Dummy plug, cable gland or adapter (depending on the device version)	▪ Dummy plug, depending on the device version: – PE – PBT-GF – Nickel-plated steel ▪ Cable gland, depending on the device version: – Nickel-plated brass (CuZn) – PA ▪ Adapter: 316L (1.4404/1.4435) ▪ Seal: EPDM
6	Dummy plug or M12 socket (depending on the device version)	▪ Dummy plug : Nickel-plated brass (CuZn) ▪ M12 socket: Nickel-plated GD-Zn
7	Pressure relief stopper	Nickel-plated brass (CuZn)

Nr.	Part	Material
8	Ground terminal	▪ Screw: A2 ▪ Spring washer: A2 ▪ Clamp: 304 (1.4301) ▪ Holder: 304 (1.4301)
9	Nameplate	Sticker

1) For the version with M12 plug the sealing material is Viton.
2) For the version with 7/8" plug, the sealing material is NBR.

Materials: Antenna and process connection

FMR50

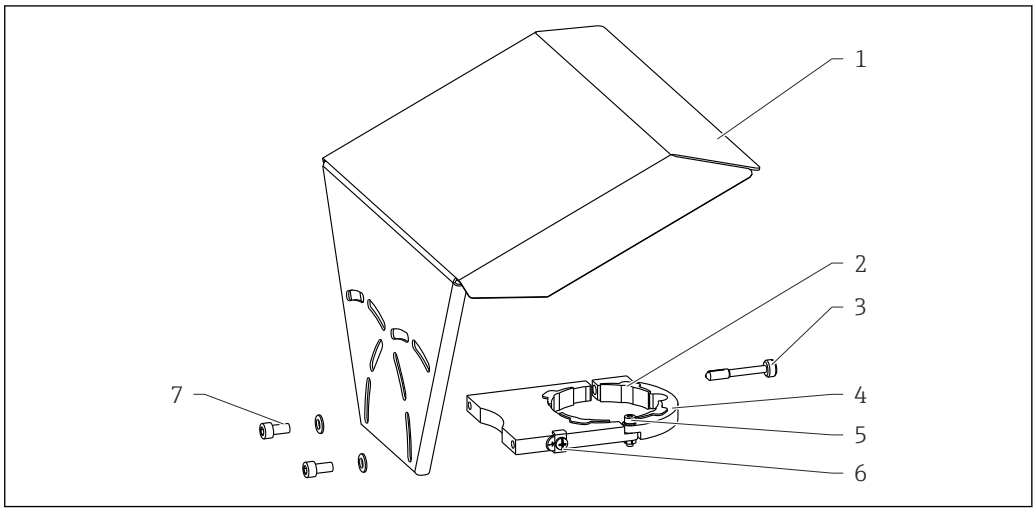


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A Standard version with mounting bracket
B Horn antenna with slip-on flange
C Horn antenna with flange and adapter ring
D Threaded version

Pos.	Part	Material
1	Mounting bracket	304 (1.4301)
	Screw	A2
	Nordlock washer	A4
2	Housing adapter	304 (1.4301)
3	Horn	PBT
4	Housing adapter	PBT
5	Slip-on flange	PP
6	Flange + adapter ring	PP
	Screw	A2
	Seal	FKM
7	Focusing lense	PP
	Seal	VMQ
8	Schrew-in adapter	PVDF

Materials: Weather protection cover



A0015473

No	Part: Material
1	Protection cover: 316L (1.4404)
2	Molded rubber part (4x): EPDM
3	Clamping screw: 316L (1.4404) + carbon fibre
4	Bracket: 316L (1.4404)
5	▪ Cheese head screw: A4-70 ▪ Nut: A4 ▪ Spring washer: A4
6	Ground terminal ▪ Screw: A4 ▪ Spring washer: A4 ▪ Clamp: 316L (1.4404) ▪ Holder: 316L (1.4404)
7	▪ Washer: A4 ▪ Cheese head screw: A4-70

Operability

Operating concept

Operator-oriented menu structure for user-specific tasks
- Commissioning
- Operation
- Diagnostics
- Expert level

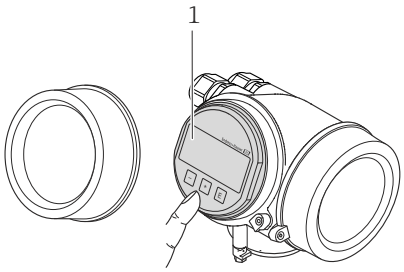
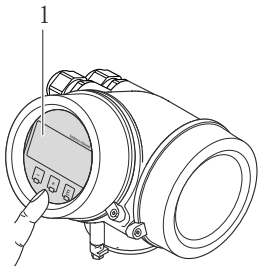
Operatring languages
- English (contained in every device)
- One additional language as ordered (feature 500 of the product structure)

Quick and safe commissioning
- Guided menus ("Make-it-run" wizards) for applications
- Menu guidance with brief explanations of the individual parameter functions

Reliable operation
- Standardized operation at the device and in the operating tools
- Data storage device (HistoROM) for process and measuring device data with event logbook available at all times - even if electronics modules are replaced

Efficient diagnostics increase measurement reliability
- Remedy information is integrated in plain text
- Diverse simulation options and line recorder functions

Local operation

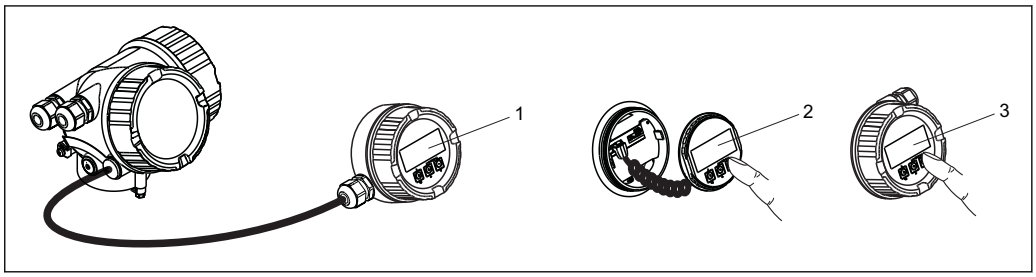
Order code for "Display; Operation", option **C** "SD02"	Order code for "Display; Operation", option **E** "SD03"
	
1 Operation with pushbuttons	*1 Operation with touch control*

Display elements
- 4-line display
- In the case of order code for "Display; Operation", option **E**: white background lighting; switches to red in event of device errors
- Format for displaying measured variables and status variables can be individually configured
- Permitted ambient temperature for the display: –20 to +70 °C (–4 to +158 °F)
  The readability of the display may be impaired at temperatures outside the temperature range.

Operating elements
- In the case of order code "Display; Operation", Option **C**: local operation with 3 push buttons (⊕, ⊖, Ⓔ)
- In the case of order code for "Display; Operation", option **E**: external operation via touch control; 3 optical keys: ⊕, ⊖, Ⓔ
- Operating elements also accessible in various hazardous areas

Additional functionality
- Data backup function
  The device configuration can be saved in the display module.
- Data comparison function
  The device configuration saved in the display module can be compared to the current device configuration.
- Data transfer function
  The transmitter configuration can be transmitted to another device using the display module.

Operation with remote display and operating module FHX50

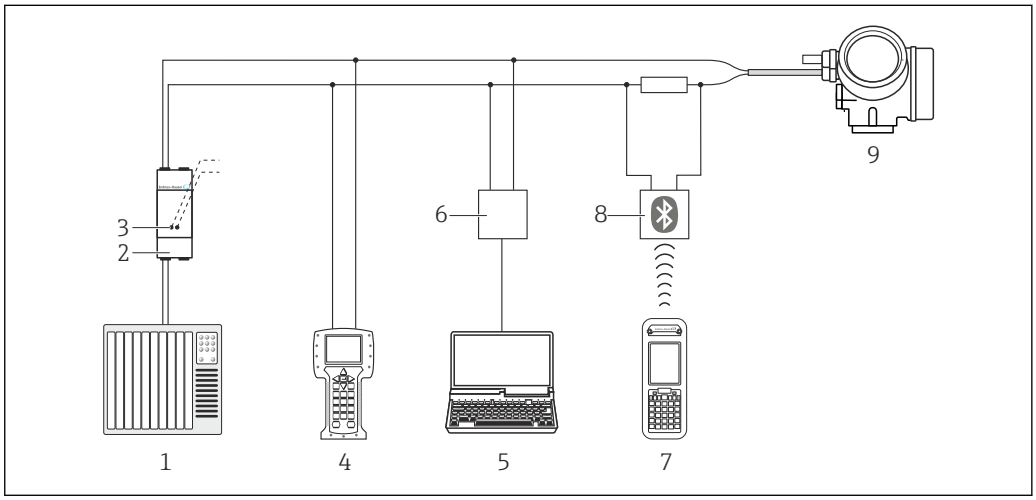


27 *FHX50 operating options*

1 *Housing of the remote display and operating module FHX50*
2 *Display and operating module SD02, push buttons; cover must be removed*
3 *Display and operating module SD03, optical keys; can be operated through the glass of the cover*

Remote operation

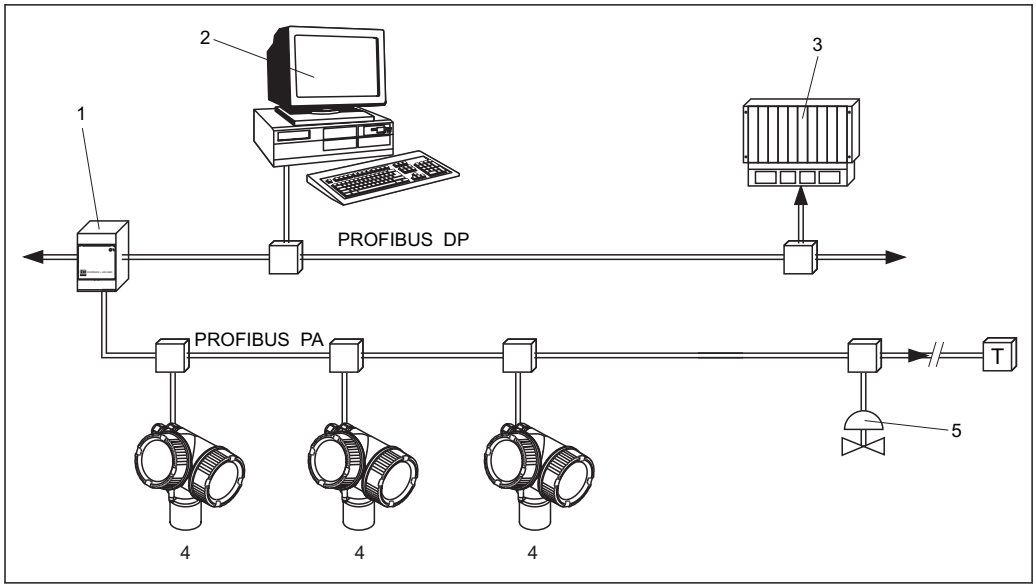
Via HART protocol



28 *Options for remote operation via HART protocol*

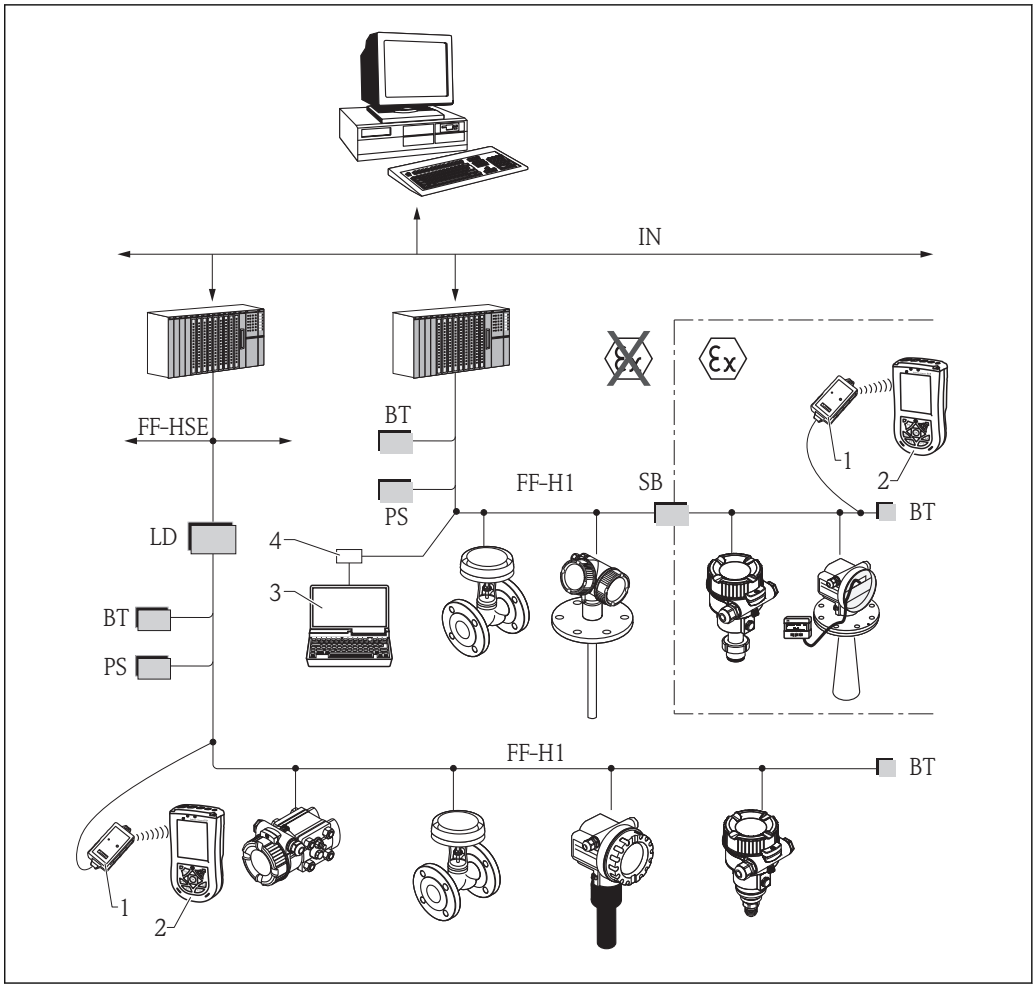
1 *PLC (programmable logic controller)*
2 *Transmitter power supply unit, e.g. RN221N (with communication resistor)*
3 *Connection for Commubox FXA191, FXA195 and Field Communicator 375, 475*
4 *Field Communicator 475*
5 *Computer with operating tool (e.g. FieldCare, AMS Device Manager, SIMATIC PDM)*
6 *Commubox FXA191 (RS232) or FXA195 (USB)*
7 *Field Xpert SFX350/SFX370*
8 *VIATOR Bluetooth modem with connecting cable*
9 *Transmitter*

Via PROFIBUS PA protocol



1 Segment coupler
2 Computer with Profiboard/Proficard and operating tool (e.g. FieldCare)
3 PLC (Progrommable Logic Controller)
4 Transmitter
5 Additional functions (valves etc.)

Via FOUNDATION Fieldbus

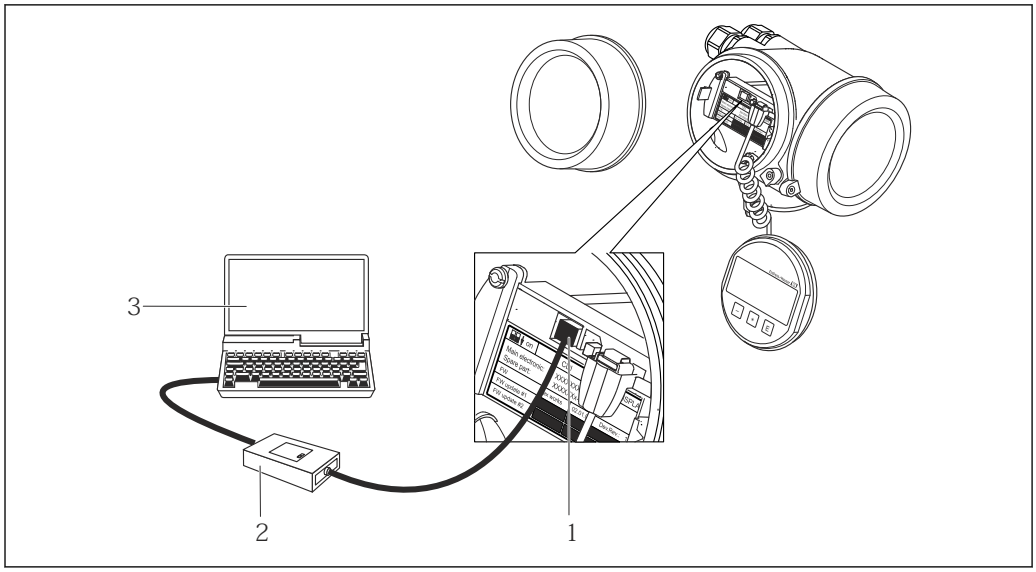


29 *FOUNDATION Fieldbus system architecture with associated components*

1 *FFblue Bluetooth modem*
2 *Field Xpert SFX350/SFX370*
3 *FieldCare*
4 *NI-FF interface card*

IN	Industrial network
FF-HSE	High Speed Ethernet
FF-H1	FOUNDATION Fieldbus-H1
LD	Linking Device FF-HSE/FF-H1
PS	Bus Power Supply
SB	Safety Barrier
BT	Bus Terminator

Via service interface (CDI)

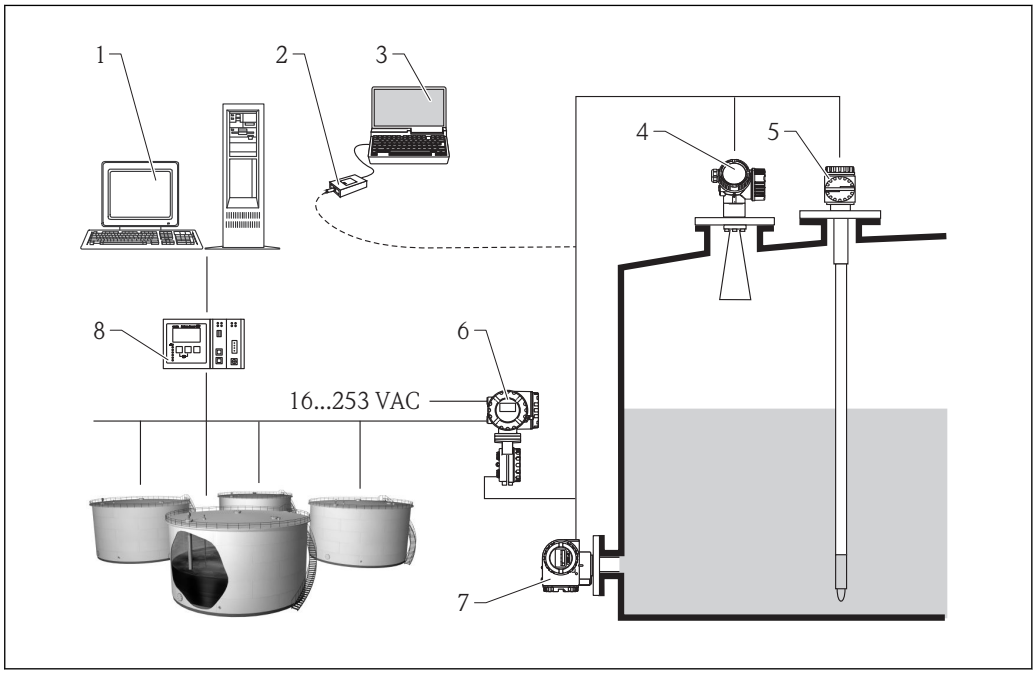


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1 Service interface (CDI) of the measuring device (= Endress+Hauser Common Data Interface)
2 Commubox FXA291
3 Computer with "FieldCare" operating tool

Integration in tank gauging system

The Endress+Hauser Tank Side Monitor NRF590 provides integrated communications for sites with multiple tanks, each with one or more sensors on the tank, such as radar, spot or average temperature, capacitive probe for water detection and/or pressure sensors. Multiple protocols out of the Tank Side Monitor guarantee connectivity to nearly any of the existing industry standard tank gauging protocols. Optional connectivity of analog 4...20 mA sensors, digital I/O and analog output simplify full tank sensor integration. Use of the proven concept of the intrinsically safe HART bus for all on-tank sensors yields extremely low wiring costs, while at the same time providing maximum safety, reliability and data availability.



30 The complete measuring system consists of:

1 Tankvision workstation
2 Commubox FXA195 (USB) - optional
3 Computer with operating tool (ControlCare) - optional
4 Level measuring device
5 Temperature measuring device
6 Tank Side Monitor NRF590
7 Pressure measuring device
8 Tankvision Tank Scanner NXA820

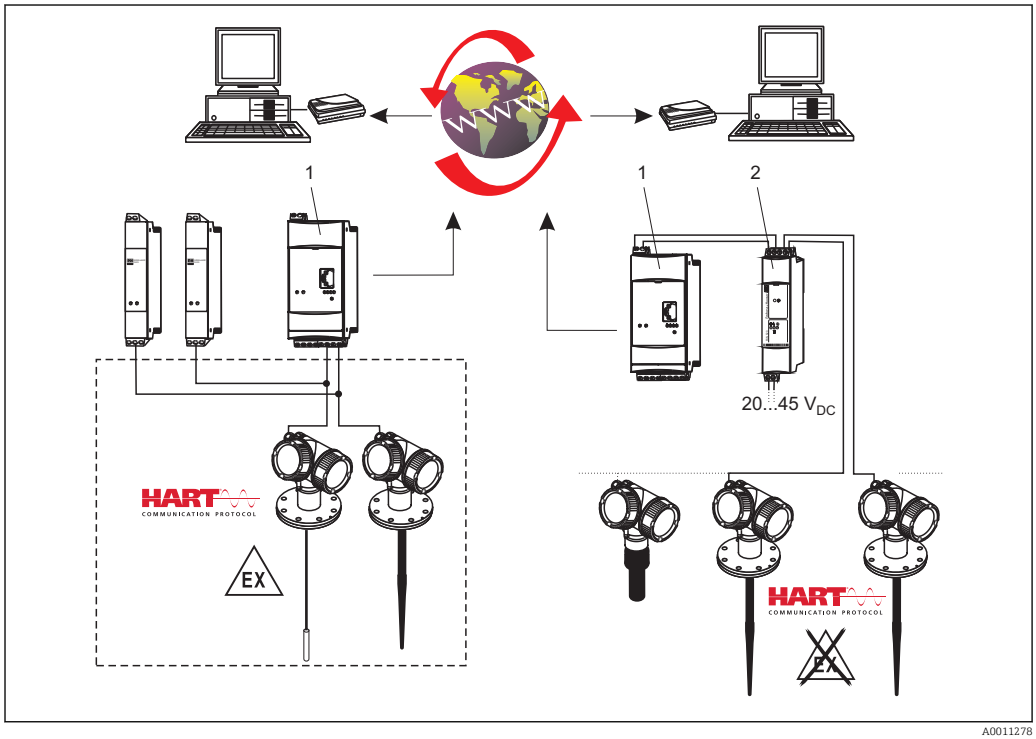
System integration via Fieldgate

Vendor Managed Inventory

By using Fieldgates to interrogate tank or silo levels remotely, suppliers of raw materials can provide their regular customers with information about the current supplies at any time and, for example, account for them in their own production planning. For their part, the Fieldgates monitor the configured level limits and, if required, automatically activate the next supply. The spectrum of options here ranges from a simple purchasing requisition via e-mail through to fully automatic order administration by coupling XML data into the planning systems on both sides.

Remote maintenance of measuring equipment

Fieldgates not only transfer the current measured values, they also alert the responsible standby personnel, if required, via e-mail or SMS. In the event of an alarm or also when performing routine checks, service technicians can diagnose and configure connected HART devices remotely. All that is required for this is the corresponding HART operating tool (e.g. FieldCare, ...) for the connected device. Fieldgate passes on the information transparently, so that all options for the respective operating software are available remotely. Some on-site service operations can be avoided by using remote diagnosis and remote configuration and all others can at least be better planned and prepared.



31 The complete measuring system consists of devices and:

1 Fieldgate FXA520
2 Multidrop Connector FXN520

The number of instruments which can be connected in mutidrop mode can be calculated by the "FieldNetCalc" program. A description of this program can be found in Technical Information TI 400F (Multidrop Conncector FXN520). The program is available form your Endress+Hauser sales organisation or in the internet at: www.de.endress.com/Download (text search = "Fieldnetcalc").

Certificates and approvals

CE mark

The measuring system meets the legal requirements of the applicable EC guidelines. These are listed in the corresponding EC Declaration of Conformity together with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

C-Tick symbol

The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".

Ex approval

- ATEX
- IEC Ex
- CSA
- FM
- NEPSI
- KC
- INMETRO
- TIIS (in preparation)

Additional safety instructions must be observed for applications in hazardous areas. They are contained in the separate "Safety Instructions" (XA) document, which is included in the scope of delivery. Reference is made to the XA on the nameplate of the device.

Details on the available certificats as well as the associated XAs can be found in the **Associated documentation** chapter in the **Safety instructions** section: → 🖹 83.

Dual seal according to ANSI/ISA 12.27.01

The devices have been designed according to ANSI/ISA 12.27.01 as dual seal devices, allowing the user to waive the use and save the cost of installing external secondary process seals in the conduit as required by the process sealing sections of ANSI/NFPA 70 (NEC) and CSA 22.1 (CEC). These instruments comply with the North-American installation practice and provide a very safe and cost-saving installation for pressurized applications with hazardous fluids.

Further information can be found in the Safety Instructions (XA) of the relevant devices.

Functional Safety

Used for level monitoring (MIN, MAX, range) up to SIL 3 (homogeneous or inhomogeneous redundancy), independently assessed by TÜV Rhineland as per IEC 61508. Other information see documentation SD01087F: "Functional Safety Manual".

WHG

WHG approval: Z-65.16-524

Pressure Equipment Directive

The Micropilot is not subject to the scope of the Pressure Equipment Directive 97/23/EC, as it does not have a pressure-bearing housing according to article 1, section 2.1.4 of the directive.

Marine certificate (in preparation)

in preparation

Radio standard EN302729-1/2

The devices Micropilot FMR50, FMR51, FMR52, FMR56 and FMR57 are conform with the LPR (Level Probing Radar) standard EN302729-1/2. The devices are allowed to be used inside or outside of closed bins or tanks in countries of th EU and the EFTA. Precondition is that the country itself already has implemented the directive.

At present, the following countries have already implemented the directive:

Belgium, Bulgaria, Germany, Denmark, Estonia, France, Greece, Great Britain, Ireland, Iceland, Italy, Liechtenstein, Lithuania, Latvia, Malta, Netherland, Norway, Austria, Poland, Romania, Sweden, Switzerland, Slovakia, Spain, Czech Republic and Cyprus.

All countries not mentioned above are at present in the implementation phase.

For the use of the devices outside of closed bins or tanks, the following has to be observed:

1. The installation has to be done by trained personnel.
2. The antenna of the device has to be mounted on a fixed place and vertically to the bottom.

3. The mounting place has to be in a distance of at least 4 km to the mentioned astronomical stations or an appropriate permission has to be issued by the national authority. If the device is mounted at a distance of 4 to 40 km from the stations mentioned, the maximum mounting height is restricted to 15 m (49 ft).

Astronomical stations

Country	Name of the station	Geographical latitude	Geographical longitude
Germany	Effelsberg	50°31'32" N	06°53'00" E
Finland	Metsähovi	60°13'04" N	24°23'37" E
	Tuorla	60°24'56" N	24°26'31" E
France	Plateau de Bure	44°38'01" N	05°54'26" E
	Floirac	44°50'10" N	00°31'37" W
United Kingdom	Cambridge	52°09'59" N	00°02'20" E
	Damhall	53°09'22" N	02°32'03" W
	Jodrell Bank	53°14'10" N	02°18'26" W
	Knockin	52°47'24" N	02°59'45" W
	Pickmere	53°17'18" N	02°26'38" W
Italy	Medicina	44°31'14" N	11°38'49" E
	Noto	36°52'34" N	14°59'21" E
	Sardinia	39°29'50" N	09°14'40" E
Poland	Krakow Fort Skala	50°03'18" N	19°49'36" E
Russia	Dmitrov	56°26'00" N	37°27'00" E
	Kalyazin	57°13'22" N	37°54'01" E
	Pushchino	54°49'00" N	37°40'00" E
	Zelenchukskaya	43°49'53" N	41°35'32" E
Sweden	Onsala	57°23'45" N	11°55'35" E
Switzerland	Bleien	47°20'26" N	08°06'44" E
Spain	Yebes	40°31'27" N	03°05'22" W
	Robledo	40°25'38" N	04°14'57" W
Hungary	Penc	47°47'22" N	19°16'53" E

In general the requirements of EN 302729-1/2 have to be taken in consideration.

Radio standard EN302372-1/2

The devices Micropilot FMR50, FMR51, FMR52, FMR53, FMR54, FMR56 and FMR57 are conform with the TLPR (Tanks Level Probing Radar) standard EN302372-1/2 and can always be used in closed tanks or bins. For installation, points a to f in Annex B of EN302372-1 have to be taken into account.

FCC / Industry Canada

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Canada CNR-Gen Section 7.1.3

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) This device may not interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

[Any] changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

In addition, the devices FMR50 [9], FMR51 [10], FMR52 [11], FMR56 and FMR57 are compliant with the LPR (Level probe radar) regulation also for free space applicactions according to the FCC Code of Federal Regulations, CFR 47, Part 15, Sections 15.205, 15.207, 15.209, 15.256 for antenna sizes bigger than 50 mm (2.0 in) [12]. For these applications the devices must be professionally installed in a downward operating position. In addition, the devices are not allowed to be mounted in a zone of 4 km around RAS stations and within a radius of 40 km around RAS stations the maxium operation height of devices is 15 m (49 ft) above ground.

Japanese radio approval

The devices FMR50, FMR51, FMR52, FMR54 and FMR57 comply with the Japanese Radio Law, Article 6, Section 1(1).

CRN approval

Some device versions have a CRN approval. Devices are CRN approved if the folowing two conditions are met:

- The device has a CSA approval (Product structure: Feature 010 "Approval")
- The device has a CRN approved process connection according to the following table.

Feature 100 of the product structure	Process connection
GGF	Gewinde ISO228 G1-1/2, PVDF
RGF	Thread ANSI MNPT1-1/2, PVDF
XWG	UNI slip on flange 3"/DN80/80, PP
XZG	UNI slip on flange 4"/DN100/100, PP
X0G	UNI slip on flange 6"/DN150/150, PP

- Process connections without CRN approval are not included in this table.
- Refer to the product structure to see which process connections are available for a specific device type.
- CRN approved devices are marked with the registration number OF15872.5C on the nameplate.

For device versions listed in the table below, the maximum allowed pressure is reduced if they have a CRN approval. For device versions not listed in the table below the pressure range as indicated in the "Process" chapter → 49 is not affected by the CRN approval.

Product	Antenna [1]	Prozessanschluss [2]	Dichtung [3]	max. pressure
FMR50/FMR56	BN: Horn 80mm/3"	XWG: UNI slip-on flange 3"		1.6 bar (23.2 psi)
		XZG: UNI slip-on flange 4"		1.5 bar (21.75 psi)
		X0G: UNI slip-on flange 6"		1.5 bar (21.75 psi)
	BR: Horn 100mm/4"	XZG: UNI slip-on flange 4"		12 bar (17.4 psi)
		X0G: UNI slip-on flange 6"		1.8 bar (26.1 psi)

1) Feature 070 of the product structure
2) Feature 100 of the product structure
3) Feature 090 of the product structure

Track record

FMR5x is the upgrade model of the corresponding FMR2xx series.

9) Except of FMR50-######BM* (Horn 40mm/1-1/2", PVDF encapsulated)
10) Except for FMR51-######BA* (Horn 40mm/1-1/2") and FMR51-######BB* (Horn 50mm/2")
11) Except for FMR52-######BO* (Horn 50mm/2", flush mount)
12)

Other standards and guidelines

- EN 60529
  Degrees of protection by housing (IP code)
- EN 61010-1
  Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures.
- IEC/EN 61326
  "Emission in accordance with Class A requirements". Electromagnetic compatibility (EMC requirements)
- NAMUR NE 21
  Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment.
- NAMUR NE 43
  Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53
  Software of field devices and signal-processing devices with digital electronics
- NAMUR NE 107
  Status classification as per NE107
- NAMUR NE 131
  Requirements for field devices for standard applications
- IEC61508
  Functional safety of electrical/electronic/programmable electronic safety-related systems

Ordering information

Ordering information

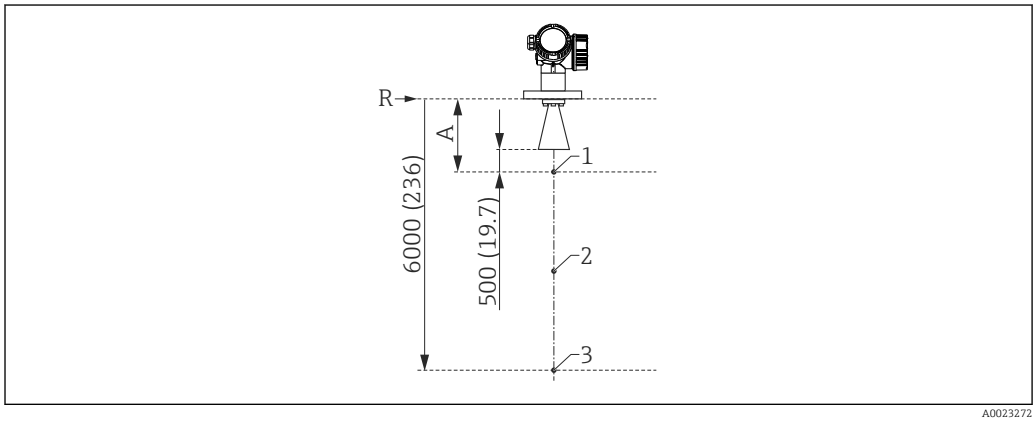
Detailed ordering information is available from the following sources:
- In the Product Configurator on the Endress+Hauser web site: www.endress.com → Choose your country → Products → Select measuring technology, software or components → Select product (picklists: measurement method, product family etc.) → Device support (right-hand column): Configure the selected product → The Product Configurator for the selected product is opened.
- From your Endress+Hauser Sales Center: www.addresses.endress.com

Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

3-point linearity protocol

The following notes must be taken into account if option F3 ("3 point linearity protocol") has been selected in feature 550 ("Calibration").

The 3 points of the linearity protocol are defined as follows:



32 *Points of the 3-point linearity protocol; Dimensions: mm (in)*

A Distance from reference point R to first measuring point
R Reference point of the measurement
1 First measuring point
2 Second measuring point (centrally between first and third measuring point)
3 Third measuring point

Measuring point	Position
1st measuring point	▪ At the distance A from the reference point ▪ A = antenne length + antenna extension (if present) + 500 mm (19.7 in) ▪ Minimum distance: A_{min} = 1 000 mm (39.4 in)
2nd measuring point	centrally between 1st and 3rd measuring point
3rd measuring point	6 000 mm (236 in) below the reference point, R

The position of the measuring points may vary by ±1 cm (±0.04 in).

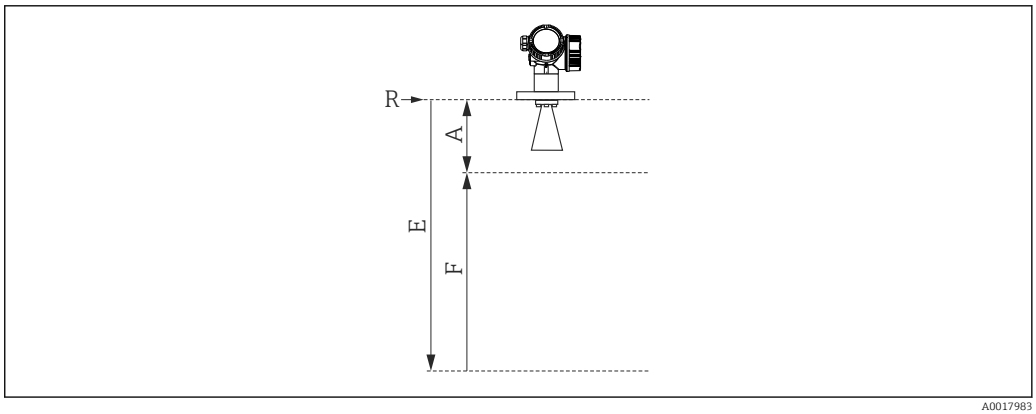
The linearity is checked under reference conditions.

5-point linearity protocol

The following notes must be taken into account if option F4 ("5 point linearity protocol") has been selected in feature 550 ("Calibration").

The five points of the linearity protocol are evenly distributetd across the measuring range (0% to 100%). In order to define the measuring range, **Empty calibration** (E) and **Full calibration** (F) have to be specified [13].

The following restrictions have to be taken into account when defining E and F:



A0017983

Minimum distance between reference point (R) and 100% level	Minimum span	Maximum value for "Empty calibration"
A ≥ Antenna length + 200 mm (8 in) Minimum value: 400 mm (16 in)	F ≥ 400 mm (16 in)	E ≤ 24 m (79 ft)

The linearity is checked under reference conditions.

The selected values of **Empty calibration** and **Full calibration** are only used to record the linearity protocol and are reset to their probe specific default values thereafter. If values different from the default are required, they must be ordered as a customized parametrization → 74.

13) If E and F are not specified, probe dependent default values will be used instead.

Customized parametrization

If the option IJ "Customized parametrization HART", IK "Customized parametrization PA" or IL "Customized parametrization FF" has been selected in feature 570 "Service", customer specific presettings can be selected for the following parameters:

Parameter	Communication	Selection list / range of values
Setup → Distance unit	▪ HART ▪ PA ▪ FF	▪ in ▪ mm
Setup → Empty calibration	▪ HART ▪ PA ▪ FF	max. 70 m (230 ft)
Setup → Full calibration	▪ HART ▪ PA ▪ FF	max. < 70 m (230 ft)
Setup → Adv. Setup → Current output 1/2 → Damping	HART	0 to 999.9 s
Setup → Adv. Setup → Current output 1/2 → Failure mode	HART	▪ Min ▪ Max ▪ Last valid value
Setup → Adv. Setup → Current output 1/2 → Burst mode	HART	▪ Off ▪ On

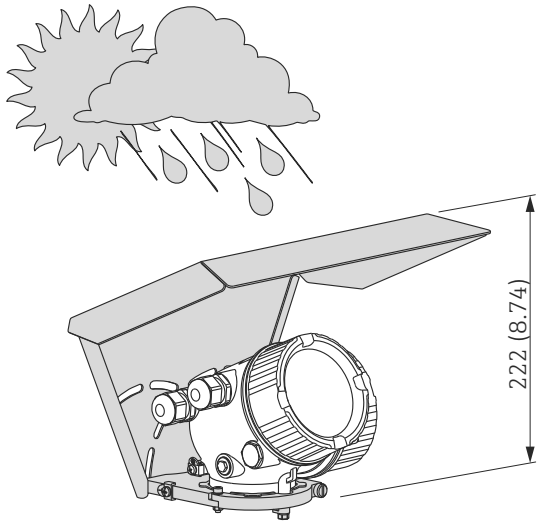
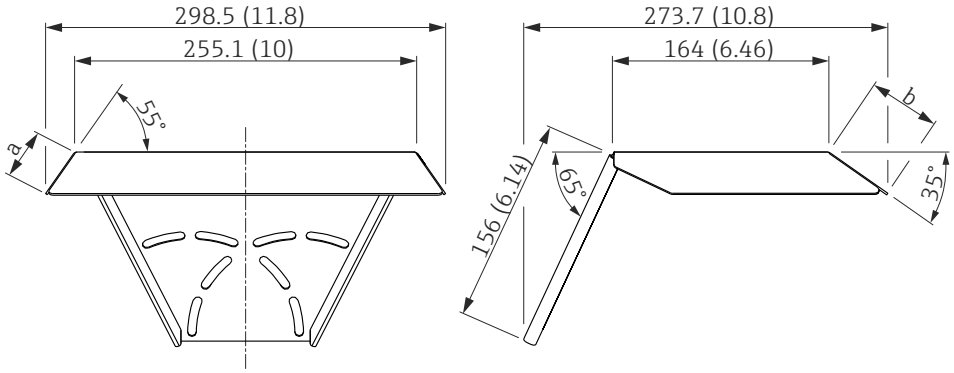
Services

The following services can be selected via the product structure in the Product Configurator [14]:
- PWIS free (PWIS: paint wetting impairment substances)
- Customized parametrization HART → 📄 74
- Customized parametrization PA→ 📄 74
- Customized parametrization FF → 📄 74
- Without tooling DVD (FieldCare)

14) Feature 570 of the product structure

Accessories

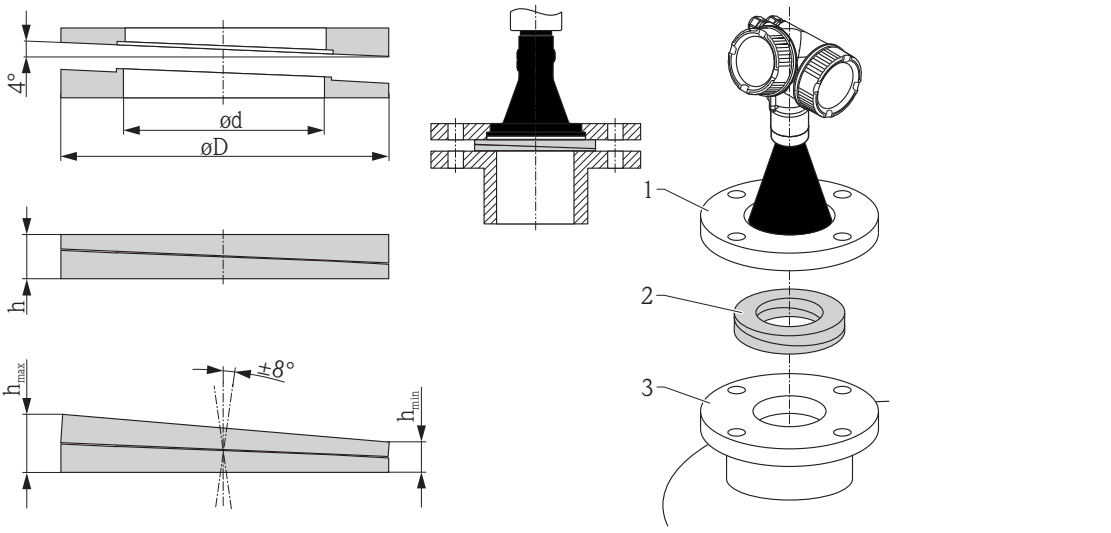
Device-specific accessories **Weather protection cover**

Accessory	Description
Weather protection cover	 A0015466  A0015472 *33 Weather protection cover; Dimensions: mm (in)* *a 37,8 mm (1,5 in)* *b 54 mm (2,1 in)* The weather protection cover can be ordered together with the device (product structure, feature 620 "Accessory Enclosed", option PB "Weather Protection Cover"). Alternatively, it can be separately ordered as an accessory; order code 71162242.

Mounting nut G1-1/2

Accessory	Description
Mounting nut G1-1/2	Drawing in preparation For FMR50 with with 40mm/1-1/2" horn antenna and G1-1/2" thread Material: PC Order code: 52014146

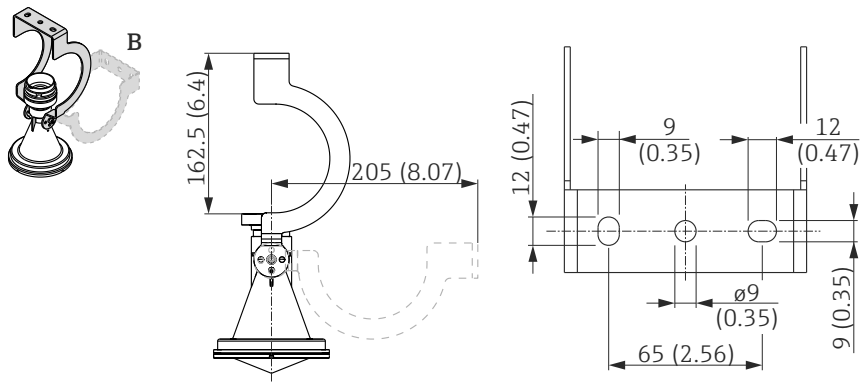
Variable flange seal for FMR50/FMR56

Accessory	Description
Variable flange seal for FMR50/FMR56	 *1 UNI slip-on flange* *2 Variable flange seal* *3 Nozzle* The material and process conditions of the adjustable flange seal must fit the process properties (temperature, pressure, resistance).

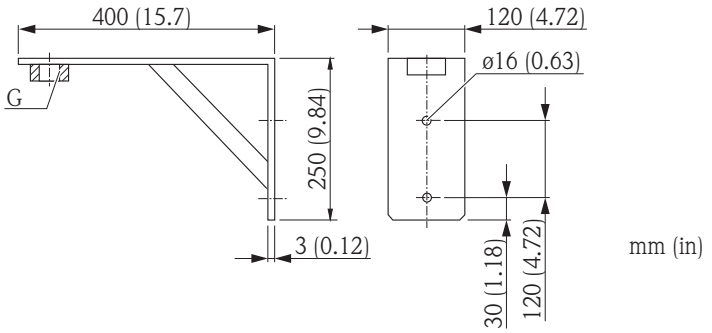
Technical data: DN/JIS version			
Order code	71074263	71074264	71074265
Compatible with	DN80 PN10/40	DN100 PN10/16	▪ DN150 PN10/16 ▪ JIS 10K 150A
Length of screws	100 mm (3.9 in)	100 mm (3.9 in)	110 mm (4.3 in)
Size of screws	M14	M14	M18
Material	EPDM		
Process pressure	−0.1 to 0.1 bar (−1.45 to 1.45 psi)		
Process temperature	−40 to +80 °C (−40 to +176 °F)		
D	142 mm (5.59 in)	162 mm (6.38 in)	218 mm (8.58 in)
d	89 mm (3.5 in)	115 mm (4.53 in)	169 mm (6.65 in)
h	22 mm (0.87 in)	23.5 mm (0.93 in)	26.5 mm (1.04 in)
h_{min}	14 mm (0.55 in)	14 mm (0.55 in)	14 mm (0.55 in)
h_{max}	30 mm (1.18 in)	33 mm (1.3 in)	39 mm (1.45 in)

Accessory	Description			
	Technical data: ASME/JIS version			
	Order code	71249070	71249072	71249073
	Compatible with	▪ ASME 3" 150lbs ▪ JIS 80A 10K	ASME 4" 150lbs	ASME 6" 150lbs
	Length of screws	100 mm (3.9 in)	100 mm (3.9 in)	110 mm (4.3 in)
	Empfohlene Schraubengröße	M14	M14	M18
	Material	EPDM		
	Process pressure	−0.1 to 0.1 bar (−1.45 to 1.45 psi)		
	Process temperature	−40 to +80 °C (−40 to +176 °F)		
	D	133 mm (5.2 in)	171 mm (6.7 in)	219 mm (8.6 in)
	d	89 mm (3.5 in)	115 mm (4.53 in)	168 mm (6.6 in)
	h	22 mm (0.87 in)	23.5 mm (0.93 in)	26.5 mm (1.04 in)
	h_{min}	14 mm (0.55 in)	14 mm (0.55 in)	14 mm (0.55 in)
	h_{max}	30 mm (1.18 in)	33 mm (1.3 in)	39 mm (1.45 in)

Mounting bracket for wall or ceiling mounting of FMR50/FMR56

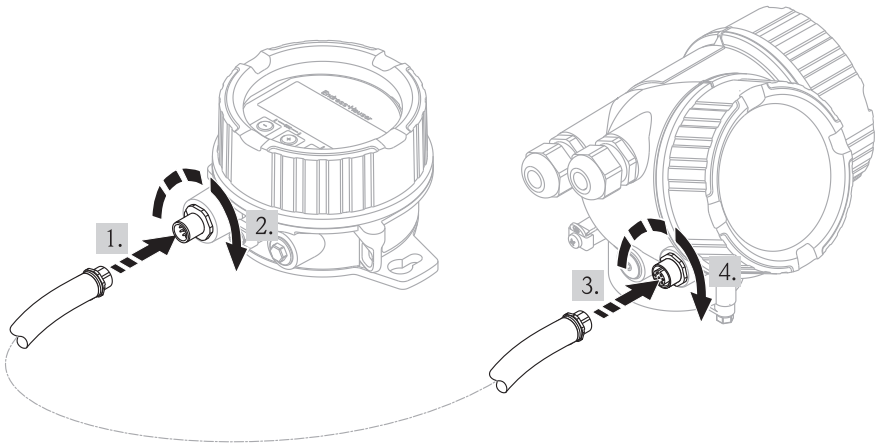
Accessory	Description
Mounting bracket for wall or ceiling mounting of FMR50/FMR56	A  A0017746 *34 Mounting bracket for FMR50/FMR56 with horn antenna* *A Mounting at ceiling* *B Mounting at wall* ▪ **Material:** – Mounting bracket: 304 (1.4301) – Screws: A2 – Nordlock washer: A4 ▪ **Order code:** 71162776

Installation bracket for FMR50

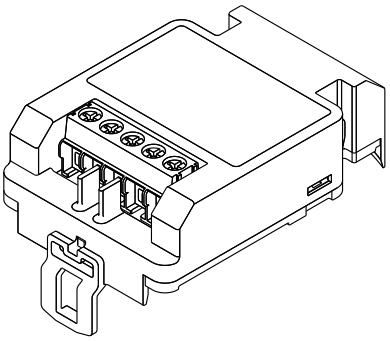
Accessory	Description
Installation bracket for FMR50	 ▪ **Material:** 316Ti (1.4571) ▪ **Suited for antenna version** [1]: BM: Horn 40mm (1½"), PVDF encapsulated, -40...130°C (-40...266°F) ▪ **Suited for process connection** [2]: – GGF: Thread ISO228 G1½, PVDF – RGF: Thread ANSI MNPT1½, PVDF ▪ **Order code:** 942669-0000 The mounting bracket has no conductive connection to the transmitter housing. Danger of electrostatic charging. Connect the mounting bracket to the local potential equalization system.

1) Feature 070 of the product structure
2) Feature 100 of the product structure

Remote display FHX50

Accessory	Description
Remote display FHX50	 A0019128 ▪ Material: – Plastics PBT – 316L ▪ Ingress protection: IP68 / NEMA 6P and IP66 / NEMA 4x ▪ Suitable for the display modules: – SD02 (push buttons) – SD03 (touch control) ▪ Connection cable: – Cable with M12 plug; supplied with the FHX50; up to 30 m (98 ft) – Customer supplied standard cable; up to 60 m (196 ft) ▪ Ambient temperature: −40 to 80 °C (−40 to 176 °F) ▪ If the remote display is to be used, the device must be ordered in the version "Prepared for display FHX50" (feature 030, option L or M). For the FHX50, on the other hand, the option A: "Prepared for display FHX50" has to be selected in feature 050: "Option Measurement Device". ▪ If a device has not been ordered in the version "Prepared for display FHX50", but is nevertheless to be equipped with an FHX50, it is essential to select the option B: "Not prepared for display FHX50" in feature 050: "Option Measurement Device" of the FHX50. In this case, a retrofit kit, needed to prepare the device for the remote display, is supplied together with the FHX50. For transmitters with approval, application of the FHX50 may be restricted. A device may only be retrofitted with the FHX50 if option L or M ("Prepared for FHX50") is quoted under *Basic specifications*, position 4 "Display, operation" in the associated Safety Instructions (XA). In addition to this, observe the Safety Instructions (XA) of the FHX50. Do not retrofit transmitters with: ▪ approval for use in areas with combustible dusts (Dust-Ex approval) ▪ type of protection Ex nA For details refer to the document SD01007F.

Overvoltage protection

Accessory	Description
Overvoltage protection for 2-wire-devices OVP10 (1 channel) OVP20 (2 channel)	 A0021734 **Technical data** ▪ Resistance per channel: 2 * 0.5 Ω_{max} ▪ Threshold DC voltage: 400 to 700 V ▪ Threshold impulse voltage: < 800 V ▪ Capacitance at 1 MHz: < 1.5 pF ▪ Nominal arrest impulse voltage (8/20 µs): 10 kA ▪ Suited for wire cross-sections: 0.2 to 2.5 mm² (24 to 14 AWG) **Ordering with device** The overvoltage protection module is preferably ordered with the device. See product structure, feature 610 "Accessory mounted", option NA "Overvoltage protection". Separate ordering of the module is only necessary if a device is to retrofitted with the overvoltage protection. **Order code for retrofitting** ▪ For 1-channel devices (feature 020, option A) OVP10: 71128617 ▪ For 2-channel devices (feature 020, option B, C, E or G) OVP20 : 71128619 **Hosuing lid for retrofitting** In order to keep the necessary safety distances, the housing lid needs to be replaced if the device is retrofitted with the overvoltage protection. Depending on the housing type, the order code of the suitable lid is as follows: ▪ GT18 housing: Lid 71185516 ▪ GT19 housing: Lid 71185518 ▪ GT20 housing: Lid 71185516 **Restrictions for retrofitting** Depending on the approval of the transmitter the usage of the OVP module may be restricted. A device may only be retrofitted with an OVP module if the option *NA* (overvoltage protection) is quoted unter *Optional Specifications* in the Safety Instructions (XA) pertaining to the device. For details refer to SD01090F.

Communication-specific accessories

Accessory	Description
Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB interface. For details refer to Technical Information TI00404F

Accessory	Description
Commubox FXA291	Connects Endress+Hauser field devices with CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a computer. Order code: 51516983 For details refer to Technical Information TI00405C

Accessory	Description
HART Loop Converter HMX50	Evaluates the dynamic HART variables and converts them to analog current signals or limit values. Order code: 71063562 For details refer to Technical Information TI00429F and Operating Instructions BA00371F

Accessory	Description
WirelessHART Adapter SWA70	Connects field devices to a WirelessHART network. The WirelessHART adapter can be mounted directly at a HART device and is easly integrated into an existing HART network. It ensures safe data transmission and can be operated in parallel with other wireless networks. For details refer to Operating Instructions BA00061S

Accessory	Description
Fieldgate FXA320	Gateway for remote monitoring of connected 4-20mA measuring devices via web browser. For details refer to Technical Information TI00025S and Operating Instructions BA00053S

Accessory	Description
Fieldgate FXA520	Gateway for remote diagnosis and parametrization of connected HART measuring devices via web browser. For details refer to Technical Information TI00025S and Operating Instructions BA00051S

Accessory	Description
Field Xpert SFX350	Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION fieldbus devices in the **non-Ex area**. For details, see Operating Instructions BA01202S

Accessory	Description
Field Xpert SFX370	Field Xpert SFX370 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION fieldbus devices in the **non-Ex area** and the **Ex area**. For details, see Operating Instructions BA01202S

Service-specific accessories

Accessory	Description
FieldCare	Endress+Hauser's FDT-based Plant Asset Management tool. Helps to configure and maintain all field devices of your plant. By supplying status information it also supports the diagnosis of the devices. For details refer to Operating Instructions BA00027S and BA00059S.

System components

Accessory	Description
Graphic Data Manager Memograph M	The graphic data manager Memograph M provides information on all the relevant process variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on an SD card or USB stick. For details refer to Technical Information TI00133R and Operating Instructions BA00247R
RN221N	Active barrier with power supply for safe separation of 4 to 20 mA current circuits. Provides bi-directional HART transmission. For details refer to Technical Information TI00073R and Operating Instructions BA00202R
RNS221	Transmitter supply for 2-wire sensors or transmitters exclusively for non-Ex areas. Provides bi-directional communication using the HART communication sockets. For details refer to Technical Information TI00081R and Operating Instructions KA00110R

Documentation

The following document types are available:
- On the CD supplied with the device
- In the Download Area of the Endress+Hauser Internet site: www.endress.com → Download

Standard documentation

Micropilot FMR50

Correlation of documentations to the device:

Device	Power supply, output	Communikation	Document type	Document code
FMR50	A, B, C, K, L	HART	Operating Instructions	BA01045F/00/EN
			Brief Operating Instructions	KA01099F/00/EN
			Description of Device Parameters	GP01014F/00/EN
	G	PROFIBUS PA	Operating Instructions	BA01124F/00/EN
			Brief Operating Instructions	KA01128F/00/EN
			Description of Device Parameters	GP01018F/00/EN
	E	FOUNDATION Fieldbus	Operating Instructions	BA01120F/00/EN
			Brief Operating Instructions	KA01124F/00/EN
			Description of Device Parameters	GP01017F/00/EN

Supplementary documentation

Device	Document type	Document code
Fieldgate FXA520	Technical Information	TI369F/00/EN
Tank Side Monitor NRF590	Technical Information	TI402F/00/EN
	Operating Instructions	BA256F/00/EN
	Description of Device Parameters	BA257F/00/EN

Safety Instructions (XA)

Depending on the approval, the following Safety Instructions (XA) are supplied with the device. They are an integral part of the Operating Instructions.

			Feature 020 "Power Supply; Output"				
Feature 010	Approval	Available for	A [1]	B [2]	C [3]	E [4]/G [5]	K [6]/L [7]
BA	ATEX: II 1 G Ex ia IIC T6-T1 Ga	FMR50	XA00677F	XA01224F	XA001225	XA00685F	-
BB	ATEX: II 1/2 G Ex ia IIC T6-T1 Ga/Gb	FMR50	XA00677F	XA01224F	XA001225	XA00685F	-
BC	ATEX: II 1/2 G Ex d [ia] IIC T6-T1 Ga/Gb	FMR50	XA00680F	XA00680F	XA01232F	XA00688F	XA01233F
BG	ATEX: II 3 G Ex nA IIC T6-T1 Gc	FMR50	XA00679F	XA01229F	XA01230F	XA00687F	XA01231F
BH	ATEX: II 3 G Ex ic IIC T6-T1 Gc	FMR50	XA00679F	XA01229F	XA01230F	XA00687F	XA01231F
B2	ATEX: II 1/2 G Ex ia IIC T6-T1 Ga/Gb ATEX: II 1/2 D Ex ia IIIC Txx°C Da/Db	FMR50	XA00683F	XA00683F	XA01235F	XA00691F	-
B3	ATEX: II 1/2 G Ex d [ia] IIC T6-T1 Ga/Gb ATEX: II 1/2 D Ex ta IIIC Txx°C Da/Db	FMR50	XA00684F	XA00684F	XA00684F	XA00692F	XA01236F
B4	ATEX:II 1/2 G Ex ia IIC T6-T1 Ga/Gb ATEX: II 1/2 G Ex d [ia] IIC T6-T1 Ga/Gb	FMR50	XA00681F	XA00681F	XA01234F	XA00689F	-
CB	CSA C/US XP Cl.I Div.1 Gr.A-D	FMR50	XA01112F	XA01112F	XA01112F	XA01114F	-
CC	CSA C/US XP Cl.I Div.1 Gr.A-D	FMR50	XA01113F	XA01113F	XA01113F	XA01115F	XA01113F

			Feature 020 "Power Supply; Output"				
Feature 010	**Approval**	**Available for**	**A** [1]	**B** [2]	**C** [3]	**E** [4]**/G** [5]	**K** [6]**/L** [7]
C2	CSA C/US IS Cl.I,II,III Div.1 Gr.A-G, NI Cl.1 Div. 2, Ex ia	FMR50	XA01112F	XA01112F	XA01112F	XA01114F	-
C3	CSA C/US XP Cl.I,II,III Div.1 Gr.A-G, NI Cl.1 Div.2, Ex d	FMR50	XA01113F	XA01113F	XA01113F	XA01115F	XA01113F
FA	FM IS Cl.I Div.1 Gr.A-D	FMR50	XA01116F	XA01116F	XA01116F	XA01118F	-
FB	FM IS Cl.I,II,III Div.1 Gr.A-G, AEx ia, NI Cl.1 Div.2	FMR50	XA01116F	XA01116F	XA01116F	XA01118F	-
FC	FM XP Cl.I Div.1 Gr.A-D	FMR50	XA01117F	XA01117F	XA01117F	XA01119F	XA01117F
FD	FM XP Cl.I,II,III Div.1 Gr.A-G, AEx d, NI Cl.1 Div.2	FMR50	XA01117F	XA01117F	XA01117F	XA01119F	XA01117F
IA	IECEx: Ex ia IIC T6-T1 Ga	FMR50	XA00677F	XA01224F	XA001225	XA00685F	-
IB	IECEx: Ex ia IIC T6-T1 Ga/Gb	FMR50	XA00677F	XA01224F	XA001225	XA00685F	-
IC	IECEx: Ex d [ia] IIC T6-T1 Ga/Gb	FMR50	XA00680F	XA00680F	XA01232F	XA00688F	XA01233F
IG	IECEx: Ex nA IIC T6-T1 Gc	FMR50	XA00679F	XA01229F	XA01230F	XA00687F	XA01231F
IH	IECEx: Ex ic IIC T6-T1 Gc	FMR50	XA00679F	XA01229F	XA01230F	XA00687F	XA01231F
I2	IECEx: Ex ia IIC T6-T1 Ga/Gb IECEx: Ex ia IIIC Txx°C Da/Db	FMR50	XA00683F	XA00683F	XA01235F	XA00691F	-
I3	IECEx: Ex d [ia] IIC T6-T1 Ga/Gb IEXEx: Ex ta IIIC Txx°C Da/Db	FMR50	XA00684F	XA00684F	XA00684F	XA00692F	XA01236F
I4	IECEx: Ex ia IIC T6-T1 Ga/Gb IECEx: Ex d [ia] IIC T6-T1 Ga/Gb	FMR50	XA00681F	XA00681F	XA01234F	XA00689F	-
KA	KC Ex ia IIC T6 Ga	FMR50	XA01045F	XA01045F	XA01045F	XA01047F	-
KB	KC Ex ia IIC T6 Ga/Gb	FMR50	XA01045F	XA01045F	XA01045F	XA01047F	-
KC	KC Ex d[ia] IIC T6	FMR50	XA01046F	XA01046F	XA01046F	XA01048F	XA01046F
MA	INMETRO: Ex ia IIC T6 Ga	FMR50	XA01286F	XA01287F	XA01288F	XA01296F	-
MC	INMETRO: Ex d[ia] IIC T6 Ga/Gb	FMR50	XA01292F	XA01292F	XA01293F	XA01298F	XA01294F
MH	INMETRO: Ex ic IIC T6 Gc	FMR50	XA01289F	XA01290F	XA01291F	XA01297F	-
NA	NEPSI Ex ia IIC T6 Ga	FMR50	XA01199F	XA01199F	XA01199F	XA01208F	-
NB	NEPSI Ex ia IIC T6 Ga/Gb	FMR50	XA01199F	XA01199F	XA01199F	XA01208F	-
NC	NEPSI Ex d[ia] IIC T6 Ga/Gb	FMR50	XA01202F	XA01202F	XA01202F	XA01211F	XA01202F
NG	NEPSI Ex nA II T6 Gc	FMR50	XA01201F	XA01201F	XA01201F	XA01210F	XA01201F
NH	NEPSI Ex ic IIC T6 Gc	FMR50	XA01201F	XA01201F	XA01201F	XA01210F	XA01201F
N2	NEPSI Ex ia IIC T6 Ga/Gb, Ex iaD 20/21 T85... 90oC	FMR50	XA01205F	XA01205F	XA01205F	XA01214F	-
N3	NEPSI Ex d[ia] IIC T6 Ga/Gb, DIP A20/21 T85...90oC IP66	FMR50	XA01206F	XA01206F	XA01206F	XA01215F	XA01206F
8A	FM/CSA IS+XP Cl.I,II,III Div.1 Gr.A-G	FMR50	▪ XA01112F ▪ XA01113F ▪ XA01116F ▪ XA01117F	▪ XA01112F ▪ XA01113F ▪ XA01116F ▪ XA01117F	▪ XA01112F ▪ XA01113F ▪ XA01116F ▪ XA01117F	▪ XA01114F ▪ XA01115F ▪ XA01118F ▪ XA01119F	-

1) 2-wire; 4-20mA HART
2) 2-wire; 4-20mA HART, switch output
3) 2-wire; 4-20mA HART, 4-20mA
4) 2-wire; FOUNDATION Fieldbus, switch output
5) 2-wire; PROFIBUS PA, switch output
6) 4-wire 90-253VAC; 4-20mA HART
7) 4-wire 10.4-48VDC; 4-20mA HART

For certified devices the relevant Safety Instructions (XA) are indicated on the nameplate.

If the device is prepared for the remote display FHX50 (product structure: feature 030: Display, Operation", option L or M), the Ex marking of some certificates changes according to the following table [15]:

Feature 010 ("Approval")	Feature 030 ("Display, Operation")	Ex marking
BG	L or M	ATEX II 3G Ex nA [ia Ga] IIC T6 Gc
BH	L or M	ATEX II 3G Ex ic [ia Ga] IIC T6 Gc
B3	L or M	ATEX II 1/2G Ex d [ia] IIC T6 Ga/Gb, ATEX II 1/2D Ex ta [ia Db] IIIC Txx°C Da/Db
IG	L or M	IECEx Ex nA [ia Ga] IIC T6 Gc
IH	L or M	IECEx Ex ic [ia Ga] IIC T6 Gc
I3	L or M	IECEx Ex d [ia] IIC T6 Ga/Gb, IECEx Ex ta [ia Db] IIIC Txx°C Da/Db
MH	L or M	Ex ic [ia Ga] IIC T6 Gc
NG	L or M	NEPSI Ex nA [ia Ga] IIC T6-T1 Gc
NH	L or M	NEPSI Ex ic [ia Ga] IIC T6-T1 Gc
N3	L or M	NEPSI Ex d [ia] IIC T6-T1 Ga/Gb, DIP A20/21 [ia D] TA, Txx°C IP6X

15) The marking of certificates not mentioned in this table are not affected by the FHX50.

Registered trademarks

HART®
Registered trademark of the HART Communication Foundation, Austin, USA

PROFIBUS®
Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

FOUNDATION™ Fieldbus
Registered trademark of the Fieldbus Foundation, Austin, Texas, USA

KALREZ®, VITON®
Registered trademark of DuPont Performance Elastomers L.L.C., Wilmington, USA

TEFLON®
Registered trademark of E.I. DuPont de Nemours & Co., Wilmington, USA

TRI CLAMP®
Registered trademark of Alfa Laval Inc., Kenosha, USA

Patents

This product may be protected by at least one of the following patents.

Further patents are pending.

US Patents	EP Patents
5.948.979	882 957
6.087.978	955 527
6.140.940	-
6.155.112	834 722
-	882 955
6.266.022	1 083 413
6.295.874	210 567
6.512.358	1 301 914
6.606.904	-
6.640.628	-
6.679.115	1 360 523
-	1 389 337
6.779.397	-
7.201.050	-
7.412.337	-
7.552.634	-
7.730.760	-
7.819.002	-
-	1 774 616
7.966.141	-
8.040.274	-
8.049.371	-



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Endress+Hauser

People for Process Automation

Product data sheet
Characteristics

XS618B1MAL2
inductive sensor XS6 M18 - L61.4mm - brass - Sn8mm - 24..240VAC/DC - cable 2m



Main

Range of product	OsiSense XS
Series name	General purpose
Sensor type	Inductive proximity sensor
Product specific application	-
Sensor name	XS6
Sensor design	Cylindrical M18
Size	61.4 mm
Body type	Fixed
Detector flush mounting acceptance	Flush mountable
Material	Metal
Type of output signal	Discrete
Wiring technique	2-wire
[Sd] sensing range	> 4...8 mm
[Sn] nominal sensing distance	8 mm
Discrete output function	1 NO
Output circuit type	AC/DC
Electrical connection	Cable
Cable length	2 m
[Us] rated supply voltage	24...240 V AC/DC (50/60 Hz)
Switching capacity in mA	5...300 mA AC 5...200 mA DC
IP degree of protection	IP68 double insulation conforming to IEC 60529 IP69 K conforming to DIN 40050

Complementary

ISO thread	M18 x 1
Detection face	Frontal
Front material	PPS
Enclosure material	Nickel plated brass
Operating zone	0...6.4 mm
Differential travel	1...15% of Sr
Cable composition	2 x 0.34 mm²
Wire insulation material	PvR
Status LED	1 LED (yellow) for output state
Supply voltage limits	20...264 V AC/DC
Residual current	<= 0.8 mA, open state
Switching frequency	<= 25 Hz AC <= 1000 Hz DC
Voltage drop	<= 5.5 V, closed state
Delay first up	<= 25 ms
Delay response	<= 0.5 ms
Delay recovery	<= 0.5 ms
Marking	CE
Threaded length	51 mm
Length	60 mm

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein.
This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications.
It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof.
Neither Schneider Electric Industries SAS nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein.

CAD overall height	18 mm
CAD overall depth	60 mm
Product weight	0.12 kg

Environment

Product certifications	CSA UL
Ambient air temperature for operation	-25...70 °C
Ambient air temperature for storage	-40...85 °C
Vibration resistance	25 gn, amplitude: +/- 2 mm (f = 10...55 Hz) conforming to IEC 60068-2-6
Shock resistance	50 gn (duration = 11 ms) conforming to IEC 60068-2-27

Technical Documentation

PDH0604

Optim TEFC | AEHH8N

Date: June 10, 2022

TECO Westinghouse
MOTORS (CANADA) INC.

Date: June 10, 2022

Dimensional Drawing

Catalogue	Type	HP	RPM	Voltage	Hz	Frame Size
PDH0604	AEHH8N	60	1800	230 / 460	60	364T

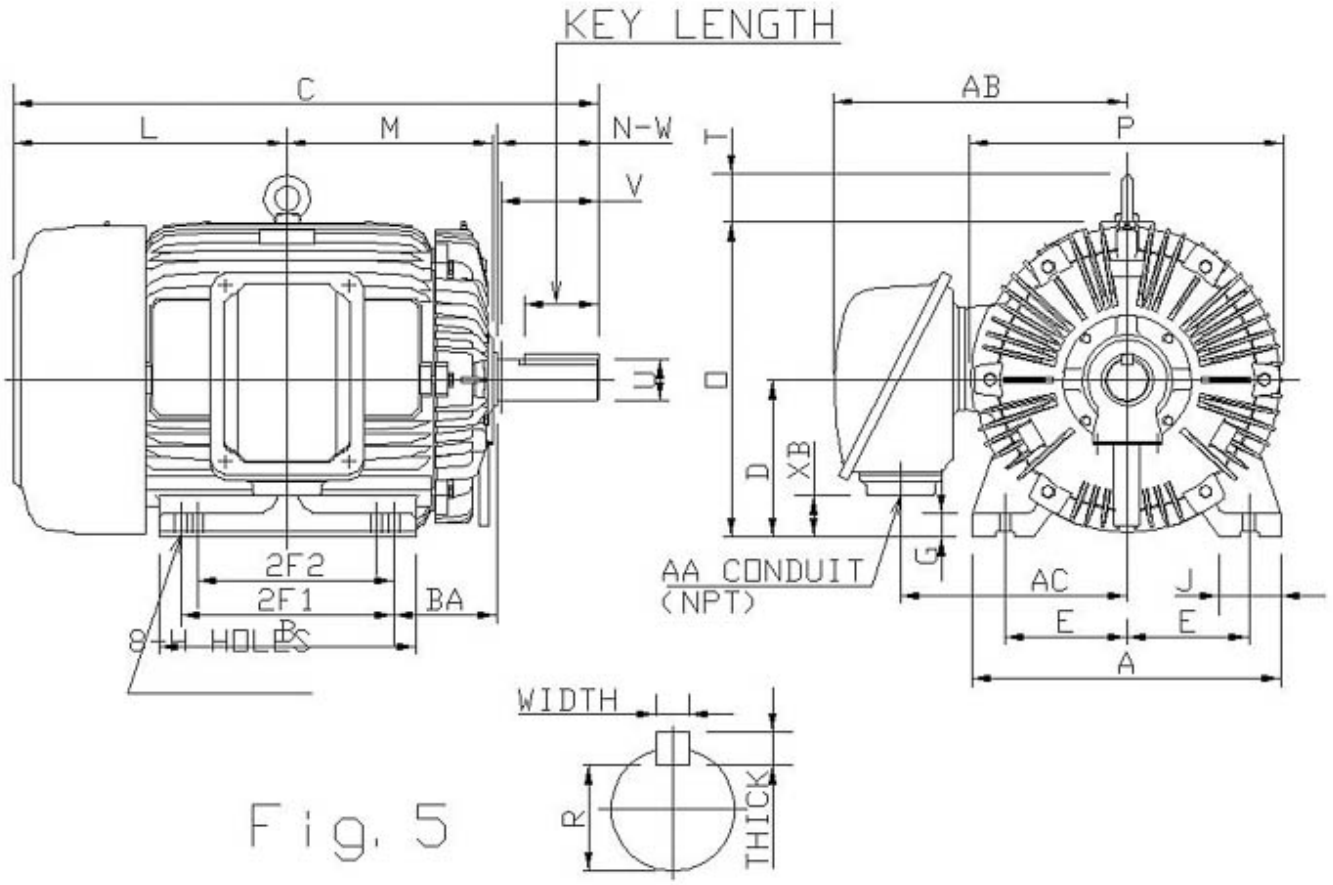


Fig. 5

Mounting					A	B	C	CL1	CL2	D	G
E	2F1	2F2	H	BA							
7	11.25		0.67	5.88	17.7	13.75	32.57			9	1.3

J	K	L	M	O	P	T
3.55		15.19	11.29	18.02	18.03	2.76

Terminal Housing			
AA	AB	AC	XB
3	18.33	13.78	2.39

Shaft Extension			Key			Keyseat
N-W	U	V	Width	Thick	Length	R
5.88	2.375	5.75	0.625	0.625	4.28	2.021

Bearings		Weight Lbs	Drive Method	Dimensions
DE	NDE			
6313	6213	777	Direct Coupling / Belt Drive	Inches

TECO Westinghouse MOTORS (CANADA) INC.

Date: June 10, 2022

Technical Data Sheet

Motor Type: AEHH8N	Catalogue No: PDH0604

Nameplate Information

HP	Pole	RPM	Frame	Voltage	Hz	Phase
60	4	1775	364T	230 / 460	60	3
Enclosure	Ins. Class	Service Factor	Time Rating	NEMA Design	Rated Amb.	Rated Altitude
TEFC	F	1.15	Continuous	C	-40 to 40 °C	<1000 m

Typical Performance

Efficiency (%)				Power Factor (%)		
Full Load		3/4 Load	1/2 Load	Full Load	3/4 Load	1/2 Load
Nom.	Min.					
95	94.1	95	94.5	86.5	83	75.5

Torque				Current (A)		
Full Load (lb-ft)	Locked Rotor (% FLT)	Pull Up (% FLT)	Break Down (% FLT)	No Load	Full Load	Locked Rotor
177.5	200	155	240	37.6 / 18.8	136.8 / 68.4	870 / 435

NEMA KVA Code	Inertia (WR^2)			Safe Stall Time (s)		Noise Level Sound Press. dB(A)
	Rotor ($lb\text{-}ft^2$)	NEMA Load ($lb\text{-}ft^2$)	Max. Allowable ($lb\text{-}ft^2$)	Cold	Hot	
G	12.23	275	486.27	17	12	79

VFD Duty Information

Max HP	Current (A)	Speed Range		VFD		S.F.
		Constant Torque	Variable Torque	Carrier Hz	Type	
60	68.37	6-60Hz	3-60Hz	3-6kHz	VPWM or CPWM	1

Hazardous Locations Information

CSA Certified	
Class I, Div 2, Groups B, C & D Class I, Zone 2, Groups IIB+H2, IIB & IIA	
Temp Code (Sinewave / VFD)	T3 / T3

Additional Certifications

Other Certification

Additional Information

Bearings		Approx. Weight
DE	NDE	lbs
6313	6213	777

TECO Westinghouse MOTORS (CANADA) INC.	
	Date: June 10, 2022

Nameplate Drawing

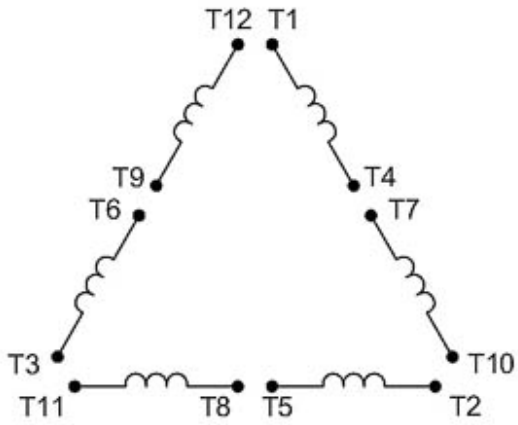
Optim TEFC

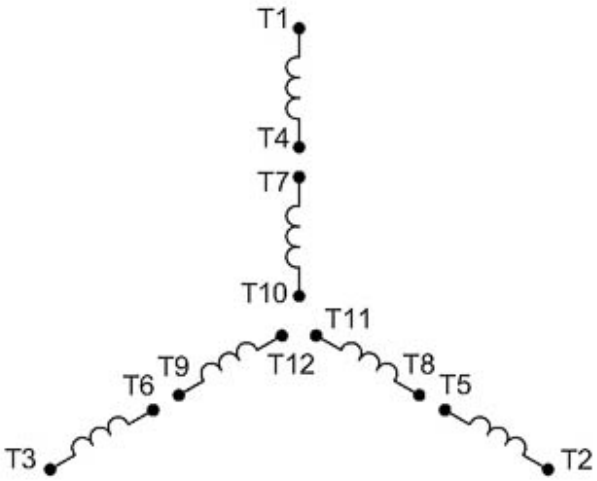
TYPE	AEHH8N	CAT. NO.	PDH0604		
OUTPUT	60 HP 44.76 kW	FRAME	364T	TEFC	
R.P.M.	1775	POLE	4	INS.	F
VOLTS	230 / 460	PHASE	3	Hz	60
AMPS	136.8 / 68.4	CODE	G	S.F.	1.15
AMBIENT	40 °C	NOM. EFF. 95		MIN. EFF. 94.1	
BEARINGS	6313 / 6213			RATING Cont.	

SER. NO.	TBD	DESIGN	C	WT. 777 LBS

PWM VFD DUTY	VT	CT	CP	S.F.
	3-60Hz	6-60Hz	60-90Hz	1

Connection Diagram





12 LEAD DUAL VOLTAGE WYE/DELTA						
VOLTAGE	CONNECTION		L1	L2	L3	JOIN
HIGH	START	WYE	1	2	3	4&7,5&8,6&9 10&11&12
	RUN	DELTA	1,12	2,10	3,11	4&7,5&8,6&9
LOW	START	2 WYE	1,7	2,8	3,9	4&5&6 10&11&12
	RUN	2 DELTA	1,6,7 12	2,4,8 10	3,5,9 11	

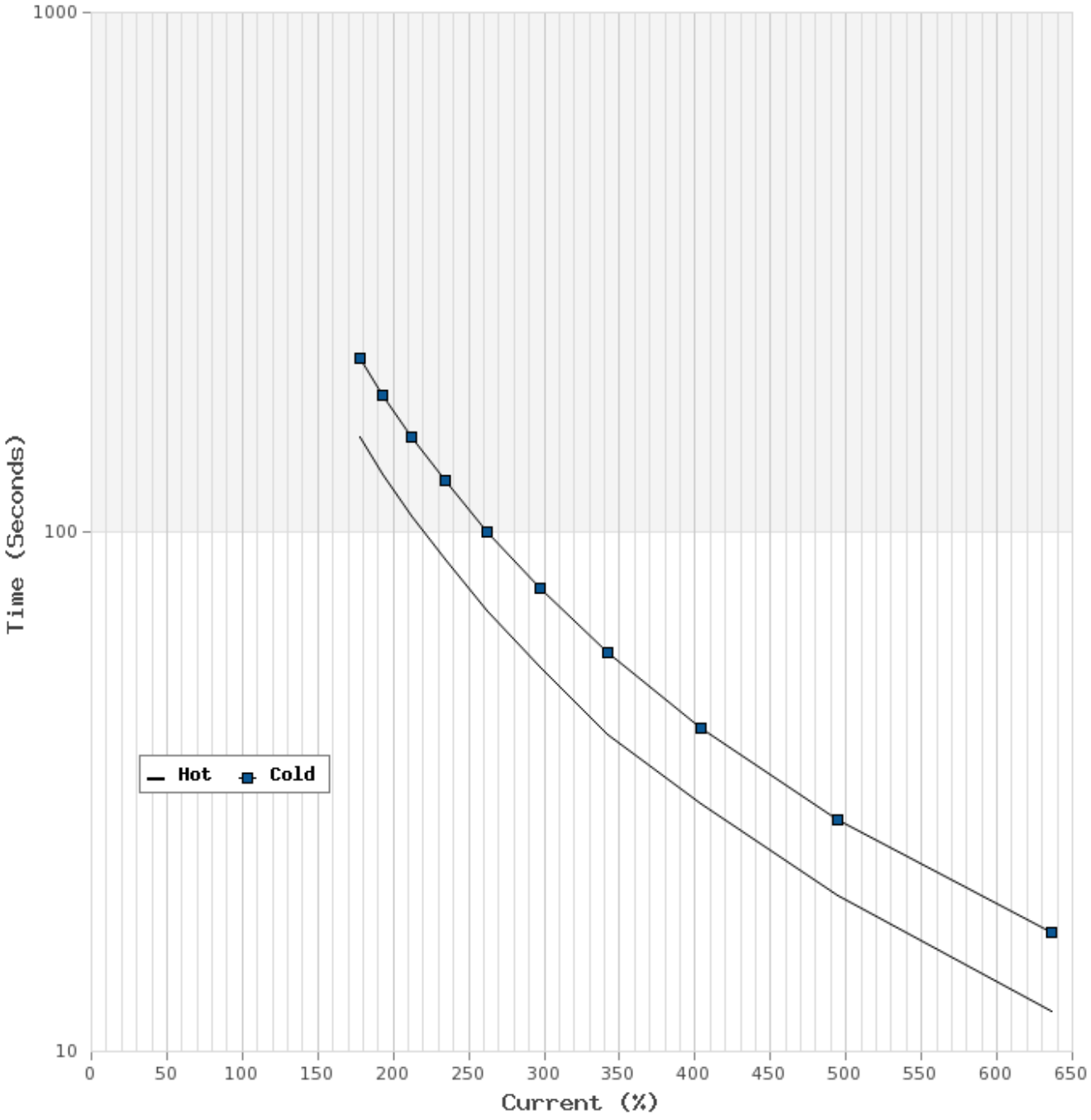
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TECO Westinghouse MOTORS (CANADA) INC.	
	Date: June 10, 2022

Thermal Limit Curves

Motor Type: AEHH8N	Catalogue No: PDH0604	Family: Optim TEFC

HP	60	Safe Stall Time		Full Load A	136.8 / 68.4 A
Voltage	230 / 460V 60Hz	Hot	12 s	% Inrush	636 / 636 %
RPM	1800	Cold	17 s	Locked Rotor A	870 / 435 A

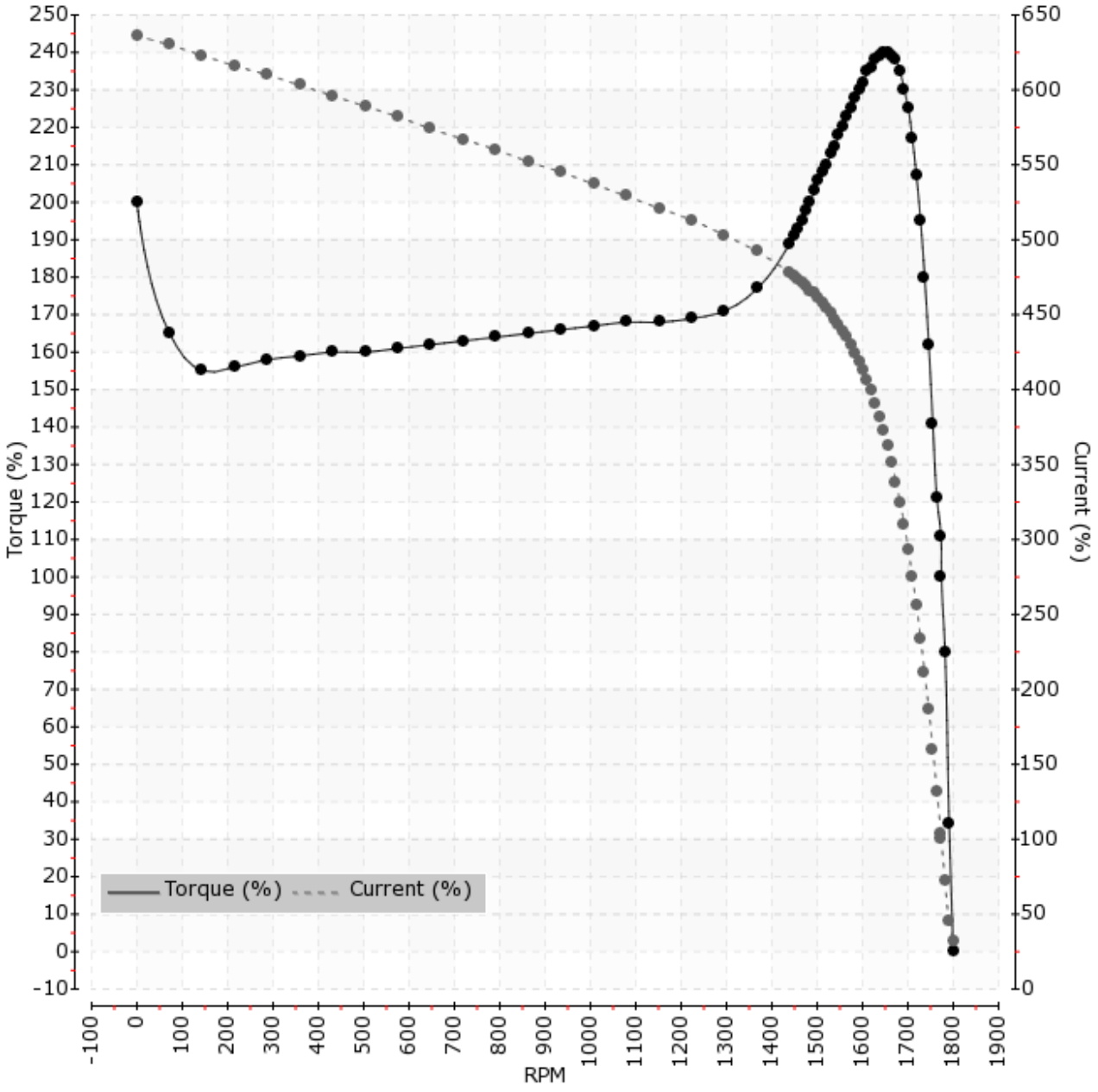


TECO Westinghouse MOTORS (CANADA) INC.	
	Date: June 10, 2022

T-N and I-N Curves

Motor Type: AEHH8N	Catalogue No: PDH0604	Family: Optim TEFC

HP	60	Full Load T	177.5 lb-ft	Full Load A	136.8 / 68.4 A
Voltage	230 / 460V 60Hz	Locked Rotor T	200 %	Locked Rotor A	870.0 / 435.0 A
RPM	1800	Pull Up T	155 %	Break Down T	240 %



TECO Westinghouse MOTORS (CANADA) INC.	
	Date: June 1, 2022

Process Blowers:
Tag: 16-B-401-A/B/C

Technical Documentation

PDH1504

Optim TEFC | AEHH8N

Date: June 1, 2022

TECO Westinghouse
MOTORS (CANADA) INC.

Date: June 1, 2022

Dimensional Drawing

Catalogue	Type	HP	RPM	Voltage	Hz	Frame Size
PDH1504	AEHH8N	150	1800	460	60	445T

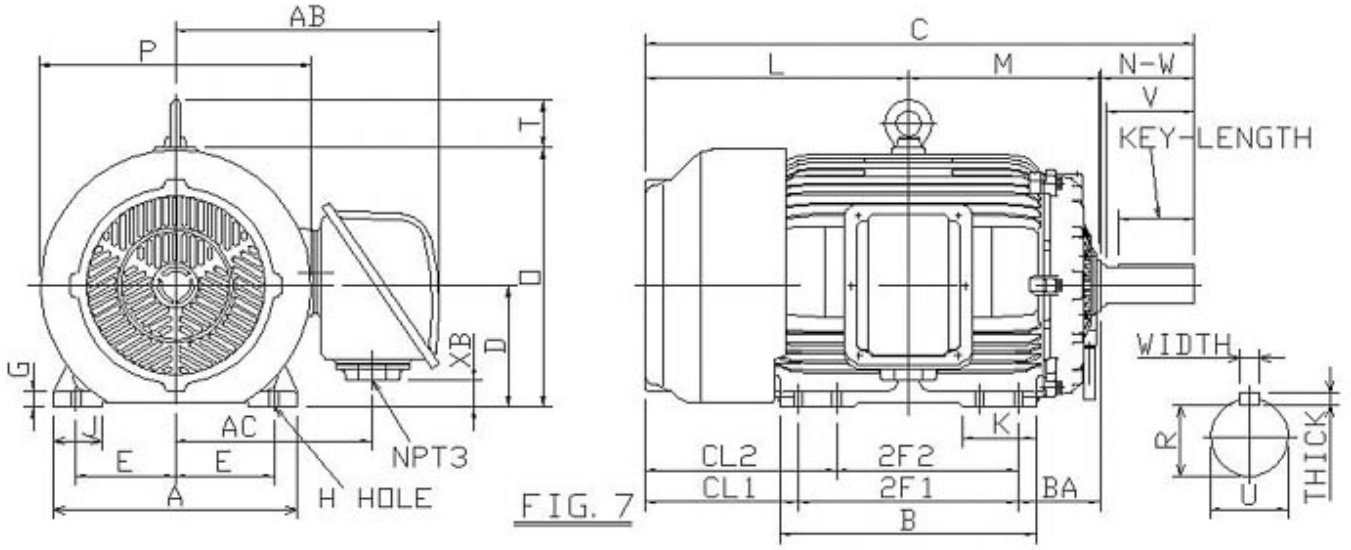


FIG. 7

Mounting					A	B	C	CL1	CL2	D	G
E	2F1	2F2	H	BA							
9	16.5	14.5	0.81	7.5	22.05	17.5	46.4			11	1.4

J	K	L	M	O	P	T
4.35		22.15	15.4	23.6	24.76	4.33

Terminal Housing			
AA	AB	AC	XB
3	24.02	17.91	2.4

Shaft Extension			Key			Keyseat
N-W	U	V	Width	Thick	Length	R
8.5	3.375	8	0.875	0.875	6.91	2.88

Bearings		Weight Lbs	Drive Method	Dimensions
DE	NDE			
6318	6316	1703	Direct Coupling / Belt Drive	Inches

TECO Westinghouse MOTORS (CANADA) INC.	
	Date: June 1, 2022

Technical Data Sheet

Motor Type: AEHH8N	Catalogue No: PDH1504

Nameplate Information

HP	Pole	RPM	Frame	Voltage	Hz	Phase
150	4	1783	445T	460	60	3
Enclosure	Ins. Class	Service Factor	Time Rating	NEMA Design	Rated Amb.	Rated Altitude
TEFC	F	1.15	Continuous	B	-40 to 40 °C	<1000 m

Typical Performance

Efficiency (%)				Power Factor (%)		
Full Load		3/4 Load	1/2 Load	Full Load	3/4 Load	1/2 Load
Nom.	Min.					
95.8	95	95.4	94.5	85	83	78

Torque				Current (A)		
Full Load (lb-ft)	Locked Rotor (% FLT)	Pull Up (% FLT)	Break Down (% FLT)	No Load	Full Load	Locked Rotor
441.7	130	100	220	52.1	172.5	1085

NEMA KVA Code	Inertia (WR^2)			Safe Stall Time (s)		Noise Level Sound Press. dB(A)
	Rotor ($lb\text{-}ft^2$)	NEMA Load ($lb\text{-}ft^2$)	Max. Allowable ($lb\text{-}ft^2$)	Cold	Hot	
G	52	640	933.36	20	15	81

VFD Duty Information

Max HP	Current (A)	Speed Range		VFD		S.F.
		Constant Torque	Variable Torque	Carrier Hz	Type	
150	172.48	12-60Hz	3-60Hz	3-6kHz	VPWM or CPWM	1

Hazardous Locations Information

CSA Certified	
Class I, Div 2, Groups B, C & D Class I, Zone 2, Groups IIB+H2, IIB & IIA	
Temp Code (Sinewave / VFD)	T3 / T3

Additional Certifications

Other Certification
Class II, Div 2, Groups F & G

Additional Information

Bearings		Approx. Weight
DE	NDE	lbs
6318	6316	1703

TECO Westinghouse MOTORS (CANADA) INC.	
	Date: June 1, 2022

Nameplate Drawing

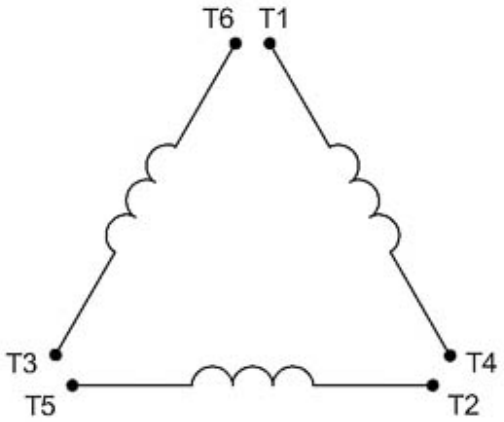
Optim TEFC

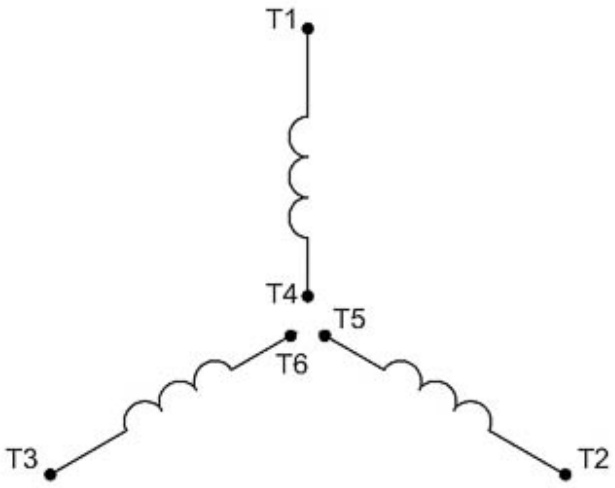
TYPE	AEHH8N	CAT. NO.	PDH1504		
OUTPUT	150 HP 111.9 kW	FRAME	445T	TEFC	
R.P.M.	1783	POLE	4	INS.	F
VOLTS	460	PHASE	3	Hz	60
AMPS	172.5	CODE	G	S.F.	1.15
AMBIENT	40 °C	NOM. EFF. 95.8		MIN. EFF. 95	
BEARINGS	6318 / 6316			RATING Cont.	

SER. NO.	TBD	DESIGN	B	WT. 1703 LBS

PWM VFD DUTY	VT	CT	CP	S.F.
	3-60Hz	12-60Hz	60-90Hz	1

Connection Diagram





6 LEAD SINGLE VOLTAGE WYE/DELTA					
CONNECTION		L1	L2	L3	JOIN
START	WYE	1	2	3	4&5&6
RUN	DELTA	1,6	2,4	3,5	-

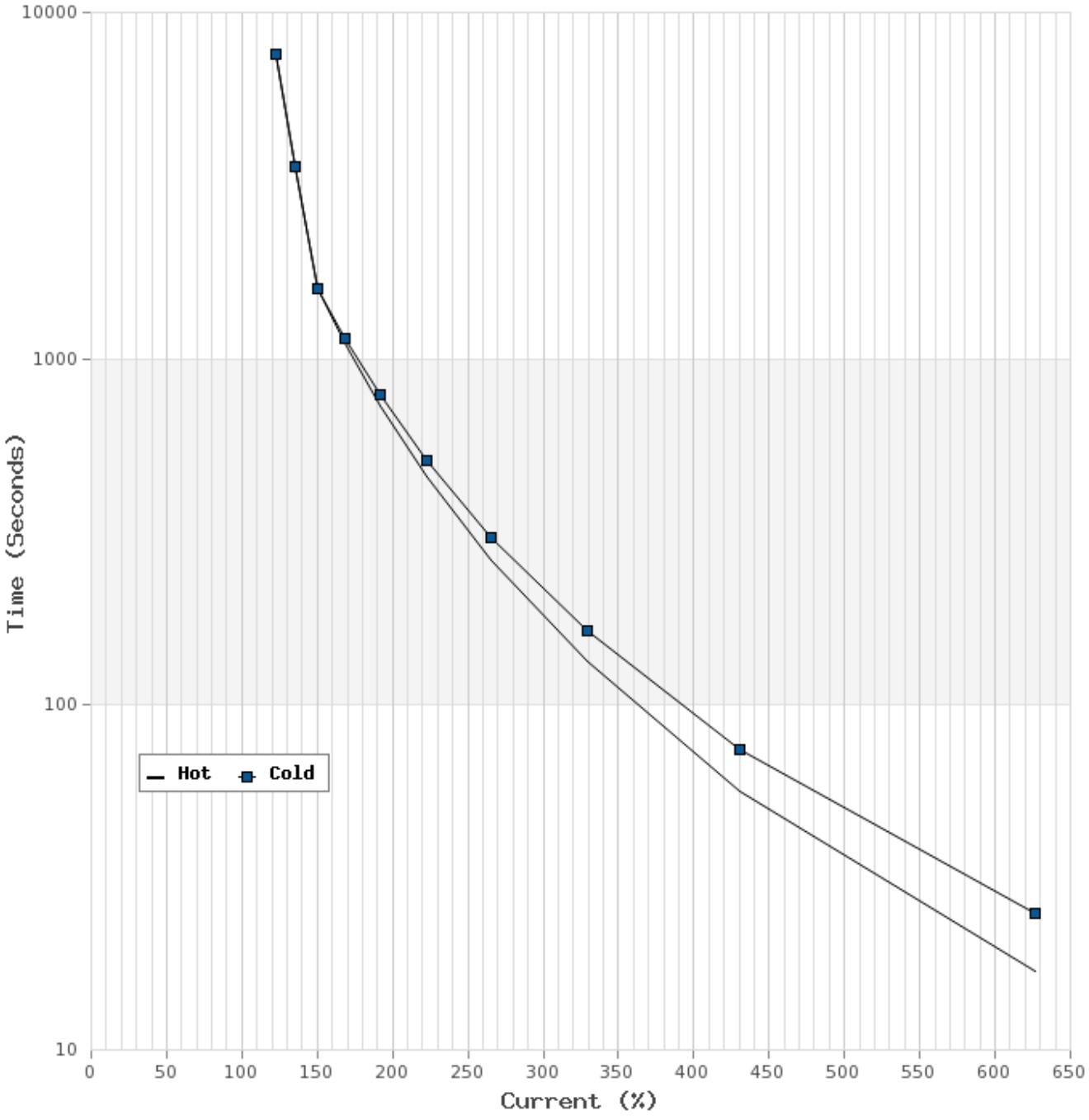
WD_6YD

TECO Westinghouse MOTORS (CANADA) INC.	
	Date: June 1, 2022

Thermal Limit Curves

Motor Type: AEHH8N	Catalogue No: PDH1504	Family: Optim TEFC

HP	150	Safe Stall Time		Full Load A	172.5 A
Voltage	460V 60Hz	Hot	15 s	% Inrush	629 %
RPM	1800	Cold	20 s	Locked Rotor A	1085 A

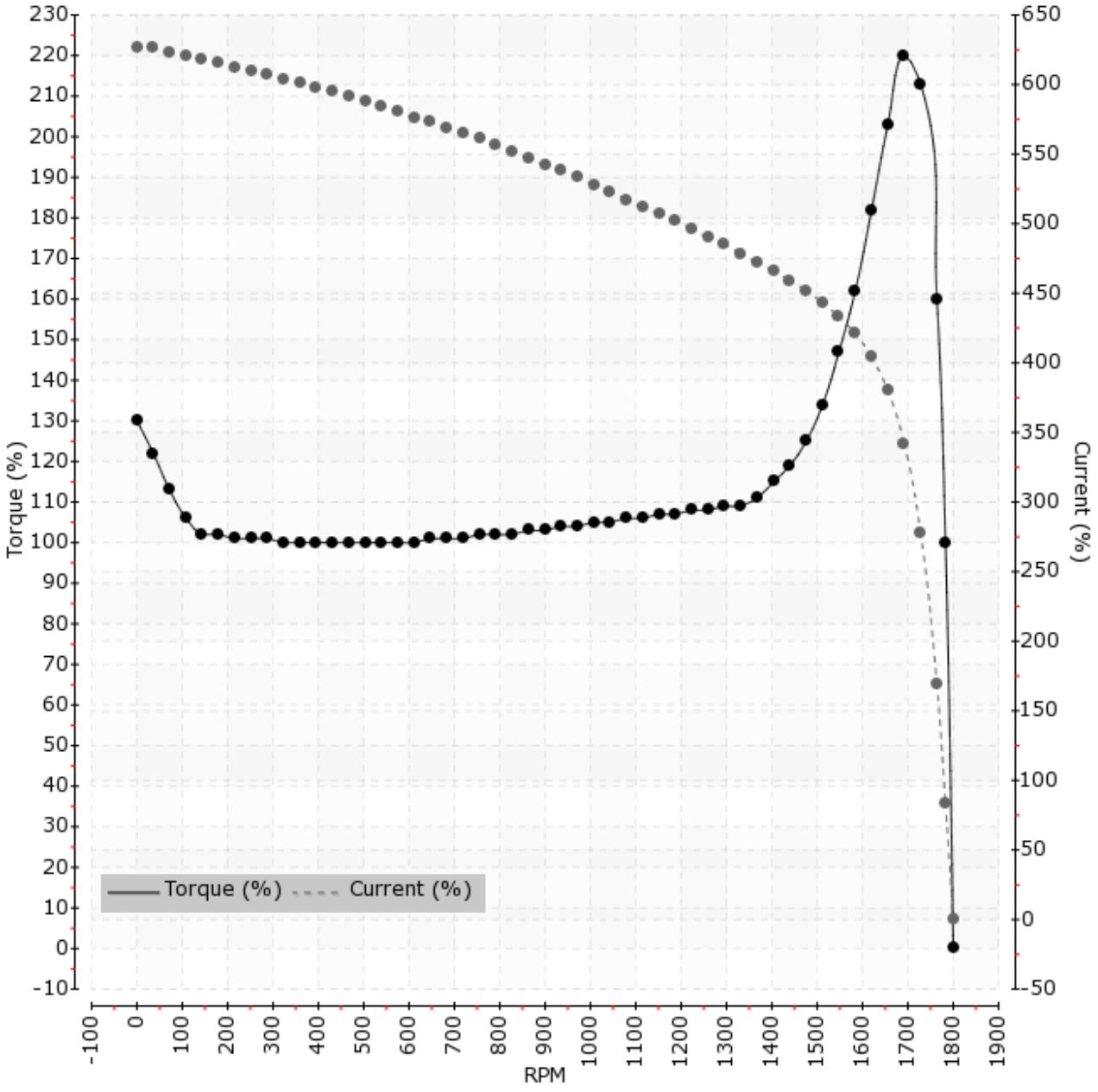


TECO Westinghouse MOTORS (CANADA) INC.	
	Date: June 1, 2022

T-N and I-N Curves

Motor Type: AEHH8N	Catalogue No: PDH1504	Family: Optim TEFC

HP	150	Full Load T	441.7 lb-ft	Full Load A	172.5 A
Voltage	460V 60Hz	Locked Rotor T	130 %	Locked Rotor A	1085.0 A
RPM	1800	Pull Up T	100 %	Break Down T	220 %



16-FCV-301-1/2/3/4

January 23, 2024

APPROVAL DRAWINGS

PROJECT NAME

360077 - V-Port Control

PURCHASE ORDER

VALVE TYPE

V-Port Ball Valve (VPB)

CUSTOMER:	VEOLIA WATER TECHNOLOGIES & 3239 DUNDAS STREET W. OAKVILLE ON L6M 4B2 Canada
LOCAL SUPPLIER:	Floval Equipment Ltd 250 Rayette Road, Unit 1 Concord Ontario L4K 2G6 Canada
MANUFACTURER:	DeZURIK Canada 385 Franklin Boulevard Cambridge ON N1R 5V5 Canada

TABLE OF CONTENTS

A Data Sheet is included for each line item on the purchase order.
Document numbers are listed at the bottom of the Data Sheet.
Any one drawing may apply to more than one item number.
All documents are assembled in alpha/numeric order within each section.

Data Sheets
Installation Drawing
Materials Of Construction
Recommended Long & Short Term Storage Procedures

Submittal Data Sheet
Date:January 23, 2024

VEOLIA WATER TECHNOLOGIES &
3239 DUNDAS STREET W.
OAKVILLE ON L6M 4B2
Canada

PROJ. NAME 360077 - V-Port Control Valves,

LINE #	Cust LINE #	QTY	PART NO.	DESCRIPTION
1		4		

Style	V-Port Ball Valve (VPB)
Size	16 Inch (400mm)
End Connection	Flanged Drilling; Class 150, ISA 75.08.02 and IEC 534-3-2F-F
Body Material	317 Stainless Steel
Packing	PTFE Chevron; Temperature to 500° F. (250° C.)
Ball Material	317 SST; Heat Treated; Electroless Nickel Overlay to 700 Degree F.
Shaft Material	2205 Duplex Stainless Steel
Seat	Rigid 317 Stainless Steel; Heat Treated; Electroless Nickel Overlay; Temperature to 450 Degree F.
Bushing	317 SST Wire Mesh Encapsulated in PTFE Liner to 500 Degree F.
Coating	Exterior: 4 mils minimum of Blue Epoxy DeZURIK with Standard (SP10) surface prep
Actuator	PowerRac Cylinder; 8 In Dia

Valve Weight (Approx)	777 lbs/ 353 kgs
Temperature Range	to 450 Degrees F.

RELATED DOCUMENTS

A41883: DWG INST VPB F1L/F1S PR-R2A-PC 10-18"
A45453: DWG INST VAL VPB F1* ISO
A45077: DWG VALVE ASSY F VPB ISO
A37260: DWG ACT-CYL ASSY PR-R*-PC
A37259: DWG ACT CYL ASSY PNEU PR-PC*
A39819: DWG CONN PARTS PR/MG/DR/CMD/LT
D10268: IM ACT POWER RAC R1A/R2A
D10324: IM VALVE VPB

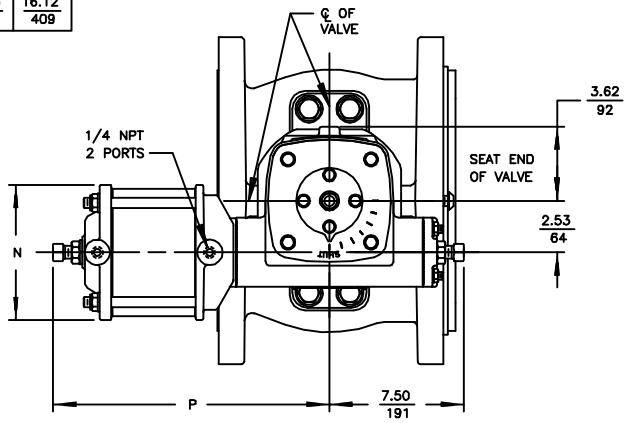
VALVE SIZE		DIMENSIONS INCHES / MILLIMETERS											
		A		B	C	D	E	F	G		H	J	K	
IN	MM	ISA	ASME										ISA	ASME
10	250	11.69 / 297	13.00 / 330	5.50 / 140	8.91 / 226	9.50 / 241	13.38 / 340	1.31 / 33	12	1.00 / 25	14.25 / 362	16.00 / 406	1.88 / 48	3.19 / 81
12	300	13.31 / 338	14.00 / 356	6.38 / 162	9.91 / 252	10.50 / 267	14.38 / 365	1.38 / 35	12	1.00 / 25	17.00 / 432	19.00 / 483	1.94 / 49	2.62 / 67
14	350	15.75 / 400		7.50 / 191	10.86 / 276	11.47 / 291	15.34 / 390	1.50 / 38	12	1.12 / 28	18.75 / 476	21.00 / 533	2.31 / 59	
16	400	15.75 / 400		6.69 / 170	13.25 / 337	14.06 / 357	17.56 / 446	1.62 / 41	16	1.12 / 28	21.25 / 540	23.50 / 597	2.69 / 68	
18	450	18.00 / 457		7.62 / 194	14.44 / 367	15.25 / 387	18.75 / 476	1.75 / 44	16	1.25 / 32	22.75 / 578	25.75 / 654	2.81 / 71	

ACTUATOR NUMBER	DIMENSIONS INCHES / MILLIMETERS		
	M	N	P
PR_–R2_–PC6	3.38 / 86	6.62 / 168	16.00 / 406
PR_–R2_–PC8	4.81 / 122	10.25 / 260	16.12 / 409

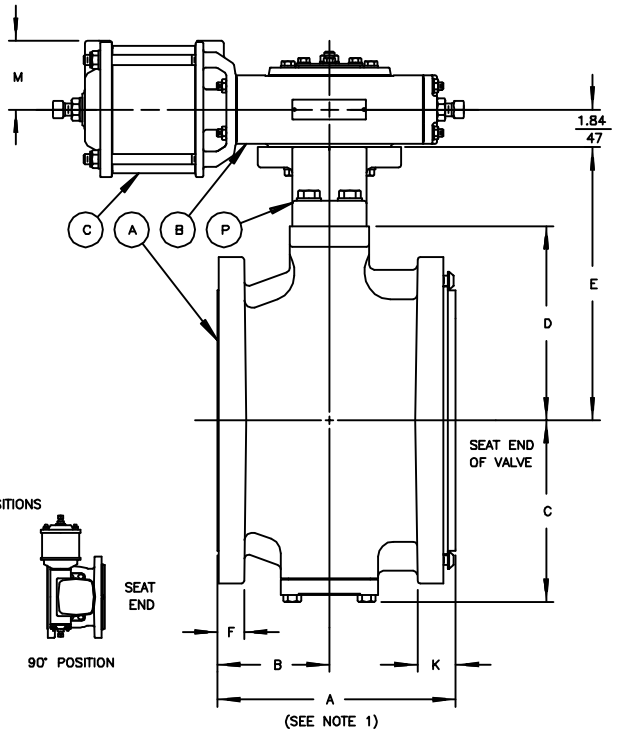
A	VALVE
B	ACTUATOR
C	CYLINDER
P	CONNECTING PARTS

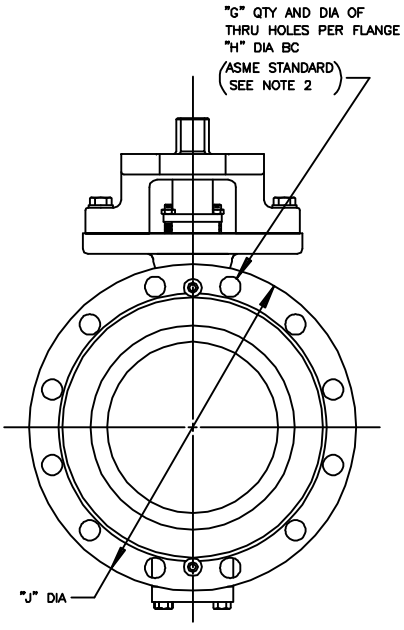
NOTE:

1. FACE TO FACE DIMENSIONS PER ASME STANDARD B16.10 (F1L) OR ISA STANDARD 75.08.02 (F1S).
2. SEE A40129 FOR NON–ASME FLANGE DRILLING.

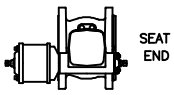


NOTICE
THIS DRAWING DOES NOT SHOW ACTUATOR ACCESSORIES. IF ACCESSORIES ARE REQUIRED, REFER TO THE APPROPRIATE ACCESSORY INSTALLATION DRAWING FOR DIMENSIONS AND OTHER RELATED INFORMATION.



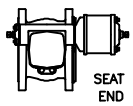


ACTUATOR MOUNTING POSITIONS

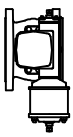


STANDARD POSITION SHOWN ON THIS DRAWING

90° POSITION



180° POSITION



270° POSITION

G	F	E	D	C	B	A
		60312	63393	52892	53177	59376
		02/01/16	04/25/17	11/27/96	04/18/95	05/28/93

DeZURIK
APCO | HILTON
www.dezurik.com

VPB V–PORT BALL VALVES (F1L)(F1S) SIZE 10–18 CL150 FLANGED POWERRACK PR_–R2_–PC_ PNEUMATIC CYLINDER ACTUATOR

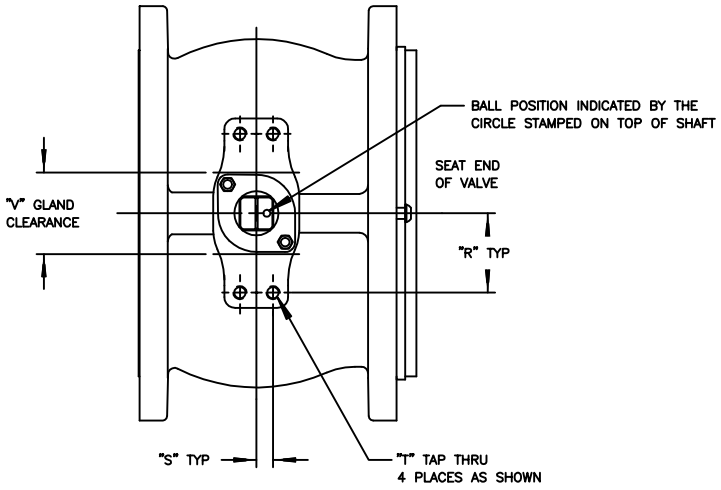
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C1	JS	FC	A41883
	CHECKED TNB	DATE 01–28–93	

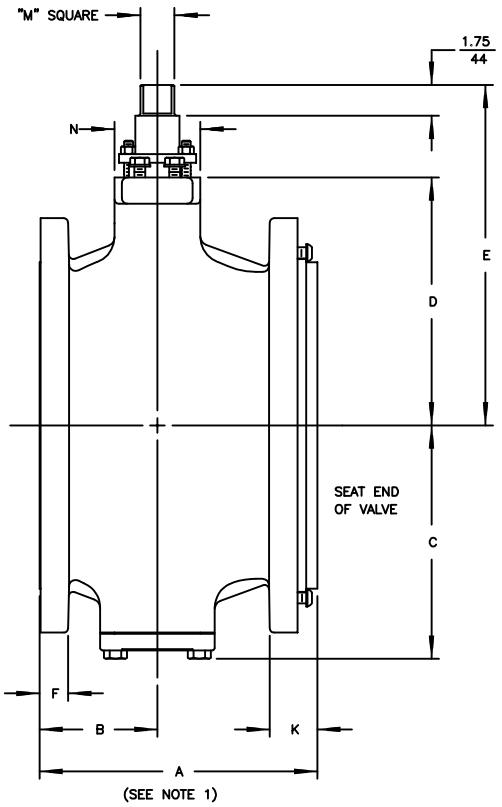
VALVE SIZE	DIMENSIONS INCHES / MILLIMETERS															
	A		B	C	D	E	F	G		H	J	K		L	M	
	ISA	ASME										ISA	ASME		INCHES	M/M
16	15.75 / 400		6.69 / 170	13.25 / 337	14.06 / 357	19.31 / 490	1.62 / 41	16	1.12 / 28	21.25 / 540	23.50 / 597	2.69 / 68		10.75 / 273	1.810 / 1.805	45.97 / 45.84
18	18.00 / 457		7.62 / 194	14.44 / 367	15.25 / 387	20.50 / 521	1.75 / 44	16	1.25 / 32	22.75 / 578	25.75 / 654	2.81 / 71		10.75 / 273	1.810 / 1.805	45.97 / 45.84
20	20.00 / 508		8.50 / 216	15.56 / 395	16.38 / 416	21.62 / 549	1.88 / 48	20	1.25 / 32	25.00 / 635	28.25 / 718	2.94 / 75		10.75 / 273	1.810 / 1.805	45.97 / 45.84

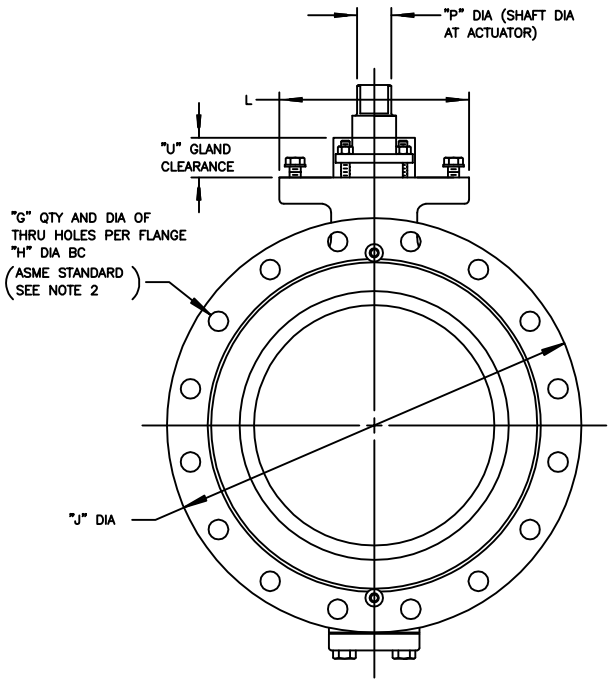
VALVE SIZE	DIMENSIONS INCHES / MILLIMETERS							
	N	P		R	S	T	U	V
		INCHES	M/M					
16	4.88 / 124	2.500 / 2.498	63.50 / 63.45	4.500 / 114.30	.938 / 23.83	5/8–11 UNC	2.25 / 57	4.62 / 117
18	4.88 / 124	2.500 / 2.498	63.50 / 63.45	4.500 / 114.30	.938 / 23.83	5/8–11 UNC	2.25 / 57	4.62 / 117
20	4.88 / 124	2.500 / 2.498	63.50 / 63.45	4.500 / 114.30	.938 / 23.83	5/8–11 UNC	2.25 / 57	4.62 / 117

NOTE:

1. FACE TO FACE DIMENSIONS PER ISA STANDARD 75.08.02 (F1S).
2. SEE A40129 FOR NON–ASME FLANGE DRILLING.







G	F	E	D	C	63393	53759	53227
					04/28/17	12/06/07	05/29/95

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VPB V–PORT BALL VALVES (F1S)
SIZE 16 – 20 CLASS 150 FLANGED

DOCT. CODE	DRAWN	APPROVED	
C1	CHECKED RJP	DATE 02/14/95	A45453

Materials Of Construction

DRAWING(S): A45077(A00)
QUOTE:
DESCRIPTION: V

ITEM	MATERIAL
A01	STAINLESS STEEL, TYPE CG-8M, ASTM A351, CERTIFIED
A02	STAINLESS STEEL, TYPE CG-8M, ASTM A351, CERTIFIED, NICKEL PLATED, HEAT TREATED
A03	STAINLESS STEEL, TYPE CG-8M, ASTM A351, CERTIFIED
A04	STAINLESS STEEL, TYPE 18-8
A05	GRAPHITE
A06	STAINLESS STEEL, S31803, ASTM A479, CERTIFIED (ALLOY 2205)
A07	STAINLESS STEEL, TYPE 316
A08	STAINLESS STEEL, TYPE 316
A09	STAINLESS STEEL, TYPE CG-8M, ASTM A351, CERTIFIED
A10	PACKING, V-FLEX, VIRGIN TEFLON
A11	STAINLESS STEEL, TYPE 317, ASTM A240/A276, CERTIFIED
A12	TETRAFLUOROETHYLENE (TEFLON) WITH 317 STAINLESS STEEL BACKING
A13	ALLOY 20
A16	STAINLESS STEEL, TYPE 317, ASTM A240/A276 CERTIFIED, NICKEL PLATED, HEAT TREATED
A18	STAINLESS STEEL, S31803, ASTM A479, CERTIFIED (ALLOY 2205)
A19	TETRAFLUOROETHYLENE (TEFLON) WITH 317 STAINLESS STEEL BACKING
A20	TETRAFLUOROETHYLENE (TEFLON) WITH 317 STAINLESS STEEL BACKING
A21	GRAPHITE
A22	STAINLESS STEEL, TYPE CG-8M, ASTM A351, CERTIFIED
A23	STAINLESS STEEL, TYPE 316, ASTM A-193, GRADE B8M
A27	STAINLESS STEEL, TYPE 316
A28	STAINLESS STEEL, TYPE 316

A31	TETRAFLUOROETHYLENE (TEFLON) WITH FLOURO RUBBER (FKM) CORE
A32	STAINLESS STEEL 17-7 PH

DeZURIK
250 Riverside Avenue North
Sartell, MN 56377 USA
Ph: 320-259-2000

RECOMMENDED LONG & SHORT TERM STORAGE PROCEDURES

LONG TERM STORAGE (6 MONTHS +)

1. All valves shall be stored in the position in which they were shipped.

2. Valves shall be stored fully enclosed in a crate or on a skid. It is acceptable to store the valves uncrated but protected from any dirt, debris or UV exposure as long as the environmental conditions as described in item 3 are met. Any desiccant packages received with the original shipment should be replaced before putting valves into long term storage. Please follow your desiccant manufacturer's recommended usage of any desiccant based on the volume of the enclosed area.

3. Valves shall be stored in a well ventilated, clean, dry indoor facility on skids or raised racks with temperatures ranging from 35°F to 95°F (2°C to 35°C) with humidity levels not exceeding 50%.

4. If the above conditions cannot be met, valves shall be separately packaged inside sealed heavy duty plastic sheeting and a weather resistant enclosure, or a standard crate lined with moisture proof paper, to protect the valves from dirt, debris and UV exposure. Desiccant packages shall be used to control moisture both inside the enclosure and the sealed heavy duty plastic covering. Please follow your desiccant manufacturer's recommended usage of any desiccant based on the volume of the enclosed area.

5. Do not store valves next to operating electric motors or equipment which may emit ozone, which can cause deterioration of valve elastomers. Store in an environment with less than 0.1 ppm concentration, at least 25 feet from ozone emitting devices, with ventilation.

6. Valves with cylinder actuators and control valves which are stored for extended periods may be subject to cylinder blow-by caused by permanent distortion of any of the seals. Valves should be operated prior to installation and damaged seals replaced. If possible, it is recommended that cylinders be cycled every 4-6 months to maintain seals.

7. Valves with electric motor operators shall be stored in accordance with the individual motor manufacturer's recommended long term storage procedures.

8. All electrical components shall be visually inspected prior to valve installation.

SHORT TERM STORAGE (LESS THAN 6 MONTHS)

1. All valves shall be stored in the position in which they were shipped.

2. Valves shall be protected from dirt, debris, excessive moisture and UV exposure. Store at temperatures ranging from 35°F to 95°F (2°C to 35°C) with humidity levels not exceeding 50%.

Form 1454 Rev A
(Y67834 references this form)

info@dezurik.com
www.dezurik.com

Submersible Mixer Type ABS RW

RW 650 | 25.6” Propeller, Direct Drive, 12 Pole, 3-Phase, 60 Hz

Anoxic Tank Mixers:
Tag : 16-MX-211-1/2/3

Submersible Motor Specifications

Motor Design		NEMA design B, squirrel cage induction
Motor Type		Fully enclosed submersible, IP68 protection rating
Motor Efficiency Standard and Rating		IEC 60034-30
Motor Efficiency Test Protocol		IEC 60034-2-1
Insulation Material	**STD**	Class F, 155ºC (311ºF), copper windings
	OPT	Class H, 180ºC (356ºF), copper windings [3,4]
Motor Filling Medium		Air
Temperature Rise		Class B
Maximum Fluid Temperature		40ºC (104ºF) continuous
Motor Protection	**Thermal**	Normally closed bimetallic switch in each phase, connected in series, 140ºC (284ºF) +/- 5ºC (41ºF) opening temperature [4]
	Leakage	Moisture detection probe in seal sensing chamber, motor housing, and junction chamber (for use with appropriate relay)
Seal Sensing Chamber Filling Medium		Non-toxic, white mineral oil
Bearings	**Inner**	1 x Single row deep groove ball bearing, permanently lubricated, preloaded
	Outer	1 x Single row deep groove ball bearing, permanently lubricated
	L_{10} Life	>100,000 hours
Motor Starter Types		Suitable for use with direct-on-line (DOL), electronic soft starters, and PWM type Variable Frequency Drives [1]
Maximum Starts per Hour		10 evenly spaced w/ DOL and soft starters; N/A with PWM type VFDs
Inverter Duty Rating		Motors meet NEMA MG1, part 31 requirements
Maximum Submergence		20 meters (65 feet)
Available Voltages		208, 230, 460, 575
Voltage Tolerance from Rated		+/-10%
Agency Approvals	**STD**	CSA
	OPT	Factory Mutual (FM)
Explosion Proof Rating	**OPT**	NEC 500 Class 1, Division 1, Group C & D, Class T3C max surface temp



The picture above may differ from the actual product.
For illustrative purposes only.

[1] Output filters may be required on VFDs. See document **DS-E00-001** for details.
[3] Not applicable with optional FM version.
[4] Thermals are set to 160ºC (320ºC) when configured with the optional Class H insulation (for standard, non-explosion-proof version only).

Motor Ratings

Motor Model	Input Power (P1)	Rated Power Output (P2)	Nominal RPM	Rated Voltage	Full Load Amps	Locked Rotor Amps	NEMA Code Letter	NEMA Service Factor	Motor Efficiency at % Load			Power Factor at % Load		
									100	75	50	100	75	50
A 60/12	8.0 kW	6.0 kW 8.1 HP	580	208 230 460 575	38.7 35.0 17.5 14.0	110 100 50 40	E	1.0	76.5	73.0	76.6	.735	.651	.515
A 90/12	11.6 kW	9.0 kW 12.1 HP	580	208 230 460 575	53.0 48.0 24.0 19.2	115 104 52 42	B	1.0	77.6	77.8	74.7	.607	.519	.399
A 120/12	15.3 kW	12.0 kW 16.1 HP	580	208 230 460 575	69.5 62.8 31.4 25.1	194 175 88 70	D	1.0	78.3	78.0	75.2	.612	.531	.414

DS-M06-031 REV: 1 DATE: 10/21 | © Sulzer | Specifications Subject to Change Without Notice

Submersible Mixer Type ABS RW

RW 650 | 25.6” Propeller, Direct Drive, 12 Pole, 3-Phase, 60 Hz

Cable Data

	Motor	Motor Voltage	Cable Qty	Cable Type	Cable Nominal Outside Diameter +/- .5mm (.02”)	
					Power	Ground
Power Cable	A 60/12	208	1	SOOW 8/4+16/3	24.4mm (0.96”)	Integrated w/ Power
		230	1	SOOW 8/4+16/3	24.4mm (0.96”)	Integrated w/ Power
		460	1	SOOW 10/7	20.7mm (0.82”)	Integrated w/ Power
		575	1	SOOW 10/7	20.7mm (0.82”)	Integrated w/ Power
	A 90/12	208	1	G-GC 6-3	26.7mm (1.05”)	Integrated w/ Power
		230	1	G-GC 6-3	26.7mm (1.05”)	Integrated w/ Power
		460	1	SOOW 8/4+16/3	24.4mm (0.96”)	Integrated w/ Power
		575	1	SOOW 10/7	20.7mm (0.82”)	Integrated w/ Power
	A 120/12	208	1	G-GC 6-3	26.7mm (1.05”)	Integrated w/ Power
		230	1	G-GC 6-3	26.7mm (1.05”)	Integrated w/ Power
		460	1	SOOW 8/4+16/3	24.4mm (0.96”)	Integrated w/ Power
		575	1	SOOW 8/4+16/3	24.4mm (0.96”)	Integrated w/ Power

	Motor Monitoring Type [5]	Cable Qty	Cable Type	Cable Nominal Outside Diameter +/- .5mm (.02”)
Control Cable	Std monitoring w/ SOOW Power Cable	N/A	Integrated w/ Power	Integrated w/ Power
	Std monitoring w/ G-GC Power Cable	1	SOOW 16/4	10.6mm (0.42”)
Cable Length	Standard: 10m (32 feet)	Optional: 15m (49 feet), 20m (65 feet), 30m (98 feet), Consult Factory for longer lengths		

[5] See motor protection on page 1.

Hydraulic Data

Type	Propeller, backswept design, 2 or 3-vane, w/ Seal Protection System													
Model	w/o Flow Ring							w/ Flow Ring						
	6521	6522	6531	6532	6533	6534	6535	6541	6542	6551	6552	6553	6554	6555
Propeller Diameter, mm (in.)	650 (25.6)	650 (25.6)	650 (25.6)	650 (25.6)	650 (25.6)	650 (25.6)	650 (25.6)	650 (25.6)	650 (25.6)	650 (25.6)	650 (25.6)	650 (25.6)	650 (25.6)	650 (25.6)
Propeller Nominal Speed, RPM	580	580	580	580	580	580	580	580	580	580	580	580	580	580
Propeller Vane Quantity	2	2	3	3	3	3	3	2	2	3	3	3	3	3
Propeller Pitch, degrees	10.8	12.8	10.8	12.8	13.5	15	19	10.8	12.8	10.8	12.8	13.5	15.0	19.0
Capacity, m³/s (GPM) [6]	0.49 (7,800)	0.52 (8,300)	0.72 (11,500)	0.77 (12,200)	0.79 (12,500)	0.85 (13,500)	0.92 (14,600)	0.48 (7,600)	0.51 (8,000)	0.70 (11,100)	0.75 (11,800)	0.77 (12,100)	0.82 (13,100)	0.90 (14,200)
Power, Pp, kW (HP) [7]	2.8 (2.1)	3.4 (2.5)	6.7 (5.0)	8.6 (6.4)	10.7 (8.0)	12.1 (9.0)	15.4 (11.5)	3.6 (2.7)	4.4 (3.3)	5.5 (4.1)	6.7 5.0)	7.4 (5.5)	12.1 (9.0)	11.5 (8.6)

[6] Flow rate in clean water at 20°C (68°F). [7] Power in clean water at 20°C (68°F).

Materials of Construction

		EC (Standard Construction)	CR (Stainless Steel Construction)
Power Cable		Chlorinated Polyethylene (CPE)	
Lifting Band		Stainless Steel 1.4401 (ASTM A276, Type 316)	
Lifting Shackle		Stainless Steel 1.4571 (ASTM A276, Type 316Ti)	
Guide Bracket Liner		Nylon (PA)	
Guide Bracket Rollers		Acetal (POM)	
Guide Bracket / Cable Connection Chamber		Cast Iron EN-GJL-250 (ASTM A48, Class 35B)	Stainless Steel 1.4408 (ASTM A743, Grade CF8M)
Motor Housing		Cast Iron EN-GJL-250 (ASTM A48, Class 35B)	Stainless Steel 1.4571 (ASTM A276, Type 316Ti)
Seal Housing		Cast Iron EN-GJL-250 (ASTM A48, Class 35B)	Stainless Steel 1.4408 (ASTM A743, Grade CF8M)
Motor Shaft		Stainless Steel 1.4021 (ASTM A276, Type 420)	Stainless Steel 1.4404 (ASTM A276, Type 316L)
Propeller Shaft		Integrated with Motor Shaft	
Propeller		Stainless Steel 1.4571 (ASTM A276, Type 316Ti)	
Flow Ring [8]		Stainless Steel 1.4571 (ASTM A276, Type 316Ti)	
Seal Protection System		Stainless Steel 1.4581 (ASTM A351, Grade CF8M)	
Solids Deflection Ring		Nitrile Rubber (NBR / Buna-N) *Optional: Fluorocarbon Rubber (FKM / Viton®)*	
External Hardware		Stainless Steel 1.4401 (ASTM A276, Type 316)	
O-Rings and Cable Glands		Nitrile Rubber (NBR / Buna-N) *Optional: Fluorocarbon Rubber (FKM / Viton®)*	
Mechanical Seals	Outer	Silicon Carbide / Silicon Carbide, Nitrile, 316 SS *Optional: Silicon Carbide / Silicon Carbide, Viton®, 316 SS*	
	Inner	Carbon / Chrome Steel, Nitrile, 316 SS	
Outer Bearing Lip Seal		Nitrile Rubber (NBR / Buna-N)	
Coating/Protection		Two-part epoxy, blue, 120µm (4.7 mil) DFT *Optional: Two-part epoxy, blue, 400 µm (15.7 mil)*	N/A

[8] Only applicable to “w/ Flow Ring” models.

DS-M06-031 REV: 1 DATE: 10/21 | © Sulzer | Specifications Subject to Change Without Notice

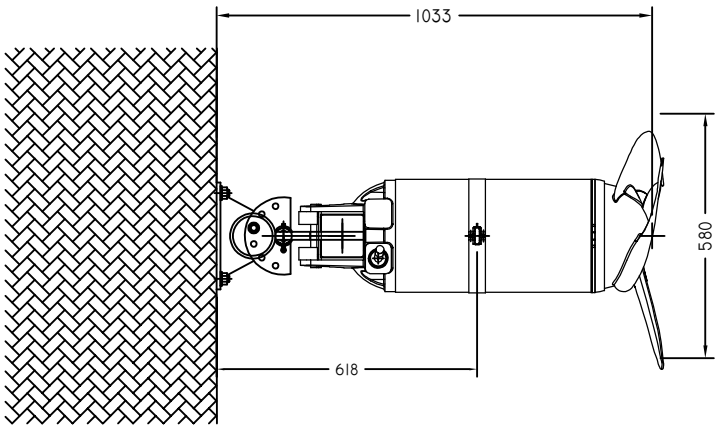
Submersible Mixer Type ABS RW

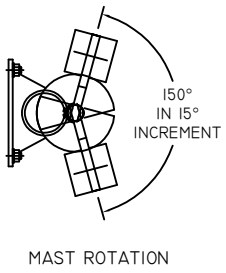
RW 650 | 25.6” Propeller, Direct Drive, 12 Pole, 3-Phase, 60 Hz

General Data (Standard Materials of Construction & Cable Length)

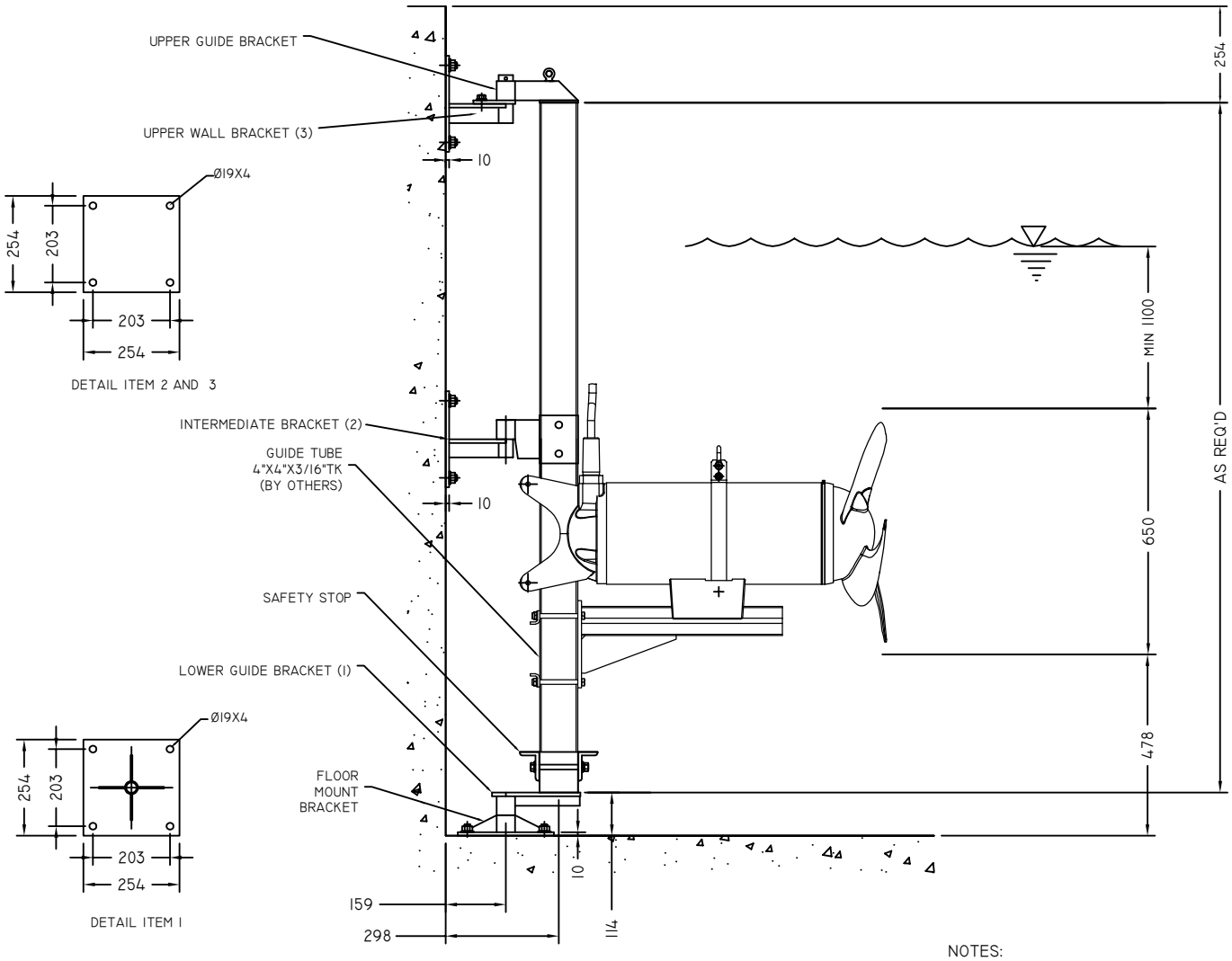
	w/o Flow Ring			w/ Flow Ring		
	A 60/12	A 90/12	A 120/12	A 60/12	A 90/12	A 120/12
≈ Mixer Weight, kg (lbs)	155 (342)	182 (401)	214 (472)	173 (381)	200 (441)	232 (512)
Guide Bracket Mast Size	4” square					

DS-M06-031 REV: 1 DATE: 10/21 | © Sulzer | Specifications Subject to Change Without Notice





MAST ROTATION



NOTES:
I. ANCHOR BOLTS BY OTHERS
II. GUIDE TUBE BY OTHERS
III.LIFTING ACCESSORIES BY OTHERS

WEIGHT 209KG

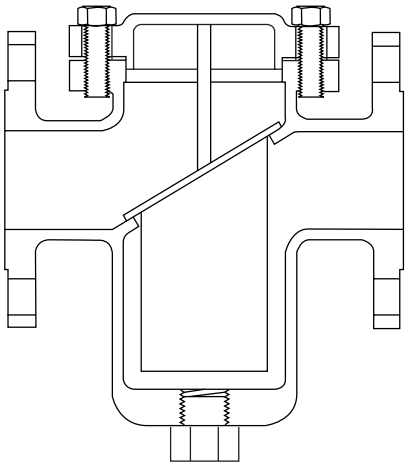
SULZER

DESCRIPTION:
INSTALLATION DRAWING
RW652I-A60/12 W/O FR W/O VR
4" SQ GUIDE RAIL /W INTER BRKT,304SS

DRAWN BY:	CC
DATE:	MAY 30,2022
REV:	0
DWG NO.	CA000583

IFC Series B125F and B150F Style 1
Iron and Bronze Flanged Basket Strainers

TAG:
20-SCN-600
C/W 20-DPS-600



Design Features:

- Iron strainers are equipped with FF flanges (Series B125F) in accordance with ASME B16.1.
- Bronze strainers are equipped with FF flanges (Series B150F) in accordance with ASME B16.24.
- Strainer body meets applicable ASME/ANSI standard.
- All strainers equipped with bolted cover flanges that utilize a flat gasket seal.
- Strainer cover flanges are designed in accordance with ASME Section VIII, Div.1 Appendix II.
- Straight thru flow is accomplished by an angular basket design.
- Standard basket construction is 304 SS perforated plate.
- Recommended minimum straining level is 250 microns.
- N.P.T. drain connection furnished with plug.
- Recommended for installation in horizontal pipelines.

Notes: 1. See page 11 for details of available quick opening covers.
2. See page 19 for basket strainer effective areas.

Parts List and Standard Materials

Part IFC Model	Cast Iron B125FIB1	Bronze B150FBB1
Body	A126-B	B62
Cover	A126-B	B62
Screen [1]	304 SS	304 SS
Plug [2]	A126-B	B62
Gasket [1]	Bolted Cover: Graphite Quick Opening: See pg. 11	Bolted Cover: Teflon Quick Opening: See pg. 11
Bolt/Stud [2]	A307-B	Nonferrous
Nut [2]	A563	Nonferrous

Notes: 1. Recommended spares.
2. Materials of equivalent strength may be substituted at manufacturer's option.

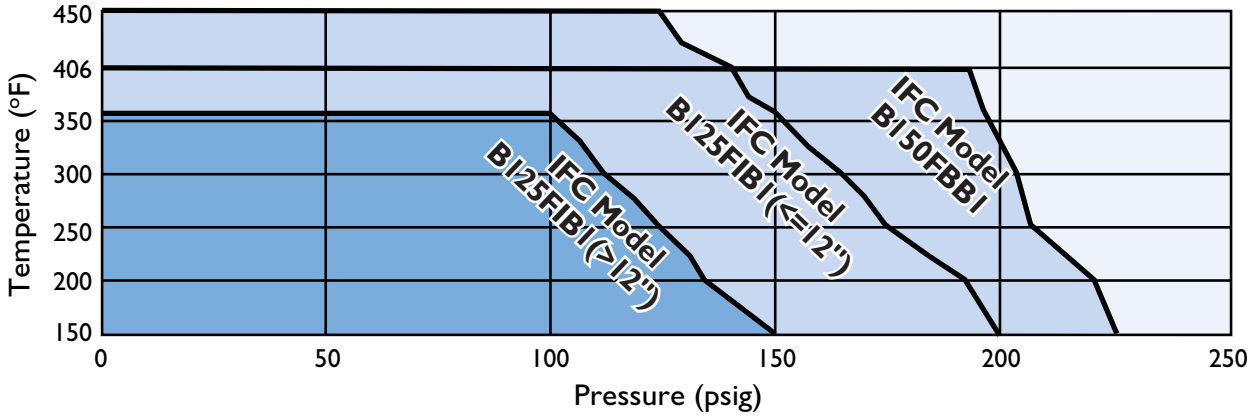
Upper Pressure Limits (Non-Shock)

IFC Model	Body Material	M.A.W.P. psig (Bars)
B125FIB1 (Up to 12" size)	A126-B	200 (13.79)
B125FIB1 (Sizes 14" and up)	A126-B	150 (10.34)
B150FBB1	B62	225 (15.51)

Lower Temperature Limits

Body Material	Lower Limit °F (°C)
A126-B, B62	-20 (-28.9)

Pressure Temperature Chart (in accordance with ASME B16.1 & ASME B16.24)



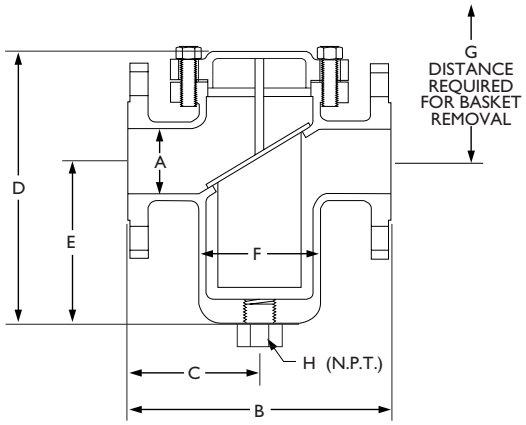
Note: Max. rating temperature for IFC model B150FBB1 limited by codes such as ASME B31.1, ASME B31.5, etc.

Tel. 905-335-8777 Fax. 905-335-0977 Toll Free Tel. 1-866-872-0072 Toll Free Fax. 1-866-872-0073

ISLIP FLOW CONTROLS Inc.

IFC Series B125F and B150F Style 1 Iron and Bronze Flanged Basket Strainers

Standard Screens	
Size range	**Opening**
2 - 3”	0.045 in.
50mm - 80mm	1.2 mm
4” - 20”	0.125 in.
100mm - 500mm	3.2 mm



Dimensional Data (Class 125-150)

Size in (mm)	A in (mm)	B in (mm)	C in (mm)	D in (mm)	E in (mm)	F in (mm)	G in (mm)	H NPT in/mm B125FIB1	H NPT in/mm B150FBB1	Weight Lb./(Kg.) Cover	Weight Lb./(Kg.) Unit
2” 50	2.00 51	8.13 206	4.06 103	8.38 213	5.00 127	3.00 76	11.75 298	1/2 15	1 25	5 2.3	23 10
2 1/2” 65	2.50 64	8.25 210	4.13 105	9.75 248	6.25 159	4.00 102	13.25 337	3/4 20	1 25	7 3.2	33 15
3” 80	3.00 76	9.88 251	4.94 125	11.25 286	7.13 181	5.00 127	15.38 391	3/4 20	1 25	9 4.1	44 20
4” 100	4.00 102	11.50 292	5.75 146	12.88 327	8.00 203	6.00 152	17.75 451	1 25	1 25	13 5.9	67 30
5” 125	5.00 127	13.13 333	6.56 167	14.50 368	8.50 216	6.50 165	20.50 521	1 25	1 25	20 9.1	88 40
6” 150	6.00 152	14.88 378	7.44 189	16.00 406	9.00 229	8.00 203	23.00 584	1 25	1 25	26 12	120 54
8” 200	8.00 203	18.75 476	9.38 238	21.00 533	12.00 305	10.00 254	30.00 762	1 1/2 40	N/A	45 20	220 100
10” 250	10.00 254	20.00 508	10.00 254	24.75 629	14.00 356	12.50 318	35.50 902	1 1/2 40	N/A	70 32	353 160
12” 300	12.00 305	26.25 667	13.13 333	29.75 756	17.00 432	15.00 381	42.50 1080	1 1/2 40	N/A	110 50	523 237
14” 350	14.00 356	30.25 768	15.13 384	37.50 953	22.00 559	18.00 457	53.00 1346	1 1/2 40	N/A	140 64	815 370
16” 400	16.00 406	33.25 845	16.63 422	39.25 997	22.88 581	20.75 527	55.63 1413	1 1/2 40	N/A	180 82	1041 472
18” 450	18.00 457	38.50 978	19.25 489	40.00 1016	19.00 483	24.25 616	61.00 1549	2 50	N/A	220 100	1446 656
20” 500	20.00 508	41.38 1051	20.69 525	46.25 1175	23.25 591	26.50 673	69.25 1759	2 50	N/A	285 129	1980 898

Notes: 1. Vents are optional.
2. Dimension “B” is +/- 0.13”.
3. Dimension “D” will change when Quick Opening covers are used.
4. Sizes 8” and larger come complete with a side drain as standard. A bottom drain is optional.

General

1. Quick opening cover features are shown on pages 11-12.
2. See pg. 14 for available perforations and screen materials.
3. Pressure drop information is shown on pg. 15.
4. See pg. 22 for ordering information.
5. Dimensions shown are subject to change. Consult factory for certified prints when required.

Sigma X: Sigma/1 (S1Cb/S1Ba)

Removable HMI Unit!



Certified to NSF/ANSI 61

Capacity range 5.3 to 38 gph (20 - 144 l/h) and pressures up to 174 psig (12 bar)

The ProMinent® Sigma/ 1 is a mechanically actuated diaphragm metering pump capable of flow rates from 5.3 to 38 gph (20 - 144 l/h) and pressures up to 174 psig (12 bar). The entire Sigma motor-driven metering pump product range, control type S1Cb/S2Cb/S3Cb, has been equipped with intelligent features to provide a high level of operating convenience, safety, and efficiency. The Sigma X features a removable HMI control unit with innovative click-wheel and 4 operating buttons.
(Also available in basic (non-microprocessor-based version).

Features & Benefits

- Certified to NSF/ANSI 61 (PVDF liquid ends)
- Variable AC frequency combined with digital stroking frequency
- Removable HMI unit with illuminated LCD, click-wheel and 4 operation buttons
- 3 LED's function as operation indicators, alarm indicator and fault indicator
- Integrated Timer (standard) and Data Logger
- Connection to PROFIBUS-DP interface
- Control via contact or analog signals
- Integrated multilayer safety diaphragm (standard) with visual or electrical rupture indicator

Field of application

- Time controlled chemical addition in cooling water circuits
- Proportional chemical addition in water treatment (e.g., Sodium Hypochlorite for drinking water disinfection)
- Measurement dependent chemical addition (e.g., acid & caustic metering for pH neutralization in wastewater treatment)
- Pulse controlled metering from variable flow meters
- Chemical Process, Mining, Petrochemical, Heavy Industrial, Pharmaceutical, Water and Wastewater Treatment

Sigma X: Sigma/1 (S1Cb/S1Ba)

Technical Data

Capacity Data														
Pump Version	**Capacity at Maximum Backpressure**				**Max. Stroking Rate**	**Output/ Stroke**	**Pre-Primed Suction Lift**		**Max. Suction Pressure**		**Suction/Discharge Connector**		**Shipping Weight**	
	psig	**(bar)**	**gph**	**l/h**	**spm**	**ml/stroke**	**ft**	**(m)**	**psig**	**(bar)**	**in**	**(DN)**	**lbs**	**kg**
S1Cb H														
12017 PVT	145	(10)	5.5	(21)	90	3.8	23	(7)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
12017 SST	174	(12)	5.5	(21)	90	3.8	23	(7)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
12035 PVT	145	(10)	11.1	(42)	170	4	23	(7)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
12035 SST	174	(12)	11.1	(42)	170	4	23	(7)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
10050 PVT	145	(10)	12.9	(49)	200	4	23	(7)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
10050 SST	145	(10)	12.9	(49)	200	4	23	(7)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
10022 PVT	145	(10)	7.1	(27)	90	5	19.6	(6)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
10022 SST	145	(10)	7.1	(27)	90	5	19.6	(6)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
10044 PVT	145	(10)	14	(53)	170	5.1	19.6	(6)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
10044 SST	145	(10)	14	(53)	170	5.1	19.6	(6)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
07065 PVT	102	(7)	16.6	(63)	200	5.2	19.6	(6)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
07065 SST	102	(7)	16.6	(63)	200	5.2	19.6	(6)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
07042 PVT	102	(7)	13.7	(52)	90	9.5	9.8	(3)	14.5	(1)	3/4 MNPT	(15)	21	(9.5)
07042 SST	102	(7)	13.7	(52)	90	9.5	9.8	(3)	14.5	(1)	1/2 FNPT	(15)	29.8	(13.5)
04084 PVT	58	(4)	26.7	(101)	170	9.7	9.8	(3)	14.5	(1)	3/4 MNPT	(15)	21	(9.5)
04084 SST	58	(4)	26.7	(101)	170	9.7	9.8	(3)	14.5	(1)	1/2 FNPT	(15)	29.8	(13.5)
04120 PVT	58	(4)	30.9	(117)	200	9.7	9.8	(3)	14.5	(1)	3/4 MNPT	(15)	21	(9.5)
04120 SST	58	(4)	30.9	(117)	200	9.7	9.8	(3)	14.5	(1)	1/2 FNPT	(15)	29.8	(13.5)
S1Ba H														
12017 PVT	145	(10)	5.3	(20.4)	88	3.8	23	(7)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
12017 SST	174	(12)	5.3	(20.4)	88	3.8	23	(7)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
12035 PVT	145	(10)	11	(42)	172	4	23	(7)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
12035 SST	174	(12)	11	(42)	172	4	23	(7)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
10050 PVT	145	(10)	15.8	(60)	246	4	23	(7)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
10050 SST	145	(10)	15.8	(60)	246	4	23	(7)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
10022 PVT	145	(10)	6.9	(26.4)	88	5	19.6	(6)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
10022 SST	145	(10)	6.9	(26.4)	88	5	19.6	(6)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
10044 PVT	145	(10)	13.9	(52.8)	172	5.1	19.6	(6)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
10044 SST	145	(10)	13.9	(52.8)	172	5.1	19.6	(6)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
07065 PVT	102	(7)	20.6	(78)	246	5.2	19.6	(6)	14.5	(1)	1/2 MNPT	(10)	19.8	(9)
07065 SST	102	(7)	20.6	(78)	246	5.2	19.6	(6)	14.5	(1)	3/8 FNPT	(10)	26.5	(12)
07042 PVT	102	(7)	13.3	(50.4)	88	9.5	9.8	(3)	14.5	(1)	3/4 MNPT	(15)	21	(9.5)
07042 SST	102	(7)	13.3	(50.4)	88	9.5	9.8	(3)	14.5	(1)	1/2 FNPT	(15)	29.8	(13.5)
04084 PVT	58	(4)	26.6	(100.8)	172	9.7	9.8	(3)	14.5	(1)	3/4 MNPT	(15)	21	(9.5)
04084 SST	58	(4)	26.6	(100.8)	172	9.7	9.8	(3)	14.5	(1)	1/2 FNPT	(15)	29.8	(13.5)
04120 PVT	58	(4)	38	(144)	246	9.7	9.8	(3)	14.5	(1)	3/4 MNPT	(15)	21	(9.5)
04120 SST	58	(4)	38	(144)	246	9.7	9.8	(3)	14.5	(1)	1/2 FNPT	(15)	29.8	(13.5)

ProMinent Fluid Controls, Inc. (USA)
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Ph: (412) 787-2484 • email: prominentcsd-us@prominent.com
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490 Southgate Drive • Guelph, N1G 4P5
Ph: (519) 836-5226 • Toll Free: 1-888-709-9933
email: sales@prominent.ca
www.prominent.com

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CABLE BILL OF MATERIALS				SIDE A		SIDE B		
CABLE FOR	ID	LENGTH L [mm]	CABLE TYPE	L1 [mm]	TERMINAL TYPE	L2 [mm]	TERMINAL TYPE	NOTES
MAIN SUPPLY (LINE)	L1 L2 GND	4000	AWG14 3G2,5	-	NEMA5-15P	80 150GND	2xBF-P10 + S2,5-M6	LISTED SJ, SJT, SJTO, SJOOW, SJTOW
MOTOR (M1)*		850	AWG14 3G2,5	100	2xBF-F 608 + 160831-3(GND)	80 150GND	2xGF-P10 + S2,5-M6	Style 2587 or 2550 or 21098 or 21216 or equivalent
FAN MOTOR (M2)		-	-	-	-	-	-	
DIGITAL CONTROLLER (DC)		450	AWG18 2x1	100	2xRF-F 608P + BF-F 608P	80	-	
SOLENOID VALVE (SOL)		1250	AWG18 2x1	-	43650/B **	80	-	
FREE CONTACT (FC)		300	AWG18 2x1	80	2xRF-F 608P	80	2x221-412	Style 1015 t≥90°C

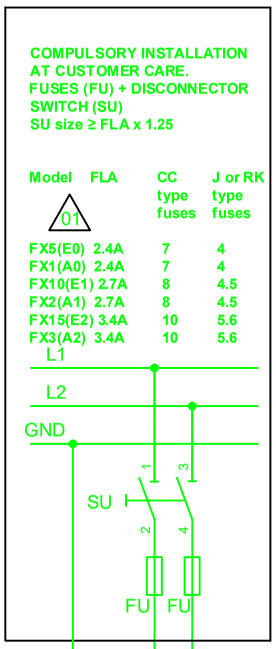
2205042801 WIRE HARN. FX5/1-15/3(E/A0-2) 115/60 UL rev01

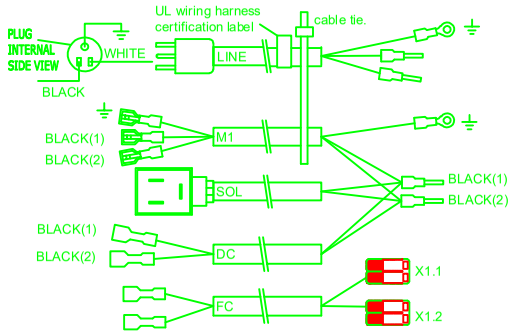
ID	DESCRIPTION	TYPE	MANUFACT.	CODE	QUANT.	POSITION
DSC	SWITCH	OT25FT3	ABB	1089949849	1	
	HANDLE	OHBS3RH	ABB	1089949850	1	
	Plastic cable tie	5203				
		320-30				
	CABLE GLAND	M20X1,5		0698514121	1	
	NUT	M20x1,5		0697980953	1	
	SERV. DIAGR	A4 FORMAT		2205042809	1	

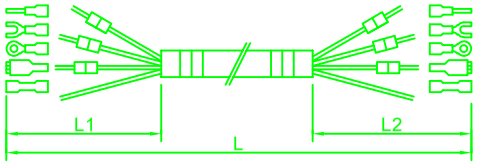
* cable Φext ≤ 9.5mm

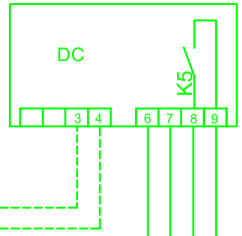
COMPULSORY INSTALLATION AT CUSTOMER CARE.
FUSES (FU) + DISCONNECTOR SWITCH (SU)
SU size ≥ FLA x 1.25

Model	FLA	CC type fuses	J or RK type fuses
FX5(E0)	2.4A	7	4
FX1(A0)	2.4A	7	4
FX10(E1)	2.7A	8	4.5
FX2(A1)	2.7A	8	4.5
FX15(E2)	3.4A	10	5.6
FX3(A2)	3.4A	10	5.6





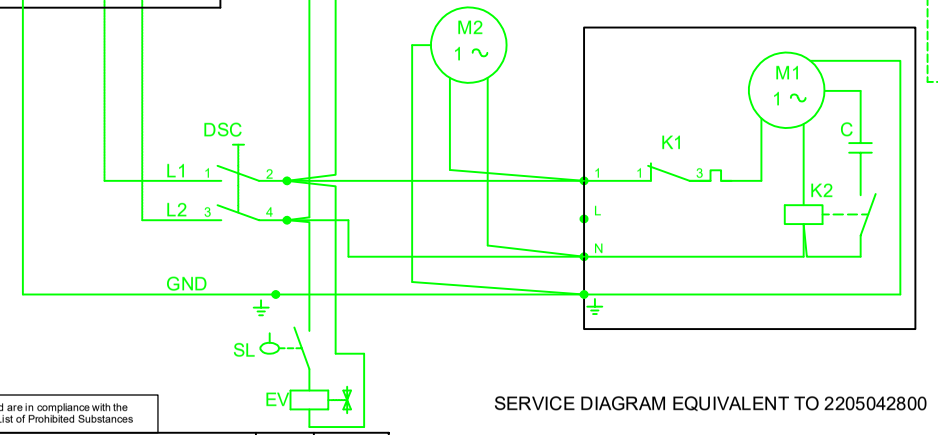


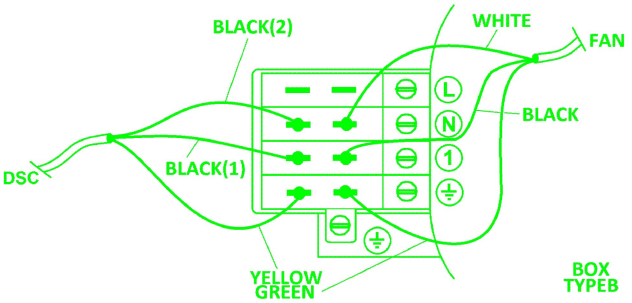


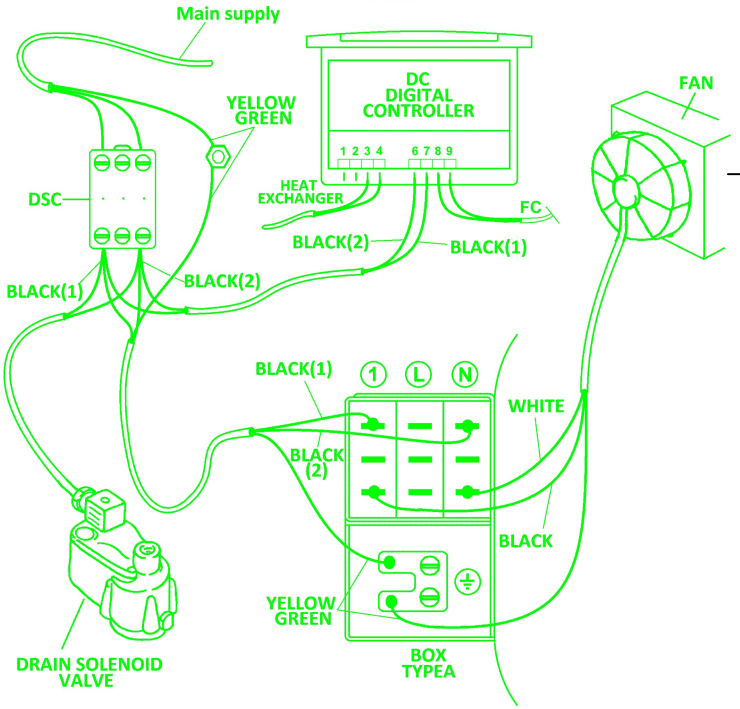
** SUPPLY WITHOUT GASKET
FIX THE SCREW WITH ADHESIVE TAPE

SU	DISCONNECTOR SWITCH CUSTOMER CARE INSTALLATION
FU	FUSES CUSTOMER CARE INSTALLATION
DSC	DISCONNECTOR SWITCH
SL	LEVEL SWITCH
EV	DRAIN SOLENOID VALVE
M1	COMPRESSOR MOTOR
M2	FAN MOTOR
K1	OVERLOAD RELAY
K2	STARTING RELAY
K5	FREE CONTACT
C	STARTING CAPACITOR
T2	TEMPERATURE SENSOR NTC (P2)
DC	DIGITAL CONTROLLER
X1	TERMINAL FREE CONTACT









SERVICE DIAGRAM EQUIVALENT TO 2205042800

All materials supplied are in compliance with the requirements of the List of Prohibited Substances

Note	Position	Modified from	Date	Intr./Appd.
00.00		Upgraded model name. DN20054137 CID27606	10/06/2020	

Parent 3D Model	Ed.Version 3D

Tolerances,if not indicated,according to:	General tolerances				
ATLAS COPCO STANDARD CLASS	1350K - V				
Name	SERVICE DIAG. FX5-15(E0-2), FX1-3(A0-2) 115/60 FREE CONTACT UL			Confidentiality class acc. to 1102 K	
Material	See Drawing			Confidential	
Treatment	Not Applicable			ACDE	
Atlas Copco	Scale -:-	Family A2	Compare	Drawing owner	Transferred from
STATUS	Drawn by ATLASCOPCO\caitmaric	Blank nr.	Replaces	CAI	
For Approval	Drawing format	Blank wt. Kg	Fini wt. Kg	Designation	Sheet ( ) 01 01
	Des checked.	Prod checked.	Approved.	Date 27/09/2018	2205042809

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MODEL BT SERIES 22

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

HEAVY DUTY KNIFE GATE VALVE

The BT(SER.22) model knife gate is a bi-directional lug type valve designed according to MSS-SP-81 and TAPPI TIS 405-8 for industrial service applications. The completely new design of the body and seat (patent pending) assures non-clogging shut off on suspended solids in industries such as:

- Pulp and Paper
- Wastewater
- Food and Beverage
- Power plants
- Mining
- Chemical plants
- Etc.



Sizes:

DN 2"/50mm to DN 36"/900mm (larger diameters on request)

Working pressure:

DN 2"/50mm to DN 24"/600mm: 150psi / 10bar
DN 30"/750mm: 100psi / 7bar
DN 36"/900mm: 100psi / 7bar

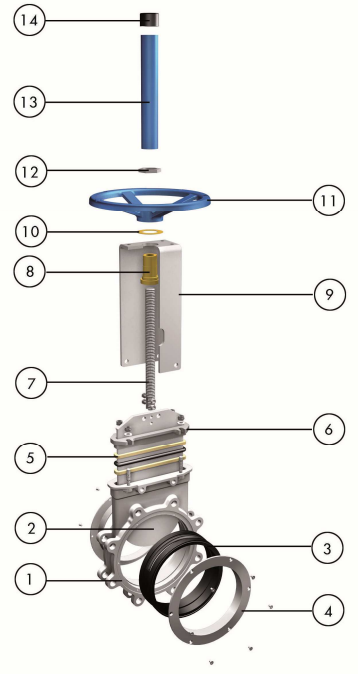
Standard flange connection:

ANSI B16.5 (class 150)
Others on request

Directives:

2006/42/CE (MACHINES)
2014/68/EU (PED) Fluid: Group 1(b), 2 (Cat. I, mod. A)
2014/34/EU (ATEX)

All valves are tested prior to shipping in accordance with the standard developed by the Quality Control Department at ORBINOX.



STANDARD PARTS LIST

Part:	Stainless Steel:
1- Body	CF8M / CF8
2- Gate	AISI 316 / AISI 304
3- Sleeve	EPDM
4- Seat Ring	AISI 316 / AISI 304
5- Packing	PTFE Impreg. Synth. Fibre + EPDM O-Ring
6-Gland Follower	CF8M / CF8
7- Stem	AISI 430
8- Stem nut	Brass
9- Yoke	AISI 304 / Carbon Steel - Epoxy Coated
10- Thrust Washer	Brass
11- Handwheel	Ductile iron
12- Nut	Zinc Plated Carbon Steel
13- Stem protector	Carbon Steel - Epoxy Coated
14- Cap	Plastic

MODEL BT SERIES 22

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

DESIGN FEATURES

BODY:

One piece integrally cast stainless steel body with reinforced ribs in larger diameters for extra body strength.
Port design according to MSS-SP-81 and Tappi TIS 405-8.
Internal design avoids any build up of solids that could prevent valve from closing.



GATE:

Standard AISI 316 or AISI 304 stainless steel gate.
Gates polished and lapped for a greater seal between the gate and both the packing and seat.

SEAT: (resilient)

Patent pending. Totally new design.
The resilient seat is an elastomer sleeve, available in different materials. This sleeve which supports, protects and also guides the gate is slotted in the top half to allow gate travel, and guarantees full tightness with low friction.
The sleeve is held by means of two seat rings which support it and also guide the gate.

PACKING:

Standard braided PTFE impregnated synthetic fibre with EPDM o-ring for better shut off, with an easy access packing gland ensuring a tight seal. The long-life braided packing is available in a wide range of materials.

STEM:

The standard stainless steel stem offers a long corrosion resistant life. For rising stem actuators only, a stem protector is provided for additional protection against dust and damage while the valve in the open position.

ACTUATORS:

All actuators supplied by ORBINOX are interchangeable, and supplied with a standard mounting kit to allow for installation on site.

YOKE or ACTUATOR SUPPORT:

Made of stainless steel (EPOXY coated carbon steel available on request). Compact design makes it extremely robust even under the most severe conditions.

EPOXY COATING:

The epoxy coating on all ORBINOX cast iron and carbon steel valve components is electrostatically applied making them corrosion resistant with a high quality finished surface. The ORBINOX standard colour is RAL-5015 blue.

GATE SAFETY PROTECTION:

*ORBINOX automated valves are provided with gate guards in accordance with EU Safety Standards. The design feature prevents any objects from being caught accidentally while the gate is moving.
* IN EUROPE ONLY

OTHER MATERIALS:

On request, the body and the gate can be supplied in other materials.

MODEL BT SERIES 22

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

ACTUATOR TYPES

MANUAL:
Handwheel (rising stem)
Handwheel (non-rising stem)
Chainwheel
Bevel Gear
Other (square nut...)

AUTOMATION:
Electric
Double Acting Pneumatic
Single Acting Pneumatic
Hydraulic

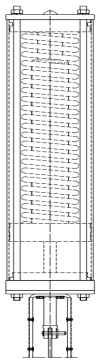
All actuators supplied by ORBINOX are interchangeable.

FAIL SAFE SYSTEMS

Used on pneumatic actuated valves

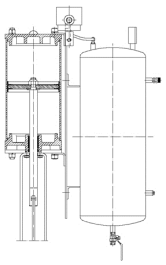
SINGLE ACTING (SPRING RETURN)

- Available from DN 2"/50mm to DN 12"/300mm
- Supply pressure:
  - min. 75 psi /(5 bar)
  - max. 150 psi /(10 bar)
- Options:
  - Pneumatic or electric fail open
  - Pneumatic or electric fail close
  - Other options on request



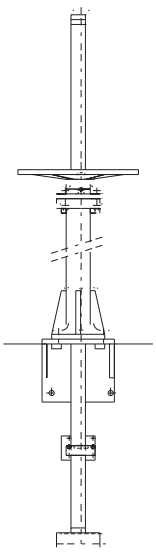
DOUBLE ACTING WITH AIR TANK

- Available for all valve sizes
- Supply pressure:
  - min. 50 psi / (3.5 bar)
  - max. 150 psi / (10 bar)
- Options:
  - Pneumatic or electric fail open
  - Pneumatic or electric fail close
  - Other options on request



ACCESSORIES

Bonet
Mechanical stops
Locking device
Manual override
Solenoid valves
Positioners
Limit switches
Proximity switches
Floor stands
Stem extensions



Wide range of valve extensions available.

For further information about fail safe systems and valve extensions, please see EX(SER.10) catalog.

We recommend consultation with our technical department.

MODEL BT SERIES 22

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

TEMPERATURE CHART

SEAT / SLEEVE

Material	Max.Temp.(°F)	(°C)	Applications
EPDM (E)	248	120	Acids and non mineral oils
Nitrile (N)	248	120	Resistance to petroleum products
FKM-FPM (V)	392	200	Chemical service/High temp.

More details and other materials upon request.
All are reinforced with a metal core.

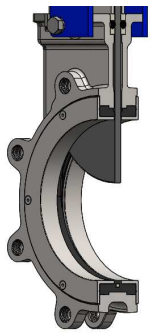
PACKING

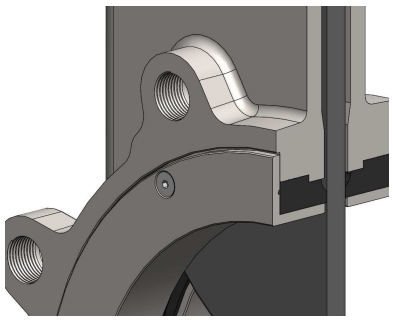
Material	Max.Temp.(°F)	(°C)	pH
Dry cotton (AS)	122	50	6-8
PTFE impregn. synth. fibre (ST)	464	240	2-13
Braided PTFE (TH)	560	260	0-14
Graphited (GR)	1112	600	0-14
Ceramic fibre (FC)	2192	1200	---

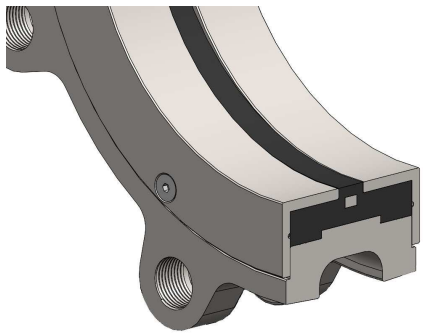
NOTE: all types include an elastomere O-ring (same material as sleeve), excluding TH, GR and FC.

SEAT

RESILIENT SEAT:
The new seat (patent pending) is a slotted sleeve on its top half and includes a metal core in the bottom half which provides a great resistance to demanding working conditions and pressures. The seat is held by means of two stainless steel rings. This design provides watertightness in both directions while avoiding any buildup of solids that could prevent the valve from closing. The seat can be supplied in different resilient material qualities.







ATEX

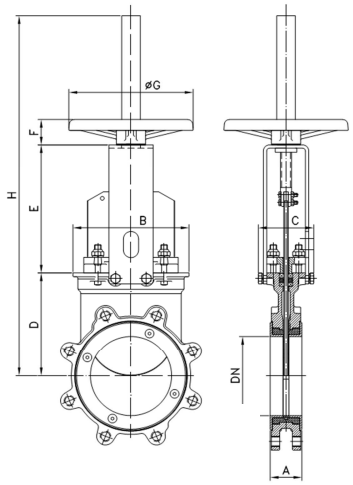
Please contact our ORBINOX representative for info and availability. Some considerations:
• Hand operated BT (SER.22) valves have been subjected to an ignition risk assessment according to DIN EN 13463: 1-5 and they are out of the scope of application of ATEX Directive. Therefore hand operated valves are suitable for ALL ATEX zones.
• Electrically, pneumatically and hydraulically operated valves must be subjected to a conformity assessment of their own and also of the whole of unit valve-actuator to get EC Type Approval to Directive 2014/34.

MODEL **BT** **SERIES 22**

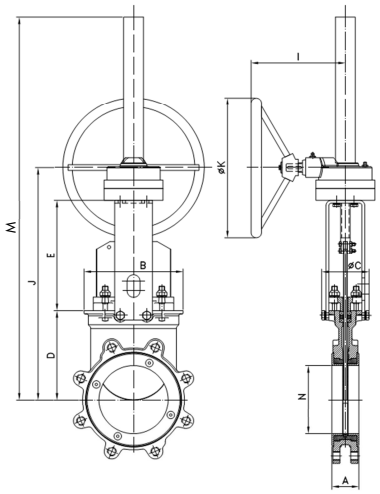
ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

HAND OPERATED (Rising stem)

HANDWHEEL



GEAR



- Standard handwheel actuator. Available from DN 2"/50mm to DN 24"/600mm

- Consists of:
  - Handwheel: Ductile iron
  - Stem
  - Stem nut
  - Yoke

- Options (on request):
  - Chainwheel
  - Locking Device
  - Extensions

- Gear is optional above DN 6"/150mm and recommended above 12"/300mm

- Consists of:
  - Stem
  - Yoke
  - Bevel Gear Actuator with Handwheel (Standard Ratio 4:1)

- Options (on request):
  - Chainwheel
  - Locking Device
  - Extensions

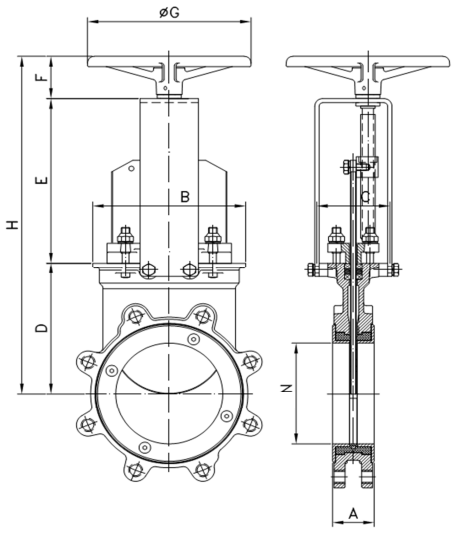
DN ("/mm)	N	A	B	C	D	E	F	J	ØG	ØK	H	I	M
2"/50	2/50	1,88/47,8	4,92/125	4,13/105	4,13/105	5,07/129	1,85/47	-	8,86/225	-	16,92/430	-	-
3"/80	2,9/75	2/50,8	6,06/154	4,13/105	4,68/119	6,37/162	1,85/47	-	8,86/225	-	18,70/475	-	-
4"/100	3,8/97	2/50,8	6,88/175	4,13/105	5,59/142	7,36/187	1,85/47	-	8,86/225	-	20,66/525	-	-
5"/125	4,76/121	2,25/57,2	7,08/180	4,13/105	6,49/165	8,30/211	1,85/47	-	8,86/225	-	24,40/620	-	-
6"/150	5,78/147	2,25/57,2	8,46/215	4,13/105	7,48/190	9,33/237	1,85/47	-	8,86/225	-	26,37/670	-	-
8"/200	7,63/194	2,74/69,8	10,23/260	4,80/122	9,44/240	12,16/309	2,63/67	24,37/619	12,20/310	12/300	40,51/1029	7,87/200	40,51/1029
10"/250	9,4/239	2,74/69,8	13,33/338	4,80/122	11,41/290	13,54/344	2,63/67	27,67/703	12,20/310	12/300	43,81/1113	7,87/200	43,82/1113
12"/300	11,18/284	3/76,2	14,40/366	4,80/122	14,17/360	15,43/392	2,60/66	32,36/822	16,14/410	12/300	48,62/1235	7,87/200	48,62/1235
14"/350	12,67/322	3/76,2	16/400	7,75/197	12,60/320	17,52/445	2,60/66	32,09/815	16,14/410	17,72/450	50,78/1290	10,62/270	63,38/1610
16"/400	14,40/366	3,50/89	18,03/458	7,75/197	14,49/368	19,80/503	2,60/66	35,75/908	16,14/410	17,72/450	54,92/1395	10,62/270	67,72/1720
18"/450	15,74/400	3,50/89	19,25/489	7,75/197	16,34/415	21,14/537	2,63/67	38,82/986	21,65/550	17,72/450	62,20/1580	10,62/270	70,87/1800
20"/500	18,11/460	4,50/114,2	21,73/552	7,75/197	18,11/460	23,82/605	2,63/67	42,87/1089	21,65/550	17,72/450	66,53/1690	10,62/270	74,61/1895
24"/600	20,86/530	4,50/114,2	25,07/637	7,75/197	20,12/511	26,10/663	2,63/67	48,03/1220	21,65/550	17,72/450	75,39/1915	10,62/270	80,31/2040
30"/ 750	26,37/670	4,6/117	33,14/842	12,59/320	26,37/670	37,2/945	-	64,17/1630	-	17,72/450	-	12,2/310	105,11/2670
36"/900	31,88/810	4,6/117	38,18/970	12,59/320	31,49/800	44,01/1418	-	77,44/1967	-	25,5/650	-	14,56/370	126,29/3208

MODEL BT SERIES 22

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

HAND OPERATED (Non-rising stem)

HANDWHEEL

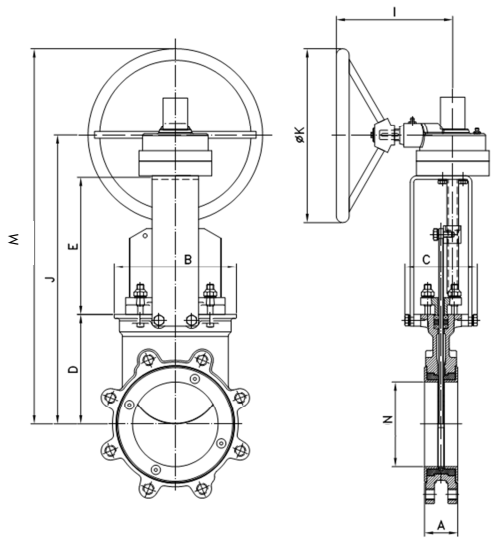


- Standard handwheel actuator. Available from DN 2"/50mm to DN 24"/600mm

- Consists of:
  - Handwheel: Ductile iron
  - Stem
  - Yoke

- Options (on request):
  - Chainwheel
  - Locking Device
  - Extensions

GEAR



- Gear is optional above DN 6"/150mm and recommended above 12"/300mm

- Consists of:
  - Yoke
  - Stem
  - Bevel Gear Actuator with Handwheel (Standard Ratio 4:1)

- Options (on request):
  - Chainwheel
  - Locking Device
  - Extensions

DN (”/mm)	N	A	B	C	D	E	F	J	ØG	ØK	H	M	I
2”/50	2/50	1,88/47,8	4,92/125	4,88/124	4,13/105	5,14/132	2,38/61	-	8,86/225	-	11,62/298	-	-
3”/80	2,9/75	2/50,8	6,06/154	4,88/124	4,68/119	6,43/165	2,38/61	-	8,86/225	-	13,45/345	-	-
4”/100	3,8/97	2/50,8	6,88/175	4,88/124	5,59/142	7,41/190	2,38/61	-	8,86/225	-	15,47/393	-	-
5”/125	4,76/121	2,25/57,2	7,08/180	4,88/124	6,49/165	8,35/214	2,38/61	-	8,86/225	-	17,32/440	-	-
6”/150	5,78/147	2,25/57,2	8,46/215	4,88/124	7,48/190	9,36/240	2,38/61	-	8,86/225	-	19,33/491	-	-
8”/200	7,63/194	2,74/69,8	10,23/260	5,59/142	9,44/240	12,28/312	2,38/61	24,48/622	12,20/310	12/300	24,13/613	30,51/775	7,87/200
10”/250	9,4/239	2,74/69,8	13,33/338	5,59/142	11,41/290	13,66/347	2,38/61	28,38/721	12,20/310	12/300	27,48/698	34,29/871	7,87/200
12”/300	11,18/284	3/76,2	14,40/366	5,59/142	14,17/360	15,55/395	2,77/71	33,07/840	16,14/410	12/300	32,52/826	38,97/990	7,87/200
14”/350	12,67/322	3/76,2	16/400	7,75/197	12,60/320	18,9/482	4,33/110	34,88/886	16,14/410	12/300	35,9/912	40,78/1036	8,54/217
16”/400	14,40/366	3,50/89	18,03/458	7,75/197	14,49/368	20,74/527	4,33/110	38,5/978	16,14/410	17,72/450	39,56/1005	47,36/1203	8,54/217
18”/450	15,74/400	3,50/89	19,25/489	7,91/201	16,34/415	22,16/563	4,37/111	41,81/1062	21,65/550	17,72/450	42,87/1089	50,66/1287	8,54/217
20”/500	18,11/460	4,50/114,2	21,73/552	7,91/201	18,11/460	25,39/645	4,37/111	47,5/1207	21,65/550	17,72/450	47,87/1216	56,37/1432	11,33/288
24”/600	20,86/530	4,50/114,2	25,07/637	7,91/201	20,12/511	27,49/711	4,37/111	52,12/1324	21,65/550	17,72/450	52,48/1333	64,92/1649	11,33/288
30”/ 750	26,37/670	4,6/117	33,14/842	12,59/320	26,37/670	34,44/875	-	65,23/1657	-	17,72/450	-	76,06/1932	12,2/310
36”/900	31,88/810	4,6/117	38,18/970	12,59/320	31,49/800	40,55/1030	-	76,06/1932	-	25,59/650	-	88,85/2257	14,56/370

Reserves the right to change specifications without notice

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www.orbinox.com

MODEL BT SERIES 22

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

PNEUMATIC CYLINDER

- The standard pneumatic actuator (double acting on-off cylinder) consists of:
  - DN ≤ 10"/250mm: Aluminum barrels
  - DN ≥ 12"/300mm: Composite barrels
  - Aluminum end covers
  - Stainless Steel (AISI 304) piston rod
  - Nitrile coated steel piston

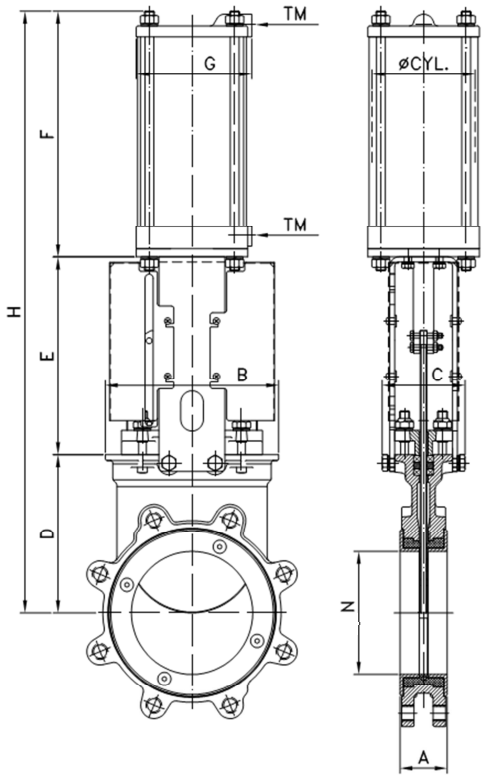
- Available from DN 2"/50mm to DN 36"/900mm

- Air supply pressure: Actuator is sized considering 90 psi / 6 bar

- For valves installed in a horizontal position, we recommend U-type support plates and/or actuator support

- Options (on request):
  - Hard anodized barrel and covers
  - Stainless Steel barrel and covers
  - Over / Undersized cylinder
  - Manual override
  - Fail safe systems
  - Limit switches

- Instrumentation (on request):
  - Positioners
  - Solenoid valves
  - Flow regulators
  - Air preparation units



DN ("/mm)	N	A	B	C	D	E	F	G	H	Standard Cyl	TM
2"/50	2/50	1,88/47,8	4,92/125	4,13/105	4,13/105	5,07/129	7,00/178	4,52/115	16,22/412	C4"-2.44"/(100-62)	¼" G
3"/80	2,9/75	2/50,8	6,06/154	4,13/105	4,68/119	6,37/162	8,31/211	4,52/115	19,37/492	C4"-3,74"/(100-95)	¼" G
4"/100	3,8/97	2/50,8	6,88/175	4,13/105	5,59/142	7,36/187	9,09/231	4,52/115	22,04/560	C4"-4,52"/(100-115)	¼" G
5"/125	4,76/121	2,25/57,2	7,08/180	4,13/105	6,49/165	8,30/211	10,67/271	5,51/140	25,47/647	C5"-5,63"/(125-143)	¼" G
6"/150	5,78/147	2,25/57,2	8,46/215	4,13/105	7,48/190	9,33/237	11,65/296	5,51/140	28,46/723	C5"-6,61"/(125-168)	¼" G
8"/200	7,63/194	2,74/69,8	10,23/260	4,80/122	9,44/240	12,16/309	14,09/358	6,88/175	35,70/907	C6.30"-8,66"/(160-220)	¼" G
10"/250	9,4/239	2,74/69,8	13,33/338	4,80/122	11,41/290	13,58/345	16,93/430	8,66/220	41,92/1065	C8"-10.63"/(200-270)	3/8" G
12"/300	11,18/284	3/76,2	14,40/366	4,80/122	14,17/360	15,47/393	18,89/480	8,66/220	48,54/1233	C8"-12.60"/(200-320)	3/8" G
14"/350	12,67/322	3/76,2	16/400	7,75/197	12,60/320	18,07/459	21,61/549	10,90/277	52,28/1328	C10"-14,76"/(250-375)	3/8" G
16"/400	14,40/366	3,50/89	18,03/458	7,75/197	14,49/368	20,31/516	21,61/549	10,90/277	56,42/1433	C10"-16,73"/(250-425)	3/8" G
18"/450	15,74/400	3,50/89	19,25/489	10,62/270	16,34/415	21,61/549	26,77/680	15,04/382	64,72/1644	C12"-18,70"/(300-475)	½"G
20"/500	18,11/460	4,50/114,2	21,73/552	10,62/270	18,11/460	24,21/615	26,77/680	15,04/382	69,09/1755	C12"-20,67"/(300-525)	½"G
24"/600	20,86/530	4,50/114,2	25,07/637	10,62/270	20,12/511	27,04/687	32,67/830	15,04/382	79,84/2028	C12"-24,60"/(300-625)	½"G
30"/ 750	26,37/670	4,6/117	33,14/842	12,59/320	26,37/670	37/940	38,77/985	17,48/444	102,16/2595	C14"-28.74"/(350-730)	¼" G
36"/900	31,88/810	4,6/117	38,18/970	12,59/320	31,49/800	43,3/1100	47,32/1202	20,27/515	122,12/3102	C16"-36,61"/(4009730)	¼" G

Reserves the right to change specifications without notice

ORBINOX CANADA, ORBINOX USA, ORBINOX BRAZIL, ORBINOX CHILE, ORBINOX SPAIN, ORBINOX UK, ORBINOX FRANCE, ORBINOX GERMANY, ORBINOX INDIA, ORBINOX CHINA, ORBINOX S.E.A.
www.orbinox.com

MODEL BT SERIES 22

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

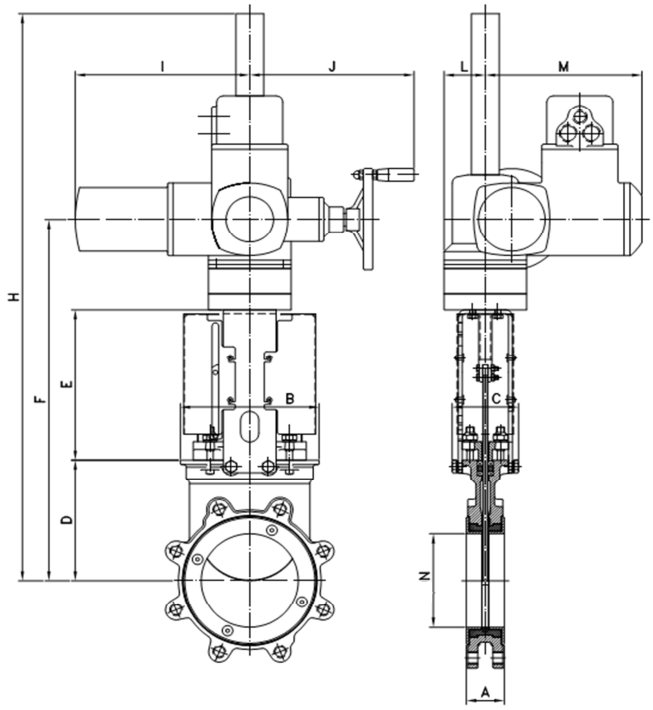
ELECTRIC ACTUATOR (Rising stem)

- Consists of:
  - Electric motor
  - Rising stem
  - Motor support yoke (Acc. to ISO 5210/DIN 3338)

- The standard electric motor is equiped with:
  - Manual emergency operation
  - Limit switches (open/closed)
  - Torque switches

- Available from DN 2"/50mm to DN 36"/900mm

- Wide range of types and makes available to meet customer's needs.



DN ("/mm)	N	A	B	C	D	E	F	ØG	H	I	J	L	M	StemØ x pitch	Torque (ft.LBS/Nm)
2"/50	2"/50	1,88/47,8	4,92/125	4,13/105	4,13/105	5,07/129	14,84/377	6,30/160	17,87/454	10,43/265	9,80/249	2,44/62	9,33/237	0.79 x 0.16/20 x 4	7.4/10
3"/80	2,9"/75	2/50,8	6,06/154	4,13/105	4,68/119	6,37/162	16,70/424	6,30/160	19,72/501	10,43/265	9,80/249	2,44/62	9,33/237	0.79 x 0.16/20 x 4	7.4/10
4"/100	3,8"/97	2/50,8	6,88/175	4,13/105	5,59/142	7,36/187	18,58/472	6,30/160	21,61/549	10,43/265	9,80/249	2,44/62	9,33/237	0.79 x 0.16/20 x 4	7.4/10
5"/125	4,76"/121	2,25/57,2	7,08/180	4,13/105	6,49/165	8,30/211	20,43/519	6,30/160	23,46/596	10,43/265	9,80/249	2,44/62	9,33/237	0.79 x 0.16/20 x 4	11.1/15
6"/150	5,78"/147	2,25/57,2	8,46/215	4,13/105	7,48/190	9,33/237	22,44/570	6,30/160	45,15/1147	10,43/265	9,80/249	2,44/62	9,33/237	0.79 x 0.16/20 x 4	14.8/20
8"/200	7,63"/194	2,74/69,8	10,23/260	4,80/122	9,44/240	12,16/309	27,71/704	6,30/160	50,86/1292	10,43/265	9,80/249	2,44/62	9,33/237	0.94 x 0.2/24 x 5	22.2/30
10"/250	9,4"/239	2,74/69,8	13,33/338	4,80/122	11,41/290	13,58/345	31,10/790	6,30/160	54,25/1378	10,43/265	9,80/249	2,44/62	9,33/237	0.94 x 0.2/24 x 5	33.3/45
12"/300	11,18"/284	3/76,2	14,40/366	4,80/122	14,17/360	15,47/393	34,76/883	7,87/200	57,91/1471	11,10/282	10,08/256	2,55/65	9,72/247	0.94 x 0.2/24 x 5	51.8/70
14"/350	12,67"/322	3/76,2	16/400	7,75/197	12,60/320	18,07/459	35,79/909	7,87/200	58,94/1497	11,14/283	10/254	2,55/65	9,76/248	1.42 x 0.24/36 x 6	81.4/110
16"/400	14,40"/366	3,50/89	18,03/458	7,75/197	14,49/368	20,31/516	42,32/1075	12,40/315	70,98/1803	15,31/389	13,22/336	3,58/91	11,25/286	1.42 x 0.24/36 x 6	118.4/160
18"/450	15,74"/400	3,50/89	19,25/489	10,62/270	16,34/415	21,61/549	44,84/1139	12,40/315	73,50/1867	15,31/389	13,22/336	3,58/91	11,25/286	1.42 x 0.24/36 x 6	140.6/190
20"/500	18,11"/460	4,50/114,2	21,73/552	10,62/270	18,11/460	24,21/615	52/1321	15,74/400	80,67/2049	15,31/389	13,34/339	3,58/91	11,25/286	1.42 x 0.24/36 x 6	199.8/270
24"/600	20,86"/530	4,50/114,2	25,07/637	10,62/270	20,12/511	27,04/687	56,85/1444	15,74/400	85,51/2172	15,31/389	13,34/339	3,58/91	11,25/286	1.57 x 0.27/40 x 7	333/450
30"/ 750	26,37/670	4,6/117	33,14/842	12,59/320	26,37/670	37/940	71,65/1820	19,68/500	115,55/2935	16,92/430	14,37/365	4,6/117	11,92/303	1,96 X 0,31/50 X 8	407/550
36"/900	31,88/810	4,6/117	38,18/970	12,59/320	31,49/800	43,3/1100	74,8/1900	19,68/500	126,96/3225	16,92/430	14,37/365	4,6/117	11,92/303	2,36 X 0,35/60 X 9	629/850

MODEL BT SERIES 22

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

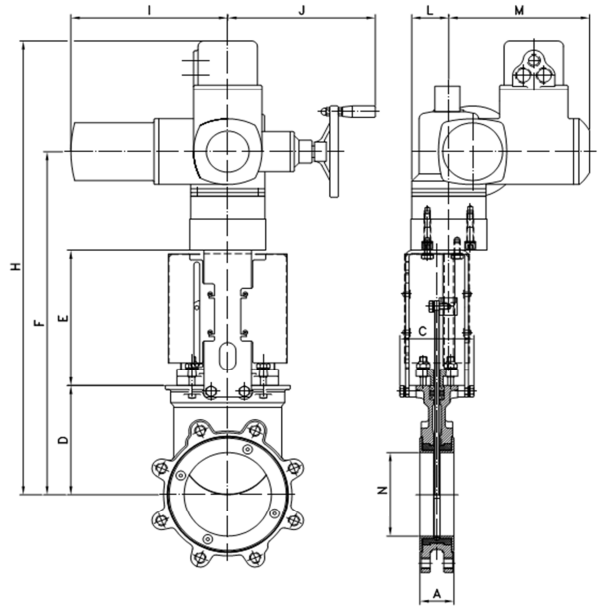
ELECTRIC ACTUATOR (Non-rising stem)

- Consists of:
  - Electric motor
  - Non-rising stem
  - Motor support yoke
    (Acc. to ISO 5210/DIN 3338)

- The standard electric motor is equiped with:
  - Manual emergency operation
  - Limit switches (open/closed)
  - Torque switches

- Available from DN 2"/50mm to DN 36"/900mm

- Wide range of types and makes available to meet customer's needs



DN ("/mm)	N	A	B	C	D	E	F	ØG	H	I	J	L	M	StemØ x pitch	Torque (ft.LBS/Nm)
2"/50	2/50	1,88/47,8	4,92/125	4,13/105	4,13/105	5,07/129	14,84/377	6,30/160	21,33/547	10,43/265	9,80/249	2,44/62	9,33/237	0.79 x 0.16/20 x 4	7.4/10
3"/80	2,9/75	2/50,8	6,06/154	4,13/105	4,68/119	6,37/162	16,70/424	6,30/160	23,17/594	10,43/265	9,80/249	2,44/62	9,33/237	0.79 x 0.16/20 x 4	7.4/10
4"/100	3,8/97	2/50,8	6,88/175	4,13/105	5,59/142	7,36/187	18,58/472	6,30/160	25,27/642	10,43/265	9,80/249	2,44/62	9,33/237	0.79 x 0.16/20 x 4	7.4/10
5"/125	4,7"/121	2,25/57,2	7,08/180	4,13/105	6,49/165	8,30/211	20,43/519	6,30/160	27,16/690	10,43/265	9,80/249	2,44/62	9,33/237	0.79 x 0.16/20 x 4	11.1/15
6"/150	5,78/147	2,25/57,2	8,46/215	4,13/105	7,48/190	9,33/237	22,44/570	6,30/160	29,13/740	10,43/265	9,80/249	2,44/62	9,33/237	0.79 x 0.16/20 x 4	14.8/20
8"/200	7,63/194	2,74/69,8	10,23/260	4,80/122	9,44/240	12,16/309	27,71/704	6,30/160	34,44/875	10,43/265	9,80/249	2,44/62	9,33/237	0.94 x 0.2/24 x 5	22.2/30
10"/250	9,4/239	2,74/69,8	13,33/338	4,80/122	11,41/290	13,58/345	31,10/790	6,30/160	37,79/960	10,43/265	9,80/249	2,44/62	9,33/237	0.94 x 0.2/24 x 5	33.3/45
12"/300	11,18/284	3/76,2	14,40/366	4,80/122	14,17/360	15,47/393	34,76/883	7,87/200	41,45/1053	11,10/282	10,08/256	2,55/65	9,72/247	0.94 x 0.2/24 x 5	51.8/70
14"/350	12,67/322	3/76,2	16/400	7,75/197	12,60/320	18,07/459	35,79/909	7,87/200	42,48/1079	11,14/283	10/254	2,55/65	9,76/248	1.42 x 0.24/36 x 6	81.4/110
16"/400	14,40/366	3,50/89	18,03/458	7,75/197	14,49/368	20,31/516	42,32/1075	12,40/315	49,01/1245	15,31/389	13,22/336	3,58/91	11,25/286	1.42 x 0.24/36 x 6	118.4/160
18"/450	15,74/400	3,50/89	19,25/489	10,62/270	16,34/415	21,61/549	44,84/1139	12,40/315	51,53/1309	15,31/389	13,22/336	3,58/91	11,25/286	1.42 x 0.24/36 x 6	140.6/190
20"/500	18,11/460	4,50/114,2	21,73/552	10,62/270	18,11/460	24,21/615	52/1321	15,74/400	58,70/1491	15,31/389	13,34/339	3,58/91	11,25/286	1.42 x 0.24/36 x 6	199.8/270
24"/600	20,86/530	4,50/114,2	25,07/637	10,62/270	20,12/511	27,04/687	56,85/1444	15,74/400	63,54/1614	15,31/389	13,34/339	3,58/91	11,25/286	1.57 x 0.27/40 x 7	333/450
30"/ 750	26,37/670	4,6/117	33,14/842	12,59/320	26,37/670	37/940	71,65/1820	19,68/500	78,43/2005	16,92/430	14,37/365	4,6/117	11,92/303	1,96 X 0,31/50 X 8	407/550
36"/900	31,88/810	4,6/117	38,18/970	12,59/320	31,49/800	43,3/1100	74,80/1900	19,68/500	40,35/2295	16,92/430	14,37/365	4,6/117	11,92/303	2,36 X 0,35/60 X 9	629/850

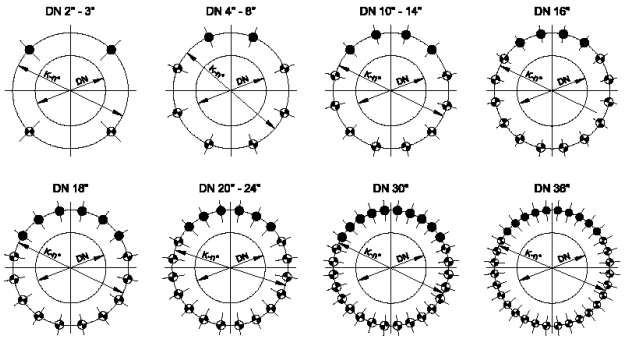
MODEL BT SERIES 22

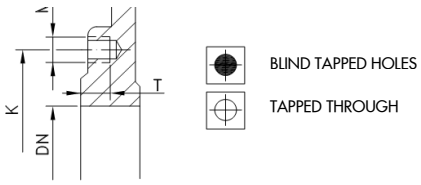
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FLANGE AND BOLTING DETAILS

ANSI B16.5 / B16.47, class 150

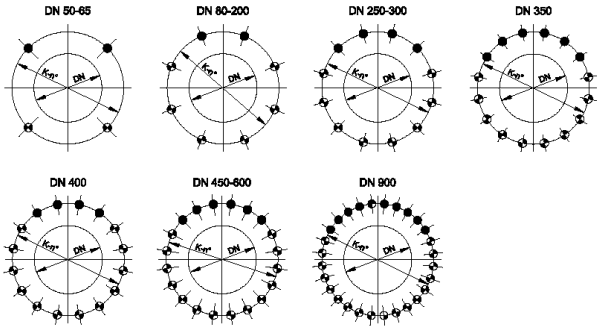
DN	K	Nº	M	T	
2″	4 ¾″	4	5/8″ - 11 UNC	7/16″	2 - 2
3″	6″	4	5/8″ - 11 UNC	11/32″	2 - 2
4″	7 ½″	8	5/8″ - 11 UNC	11/32″	2 - 6
5″	8 ½″	8	3/4″ -10 UNC	3/8″	2 - 6
6″	9 ½″	8	3/4″ -10 UNC	3/8″	2 - 6
8″	11 ¾″	8	3/4″ -10 UNC	7/16″	2 - 6
10″	14 ¼″	12	7/8″ - 9 UNC	18/32″	4 - 8
12″	17″	12	7/8″ - 9 UNC	18/32″	4 - 8
14″	18 ¾″	12	1″ - 8 UNC	½″	4 - 8
16″	21 ¼″	16	1″ - 8 UNC	½″	4 - 12
18″	22 ¾″	16	1 1/8″ - 7 UNC	18/32″	6 - 10
20″	25″	20	1 1/8″ - 7 UNC	1″	6 - 14
24″	29 ½″	20	1 1/4″ - 7 UNC	7/8″	6 - 14
30″	36″	28	1 1/4″ - 7 UNC	1 1/8″	10 - 18
36″	42 ¾″	32	1 1/2″ - 6 UNC	1 ¼″	10 - 22





EN 1092-2 PN10

DN	K	Nº	M	T	
50	125	4	M-16	11	2 - 2
100	180	8	M-16	9	2 - 6
125	210	8	M-16	10	2 - 6
150	240	8	M-20	10	2 - 6
200	295	8	M-20	12	2 - 6
250	350	12	M-20	14	4 - 8
300	400	12	M-20	14	4 - 8
400	515	16	M-24	12	4 - 12
500	620	20	M-24	24	6 - 14
600	725	20	M-27	22	6 - 14
900	1050	28	M-30	32	10 - 18



Digital Controller SC4500

Applications

- Wastewater
- Drinking Water
- Industrial Water
- Other



TAG:
16-AIT-405-1
16-AIT-405-2
16-AIT-405-3

TAG:
16-AIT-403-1
16-AIT-403-2
16-AIT-403-3

Claros Enabled

Service Protected

Ready for Now. Ready for the Future.

Technologies are advancing rapidly, providing new levels of convenience, accuracy, and efficiency. Which is exactly why the SC4500 Controller from Hach® is designed to integrate easily into your current system while allowing you to upgrade as your capabilities advance, without having to replace inventory. With a wide range of analog and digital connectivity options and the availability of intelligent instrument and data management features, the SC4500 unlocks the future, today.

Easy Adoption

The familiar experience of a modern touchscreen, the ability to use your current Hach sensors, and the same footprint as the SC200, make installation and integration of the SC4500 Controller seamless.

No Time for Downtime

The SC4500's built-in predictive diagnostic software ensures measurement confidence and reduces the risk of unexpected equipment downtime by enabling proactive maintenance planning via MSM, including step-by-step instructions.

The Connectivity Options You Need

The Controller provides local communication to SCADA or a PLC, as well as remote access through a secure, cloud-based connectivity option to integrate with Claros™, the Water Intelligence System from Hach. From analog and advanced digital protocols to wi-fi, cellular or LAN, the SC4500 gives you the flexibility to adapt in a rapidly changing world.

Technical Data*

Description	Microprocessor-controlled and menu-driven controller that operates the sensor
Dimensions	½ DIN - 144 x 144 x 192 mm (5.7 x 5.7 x 7.6 in.)
Weight	3.7 lb (controller only, w/o modules)
Display	3.5-inch TFT color display with capacitive touchpad
Enclosure Rating	UL50E type 4X, IEC/EN 60529–IP 66, NEMA 250 type 4X Metal enclosure with a corrosion-resistant finish
Operating Temperature Range	-20 to 60 °C (-4 to 140 °F) (8 W (AC)/9 W (DC) sensor load) -20 to 45 °C (-4 to 113 °F) (28 W (AC)/20 W (DC) sensor load) Linear derating between 45 and 60 °C (-1.33 W/°C)
Storage Conditions	-20 - 70 °C (-4 - 158 °F), 0 - 95% relative humidity, non-condensing
Altitude	2000 m (6562 ft) maximum
Installation Category	Category II
Pollution Degree	4
Protection Class	I, connected to protective earth
Power requirements	AC controller: 100-240 VAC ±10%, 50/60 Hz; 1 A (28 W sensor load) DC controller: 24 VDC +15% -20%; 2.5 A (20 W sensor load)
Measurements	Two device digital SC connectors
Relays	Two relays (SPDT); Wire gauge: 0.75 to 1.5 mm^2 (18 to 16 AWG) AC controller Maximum switching voltage: 100 - 240 VAC Maximum switching current: 5 A Resistive/1 A Pilot Duty Maximum switching power: 1200 VA Resistive/360 VA Pilot Duty DC controller Maximum switching voltage: 30 VAC or 42 VDC Maximum switching current: 4 A Resistive/1 A Pilot Duty Maximum switching power: 125 W Resistive/28 W Pilot Duty
Communication (optional)	Analog: Five 0-20 mA or 4-20 mA analog outputs on each analog output module Up to two analog Input modules (0-20 mA or 4-20 mA). Each input module replaces a digital sensor input. Digital: Profibus DPV1 module Modbus TCP Profinet IO module Ethernet IP module
Network Connectivity	LAN: Two Ethernet connectors (10/100 Mbps) Cellular: External 4G Wi-Fi
USB Port	Used for data download and software upload. The controller records approximately 20,000 data points for each connected sensor.
Compliance Certifications	CE. ETL certified to UL and CSA safety standards (with all sensor types), FCC, ISED, KC, RCM, EAC, UKCA, SABS, C (Morocco)
Warranty	12 months
Compatible Network Technologies	GSM 3G/4G (e.g. AT&T, T-Mobile, Rogers, Vodafone etc.) CDMA (e.g. Verizon)

**Subject to change without notice.*

Compatible Instruments / Software Version (Release Year)

Amtax sc / V2.30 (2018) or higher

A-ISE sc / V1.02 or higher

AN-ISE sc / V1.08 (2013) or higher

N-ISE sc / V1.02 or higher

Nitratax clear sc, Nitratax eco sc, Nitratax plus sc / V3.13 (2013) or higher

Phosphax sc / V2.30 (2018) or higher

Phosphax sc LR/MR/HR / V1.01 (2018) or higher

TSS sc / V41.73 (2013) or higher

Solitax sc / V2.20 (2013) or higher

TU5300sc, TU5400sc / V1.34 (2017) or higher

SS7 sc (in Bypass) / V1.06 (2006) or higher

Ultraturb sc / V3.06 (2017) or higher

1720E / V2.10 (2006) or higher

Sonatax sc / V1.15 (2016) or higher

CL17sc / V2.7 (2019) or higher

CL10sc / V1.14 (2013) or higher

9184sc, 9185sc, 9187sc* / V2.03 (2013) or higher

Uvas plus sc / V3.01 (2017) or higher

LDO 2 sc* / V1.22 (2013) or higher

3798sc* / V2.03 (2013) or higher

3700sc + Inductive Conductive Digital Gateway 6120800 / V3.00 (2017) or higher

3422sc, Analog 3400 + Contacting Cond. Digital Gateway 6120700 / V3.00 or higher

pHD sc*, pHD-S sc / V3.10 (2016) or higher

1200-S sc* / V2.04 (2013) or higher

pHD analog + Digital Gateway 6120500 / V3.00 (2017) or higher

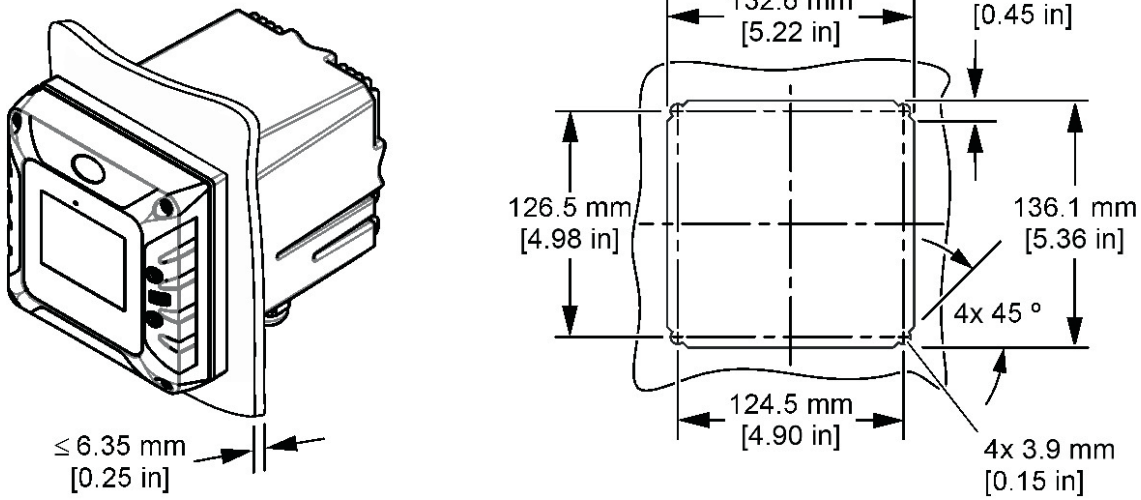
RC and PC analog sensor + Digital Gateway for conventional analog pH and ORP sensors 6120600 / V3.00 (2017) or higher

8362sc* / V3.00 (2017) or higher

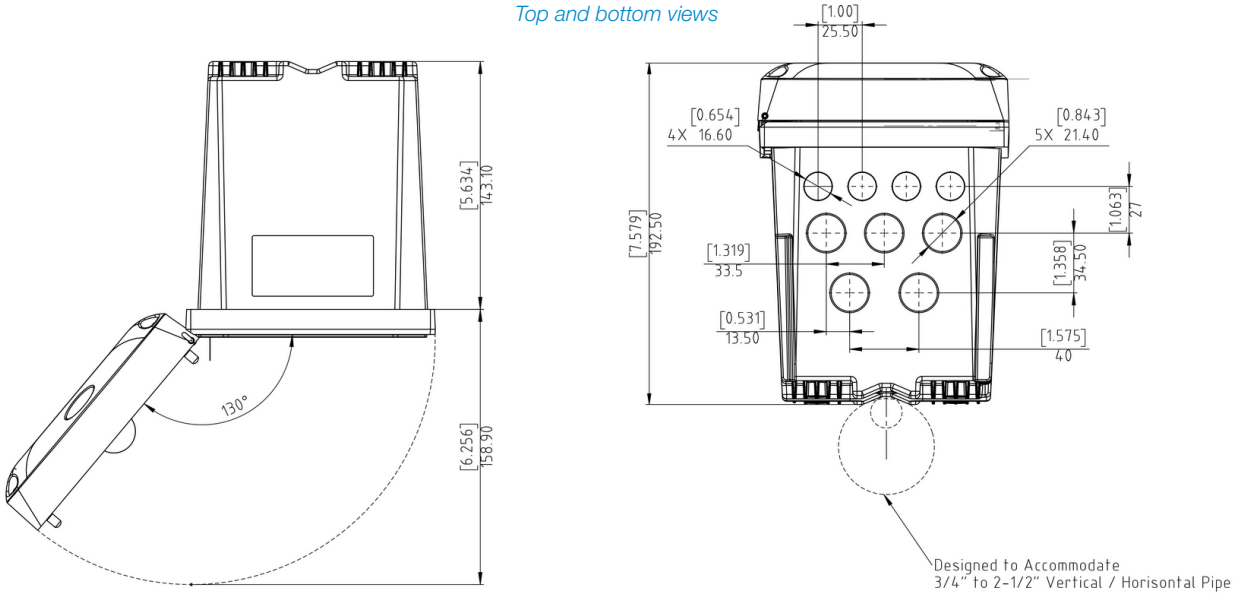
**Hardware Version1 of instrument is not supported*

Dimensions

Panel mounting dimensions



Top and bottom views



Door Opening Details

Order Information

Controller

LXV525.99A11551	SC4500 Controller, Prognosys, 5x mA Output, 2 digital Sensors, without plug
LXV525.99E11551	SC4500 Controller, Prognosys, 5x mA Output, 2 digital Sensors, US plug
LXV525.99A11541	SC4500 Controller, Prognosys, 5x mA Output, 1 digital Sensor, 1 mA Input, without plug
LXV525.99E11541	SC4500 Controller, Prognosys, 5x mA Output, 1 digital Sensor, 1 mA Input, US plug
LXV525.99AA1551	SC4500 Controller, Claros-enabled, 5x mA Output, 2 digital Sensors, without plug
LXV525.99EA1551	SC4500 Controller, Claros-enabled, 5x mA Output, 2 digital Sensors, US plug
LXV525.99AA1541	SC4500 Controller, Claros-enabled, 5x mA Output, 1 digital Sensor, 1 mA Input, without plug
LXV525.99EA1541	SC4500 Controller, Claros-enabled, 5x mA Output, 1 digital Sensor, 1 mA Input, US plug

Additional configurations are available. Please contact Hach Technical Support or your Hach representative.

Accessories

LXZ524.97.00042	SC4x00 Input Module
LXZ525.99.D0002	SC4x00 mA Output Module (5 Outputs)
LXZ525.99.C0002	SC4500 Ethernet IP Upgrade Kit
LXZ525.99.C0003	SC4500 Modbus TCP/IP Upgrade Kit
LXZ525.99.00026	SC4500 Ethernet Cable M12 to M12 / C1D2, 10 m
LXZ525.99.00017	SC4500 USB Stick
LXZ524.99.00004	SC4x00 UV Protection Screen
LXZ524.99.00005	SC4x00 UV Protection Screen with Sunroof
LXZ524.99.00033	SC4x00 Sunroof Visor
LXZ524.99.00036	SC4x00 Mounting Hardware Sunroof with Visor
LXZ524.99.00037	SC4x00 Sunroof with Visor

Claros Enabled

This instrument connects to Claros, Hach's innovative Water Intelligence System. Claros allows you to seamlessly connect and manage instruments, data, and process – anywhere, anytime. The result is greater confidence in your data and improved efficiencies in your operations. To unlock the full potential of Claros, insist on Claros Enabled instruments.

Service Protected

With Hach Service, you have a global partner who understands your needs and cares about delivering timely, high-quality service you can trust. Our Service Team brings unique expertise to help you maximize instrument uptime, ensure data integrity, maintain operational stability, and reduce compliance risk.

DOC053.53.35316.Nov21

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Outside United States: 970-669-3050 tel 970-461-3939 fax int@hach.com
hach.com

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In the interest of improving and updating its equipment, Hach Company reserves the right to alter specifications to equipment at any time.

HACH® Be Right™

SSI PROPOSAL

SSI Aeration Inc.





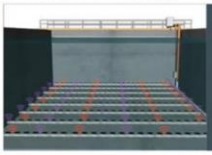
Fine Bubble Diffusers
Disc Type



Fine Bubble Diffusers
Tube Type



Coarse Bubble Diffusers
Reliability Built In



Telemetry Systems
Real Time Camera Monitoring



Advanced
Membrane Materials
PTFE



Retrievable Systems
Easy to Maintain



Complete Aeration Systems
Designed for You



OEM Replacement
Membranes
Retrofit Existing Systems

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Email: info@ssiaeration.com
www.ssiaeration.com

September 9th, 2024.

File: RFP052822, NY (Suez)_P-060122 [D]

SUEZ WATER TECHNOLOGIES
Attention: Fan, Fengshen (WTS)
E-Mail: fengshen.fan@suez.com
Phone: 905 469 7792

Ref: RFP052822, NY - **Proposal**

Revision 'A': Revised with Tank Dimensions as per email dated on 07/06/2022.
Revision "B": Revised with Tank dimensions & AOR Loadings as per email dated on 08/19/2022.
Revision" C": Revised with Tank dimensions & AOR Loadings as per email dated on 02/13/2023.
Revision "D" with Tank dimensions & AOR Loadings as per email dated on 09/04/2024.

Sir/Madam,

In response to your email and based on the information, SSI as an ISO-9001 certified corporation is pleased to submit this proposal for the design, manufacture & supply of Aeration Equipment for **Three (3) Biological Trains** with POD270-E (9") Fine Bubble Disc Diffusers with EPDM Membranes.

Unless otherwise noted equipment supplied will meet or exceed any engineer specified performance requirements and/or called in the RFP/Email and Design calculations & Preliminary Drawings showing the general arrangement of diffuser/Piping layouts are included (Refer item *1*).

A. Scope of supply is complete with all components from the downstream of air supply line connection (±6" above water level) starting with SS Vanstone and loose follower flange including drop pipe *(Isolation valve and associated accessories are not included in SSI supply limit)*

Each Train has two (2) zones; Each Zone is 44.75' x 24' x 20.5' (SWD) and Aeration Equipment Supply ***per zone*** is listed below:

ZONE	304SS Sch.10 Drop pipe ±20'			PVC Sch.40 Manifold ±25'			Ø4" PVC SDR 26 Headers c/w Factory installed diffuser			POD270-E Diffusers
	Size	304SS Supports	304SS Couplings	Size	304SS Supports	PVC Couplings	Length (ft)	304SS Supports	PVC Unions	
#1	Ø8"	3	1	Ø8"	5	1	±440'	77	33	440
#2	Ø6"	3	1	Ø6"	5	1	±320'	56	24	312
Number of AFD270-E Diffuser for One (1) Biological Train										**752**

COMMON FOR ALL TRAINS

Total number of AFD270-E Diffuser for Three (3) Biological Trains (752/Tank) * 3 = **2,256**

B. Spares:
- AFD270-E Diffuser Assemblies – **9**
- 4" 304SS Supports - **5**
- 4" Repair Couplings – **2**
- Special Tools Set – **1**

C. Estimated Freight: Orange Town of NY, 10962 *(Subject to change at actuals)*

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DIFFUSED AERATION SYSTEM

Doc #	**SD00013238**	Revision #	**3**
Project	**RFP052822,NY (Suez)**	Date	**9-6-2024**
Process Type	**MBR**	Units	**Imperial**

Three (3) Biological Train design for 3 tank(s)			
Tank Type	**Aeration**	Tank Shape	**Rectangular**
Type of Input	**AOR**	Diffuser Type	**AFD270-1mm**

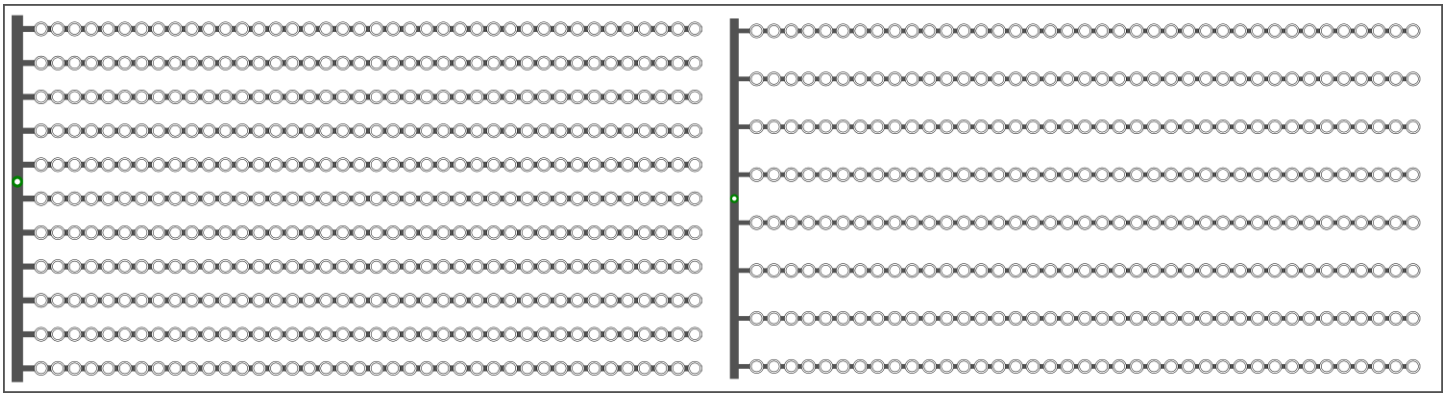
Three (3) Biological Train / design for 3 tank(s)			
	Units	**Aerobic Zone #1**	**Aerobic Zone #2**
Design Scenario		**Standard**	**Standard**
AOR	(Lbs/day)	8,208	5,856
AOR	(lbs O_2/hr)	342	244
Site Elevation	(ft)	140	140
Length per tank	(ft)	44.75	44.75
Width per tank	(ft)	24	24
Diffuser Water Depth	(ft)	19.5	19.5
SOR	**(lbs O_2/hr)**	**955.77**	**681.89**
Total Airflow	**(SCFM)**	**2,366**	**1,710**
Airflow Per Diffuser	**(SCFM)**	**1.79**	**1.83**
Diffuser Quantity	**(pcs)**	**1,320**	**936**
Diffuser Density	**(%)**	**16.8**	**11.91**
SOTE	**(%/ft)**	**1.98**	**1.96**
Total SOTE	**(%)**	**38.69**	**38.2**
Blower Pressure	(PSIG)	9.74	9.74
Pressure @ Top Of Dropleg	(PSIG)	9.18	9.19

Three (3) Biological Train / design for 3 tank(s)

	Units	Aerobic Zone #1	Aerobic Zone #2
AOR	(Lbs/day)	8,208	5,856
AOR	(lbs O_2/hr)	342	244
MLSS	(mg/l)	10,000	10,000
Aeration Time	(hrs)	24	24
Liquid Temperature	(°C)	25	25
Ambient Air Temperature	(°C)	29	29
Site Elevation	(ft)	140	140
Barometric Pressure	(PSIG)	14.62	14.62
O_2 Uptake Rate	(mg/l/hr)	83	59.22
Minimum Diffuser Density	(%)	5	5
Alpha Factor	(α)	0.44	0.44
Fouling Factor	(F)	1	1
Beta Factor	(ß)	0.95	0.95
Theta Factor	(θ)	1.024	1.024
Dissolved Oxygen	(mg/l)	1.5	1.5
Length per tank	(ft)	44.75	44.75
Width per tank	(ft)	24	24
Side Water Depth	(ft)	20.5	20.5
Diffuser Water Depth	(ft)	19.5	19.5
Total Area of 3 tank(s).	(ft^2)	3,222	3,222
Tank Volume	(ft^3)	66,051	66,051
Tank Volume	(Million Gallons)	0.49	0.49
C *, Surface Saturation, Std., Meth	(mg/l)	8.26	8.26
Csw, Site Basin Saturation	(mg/l)	9.88	9.88
Css, Std., Basin Saturation	(mg/l)	10.92	10.92
SOR	(lbs O_2/hr)	955.76	681.89
SOR	(lbs O_2/day)	22,938.33	16,365.36
KLa20 - /hr		21.4	15.27
Required Mixing Energy	(SCFM/ft^2)	0.12	0.12
Airflow For Minimum Mixing	(SCFM)	386.64	386.64
Minimum Diffuser Quantity	(pcs)	393	393
SP O_2Transfer Rate	gr O_2/Nm^3-m	19.55	19.3
SAE	(lbs O_2/hp-h)	7.84	7.74
Blower Efficiency	(%)	70	70
Blower Power	(hp)	121.88	88.08
Estimated cost per kWh	(kWh)	0.11	0.11
Annual Operating Cost	(USD)	87,579.1	63,291.49

II. Preliminary Drawings

THREE (3) BIOLOGICAL TRAINS



ONE (1) SHOWN THREE (3) REQUIRED

Aerobic Zone #1
24' (L) X 44'-9" (W) X 20'-6" (SWD)
11-HEADERS PER GRID @ 2'-1.35" C-C
40-DIFFUSERS PER HEADER @ 1'-0.54" C-C
440-DIFFUSERS PER GRID

Aerobic Zone #2
24' (L) X 44'-9" (W) X 20'-6" (SWD)
8-HEADERS PER GRID @ 2'-11.8" C-C
39-DIFFUSERS PER HEADER @ 1'-0.92" C-C
312-DIFFUSERS PER GRID

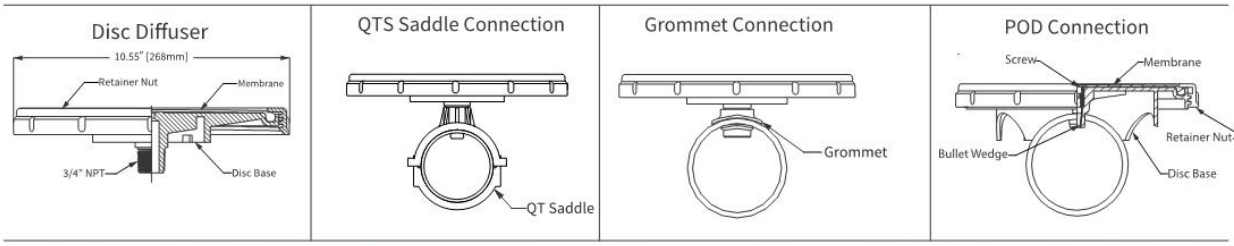
Note: This schematic layout is for conceptual purpose not for construction

SSI Aeration
SMART IDEAS FOR WATER

AFD270 Disc Diffuser

What Makes the a
SSI 9” AFD270 Disc Diffuser Systems
Worldwide Choice?

The SSI 9” Disc Diffuser System combines engineering excellence, superior component quality, and a technically advanced product design. Proven highly durable and efficient in thousands of municipal and industrial installations around the world, this advanced system has reliability built into every stage of performance. SSI’s AFD270 comes in several membrane materials including our patented PTFE membrane, designed to use less energy and require minimal maintenance. Industry standand size and shape are interchangable with other manufacturers. The diffuser base is molded with virgin polypropeline for extended performance, and is highly efficient with airflow performance of 1.5-2.5 SCFM.





SSI Aeration
An ISO 9001:2015 Certified Company

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AFD270 Disc Diffuser

Unique System Strengths

Complete product line – creating the system that fits your needs

SSI manufactures disc diffusers and coarse bubble diffusers, and we mount these products on a wide range of piping materials including PVC, CPVC, PP and Stainless Steel. We have the ability to attach diffusers to pipe using saddles, grommets, or pre-assembled PODS. We can provide retrievable systems or fixed grids, and systems in kit form or mostly factory assembled. We try to understand and anticipate your needs, and fit our recommendations to your situation.

Piping system integrity – thicker wall pipe and double anchors for fewer breakages

Our piping is 38% thicker and has double rod support stands as standard – two anchors for each support location means twice the resistance to hydraulic and thermal loads. Most often supports fail due to temperature and water velocity. SSI locates two anchors where support is needed most, helping to increase product longevity.

Comprehensive design service and after sales support

SSI provides full design services, including biological and mixing calculations, process simulations and hydraulic studies. We maintain a full drafting department with 3D and animation capabilities and we can assist with specifications and CAD drawings. Our service and installation crew can hold your hand during the early stages of the project and our worldwide multilingual staff is dedicated to your complete satisfaction.

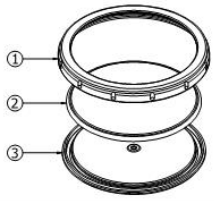
Intelligent Upgrade Options

Patented PTFE membranes prolong efficiency and reduce whole-life costs

SSI's patented PTFE membrane barrier properties not only reduce plasticizer extraction, shrinking, and membrane hardening but also limit dynamic changes that can result from swell, such as creep. Compared with uncoated products that are more susceptible to increases in DWP due to more aggressive fouling and changes in physical properties and weight, the PTFE coated membrane improves consistency of DWP (Headloss) values over the product life. This directly impacts long-term power costs and the ability of the system to distribute air uniformly across the tank floor.

Diffuser Parts	Material
1. Retainer nut	PP
2. Membrane	EPDM / PTFE / PEEK / Silicone
3. Diffuser Base	PP

Max. Temperature resistance - 212° F / 100° C



Pods Connection

Factory assembled diffusers mounted on laterals save contractors up to 30% on assembly time. PODS are a viable solution if you want to tank down for a minimum period, if your labor costs are high, or if you have a field labor shortage. For engineers unsure about the skill set of a contractor's field labor, SSI PODS are worry free with fewer field connections, and most connections created in controlled factory settings by trained personnel and automatic machines.

Grommet Connection

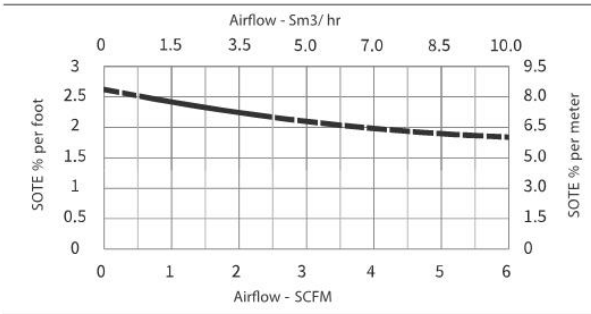
Simple to install on site, compact to ship and move. Affordably priced and time tested over 15 years worldwide.

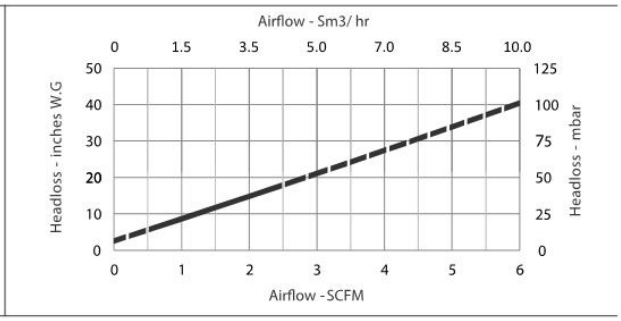
Quick Threaded Saddle

QTS saddles quickly and easily bolt onto the pipe and allow installation of the diffuser with a few simple turns.

Avg Operating Condition per Diffuser	Peak Air Flow per Diffuser	Orifice Size	Slit Qty	Active Surface Area per Diffuser	Weight per Diffuser AFD270
0.45 - 2.5 SCFM 0.8 - 4.5 Sm^3/hr	4.0 SCFM 7.0 Sm^3/hr	1/4" 6mm	+/- 6600	0.41 ft^2 0.038 m^2	1.5 lbs 0.68 kg

Operating diffusers distant to average operating conditions range might leads to poor uniform distribution and subjected to rapid fouling.





Above curves are generated based on ideal condition. Actual curves for specified project/condition to be provided upon request.

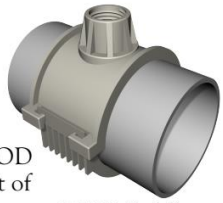
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TECHNICAL DATA SHEET

SSI™ ACCESSORIES

QCTS SADDLES



Quick Connect NPT Saddles mount on nominal US 3" or metric 88.9mm, 90mm OD, US 4" or 114.3mm and 110mm OD pipe. They allow retrofit of 12" to 9"discs without changing the piping system.

QCTS Saddle

Quick Connect NPT Saddles are made of polypropylene, and install into a 5/8" (16mm) hole. changing the piping system.

GROMMETS



Grommets are available for round plastic or square stainless steel pipes in US or Metric dimensions. Installation is simple. Multiple sizes are available based on pipe wall thickness. Grommets install into a 1-1/4" (32mm) chamfered hole.

EXPANSION JOINT OPTIONS



Rigid Bolted SS

Expansion Joints are available in three types: Flexible PVC with SS Shell, Rigid Bolted SS, and Anti-rotation, Telescoping PVC. The flexible expansion joints are recommended for disc installations and the positive locking type for tube diffuser projects.



Flexible PVC w/SS shell

Slotted band joints with stainless steel shear rings are suitable for disc-type fine bubble and cap-type coarse bubble lateral plastic piping systems, in conjunction with SSI's fixed and guide support stand system to manage thermal expansion and contraction.

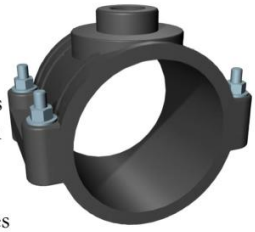
Positive locking bolted stainless steel couplings are suitable for drop pipes, stainless joints, and for all tube diffuser piping systems to restrict header pipe rotation.



Anti-rotation, Telescoping PVC

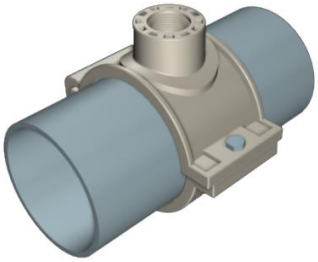
SSI's Sliding Expansion Joint is an anti-rotational telescopic union which absorbs pipe expansion and contraction to up to 1.5" (38mm).

CLAMP SADDLES



Clamp Saddles are avialable to suit different pipe sizes and its installed on 1" to 4" pipes with 5/8" (16mm) hole.Clamp Saddles are also easy to install using bolt, nuts and washers. Clamp saddles are typically made from metal or plastic. Metal clamps are more durable

BOLTED SADDLE



SSI manufactures nominal 2",3" and 4" Quick Bolted Saddles QTS269 for both 2.375"/60.3mm O.D pipes, QTS390 for both 3.5"/ 90mm O.D pipes and QTS4110 for 4.5"/110mm O.D pipes . Quick Threaded Bolted Saddles are made of talc-filled polypropylene, and installation into a 5/8" (16mm) hole with an O-ring (ORQTS). Easily install Quick threaded saddle on pipe using SSI's special channel-lock pliers.

Please see reverse for additional technical data

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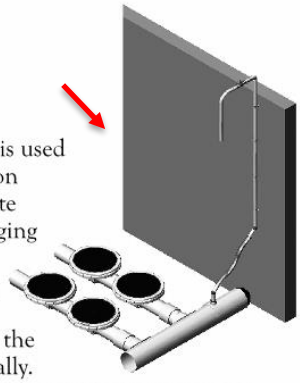
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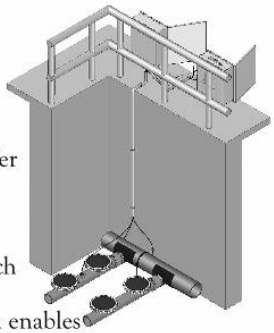
SSI™ ACCESSORIES *continued*

MOISTURE PURGE SYSTEM



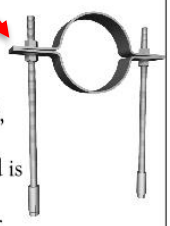
An airlift type purge system is used in all SSI fine bubble aeration systems to remove condensate from the piping system. Purging entrained water helps ensure even air distribution to all diffusers in a grid. A ball valve is supplied with the system and is opened manually. Continuous purge systems are available for retrievable-type aeration systems, or where it is not possible to fasten a purge line to a tank wall.

PRESSURE MONITORING SYSTEM

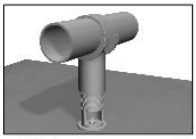


Throughout the life of an aeration system, oxygen transfer efficiency may decline somewhat when diffusers become fouled, but headloss can increase dramatically which in turn increases energy costs. A pressure monitoring system enables the operator to better determine the optimal cleaning frequency of the membranes. The fouling rate can vary by aeration zone, hence it is recommended to install at least one system in each zone.

SUPPORT STANDS



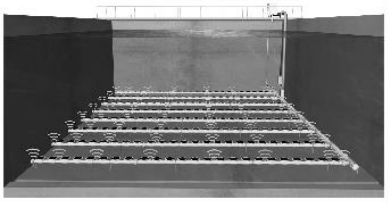
Support Stands are available in 304SS, 316SS or in ABS plastic. SSI's standard is 304SS with drop-in anchor bolts. In our aeration piping systems, support stands fulfill the dual role of anchoring pipes to the floor and controlling thermal expansion and contraction. Special support stands for uneven tank floors, for installing into concrete ballast forms, and for tanks with significant channel velocity (with lateral supports) are also available. ABS support stands are primarily used with disc diffusers and plastic pipe, where a low capital cost is the primary objective.



ABS plastic support stand

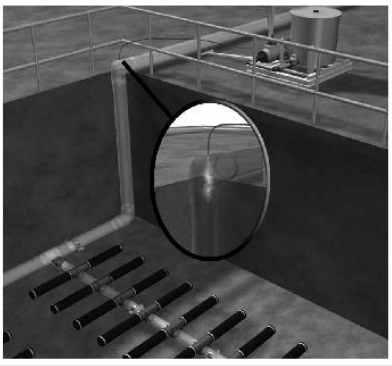
TELEMETRY SYSTEM

Adding a Telemetry System to your aeration system will allow you to remotely monitor factors inside your tank from any PC, tablet or mobile device. Telemetry can be installed in new systems or retrofitted through an end cap into existing systems. Telemetry sensors are available to monitor variables in your system such as temperature, vibration, humidity, water detection, DO, and other environmental factors.



ACID DOSING SYSTEM

In-situ Acid Dosing Systems are available to control calcareous deposits in the perforations which will reduce membrane backpressure.



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SSI – SSI Aeration, Inc.
Standard Terms and Conditions of Sale

1. **General:** All products and services offered for sale by Stamford Scientific International, Inc. (hereinafter "Seller") or its subsidiaries or through its distributors or sales representatives are sold subject to the terms and conditions stated herein. This offer expressly limits acceptance to the terms hereof and any additional, different or inconsistent terms proposed by Buyer, whether in writing or otherwise, are hereby objected to and rejected and Seller shall not be bound thereby unless expressly agreed in a writing signed by an officer of the Seller that such terms and conditions shall supersede those contained herein.

2. **Estimates and Quotations**: All prices are subject to adjustment on account of specifications, quantities, shipment arrangements or other terms and conditions, which are not part of the original price quotation. Written estimates issued by the Seller will be valid for 30 days only. Products are sold at prices in effect at the time the order is taken. The company reserves the right to change prices without notice when necessary.

3. **Terms and Method of Payment**: For Buyers with established credit, payment of accounts due must be made within 30 days of shipment FOB Seller facility or 30 days after the goods are ready to ship and Buyer is notified of same. Seller may make partial billings of the contract price or invoice as various components of the equipment are shipped. Partial payments are expected to be made according to partial goods shipped. Custom built and special large orders shall require deposits in advance of production together with progress payments. For Buyers without credit, payment will be by company check, bank draft, Visa or Mastercard, telegraphic transfer or irrevocable letter of credit at time of order or progress payments according to quote offer. The Buyer shall not be entitled to withhold payment of any sums due to the Seller by reason of any disputed claim by the customer relating to any goods or deliveries. If Buyer fails to make payment by the due dates then without prejudice to any other rights of the Seller: The Seller shall be entitled to suspend all or any other deliveries to be made under that or any other contract with the Buyer and in such event the Buyer shall not in any respect be released from its obligations to the Seller under that or any such other contract. The Seller shall also be entitled to treat the relevant contract or any other contract with the Buyer as having been terminated by the Buyer and to claim damages for breach of contract accordingly.

4. **Taxes**: Product prices do not include taxes. The amount of any present or future sales, use, excise, value-added or similar tax if applicable to the sale shall be paid by the Buyer unless a tax exemption certificate acceptable to the tax authorities is approved. If Seller is required to pay any such tax, fee or charge, Buyer shall reimburse Seller therefore.

5. **Delays in Delivery and Force Majeure**: All quoted delivery dates are approximate. The Seller will make commercially reasonable efforts to meet any delivery date(s) quoted in the agreement. However, under no circumstances shall the Seller be liable to Buyer for any delay in shipment or failure to meet any quoted delivery date(s) due to unforeseen circumstances or due to a cause beyond its control. Examples of such causes are acts of God, wars, riots, embargoes, acts of civil or military authorities, fires, floods, accidents, strikes, transportation delays, inability to obtain materials or supplies, interruption for any reason in the manufacture of products by Seller's supplies or other causes not within Seller's control.

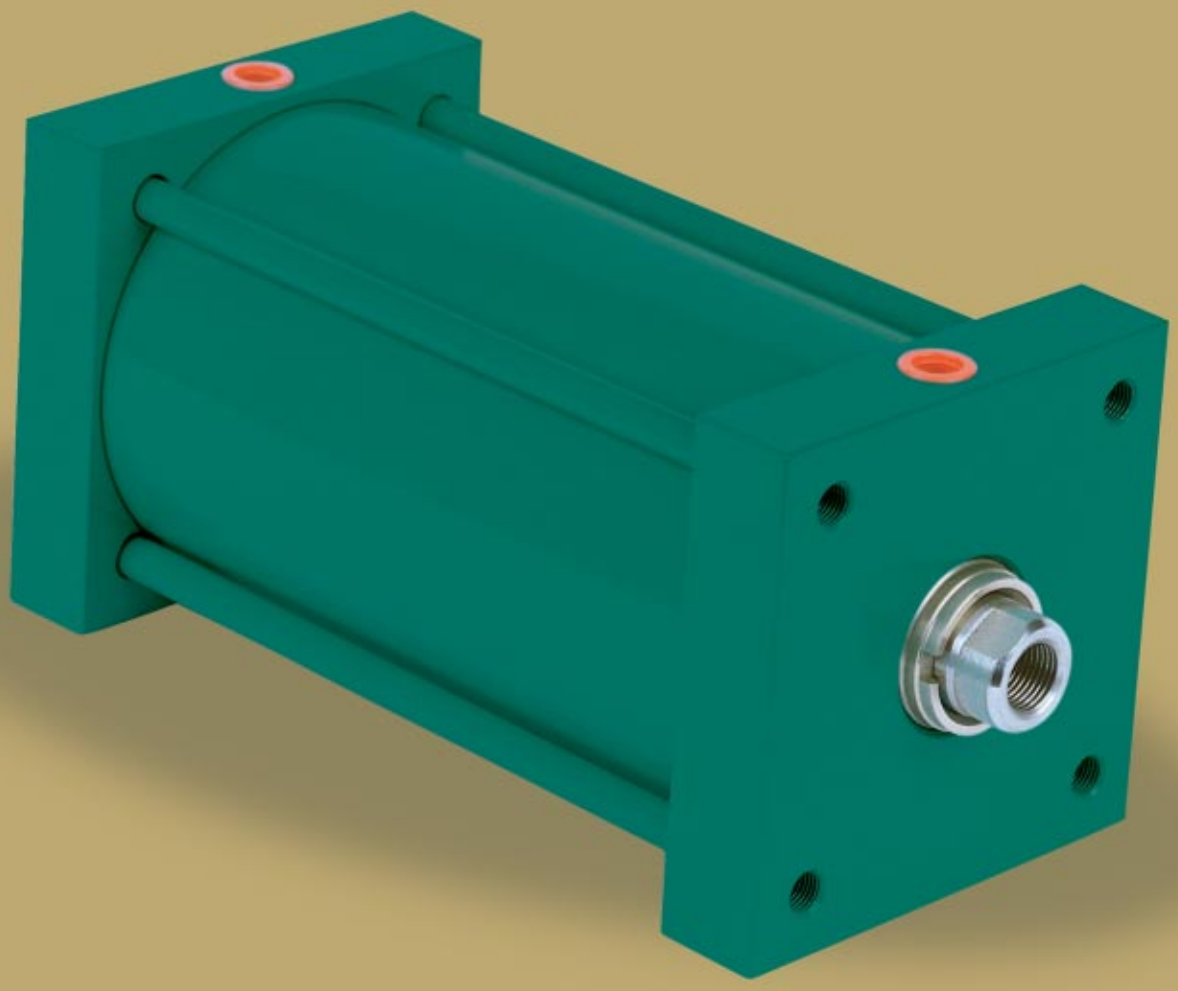
6. **Warranty/Repairs**: Products manufactured by Seller are warranted to be free from defects in materials or workmanship for 18 months from date of shipment or 12 months from the date of start up, whichever comes first. Parts found to be defective in materials or workmanship will be repaired or replaced without charge, F.O.B. original point of shipment. The forgoing warranty is in lieu of and excludes all other warranties expressed or implied (including any warranty of merchantability or fitness or purpose). The responsibility of the Seller is limited to the cost of the defective part. Wear caused by faulty maintenance or operation shall not constitute defects. Elastomeric components damaged as a result of maintenance activities, excessive airflow, foreign debris in the process solution, or excessive exposure to direct ultraviolet and thermal radiation shall be excluded. Decomposition by chemical action and chemical precipitate shall not constitute defects. Claims for defective, damaged or improper material or for shortages will not be allowed unless written notice specifying the nature and extent of the defect, damage or shortage is received in the Seller's office within fourteen (14) days from delivery. Seller assumes no responsibility of expense for repairs made on equipment sold by it to Buyer when such repairs are done outside Seller's factory facilities without its written consent. In all cases, a Start-Up certificate issued by SSI is for general conformance to the Manufacturer's installation instructions only after audit for work performed. However, in no cases, SSI can audit 100% of all work performed by others and cannot guarantee their work to fully meet our installation instructions. Warranty for installation labor and services provided by others shall be covered by the warranty of the entity performing those services. Failure by the Installer to fully meet our installation instructions and requirements may result in installation errors which may lead to equipment failure, for which Seller shall not be liable.

7. **Cancellation and Returns Policy**: (A) Cancellations: Any request for order cancellation, rescheduling or modification by Buyer must be made in writing and such action must be approved in writing by an officer of Seller. Such request should be made to Seller at least four (4) weeks from scheduled shipment date in order to be considered. Such cancellation, rescheduling or modification shall be subject to the payment of reasonable cancellation charges, which shall include but not be limited to expenses already incurred for labor and material costs, commitments made by Seller and a reasonable profit. (B) Returns: Any request for product return by Buyer must be made in writing. Returns of products will not be accepted for any reason without prior written consent of Seller and issuance of a Return Material Authorization (RMA) number. Return of products must be shipped freight prepaid by Buyer. Seller will not accept freight charges. Returns may be subject to a 15% restocking fee and any other reasonable charges. Returns made without obtaining prior authorization shall be returned to sender at Buyer's expense. Custom made goods may not be returned under any circumstance.

SERIES PA

PNEUMATIC CYLINDERS FOR VALVE ACTUATION

BORE SIZE: 3 1/4″ TO 20″ • RATING: 150 PSIG (1000 KPA)



RDC CONTRÔLE

PNEUMATIC CYLINDERS FOR VALVE ACTUATION FEATURES

The PA Series of valve actuators are designed to automate valve operation. These actuators can be adapted for many applications,including special needs. Their compact design allows for easy installation. In addition, RDC Controle fabricates them under strict quality conditions.

HEAD & CAP
Numerically controlled machined from hot rolled steel plates ASTM A36 or better.

PISTON PACKING
2 pressure sensitive "U" cups for better sealing and durability.

CYLINDER BARREL
Bore size from 3 1/4 to 12": Heavy wall steel tubing with a polished chrome plated interior for better durability.

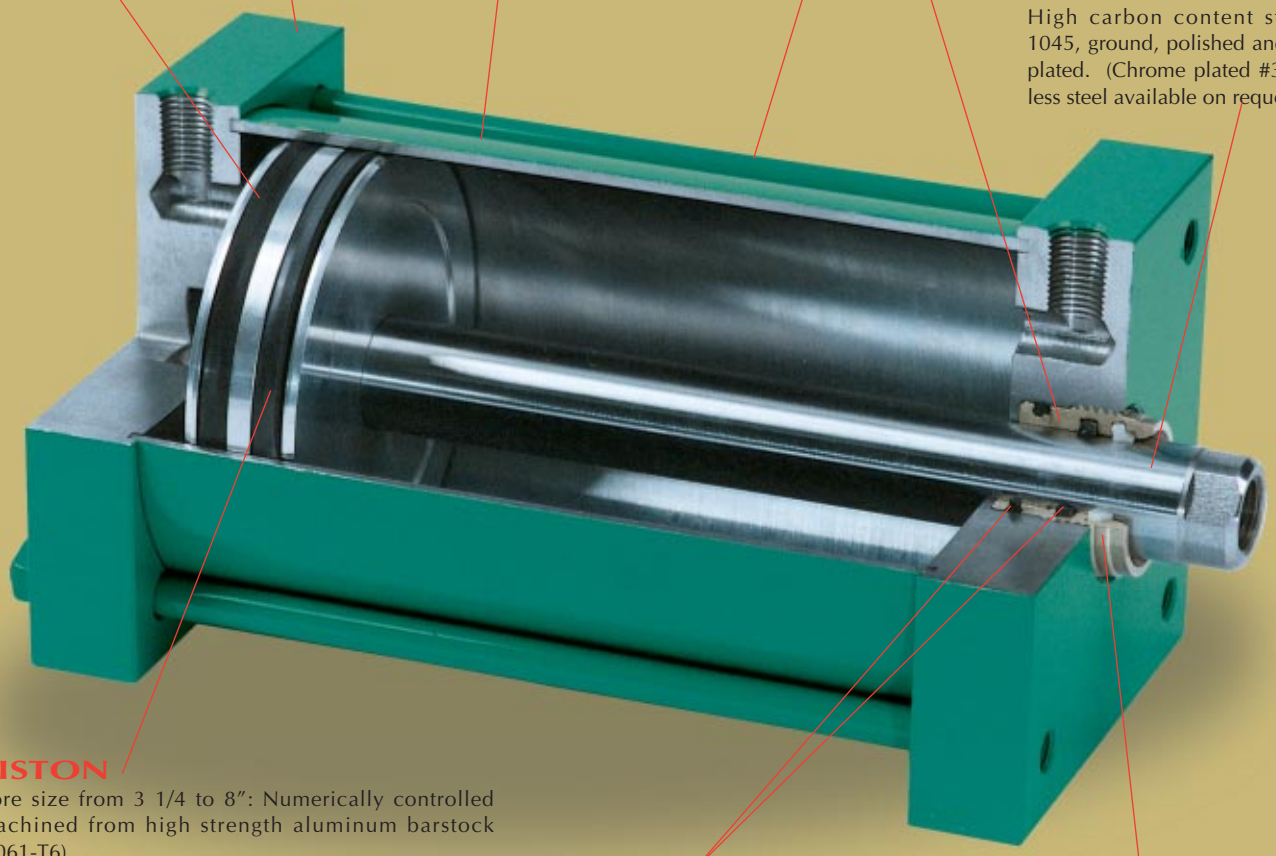
Bore size from 14" to 20": Thermoset fiber reinforced composite, specially designed for cylinder tubing for weight reduction and corrosion resistance.

TIE RODS AND NUTS
Bore size from 3 1/4 to 12": Made from STAINLESS STEEL to limit corrosion.

Bore size from 14" to 20": High strength steel barstock along with zinc plated steel nuts (Grade 5).

GLAND BUSHING
Cartridge type, made from Bronze SAE 660. Seals can be replaced without dismantling the cylinder.

PISTON ROD
High carbon content steel SAE 1045, ground, polished and chrome plated. (Chrome plated #316 stainless steel available on request).



PISTON
Bore size from 3 1/4 to 8": Numerically controlled machined from high strength aluminum barstock (6061-T6).
Bore size from 10" to 20": Made from mild steel. A wear strip is added on the outside diameter to protect the tube and assure a perfect fit.

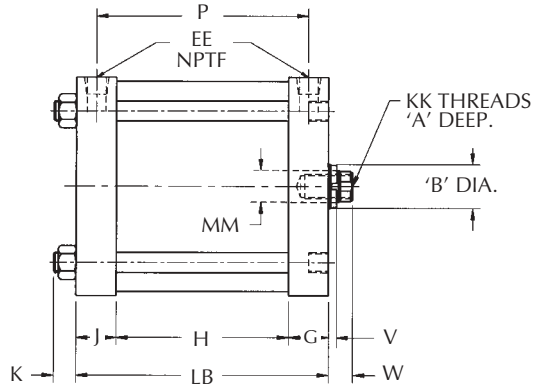
PISTON WEAR STRIP
Bore size from 10" to 20": It consists of a teflon tape filled with particles of bronze and glass, for smoother piston operation.

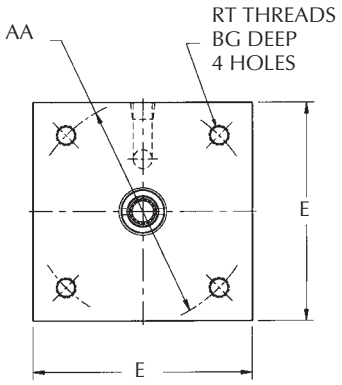
SEALS AND PACKING
"U" CUP AND "O" RING used for added security. A high durometer nitrile material is offered as a standard for a temperature rating from -34°C to 120°C (-30°F to 250°F). For temperature range up to 250°C (450°F), fluorocarbon (viton) seals and packings are available

ROD WIPER
Stops dust and other particles from entering into the cylinder. Standard material is polyurethane. It can be replaced by fluorocarbon (viton) for higher temperature applications.

SERIES PA

PNEUMATIC CYLINDERS FOR VALVE ACTUATION
A0 - BASE MOUNTING





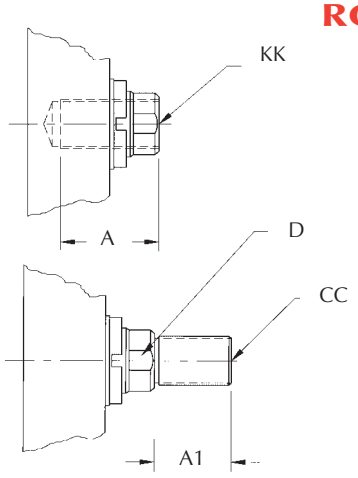
DIMENSIONS (IN.)

BORE	MM ROD SIZE	KK UNF	A	AA	B	BG	E	EE NPTF	G	J	K	RT UNF	V	W	ADD STROKE		
															LB	H	P
31/4	1	5/8 - 18	11/2	3.900	1.375	5/8	3 3/4	1/4	1	1	3/8	3/8 - 24	1/4	3/4	3	1	2
4	1	5/8 - 18	11/2	4.700	1.375	5/8	4 1/2	1/4	1	1	3/8	3/8 - 24	1/4	3/4	3	1	2
5	1	5/8 - 18	11/2	5.800	1.375	1/2	5 1/2	1/4	1	1	1/2	1/2 - 20	1/4	3/4	3 1/8	1 1/8	2 1/8
6	1	5/8 - 18	11/2	6.900	1.375	1/2	6 1/2	1/4	1	1	1/2	1/2 - 20	1/4	3/4	3 1/8	1 1/8	2 1/8
7	1	5/8 - 18	11/2	8.100	1.375	5/8	7 1/2	3/8	11/4	11/4	5/8	5/8 - 18	1/4	3/4	3 3/4	1 1/4	2 1/2
8	1	5/8 - 18	11/2	9.100	1.375	5/8	8 1/2	3/8	11/4	11/4	5/8	5/8 - 18	1/4	3/4	3 3/4	1 1/4	2 1/2
10	13/8	1 - 14	2	11.200	1.875	3/4	10 5/8	3/8	11/2	11/2	3/4	3/4 - 16	5/16	1	4 3/4	1 3/4	3 1/4
12	13/8	1 - 14	2	13.300	1.875	3/4	12 3/4	1/2	11/2	11/2	3/4	3/4 - 16	5/16	1	4 3/4	1 3/4	3 1/4
14	13/8	1 - 14	2	15.400	1.875	7/8	14 3/4	1/2	13/41	13/41	7/8	7/8 - 14	5/16	1	5 1/2	2	3 3/4
16	2	1 1/2-12	21/2	17.800	2.500	-	17	1/2	3/4	3/4	1	-	3/8	11/2	5 5/8	2 1/8	3 7/8
18	2	1 1/2 -12	21/2	20.000	2.500	-	19	3/4	13/4	13/4	1 1/8	-	3/8	11/2	5 7/8	2 3/8	4 1/8
20	2	1 1/2 -12	21/2	22.300	2.500	-	21	3/4	13/4	13/4	11/4	-	3/8	11/2	6 1/8	2 5/8	4 3/8

ROD THREADS

TYPE -4-
Female threads (standard)

TYPE -1-
Male threads (optionnal)



DIMENSIONS (IN.)

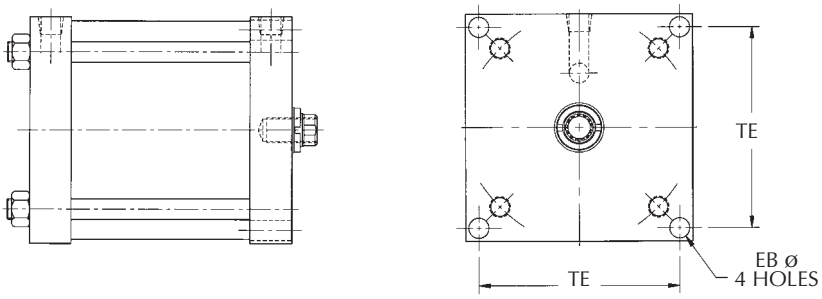
ROD SIZE	A1	CC UNF-2A	D	A	KK UNF-2B
1	1 1/8	3/4 - 16	7/8	1 1/2	5/8- 18
1 3/8	15/8	1 - 14	1 1/8	2	1 - 14
2	21/4	1 1/2 - 12	1 11/16	2 1/2	11/2 - 12

RDC Contrôle can also manufacture special rod ends to answer your specific needs.
Use thread type –9– in model number and specify required dimensions

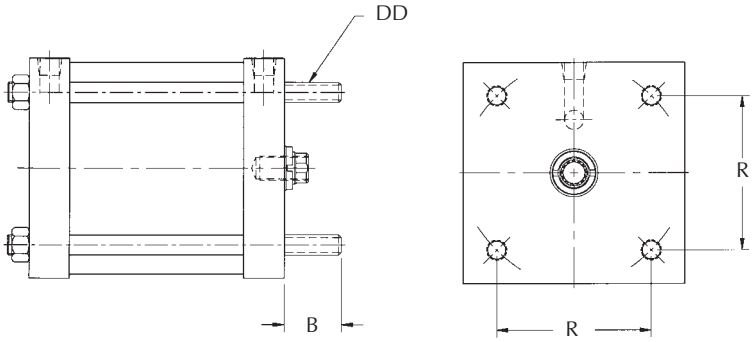
SERIES PA

PNEUMATIC CYLINDERS FOR VALVE ACTUATION
OPTIONAL MOUNTINGS

E3 – SQUARE HEAD MOUNTING
BORE SIZE: 7" TO 20" ONLY



X3 – EXTENDED TIE RODS MOUNTING



BORE	EB	TE	BB	DD UNF	R
3 1/4	–	–	1 3/8	3/8 – 24	2.76
4	–	–	1 3/8	3/8 – 24	3.32
5	–	–	1 3/4	1/2 – 20	4.10
6	–	–	1 3/4	1/2 – 20	4.88
7	9/16	6.75	2	5/8 – 18	5.73
8	11/16	7.57	2	5/8 – 18	6.44
10	13/16	9.40	2 1/4	3/4 – 16	7.92
12	13/16	11.10	2 1/4	3/4 – 16	9.40
14	15/16	12.87	2 1/2	7/8 – 14	10.90
16	1 1/16	14.85	2 3/4	1 – 14	12.59
18	1 3/16	16.69	3 1/4	1 1/8 – 12	14.14
20	1 5/16	18.46	3 1/4	1 1/4 – 12	15.77

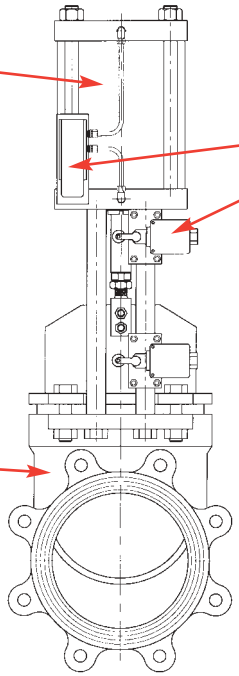
RDC Contrôle can also adapt any special mounting to your needs. Consult our engineering department.

VALVE MOUNTINGS, OPTIONS AND ACCESSORIES

RDC Contrôle can also design and fabricate your valve mountings. In addition, we can also add a complete range of accessories to answer your automation requirements.

CYLINDER OPTIONS
- Stainless steel piston rod
- Double ended cylinder
- Viton seals (450°F)
- Piston rod scrapper
- Special exterior finish
- Water operation (AWWA)
- Spring return (fail safe)
- Multiple stage cylinder

VALVE TYPES
- Knife gate
- Wedge gate
- Globe
- Pinch
- Sluice



AUTOMATION ACCESSORIES
- Control valve:
  - Manual
  - Solenoid
- Limit switches
- Positioners
- Position transmiters

OTHER OPTIONS
- Stroke adjustment
- Manual overide
- Stainless steel mounting
- Air fail safe system

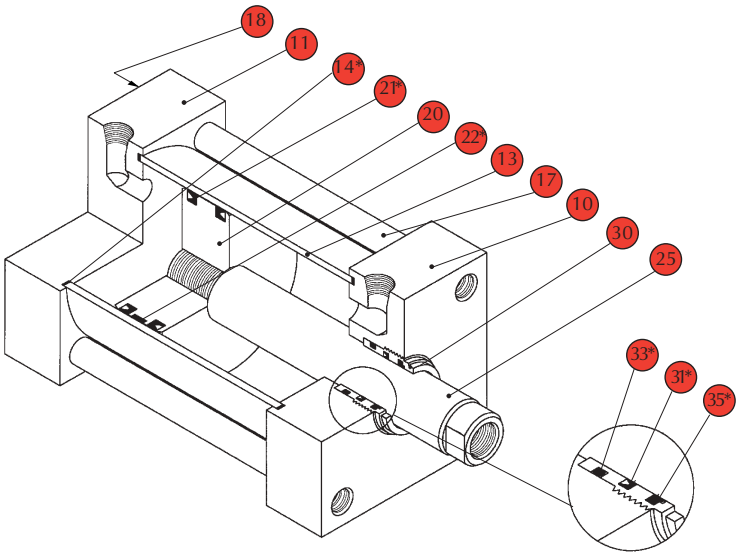
SERIES PA

PNEUMATIC CYLINDERS FOR VALVE ACTUATION
MODEL NUMBERING

Series	Bore	Rod size	Rod threads	Cushions	Mounting	Option suffix	Stroke
PA	G - 3 1/4 H - 4 K - 5 L - 6 M - 7 N - 8 P - 10 R - 12 S - 14 T - 16 V - 18 W - 20 Z -OTHERS	E - 1 G - 1 3/8 J - 2 K - 2 1/2 Z - OTHERS	1 - Male (opt.) 4 - Female (STD) 5 - Added stud 9 - Special	N - none	AO - Base E3 - Square head X3 - Extended tie rods Z9 - Special or Valve mounting State: - Make - Type - Size	(Blank if none) A - Stroke adjustment D - Double-rod E - Special exterior finish J - Rod extention S - Stainless steel piston rod T - Stop tube V - Viton seals for temp. up to 250°C (450°F) W -Water operation specs. AWWA C-504 X - Spring to extend Y - Spring to retract Z - Others	
PA	L	E	4	N	AO	V	11
Series PA	6″Bore	1″ Rod	Female threads	No cushions	Base mount	Viton seals	11″ stroke

REPLACEMENT PARTS

Spare parts and seal kits can be ordered, using the part number prefix, followed by the cylinder model number
EXAMPLE: 20–PALE4NAO-11 (piston).
It is recommended to provide the cylinder serial number to facilitate inquiries for part replacement.



Pieces	Description	Qty
10	Head	1
11	Cap	1
13	Barrel	1
14*	Barrel seals	2
17	Tie rods	4
18	Tie rod nuts	4
20	Piston	1
21*	Piston packings	2
22*	Wear strip (10″ and up)	1
25	Piston rod	1
30	Gland bushing	1
31*	Gland packing	1
33*	Gland seal	1
35*	Piston rod wiper	1

Seal kit	
29	for piston (parts #21 and #22)
39	for bushing (parts #31, #33 and #35)
99	Complete (parts indicated with an *)

A Maintenance & Operation Manual (#8 - PA) is available for more detailled maintenance instructions of Series PA actuators.

Torque chart (minimum & maximum)

Bore size	Tie rods		Gland bushing	
	Dia.	Torque (ft-lbs)	Rod dia.	Torque (ft-lbs)
3 1/4 - 4	3/8	6-15	1″	30 - 50
5 - 6	1/2	15-30	1″	30 - 50
7	5/8	20-70	1″	30 - 50
8	5/8	30-70	1″	30 - 50
10	3/4	55-110	1 3/8	40 - 60
12	3/4	70-110	1 3/8	40 - 60
14	7/8	100-180	1 3/8	40 - 60
16	1	150-350	2″	55 - 75
18	1 1/8	220-500	2″	55 - 75
20	1 1/4	300-720	2″	55 - 75

CONTRÔLE

MANUFACTURER
THERMOCOUPLES - RTD'S
CYLINDERS

1100 Michele-Bohec, Blainville (Quebec) J7C 5N5
Tel.: (450) 434-0216 - Fax: (450) 434-0219 - Toll free: 1-800-363-2264
Internet: www.rdccontrol.com

MRK-101 Rev : 1

SULZER

Pump Performance Datasheet

Customer	: SUEZ Water Technologies & Solutions Canada	Sulzer Reference ID	: CAN.7444-YYZ.22.7444-B0
Customer reference	:	Type / Size	: APT52-16 (SO)
Item number	: 001	Stages	: 1
Service	: RAS PUMP	Based on curve number	: APP52-400_720_SO Rev 1
Quantity	: 1	Date of Last Update	: 22 Feb 2023 11:31 AM

Operating Conditions

Flow, rated	: 6,302.0 USgpm
Differential head / pressure, rated (requested)	: 12.00 ft
Suction pressure, rated / max	: 0.00 / 0.00 bar.g
NPSH available, rated	: Ample
Site Supply Frequency	: 60 Hz

Performance

Speed criteria	: Synchronous
Speed, rated	: 590 rpm
Impeller diameter, rated	: 460 mm
Impeller diameter, maximum	: 533 mm
Impeller diameter, minimum	: 450 mm
Efficiency	: 76.01 %
NPSH (3% head drop) / margin required	: 4.29 / 0.00 m
Ns (imp. eye flow) / Nss (imp. eye flow)	: 3,919 / 8,960 US Units
MCSF	: 2,036.3 USgpm
Head, maximum, rated diameter	: 23.26 ft
Head rise to shutoff	: 93.84 %
Flow, best eff. point	: 5,144.9 USgpm
Flow ratio, rated / BEP	: 122.49 %
Diameter ratio (rated / max)	: 86.30 %
Head ratio (rated dia / max dia)	: 46.11 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Liquid

Liquid type	: Water
Additional liquid description	:
Solids diameter, max	: 0.00 mm
Solids concentration, by volume	: 0.00 %
Temperature, rated / max	: 20.00 / 20.00 deg C
Fluid density, rated / max	: 0.998 / 0.998 kg/dm3
Viscosity, rated	: 1.00 cSt
Vapor pressure, rated	: 0.02 bar.a

Material

Material selected	: Cast Iron - ASTM A48 CL35B (53 / F0067)

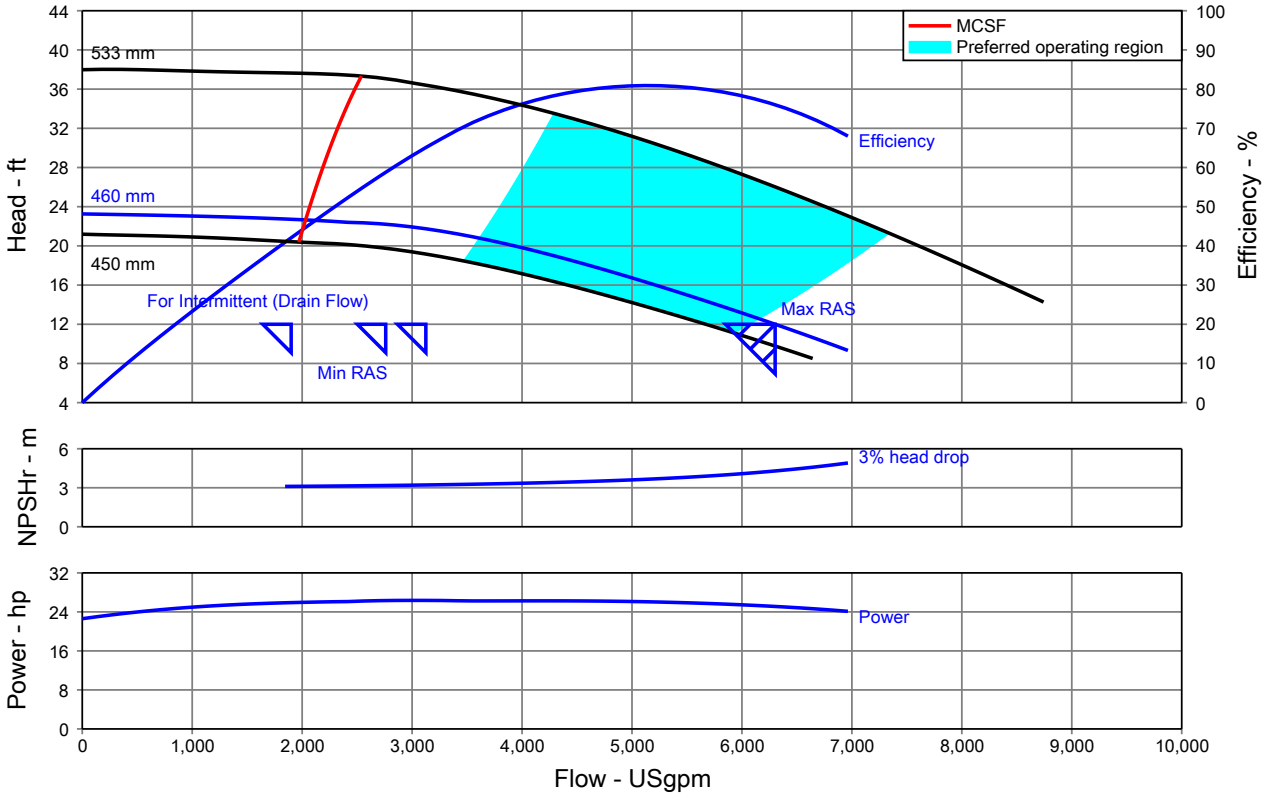
Pressure Data

Maximum casing/bowl working pressure	: 0.69 bar.g
Maximum allowable working pressure	: 10.00 bar.g
Maximum allowable suction pressure	: N/A
Hydrostatic test pressure	: 15.00 bar.g

Driver & Power Data (@Max density)

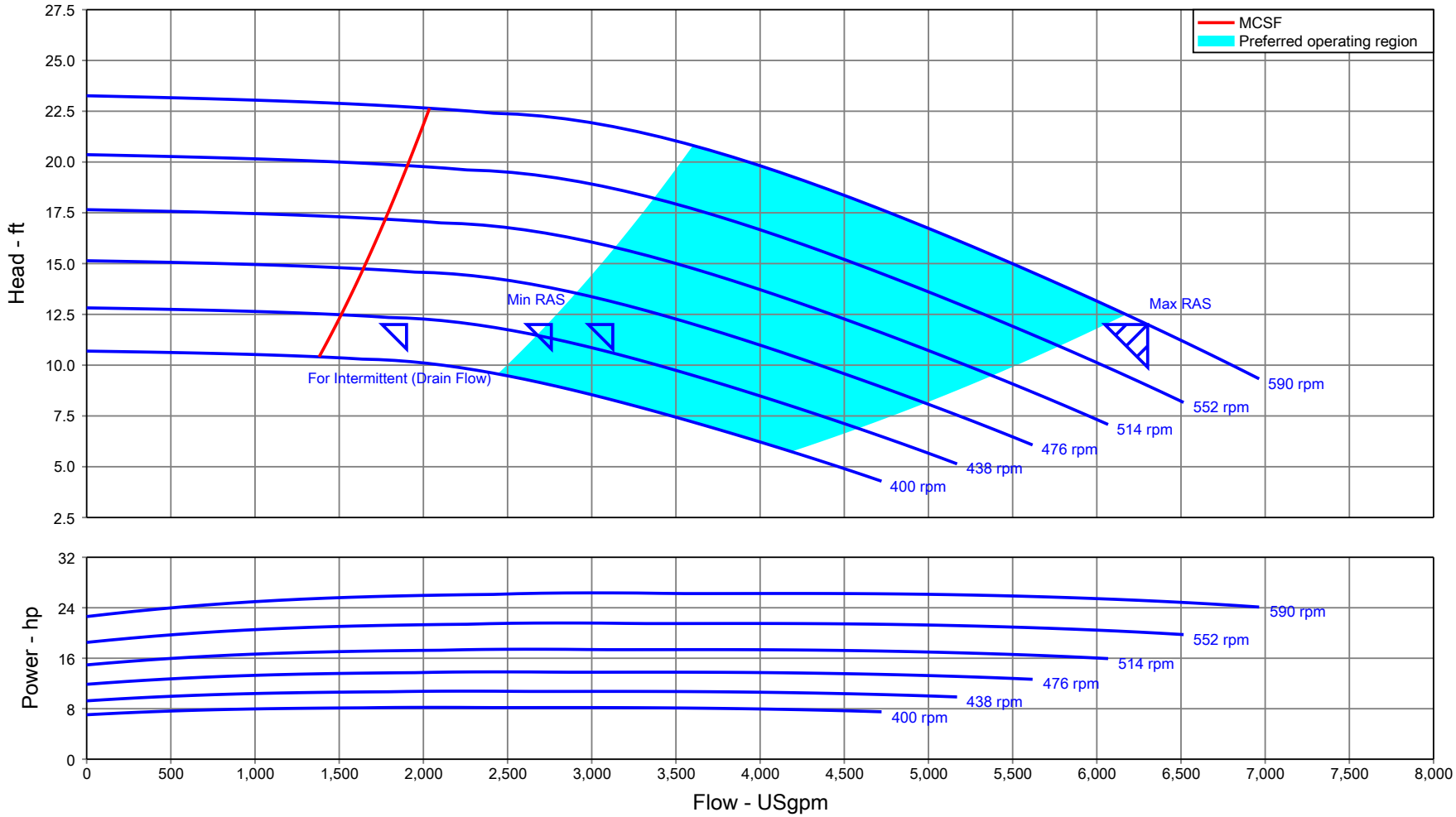
Driver sizing specification	: Rated power
Margin over specification	: 0.00 %
Service factor	: 1.00
Power, hydraulic	: 19.09 hp
Power, rated	: 25.12 hp
Power, maximum, rated diameter	: 26.36 hp
Minimum recommended motor rating	: 30.00 hp / 22.37 kW

Hydraulic Performance Acceptance Test: ISO 9906:2012 / HI 14.6-2011 Grade 2B



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Multi-Speed Performance Curve



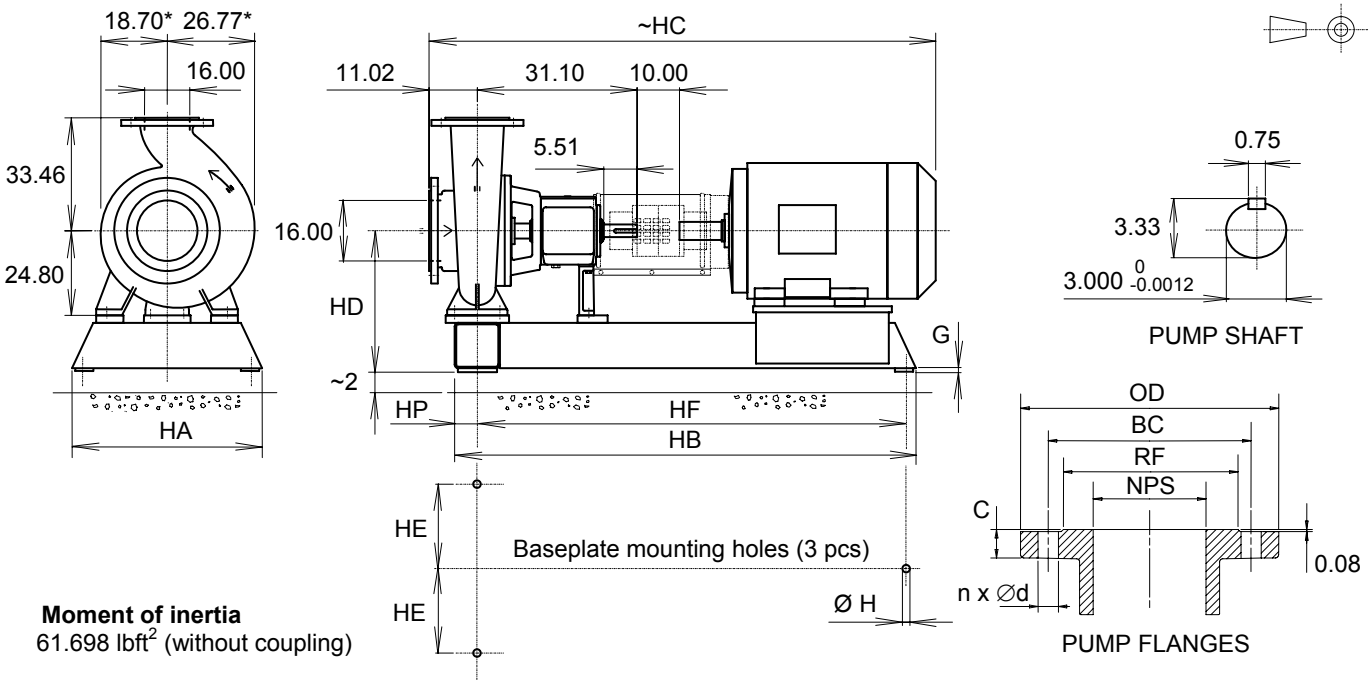
Customer	: SUEZ Water Technologies & Solutions Canada	Stages	: 1	Nominal speed	: 590 rpm
Customer reference	:	Based on curve number	: APP52-400_720_SO Rev 1	Flow, rated	: 6,302.0 USgpm
Item number	: 001	Efficiency	: 76.01 %	Differential head / pressure, rated	: 12.00 ft
Service	: RAS PUMP	Power, rated	: 25.12 hp	Speed, rated	: 590 rpm
Quantity	: 1	NPSH (3% head drop)	: 4.29 m	Impeller diameter, rated	: 460 mm
Sulzer Reference ID	: CAN.7444-YYZ.22.7444-B0	Site Supply Frequency	: 60 Hz	Fluid density, rated / max	: 0.998 / 0.998 kg/dm3
Date of Last Update	: 22 Feb 2023 11:31 AM			Viscosity, rated	: 1.00 cSt
Type / Size	: APT52-16 (SO)			Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00

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DIMENSIONAL DATA –AHLSTAR
General Arrangement – Pump + Motor + Baseplate – US Units

SPP id: Version 04 > / 120601 / Replaces 981115 / en / **P20045** / 2

Product scope: Assembly (ASSE.0)
Pump type and size: APT52-16
Motor standard: NEMA motor, NEMA
Drive type: Direct drive, DD
Baseplate type: Baseplate for pump and motor, SLP
Pump mounting size: 56



Moment of inertia
61.698 lbft^2 (without coupling)

*) If sealing unit type = Air separating pump, please check the dimensions from bare pump dimensional drawing.

Dimensions in inches

DIMENSIONS													
Primary motor frame	Max motor frame (1	(2	Baseplate	HD	HC	HB	HP	HF	HA	HE	H	G	Weight lbs (3
445T	509LL	449T	12	36.50	97.00	106.25	5.00	99.00	52.75	24.00	1.50	0.69	3020
447T	5011LL	449T	12	36.50	100.00	106.25	5.00	99.00	52.75	24.00	1.50	0.69	3110
447TS	509LS	449TS	12	36.50	98.00	106.25	5.00	99.00	52.75	24.00	1.50	0.69	3020
449T	5011LL	-	12	36.50	106.00	106.25	5.00	99.00	52.75	24.00	1.50	0.69	3110
449TS	509LS	-	12	36.50	103.00	106.25	5.00	99.00	52.75	24.00	1.50	0.69	3020

1. Max. NEMA motor frame, which can be installed onto the baseplate.
2. Max. NEMA motor frame with the same shaft height as primary motor.
3. Weight without coupling and motor.

DRILLING OF FLANGES									
				ASME B 16.1 Class 125			ASME B 16.5 Class 150		
NPS	OD	RF	C	BC	d	n	BC	d	n
16.00	23.82	18.98	1.44	21.25	1.12	16	21.25	1.12	16

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90-DR-001-A/B

FX 5-300

ATLAS COPCO QUALITY AIR SOLUTIONS

General Description

The FX range of refrigerant dryers offers a reliable, cost effective and simple solution to those who need quality compressed air for their manufacturing processes. To avoid condensation, and therefore all chance of equipment and end-product corrosion and damage, compressed air needs to be dry — exactly what FX dryers are designed to do.

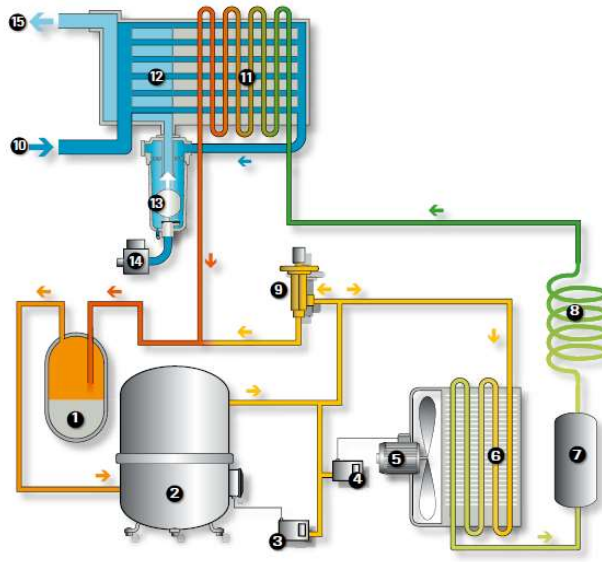
The FX dryer range is simple, yet robust and reliable. It is a no-frills range that relies on proven technology, solid components and uncomplicated design; these features combined deliver a constant dew point and reliable performance at any flow — in almost every manufacturing application.



Working Principle

Refrigerant drying means that the compressed air is cooled, which allows a large amount of the water condense and be separated. After cooling and condensing, the compressed air is reheated to around room temperature so that condensation does not form on the outside of the pipe system. This heat exchange between ingoing and outgoing compressed air, and as such reduces the required cooling capacity of the refrigerant circuit.

Cooling takes place via closed refrigerant system. FX refrigerant dryer, a freestanding machine that is used for dew points between +4°C and +3°C.



1. Refrigerant separator
2. Refrigerant compressor
3. Maximum pressure switch
4. Fan control pressure switch
5. Condensed fan
6. Condenser
7. Capillary filter
8. Capillary tube
9. Hot gas bypass
10 Air inlet
11. Air-refrigerant heat exchanger
12. Air-air heat exchanger
13. Water separator
14. Automatic drain
15. Air outlet

Scope of supply

1. Reliable Refrigerant Circuit

A closed circuit where the refrigerant flow is. Refrigerant compressor brings gaseous refrigerant to high pressure and high temperature. To ensure that only gaseous refrigerant only enters the compressor, a refrigerant separator is installed before it. It also includes the condenser that cools slightly the refrigerant, thus changes the refrigerant from gas to liquid state. The refrigerant's pressure should be reduced, thus lowering its temperature and increasing its cooling capacity. The capillary tube does this, and to protect from harmful particles, a Capillary filter is designed for the FX. Finally, to regulate the amount of refrigerant passing through the air-refrigerant heat exchanger, ensuring a stable pressure dew point, and eliminating the chance of the condensate freezing.



Energy efficient Air Circuit





Hot saturated air enters the dryer and is cooled down by the outgoing air via air-air heat exchanger. Reducing the temperature of the inlet air reduces the load on the refrigerant circuit. The air-refrigerant heat exchanger transfers the heat from compressed air to the cold refrigerant, forcing water vapour in the compressed air to condense. These condensates are separated in the water separator, equipped with electronic drain. On the air outlet, the cooled compressed air is reheated to prevent condensation into the pipe works, and now equipped with a pressure dew point sensor

Features & Benefits

Energy Savings

Low energy consumption

- Improved heat exchanger, lowering the overall pressure drop
- Air-air heat exchanger lowers the load in the refrigerant circuit
- High efficiency refrigerant compressor

Reliable operation

No condensation in the factory pipe work

- Air-air heat exchanger, pre heats the cold compressed air
- Hot gas bypass, to prevent freezing at partial load
- Efficient water separator and automatic drain
- Pressure dew point sensor for an accurate pressure dew point measurement

Easy connectivity

Potential free contact, to allow remote monitoring on customer's data control system

HACH®
Be Right™

TAG:
16-AE-402-1,
16-AE-402-2,
16-AE-402-3

Differential pH and ORP Sensors

Applications
- Drinking Water
- Wastewater
- Industrial
- Power Generation

The smart choice for accurate and reliable online process pH/ ORP measurement

Hach Digital pHD sc sensors are available in convertible (PEEK or PPS), insertion, and sanitary body styles. Three electrodes are used in these sensors to increase measurement accuracy and eliminate sensor ground loops.



Exceptional Process Sensor Performance with the Differential Electrode pHD Measurement Technique

This field-proven technique uses three electrodes instead of the two normally used in conventional pH/ORP sensors. Process and reference electrodes measure the pH/ORP differentially with respect to a third ground electrode. The end result is unsurpassed measurement accuracy, reduced reference junction potential, and elimination of sensor ground loops. These process pH/ORP sensors provide greater reliability, resulting in less downtime and maintenance.

Lower Maintenance Needs with the Double Junction Salt Bridge

The double junction salt bridge creates a barrier to contamination which minimizes the dilution of the internal standard cell solution. The result is lower maintenance needs and a longer time period between calibrations.

Extended Working Life with the Replaceable Salt Bridge/Protector

The unique, replaceable salt bridge holds an extraordinary volume of buffer to extend the working life of the sensor by protecting the reference electrode from harsh process conditions. The salt bridge simply threads onto the end of the sensor if replacement is needed.

Reliability with Built-in Encapsulated Preamp

Encapsulated construction protects the sensor's built-in preamp from moisture and humidity, ensuring reliable sensor operation. The preamp in the pHD analog sensor produces a strong signal, enabling the sensor to be located up to 1000 m (3280 ft.) from the analyzer.

Innovative Technology

The former GLI, now a Hach Company brand, invented the Differential Electrode Technique for pH measurement in 1970. The pHD sensor series takes this field-proven technology to a new level.

Versatile Mounting Styles

Sensors are available in four mounting styles - convertible, insertion, immersion, and sanitary

Differential Sensor Warranty

Hach Company offers the best sensor warranty in the industry on its Differential Sensors. We will replace any Differential Sensor that fails due to defects in materials or workmanship within one year from the date of shipment-and up to 30 months on a prorated basis for any failure.

Technical Data*

Compliance	For hazardous and maritime applications, CE	For non-hazardous and non-maritime applications only
Operating Temperature Range	-5 - 70 °C (23 - 158 °F) pHD and ORP 0 - 50 °C (32 - 122 °F) SS pHD Before initial pH calibration, calibrate the temperature measurement when the sensor is in water or buffer which is at approximately the same temperature as the pH buffers (matches current recommendation)	-5 - 70 °C (23 - 158 °F) pHD and ORP 0 - 50 °C (32 - 122 °F) SS pHD Before initial pH calibration, calibrate the temperature measurement when the sensor is in water or buffer which is at approximately the same temperature as the pH buffers (matches current recommendation) Please Note: When the sensor is placed into the application sample, if that sample is more than 10 °C (18 °F) different than the previous temperature/pH calibration, then it is recommended to recalibrate the temperature while the sensor is in the sample to maintain the ±0.5 °C (±0.9 °F) temperature accuracy specification.
Range	-2.0 to 14.0 pH -1500 to +1500 mV ORP	
Sensitivity	± 0.01 pH ± 0.5 mV	
Flow Rate	3 m (10 ft.) per second, maximum	
Pressure Range	Digital: 6.9 bar at 70 °C (100 psi at 158 °F)	
Temperature Sensor	NTC 300 Ω thermistor for automatic temperature compensation and analyzer temperature readout	
Transmission Distance	100 m (328 ft.), maximum	
	1000 m (3280 ft.), maximum when used with a termination box.	
Temperature Accuracy	± 0.5 °C (± 0.9 °F)	
Sensor Cable	4 conductor cable with one shield and polyurethane jacket; rated to 105 °C (221 °F); 10 m (33 ft.) standard length	
Wetted Materials	PEEK or PPS, salt bridge of matching material with PVDF junction, glass process electrode, titanium ground electrode, and FKM/FPM O-ring seals (pH sensor with optional HF-resistant glass process electrode has 316 stainless steel ground electrode, and perfluoroelastomer wetted O-rings; consult factory for other available wetted O-ring materials)	

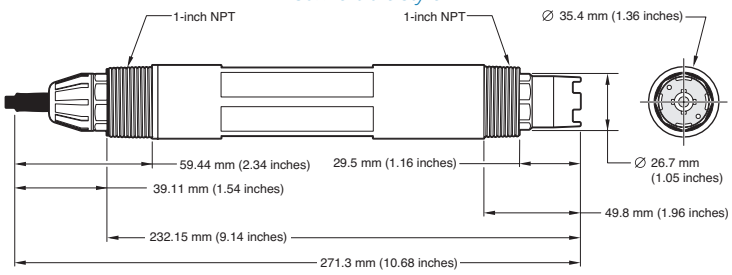
**Subject to change without notice.*

Some industrial applications require accurate measurement and control below 2 or above 12 pH. In these special cases, please contact Hach Technical Support for further details.

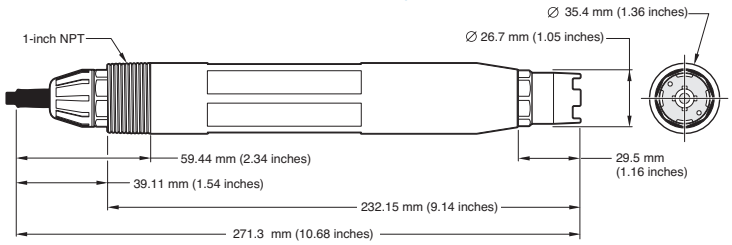
For best ORP measuring results in solutions containing zinc, cyanide, cadmium or nickel, Hach recommends using the pHD sc ORP sensor equipped with an optional gold electrode.

Dimensions

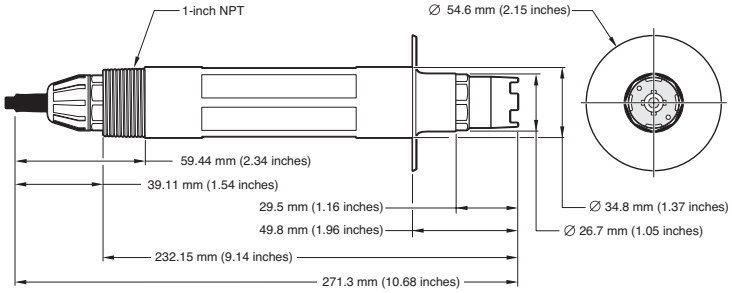
Convertible style



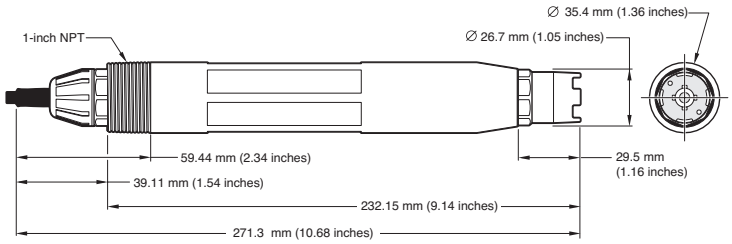
Insertion style



Sanitary style



Immersion style



Order Information

pHD sc Digital Differential pH Sensors

DPD1P1	Digital pH Sensor, PEEK, Convertible, General Purpose
DPD1P1.1	Digital pH Sensor, PEEK, Convertible, General Purpose, Non-Hazardous Environment
DPD1P3	Digital pH Sensor, PEEK, Convertible, HF-resistant
DPD1P3.1	Digital pH Sensor, PEEK, Convertible, HF-resistant, Non-Hazardous Environment
DPD2P1	Digital pH Sensor, PEEK, Insertion, General Purpose
DPD2P1.1	Digital pH Sensor, PEEK, Insertion, General Purpose, Non-Hazardous Environment
DPD3P1	Digital pH Sensor, PPS, Convertible, HF-resistant
DPD1R1	Digital pH Sensor, PPS, Convertible, General Purpose
DPD1R1.1	Digital pH Sensor, PPS, Convertible, General Purpose, Non-Hazardous Environment
DPD1R3	Digital pH Sensor, PPS, Convertible, HF-resistant
DPD1R3.1	Digital pH Sensor, PPS, Convertible, HF-resistant, Non-Hazardous Environment
DPS1	Digital pH Sensor, Stainless Steel, Immersion, General Purpose
DPS1.1	Digital pH Sensor, Stainless Steel, Immersion, General Purpose, Non-Hazardous Environment

pHD sc Digital Differential ORP Sensors

DRD1P5	Digital ORP Sensor, PEEK, Convertible, Platinum
DRD1P5.1	Digital ORP Sensor, PEEK, Convertible, Platinum, Non-Hazardous Environment
DRD1P6	Digital ORP Sensor, PEEK, Convertible, Gold
DRD1R5	Digital ORP Sensor, PPS, Convertible, Platinum
DRD1R5.1	Digital ORP Sensor, PPS, Convertible, Platinum, Non-Hazardous Environment
DRD1R6	Digital ORP Sensor, PPS, Convertible, Gold
DRD1R6.1	Digital ORP Sensor, PPS, Convertible, Gold, Non-Hazardous Environment
DRD2P5	Digital ORP Sensor, PEEK, Insertion, Platinum
DRD2P5.1	Digital ORP Sensor, PEEK, Insertion, Platinum, Non-Hazardous Environment
DRS5	Digital ORP Sensor, Stainless Steel, Immersion, Platinum
DRS5.1	Digital ORP Sensor, Stainless Steel, Immersion, Platinum, Non-Hazardous Environment

All digital sensors include built-in digital electronics and integral 10 m (33 ft.) cable terminated with connector for the Hach SC Digital Controllers.

Digital Gateway

6120500	Use the Digital Gateway to connect pHD analog sensors to a Hach digital controller
6120500.1	Use the Digital Gateway to connect pHD analog sensors to a Hach digital controller

pHD Analog pH Sensors

PD1P1	Analog pH Sensor, PEEK, Convertible, General Purpose
PD1P3	Analog pH Sensor, PEEK, Convertible, HF-resistant
PD2P1	Analog pH Sensor, PEEK, Insertion, General Purpose
PD3P1	Analog pH Sensor, PEEK, Sanitary, General Purpose
PD1R1	Analog pH Sensor, PPS, Convertible, General Purpose
PD1R3	Analog pH Sensor, PPS, Convertible, HF-resistant

pHD Analog ORP Sensors

RD1P5	Analog ORP Sensor, PEEK, Convertible, Platinum
RD1P6	Analog ORP Sensor, PEEK, Convertible, Gold
RD2P5	Analog ORP Sensor, PEEK, Insertion, Platinum
RD1R5	Analog ORP Sensor, PPS, Convertible, Platinum
RD1R6	Analog ORP Sensor, PPS, Convertible, Gold

All analog sensors include built-in preamplifier and integral 4.5 m (15 ft.) cable terminated with stripped and tinned wires.

Cables

Extension cables are used only with digital sensors or digital gateways when connecting to an SC Digital Controller.

6122400	Digital Extension Cable, 1 m (3.3 ft.)
5796000	Digital Extension Cable, 7.7 m (25 ft.)
5796100	Digital Extension Cable, 15 m (50 ft.)
5796200	Digital Extension Cable, 30 m (100 ft.)

Interconnect cables are used only with analog sensors, junction box, and controller.

1W1100	Analog Interconnect Cable, order per foot

Digital Termination Box

Required when the cable between the sensor/gateway and SC Digital Controller is 100 m (328 ft.) to 1000 m (3280 ft.)

5867000	Digital Termination Box

Continued on next page.

Order Information *Continued.*

Analog Junction Box

Required when the cable between the analog sensor and controller is greater than standard sensor cable. Includes terminal strip and gasket.

60A2053	Junction Box, Surface-mount, aluminum (includes mounting hardware)
60A9944	Junction Box, Pipe-mount, PVC (for 1/2-inch diameter pipe, includes mounting hardware)
60G2052	Junction Box, Pipe-mount, PVC (for 1-inch diameter pipe, includes mounting hardware)
76A4010-001	Junction Box, NEMA 4X (no mounting hardware included)

Salt Bridges

The double junction salt bridge on the standard cell of all Hach pHD sensors is field-replaceable.

SB-P1SV	PEEK sensor and salt bridge body, PVDF outer junction
SB-P2SV	PEEK sensor and salt bridge body, ceramic outer junction
SB-P1SP	PEEK sensor and salt bridge body, PVDF outer junction
SB-R1SV	PPS sensor and salt bridge body, PVDF outer junction

pHD sensor reagents and standards

25M1A1025-115	Standard cell solution, concentrated pH 7.0 buffer (equi-transferrant), 500 mL
25M8A1002-101	Proprietary Gel Powder for pHD sc and pHD Sensors for high temperature applications

pH buffers

2283549	pH Buffer Solution, pH 7.00, 500 mL
2283549	pH Buffer Solution, pH 7.00, 500 mL
2283449	pH Buffer Solution, pH 4.01, 500 mL

ORP reference solutions (in resealable plastic bottles)

25M2A1001-115	200 mV reference sol. 500 mL (1 pt)
25M2A1002-115	600 mV reference sol. 500 mL (1 pt)

Sanitary mount

MH018S8SZ	316 SS

Includes 2 inch sanitary tee and heavy-duty clamp. cap and EPDM compound gasket supplied with sensor; can be ordered separately.

Union mount

6131300	CPVC
6131400	316 SS

Includes standard 1½ inch tee, union pipe with adapter, sealing hub, and lock ring and FKM/FPM O-ring.

Flow-through mount

MH334N4NZ	316 SS
MH314N4MZ	CPVC

Includes a standard 1 inch tee in respective material.

Insertion mount

Digital

5646300	CPVC
5646350	316 SS

Analog

5646400	CPVC
5646450	316 SS

Includes a 1½ inch ball valve, 1½ inch NPT close nipple, sensor adapter with two FKM/FPM O-rings and wiper, extension pipe, pipe adapter, back tube, and lock ring.

Immersion mount

Standard hardware

Digital

6136400	CPVC
6136500	316 SS

Analog

MH434A00B	CPVC
MH414A00B	316 SS

Includes 1 inch by 4 ft. pipe and 1 inch x 1 inch NPT coupling (pipe-mount junction box with terminal strip included in analog hardware).

Handrail hardware

MH236B00Z	Handrail Mounting Kit (for sensor to be used with either adapter above) includes 1.5-inch diameter by 7.5-ft long CPVC pipe and swivel/ pivot/ pipe clamp assembly

Includes 1½ inch by 7.5 ft., CPVC pipe, and swivel/pivot pipe clamp assembly.

Chain mount hardware

2881900	316 SS

Includes stainless steel bail, nuts, and washers. Does not include chain. To be used with stainless steel immersion sensor only.

Ball Float Hardware

6131000	CPVC

Includes 1½ inch by 7.5 ft. CPVC pipe, ball float assembly, and swivel/pivot pipe clamp assembly.

World Headquarters: Loveland, Colorado USA | hach.com

United States **800-227-4224** fax: 970-669-2932 email: orders@hach.com
Outside United States **970-669-3050** fax: 970-461-3939 email: int@hach.com

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DOC053.53.35337.Sep22

TAG:20-HV-320-1/2/3/4

Polypropylene Ball Valves

For proven leak-free performance, specify **Polypropylene Ball Valves**. Their corrosion-resistant, all-plastic design makes them ideal for water filtration units, coffee and beverage machines and a wide variety of other fluid applications. Polypropylene material meets all FDA and NSF-51 requirements for food contact.

Features/Benefits:

- Precision molded, all-plastic design is leak free and corrosion resistant.
- Polypropylene material offers a wider chemical acceptance range, as well as a wide temperature range.
- Bi-directional flow maximizes productivity.
- Full flow design reduces pressure drop across the valve.
- Special o-ring seal ensures a reliable leak-tight connection.
- TrueSeal™ connection reduces potential leaks.

Specifications:

- Temperature range: 0°F to 225°F (-18°C to 107°C).
- O-ring seal material: Nitrile.
- NSF-51 listed.
- Pressure rated to 150 PSI with a 600 PSI burst pressure. Actual working pressures with be lower at elevated temperatures

Advantages:

- Reduce costs—Built-in TrueSeal™ connection eliminates the need for a secondary fitting.
- Save space—Low-profile design allows for easy assembly and access where space is at a premium.

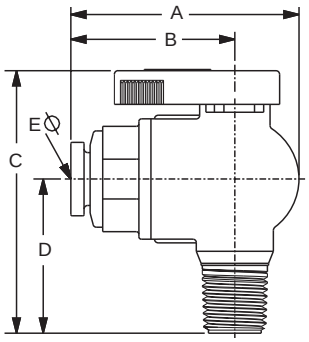
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Assembly Instructions:

1. Inspect the mating threads for debris or damage. Remove any old fluoropolymer tape or sealant on previously used threads. If threads are damaged, replace with new adapter before proceeding.
2. Apply 2 to 3 wraps of fluoropolymer tape, Parker TrueSealant™ or an NSF/FDA approved silicon sealant. Do not user Plumbers Putty or Pipe Dope. These chemically react with plastic materials and could cause a failure.
3. Align ball valve to mating thread to ensure cross threading does not occur.
4. Screw ball valve onto mating thread 3 to 5 turns. This should be sufficient to properly seal the threads.
5. Pressurize system and check for leaks.

VME - Valve Male Elbow

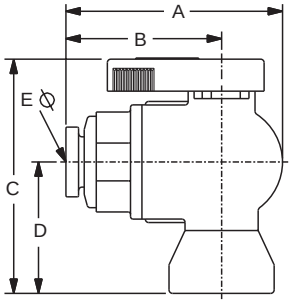




PART NUMBER	NOM. TUBE O.D.	NPTF THREAD SIZE	A	B	C	D	ØE THRU HOLE MIN.
PP4VME2-MG (+)	1/4	1/8	1.74	1.21	2.00	1.10	.19
PP4VME4-MG	1/4	1/4	1.74	1.21	2.18	1.28	.19
PP4VME6-MG	1/4	3/8	1.74	1.21	2.18	1.28	.19
PP4VME8-MG (+)	1/4	1/2	1.74	1.21	2.37	1.47	.19
PP6VME2-MG (+)	3/8	1/8	1.85	1.32	2.00	1.10	.25
PP6VME4-MG	3/8	1/4	1.85	1.32	2.18	1.28	.25
PP6VME6-MG	3/8	3/8	1.85	1.32	2.18	1.28	.25
PP6VME8-MG	3/8	1/2	1.85	1.32	2.37	1.47	.25

VFE - Valve Female Elbow





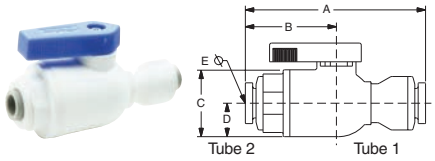
PART NUMBER	NOM. TUBE O.D.	NPTF THREAD SIZE	A	B	C	D	ØE THRU HOLE MIN.
PP4VFE2-MG (+)	1/4	1/8	1.74	1.21	1.82	0.92	.19
PP4VFE4-MG	1/4	1/4	1.74	1.21	2.05	1.15	.19
PP4VFE6-MG	1/4	3/8	1.74	1.21	2.18	1.28	.19
PP6VFE2-MG (+)	3/8	1/8	1.85	1.32	1.82	0.92	.25
PP6VFE4-MG	3/8	1/4	1.85	1.32	2.05	1.15	.25
PP6VFE6-MG	3/8	3/8	1.85	1.32	2.18	1.28	.25

(+) Non Standard.

NOTE: PPL refers to Polypropylene. FCB refers to Fluorocarbon.

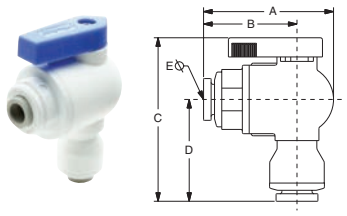
Parker Hannifin Corporation
Fluid System Connectors
Otsego, Michigan

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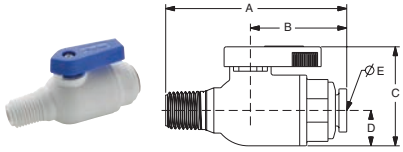
VUC - Valve Union Connector

PART NUMBER	1 TUBE SIZE	2 TUBE SIZE	A	B	C	D	ØE THRU HOLE MIN.
PP4VUC4-MG	1/4	1/4	2.55	1.22	1.0	0.5	.19
PP4VUC6-MG	1/4	3/8	2.55	1.22	1.0	0.5	.19
PP6VUC4-MG	3/8	1/4	2.57	1.30	1.0	0.5	.19
PP6VUC6-MG	3/8	3/8	2.67	1.32	1.4	0.5	.25



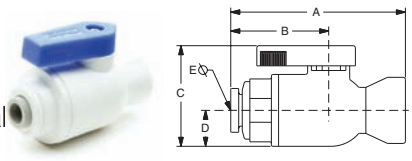
VEU - Valve Elbow Union

PART NUMBER	1 TUBE SIZE	2 TUBE SIZE	A	B	C	D	ØE THRU HOLE MIN.
PP4VEU4-MG	1/4	1/4	1.75	1.22	2.33	1.42	.19
PP4VEU6-MG	1/4	3/8	1.75	1.22	2.33	1.42	.11
PP6VEU4-MG	3/8	1/4	1.83	1.30	2.32	1.40	.19
PP6VEU6-MG	3/8	3/8	1.85	1.32	2.34	1.44	.25



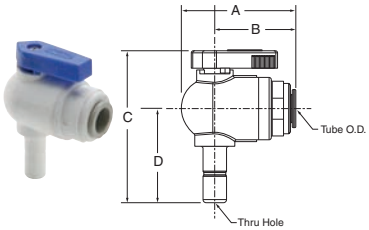
VMC - Valve Male Connector

PART NUMBER	NOM. TUBE O.D.	NPTF THREAD SIZE	A	B	C	D	ØE THRU HOLE MIN.
PP4VMC2-MG (+)	1/4	1/8	2.22	1.21	1.4	0.5	.19
PP4VMC4-MG	1/4	1/4	2.40	1.21	1.4	0.5	.19
PP4VMC6-MG	1/4	3/8	2.40	1.21	1.4	0.5	.19
PP4VMC8-MG (+)	1/4	1/2	2.59	1.21	1.4	0.5	.19
PP6VMC2-MG (+)	3/8	1/8	2.33	1.32	1.4	0.5	.25
PP6VMC4-MG	3/8	1/4	2.51	1.32	1.4	0.5	.25
PP6VMC6-MG	3/8	3/8	2.51	1.32	1.4	0.5	.25
PP6VMC8-MG (+)	3/8	1/2	2.70	1.32	1.4	0.5	.25



VFC - Valve Femal Connector

PART NUMBER	NOM. TUBE O.D.	NPTF THREAD SIZE	A	B	C	D	ØE THRU HOLE MIN.
PP4VFC2-MG	1/4	1/8	2.04	1.21	1.4	0.5	.19
PP4VFC4-MG	1/4	1/4	2.27	1.21	1.4	0.5	.19
PP4VFC6-MG	1/4	3/8	2.40	1.21	1.4	0.5	.19
PP6VFC2-MG	3/8	1/8	2.15	1.32	1.4	0.5	.25
PP6VFC4-MG	3/8	1/4	2.38	1.32	1.4	0.5	.25
PP6VFC6-MG	3/8	3/8	2.51	1.32	1.4	0.5	.25



VTEU - Valve Tube Elbow Union

PART NUMBER	NOM. TUBE O.D.	STEM	A	B	C	D	ØE THRU HOLE MIN.
PP4VTEU6-MG	1/4	3/8	1.75	1.22	2.43	1.50	.17
PP6VTEU6-MG	3/8	3/8	1.83	1.30	2.43	1.50	.25

NOTE: PPL refers to Polypropylene. FCB refers to Fluorocarbon.

Parker Hannifin Corporation
Fluid System Connectors
Otsego, Michigan

Cold Water Supply Valve

(Patent No. 6,213,149)

Parker's water supply valve is intended for use with Point Of Use water appliances requiring a cold water supply such as POU faucets, instant hot water faucets, reverse osmosis systems and water filtration systems. The Parker TrueSeal™ Cold Water Supply Valve is designed for temporary cold water shut-off to a POU appliance to change filters, tanks or when servicing the appliance — all while maintaining full water flow to the sink or water basin above. When the POU system is removed from service, the Parker TrueSeal™ Cold Water Supply Valve is to be removed also.

TrueSeal™ Cold Water Supply Valves are for cold water service at temperatures above freezing to 125°F ambient. Not for use in hot water service applications.

Features/Benefits:

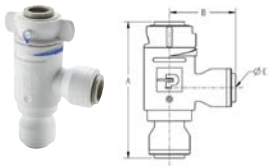
- Fast, easy installation.
- No pierced lines or saddle hookups.
- Optimum flow to the faucet - full flow porting.
- No need to pierce the supply line.
- Connects 3/8" OD tubing directly to valve.
- 1/2" NPT connections available.
- Excellent resistance to chlorine and other chemicals.
- Integrated handle for easy on/off operation.
- Visual indicator shows open/closed position.

Specifications:

- NSF Standard 51 listed.
- Pressure rating: 150 PSI with a 600 PSI burst pressure.
- Design factor: 4:1
- O-ring seal material: EPDM.
- Meets the pressure integrity test of NSF-53 and NSF-58.

Applications:

- Reverse osmosis systems.
- Under sink filtration systems.
- POU faucets.
- Water supply valves are intended for cold water service at temperatures from above freezing to 125°F ambient.
- NOT for use in hot water service applications.



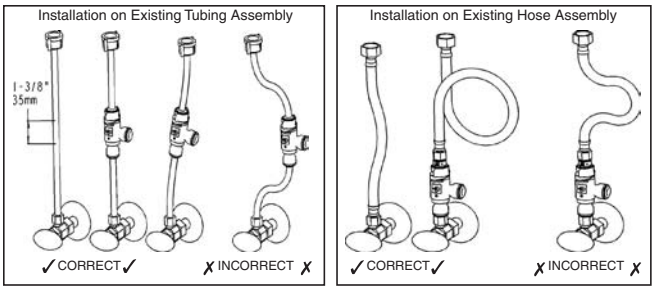
VTU - Water Supply Valve

WHITE POLYPROPYLENE	NOM. TUBE O.D.	A	B	D THRU HOLE MIN.
PP6VTU6-MG	3/8	2.92	1.3	.30

(+) Non Standard.

NOTE: PPL refers to Polypropylene. FCB refers to Fluorocarbon.

TrueSeal™ Cold Water Supply Valve Assembly Instructions



For Installation with 3/8" Plastic Tubing:

1. Shut off water at the chrome or brass valve.
2. Disconnect existing tube assembly.
3. Cut out a 1-3/8" (35 mm) section near the center of the existing tubing. Cut the tube squarely and remove any burrs.
4. Place an insertion depth mark 3/4" (19 mm) from the end of each cut on the tubing to be reused. Refer to "TrueSeal Assembly Instructions," Steps 2 and 3, for tubing assembly (reverse side).
5. Reconnect tube assembly with new valve.
6. Make sure new valve is closed before opening water valve. Open valve in Step 1 and check for leaks.
7. Insert 3/8" tubing from water appliance into side port.
8. Open new valve by turning pointer to large end of flow indicator.

For Installation with Flexible Hose:

1. Shut off water at the chrome or brass valve.
2. Disconnect one end of existing hose assembly.
3. Place the appropriate adapters on the chrome or brass valve and the hose end.
4. Tighten adapter on chrome or brass valve finger tight plus 1/2 turn. Do not over tighten.
5. Push tube portion of adapters into top and bottom of valve until bottomed out. Hose should not be kinked. A longer hose assembly might be required if a gently loop cannot be made.
6. Make sure new valve is closed before opening water valve. Pointer will be at the small end of triangle flow indicator. Open valve in Step 1 and check for leaks.
7. Insert 3/8" tubing form water appliance into side port.
8. Open new valve by turning pointer to large end of flow indicator.

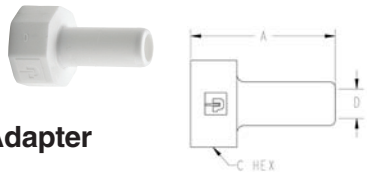


Water Supply Valve Kits

PART NO.	CONNECTS TO:	KIT CONTAINS
WSV4-KIT	1/4" COMPRESSION VALVE	AW6TAF7-MG, AW6TFA7-MG, PP6VTU6-MG
WSV6-KIT	3/8" COMPRESSION VALVE	AW6TAF9-MG, AW6TFA9-MG, PP6VTU6-MG
WSV8-KIT	1/2" NPSM FAUCET STEM	AW6TAF8-MG, AW6TFA8-MG, PP6VTU6-MG

Parker Hannifin Corporation
Fluid System Connectors
Otsego, Michigan

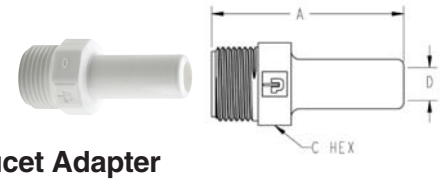
D



TFA - Tube Faucet Adapter

(Female Thread)

WHITE ACETAL	TUBE STEM O.D.	THREAD SIZE	A	C HEX	D MIN.
AW6TFA7-MG	3/8	7/16-24	1.25	.69	.17
AW6TFA8-MG	3/8	1/2-14 NPSM	1.45	1.06	.22
AW6TFA9-MG	3/8	9/16-24	1.25	.75	.22



TAF - Tube Faucet Adapter

(Male Thread)

WHITE ACETAL	TUBE STEM O.D.	THREAD SIZE	A	C HEX	D MIN.
AW6TAF7-MG	3/8	7/16-24	1.41	.50	.22
AW6TAF8-MG	3/8	1/2-14 NPSM	1.65	.88	.22
AW6TAF9-MG	3/8	9/16-24	1.45	.63	.22



SC - Safety Clip

(Patent No. 6,065,779)

PART NUMBER	PART NUMBER	FOR NOMINAL TUBE O.D.
SC-4	SC-4-B	1/4
SC-5	SC-5-B	5/16
SC-6	SC-6-B	3/8
SC-8	SC-8-B	1/2



TS - Tube Supports

NYLON PART NUMBER	POLYPROPYLENE PART NUMBER
N4TS3	P4TS3
N5TS3	P5TS3
N6TS4	P6TS4
N8TS6	P8TS6

To be used with soft durometer tubing.

AQRT - Quick Release Tool



Makes disconnection of tube adapters and tubing a breeze.

NOTE: PPL refers to Polypropylene. FCB refers to Fluorocarbon.

Parker Hannifin Corporation
Fluid System Connectors
Otsego, Michigan

16-HV-705

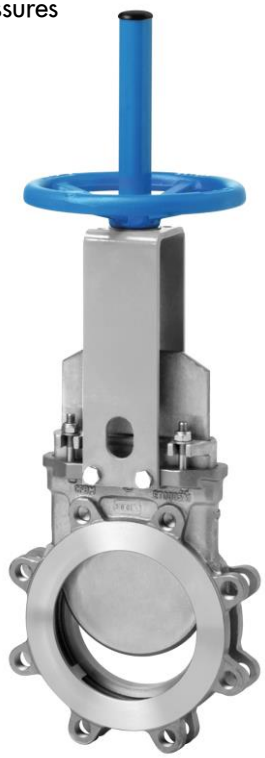
MODEL **ET** **SERIES 20**

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

HEAVY DUTY KNIFE GATE VALVE

The ET(SER.20) model knife gate is an uni-directional lug type valve designed according to MSS-SP-81 and TAPPI TIS 405-8 for industrial service applications. The design of the body and seat assures non-clogging shut off on suspended solids in industries such as:

- Pulp and Paper
- Power plants
- Mining
- Chemical plants
- Wastewater treatment plants
- Food and Beverage
- Etc.



Sizes:

DN 2"/50mm to DN 36"/900mm (larger diameters on request)

Working pressure:

DN 2"/ 50mm to DN 24"/600mm	150 psi /(10 kg/cm²)
DN 30"/750mm	100 psi / (7 kg/cm²)
DN 36"/900mm	100 psi / (7 kg/cm²)

Standard flange connection:

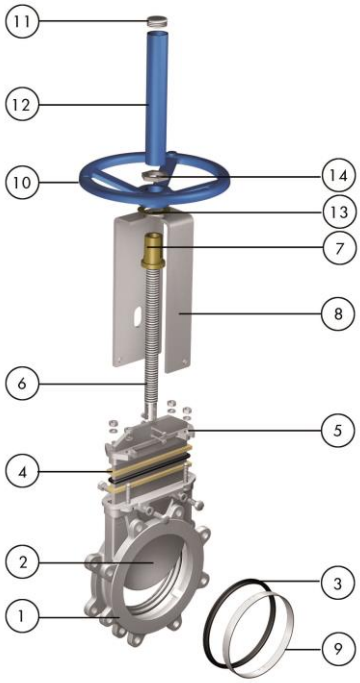
DIN PN 10 and ANSI B16.5 (class 150)

Other flange connections available on request

Directives:

For EU Directives and other Certificates, please see the document: Directives and Certificates Compliance - Knife Gate Valves - Catalogues and Datasheets

All valves are tested prior to shipping in accordance with the standard developed by the Quality Control Department at ORBINOX.



STANDARD PARTS LIST

Part:	Stainless Steel:
1- Body	CF8M
2- Gate	AISI 316
3- Seat	Metal or EPDM
4- Packing	PTFE Impreg. Synth. Fibre with an EPDM O-Ring
5- Gland Follower	CF8M
6- Stem	Stainless Steel
7- Stem nut	Brass
8- Yoke	AISI 304 / Epoxy-coated Carbon Steel
9- Seat Retainer Ring	AISI 316
10- Handwheel	GJS400 (GGG40)
11- Cap	Plastic
12- Stem Protector	Epoxy-coated Carbon Steel
13- Friction Washer	Brass
14- Nut	Zinc Plated Carbon Steel

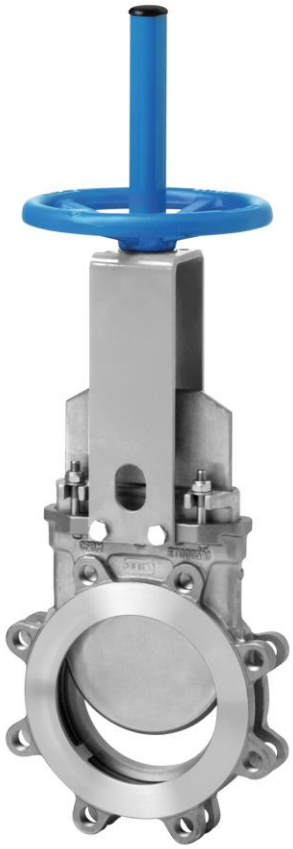
MODEL ET SERIES 20

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

DESIGN FEATURES

BODY:

Lug type one piece integrally cast stainless steel body with reinforced ribs in larger diameters for extra body strength. Internal cast gate wedges and guides allows for tighter shutoff. Port design follows the MSS-SP-81 and Tappi TIS 405-8 standards.
The internal design of the valve avoids any build up of solids that would prevent the valve from closing.



GATE:

Standard AISI 316 stainless steel gate.
The gates are polished and lapped to attain a greater seal between the gate and both the packing and the seat. The bottom of the gate edge is also machined to a bevel, so that it cuts through the solids for a tighter seal in the closed position.

SEAT: (resilient)

Unique design that mechanically locks the seal in the internal of the valve body with a stainless steel retainer ring. Standard EPDM also available in different materials such as Viton, PTFE, etc.

PACKING:

Long-life packing with several layers of PTFE impregnated fibre plus an EPDM O-ring, with an easy access packing gland ensuring a tight seal. Long-life braided packing is available in a wide range of materials.

STEM:

The standard stainless steel stem offers a long corrosion resistant life. For rising stem actuators only, a stem protector is provided for additional protection against dust while the valve in the open position.

ACTUATORS:

All actuators supplied by ORBINOX are interchangeable, and supplied with a standard mounting kit for installation purposes on site.

YOKE or ACTUATOR SUPPORT:

Made of stainless steel (EPOXY coated carbon steel available on request). Compact design makes it extremely robust even under the most severe conditions.

EPOXY COATING:

The epoxy coating on all ORBINOX cast iron and carbon steel valve bodies and components is electrostatically applied making the valves to be corrosion resistant with a high quality finished surface. The ORBINOX standard colour is RAL-5015 blue.

GATE SAFETY PROTECTION:

ORBINOX automated valves are provided with gate guards in accordance with EU Safety Standards. The design feature prevents any objects from being caught accidentally while the gate is moving.
*ONLY IN EUROPE

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

OTHER OPTIONS

Bonnet (Fig.1):

Assures tight seal to atmosphere.
Reduces packing maintenance.

V-port:

60 degree and pentagonal port design. Selection depends on the desired fluid control type.

Flush ports (Fig.2):

Allow for cleaning of solids trapped within the body cavities that can obstruct the flow or prevent the valve from closing. Depending on the process, purging can be made with air, steam, liquids, etc.

Other materials of construction:

Special alloys such as AISI 317 (1.4449), 254SMO (1.4544), Hastelloys, …

Fabricated valves:

ORBINOX designs, produces and delivers special fabricated valves for special process conditions (big sizes and/or high pressures).

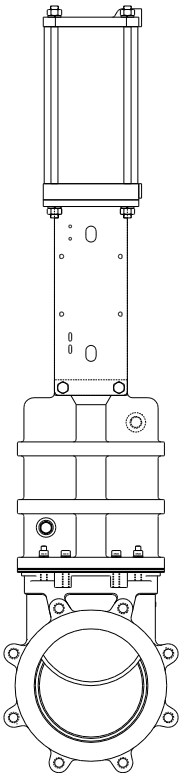


Fig.1

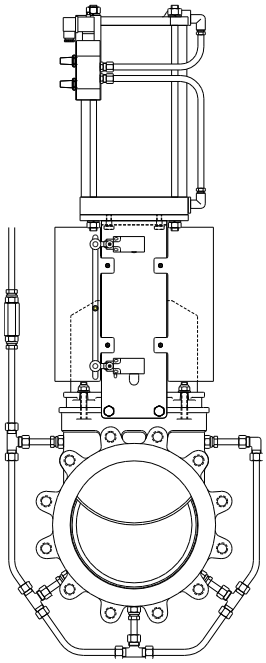


Fig.2

SURFACE TREATMENTS

Valve components can be protected or coated for a longer life expectancy, depending on the application of the valves and the valve service conditions. At ORBINOX we can offer alternative treatments and coatings for the different valve components to improve their properties against abrasion (Stellite, polyurethane…), against corrosion (Halar, Rilsan, galvanizing…) and against adherence (polishing, PTFE…).

We recommend to contact our technical department.

MODEL ET SERIES 20

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

ACTUATOR TYPES

MANUAL:
Handwheel (rising stem)
Handwheel (non-rising stem)
Chainwheel
Lever
Bevel Gear
Other (square nut)

AUTOMATIC:
Electric (rising & non-rising stem)
Pneumatic (single & double-acting)
Hydraulic

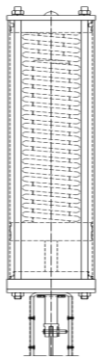
All actuators supplied by ORBINOX are interchangeable.

FAIL SAFE SYSTEMS

Used on pneumatic actuated valves

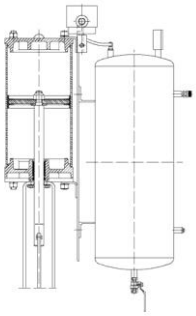
SINGLE ACTING (SPRING RETURN)

- Available from DN 2"/50mm to DN 12"/300mm
- Supply pressure:
  - min. 75 psi/ (5 kg/cm²)
  - max. 150 psi/ (10 kg/cm²)
- Options:
  - Pneumatic or electric fail open
  - Pneumatic or electric fail close
  - Other options on request



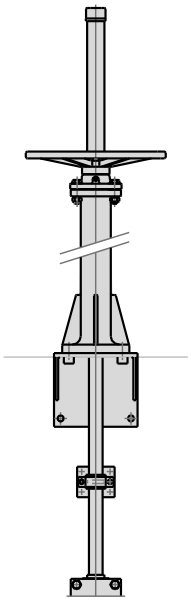
DOUBLE ACTING WITH AIR TANK

- Available for all valve sizes
- Supply pressure:
  - min. 50 psi / (3.5 kg/cm²)
  - max. 150 psi / (10 kg/cm²)
- Options:
  - Pneumatic or electric fail open
  - Pneumatic or electric fail close
  - Other options on request



ACCESSORIES

Mechanical stops
Locking device
Manual override
Solenoid valves
Positioners
Limit switches
Proximity switches
Floor stands
Stem extensions



Wide range of valve extensions available

For further information about fail safe systems and valve extensions, please see EX(SER.10) catalog.

We recommend to contact with our technical department.

MODEL ET SERIES 20

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

TEMPERATURE CHART

SEAT / SEALS

Material	Max.T.(Fº)	(ºC)	Applications
Metal/Metal	>482	>250	High temp. Low tightness.
EPDM (E)	248	120	Acids and non mineral oils.
NBR (N)	248	120	Resistance to petroleum products.
FKM-FPM (V)	392	200	Chemical service./High temp.
VMQ (S)	482	250	Food service. / High temp.
PTFE (T)	482	250	Corrosion resistance.

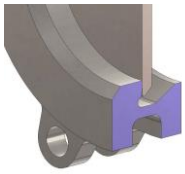
More details and other materials under request

PACKING

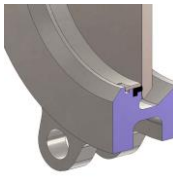
Material	Max.T. (Fº)	(ºC)	pH
PTFE impregn. synth. fibre (ST)	482	250	2-13
Braided PTFE (TH)	500	260	0-14
Graphited (GR)	1112	600	0-14
Ceramic fibre (FC)	2192	1200	--

NOTE: all types include an elastomere O-ring (same material as seal), excluding TH, GR and FC.

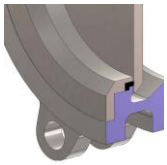
SEAT TYPES



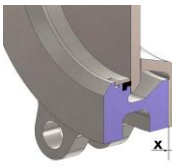
METAL / METAL
For applications with:
- High temperature
- High density media application
- When full tightness is not required



RESILIENT, TYPE "A"
- Standard resilient seat.
- Temperature limitations according to seat material selected. Review the above chart or contact our technical department for more information.
- Replaceable seat retainer ring.



RESILIENT, TYPE "B"
- Temperature limitations according to the selected seat material. Review the above chart or contact our Technical Department for more information.
- Replaceable and reinforced seat ring available in different materials such as: AISI 316 (1.4401), CA15, Ni Hard, etc.



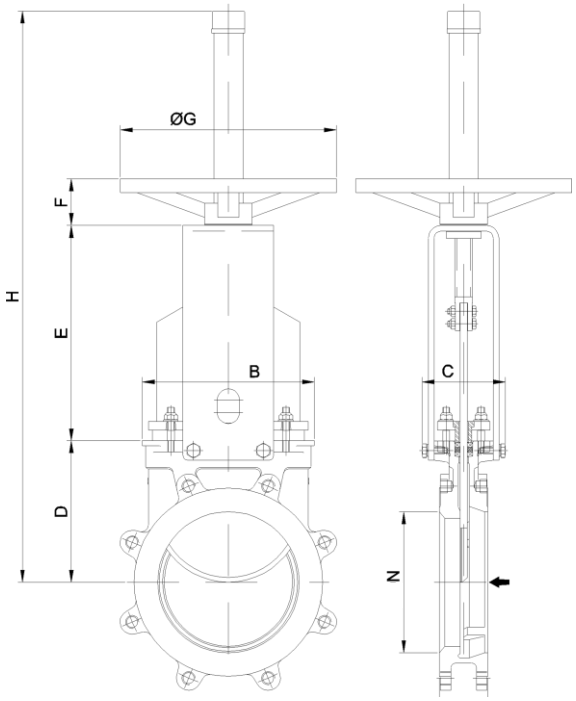
DEFLECTION CONE "C"
- Deflects the media away from any valve internal exposed parts (gate, seat,...)
- Material: AISI 316 (1.4401), CA15, Ni-Hard, PU, etc.
- Face-to-face dimension increases:
DN 2"/50mm to DN 10"250mm X = 0.35"/9mm
DN 12"/300mm to DN 24"/600mm X = 0.47"/12mm
Larger diameters on request

MODEL ET SERIES 20

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

HANDWHEEL (rising stem)

- Standard handwheel actuator.
- Consists of:
  - Handwheel: Epoxy coated Cast Iron
  - Yoke
  - Stem
  - Stem nut
  - Stem protector
- Available from DN 2"/50mm to DN 24"/600mm
- Options (on request):
  - Chainwheel
  - Non-rising stem
  - Locking Device
  - Extensions



DN("/mm)	N	A	B	C	D	E	F	ØG	H	Weight (lbs/kg.)
2"/50	1,96/50	1,89/48	4,88/124	4/100	3,85/98	5,35/139	1,85/47	8,86/225	16,53/420	18/8
3"/80	3,14/80	2/51	5,87/149	4/100	4,68/119	6,38/162	1,85/47	8,86/225	18,50/470	22/10
4"/100	3,81/97	2/51	6,65/169	4/100	5,47/139	7,36/187	1,85/47	8,86/225	20,43/519	28/12,5
5"/125	4,6/117	2,24/57	6,65/169	4/100	5,90/150	8,78/223	1,85/47	8,86/225	24,13/613	35/16
6"/150	5,51/140	2,24/57	7,75/197	4/100	6,50/165	9,33/237	1,85/47	8,86/225	25,27/642	44/20
8"/200	7,24/184	2,75/70	9,72/247	4,80/122	7,99/203	12,16/309	2,64/67	12,20/310	32,28/820	70/32
10"/250	9,05/230	2,75/70	11,73/298	4,80/122	9,17/233	13,58/345	2,64/67	12,20/310	38,81/986	103/47
12"/300	10,82/275	2,99/76	13,74/349	4,80/122	10,74/273	15,35/390	2,72/69	16,14/410	42,16/1071	143/65
14"/350	12/305	2,99/76	15,39/391	7,60/193	12,28/312	17,04/433	2,60/66	16,14/410	49,01/1245	209/95
16"/400	13,84/351,6	3,50/89	17,28/439	7,60/193	13,66/347	18,81/478	2,60/66	16,14/410	52,16/1325	268/122
18"/450	15,35/390	3,50/89	19,01/483	7,75/197	16,33/415	21,73/552	2,64/67	21,65/550	59,49/1510	352/160
20"/500	17,12/435	4,49/114	21,33/542	7,75/197	17,71/450	24,05/611	2,64/67	21,65/550	63,66/1617	444/202
24"/600	20,55/522	4,49/114	25,08/637	7,75/197	19,72/501	27,44/697	2,64/67	21,65/550	74,13/1883	638/290

Reserves the right to change specifications without notice

MODEL ET SERIES 20

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

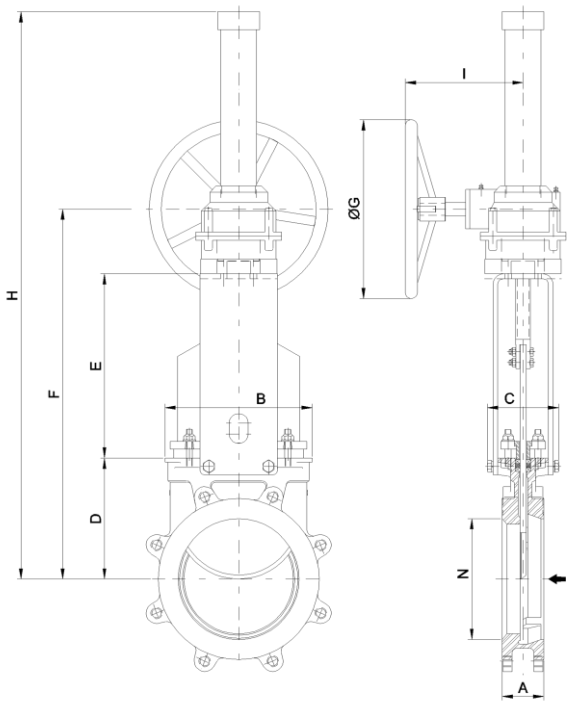
GEAR

- Recommended for valves larger than DN14"/350mm and working pressures greater than 50 psi/(3.5 kg/cm²)

- Consists of:
  - Stem
  - Yoke
  - Bevel Gear Actuator with Handwheel (Standard Ratio 4:1)

- Available from DN 8"/200mm to DN 36"/900mm

- Options:
  - Chainwheel
  - Non-rising Stem
  - Locking Device
  - Extensions



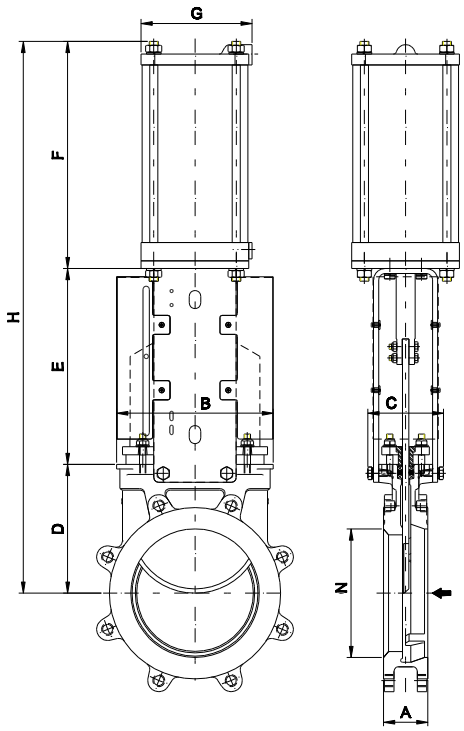
DN("/mm)	N	A	B	C	D	E	F	ØG	H	I
8"/200	7,24/184	2,75/70	9,72/247	4,80/122	7,99/203	12,16/309	22,91/582	12/300	39,05/992	7,87/200
10"/250	9,05/230	2,75/70	11,73/298	4,80/122	9,17/233	13,58/345	25,51/648	12/300	41,73/1060	7,87/200
12"/300	10,82/275	2,99/76	13,74/349	4,80/122	10,74/273	15,35/390	28,85/733	12/300	45/1143	7,87/200
14"/350	12/305	2,99/76	15,39/391	7,75/197	12,28/312	16,93/430	31,10/790	18/450	58,62/1489	10,63/270
16"/400	13,84/351,6	3,50/89	17,28/439	7,75/197	13,66/347	18,70/475	34,25/870	18/450	61,81/1570	10,63/270
18"/450	15,35/390	3,50/89	19,01/483	7,91/201	16,33/415	20,39/518	38,74/984	18/450	63,58/1615	10,63/270
20"/500	17,12/435	4,49/114	21,33/542	7,91/201	17,71/450	21,97/558	42,99/1092	18/450	71,25/1810	11,02/280
24"/600	20,55/522	4,49/114	25,08/637	7,91/201	19,72/501	26,10/663	49,13/1248	26/650	73,98/1879	11,41/290
30"/750	26,37/670	4,60/117	33,15/842	12,60/320	24,57/624	34,29/871	62,87/1597	26/650	104,33/2650	16,26/413
36"/900	31,88/810	4,60/117	38,19/970	12,60/320	30,67/779	41,18/1046	84,05/2135	26/650	123,42/3135	17,40/442

MODEL ET SERIES 20

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

PNEUMATIC CYLINDER

- The standard pneumatic actuator (double acting on-off cylinder) consists of:
  - Ø ≤ 12"/300mm: Aluminum barrels
  - Ø ≥ 14"/350mm: Composite barrels
  - Aluminum end covers
  - Stainless Steel (AISI 304) piston rod
  - Nitrile coated steel piston
- Available from DN 2"/50mm to DN 36"/900mm
- Supply Pressure: min. 50 psi/(3.5 kg/cm²) - max. 145 psi/(10 kg/cm²)
  Actuator designed with 85psi/(6 kg/cm²) air supply
- For valves installed in a horizontal position, we recommend U-type support plates and/or actuator support.
- Options:
  - Hard anodized barrel and covers
  - Stainless Steel barrel and covers
  - Over / Undersized cylinder
  - Manual override
  - Fail safe systems
  - Travel stops
- Instrumentation (on request):
  - Positioners
  - Flow regulators
  - Solenoid valves
  - Air preparation units



DN(“/mm)	N	A	B	C	D	E	F	G	H	Weight (lbs./kg.)	Standard Cyl.	Connect.
2”/50	1,96/50	1,89/48	4,88/124	4/100	3,85/98	5,35/139	7,00/178	4,53/115	16,22/412	22/10	C4”-2.44”/(100-62)	¼” G
3”/80	3,14/80	2/51	5,87/149	4/100	4,68/119	6,38/162	8,30/211	4,53/115	19,37/492	26/12	C4”-3.74”/(100-95)	¼” G
4”/100	3,81/97	2/51	6,65/169	4/100	5,47/139	7,36/187	9,09/231	4,53/115	21,93/557	33/15	C4”-4.52”/(100-115)	¼” G
5”/125	4,6/117	2,24/57	6,65/169	4/100	5,90/150	8,78/223	10,66/271	5,51/140	25,35/644	46/21	C5”-5.52”/(125-143)	¼” G
6”/150	5,51/140	2,24/57	7,75/197	4/100	6,50/165	9,33/237	11,65/296	5,51/140	27,48/698	59/27	C5”-6.61”/(125-168)	¼” G
8”/200	7,24/184	2,75/70	9,72/247	4,80/122	7,99/203	12,16/309	14,09/358	6,89/175	34,25/870	101/46	C6.30”-8.66”/(160-220)	¼” G
10”/250	9,05/230	2,75/70	11,73/298	4,80/122	9,17/233	13,58/345	16,85/428	8,66/220	39,60/1006	154/70	C8”-10.62”/(200-270)	3/8” G
12”/300	10,82/275	2,99/76	13,74/349	4,80/122	10,74/273	15,35/390	18,81/478	8,66/220	44,93/1141	195/89	C8”-12.60”/(200-320)	3/8” G
14”/350	12/305	2,99/76	15,39/391	7,60/193	12,28/312	18,07/459	21,61/549	10,90/277	51,96/1320	297/135	C10”-14.76”/(250-375)	3/8” G
16”/400	13,84/351,6	3,50/89	17,28/439	7,60/193	13,66/347	18,81/478	23,58/599	10,90/277	56,06/1424	356/162	C10”-16.78”/(250-425)	3/8” G
18”/450	15,35/390	3,50/89	19,01/483	7,75/197	16,33/415	21,73/552	26,77/680	15,03/382	64,84/1647	466/212	C12”-18.70”/(300-475)	½” G
20”/500	17,12/435	4,49/114	21,33/542	7,75/197	17,71/450	24,05/611	28,74/730	15,03/382	70,51/1791	638/290	C12”-20.67”/(300-525)	½” G
24”/600	20,55/522	4,49/114	25,08/637	7,75/197	19,72/501	27,44/697	32,68/830	15,03/382	79,84/2028	825/375	C12”-24.60”/(300-625)	½” G
30”/750	26,37/670	4,60/117	33,15/842	12,60/320	24,57/624	37,00/940	38,77/985	17,48/444	100,35/2549	1419/645	C14”-30.70”/(350-780)	¾” G
36”/900	31,88/810	4,60/117	38,19/970	12,60/320	30,51/775	43,30/1100	47,32/1202	20,27/515	121,14/3077	1716/780	C16”-36.61”/(400-930)	¾” G

MODEL ET SERIES 20

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

ELECTRIC ACTUATOR

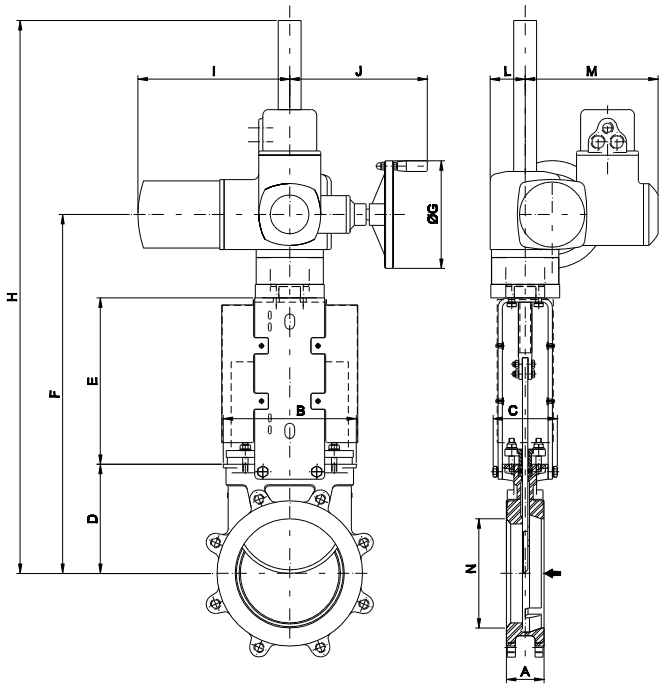
- Consists of:
  - Electric actuator
  - Rising stem
  - Motor support yoke flange acc. to ISO 5210 / DIN 3338

- The standard electric motor is equiped with:
  - Manual emergency operation
  - Limit switches (open/closed)
  - Torque switches

- Available from DN 2"/50mm to DN 48"/1200mm

- Wide range of types and marks available to meet customer's needs.

- Option:
  - Non rising stem



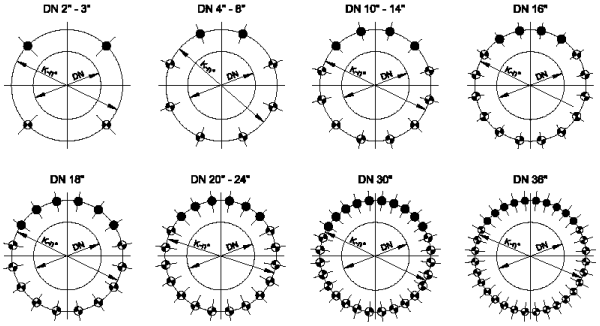
DN(“/mm)	N	A	B	C	D	E	F	ØG	H	I	J	L	M	Stem Ø x pich	Torque (ft.LBS/Nm)
2”/50	1,96/50	1,89/48	4,88/124	4/100	3,86/98	5,35/136	14,84/377	6,30/160	17,87/454	10,43/265	9,80/249	2,44/62	9,37/238	0.79 x 0.16/20 x 4	7.4/10
3”/80	3,14/80	2/51	5,87/149	4/100	4,68/119	6,38/162	16,69/424	6,30/160	19,72/501	10,43/265	9,80/249	2,44/62	9,37/238	0.79 x 0.16/20 x 4	7.4/10
4”/100	3,81/97	2/51	6,65/169	4/100	5,47/139	7,36/187	18,46/469	6,30/160	21,49/546	10,43/265	9,80/249	2,44/62	9,37/238	0.79 x 0.16/20 x 4	7.4/10
5”/125	4,6/117	2,24/57	6,65/169	4/100	5,90/150	8,78/223	20,31/516	6,30/160	23,34/593	10,43/265	9,80/249	2,44/62	9,37/238	0.79 x 0.16/20 x 4	11.1/15
6”/150	5,51/140	2,24/57	7,75/197	4/100	6,50/165	9,33/237	21,45/545	6,30/160	44,17/1122	10,43/265	9,80/249	2,44/62	9,37/238	0.79 x 0.16/20 x 4	14.8/20
8”/200	7,24/184	2,75/70	9,72/247	4,80/122	7,99/203	12,16/309	26,25/667	6,30/160	49,40/1255	10,43/265	9,80/249	2,44/62	9,37/238	0.98 x 0.2/25 x 5	22.2/30
10”/250	9,05/230	2,75/70	11,73/298	4,80/122	9,17/233	13,58/345	28,85/733	6,30/160	52,00/1321	10,43/265	9,80/249	2,44/62	9,37/238	0.98 x 0.2/25 x 5	33.3/45
12”/300	10,82/275	2,99/76	13,74/349	4,80/122	10,74/273	15,35/390	31,22/793	7,87/200	54,37/1381	11,14/283	10/254	2,55/65	9,76/248	0.98 x 0.2/25 x 5	51.8/70
14”/350	12/305	2,99/76	15,39/391	7,60/193	12,28/312	17,04/433	34,44/875	7,87/200	57,59/1463	11,14/283	10/254	2,55/65	9,76/248	1.38 x 0.24/35 x 6	81.4/110
16”/400	13,84/351,6	3,50/89	17,28/439	7,60/193	13,66/347	18,81/478	37,60/955	12,40/315	60,75/1543	15,31/389	13,22/336	3,58/91	11,25/286	1.38 x 0.24/35 x 6	118.4/160
18”/450	15,35/390	3,50/89	19,01/483	7,75/197	16,33/415	21,73/552	44,96/1142	12,40/315	73,63/1870	15,31/389	13,22/336	3,58/91	11,25/286	1.38 x 0.24/35 x 6	140.6/190
20”/500	17,12/435	4,49/114	21,33/542	7,75/197	17,71/450	24,05/611	48,11/1222	15,74/400	76,77/1950	15,31/389	13,34/339	3,58/91	11,25/286	1.38 x 0.24/35 x 6	199.8/270
24”/600	20,55/522	4,49/114	25,08/637	7,75/197	19,72/501	27,44/697	56,85/1444	15,74/400	85,51/2172	15,31/389	13,34/339	3,58/91	11,25/286	1.57 x 0.27/40 x 7	333/450
30”/750	26,37/670	4,60/117	33,15/842	12,60/320	24,57/624	34,76/883	70,03/1779	19,68/500	111,49/2832	16,92/430	14,37/365	4,61/117	11,93/303	1.97 x 0.31/50 x 8	407/550
36”/900	31,88/810	4,60/117	38,19/970	12,60/320	30,67/779	41,18/1046	80,11/2035	19,68/500	121,26/3080	16,92/430	14,37/365	4,61/117	11,93/303	2.36 x 0.35/60 x 9	627/850

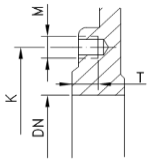
ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

FLANGE AND BOLTING DETAILS

ANSI B16.5 / B16.47, class 150

DN	K	nº	M	T	⌖ ⊕
2″	4 ¾″	4	5/8″ - 11 UNC	7/16″	2 - 2
3″	6″	4	5/8″ - 11 UNC	11/32″	2 - 2
4″	7 ½″	8	5/8″ - 11 UNC	11/32″	2 - 6
5″	8 ½″	8	3/4″ - 10 UNC	3/8″	2 - 6
6″	9 ½″	8	3/4″ - 10 UNC	3/8″	2 - 6
8″	11 ¾″	8	3/4″ - 10 UNC	15/32″	2 - 6
10″	14 ¼″	12	7/8″ - 9 UNC	15/32″	4 - 8
12″	17″	12	7/8″ - 9 UNC	15/32″	4 - 8
14″	18 ¾″	12	1″ - 8 UNC	19/32″	4 - 8
16″	21 ¼″	16	1″ - 8 UNC	19/32″	4 - 12
18″	22 ¾″	16	1 1/8″ - 7 UNC	19/32″	6 - 10
20″	25″	20	1 1/8″ - 7 UNC	7/8″	6 - 14
24″	29 ½″	20	1 1/4″ - 7 UNC	7/8″	6 - 14
30″	36″	28	1 1/4″ - 7 UNC	1 1/4″	10 - 18
36″	42 ¾″	32	1 1/2″ - 6 UNC	1 1/4″	10 - 22



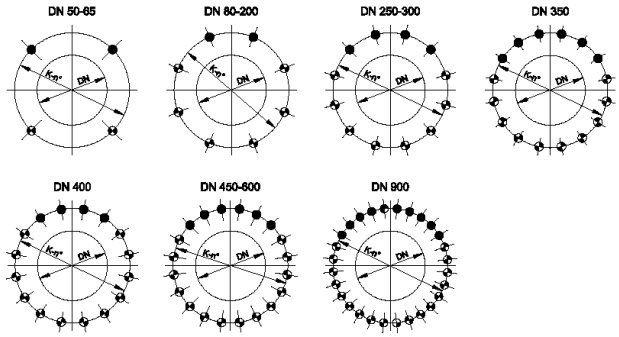


BLIND TAPPED HOLES

TAPPED THROUGH

EN 1092-2 PN10

DN	K	nº	M	T	⌖ ⊕
50	125	4	M-16	11	2 - 2
80	160	8	M-16	9	2 - 6
100	180	8	M-16	9	2 - 6
125	210	8	M-16	10	2 - 6
150	240	8	M-20	10	2 - 6
200	295	8	M-20	12	2 - 6
250	350	12	M-20	12	4 - 8
300	400	12	M-20	12	4 - 8
350	460	16	M-20	15	6 - 10
400	515	16	M-24	15	6 - 12
450	565	20	M-24	15	6 - 14
500	620	20	M-24	22	6 - 14
600	725	20	M-27	22	6 - 14
900	1050	28	M-30	32	10 - 18



16-FV-700
20-FV-502
16-FV-510

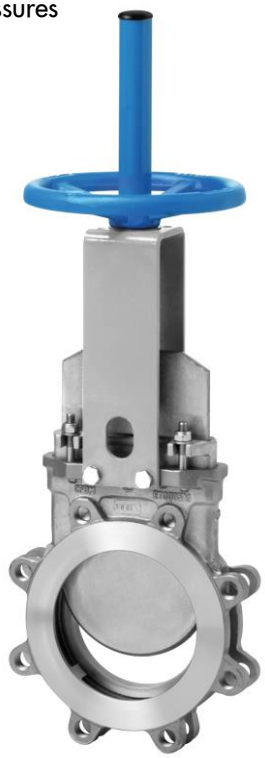
MODEL **ET** **SERIES 20**

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

HEAVY DUTY KNIFE GATE VALVE

The ET(SER.20) model knife gate is an uni-directional lug type valve designed according to MSS-SP-81 and TAPPI TIS 405-8 for industrial service applications. The design of the body and seat assures non-clogging shut off on suspended solids in industries such as:

- Pulp and Paper
- Power plants
- Mining
- Chemical plants
- Wastewater treatment plants
- Food and Beverage
- Etc.



Sizes:

DN 2"/50mm to DN 36"/900mm (larger diameters on request)

Working pressure:

DN 2"/ 50mm to DN 24"/600mm	150 psi /(10 kg/cm²)
DN 30"/750mm	100 psi / (7 kg/cm²)
DN 36"/900mm	100 psi / (7 kg/cm²)

Standard flange connection:

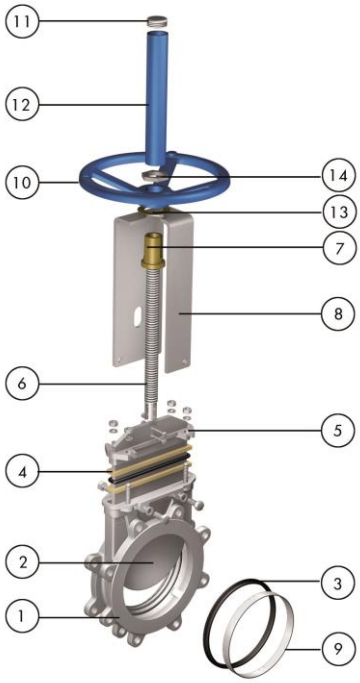
DIN PN 10 and ANSI B16.5 (class 150)

Other flange connections available on request

Directives:

For EU Directives and other Certificates, please see the document: Directives and Certificates Compliance - Knife Gate Valves - Catalogues and Datasheets

All valves are tested prior to shipping in accordance with the standard developed by the Quality Control Department at ORBINOX.



STANDARD PARTS LIST

Part:	Stainless Steel:
1- Body	CF8M
2- Gate	AISI 316
3- Seat	Metal or EPDM
4- Packing	PTFE Impreg. Synth. Fibre with an EPDM O-Ring
5- Gland Follower	CF8M
6- Stem	Stainless Steel
7- Stem nut	Brass
8- Yoke	AISI 304 / Epoxy-coated Carbon Steel
9- Seat Retainer Ring	AISI 316
10- Handwheel	GJS400 (GGG40)
11- Cap	Plastic
12- Stem Protector	Epoxy-coated Carbon Steel
13- Friction Washer	Brass
14- Nut	Zinc Plated Carbon Steel

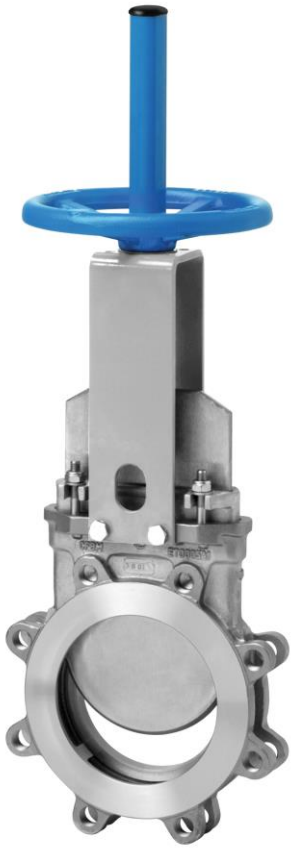
MODEL ET SERIES 20

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

DESIGN FEATURES

BODY:

Lug type one piece integrally cast stainless steel body with reinforced ribs in larger diameters for extra body strength. Internal cast gate wedges and guides allows for tighter shutoff. Port design follows the MSS-SP-81 and Tappi TIS 405-8 standards.
The internal design of the valve avoids any build up of solids that would prevent the valve from closing.



GATE:

Standard AISI 316 stainless steel gate.
The gates are polished and lapped to attain a greater seal between the gate and both the packing and the seat. The bottom of the gate edge is also machined to a bevel, so that it cuts through the solids for a tighter seal in the closed position.

SEAT: (resilient)

Unique design that mechanically locks the seal in the internal of the valve body with a stainless steel retainer ring. Standard EPDM also available in different materials such as Viton, PTFE, etc.

PACKING:

Long-life packing with several layers of PTFE impregnated fibre plus an EPDM O-ring, with an easy access packing gland ensuring a tight seal. Long-life braided packing is available in a wide range of materials.

STEM:

The standard stainless steel stem offers a long corrosion resistant life. For rising stem actuators only, a stem protector is provided for additional protection against dust while the valve in the open position.

ACTUATORS:

All actuators supplied by ORBINOX are interchangeable, and supplied with a standard mounting kit for installation purposes on site.

YOKE or ACTUATOR SUPPORT:

Made of stainless steel (EPOXY coated carbon steel available on request). Compact design makes it extremely robust even under the most severe conditions.

EPOXY COATING:

The epoxy coating on all ORBINOX cast iron and carbon steel valve bodies and components is electrostatically applied making the valves to be corrosion resistant with a high quality finished surface. The ORBINOX standard colour is RAL-5015 blue.

GATE SAFETY PROTECTION:

ORBINOX automated valves are provided with gate guards in accordance with EU Safety Standards. The design feature prevents any objects from being caught accidentally while the gate is moving.
*ONLY IN EUROPE

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

OTHER OPTIONS

Bonnet (Fig.1):

Assures tight seal to atmosphere.
Reduces packing maintenance.

V-port:

60 degree and pentagonal port design. Selection depends on the desired fluid control type.

Flush ports (Fig.2):

Allow for cleaning of solids trapped within the body cavities that can obstruct the flow or prevent the valve from closing. Depending on the process, purging can be made with air, steam, liquids, etc.

Other materials of construction:

Special alloys such as AISI 317 (1.4449), 254SMO (1.4544), Hastelloys, …

Fabricated valves:

ORBINOX designs, produces and delivers special fabricated valves for special process conditions (big sizes and/or high pressures).

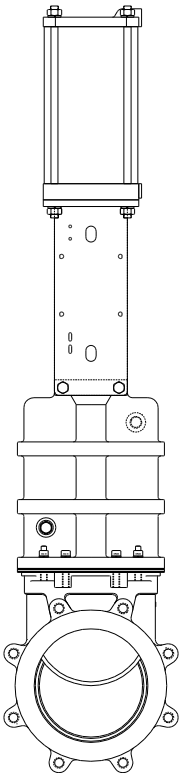


Fig.1

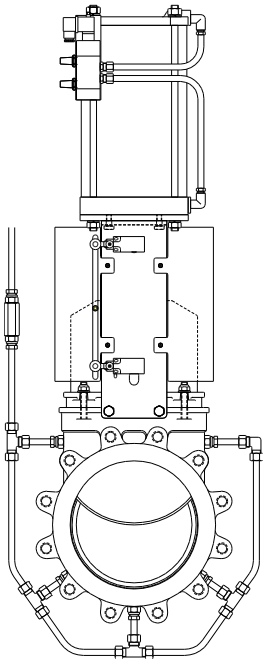


Fig.2

SURFACE TREATMENTS

Valve components can be protected or coated for a longer life expectancy, depending on the application of the valves and the valve service conditions. At ORBINOX we can offer alternative treatments and coatings for the different valve components to improve their properties against abrasion (Stellite, polyurethane…), against corrosion (Halar, Rilsan, galvanizing…) and against adherence (polishing, PTFE…).

We recommend to contact our technical department.

MODEL ET SERIES 20

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

ACTUATOR TYPES

MANUAL:
Handwheel (rising stem)
Handwheel (non-rising stem)
Chainwheel
Lever
Bevel Gear
Other (square nut)

AUTOMATIC:
Electric (rising & non-rising stem)
Pneumatic (single & double-acting)
Hydraulic

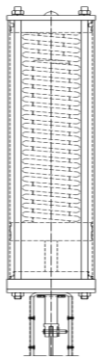
All actuators supplied by ORBINOX are interchangeable.

FAIL SAFE SYSTEMS

Used on pneumatic actuated valves

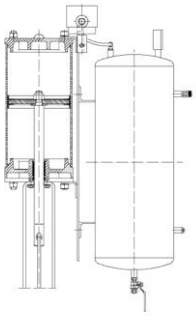
SINGLE ACTING (SPRING RETURN)

- Available from DN 2"/50mm to DN 12"/300mm
- Supply pressure:
  - min. 75 psi/ (5 kg/cm²)
  - max. 150 psi/ (10 kg/cm²)
- Options:
  - Pneumatic or electric fail open
  - Pneumatic or electric fail close
  - Other options on request



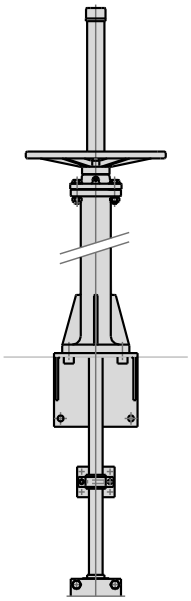
DOUBLE ACTING WITH AIR TANK

- Available for all valve sizes
- Supply pressure:
  - min. 50 psi / (3.5 kg/cm²)
  - max. 150 psi / (10 kg/cm²)
- Options:
  - Pneumatic or electric fail open
  - Pneumatic or electric fail close
  - Other options on request



ACCESSORIES

Mechanical stops
Locking device
Manual override
Solenoid valves
Positioners
Limit switches
Proximity switches
Floor stands
Stem extensions



Wide range of valve extensions available

For further information about fail safe systems and valve extensions, please see EX(SER.10) catalog.

We recommend to contact with our technical department.

MODEL ET SERIES 20

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

TEMPERATURE CHART

SEAT / SEALS

Material	Max.T.(Fº)	(ºC)	Applications
Metal/Metal	>482	>250	High temp. Low tightness.
EPDM (E)	248	120	Acids and non mineral oils.
NBR (N)	248	120	Resistance to petroleum products.
FKM-FPM (V)	392	200	Chemical service./High temp.
VMQ (S)	482	250	Food service. / High temp.
PTFE (T)	482	250	Corrosion resistance.

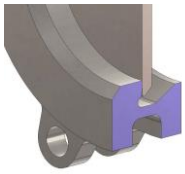
More details and other materials under request

PACKING

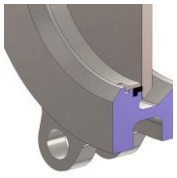
Material	Max.T. (Fº)	(ºC)	pH
PTFE impregn. synth. fibre (ST)	482	250	2-13
Braided PTFE (TH)	500	260	0-14
Graphited (GR)	1112	600	0-14
Ceramic fibre (FC)	2192	1200	--

NOTE: all types include an elastomere O-ring (same material as seal), excluding TH, GR and FC.

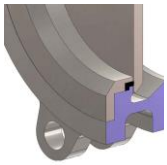
SEAT TYPES



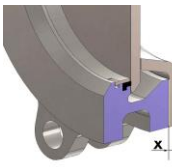
METAL / METAL
For applications with:
- High temperature
- High density media application
- When full tightness is not required



RESILIENT, TYPE "A"
- Standard resilient seat.
- Temperature limitations according to seat material selected. Review the above chart or contact our technical department for more information.
- Replaceable seat retainer ring.



RESILIENT, TYPE "B"
- Temperature limitations according to the selected seat material. Review the above chart or contact our Technical Department for more information.
- Replaceable and reinforced seat ring available in different materials such as: AISI 316 (1.4401), CA15, Ni Hard, etc.



DEFLECTION CONE "C"
- Deflects the media away from any valve internal exposed parts (gate, seat,...)
- Material: AISI 316 (1.4401), CA15, Ni-Hard, PU, etc.
- Face-to-face dimension increases:
DN 2"/50mm to DN 10"250mm X = 0.35"/9mm
DN 12"/300mm to DN 24"/600mm X = 0.47"/12mm
Larger diameters on request

MODEL **ET** **SERIES 20**

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

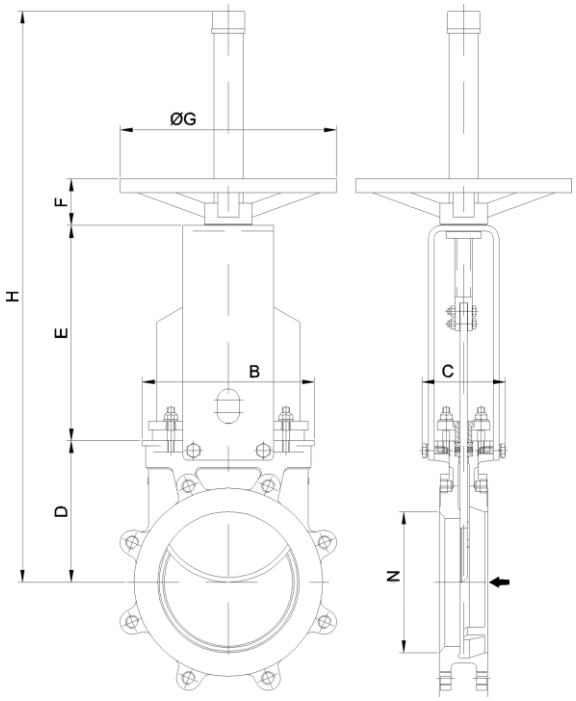
HANDWHEEL (rising stem)

- Standard handwheel actuator.

- Consists of:
  - Handwheel: Epoxy coated Cast Iron
  - Yoke
  - Stem
  - Stem nut
  - Stem protector

- Available from DN 2"/50mm to DN 24"/600mm

- Options (on request):
  - Chainwheel
  - Non-rising stem
  - Locking Device
  - Extensions



DN("/mm)	N	A	B	C	D	E	F	ØG	H	Weight (lbs/kg.)
2"/50	1,96/50	1,89/48	4,88/124	4/100	3,85/98	5,35/139	1,85/47	8,86/225	16,53/420	18/8
3"/80	3,14/80	2/51	5,87/149	4/100	4,68/119	6,38/162	1,85/47	8,86/225	18,50/470	22/10
4"/100	3,81/97	2/51	6,65/169	4/100	5,47/139	7,36/187	1,85/47	8,86/225	20,43/519	28/12,5
5"/125	4,6/117	2,24/57	6,65/169	4/100	5,90/150	8,78/223	1,85/47	8,86/225	24,13/613	35/16
6"/150	5,51/140	2,24/57	7,75/197	4/100	6,50/165	9,33/237	1,85/47	8,86/225	25,27/642	44/20
8"/200	7,24/184	2,75/70	9,72/247	4,80/122	7,99/203	12,16/309	2,64/67	12,20/310	32,28/820	70/32
10"/250	9,05/230	2,75/70	11,73/298	4,80/122	9,17/233	13,58/345	2,64/67	12,20/310	38,81/986	103/47
12"/300	10,82/275	2,99/76	13,74/349	4,80/122	10,74/273	15,35/390	2,72/69	16,14/410	42,16/1071	143/65
14"/350	12/305	2,99/76	15,39/391	7,60/193	12,28/312	17,04/433	2,60/66	16,14/410	49,01/1245	209/95
16"/400	13,84/351,6	3,50/89	17,28/439	7,60/193	13,66/347	18,81/478	2,60/66	16,14/410	52,16/1325	268/122
18"/450	15,35/390	3,50/89	19,01/483	7,75/197	16,33/415	21,73/552	2,64/67	21,65/550	59,49/1510	352/160
20"/500	17,12/435	4,49/114	21,33/542	7,75/197	17,71/450	24,05/611	2,64/67	21,65/550	63,66/1617	444/202
24"/600	20,55/522	4,49/114	25,08/637	7,75/197	19,72/501	27,44/697	2,64/67	21,65/550	74,13/1883	638/290

MODEL ET SERIES 20

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

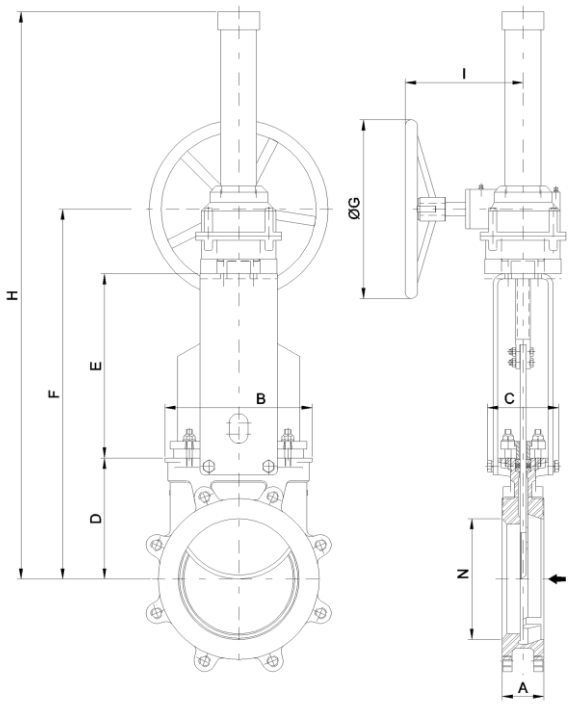
GEAR

- Recommended for valves larger than DN14"/350mm and working pressures greater than 50 psi/(3.5 kg/cm²)

- Consists of:
  - Stem
  - Yoke
  - Bevel Gear Actuator with Handwheel (Standard Ratio 4:1)

- Available from DN 8"/200mm to DN 36"/900mm

- Options:
  - Chainwheel
  - Non-rising Stem
  - Locking Device
  - Extensions



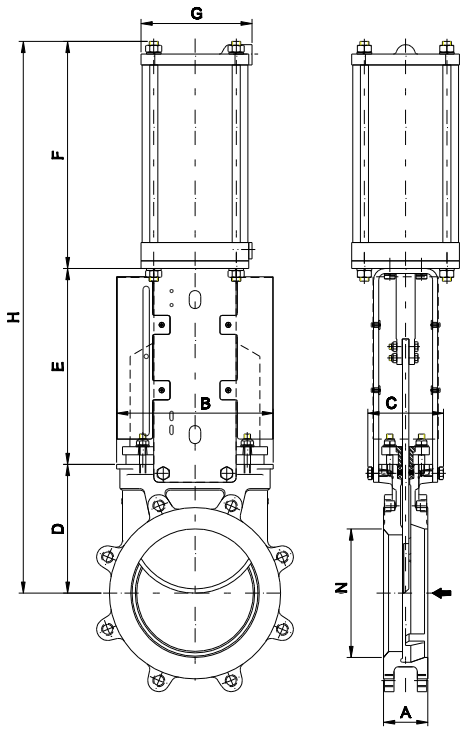
DN("/mm)	N	A	B	C	D	E	F	ØG	H	I
8"/200	7,24/184	2,75/70	9,72/247	4,80/122	7,99/203	12,16/309	22,91/582	12/300	39,05/992	7,87/200
10"/250	9,05/230	2,75/70	11,73/298	4,80/122	9,17/233	13,58/345	25,51/648	12/300	41,73/1060	7,87/200
12"/300	10,82/275	2,99/76	13,74/349	4,80/122	10,74/273	15,35/390	28,85/733	12/300	45/1143	7,87/200
14"/350	12/305	2,99/76	15,39/391	7,75/197	12,28/312	16,93/430	31,10/790	18/450	58,62/1489	10,63/270
16"/400	13,84/351,6	3,50/89	17,28/439	7,75/197	13,66/347	18,70/475	34,25/870	18/450	61,81/1570	10,63/270
18"/450	15,35/390	3,50/89	19,01/483	7,91/201	16,33/415	20,39/518	38,74/984	18/450	63,58/1615	10,63/270
20"/500	17,12/435	4,49/114	21,33/542	7,91/201	17,71/450	21,97/558	42,99/1092	18/450	71,25/1810	11,02/280
24"/600	20,55/522	4,49/114	25,08/637	7,91/201	19,72/501	26,10/663	49,13/1248	26/650	73,98/1879	11,41/290
30"/750	26,37/670	4,60/117	33,15/842	12,60/320	24,57/624	34,29/871	62,87/1597	26/650	104,33/2650	16,26/413
36"/900	31,88/810	4,60/117	38,19/970	12,60/320	30,67/779	41,18/1046	84,05/2135	26/650	123,42/3135	17,40/442

MODEL ET SERIES 20

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

PNEUMATIC CYLINDER

- The standard pneumatic actuator (double acting on-off cylinder) consists of:
  - Ø ≤ 12"/300mm: Aluminum barrels
  - Ø ≥ 14"/350mm: Composite barrels
  - Aluminum end covers
  - Stainless Steel (AISI 304) piston rod
  - Nitrile coated steel piston
- Available from DN 2"/50mm to DN 36"/900mm
- Supply Pressure: min. 50 psi/(3.5 kg/cm²) - max. 145 psi/(10 kg/cm²)
  Actuator designed with 85psi/(6 kg/cm²) air supply
- For valves installed in a horizontal position, we recommend U-type support plates and/or actuator support.
- Options:
  - Hard anodized barrel and covers
  - Stainless Steel barrel and covers
  - Over / Undersized cylinder
  - Manual override
  - Fail safe systems
  - Travel stops
- Instrumentation (on request):
  - Positioners
  - Flow regulators
  - Solenoid valves
  - Air preparation units



DN(“/mm)	N	A	B	C	D	E	F	G	H	Weight (lbs./kg.)	Standard Cyl.	Connect.
2”/50	1,96/50	1,89/48	4,88/124	4/100	3,85/98	5,35/139	7,00/178	4,53/115	16,22/412	22/10	C4”-2.44”/(100-62)	¼” G
3”/80	3,14/80	2/51	5,87/149	4/100	4,68/119	6,38/162	8,30/211	4,53/115	19,37/492	26/12	C4”-3.74”/(100-95)	¼” G
4”/100	3,81/97	2/51	6,65/169	4/100	5,47/139	7,36/187	9,09/231	4,53/115	21,93/557	33/15	C4”-4.52”/(100-115)	¼” G
5”/125	4,6/117	2,24/57	6,65/169	4/100	5,90/150	8,78/223	10,66/271	5,51/140	25,35/644	46/21	C5”-5.52”/(125-143)	¼” G
6”/150	5,51/140	2,24/57	7,75/197	4/100	6,50/165	9,33/237	11,65/296	5,51/140	27,48/698	59/27	C5”-6.61”/(125-168)	¼” G
8”/200	7,24/184	2,75/70	9,72/247	4,80/122	7,99/203	12,16/309	14,09/358	6,89/175	34,25/870	101/46	C6.30”-8.66”/(160-220)	¼” G
10”/250	9,05/230	2,75/70	11,73/298	4,80/122	9,17/233	13,58/345	16,85/428	8,66/220	39,60/1006	154/70	C8”-10.62”/(200-270)	3/8” G
12”/300	10,82/275	2,99/76	13,74/349	4,80/122	10,74/273	15,35/390	18,81/478	8,66/220	44,93/1141	195/89	C8”-12.60”/(200-320)	3/8” G
14”/350	12/305	2,99/76	15,39/391	7,60/193	12,28/312	18,07/459	21,61/549	10,90/277	51,96/1320	297/135	C10”-14.76”/(250-375)	3/8” G
16”/400	13,84/351,6	3,50/89	17,28/439	7,60/193	13,66/347	18,81/478	23,58/599	10,90/277	56,06/1424	356/162	C10”-16.78”/(250-425)	3/8” G
18”/450	15,35/390	3,50/89	19,01/483	7,75/197	16,33/415	21,73/552	26,77/680	15,03/382	64,84/1647	466/212	C12”-18.70”/(300-475)	½” G
20”/500	17,12/435	4,49/114	21,33/542	7,75/197	17,71/450	24,05/611	28,74/730	15,03/382	70,51/1791	638/290	C12”-20.67”/(300-525)	½” G
24”/600	20,55/522	4,49/114	25,08/637	7,75/197	19,72/501	27,44/697	32,68/830	15,03/382	79,84/2028	825/375	C12”-24.60”/(300-625)	½” G
30”/750	26,37/670	4,60/117	33,15/842	12,60/320	24,57/624	37,00/940	38,77/985	17,48/444	100,35/2549	1419/645	C14”-30.70”/(350-780)	¾” G
36”/900	31,88/810	4,60/117	38,19/970	12,60/320	30,51/775	43,30/1100	47,32/1202	20,27/515	121,14/3077	1716/780	C16”-36.61”/(400-930)	¾” G

MODEL ET SERIES 20

ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

ELECTRIC ACTUATOR

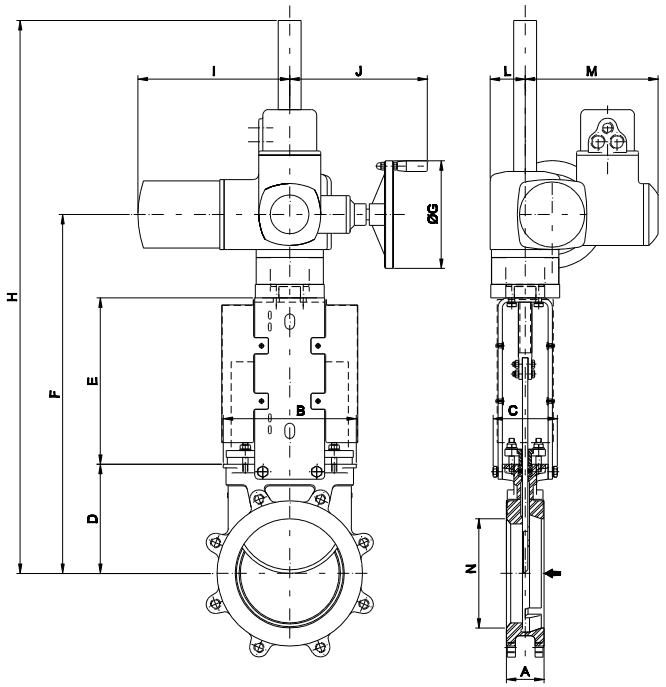
- Consists of:
  - Electric actuator
  - Rising stem
  - Motor support yoke flange acc. to ISO 5210 / DIN 3338

- The standard electric motor is equiped with:
  - Manual emergency operation
  - Limit switches (open/closed)
  - Torque switches

- Available from DN 2"/50mm to DN 48"/1200mm

- Wide range of types and marks available to meet customer's needs.

- Option:
  - Non rising stem



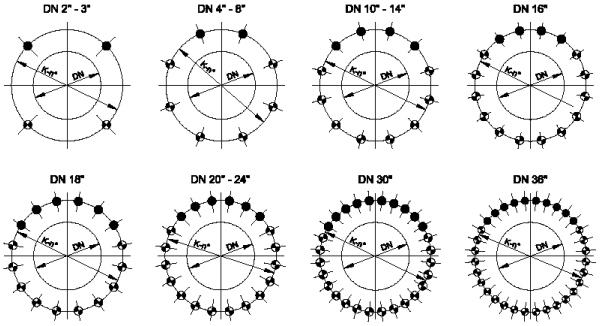
DN(“/mm)	N	A	B	C	D	E	F	ØG	H	I	J	L	M	Stem Ø x pich	Torque (ft.LBS/Nm)
2”/50	1,96/50	1,89/48	4,88/124	4/100	3,86/98	5,35/136	14,84/377	6,30/160	17,87/454	10,43/265	9,80/249	2,44/62	9,37/238	0.79 x 0.16/20 x 4	7.4/10
3”/80	3,14/80	2/51	5,87/149	4/100	4,68/119	6,38/162	16,69/424	6,30/160	19,72/501	10,43/265	9,80/249	2,44/62	9,37/238	0.79 x 0.16/20 x 4	7.4/10
4”/100	3,81/97	2/51	6,65/169	4/100	5,47/139	7,36/187	18,46/469	6,30/160	21,49/546	10,43/265	9,80/249	2,44/62	9,37/238	0.79 x 0.16/20 x 4	7.4/10
5”/125	4,6/117	2,24/57	6,65/169	4/100	5,90/150	8,78/223	20,31/516	6,30/160	23,34/593	10,43/265	9,80/249	2,44/62	9,37/238	0.79 x 0.16/20 x 4	11.1/15
6”/150	5,51/140	2,24/57	7,75/197	4/100	6,50/165	9,33/237	21,45/545	6,30/160	44,17/1122	10,43/265	9,80/249	2,44/62	9,37/238	0.79 x 0.16/20 x 4	14.8/20
8”/200	7,24/184	2,75/70	9,72/247	4,80/122	7,99/203	12,16/309	26,25/667	6,30/160	49,40/1255	10,43/265	9,80/249	2,44/62	9,37/238	0.98 x 0.2/25 x 5	22.2/30
10”/250	9,05/230	2,75/70	11,73/298	4,80/122	9,17/233	13,58/345	28,85/733	6,30/160	52,00/1321	10,43/265	9,80/249	2,44/62	9,37/238	0.98 x 0.2/25 x 5	33.3/45
12”/300	10,82/275	2,99/76	13,74/349	4,80/122	10,74/273	15,35/390	31,22/793	7,87/200	54,37/1381	11,14/283	10/254	2,55/65	9,76/248	0.98 x 0.2/25 x 5	51.8/70
14”/350	12/305	2,99/76	15,39/391	7,60/193	12,28/312	17,04/433	34,44/875	7,87/200	57,59/1463	11,14/283	10/254	2,55/65	9,76/248	1.38 x 0.24/35 x 6	81.4/110
16”/400	13,84/351,6	3,50/89	17,28/439	7,60/193	13,66/347	18,81/478	37,60/955	12,40/315	60,75/1543	15,31/389	13,22/336	3,58/91	11,25/286	1.38 x 0.24/35 x 6	118.4/160
18”/450	15,35/390	3,50/89	19,01/483	7,75/197	16,33/415	21,73/552	44,96/1142	12,40/315	73,63/1870	15,31/389	13,22/336	3,58/91	11,25/286	1.38 x 0.24/35 x 6	140.6/190
20”/500	17,12/435	4,49/114	21,33/542	7,75/197	17,71/450	24,05/611	48,11/1222	15,74/400	76,77/1950	15,31/389	13,34/339	3,58/91	11,25/286	1.38 x 0.24/35 x 6	199.8/270
24”/600	20,55/522	4,49/114	25,08/637	7,75/197	19,72/501	27,44/697	56,85/1444	15,74/400	85,51/2172	15,31/389	13,34/339	3,58/91	11,25/286	1.57 x 0.27/40 x 7	333/450
30”/750	26,37/670	4,60/117	33,15/842	12,60/320	24,57/624	34,76/883	70,03/1779	19,68/500	111,49/2832	16,92/430	14,37/365	4,61/117	11,93/303	1.97 x 0.31/50 x 8	407/550
36”/900	31,88/810	4,60/117	38,19/970	12,60/320	30,67/779	41,18/1046	80,11/2035	19,68/500	121,26/3080	16,92/430	14,37/365	4,61/117	11,93/303	2.36 x 0.35/60 x 9	627/850

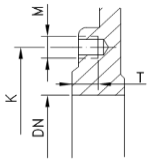
ORBINOX
VALVE SOLUTIONS IN MORE THAN 70 COUNTRIES

FLANGE AND BOLTING DETAILS

ANSI B16.5 / B16.47, class 150

DN	K	nº	M	T	⌖ ⊕
2″	4 ¾″	4	5/8″ - 11 UNC	7/16″	2 - 2
3″	6″	4	5/8″ - 11 UNC	11/32″	2 - 2
4″	7 ½″	8	5/8″ - 11 UNC	11/32″	2 - 6
5″	8 ½″	8	3/4″ - 10 UNC	3/8″	2 - 6
6″	9 ½″	8	3/4″ - 10 UNC	3/8″	2 - 6
8″	11 ¾″	8	3/4″ - 10 UNC	15/32″	2 - 6
10″	14 ¼″	12	7/8″ - 9 UNC	15/32″	4 - 8
12″	17″	12	7/8″ - 9 UNC	15/32″	4 - 8
14″	18 ¾″	12	1″ - 8 UNC	19/32″	4 - 8
16″	21 ¼″	16	1″ - 8 UNC	19/32″	4 - 12
18″	22 ¾″	16	1 1/8″ - 7 UNC	19/32″	6 - 10
20″	25″	20	1 1/8″ - 7 UNC	7/8″	6 - 14
24″	29 ½″	20	1 1/4″ - 7 UNC	7/8″	6 - 14
30″	36″	28	1 1/4″ - 7 UNC	1 1/4″	10 - 18
36″	42 ¾″	32	1 1/2″ - 6 UNC	1 1/4″	10 - 22



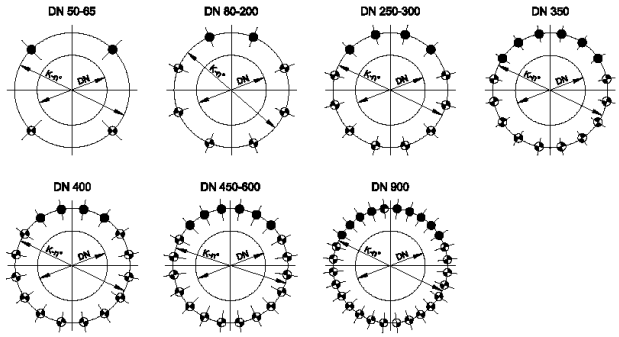


BLIND TAPPED HOLES

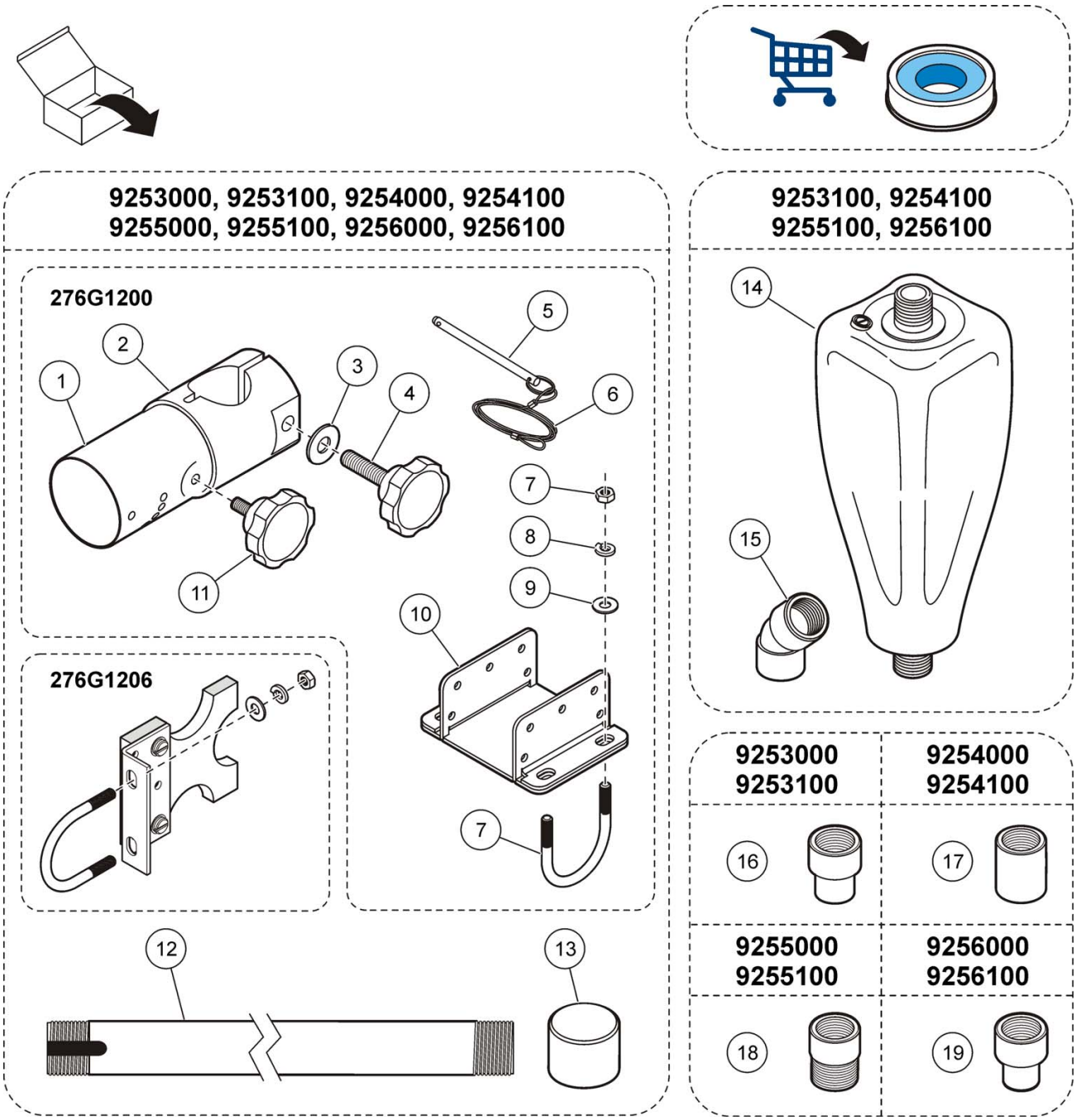
TAPPED THROUGH

EN 1092-2 PN10

DN	K	nº	M	T	⌖ ⊕
50	125	4	M-16	11	2 - 2
80	160	8	M-16	9	2 - 6
100	180	8	M-16	9	2 - 6
125	210	8	M-16	10	2 - 6
150	240	8	M-20	10	2 - 6
200	295	8	M-20	12	2 - 6
250	350	12	M-20	12	4 - 8
300	400	12	M-20	12	4 - 8
350	460	16	M-20	15	6 - 10
400	515	16	M-24	15	6 - 12
450	565	20	M-24	15	6 - 14
500	620	20	M-24	22	6 - 14
600	725	20	M-27	22	6 - 14
900	1050	28	M-30	32	10 - 18

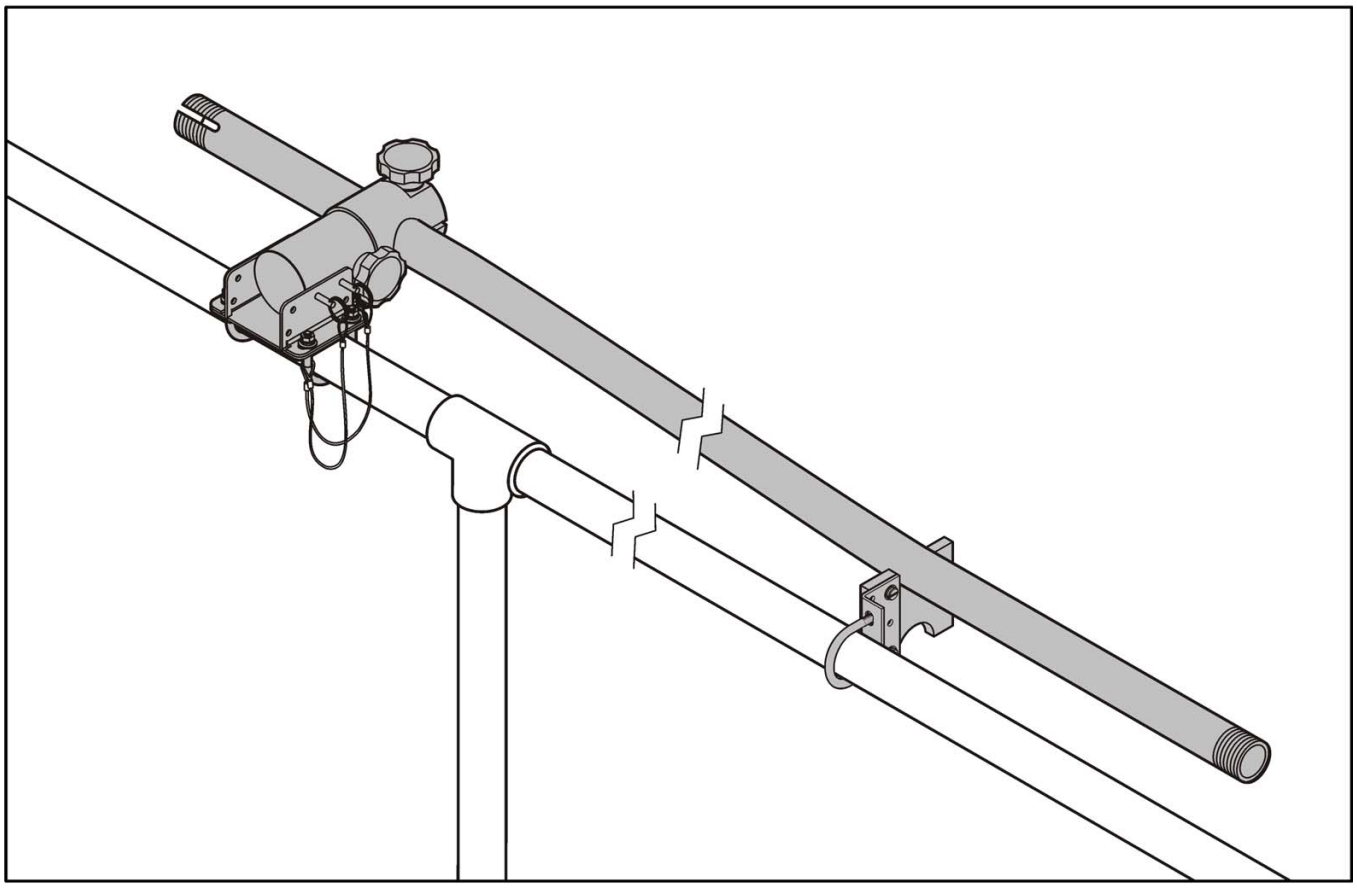


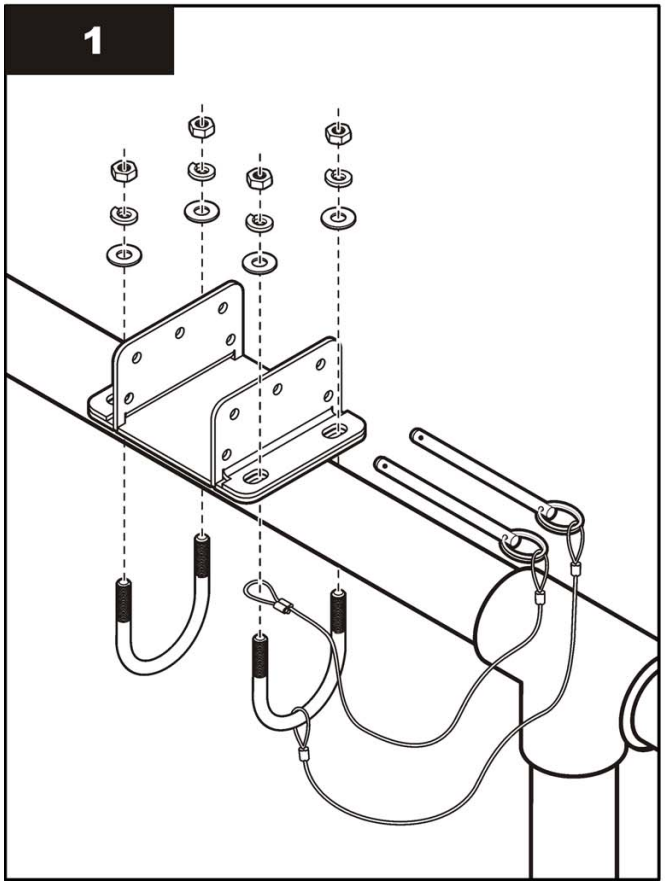
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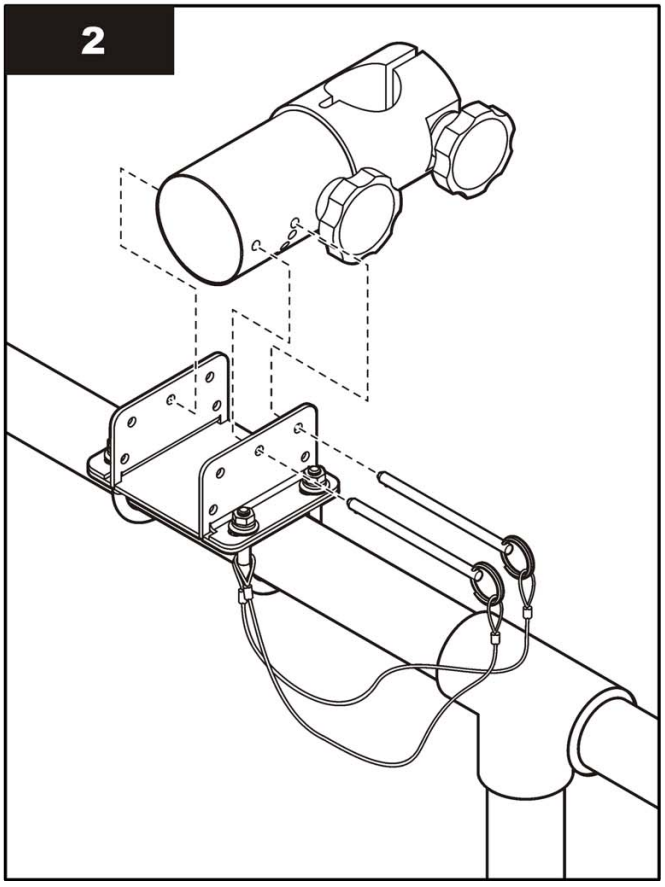


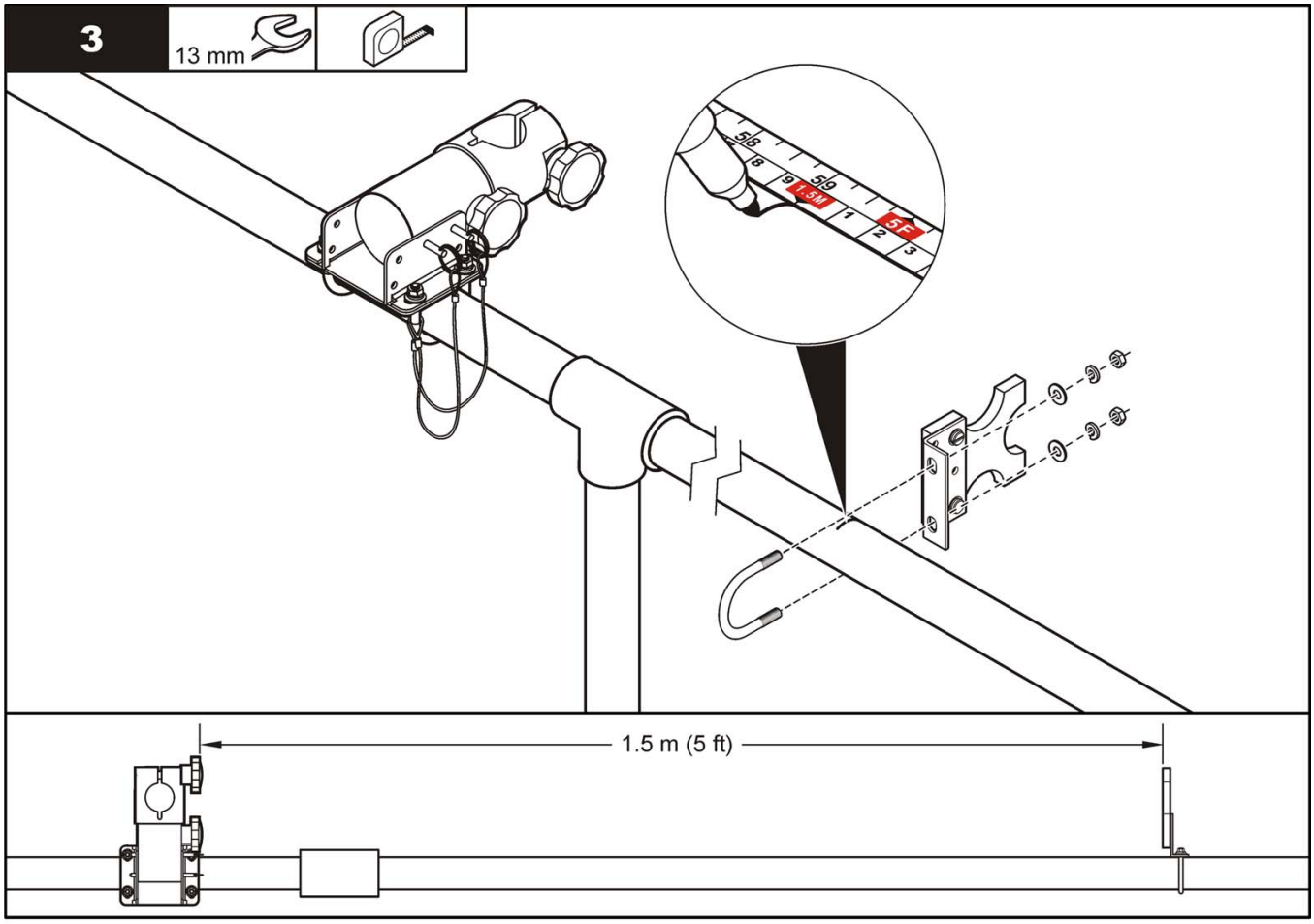
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3	SE 966	**8**	8H1337	**13**	1P2116-107	**18**	9255200
4	9092800	**9**	8H1347	**14**	5792002	**19**	9256200
5	9H1285-040	**10**	276A3A1203	**15**	1P2106-107		

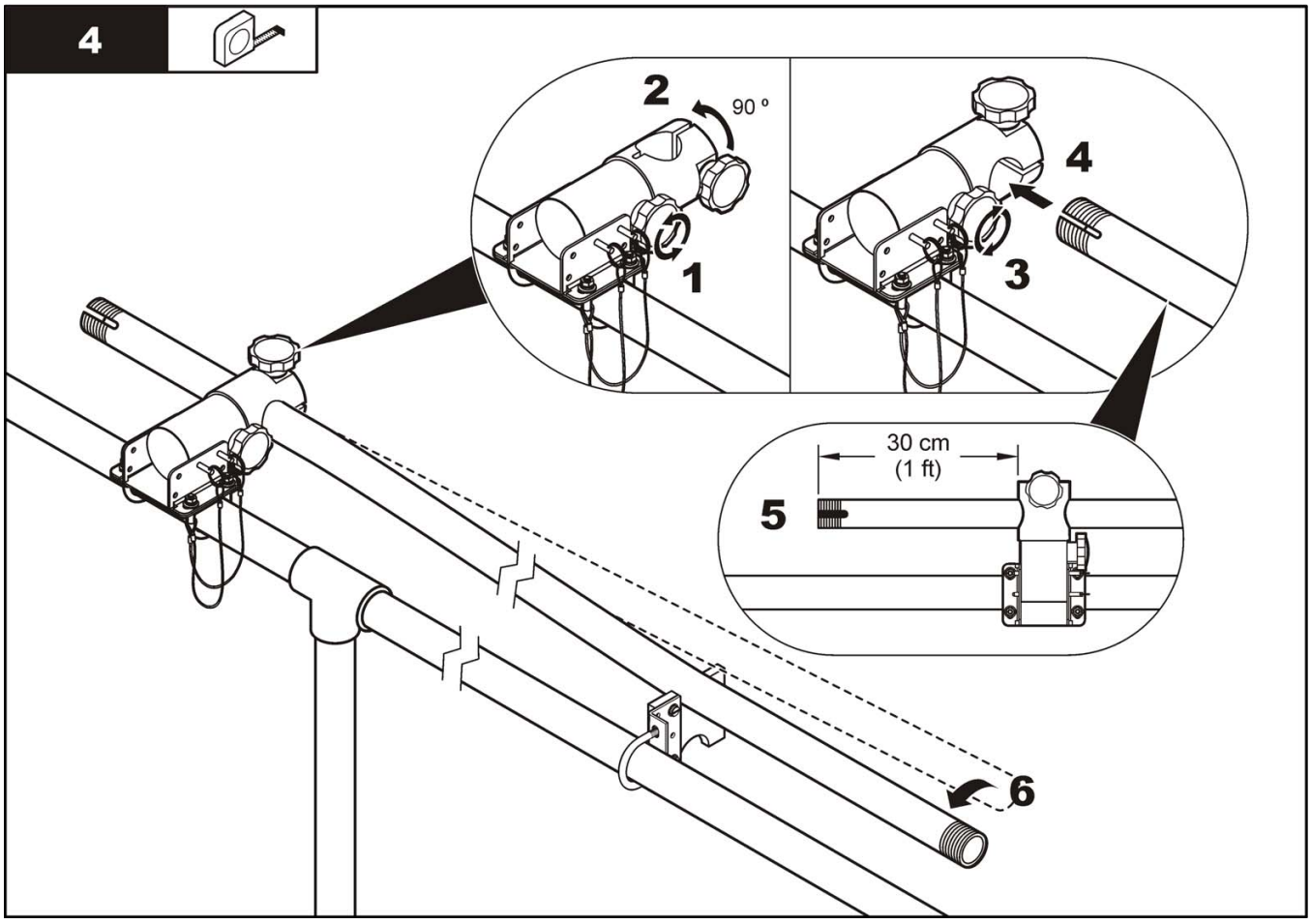
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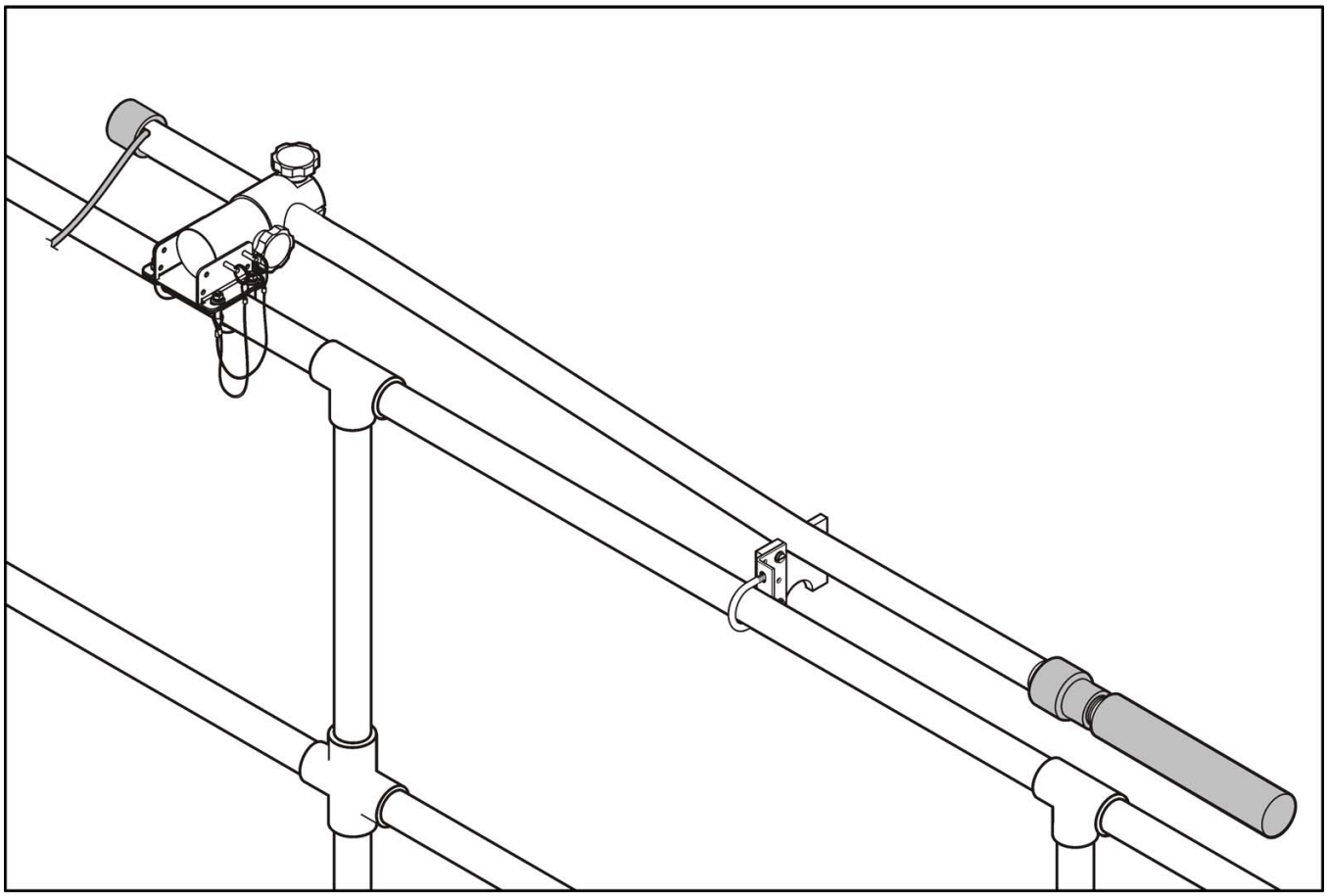


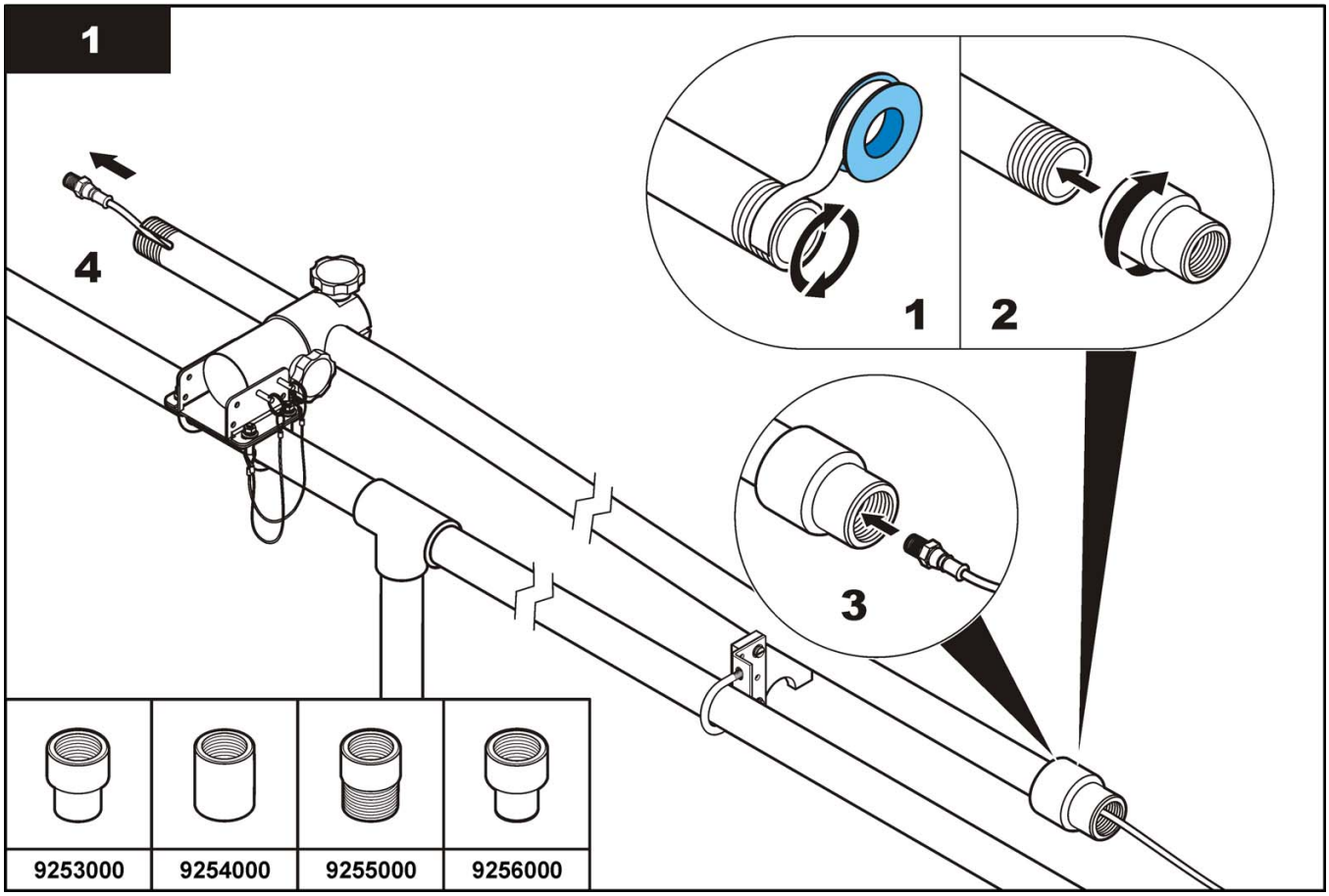


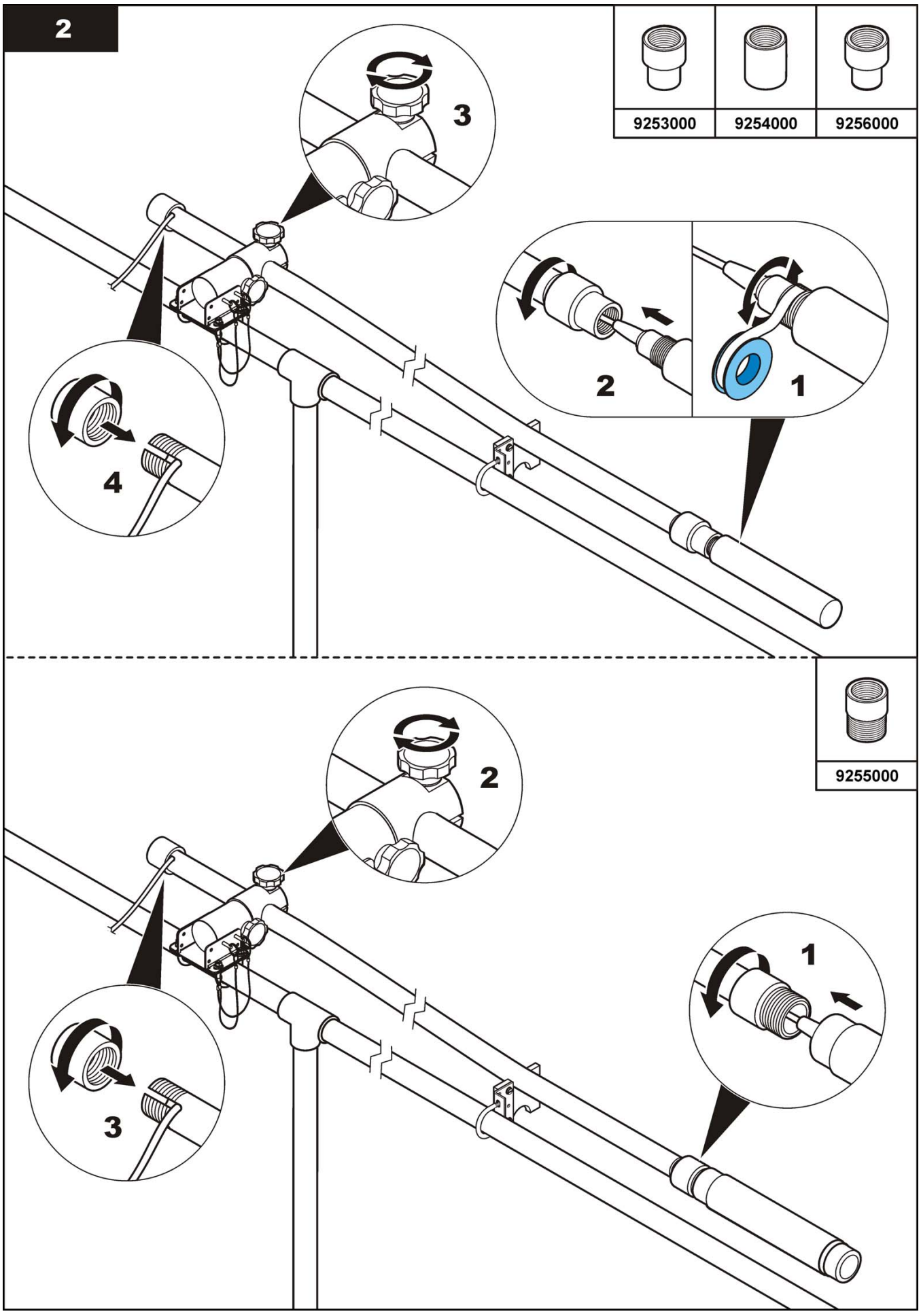

3
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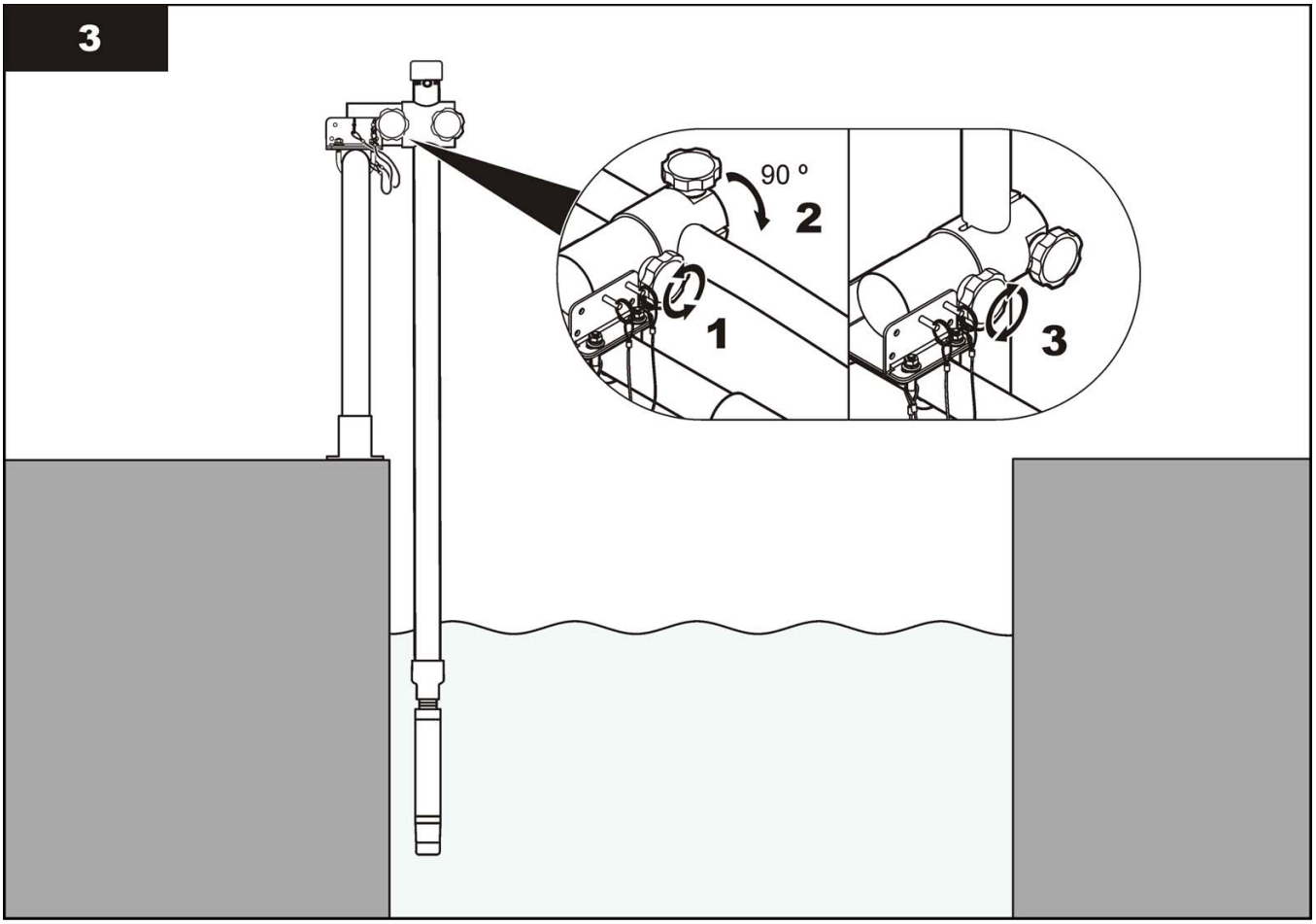

4
2
90 °
1
3
4
30 cm
(1 ft)
5
6

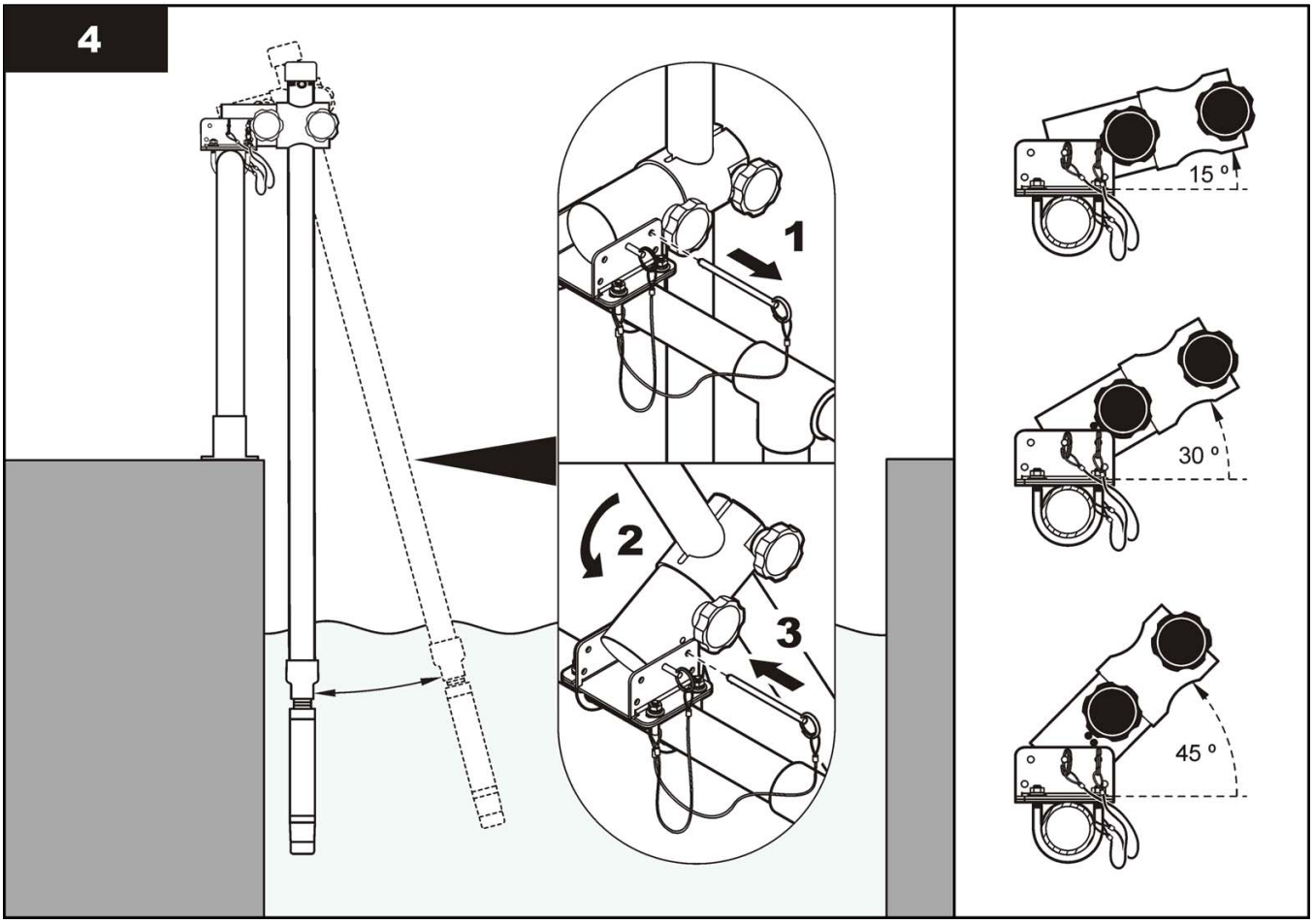
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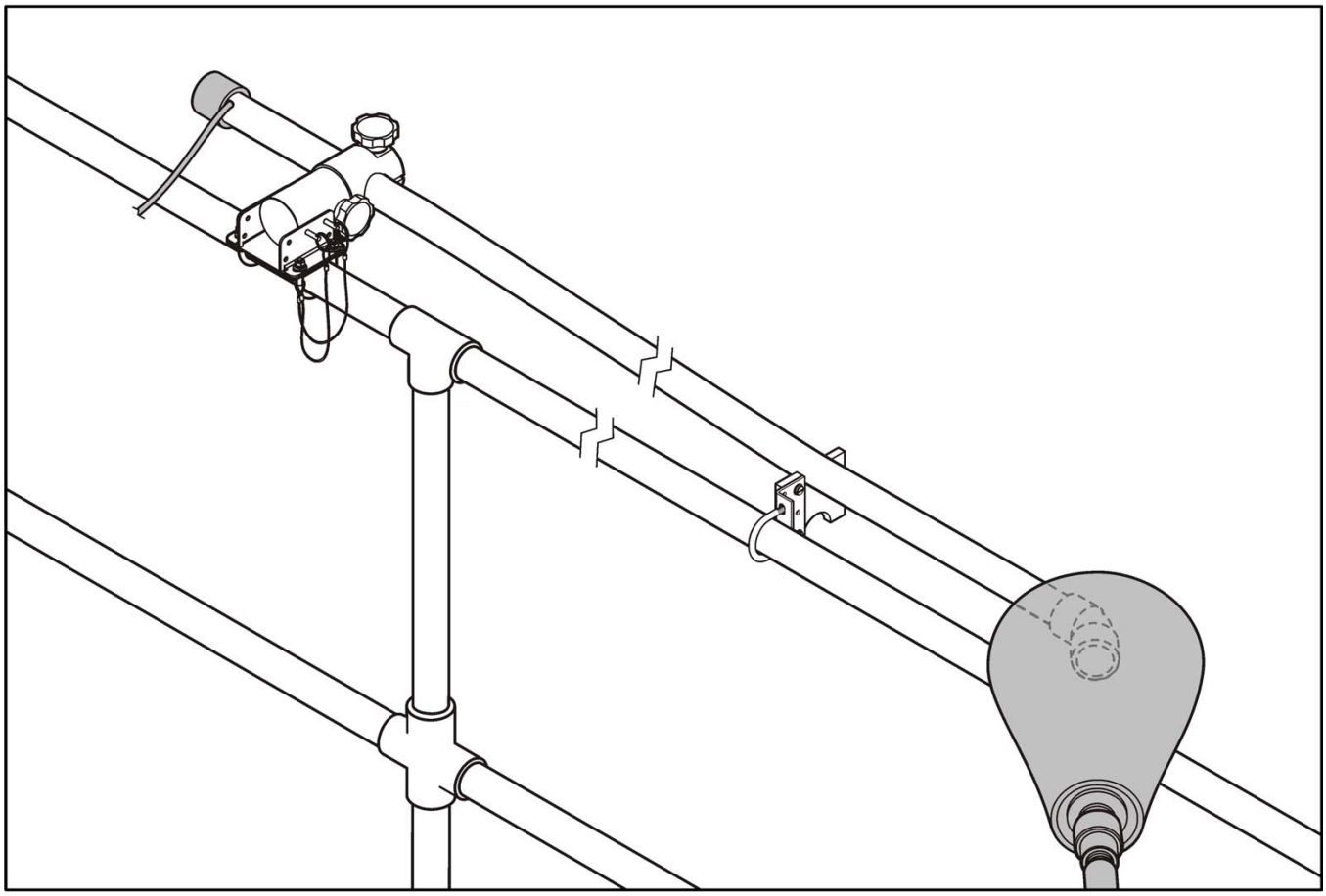


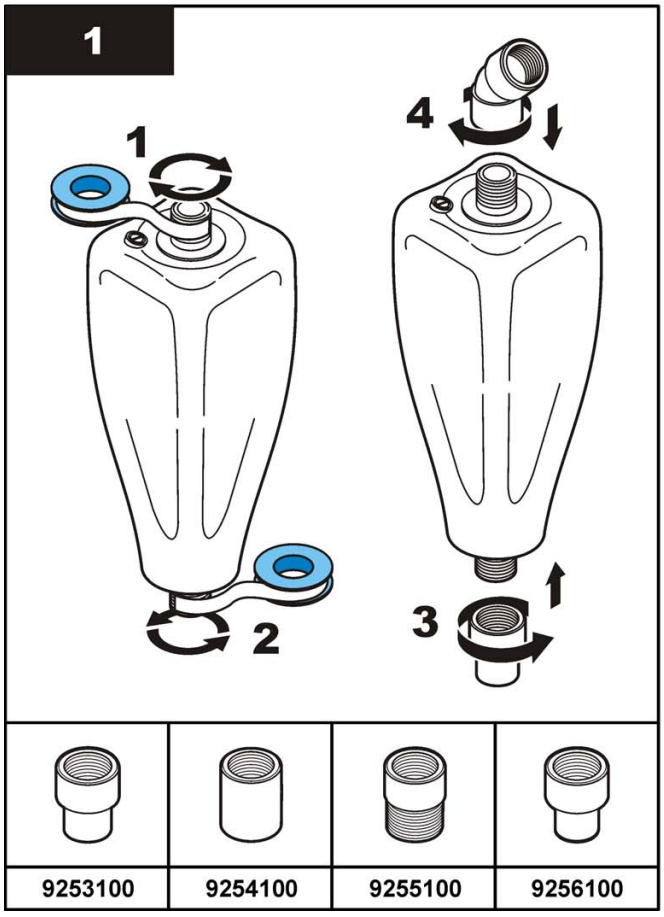

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9254000
9256000
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9255000
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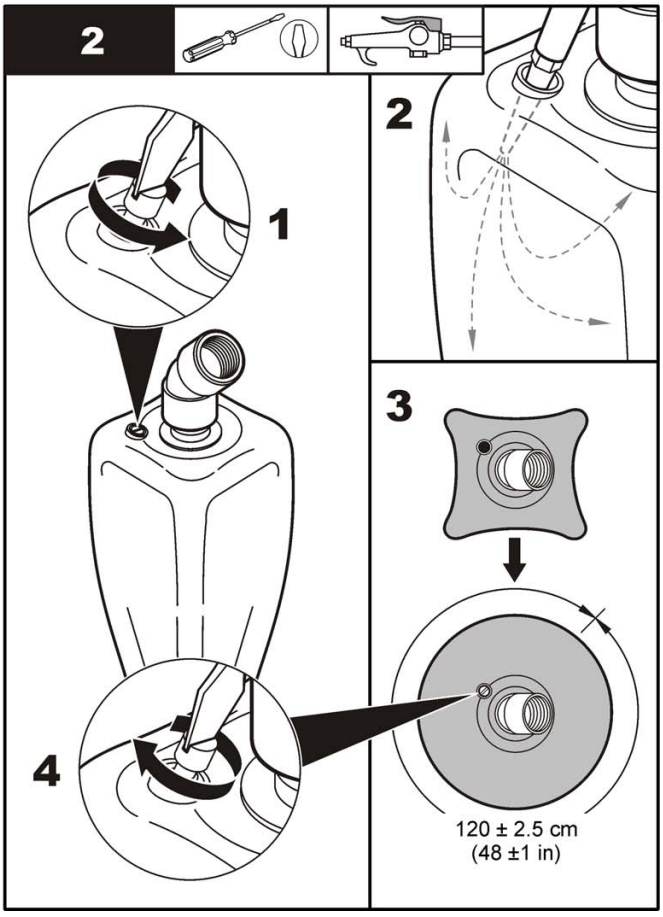

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90 °
2
1
3

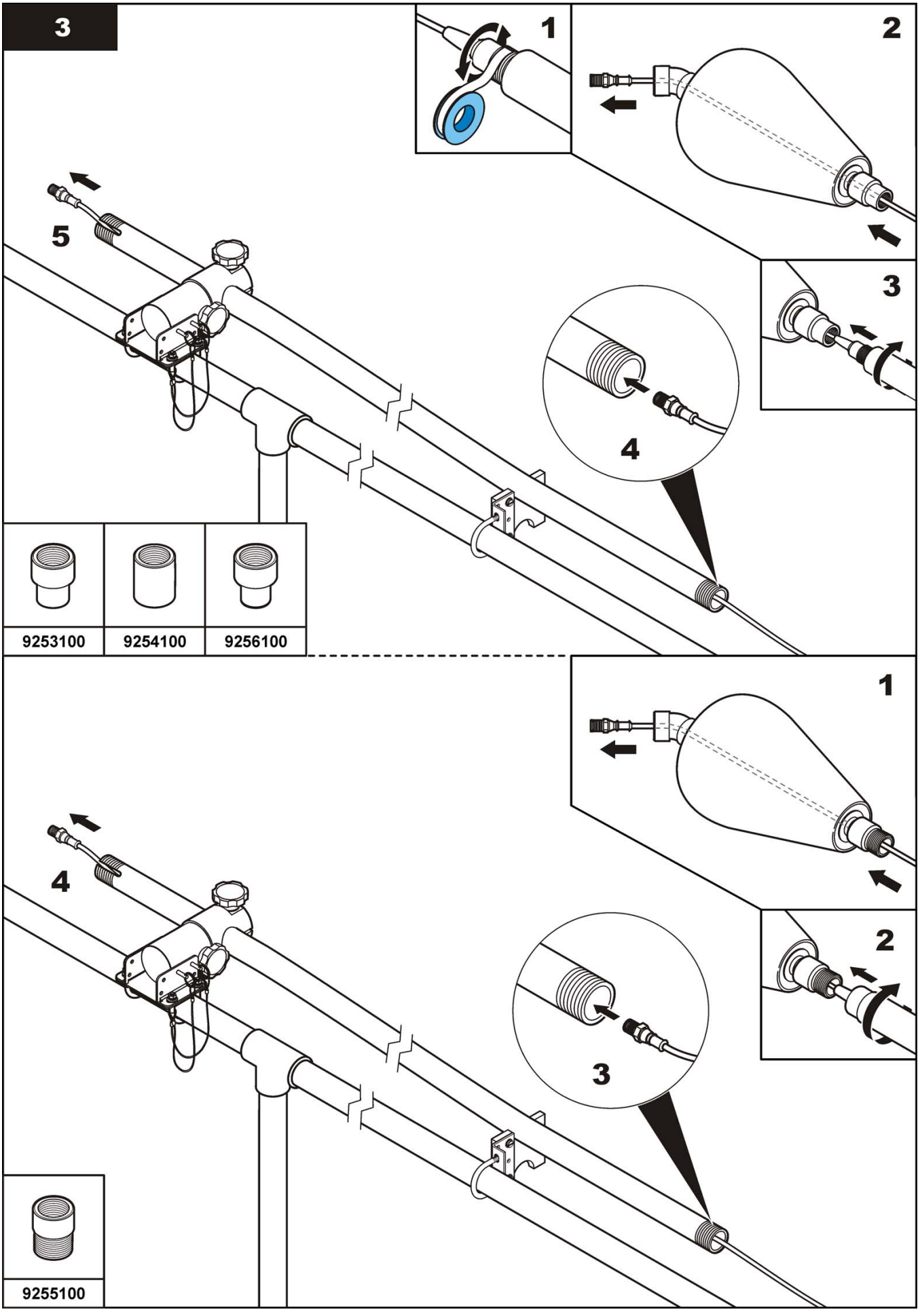

4
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15 °
30 °
45 °

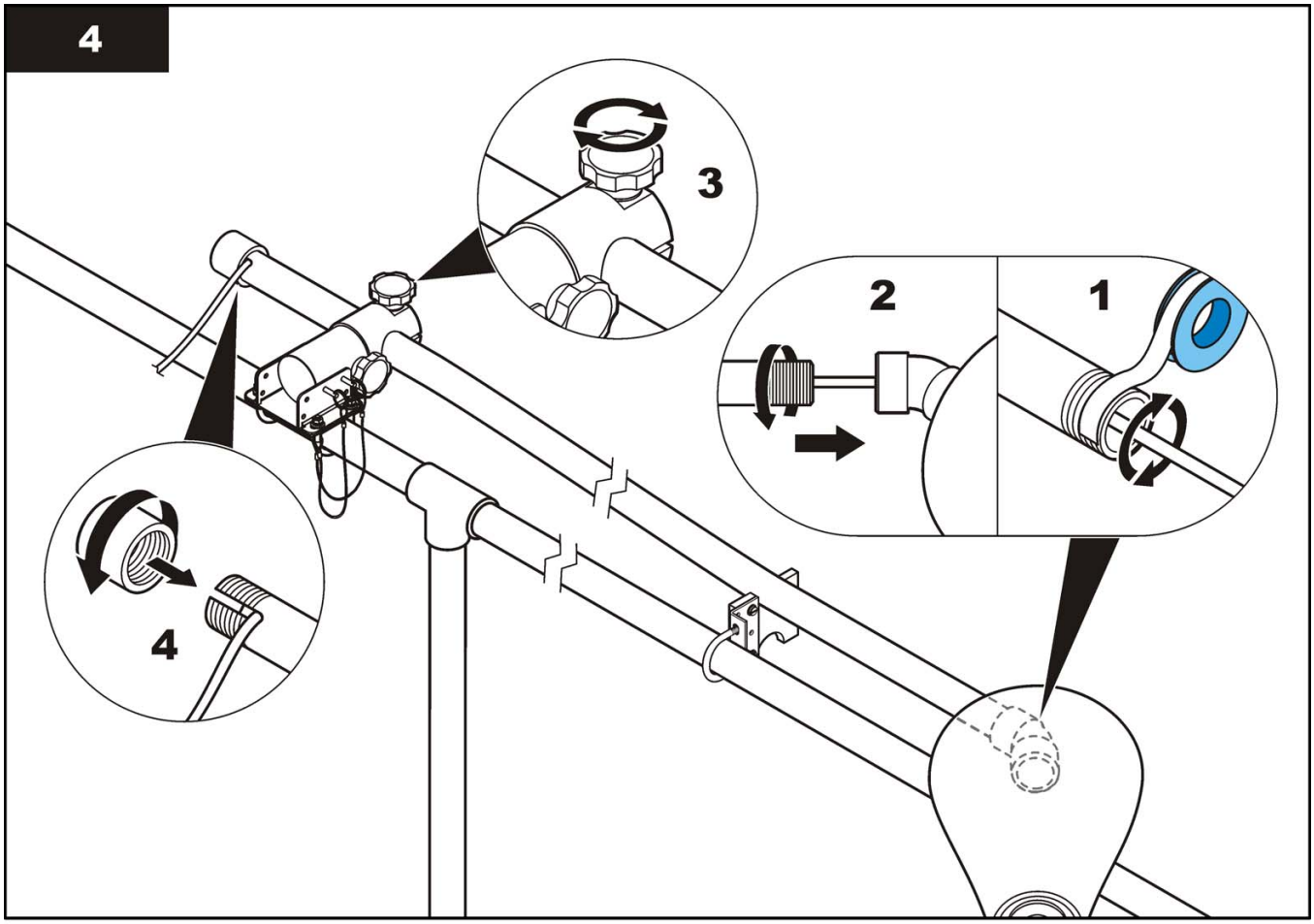
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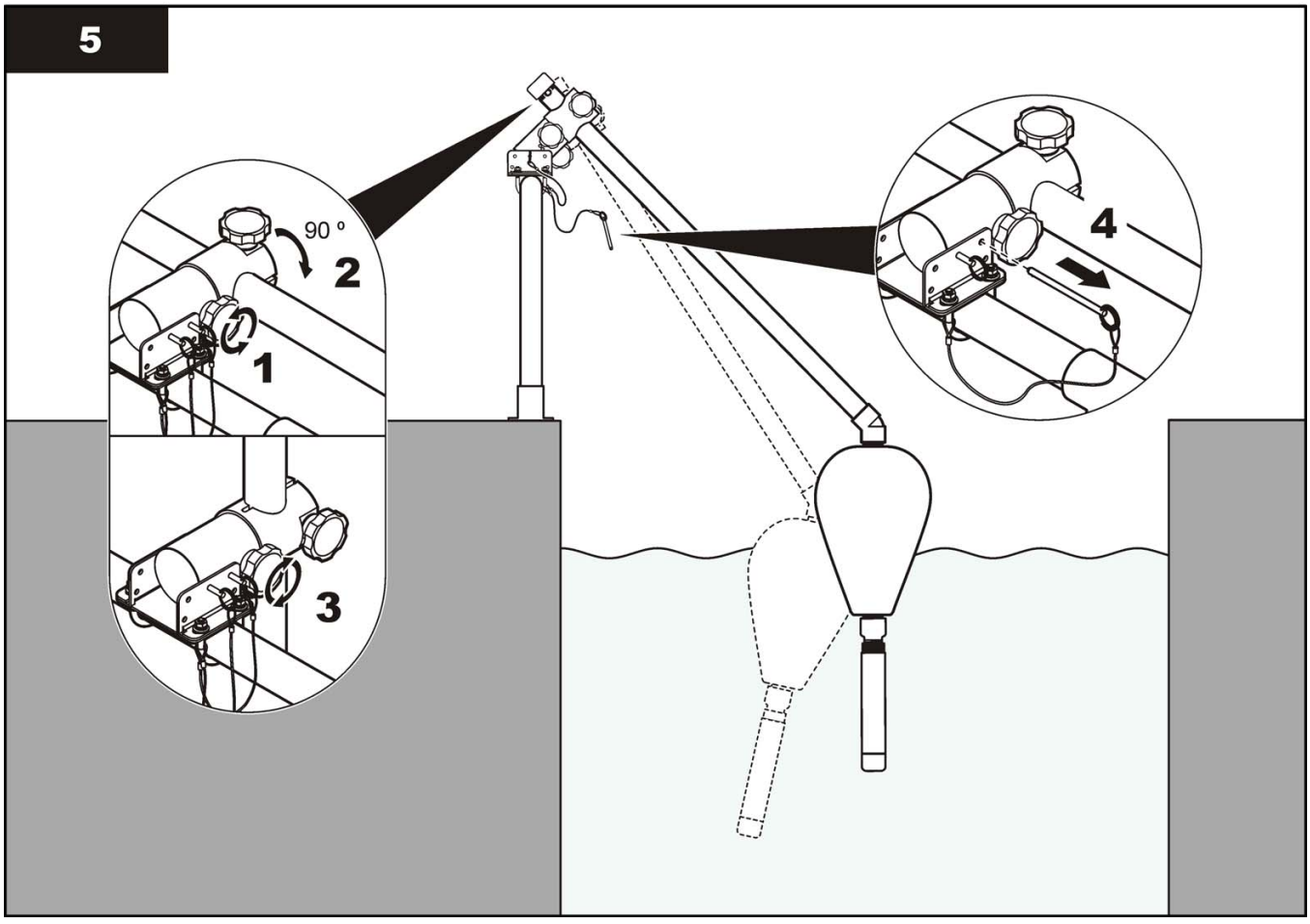







3
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2
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3
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9253100
9254100
9256100
1
4
2
3
9255100


4
3
2
1
4


5
90 °
2
1
3
4

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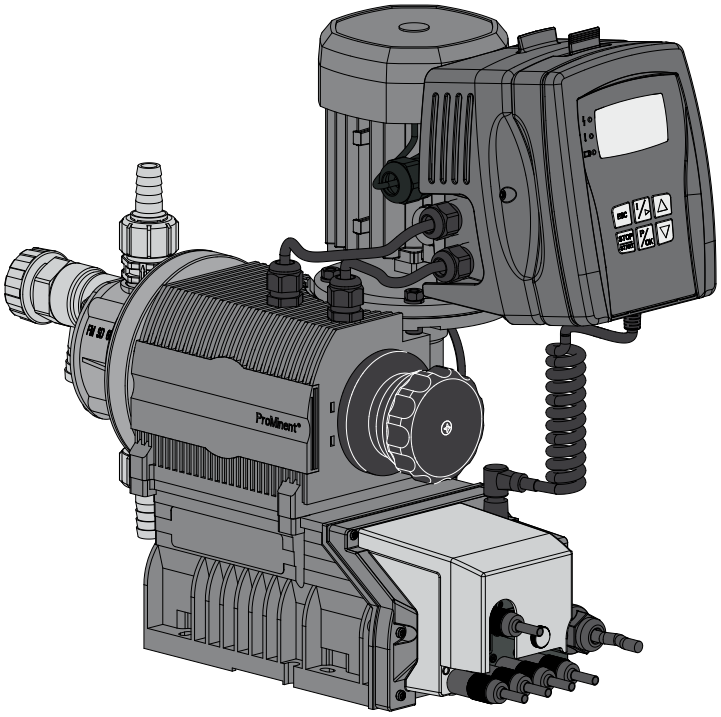


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02/2012 Edition 1

20-P-321-1/2/3/4

Operating instructions

Diaphragm Motor-Driven Metering Pump
Sigma/ 1 Control Type S1Cb



Please carefully read these operating instructions before use! · Do not discard!
The operator shall be liable for any damage caused by installation or operating errors!
Technical changes reserved.

Supplementary information



Fig. 1: Please read!

Read the following supplementary information in its entirety! Should you already know this information, you will benefit more from referring to the operating instructions.

The following are highlighted separately in the document:

- Enumerated lists

→ Handling instructions

⇨ Outcome of the operation guidelines

- see (reference)

Information

This provides important information relating to the correct operation of the device or is intended to make your work easier.

Safety notes

Safety notes are identified by pictograms - see Safety Chapter.

Validity

At the time of going to press, these operating instructions conformed to the current EU regulations.

State the identity code and serial number

Please state identity code and serial number, which you can find on the nameplate when you contact us or order spare parts. This enables the device type and material versions to be clearly identified.

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1 Identity code

S1Cb Sigma 1, Control Type, Version b										
Product range										
S1Cb										
	Power end type									
	H	Main power end, diaphragm								
		Type								
		_ _ _ _ _	Performance data at maximum back pressure and type: refer to nameplate on the pump housing							
			Dosing head material							
			PV	PVDF						
			SS	Stainless steel						
				Seal material						
				T	PTFE					
					Displacement body					
					S	Multi-layer safety diaphragm with optical rupture indicator				
					A	Multi-layer safety diaphragm with rupture signalling by electrical signal				
						Dosing head design				
						0	without bleed valve, without valve springs			
						1	without bleed valve, with valve springs			
						2	with bleed valve, FPM, without valve springs***			
						3	with bleed valve, FPM, with valve springs***			
						4	with relief valve, FPM, without valve springs***			
						5	with relief valve, FPM, with valve springs***			
						6	with relief valve, EPDM, without valve springs***			
						7	with relief valve, EPDM, with valve springs***			
						8	with bleed valve, EPDM, without valve springs***			
						9	with bleed valve, EPDM, with valve springs***			
							Hydraulic connector			
							0	Standard threaded connector (in line with technical data)		
							1	Union nut and PVC insert		
							2	Union nut and PP insert		
							3	Union nut and PVDF insert		
							4	Union nut and SS insert		
							7	Union nut and PVDF tube nozzle		
							8	Union nut and SS tube nozzle		
							9	Union nut and SS welding sleeve		
								Design		
								0	With ProMinent® logo	
								1	Without ProMinent® logo	

S1Cb Sigma 1, Control Type, Version b																						
								F	Physiological safety with regard to wetted materials											FDA No. 21 CFR §177.1550 (PTFE) FDA No. 21 CFR §177.2510 (PVDF)
								5	Left liquid end												
									Electric power supply												
									U	1 ph, 100-230 V ± 10 %, 50/60 Hz											
										Cable and plug											
										A	2 m European										
										B	2 m Swiss										
										C	2 m Australian										
										D	2 m USA										
											Relay										
											0	No relay									
											1	Fault indicating relay (230V - 8A)									
											3	Fault indicating relay + pacing relay (24V - 100mA)									
											8	0/4-20 mA analog output + fault indicating -/ pacing relay (24V - 100mA)									
												Control version									
												0	Manual + external contact with pulse control								
												1	Manual + external contact with pulse control + analog + dosing profiles								
												5	as 1 + timer								
												6	as 1 + PROFIBUS®-DP interface (M12 plug)								
												7	As 1 + CANopen **								
													Overload switch-off								
													0	without overload switch-off							
													1	with overload switch-off - 4 bar							
													2	with overload switch-off - 7 bar							
													3	with overload switch-off - 10 bar							
														Operating unit (HMI)							
														S	HMI (0.5 m cable)						
														1	HMI + 2 m cable						
														2	HMI + 5 m cable						
														3	HMI + 10 m cable						
														X	without HMI						
															Safety options						

S1Cb Sigma 1, Control Type, Version b																	
															0	Dosing monitor, dynamic, without access control	
															1	Dosing monitor, dynamic, with access control	
															Language		
																DE	German
																EN	English
																ES	Spanish
																FR	French

FPM = fluorine rubber

** Pump without HMI control unit

*** Standard with tube nozzle in the bypass Threaded connection on request.

2 Safety chapter

Identification of safety notes

The following signal words are used in these operating instructions to denote different severities of danger:

Signal word	Meaning
WARNING	Denotes a possibly dangerous situation. If this is disregarded, you are in a life-threatening situation and this can result in serious injuries.
CAUTION	Denotes a possibly dangerous situation. If this is disregarded, it could result in slight or minor injuries or material damage.

Warning signs denoting different types of danger

The following warning signs are used in these operating instructions to denote different types of danger:

Warning signs	Type of danger
	Warning – high-voltage.
	Warning – danger zone.

Intended use

- Only use the pump to meter liquid metering chemicals.
- Only use the pump after it has been correctly installed and started up in accordance with the technical data and specifications contained in the operating instructions.
- Only pumps with the identity code option "Multi-layer safety diaphragm with rupture signalling by electrical signal" are approved for use with flammable feed chemicals, at back pressures of over 2 bar, software setting *'Diaphragm rupture' - 'Error'* and if the operator takes appropriate safety measures.
- Only pumps with the design "F - Physiological safety with regard to wetted materials" are approved for use with physiologically harmless applications.
- Observe the general restrictions with regard to viscosity limits, chemical resistance and density - see also ProMinent Resistance List (in the Product Catalogue or at www.prominent.com/en/downloads)!
- All other uses or modifications are prohibited.
- The pump is not intended for the metering of gaseous media or solids.
- The pump is not intended for operation in hazardous locations.
- The pump is not intended for unprotected outside use.
- The pump is only intended for industrial use.
- The pump should only be operated by trained and authorised personnel, see the following "Qualifications" table.
- Observe the information contained in the operating instructions at the different phases of the device's service life.

Qualification of personnel

Action	Qualification
Storage, transport, unpacking	Instructed person
Assembly	Technical personnel, service
Planning hydraulic installation	Qualified personnel who have a thorough knowledge of oscillating diaphragm pumps.
Hydraulic installation	Technical personnel, service
Installation, electrical	Electrical technician
Operation	Instructed person
Maintenance, repair	Technical personnel, service
Decommissioning, disposal	Technical personnel, service
Troubleshooting	Technical personnel, electrical technician, instructed person, service

Explanation of the terms:

Technical personnel

A qualified employee is deemed to be a person who is able to assess the tasks assigned to him and recognise possible dangers based on his/her technical training, knowledge and experience, as well as knowledge of pertinent regulations.

Note:

A qualification of equal validity to a technical qualification can also be gained by several years employment in the relevant work area.

Electrical technician

Electrical technicians are deemed to be people, who are able to complete work on electrical systems and recognise and avoid possible dangers independently based on their technical training and experience, as well as knowledge of pertinent standards and regulations.

Electrical technicians should be specifically trained for the working environment in which they are employed and know the relevant standards and regulations.

Electrical technicians must comply with the provisions of the applicable statutory directives on accident prevention.

Instructed person

An instructed person is deemed to be a person who has been instructed and, if required, trained in the tasks assigned to him/her and possible dangers that could result from improper behaviour, as well as having been instructed in the required protective equipment and protective measures.

Service

Customer Service department refers to service technicians, who have received proven training and have been authorised by ProMinent or ProMaqua to work on the system.

Safety notes

WARNING!

Warning of dangerous or unknown feed chemical

Should a dangerous or unknown feed chemical be used: It may escape from the hydraulic components when working on the pump.

- Take appropriate protective measures before working on the pump (e.g. safety glasses, safety gloves, ...). Observe the safety data sheet for the feed chemical.
- Drain and flush the liquid end before working on the pump.

WARNING!

Danger from hazardous substances!

Possible consequence: Fatal or very serious injuries.

Please ensure when handling hazardous substances that you have read the latest safety data sheets provided by the manufacture of the hazardous substance. The actions required are described in the safety data sheet. Check the safety data sheet regularly and replace, if necessary, as the hazard potential of a substance can be re-evaluated at any time based on new findings.

The system operator is responsible for ensuring that these safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workstations affected.

CAUTION!

Warning of feed chemical spraying around

Feed chemical can spray out of the hydraulic components if they are manipulated or opened due to pressure in the liquid end and adjacent parts of the system.

- Disconnect the pump from the mains power supply and ensure that it cannot be switched on again by unauthorised persons.
- Depressurise the system before commencing any work on hydraulic parts.

CAUTION!

Warning of feed chemical spraying around

An unsuitable feed chemical can damage the parts of the pump that come into contact with the chemical.

- Take into account the resistance of the wetted materials when selecting the feed chemical - see the ProMinent product catalogue or visit www.prominent.com/en/downloads.

CAUTION!

Danger of personnel injury and material damage

The use of untested third party parts can result in personnel injuries and material damage.

- Only fit parts to metering pumps, which have been tested and recommended by ProMinent.



CAUTION!

Danger from incorrectly operated or inadequately maintained pumps

Danger can arise from a poorly accessible pump due to incorrect operation and poor maintenance.

– Ensure that the pump is accessible at all times.
– Adhere to the maintenance intervals.



WARNING!

An on/off switch may not be fitted on the pump, dependent on the identity code and installation.

Isolating protective equipment

All isolating protective equipment must be installed for operation:

- Drive front cover
- Motor fan cowling
- Terminal box cover, motor
- Hood

In exactly the same way, plug all relays, modules and options into the hood - if available.

Only remove them when the operating instructions request you to do so.

Information in the event of an emergency

In the event of an electrical accident, disconnect the mains cable from the mains or press the emergency cut-off switch fitted on the side of the system!

If feed chemical escapes, also depressurise the hydraulic system around the pump as necessary. Adhere to the safety data sheet for the feed chemical.

Sound pressure level

Sound pressure level LpA < 70 dB according to EN ISO 20361

at maximum stroke length, maximum stroke rate, maximum back pressure (water)

3 Storage, transport and unpacking

Safety notes



WARNING!

Only return the metering pump for repair in a cleaned state and with a flushed liquid end - refer to the chapter "Decommissioning"!

Only return metering pumps with a completed Decontamination Declaration form. The Decontamination Declaration constitutes an integral part of an inspection / repair order. A unit can only be inspected or repaired when a Declaration of Decontamination Form is submitted that has been completed correctly and in full by an authorised and qualified person on behalf of the pump operator.

The "Decontamination Declaration Form" can be found at www.prominent.com/en/downloads.



CAUTION!

Danger of material damage

The device can be damaged by incorrect or improper storage or transportation!

- The unit should only be stored or transported in a well packaged state - preferably in its original packaging.
- The packaged unit should also only be stored or transported in accordance with the stipulated storage conditions.
- The packaged unit should be protected from moisture and the ingress of chemicals.

Scope of supply

Compare the delivery note with the scope of supply:

Storage

Personnel: ■ Technical personnel

1. Plug the caps on the valves.
3. Preferably place the pump standing vertically on a pallet and secure against falling over.
4. Cover the pump with a tarpaulin cover - allowing rear ventilation.

Store the pump in a dry, sealed place under the ambient conditions according to chapter "Technical Data".

4 Overview of equipment and control elements

Overview of Equipment

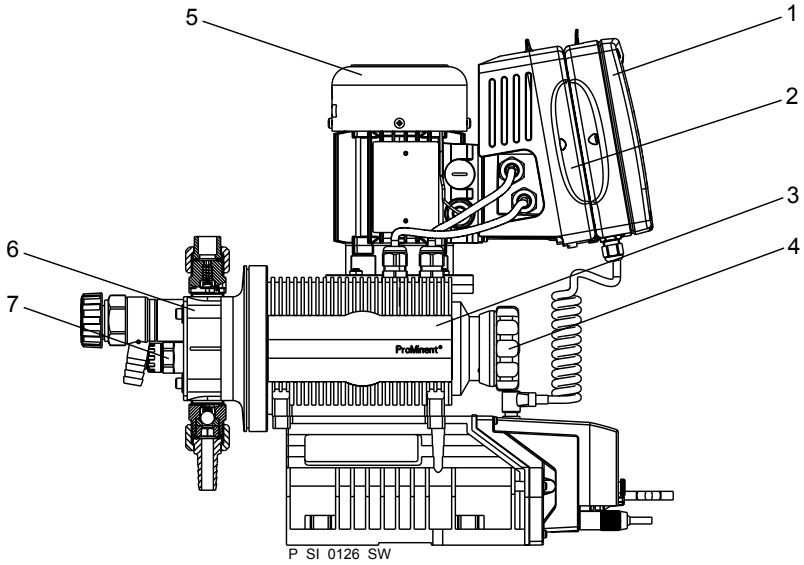


Fig. 2: Overview of equipment S1Cb

1 HMI control unit
2 Frequency converter
3 Drive unit
4 Stroke length adjustment wheel
5 Drive motor
6 Liquid end
7 Diaphragm rupture sensor

Control elements

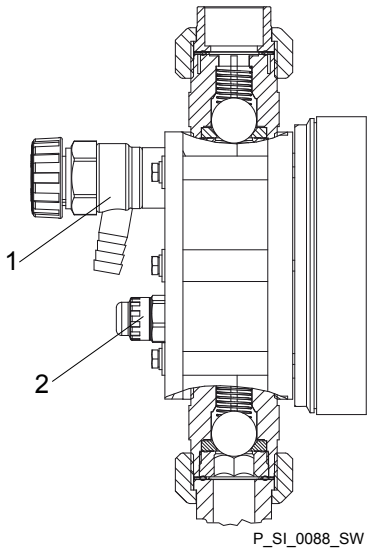


Fig. 3: Sigma control elements

1 Bleed valve or relief valve (dependent on identity code)
2 Diaphragm rupture sensor (visual)

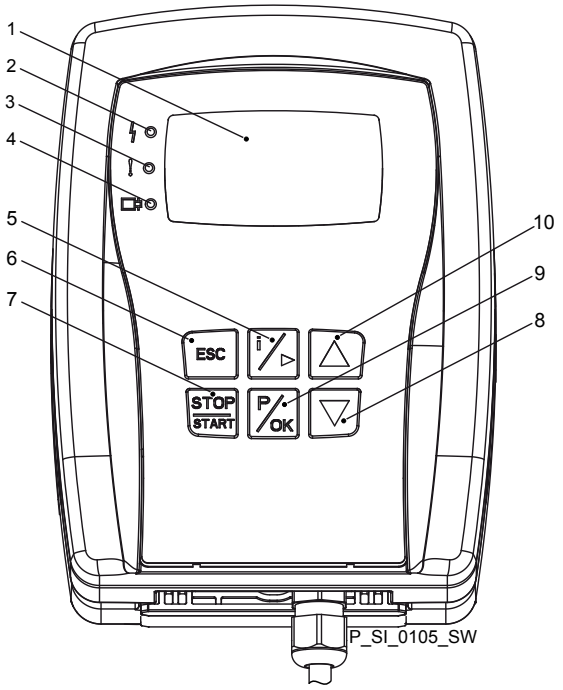


Fig. 4: HMI control elements

1 LCD screen
2 Fault indicator (red)
3 Warning indicator (yellow)
4 Operating indicator (green)
5 *[i]* key / Cursor to right
6 *[ESC]* key
7 *[START/STOP]* key
8 *[DOWN]* key
9 *[P / OK]* key
10 *[UP]* key

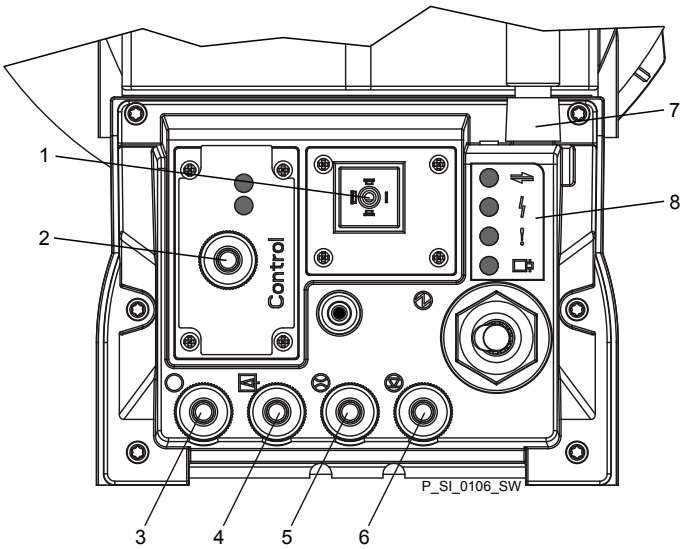


Fig. 5: Connector cover control elements

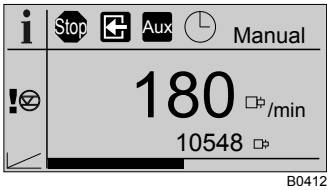
1 Relay and mA-output (option)
2 Optional module slot (timer, PROFIBUS®)
3 "Diaphragm rupture" terminal
4 "External control" terminal
5 "Dosing monitor" terminal
6 "Level Switch" terminal
7 "CAN-bus" port (external)
8 LEDs (as Fig. 4) and status LED CAN bus (external)
not shown Stroke length adjustment wheel

4.1 Key functions

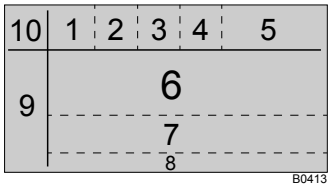
Key	Application	In continuous displays (operation)	In adjustment mode (set up)
STOP START			
[STOP/START]	Pressed briefly	Stop pump,	Stop pump,
		start pump	start pump
P OK			
[P / OK]	Pressed briefly	Start batch (only in *'Batch'* operating mode), Acknowledge errors	Confirm entry - jump to next menu option or to continuous display
	Pressed for 2 s	Change to adjustment mode	-
i ▷			
[i / >]	1x short press	Change between the continuous displays Change between the secondary displays	Change between "Changing individual numbers" and "Changing a number" Change to the next digit
	1x long press	Change from the continuous displays to the secondary displays	
△ ▽			
[UP], [DOWN]	Pressed briefly	Change directly changeable variables	Select another setting, change individual number or number.
	Simultaneous long press	Priming	-
ESC			
[ESC]	Pressed briefly	-	Jumps back one menu level
	Pressed for 2s	-	Jumps to a continuous display Exit the setting menu without saving

4.2 LCD screen identifiers

The LCD screen supports the operation and adjustment of the pump using different identifiers:



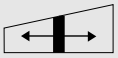
The identifiers and information in the various fields of the LCD screen have different meanings:



1 Operating main display
2 Source indicator for stop
3 Auxiliary operation / Diaphragm break sensor deactivated
4 Module option
5 Mode
6 Main display
7 Secondary display
8 Display type (number of pages)
9 Other identifiers, error source indicator
10 Continuous display identifier (" i " as "Info")

The identifiers have the following meanings:

Field no.	Icon	Name	Meaning
1		Stop	The pump is stopped. Cause see field 2.
1		Priming	The pump is currently priming (both *[arrow keys]* pressed).
2		Manual	The pump was stopped manually.
2		External signal	The pump was externally stopped by the Pause contact.
2		Timer	The pump was stopped via the timer.
2	CAN open	CANopen	The pump was stopped via the external CAN bus.
2	Profi bus	PROFIBUS®	The pump was externally stopped by the PROFIBUS®.
3	Aux	Auxiliary	The pump is currently pumping with the auxiliary frequency as the stroke rate. During this time, the pump is in *'Manual'* operating mode.
3	dia	Diaphragm rupture	A diaphragm rupture sensor is connected, but deactivated.
4		Timer	The "Timer" option is active.
4	CAN open	CANopen	The "CANopen" option is active.
4	Profi bus	PROFIBUS®	The "PROFIBUS®" option is active.
5	MANUAL	*'Manual'*	*'Manual'* operating mode
5	CONTACT	*'Contact'*	*'Contact'* operating mode
5	BATCH	*'Batch'*	*'Batch'* operating mode

Field no.	Icon	Name	Meaning
5	ANALOG	*'Analog'*	*'Analog'* operating mode
9		Error	A fault exists.
9		Stroke length adjustment	Deviation in the stroke length from the value set at the time of the last locking of the setting menu.
9		Flow control	A flow control is connected.
9	m	Memory	The pump is in operating mode *'Contact'* or *'Batch'* and the auxiliary function "Memory" is set.
9	0..20	0...20 mA	The pump is in operating mode *'Analog'*. The processing type *'0...20'* is set.
9	4..20	4...20 mA	The pump is in operating mode *'Analog'*. The processing type *'4...20'* is set.
9		Linear	The pump is in operating mode *'Analog'*. The processing type *'Curve'- 'Linear'* is set.
9		Upper sideband	The pump is in operating mode *'Analog'*. The processing type *'Curve'- 'Upper sideband'* is set.
9		Lower sideband	The pump is in operating mode *'Analog'*. The processing type *'Curve'- 'Lower sideband'* is set.
10	i	Continuous display	A continuous display appears on the LCD screen.
10		Security	Security lock (if a code was set).



For identifiers which appear in response to errors, see the "Troubleshooting" chapter.

5 Functional description

5.1 Pump

The metering pump is an oscillating diaphragm pump, the stroke length of which is adjustable. An electric motor drives the pump. The slide rod transmits the stoke motion to the diaphragms.

Illustration of the stroke movement

The stroke movement of the displacement body is continuously measured and regulated so that the stroke is executed according to a previously set dosing profile, see chapter *'Set-up'- 'Metering'*.

The following dosing profiles are available:

- Normal
- Discharge opti.
- Suction opti.

Every metering profile is ineffective below the switch-over frequency for Start/Stop mode.

Normal

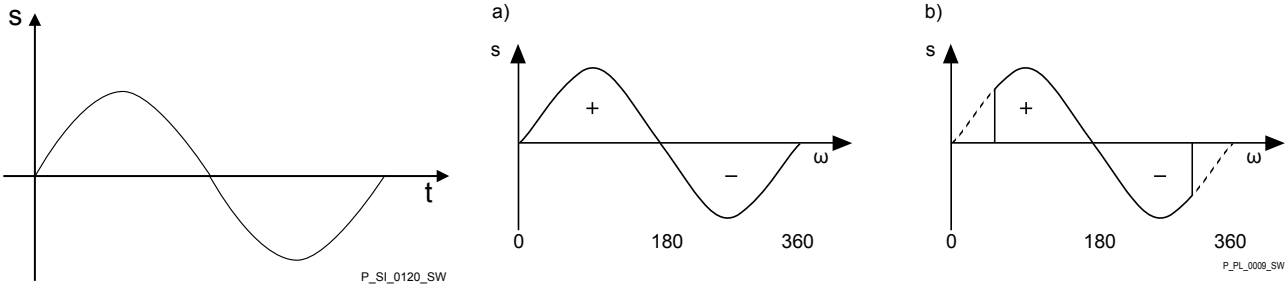
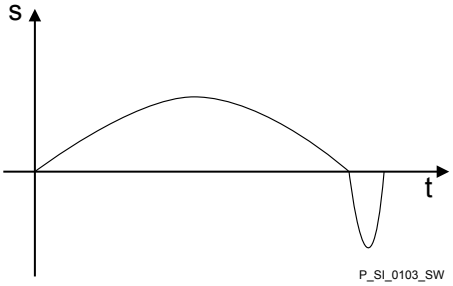


Fig. 6: Stroke movement at a) maximum stroke length and b) reduced stroke length.

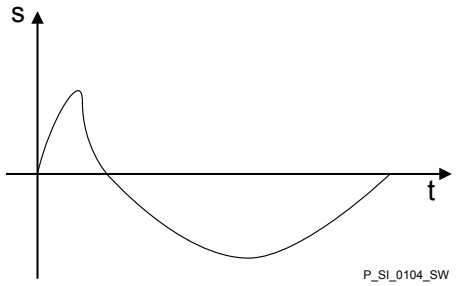
t Stroke velocity
ω Cam rotational angle
\+ Discharge stroke
\- Suction stroke

Discharge opti.



With a discharge optimised dosing profile, the discharge stroke is elongated, the suction stroke is executed as quickly as possible. This setting is for example suitable for those applications that require optimum mixing ratios and as continuous as possible chemical mixing.

Suction opti.



With a suction optimised dosing profile, the suction stroke is elongated as much as possible, which makes possible a precise and problem-free dosing of viscous and gaseous media. Select this setting to minimise the NPSH value as well.

5.2 Liquid end

The diaphragm (2) hermetically shuts off the pump volume of the dosing head (4) towards the outside. The suction valve (1) closes as soon as the diaphragm (2) is moved in to the dosing head (4) and the feed chemical flows through the discharge valve (3) out of the dosing head. The discharge valve (3) closes as soon as the diaphragm (2) is moved in the opposite direction due to the vacuum pressure in the dosing head and fresh feed chemical flows through the suction valve (1) into the dosing head. One cycle is thus completed.

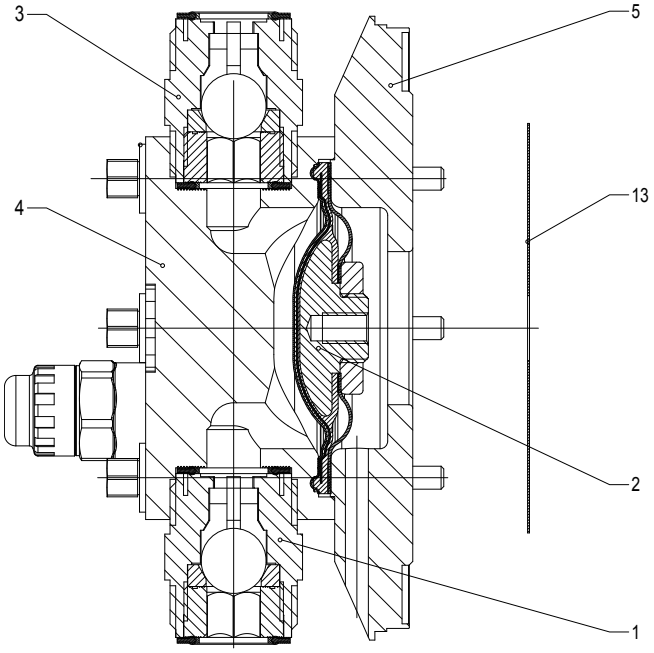


Fig. 7: Cross-section through the liquid end

1 Suction valve
2 Diaphragm
3 Discharge valve
4 Dosing head
5 Backplate
13 Safety diaphragm

5.3 Bleed valve and integrated relief valve

Bleed valve

Turning the rotary dial (3) on the bleed valve to "open" causes it to open and the liquid end can be bled. Or it is used as a priming aid for priming against pressure. The feed chemical flows out through the hose connection (5), e.g. into a storage tank.

Integral relief valve

The integral relief valve operates in the "close" position as a simple, directly controlled **relief valve**. As soon as the pressure exceeds the pressure value, which is preset using the large spring (1), it lifts the ball (2). The feed chemical flows out through the hose connection (5), e.g. into a storage tank.

The integral relief valve can only protect the motor and the gear, and then only against impermissible positive pressure that is caused by the metering pump itself. It cannot protect the system against positive pressure.

The integral relief valve works as a **bleed valve** as soon as the rotary dial (3) is turned to "open": The valve opens and the liquid end can be bled. Or it is used as a priming aid for priming against pressure.

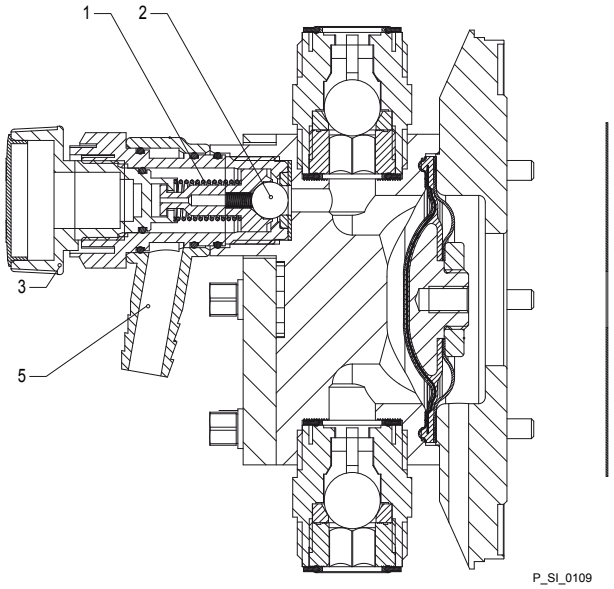


Fig. 8: Relief valve and integrated relief valve

1 Spring, large
2 Ball
3 Rotary dial
5 Hose connection

5.4 Multi-layer safety diaphragm

With the **visual** diaphragm rupture sensor, the lowered red cylinder (6) springs forward beneath the transparent cover (7) so that it then becomes clearly visible Fig. 9.

With the **electrical** diaphragm rupture sensor, a switch is switched. A connected signalling device must signal the diaphragm rupture.

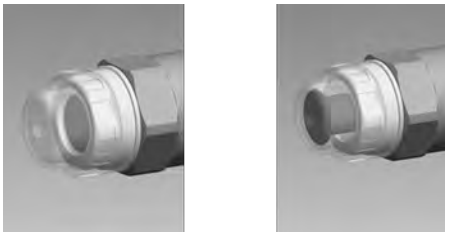


Fig. 9: Visual diaphragm rupture sensor, triggered and untriggered

The electrical diaphragm rupture sensor is connected to the "diaphragm rupture indicator" terminal. If a diaphragm ruptures, the red LED "Fault" display lights up on the pump and the identifier "Error" and *'dia'* flash on the LCD screen.

5.5 Operating modes

The operating modes are selected via the *'Mode'* menu (dependent on the identity code, some operating modes may not be present):

'Analog' **operating mode** The stroke rate is controlled using an analog current signal via the "External control" terminal Processing of the current signal can be preselected via the control unit.

'Manual' **operating mode** The stroke rate is set manually via the control unit.

'Contact' **operating mode:** This operating mode provides the option of making fine adjustments using small scaling or transfer factors. The metering can be triggered either by a pulse received via the "External control" terminal or through a contact or a semiconductor switching element. A metering quantity (batch) or a number of strokes (scaling or transfer factor 0.01 to 100.00) can be pre-selected via the control unit using the *'Factor'* setting.

'Batch' **operating mode:** This operating mode provides the option of working with large transfer factors (up to 99,999). The metering can be triggered either by pressing the *[P]* key or by a pulse received via the "External control" terminal or through a contact or a semiconductor switching element. It is possible to pre-select a metering quantity (batch) or a number of strokes via the control unit.

'BUS' **operating mode** (Identity code, control variant: CANopen or PROFIBUS® DP interface). This operating mode provides the option of controlling the pump via BUS (see “Supplementary instructions for ProMinent delta and Sigma with PROFIBUS®".

5.6 Functions

The following function can be ordered via the identity code:

Overload switch-off: As the power consumption is monitored, the pump may switch off electronically if a defined tolerance range is exceeded. The overload switch-off is to protect the pump, not the system.

The following functions can be selected using the *'Settings'* menu:

"Calibrate" function: The pump can also be operated in the calibrated state in all operating modes. In this case, the corresponding continuous displays can then indicate the metering volume or the capacity directly. Calibration is maintained throughout the stroke rate range. The calibration is also maintained when the stroke length is altered by up to ±10 % scale divisions.

"Auxiliary frequency" function: Enables a freely selectable and programmable stroke rate to be switched on in the *'Settings'* menu, which can be controlled via the "external control" terminal. This auxiliary frequency has priority over the operating mode stroke rate settings.

"Flow" function: Stops the pump when the flow is insufficient, provided a dosing monitor is connected. The number of defective strokes, after which the pump is switched off, can be set in the *'Settings'* menu.

The following functions are available as standard:

"Level switch" function: Information about the liquid/powder level in the chemical feed container is reported to the pump control. To do so, a two-stage level switch must be fitted; it is connected to the "Level switch" terminal.

"Pause" function: The pump can be remotely stopped via the "External Control" terminal. The "Pause" function only works via the "External Control" terminal.

The following functions are triggered by a key press:

"Stop" function: The pump can be stopped without disconnecting it from the mains/power supply by pressing the *[STOP/START]* key.

"Priming" function: Priming (short-term transport at maximum frequency) can be triggered by simultaneous pressing of the two arrow keys.

5.7 Options

Relay option

The pump has several connection possibilities for the following options:

"Output relay" option: In the event of fault signals, warning signals, stopping of the pump or tripped level switches, the relay connects to complete an electric circuit (for alarm horns etc.).

The relay can be retrofitted via a knock-out in the drive unit.

The various functions can be adjusted, see "Settings" - "Relay".

"Fault indicating and semiconductor relay" option In the event of fault signals, warning signals, stopping of the pump or tripped level switches, the fault indicating relay connects to complete an electric circuit (for control panel etc.).

In addition to the fault indicating relay, the pacing relay can be used to make a contact every stroke.

Other functions can be adjusted, see "Settings" - "Relay". The option can be retrofitted via a knock-out in the drive unit.

Option "0/4-20 mA analog current output and fault indicating relay"

The I signal of the current output signals the currently calculated pump metering volume.

The option "0/4-20 mA analog current output and fault indicating relay" can be retrofitted via a knock-out in the control unit.

Additionally the option always provides a semiconductor relay, see above. Other functions can be adjusted, see "Settings" - "Relay".

5.8 Function and fault indicator

The operating and fault statuses are indicated by the three LED indicators and the *'Error'* identifier on the LCD screen, see also the "Trouble-shooting" chapter.

5.9 LCD screen

If a fault occurs, the identifier *'Error'* appears and an additional error message.

5.10 LED displays

CANopen status indicator (green): The CANopen status indicator shows the status of the CANopen bus.

Colour	Flash code	Cause	Consequence	Remedy
green	illuminated	Bus status OPERATIONAL	Normal bus mode	-
green	flashing	Bus status PRE-OPERATIONAL	currently no measured value communication	wait briefly. Disconnect HMI then reconnect
red	any	Bus-error	no measured value communication	Check whether the CAN connection is faulty. Contact customer service

Contact customer service in the event of all other flash codes.

Fault indicator (red): The fault indicator illuminates if a fault occurs e.g. liquid level low 2nd stage".

Warning indicator (yellow): The warning indicator illuminates if the pump electronics detect a condition which may lead to a fault, e.g. "liquid level low 1st stage".

Operating indicator (green): The operating indicator illuminates provided the pump is correctly connected to the operating voltage. The operating indicator goes out briefly with every stroke.

5.11 Hierarchy of operating modes, functions and fault statuses

The different operating modes, functions and fault statuses have a different effect on if and how the pump reacts.

The following list shows the order:

1. - Priming
2. - Fault, Stop, Pause
3. - Auxiliary frequency (external frequency changeover)
4. - Manual, external contact, batch, external analog

Comments:

re 1 - "Priming" can take place in any mode of the pump (providing it is functioning).

re 2 - "Fault", "Stop" and "Pause" stop everything apart from "Priming".

re 3 - The "Auxiliary frequency" stroke rate always has priority over the stroke rate specified by an operating mode listed under 4.

6 Assembly

Compare the dimensions on the dimensional drawing and pump.

Base

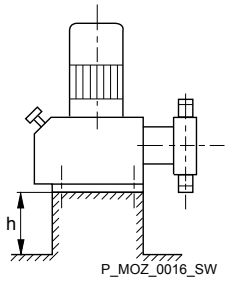


Fig. 10

WARNING!

Danger of electric shock

If water or other electrically conducting liquids penetrate into the drive housing, in any other manner than via the pump's suction connection, an electric shock may occur.

– Position the pump so that it cannot be flooded.

WARNING!

The pump can break through the base or slide off it

– Ensure that the base is horizontal, smooth and permanently load-bearing.

Capacity too low

Vibrations can disrupt the liquid end valves.

– *The supporting floor must not vibrate.*

Space requirement

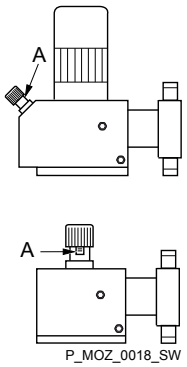


Fig. 11

CAUTION!

Danger from incorrectly operated or inadequately maintained pumps

Danger can arise from a poorly accessible pump due to incorrect operation and poor maintenance.

– Ensure that the pump is accessible at all times.
– Adhere to the maintenance intervals.

Position the pump so that control elements such as the stroke length adjustment knob or the indicating dial A are easily accessible.

If the HMI is mounted at a distance from the pump, fit a clearly marked Stop mechanism in the direct vicinity of the pump for emergencies!

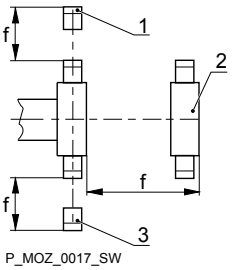


Fig. 12

1 Discharge valve
2 Dosing head
3 Suction valve

Ensure that there is sufficient free space (f) around the dosing head, as well as the suction and discharge valve, so that maintenance and repair work can easily be carried out on these components.

Liquid end alignment

Capacity too low

The liquid valves cannot close correctly if they are not upright.

– *Ensure that the discharge valve is upright.*

Fastening

Capacity too low

Vibrations can disrupt the liquid end valves.

– *Secure the metering pump so that no vibrations can occur.*

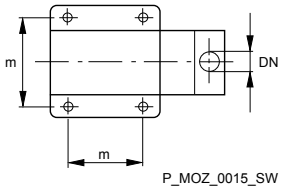


Fig. 13

Take the dimensions (m) for the fastening holes from the appropriate dimensional drawings or data sheets.

Fix the pump base to the base with suitable screws.

Mounting the HMI user control

If ordered with the wall mounting, the HMI can be mounted directly on a wall.

Install the HMI in the immediate vicinity of the pump. If not provided for, fit a circuit breaker there - refer to the "Installation, electrical" chapter. Ensure that the system is arranged ergonomically.

When doing so, consider the available cable length.

Prevent tripping hazards.

Refer to the relevant dimensional drawing for the dimensions of the HMI and fixing holes.

CAUTION!

Warning of faulty operation

– Do not install the HMI and cable too close to devices and cabling that emit strong electrical interference.

7 Installation

CAUTION!

Danger of personnel injury and material damage

The disregard of technical data during installation may lead to personal injuries or damage to property.

– Observe the technical data- refer to chapter "Technical Data" and, where applicable, the operating instructions of the accessories.

7.1 Installation, hydraulic

WARNING!

Danger of fire with flammable feed chemicals

– Only metering pumps with the identity code option "Multi-layer safety diaphragm with rupture signalling with electrical signal" are permitted to meter flammable media, with back pressures over 2 bar and if the operator takes appropriate safety precautions.

WARNING!

Warning of feed chemical reactions to water

Feed chemicals that should not come into contact with water may react to residual water in the liquid end that may originate from works testing.

– Blow the liquid end dry with compressed air through the suction connector.
– Then flush the liquid end with a suitable medium through the suction connector.

WARNING!

The following measures are an advantage when working with highly aggressive or hazardous feed chemicals:

– Install a bleed valve with recirculation in the storage tank.
– Install an additional shut-off valve on the discharge or suction ends.

CAUTION!

Warning of feed chemical spraying around

PTFE seals, which have already been used / compressed, can no longer reliably seal a hydraulic connection.

– New, unused PTFE seals must always be used.

CAUTION!

Suction problems possible

The valves may no longer close properly with feed chemicals with a particle size of greater than 0.3 mm.

– Install a suitable filter in the suction line.

CAUTION!

Warning against the discharge line bursting

With a closed discharge line (e.g. from a clogged discharge line or by closing a valve), the pressure that the metering pump generates can reach several times more than the permissible pressure of the system or the metering pump. This could lead to lines bursting resulting in dangerous consequences with aggressive or hazardous feed chemicals.

– Install a relief valve that limits the pressure of the pump to the maximum permissible operating pressure of the system.

CAUTION!

Warning against bursting of the suction or discharge lines

Hose lines with insufficient pressure rating may burst.

– Only use hose lines with the required pressure rating.

CAUTION!

Uncontrolled flow of feed chemical

Feed chemical can leak through the metering pump in an uncontrolled manner in the event of excessive priming pressure on the suction side of the metering pump.

– Do not exceed the maximum permissible priming pressure for the metering pump.
– Arrange the installation properly.

CAUTION!

Warning against lines coming loose

If suction, discharge and relief lines are installed incorrectly, they can loosen / disconnect from the pump connection.

– Only use original hoses with the specified tube diameter and wall thickness.
– Only use clamp rings and hose nozzles that correspond to the respective hose diameter.
– Always connect the lines without mechanical tension.

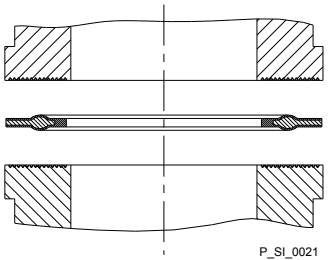


Fig. 14: Moulded composite seals with corrugated insert

CAUTION!

Warning against leaks

Leaks can occur on the pump connection depending on the insert used.

– The pump is supplied with PTFE moulded composite seals with a flare, which are used for the pump connections. They seal the connections between grooved pump valves and the grooved inserts from ProMinent - see *on page 26*.
– In the event that an unflared insert is used (e.g. third party part), an elastomer flat seal must be used - see *on page 26*.

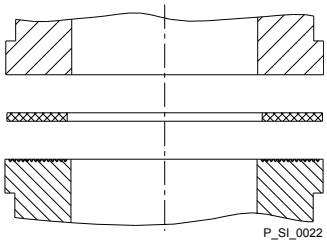


Fig. 15: Elastomer flat seal for a smooth insert

– *Precise metering is only possible when the back pressure is maintained above 1 bar at all times.*
– *If metering at atmospheric pressure, a back pressure valve should be used to create a back pressure of approx. 1.5 bar.*

CAUTION!

Warning of backflow

A back pressure valve, spring-loaded injection valve, relief valve, foot valve or a liquid end do not represent absolutely leak-tight closing elements.

– Use a shut-off valve, a solenoid valve or a vacuum breaker for this purpose.

CAUTION!

To check the pressure conditions in the piping system it is recommended that connecting options are provided for a manometer close to the suction and pressure connector.

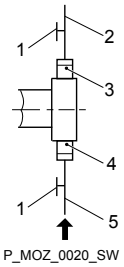


Fig. 16: Manometer connecting options

1 Manometer socket
2 Discharge line (pipe)
3 Discharge valve
4 Suction valve
5 Suction line (pipe)

CAUTION!

Connect the pipelines to the pump so that no residual forces act on the pump, e.g. due to the offsetting, weight or expansion of the line.

Only connect steel or stainless steel piping via a flexible piping section to a plastic liquid end.

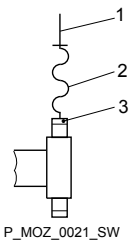


Fig. 17: Steel pipeline at the liquid end

1 Steel pipe
2 Flexible pipe section
3 Plastic liquid end

Integral relief valve or integral bleeder valve

WARNING!

Product can be dangerously contaminated

Only with the design "Physiologically safety with regard to wetted materials".

If the integral bleed valve or the integral relief valve opens, the feed chemical comes into contact with physiologically harmful seals.

– Do not route feed chemical that escapes from the integral bleed valve or the integral relief valve back into the process.

CAUTION!

Danger due to incorrect use of the integral relief valve

The integral relief valve can only protect the motor and the gear, and then only against impermissible positive pressure that is caused by the metering pump itself. It cannot protect the system against positive pressure.

– Protect the motor and gear of the system against positive pressure using other mechanisms.
– Protect the system against illegal positive pressure using other mechanisms.

CAUTION!

Warning of feed chemical spraying around

If no overflow line is connected to the integral relief valve or the integral bleeder valve, feed chemical will spray out of the hose connector as soon as the relief valve opens.

– Always connect an overflow line to the integral relief valve or the integral bleeder valve and feed it back into the storage tank or - if required by the regulations - into a special storage tank.

CAUTION!

Danger of cracking

Cracking of the PVT liquid end can occur if a metal overflow line is connected to the relief valve.

– Never connect a metal overflow line to the relief valve.

CAUTION!

Danger of the integral relief valve failing

The integral relief valve no longer operates reliably with feed chemicals having a viscosity of greater than 200 mPa s.

– Only use the integral relief valve with feed chemicals having a viscosity up to 200 mPa s.

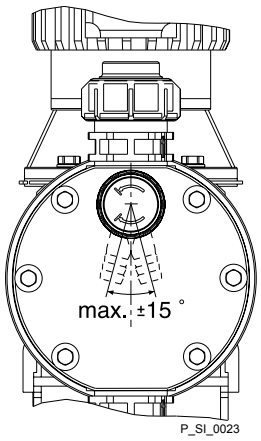


Fig. 18: Permissible alignment of the relief valve

CAUTION!

Warning against leaks

Feed chemical, which remains in the overflow line at the relief valve or bleeder valve, can attack the valve or cause it to leak

– Route the overflow line with a continuous slope and moreover with the tube nozzle pointed downwards - see .

If the overflow line is fed into the suction line, the bleed function is blocked.

Therefore lead the overflow line back into the storage tank.

When operating the integral relief valve close to the opening pressure, a minimal overflow into the overflow line can occur.

Diaphragm rupture sensor



CAUTION!

Danger resulting from unnoticed diaphragm rupture

If the pump has been ordered with an electric diaphragm rupture sensor, it still has to be installed.

– Screw the enclosed diaphragm rupture sensor into the liquid end.



CAUTION!

Warning of unnoticed diaphragm rupture

Only above approximately 2 bar system back pressure is a signal generated upon a diaphragm rupture.

– Only rely on the diaphragm rupture sensor at back pressures greater than 2 bar.

7.1.1 Basic installation notes

Safety notes



CAUTION!

Danger resulting from rupturing hydraulic components

Hydraulic components can rupture if the maximum permissible operating pressure is exceeded.

– Never allow the metering pump to run against a closed shut-off device.
– With metering pumps without integral relief valve: Install a relief valve in the discharge line.



CAUTION!

Hazardous feed chemicals can escape

With hazardous feed chemicals: Hazardous feed chemical can leak out when using conventional bleeding procedures with metering pumps.

– Install a bleed line with a return into the storage tank.

→ Shorten the return line so that it does not dip into the feed chemical in the storage tank.

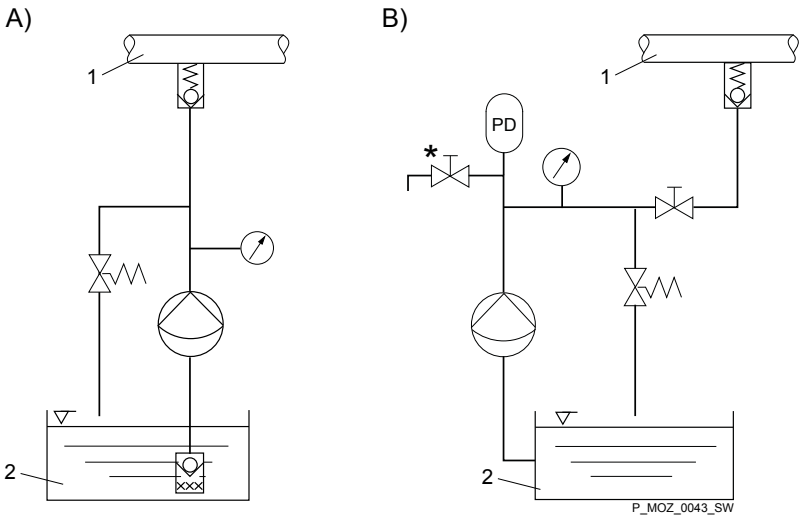


Fig. 19: (A) standard installation, (B) with pulsation damper

1 Main line
2 Storage tank

Legend for hydraulic diagram

Symbol	Explanation	Symbol	Explanation
	Metering pump		Foot valve with filter meshes
	Injection valve		Level switch
	Multifunctional valve		Manometer

7.2 Installation, electrical

General safety notes

WARNING!
Danger of electric shock
Unprofessional installation may lead to electric shocks.

– Provide all shortened cable cores with cable end sleeves.
– Only technically trained personnel are authorised to undertake the electrical installation of the device.

WARNING!
Danger of electric shock
A mains voltage may exist inside the motor or electrical ancillaries.

– If the housing of the motor or electrical ancillaries has been damaged, you must disconnect it from the mains immediately. The pump must only be returned to service after an authorised repair.

What requires electrical installation?

What requires electrical installation?

- Level switch
- Diaphragm rupture sensor, electrical (option)

- Dosing monitor (option)
- Relay (option)
- External control
- mA output (option)
- Bus connector (option)
- Timer (option)
- Pump, power supply

7.2.1 Control connectors

CAUTION!

Incoming signals can remain without effect

If the universal control wire, the external/pacing cable or the level monitoring cable is shortened below 1.20 m, the pump does not detect that it is connected. Consequently a warning message (for example) can be suppressed.

– Do not shorten this cable below 1.20 m.

Level switch, diaphragm rupture sensor (option) and dosing monitor (option)

Connect the plugs of the level switch, diaphragm rupture sensor and dosing monitor to the corresponding sockets on the front side of the control. In case of uncertainty - see chapter "Overview of equipment and control elements"

CAUTION!

Danger resulting from unnoticed diaphragm rupture

If the pump has been ordered with an electric diaphragm rupture sensor, it must also be electrically installed.

– Electrically connect the enclosed diaphragm rupture sensor.

Only with combustible media:

WARNING!

Fire danger

The electric diaphragm rupture sensor must stop the pump immediately after a diaphragm rupture and trigger an alarm.

The pump must only be returned to service once a new diaphragm has been fitted.

7.2.1.1 Relay

7.2.1.1.1 Fault indicating relay 230 V

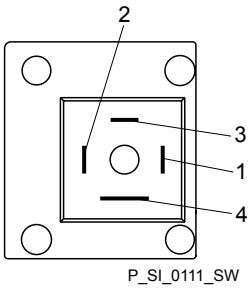


Fig. 20: Pump pin assignments

If another switching function is required, the pump can be reprogrammed in the *'Relay'* menu.

The relay can be retrofitted and operates once it is plugged into the relay board.

Fault indicating relay 230 V

Data	Value	Unit
Maximum contact load at 230 V and 50/60 Hz:	8	A (resistive)
Minimum mechanical lifespan:	200 000	Switching operations

Fault indicating relay 230 V

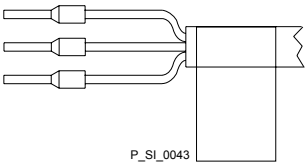


Fig. 21: Cable conductor assignments

Pin assignment

To pin	VDE cable	Contact	CSA cable
1	white	NO (normally open)	white
2	green	NC (normally closed)	red
4	brown	C (common)	black

7.2.1.1.2 Fault indicating and pacing relay option

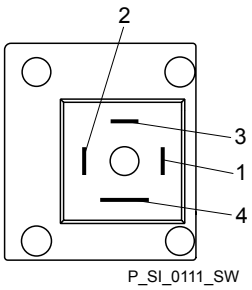


Fig. 22: Pump pin assignments

The first switch is a relay. The pacing output is electrically-isolated by means of an optocoupler with a semiconductor switch.

If another switching function is required, the pump can be reprogrammed in the *'Relay'* menu.

The relay can be retrofitted and operates once it is plugged into the relay board.

Fault indicating relay (24 V)

Data	Value	Unit
Maximum contact load at 24 V and 50/60 Hz:	100	mA
Minimum mechanical lifespan:	200 000	Switching operations

Pacing relay

Data	Value	Unit
Residual voltage max. at $I_{off\ max}$ = 1 µA	0.4	V

Data	Value	Unit
Maximum current	100	mA
Maximum voltage	24	VDC
Closing duration	100	ms

Fault indicating and pacing relay option

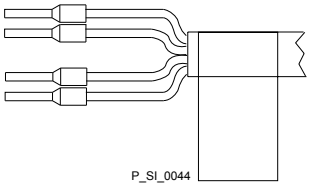


Fig. 23: Cable conductor assignments

Pin assignment

To pin	VDE cable	Contact	Relay
1	yellow	NC (normally closed) or NO (normally open)	Fault indicating relay
4	green	C (common)	Fault indicating relay
3	white	NC (normally closed) or NO (normally open)	Pacing relay
2	brown	C (common)	Pacing relay

7.2.1.1.3 Current output and fault indicating / pacing relay (24 V)

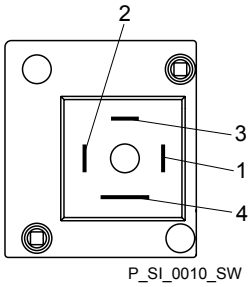


Fig. 24: Pump pin assignments

The module can be retrofitted and operates once it is plugged into the module board.

In the *'ANALOG OUTPUT'* menu, the variable to be signalled by the current output can be selected.

If another switching function is required, the relay can be reprogrammed in the *'Relay'* menu.

Current output

Data	Value	Unit
Open circuit voltage:	8	V
Current range:	4 ... 20	mA
Ripple, max.:	80	µA pp
Ripple, max.:	250	Ω

Fault indicating / pacing relay (24 V)

Data	Value	Unit
Residual voltage max. at $I_{off\ max}$ = 1 µA	0.4	V
Maximum current	100	mA
Maximum voltage	24	VDC
Closing duration	100	ms

Current output and fault indicating / pacing relay (24 V)

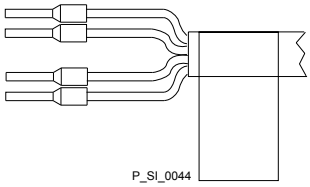
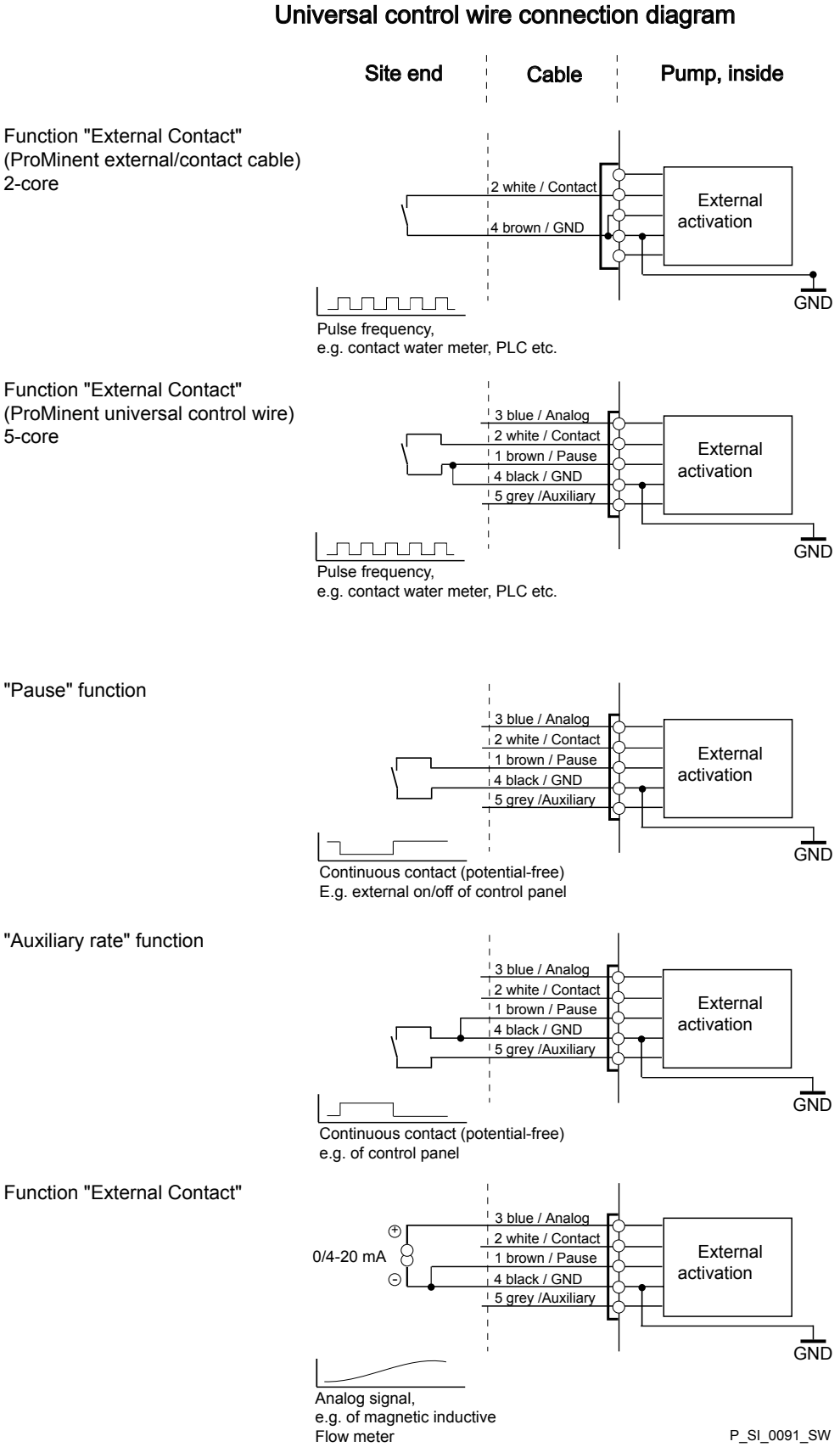


Fig. 25: Cable conductor assignments

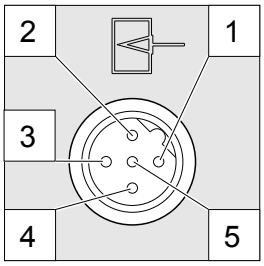
To pin	VDE cable	Contact	Relay
1	yellow	"+"	Current output
4	green	"-"	Current output
3	white	NC (normally closed) or NO (normally open)	Fault indicating / pacing relay
2	brown	C (common)	Fault indicating / pacing relay

7.2.1.2 External control

External control



Technical data "external control"



P_BE_0014_SW

Semi-conductor switch elements with a residual voltage of -0.7 V (e.g. transistors in open-collector circuits) or contacts (relays) can be used as input switch elements.

Pin		
Pin 1 = Pause input (activating function)	Voltage with open contacts:	approx. 5 V
	Input resistance:	10 kΩ
	Control:	■ Potential-free contact (approx. 0.5 mA) ■ Semiconductor switch (residual voltage < 0.7 V)
2 = contact input	Voltage with open contacts:	approx. 5 V
	Input resistance:	10 kΩ
	Control:	■ Potential-free contact (approx. 0.5 mA) ■ Semiconductor switch (residual voltage < 0.7 V)
	min. contact duration:	20 ms
	Max. pulse frequency:	25 pulses/s
3 =Analog input	Input apparent ohmic resistance	approx. 120 Ω
4 = GND		
5 = auxiliary input	Voltage with open contacts:	approx. 5 V
	Input resistance:	10 kΩ
	Control:	■ Potential-free contact (approx. 0.5 mA) ■ Semiconductor switch (residual voltage < 0.7 V)

The metering pump makes its first metering stroke at approx. 0.4 mA (4.4 mA) and enters into continuous operation at approx. 19.2 mA.

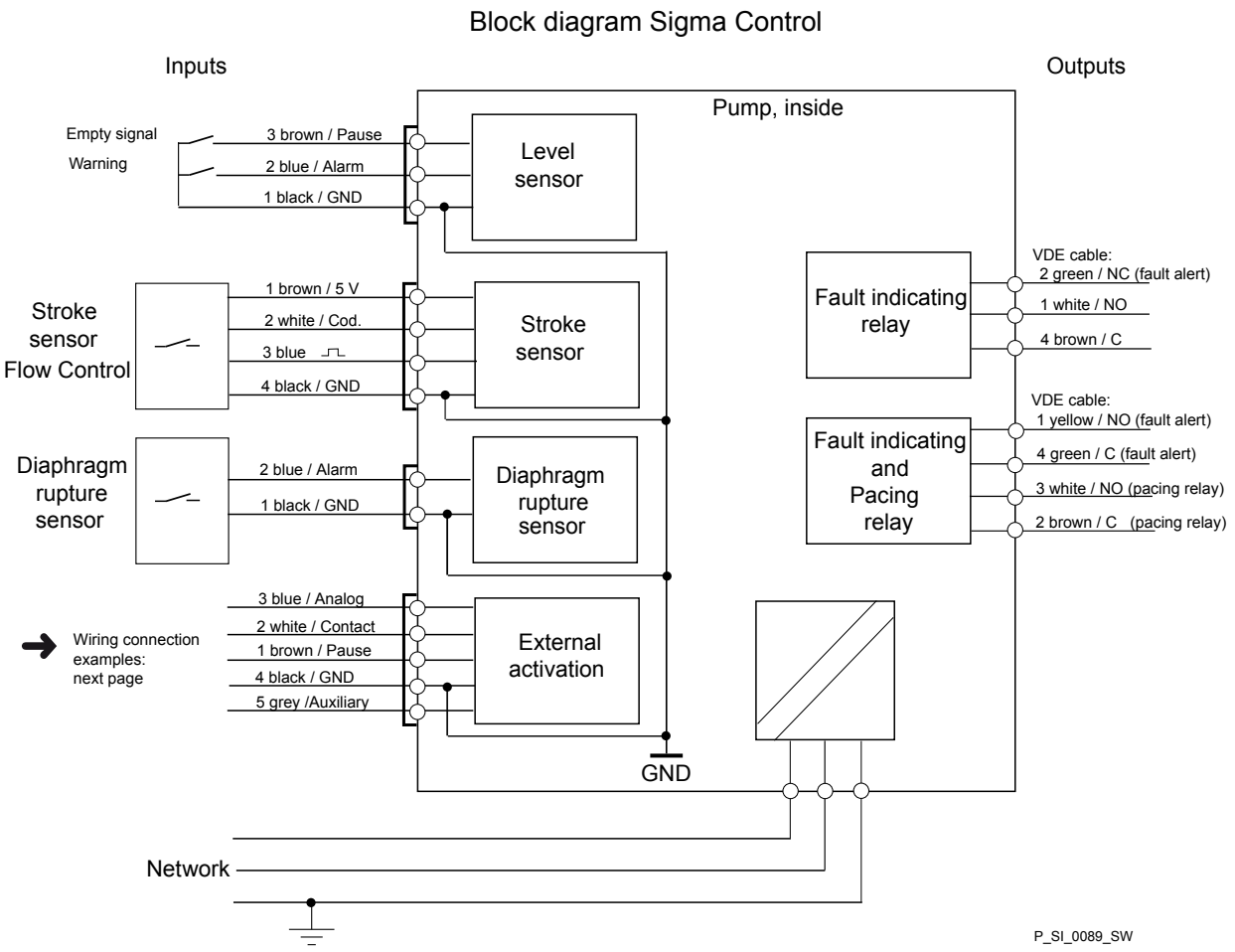
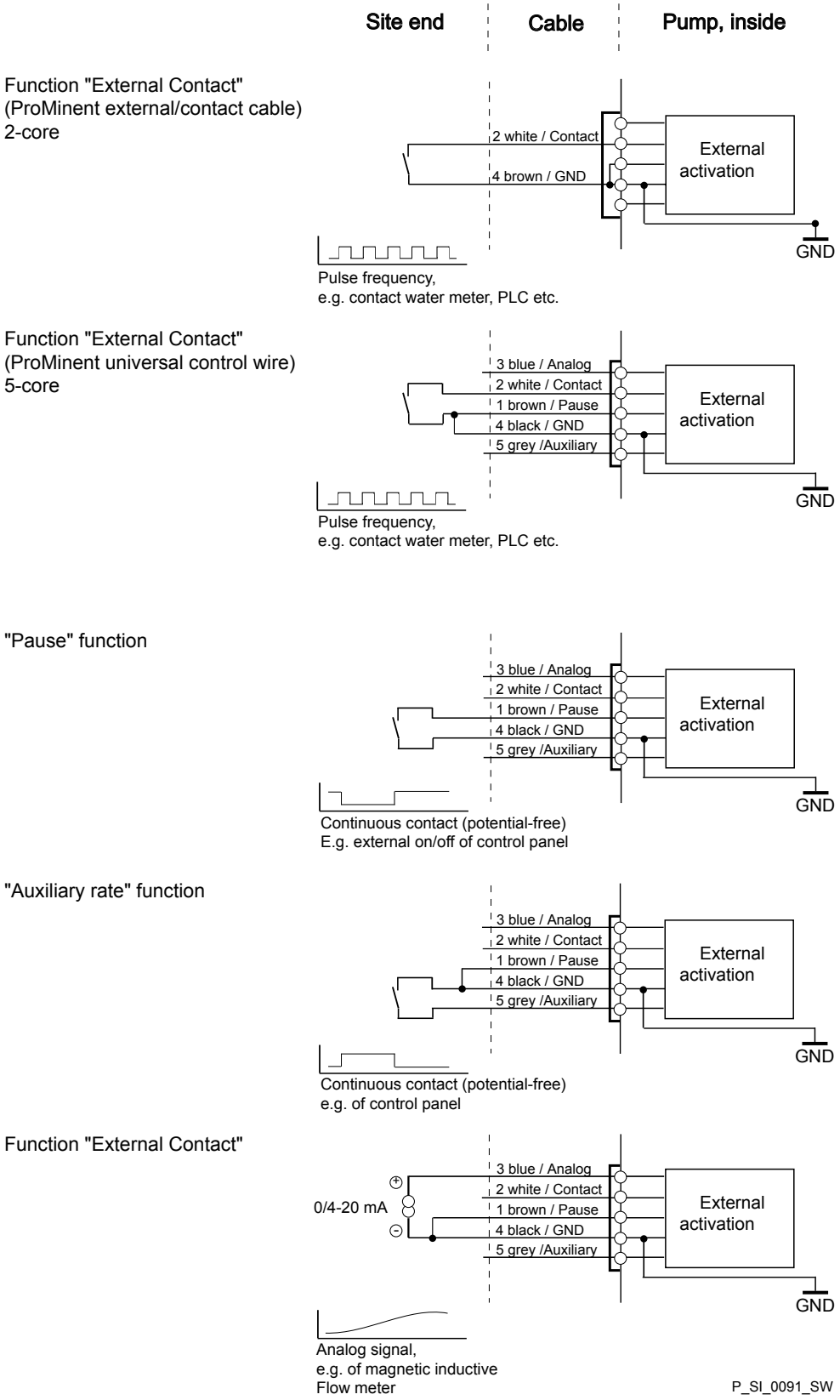


Fig. 26: Block diagram Sigma Control

Universal control wire connection diagram



7.2.2 HMI operating unit

If the pump is operated via the HMI, the HMI must be connected to the CAN port above the LEDs of the pump base.

If the pump is operated without the HMI, the supplied sealing cap must be plugged into the CAN port above the LEDs of the pump base.



CAUTION!

Risk of short circuit

If liquid penetrates into the CAN port, a short circuit may occur in the pump.

– A CAN plug or the supplied sealing cap must always be plugged into the CAN port.



CAUTION!

Danger of malfunctions

Incorrect operation via the CAN bus leads to malfunctions.

– When operating with the HMI connected, do not connect any other control (e.g. DXCa) to the CAN port.

7.2.3 Pump, power supply



WARNING!

Risk of electric shock

This pump is supplied with a grounding conductor and a grounding-type attachment plug.

– To reduce the risk of electric shock, ensure that it is connected only to a proper grounding-type receptacle.



WARNING!

Danger of electric shock

In the event of an electrical accident, it must be possible to quickly disconnect the pump, and any electrical ancillaries which may possibly be present, from the mains.

– Install an emergency cut-off switch in the mains supply line to the pump and any electrical ancillaries which may be present or
– Integrate the pump and electrical ancillaries which may be present in the emergency cut-off management of the system and inform personnel of the isolating option.



WARNING!

If the HMI cannot be operated directly from the pump (specifically with versions with a cable longer than 2 m), provide an option to disconnect the pump from the mains power supply in the event of an emergency. Clearly assign and label this option to the pump.



WARNING!

An on/off switch may not be fitted on the pump, dependent on the identity code and installation.

To be able to switch off the pump (to a zero-volts state) independently from the entire installation (e.g. for repair), use an electrical isolating device in the mains supply cable, e.g. a mains switch or a plug / socket combination. Clearly identify this isolating device as such.

Install the pump cable.

– *Key electrical data can be found on the pump nameplate.*

7.2.4 Other units

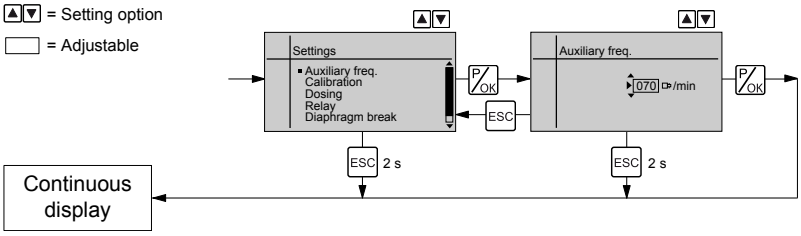
Other units

Install the other units according to their supplied documentation.

8 Set up

– *Please read the overviews in the appendix, "Control elements and key functions" and "Operating/setting diagram" for supplementary information.*
– *If no key is pressed for a 1 minute duration, the pump returns to a continuous display.*

8.1 Basic principles of control adjustment



Confirming an entry

Briefly press the *[P/OK]* key.

The display simultaneously changes to the next selection, to the next menu option or into a continuous display.

Quitting a menu option without confirming it

Press *[ESC]*.

You will jump back to the previous menu option or menu.

Jumping back to a continuous display

Press and hold the *[ESC]* key for 2 seconds.

Changing adjustable values

Press the arrow keys *[UP]* or *[DOWN]*.

In this way the digit between the triangles is increased or reduced.

Select the digit position in a number using the key *[i/>]*.

Confirming adjustable values

Press the *[P/OK]* key.

The display simultaneously changes to the next selection, to the next menu option or into a continuous display.

8.2 Checking adjustable values / error messages

Continuous displays

Before you adjust the pump, you can check the actual settings of the adjustable variables:

1. Press the key *[i/>]* ("i" for "Info"), if the pump is displaying a continuous display (An "i" is visible at the top left).
   ⇨ Each press of the *[i/>]* key displays another continuous display or a plain text error message.
2. The continuous display values can be changed using the *[arrow keys]*.

The number of continuous displays depends on the identity code, the selected operating mode and the connected additional devices, see overview "Continuous displays" in the appendix.

A horizontal scroll bar shows the number of continuous displays and error messages and the position of the displayed continuous display or error message.

With error messages an identifier appears while displays with clear text appear between the continuous displays (and an error code).

Secondary displays

The lowest line of the Info displays (2nd level continuous display) various information, which cannot however be adjusted here, see overview "Secondary displays" in the appendix.

If you are in a continuous display, you can access the bottom line of the info displays by:

1. Keep key *[i/>]* pressed down until a small triangle appears in the bottom line.
2. Now quickly press the *[i/>]* key to page through the info displays of the bottom line.

8.3 Changing to adjustment mode

If the *[P/OK]* key is pressed for 2 seconds in a continuous display, the pump changes to adjustment mode.

If under *'Service ➔ Safety ➔ Access protection' 'Lock menu'* or *'Lock all'* was set (top left key symbol instead of "i"), proceed as follows:

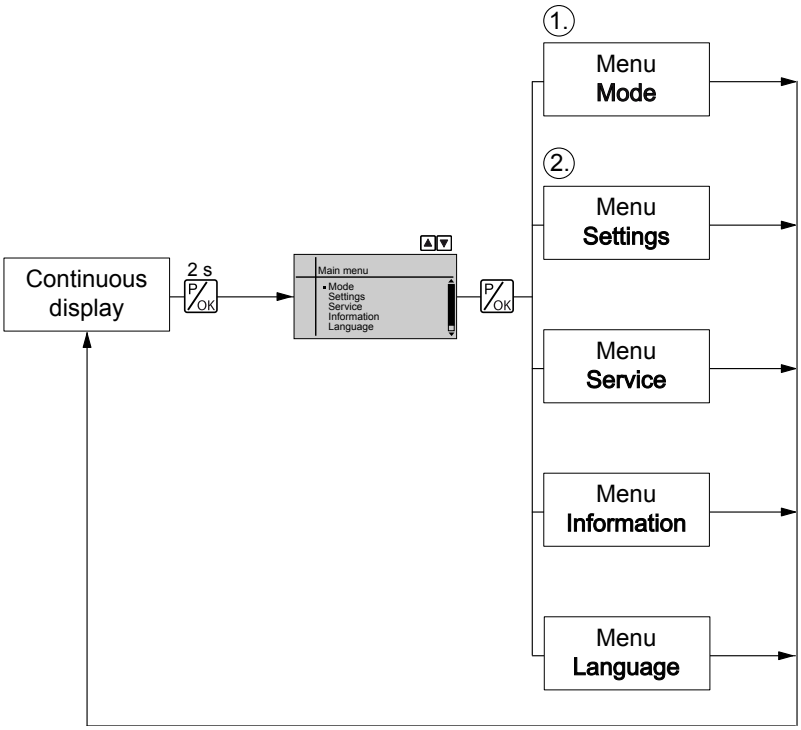
1. Press the *[P/OK]* key.
   ⇨ The *'Password'* display appears.
2. Enter the password (*[Arrow keys]*) and confirm with the *[P/OK]* key.
   ⇨ The *'Password valid'* display appears.
3. Confirm the display with the *[P/OK]* key.
   ⇨ The *'Main menu'* appears.

The following menus can be initially chosen in adjustment mode - see also the overview "Operating/setting diagram":

- Menu *'Mode'*
- Menu *'Settings'*
- Menu *'Service'*
- Menu *'Information'*
- Menu *'Language'*

To adapt the pump to your process requirements, you must:

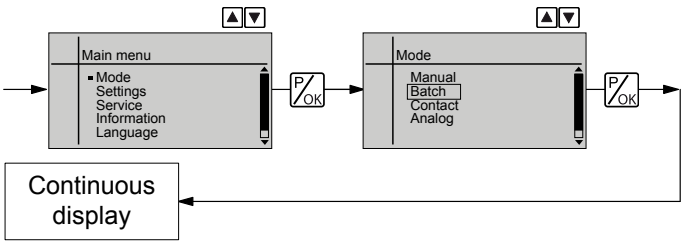
1. Select the operating mode in the *'Mode'* menu.
2. Carry out the adjustment for this operating mode under the *'Settings'* menu.



8.4 Selecting the operating mode (Menu "Mode")

In the *'Mode'* menu (depending on the identity code, some operating modes may not be present) the following operating modes can be selected:

- *'Manual'*: for manual operation
- *'Batch'*: for batch operation
- *'Contact'*: for contact operation
- *'Analog'*: for current control



8.5 Operating mode settings (menu "Settings")

Various settings can be adjusted in the *'Settings'* menu dependent on the selected operating mode.

Setting menus are available in all operating modes for the following programmable functions:

- *'Auxiliary frequency'*
- *'Calibrate'*
- *'Dosing'*
- *'Diaphragm break'*
- *'System'*

See also "Programmable function settings".

As to whether or not a further setting menu is available, depends on the selected operating mode and the connected devices or modules.

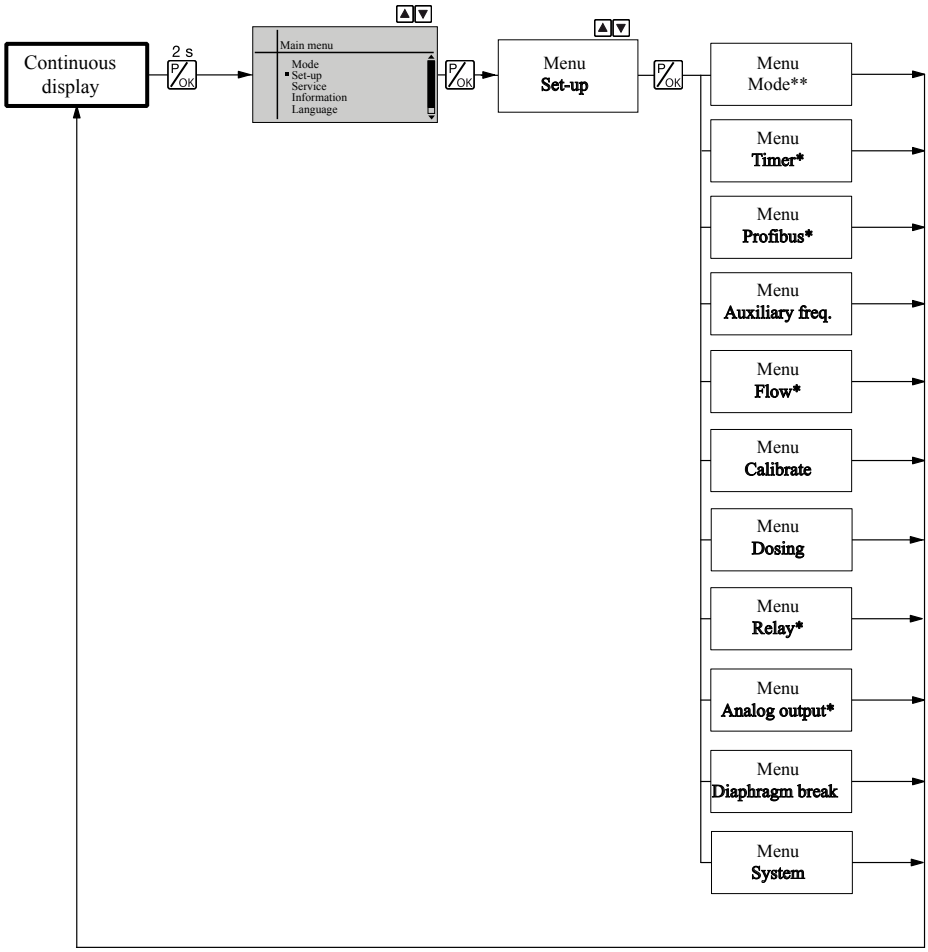


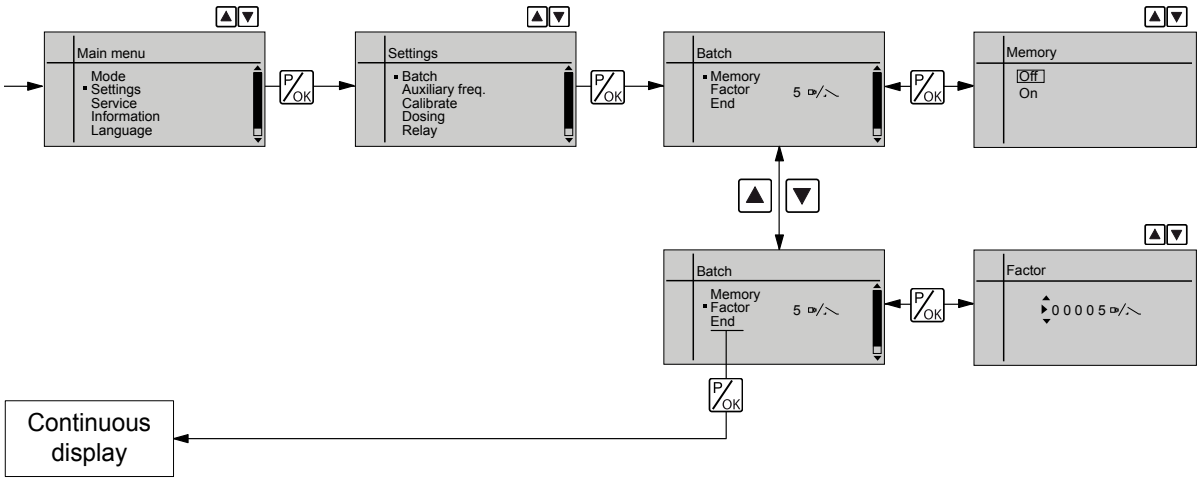
Fig. 27: "Settings" menu branch

8.5.1 "Manual" operating mode settings

No setting menu is available in *'Manual'* operating mode in the menu *'Settings'*.

8.5.2 "Batch" mode settings

The *'BATCH'* menu is available under *'Batch'* mode in the *'Settings'* menu.



The operating mode *'Batch'* is one variant of the *'Contact'* operating mode - see the following chapter. Here also, you can select a number of strokes (no fractions, only integers from 1 to 99,999).

Operating mode *'Batch'* is intended for large metering quantities.

Metering can be triggered by pressing the *[P/OK]* key or via a pulse received via the "External Control" terminal.

The number of received pulses, which could not yet be processed, is stored by the pump in the stroke memory, if it was activated.

CAUTION!
When changing over from the "Manual" operating mode to the "Batch" operating mode, the pump maintains the stroke rate.

The stroke rate can also be set in 'Batch' mode. It should normally be set to the maximum stroke rate.

"Memory" function extension

Additionally, you can activate the "Memory" function extension (Identifier "m"). When "Memory" is activated, the pump adds up the remaining strokes , which could not be processed, up to the maximum capacity of the stroke memory of 99,999 strokes. If this maximum capacity is exceeded, the pump goes into fault mode.

8.5.3 "Contact" operating mode settings

The *'Contact'* menu is available under *'Contact'* mode in the *'Settings'* menu.

'Contact' operating mode allows you to trigger individual strokes or a stroke series.

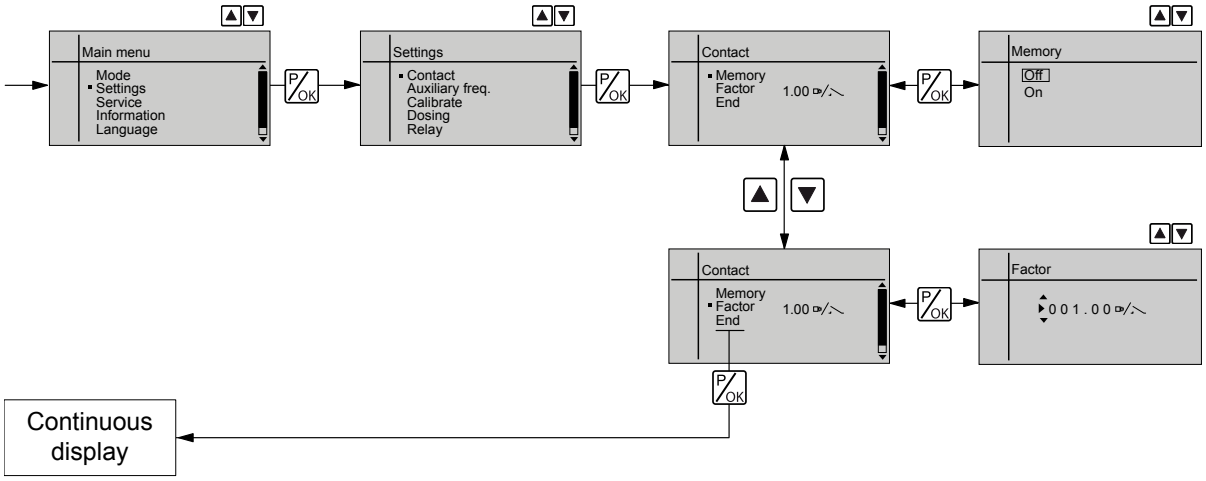
You can trigger the strokes via a pulse sent via the "External control" terminal.

The purpose of this operating mode is to convert the incoming pulses with a reduction (fractions) or small step-up into strokes.

CAUTION!

When changing over from *'Manual'* operating mode to *'Contact'* operating mode, the pump maintains the stroke rate.

The stroke rate can also be set in 'Contact' operating mode. It should normally be set to the maximum stroke rate.



The number of strokes per pulse depends on the factor which you input. By use of the factor you can multiply incoming pulses by a factor between 1.01 and 100.00 or reduce them by a factor of 0.01 to 1.00.

```
Number of strokes executed = factor x number of
incoming pulses
```

Example table

	Factor	Pulse (sequence)	Number of strokes (sequence)
Step-up*			
	1	1	1
	2	1	2
	25	1	25
	100.00	1	100.00
	1.50	1	1.50 (1 / 2)
	1.25	1	1.25 (1 / 1 / 1 / 2)
Reduction**			
	1	1	1
	0.50	2	1
	0.10	10	1
	0.01	100	1
	0.25	4	1
	0.40	2.5 (3 / 2)	(1 / 1)
	0.75	1.33 (2 / 1 / 1)	(1 / 1 / 1)

*** Explanation of the conversion ratio**

With a factor of 1,	... 1 stroke is executed per 1 pulse.
With a factor of 2,	... 2 strokes are executed per 1 pulse.
With a factor of 25,	... 25 strokes are executed per 1 pulse.

**** Explanation of reduction**

With a factor of 1,	... 1 stroke is executed per 1 pulse.
With a factor of 0.5,	...1 stroke is executed after 2 pulses.
With a factor of 0.1,	...1 stroke is executed after 10 pulses.
With a factor of 0.75,	...1 stroke is executed once after 2 pulses, then 1 stroke is executed after 1 pulse two times, and then again 1 stroke after 2 pulses etc.

If a remainder is obtained when dividing by the factor, then the device adds the remainders together. As soon as this sum reaches or exceeds "1", the pump executes an additional stroke. Therefore on average during the metering operation, the resultant number of strokes precisely matches the factor.

Non-processed pulses

The number of received pulses, which could not yet be processed, is stored by the device in the stroke memory, if it was activated. When the *[STOP/START]* key is pressed or the "Pause" function is activated, the stroke memory is deleted. You can avoid this with the "Memory" function extension:

"Memory" function extension

Additionally, you can activate the "Memory" function extension (Identifier "m"). When "Memory" is activated, the pump adds up the remaining strokes , which could not be processed, up to the maximum capacity of the stroke memory of 99,999 strokes. If this maximum capacity is exceeded, the pump goes into fault mode.

8.5.4 "Analog" operating mode settings

The *'ANALOG'* menu is available under *'Analog'* mode in the *'Settings'* menu. The stroke rate is controlled using an analog current signal via the "External control" terminal. The secondary display "Signal current" indicates the incoming current.

You can select three types of current signal processing:

- *'Standard'* (*'0 - 20 mA'* or *'4 - 20 mA'*)
- *'Extended'* (*'Curve type'*)

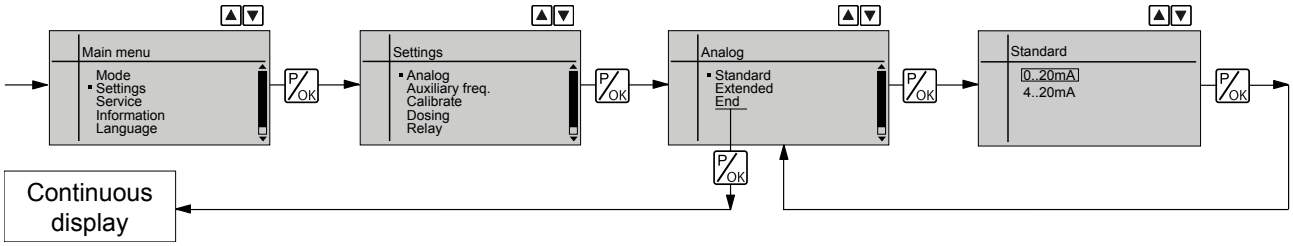
Standard

0 - 20 mA

At 0 mA the pump is stationary -

At 20 mA the pump works at the maximum stroke rate.

Between these values, the stroke rate is proportional to the current signal.



4 - 20 mA

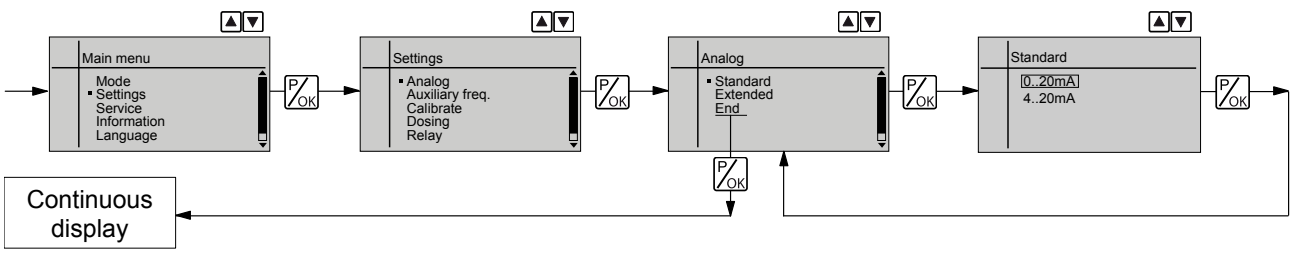
At 4 mA the pump is stationary -

At 20 mA the pump works at the maximum stroke rate.

Between these values, the stroke rate is proportional to the current signal.

For current signals less than 3.8 mA a fault message appears and the pump stops (e.g. if a cable has broken).

The maximum stroke rate can only be reduced under 'Extended' processing types, not under 'Standard' processing types.



Extended

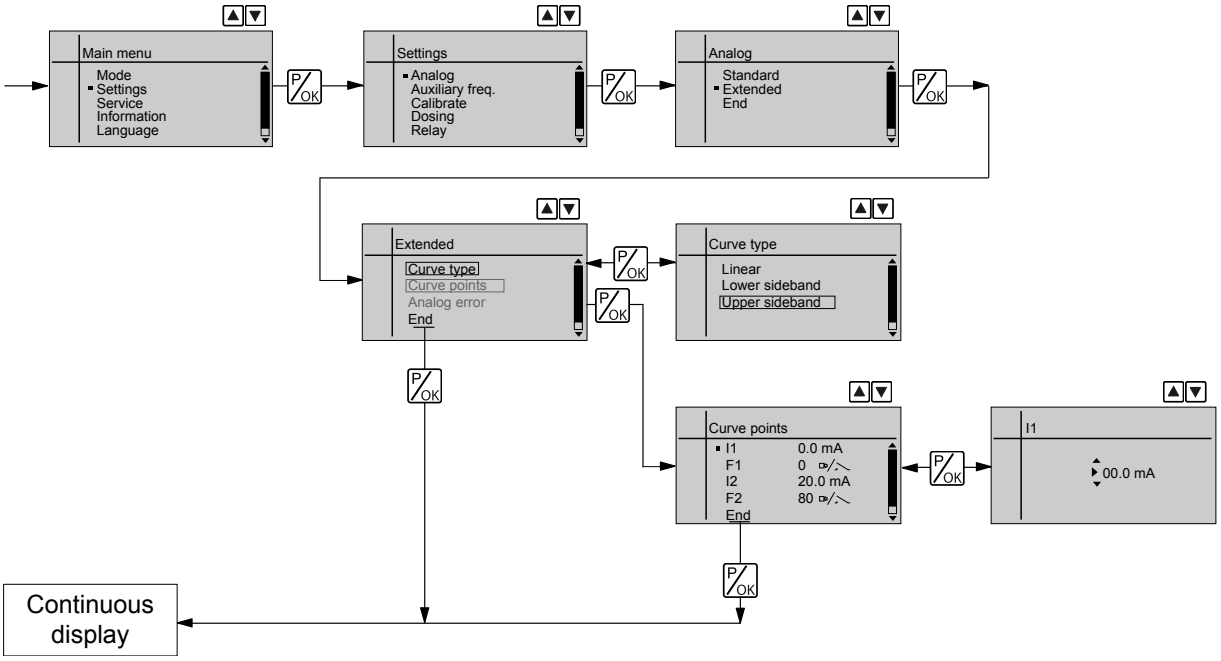
Under *'Extended'* - *'Curve type'* processing types, you can freely program the pump behaviour.

There are 3 curve types:

- *'Linear'*
- *'Lower sideband'* (lower sideband)
- *'Upper sideband'* (upper sideband)

The following applies to all three curve types:

The smallest processable difference between I1 and I2 is 4 mA (II I1-I2 II ≥4 mA).



'Linear'

The symbol *'Linear'* appears on the LCD screen. You can enter any stroke rate- behaviour of the pump proportional to the current signal. For this purpose, enter any two points P1 (I1, F1) and P2 (I2, F2) (F1 is the stroke rate at which the pump is to operate at current I1, F2 is the stroke rate at which the pump is to operate at current I2...); this defines a straight line and thus the behaviour is specified:

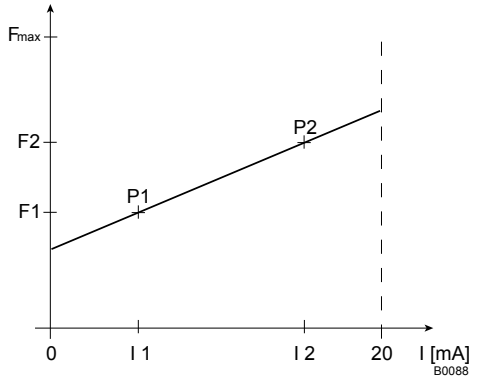


Fig. 28: Rate(frequency)-Current Diagram for Linear control

Plot a diagram similar to the one above - with values for (I1, F1) and (I2, F2) – so that you can set the pump as desired!

'Lower sideband'

Using this processing type, you can control a metering pump using the current signal as shown in the diagram below.

However, you can also control two metering pumps for different feed chemicals via a current signal (e.g. one acid pump and one alkali pump using the signal of a pH sensor). To do this, you must connect the pumps electrically in series.

The "Lower sideband" symbol appears in the LCD display. Below I1, the pump works at a rate of F1 - above I2 it stops. Between I1 and I2 the stroke rate varies between F1 and F2 in proportion to the signal current.

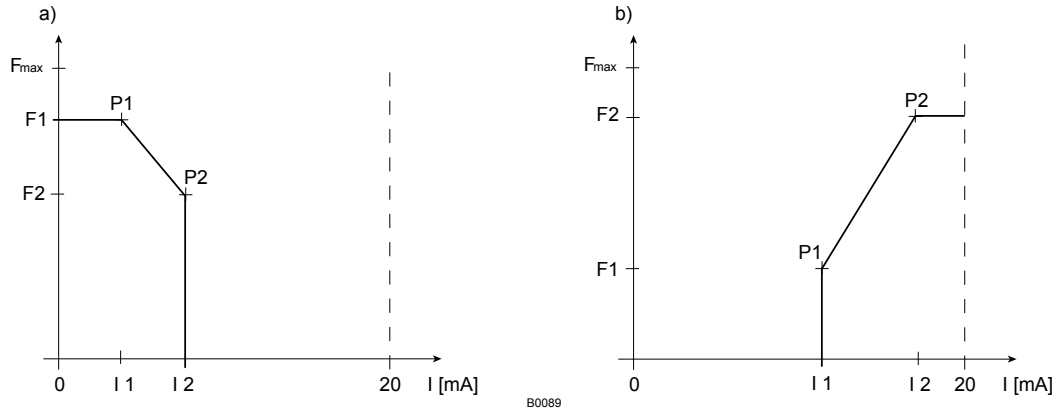


Fig. 29: Frequency-current diagram for a) Lower sideband, b) Upper sideband

'Upper sideband'

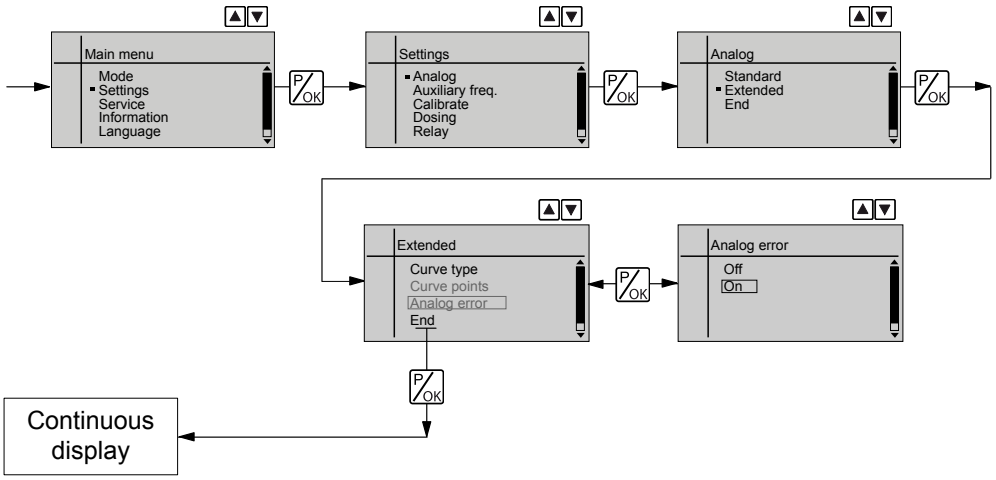
Using this processing type, you can control a metering pump using the current signal as shown in the diagram above.

However, you can also control two metering pumps for different feed chemicals via a current signal (e.g. one acid pump and one alkali pump using the signal of a pH sensor). To do this, you must connect the pumps electrically in series.

The "Upper sideband" symbol appears in the LCD display. Below I1, the pump is stationary - above I2 the pump works at rate F2. Between I1 and I2 the stroke rate varies between F1 and F2 in proportion to the signal current.

Fault processing

Under menu option *'Analog error'* you can activate error processing for processing type *'Curve'*. For current signals below 3.8 mA, a fault message appears and the pump stops.

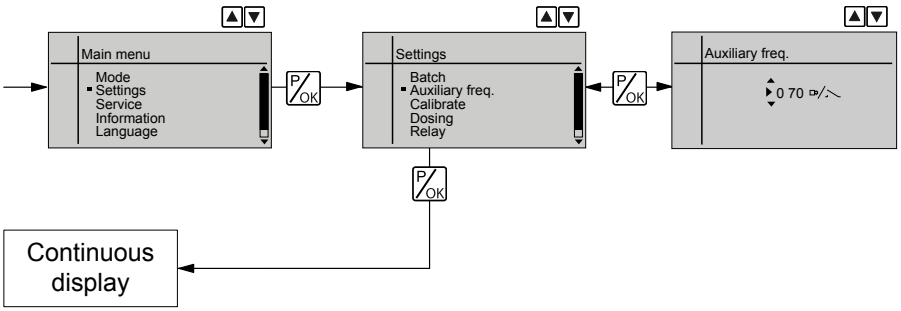


8.6 Programmable function settings ("Settings" menu)

Setting menus are available in all operating modes in the menu "SETTINGS" for the following programmable functions:

- Auxiliary frequency (menu *'AUX'*)
- Flow (menu *'FLOW'*) (only available if a dosing monitor is connected)
- Calibrate (menu *'CALIBRATE'*)
- Metering (menu *'METERING'*)
- Relay (menu *'RELAY'*) (only available if a relay is fitted)
- System (menu *'SYSTEM'*)

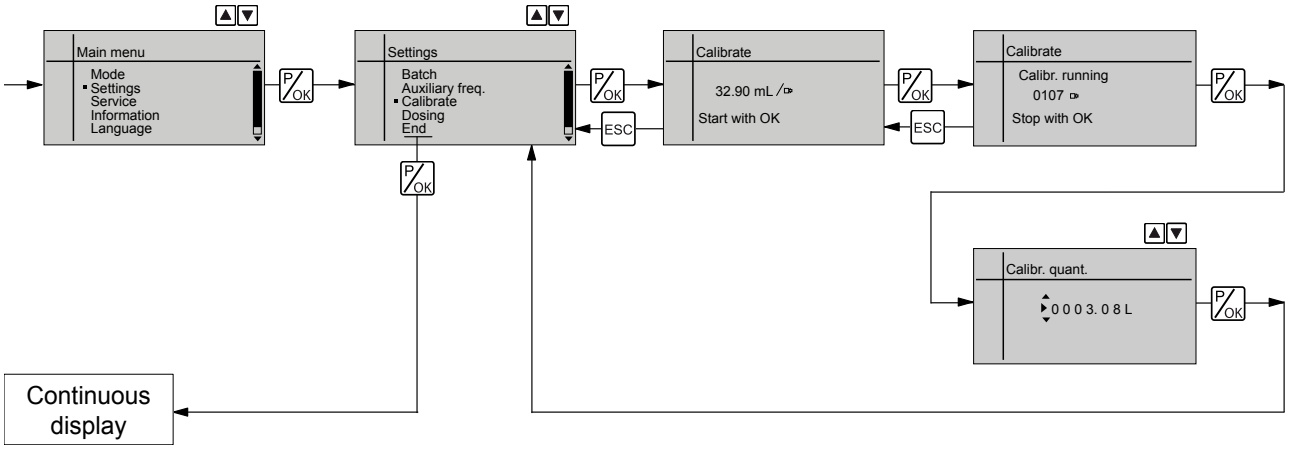
8.6.1 Settings for the “Auxiliary frequency” function (AUX menu)



The programmable function *'Auxiliary frequency'* facilitates the switchover to an auxiliary stroke rate, which can be set in the *'Auxiliary freq.'* menu. It can be activated via the "External control" terminal. If the auxiliary frequency is being used, then the identifier "Aux" appears on the LCD screen.

This *'auxiliary frequency'* has priority over the stroke rate, which is specified by the currently selected operating mode - see also the chapter "Function description" - "Hierarchy of operating modes".

8.6.2 Settings for the “Calibrate” function (CALIBRATE menu)



The pump can also be operated in the calibrated state. In this case, the corresponding continuous displays then indicate the metering volume or the capacity directly.

Accuracy of the calibration

The calibration will not be accurate, if these conditions are not adhered to:

- *Operate with at least 30 % stroke length.*
- *The pump should operate at maximum frequency.*

Calibrate

WARNING!

If the feed chemical is dangerous, take appropriate safety precautions when executing the following calibration instructions.

Observe the safety data sheet for the feed chemical!

1. Lead the suction hose into a measuring cylinder containing the feed chemical - the discharge hose must be installed in a permanent manner (operating pressure, ...!).
2. Prime using the feed chemical (simultaneously press the two *[arrow keys]*), should the suction hose be empty.
3. Record the level in the measuring cylinder.
4. To set the volume unit, follow the menu path *‘Settings ➔ System ➔ Units’*.
5. Using the *[arrow keys]*, select the correct units and confirm by pressing the *[P/OK]* key.
6. Select the *‘CALIBRATE’* menu and then use the *[P/OK]* key to change to the first menu option.
7. To start the calibration, press the *[P/OK]* key. The next menu option, *‘Calib. running’* appears, the pump starts to pump and indicates the stroke rate (the pump works at the stroke rate, which is set under *‘MANUAL’*).
8. After a reasonable number of strokes (e.g. 200), stop the pump by pressing the *[P/OK]* key.
9. Determine the required metering volume (difference initial volume - residual volume).
10. Enter this volume in the menu option which appears and then press the key *[P/OK]* - the pump changes to the main menu.

11. Select the option *'End'* and then press the key *[P/OK]* - the pump changes to a continuous display.

⇨ The pump is calibrated.

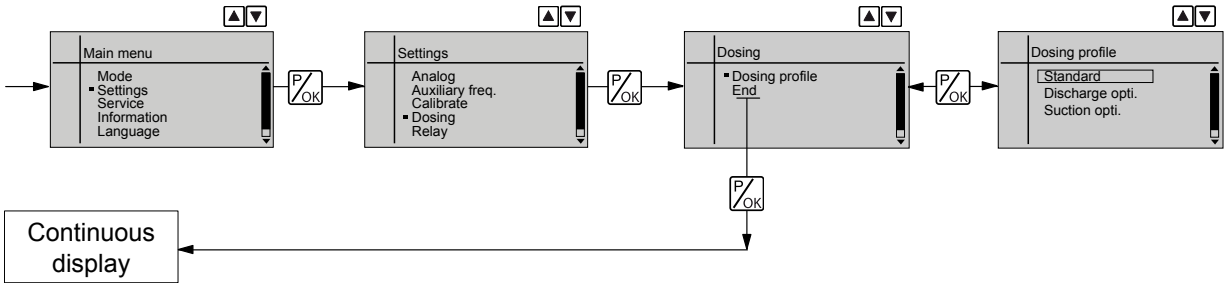
The corresponding continuous displays indicate the calibrated values.

8.6.3 Settings for the “Metering” function (DOSING menu)

The "Dosing" menu has the following sub-menu:

1 - *'Dosing profile'*

8.6.3.1 Settings in the sub-menu ″Dosing″



Under *'Dosing ➔ Dosing profile'* you can precisely match the pump metering flow over time against the requirements of the particular application, see Chapter "Function Description".

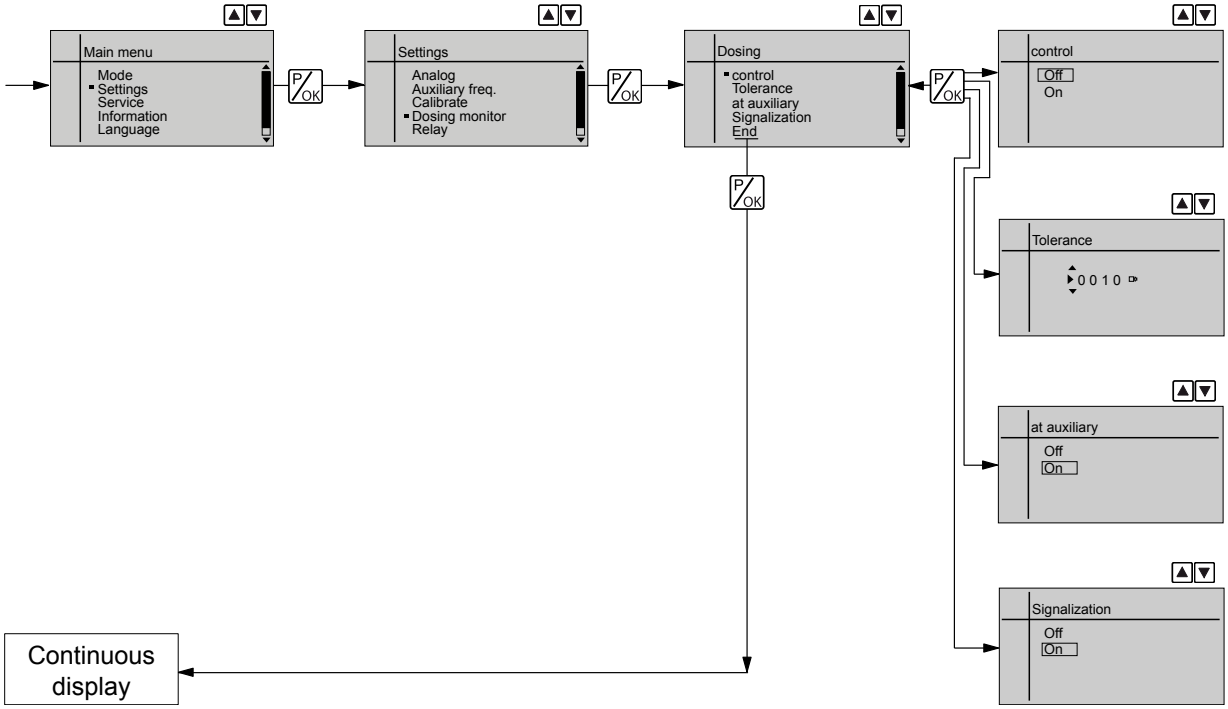
Discharge opti.

Under *'Dosing profile'* - *'Discharge opti.'*, the discharge stroke is elongated, the suction stroke is executed as quickly as possible. This setting is suitable for example for those applications that require optimum mixing ratios and as continuous as possible chemical mixing.

Suction opti.

Under *'Dosing profile'* - *'Suction opti.'*, the suction stroke is elongated as much as possible, which makes possible a precise and problem-free dosing of viscous and gaseous media. This setting should also be chosen to minimise the NPSH value.

8.6.4 Settings for the “Dosing monitor” function (DOSING MONITOR menu)



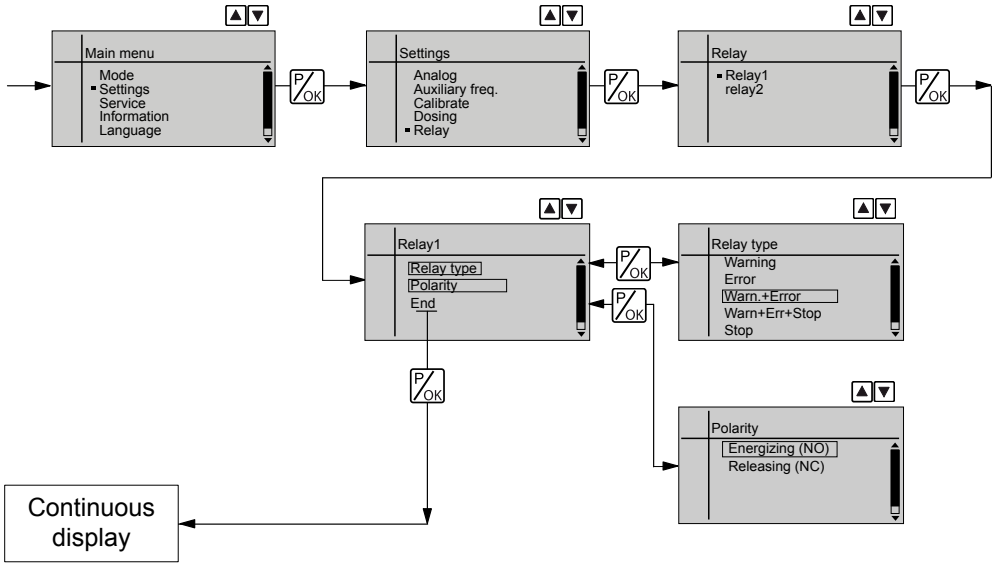
The menu *‘Dosing monitor’* only appears if a dosing monitor is connected to the "dosing monitor" terminal. The dosing monitor records the individual pressure surges of the pump at the discharge connector during pulsed metering and reports them back to the pump. In the event that this feed-back message remains missing in a sequence as often as set in the menu *‘Dosing monitor’* under *‘Tolerance’* (due to a failure or too low a metering level), then this function stops the pump.

The last menu option *‘Signalization’* provides the choice, of whether this case should lead to an *‘Error’* or a *‘Warning’*.

The function *‘Dosing monitor’* can be deactivated under *‘Control’*.

The function *‘Dosing monitor’* can be deactivated for the operating mode *‘Auxilary freq.’*.

8.6.5 Settings for the “Relay” function (RELAY menu)



Using the *‘Relay’* programmable function, you can match the pump relays to your requirements.

You can reprogram the relays using the *'Relay'* function in an almost unlimited way.

You can set whether the respective relay is to switch due to a warning alert, a fault alert, a pump stroke or to a triggering event of the timer:

Selectable behaviour types

Setting in the *'Relay'* menu	Effect
Warning	The relay switches upon a warning alert (yellow LED*).
Error	The relay switches upon a fault alert (red LED*).
Warn.+Error	The relay switches upon a warning alert (yellow LED*) or a fault alert (red LED*).
Warn+Err+Stop	The relay switches upon a warning alert (yellow LED*) or a fault alert (red LED*) or a stop (key *[STOP/START]* or pause or bus command).
Stop	The relay switches upon a stop (key *[STOP/START]* or pause or command from an optional module).
Pacing relay	The relay switches every stroke.
Option	The relay has the option of which module was plugged in (e.g. timer).

* see "Troubleshooting" chapter

You can also indicate how the respective relay should behave as soon as it switches. You can change this via the setting *'ENERGIZING (NO)'* / *'RELEASING (NC).'*

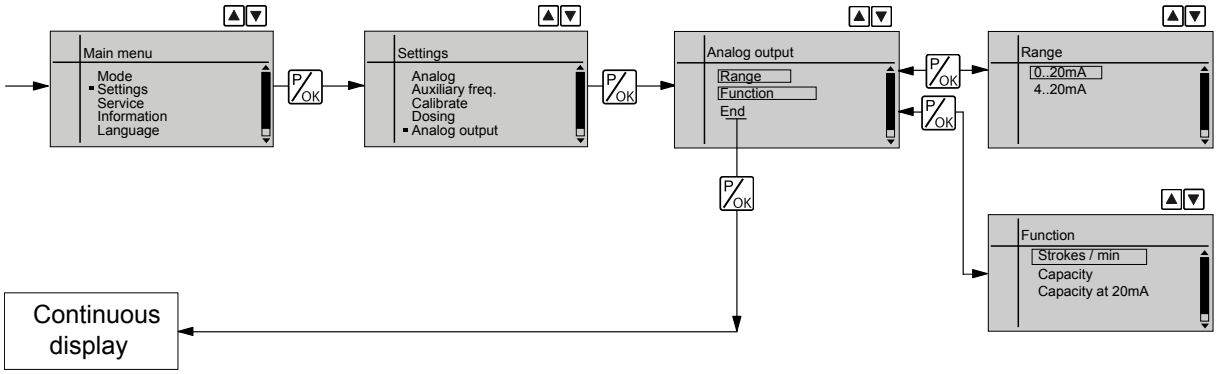


The setting option for the 'Relay' function only exists if a relay is present.

Allocations for the relay combinations

Display text	"Relay 1"	"Relay 2"
	(Mechanical relay)	Semiconductor relay)
Warning	Warning relay	Warning relay
Error	Fault indicating relay	Fault indicating relay
Warn.+Error	Warning and fault indicating relay	Warning and fault indicating relay
Warn.+Error+Stop	Warning, fault indicating and cut-off relay	Warning, fault indicating and cut-off relay
Stop	Cut-off relay	Cut-off relay
Pacing relay	-	Pacing relay

8.6.6 Settings for the “Analog output” function (ANALOG OUTPUT menu)



Using the "Analog output" programmable function, you can match the pump current output signal (optional) to your requirements.

The signal I of the current output signal one of the three following variables:

- Strokes / min
- Capacity (= current, calculated capacity)
- Capacity at 20 mA (= capacity, value adjustable at 20 mA)

In the "Stop" or "Pause" states (either because of a fault or operation) or "Pause" the current output transmits a current of 4 mA or 0 mA.

The signal for the current, calculated capacity is calculated by the pump according to the following formula (here for the range 4...20 mA):

```
I(4...20) = 16 x (f/fmax) x (L/100) + 4
```

with

I - Output current in mA

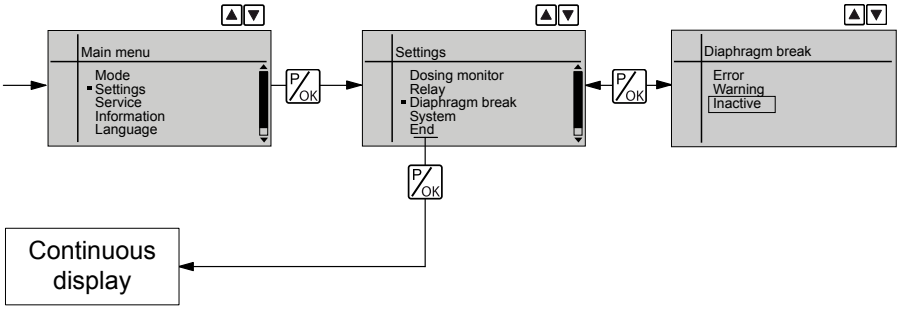
f - Stroke rate in strokes/min

L - Stroke length in %

fmax - Maximum stroke rate in strokes/min

In the *‘Contact’* and *‘Batch’* operating modes, f is the stroke rate which is set in the "Stroke rate" continuous display.

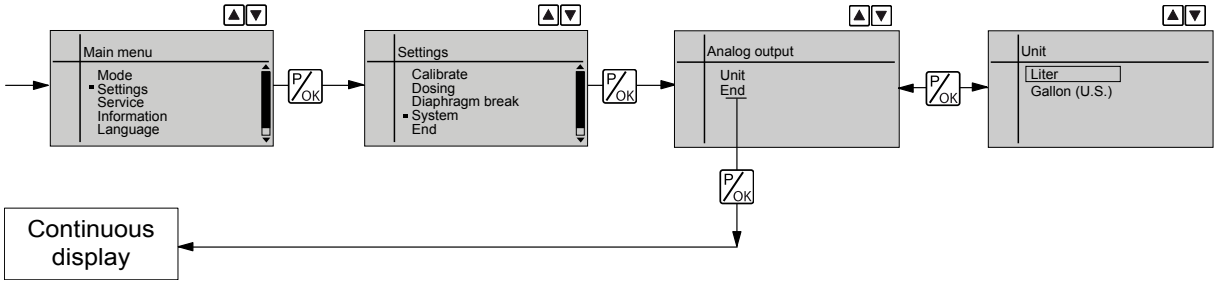
8.6.7 Settings for the “Diaphragm break” function (DIAPHRAGM BREAK menu)



Using the "Diaphragm break" programmable function, you can match the behaviour under fault conditions of the pump to your requirements, provided an electrical membrane rupture sensor is connected.

There is a choice, of whether a membrane rupture should lead to an *‘Error’* or a *‘Warning’*. If *‘Inactive’* is set, the pump does not react to a diaphragm rupture, however the symbol **dia** indicates that an electrical membrane rupture sensor is connected.

8.6.8 Settings in the "System" menu" (SYSTEM menu)



In the *'System'* menu you can select whether the pump uses *'Liter'* or *'Gallon (US)'* as the *'Unit'*.

8.7 Service (SERVICE menu)

The following can be carried out from this menu:

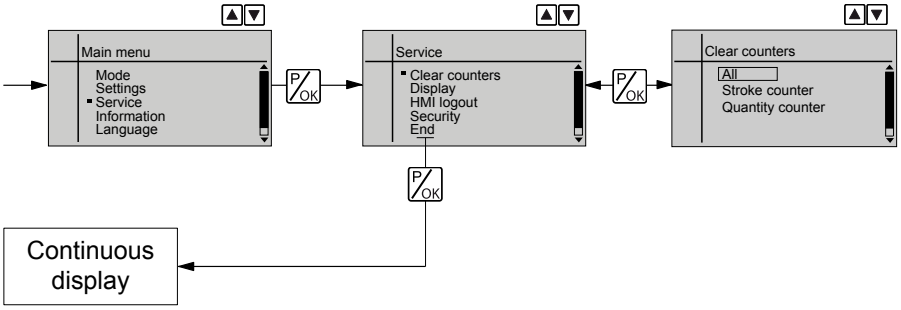
1 - *'Clear counters'*

2 - Set contrast (Menu *'Display'*)

3 - *'HMI logout'*

4 - Set safety settings for operating menu (*'Safety'* menu)

8.7.1 Clear counters (CLEAR COUNTERS menu)



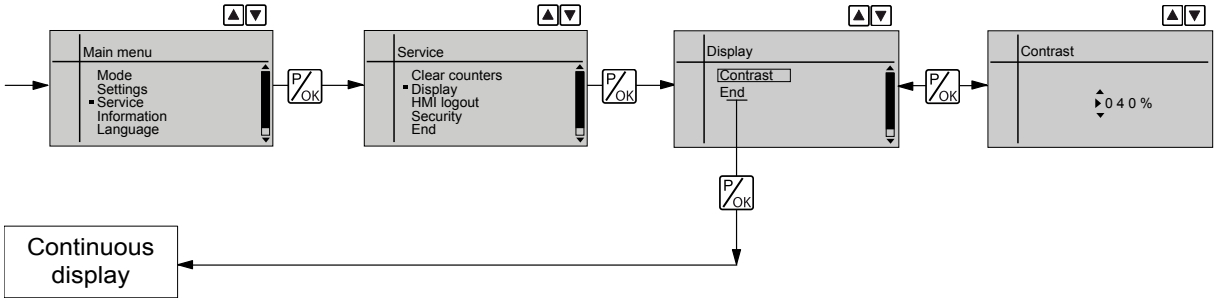
In the *'CLEAR COUNTERS'* menu, you can either delete the stored total number of strokes (*'Stroke counter'*) or the total litres (*'Quantity counter'*) (= reset to "0") or both together :

- *'All'*
- *'Stroke counter'* (total number of strokes)
- *'Quantity counter'* (total litres)
- *'Memory'* (remaining strokes) (only with *'Batch'* and *'Contact'*)

To do this simply quit the menu by quickly pressing the key *[P/OK]* key.

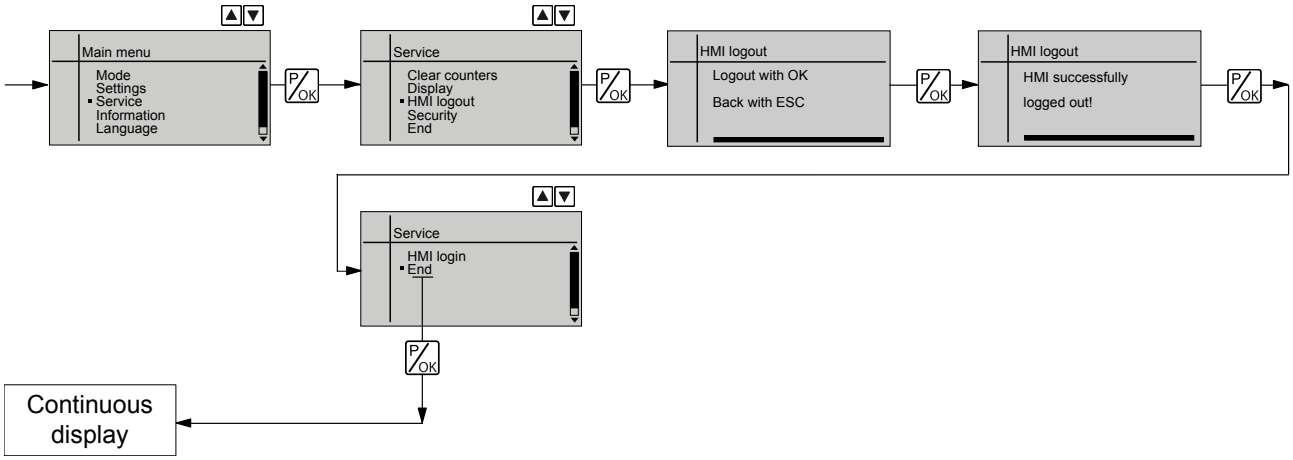
The variables have increased since commissioning of the pump, the last calibration or the last deletion.

8.7.2 Adjusting the Display (DISPLAY menu)



In the *'DISPLAY'* sub-menu the LCD screen contrast can be changed using the *[Arrow keys]*.

8.7.3 HMI logout



In this menu you can log into and out of the pump HMI:

To logout run through the menu above. Thereafter the HMI can be removed from the pump.

Logging on takes place automatically whenever the HMI cable is connected to the CAN port.

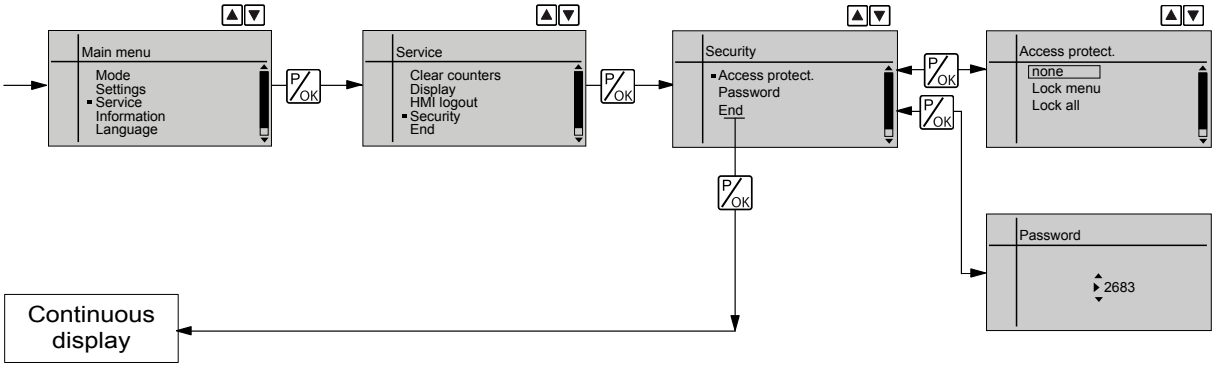
If the HMI must be formally logged into: Logging on via the menu occurs in exactly the same way as logging off.

If the HMI is disconnected from the CAN bus, without first logging it off, the pump remains stationary.

WARNING!
An on/off switch may not be fitted on the pump, dependent on the identity code and installation.

To be able to switch off the pump (to a zero-volts state) independently from the entire installation (e.g. for repair), use an electrical isolating device in the mains supply cable, e.g. a mains switch or a plug / socket combination. Clearly identify this isolating device as such.

8.7.4 Security (SECURITY menu)



In the *'SECURITY'* menu, you can enter for which parts of the adjustment options an *'Access protect'* should apply and a *'password'* be specified.

This menu itself is ALWAYS password protected.

As supplied the 'password' is "1111".

8.7.4.1 Access protect.

In the first menu option, you can either set *'None'* (*'Access protect'*) or *'Lock menu'* or *'Lock all'* :

- Select *'None'*, to clear a set *'Access protect'*.
- Select *'Lock menu'* to lock the adjustment mode (point ① in the overview "Operating/setting diagram", in the appendix).
- Select *'Lock all'* to lock the adjustment option for the directly adjustable variables in the continuous displays and to lock the stroke length (point ② in the overview "Operating/setting diagram", in the appendix), in addition to the adjustment mode.

If an Access protect is then set after 1 minute a padlock will appear instead of the " i " in the top left of the continuous display if in the meantime no key has been pressed.

8.7.4.2 Password

In this menu enter the number you want to use as a password.

The password applies for both locks.

8.7.4.3 Using Access protect and Password

Test

To test whether the menu is locked, press the *[P/OK]* key for 2 s.

If you try to change into a locked area, a *'Password'* request appears.

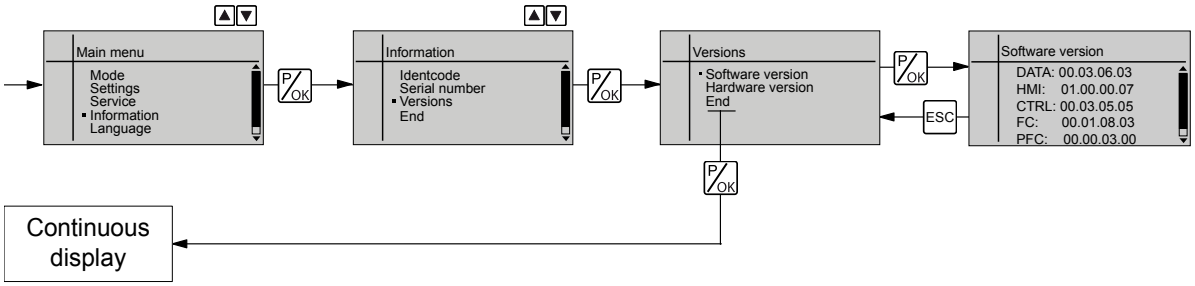
Overriding the Access protect.

To override the Access protect, enter the *'Password'* using the *[arrow keys]* and press the *[P/OK]* key.

Changing the stroke length variable

In the stroke adjustment dial has been turned, the padlock flashes, the pump stops and a fault alert and key appear. If you enter the code, the pump continues metering and the fault alert clears.

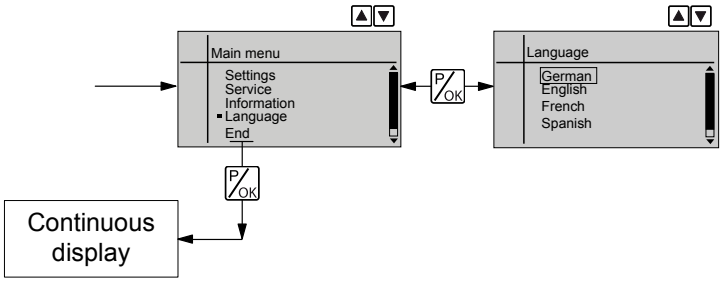
8.8 Information about the pump (INFORMATION menu)



In the "Info" sub-menu you can read off the following identification numbers:

- Identity Code
- Serial number
- Software versions
- Hardware versions

8.9 Set language (LANGUAGE menu)



In the *'LANGUAGE'* menu, you can select the desired operating language.

9 Start up

Safety notes



WARNING!

Fire hazard with flammable media

Only with combustible media: These may start to burn when combined with oxygen.

– During filling and draining of the liquid end, an expert must ensure that feed chemical does not come into contact with oxygen.



CAUTION!

Feed chemical could escape

– Check suction and discharge lines and liquid end with valves for leak-tightness and tighten if necessary.
– Check whether the necessary flushing pipes or bleed lines have been connected.



CAUTION!

Prior to commissioning, check that the pump and corresponding ancillary equipment is connected in compliance with the regulations.



CAUTION!

When using pumps with speed control, observe the instructions in the frequency converter operating instructions.

Diaphragm rupture sensor



CAUTION!

Danger resulting from unnoticed diaphragm rupture

If the pump has been ordered with an electric diaphragm rupture sensor, it still has to be installed.

– Screw the enclosed diaphragm rupture sensor into the liquid end.



CAUTION!

Warning of unnoticed diaphragm rupture

Only above approximately 2 bar system back pressure is a signal generated upon a diaphragm rupture.

– Only rely on the diaphragm rupture sensor at back pressures greater than 2 bar.

Checking the direction of rotation

When commissioning the unit, check whether the drive motor is rotating correctly - check this against the arrow on the motor housing or the diagram in the chapter entitled "Electrical Installation."

Using the integral relief valve

CAUTION!

Danger due to incorrect use of the integral relief valve

The integral relief valve can only protect the motor and the gear, and then only against impermissible positive pressure that is caused by the metering pump itself. It cannot protect the system against positive pressure.

- Protect the motor and gear of the system against positive pressure using other mechanisms.
- Protect the system against illegal positive pressure using other mechanisms.

CAUTION!

Danger of the integral relief valve failing

The integral relief valve no longer operates reliably with feed chemicals having a viscosity of greater than 200 mPa s.

- Only use the integral relief valve with feed chemicals having a viscosity up to 200 mPa s.

Priming against pressure

1. Hydraulically isolate the discharge line from the pump using an isolation device.
2. Turn the rotary dial on the integral relief valve in a counter-clockwise direction as far as the "open" stop.
   ⇨ The excess pressure escapes through the hose connector.
3. Run the pump until the feed chemical coming out of the hose connector is free from bubbles.
4. Turn the rotary dial on the integral relief valve in a clockwise direction up to the "close" stop.
   ⇨ **The pump can be started.**

When operating the integral relief valve close to the opening pressure, a minimal overflow into the overflow line can occur.

Adjusting the stroke length

Only adjust the stroke length when the pump is running. This is easier and also better for the pump.

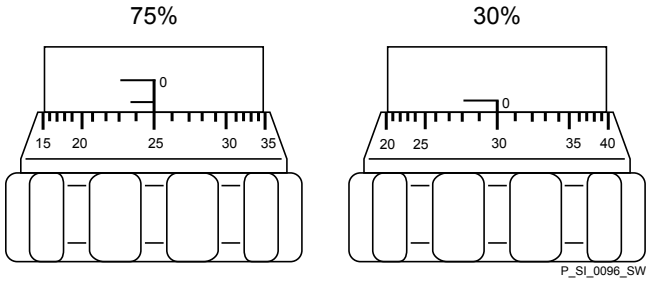


Fig. 30: Adjusting the stroke length

- 100 % = 2 rotations
- 50 % = 1 rotation
- 1 % = 1 scale mark on stroke adjustment dial

10 Operation

WARNING!
Fire hazard with flammable media
Only with combustible media: These may start to burn when combined with oxygen.

– During filling and draining of the liquid end, an expert must ensure that feed chemical does not come into contact with oxygen.

WARNING!
Danger of electric shock
Incompletely installed electrical options can allow moisture into the inside of the housing.

– Knock-out openings in the pump housing must be equipped with matching modules or be sealed in a leak-tight manner.

WARNING!
Danger of electric shock
A mains voltage may exist inside the pump housing.

– If the pump housing has been damaged, you must disconnect it from the mains immediately. It may only be returned to service after an authorised repair.

CAUTION!
Do not over extend the spiral cable of the HMI.

It may only be extended to 0.5 m.

This chapter describes all the operating options available to you if the pump is displaying a continuous display - in the top left of the display there is an " i ".

– *For supplementary information, see the overviews "Control elements and key functions" in the chapter "Device overview and control elements" and "Operating/setting diagram" in the appendix.*
– *Also take note of the overview "Continuous displays" in the appendix. It shows which continuous displays are available in which operating mode and which variables are directly changeable in the relevant continuous display.*

10.1 Manual

Personnel: ■ Instructed personnel

Adjusting the stroke length

The stroke length is adjusted by the stroke length adjustment knob within a range of 0 ... 100 %. A stroke length of between 30 ... 100 %) is recommended to achieve the specified reproducibility.

The following operating options are available via the keys - see the next figure:

Stopping/starting the pump

Stop the pump: Press the *[STOP/START]* key.

Start the pump: press the *[STOP/START]* key again.

Starting batch

In *'Batch'* operating mode: briefly press key *[P/OK]*.

Changing to adjustment mode

In continuous display if you keep the *[P/OK]* key pressed for 2 s, the pump switches into adjustment mode - see "Adjustment" chapter.

If under *'Service ➔ Security ➔ Access protect'* the selection *'Lock menu'* or *'Lock all'* was set, then after pressing the key *[P/OK]* the *'Password'* must first be entered.

Checking adjustable values

Each time you press the *[i/>]* key, you can see a different continuous display possibly mixed with error messages. The number of continuous displays depends on the identity code, the selected operating mode and the connected additional devices.

The same applies for auxiliary displays, which are accessed a longer single press of the key *[i/>]*.

Change directly changeable variables

To change a variable (see below) directly in the corresponding continuous display, press one of the *[arrow keys]*.

If under *'Service ➔ Security ➔ Access protect'* the selection *'Lock all'* was set, then after pressing the key *[P/OK]* the *'Password'* must first be entered.

The directly changeable variables are in detail:

Stroke rate

In operating modes *'Manual'*, *'Contact'* and *'Batch'*:

You can change the stroke rate in the "Stroke rate" continuous display.



To change a precisely previously set feed rate (possibly specified in litres), there is an option of changing it via the stroke rate. As the stroke rate is digitally processed, there is no tolerance.

By contrast, changing via the stroke length interferes with the mechanical tolerance.

Capacity

You can change the capacity once the pump has been calibrated in the "Capacity" continuous display.



To change a precisely previously set feed rate (possibly specified in litres), there is an option of changing it via the capacity. As the capacity is digitally processed, there is no tolerance.

By contrast, changing via the stroke length interferes with the mechanical tolerance.

Factor

Only in *'Batch'* mode: The factor is the number of strokes which are triggered upon an external pulse or pressing of key *[P/OK]*.

Other key functions:

Priming

Simultaneous pressing of the two *[arrow keys]* triggers the "Priming" function.

Acknowledging errors

Error displays are acknowledged by brief pressing of the *[P/OK]* key.

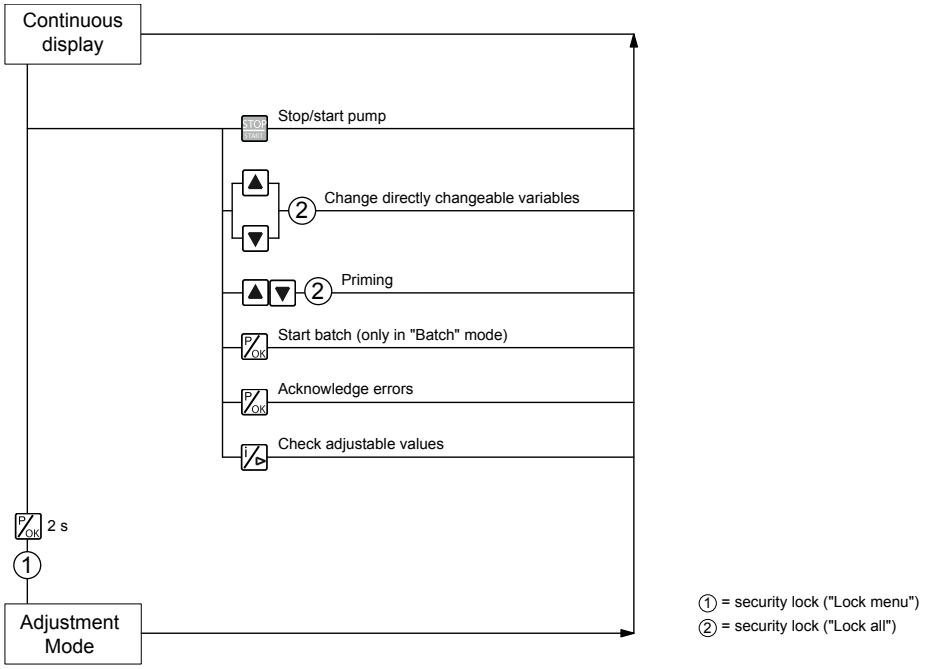


Fig. 31: Operating options with a locked operating menu

10.2 Remote operation

There is an option to control the pump remotely via a signal cable - refer to your system documentation and to the "Electrical Installation" chapter.

The pump can also be remotely controlled via PROFIBUS® (option). Supplementary instructions are available for this.

Or via an external CANopen bus. Supplementary instructions are available for this.

11 Maintenance

Safety notes



WARNING!

Fire hazard with flammable media

Only with combustible media: These may start to burn when combined with oxygen.

– During filling and draining of the liquid end, an expert must ensure that feed chemical does not come into contact with oxygen.



WARNING!

It is mandatory that you read the safety information and specifications in the "Storage, Transport and Unpacking" chapter prior to shipping the pump.



CAUTION!

Warning of feed chemical spraying around

Feed chemical can spray out of the hydraulic components if they are manipulated or opened due to pressure in the liquid end and adjacent parts of the system.

– Disconnect the pump from the mains power supply and ensure that it cannot be switched on again by unauthorised persons.
– Depressurise the system before commencing any work on hydraulic parts.



WARNING!

Warning of dangerous or unknown feed chemical

Should a dangerous or unknown feed chemical be used: It may escape from the hydraulic components when working on the pump.

– Take appropriate protective measures before working on the pump (e.g. safety glasses, safety gloves, ...). Observe the safety data sheet for the feed chemical.
– Drain and flush the liquid end before working on the pump.



WARNING!

Danger of an electric shock

When working on the motor or electrical auxiliary equipment, there is a danger of an electric shock.

– Before working on the motor, take note of the safety instructions in its operating instructions!
– Should external fans, servomotors or other auxiliary equipment be installed, these should also be disconnected and checked that they are voltage free.

Third party spare parts for the pumps may lead to problems when pumping.

– *Use only original spare parts.*
– *Use the correct spare parts kits. In case of doubt, refer to the exploded views and ordering information in the appendix.*

Standard liquid ends:

Interval	Maintenance work	Personnel
Quarterly*	■ Check that the metering lines are fixed firmly to the liquid end. ■ Check that the suction valve and discharge valve are fitted tightly. ■ Check that the dosing head screws are tight. ■ Check the condition of the metering diaphragm - see *'Check the condition of the metering diaphragm' on page 68*. ■ Check that the flow is correct: Allow the pump to prime briefly. ■ Check that the electrical connections are intact.	Technical personnel

* Under normal loading (approx. 30 % of continuous operation).

Under heavy loading (e.g. continuous operation): shorter intervals.

Check the condition of the metering diaphragm

The diaphragm is a wearing part, the service life of which is dependent upon the following parameters:

- System back pressure
- Operating temperature
- Feed chemical properties

When using abrasive feed chemicals, the diaphragm service life is reduced. In such cases, more frequent checking of the diaphragm is recommended.

Tightening torques

Data	Value	Unit
Tightening torques for dosing head screws:	4.5 ... 5.0	Nm

Liquid ends with integral relief valve

WARNING!
Warning of eye injuries
When opening the relief valve, a spring under high tension can jump out.

– Wear protective glasses.

12 Repairs

Safety notes



WARNING!

Fire hazard with flammable media

Only with combustible media: These may start to burn when combined with oxygen.

– During filling and draining of the liquid end, an expert must ensure that feed chemical does not come into contact with oxygen.



WARNING!

It is mandatory that you read the safety information and specifications in the "Storage, Transport and Unpacking" chapter prior to shipping the pump.



CAUTION!

Warning of feed chemical spraying around

Feed chemical can spray out of the hydraulic components if they are manipulated or opened due to pressure in the liquid end and adjacent parts of the system.

– Disconnect the pump from the mains power supply and ensure that it cannot be switched on again by unauthorised persons.
– Depressurise the system before commencing any work on hydraulic parts.



WARNING!

Warning of dangerous or unknown feed chemical

Should a dangerous or unknown feed chemical be used: It may escape from the hydraulic components when working on the pump.

– Take appropriate protective measures before working on the pump (e.g. safety glasses, safety gloves, ...). Observe the safety data sheet for the feed chemical.
– Drain and flush the liquid end before working on the pump.

12.1 Cleaning valves



Unsuitable spare parts for the valves may lead to problems for the pumps.

– *Only use new components that are especially adapted to fit your valve (both in terms of shape and chemical resistance).*
– *Use the correct spare parts kits. In case of doubt, refer to the exploded views and ordering information in the appendix.*

Only with the "Physiologically safe" design:

WARNING!
Product can be dangerously contaminated
Only use the spare parts from the "Physiologically safe" spare parts kits.

Personnel: ■ Technical personnel

Repairing ball valves

CAUTION!
Warning of personal injury and material damage
Feed chemical may escape from the liquid end, for example, if ball valves not repaired correctly.

– Only use new components which fit your valve - both in terms of shape and chemical resistance!
– Note the flow direction of the discharge and suction connectors when fitting the valve.

CAUTION!
Warning of feed chemical spraying around
PTFE seals, which have already been used / compressed, can no longer reliably seal a hydraulic connection.

– New, unused PTFE seals must always be used.

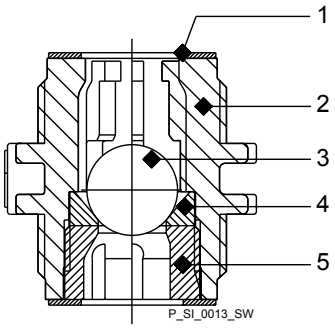


Fig. 32: Simple cross-section through ball valve

1 Flat seal
2 Valve body
3 Valve ball
4 Valve seat
5 Valve cap

12.2 Replacing the diaphragm

Third party spare parts for the pumps may lead to problems when pumping.

- *Use only original spare parts.*
- *Use the correct spare parts kits. In case of doubt, refer to the exploded views and ordering information in the appendix.*

Personnel: ■ Technical personnel

Requirements:

- If necessary take protective measures.
- Adhere to the safety data sheet for the feed chemical.
- Ensure that the system is at atmospheric pressure.

1. Drain the liquid end: Place the liquid end on its head and allow the feed chemical to run out; flush out with a suitable medium; flush the liquid end thoroughly when using hazardous feed chemicals!
2. With the pump running, move the stroke adjustment dial to the stop at 0 % stroke length.
   ⇨ The drive axle is now difficult to turn.
3. Switch off the pump.
4. Unscrew the hydraulic connectors on the discharge and suction side.
5. Unscrew the diaphragm rupture sensor from the dosing head.
6. Remove the 6 screws on the dosing head.
7. Remove the dosing head.
8. Check the condition of the diaphragm rupture sensor - see *'Checking the condition of the diaphragm rupture sensor' on page 73*.
9. Loosen the diaphragm from the drive axle with a gentle backwards turn in the anti-clockwise direction.
10. Completely unscrew the diaphragm from the drive axle.
11. Tentatively screw the new diaphragm anticlockwise up to the stop on the drive axle.
    ⇨ The diaphragm now is now seated against the stop of the thread while the diaphragm flap is within the tolerance range.

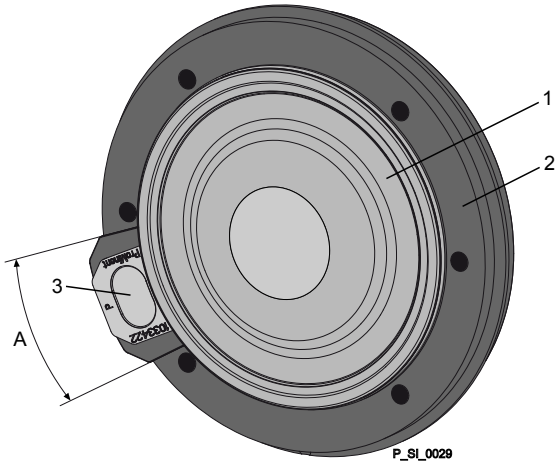


Fig. 33: Tolerance range of the flap on the backplate

1 Diaphragm
2 Backplate
3 Flap
A Tolerance range

12. Should this not work, remove dirt or swarf out of the thread and screw the diaphragm correctly onto the drive axle this time.

    ⇨ If this is still unsuccessful, contact ProMinent-ProMaqua customer service.

13. Place the dosing head with the screws onto the diaphragm - the suction connector must be pointing downwards in the pump's fitting position.

14. Tighten the screws gently to start with.

15. Screw the diaphragm rupture sensor into the dosing head.

16. Start up the pump and adjust the stroke length to 100 %.

17. Stop the pump and tighten the screws crosswise. Tightening torque - see *'Tightening torques' on page 68*.

18. Start the pump and at maximum pressure, check for leaks.

CAUTION!

Warning of escaping feed chemical

The liquid end may leak should it not be possible to check the tightening torque of the screws.

– Check the tightening torque of the screws after 24 hours of operation!
– With PP, PC and TT dosing heads also re-check the tightening torques quarterly!

Checking the condition of the diaphragm rupture sensor

1. If the inside of the diaphragm rupture sensor has become damp or dirt has penetrated it: replace.

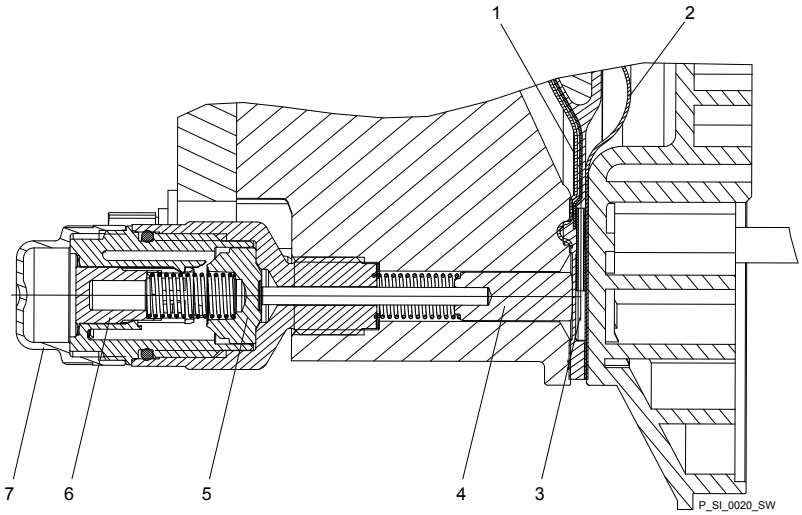


Fig. 34: Section through the Sigma diaphragm rupture warning system ("Visual break indicator" version)

1 Working layer (≙ operating diaphragm)
2 Safety layer (≙ safety diaphragm)
3 Flap
4 Piston
5 Diaphragm rupture sensor
6 Cylinder, red
7 Cover, transparent

2. If the piston of the diaphragm rupture sensor - see Fig. 34, item 4 - should have become dirty or damp, clean both it and the hole in which it runs.
3. Check whether it can move freely in the hole.
4. Refit the clean diaphragm rupture sensor with the clean piston.
5. Test the diaphragm rupture sensor.

Optical diaphragm rupture sensor

1. Unscrew the transparent cover from the diaphragm rupture sensor.
2. Press the red cylinder into the diaphragm rupture sensor until it engages.
3. Press the piston on the other side of the diaphragm rupture sensor with a blunt, smooth object into the dosing head (approximately 4 mm) until it triggers.



CAUTION!

Feed chemical may escape

If the expandable flap of the diaphragm is damaged, then feed chemical can escape when there is a diaphragm rupture.

The piston must not be scratched, it must remain completely smooth so that during operation it does not damage the expandable flap of the diaphragm.

4. Press the red cylinder into the diaphragm rupture sensor again and repeat the test.
5. If it does not trigger both times, replace the membrane rupture sensor.

6. After a successful test, screw the transparent cover onto the diaphragm rupture sensor and then continue at the top by fitting the diaphragm.

Electrical diaphragm rupture sensor

1. Press the piston of the diaphragm rupture sensor with a blunt, smooth object into the dosing head (approximately 4 mm) until the monitor triggers alarm.

CAUTION!

Feed chemical may escape

If the expandable flap of the diaphragm is damaged, then feed chemical can escape when there is a diaphragm rupture.

The piston must not be scratched, it must remain completely smooth so that during operation it does not damage the expandable flap of the diaphragm.

2. Repeat the test.
3. If the monitor does not trigger an alarm both times, replace the membrane rupture sensor.
4. After a successful test, continue at the top by fitting the diaphragm.

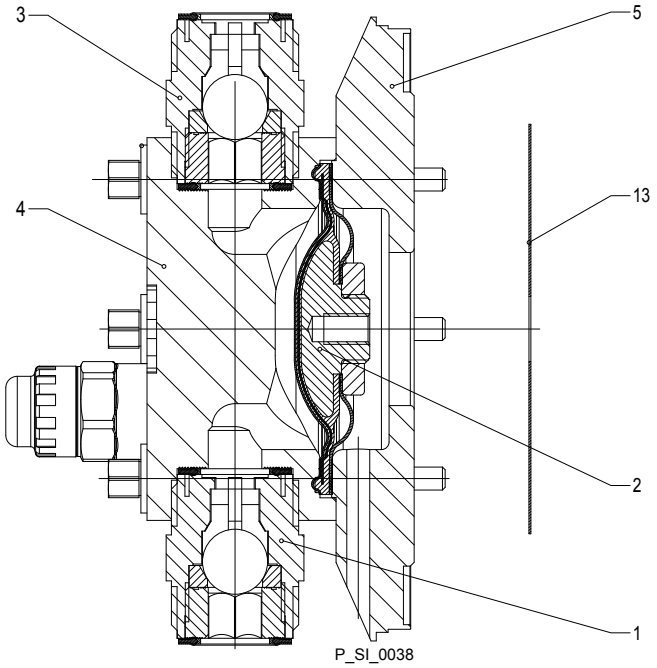


Fig. 35: Cross-section through the liquid end

1 Suction valve
2 Diaphragm
3 Discharge valve
4 Dosing head
5 Backplate
13 Safety diaphragm

Tightening torques

Data	Value	Unit
Tightening torques for dosing head screws:	4.5 ... 5.0	Nm

13 Troubleshooting

Safety notes



WARNING!

Fire hazard with flammable media

Only with combustible media: These may start to burn when combined with oxygen.

– During filling and draining of the liquid end, an expert must ensure that feed chemical does not come into contact with oxygen.



WARNING!

Danger of an electric shock

Personnel working on electrical parts can be electrocuted if all electrical lines carrying current have not been disconnected.

– Disconnect the supply cable before working on the motor and prevent it from being reconnected accidentally.
– Any separately driven fans, servo motors, speed controllers or diaphragm rupture sensors fitted should also be disconnected.
– Check that the supply cables are de-energised.



WARNING!

Warning of dangerous or unknown feed chemical

Should a dangerous or unknown feed chemical be used: It may escape from the hydraulic components when working on the pump.

– Take appropriate protective measures before working on the pump (e.g. safety glasses, safety gloves, ...). Observe the safety data sheet for the feed chemical.
– Drain and flush the liquid end before working on the pump.



CAUTION!

Warning of feed chemical spraying around

Feed chemical can spray out of the hydraulic components if they are manipulated or opened due to pressure in the liquid end and adjacent parts of the system.

– Disconnect the pump from the mains power supply and ensure that it cannot be switched on again by unauthorised persons.
– Depressurise the system before commencing any work on hydraulic parts.

13.1 Faults without a fault alert

Fault description	Cause	Remedy	Personnel
Pump does not prime in spite of full stroke motion and bleeding.	Minor crystalline deposits on the ball seat due to the valves drying out	Take suction hose out of the storage tank and thoroughly flush out the liquid end	Technical personnel
	Major crystalline deposits on the ball seat due to the valves drying out	Dismantle the valves and clean them - refer to the "Overhaul" chapter.	Technical personnel

Fault description	Cause	Remedy	Personnel
Fluid is escaping from the backplate.	The screws in the dosing head are too loose	Tighten the screws in the dosing head in a diagonal pattern - refer to the "Repairs" chapter for tightening torque.	
	The diaphragm is not tight.	Replace the diaphragm - refer to the "Overhaul" chapter. If a diaphragm rupture has been indicated, clean the diaphragm rupture reporter, refer to the "Overhaul" chapter.	Technical personnel
The CAN LED flickers after connection of the HMI to the pump.	The software versions of the pump and HMI are different.	Wait. In the log term, arrange for service to update the pump software.	
Green LED display (operating display) does not light up	The wrong mains voltage or no mains voltage is connected.	Connect the pump correctly to the specified mains voltage - according to the specification on the nameplate.	Electrician

13.2 Fault alerts

Red LED "Fault indicator" lights up.

Fault description	Cause	Remedy	Personnel
The "Level" symbol appears flashing on the LCD screen, plus the error message *'Level error'* E-33-3 and the pump stops.	The fluid level in the storage tank has reached "liquid level low 2nd stage".	Fill the storage tank.	Technical personnel
The "External" **MEM** symbol appears flashing on the LCD screen plus the *'Memory overflow'* E-34-3 error message, and the pump stops.	The stroke memory has overflown.	Rectify the cause, then press the *[P/OK]* key (think through the consequences for the process!).	Technical personnel
The **i < 4mA** symbol appears flashing on the LCD screen plus the error message *'4 mA undershot'* E-35-3, and the pump stops.	The pump is in *'Analog' 'operating mode'*, a fault behaviour has been programmed in the *'ANALOG'* menu and the control current has fallen below 4 mA.	Clear the cause of the low control current or	Technical personnel
The **i > 20mA** symbol appears flashing on the LCD screen plus the error message *'20 mA exceeded'* E36-3, and the pump stops.	The pump is in *'Analog' 'operating mode'*, a fault behaviour has been programmed in the *'ANALOG'* menu and the control current has risen above 23 mA.	Clear the cause of the high control current or	Technical personnel
The **FLOW** symbol appears flashing on the LCD screen plus the error message *'Defective metering strokes'* E37-3, and the pump stops.	The dosing monitor is not correctly connected.	Connect the dosing monitor correctly and Press the *[P/OK]* key.	Electrician
	The dosing monitor reported too few strokes, more than set in the *'FLOW'* menu.	Press the *[P/OK]* key. Investigate and clear the cause	Technical personnel
The **DIA** "Diaphragm" symbol appears flashing on the LCD screen plus the *'Diaphragm rupture'* E38-3 error message, and the pump stops.	The diaphragm is broken.	Replace the diaphragm and clean the diaphragm rupture sensor, refer to the "Repair" chapter.	Technical personnel
The **STRK** "Stoke length adjustment" symbol appears flashing on the LCD screen plus the error message *'Stroke length adjusted'* E39-3, and the pump stops.	The stroke adjustment dial was rotated by more than 10 % while the menu was locked.	Turn the stroke adjustment dial back or enter the password.	Technical personnel

Fault description	Cause	Remedy	Personnel
The FC "Temperature" symbol appears flashing on the LCD screen plus the error message *'FC temperature'* E47-4, and the pump stops.	The pump is overloaded.	Rectify the cause, then press the *[P/OK]* key (think through the consequences for the process!).	Technical personnel
	The temperature is too high.	Rectify the cause, then press the *[P/OK]* key (think through the consequences for the process!).	Technical personnel
The p+ FC "excess pressure" symbol appears flashing on the LCD screen plus the error message *'Overload FC'* E48-4, and the pump stops.	A constriction or a closed shut-off valve on the discharge side.	Open the shut-off valve or clear the constriction, then press the *[P/OK]* key (think through the consequences for the process!).	Technical personnel
The PWR "Power" symbol appears on the LCD screen plus the *'Mains voltage'* E51-5 error message, and the pump stops.	No or incorrect mains voltage.	Connect the correct mains voltage.	Technical personnel

13.3 Warning messages

Yellow LED indicator "warning indicator" lights up:

Fault description	Cause	Remedy	Personnel
The "Level" symbol ! appears flashing on the LCD screen, plus the error message *'Level warning'* W1-3.	The fluid level in the storage tank has reached "liquid level low 1st stage".	Fill the storage tank.	Instructed personnel
The ! cal "Calibration" symbol appears on the LCD screen, plus the error message *'Calibration warning'* W2-3.	The stroke adjustment dial of the calibrated pump was rotated by more than 10 %.	Turn the stroke adjustment dial back or recalibrate the pump.	Instructed personnel
The "Flow" symbol ! appears flashing on the LCD screen, plus the error message *'Defective strokes dosing'* W3-3.	The dosing monitor is not correctly connected.	Connect the dosing monitor correctly and Press the *[P/OK]* key.	Electrician
	The dosing monitor reported too few strokes, more than set in the *'FLOW'* menu.	Press the *[P/OK]* key. Investigate and clear the cause.	Technical personnel
The ! dia "diaphragm" symbol appears on the LCD screen, plus the error message *'Diaphragm rupture'* W4-3.	The diaphragm is broken.	Replace the diaphragm and clean the diaphragm rupture sensor, refer to the "Repair" chapter.	Technical personnel
The "Stroke length adjustment" symbol ! appears flashing on the LCD screen, plus the error message *'Stroke length wrongly adjusted'* W5-3.	The stroke adjustment dial was rotated by more than 10 % while the menu was locked.	Turn the stroke adjustment dial back or enter the code.	Technical personnel
The ! p+ "Overload" symbol appears flashing on the LCD screen plus the error message *'FU overload'* W6-4.	A constriction or a closed shut-off valve on the discharge side.	Open the shut-off valve or rectify the constriction.	Technical personnel
The "Temperature" symbol ! appears flashing on the LCD screen, plus the error message *'Temperature FC'* W7-4.	The frequency converter is overloaded.	Rectify the cause, then press the *[P/OK]* key (think through the consequences for the process!).	Technical personnel
	The temperature is too high.	Rectify the cause, then	Technical personnel

Fault description	Cause	Remedy	Personnel
		press the *[P/OK]* key (think through the consequences for the process!).	
The "Temperature" symbol ! appears flashing on the LCD screen, plus the error message *'Temperature PFC'* W7-5.	The pump is overloaded.	Rectify the cause, then press the *[P/OK]* key (think through the consequences for the process!).	Technical personnel
	The temperature is too high.	Rectify the cause, then press the *[P/OK]* key (think through the consequences for the process!).	Technical personnel
The *'BUS'* symbol ! appears flashing on the LCD screen, plus the error message *'CANopen pump'* W8-3.	The HMI was connected to a CANopen pump.	Disconnect the HMI from the pump.	Technical personnel

13.4 All other faults

Please contact the responsible ProMinent branch or agency, see *www.prominent.de* - "Contact" - "Your contact worldwide" or as the case may be, the published by details of these operating instructions.

14 Decommissioning

Decommissioning



WARNING!

Fire hazard with flammable media

Only with combustible media: These may start to burn when combined with oxygen.

– During filling and draining of the liquid end, an expert must ensure that feed chemical does not come into contact with oxygen.



WARNING!

Danger of an electric shock

When working on the motor or electrical auxiliary equipment, there is a danger of an electric shock.

– Before working on the motor, take note of the safety instructions in its operating instructions!
– Should external fans, servomotors or other auxiliary equipment be installed, these should also be disconnected and checked that they are voltage free.



WARNING!

Danger from chemical residues

There is normally chemical residue in the liquid end and on the housing after operation. This chemical residue could be hazardous to people.

– It is mandatory that the safety note relating to the "Storage, Transport and Unpacking" chapter is read before shipping or transporting the unit.
– Thoroughly clean the liquid end and the housing of chemicals and dirt. Adhere to the safety data sheet for the feed chemical.



WARNING!

Warning of dangerous or unknown feed chemical

Should a dangerous or unknown feed chemical be used: It may escape from the hydraulic components when working on the pump.

– Take appropriate protective measures before working on the pump (e.g. safety glasses, safety gloves, ...). Observe the safety data sheet for the feed chemical.
– Drain and flush the liquid end before working on the pump.



CAUTION!

Warning of feed chemical spraying around

Feed chemical can spray out of the hydraulic components if they are manipulated or opened due to pressure in the liquid end and adjacent parts of the system.

– Disconnect the pump from the mains power supply and ensure that it cannot be switched on again by unauthorised persons.
– Depressurise the system before commencing any work on hydraulic parts.



WARNING!

Warning of eye injuries

When opening the relief valve, a spring under high tension can jump out.

– Wear protective glasses.



CAUTION!

Danger of damage to the device

The device can be damaged by incorrect and improper storage or transportation.

– Take into account the information in the "Storage, Transport and Unpacking" chapter if the system is decommissioned for a temporary period.

(Temporary) decommissioning

Personnel: ■ Technical personnel

1. Disconnect the pump from the mains power supply.
2. Depressurise and bleed the hydraulic system around the pump.
3. Drain the liquid end by turning the pump upside down and allowing the feed chemical to run out.
4. Flush the liquid end with a suitable medium - Observe the safety data sheet! Flush the dosing head thoroughly when using hazardous feed chemicals!
5. Possible additional work - see chapter "Storage, Transport and Unpacking".

Disposal

Personnel: ■ Technical personnel



CAUTION!

Environmental hazard due to incorrect disposal

– Note the local guidelines currently applicable in your country, particularly in regard to electronic waste!

15 Technical data

15.1 Performance data

S1Cb

Type	Minimum pump capacity at maximum back pressure				Maximum stroke rate		Suction lift	Permissible priming pressure, suction side	Connector size
	bar	psi	l/h	gph	Strokes/min	ml/stroke	m WS	bar	R"-DN
12017 PVT	10	145	21	5	90	3.8	7	1	3/4" - 10
12017 SST	12	174	21	5	90	3.8	7	1	3/4" - 10
12035 PVT	10	145	42	11	170	4.0	7	1	3/4" - 10
12035 SST	12	174	42	11	170	4.0	7	1	3/4" - 10
10050 PVT	10	145	49	12	200	4.0	7	1	3/4" - 10
10050 SST	10	145	49	12	200	4.0	7	1	3/4" - 10
10022 PVT	10	145	27	7	90	5.0	6	1	3/4" - 10
10022 SST	10	145	27	7	90	5.0	6	1	3/4" - 10
10044 PVT	10	145	53	14	170	5.1	6	1	3/4" - 10
10044 SST	10	145	53	14	170	5.1	6	1	3/4" - 10
07065 PVT	7	102	63	16	200	5.2	6	1	3/4" - 10
07065 SST	7	102	63	16	200	5.2	6	1	3/4" - 10
07042 PVT	7	102	52	13	90	9.6	3	1	1" - 15
07042 SST	7	102	52	13	90	9.6	3	1	1" - 15
04084 PVT	4	58	101	26	170	9.7	3	1	1" - 15
04084 SST	4	58	101	26	170	9.7	3	1	1" - 15
04120 PVT	4	58	117	30	200	9.7	3	1	1" - 15
04120 SST	4	58	117	30	200	9.7	3	1	1" - 15

All figures refer to water at 20 °C.

The suction lift applies to filled suction line and filled liquid end - when installed correctly.

Precision

Data	Value	Unit
Reproducibility	±2	% *

* - when installed correctly, under constant conditions, at least 30 % stroke length and water at 20 °C

15.2 Viscosity

The liquid ends are suitable for the following viscosity ranges:

Version	Stroke rate, max.	Viscosity
	Strokes/min	mPas
Standard	180	0 ... 200
With valve springs	130	200 ... 500
With valve springs and suction-side feed	90	500 ... 1000*

* Only when the installation is correctly adjusted

15.3 Shipping weight

Types	Material version	Shipping weight
		kg
12017; 12035; 10050	PVT	9.8
	SST	11.7
10022; 10044; 07065	PVT	9.8
	SST	11.7
07042; 04084; 04120	PVT	10.0
	SST	13.2

15.4 Wetted materials

Material version	Liquid end	Suction/pressure connector	Seals* / ball seat	Balls	Springs	Integral relief valve
PVT	PVDF	PVDF	PTFE/PTFE	Ceramic	Hastelloy C	PVDF / FPM or EPDM
SST	Stainless steel 1.4404	Stainless steel 1.4581	PTFE/PTFE	Stainless steel 1.4404	Hastelloy C	Stainless steel / FPM or EPDM

* Metering diaphragm is PTFE coated

15.5 Ambient conditions

15.5.1 Ambient temperatures

Pump, compl.

Data	Value	Unit
Storage and transport temperature	-10 ... +50	°C
Ambient temperature in operation (drive + motor):	-10 ... +45	°C

15.5.2 Media temperatures

PVT liquid end

Data	Value	Unit
Max. temperature long-term at max. operating pressure	65	°C
Max. temperature for 15 min at max. 2 bar	100	°C
Minimum temperature	-10	°C

SST liquid end

Data	Value	Unit
Max. temperature long-term at max. operating pressure	90	°C
Max. temperature for 15 min at max. 2 bar	120	°C
Minimum temperature	-10	°C

15.5.3 Air humidity

Air humidity

Data	Value	Unit
Maximum air humidity *:	95	% rel. humidity

* non-condensing

15.5.4 Enclosure rating and safety requirements

Degree of protection

Protection against accidental contact and humidity:

IP 65 in accordance with IEC 529, EN 60529, DIN VDE 0470 Part 1

A CAN plug or the supplied sealing cap must always be plugged into the CAN port for the HMI.

Safety requirements

Degree of protection:

1 - mains power connection with protective earth conductor

15.6 Electrical connection

The electrical data do not relate to the motor, but the pump, which is connected as a whole unit.

For the motor electrical data use the motor data sheet in the appendix.

Electrical data S1Cb pump

Identity code specification "power supply" - "U": 100 - 230 V ± 10 %, 240 V ± 6 %, 50/60 Hz

Data	Value	Unit
Capacity	110	W
Max. starting current	8.5	A

Electrical data at 100 VAC

Data	Value	Unit
Effective current	1.5	A
Switch on peak current, (for approx. 100 ms)	4	A

Electrical data at 230 VAC

Data	Value	Unit
Effective current	0.6	A
Switch on peak current, (for approx. 100 ms)	8	A

Fuses

Fuse	Value	Part no.
Fuse, internal	3.15 AT - (1.5 kA)	732414

Only use the original fuses from ProMinent! It is not sufficient to use a fuse with the above fuse rating.

15.7 Diaphragm rupture sensor

Contact (standard)

Contact loading, max.

at voltage	Maximum current
30 V DC	1 A

The contact is an opener.

The contact is an potential-free.

- *For safety reasons we recommend connecting to a protective low voltage, e.g. in accordance with EN 60335-1 (SELV).*
- *The cable can be poled as required.*

15.8 Relay

The technical data for the relay are contained in the chapter "Installation, electrical".

15.9 Sound pressure level

Sound pressure level

Sound pressure level LpA < 70 dB according to EN ISO 20361

at maximum stroke length, maximum stroke rate, maximum back pressure (water)

16 Dimensional drawings

- *Compare the dimensions on the dimension sheet and pump.*
- *All dimensions are in mm.*

HMI and wall bracket

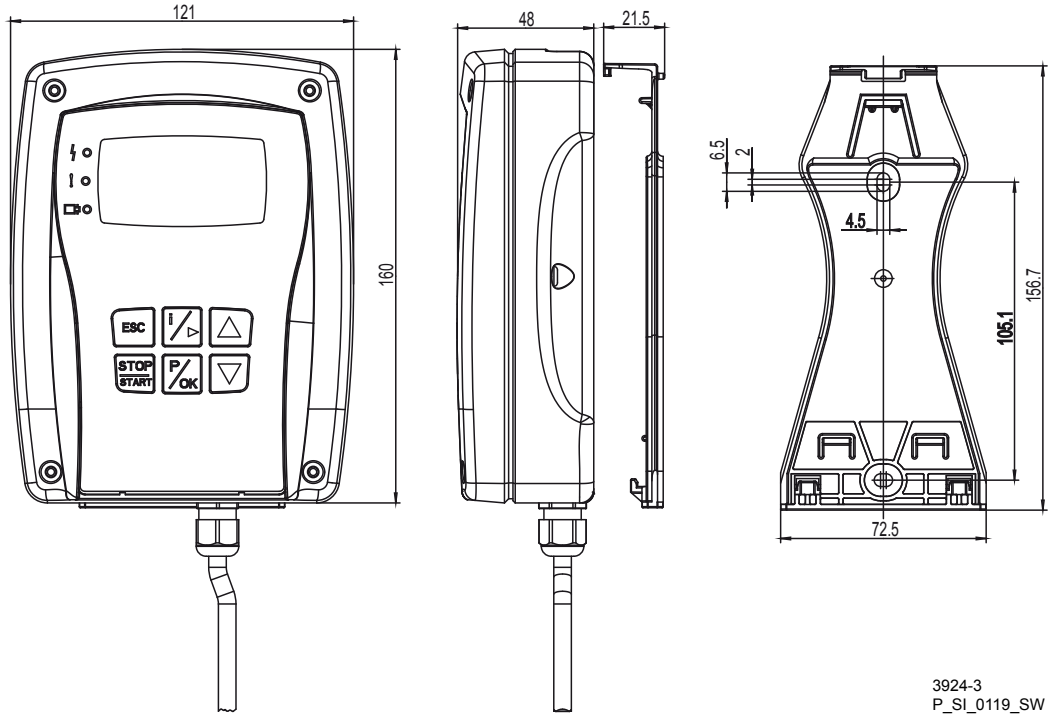
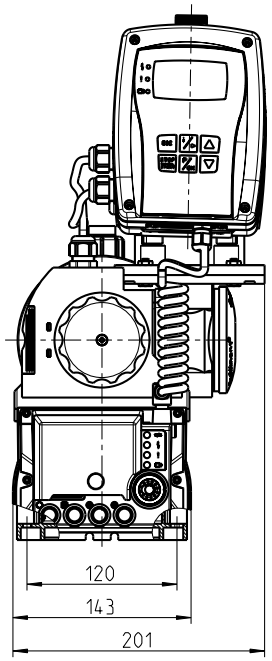
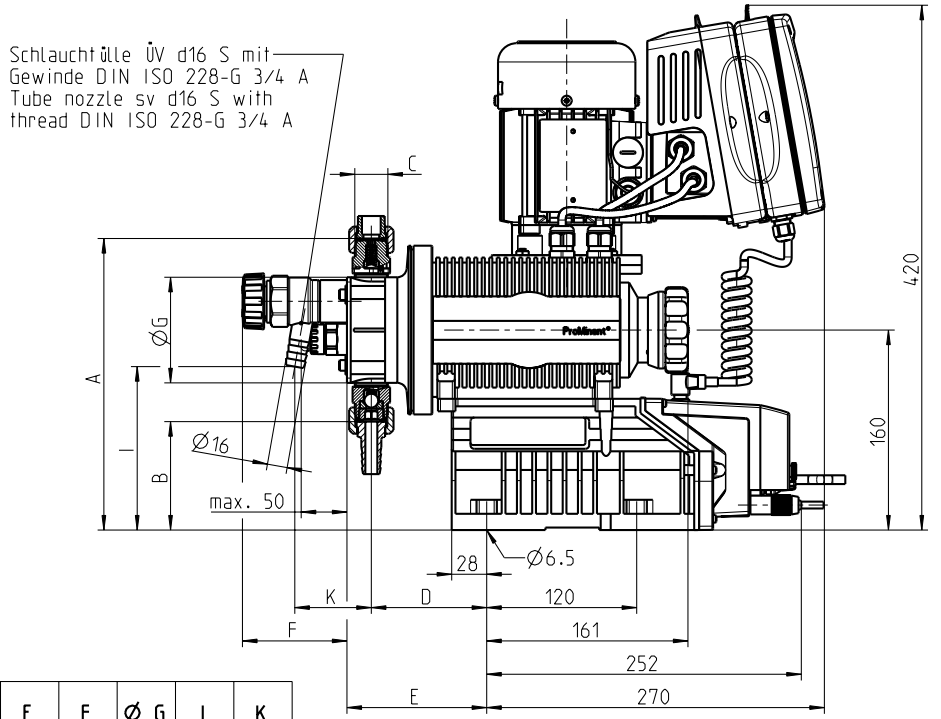


Fig. 36: Dimensions in mm





Typ	Anschluss connection	A	B	C	D	E	F	Ø G	I	K
Sigma 12017.12035. 10050 PVT	DN 10	234	87	G 3/4 A	93	109	-/-	96	-/-	-/-
Sigma 12017.12035. 10050 PVT - Entlüft./vent						112	84		131	62
Sigma 12017.12035. 10050 SST	DN 10	231	89	G 3/4 A	92	108	-/-	108	-/-	-/-
Sigma 12017.12035. 10050 SST - Entlüft./vent							88		100	45
Sigma 10022.10044. 07065 PVT	DN 10	234	87	G 3/4 A	93	109	-/-	96	-/-	-/-
Sigma 10022.10044. 07065 PVT - Entlüft./vent						112	84		131	62
Sigma 10022.10044. 07065 SST	DN 10	231	89	G 3/4 A	92	108	-/-	108	-/-	-/-
Sigma 10022.10044. 07065 SST - Entlüft./vent							88		100	45
Sigma 07042.04084. 04120 PVT	DN 15	243	78	G 1 A	98	119	-/-	122	-/-	-/-
Sigma 07042.04084. 04120 PVT - Entlüft./vent						129	74		138	63
Sigma 07042.04084. 04120 SST	DN 15	243	78	G 1 A	97	118	-/-	124	-/-	-/-
Sigma 07042.04084. 04120 SST - Entlüft./vent							88		112	51

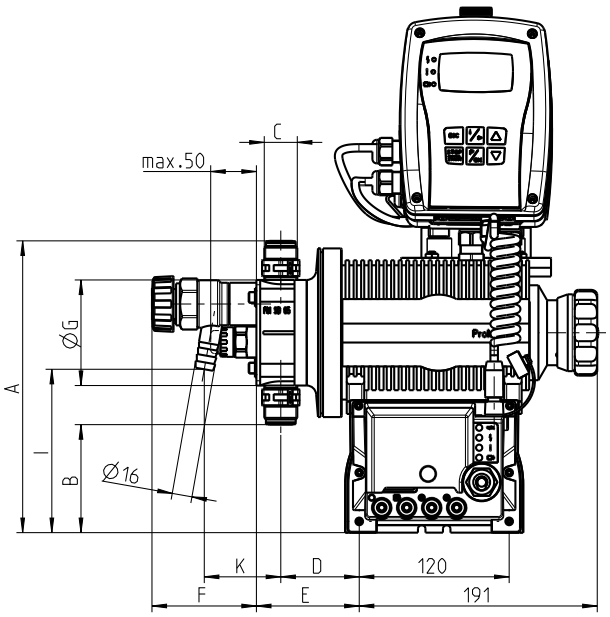
Revision	Aenderungen Changes	Aenderungsbeschreibung: 09214 Change description
1		

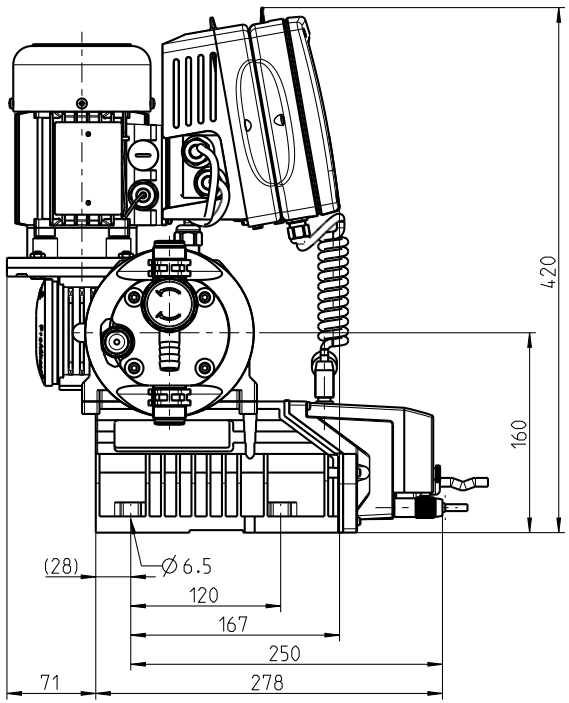
Status	Datum/Date	Name:	Modell/Model: 61_01-101_00_78-0A_001	1.17
Freigegeben	31.07.2012	Silke Bonin	Zng./Draw.: 61_01-101_00_83-7A	1.9
Massstab/Scale -/-	Volumen/Volume	Gewicht/Weight	Werkstoff/Material: Halbzeug/Half-finished part:	
Form- und Lage Shape and positional tolerance	Werkstueckkanten Edge finish	Allgem.Tol. General tolerances	Oberflaechentol. Surfaces tolerance	Bezeichnung/Description: Maßblatt S1Cb Dimension drawing

ProMinent Dosiertechnik GmbH Im Schuhmachergewann 5-11 D-69123 Heidelberg Postfach 101760 D-69007 Heidelberg	Tolerierungsgrundsatz Fundamental Tolerancing Principle DIN 7167	ISO 128	Zeichnungsnummer/Drawing number: 61_01-101_00_83-7A	Blatt/Sheet: 1/2
	(Urspr.)		(Ers. f.:)	

CAD-System: Pro/ENGINEER | Format/ Size: A3 (2010-11-01)

Schutzvermerk ISO 16016 beachten
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Typ	Anschluss connection	A	B	C	D	E	F	Ø G	I	K
Sigma 12017.12035, 10050 PVT	DN 10	234	87	G 3/4 A	63	79	-/-	96	-/-	-/-
Sigma 12017.12035, 10050 PVT - Entlüft./vent						82	84		131	62
Sigma 12017.12035, 10050 SST	DN 10	231	89	G 3/4 A	62	78	-/-	108	-/-	-/-
Sigma 12017.12035, 10050 SST - Entlüft./vent							88		100	45
Sigma 10022.10044, 07065 PVT	DN 10	234	87	G 3/4 A	63	79	-/-	96	-/-	-/-
Sigma 10022.10044, 07065 PVT - Entlüft./vent						82	84		131	62
Sigma 10022.10044, 07065 SST	DN 10	231	89	G 3/4 A	62	78	-/-	108	-/-	-/-
Sigma 10022.10044, 07065 SST - Entlüft./vent							88		100	45
Sigma 07042.04084, 04120 PVT	DN 15	243	78	G 1 A	68	89	-/-	122	-/-	-/-
Sigma 07042.04084, 04120 PVT - Entlüft./vent						99	74		138	63
Sigma 07042.04084, 04120 SST	DN 15	243	78	G 1 A	67	88	-/-	124	-/-	-/-
Sigma 07042.04084, 04120 SST - Entlüft./vent							88		112	51

Ausführung "Fördereinheit links"
Execution "Liquid end left"

Revision	Aenderungen Changes	Aenderungsbeschreibung/ ECN: 13306-004 Change description
2	1	Blatt 3 hinzu / Page 3 added

Status	Datum/Date	Genehmiger/Released by	Modell/Model: 61_01-101_00_78-0A_LINKS	6.5
Freigegeben	2014-01-15	T. Urbahn	Zng./Draw.: 61_01-101_00_83-7A	2.4

Massstab/Scale	Volumen/Volume	Gewicht/Weight	Werkstoff/Material:
-	-	-	Halbzeug/Half-finished part: -

Form- und Lage Shape and positional tolerance	Werkstueckkanten Edge finish	Allgem.Tol. General tolerances	Oberflaechentol. Surfaces tolerance	Bezeichnung/Description
				Maßblatt S1Cb Dimension drawing S1Cb

ProMinent Dosiertechnik GmbH	Tolerierungsgrundsatz Fundamental Tolerancing Principle	ISO 128	Zeichnungsnummer/Drawing number	Blatt/Sheet
Im Schumachergewann 5-11 D-69123 Heidelberg Postfach 101760 D-69007 Heidelberg	DIN 7167		61_01-101_00_83-7A	3/3
	(Urspr.)		(Ers. f.:)	

CAD-System: Pro/ENGINEER | Format/ Size: A3 (2013-11-01)

Schutzvermerk ISO 16016 beachten
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17 Motor data sheets

Motor Datenblatt / Motor data sheet / Fiche technique pour moteur / Hoja de datos del motor

Bestell Nr. / order no. **no. de commade / No.de pedido**	**1042145**	**Hersteller / producer** **producteur / fabricánte**	**Bonfiglioli** (W83032050790023)

Motor- Typ motor type type du moteur tipo de motor	X_BN 56B 4 230/400-50 IP55 CLF B5 12649/1000	**Leistungsfaktor** power factor facteur de puissance factor de potencia	0,6	
Maschinenart type of machine désignation tipo de máquina	3 Ph. Motor	**Wirkungsgrad** efficiency rendement rendimiento	51,7 % (100 %) 47,6 % (75 %)	
Schutzart degree of protection degré de protection clase de protección	IP 55	**Bemessungsfrequenz** rated frequency fréquence nominale frequencia nominal	50 / 60 Hz	
Bauform mounting construction Forma constructiva	B5	**Bemessungsdrehzahl** rated speed vitesse nominale velocidad nominal	1350/1620	U/min rpm t/mn
Bemessungsleistung rated output puissance nominale potencia nominal	0,09 kW	**Wärmeklasse** temperature class class d'isolement clase térmica	F	
Bemessungsspannung rated voltage tension nominale tension nominal	⅄ / Δ 400/230 V (+/- 10%)	**Anzugsstrom** starting current courant de démarrage correinte de arranque	2,6	fach fold fois veces
Bemessungsstrom rated current courant nominale corriente nominal	0,42 A bei / at 400 V	**Anzugsmoment** starting torque couple de démarrage par de arranque	2,4	fach fold fois veces
Geprüft nach tested in acc. with contrôlé selon testado de acuerdo a	CEI EN 60034-1	**Kippmoment** pull-out torque couple de décrochage par de inversión	2,5	fach fold fois veces
ATEX Nr.		**Umgebungstemperatur** ambient temperature température ambiante temperatura ambiente	-15° C - +40° C	
Ex-Schutzklasse ex-protective system class de protection Ex clase de protección Ex		**Schaltung** connection branchement conexión	⅄ / Δ	
		Drehzahlregelbereich speed ajustment range		

Anmerkung comments observation observación	Getriebemotor / drive motor / motoréducteur / motorreductor Übersetzung / drive ratio / rapport de transmission / relación de transmisiòn: 20:1
ProMinent Pumpentyp pump type type de pompe tipo de bomba	S1CbH _ _ _ _ _ _ _ _ _ _ _ _ U _ _ _ _ _ _

Die Daten entsprechen den Angaben der Motorenhersteller. Kenndaten funktionsgleicher Motoren anderer Hersteller ändern sich nur unwesentlich. Angaben ohne Gewähr. The data correspond to the details given by the motor manufacturers. Ratings of motors with the same functions made by other producers show insignificant changes only. This information is supplied without liability. Les données techniques correspondent au descriptif du fabricant des moteurs. Les données techniques des moteurs similaires chez d' autres fabricants varient très peu. Données sont d' ordre général.Los datos corresponden la información obtenida por el fabricante de Motores. Las caracteristicas del funcionamiento identico de los Motores de otros fabricantes cambian solo marginalmente. A la Información no se asuma responsabilidad.

ProMinent Dosiertechnik GmbH . 69123 Heidelberg . Germany No. MD-1042145 Datum/Date August 2012

18 Exploded view drawings

18.1 Exploded drawings Sigma/ 1

Liquid end Sigma/ 1 050 and 065 PVT

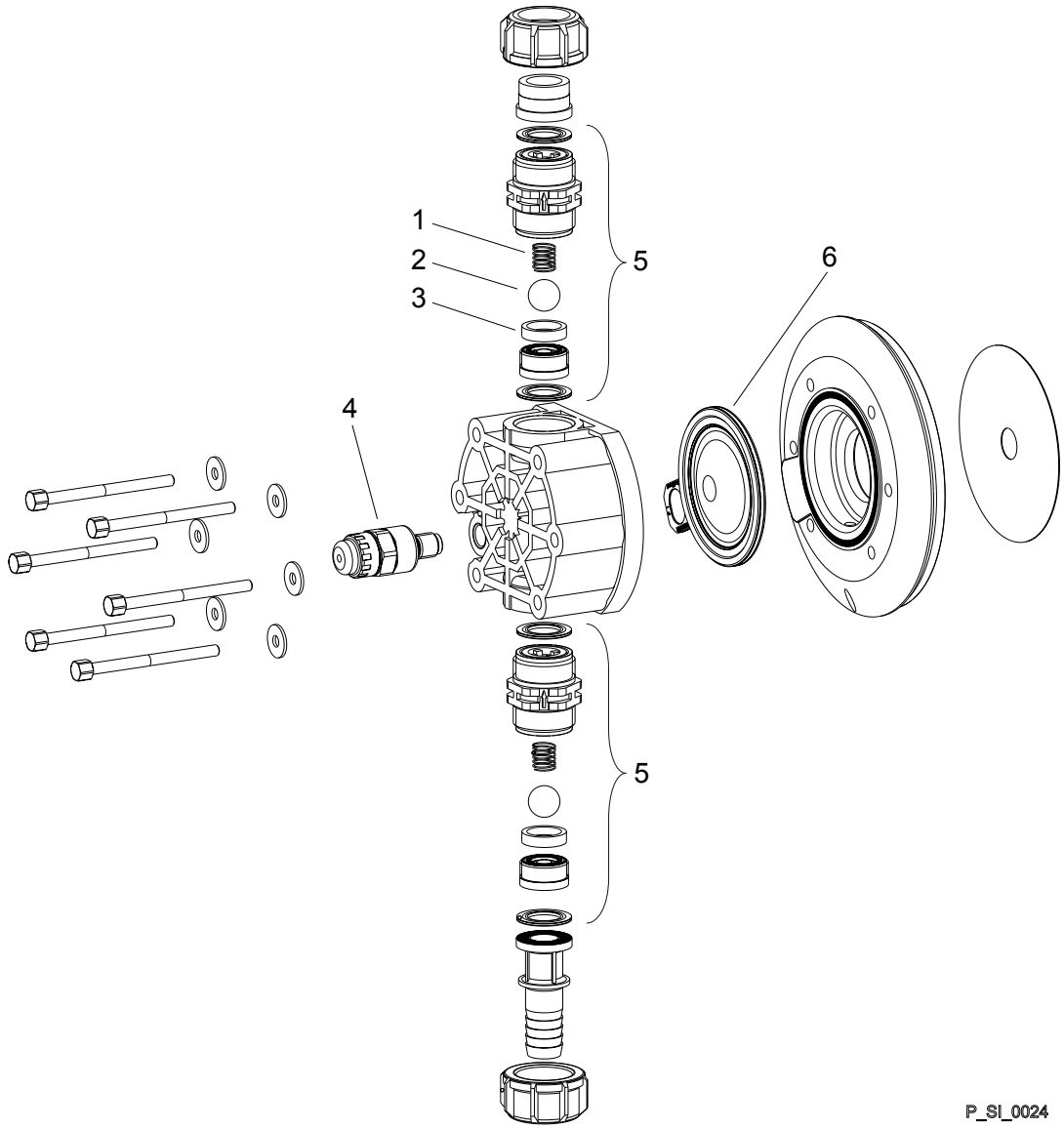


Fig. 37: Liquid end Sigma/ 1 050 and 065 PVT

Item	Description	Type 12035, 12017, 10050	Type 07065, 10044, 10022
1	Spring	**	**
2	Ball	*	*
3	Ball seat	*	*
4	Diaphragm rupture sensor, visual	1033323	1033323
5	Valve	1002267*	1002267*
6	Multi-layer diaphragm	1030114*	1030115*

* The items listed are included in the spare parts kit. ** Special accessories (not included in the spare parts kit). Technical changes reserved.

Liquid end Sigma/ 1 120 PVT

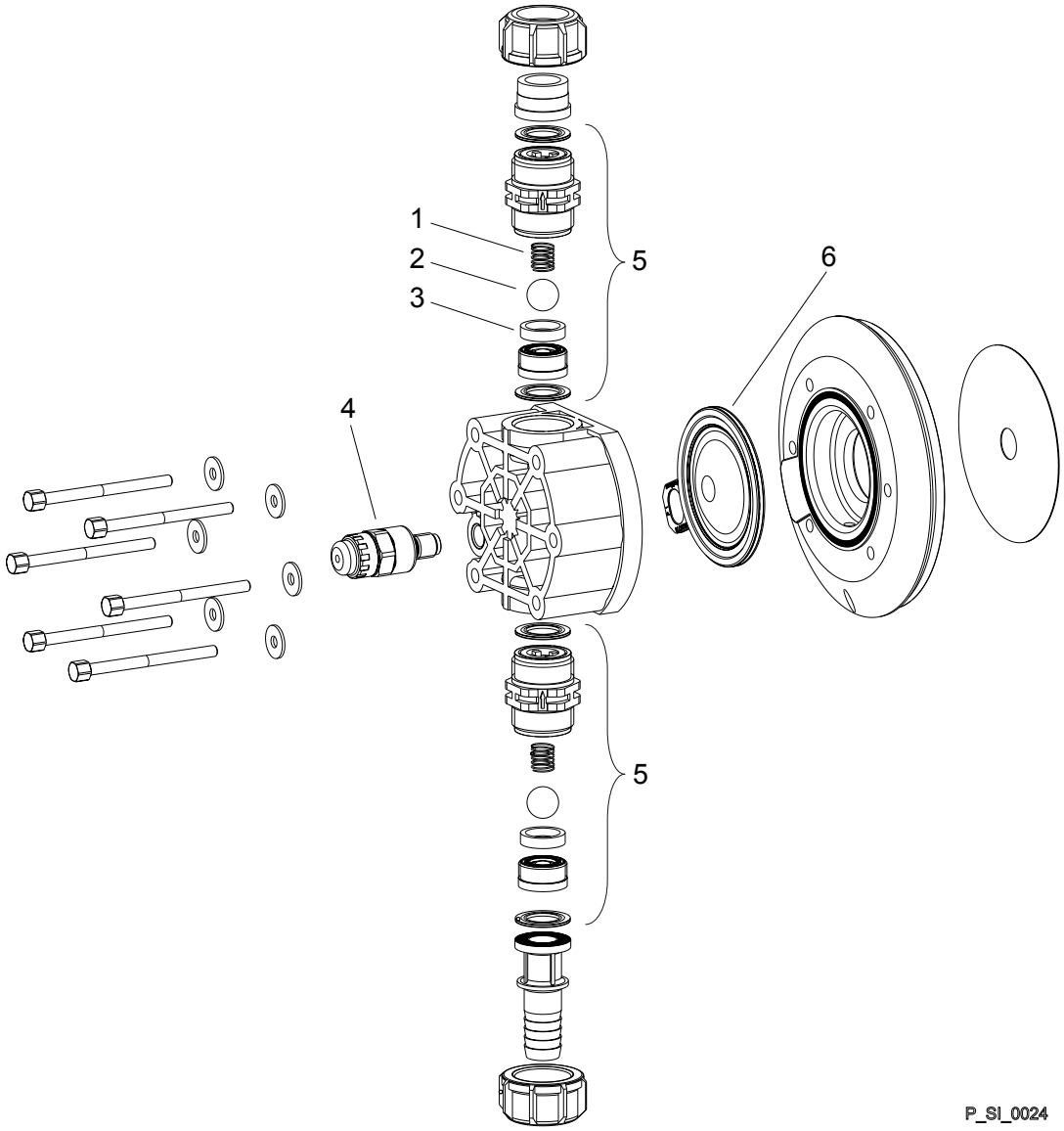


Fig. 38: Liquid end Sigma/ 1 120 PVT

Item	Description	Type 04084, 04120, 07042
1	Spring	**
2	Ball	*
3	Ball seat	*
4	Diaphragm rupture sensor, visual	1033323
5	Valve	792517*
6	Multi-layer diaphragm	1035828*

* The items listed are included in the spare parts kit. ** Special accessories (not included in the spare parts kit). Technical changes reserved.

Sigma/ 1 PVT bleed valve

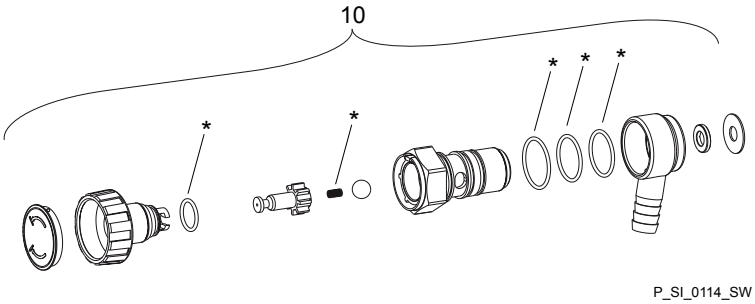


Fig. 39: Sigma/ 1 PVT bleed valve

Item	Description	Part no.
10	Integrated bleed valve, complete, DN10 PVA	1041067
10	Integrated bleed valve, complete, DN10 PVE	1041068
* The items listed are included in the spare parts kit. Springs made from Hastelloy C, O-rings from FPM-A and EPDM. Technical changes reserved.		

Sigma/ 1 PVT relief valve-A

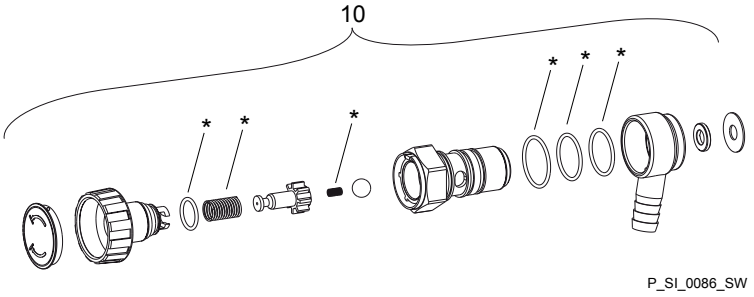


Fig. 40: Sigma/ 1 PVT relief valve-A

Item	Description	Type 12035, 12017	Type 10050, 10044, 10022	Type 07065, 07042	Type 04084, 04120
10	Relief valve, compl. 12 bar PVA	1018572			
10	Relief valve, compl. 10 bar PVA		1018947		
10	Relief valve, compl. 7 bar PVA			740811	
10	Relief valve, compl. 4 bar PVA				740812
* The items listed are included in the spare parts kit. Springs made from Hastelloy C, O-rings from FPM-A and EPDM. Technical changes reserved.					

Liquid end Sigma/ 1 050 and 065 SST

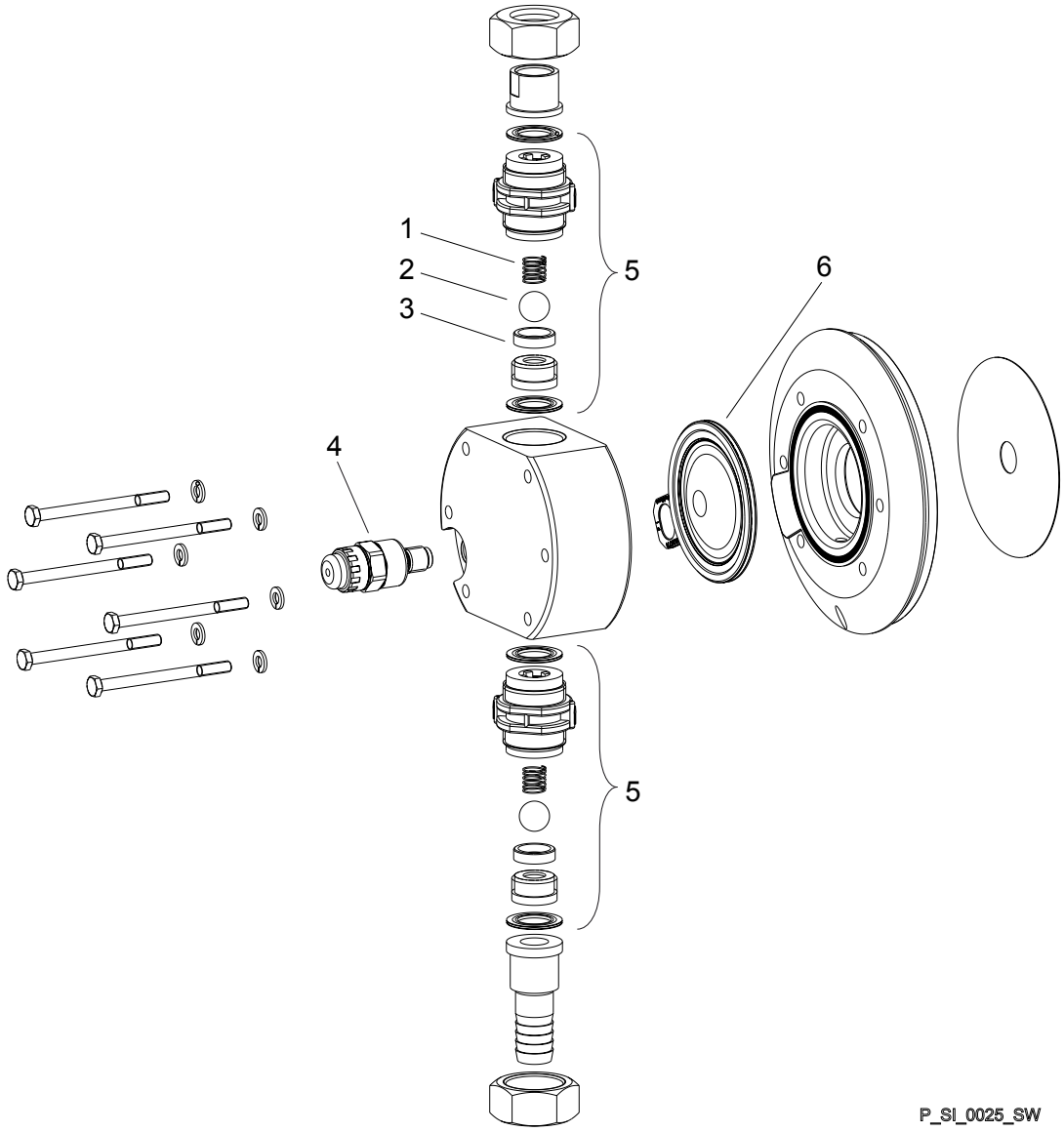


Fig. 41: Liquid end Sigma/ 1 050 and 065 SST

Item	Description	Type 12035, 12017, 10050	Type 07065, 10044, 10022
1	Spring	**	**
2	Ball	*	*
3	Ball seat	*	*
4	Diaphragm rupture sensor, visual	1033323	1033323
5	Valve	809459	809459
6	Multi-layer diaphragm	1030114*	1030115*

* The items listed are included in the spare parts kit. ** Special accessories (not included in the spare parts kit). Technical changes reserved.

Liquid end Sigma/ 1 120 SST

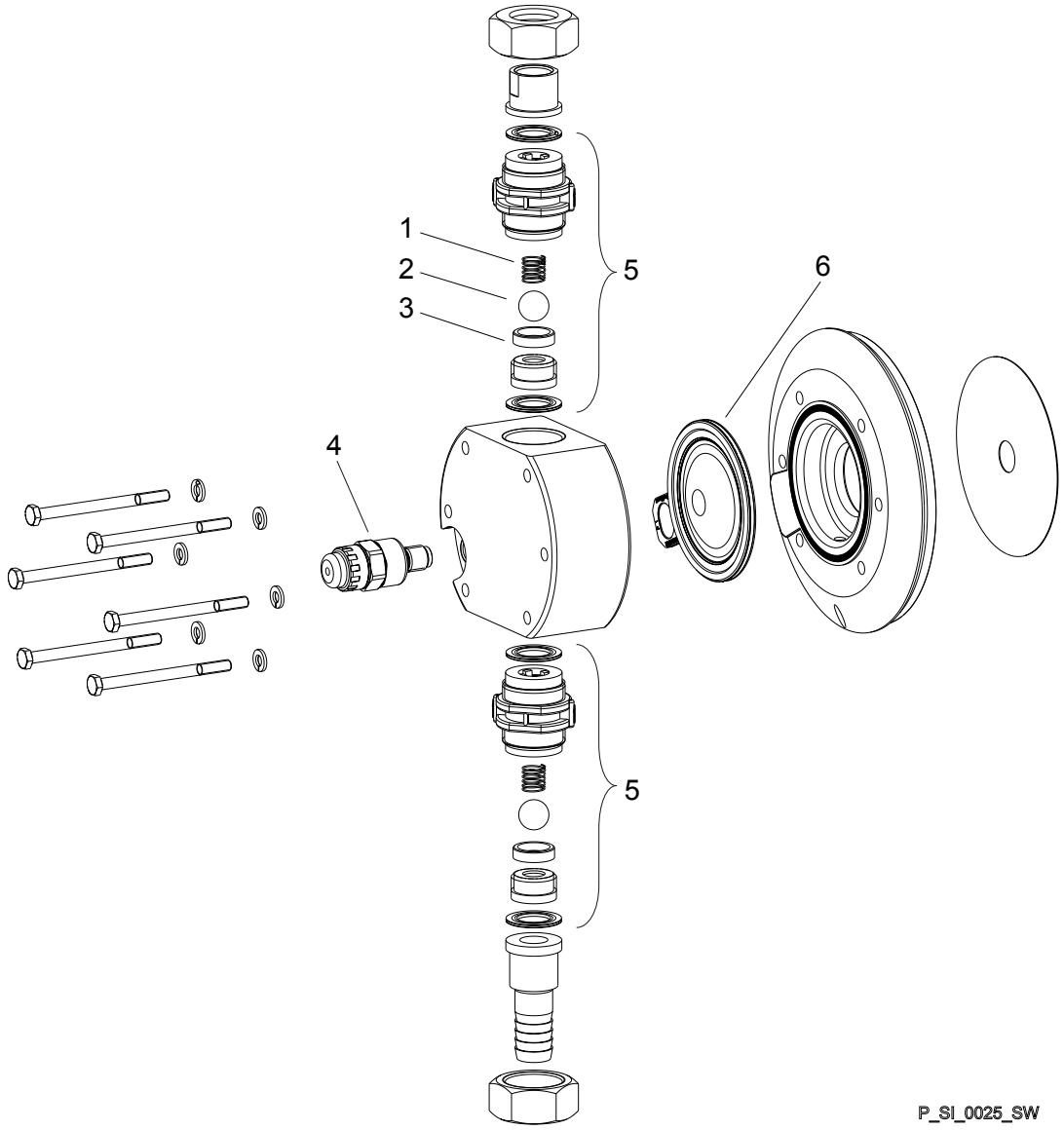


Fig. 42: Liquid end Sigma/ 1 120 SST

Item	Description	Type 04084, 04120, 07042
1	Spring	**
2	Ball	*
3	Ball seat	*
4	Diaphragm rupture sensor, visual	1033323
5	Valve	809404
6	Multi-layer diaphragm	1035828*

* The items listed are included in the spare parts kit. ** Special accessories (not included in the spare parts kit). Technical changes reserved.

Sigma/ 1 SST bleed valve

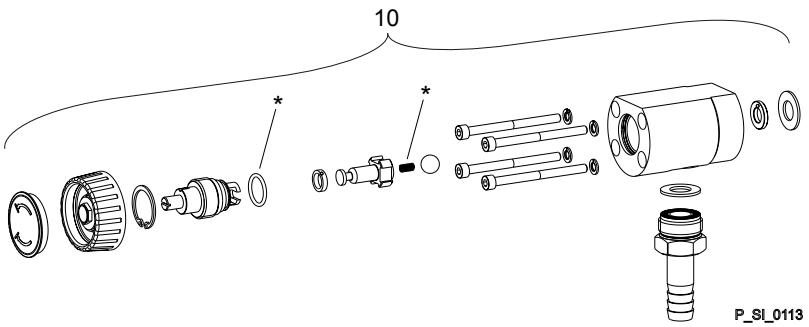


Fig. 43: Sigma/ 1 SST bleed valve

Item	Description	Part no.
10	Integrated bleed valve, complete, DN10 SSA	1041071
10	Integrated bleed valve, complete, DN10 SSE	1041072
* The items listed are included in the spare parts kit. Springs made from Hastelloy C, O-rings from FPM-A and EPDM. Technical changes reserved.		

Sigma/ 1 SST relief valve-A

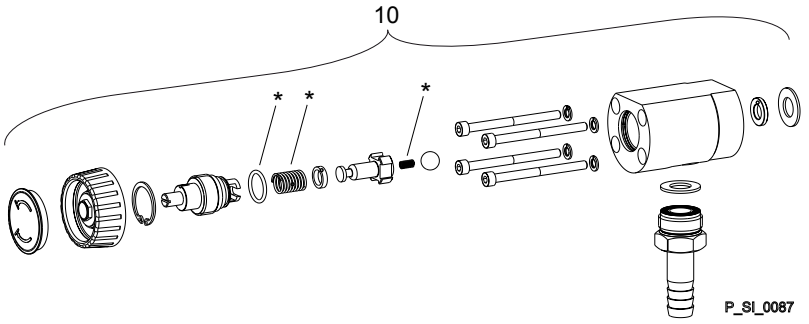


Fig. 44: Sigma/ 1 SST relief valve-A

Item	Description	Type 12035, 12017	Type 10050, 10044, 10022	Type 07065, 07042	Type 04084, 04120
10	Relief valve, compl. 12 bar SSA	1005625			
10	Relief valve, compl. 10 bar SSA		1018573		
10	Relief valve, compl. 7 bar SSA			740815	
10	Relief valve, compl. 4 bar SSA				740814
* The items listed are included in the spare parts kit. Springs made from Hastelloy C, O-rings from FPM-A and EPDM. Technical changes reserved.					

19 Wearing parts for S1Cb

Spare parts kits normally include the wearing parts of a liquid end.

19.1 Standard

Spare parts kits PVT (liquid ends)

Spare parts kit	Types 12017, 12035, 10050	Types 10022, 10044, 07065	Types 07042, 04084, 04120
FM 50 - DN 10	1035964		
FM 65 - DN 10		1035967	
FM 120 - DN 15			1035961

Scope of supply: see exploded view drawings.

Spare parts kits SST (liquid ends)

Spare parts kit	Types 12017, 12035, 10050	Types 10022, 10044, 07065	Types 07042, 04084, 04120
FM 50 - DN 10	1035966		
FM 50 with 2 complete valves	1035965		
FM 65 - DN 10		1035969	
FM 65 with 2 complete valves		1035968	
FM 120 - DN 15			1035963
FM 120 with 2 complete valves			1035962

Scope of supply: see exploded view drawings.

Spare parts kits for integrated bleed valve

Spare parts kit	for material version	Seals	Part no.
ETS EV	PVT/SST	FPM-A and EPDM	1043785

Scope of supply: see exploded view drawings.

Spare parts kits for integrated relief valve

Spare parts kit	for material version	Seals	Part no.
SPK PRV 4 bar	PVT/SST	FPM-A / EPDM	1031199
SPK PRV 7 bar	PVT/SST	FPM-A / EPDM	1031200
SPK PRV 10 bar	PVT/SST	FPM-A / EPDM	1031202
SPK PRV 12 bar	PVT/SST	FPM-A / EPDM	1031203

Scope of supply: see exploded view drawings.

HMI spare parts

Spare part	Part no.
HMI wall bracket	1036683
HMI protective film	1036724

19.2 Physiological safety

Spare parts kits

Scope of supply with PVT material version

1 x Diaphragm, 2 x Valve balls, 1 x Suction valve, complete, 1 x Discharge valve, complete
1 x Elastomer sealing set (EPDM)
2 x Ball seat housings, 2 x Ball seat discs, 4 x Composite seals
1x Seal washer (for bleed valve or relief valve)

Scope of supply with SST material version

1 x Diaphragm, 2 x Valve balls
2 x Cover rings
4 x Composite seals
1x Seal washer (for bleed valve or relief valve)

Ordering Information

Spare parts kits PVT (liquid ends)

Liquid end	Types 12017, 12035, 10050	Types 10022, 10044, 07065	Types 07042, 04084, 04120
FM 50 - DN 10	1046466	-	-
FM 65 - DN 10	-	1046469	-
FM 120 - DN 15	-	-	1046453

Spare parts kits SST (liquid ends)

Liquid end	Types 12017, 12035, 10050	Types 10022, 10044, 07065	Types 07042, 04084, 04120
FM 50 - DN 10	1046468	-	-
FM 50 - DN 10 with 2 valves complete	1046467	-	-
FM 65 - DN 10	-	1046471	-
FM 65 - DN 10 with 2 valves complete	-	1046470	-
FM 120 - DN 15	-	-	1046465
FM 120 - DN 15 with 2 valves complete	-	-	1046464

Wetted materials – "Physiologically safety with regard to wetted materials" design

Material version	Liquid end	Suction / pressure connector	Seals* / ball seat	Balls	Integral bleed valve or relief valve
PVT	PVDF	PVDF	PTFE / PVDF	Ceramic	PVDF / EPDM
SST	Stainless steel 1.4404	Stainless steel 1.4581	PTFE / PVDF	Stainless steel 1.4404	Stainless steel / EPDM

* Metering diaphragm is PTFE-coated; seals are PTFE composite seals

PTFE: FDA No. 21 CFR §177.1550

PVDF: FDA No. 21 CFR §177.2510

20 Diagrams for adjusting the capacity

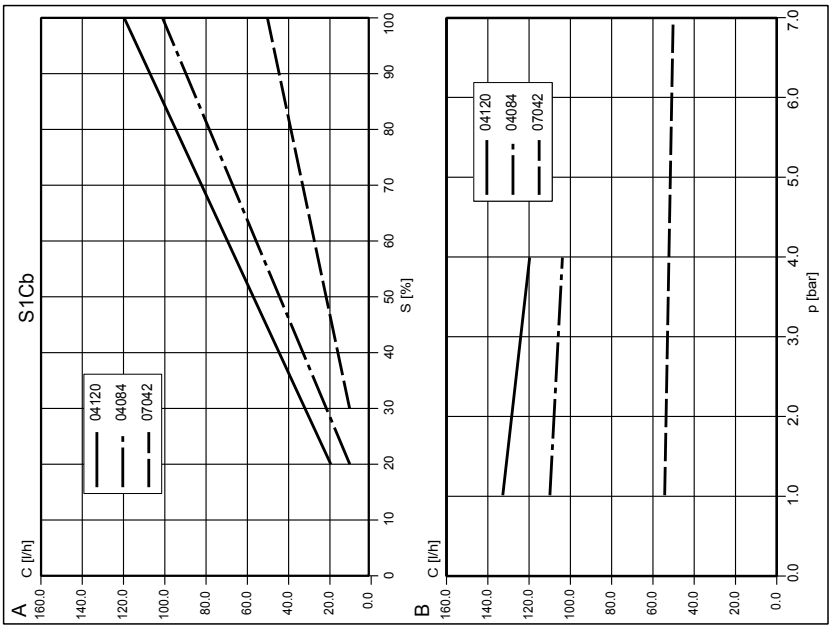


Fig. 45: A) Capacity C at maximum back pressure dependent on the stroke length s. B) Capacity C dependent on the back pressure p.

21 EC Declaration of Conformity for Machinery

In accordance with DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL, Appendix I, BASIC HEALTH AND SAFETY REQUIREMENTS, section 1.7.4.2. C.

We,

- ProMinent Dosiertechnik GmbH
- Im Schuhmachergewann 5 - 11
- D - 69123 Heidelberg,

hereby declare that the product specified in the following, complies with the relevant basic health and safety requirements of the EC Directive, on the basis of its functional concept and design and in the version distributed by us.

This declaration loses its validity in the event of a modification to the product not agreed with us.

Extract from the EC Declaration of Conformity

Designation of the product:	Metering pump, Sigma product range
Product type:	S1Cb...
Serial number:	refer to nameplate on the device
Relevant EC directives:	EC Machinery Directive (2006/42/EC) EC EMC Directive (2004/108/EC) Compliance with the protection targets of the Low Voltage Directive (2006/95/EC) according to Appendix I, No. 1.5.1 of the Machinery Directive 2006/42/EC
Harmonised standards applied, in particular:	EN ISO 12100 EN 809 EN 61010-1 EN 61000-6-2/4
Date:	20/09/2013

You can download the EC Declaration of Conformity at www.prominent.com/en/downloads

22 Operating / adjustment overview

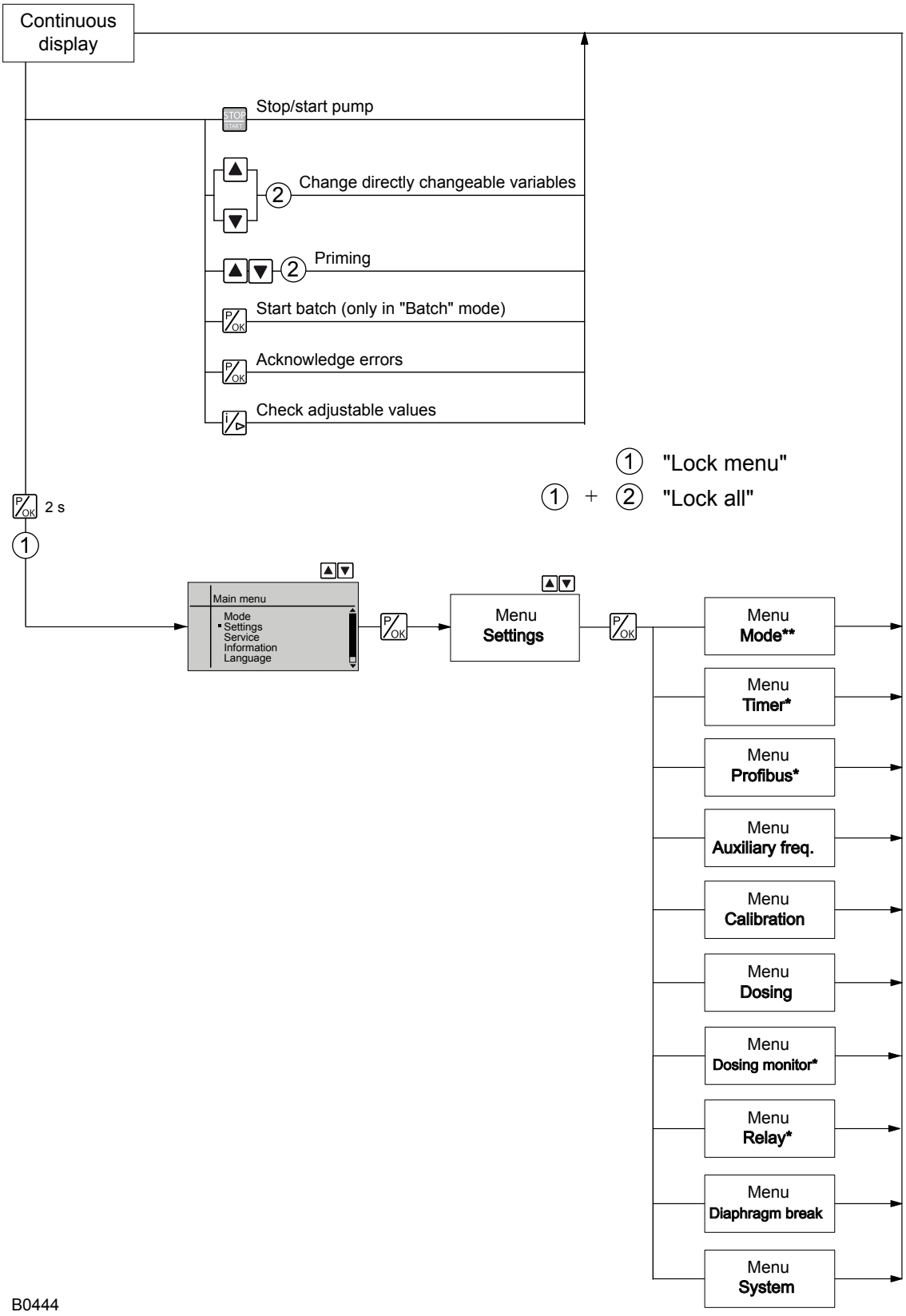
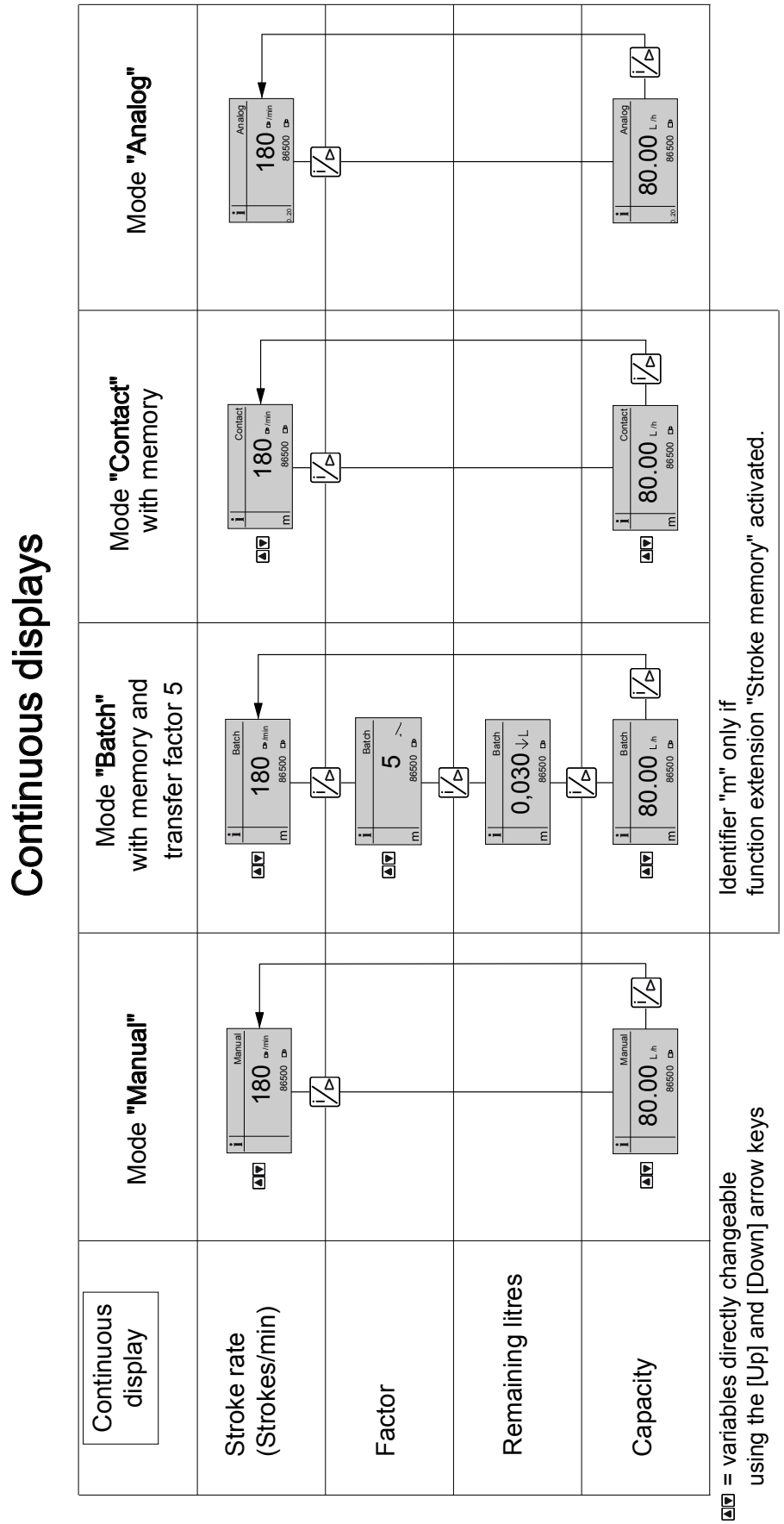


*Fig. 46: * Menu appears only with corresponding module*

23 Continuous displays



Auxiliary displays in the continuous display

Auxiliary display	Mode **"Manual"**	Mode **"Batch"** with memory and transfer factor 5	Mode **"Contact"** with memory and transfer factor 5	Mode **"Analog"**
Total number of strokes	86500	86500	86500	86500
Stroke length	65 %	65 %	65 %	65 %
Total litres (metering quantity)	576,67 L [1]	576,67 L [1]	576,67 L [1]	576,67 L [1]
Remaining strokes		25,00↓ [2]	25,00↓ [2]	
Factor		5	5	
Signal current (at the input)				12,7 mA [3]
Stroke rate (Strokes/min)	180 /min	180 /min	180 /min	180 /min
Dosing mode	Standard	Standard	Standard	Standard
Capacity	80,00 L/h [1]	80,00 L/h [1]	80,00 L/h [1]	80,00 L/h [1]
Batch size/ remaining litres		0,833↓ L [1, 2]	0,833↓ L [1, 2]	
Stroke rate (Strokes /h)	12000 /h	12000 /h	12000 /h	12000 /h

1 = only by running through the CALIBRATE menu, even after changing the operating mode
2 = only with function extension "Memory"
3 = only with current output

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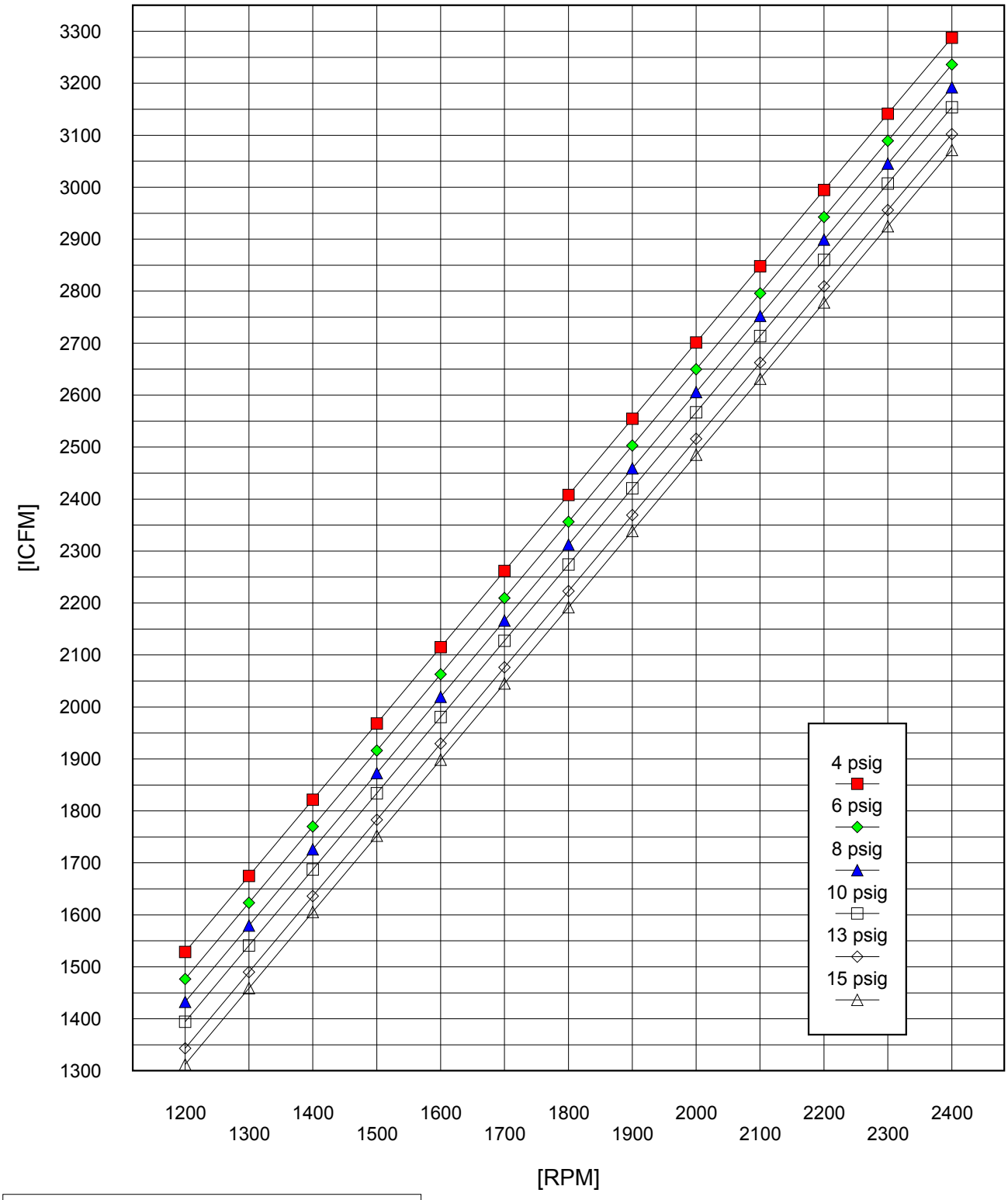
985451, 4, en_GB

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Process Blowers:
Tag: 16-B-401-A/B/C

AERZEN GM 90S DELTA PACKAGE, PRESSURE

INLET FLOW

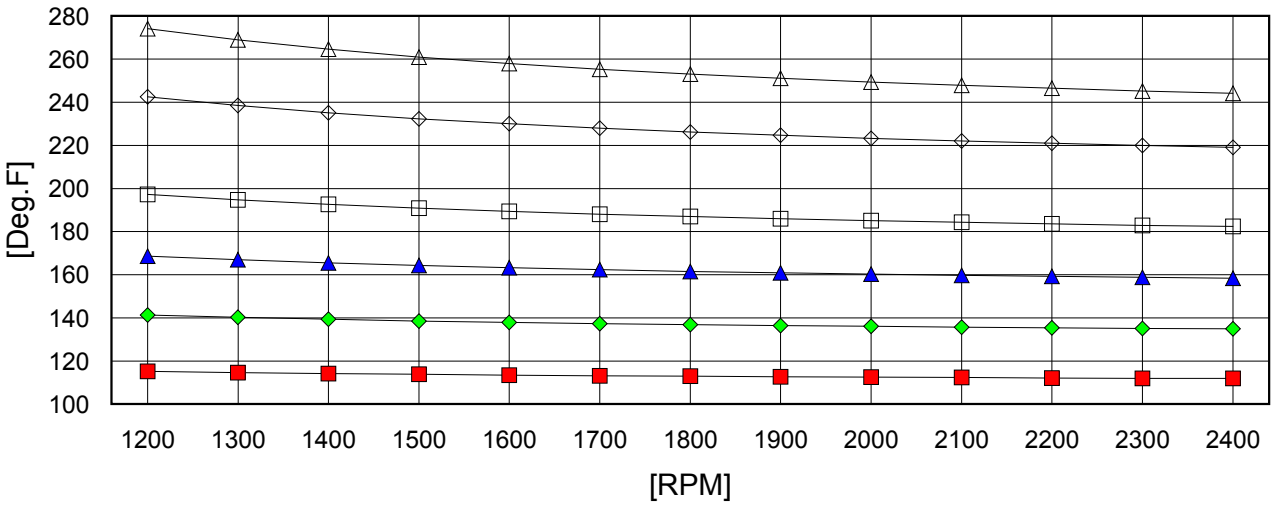


Performance data based on air @ 68 deg.F/ 14.7 psia inlet.

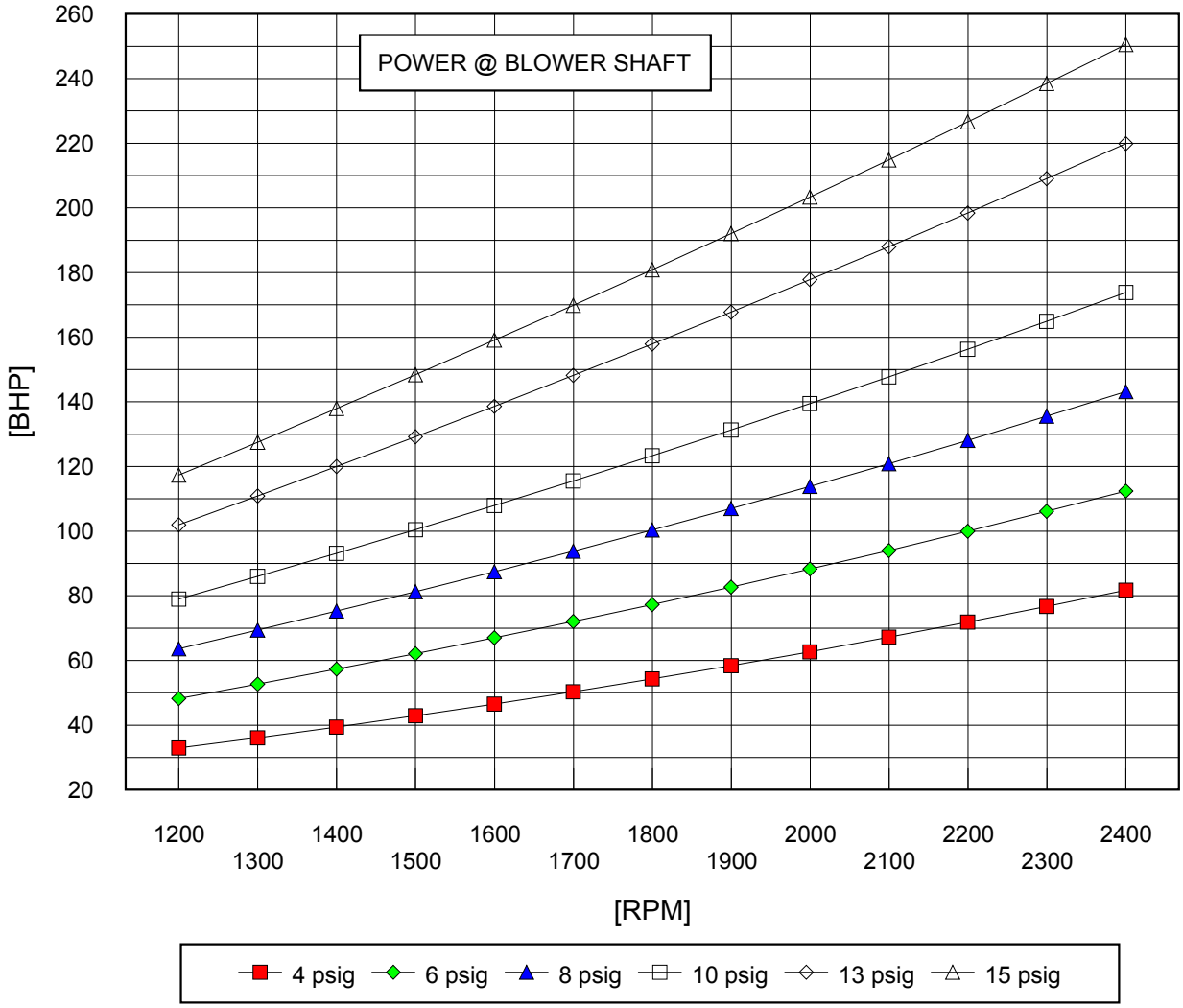
See temperature chart on second sheet for allowable operating range.

AERZEN GM 90S DELTA PACKAGE, PRESSURE

DISCHARGE TEMPERATURE

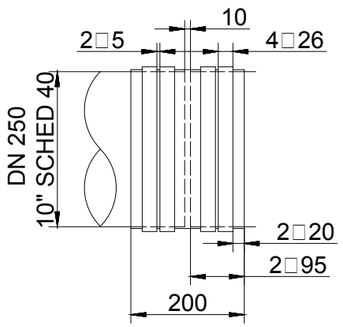


MAXIMUM ALLOWABLE DISCHARGE TEMPERATURE: 285 deg.F
Performance data based on air @ 68 deg.F/ 14.7 psia inlet.



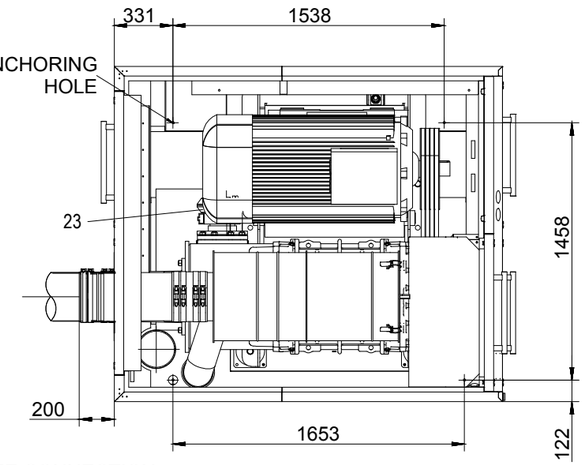
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CAUTION
BLOWER PACKAGES MUST BE CAREFULLY LEVELED. USE OIL LEVEL ON SIGHT GLASSES OF THE BLOWER STAGE. USE PROVIDED SHIMS TO ADJUST LEVEL IF NECESSARY. PLEASE REFER TO THE OPERATING AND INSTALLATION INSTRUCTIONS MANUAL (DOCUMENT # G4-006) FOR MORE DETAILS.

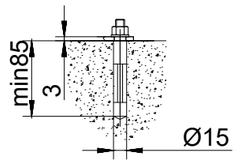


CONNECTION DETAILS

Process Blowers:
Tag numbers:
16-B-401-A/B/C
16-F-401-A/B/C
16-PSV-401-A/B/C
16-HV-403-A/B/C
16-PI-403-A/B/C
16-CV-401-A/B/C

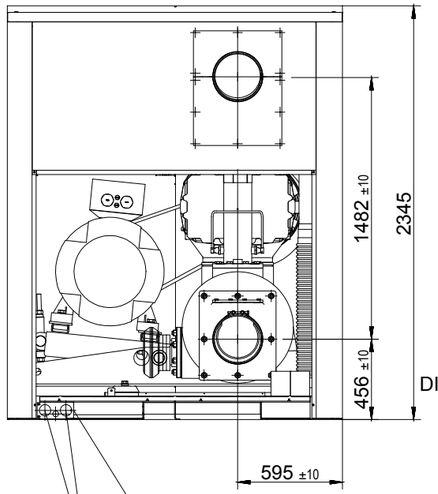


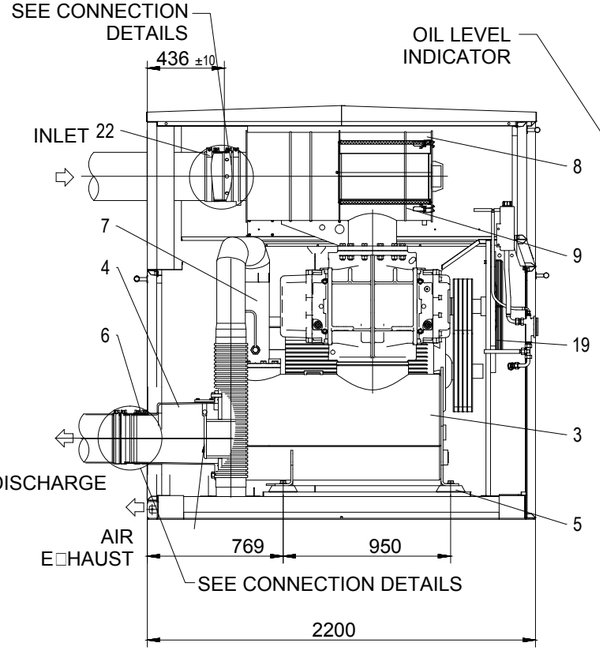
FOR STRADDLING DOWELS A/B 15/15 - LIEBIG DOWEL □NOT INCLUDED IN AER□EN'S SCOPE OF SUPPLY

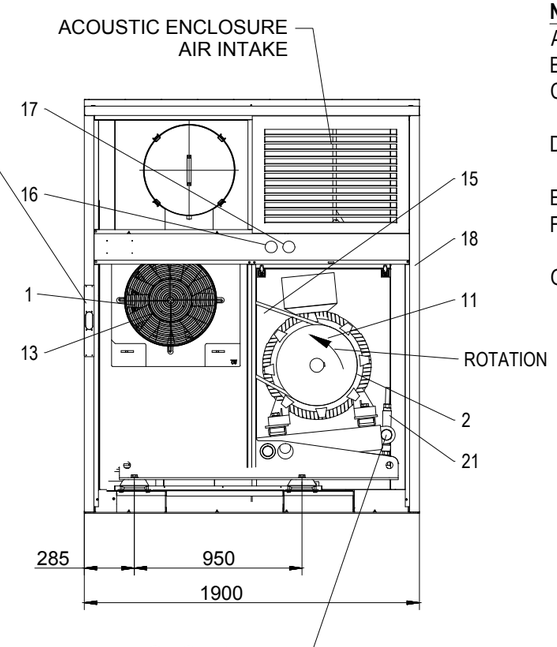


ANCHORING DETAILS

NOTE	QTY.	POS	DESCRIPTION
	1	1	BLOWER - GM 90 S - 690 KG
D	1	2	ELECTRIC MOTOR
	1	3	BASEFRAME / DISCHARGE SILENCER - DN 250
	1	4	CONNECTION HOUSING WITH CHECK VALVE - DN 250
	1	5	SET OF 4 VIBRATION ISOLATORS - DN 250
	1	6	DISCHARGE FLEXIBLE SLEEVE - WITH 4 CLAMPS - DN 250
	1	7	PRESSURE RELIEF VALVE - DN 150
	1	8	INLET FILTER / SILENCER - DN 250
	1	9	INLET FILTER ELEMENT - DN 250
E	1	10	BELT GUARD - DN 250
	1	11	DRIVER SHEAVE
E	1	12	DRIVER BUSHING
	1	13	DRIVEN SHEAVE
E	1	14	DRIVEN BUSHING
	1	15	V-BELT SET
	1	16	FILTER MAINTENANCE INDICATOR - WIKA
	1	17	DISCHARGE PRESSURE GAUGE WITH BALL VALVE - WIKA
	1	18	ACOUSTIC ENCLOSURE - DN 250
	1	19	FAN - MOUNTED ON BLOWER SHAFT - DN 250
E	1	20	FAN ADAPTOR - GM 90S
	1	21	LIFTING DEVICE
G	1	22	INLET FLEXIBLE SLEEVE - WITH 4 CLAMPS - DN 250
G	1	23	UNLOADING VALVE







NOTES:

A. ASSEMBLY WEIGHT WITHOUT MOTOR: 3630 KG
B. PAINT: AERZEN STANDARD BLUE
C. 1M OF FREE SPACE AT THE FRONT OF THE PACKAGE IS RECOMENDED FOR MAINTENANCE ACCESS
D. MOTOR: WEG 400T FRAME REPRESENTED, OTHER SIZE AND MANUFACTURER AVAILABLE
E. NOT SHOWN ON DRAWING
F. FOR VARIABLE SPEED APPLICATIONS, CONSTANT TORQUE VFD ARE REQUIRED
G. OPTIONAL

REVISION DETAILS						
REV	DRAWN BY	DATE	REVIEWED	DATE	DETAILS	AREA
C	-	23/02/15	-	23/02/15	UPDATE ON GENERAL ARRANGMENT DRAWING	
B	-	18-10-12	-	18-10-12	UPDATE ON GENERAL ARRANGMENT DRAWING	
A	-	18/06/12	-	18/06/12	RELEASE	-

AERZEN
AERZEN CANADA
980 RUE VALOIS, SUITE 100, VAUDREUIL QC J7V 8P2
(450) 424-3966 PH, (450) 424-3985 FX

GEN 5 - GM 90S
DN 250 - PRESSURE

DWG NO. ZG-01515

DRAWN BY	REVIEWED BY
-	-

THIRD ANGLE PROJECTION

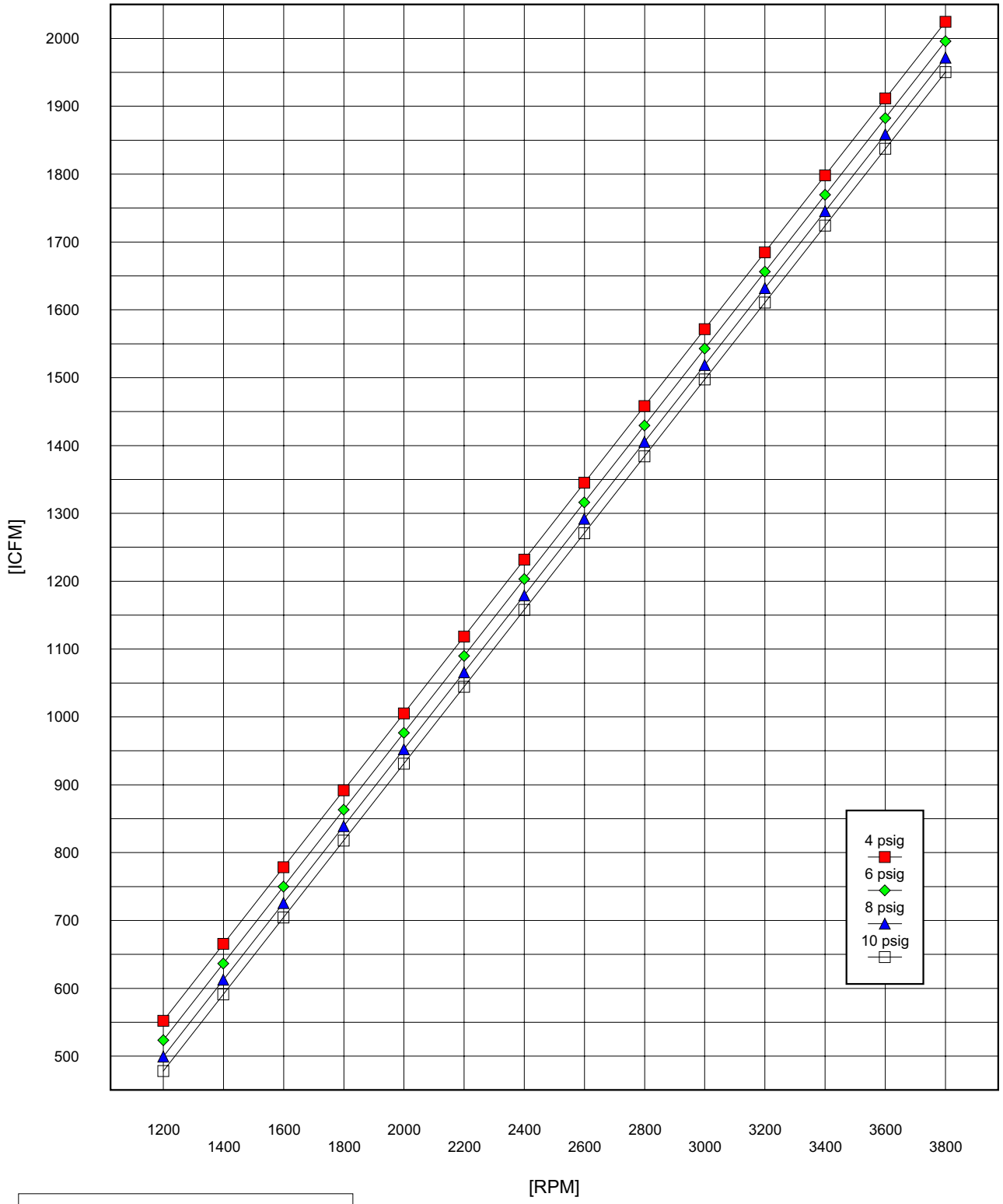
DATE	REV
18 JUNE 2012	C

SCALE: NONE | SIZE: B | SHEET: 1 OF 1

Membrane Blowers:
Tag:
20-B-201-A/B/C/D/E

AERZEN GM 50L DELTA PACKAGE, PRESSURE

INLET FLOW

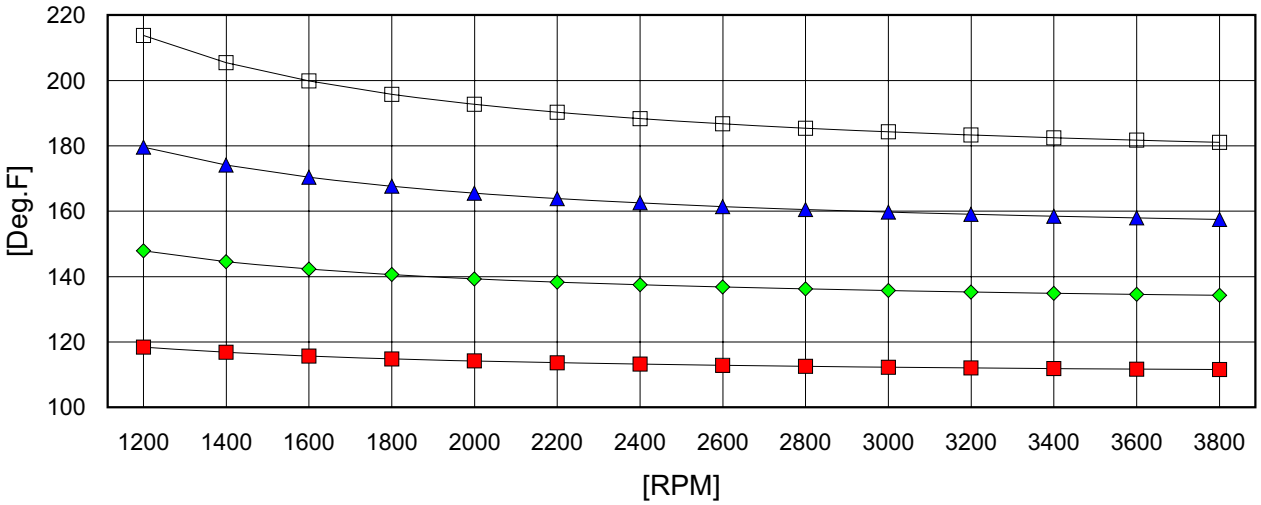


Performance data based on air @ 68 deg.F/ 14.7 psia inlet.

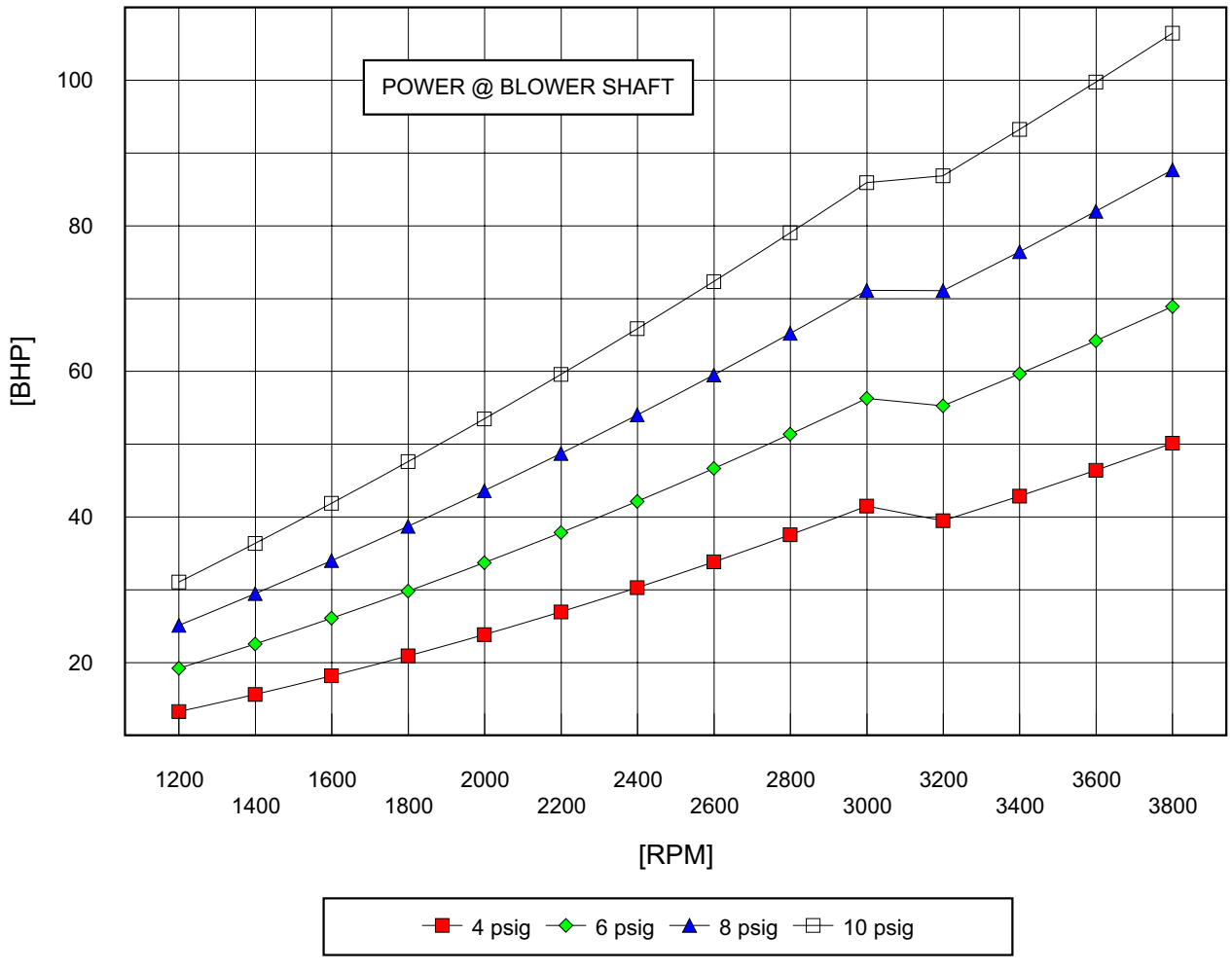
See temperature chart on second sheet for allowable operating range.

AERZEN GM 50L DELTA PACKAGE, PRESSURE

DISCHARGE TEMPERATURE



MAXIMUM ALLOWABLE DISCHARGE TEMPERATURE: 285 deg.F
Performance data based on air @ 68 deg.F/ 14.7 psia inlet.

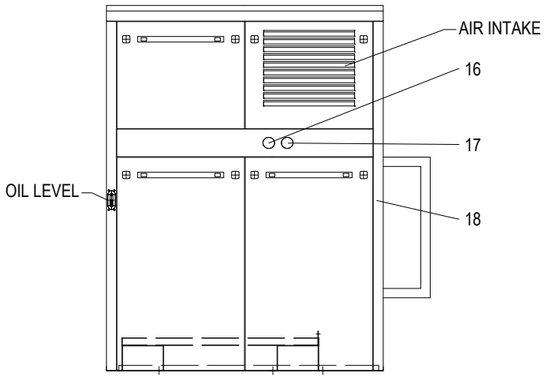


6" (DN 150 accessories) up to 3000 rpm; 8"(DN 200) above>3000 rpm

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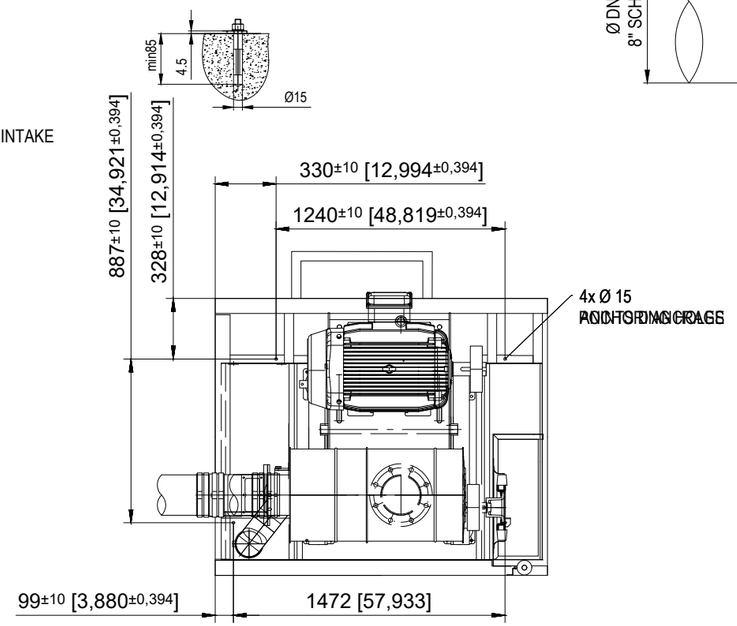
Membrane Blowers with VFD :
TAG:
20-B-201-A/B
20-F-201-A/B
20-PSV-201-A/B
20-HV-203-A/B
20-PI-203-A/B
20-CV-201-A/B

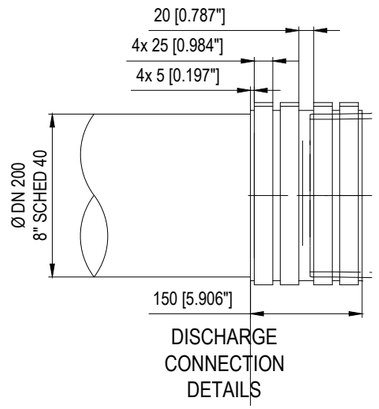
Membrane Blowers without VFD:
TAG:
20-B-201-C/D/E
20-F-201-C/D/E
20-PSV-201-C/D/E
20-HV-203-C/D/E
20-PI-203-C/D/E
20-CV-201-C/D/E



VIEW 'A-A' FRONT OF PACKAGE

for straddling dowels A/B 15/15 - Liebig - dowel
(not included in Aerzen's scope of supply)





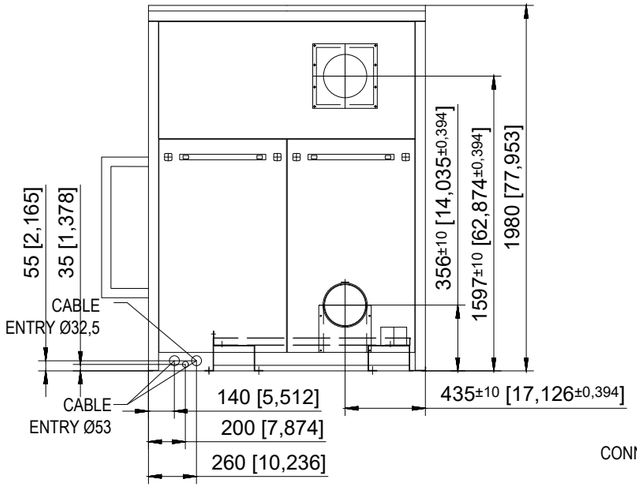
DISCHARGE CONNECTION DETAILS

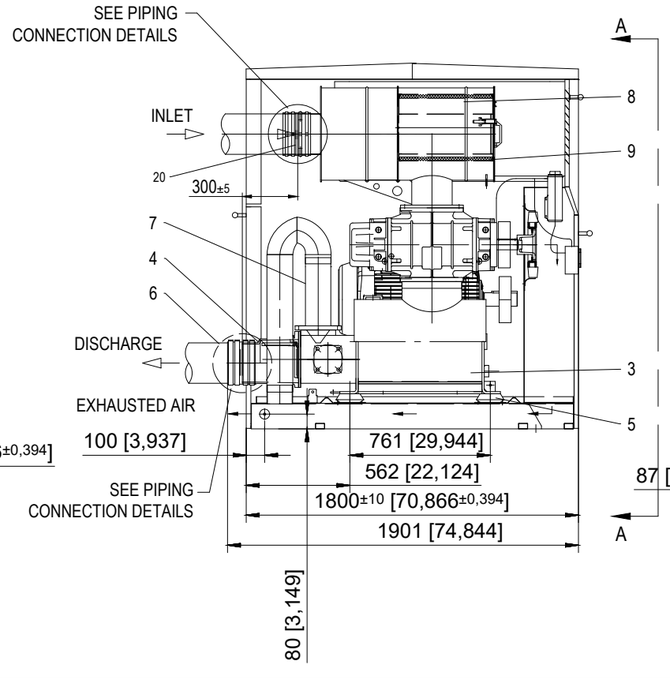
NOTE	QTY.	POS	DESCRIPTION
	1	1	BLOWER - GM 50L - 360 KG
D	1	2	ELECTRIC MOTOR: TECO WESTINGHOUSE REPRESENTED
	1	3	BASE FRAME / DISCHARGE SILENCER
	1	4	CONNECTION HOUSING WITH CHECK VALVE - DN 200
	1	5	SET OF 4 VIBRATION ISOLATORS
	1	6	DISCHARGE FLEXIBLE SLEEVE - DN 200 / 8" SCHED. 40
	1	7	PRESSURE RELIEF VALVE - DN 125 - SET TO 1050 mbar
	1	8	INLET FILTER / SILENCER ASSEMBLY - DN 200
	1	9	INLET FILTER ELEMENT
E	1	10	BELT GUARD
	1	11	MOTOR SHEAVE
E	1	12	MOTOR BUSHING
	1	13	BLOWER SHEAVE
E	1	14	BLOWER BUSHING
		15	V-BELT SET
	1	16	FILTER MAINTENANCE INDICATOR - WIKA
	1	17	DISCHARGE PRESSURE GAUGE WITH BALL VALVE - WIKA
	1	18	ACOUSTIC ENCLOSURE - G5 - INDOOR INSTALLATION
	1	19	MECHANICAL FAN - MOUNTED ON THE BLOWER SHAFT - GM 50L
G	1	20	INLET FLEXIBLE SLEEVE - DN 200 / 8" SCHED. 40
G	1	21	UNLOADING VALVE
		22	MOTOR EXTENSION BOX 10" - 022-MBOX00010

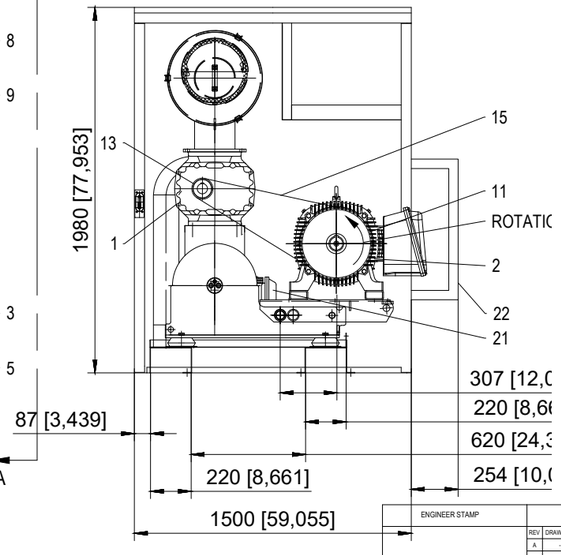
NOTES:

A. UNIT ASSEMBLY WEIGHT: 1180+ *MOTOR KG*
B. PAINT: PACKAGE - AERZEN STANDARD BLUE
C. 1M CLEARANCE IS RECOMMENDED AT THE FRONT & REAR OF THE PACKAGE FOR MAINTENANCE ACCESS
D. MOTOR: TECO WESTINGHOUSE REPRESENTED
E. INCLUDED BUT NOT SHOWN ON DRAWING
F. FOR VARIABLE SPEED APPLICATIONS, CONSTANT TORQUE VFD ARE REQUIRED
G. OPTIONAL

DIMENSIONS ARE IN MILLIMETERS [INCHES]







ENGINEER STAMP

REVISION DETAILS

REV	DRAWN BY	DATE	REVIEWED	DATE	DETAILS	AREA
A	-	-	-	-	RELEASE	-

AERZEN

AERZEN CANADA
980 VALOIS STREET, SUITE# 100, VAUDREUIL QC J7V 8P2
(450) 424-3966 PH, (450) 424-3985 FX

THIRD ANGLE PROJECTION

GEN 5 - GM 50L DN 200 - PRESSURE

DWG NO. ZG-00771S

DRAWN BY -

REVIEWED BY -

DATE SEPTEMBER 11, 2020

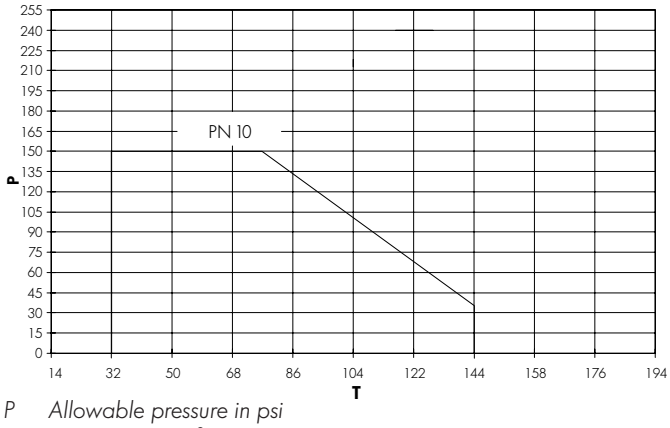
REV A

SCALE: NONE | SIZE: B | SHEET: 1 OF 1

Technical Data of Ball Valves

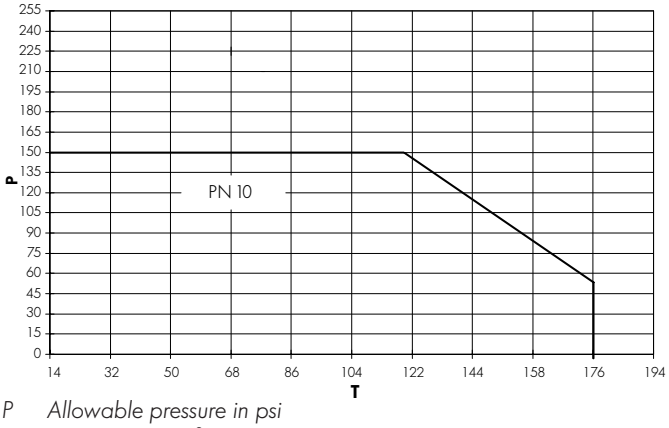
Pressure-temperature diagram

For PVC ball valve type 546



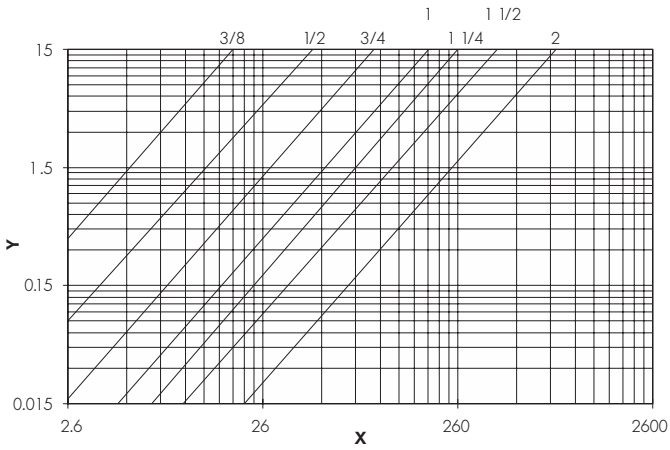
P Allowable pressure in psi
T Temperature in °F

For CPVC ball valve type 546



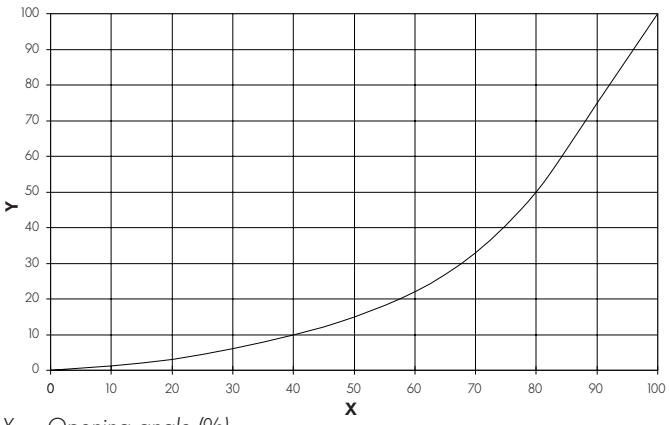
P Allowable pressure in psi
T Temperature in °F

Pressure loss for ball valve type 546



Medium: water, 68°F
X Flow volume (gpm)
Y Pressure loss Δp (psi)

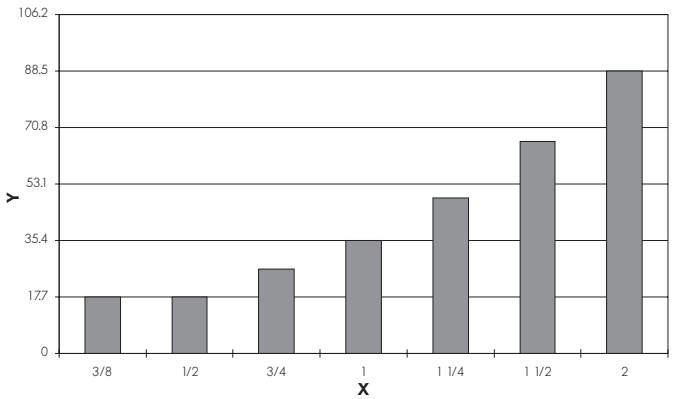
Flow characteristics for ball valve type 546



X Opening angle (%)
Y C_V-value (%)

Tags :
23-HV-130
23-HV-330

Torque for ball valve type 546 (reference values)



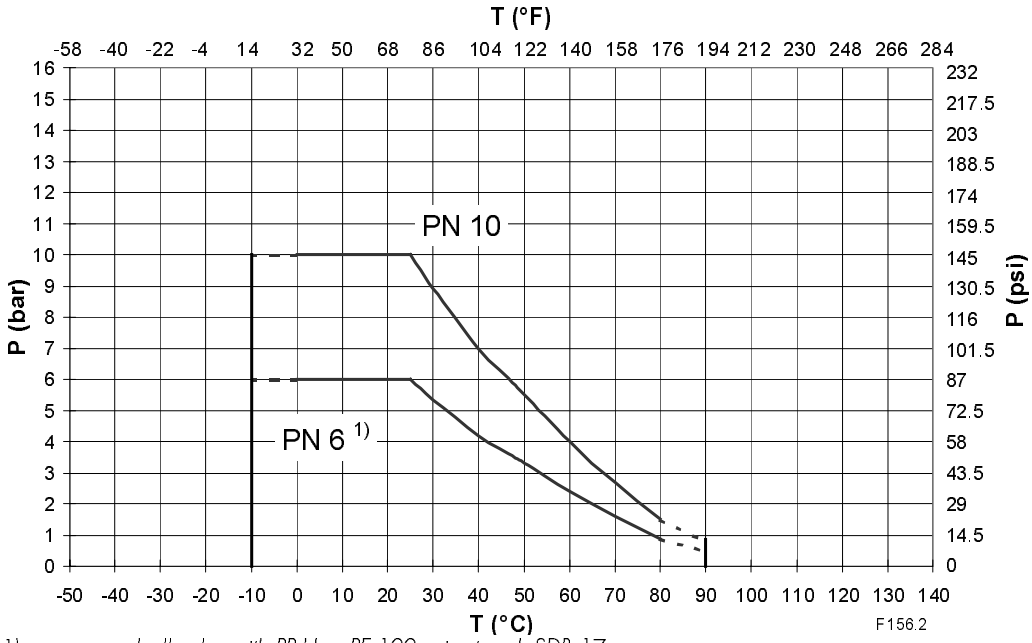
X Nominal diameter (inch)
Y Torque (in-lbf)

Fundamentals for Ball Valves, hand operated

Ball Valve Type 546

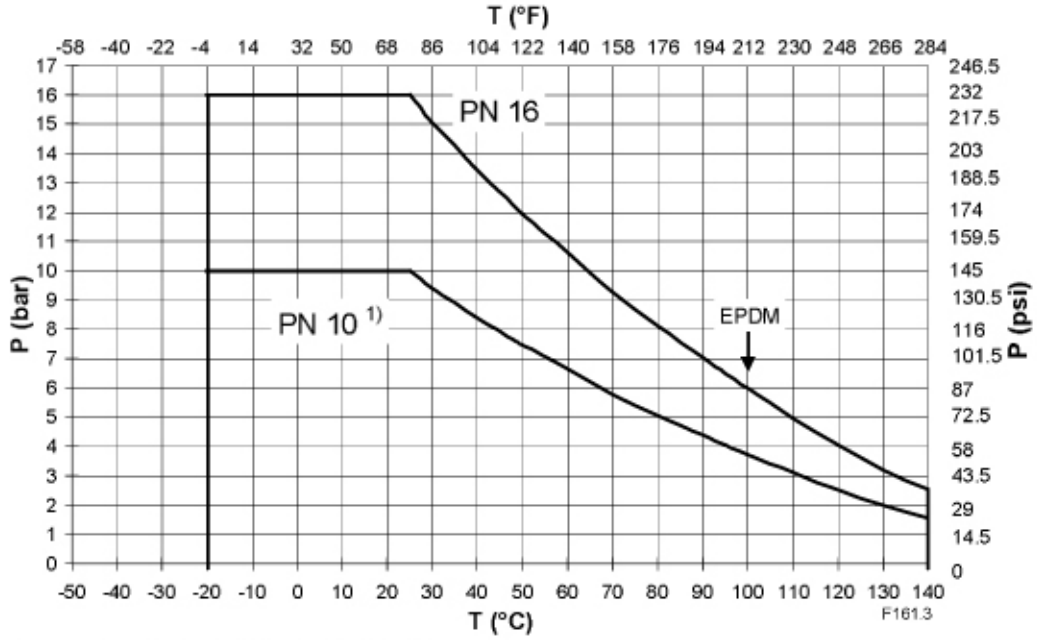
Pressure-Temperature Diagram Ball Valve in PP-H (service life 25 years, medium water or similar media)

For applications with temperatures in the range of the dotted lines, please contact your George Fischer representative.



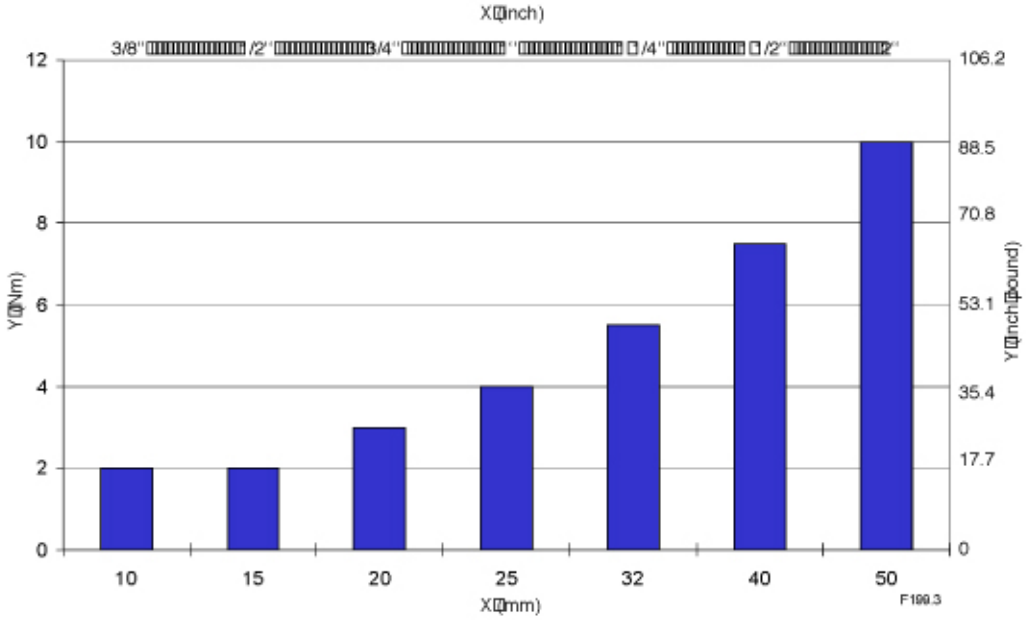
1) *e.g. ball valve with PP-H or PE 100 spigot end SDR 17*
T *Temperature in °C / °F*
p *permissible pressure in bar / psi*

Pressure-Temperature Diagram Ball Valve Type 546 in PVDF (service life 25 years, medium water or similar media)



1)	*e.g. ball valve with threaded sockets*
EPDM	*EPDM-seal max. 100°C*
T	*Temperature in °C / °F*
p	*permissible pressure in bar / psi*

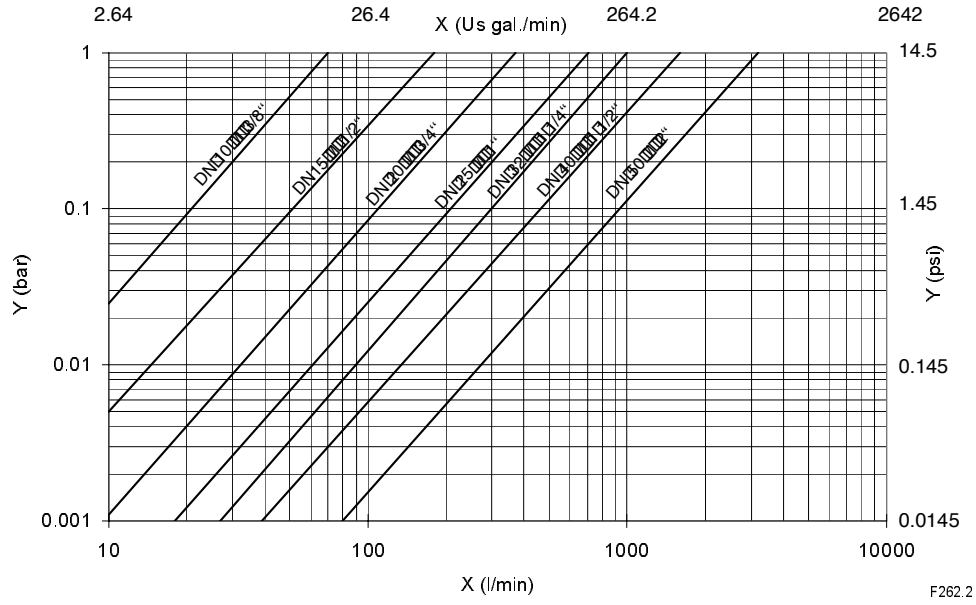
Operating Torque for Ball Valve Type 546 (Average Values)



X *Size DN (mm / inch)*
Y *Torque (Nm / inch pound)*

Depending on the application (e.g. operating speed, fluid, temperature, etc.). about 2 times the operating torque should be taken for sizing actuators.

Pressure Loss for Ball Valve Type 546

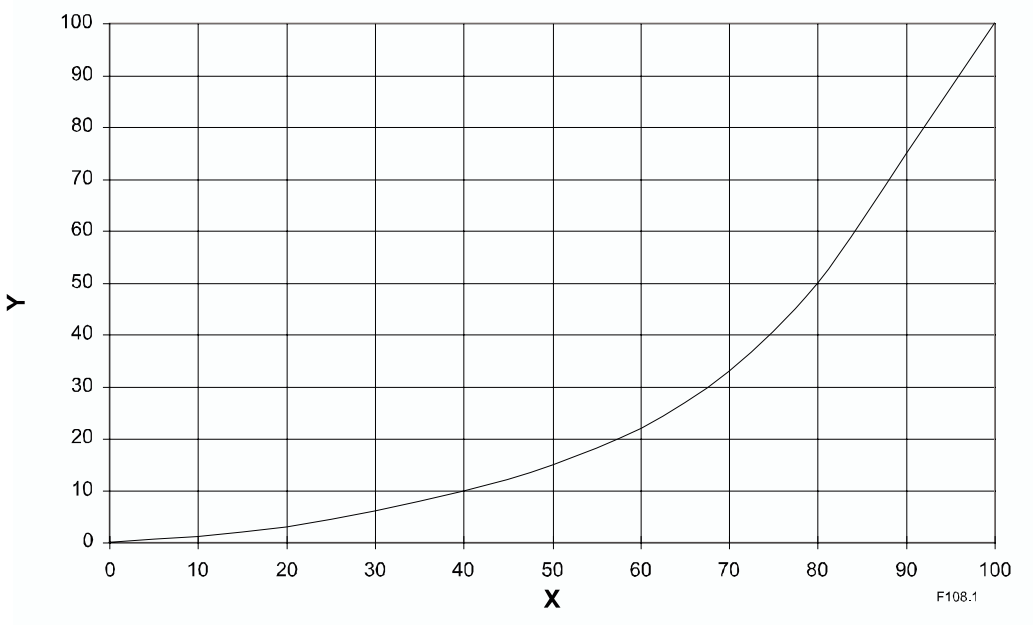


Medium: water, 20 °C

X *Flow rate (l/min), (US gal./min)*

Y *Pressure loss Δp (bar), (psi)*

Flow Characteristics for Ball Valve Type 546



X *Open angle (%)*

Y *Flow factor kv, cv (%)*

kv 100 Values for Ball Valve Type 546

The k_v values for each intermediate valve position can be determined using the flow value characteristic and the k_v 100 values.

DN mm	DN inch	d mm	k_v 100 l/min (Δp = 1 bar)	C_v 100 US gal. / min (Δp = 1 psi)	k_v 100 m^3/h (Δp = 1 bar)
10	3/8	16	70	4.9	4.2
15	1/2	20	185	12.9	11.1
20	3/4	25	350	24.5	21
25	1	32	700	49.0	42
32	1¼	40	1000	70.0	60
40	1½	50	1600	112.0	96
50	2	63	3100	217.1	186

Tightening torque values for bolts type 546

Flanged joints with flange gaskets or flat gaskets

d mm	DN mm	DN Zoll	Total number of screws (for 2 flanged joints) standard nut (height 0.8 x d) [1]	Torque (average values) Flange gasket [2]		Torque (average values) Flat gasket	
				in Nm	in In lbf	in Nm	in In lbf
20	15	½	8 x M12 x 50	15	133	15	133
25	20	¾	8 x M12 x 55	15	133	15	133
32	25	1	8 x M12 x 60	15	133	15	133
40	32	1¼	8 x M16 x 70	15	133	20	177
50	40	1½	8 x M16 x 70	15	133	30	266
63	50	2	8 x M16 x 80	20	177	35	310

1) for valve ends Type 546 in PP-H in combination with backing flanges, use half of the standard nut height
2) preferred (plastics-oriented) gasket type

Attention: For more information on the use of the different gasket types, see Chapter: Jointing Technology => Separable Connections

Technical Features of the Ball Valve Type 546

a) Valve ends parts for the Type 546 are available as:
- Solvent cement/fusion socket (short installation length)
- Solvent cement/fusion spigot (for standard installation length)
- Threaded socket (on request with stainless steel outer reinforcement ring)
- Butt fusion spigot
- electrofusion spigot
- Fixed flange (for standard installation length)
- Backing flange (for standard installation length)
- Solvent cement and threaded connections for other standards.

b) Newly designed valve nuts with buttress thread. These enable fast and safe radial mounting and dismounting of the valve during installation or maintenance work, without tools.
Attention: Only hand tighten valve nuts.

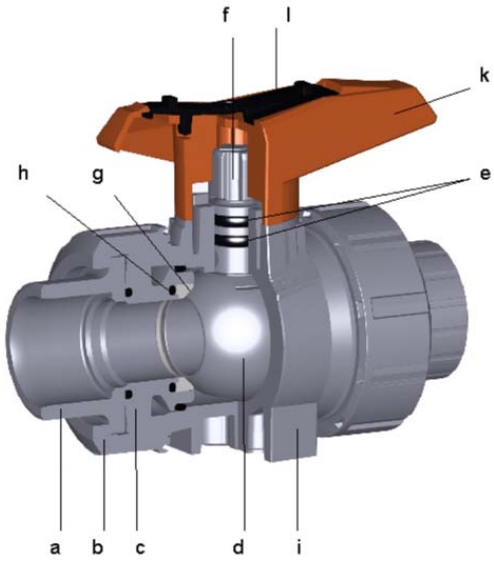
c) Union bush with fine buttress thread makes it easier to adjust the operating torque. **Attention:** Please observe the operating torque guidelines!

d) Ball with fully circular cross-section for optimal flow characteristics. The system with the floating ball permits a tight seal.

e) Two spigot seals with o-rings guarantee a long service life and high reliability.

f) The stem features a predetermined breaking point, which is located outside of the housing. In case of damage, the medium cannot therefore leak to the outside along the spigot.

g) Sturdy ball seals made of pure PTFE demonstrate high abrasion resistance, good sliding properties, chemical resistance (see the special list of "Chemical Resistance") and a long working life.



h) The backing seal effectuates continuous readjustment of the ball seal and this means that under normal working conditions maintenance-free operation and a constant torque can be warranted.

The special geometry of the o-ring chamber prevents the o-rings from being flushed out.

i) Compact housing, designed especially for plastics, with short installation length. The basic model has pick-up points for threaded inserts so that they can be attached directly on the valve. A multifunctional module with limit switches, which simultaneously serves as an interface for adding actuators, can be mounted quickly and simply on the valve body.

k) Ergonomic polypropylene handle with double stops and coding for clear positioning on the stem. Multifunctional handle, lockable and with grid positioning at 0° and 90°, available as an option.

l) Integrated handle clip of reinforced polypropylene with two cams, enabling the handle to be used as a tool for assembly and disassembly of the union bush (Attention: The union bush has left-handed thread)

TAG:16-HV-700

Diaphragm Valve Type 317

Standard Features

- **Size**
  ½"–6"
- **Valve Body Material**
  PVC, CPVC, PROGEF Standard
  Polypropylene, SYGEF PVDF
- **Diaphragm Material**
  EPDM, PTFE, FPM, NBR, or Hypalon
- **Connection**
  ANSI flange
- **Pressure rating**
  150 PSI
- **Easy replacement of diaphragm**

Optional Features

- **Pneumatic actuation**
- **Lockable handle (½"–2½")**
- **Connection**
  ISO/DIN flanged connection
  Union connection (½"–2")
  Spigot connection (½"–2")



General

The Type 317 diaphragm valve incorporates a robust design with several options for wetted materials. Diaphragms are available in EPDM, PTFE, FPM, NBR, or Hypalon. The valve body is available in PVC, CPVC, PP, and PVDF, allowing the valve to handle most chemical applications. In addition to being chemically resistant, the GF diaphragm valves are often the best solution for applications where particulates are present. The flanged connections allow for easy repair or replacement in the field.

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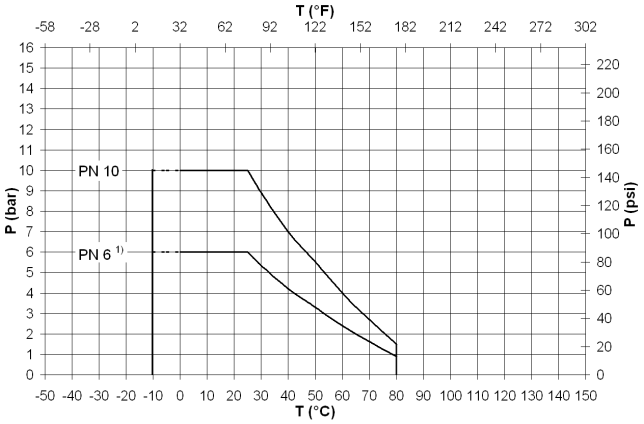
Diaphragm Valve Type 317

Pressure-Temperature Diagrams

The following pressure temperature diagrams are based on a lifetime of 25 years and the medium water or similar media.

Remark: At temperatures below 0°C, please check the torque of the bolts of the membrane according to the recommended values after the system is in use.

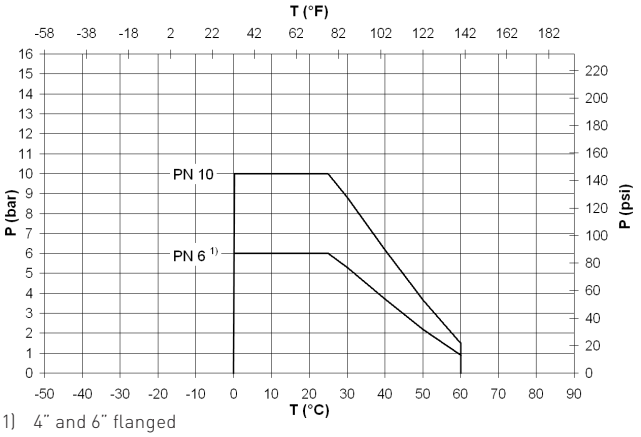
PP



1) 4" and 6" flanged
p Permissible pressure in bar, psi
T Temperature in °C, °F

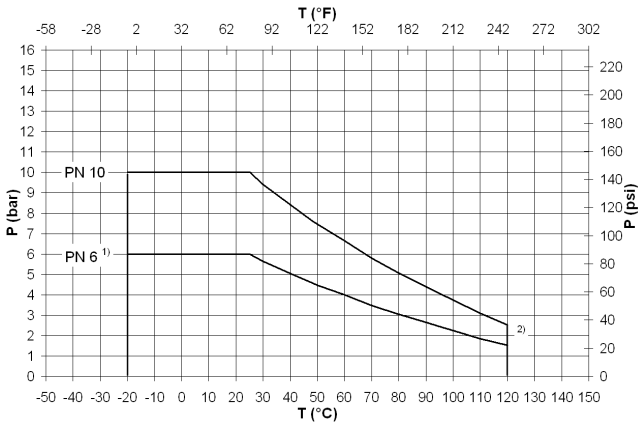
In case of applications with temperatures in the range of the dotted lines, please contact your GF representative.

PVC



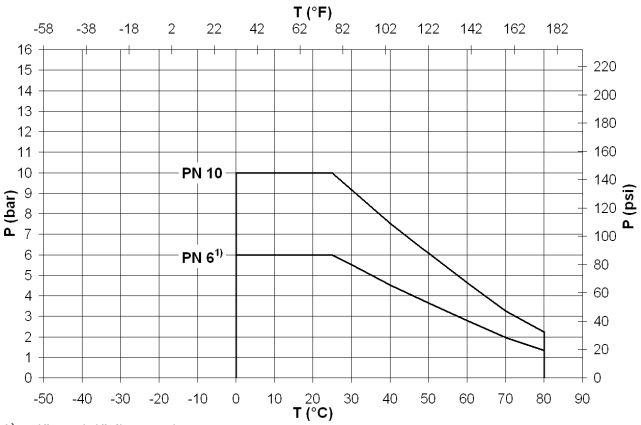
1) 4" and 6" flanged
p Permissible pressure in bar, psi
T Temperature in °C, °F

PVDF



1) 4" and 6" flanged
p Permissible pressure in bar, psi
T Temperature in °C, °F

CPVC

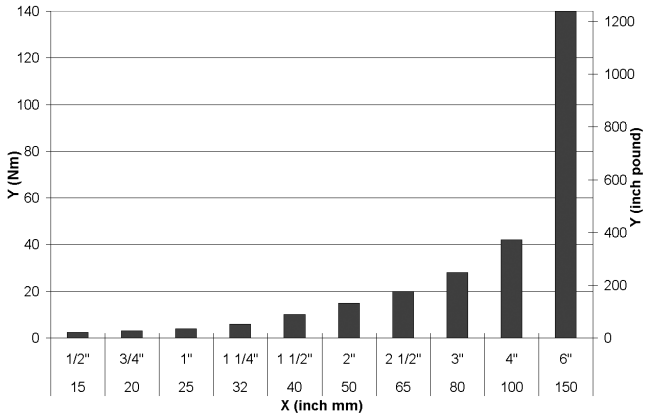


1) 4" and 6" flanged
p Permissible pressure in bar, psi
T Temperature in °C, °F

Diaphragm Valve Type 317

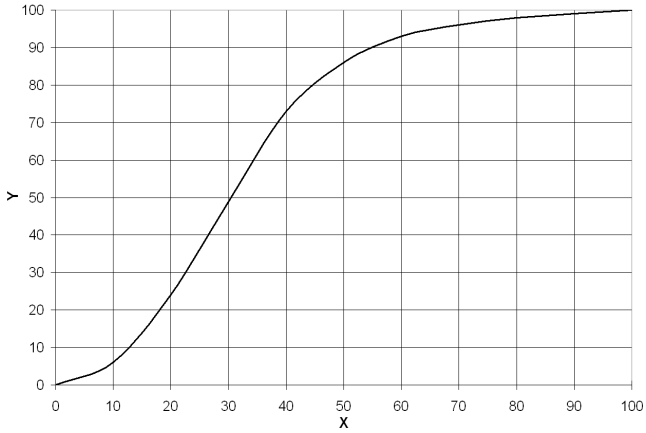
Technical Data

Operating Torque (average values)



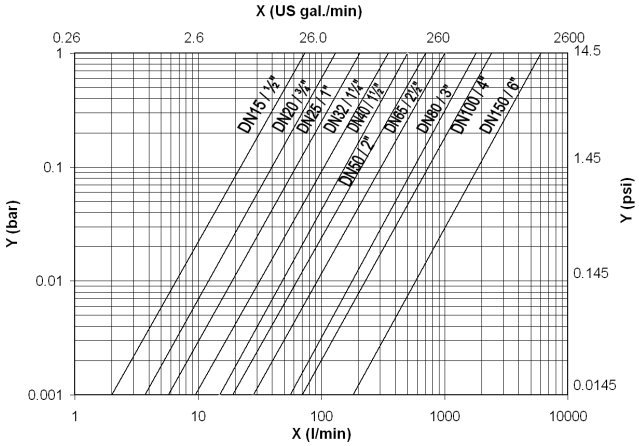
X Size DN (mm, inch)
Y Torque (Nm, inch pound)

Flow Characteristics



X Lift (%)
Y Flow factor kv, cv (%)

Pressure Loss



Medium: water 20°C
X Flow rate (l/min, US gal/min
Y Pressure loss Δp (bar, psi)

Cv Values

The Cv values for each intermediate valve position can be determined using the flow value characteristic and the Cv values.

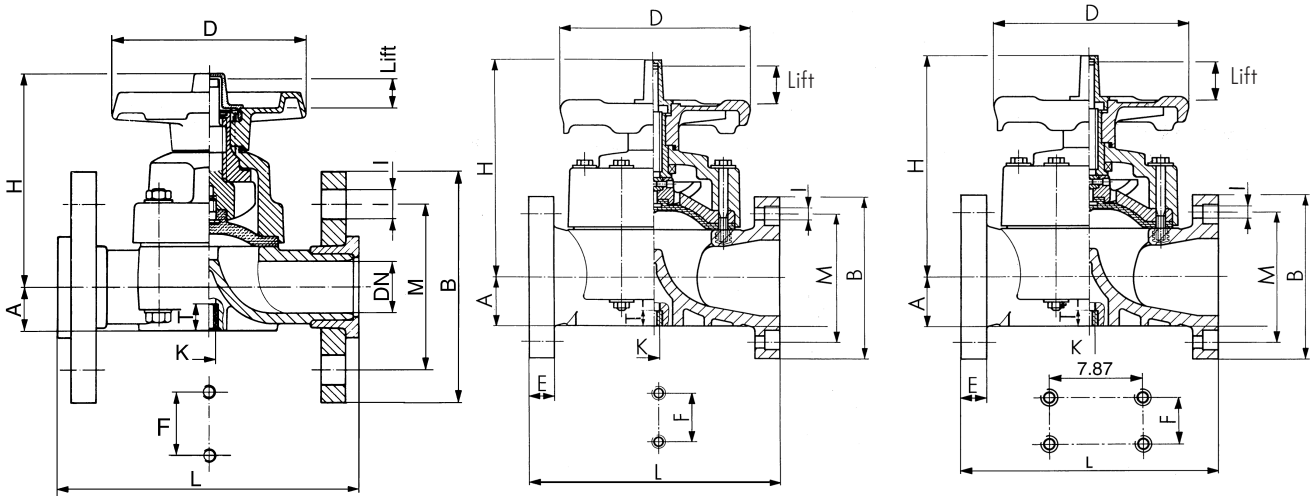
DN inch	d mm	kv 100 l/min (Δp=1 bar)	Cv US gal/min (Δp=1 psi)	kv 100 m³/h (Δp=1 bar)
½	20	72	5.0	4.3
¾	25	137	9.6	8.2
1	32	207	14.5	12.4
1¼	40	354	24.8	21.2
1½	50	517	36.2	31.0
2	63	713	49.9	42.8
2½	75	992	69.5	59.5
3	90	1700	119.0	102.0
4	110	2700	189.0	162.0
6	160	6033	422.3	362.0

Dimensions for Type 317 Diaphragm Valve

Inch size	A inch	B CPVC inch	B PVC/ PP/ PVDF inch	D inch	E CPVC inch	E PVC/ PP/ PVDF inch	H inch	L PVC/ PP/ PVDF inch	L CPVC inch	M inch	I inch	No. bolt holes	F inch	K* mm	T inch	Lift inch
½	0.55	3.50	3.74	3.15	0.50	0.43	3.54	5.12	5.91	2.38	0.55	4	0.98	M6	0.47	0.31
¾	0.69	3.88	4.13	3.15	0.50	0.47	4.02	5.91	6.54	2.75	0.55	4	0.98	M6	0.47	0.43
1	0.83	4.25	4.53	3.70	0.56	0.55	4.67	6.30	7.09	3.13	0.55	4	0.98	M6	0.47	0.51
1¼	1.00	4.63	5.51	4.61	0.63	0.59	4.96	7.09	7.56	3.50	0.71	4	1.77	M8	0.59	0.63
1½	1.28	5.00	5.91	4.61	0.69	0.63	5.47	7.87	8.27	3.88	0.71	4	1.77	M8	0.59	0.83
2	1.53	6.00	6.50	5.98	0.75	0.71	6.77	9.06	9.06	4.75	0.71	4	1.77	M8	0.59	1.10
2½	1.81	7.28	7.28	5.98	0.79	0.79	7.91	11.42	11.42	5.50	0.71	4	2.76	M8	0.59	1.18
3	2.24	7.87	7.87	10.63	1.38	1.38	10.43	12.20	12.20	6.00	0.71	4	4.72	M12	0.91	1.57
4	2.72	8.86	8.86	10.63	1.38	1.38	11.97	13.78	13.78	7.50	0.71	8	4.72	M12	0.91	1.97
6	4.25	—	11.22	15.75	—	1.38	17.20	18.90	—	9.50	0.87	8	3.94	M12	0.91	2.76

* metric thread
Loose ring flanges ½"–2½"
Integrally molded, fixed flanges 3"–6"

Inch size	Weight PVC/CPVC lbs	Weight PVDF lbs	Weight PP lbs
½	1.0	1.3	1.2
¾	1.5	1.9	1.8
1	2.2	2.6	2.7
1¼	3.5	5.1	3.1
1½	4.2	5.1	5.3
2	7.1	8.2	7.9
2½	9.5	12.6	12.0
3	21.4	23.6	19.0
4	30.0	32.8	25.0
6	59.5	68.3	55.2



½" – 2½"
(2½" is socket body/spigot flange adapter)

3" – 4"

6"

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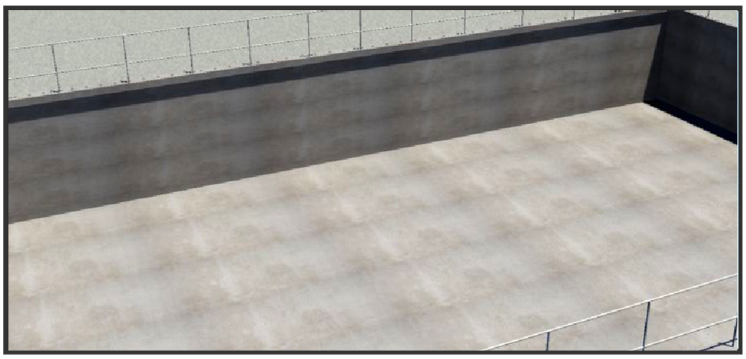
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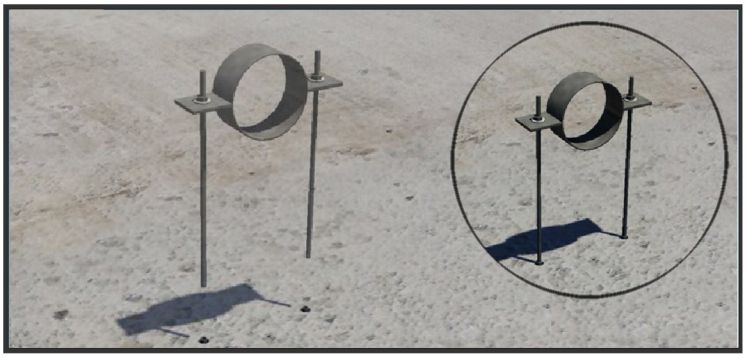
Installation Procedure of General Plant

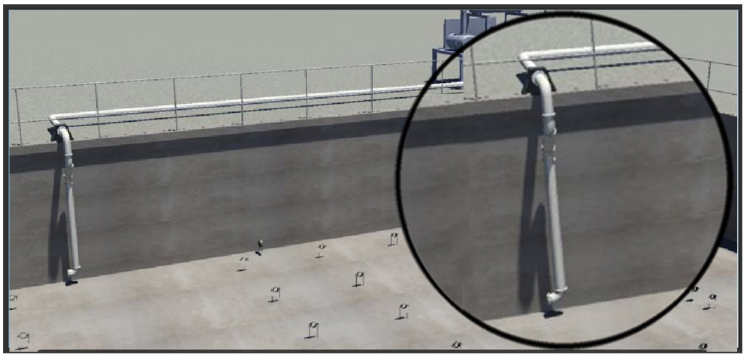




1. The concrete must be cured before any holes for the pipe supports are drilled. Allow concrete to cure before drilling holes for supports.

2. Drill suitable holes at specified location. [For location refer submittal drawings.]

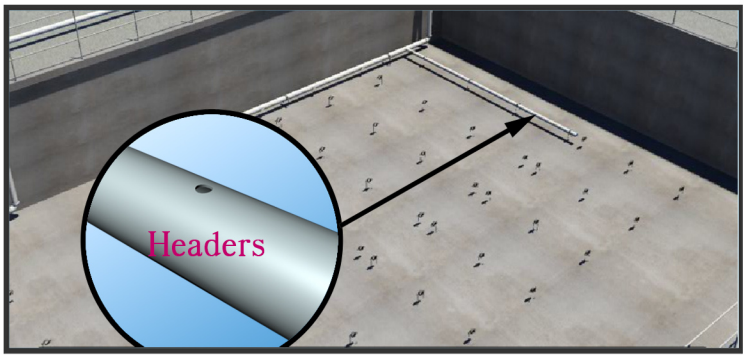




3. Holes must be clean & dry before installing anchor bolts.

4. Install the drop pipe supports and connect the drop pipe to main supply header

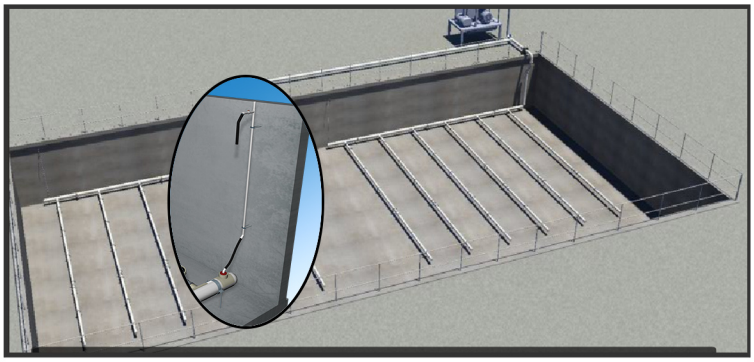




5. Connect the manifold pipe to the drop pipe.

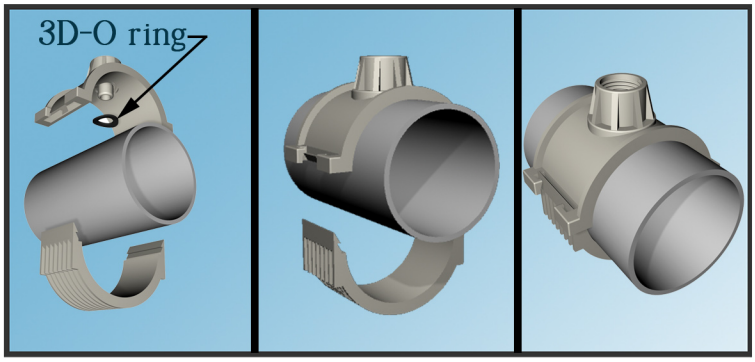
6. Install headers on the supports.
The first support after expansion joint is a fixed support. Remaining supports are guide supports.

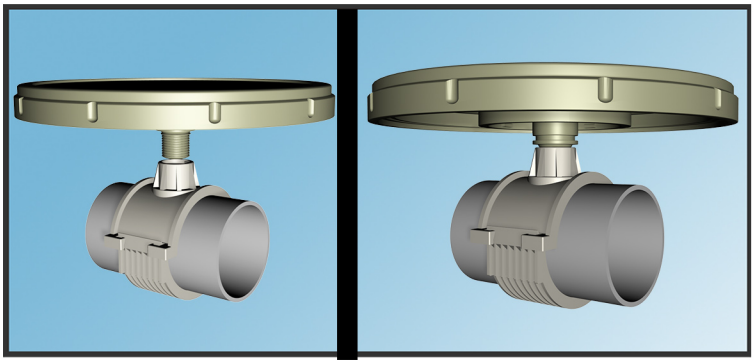




7. Maximum length of header is 20'. Header sections are connected with expansion joints. Make sure all headers with suitable holes.

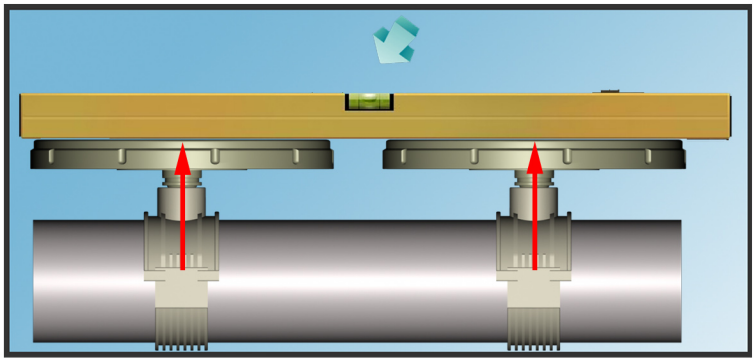
8. Install moisture purge at end of the manifold. [Moisture purge system comes ready to use from the factory]





9. Place upper saddle on header using 3D-O ring in to saddle base, next push lower saddle from down side as shown to complete the NPT saddle installation.

10. Hands tighten the diffuser unit by rotating clockwise. DO NOT OVER TIGHTEN.



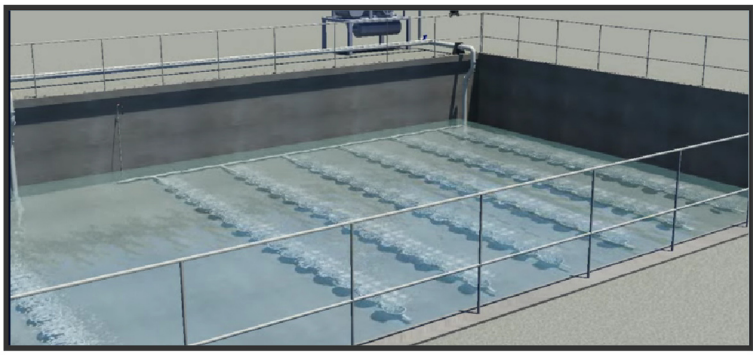


11. Diffusers should be installed on a common plane. A variance in elevation of 3/8" (10") is acceptable between diffusers.

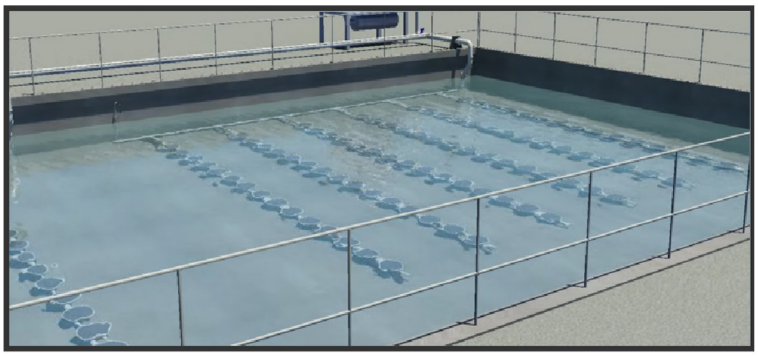
12. Fill Tank with clean water. Do not fill more than 12" (300mm) above top of the diffusers at this time.



13. Fill tank with clean water. Do not fill more than 12"(300mm) above top of the diffusers at this time.



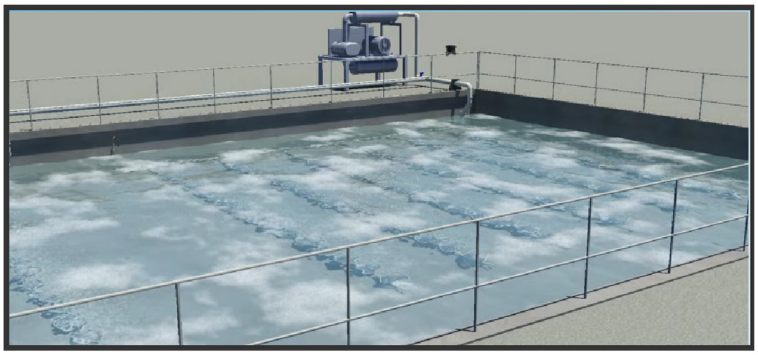
14. Check water levels right above & right below for any leaks & even bubbling pattern.



15. Fill tank to top with clean water and test for leaks.

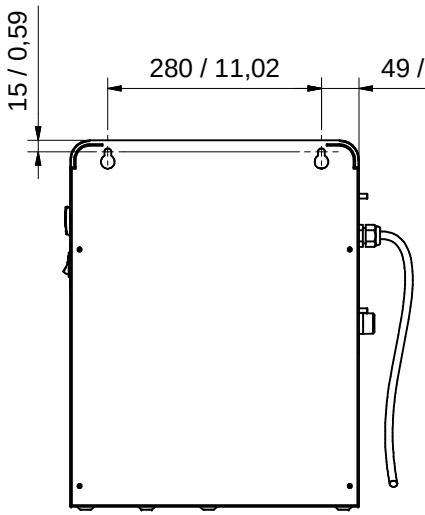


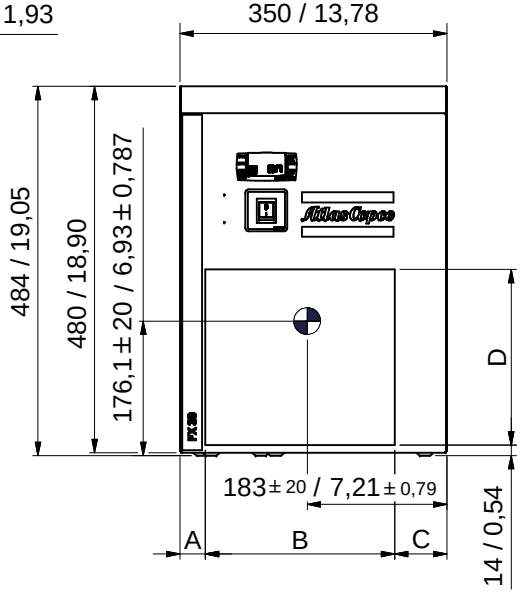
16. Check moisture purge for water to rule out negative pressure leaks.

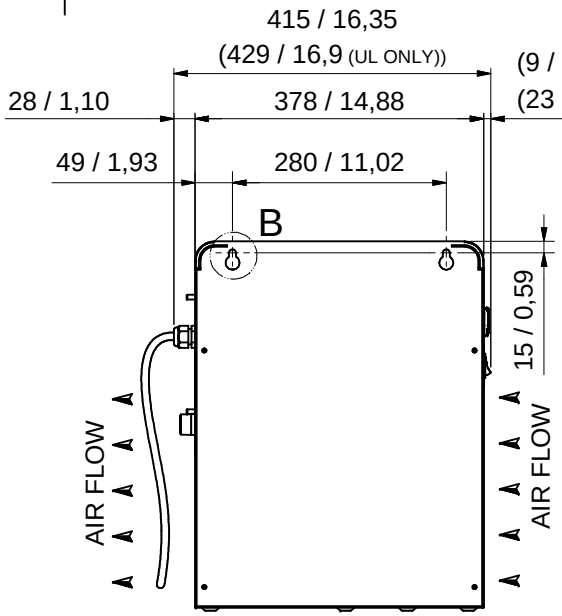


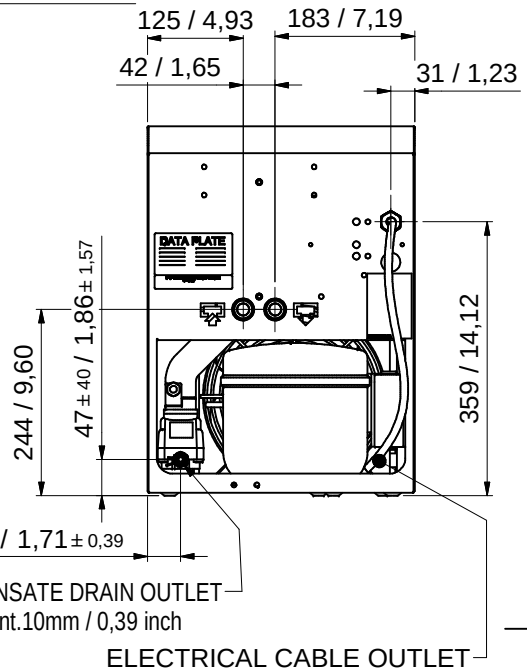
17. Your SSI aeration system ready to use.

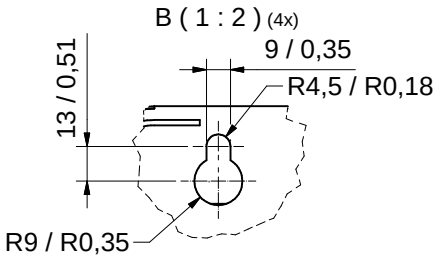
All materials supplied are in compliance with the requirements of the List of Prohibited Substances

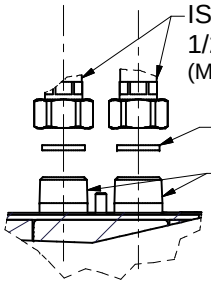


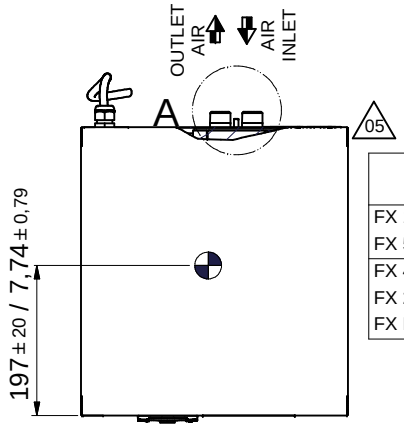




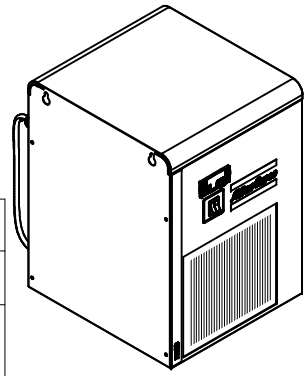








CENTER OF GRAVITY



DRYER VERSION	A (mm / inch)	B (mm / inch)	C (mm / inch)	D (mm / inch)
FX 1-2-3 MODEL (R134a) FX 5-10-15 MODEL (R513A)	81 / 3,19	188 / 7,4	81 / 3,19	175 / 6,89
FX 4-5 MODEL (R134a) FX 20-30 MODEL (R513A) FX HT1 (R134a) + HT6 MODEL (R513A)	34 / 1,34	248 / 9,76	68 / 2,68	230 / 9,06

ALL DIMENSIONS: mm [inch]

Tolerances, if not indicated, according to:
ATLAS COPCO STANDARD CLASS

Name: DIMENS. DRAWING — FX1-5+FX5-30+FXHT1+6
Material: Not applicable
Treatment: Not Applicable
Confidentiality Class acc. to 1102 K: Confidential
INV

Atlas Copco
STATUS: Approved

Scale 1:5 | Family DRYERS FX | Compare
Drawn by sgraser | Blank nr. | Replaces
Drawing Owner: CAI | Transferred from
Drawing format A3 | Blank wt. 0 Kg | Fini wt. N/A | Designation | Sheet 1 / 1
Des checked. | Prod checked. | Approved. | Date 14/04/2005

2202754900

Ed	Position	Modified from	Date	Intr./Appd.	Parent 3D model	Ed . Version 3D
05		Added FX5-30 versions. CID.27573, DN20054129	23-06-20	asavio	2202754800	04.00

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Atlas Copco

Refrigerant compressed air dryers



FX HT 1

90-DR-001-A/B

Instruction book

Atlas Copco

Atlas Copco

Refrigerant compressed air dryers

FX HT 1

From following serial No. onwards: CAI819564

Instruction book

Original instructions

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This instruction book is valid for CE as well as non-CE labelled machines. It meets the requirements for instructions specified by the applicable European directives as identified in the Declaration of Conformity.

2016 - 09

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1 Safety precautions

1.1 Safety icons

Explanation

	Danger to life
	Warning
	Important note

1.2 Safety precautions, general

General precautions

	All responsibility for any damage or injury resulting from neglecting these precautions, or non-observance of the normal caution and care required for installation, operation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.

1. The dryers are designed for normal indoor use.
2. The operator must employ safe working practices and observe all related work safety requirements and regulations.
3. If any of the following statements does not comply with the applicable legislation, the stricter of the two shall apply.
4. Installation, operation, maintenance and repair work must only be performed by authorized, trained, specialized personnel.
5. The dryer is not considered capable of producing air of breathing quality. To obtain air of breathing quality, the compressed air must be adequately purified according to the applicable legislation and standards.
6. Before any maintenance, repair work, adjustment or any other non-routine checks, stop the dryer, press the emergency stop button, switch off the voltage and depressurize the dryer. In addition, the power isolating switch must be opened and locked. For plug versions, remove the plug from the wall socket and secure it.
7. Never play with compressed air. Do not apply the air to your skin or direct an air stream at people. Never use the air to clean dirt from your clothes. When using the air to clean equipment, do so with extreme caution and wear eye protection.
8. The owner is responsible for maintaining the dryer in safe operating condition. Parts and accessories shall be replaced if unsuitable for safe operation.
9. It is not allowed to walk or stand on the dryer or its components.

1.3 Safety precautions during installation

Precautions during installation

1. The dryer must only be lifted using suitable equipment and in accordance with the applicable safety regulations. Loose or pivoting parts must be securely fastened before lifting. It is strictly forbidden to dwell or stay in the risk zone under a lifted load. Lifting acceleration and deceleration must be kept within safe limits. Wear a safety helmet when working in the area of overhead or lifting equipment.
2. Place the dryer where the ambient air is as cool and clean as possible. If necessary, install a suction duct. Never obstruct the air inlet. Care must be taken to minimize the entry of moisture at the inlet air.
3. Any blanking flanges, plugs, caps or desiccant bags must be removed before connecting the pipes.
4. Air hoses must be of correct size and suitable for the working pressure. Never use frayed, damaged or worn hoses. Distribution pipes and connections must be of the correct size and suitable for the working pressure.
5. The aspirated air must be free of flammable fumes, vapours and particles, e.g. paint solvents, that can lead to internal fire or explosion.
6. Arrange the air intake so that loose clothing worn by people cannot be sucked in.
7. Ensure that all piping is free to expand under heat and that it is not in contact with or close to flammable materials.
8. No external force may be exerted on the air outlet valve. The connected pipe must be free of strain.
9. If remote control is installed, the machine must bear a clear sign stating "Danger: This machine is remotely controlled and may start without warning".
   The operator has to make sure that the machine is stopped and that the isolating switch is open and locked before any maintenance or repair. As a further safeguard, persons switching on remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the starting equipment.
10. Air-cooled machines must be installed in such a way that an adequate flow of cooling air is available and that the exhausted cooling air does not recirculate to the inlet.
11. The electrical connections must correspond to the applicable codes. The machines must be earthed and protected against short circuits by fuses in all phases. A lockable power isolating switch must be installed near the equipment.
12. On machines with automatic start-stop system or if the automatic restart function after voltage failure is activated, a sign stating "This machine may start without warning" must be affixed near the instrument panel.
13. Never remove or tamper with the safety devices, guards or insulation fitted on the machine. Every pressure vessel or auxiliary installed outside the machine to contain air above atmospheric pressure must be protected by a pressure-relieving device or devices as required.
14. Piping or other parts with a temperature in excess of 80˚C (176˚F) and which may be accidentally touched by personnel during normal operation must be guarded or insulated. Other high-temperature piping must be clearly marked.
15. For water-cooled machines, the cooling water system installed outside the machine has to be protected by a safety device with set pressure according to the maximum cooling water inlet pressure.
16. If no safety valve is present in the air net close to the desiccant dryer (e.g. safety valve of compressor), full flow safety valves must be installed on the dryer vessels.
17. If the maximum pressure of the compressor is higher than the design pressure of the dryer, a full flow safety valve must be installed between the compressor and the dryer in order to blow off the excessive pressure in case the safety valve of the dryer should be out of order or blocked.
18. When unit is not permanently secured to the floor in the vertical position or mounted horizontally, access to electrical equipment is feasible through the unit base. In this case additional barriers must be provided during installation. Tag with "warning high voltage" symbol

	Also consult following safety precautions: Safety precautions during operation and Safety precautions during maintenance or repair. These precautions apply to machinery processing or consuming air or inert gas. Processing of any other gas requires additional safety precautions typical to the application which are not included herein. Some precautions are general and cover several machine types and equipment; hence some statements may not apply to your machine.

1.4 Safety precautions during operation

Precautions during operation

1. Always be careful when touching any piping or components of the dryer during operation. On dryers using heat to regenerate the desiccant, some parts will become very hot.
2. Use only the correct type and size of hose end fittings and connections. When blowing through a hose or air line, ensure that the open end is held securely. A free end will whip and may cause injury. Make sure that a hose is fully depressurized before disconnecting it.
3. Persons switching on remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the remote start equipment.
4. Never operate the machine when there is a possibility of taking in flammable or toxic fumes, vapors or particles.
5. Never operate the machine below or in excess of its limit ratings.
6. Keep all bodywork closed during operation. Bodywork should be opened for short periods only, e.g. to carry out routine checks. Wear ear protectors when removing a panel.
7. People staying in environments or rooms where the sound pressure level reaches or exceeds 90 dB(A) shall wear ear protectors.
8. Periodically check that:
   - All guards are in place and securely fastened
   - All hoses and/or pipes inside the machine are in good condition, secure and not rubbing
   - There are no leaks
   - All fasteners are tight
   - All electrical leads are secure and in good order
   - Safety valves and other pressure relief devices are not obstructed by dirt or paint
   - Air outlet valve and air net, i.e. pipes, couplings, manifolds, valves, hoses, etc. are in good condition, free of wear or abuse
9. If warm cooling air from dryers is used in air heating systems, e.g. to warm up a working area, take precautions against air pollution and possible contamination of the breathing air.
10. Do not remove any of, or tamper with, the sound dampening material.
11. Never remove or tamper with the safety devices, guards or insulations fitted on the machine. Every pressure vessel or auxiliary installed outside the machine to contain air above atmospheric pressure shall be protected by a pressure relieving device or devices as required.
12. Yearly inspect the air receiver. Minimum wall thickness as specified in the instruction book must be respected. Local regulations remain applicable if they are more strict.

	Also consult following safety precautions: Safety precautions during installation and Safety precautions during maintenance or repair. These precautions apply to machinery processing or consuming air or inert gas. Processing of any other gas requires additional safety precautions typical to the application which are not included herein. Some precautions are general and cover several machine types and equipment; hence some statements may not apply to your machine.

1.5 Safety precautions during maintenance or repair

Precautions during maintenance or repair

1. Always use the correct safety equipment (such as safety glasses, gloves, safety shoes, etc.).
2. Use only the correct tools for maintenance and repair work.
3. Use only genuine spare parts.
4. All maintenance work shall only be undertaken when the machine has cooled down.
5. A warning sign bearing a legend such as "Work in progress - do not start" shall be attached to the starting equipment.
6. Persons switching on remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the remote starting equipment.
7. Close the dryer air outlet valve before connecting or disconnecting a pipe.
8. Before removing any pressurized component, effectively isolate the machine from all sources of pressure and relieve the entire system of pressure.
9. Never use flammable solvents or carbon tetrachloride for cleaning parts. Take safety precautions against toxic vapours of cleaning liquids.
10. Scrupulously observe cleanliness during maintenance and repair. Keep dirt away by covering the parts and exposed openings with a clean cloth, paper or tape.
11. Never weld on, or in any way modify, pressure vessels.
12. Whenever there is an indication or any suspicion that an internal part of a machine is overheated, the machine shall be stopped but no inspection covers shall be opened before sufficient cooling time has elapsed; this to avoid the risk of spontaneous ignition of the oil vapor when air is admitted.
13. Never use a light source with open flame for inspecting the interior of a machine, pressure vessel, etc.
14. Make sure that no tools, loose parts or rags are left in or on the machine.
15. All regulating and safety devices shall be maintained with due care to ensure that they function properly. They may not be put out of action.
16. Before clearing the machine for use after maintenance or overhaul, check that operating pressures, temperatures and time settings are correct. Check that all control and shut-down devices are fitted and that they function correctly.
17. Protect the motor, electrical and regulating components, etc. to prevent moisture from entering them, e.g. when steam-cleaning.
18. Make sure that all sound-damping material and vibration dampers, e.g. damping material on the bodywork, is in good condition. If damaged, replace it by genuine material from the manufacturer to prevent the sound pressure level from increasing.
19. Never use caustic solvents which can damage materials of the air net, e.g. polycarbonate bowls.
20. **The following safety precautions are stressed when handling refrigerant:**
    - Never inhale refrigerant vapours. Check that the working area is adequately ventilated; if required, use breathing protection.
    - Always wear special gloves. In case of refrigerant contact with the skin, rinse the skin with water. If liquid refrigerant contacts the skin through clothing, never tear off or remove the latter;

flush abundantly with fresh water over the clothing until all refrigerant is flushed away; then seek medical first aid.

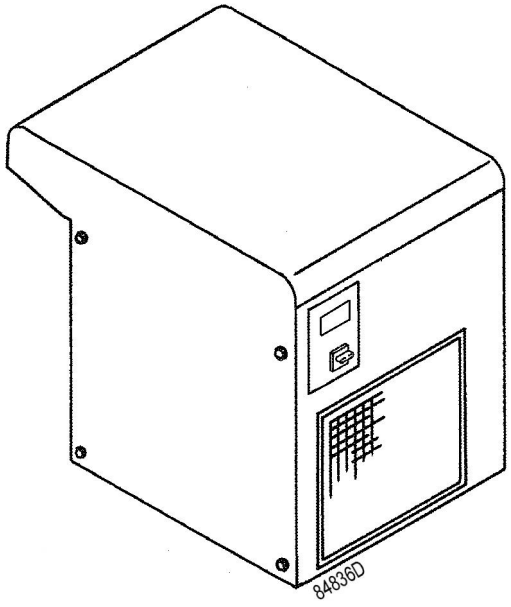
21. **The following safety precautions are stressed when handling desiccant:**
    - Take precautions not to inhale desiccant dust.
    - Check that the working area is adequately ventilated; if required, use breathing protection.
    - Do not overfill the dryer when replacing desiccant.

	Also consult following safety precautions: Safety precautions during installation and Safety precautions during operation. These precautions apply to machinery processing or consuming air or inert gas. Processing of any other gas requires additional safety precautions typical to the application which are not included herein. Some precautions are general and cover several machine types and equipment; hence some statements may not apply to your machine.

2 General description

2.1 Introduction

General views



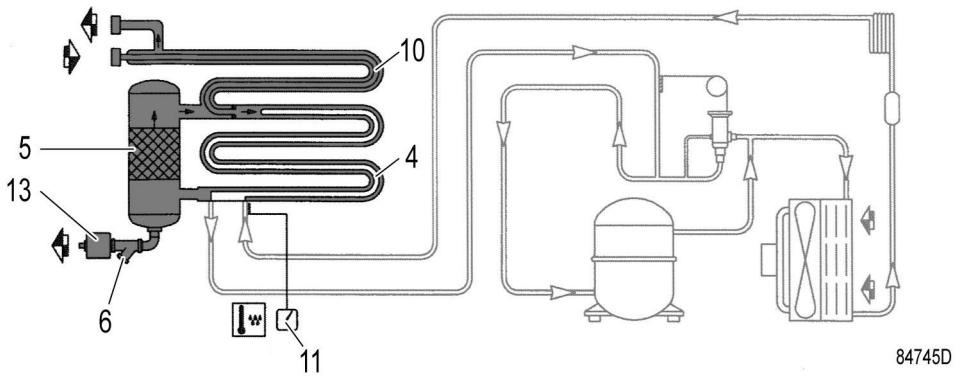
FX HT 1

Introduction

The FX HT air dryers remove moisture from compressed air by cooling the air to near freezing point. This causes water to condense. The condensate is automatically drained. The air is warmed up before leaving the dryer.

2.2 Air system

Air flow diagram



Reference	Name
4	Evaporator
5	Condensate separator
6	Impurity trap
10	Heat exchanger
11	Digital dewpoint indicator
13	Condensate drain

Description

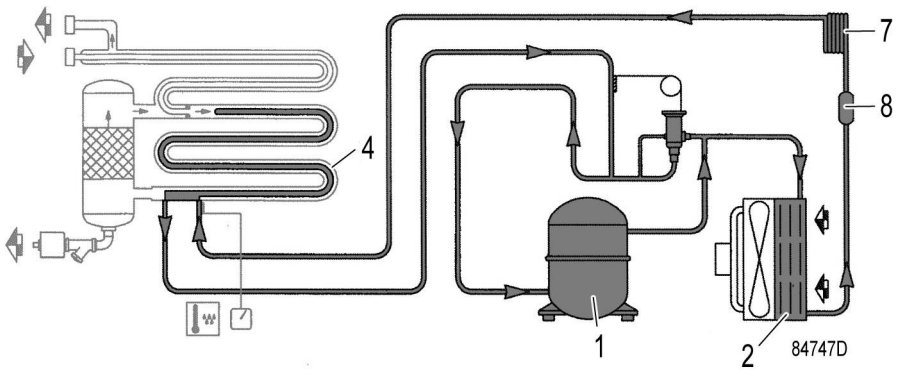
Compressed air enters heat exchanger (10) and is cooled by the outgoing, cold, dried air. Water in the incoming air starts to condense. The air then flows through heat exchanger/evaporator (10 and 4) where the refrigerant evaporates, causing the air to be cooled further to close to the evaporating temperature of the refrigerant. More water in the air condenses. The cold air then flows through separator (5) where all the condensate is separated from the air. The condensate is automatically drained in the condensate drain.

The cold, dried air flows through heat exchanger (10) where it is warmed up by the incoming air to approximately 10˚C (18˚F) below the incoming air temperature.

Condensation in the air net cannot occur unless the air is cooled to below the pressure dewpoint, indicated by the dewpoint indicator (11).

2.3 Refrigeration system

Refrigerant flow diagram



Reference	Name
1	Refrigerant compressor
2	Condenser
4	Evaporator
7	Expansion capillary tube
8	Refrigerant filter

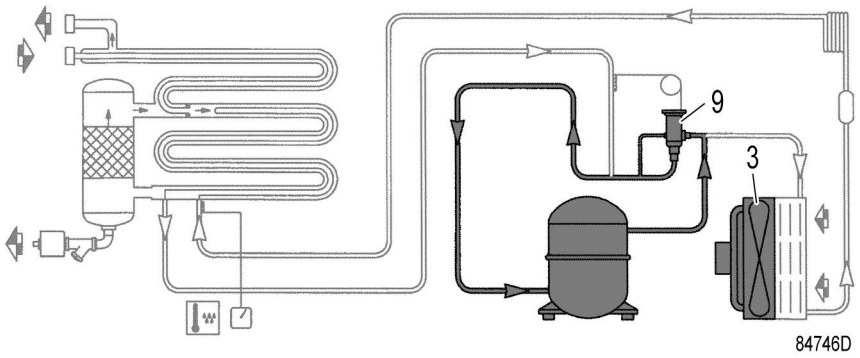
Description

Compressor (1) delivers hot, high-pressure refrigerant gas which flows through condenser (2) where most of the refrigerant condenses.

The liquid flows through the refrigerant dryer/filter (8) to capillary tube (7). The refrigerant leaves the capillary tube at evaporating pressure.

The refrigerant enters evaporator (4) where it withdraws heat from the compressed air by further evaporation at constant pressure. The heated refrigerant leaves the evaporator and flows through the liquid separator (9) back to the compressor (1).

2.4 Automatic regulation system



Reference	Name
3	Cooling fan
9	Hot gas bypass valve

Description

The condenser pressure must be kept as constant as possible to obtain stable operation. Fan control switch therefore stops and starts the cooling fan (3).

If, under partial or no load, the evaporator pressure drops below a certain level, the hot gas bypass valve opens and hot, high-pressure gas is fed to the evaporator circuit to prevent the evaporator pressure from dropping any further.

2.5 Electrical system

Description

The fan control switch starts the fan motor as soon as the condenser pressure reaches the upper set point of the switch and will stop the fan motor when the condenser pressure decreases to its lower set point.

3 Installation

3.1 Dimension drawings

The dimension drawings can be found on the CD-ROM, delivered with the dryer.

Dimension drawing	Model
2202 7549 00	FX HT 1

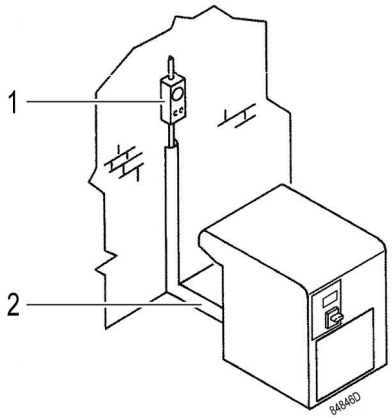
Text on drawings	Translation or explanation
Electric cable outlet	Outlet for electric cable
Condensate pipe drain outlet	Outlet for condensate drain hose or pipe
Air inlet	Air inlet
Air outlet	Air outlet
Air flow	Air flow direction
Bushings UL version only	Bushings (UL certification version only)
Female	Female connection
Male	Male connection
All dimensions: mm / inch	All dimensions are in mm or inch as indicated on the drawing

3.2 Installation proposal

Moving

	Use a suitable tool (pallet carrier, fork lift truck) to move the dryer. Do not use metal cables for lifting. Move the dryer gently.

Example of compressor/dryer room

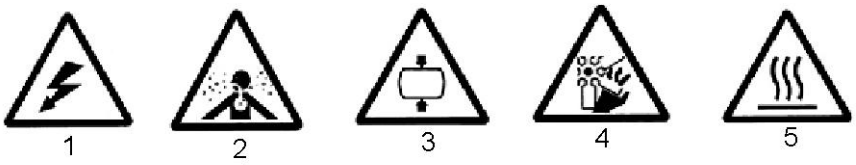


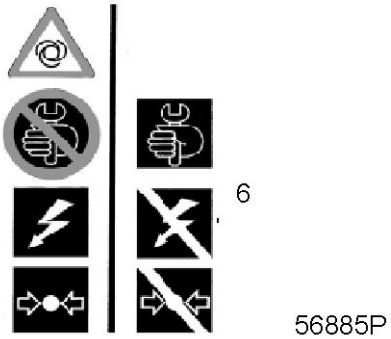
Installation proposal for FX HT 1

Reference	Description
-	Install the refrigerant air dryer on a level floor, suitable for its weight.
-	The recommended minimum distance between the top of the unit and the ceiling is 1.5 m (58.5 in). The minimum distance between the wall and the back of the dryer must be 1.5 m (58.5 in). Lay out the condensate drain hose via a funnel towards a drain collector to allow visual inspection. The hose must slope downwards. If the condensate drain has been fitted outside the dryer room where it may be exposed to freezing temperatures, it must be insulated.
-	The power cable must be connected by a qualified electrician. Connect the dryer to the correct voltage; if necessary, check the unit data plate. Check that the electrical installation corresponds to local codes. The dryer must be earthed and protected against short circuits using an automatic cut-out device with a differential device. An isolating switch must be installed near the dryer.
-	Connect the compressed air lines to the marked inlet and outlet pipes of the dryer (see Dimension drawings). Provide an air inlet valve and outlet valve. If a bypass pipe and valve are installed, the dryer can be serviced while it is bypassed.
1	Location of isolating switch and fuses.
2	Minimum distance 1.5 m (58.5 in).

3.3 Pictographs

Pictographs





Reference	Name
1	Warning, under tension
2	Warning, air not fit for breathing
3	Warning, high pressure
4	Warning, rotating fan
5	Warning, hot surface
6	Switch off the voltage and depressurize the dryer before maintenance or repair

4 Operating instructions

4.1 Warnings

Safety precautions

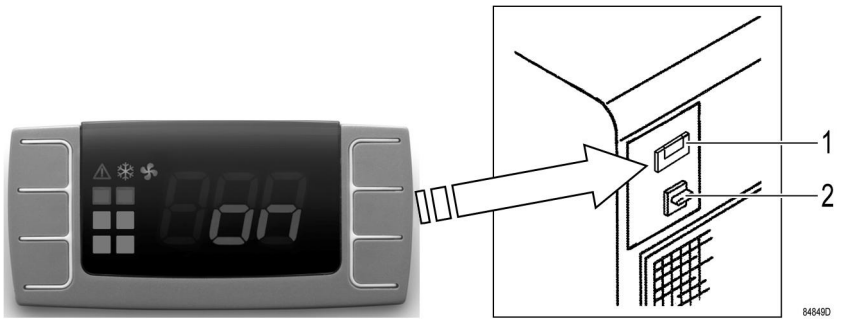
The operator must apply all relevant safety precautions, including those mentioned in this manual.

Altitude operation

Consult your supplier if operating above 3000 m (9843 ft).

4.2 Control panel

Description

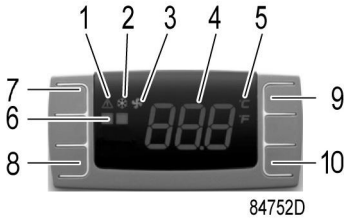


FX HT 1

Reference	Name
1	Digital controller, used for: 1. pressure dewpoint indication (main function) 2. alarms information 3. maintenance interval scheduling
2	Dryer on/off switch

4.3 Digital controller

Identification



Front panel of the controller

Reference	Name
1	Alarm icon
2	Refrigerant compressor icon
3	Fan icon
4	PDP (dewpoint) temperature
5	Unit (°C or °F)
6	Alarm LED
7	Not used
8	SET button
9	UP button
10	DOWN button
8+9	Back to previous screen
8+10	Menu

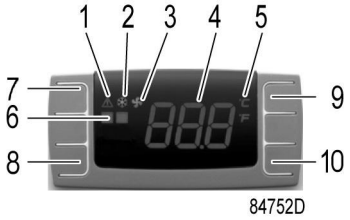
Icons

Icon	Name	Mode	Function
	Alarm	Off	No active alarms
		On	Probe failure alarm
			High temperature or low temperature alarm
			Service alarm
	Refrigerant compressor	Off	Dryer off
		On	Dryer on
		Flashing + SE	Maintenance warning
	Fan	Off	Fan off
		Flashing	Not applicable
		On	Fan on

Fault messages

Flashing fault message	Description	Remedy
 84758D	Fan control probe failure.	Replace the probe.
 84759D	Dewpoint temperature probe failure	Replace the probe.
 84762D	Pressure dewpoint too high.	Refer to the fault and remedies section.
 84765D	Pressure dewpoint too low	Refer to the fault and remedies section.
 84766D	Internal EPROM error	Reset by pressing one of the four buttons. If the problem persists, replace the controller.
 84767D	Maintenance required	Perform the maintenance and reset the alarm.

Resetting the maintenance warning



Front panel of the controller

To reset the maintenance warning, follow steps 1 to 12:

1. The display is flashing between standard view (dewpoint) and Maintenance required (SE) alarm.
2. Push and hold buttons SET (8) and DOWN (10) to enter the menu.
3. Message “SE” appears on display.



4. Push and release the UP button (9).
5. Message “rS” appears on display.



6. Push and release the SET button (8).
7. Message “n” appears on display.



8. Push and release the UP button (9).
9. Message “y” appears on display.



10. Push and release SET (8) to reset service alarm.
11. Message “y” blinks for 3 seconds.



12. Then “rL” is fixed and “°C” blinks on display for about 10 seconds.



The service alarm is now reset.

Setting the service interval

To set the service interval, follow steps 1 to 9:

1. PDP is showing standard view.
2. Push and hold buttons SET (8) and DOWN (10) to enter the menu.
3. Message “SE” appears on display.



4. Push and release SET (8) to enter the “SE” menu.
5. Current service interval is displayed.
   (“60” or any other value between “0” and “99”)



6. Select desired service interval using the UP or DOWN button.
   (40=4000h, 55=5500h, 80=8000h,…)
7. Push and release SET to confirm the new service interval.
8. The selected value blinks during 3 seconds.



9. Then “rS” is fixed and “°C” blinks on display for ~10 seconds.



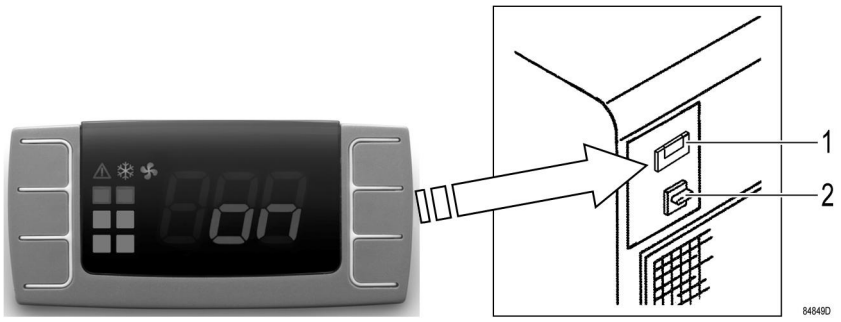
The new service interval is now set.

4.4 Starting

Attention

	To ensure optimum operational efficiency, do not use dryer on/off switch repeatedly within a short time period. Wait at least 5 minutes to start the dryer again after stopping to allow pressure equalization.
	To keep the compressed air net free of condensate, start the dryer before starting the compressor and stop the compressor before stopping the dryer.

Procedure

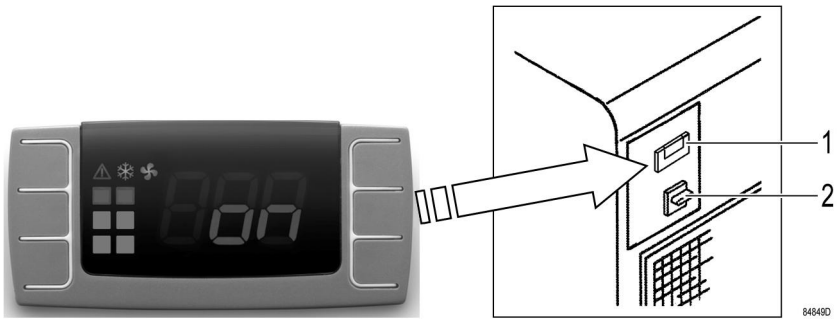


FX HT 1

Step	Action
1	If installed, close the dryer by-pass valve. See Installation proposal.
2	Press dryer on/off switch (2).
3	Open dryer air inlet valve (customer's installation).
4	Approx. 5 minutes later, open dryer air outlet valve (customer's installation).
5	Approx. 10 minutes later, the nominal dewpoint will be reached.

4.5 During operation

Procedure



FX HT 1

Regularly check:

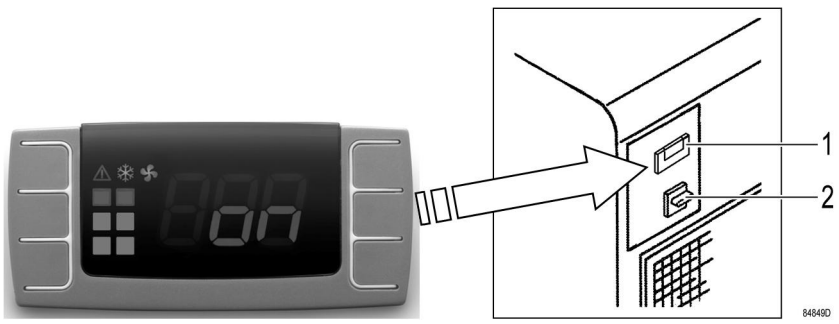
- The pressure dewpoint on the digital controller (1). The pressure dewpoint will deviate from nominal if the air inlet conditions or volume flow differ from nominal.
- That condensate is discharged via condensate outlet. The amount depends on the operating conditions.

4.6 Stopping

Attention

	To ensure optimum operational efficiency, do not use dryer on/off switch repeatedly within a short time period. Wait at least 5 minutes to start the dryer again after stopping to allow pressure equalization.
	To keep the compressed air net free of condensate, start the dryer before starting the compressor and stop the compressor before stopping the dryer.

Procedure



FX HT 1

Step	Action
1	Close the dryer inlet and outlet valve (customer’s installation).
2	Press dryer on/off switch (2), the dryer stops.
3	If provided, open the dryer by-pass valve.

5 Maintenance instructions

Safety precautions

Before starting any maintenance or repair work, close the air inlet and outlet valve and switch off the voltage.

When removing the side panels of the dryer, be aware that internal elements such as the pipes can be hot. Therefore, wait until the dryer has cooled down before removing the side panels.

Dryers of FX type contain refrigerant HFC.

When handling refrigerant, all applicable safety precautions must be observed. Please be aware of the following points:

- Contact of refrigerant with the skin will cause freezing. Special gloves must be worn. In case of contact with the skin, the skin should be rinsed with water. On no account may clothing be removed.
- Fluid refrigerant will also cause freezing of the eyes; safety glasses must hence be worn.
- Refrigerant is hazardous. Do not inhale refrigerant vapours. Check that the working area is adequately ventilated.

Local legislation

Local legislation may stipulate that:

- Work on the refrigerant circuit of the cooling dryer or on any equipment which influences its function must be undertaken by an authorised control body.
- The installation is checked once a year by an authorised control body.

Instructions

- Keep the dryer clean.
- Inspect and clean the filter of the automatic condensate drain monthly, in dusty environment drain weekly:
  - Release the pressure in the dryer by pressing the TEST push button on top of the condensate drain (before switching off the supply voltage).
  - Switch off the voltage
  - Remove the filter from the automatic drain and clean it with an air jet, working from inside to outside
  - Reinstall the filter
- Brush or blow off the finned surface of the condenser monthly. Do not use water or solvents.
- Apply the drain wear kit once per year (see Spare Parts list for part number).

	These maintenance intervals are intended for well ventilated, non-humid and not dusty environments. For particularly high humidity ambient conditions, the intervals should be halved.

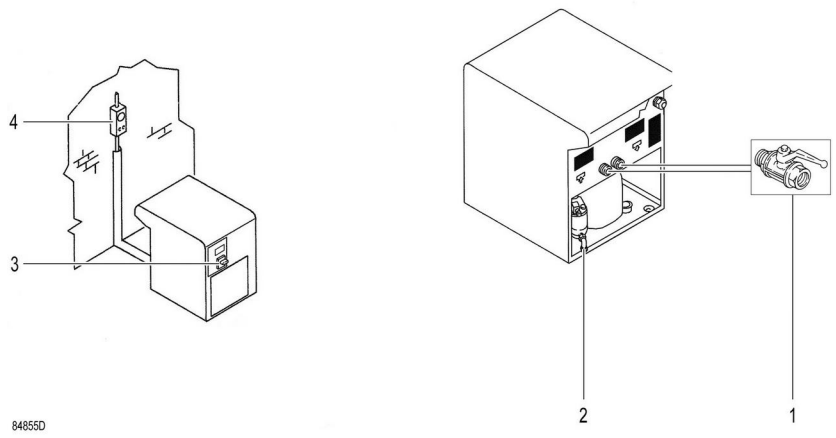
6 Device settings

Regulating and safety devices

The regulating and safety devices are factory-adjusted to obtain optimum performance of the dryer. Do not alter the setting of any of the devices.

7 Problem solving

Condensate drain and air inlet and outlet valves



FX HT 1

Reference	Name
1	Inlet and outlet valves
2	Condensate drain
3	Dryer on/ off switch
4	Isolating switch

Attention

	Use only authorised parts. Any damage or malfunction caused by the use of unauthorised parts is not covered by Warranty or Product Liability. Apply all relevant safety precautions.
	Before carrying out any maintenance or repair work on the dryer: Close air inlet and outlet valves (1) of the dryer. Move dryer on/off switch (3) to position 0 to switch off the voltage. See section Stopping. Open the isolating switch (4) to prevent an accidental start.
	The air inlet and outlet valves (1) can be locked during maintenance or repair work as follows: • Close the valve. • Using a wrench, remove the screw fixing the handle. • Lift the handle and turn it until the slot of the handle fits over the blocking edge on the valve body. • Fit the screw.

Faults and remedies

	Condition	Fault	Remedy
1	Pressure dewpoint too high	Air inlet temperature too high	Check and correct; if necessary, install a pre-cooler

	Condition	Fault	Remedy
		Ambient temperature too high	Check and correct; if necessary, draw cooling air via a duct from a cooler place or relocate the dryer
		Air inlet pressure too low	Increase inlet pressure Adjust the pressure switch
		Dryer capacity exceeded	Reduce air flow
		Shortage of refrigerant	Have circuit checked for leaks and recharged
		Refrigerant compressor does not run	See 3
		Evaporator pressure too high	See 5
		Condenser pressure too high	See 2
2	Condenser temperature too high or too low	Fan or fan motor out of order	Check fan/fan motor
		Ambient temperature too high	Check and correct; if necessary, draw cooling air via a duct from a cooler room or relocate the dryer
		Condenser externally clogged	Clean condenser
3	Compressor stops or does not start	Electric power supply to compressor is interrupted	Check and correct as necessary
		Thermal protection of refrigerant compressor motor has tripped	Reset the thermostatic protection
		Restart of the dryer has been too fast, not enough time for pressure balancing	Wait a few minutes and restart
4	The condensate drain remains inoperative	Drain system clogged	Have system inspected
5	Evaporator pressure is too high or too low at unload	Hot gas by-pass valve incorrectly set or out of order	Have hot gas by-pass valve adjusted
		Condenser pressure too high or too low	See 2
		Shortage of refrigerant	Have circuit checked for leaks and recharged

8 Technical data

8.1 Reference conditions and limitations

Reference conditions

	Unit	
Compressed air inlet pressure	bar(e)	8.6
Compressed air inlet pressure	psig	125
Compressed air inlet temperature	˚C	82
Compressed air inlet temperature	˚F	180
Ambient temperature	˚C	35
Ambient temperature	˚F	95

Limits

	Unit	
Maximum compressed air inlet pressure	bar(e)	16
Maximum compressed air inlet pressure	psig	232
Min.-max. ambient air temperature	˚C	5–35
Min.-max. ambient air temperature	˚F	41–95
Maximum compressed air inlet temperature	˚C	82
Maximum compressed air inlet temperature	˚F	180

8.2 Air dryer data

FX HT 1

Air dryer type	Unit	FX HT 1
Frequency	Hz	60
Electric power input	W	470
	hp	0.63
Electric power input, compressor	W	424
	hp	0.56
Electric power input, fan motor	W	46
	hp	0.06
Weight of the unit	kg	26
	lb	57
Refrigerant		R134A

Air dryer type	Unit	FX HT 1
Total charge (approx.)	kg	0.47
	lb	1.04

9 Pressure equipment directives

Components subject to Pressure Equipment Directive

All pressure bearing components are designed category I or less according to European Directive 97/23/EC (until 19/07/2016) or Directive 2014/68/EU (from 20/07/2016 onwards).

10 Declaration of conformity

EC DECLARATION OF CONFORMITY

We, ……(1)……, declare under our sole responsibility, that the product
Machine name:
Machine type:
Serial number:

Which falls under the provisions of article 12.2 of the EC Directive 2006/42/EC on the approximation of the laws of the Member States relating to machinery, is in conformity with the relevant Essential Health and Safety Requirements of this directive.

The machinery complies also with the requirements of the following directives and their amendments as indicated.

	Directive on the approximation of laws of the Member States relating to (2)		Harmonized and/or Technical Standards used (3)	Att' mnt
a.				X
b.				
c.				X
d.				
e.				X

The harmonized and the technical standards used are identified in the attachments hereafter

……(1)…… is authorized to compile the technical file.

	Conformity of the specification to the directives	Conformity of the product to the specification and by implication to the directives
Issued by	Engineering	Manufacturing
Name		
Signature		
Date		

84350D

Typical example of a Declaration of Conformity document

(1): Contact address:

Atlas Copco Airpower n.v.

P.O. Box 100

B-2610 Wilrijk (Antwerp)

Belgium

(2): Applicable directives

(3): Standards used

On the Declaration of Conformity / Declaration by the Manufacturer, the harmonized and/or other standards that have been used for the design are shown and/or referred to.

The Declaration of Conformity / Declaration by the Manufacturer is part of the documentation that is supplied with this device.



In order to be First in Mind—First in Choice® for all your quality compressed air needs, Atlas Copco delivers the products and services that help to increase your business' efficiency and profitability.

Atlas Copco's pursuit of innovation never ceases, driven by our need for reliability and efficiency. Always working with you, we are committed to providing you the customized quality air solution that is the driving force behind your business.

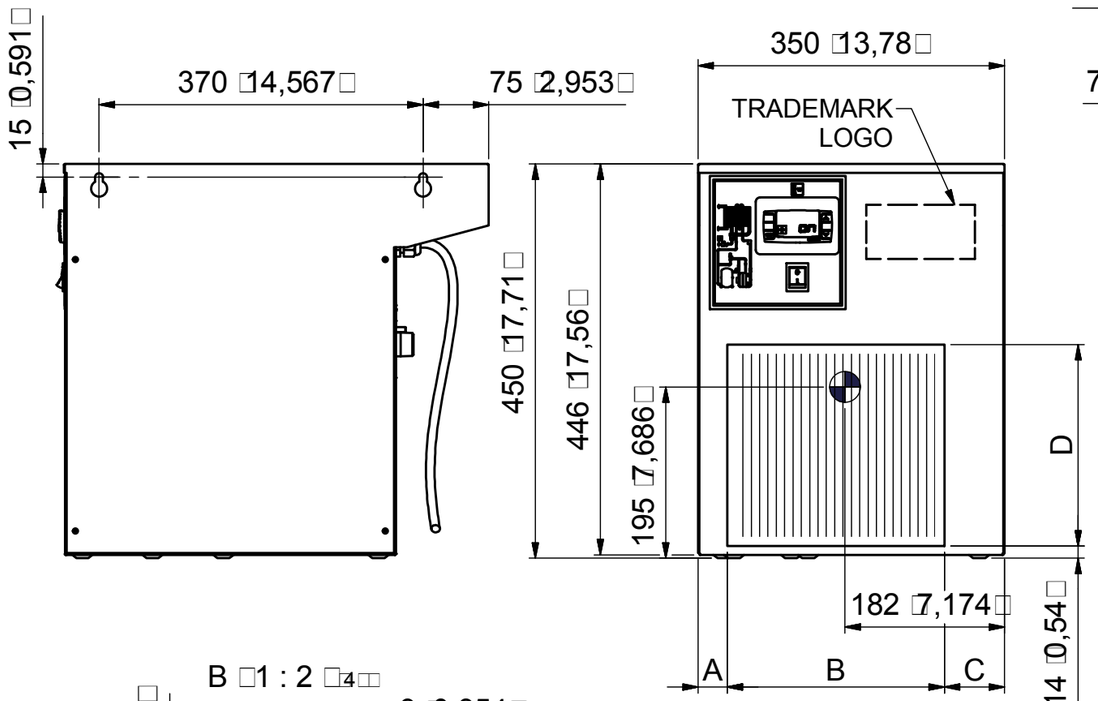
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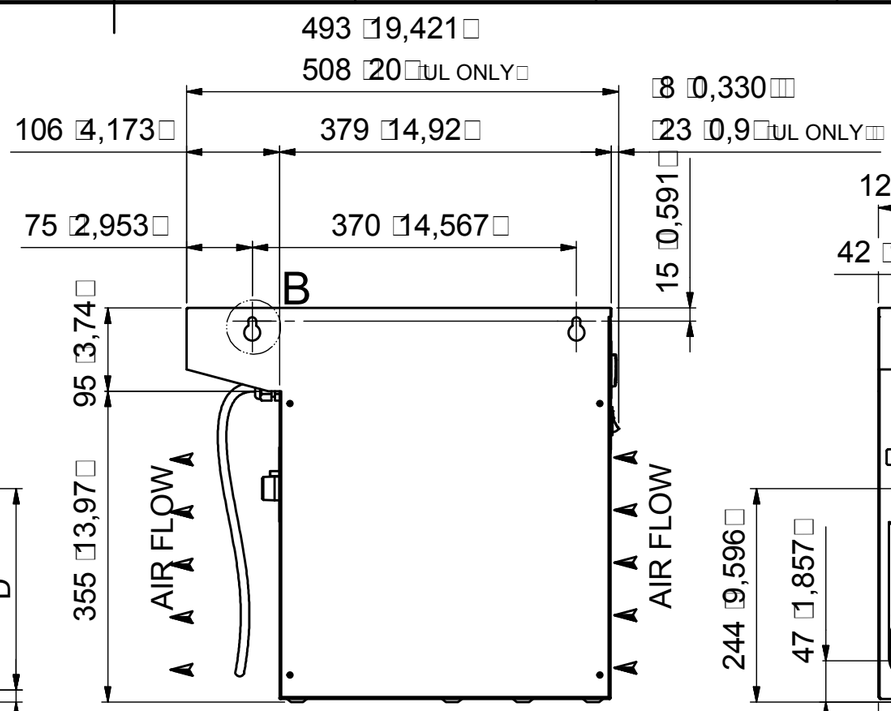
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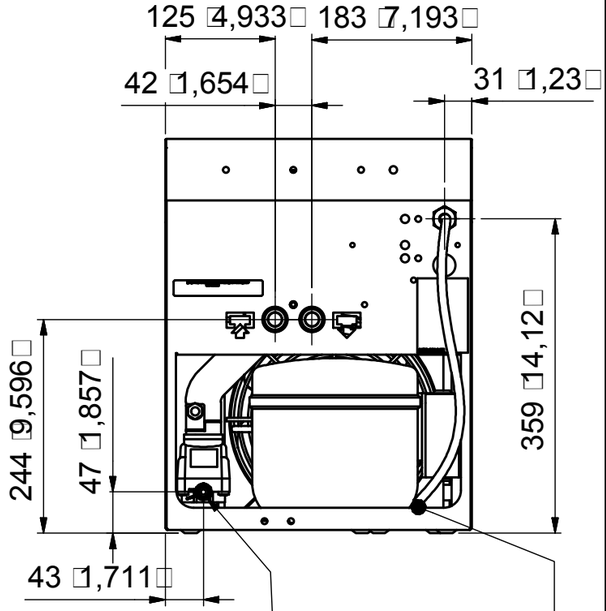
www.atlascopco.com

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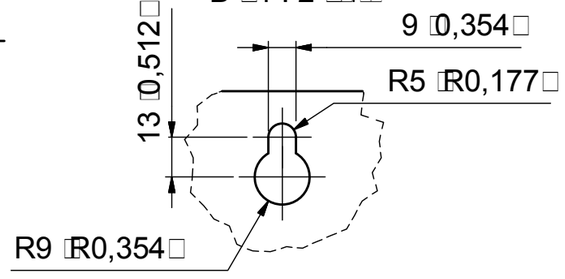
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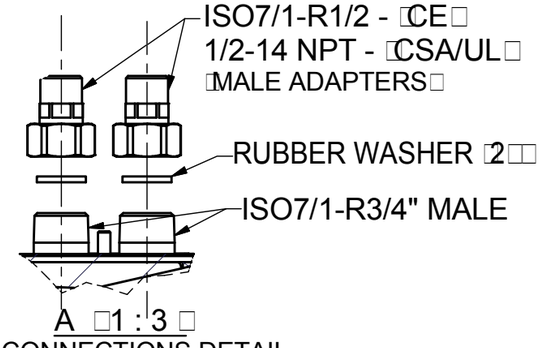






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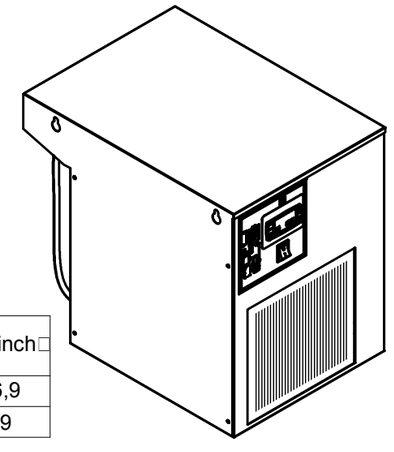


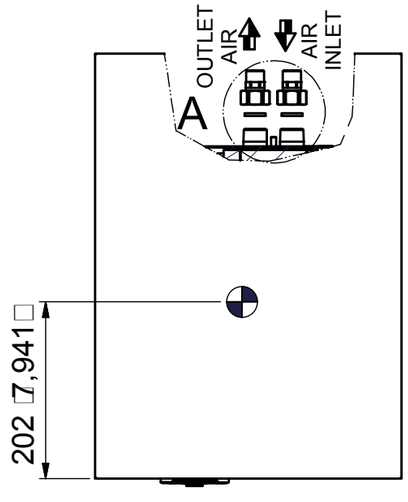


AIR CONNECTIONS DETAIL

CONDENSATE DRAIN OUTLET
PIPE Ø int.10mm / 0,39 inch

ELECTRICAL CABLE OUTLET





CENTER OF GRAVITY

DRYER VERSION	A □mm / inch□	B □mm / inch□	C □mm / inch□	D □mm / inch□
A/E 0-2 □B/BE0/1-1/2 MODEL	81 / 3,2	188 / 7,4	81 / 3,2	175 / 6,9
A/E 3-4 □B/BE 2/3-4 □H1 MODEL	34 / 1,3	248 / 9,7	68 / 2,7	230 / 9

05

ALL DIMENSIONS: mm □inch□

Ed	Position	Modified from	Date	Intr./Appd.	Parent 3D model	Ed . Version 3D
05		Added E versions. CID.27573, DN20054129.	22-06-20	asavio	2202754800	04.00

Tolerances, if not indicated, according to:

Name	DIMENS. DRAWING	A/E0-4, B/BE0/1-4, H1 MB	Confidentiality Class acc. to 1102 K	
Material	Not applicable		Confidential	
Treatment	Not Applicable		INV	
	Scale 1:5	Family DRYERS A/E0-4 MB	Compare	Drawing Owner: CAI; Transferred from
	Drawn by sgraser	Blank nr.	Replaces	
STATUS	Drawing format A3	Blank wt 0 Kg	Fini wt. N/A	Designation 2202754800 Sheet 1 / 1
Approved	Des checked.	Prod checked.	Approved.	Date 14/04/2005

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FX 5-300

ATLAS COPCO QUALITY AIR SOLUTIONS

General Description

The FX range of refrigerant dryers offers a reliable, cost effective and simple solution to those who need quality compressed air for their manufacturing processes. To avoid condensation, and therefore all chance of equipment and end-product corrosion and damage, compressed air needs to be dry — exactly what FX dryers are designed to do.

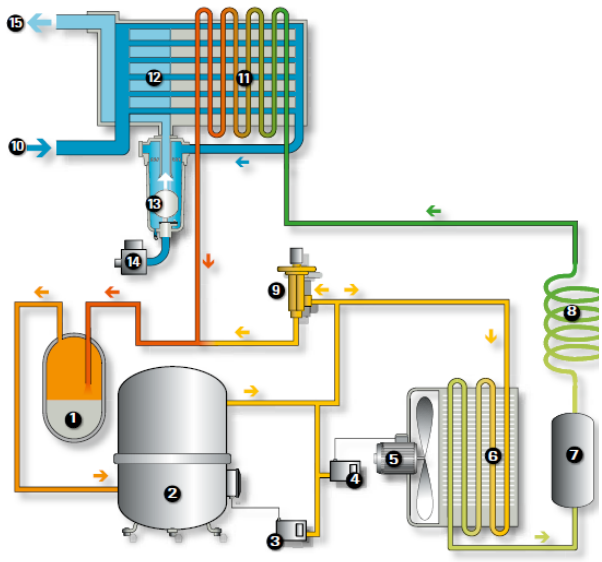
The FX dryer range is simple, yet robust and reliable. It is a no-frills range that relies on proven technology, solid components and uncomplicated design; these features combined deliver a constant dew point and reliable performance at any flow — in almost every manufacturing application.



Working Principle

Refrigerant drying means that the compressed air is cooled, which allows a large amount of the water condense and be separated. After cooling and condensing, the compressed air is reheated to around room temperature so that condensation does not form on the outside of the pipe system. This heat exchange between ingoing and outgoing compressed air, and as such reduces the required cooling capacity of the refrigerant circuit.

Cooling takes place via closed refrigerant system. FX refrigerant dryer, a freestanding machine that is used for dew points between +4°C and +3°C.



1. Refrigerant separator
2. Refrigerant compressor
3. Maximum pressure switch
4. Fan control pressure switch
5. Condensed fan
6. Condenser
7. Capillary filter
8. Capillary tube
9. Hot gas bypass
10 Air inlet
11. Air-refrigerant heat exchanger
12. Air-air heat exchanger
13. Water separator
14. Automatic drain
15. Air outlet

Scope of supply

1. Reliable Refrigerant Circuit

A closed circuit where the refrigerant flow is. Refrigerant compressor brings gaseous refrigerant to high pressure and high temperature. To ensure that only gaseous refrigerant only enters the compressor, a refrigerant separator is installed before it. It also includes the condenser that cools slightly the refrigerant, thus changes the refrigerant from gas to liquid state. The refrigerant's pressure should be reduced, thus lowering its temperature and increasing its cooling capacity. The capillary tube does this, and to protect from harmful particles, a Capillary filter is designed for the FX. Finally, to regulate the amount of refrigerant passing through the air-refrigerant heat exchanger, ensuring a stable pressure dew point, and eliminating the chance of the condensate freezing.



Energy efficient Air Circuit





Hot saturated air enters the dryer and is cooled down by the outgoing air via air-air heat exchanger. Reducing the temperature of the inlet air reduces the load on the refrigerant circuit. The air-refrigerant heat exchanger transfers the heat from compressed air to the cold refrigerant, forcing water vapour in the compressed air to condense. These condensates are separated in the water separator, equipped with electronic drain. On the air outlet, the cooled compressed air is reheated to prevent condensation into the pipe works, and now equipped with a pressure dew point sensor

Features & Benefits

Energy Savings

Low energy consumption

- Improved heat exchanger, lowering the overall pressure drop
- Air-air heat exchanger lowers the load in the refrigerant circuit
- High efficiency refrigerant compressor

Reliable operation

No condensation in the factory pipe work

- Air-air heat exchanger, pre heats the cold compressed air
- Hot gas bypass, to prevent freezing at partial load
- Efficient water separator and automatic drain
- Pressure dew point sensor for an accurate pressure dew point measurement

Easy connectivity

Potential free contact, to allow remote monitoring on customer’s data control system

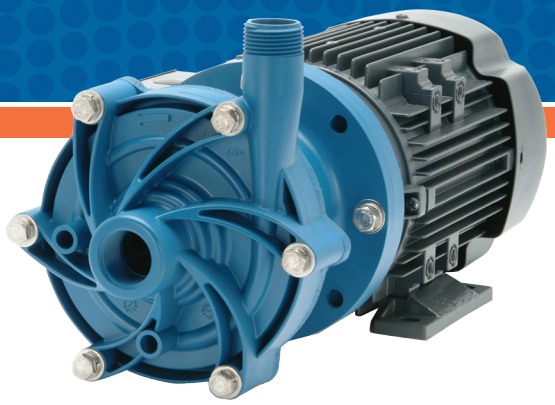
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DB SERIES
MODEL DB9

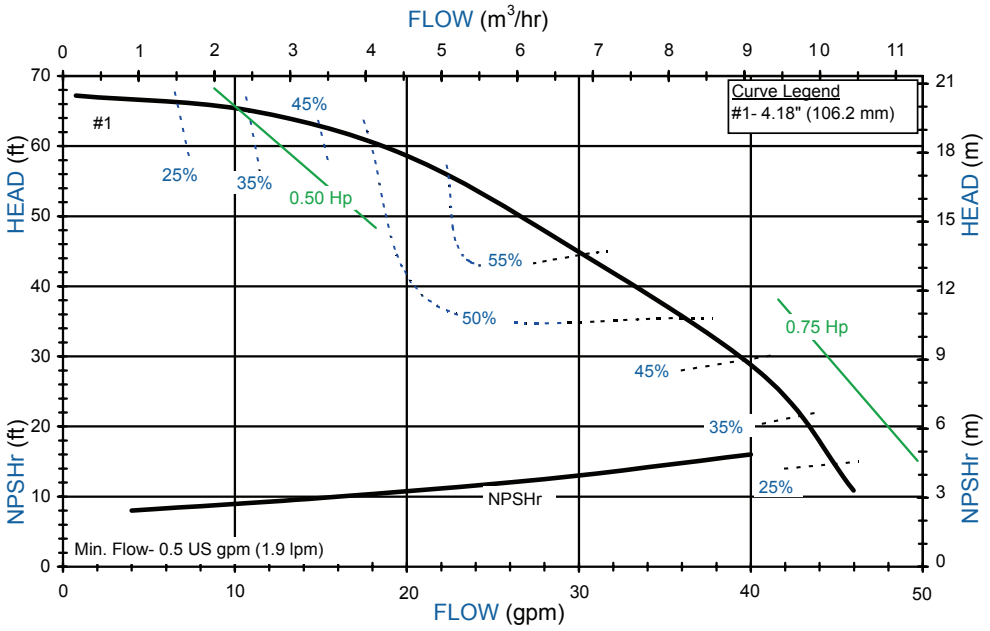
For Citric Acid
Tag: 23-P-301-A/B



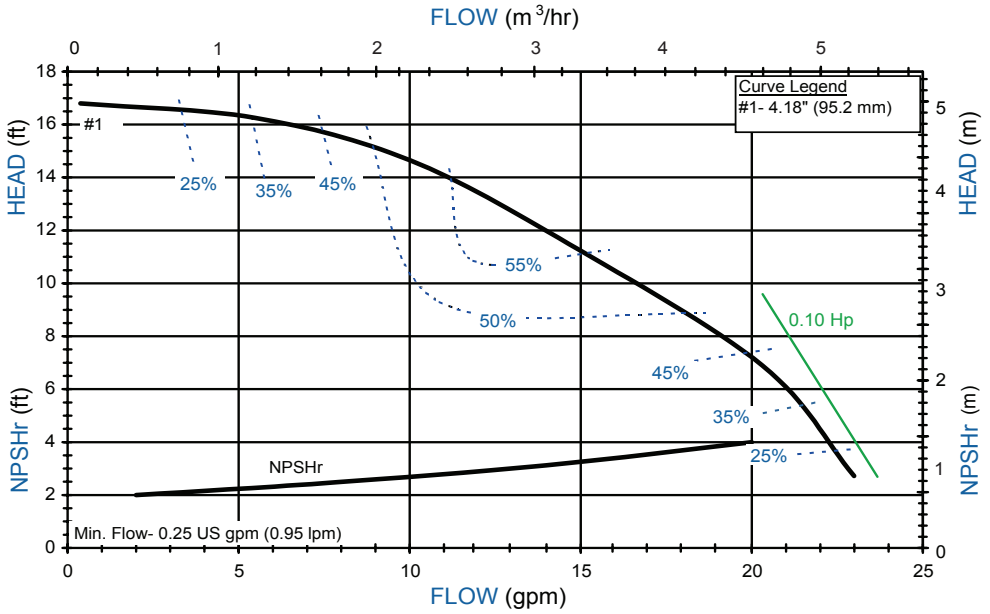
5 YEAR WARRANTY



DB9 PERFORMANCE 3450 RPM



DB9 PERFORMANCE 1725 RPM



FEATURES & CAPABILITIES

+ *Five-year warranty*
+ *Extended run dry ability (with carbon bushing)*
+ *High operating efficiency*
+ *Polypropylene or PVDF construction*
+ *Powerful neodymium magnets*
+ *Close-coupled design*
+ *Threaded (NPT or BSP), flanged, or union connections*
+ *Horizontal or vertical installation with IEC motor*
+ *Back pullout design*
+ *Mounts to NEMA and IEC (B5 & B14) motor frames*
+ *Easy set measurement free drive*
+ *ISO 1940 G2.5 balancing*
+ *CE certified/ATEX available*
+ *Working pressure to 80 psi (5.5 bar)*
+ *Specific gravity over 1.8*
+ *Viscosity up to 150 cP*
+ *Polypropylene—180° F (82° C)*
+ *PVDF—220° F (104° C)*

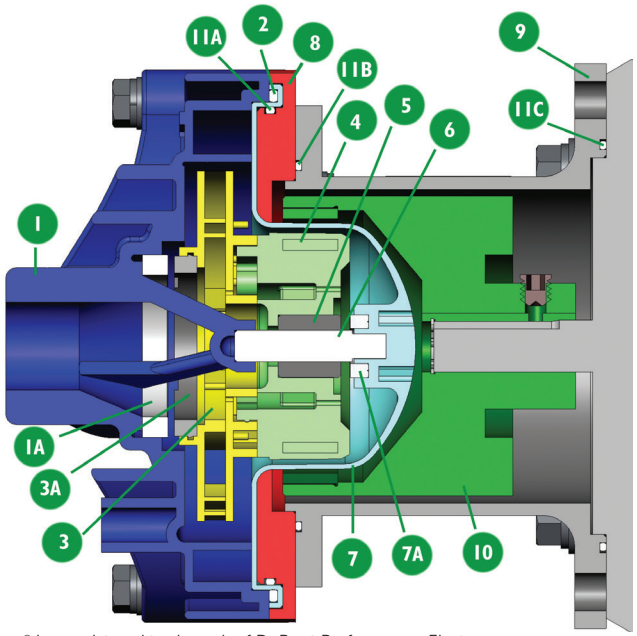
APPLICATIONS

+ *Chemical processing*
+ *Plating*
+ *Water and wastewater*
+ *Electronics*
+ *Pharmaceuticals*
+ *Wet scrubber*
+ *Pulp and paper*
+ *Heat exchanger*
+ *and many more!*

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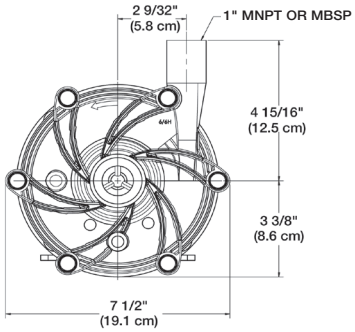
Specifications

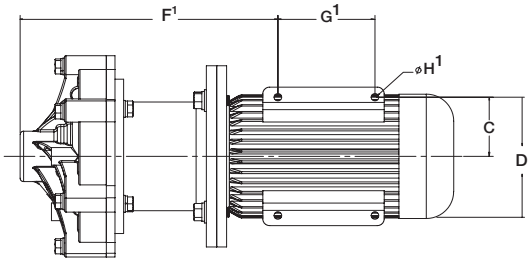
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1A	Impeller housing thrust ring	High purity alumina ceramic or silicon carbide (SiC)	
2	O-ring	FKM, EPDM, Simriz®, or Kalrez	
3	Impeller	GF PP	CF PVDF
3A	Impeller thrust ring	GF molybdenum disulfide filled PTFE, or SiC	
4	Inner drive	Neodymium iron boron magnets encapsulated in unfilled polypropylene	Neodymium iron boron magnets encapsulated in unfilled PVDF
5	Bushing	Carbon, PTFE, high purity alumina ceramic, or SiC	
6	Shaft	High purity alumina ceramic, Hastelloy® C, or SiC	
7	Barrier	GF PP	CF PVDF
7A	Barrier thrust ring	Silicon carbide	
8	Clamp ring	Ductile iron	
9	Motor adapter	GF PP	
10	Outer drive magnet	Nickel-plated neodymium iron boron magnets/ steel	
11A 11B 11C	Motor adapter sealing kit (NEMA only)	Buna N	



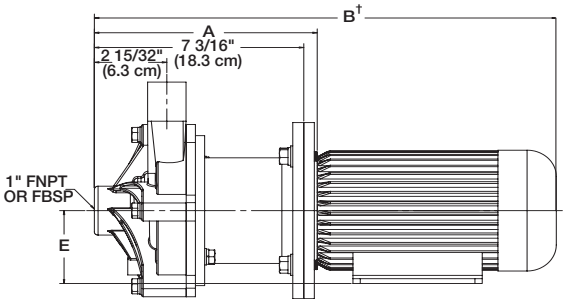
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Simriz® Perfluoroelastomer is a registered trademark of the Simrit® division of Freudenberg-NOK
Hastelloy® C is a registered trademark of Haynes International, Inc.

Dimensions





[1]Dimensions for F, G, and H can be found in the Outline Dimensions booklet in the Downloads section of www.finishthompson.com.



Also available 1" x 1" 150 lb. ANSI/ISO PN20/PN40/JIS 10K or 32mm x 32mm union connection. Flanges are in compliance with bolting dimensions only.

Motor Frame	A	B†	C	D	E	lbs. [kg] PP	lbs. [kg] PVDF
NEMA 56C	7-3/16" [18.3 cm]	17-7/16" [44.3 cm]	2-7/16" [6.2 cm]	4-7/8" [12.4 cm]	3-1/2" [8.9 cm]	10.5 [4.8]	11.1 [5.0]
NEMA 145TC	7-3/16" [18.3 cm]	17 15/16" [45.6 cm]	2-3/4" [7.0 cm]	5-1/2" [14.0 cm]	3-1/2" [8.9cm]	10.5 [4.8]	11.1 [5.0]
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Dimensions and weights are for reference only. Weights listed are for pump only; motor not included.
†Varies with motor manufacturer.

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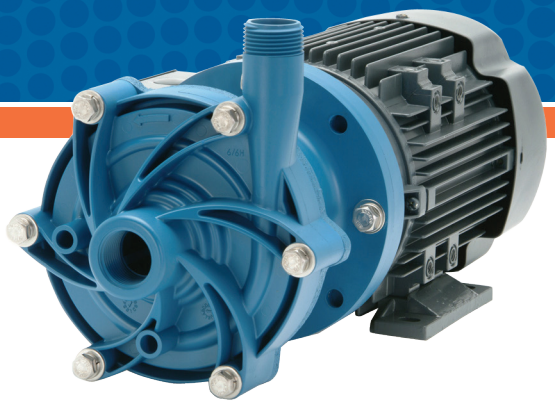
PumpCatalog.com
Questions? Call 1-800-810-1053

DB SERIES
MODEL DB9

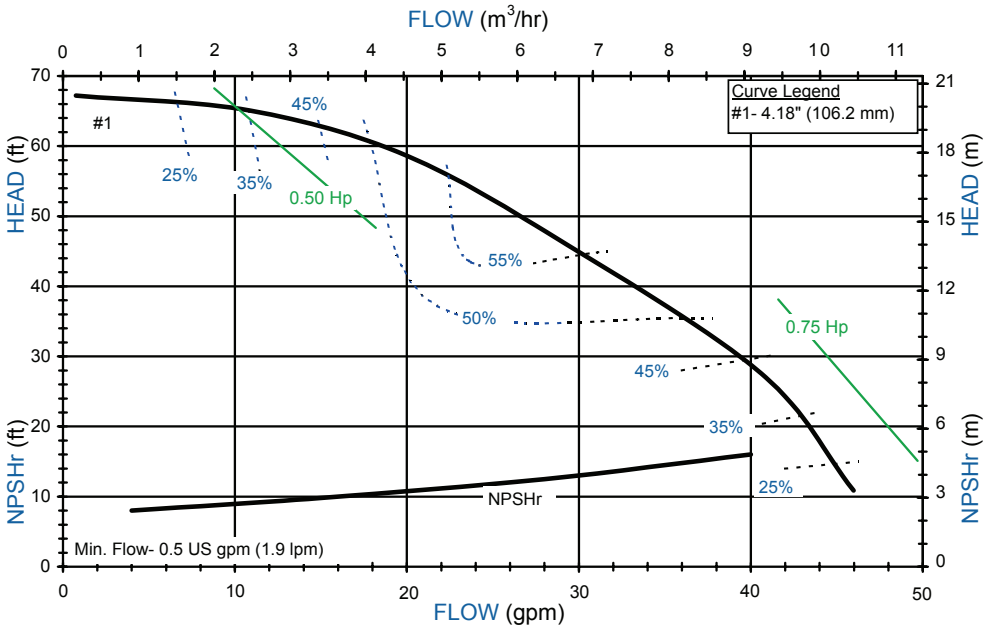
For Sodium Hypochlorite
Tag No. : 23-P-101-A/B



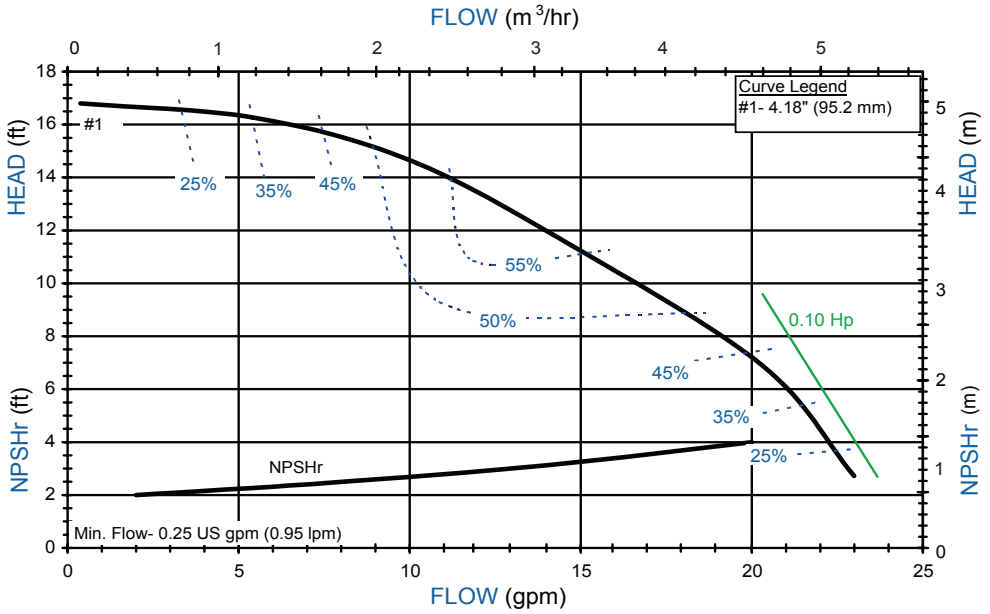
5 YEAR WARRANTY



DB9 PERFORMANCE 3450 RPM



DB9 PERFORMANCE 1725 RPM



FEATURES & CAPABILITIES

+ *Five-year warranty*
+ *Extended run dry ability (with carbon bushing)*
+ *High operating efficiency*
+ *Polypropylene or PVDF construction*
+ *Powerful neodymium magnets*
+ *Close-coupled design*
+ *Threaded (NPT or BSP), flanged, or union connections*
+ *Horizontal or vertical installation with IEC motor*
+ *Back pullout design*
+ *Mounts to NEMA and IEC (B5 & B14) motor frames*
+ *Easy set measurement free drive*
+ *ISO 1940 G2.5 balancing*
+ *CE certified/ATEX available*
+ *Working pressure to 80 psi (5.5 bar)*
+ *Specific gravity over 1.8*
+ *Viscosity up to 150 cP*
+ *Polypropylene—180° F (82° C)*
+ *PVDF—220° F (104° C)*

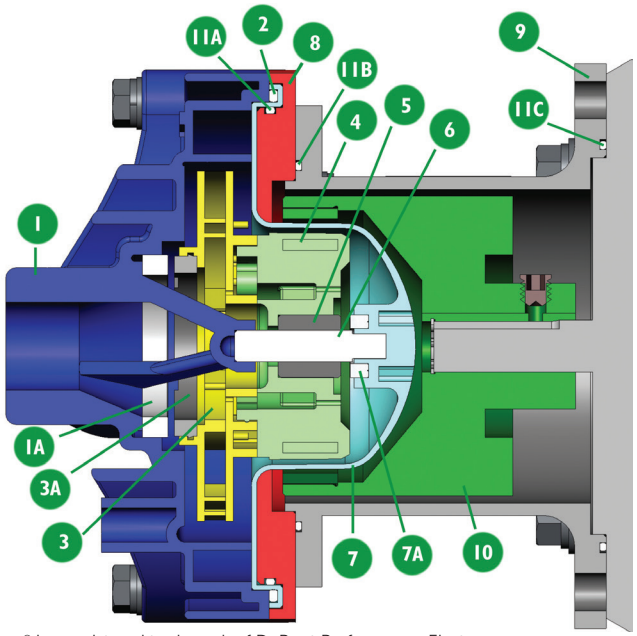
APPLICATIONS

+ *Chemical processing*
+ *Plating*
+ *Water and wastewater*
+ *Electronics*
+ *Pharmaceuticals*
+ *Wet scrubber*
+ *Pulp and paper*
+ *Heat exchanger*
+ *and many more!*

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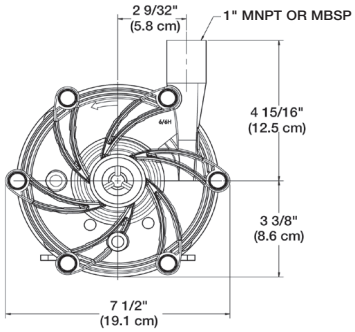
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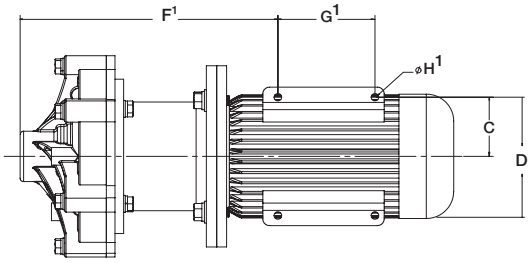
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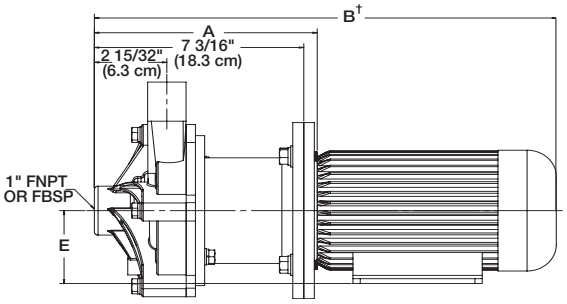
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ZeeWeed* 500 for Large Municipal MBR

FACT SHEET

Experience, Expand, Evolve with ZeeWeed



Addressing the everchanging needs of Municipal customers looking to:

- Lower the CAPEX associated with expanding capacity
- Increase treatment capacity in a smaller footprint
- Reduce annual energy and maintenance costs
- Enjoy longer membrane life with simplified maintenance

Performance

- High flux dedicated MBR membrane chemistry since 2007 with permeability > 900 lmh/bar
- True UF membrane for over 25 years with proven 0.035 µm nominal pore size
- Patented LEAPmbr aeration providing exceptional energy consumption savings
- Superior fiber strength, 60x greater than non-reinforced PVDF membranes

Reliability

Exceptional membrane reliability and product life with many municipal customers achieving 12 to 16 years operation; longest proven life 21 years!

Veolia stands by its product offering Peace of mind with warranties up to 15 years in duration.

Proven Experience

Nearly 2500 MBRs globally running with ZeeWeed 500 membranes. More than 1.3 million operating modules treating over 27000 MLD (7200 MGD) daily.

Flexibility & Simplicity

Configurable product to provide plant layout versatility for easy future expansion even for those with footprint constraints.

Demonstrated simple retrofit solutions for conventional upgrades and more than 15 other MBR membrane suppliers.

ZeeWeed 500 in Action



Henriksdal WWTP, Sweden

ADF 536 MLD (142 MGD)

MDF 864 MLD (228 MGD) PH1

Commissioned 2020



Luo Fang WWTP, China

ADF 400 MLD (106 MGD)

MDF 462 MLD (122 MGD)

Commissioned 2018



Seine Aval WWTP, France

ADF 218 MLD (59 MGD)

MDF 348 MLD (92 MGD)

Commissioned 2017



Euclid WWTF, USA

ADF 83 MLD (22 MGD)

MDF 250 MLD (66 MGD)

Commissioned 2018



Beijin Shunyi WWTP, China

ADF 180 MLD (48 MGD)

MDF 234 MLD (62 MGD)

Commissioned 2016



Brussels Sud WWTP, Belgium

ADF 86 MLD (23 MGD)

MDF 190 MLD (44 MGD)

Commissioned 2018



Oxford WWTP, Canada

ADF 13 MLD (3.6 MGD)

MDF 25 MLD (6.8 MGD)

Commissioned 2008

Proven membrane life 14 years



Traverse City WWTP, USA

ADF 27 MLD (7.1 MGD)

MDF 64 MLD (17 MGD)

Commissioned 2005

Proven membrane life 16 years



Brescia WWTP, Italy

ADF 30 MLD (8 MGD)

MDF 60 MLD (16 MGD)

Commissioned 2002

Proven membrane life 14 years

Cassette Properties



Table 1: Cassette Dimensions

Product	Width (A) mm (in)	Length (B) mm (in)	Height (C) mm (in)
500EV-64M	1,744 (68.7)	2,136 (84.1)	2,735 (107.7)
500D-52M			2,562 (100.9)

Table 2: Cassette Tie Points and Weights

Application	Product	Max. # of Modules	Min. # of Modules	Permeate Connection	Air Connection	Max. Shipping Weight [1] kg (lb)	Wet Weight [2] kg (lb)	Lifting Design Weight [3] kg (lb)	Cassette Material [4]
LEAPmbr	EV-64M	64	32	1 x 8” vert. pipe	1 x 3” FNPT half coupling	2,091 (4,610)	2,329 (5,135)	4,536 (10,000)	316L SS frame with engineered plastics
	D-52M	52	26	1 x 6” vert. pipe	1 x 3” FNPT half coupling	1,892 (4,172)	2,184 (4,816)	4,536 (10,000)	

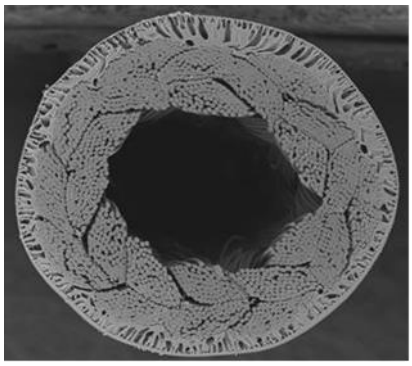
1 Crated with maximum number of modules

2 Wet weight of a clean, fully populated cassette. Lower module population will reduce this value. Cassette support method and lifting module can also vary this weight, depending on design. An estimate is used based on several standard designs.

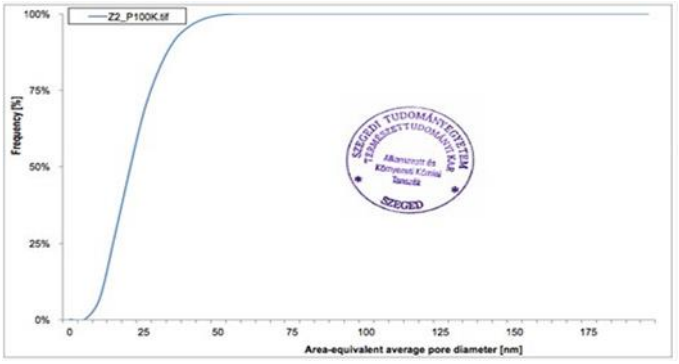
3 Product lifting design weight assumes a fully populated cassette with solids accumulation, standard lifting module and hanging arms. Alternative support and lifting methods could vary this value.

4 Alternative grades of stainless steel offered for cassettes are 304L, 2205 and SMO254 as required.

Membrane Properties



Membrane cross-section



3rd party certified UF pore size



Table 3: module dimensions

Application	Product	Width – A mm (in)	Length - B mm (in) Header-to-Header	Depth – C mm (in)
MBR	500EV	861 (33.9)	2,051 (80.7)	51 (2.0)
	500D	844 (33.2)	1,940 (76.4)	49 (1.9)

Table 4: Module Properties

Application	Membrane Surface Area m^2 (ft^2)	Lifting Weight [1] kg (lb)	Material	Nominal Pore Size [2] (µm)	Fiber Diameter [3] (mm)	Surface Properties	Fiber Tensile Strength [4] (N)	Flow Path
MBR	500EV 49.2 (530)	29 (64)	PVDF	0.04	2.2	Non-ionic & Hydrophilic	>600	Submerged, Outside-In
	500D 40.0 (430)	28 (61)						

1 Clean wet weight excluding any solids accumulation

2 Nominal pore size is often rounded to 40nm (0.04 micron) for simplicity.

3 Fiber dimensions have been rounded to the nearest decimal place for simplicity.

4 Tensile strength measured using a modification of ASTM protocol (D 3822)

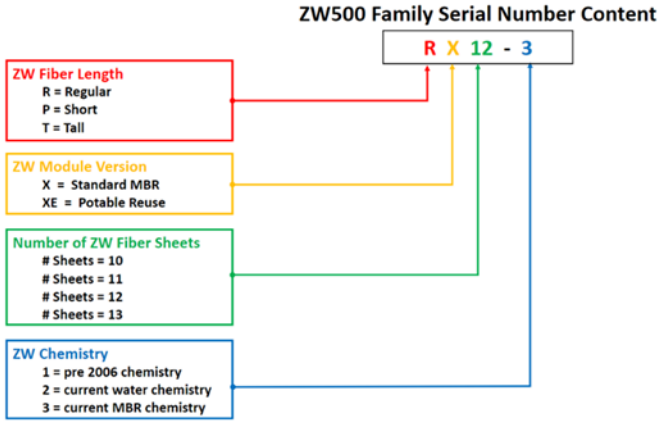
Table 5: Operating & Cleaning Specifications [1]

Application	TMP Range kPa (psig)	Typ. Aeration Nm^3/h/cassette (scfm/cassette)	Max. Operating Temp. °C (°F)	Operating pH Range	Backpulse Type	Max. Cleaning Temp. °C (°F)	Cleaning pH Range	Max. lifetime exposure Cl2 (ppm)
MBR	-55 to 55 (-8 to +8)	500EV 222-445 Nm^3/h (132-264 SCFM) 500D 182-363 Nm^3/h (108-215 SCFM)	40 (104)	5.0-9.5	Relax Aeration (Standard) Backpulse-capable (as-required)	40 (104)	2.0 – 10.5 (<30°C) 2.0 -10.0 (30-40°C)	1,000,000

[1] Cassettes can be populated with 26 to 52 modules (500D), or 32 to 64 modules (500EV). Normalized ADF flow for fully populated cassette at 150m ASL, 20°C wastewater temperature. Delivered value at modules will differ based on site conditions. Lower cassette populations will have a lower aeration rate.

ZeeWeed 500 Series Products

The ZeeWeed 500 series of membranes have been applied to MBR applications since 1997 when the ZW500A was introduced. There are four products within the current 5th generation – the ZW500M (laboratory use), ZW500S, ZW500D and ZW500EV. All ZeeWeed 500 series MBR products use the same PVDF chemistry formulation, designed specifically for membrane bioreactor application.



ZeeWeed 500 Product Identification

All ZeeWeed 500 series products have a product type identification code tied to the product specification. The code provides information on the version of the module, the fiber length, the number of sheets, and the membrane chemistry. It is typically found with the module serial number and takes the format of 1 to 3 letters, a number, and usually, but not always, a dash and third number.



Contact Us

If you would like to learn more about how Veolia can provide MBR solutions for your large municipal projects, contact your Veolia representative or visit our website.

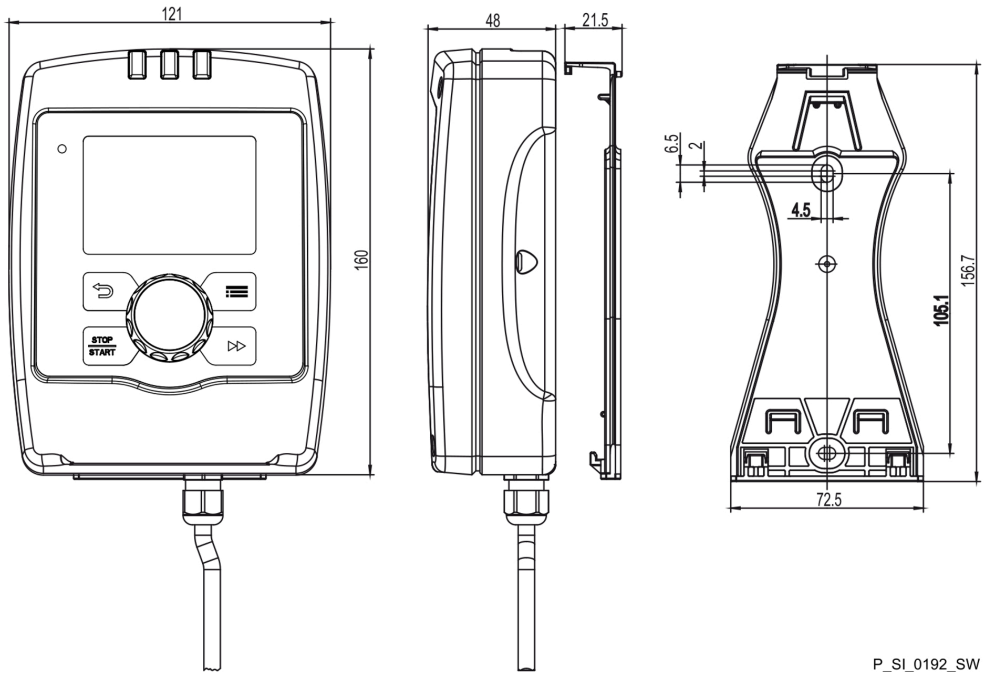
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Tag No. : 15-P-301-A/B

Motor-Driven Metering Pump Sigma X Control Type – Sigma/ 3 - S3Cb

The new Sigma X range – reliable, smart and connectible



Exemplary representation. The dimensions depend on the configuration chosen.

The Sigma control type is a smart motor-driven metering pump that is setting new standards in terms of productivity, reliability and safety.

Technical Details

- Stroke length: 6 mm
- Stroke length adjustment range: 0 – 100%
- Stroke length adjustment: manually using self-locking rotary dial in 1 % increments
- With the right, constant conditions, correct installation and calibration, precision exceeds ±1 %, based on maximum stroke volume.
- Power supply: 1-phase, 100 – 230 V ±10%, 240 V ±6%, 50/60 Hz (420 W)
- IP 65 degree of protection
- Fibreglass-reinforced plastic housing
- Manual or external contact mode can be set, factor with external contact control 99:1 – 1:99; batch mode with max. 99,999 strokes/start pulse.
- Metering profiles for optimum metering results.
- Display of wear parts in the Service menu.
- Connector for 2-stage level switch.
- Connection to PROFINET using the ProMinent DULCOnvert PROFIBUS®-PROFINET converter
- Various relay modules can be selected.
- The Sigma product range is available in a 'Physiologically safe in respect of wetted materials' design.
- Wetted materials: PVDF, stainless steel 1.4571/1.4404, special materials on request.
- Dosing heads with electro-polished stainless steel for aqueous media are available on request for applications with strict hygiene requirements.
- We are happy to supply alternative material versions to comply with export conditions for pump capacities of >600 l/h and PVDF.
- Customised designs are available on request.

For reasons of safety, provide suitable overflow devices during installation for all mechanically deflected diaphragm metering pumps.



ProMinent Webshop

Technical changes reserved. Printed in Germany, 20-2-2023.

Motor-Driven Metering Pump Sigma X Control Type – Sigma/ 3 - S3Cb

The new Sigma X range – reliable, smart and connectible

Technical Data

Type	Capacity at max. back pressure			Max. stroke rate	Pump capacity at max. back pressure		Suction lift	Perm. pre-pressure suction side	Connector Suction/ Discharge Side	Shipping weight
S3Cb	l/h	bar	ml/stroke	Strokes/min	gph (US)	psi	m WC	bar	G-DN	kg
120145 PVT	182	10	33.7	90	48.0	145	5	2	1 1/2–25	22
120145 SST	182	12	33.7	90	48.0	174	5	2	1 1/2–25	26
120190 PVT	243	10	33.7	120	64.1	145	5	2	1 1/2–25	22
120190 SST	243	12	33.7	120	64.1	174	5	2	1 1/2–25	26
120270 PVT	365	10	33.8	180	96.4	145	5	2	1 1/2–25	22
120270 SST	365	12	33.8	180	96.4	174	5	2	1 1/2–25	26
070410 PVT	500	7	95.1	90	132.0	102	4	1	2–32 *	24
070410 SST	500	7	95.1	90	132.0	102	4	1	2–32 *	29
070580 PVT	670	7	95.1	120	176.9	102	4	1	2–32 *	24
070580 SST	670	7	95.1	120	176.9	102	4	1	2–32 *	29
040830 PVT	1,040	4	95.1	180	274.7	58	3	1	2–32 *	24
040830 SST	1,040	4	95.1	180	274.7	58	3	1	2–32 *	29

* DN32 plate valves with valve spring

Materials in Contact with the Medium

		DN 25 ball valves			DN 32 plate valves			
Identity code of material	Seals	Suction / discharge connection on dosing head DN 25	Valve balls	Valve seats	Suction / discharge connection on dosing head DN 32	Valve plates/ valve springs	Valve seats	Integral relief valve
PVT	PTFE	PVDF	Glass	PTFE *	PVDF	Ceramic/ Hastelloy C + CTFE **	PTFE	PVDF/FKM or EPDM
SST	PTFE	Stainless steel 1.4581	Stainless steel 1.4404	PTFE *	Stainless steel 1.4581	Stainless steel 1.4404/Hastelloy C	PTFE	Stainless steel/FKM or EPDM
TTT ***	PTFE	PTFE + 25% carbon	Stainless steel 1.4404	PTFE *	PVDF	Ceramic/ Hastelloy C + CTFE **	PTFE	-
PVF	PTFE	PVDF	Glass	PVDF	-	-	-	-
SSF	PTFE	Stainless steel 1.4581/1.4404	Stainless steel 1.4404	PVDF	-	-	-	-
SSG	PTFE	Stainless steel 1.4581/1.4404	Stainless steel 1.4404	Stainless steel 1.4404	-	-	-	-
SSH ****	EPDM or FKM	Stainless steel 1.4435	Stainless steel 1.4404	Stainless steel 1.4404	Stainless steel 1.4581	Ceramic/E-CTFE	Stainless steel 1.4404	-

* With design 'F', the ball seat is made of PVDF, only for DN 25 ball valves

** The valve spring is coated with CTFE (resistance similar to PTFE)

*** Specifically for areas at risk from explosion

**** DN 25 and DN 32 designed as ball non-return valve

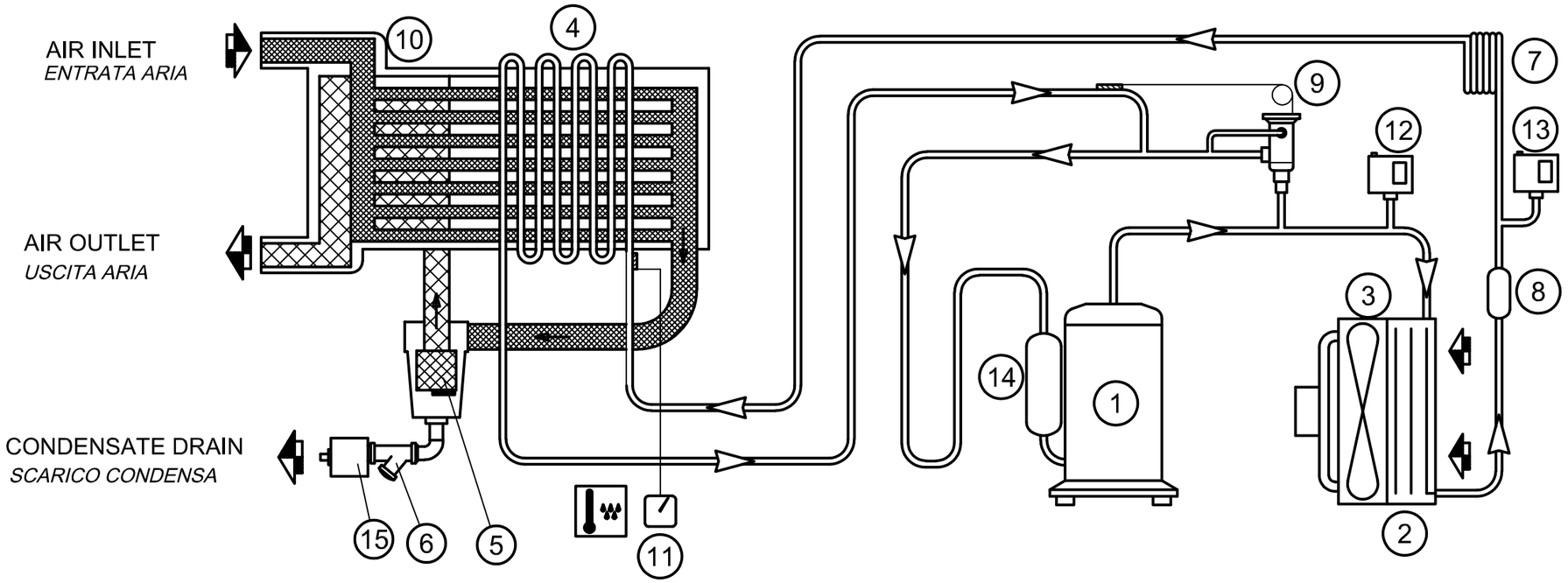
Motor Data

Identity code specification		Power supply			Remarks
U	1-phase, IP 65	100 – 230 V ±10 % / 240 V ±6 %	50/60 Hz	420 W	Wide-range voltage power unit

Motors less than 0.75 kW and motors designed for speed-controllable operation are not subject to the IE3 standard in compliance with the Ecodesign Directive 2009/125/EC.

Technical changes reserved. Printed in Germany, 20-2-2023.

ProMinent Group
info@prominent.com



		15	CONDENSATE DISCHARGE *SCARICO CONDENSA*
7	EXSPANSION CAPILLARY *CAPILLARE*	14	LIQUID SEPARATOR (if included) *SEPARATORE DI LIQUIDO (se incluso)*
6	IMPURITY TRAP *RACCOGLITORE DI IMPURITA'*	13	FAN PRESSUE SWITCH (if included) *PRESSOSTATO VENTILATORE (se incluso)*
5	SEPARATOR *SEPARATORE*	12	MAX PRESSURE SWITCH (if included) *PRESSOSTATO MASSIMA (se incluso)*
4	EVAPORATOR *EVAPORATORE*	11	*DEW POINT THERMOMETER (if included)* *MISURATORE PUNTO DI RUGIADA (se incluso)*
3	FAN MOTOR *MOTOVENTILATORE*	10	AIR-AIR EXCHANGER *SCAMBIATORE ARIA-ARIA*
2	CONDENSER *CONDENSATORE*	9	HOT GAS VALVE *VALVOLA BY-PASS GAS CALDO*
1	COMPRESSOR *COMPRESSORE*	8	FREON FILTER *FILTRO FREON*

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Note	Position	Modified from	Date	Intr./Appd.		
00		Table updated. CID.27644, DN20054153	21-07-20	asavio	Parent 3D Model	Ed.Version 3D

Tolerances,if not indicated,according to:

Name	FLOW DIAGRAM	ATLAS COPCO DRYERS	Confidentiality class acc. to 1102 K: Confidential
Material	Not applicable		
Treatment	Not Applicable		ACDE

Atlas Copco

STATUS: APPROVED

Scale -:-	Family Dryers	Compare 9828490240	Drawing owner CAI	Transferred from
Drawn by Administrator	Blank nr.	Replaces		
Drawing format A3	Blank wt. Kg	Fini wt. Kg	Designation	Sheet ( ) 01 01
Des checked.	Prod checked.	Approved.	Date 16/11/2015	9828490250



Refrigerant air dryers

FD VSD 100-300, FD 5-95 and FX 5-300
(5-300 l/s/11-636 cfm)



Why dry your compressed air?

Compressed air contains oil, solid particles and water vapors. It is the inherent result of the compression process, which concentrates the natural water vapors and particles in the air that surrounds us. This untreated compressed air poses a substantial risk to your air system and end products. Its moisture content alone can cause corrosion in pipe work, premature failure of pneumatic equipment, product spoilage and more. An air dryer is therefore essential to protect your systems and processes.

Refrigerant dryers by Atlas Copco

Atlas Copco's refrigerant dryers provide the clean, dry air you need to expand the life of your equipment and ensure the quality of your products. Our FD and FX dryers are designed in-house and tested using the most stringent methods. They meet or exceed the international standards for compressed air purity and are tested according to ISO 7183:2007.

FX 5-300
Quality Performance

- Available in 16 sizes from 6 to 300 l/s/15 to 636 cfm.
- Pressure dew point as low as +3°C/+37.4°F.
- Electronic no-loss drain with safety function.
- Controller with pressure dew point display.
- Easy installation.
- Minimal maintenance.

FD 5-95
First-Rate Efficiency

- Available in 11 sizes from 6 to 95 l/s/13 to 201 cfm.
- Pressure dew point as low as +3°C/+37.4°F.
- Electronic no loss drain with safety function.
- Controller with pressure dew point display, energy saving option, alarm contacts, …
- Quiet operation.
- Constant purity class -;4 - according ISO 8573-1:2010.

FD VSD 100-300
Unrivalled Energy Savings

- Available in 6 sizes from 100 to 300 l/s/212 to 636 cfm.
- Supreme energy savings: up to 50% on indirect energy costs and up to 70% on direct energy costs.
- Low pressure drop, typically below 0.2 bar/2.9 psi.
- Pressure dew point as low as +3°C/+37.4°F.
- Advanced touchscreen controller: visualization, alarm history, remote control,…
- All-in-one design with very small footprint.
- Delivered ready for use.
- Quiet operation.
- Constant purity class -;4;- according ISO 8573-1:2010.

VSD

Extending your VSD energy savings to your quality air

The introduction of Atlas Copco's VSD (and later VSD+) compressor technology was an industry milestone. By automatically adjusting its motor speed as air demand fluctuates depending on production flow or time, a VSD compressor offers double digit reductions in energy use and in lifecycle costs. With the FD VSD, Atlas Copco is extending this energy-saving principle to your quality air equipment.

FD VSD 100-300:
Unrivalled Energy Savings



1

VSD inverter

Controls the speed of the compressor to match your air demand and ensure the highest possible energy savings.

2

High-efficiency heat exchanger

Counter-flow compact brazed plate or aluminum heat exchanger, with air-to-air side for optimum cooling efficiency and the lowest possible pressure drop.

3

Integrated water separator

Low velocity with high separation efficiency, even in low flow conditions.

4

Electronic no-loss condensate drain

Opens the drain only when needed to eliminate unnecessary loss of compressed air during timed draining.

5

Elektronikon® Touch controller

Provides advanced control and allows for remote monitoring.

6

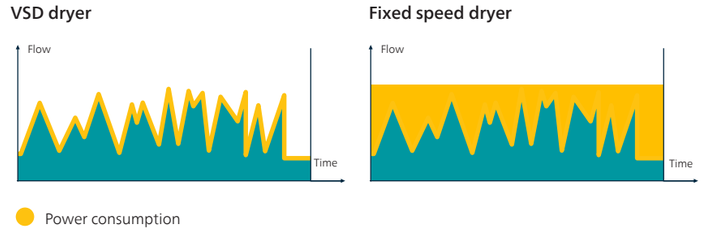
Single electrical connection

Ensures plug-and-play installation.



VSD for superior energy savings

Atlas Copco's in-house developed VSD technology matches your FD dryer's power consumption to your production's actual air flow. While a traditional refrigerant dryer can only be turned on or off, Atlas Copco's FD VSD mirrors your production's demand for compressed air as it fluctuates during the day, week or year. This ensures supreme energy savings as well as a stable dew point.



Minimal environmental impact

FD VSD dryers use the CFC-free R410A refrigerant, which has an ozone depletion potential (ODP) of zero. The refrigerant meets the strict F-Gas regulations and, due to its low power consumption, has an an outstanding TEWI (Total Equivalent Warming Impact) performance.

Optimum performance and safety in all conditions

- Hot gas bypass valve prevents freezing at lower loads.
- The extremely reliable R410A rotary compressor provides the best performance with minimum environmental impact. Capillary tubes cope with all conditions – no moving parts for extra reliability.
- Condenser with louvered fin technology for improved performance in dusty environments.

Advanced remote monitoring and control

- High-tech Elektronikon® Touch controller with warning indications, dryer shutdown and maintenance scheduling.
- Standard SMARTLINK remote monitoring to maximize air system performance and energy savings.

Robust and compact design

- Forklift opening for smooth transport.
- Easy front and side panel access.
- No bulky thermal mass heat exchanger needed to save on energy.

Filters

If your production requires higher levels of air quality and filtration, UD+ filters can be added on to your FD VSD dryer.

FD 5-95:
First-Rate Efficiency





1

Low-noise compressor with liquid separator

Lasts longer thanks to limited vibrations, minimal moving parts, and reduced risk of leakage.

2

High-efficiency heat exchanger

Counter-flow compact brazed plate or aluminum heat exchanger, with air-to-air side for optimum cooling efficiency and the lowest possible pressure drop.

3

Integrated water separator

Low velocity with high separation efficiency even in low flow conditions.

4

Electronic no-loss condensate drain

With level sensor, backup manual drain and drain alarm.

6

Hot gas bypass valve

Ensures stable pressure dew point and prevents freezing at lower loads.

5

Fan switch

Reduces energy consumption and optimizes the pressure dew point at very low temperatures.

7

Refrigerant separator

Eliminates the chance of moisture entering the compressed air system.

8

Single electrical connection

Allows for plug-and-play installation.

Supreme energy efficiency

- The FD offers a low pressure drop – typically below 0.2 bar/2.9 psi – and minimal energy consumption.
- The compact brazed plate or aluminum heat exchanger was designed specifically to provide optimal pre-cooling and the lowest possible pressure drop.
- The electronic no-loss condensate drain comes with a level sensor to open the drain only when needed, preventing unnecessary loss of compressed air.

Comprehensive control and monitoring options

- The Elektronikon® Alpha controller displays the pressure dew point and relative humidity.
- Remote alarm and start/stop control through voltage-free contact.
- Additional features such as alarm history and standard remote visualization.

Easy installation and long maintenance intervals

- Small footprint thanks to an innovative all-in-one design.
- Delivered ready for use, minimizing costly production downtime.

Low environmental impact

FD dryers use CFC-free refrigerants (R134A and R410A) with an ozone depletion potential (ODP) of zero.

Reliable performance in tough conditions

- Hot gas bypass valve prevents freezing at lower loads.
- R134A piston compressor with high coefficient of performance (extremely reliable R410A rotary compressor for models FD 60-FD 95) provides the best performance with minimum environmental impact. Capillary tubes cope with all conditions – no moving parts for extra reliability.
- Condenser with louvered fin technology for improved performance in dusty environments.

FX 5-300: Quality Performance



1

Refrigerant separator

No chance of moisture entering the compressed air system.

2

Hot gas bypass

Ensures stable pressure dew point and eliminates the possibility of condensate freezing.

3

Digital display

Provides peace of mind through precise monitoring of pressure dew point.



4

Single electrical connection

Allows for plug-and-play installation.

6

Water separator

Offers high efficiency for better pressure dew point.

5

Easy access to key components

For straightforward servicing.

7

Compact design

For a small footprint.

8

Low-noise rotary compressor with integrated liquid separator

Lasts longer thanks to limited vibrations, minimal moving parts, and reduced risk of leakage.



Pressure dew point precision

The FX comes in a wide range of sizes (6-300 l/s or 13 -636 cfm) to offer a steady pressure dew point as low as +3°C/+37.4°F. Its easy to use digital display precision-measures and monitors the pressure dew point and dryer performance.

Digital display

- Pressure dew point: exact measurement and visual monitoring.
- Status: refrigerant compressor and fan.
- Alarms: high/low pressure dew point and probe failure.
- Service warning.

Reliable

Built according to the stringent Atlas Copco standards, the FX is made of high quality, generously sized components.

Hot environments

High ambient temperatures can put your equipment to the test. The FX range offers several high temperature models that ensure dependable performance in conditions up to 46°C/115°F.

Significant cost savings

- Increased reliability and lifetime of tools and equipment.
- Reduced pipe work leaks and thus a lower energy bill.
- Less equipment breakdowns and operational interruptions.
- Minimal chance of product damage as a result of moisture carryover.

Sustainable refrigerant

The FX range comes with refrigerant that is compliant with F-Gas regulations to ensure the lowest possible carbon footprint and energy consumption.

VSD:
a game-changer in energy savings

When purchasing a refrigerant dryer, the main focus is usually on the initial cost. However, this only represents approximately 10% of the lifecycle cost of the dryer. Energy, maintenance and installation make up the bulk of your actual dryer costs. Direct and indirect (pressure drop) energy costs are the most important.

Indirect energy costs

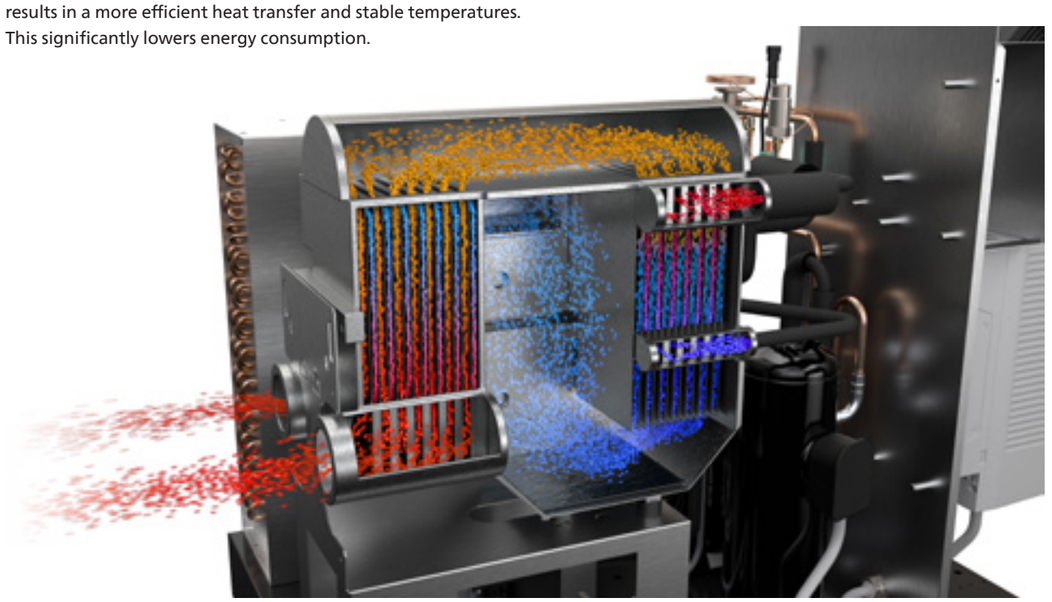
Indirect energy costs are related to the extra energy your air compressor must consume to overcome the pressure drop that takes place in the air dryer. By design, Atlas Copco FD VSD dryers offer a low pressure drop and efficient heat transfer – both of which contribute to a reduction of the indirect energy costs.

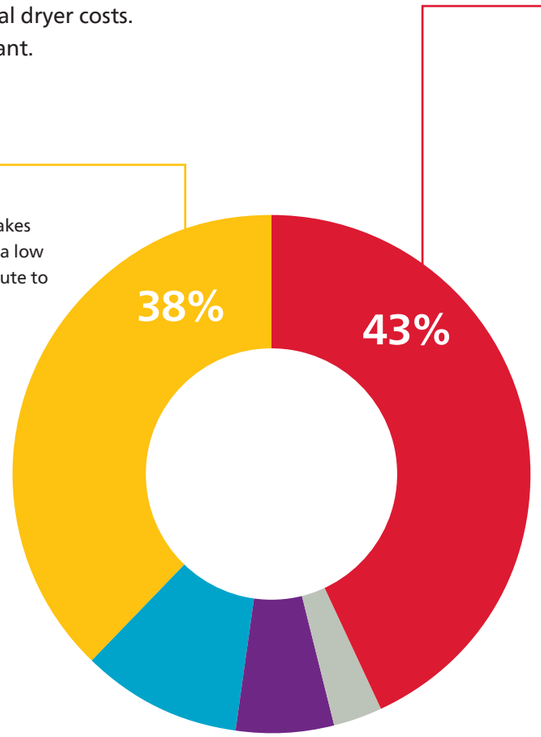
Low pressure drop

If a refrigerant dryer has a high internal pressure drop, the compressor needs to run at a higher pressure. This wastes energy and increases operating costs. Atlas Copco has designed our refrigerant dryers to minimize pressure drop. A pressure drop typically below 0.2 bar/2.9 psi at full flow is ensured by the heat exchanger technology, an integrated low velocity water separator, and generously sized components.

Efficient heat exchanger technology

Atlas Copco's refrigerant dryers use a counter flow heat exchanger on both the air-to-air and air-to-refrigerant side. Compared to a cross flow heat exchanger, the counter flow design results in a more efficient heat transfer and stable temperatures. This significantly lowers energy consumption.





Lifecycle cost

- Direct energy costs
- Indirect energy costs
- Investment
- Maintenance
- Installation

Direct energy costs

Direct energy costs are related to the power that the dryer consumes. Atlas Copco's FD VSD dryers match their energy usage to the actual compressed air demand. This reduces energy consumption by as much as 70% compared to conventional dryers.

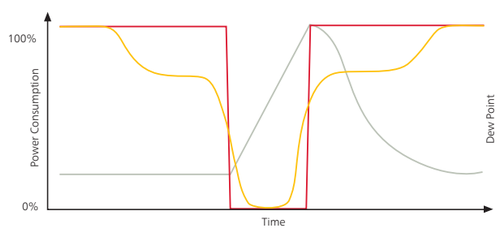
Reduce your total lifecycle cost by up to 50% with Atlas Copco's VSD dryers

- Up to 50% savings on indirect energy costs
- Up to 70% savings on direct energy costs

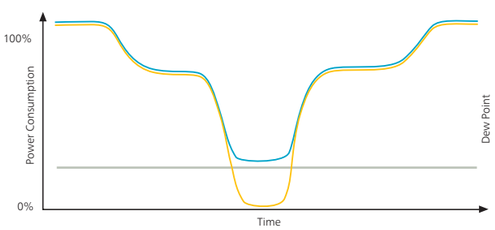
VSD outperforms thermal mass technology

Many conventional dryers rely on thermal mass technology to reduce energy costs. Also called cycling dryers, these units come with thermal mass storage which can be used to dry the air with the dryer's compressor temporarily switched off. While thermal mass technology certainly generates energy savings, these are offset by the additional energy these dryers require to cool the thermal mass. In addition, as the refrigerant compressor's operation is controlled by the thermal mass, the compressed air dew point rises and falls significantly. This can compromise your air quality by up to 2 purity classes. Finally, thermal mass dryers offer only limited or no energy savings in environments with high ambient temperatures. VSD technology has proven to deliver superior results in terms of energy use, dew point stability and service costs.

**Thermal mass:
some energy savings and unstable dew point**



**VSD:
superior energy savings and stable dew point**



Flow · Power Consumption thermal mass · Power Consumption VSD · Dew point

Advanced control

Atlas Copco's refrigerant dryers are built to reliably and efficiently deliver quality air. But in the end, it's all about how they perform on your work floor, meeting your individual needs and responding to your specific conditions. That is why the FD VSD, FD and FX come with comprehensive control options to allow you to get the best performance from your Atlas Copco dryer.



FD VSD 100-300: Elektronikon® Touch controller

- 4.3-inch high-definition color display with clear pictograms and service indicator.
- Internet-based dryer visualization using a simple Ethernet connection.
- Automatic restart after voltage failure.
- Built-in SMARTLINK online monitoring.
- More flexibility: four different week schedules.
- Graphical service plan indication.
- Remote control and connectivity functions.

FD 5-95: Elektronikon® Alpha controller

- Exact measurement and visual monitoring of pressure dew point and ambient temperature.
- High/low pressure dew point alarm.
- Relative humidity indicator.
- Energy saving mode.
- Switch off at freezing alarm.
- Alarm history and standard remote visualization.





FX 5-300: Digital display

- Pressure dew point: exact measurement and visual monitoring.
- Energy saving mode.
- Alarms: high/low pressure dew point and probe failure.
- Service warnings.

Remote monitoring



SMARTLINK: Data Monitoring Program

SMARTLINK captures live data from your compressed air equipment and translates it in clear insights. At a glance, you can check uptime, energy efficiency and machine health.

- Remote monitoring that helps you optimize your compressed air system and save energy and costs.
- Provides a complete insight in your compressed air network.
- Anticipates potential problems by warning you upfront.
- Efficient service planning and parts handling to give you improved uptime.

SMARTLINK & Total Responsibility

Get the most out of SMARTLINK as part of a Total Responsibility Plan. Step back, relax, and let our service engineers monitor your compressed air system. We know exactly when to service your machines, diagnose any issues and be there on time to fix them.

Technical specifications FD VSD 100-300

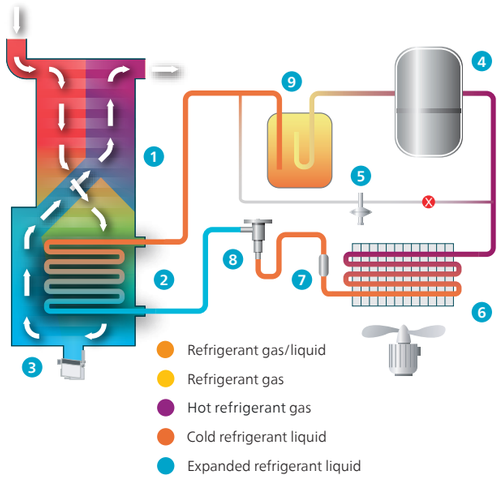
Model	Maximum inlet conditions at full flow (ambient/ inlet)	Inlet flow with a pressure dew point of 3°C/37.4°F		Pressure drop at full flow		Power consumption		Max. working pressure		Compressed air connections	Dimensions						Weight	
											Length		Width		Height			
	°C	l/s	cfm	bar	psi	kW	hp	bar	psi		mm	in	mm	in	mm	in	kg	lb
FD 100 VSD	60	100	212	0.16	2.3	0.66	0.90	14.5	210	G 1 1/2 F (NPT for UL version)	805	31.69	962	37.87	1040	41	130	287
FD 140 VSD	60	140	297	0.11	1.6	1.04	1.41	14.5	210	G 2 F (NPT for UL version)	805	31.69	962	37.87	1040	41	130	287
FD 180 VSD	60	180	381	0.18	2.6	1.54	2.09	14.5	210	G 2 F (NPT for UL version)	805	31.69	962	37.87	1040	41	134	295
FD 220 VSD	60	220	466	0.14	2	1.77	2.41	14.5	210	G 2 1/2 F (NPT for UL version)	805	31.69	962	37.87	1040	41	143	315
FD 260 VSD	60	260	551	0.1	1.5	1.9	2.58	14.5	210	G 2 1/2 F (NPT for UL version)	805	31.69	962	37.87	1040	41	150	331
FD 300 VSD	60	300	636	0.18	2.6	2.64	3.59	14.5	210	G 2 1/2 F (NPT for UL version)	805	31.69	962	37.87	1040	41	165	364

Technical specifications FD 5-95 50 Hz & 60 Hz

Model	Maximum inlet conditions at full flow (ambient/ inlet)	Inlet flow with a pressure dew point of 3°C/37.4°F		Pressure drop at full flow		Power consumption		Max. working pressure		Compressed air connections	Dimensions						Weight	
											Length		Width		Height			
	°C	l/s	cfm	bar	psi	kW	hp	bar	psi		mm	in	mm	in	mm	in	kg	lb
FD 5	60	6	13	0.07	1.02	0.2	0.27	16 (1)	233 (1)	R 3/4	525.5	20.7	390	15.4	530	20.9	27	60
FD 10	60	10	21	0.11	1.6	0.2	0.27	16 (1)	233 (1)	R 3/4	525.5	20.7	390	15.4	530	20.9	27	60
FD 15	60	15	32	0.12	1.75	0.33	0.45	16 (1)	233 (1)	R 3/4	525.5	20.7	390	15.4	530	20.9	32	70
FD 20	60	20	42	0.12	1.75	0.41	0.56	16 (1)	233 (1)	R 3/4	525.5	20.7	390	15.4	530	20.9	34	75
FD 25	60	25	53	0.17	2.47	0.41	0.56	16 (1)	233 (1)	R 3/4	525.5	20.7	390	15.4	530	20.9	34	75
FD 30	60	30	64	0.25	3.64	0.41	0.56	16 (1)	233 (1)	R 3/4	525.5	20.7	390	15.4	530	20.9	34	75
FD 40	60	40	85	0.2	2.91	0.57	0.76	16 (1)	233 (1)	R 1	716	28.2	389	15.3	679	26.8	57	125
FD 50	60	50	106	0.2	2.91	0.54	0.72	16 (1)	233 (1)	R 1	716	28.2	389	15.3	679	26.8	58	128
FD 60	60	60	127	0.22	3.2	0.63	0.84	13	189	R 1	795	31.3	482	19.0	804	31.7	80	176
FD 70	60	70	148	0.22	3.2	0.87	1.17	13	189	R 1	795	31.3	482	19.0	804	31.7	81	178
FD 95	60	95	201	0.22	3.2	1.18	1.58	13	189	R 1	795	31.3	482	19.0	804	31.7	87	192

How refrigerant dryers work

A refrigerant dryer uses a refrigerant circuit and heat exchanger(s) to pre-cool air, refrigerate it to condense out moisture vapor, and then re-heat the air to prevent pipe sweating downstream.



Air circuit

1. Air-to-air heat exchanger: Incoming air is cooled down by the outgoing dry, cold air
2. Air-to-refrigerant heat exchanger: The air is cooled to the required dew point by the refrigerant circuit. The water vapor condenses into water droplets
3. Integrated water separator: The moisture is collected and evacuated by the electronic drain

Refrigerant circuit

4. Refrigerant compressor: Compresses the gaseous refrigerant to a higher pressure
5. Regulation device: The hot gas bypass valve regulates the dryer to prevent freezing at lower load conditions
6. Refrigerant condenser: Cools the refrigerant so that it changes from a gas to a liquid
7. Refrigerant filter: Protects the expansion device from harmful particles
8. Thermostatic expansion valve: The expansion process reduces the pressure and cools the refrigerant further
9. Liquid separator: Ensures that only refrigerant gas enters the compressor

Technical specifications FX 5-300 50& 60Hz

Model	Inlet capacity		Pressure drop		Maximum working pressure		Electrical supply		Dimensions						Weight		Compressed air connections
							voltage/phase/frequency		Length		Width		Height				
	l/s	cfm	bar	psi	bar	psi			mm	inch	mm	inch	mm	inch	kg	lb	
FX5	6	13	0.15	2.18	16	232	230/1/50Hz	115-230/1/60Hz	493	19.41	350	13.78	450	17.72	19	42	3/4" M
FX10	10	21	0.25	3.63	16	232	230/1/50Hz	115-230/1/60Hz	493	19.41	350	13.78	450	17.72	19	42	3/4" M
FX15	14	30	0.25	3.63	16	232	230/1/50Hz	115-230/1/60Hz	493	19.41	350	13.78	450	17.72	20	44	3/4" M
FX20	20	42	0.25	3.63	16	232	230/1/50Hz	115-230/1/60Hz	493	19.41	350	13.78	450	17.72	25	55	3/4" M
FX30	30	64	0.3	4.35	16	232	230/1/50Hz	115-230/1/60Hz	493	19.41	350	13.78	450	17.72	27	60	3/4" M
FX40	39	83	0.14	2.03	14	203	230/1/50Hz	115-230/1/60Hz	497	19.57	370	14.57	764	30.08	51	112	1" F
FX50	50	106	0.2	2.90	14	203	230/1/50Hz	115-230/1/60Hz	497	19.57	370	14.57	764	30.08	51	112	1" F
FX60	60	127	0.18	2.61	14	203	230/1/50Hz	115-230/1/60Hz	557	21.93	460	18.11	789	31.06	62	137	1 1/2" F
FX70	68	144	0.18	2.61	14	203	230/1/50Hz	115-230/1/60Hz	557	21.93	460	18.11	789	31.06	62	137	1 1/2" F
FX90	87	184	0.25	3.63	14	203	230/1/50Hz	115-230/1/60Hz	557	21.93	460	18.11	789	31.06	62	137	1 1/2" F
FX110	108	229	0.2	2.90	14	203	230/1/50Hz	230/1/60Hz	557	21.93	580	22.83	899	35.39	82	181	1 1/2" F
FX130	128	271	0.26	3.77	14	203	230/1/50Hz	230/1/60Hz	557	21.93	580	22.83	899	35.39	82	181	1 1/2" F
FX170	167	354	0.16	2.32	14	203	400/3/50Hz	460/3/60Hz	1040	40.94	805	31.69	962	37.87	145	320	2" F
FX200	200	424	0.23	3.34	14	203	400/3/50Hz	460/3/60Hz	1040	40.94	805	31.69	962	37.87	158	348	2" F
FX250	250	530	0.18	2.61	14	203	400/3/50Hz	460/3/60Hz	1040	40.94	805	31.69	962	37.87	165	364	2 1/2" F
FX300	300	636	0.18	2.61	14	203	400/3/50Hz	460/3/60Hz	1040	40.94	805	31.69	962	37.87	164	362	2 1/2" F

Reference conditions Limitations

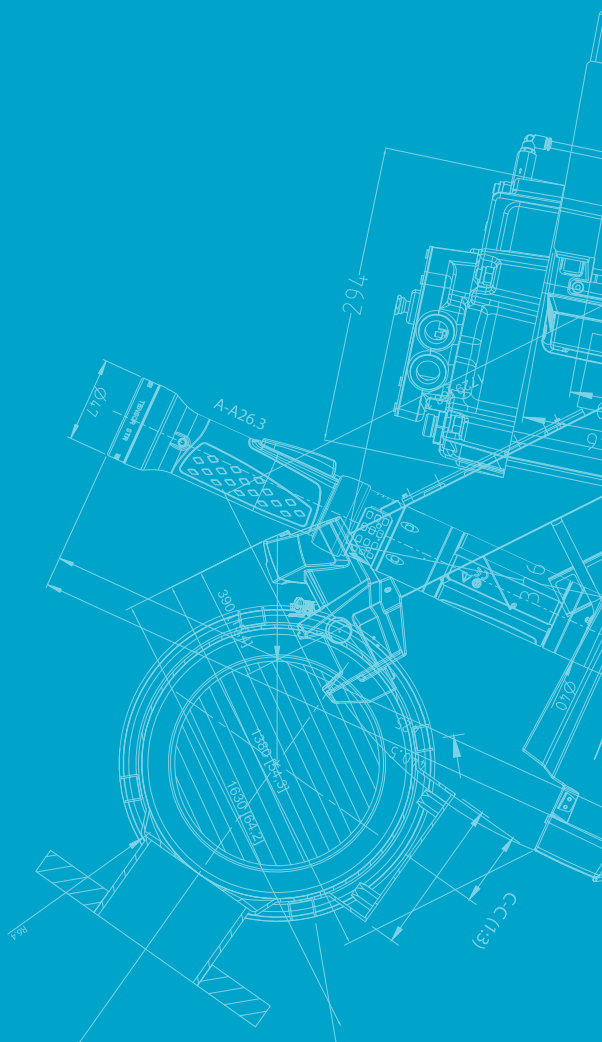
		Reference conditions		Limitations	
		Standard	UL-approved	Standard	UL-approved
FX 5-300	Ambient temperature	25°C	100°F	5°C-43°C (1)	41°F-109°F (1)
	Inlet temperature	35°C	100°F	5°C-55°C	41°F-131°F
	Operating pressure	7 bar	100 psi	6-14 bar (2)	87-203 psi (2)
FD 5-95	Ambient temperature	25°C	100°F	1°C-46°C	34°F-131°F
	Inlet temperature	35°C	100°F	5°C-60°C	41°F-115°F
	Operating pressure	7 bar	100 psi	6-14 bar (3)	87-203 psi (3)
FD VSD 100-300	Ambient temperature	25°C	100°F	5°C-46°C	41°F-131°F
	Inlet temperature	35°C	100°F	5°C-60°C	41°F-140°F
	Operating pressure	7 bar	100 psi	6-14 bar	87-203 psi

Tested according to ISO 7183:2007 (1) FX 170-300: 46°C/131°F (2) FX 5-30: 16 bar/232 psi (3) FD 5-50:16 bar/232 psi

Notes

Refrigerant types:	R513A for FX 5-50, FD 5-50
	R410A for FX 60-300, FD 60-95, FD VSD

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TI01046D/06/EN/09.20
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2020-01-01

TAG:
20-FIT-301-1/2/3/4
20-FIT-602
20-FIT-507-1/2/3/4
16-FIT-707

Technical Information
Proline Promag W 400

Electromagnetic flowmeter



Versatile standard flowmeter for the water and wastewater industry

Application

- The bidirectional measuring principle is virtually independent of pressure, density, temperature and viscosity
- Ideal for water measurement, e.g. drinking water, utility water and industrial/municipal wastewater

Device properties
- International drinking water approvals
- Degree of protection IP68 (Type 6P enclosure)
- Approved for custody transfer to MI-001/OIML R49
- Transmitter housing made of durable polycarbonate or aluminum
- WLAN access
- Integrated data logger: measured values monitoring

Ihre Vorteile

- Reliable measurement at constant accuracy with 0 x DN inlet run and no pressure loss
- Flexible engineering – sensor with fixed or lap-joint process connections
- Application fitness – EN ISO 12944 corrosion protection for underground or underwater installation
- Improved plant availability – sensor compliant with industry-specific requirements
- Safe operation – no need to open the device due to display with touch control, background lighting
- Time-saving local operation without additional software and hardware – integrated web server
- Integrated verification – Heartbeat Technology

Endress+Hauser
People for Process Automation

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About this document

Symbols

Electrical symbols

Symbol	Meaning
	Direct current
	Alternating current
	Direct current and alternating current
	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	**Protective Earth (PE)** A terminal which must be connected to ground prior to establishing any other connections. The ground terminals are situated inside and outside the device: ▪ Inner ground terminal: Connects the protectiv earth to the mains supply. ▪ Outer ground terminal: Connects the device to the plant grounding system.

Communication symbols

Symbol	Meaning
	**Wireless Local Area Network (WLAN)** Communication via a wireless, local network.
	**Bluetooth** Wireless data transmission between devices over a short distance.
	**LED** Light emitting diode is off.
	**LED** Light emitting diode is on.
	**LED** Light emitting diode is flashing.

Symbols for certain types of information

Symbol	Meaning
	**Permitted** Procedures, processes or actions that are permitted.
	**Preferred** Procedures, processes or actions that are preferred.
	**Forbidden** Procedures, processes or actions that are forbidden.
	**Tip** Indicates additional information.
	Reference to documentation.
	Reference to page.
	Reference to graphic.
	Visual inspection.

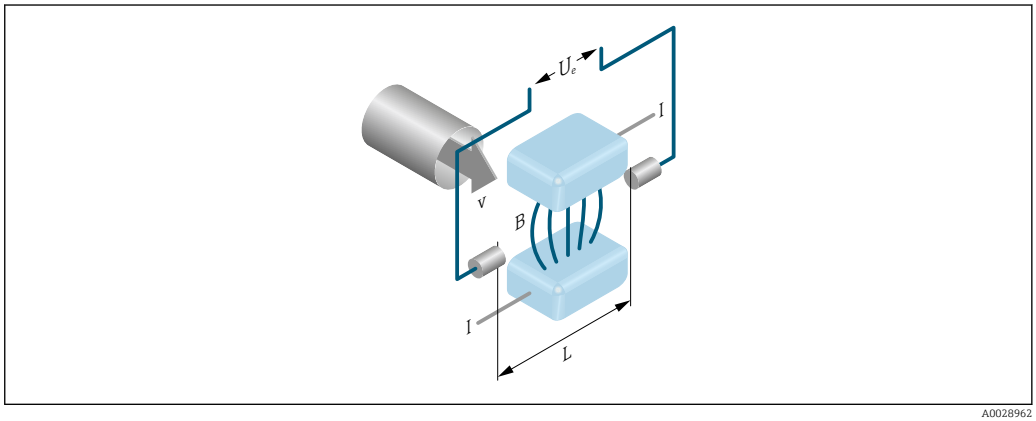
Symbols in graphics

Symbol	Meaning
1, 2, 3, ...	Item numbers
1., 2., 3., ...	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections
	Hazardous area
	Safe area (non-hazardous area)
	Flow direction

Function and system design

Measuring principle

Following *Faraday's law of magnetic induction*, a voltage is induced in a conductor moving through a magnetic field.



A0028962

Ue *Induced voltage*
B *Magnetic induction (magnetic field)*
L *Electrode spacing*
I *Current*
v *Flow velocity*

In the electromagnetic measuring principle, the flowing medium is the moving conductor. The voltage induced (U_e) is proportional to the flow velocity (v) and is supplied to the amplifier by means of two measuring electrodes. The flow volume (Q) is calculated via the pipe cross-section (A). The DC magnetic field is created through a switched direct current of alternating polarity.

Formulae for calculation

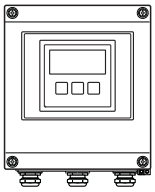
- Induced voltage $U_e = B \cdot L \cdot v$
- Volume flow $Q = A \cdot v$

Measuring system

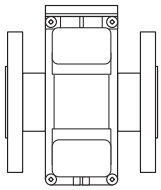
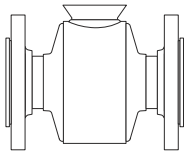
The device consists of a transmitter and a sensor.

Two device versions are available:
- Compact version – transmitter and sensor form a mechanical unit.
- Remote version - transmitter and sensor are mounted in separate locations.

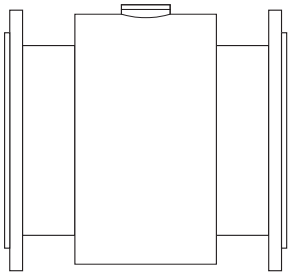
Transmitter

Proline 400
 
A0017117
	Device versions and materials
	▪ Compact version: compact housing
	  ▪ Polycarbonate plastic
	  ▪ Aluminum, AlSi10Mg, coated
	▪ Remote version: wall-mount housing
	  ▪ Polycarbonate plastic
	  ▪ Aluminum, AlSi10Mg, coated
	
	Configuration:
	▪ External operation via four-line, illuminated local display with touch control and guided menus ("Make-it-run" wizards) for applications
	▪ Via operating tools (e.g. FieldCare)
	▪ Via Web browser (e.g. Microsoft Internet Explorer)
	▪ Also for device version with EtherNet/IP output:
	  ▪ Via Add-on Profile Level 3 for automation system from Rockwell Automation
	  ▪ Via Electronic Data Sheet (EDS)
	▪ Also for device version with PROFIBUS DP output:
	Via PDM driver for Siemens automation system

Sensor

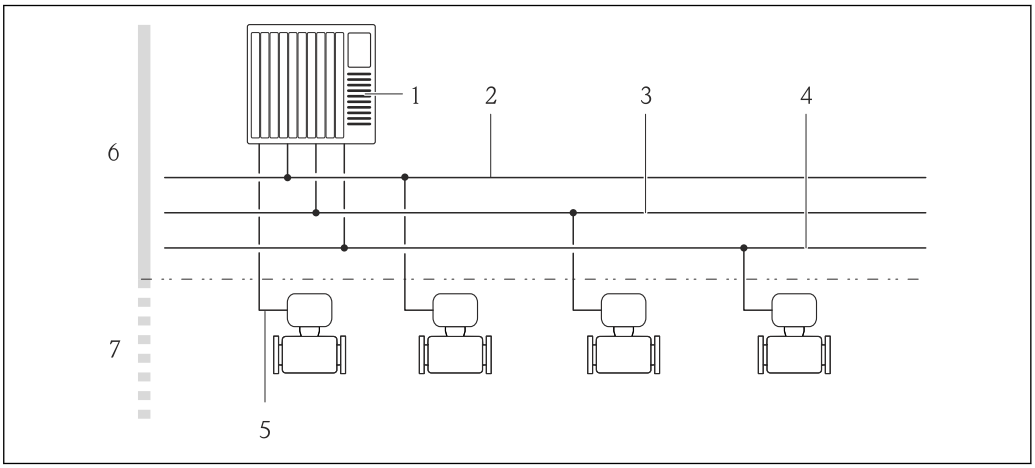
Promag W *Lap joint flange, lap joint flange, stamped plate or fixed flange with aluminum half-shell housing: DN 25 to 300 (1 to 12")*  A0017040	▪ Nominal diameter range: DN 25 to 2400 (1 to 90") ▪ Materials→ 🖹 83
Fixed flange with fully welded housing made of carbon steel: DN 25 to 300 (1 to 12")  A0022673	

Fixed flange with fully welded housing made of carbon steel: DN 350 to 2400 (14 to 90")



A0017041

Equipment architecture



A0037833

1 *Possibilities for integrating measuring devices into a system*

1 *Control system (e.g. PLC)*
2 *EtherNet/IP*
3 *PROFIBUS DP*
4 *Modbus RS485*
5 *4-20 mA HART, pulse/frequency/switch output*
6 *Non-hazardous area*
7 *Non-hazardous area and Zone 2/Div. 2*

Safety

IT security

Our warranty is valid only if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the settings.

IT security measures, which provide additional protection for the device and associated data transfer, must be implemented by the operators themselves in line with their security standards.

Device-specific IT security

The device offers a range of specific functions to support protective measures on the operator's side. These functions can be configured by the user and guarantee greater in-operation safety if used correctly. An overview of the most important functions is provided in the following section.

Protecting access via hardware write protection

Write access to the device parameters via the local display or operating tool (e.g. FieldCare, DeviceCare) can be disabled via a write protection switch (DIP switch on the motherboard). When hardware write protection is enabled, only read access to the parameters is possible.

Hardware write protection is disabled when the device is delivered.

Protecting access via a password

Different passwords are available to protect write access to the device parameters or access to the device via the WLAN interface.

- User-specific access code
  Protect write access to the device parameters via the local display, Web browser or operating tool (e.g. FieldCare, DeviceCare). Access authorization is clearly regulated through the use of a user-specific access code.
- WLAN passphrase
  The network key protects a connection between an operating unit (e.g. notebook or tablet) and the device via the WLAN interface which can be ordered as an option.
- Infrastructure mode
  When the device is operated in infrastructure mode, the WLAN passphrase corresponds to the WLAN passphrase configured on the operator side.

User-specific access code

Write access to the device parameters via the local display or operating tool (e.g. FieldCare, DeviceCare) can be protected by the modifiable, user-specific access code.

WLAN passphrase: Operation as WLAN access point

A connection between an operating unit (e.g. notebook or tablet) and the device via the WLAN interface, which can be ordered as an optional extra, is protected by the network key. The WLAN authentication of the network key complies with the IEEE 802.11 standard.

When the device is delivered, the network key is pre-defined depending on the device. It can be changed via the **WLAN settings** submenu in the **WLAN passphrase** parameter.

Infrastructure mode

A connection between the device and WLAN access point is protected by means of an SSID and passphrase on the system side. Please contact the relevant system administrator for access.

General notes on the use of passwords

- The access code and network key supplied with the device should be changed during commissioning.
- Follow the general rules for generating a secure password when defining and managing the access code or network key.
- The user is responsible for the management and careful handling of the access code and network key.

Access via Web server

The device can be operated and configured via a Web browser with the integrated Web server. The connection is via the service interface (CDI-RJ45) or the WLAN interface. For device versions with the EtherNet/IP and PROFINET communication protocols, the connection can also be established via the terminal connection for signal transmission with EtherNet/IP or PROFINET (RJ45 connector).

The Web server is enabled when the device is delivered. The Web server can be disabled if necessary (e.g. after commissioning) via the **Web server functionality** parameter.

The device and status information can be hidden on the login page. This prevents unauthorized access to the information.

For detailed information on device parameters, see:
The "Description of Device Parameters" document → 98

Input

Measured variable

Direct measured variables

- Volume flow (proportional to induced voltage)
- Electrical conductivity

In custody transfer: only volume flow

Calculated measured variables

Mass flow

Measuring range

Typically v = 0.01 to 10 m/s (0.03 to 33 ft/s) with the specified accuracy

Electrical conductivity: ≥ 5 µS/cm for liquids in general

Flow characteristic values in SI units: DN 25 to 125 (1 to 4")

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.3/10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[mm]	[in]	[dm³/min]	[dm³/min]	[dm³]	[dm³/min]
25	1	9 to 300	75	0.5	1
32	–	15 to 500	125	1	2
40	1 ½	25 to 700	200	1.5	3
50	2	35 to 1 100	300	2.5	5
65	–	60 to 2 000	500	5	8
80	3	90 to 3 000	750	5	12
100	4	145 to 4 700	1200	10	20
125	–	220 to 7 500	1850	15	30

Flow characteristic values in SI units: DN 150 to 2400 (6 to 90")

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.3/10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[mm]	[in]	[m³/h]	[m³/h]	[m³]	[m³/h]
150	6	20 to 600	150	0.025	2.5
200	8	35 to 1 100	300	0.05	5
250	10	55 to 1 700	500	0.05	7.5
300	12	80 to 2 400	750	0.1	10
350	14	110 to 3 300	1000	0.1	15
375	15	140 to 4 200	1200	0.15	20
400	16	140 to 4 200	1200	0.15	20
450	18	180 to 5 400	1500	0.25	25
500	20	220 to 6 600	2000	0.25	30
600	24	310 to 9 600	2500	0.3	40
700	28	420 to 13 500	3500	0.5	50
750	30	480 to 15 000	4000	0.5	60
800	32	550 to 18 000	4500	0.75	75
900	36	690 to 22 500	6000	0.75	100
1000	40	850 to 28 000	7000	1	125
–	42	950 to 30 000	8000	1	125
1200	48	1 250 to 40 000	10000	1.5	150
–	54	1 550 to 50 000	13000	1.5	200
1400	–	1 700 to 55 000	14000	2	225
–	60	1 950 to 60 000	16000	2	250

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.3/10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[mm]	[in]	[m³/h]	[m³/h]	[m³]	[m³/h]
1600	–	2 200 to 70 000	18000	2.5	300
–	66	2 500 to 80 000	20500	2.5	325
1800	72	2 800 to 90 000	23000	3	350
–	78	3 300 to 100 000	28500	3.5	450
2000	–	3 400 to 110 000	28500	3.5	450
–	84	3 700 to 125 000	31000	4.5	500
2200	–	4 100 to 136 000	34000	4.5	540
–	90	4 300 to 143 000	36000	5	570
2400	–	4 800 to 162 000	40000	5.5	650

Flow characteristic values in SI units: DN 50 to 300 (2 to 12") for order code for "Design", option C "Fixed flange, without inlet/outlet runs"

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.12/5 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 4 pulse/s)	Low flow cut off (v ~ 0.01 m/s)
[mm]	[in]	[m³/h]	[m³/h]	[m³]	[m³/h]
50	2	15 to 600 dm³/min	300 dm³/min	1.25 dm³	1.25 dm³/min
65	–	25 to 1 000 dm³/min	500 dm³/min	2 dm³	2 dm³/min
80	3	35 to 1 500 dm³/min	750 dm³/min	3 dm³	3.25 dm³/min
100	4	60 to 2 400 dm³/min	1 200 dm³/min	5 dm³	4.75 dm³/min
125	–	90 to 3 700 dm³/min	1 850 dm³/min	8 dm³	7.5 dm³/min
150	6	145 to 5 400 dm³/min	2 500 dm³/min	10 dm³	11 dm³/min
200	8	220 to 9 400 dm³/min	5 000 dm³/min	20 dm³	19 dm³/min
250	10	20 to 850	500	0.03	1.75
300	12	35 to 1 300	750	0.05	2.75

Flow characteristic values in US units: 1 to 48" (DN 25 to 1200)

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.3/10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[in]	[mm]	[gal/min]	[gal/min]	[gal]	[gal/min]
1	25	2.5 to 80	18	0.2	0.25
–	32	4 to 130	30	0.2	0.5
1 ½	40	7 to 185	50	0.5	0.75
2	50	10 to 300	75	0.5	1.25
–	65	16 to 500	130	1	2
3	80	24 to 800	200	2	2.5

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.3/10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[in]	[mm]	[gal/min]	[gal/min]	[gal]	[gal/min]
4	100	40 to 1250	300	2	4
–	125	60 to 1950	450	5	7
6	150	90 to 2650	600	5	12
8	200	155 to 4850	1200	10	15
10	250	250 to 7500	1500	15	30
12	300	350 to 10600	2400	25	45
14	350	500 to 15000	3600	30	60
15	375	600 to 19000	4800	50	60
16	400	600 to 19000	4800	50	60
18	450	800 to 24000	6000	50	90
20	500	1000 to 30000	7500	75	120
24	600	1400 to 44000	10500	100	180
28	700	1900 to 60000	13500	125	210
30	750	2150 to 67000	16500	150	270
32	800	2450 to 80000	19500	200	300
36	900	3100 to 100000	24000	225	360
40	1000	3800 to 125000	30000	250	480
42	–	4200 to 135000	33000	250	600
48	1200	5500 to 175000	42000	400	600

Flow characteristic values in US units: 54 to 90" (DN 1400 to 2400)

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.3/10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[in]	[mm]	[Mgal/d]	[Mgal/d]	[Mgal]	[Mgal/d]
54	–	9 to 300	75	0.0005	1.3
–	1400	10 to 340	85	0.0005	1.3
60	–	12 to 380	95	0.0005	1.3
–	1600	13 to 450	110	0.0008	1.7
66	–	14 to 500	120	0.0008	2.2
72	1800	16 to 570	140	0.0008	2.6
78	–	18 to 650	175	0.0010	3.0
–	2000	20 to 700	175	0.0010	2.9
84	–	24 to 800	190	0.0011	3.2
–	2200	26 to 870	210	0.0012	3.4
90	–	27 to 910	220	0.0013	3.6
–	2400	31 to 1030	245	0.0014	4.1

Flow characteristic values in US units: 2 to 12" (DN 50 to 300) for order code for "Design", option C "Fixed flange, without inlet/outlet runs"

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.12/5 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 4 pulse/s)	Low flow cut off (v ~ 0.01 m/s)
[in]	[mm]	[gal/min]	[gal/min]	[gal]	[gal/min]
2	50	4 to 160	75	0.3	0.35
–	65	7 to 260	130	0.5	0.6
3	80	10 to 400	200	0.8	0.8
4	100	16 to 650	300	1.2	1.25
–	125	24 to 1 000	450	1.8	2
6	150	40 to 1 400	600	2.5	3
8	200	60 to 2 500	1 200	5	5
10	250	90 to 3 700	1 500	6	8
12	300	155 to 5 700	2 400	9	12

Recommended measuring range

Flow limit → 48

For custody transfer, the applicable approval determines the permitted measuring range, the pulse value and the low flow cut off.

Operable flow range

Over 1000 : 1

For custody transfer, the operable flow range is 100 : 1 to 630 : 1, depending on the nominal diameter. Further details are specified by the applicable approval.

Input signal

External measured values

Various pressure transmitters and temperature measuring devices can be ordered from Endress +Hauser: see "Accessories" section → 97

It is recommended to read in external measured values to calculate the following measured variables: Mass flow

HART protocol

The measured values are written from the automation system to the measuring device via the HART protocol. The pressure transmitter must support the following protocol-specific functions:
- HART protocol
- Burst mode

Digital communication

The measured values can be written from the automation system to the measuring via:
- PROFIBUS DP
- Modbus RS485
- EtherNet/IP

Status input

Maximum input values	▪ DC 30 V ▪ 6 mA
Response time	Adjustable: 5 to 200 ms

Input signal level	▪ Low signal: DC −3 to +5 V ▪ High signal: DC 12 to 30 V
Assignable functions	▪ Off ▪ Reset totalizers 1-3 separately ▪ Reset all totalizers ▪ Flow override

Output

Output signal

Current output

Current output	Can be set as: ▪ 4-20 mA NAMUR ▪ 4-20 mA US ▪ 4-20 mA HART ▪ 0-20 mA
Maximum output values	▪ DC 24 V (no flow) ▪ 22.5 mA
Load	0 to 700 Ω
Resolution	0.5 µA
Damping	Adjustable: 0.07 to 999 s
Assignable measured variables	▪ Volume flow ▪ Mass flow ▪ Flow velocity ▪ Conductivity ▪ Electronic temperature

Pulse/frequency/switch output

Function	▪ With the order code for "Output; Input", option **H**: output 2 can be set as a pulse or frequency output ▪ With the order code for "Output; Input", option **I**: output 2 and 3 can be set as a pulse, frequency or switch output ▪ With the order code for "Output; Input", option **J**: output 2 firmly assigned as certified pulse output
Version	Passive, open collector
Maximum input values	▪ DC 30 V ▪ 250 mA
Voltage drop	For 25 mA: ≤ DC 2 V
Pulse output	
Pulse width	Adjustable: 0.05 to 2 000 ms
Maximum pulse rate	10 000 Impulse/s
Pulse value	Adjustable
Assignable measured variables	▪ Volume flow ▪ Mass flow
Frequency output	
Output frequency	Adjustable: 0 to 12 500 Hz
Damping	Adjustable: 0 to 999 s
Pulse/pause ratio	1:1

Assignable measured variables	▪ Volume flow ▪ Mass flow ▪ Conductivity ▪ Flow velocity ▪ Electronic temperature
Switch output	
Switching behavior	Binary, conductive or non-conductive
Switching delay	Adjustable: 0 to 100 s
Number of switching cycles	Unlimited

Assignable functions	▪ Off
	▪ On
	▪ Diagnostic behavior
	▪ Limit value:
	  ▪ Off
	  ▪ Volume flow
	  ▪ Mass flow
	  ▪ Conductivity
	  ▪ Flow velocity
	  ▪ Totalizer 1-3
	  ▪ Electronic temperature
	▪ Flow direction monitoring
	▪ Status
	  ▪ Empty pipe detection
	  ▪ Low flow cut off

PROFIBUS DP

Signal encoding	NRZ code
Data transfer	9.6 kBaud...12 MBaud

Modbus RS485

Physical interface	In accordance with EIA/TIA-485-A standard
Terminating resistor	Integrated, can be activated via DIP switch on the transmitter electronics module

EtherNet/IP

Standards	In accordance with IEEE 802.3

Signal on alarm

Depending on the interface, failure information is displayed as follows:

Current output 4 to 20 mA

4 to 20 mA

Failure mode	Choose from: ▪ 4 to 20 mA in accordance with NAMUR recommendation NE 43 ▪ 4 to 20 mA in accordance with US ▪ Min. value: 3.59 mA ▪ Max. value: 22.5 mA ▪ Freely definable value between: 3.59 to 22.5 mA ▪ Actual value ▪ Last valid value

0 to 20 mA

Failure mode	Choose from: ▪ Maximum alarm: 22 mA ▪ Freely definable value between: 0 to 22.5 mA

HART current output

Device diagnostics	Device condition can be read out via HART Command 48

Pulse/frequency/switch output

Pulse output	
Failure mode	Choose from: ▪ Actual value ▪ No pulses
Frequency output	
Failure mode	Choose from: ▪ Actual value ▪ 0 Hz ▪ Defined value: 0 to 12 500 Hz
Switch output	
Failure mode	Choose from: ▪ Current status ▪ Open ▪ Closed

PROFIBUS DP

Status and alarm messages	Diagnostics in accordance with PROFIBUS PA Profile 3.02

Modbus RS485

Failure mode	Choose from: ▪ NaN value instead of current value ▪ Last valid value

EtherNet/IP

Device diagnostics	Device condition can be read out in Input Assembly

Local display

Plain text display	With information on cause and remedial measures
Backlight	Red backlighting indicates a device error.

Status signal as per NAMUR recommendation NE 107

Interface/protocol

- Via digital communication:
  - HART protocol
  - PROFIBUS DP
  - Modbus RS485
  - EtherNet/IP
- Via service interface
  - CDI-RJ45 service interface
  - WLAN interface

Plain text display	With information on cause and remedial measures

Additional information on remote operation → 📄 87

Web browser

Plain text display	With information on cause and remedial measures

Light emitting diodes (LED)

Status information	Status indicated by various light emitting diodes The following information is displayed depending on the device version: ▪ Supply voltage active ▪ Data transmission active ▪ Device alarm/error has occurred ▪ EtherNet/IP network available ▪ EtherNet/IP connection established

Low flow cut off

The switch points for low flow cut off are user-selectable.

Galvanic isolation

The following connections are galvanically isolated from each other:
- Inputs
- Outputs
- Power supply

Protocol-specific data

HART

Manufacturer ID	0x11
Device type ID	0x69
HART protocol revision	7
Device description files (DTM, DD)	Information and files under: www.endress.com
HART load	Min. 250 Ω

Dynamic variables	Read out the dynamic variables: HART command 3 The measured variables can be freely assigned to the dynamic variables. **Measured variables for PV (primary dynamic variable)** ▪ Off ▪ Volume flow ▪ Mass flow ▪ Conductivity ▪ Flow velocity ▪ Electronic temperature **Measured variables for SV, TV, QV (secondary, tertiary and quaternary dynamic variable)** ▪ Volume flow ▪ Mass flow ▪ Conductivity ▪ Flow velocity ▪ Electronic temperature ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3
Device variables	Read out the device variables: HART command 9 The device variables are permanently assigned. A maximum of 8 device variables can be transmitted: ▪ 0 = volume flow ▪ 1 = mass flow ▪ 2 = conductivity ▪ 3 = flow velocity ▪ 4 = electronic temperature ▪ 5 = totalizer 1 ▪ 6 = totalizer 2 ▪ 7 = totalizer 3

PROFIBUS DP

Manufacturer ID	0x11
Ident number	0x1562
Profile version	3.02
Device description files (GSD, DTM, DD)	Information and files under: ▪ www.endress.com ▪ www.profibus.org
Output values (from measuring device to automation system)	**Analog input 1 to 4** ▪ Mass flow ▪ Volume flow ▪ Flow velocity ▪ Conductivity ▪ Electronic temperature **Digital input 1 to 2** ▪ Empty pipe detection ▪ Low flow cut off ▪ Verification status **Totalizer 1 to 3** ▪ Mass flow ▪ Volume flow

Input values
(from automation system to measuring device)
	Analog output 1 (fixed assignment)
	External density
	Digital output 1 to 2 (fixed assignment)
	▪ Digital output 1: switch positive zero return on/off
	▪ Digital output 2: start verification
	Totalizer 1 to 3
	▪ Totalize
	▪ Reset and hold
	▪ Preset and hold
	▪ Stop
	▪ Operating mode configuration:
	  ▪ Net flow total
	  ▪ Forward flow total
	  ▪ Reverse flow total

Supported functions	▪ Identification & Maintenance Simplest device identification on the part of the control system and nameplate ▪ PROFIBUS upload/download Reading and writing parameters is up to ten times faster with PROFIBUS upload/download ▪ Condensed status Simplest and self-explanatory diagnostic information by categorizing diagnostic messages that occur
Configuration of the device address	▪ DIP switches on the I/O electronics module ▪ Via operating tools (e.g. FieldCare)

Modbus RS485

Protocol	Modbus Applications Protocol Specification V1.1
Device type	Slave
Slave address range	1 to 247
Broadcast address range	0
Function codes	▪ 03: Read holding register ▪ 04: Read input register ▪ 06: Write single registers ▪ 08: Diagnostics ▪ 16: Write multiple registers ▪ 23: Read/write multiple registers
Broadcast messages	Supported by the following function codes: ▪ 06: Write single registers ▪ 16: Write multiple registers ▪ 23: Read/write multiple registers
Supported baud rate	▪ 1 200 BAUD ▪ 2 400 BAUD ▪ 4 800 BAUD ▪ 9 600 BAUD ▪ 19 200 BAUD ▪ 38 400 BAUD ▪ 57 600 BAUD ▪ 115 200 BAUD
Data transfer mode	▪ ASCII ▪ RTU
Data access	Each device parameter can be accessed via Modbus RS485. For detailed information on "Modbus RS485 register information", see the Description of Device Parameters → 🖹 98

EtherNet/IP

Protocol	▪ The CIP Networks Library Volume 1: Common Industrial Protocol ▪ The CIP Networks Library Volume 2: EtherNet/IP Adaptation of CIP		
Communication type	▪ 10Base-T ▪ 100Base-TX		
Device profile	Generic device (product type: 0x2B)		
Manufacturer ID	0x49E		
Device type ID	0x1067		
Baud rates	Automatic $^{10}/_{100}$ Mbit with half-duplex and full-duplex detection		
Polarity	Auto-polarity for automatic correction of crossed TxD and RxD pairs		
Supported CIP connections	Max. 3 connections		
Explicit connections	Max. 6 connections		
I/O connections	Max. 6 connections (scanner)		
Configuration options for measuring device	▪ DIP switches on the electronics module for IP addressing ▪ Manufacturer-specific software (FieldCare) ▪ Custom Add-on Profile for Rockwell Automation control systems ▪ Web browser ▪ Electronic Data Sheet (EDS) integrated in the measuring device		
Configuration of the EtherNet interface	▪ Speed: 10 MBit, 100 MBit, auto (factory setting) ▪ Duplex: half-duplex, full-duplex, auto (factory setting)		
Configuration of the device address	▪ DIP switches on the electronics module for IP addressing (last octet) ▪ DHCP ▪ Manufacturer-specific software (FieldCare) ▪ Custom Add-on Profile for Rockwell Automation control systems ▪ Web browser ▪ EtherNet/IP tools, e.g. RSLinx (Rockwell Automation)		
Device Level Ring (DLR)	No		
Fix Input			
RPI	5 ms to 10 s (factory setting: 20 ms)		
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0x66	56
	T → O configuration:	0x64	32
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0x66	56
	T → O configuration:	0x64	32
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0xC7	-
	T → O configuration:	0x64	32
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0xC7	-
	T → O configuration:	0x64	32

Input Assembly	▪ Current device diagnostics ▪ Volume flow ▪ Mass flow ▪ Conductivity ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3		
Configurable Input			
RPI	5 ms to 10 s (factory setting: 20 ms)		
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0x66	56
	T → O configuration:	0x65	88
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0x66	56
	T → O configuration:	0x65	88
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0xC7	-
	T → O configuration:	0x65	88
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0xC7	-
	T → O configuration:	0x65	88
Configurable Input Assembly	▪ Volume flow ▪ Mass flow ▪ Electronic temperature ▪ Conductivity ▪ Totalizer 1 to 3 ▪ Flow velocity ▪ Volume flow unit ▪ Mass flow unit ▪ Temperature unit ▪ Conductivity unit ▪ Unit totalizer 1-3 ▪ Flow velocity unit ▪ Verification result ▪ Verification status The range of options increases if the measuring device has one or more application packages.		
Fix Output			
Output Assembly	▪ Activation of reset totalizers 1-3 ▪ Activation of reference density compensation ▪ Reset totalizers 1-3 ▪ External density ▪ Density unit ▪ Activation verification ▪ Start verification		

Configuration	

Configuration Assembly	Only the most common configurations are listed below.
	▪ Software write protection
	▪ Mass flow unit
	▪ Mass unit
	▪ Volume flow unit
	▪ Volume unit
	▪ Density unit
	▪ Conductivity
	▪ Temperature unit
	▪ Totalizer 1-3:
	  ▪ Assignment
	  ▪ Unit
	  ▪ Operating mode
	  ▪ Failure mode
	▪ Alarm delay

Power supply

Terminal assignment

Transmitter: 0-20 mA/4-20 mA HART

The sensor can be ordered with terminals.

Connection methods available		Possible options for order code "Electrical connection"
Outputs	Power supply	
Terminals	Terminals	▪ Option **A**: coupling M20x1 ▪ Option **B**: thread M20x1 ▪ Option **C**: thread G ½" ▪ Option **D**: thread NPT ½"

Supply voltage

Order code "Power supply"	Terminal numbers	terminal voltage		Frequency range
Option **L** (wide range power unit)	1 (L+/L), 2 (L-/N)	DC 24 V	±25%	–
		AC 24 V	±25%	50/60 Hz, ±4 Hz
		AC 100 to 240 V	−15 to +10%	50/60 Hz, ±4 Hz

Signal transmission 0-20 mA/4-20 mA HART and additional outputs and inputs

Order code for "Output" and "Input"	Terminal numbers							
	Output 1		Output 2		Output 3		Input	
	26 (+)	27 (-)	24 (+)	25 (-)	22 (+)	23 (-)	20 (+)	21 (-)
Option **H**	▪ 4-20 mA HART (active) ▪ 0-20 mA (active)		Pulse/frequency output (passive)		Switch output (passive)		-	
Option **I**	▪ 4-20 mA HART (active) ▪ 0-20 mA (active)		Pulse/frequency/ switch output (passive)		Pulse/frequency/ switch output (passive)		Status input	
Option **J**	▪ 4-20 mA HART (active) ▪ 0-20 mA (active)		Permanently assigned: Pulse output adjusted (passive)		Pulse/frequency/ switch output (passive)		Status input	

Transmitter: PROFIBUS DP

The sensor can be ordered with terminals.

Connection methods available		Possible options for order code "Electrical connection"
Outputs	**Power supply**	
Terminals	Terminals	▪ Option **A**: coupling M20x1 ▪ Option **B**: thread M20x1 ▪ Option **C**: thread G ½" ▪ Option **D**: thread NPT ½"

Supply voltage

Order code "Power supply"	Terminal numbers	terminal voltage		Frequency range
Option **L** (wide range power unit)	1 (L+/L), 2 (L-/N)	DC 24 V	±25%	–
		AC 24 V	±25%	50/60 Hz, ±4 Hz
		AC 100 to 240 V	−15 to +10%	50/60 Hz, ±4 Hz

PROFIBUS DP signal transmission

Order code for "Output" and "Input"	Terminal numbers	
	26 (RxD/TxD-P)	**27 (RxD/TxD-N)**
Option **L**	B	A
Order code for "Output": Option L: PROFIBUS DP, for use in non-hazardous areas and Zone 2/div. 2		

Transmitter: Modbus RS485

The sensor can be ordered with terminals.

Connection methods available		Possible options for order code "Electrical connection"
Outputs	**Power supply**	
Terminals	Terminals	▪ Option **A**: coupling M20x1 ▪ Option **B**: thread M20x1 ▪ Option **C**: thread G ½" ▪ Option **D**: thread NPT ½"

Supply voltage

Order code "Power supply"	Terminal numbers	terminal voltage		Frequency range
Option **L** (wide range power unit)	1 (L+/L), 2 (L-/N)	DC 24 V	±25%	–
		AC 24 V	±25%	50/60 Hz, ±4 Hz
		AC 100 to 240 V	−15 to +10%	50/60 Hz, ±4 Hz

Signal transmission Modbus RS485

Order code for "Output" and "Input"	Terminal numbers	
	26 (+)	**27 (-)**
Option **M**	B	A

Transmitter: EtherNet/IP

The transmitter can be ordered with terminals or a device plug.

Connection methods available		Possible options for order code "Electrical connection"
Outputs	**Power supply**	
EtherNet/IP (RJ45 connector)	Terminals	Option **D**: thread NPT ½"
Device plug → 🖹 23	Terminals	▪ Option **L**: plug M12x1 + thread NPT ½" ▪ Option **N**: plug M12x1 + coupling M20 ▪ Option **P**: plug M12x1 + thread G ½" ▪ Option **U**: plug M12x1 + thread M20

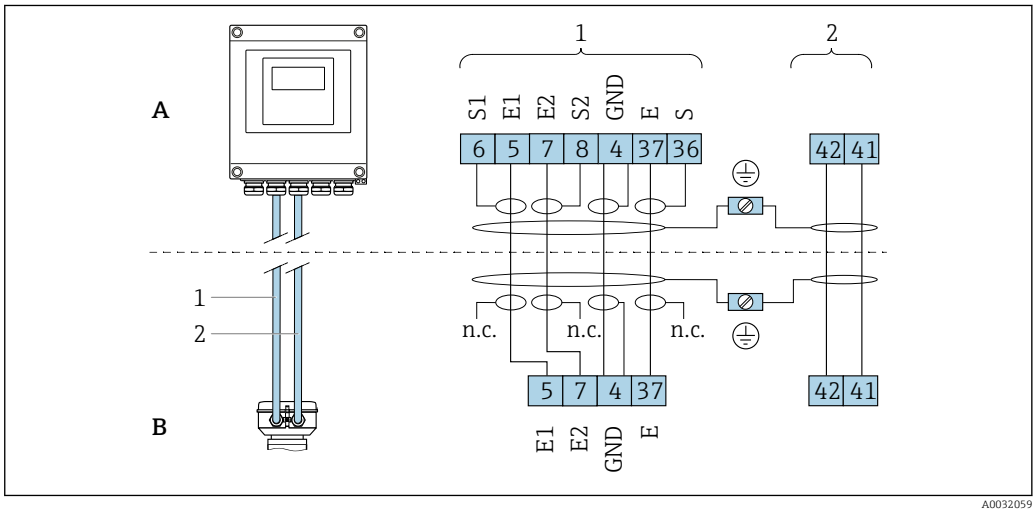
Supply voltage

Order code "Power supply"	Terminal numbers	terminal voltage		Frequency range
Option **L** (wide range power unit)	1 (L+/L), 2 (L-/N)	DC 24 V	±25%	–
		AC 24 V	±25%	50/60 Hz, ±4 Hz
		AC 100 to 240 V	−15 to +10%	50/60 Hz, ±4 Hz

EtherNet/IP signal transmission

Order code for "Output"	Connection via
Option **N**	EtherNet/IP: RJ45 or M12 connector

Remote version



🖹 2 *Remote version terminal assignment*

A Transmitter wall-mount housing
B Sensor connection housing
1 Electrode cable
2 Coil current cable
n.c. Not connected, insulated cable shields

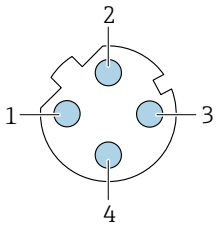
Terminal No. and cable colors: 6/5 = brown; 7/8 = white; 4 = green; 36/37 = yellow

Pin assignment, device plug

Order codes for the M12x1 connectors, see the "Order code for electrical connection" column: EtherNet/IP → 🖹 23

EtherNet/IP

Device plug for signal transmission (device side)



Pin	Assignment		Coding	Plug/socket
1	+	Tx	D	Socket
2	+	Rx		
3	-	Tx		
4	-	Rx		

Recommended plug:
- Binder, series 763, part no. 99 3729 810 04
- Phoenix, part no. 1543223 SACC-M12MSD-4Q
- The device plug is not permitted in the hazardous area, Class I Division 2. The device plug may only be used in the non-hazardous area (General Purpose).

Supply voltage

Transmitter

Order code for "Power supply"	terminal voltage		Frequency range
Option **L**	DC 24 V	±25%	–
	AC 24 V	±25%	50/60 Hz, ±4 Hz
	AC 100 to 240 V	−15 to +10%	50/60 Hz, ±4 Hz

Power consumption

Order code for "Output"	Maximum power consumption
Option **H**: 4-20mA HART, pulse/frequency/switch output, switch output	30 VA/8 W
Option **I**: 4-20mA HART, 2 x pulse/frequency/switch output, status input	30 VA/8 W
Option **J**: 4-20mA HART, certified pulse output, pulse/frequency/switch output, status input	30 VA/8 W
Option **L**: PROFIBUS DP	30 VA/8 W
Option **M**: Modbus RS485	30 VA/8 W
Option **N**: EtherNet/IP	30 VA/8 W

Current consumption

Transmitter

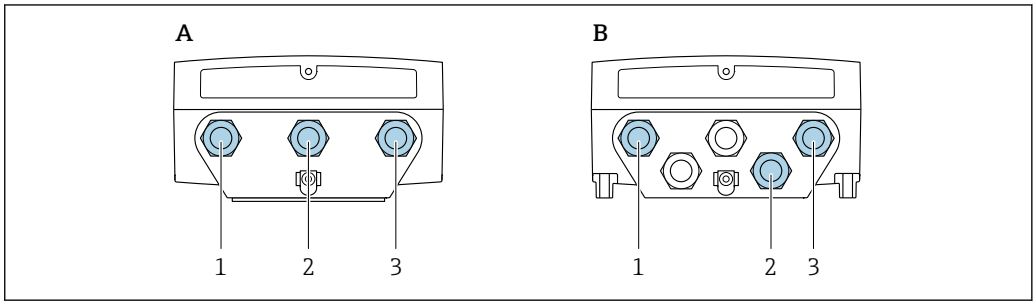
Order code for "Power supply"	Maximum Current consumption	Maximum switch-on current
Option **L**: AC 100 to 240 V	145 mA	25 A (< 5 ms)
Option **L**: AC/DC 24 V	350 mA	27 A (< 5 ms)

Power supply failure

- Totalizers stop at the last value measured.
- Depending on the device version, the configuration is retained in the device memoryor in the pluggable data memory (HistoROM DAT).
- Error messages (incl. total operated hours) are stored.

Electrical connection

Connecting the transmitter

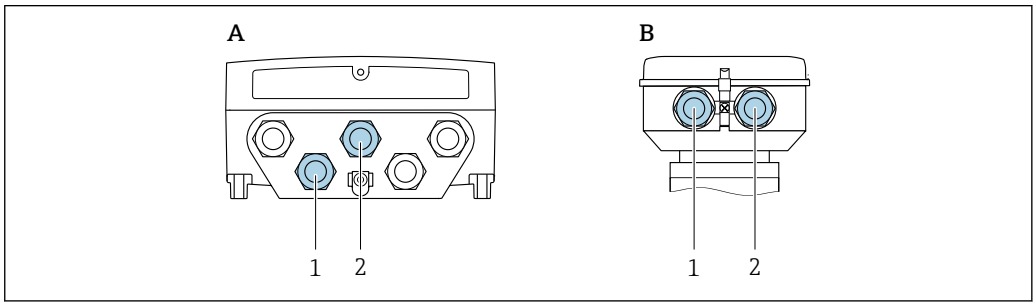


3 *Supply voltage and signal transmission connection*

A Compact version
B Remote version wall-mount housing
1 Cable entry for supply voltage
2 Cable entry for signal transmission
3 Cable entry for signal transmission

Remote version connection

Connecting cable



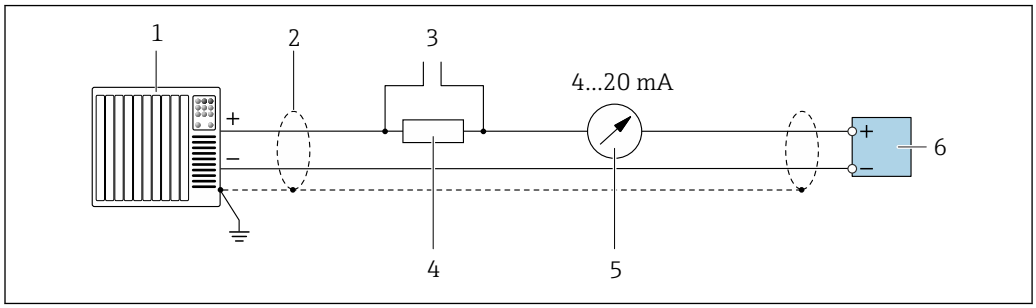
4 *Connecting cable connection: electrode and coil current cable*

A Transmitter wall-mount housing
B Sensor connection housing
1 Electrode cable
2 Coil current cable

- Fix the cable run or route it in an armored conduit.
  Cable movements can influence the measuring signal especially in the case of low fluid conductivities.
- Route the cable well clear of electrical machines and switching elements.
- Ensure potential equalization between sensor and transmitter .

Connection examples

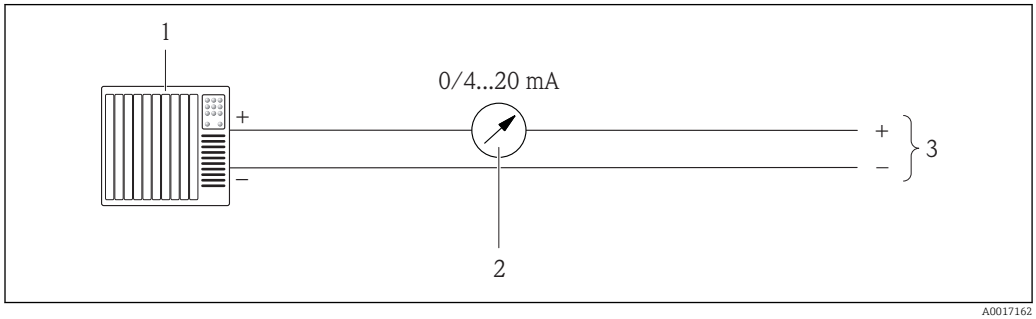
Current output 4 to 20 mA HART



5 Connection example for 4 to 20 mA HART current output (active)

1 *Automation system with current input (e.g. PLC)*
2 *Cable shield provided at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications → 31*
3 *Connection for HART operating devices → 87*
4 *Resistor for HART communication (≥ 250 Ω): observe maximum load → 13*
5 *Analog display unit: observe maximum load → 13*
6 *Transmitter*

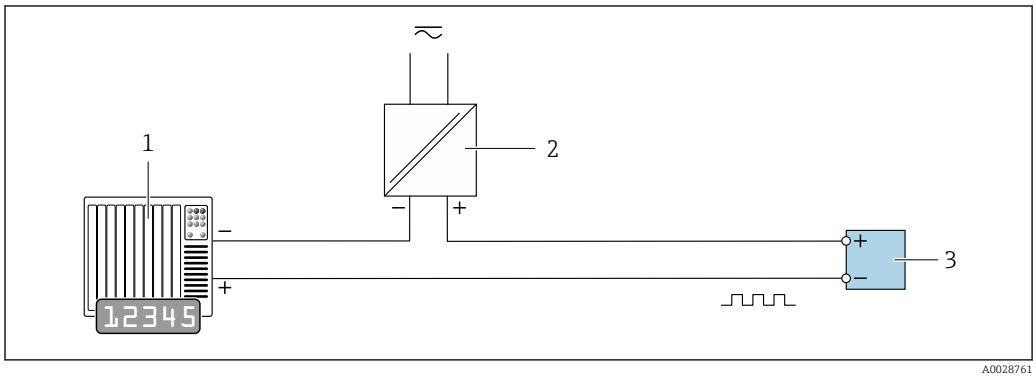
Current output 4-20 mA



6 Connection example for 0-20 mA current output (active) and 4-20 mA current output (active)

1 *Automation system with current input (e.g. PLC)*
2 *Analog display unit: observe maximum load*
3 *Transmitter*

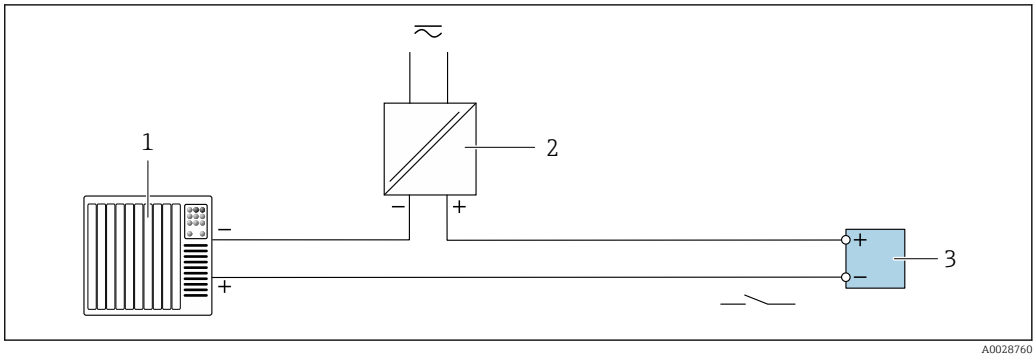
Pulse/frequency output



7 Connection example for pulse/frequency output (passive)

1 *Automation system with pulse/frequency input (e.g. PLC)*
2 *Power supply*
3 *Transmitter: Observe input values → 13*

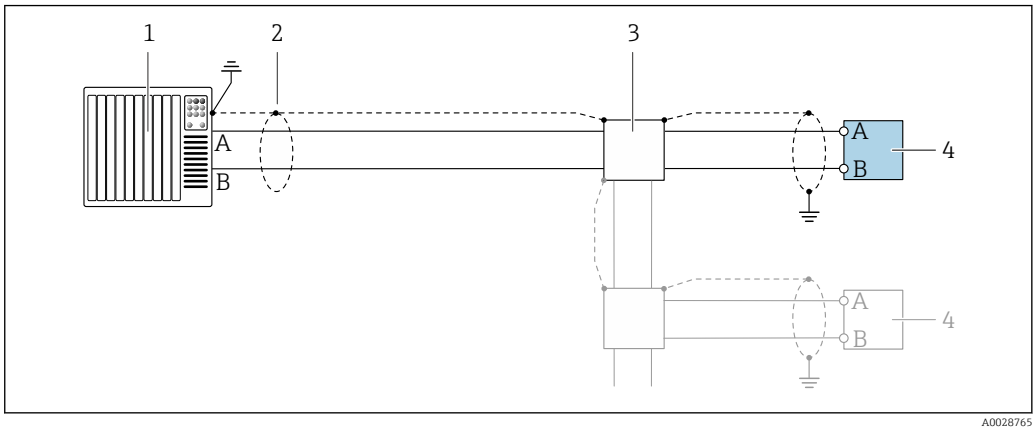
Switch output



8 Connection example for switch output (passive)

1 Automation system with switch input (e.g. PLC)
2 Power supply
3 Transmitter: Observe input values → 13

PROFIBUS DP

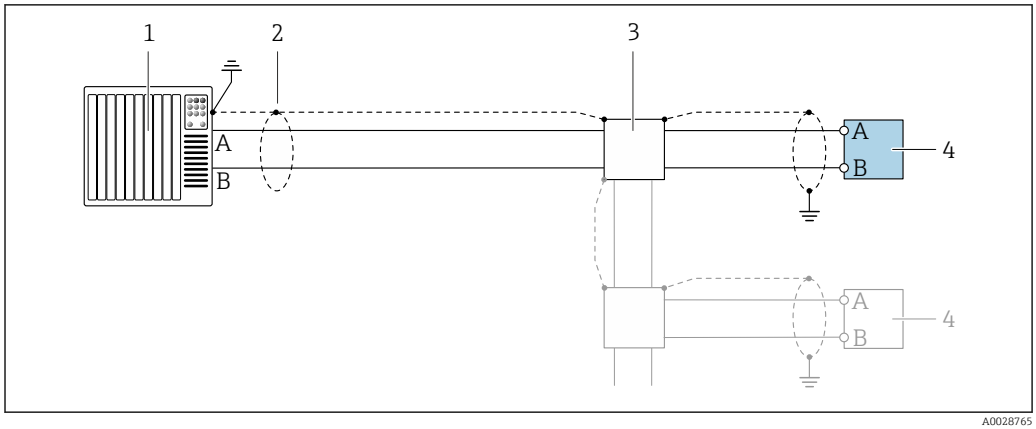


9 Connection example for PROFIBUS DP, non-hazardous area and Zone 2/Div. 2

1 Control system (e.g. PLC)
2 Cable shield provided at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
3 Distribution box
4 Transmitter

If baud rates > 1.5 MBaud an EMC cable entry must be used and the cable shield must continue as far as the terminal wherever possible.

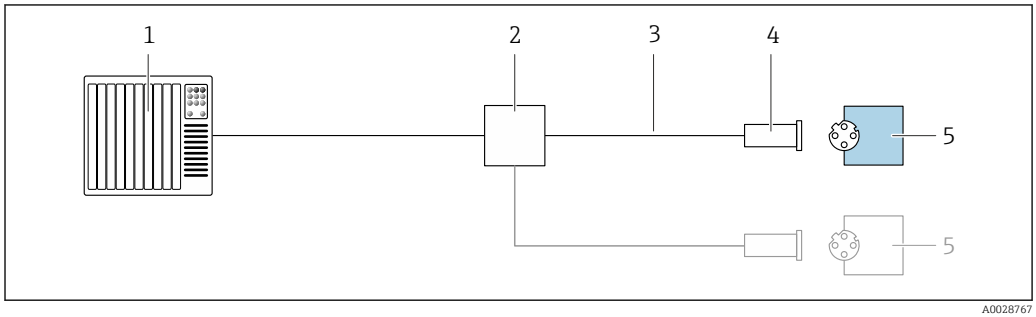
Modbus RS485



10 Connection example for Modbus RS485, non-hazardous area and Zone 2/Div. 2

1 *Control system (e.g. PLC)*
2 *Cable shield provided at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications*
3 *Distribution box*
4 *Transmitter*

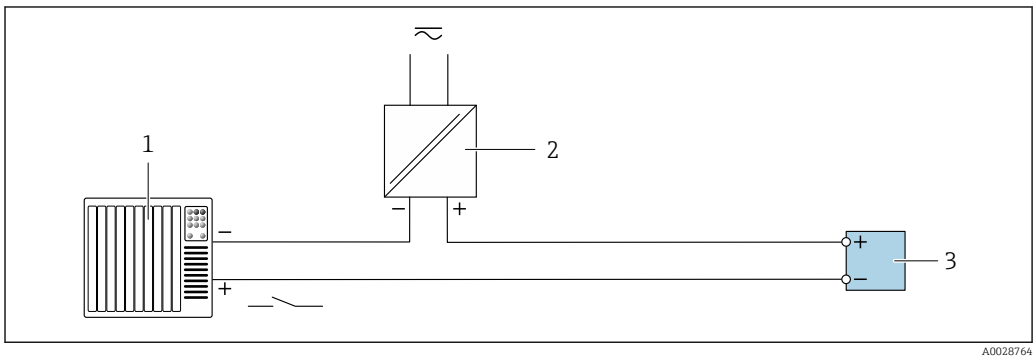
EtherNet/IP



11 Connection example for EtherNet/IP

1 *Control system (e.g. PLC)*
2 *Ethernet switch*
3 *Observe cable specifications*
4 *Device plug*
5 *Transmitter*

Status input



12 Connection example for status input

1 *Automation system with status output (e.g. PLC)*
2 *Power supply*
3 *Transmitter*

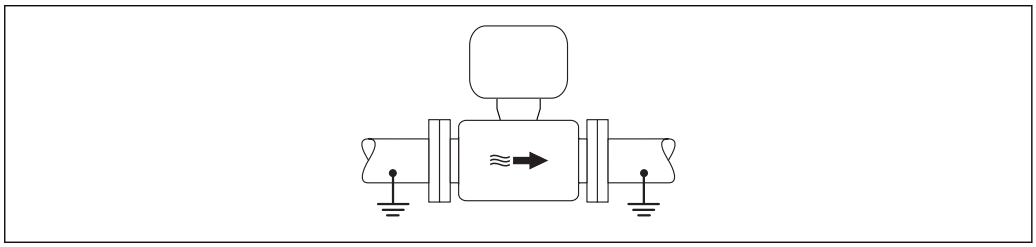
Potential equalization

Requirements

Please consider the following to ensure correct measurement:
- Same electrical potential for the fluid and sensor
- Remote version: same electrical potential for the sensor and transmitter
- Company-internal grounding concepts
- Pipe material and grounding

Connection example, standard scenario

Metal, grounded pipe



A0016315

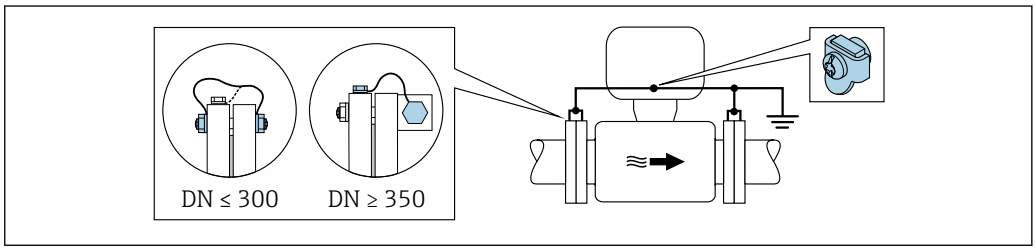
13 *Potential equalization via measuring tube*

Connection example in special situations

Unlined and ungrounded metal pipe

This connection method also applies in situations where:
- The customary potential equalization is not used
- Equalizing currents are present

Ground cable	Copper wire, at least 6 mm² (0.0093 in²)



A0029338

14 *Potential equalization via ground terminal and pipe flanges*

Note the following when installing:
- Connect both sensor flanges to the pipe flange via a ground cable and ground them.
- Connect the connection housing of the transmitter or sensor to ground potential by means of the ground terminal provided for the purpose. To mount the ground cable:
  - If DN ≤ 300 (12"): Mount the ground cable directly on the conductive flange coating of the sensor with the flange screws.
  - If DN ≥ 350 (14"): Mount the ground cable directly on the metal transport bracket.

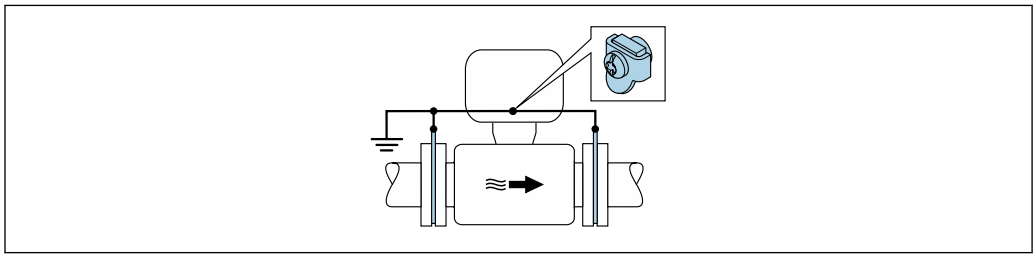
For remote device versions, the ground terminal in the example always refers to the sensor and **not** to the transmitter.

You can order the necessary ground cable from Endress+Hauser: .

Plastic pipe or pipe with insulating liner

This connection method also applies in situations where:
- The customary potential equalization is not used
- Equalizing currents are present

Ground cable	Copper wire, at least 6 mm² (0.0093 in²)



A0029339

15 Potential equalization via ground terminal and ground disks

Note the following when installing:
The ground disks must be connected to the ground terminal via the ground cable and be connected to ground potential.

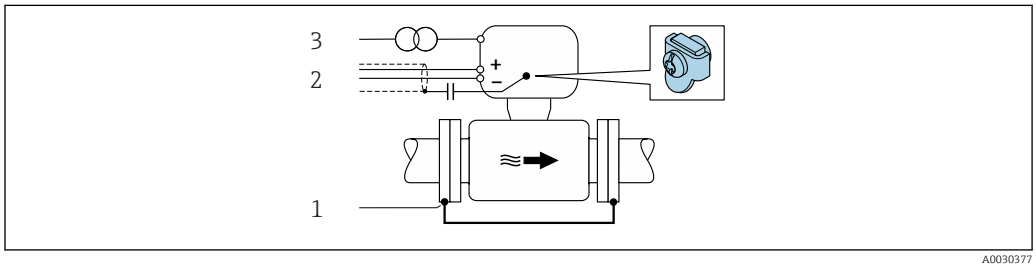
For remote device versions, the ground terminal in the example always refers to the sensor and **not** to the transmitter.

The ground cable and ground disks can be ordered from Endress+Hauser → 96.

Pipe with a cathodic protection unit

This connection method is only used if the following two conditions are met:
- Metal pipe without liner or pipe with electrically conductive liner
- Cathodic protection is integrated in the personal protection equipment

Ground cable	Copper wire, at least 6 mm² (0.0093 in²)



A0030377

1 *Connection of the two flanges of the pipe via a ground cable*
2 *Signal line shielding via a capacitor*
3 *Measuring device connected to power supply such that it is floating in relation to the protective ground (isolation transformer)*

Note the following when installing:
The sensor is installed in the pipe in a way that provides electrical insulation.

For remote device versions, the ground terminal in the example always refers to the sensor and **not** to the transmitter.

You can order the necessary ground cable from Endress+Hauser: .

terminals

Transmitter
- Supply voltage cable: plug-in spring terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)
- Signal cable: plug-in spring terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)
- Electrode cable: spring terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)
- Coil current cable: spring terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)

Sensor connection housing
Spring terminals for wire cross-sections0.5 to 2.5 mm² (20 to 14 AWG)

Cable entries

Cable entry thread
- M20 x 1.5
- Via adapter:
  - NPT ½"
  - G ½"

Cable gland
- For standard cable: M20 × 1.5 with cable ϕ6 to 12 mm (0.24 to 0.47 in)
- For reinforced cable: M20 × 1.5 with cable ϕ9.5 to 16 mm (0.37 to 0.63 in)

If metal cable entries are used, use a grounding plate.

Cable specification

Permitted temperature range
- The installation guidelines that apply in the country of installation must be observed.
- The cables must be suitable for the minimum and maximum temperatures to be expected.

Power supply cable

Standard installation cable is sufficient.

Signal cable

Current output 0/4 to 20 mA

Standard installation cable is sufficient.

Current output 4 to 20 mA HART

A shielded cable is recommended. Observe grounding concept of the plant.

Pulse/frequency/switch output

Standard installation cable is sufficient.

Status input

Standard installation cable is sufficient.

PROFIBUS DP

The IEC 61158 standard specifies two types of cable (A and B) for the bus line which can be used for every transmission rate. Cable type A is recommended.

Cable type	A
Characteristic impedance	135 to 165 Ω at a measuring frequency of 3 to 20 MHz
Cable capacitance	< 30 pF/m
Wire cross-section	> 0.34 mm² (22 AWG)
Cable type	Twisted pairs
Loop resistance	≤110 Ω/km
Signal damping	Max. 9 dB over the entire length of the cable cross-section
Shield	Copper braided shielding or braided shielding with foil shield. When grounding the cable shield, observe the grounding concept of the plant.

For further information on planning and installing PROFIBUS networks see:

Operating Instructions "PROFIBUS DP/PA: Guidelines for planning and commissioning" (BA00034S)

Modbus RS485

The EIA/TIA-485 standard specifies two types of cable (A and B) for the bus line which can be used for every transmission rate. Cable type A is recommended.

Cable type	A
Characteristic impedance	135 to 165 Ω at a measuring frequency of 3 to 20 MHz
Cable capacitance	< 30 pF/m
Wire cross-section	> 0.34 mm² (22 AWG)
Cable type	Twisted pairs
Loop resistance	≤110 Ω/km
Signal damping	Max. 9 dB over the entire length of the cable cross-section
Shield	Copper braided shielding or braided shielding with foil shield. When grounding the cable shield, observe the grounding concept of the plant.

EtherNet/IP

The standard ANSI/TIA/EIA-568-B.2 Annex specifies CAT 5 as the minimum category for a cable used for EtherNet/IP. CAT 5e and CAT 6 are recommended.

For more information on planning and installing EtherNet/IP networks, please refer to the "Media Planning and Installation Manual. EtherNet/IP" of ODVA Organization

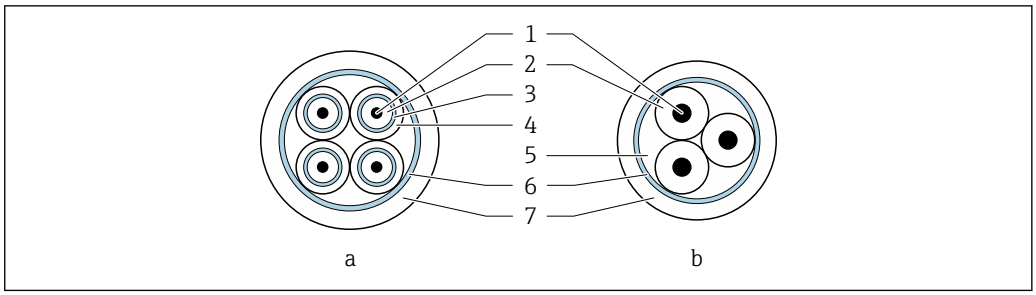
Connecting cable for remote version

Electrode cable

Standard cable	3 ×0.38 mm² (20 AWG) with common, braided copper shield (ϕ ~9.5 mm (0.37 in)) and individual shielded cores
Cable for empty pipe detection (EPD)	4 ×0.38 mm² (20 AWG) with common, braided copper shield (ϕ ~9.5 mm (0.37 in)) and individual shielded cores
Conductor resistance	≤50 Ω/km (0.015 Ω/ft)
Capacitance: core/shield	≤420 pF/m (128 pF/ft)
Operating temperature	–20 to +80 °C (–4 to +176 °F)

Coil current cable

Standard cable	3 ×0.75 mm² (18 AWG) with common, braided copper shield (ϕ ~9 mm (0.35 in))
Conductor resistance	≤37 Ω/km (0.011 Ω/ft)
Capacitance: core/core, shield grounded	≤120 pF/m (37 pF/ft)
Operating temperature	–20 to +80 °C (–4 to +176 °F)
Test voltage for cable insulation	≤ AC 1433 V r.m.s. 50/60 Hz or ≥ DC 2026 V



16 *Cable cross-section*

a *Electrode cable*
b *Coil current cable*
1 *Core*
2 *Core insulation*
3 *Core shield*
4 *Core jacket*
5 *Core reinforcement*
6 *Cable shield*
7 *Outer jacket*

A connecting cable can be ordered from Endress+Hauser for IP68:
- Pre-terminated cables that are already connected to the sensor.
- Pre-terminated cables, where the cables are connected by the customer onsite (incl. tools for sealing the connection compartment)

Reinforced connecting cables

Reinforced connecting cables with an additional, reinforcing metal braid should be used:
- When laying the cable directly in the ground
- Where there is a risk of damage from rodents
- If using the device below IP68 degree of protection

Reinforced connecting cables with an additional, reinforcing metal braid can be ordered from Endress+Hauser .

Operation in areas with strong electrical interference

The measuring system meets the general safety requirements → 93 and EMC specifications → 43.

Grounding is by means of the ground terminal provided for the purpose inside the connection housing. The stripped and twisted lengths of cable shield to the ground terminal must be as short as possible.

Performance characteristics

Reference operating conditions

- Error limits following DIN EN 29104, in future ISO 20456
- Water, typically +15 to +45 °C (+59 to +113 °F); 0.5 to 7 bar (73 to 101 psi)
- Data as indicated in the calibration protocol
- Accuracy based on accredited calibration rigs according to ISO 17025

Maximum measured error

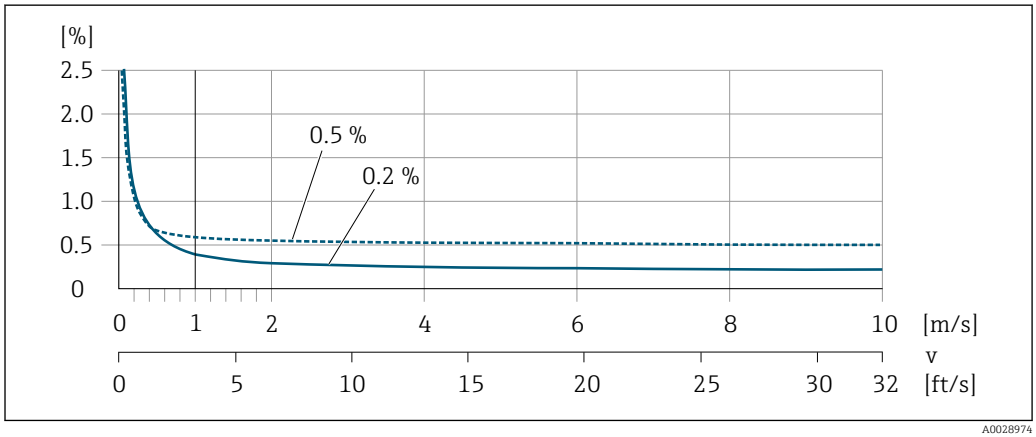
Error limits under reference operating conditions

Volume flow

- ±0.5 % o.r. ± 1 mm/s (0.04 in/s)
- Optional: ±0.2 % o.r. ± 2 mm/s (0.08 in/s)

Order code for "Design"	Installation *with* inlet and outlet runs max. measured error 0.5 %	Installation *with* inlet and outlet runs max. measured error 0.2 %	Installation *without* inlet and outlet runs max. measured error 0.5 %
Options A, B, D, E, F, G (standard)	☑	☑	not recommended
Options C, H, I (0 x DN)	☑	☑	☑

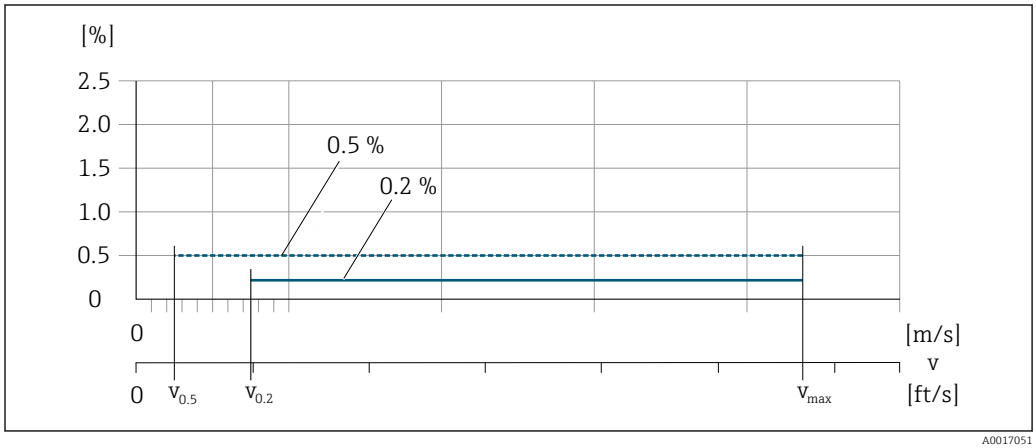
Fluctuations in the supply voltage do not have any effect within the specified range.



17 *Maximum measured error in % o.r.*

Flat Spec

For Flat Spec in the range $v_{0.5}$ ($v_{0.2}$) up to v_{max} the measured error is constant.



18 *Flat Spec in % o.r.*

Flat Spec flow values 0.5 %

Nominal diameter [mm]	Nominal diameter [in]	$v_{0.5}$ [m/s]	$v_{0.5}$ [ft/s]	v_{max} [m/s]	v_{max} [ft/s]
25 to 600	1 to 24	0.5	1.64	10	32
50 to 300 [1]	2 to 12	0.25	0.82	5	16

1) Order code for "Design", option C

Flat Spec flow values 0.2 %

Nominal diameter		$v_{0.2}$		v_{max}	
[mm]	[in]	[m/s]	[ft/s]	[m/s]	[ft/s]
25 to 600	1 to 24	1.5	4.92	10	32
50 to 300 [1)]	2 to 12	0.6	1.97	4	13

1) Order code for "Design", option C

Electrical conductivity

Max. measured error not specified.

Accuracy of outputs

The outputs have the following base accuracy specifications.

Current output

Accuracy	Max. ±5 µA

Pulse/frequency output

o.r. = of reading

Accuracy	Max. ±50 ppm o.r. (over the entire ambient temperature range)

Repeatability

o.r. = of reading

Volume flow
max. ±0.1 % o.r. ± 0.5 mm/s (0.02 in/s)

Electrical conductivity
Max. ±5 % o.r.

Influence of ambient temperature

Current output

o.r. = of reading

Temperature coefficient	Max. ±0.005 % o.r./°C

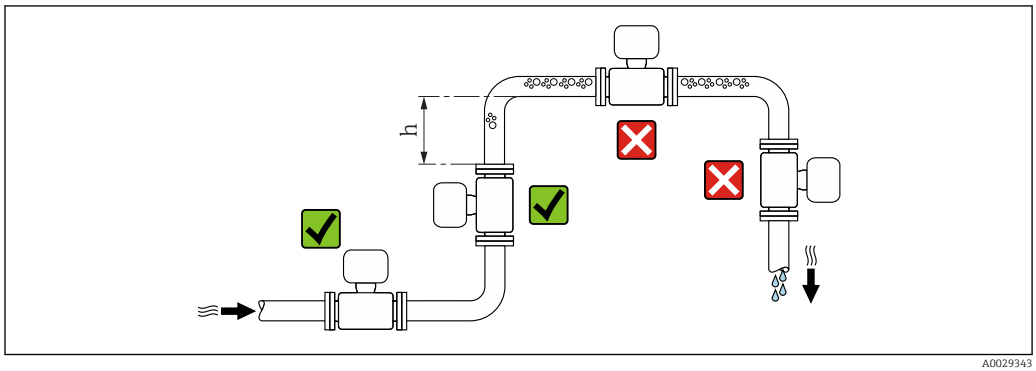
Pulse/frequency output

Temperature coefficient	No additional effect. Included in accuracy.

Installation

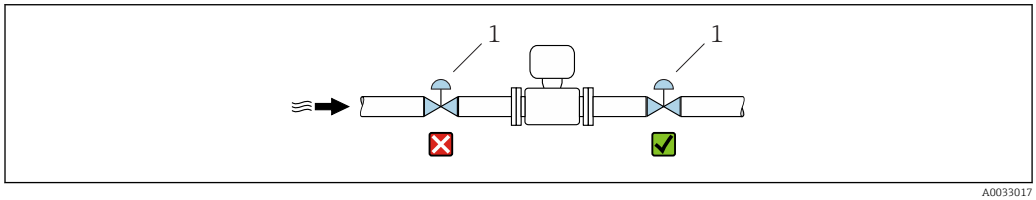
No special measures such as supports etc. are necessary. External forces are absorbed by the construction of the device.

Mounting location



Preferably install the sensor in an ascending pipe, and ensure a sufficient distance to the next pipe elbow: h ≥ 2 × DN.

Distance h ≥ 2 × DN not necessary with order code for "Design", option C, H, I.

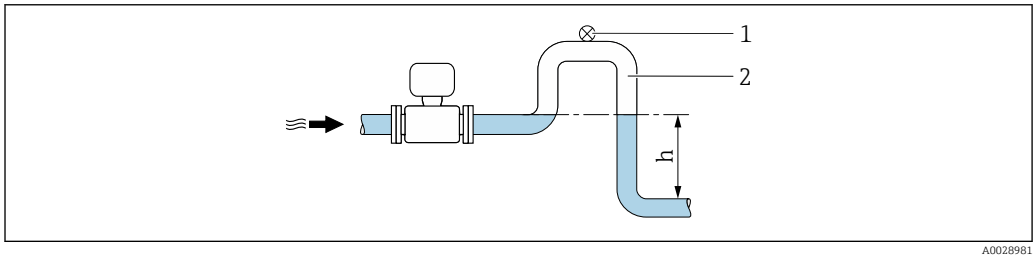


19 *Installation of the sensor after a control valve is not recommended*

1 Control valve

Installation in down pipes

Install a siphon with a vent valve downstream of the sensor in down pipes whose length h ≥ 5 m (16.4 ft). This precaution is to avoid low pressure and the consequent risk of damage to the measuring tube. This measure also prevents the system losing prime.



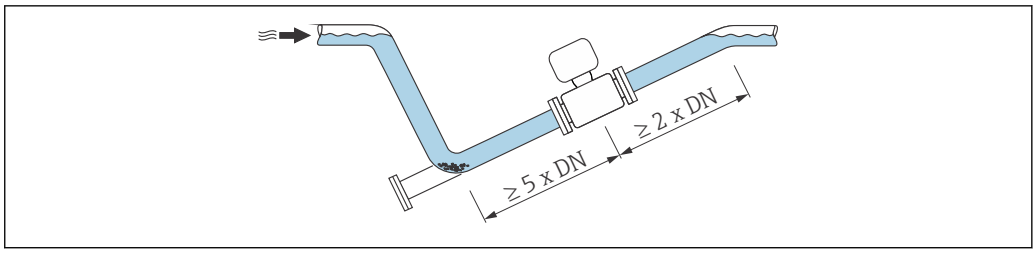
20 *Installation in a down pipe*

1 Vent valve
2 Pipe siphon
h Length of down pipe

Installation in partially filled pipes

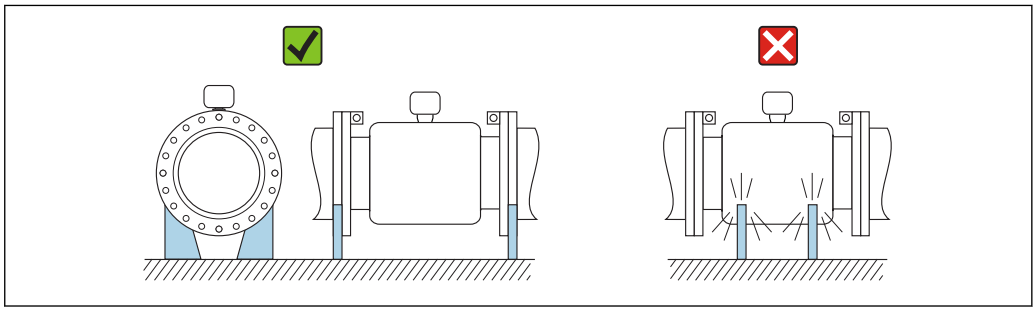
A partially filled pipe with a gradient necessitates a drain-type configuration.

No inlet runs necessary with order code for "Design", option C, H, I



A0029257

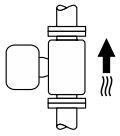
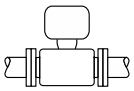
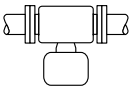
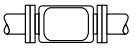
For heavy sensors DN ≥ 350 (14")



A0016276

Orientation

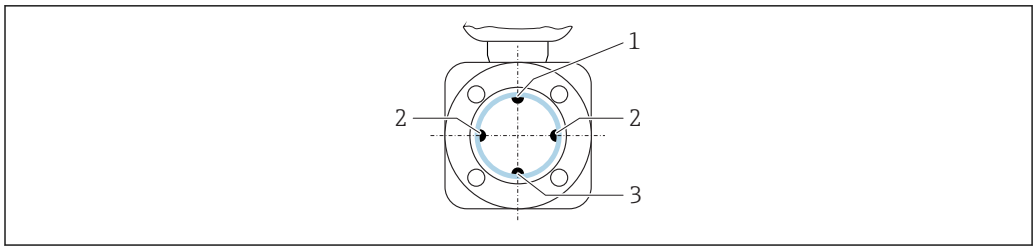
The direction of the arrow on the sensor nameplate helps you to install the sensor according to the flow direction (direction of medium flow through the piping).

	Orientation		Recommendation
A	Vertical orientation	 A0015591	✓✓
B	Horizontal orientation, transmitter at top	 A0015589	✓✓ 1)
C	Horizontal orientation, transmitter at bottom	 A0015590	✓✓ 2) 3) ✗ 4)
D	Horizontal orientation, transmitter at side	 A0015592	✗

1) Applications with low process temperatures may decrease the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.
2) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.
3) To prevent the electronics module from overheating in the case of a sharp rise in temperature (e.g. CIP or SIP processes), install the device with the transmitter component pointing downwards.
4) With the empty pipe detection function switched on: empty pipe detection only works if the transmitter housing is pointing upwards.

Horizontal

- Ideally, the measuring electrode plane should be horizontal. This prevents brief insulation of the measuring electrodes by entrained air bubbles.
- Empty pipe detection only works if the transmitter housing is pointing upwards as otherwise there is no guarantee that the empty pipe detection function will actually respond to a partially filled or empty measuring tube.



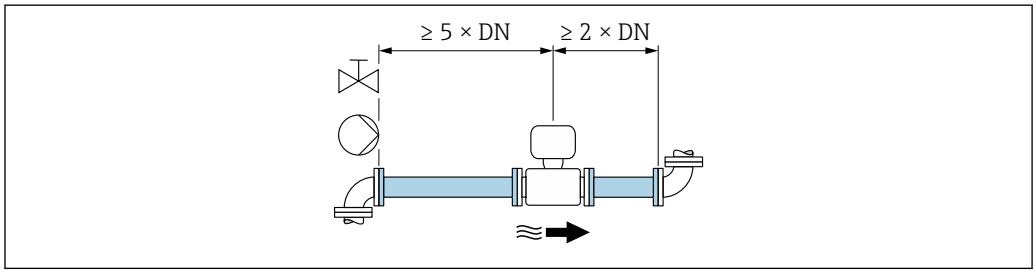
A0029344

1 *EPD electrode for empty pipe detection*
2 *Measuring electrodes for signal detection*
3 *Reference electrode for potential equalization*

Inlet and outlet runs

If possible, install the sensor upstream from fittings such as valves, T-pieces or elbows.

Observe the following inlet and outlet runs to comply with accuracy specifications:



A0028997

For sensors with the order code for "Design", option C , H, I , no inlet or outlet runs need to be taken into account.

To keep within the in-service maximum permissible errors for custody transfer no additional requirements apply with regard to the graphic illustrated above.

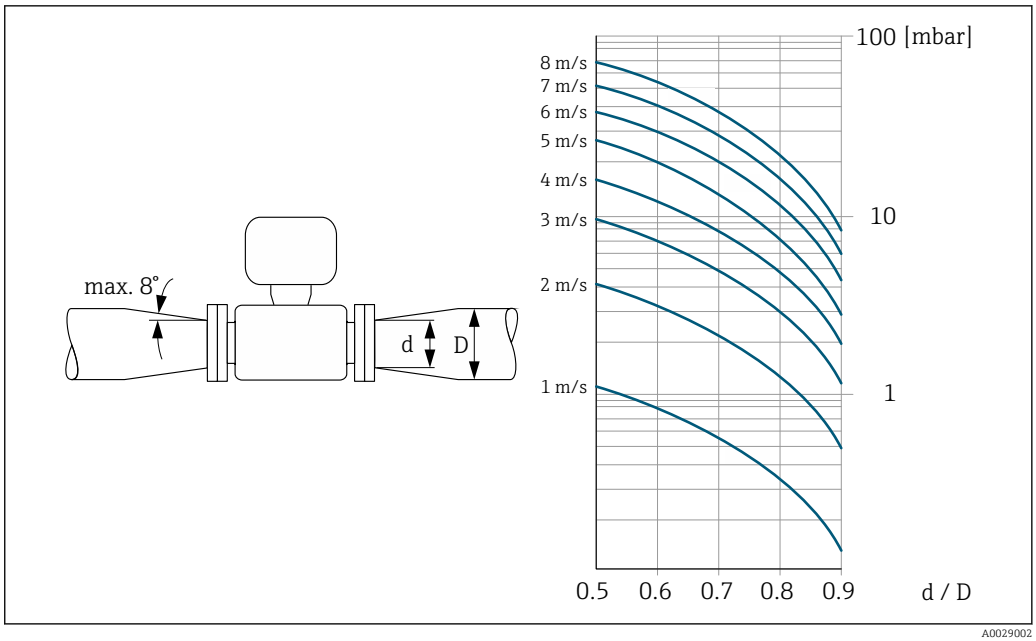
Adapters

Suitable adapters to DIN EN 545 (double-flange reducers) can be used to install the sensor in larger-diameter pipes. The resultant increase in the rate of flow improves measuring accuracy with very slow-moving fluids.

The nomogram shown here can be used to calculate the pressure loss caused by reducers and expanders:

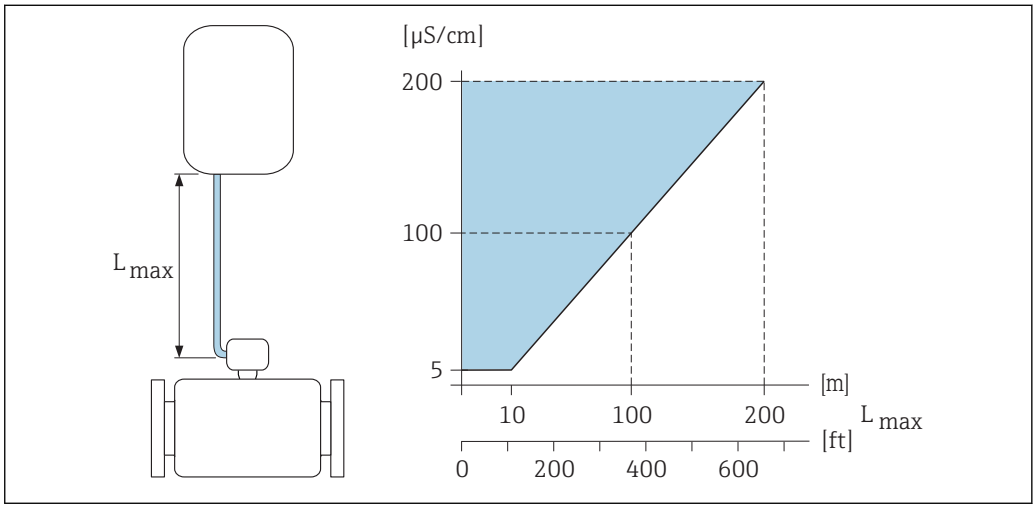
- Calculate the ratio of the diameters d/D.
- From the nomogram read off the pressure loss as a function of flow velocity (downstream from the reduction) and the d/D ratio.

The nomogram only applies to liquids with a viscosity similar to that of water.



Length of connecting cable

To obtain correct measurement results, observe the permitted connecting cable length of L_{max}. This length is determined by the conductivity of the fluid. If measuring liquids in general: 5 µS/cm

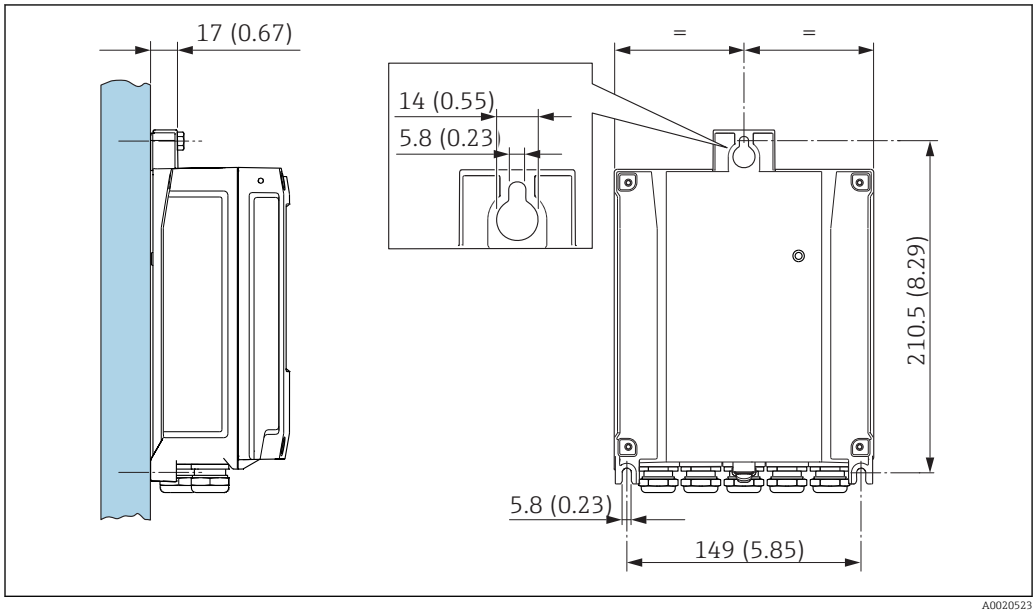


21 Permitted length of connecting cable

Colored area = permitted range
L_{max} = length of connecting cable in [m] ([ft])
[µS/cm] = fluid conductivity

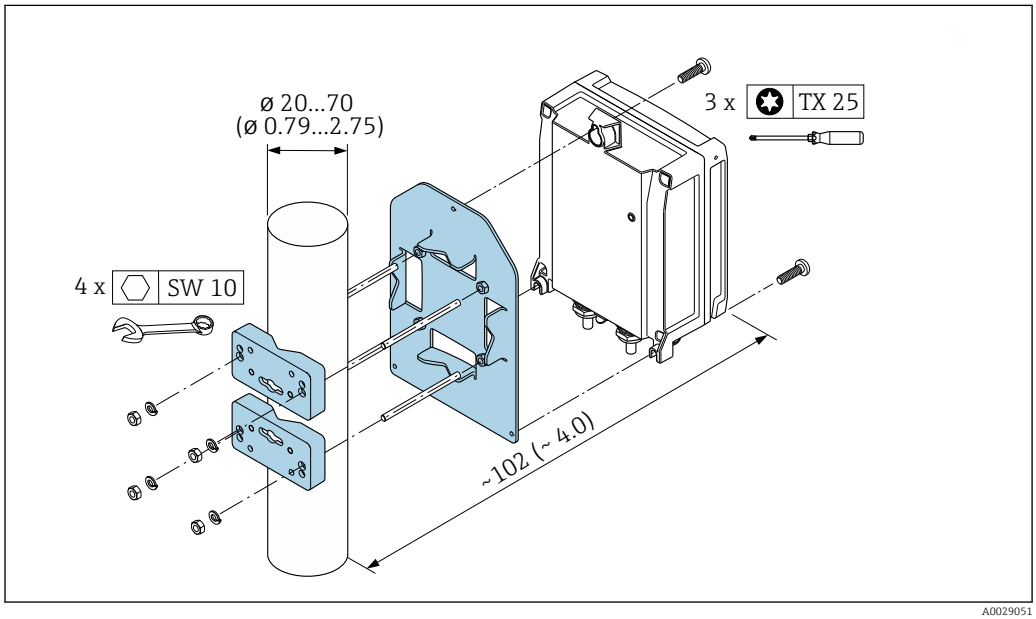
Mounting the transmitter housing

Wall mounting



22 *Engineering unit mm (in)*

Post mounting



23 *Engineering unit mm (in)*

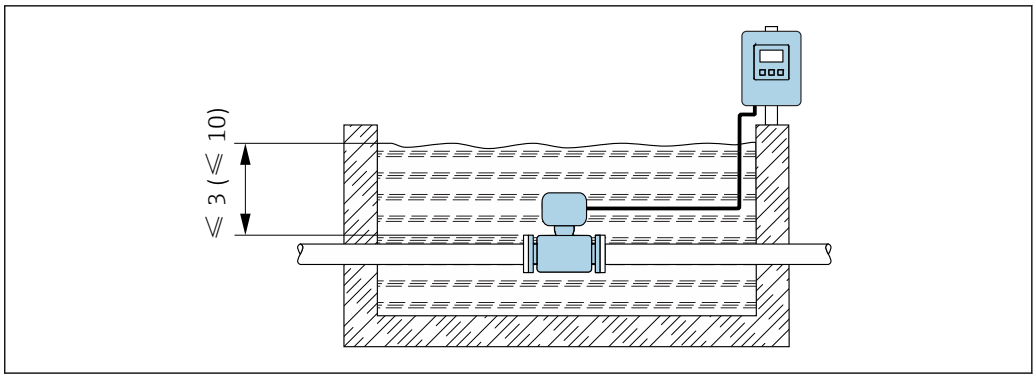
Special mounting instructions

Display guard

To ensure that the optional display guard can be easily opened, maintain the following minimum head clearance: 350 mm (13.8 in)

Permanent immersion in water

A fully welded remote version with IP68 protection is optionally available for permanent immersion in water ≤ 3 m (10 ft) or in exceptional cases for use for up to 48 hours at ≤ 10 m (30 ft). The measuring device meets the requirements of corrosion categories C5-M and Im1/Im2/Im3. The fully welded design along with the connection compartment sealing system ensure that moisture cannot enter the measuring device.



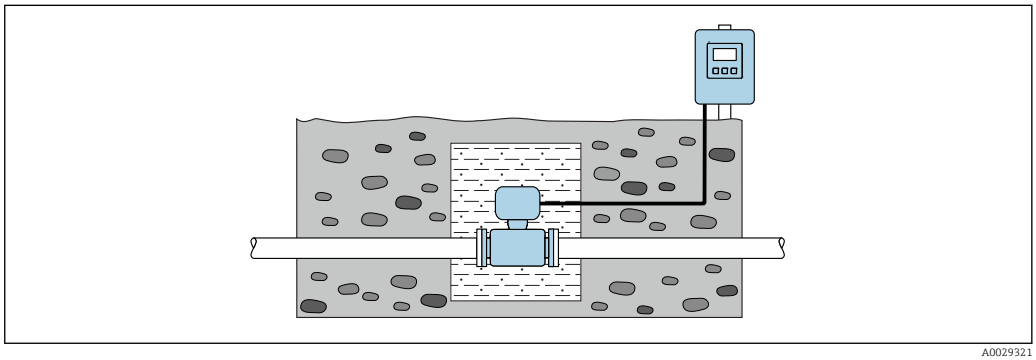
A0029320

24 *Engineering unit in m(ft)*

Replacement of cable gland on connection housing

Buried applications

A remote version with IP68 protection is optionally available for buried applications. The measuring device satisfies the certified corrosion protection Im1/Im2/Im3 in accordance with EN ISO 12944. It can be used directly underground without the need for additional protective measures. The device is mounted in accordance with the usual regional installation regulations (e.g. EN DIN 1610).



A0029321

Environment

Ambient temperature range

Transmitter	−40 to +60 °C (−40 to +140 °F)
Local display	−20 to +60 °C (−4 to +140 °F), the readability of the display may be impaired at temperatures outside the temperature range.
Sensor	▪ Process connection material, carbon steel: −10 to +60 °C (+14 to +140 °F) ▪ Process connection material, stainless steel: −40 to +60 °C (−40 to +140 °F) Mount the transmitter separately from the sensor if both the ambient and fluid temperatures are high.
Liner	Do not exceed or fall below the permitted temperature range of the liner .

If operating outdoors:
- Install the measuring device in a shady location.
- Avoid direct sunlight, particularly in warm climatic regions.
- Avoid direct exposure to weather conditions.

- If the compact version of the device is insulated at low temperatures, the insulation must also include the device neck.
- Protect the display against impact.
- Protect the display from abrasion by sand in desert areas.

Display guard available as an accessory → 96.

Temperature tables

Observe the interdependencies between the permitted ambient and fluid temperatures when operating the device in hazardous areas.

For detailed information on the temperature tables, see the separate document entitled "Safety Instructions" (XA) for the device.

Storage temperature

The storage temperature corresponds to the operating temperature range of the transmitter and the sensor → 41.

- Protect the measuring device against direct sunlight during storage in order to avoid unacceptably high surface temperatures.
- Select a storage location where moisture cannot collect in the measuring device as fungus or bacteria infestation can damage the liner.
- If protection caps or protective covers are mounted these should never be removed before installing the measuring device.

Atmosphere

If a plastic transmitter housing is permanently exposed to certain steam and air mixtures, this can damage the housing.

In cases of doubt, please contact the Sales Center.

Degree of protection

Transmitter
- As standard: IP66/67, type 4X enclosure
- When housing is open: IP20, type 1 enclosure

Sensor
- As standard: IP66/67, type 4X enclosure
- Optionally available for compact and remote version:
  IP66/67, type 4X enclosure; fully welded, with protective varnish EN ISO 12944 C5-M. Suitable for use in corrosive atmospheres.
- Optionally available for remote version:
  - IP68, type 6P enclosure; fully welded, with protective varnish as per EN ISO 12944 C5-M. Suitable for permanent immersion in water ≤ 3 m (10 ft) or up to 48 hours at depths ≤ 10 m (30 ft).
  - IP68, type 6P enclosure; fully welded, with protective varnish as per EN ISO 12944 Im1/Im2/Im3. Suitable for permanent immersion in saline water ≤ 3 m (10 ft) or up to 48 hours at depths ≤ 10 m (30 ft) or in buried applications.

Vibration- and shock-resistance

Vibration sinusoidal, in accordance with IEC 60068-2-6

Compact version; order code for "Housing", option A "Compact, alu, coated"
- 2 to 8.4 Hz, 3.5 mm peak
- 8.4 to 2 000 Hz, 1 g peak

Compact version; order code for "Housing", option M "Compact, polycarbonate"
- 2 to 8.4 Hz, 7.5 mm peak
- 8.4 to 2 000 Hz, 2 g peak

Remote version; order code for "Housing", option N "Remote, polycarbonate" and option P "Remote, alu, coated"
- 2 to 8.4 Hz, 7.5 mm peak
- 8.4 to 2 000 Hz, 2 g peak

Vibration broad-band random, according to IEC 60068-2-64

Compact version; order code for "Housing", option A "Compact, alu, coated"
- 10 to 200 Hz, 0.003 g^2/Hz
- 200 to 2 000 Hz, 0.001 g^2/Hz
- Total: 1.54 g rms

Compact version; order code for "Housing", option M "Compact, polycarbonate"
- 10 to 200 Hz, 0.01 g^2/Hz
- 200 to 2 000 Hz, 0.003 g^2/Hz
- Total: 2.70 g rms

Remote version; order code for "Housing", option N "Remote, polycarbonate" and option P "Remote, alu, coated"
- 10 to 200 Hz, 0.01 g^2/Hz
- 200 to 2 000 Hz, 0.003 g^2/Hz
- Total: 2.70 g rms

Shock half-sine, according to IEC 60068-2-27

- Compact version; order code for "Housing", option A "Compact, alu, coated"
  6 ms 30 g
- Compact version; order code for "Housing", option M "Compact, polycarbonate"
  6 ms 50 g
- Remote version; order code for "Housing", option N "Remote, polycarbonate" and option P "Remote, alu, coated"
  6 ms 50 g

Rough handling shocks according to IEC 60068-2-31

Mechanical load

- Protect the transmitter housing against mechanical effects, such as shock or impact; the use of the remote version is sometimes preferable.
- Never use the transmitter housing as a ladder or climbing aid.

Electromagnetic compatibility (EMC)

- As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21)
- Complies with emission limits for industry as per EN 55011 (Class A)
- Device version with PROFIBUS DP: Complies with emission limits for industry as per EN 50170 Volume 2, IEC 61784

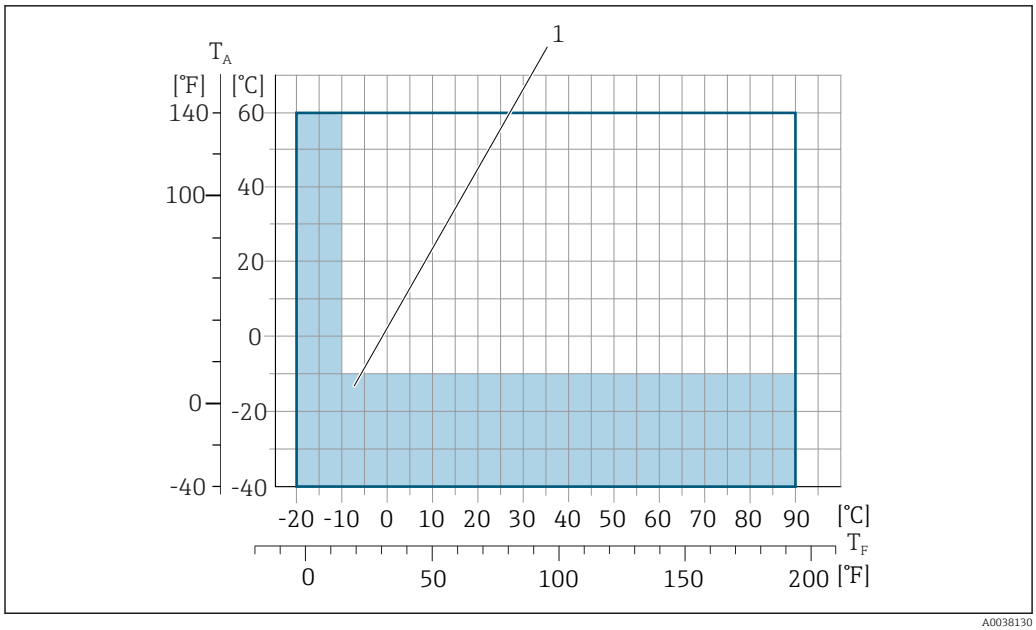
The following applies for PROFIBUS DP: If baud rates > 1.5 MBaud, an EMC cable entry must be used and the cable shield must continue as far as the terminal wherever possible.

Details are provided in the Declaration of Conformity.

Process

Medium temperature range

- 0 to +80 °C (+32 to +176 °F) for hard rubber, DN 50 to 2400 (2 to 90")
- −20 to +50 °C (−4 to +122 °F) for polyurethane, DN 25 to 1200 (1 to 48")
- −20 to +90 °C (−4 to +194 °F) for PTFE, DN 25 to 300 (1 to 12")



T_A *Ambient temperature range*
T_F *Medium temperature*
1 *Colored area: the ambient temperature range of −10 to −40 °C (+14 to −40 °F) and the fluid temperature range of −10 to −20 °C (+14 to −4 °F) applies to stainless flanges only*

The permitted fluid temperature in custody transfer is 0 to +50 °C (+32 to +122 °F).

Conductivity

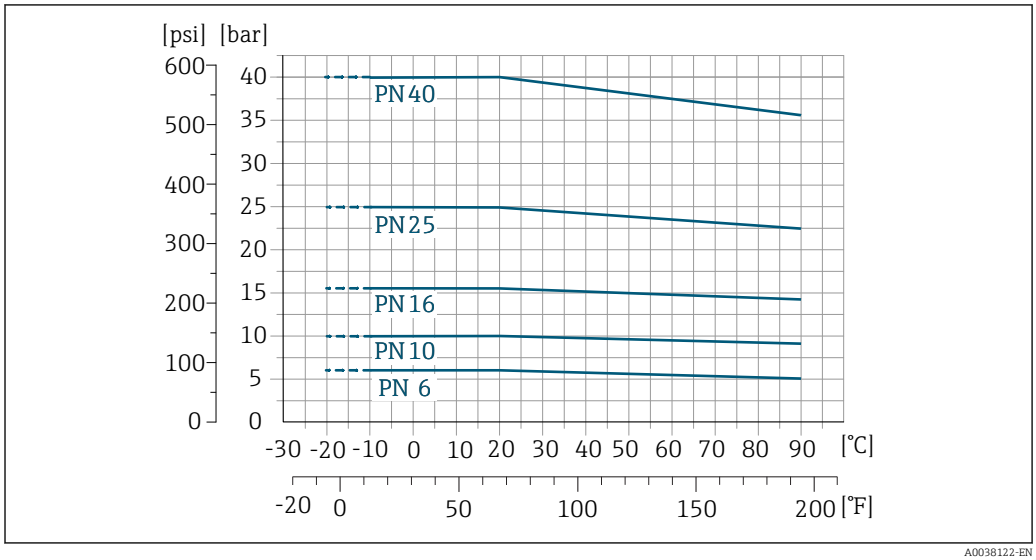
≥ 5 µS/cm for liquids in general.

Remote version
The necessary minimum conductivity also depends on the cable length → 39.

Pressure-temperature ratings

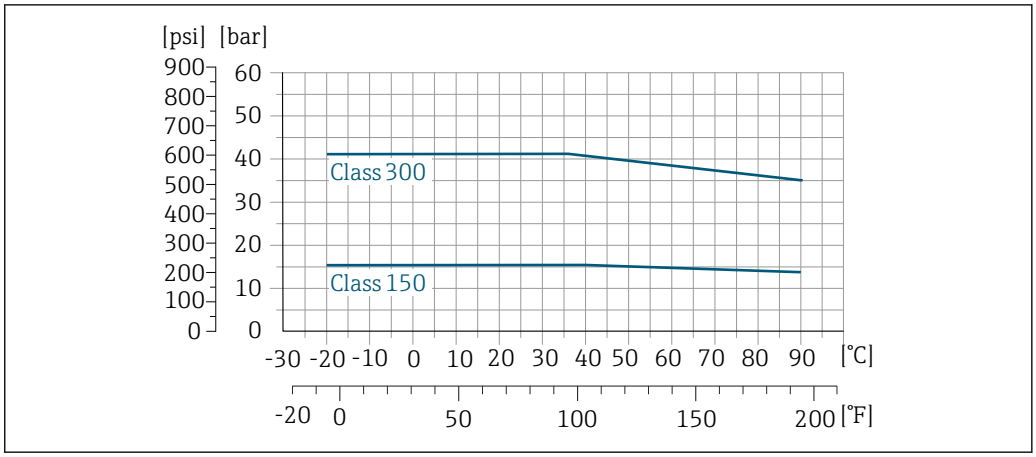
The following pressure/temperature diagrams apply to all pressure-bearing parts of the device and not just the process connection. The diagrams show the maximum permissible medium pressure depending on the specific medium temperature.

Process connection: fixed flange according to EN 1092-1 (DIN 2501)

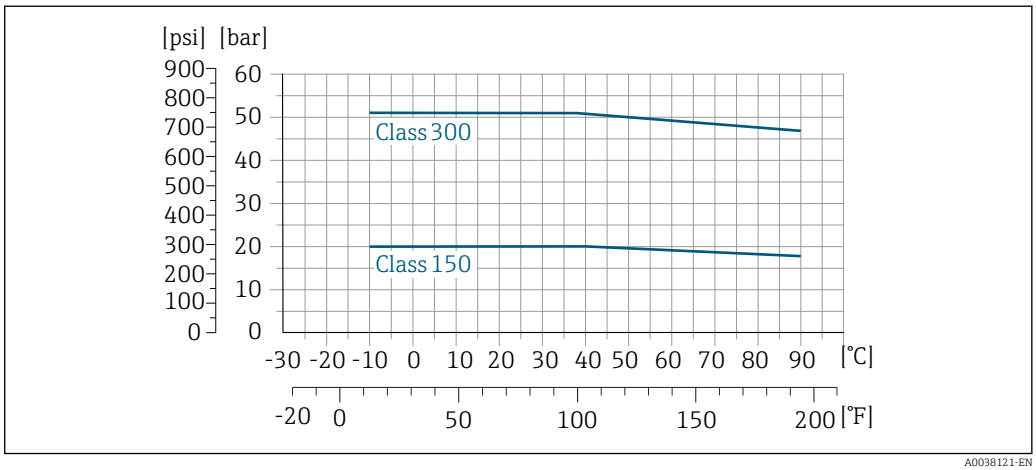


25 *Process connection material: stainless steel (−20 °C (−4 °F)); carbon steel (−10 °C (14 °F))*

Process connection: fixed flange according to ASME B16.5

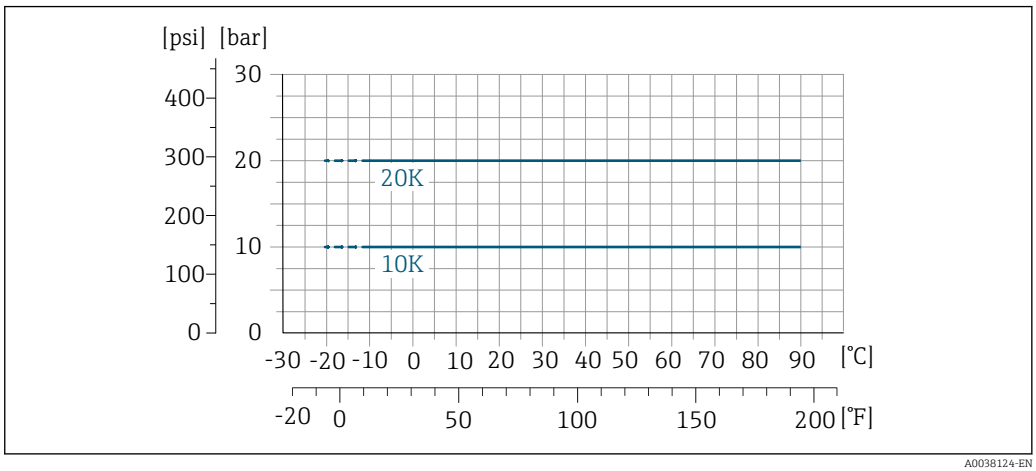


26 *Process connection material: stainless steel*



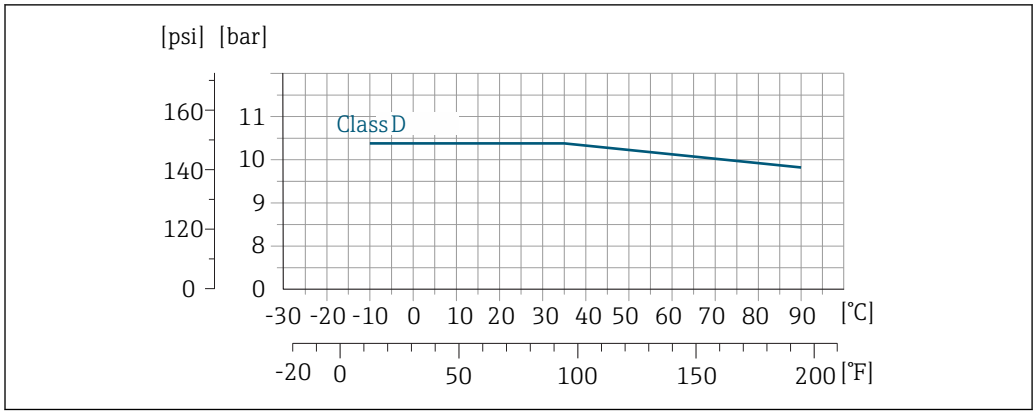
27 *Process connection material: carbon steel*

Process connection: fixed flange according to JIS B2220



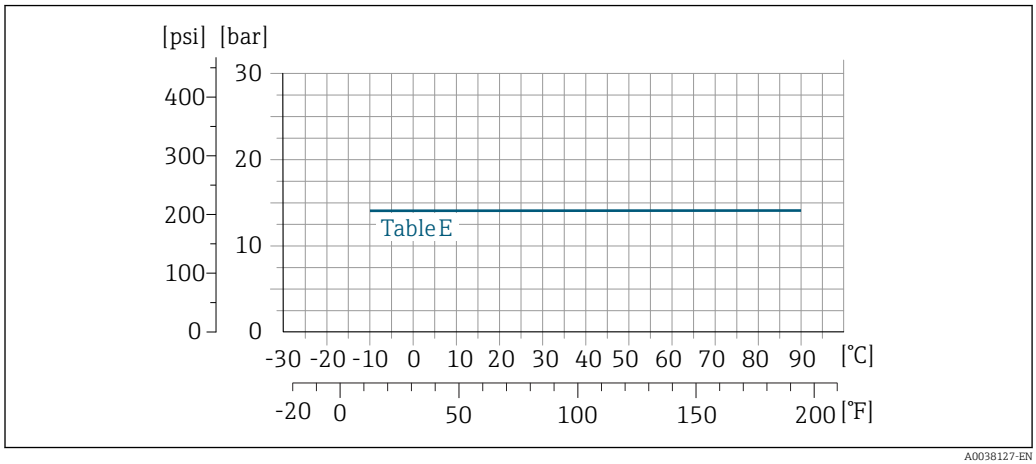
28 *Process connection material: stainless steel (−20 °C (−4 °F)); carbon steel (−10 °C (14 °F))*

Process connection: fixed flange according to AWWA C207



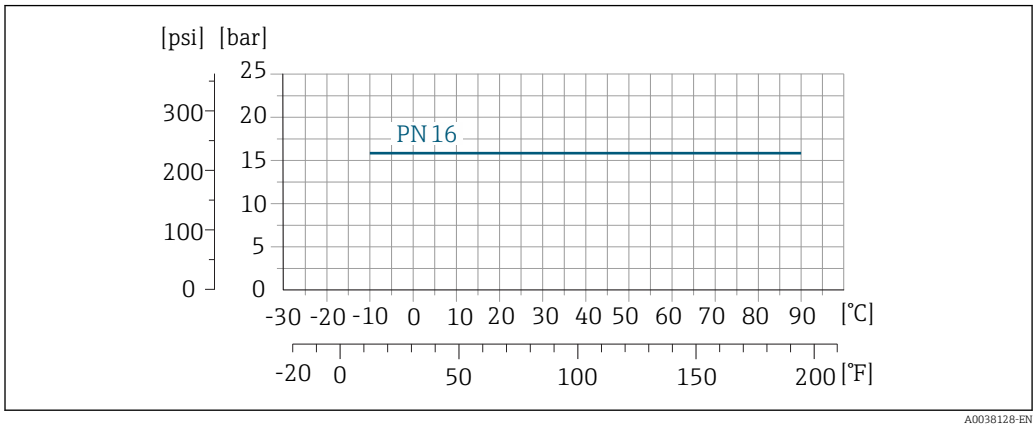
29 *Process connection material: carbon steel*

Process connection: fixed flange according to AS 2129



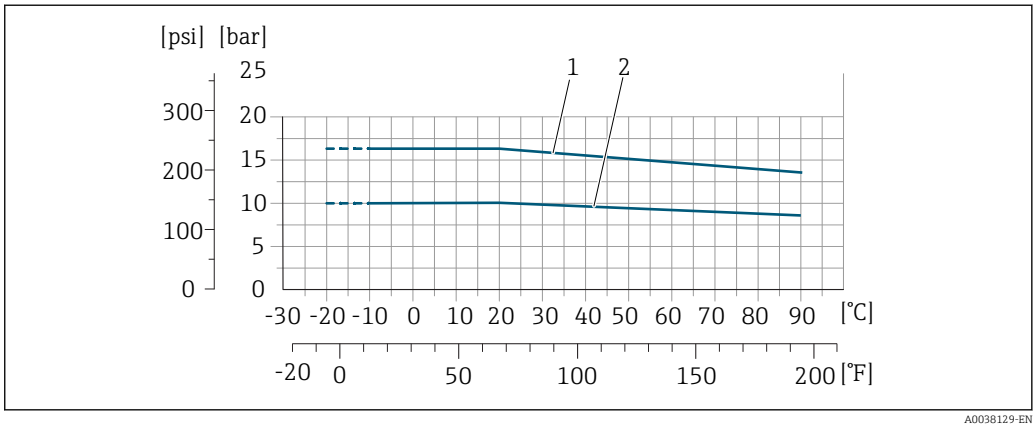
30 *Process connection material: carbon steel*

Process connection: fixed flange according to AS 4087



31 *Process connection material: carbon steel*

Process connection: lap joint flange/lap joint flange, stamped plate according to EN 1092-1 (DIN 2501) and ASME B16.5; DN 25 to 300 (1 to 12")



32 *Process connection material: stainless steel (−20 °C (−4 °F)); carbon steel (−10 °C (14 °F))*

1 *Lap joint flange PN16/ Class150*
2 *Lap joint flange, stamped plate PN10, lap joint flange PN10*

Pressure tightness

Liner: hard rubber

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for medium temperatures:		
[mm]	[in]	+25 °C (+77 °F)	+50 °C (+122 °F)	+80 °C (+176 °F)
50 … 2400	2 … 90	0 (0)	0 (0)	0 (0)

Liner: polyurethane

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for medium temperatures:	
[mm]	[in]	+25 °C (+77 °F)	+50 °C (+122 °F)
25 … 1200	1 … 48	0 (0)	0 (0)

Liner: PTFE

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for medium temperatures:	
[mm]	[in]	+25 °C (+77 °F)	+90 °C (+194 °F)
25	1	0 (0)	0 (0)
40	2	0 (0)	0 (0)
50	2	0 (0)	0 (0)
65	2 ½	0 (0)	40 (0.58)
80	3	0 (0)	40 (0.58)
100	4	0 (0)	135 (2.0)
125	5	135 (2.0)	240 (3.5)
150	6	135 (2.0)	240 (3.5)
200	8	200 (2.9)	290 (4.2)
250	10	330 (4.8)	400 (5.8)
300	12	400 (5.8)	500 (7.3)

Flow limit

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is between 2 to 3 m/s (6.56 to 9.84 ft/s). Also match the velocity of flow (v) to the physical properties of the fluid:
- v < 2 m/s (6.56 ft/s): for abrasive fluids (e.g. potter's clay, lime milk, ore slurry)
- v > 2 m/s (6.56 ft/s): for fluids producing buildup (e.g. wastewater sludge)

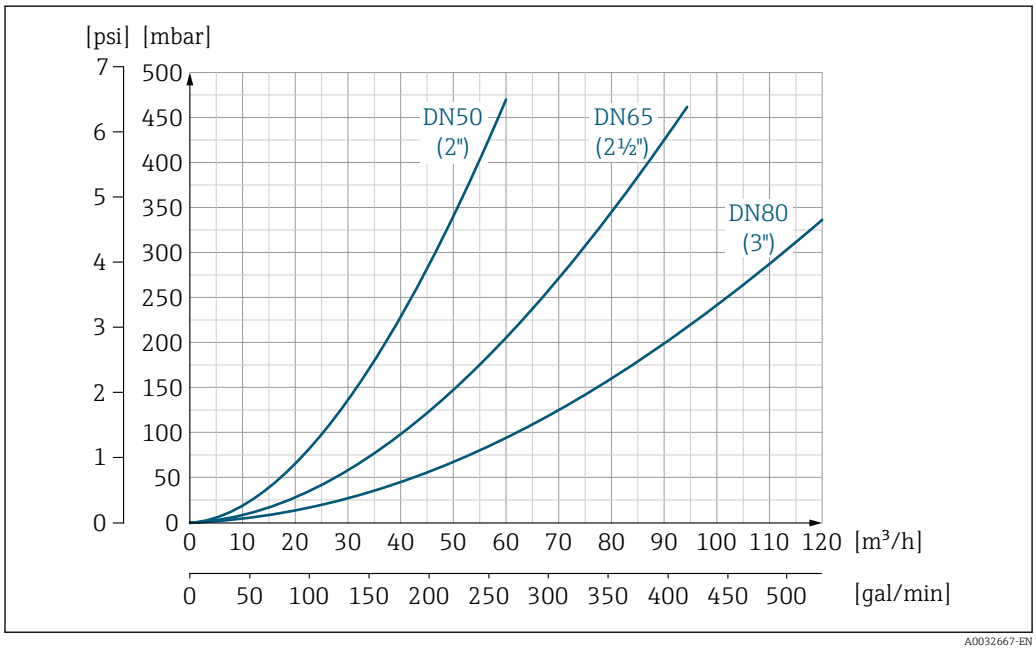
A necessary increase in the flow velocity can be achieved by reducing the sensor nominal diameter.

For an overview of the full scale values for the measuring range, see the "Measuring range" section → 9

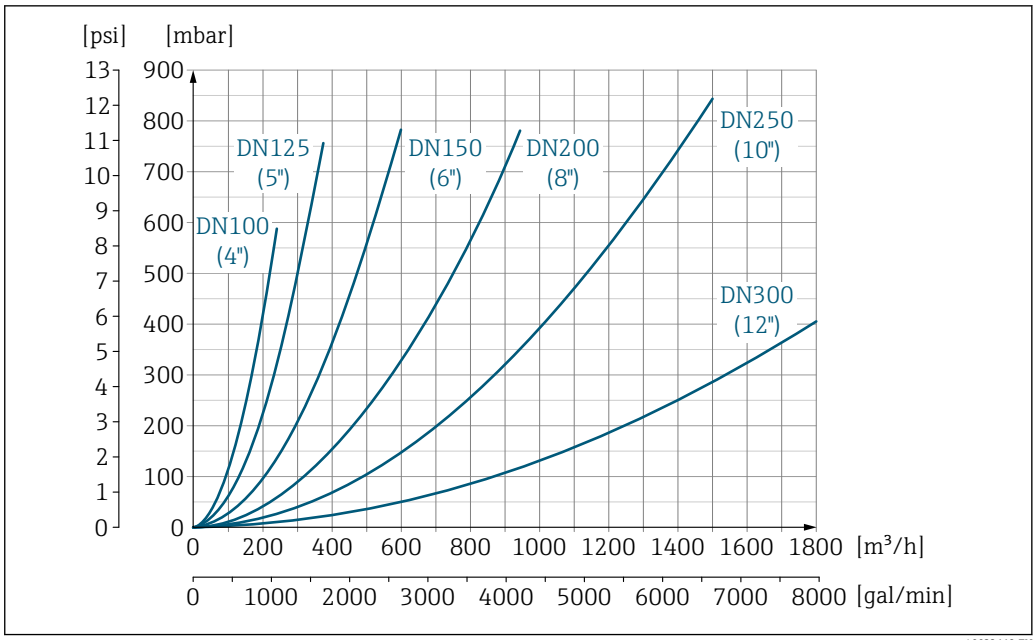
For custody transfer, the applicable approval determines the permitted measuring range.

Pressure loss

- No pressure loss occurs if the sensor is installed in a pipe with the same nominal diameter.
- Pressure losses for configurations incorporating adapters according to DIN EN 545 → 38

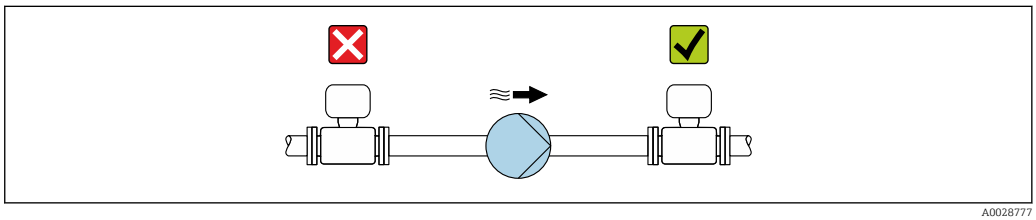


33 *Pressure loss DN 50 to 80 (2 to 3") for order code for "Design", option C "fixed flange, without inlet/outlet runs"*



34 *Pressure loss DN 100 to 300 (4 to 12") for order code for "Design", option C "fixed flange, without inlet/ outlet runs"*

System pressure

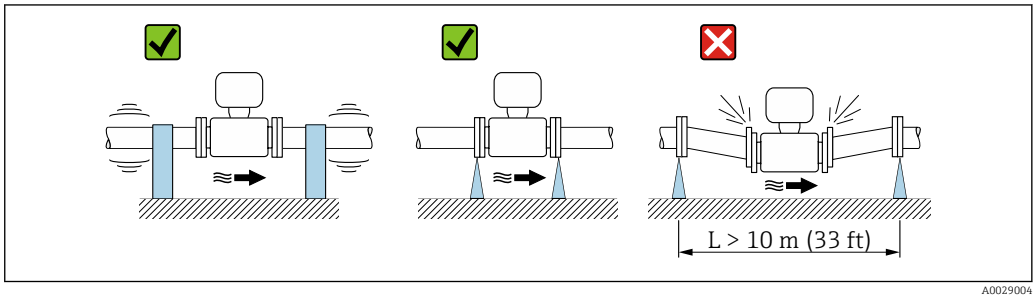


Never install the sensor on the pump suction side in order to avoid the risk of low pressure, and thus damage to the liner.

Furthermore, install pulse dampers if reciprocating, diaphragm or peristaltic pumps are used.

- Information on the liner's resistance to partial vacuum → 47
- Information on the shock resistance of the measuring system
- Information on the vibration resistance of the measuring system

Vibrations



35 *Measures to prevent vibration of the device*

In the event of very strong vibrations, the pipe and sensor must be supported and fixed.

It is also advisable to mount the sensor and transmitter separately.

- Information on the shock resistance of the measuring system
- Information on the vibration resistance of the measuring system

Custody transfer mode

The measuring device is optionally tested in accordance with OIML R137 and has an EU type-examination certificate according to Measuring Instruments Directive 2014/32/EU for service subject to legal metrological control ("custody transfer") for cold water (Annex III).

The permitted fluid temperature in these applications is 0 to +50 °C (+32 to +122 °F).

The device is used with a legally controlled totalizer on the local display and optionally with legally controlled outputs.

Measuring devices subject to legal metrological control totalize in both directions, i.e. all the outputs consider flow components in the positive (forward) and negative (reverse) flow direction.

Generally a measuring device subject to legal metrological control is secured against tampering by seals on the transmitter or sensor. These seals may normally only be opened by a representative of the competent authority for legal metrology controls.

After putting the device into circulation or after sealing the device, operation is only possible to a limited extent.

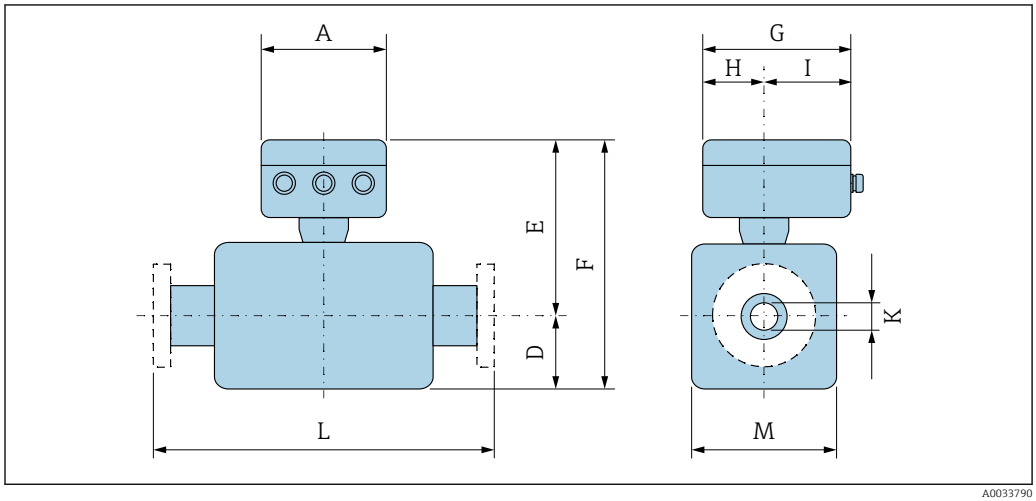
Detailed ordering information is available from your local Endress+Hauser sales center for national approvals (outside Europe) as cold water meters based on OIML R49.

Mechanical construction

Dimensions in SI units

Compact version

Order code for "Housing", option A "Compact, aluminum, coated" or option M "Compact, polycarbonate"



A0033790

A [mm]	G [1] [mm]	H [mm]	I [1] [mm]
167	193	90	103

1) Depending on the cable gland used: values up to + 30 mm

DN 25 to 300 (1 to 12"): sensor with aluminum half-shell housing

DN		Order code for "Design"								K	L
		Options A, D, E, H, I				Option C					
		D [1]	E [1) 2)]	F [1) 2)]	M [1)]	D [1)]	E [1) 2)]	F [1) 2)]	M [1)]		
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	1	84	201	285	120	–	–	–	–	3)	200
32	–	84	201	285	120	–	–	–	–	3)	200
40	1 ½	84	201	285	120	–	–	–	–	3)	200
50	2	84	201	285	120	84	201	285	120	3)	200
65	–	109	226	335	180	84	201	285	120	3)	200
80	3	109	226	335	180	84	201	285	120	3)	200
100	4	109	226	335	180	109	226	335	180	3)	250
125	–	150	266	416	260	109	226	335	180	3)	250
150	6	150	266	416	260	109	226	335	180	3)	300
200	8	180	291	471	324	150	266	416	260	3)	350
250	10	205	316	521	400	150	266	416	260	3)	450
300	12	230	341	571	460	180	291	471	324	3)	500

1) The dimensions are reference values. They may vary depending on the pressure rating, design and order option.
2) With order code for "Sensor option", option CG "Sensor extended neck for insulation": values + 110 mm
3) Depends on the liner→ 🖹 81

DN 350 to 900 (14 to 36")

DN		Order code for "Design"								K	L	
		Options A, E, F				Option B, G						
		D [1)]	E [1) 2)]	F [1) 2)]	M [1)]	D [1)]	E [1) 2)]	F [1) 2)]	M [1)]			
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	
350	14	245	412	658	490	–	–	–	–	3)	550	
375	15	271	438	709	542	–	–	–	–	3)	550	
400	16	271	438	709	542	–	–	–	–	3)	600	
450	18	299	466	765	598	333	450	783	666	3)	600 [4)]	650 [5)]
500	20	324	491	815	648	359	475	834	717	3)	600 [4)]	650 [5)]
600	24	365	542	907	730	411	528	939	821	3)	600 [4)]	780 [5)]
700	28	430	603	1033	860	512	630	1142	1024	3)	700 [4)]	910 [5)]
750	30	467	641	1108	934	512	630	1142	1024	3)	700 [4)]	910 [5)]
800	32	486	660	1146	972	534	650	1184	1065	3)	800 [4)]	1040 [5)]
900	36	536	710	1246	1072	610	727	1337	1218	3)	900 [4)]	1170 [5)]

1) The dimensions are reference values. They may be different than indicated, depending on the pressure rating, design and order code.
2) With order code for "Sensor option", option CG "Sensor extended neck for insulation": values + 110 mm
3) Depends on the liner→ 🖹 81
4) Order code for "Design", option F "Fixed flange, short installation length"
5) Order code for "Design", option G "Fixed flange, long installation length"

DN 1000 to 2400 (40 to 90")

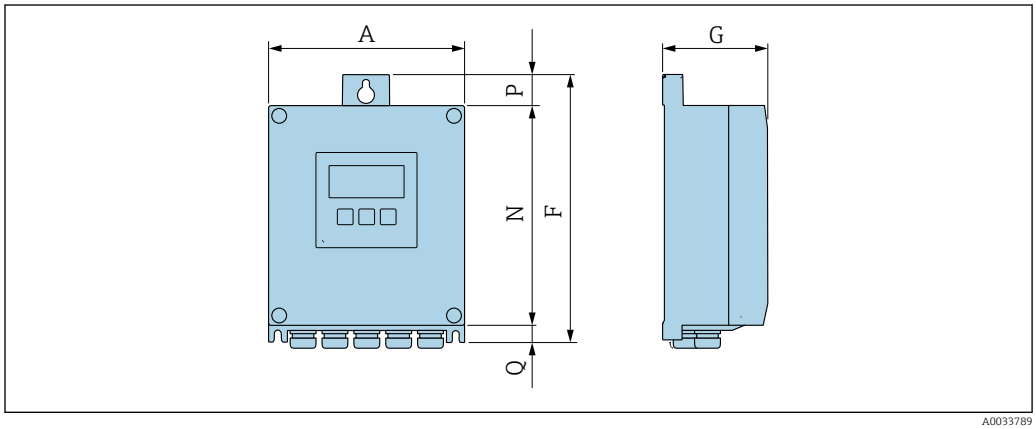
DN		D [1]	E [1) 2)]	F [1) 2)]	K	L		M [1]
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]		[mm]
1000	40	686	803	1 489	[3]	1 000 [4]	1 300 [5]	1 370
–	42	712	828	1 540	[3]	1 050 [4]	1 365 [5]	1 420
1200	48	811	929	1 740	[3]	1 200 [4]	1 560 [5]	1 620
–	54	912	1 029	1 941	[3]	1 350 [4]	1 755 [5]	1 820
1400	–	987	1 104	2 091	[3]	1 400 [4]	1 820 [5]	1 970
–	60	1 011	1 128	2 139	[3]	1 500 [4]	1 950 [5]	2 018
1600	–	1 056	1 173	2 229	[3]	1 600 [4]	2 080 [5]	2 108
–	66	1 093	1 209	2 302	[3]	1 650 [4]	2 145 [5]	2 180
1800	72	1 188	1 304	2 492	[3]	1 800 [4]	2 340 [5]	2 370
–	78	1 238	1 354	2 592	[3]	2 000 [4]	2 600 [5]	2 470
2000	–	1 238	1 354	2 592	[3]	2 000 [4]	2 600 [5]	2 470
–	84	1 238	1 354	2 592	[3]	2 200 [4]		2 470
2200	–	1 227	1 346	2 573	[3]	2 200 [4]		2 454
–	90	1 227	1 346	2 573	[3]	2 400 [4]		2 454
2400	–	1 332	1 451	2 783	[3]	2 400 [4]		2 664

1) The dimensions are reference values. They may be different than indicated, depending on the pressure rating, design and order code.
2) With order code for "Sensor option", option CG "Sensor extended neck for insulation": values + 110 mm
3) Depends on the liner→ 🖹 81
4) Order code for "Design", option F "Fixed flange, short installation length"
5) Order code for "Design", option G "Fixed flange, long installation length"

Remote version

Transmitter remote version

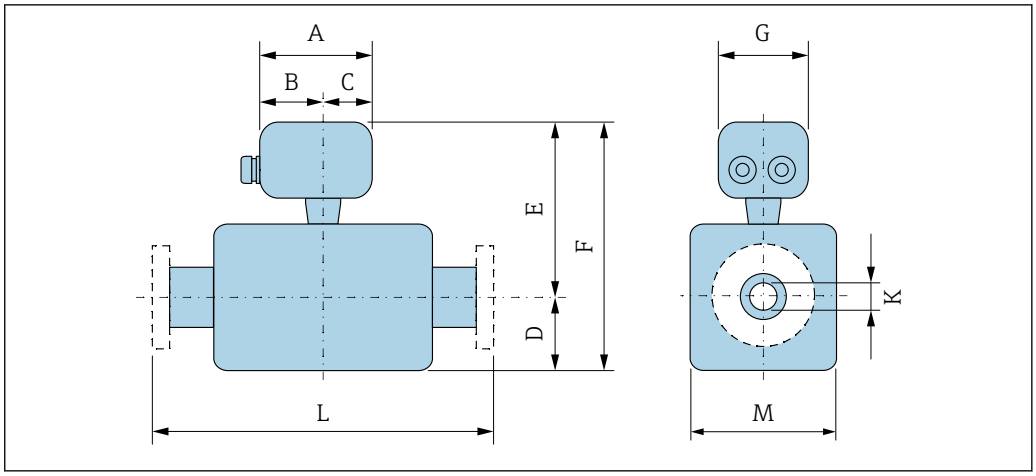
Order code for "Housing", option N "Remote, polycarbonate" or option P "Remote, aluminum coated"



A0033789

A [mm]	F [mm]	G [mm]	N [mm]	P [mm]	Q [mm]
167	232	80	187	24	21

Sensor connection housing



A0033784

Aluminum, coated

A [mm]	B [mm]	C [mm]	G [mm]
148	94	54	136

Polycarbonate (only in conjunction with order code for "Sensor option", options CA...CE)

A [mm]	B [mm]	C [mm]	G [mm]
113	62	51	112

DN 25 to 300 (1 to 12"): sensor with aluminum half-shell housing

DN		Order code for "Design"								K	L
		Options A, D, E, H, I				Option C					
		D [1]	E [1]	F [1]	M [1]	D [1]	E [1]	F [1]	M [1]		
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	1	84	200	284	120	–	–	–	–	[2]	200
32	–	84	200	284	120	–	–	–	–	[2]	200
40	1 ½	84	200	284	120	–	–	–	–	[2]	200
50	2	84	200	284	120	84	200	284	120	[2]	200
65	–	109	225	334	180	84	200	284	120	[2]	200
80	3	109	225	334	180	84	200	284	120	[2]	200
100	4	109	225	334	180	109	225	334	180	[2]	250
125	–	150	265	415	260	109	225	334	180	[2]	250
150	6	150	265	415	260	109	225	334	180	[2]	300
200	8	180	290	470	324	150	265	415	260	[2]	350
250	10	205	315	520	400	150	265	415	260	[2]	450
300	12	230	340	570	460	180	290	470	324	[2]	500

1) The dimensions are reference values. They may vary depending on the pressure rating, design and order option.
2) Depends on the liner→ 🖹 81

DN 25 to 300 (1 to 12"): sensor with fully welded carbon steel housing

DN		Order code for "Design"								K	L
		Options A, E				Option C					
		D [1]	E [1]	F [1]	M [1]	D [1]	E [1]	F [1]	M [1]		
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	1	70	200	270	140	–	–	–	–	[2]	200
32	–	70	200	270	140	–	–	–	–	[2]	200
40	1 ½	70	200	270	140	–	–	–	–	[2]	200
50	2	70	200	270	140	70	200	270	140	[2]	200
65	–	82	225	307	165	70	200	270	140	[2]	200
80	3	87	225	312	175	70	200	270	140	[2]	200
100	4	100	225	325	200	82	225	307	165	[2]	250
125	–	113	265	378	226	87	225	312	175	[2]	250
150	6	134	265	399	269	100	225	325	200	[2]	300
200	8	160	290	450	320	113	265	378	226	[2]	350
250	10	193	315	508	387	134	265	399	269	[2]	450
300	12	218	340	558	437	160	290	450	320	[2]	500

1) The dimensions are reference values. They may vary depending on the pressure rating, design and order option.
2) Depends on the liner→ 🖹 81

DN 350 to 900 (14 to 36")

DN		Order code for "Design"								K	L	
		Options A, E, F				Option B, G						
		D [1]	E [1]	F [1]	M [1]	D [1]	E [1]	F [1]	M [1]			
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	
350	14	245	350	595	490	–	–	–	–	[2]	550	
375	15	271	375	646	542	–	–	–	–	[2]	550	
400	16	271	375	646	542	–	–	–	–	[2]	600	
450	18	299	403	702	598	333	447	780	666	[2]	600 [3]	650 [4]
500	20	324	428	752	648	359	472	831	717	[2]	600 [3]	650 [4]
600	24	365	479	844	730	411	525	936	821	[2]	600 [3]	780 [4]
700	28	430	540	970	860	512	627	1139	1024	[2]	700 [3]	910 [4]
750	30	467	578	1045	934	512	627	1139	1024	[2]	700 [3]	910 [4]
800	32	486	597	1083	972	534	647	1181	1065	[2]	800 [3]	1040 [4]
900	36	536	647	1183	1072	610	724	1334	1218	[2]	900 [3]	1170 [4]

1) The dimensions are reference values. They may vary depending on the pressure rating, design and order option.
2) Depends on the liner→ 🖹 81
3) Order code for "Design", option F "Fixed flange, short installation length"
4) Order code for "Design", option G "Fixed flange, long installation length"

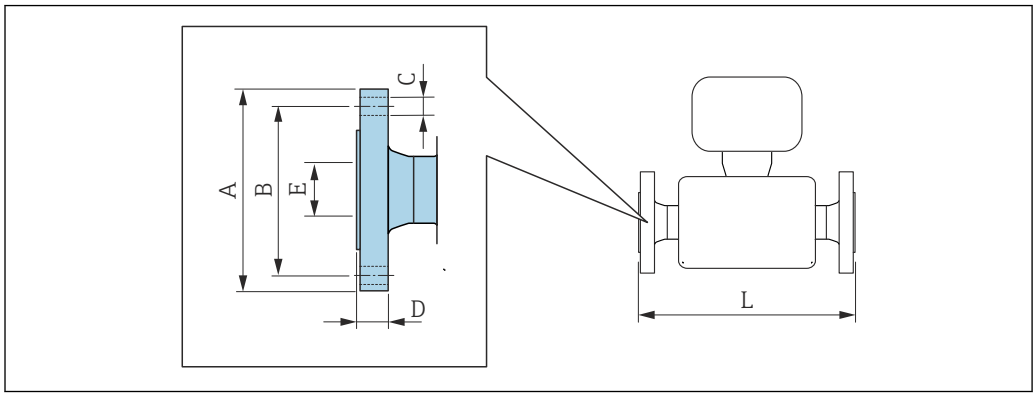
1000 ... 2400 (40 ... 90")

DN		D [1]	E [1]	F [1]	K	L		M [1]
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]		[mm]
1000	40	686	800	1486	[2]	1000 [3]	1300 [4]	1370
–	42	712	825	1537	[2]	1050 [3]	1365 [4]	1420
1200	48	811	926	1737	[2]	1200 [3]	1560 [4]	1620
–	54	912	1026	1938	[2]	1350 [3]	1755 [4]	1820
1400	–	987	1101	2088	[2]	1400 [3]	1820 [4]	1970
–	60	1011	1125	2136	[2]	1500 [3]	1950 [4]	2018
1600	–	1056	1170	2226	[2]	1600 [3]	2080 [4]	2108
–	66	1093	1206	2299	[2]	1650 [3]	2145 [4]	2180
1800	72	1188	1301	2489	[2]	1800 [3]	2340 [4]	2370
–	78	1238	1351	2589	[2]	2000 [3]	2600 [4]	2470
2000	–	1238	1351	2589	[2]	2000 [3]	2600 [4]	2470
–	84	1238	1351	2589	[2]	2200 [3]		2470
2200	–	1227	1343	2570	[2]	2200 [3]		2454
–	90	1227	1343	2570	[2]	2400 [3]		2454
2400	–	1332	1448	2780	[2]	2400 [3]		2664

1) The dimensions are reference values. They may be different than indicated, depending on the pressure rating, design and order code.
2) Internal diameter depends on liner, see measuring tube specification → 🖹 81
3) Order code for "Design", option F "Fixed flange, short installation length"
4) Order code for "Design", option G "Fixed flange, long installation length"

Flange connections

Fixed flange



A0015621

Flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 6 **Carbon steel:** *order code for "Process connection", option* **D1K** **Stainless steel:** *order code for "Process connection", option* **D1S**						
DN **[mm]**	**A** **[mm]**	**B** **[mm]**	**C** **[mm]**	**D** **[mm]**	**E** **[mm]**	**L** **[mm]**
350	490	445	12 × Ø22	22	1)	2)
400	540	495	16 × Ø22	22		
450	595	565	20 × Ø26	26		
500	645	600	20 × Ø22	24		
600	755	705	20 × Ø26	30		
700	860	810	24 × Ø26	30		
800	975	920	24 × Ø30	30		
900	1075	1020	24 × Ø30	34		
1000	1175	1120	28 × Ø30	38		
1200	1405	1340	32 × Ø33	42		
1400	1630	1560	36 × Ø36	56		
1600	1830	1760	40 × Ø36	63		
1800	2045	1970	44 × Ø39	69		
2000	2265	2180	48 × Ø42	74		
2200	2475	2390	52 × Ø42	81		
2400	2685	2600	56 × Ø42	87		
Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 6.3 to 12.5 µm						

1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 50 (compact version) → 🖹 53 (remote version)

Flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 10
Carbon steel: *order code for "Process connection", option* **D2K**
Stainless steel: *order code for "Process connection", option* **D2S**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
200	340	295	8 × Ø22	26	1)	2)
250	395	350	12 × Ø22	28		
300	445	400	12 × Ø22	28		
350	505	460	16 × Ø22	26		
400	565	515	16 × Ø26	26		
450	615	565	20 × Ø26	26		
500	670	620	20 × Ø26	28		
600	780	725	20 × Ø30	30		
700	895	840	24 × Ø30	35		
800	1015	950	24 × Ø33	38		
900	1115	1050	28 × Ø33	38		
1000	1230	1160	28 × Ø36	44		
1200	1455	1380	32 × Ø39	55		
1400	1675	1590	36 × Ø42	65		
1600	1915	1820	40 × Ø48	75		
1800	2115	2020	44 × Ø48	85		
2000	2325	2230	48 × Ø48	90		
2200	2550	2440	52 × Ø56	100		
2400	2760	2650	56 × Ø56	110		

Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 6.3 to 12.5 µm

1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 50 (compact version) → 🖹 53 (remote version)

Flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 16
Carbon steel: *order code for "Process connection", option* **D3K**
Stainless steel: *order code for "Process connection", option* **D3S**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
65	185	145	8 × Ø18	20	1)	2)
80	200	160	8 × Ø18	20		
100	220	180	8 × Ø18	22		
125	250	210	8 × Ø18	24		
150	285	240	8 × Ø22	24		
200	340	295	12 × Ø22	26		
250	405	355	12 × Ø26	32		
300	460	410	12 × Ø26	32		
350	520	470	16 × Ø26	30		
400	580	525	16 × Ø30	32		
450	640	585	20 × Ø30	34		
500	715	650	20 × Ø33	36		

Flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 16
Carbon steel: *order code for "Process connection", option* **D3K**
Stainless steel: *order code for "Process connection", option* **D3S**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
600	840	770	20 × Ø36	40		
700	910	840	24 × Ø36	40		
800	1025	950	24 × Ø39	41		
900	1125	1050	28 × Ø39	48		
1000	1255	1170	28 × Ø42	59		
1200	1485	1390	32 × Ø48	78		
1400	1685	1590	36 × Ø48	84		
1600	1930	1820	40 × Ø56	102		
1800	2130	2020	44 × Ø56	110		
2000	2345	2230	48 × Ø62	124		

Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 6.3 to 12.5 µm

1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 50 (compact version) → 🖹 53 (remote version)

Flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 25
Carbon steel: *order code for "Process connection", option* **D4K**
Stainless steel: *order code for "Process connection", option* **D4S**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
200	360	310	12 × Ø26	32	1)	2)
250	425	370	12 × Ø30	36		
300	485	430	16 × Ø30	40		
350	555	490	16 × Ø33	38		
400	620	550	16 × Ø36	40		
450	670	600	20 × Ø36	46		
500	730	660	20 × Ø36	48		
600	845	770	20 × Ø39	48		
700	960	875	24 × Ø42	50		
800	1085	990	24 × Ø48	53		
900	1185	1090	28 × Ø48	57		
1000	1320	1210	28 × Ø56	63		

Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 6.3 to 12.5 µm

1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 50 (compact version) → 🖹 53 (remote version)

Flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 40
Carbon steel: *order code for "Process connection", option* **D5K**
Stainless steel: *order code for "Process connection", option* **D5S**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
25	115	85	4 × Ø14	16	1)	2)
32	140	100	4 × Ø18	18		
40	150	110	4 × Ø18	18		
50	165	125	4 × Ø18	20		
65	185	145	8 × Ø18	24		
80	200	160	8 × Ø18	26		
100	235	190	8 × Ø22	26		
125	270	220	8 × Ø26	28		
150	300	250	8 × Ø26	30		
Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 6.3 to 12.5 µm						

1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 50 (compact version) → 🖹 53 (remote version)

Flange according to ASME B16.5, Class 150
Carbon steel: *order code for "Process connection", option* **A1K**
Stainless steel: *order code for "Process connection", option* **A1S**

DN		A	B	C	D	E	L
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	1	108	79.2	4 × Ø16	12.6	1)	2)
40	1 ½	127	98.6	4 × Ø16	15.9		
50	2	152.4	120.7	4 × Ø19.1	17.5		
80	3	190.5	152.4	4 × Ø19.1	22.3		
100	4	228.6	190.5	8 × Ø19.1	22.3		
150	6	279.4	241.3	8 × Ø22.4	23.8		
200	8	342.9	298.5	8 × Ø22.4	26.8		
250	10	406.4	362	12 × Ø25.4	29.6		
300	12	482.6	431.8	12 × Ø25.4	30.2		
350	14	535	476.3	12 × Ø28.6	35.4		
400	16	595	539.8	16 × Ø28.6	37		
450	18	635	577.9	16 × Ø31.8	40.1		
500	20	700	635	20 × Ø31.8	43.3		
600	24	815	749.3	20 × Ø34.9	48.1		
Surface roughness (flange): Ra 6.3 to 12.5 µm							

1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 50 (compact version) → 🖹 53 (remote version)

Flange according to ASME B16.5, Class 300
Carbon steel: *order code for "Process connection", option* **A2K**
Stainless steel: *order code for "Process connection", option* **A2S**

DN		A	B	C	D	E	L
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	1	123.9	88.9	4 × Ø19.1	15.9	1)	2)
40	1 ½	155.4	114.3	4 × Ø22.4	19		
50	2	165.1	127	8 × Ø19.1	20.8		
80	3	209.6	168.1	8 × Ø22.4	26.8		
100	4	254	200.2	8 × Ø22.4	30.2		
150	6	317.5	269.7	12 × Ø22.4	35		
Surface roughness (flange): Ra 6.3 to 12.5 µm							

1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 50 (compact version) → 🖹 53 (remote version)

Flange according to JIS B2220, 10K
Carbon steel: *order code for "Process connection", option* **N3K**
Stainless steel: *order code for "Process connection", option* **N3S**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
50	155	120	4 × Ø19	16	1)	2)
65	175	140	4 × Ø19	18		
80	185	150	8 × Ø19	18		
100	210	175	8 × Ø19	18		
125	250	210	8 × Ø23	20		
150	280	240	8 × Ø23	22		
200	330	290	12 × Ø23	22		
250	400	355	12 × Ø25	24		
300	445	400	16 × Ø25	24		
Surface roughness (flange): Ra 6.3 to 12.5 µm						

1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 50 (compact version) → 🖹 53 (remote version)

Flange according to JIS B2220, 20K
Carbon steel: *order code for "Process connection", option* **N4K**
Stainless steel: *order code for "Process connection", option* **N4S**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
25	125	90	4 × Ø19	16	1)	2)
32	135	100	4 × Ø19	18		
40	140	105	4 × Ø19	18		
50	155	120	8 × Ø19	18		
65	175	140	8 × Ø19	20		
80	200	160	8 × Ø23	22		
100	225	185	8 × Ø23	24		

Flange according to JIS B2220, 20K
Carbon steel: *order code for "Process connection", option* **N4K**
Stainless steel: *order code for "Process connection", option* **N4S**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
125	270	225	8 × Ø25	26		
150	305	260	12 × Ø25	28		
200	350	305	12 × Ø25	30		
250	430	380	12 × Ø27	34		
300	480	430	16 × Ø27	36		
Surface roughness (flange): Ra 6.3 to 12.5 µm						

1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 50 (compact version) → 🖹 53 (remote version)

Flange according to AWWA, Class D
Order code for "Process connection", option **W1K**

DN		A	B	C	D	E	L
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
700	28	927	863.6	28 × Ø35	33.4	1)	2)
750	30	984	914.4	28 × Ø35	35		
800	32	1060	977.9	28 × Ø42	38.1		
900	36	1168	1085.9	32 × Ø42	41.3		
1000	40	1289	1200.2	36 × Ø42	41.3		
–	42	1346	1257.3	36 × Ø42	44.5		
1200	48	1511	1422.4	44 × Ø42	47.7		
–	54	1683	1593.9	44 × Ø48	54		
–	60	1855	1759	52 × Ø48	57.2		
–	66	2032	1930.4	52 × Ø48	63.5		
1800	72	2197	2095.5	60 × Ø48	66.7		
–	78	2362	2260.6	64 × Ø54	69.9		
–	84	2535	2425.7	64 × Ø54	73.1		
–	90	2705	2717.8	68 × Ø60	76.2		
Surface roughness (flange): Ra 6.3 to 12.5 µm							

1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 50 (compact version) → 🖹 53 (remote version)

Flange according to AS 2129, Tab. E
Order code for "Process connection", option **M2K**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
80	185	146	4 × Ø18	12	1)	2)
100	215	178	8 × Ø18	13		
150	280	235	8 × Ø22	17		
200	335	292	8 × Ø22	19		
250	405	356	12 × Ø22	22		

Flange according to AS 2129, Tab. E *Order code for "Process connection", option* **M2K**						
DN [mm]	**A [mm]**	**B [mm]**	**C [mm]**	**D [mm]**	**E [mm]**	**L [mm]**
300	455	406	12 × Ø26	25		
350	525	470	12 × Ø26	30		
400	580	521	12 × Ø26	32		
450	640	584	16 × Ø26	35		
500	705	641	16 × Ø26	38		
600	825	756	16 × Ø33	48		
700	910	845	20 × Ø33	51		
750	995	927	20 × Ø36	54		
800	1060	984	20 × Ø36	54		
900	1175	1092	24 × Ø36	64		
1000	1255	1175	24 × Ø39	67		
1200	1490	1410	32 × Ø39	79		
Surface roughness (flange): Ra 6.3 to 12.5 µm						

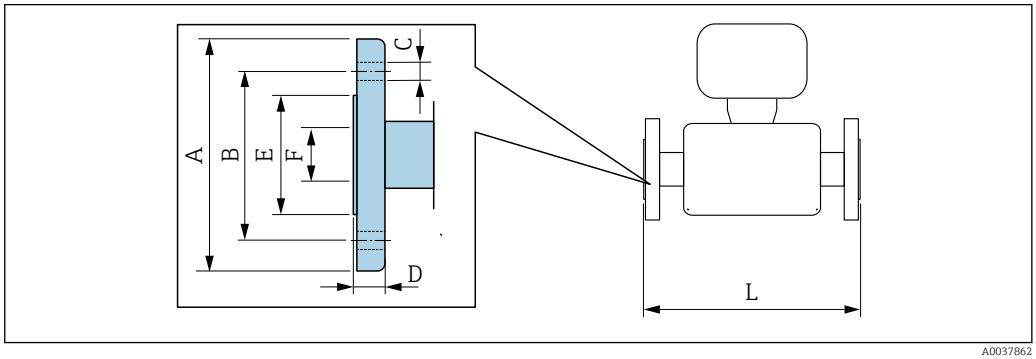
1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 50 (compact version) → 🖹 53 (remote version)

Flange according to AS 4087, PN 16 *Order code for "Process connection", option* **M3K**						
DN [mm]	**A [mm]**	**B [mm]**	**C [mm]**	**D [mm]**	**E [mm]**	**L [mm]**
80	185	146	4 × Ø18	12	1)	2)
100	215	178	4 × Ø18	13		
150	280	235	8 × Ø18	13		
200	335	292	8 × Ø18	19		
250	405	356	8 × Ø22	19		
300	455	406	12 × Ø22	23		
350	525	470	12 × Ø26	30		
375	550	495	12 × Ø26	30		
400	580	521	12 × Ø26	32		
450	640	584	12 × Ø26	30		
500	705	641	16 × Ø26	38		
600	825	756	16 × Ø30	48		
700	910	845	20 × Ø30	56		
750	995	927	20 × Ø33	56		
800	1060	984	20 × Ø36	56		
900	1175	1092	24 × Ø36	66		
1000	1255	1175	24 × Ø36	66		

Flange according to AS 4087, PN 16 *Order code for "Process connection", option* **M3K**						
DN [mm]	**A [mm]**	**B [mm]**	**C [mm]**	**D [mm]**	**E [mm]**	**L [mm]**
1200	1 490	1 410	32 × Ø36	76		
Surface roughness (flange): Ra 6.3 to 12.5 µm						

1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 50 (compact version) → 🖹 53 (remote version)

Lap joint flange



A0037862

Lap joint flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 10 **Carbon steel:** *order code for "Process connection", option* **D22** **Stainless steel:** *order code for "Process connection", option* **D24**								
DN		**A**	**B**	**C**	**D**	**E**	**F**	**L**
[mm]	**[in]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**
200	8	340	295	8 × Ø22	24	264	1)	2)
250	10	395	350	12 × Ø22	26	317		
300	12	445	400	12 × Ø22	26	367		
Surface roughness (flange): Ra 6.3 to 12.5 µm								

1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 50 (compact version) → 🖹 53 (remote version)

Lap joint flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 16 **Carbon steel:** *order code for "Process connection", option* **D32** **Stainless steel:** *order code for "Process connection", option* **D34**								
DN		**A**	**B**	**C**	**D**	**E**	**F**	**L**
[mm]	**[in]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**
25	1	115	85	4 × Ø14	16	49	1)	2)
32	-	140	100	4 × Ø18	18	65		
40	1 ½	150	110	4 × Ø18	18	71		
50	2	165	125	4 × Ø18	20	88		
65	-	185	145	8 × Ø18	20	103		
80	3	200	160	8 × Ø18	20	120		
100	4	220	180	8 × Ø18	22	148		
125	-	250	210	8 × Ø18	22	177		

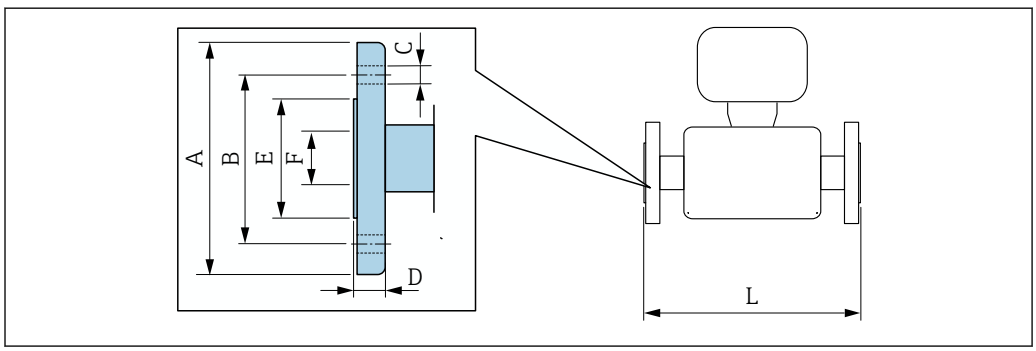
Lap joint flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 16 **Carbon steel:** *order code for "Process connection", option* **D32** **Stainless steel:** *order code for "Process connection", option* **D34**								
DN		**A**	**B**	**C**	**D**	**E**	**F**	**L**
[mm]	**[in]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**
150	6	285	240	8 × Ø22	24	209		
200	8	340	295	12 × Ø22	26	264		
250	10	405	355	12 × Ø26	29	317		
300	12	460	410	12 × Ø26	32	367		
Surface roughness (flange): Ra 6.3 to 12.5 µm								

1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 50 (compact version) → 🖹 53 (remote version)

Lap joint flange according to ASME B16.5, Class 150 **Carbon steel:** *order code for "Process connection", option* **A12** **Stainless steel:** *order code for "Process connection", option* **A14**								
DN		**A**	**B**	**C**	**D**	**E**	**F**	**L**
[mm]	**[in]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**
25	1	110	80	4 × Ø16	14	49	1)	2)
40	1 ½	125	98	4 × Ø16	17.5	71		
50	2	150	121	4 × Ø19	19	88		
80	3	190	152	4 × Ø19	24	120		
100	4	230	190	8 × Ø19	24	148		
150	6	280	241	8 × Ø23	25	209		
200	8	345	298	8 × Ø23	29	264		
250	10	405	362	12 × Ø25	30	317		
300	12	485	432	12 × Ø25	32	378		
Surface roughness (flange): Ra 6.3 to 12.5 µm								

1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 50 (compact version) → 🖹 53 (remote version)

Lap joint flange, stamped plate



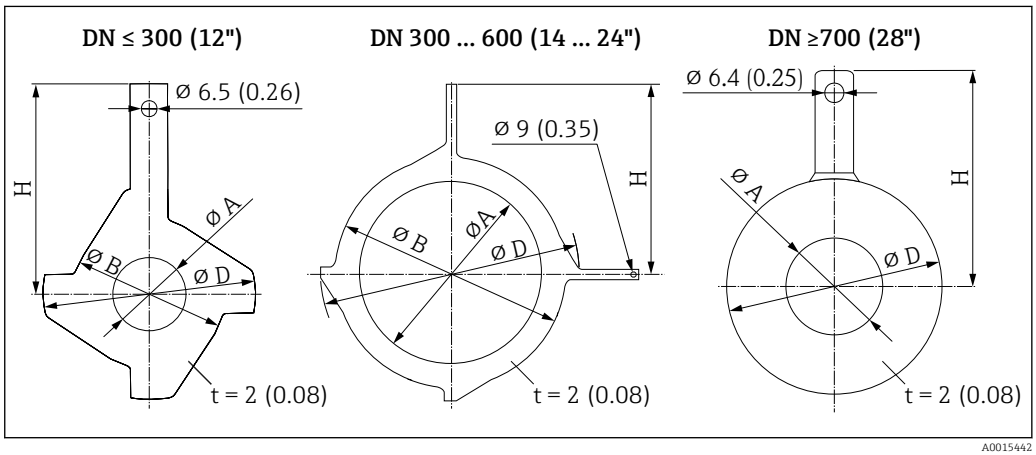
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Lap joint flange, stamped plate in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 10 **Carbon steel:** *order code for "Process connection", option* **D21** **Stainless steel:** *order code for "Process connection", option* **D23**							
DN **[mm]**	**A** **[mm]**	**B** **[mm]**	**C** **[mm]**	**D** **[mm]**	**E** **[mm]**	**F** **[mm]**	**L** **[mm]**
25	115	85	4 x Ø13.5	16.5	49	1)	2)
32	140	100	4 x Ø17.5	17	65		
40	150	110	4 x Ø17.5	16.5	71		
50	165	125	4 x Ø17.5	18.5	88		
65	185	145	4 x Ø17.5	20	103		
80	200	160	8 x Ø17.5	23.5	120		
100	220	180	8 x Ø17.5	24.5	148		
125	250	210	8 x Ø17.5	24	177		
150	285	240	8 x Ø21.5	25	209		
200	340	295	8 x Ø21.5	27.5	264		
250	405	350	12 x Ø21.5	30.5	317		
300	445	400	12 x Ø21.5	34.5	367		
Surface roughness (flange): Ra 6.3 to 12.5 µm							

1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 50 (compact version) → 🖹 53 (remote version)

Accessories

Ground disks for flange connections



DN		**Pressure rating**	**A**		**B**		**D**		**H**	
[mm]	**[inch]**		**[mm]**	**[inch]**	**[mm]**	**[inch]**	**[mm]**	**[inch]**	**[mm]**	**[inch]**
25	1"	1)	26	1.02	62	2.44	77.5	3.05	87.5	3.44
32	1 ¼"	1)	35	1.38	80	3.15	87.5	3.44	94.5	3.72
40	1 ½"	1)	41	1.61	82	3.23	101	3.98	103	4.06
50	2"	1)	52	2.05	101	3.98	115.5	4.55	108	4.25
65	2 ½"	1)	68	2.68	121	4.76	131.5	5.18	118	4.65
80	3"	1)	80	3.15	131	5.16	154.5	6.08	135	5.31

DN		Pressure rating	A		B		D		H	
[mm]	[inch]		[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]
100	4"	1)	104	4.09	156	6.14	186.5	7.34	153	6.02
125	5"	1)	130	5.12	187	7.36	206.5	8.13	160	6.30
150	6"	1)	158	6.22	217	8.54	256	10.08	184	7.24
200	8"	1)	206	8.11	267	10.51	288	11.34	205	8.07
250	10"	1)	260	10.24	328	12.91	359	14.13	240	9.45
300	12"	PN 10 PN 16 Cl. 150	312	12.28	375	14.76	413	16.26	273	10.75
		PN 25 JIS 10K JIS 20K	310	12.20	375	14.76	404	15.91	268	10.55
350	14"	PN 6	343	13.50	420	16.54	479	18.86	365	14.37
		PN 10								
		PN 16								
375	15"	PN 16	393	15.5	461	18.2	523	20.6	395	15.6
400	16"	PN 6	393	15.5	470	18.50	542	21.34	395	15.55
		PN 10								
		PN 16								
450	18"	PN 6	439	17.28	525	20.67	583	22.95	417	16.42
		PN 10								
		PN 16								
500	20"	PN 6	493	19.41	575	22.64	650	25.59	460	18.11
		PN 10								
		PN 16								
600	24"	PN 6	593	23.35	676	26.61	766	30.16	522	20.55
		PN 10								
		PN 16								
700	28"	PN 6	697	27.44	–	–	786	30.94	460	18.11
		PN10	693	27.28	–	–	813	32.01	480	18.9
		PN16	687	27.05	–	–	807	31.77	490	19.29
		Cl, D	693	27.28	–	–	832	32.76	494	19.45
750	30"	Cl, D	743	29.25	–	–	833	32.8	523	20.59
800	32"	PN 6	799	31.46	–	–	893	35.16	520	20.47
		PN 10	795	31.3	–	–	920	36.22	540	21.26
		PN 16	789	31.06	–	–	914	35.98	550	21.65
		Cl, D	795	31.3	–	–	940	37.01	561	22.09
900	36"	PN 6	897	35.31	–	–	993	39.09	570	22.44
		PN 10	893	35.16	–	–	1020	40.16	590	23.23
		PN 16	886	34.88	–	–	1014	39.92	595	23.43
		Cl, D	893	35.16	–	–	1048	41.26	615	24.21
1000	40"	PN 6	999	39.33	–	–	1093	43.03	620	24.41
		PN 10	995	39.17	–	–	1127	44.37	650	25.59
		PN 16	988	38.9	–	–	1131	44.53	660	25.98

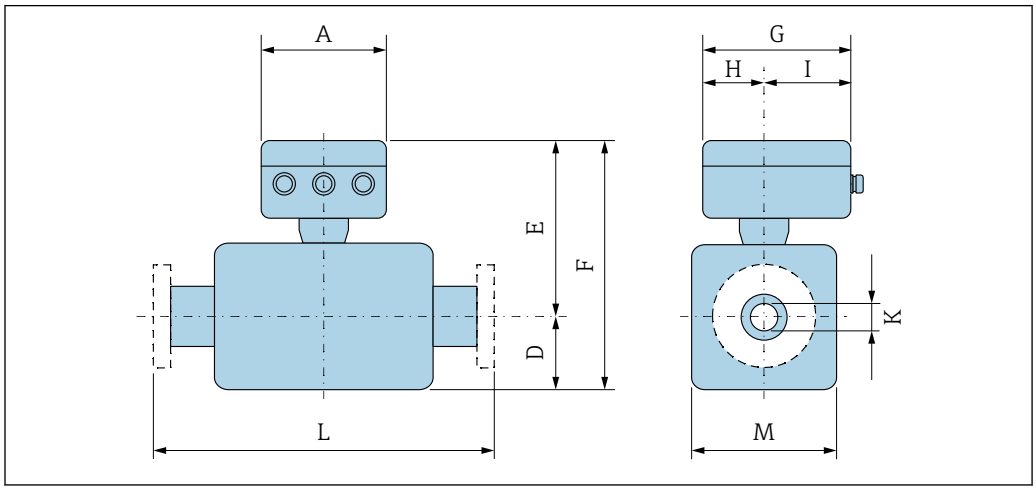
DN		Pressure rating	A		B		D		H	
[mm]	[inch]		[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]
		Cl, D	995	39.17	–	–	1163	45.79	675	26.57
–	42"	PN 6	1044	41.1	–	–	1220	48.03	704	27.72
1200	48"	PN 6	1203	47.36	–	–	1310	51.57	733	28.86
		PN 10	1196	47.09	–	–	1344	52.91	760	29.92
		PN 16	1196	47.09	–	–	1385	54.53	786	30.94
		Cl, D	1188	46.77	–	–	1345	52.95	775	30.51

1) In the case of DN 25 to 250, ground disks can be used for all the flange standards/pressure ratings which can be supplied in the standard version

Dimensions in US units

Compact version

Order code for "Housing", option A "Compact, aluminum, coated" or option M "Compact, polycarbonate"



A0033790

A [in]	G 1) [in]	H [in]	I 1) [in]
6.57	7.60	3.54	4.06

1) Depending on the cable gland used: values up to + 1.18 in

DN 25 to 300 (1 to 12"): sensor with aluminum half-shell housing

DN		Order code for "Design"								K	L
		Options A, D, E, H, I				Option C					
		D 1)	E 1) 2)	F 1) 2)	M 1)	D 1)	E 1) 2)	F 1) 2)	M 1)		
[mm]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
25	1	3.31	7.91	11.22	4.72	–	–	–	–	3)	7.87
32	–	3.31	7.91	11.22	4.72	–	–	–	–	3)	7.87
40	1 ½	3.31	7.91	11.22	4.72	–	–	–	–	3)	7.87
50	2	3.31	7.91	11.22	4.72	3.31	7.91	11.22	4.72	3)	7.87
65	–	4.29	8.9	13.19	7.09	3.31	7.91	11.22	4.72	3)	7.87
80	3	4.29	8.9	13.19	7.09	3.31	7.91	11.22	4.72	3)	7.87
100	4	4.29	8.9	13.19	7.09	4.29	8.9	13.19	7.09	3)	9.84
125	–	5.91	10.47	16.38	10.24	4.29	8.9	13.19	7.09	3)	9.84
150	6	5.91	10.47	16.38	10.24	4.29	8.9	13.19	7.09	3)	11.81
200	8	7.09	11.46	18.54	12.76	5.91	10.47	16.38	10.24	3)	13.78
250	10	8.07	12.44	20.51	15.75	5.91	10.47	16.38	10.24	3)	17.72
300	12	9.06	13.43	22.48	18.11	7.09	11.46	18.54	12.76	3)	19.69

1) The dimensions are reference values. They may vary depending on the pressure rating, design and order option.
2) With order code for "Sensor option", option CG "Sensor extended neck for insulation": values + 4.33 in
3) Depends on the liner→ 🖹 81

DN 350 to 900 (14 to 36")

DN		Order code for "Design"										
		Options A, E, F				Option B, G				K	L	
		D [1]	E [1) 2)]	F [1) 2)]	M [1)]	D [1)]	E [1) 2)]	F [1) 2)]	M [1)]			
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	
350	14	9.65	16.2	25.91	19.29	–	–	–	–	[3)]	21.65	
375	15	10.67	17.24	27.91	21.34	–	–	–	–	[3)]	21.65	
400	16	10.67	17.24	27.91	21.34	–	–	–	–	[3)]	23.62	
450	18	11.77	18.35	30.12	23.54	13.11	17.72	30.83	26.22	[3)]	23.62 [4)]	25.59 [5)]
500	20	12.76	19.33	32.09	25.51	14.13	18.7	32.83	28.23	[3)]	23.62 [4)]	25.59 [5)]
600	24	14.37	21.34	35.71	28.74	16.18	20.79	36.97	32.32	[3)]	23.62 [4)]	30.71 [5)]
700	28	16.93	23.74	40.67	33.86	20.16	24.8	44.96	40.31	[3)]	27.56 [4)]	35.83 [5)]
750	30	18.39	25.24	43.62	36.77	20.16	24.8	44.96	40.31	[3)]	27.56 [4)]	35.83 [5)]
800	32	19.13	25.98	45.12	38.27	21.02	25.59	46.61	41.93	[3)]	31.5 [4)]	40.94 [5)]
900	36	21.1	27.95	49.06	42.2	24.02	28.62	52.64	47.95	[3)]	35.43 [4)]	46.06 [5)]

1) The dimensions are reference values. They may be different than indicated, depending on the pressure rating, design and order code.
2) With order code for "Sensor option", option CG "Sensor extended neck for insulation": values + 110 mm
3) Depends on the liner→ 🖹 81
4) Order code for "Design", option F "Fixed flange, short installation length"
5) Order code for "Design", option G "Fixed flange, long installation length"

DN 1000 to 2400 (40 to 90")

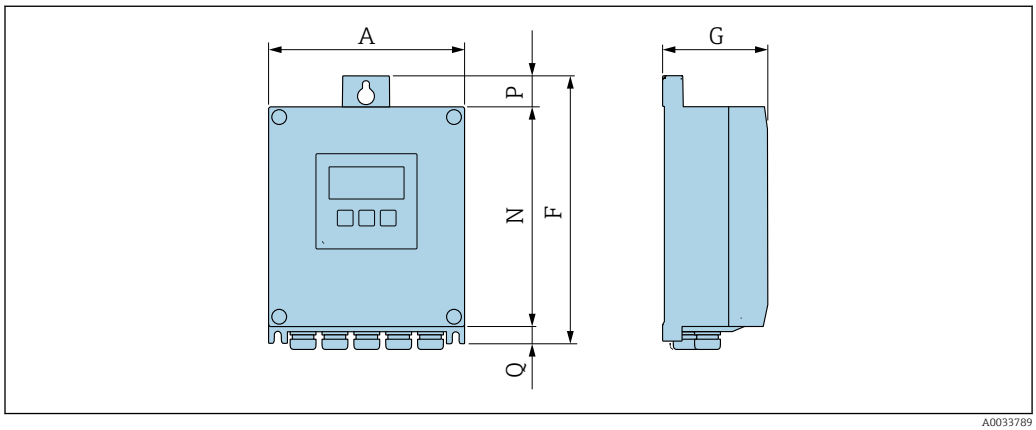
DN		D [1)]	E [1) 2)]	F [1) 2)]	K	L		M [1)]
[mm]	[in]	[in]	[in]	[in]	[in]	[in]		[in]
1000	40	27.01	31.61	58.62	[3)]	39.37 [4)]	51.18 [5)]	53.94
–	42	28.03	32.6	60.63	[3)]	41.34 [4)]	53.74 [5)]	55.91
1200	48	31.93	36.57	68.5	[3)]	47.24 [4)]	61.42 [5)]	63.78
–	54	35.91	40.51	76.42	[3)]	53.15 [4)]	69.09 [5)]	71.65
1400	–	38.86	43.46	82.32	[3)]	55.12 [4)]	71.65 [5)]	77.56
–	60	39.8	44.41	84.21	[3)]	59.06 [4)]	76.77 [5)]	79.45
1600	–	41.57	46.18	87.76	[3)]	62.99 [4)]	81.89 [5)]	82.99
–	66	43.03	47.6	90.63	[3)]	64.96 [4)]	84.45 [5)]	85.83
1800	72	46.77	51.34	98.11	[3)]	70.87 [4)]	92.13 [5)]	93.31
–	78	48.74	53.31	102.05	[3)]	78.74 [4)]	102.36 [5)]	97.24
2000	–	48.74	53.31	102.05	[3)]	78.74 [4)]	102.36 [5)]	97.24
–	84	48.74	53.31	102.05	[3)]	86.61 [4)]		97.24
2200	–	48.31	52.99	101.3	[3)]	86.61 [4)]		96.61
–	90	48.31	52.99	101.3	[3)]	94.49 [4)]		96.61
2400	–	52.44	57.13	109.57	[3)]	94.49 [4)]		104.88

1) The dimensions are reference values. They may be different than indicated, depending on the pressure rating, design and order code.
2) With order code for "Sensor option", option CG "Sensor extended neck for insulation": values + 4.33 in
3) Depends on the liner→ 🖹 81
4) Order code for "Design", option F "Fixed flange, short installation length"
5) Order code for "Design", option G "Fixed flange, long installation length"

Remote version

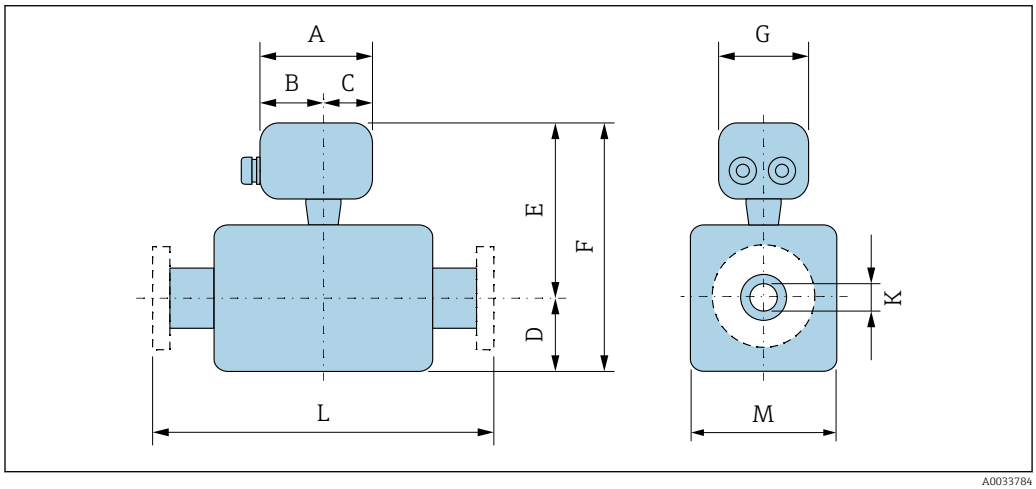
Transmitter remote version

Order code for "Housing", option N "Remote, polycarbonate" or option P "Remote, aluminum coated"



A [in]	F [in]	G [in]	N [in]	P [in]	Q [in]
6.57	9.13	3.15	7.36	0.94	0.83

Sensor connection housing



Aluminum, coated

A [in]	B [in]	C [in]	G [in]
5.83	3.7	2.13	5.35

Polycarbonate (only in conjunction with order code for "Sensor option", options CA...CE)

A [in]	B [in]	C [in]	G [in]
4.45	2.44	2.01	4.41

DN 25 to 300 (1 to 12"): sensor with aluminum half-shell housing

DN		Order code for "Design"								K	L
		Options A, D, E, H, I				Option C					
		D [1]	E [1]	F [1]	M [1]	D [1]	E [1]	F [1]	M [1]		
[mm]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
25	1	3.31	7.87	11.18	4.72	–	–	–	–	[2]	7.87
32	–	3.31	7.87	11.18	4.72	–	–	–	–	[2]	7.87
40	1 ½	3.31	7.87	11.18	4.72	–	–	–	–	[2]	7.87
50	2	3.31	7.87	11.18	4.72	3.31	7.87	11.18	4.72	[2]	7.87
65	–	4.29	8.86	13.15	7.09	3.31	7.87	11.18	4.72	[2]	7.87
80	3	4.29	8.86	13.15	7.09	3.31	7.87	11.18	4.72	[2]	7.87
100	4	4.29	8.86	13.15	7.09	4.29	8.86	13.15	7.09	[2]	9.84
125	–	5.91	10.43	16.34	10.24	4.29	8.86	13.15	7.09	[2]	9.84
150	6	5.91	10.43	16.34	10.24	4.29	8.86	13.15	7.09	[2]	11.81
200	8	7.09	11.42	18.5	12.76	5.91	10.43	16.34	10.24	[2]	13.78
250	10	8.07	12.4	20.47	15.75	5.91	10.43	16.34	10.24	[2]	17.72
300	12	9.06	13.39	22.44	18.11	7.09	11.42	18.5	12.76	[2]	19.69

1) The dimensions are reference values. They may vary depending on the pressure rating, design and order option.
2) Depends on the liner→ 🖹 81

DN 25 to 300 (1 to 12"): sensor with fully welded carbon steel housing

DN		Order code for "Design"								K	L
		Options A, E				Option C					
		D [1]	E [1]	F [1]	M [1]	D [1]	E [1]	F [1]	M [1]		
[mm]	[in]	[mm]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
25	1	2.76	7.87	10.63	5.51	–	–	–	–	[2]	7.87
32	–	2.76	7.87	10.63	5.51	–	–	–	–	[2]	7.87
40	1 ½	2.76	7.87	10.63	5.51	–	–	–	–	[2]	7.87
50	2	2.76	7.87	10.63	5.51	2.76	7.87	10.63	5.51	[2]	7.87
65	–	3.23	8.86	12.09	6.5	2.76	7.87	10.63	5.51	[2]	7.87
80	3	3.43	8.86	12.28	6.89	2.76	7.87	10.63	5.51	[2]	7.87
100	4	3.94	8.86	12.8	7.87	3.23	8.86	12.09	6.5	[2]	9.84
125	–	4.45	10.43	14.88	8.9	3.43	8.86	12.28	6.89	[2]	9.84
150	6	5.28	10.43	15.71	10.59	3.94	8.86	12.8	7.87	[2]	11.81
200	8	6.3	11.42	17.72	12.6	4.45	10.43	14.88	8.9	[2]	13.78
250	10	7.6	12.4	20	15.24	5.28	10.43	15.71	10.59	[2]	17.72
300	12	8.58	13.39	21.97	17.2	6.3	11.42	17.72	12.6	[2]	19.69

1) The dimensions are reference values. They may vary depending on the pressure rating, design and order option.
2) Depends on the liner→ 🖹 81

DN 350 to 900 (14 to 36")

DN		Order code for "Design"								K	L	
		Options A, E, F				Option B, G						
		D [1]	E [1]	F [1]	M [1]	D [1]	E [1]	F [1]	M [1]			
[mm]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	
350	14	9.65	13.78	23.43	19.29	–	–	–	–	[2]	21.65	
375	15	10.67	14.76	25.43	21.34	–	–	–	–	[2]	21.65	
400	16	10.67	14.76	25.43	21.34	–	–	–	–	[2]	23.62	
450	18	11.77	15.87	27.64	23.54	13.11	17.6	30.71	26.22	[2]	23.62 [3]	25.59 [4]
500	20	12.76	16.85	29.61	25.51	14.13	18.58	32.72	28.23	[2]	23.62 [3]	25.59 [4]
600	24	14.37	18.86	33.23	28.74	16.18	20.67	36.85	32.32	[2]	23.62 [3]	30.71 [4]
700	28	16.93	21.26	38.19	33.86	20.16	24.69	44.84	40.31	[2]	27.56 [3]	35.83 [4]
750	30	18.39	22.76	41.14	36.77	20.16	24.69	44.84	40.31	[2]	27.56 [3]	35.83 [4]
800	32	19.13	23.5	42.64	38.27	21.02	25.47	46.5	41.93	[2]	31.5 [3]	40.94 [4]
900	36	21.1	25.47	46.57	42.2	24.02	28.5	52.52	47.95	[2]	35.43 [3]	46.06 [4]

1) The dimensions are reference values. They may vary depending on the pressure rating, design and order option.
2) Depends on the liner→ 🖹 81
3) Order code for "Design", option F "Fixed flange, short installation length"
4) Order code for "Design", option G "Fixed flange, long installation length"

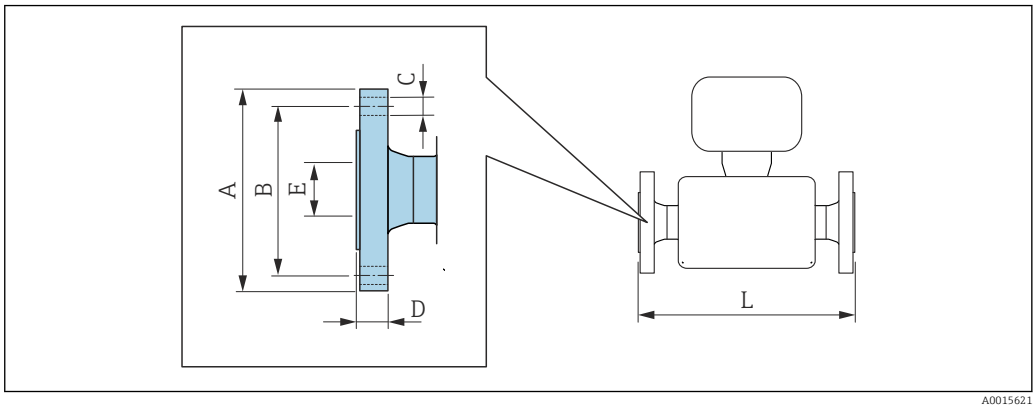
1000 ... 2400 (40 ... 90")

DN		D [1]	E [1]	F [1]	K	L		M [1]
[mm]	[in]	[in]	[in]	[in]	[in]	[in]		[in]
1000	40	27.01	31.5	58.5	[2]	39.37 [3]	51.18 [4]	53.94
–	42	28.03	32.48	60.51	[2]	41.34 [3]	53.74 [4]	55.91
1200	48	31.93	36.46	68.39	[2]	47.24 [3]	61.42 [4]	63.78
–	54	35.91	40.39	76.3	[2]	53.15 [3]	69.09 [4]	71.65
1400	–	38.86	43.35	82.2	[2]	55.12 [3]	71.65 [4]	77.56
–	60	39.8	44.29	84.09	[2]	59.06 [3]	76.77 [4]	79.45
1600	–	41.57	46.06	87.64	[2]	62.99 [3]	81.89 [4]	82.99
–	66	43.03	47.48	90.51	[2]	64.96 [3]	84.45 [4]	85.83
1800	72	46.77	51.22	97.99	[2]	70.87 [3]	92.13 [4]	93.31
–	78	48.74	53.19	101.93	[2]	78.74 [3]	102.36 [4]	97.24
2000	–	48.74	53.19	101.93	[2]	78.74 [3]	102.36 [4]	97.24
–	84	48.74	53.19	101.93	[2]	86.61 [3]		97.24
2200	–	48.31	52.87	101.18	[2]	86.61 [3]		96.61
–	90	48.31	52.87	101.18	[2]	94.49 [3]		96.61
2400	–	52.44	57.01	109.45	[2]	94.49 [3]		104.88

1) The dimensions are reference values. They may be different than indicated, depending on the pressure rating, design and order code.
2) Internal diameter depends on liner, see measuring tube specification → 🖹 81
3) Order code for "Design", option F "Fixed flange, short installation length"
4) Order code for "Design", option G "Fixed flange, long installation length"

Flange connections

Fixed flange



A0015621

Flange according to ASME B16.5, Class 150 **Carbon steel:** *order code for "Process connection", option* **A1K** **Stainless steel:** *order code for "Process connection", option* **A1S**							
DN		**A**	**B**	**C**	**D**	**E**	**L**
[mm]	**[in]**	**[in]**	**[in]**	**[in]**	**[in]**	**[in]**	**[in]**
25	1	4.25	3.12	4 × Ø0.63	0.5	1)	2)
40	1 ½	5	3.88	4 × Ø0.63	0.63		
50	2	6	4.75	4 × Ø0.75	0.69		
80	3	7.5	6	4 × Ø0.75	0.88		
100	4	9	7.5	8 × Ø0.75	0.88		
150	6	11	9.5	8 × Ø0.88	0.94		
200	8	13.5	11.75	8 × Ø0.88	1.06		
250	10	16	14.25	12 × Ø1	1.17		
300	12	19	17	12 × Ø1	1.19		
350	14	21.06	18.75	12 × Ø1.13	1.39		
400	16	23.43	21.25	16 × Ø1.13	1.46		
450	18	25	22.75	16 × Ø1.25	1.58		
500	20	27.56	25	20 × Ø1.25	1.7		
600	24	32.09	29.5	20 × Ø1.37	1.89		
Surface roughness (flange): Ra 250 to 492 µm							

1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 68 (compact version) → 🖹 70 (remote version)

Flange according to ASME B16.5, Class 300 **Carbon steel:** *order code for "Process connection", option* **A2K** **Stainless steel:** *order code for "Process connection", option* **A2S**							
DN		**A**	**B**	**C**	**D**	**E**	**L**
[in]	**[mm]**	**[in]**	**[in]**	**[in]**	**[in]**	**[in]**	**[in]**
1	25	4.88	3.5	4 × Ø0.75	0.63	1)	2)
1 ½	40	6.12	4.5	4 × Ø0.88	0.75		
2	50	6.5	5	8 × Ø0.75	0.82		

Flange according to ASME B16.5, Class 300
Carbon steel: *order code for "Process connection", option* **A2K**
Stainless steel: *order code for "Process connection", option* **A2S**

DN		A	B	C	D	E	L
[in]	[mm]	[in]	[in]	[in]	[in]	[in]	[in]
3	80	8.25	6.62	8 × Ø0.88	1.06		
4	100	10	7.88	8 × Ø0.88	1.19		
6	150	12.5	10.62	12 × Ø0.88	1.38		
Surface roughness (flange): Ra 250 to 492 µm							

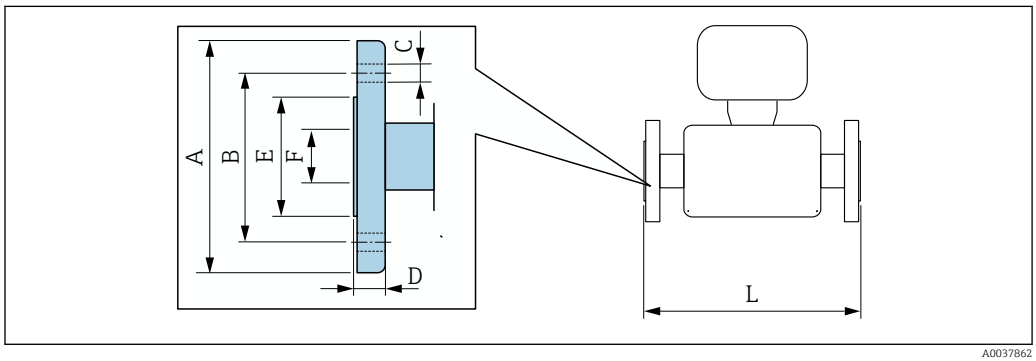
1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 68 (compact version) → 🖹 70 (remote version)

Flange according to AWWA, Cl. D
Order code for "Process connection", option **W1K**

DN		A	B	C	D	E	L
[in]	[mm]	[in]	[in]	[in]	[in]	[in]	[in]
28	700	36.5	34	28 × Ø1.38	1.31	1)	2)
30	–	38.74	36	28 × Ø1.38	1.38		
32	800	41.73	38.5	28 × Ø1.65	1.5		
36	900	45.98	42.75	32 × Ø1.65	1.63		
40	1000	50.75	47.25	36 × Ø1.65	1.63		
42	–	52.99	49.5	36 × Ø1.65	1.75		
48	1200	59.49	56	44 × Ø1.65	1.88		
54	–	66.26	62.75	44 × Ø1.89	2.13		
60	–	73.03	69.25	52 × Ø1.89	2.25		
66	–	80	76	52 × Ø48	2.5		
72	1800	86.5	82.5	60 × Ø48	2.63		
78	–	92.99	89	64 × Ø54	2.75		
84	–	99.8	95.5	64 × Ø54	2.88		
90	–	106.5	107	68 × Ø60	3		
Surface roughness (flange): Ra 250 to 492 µin							

1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 68 (compact version) → 🖹 70 (remote version)

Lap joint flange



A0037862

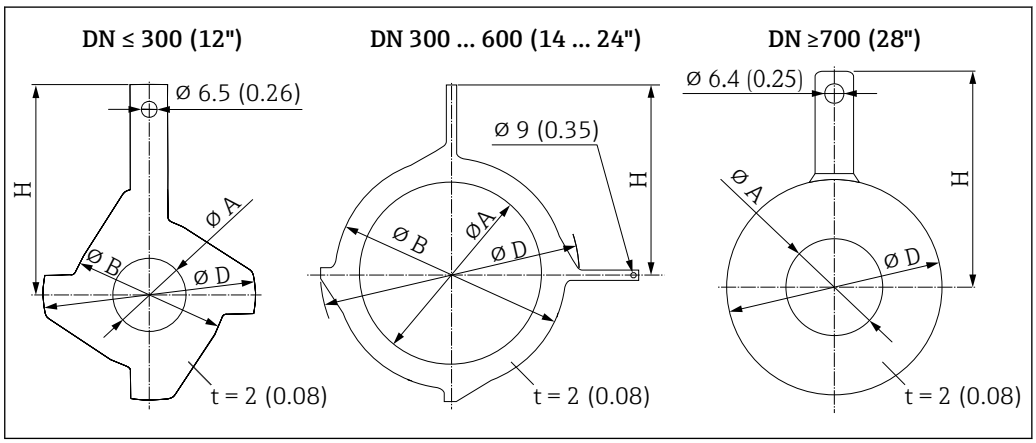
Lap joint flange according to ASME B16.5, Class 150
Carbon steel: *order code for "Process connection", option* **A12**
Stainless steel: *order code for "Process connection", option* **A14**

DN		A	B	C	D	E	F	L
[mm]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
25	1	4.33	3.15	4 × Ø0.63	0.55	1.93	1)	2)
40	1 ½	4.92	3.86	4 × Ø0.63	0.69	2.8		
50	2	5.91	4.76	4 × Ø0.75	0.75	3.46		
80	3	7.48	5.98	4 × Ø0.75	0.94	4.72		
100	4	9.06	7.48	8 × Ø0.75	0.94	5.83		
150	6	11.02	9.49	8 × Ø0.91	0.98	8.23		
200	8	13.58	11.73	8 × Ø0.91	1.14	10.39		
250	10	15.94	14.25	12 × Ø0.98	1.18	12.48		
300	12	19.09	17.01	12 × Ø0.98	1.26	14.88		
Surface roughness (flange): Ra 248 to 492 µin								

1) Depends on the liner→ 🖹 81
2) Total length is independent of the process connections. Length according to DVGW (German Technical and Scientific Association for Gas and Water) → 🖹 68 (compact version) → 🖹 70 (remote version)

Accessories

Ground disks for flange connections



A0015442

DN		Pressure rating	A		B		D		H	
[mm]	[inch]		[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]
25	1"	1)	26	1.02	62	2.44	77.5	3.05	87.5	3.44
32	1 ¼"	1)	35	1.38	80	3.15	87.5	3.44	94.5	3.72
40	1 ½"	1)	41	1.61	82	3.23	101	3.98	103	4.06
50	2"	1)	52	2.05	101	3.98	115.5	4.55	108	4.25
65	2 ½"	1)	68	2.68	121	4.76	131.5	5.18	118	4.65
80	3"	1)	80	3.15	131	5.16	154.5	6.08	135	5.31
100	4"	1)	104	4.09	156	6.14	186.5	7.34	153	6.02
125	5"	1)	130	5.12	187	7.36	206.5	8.13	160	6.30

DN		Pressure rating	A		B		D		H	
[mm]	[inch]		[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]
150	6"	1)	158	6.22	217	8.54	256	10.08	184	7.24
200	8"	1)	206	8.11	267	10.51	288	11.34	205	8.07
250	10"	1)	260	10.24	328	12.91	359	14.13	240	9.45
300	12"	PN 10 PN 16 Cl. 150	312	12.28	375	14.76	413	16.26	273	10.75
		PN 25 JIS 10K JIS 20K	310	12.20	375	14.76	404	15.91	268	10.55
350	14"	PN 6	343	13.50	420	16.54	479	18.86	365	14.37
		PN 10								
		PN 16								
375	15"	PN 16	393	15.5	461	18.2	523	20.6	395	15.6
400	16"	PN 6	393	15.5	470	18.50	542	21.34	395	15.55
		PN 10								
		PN 16								
450	18"	PN 6	439	17.28	525	20.67	583	22.95	417	16.42
		PN 10								
		PN 16								
500	20"	PN 6	493	19.41	575	22.64	650	25.59	460	18.11
		PN 10								
		PN 16								
600	24"	PN 6	593	23.35	676	26.61	766	30.16	522	20.55
		PN 10								
		PN 16								
700	28"	PN 6	697	27.44	–	–	786	30.94	460	18.11
		PN10	693	27.28	–	–	813	32.01	480	18.9
		PN16	687	27.05	–	–	807	31.77	490	19.29
		Cl, D	693	27.28	–	–	832	32.76	494	19.45
750	30"	Cl, D	743	29.25	–	–	833	32.8	523	20.59
800	32"	PN 6	799	31.46	–	–	893	35.16	520	20.47
		PN 10	795	31.3	–	–	920	36.22	540	21.26
		PN 16	789	31.06	–	–	914	35.98	550	21.65
		Cl, D	795	31.3	–	–	940	37.01	561	22.09
900	36"	PN 6	897	35.31	–	–	993	39.09	570	22.44
		PN 10	893	35.16	–	–	1020	40.16	590	23.23
		PN 16	886	34.88	–	–	1014	39.92	595	23.43
		Cl, D	893	35.16	–	–	1048	41.26	615	24.21
1000	40"	PN 6	999	39.33	–	–	1093	43.03	620	24.41
		PN 10	995	39.17	–	–	1127	44.37	650	25.59
		PN 16	988	38.9	–	–	1131	44.53	660	25.98
		Cl, D	995	39.17	–	–	1163	45.79	675	26.57
–	42"	PN 6	1044	41.1	–	–	1220	48.03	704	27.72

DN		Pressure rating	A		B		D		H	
[mm]	[inch]		[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]
1200	48"	PN 6	1203	47.36	–	–	1310	51.57	733	28.86
		PN 10	1196	47.09	–	–	1344	52.91	760	29.92
		PN 16	1196	47.09	–	–	1385	54.53	786	30.94
		Cl, D	1188	46.77	–	–	1345	52.95	775	30.51

1) In the case of DN 25 to 250, ground disks can be used for all the flange standards/pressure ratings which can be supplied in the standard version

Weight

All values (weight exclusive of packaging material) refer to devices with flanges of the standard pressure rating.
The weight may be lower than indicated depending on the pressure rating and design.

Weight in SI units

Order code for "Design", options A, B, C, D, E DN 25 to 400, DN 1" to 16"				
Nominal diameter		Reference values		
		EN (DIN), AS, JIS		ASME (Class 150)
[mm]	[in]	Pressure rating	[kg]	[kg]
25	1	PN 40	10	5
32	–	PN 40	11	–
40	1 ½	PN 40	12	7
50	2	PN 40	13	9
65	–	PN 16	13	–
80	3	PN 16	15	14
100	4	PN 16	18	19
125	–	PN 16	25	–
150	6	PN 16	31	33
200	8	PN 10	52	52
250	10	PN 10	81	90
300	12	PN 10	95	129
350	14	PN 6	106	172
375	15	PN 6	121	–
400	16	PN 6	121	203

Order code for "Design", options A, F ≥ DN 450 (18")				
Nominal diameter		Reference values		
		EN (DIN) (PN16)	AS (PN 16)	ASME (Class 150), AWWA (Class D)
[mm]	[in]	[kg]	[kg]	[kg]
450	18	142	138	191
500	20	182	186	228
600	24	227	266	302
700	28	291	369	266
–	30	–	447	318
800	32	353	524	383
900	36	444	704	470
1000	40	566	785	587
–	42	–	–	670
1200	48	843	1229	901
–	54	–	–	1273
1400	–	1204	–	–
–	60	–	–	1594

Order code for "Design", options A, F ≥ DN 450 (18")				
Nominal diameter		Reference values		
		EN (DIN) (PN16)	AS (PN 16)	ASME (Class 150), AWWA (Class D)
[mm]	[in]	[kg]	[kg]	[kg]
1600	–	1845	–	–
–	66	–	–	2131
1800	72	2357	–	2568
–	78	2929	–	3113
2000	–	2929	–	3113
–	84	–	–	3755
2200	–	3422	–	–
–	90	–	–	4797
2400	–	4094	–	–

Order code for "Design", options B, G ≥ DN 450 (18")			
Nominal diameter		Reference values	
		EN (DIN) (PN 6)	ASME (Class 150), AWWA (Class D)
[mm]	[in]	[kg]	[kg]
450	18	161	255
500	20	156	285
600	24	208	405
700	28	304	400
–	30	–	460
800	32	357	550
900	36	485	800
1000	40	589	900
–	42	–	1100
1200	48	850	1400
–	54	850	2200
1400	–	1300	–
–	60	–	2700
1600	–	1845	–
–	66	–	3700
1800	72	2357	4100
–	78	2929	4600
2000	–	2929	–

Weight in US units

Order code for "Design", options A, B, C, D, E DN 25 to 400, DN 1" to 16"		
Nominal diameter		Reference values ASME (Class 150)
[mm]	[in]	[lb]
25	1	11
32	–	–
40	1 ½	15
50	2	20
65	–	–
80	3	31
100	4	42
125	–	–
150	6	73
200	8	115
250	10	198
300	12	284
350	14	379
375	15	–
400	16	448

Order code for "Design", options A, F ≥ DN 450 (18")		
Nominal diameter		Reference values ASME (Class 150), AWWA (Class D)
[mm]	[in]	[lb]
450	18	421
500	20	503
600	24	666
700	28	587
–	30	701
800	32	845
900	36	1036
1000	40	1294
–	42	1477
1200	48	1987
–	54	2807
1400	–	–
–	60	3515
1600	–	–
–	66	4699
1800	72	5662
–	78	6864
2000	–	6864

Order code for "Design", options A, F ≥ DN 450 (18")		
Nominal diameter		Reference values ASME (Class 150), AWWA (Class D)
[mm]	[in]	[lb]
–	84	8280
2200	–	–
–	90	10577
2400	–	–

Order code for "Design", options B, G ≥ DN 450 (18")		
Nominal diameter		Reference values ASME (Class 150), AWWA (Class D)
[mm]	[in]	[lb]
450	18	562
500	20	628
600	24	893
700	28	882
–	30	1014
800	32	1213
900	36	1764
1000	40	1984
–	42	2426
1200	48	3087
–	54	4851
1400	–	–
–	60	5954
1600	–	–
–	66	8158
1800	72	9040
–	78	10143
2000	–	–

Measuring tube specification

Nominal diameter		Pressure rating				Measuring tube internal diameter					
		EN (DIN)	ASME AWWA	AS 2129 AS 4087	JIS	Hard rubber		Polyurethane		PTFE	
[mm]	[in]					[mm]	[in]	[mm]	[in]	[mm]	[in]
25	1	PN 40	Class 150	–	20K	–	–	24	0.94	25	0.98
32	–	PN 40	–	–	20K	–	–	32	1.26	34	1.34
40	1 ½	PN 40	Class 150	–	20K	–	–	38	1.50	40	1.57
50	2	PN 40	Class 150	Table E, PN 16	10K	50	1.97	50	1.97	52	2.05
50 [1)]	2	PN 40	Class 150	Table E, PN 16	10K	32	1.26	–	–	–	–
65	–	PN 16	–	–	10K	66	2.60	66	2.60	68	2.68

Nominal diameter		Pressure rating				Measuring tube internal diameter					
		EN (DIN)	ASME AWWA	AS 2129 AS 4087	JIS	Hard rubber		Polyurethane		PTFE	
[mm]	[in]					[mm]	[in]	[mm]	[in]	[mm]	[in]
65 [1]	–	PN 16	–	–	10K	38	1.50	–	–	–	–
80	3	PN 16	Class 150	Table E, PN 16	10K	79	3.11	79	3.11	80	3.15
80 [1]	3	PN 16	Class 150	Table E, PN 16	10K	50	1.97	–	–	–	–
100	4	PN 16	Class 150	Table E, PN 16	10K	102	4.02	102	4.02	104	4.09
100 [1]	4	PN 16	Class 150	Table E, PN 16	10K	66	2.60	–	–	–	–
125	–	PN 16	–	–	10K	127	5.00	127	5.00	130	5.12
125 [1]	–	PN 16	–	–	10K	79	3.11	–	–	–	–
150	6	PN 16	Class 150	Table E, PN 16	10K	156	6.14	156	6.14	156	6.14
150 [1]	6	PN 16	Class 150	Table E, PN 16	10K	102	4.02	–	–	–	–
200	8	PN 10	Class 150	Table E, PN 16	10K	204	8.03	204	8.03	202	7.95
200 [1]	8	PN 16	Class 150	Table E, PN 16	10K	127	5.00	–	–	–	–
250	10	PN 10	Class 150	Table E, PN 16	10K	258	10.2	258	10.2	256	10.08
250 [1]	10	PN 16	Class 150	Table E, PN 16	10K	156	6.14	–	–	–	–
300	12	PN 10	Class 150	Table E, PN 16	10K	309	12.2	309	12.2	306	12.05
300 [1]	12	PN 16	Class 150	Table E, PN 16	10K	204	8.03	–	–	–	–
350	14	PN 6	Class 150	Table E, PN 16	10K	337	13.3	342	13.5	–	–
375	15	–	–	PN 16	10K	389	15.3	–	–	–	–
400	16	PN 6	Class 150	Table E, PN 16	10K	387	15.2	392	15.4	–	–
450	18	PN 6	Class 150	–	10K	436	17.1	437	17.2	–	–
500	20	PN 6	Class 150	Table E, PN 16	10K	487	19.1	492	19.4	–	–
600	24	PN 6	Class 150	Table E, PN 16	10K	589	23.0	594	23.4	–	–
700	28	PN 6	Class D	Table E, PN 16	10K	688	27.1	692	27.2	–	–
750	30	–	Class D	Table E, PN 16	10K	737	29.1	742	29.2	–	–
800	32	PN 6	Class D	Table E, PN 16	–	788	31.0	794	31.3	–	–
900	36	PN 6	Class D	Table E, PN 16	–	889	35.0	891	35.1	–	–
1000	40	PN 6	Class D	Table E, PN 16	–	991	39.0	994	39.1	–	–
–	42	–	Class D	–	–	1043	41.1	1043	41.1	–	–
1200	48	PN 6	Class D	Table E, PN 16	–	1191	46.9	1197	47.1	–	–
–	54	–	Class D	–	–	1339	52.7	–	–	–	–
1400	–	PN 6	–	–	–	1402	55.2	–	–	–	–
–	60	–	Class D	–	–	1492	58.7	–	–	–	–
1600	–	PN 6	–	–	–	1600	63.0	–	–	–	–
–	66	–	Class D	–	–	1638	64.5	–	–	–	–
1800	72	PN 6	–	–	–	1786	70.3	–	–	–	–
–	78	–	Class D	–	–	1989	78.3	–	–	–	–
2000	–	PN 6	–	–	–	1989	78.3	–	–	–	–
–	84	–	Class D	–	–	2099	84.0	–	–	–	–
2200	–	PN 6	–	–	–	2194	87.8	–	–	–	–

Nominal diameter		Pressure rating				Measuring tube internal diameter					
		EN (DIN)	ASME AWWA	AS 2129 AS 4087	JIS	Hard rubber		Polyurethane		PTFE	
[mm]	[in]					[mm]	[in]	[mm]	[in]	[mm]	[in]
–	90	–	Class D	–	–	2 246	89.8	–	–	–	–
2400	–	PN 6	–	–	–	2 391	94.1	–	–	–	–

1) Order code for "Design", option C

Materials

Transmitter housing

Compact version

- Order code for "Housing", option **A** "Compact, alu, coated": Aluminum, AlSi10Mg, coated
- Order code for "Housing", option **M**: polycarbonate plastic
- Window material:
  - For order code for "Housing", option **A**: glass
  - For order code for "Housing", option **M**: plastic

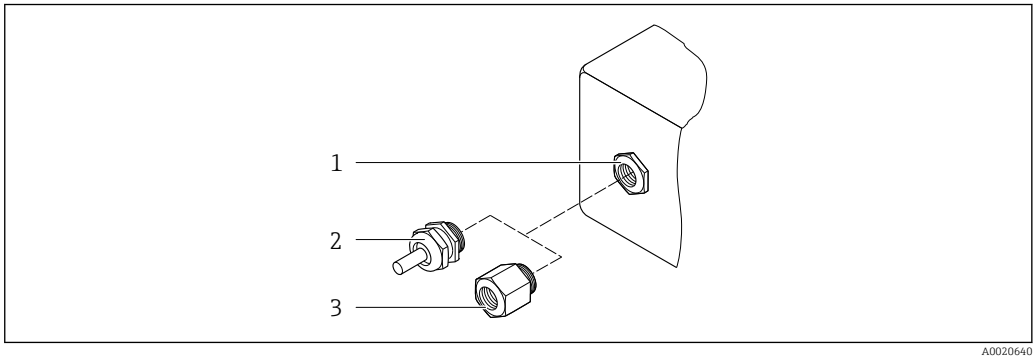
Remote version (wall-mount housing)

- Order code for "Housing", option **P** "Remote, alu, coated": Aluminum, AlSi10Mg, coated
- Order code for "Housing", option **N**: polycarbonate plastic
- Window material:
  - For order code for "Housing", option **P**: glass
  - For order code for "Housing", option **N**: plastic

Sensor connection housing

- Aluminum, AlSi10Mg, coated
- Polycarbonate plastic (only in conjunction with order code for "Sensor option", options CA...CE)

Cable entries/cable glands



36 Possible cable entries/cable glands

1 Female thread M20 × 1.5
2 Cable gland M20 × 1.5
3 Adapter for cable entry with internal thread G ½" or NPT ½"

Compact and remote versions and sensor connection housing

Cable entry/cable gland	Material
Cable gland M20 × 1.5	Plastic
Remote version: cable gland M20 × 1.5 Option of reinforced connecting cable	▪ Sensor connection housing: Nickel-plated brass ▪ Transmitter wall-mount housing: Plastic
Adapter for cable entry with internal thread G ½" or NPT ½"	Nickel-plated brass

Device plug

Electrical connection	Material
Plug M12x1	▪ Socket: Stainless steel, 1.4404 (316L) ▪ Contact housing: Polyamide ▪ Contacts: Gold-plated brass

Connecting cable for remote version

Electrode and coil current cable
- Standard cable: PVC cable with copper shield
- Reinforced cable: PVC cable with copper shield and additional steel wire braided jacket

Sensor housing

- DN 25 to 300 (1 to 12")
  - Aluminum half-shell housing, aluminum, AlSi10Mg, coated
  - Fully welded carbon steel housing with protective varnish
- DN 350 to 2400 (14 to 90")
  Fully welded carbon steel housing with protective varnish

Measuring tubes

- DN 25 to 600 (1 to 24")
  Stainless steel: 1.4301, 1.4306, 304, 304L
- DN 700 to 2400 (28 to 90")
  Stainless steel: 1.4301, 304

Liner

- DN 25 to 300 (1 to 12"): PTFE
- DN 25 to 1200 (1 to 48"): polyurethane
- DN 50 to 2400 (2 to 90"): hard rubber

Electrodes

- Stainless steel, 1.4435 (316L)
- Alloy C22, 2.4602 (UNS N06022)
- Tantalum

Process connections

For flanges made of carbon steel:
- DN ≤ 300 (12"): with Al/Zn protective coating or protective varnish
- DN ≥ 350 (14"): protective varnish

All carbon steel lap joint flanges are supplied with a hot-dip galvanized finish.

EN 1092-1 (DIN 2501)

Fixed flange
- Carbon steel:
  - DN ≤ 300: S235JRG2, S235JR+N, P245GH, A105, E250C
  - DN 350 to 2400: P245GH, S235JRG2, A105, E250C
- Stainless steel:
  - DN ≤ 300: 1.4404, 1.4571, F316L
  - DN 350 to 600: 1.4571, F316L, 1.4404
  - DN 700 to 1000: 1.4404, F316L

Lap joint flange
- Carbon steel DN ≤ 300: S235JRG2, A105, E250C
- Stainless steel DN ≤ 300: 1.4306,1.4404, 1.4571, F316L

Lap joint flange, stamped plate
- Carbon steel DN ≤ 300: S235JRG2 similar to S235JR+AR or 1.0038
- Stainless steel DN ≤ 300: 1.4301 similar to 304

ASME B16.5

Fixed flange, lap joint flange
- Carbon steel: A105
- Stainless steel: F316L

JIS B2220

- Carbon steel: A105, A350 LF2
- Stainless steel: F316L

AWWA C207

Carbon steel: A105, P265GH, A181 Class 70, E250C, S275JR

AS 2129

Carbon steel: A105, E250C, P235GH, P265GH, S235JRG2

AS 4087

Carbon steel: A105, P265GH, S275JR

Seals

As per DIN EN 1514-1, form IBC

Accessories

Display guard

Stainless steel, 1.4301 (304L)

Ground disks

- Stainless steel, 1.4435 (316L)
- Alloy C22, 2.4602 (UNS N06022)
- Tantalum

Fitted electrodes

Measurement, reference and empty pipe detection electrodes available as standard with:
- 1.4435 (316L)
- Alloy C22, 2.4602 (UNS N06022)
- Tantalum

Process connections

- EN 1092-1 (DIN 2501)
  - DN ≤ 300: fixed flange (PN 10/16/25/40) = Form A, lap joint flange (PN 10/16), lap joint flange, stamped plate (PN 10) = Form A
  - DN ≥ 350: fixed flange (PN 6/10/16/25) = flat face (Form B)
  - DN 450 to 2400: fixed flange (PN 6/10/16) = flat face (Form B)
- ASME B16.5
  - DN 350 to 2400 (14 to 90"): fixed flange (Class 150)
  - DN 25 to 600 (1 to 24"): lap joint flange (Class 150)
  - DN 25 to 150 (1 to 6"): fixed flange (Class 300)
- JIS B2220
  - DN 50 to 750: fixed flange (10K)
  - DN 25 to 600: fixed flange (20K)
- AWWA C207
  DN 48 to 90": fixed flange (Class D)
- AS 2129
  DN 50 to 1200: fixed flange (Table E)
- AS 4087
  DN 50 to 1200): fixed flange (PN 16)

For information on the different materials used in the process connections → 84

Surface roughness

Electrodes with 1.4435 (316L); Alloy C22, 2.4602 (UNS N06022); tantalum:
≤ 0.3 to 0.5 µm (11.8 to 19.7 µin)
(All data relate to parts in contact with fluid)

Human interface

Operating concept

Operator-oriented menu structure for user-specific tasks
- Commissioning
- Operation
- Diagnostics
- Expert level

Fast and safe commissioning
- Guided menus ("Make-it-run" wizards) for applications
- Menu guidance with brief descriptions of the individual parameter functions
- Access to the device via Web server or SmartBlue App → 97
- WLAN access to the device via mobile handheld terminal, tablet or smart phone

Reliable operation
- Operation in local language
- Uniform operating philosophy applied to device and operating tools
- If replacing electronic modules, transfer the device configuration via the integrated memory (HistoROM backup) which contains the process and measuring device data and the event logbook. No need to reconfigure.

Efficient diagnostics increase measurement availability
- Troubleshooting measures can be called up via the device and in the operating tools
- Diverse simulation options, logbook for events that occur and optional line recorder functions

Languages

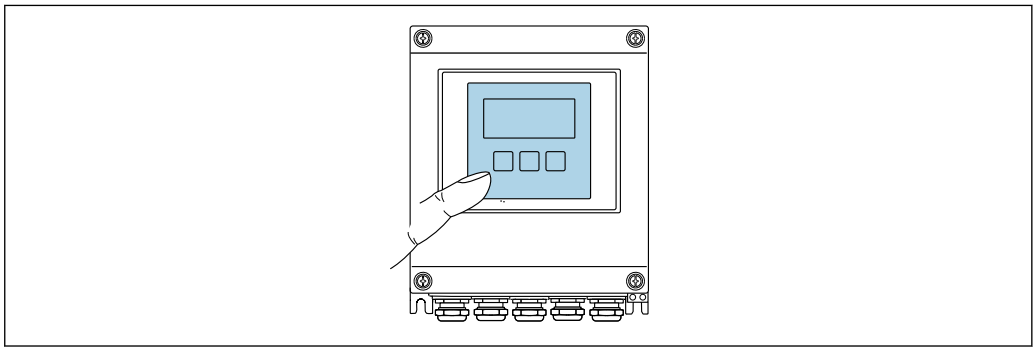
Can be operated in the following languages:
- Via local operation:
  English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Bahasa (Indonesian), Vietnamese, Czech, Swedish
- Via "FieldCare", "DeviceCare" operating tool:
  English, German, French, Spanish, Italian, Chinese, Japanese
- Via Web browser (only available for device versions with HART, PROFIBUS DP and EtherNet/IP):
  English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Bahasa (Indonesian), Vietnamese, Czech, Swedish

Local display

Via display module

Features:
- Standard features 4-line, illuminated, graphic display; touch control
- Order code for "Display; operation", option BA "WLAN" = standard features plus access via Web browser

Information about WLAN interface → 89



A0032074

37 *Operation with touch control*

Display elements

- 4-line, illuminated, graphic display
- White background lighting; switches to red in event of device errors
- Format for displaying measured variables and status variables can be individually configured
- Permitted ambient temperature for the display: −20 to +60 °C (−4 to +140 °F)
  The readability of the display may be impaired at temperatures outside the temperature range.

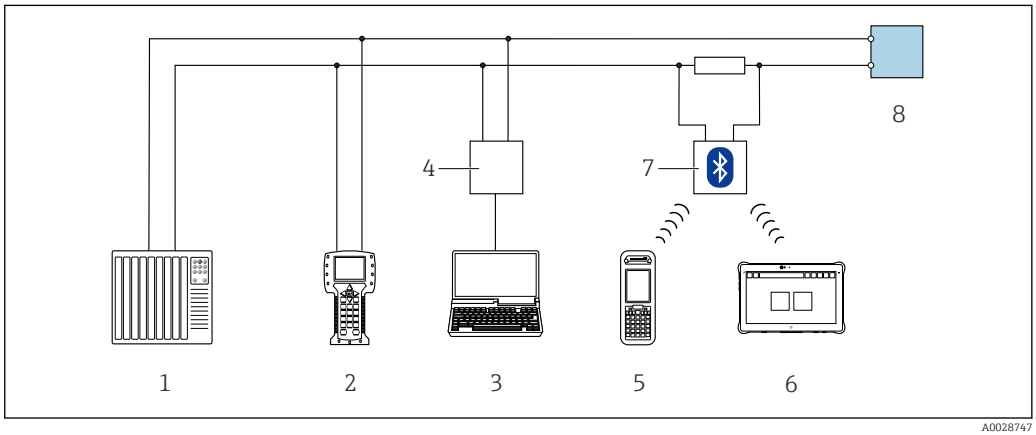
Operating elements

- External operation via touch control (3 optical keys) without opening the housing: ⊞, ⊟, Ⓔ
- Operating elements also accessible in the various zones of the hazardous area

Remote operation

Via HART protocol

This communication interface is available in device versions with a HART output.



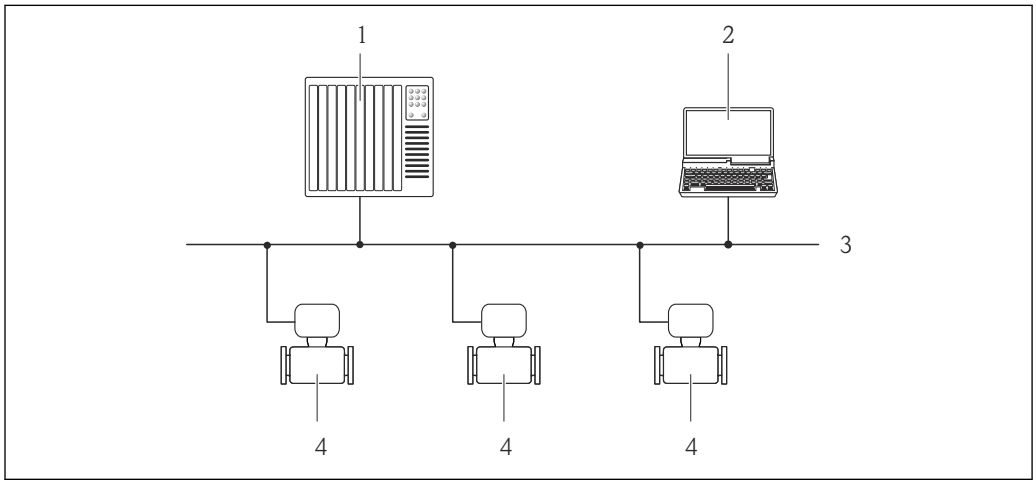
A0028747

38 *Options for remote operation via HART protocol*

1 *Control system (e.g. PLC)*
2 *Field Communicator 475*
3 *Computer with operating tool (e.g. FieldCare, AMS Device Manager, SIMATIC PDM)*
4 *Commubox FXA195 (USB)*
5 *Field Xpert SFX350 or SFX370*
6 *Field Xpert SMT70*
7 *VIATOR Bluetooth modem with connecting cable*
8 *Transmitter*

Via PROFIBUS DP network

This communication interface is available in device versions with PROFIBUS DP.

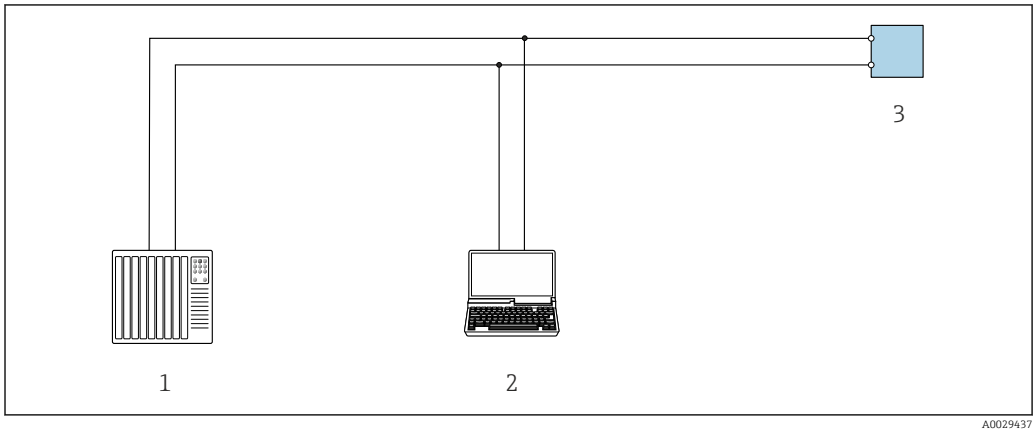


39 Options for remote operation via PROFIBUS DP network

1 Automation system
2 Computer with PROFIBUS network card
3 PROFIBUS DP network
4 Measuring device

Via Modbus RS485 protocol

This communication interface is available in device versions with a Modbus-RS485 output.



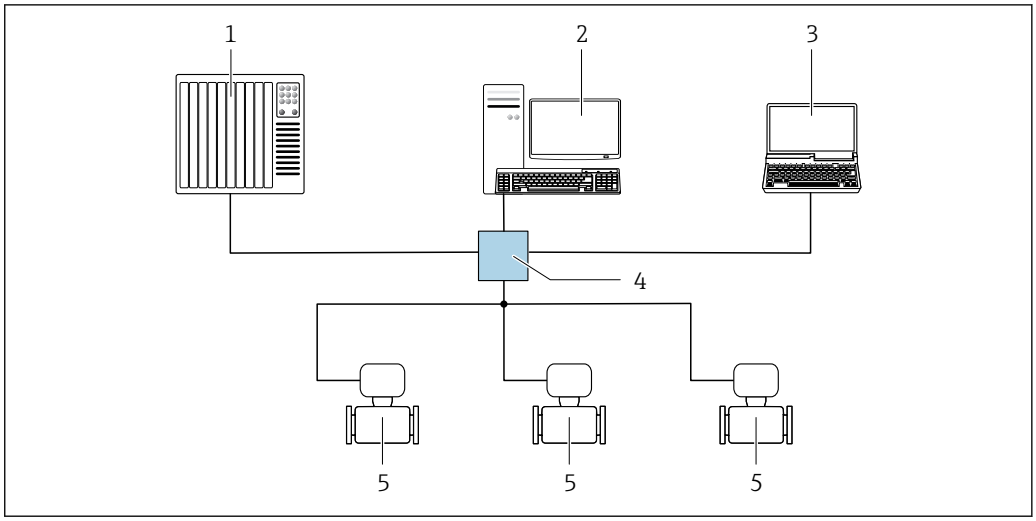
40 Options for remote operation via Modbus-RS485 protocol (active)

1 Control system (e.g. PLC)
2 Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or with operating tool (e.g. FieldCare, DeviceCare) with COM DTM "CDI Communication TCP/IP" or Modbus DTM
3 Transmitter

Via EtherNet/IP network

This communication interface is available in device versions with EtherNet/IP.

Star topology



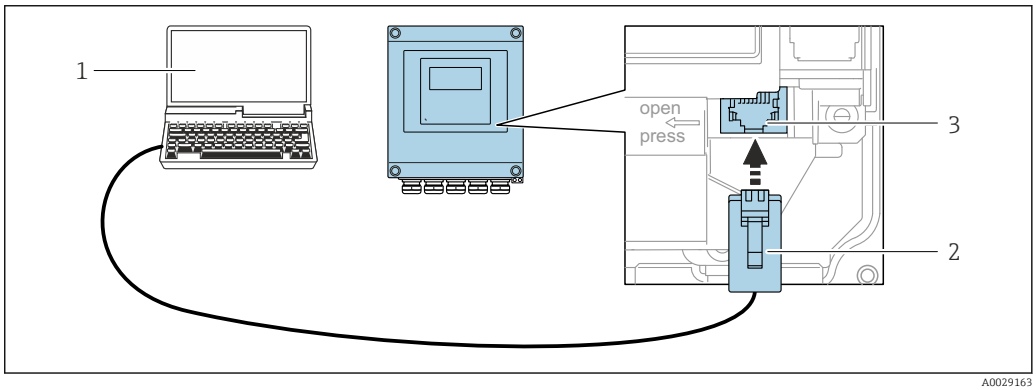
41 Options for remote operation via EtherNet/IP network: star topology

1 Automation system, e.g. "RSLogix" (Rockwell Automation)
2 Workstation for measuring device operation: with Custom Add-On Profile for "RSLogix 5000" (Rockwell Automation) or with Electronic Data Sheet (EDS)
3 Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or computer with operating tool (e.g. FieldCare, DeviceCare) with COM DTM "CDI Communication TCP/IP"
4 Ethernet switch
5 Measuring device

Service interface

Via service interface (CDI-RJ45)

This communication interface is present in the following device version:
- Order code for "Output", option **H**: 4-20/0-20 mA HART, pulse/frequency/switch output
- Order code for "Output", option **I**: 4-20/0-20 mA HART, pulse/frequency/switch output, status input
- Order code for "Output", option **L**: PROFIBUS DP
- Order code for "Output", option **N**: EtherNet/IP
- Order code for "Output", option **M**: Modbus RS485

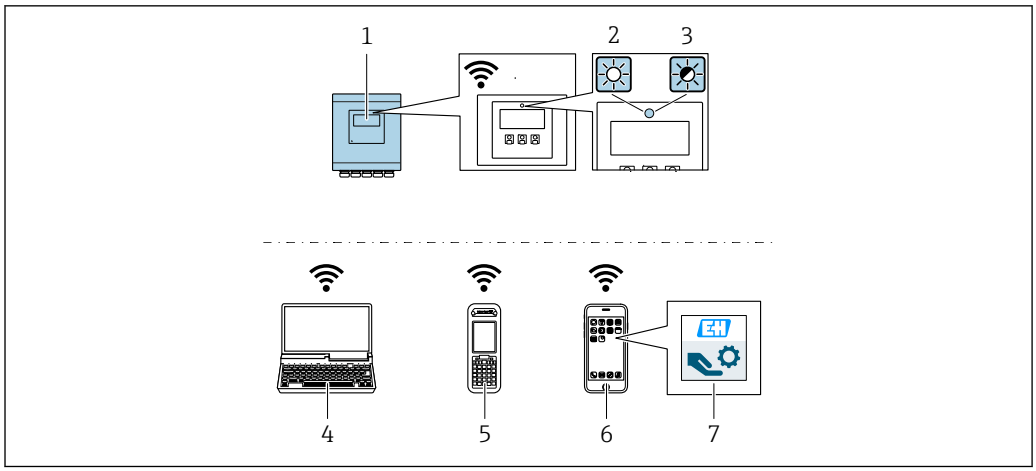


42 Connection via service interface (CDI-RJ45)

1 Computer with Web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated device Web server or with "FieldCare", "DeviceCare" operating tool with COM DTM "CDI Communication TCP/IP" or Modbus DTM
2 Standard Ethernet connecting cable with RJ45 plug
3 Service interface (CDI-RJ45) of the measuring device with access to the integrated Web server

Via WLAN interface

The optional WLAN interface is available on the following device version:
Order code for "Display", option BA "WLAN":
4-line, illuminated, graphic display; touch control + WLAN



1 *Transmitter with integrated WLAN antenna*
2 *LED lit constantly: WLAN reception is enabled on measuring device*
3 *LED flashing: WLAN connection established between operating unit and measuring device*
4 *Computer with WLAN interface and Web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated device Web server or with operating tool (e.g. FieldCare, DeviceCare)*
5 *Mobile handheld terminal with WLAN interface and Web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated device Web server or operating tool (e.g. FieldCare, DeviceCare)*
6 *Smart phone or tablet (e.g. Field Xpert SMT70)*
7 *SmartBlue App*

Function	WLAN: IEEE 802.11 b/g (2.4 GHz) ▪ Access point with DHCP server (default setting) ▪ Network
Encryption	WPA2-PSK AES-128 (in accordance with IEEE 802.11i)
Configurable WLAN channels	1 to 11
Degree of protection	IP67
Available antennas	▪ Internal antenna ▪ External antenna (optional) In the event of poor transmission/reception conditions at the place of installation. Available as an accessory . Only one antenna active in each case!
Range	▪ Internal antenna: typically 10 m (32 ft) ▪ External antenna: typically 50 m (164 ft)
Materials (external antenna)	▪ Antenna: ASA plastic (acrylic ester-styrene-acrylonitrile) and nickel-plated brass ▪ Adapter: Stainless steel and nickel-plated brass ▪ Cable: Polyethylene ▪ Connector: Nickel-plated brass ▪ Angle bracket: Stainless steel

Supported operating tools

Different operating tools can be used for local or remote access to the measuring device. Depending on the operating tool used, access is possible with different operating units and via a variety of interfaces.

Supported operating tools	Operating unit	Interface	Additional information
Web browser	Notebook, PC or tablet with Web browser	▪ CDI-RJ45 service interface ▪ WLAN interface ▪ Ethernet-based fieldbus (EtherNet/IP)	Special Documentation for device
DeviceCare SFE100	Notebook, PC or tablet with Microsoft Windows system	▪ CDI-RJ45 service interface ▪ WLAN interface ▪ Fieldbus protocol	→ 🖹 97
FieldCare SFE500	Notebook, PC or tablet with Microsoft Windows system	▪ CDI-RJ45 service interface ▪ WLAN interface ▪ Fieldbus protocol	→ 🖹 97
Device Xpert	Field Xpert SFX 100/350/370	HART and FOUNDATION Fieldbus fieldbus protocol	Operating Instructions BA01202S Device description files: Use update function of handheld terminal

Other operating tools based on FDT technology with a device driver such as DTM/iDTM or DD/EDD can be used for device operation. These operating tools are available from the individual manufacturers. Integration into the following operating tools, among others, is supported:

- FactoryTalk AssetCentre (FTAC) by Rockwell Automation → www.rockwellautomation.com
- Process Device Manager (PDM) by Siemens → www.siemens.com
- Asset Management Solutions (AMS) by Emerson → www.emersonprocess.com
- FieldCommunicator 375/475 by Emerson → www.emersonprocess.com
- Field Device Manager (FDM) by Honeywell → www.honeywellprocess.com
- FieldMate by Yokogawa → www.yokogawa.com
- PACTWare → www.pactware.com

The associated device description files are available at: www.endress.com → Downloads

Web server

Thanks to the integrated Web server, the device can be operated and configured via a Web browser and via a service interface (CDI-RJ45) or via a WLAN interface. The structure of the operating menu is the same as for the local display. In addition to the measured values, status information on the device is also displayed and allows the user to monitor the status of the device. Furthermore the device data can be managed and the network parameters can be configured.

A device that has a WLAN interface (can be ordered as an option) is required for the WLAN connection: order code for "Display", option BA "WLAN": 4-line, illuminated; touch control + WLAN. The device acts as an Access Point and enables communication by computer or a mobile handheld terminal.

Supported functions
Data exchange between the operating unit (such as a notebook for example) and the measuring device:
- Upload the configuration from the measuring device (XML format, configuration backup)
- Save the configuration to the measuring device (XML format, restore configuration)
- Export event list (.csv file)
- Export parameter settings (.csv file or PDF file, document the measuring point configuration)
- Export the Heartbeat verification log (PDF file, only available with the "Heartbeat Verification" application package)
- Flash firmware version for device firmware upgrade, for instance
- Download driver for system integration
- Visualize up to 1000 saved measured values (only available with the **Extended HistoROM** application package → 🖹 95)

Web server special documentation → 🖹 98

HistoROM data management

The measuring device features HistoROM data management. HistoROM data management comprises both the storage and import/export of key device and process data, making operation and servicing far more reliable, secure and efficient.

Additional information on the data storage concept

There are different types of data storage units in which device data are stored and used by the device:

	Device memory	T-DAT	S-DAT

Available data	▪ Device firmware package
	▪ Driver for system integration e.g.:
	  ▪ GSD for PROFIBUS DP
	  ▪ EDS for EtherNet/IP
		▪ Event history, such as diagnostic events
		▪ Measured value memory ("Extended HistoROM" order option)
		▪ Current parameter data record (used by firmware at run time)
		▪ Maximum indicators (min/max values)
		▪ Totalizer values
			▪ Sensor data: diameter etc.
			▪ Serial number
			▪ User-specific access code (to use the "Maintenance" user role)
			▪ Calibration data
			▪ Device configuration (e.g. SW options, fixed I/O or multi I/O)

Storage location	Fixed on the user interface board in the connection compartment	Can be plugged into the user interface board in the connection compartment	In the sensor plug in the transmitter neck part

Data backup

Automatic
- The most important device data (sensor and transmitter) are automatically saved in the DAT modules
- If the transmitter or measuring device is replaced: once the T-DAT containing the previous device data has been exchanged, the new measuring device is ready for operation again immediately without any errors
- If the sensor is replaced: once the sensor has been replaced, new sensor data are transferred from the S-DAT in the measuring device and the measuring device is ready for operation again immediately without any errors

Data transfer

Manual
- Transfer of a device configuration to another device using the export function of the specific operating tool, e.g. with FieldCare, DeviceCare or Web server: to duplicate the configuration or to store in an archive (e.g. for backup purposes)
- Transmission of the drivers for system integration via Web server, e.g.:
  - GSD for PROFIBUS DP
  - EDS for EtherNet/IP

Event list

Automatic
- Chronological display of up to 20 event messages in the events list
- If the **Extended HistoROM** application package (order option) is enabled: up to 100 event messages are displayed in the events list along with a time stamp, plain text description and remedial measures
- The events list can be exported and displayed via a variety of interfaces and operating tools e.g. DeviceCare, FieldCare or Web server

Data logging

Manual

If the **Extended HistoROM** application package (order option) is enabled:
- Record up to 1 000 measured values via 1 to 4 channels
- User configurable recording interval
- Record up to 250 measured values via each of the 4 memory channels
- Export the measured value log via a variety of interfaces and operating tools e.g. FieldCare, DeviceCare or web server

Certificates and approvals

Currently available certificates and approvals can be called up via the product configurator.

CE mark

The device meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

RCM-tick symbol

The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".

Ex approval

The devices are certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Control Drawing" document. Reference is made to this document on the nameplate.

Drinking water approval

- ACS
- KTW/W270
- NSF 61
- WRAS BS 6920

HART certification

HART interface

The measuring device is certified and registered by the FieldComm Group. The measuring system meets all the requirements of the following specifications:
- Certified according to HART 7
- The device can also be operated with certified devices of other manufacturers (interoperability)

Certification PROFIBUS

PROFIBUS interface

The measuring device is certified and registered by the PNO (PROFIBUS User Organization Organization). The measuring system meets all the requirements of the following specifications:
- Certified in accordance with PROFIBUS PA Profile 3.02
- The device can also be operated with certified devices of other manufacturers (interoperability)

Modbus RS485 certification

The measuring device meets all the requirements of the MODBUS/TCP conformity test and has the "MODBUS/TCP Conformance Test Policy, Version 2.0". The measuring device has successfully passed all the test procedures carried out.

EtherNet/IP certification

The measuring device is certified and registered by the ODVA (Open Device Vendor Association). The measuring system meets all the requirements of the following specifications:
- Certified in accordance with the ODVA Conformance Test
- EtherNet/IP Performance Test
- EtherNet/IP PlugFest compliance
- The device can also be operated with certified devices of other manufacturers (interoperability)

Radio approval

The measuring device has radio approval.

For detailed information regarding radio approval, see Special Documentation → 98

Measuring instrument approval

The measuring device is (optionally) approved as a cold water meter (MI-001) for volume measurement in service subject to legal metrological control in accordance with the European Measuring Instruments Directive 2014/32/EU (MID).

The measuring device is qualified to OIML R49: 2013.

Other standards and guidelines

- EN 60529
  Degrees of protection provided by enclosures (IP code)
- EN 61010-1
  Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements
- IEC/EN 61326
  Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements).

- ANSI/ISA-61010-1 (82.02.01)
  Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1 General Requirements
- CAN/CSA-C22.2 No. 61010-1-12
  Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1 General Requirements
- NAMUR NE 21
  Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment
- NAMUR NE 32
  Data retention in the event of a power failure in field and control instruments with microprocessors
- NAMUR NE 43
  Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53
  Software of field devices and signal-processing devices with digital electronics
- NAMUR NE 105
  Specifications for integrating fieldbus devices in engineering tools for field devices
- NAMUR NE 107
  Self-monitoring and diagnosis of field devices
- NAMUR NE 131
  Requirements for field devices for standard applications

Ordering information

Detailed ordering information is available from the following sources:
- In the Product Configurator on the Endress+Hauser website: www.endress.com -> Click "Corporate" -> Select your country -> Click "Products" -> Select the product using the filters and search field -> Open product page -> The "Configure" button to the right of the product image opens the Product Configurator.
- From your Endress+Hauser Sales Center: www.addresses.endress.com

Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

Product generation index

Release date	Product root	Modification
01.07.2012	5W4B	Original
01.11.2016	5W4C	▪ Web server: current version ▪ Logbook: current concept, including Parameter Change ▪ Upload/download: current concept ▪ Heartbeat Technology: new hardware, diagnostics, events ▪ Security concept: encrypted password transmission ▪ WLAN ▪ Custody transfer mode

More information is available from your Sales Center or at:
www.service.endress.com → Downloads

Application packages

Many different application packages are available to enhance the functionality of the device. Such packages might be needed to address safety aspects or specific application requirements.

The application packages can be ordered with the device or subsequently from Endress+Hauser. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

Cleaning

Package	Description
Electrode cleaning circuit (ECC)	The electrode cleaning circuit (ECC) function has been developed to have a solution for applications where magnetite (Fe_3O_4) deposits frequently occur (e.g. hot water). Since magnetite is highly conductive this build up leads to measuring errors and ultimately to the loss of signal. The application package is designed to AVOID build up of highly conductive matter and thin layers (typical of magnetite).

Diagnostics functions

Package	Description
Extended HistoROM	Comprises extended functions concerning the event log and the activation of the measured value memory. Event log: Memory volume is extended from 20 message entries (standard version) to up to 100 entries. Data logging (line recorder): ▪ Memory capacity for up to 1000 measured values is activated. ▪ 250 measured values can be output via each of the 4 memory channels. The recording interval can be defined and configured by the user. ▪ Measured value logs can be accessed via the local display or operating tool e.g. FieldCare, DeviceCare or Web server.

Heartbeat Technology

Package	Description
Heartbeat Verification +Monitoring	**Heartbeat Verification** Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment". ▪ Functional testing in the installed state without interrupting the process. ▪ Traceable verification results on request, including a report. ▪ Simple testing process via local operation or other operating interfaces. ▪ Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications. ▪ Extension of calibration intervals according to operator's risk assessment. **Heartbeat Monitoring** Continuously supplies data, which are characteristic of the measuring principle, to an external condition monitoring system for the purpose of preventive maintenance or process analysis. These data enable the operator to: ▪ Draw conclusions - using these data and other information - about the impact process influences (such as corrosion, abrasion, buildup etc.) have on the measuring performance over time. ▪ Schedule servicing in time. ▪ Monitor the process or product quality, e.g. gas pockets.

Accessories

Various accessories, which can be ordered with the device or subsequently from Endress+Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

Device-specific accessories

For the transmitter

Accessories	Description
Promag 400 transmitter	Transmitter for replacement or storage. Use the order code to define the following specifications: ▪ Approvals ▪ Output / input ▪ Display/operation ▪ Housing ▪ Software For details, see Installation Instructions EA00104D
Display guard	Is used to protect the display against impact or scoring from sand in desert areas. Order number: 71228792 Installation Instructions EA01093D
Connecting cable for remote version	Coil current and electrode cables, various lengths, reinforced cables available on request.
Ground cable	Set, consisting of two ground cables for potential equalization.
Post mounting kit	Post mounting kit for transmitter.
Compact → Remote conversion kit	For converting a compact device version to a remote device version.
Conversion kit Promag 50/53 → Promag 400	For converting a Promag with transmitter 50/53 to a Promag 400.

For the sensor

Accessories	Description
Ground disks	Are used to ground the medium in lined measuring tubes to ensure proper measurement. For details, see Installation Instructions EA00070D

Communication-specific accessories

Accessories	Description
Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB interface. Technical Information TI00404F
Commubox FXA291	Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop. Technical Information TI405C/07
HART Loop Converter HMX50	Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values. ▪ Technical Information TI00429F ▪ Operating Instructions BA00371F
Wireless HART adapter SWA70	Is used for the wireless connection of field devices. The WirelessHART adapter can be easily integrated into field devices and existing infrastructures, offers data protection and transmission safety and can be operated in parallel with other wireless networks with minimum cabling complexity. Operating Instructions BA00061S
Fieldgate FXA42	Is used to transmit the measured values of connected 4 to 20 mA analog measuring devices, as well as digital measuring devices ▪ Technical Information TI01297S ▪ Operating Instructions BA01778S ▪ Product page: www.endress.com/fxa42

Field Xpert SMT70	The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in hazardous and non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress. This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle. ▪ Technical Information TI01342S ▪ Operating Instructions BA01709S ▪ Product page: www.endress.com/smt70
Field Xpert SMT77	The Field Xpert SMT77 tablet PC for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1. ▪ Technical Information TI01418S ▪ Operating Instructions BA01923S ▪ Product page: www.endress.com/smt77

Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: ▪ Choice of measuring devices for industrial requirements ▪ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and accuracy. ▪ Graphic illustration of the calculation results ▪ Determination of the partial order code, administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. Applicator is available: ▪ Via the Internet: https://portal.endress.com/webapp/applicator ▪ As a downloadable DVD for local PC installation.
W@M	W@M Life Cycle Management Improved productivity with information at your fingertips. Data relevant to a plant and its components is generated from the first stages of planning and during the asset's complete life cycle. W@M Life Cycle Management is an open and flexible information platform with online and on-site tools. Instant access for your staff to current, in-depth data shortens your plant's engineering time, speeds up procurement processes and increases plant uptime. Combined with the right services, W@M Life Cycle Management boosts productivity in every phase. For more information, visit www.endress.com/lifecyclemanagement
FieldCare	FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition. Operating Instructions BA00027S and BA00059S
DeviceCare	Tool to connect and configure Endress+Hauser field devices. Innovation brochure IN01047S
Commubox FXA291	Connects Endress+Hauser field devices with a CDI interface (= Endress +Hauser Common Data Interface) and the USB port of a computer or laptop. Technical Information TI00405C

System components

Accessories	Description
Memograph M graphic data manager	The Memograph M graphic data manager provides information on all the relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick. ▪ Technical Information TI00133R ▪ Operating Instructions BA00247R

Supplementary documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:
- *W@M Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from nameplate
- *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2D matrix code (QR code) on the nameplate

Standard documentation

Brief Operating Instructions

Brief Operating Instructions for the sensor

Measuring device	Documentation code
Proline Promag W	KA01266D

Transmitter Brief Operating Instructions

Measuring device	Documentation code			
	HART	PROFIBUS DP	Modbus RS485	EtherNet/IP
Proline 400	KA01263D	KA01420D	KA01419D	KA01418D

Operating Instructions

Measuring device	Documentation code			
	HART	PROFIBUS DP	Modbus RS485	EtherNet/IP
Promag W 400	BA01063D	BA01234D	BA01231D	BA01214D

Description of device parameters

Measuring device	Documentation code			
	HART	PROFIBUS DP	Modbus RS485	EtherNet/IP
Promag 400	GP01043D	GP01044D	GP01045D	GP01046D

Supplementary device-dependent documentation

Special Documentation

Content	Documentation code
Heartbeat Technology	SD01847D
Display modules A309/A310	SD01793D
Information on Custody Transfer Measurement	SD02038D

Content	Documentation code			
	HART	PROFIBUS DP	Modbus RS485	EtherNet/IP
Web server	SD01811D	SD01813D	SD01812D	SD01814D

Installation Instructions

Content	Comment
Installation instructions for spare part sets and accessories	Documentation code: specified for each individual accessory → 96.

Registered trademarks

HART®
Registered trademark of the FieldComm Group, Austin, Texas, USA

PROFIBUS®
Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

Modbus®
Registered trademark of SCHNEIDER AUTOMATION, INC.

EtherNet/IP™
Trademark of ODVA, Inc.

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Endress+Hauser

People for Process Automation

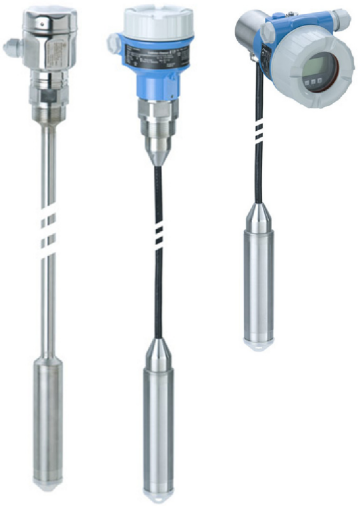
TI00437P/00/EN/20.16
No. 71316865

Tags:
20-LIT-200
20-LIT-203-1/2/3/4
20-LIT-601

Technical Information
Deltapilot M FMB50, FMB51, FMB52, FMB53

Hydrostatic level measurement





Pressure sensor with the CONTITE™ measuring cell
Condensate-resistant

Application

The device is used for the following measuring tasks:
- Hydrostatic pressure measurement in liquids and paste-like media in all areas of process engineering, process measuring technology, pharmaceuticals and the food industry
- Level, volume or mass measurements in liquids

Your benefits

- Very good reproducibility and long-term stability
- Maximum plant safety provided by one-of-a-kind, condensate-proofed CONTITE measuring cell
- High reference accuracy: ±0.2 %
  optionally ±0.1 %
- Turn down 100:1
- Standardized platform for differential pressure, hydrostatics, and pressure (Deltabar M – Deltapilot M – Cerabar M)
- Simple, fast commissioning through a user interface designed for real-world applications
- Used for process pressure monitoring up to SIL2, certified to IEC 61508 Edition 2.0 and IEC 61511 by TÜV NORD
- Usage in drinking water: KTW, NSF

Endress+Hauser
People for Process Automation

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Document information

Symbols used

Safety symbols

Symbol	Meaning
 A0011189-EN	**DANGER!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
 A0011190-EN	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
 A0011191-EN	**CAUTION!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
 A0011192-EN	**NOTE!** This symbol contains information on procedures and other facts which do not result in personal injury.

Electrical symbols

Symbol	Meaning
A0018335	**Direct current** A terminal at which DC voltage is present or through which direct current flows.
A0018336	**Alternating current** A terminal at which alternating voltage is present or through which alternating current flows.
 A0018337	**Direct current and alternating current** ▪ A terminal at which alternating voltage or DC voltage is present. ▪ A terminal through which alternating current or direct current flows.
 A0018338	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
 A0018339	**Protective ground connection** A terminal which must be connected to ground prior to establishing any other connections.
 A0011201	**Equipotential connection** A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.

Tool symbols

Symbol	Meaning
 A0011219	Phillips head screwdriver
 A0011220	Flat-blade screwdriver
 A0013442	Torx screwdriver
 A0011222	Hexagon wrench
 A0011221	Allen screw

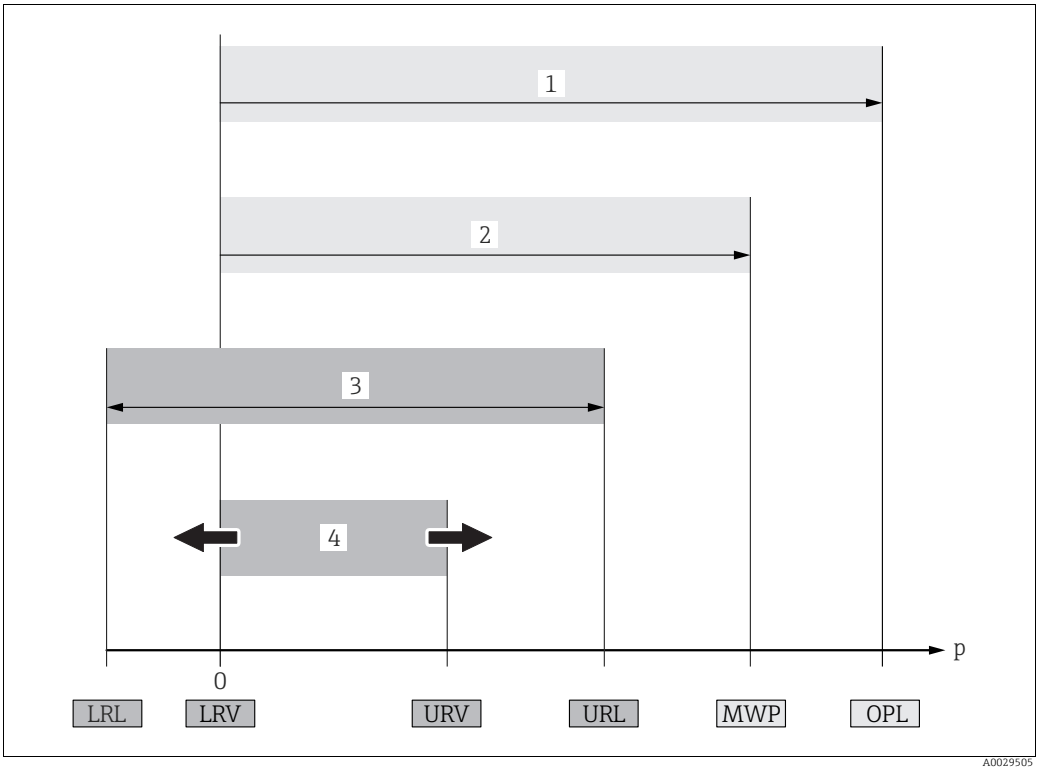
Symbols for certain types of information

Symbol	Meaning
 A0011182	**Permitted** Indicates procedures, processes or actions that are permitted.
 A0011183	**Preferred** Indicates procedures, processes or actions that are preferred.
 A0011184	**Forbidden** Indicates procedures, processes or actions that are forbidden.
 A0011193	**Tip** Indicates additional information.
 A0015483	**Reference to documentation** Refers to the corresponding device documentation.
 A0015484	**Reference to page** Refers to the corresponding page number.
 A0015486	**Reference to graphics** Refers to the corresponding graphic number and page number.
1. , 2. , ...	Series of steps
 A0015488	**Help in the event of a problem**

Symbols in graphics

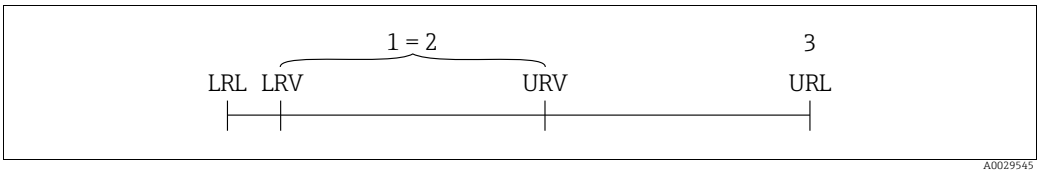
Symbol	Meaning
1, 2, 3, 4 etc.	Numbering for main items
1. , 2. , ...	Series of steps
A, **B**, **C**, **D** etc.	Views
A-A, **B-B**, etc.	Sections
 A0011187	**Hazardous area** Indicates the hazardous area.
 A0011188	Safe area (non-hazardous area) Indicates the non-hazardous area.

Terms and abbreviations



Position	Term/Abbreviation	Explanation
1	OPL	The OPL (over pressure limit = sensor overload limit) for the sensors depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection must be taken into consideration in addition to the measuring cell. Also observe pressure-temperature dependency. For the relevant standards and additional notes, see the "→ 35" section. The OPL may be applied for a limited time period.
2	MWP	The MWP (maximum working pressure) for the sensors depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Also observe pressure-temperature dependency. For the relevant standards and additional notes, see the "→ 35" section. The MWP may be applied for an unlimited time.
3	Maximum sensor measuring range	Range between LRL and URL This span is the maximum calibratable/adjustable measuring span.
4	Calibrated/Adjusted measuring span	Range between LRV and URV Factory setting: 0...URL Other calibrated spans can be ordered with customised settings.
p	-	Pressure
-	LRL	Lower range limit
-	URL	Upper range limit
-	LRV	Lower range value
-	URV	Upper range value
-	TD	Turn down

Turn down calculation



1 Calibrated/Adjusted measuring span
2 Zero-based span
3 Upper range limit

Example

- Sensor: 10 bar (150 psi)
- Upper range limit (URL) = 10 bar (150 psi)
- Calibrated/Adjusted measuring span: 0...5 bar (0...75 psi)
- Lower range value (LRV) = 0 bar
- Upper range value (URV) = 5 bar (75 psi)

Turn down (TD):

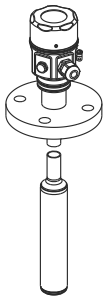
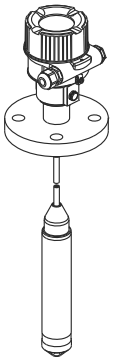
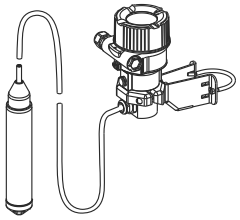
$$TD = \frac{URL}{|URV - LRV|}$$

$$TD = \frac{10\ \text{bar (150 psi)}}{|5\ \text{bar (75 psi)} - 0\ \text{bar (0 psi)}|} = 2$$

In this example, the TD is thus 2:1.
This span is based on the zero point.

Function and system design

Device selection

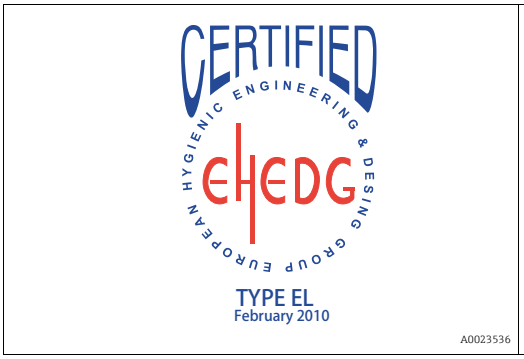
Deltapilot M – Product family	**FMB50**  A0023537 **Compact version**	**FMB51**  A0023538 **Rod version**	**FMB52**  A0023539 **Cable version**	**FMB53**  A0023540 **Cable version with Mounting bracket**
Field of application	– Level measurement – Pressure measurement			
Industries	Food, pharmaceuticals, chemicals, power plants, automotive, etc.			Environment (freshwater and wastewater)
Process connections	– Thread – Flanges – Flush-mounted hygienic connections	– Thread – Flanges	– Thread – Flanges	Suspension clamp
Measuring ranges	From −0.1 to +0.1 (-1.5 to +1.5 psi) bar to −1 bar to +10 bar (-15 to 150 psi)			
OPL	Max. 40 bar (600 psi)			
Process temperature range	−10 to +100 °C (+14 to +212°F) (+135 °C (275°F) for 30 minutes maximum)	−10 to +85 °C (+14 to +185°F)	With PE cable (unmoved): −10 to +70 °C (+14 to +158°F) With FEP cable (unmoved): −10 to +80 °C (+14 to +176°F)	
Ambient temperature range	▪ Without LCD display: -40 to +85 °C (-40 to +185°F) ▪ With LCD display: -20 to +70 °C (-4 to +158°F) (extended temperature application range -40 to 85 °C (-40 to +158°F) with restrictions in optical properties such as display speed and contrast) ▪ Separate housing: -20 to +60 °C (-4 to +140°F)			
Reference accuracy	0.2 % (option 0.1 %) depends on the measuring range → 27			
Supply voltage	– 11.5 to 45 V DC (versions with plug-in connection 35 V DC) – For intrinsically safe device versions: 11.5 to 30 V DC			
Output	4 to 20 mA with superimposed HART protocol, PROFIBUS PA or FOUNDATION Fieldbus			
Options	– Gold/rhodium-coated process isolating diaphragm – 3.1 inspection certificate – 3A approval and EHEDG approval for FMB50 – Specific firmware versions – Initial device settings can be ordered – Separate housing			
Specialties	– Absolute resistance to condensate thanks to hermetically sealed CONTITE™ cell – Maximum flexibility thanks to modular design – Special cleaning of the transmitter to remove paint-wetting substances, for use in paint shops			

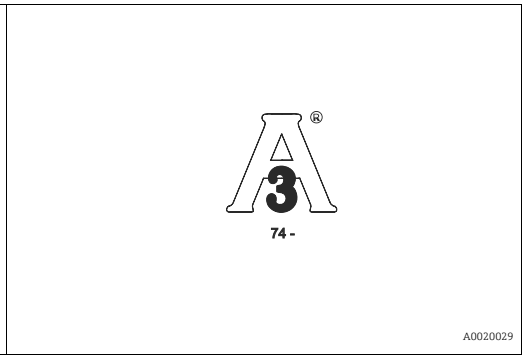
FMB50, FMB51, FMB52 universal application

- Modular probe program to ensure optimum process adaptation
- FMB50 compact version: installation in the tank from below or from the side
- FMB51, FMB52 rod and cable extension: installation from above, i.e. easy to retrofit ground tanks, no additional opening in the vessel floor

FMB50 optimized for hygienic applications

- All typical flush-mounted process connections can be supplied
- Welding flanges
- Stainless steel housing
- All the sanitary process connections are gap-free and can be cleaned so that the unit is free of residue, e.g. CIP cleaning
- USDA/H1-approved transfer liquid as per FDA Directive
- 3A approval or EHEDG approvals

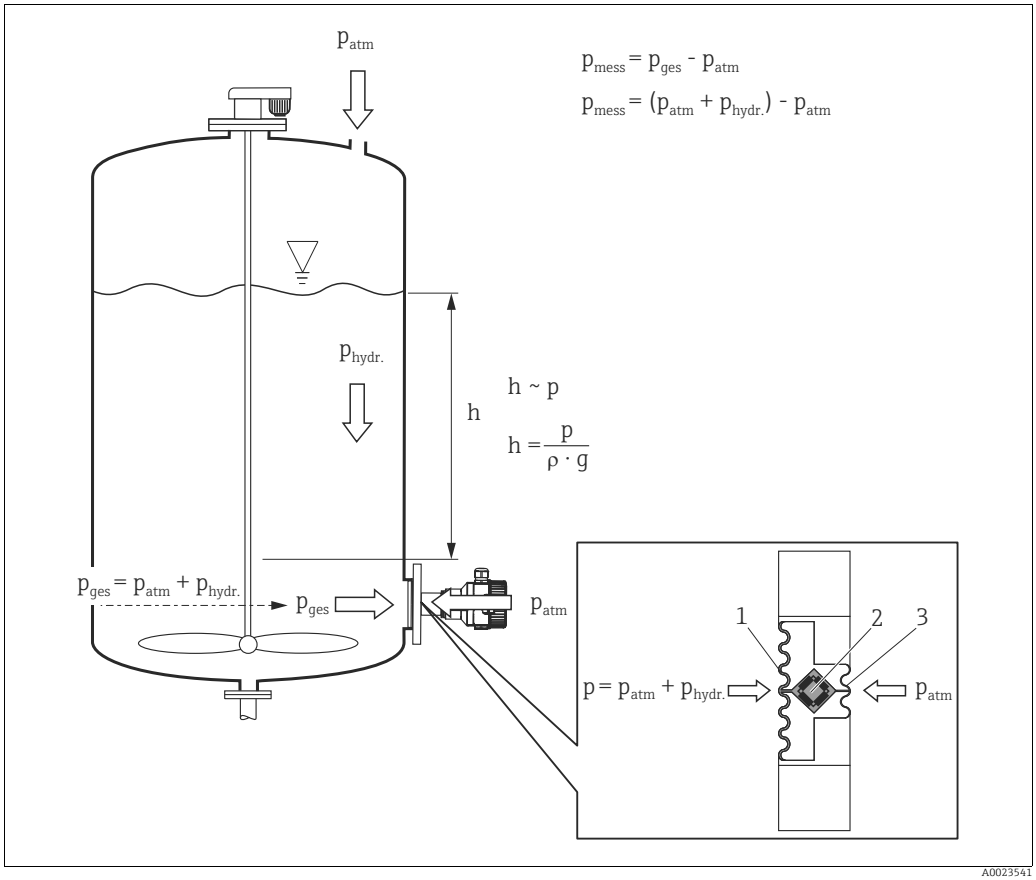




FMB53 for level measurement in water and wastewater

- The housing with the electronic insert is mounted outside shafts and vessels in such a way that it is protected from flooding. The extension cable is secured with a suspension clamp.
- The measuring cell tube made of stainless steel (AISI 316L) and the Alloy process isolating diaphragm allow use in aggressive media such as wastewater for example.
- Extension cable up to 400 m (1312 ft) in length (up to 100 m (328 ft) in Ex-areas) without strain relief.
- Special measuring cell with gold/rhodium coating for applications in which severe hydrogen formation can occur (e.g. digested sludge); → 32.
- Special measuring cell with gold/platinum coating for acids, alkalis or sea water; → 32.

Measuring principle



Deltapilot M hydrostatic level measurement and measuring principle

1 Rear isolating membrane of the CONTITE™ measuring cell
2 Measuring element
3 Process isolating diaphragm

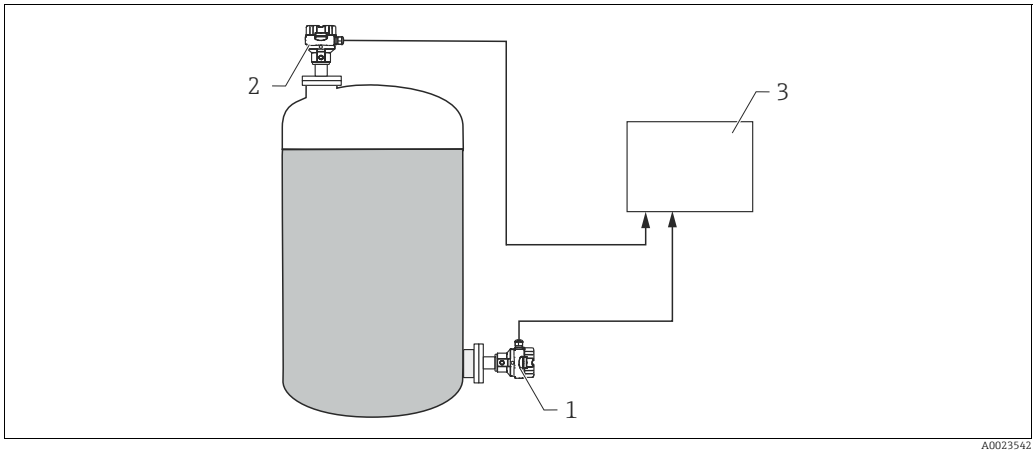
g Gravitational acceleration
h Level height
p_{ges} Total pressure = hydrostatic pressure + atmospheric pressure
p_{atm} Atmospheric pressure
$p_{hydr.}$ Hydrostatic pressure
p_{mess} Measured pressure in the measuring cell = hydrostatic pressure
ρ Density of the medium

Due to its weight, a liquid column creates hydrostatic pressure. If the density is constant, the hydrostatic pressure depends solely on the height h of the liquid column.
The CONTITE™ measuring cell, which works on the principle of the gauge pressure sensor, constitutes the core of Deltapilot M. In contrast to conventional gauge pressure sensors, the precision measuring element (2) in the CONTITE™ measuring cell is absolutely protected, situated between the process isolating diaphragm (3) and the rear isolating membrane (1). Thanks to this hermetic sealing of the measuring element, the CONTITE™ measuring cell is absolutely insensitive to condensate/ condensation and aggressive gases. The pressure applied is transferred from the process isolating diaphragm to the measuring element by means of an oil without any loss in pressure.
Any measured errors due to fluctuations in temperature are compensated for in the electronics unit by means of the sensor temperature.

A linearization function with max. 32 points, based on a table entered either manually or semi-automatically, can be activated locally or remotely. This function facilitates measurement in engineering units, and provides a linear output signal for spherical and horizontal cylindrical vessels, and vessels with a conical outlet.

Level measurement in closed tanks with pressure overlay

You can determine the differential pressure in tanks with pressure overlay using two Deltapilot M. The pressure measured values of the two probes are sent to a signal processing unit such as Endress+Hauser RMA or a PLC. The signal processing unit or PLC determines the difference in pressure and uses this to calculate the level and the density where necessary.



Level measurement in a closed tank with pressure overlay

1 Deltapilot 1 measures the total pressure (hydrostatic pressure and top pressure)
2 Deltapilot 2 measures the top pressure
3 Signal processing unit determines the difference in pressure and uses this to calculate the level

NOTICE

Measured errors can occur.

Large measured errors can occur if the ratio of the level to the top pressure is >1:6. This does not affect reproducibility.

- When selecting the measuring cell, make sure you select measuring ranges that are sufficiently wide (→ see example).

Example:

- Max. hydrostatic pressure = 600 mbar (9 psi)
- Max. top pressure (Deltapilot 2) = 300 mbar (4.5 psi)
- Max. total pressure, measured with Deltapilot 1 = 300 mbar (4.5 psi) + 600 mbar (9 psi) = 900 mbar (13.5 psi) ⇒ measuring cell to be selected: 0 to 1200 mbar (0 to 18 psi)
- Max. pressure, measured with Deltapilot 2: 300 mbar (4.5 psi) ⇒ measuring cell to be selected: 0 to 400 mbar (6 psi)

NOTICE

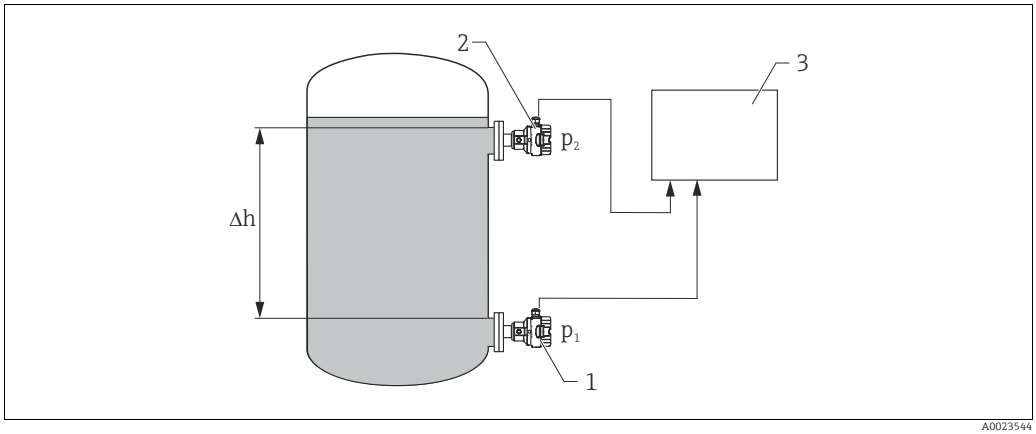
Possibility of probe 2 flooding during differential pressure measurement.

Measured errors can occur.

- When installing, make sure that probe 2 cannot be flooded.

Density measurement

You can measure the density in tanks with pressure overlay using two Deltapilot M and a signal processing unit or a PLC. The signal processing unit or the PLC calculates the density from the known distance between the two Deltapilot M devices Δh and the two measured values p_1 and p_2.

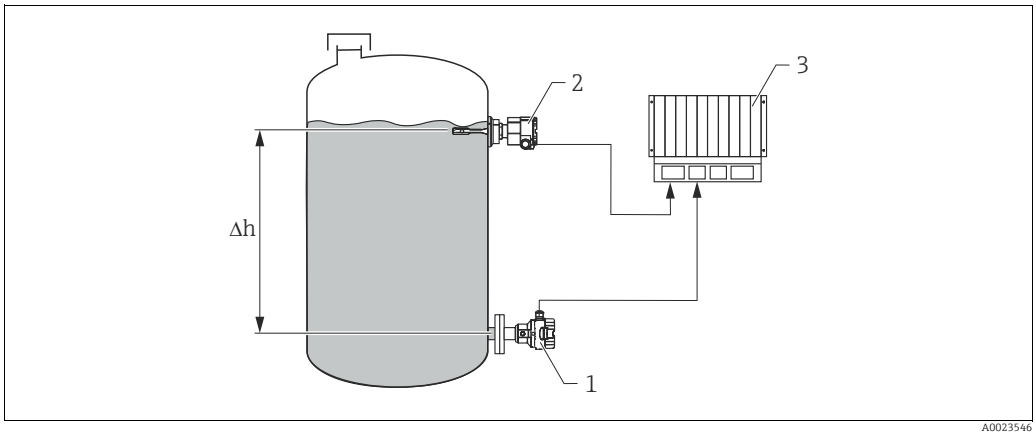


Level measurement in a closed tank with pressure overlay

1 Deltapilot 1 determines pressure measured value p_1
2 Deltapilot 2 determines pressure measured value p_2
3 Signal processing unit determines the density from the two measured values p_1 and p_2 and the distance Δh

Level measurement with automatic density correction (with media changing in the tank)

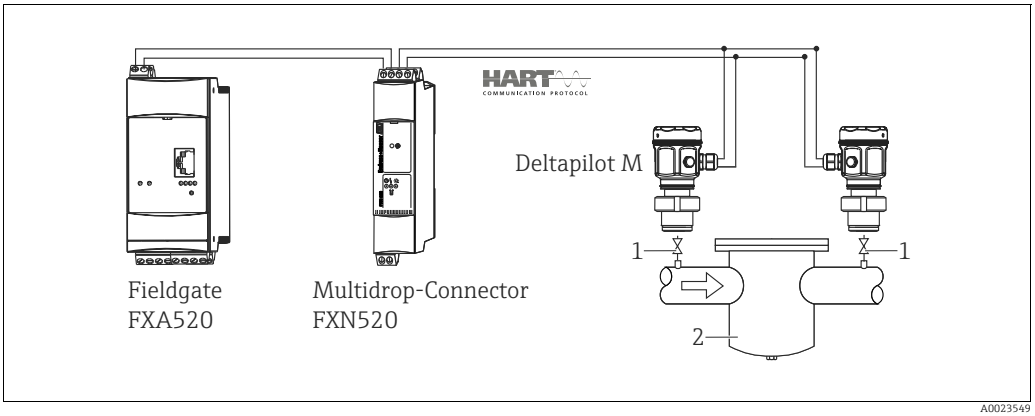
Level measurement with automatic density correction is possible in conjunction with a limit switch such as Liquiphant and a PLC. The limit switch always switches at the same level. In the switch point, the signal processing unit determines the corrected density from the pressure of the Deltapilot M currently measured and the known distance between Deltapilot M and the limit switch. The signal processing unit then calculates the level from the new density and the measured pressure of the Deltapilot M.



Level measurement with automatic density correction

1 Deltapilot M
2 Liquiphant
3 PLC

Electrical differential pressure measurement with gauge pressure sensors



1 Shut-off valves

2 e.g. filter

In the example given, two Deltapilot M devices (each with a gauge pressure sensor) are interconnected. The pressure difference can thus be measured using two independent Deltapilot M devices.

⚠ WARNING

Risk of explosion!

- ▸ If using intrinsically safe devices, strict compliance with the rules for interconnecting intrinsically safe circuits as stipulated in IEC60079-14 (proof of intrinsic safety) is mandatory.

Communication and data processing

- 4 to 20 mA with HART communication protocol
- PROFIBUS PA
  - The Endress+Hauser devices meet the requirements of the FISCO model.
  - Due to the low current consumption of 11 mA ± 1 mA, the following number of devices can be operated on one bus segment if installing as per FISCO:
    - up to 8 Deltapilot M for Ex ia, CSA IS and FM IS applications
    - up to 31 Deltapilot M for all other applications, e.g. in non-hazardous areas, Ex nA, etc.

  Further information on PROFIBUS PA can be found in Operating Instructions BA00034S "PROFIBUS DP/PA: Guidelines for planning and commissioning" and in the PNO Guideline.
- FOUNDATION Fieldbus
  - The Endress+Hauser devices meet the requirements of the FISCO model.
  - Due to the low current consumption of 16 mA ± 1 mA, the following number of devices can be operated on one bus segment if installing as per FISCO:
    - up to 6 Deltapilot M for Ex ia, CSA IS and FM IS applications
    - up to 22 Deltapilot M for all other applications, e.g. in non-hazardous areas, Ex nA, etc.

  Further information on FOUNDATION Fieldbus, such as requirements for bus system components can be found in Operating Instructions BA00013S "FOUNDATION Fieldbus Overview".

Input

Measured variable Hydrostatic pressure

Measuring range

Sensor	Maximum sensor measuring range		Smallest calibratable measuring span (preset at the factory) [1]	MWP	OPL	Vacuum resistance [2] Synthetic oil/ Inert oil	Option [3]
	lower (LRL) [4]	upper (URL)					
[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar_{abs} (psi_{abs})]	
0.1 (1.5)	−0.1 (-1.5)	+0.1 (+1.5)	0.01 (0.15)	2.7 (40.5)	4 (60)	0.01/0.04 (0.145/0.6)	1C
0.4 (6)	−0.4 (-6)	+0.4 (+6)	0.02 (0.3)	5.3 (79.5)	8 (120)		1F
1.2 (18)	−1 (-15)	+1.2 (+18)	0.06 (1)	16 (240)	24 (360)		1H
4 (60)	−1 (-15)	+4 (+60)	0.2 (3)	16 (240)	24 (360)		1M
10 (150)	−1 (-15)	+10 (+150)	0.5 (7.5)	27 (405)	40 (600)		1P

1) Factory calibration Turn down: Max 20:1, higher on request.

2) The vacuum resistance applies to the measuring cell at reference conditions.

3) Product Configurator, "Sensor range" ordering feature

4) By default, the device is set to a lower range limit of 0 bar. Please specify in the order if the lower range limit is to be set to a different default value.

Output

Output signal

- 4 to 20 mA with superimposed digital communication protocol HART 6.0, 2-wire
- Digital communication signal PROFIBUS PA (Profile 3.02)
- Digital communication signal FOUNDATION Fieldbus

Output	Option [1]
4 to 20mA HART	2
PROFIBUS PA	3
FOUNDATION Fieldbus	4

1) Product Configurator, "Output" ordering feature

Signal range – 4 to 20 mA HART

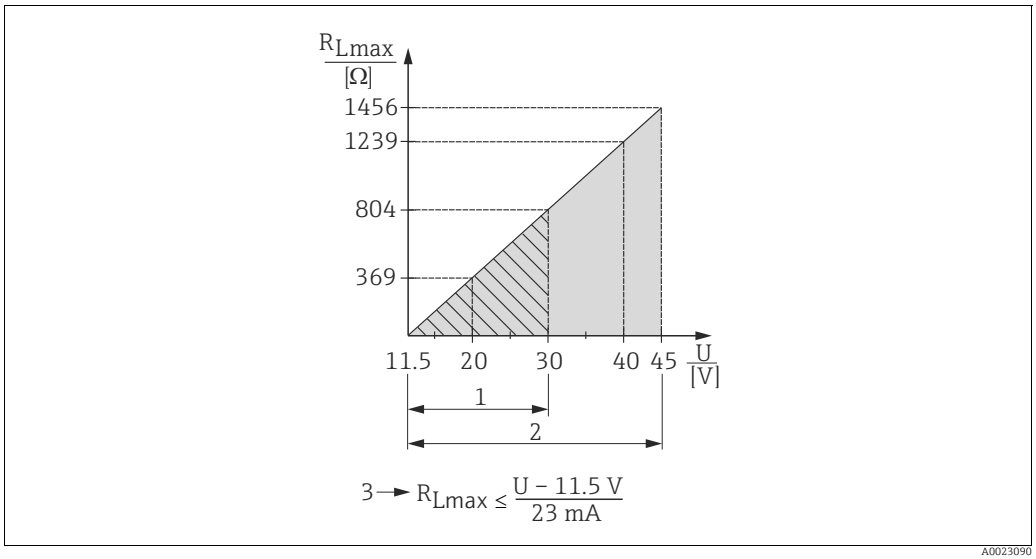
3.8 to 20.5 mA

Signal on alarm

As per NAMUR NE 43

- 4 to 20 mA HART
  Options:
  - Max. alarm: can be set from 21 to 23 mA (Factory setting: 22 mA)
  - Hold measured value: last measured value is held
  - Min. alarm: 3.6 mA
- PROFIBUS PA: can be set in the Analog Input block,
  Options: Last Valid Out Value (factory setting), Fail-safe Value, Status Bad
- FOUNDATION Fieldbus: can be set in the Analog Input block,
  Options: Last Good Value, Fail-safe Value (factory setting), Wrong Value

Load - 4 to 20 mA HART

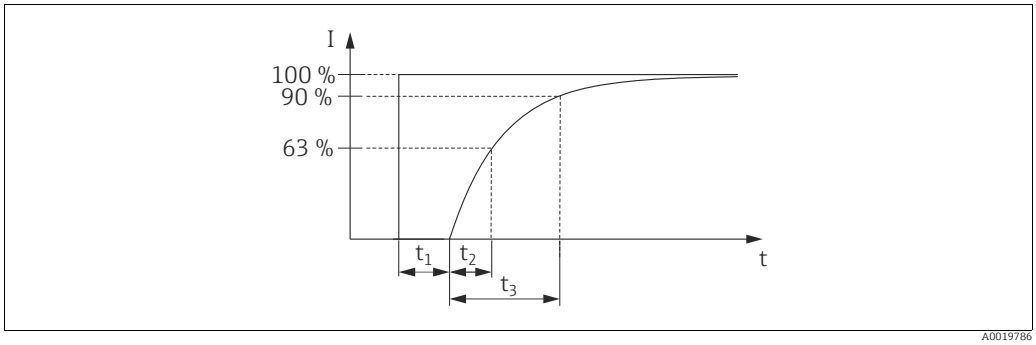


Load diagram

1 Power supply 11.5 to 30 V DC for intrinsically safe device versions
2 Power supply 11.5 to 45 V DC (versions with plug-in connector 35 V DC) for other types of protection and for uncertified device versions
R_{Lmax} Maximum load resistance
U Supply voltage

When operating via a handheld terminal or via a PC with an operating program, a minimum communication resistance of 250 Ω must be taken into account.

Dead time, time constant



Presentation of the dead time and the time constant

Dynamic behavior: current output

	Type	Dead time (t_1) [ms]	Time constant T63 (= t_2) [ms]	Time constant T90 (= t_3) [ms]
max.	FMB50	60	90	210
max.	FMB51 FMB52 FMB53	500	250	-

Dynamic behavior: HART

	Type	Dead time (t_1) [ms]	Dead time (t_1) [ms] + Time constant T63 (= t_2) [ms]	Dead time (t_1) [ms] + Time constant T90 (= t_3) [ms]
min.	FMB50	220	310	370
max.		1020	1110	1170
min.	FMB51 FMB52 FMB53	660	910	-
max.		1460	1710	-

Reading cycle

- Acyclic: max. 3/s, typical 1/s (depends on command # and number of preambles)
- Cyclic (Burst): max. 3/s, typical 2/s

The Deltapilot M commands the BURST MODE function for cyclic value transmission via the HART communication protocol.

Cycle time (update time)

Cyclic (Burst): min. 300 ms

Response time

- Acyclic: min. 330 ms, typical 590 ms (depends on command # and number of preambles)
- Cyclic (Burst): min. 160 ms, typical 350 ms (depends on command # and number of preambles)

Dynamic behavior: PROFIBUS PA

	Type	Dead time (t_1) [ms]	Dead time (t_1) [ms] + Time constant T63 (= t_2) [ms]	Dead time (t_1) [ms] + Time constant T90 (= t_3) [ms]
min.	FMB50	95	185	245
max.		1195	1285	1345
min.	FMB51 FMB52 FMB53	535	785	-
max.		1635	1885	-

Reading cycle

- Cyclic: max. 30/s (dependent on the number and type of function blocks used in a closed-control loop)
- Acyclic: typical 25/s

Cycle time (update time)

min. 100 ms
The cycle time in a bus segment in cyclic data communication depends on the number of devices, on the segment coupler used and on the internal PLC cycle time.

Response time

- Cyclic: approx. 8 to 13 ms (depends on Min. Slave Interval)
- Acyclic: approx. 23 to 35 ms (depends on Min. Slave Interval)

Dynamic behavior: FOUNDATION Fieldbus

	Type	Dead time (t_1) [ms]	Dead time (t_1) [ms] + Time constant T63 (= t_2) [ms]	Dead time (t_1) [ms] + Time constant T90 (= t_3) [ms]
min.	FMB50	105	195	255
max.		1105	1195	1255
min.	FMB51 FMB52 FMB53	545	795	-
max.		1545	1795	-

Reading cycle

- Cyclic: max. 10/s (dependent on the number and type of function blocks used in a closed-control loop)
- Acyclic: typical 5/s

Cycle time (update time)

Cyclic: min. 100 ms

Response time

- Cyclic: max. 20 ms (for standard bus parameter settings)
- Acyclic: typical 70 ms (for standard bus parameter settings)

Damping

A damping affects all outputs (output signal, display).

- Via on-site display, handheld terminal or PC with operating program, continuous from 0...999 s
- Via DIP-switch on the electronic insert, switch position "on" (= set value) and "off" (= damping switched off)
- Factory setting: 2 s

Firmware version

Designation	Option [1]
01.00.zz, FF, DevRev01	76
01.00.zz, PROFIBUS PA, DevRev01	77
01.00.zz, HART, DevRev01	78

1) Product Configurator, "Firmware version" ordering feature

Galvanic isolation

The following devices have a galvanic isolation between electronic and probe:
- FMB51, FMB52, FMB53
- FMB50 with separate housing

Protocol-specific data

HART

Manufacturer ID	17 (11 hex)
Device Type Code	35 (23 hex)
Device Revision	01 (01 hex) - SW version 01.00.zz
HART specification	6
DD Revision	▪ 01 (Dutch) ▪ 02 (Russian)
Device description files (DTM, DD)	Information and files can be found: ▪ www.endress.com ▪ www.hartcomm.org
HART load	Min. 250 Ω
HART device variables	The measured values can be freely assigned to the device variables: **Measured values for PV (primary variable)** ▪ Pressure ▪ Level ▪ Tank content **Measured values for SV, TV (second and third variable)** ▪ Pressure ▪ Level **Measured values for QV (fourth variable)** ▪ Temperature
Supported functions	▪ Burst mode ▪ Additional Transmitter Status ▪ Device Locking ▪ Alternative operating modes

PROFIBUS PA

Manufacturer ID	17 (11 hex)
Ident number	1554 hex
Profile Version	3.02 ▪ SW Version 01.00.zz
GSD Revision	5
DD Revision	1
GSD File	Information and files can be found: ▪ www.endress.com ▪ www.profibus.org
DD Files	
Output values	**Measured values for PV (via Analog Input Function Block)** ▪ Pressure ▪ Flow ▪ Level ▪ Tank content **Measured values for SV** ▪ Pressure ▪ Temperature

Input values	Input value sent from PLC, can be shown on display
Supported functions	▪ Identification & Maintenance Simple device identification via control system and nameplate ▪ Condensed status[1)] ▪ Automatic ident number adaptation and switchable to following ident numbers[1)]: – 9700: Profile-specific transmitter identification number with the "Classic" or "Condensed" status". – 1503: Compatibility mode for the old Deltapilot M (DB50, DB50L, DB51, DB52, DB53). – 1555: Identification number for the new Deltapilot M (FMB50, FMB51, FMB52, FMB53). ▪ Device locking: The device can be locked by hardware or software.

1) Only with Profile Version 3.02

Data of the FOUNDATION Fieldbus interface

Basic data

Device Type	0x1023
Device Revision	01 (hex)
DD Revision	0x01021
CFF Revision	0x000102
ITK Version	5.2.0
ITK Certification Driver No.	IT067500
Link-Master (LAS) capable	Yes
Link Master / Basic Device selectable	Yes; Factory setting: Basic Device
Number of VCRs	44
Number of Link Objects in VFD	50
Number of FB-Schedule Objects	40

Virtual communication references (VCRs)

Permanent Entries	44
Client VCRs	0
Server VCRs	5
Source VCRs	8
Sink VCRs	0
Subscriber VCRs	12
Publisher VCRs	19

Link settings

Slot time	4
Min. inter PDU delay	12
Max. response delay	40

Transducer Blocks

Block	Content	Output values
TRD1 Block	Contains all parameters related to the measurement	▪ Pressure or level (channel 1) ▪ Process temperature (channel 2) ▪ Measured pressure value (channel 3) ▪ Max. pressure (channel 4) ▪ Level before linearization (channel 5)
Diagnostic Block	Contains diagnostic information	▪ Error code via DI channels (channel 10 to 15)
Display Block	Contains parameters to configure the onsite display	No output values

Function blocks

Block	Content	Number of blocks	Execution time	Functionality
Resource Block	The Resource Block contains all the data that uniquely identify the device. It is an electronic version of a nameplate of the device.	1		enhanced
Analog Input Block 1 Analog Input Block 2	The AI Block receives the measuring data from the Sensor Block, (selectable via a channel number) and makes the data available to other function blocks at its output. Enhancement: digital outputs for process alarms, fail safe mode.	2	25 ms	enhanced
Digital Input Block	This block contains the discrete data of the Diagnose Block (selectable via a channel number 10 to 15) and provides them for other blocks at the output.	1	20 ms	Standard
Digital Output Block	This block converts the discrete input and thus initiates an action (selectable via a channel number) in the DP Flow Block or in the TRD1 Block. Channel 20 resets the counter for max. pressure transgressions value and Channel 21 resets the Totalizer.	1	20 ms	Standard
PID Block	The PID Block serves as a proportional-integral-derivative controller and is used almost universally for closed-loop-control in the field including cascade and feedforward. Input IN can be indicated on the display. The selection is performed in the Display Block (DISPLAY_MAIN_LINE_CONTENT).	1	40 ms	Standard
Arithmetic Block	This block is designed to permit simple use of popular measurement math functions. The user does not have to know how to write equations. The math algorithm is selected by name, chosen by the user for the function to be performed.	1	35 ms	Standard
Input Selector Block	The Input Selector Block facilitates the selection of up to four inputs and generates an output based on the configured action. This block normally receives its inputs from AI Blocks. The block performs maximum, minimum, average and 'first good' signal selection. Inputs IN1 to IN4 can be indicated on the display. The selection is performed in the Display Block (DISPLAY_MAIN_LINE_1_CONTENT).	1	30 ms	Standard

Block	Content	Number of blocks	Execution time	Functionality
Signal Characterizer Block	The Signal Characterizer Block has two sections, each with an output that is a non-linear function of the respective input. The non-linear function is generated by a single look-up table with 21 arbitrary x-y pairs.	1	40 ms	Standard
Integrator Block	The Integrator Block integrates a variable as a function of the time or accumulates the counts from a Pulse Input Block. The block may be used as a totalizer that counts up until reset or as a batch totalizer that has a setpoint, where the integrated or accumulated value is compared to pre-trip and trip settings, generating a binary signal when the setpoint is reached.	1	35 ms	Standard

Additional function block information:

Instantiate Function Block	YES
Number of instantiate blocks	20

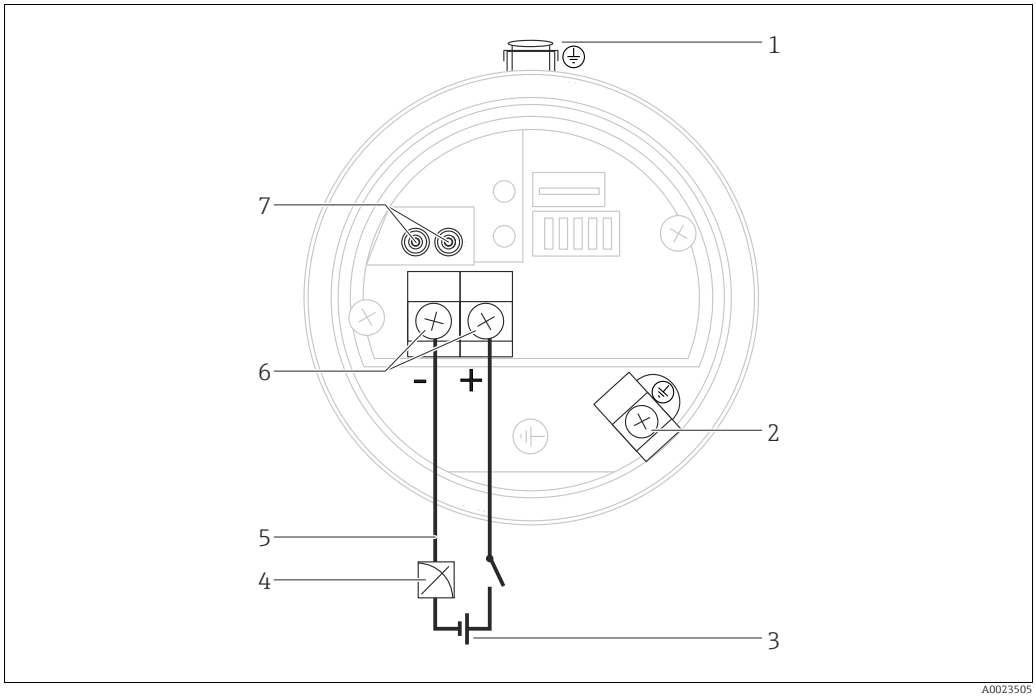
Power supply

⚠ WARNING

Incorrect connection can limit electrical safety!

- When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings → 71 ff, "Safety instructions" and "Installation/Control Drawings" ordering features.
- All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is provided with all Ex-systems as standard → 71 ff, "Safety instructions" and "Installation/Control Drawings" ordering features.
- According to IEC/EN61010 a suitable disconnector has to be installed for the device
- HART: Overvoltage protection HAW569-DA2B for the non-hazardous area, ATEX II 2 (1) Ex ia IIC and IEC Ex ia can be ordered as an option (see "Ordering information" ordering feature).
- Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed.
- The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the power supply.

Terminal assignment



Electrical connection

1 *External grounding terminal*
2 *Internal grounding terminal*
3 *Supply voltage → 22*
4 *4...20 mA for HART devices*
5 *For HART and FOUNDATION Fieldbus devices: With a handheld terminal, all the parameters can be configured anywhere along the bus line via menu operation.*
6 *Terminals*
7 *For HART devices: test terminals, see section "Taking 4 to 20 mA test signal"*

Supply voltage

4 to 20 mA HART

Type of protection	Supply voltage
▪ Intrinsically safe	11.5 ... 30 V DC
▪ Other types of protection ▪ Devices without certificate	11.5 to 45 V DC (versions with plug-in connection 35 V DC)

Taking 4 to 20 mA test signal

A 4 to 20 mA test signal may be measured via the test terminals without interrupting the measurement.

PROFIBUS PA

- Version for non-hazardous areas: 9 to 32 V DC

FOUNDATION Fieldbus

- Version for non-hazardous areas: 9 to 32 V DC

Current consumption

- PROFIBUS PA: 11 mA ± 1 mA, switch-on current corresponds to IEC 61158-2, Clause 21
- FOUNDATION Fieldbus: 16 mA ± 1 mA, switch-on current corresponds to IEC 61158-2, Clause 21

Electrical connection

Cable entry	Degree of protection	Option [1]
M20 gland	IP66/68 NEMA 4X/6P	A
G ½" thread	IP66/68 NEMA 4X/6P	C
NPT ½" thread	IP66/68 NEMA 4X/6P	D
M12 plug	IP66/67 NEMA 4X/6P	I
7/8" plug	IP66/68 NEMA 4X/6P	M
HAN7D connector, 90 deg	IP65	P
PE cable 5m [2]	IP66/68 NEMA4X/6P + pressure compensation via cable	S
M16 valve connector	IP64	V

1) Product Configurator, "Electrical connection" ordering feature

2) Only for FMB50

PROFIBUS PA

The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the power supply. For further information on the network structure and grounding, and for further bus system components such as bus cables, see the relevant documentation, e.g. Operating Instructions BA00034S "PROFIBUS DP/PA: Guidelines for planning and commissioning" and the PNO Guideline.

FOUNDATION Fieldbus

The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the power supply. For further information on the network structure and grounding and for further bus system components such as bus cables, see the relevant documentation, e.g. Operating Instructions BA00013S "FOUNDATION Fieldbus Overview" and the FOUNDATION Fieldbus Guideline.

Terminals

- Supply voltage and internal ground terminal: 0.5 … 2.5 mm² (20…14 AWG)
- External ground terminal: 0.5 … 4 mm² (20…14 AWG)

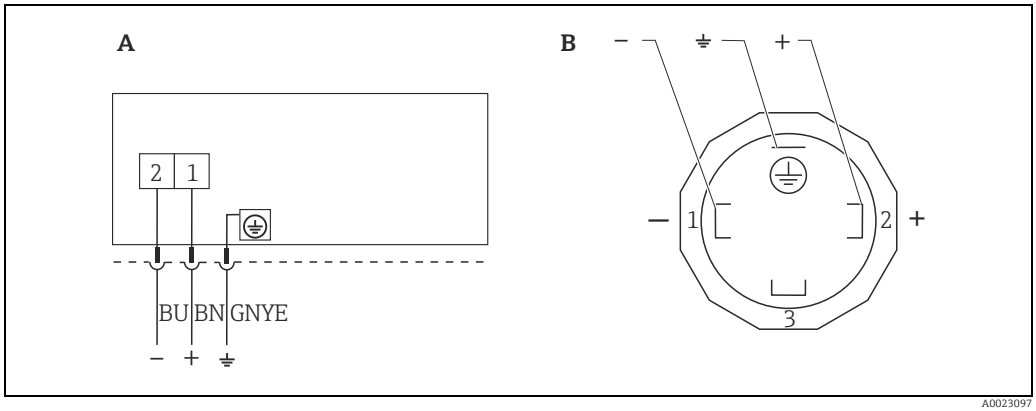
Cable entry

Approval	Type	Clamping area
Standard, CSA GP ATEX II1/2G or II2G Ex ia, IEC Ex ia Ga/Gb or Ex ia Gb, FM/ CSA IS	Plastic M20x1.5	5 to 10 mm (0.2 to 0.39 in)
ATEX II1/2D Ex t, II1/2GD Ex ia, II3G Ex nA, IEC Ex t Da/Db	Metal M20x1.5 (Ex e)	7 to 10.5 mm (0.28 to 0.41 in)

For other technical data, see the housing section → 36 ff".

Connector

Devices with valve connector

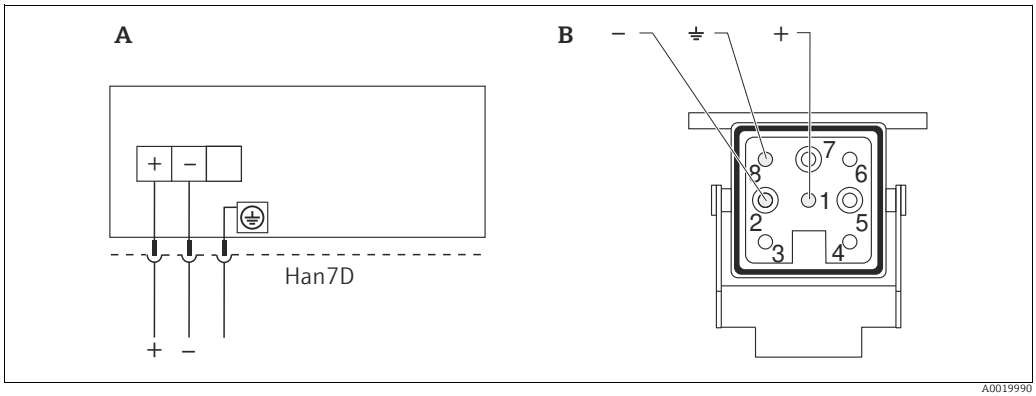


BN = brown, BU = blue, GNYE = green/yellow

A Electrical connection for devices with valve connector
B View of the connection on the device

Material: PA 6.6

Devices with Harting plug Han7D

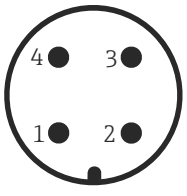


A Electrical connection for devices with Harting plug Han7D
B View of the connection on the device

Material: CuZn, gold-plated contacts of plug-in jack and connector

Devices with M12 plug

PIN assignment for M12 connector

PIN assignment for M12 connector	PIN	Meaning
	1	Signal +
	2	Not assigned
	3	Signal −
	4	Earth

Endress+Hauser offers the following accessories for devices with an M12 plug:
Plug-in jack M 12x1, straight
- Material: body PA; coupling nut CuZn, nickel-plated

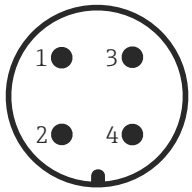
- Degree of protection (fully locked): IP66/67
- Order number: 52006263

Plug-in jack M 12x1, elbowed
- Material: body PBT/PA; coupling nut GD-Zn, nickel-plated
- Degree of protection (fully locked): IP66/67
- Order number: 71114212

Cable 4x0.34 mm² (20 AWG) with M12 socket, elbowed, screw plug, length 5 m (16 ft)
- Material: body PUR; coupling nut CuSn/Ni; cable PVC
- Degree of protection (fully locked): IP66/67
- Order number: 52010285

Devices with 7/8" plug

PIN assignment for 7/8" connector

PIN assignment for 7/8" connector	PIN	Meaning
 A0011176	1	Signal −
	2	Signal +
	3	Not assigned
	4	Shield

External thread: 7/8 - 16 UNC
- Material: 316L (1.4401)
- Protection: IP66/68

Cable specification

HART

- Endress+Hauser recommends using twisted, shielded two-wire cables.
- The cable outer diameter depends on the cable entry used.

PROFIBUS PA

Use a twisted, shielded two-wire cable, preferably cable type A

For further information on the cable specifications, see Operating Instructions BA00034S "PROFIBUS DP/PA: Guidelines for planning and commissioning", the PNO Guideline 2.092 "PROFIBUS PA User and Installation Guideline" and IEC 61158-2 (MBP).

FOUNDATION Fieldbus

Use a twisted, shielded two-wire cable, preferably cable type A

For further information on the cable specifications, see Operating Instructions BA00013S "FOUNDATION Fieldbus Overview", FOUNDATION Fieldbus Guideline and IEC 61158-2 (MBP).

Start-up current HART

12 mA or 22 mA (selectable)

Residual ripple

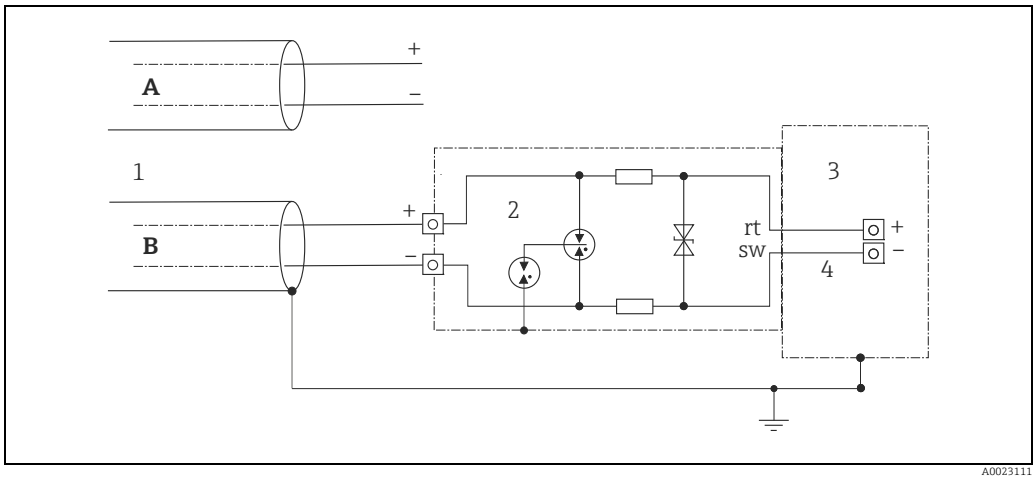
No influence on 4 to 20 mA signal up to ±5 % residual ripple within the permitted voltage range [according to HART hardware specification HCF_SPEC-54 (DIN IEC 60381-1)]

Influence of power supply

≤ 0.001 % of URL/V

Overvoltage protection (optional)

The device can be fitted with overvoltage protection. The overvoltage protection is mounted at the factory on the housing thread (M20x1.5) for the cable gland and is approx. 70 mm (2.76 in) in length (take additional length into account when installing). The device is connected as illustrated in the following graphic.
For details refer to TI001013KEN, XA01003KA3 and BA00304KA2.
Ordering information:
Product Configurator, "Mounted accessories" ordering feature, option NA



A Without direct shield grounding
B With direct shield grounding
1 Incoming connection cable
2 HAW569-DA2B
3 Unit to be protected
4 Connection cable

Performance characteristics

Reference operating conditions

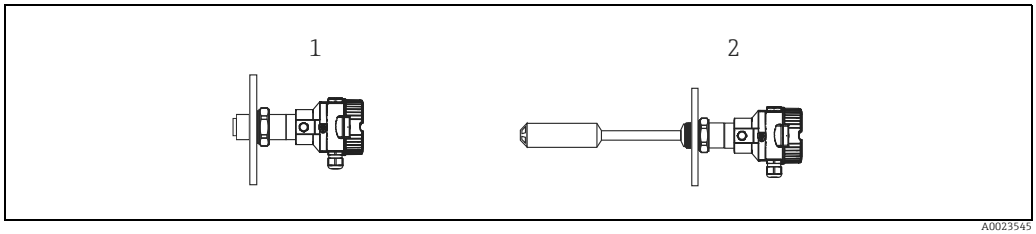
- As per IEC 60770
- Ambient temperature T_A = constant, in the range of: +21 to +33 °C (+70 to 91°F)
- Humidity φ = constant, in the range of: 5 to 80 % RH
- Ambient pressure p_A = constant, in the range of: 860 to 1060 mbar (12.47 to 15.37 psi)
- Position of the measuring cell: constant, in range: FMB50: horizontally ±1°
  FMB51/FMB52/FMB53: vertically ±1°
- Input of LOW SENSOR TRIM and HIGH SENSOR TRIM for lower range value and upper range value
- Span based on zero point
- Material of the process isolating diaphragm: Alloy C276 (2.4819) and Alloy C276 (2.4819) with coating (AuRh or AuPt)
- Measuring cell material (meter body): Alloy C276 (2.4819), 316L (1.4435)
- Filling oil: synthetic oil (FDA)/inert oil
- Supply voltage: 24 V DC ± 3 V DC
- Load with HART: 250 Ω

Influence of orientation

- < 2.3 mbar (0.0345 psi) when using synthetic oil (FDA)
- < 5 mbar (0.075 psi) when using inert oil

Position-dependent zero point shift can be corrected → 29, "General installation instructions" ordering feature.

Calibration position



1 FMB50

2 FMB51, FMB52, FMB53

To minimize the effect of the orientation (e.g. in the case of vertical device installation), position offset is preset at the factory.

Resolution

- Current output: 1 µA
- Display: can be set (factory setting: presentation of the maximum accuracy of the transmitter)

Reference accuracy

The reference accuracy comprises the non-linearity according to limit point setting, hysteresis and non-reproducibility as per IEC 60770. The data refer to the calibrated span.

Reference accuracy in % of the calibrated span			
Measuring cell	**TD**	**"Standard" option**[1]	**"Platinum" option**[1]
0.1 bar (1.5 psi)	▪ TD 1:1 to TD 2:1 ▪ TD > 2:1 to TD 4:1	▪ < 0.2 ▪ < 0.1 x TD	▪ < 0.15 ▪ < 0.075 x TD
0.4 bar (6 psi)	▪ TD 1:1 to TD 4:1 ▪ TD > 4:1 to TD 10:1	▪ < 0.2 ▪ < 0.05 x TD	▪ < 0.15 ▪ < 0.0375 x TD
1.2 bar (18 psi)	▪ TD 1:1 to TD 2:1 ▪ TD > 2:1 to TD 12:1	▪ < 0.2 ▪ < 0.1 x TD	▪ < 0.1 ▪ < 0.05 x TD
4 bar (60 psi)	▪ TD 1:1 to TD 4:1 ▪ TD > 4:1 to TD 20:1	▪ < 0.2 ▪ < 0.05 x TD	▪ < 0.1 ▪ < 0.025 x TD
10 bar (150 psi)	▪ TD 1:1 to TD 2.5:1 ▪ TD > 2.5:1 to TD 20:1	▪ < 0.2 ▪ < 0.08 x TD	▪ < 0.1 ▪ < 0.04 x TD

1) Product Configurator, "Reference accuracy" ordering feature

Thermal change in the zero output and the output span

Version	Measuring cell	-10 to +60 °C (+14 to +140°F)	60 to 85 °C (140 to 185°F)	Only FMB50: 85 to 100 °C (185 to 212°F)
		% of the calibrated span		
FMB50 FMB51/52/53 snap-on	0.1 bar (1.5 psi)	< (0.32 + 0.30 x TD)	< (0.34 + 0.40 x TD)	< (0.34 + 0.55 x TD)
FMB51/52/53 welded	0.1 bar (1.5 psi)	< (0.32 + 0.50 x TD)	< (0.34 + 0.60 x TD)	-
FMB50/51/52/53	0.4 bar (6 psi)	< (0.31 + 0.25 x TD)	< (0.32 + 0.30 x TD)	-
	1.2 bar (18 psi), 4 bar (60 psi), 10 bar (150 psi)	< (0.31 + 0.10 x TD)	< (0.32 + 0.15 x TD)	< (0.33 + 0.20 x TD)

Total performance

The "Total performance" specification comprises the non-linearity including hysteresis, non-reproducibility as well as the thermal change in the zero point.

Total performance in % of the URL				
Version	Measuring cell	-10 to +60 °C (+14 to +140°F)	60 to 85 °C (140 to 185°F)	85 to 100 °C (185 to 212°F)
FMB50 FMB51/52/53 snap-on	0.1 bar (1.5 psi)	< 0.35	< 0.45	< 0.6
FMB51/52/53 welded	0.1 bar (1.5 psi)	< 0.8	< 1	< 1.4
FMB50/51/52/53	0.4 bar (6 psi)	< 0.35	< 0.45	< 0.6
	1.2 bar (18 psi), 4 bar (60 psi), 10 bar (150 psi)	< 0.15	< 0.2	< 0.25

Long-term stability

Measuring cell	Long-term stability [%]
0.1 bar (1.4 psi)	▪ < 0.18 of the upper range limit (URL) / year ▪ < 0.45 of the upper range limit (URL) / 5 years
0.4 bar (6 psi) 1.2 bar (18 psi)	▪ < 0.1 of the upper range limit (URL) / year ▪ < 0.25 of the upper range limit (URL) / 5 years
4 bar (60 psi) 10 bar (150 psi)	▪ < 0.05 of the upper range limit (URL) / year ▪ < 0.125 of the upper range limit (URL) / 5 years

Total error

The total error comprises the long-term stability and the total performance:

Measuring cell	% of the URL/year (in the permitted temperature range)
0.1 bar (1.5 psi)	▪ Snap-on: ±0.63 ▪ Welded: ±1.0
0.4 bar (6 psi)	±0.61
1.2 bar (18 psi)	±0.27
4 bar (60 psi), 10 bar (150 psi)	±0.25

Warm-up period

- 4 to 20 mA HART:
  - FMB50 = ≤5 s
  - FMB51/FMB52/FMB53 = ≤8 s
- PROFIBUS PA: ≤8 s
- FOUNDATION Fieldbus: ≤20 s (after a TOTAL-reset ≤45 s)

Installation

General installation instructions

- The position-dependent zero point shift can be corrected:
  - directly at the device via an operating key
  - directly at the device via operating keys on the display
  - via digital communication if the cover is not open

⚠ WARNING

Risk of explosion!
In hazardous areas, comply strictly with the safety instructions when the housing cover is closed and open.

- The local display can be rotated in 90° stages.

FMB50

Level measurement

- Always install the device below the lowest measuring point.
- Do not install the device at the following positions:
  - in the filling curtain
  - in the tank outflow
  - or at a point in the tank that can be affected by pressure pulses from the agitator
- The calibration and functional test can be carried out more easily if you mount the device downstream of a shutoff device.
- Deltapilot M must be included in the insulation for media that can harden when cold.

Pressure measurement in gases

Mount Deltapilot M with shutoff device above the tapping point so that any condensate can flow into the process.

Pressure measurement in steams

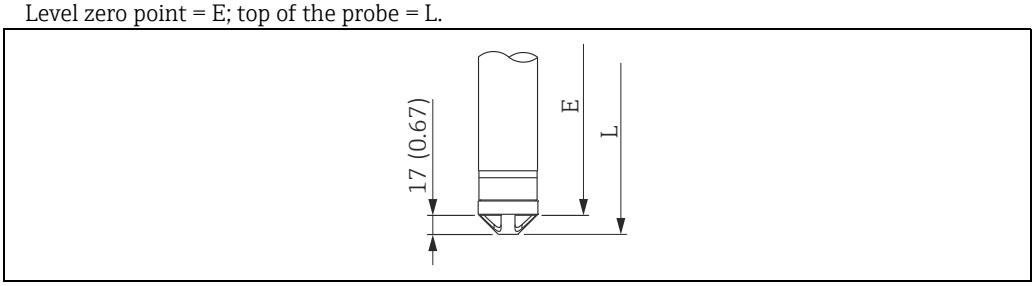
- Mount Deltapilot M with siphon above the tapping point.
- Fill the siphon with liquid before commissioning.
  The siphon reduces the temperature to almost the ambient temperature.

Pressure measurement in liquids

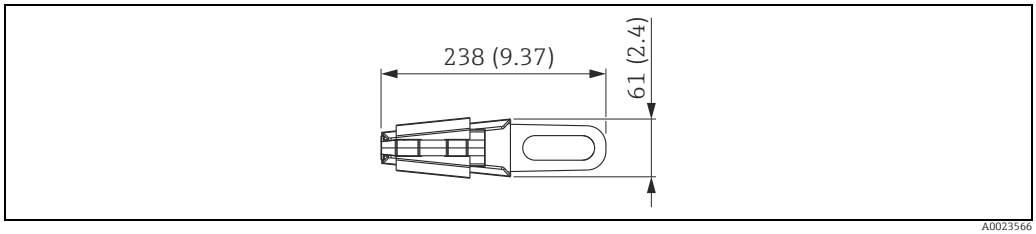
Mount Deltapilot M with the shutoff device below or at the same level as the tapping point.

FMB51/FMB52/FMB53

- When mounting rod and cable versions, make sure that the probe head is located at a point as free as possible from flow. To protect the probe from impact resulting from lateral movement, mount the probe in a guide tube (preferably made of plastic) or secure it with a clamping fixture.
- In the case of devices for hazardous areas, comply strictly with the safety instructions when the housing cover is open.
- The length of the extension cable or the probe rod is based on the planned level zero point.
  The height of the protective cap must be taken into consideration when designing the layout of the measuring point. The level zero point (E) corresponds to the position of the process isolating diaphragm.
  Level zero point = E; top of the probe = L.



- Suspension clamp (required for FMB53)
  Material: → 56 ff
  Ordering information:
  Order number: 52010869 → 67 ff
  Product Configurator, "Accessory enclosed" ordering feature, option "PO".



Engineering unit mm (in)

Supplementary installation instructions

Process isolating diaphragm
- Do not clean or touch process isolating diaphragms with hard or pointed objects.
- The process isolating diaphragm in the rod and cable version is protected against mechanical damage by a plastic cap.

Seal
- Deltapilot M devices with a G 1 ½ thread:
  When screwing the device into the tank, the flat seal has to be positioned on the sealing surface of the process connection. To avoid additional strain on the process isolating diaphragm, the thread should never be sealed with hemp or similar materials.
- Deltapilot M devices with NPT threads:
  – Wrap Teflon tape around the thread to seal it.
  – Tighten the device at the hexagonal bolt only. Do not turn the device at the housing.
  – Do not overtighten the thread when screwing in the screw. Max. torque: 20 to 30 Nm (14.75 to 22.13 lbf ft)

Sealing the probe housing
Moisture must not penetrate the housing when mounting the device, establishing the electrical connection and during operation.
- Always firmly tighten the housing cover and the cable entries.
- Lubricant is provided on the O-ring seal in the housing cover and on the thread of the aluminum cover. To ensure that the cover seals tight, any lubricant which has been removed must be replaced. Use silicone grease or graphite paste as the lubricant. Mineral oil-based grease can destroy the O-ring.

PE cable length > 300 m (984 ft)
- Two suspension clamps must be used for PE cables longer than 300 meters (984 ft).

Cable length tolerances
- FMB52
  – Cable length < 5 m (16 ft): up to -35 mm (-1.38 in)
  – Cable length 5…10 m (16…33 ft): up to -75 mm (-2.95 in)
  – Cable length 10…100 m (33…328 ft): up to -100 mm (-3.94 in)
- FMB53
  – Cable length < 5 m (16 ft): up to ±17.5 mm (±0.69 in)
  – Cable length 5…10 m (16…33 ft): up to ±37.5 mm (±1.48 in)
  – Cable length 10…100 m (33…328 ft): up to ±50 mm (±1.97 in)

Rod length tolerances
- FMB51
  – Rod length < 4000 mm (157 in): up to -4 mm (-0.16 in)

Wall and pipe mounting

Endress+Hauser offers a mounting bracket for installing the device on pipes or walls. The mounting bracket is
- included in the delivery for the FMB50/51/52 with a separate housing (available for order via feature 600) and for the FMB53
- available for order as a separate accessory (Part No.: 71102216).

For the dimensions, see → 50.

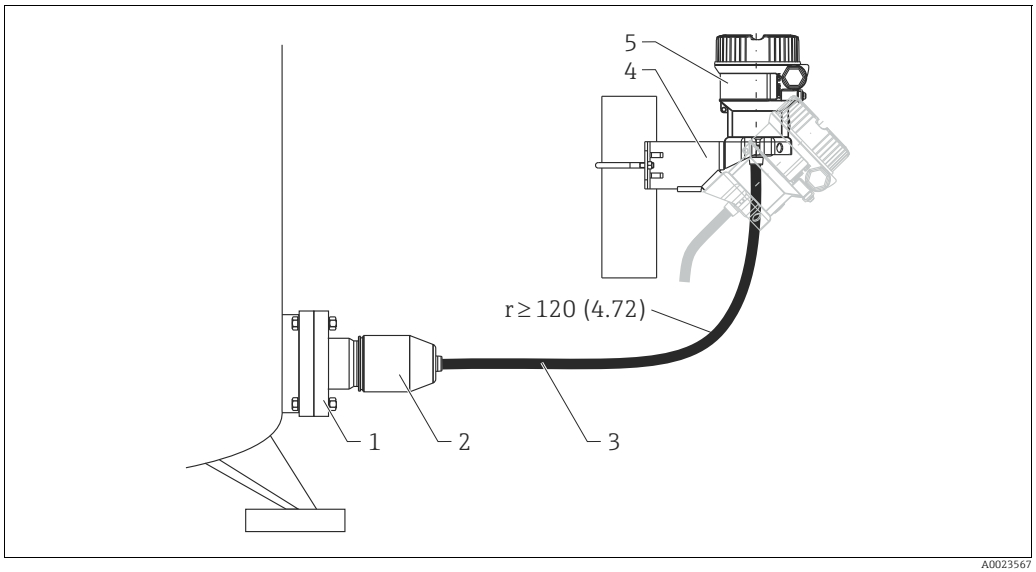
"Separate housing" version

With the "separate housing" version, you are able to mount the housing with the electronics insert at a distance from the measuring point. This allows for trouble-free measurement:
- Under particularly difficult measuring conditions (at installation locations that are cramped or difficult to access)
- If rapid cleaning of the measuring point is required
- If the measuring point is exposed to vibrations

You can choose between different cable versions:
- PE (2 m (6.6 ft), 5 m (16 ft) and 10 m (33 ft))
- FEP (5 m (16 ft)).

Ordering information:
Product Configurator, "Separate housing" ordering feature
Product Configurator, "Enclosed accessories" ordering feature, option PA

For the dimensions, see → 50.



A0023567

Engineering unit mm (in)

In the case of the "separate housing" version, the sensor is delivered with the process connection and cable ready mounted. The housing and a mounting bracket are enclosed as separate units. The cable is provided with a socket at both ends. These sockets are simply connected to the housing and the sensor.

1 Process connection with sensor - see the following section for the degrees of protection
2 Process connection adapter (weight 0.93 kg (2.05 lbs))
3 Cable (weight 0.05 kg/Meter (0.11 lbs/meter)), both ends are fitted with a socket
4 Mounting bracket provided, suitable for pipe and wall mounting (for pipes from 1 1/4" up to 2" diameter)
5 Housing with electronic insert - degrees of protection → 33 ff

Degree of protection for the process connection and sensor with the use of
- FEP cable:
  - IP69[1)]
  - IP66 NEMA 4/6P
  - IP68 (1.83 mH_2O for 24 h) NEMA 4/6P
- PE cable:
  - IP66 NEMA 4/6P
  - IP68 (1.83 mH_2O for 24 h) NEMA 4/6P

Technical data of the PE and FEP cable:
- Minimum bending radius: 120 mm (4.72 in)
- Cable extraction force: max. 450 N (101 lbf)
- Resistance to UV light

Use in hazardous area:
- Intrinsically safe installations (Ex ia/IS)
- FM/CSA IS: for Div.1 installation only

1) Identification of IP protection category according to DIN EN 60529. The earlier designation “IP69K” according to DIN 40050 Part 9 is no longer valid (the standard was withdrawn on November 1, 2012). The tests required for both standards are identical.

Oxygen applications

Oxygen and other gases can react explosively to oils, grease and plastics. As a result, the following are some of the precautions that must be taken:
- All components of the system, such as measuring devices, must be cleaned in accordance with the BAM (DIN 19247) requirements.
- Depending on the materials used, a certain maximum temperature and maximum pressure must not be exceeded for oxygen applications. The maximum temperature T_{max} for oxygen applications is 60 °C (140°F).

The devices suitable for gaseous oxygen applications are listed in the following table with the specification p_{max}.

Order code for devices[1] cleaned for oxygen applications	p_{max} for oxygen applications
FMB50 [2]	▪ Depends on the lowest-rated element, with regard to pressure, of the selected components: over pressure limit (OPL) of the sensor or process connection (1.5 x PN)[3] ▪ Depends on filling oil [4]
FMB51 [2]	▪ Depends on the lowest-rated element, with regard to pressure, of the selected components: over pressure limit (OPL) of the sensor or process connection (1.5 x PN) [3] ▪ Depends on filling oil [4] ▪ Depends on seal material

1) Only device, not accessory or enclosed accessory

2) Product Configurator, "Service" ordering feature, option "HB"

3) → 14, "Measuring range" ordering feature and → 36 ff, "Mechanical construction" ordering feature

4) Oxygen applications possible with FKM seal and inert oil.

PWIS cleaning

Special cleaning of the transmitter to remove paint-wetting substances, for use in paint shops, for instance.
Ordering information: Product Configurator, "Service" ordering feature, option HC
The stability of the materials used must be checked before using them in the medium.
The protective cap of the process isolating diaphragm must be removed if necessary (FMB51/FMB52/FMB53).

Applications with hydrogen

A **gold-plated** metal process isolating diaphragm offers universal protection against hydrogen diffusion, both in gas applications and in applications with aqueous solutions.

Applications with hydrogen in aqueous solutions

A **gold/rhodium-plated** metal process isolating diaphragm (AU/Rh) offers effective protection against hydrogen diffusion.

Special measuring cells for acids, alkalis or sea water (not FMB50)

For acids, alkalis or sea water, Endress+Hauser offers process isolating diaphragms with a gold/platinum coating.

NOTICE

With temperature exposure (up to 85°C(185°F)) there is an additional zero point deviation of 1.1 mbar (0.0165 psi).

Ordering information:
Product Configurator, "Process isolating diaphragm material" ordering feature, option N

Environment

Ambient temperature limits

Version	FMB50	FMB51	FMB52	FMB53
Without LCD display	−40 °C to +85 °C (-40°F to +185°F)		With PE cable: -40 °C to +70 °C (-40°F to +158°F) With FEP cable: −40 °C to +80 °C (-40°F to +176°F)	
With LCD display [1]	−20 °C to +70 °C (-4°F to +158°F)			
With M12 plug , elbowed	-25 °C to +85 °C (-13°F to +185°F)		With PE cable: -25 °C to +70 °C (-13°F to +158°F) With FEP cable: -25 °C to +80 °C (-13°F to +176°F)	
With separate housing (PE and FEP cable)	-20 °C to +60 °C (-4°F to +140°F)			

1) Extended temperature application range (-40 °C to +85 °C (−40°F to +185°F)) with restrictions in optical properties such as display speed and contrast

Storage temperature range

Version	FMB50	FMB51	FMB52	FMB53
Without LCD display	−40 °C to +90 °C (-40°F to +194°F)		With PE cable: -40 °C to +70 °C (-40°F to +158°F) With FEP cable: −40 °C to +80 °C (-40°F to +176°F)	
With LCD display	−40 °C to +85 °C (-40°F to +185°F)			
With M12 plug , elbowed	-25 °C to +90 °C (-13°F to +194°F)		With PE cable: -25 °C to +70 °C (-13°F to +158°F) With FEP cable: -25 °C to +80 °C (-13°F to +176°F)	
With separate housing and FEP cable	-20 °C to +60 °C (-4°F to +140°F)			

Climate class

Class 4K4H (air temperature: −20 to 55 °C (−4 to +131°F), relative humidity: 4 to 100%) satisfied as per DIN EN 60721-3-4 (condensation possible)

Degree of protection

- F31 housing: IP 68 (1.83 mH_2O for 24 h)
- Ordering information:
  Product Configurator, "Electrical connection" ordering feature
- Separate housing → 31

Vibration resistance

Device/accessory	Test standard	Vibration resistance
FMB50, FMB52, FMB53	GL VI-7-2 ▪ Part 7: Guidelines for the Performance of Type Approvals ▪ Chapter 2: Test Requirements for Electrical / Electronic Equipment and Systems	Guaranteed for: 5 to 25 Hz: ±1.6 mm (0.06 in); 25 to 100 Hz: 4 g in all 3 planes
FMB50, FMB52, FMB53 with mounting bracket	IEC 61298-3	Guaranteed for: 10 to 60 Hz: ±0.15 mm (0.01 in); 60 to 500 Hz: 2 g in all 3 planes
FMB51	IEC 60068-2-6	Guaranteed for: 10 to 60 Hz: ±0.075 mm (0.003 in) 60 to 150 Hz 1g in all 3 planes

Electromagnetic compatibility

- Electromagnetic compatibility as per all the relevant requirements of the EN 61326 series and NAMUR Recommendation EMC (NE21).
- Max. deviation during EMC-tests < 0.5% of the span
- All tests were performed with full measurement range (TD 1:1).

Further details can be found in the manufacturer declaration.

Process

Process temperature range

FMB50	FMB51	FMB52	FMB53
−10 °C to +100 °C (+14°F to 212°F) 135 °C (275°F) for 30 min. maximum	−10 °C to +85 °C (+14°F to +185°F)	With PE cable: -10 °C to +70 °C (-14°F to 158°F) With FEP cable: −10 °C to +80 °C (-14°F to 176°F)	
	Min. process temperature when using the KALREZ seal: -3 °C (27°F)		

Lateral load FMB51 (static)

≤30 Nm

Pressure specifications

⚠ WARNING

The maximum pressure for the measuring device depends on the lowest-rated element with regard to pressure → 🗎 14 ff, "Measuring range" ordering feature and → 🗎 36 ff "Mechanical construction" ordering feature

- Only operate the measuring device within the prescribed limits!
- The Pressure Equipment Directive (EC Directive 97/23/EC) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the measuring device.
- The MWP (maximum working pressure) is specified on the nameplate. This value refers to a reference temperature of +20 °C (68°F), (100°F (38 °C) for ANSI flanges), and may be applied to the device for an unlimited time. Pay attention to pressure-temperature dependencies. Please refer to the following standards for pressure values permitted at higher temperatures
  EN 1092-1: 2001 Tab. 18 [2)]
  ASME B 16.5a – 1998 Tab. 2-2.2 F316
  ASME B 16.5a – 1998 Tab. 2.3.8 N10276
  JIS B 2220.
- OPL (Over Pressure Limit = sensor overload limit):
  The test pressure corresponds to the over pressure limit of the sensor and may only be applied for a limited time period to ensure measurement within specification and in order to avoid permanent damage. In the case of sensor range and process connections where the over pressure limit (OPL) of the process connection is smaller than the nominal value of the sensor, the device is set at the factory, at the very maximum, to the OPL value of the process connection. If you want to use the entire sensor range, select a process connection with a higher OPL value.
- Oxygen applications:
  The values for "p_{max} and T_{max} for oxygen applications" as per → 🗎 32, "Oxygen applications" may not be exceeded.
- Avoid steam hammering!
  Steam hammering can cause zero point drift.
  Recommendation: Residue (such as condensation or drops of water) can remain at the process isolating diaphragm after CIP cleaning and lead to local steam hammering if immediately steam is introduced. In practice, drying the process isolating diaphragm (e.g. by blowing off excess moisture) has proven to be a successful way of avoiding steam hammering.

2) With regard to their stability-temperature property, the materials 1.4435 and 1.4404 are grouped together under 13E0 in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.

Mechanical construction

Device height

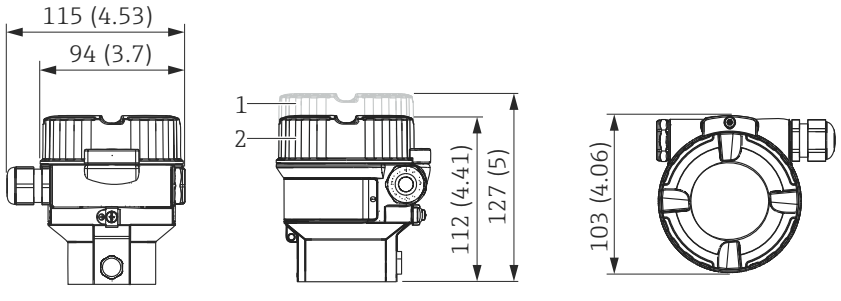
The device height is calculated from

- the height of the housing and
- the height of the individual process connection.

The individual heights of the components are listed in the following sections. To calculate the device height simply add up the individual heights of the components. Where applicable also take into consideration the installation distance (space that is used to install the device).
You can use the following table for this purpose:

Section	Page	Height
Housing height	→ 36 ff	
Process connections	→ 37 ff	
Installation distance		
Device height		

F31 housing, aluminum



Engineering unit mm (in)

1 Cover with viewing window
2 Cover without viewing window

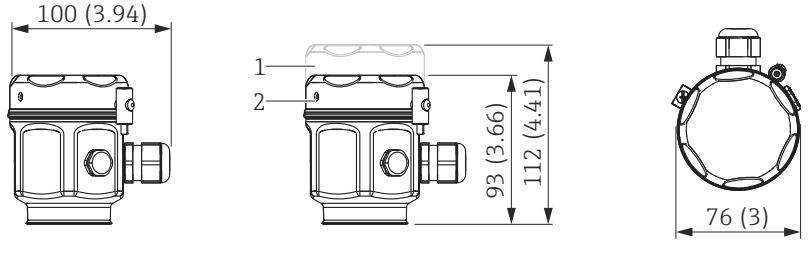
Front view, left-hand side view, top view

Material	Weight kg (lbs)		Option [1]
	With display	Without display	
Aluminum [2]	1.1 (2.43)	1.0 (2.21)	I
Aluminum with glass viewing window [2]			J

1) Product Configurator, "Housing" ordering feature

2) Degree of protection dependent on cable entry used → 23

F15 housing, stainless steel (hygienic)



Engineering unit mm (in)

1 Cover with viewing window
2 Cover without viewing window

Front view, left-hand side view, top view

Material	Weight kg (lbs)		Option [1]
	With display	Without display	
Stainless steel [2]	1.1 (2.43)	1.0 (2.21)	Q
Stainless steel with glass viewing window [2]			R
Stainless steel with plastic viewing window [2]			S

1) Product Configurator, "Housing" ordering feature

2) Degree of protection dependent on cable entry used → 🖹 23

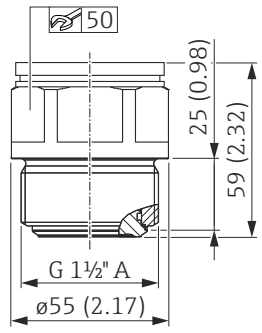
Diameter of the process isolating diaphragm

35.8 mm (1.41 in)

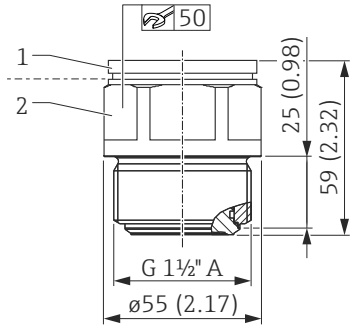
Process connections FMB50, FMB51, FMB52

ISO 228 G threaded connection

A



B

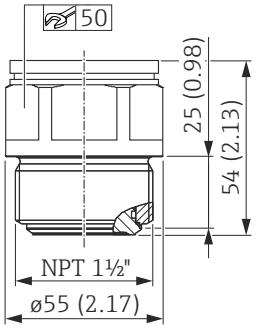


Engineering unit mm (in)

Item	Designation	Material	Weight kg (lbs)	Option [1]
A	Thread ISO 228 G 1 ½" A	AISI 316L (1.4435)	0.8 (1.76)	GGJ
B	Thread ISO 228 G 1 ½" A	▪ 1: top section AISI 316L (1.4435) ▪ 2: bottom section Alloy C276 (2.4819)		GGC

1) Product Configurator, “Process connection” section

Threaded connection NPT



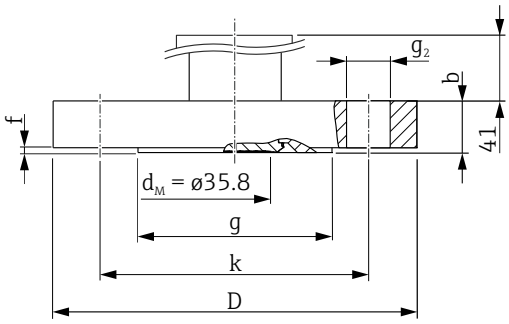
Engineering unit mm (in)

Designation	Material	Weight kg (lbs)	Option [1]
Thread ANSI 1 ½" MNPT	AISI 316L (1.4435)	0.8 (1.76)	RGJ

1) Product Configurator, “Process connection” section

Process connections FMB50, FMB51, FMB52

EN/DIN flanges, connection dimensions as per EN 1092-1/DIN 2527



Engineering unit mm

Flange [1]								Boltholes			Weight	Option [2]
Material [3]	Nominal diameter	Nominal pressure	Shape [4]	D	Thickness b	Diameter of raised face g	Height of raised face f	Quantity	g_2	Hole circle k		
				[mm]	[mm]	[mm]	[mm]		[mm]	[mm]	[kg (lbs)]	
AISI 316L	DN 40	PN 10/16	B1 (C)	150	18	88	2	4	18	110	3.05 (6.72)	CEJ
AISI 316L	DN 50	PN 10/16	B1 (C)	165	18	102	2	4	18	125	3.75 (8.27)	CFJ
AISI 316L	DN 80	PN 10/16	B1 (C)	200	20	138	2	8	18	160	5.55 (12.24)	CGJ
AISI 316L	DN 100	PN 10/16	B1 (C)	220	20	158	2	8	18	180	6.75 (14.88)	CHJ

1) The roughness of the surface in contact with the medium, including the sealing surface of the flanges, is < R_a 0.8 µm (31.5 µin). Lower surface roughness available on request.

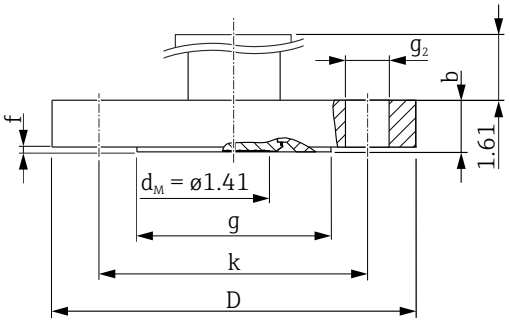
2) Product Configurator, “Process connection” section

3) Endress+Hauser supplies DIN/EN stainless steel flanges as per AISI 316L (DIN/ EN material number 1.4404 or 14435). With regard to their stability-temperature property, the materials 1.4404 and 1.4435 are grouped together under 13E0 in EN 1092-1: 2001 Tab.18. The chemical composition of the two materials can be identical.

4) Designation as per DIN 2526 in brackets

Process connections FMB50, FMB51, FMB52 - continued

ASME flanges, connection dimensions as per ANSI B 16.5, raised face RF



Engineering unit in

Flange [1]							Boltholes			Weight	Option [2]
Material [3]	Nominal diameter	Class	D	Thickness b	Diameter of raised face g	Height of raised face f	Quantity	Diameter g_2	Hole circle k		
	[in]	[lb./sq in]	[in]	[in]	[in]	[in]		[in]	[in]	[kg (lbs)]	
AISI 316/316L	1 ½	150	5	0.69	2.88	0.06	4	0.62	3.88	2.55 (5.62)	AEJ (not FMB51/52)
AISI 316/316L	2	150	6	0.75	3.62	0.06	4	0.75	4.75	3.45 (7.61)	AFJ
AISI 316/316L	3	150	7.5	0.94	5	0.06	4	0.75	6	6.15 (13.56)	AGJ
AISI 316/316L	4	150	9	0.94	6.19	0.06	8	0.75	7.5	8.25 (18.19)	AHJ

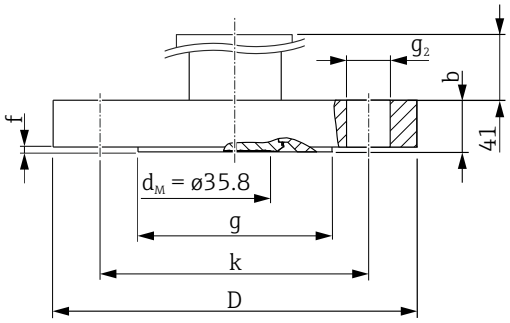
1) The roughness of the surface in contact with the medium, including the sealing surface of the flanges, is < R_a 0.8 µm (31.5 µin). Lower surface roughness available on request.

2) Product Configurator, “Process connection” section

3) Combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated)

Process connections FMB50, FMB51, FMB52 - continued

JIS flanges, connection dimensions as per JIS B 2220 BL, raised face RF



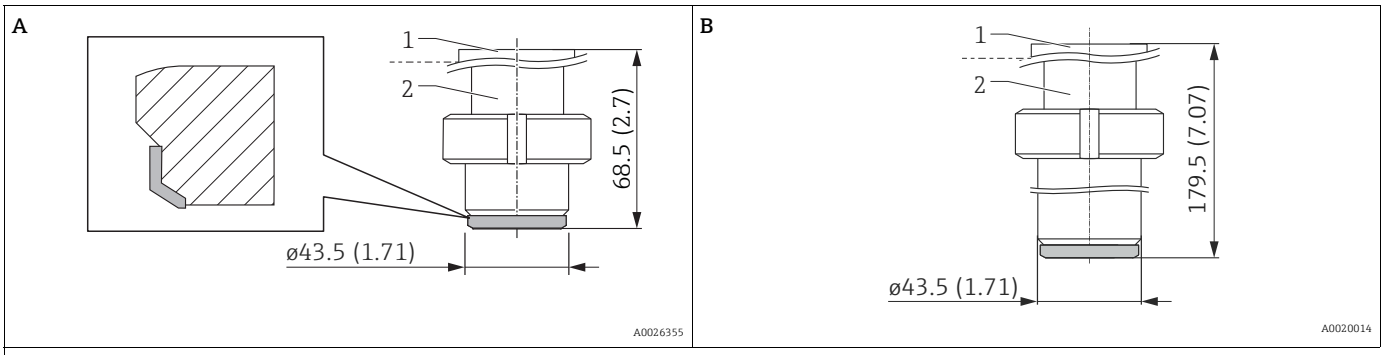
Engineering unit mm

Flange [1]							Boltholes			Weight	Option [2]
Material	Nominal diameter	Nominal pressure	D	Thickness b	Diameter of raised face g	Height of raised face f	Quantity	Diameter g_2	Hole circle k		
			[mm]	[mm]	[mm]	[mm]		[mm]	[mm]	[kg (lbs)]	
AISI 316L (1.4435)	40 A	10 K	140	16	81	2	4	19	105	2.55 (5.62)	KEJ
	50 A	10 K	155	16	96	2	4	19	120	2.95 (6.50)	KFJ
	80 A	10 K	185	18	126	2	8	19	150	4.25 (9.37)	KGJ
	100 A	10 K	210	18	151	2	8	19	175	5.35 (11.79)	KHJ

1) The roughness of the surface in contact with the medium, including the sealing surface of the flanges (all standards), is < R_a 0.8 µm (31.5 µin). Lower surface roughness available on request.

2) Product Configurator, “Process connection” section

Process connections FMB50 - continued **Universal adapter**



Engineering unit mm (in)

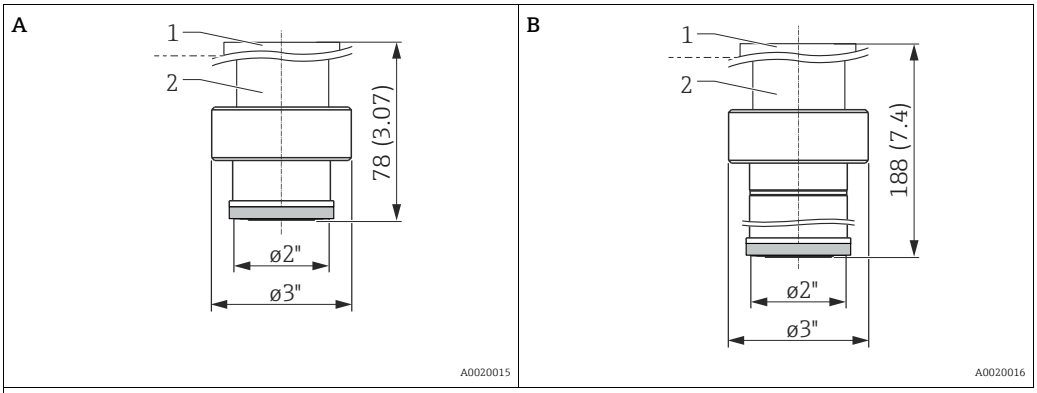
Item[1)]	Designation	Material	Approval	Weight kg (lbs)	Option [2)]
A	Universal process adapter incl. silicone molded seal (spare part no.: 52023572) FDA 21CFR177.2600/USP Class VI-70C	▪ 1: top section AISI 316L (1.4404) ▪ 2: bottom section AISI 316L (1.4435)	EHEDG, 3A	0.8 (1.76)	UPJ [3)]
	Universal process adapter incl. EPDM molded seal (order no.: 71100719) EPDM-70, FDA, USP Class VI; (5 pieces)		EHEDG, 3A		UNJ [3)]
B	Universal process adapter, 6 inch extension incl. silicone molded seal (spare part no.: 52023572) FDA 21CFR177.2600/USP Class VI-70C		EHEDG, 3A	1.7 (3.75)	UQJ [3)]
	Universal process adapter, 6 inch extension incl. EPDM molded seal (order no.: 71100719) EPDM-70, FDA, USP Class VI; (5 pieces)		EHEDG, 3A		UOJ [3)]

1) Surface roughness of the surfaces in contact with the medium R_a ≤0.76 µm (30 µin) as standard. Surface roughness R_a<0.38 µm electropolished (wetted) Ordering information: Product Configurator, "Service" ordering feature, option "HK".

2) Product Configurator, “Process connection” section

3) Endress+Hauser supplies these slotted nuts in stainless steel AISI 304 (1.4301) or in AISI 304L (1.4307).

Anderson process adapter



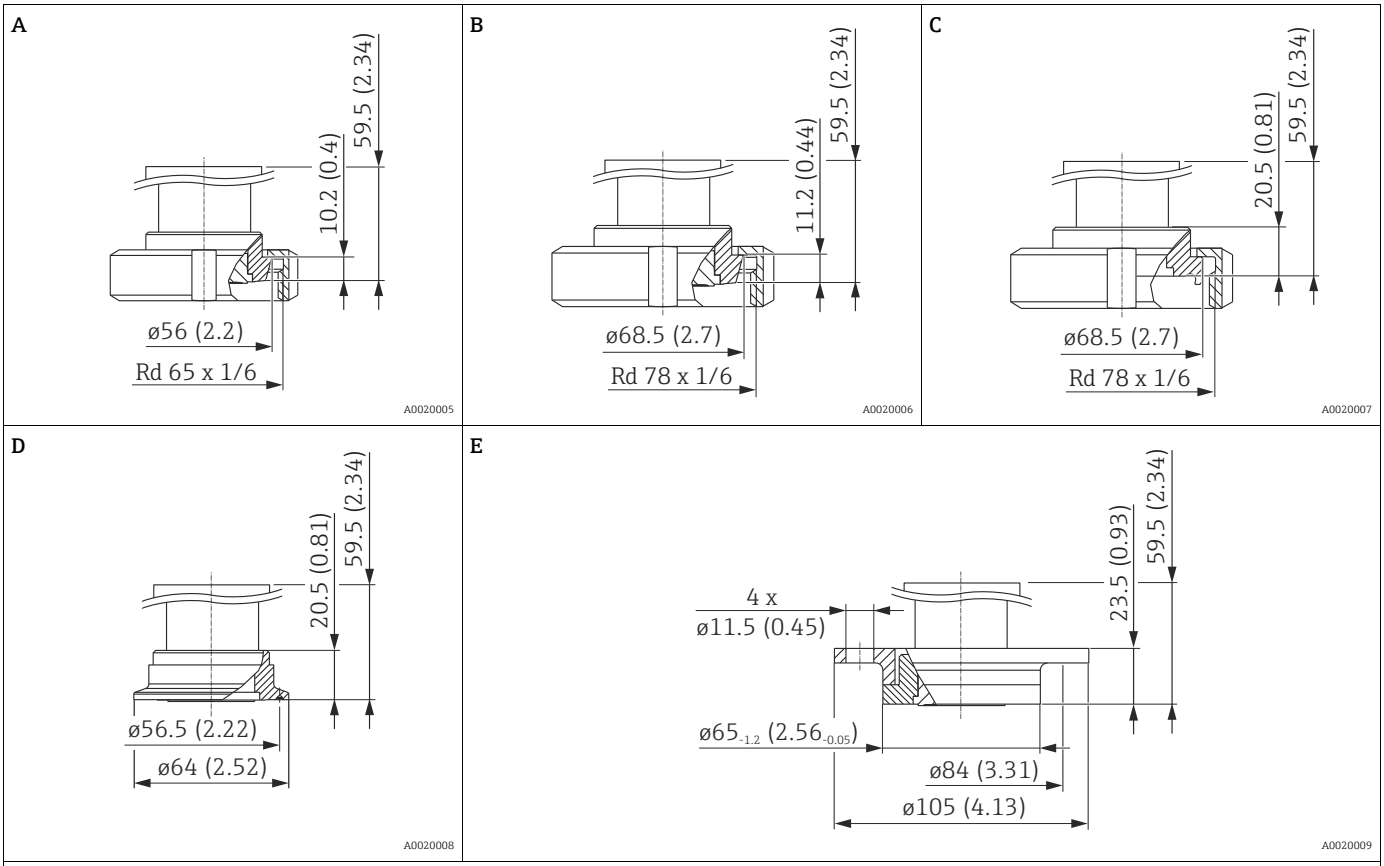
Engineering unit mm (in)

Item[1)]	Designation	Material	Approval	Weight kg (lbs)	Option [2)]
A	Short Anderson process adapter, 2-3/16", 316L, incl. silicone molded seal FDA 21CFR177.2600	▪ 1: top section AISI 316L (1.4404) ▪ 2: bottom section AISI 316L (1.4435) ▪ Slotted nut AISI 316L (1.4404)	3A	1.5 (3.31)	USJ
B	Long Anderson process adapter, 6-1/2", 316L, incl. silicone molded seal FDA 21CFR177.2600		3A	2.9 (6.39)	UTJ

1) Surface roughness of the surfaces in contact with the medium R_a ≤0.76 µm (30 µin) as standard. Lower surface roughness available on request.

2) Product Configurator, “Process connection” section

Process connections FMB50 - continued **Hygienic connections**



Engineering unit mm (in)

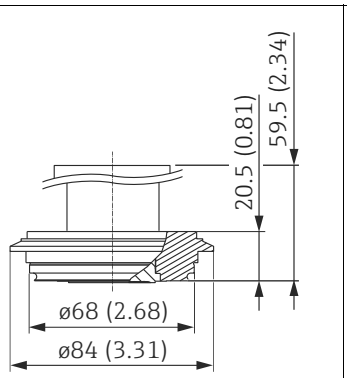
Item[1)]	Designation	Material	Approval	Weight kg (lbs)	Option [2)]
A	DIN 11851 DN 40 PN 25	AISI 316L (1.4435)	EHEDG, 3A	0.7 (1.54)	MZJ[3)]
B	DIN 11851 DN 50 PN 25		EHEDG, 3A	0.9 (1.98)	MRJ [3)]
C	DIN11864-1 A DN50 PN16 pipe DIN11866-A, slotted nut, 316L		EHEDG, 3A	1 (2.21)	NDJ [3)]
D	Tri-Clamp ISO 2852 DN 40 – DN 51 (2"), DIN 32676 DN 50		EHEDG, 3A	0.7 (1.54)	TDJ [3)]
E	DRD DN 50 (65 mm) PN 25, slotted nut AISI 304 (1.4301)		-	1.1 (1.98)	TIJ

1) Surface roughness of the surfaces in contact with the medium R_a ≤0.76 µm (30 µin) as standard. Lower surface roughness available on request.

2) Product Configurator, "Process connection" section

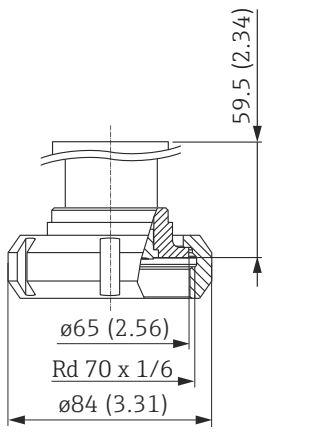
3) Endress+Hauser supplies these slotted nuts in stainless steel AISI 304 (DIN/EN material number 1.4301) or in AISI 304L (DIN/EN material number 1.4307).

F



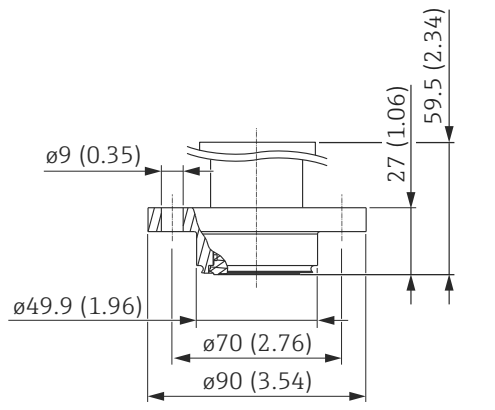
Engineering unit mm (in)

G



Engineering unit mm (in)

H



Engineering unit mm (in)

Item[1)]	Designation	Material	Approval	Weight kg (lbs)	Option [2)]
F	Varivent Type N for pipes 40 – 162, PN 40	AISI 316L (1.4435)	EHEDG, 3A	1 (2.21)	TRJ
G	SMS 2", PN 25		EHEDG, 3A	0.7 (1.54)	TXJ[3)]
H	NEUMO, D50, PN 16, 316L		3A	0.8 (1.76)	S4J

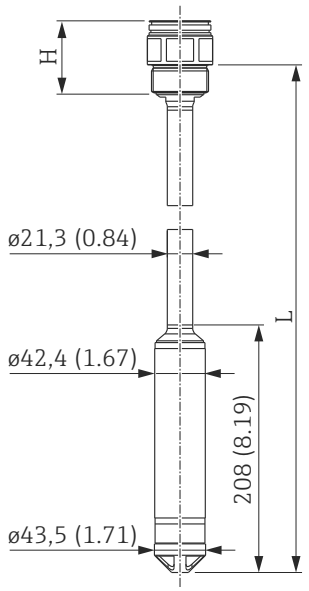
1) Surface roughness of the surfaces in contact with the medium R_a ≤0.76 µm (30 µin) as standard. Lower surface roughness available on request.

2) Product Configurator, “Process connection” section

3) Endress+Hauser supplies these slotted nuts in stainless steel AISI 304 (DIN/EN material number 1.4301) or in AISI 304L (DIN/EN material number 1.4307).

Process connections FMB51 (rod version)

Threaded connection ISO 228 and NPT

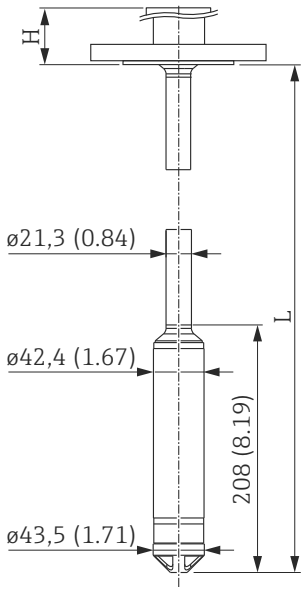


H *For dimensions of process connections → 36 ff*
L *Probe length L = 0.4 m to 4 m (1.3 ft to 13 ft) - see Product Configurator, "Probe connection" section*

Engineering unit mm (in)

Process connection incl. sensor	Weight
Housing weight	→ 36 ff
Process connection weight	→ 37 ff
Pipe incl. cable	0.77 kg/m (1.70 lbs/3.3 ft)
Threaded connection incl. measuring cell tube and sensor	1.65 kg (3.64 lbs)
Flange connection incl. measuring cell tube and sensor, without a flange	-
Total weight of device	

EN/DIN, ANSI and JIS flanges



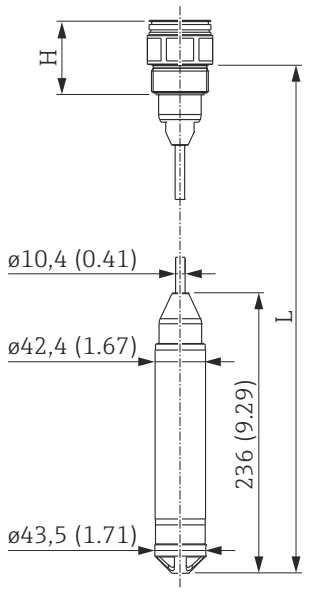
H *For dimensions of process connections → 36 ff*
L *Probe length L = 0.4 m to 4 m (1.3 ft to 13 ft) - see Product Configurator, "Probe connection" section*

Engineering unit mm (in)

Process connection incl. sensor	Weight
Housing weight	→ 36 ff
Process connection weight	→ 37 ff
Pipe incl. cable	0.77 kg/m (1.70 lbs/3.3 ft)
Threaded connection incl. measuring cell tube and sensor	-
Flange connection incl. measuring cell tube and sensor, without a flange	1.3 kg (2.87 lbs)
Total weight of device	

Process connections FMB52 (cable version)

Threaded connection ISO 228 and NPT

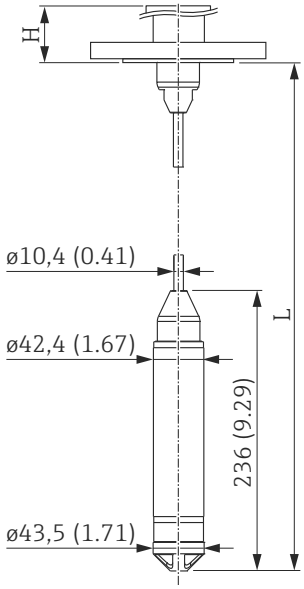


H *For dimensions of process connections → 36 ff*
L *Probe length L = 0.5 to 400 m (1.6 to 1312 ft) - see Product Configurator, "Probe connection" section*

Engineering unit mm (in)

Process connection incl. sensor	Weight
Housing weight	→ 36 ff
Process connection weight	→ 37 ff
PE cable	0.13 kg/m (0.28 lbs/3.3 ft)
FEP cable	0.18 kg/m (0.40 lbs/3.3 ft)
Threaded connection incl. measuring cell tube and sensor	1.65 kg (3.64 lbs)
Flange connection incl. measuring cell tube and sensor, without a flange	-
Total weight of device	

EN/DIN, ANSI and JIS flanges

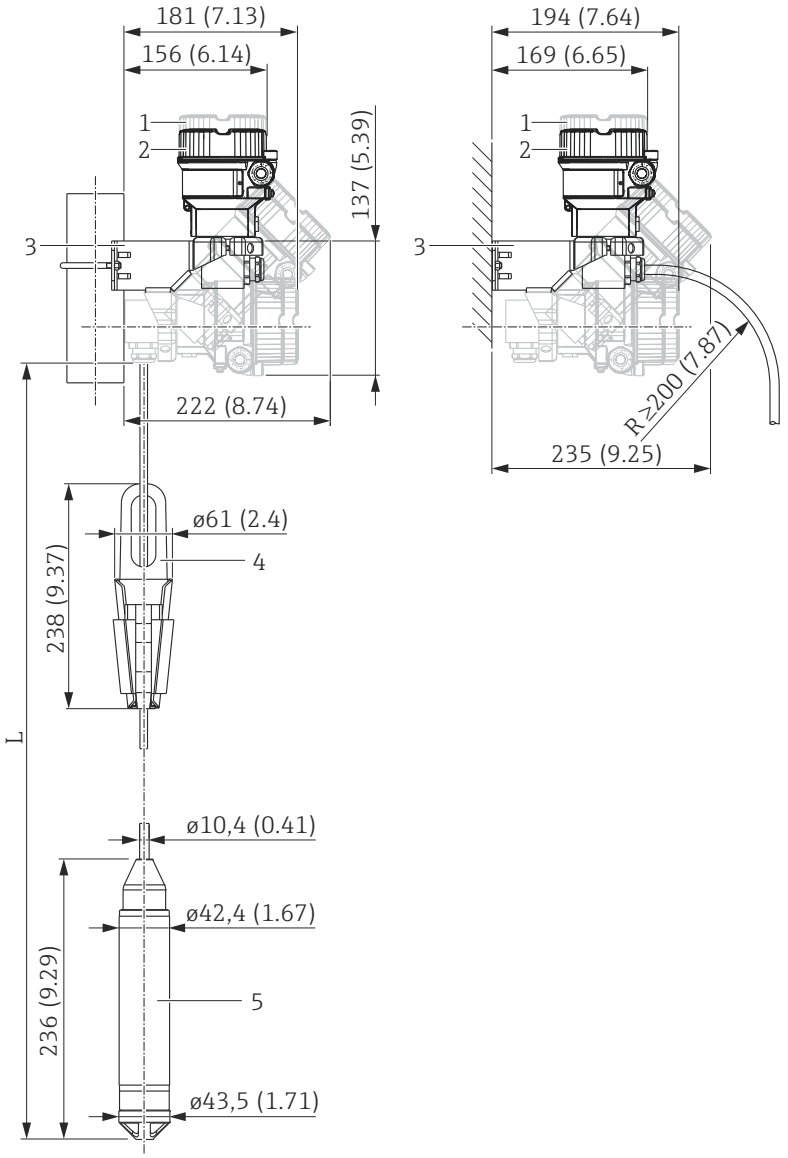


H *For dimensions of process connections → 36 ff*
L *Probe length L = 0.5 to 400 m (1.6 to 1312 ft) - see Product Configurator, "Probe connection" section*

Engineering unit mm (in)

Process connection incl. sensor	Weight
Housing weight	→ 36 ff
Process connection weight	→ 37 ff
PE cable	0.13 kg/m (0.28 lbs/3.3 ft)
FEP cable	0.18 kg/m (0.40 lbs/3.3 ft)
Flange connection incl. measuring cell tube and sensor, without a flange	1.3 kg (2.87 lbs)
Total weight of device	

Dimensions of FMB53 with F31 housing, suspension clamp and mounting bracket



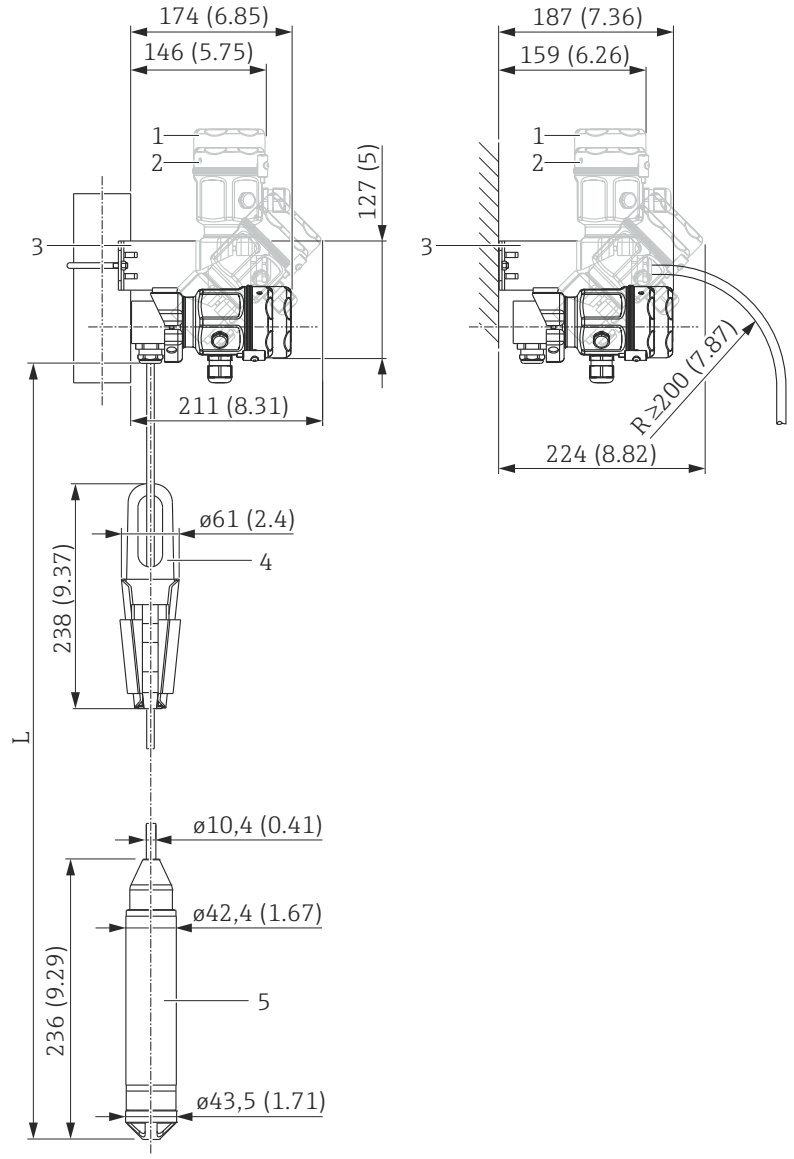
FMB53 with suspension clamp and mounting bracket (mounting bracket without marine approval)

1 Dimensions for housing covers with a viewing window.
2 Housing covers without a viewing window are approx. 15 mm (0.59 in) lower.
3 Mounting bracket for pipe and wall mounting (for pipes from 1 ¼" up to 2" diameter)
4 Suspension clamp
5 Measuring cell tube
L Probe length = 0.5 to 400 m (1.6 to 1312 ft) - see Product Configurator, "Probe connection" section

Engineering unit mm (in)

Process connection incl. sensor	Weight
Housing weight	→ 36 ff
PE cable (cable length > 120 m (394 ft) = Delivery on cable reel)	0.13 kg/m (0.28 lbs/3.3 ft)
FEP cable (cable length > 120 m (394 ft) = Delivery on cable reel)	0.18 kg/m (0.40 lbs/3.3 ft)
Mounting bracket	0.2 kg (0.44 lbs)
Pipe bend incl. cable entry	0.65 kg (1.43 lbs)
Suspension clamp	0.4 kg (0.88 lbs)
Measuring cell tube incl. sensor	1.0 kg (2.21 lbs)
Total weight of device	

Dimensions of FMB53 with F15 housing, suspension clamp and mounting bracket



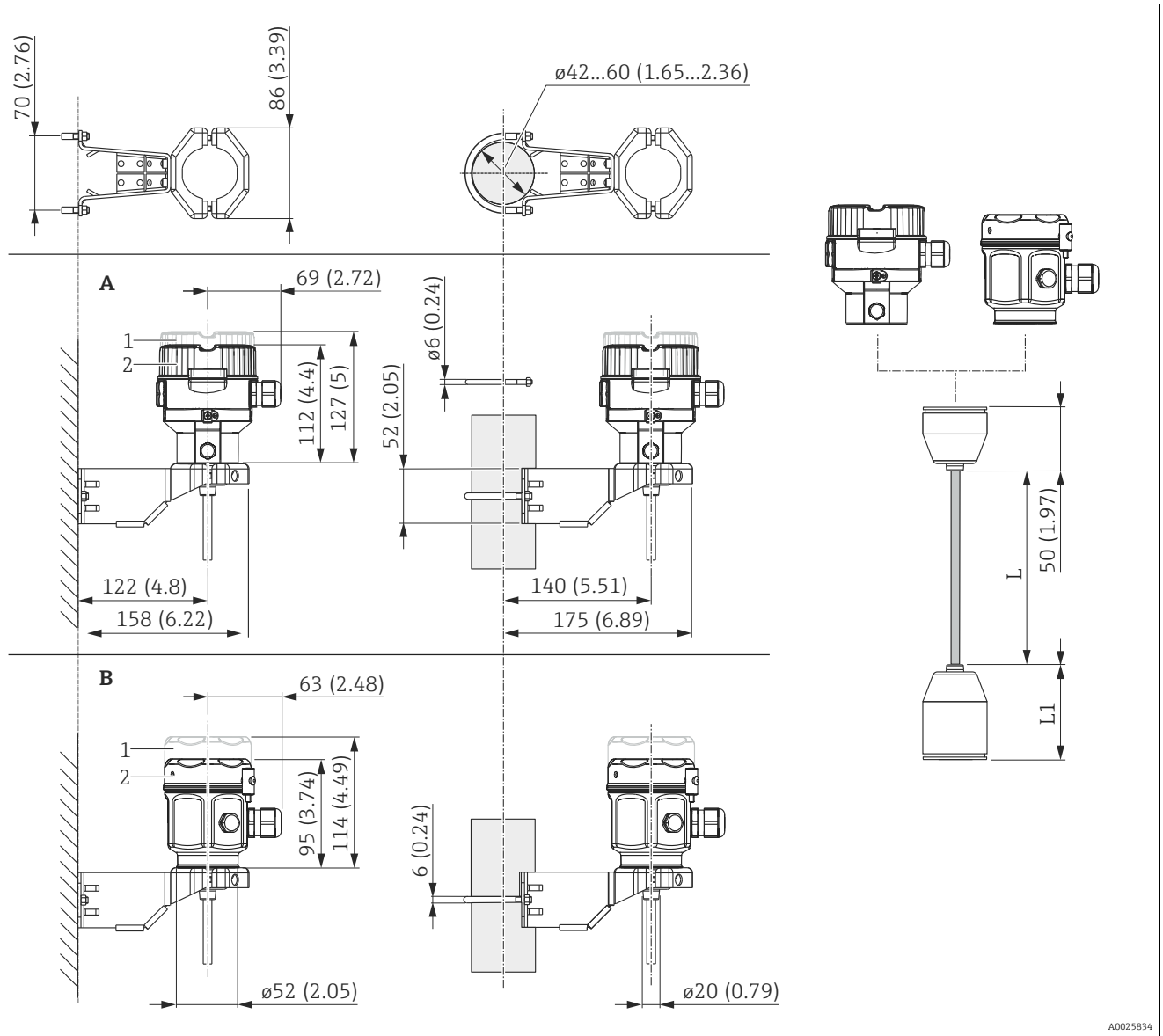
FMB53 with suspension clamp and mounting bracket (mounting bracket without marine approval)

1 Dimensions for housing covers with a viewing window.
2 Housing covers without a viewing window are approx. 15 mm (0.59 in) lower.
3 Mounting bracket for pipe and wall mounting (for pipes from 1 ¼" up to 2" diameter)
4 Suspension clamp
5 Measuring cell tube
L Probe length = 0.5 to 400 m (1.6 to 1312 ft) - see Product Configurator, "Probe connection" section

Engineering unit mm (in)

Process connection incl. sensor	Weight
Housing weight	→ 🖹 36 ff
PE cable (cable length > 120 m (394 ft) = Delivery on cable reel)	0.13 kg/m (0.28 lbs/3.3 ft)
FEP cable (cable length > 120 m (394 ft) = Delivery on cable reel)	0.18 kg/m (0.40 lbs/3.3 ft)
Mounting bracket	0.2 kg (0.44 lbs)
Pipe bend incl. cable entry	0.65 kg (1.43 lbs)
Suspension clamp	0.4 kg (0.88 lbs)
Measuring cell tube incl. sensor	1.0 kg (2.21 lbs)
Total weight of device	

Wall and pipe mounting with "Separate housing" version



1 Housing cover with viewing window.
2 Housing cover without viewing window
L PE cable 2 m (6.6 ft), 5 m (16 ft) or 10 m (33 ft). FEP cable 5 m (16 ft)
L1 FMB50 = 91 mm (3.58 in); FMB51 and FMB52 = 81 mm (3.19 in)

Engineering unit mm (in)

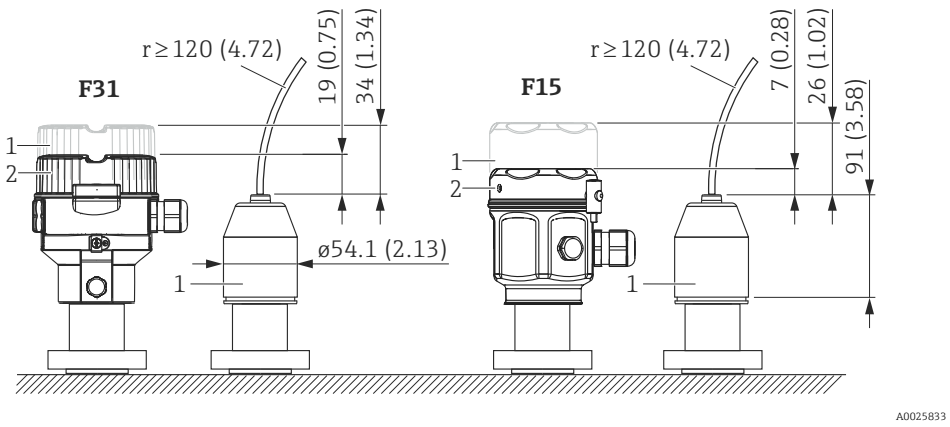
Item	Designation	Weight		Option [1]
		Housing (F31 or F15)	Mounting bracket	
A	Dimensions with F31 housing	→ 36 ff	0.5 kg (1.10)	U
B	Dimensions with F15 housing			

1) Product Configurator, "Separate housing" ordering feature

Also available for order as a separate accessory: part number 71102216

FMB50: Reduction in installation height

If the separate housing is used, the mounting height of the process connection is reduced compared to the dimensions of the standard version.

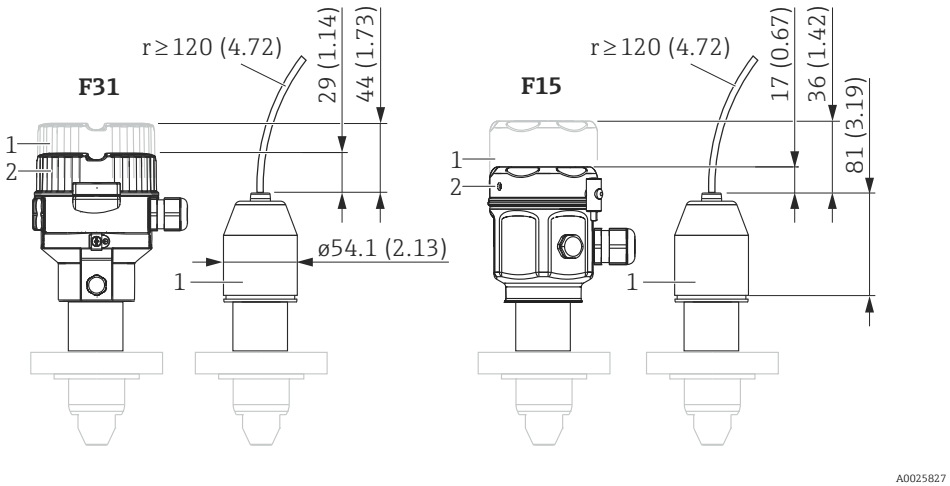


1 Process connection adapter

Engineering unit mm (in)

FMB51, FMB52: Reduction in installation height

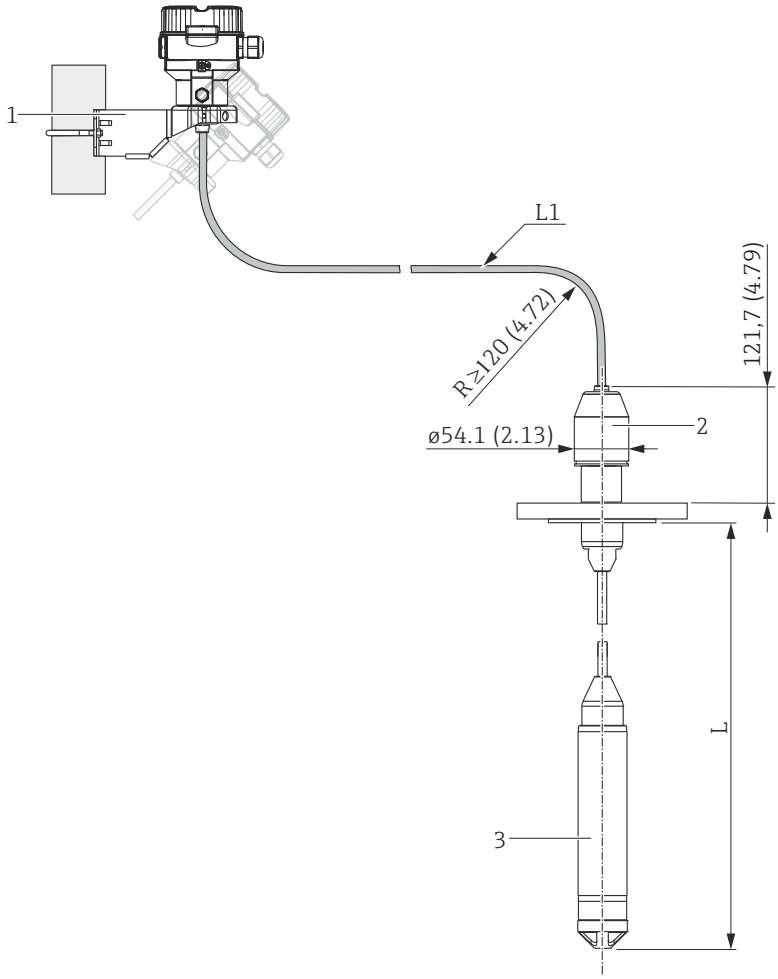
If the separate housing is used, the mounting height of the process connection is reduced compared to the dimensions of the standard version.



1 Process connection adapter

Engineering unit mm (in)

Example for a "Separate housing" version



Connecting cable with process connection adapter and mounting bracket, here shown with an FMB52

1 Mounting bracket for pipe and wall mounting (for pipes from 1 1/4" up to 2" diameter)
2 Process connection adapter
3 Measuring cell tube
L1 PE cable = 2 m (6.6 ft), 5m (16 ft) or 10 m (33 ft)
FEP cable = 5 m (16 ft)
L Probe length = 0.5 to 400 m (1.6 to 1312 ft)

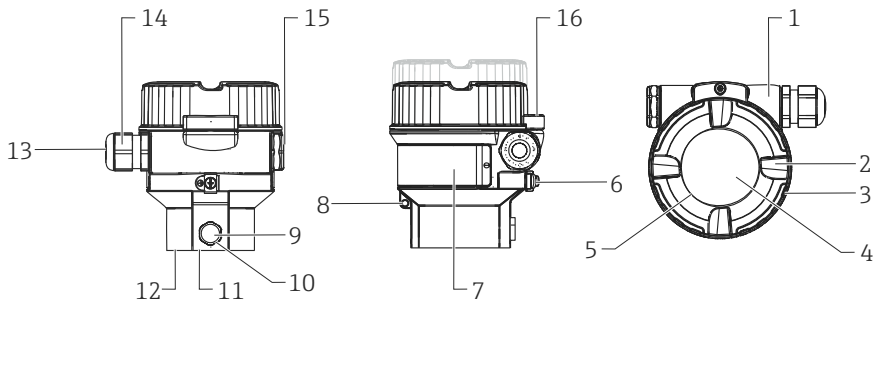
Engineering unit mm (in)

Process connection incl. sensor	Weight
Separate housing for FMB50	Weight of housing (→ 36 ff) + 0.5 kg (1.10 lbs)
Separate housing for FMB51 and FMB52	Weight of housing (→ 36 ff) + 0.65 kg (1.43 lbs)
Process connection adapter	0.4 kg (0.88 lbs)
Mounting bracket	0.2 kg (0.44 lbs)
Pipe bend incl. cable entry	0.65 kg (1.43 lbs)
PE cable 2 m (6.6 ft)	0.16 kg (0.35 lbs)
PE cable 5 m (16 ft)	0.32 kg (0.71 lbs)
Total weight of device	

Ordering information for FMB50, FMB51, FMB52: Product Configurator, "Separate housing" ordering feature

Materials not in contact with process

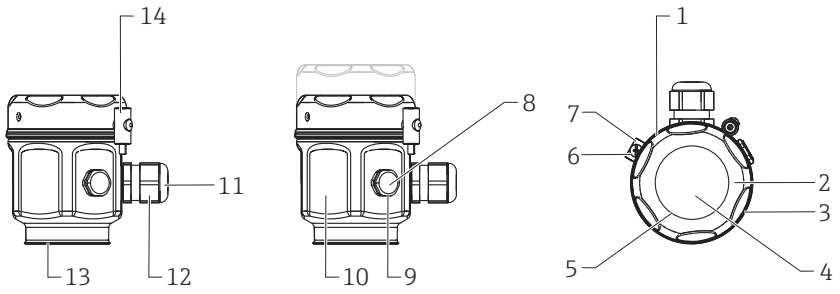
F31 housing



Front view, left-hand side view, top view

Item number	Component part	Material
1	F31 housing, RAL 5012 (blue)	Die-cast aluminum with protective powder-coating on polyester base
2	Cover, RAL 7035 (gray)	Die-cast aluminum with protective powder-coating on polyester base
3	Cover seal	EPDM
4	Sight glass	Mineral glass
5	Sight glass seal	Silicone (VMQ)
6	External ground terminal	AISI 304 (1.4301)
7	Nameplates	Plastic film
8	Attachment for tie-on label	AISI 304 (1.4301)/ AISI 316 (1.4401)
9	Pressure compensation filter	AISI 316L (1.4404) and PBT-FR
10	Pressure compensation filter, O-ring	VMQ or EPDM
11	Sealing ring	EPDM
12	Snap ring	PC Plastic
13	Seal of cable gland and blind plug	EPDM/NBR
14	Cable gland	Polyamide (PA), for dust ignition-proof: CuZn nickel-plated
15	Blind plug	PBT-GF30 FR
		for dust ignition-proof, Ex d, FM XP and CSA XP: AISI 316L (1.4435)
16	Cover clamp	Clamp AISI 316L (1.4435), screw A4

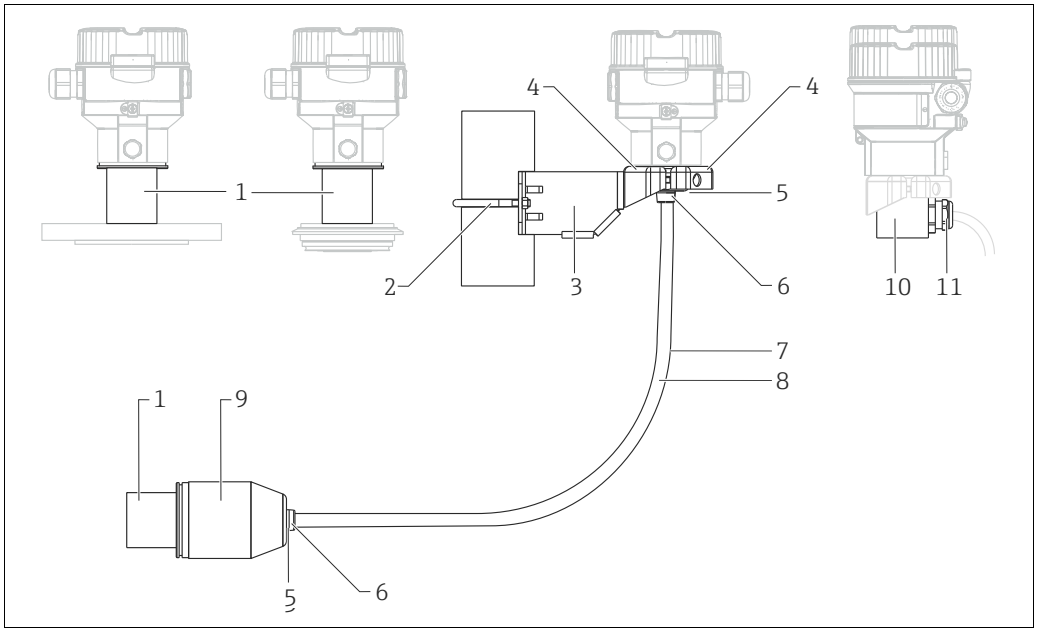
F15 housing



Front view, left-hand side view, top view

Item number	Component part	Material
1	F15 housing	AISI 316L (1.4404)
2	Cover	
3	Cover seal	Silicone with PTFE coating
4	Sight glass for non-hazardous area, ATEX Ex ia, NEPSI Zone 0/1 Ex ia, IECEx Zone 0/1 Ex ia, FM NI, FM IS, CSA IS	Polycarbonate (PC)
4	Sight glass for ATEX 1/2 D, ATEX 1/3 D, ATEX 1 GD, ATEX 1/2 GD, ATEX 3 G, FM DIP, CSA dust ignition-proof	Mineral glass
5	Sight glass seal	Silicone (VMQ)
6	External ground terminal	AISI 304 (1.4301)
7	Attachment for tie-on label	AISI 304 (1.4301)/ AISI 316 (1.4401)
8	Pressure compensation filter	AISI 316L (1.4404) and PBT-FR
9	Pressure compensation filter, O-ring	VMQ or EPDM
10	Nameplates	lasered
11	Cable gland	Polyamide (PA), for dust ignition-proof: CuZn nickel-plated
12	Seal of cable gland and blind plug	NBR/Silicone/EPDM
13	Sealing ring	EPDM
14	Screw	A4-50

Connecting parts



A0023617

Item number	Component part	Material
1	Connection between the housing and process connection	AISI 316L (1.4404)
2	Mounting bracket	Bracket AISI 316L (1.4404)
3		Screw and nuts A4-70
4		Half-shells: AISI 316L (1.4404)
5	Seal for cable from Separate housing	FKM, EPDM
6	Gland for cable from separate housing: Screws:	AISI 316L (1.4404) A2
7	PE cable for separate housing	Abrasion-proof cable with strain-relief Dynema members; shielded using aluminum-coated film; insulated with polyethylene (PE-LD), black; copper wires, twisted, UV-resistant
8	FEP cable for separate housing	Abrasion-proof cable; shielded using galvanized steel wire netting; insulated with fluorinated ethylene propylene (FEP), black; copper wires, twisted, UV-resistant
9	Process connection adapter for separate housing	AISI 316L (1.4404)
10	Housing adapter	FMB50, FMB51, FMB52: AISI 316L (1.4404) FMB53: AISI 304 (1.4301)
11	Cable gland: Sealing insert: O-ring:	CuZn nickel-plated TPE-V NBR

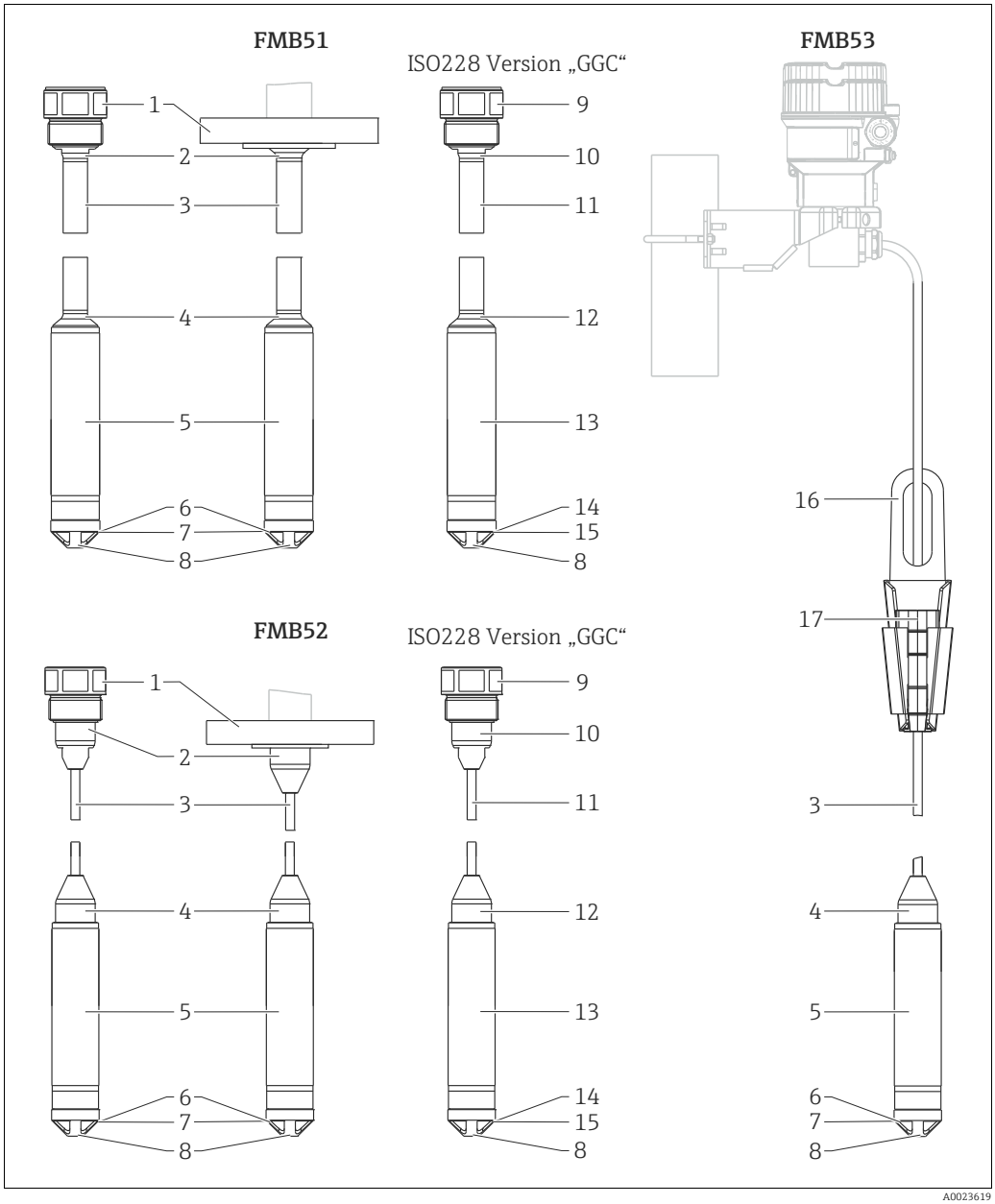
Fill fluid

Designation	Option [1]
Inert oil	2
Synthetic oil polyalphaolefin FDA 21 CFR 178.3570, NSF H1	3

1) Product Configurator, “Fill fluid” section

Materials in contact with the process

The wetted device components are listed in the "Mechanical construction" (→ 36 ff) and "Ordering information" (→ 67 ff) sections.



A0023619

Item number	Component part	Material
1	Process connection	→ 36 ff
2	Socket	AISI 316L (1.4404)
3	Rod	AISI 316L (1.4435)
	PE cable	Abrasion-proof cable; shielded using galvanized steel wire netting and aluminum-coated film; insulated with polyethylene (PE-LD), black/blue; copper wires, twisted, UV-resistant
	PE cable (Usage in drinking water)	Abrasion-proof cable; shielded using galvanized steel wire netting and aluminum-coated film; insulated with polyethylene (PE-LD), black; copper wires, twisted, UV-resistant

Item number	Component part	Material
3	FEP cable	Abrasion-proof cable; shielded using galvanized steel wire netting and aluminum-coated film; insulated with fluorinated ethylene propylene (FEP), black; copper wires, twisted, UV-resistant
4	Socket	AISI 316L (1.4404)
5	Probe tube	AISI 316L (1.4404)

Item number	Component part	Material
6	Process isolating diaphragm and meter body	→ 67 ff
7	Seals	→ 67 ff
8	Protection cap	POM
9	Process connection	Alloy C276 (2.4819)
10	Socket	Alloy C4 (2.4610)
11	Rod	Alloy C4 (2.4610)
12	Socket	Alloy C4 (2.4610)
13	Probe tube	Alloy C22 (2.4602)
14	Process isolating diaphragm and meter body	→ 67 ff
15	Seals	→ 67 ff
16	Suspension clamp	AISI 316L (1.4404)
17	Clamping jaw	PA-GF

DIN/EN flanges

Endress+Hauser supplies DIN/EN flanges made of stainless steel AISI 316L as per material numbers 1.4435 or 1.4404. With regard to their stability-temperature property, the materials 1.4435 and 1.4404 are grouped together under 13EO in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.

Process isolating diaphragm

Process isolating diaphragm	Coating	Meter body	FMB50	FMB51	FMB52	Option [1]
Alloy C276 (2.4819)	-	316L (1.4435) or Alloy C276 (2.4819) [2]	✔	✔	✔	B
Alloy C276 (2.4819)	Gold>Rhodium	Alloy C276 (2.4819)	✔	✔	✔	L
Alloy C276 (2.4819)	Gold>Platin	Alloy C276 (2.4819)	—	✔	✔	N

1) Product Configurator, "Material of process isolating diaphragm" ordering feature

2) The material of the meter body corresponds to the material of the process connection.

Process isolating diaphragm	Coating	Meter body	FMB53	Option [1]
Alloy C276 (2.4819)	-	316L (1.4435)	✔	B
Alloy C276 (2.4819)	Gold>Rhodium	Alloy C276 (2.4819)	✔	L
Alloy C276 (2.4819)	Gold>Platin	Alloy C276 (2.4819)	✔	N

1) Product Configurator, "Material of process isolating diaphragm" ordering feature

Seals

Designation	Option [1]
FKM Viton	A [2]
EPDM	J [2]
Kalrez 6375	L [2]
None, welded cell	U

1) Product Configurator, "Seal" ordering feature

2) Not FMB50

TSE Certificate of Suitability (Transmissible Spongiform Encephalopathy)

The following applies to all process wetted device components:
- They do not contain any materials derived from animals.
- No auxiliaries or operating materials derived from animals are used in production or processing.

Operability

Operating concept

Operator-oriented menu structure for user-specific tasks

- Commissioning
- Operation
- Diagnostics
- Expert level

Quick and safe commissioning

Guided menus for applications

Reliable operation

- Onsite operation possible in several languages
- Standardized operation at the device and in the operating tools
- Parameters relating to measured values can be locked/unlocked using the device's write protection switch, using the device software or via remote control.

Efficient diagnostics increase measurement availability

- Remedial measures are integrated in plain text
- Diverse simulation options

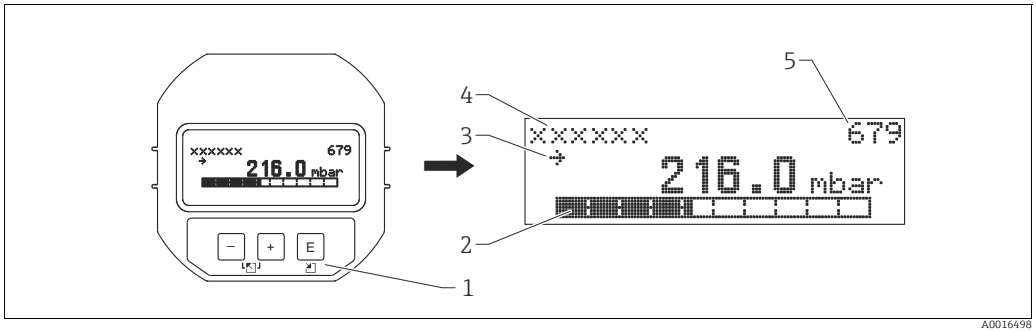
Onsite operation

Local display (optional)

A 4-line liquid crystal display (LCD) is used for display and operation. The local display shows measured values, dialog texts as well as fault and notice messages in plain text, thereby supporting the user at every stage of operation. The liquid crystal display of the device can be turned in 90° stages. Depending on the orientation of the device, this makes it easy to operate the device and read the measured values.

Functions:

- 8-digit measured value display including sign and decimal point, bar graph for 4 to 20 mA HART as current display; or for PROFIBUS PA as graphic display of the standardized value of the AI Block; for FOUNDATION Fieldbus as graphic display of the transducer output in relation to the set pressure range.
- Simple and complete menu guidance as parameters are split into several levels and groups
- Each parameter is given a 3-digit ID number for easy navigation
- Possibility of configuring the display to suit individual requirements and preferences, such as language, alternating display, contrast setting, display of other measured values such as sensor temperature etc.
- Comprehensive diagnostic functions (fault and warning message etc.)



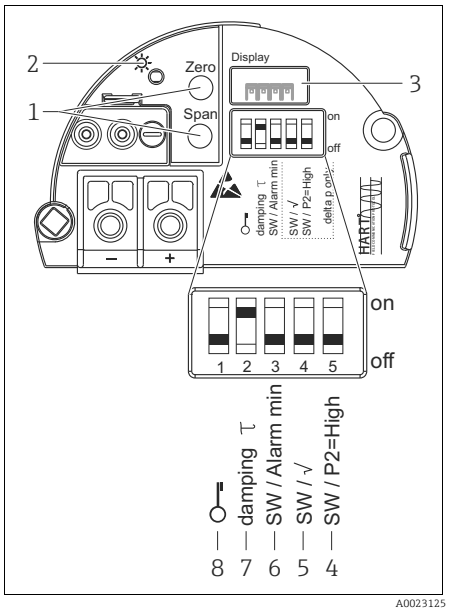
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1 Operating keys
2 Bar graph
3 Symbol
4 Header
5 Parameter ID number

Ordering information:
Product Configurator, "Output; operation" ordering feature

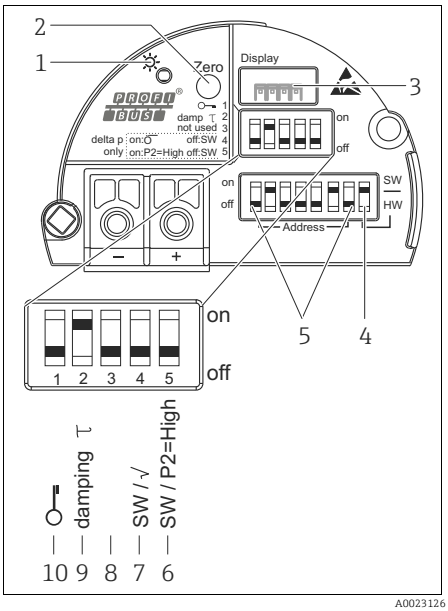
Function	Operation via display		
	HART	PROFIBUS PA	FOUNDATION Fieldbus
Position adjustment (zero point correction)	✔	✔	✔
Setting lower range value and upper range value - reference pressure present at the device	✔	✔	✔
Device reset	✔	✔	✔
Locking and unlocking parameters relevant to the measured value	✔	✔	✔
Value acceptance indicated by the green LED	–	–	–
Switching damping on and off	✔	✔	✔

Operating keys and elements located on the electronic insert



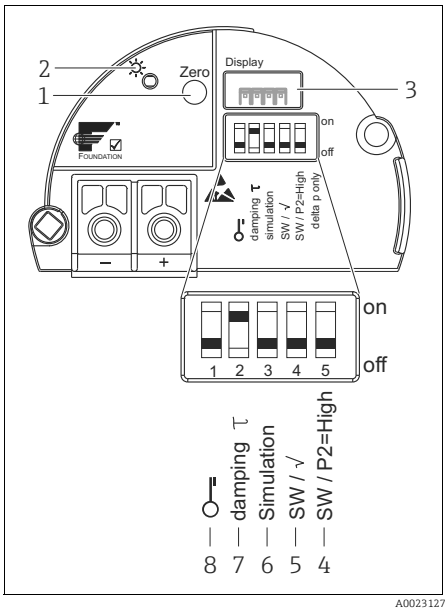
HART electronic insert

1 *Operating keys for lower range value (zero) and upper range value (span)*
2 *Green LED to indicate successful operation*
3 *Slot for optional local display*
4 *DIP switch only for Deltabar M*
5 *DIP switch only for Deltabar M*
6 *DIP switch for alarm current SW / Alarm Min (3.6 mA)*
7 *DIP switch for switching damping on/off*
8 *DIP switch for locking/unlocking parameters relevant to the measured value*



PROFIBUS PA electronic insert

1 *Green LED to indicate successful operation*
2 *Operating key for position zero adjustment or reset (Zero)*
3 *Slot for optional local display*
4 *DIP switch for bus address SW / HW*
5 *DIP switch for hardware address*
6 *DIP switch only for Deltabar M*
7 *DIP switch only for Deltabar M*
8 *Not used*
9 *DIP switch for switching damping on/off*
10 *DIP switch for locking/unlocking parameters relevant to the measured value*



FOUNDATION Fieldbus electronic insert

1 *Operating key for position zero adjustment or reset (Zero)*
2 *Green LED to indicate successful operation*
3 *Slot for optional local display*
4 *DIP switch only for Deltabar M*
5 *DIP switch only for Deltabar M*
6 *DIP switch for simulation mode*
7 *DIP switch for switching damping on/off*
8 *DIP switch for locking/unlocking parameters relevant to the measured value*

Function	Operation with operating keys and elements on the electronic insert		
	HART	PROFIBUS PA	FOUNDATION Fieldbus
Position adjustment (zero point correction)	✔	✔	✔
Setting lower range value and upper range value - reference pressure present at the device	✔	–	–
Device reset	✔	✔	✔
Locking and unlocking parameters relevant to the measured value	✔	✔	✔
Value acceptance indicated by the green LED	✔	✔	✔
Switching damping on and off	✔	✔	✔

Ordering information:
Product Configurator, "Display, operation" ordering feature

Operating languages

You can also choose another language in addition to the standard language "English":

Designation	Option [1]
English	AA
German	AB
French	AC
Spanish	AD
Italian	AE
Dutch	AF
Chinese	AK
Japanese	AL

1) Product Configurator, "Additional operating language" ordering feature

Remote operation

All software parameters are accessible depending on the position of the write protection switch on the device.

Hardware and software for remote operation	HART	PROFIBUS PA	FOUNDATION Fieldbus
FieldCare → 61 ff	✔ [1]	✔ [2]	✔
FieldXpert SFX100 → 61 ff	✔	–	✔
NI-FBUS Configurator → 62 ff	–	–	✔

1) Commubox FXA195 required → 62 ff

2) Profiboard or Proficard required → 62 ff

FieldCare

FieldCare is an Endress+Hauser asset management tool based on FDT technology. With FieldCare, you can configure all Endress+Hauser devices as well as devices from other manufacturers that support the FDT standard.

FieldCare supports the following functions:
- Configuration of transmitters in offline and online mode
- Loading and saving device data (upload/download)
- HistoROM®/M-DAT analysis
- Documentation of the measuring point

Connection options:
- HART via Commubox FXA195 and the USB port on a computer
- PROFIBUS PA via segment coupler and PROFIBUS interface card
- Service interface with Commubox FXA291 and ToF adapter FXA291 (USB).

For further information please contact your local Endress+Hauser Sales Center.

Field Xpert SFX100

Field Xpert is an industrial PDA with integrated 3.5" touchscreen from Endress+Hauser based on Windows Mobile. It offers wireless communication via the optional VIATOR Bluetooth modem. Field Xpert also works as a stand-alone device for asset management applications. For details refer to BA00060S/04/EN.

Commubox FXA195

For intrinsically safe HART communication with FieldCare via the USB interface. For details refer to TI00404F/00/EN.

Commubox FXA291

The Commubox FXA291 connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop.
For details, see TI00405C/07/EN.

For the following Endress+Hauser devices, you also need the "ToF adapter FXA291" accessory:

- Cerabar S PMC71, PMP7x
- Deltabar S PMD7x, FMD7x
- Deltapilot S FMB70

ToF adapter FXA291

The ToF adapter FXA291 connects the Commubox FXA291 to devices in the ToF platform, pressure devices and Gammapilot via the USB port of a computer or laptop. For details, see KA00271F.

Profiboard

For connecting a PC to PROFIBUS.

Proficard

For connecting a laptop to PROFIBUS.

FF configuration program

FF configuration program, such as NI-FBUS Configurator, to
- connect devices with "FOUNDATION Fieldbus signal" into an FF-network
- set FF-specific parameters

Remote operation via:
- Operation with NI-FBUS Configurator:
  The NI-FBUS Configurator is an easy-to-use graphical environment for creating linkages, loops, and a schedule based on the fieldbus concepts.
  You can use the NI-FBUS Configurator to configure a fieldbus network as follows:
  - Set block and device tags
  - Set device addresses
  - Create and edit function block control strategies (function block applications)
  - Configure vendor-defined function and transducer blocks
  - Create and edit schedules
  - Read and write to function block control strategies (function block applications)
  - Invoke Device Description (DD) methods
  - Display DD menus
  - Download a configuration
  - Verify a configuration and compare it to a saved configuration
  - Monitor a downloaded configuration
  - Replace a virtual device by a real device
  - Save and print a configuration

System integration

The device can be given a tag name (max. 8 alphanumeric characters).

Designation	Option [1]
Measuring point (TAG), see additional specifications	Z1
Bus address, see additional specifications	Z2

1) Product Configurator, "Identification" ordering feature

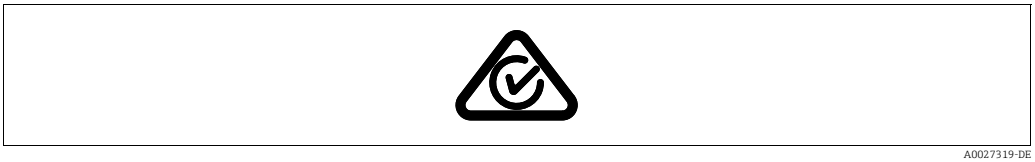
Certificates and approvals

CE mark

The device meets the legal requirements of the relevant EC directives.
Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.

RCM-Tick marking

The supplied product or measuring system meets the ACMA (Australian Communications and Media Authority) requirements for network integrity, interoperability, performance characteristics as well as health and safety regulations. Here, especially the regulatory arrangements for electromagnetic compatibility are met. The products are labelled with the RCM- Tick marking on the name plate.



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Ex approvals

- ATEX
- FM
- CSA
- Also combinations of different approvals

All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas.
→ 71 ff, "Safety Instructions" and "Installation/Control Drawings" ordering features.

EAC conformity

The measuring system meets the legal requirements of the applicable EAC guidelines. These are listed in the corresponding EAC Declaration of Conformity together with the standards applied.
Endress+Hauser confirms successful testing of the device by affixing to it the EAC mark.

Suitability for hygienic processes

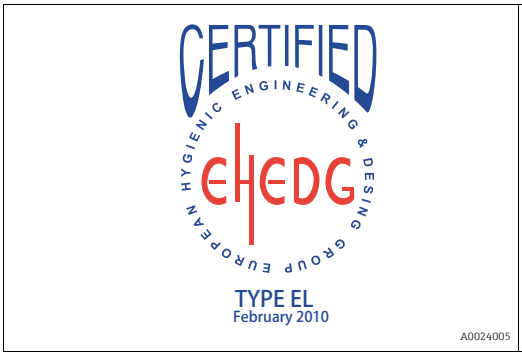
All materials in contact with foodstuffs comply with framework Regulation (EC) 1935/2004.
The Deltapilot is available with hygienic process connections (overview: see order code).

⚠ CAUTION

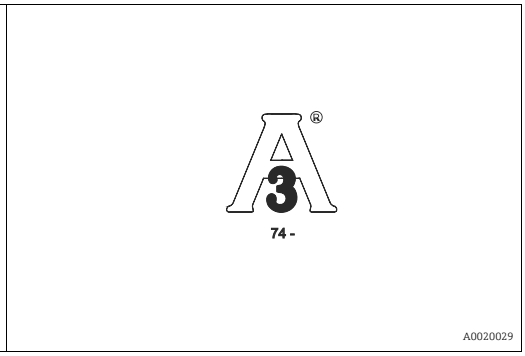
Contamination in the process!

Risk of contamination if incorrect seals and parts are used!

- To avoid the risk of contamination, when installing the device comply with the design principles of EHEDG, Guideline 37 "Hygienic Design and Application of Sensors" and Guideline 16 "Hygienic Pipe Couplings".
- Suitable assemblies and seals must be used to ensure hygienic design in accordance with 3-A SSI and EHEDG specifications.
- The leak-proof connections can be cleaned with the cleaning methods typical of this industry (CIP and SIP). Attention must be paid to the pressure and temperature specifications of the sensor and process connections for CIP and SIP processes (clean in place/sterilize in place).



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A0020029

Gap-free connections can be cleaned without residue using the usual cleaning methods.

Certificate of Compliance ASME BPE 2012 (FMB50 only)

Ordering information:
Product Configurator, "Additional approval" ordering feature, option "LW"

Functional safety SIL

The Deltapilot M with 4 to 20 mA output signal has been developed to assessed and certified by TÜV NORD CERT as per IEC 61508 Edition 2.0 and IEC 61511. These devices can be used to monitor the process level and pressure up to SIL 2. For a detailed description of the safety functions with Deltapilot M, settings and functional safety data, see the "Functional safety manual - Deltapilot M" SD00347P.
Ordering information:
Product Configurator, "Additional approval:" ordering feature, option "LA".

Overfill protection

WHG (FMB50, FMB51, FMB52): see document ZE00275P

Ordering information:
Product Configurator, "Additional approval" ordering feature, option "LC".

AD2000

The pressure retaining material 316L (1.4435/1.4404) corresponds to AD2000 - W2/W10.

Pressure Equipment Directive (PED)

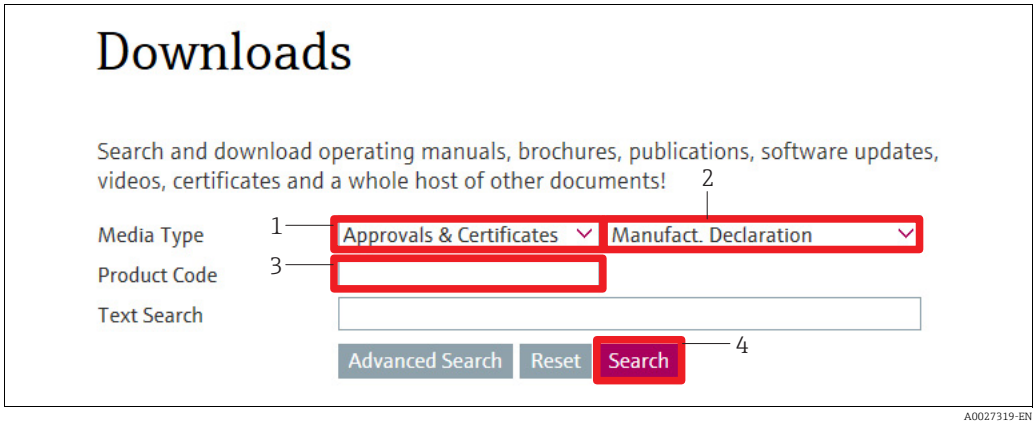
The Deltapilot M device corresponds to Article 3 (3) of the EC directive 97/23/EC (Pressure Equipment Directive) and has been designed and manufactured according to good engineering practice.

Manufacturer declaration

- FDA conformity
- TSE-free, materials free from animal origin
- Regulation EC 2023/ 2006 (GMP)
- Regulation (EC) No. 1935/2004 on materials intended to come into contact with food

Downloading the manufacturer declaration

http://www.endress.com/en/download



1. Enter desired product code
2. Select "Approvals & Certificates"
3. Select "Manufact. Declaration"
4. Click on "Start Search"

The available downloads are displayed.

Marine approval

Designation	FMB50	FMB51	FMB52	FMB53	Option [1]
GL	✔	–	✔	✔	LE
ABS	✔	–	✔	✔	LF
LR	✔	–	✔	✔	LG
BV	✔	–	✔	✔	LH

Designation	FMB50	FMB51	FMB52	FMB53	Option [1]
DNV	✔	–	✔	✔	LI

1) Product Configurator, "Additional options 1" and "Additional options 2" ordering feature

Other standards and guidelines

DIN EN 60770 (IEC 60770):
Transmitters for use in industrial process control systems
Part 1: Methods for inspection and routine testing

DIN 16086:
Electrical pressure measuring instruments, pressure sensors, pressure transmitters, pressure measuring instruments, concepts, specifications on data sheets

EN 61326 series:
EMC product family standard for electrical equipment for measurement, control and laboratory use.

EN 60529:
Degrees of protection by housing (IP code)

Drinking water approval

Designation	Option [1]
KTW	LQ
NSF61	LR
ACS (under development)	LS

1) Product Configurator, "Additional options 1" and "Additional options 2" ordering feature

Classification of process sealing between electrical systems and (flammable or combustible) process fluids in accordance with ANSI/ ISA 12.27.01

Endress+Hauser instruments are designed according to ANSI/ISA 12.27.01 either as single seal or dual seal devices with annunciation, allowing the user to waive the use and save the cost of installing external secondary process seals in the conduit as required by the process sealing sections of ANSI/ NFPA 70 (NEC) and CSA 22.1 (CEC). These instruments comply with the North-American installation practice and provide a very safe and cost-saving installation for pressurized applications with hazardous fluids.
Further information can be found in the control drawings of the relevant devices.

Inspection certificate

Designation	FMB50	FMB51	FMB52	FMB53	Option [1]
3.1 Material certificate, wetted metallic parts, EN10204-3.1 inspection certificate	✔	✔	✔	✔	JA [2]
Conformity to NACE MR0175, wetted metallic parts	✔	✔	✔	✔	JB [2]
Conformity to NACE MR0103, wetted metallic parts	✔	✔	✔	✔	JE [2]
Conformity to AD2000, wetted metallic parts, excepting process membrane	✔	–	–	–	JF
Surface finish measurement ISO4287/Ra, wetted metallic parts, Inspection certificate	✔	–	–	–	KB
Helium leak test, internal procedure, inspection certificate	✔	✔	✔	✔	KD
Pressure test, internal procedure, inspection certificate	✔	✔	✔	–	KE
3.1 Material certificate+Delta-Ferrit measurement, internal procedure, wetted metallic parts, EN10204-3.1 inspection certificate	✔	–	–	–	KF
3.1 Material certificate+PMI test (XRF), internal procedure, wetted metallic parts, EN10204-3.1 inspection certificate	✔	✔	✔	✔	KG

1) Product Configurator, "Test, certificate" ordering feature

2) The selection of this feature for coated process isolating diaphragm / process connections refers to the metallic base material.

Calibration; unit

Designation	Option [1]
Sensor range; %	A
Sensor range; mbar/bar	B
Sensor range; kPa/MPa	C
Sensor range; mm/mH2O	D
Sensor range; inH2O/ftH2O	E
Sensor range; psi	F
Customized pressure; see additional specification	J
Customized level; see additional specification	K

1) Product Configurator, "Calibration; unit" ordering feature

Calibration

Designation	Option [1]
Factory calibration, 5-point	F1
DKD/DAkkS calibration certificate 10-point[2]	F2

1) Product Configurator, "Calibration" ordering feature

2) Only for FMB50

Service

Designation	Option [1]
Oil and grease removed [2]	HA
Cleaned for oxygen service [2]	HB
Cleaned from PWIS (PWIS = paint wetting impairment substances) [2]	HC
Configured min alarm current	IA
Configured HART Burst Mode PV	IB

1) Product Configurator, "Service" ordering feature

2) Only device, not accessory or enclosed accessory

Ordering information

Detailed ordering information is available as follows:
- In the Product Configurator on the Endress+Hauser website: www.endress.com → Click "Corporate" → Select your country → Click "Products" → Select the product using the filters and search field → Open product page → The "Configure" button to the right of the product image opens the Product Configurator.
- From your Endress+Hauser Sales Center: www.addresses.endress.com

Product Configurator - the tool for individual product configuration

- Up-to-the-minute configuration data
- Depending on the device: direct input of information specific to measuring point, such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

Configuration data sheet

Pressure

The following configuration data sheet has to be filled in and included with the order if the option J - Customized pressure has been selected in feature 90 "Calibration; unit" in the ordering information.

Pressure Engineering Unit

❑ mbar	❑ mmH_2O	❑ mmHg	❑ Pa
❑ bar	❑ mH_2O		
	❑ ftH_2O	❑ kgf/cm^2	❑ kPa
❑ psi	❑ inH_2O		❑ MPa

Calibration Range / Output

Low range value (LRV): _____ [pressure engineering unit]

Upper range value (URV): _____ [pressure engineering unit]

Display Information

1st Value Display [1)]
❑ Main Value

2nd Value Display [1)]
❑ none (Default)
❑ Main Value [%]
❑ Pressure
❑ Current [mA] (HART only)
❑ Temperature

[1)] Depending on sensor and communication variant

Damping

Damping: _____ sec (Default 2 sec)

Level

The following configuration data sheet has to be filled in and included with the order if the option K - Customized level has been selected in feature 90 "Calibration; unit" in the ordering information.

Pressure Engineering Unit

❑ mbar	❑ mmH_2O	❑ mmHg	❑ Pas
❑ bar	❑ mH_2O		❑ kPa
	❑ ftH_2O	❑ kgf/cm^2	❑ MPa
❑ psi	❑ inH_2O		

Output Unit (Scaled unit)

Mass	Length	Volume	Volume	Percent
❑ kg	❑ m	❑ l	❑ gal	❑ %
❑ t	❑ dm	❑ hl	❑ Igal	
❑ lb	❑ cm			
	❑ mm	❑ m^3		
		❑ ft^3		
	❑ ft	❑ in^3		
	❑ inch			

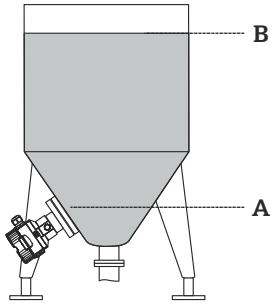
Empty pressure [a]:
Low pressure value (empty) _____ [pressure engineering unit]

Empty calibration [a]:
Low level value (empty) _____ [Scaled Unit]

Full pressure [b]:
High pressure value (full) _____ [pressure engineering unit]

Full calibration [b]:
High level value (full) _____ [Scaled Unit]

Example



A0023621

A *0 mbar / 0m*
B *300 mbar (4.5psi) / 3 m (9.8 ft).*

Display Information

1st Value Display [1)]
❑ Main Value

2nd Value Display [1)]
❑ none (Default)
❑ Main Value [%]
❑ Pressure
❑ Current [mA] (HART only)
❑ Temperature

[1)] Depending on sensor and communication variant

Damping

Damping: _____ sec (Default 2 sec)

Smallest calibratable measuring span (preset at the factory) → 14.

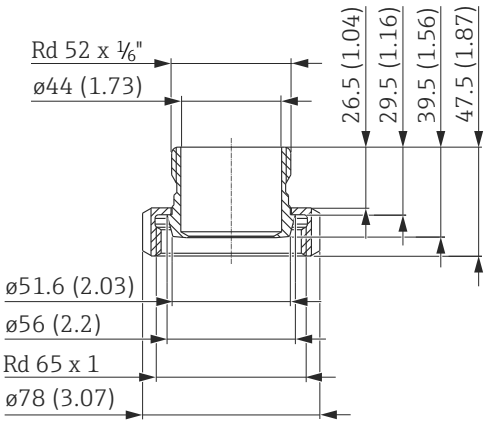
Accessories

Suspension clamp (FMB53 only)	→ 30 ff
Extension cable shortening kit (FMB53 only)	See Product Configurator, "Accessory enclosed" ordering feature, option "PW" or can be ordered as a separate accessory (part no. 71125862). For details refer to SD00553P/00/A2.
M12 connector	→ 24 ff Ordering information: Product Configurator, "Enclosed accessories" ordering feature, option "RL, RM, RN".
Welding necks and Weld-in tool flanges	See technical Information TI00426F/00.

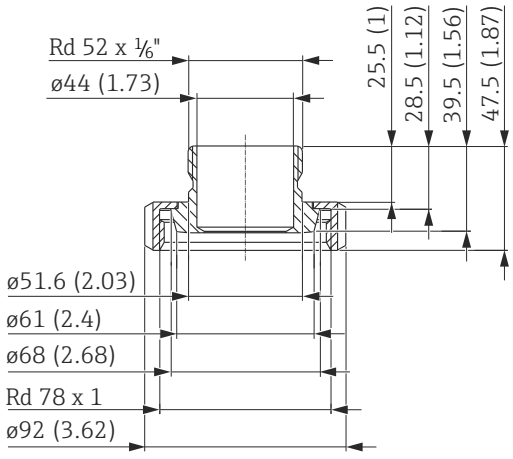
Adapter Uni for FMB50

The following adapters can be used to create a connection between the customer's process connection and the Deltapilot S FMB50 with a universal adapter:

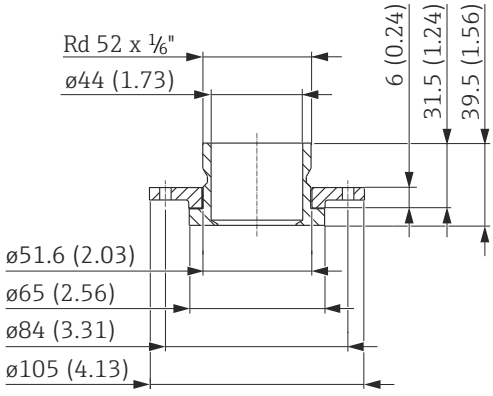
A



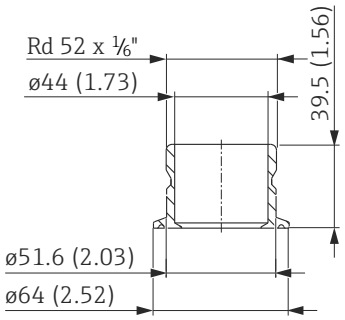
B



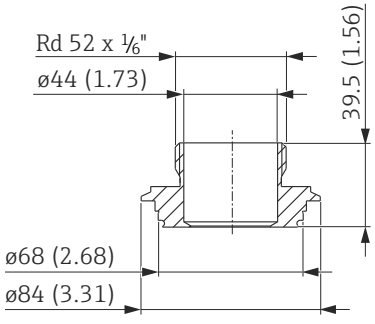
C



D



E



Engineering unit mm (in)

Item	Designation	Material	Weight kg (lbs)	Order number	Order number with 3.1 inspection certificate	Option [1]
A	DIN11851 DN40	AISI 316L (1.4435)	0.2 (0.44)	71114172	71114178	RA / R1
B	DIN11851 DN50		0.3 (0.66)	71114173	71114205	RB / R2
C	DRD DN50		0.6 (1.32)	71114174	71114206	RC / R3
D	Clamp 2"		0.2 (0.44)	71114176	71114207	RD / R4
E	Varivent		0.5 (1.1)	71114177	71114208	RF / R6

1) Product Configurator, “Enclosed accessories” section

Documentation

Technical Information

- EMC test procedures: TI00241F/00/EN
- Deltabar M: TI00434P/00/EN
- Cerabar M: TI00436P/00/EN

Operating Instructions

- 4...20 mA HART: BA00382P/00/EN
- PROFIBUS PA: BA00383P/00/EN
- FOUNDATION Fieldbus: BA00384P/00/EN

Brief Operating Instructions

- 4...20 mA HART: KA01033P/00/EN
- PROFIBUS PA: KA01034P/00/EN
- FOUNDATION Fieldbus: KA01035P/00/EN

Functional safety manual (SIL)

Deltapilot M (4 to 20 mA): SD00347P/00/EN

Safety Instructions

Directive	Approval	Category	Type	Electronics	Documentation	Option [1]
ATEX	Ex ia IIC	II 1/2 G	FMB50, FMB51, FMB52	– 4 to 20 mA HART	– XA00474P/00	BA
	Ex t IIC	II 1/2 D	FMB50, FMB51	– 4 to 20 mA HART	– XA00475P/00	BB
	Ex nA	II 3 G	FMB50, FMB51, FMB52, FMB53	– 4 to 20 mA HART – PROFIBUS PA – FOUNDATION Fieldbus	– XA00477P/00	BD
	Ex ia IIC	II 2 G	FMB50, FMB51, FMB52, FMB53	– 4 to 20 mA HART	– XA00474P/00	BE
	Ex ic IIC	II 3 G	FMB50, FMB51, FMB52, FMB53	– 4 to 20 mA HART	– XA00494P/00	BG
	Ex ia IIC Ex ia IIC	II 1/2 G II 1/2 D	FMB50, FMB51	– 4 to 20 mA HART	– XA00476P/00	B1

1) Product Configurator, "Approval" ordering feature

Directive	Approval	EPL	Type	Electronics	Documentation	Option [1]
IECEx	Ex ia IIC	Ga/Gb	FMB50, FMB51, FMB52	– 4 to 20 mA HART	– XA00478P/00	IA
	Ex ia IIC	Gb	FMB52, FMB53	– 4 to 20 mA HART	– XA00478P/00	IC
	Ex t IIIC	Da/Db	FMB50, FMB51	– 4 to 20 mA HART	– XA00479P/00	ID
	Ex ic IIC	Gc	FMB50, FMB51, FMB52, FMB53	– 4 to 20 mA HART	– XA00493P/00	IE
	Ex ia IIC Ex ia IIIC	Ga/Gb Da/Db	FMB50, FMB51	– 4 to 20 mA HART	– XA00480P/00	I1

1) Product Configurator, "Approval" ordering feature

Directive	Approval	Type	Electronics	Documentation	Option [1]
NEPSI	Ex ia IIC	FMB50, FMB51, FMB52, FMB53	– 4 to 20 mA HART – PROFIBUS PA – FOUNDATION Fieldbus	– XA00535P/00	NA

1) Product Configurator, "Approval" ordering feature

Directive	Approval	Electronics	Documentation	Option [1]
TIIS	Ex ia IIC T4	– 4 to 20 mA HART	–	TA

1) Product Configurator, "Approval" ordering feature

Directive	Approval	Type	Electronics	Documentation	Option [1]
INMETRO	Ex ia IIC T6...T4 Ga/Gb Ex ia IIC T6...T4 Gb	FMB50, FMB51, FMB52	– 4 to 20 mA HART – PROFIBUS PA – FOUNDATION Fieldbus	– XA01304P/00	MA

1) Product Configurator, "Approval" ordering feature

Installation/Control Drawings

Directive	Approval	Type	Electronics	Documentation	Option [1]
FM	FM IS Cl.I,II,III Div.1 Gr.A-G, AEx ia, FM NI Cl.I Div.2 Gr.A-D, FM IS: Zone 0, 1, 2, 20, 21, 22/ FM NI: Zone 2	FMB50	– 4 to 20 mA HART – PROFIBUS PA, FOUNDATION Fieldbus	– ZD00236P/00 – XA00566P/00	FA
	FM IS Cl.I,II,III Div.1 Gr.A-G, AEx ia, Zone 0,1, 2, 20, 21, 22	FMB51	– 4 to 20 mA HART – PROFIBUS PA, FOUNDATION Fieldbus	– – XA00566P/00	
	FM DIP Cl.II,III Div.1 Gr.E-G, Zone 21, 22	FMB50, FMB51	– 4 to 20 mA HART – PROFIBUS PA – FOUNDATION Fieldbus	–	FC
	FM NI Cl.I Div.2 Gr.A-D, Zone 2	FMB50, FMB51	– 4 to 20 mA HART – PROFIBUS PA – FOUNDATION Fieldbus	–	FD
	FM IS Cl.I Div.1 Gr.A-D, AEx ia, Zone 0, 1, 2	FMB52, FMB53	– 4 to 20 mA HART – PROFIBUS PA. FOUNDATION Fieldbus	– ZD00236P/00 – XA00566P/00	FE
CSA	C/US IS Cl.I,II,III Div.1 Gr.A-G, C/US IS Cl.I Div.2 Gr.A-D, Ex ia, Zone 0,1, 2	FMB50, FMB53	– 4 to 20 mA HART – PROFIBUS PA, FOUNDATION Fieldbus	– ZD00239P/00 – XA00560P/00	CA
	C/US IS Cl.I,II,III Div.1 Gr.A-G, C/US IS Cl.I Div.2 Gr.A-D, Ex ia C: Zone 0, 1, 2/ US: Zone 0, 1, 2, 20, 21, 22	FMB51, FMB52	– 4 to 20 mA HART – PROFIBUS PA, FOUNDATION Fieldbus	– – XA00560P/00	
	CSA C/US Cl.II, III Div.1 Gr.E-G	FMB50	– 4 to 20 mA HART	–	CC
	CSA C/US Cl.II, III Div.1 Gr.E-G US: Zone 21, 22	FMB51	– 4 to 20 mA HART	–	

1) Product Configurator, "Approval" ordering feature

Combination certificate

Directive	Approval	Electronics	Documentation	Option [1]
KEMA/ FM / CSA	ATEX II Ex ia + FM/CSA IS ATEX II 1/2G Ex ia IIC T6 + FM/CSA IS CL.I Div.1 Gr.A-D, FM/CSA: Zone 0,1,2	– 4 to 20 mA HART	– ZD00236P/00 – ZD00239P/00	8C
		PROFIBUS PA, FOUNDATION Fieldbus	– XA00474P/00	

1) Product Configurator, "Approval" ordering feature

Overfill protection

WHG (FMB50, FMB51, FMB52): ZE00275P/00/DE

Registered trademarks

HART®	Registered trademark of the FieldComm Group, Austin, USA
PROFIBUS®	Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany
FOUNDATION™ Fieldbus	Registered trademark of the FieldComm Group, Austin, USA



www.addresses.endress.com

Endress+Hauser

People for Process Automation

TAG:20-PIT-301-1/2/3/4

Technical Information
Cerabar S
PMC71, PMP71, PMP75

Process pressure measurement



Pressure transmitter with ceramic and metal sensors

Applications

The device is used for the following measuring tasks:
- Absolute pressure and gauge pressure measurement in gases, steams or liquids in all areas of process engineering and process measurement technology
- Level, volume or mass measurements in liquids
- High process temperatures
  - up to 150 °C (302 °F)without diaphragm seal
  - up to 400 °C (752 °F)with typical diaphragm seals
- High pressures up to 700 bar (10 500 psi)
- MID part certificate according to OIML R117-1 Edition 2007 (E) and EN 12405-1/A1 Edition 2006
- Low-energy version with voltage output (1-5V DC), e.g. for operation on solar-operated control units (Remote Terminal Unit (RTU))

Your benefits

- Very good reproducibility and long-term stability
- High reference accuracy up to ±0.025 %
- Turn down up to 100:1, higher on request
- Used for process pressure monitoring up to SIL 3, certified to IEC 61508 by TÜV SÜD
- High level of safety during operation thanks to function monitoring from the measuring cell to the electronics
- The patented TempC membrane for the diaphragm seal reduces measured errors caused by environmental and process temperature influences to a minimum
- Easy electronic replacement guaranteed with HistoROM®/M-DAT
- Uniform platform for differential pressure, hydrostatics and pressure (Deltabar S – Deltapilot S – Cerabar S)
- Practical user navigation for quick and easy commissioning
- Extensive diagnostic functions

Endress+Hauser
People for Process Automation

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Document information

Document function

The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.

Symbols used

Safety symbols

Symbol	Meaning
DANGER	**DANGER!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
WARNING	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
CAUTION	**CAUTION!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
NOTICE	**NOTE!** This symbol contains information on procedures and other facts which do not result in personal injury.

Electrical symbols

Symbol	Meaning	Symbol	Meaning
	**Protective ground connection** A terminal which must be connected to ground prior to establishing any other connections.		**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.

Symbols for certain types of information

Symbol	Meaning
	**Permitted** Procedures, processes or actions that are permitted.
	**Preferred** Procedures, processes or actions that are preferred.
	**Forbidden** Procedures, processes or actions that are forbidden.
	**Tip** Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
	Visual inspection

Symbols in graphics

Symbol	Meaning
1, 2, 3 ...	Item numbers
1. , 2. , 3. ...	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections

Documentation

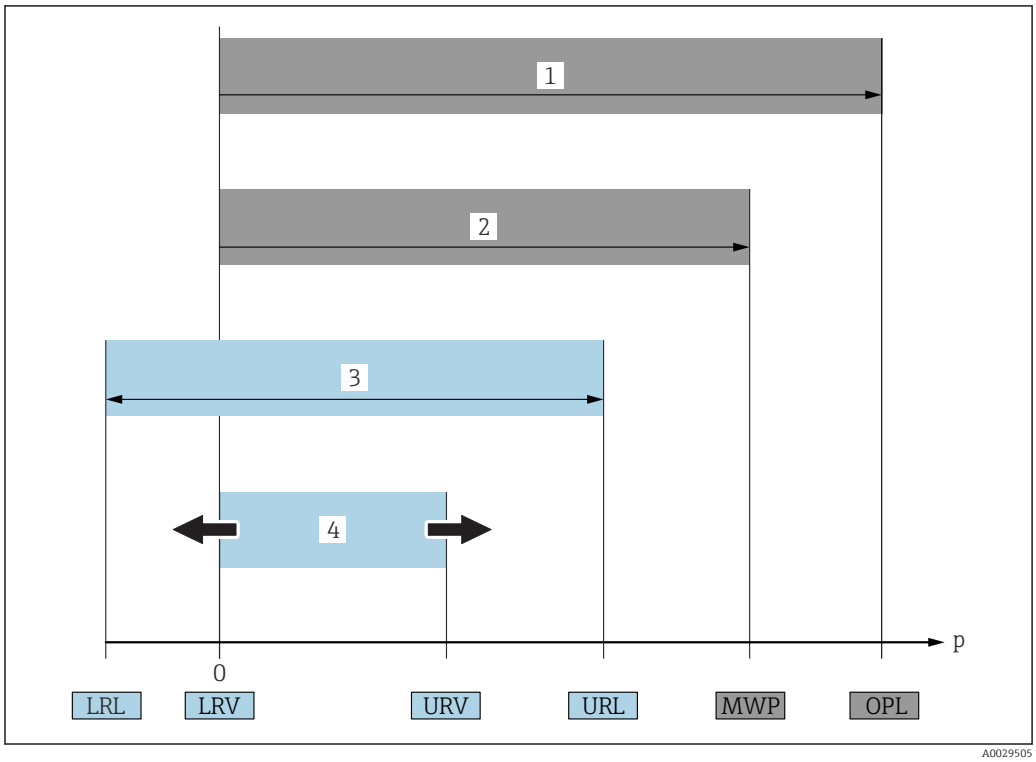
See chapter "Additional documentation" → 127

The document types listed are available:
In the Download Area of the Endress+Hauser Internet site: www.endress.com → Download

Safety Instructions (XA)

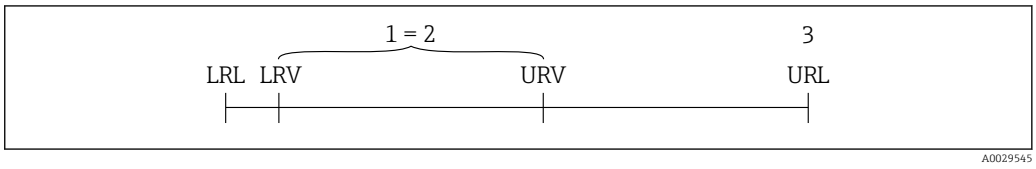
See the "Safety instructions" section → 127

Terms and abbreviations



Item	Term/abbreviation	Explanation
1	OPL	The OPL (over pressure limit = sensor overload limit) for the measuring device depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Also observe pressure-temperature dependency. For the relevant standards and additional information, see the "Pressure specifications"→ 🖹 53 section. The OPL may only be applied for a limited period of time.
2	MWP	The MWP (maximum working pressure) for the sensors depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Also observe pressure-temperature dependency. For the relevant standards and additional information, see the "Pressure specifications"→ 🖹 53 section. The MWP may be applied at the device for an unlimited period. The MWP can also be found on the nameplate.
3	Maximum sensor measuring range	Span between LRL and URL This sensor measuring range is equivalent to the maximum calibratable/adjustable span.
4	Calibrated/adjusted span	Span between LRV and URV Factory setting: 0 to URL Other calibrated spans can be ordered as customized spans.
p	-	Pressure
-	LRL	Lower range limit
-	URL	Upper range limit
-	LRV	Lower range value
-	URV	Upper range value
-	TD (turn down)	Turn down Example - see the following section.

Turn down calculation



1 Calibrated/adjusted span
2 Zero point-based span
3 URL sensor

Example

- Sensor:10 bar (150 psi)
- Upper range value (URL) = 10 bar (150 psi)
- Calibrated/adjusted span: 0 to 5 bar (0 to 75 psi)
- Lower range value (LRV) = 0 bar (0 psi)
- Upper range value (URV) = 5 bar (75 psi)

Turn down (TD):

$$TD = \frac{URL}{|URV - LRV|}$$

$$TD = \frac{10\ \text{bar (150 psi)}}{|5\ \text{bar (75 psi)} - 0\ \text{bar (0 psi)}|} = 2$$

In this example, the TD is 2:1.
This span is based on the zero point.

Registered trademarks

HART®

Registered trademark of the FieldComm Group, Austin, USA

PROFIBUS®

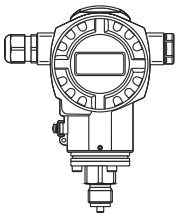
Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

FOUNDATION™Fieldbus

Registered trademark of the FieldComm Group, Austin, Texas, USA

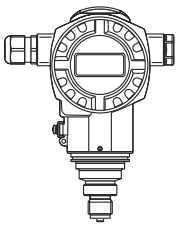
Function and system design

Device selection



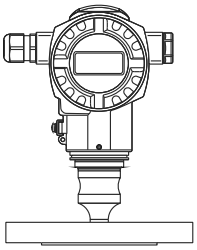
A0020461

PMC71 with capacitive measuring cell and ceramic process isolating diaphragm (Ceraphire®)



A0020463

PMP71 with piezoresistive measuring cell and metallic welded process isolating diaphragm



A0020464

PMP75 with diaphragm seal

Field of application

- Gauge pressure and absolute pressure
- Level

Process connections

PMC71:
- Thread
- EN flanges DN 25 – DN 80
- ANSI flanges 1" – 4"
- JIS flanges 50 A – 100 A

PMP71:
- Thread
- DN 25 – DN 80
- ASME 1 ½" – 4"
- JIS 25 A – 100 A
- Oval flange adapters
- Prepared for diaphragm seal mount

PMP75:
Wide range of diaphragm seals

Measuring ranges

- PMC71: From −100/0 to 100 mbar (−1.5/0 to 1.5 psi) to −1/0 to 40 bar (−15/0 to 600 psi)
- PMP71: From −400/0 to 400 mbar (−6/0 to 6 psi) to −1/0 to 700 bar (−15/0 to 10500 psi)
- PMP75: From −400/0 to 400 mbar (−6/0 to 6 psi) to −1/0 to 400 bar (−15/0 to 6000 psi)

OPL

- PMC71: max. 60 bar (900 psi)
- PMP71: max. 1 050 bar (15 750 psi)
- PMP75: max. 600 bar (9 000 psi)

Process temperature range(temperature at process connection)

- PMC71:−25 to +125 °C (−13 to +257 °F)
  −20 to +150 °C (−4 to +302 °F) (High-temperature version, see Product Configurator "Additional option 1" or 110 "Additional option 2" section, option "T")
- PMP71:−40 to +125 °C (−40 to +257 °F)
- PMP75: −70 to +400 °C (−94 to +752 °F)
  (depending on the filling oil)

Ambient temperature range

- Without LCD display: −40 to +85 °C (−40 to +185 °F) optional (PMP71 and PMP75):
  −50 to +85 °C (−58 to +185 °F) Product Configurator, order code for "Test, certificate" option "JN"
- With LCD display: −20 to +70 °C (−4 to +158 °F)
  (extended temperature application range−50 to +85 °C (−58 to +185 °F) with limitations in optical properties, such as display speed and contrast)
- Separate housing −20 to +60 °C (−4 to +140 °F):
- PMP75: Diaphragm seal systems depending on the version

Reference accuracy

- PMC71: Up to ±0.05% of the set span
  PLATINUM version: up to ±0.025 % of the set span
- PMP71: Up to ±0.05% of the set span
  PLATINUM version: up to ±0.025 % of the set span
- PMP75: Up to ±0.075% of the set span

Supply voltage

Supply voltage non-Ex
- 4 to 20 mA HART: 10.5 to 45 V DC
- 1-5V DC: 9 to 35 V DC
- PROFIBUS PA and FOUNDATION Fieldbus: 9 to 32 V DC

Supply voltage Ex ia
10.5 to 30 V DC

Supply voltage Ex d (1-5V DC)
9 to 35 V DC

Output

- 4 to 20 mA with superimposed HART protocol
- 1-5V DC
- PROFIBUS PA
- FOUNDATION Fieldbus

Options

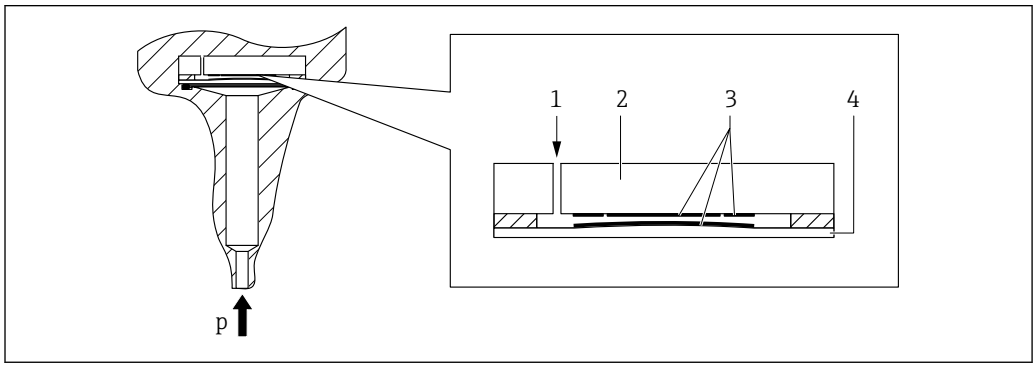
- Inspection certificate 3.1
- HistoROM®/M-DAT memory chip
- Separate housing
- PMP75: gold-plated process isolating diaphragm
- PMP71, PMP75: gold-rhodium coated process isolating diaphragm
- PMP71, PMP75:NACE-compliant materials

Specialties

- PMC71:
  - Metal-free measurement with PVDF connection
  - Special cleaning of the transmitter to remove paint-wetting substances, for use in paint shops
- PMP71:
  - Process connections with minimum oil volume
  - Gas-tight, elastomer-free
- PMP75:
  - Wide range of diaphragm seals
  - For extreme medium temperatures
  - Process connections with minimum oil volume
  - Completely welded versions

Measuring principle

Devices with ceramic process isolating diaphragm (Ceraphire®)



A0020465

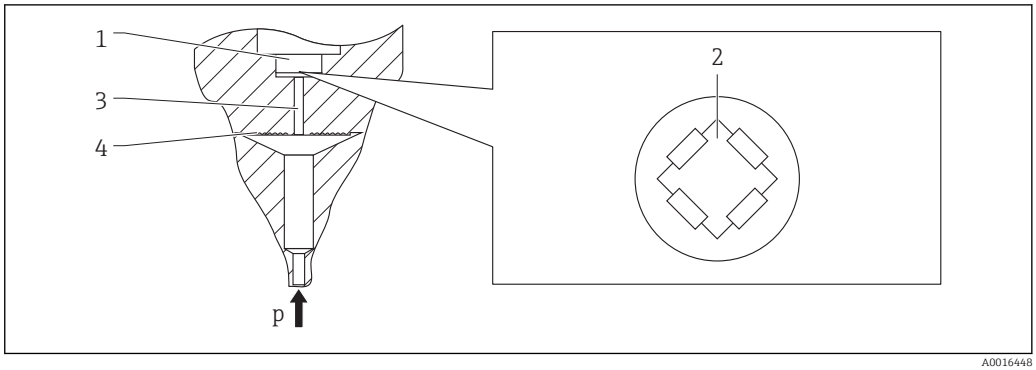
1 Air pressure (gauge pressure sensors)
2 Ceramic substrate
3 Electrodes
4 Ceramic process isolating diaphragm

The ceramic sensor is an oil-free sensor, i.e. the process pressure acts directly on the robust ceramic process isolating diaphragm and causes it to deflect. A pressure-dependent change in capacitance is measured at the electrodes of the ceramic substrate and the process isolating diaphragm. The measuring range is determined by the thickness of the ceramic process isolating diaphragm.

Advantages:

- Guaranteed overload resistance up to 40 times the nominal pressure (see "OPL" column in table) → 13)
- The ultrapure 99.9% ceramic (Ceraphire®, see also "www.endress.com/ceraphire") ensures:
  - Extremely high chemical durability
  - High mechanical durability
- Suitable for vacuums
- Secondary containment for enhanced integrity
- Process temperatures up to 150 °C (302 °F)

Devices with metallic process isolating diaphragm



1 Silicon measuring element, substrate
2 Wheatstone bridge
3 Channel with fill fluid
4 Metal process isolating diaphragm

PMP71

The process pressure deflects the metal process isolating diaphragm of the sensor and a fill fluid transfers the pressure to a Wheatstone bridge (semiconductor technology). The pressure-dependent change in the bridge output voltage is measured and evaluated.

Advantages:
- Can be used for process pressures up to 700 bar (10 500 psi)
- High long-term stability
- Guaranteed overload resistance up to 4 times the nominal pressure
- Secondary containment for enhanced integrity
- Significantly reduced thermal effect e.g. compared to diaphragm seal systems with capillaries

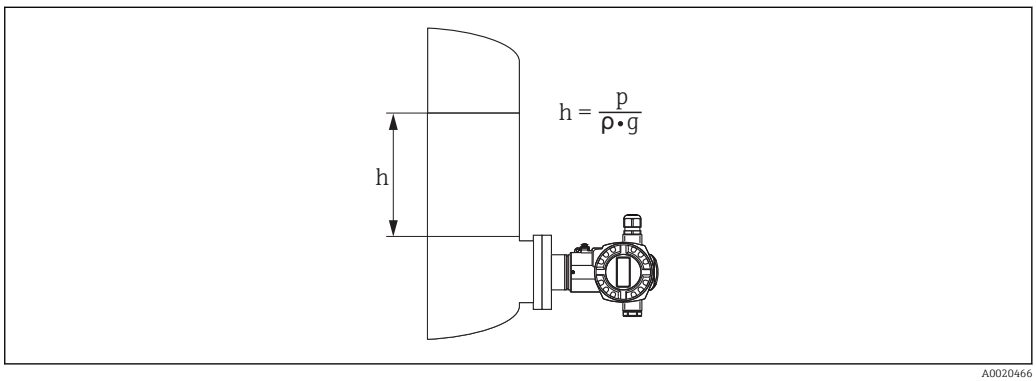
PMP75

The operating pressure acts on the process isolating diaphragm of the diaphragm seal and is transferred to the process isolating diaphragm of the sensor by a diaphragm seal fill fluid. The process isolating diaphragm is deflected and a fill fluid transfers the pressure to a resistance measuring bridge. The pressure-dependent change in the bridge output voltage is measured and evaluated.

Advantages:
- Depending on the version, can be used for process pressures up to 400 bar (6 000 psi) and for extreme process temperatures
- High long-term stability
- Guaranteed overload resistance up to 4 times the nominal pressure
- Secondary containment for enhanced integrity

Product design

Level measurement (level, volume and mass):



h Height (level)
p Pressure
ρ Density of the medium
g Gravitational constant

Your benefits

- Selection of the level operating mode which is optimum for your application in the device software
- Volume and mass measurements in any container shapes by means of a freely programmable characteristic curve
- Choice of diverse level units with automatic unit conversion
- A customized unit can be specified.
- Has a wide range of uses, e.g.
  - in the event of foam formation
  - in containers with agitators or screen fittings
  - in the event of liquid gases

Applications suitable for custody transfer measurement

The Parts Certificate is issued on the basis of the following standards:
- WELMEC guide 8.8 "General and Administrative Aspects of the Voluntary System of Modular Evaluation of Measuring instruments under the MID".
- OIML R117-1 Edition 2007 (E) "Dynamic measuring systems for liquids other than water".
- EN 12405-1/A1 Edition 2006 "Gas meters – Conversion devices – Part 1: Volume conversion".

Communication protocol

- 4 to 20 mA with HART communication protocol
- PROFIBUS PA
  - The Endress+Hauser devices meet the requirements of the FISCO model.
  - Due to a low current consumption of 13 mA ± 1 mA, the following number of devices can be operated on one bus segment if installing as per FISCO: up to 7 devices for Ex ia, CSA IS and FM IS applications or up to 27 devices for all other applications e.g. in non-hazardous areas, Ex nA etc. Further information on PROFIBUS PA can be found in Operating Instructions BA00034S "PROFIBUS DP/PA: Guidelines for planning and commissioning" and in the PNO Guideline.
- FOUNDATION Fieldbus
  - The Endress+Hauser devices meet the requirements of the FISCO model.
  - Due to a low current consumption of 15.5 mA ± 1 mA, the following number of devices can be operated on one bus segment if installing as per FISCO: up to 6 devices for Ex ia, CSA IS and FM IS applications or up to 24 devices for all other applications e.g. in non-hazardous areas, Ex nA etc. Further information on FOUNDATION Fieldbus, such as requirements for bus system components, can be found in Operating Instructions BA00013S "FOUNDATION Fieldbus Overview".

Input

Measured variable

Measured process variables

- Absolute pressure
- Gauge pressure

Calculated process variables

Level (level, volume or mass)

Measuring range

PMC71 – with ceramic process isolating diaphragm (Ceraphire®) for gauge pressure

Sensor	Maximum sensor measuring range		Lowest calibratable Span [1]	MWP	OPL	Vacuum resistance	Option [2]
	lower (LRL)	upper (URL)					
	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar_{abs} (psi_{abs})]	
100 mbar (1.5 psi)	−0.1 (−1.5)	+0.1 (+1.5)	0.005 (0.075)	2.7 (40.5)	4 (60)	0.7 (10.5)	1C
250 mbar (3.75 psi)	−0.25 (−3.75)	+0.25 (+3.75)	0.005 (0.075)	3.3 (49.5)	5 (75)	0.5 (7.5)	1E
400 mbar (6 psi)	−0.4 (−6)	+0.4 (+6)	0.005 (0.075)	5.3 (79.5)	8 (120)	0	1F
1 bar (15 psi)	−1 (−15)	+1 (+15)	0.01 (0.15)	6.7 (100.5)	10 (150)	0	1H
2 bar (30 psi)	−1 (−15)	+2 (+30)	0.02 (0.3)	12 (180)	18 (270)	0	1K
4 bar (60 psi)	−1 (−15)	+4 (+60)	0.04 (0.6)	16.7 (250.5)	25 (375)	0	1M
10 bar (150 psi)	−1 (−15)	+10 (+150)	0.1 (1.5)	26.7 (400.5)	40 (600)	0	1P
40 bar (600 psi)	−1 (−15)	+40 (+600)	0.4 (6)	40 (600)	60 (900)	0	1S

1) Turn down > 100:1 on request or can be set on device
2) Product Configurator, order code for "Sensor range; sensor over pressure limit"

PMC71 – with ceramic process isolating diaphragm (Ceraphire®) for absolute pressure

Sensor	Maximum sensor measuring range		Lowest calibratable Span [1]	MWP	OPL	Vacuum resistance	Option [2]
	lower (LRL)	upper (URL)					
	[bar_{abs} (psi_{abs})]	[bar_{abs} (psi_{abs})]	[bar (psi)]	[bar_{abs} (psi_{abs})]	[bar_{abs} (psi_{abs})]	[bar_{abs} (psi_{abs})]	
100 mbar (1.5 psi)	0	+0.1 (+1.5)	0.005 (0.075)	2.7 (40.5)	4 (60)	0	2C
250 mbar (3.75 psi)	0	+0.25 (+3.75)	0.005 (0.075)	3.3 (49.5)	5 (75)	0	2E
400 mbar (6 psi)	0	+0.4 (+6)	0.005 (0.075)	5.3 (79.5)	8 (120)	0	2F
1 bar (15 psi)	0	+1 (+15)	0.01 (0.15)	6.7 (100.5)	10 (150)	0	2H
2 bar (30 psi)	0	+2 (+30)	0.02 (0.3)	12 (180)	18 (270)	0	2K
4 bar (60 psi)	0	+4 (+60)	0.04 (0.6)	16.7 (250.5)	25 (375)	0	2M
10 bar (150 psi)	0	+10 (+150)	0.1 (1.5)	26.7 (400.5)	40 (600)	0	2P
40 bar (600 psi)	0	+40 (+600)	0.4 (6)	40 (600)	60 (900)	0	2S

1) Turn down > 100:1 on request or can be set on device
2) Product Configurator, order code for "Sensor range; sensor over pressure limit"

PMP71 and PMP75 – metallic process isolating diaphragm for gauge pressure

Sensor	Maximum sensor measuring range		Lowest calibratable Span [1]	MWP	OPL	Vacuum resistance [2]	Option [3]
	lower (LRL)	upper (URL)				Silicone oil/ Inert oil	
	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar_{abs} (psi_{abs})]	
400 mbar (6 psi)	−0.4 (−6)	+0.4 (+6)	0.005 (0.075)	4 (60)	6 (90)	0.01/0.04 (0.15/0.6)	1F
1 bar (15 psi)	−1 (−15)	+1 (+15)	0.01 (0.15)	6.7 (100)	10 (150)		1H
2 bar (30 psi)	−1 (−15)	+2 (+30)	0.02 (0.3)	13.3 (200)	20 (300)		1K
4 bar (60 psi)	−1 (−15)	+4 (+60)	0.04 (0.6)	18.7 (280.5)	28 (420)		1M
10 bar (150 psi)	−1 (−15)	+10 (+150)	0.1 (1.5)	26.7 (400.5)	40 (600)		1P
40 bar (600 psi)	−1 (−15)	+40 (+600)	0.4 (6)	100 (1500)	160 (2400)		1S
100 bar (1 500 psi)	−1 (−15)	+100 (+1500)	1.0 (15)	100 (1500)	400 (6000)		1U
400 bar (6 000 psi)	−1 (−15)	+400 (+6000)	4.0 (60)	400 (6000)	600 (9000)		1W
700 bar (10 500 psi) [4]	−1 (−15)	+700 (+10500)	7.0 (105)	700 (10500)	1050 (15750)		1X

1) Turn down > 100:1 on request or can be set on device
2) The vacuum resistance applies for the measuring cell under reference operating conditions. A ceramic process isolating diaphragm is recommended for applications in the limit range. For type PMP75, the pressure and temperature application limits of the selected filling oil must also be observed → 🖹 113.
3) Product Configurator, order code for "Sensor range; sensor over pressure limit"
4) PMP71 only, PMP75 on request

PMP71 and PMP75 – metallic process isolating diaphragm for absolute pressure

Sensor	Maximum sensor measuring range		Lowest calibratable Span [1]	MWP	OPL	Vacuum resistance [2]	Option [3]
	lower (LRL)	upper (URL)				Silicone oil/ Inert oil	
	[bar_{abs} (psi_{abs})]	[bar_{abs} (psi_{abs})]	[bar (psi)]	[bar_{abs} (psi_{abs})]	[bar_{abs} (psi_{abs})]	[bar_{abs} (psi_{abs})]	
400 mbar (6 psi)	0	+0.4 (+6)	0.005 (0.075)	4 (60)	6 (90)	0.01/0.04 (0.15/0.6)	2F
1 bar (15 psi)	0	+1 (+15)	0.01 (0.15)	6.7 (100)	10 (150)		2H
2 bar (30 psi)	0	+2 (+30)	0.02 (0.3)	13.3 (200)	20 (300)		2K
4 bar (60 psi)	0	+4 (+60)	0.04 (0.6)	18.7 (280.5)	28 (420)		2M
10 bar (150 psi)	0	+10 (+150)	0.1 (1.5)	26.7 (400.5)	40 (600)		2P
40 bar (600 psi)	0	+40 (+600)	0.4 (6)	100 (1500)	160 (2400)		2S
100 bar (1 500 psi)	0	+100 (+1500)	1.0 (15)	100 (1500)	400 (6000)		2U
400 bar (6 000 psi)	0	+400 (+6000)	4.0 (60)	400 (6000)	600 (9000)		2W
700 bar (10 500 psi) [4]	0	+700 (+10500)	7.0 (105)	700 (10500)	1050 (15750)		2X

1) Turn down > 100:1 on request or can be set on device
2) The vacuum resistance applies for the measuring cell under reference operating conditions. A ceramic process isolating diaphragm is recommended for applications in the limit range. For type PMP75, the pressure and temperature application limits of the selected filling oil must also be observed → 🖹 113.
3) Product Configurator, order code for "Sensor range; sensor over pressure limit"
4) PMP71 only, PMP75 on request

PMP71 - metallic process isolating diaphragms for absolute pressure with MID parts certificate

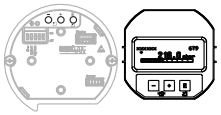
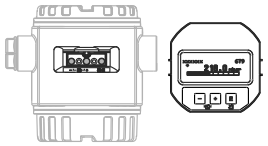
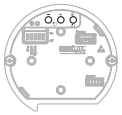
Sensor	Maximum sensor measuring range		Min. WP for gas applications suitable for custody transfer measurement	Min. WP for liquid applications suitable for custody transfer measurement	MWP	OPL	Vacuum resistance [1]	Option [2]
	lower (LRL) [3]	upper (URL) [4]					Silicone oil/ Inert oil	
[bar (psi)]	[bar_{abs} (psi_{abs})]	[bar_{abs} (psi_{abs})]	[bar (psi)]	[bar (psi)]	[bar_{abs} (psi_{abs})]	[bar_{abs} (psi_{abs})]	[bar (psi)]	
10 (150)	0	+10 (150)	0.5 (7.5)	0.5 (7.5)	26.7 (400.5)	40 (600)	0.01/0.04 (0.15/1)	MP
50 (750)	0	+50 (750)	10 (150)	2.5 (37.5)	100 (1500)	400 (6000)	0.01/0.04 (0.15/1)	MT
100 (1500)	0	+100 (1500)	5 (75)	5 (75)	100 (1500)	400 (6000)	0.01/0.04 (0.15/1)	MU

1) The vacuum resistance applies to the measuring cell under reference operating conditions
2) Product Configurator, order code for "Sensor range; sensor over pressure limit"
3) By default, the device is set to a lower sensor measuring range of 0 bar. Please specify when ordering if the lower sensor measuring range is to be set to a different default value.
4) Max. WP (working pressure) for gas and liquid applications suitable for calibration to regulatory standards

Output

Output Signal

- 4 to 20 mA with superimposed digital communication protocol HART, 2-wire
- 1-5V DC, 3-wire
- Digital communication signal PROFIBUS PA (Profile 3.0), 2-wire
  - Signal coding: Manchester Bus Powered (MBP): Manchester II
  - Transmission rate: 31.25 KBit/s voltage mode
- Digital communication signal FOUNDATION Fieldbus, 2-wire
  - Signal coding: Manchester Bus Powered (MBP): Manchester II
  - Transmission rate: 31.25 KBit/s voltage mode

Output	Internal + LCD	External + LCD	Internal
			 A0021280
	Option [1]		
4 to 20mA HART	B	A	C
4 to 20mA HART, Li=0	E	D	F
1-5V DC	H	G	-
PROFIBUS PA	N	M	O
FOUNDATION Fieldbus	Q	P	R

1) Product Configurator, order code for "Display, operation: "

Signal range

4 to 20 mA

3.8 mA to 20.5 mA

1-5V DC

0.95 to 5.125 V

Signal on alarm

4 to 20 mA HART

As per NAMUR NE43.

- Max. alarm: can be set from 21 to 23 mA (factory setting: 22 mA)
- Hold measured value: last measured value is held
- Min. alarm: 3.6 mA

1-5V DC

- Max. alarm: can be set from 5.25 to 5.75 V
- Min. Alarm: 0.9 V

PROFIBUS PA

As per NAMUR NE43.

Can be set in the Analog Input Block.

Options:
- Last Valid Out Value (factory setting)
- Fail Safe Value
- Status bad

FOUNDATION Fieldbus

As per NAMUR NE43.

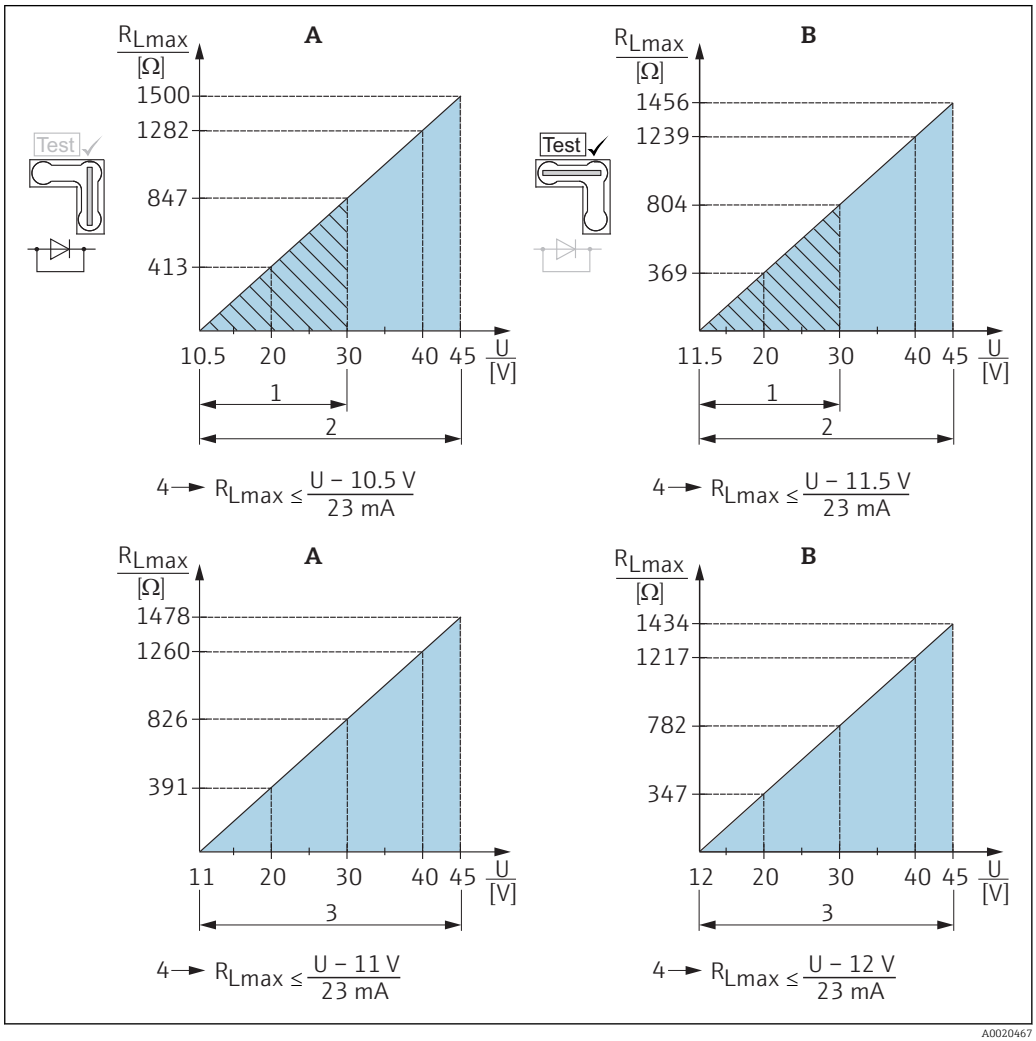
Can be set in the Analog Input Block.

Options:
- Last Good Value
- Fail Safe Value (factory setting)
- Wrong Value

Load

4 to 20 mA HART

In order to guarantee sufficient terminal voltage in two-wire devices, a maximum load resistance R (including line resistance) must not be exceeded depending on the supply voltage U_0 of the supply unit. In the following load diagrams, observe the position of the jumper and the explosion protection:



A0020467

A Jumper for 4 to 20 mA test signal set to "Non-test" position
B Jumper for 4 to 20 mA test signal set to "Test" position
1 Power supply 10.5 (11.5) to 30 V DC for 1/2 G, 1 GD, 1/2 GD, FM IS, CSA IS, IECEx ia, NEPSI Ex ia
2 Power supply 10.5 (11.5) to 45 V DC for devices for non-hazardous areas, 1/2 D, 1/3 D, 2 G Ex d, 3 G Ex nA, FM XP, FM DIP, FM NI, CSA XP, CSA dust ignition-proof, NEPSI Ex d
3 Power supply 11 (12) to 45 V DC for PMC71, Ex d[ia], NEPSI Ex d[ia]
4 R_{Lmax} maximum load resistance
U Supply voltage

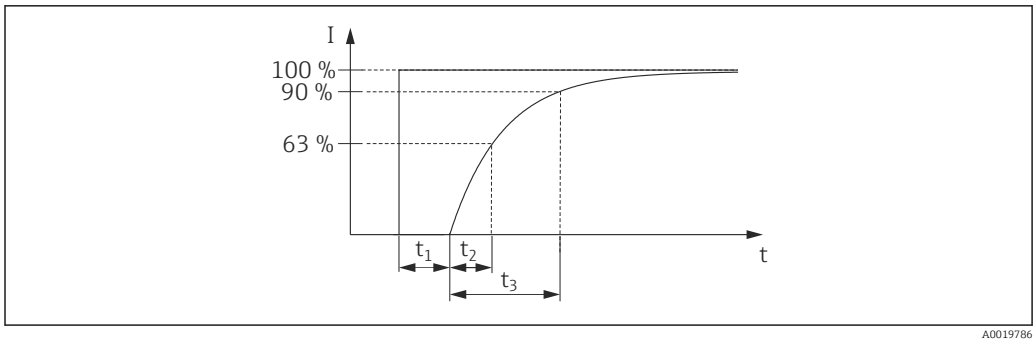
When operating via a handheld terminal or via a PC with an operating program, a minimum communication resistance of 250 Ω must be taken into account.

1-5V DC

The load must be at least 100 kΩ.

Dead time, time constant

Presentation of the dead time and the time constant:



Dynamic behavior, current output

Type		Measuring cell	Dead time (t_1) [ms]	Time constant T63 (t_2) [ms]	Time constant T90 (t_3) [ms]
PMC71	max.	All	90	120	276
PMP71	max.	▪ 400 mbar (6 psi) ▪ ≥1 bar (15 psi)	45	▪ 70 ▪ 35	▪ 161 ▪ 81
PMP75	max.	PMP71 + influence of the diaphragm seal			

Dynamic behavior Digital output (HART electronics)

A typical burst rate of 300 ms results in the following behavior:

Type		Measuring cell	Dead time (t_1) [ms]	Dead time (t_1) [ms] + Time constant T63 (t_2) [ms]	Dead time (t_1) [ms] + Time constant T90 (t_3) [ms]
PMC71	remains stable for a minimum of	All	250	370	436
	max.		1050	1170	1236
PMP71	remains stable for a minimum of	▪ 400 mbar (6 psi) ▪ ≥1 bar (15 psi)	205	▪ 275 ▪ 240	▪ 321 ▪ 241
	max.	▪ 400 mbar (6 psi) ▪ ≥1 bar (15 psi)	1005	▪ 1075 ▪ 1040	▪ 1121 ▪ 1041
PMP75	max.	PMP71 + influence of the diaphragm seal			

Reading cycle

- Acyclic: max. 3/s, typically 1/s (depending on command # and number of preambles)
- Cyclic (burst): max. 3/s, typically 2/s

The device commands the BURST MODE functionality for cyclical value transmission via the HART communication protocol.

Cycle time (update time)

Cyclic (burst): min. 300 ms

Response time

- Acyclic: min. 330 ms, typically 590 ms (depending on command # and number of preambles)
- Cyclic (burst): min. 160 ms, typically 350 ms (depending on command # and number of preambles)

Dynamic behavior 1-5V DC

Type		Measuring cell	Dead time (t_1) [ms]	Time constant T63 (t_2) [ms]	Time constant T90 (t_3) [ms]
PMP71	max.	All	40	70	180

Dynamic behavior PROFIBUS PA

A typical PLC cycle time of 1 s results in the following behavior:

Type		Measuring cell	Dead time (t_1) [ms]	Dead time (t_1) [ms] + Time constant T63 (t_2) [ms]	Dead time (t_1) [ms] + Time constant T90 (t_3) [ms]
PMC71	remains stable for a minimum of	All	125	245	311
	max.		1325	1445	1511
PMP71	remains stable for a minimum of	▪ 400 mbar (6 psi) ▪ ≥1 bar (15 psi)	80	▪ 150 ▪ 115	▪ 196 ▪ 116
	max.	▪ 400 mbar (6 psi) ▪ ≥1 bar (15 psi)	1280	▪ 1350 ▪ 1315	▪ 1396 ▪ 1316
PMP75	max.	PMP71 + influence of the diaphragm seal			

Reading cycle (PLC)

- Acyclic: Typically 25/s
- Cyclic: Typically 30/s (depending on the number and type of the function blocks used in the closed-control loop)

Cycle time (update time)

remains stable for a minimum of 200 ms

The cycle time in a bus segment in cyclic data communication depends on the number of devices, on the segment coupler used and on the internal PLC cycle time. A new measured value can be determined up to five times a second.

Response time

- Acyclic: Approx. 60 ms to 70 ms (depending on Min. Slave Interval)
- Cyclic: Approx. 10 ms to 13 ms (depending on Min. Slave Interval)

Dynamic behavior FOUNDATION Fieldbus

A typical configuration for the macro cycle time (host system) of 1 s results in the following behavior:

Type		Measuring cell	Dead time (t_1) [ms]	Dead time (t_1) [ms] + Time constant T63 (t_2) [ms]	Dead time (t_1) [ms] + Time constant T90 (t_3) [ms]
PMC71	remains stable for a minimum of	All	135	255	321
	max.		1135	1255	1321
PMP71	remains stable for a minimum of	▪ 400 mbar (6 psi) ▪ ≥1 bar (15 psi)	90	▪ 160 ▪ 125	▪ 206 ▪ 126
	max.	▪ 400 mbar (6 psi) ▪ ≥1 bar (15 psi)	1090	▪ 1160 ▪ 1125	▪ 1206 ▪ 1126
PMP75	max.	PMP71 + influence of the diaphragm seal			

Reading cycle

- Acyclic: Typically 10/s
- Cyclic: max. 10/s (dependent on the number and type of function blocks used in a closed-control loop)

Cycle time (update time)

Cyclic: Min. 100 ms

Response time

- Acyclic: Typically 100 ms (for standard bus parameter settings)
- Cyclic: max. 20 ms (for standard bus parameter settings)

Damping

A damping affects all outputs (output signal, display):
- via local display, handheld terminal or PC (handheld terminal or PC not for 1-5V DC) with operating program, continuous from 0 to 999 s
- Also for HART and PROFIBUS PA: Via DIP switch on the electronic insert, switch position "on" = set value and "off"
- 1-5V DC: via DIP switch on electronic insert switch position "on" = set value and "off"
- Factory setting: 2 s

Alarm current

Description	Option [1]
Min alarm current	J
HART burst mode PV	J
Min alarm current + HART burst mode PV	J

1) Product Configurator, "Additional options 1" and "Additional options 2" ordering feature

Firmware version

Description	Option [1]
02.20.zz, HART 7, DevRev22	72
02.11.zz, HART 5, DevRev21	73
04.00.zz, FF, DevRev07	74
04.01.zz, PROFIBUS PA, DevRev03	75
02.10.zz, HART 5, DevRev21	76
03.00.zz, FF, DevRev06	77
04.00.zz, PROFIBUS PA	78
02.30.zz, HART 7	In preparation

1) Product Configurator, order code for "Firmware version"

HART protocol-specific data

Manufacturer ID	17 (11 hex)
Device type code	24 (18 hex)
Device revision	▪ 21 (15 hex) - SW version 02.1y.zz - HART specification 5 ▪ 22 (16 hex) - SW version 02.2y.zz - HART specification 7
HART specification	▪ 5 ▪ 7
DD revision	▪ 4 (Russian in language selection) for device revision 21 ▪ 3 (Dutch in language selection) for device revision 21 ▪ 1 for device revision 22
Device description files (DTM, DD)	Information and files at: ▪ www.endress.com ▪ www.fieldcommgroup.org
HART load	Min. 250 Ω

HART device variables	The measured values are assigned to the device variables as follows: **Measured values for PV (primary variable)** ▪ Pressure ▪ Level ▪ Tank content **Measured values for SV, TV (second and third variable)** Pressure **Measured values for QV (fourth variable)** Temperature
Supported functions	▪ Burst mode ▪ Additional transmitter status ▪ Device locking ▪ Alternative operating modes

PROFIBUS PA protocol-specific data

Manufacturer ID	17 (11 hex)
Identification number	1541 hex
Profile version	3.0 ▪ SW version 03.00.zz ▪ SW version 04.00.zz 3.02 SW version 04.01.zz (device revision 3) Compatibility with SW version 03.00.zz and higher.
GSD revision	▪ 4 (SW version 3.00.zz and 4.00.zz) ▪ 5 (device revision 3)
DD revision	▪ 1 (SW version 3.00.zz and 4.00.zz) ▪ 1 (device revision 3)
GSD file	Information and files at: ▪ www.endress.com ▪ www.profibus.org
DD files	
Output values	**Measured value for PV (via Analog Input Function Block)** ▪ Pressure ▪ Level ▪ Tank content **Measured value for SV** ▪ Pressure ▪ Temperature
Input values	Input value sent from PLC, can be shown on display
Supported functions	▪ Identification & maintenance Simplest device identifier on the control system and nameplate ▪ Condensed status (only with Profile Version 3.02) ▪ Automatic ID number adjustment and switchable to the following ID numbers (only with Profile Version 3.02): – 9700: Profile-specific transmitter identification number with the "Classic" or "Condensed" status". – 1501: Compatibility mode for the old Cerabar S generation (PMC731, PMP731, PMC631, PMP635). – 1541: Identification number of the new Cerabar S generation (PMC71, PMP71, PMP75). ▪ Device locking: The device can be locked by hardware or software.

FOUNDATION Fieldbus protocol-specific data

Manufacturer ID	452B48 hex
Device type	1007 hex
Device revision	▪ 6 - SW version 03.00.zz ▪ 7 - SW version 04.00.zz (FF-912)
DD revision	▪ 3 (device revision 6) ▪ 2 (device revision 7)
CFF revision	▪ 4 (device revision 6) ▪ 1 (device revision 7)

DD files	Information and files at: ▪ www.endress.com ▪ www.fieldcommgroup.org
CFF files	
Device tester version (ITK version)	▪ 5.0 (device revision 6) ▪ 6.01 (device revision 7)
Number of ITK test campaign	▪ IT054600 (Device Revision 6) ▪ IT085500 (Device Revision 7)
Link Master (LAS) capable	Yes
Choice of "Link Master" and "Basic Device"	Yes, factory setting is Basic Device
Node address	Factory setting: 247 (F7 hex)
Supported functions	Field diagnostics profile (only with FF912) The following methods are supported: ▪ Restart ▪ Configure error as warning or alarm ▪ HistoROM ▪ Peakhold ▪ Alarm info ▪ Sensor trim
Number of VCRs	▪ 44 (device revision 6) ▪ 24 (device revision 7)
Number of link objects in VFD	50

Virtual communication references (VCRs)

	Device revision 6	Device revision 7
Permanent entries	44	1
Client VCRs	0	0
Server VCRs	5	10
Source VCRs	8	43
Sink VCRs	0	0
Subscriber VCRs	12	43
Publisher VCRs	19	43

Link settings

	Device revision 6	Device revision 7
Slot time	4	4
Min. Inter PDU delay	12	10
Max. response delay	10	10

Transducer Blocks

Block	Content	Output values
TRD1 Block	Contains all parameters related to the measurement	▪ Pressure or level (channel 1) ▪ Process temperature (channel 2)
Service Block	Contains service information	▪ Pressure after damping (channel 3) ▪ Pressure peakhold indicator (channel 4) ▪ Counter for max. pressure transgressions (channel 5)

Block	Content	Output values
Diagnostic Block	Contains diagnostic information	Error code via DI channels (channel 0 to 16)
Display Block	Contains parameters to configure the onsite display	No output values

Function blocks

Block	Content	Number blocks	Execution time		Functionality	
			Device Revision 6	Device Revision 7	Device Revision 6	Device Revision 7
Resource Block	This block contains all the data that uniquely identifies the device; it is an electronic version of a nameplate for the device.	1			enhanced	enhanced
Analog Input Block 1 Analog Input Block 2	The AI Block receives the measuring data from the Sensor Block, (selectable via a channel number) and makes the data available to other function blocks at its output. Enhancement: Digital outputs for process alarms, fail safe mode	2	45 ms	45 ms (without trend and alarm reports)	enhanced	enhanced
Digital Input Block	This block contains the discrete data of the Diagnose Block (selectable via a channel number 0 to 16) and provides them for other blocks at the output.	1	40 ms	30 ms	standard	enhanced
Digital Output Block	This block converts the discrete input and thus initiates an action (selectable via a channel number) in the DP Flow Block or in the Service Block. Channel 1 resets the counter for max. pressure transgressions.	1	60 ms	40 ms	standard	enhanced
PID Block	This block is used as a proportional-integral-derivative controller and can be used universally for closed-loop-control in the field. It enables cascade mode and feedforward control. Input IN can be indicated on the display. The selection is performed in the Display Block (DISPLAY_MAIN_LINE_CONTENT).	1	120 ms	70 ms	standard	enhanced
Arithmetic Block	This block is designed to permit simple use of popular measurement math functions. The user does not have to know how to write equations. The math algorithm is selected by name, chosen by the user for the function to be performed.	1	50 ms	40 ms	standard	enhanced
Input Selector Block	The Input Selector Block facilitates the selection of up to four inputs and generates an output based on the configured action. This block normally receives its inputs from AI Blocks. The block performs maximum, minimum, average and 'first good' signal selection. Inputs IN1 to IN4 can be indicated on the display. The selection is performed in the Display Block (DISPLAY_MAIN_LINE_CONTENT).	1	35 ms	35 ms	standard	enhanced
Signal Characterizer Block	The Signal Characterizer Block has two sections, each with an output that is a non-linear function of the respective input. The non-linear function is generated by a single look-up table with 21 arbitrary x-y pairs.	1	30 ms	40 ms	standard	enhanced
Integrator Block	The Integrator Block integrates a variable as a function of the time or accumulates the counts from a Pulse Input Block. The block can be used as a totalizer that counts up until a reset, or as a batch totalizer whereby the integrated value is compared against a target value generated before or during the control routine and generates a binary signal when the target value is reached.	1	35 ms	40 ms	standard	enhanced
Analog Alarm Block	This block contains all process alarm conditions (working like a comparator) and represents them at the output.	1	35 ms	35 ms	standard	enhanced

Additional function block information:

Instantiatable function blocks	YES	YES
Number of additional instantiatable function blocks	11	5

Power supply

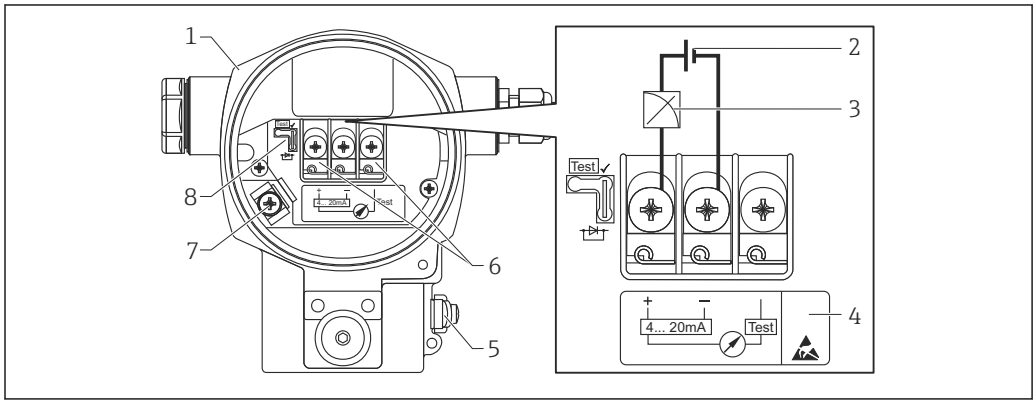
WARNING

Electrical safety is compromised by an incorrect connection!

- When using the measuring device in hazardous areas, the relevant national standards and regulations as well as the Safety Instructions or Installation or Control Drawings must also be observed.→ 127.
- All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all Ex devices→ 127.
- Devices with integrated overvoltage protection must be grounded→ 29.
- Protective circuits against reverse polarity, HF influences and overvoltage peaks are integrated.

Terminal assignment

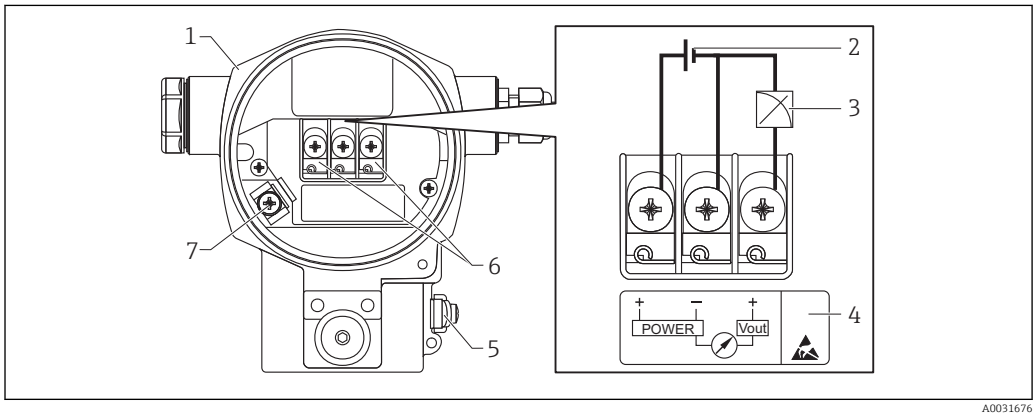
4 to 20 mA HART



A0019989

1 *Housing*
2 *Supply voltage*
3 *4 to 20 mA*
4 *Devices with integrated overvoltage protection are labeled "OVP" (overvoltage protection) here.*
5 *External ground terminal*
6 *4 to 20 mA test signal between positive and test terminal*
7 *Internal ground terminal*
8 *Jumper for 4 to 20 mA test signal*

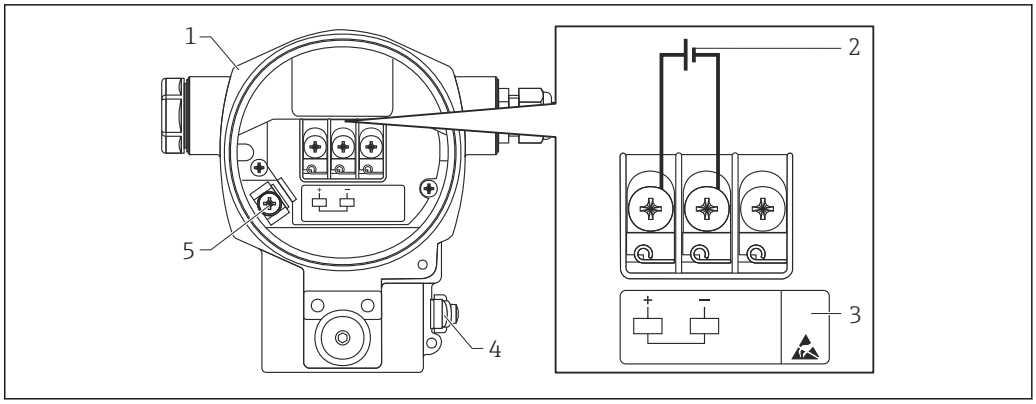
1-5V DC



A0031676

1 *Housing*
2 *Supply voltage*
3 *1-5V DC*
4 *Overvoltage protection (OVP) marking*
5 *External ground terminal*
6 *Terminals*
7 *Internal ground terminal*

PROFIBUS PA and FOUNDATION Fieldbus



A0020158

1 Housing
2 Supply voltage
3 Devices with integrated overvoltage protection are labeled "OVP" (overvoltage protection) here.
4 External ground terminal
5 Internal ground terminal

Supply voltage

4 to 20 mA HART

Electronic version	Jumper for 4 to 20 mA test signal in "Test" position (delivery status)	Jumper for 4 to 20 mA test signal in "Non-test" position
Version for non-hazardous area	11.5 to 45 V DC	10.5 to 45 V DC
Intrinsically safe	11.5 to 30 V DC	10.5 to 30 V DC
▪ Other types of protection ▪ Devices without certificate	11.5 to 45 V DC (versions with 35 V DC plug-in connection)	10.5 to 45 V DC (versions with 35 V DC plug-in connection)

Measuring a 4 to 20 mA test signal

Jumper position for test signal	Description
 A0019992	▪ Measurement of 4 to 20 mA test signal via the positive and test terminal: Possible. (Thus, the output current can be measured without interruption via the diode.) ▪ Delivery status ▪ Minimum supply voltage: 11.5 V DC
 A0019993	▪ Measurement of 4 to 20 mA test signal via positive and test terminal: Not possible. ▪ Minimum supply voltage: 10.5 V DC

1-5V DC

- Non-hazardous area: 9 to 35 V DC
- Ex-d: 9 to 35 V DC

PROFIBUS PA

- Version for non-hazardous areas: 9 to 32 V DC
- Ex ia: 10.5 to 30 V DC

FOUNDATION Fieldbus

- Version for non-hazardous areas: 9 to 32 V DC
- Ex ia: 10.5 to 30 V DC

Current consumption

- 1-5V DC:
  9 V = 1.8 mA
  35 V = 0.8 mA
- PROFIBUS PA: 13 mA ±1 mA, switch-on current corresponds to IEC 61158-2, Clause 21
- FOUNDATION Fieldbus: 15.5 mA ±1 mA, switch-on current corresponds to IEC 61158-2, Clause 21

Electrical connection

PROFIBUS PA

The digital communication signal is transmitted to the bus via a two-wire connection. The bus also provides the power supply. For further information on the network structure and grounding, and for further bus system components such as bus cables, see the relevant documentation, e.g. Operating Instructions BA00034S "PROFIBUS DP/PA: Guidelines for planning and commissioning" and the PNO Guideline.

FOUNDATION Fieldbus

The digital communication signal is transmitted to the bus via a two-wire connection. The bus also provides the power supply. For further information on the network structure and grounding and for further bus system components such as bus cables, see the relevant documentation, e.g. Operating Instructions BA00013S "FOUNDATION Fieldbus Overview" and the FOUNDATION Fieldbus Guideline.

Terminals

- Supply voltage and internal ground terminal: 0.5 to 2.5 mm^2 (20 to 14 AWG)
- External ground terminal: 0.5 to 4 mm^2 (20 to 12 AWG)

Cable entries

Approval	Cable gland	Clamping area
Standard, II 1/2 G Ex ia, IS	Plastic M20x1.5	5 to 10 mm (0.2 to 0.39 in)
ATEX II 1/2 D, II 1/3 D, II 1/2 GD Ex ia, II 1 GD Ex ia, II 3 G Ex nA	Metal M20x1.5 (Ex e)	7 to 10.5 mm (0.28 to 0.41 in)

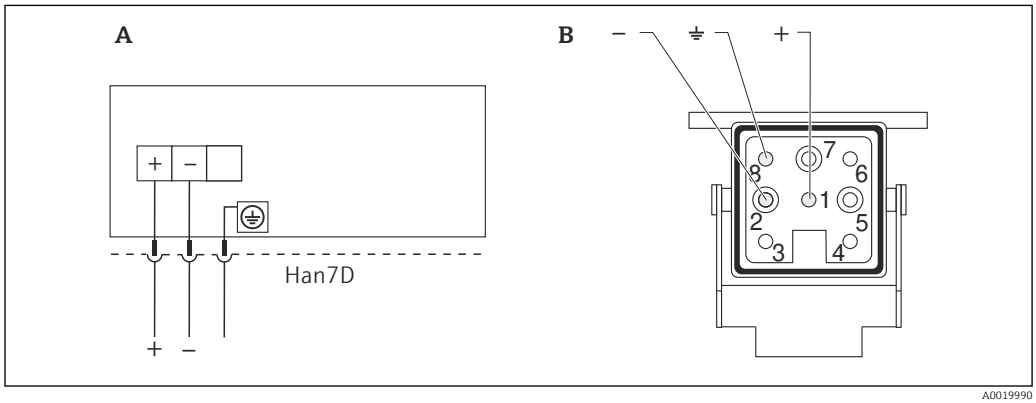
1-5V DC

The cable entries have a 1/2 FNPT thread. The connection on the customer's side is protected by a plastic connector. A cable gland is not envisaged.

For additional technical data, see section on housing → 55

Device plug

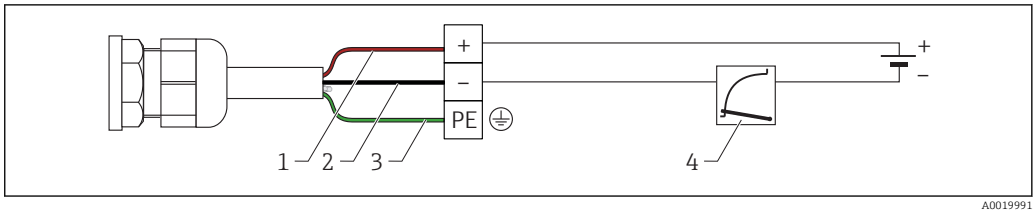
Devices with Harting plug Han7D



A Electrical connection for devices with Harting plug Han7D
B View of the plug-in connection on the device

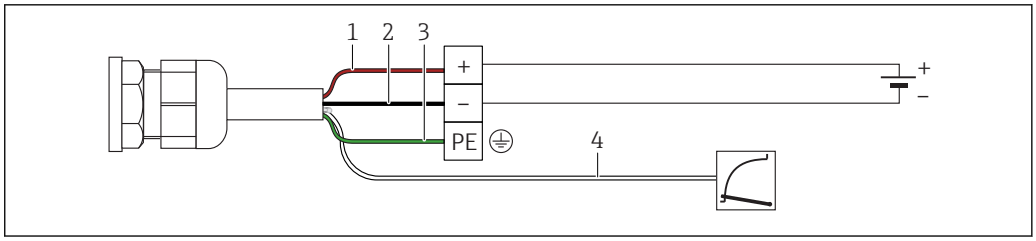
Material: CuZn, gold-plated plug-in jack and plug

Cable version connection



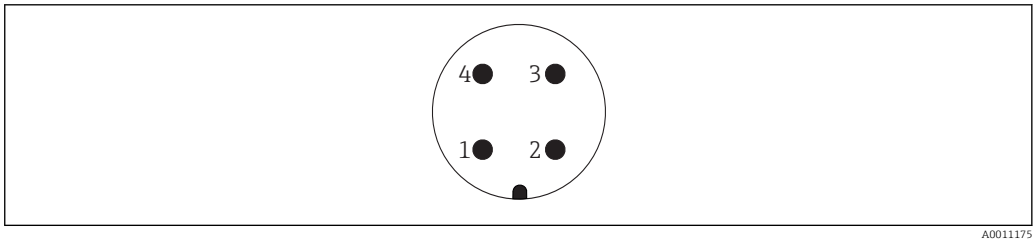
1 *rd = red*
2 *bk = black*
3 *gnye = green*
4 *4 to 20 mA*

Connection via cable version 1-5V DC



1 *rd = red*
2 *bk = black*
3 *gnye = green*
4 *1-5V DC*

Devices with M12 plug



1 *Signal +*
2 *Not assigned*
3 *Signal –*
4 *Ground*

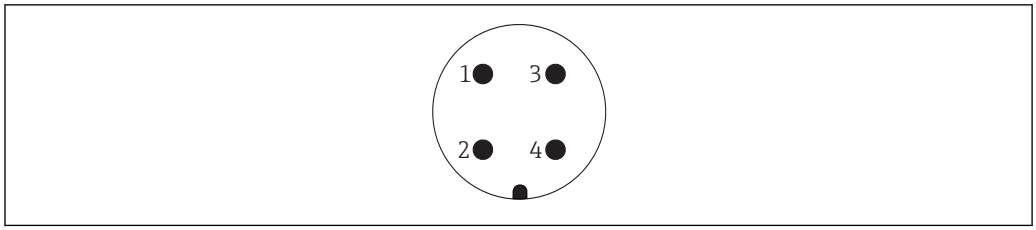
Endress+Hauser offers the following accessories for devices with an M12 plug:

Plug-in jack M 12x1, straight
- Material: Body PA; coupling nut CuZn, nickel-plated
- Degree of protection (fully locked): IP67
- Order number: 52006263

Plug-in jack M 12x1, elbowed
- Material: Body PBT/PA; coupling nut GD-Zn, nickel-plated
- Degree of protection (fully locked): IP67
- Order number: 71114212

Cable 4x0.34 mm^2 (20 AWG) with M12 socket, elbowed, screw plug, length 5 m (16 ft)
- Material: Body PUR; coupling nut CuSn/Ni; cable PVC
- Degree of protection (fully locked): IP67
- Order number: 52010285

Devices with 7/8" plug



A0011176

1 *Signal –*
2 *Signal +*
3 *Not assigned*
4 *Shielding*

External thread: 7/8 - 16 UNC
- Material: 316L (1.4401)
- Degree of protection: IP68

Cable specification

HART

- Endress+Hauser recommends using shielded, twisted-pair two-wire cables.
- Cable outer diameter: 5 to 9 mm (0.2 to 0.35 in) depending on the cable entry used → 🖹 26

1-5V DC

- Endress+Hauser recommends using a shielded cable.
- Cable outer diameter: 5 to 9 mm (0.2 to 0.35 in) depending on the cable entry used → 🖹 26

Maximum cable length

The following table shows the tolerance of the voltage output for a representative cable with a length of up to 100 m (328 ft), a resistance of 18 Ohm/km and specification 18 AWG (cable cross-section 0.8 mm^2).

Tolerance of voltage output at cable end	Length
0.5 mV	25 m (82 ft)
1 mV	50 m (164 ft)
1.5 mV	75 m (246 ft)
2 mV	100 m (328 ft)

PROFIBUS PA

Use a twisted, shielded twin-core cable, preferably cable type A.

For further information regarding cable specifications, see the Operating Instructions BA00034S "PROFIBUS DP/PA: Guidelines for planning and commissioning", the PNO guideline 2.092 "PROFIBUS PA User and Installation Guideline" and IEC 61158-2 (MBP).

FOUNDATION Fieldbus

Use a twisted, shielded twin-core cable, preferably cable type A.

For further information on the cable specifications, see Operating Instructions BA00013S "FOUNDATION Fieldbus Overview", FOUNDATION Fieldbus Guideline and IEC 61158-2 (MBP).

Start-up current

12 mA

Residual ripple

Without influence on 4 to 20 mA signal up to ±5% residual ripple within the permitted voltage range [according to HART hardware specification HCF_SPEC-54 (DIN IEC 60381-1)].

Overvoltage protection (optionally for HART, PROFIBUS PA and FOUNDATION Fieldbus)

- Overvoltage protection:
  - Nominal functioning DC voltage: 600 V
  - Nominal discharge current: 10 kA
- Surge current check î = 20 kA satisfied as per DIN EN 60079-14: 8/20 µs
- Arrester AC current check I = 10 A satisfied

Ordering information: Product Configurator, order code for "Additional options 1" or Additional options 2", option "M"

NOTICE

Device could be destroyed!

► Devices with integrated overvoltage protection must be grounded.

Influence of power supply

≤0.0006 % of URL/1 V

Performance characteristics of PMP71/PMP75 metal pressure transmitter (Sensor module + Electronic module)

Preamble

The performance characteristic of the transmitter refers to "Accuracy of the transmitter". The factors influencing accuracy can be divided into two groups
- Total performance of transmitter → 30
- Installation dependent influencing factors → 42

Total performance of transmitter

Transmitter total performance → 31comprises the reference accuracy and the ambient temperature effect and is calculated using the following formula:

Total performance	=	$\pm \sqrt{ (E1)^2 + (E2)^2 }$
E1	=	Reference accuracy → 30
E2	=	ambient temperature effect per ±28 °C (50 °F) (corresponds to the range of −3 to +53 °C (+27 to +127 °F)) → 32

Reference accuracy [E1]

Reference accuracy E1 as % [1] The specifications refer to the calibrated span/Upper Range Value (URV).			
Measuring cell	**PMP71**		**PMP75** [2]
	Standard Reference accuracy [3]	**Platinum** [4] **Reference accuracy**	**Standard Reference accuracy**
400 mbar (6 psi)	▪ TD 1:1 = ±0.05 ▪ TD > 1:1 = ±0.05 · TD	▪ TD 1:1 = ±0.025 ▪ TD > 1:1 = ±0.04	▪ TD 1:1 = ±0.15 ▪ TD > 1:1 = ±0.15 · TD
1 bar (15 psi)	▪ TD ≤ 2.5:1 = ±0.05 ▪ TD > 2.5:1 = ±0.02 · TD	▪ TD 1:1 = ±0.025 ▪ TD > 1:1 = ±0,03	▪ TD ≤ 2.5:1 = ±0.075 ▪ TD > 2.5:1 = ±0.03 · TD
2 bar (30 psi)	▪ TD ≤ 5:1 = ±0.05 ▪ TD > 5:1 = ±0.01 · TD	▪ TD 1:1 = ±0.025 ▪ TD > 1:1 = ±0,03	▪ TD ≤ 5:1 = ±0.075 ▪ TD > 5:1 = ±0.015 · TD
4 bar (60 psi)	▪ TD ≤ 10:1 = ±0.05 ▪ TD > 10:1 = ±0.005 · TD	▪ TD 1:1 = ±0.025 ▪ TD > 1:1 = ±0,03	▪ TD ≤ 10:1 = ±0.075 ▪ TD > 10:1 = ±0.0075 · TD
10 bar (150 psi)	▪ TD ≤ 10:1 = ±0.05 ▪ TD > 10:1 = ±0.005 · TD	▪ TD 1:1 = ±0.025 ▪ TD > 1:1 = ±0,03	▪ TD ≤ 10:1 = ±0.075 ▪ TD > 10:1 = ±0.0075 · TD
40 bar (600 psi)	▪ TD ≤ 10:1 = ±0.05 ▪ TD > 10:1 = ±0.005 · TD	▪ TD 1:1 = ±0.025 ▪ TD > 1:1 = ±0,03	▪ TD ≤ 10:1 = ±0.075 ▪ TD > 10:1 = ±0.0075 · TD
100 bar (1 500 psi)	▪ TD ≤ 10:1 = ±0.05 ▪ TD > 10:1 = ±0.005 · TD	▪ TD 1:1 = ±0.035 ▪ TD > 1:1 = ±0.04	▪ TD ≤ 10:1 = ±0.075 ▪ TD > 10:1 = ±0.0075 · TD
400 bar (6 000 psi)	▪ TD ≤ 5:1 = ±0.1 ▪ TD > 5:1 = ±0.02 · TD	▪ TD 1:1 = ±0.065 ▪ TD > 1:1 = ±0.09	▪ TD ≤ 5:1 = ±0.15 ▪ TD > 5:1 = ±0.03 · TD
700 bar (10 500 psi)	▪ TD ≤ 5:1 = ±0.1 ▪ TD > 5:1 = ±0.02 · TD	▪ TD 1:1 = ±0.065 ▪ TD > 1:1 = ±0.09	-

1) Reference accuracy comprises the non-linearity [DIN EN 61298-2] including the hysteresis [DIN EN 61298-2] and non-repeatability [DIN EN 61298-2] in accordance with the limit point method as per [DIN EN 60770]. Reference accuracy for standard up to TD 100:1, for platinum up to TD 5:1. Valid for all membrane materials.
2) PMP75: No diaphragm seal errors are taken into account. Diaphragm seal errors can be calculated separately in the Applicator diaphragm seal calculation module. Link to online tool Applicator: www.endress.com/applicator → Sizing Diaphragm Seal
3) PMP71 with 1-5V DC: for 400 mbar (6 psi) to 100 bar (1 500 psi) measuring cells, the values specified in the table must be multiplied by a factor of 2. For 400 bar (6 000 psi) and 700 bar (10 500 psi) measuring cells, the values specified in the table must be multiplied by a factor of 1.5.
4) Platinum version not for flush-mounted process connections G ½ and M20

Please refer to the next chapter “Detailed performance explanation and calculation” for further explanations on "Ambient temperature effect".

Total performance – Specification values

PMP71: Total performance as % The specifications refer to the calibrated span/Upper Range Value (URV).										
Measuring cell	Standard [1]					Platinum [1]				
	TD 1:1	TD 2:1	TD 3:1	TD 4:1	TD 5:1	TD 1:1	TD 2:1	TD 3:1	TD 4:1	TD 5:1
400 mbar (6 psi)	±0.18	±0.23	±0.29	±0.35	±0.41	±0.17	±0.21	±0.25	±0.29	±0.33
1 bar (15 psi)	±0.18	±0.22	±0.26	±0.30	±0.34	±0.17	±0.21	±0.25	±0.29	±0.33
2 bar (30 psi)	±0.18	±0.22	±0.25	±0.29	±0.33	±0.17	±0.21	±0.25	±0.29	±0.33
4 bar (60 psi)	±0.18	±0.22	±0.25	±0.29	±0.33	±0.17	±0.21	±0.25	±0.29	±0.33
10 bar (150 psi)	±0.12	±0.15	±0.18	±0.21	±0.24	±0.11	±0.14	±0.17	±0.20	±0.23
40 bar (600 psi)	±0.12	±0.15	±0.18	±0.21	±0.24	±0.11	±0.14	±0.17	±0.20	±0.23
100 bar (1 500 psi)	±0.13	±0.15	±0.16	±0.18	±0.19	±0.13	±0.15	±0.16	±0.17	±0.19
400 bar (6 000 psi)	±0.16	±0.17	±0.18	±0.20	±0.21	±0.14	±0.17	±0.18	±0.19	±0.21
700 bar (10 500 psi)	±0.16	±0.17	±0.18	±0.20	±0.21	±0.14	±0.17	±0.18	±0.19	±0.21

1) The specification values apply to the temperature range per ±28 °C (50 °F) (corresponds to the range of −3 to +53 °C (+27 to +127 °F)) for all measuring cells. The specification values apply to the analog output (i.e. including electronics errors). The specification values apply to gauge pressure and absolute pressure. The specification values apply to membrane material AISI 316L (1.4435).

Long-term stability

PMP71/PMP75: long-term stability as % The specifications refer to the upper range limit (URL) [1].			
Measuring cell	Standard & platinum		
	1 year	5 years	10 years
400 mbar (6 psi)	± 0.05	± 0.07	± 0.10
1 bar (15 psi)	± 0.05	± 0.07	± 0.10
2 bar (30 psi)	± 0.07	± 0.12	± 0.15
4 bar (60 psi)	± 0.05	± 0.07	± 0.10
10 bar (150 psi)	± 0.05	± 0.07	± 0.10
40 bar (600 psi)	± 0.05	± 0.07	± 0.10
100 bar (1 500 psi)	± 0.05	± 0.07	± 0.10
400 bar (6 000 psi)	± 0.05	± 0.07	± 0.10
700 bar (10 500 psi)	± 0.05	± 0.07	± 0.10

1) PMP75: No diaphragm seal errors are taken into account. Diaphragm seal errors can be calculated separately in the Applicator diaphragm seal calculation module. Link to online tool Applicator: www.endress.com/applicator → Sizing Diaphragm Seal

Detailed Performance Explanation and Calculation

To calculate the total performance outside the temperature range of −3 to +53 °C (+27 to +127 °F) or for a membrane material other than 1.4435/316L, please refer to the following sections: "Ambient temperature effect" and "Calculating the total performance" [1].

Ambient temperature effect [E2]

- $E2 = (E2_M \cdot CF_1) + E2_E + E2_{LT}$
- $E2_M$ = Main temperature error
- CF_1 = Temperature range correction factor
- $E2_E$ = Electronics error for analog output
- $E2_{LT}$ = low temperature error

$E2_M$ - Main temperature error

The output changes due to the effect of ambient temperature [IEC 61298-3] with respect to reference temperature [DIN 16086]. The values specify the maximum error due to min./max. ambient or process temperature conditions.

The specified error is applicable to the membrane material AISI 316L.

PMP71/PMP75: main temperature error $E2_M$ as % per ±28 °C (50 °F) (corresponds to the range of −3 to +53 °C (+27 to +127 °F)) The specifications refer to the calibrated span/Upper Range Value (URV).		
Measuring cell	**Standard**	**Platinum**
400 mbar (6 psi)	± (0.04 · TD + 0.08)	± (0.04 · TD + 0.08)
1 bar (15 psi)	± (0.04 · TD + 0.08)	± (0.04 · TD + 0.08)
2 bar (30 psi)	± (0.04 · TD + 0.08)	± (0.04 · TD + 0.08)
4 bar (60 psi)	± (0.04 · TD + 0.08)	± (0.04 · TD + 0.08)
10 bar (150 psi)	± (0.03 · TD + 0.03)	± (0.03 · TD + 0.03)
40 bar (600 psi)	± (0.03 · TD + 0.03)	± (0.03 · TD + 0.03)
100 bar (1 500 psi)	± (0.015 · TD + 0.06)	± (0.015 · TD + 0.06)
400 bar (6 000 psi)	± (0.015 · TD + 0.06)	± (0.015 · TD + 0.06)
700 bar (10 500 psi)	± (0.015 · TD + 0.06)	± (0.015 · TD + 0.06)

CF_1 - Temperature range correction factor

PMP71/PMP75: correction factor CF_1		
Measuring cell	**Temperature range**	**Factor, CF_1**
For all measuring cells	25 °C ± 28 °C (−3 to +53 °C (+27 to +127 °F))	1
	−32 to −4 °C (−26 to +25 °F) and +54 to +85 °C (+129 to +185 °F)	2
	−50 to −33 °C (−58 to −27 °F)	2.3

$E2_E$ - Electronics error

PMP71/PMP75: electronics error $E2_E$ as % The specifications refer to the calibrated span/Upper Range Value (URV).			
Measuring cell	**Electronics**	**Temperature range**	**Error [1]**
For all measuring cells	Analog output (4 to 20 mA)	−50 to +85 °C (−58 to +185 °F)	0.05
	Digital output (HART)	−50 to +85 °C (−58 to +185 °F)	0
	Digital output (PA/FF)	−40 to +85 °C (−40 to +185 °F)	0

1) PMP75: No diaphragm seal errors are taken into account. Diaphragm seal errors can be calculated separately in the Applicator diaphragm seal calculation module. Link to online tool Applicator: www.endress.com/applicator → Sizing Diaphragm Seal

PMP71/PMP75: electronics error $E2_E$ as % The specifications refer to the calibrated span/Upper Range Value (URV).			
Measuring cell	**Electronics**	**Temperature range**	**Error** [1]
	PMP71 with 1-5V DC	−3 to +53 °C (+27 to +127 °F)	0.18
	PMP71 with 1-5V DC	−40 to −4 °C (−40 to +25 °F) and +54 to +85 °C (+129 to +185 °F)	0,55

1) The additional electronics error that occurs in the temperature range −50 to −41 °C (−58 to −42 °F) is covered by $E2_{LT}$.

$E2_{LT}$ - low temperature error

PMP71/PMP75: low temperature error $E2_{LT}$ as % The specifications refer to the calibrated span/Upper Range Value (URV).		
Measuring cell	**Temperature range**	**Problem**
For all measuring cells	−40 to +85 °C (−40 to +185 °F)	0
	−50 to −41 °C (−58 to −42 °F)	1.5

Total error

Total error = total performance + long-term stability

Total performance as % of the set span with TD1:1 → 31

Long-term stability as % of the upper range limit (URL) → 31

PMP71: total error as % The specifications refer to the upper range limit (URL).						
Measuring cell	**Standard** [1]			**Platinum** [1]		
	1 year	**5 years**	**10 years**	**1 year**	**5 years**	**10 years**
400 mbar (6 psi)	± 0.23	± 0.25	± 0.28	± 0.22	± 0.24	± 0,27
1 bar (15 psi)	± 0.23	± 0.25	± 0.28	± 0.22	± 0.24	± 0,27
2 bar (30 psi)	± 0.25	± 0.30	± 0.33	± 0.24	± 0.29	± 0.32
4 bar (60 psi)	± 0.23	± 0.25	± 0.28	± 0.22	± 0.24	± 0,27
10 bar (150 psi)	± 0.17	± 0.19	± 0.22	± 0.16	± 0.18	± 0.21
40 bar (600 psi)	± 0.17	± 0.19	± 0.22	± 0.16	± 0.18	± 0.21
100 bar (1 500 psi)	± 0.18	± 0.20	± 0.23	± 0.18	± 0.20	± 0.23
400 bar (6 000 psi)	± 0.21	± 0.23	± 0.26	± 0.19	± 0.21	± 0.24
700 bar (10 500 psi)	± 0.21	± 0.23	± 0.26	± 0.19	± 0.21	± 0.24

1) The specification values apply to the temperature range per ±28 °C (50 °F) (corresponds to the range of −3 to +53 °C (+27 to +127 °F)) for all measuring cells. The specification values apply to the analog output (i.e. including electronics errors) and TD 1:1. The specifications values apply to gauge pressure and absolute pressure. The specification values apply to membrane material AISI 316L (1.4435), Alloy C 276.

Performance characteristics of PMC71 ceramic pressure transmitter (Sensor module + Electronic module)

Preamble

The performance characteristic of the transmitter refers to "Accuracy of the transmitter". The factors influencing accuracy can be divided into two groups
- Total performance of transmitter → 🖹 34
- Installation dependent influencing factors → 🖹 42

Total performance of transmitter

Transmitter total performance → 🖹 35 comprises the reference accuracy and the ambient temperature effect and is calculated using the following formula:

Total performance	=	$\pm \sqrt{((E1)^2 + (E2)^2)}$
E1	=	Reference accuracy → 🖹 34
E2	=	ambient temperature effect per ±28 °C (50 °F) (corresponds to the range of −3 to +53 °C (+27 to +127 °F)) → 🖹 36

Reference accuracy [E1]

PMC71: Reference accuracy E1 as % [1]
The specifications refer to the calibrated span/Upper Range Value (URV).

Measuring cell	Standard Reference accuracy	Platinum Reference accuracy
100 mbar (1.5 psi)	▪ TD ≤ 10:1 = ±0.075 ▪ TD > 10:1 = ±0.0075 · TD	▪ TD 1:1 = ±0.05 ▪ TD > 1:1 = ±0.075
250 mbar (3.75 psi)	▪ TD ≤ 10:1 = ±0.075 ▪ TD > 10:1 = ±0.0075 · TD	TD ≥ 1:1 = ±0.05
400 mbar (6 psi)	▪ TD ≤ 10:1 = ±0.05 ▪ TD > 10:1 = ±0.005 · TD	TD ≥ 1:1 = ±0.035
1 bar (15 psi)	▪ TD ≤ 10:1 = ±0.05 ▪ TD > 10:1 = ±0.005 · TD	TD ≥ 1:1 = ±0.035
2 bar (30 psi)	▪ TD ≤ 10:1 = ±0.05 ▪ TD > 10:1 = ±0.005 · TD	▪ TD 1:1 = ±0.025 ▪ TD ≥ 1:1 = ±0.035
4 bar (60 psi)	▪ TD ≤ 10:1 = ±0.05 ▪ TD > 10:1 = ±0.005 · TD	TD ≥ 1:1 = ±0.025
10 bar (150 psi)	▪ TD ≤ 10:1 = ±0.05 ▪ TD > 10:1 = ±0.005 · TD	TD ≥ 1:1 = ±0.035
40 bar (600 psi)	▪ TD ≤ 10:1 = ±0.05 ▪ TD > 10:1 = ±0.005 · TD	TD ≥ 1:1 = ±0.035

1) Reference accuracy comprises the non-linearity [DIN EN 61298-2] including the hysteresis [DIN EN 61298-2] and the non-repeatability [DIN EN 61298-2] in accordance with the limit point method as per [DIN EN 60770]. Reference accuracy for standard up to TD 100:1, for platinum up to TD 5:1.

Total performance – Specification values

PMC71: total performance as % The specifications refer to the calibrated span/Upper Range Value (URV).										
Measuring cell	Standard [1]					Platinum [1]				
	TD 1:1	TD 2:1	TD 3:1	TD 4:1	TD 5:1	TD 1:1	TD 2:1	TD 3:1	TD 4:1	TD 5:1
100 mbar (1.5 psi)	±0.17	±0.24	±0.31	±0.38	±0.44	±0.17	±0.24	±0.31	±0.38	±0.44
250 mbar (3.75 psi)	±0.17	±0.24	±0.31	±0.38	±0.44	±0.17	±0.23	±0.30	±0.37	±0.44
400 mbar (6 psi)	±0.17	±0.23	±0.30	±0.37	±0.44	±0.16	±0.23	±0.30	±0.37	±0.44
1 bar (15 psi)	±0.14	±0.21	±0.17	±0.33	±0.40	±0.14	±0.20	±0.27	±0.33	±0.40
2 bar (30 psi)	±0.14	±0.21	±0.27	±0.33	±0.40	±0.14	±0.20	±0.27	±0.33	±0.40
4 bar (60 psi)	±0.14	±0.21	±0.27	±0.33	±0.40	±0.14	±0.20	±0.27	±0.33	±0.40
10 bar (150 psi)	±0.14	±0.21	±0.27	±0.33	±0.40	±0.14	±0.20	±0.27	±0.33	±0.40
40 bar (600 psi)	±0.14	±0.21	±0.27	±0.33	±0.40	±0.14	±0.20	±0.27	±0.33	±0.40

1) The specification values apply to the temperature range per ±28 °C (50 °F) (corresponds to the range of −3 to +53 °C (+27 to +127 °F)) for all measuring cells. The specification values apply to the analog output (i.e. including electronics errors). The specification values apply to gauge pressure and absolute pressure.

Long-term stability

PMC71: long-term stability as % The specifications refer to the upper range limit (URL).						
Measuring cell	Gauge pressure			Absolute pressure		
	1 year	5 years	10 years	1 year	5 years	10 years
100 mbar (1.5 psi)	± 0.05	± 0.08	± 0.10	± 0.05	± 0.15	± 0.20
250 mbar (3.75 psi)	± 0.05	± 0.08	± 0.10	± 0.05	± 0.15	± 0.20
400 mbar (6 psi)	± 0.05	± 0.08	± 0.10	± 0.05	± 0.15	± 0.20
1 bar (15 psi)	± 0.05	± 0.08	± 0.10	± 0.05	± 0.15	± 0.20
2 bar (30 psi)	± 0.05	± 0.08	± 0.10	± 0.05	± 0.15	± 0.20
4 bar (60 psi)	± 0.05	± 0.08	± 0.10	± 0.05	± 0.15	± 0.20
10 bar (150 psi)	± 0.05	± 0.08	± 0.10	± 0.05	± 0.15	± 0.20
40 bar (600 psi)	± 0.05	± 0.08	± 0.10	± 0.05	± 0.15	± 0.20

Detailed Performance Explanation and Calculation

To calculate the total performance outside the temperature range of −3 to +53 °C (+27 to +127 °F), please refer to the following sections: "Ambient temperature effect" and "Calculating the total performance".

PMC71 standard version - Ambient temperature effect [E2]

- $E2 = (E2_M \cdot CF_1) + 0.05$
- $E2_M$ = Main temperature error
- CF_1 = Temperature range correction factor

$E2_M$ - Main temperature error

The output changes due to the effect of ambient temperature [IEC 61298-3] with respect to reference temperature [DIN 16086]. The values specify the maximum error due to min./max. ambient or process temperature conditions.

PMC71: main temperature error $E2_M$ as % per ±28 °C (50 °F) (corresponds to the range of −3 to +53 °C (+27 to +127 °F)) The specifications refer to the calibrated span/Upper Range Value (URV).		
Measuring cell	**Standard**	**Platinum**
100 mbar (1.5 psi)	± (0.07 · TD + 0.038)	± (0.07 · TD + 0.038)
250 mbar (3.75 psi)	± (0.07 · TD + 0.038)	± (0.07 · TD + 0.038)
400 mbar (6 psi)	± (0.07 · TD + 0.038)	± (0.07 · TD + 0.038)
1 bar (15 psi)	± (0.065 · TD + 0.02)	± (0.065 · TD + 0.02)
2 bar (30 psi)	± (0.065 · TD + 0.02)	± (0.065 · TD + 0.02)
4 bar (60 psi)	± (0.065 · TD + 0.02)	± (0.065 · TD + 0.02)
10 bar (150 psi)	± (0.065 · TD + 0.02)	± (0.065 · TD + 0.02)
40 bar (600 psi)	± (0.065 · TD + 0.02)	± (0.065 · TD + 0.02)

CF_1 - Temperature range correction factor

PMC71: correction factor CF_1		
Measuring cell	**Temperature range**	**Factor, CF_1**
100 mbar (1.5 psi) 250 mbar (3.75 psi) 400 mbar (6 psi) 1 bar (15 psi) 2 bar (30 psi) 4 bar (60 psi) 10 bar (150 psi) 40 bar (600 psi)	25 °C ± 28 °C (−3 to +53 °C (+27 to +127 °F))	1
	−20 to −4 °C (−4 to +25 °F) and +54 to +82 °C (+129 to +180 °F)	2.4
	+83 to +125 °C (+181 to +257 °F)	2.4

PMC71 high-temperature version - Ambient temperature effect [E2]

- E2 = $E2_M$
- $E2_M$ = Main temperature error

$E2_M$ - Main temperature error

The output changes due to the effect of ambient temperature [IEC 61298-3] with respect to reference temperature [DIN 16086]. The values specify the maximum error due to min./max. ambient or process temperature conditions.

PMC71 high-temperature version: main temperature error $E2_M$ as % for −10 to +60 °C (+14 to +140 °F) The specifications refer to the calibrated span/Upper Range Value (URV).		
Measuring cell	**Standard**	**Platinum**
100 mbar (1.5 psi)	± (0.088 · TD + 0.088)	± (0.088 · TD + 0.088)
250 mbar (3.75 psi)	± (0.088 · TD + 0.088)	± (0.088 · TD + 0.088)
400 mbar (6 psi)	± (0.088 · TD + 0.088)	± (0.088 · TD + 0.088)
1 bar (15 psi)	± (0.088 · TD + 0.04)	± (0.088 · TD + 0.04)
2 bar (30 psi)	± (0.088 · TD + 0.04)	± (0.088 · TD + 0.04)
4 bar (60 psi)	± (0.088 · TD + 0.04)	± (0.088 · TD + 0.04)
10 bar (150 psi)	± (0.088 · TD + 0.04)	± (0.088 · TD + 0.04)
40 bar (600 psi)	± (0.088 · TD + 0.04)	± (0.088 · TD + 0.04)

PMC71 high-temperature version: main temperature error $E2_M$ as % for +60 to +150 °C (+140 to +302 °F) The specifications refer to the calibrated span/Upper Range Value (URV).				
Measuring cell	**Standard**		**Platinum**	
	Gauge pressure	**Absolute pressure**	**Gauge pressure**	**Absolute pressure**
100 mbar (1.5 psi)	± (0.75 · TD)	± (1.25 · TD)	± (0.75 · TD)	± (1.25 · TD)
250 mbar (3.75 psi)	± (0.75 · TD)	± (0.75 · TD)	± (0.75 · TD)	± (0.75 · TD)
400 mbar (6 psi)	± (0.75 · TD)	± (0.75 · TD)	± (0.75 · TD)	± (0.75 · TD)
1 bar (15 psi)	± (0.50 · TD)	± (0.75 · TD)	± (0.50 · TD)	± (0.75 · TD)
2 bar (30 psi)	± (0.50 · TD)	± (0.75 · TD)	± (0.50 · TD)	± (0.75 · TD)
4 bar (60 psi)	± (0.50 · TD)	± (0.75 · TD)	± (0.50 · TD)	± (0.75 · TD)
10 bar (150 psi)	± (0.50 · TD)	± (0.75 · TD)	± (0.50 · TD)	± (0.75 · TD)
40 bar (600 psi)	± (0.50 · TD)	± (0.50 · TD)	± (0.50 · TD)	± (0.50 · TD)

Total error

Total error = total performance + long-term stability

Total performance as % of the set span with TD1:1 → 🖹 35

Long-term stability as % of the upper range limit (URL) → 🖹 35

PMC71: total error as % The specifications refer to the upper range limit (URL).						
Measuring cell	Gauge pressure - Standard [1]			Gauge pressure - platinum [1]		
	1 year	5 years	10 years	1 year	5 years	10 years
100 mbar (1.5 psi)	± 0.225	± 0.255	± 0.275	± 0.216	± 0.246	± 0.266
250 mbar (3.75 psi)	± 0.225	± 0.255	± 0.275	± 0.216	± 0.246	± 0.266
400 mbar (6 psi)	± 0.216	± 0.246	± 0.266	± 0.212	± 0.242	± 0.262
1 bar (15 psi)	± 0.194	± 0.224	± 0.244	± 0.189	± 0.219	± 0.239
2 bar (30 psi)	± 0.194	± 0.224	± 0.244	± 0.187	± 0.217	± 0.237
4 bar (60 psi)	± 0.194	± 0.224	± 0,240	± 0.187	± 0.217	± 0.237
10 bar (150 psi)	± 0.194	± 0.224	± 0.244	± 0.189	± 0.219	± 0.239
40 bar (600 psi)	± 0.194	± 0.224	± 0.244	± 0.189	± 0.219	± 0.239

1) The specification values apply to the temperature range per ±28 °C (50 °F) (corresponds to the range of −3 to +53 °C (+27 to +127 °F)) for all measuring cells. The specification values apply to the analog output (i.e. including electronics errors). The specification values apply to the standard version of the PMC71.

PMC71: total error as % The specifications refer to the upper range limit (URL).						
Measuring cell	Absolute pressure - Standard [1]			Absolute pressure - Platinum [1]		
	1 year	5 years	10 years	1 year	5 years	10 years
100 mbar (1.5 psi)	± 0.225	± 0.325	± 0.375	± 0.216	± 0.316	± 0.366
250 mbar (3.75 psi)	± 0.225	± 0.325	± 0.375	± 0.216	± 0.316	± 0.366
400 mbar (6 psi)	± 0.216	± 0.316	± 0.366	± 0.212	± 0.312	± 0.362
1 bar (15 psi)	± 0.194	± 0.294	± 0.344	± 0.189	± 0.289	± 0.339
2 bar (30 psi)	± 0.194	± 0.294	± 0.344	± 0.187	± 0.287	± 0.337
4 bar (60 psi)	± 0.194	± 0.294	± 0.344	± 0.187	± 0.287	± 0.337
10 bar (150 psi)	± 0.194	± 0.294	± 0.344	± 0.189	± 0.289	± 0.339
40 bar (600 psi)	± 0.194	± 0.294	± 0.344	± 0.189	± 0.289	± 0.339

1) The specification values apply to the temperature range per ±28 °C (50 °F) (corresponds to the range of −3 to +53 °C (+27 to +127 °F)) for all measuring cells. The specification values apply to the analog output (i.e. including electronics errors). The specification values apply to the standard version of the PMC71.

Performance characteristics - calculation example and additional information

Calculating the total performance in 4 steps

Data (example with PMP71)

Measuring Conditions / Device configuration	
Measuring range (URV)	5 bar (75 psi)
Min./max. temp. pressure transmitter (ambient/process)	Ambient temp.:0 to 45 °C (32 to 113 °F) Max. Process temp.:50 °C (122 °F)
Membrane material	AISI 316L
Reference accuracy (± 0.05%)	Standard
PMP71 - Suitable measuring cell (upper range limit, URL)	10 bar (150 psi) with TD 2:1
Output Signal	4 to 20 mA

Formula

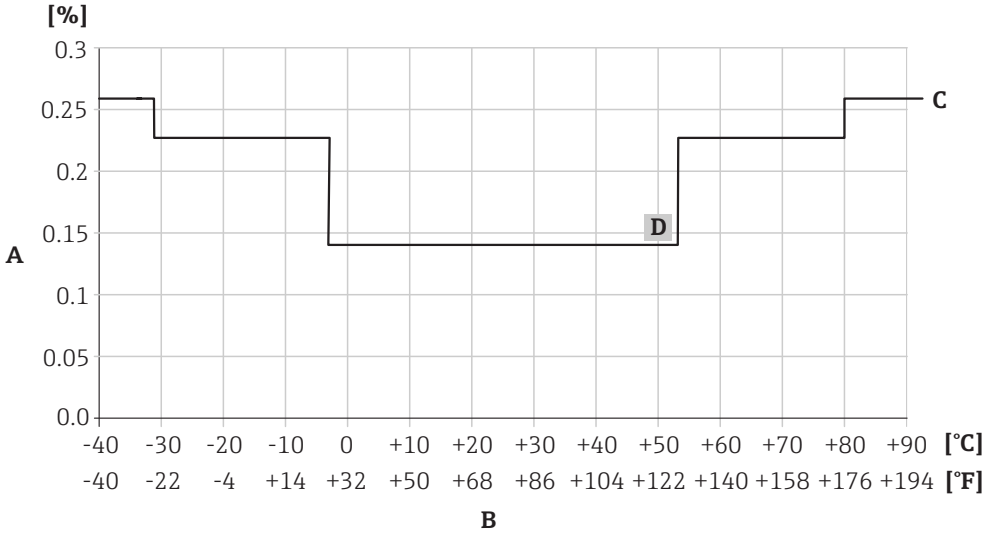
Total performance	=	$\pm \sqrt{ (E1)^2 + (E2)^2 }$
E1	=	Reference accuracy → 🖹 30
E2	=	Ambient temperature effect per ±28 °C (50 °F) (corresponds to the range of −3 to +53 °C (+27 to +127 °F)) → 🖹 32

Calculation

Step 1: Calculating the turn down → 🖹 7			
Turn down (TD) = URL/ | URV - LRV |		=	10 bar (150 psi)/5 bar (75 psi)
		=	TD = 2:1
Step 2: Calculating the reference accuracy (E1) → 🖹 30			
For the measuring conditions,			
Reference accuracy, E1		=	± 0.05 (% of the set span)
		=	± (0.05/100) · 5 bar (75 psi)
		=	±0.0025 bar (0.03625 psi)
	E1	=	± 0.05 (% of the set span)
		(or)	±0.0025 bar (0.03625 psi)

Step 3: Calculation of the ambient temperature effect [$E2 = (E2_M \cdot CF_1) + E2_E + E2_{LT}$] → 32

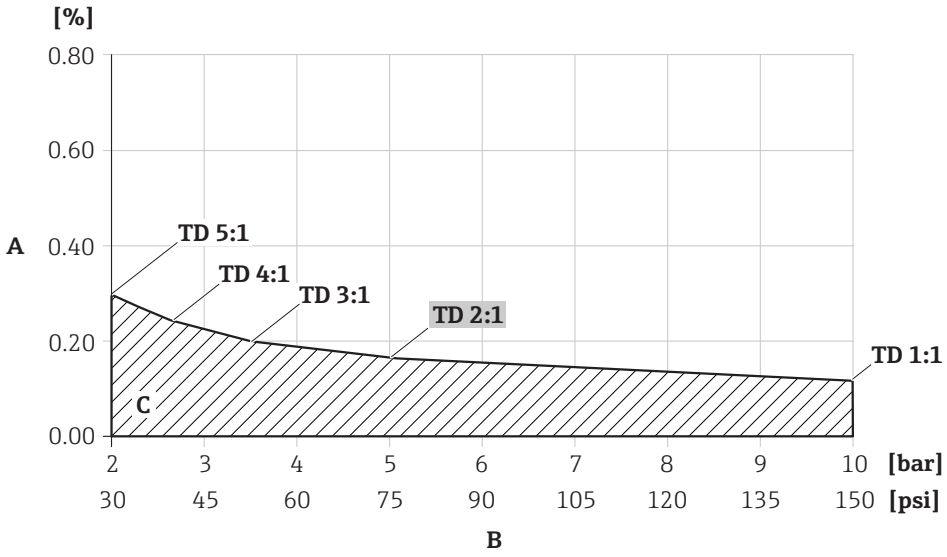
For the measuring conditions, Main temperature error, $E2_M$	=	± (0.03 · TD + 0.03) % of the set span
Temperature correction factor, CF_1	=	1
Electronics error , $E2_E$	=	0.05 %
Low temperature error $E2_{LT}$	=	0 %
Ambient temperature effect, E2	=	± [(0.03 · TD + 0.03) · 1] + 0.05 + 0
	=	± [(0.03 · 2 + 0.03) · 1] + 0.05 + 0
	=	± 0.14 (% of the set span)
	=	± (0.14/100) · 5 bar (75 psi)
	=	±0.007 bar (0.1015 psi)
E2	=	± 0.14 (% of the set span)
	(or)	±0.007 bar (0.1015 psi)



A Error (% of the set span)
B Temperature
C 316L process isolating diaphragm
D Ambient temperature effect: 0.14 (% of the set span)

Step 4: Calculation of the total performance

Total performance	=	$\pm \sqrt{((E1)^2 + (E2)^2)}$
		E1 = Reference accuracy E2 = Ambient temperature effect per ±28 °C (50 °F) (corresponds to the range of −3 to +53 °C (+27 to +127 °F))
Total performance, if calculated in mbar	=	$\pm \sqrt{((0.0025)^2 + (0.007)^2)}$
	=	± 0.0074 bar (0.1073 psi) or 7.4 mbar (0.1073 psi)
	~	0.149 % of 5 bar (75 psi)
	(or)	
Total performance, if calculated in % of the upper range limit	=	$\pm \sqrt{((0.05)^2 + (0.14^2))}$
	=	± 0.149 (% of the set span)
Total performance	=	± 0.149 (% of the set span)
	(or)	±0.0074 bar (0.1073 psi)



A Error (% of the set span)
B Set span [bar]
C Standard measuring cell

Installation factors

Some of the influencing factors are:
- Influence of installation position → 🖹 42
- Uncertainty of measurement for small absolute pressure ranges → 🖹 42

Influence of installation position

- PMP71: Device rotated 180°, process connection pointing upwards. The value is doubled for devices with inert oil.
  - Process connection thread G 1 A, G 1 ½, G 2, 1 ½ MNPT, 2 MNPT, M 44x1.25, EN/DIN, ASME and JIS flanges: ≤ 10 mbar (0.15 psi).
  - Process connection thread: G ½, ½ MNPT, JIS G ½, JIS R ½, M20x1.5: ≤ 4 mbar (0.06 psi).
- PMC71: ≤ 0.18 mbar (0.003 psi). Device rotated 180°, process connection pointing upwards.

A position-dependent zero point shift can be corrected. Please refer to operating instructions and chapter Commissioning → Position adjustment.

Different tightening torques (e.g. for Clamp or Varivent connections) can merely cause a shift in the zero point. This effect is corrected by position adjustment during commissioning.

Uncertainty of measurement for small absolute pressure ranges

The smallest expanded uncertainty of measurement that can be returned by our calibration standards is:
- in the range 1 to 30 mbar (0.0145 to 0.435 psi): 0.4 % of (current) reading
- in the range < 1 mbar (0.0145 psi): 1 % of (current) reading.

Performance Characteristics Conformance

All performance characteristics are in conformance to ≥ ± 3 sigma.

Resolution

Current output: 1 µA

Voltage output: 1 mW

Warm-up period

- 4 to 20 mA HART: < 10 s
- PROFIBUS PA: 6 s
- FOUNDATION Fieldbus: 50 s

Reference operating conditions

- As per IEC 60770
- Ambient temperature T_A = constant, in the range +21 to +33 °C (+70 to +91 °F)
- Humidity φ = constant, in the range: 5 to 80 % RH ± 5 %
- Ambient pressure p_A = constant, in range: 860 to 1060 mbar (12.47 to 15.37 psi)
- Position of measuring cell: horizontal ±1° (see also "Influence of installation position" section→ 🖹 42)
- Input of LOW SENSOR TRIM and HIGH SENSOR TRIM for lower range value and upper range value
- Zero based span
- Membrane material PMC71: Al_2O_3 aluminum oxide ceramic FDA, ultrapure 99.9 %
- Membrane material PMP71/PMP75: AISI 316L (1.4435) or Alloy C
- Filling oil PMP71/PMP75: silicone oil
- Supply voltage: 24 V DC ±3 V DC
- Load with HART: 250 Ω
- Turn down (TD) = URL/ | URV - LRV |

Installation

General installation instructions

- For PMP75: → 🖹 110 "Installation instructions" section.
- A position-dependent zero point shift can be corrected directly at the device via operating keys, and also in hazardous areas in the case of devices with external operation.
  Diaphragm seals also shift the zero point, depending on the installation position → 🖹 113.
- The device housing can be rotated up to 380°.
- Endress+Hauser offers a mounting bracket for installing the device on pipes or walls → 🖹 44.
- Use flushing rings for flange and cell diaphragm seals if buildup or clogging can be expected at the diaphragm seal connection. The flushing ring can be fitted between the process connection and diaphragm seal. Material buildup in front of the process isolating diaphragm can be flushed away, and the pressure chamber vented, via the two lateral flushing holes.
- When measuring in media containing solids, such as dirty liquids, installing separators and drain valves is useful for capturing and removing sediment.
- Point the cable and connector downwards where possible to prevent moisture from entering (e.g. rain or condensation water).

Measuring arrangement for devices without diaphragm seals – PMC71, PMP71

Cerabar S devices without diaphragm seals are mounted in accordance with the same guidelines as a manometer (DIN EN 837-2). We recommend the use of shutoff devices and siphons. The orientation depends on the measuring application.

Pressure measurement in gases

Mount the Cerabar S with shutoff device above the tapping point so that any condensate can flow into the process.

Pressure measurement in vapors

Use siphons for pressure measurement in steam. The siphon reduces the temperature to almost ambient temperature. Fill the siphon with liquid before commissioning. Preferably mount the Cerabar S with the siphon below the tapping point.

Advantages:
- defined water column only causes minimal/negligible measured errors
- only minimal/negligible thermal effects on the device

Mounting above the tapping point is also possible. Note the max. permitted ambient temperature of the transmitter!

Pressure measurement in liquids

Mount the Cerabar S with shutoff device below or at the same level as the tapping point.

Level measurement

- Mount the Cerabar S below the lowest measuring point.
- Do not install the device in the following positions: In the filling curtain, in the tank outlet or at a point in the container which could be affected by pressure pulses from an agitator or a pump.
- The calibration and functional test can be carried out more easily if you mount the device downstream from a shutoff device.

Measuring arrangement for devices with diaphragm seals – PMP75

→ 🖹 110

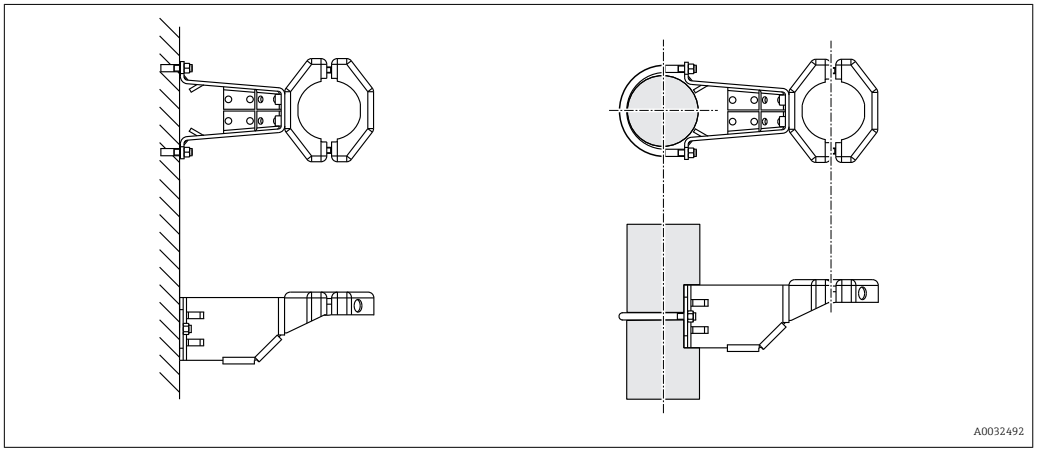
Orientation

The orientation may cause a zero point shift, see → 🖹 42.

This position-dependent zero point shift can be corrected directly at the device via the operating key, and also in hazardous areas in the case of devices with external operation (position adjustment).

Wall and pipe mounting, transmitter (optional)

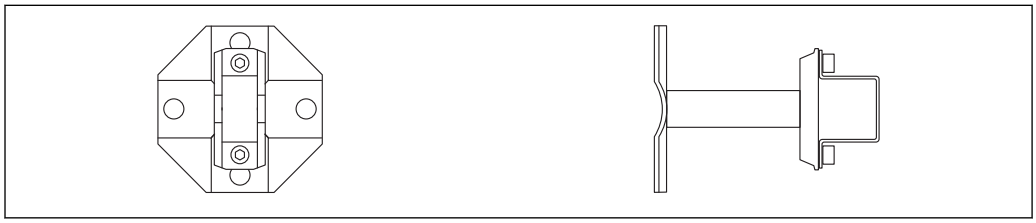
Endress+Hauser offers the following mounting bracket for installing the device on pipes or walls:



Ordering information:
- Product Configurator, order code for "Accessories enclosed", option "PA"
- For devices with separate housing (can be ordered using the order code "Additional options 2") included in the scope of delivery
- Can be ordered as a separate accessory (part no.: 71102216).

For further details, see → 97.

Wall and pipe mounting, valve manifold (optional)



For the technical data (such as the dimensions or order numbers for screws), see the document SD01553P/00/EN.

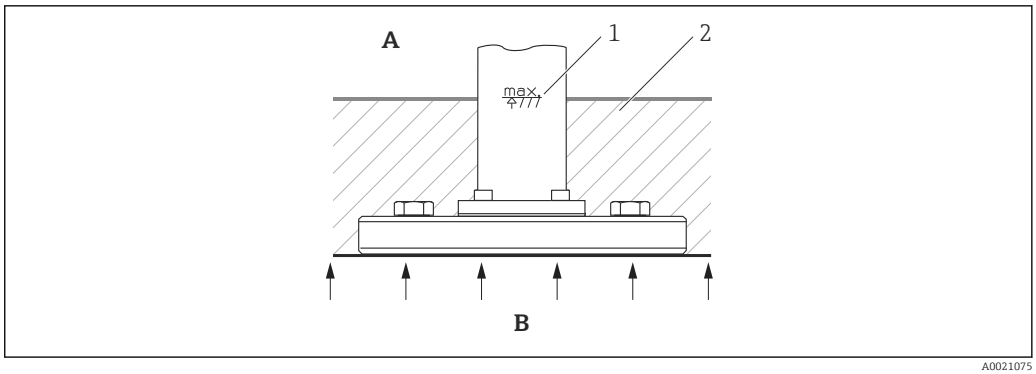
Ordering information:

Product Configurator, order code for "Accessories enclosed", option "PK"

Heat insulation – PMC71 high-temperature version

The PMC71 high-temperature version must only be insulated up to a certain height. The maximum permitted insulation height is indicated on the devices and applies to an insulation material with a heat conductivity ≤ 0.04 W/(m x K) and to the maximum permitted ambient and process temperature (see table below). The data were determined under the most critical application "quiescent air".

The data were determined under the most critical application "quiescent air".



A0021075

A Ambient temperature
B Process temperature
1 Insulation height
2 Insulation material

	Temperature
Ambient temperature	≤ 70 °C (158 °F)
Process temperature	≤ 150 °C (302 °F)

Mounting of PVDF screw-in fittings

⚠ WARNING

Risk of damage to process connection!
Risk of injury!
- ▶ PVDF process connections with threaded connections must be installed with the enclosed mounting bracket!

The mounting bracket can be installed on pipes with a diameter of 1¼" to 2" or on walls.

Dimensions → 🖹 54.

"Separate housing" version

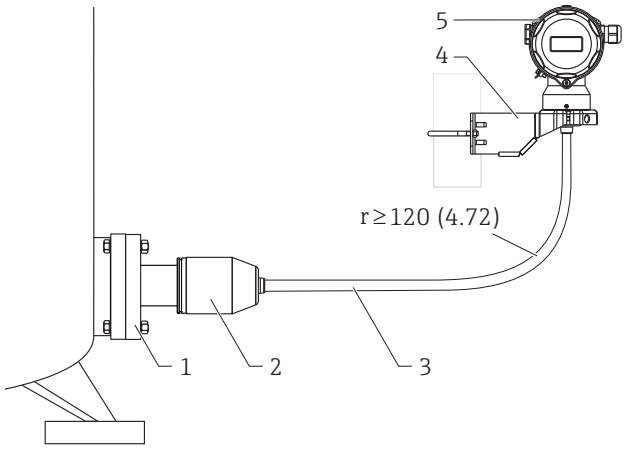
With the "separate housing" version, you are able to mount the housing with the electronics insert at a distance from the measuring point. This version facilitates trouble-free measurement
- Under particularly difficult measuring conditions (at installation locations that are cramped or difficult to access)
- If rapid cleaning of the measuring point is required and
- If the measuring point is exposed to vibrations.

You can choose between different cable versions:
- PE: 2 m (6.6 ft), 5 m (16 ft) and 10 m (33 ft)
- FEP: 5 m (16 ft).

Ordering information: Product Configurator, order code for "Additional options 2", version "G".

Dimensions → 🖹 97

In the case of the "separate housing" version, the sensor is delivered with the process connection and cable ready mounted. The housing and a mounting bracket are enclosed as separate units. The cable is provided with a socket at both ends. These sockets are simply connected to the housing and the sensor.



1 Process connection with sensor - For degrees of protection, see the following section
2 Process connection adapter (weight: 0.93 kg (2.05 lb))
3 Cable (weight: 0.05 kg/meter (0.11 lb)), both ends are fitted with a socket
4 Mounting bracket provided, suitable for pipe and wall mounting
5 Housing with electronic insert - degrees of protection → 🖹 55

Engineering unit mm (in)

Degree of protection for the process connection and sensor with the use of
- FEP cable:
  - IP 69 [2)]
  - IP 66 NEMA 4/6P
  - IP 68 (1.83 mH_2O for 24 h) NEMA 4/6P
- PE cable:
  - IP 66 NEMA 4/6P
  - IP 68 (1.83 mH_2O for 24 h) NEMA 4/6P

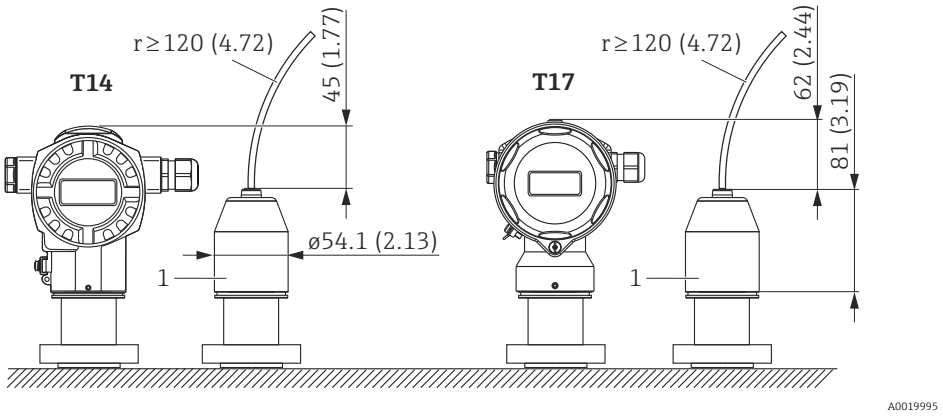
Technical data of the PE and FEP cable:
- Minimum bending radius: 120 mm (4.72 in)
- Cable extraction force: max. 450 N (101.16 lbf)
- Resistance to UV light

Use in hazardous area:
- Intrinsically safe installations (Ex ia/IS)
- FM/CSA IS: for Div. 1 installation only

2) Designation of the IP protection class according to DIN EN 60529. Previous designation "IP69K" according to DIN 40050 Part 9 is no longer valid (standard withdrawn on November 1, 2012). The tests required by both standards are identical.

Reduction of the installation height

If the separate housing is used, the installation height of the process connection is reduced compared to the dimensions of the standard version.



1 Process connection adapter

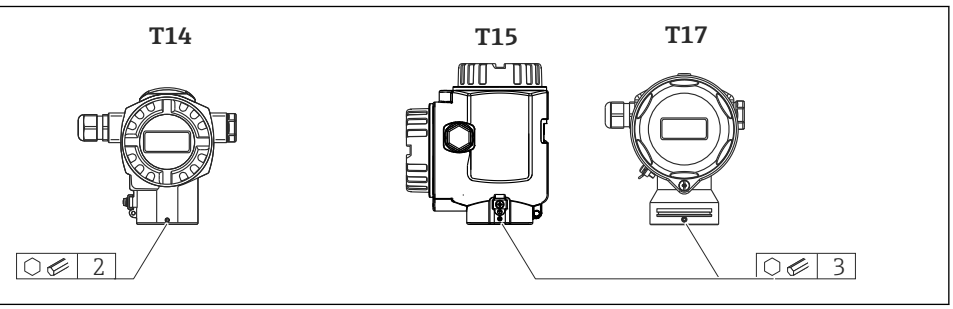
Engineering unit mm (in)

Turning the housing

The housing can be rotated up to 380° by loosening the Allen screw.

Your benefits

- Easy mounting due to optimum alignment of housing
- Good, accessible device operation
- Optimum readability of the onsite display (optional).



Oxygen applications

Oxygen and other gases can react explosively to oils, grease and plastics, such that, among other things, the following precautions must be taken:
- All components of the system, such as measuring devices, must be cleaned in accordance with the BAM (DIN 19247) requirements.
- Dependent on the materials used, a certain maximum temperature and a maximum pressure for oxygen applications must not be exceeded.

The devices suitable for gaseous oxygen applications are listed in the following table with the specification p_{max}.

HB = Cleaned for oxygen service

Order code for devices [1], cleaned for oxygen applications	p_{max} for oxygen applications	T_{max} for oxygen applications
PMC71 – * * * * * * ** 2 * * or PMC71 – * * * * * * ** A * * HB, Devices with sensors, nominal value < 10 bar (150 psi)	Over pressure limit (OPL) [2] [3] of sensor	60 °C (140 °F)
PMC71 – * * * * * * ** 2 * *, PMC71 – * * * * * * ** A * * HB, Devices with sensors, nominal value ≥ 10 bar (150 psi)	60 bar (900 psi)	60 °C (140 °F)
PMP71 – * * * * * * * ** N * * or PMP71 – * * * * * * * ** F * * HB	depends on the lowest-rated element, with regard to pressure, of the selected components: over pressure limit (OPL) of the sensor, process connection (1.5 x PN) or fill fluid (160 bar (2 400 psi))	85 °C (185 °F)
PMP75 – * * * * * * * * ** N * * or PMP75 – * * * * * * * * ** F * * HB	depends on the lowest-rated element, with regard to pressure, of the selected components: over pressure limit (OPL) of the sensor, process connection (1.5 x PN) or fill fluid (160 bar (2 400 psi))	85 °C (185 °F)

1) Devices only, not accessories or enclosed accessories.
2) Product Configurator, order code for "Sensor range; sensor over pressure limit (= OPL)"
3) PMC71 with PVDF threaded connection: Only mount with the enclosed mounting bracket. MWP 10 bar (150 psi), OPL max. 15 bar (225 psi). Process temperature range−10 to +60 °C (+14 to +140 °F)

PWIS-free applications

Special cleaning of the transmitter to remove paint-wetting substances, for use in paint shops, for instance.

Ordering information:

Product Configurator, order code for "Seal", option "L" or "M".

Ultrapure gas applications

Endress+Hauser also offers devices for special applications, such as ultrapure gas, cleaned from oil and grease. No special restrictions regarding the process conditions apply to these devices.

Ordering information:
- Product Configurator, order code for "Seal" or
- Product Configurator, order code for "Fill fluid".

Applications with hydrogen

A **ceramic** process isolating diaphragm or a **gold-plated** metal process isolating diaphragm offers universal protection against hydrogen diffusion, both in gas applications and in applications with aqueous solutions.

Applications with hydrogen in aqueous solutions

A **gold/rhodium-plated** metal process isolating diaphragm (AU/Rh) offers effective protection against hydrogen diffusion.

Environment

Ambient temperature range

Version	PMC71 High-temperature version	PMC71	PMP71	PMP75
Without LCD display	−20 to +70 °C (−4 to +158 °F)	−40 to +85 °C (−40 to +185 °F)	−50 to +85 °C (−58 to +185 °F) [1]	
With LCD display [2]		−20 to +70 °C (−4 to +158 °F)		
With M12 connector, elbowed		−25 to +85 °C (−13 to +185 °F)		
With separate housing	–	−20 to +60 °C (−4 to +140 °F)		–
Diaphragm seal systems [3]	–	–	–	→ 🖹 110
MID parts certificate	–	–	−25 to +55 °C (−13 to +131 °F)	–

1) If the temperature is below −40 °C (−40 °F), chances of failure increases. Product Configurator, order code for "Test, certificate" option "JN".
2) Extended temperature application range (−50 to +85 °C (−58 to +185 °F)) with restrictions in optical properties, such as display speed and contrast
3) Ambient temperature range and process temperature range are mutually dependent - see "Heat insulation" section → 🖹 114

For high-temperature applications, either a PMP75 with a temperature isolator or with a capillary can be used. If vibrations also occur in the application, Endress+Hauser recommends using a PMP75 with a capillary. If a PMP75 with a temperature isolator or capillary is used, we recommend a suitable bracket for mounting (see "Wall and pipe mounting" section).→ 🖹 44

Hazardous areas

- For devices for use in hazardous areas, see Safety Instructions, Installation or Control Drawing→ 🖹 127.
- Pressure measuring devices that have the usual explosion protection certificates (e.g. ATEX-/ CSA-/ FM-/ IEC Ex,...) can be used in hazardous areas at ambient temperatures down to −50 °C (−58 °F). The functionality of the explosion protection is also guaranteed for ambient temperatures down to −50 °C (−58 °F).

Storage temperature range

- −40 to +90 °C (−40 to +194 °F)
- Local display: −40 to +85 °C (−40 to +185 °F)
- Separate housing:−40 to +60 °C (−40 to +140 °F)
- Devices with PVC-sheathed capillary: −25 to +90 °C (−13 to +194 °F)

Degree of protection

Depends on the deployed
- Housing → 🖹 55
- Separate housing → 🖹 46

Climate class

Class 4K4H (air temperature: −20 to +55 °C (−4 to +131 °F), relative humidity: 4 to 100 %) fulfilled as per DIN EN 60721-3-4 (condensation possible. With PMC71, avoid condensate in the device.)

Electromagnetic compatibility

- Electromagnetic compatibility as per EN 61326 and NAMUR recommendation EMC (NE21).
- With enhanced immunity against electromagnetic fields as per EN 61000-4-3: 30 V/m with closed cover (for devices with T14 housing)
  Increased interference immunity with 30 V/m not available for 1-5V DC. EMC interference immunity for 1-5V DC: 10 V/m
- Maximum deviation: < 0.5 % of span
- All EMC measurements were performed with a turn down (TD) = 2:1.
- Class E3 as per OIML R75-2

For further details refer to the Declaration of Conformity.

Vibration resistance

Device/accessory	Test standard	Vibration resistance
PMC71 [1]	GL	Guaranteed for 3 to 25 Hz: ±1.6 mm (0.063 in); 25 to 100 Hz: 4 g in all 3 planes
PMP71		
PMP75 [2] [3]		
With mounting bracket	IEC 61298-3	Guaranteed for 10 to 60 Hz: ±0.15 mm (0.0059 in); 60 to 500 Hz: 2 g in all 3 planes
PMP71 with MID parts certificate	OIML R117-1	Class M3

1) Not for high-temperature version with Ex d[ia], CSA XP or FM XP
2) With aluminum T14 housing only
3) For applications with very high temperatures, a PMP75 with either a temperature isolator or a capillary can be used. If vibrations also occur in the application, Endress+Hauser recommends using a PMP75 with a capillary. If a PMP75 with a temperature isolator or capillary is used, it must be mounted with a mounting bracket

Process

Process temperature limits

For oxygen applications, observe → 📄 48

PMC71 (with ceramic process isolating diaphragm)

- −25 to +125 °C (−13 to +257 °F)
- High-temperature version: −25 to +150 °C (−13 to +302 °F); Product Configurator, order code for "Additional options 1", version "T".
- For saturated steam applications, use a device with a metal process isolating diaphragm, or provide a siphon for temperature isolation when installing.
- Observe the process temperature range of the seal in the following table.

Seal	Notes	Process temperature range	Option [1]
FKM Viton	–	−25 to +125 °C (−13 to +257 °F)/ 150 °C (302 °F) [2]	A, L
EPDM	FDA 21CFR177.2600; 3A Class II; USP Class VI DVGW (KTW, W270, W534), WRAS, ACS, NSF61	−20 to +125 °C (−4 to +257 °F)/ 150 °C (302 °F) [2]	B
FFKM Perlast G75LT	–	−20 to +125 °C (−4 to +257 °F)/ 150 °C (302 °F) [2]	C
Kalrez, Compound 4079	–	+5 to +125 °C (+41 to +257 °F)/ 150 °C (302 °F) [2]	D, M
Chemraz, Compound 505	–	−10 to +125 °C (+14 to +257 °F)/ 150 °C (302 °F) [2]	E
HNBR	FDA 21CFR177.2600; 3A Class II; KTW; AFNOR; BAM	−25 to +125 °C (−13 to +257 °F)	F [3]
NBR	–	−10 to +100 °C (+14 to +212 °F)	F
FKM Viton	FDA 21CFR177.2600	−5 to +125 °C (+23 to +257 °F)	G
FKM Viton	cleaned of oil and grease	−10 to +125 °C (+14 to +257 °F)/ 150 °C (302 °F) [2]	1
FKM Viton	cleaned for oxygen service	−10 to +60 °C (+14 to +140 °F)	2 or A [4]
The process temperature ranges specified here refer to permanent application of the PMC71. They may be exceeded for a short time (e.g. for cleaning).			

1) Product Configurator, order code for "Seal"
2) 150 °C (302 °F) for high-temperature version
3) These seals are used for devices with 3A-approved process connections.
4) with option "HB", see Product Configurator, order code for "Service"

Applications with jumps in temperature

Extreme jumps in temperature can result in temporary measuring errors. Temperature compensation takes effect after several minutes. Internal temperature compensation is faster the smaller the jump in temperature and the longer the time interval involved.

For further information please contact your local Endress+Hauser Sales Center.

PMP71 (with metallic process isolating diaphragm)

Designation	Limits
Process connections with internal process isolating diaphragm	−40 to +125 °C (−40 to +257 °F) (150 °C (302 °F) for max. one hour)
Process connections with flush-mounted process isolating diaphragm,	−40 to +100 °C (−40 to +212 °F)

PMP71 (with metallic process isolating diaphragm) with MID parts certificate

−25 to +55 °C (−13 to +131 °F)

PMP75 (with diaphragm seal)

- Depending on the design and depending on the diaphragm seal and filling oil: −70 °C (−94 °F) up to +400 °C (+752 °F). Observe temperature application limits of diaphragm seal oil → 113.
- Please observe the maximum gauge pressure and maximum temperature.

Devices with PTFE-coated process isolating diaphragm

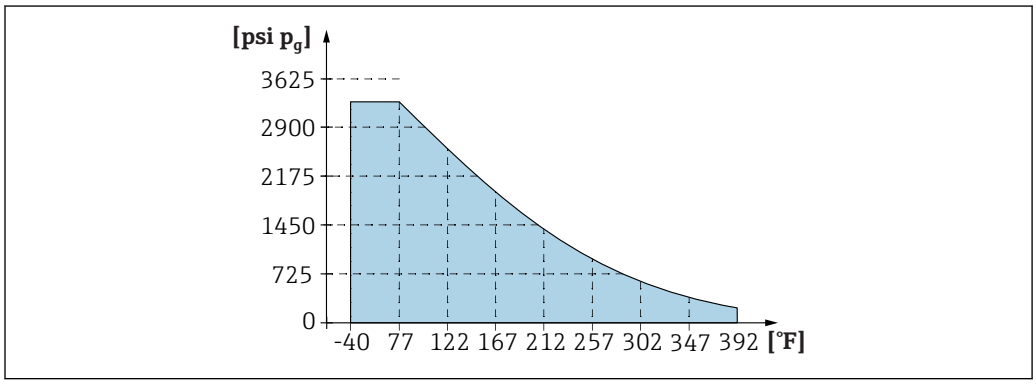
The non-stick coating has excellent gliding properties and is used to protect the process isolating diaphragm against abrasive media.

NOTICE

Incorrect use of the PTFE foil will destroy the device!

► The PTFE foil used is designed to protect the unit against abrasion. It does not provide protection against corrosive media.

For the range of application of the 0.25 mm (0.01 in) PTFE foil on an AISI 316L (1.4404/1.4435) process isolating diaphragm, see the following diagram:

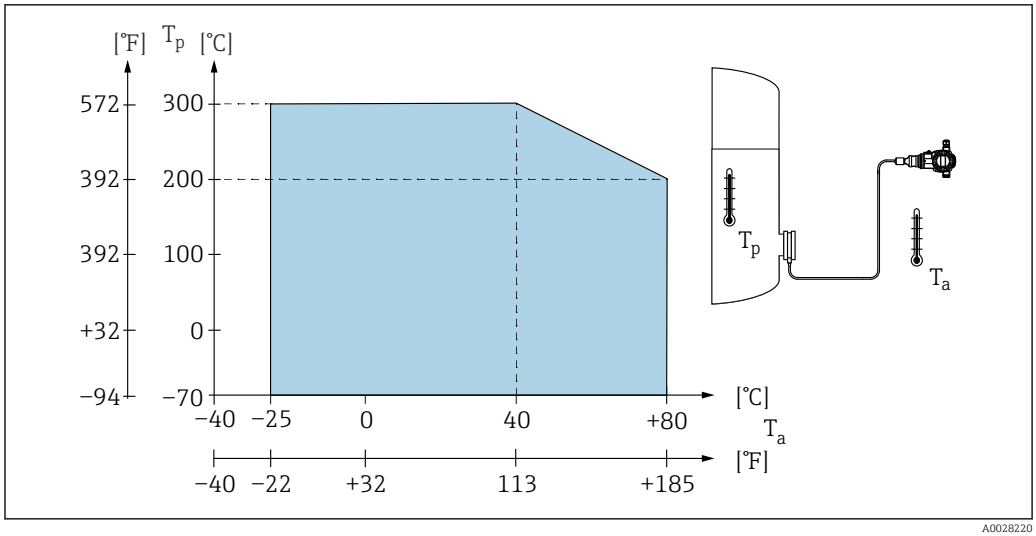


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For vacuum applications: p_{abs} ≤ 1 bar (14.5 psi) to 0.05 bar (0.725 psi) up to max. +150 °C (302 °F).

Process temperature limits of capillary armoring: PMP75

- 316L: No restrictions
- PTFE: No restrictions
- PVC: See the following diagram



A0028220

Pressure specifications

⚠ WARNING

The maximum pressure for the measuring device depends on the lowest-rated element with regard to pressure.

- For pressure specifications, see the "Measuring range" section and the "Mechanical construction" section.
- The measuring device must be operated only within the specified limits!
- MWP (maximum working pressure): The MWP (maximum working pressure) is specified on the nameplate. This value refers to a reference temperature of +20 °C (+68°F) and may be applied to the device for an unlimited time. Observe temperature dependency of the MWP. The pressure values permitted at higher temperatures can be found in the standards EN 1092-1: 2001 Tab. 18 (With regard to their stability-temperature property, the materials 1.4435 and 1.4404 are grouped together under 13EO in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.), ASME B 16.5a – 1998 Tab. 2-2.2 F316, ASME B 16.5a – 1998 Tab. 2.3.8 N10276, JIS B 2220.
- The test pressure corresponds to the over pressure limit of the individual sensors (OPL = 1.5 x MWP (formula does not apply to the PMP71 or PMP75 with a 40 bar (600 psi) or 100 bar (1500 psi) measuring cell)) and may be applied only for a limited period of time to prevent any lasting damage.
- The Pressure Equipment Directive (2014/68/EU) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the measuring device.
- In the case of sensor range and process connections where the over pressure limit (OPL) of the process connection is smaller than the nominal value of the sensor, the device is set at the factory, at the very maximum, to the OPL value of the process connection. If you want to use the entire sensor range, select a process connection with a higher OPL value (1.5 x PN; MWP = PN)
- In oxygen applications, the values for "p_{max} and T_{max} for oxygen applications must not be exceeded→ 🖹 48.
- Devices with ceramic process isolating diaphragm: avoid steam hammering! Steam hammering can cause zero point drifts. Recommendation: Residue (water droplets or condensation) may remain on the process isolating diaphragm following SIP cleaning and can result in local steam hammering the next time steam cleaning takes place. In practice, drying the process isolating diaphragm (e.g. by blowing) has proved to prevent steam hammering.

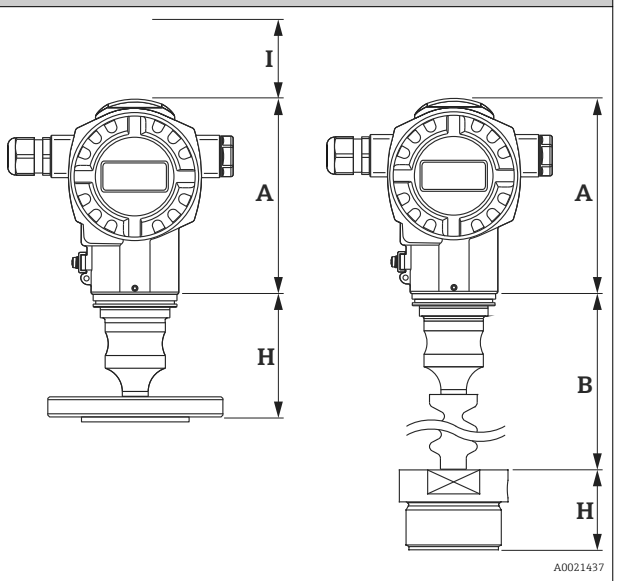
Mechanical construction

Device height

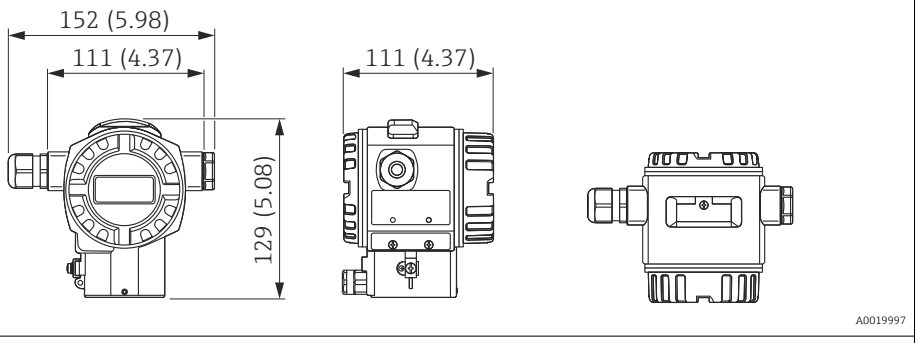
The device height is calculated from

- the height of the housing
- the height of optional mounted parts such as temperature isolators or capillaries
- the height of the relevant process connection.

The individual heights of the components can be found in the following sections. To calculate the device height, simply add up the individual heights of the components. If necessary, the installation space (the space used to install the device) must also be taken into account. You can use the following table for this:

Section	Page	Height	Example
Height of housing	→ 55 ff.	(A)	
Optional mounted parts	→ 59	(B)	
Process connections	→ 59	(H)	
Installation space	-	(I)	
Device height			

T14 housing, optional display on the side

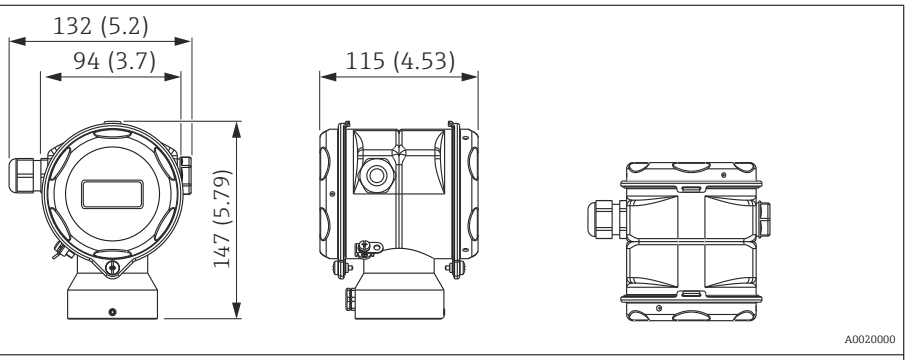


Engineering unit mm (in). Front view, left-hand side view, top view

Material		Degree of protection	Cable entry	Weight in kg (lb)		Option [1]
Housing	Cover seal			with display	without display	
Aluminum	EPDM	IP66/67 NEMA 6P	M20 gland	1.2 (2.65)	1.1 (2.43)	A
		IP66/67 NEMA 6P	G ½" thread			B
		IP66/67 NEMA 6P	NPT ½" thread			C
		IP66/67 NEMA 6P	M12 plug			D
		IP66/67 NEMA 6P	7/8" plug			E
		IP65 NEMA 4	HAN7D plug 90 degrees			F
316L	EPDM	IP66/67 NEMA 6P	M20 gland	2.1 (4.63)	2.0 (4.41)	1
		IP66/67 NEMA 6P	G ½" thread			2
		IP66/67 NEMA 6P	NPT ½" thread			3
		IP66/67 NEMA 6P	M12 plug			4
		IP66/67 NEMA 6P	7/8" plug			5
		IP65 NEMA 4	HAN7D plug 90 degrees			6
	FVMQ	IP66/67 NEMA 6P	M20 gland			7
	FVMQ	IP66/67 NEMA 6P	NPT ½" thread			8

1) Product Configurator, order code for "Housing, cover seal, cable entry, degree of protection"

T17 housing (hygienic), optional display on the side



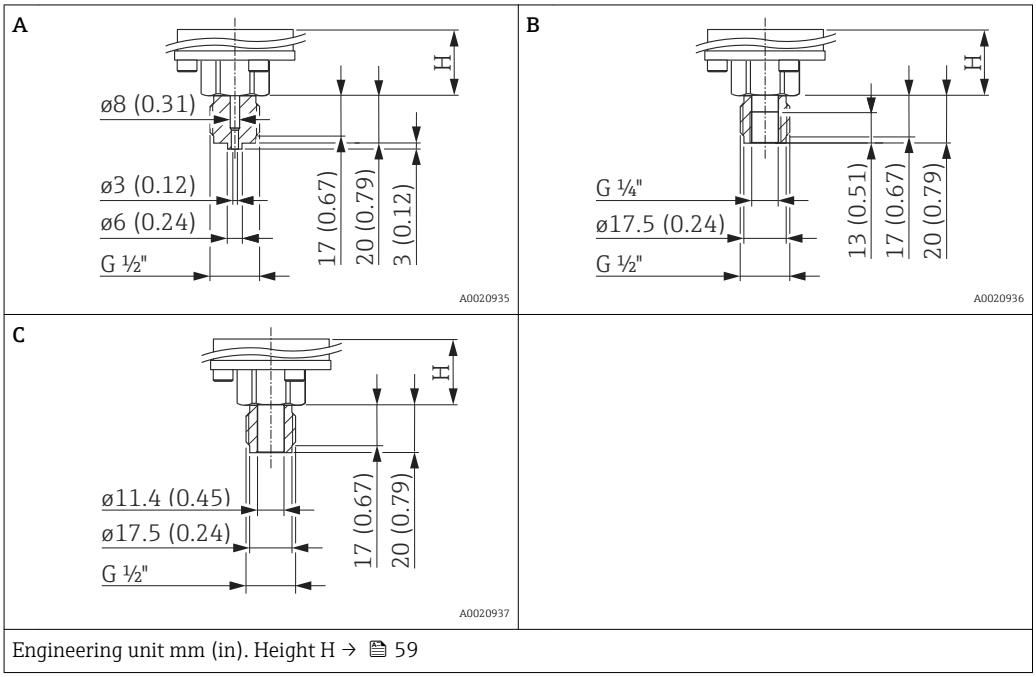
Engineering unit mm (in). Front view, left-hand side view, top view

Material		Degree of protection [1]	Cable entry	Weight in kg (lb)		Option [2]
Housing	Cover seal			with display	without display	
316L	EPDM	IP66/68 NEMA 6P	M20 gland	1.2 (2.65)	1.1 (2.43)	R
		IP66/68 NEMA 6P	G ½" thread			S
		IP66/68 NEMA 6P	NPT ½" thread			T
		IP66/68 NEMA 6P	M12 plug			U
		IP66/68 NEMA 6P	7/8" plug			V

1) Degree of protection IP 68: 1.83 mH_2O for 24 h
2) Product Configurator, order code for "Housing, cover seal, cable entry, degree of protection"

Process connections for PMC71 with internal process isolating diaphragm

Threaded connection ISO 228 G

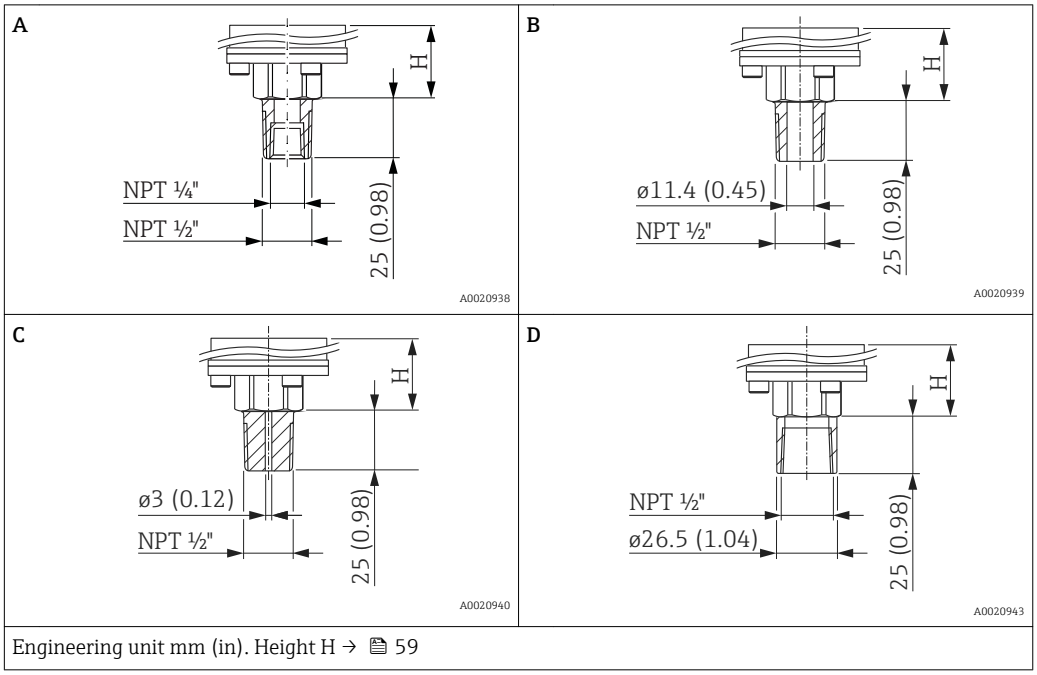


Engineering unit mm (in). Height H → 🖹 59

Item	Description	Material	Weight	Approval [1]	Option [2]
			kg (lb)		
A	Thread ISO 228 G ½" A EN 837	AISI 316L	0.63 (1.39)	CRN	GA
		Alloy C276 (2.4819)		CRN	GB
		Monel (2.4360)		-	GC
		PVDF ▪ Only mount with a mounting bracket (included) ▪ MWP 10 bar (150 psi), OPL max. 15 bar (225 psi) ▪ Process temperature range: −10 to +60 °C (+14 to +140 °F)		-	GD
B	Thread ISO 228 G ½" A, G ¼" (internal)	AISI 316L		CRN	GE
		Alloy C276 (2.4819)		CRN	GF
		Monel (2.4360)		-	GG
C	Thread ISO 228 G ½" A, Hole11.4 mm (0.45 in)	AISI 316L		CRN	GH
		Alloy C276 (2.4819)		CRN	GJ
		Monel (2.4360)		-	GK

1) CSA approval: Product Configurator, order code for "Approval"
2) Product Configurator, order code for "Process connection"

Threaded connection ANSI



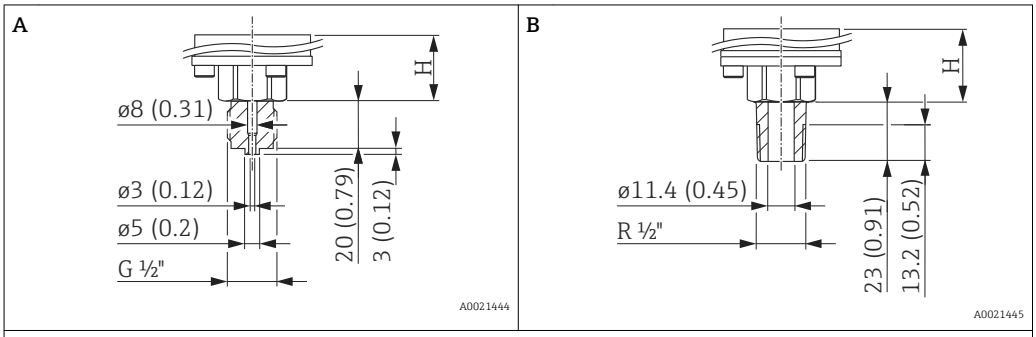
Engineering unit mm (in). Height H → 🖹 59

Item	Description	Material	Weight	Approval [1]	Option [2]
			kg (lb)		
A	ANSI ½" MNPT, ¼" FNPT	AISI 316L	0.63 (1.39)	CRN	RA
		Alloy C276 (2.4819)		CRN	RB
		Monel (2.4360)		-	RC
B	ANSI ½" MNPT, Hole11.4 mm (0.45 in)	AISI 316L		CRN	RD
		Alloy C276 (2.4819)		CRN	RE
		Monel (2.4360)		-	RF
C	ANSI ½" MNPT, Hole3 mm (0.12 in)	**PVDF** ▪ Only mount with a mounting bracket (included) ▪ MWP 10 bar (150 psi), OPL max. 15 bar (225 psi) ▪ Process temperature range: +10 to +60 °C (+14 to +140 °F)		-	RG
D	ANSI ½" FNPT Hole11.4 mm (0.45 in)	AISI 316L		CRN	RH
		Alloy C276 (2.4819)		CRN	RJ
		Monel (2.4360)		-	RK

1) CSA approval: Product Configurator, order code for "Approval"
2) Product Configurator, order code for "Process connection"

Process connections for PMC71 with internal process isolating diaphragm

Threaded connection JIS

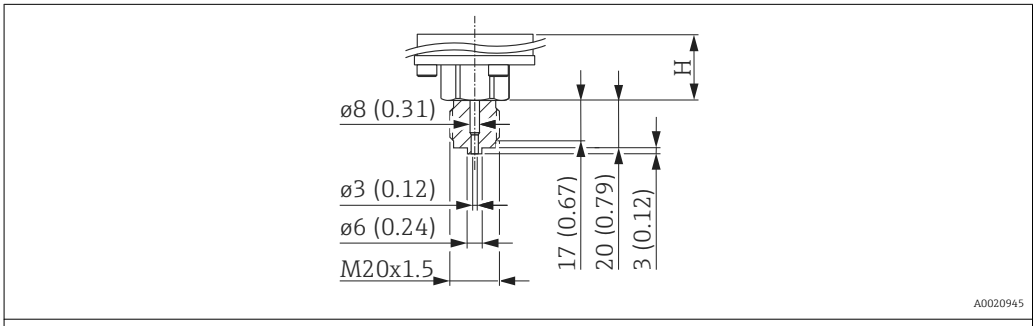


Engineering unit mm (in). Height H → 59

Item	Description	Material	Weight	Option [1]
			kg (lb)	
A	JIS B0202 G ½" (male)	AISI 316L	0.63 (1.39)	GL
B	JIS B0203 R ½" (male)			RL

1) Product Configurator, order code for "Process connection"

Threaded connection DIN 13



Engineering unit mm (in). Height H → 59

Description	Material	Weight	Option [1]
		kg (lb)	
DIN 13 M20 x 1.5, EN 837 3 mm (0.12 in)	AISI 316L	0.63 (1.39)	GP
	Alloy C276 (2.4819)		GQ

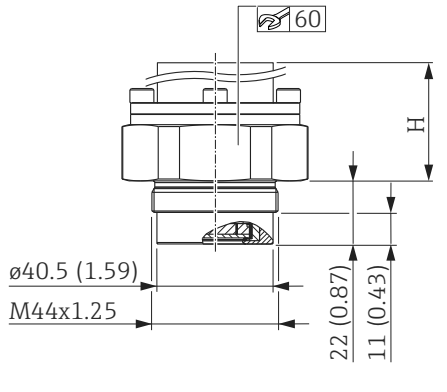
1) Product Configurator, order code for "Process connection"

Process connections for PMC71 with internal process isolating diaphragm - height H

Description	Height H
Standard height	26 mm (1.02 in)
Device with Ex d[ia], CSA XP or FM XP	96 mm (3.78 in)
High-temperature version	106 mm (4.17 in)
High-temperature version with Ex d[ia], CSA XP or FM XP	176 mm (6.93 in)

Process connections for PMC71 with flush-mounted process isolating diaphragm

Threaded connection DIN 13

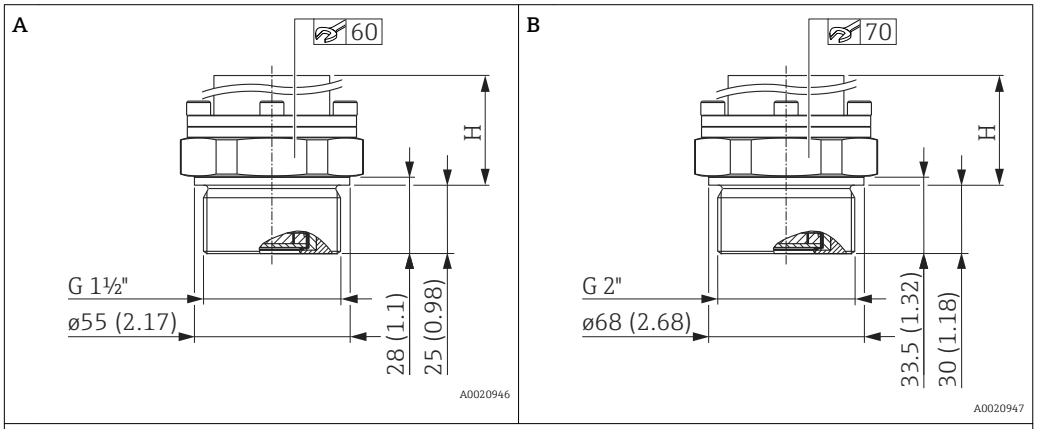


Measurements in mm (in). Height H → 🖹 61

Description	Material	Weight	Option [1]
		kg (lb)	
DIN 13 M44 x 1.25	AISI 316L	0.63 (1.39)	1R
	Alloy C276 (2.4819)		1S

1) Product Configurator, order code for "Process connection"

Threaded connection ISO 228 G



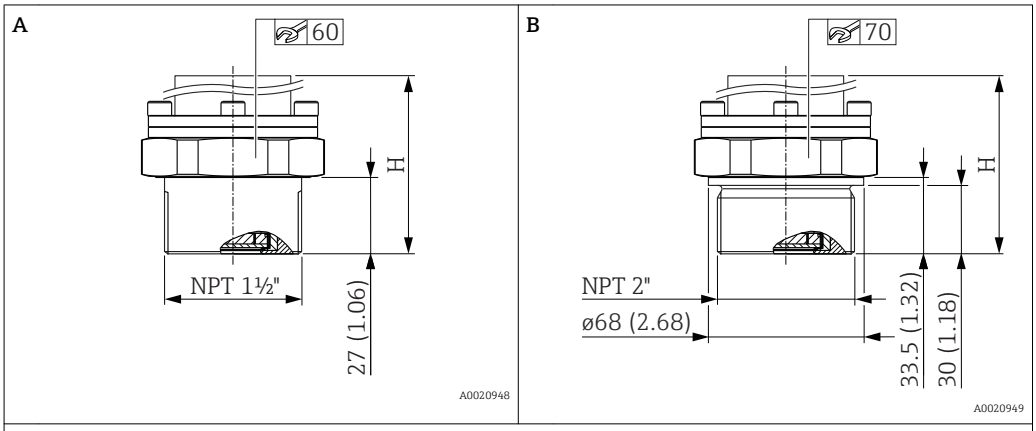
Measurements in mm (in). Height H → 🖹 61

Position	Description	Material	Weight	Option [1]
			kg (lb)	
A	Thread ISO 228 G 1 ½" A	AISI 316L	0.63 (1.39)	1G
		Alloy C276 (2.4819)		1H
		Monel (2.4360)		1J
B	Thread ISO 228 G 2" A	AISI 316L		1K
		Alloy C276 (2.4819)		1L
		Monel (2.4360)		1M

1) Product Configurator, order code for "Process connection"

Process connections for PMC71 with flush-mounted process isolating diaphragm

Threaded connection ANSI



Engineering unit mm (in). Height H → 🖹 61

Position	Designation	Material	Weight	Approval [1]	Option [2]
			kg (lb)		
A	ANSI 1 ½" MNPT	AISI 316L (CRN)	0.63 (1.39)	CRN	2D
		Alloy C276 (2.4819) (CRN)		CRN	2E
		Monel (2.4360)		CRN	2F
B	ANSI 2" MNPT	AISI 316L (CRN)		CRN	2G
		Alloy C276 (2.4819) (CRN)		CRN	2H
		Monel (2.4360)		-	2J

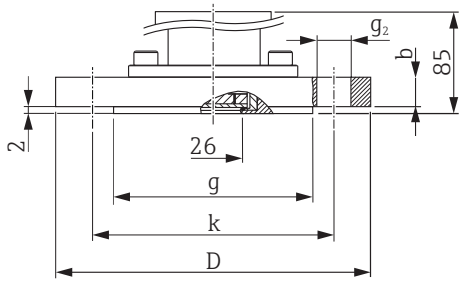
1) CSA approval: Product Configurator, order code for "Approval"
2) Product Configurator, order code for "Process connection"

Process connections for PMC71 with flush-mounted process isolating diaphragm - height H

Description	Height H
High-temperature version and standard version	86 mm (3.39 in)
Version with Ex d[ia], CSA XP or FM XP	151 mm (5.94 in)

Process connections for PMC71 with flush-mounted process isolating diaphragm

EN/DIN flanges, connection dimensions in accordance with EN 1092-1/DIN 2527



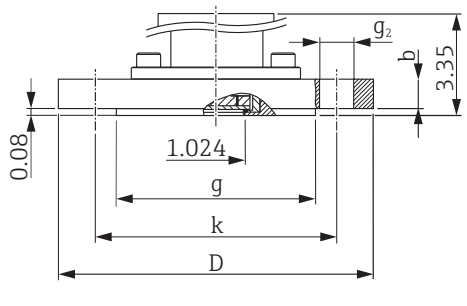
D *Diameter of flange*
b *Thickness*
g *Raised face*
k *Hole circle*
g_2 *Diameter of hole*

Engineering unit mm

Flange							Boltholes			Weight	Option [1]
Material	Nominal diameter	Nominal pressure	Shape [2]	D	b	g	Number	g_2	k		
				mm	mm	mm		mm	mm	kg (lb)	
AISI 316L	DN 25	PN 10-40	B1 (D)	115	18	68	4	14	85	1.4 (3.09)	BA
AISI 316L	DN 32	PN 10-40	B1 (D)	140	18	78	4	18	100	2.0 (4.41)	CP
AISI 316L	DN 40	PN 10-40	B1 (D)	150	18	88	4	18	110	2.4 (5.29)	CQ
AISI 316L	DN 50	PN 10-40	B1 (D)	165	20	102	4	18	125	3.2 (7.06)	B3
PVDF	DN 50	PN 10-16	B1 (D)	165	21.4	102	4	18	125	0.6 (1.32)	BR
AISI 316L	DN 50	PN 63	B2 (E)	180	26	102	4	22	135	4.6 (10.14)	C3
PVDF	DN 80	PN 10-16	B1 (D)	200	21.4	138	8	18	160	1.0 (2.21)	BS
AISI 316L	DN 80	PN 10-40	B1 (D)	200	24	138	8	18	160	5.4 (11.91)	B4

1) Product Configurator, order code for "Process connection"
2) Description as per DIN 2527 provided in brackets

ASME flanges, connection dimensions in accordance with ASME B 16.5, raised face RF



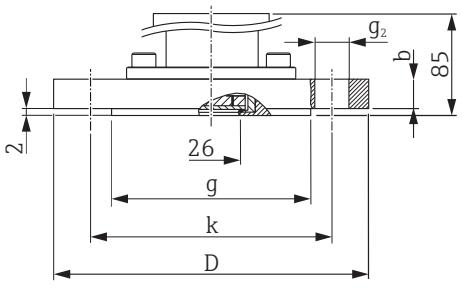
D *Diameter of flange*
b *Thickness*
g *Raised face*
k *Hole circle*
g_2 *Diameter of hole*

Engineering unit in.

Flange						Boltholes			Weight	Approval [1]	Option [2]
Material	Nominal diameter	Class	D	b	g	Number	g_2	k			
	[in]	[lb./sq.in]	[in]	[in]	[in]		[in]	[in]	[kg (lb)]		
AISI 316/316L [3]	1	150	4.25	1.18	2	4	0.62	3.12	0.9 (1.98)	-	AA [4]
AISI 316/316L [3]	1	300	4.88	1.18	2	4	0.75	3.5	1.4 (3.09)	-	AB [4]
AISI 316/316L [3]	1 ½	150	5	0.69	2.88	4	0.62	3.88	1.0 (2.21)	CRN	AE
AISI 316/316L [3]	1 ½	300	6.12	0.81	2.88	4	0.88	4.5	2.6 (5.73)	CRN	AQ
AISI 316/316L [3]	2	150	6	0.75	3.62	4	0.75	4.75	2.4 (5.29)	CRN	AF
ECTFE [5]	2	150	6	0.75	3.62	4	0.75	4.75	2.4 (5.29)	-	JR
PVDF	2	150	6	0.75	3.62	4	0.75	4.75	0.5 (1.1)	-	A3
AISI 316/316L [3]	2	300	6.5	0.88	3.62	8	0.75	5	3.2 (7.06)	CRN	AR
AISI 316/316L [3]	3	150	7.5	0.94	5	4	0.75	6	4.9 (10.8)	CRN	AG
ECTFE [5]	3	150	7.5	0.94	5	4	0.75	6	4.9 (10.8)	-	JS
PVDF	3	150	7.5	0.94	5	4	0.75	6	0.9 (1.98)	-	A4
AISI 316/316L [3]	3	300	8.25	1.12	5	8	0.88	6.62	6.8 (14.99)	CRN	AS
AISI 316/316L [3]	4	150	9	0.94	6.19	8	0.75	7.5	7.1 (15.66)	CRN	AH
ECTFE [5]	4	150	9	0.94	6.19	8	0.75	7.5	7.1 (15.66)	-	JT
AISI 316/316L [3]	4	300	10	1.25	6.19	8	0.88	7.88	11.6 (25.58)	CRN	AT

1) CSA approval: Product Configurator, order code for "Approval"
2) Product Configurator, order code for "Process connection"
3) Combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated)
4) Screws must be 15 mm (0.59 in) longer than the standard flange screws
5) ECTFE coating on AISI 316/316L. When operating in hazardous areas, avoid electrostatic charge on the plastic surfaces.

JIS flanges, connection dimensions in accordance with JIS B 2220 BL, raised face RF



D *Diameter of flange*
b *Thickness*
g *Raised face*
k *Hole circle*
g_2 *Diameter of hole*

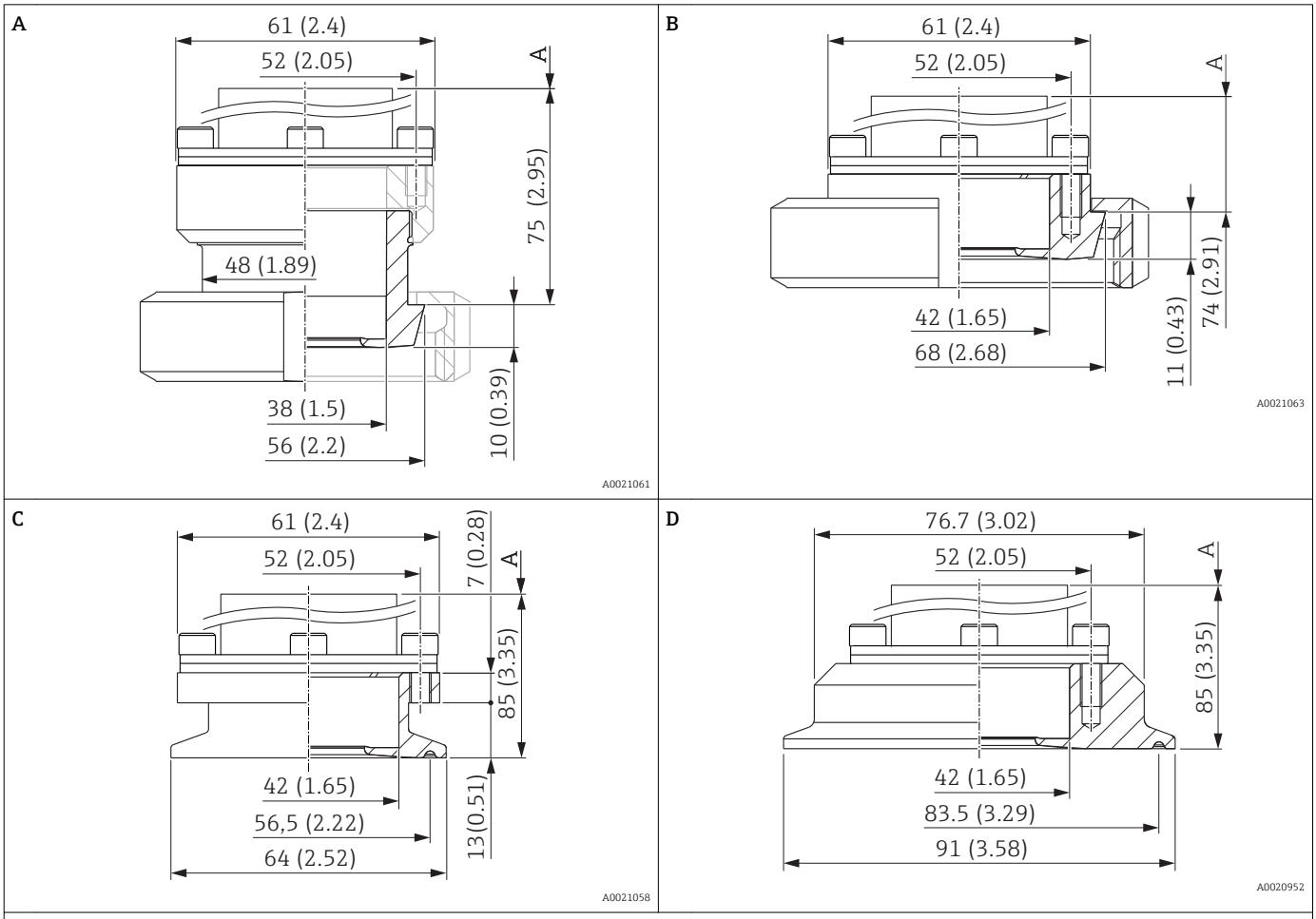
Engineering unit mm

Flange						Boltholes			Weight	Option [1]
Material	Nominal diameter	Nominal pressure	D	b	g	Number	g_2	k		
			mm	mm	mm		mm	mm	kg (lb)	
AISI 316L (1.4435)	50 A	10 K	155	16	96	4	19	120	2.0 (4.41)	CF
	80 A	10 K	185	18	127	8	19	150	3.3 (7.28)	KL
	100 A	10 K	210	18	151	8	19	175	4.4 (9.7)	KH

1) Product Configurator, order code for "Process connection"

Hygienic process connections for PMC71 with flush-mounted process isolating diaphragm

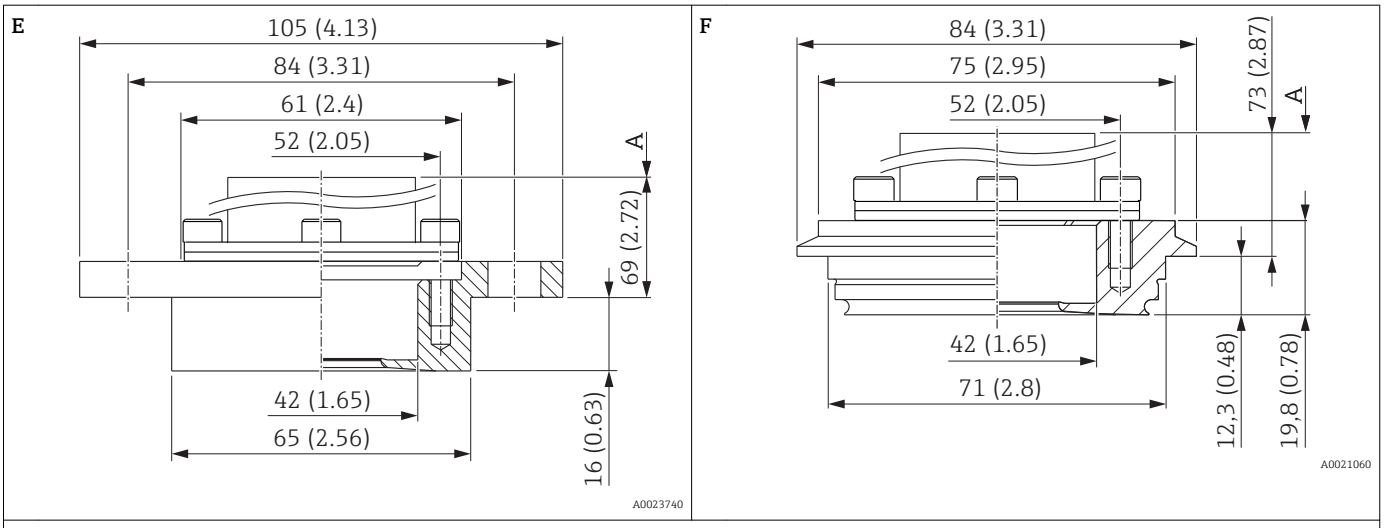
Many process connections with an EPDM or HNBR seal are approved for the PMC71 in accordance with the guidelines of the 3A Sanitary Standard. To ensure that the 3A approval is valid for the PMC71 version, a 3A-approved process connection together with an EPDM or HNBR seal must be selected when ordering (Product Configurator, order code for "Seal").



Engineering unit mm (in)

Position	Designation	Nominal pressure	Material [1]	Weight	Approval [2]	Option [3]
				kg (lb)		
A	DIN 11851 DN 40 PN 25, with HNBR or EPDM seal	PN 25	AISI 316L (1.4435)	0.7 (1.54)	EHEDG, 3A, CRN	MP [4]
B	DIN 11851 DN 50 PN 25, with HNBR or EPDM seal	PN 25		0.9 (1.98)	EHEDG, 3A, CRN	MR [4]
C	Tri-Clamp ISO 2852 DN 51 (2"), with HNBR or EPDM seal	PN 40 [5]		0.7 (1.54)	EHEDG, 3A, CRN	TD [4]
D	Tri-Clamp ISO 2852 DN 76.1 (3"), with NBR or EPDM seal	PN 40 [5]		0.9 (1.98)	EHEDG, 3A, CRN	TF [4]

1) Delta-ferrite content < 1 %. Roughness of wetted surfaces R_a < 0.80 µm (31.5 µin) as standard. Lower surface roughness available on request.
2) CSA approval: Product Configurator, order code for "Approval"
3) Product Configurator, order code for "Process connection"
4) Endress+Hauser supplies these slotted nuts in stainless steel AISI 304 (DIN/EN material number 1.4301) or in AISI 304L (DIN/EN material number 1.4307).
5) Restricted nominal pressure (13.8 bar (200 psi)) for the following approvals: Product Configurator, order code for "Approval", option "E", "U" and "V".



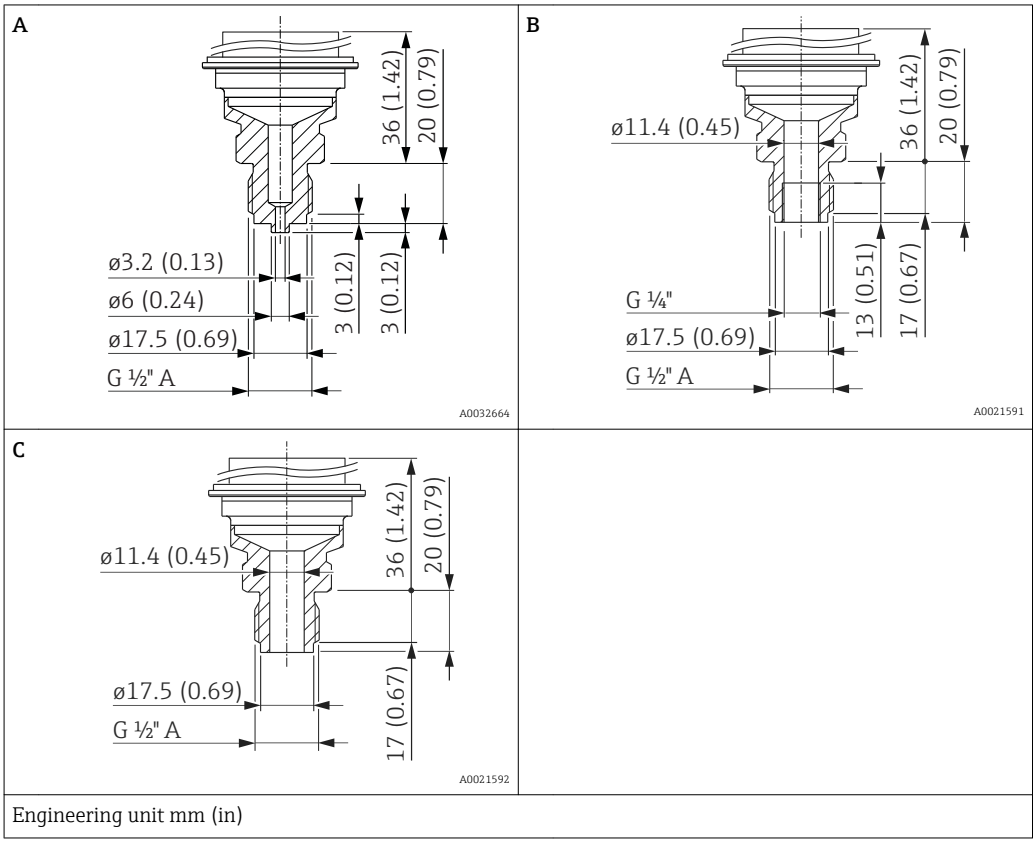
Engineering unit mm (in)

Position	Designation	Nominal pressure	Material [1]	Weight	Approval [2]	Option [3]
				kg (lb)		
E	DRD DN50 (65 mm) with HNBR or EPDM seal	PN 25	AISI 316L (1.4435)	0.9 (1.98)	EHEDG	TK [4]
F	Varivent type N for pipes 40 – 162, with HNBR or EPDM seal	PN 40		1 (2.21)	EHEDG, 3A, CRN	TR

1) Delta-ferrite content < 1 %. Roughness of wetted surfaces R_a < 0.80 µm (31.5 µin) as standard. Lower surface roughness available on request.
2) CSA approval: Product Configurator, order code for "Approval"
3) Product Configurator, order code for "Process connection"
4) Endress+Hauser supplies these slotted nuts in stainless steel AISI 304 (DIN/EN material number 1.4301) or in AISI 304L (DIN/EN material number 1.4307).

Process connections for PMP71 with internal process isolating diaphragm

Threaded connection ISO 228 G



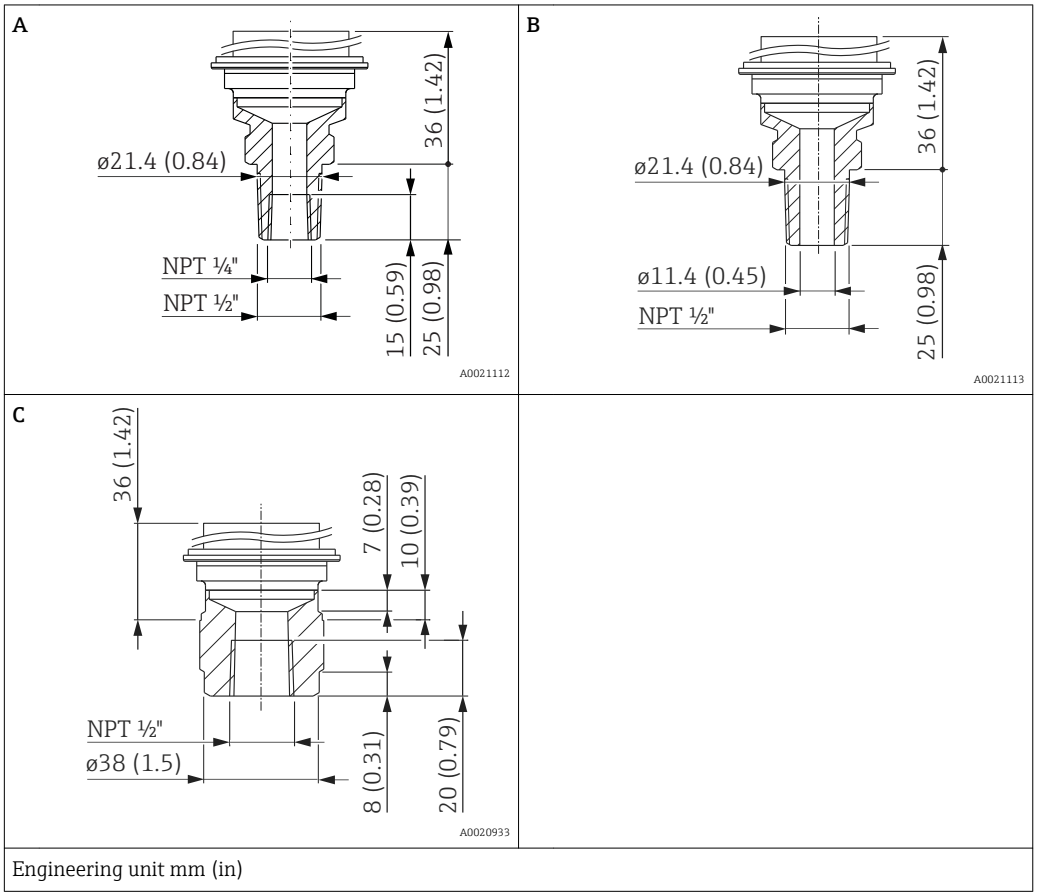
Engineering unit mm (in)

Item	Description	Material	Weight	Option [1]
			kg (lb)	
A	Thread ISO 228 G ½" A EN 837	AISI 316L	0.63 (1.39)	GA
		Alloy C276 (2.4819)		GB
B	Thread ISO 228 G ½" A, G ¼" (internal)	AISI 316L		GE
		Alloy C276 (2.4819)		GF
C	Thread ISO 228 G ½" A, Hole11.4 mm (0.45 in)	AISI 316L		GH
		Alloy C276 (2.4819)		GJ

1) Product Configurator, order code for "Process connection"

Process connections for PMP71 with internal process isolating diaphragm

Threaded connection ANSI



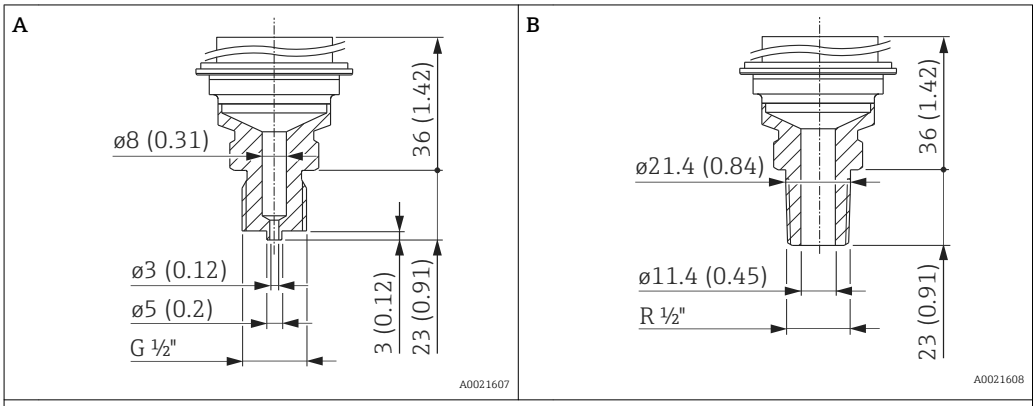
Engineering unit mm (in)

Item	Description	Material	Weight	Approval [1]	Option [2]
			kg (lb)		
A	ANSI ½" MNPT, ¼" FNPT	AISI 316L	0.63 (1.39)	CRN	RA
		Alloy C276 (2.4819)		CRN	RB
B	ANSI ½" MNPT, Hole 11.4 mm (0.45 in) = 400 bar (6 000 psi) Hole 3.2 mm (0.13 in) = 700 bar (10 500 psi)	AISI 316L		CRN	RD
		Alloy C276 (2.4819)		CRN	RE
C	ANSI ½" FNPT	AISI 316L	0.7 (1.54)	CRN	RH
		Alloy C276 (2.4819)		CRN	RJ

1) CSA approval: Product Configurator, order code for "Approval"
2) Product Configurator, order code for "Process connection"

Process connections for PMP71 with internal process isolating diaphragm

Threaded connection JIS

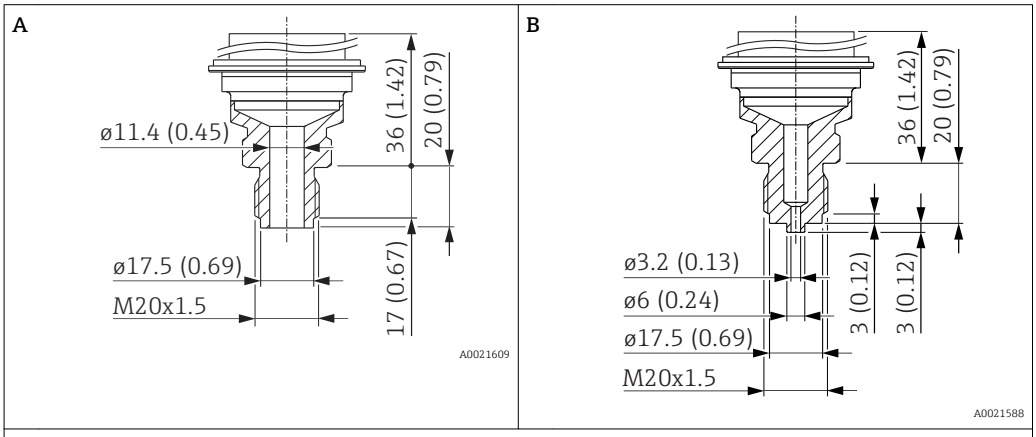


Engineering unit mm (in)

Position	Description	Material	Weight	Option [1]
			kg (lb)	
A	JIS B0202 G ½" (male)	AISI 316L	0.6 (1.32)	GL
B	JIS B0203 R ½" (male)			RL

1) Product Configurator, order code for "Process connection"

Threaded connection DIN 13



Engineering unit mm (in)

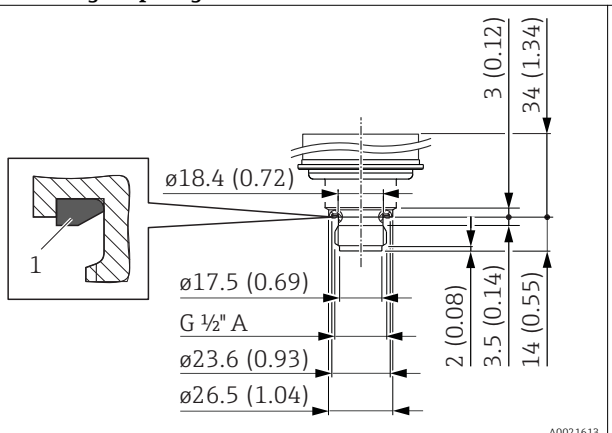
Position	Description	Material	Weight	Option [1]
			kg (lb)	
A	DIN 13 M20 x 1.5 11.4 mm (0.45 in)	AISI 316L	0.6 (1.32)	GP
		Alloy C276 (2.4819)		GQ
B	DIN 13 M20 x 1.5, EN 837 3 mm (0.12 in)	AISI 316L		GR
		Alloy C276 (2.4819)		GS

1) Product Configurator, order code for "Process connection"

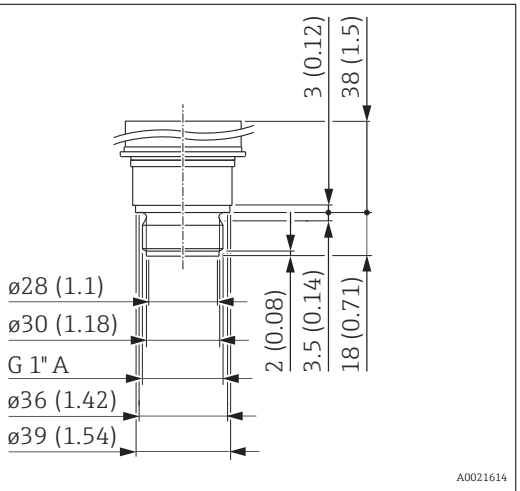
Process connections for PMP71 with flush-mounted process isolating diaphragm

Threaded connection ISO 228 G

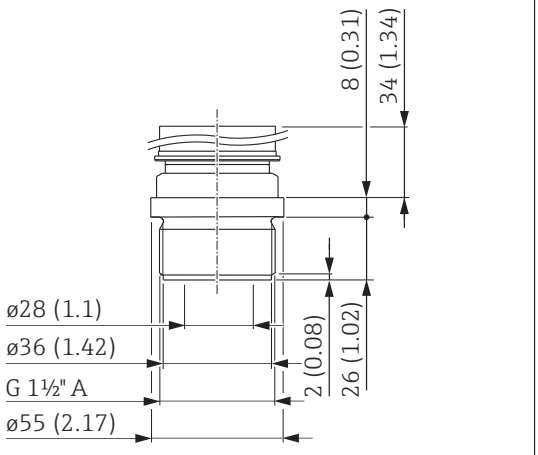
A



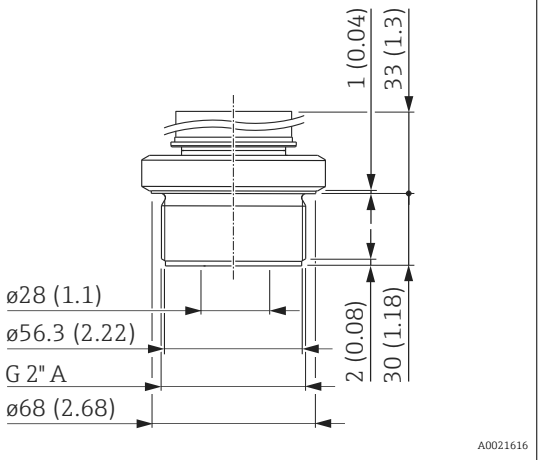
B



C



D



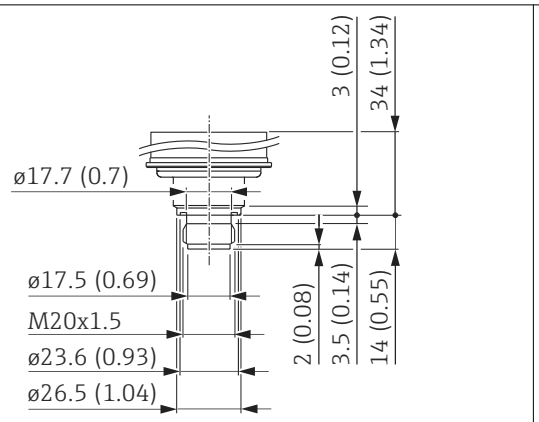
Engineering unit mm (in)

Item	Description	Material	Weight	Option [1]
			kg (lb)	
A	Thread ISO 228 G ½" A, DIN 3852 FKM seal (item 1) pre-installed	AISI 316L	0.4 (0.88)	1A
		Alloy C276 (2.4819)		1B
B	Thread ISO 228 G 1" A	AISI 316L	0.7 (1.54)	1D
		Alloy C276 (2.4819)		1E
C	Thread ISO 228 G 1 ½" A	AISI 316L	1.1 (2.43)	1G
		Alloy C276 (2.4819)		1H
D	Thread ISO 228 G 2" A	AISI 316L	1.5 (3.31)	1K
		Alloy C276 (2.4819)		1L

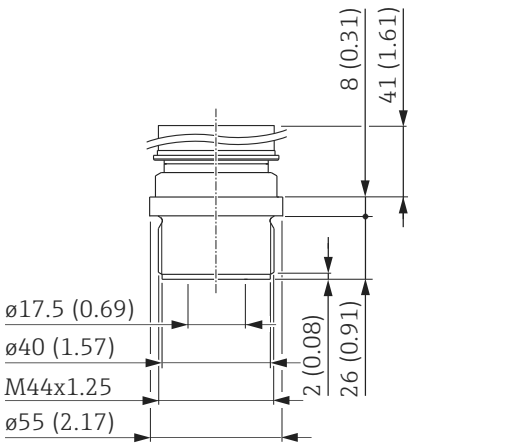
1) Product Configurator, order code for "Process connection"

Threaded connection DIN

A



B



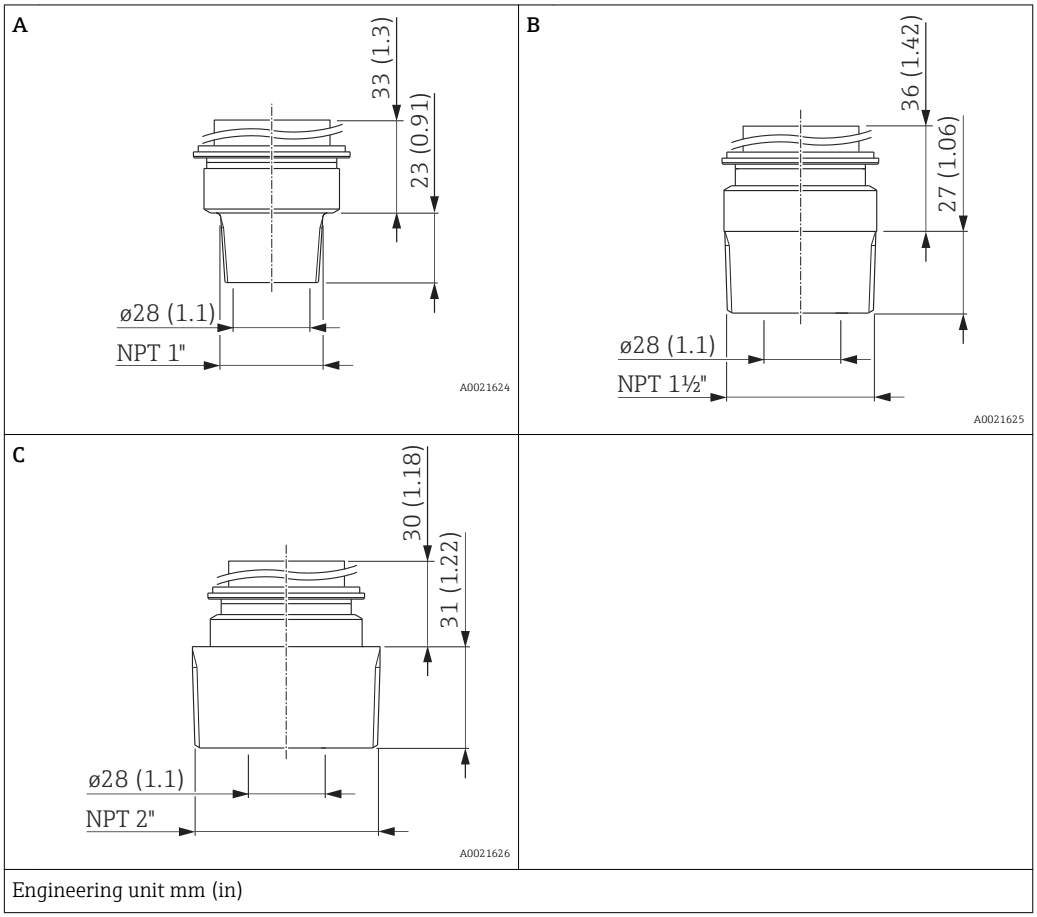
Engineering unit mm (in)

Item	Description	Material	Weight	Option [1]
			kg (lb)	
A	Thread DIN 16288 M20	AISI 316L	0.4 (0.88)	1N
		Alloy C276 (2.4819)		1P
B	Thread DIN 13 M44 x 1.25	AISI 316L	1.1 (2.43)	1R
		Alloy C276 (2.4819)		1S

1) Product Configurator, order code for "Process connection"

Process connections for PMP71 with flush-mounted process isolating diaphragm

Threaded connection ANSI



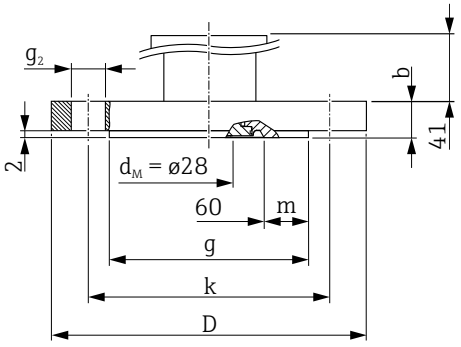
Engineering unit mm (in)

Item	Description	Material	Weight	Approval [1]	Option [2]
			kg (lb)		
A	ANSI 1" MNPT	AISI 316L	0.7 (1.54)	CRN	2A
		Alloy C276 (2.4819)		CRN	2B
B	ANSI 1 ½" MNPT	AISI 316L	1 (2.21)	CRN	2D
		Alloy C276 (2.4819)		CRN	2E
C	ANSI 2" MNPT	AISI 316L	1.3 (2.87)	CRN	2G
		Alloy C276 (2.4819)		CRN	2H

1) CSA approval: Product Configurator, order code for "Approval"
2) Product Configurator, order code for "Process connection"

Process connections for PMP71 with flush-mounted process isolating diaphragm

EN/DIN flanges, connection dimensions in accordance with EN 1092-1/DIN 2527



D *Diameter of flange*
b *Thickness*
g *Raised face*
m *Width of raised face*
k *Hole circle*
g_2 *Diameter of hole*
d_M *Max. diameter of the process isolating diaphragm*

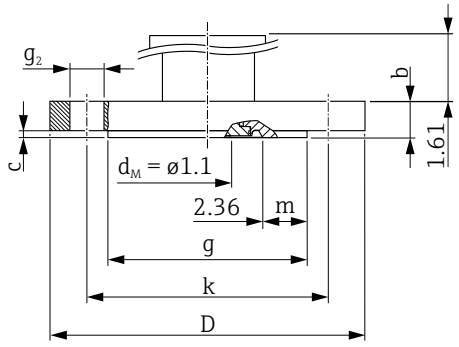
Engineering unit mm

Flange [1]							Boltholes			Weight Flange	Option [2]
Nominal diameter	Nominal pressure	Shape [3]	D	b	g	m	Number	g_2	k		
			[mm]	[mm]	[mm]	[mm]		[mm]	[mm]	[kg]	
DN 25	PN 10-40	B1 (D)	115	18	68 [4]	4	4	14	85	1.2 (2.65)	CN
DN 32	PN 10-40	B1 (D)	140	18	78 [4]	9	4	18	100	1.9 (4.19)	CP
DN 40	PN 10-40	B1 (D)	150	18	88 [4]	14	4	18	110	2.2 (4.85)	CQ
DN 50	PN 10-40	B1 (D)	165	20	102	-	4	18	125	3.0 (6.62)	B3
DN 80	PN 10-40	B1 (D)	200	24	138	-	8	18	160	5.3 (11.69)	B4

1) Material: AISI 316L
2) Product Configurator, order code for "Process connection"
3) Description as per DIN 2527 provided in brackets
4) With these process connections the raised face is smaller than described in the standard. Due to the smaller raised face, a special seal must be used.

Process connections for PMP71 with flush-mounted process isolating diaphragm

ASME flanges, connection dimensions in accordance with ASME B 16.5, raised face RF*



D *Diameter of flange*
b *Thickness*
g *Raised face*
c *Thickness of raised face*
m *Width of raised face*
k *Hole circle*
g_2 *Diameter of hole*
d_M *Max. diameter of the process isolating diaphragm*

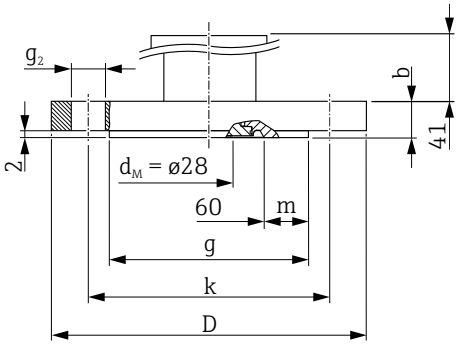
Engineering unit in.
(*all apart from AN, see table below)

Flange [1]							Boltholes			Weight	Approval [2]	Option [3]
Nominal diameter	Class/nominal pressure	D	b	g	c	m	Number	g_2	k			
[in]	lb./sq.in	[in]	[in]	[in]	[in]	[in]		[in]	[in]	[kg]		
1	300	4.88	0.69	2 [4]	0.06	0.2	4	0.75	3.5	1.3 (2.87)	CRN	AN
1 ½	150	5	0.69	2.88 [4]	0.08	0.52	4	0.62	3.88	1.5 (3.31)	CRN	AE
1 ½	300	6.12	0.81	2.88 [4]	0.08	0.52	4	0.88	4.5	2.6 (5.73)	CRN	AQ
2	150	6	0.75	3.62	0.08	-	4	0.75	4.75	2.4 (5.29)	CRN	AF
2	300	6.5	0.88	3.62	0.08	-	8	0.75	5	3.2 (7.06)	CRN	AR
3	150	7.5	0.94	5	0.08	-	4	0.75	6	4.9 (10.8)	CRN	AG
3	300	8.25	1.12	5	0.08	-	8	0.88	6.62	6.7 (14.77)	CRN	AS
4	150	9	0.94	6.19	0.08	-	8	0.75	7.5	7.1 (15.66)	CRN	AH
4	300	10	1.25	6.19	0.08	-	8	0.88	7.88	11.6 (25.88)	CRN	AT

1) Material: AISI 316/316L; Combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated)
2) CSA approval: Product Configurator, order code for "Approval"
3) Product Configurator, order code for "Process connection"
4) With these process connections the raised face is smaller than described in the standard. Due to the smaller raised face, a special seal must be used.

Process connections for PMP71 with flush-mounted process isolating diaphragm

JIS flanges, connection dimensions in accordance with JIS B 2220 BL, raised face RF



D *Diameter of flange*
b *Thickness*
g *Raised face*
m *Width of raised face*
k *Hole circle*
g_2 *Diameter of hole*

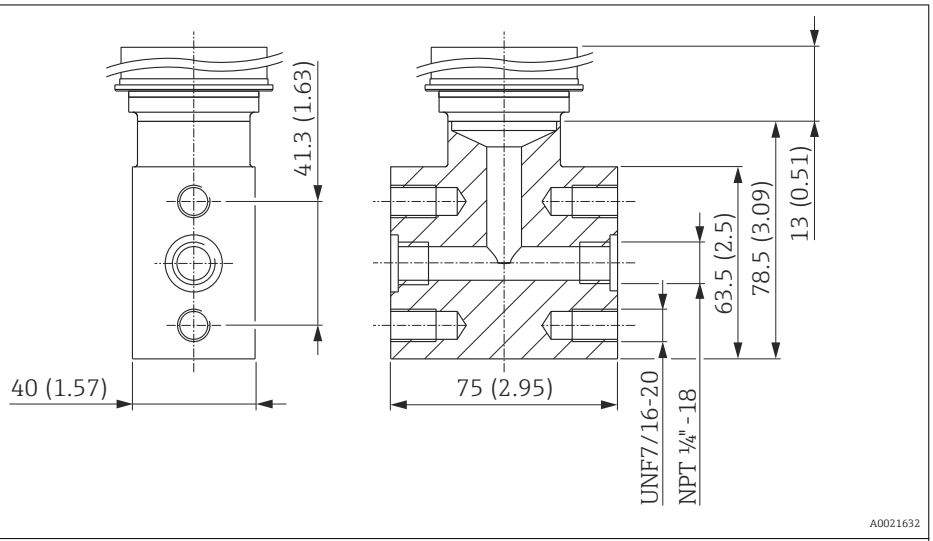
Engineering unit mm

Flange							Boltholes			Weight Flange	Option [1]
Material	Nominal diameter	Class/ Nominal pressure	D	b	g	m	Number	g_2	k		
			[mm]	[mm]	[mm]	[mm]		[mm]	[mm]	[kg]	
AISI 316L	25 A	20 K	125	16	67 [2]	3.5	4	19	90	1.5 (3.31)	KA
AISI 316L	50 A	10 K	155	16	96	-	4	19	120	2.0 (4.41)	CF
AISI 316L	80 A	10 K	185	18	127	-	8	19	150	3.3 (7.28)	KL
AISI 316L	100 A	10 K	210	18	151	-	8	19	175	4.4 (9.7)	KH

1) Product Configurator, order code for "Process connection"
2) With these process connections the raised face is smaller than described in the standard. Due to the smaller raised face, a special seal must be used.

Process connections for PMP71

Oval flange



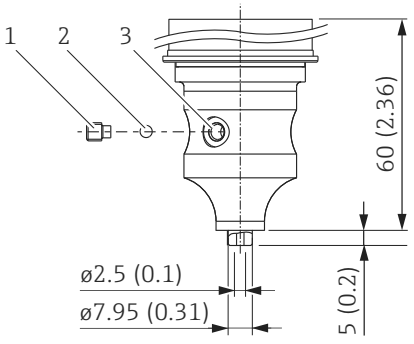
Engineering unit mm (in)

Material	Description	Weight	Approval [1]	Option [2]
		kg (lb)		
AISI 316L (1.4404)	Oval flange adapter 1/4-18 NPT as per IEC 61518 Mounting: 7/16-20 UNF	1.9 (4.19)	CRN	UR

1) CSA approval: Product Configurator, order code for "Approval"
2) Product Configurator, order code for "Process connection"

Process connections for PMP71

Prepared for diaphragm seal mount



1 Setscrew with hexagonal recess4 mm (0.16 in), material A2-70
2 Bearing DIN 5401 (1.3505)
3 Hole for filling fluid

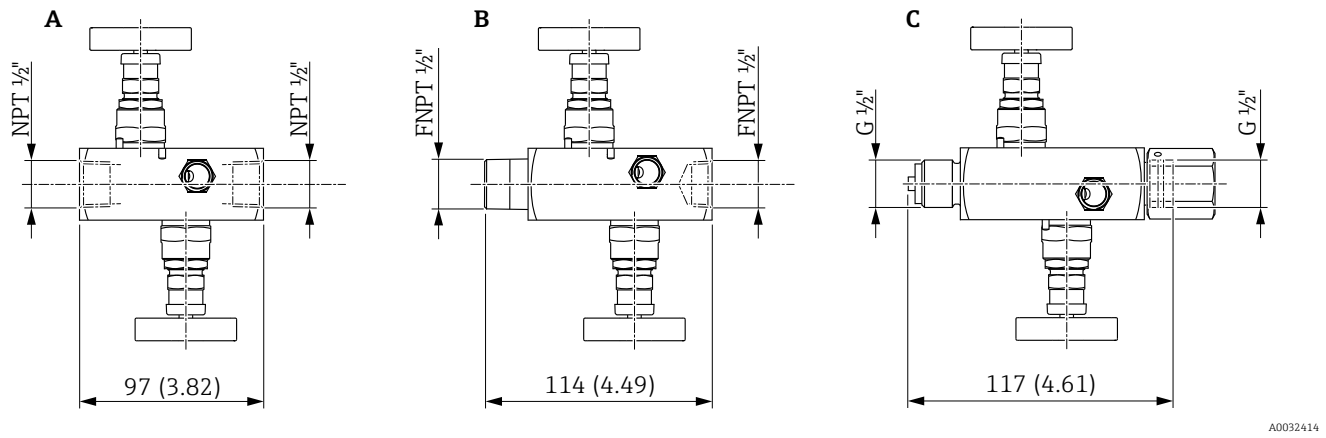
Engineering unit mm (in)

Material	Description	Weight in kg (lb)	Approval [1]	Option [2]
AISI 316L (1.4404)	Prepared for diaphragm seal mount	1.9 (4.19)	CRN	U1

1) CSA approval: Product Configurator, order code for "Approval"
2) Product Configurator, order code for "Process connection"

Valve manifold DA63M- (optional)

Endress+Hauser supplies milled valve manifolds via the transmitter's product structure in the following versions:



A 2-way valve manifold FNPT x FNPT
B 2-way valve manifold MNPT x FNPT
C 2-way valve manifold G ½" + adjusting nut

Engineering unit mm (in)

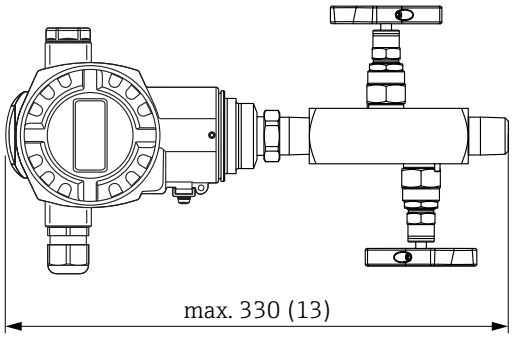
2-way valve manifolds in 316L or AlloyC can be
- as an **enclosed** accessory (seal for mounting enclosed)
- ordered as a **mounted** accessory (mounted valve manifolds are supplied with a documented leakage test).

Certificates ordered with the equipment (e.g. 3.1 material certificate and NACE) and tests (e.g. PMI and pressure test) apply to the transmitter and the valve manifold.

For other details (order option, dimension, weight, materials), see SD01553P/00/EN "Mechanical accessories for pressure measuring devices".

During the operating life of the valves, it may be necessary to re-tighten the packing.

Mounting on valve manifold

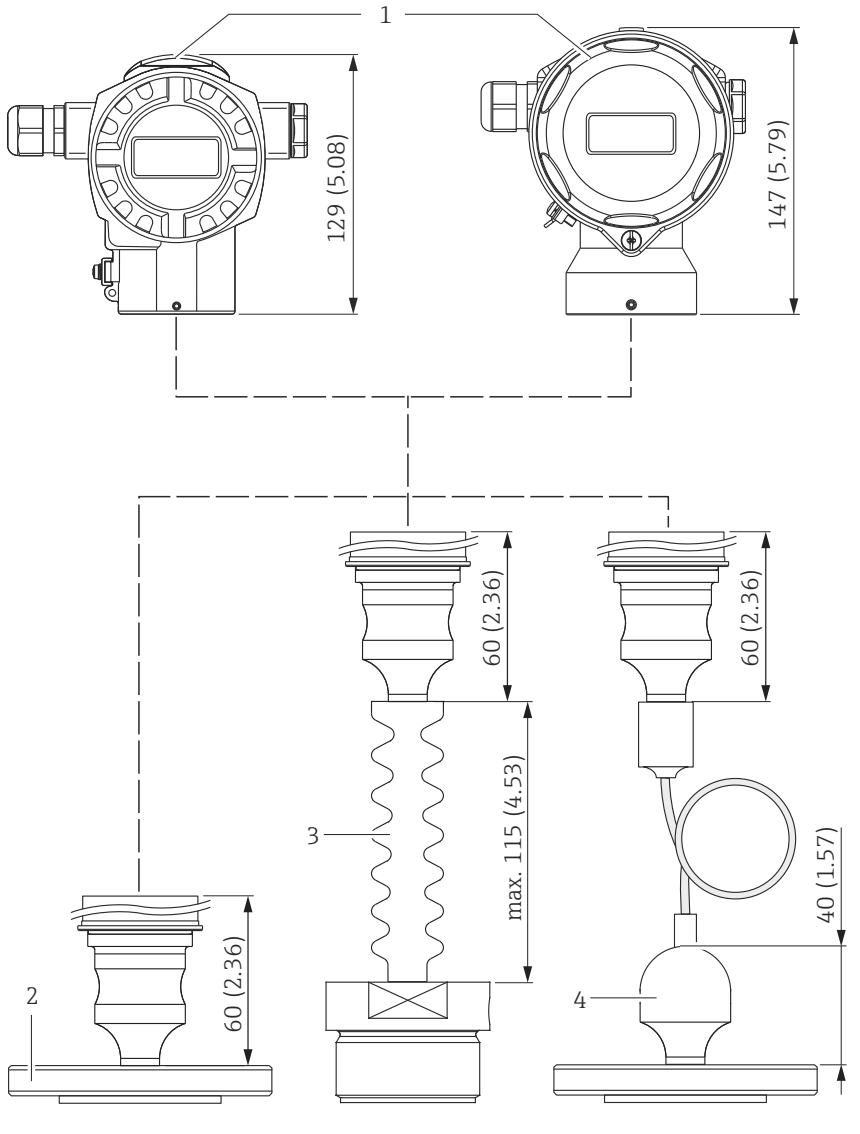


Engineering unit mm (in)

Ordering information:

Product Configurator, order code for "Accessories mounted"

PMP75 basic device



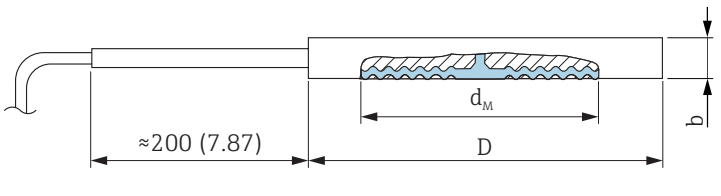
1 PMP75 basic device
2 Diaphragm seal, here, e.g. flange diaphragm seal
3 Diaphragm seal with temperature isolator
4 Process connections with capillary lines are 40 mm (1.57 in) higher than process connections without capillary lines

Engineering unit mm (in). PMP75 basic device with diaphragm seal.

Process connections for PMP75 with flush-mounted process isolating diaphragm

- The weights of the diaphragm seals are given in the tables. For weight of housing, see → 🖹 55
- The following drawings are drawings that illustrate how the system works in principle. In other words, the dimensions of a diaphragm seal supplied can deviate from the dimensions given in this document.
- Note "Planning instructions, diaphragm seal systems" section→ 🖹 110
- For further information please contact your local Endress+Hauser Sales Center.

Diaphragm seal cell structure



D *Diameter*
d_M *Max. diameter of the process isolating diaphragm*
b *Thickness*

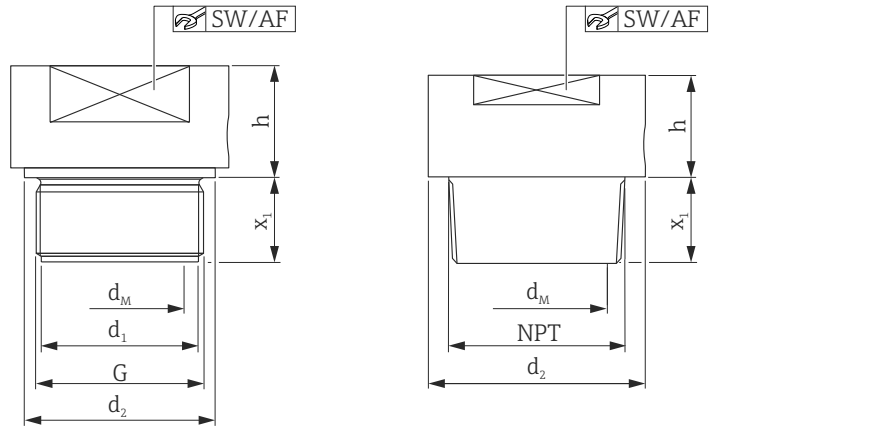
Engineering unit mm (in)

Flange					Diaphragm seal		Approval [1]	Option [2]
Material	Nominal diameter	Nominal pressure [3]	D	b	d_M	Weight		
			[mm]	[mm]	[mm]	[kg (lb)]		
AISI 316L	DN 50	PN 16-400	102	20	59	1.3 (2.87)	-	UI
	DN 80	PN 16-400	138	20	89	2.3 (5.07)	-	UJ
	DN 100	PN 16-400	162	20	89	3.1 (6.84)	-	UK
	[in]	[lb/sq.in]	[in (mm)]	[in (mm)]	[in (mm)]			
	2	150-2500	3.89 (99)	0.79 (20)	2.32 (59)	1.3 (2.87)	CRN	UL
	3	150-2500	5.00 (127)	0.79 (20)	3.50 (89)	2.3 (5.07)	CRN	UM
	4	150-2500	6.22 (158)	0.79 (20)	3.50 (89)	3.1 (6.84)	CRN	UR

1) CSA approval: Product Configurator, order code for "Approval"
2) Product Configurator, order code for "Process connection"
3) The specified nominal pressure applies to the diaphragm seal. The maximum pressure for the measuring device is dependent on the lowest-rated element, with regard to pressure, of the selected components → 🖹 53.

Process connections for PMP75 with flush-mounted process isolating diaphragm

Thread ISO 228 and ANSI



d_1 Diameter
d_2 Diameter
G Thread
x_1 Screw-in length
AF across flats
d_M Max. diameter of the process isolating diaphragm
h Height

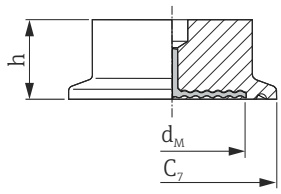
Engineering unit mm (in). Left: thread ISO 228, right: thread ANSI

Threaded connection							Diaphragm seal			Approval [1]	Option [2]
Material	G	Nominal pressure	d_1	d_2	x_1	SW/AF	d_M	h	Weight		
		PN	[mm]	[mm]	[mm]		[mm]	[mm]	[kg (lb)]		
AISI 316L	G 1" A	400	30	39	21 [3]	32	30	19	0.4 (0.88)	-	1D
Alloy C276									0.5 (1.1)	-	1E
AISI 316L	G 1 ½" A	400	44	55	30	50	42	20	0.9 (1.98)	-	1G
Alloy C276									1.0 (2.21)	-	1H
AISI 316L	G 2"	400	56	68	30	65	50	20	1.9 (4.19)	-	1K
Alloy C276									2.1 (4.63)	-	1L
AISI 316L	1" MNPT	400	–	45	28	41	24	17	0.6 (1.32)	CRN	2A
Alloy C276									0.7 (1.54)	CRN	2B
AISI 316L	1 ½" MNPT	400	–	60	30	41	36	20	0.9 (1.98)	CRN	2D
Alloy C276				52	30	46	32	20	1.0 (2.21)	CRN	2E
AISI 316L	2" MNPT	400	–	78	30	65	38	25	1.8 (3.97)	CRN	2G
Alloy C276									2.0 (4.41)	CRN	2H

1) CSA approval: Product Configurator, order code for "Approval"
2) Product Configurator, order code for "Process connection"
3) 28 mm (1.1 in) in conjunction with high-temperature oil

Process connections for PMP75 with flush-mounted process isolating diaphragm

Tri-Clamp ISO 2852



A0021644

C7 *Diameter of flange*
h *Height*
d_M *Max. diameter of the process isolating diaphragm*

Engineering unit mm (in)

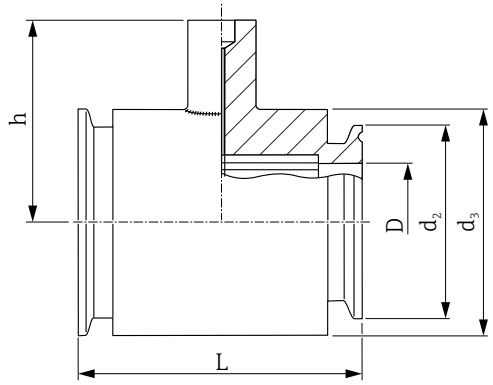
Material [1]	Nominal diameter ISO 2852	Nominal diameter DIN 32676	Nominal diameter	C_7	d_M		h	Weight	Approval [2]	Option [3]
					Standard	with TempC membrane				
			[in]	[mm]	[mm]	[mm]	[mm]	[kg (lb)]		
AISI 316L	ND 25 / 33.7	DN 25	1	50.5	24	-	37	0.32 (0.71)	EHEDG, 3A, CRN	TB
	ND 38	DN 40	1 ½	50.5	36	36	30	1 (2.21)	EHEDG, 3A, CRN	TC [4] [5]
	ND 51 / 40	DN 50	2	64	48	41	30	1.1 (2.43)	EHEDG, 3A, CRN	TD [4] [5]
	ND 63.5	DN 50	2 ½	77.5	61	61	30	0.7 (1.54)	EHEDG, 3A	TE [6]
	ND 76.1	–	3	91	73	61	30	1.2 (2.65)	EHEDG, 3A, CRN	TF [5]

1) Surface roughness of the wetted surfaces R_a < 0.76 µm (29.9 µin) as standard. Lower surface roughness available on request.
2) CSA approval: Product Configurator, order code for "Approval"
3) Product Configurator, order code for "Process connection"
4) Optionally available as an ASME-BPE-compliant diaphragm seal version for use in biochemical processes, surfaces in contact with medium R_a < 0.38 µm (15 µin)) , electropolished; order using order code for "Additional options", option "P".
5) Alternatively available with TempC membrane.
6) With TempC membrane

PN max. = 40 bar (580 psi). The maximum PN depends on the clamp used.

Process connections for PMP75 with flush-mounted process isolating diaphragm

Tri-Clamp pipe diaphragm seal ISO 2852



h *Height*
D *Diameter*
d_2 *Diameter*
d_3 *Diameter*
L *Installation length*

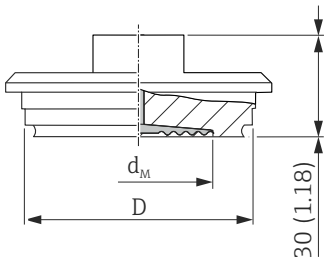
Engineering unit mm (in)

Material [1]	Nominal diameter ISO 2852	Nominal diameter	Nominal pressure	D	d_2	d_3	h	L	Weight	Approval [2]	Option [3]
		[in]		[mm]	[mm]	[mm]	[mm]	[mm]	[kg (lb)]		
AISI 316L	DN 25	1	PN 40	22.5	50.5	54	67	126	1.7 (3.75)	3A, CRN	SB
	DN 38	1 ½	PN 40	35.5	50.5	69	67	126	1.0 (2.21)	3A, CRN	SC [4]
	DN 51	2	PN 40	48.6	64	78	79	100	1.7 (3.75)	3A, CRN	SD [4]

1) Surface roughness of the wetted surfaces R_a < 0.8 µm (31.5 µin) as standard.
2) CSA approval: Product Configurator, order code for "Approval"
3) Product Configurator, order code for "Process connection"
4) incl. 3.1 and pressure test according to Pressure Equipment Directive, Category II

Hygienic process connections for PMP75 with flush-mounted process isolating diaphragm

Varivent for pipes



A0021672

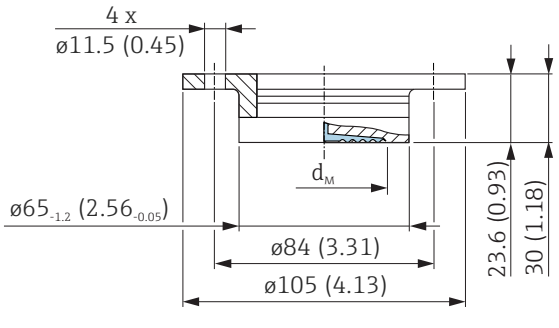
D Diameter
d_M Max. diameter of the process isolating diaphragm

Engineering unit mm (in)

Material [1]	Designation	Nominal pressure	D	d_M		Weight	Approval	Option [2]
				Standard	with TempC membrane			
			[mm]	[mm]	[mm]	[kg (lb)]		
AISI 316L	Type F for pipes DN 25 - DN 32	PN 40	50	34	36	0.4 (0.88)	EHEDG, 3A	TU [3]
AISI 316L	Type N for pipes DN 40 - DN 162	PN 40	68	58	61	0.8 (1.76)	EHEDG, 3A	TR [4] [5]

1) Surface roughness of the wetted surfaces R_a < 0.76 µm (29.9 µin) as standard.
2) Product Configurator, order code for "Process connection"
3) With TempC membrane
4) Optionally available as an ASME-BPE-compliant diaphragm seal version for use in biochemical processes, surfaces in contact with medium R_a < 0.38 µm (15 µin)) , electropolished; order using order code for "Additional options", option "P". Reduced surface roughness on request.
5) Alternatively available with TempC membrane.

DRD DN50 (65 mm)



A0021673

d_M Max. diameter of the process isolating diaphragm

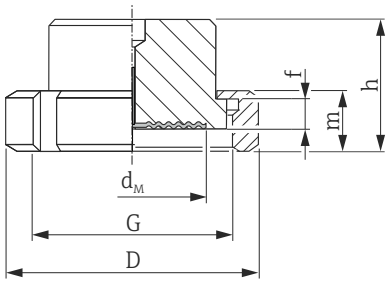
Engineering unit mm (in)

Material [1]	Nominal pressure	d_M		Weight	Option [2]
		Standard	with TempC membrane		
		[mm]	[mm]	[kg (lb)]	
AISI 316L	PN 25	50	48	0.75 (1.65)	TK [3]

1) Surface roughness of the wetted surfaces R_a < 0.76 µm (29.9 µin) as standard.
2) Product Configurator, order code for "Process connection"
3) Alternatively available with TempC membrane.

Hygienic process connections for PMP75 with flush-mounted process isolating diaphragm

SMS nozzles with coupling nut



A0021674

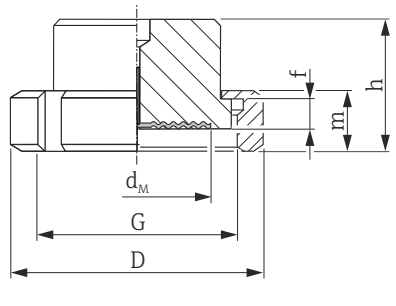
D *Diameter*
f *Nozzle height*
G *Thread*
h *Height*
m *Height*
d_M *Max. diameter of the process isolating diaphragm*

Engineering unit mm (in)

Material [1]	Nominal diameter	Nominal pressure	D	f	G	m	h	d_M	Weight	Approval	Option [2]
			[mm]	[mm]		[mm]	[mm]	[mm]	[kg (lb)]		
AISI 316L	1	PN 25	54	3.5	Rd 40 – 1/6	20	42.5	24	0.25 (0.55)	3A, EHEDG	TG
	1 ½	PN 25	74	4	Rd 60 – 1/6	25	57	36	0.65 (1.43)	3A, EHEDG	TH [3]
	2	PN 25	84	4	Rd 70 – 1/6	26	62	48	1.05 (2.32)	3A, EHEDG	TI [3]

1) Surface roughness of the wetted surfaces R_a < 0.76 µm (29.9 µin) as standard.
2) Product Configurator, order code for "Process connection"
3) Alternatively available with TempC diaphragm.

APV-RJT nozzles with coupling nut



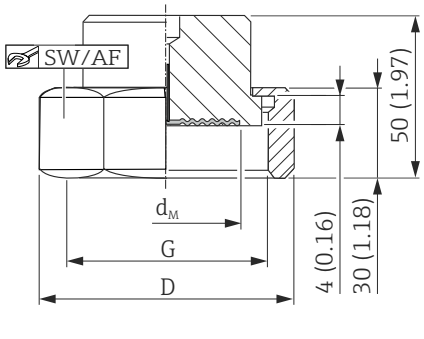
D Diameter
f Nozzle height
G Thread
h/m Height
d_M Max. diameter of the process isolating diaphragm

Engineering unit mm (in)

Material [1]	Nominal diameter	Nominal pressure	D	f	G	m	h	d_M	Weight	Option [2]
	[in]	[bar]	[mm]	[mm]		[mm]	[mm]	[mm]	[kg (lb)]	
AISI 316L	1	PN 40	77	6.5	1 13/16 – 1/8"	22	42.6	21	0.45 (0.99)	TL
	1 ½	PN 40	72	6.4	2 5/16 – 1/8"	22	42.6	28	0.75 (1.65)	TM
	2	PN 40	86	6.4	2 7/8 – 1/8"	22	42.6	38	1.2 (2.65)	TN

1) Surface roughness of the wetted surfaces R_a < 0.8 µm (31.5 µin) as standard.
2) Product Configurator, order code for "Process connection"

APV-ISS nozzles with coupling nut



D Diameter
G Thread
AF across flats
d_M Max. diameter of the process isolating diaphragm

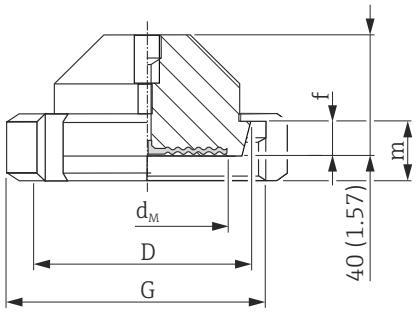
Engineering unit mm (in)

Material [1]	Nominal diameter	Nominal pressure	D	G	SW/AF	d_M	Weight	Option [2]
	[in]	[bar]	[mm]			[mm]	[kg (lb)]	
AISI 316L	1	PN 40	54.1	1 ½" – 1/8"	46.8	24	0.4 (0.88)	TP
	1 ½	PN 40	72	2" – 1/8"	62	34	0.6 (1.32)	TQ
	2	PN 40	89	2 ½" – 1/8"	77	45	1.1 (2.43)	TS

1) Surface roughness of the wetted surfaces R_a < 0.8 µm (31.5 µin) as standard.
2) Product Configurator, order code for "Process connection"

Hygienic process connections for PMP75 with flush-mounted process isolating diaphragm

Taper adapter with coupling nut, DIN 11851



A0021678

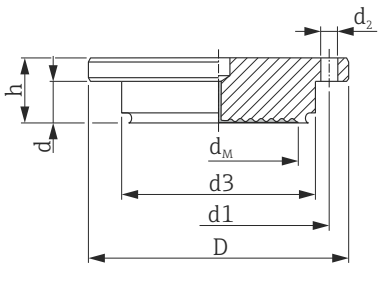
D Diameter
f Nozzle height
G Thread
m Height
d_M Max. diameter of the process isolating diaphragm

Engineering unit mm (in)

Material [1]	Taper adapter				Slotted nut		Diaphragm seal			Approval	Option [2]
							d_M		Weight		
	Designation	Nominal pressure	D	f	G	m	Standard	with TempC membrane			
		[bar]	[mm]	[mm]		[mm]	[mm]	[mm]	[kg (lb)]		
AISI 316L	DN 32	PN 40	50	10	Rd 58 x 1/6"	21	32	28	0.45 (0.99)	3A, EHEDG	MI [3]
	DN 40	PN 40	56	10	Rd 65 x 1/6"	21	38	36	0.45 (0.99)	3A, EHEDG	MZ [3]
	DN 50	PN 25	68.5	11	Rd 78 x 1/6"	19	52	48	1.1 (2.43)	3A, EHEDG	MR [4]
	DN 65	PN 25	86	12	Rd 95 x 1/6"	21	66	61	2.0 (4.41)	3A, EHEDG	MS [4]
	DN 80	PN 25	100	12	Rd 110 x 1/4"	26	81	61	2.55 (5.62)	3A, EHEDG	MT [4]

1) Surface roughness of the wetted surfaces R_a < 0.76 µm (29.9 µin) as standard.
2) Product Configurator, order code for "Process connection"
3) With TempC membrane
4) Alternatively available with TempC membrane.

NEUMO BioControl



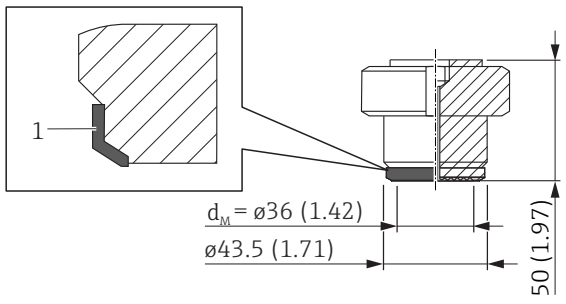
D Diameter
h/d Height
d1/ d3 diameter
d_2 Diameter of hole
d_M Max. diameter of the process isolating diaphragm

Engineering unit mm (in)

Material [1]	NEUMO BioControl (Process temperature range: −10 to +200 °C (+14 to +392 °F))								Diaphragm seal			Approval	Option [2]
									d_M		Weight		
	Nominal diameter	Nominal pressure	D	d	d_2	d_3	d_1	m	Standard	with TempC membrane			
		[bar]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg (lb)]		
AISI 316L	DN 50	PN 16	90	17	4 x Ø 9	50	70	27	40	36	1.1 (2.43)	3A	S4 [3]
	DN 80	PN 16	140	25	4 x Ø 11	87.4	115	37	61	61	2.6 (5.73)	3A	S6 [3]

1) Surface roughness of the wetted surfaces R_a < 0.76 µm (29.9 µin) as standard.
2) Product Configurator, order code for "Process connection"
3) With TempC membrane

Universal process adapter



1 Silicone molded seal

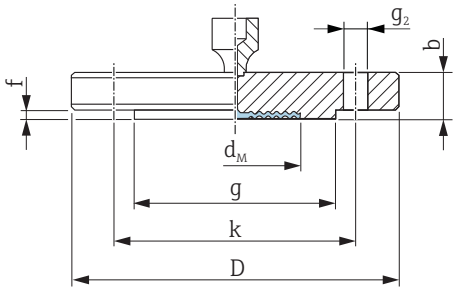
Engineering unit mm (in)

Designation	Nominal pressure	Material [1]	Weight [kg (lb)]	Approval	Option [2]
Universal adapter with silicone molded seal (spare part no.: 52023572) FDA 21CFR177.2600/USP Class VI	PN 10	AISI 316L (1.4435)	0.8 (1.76)	3A, EHEDG	00 [3] [4]

1) Surface roughness of wetted surfaces R_a< 0.76 µm (29.9 µin).
2) Product Configurator, order code for "Process connection"
3) Endress+Hauser supplies these slotted nuts in stainless steel AISI 304 (DIN/EN material number 1.4301) or in AISI 304L (DIN/EN material number 1.4307).
4) Alternatively available with TempC membrane.

Process connections for PMP75 with flush-mounted process isolating diaphragm

EN/DIN flanges, connection dimensions in accordance with EN 1092-1/DIN 2527 and DIN 2501-1



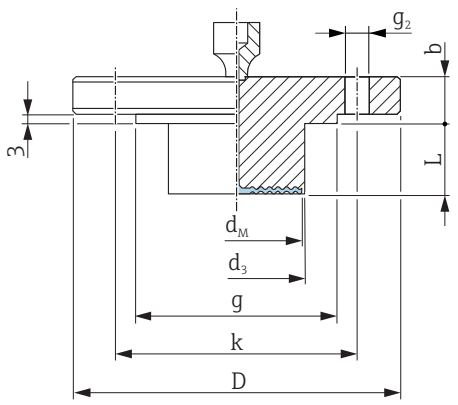
D *Diameter of flange*
b *Thickness*
g *Raised face*
f *Raised face*
k *Hole circle*
g_2 *Diameter of hole*
d_M *Max. diameter of the process isolating diaphragm*

Engineering unit mm

Flange [1) 2) 3)]							Boltholes			Diaphragm seal		Option [4)]
Nominal diameter	Nominal pressure	Shape [5)]	D	b	g	f	Number	g_2	k	d_M	Weight	
			[mm]	[mm]	[mm]	[mm]		[mm]	[mm]	[mm]	[kg (lb)]	
DN 25	PN 10-40	B1 (D)	115	18	68	3	4	14	85	32	2.1 (4.63)	CN [6)]
DN 25	PN 63-160	B2 (E)	140	24	68	2	4	18	100	28	2.5 (5.51)	DN
DN 25	PN 250	B2 (E)	150	28	68	2	4	22	105	28	3.7 (8.16)	EN
DN 25	PN 400	B2 (E)	180	38	68	2	4	26	130	28	7.0 (15.44)	E1
DN 32	PN 10-40	B1 (D)	140	18	77	2.6	4	18	100	34	1.9 (4.19)	CP
DN 40	PN 10-40	B1 (D)	150	18	87	2.6	4	18	110	48	2.2 (4.85)	CQ
DN 50	PN 10-40	B1 (D)	165	20	102	3	4	18	125	59	3.0 (6.62)	B3 [6)]
DN 50	PN 63	B2 (E)	180	26	102	3	4	22	135	59	4.6 (10.14)	C3
DN 50	PN 100-160	B2 (E)	195	30	102	3	4	26	145	59	6.2 (13.67)	EF
DN 50	PN 250	B2 (E)	200	38	102	3	8	26	150	59	7.7 (16.98)	ER
DN 50	PN 400	B2 (E)	235	52	102	3	8	30	180	59	14.7 (32.41)	E3
DN 80	PN 10-40	B1 (D)	200	24	138	3.5	8	18	160	89	5.3 (11.69)	B4 [6)]
DN 80	PN 100	B2 (E)	230	32	138	4	8	24	180	89	8.9 (19.62)	C4
DN 100	PN 100	B2 (E)	265	36	175	5	8	30	210	89	13.7 (30.21)	C5

1) material: AISI 316L
2) The roughness of the surface in contact with the medium, including raised faced of flanges (all standards) made of Alloy C276, Monel, tantalum, rhodium>gold, gold or PTFE is R_a< 0.8 µm (31.5 µin). Lower surface roughness on request.
3) The flange raised face is made of the same material as the process isolating diaphragm.
4) Product Configurator, order code for "Process connection"
5) Description as per DIN 2527 provided in brackets
6) Alternatively available with TempC membrane. Diameter of process isolating diagram modified in TempC version: DN25: 28 mm; DN50: 61 mm.

EN/DIN flanges with barrel (extended diaphragm seal), connection dimensions in accordance with EN 1092-1/DIN 2527 and DIN 2501-1



D *Diameter of flange*
b *Thickness*
g *Raised face*
k *Hole circle*
g_2 *Diameter of hole*
d_M *Max. diameter of the process isolating diaphragm*
d_3 *Barrel (extended diaphragm seal) diameter*
L *Barrel (extended diaphragm seal) length*

Engineering unit mm

Flange [1) 2)]						Boltholes			Diaphragm seal		Option [3)]
Nominal diameter	Nominal pressure	Shape [4)]	D	b	g	Number	g_2	k	d_M	Weight	
			[mm]	[mm]	[mm]		[mm]	[mm]	[mm]	[kg (lb)]	
DN 50	PN 10-40	B1 (D)	165	20	102	4	18	125	47	[5)]	D3 [5)]
DN 80	PN 10-40	B1 (D)	200	24	138	8	18	160	72	[5)]	D4 [5)]

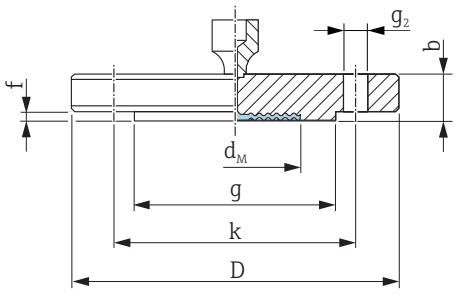
1) Material: AISI 316L
2) In the case of process isolating diaphragms made of Alloy C276, Monel or tantalum, the raised face of the flange and the barrel pipe are made of 316L
3) Product Configurator, order code for "Process connection"
4) Description as per DIN 2527 provided in brackets
5) Available with 50 mm (1.97 in), 100 mm (3.94 in) and 200 mm (7.87 in)barrel, (extended diaphragm seal), for barrel (extended diaphragm seal) diameter and weight see the following table

Option [1)]	Nominal diameter	Nominal pressure	L	d_3	Weight
			[mm]	[mm]	[kg (lb)]
D3	DN 50	PN 10-40	50 / 100 / 200	48.3	3.2 (7.1)/ 3.8 (8.4)/ 4.4 (9.7)
D4	DN 80	PN 10-40	50 /100 / 200	76	6.2 (13.7)/ 6.7 (14.8)/ 7.8 (17.2)

1) Product Configurator, order code for "Process connection"

Process connections for PMP75 with flush-mounted process isolating diaphragm

ASME flanges, in accordance with connection dimensions ASME B 16.5, raised face RF



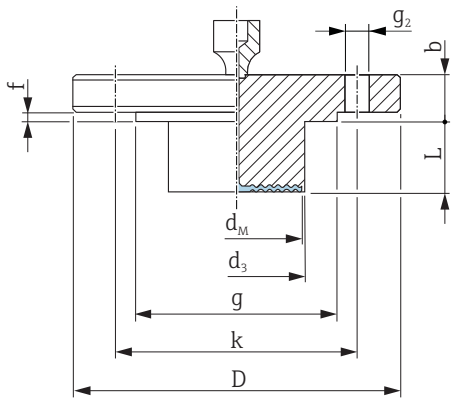
D *Diameter of flange*
b *Thickness*
g *Raised face*
f *Raised face*
k *Hole circle*
g_2 *Diameter of hole*
d_M *Max. diaphragm diameter*

Engineering unit in

Flange [1) 2) 3)]						Boltholes			Diaphragm seal		Approval [4)]	Option [5)]
Nominal diameter	Class	D	b	g	f	Number	g_2	k	d_M	Weight		
[in]	[lb./sq.in]	[in]	[in]	[in]	[in]		[in]	[in]	[in]	[kg (lb)]		
1	150	4.25	0.56	2	0.08	4	0.62	3.12	1.26	1.2 (2.65)	CRN [6)]	AC [7)]
1	300	4.88	0.69	2	0.08	4	0.75	3.5	1.26	1.3 (2.87)	CRN	AN [7)]
1	400/600	4.88	0.69	2	0.25	4	0.75	3.5	1.26	1.4 (3.09)	CRN	HC
1	900/1500	5.88	1.12	2	0.25	4	1	4	1.26	3.2 (7.06)	CRN	HN
1	2500	6.25	1.38	2	0.25	4	1	4.25	1.26	4.6 (10.14)	CRN	HO
1 ½	150	5	0.69	2.88	0.06	4	0.62	3.88	1.89	1.5 (3.31)	CRN	AE
1 ½	300	6.12	0.81	2.88	0.06	4	0.88	4.5	1.89	2.6 (5.73)	CRN	AQ
2	150	6	0.75	3.62	0.06	4	0.75	4.75	2.32	2.2 (4.85)	CRN	AF [7)]
2	300	6.5	0.88	3.62	0.06	8	0.75	5	2.32	3.4 (7.5)	CRN	AR [7)]
2	400/600	6.5	1	3.62	0.25	8	0.75	5	2.32	4.3 (9.48)	CRN	HF
2	900/1500	8.5	1.5	3.62	0.25	8	1	6.5	2.32	10.3 (22.71)	CRN	HR
2	2500	9.25	2	3.62	0.25	8	1.12	6.75	2.32	15.8 (34.84)	-	H3
3	150	7.5	0.94	5	0.06	4	0.75	6	3.5	5.1 (11.25)	CRN	AG [7)]
3	300	8.25	1.12	5	0.06	8	0.75	6	3.5	7.0 (15.44)	CRN	AS [7)]
4	150	9	0.94	6.19	0.06	8	0.75	7.5	3.5	7.2 (15.88)	CRN	AH
4	300	10	1.25	6.19	0.06	8	0.88	7.88	3.5	11.7 (25.8)	CRN	AT

1) material AISI 316/316L: Combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated)
2) The roughness of the surface in contact with the medium, including the raised face of the flanges (all standards) made of Alloy C276, Monel, tantalum, rhodium>gold, gold or PTFE is R_a< 0.8 µm (31.5 µin). Lower surface roughness on request.
3) The flange raised face is made of the same material as the process isolating diaphragm.
4) CSA approval: Product Configurator, order code for "Approval"
5) Product Configurator, order code for "Process connection"
6) CRN approval not for TempC membrane.
7) Alternatively available with TempC membrane. Diameter of process isolating diaphragm is modified in TempC version: nominal diameter 1": 1.1 in; 2": 2.40 in.

ASME flanges with barrel (extended diaphragm seal), connection dimensions in accordance with ASME B 16.5, raised face RF



A0021683

D *Diameter of flange*
b *Thickness*
g *Raised face*
k *Hole circle*
g_2 *Diameter of hole*
d_M *Max. diameter of the process isolating diaphragm*
d_3 *Barrel (extended diaphragm seal) diameter*
L *Barrel (extended diaphragm seal) length*

Engineering unit in

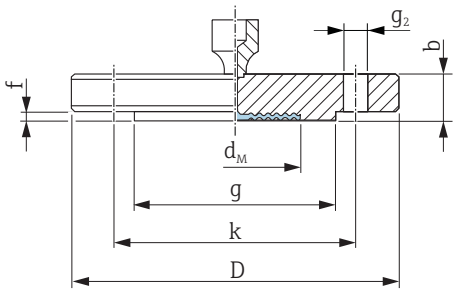
Flange [1) 2)]						Boltholes			Diaphragm seal		Approval [3)]	Option [4)]
Nominal diameter	Class	D	b	g	f	Number	g_2	k	d_M	Weight		
[in]	[lb./sq.in]	[in]	[in]	[in]	[in]		[in]	[in]	[in]	[kg (lb)]		
2	150	6	0.75	3.62	0.06	4	0.75	4.75	1.85	[5)]	CRN	J3 [5)]
3	150	7.5	0.94	5	0.06	4	0.75	6	2.83	[5)]	CRN	J4 [5)]
3	300	8.25	1.12	5	0.06	8	0.88	6.62	2.83	[5)]	CRN	J7 [5)]
4	150	9	0.94	6.19	0.06	8	0.75	7.5	3.5	[5)]	CRN	J5 [5)]
4	300	10	1.25	6.19	0.06	8	0.88	7.88	3.5	[5)]	CRN	J8 [5)]

1) Material: AISI 316/316L. Combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated)
2) In the case of process isolating diaphragms made of Alloy C276, Monel or tantalum, the raised face of the flange and the barrel pipe are made of 316L.
3) CSA approval: Product Configurator, order code for "Approval"
4) Product Configurator, order code for "Process connection"
5) Choice of 2", 4", 6" or 8" barrel (extended diaphragm seal), for diameter and weight of barrel (extended diaphragm seal) see the following table

Option [1)]	Nominal diameter	Class	(L)	d_3	Weight
	[in]	[lb./sq.in]	in (mm)	in (mm)	[kg (lb)]
J3	2	150	2 (50.8) / 4 (101.6) / 6 (152.4) / 8 (203.2)	1.9 (48.3)	3.0 (6.6)/ 3.4 (7.5)/ 3.9 (8.6)/ 4.4 (9.7)
J4	3	150	2 (50.8) / 4 (101.6) / 6 (152.4) / 8 (203.2)	2.99 (76)	6.0 (13.2) / 6.6 (14.5) / 7.1 (15.7) / 7.8 (17.2)
J7	3	300	2 (50.8) / 4 (101.6) / 6 (152.4) / 8 (203.2)	2.99 (76)	7.9 (17.4) / 8.5 (18.7) / 9.0 (19.9) / 9.6 (21.2)
J5	4	150	2 (50.8) / 4 (101.6) / 6 (152.4) / 8 (203.2)	3.7 (94)	8.6 (19) / 9.9 (21.8) / 11.2 (24.7) / 12.4 (27.3)
J8	4	300	2 (50.8) / 4 (101.6) / 6 (152.4) / 8 (203.2)	3.7 (94)	13.1 (28.9)/ 14.4 (31.6)/ 15.7 (34.6)/ 16.9 (37.3)

1) Product Configurator, order code for "Process connection"

JIS flanges, connection dimensions in accordance with JIS B 2220 BL, raised face RF



D *Diameter of flange*
b *Thickness*
g *Raised face*
f *Thickness of raised face*
k *Hole circle*
g_2 *Diameter of hole*

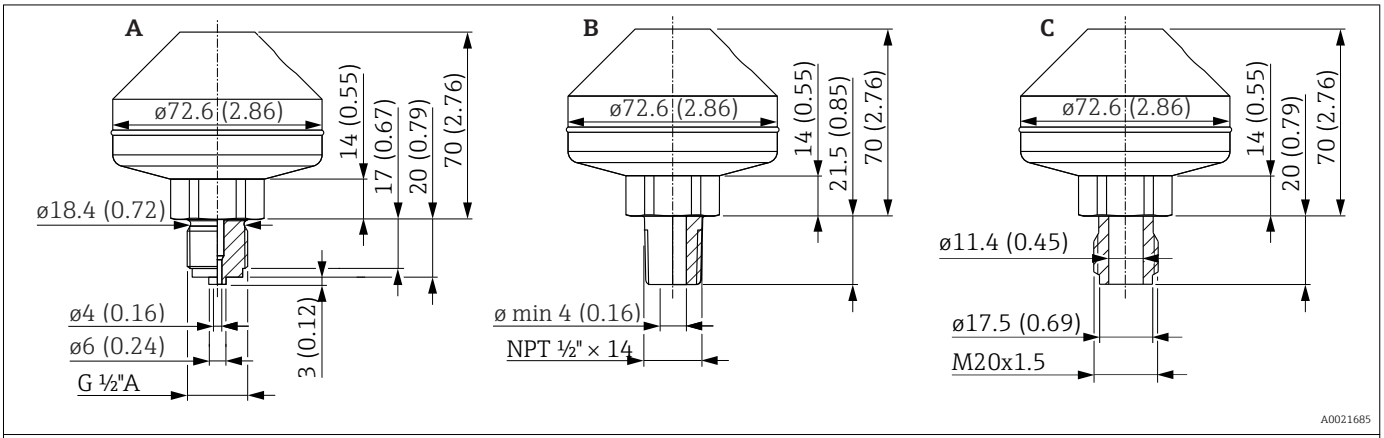
Engineering unit mm

Flange [1) 2) 3)]						Boltholes			Diaphragm seal		Option [4)]
Nominal diameter	Nominal pressure	D	b	g	f	Number	g_2	k	d_M	Weight	
		[mm]	[mm]	[mm]	[mm]		[mm]	[mm]	[mm]	[kg (lb)]	
25 A	10 K	125	14	67	1	4	19	90	32	1.5 (3.31)	KC
50 A	10 K	155	16	96	2	4	19	120	59	2.3 (5.07)	CF
80 A	10 K	185	18	127	2	8	19	150	89	3.3 (7.28)	KL
100 A	10 K	210	18	151	2	8	19	175	89	4.4 (9.7)	KH

1) material: AISI 316L
2) The roughness of the surface in contact with the medium, including the raised face of the flanges (all standards) made of Alloy C276, Monel, tantalum, rhodium>gold, gold or PTFE is R_a< 0.8 µm (31.5 µin). Lower surface roughness on request.
3) The flange raised face is made of the same material as the process isolating diaphragm.
4) Product Configurator, order code for "Process connection"

Process connections for PMP75

Welded separators

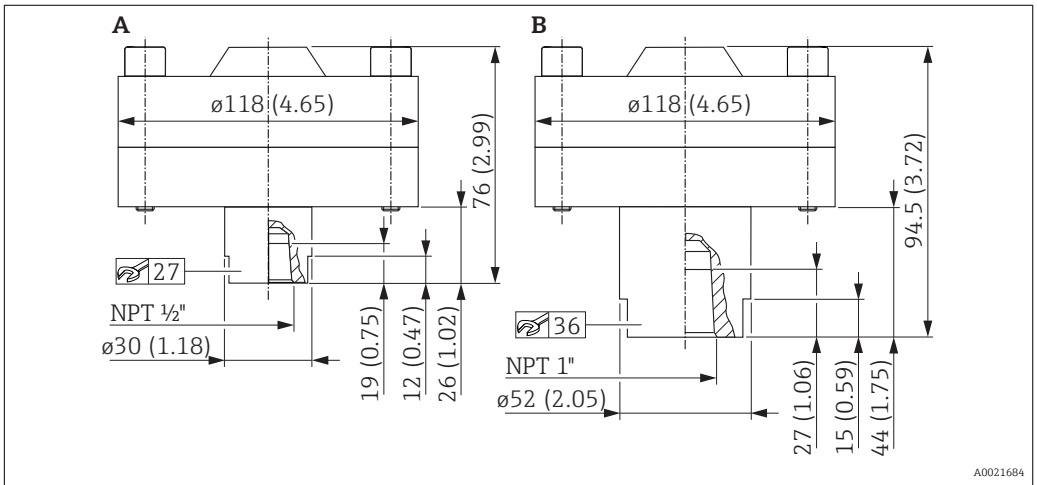


Engineering unit mm (in)

Position	Designation	Material	Measuring range [bar (psi)]	Nominal pressure	Approval	Weight [kg (lb)]	Option [1]
A	Welded, ISO 228 G ½ A EN837	AISI 316L	≤ 160 (2320)	PN 160	-	1.43 (3.15)	UA
B	Welded, ANSI ½ MNPT				CRN [2]		UB
C	Welded, thread DIN13 M20x1.5				-		UF

1) Product Configurator, order code for "Process connection"
2) CSA approval: Product Configurator, order code for "Approval"

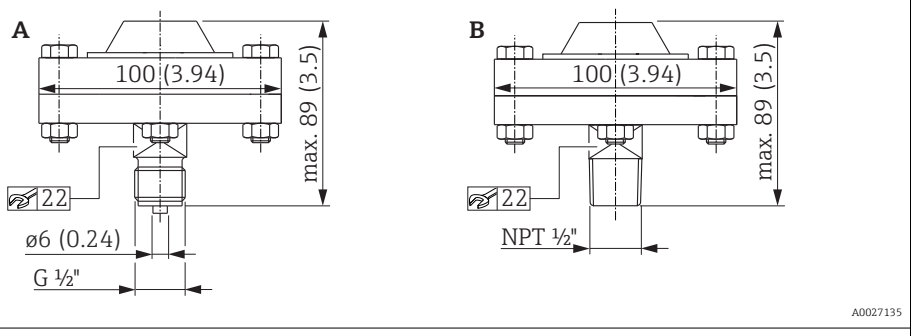
Threaded separators



Engineering unit mm (in)

Position	Designation	Material	Measuring range [bar (psi)]	Nominal pressure	Weight [kg (lb)]	Option [1]
A	Threaded, ½" NPT with FKM Viton seal −20 to +200 °C (−4 to +392 °F)	AISI 316L screws made of A4	≤ 250 (3625)	PN 250	4.75 (10.47)	UG
B	Threaded, 1" NPT with FKM Viton seal −20 to +200 °C (−4 to +392 °F)				5.0 (11.03)	UH

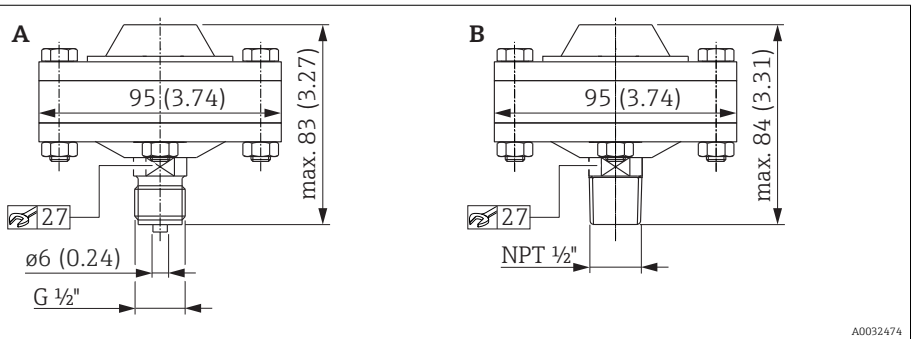
1) Product Configurator, order code for "Process connection"



Engineering unit mm (in)

Position	Designation	Material	Measuring range [bar (psi)]	Nominal pressure	Weight [kg (lb)]	Option [1]
A	Threaded, ISO 228 G ½ A EN837 with PTFE seal −40 to +260 °C (−40 to +500 °F)	AISI 316L, screws made of A4	≤ 40 (580)	PN 40	1.43 (3.15)	UC [2]
B	Threaded, ANSI ½ MNPT with PTFE seal −40 to +260 °C (−40 to +500 °F)					UD [2]

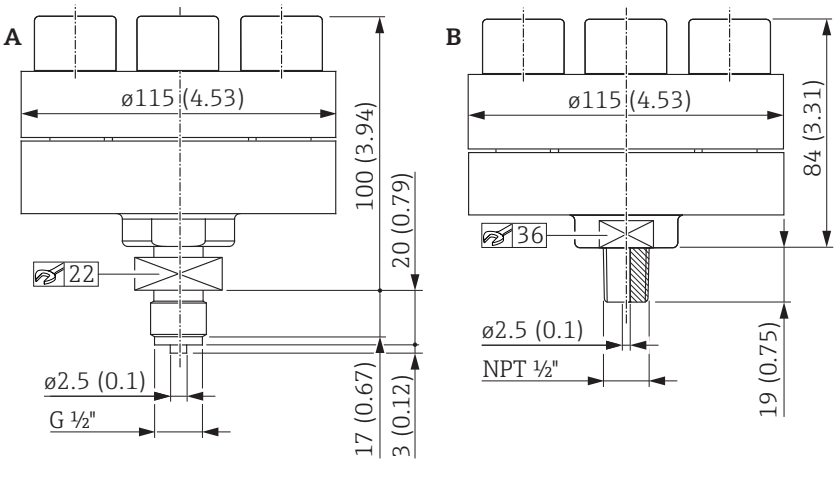
1) Product Configurator, order code for "Process connection"
2) In combination with silicone oil, inert oil and plant oil.



Engineering unit mm (in)

Position	Designation	Material	Measuring range [bar (psi)]	Nominal pressure	Weight [kg (lb)]	Option [1]
A	Threaded, ISO 228 G ½ A EN837 with metal seal (silver-plated) −60 to +400 °C (−76 to +752 °F)	AISI 316L, screws made of A4	≤ 40 (580)	PN 40	1.38 kg (3.04 lb)	UC [2]
B	Threaded, ANSI ½ MNPT with metal seal (silver-plated) −60 to +400 °C (−76 to +752 °F)					UD [2]

1) Product Configurator, order code for "Process connection"
2) In combination with high-temperature oil.

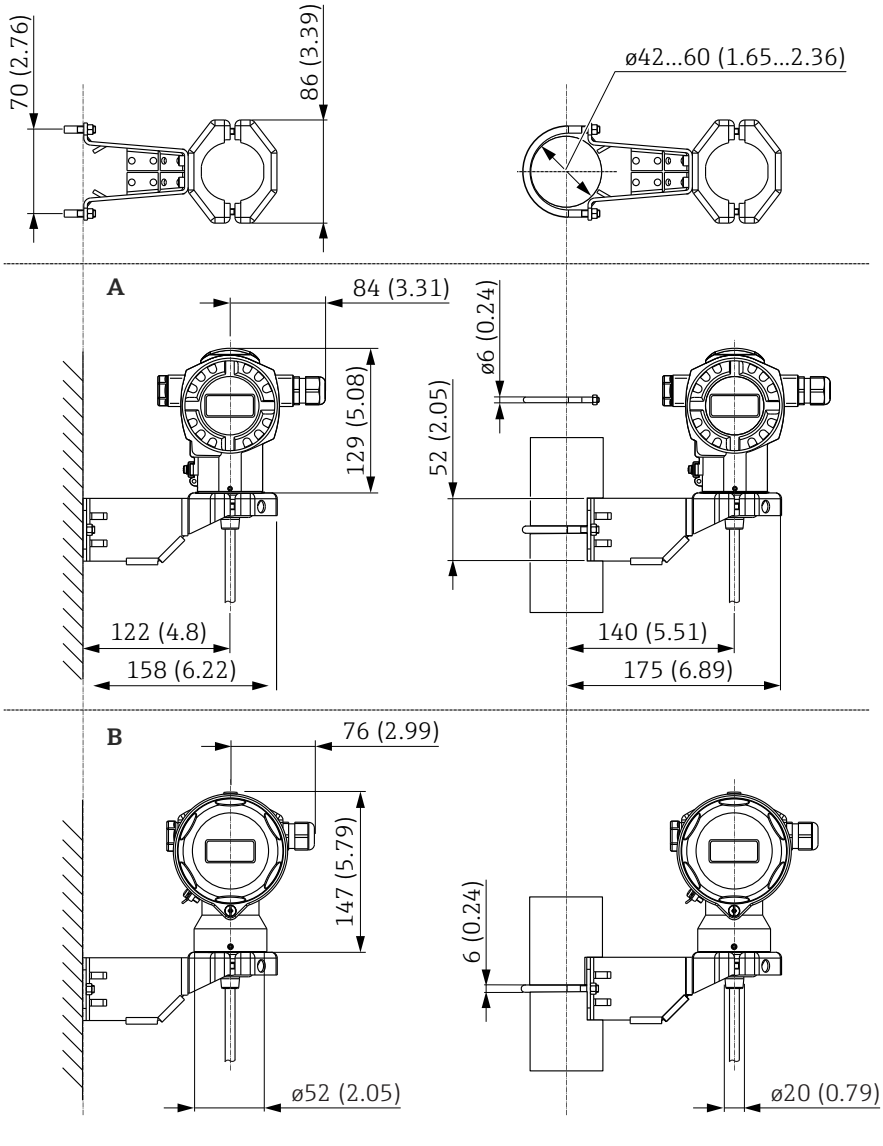


Engineering unit mm (in)

Position	Designation	Material	Measuring range [bar (psi)]	Nominal pressure [1]	Weight [kg (lb)]	Option [2]
A	Threaded, ISO 228 G ½ A EN837, with integrated seal lip −60 to +400 °C (−76 to +752 °F)	AISI 316L, screws made of A4	> 40 bar (580)	PN 400	4.75 (10.47)	UC
B	Threaded, ANSI ½ MNPT, with integrated seal lip −60 to +400 °C (−76 to +752 °F)					UD

1) This separator is assembled prior to delivery and must not be disassembled!
2) Product Configurator, order code for "Process connection"

Separate housing: Wall and pipe mounting with mounting bracket



Engineering unit mm (in)

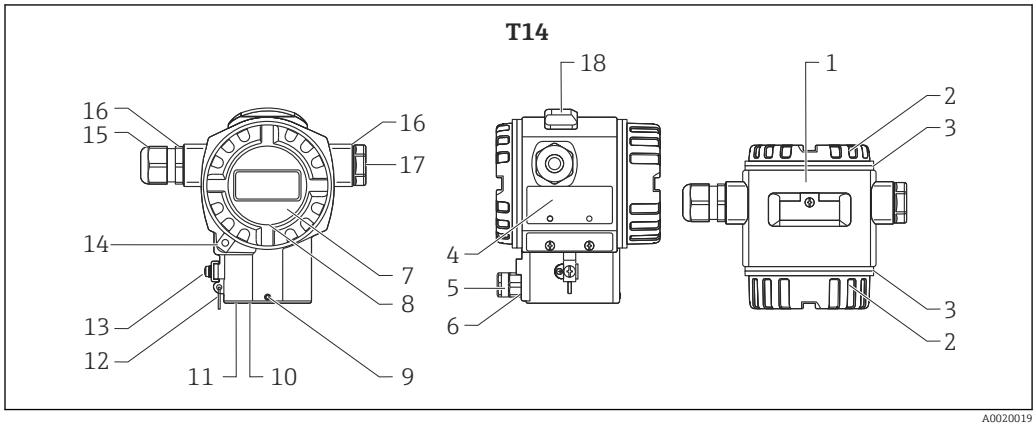
Position	Designation	Weight in kg (lb)		Option [1]
		Housing (T14 or T17)	Mounting bracket	
A	Dimensions with T14 housing, optional side display	→ 🖹 55	0.5 (1.10)	U
B	Dimensions with T17 housing, optional side display			

1) Product Configurator, order code for "Additional options 2", version "G"

Also available for order as a separate accessory: Part number 71102216

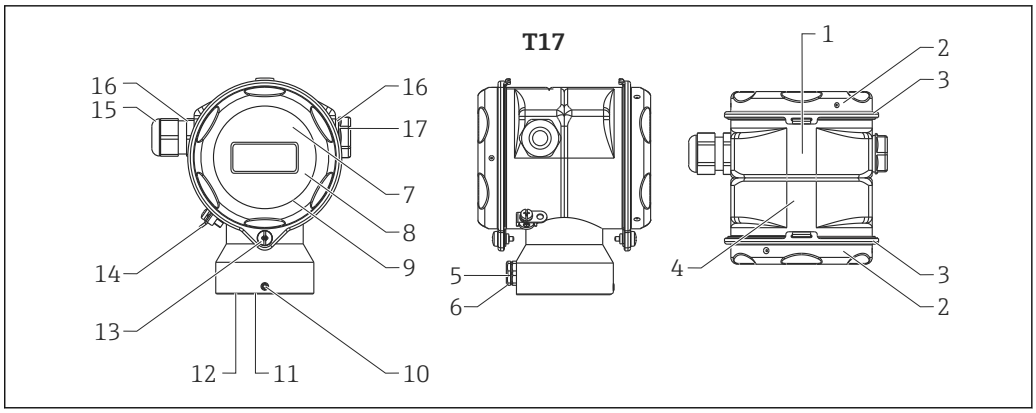
Materials not in contact with process

Transmitter housing



A0020019

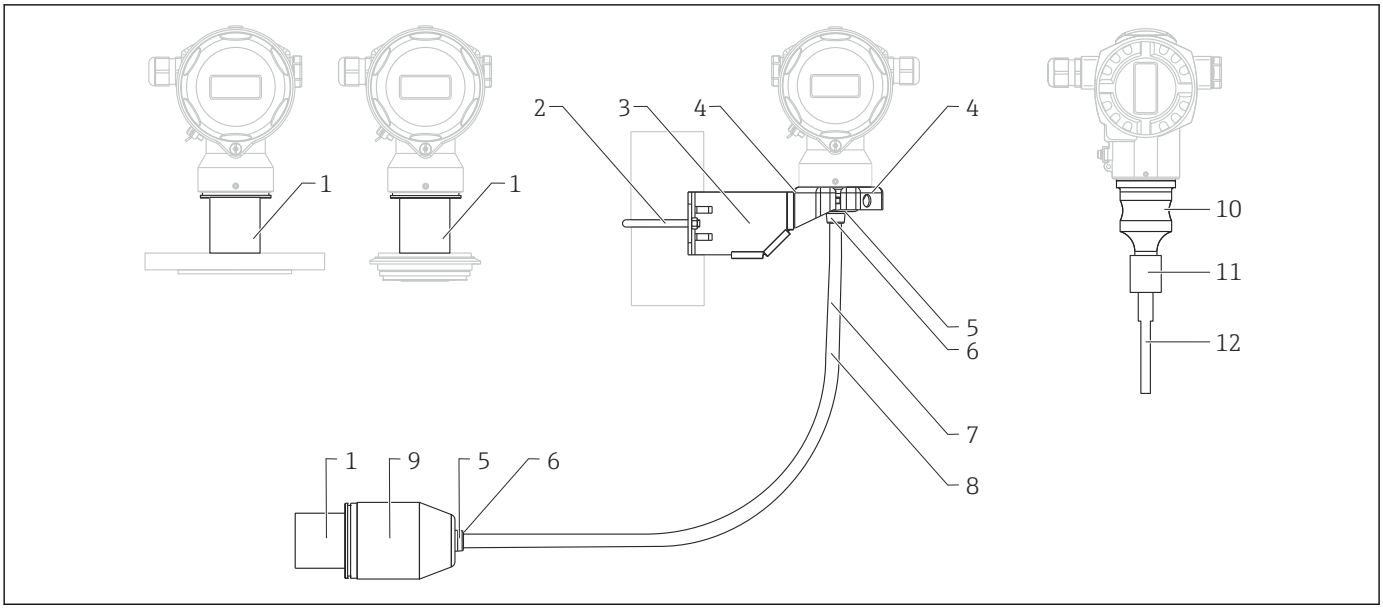
Item number	Component part	Material
1	T14 housing, RAL 5012 (blue)	▪ Die-cast aluminum with protective powder-coating on polyester base ▪ Thread coating: Heat-curing lubricant varnish
1	T14 housing	▪ Precision casting AISI 316L (1.4435) ▪ Thread coating: Heat-curing lubricant varnish
2	Cover, RAL 7035 (gray)	Die-cast aluminum with protective powder-coating on polyester base
3	Cover seal	EPDM
4	Nameplates	▪ AISI 316L (1.4404), if T14 housing is precision-cast ▪ Anodized aluminum, if housing T14/T15 of die-cast aluminum
5	Pressure compensation filter	AISI 316L (1.4404) and PBT-FR
6	Pressure compensation filter, O-ring	VMQ or EPDM
7	Sight glass	Mineral glass
8	Sight glass seal	Silicone (VMQ)
9	Screw	A4
10	Sealing ring	EPDM
11	Snap ring	PA66-GF25
12	Snap ring for nameplates	AISI 304 (1.4301)/AISI 316 (1.4401)
13	External ground terminal	AISI 304 (1.4301)
14	Cover clamp	Clamp AISI 316L (1.4435), screw A4
15	Cable entry	Polyamide (PA) or CuZn nickel-plated
16	Seal of cable entry and plug	Silicone (VMQ)
17	Blind plug	PBT-GF30 FR, for dust ignition-proof: AISI 316L (1.4435)
18	External operation (keys and key cover), RAL 7035 (gray)	Polycarbonate PC-FR, screw A4
Devices with MID parts certificate	Seal wire	DIN 1367-0 St/Zn (soft galvanized steel)
Devices with MID parts certificate	Seals	Pb (lead)



A0020021

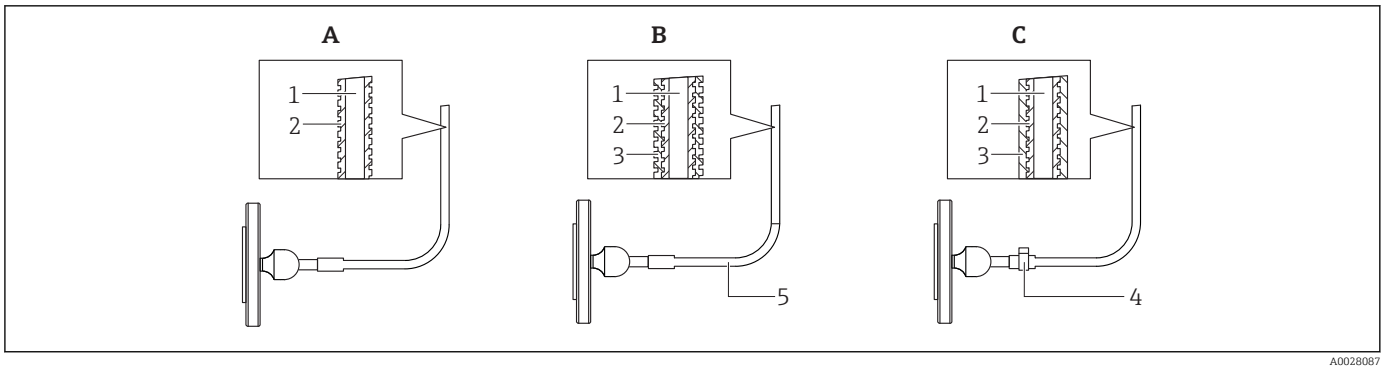
Item number	Component part	Material
1	T17 housing	AISI 316L (1.4404)
2	Cover	
3	Cover seal	EPDM
4	Nameplates	Lasered on
5	Pressure compensation filter	AISI 316L (1.4404) and PBT-FR
6	Pressure compensation filter, O-ring	VMQ or EPDM
7	Sight glass for non-hazardous area, ATEX Ex ia, NEPSI Zone 0/1 Ex ia, IECEx Zone 0/1 Ex ia, FM NI, FM IS, CSA IS	Polycarbonate (PC)
8	Sight glass for ATEX 1/2 D, ATEX 1/3 D, ATEX 1 GD, ATEX 1/2 GD, ATEX 3 G, FM DIP, CSA dust ignition-proof	Mineral glass
9	Sight glass seal	EPDM
10	Screw	A2-70
11	Sealing ring	EPDM
12	Snap ring	PA6
13	Screw	A4-50 Thread coating: Heat-curing lubricant varnish
14	External ground terminal	AISI 304 (1.4301)
15	Cable entry	Polyamide PA, for dust ignition-proof: CuZn nickel-plated
16	Seal of cable entry and plug	Silicone (VMQ)
17	Blind plug	PBT-GF30 FR, for dust ignition-proof: AISI 316L (1.4435)
Devices with MID parts certificate	Seal wire	DIN 1367-0 St/Zn (soft galvanized steel)
Devices with MID parts certificate	Seals	Pb (lead)

Connecting parts



A0028222

Item number	Component part	Material
1	Connection between the housing and process connection	AISI 316L (1.4404)
2	Mounting bracket	Bracket AISI 316L (1.4404)
3		Screw and nuts A4-70
4		Half-shells: AISI 316L (1.4404)
5	Seal for cable from separate housing	EPDM
6	Gland for cable from separate housing	AISI 316L (1.4404)
7	PE cable for separate housing	abrasion-proof cable with strain-relief Dynema members; shielded using aluminum-coated foil; insulated with polyethylene (PE-LD), black; copper wires, twisted, UV-resistant
8	FEP cable for separate housing	Abrasion-proof cable; shielded using galvanized steel wire netting; insulated with fluorinated ethylene propylene (FEP), black; copper cores, twisted, UV-resistant
9	Process connection adapter for separate housing	AISI 316L (1.4404)
10	Cell body	AISI 316L (1.4404)
11	Connection between body of measuring cell and capillary	AISI 316L (1.4404)
12	Heat-shrink tube (available only if capillary has PTFE or PVC sheath)	Polyolefin



A0028087

Position	Component part	A Standard [1] Armor for capillary	B PVC-coated Armor for capillary	C PTFE hose Armor for capillary
1	Capillary	AISI 316 Ti (1.4571)	AISI 316 Ti (1.4571)	AISI 316 Ti (1.4571)
2	Flexible armor for capillary	AISI 316L (1.4404) [2]	AISI 316L (1.4404)	AISI 316L (1.4404)
3	Coating/armor	-	PVC [3]	PTFE [4]
4	Single-ear clamp	-	-	1.4301
5	Shrink tubing at capillary junction	-	Polyolefin	-

1) If no option is specified when ordering, order option "SA" is supplied.
2) Product Configurator, order code for "Capillary armoring:" option "SA"
3) Product Configurator, order code for "Capillary armoring:" option "SB"
4) Product Configurator, order code for "Capillary armoring:" option "SC"

Weight

Component part	Weight
Housing	See "Housing" section
Process connection	See "Process connections" section
Capillary with armoring made of AISI 316L (1.4404)	0.16 kg/m (0.35 lb/m) + 0.35 kg (0.77 lb)
Capillary with armoring made of AISI 316L (PVC)	0.21 kg/m (0.46 lb/m) + 0.35 kg (0.77 lb)
Capillary with armoring made of AISI 316L (PTFE)	0.29 kg/m (0.64 lb/m) + 0.35 kg (0.77 lb)

Materials in contact with process

NOTICE

- The device components in contact with the process are specified in the "Mechanical construction" → 54 and "Ordering information" → 123 sections.

Delta-ferrite content

A delta-ferrite content of ≤ 3% can be guaranteed and certified for the wetted parts if option "8" is selected in the "Additional options 1" or "Additional options 2" order code in the Product Configurator.

If the PMC71 with hygienic process connections is selected, a delta-ferrite content of ≤ 1% can be guaranteed and certified if option "8" is selected in the "Additional options 1" or "Additional options 2" order code in the Product Configurator.

TSE Certificate of Suitability (Transmissible Spongiform Encephalopathy)

The following applies to all device components in contact with the process:

- They do not contain any materials derived from animals.
- No additives or operating materials derived from animals are used in production or processing.

Process connections

- "Clamp connections" and "Hygienic process connections": AISI 316L (DIN/EN material number 1.4435)
- Endress+Hauser supplies process connections with a threaded connection as well as DIN/ EN flanges made of stainless steel as per AISI 316L (DIN/EN material number 1.4404 or 1.4435). With regard to their stability-temperature property, the materials 1.4404 and 1.4435 are grouped together under 13E0 in EN 1092-1: 2001 Tab. 18. The chemical composition of the two materials can be identical.
- Some process connections are also available in alloy C276 (DIN/EN material number 2.4819). For this purpose see the information in the "Mechanical construction" section.

Process isolating diaphragm

Sensor	Designation	Option [1]
PMC71	Al_2O_3 aluminum-oxide ceramic FDA, ultra-pure 99.9 % [2] Ceraphire® (see also www.endress.com/ceraphire)	Standard
PMP71	AISI 316L	1
	AISI 316L with gold-rhodium coating	6
	Alloy C276 (2.4819)	2
PMP75	AISI 316L	1
	AISI 316L, TempC	E
	AISI 316L with gold-rhodium coating	6
	AISI 316L with 0.25 mm (0.01 in) PTFE coating	8
	Alloy C276 (2.4819)	2 [3]
	Monel (2.4360)	3 [3]
	AISI 316L with gold coating	4
	Tantalum (UNS R05200)	5 [3]

1) Product Configurator, order code for "Membrane material"
2) The US Food & Drug Administration (FDA) has no objections to the use of ceramics made of aluminum oxide as a surface material in contact with foodstuffs. This declaration is based on the FDA certificates of our ceramic suppliers
3) The material of the flange raised face is the same material as is used for the process isolating diaphragm. For devices with a barrel (extended diaphragm seal), the flange raised face and the barrel pipe are made of 316L.

Seals

Device	Designation	Option [1]
PMC71	FKM Viton	A
	FKM Viton, FDA	G
	EPDM	B
	FFKM Perlast G75LT	C
	Kalrez	D
	Chemraz	E
	NBR (FDA)/3A: HNBR (FDA)	F
	FKM Viton, cleaned for PWIS-free applications	L
	Kalrez, cleaned for PWIS-free applications	M
	FKM Viton, cleaned from oil and grease	1
	FKM Viton, cleaned for oxygen service, note pressure and temperature application limits	2

1) Product Configurator, "Seal" ordering feature

Fill fluid

PMP71

Designation	Option [1]
Silicone oil	A
Inert oil	F
Inert oil, cleaned from oil and grease	K
Inert oil, cleaned for oxygen service (observe application limits pressure/temperature)	N

1) Product Configurator, order code for "Fill fluid"

PMP75

Designation	Option [1] [2]
Silicone oil (food-safe FDA 21 CFR 175.105)	A
...m capillary, inert oil	B
...ft capillary, inert oil	C
Vegetable oil (food-safe FDA 21 CFR 172.856)	D
Inert oil	F
High-temperature oil, temperature isolator	G
Silicone oil, temperature isolator (food-safe FDA 21 CFR 175.105)	H
Vegetable oil, temperature isolator	J
Inert oil, cleaned from oil and grease	K
Inert oil, cleaned for oxygen service	N
...m capillary, silicone oil (food-safe FDA 21 CFR 175.105)	1
...ft capillary, silicone oil (food-safe FDA 21 CFR 175.105)	2
...m capillary, high-temperature oil	3
...ft capillary, high-temperature oil	4
...m capillary, vegetable oil (food-safe FDA 21 CFR 172.856)	5
...ft capillary, vegetable oil (food-safe FDA 21 CFR 172.856)	6
...m capillary, low-temperature oil	7
...ft capillary, low-temperature oil	8

1) Product Configurator, order code for "Fill fluid"
2) For diaphragm seal devices with 3-A and EHEDG certificates, only select filling oils with FDA approval!

Operability

Operating concept

Operator-oriented menu structure for user-specific tasks

- Commissioning
- Operation
- Diagnosis

Fast and safe commissioning

Guided menus for applications

Reliable operation

- Local operation possible in several languages
- Standardized operation at the device and in the operating tools
- Parameters relating to measured values can be locked/unlocked using the device's write protection switch, using the device software or via remote operation

Efficient diagnostics increase measurement availability

- Remedial measures are integrated in plain text
- Diverse simulation options

Local operation

Functions

Function	External operation (operating keys, optional, not T17 housing)	Internal operation (electronic insert)	Onsite display (optional)
Position adjustment (zero point correction)	✔	✔	✔
Setting lower-range value and upper-range value - reference pressure present at the device	✔ (HART only)	✔ (HART only)	✔
Device reset	✔	✔	✔
Locking and unlocking parameters relevant to the measured value	—	✔	✔
Value acceptance indicated by green LED	✔	✔	✔
Switching damping on and off	✔ (only if display is connected)	✔ (HART and PA only)	✔
Configuring the bus address of the device (PA)	—	✔	✔
Switching simulation mode on and off (FOUNDATION Fieldbus)	—	✔	✔

Operating the device using onsite display (optional)

A 4-line liquid crystal display (LCD) is used for display and operation. The onsite display shows measured values, dialog text as well as fault and notice messages in plain text, thereby supporting the user in every stage of operation.

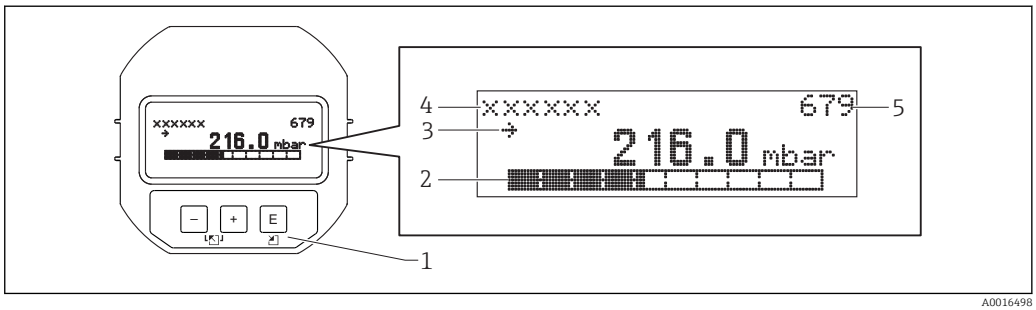
The display can be removed for easy operation.

The device display can be turned in 90° steps.

Depending on the installation position of the device, this makes it easy to operate the device and read the measured value.

Functions:
- 8-digit measured value display including sign and decimal point and bar graph for
  - 4 to 20 mA HART (bar graph from 4 to 20 mA)
  - 1-5V DC (bar graph from 1 to 5 volt)
  - PROFIBUS PA (bar graph as graphic display of standardized value of AI block)
  - FOUNDATION Fieldbus (bar graph as graphic display of transducer output).
-
- Simple and complete menu guidance due to breakdown of parameters into several levels and groups
- Menu guidance in up to 8 languages
- Each parameter is given a 3-digit ID number for easy navigation.
- Option for configuring the display according to individual requirements and preferences, such as language, alternating display, display of other measured values such as sensor temperature, contrast setting.
- Comprehensive diagnostic functions (fault and warning message, peak-hold indicators, etc.).
- Rapid and safe commissioning with the Quick Setup menus

Overview

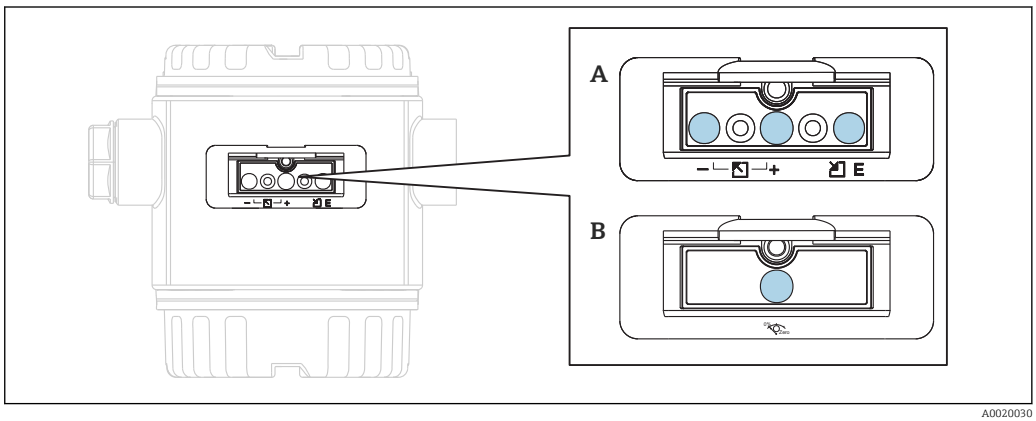


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1 Operating keys
2 Bargraph
3 Symbol
4 Header
5 Parameter ID number

Operating keys on the exterior of the device

With the aluminum housing (T14), the operating keys are located either outside on the housing, under the protection cap or inside on the electronic insert. With the stainless steel housing (T17), the operating keys are always located inside the housing on the electronic insert.



A0020030

A 1-5V DC and 4 to 20 mA HART
B PROFIBUS PA and FOUNDATION Fieldbus

The operating keys located externally on the device work on the Hall sensor principle. As a result, no additional openings are required in the device. This guarantees:

- Complete protection against environmental influences such as moisture and contamination.
- Simple operation without any tools.
- No wear.

Ordering information:

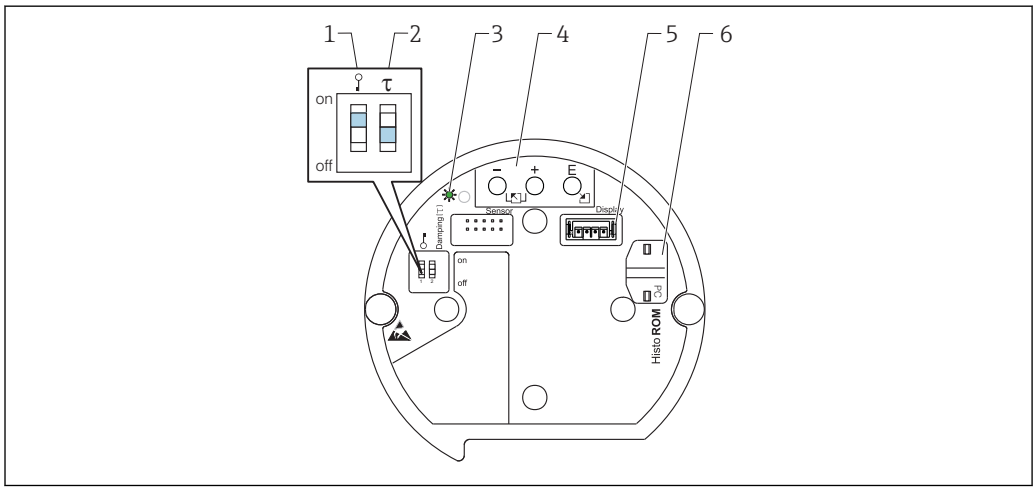
Product Configurator, order code for "Output, operation"

Operating keys and elements located internally on the electronic insert

Ordering information:

Product Configurator, order code for "Output, operation"

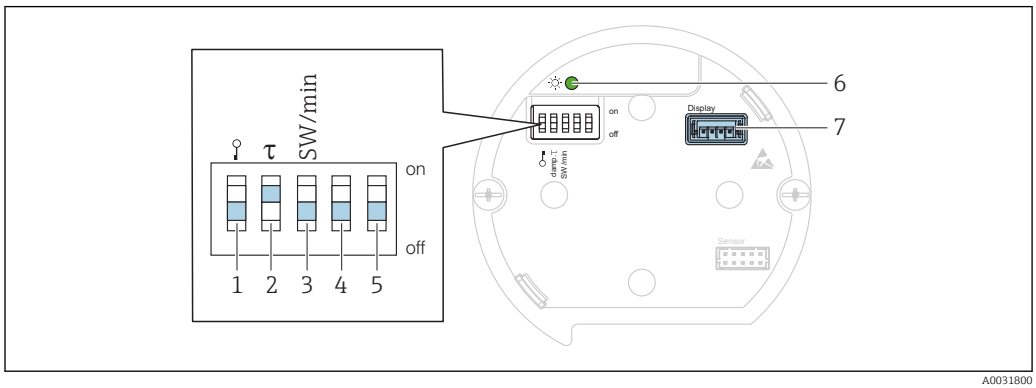
HART



A0020031

1 DIP switch for locking/unlocking parameters relevant to the measured value
2 DIP switch for switching damping on/off
3 Green LED to indicate value being accepted
4 Operating keys
5 Slot for optional display
6 Slot for optional HistoROM®/M-DAT

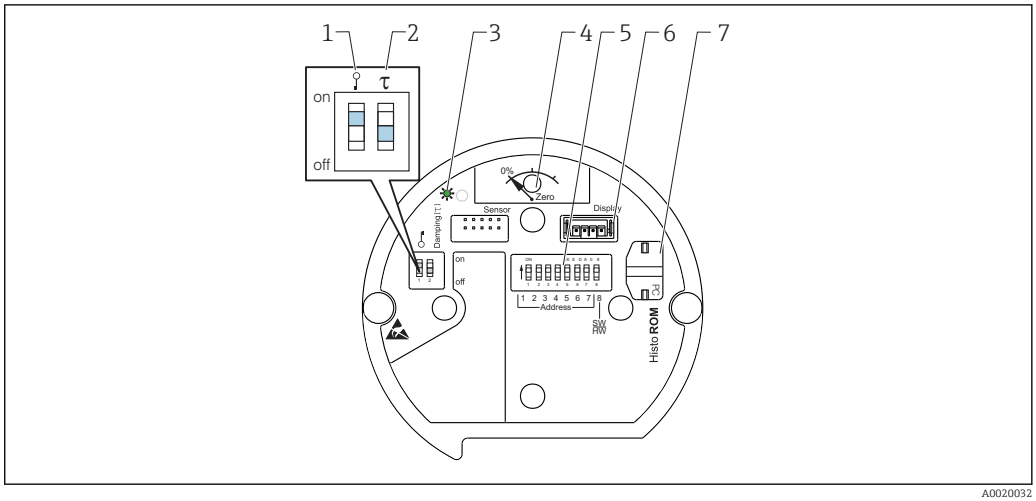
1-5V DC



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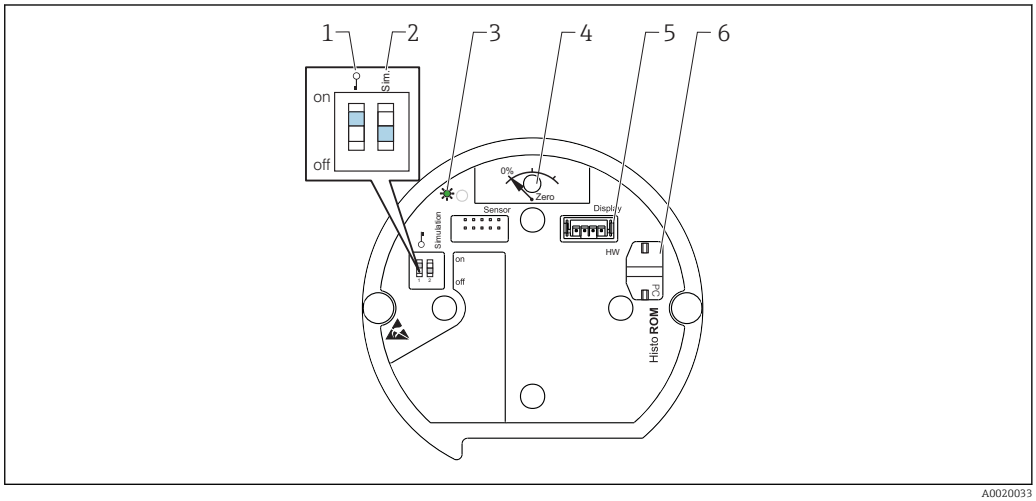
1 DIP switch for locking/unlocking parameters relevant to the measured value
2 DIP switch for switching damping on/off
3 DIP switch for alarm voltage/alarm current SW / alarm min (0.9 V/~3.6 mA)
4...5 Not assigned
6 Green LED to indicate value being accepted
7 Slot for display

PROFIBUS PA



1 *DIP switch for locking/unlocking parameters relevant to the measured value*
2 *DIP switch for switching damping on/off*
3 *Green LED to indicate value being accepted*
4 *Key for position adjustment and device reset*
5 *DIP switch for bus address*
6 *Slot for optional display*
7 *Slot for optional HistoROM®/M-DAT*

FOUNDATION Fieldbus



1 *DIP switch for locking/unlocking parameters relevant to the measured value*
2 *DIP switch for simulation mode on/off*
3 *Green LED to indicate value being accepted*
4 *Key for position adjustment and device reset*
5 *Slot for optional display*
6 *Slot for optional HistoROM®/M-DAT*

Remote operation

All software parameters are accessible depending on the position of the write protection switch on the device.

Hardware and software for remote operation [1]	HART	PROFIBUS PA	FOUNDATION Fieldbus
FieldCare	✔	✔	✔
FieldXpert SFX100	✔	–	✔

Hardware and software for remote operation [1]	HART	PROFIBUS PA	FOUNDATION Fieldbus
NI-FBUS Configurator	–	–	✔
HistoROM®/M-DAT	✔	✔	✔

1) Not for 1-5V DC

FieldCare

FieldCare is an Endress+Hauser asset management tool based on FDT technology. With FieldCare, you can configure all Endress+Hauser devices as well as devices from other manufacturers that support the FDT standard.

FieldCare supports the following functions:
- Configuration of transmitters in offline and online mode
- Device data upload/download (not for 1-5V DC)
- HistoROM®/M-DAT analysis
- Documentation of the measuring point

Connection options:
- HART via Commubox FXA195 and the USB interface of a computer
- PROFIBUS PA via segment coupler and PROFIBUS interface card
- Service interface with Commubox FXA291 and ToF adapter FXA291 (USB).

For further information please contact your local Endress+Hauser Sales Center.

Field Xpert SFX100

Field Xpert is an industrial PDA with integrated 3.5" touchscreen from Endress+Hauser based on Windows Mobile. It offers wireless communication via the optional VIATOR Bluetooth modem from Endress+Hauser. Field Xpert also works as a stand-alone device for asset management applications. For details, refer to BA00060S/04/EN.

Commubox FXA195

For intrinsically safe HART communication with FieldCare via the USB interface. For details refer to TI00404F/00/EN.

Commubox FXA291

The Commubox FXA291 connects Endress+Hauser field devices with a CDI interface (=Endress +Hauser Common Data Interface) to the USB interface of a personal computer or a notebook. For details refer to TI00405C/07/EN.

For the following Endress+Hauser devices you need the "ToF adapter FXA291" as an additional accessory:
- Cerabar S PMC71, PMP7x
- Deltabar S PMD7x, FMD7x
- Deltapilot S FMB70

ToF adapter FXA291

The ToF adapter FXA291 connects the Commubox FXA291 with devices of the ToF platform, pressure equipment and Gammapilot via the USB interface of a personal computer or a notebook. For details refer to KA00271F.

Profiboard

For connecting a PC to PROFIBUS.

Proficard

For connecting a laptop to PROFIBUS.

FF configuration program

FF configuration program, such as NI-FBUS Configurator, to
- connect devices with "FOUNDATION Fieldbus signal" into an FF network
- set FF-specific parameters

Remote operation via the NI-FBUS Configurator:

The NI-FBUS Configurator is an easy-to-use graphical environment for creating linkages, field-based control loops and schedules based on the FOUNDATION Fieldbus concept.

You can use the NI-FBUS Configurator to configure a fieldbus network as follows:
- Set block and device tags
- Set device addresses
- Create and edit function block control strategies (function block applications)
- Configure vendor-defined function and transducer blocks
- Create and edit schedules
- Read and write to function block control strategies (function block applications)
- Invoke Device Description (DD) methods
- Display DD menus
- Download a configuration
- Verify a configuration and compare it to a saved configuration
- Monitor a downloaded configuration
- Replace a virtual device by a real device
- Save and print a configuration

HistoROM®/M-DAT (optional)

The HistoROM®/M-DAT is a memory module that can be attached to any electronic insert (not for 1-5V DC). HistoROM®/M-DAT can be retrofitted at any stage (order number: 52027785).

Your benefits
- Quick and safe commissioning of the same measuring points by copying the configuration data of one transmitter to another transmitter
- Reliable process monitoring thanks to cyclical recording of pressure and sensor temperature measured values
- Simple diagnosis by recording diverse events such as alarms, configuration changes, counters for measuring range undershoot and overshoot for pressure and temperature as well as user limit overshoot and undershoot for pressure and temperature etc.
- Analysis and graphic evaluation of the events and process parameters via software (contained in scope of supply).

A CD with an Endress+Hauser operating program is also included in the scope of delivery. You can copy data from one transmitter to another transmitter when operating a FOUNDATION Fieldbus device via an FF configuration program. You need the Endress+Hauser FieldCare operating program, the Commubox FXA291 service interface and the ToF adapter FXA291 to be able to access the data and events saved in the HistoROM®/M-DAT.

Ordering information:

Product Configurator, order code for "Additional options:", version "N" or

Product Configurator, order code for "Application package:", option "EN" or

as a separate accessory (part no.: 52027785).

For further information please contact your local Endress+Hauser Sales Center.

System integration

The device can be given a tag name (max. 8 alphanumeric characters).

Description	Option [1]
Measuring point (TAG), see additional spec.	Z1
Bus address, see additional spec.	Z2

1) Product Configurator, order code for "Identification"

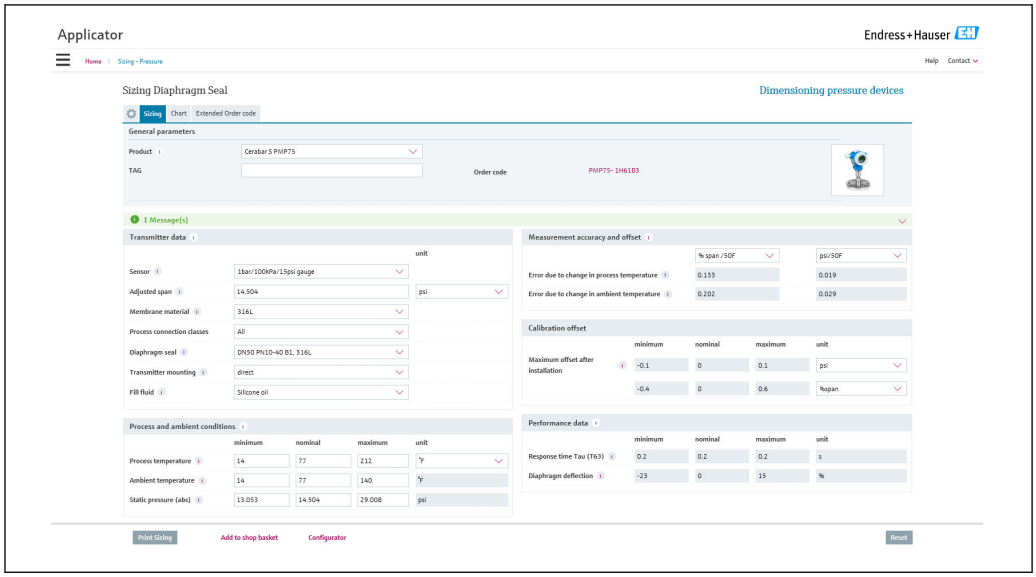
Planning instructions, diaphragm seal systems

NOTICE

Incorrect sizing/ordering of diaphragm seal systems

The performance and the permitted range of application of a diaphragm seal system depend on the process isolating diaphragm used, the filling oil, the coupling, the unit design and on the process and ambient conditions present in the individual application.

- ▶ To help you select the right diaphragm seal systems for your particular applications, Endress +Hauser provides its customers with the "Applicator Sizing Diaphragm Seal" selection tool, which is available free of charge at "www.endress.com/applicator" or as a download.



A0034616

For more detailed information or the layout of the optimum diaphragm seal solution for your application, please contact your local Endress+Hauser Sales Center.

Applications

Diaphragm seal systems should be used if the process and the device should be separated. Diaphragm seal systems offer clear advantages in the following instances:

- In the case of extreme process temperatures
- For aggressive media
- In the case of process media that crystallize
- In the case of corrosive or highly various process media or process media with solids content
- In the case of heterogeneous and fibrous process media
- If extreme measuring point cleaning is necessary, or for very humid mounting locations
- If the measuring point is exposed to severe vibrations
- For mounting locations that are difficult to access

Design and operation mode

Diaphragm seals are separating equipment between the measuring system and the process.

A diaphragm seal system consists of:
- A diaphragm seal
- A capillary tube or temperature isolator if necessary
- Fill fluid
- A pressure transmitter

The process pressure acts via the process isolating diaphragm of a diaphragm seal on the liquid-filled system, which transfers the process pressure onto the sensor of the pressure transmitter.

Endress+Hauser delivers all diaphragm seal systems as welded versions. The system is hermetically sealed, which ensures the highest reliability.

The diaphragm seal determines the application range of the system by:
- The diameter of the process isolating diaphragm
- The stiffness and material of the process isolating diaphragm
- The design (oil volume)

Diameter of the process isolating diaphragm

The greater the diameter of the process isolating diaphragm (less stiff), the smaller the temperature effect on the measurement result.

Stiffness of the process isolating diaphragm

The stiffness depends on the diameter of the process isolating diaphragm, the material, any existing coating and the thickness and shape of the process isolating diaphragm. The thickness of the process isolating diaphragm and the shape are determined by the design. The stiffness of a process isolating diaphragm of a diaphragm seal influences the temperature operating range and the measuring error caused by temperature effects.

The Endress+Hauser TempC membrane: Highest accuracy and process safety when measuring pressure and differential pressure using diaphragm seals

To measure even more precisely in such applications and to increase process safety, Endress+Hauser has developed the TempC membrane based on a completely revolutionary technology. This membrane guarantees the highest level of accuracy and process safety in diaphragm seal applications.
- The very low temperature effect minimizes the influence of fluctuations of both process and ambient temperatures, thus guaranteeing accurate and stable measurements. Measurement inaccuracies caused by temperature are reduced to a minimum.
- The TempC membrane can be used at temperatures between −70 °C (−94 °F) and +400 °C (+752 °F). This guarantees maximum process safety even for very long sterilization and cleaning cycles (SIP/CIP) in tanks and pipes at high temperatures.
- Thanks to the TempC membrane, smaller dimension process connections are possible. With a smaller process connection, the new membrane measures at least as accurately as a conventional membrane with a larger diameter.
- Due to the geometry of the membrane, an overshoot occurs initially immediately following a temperature shock. This results in a transient response, the duration and deviation of which are significantly less compared to traditional membrane types. In the case of batch processes, these shorter recovery times mean a far higher level of availability of the production facilities. For TempC membranes, the effect of the overshoot on the output signal can be reduced by adjusting the damping.

Ordering information:

See the Product Configurator for the individual process connection and the choice of process isolating diaphragm.

Selection in the Applicator:

Under "Transmitter data" in the "Membrane material" field.

Capillary

As standard, capillaries with an internal diameter of 1 mm (0.04 in) are used.

The capillary tube influences the thermal change, the ambient temperature operating range and the response time of a diaphragm seal system as a result of its length and internal diameter.

Filling oil

When selecting the filling oil, the media and ambient temperature as well as the operating pressure are of crucial importance. Observe the temperatures and pressures during commissioning and cleaning. A further selection criterion is the compatibility of the filling oil with the requirements of the process media. For this reason, only filling oils that are harmless to health may be used in the food industry, such as vegetable oil or silicone oil (see also the following section on "diaphragm seal filling oils").

The filling oil used influences the thermal change, the temperature operating range of a diaphragm seal system and the response time. A temperature change results in a volume change of the filling oil. The volume change is dependent on the expansion coefficient and on the volume of the filling oil at calibration temperature (constant in range: +21 to +33 °C (+70 to +91 °F)). The application range can be extended by a filling oil with a lower expansion coefficient and a shorter capillary.

For example, the filling oil expands in the event of a temperature increase. The additional volume presses against the process isolating diaphragm of a diaphragm seal. The stiffer a process isolating diaphragm is, the greater its return force, which counteracts a volume change and acts on the measuring cell together with the operating pressure, thus shifting the zero point.

Pressure transmitter

The pressure transmitter influences the temperature operating range, the TK zero point and the response time as a result of its volume change. The volume change is the volume that has to be shifted to pass through the complete measuring range.

Pressure transmitters from Endress+Hauser are optimized with regard to minimum volume change.

Diaphragm seal filling oils

Filling oil	Permissible temperature range [1] at 0.05 bar (0.725 psi) ≤ p_{abs} ≤ 1 bar (14.5 psi)	Permitted temperature range [1] at p_{abs} ≥1 bar (14.5 psi)	Option [2]
Silicone oil	−40 to +180 °C (−40 to +356 °F)	−40 to +250 °C (−40 to +482 °F)	A, H, 1 or 2
High-temperature oil	−10 to +200 °C (+14 to +392 °F)	−10 to +400 °C (+14 to +752 °F) [3) 4) 5)]	G, 3 or 4
Inert oil	−40 to +80 °C (−40 to +176 °F)	−40 to +175 °C (−40 to +347 °F)	F or N
Vegetable oil	−10 to +120 °C (+14 to +248 °F)	−10 to +200 °C (+14 to +392 °F)	D, 5 or 6
Low-temperature oil	−70 to +80 °C (−94 to +176 °F)	−70 to +180 °C (−94 to +356 °F)	7 or 8

1) Observe temperature limits of the device and of the system
2) Product Configurator, “Fill fluid” ordering feature
3) 325 °C (617 °F) at ≥1 bar (14.5 psi)absolute pressure.
4) 350 °C (662 °F) at ≥1 bar (14.5 psi) absolute pressure (max. 200 hours).
5) 400 °C (752 °F) at ≥1 bar (14.5 psi) absolute pressure (max. 10 hours).

Additional data:

Filling oil	Density [g/cm3] / [SGU]	Viscosity [mm²/s] / [cSt] at 25 °C (77 °F)	Expansion coefficient [1] [1/K]	Notes [2]	Option [3]
Silicone oil	0.96	100	0.00096	suitable for foods FDA 21 CFR 175.105	A, H, 1 or 2
High-temperature oil	1.00	150	0.00096	High temperatures	G, 3 or 4
Inert oil	1.87	27	0.000876	For ultrapure gas and oxygen applications	F or N
Vegetable oil	0.94	9.5	0.00101	suitable for foods FDA 21 CFR 172.856	D, 5 or 6
Low-temperature oil	0.92	4.4	0.00108	Low temperatures	7 or 8

1) The thermal change in the diaphragm seal and other important technical features can be found in the "Applicator Sizing Diaphragm Seal" selection tool.
2) Only select FDA-approved filling oils for diaphragm seal devices with 3-A and EHEDG certification!
3) Product Configurator, “Fill fluid” ordering feature

Information on cleaning

Endress+Hauser provides flushing rings as an accessory to enable cleaning of the process isolating diaphragm without removing the transmitter from the process.

For further information please contact your local Endress+Hauser Sales Center.

We recommend you perform CIP (cleaning in place (hot water)) before SIP (sterilization in place (steam)) for pipe diaphragm seals. A frequent use of sterilization in place (SIP) will increase the stress on the process isolating diaphragm. Under unfavorable circumstances in the long term view we cannot exclude that a frequent temperature change could lead to a material fatigue of the process isolating diaphragm and possibly to a leakage.

Installation instructions

Diaphragm seal systems

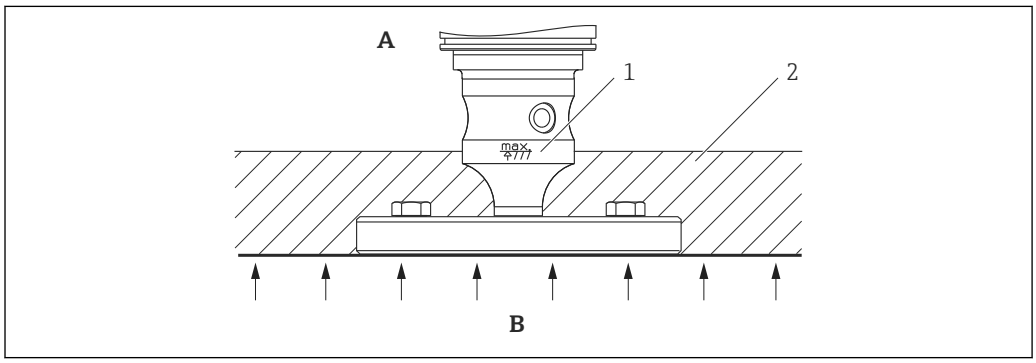
- The diaphragm seal together with the transmitter form a closed, calibrated system, which is filled through ports in the diaphragm seal and in the measuring system of the transmitter. These ports are sealed and must not be opened.
- For devices with a temperature isolator or capillary, a suitable fastening device (mounting bracket) is recommended.
- When mounting, sufficient strain relief must be provided for the capillary line to prevent the capillary from bending (capillary bending radius ≥ 100 mm (3.94 in)
- For more detailed installation instructions, Endress+Hauser provides its customers with the free "Applicator Sizing Diaphragm Seal" selection tool, which is available online at "www.endress.com/applicator" or as a download.

Capillary

In order to obtain more precise measurement results and to avoid a defect in the device, mount the capillaries as follows:
- vibration-free (in order to avoid additional pressure fluctuations)
- not in the vicinity of heating or cooling lines
- insulate if the ambient temperature is below or above the reference temperature
- with a bending radius ≥ 100 mm (3.94 in)
- When using diaphragm seal systems with a capillary, sufficient strain relief must be provided to prevent the capillary from bending (capillary bending radius ≥ 100 mm (3.94 in)).
- In the case of devices with diaphragm seals and capillaries, the zero point shift caused by the hydrostatic pressure of the filling liquid column in the capillaries must be taken into account when selecting the measuring cell. If a measuring cell with a small measuring range is selected, a position adjustment can cause range violation.

Heat insulation

The PMP75 must only be insulated up to a certain height. The maximum permitted insulation height is indicated on the devices and applies to an insulation material with a heat conductivity ≤ 0.04 W/(m x K) and to the maximum permitted ambient and process temperature. The data were determined under the most critical application "quiescent air". Maximum permitted insulation height, here indicated on a PMP75 with a flange:

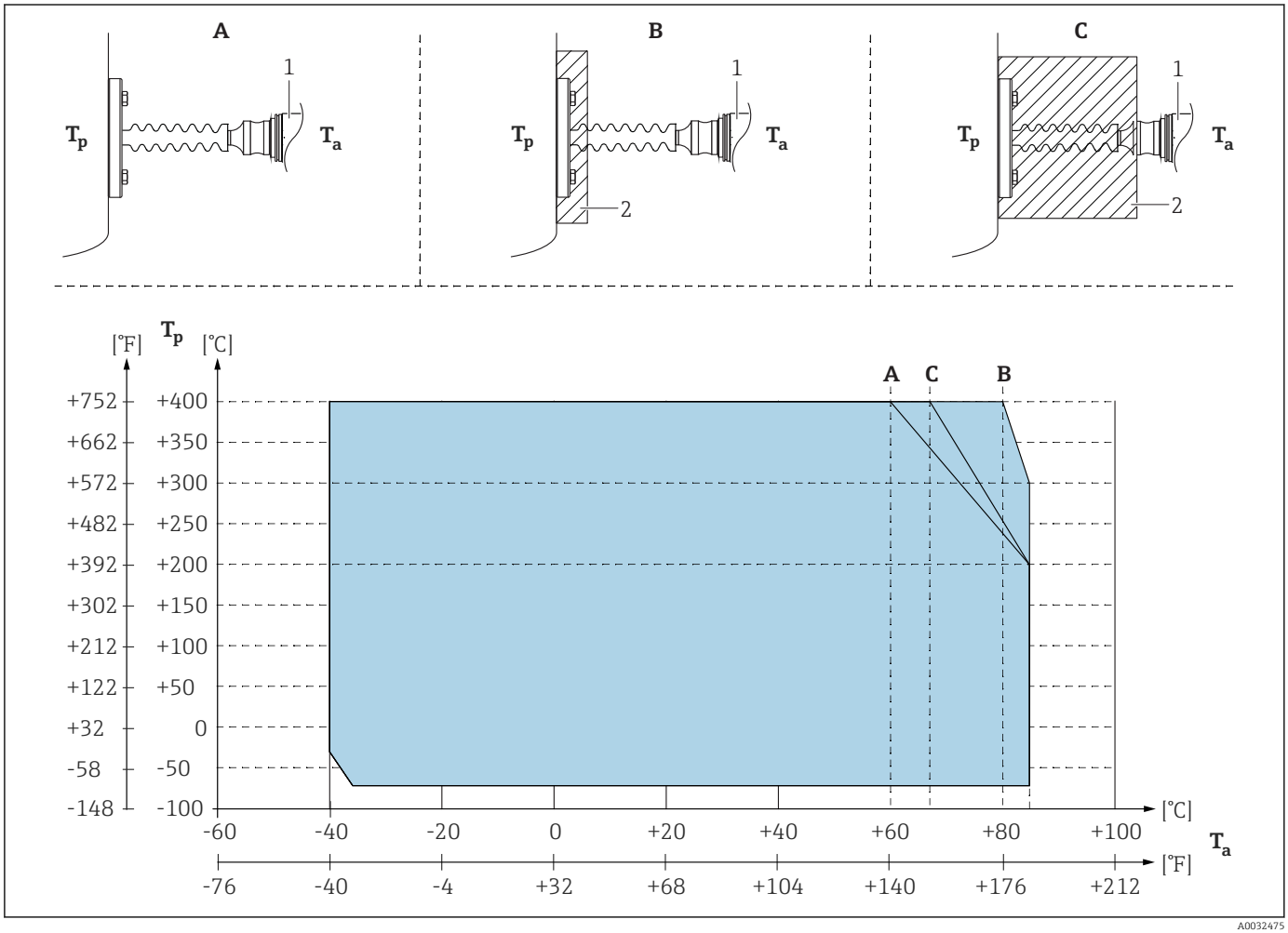


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A Ambient temperature ≤ 80 °C (176 °F)
B Process temperature 400 °C (752 °F), depends on the diaphragm seal filling oil used
1 Maximum insulation height
2 Insulation material

Mounting with temperature isolator

Endress+Hauser recommends the use of temperature isolators in the event of constant extreme fluid temperatures which cause the maximum permitted electronics temperature of +85 °C (+185 °F) to be exceeded. Diaphragm seal systems with temperature isolators can be used at temperatures up to a maximum of +400 °C (+752 °F) depending on the filling oil used → 115, see the "Diaphragm seal filling oils" section. To minimize the influence of rising heat, Endress+Hauser recommends the device be mounted horizontally or with the housing pointing downwards. The additional installation height also brings about a zero point shift of maximum 21 mbar (0.315 psi)due to the hydrostatic column in the temperature isolator. You can correct this zero point shift at the device.



1 Transmitter
2 Insulation material

Position	Insulation	Ambient temperature(T_a) at transmitter	Maximum process temperature (T_p)
A	No insulation	60 °C (140 °F)	400 °C (752 °F) [1]
		85 °C (185 °F)	200 °C (392 °F)
B	30 mm (1.18 in) Insulation	80 °C (176 °F)	400 °C (752 °F) [1]
		85 °C (185 °F)	300 °C (572 °F)
C	Maximum insulation	67 °C (153 °F)	400 °C (752 °F) [1]
		85 °C (185 °F)	200 °C (392 °F)

1) Process temperature: max.400 °C (752 °F), depending on the diaphragm seal filling oil used

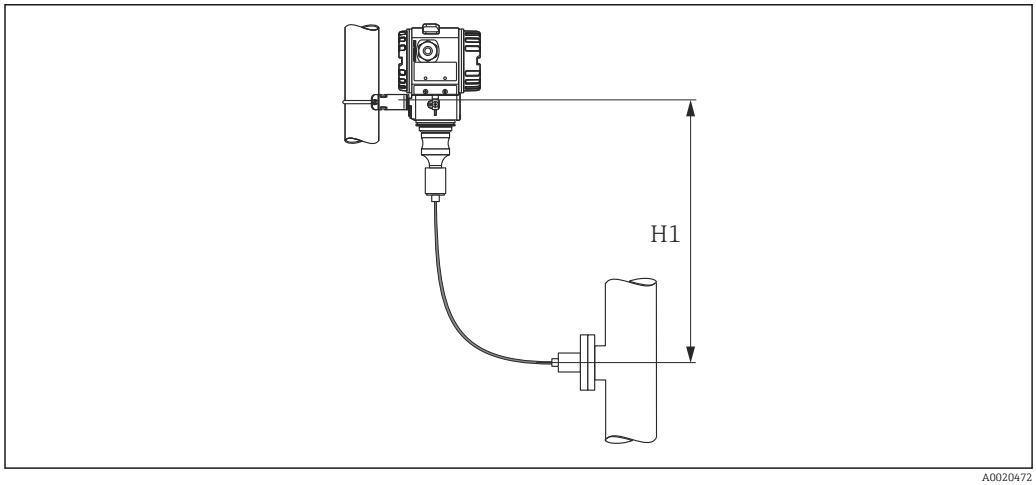
Vacuum applications

Installation instructions

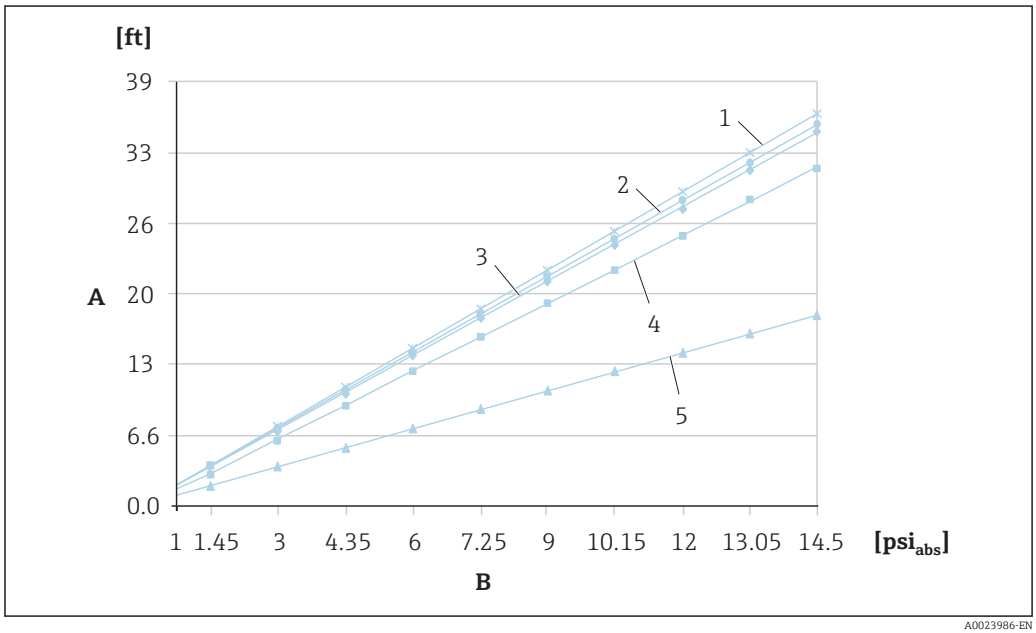
For vacuum applications, pressure transmitters with a ceramic measuring membrane (oil-free) are preferable.

For applications under vacuum, Endress+Hauser recommends mounting the pressure transmitter below the diaphragm seal. This prevents vacuum loading of the diaphragm seal caused by the presence of fill fluid in the capillary.

When the pressure transmitter is mounted above the diaphragm seal, the maximum height difference H1 in accordance with the illustration below must not be exceeded. The following graphic depicts mounting above the lower diaphragm seal:



The maximum height difference depends on the density of the filling oil and the smallest ever pressure that is permitted to occur at the diaphragm seal (empty container), see the following diagram. The following diagram depicts the maximum installation height above the diaphragm seal for vacuum applications.



A Height difference H1
B Pressure at diaphragm seal
1 Low-temperature oil
2 Vegetable oil
3 Silicone oil
4 High-temperature oil
5 Inert oil

Certificates and approvals

CE mark

The device meets the legal requirements of the relevant EC directives. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.

RoHS

The measuring system complies with European Directive 2002/96/EC.

RCM-Tick marking

The supplied product or measuring system meets the ACMA (Australian Communications and Media Authority) requirements for network integrity, interoperability, performance characteristics as well as health and safety regulations. Here, especially the regulatory arrangements for electromagnetic compatibility are met. The products are labelled with the RCM- Tick marking on the name plate.



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Ex approvals

- ATEX
- FM
- CSA
- NEPSI
- IECEx
- TIIS
- Also combinations of different approvals

All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all Ex devices→ 127.

EAC conformity

The measuring system meets the legal requirements of the applicable EAC guidelines. These are listed in the corresponding EAC Declaration of Conformity together with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the EAC mark.

Suitable for hygiene applications

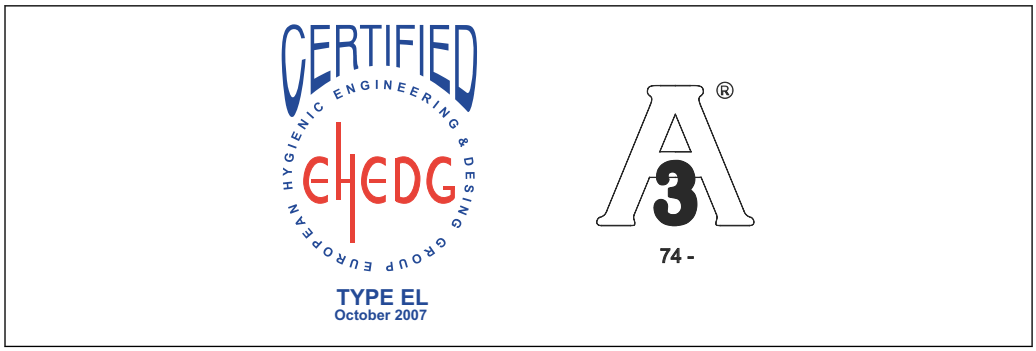
The device is available with hygienic process connections (overview: see order code). The materials of the hygienic process connections in contact with foodstuffs comply with framework Regulation (EC) 1935/2004.

⚠ CAUTION

Contamination in the process!

Risk of contamination if incorrect seals and parts are used!

- ▶ To avoid the risk of contamination, when installing the device comply with the design principles of EHEDG, Guideline 37 "Hygienic Design and Application of Sensors" and Guideline 16 "Hygienic Pipe Couplings".
- ▶ Suitable assemblies and seals must be used to ensure hygienic design in accordance with 3-A SSI and EHEDG specifications.
- ▶ The leak-proof connections can be cleaned with the cleaning methods typical of this industry (CIP and SIP). Attention must be paid to the pressure and temperature specifications of the sensor and process connections for CIP and SIP processes (clean in place/sterilize in place).
- ▶ For diaphragm seal devices with 3-A and EHEDG certificates, only select filling oils with FDA approval!



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The gap-free connections can be cleaned of all residue using the usual cleaning methods within this industry.

Functional safety SIL/ IEC 61508 Declaration of Conformity (optional)

The Cerabar S with 4 to 20 mA output signal has been developed in accordance with the IEC 61508 standard. These devices can be used to monitor the process level and pressure up to SIL 3. For a detailed description of safety functions with the Cerabar S, settings and functional safety data, see the "Functional safety manual - Cerabar S" SD00190P/00.

For devices up to SIL 3 / IEC 61508 Declarations of Conformity see:

Ordering information:

Product Configurator, order code for "Additional options 1" and "Additional options 2", version "E".

Overfill protection

WHG (see document ZE00260P/00/EN)

Ordering information:

Product Configurator, order code for "Approval", option "6".

CRN approval

Some device versions have CRN approval. A CRN-approved process connection with a CSA approval must be ordered for a CRN-approved device. These devices are fitted with a separate nameplate with the registration number CRN 0F10525.5C .

PMP75 devices with a capillary are not CRN-approved.

Ordering information:

Product Configurator, order code for "Process connection; material" and

Product Configurator, order code for "Approval" (only in conjunction with an approved process connection)

Other standards and guidelines

The applicable European guidelines and standards can be found in the relevant EU Declarations of Conformity. The following were also applied:

DIN EN 60770 (IEC 60770):

Transmitters for use in industrial-process control systems. Part 1: Methods for operating performance evaluation

DIN 16086:

Electrical pressure measuring instruments, pressure sensors, pressure transmitters, pressure measuring instruments, concepts, specifications on data sheets

EN 61326-X:

EMC product family standard for electrical equipment for measurement, control and laboratory use.

EN 60529:

Degrees of protection provided by enclosures (IP code)

WELMEC guide 8.8:

General and Administrative Aspects of the Voluntary System of Modular Evaluation of Measuring instruments under the MID.

OIML R117-1 Edition 2007 (E):

Dynamic measuring systems for liquids other than water.

EN 12405-1/A1 Edition 2006:

Gas meters – Conversion devices – Part 1: Volume conversion

Pressure Equipment Directive 2014/68/EU (PED)

Pressure equipment with allowable pressure ≤ 200 bar (2 900 psi)

Pressure equipment (having a maximum allowable pressure PS ≤ 200 bar (2 900 psi)) can be classified as pressurized equipment in accordance with Pressure Equipment Directive 2014/68/EU. If the maximum allowable pressure is ≤ 200 bar (2 900 psi) and the pressurized volume of the pressure equipment is ≤ 0.1 l, the pressure equipment is subject to the Pressure Equipment Directive (cf. Pressure Equipment Directive 2014/68/EU, Article 4, point 3). The Pressure Equipment Directive only requires that the pressure equipment shall be designed and manufactured in accordance with the "sound engineering practice of a Member State".

Reasons:

- Pressure Equipment Directive (PED) 2014/68/EU Article 4, point 3
- Pressure equipment directive 2014/68/EU, Commission's Working Group "Pressure", Guideline A-05 + A-06

Note:

A partial examination shall be performed for pressure instruments that are part of safety equipment for the protection of a pipe or vessel from exceeding allowable limits (equipment with safety function in accordance with Pressure Equipment Directive 2014/68/EU, Article 2, point 4).

Pressure equipment with allowable pressure > 200 bar (2 900 psi)

Pressure equipment designated for application in every process fluid having a pressurized volume of <0.1 l and a max. allowable pressure PS > 200 bar (2 900 psi) shall satisfy the essential safety requirements set out in Annex I of the Pressure Equipment Directive 2014/68/EU. According to Article 13 pressure equipment shall be classified by category in accordance with Annex II. The conformity assessment of the pressure equipment shall be determined by the category I under consideration of the above-mentioned low pressurized volume. These devices shall be provided with CE marking.

Reasons:

- Pressure Equipment Directive 2014/68/EU, Article 13, Annex II
- Pressure equipment directive 2014/68/EU, Commission's Working Group "Pressure", Guideline A-05

Note:

A partial examination shall be performed for pressure instruments that are part of safety equipment for the protection of a pipe or vessel from exceeding allowable limits (equipment with safety function in accordance with Pressure Equipment Directive 2014/68/EU, Article 2, point 4).

The following also applies:

- PMP71 with threaded connection and internal process isolating diaphragm PN > 200 as well as oval flange adapter PN > 200:
  Suitable for stable gases in group 1, category I, module A
- PMP75 with pipe diaphragm seal ≥ 1.5"/PN40:
  Suitable for stable gases in group 1, category II, module A2
- PMP75 with barriers PN > 200 ≥ 1.5"/PN40:
  Suitable for stable gases in group 1, category I, module A
- PMP75 with threaded connection PN > 200:
  Suitable for stable gases in group 1, category I, module A

Manufacturer declarations

Depending on the desired configuration, the following documents can be ordered additionally with the device:
- FDA conformity
- TSE-free: materials free from animal origin
- Regulation (EC) No. 2023/2006 (GMP)
- Regulation (EC) No. 1935/2004 on materials and articles intended to come into contact with food

Downloading the Declaration of Conformity

http://www.endress.com/en/download



1. Select "Approvals & Certificates"
2. Select "Manufact. Declaration"
3. Enter the required product code
4. Click "Search"

The available downloads are displayed.

Marine approval

- GL (German Lloyd)
- ABS

Ordering information:

Product Configurator, order code for "Additional options 1" or "Additional options 2", version "S".

Drinking water approval

PMC71/PMP71: NSF 61 approval

PMC71/PMP71: UBA/W270 approval (ordering information as for NSF approval: Product Configurator, order code for "Additional options 1" or "Additional options 2" option "F".)

Ordering information:

Product Configurator, order code for "Additional options 1" or Additional options 2", version "F".

Approvals for custody transfer

All aspects of OIML R117-1 Edition 2007 (E) and EN 12405-1/A1 Edition 2006 are fulfilled.

MID Parts Certificate

TC7975

Classification of process sealing between electrical systems and (flammable or combustible) process fluids in accordance with ANSI/ISA 12.27.01

Endress+Hauser devices are designed in accordance with ANSI/ISA 12.27.01. allowing the user to waive the use and save the cost of installing external secondary process seals in the conduit as required by the process sealing sections of ANSI/NFPA 70 (NEC) and CSA 22.1 (CEC). These instruments comply with the North American installation practice and provide a very safe and cost-

saving installation for pressurized applications with hazardous fluids. Please refer to the following table for the seal class assigned (single seal or dual seal):

Device	Approval	Remark	Single seal MWP	Dual seal MWP
PMC71	CSA C/US IS, XP	except separate housing	-	60 bar (900 psi)
	CSA C/US IS	With separate housing	40 bar (600 psi)	-
PMP71	CSA C/US XP, XP+IS	except separate housing	400 bar (6 000 psi)	-
	CSA C/US IS	except separate housing	>200 to 400 bar (3 000 to 6 000 psi)	≤200 bar (3 000 psi)
	CSA C/US IS	With separate housing	400 bar (6 000 psi)	-
PMP75	XP, XP+IS	except separate housing	400 bar (6 000 psi)	-
	CSA C/US IS	except separate housing	>200 to 400 bar (3 000 to 6 000 psi)	≤200 bar (3 000 psi)
	CSA C/US IS	With separate housing	400 bar (6 000 psi)	-

Further information can be found in the control drawings of the relevant devices.

Inspection certificate

Designation	PMC71	PMP71	PMP75	Option
3.1 Material documentation, wetted metal parts, EN10204-3.1 inspection certificate	✔	✔	✔	B [1) 3)]
Declaration of Conformity NACE MR0175, wetted metal parts	—	✔	✔	C [1) 3)]
EN10204-3.1 material, NACE MR0175, wetted metal parts, inspection certificate	—	✔	✔	D [1) 3)]
Individual test, test report	✔	✔	✔	3 [1)]
Pressure test, internal procedure, test report	✔	✔	✔	4 [1)]
Helium leak test, internal procedure, test report	✔	✔	—	5 [1)]
EN10204-3.1 material wetted parts +Ra, Ra= surface roughness, dimensional check, inspection certificate	✔	—	—	6 [1)]
Delta-Ferrit measurement, internal procedure, wetted metallic parts, inspection certificate	✔	—	—	8 [1)]
3.1 Material documentation, wetted metal parts, EN10204-3.1 inspection certificate	✔	✔	✔	JA [2) 3)]
Declaration of Conformity NACE MR0175, wetted metal parts	✔	✔	✔	JB [2) 3)]
Declaration of Conformity NACE MR0103, wetted metal parts	✔	✔	✔	JE [2) 3)]
Surface finish measurement ISO4287/Ra, wetted metal parts, inspection certificate	✔	—	✔	KB [2)]
Helium leak test, internal procedure, inspection certificate	✔	✔	✔	KD [2)]
Pressure test, internal procedure, inspection certificate	✔	✔	✔	KE [2)]
Delta-Ferrit measurement, internal procedure, wetted metallic parts, inspection certificate	✔	—	✔	KF [2)]
PMI test (XRF), internal procedure, metal parts in contact with the medium	✔	✔	✔	KG [2)]
Welding documentation, wetted/pressurized seams	—	✔	—	KS [2)]

1) Product Configurator, order code for "Additional options 1" and "Additional options 2"
2) Product Configurator, order code for "Test, Certificate"
3) The choice of this feature for coated process isolating diaphragms/process connections refers to the metal base material.

Calibration

Designation	PMC71	PMP71	PMP75	Option [1)]
Sensor range; mbar/bar	✔	✔	✔	1
Sensor range; kPa/MPa	✔	✔	✔	2
Sensor range; mmH2O/mH2O	✔	✔	✔	3
Sensor range; inH2O/ftH2O	✔	✔	✔	4

Designation	PMC71	PMP71	PMP75	Option [1]
Sensor range; psi	✔	✔	✔	6
Factory calibration certificate, 5-point; see additional specification	✔	✔	✔	C
DKD/DAkkS certificate; see additional specification	✔	✔	✔	D
Customized pressure; see additional specification	✔	✔	✔	E
Customized level; see additional specification	✔	✔	✔	F
Customized pressure + 5-point factory calibration certificate; see additional specification	✔	✔	✔	H
Customized level + 5-point factory calibration certificate; see additional specification	✔	✔	✔	I
Platinum; see additional specification	✔	✔	—	K
Platinum + factory calibration certificate 5-point; see additional specification	✔	✔	—	L
Platinum + DKD/DAkkS certificate; see additional specification	✔	✔	—	M

1) Product Configurator, order code for "Calibration; unit"

Service

Designation	Option [1] (not for 1-5V DC)
Cleaned of oil+grease [2]	HA
Cleaned for oxygen service [2]	HB
Cleaned of PWIS (paint-wetting impairment substances) [2]	HC

1) Product Configurator, order code for "Service"
2) Device only, not accessories or enclosed accessories.

Ordering information

Detailed ordering information is available from the following sources:
- In the Product Configurator on the Endress+Hauser website: www.endress.com -> Click "Corporate" -> Select your country -> Click "Products" -> Select the product using the filters and search field -> Open product page -> The "Configure" button to the right of the product image opens the Product Configurator.
- From your Endress+Hauser Sales Center: www.addresses.endress.com

Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly from the Endress+Hauser Online Shop

Scope of delivery

- Measuring device
- Optional accessories
- Brief Operating Instructions
- Certificates of calibration
- Optional certificates

Measuring point (TAG)

Ordering feature	895: Marking
Option	Z1: Tagging (TAG), see additional spec.
Position of the measuring point marking	To be selected in the additional specifications: ▪ Tag plate Stainless Steel ▪ Self-adhesive paper label ▪ Supplied label/plate ▪ RFID TAG ▪ RFID TAG + Tag plate Stainless Steel ▪ RFID TAG + Self-adhesive paper label ▪ RFID TAG + Supplied label/plate
Definition of the measuring point designation	To be defined in the additional specifications: 3 lines containing up to 18 characters each The measuring point designation appears on the selected label and/or the RFID TAG.
Identification on electronic nameplate (ENP)	32 characters

Configuration data sheet

Pressure

The following configuration data sheet must be completed and included with the order if the option "E" or "H" has been selected in the Product Configurator, order code for "Calibration; Unit".

Pressure unit

❑ mbar	❑ mmH_2O [1]	❑ mmHg [2]	❑ Pascal	❑ torr
❑ bar	❑ mH_2O [1]	❑ inHg [2]	❑ hPa	❑ g/cm^2
❑ psi	❑ ftH_2O [1]	❑ gf/cm^2	❑ kPa	❑ kg/cm^2
	❑ inH_2O [1]	❑ kgf/cm^2	❑ MPa	❑ lb/ft^2
				❑ atm

1) The conversion factor for the pressure unit is based on a reference temperature of 4 °C (39.2 °F).
2) The conversion factor of the pressure unit refers to a reference temperature of 0 °C (32 °F).

Calibration range / Output

Lower range value (LRV): _____ [pressure unit]
Upper range value (URV): _____ [pressure unit]

Display

Display of the content of the main line (option depends on sensor and communication variant)

- ❑ Primary value [PV] (default)
- ❑ Primary value [%]
- ❑ Pressure
- ❑ Current [mA] (HART only)
- ❑ Temperature
- ❑ Error number
- ❑ Alternating display

Damping

Damping: _____ sec (Default 2 sec)

Smallest span (factory calibration) → 13

Level

The following configuration data sheet must be completed and included with the order if the option "F" or "T" has been selected in the Product Configurator, order code for "Calibration; Unit".

Pressure unit

- ❑ mbar
- ❑ bar
- ❑ psi
- ❑ mmH_2O [1)]
- ❑ mH_2O [1)]
- ❑ ftH_2O [1)]
- ❑ inH_2O [1)]
- ❑ mmHg [2)]
- ❑ inHg [2)]
- ❑ gf/cm^2
- ❑ kgf/cm^2
- ❑ Pascal
- ❑ hPa
- ❑ kPa
- ❑ MPa
- ❑ torr
- ❑ g/cm^2
- ❑ kg/cm^2
- ❑ lb/ft^2
- ❑ atm

Output unit (scaled unit)

Mass	Lengths	Volume	Volume	Percent
❑ kg	❑ m	❑ l	❑ USgal	❑ %
❑ t	❑ dm	❑ hl	❑ impgal	
❑ lb	❑ cm	❑ m^3	❑ USbblPE TR	
	❑ mm	❑ ft^3		
	❑ ft			
	❑ inch			

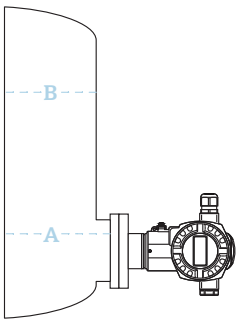
Empty calibration [a]:
Low pressure value (empty) _____ [pressure unit]

Full calibration [b]:
High pressure value (full) _____ [pressure unit]

Empty calibration [a]:
Low measured value (empty) _____ [Scaled unit]

Full calibration [b]:
High level value (full) _____ [Scaled unit]

Example



A0020477

A 0 mbar/0 m
B 300 mbar (4.5 psi) / 3 m (9.8 ft)

1) The conversion factor for the pressure unit is based on a reference temperature of 4 °C (39.2 °F).
2) The conversion factor of the pressure unit refers to a reference temperature of 0 °C (32 °F).

Display

Display of the content of the main line (option depends on sensor and communication variant)

- ❑ Primary value [PV] (default)
- ❑ Primary value [%]
- ❑ Pressure
- ❑ Current [mA] (HART only)
- ❑ Temperature
- ❑ Level before lin.
- ❑ Tank content
- ❑ Error number
- ❑ Alternating display

Damping

Damping: _____ sec (Default 2 sec)

Accessories

HistoROM®/M-DAT	The HistoROM®/M-DAT is a memory module that can be attached to any electronic insert (not for 1-5V DC). Ordering information: Product Configurator, order code for "Additional options 1" or Additional options 2", version "N" or as a separate accessory (part no.: 52027785).
Welding flanges and welding neck	For details, refer to TI00426F/00/EN "Weld-in adapters, process adapters and flanges".
Manifolds	See → 77. For further details, see SD01553P/00/EN "Mechanical accessories for pressure measuring devices".
Additional mechanical accessories	Oval flange adapters, pressure gauge valves, shutoff valves, siphons, condensate pots, cable shortening kits, adapter test, flushing rings, block&bleed valves, protective roofs. For details see SD01553P/00/EN "Mechanical accessories for pressure measuring devices".

Supplementary documentation

Field of Activities

Pressure measurement, powerful instruments for process pressure, differential pressure, level and flow:

FA00004P/00/EN

Technical Information

- Deltabar S: TI00382P/00/EN
- Deltapilot S: TI00416P/00/EN
- EMC test procedures: TI00241F/00/EN
- Weld-in adapters, process adapters and flanges: TI00426F/00/EN

Special Documentation

Mechanical accessories for pressure measuring devices: SD01553P/00/EN

Operating Instructions

4 to 20 mA HART:
- Cerabar S: BA00271P/00/EN
- Description of device functions Cerabar S/Deltabar S/Deltapilot S: BA00274P/00/EN

4 to 20 mA HART with MID parts certificate:
- BA00412P/00/EN
- Description of Device Functions: BA00413P/00/EN

1-5V DC:
Cerabar S PMP71: BA01633P/00/EN

PROFIBUS PA:
- Cerabar S: BA00295P/00/EN
- Description of device functions Cerabar S/Deltabar S/Deltapilot S: BA00296P/00/EN

FOUNDATION Fieldbus:
- Cerabar S: BA00302P/00/EN
- Description of device functions Cerabar S/Deltabar S/Deltapilot S: BA00303P/00/EN

Brief Operating Instructions

- 4 to 20 mA HART, Cerabar S: KA01019P/00/EN
- 1-5V DC, Cerabar S PMP71: KA01258P/00/EN
- PROFIBUS PA, Cerabar S: KA01022P/00/EN
- FOUNDATION Fieldbus, Cerabar S: KA01025P/00/EN

Functional safety manual (SIL)

Cerabar S (4 to 20 mA): SD00190P/00/EN

Overfill protection

WHG: ZE00260P/00/DE

Safety Instructions (XA)

Depending on the approval, the following Safety Instructions (XA) are supplied with the device. They are an integral part of the Operating Instructions.

HART, PROFIBUS PA, FOUNDATION Fieldbus

Directive	Device	Electronics	Documentation	Option [1]
ATEX II 1/2 G Ex ia IIC T6 Ga/Gb	PMC71, PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA00244P	1
ATEX II 1/2 D Ex ta/tb IIIC Da/Db	PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	▪ XA00246P ▪ XA00289P	2
ATEX II 1/2D Ex ia IIIC Da/Db	PMC71	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	▪ XA00247P ▪ XA00290P	2
ATEX II 1/3D Ex ta/tc IIIC Da/Dc	PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	▪ XA00248P ▪ XA00291P	4
ATEX II 2G Ex d IIC T6 Gb	PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA00249P	5
ATEX II 2G Ex d ia IIC T6 Gb	PMC71	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA00250P	5
ATEX II 1/2G Ex ia IIC T6, WHG (German Water Resources Act)	PMC71, PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA00244P	6

Directive	Device	Electronics	Documentation	Option [1]
ATEX II 3 G Ex nA II T6	PMC71, PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA00251P	7
ATEX II 1/2G Ex ia IIC T6 Ga/Gb + ATEX II 1/2D Ex ia IIIC Da/Db	PMC71, PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA00253P	3
ATEX II 1G Ex ia IIC Ga + II 1D Ex ia IIIC Da	PMC71, PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA00276P	8
ATEX II 1/2G Ex ia IIC T6 + II 2G Ex d IIC T6	PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA00252P	B
ATEX II Ex ia + FM IS + CSA IS ATEX II 1/2G Ex ia IIC T6 + FM/CSA IS Cl.I,II,III Div.1 Gr.A-G, FM/CSA: Zone 0,1,2	PMC71	▪ 4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus ▪ HART ▪ PROFIBUS PA, FOUNDATION Fieldbus	▪ XA00244P ▪ XA00593P + XA01059P ▪ XA00596P + XA01060P	E
ATEX II Ex ia / Ex d + FM/CSA IS + XP ATEX II 1/2G Ex ia IIC T6+ ATEX II 2G Ex d IIC T6+ FM/CSA IS + XP Cl.I.II Div.1 Gr.A-G/B-G FM: Zone 1.2/CSA: Zone 1,2	PMP71, PMP75	▪ 4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus ▪ HART ▪ PROFIBUS PA, FOUNDATION Fieldbus	▪ XA00252P ▪ XA00592P + XA01197P ▪ XA00590P + XA01198P	F

1) Product Configurator, order code for "Approval"

Directive	Device	Electronics	Documentation	Option [1]
IECEx Ex ia IIC T6 Ga/Gb	PMC71, PMP71, PMP75	4 to 20 mA HART	XB00005P	I
IEC Ex d ia IIC T6 Gb	PMC71	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA00511P	B
IEC Ex d IIC T6 Gb	PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA00510P	M

1) Product Configurator, order code for "Approval"

1-5V DC

Directive	Device	Electronics	Documentation	Option [1]
CSA C/US XP Cl.I Div.1 Gr.B-D, Ex d, Zone 1,2	PMP71	1-5V DC	XA00599P	V

1) Product Configurator, order code for "Approval"

Directive	Device	Electronics	Documentation	Option [1]
NEPSI Ex ia IIC T6	PMC71, PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA00549P	H
NEPSI Ex d IIC T6	PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA00551P	G
NEPSI Ex d ia IIC T6	PMC71	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA00551P	G

1) Product Configurator, order code for "Approval"

Directive	Device	Electronics	Documentation	Option [1]
TIIS Ex d [ia] IIC T6	PMC71	4 to 20 mA HART	TC17436	L
TIIS Ex d [ia] IIC T4	PMC71	4 to 20 mA HART	TC17398, TC17399	M
TIIS Ex d IIC T6	PMP71 (700 bar version)	4 to 20 mA HART	TC17445	L
TIIS Ex d IIC T6	PMP71, PMP75	4 to 20 mA HART	TC17446	L

1) Product Configurator, order code for "Approval"

Directive	Device	Electronics	Documentation	Option [1]
INMETRO Ex ia IIC T6 Ga/Gb	PMC71, PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA01315P	J
INMETRO Ex d IIC T6 Gb	PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA01279P	O
INMETRO Ex ta IIIC Da/Db	PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA01313P	Z
INMETRO Ex d ia IIC T6 Gb	PMC71	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA01280P	P
INMETRO Ex ia IIIC Da/Db	PMC71	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA01314P	Z

1) Product Configurator, order code for "Approval"

Installation/Control Drawings

Directive	Device	Electronics	Documentation	Option [1]
FM IS Class I, II, III, Division 1, Groups A – G; NI, Class I Division 2, Groups A – D; AEx ia	PMC71, PMP71, PMP75	▪ 4 to 20 mA HART ▪ PROFIBUS PA, FOUNDATION Fieldbus	▪ XA01059P ▪ XA01060P	S
CSA IS Class I, II, III, Division 1, Groups A – G; Class I Division 2, Groups A – G	PMC71, PMP71, PMP75	▪ 4 to 20 mA HART ▪ PROFIBUS PA, FOUNDATION Fieldbus	▪ XA00593P ▪ XA00596P	U
FM IS + XP Class I, Division 1, Groups A – D	PMP71, PMP75	▪ 4 to 20 mA HART ▪ PROFIBUS PA, FOUNDATION Fieldbus	▪ XA01197P ▪ XA01198P	C
CSA IS + XP Class I Division 1, Groups A – D	PMP71, PMP75	▪ 4 to 20 mA HART ▪ PROFIBUS PA, FOUNDATION Fieldbus	▪ XA00592P ▪ XA00590P	D
FM/CSA IS + XP Class I Division 1, Groups A – D	PMP71, PMP75	▪ 4 to 20 mA HART ▪ PROFIBUS PA, FOUNDATION Fieldbus	▪ XA00592P + XA01197P ▪ XA01198P + XA00590P	E
FM NI Cl.I Div.2 Groups A - D, Zone 2	PMC71, PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA01063P	R
FM XP Cl.I Div.1 Groups A - D, AEx d, Zone 1,2	PMC71, PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	XA01070P	T
FM DIP Cl.II,III Div.1 Gr.E-G, Zone 21,22	PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	FM3017778	Q
CSA C/US XP Cl.I Div.1 Gr.B-D, Ex d, Zone 1,2	PMC71, PMP71, PMP75	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	ZD00230P + XA00599P	V
CSA C/US General Purpose	PMD75, FMD77, FMD78	4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	-	X

1) Product Configurator, order code for "Approval"



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Endress+Hauser

People for Process Automation

Dissolved Oxygen: Hach LDO sc Probe, Model 2

Applications
- Wastewater
- Industrial Water
- Drinking Water

16-AE-405-1
16-AE-405-2
16-AE-405-3

16-AE-403-1
16-AE-403-2
16-AE-403-3



Service Protected

Claros Enabled

Accurate process monitoring of dissolved oxygen in water for precise aeration control

No Calibration Required

The Hach® LDO sc probe uses luminescent dissolved oxygen technology. Traditional DO probes require DO sensor calibration, which increase maintenance requirements.

No Membranes to Replace

There is virtually no maintenance with Hach's breakthrough luminescent technology. There are no membranes to replace, no electrolyte solution to replenish, and no anode or cathode to clean.

No Missed Cleaning Cycles

The Hach LDO sc probe is equipped with Prognosys, a predictive diagnostic system, that allows you to be proactive in your maintenance by alerting you to upcoming instrument issues. Know with confidence whether changes in your dissolved oxygen level measurements are due to changes in your instrument or your water. To make sure routine cleaning cycles are never missed, the probe offers operators customizable diagnostic alert indicators, ensuring the probe can operate at its maximum performance level.

Customizable service indicators trigger a service message so that a cleaning cycle is never missed.

No Drift

Cutting-edge 3D calibration procedure is conducted prior to shipping, the DO probe will not drift and is more accurate than ever before.

No Complications

Our newest DO probe has a robust design with a smaller footprint allows for easier handling with enhanced durability.

Technical Data*

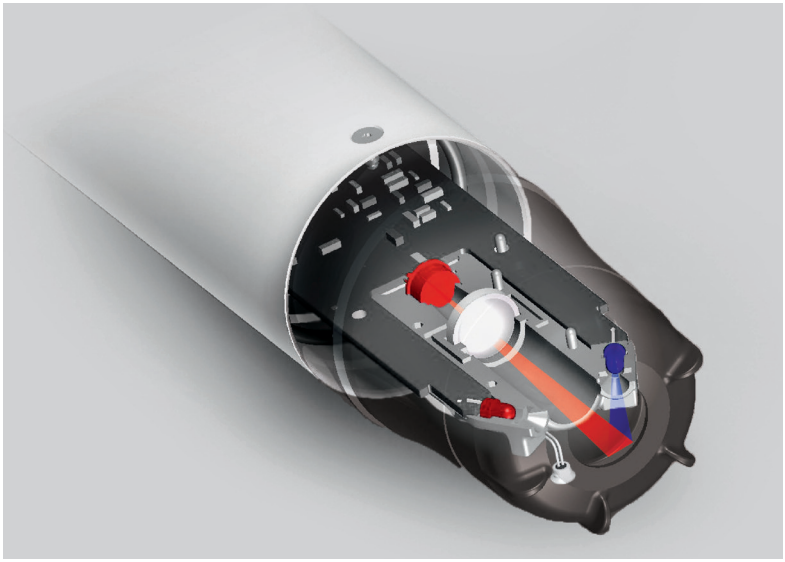
Range	0 - 20.00 ppm 0 - 20.00 mg/L 0 - 200% saturation
Accuracy	± 0.05 ppm below 5 ppm ± 0.1 ppm above 5 ppm
Response Time	T_{90} < 40 s T_{95} < 60 s
Resolution	0.01 ppm (mg/L) 0.1% saturation
Repeatability	± 0.1 ppm (mg/L)

Flow Rate	None required
Sensor Immersion Depth	Pressure Limits at 345 kPa 345 kPa (50 psi), maximum; accuracy may not be maintained at this depth
Transmission Distance	1000 m (3280 ft.) maximum when used with a termination box
Cable Length	10 m (options with 30 m, 60 m, 100 m)
Dimensions (D x L)	48.25 mm x 254 mm (1.9 in x 10 in)
Weight	1 kg (2.2 lbs), probe only

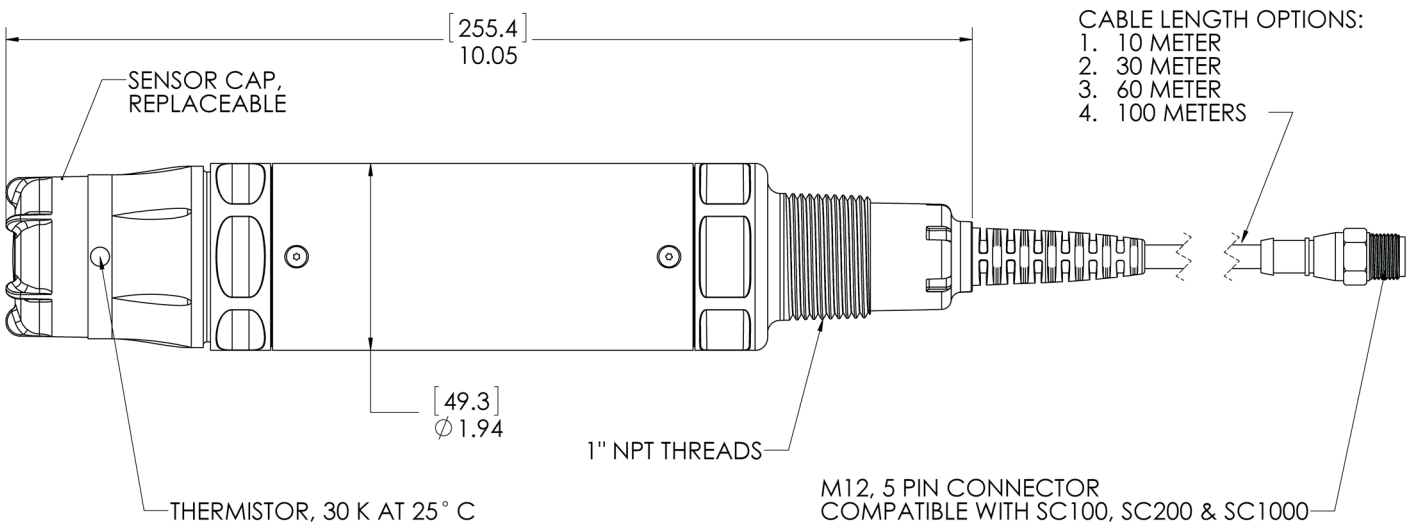
**Subject to change without notice.*

Principle of Operation

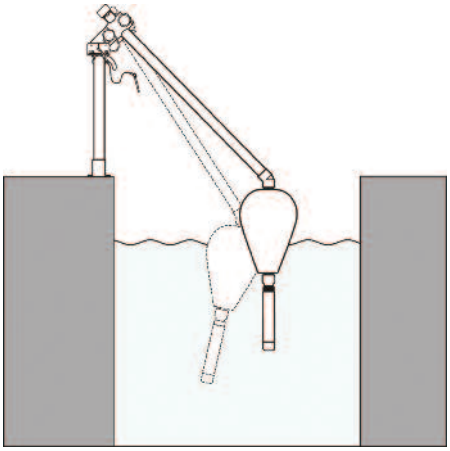
The Hach LDO sc sensor is coated with a luminescent material. Blue light from an LED is transmitted to the sensor surface. The blue light excites the luminescent material. As the material relaxes it emits red light. The time it takes for the red light to be emitted is measured. Between the flashes of blue light, a red LED is flashed on the sensor and used as an internal reference. Increased oxygen in the sample decreases the time it takes for the red light to be emitted. The time measurements correlate to the oxygen concentration.



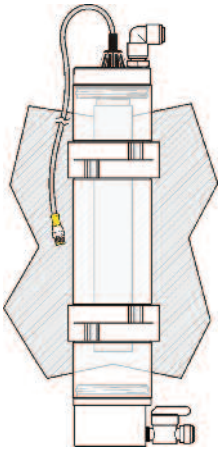
Dimensions



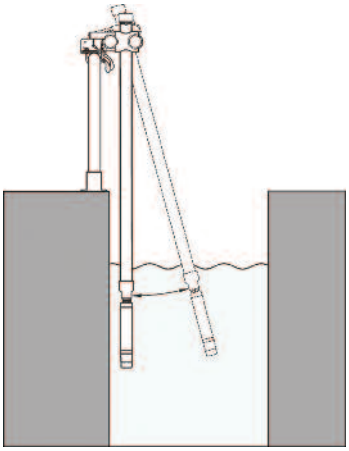
Installation / Mounting



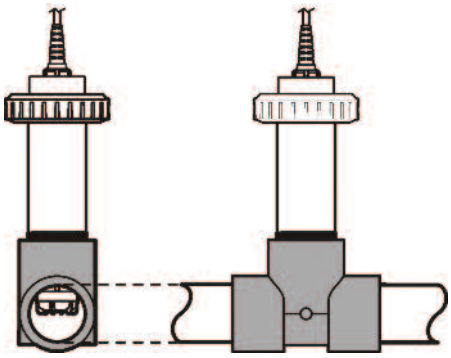
Float Mount Kit



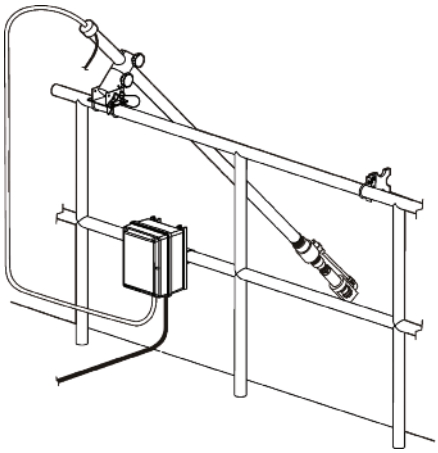
Flow Cell



Pole Mount Kit



Union Mount Kit



Air Blast Cleaning System

Order Information

Sensor

9020000	Hach LDO 2 sc Dissolved Oxygen Probe
9020000-UPGRADE	Hach LDO 2 sc Dissolved Oxygen Probe, with Mounting Conversion Adapter

Please note that a Hach SC controller is required to operate the LDO sc Sensor, controller must be purchased separately.

Accessories

5867000	Digital Termination Box
5796000	Digital Extension Cable, 7.7 m (25 ft.)
5796100	Digital Extension Cable, 15 m (50 ft.)
5796200	Digital Extension Cable, 30 m (100 ft.)
6860000	High Output Air Blast Cleaning System, 115 VAC
6860100	High Output Air Blast Cleaning System, 230 Vac
9253500	Air Blast Hardware Components

Replacements and Parts

9021100	LDO sc Model 2 Sensor Cap Replacement Kit

Mounting Kits

9253000	Pole Mount Kit, PVC
9253100	Ball Float Mount Kit, PVC
9257000	Union Mount Kit, PVC
9253400	Mounting Conversion Adapter, LDO sc Model 1 to LDO sc Model 2
7300800	1" NPT sc Sensors Flow Cell

Controllers

SC4500 Digital Controllers

LXV525.99A11551	SC4500 Controller, Prognosys, 5x mA Output, 2 digital Sensors, without plug
LXV525.99A11541	SC4500 Controller, Prognosys, 5x mA Output, 1 digital Sensor, 1 mA Input, without plug
LXV525.99A11501	SC4500 Controller, Prognosys, 5x mA Output, 1 digital Sensor, 100-240 VAC, without power cord

SC200 Digital Controllers

LXV404.99.00512	SC200 controller, 2 channel, digital & pH/DO
LXV404.99.00522	SC200 controller, 2 channel, digital & Conductivity
LXV404.99.00532	SC200 controller, 2 channel, digital & Flow

SC1000 Digital Controllers

LXV402.99.00002	SC1000 Display Module
LXV400.99.1R572	SC1000 Probe Module, 4 Sensors, 4x 4-20mA Out, 4x 4-20mA In, 4x Relays, 100-240 V AC with Conduits
LXV400.99.1B572	SC1000 Probe Module, 4 Sensors, 4x 4-20mA Out, 4x 4-20mA In, Modbus® RS485, 4x Relays, 100-240 V AC with Conduits
LXV400.99.1F572	SC1000 Probe Module, 4 Sensors, 4x 4-20mA Out, 4x 4-20mA In, Profibus® DP, 4x Relays, 100-240 V AC with Conduits
LXV400.99.1R582	SC1000 Probe Module, 6 Sensors, 4x 4-20mA Out, 4x 4-20mA In, 4x Relays, 100-240 V AC with Conduits

Claros Enabled

This instrument connects to Claros, Hach's innovative Water Intelligence System.
Claros allows you to seamlessly connect and manage instruments, data, and process – anywhere, anytime. The result is greater confidence in your data and improved efficiencies in your operations. To unlock the full potential of Claros, insist on Claros Enabled instruments.

Service Protected

With Hach Service, you have a global partner who understands your needs and cares about delivering timely, high-quality service you can trust. Our Service Team brings unique expertise to help you maximize instrument uptime, ensure data integrity, maintain operational stability, and reduce compliance risk.

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DeZURIK

BULLETIN 80.01-5
JUNE 2020

16-FCV-301-1/2/3/4

DeZURIK P200 SERIES POSITIONERS



Critical Performance

The P200 (pneumatic) and P201-P204 (electro-pneumatic) positioners are designed for critical control applications. Valves with double acting actuators and the P200 series positioners meet the most demanding valve performance specifications.

Span and Zero

Calibration is made very simple with the externally adjustable span and zero. Once the center zero screw is set first, the span screw can be adjusted with very little interaction. These adjustments can be made without removing the positioner's cover if needed.

Split Range Output/Field Reversible

The standard stainless steel cam offers several signal input options; 90 degree full scale, 90 degree split range or 180 degree full scale operation. Other cam options are available for special applications and characterization. Positioner operation can be reversed in the field by flipping the cam and reversing the ports on double-acting actuators, and simply flipping the cam on spring-return actuators. Dual scaling on the positioner cover provides for mechanical pointer adjustment for CW or CCW rotation.

High Performance, Long Life

The unique spool valve design is key to the positioner's accuracy and control. The gold plated stainless spool in combination with the stainless seats provide a smooth, corrosion-resistant operation in a wide range of applications. The unique guiding of the spool throughout its travel, and the special porting provide trouble-free operation in most applications.

Sealed Housing

The P200 series units are sealed and vented through a tapped exhaust port. Vent valves along with positive internal pressure allow for constant liquid drainage. The housing is die cast aluminum and protected with an industrial grade polyester coating. The P200 and P201 are Nema 4X and IP 66 approved.

Approvals

In addition to Nema 4X/IP66, the following approvals can be specified:

Explosion Proof (P202)
- ATEX – EEx d IIB + H2 T4
- FM/CSA – Cl 1 Div 1 & 2 Gps B,C,D T6

Intrinsically Safe (P203)
- ATEX – EEx ia IIC T4/T6
- FM – Cl 1 Div 1 Grp A-D
- CSA – Ex ia, Cl 1 Grp A-D, Cl 1 DIV2 Grp A-D

I/P Conversion

Pneumatic positioners can be easily field converted to electropneumatic with the compact and modular I/P converter module. No special gaskets or unusual parts are needed. Small 20 micron filters act as a secondary filter for the P200 and P204. **It is recommended that a good primary filter be used with these instruments. Air quality specs should meet those published by ISA-S7.3.81**

Accurate, Precise Valve Control

The high flow/high gain spool valve assembly has air delivery of over 28 SCFM. This provides for quick and accurate control on a wide range of applications. Valve position readout is clearly shown with the dual scale, bright pointer indicator. A dome style indicator is optional.

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Positioner Specifications

Order Code	P200 Pneumatic	P201-P204 Electropneumatic
Air Supply (psi)*	25-145 psi	25-145 psi
Linearity	< 0.7% of full scale	< 1.0% of full scale
Hysteresis	< 0.4% of full scale	< 0.6% of full scale
Repeatability	< 0.3% of full scale	< 0.5% of full scale
Air Consumption	0.35 SCFM @ 87 psi	0.38 SCFM @ 87 psi
Air Delivery	28.3 SCFM @ 87 psi	28.3 SCFM @ 87 psi
Input Impedance	–	170 ohms
Temperature Range	-40° to 185°F (-40° to 85°C)	-40° to 185°F (-40° to 85°C)
Weight	3.2 lbs (1.45 kg)	3.8 lbs (1.72 kg)

* Check maximum pressure of actuator; regulator may be required.

Ordering

The P200 series can be used with double acting or spring return, pneumatic actuators. For spring return applications (single acting) one port should be plugged.

Positioners

Positioners	Order Code
P200, 3-15 PSI Pneumatic Positioner NEMA 4X and IP66, Double/Single Acting W/ Arrow Indicator	P200
P201, 4-20 mA Electro-pneumatic Positioner NEMA 4X and IP66, Double/Single Acting W/ Arrow Indicator	P201
P202 Explosion Proof, 4-20 mA Electro-pneumatic Positioner NEMA 4X and IP66, Double/Single Acting W/ Arrow Indicator	P202
P203 Intrinsically Safe, 4-20 mA Electro-pneumatic Positioner NEMA 4X and IP66, Double/Single Acting W/ Arrow Indicator	P203
P204 Fail Freeze, 4-20 mA Electro-pneumatic Positioner NEMA 4X and IP66, Double/Single Acting W/ Arrow Indicator	P204

Three lobe cam is standard:
Linear characterized full span, 0-50% and 50% split range lobes.

Positioner Options

Positioner	Usage	Order Code
Raised (Beacon) Indicator	P200 – P204	B
Gauges	P200 – P204	G
Feedback, 4-20 mA Transmitter	P200, P201, P203, P204	F
Feedback, Mech. Switch (2 SPDT, I5A)	P200, P201, P203, P204	M
Feedback, 4-20 mA Transmitter, Mech. Switch (2 SPDT, I5A)	P200, P201, P203, P204	S

Air Filter Regulators for Positioners

Air filter regulators should be used on the supply line of every positioner.

Filter	Order Code
Air Filter	AFR2

Ordering Example:
PEC,6,F1,CI,NBR,CR*GS-6-PC6,P200-AFR2-G-B

Sales and Service

For information about our worldwide locations, approvals, certifications and local representative:
Web Site: DeZURIK.com **E-Mail:** info@DeZURIK.com

250 Riverside Ave. N. Sartell, Minnesota 56377 • Phone: 320-259-2000 • Fax: 320-259-2227

DeZURIK, Inc. reserves the right to incorporate our latest design and material changes without notice or obligation. Design features, materials of construction and dimensional data, as described in this bulletin, are provided for your information only and should not be relied upon unless confirmed in writing by DeZURIK, Inc. Certified drawings are available upon request.

Printed in the U.S.A.

DeZURIK

BULLETIN
JUNE 2023

15.00-1

TAG: 20-FCV-301-1/2/3/4

DeZURIK VPB V-PORT BALL VALVES



DeZURIK.com

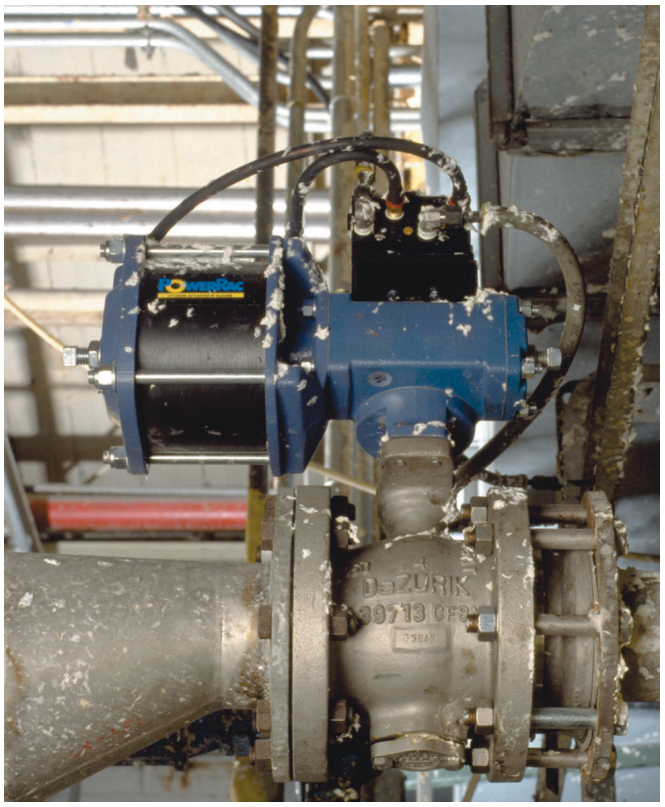
VPB V-Port Ball Valves

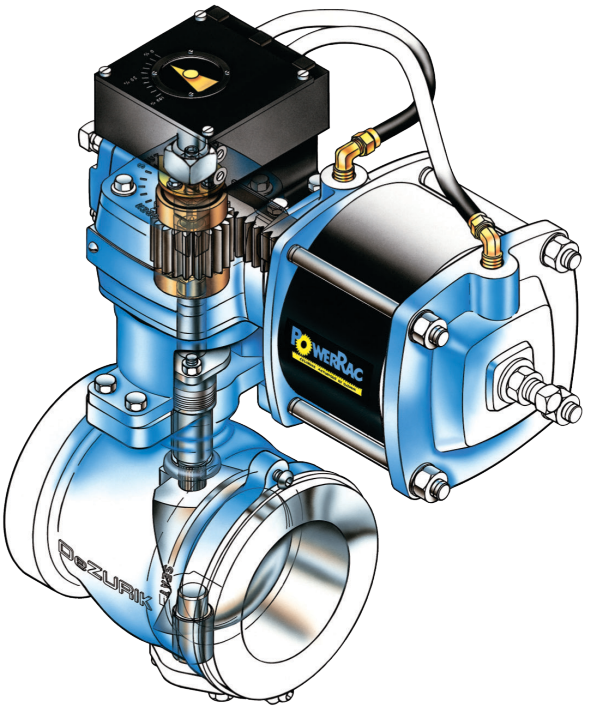
Design and Construction

DeZURIK V-Port Ball Valves deliver superior performance and reliability required to optimize process performance. This versatile valve is designed for control of fibrous suspension applications, in addition to clean, dirty, viscous and corrosive liquids and gases.

The VPB is available in ASME Class 150 in size range 1-20" and is available in ASME Class 300 in size range 1-12". DeZURIK V-Port Ball Valves feature one-piece body construction and are available in flanged or flangeless end connections. They conform to or exceed North American and International Standards for control valves. Superior control performance is designed into the geometry of the ball for critical management of flow. A locked ball-to-shaft connection ensures no lost motion for critical control. Bearings, covers and fasteners are designed for maximum valve reliability.

When operated by a high quality DeZURIK actuator and controlled by one of many high performing positioners, the DeZURIK V-Port Ball control valve can deliver control accuracy exceeding 0.5% as measured by the BenchMark Control Valve Diagnostics™ System. Control accuracy will increase process plant efficiency, improve overall profitability and reduce control valve life-cycle costs.





In the event maintenance is needed, DeZURIK's unique design facilitates fast, easy breakdown and assembly of valve components with no special tools required. The result is reduced maintenance time and the lowest overall cost of ownership.

Drop-in-place, self-aligning and interchangeable seat options offer ease in maintenance. Available seat options include reinforced PTFE, flexible metal, rigid metal and clearance.

Streamlined Flow Passages

DeZURIK V-Port Ball Valves feature a streamlined flow passage, providing maximum efficiency (Cv/Kv per valve size) and minimizing erosion inside the valve body.

Rugged, Easy-to-Maintain Construction

The heavy-duty cast body is a one-piece design for increased installed-pipe integrity and minimal potential leak paths. Stainless steel construction combined with drop-in seats and a splined shaft and ball connection makes the DeZURIK V-Port Ball Valve easy to maintain.

Carbon Steel and High Alloy Valves Available

VPB valve bodies are available in 316 and 317 stainless steel, carbon steel and Hastelloy C.

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Laying Length Flexibility

DeZURIK VPB valves offer the ultimate in face-to-face flexibility. The solid one-piece body is available in either ASME B16.10 or ASME/ISA take-out dimensions. V-Port Ball valves are available in flanged or flangeless construction to meet individual requirements and common piping standards. For added versatility, these valves meet IEC, ISO and EN face-to-face dimensions. In plants that have an installed base of both ASME B16.10 and ASME/ISA control valves, VPB users have been able to minimize storeroom inventory by stocking valve bodies, ASME/ISA retainers and ASME B16.10 retainers. A replacement valve with either face-to-face dimension can be quickly installed. DeZURIK also offers an integrally flanged one-piece ASME B16.10 body. Laying length flexibility is one example of how the VPB can save money.

International Flange Drilling

DIN 10, 16, 25 and 40, and JIS 10, 16 and 20 flange drilling bolt circle options are available in addition to ASME B16.5.





V-Ball Design

Utilizing computer-aided design and extensive flow-loop testing, the v-orifice was designed to provide the high rangeability and precision throttling required on fibrous suspension applications, as well as clean or dirty liquids and gases.

The straight through flow passage provides maximum efficiency and excellent erosion resistance. The ball can be furnished with a range of high-alloy materials, all provided with a heat-treated nickel overlay. This overlay provides a non-porous and lubricious surface, resulting in greater corrosion resistance and less sliding friction. For abrasive and high temperature applications, a 317 stainless steel ball can be furnished with a tungsten carbide overlay or a Hastelloy C ball with nickel overlay can be provided.

Uninterrupted Gasket Surface

DeZURIK V-Port Ball Valves feature a full, uninterrupted, raised-face gasket surface that provides maximum gasket integrity. The gasket surface provides full seal contact area with ASME B16.20 gaskets.

Sealed Bearings

The sealed-bearing option prevents media from entering the bearing areas, which can hinder valve operation. PFA Fluoropolymer or FFKM Perfluoroelastomer seals are available for bearings that need exceptional protection from scaling, plating, abrasive or polymerizing media.

Corrosion-Resistant Bearings



The one-piece bearing provides a large area of radial support to the shaft. The shaft is fully supported, greatly reducing shaft fatigue. The 317 stainless steel wire mesh reinforced PTFE bearing has a low coefficient of friction that minimizes operating torques and reduces actuator sizing requirements. For severe-service applications, a cobalt-chromium alloy bearing is available. A sealed-bearing option is also available.



Self-Aligning Ball and Seat

The self-aligning ball and seat on the VPB valve reduces lengthy setup time during repair and reassembly. Valves can easily be returned to like-new performance without time-consuming special procedures. And because of the spring-loaded metal seat design, the ball and seat self-compensate for wear on either surface.

Stainless Steel Fasteners

As standard, all DeZURIK V-Port Ball Valve fasteners are stainless steel, providing easy disassembly. An additional maintenance feature is a bottom access cover for valve disassembly and reassembly.

Splined Shaft with Solid Ball-to-Shaft Connection

The splined shaft and ball with locking torque screw on DeZURIK V-Port Ball Valves provide a high-strength, positive connection that effectively eliminates mechanical backlash and hysteresis. The splined connection with locking torque screw ensures accurate, precise positioning of the ball.
The machined diameter of the shaft provides blow-out proof protection.

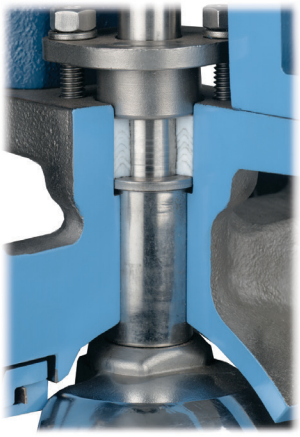


Common Valve Components

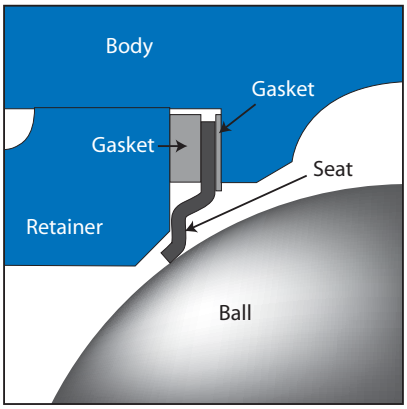
DeZURIK's V-Port Ball Valve was designed to share a majority of valve components with the DeZURIK RCV Rotary Control Valve. The two valves use the same bodies, packing components, bearings, brackets and fasteners. The common components reduce spare parts in inventory and associated costs for plants utilizing both styles of DeZURIK control valves.

Streamlined Maintenance

DeZURIK V-Port Ball Valves feature the simplest maintenance procedures among control valves available. There are no threaded trim parts. The seat retainer and trim components drop in place ensuring precise alignment of plug and seat. Disassembly and reassembly are easily completed with no special wrenches or other special tools required. On viscous and suspended fibrous services where routine maintenance is expected, the VPB's drop-in trim, optional sealed bearings and self-aligning ball/seat reduce maintenance costs and minimize lost production.

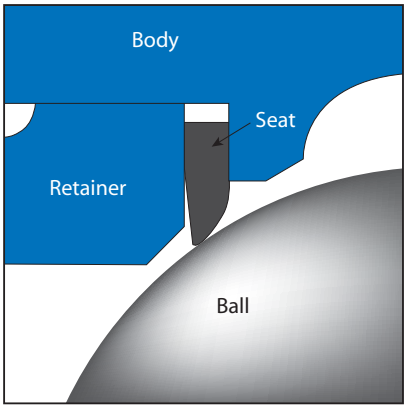


Seat Options



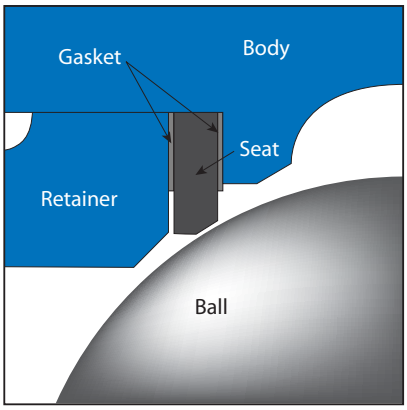
Flexible Metal Seat

The flexible metal seat is designed to shear fibrous fluids and provides shutoff up to ANSI/FCI 70.2 Class IV standard. Flexible metal seats are rated to the full valve pressure rating with the valve installed in the flow-to-open direction and rated to 150 psi (1030 kPa) pressure differential when installed in the flow-to-close direction.



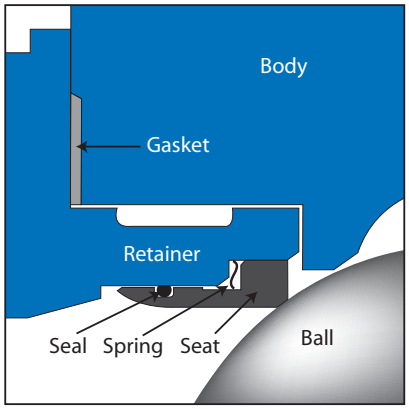
Reinforced PTFE Seat

Reinforced PTFE seats are typically used on clean fluid applications where ANSI/FCI 70.2 Class VI shutoff is required. DeZURIK V-Port Ball Valves feature a reinforced PTFE seat, designed for flow-to-open operation, rated to 285 psi (1895 kPa) pressure differential. For added versatility, all V-Port Ball valve seat options are field-interchangeable.



Clearance Seat

The clearance seat provides maximum controllability and minimum hysteresis in applications that do not require tight shutoff. This bi-directional seat eliminates seat friction. Shutoff is 5% of valve's maximum flow when closed.



Rigid Seat

Rigid seats are available for abrasive application including reclaimed fiber systems and applications with suspended chemical solids. The rigid seat provides shutoff performance to ANSI/FCI 70.2 Class IV. Materials include 317 stainless steel and Hastelloy C, all with heat treated nickel overlay. For enhanced abrasion resistance, a 317 stainless steel seat with tungsten carbide seating surface and solid Cobalt-Chromium alloy bearing is available.

An optional nickel-chromium spring can be substituted for the 17-4 PH stainless steel seat spring when added corrosion resistance is required.

The rigid seat is designed for flow-to-open operations and is field-interchangeable with the reinforced PTFE, flexible metal and clearance seats.

Actuators

Actuator Flexibility Options

V-Port Ball valves are available with DeZURIK PowerRac® or Diaphragm actuators. The actuator top mounting pads or adapter brackets of currently manufactured DeZURIK rotary control and isolation valves (RCV, VPB, BHP, BOS) are compatible with the ISO 5211 standard. This common actuator platform increases flexibility and helps reduce spare parts inventory.

Cylinder Actuators

PowerRac® Cylinder actuators are available as double-acting or spring return. They feature a high opening torque for on-off applications and also maintain a high operating torque throughout the full stroke for modulating service.

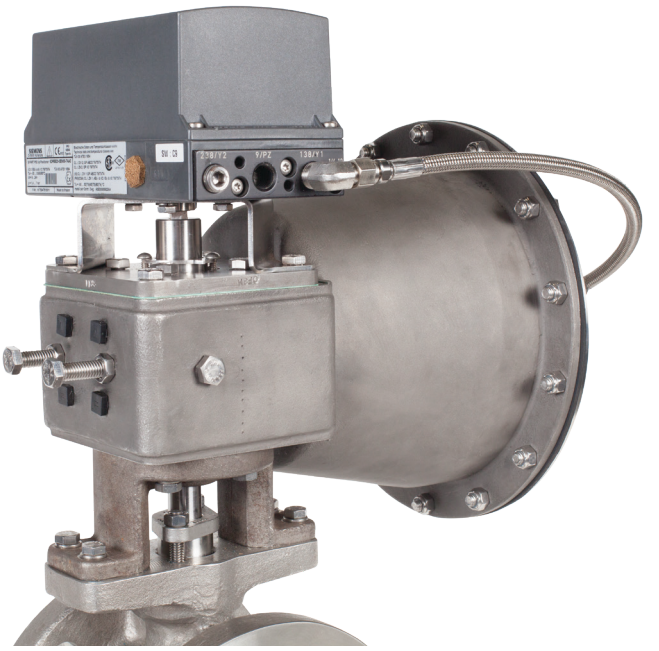
Diaphragm Actuators

Diaphragm actuators DR-40B & DR-85B are 316 stainless steel construction to provide corrosion resistance for a wide range of demanding industrial environments. They are designed for on-off or modulating service in either a Reverse (spring-to-close) or Direct (spring-to-open) mode. Fail action can be easily changed in the field by flipping the actuator over with no additional parts required. Larger size diaphragm actuators DR-145 & DR-250 are available to accommodate larger valve sizes and higher shutoff pressure differentials.



Close Coupling of Actuator to Valve

DeZURIK Diaphragm and PowerRac® actuators rigidly connect to the valve and the positioner on the actuator housing. This accurately feeds exact valve position directly to the positioner. In addition, the close coupling of the actuator to the valve makes the total package as compact as possible.



Throttling Control

The V-Port Ball valve design ensures unsurpassed accuracy over the 90° range of operation. Splined and locked ball-to-shaft connection, characterized v-port ball, low-friction bearings and low-friction packing combine to give superior control, including fast, accurate response to signal changes. These rigid connections effectively eliminate mechanical backlash and hysteresis.

The V-Port Ball valve with a high quality DeZURIK actuator and one of many high performing positioners will exceed 0.5% control accuracy, delivering over 200 discrete positions. This exceeds industry valve dynamic performance standards as well as the accuracy levels of most pneumatically actuated control valves.

To enhance accuracy of the VPB in real world process systems, the control valve assembly can be fitted with a smart digital positioner that not only provides near zero air bleed. This allows precise control and feedback of valve performance to the Distributed Control System (DCS).

Intelligent Positioners

Digital positioners improve reliability and performance through accurate calibration. Accurate calibration is achieved by the touch of a button; the positioner self-calibrates. They also offer diagnostic capabilities which monitor variables in the valves such as valve travel, valve friction, air consumption, and more to ensure operation is at peak performance. Digital positioners are available with HART, Foundation Fieldbus, or Profibus communication protocols. Digital positioners can also be used in a conventional 4-20 mA, analog control environment.



DeZURIK P30A



DeZURIK P85

Performance Testing

Control valve performance is tested with a BenchMark Control Valve Diagnostic™ system. Each valve has a discrete test result that can be referenced through the valve's serial number. V-Port Ball valve performance accuracy provides in excess of 200 repeatable positions. With routine maintenance, field monitoring or monitoring through a digital positioner, this performance level can be maintained throughout the life of the valve.

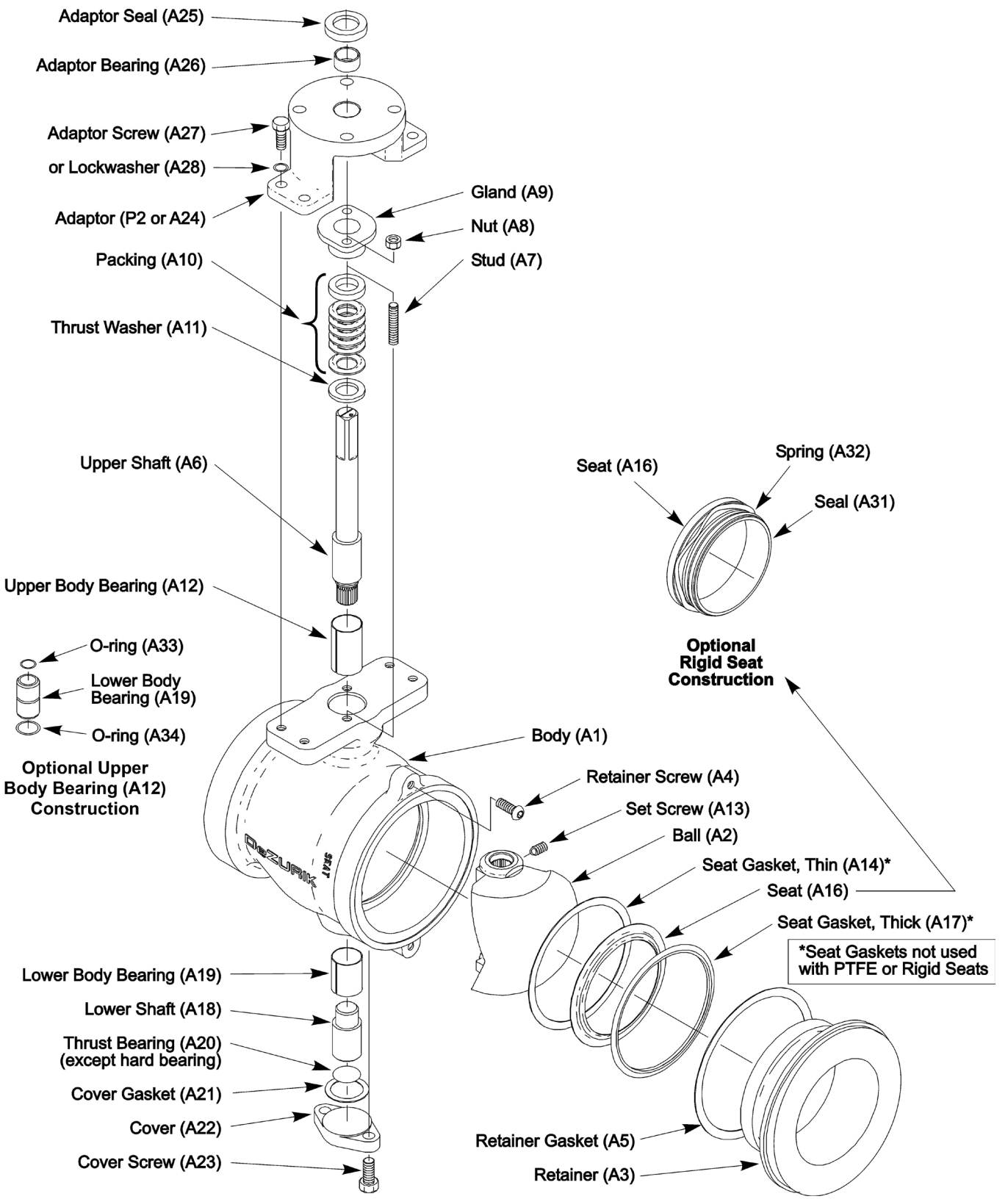
Control Valve Test Report

All VPB valve/actuator/positioner assemblies are tested for accuracy. The optional CVT Control Valve Test Report can be ordered which documents the response measurement from step inputs per ISA-75.25.01-2000 (R2010).

Accessories

A full line of accessories integrated to the actuator system is available to meet your individual mill/plant requirements.

Materials of Construction

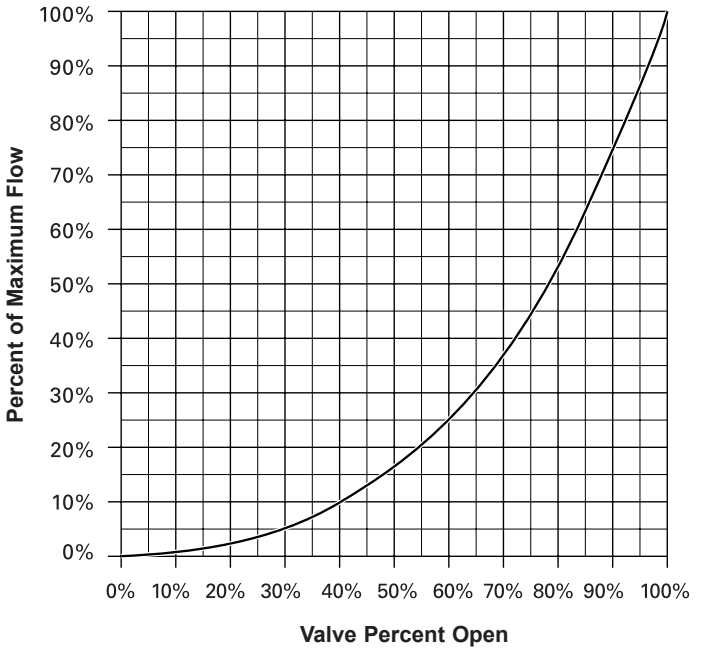


Materials of Construction

Item	Description	Order Code	Material
A1	Body	S2	316 Stainless Steel, ASTM A 351, Grade CF8M
		S3	317 Stainless Steel, ASTM A 351, Grade CG8M
		CS	Carbon Steel, ASTM A 216, Grade WCB
		HC	Hastelloy C, ASTM A 494, Grade CW2M
A2	Ball	S3NH	317 Stainless Steel, ASTM A 351, Grade CF8M, with Heat Treated Nickel Overlay
		S3S	317 Stainless Steel, ASTM A 351, Grade CF8M, with Tungsten Carbide Overlay
		HCNH	Hastelloy C, ASTM A494, Grade CW2M with Heat Treated Electroless Nickel Overlay
A3	Retainer	S2	316 Stainless Steel, ASTM A 351, Grade CF8M
		S3	317 Stainless Steel, ASTM A 351, Grade CG8M
		CS	Carbon Steel, ASTM A 216, Grade WCB
		HC	Hastelloy C, ASTM A 494, Grade CW2M
A4	Screw, Retainer	All	18-8 Stainless Steel
A5	Gasket, Retainer	All	Flexible Graphite
A6	Shaft, Upper	S10	2205 Duplex Stainless Steel
		S5	17-4 PH Stainless Steel
		HCC	Hastelloy C, ASTM B 574, Alloy N06022 Ceramic Coated
		TNC	Titanium, Ceramic Coated
A7	Stud, Packing	All	18-8 Stainless Steel
A8	Nut, Packing	All	18-8 Stainless Steel
A9	Gland	S2, CS	316 Stainless Steel, ASTM A 351, Grade CF8M
		S3	317 Stainless Steel, ASTM A 351, Grade CG8M
		HC	Hastelloy C, ASTM A 494, Grade CW2M
A10	Packing	TC	PTFE Chevron
		G2	Braided Carbon Graphite
A11	Thrust Washer	S2, CS	316 Stainless Steel, ASTM A 276, Type 316
		S3	317 Stainless Steel, ASTM A 276, Type 317
		HC	Hastelloy C, ASTM B 574 or B 575
A12	Bearing, Upper	FT	317 Stainless Steel Wire Mesh Reinforced PTFE
		HC	Hastelloy C
		SL	Cobalt Chromium Alloy
		S9	440C Stainless Steel
A13	Set Screw	S2, CS	316 Stainless Steel
		S3, HC	Alloy 20 Stainless Steel
A14	Gasket, Seat	S2, S3, HC	Flexible Graphite
A16	Seat	RT	Reinforced PTFE, Filled 15% Glass, 5% Molybdenum
		S6N	Super Austenitic Stainless Steel (AL-6XN®), Electroless Nickel Plated, Heat Treated
		S5C	17-4 PH Stainless Steel , H 1150
		S3R	317 Stainless Steel, ASTM A351, Grade CG8M, Electroless Nickel Plated, Heat Treated
		S3S	317 Stainless Steel, ASTM A351, Grade CF8M, UCAR 100 and SDG Tungsten Carbide Coated
		S3RI	317 Stainless Steel, ASTM A351, Grade CG8M, Hard Faced, Heat Treated
		S3SI	317 Stainless Steel, ASTM A351, Grade CG8M, Hard Faced, Heat Treated
		HCRI	Hastelloy C, ASTM A494, Grade CW2M, Electroless Nickel Plated, Heat Treated
A17	Gasket, Seat	S3	317L Stainless Steel, Flexible Graphite Filled
		HC	Hastelloy C, Flexible Graphite Filled
A18	Shaft, Lower	S10	2205 Duplex Stainless Steel
		S5	17-4 PH Stainless Steel
		HCC	Hastelloy C, ASTM B 574, Alloy N06022 Ceramic Coated
		TNC	Titanium, Ceramic Coated
A19	Bearing, Lower	FT	317 Stainless Steel Wire Mesh Reinforced PTFE
		HC	Hastelloy C
		SL	Cobalt Chromium Alloy
		S9	440C Stainless Steel
A20	Bearing, Thrust	FT	PTFE Fabric Bonded to 317 SS
		FT, HC	PTFE Fabric Bonded to Hastelloy C
		SL	Graphite
A21	Gasket, Cover	All	Graphite
A22	Cover	S2	316 Stainless Steel, ASTM A 351, Grade CF8M
		S3	317 Stainless Steel, ASTM A 351, Grade CG8M
		CS	Carbon Steel, ASTM A 216, Grade WCB
		HC	Hastelloy C, ASTM A 494, Grade CW2M
A23	Screw, Cover	All	316 Stainless Steel
A24	Adaptor	All	Ductile Iron
A25	Seal, Adaptor	DR, PR	Nitrile Rubber, Carbon Steel Case
A26	Bearing, Adaptor	DR55, 85	Oil-Impregnated Bronze
A27	Screw, Adaptor	All	18-8 Stainless Steel
A28	Lockwasher, Adaptor	All	18-8 Stainless Steel
A31	Seal, O-Ring	All	Fluoro Rubber, Encapsulated in PFA
A32	Spring	All	Fluoro Rubber, Encapsulated in PFA
A33	O-ring	S9VS, SLVS, HCVS	Fluoropolymer Seal
		SLKS, HCKS	FFKM Perfluoroelastomer Seal
A34	O-ring	S9VS, SLVS, HCVS	Fluoropolymer Seal
		SLKS, HCKS	FFKM Perfluoroelastomer Seal

Valve Selection

Flow Characteristic



Applicable Standards

DeZURIK VPB V-Port Ball Valves are designed and/or tested to meet the following standards:	
ASME B16.10	Face-to-Face dimensions, short pattern requirements
ASME B16.34	Body Wall Thickness and Pressure/temperature ratings for Class 150 and 300 Valves
ASME B16.5	Flange dimensions conform to Pipe flanges and Flanged Fittings for Class 150 and 300
ANSI/FCI 70.2	Control valve seat leakage
EN 558-1 PN 10/16	Basic Series 3, Face-to-Face dimensions
IEC 534-3-2 F-F	Face-to-Face dimensions, Industrial Process Control Valves
ANSI/ISA-75.02	Control Valve Capacity Test Procedures
ANSI/ISA-75.08.02	Face-to-Face dimensions for Flanged and Flangeless Rotary Control Valves
ISO 5211/1 & 2	Part-turn valve actuator attachment, Part 1: Flange dimensions and Part 2: Flange and Coupling performance characteristics
ISO 5752 PN 10/16	Basic Series 3, Face-to-Face dimensions
MSS-SP-25	Data Plate and body identification conform to marking requirements

Flow Parameters

Valve Size	Cv*/Kv* 100% Open	
	Flexible Metal & Rigid Metal Seats	Reinforced PTFE & Clearance Seats
1" / 25mm	36 / 31	40 / 35
1.5" / 40mm	120 / 104	135 / 117
2" / 50mm	210 / 182	235 / 203
2.5" / 65mm	260 / 225	295 / 255
3" / 80mm	360 / 311	420 / 363
4" / 100mm	600 / 519	690 / 597
6" / 150mm	1230 / 1064	1290 / 1116
8" / 200mm	2015 / 1743	2190 / 1894
10" / 250mm	3000 / 2595	3180 / 2751
12" / 300mm	4225 / 3655	4390 / 3797
14" / 350mm	5830 / 5043	6060 / 5242
16" / 400mm	7500 / 6488	7770 / 6721
18" / 450mm	9500 / 8218	9840 / 8512
20" / 500mm	12000 / 10380	12430 / 10752

*Cv = Flow in GPM of water at 1 psi pressure drop.
*Kv = Flow in m3/hr. of water at 100 kPa pressure drop.

Valve Weights

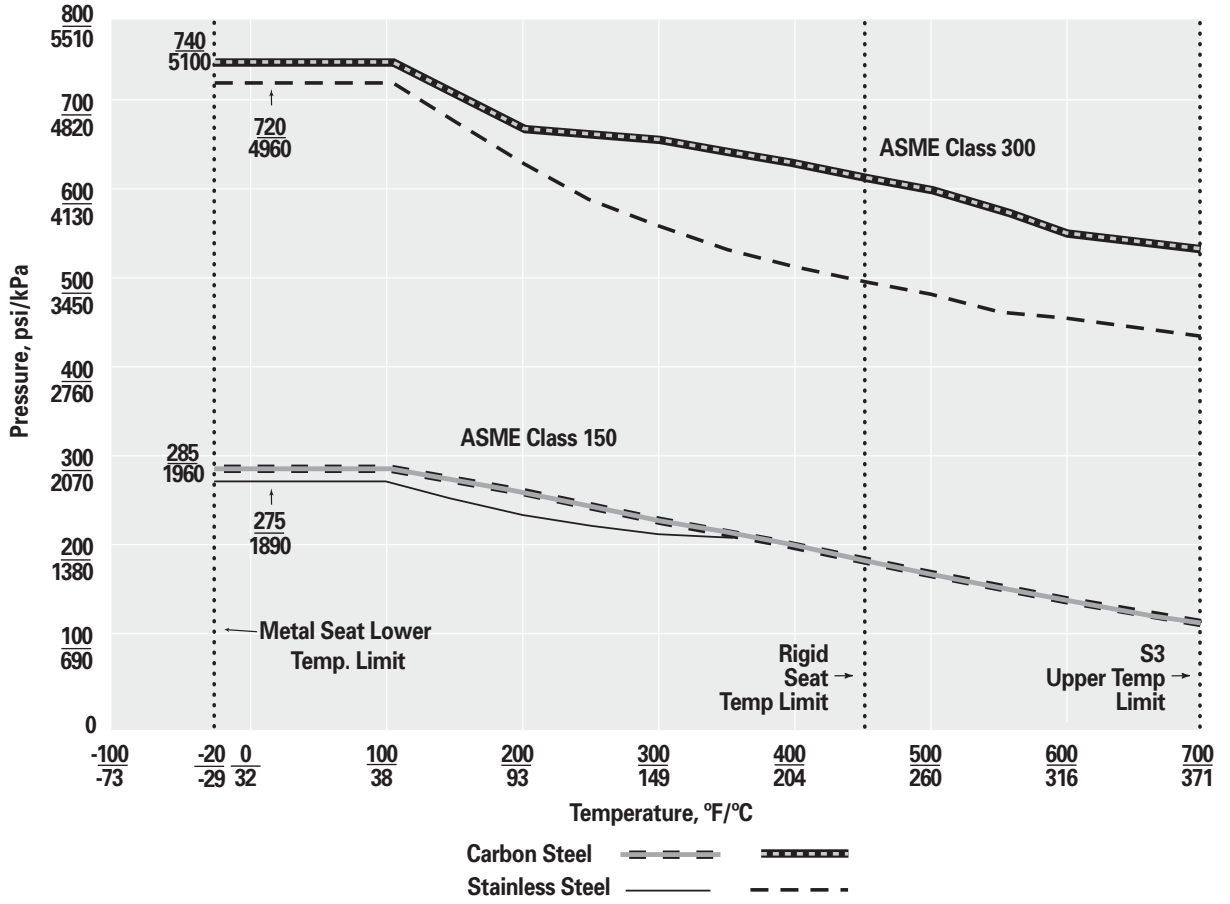
Valve Size	Class 150			Class 300
	Flanged (F1S & F1A)	Flangeless (W1S)	Add for Long Body (F1L)	Flanged (F2S)
1" / 25mm	12 / 6	9 / 5	0.5 / 1	15 / 7
1.5" / 40mm	17 / 8	12 / 6	2.0 / 1	24 / 11
2" / 50mm	21 / 10	13 / 6	2.8 / 2	27 / 13
2.5" / 65mm	32 / 15	20 / 10	3.0 / 2	40 / 19
3" / 80mm	47 / 22	35 / 16	3.3 / 2	58 / 27
4" / 100mm	63 / 29	42 / 20	3.5 / 2	79 / 36
6" / 150mm	95 / 44	74 / 34	10.5 / 5	142 / 65
8" / 200mm	152 / 69	116 / 53	15.3 / 7	208 / 95
10" / 250mm	236 / 108	182 / 83	17.5 / 8	342 / 156
12" / 300mm	368 / 167	314 / 143	11.3 / 6	516 / 235
14" / 350mm	560 / 255	—	—	—
16" / 400mm	695 / 316	—	—	—
18" / 450mm	890 / 404	—	—	—
20" / 500mm	1105 / 501	—	—	—

Pounds
Kilograms

Valve Selection

Pressure Ratings

Flex Metal*, Rigid Metal and Clearance Seats (S6N, S5C, S3R, S3S, S3RI, S3SI, HCRI)



Shut-Off Capabilities

Seat type	Flow	Shut-Off Class (ANSI /FCI 70-2)
Flexible Metal*	Bi-Directional	IV
Rigid Metal	Uni-Directional	IV
Reinforced PTFE**	Uni-Directional	VI
Clearance Seat	Bi-Directional	5% of max flow when closed

NOTE: Uni-directional valves must be installed with flow-to-open (forward flow; flow into the convex side of ball). Flow-to-open is the preferred direction for bi-directional valves. Seats are rated to the full valve pressure rating unless noted below.

* Flexible metal seats are rated to 150 psi (1030kPa) pressure differential when installed in the flow-to-close direction.

** Reinforced PTFE seats are rated to 285 psi (1895 kPa) maximum shutoff pressure differential.

Ordering

To order, simply complete the valve order code from information shown. An ordering example is shown for your reference.

Valve Style
Give valve style code as follows:

VPB	=	V-Port Ball Valve

Valve Size
Give valve size code as follows:

1	=	1"	(25mm)	8	=	8"	(200mm)
1.5	=	1.5"	(40mm)	10	=	10"	(250mm)
2	=	2"	(50mm)	12	=	12"	(300mm)
2.5	=	2.5"	(65mm)	14	=	14"	(350mm)
3	=	3"	(80mm)	16	=	16"	(400mm)
4	=	4"	(100mm)	18	=	18"	(450mm)
6	=	6"	(150mm)	20	=	20"	(500mm)

End Connection
Give end connection code as follows:

Flangeless

W1S	=	Class 150, ANSI/ISA-75.08.02 and IEC 534-3-2-F 1-12" valves

Flanged

F1S	=	Class 150, ANSI/ISA-75.08.02 and IEC 534-3-2F-F 1-20" valves
F2S	=	Class 300, ANSI/ISA-75.08.02 and IEC 534-3-2F-F 1-12" valves
F1L	=	Class 150, ASME B16.10, ISO 5752 and EN 558-1 PN 10/16, 1-12" valves
F1A	=	Class 150, ASME B16.10, ISO 5752 and EN 558-1 PN 10/16 (Long body) 1-12" excluding 2.5" valve size.

Body Material
Give body material code as follows:

S3	=	317 stainless steel (Class 150 only) S3 bodies must be ordered with S3NH or S3S ball , S10 shaft and S3, S3S, S3R or RT seat.
CS	=	Carbon Steel. CS bodies must be ordered with S3NH or S3S ball, S10 shaft, and S3, S3S, S3R or RT seat.
S2	=	316 stainless steel (Class 300 only). S2 bodies must be ordered with S3NH or S3S ball, S5 or S10 shaft, and either S3, S3S, S3R or RT seat.
HC	=	Hastelloy C. HC body must be ordered with HCNH ball, HCC or TNC shaft, HCRI or RT seat, and HC, HCVS or HCKS bearings.

Packing Material
Give packing material code as follows:

TC	=	PTFE Chevron, to 500°F (260°C)
G2	=	Braided carbon graphite, to 1000°F (540°C) (Available with S3 seat and S9 or SL bearings)

Trim Combination
Give ball, shaft, seat and bearing codes as follows:

S3NH	=	317 stainless steel heat treated nickel overlay, to 700°F (370°C)
S3S	=	317 stainless steel with tungsten carbide overlay, to 1000°F (540°C) (Available with S3S, S3SI or S3 seats only)
HCNH	=	Hastelloy C with heat treated electroless nickel overlay, to 700°F (370°C)

Shaft Material

S10	=	2205 Duplex stainless steel
S5	=	17-4 PH stainless steel
HCC	=	Hastelloy C Ceramic Coated (HC Bearings only)
TNC	=	Titanium Ceramic Coated

Seat Material

RT	=	Reinforced PTFE, to 500°F (260°C)
S6N	=	Flexible Super Austenitic Stainless Steel (AL-6XN®) with heat treated electroless nickel overlay, to 700°F (370°C)
S5C	=	Clearance Seat, 17-4PH Stainless Steel to 1000°F (540°C)
S3R	=	Rigid 317 stainless steel with heat treated nickel overlay, to 450°F (230°C)
S3S	=	Rigid 317 stainless steel with tungsten carbide overlay, to 450°F (230°C)(Available with S3S Ball only)
S3RI	=	Rigid 317 stainless steel with heat treated electroless nickel overlay and nickel-chromium spring, to 450°F (230°C)
S3SI	=	Rigid 317 stainless steel with tungsten carbide overlay and nickel-chromium alloy spring, to 450°F (230°C)
HCRI	=	Rigid Hastelloy C with heat treated electroless nickel overlay and nickel-chromium alloy spring, to 450°F (230°C)

Bearing Material

FT	=	317 stainless steel wire mesh reinforced PTFE, to 500°F (260°C)
S9	=	440C stainless steel bearings, to 1000°F (540°C)
S9VS	=	440C stainless steel bearings with PFA Fluoropolymer seal to 450°F (230°C)
SL	=	Solid Cobalt-Chromium Alloy, to 1000°F (540°C)
SLVS	=	Solid Cobalt-Chromium Alloy with PFA Fluoropolymer seal, to 450°F (230°C)
SLKS	=	Solid Cobalt-Chromium Alloy with FFKM Perfluoroelastomer seal, to 550°F (288°C)

On Application

HC	=	Hastelloy C 1000°F (540°C)
HCVS	=	Hastelloy C with PFA Fluoropolymer seal, to 450°F (230°C)
HCKS	=	Hastelloy C with FFKM Perfluoroelastomer seal, to 550°F (288°C)

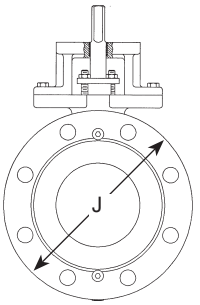
On Application
Give options code as follows:

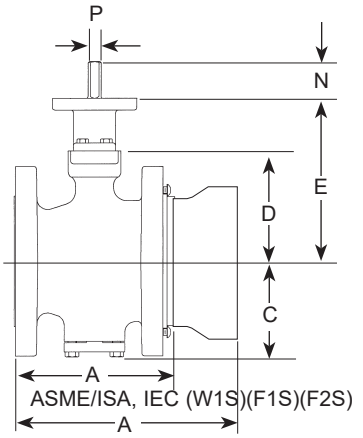
BAA	=	Buy American Act
CMC	=	Certificate of Material Conformance
CRT	=	Certified Material Physical & Chemical Test Report
DTR	=	DeZURIK Standard Certified Production Hydrostatic Shell & Seat Test Report
ST3	=	Pennsylvania Steel Procurement Act
G1	=	DIN 10 or BS4504/10 Drilling (W1S, F1L & F1S only)
G2	=	DIN 16 or BS4504/16 Drilling (W1S, F1L & F1S only)
G3	=	DIN 25 or BS4504/25 Drilling (F2S only)
G4	=	DIN 40 or BS4504/40 Drilling (F2S only)
J1	=	J1S 10 Flange Drilling (F1L or F1S only)
J6	=	J1S 16 Flange Drilling (F1L or F1S only)
J2	=	J1S 20 Flange Drilling (F2S only)

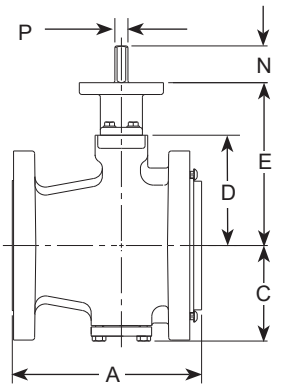
On Application
Pressure Equipment Directive (CE Mark)

Ordering Example
VPB,4,F1L,S3,TC,S3NH-S10-RT-FT,G1*PR-R1A-PC4

Dimensions







Basic Valve

Inches
Millimeters

Valve Size	A		C	D	E	J			N	P Diameter	P Square
	ASME /ISA IEC	ASME ISO EN				Flanged Class 150	Flangeless Class 150	Flanged Class 300			
1" 25mm	4.00 102	5.00 127	2.75 70	3.25 83	5.62 143	4.25 108	2.44 62	4.88 124	1.75 44	.62 16	.50 13
1.5" 40mm	4.50 114	6.50 165	2.94 75	3.47 88	5.84 148	5.00 127	3.06 78	6.12 155	1.75 44	.62 16	.50 13
2" 50mm	4.88 124	7.00 178	3.22 82	3.75 95	6.12 155	6.00 152	3.81 97	6.50 165	1.75 44	.62 16	.50 13
2.5" 65mm	5.50 140	7.50 191	3.75 95	4.44 113	6.94 176	7.00 178	4.38 111	7.50 190	1.75 44	.75 19	.62 16
3" 80mm	6.50 165	8.00 203	4.00 102	4.69 119	7.19 183	7.50 191	5.19 132	8.25 210	1.75 44	.75 19	.62 16
4" 100mm	7.62 194	9.00 229	4.56 116	5.25 133	7.75 197	9.00 229	6.38 162	10.00 254	1.75 44	.75 19	.62 16
6" 150mm	9.00 229	10.50 267	5.72 145	6.50 165	9.50 241	11.00 279	8.50 216	12.50 317	1.75 44	1.25 32	.94* 24
8" 200mm	9.56 243	11.50 292	7.28 185	8.12 206	11.12 282	13.50 343	10.62 270	15.00 381	1.75 44	1.50 38	1.19 30
10" 250mm	11.69 297	13.00 330	8.91 226	9.50 241	13.38 340	16.00 406	13.12 333	17.50 444	1.75 44	2.00 51	1.62** 41
12" 300mm	13.31 338	14.00 356	9.91 252	10.50 267	14.38 365	19.00 483	15.38 391	20.50 521	1.75 44	2.00 51	1.62 41
14" 350mm	15.75 400	—	10.86 276	11.47 291	15.34 390	21.00 533	—	—	1.75 44	2.00 51	1.62 41
16" 400mm	15.75 400	—	13.25 337	14.06 375	18.56 471	23.50 597	—	—	1.75 44	2.50 64	1.81 46
18" 450mm	18.00 457	—	14.44 367	15.25 387	19.75 502	25.00 635	—	—	1.75 44	2.50 64	1.81 46
20" 500mm	20.00 508	—	15.56 395	16.38 416	20.38 518	27.50 686	—	—	1.75 44	2.50 64	1.81 46

Note: All dimensions are subject to change without notice.
Request certified drawings for use in preparing piping layouts.

*6" (150mm) $\frac{.88}{22}$ for DR-40B actuators

**10" (250mm) $\frac{1.19}{30}$ for DR-85B actuators

Sales and Service

For information about our worldwide locations, approvals, certifications and local representative:
Web Site: DeZURIK.com **E-Mail:** info@DeZURIK.com

DeZURIK

250 Riverside Ave. N. Sartell, Minnesota 56377 • Phone: 320-259-2000 • Fax: 320-259-2227

DeZURIK, Inc. reserves the right to incorporate our latest design and material changes without notice or obligation. Design features, materials of construction and dimensional data, as described in this bulletin, are provided for your information only and should not be relied upon unless confirmed in writing by DeZURIK, Inc. Certified drawings are available upon request.

16-FCV-301-1/2/3/4

DEZURIK R3 POWERRAC® CYLINDER ACTUATOR

Instruction D10359
November 2020

DeZURIK, Inc. Sartell, Minnesota USA | Phone: 320-259-2000 | www.dezurik.com | info@dezurik.com

Instructions

These instructions are for use by personnel who are responsible for the installation, operation and maintenance of DeZURIK valves, actuators or accessories.

Safety Messages

All safety messages in the instructions are identified by a general warning sign and the signal word CAUTION, WARNING or DANGER. These messages indicate procedures to avoid injury or death.

Safety label(s) on the product indicate hazards that can cause injury or death. If a safety label becomes difficult to see or read, or if a label has been removed, please contact DeZURIK for replacement label(s).

⚠WARNING

Personnel involved in the installation or maintenance of valves should be constantly alert to potential emission of pipeline material and take appropriate safety precautions. Always wear suitable protection when dealing with hazardous pipeline materials. Handle valves which have been removed from service with suitable protection for any potential pipeline material in the valve.

Inspection

Your DeZURIK product has been packaged to provide protection during shipment; however, items can be damaged in transport. Carefully inspect the unit for damage upon arrival and file a claim with the carrier if damage is apparent.

Parts

Replaceable wear parts are listed on the assembly drawing. These parts can be stocked to minimize downtime. Order parts from your local DeZURIK sales representative or directly from DeZURIK. When ordering parts please provide the following information:

If the valve has a data plate: please include the 7-digit part number with either 4-digit revision number (example: 9999999R000) or 8-digit serial number (example: S1900001) whichever is applicable. The data plate will be attached to the valve assembly. Also, include the part name, the assembly drawing number, the balloon number and the quantity stated on the assembly drawing.

If there isn't any data plate visible on the valve: please include valve model number, part name, and item number from the assembly drawing. You may contact your local DeZURIK Representative to help you identify your valve.

DeZURIK Service

DeZURIK service personnel are available to maintain and repair all DeZURIK products. DeZURIK also offers customized training programs and consultation services. For more information, contact your local DeZURIK sales representative or visit our website at DeZURIK.com.

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Description

The R3 PowerRac Cylinder Actuator is a quarter-turn double-acting enclosed rack and gear cylinder actuator. The actuator is used for on-off or modulating control of butterfly valves and other valves that have a square or double-D shaft connection. A choice of an 8" (200 mm) or a 10" (250 mm) diameter cylinder is offered. A lockable model is available as an option.Installation

The actuator requires two pneumatic connections— one to each port on opposite ends of the cylinder. Air to the connection closest to the actuator drives the actuator clockwise, towards the “shut” position on the dial; air to the connection farthest from the actuator drives the actuator counterclockwise, towards the “open” position on the dial. The 8" (200 mm) cylinder has ½" NPT connections, and the 10" (250 mm) cylinder has ¾" NPT connections.

Operation

The R3 PowerRac Cylinder Actuator is powered pneumatically, and rotates 90° between the open and closed positions. The cylinder is sized for 60 psi or 80 psi (415 kPa or 550 kPa), and is limited to 100 psi (690 kPa) maximum.

Lubrication

The R3 PowerRac Cylinder Actuator is lubricated at the factory, and does not require routine maintenance lubrication. If the actuator is disassembled, lubrication is required as described in the *Actuator Reassembly* section.

Open and Closed Position Stops

The adjustable open and closed position stops prevent the actuator from rotating beyond the open and closed positions of the valve. If the actuator is factory-mounted on the valve, the stops are preset, and do not require further adjustment. If the actuator is not factory-mounted on the valve, or if the actuator is removed and/or disassembled, the stops will require adjustment as described below. Refer to the Valve Instructions for closed-position information, and adjust the stop screws after the actuator is mounted on the valve.

The adjustable stop screws are secured with jam nuts, and are located in the extreme ends of the actuator as shown in Figures 1 and 2. The closed position stop is located in the cylinder cap, and the open position stop is located in the end cover. To adjust either stop screw, loosen the jam nut and turn the screw counterclockwise to increase the stroke, or clockwise to decrease the stroke. After the stop is adjusted to the desired position, hold the screw from turning, and tighten the jam nut.

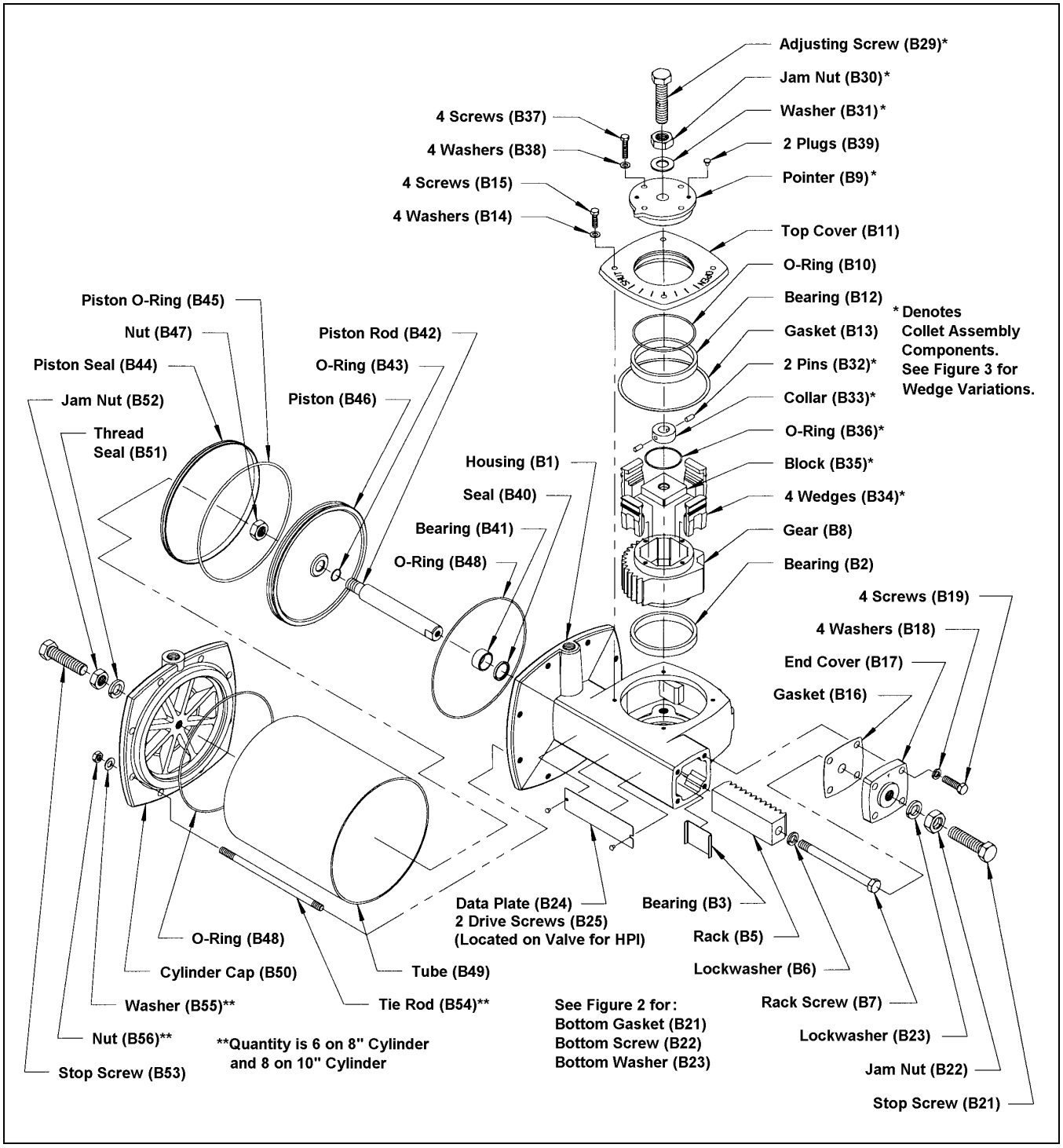
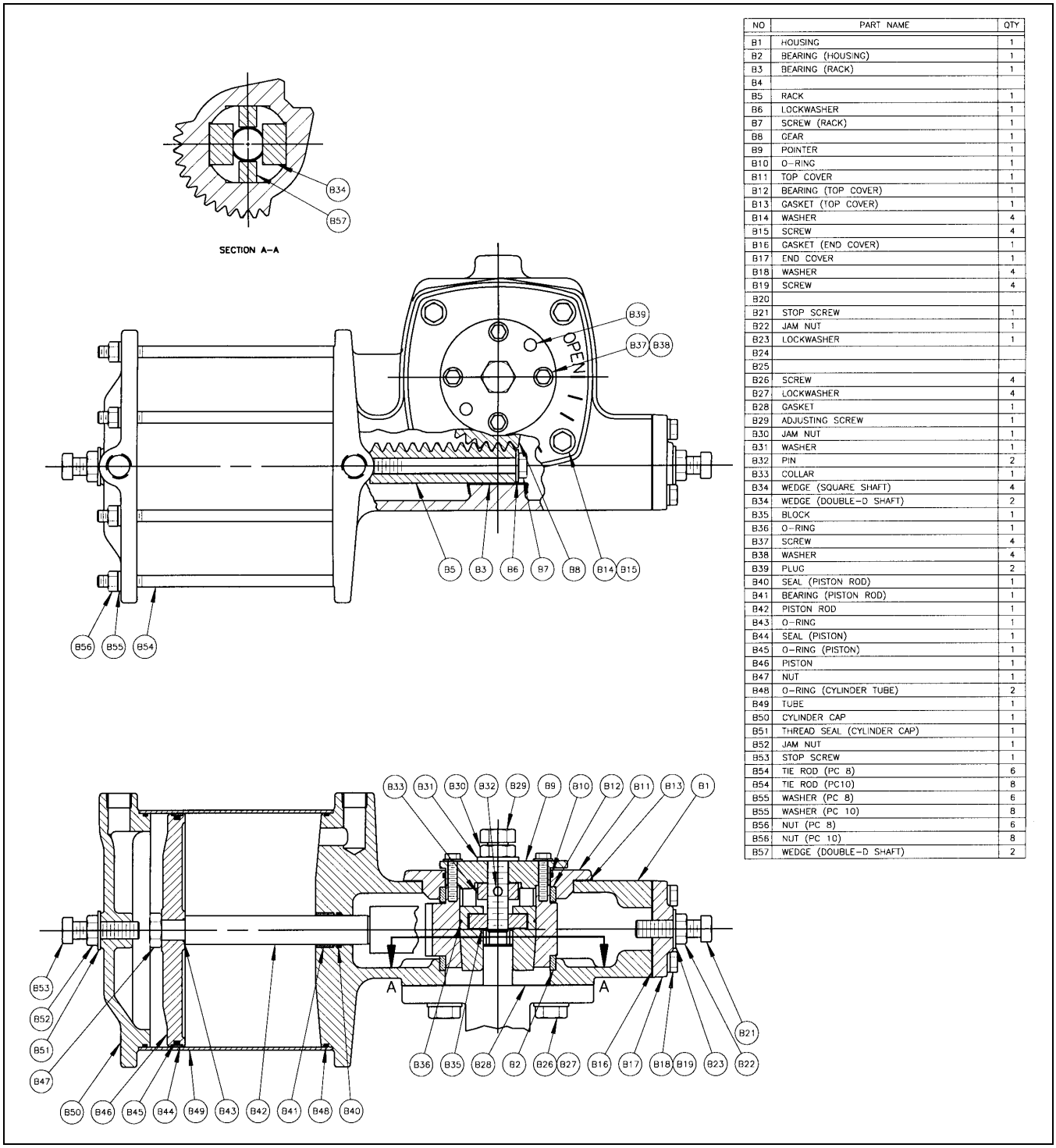


Figure 1 - Component Identification, Unassembled



NO	PART NAME	QTY
B1	HOUSING	1
B2	BEARING (HOUSING)	1
B3	BEARING (RACK)	1
B4		
B5	RACK	1
B6	LOCKWASHER	1
B7	SCREW (RACK)	1
B8	GEAR	1
B9	POINTER	1
B10	O–RING	1
B11	TOP COVER	1
B12	BEARING (TOP COVER)	1
B13	GASKET (TOP COVER)	1
B14	WASHER	4
B15	SCREW	4
B16	GASKET (END COVER)	1
B17	END COVER	1
B18	WASHER	4
B19	SCREW	4
B20		
B21	STOP SCREW	1
B22	JAM NUT	1
B23	LOCKWASHER	1
B24		
B25		
B26	SCREW	4
B27	LOCKWASHER	4
B28	GASKET	1
B29	ADJUSTING SCREW	1
B30	JAM NUT	1
B31	WASHER	1
B32	PIN	2
B33	COLLAR	1
B34	WEDGE (SQUARE SHAFT)	4
B34	WEDGE (DOUBLE–D SHAFT)	2
B35	BLOCK	1
B36	O–RING	1
B37	SCREW	4
B38	WASHER	4
B39	PLUG	2
B40	SEAL (PISTON ROD)	1
B41	BEARING (PISTON ROD)	1
B42	PISTON ROD	1
B43	O–RING	1
B44	SEAL (PISTON)	1
B45	O–RING (PISTON)	1
B46	PISTON	1
B47	NUT	1
B48	O–RING (CYLINDER TUBE)	2
B49	TUBE	1
B50	CYLINDER CAP	1
B51	THREAD SEAL (CYLINDER CAP)	1
B52	JAM NUT	1
B53	STOP SCREW	1
B54	TIE ROD (PC 8)	6
B54	TIE ROD (PC10)	8
B55	WASHER (PC 8)	6
B55	WASHER (PC 10)	8
B56	NUT (PC 8)	6
B56	NUT (PC 10)	8
B57	WEDGE (DOUBLE–D SHAFT)	2

Figure 2 - Component Identification, Assembled

Open and Closed Position Stops *(Continued)*

- With an 8" (200 mm) cylinder, tighten the closed position stop nut (3/4") to 140 ± 18 foot pounds (190 ± 24 Nm); tighten the open position stop nut (7/8") to 230 ± 30 foot pounds (312 ± 41 Nm).
- With a 10" (250 mm) cylinder, tighten both stop nuts (7/8") to 230 ± 30 foot pounds (312 ± 41 Nm).

Removing Actuator From Valve

Refer to Figures 1 and 2 for component identification.

1. Shut down the flow in the pipeline.

WARNING!

Flow in the pipeline with the actuator removed can allow the valve to slam closed and cause personal injury and/or damage to the flow system. Shut down the flow in the pipeline before removing the actuator from the valve.

2. Disconnect and lock out the pneumatic power to the actuator to prevent accidental operation of the actuator.

WARNING!

Moving parts from unexpected operation of a powered actuator can cause personal injury or equipment damage. Disconnect and lock out power to the actuator before servicing.

3. Disengage the actuator from the valve shaft by loosening the jam nut (B30) *clockwise* and loosening the adjusting screw (B29) *counterclockwise*.
4. Remove the four mounting screws (B26) that fasten the actuator to the valve.
5. Remove the actuator from the valve by lifting the actuator from the valve shaft.

Actuator Disassembly

Refer to Figures 1 and 2 for component identification.

1. Remove the four pointer screws (B37) and washers (B38); remove the pointer (B9), together with the other collet assembly components indicated in Figure 1.
2. Remove the four top cover screws (B15) and washers (B14), and remove the top cover (B11).
3. Remove the top cover gasket (B13) and the O-Ring (B10).
4. Remove the gear (B8).
5. Remove the four end cover screws (B19) and washers (B18), and remove the end cover (B17) and gasket (B16).
6. Remove the rack screw (B7) and lockwasher (B6), and separate the rack (B5) from the piston rod (B42).
7. Remove the rack bearing (B3).

Actuator Disassembly *(Continued)*

1. Remove the tie rod nuts (B56) and washers (B55) from the tie rods (B54), and remove the cylinder cap (B50).
2. Remove the piston rod (B42)— with piston (B46) and cylinder tube (B49)— from the cylinder head on the housing (B1).
3. Remove the piston rod (B42) and piston (B46) from the cylinder Tube (B49).
4. Remove the piston nut (B47), the piston (B46), and the O-ring (B43) from the piston rod (B42).
5. Remove the piston seal (B44) and the O-ring (B45) from the piston (B46).
6. Remove the piston rod seal (B40) from the actuator housing (B1).
7. Remove the two cylinder tube O-rings (B48) from the cylinder head on the housing (B1) and from the cylinder cap (B50).
8. Remove the tie rods (B54) from the actuator housing (B1).

Actuator Reassembly

Steps 1 through 7 apply to reassembly of the cylinder components. Clean and inspect all parts before reassembly. Worn parts, especially sealing components such as O-rings and other seals should be replaced. Lubricate the cylinder O-rings, other seals, and cylinder tube walls with a paint-like coating using one of these lubricants:

- Dow Corning Molykote No. 44 (**recommended**)
- Shell Retinax AM (alternate)
- Shell Lithall MDS (alternate)

Refer to Figures 1 and 2 for component identification.

1. With the O-ring groove toward the piston rod, place the O-ring (B43), the piston (B46), and the nut (B47) on the piston rod (B42). Tighten the nut to 120 ± 10 foot pounds (163 ± 14 Nm).
2. Place the O-ring (B45) in the smaller groove of the piston (B46). Place the piston seal (B44) in the larger groove of the piston as far around the circumference as possible without stretching the seal. Angle the remaining.
3. Place one cylinder tube O-ring (B48) in the groove in the cylinder head on the housing (B1), and place the other O-ring in the groove in the cylinder cap (B50).
4. Place the 3-piece piston rod seal (B40) in the cylinder head of the housing (B1). Place the rubber seal in position first, and then place a wiper ring in position on each side of the seal.
5. Place the cylinder tube (B49) over the piston (B46) at about a 45° angle. Carefully square the piston into alignment with the cylinder tube, and push the cylinder tube and piston rod into position on the cylinder head of the housing (B1). Use care to prevent damage to the seals. Push the piston (B46) into the cylinder so that the piston is against the cylinder head.
6. Apply Loctite Primer N and Loctite Stud Lock to the shorter threads on each of the tie rods (B54), and turn each stud as far as it will go into the housing (B1).
7. Align the holes in the cylinder cap (B50) with the tie rods (B54) and insert the cylinder cap into the cylinder tube (B49). Place the tie rod nuts (B56) and washers (B55) on the tie rods. Tighten the nuts to 16 ± 2 foot pounds (22 ± 3 Nm).

Actuator Reassembly *(Continued)*

Steps 8 through 18 apply to reassembly of the housing components. Clean and inspect all parts before reassembly. Worn parts, especially sealing components such as O-rings, other seals, and gaskets should be replaced. Before housing reassembly, apply a paint-like coating using one of these lubricants:

- Keystone Zeniplex-1 (**recommended**)
- Amoco Amolith Grease #1-EP (alternate)
- Amsoil GHD (alternate)
- Mobil Mobilux EP 1 (alternate)
- Shell Alvania EP 1 (alternate)
- Texaco Multifak EP 1 (alternate)

to the following surfaces:

- The fabric side of the rack bearing (B3) and the mating side of the rack (B5)
- Both bearing hubs of the gear (B8)
- The top cover O-ring (B10) and the groove in the top cover (B11)
- Both sides of the four wedges, and the mating surfaces inside of the gear (B8)
- The teeth in the rack (B5) and in the gear (B8)

8. Place the rack bearing (B3) in position in the housing (B1). A dab of grease on the back side of the rack bearing will help to hold it in place.
9. Note the witness mark on the tooth near one end of the rack (B5). Assemble the end of the rack opposite the witness mark to the end of the piston rod (B42) with the rack screw (B7) and lockwasher (B6). Do not tighten the screw until step 14 below.
10. With the four tapped holes facing upwards, place the gear (B8) into the housing bearing (B2) so that the marked tooth on the rack (B5) meshes between the two marked teeth on the gear as shown in Figure 3.
11. Place the O-ring (B10) in the groove of the top cover (B11).
12. Mount the top cover (B11) and gasket (B13) to the housing (B1) with the four screws (B15) and washers (B14). Tighten the screws to 15 ± 2 foot pounds (20 ± 3 Nm).
13. Place the actuator in the open position— with the piston rod (B42) extended into the housing— before the next step.
14. Tighten the rack screw (B7) to 216 foot pounds minimum, (293 Nm). If necessary, apply 80 psi (550 kPa) air pressure to the cap end of the cylinder to prevent the piston rod from rotating.
15. Turn the jam nut (B22) and the lockwasher (B23) onto the stop screw (B21), and turn the stop screw into the center hole in the end cover (B17) until the end of the stop screw protrudes about 1/4" (6 mm) through the end cover. Turn the jam nut finger tight.
16. Mount the end cover (B17)— with the 'T' mark towards the top— and the gasket (B16) to the housing (B1) with the four screws (B19) and washers (B18). Tighten the screws to 38 ± 5 foot pounds (52 ± 7 Nm).
17. Turn the adjusting screw (B29) so that the four wedges (B34) are about 1/32" (0.8 mm) from the bottom of the pointer (B9).
18. With the actuator in the open or closed position, place the collet assembly components into the opening in the gear (B8), and align the pointer (B9) with the corresponding position on the top cover (B11). Mount the pointer to the gear with the four screws (B37) and washers (B38). Tighten the screws to 15 ± 2 foot pounds (20 ± 3 Nm).

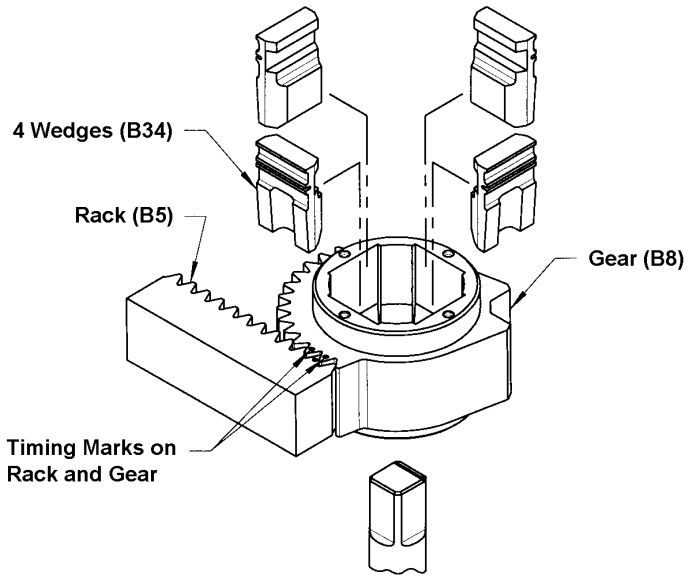


Figure 3 – Collet Assembly

Mounting Actuator on Valve

Refer to Figures 1 and 2 for component identification.

1. Select one of the available actuator-to-valve mounting positions shown on the Installation Drawing. Match the open or closed position of the valve with the open or closed position of the actuator. Also, note the position of the word “open” on the top cover (B11). The cover must be positioned on the housing (B1) so that dial hash mark for “open” will be parallel with the pipeline when the valve is installed. One or more of the following four steps may be required, depending upon the positions of the valve, the actuator, the actuator cover, and the mounting position selected.
    a. Rotate the valve shaft, and/or
    b. Stroke the actuator, and/or
    c. Select a different actuator-to-valve mounting position, and/or
    d. Remove and re-index the cover. If this step is necessary, remove the four cover screws B15), rotate the cover, and replace the four cover screws (B15) and washers (B14). Tighten the screws to 15 ± 2 foot pounds (20 ± 3 Nm).
2. If the actuator does not include the collet assembly (the components are identified in Figure 1, grease the components as described in the *Actuator Reassembly* section and install the assembly as explained in steps 17 and 18 in the same section.

Mounting Actuator on Valve (Continued)

3. Certain high-temperature valves include and require a high-temperature gasket (B28). If the valve includes a gasket, use the gasket included with the valve rather than the gasket included with the actuator. Place the gasket between the actuator and the valve; engage the actuator with the valve shaft in the desired mounting position as determined in step 1, and slide the actuator onto the valve shaft.
4. Assemble the four actuator mounting screws (B26) with lockwashers (B27) up through the mounting holes in the top of the valve (or the actuator adaptor on the valve), through the gasket (B28), and into the threaded holes in the bottom of the actuator. Tighten the screws finger tight— so that the valve and actuator mounting surfaces are in contact, but are free to slide and self-center during the next step.
5. Tighten the adjusting screw (B9A) to 200 ± 30 foot pounds (271 ± 41 Nm).
6. Tighten the actuator mounting screws (B26) to 318 foot pounds minimum, (431 Nm).
7. Loosen the adjusting screw (B9A).
8. Re-tighten the mounting screws (B26) to 318 foot pounds minimum (431 Nm).
9. Tap the adjusting screw with a rubber mallet so that the gear (B8) bottoms out against the lower housing bearing (B2).
10. Begin to tighten the adjusting screw (B9A); as the adjusting screw becomes snug, repeat step 9, and finish tightening to 200 ± 30 foot pounds (271 ± 41 Nm).
11. Tighten the jam nut (B30) *counterclockwise* to 200 ± 30 foot pounds (271 ± 41 Nm).
12. Adjust the open and closed position stops as explained in the *Open and Closed Position Stops* section.
13. Operate the actuator and valve three full cycles to demonstrate that the unit operates smoothly in both directions. Do not exceed 100 psi (690 kPa) in the cylinder.

Changing Mounting Position of Actuator on Valve

The actuator may be mounted on the valve in any one of the mounting positions shown on the Installation Drawing. The mounting position may be changed as follows:

1. Remove the actuator from the valve as described in the *Removing Actuator From Valve* section.
2. Replace the actuator on the valve as described in the *Mounting Actuator On Valve* section.

Lockable Model

The R3 PowerRac Cylinder Actuator is available as a lockable model that allows the actuator to be locked in either the open or closed position. The lockable model is identified by PRL in the catalog characteristic.

As shown in Figure 4, the lockable model includes two lock screws (B64) and two jam nuts (B65). In the locked position, the screws engage with mating notches in the gear (B8). A lockout cover assembly (B60) is also included.

Lockable Model (Continued)

CAUTION!

The two lock screws (B64) must be in either the unlocked or the locked position as described in the following sections. The gear (B8) will be damaged if either of the stop screws is placed in an intermediate position between the unlocked and locked positions.

Unlocked Condition

Under normal unlocked running conditions, both of the lock screws are backed out of the housing to allow the gear to rotate freely in either direction. To be fully disengaged, the distance from the housing to the end of each lock screw must be at least 3 1/8" (80 mm). To hold the lock screws in position, the jam nuts are tightened to 140 ± 18 foot pounds (190 ± 24 Nm).

Locked: Closed Position

Follow the steps below to change the unit from the unlocked condition to the locked closed position. Refer to Figure 3 for component identification. Before proceeding, the open and closed position stops must be correctly adjusted as described in the *Open and Closed Stops* section.

1. Operate the actuator to the fully closed (clockwise) position.

WARNING!

Adjust only the left-side lock screw to lock the actuator in the closed position. Adjusting the wrong screw does not lock the actuator, and can result in personal injury or equipment damage.

2. Loosen the jam nut (B65) on the **left** side lock screw (B64), as viewed when facing the top of the heads of the lock screws. Hold the lock screw from turning, and turn the jam nut several turns counterclockwise, to the head of the lock screw.
3. Turn the **left** side lock screw clockwise several turns until resistance is felt from the lock screw contacting the notch in the gear (B8). Tighten the lock screw to 5 to 10 foot pounds (7 to 14 Nm) to assure that the lock screw is contacting the gear.
4. Turn the **left** side jam nut clockwise against the actuator housing. While holding the lock screw from turning, tighten the jam nut to 140 ± 18 foot pounds (190 ± 24 Nm).
5. Place and lock the lockout cover assembly (B60) on the head of the **left** side lock screw.

Locked: Open Position

Follow the steps below to change the unit from the unlocked condition to the locked open position. Refer to Figure 4 for component identification. Before proceeding, the open and closed position stops must be correctly adjusted as described in the *Open and Closed Stops* section.

1. Operate the actuator to the fully open (counterclockwise) position.

WARNING!

Adjust only the right-side lock screw to lock the actuator in the open position. Adjusting the wrong screw does not lock the actuator, and can result in personal injury or equipment damage.

2. Loosen the jam nut (B65) on the **right** side lock screw (B64), as viewed when facing the top of the heads of the lock screws. Hold the lock screw from turning, and turn the jam nut several turns counterclockwise, to the head of the lock screw.
3. Turn the **right** side lock screw clockwise several turns until resistance is felt from the lock screw contacting the notch in the gear (B8). Tighten the lock screw to 5 to 10 foot pounds (7 to 14 Nm) to assure that the lock screw is contacting the gear.
4. Turn the **right** side jam nut clockwise against the actuator housing. While holding the lock screw from turning, tighten the jam nut to 140 ± 18 foot pounds (190 ± 24 Nm).
5. Place and lock the lockout cover assembly (B60) on the head of the **right** side lock screw.

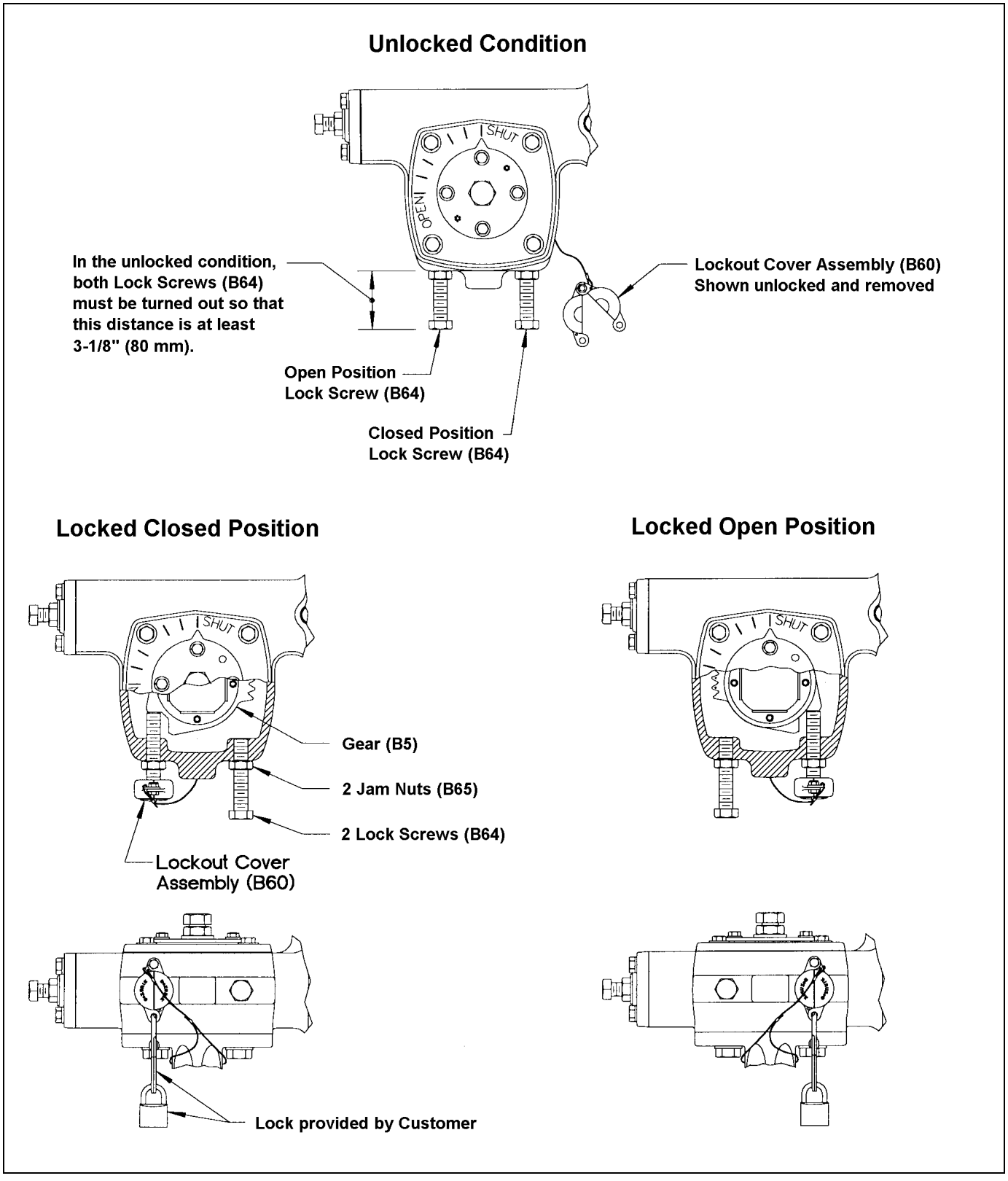


Figure 4 – Lockable Model, Component Identification

Troubleshooting

Condition	Possible Cause	Corrective Action
Actuator closes to wrong position	Closed position stop is set incorrectly	Adjust closed position stop. See OPEN AND CLOSED STOPS.
Actuator opens to wrong position	Open position stop is set incorrectly	Adjust open position stop. See OPEN AND CLOSED STOPS.
Actuator will not fully operate valve	Cylinder pressure is low	Increase cylinder pressure. Do not exceed 100 psi (69 kPa).
	Actuator is sized incorrectly	Use larger actuator
	Piston seal in cylinder is leaking	Replace piston seal(s). See ACTUATOR DISASSEMBLY AND REASSEMBLY.
	Pipeline obstruction in valve is preventing closure	Remove obstruction
	Lockable Model is locked.	Place in unlocked condition. See LOCKABLE MODEL.
Actuator rotates wrong direction	Air connections to cylinder are incorrect	Reverse air connections to cylinder

Limited Warranty

DeZURIK, Inc. (“Seller”) manufactured products, auxiliaries and parts thereof that we manufacture for a period of twenty-four (24) months from date of shipment from Seller’s factory, are warranted to the original purchaser only against defective workmanship and material, but only if properly stored, installed, operated, and serviced in accordance with Seller’s recommendations and instructions.

For items proven to be defective within the warranty period, your exclusive remedy under this limited warranty is repair or replacement of the defective item, at Seller’s option, FCA Incoterms 2020 Seller’s facility with removal, transportation, and installation at your cost.

Products or parts manufactured by others but furnished by Seller are not covered by this limited warranty. Seller may provide repair or replacement for other’s products or parts only to the extent provided in and honored by the original manufacturer’s warranty to Seller, in each case subject to the limitations contained in the original manufacturer’s warranty.

No claim for transportation, labor, or special or consequential damages or any other loss, cost or damage is being provided in this limited warranty. You shall be solely responsible for determining suitability for use and in no event shall Seller be liable in this respect.

This limited warranty does not warrant that any Seller product or part is resistant to corrosion, erosion, abrasion or other sources of failure, nor does Seller warrant a minimum length of service.

Your failure to give written notice to us of any alleged defect under this warranty within twenty (20) days of its discovery, or attempts by someone other than Seller or its authorized representatives to remedy the alleged defects therein, or failure to return product or parts for repair or replacement as herein provided, or failure to store, install, or operate said products and parts according to the recommendations and instructions furnished by Seller shall be a waiver by you of all rights under this limited warranty.

This limited warranty is voided by any misuse, modification, abuse or alteration of Seller’s product or part, accident, fire, flood or other Act of God, or your failure to pay entire contract price when due.

The foregoing limited warranty shall be null and void if, after shipment from our factory, the item is modified in any way or a component of another manufacturer, such as but not limited to; an actuator is attached to the item by anyone other than a Seller factory authorized service personnel.

All orders accepted shall be deemed accepted subject to this limited warranty, which shall be exclusive of any other or previous warranty, and this shall be the only effective guarantee or warranty binding on Seller, despite anything to the contrary contained in the purchase order or represented by any agent or employee of Seller in writing or otherwise, notwithstanding, including but not limited to implied warranties.

THE FOREGOING REPAIR AND REPLACEMENT LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, OBLIGATIONS AND LIABILITIES, INCLUDING, BUT NOT LIMITED TO, ALL WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR OF MERCHANTABILITY OR OTHERWISE, EXPRESSED OR IMPLIED IN FACT OR BY LAW, AND STATE SELLER’S ENTIRE AND EXCLUSIVE LIABILITY AND YOUR EXCLUSIVE REMEDY FOR ANY CLAIM IN CONNECTION WITH THE SALE AND FURNISHING OF SERVICES, GOODS OR PARTS, THEIR DESIGN, SUITABILITY FOR USE, INSTALLATION OR OPERATIONS. NEITHER ANY PERFORMANCE OR OTHER CONDUCT, NOR ANY ORAL OR WRITTEN INFORMATION, STATEMENT, OR ADVICE PREPARED BY SELLER OR ANY OF OUR EMPLOYEES OR AGENTS WILL CREATE A WARRANTY, OR IN ANY WAY INCREASE THE SCOPE OR DURATION OF THE LIMITED WARRANTY.

Disclaimer

Metric fasteners should not be used with ASME Class 150/300 bolt holes and flange bolt patterns. If you use metric fasteners with ASME Class 150/300 bolt holes and flange bolt patterns, it may lead to product failure, injury, and loss of life. DeZURIK Inc. disclaims all liability associated with the use of metric fasteners with ASME Class 150/300 bolt holes and flange patterns, including but not limited to personal injury, loss of life, loss of product, production time, equipment, property damage, lost profits, consequential damages of any kind and environment damage and/or cleanup. Use of metric fasteners with ASME Class 150/300 bolt holes and flange bolt patterns is a misuse that voids all warranties and contractual assurances. If you use metric fasteners with ASME Class 150/300 bolt holes and flange bolt patterns, you do so at your sole risk and any liability associated with such use shall not be the responsibility of DeZURIK, Inc. In addition to the foregoing, DeZURIK’s Manufacturer’s Conditions apply.

Limitation of Liability

IN NO EVENT SHALL SELLER BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, PUNITIVE, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO; DAMAGE TO OR LOSS OF OTHER PROPERTY OR EQUIPMENT, BUSINESS INTERUPTION, COST OF SUBSTITUTE PRODUCTS, LOSS OF TIME, LOSS OF PROFITS OR REVENUE, COST OF CAPTIAL, LOSS OF USE, OR DIMINUTION IN VALUE) WHATSOEVER, AND SELLER’S LIABILITY, UNDER NO CIRCUMSTANCES, WILL EXCEED THE CONTRACT PRICE FOR THE GOODS AND/OR SERVICES FOR WHICH LIABILITY IS CLAIMED. ANY ACTION FOR BREACH OF CONTRACT BY YOU, OTHER THAN RIGHTS RESPECTING OUR LIMITED WARRANTY DESCRIBED ABOVE, MUST BE COMMENCED WITHIN 12 MONTHS AFTER THE DATE OF SALE.

Sales and Service

For information about our worldwide locations, approvals, certifications and local representative:

Web site: www.dezurik.com E-Mail: info@dezurik.com

250 Riverside Ave. N., Sartell, MN 56377 ● Phone: 320-259-2000 ● Fax: 320-259-2227

DeZURIK, Inc. reserves the right to incorporate our latest design and material changes without notice or obligation. Design features, materials of construction and dimensional data, as described in this manual, are provided for your information only and should not be relied upon unless confirmed in writing by DeZURIK, Inc. Certified drawings are available upon request.

December 2022

TAG: 20-FCV-301-1/2/3/4

May 30, 2022

SUBMITTAL

PROJECT NAME

360077 SUEZ ON V port

PURCHASE ORDER

VALVE TYPE

V-Port Ball Valve (VPB)

CONTRACTOR: CAN

LOCAL SUPPLIER: CAN

MANUFACTURER: DeZURIK
250 RIVERSIDE AVE NORTH
SARTELL, MN 56377
(320) 259-2000

Quote Number: 272805

I.D. (Rep. Use) 360077 SUEZ ON V port

TABLE OF CONTENTS

A Data Sheet is included for each line item on the purchase order.
Document numbers are listed at the bottom of the Data Sheet.
Any one drawing may apply to more than one item number.
All documents are assembled in alpha/numeric order within each section

- DATA SHEETS
- INSTALLATION DRAWINGS & CROSS SECTION DRAWINGS

Submittal Data Sheet

Date: 05/30/2022

CAN

QUOTE NUMBER 272805
I.D. (Rep. Use) 360077 SUEZ ON V port
REV

PROJ. 360077 SUEZ ON V port

Fact. ITEM	Cust. ITEM	QTY	DESCRIPTION
1		4	

Style	V-Port Ball Valve
Size	14 Inch (350mm)
End Connection	Class 150; Flanged Drilling; ISA 75.08.02 and IEC 534-3-2F-F
Body Material	317 Stainless Steel
Packing	PTFE Chevron; Temperature to 500 Degree F. (260 Degree C.)
Ball Material	317 SST; Heat Treated; Electroless Nickel Overlay to 700 Degree F.
Shaft	2205 Duplex Stainless Steel
Seat Type	Rigid 317 Stainless Steel; Heat Treated; Electroless Nickel Overlay; Temperature to 450 Degree F.
Bushing	317 SST Wire Mesh Encapsulated in PTFE Liner to 500 Degree F.
Coating or Paint	4 mils minimum (non-stainless steel parts) of Blue DeZURIK Epoxy (NSF Std. 61) on Exterior with Standard (SP10) surface prep
Actuator Type	PowerRac Cylinder; 8 In Dia

Submittal Data Sheet

Date: 05/30/2022

CAN

QUOTE NUMBER 272805
I.D. (Rep. Use) 360077 SUEZ ON V port
REV

PROJ. 360077 SUEZ ON V port

Fact. ITEM	Cust. ITEM	QTY	DESCRIPTION
2		4	

Style	V-Port Ball Valve
Size	14 Inch (350mm)
End Connection	Class 150; Flanged Drilling; ISA 75.08.02 and IEC 534-3-2F-F
Body Material	Carbon Steel
Packing	PTFE Chevron; Temperature to 500 Degree F. (260 Degree C.)
Ball Material	317 SST; Heat Treated; Electroless Nickel Overlay to 700 Degree F.
Shaft	2205 Duplex Stainless Steel
Seat Type	Rigid 317 Stainless Steel; Heat Treated; Electroless Nickel Overlay; Temperature to 450 Degree F.
Bushing	317 SST Wire Mesh Encapsulated in PTFE Liner to 500 Degree F.
Coating or Paint	4 mils minimum (non-stainless steel parts) of Blue DeZURIK Epoxy (NSF Std. 61) on Exterior with Standard (SP10) surface prep
Actuator Type	PowerRac Cylinder; 8 In Dia

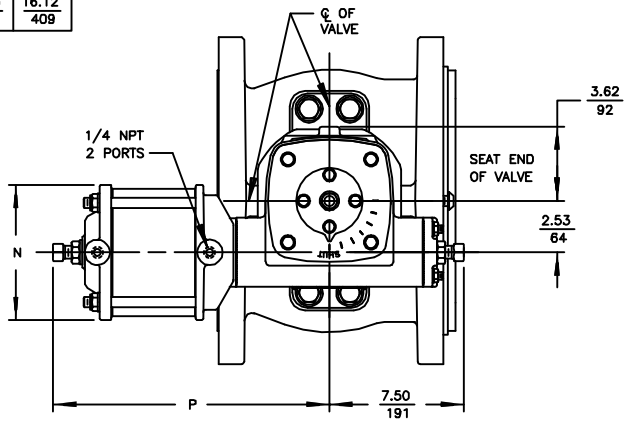
VALVE SIZE		DIMENSIONS INCHES / MILLIMETERS											
		A		B	C	D	E	F	G		H	J	K	
IN	MM	ISA	ASME										ISA	ASME
10	250	11.69 / 297	13.00 / 330	5.50 / 140	8.91 / 226	9.50 / 241	13.38 / 340	1.31 / 33	12	1.00 / 25	14.25 / 362	16.00 / 406	1.88 / 48	3.19 / 81
12	300	13.31 / 338	14.00 / 356	6.38 / 162	9.91 / 252	10.50 / 267	14.38 / 365	1.38 / 35	12	1.00 / 25	17.00 / 432	19.00 / 483	1.94 / 49	2.62 / 67
14	350	15.75 / 400		7.50 / 191	10.86 / 276	11.47 / 291	15.34 / 390	1.50 / 38	12	1.12 / 28	18.75 / 476	21.00 / 533	2.31 / 59	
16	400	15.75 / 400		6.69 / 170	13.25 / 337	14.06 / 357	17.56 / 446	1.62 / 41	16	1.12 / 28	21.25 / 540	23.50 / 597	2.69 / 68	
18	450	18.00 / 457		7.62 / 194	14.44 / 367	15.25 / 387	18.75 / 476	1.75 / 44	16	1.25 / 32	22.75 / 578	25.75 / 654	2.81 / 71	

ACTUATOR NUMBER	DIMENSIONS INCHES / MILLIMETERS		
	M	N	P
PR_–R2_–PC6	3.38 / 86	6.62 / 168	16.00 / 406
PR_–R2_–PC8	4.81 / 122	10.25 / 260	16.12 / 409

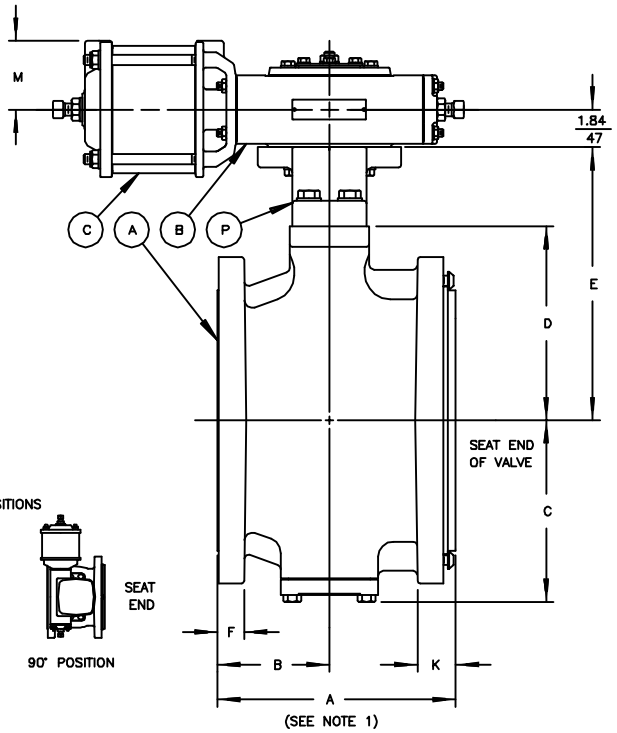
A	VALVE
B	ACTUATOR
C	CYLINDER
P	CONNECTING PARTS

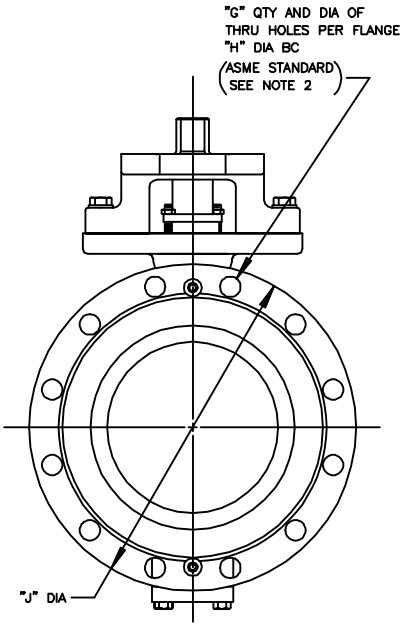
NOTE:

1. FACE TO FACE DIMENSIONS PER ASME STANDARD B16.10 (F1L) OR ISA STANDARD 75.08.02 (F1S).
2. SEE A40129 FOR NON–ASME FLANGE DRILLING.

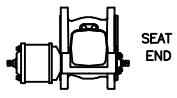


NOTICE
THIS DRAWING DOES NOT SHOW ACTUATOR ACCESSORIES. IF ACCESSORIES ARE REQUIRED, REFER TO THE APPROPRIATE ACCESSORY INSTALLATION DRAWING FOR DIMENSIONS AND OTHER RELATED INFORMATION.



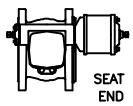


ACTUATOR MOUNTING POSITIONS

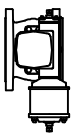


STANDARD POSITION SHOWN ON THIS DRAWING

90° POSITION



180° POSITION



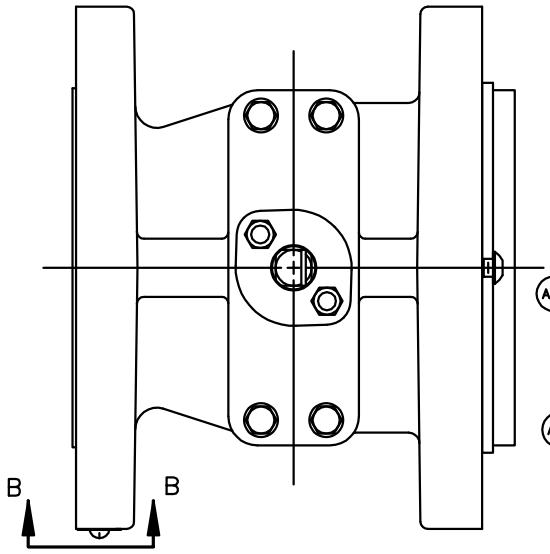
270° POSITION

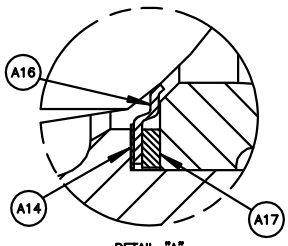
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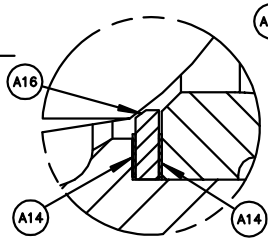
VPB V–PORT BALL VALVES (F1L)(F1S) SIZE 10–18 CL150 FLANGED POWERRACK PR_–R2_–PC_ PNEUMATIC CYLINDER ACTUATOR

DOCT. CODE	DRAWN	APPROVED	
C1	JS	FC	A41883
	CHECKED TNB	DATE 01–28–93	

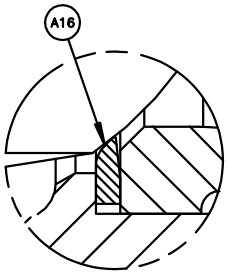




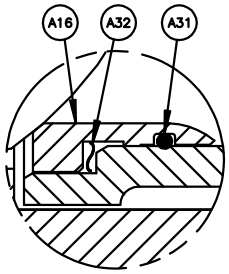
DETAIL "A"
SHOWING FLEX METAL SEAT
(ENLARGED)



DETAIL "A"
SHOWING CLEARANCE SEAT
(ENLARGED)



DETAIL "A"
SHOWING PTFE SEAT
(ENLARGED)

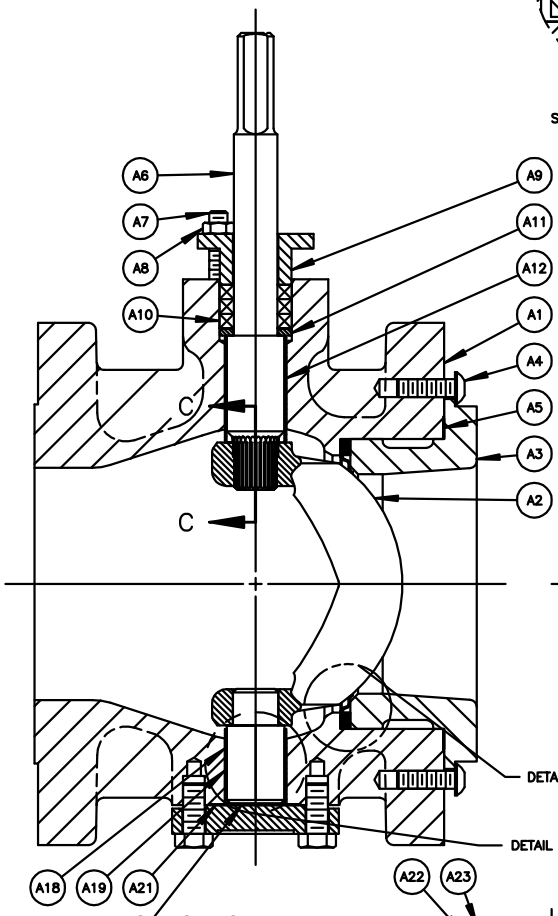


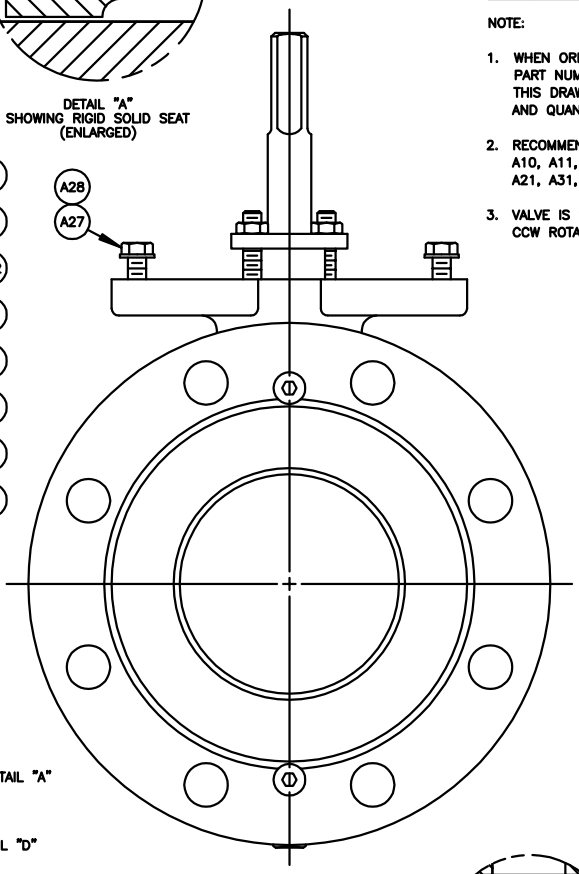
DETAIL "A"
SHOWING RIGID SOLID SEAT
(ENLARGED)

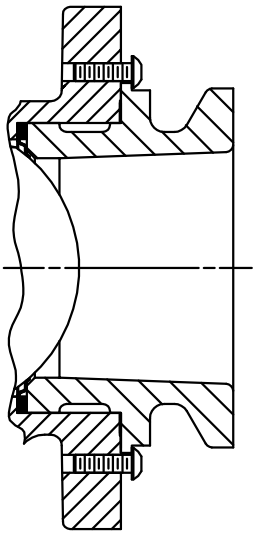
NO	PART NAME	QTY
A1	BODY	1
A2	BALL	1
A3	RETAINER	1
A4	SCREW	2
A5	GASKET (RETAINER)	1
A6	SHAFT UPPER	1
A7	STUD	2
A8	NUT	2
A9	GLAND	1
A10	PACKING	–
A11	THRUST WASHER	1
A12	BEARING UPPER (BODY)	1
A13	SET SCREW	1
A14	GASKET (FLEX METAL SEAT)	1
A14	GASKET (CLEARANCE SEAT)	2
A16	SEAT	1
A17	GASKET (FLEX METAL SEAT)	1
A18	SHAFT LOWER	1
A19	BEARING LOWER (BODY)	1
A20	THRUST BEARING (EXCEPT HARD BRG)	1
A21	GASKET (COVER)	1
A22	COVER	1
A23	SCREW (1" – 4" VALVES)	2
A23	SCREW (6" – 20" VALVES)	4
A24		
A25		
A26		
A27	SCREW	4
A28	LOCKWASHER	4
A29	TAG, (1" – 12" CLASS 300 VALVES)	1
A30	SCREW (1" – 12" CLASS 300 VALVES)	2
A31	SEAL (SOLID METAL SEAT)	1
A32	SPRING (SOLID METAL SEAT)	1
A33	SEAL (INNER) (SEALED BRG ONLY)	2
A34	SEAL (OUTER) (SEALED BRG ONLY)	2

NOTE:

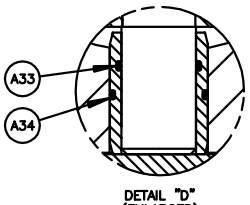
1. WHEN ORDERING PARTS, INCLUDE VALVE SIZE AND PART NUMBER FROM DATA PLATE. ALSO INCLUDE THIS DRAWING NUMBER WITH PART NAME, NUMBER AND QUANTITY.
2. RECOMMENDED SPARE PARTS ARE ITEMS NO A5, A10, A11, A12, A14, A16, A17, A19, A20, A21, A31, A33 AND A34. (ADD A2 FOR TUNGSTEN TRIM)
3. VALVE IS SHOWN IN CLOSED POSITION. CCW ROTATION OF UPPER SHAFT OPENS VALVE.



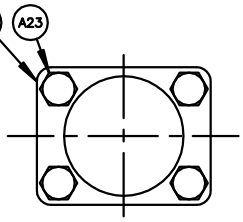




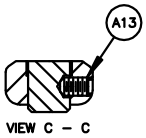
VIEW SHOWING
OPTIONAL LONG RETAINER
1" – 12" CLASS 150 ONLY



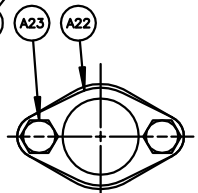
DETAIL "D"
(ENLARGED)



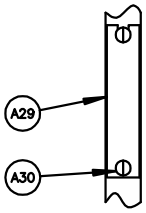
6" – 20" VALVES



VIEW C – C



1" – 4" VALVES



VIEW B–B

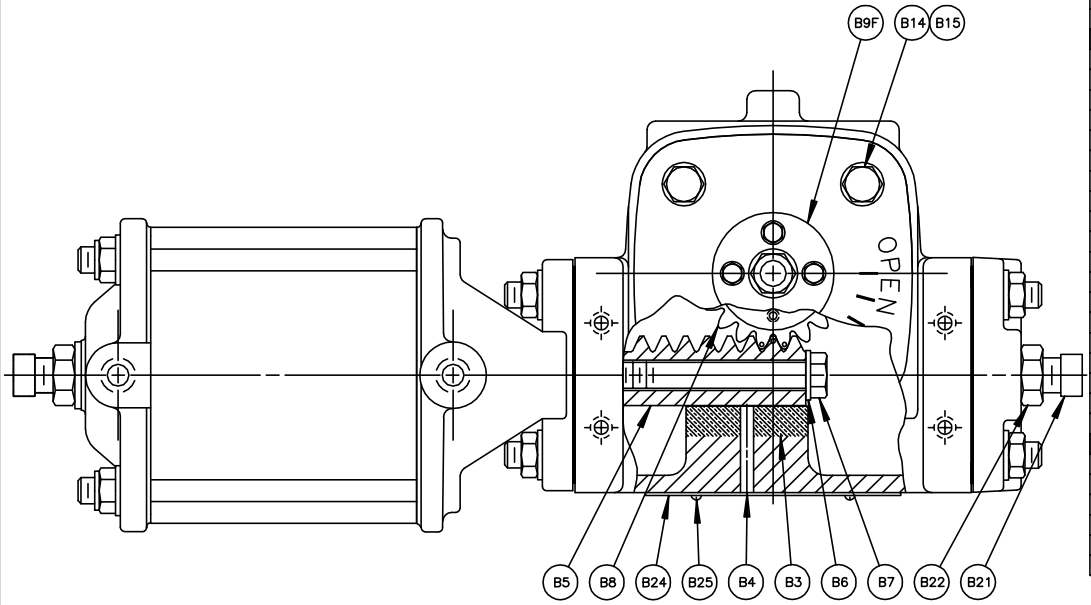
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03/14/17	03/14/17	07/11/16	02/28/16	06/17/10	12/27/06	12/29/05	

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VALVE ASSEMBLY
1 – 20 V-PORT BALL VALVES, FLANGED

DOCT. CODE	DRAWN	APPROVED	
C1	CHECKED RJP	DATE 11/02/94	A45077

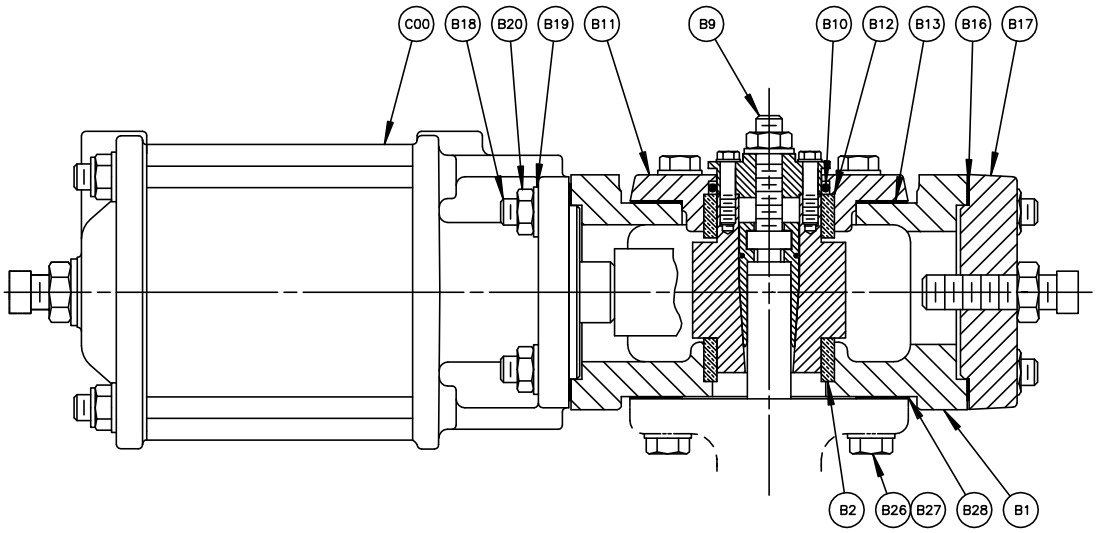
NO	PART NAME	QTY
B1	HOUSING	1
B2	BEARING (HOUSING)	1
B3	RACK BEARING	1
B4	PIN	1
B5	RACK	1
B6	LOCKWASHER	1
B7	SCREW (RACK)	1
B8	GEAR	1
B9	COLLET ASSEMBLY	1
B9A	ADJUSTING SCREW	1
B9B	WEDGE	4
B9C	O-RING (R1 ACTUATOR)	2
B9C	O-RING (R2 ACTUATOR)	1
B9D	NUT	1
B9E	LOCKWASHER	1
B9F	POINTER	1
B9G	SCREW	4
B9H	WASHER	4
B10	O-RING	1
B11	TOP COVER	1
B12	BEARING (TOP COVER)	1
B13	GASKET (TOP COVER)	1
B14	WASHER	4
B15	SCREW	4
B16	GASKET (END COVER)	2
B17	END COVER	1
B18	STUD	8
B19	LOCKWASHER	8
B20	NUT	8
B21	STOP SCREW	1
B22	JAM NUT	1
B23		
B24	DATA PLATE	1
B25	DRIVE SCREW	2
B26	SCREW	4
B27	LOCKWASHER	4
B28	GASKET	1
C00	CYLINDER ASSEMBLY	1

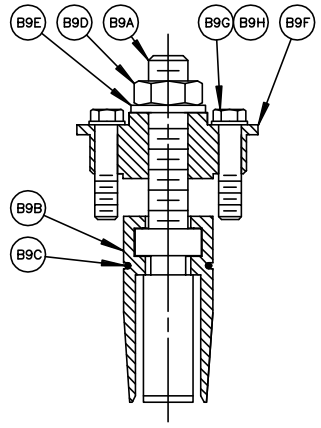


NOTE:

1. WHEN ORDERING PARTS, INCLUDE VALVE SIZE AND PART NUMBER FROM DATA PLATE. ALSO INCLUDE THIS DRAWING NUMBER WITH PART NAME, NUMBER AND QUANTITY.

2. RECOMMENDED SPARE PARTS ARE ITEMS NO B9C, B10, B13, B16 AND B28.





COLLET ASSEMBLY (B9)
(VIEW ENLARGED)

J	61881	10/08/15
H	61881	02/12/10
G	50312	06/14/96
F	52892	06/14/95
E	51951	05/22/92
D	51893	03/26/92
C	50312	12/17/91
B	50312	11/05/91
A	50312	10/22/91

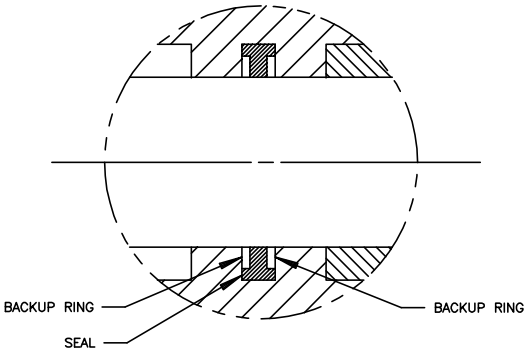
DeZURIK
Sartell, MN USA 56377
www.dezurik.com

PR_-R___-PC_ POWERRAC DOUBLE ACTING
CYLINDER ACTUATOR ASSEMBLY
FOR USE WITH VALVES WITH SQUARE SHAFT

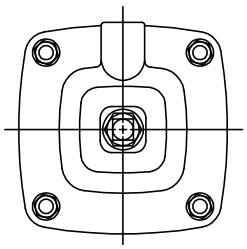
DOCT. CODE	DRAWN	APPROVED
C1	SN	DT
	CHECKED TNB	DATE 09-04-91

A37260

NO	PART NAME	QTY
C1	CYLINDER HEAD	1
C2	BEARING	1
C3	ROD SEAL (1 SEAL AND 2 BACKUP RINGS)	1
C4	PISTON ROD	1
C5	O-RING (CYLINDER TUBE)	2
C6	TUBE	1
C7	PISTON	1
C8	O-RING (PISTON)	1
C9	SEAL (PISTON)	1
C10	NUT	1
C11	CYLINDER CAP	1
C12	TIE ROD (PC4 & PC6 CYL)	4
C12	TIE ROD (PC8 CYL)	6
C13	WASHER (PC4 & PC6 CYL)	4
C13	WASHER (PC8 CYL)	6
C14	O-RING (PISTON ROD)	1
C15	LOCK NUT (PC4 & PC6 CYL)	4
C15	LOCK NUT (PC8 CYL)	6
C16	THREAD SEAL (CYLINDER CAP)	–
C17	JAM NUT	1
C18	SET SCREW	1



DETAIL 'B'
SHOWING ROD SEAL ITEM C3

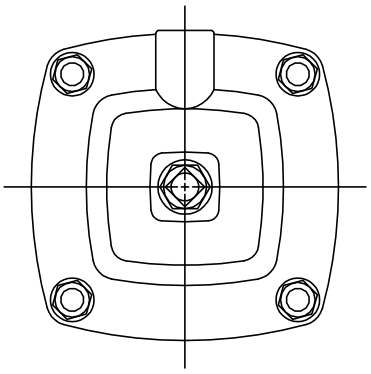


PC4 CYLINDER

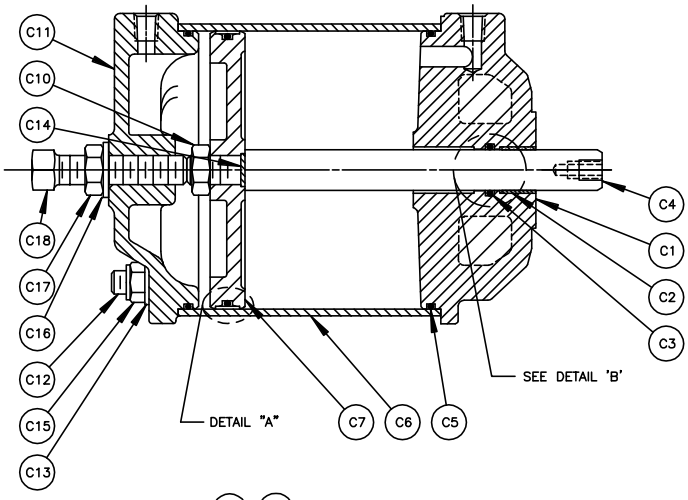
NOTE:

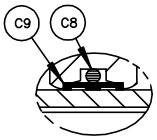
1. WHEN ORDERING PARTS, INCLUDE VALVE SIZE AND PART NUMBER FROM DATA PLATE. ALSO INCLUDE THIS DRAWING NUMBER WITH PART NAME, NUMBER AND QUANTITY.

2. RECOMMENDED SPARE PARTS ARE ITEMS NO C3, C5, C8, C9, C14 AND C16.

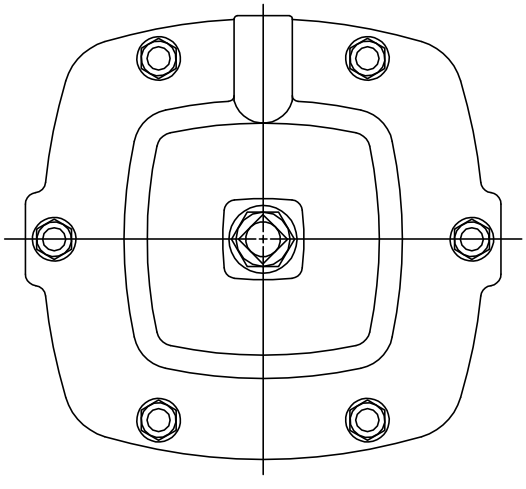


PC6 CYLINDER





DETAIL "A"



PC8 CYLINDER

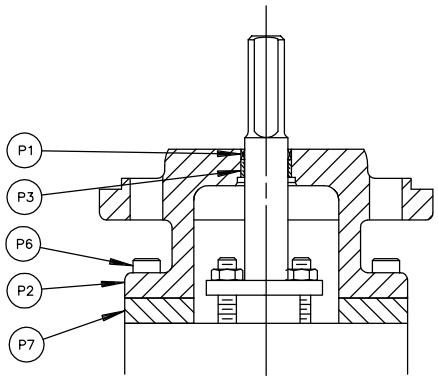
G	F	E	D	C	B	83156	03/07/16	
					A	50312	01/30/92	

DeZURIK
Sartell, MN USA 56377
www.dezurik.com

PC4, PC6 & PC8 CYLINDER ASSEMBLY FOR USE WITH POWER RAC DOUBLE ACTING CYLINDER ACTUATORS

DOCT. CODE	DRAWN	APPROVED	A37259
C1	SN	DT	
	CHECKED TNB	DATE 09-04-91	

NO	PART NAME	QTY
P1	SEAL (SEE NOTE 3)	1
P2	ADAPTER	1
P3	BEARING (SEE NOTE 3)	1
P4		
P5	GASKET (S2, IS_ SEATS ONLY)	1
P6	SCREW	4
P7	SPACER (14" CLASS 150 ONLY)	2

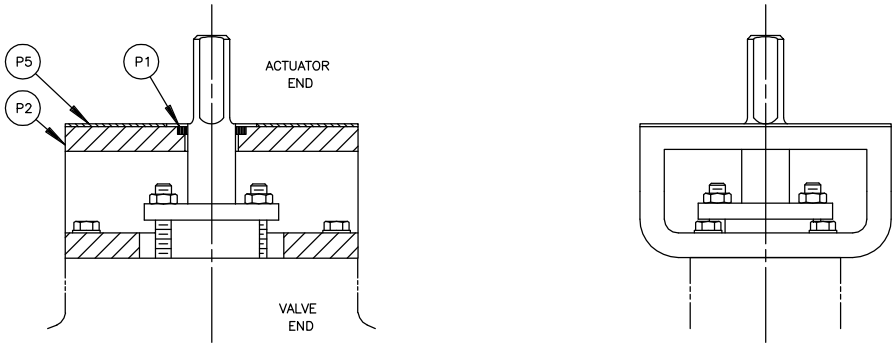


BHP VALVE WITH DR55 AND DR85 ACTUATORS

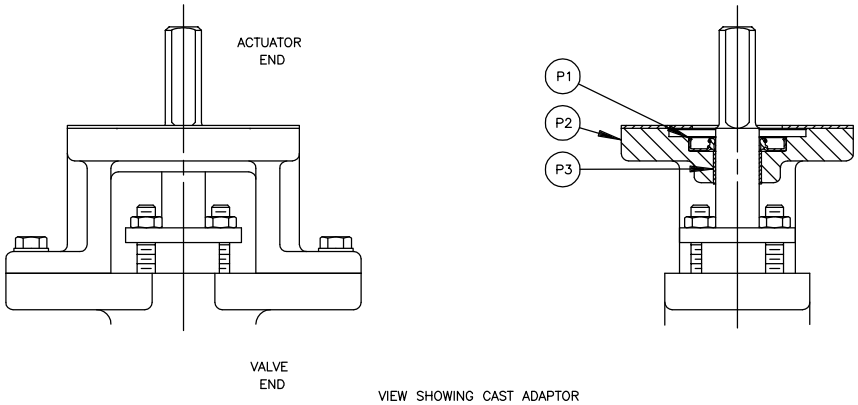
NOTE:

1. WHEN ORDERING PARTS, INCLUDE VALVE SIZE AND PART NUMBER FROM DATA PLATE. ALSO INCLUDE THIS DRAWING NUMBER WITH PART NAME, NUMBER AND QUANTITY.
2. RECOMMENDED SPARE PARTS ARE ITEMS NO. P1 & P5.
3. ITEM P1 (SEAL) IS USED WITH DIAPHRAGM DR40/55/85 AND POWERRAC PR ACTUATORS ONLY.

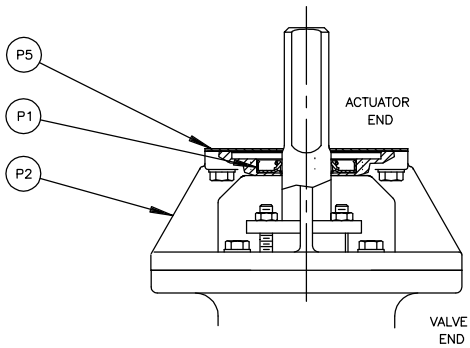
   ITEM P3 (BEARING) IS USED WITH LEVER AND DIAPHRAM DR55_ & DR85_ ACTUATORS ONLY.



VIEW SHOWING FABRICATED ADAPTOR



VIEW SHOWING CAST ADAPTOR



VIEW SHOWING ADAPTOR FUW BHP VALVES

K	50312	1/28/16
J	50312	02/19/02
H	60110	01/02/02
G	54088	12/04/97
F	50312	08/09/95
E	50896	01/06/95
D	52896	09/19/94
C	52753	04/29/94
B	52492	04/29/94
A	51960	06/11/92

DeZURIK
Sartell, MN USA 56377
www.dezurik.com

CONNECTING PARTS FOR USE WITH LEVER, POWERRAC, MANUAL GEAR AND DIAPHRAGM ACTUATORS ON VPB, RCV AND BHP VALVES

DOCT. CODE	DRAWN	APPROVED
C1	SN	JEB
	CHECKED TNB	DATE 09-19-91

A-39819

DeZURIK
APCO | HILTON

BULLETIN
JUNE 2020

15.00-1

DeZURIK VPB V-PORT BALL VALVES



VPB V-Port Ball Valves

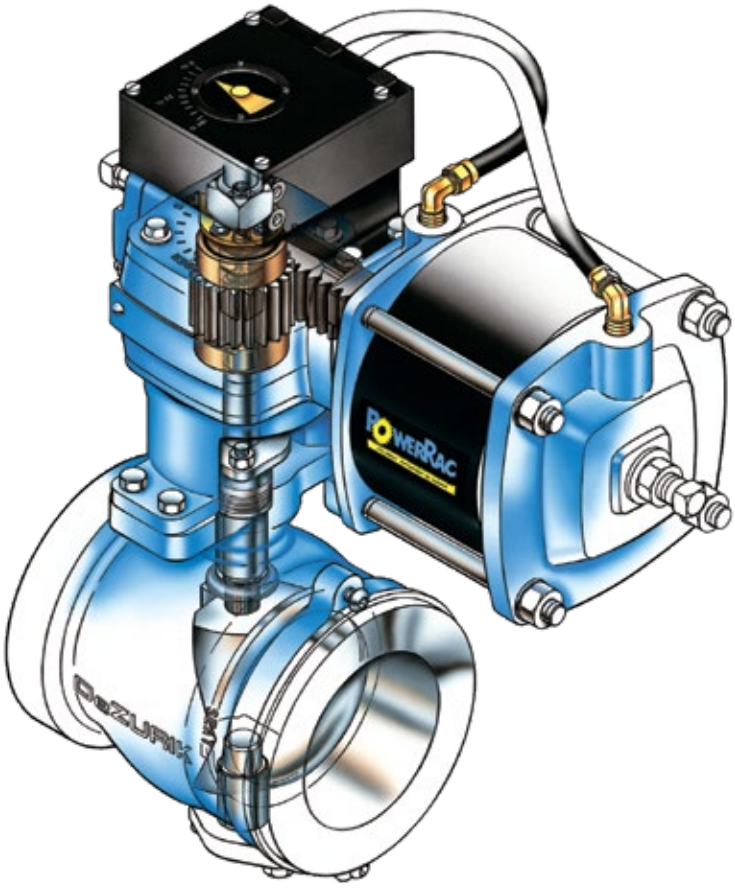
Design and Construction

DeZURIK V-Port Ball valves deliver superior performance and reliability required to optimize process performance. This versatile valve is designed for control of fibrous suspension applications, plus clean, dirty, viscous and corrosive liquids and gases.

The VPB has an ASME 150 class valve in size range 1-20" and an ASME 300 class valve in size range 1-12". DeZURIK V-Port Ball valves feature one-piece body construction and are available in flanged or flangeless end connections. They conform to or exceed North American and International Standards for control valves. Superior control performance is designed into the geometry of the ball for critical management of flow. A locked ball-to-shaft connection ensures no lost motion for critical control. Bearings, covers and fasteners are designed for maximum valve reliability.

When operated by a high quality DeZURIK actuator and controlled by one of many high performing positioners, the DeZURIK V-Port Ball control valve can deliver control accuracy exceeding 0.5% as measured by the Benchmark Control Valve Diagnostics™ System. Control accuracy will increase process plant efficiency, improve overall profitability and reduce control valve life-cycle costs.





In the event maintenance is needed, DeZURIK's unique design facilitates fast, easy breakdown and assembly of valve components with no special tools required. The result is reduced maintenance time and the lowest overall cost of ownership.

Drop-in-place, self-aligning and interchangeable seat options offer ease in maintenance. Available seat options include reinforced PTFE, flexible metal, rigid metal and clearance.

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Streamlined Flow Passages

DeZURIK V-Port Ball valves feature a streamlined flow passage, providing maximum efficiency (Cv/Kv per valve size) and minimizing erosion inside the valve body.

Rugged, Easy-to-Maintain Construction

The heavy-duty cast body is a one-piece design for increased installed-pipe integrity and minimal potential leak paths. Stainless steel construction combined with drop-in seats and a splined shaft and ball connection makes the DeZURIK V-Port Ball valve easy to maintain.

Carbon Steel and High Alloy Valves Available

VPB valve bodies are available in 316 and 317 stainless steel, carbon steel and Hastelloy C.

Laying Length Flexibility

DeZURIK VPB valves offer the ultimate in face-to-face flexibility. The solid one-piece body is available in either ASME B16.10 or ANSI/ISA take-out dimensions. V-Port Ball valves are available in flanged or flangeless construction to meet individual requirements and common piping standards. For added versatility, these valves meet IEC, ISO and EN face-to-face dimensions. In plants that have an installed base of both ASME B16.10 and ANSI/ISA control valves, VPB users have been able to minimize storeroom inventory by stocking valve bodies, ANSI/ISA retainers and ASME B16.10 retainers. A replacement valve with either face-to-face dimension can be quickly installed. DeZURIK also offers an integrally flanged one-piece ASME B16.10 body. Laying length flexibility is just another example of how the VPB can save money.

International Flange Drilling

DIN 10, 16, 25 and 40, and JIS 10, 16 and 20 flange drilling bolt circle options are available in addition to ASME B16.5.



Uninterrupted Gasket Surface

V-Port Ball valves feature a full, uninterrupted, raised-face gasket surface that provides maximum gasket integrity. The gasket surface provides full seal contact area with ASME B16.20 gaskets.

Self-Aligning Ball and Seat

The self-aligning ball and seat on the VPB valve reduces lengthy setup time during repair and reassembly. Valves can easily be returned to like-new performance without time-consuming special procedures. And, because of the spring-loaded metal seat design, the ball and seat self-compensate for wear on either surface.



Common Valve Components

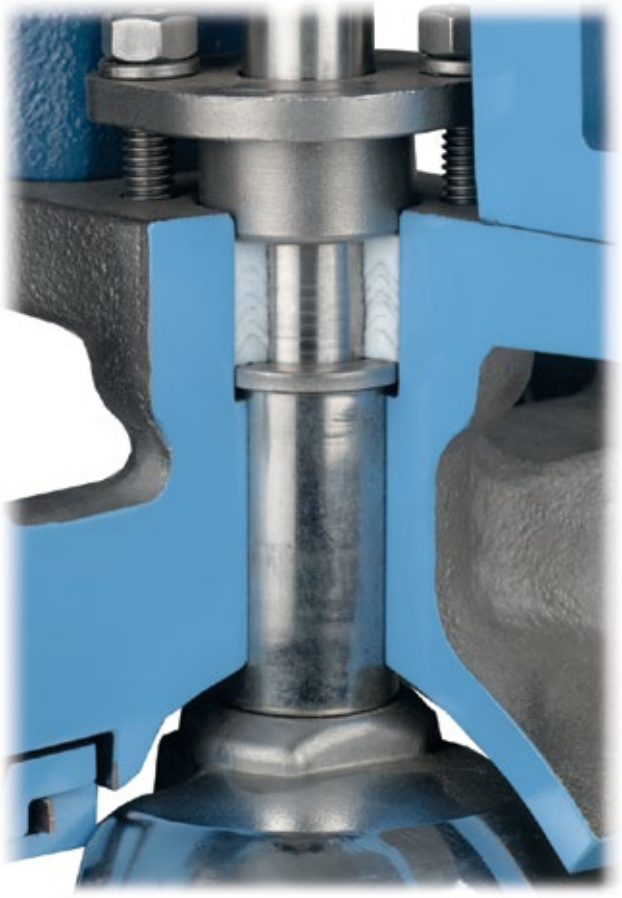
DeZURIK's V-Port Ball valve was designed to share a majority of valve components with the DeZURIK RCV Rotary Control valve. The two valves use the same bodies, packing components, bearings, brackets and fasteners. The common components reduce spare parts in inventory requirements and associated costs for plants utilizing both styles of DeZURIK control valves.

Stainless Steel Fasteners

As standard, all DeZURIK V-Port Ball valve fasteners are stainless steel, providing easy disassembly. An additional maintenance feature is a bottom access cover for valve disassembly and reassembly.

Streamlined Maintenance

DeZURIK V-Port Ball valves feature the simplest maintenance procedures among control valves available. There are no threaded trim parts. The seat retainer and trim components drop in place ensuring precise alignment of plug and seat. Disassembly and reassembly are easily completed with no special wrenches or other tools required. On viscous and suspended fibrous services where routine maintenance is expected, the VPB's drop-in trim, optional sealed bearings and self-aligning ball/seat reduce maintenance costs and minimize lost production.





V-Ball Design

Utilizing computer-aided design and extensive flow-loop testing, the v-orifice was designed to provide the high rangeability and precision throttling required on fibrous suspension applications, as well as clean or dirty liquids and gases.

The straight through flow passage provides maximum efficiency and excellent erosion resistance. The ball can be furnished with a range of high-alloy materials, all provided with a heat-treated nickel overlay. This overlay provides a non-porous and lubricous surface, resulting in greater corrosion resistance and less sliding friction. For abrasive and high temperature applications, a 317 stainless steel ball can be furnished with a tungsten carbide overlay or a Hastelloy C ball with nickel overlay can be provided.

Sealed Bearings

The sealed-bearing option prevents media from entering the bearing areas, which can hinder valve operation. PFA Fluoropolymer or FFKM Perfluoroelastomer seals are available for bearings that need exceptional protection from scaling, plating, abrasive or polymerizing media.





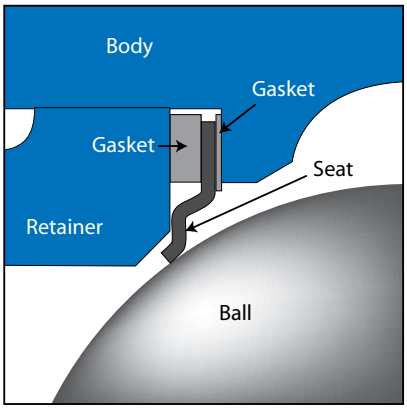
Corrosion-Resistant Bearings

The one-piece bearing provides a large area of radial support to the shaft. The shaft is fully supported, greatly reducing shaft fatigue. The 317 stainless steel wire mesh reinforced PTFE bearing has a low coefficient of friction that minimizes operating torques and reduces actuator sizing requirements. For severe-service applications, a cobalt-chromium alloy bearing is available. A sealed-bearing option is also available.

Splined Shaft with Solid Ball-to-Shaft Connection

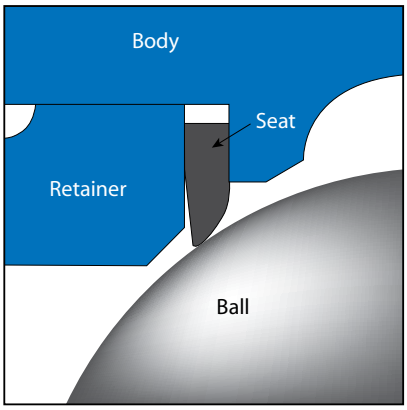
The splined shaft and ball with locking torque screw on DeZURIK V-Port Ball valves provide a high-strength, positive connection that effectively eliminates mechanical backlash and hysteresis. The splined connection with locking torque screw ensures accurate, precise positioning of the ball. The machined diameter of the shaft provides blow-out proof protection.

Seat Options



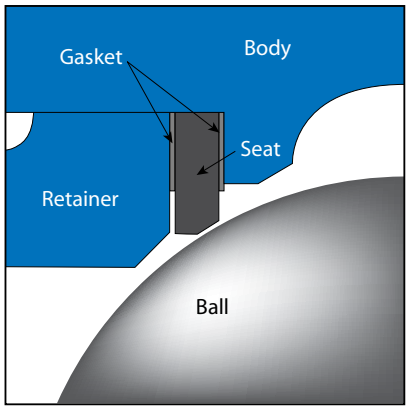
Flexible Metal Seat

The flexible metal seat is designed to shear fibrous fluids and provides shutoff up to ANSI/FCI 70.2 Class IV standard. Flexible metal seats are rated to the full valve pressure rating with the valve installed in the flow-to-open direction and rated to 150 psi (1030 kPa) pressure differential when installed in the flow-to-close direction.



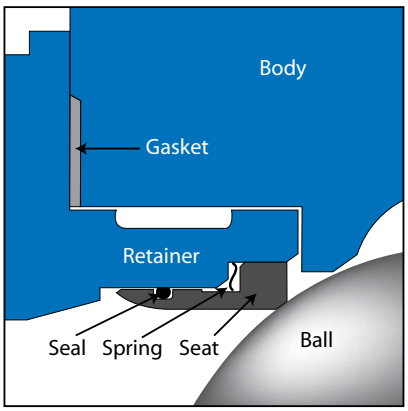
Reinforced PTFE Seat

Reinforced PTFE seats are typically used on clean fluid applications where ANSI/FCI 70.2 Class VI shutoff is required. DeZURIK V-Port Ball valves feature a reinforced PTFE seat, designed for flow-to-open operation, rated to 285 psi (1895 kPa) pressure differential. For added versatility, all V-Port Ball valve seat options are field-interchangeable.



Clearance Seat

The clearance seat provides maximum controllability and minimum hysteresis in applications that do not require tight shutoff. This bi-directional seat eliminates seat friction. Shutoff is 5% of valve's maximum flow when closed.



Rigid Seat

Rigid seats are available for abrasive application including reclaimed fiber systems and applications with suspended chemical solids. The rigid seat provides shutoff performance to ANSI/FCI 70.2 Class IV. Materials include 317 stainless steel and Hastelloy C, all with heat treated nickel overlay. For enhanced abrasion resistance, a 317 stainless steel seat with tungsten carbide seating surface and solid Cobalt-Chromium alloy bearing is available.

An optional nickel-chromium spring can be substituted for the 17-7 PH stainless steel seat spring when added corrosion resistance is required.

The rigid seat is designed for flow-to-open operations and is field-interchangeable with the reinforced PTFE, flexible metal and clearance seats.

Intelligent Positioners

Digital positioners can be used in a conventional 4-20 mA, analog control environment. They can also be used with HART, Foundation Fieldbus, or Profibus communication protocols bringing you access to diagnostic capabilities that will allow you to ensure your process is operating at its peak effectiveness.



DeZURIK P30A



DeZURIK P85

Throttling Control

The V-Port Ball valve design ensures unsurpassed accuracy over the 90° range of operation. Splined and locked ball-to-shaft connection, computer-designed ball, characterized v-port, low-friction bearings and low-friction packing combine to give superior control, including fast, accurate response to signal changes. These rigid connections effectively eliminate mechanical backlash and hysteresis.

The V-Port Ball valve with a high quality DeZURIK actuator and one of many high performing positioners will exceed 0.5% control accuracy, delivering over 200 discrete positions. This exceeds industry valve dynamic performance standards as well as the accuracy levels of most alternative pneumatically actuated control valves.

To enhance accuracy of the VPB in real world process systems, the control valve assembly can be fitted with a smart digital positioner that not only provides near zero air bleed but also can be used in control systems using HART, Foundation Fieldbus, or Profibus protocols. This allows precise control and feedback of valve performance to the Distributed Control System (DCS).

Performance Testing

Control valve performance is tested with a BenchMark Control Valve Diagnostic™ system. Each valve has a discrete test result that can be referenced through the valve's serial number. V-Port Ball valve performance accuracy provides in excess of 200 repeatable positions. With routine maintenance, field monitoring or monitoring through a digital positioner, this performance level can be maintained throughout the life of the valve.

Control Valve Test Report

All VPB valve/actuator/positioner assemblies are tested for accuracy. The optional CVT Control Valve Test Report can be ordered which documents the response measurement from step inputs per ISA-75.25.01-2000 (R2010).

Actuator Flexibility Options

V-Port Ball valves are available with DeZURIK PowerRac® or Diaphragm actuators. The actuator top mounting pads or adapter brackets of currently manufactured DeZURIK rotary control and isolation valves (RCV, VPB, BHP) are compatible with the ISO 5211 standard. This common actuator platform increases flexibility and helps reduce spare parts inventory.



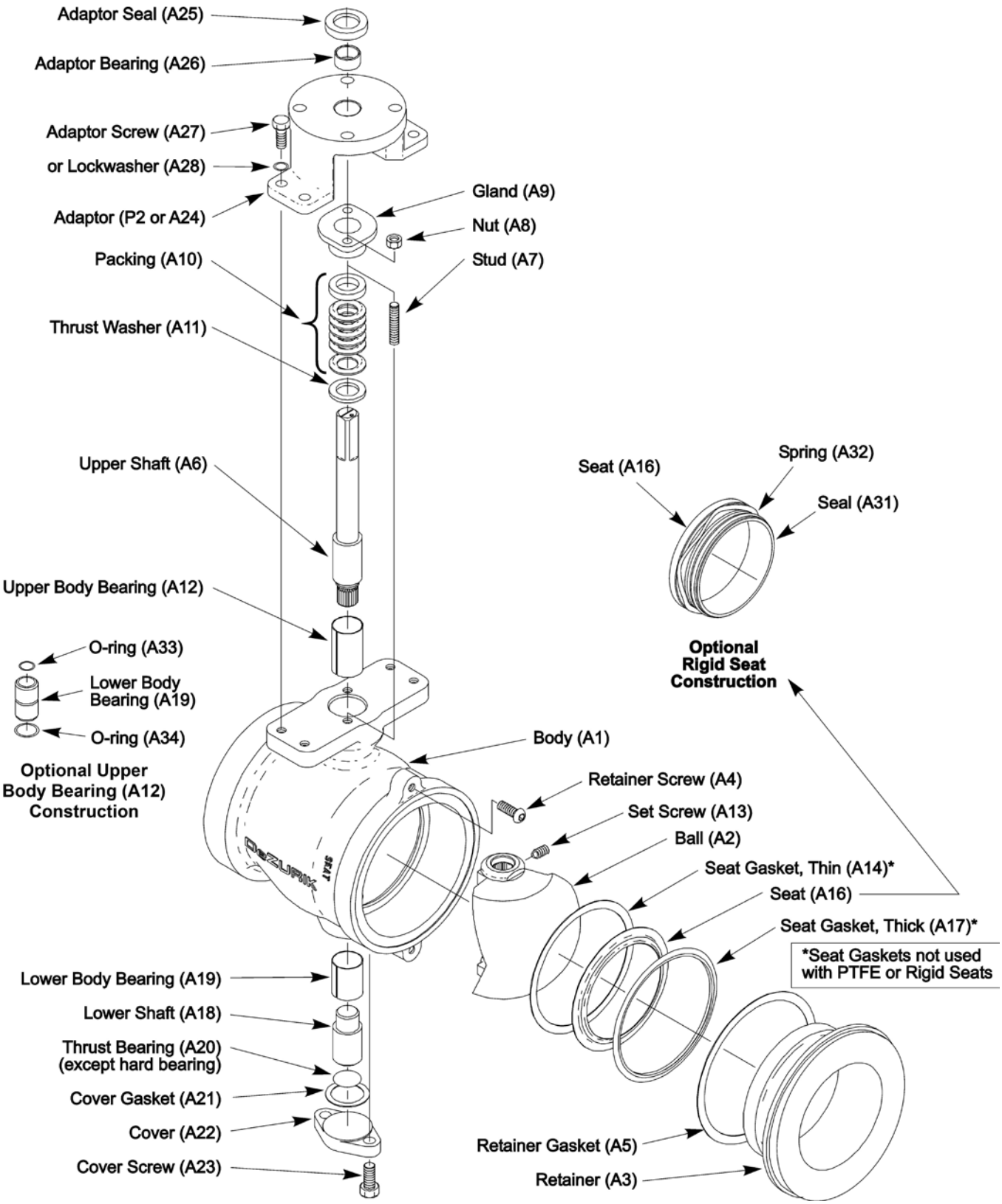
Close Coupling of Actuator to Valve

DeZURIK Diaphragm and PowerRac® actuators rigidly connect to the valve and the positioner on the actuator housing. This accurately feeds exact valve position directly to the positioner. In addition, the close coupling of the actuator to the valve makes the total package as compact as possible.

Accessories

A full line of accessories integrated to the actuator system is available to meet your individual mill/plant requirements.

Materials of Construction

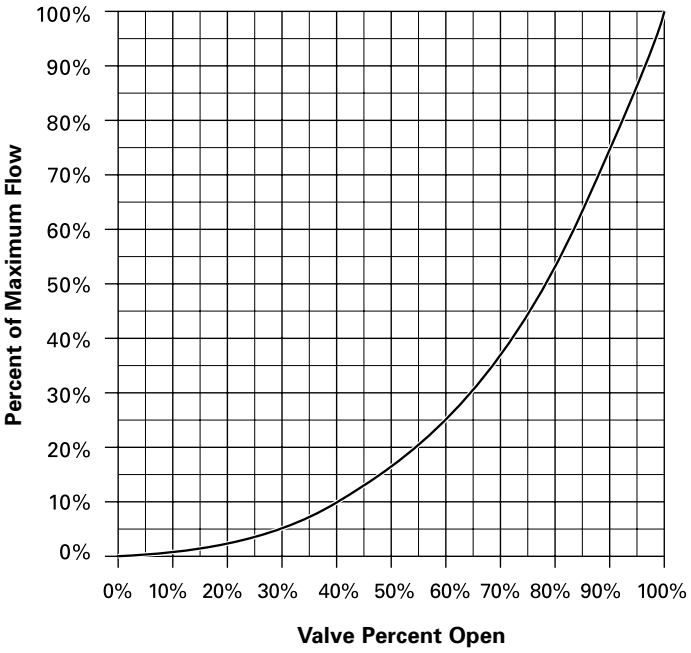


Materials of Construction

Item	Description	Order Code	Material
A1	Body	S2	316 Stainless Steel, ASTM A 351, Grade CF8M
		S3	317 Stainless Steel, ASTM A 351, Grade CG8M
		CS	Carbon Steel, ASTM A 216, Grade WCB
		HC	Hastelloy C, ASTM A 494, Grade CW2M
A2	Ball	S3NH	317 Stainless Steel, ASTM A 351, Grade CF8M, with Heat Treated Nickel Overlay
		S3S	317 Stainless Steel, ASTM A 351, Grade CF8M, with Tungsten Carbide Overlay
		HCNH	Hastelloy C, ASTM A494, Grade CW2M with Heat Treated Electroless Nickel Overlay
A3	Retainer	S2	316 Stainless Steel, ASTM A 351, Grade CF8M
		S3	317 Stainless Steel, ASTM A 351, Grade CG8M
		CS	Carbon Steel, ASTM A 216, Grade WCB
		HC	Hastelloy C, ASTM A 494, Grade CW2M
A4	Screw, Retainer	All	18-8 Stainless Steel
A5	Gasket, Retainer	All	Flexible Graphite
A6	Shaft, Upper	S10	2205 Duplex Stainless Steel
		S5	17-4 PH Stainless Steel
		HCC	Hastelloy C, ASTM B 574, Alloy N06022 Ceramic Coated
		TNC	Titanium, Ceramic Coated
A7	Stud, Packing	All	18-8 Stainless Steel
A8	Nut, Packing	All	18-8 Stainless Steel
A9	Gland	S2, CS	316 Stainless Steel, ASTM A 351, Grade CF8M
		S3	317 Stainless Steel, ASTM A 351, Grade CG8M
		HC	Hastelloy C, ASTM A 494, Grade CW2M
A10	Packing	TC	PTFE Chevron
		G2	Braided Carbon Graphite
A11	Thrust Washer	S2, CS	316 Stainless Steel, ASTM A 276, Type 316
		S3	317 Stainless Steel, ASTM A 276, Type 317
		HC	Hastelloy C, ASTM B 574 or B 575
A12	Bearing, Upper	FT	317 Stainless Steel Wire Mesh Reinforced PTFE
		HC	Hastelloy C
		SL	Cobalt Chromium Alloy
		S9	440C Stainless Steel
A13	Set Screw	S2, CS	316 Stainless Steel
		S3, HC	Alloy 20 Stainless Steel
A14	Gasket, Seat	S2, S3, HC	Flexible Graphite
A16	Seat	S3	317 Stainless Steel, Electroless Nickel Overlay, Heat Treated
		RT	Reinforced PTFE, Filled 15% Glass, 5% Molybdenum
		S3S, S3SI	317 Stainless Steel, ASTM A 351, Grade CF8M, Tungsten Carbide Overlay
		S3R, S3RI	317 Stainless Steel, ASTM A 743, Grade CG8M, Electroless Nickel Overlay, Heat Treated
		S5C	17-4 PH Stainless Steel , H1150
		HCRI	Hastelloy C, ASTM A 494, Grade CW2M, Heat Treated, Electroless Nickel Overlay
A17	Gasket, Seat	S3	317L Stainless Steel, Flexible Graphite Filled
		HC	Hastelloy C, Flexible Graphite Filled
A18	Shaft, Lower	S10	2205 Duplex Stainless Steel
		S5	17-4 PH Stainless Steel
		HCC	Hastelloy C, ASTM B 574, Alloy N06022 Ceramic Coated
		TNC	Titanium, Ceramic Coated
A19	Bearing, Lower	FT	317 Stainless Steel Wire Mesh Reinforced PTFE
		HC	Hastelloy C
		SL	Cobalt Chromium Alloy
		S9	440C Stainless Steel
A20	Bearing, Thrust	FT	PTFE Fabric Bonded to 317 SS
		FT, HC	PTFE Fabric Bonded to Hastelloy C
		SL	Graphite
A21	Gasket, Cover	All	Graphite
A22	Cover	S2	316 Stainless Steel, ASTM A 351, Grade CF8M
		S3	317 Stainless Steel, ASTM A 351, Grade CG8M
		CS	Carbon Steel, ASTM A 216, Grade WCB
		HC	Hastelloy C, ASTM A 494, Grade CW2M
A23	Screw, Cover	All	316 Stainless Steel
A24	Adaptor	All	Ductile Iron
A25	Seal, Adaptor	DR, PR	Nitrile Rubber, Carbon Steel Case
A26	Bearing, Adaptor	DR55, 85	Oil-Impregnated Bronze
A27	Screw, Adaptor	All	18-8 Stainless Steel
A28	Lockwasher, Adaptor	All	18-8 Stainless Steel
A31	Seal, O-Ring	All	Fluoro Rubber, Encapsulated in PFA
A32	Spring	All	Fluoro Rubber, Encapsulated in PFA
A33	O-ring	S9VS, SLVS, HCVS	Fluoropolymer Seal
		SLKS, HCKS	FFKM Perfluoroelastomer Seal
A34	O-ring	S9VS, SLVS, HCVS	Fluoropolymer Seal
		SLKS, HCKS	FFKM Perfluoroelastomer Seal

Valve Selection

Flow Characteristic



Applicable Standards

DeZURIK VPB V-Port Ball Valves are designed and/or tested to meet the following standards:	
ASME B16.10	Face-to-Face dimensions, short pattern requirements
ASME B16.34	Body Wall Thickness and Pressure/temperature ratings for Class 150 and 300 Valves
ASME B16.5	Flange dimensions conform to Pipe flanges and Flanged Fittings for Class 150 and 300
ANSI/FCI 70.2	Control valve seat leakage
EN 558-1 PN 10/16	Basic Series 3, Face-to-Face dimensions
IEC 534-3-2 F-F	Face-to-Face dimensions, Industrial Process Control Valves
ANSI/ISA-75.02	Control Valve Capacity Test Procedures
ANSI/ISA-75.08.02	Face-to-Face dimensions for Flanged and Flangeless Rotary Control Valves
ISO 5211/1 & 2	Part-turn valve actuator attachment, Part 1: Flange dimensions and Part 2: Flange and Coupling performance characteristics
ISO 5752 PN 10/16	Basic Series 3, Face-to-Face dimensions
MSS-SP-25	Data Plate and body identification conform to marking requirements

Flow Parameters

Valve Size	Cv*/Kv* 100% Open	
	Flexible Metal & Rigid Metal Seats	Reinforced PTFE & Clearance Seats
1" 25mm	36 31	40 35
1.5" 40mm	120 104	135 117
2" 50mm	210 182	235 203
2.5" 65mm	260 225	295 255
3" 80mm	360 311	420 363
4" 100mm	600 519	690 597
6" 150mm	1230 1064	1290 1116
8" 200mm	2015 1743	2190 1894
10" 250mm	3000 2595	3180 2751
12" 300mm	4225 3655	4390 3797
14" 350mm	5830 5043	6060 5242
16" 400mm	7500 6488	7770 6721
18" 450mm	9500 8218	9840 8512
20" 500mm	12000 10380	12430 10752

*Cv = Flow in GPM of water at 1 psi pressure drop.
Kv = Flow in m3/hr. of water at 100 kPa pressure drop.

Valve Weights

Valve Size	Class 150			Class 300
	Flanged (F1S & F1A)	Flangeless (W1S)	Add for Long Body (F1L)	Flanged (F2S)
1" 25mm	12 6	9 5	0.5 1	15 7
1.5" 40mm	17 8	12 6	2.0 1	24 11
2" 50mm	21 10	13 6	2.8 2	27 13
2.5" 65mm	32 15	20 10	—	40 19
3" 80mm	47 22	35 16	3.3 2	58 27
4" 100mm	63 29	42 20	3.5 2	79 36
6" 150mm	95 44	74 34	10.5 5	142 65
8" 200mm	152 69	116 53	15.3 7	208 95
10" 250mm	236 108	182 83	17.5 8	342 156
12" 300mm	368 167	314 143	11.3 6	516 235
14" 350mm	560 255	—	—	—
16" 400mm	695 316	—	—	—
18" 450mm	890 404	—	—	—
20" 500mm	1105 501	—	—	—

Pounds
Kilograms

Valve Selection

Shut-Off Capabilities

Seat type	Flow	Shut-Off Class (ANSI /FCI 70-2)
Flexible Metal*	Bi-Directional	IV
Rigid Metal	Uni-Directional	IV
Reinforced PTFE**	Uni-Directional	VI
Clearance Seat	Bi-Directional	5% of max flow when closed

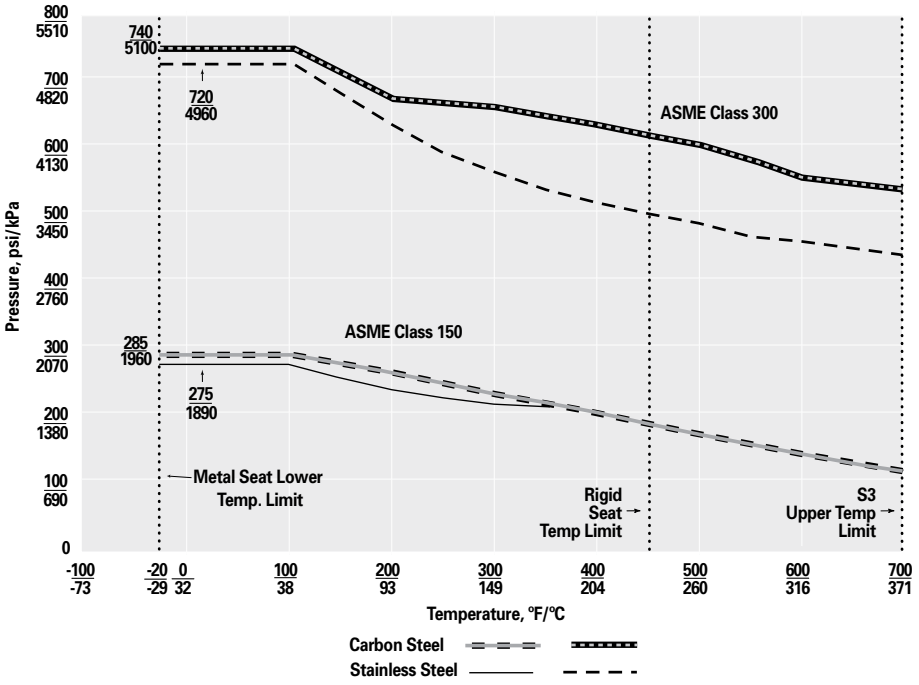
NOTE: Uni-directional valves must be installed with flow-to-open (forward flow; flow into the convex side of ball). Flow-to-open is the preferred direction for bi-directional valves. Seats are rated to the full valve pressure rating unless noted below.

* Flexible metal seats are rated to 150 psi (1030kPa) pressure differential when installed in the flow-to-close direction.

** Reinforced PTFE seats are rated to 285 psi (1895 kPa) maximum shutoff pressure differential.

Pressure Ratings

Flex Metal*, Rigid Metal and Clearance Seats (S3, S3R, S35, S3RI, S3SI, HCRI)



Ordering

To order, simply complete the valve order code from information shown. An ordering example is shown for your reference.

Valve Style
Give valve style code as follows:

VPB	=	V-Port Ball Valve

Valve Size
Give valve size code as follows:

1	=	1"	(25mm)	8	=	8"	(200mm)
1.5	=	1.5"	(40mm)	10	=	10"	(250mm)
2	=	2"	(50mm)	12	=	12"	(300mm)
2.5	=	2.5"	(65mm)	14	=	14"	(350mm)
3	=	3"	(80mm)	16	=	16"	(400mm)
4	=	4"	(100mm)	18	=	18"	(450mm)
6	=	6"	(150mm)	20	=	20"	(500mm)

End Connection
Give end connection code as follows:

Flangeless

W1S	=	Class 150, ANSI/ISA-75.08.02 and IEC 534-3-2-F 1-12" valves

Flanged

F1S	=	Class 150, ANSI/ISA-75.08.02 and IEC 534-3-2F-F 1-20" valves
F2S	=	Class 300, ANSI/ISA-75.08.02 and IEC 534-3-2F-F 1-12" valves
F1L	=	Class 150, ASME B16.10, ISO 5752 and EN 558-1 PN 10/16, 1-12" valves
F1A	=	Class 150, ASME B16.10, ISO 5752 and EN 558-1 PN 10/16 (Long body) 1-12" excluding 2.5" valve size.

Body Material
Give body material code as follows:

S3	=	317 stainless steel (Class 150 only) S3 bodies must be ordered with S3NH or S3S ball , S10 shaft and S3, S3S, S3R or RT seat.
CS	=	Carbon Steel. CS bodies must be ordered with S3NH or S3S ball, S10 shaft, and S3, S3S, S3R or RT seat.
S2	=	316 stainless steel (Class 300 only). S2 bodies must be ordered with S3NH or S3S ball, S5 or S10 shaft, and either S3, S3S, S3R or RT seat.
HC	=	Hastelloy C. HC body must be ordered with HCNH ball, HCC or TNC shaft, HCRI or RT seat, and HC, HCVS or HCKS bearings.

Packing Material
Give packing material code as follows:

TC	=	PTFE Chevron, to 500°F (260°C)
G2	=	Braided carbon graphite, to 1000°F (540°C) (Available with S3 seat and S9 or SL bearings)

Trim Combination
Give ball, shaft, seat and bearing codes as follows:

S3NH	=	317 stainless steel heat treated nickel overlay, to 700°F (370°C)
S3S	=	317 stainless steel with tungsten carbide overlay, to 1000°F (540°C) (Available with S3S, S3SI or S3 seats only)
HCNH	=	Hastelloy C with heat treated electroless nickel overlay, to 700°F (370°C)

Shaft Material

S10	=	2205 Duplex stainless steel
S5	=	17-4 PH stainless steel
HCC	=	Hastelloy C Ceramic Coated (HC Bearings only)
TNC	=	Titanium Ceramic Coated

Seat Material

RT	=	Reinforced PTFE, to 500°F (260°C)
S3	=	Flexible 317 stainless steel with heat treated electroless nickel overlay, to 700°F (370°C)
S5C	=	Clearance Seat, 17-4PH Stainless Steel to 1000°F (540°C)
S3R	=	Rigid 317 stainless steel with heat treated nickel overlay, to 450°F (230°C)
S3S	=	Rigid 317 stainless steel with tungsten carbide overlay, to 450°F (230°C) (Available with S3S Ball only)
S3RI	=	Rigid 317 stainless steel with heat treated electroless nickel overlay and nickel-chromium spring, to 450°F (230°C)
S3SI	=	Rigid 317 stainless steel with tungsten carbide overlay and nickel-chromium alloy spring, to 450°F (230°C)
HCRI	=	Rigid Hastelloy C with heat treated electroless nickel overlay and nickel-chromium alloy spring, to 450°F (230°C)

Bearing Material

FT	=	317 stainless steel wire mesh reinforced PTFE, to 500°F (260°C)
S9	=	440C stainless steel bearings, to 1000°F (540°C)
S9VS	=	440C stainless steel bearings with PFA Fluoropolymer seal to 450°F (230°C)
SL	=	Solid Cobalt-Chromium Alloy, to 1000°F (540°C)
SLVS	=	Solid Cobalt-Chromium Alloy with PFA Fluoropolymer seal, to 450°F (230°C)
SLKS	=	Solid Cobalt-Chromium Alloy with FFKM Perfluoroelastomer seal, to 550°F (288°C)

On Application

HC	=	Hastelloy C 1000°F (540°C)
HCVS	=	Hastelloy C with PFA Fluoropolymer seal, to 450°F (230°C)
HCKS	=	Hastelloy C with FFKM Perfluoroelastomer seal, to 550°F (288°C)

On Application
Give options code as follows:

BAA	=	Buy American Act
CMC	=	Certificate of Material Conformance
CRT	=	Certified Material Physical & Chemical Test Report
DTR	=	DeZURIK Standard Certified Production Hydrostatic Shell & Seat Test Report
ST3	=	Pennsylvania Steel Procurement Act
G1	=	DIN 10 or BS4504/10 Drilling (W1S, F1L & F1S only)
G2	=	DIN 16 or BS4504/16 Drilling (W1S, F1L & F1S only)
G3	=	DIN 25 or BS4504/25 Drilling (F2S only)
G4	=	DIN 40 or BS4504/40 Drilling (F2S only)
J1	=	J1S 10 Flange Drilling (F1L or F1S only)
J6	=	J1S 16 Flange Drilling (F1L or F1S only)
J2	=	J1S 20 Flange Drilling (F2S only)

On Application
Pressure Equipment Directive (CE Mark)

Ordering Example
VPB,4,F1L,S3,TC,S3NH-S10-RT-FT,G1*PR-R1A-PC4

Actuators

Manual Gear Actuators

Manual gear actuators with handwheel or chainwheel input are available in cast iron construction. They feature sintered bronze bearings on each end of the input shaft for durability and performance.



Cylinder Actuators

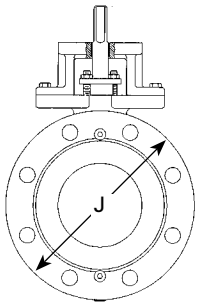
PowerRac® Cylinder actuators are available as double-acting or spring return. They feature a high opening torque for on-off applications and also maintain a high operating torque throughout the full stroke for modulating service.

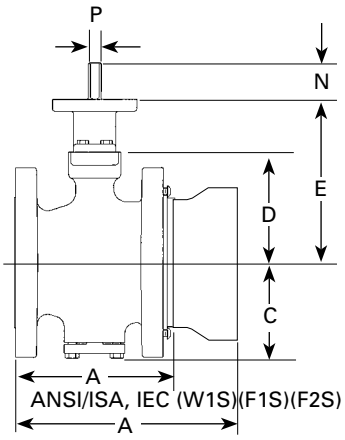
Diaphragm Actuators

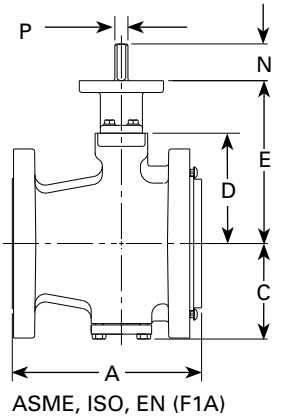
Diaphragm actuators may be specified also. They're available with 40, 55, 85, 125, 145 and 250 square inch (0.026m^2, 0.036m^2, 0.055m^2, 0.094m^2, 0.161m^2) sizes and with 20, 35 or 60 psi (140, 240 or 410 kPa) spring options.



Dimensions







Basic Valve

Inches
Millimeters

Valve Size	A		C	D	E	J			N	P Diameter	P Square
	ANSI/ISA IEC	ASME ISO EN				Flanged Class 150	Flangeless Class 150	Flanged Class 300			
1" 25mm	4.00 102	5.00 127	2.75 70	3.25 83	5.62 143	4.25 108	2.44 62	4.88 124	1.75 44	.62 16	.50 13
1.5" 40mm	4.50 114	6.50 165	2.94 75	3.47 88	5.84 148	5.00 127	3.06 78	6.12 155	1.75 44	.62 16	.50 13
2" 50mm	4.88 124	7.00 178	3.22 82	3.75 95	6.12 155	6.00 152	3.81 97	6.50 165	1.75 44	.62 16	.50 13
2.5" 65mm	5.50 140	7.50 191	3.75 95	4.44 113	6.94 176	7.00 178	4.38 111	7.50 190	1.75 44	.75 19	.62 16
3" 80mm	6.50 165	8.00 203	4.00 102	4.69 119	7.19 183	7.50 191	5.19 132	8.25 210	1.75 44	.75 19	.62 16
4" 100mm	7.62 194	9.00 229	4.56 116	5.25 133	7.75 197	9.00 229	6.38 162	10.00 254	1.75 44	.75 19	.62 16
6" 150mm	9.00 229	10.50 267	5.72 145	6.50 165	9.50 241	11.00 279	8.50 216	12.50 317	1.75 44	1.25 32	.94* 24
8" 200mm	9.56 243	11.50 292	7.28 185	8.12 206	11.12 282	13.50 343	10.62 270	15.00 381	1.75 44	1.50 38	1.19 30
10" 250mm	11.69 297	13.00 330	8.91 226	9.50 241	13.38 340	16.00 406	13.12 333	17.50 444	1.75 44	2.00 51	1.62** 41
12" 300mm	13.31 338	14.00 356	9.91 252	10.50 267	14.38 365	19.00 483	15.38 391	20.50 521	1.75 44	2.00 51	1.62 41
14" 350mm	15.75 400	—	10.86 276	11.47 291	15.34 390	21.00 533	—	—	1.75 44	2.00 51	1.62 41
16" 400mm	15.75 400	—	13.25 337	14.06 375	18.56 471	23.50 597	—	—	1.75 44	2.50 64	1.81 46
18" 450mm	18.00 457	—	14.44 367	15.25 387	19.75 502	25.00 635	—	—	1.75 44	2.50 64	1.81 46
20" 500mm	20.00 508	—	15.56 395	16.38 416	20.38 518	27.50 686	—	—	1.75 44	2.50 64	1.81 46

Note: All dimensions are subject to change without notice.
Request certified drawings for use in preparing piping layouts.

*6" (150mm) $\frac{.88}{22}$ for DR-40 actuators

**10" (250mm) $\frac{1.19}{30}$ for DR-85 actuators

Sales and Service

For information about our worldwide locations, approvals, certifications and local representative:
Web Site: www.dezurik.com E-Mail: info@dezurik.com

DeZURIK
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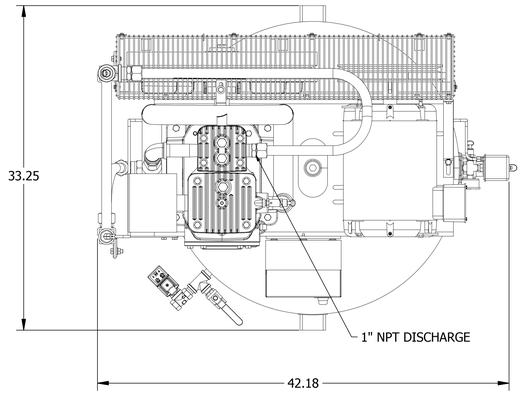
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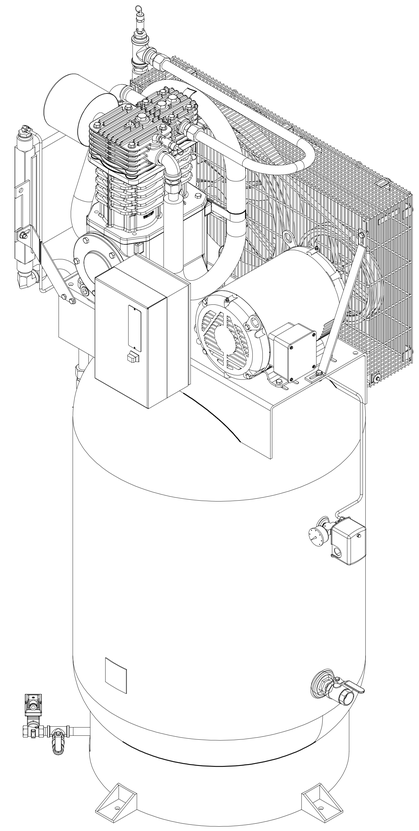
DeZURIK, Inc. reserves the right to incorporate our latest design and material changes without notice or obligation. Design features, materials of construction and dimensional data, as described in this bulletin, are provided for your information only and should not be relied upon unless confirmed in writing by DeZURIK, Inc. Certified drawings are available upon request.

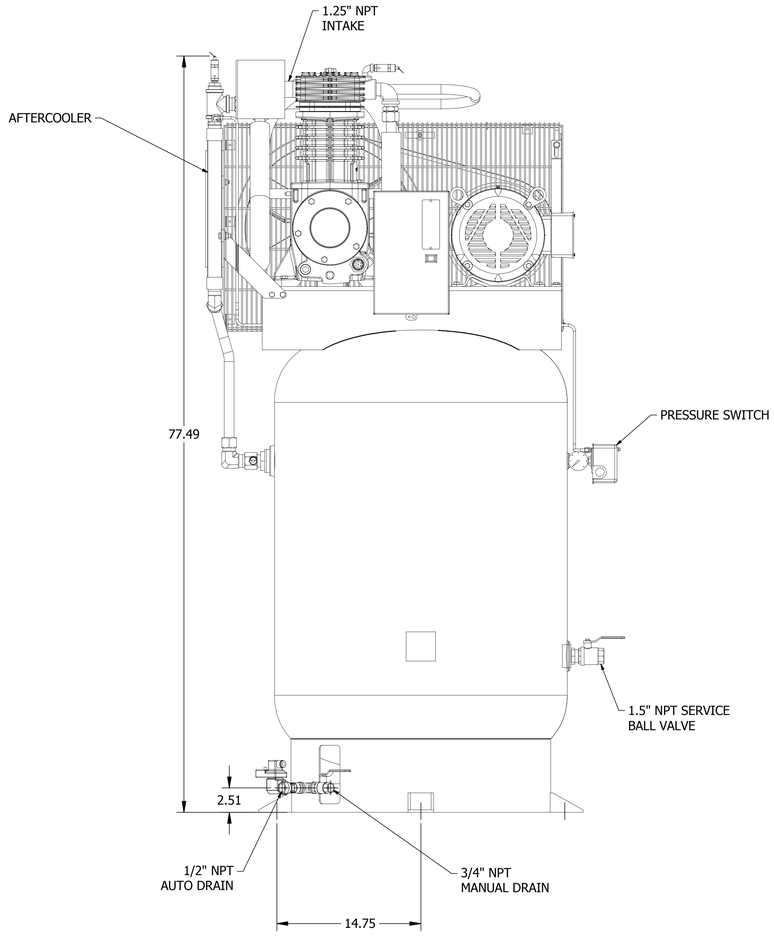
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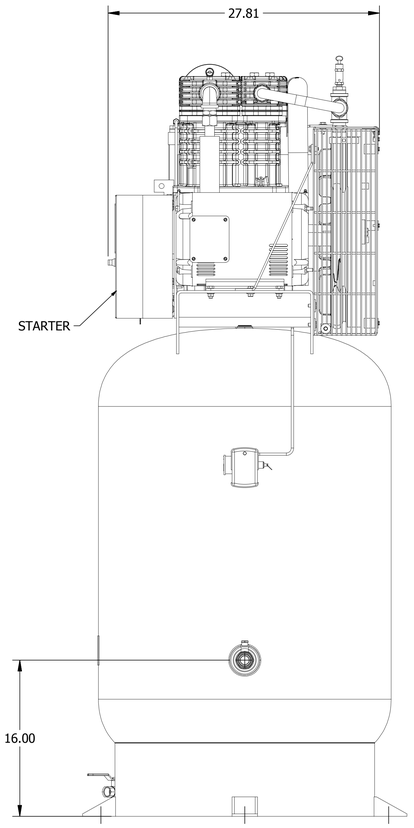
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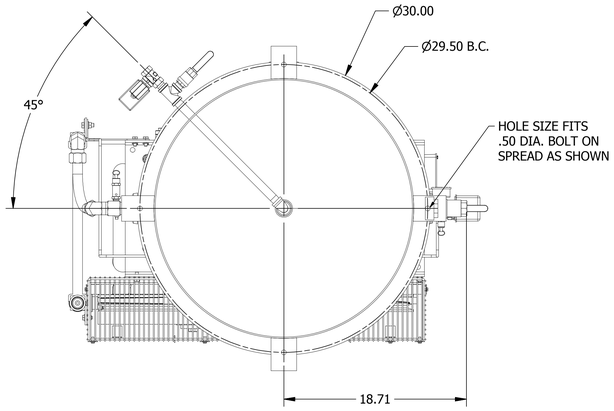
Ed	Position	Description	Date	Intr./Appd.
01		DRAWING RELEASED	08/18	BJW











NOTES:

1) ALL DIMENSIONS GIVEN IN INCHES.
2) ALLOW A MINIMUM OF 12 INCHES ON ALL SIDES FOR SERVICE AND COOLING.
3) NEMA 4 STARTER SHIPPED LOOSE.

Dimensions and tolerances in accordance with ASME Y14.5 M-1994 Unless otherwise specified all dimensions are in inches primary.	Name	DRAWING,DIM,CR10-TS-120V-PPS				Confidentiality Class acc. to 20122203718	
TOLERANCES ON ANGLES ±	Material	Not Applicable				Internal	
TOLERANCES ON 2 PLANES DIM'S ±	Finish	Not Applicable				INV	
TOLERANCES ON 3 PLANES DIM'S ±	Ingersoll Rand	Scale 1/5	Family	E	Similar to		Drawing owner UTY
FINISH ON MACHINED SURFACES √		Drawn by utymcobar	Make From		Replaces		
2022035040	STATUS	Version Drwg	Blank wt lb	Fini wt. 0 lb	Designation		Sheet 1 / 1
Parent 3D model	Ed . Version 3D	Approved Internal	Date checked.	Prod checked.	Approved.	Date 8/14/2018	2022035041

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Series 800 Overview

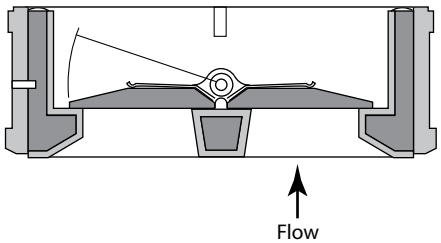
- Available in sizes 2" to 20".
- Only fully elastomer lined check valve available.
- Bubble-tight shutoff from 25 to 150 psi ΔP. Lower minimum pressure available on request.
- Wide range of available elastomers; Buna-N or EPDM standard.
- Check valves compatible with ASME B16.1, Class 125 (Iron) or B16.5, Class 150 (Steel) flanges.
- Use of dual springs distributes the load force evenly across each plate, resulting in quick response to flow reversal.
- Commercial cleaning available for Oxygen level 2.
- CE/PED Certification available for sizes 2" to 24".

Liner Temperature Ratings

Material	Temperature Ratings °F
Buna-N (Standard)	+10 to 180
EPDM (Standard)	-30 to 275
Neoprene	+20 to 200
Viton®	+10 to 400

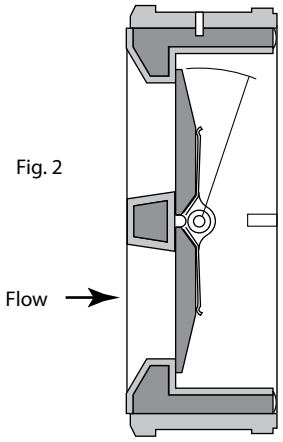
Some flow media may further restrict the published temperature limits and/or significantly reduce seat life. Consult factory for additional information.

Fig. 1



For flow going up recommended installation sizes: 2" - 20". For flow going down, consult factory.

Fig. 2



Valve should be installed with shaft in the vertical position in a horizontal pipe. This view rotated 90° for pictorial clarity.

C_v Values – Valve Sizing Coefficients (US-GPM @ 1ΔP)

Valve Size	C_v	Cracking Pressure To Open Valve (Inches of Water Column)*		
		Figure 1	Figure 2	Figure 3
2"	36	14	10	5
2 ½"	62	18	12	6
3"	123	11	7	2
4"	281	10	6	2
5"	522	14	10	6
6"	1033	12	8	5
8"	2158	12	9	5
10"	3368	14	13	8
12"	5068	15	10	6
14"	6465	20	12	6
16"	9172	20	12	6
18"	12,853	16	10	–
20"	17,398	24	16	–

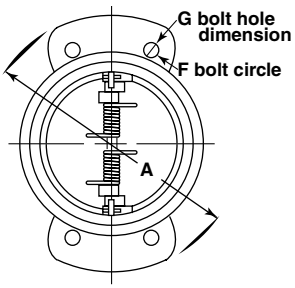
*Figures are approximate. 1" of water column = .036 psi.

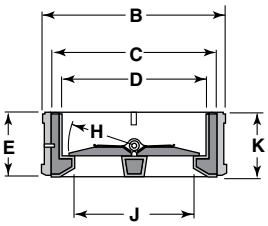
Series 800 Dimensions and Materials of Construction

Dimensions (in [mm]) and Weights (lbs [kg])

For installation and maintenance instructions, please refer to the IOM manual

Valve Size	A	B	C	D	E	F	G	H	J	K	Weight
2 (50)	6.25 (158.75)	4.35 (110.49)	3.34 (84.14)	2.62 (66.68)	2.00 (51.00)	4.81 (122.17)	0.82 (20.80)	1.12 (47.63)	1.88 (47.63)	2.12 (53.98)	5 (2.27)
2 1/2 (65)	7.00 (177.80)	5.13 (130.30)	3.9 (98.43)	3.12 (79.38)	2.00 (51.00)	5.63 (143.00)	0.82 (20.80)	1.44 (36.51)	2.31 (58.74)	2.12 (53.98)	6 (2.72)
3 (80)	7.50 (190.50)	5.50 (139.70)	4.56 (115.89)	3.62 (92.08)	2.00 (51.00)	6.20 (157.48)	0.88 (22.35)	1.62 (41.28)	2.75 (69.85)	2.12 (53.98)	8 (3.63)
4 (100)	9.25 (234.95)	5.75 (146.05)	5.62 (142.88)	4.62 (117.48)	2.37 (60.19)	7.28 (184.91)	0.94 (23.87)	2.12 (53.98)	3.44 (87.31)	2.50 (63.50)	15 (6.81)
5 (125)	10.62 (269.88)	7.62 (193.68)	6.75 (171.45)	5.69 (144.46)	2.50 (63.50)	8.44 (214.37)	0.88 (22.35)	2.66 (67.47)	4.44 (112.71)	2.62 (66.68)	20 (9.08)
6 (150)	12.00 (304.80)	8.75 (222.25)	7.88 (200.03)	6.75 (171.45)	3.00 (76.20)	9.44 (239.77)	0.88 (22.35)	3.16 (80.17)	5.56 (141.29)	3.12 (79.38)	26 (11.80)
8 (200)	14.50 (368.30)	10.62 (269.88)	10.00 (254.00)	8.75 (222.25)	3.75 (95.25)	11.66 (296.16)	0.91 (23.11)	4.16 (105.57)	7.56 (192.09)	3.88 (98.43)	43 (19.52)
10 (250)	16.88 (428.63)	13.25 (336.55)	12.12 (307.98)	10.88 (276.23)	3.86 (98.04)	14.06 (357.12)	1.14 (28.95)	5.12 (130.18)	9.06 (230.19)	4.00 (101.60)	58 (26.33)
12 (300)	19.50 (495.30)	16.00 (406.40)	14.38 (365.13)	12.88 (327.03)	5.00 (127.00)	16.14 (409.95)	1.02 (25.90)	6.25 (158.75)	10.81 (274.64)	5.12 (130.18)	100 (45.40)
14 (350)	22.50 (571.50)	17.00 (431.80)	15.62 (396.88)	14.12 (358.78)	7.00 (177.80)	18.65 (473.71)	1.72 (43.68)	6.75 (171.45)	12.06 (306.39)	7.12 (180.98)	135 (61.29)
16 (400)	24.88 (631.83)	20.12 (511.18)	17.75 (450.85)	16.12 (409.58)	6.25 (158.75)	21.25 (539.75)	1.06 (26.99)	7.75 (196.85)	14.00 (355.60)	6.38 (161.93)	170 (77.18)
18 (450)	25.25 (641.35)	21.50 (546.10)	20.00 (508.00)	18.12 (460.37)	7.13 (181.10)	22.75 (577.85)	1.19 (30.16)	8.75 (222.25)	16.00 (406.14)	7.25 (184.15)	220 (99.88)
20 (500)	27.50 (698.50)	23.50 (596.90)	21.88 (555.62)	20.12 (511.17)	8.38 (212.72)	25.00 (635.00)	1.19 (30.16)	9.75 (247.65)	18.12 (469.90)	8.50 (215.90)	287 (130.30)

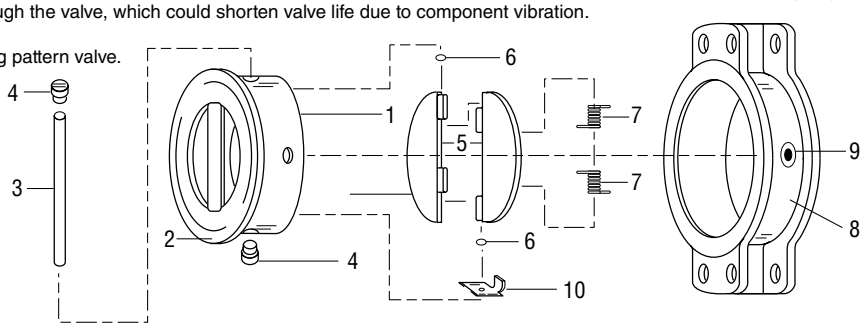




Notes:

Preferred mounting of check valves of any manufacturer is 8 pipe diameters downstream from the pump discharge or pipe elbow. If this is not feasible, the valve should be mounted downstream as far as possible. This recommendation is not exclusive to Center Line valves, but common practice in valve and piping engineering. Its purpose is to reduce the likelihood of turbulent flow through the valve, which could shorten valve life due to component vibration.

These dimensions reflect the universal bolting pattern valve.



Bill of Materials

Item	Description	Materials	Optional Materials
1	Valve Body	Ductile Iron	No option available
2	Liner (Molded to Item 1)	Buna-N or EPDM	Neoprene, Viton®
3	Shaft	316 Stainless Steel	Monel®
4	Shaft Plug (Qty. 2)	316 Stainless Steel	Monel®
5	Plate (Qty. 2)	2" 316 Stainless Steel 2½" -5" Aluminum Bronze 6"-20" Ductile Iron	2"-12" Monel® 2½"-12" 316 Stainless Steel 6"-20" Aluminum Bronze
6	Thrust Washer (Qty. 4)	PTFE	No option available
7	Spring (Qty. 2)	316 Stainless Steel	No option available
8	Alignment Body	Ductile Iron	No option available
9	Set Screw	Carbon Steel	No option available
10	Plate Travel Stop	316 Stainless Steel (14"-20")	No option available

* Items 1 and 2 must be ordered together.

Handle Features and Dimensions

Handles are available for on/off and throttling control of Center Line resilient seated butterfly valves. These handles can be used for manual actuation of 2" to 12" valves at 200 psi and for 2" to 6" valves at 285 psi. For valves larger than 8", excessive operator effort and extreme handle reaction to internal valve forces are possible. In these cases, a gear operator is recommended for safe operation.



Features

The rugged construction of Center Line handles makes them ideally suited for manually actuating smaller valves. The latchplate permits the valve to be locked in any of the 10 positions on DIT handles or in any position on IOL handles.

Specifications

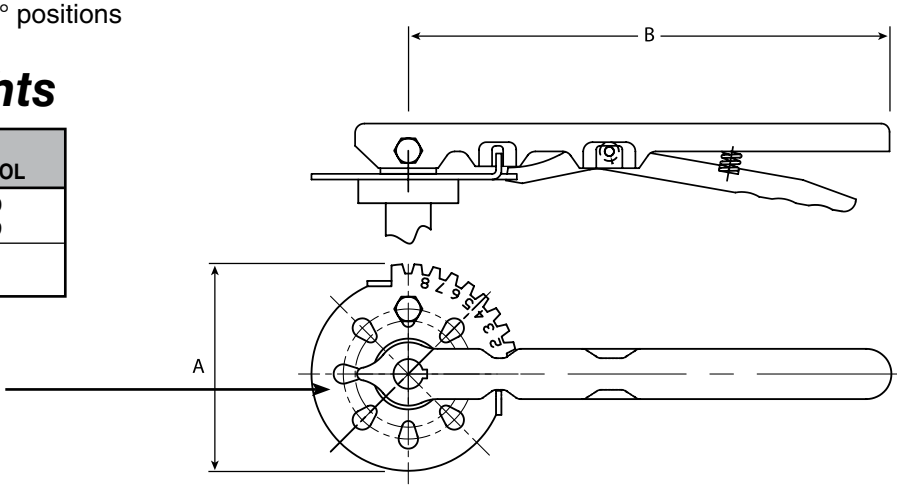
DIT — Mechanically locks the valve in any of the 10 positions from 0° to 90° in 10° increments

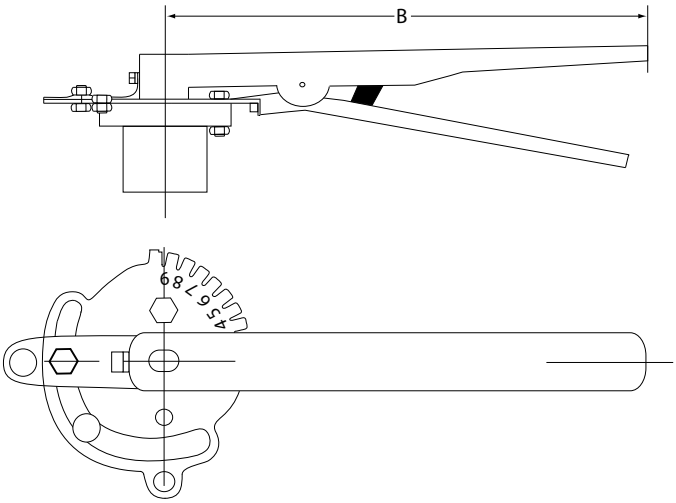
DIT/IOL — Can hold the valve in intermediate positions (32°, 68°, etc.) and can also be locked in 0° and 90° positions

Dimensions and Weights

Valve Size		A	B	Weight DIT	Weight DIT/IOL
2–6	in.	2.25	10.5	1.8	2.0
50–150	mm	57.15	266.7	0.8	0.9
8–12	in.	3.34	14.0	4.0	-
200–300	mm	84.84	355.6	1.8	-

Plates are adaptable for ISO or standard mounting flange.





Gear Operators **Features and Dimensions**

Gear operators can be used for on/off and throttling control of Center Line resilient seated butterfly valves. All models are weatherproof and usable for above ground service. Consult factory for buried service gears. For manual operation of valves, gear operators are required for valves 14" and larger and are recommended for valves 8" and larger.



Features

Gear operators from Center Line are 90° manual actuators, and they come with a handwheel, chainwheel, or square nut input device. The durable housing completely encloses the worm gear (on the input shaft) and the segment gear (on the output). Adjustable stops are standard and factory set when installed at the factory. Fully adjustable memory stops are available as an option. A position indicator is standard on all models for above ground service.

Specifications

Operation Handwheel or chainwheel or 2" square nut. Input shaft extension available.

Mounting Available with bolt patterns and bore/keyway for direct mount to all 2" through 30" Center Line resilient seated butterfly valves. Dual bolt patterns accommodate different pad designs. Gears are drilled for ISO pattern through 24". Contact factory for 30" and above.

Dimensions and Weights

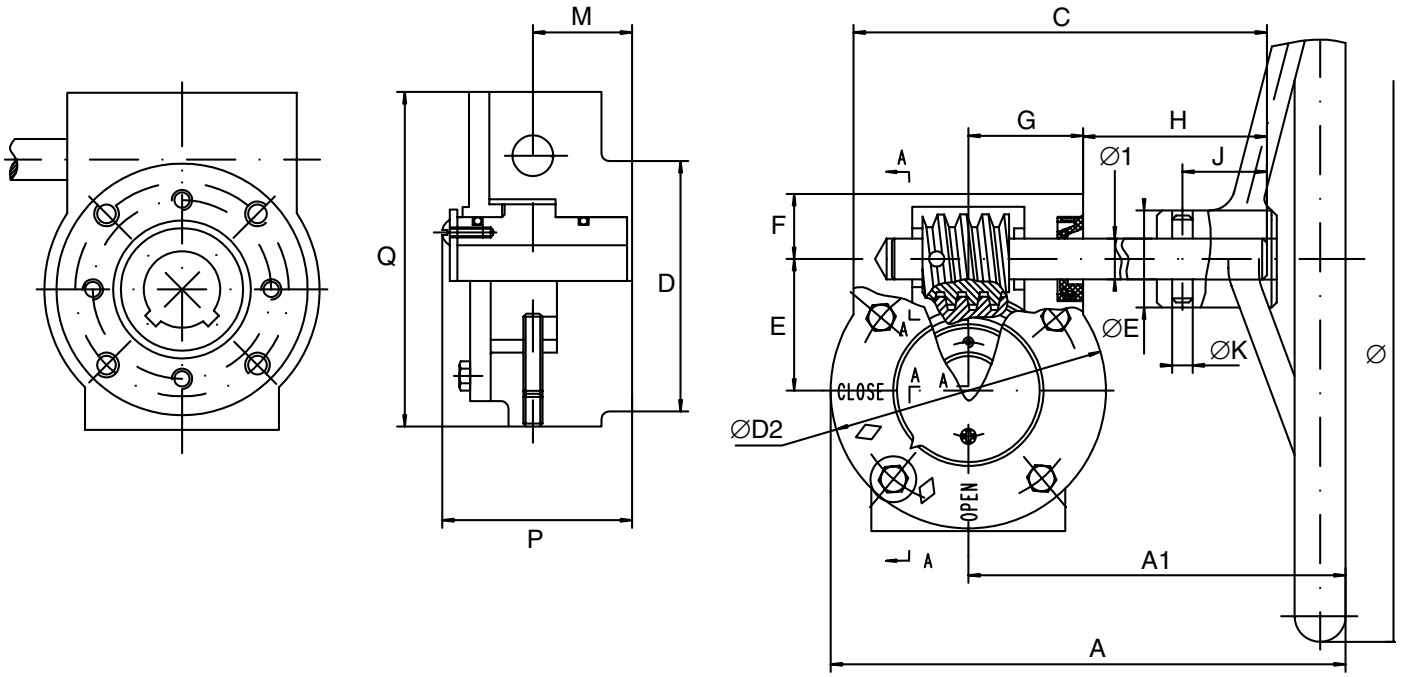
Valve Size (Drawing 1)		A	A1	C	E	F	G	H	Ø1	J	ØK	M	D	P	Q	Ø	ØD2	ØE	Wt. (Kg.)
2–6	in.	12.56	9.52	10.72	2.52	1.46	2.36	6.00	0.76	1.36	0.24	1.66	3.68	3.36	7.06	12.00	6.08	1.52	27.1
50–150	mm	314.00	238.00	268.00	63.00	37.00	59.00	150.00	19.00	34.00	6.00	41.50	92.00	84.00	176.50	300.00	152.00	38.00	(12.3)
8–14	in.	12.28	9.04	10.60	3.12	1.54	2.74	5.12	0.76	1.36	0.24	1.53	5.60	3.36	7.90	12.00	6.48	1.52	31.7
200–350	mm	307.00	226.00	265.00	78.00	38.50	68.50	128.00	19.00	34.00	6.00	38.20	140.00	84.00	197.50	300.00	162.00	38.00	(14.4)
16–18	in.	16.28	11.08	13.76	4.80	1.60	4.08	5.60	1.00	1.36	0.32	2.28	7.88	5.00	11.60	18.00	10.40	2.00	77.4
400–450	mm	407.00	277.00	344.00	120.00	40.00	102.00	140.00	25.00	34.00	8.00	57.00	197.00	125.00	290.00	450.00	260.00	50.00	(35.2)

Valve Size (Drawing 2)		A	B	C	D	E	F	Ø	Ø1	Ø2	Wt. (Kg.)
20	in.	7.40	6.40	4.40	18.90	4.60	2.50	18.00	0.98	0.32	121.0
500	mm	185.00	160.00	110.00	473.00	115.00	63.00	450.00	25.00	8.00	(55.0)
24	in.	7.40	6.40	5.00	20.00	4.80	2.50	18.00	0.98	0.32	132.0
600	mm	185.00	160.00	125.00	500.00	120.00	63.00	450.00	25.00	8.00	(60.0)
28	in.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
700	mm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
30	in.	10.60	6.60	6.40	21.80	5.12	3.12	18.00	0.98	0.32	198.0
750	mm	265.00	165.00	160.00	545.00	128.00	78.00	450.00	25.00	8.00	(90.0)
32	in.	9.72	6.92	6.48	21.20	6.56	3.52	17.40	0.98	0.32	292.6
800	mm	243.00	173.00	162.00	530.00	164.00	88.00	435.00	25.00	8.00	(133.0)
36	in.	11.12	8.04	7.84	21.44	10.32	5.04	17.40	0.98	0.32	424.6
900	mm	278.00	201.00	196.00	611.00	258.00	126.00	435.00	25.00	8.00	(193.0)
40	in.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1000	mm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
42	in.	16.72	10.20	9.60	25.56	12.40	5.04	17.40	0.98	0.32	792.0
1050	mm	418.00	255.00	240.00	611.00	310.00	126.00	435.00	25.00	8.00	(360.0)
48	in.	16.72	10.20	9.60	25.56	12.40	5.04	17.40	0.98	0.32	792.0
1200	mm	418.00	255.00	240.00	639.00	310.00	126.00	435.00	25.00	8.00	(360.0)

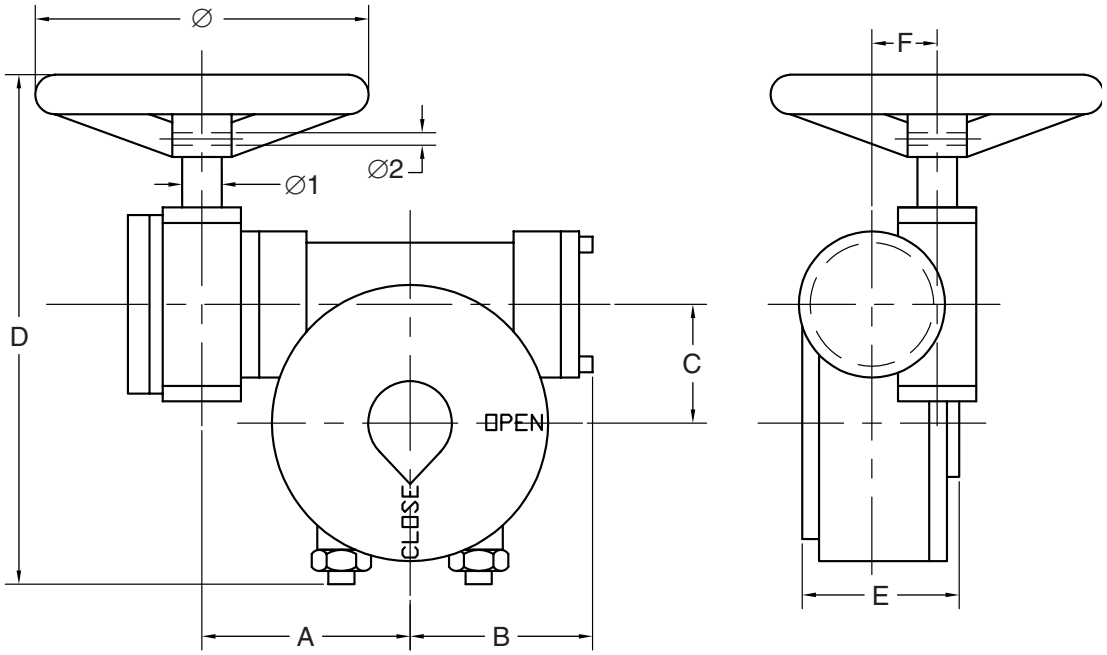
Some sizes Series 200 and 225/250 require different operators, please consult factory.

Gear Operators **Dimensions**

Drawing 1 (for sizes 2" - 18")

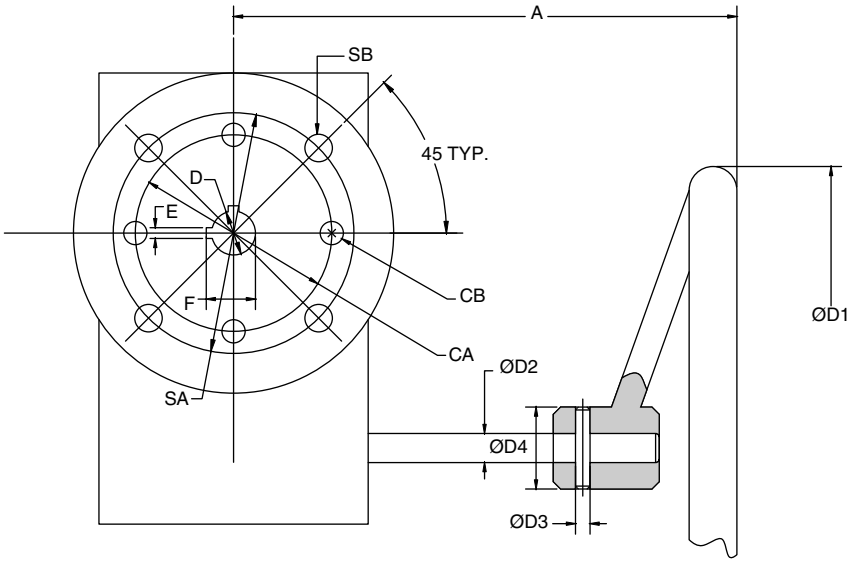


Drawing 2 (for sizes 20" and larger)



Gear Operators **Dimensions**

Gear Operator Drilling Patterns



Dimensions

Valve Size		CA	CB	SA	SB	D	ØD1	ØD2	ØD3	ØD4	A	E	F
2	in.	2.25	M6-1	2.76	M8-15	0.50	11.81	0.75	0.24	1.50	9.37	0.13	0.56
50	mm	57.15		70.00		12.70	300.00	19.00	6.00	38.00	238.00	3.18	14.30
3	in.	2.25	M6-1	2.76	M8-15	0.50	11.81	0.75	0.24	1.50	9.37	0.13	0.56
80	mm	57.15		70.00		12.70	300.00	19.00	6.00	38.00	238.00	3.18	14.30
4	in.	2.75	M8-1.25	2.76	M8-15	0.63	11.81	0.75	0.24	1.50	9.37	0.19	0.72
100	mm	69.85		70.00		15.90	300.00	19.00	6.00	38.00	238.00	4.76	18.30
5	in.	2.75	M8-1.25	2.76	M8-15	0.75	11.81	0.75	0.24	1.50	9.37	0.19	0.84
125	mm	69.85		70.00		19.05	300.00	19.00	6.00	38.00	238.00	4.76	21.40
6	in.	2.75	M8-1.25	2.76	M8-15	0.75	11.81	0.75	0.24	1.50	9.37	0.19	0.84
150	mm	69.85		70.00		19.05	300.00	19.00	6.00	38.00	238.00	4.76	21.40
8	in.	3.50	M12-1.75	4.02	M10-18	0.87	11.81	0.75	0.24	1.50	8.89	0.19	0.97
200	mm	88.90		102.00		22.20	300.00	19.00	6.00	38.00	226.00	4.76	24.50
10	in.	3.50	M12-1.75	4.02	M10-18	1.13	11.81	0.75	0.24	1.50	8.89	0.25	1.25
250	mm	88.90		102.00		28.60	300.00	19.00	6.00	38.00	226.00	6.35	31.80
12	in.	4.25	M12-1.75	4.02	M10-18	1.25	11.81	0.75	0.24	1.50	8.89	0.25	1.39
300	mm	107.95		102.00		31.80	300.00	19.00	6.00	38.00	226.00	6.35	35.00
14	in.	4.25	M12-1.75	4.02	M10-18	1.25	11.81	0.75	0.24	1.50	8.89	0.25	1.39
350	mm	107.95		102.00		31.80	300.00	19.00	6.00	38.00	226.00	6.35	35.00
16	in.	6.25	M18-2.5	6.50	M20-26	1.31	18.00	0.98	0.32	1.99	10.90	0.31	1.49
400	mm	158.75		165.00		33.30	450.00	25.00	8.00	50.00	277.00	7.90	37.30
18	in.	6.25	M18-2.5	6.50	M20-26	1.50	18.00	0.98	0.32	1.99	10.90	0.38	1.69
450	mm	158.75		165.00		38.10	450.00	25.00	8.00	50.00	277.00	9.53	42.80
18	in.	6.25	M18-2.5	6.50	M20-26	1.63	18.00	0.98	0.32	1.99	12.64	0.38	1.81
450	mm	158.75		165.00		41.30	450.00	25.00	8.00	50.00	321.00	9.53	46.00
20	in.	6.25	M18-2.5	6.50	M20-26	1.63	18.00	0.98	0.32	1.99	12.64	0.38	1.81
500	mm	158.75		165.00		41.30	450.00	25.00	8.00	50.00	321.00	9.53	46.00
24	in.	8.50	M20-2.5	6.50	M20-26	2.00	18.00	0.98	0.32	1.99	13.19	0.50	2.24
600	mm	215.90		165.00		50.80	450.00	25.00	8.00	50.00	335.00	12.70	56.80

Series 800 Figure Number System

Series 800

1	1	2	3	4	5	6	7	8	9

1. Size	Code
2"	02
2½"	25
3"	03
to	
20"	20

2. Series/Style	Code
Wafer	R
Euro	W

3. Body	Code
Ductile Iron	1
Epoxy Coated DI (A536)	S

4. Pressure	Code
150 PSI	6

5. Plate	Code
316 SS (2"-14")	4
Ductile Iron (6"-20")	5
Aluminum Bronze (2.5"-20")	6
Monel® (2"-8")	7

6. Shaft	Code
316 SS	4
Monel®	7

7. Springs	Code
316 SS	D
Monel® 400	M

8. Seat/Liner	Code
Buna-N	1
Neoprene	3
EPDM	5
Viton®	0

9. Special Features	Code
CE Marked - Non-Impact Tested	P

The nomograph on the next page gives the relationships of valve size, flow, velocity, and pressure drop for various disc positions.

Size	C_v at Full-Open
2"	115
2 ½"	196
3"	302
4"	600
5"	1022
6"	1579
8"	3136
10"	5340
12"	8250
14"	11917
16"	16388
18"	21705
20"	27908
24"	43116
30"	73426

Sample Calculation, Liquid (see black line on chart)

Given:

Water (1.0 specific gravity) at 60°F is flowing through a 6-inch valve at a rate of 1000 gpm.

Find:

Line velocity (ft./sec.) and pressure drop when valve is in full-open (disc at 90°) position.

Solution:

From the 6-inch valve size at lower left of nomograph, go diagonally up to the intersecting horizontal line for 1000 gpm. From that point, proceed directly down to determine line velocity as 11 ft./sec.

For pressure drop, return to the 1000 gpm intersection and continue up vertically to "90° disc open" intersecting diagonal line. From this point, go horizontally to the left to determine pressure drop as 0.5 psi.

Sample Calculation, Gas (see gray line on chart)

Given:

Gas (0.8 lb/cu. ft. density) is flowing through an 8-inch valve at a rate of 1500 cu. ft./min.

Find:

Line velocity (ft./min.) and pressure drop when valve is in full-open (disc at 90°) position.

Solution:

From 8-inch valve size at lower left of nomograph, go diagonally up to the intersecting horizontal line for 1500 cu. ft./min. From that point, proceed directly down to the bottom line of the nomograph to determine line velocity as 4000 ft./min.

For pressure drop, return to the 1500 cu. ft./min. intersection and continue up vertically to "90° disc open" intersecting diagonal line. From this point, go horizontally to the left to determine pressure drop as 17 psi. Now, convert pressure drop to gas by dividing gas density by liquid density and multiplying by 17.

General Notes

1. Liquid flow data is based on pressure drop and flow rate with viscosity similar to water at 60°F using flow coefficient.

$$\frac{0.8}{62.34} \times 17.0 = 0.22 \text{ psi}$$

2. Velocities for liquids with densities similar to water should be less than 16 ft./sec.
3. Nomograph flow rate for gases is in cubic feet per minute (CFM) at flowing conditions. To convert flow rate from standard cubic feet per minute to CFM, use the following formula:
4. Gas density in lbs./cu. ft. equals:

$$\text{CFM} = \frac{(\text{SCFM} \times 14.7) \times (460 + °\text{F})}{(\text{line pressure, psia}) \times 520}$$

$$\frac{\left(\begin{array}{c}270 \times \\ \text{line pressure, psia}\end{array}\right) \times \left(\begin{array}{c}\text{specific gravity of} \\ \text{gas (relative to air)}\end{array}\right)}{460 + °\text{F}}$$

Definitions

C_v = Flow coefficient for valves; expresses flow rate in gallons per minute of 60°F water with 1.0 psi pressure drop across valve.

K = resistance coefficient.

K = $d\sqrt{\frac{29.9}{C_v}}$

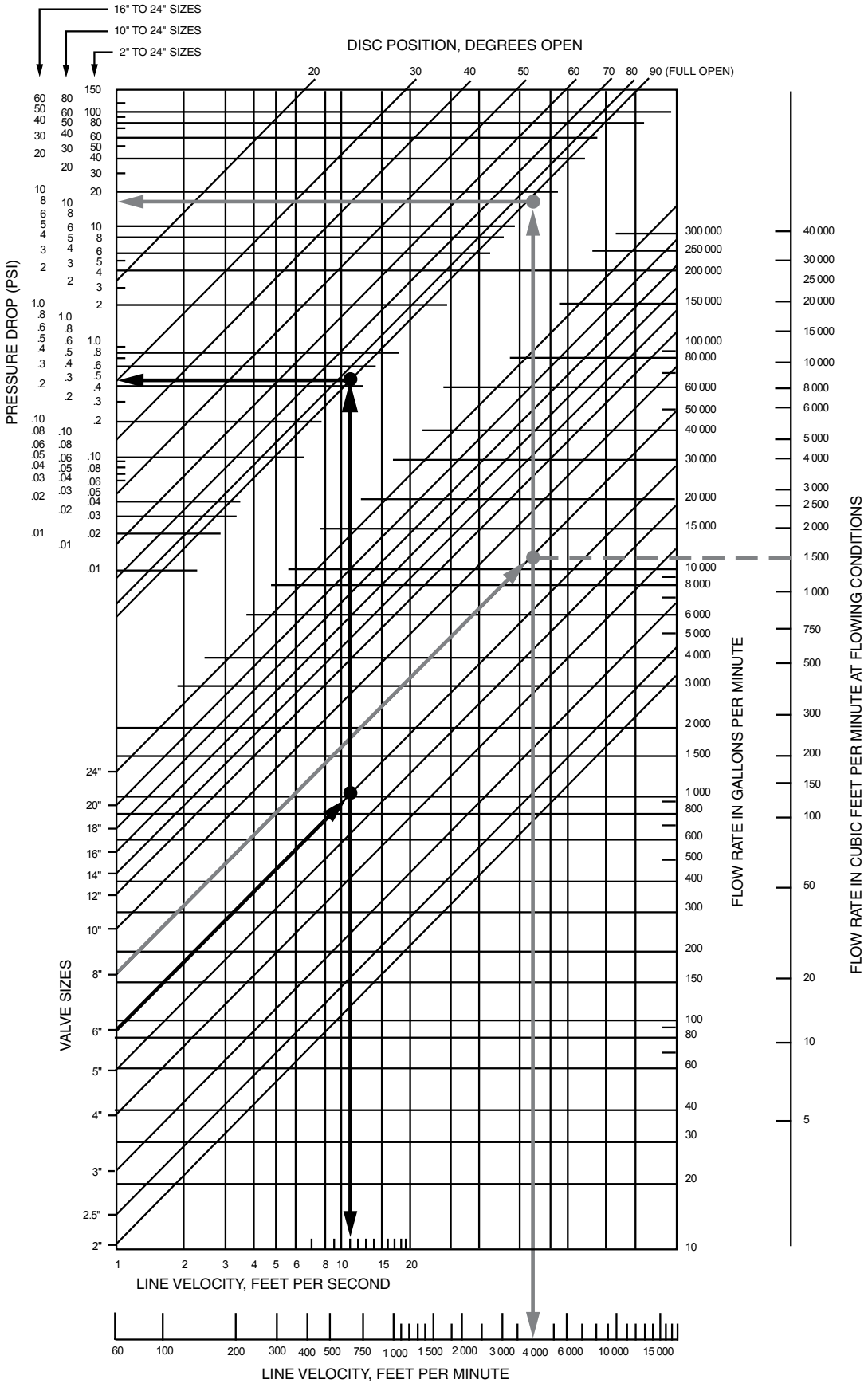
P = weight density of fluid, in pounds per cubic foot.

d = internal diameter of Schedule 40 pipe, in inches.

Q = rate of flow, in gallons per minute.

ΔP = differential pressure, in pounds per square inch gauge.

Technical Data



Seat Temperature Ratings and Application Information

Elastomer	Continuous Temp Range	Description
Buna-N	+10°F to 180°F	Also known as Nitrile or NBR. Buna-N is a good, general purpose material for most general services such as water at ambient temperatures, vacuum, compressed air, salt solutions, alkaline solutions and aliphatic h hydrocarbons (saturated and unsaturated). **Buna-N is not recommended for strong oxidizing agents, nitrated hydrocarbons, Ketones, acetates, phenols, aldehydes or for gasolines with additives. Also, Buna-N can swell in hot water applications, and increase operating torque.**
EPDM	-30°F to 275°F	EPDM is a synthetic rubber suitable for many general purpose applications with higher temperature requirements. It is acceptable for hot and chilled water, glycols, detergents, phosphate esters, Ketones and alcohols. **EPDM is not suitable for any hydrocarbon-based oils and lubricants, or in compressed air systems with hydrocarbons.**
Viton®	+10°F to 400°F	Viton® is a fluoroelastomer with exceptional resistance to oils and chemicals at higher temperatures. Viton® is suitable for hydrocarbons, and has a greater chemical resistance than Buna-N. Viton® can also be recommended for mineral acids, dilute and concentrated solutions and alcohols. **Viton® is not recommended for higher temperature water and steam applications as it has a tendency to swell. Also, Viton® hardens at the lower end of the temperature range, which can increase operation torque.**

Crane is please to offer other seat materials upon request. Please consult your sales representative or the factory for availability and application information.

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FLOWSEAL® SINCE 1864 JENKINS® FK® KROMBACH ARMATUREN be safe NOZ-CHEK® PACIFIC VALVES
STOCKHAM® Triangle® UNI-CHEK® NUCLEAR VALVE SERVICES

EG-CL-TB-EN-L16-05-1210

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numatics®

Mark 15 & PA 15 Series

Direct Solenoid or Air Pilot Valves





www.numatics.com

EMERSON
Industrial Automation

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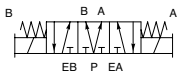
5 Ported, 2 and 3 position, 4-way, Spool & Sleeve

Cv: 1.5

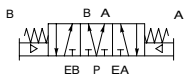
- Direct solenoid or air pilot actuated
- Plug-in solenoid with indicator light
- Unlubricated or lubricated service
- Integral speed control available
- Integral regulators available
- NEMA 4
- Body to base plug-in



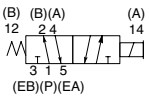
double solenoid
3 Position 4-Way (5/3),
pressure center



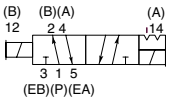
double air pilot
3 Position 4-Way (5/3),
pressure center



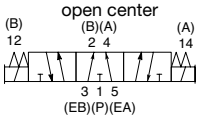
single solenoid
2 position 4-way



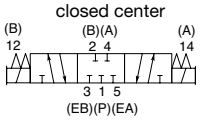
double solenoid
2 position 4-way



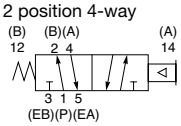
double solenoid
3 position 4-way
open center



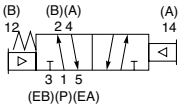
double solenoid
3 position 4-way
closed center



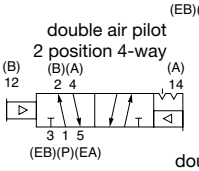
single air pilot
2 position 4-way



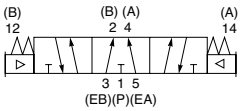
double air pilot
2 position 4-way
with spring offset



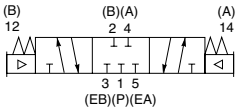
double air pilot
2 position 4-way



double air pilot
3 position 4-way
open center



double air pilot
3 position 4-way
closed center



Technical Data

Valve Data		English		Metric Mark 15 Only	
Cv		1/4 NPTF = 1.4	3/8 NTPF = 1.5	1/4 G Tap = 1.4	3/8 G Tap = 1.5
Flow Capacity		65 SCFM	69 SCFM	1379 Nl/m	1477 Nl/m
		Upstream pressure to atmosphere @80 PSIG		@ 6 bar upstream/5 bar downstream	
Operating Pressure Range		28" Hg. Vacuum to 150 PSIG		Vacuum to 10 bar	
Temperature Range (Ambient)		-10°F to +115°F		-23°C to +46°C	
Pilot Pressure Range (PA15)	2-Position, Spring Return 2-Position, Detented 3-Position	20 to 125 PSIG 15 to 125 PSIG 20 to 125 PSIG			

Operating Data

All Solenoids Are Continuous Duty Rated		12 VDC	24 VDC	24 VAC 50 Hz	24 VAC 60 Hz	115 VAC 50 Hz	120 VAC 60 Hz	230 VAC 50 Hz	240 VAC 60 Hz
Power (Watts)		6.0	6.0	N/A	N/A	N/A	N/A	N/A	N/A
Holding Current (Amps.)		0.500	0.250	0.590	0.420	0.110	0.090	0.070	0.050
Inrush Current (Amps.)		N/A	N/A	2.850	2.530	0.630	0.580	0.310	0.290
Energize in seconds	2-Position, Single, Spring Return	0.038	0.034	0.010	0.010	0.010	0.010	0.010	0.010
	2-Position, Double, Detented	0.035	0.035	0.010	0.010	0.010	0.010	0.010	0.010
	3-Position, Spring Centered	0.040	0.040	0.010	0.010	0.010	0.010	0.010	0.010
De-energize in seconds	2-Position, Single, Spring Return	0.016	0.011	0.015	0.015	0.015	0.015	0.015	0.015
	2-Position, Double, Detented	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	3-Position, Spring Centered	0.010	0.010	0.012	0.012	0.012	0.012	0.012	0.012

Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.

How to Order

Valves

153 SA 4 15 K 0 000 30

Valve Series & Port Size
152* = 1/4
153 = 3/8
*Valve unit only.

Valve Type
SA = Single Solenoid, Spring Return W/Flush Non-locking Override
SS = Double Direct Solenoid w/Flush Non-locking Override (Standard)
JA = Single Air Pilot, Spring Return w/Flush Non-Locking Override (Std.)
JJ = Double Air Pilot w/Flush Non-Locking Override
JK = Double Air Pilot, Spring Return w/Flush Non-Locking Override
PA = Single Air Pilot, Spring Return w/out Override
PP = Double Air Pilot w/out Override

Function
4 = 2 Position, 4-Way
5 = 3 Position, 4-Way Open Center
6 = 3 Position, 4-Way Closed Center
7 = 3 Position 4-Way (5/3), Pressure Center
0 = Manifold Block w/o Valve
P = Manifold Block, w/Blank Station Plate

Mounting
00 = Valve Unit, w/o Mounting
01 = Valve Unit, Speed Control, w/o Mounting
02 = Valve Unit w/ Long Screws for Speed Control
15 = Manifold Block, Side and Bottom Cylinder Ports
16 = Manifold Block, Side and Bottom Cylinder Ports, Auxiliary Inlet
1B = Manifold Block, Side and Bottom Cylinder Ports, Alternate Outlet
18 = Manifold Block, Side and Bottom Cylinder Ports, Alternate Outlet & Auxiliary Inlet
25 = Manifold Block, Side and Bottom Cylinder Ports, Speed Control
3A = Plug-in Base, Individual Exhaust, Side Cylinder Ports, (Mark 15 only)
3B = Plug-in Base, Individual Exhaust, Side and Bottom Cylinder Ports, (Mark 15 only)
3C = Plug-in Base, Individual Exhaust, Side Cylinder Ports, Speed Control (Mark 15 only)
3D = Plug-in Base, Individual Exhaust, Side and Bottom Cylinder Ports, Speed Control (Mark 15 only)
31 = Plug-in Base, Common Exhaust, Side Cylinder Ports (Mark 15 only)
32 = Plug-in Base, Common Exhaust, Side and Bottom Cylinder Ports (Mark 15 only)
35 = Plug-in Base, Common Exhaust, Side Cylinder Ports, Speed Control (Mark 15 only)
36 = Plug-in Base, Common Exhaust, Side and Bottom Cylinder Ports, Speed Control (Mark 15 only)
41 = Base, Individual Exhaust, Side Cylinder Ports (PA15 only)
43 = Base, Individual Exhaust, Side and Bottom Cylinder Ports (PA15 only)
44 = Base, Common Exhaust, Side Cylinder Ports (PA15 only)
46 = Base, Individual Exhaust, Side Cylinder Ports, Speed control (PA15 only)
48 = Base, Individual Exhaust, Side and Bottom Cylinder Ports, Speed Control (PA15 only)
49 = Base, Common Exhaust, Side Cylinder Ports, Speed Control (PA15 only)
54 = Base, Common Exhaust, Side and Bottom Cylinder Ports (PA15 only)
55 = Base, Common Exhaust, Side and Bottom Cylinder Ports, Speed Control (PA15 only)

Voltage
00 = Manifold Block, w/o Valve
20 = 24 VAC, 50-60 Hz
30 = 110-120 VAC, 50-60 Hz
40 = 220-240 VAC, 50-60 Hz
60 = 12 VDC
61 = 24 VDC

Options
000 = No Options
11B = Flush Locking Manual Override
11Y = Extended Non- Locking Manual Override
11Z = Extended Locking Manual Override
12A = FKM Seals on Sleeve Assembly
12B = Lubricant Free Assembly
13A = 4 Foot Leads
15W = 5-Pin Straight Mini Connector in Mounting; Pin 1=A+(14+), 2=A-(14-), 3=Gnd, 4=B+(12+), 5=B-(12-)
16T = Adds Bottom P (1) Port to Mounting
17N = Surge Suppression (DC Only)
19M = Terminal Block in Mounting
46T = Zinc Plated Solenoid Armature (A C Only)
47J = 5-Pin Straight Mini Connector in Mounting; Pin 1=B+(12+), 2=A-(14-), 3=Gnd, 4=A+(14+), 5=B-(12-)
56Y = 4 Pin Straight Micro Connector in Mounting; Pin 1=Not Used, 2=12+(B+), 3=Com, 4=14+(A+)

Combination Options
41W = (11B) Flush Locking Manual Override & (17N) Surge Suppression (DC Only)
48S = (11B) Flush Locking Manual Override & (19M) Terminal Block in Mounting
26K = (11B) Flush Locking Manual Override & (46T) Zinc Plated Solenoid Armature (A C Only)
46Z = (11Z) Extended Locking Manual Override & (17N) Surge Suppression (DC Only)
26C = (11Z) Extended Locking Manual Override & (19M) Terminal Block in Mounting
48Q = (11Z) Extended Locking Manual Override & (46T) Zinc Plated Solenoid Armature (A C Only)
46P = (17N) Surge Suppression (DC Only) & (19M) Terminal Block in Mounting

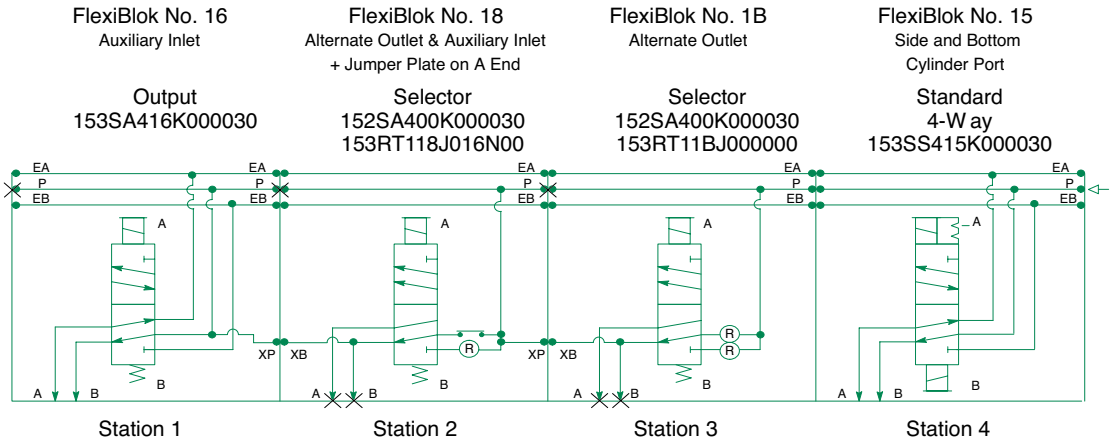
Port Type
0 = NPTF Pressure Ports w/NPTF Conduit Ports or Valve Unit w/o Mounting
G = ISO228/1-G Pressure Ports w/ ISO Metric - 1.5mm Pitch Conduit Ports

Wiring Option
K = Plug-in, w/ Light, VAC
M = Plug-in, w/ Light, VDC
2 = DIN Plug-in Solenoid, VAC
4 = DIN Plug-in Solenoid, VDC
6 = DIN Plug-in Solenoid, w/ Light, VAC
O = Non Plug-in (hardwired), VAC or Mounting Only w/ Electrical Receptacle
B = Non Plug-in (hardwired), VDC or Mounting Only w/o Electrical Receptacle

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Flexiblok Diagrams

Sample diagram with regulators Mark 15 3-pressure selector Flexiblok with output valve and separate 4-way (3/8 NPTF).



Blocking discs must be installed in “P” gallery, as shown.

Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.

How to Order

Regulators

153 RS 1 15 J 0 000 00

Valve Series & Port Size
152* = 1/4
153 = 3/8
*Regulator unit only.

Regulator Type
RS = Single Pressure to Valve P(1)
RD = Dual Pressure to Valve EB(3) & EA(5)
RC = Dual Pressure w/ Non-Relieving Checks to Valve EB(3) & EA(5)
RQ = Dual Pressure w/ Relieving Checks to Valve EB(3) & EA(5)
RE = External Jumper Plate, Dual Pressure to Ports A(4) & B(2)
RT = Dual Pressure to Valve P(1) & EB(3)

Pressure Range
1 = 10-130 PSIG (0.7-9 bar)
3 = 3-30 PSIG (0.2-2 bar)
4 = 5-60 PSIG (0.3-4.1 bar)

Mounting
00 = Regulator Unit, w/o Mounting
15 = Manifold Block, Side and Bottom Cylinder Ports
16 = Manifold Block, Side and Bottom Cylinder Ports, Auxiliary Inlet
1B = Manifold Block, Side and Bottom Cylinder Ports, Alternate Outlet
18 = Manifold Block, Side and Bottom Cylinder Ports, Alternate Outlet & Auxiliary Inlet
25 = Manifold Block, Side and Bottom Cylinder Ports, Speed Control
3A = Plug-in Base, Individual Exhaust, Side Ports (Mark 15 only)
3B = Plug-in Base, Individual Exhaust, Side and Bottom Ports (Mark 15 only)
3C = Plug-in Base, Individual Exhaust, Side Ports, Speed Control (Mark 15 only)
3D = Plug-in Base, Individual Exhaust, Side and Bottom Ports, Speed Control (Mark 15 only)
31 = Plug-in Base, Common Exhaust, Side Ports (Mark 15 only)
32 = Plug-in Base, Common Exhaust, Side and Bottom Ports (Mark 15 only)
35 = Plug-in Base, Common Exhaust, Side Ports, w/ Speed Control (Mark 15 only)
36 = Plug-in Base, Common Exhaust, Side and Bottom Ports, w/ Speed Control (Mark 15 only)
41 = Base, Individual Exhaust, Side ports (PA15 only)
43 = Base, Individual Exhaust, Side and Bottom Ports (PA15 only)
44 = Base, Common Exhaust, Side Ports (PA15 only)
46 = Base, Individual Exhaust, Side Ports w/ Speed control (PA15 only)
48 = Base, Individual Exhaust, Side and Bottom Ports w/Speed Control (PA15 only)
49 = Base, Common Exhaust, Side Ports with Speed Control (PA15 only)
54 = Base, Common Exhaust, Side and Bottom Ports (PA15 only)
55 = Base, Common Exhaust, Side and Bottom Ports w/ Speed Control (PA15 only)

Voltage
00 = No Voltage

Options
Single Options
000 = No Options
12H = Regulator Less Gauge
13A = 4 Foot Leads
15W = 5-Pin Straight Mini Connector in Mounting; Pin 1=A+, 2=A-, 3=Gnd, 4=B+, 5=B-
19M = Terminal Block in Mounting
16N = Jumper for Supply Pressure to Valve, A (14) End
16P = Jumper for Supply Pressure to Valve, B (12) End
16T = Adds Bottom P (1) Port to Mounting
16W = Fitting(s) for Top Facing Gauge
16Y = Regulator Less Gauge and Fittings
17A = Plugged Regulator Gauge Port
47J = 5-Pin Straight Mini Connector in Mounting; Pin 1=B+(12+), 2=A-(14-), 3=Gnd, 4=A+(14+) 5=B-(12-)
56Y = 4 Pin Straight Micro Connector in Mounting; Pin 1=Not Used, 2=12(B+), 3=Com, 4=14(A+)

Combination Options
27J = (12H) Regulator Less Gauge & (16N) Jumper for Supply Pressure to Valve, A (14) End
27K = (12H) Regulator Less Gauge& (16P) Jumper for Supply Pressure to Valve, B (12) End
27M = (16P) Jumper for Supply Pressure to Valve, B (12) End & (16W) Fitting(s) for Top Facing Gauge
27P = (16N) Jumper for Supply Pressure to Valve, A (14) End & (16W) Fitting(s) for Top Facing Gauge
27Q = (12H) Regulator Less Gauge & (16W) Fitting(s) for Top Facing Gauge
45E = (16N) Jumper for Supply Pressure to Valve, A (14) End & (16Y) Regulator Less Gauge and Fittings
46F = (16W) Fitting(s) for Top Facing Gauge & (19M) Terminal Block in Mounting
48D = (16P) Jumper for Supply Pressure to Valve, B (12) End & (19M) Terminal Block in Mounting
48G = (16N) Jumper for Supply Pressure to Valve, A (14) End & (19M) Terminal Block in Mounting
54A = (16P) Jumper for Supply Pressure to Valve, B (12) End & (16Y) Regulator Less Gauge and Fittings
58Z = (12H) Regulator Less Gauge & (19M) Terminal Block in Mounting
67P = (16Y) Regulator Less Gauge and Fittings & (19M) Terminal Block in Mounting

Port Type
0 = NPTF Pressure Ports w/NPTF Conduit Ports or Valve Unit w/o Mounting
G = ISO228/1-G Pressure Ports w/ISO Metric - 1.5mm Pitch Conduit Ports

Wiring Option
J = Plug-in Receptacle Assembly (MK 15 only)
O = Non Plug-In (PA 15 only)

Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.

How to Order

Manifold Assembly

AK 0 J H 0000 4 N STD

Electrical/Electronics Type & Location
0 = Standard
V = Fieldbus Electronics w/ Internal Wiring

Valve Line
J = Mark 15 Series or PA 15 Series

Number of Valve Stations
A = 1 E = 5 I = 9 M = 13
B = 2 F = 6 J = 10 N = 14
C = 3 G = 7 K = 11 O = 15
D = 4 H = 8 L = 12 P = 16

Options
STD = Standard
A05 = All Stations Wired for Double Solenoid Valves ('AKV...' only)

Port Type
N = NPTF Pressure
G = ISO228/1-G Pressure Ports w/ ISO Metric - 1.5mm Pitch Conduit Ports

End Plate Port Size
4 = 1/2
X = Two or More Valve Series in One Manifold

Valve Line and Number of Stations Second Valve Series
0 = No Second Valve Series
H = Mark 8
M = Mark 55 Compact

Number of Stations of Second Valve Series
0 = None
A = 1 E = 5 I = 9 M = 13
B = 2 F = 6 J = 10 N = 14
C = 3 G = 7 K = 11 O = 15
D = 4 H = 8 L = 12 P = 16

Third Valve Series
0 = No Third Valve Series
J = Mark 15 / PA 15

Number of Stations of Third Valve Series
0 = None
A = 1 E = 5 I = 9 M = 13
B = 2 F = 6 J = 10 N = 14
C = 3 G = 7 K = 11 O = 15
D = 4 H = 8 L = 12 P = 16

Example order:

List in order, left to right, facing cylinder ports

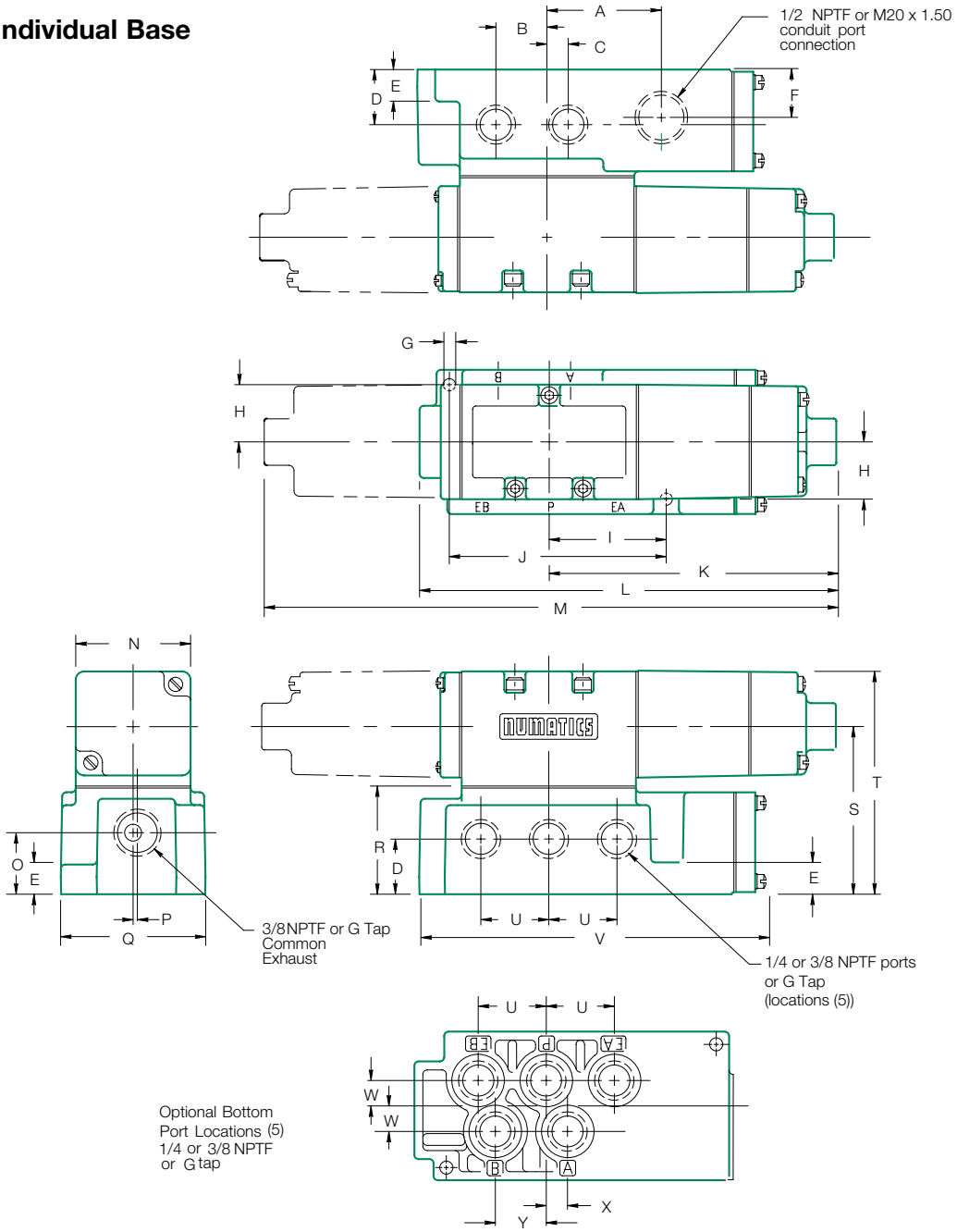
Assembly Kit	AK0JF00004NSTD
Station 1	153SA415M000061
Station 2	153SS425M000061
Station 3 & 4	152SA415M000061
Station 5	152SS615M000061
Station 6	153SS425M000061
	ASSEMBLED

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Dimensions: Inches (mm)

Mark 15

Valve on Individual Base



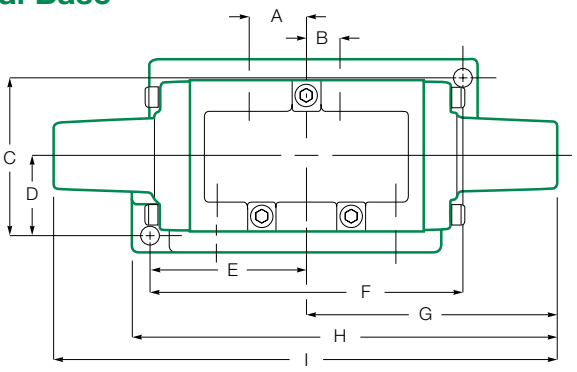
A	B	C	D	E	F	G	H	I	J	K (AC)	K (DC)	L (AC)	L (DC)	M (AC)
1.72 (43.7)	0.78 (19.8)	0.31 (7.9)	0.84 (21.3)	0.47 (11.9)	0.72 (18.3)	0.20 (5.1)	0.88 (22.4)	1.75 (44.5)	3.25 (82.6)	4.43 (112.5)	4.95 (125.7)	6.34 (161.0)	6.86 (174.2)	8.86 (225.0)

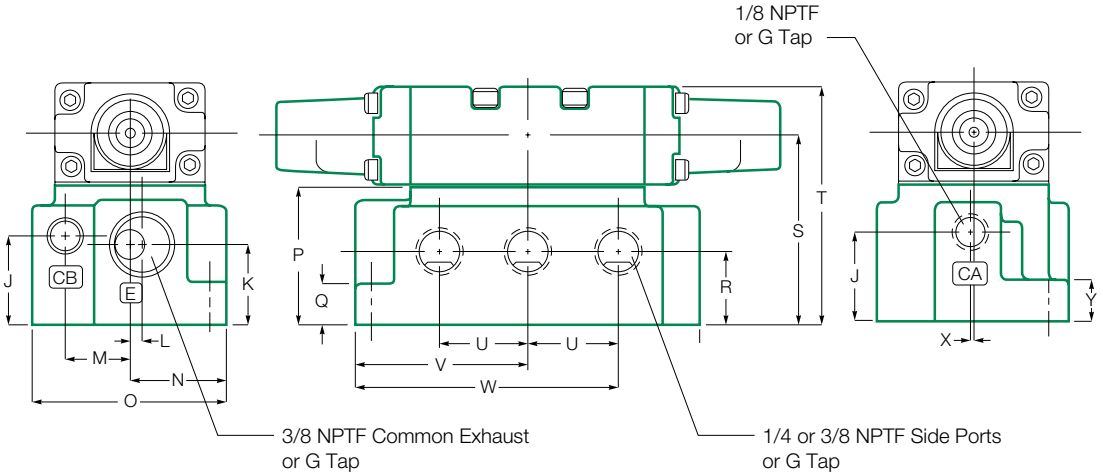
M (DC)	N	O	P	Q	R	S	T	U	V	W	X	Y
9.90 (251.5)	1.70 (44.7)	0.91 (23.0)	0.06 (1.5)	2.16 (54.9)	1.56 (39.6)	2.47 (62.7)	3.30 (83.8)	1.00 (25.4)	5.11 (130.0)	0.38 (9.6)	0.31 (7.9)	0.78 (19.8)

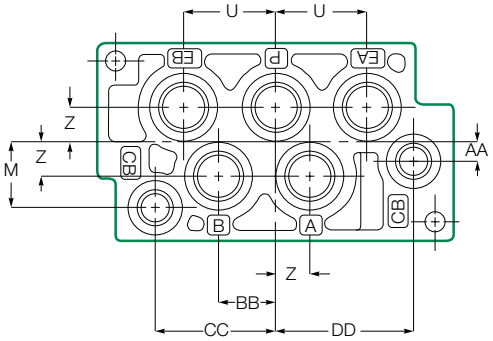
Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.

Dimensions: Inches (mm)

PA 15 Valve on Individual Base







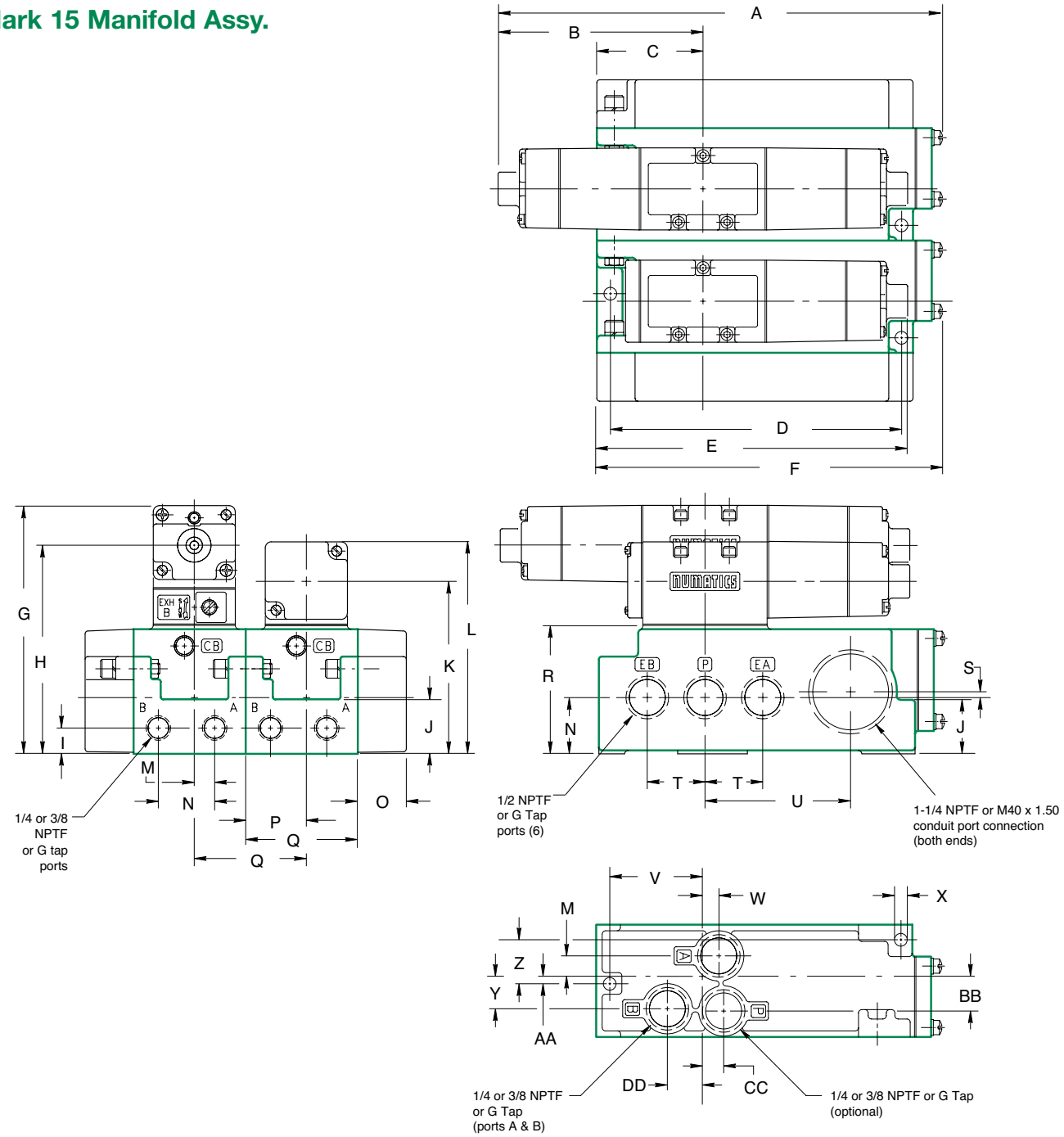
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
0.63 (15.9)	0.38 (9.52)	1.75 (44.4)	0.88 (22.2)	1.75 (44.4)	3.50 (88.9)	2.81 (71.4)	4.75 (120.6)	5.62 (142.7)	1.00 (25.4)	0.91 (23.0)	0.13 (3.2)	0.72 (18.2)	1.08 (27.4)	2.16 (54.9)

P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD
1.56 (39.6)	0.47 (11.9)	0.84 (21.3)	2.15 (54.6)	2.69 (68.3)	1.00 (25.4)	1.94 (49.3)	3.88 (98.6)	0.03 (0.8)	0.47 (11.9)	0.38 (9.5)	0.22 (5.5)	0.63 (15.9)	1.31 (33.2)	1.50 (38.1)

Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.

Dimensions: Inches (mm)

Mark 15 Manifold Assy.



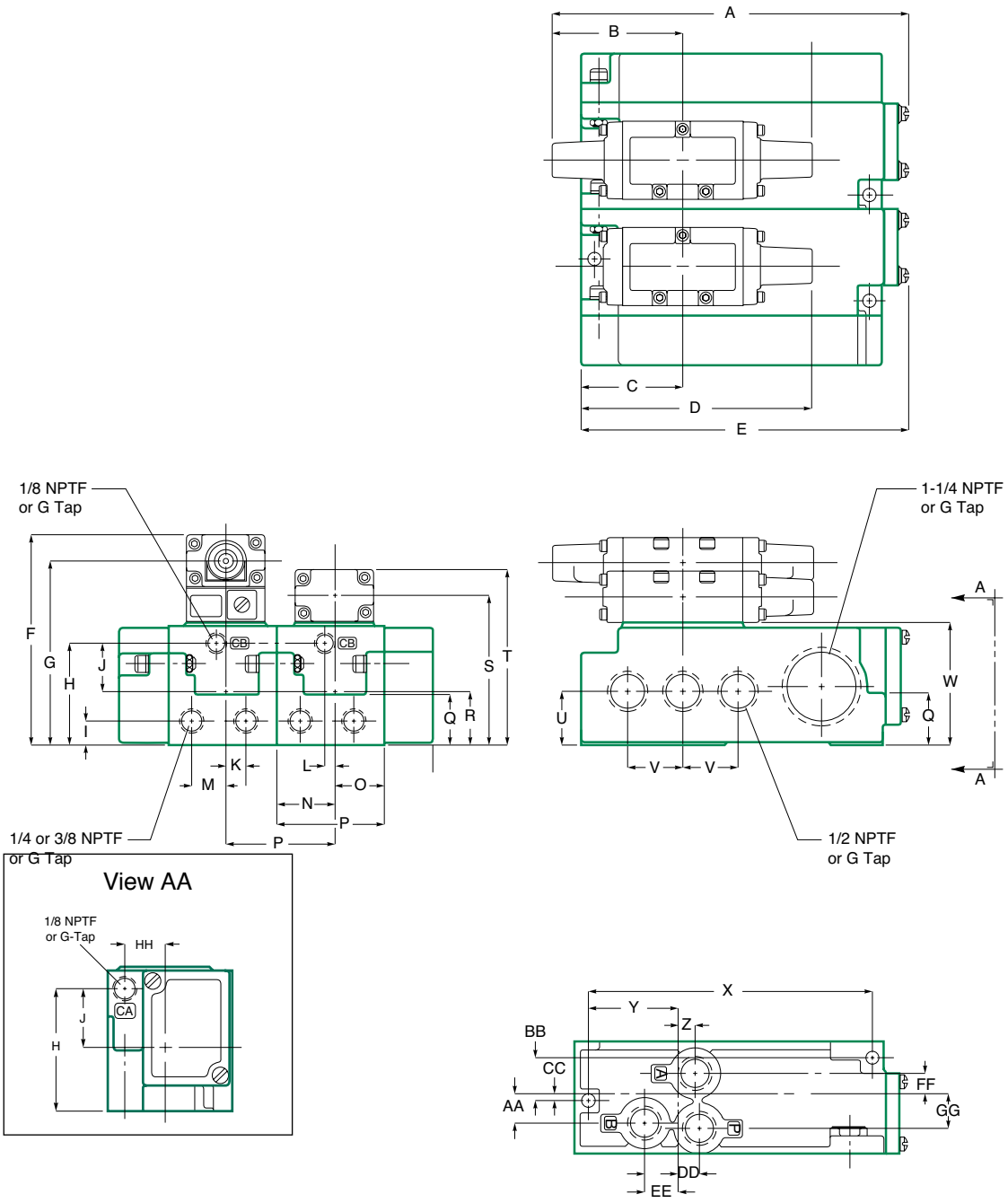
A (AC)	A (DC)	B (AC)	B (DC)	C	D	E (AC)	E (DC)	F	G	H	I	J	K	L	M	N
9.13 (231.9)	9.86 (250.4)	4.22 (107.2)	4.95 (125.7)	2.19 (55.6)	6.00 (152.4)	6.41 (162.8)	7.14 (181.4)	7.09 (180.8)	5.11 (129.8)	4.29 (109.0)	0.53 (13.5)	1.12 (28.4)	3.54 (89.9)	4.36 (110.7)	0.42 (10.7)	1.16 (29.5)

O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD
1.06 (26.9)	1.25 (31.7)	2.31 (58.7)	2.62 (66.5)	0.12 (3.0)	1.19 (30.2)	3.00 (76.2)	1.91 (48.5)	0.34 (8.6)	0.26 (6.6)	0.67 (17.0)	0.91 (23.1)	0.16 (4.1)	0.74 (18.8)	0.44 (11.2)	0.72 (18.3)

Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.

Dimensions: Inches (mm)

PA 15 Manifold Block Assembly



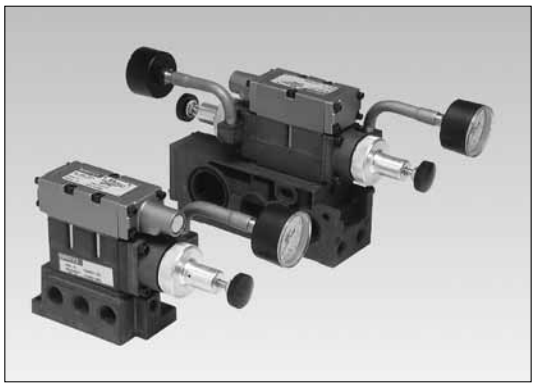
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
7.72 (196.1)	2.81 (71.4)	2.19 (55.6)	5.00 (127.0)	7.10 (180.3)	4.51 (114.6)	3.97 (100.8)	2.22 (56.4)	0.53 (13.5)	1.06 (26.9)	0.42 (10.7)	0.20 (5.1)	1.16 (29.5)	1.25 (31.7)	1.06 (26.9)	2.31 (58.9)	1.12 (28.4)

R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE	FF	GG	HH
1.16 (29.5)	3.22 (81.8)	3.76 (95.5)	1.16 (29.5)	1.19 (30.2)	2.62 (66.5)	6.00 (152.4)	1.91 (48.5)	0.34 (8.6)	0.67 (17.0)	0.91 (23.1)	0.16 (4.1)	0.44 (11.2)	0.72 (18.3)	0.42 (10.7)	0.74 (18.8)	0.75 (19.1)

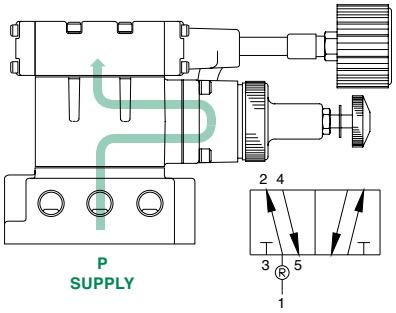
Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.

Sandwich Pressure Regulators

Types: RS / RD / RE / RT / RC / RQ

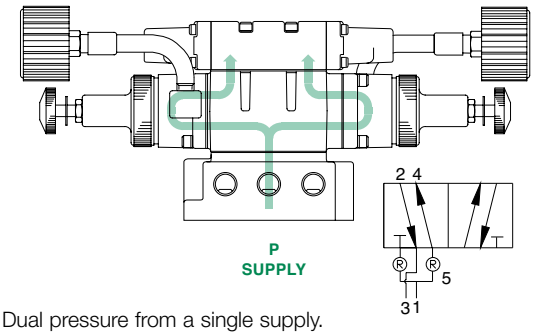


Type RS



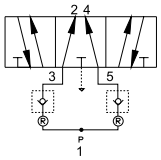
Single pressure from a single supply.

Type RD

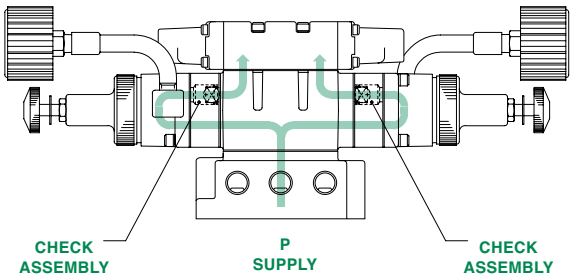


Dual pressure from a single supply.

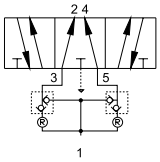
Type RC



Type RC is Non-Relieving: traps downstream pressure if upstream pressure is exhausted.

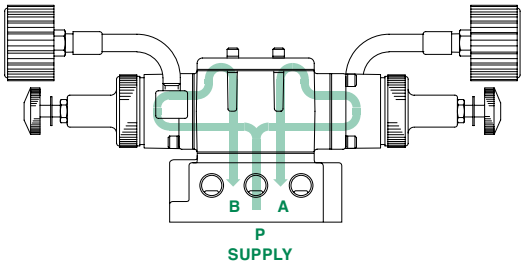


Type RQ



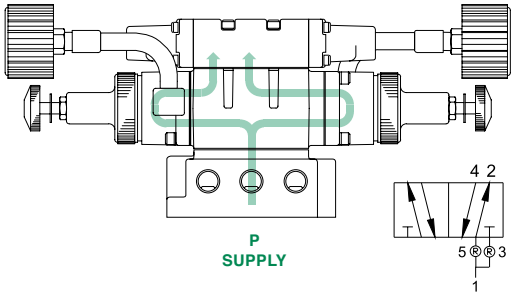
Type RQ is Relieving: exhaust pressure in cylinder if upstream pressure is exhausted.

Type RE



External outlet regulator used with jumper plate for single or dual pressure.

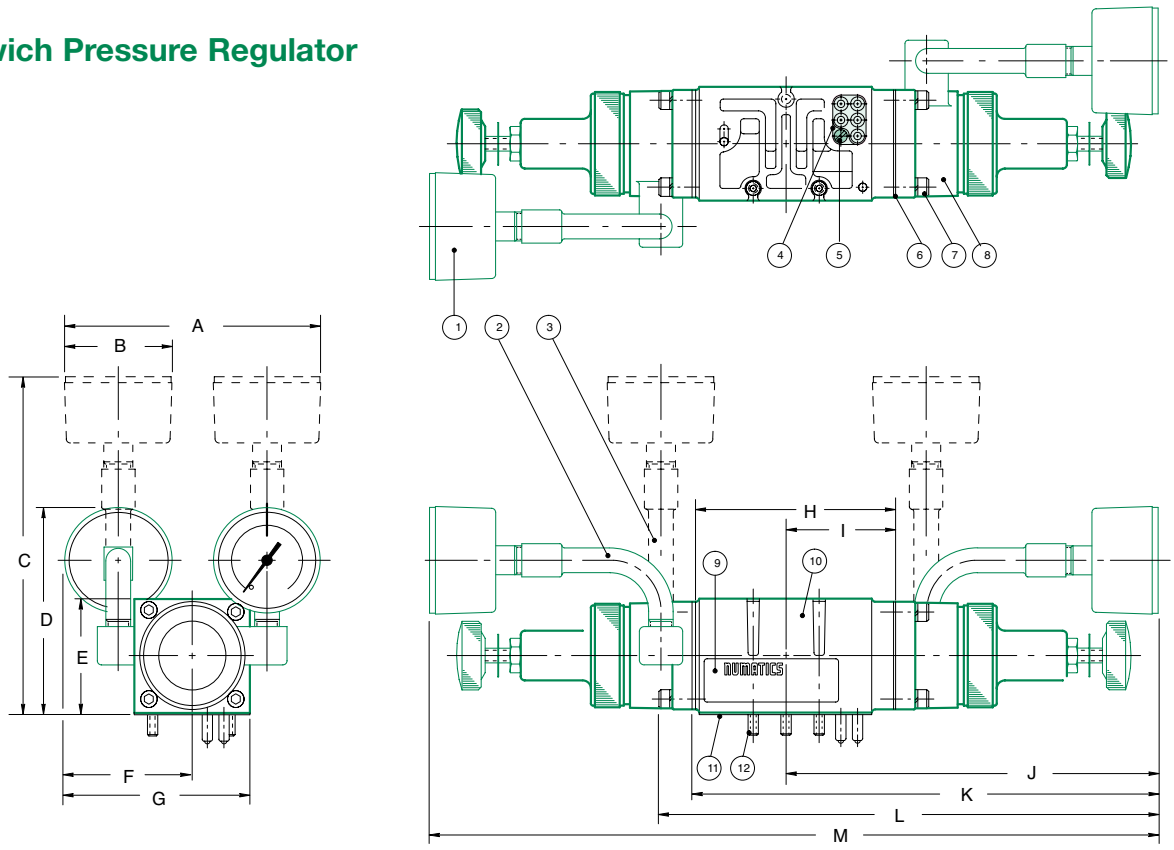
Type RT



Two-pressure selector used for multi-pressure applications.

Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.

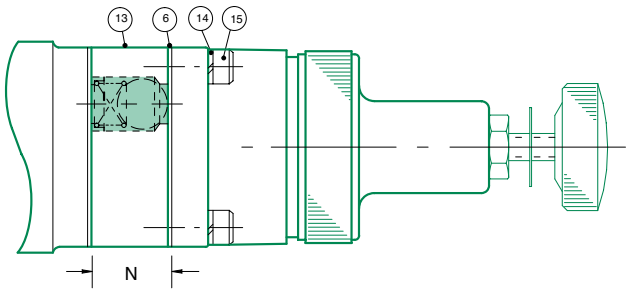
Sandwich Pressure Regulator



Check Assembly Kits

RC: 239-533

RQ: 239-537



*RS models require (1).
**(1) for RS; (2) for RD, RE, RT; (4) for RC, RQ.
~RS models require (4).

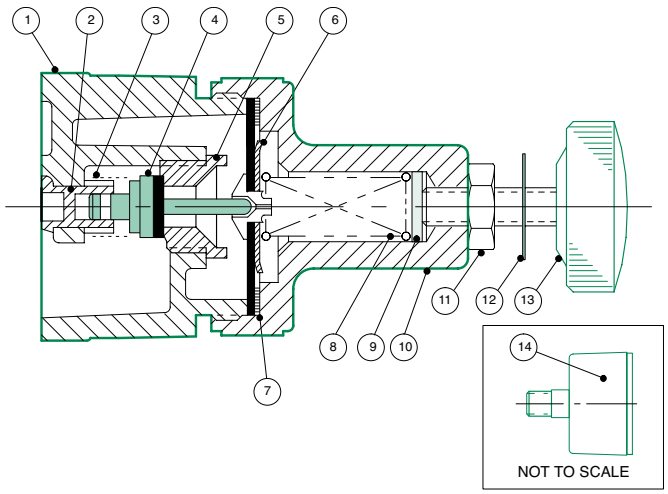
Parts List

Det. No.	No. Req'd	Part Name	Part No.
1	2*	Gauge (See Chart on p.12)	
2	2*	90 Tube Fitting	134-289
3	2*	Straight Fitting	134-293
4	1	Plug Receptacle Assembly	230-257
5	1	Screw	127-342
6	**	Gasket to regulator	113-272
7	8~	Screw	127-235
8	2*	Reg. Assembly (not sold separately)	
9	1	Nameplate	122-551
10	1	Regulator Block RS RD, RC, RQ RT RE	125-311 125-312 125-313 125-316
11	1	Gasket body/base	113-264
12	3	Studs	127-304
13	2	Check Assembly (not sold separately)	
14	8	Hi-Collar Lockwasher (RC, RQ only)	128-144
15	8	Screw (RC, RQ only)	127-227

A	B	C	D	E	F	G	H	I	J	K	L	M	N
3.79 (96.3)	1.54 (39.1)	5.70 (144.0)	3.07 (78.0)	1.73 (44.0)	1.90 (48.3)	2.75 (69.9)	3.03 (76.8)	1.66 (42.2)	5.79 (147.1)	7.145 (181.5)	7.33 (186.0)	10.92 (277.0)	0.66 (16.7)

Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.

Regulator Service Kit 229-640



Parts List

Det. No.	No. Req'd	Part Name	Pressure Range PSIG		
			3-30	5-60	10-130
1	1	Regulator Assembly** (not sold separately)			
2*	1	Retainer	116-291	116-291	116-291
3*	1	Spring	115-210	115-210	115-210
4*	1	Poppet Assembly	221-121	221-121	221-121
5*	1	Poppet Seat	124-142	124-142	124-142
6*	1	Diaphragm Assembly	213-285	213-285	213-285
7*	1	Washer	116-292	116-292	116-292
8	1	Bonnet Spring	115-211	115-212	115-213
9*	1	Spring Guide	116-293	116-293	116-293
10	1	Bonnet	125-314	125-314	125-314
11	1	Locknut	128-177	128-177	128-177
12	1	Pressure Label	122-508	122-509	122-510
13	1	Knob Assembly	213-284	213-284	213-284
14		Regulator Gauges (with PSIG of...)	214-116 (0-60)	214-117 (0-100)	214-103 (0-160)
**Regulator Unit Kits (includes regulator assembly, gaskets, screws)			229-641	229-642	229-643

Jumper Plate Kit 229-644

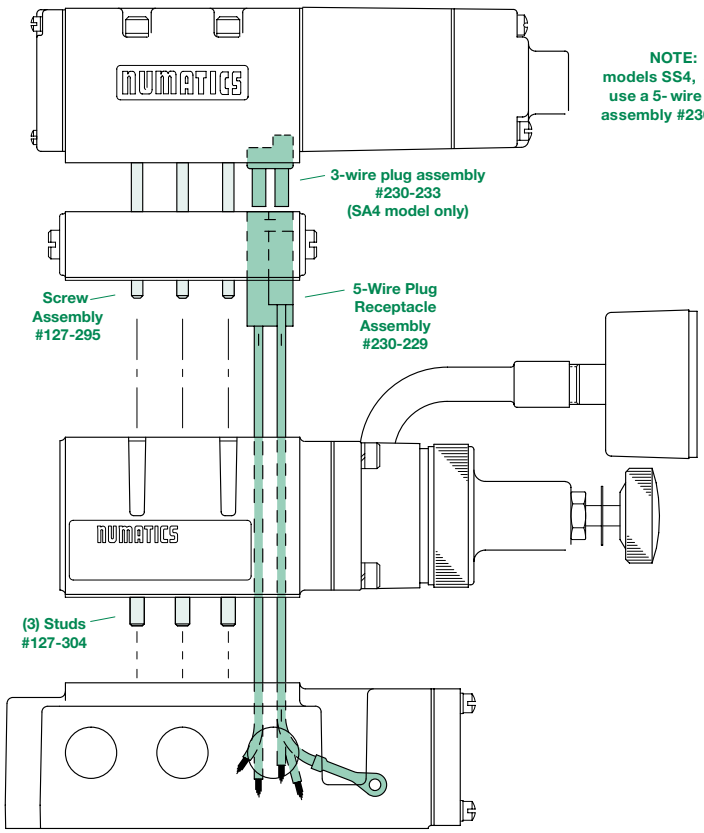
(includes gasket #113-434 and screws #127-235)

RE Top Jumper Plate Kit 229-620

(includes gasket #113-264 and screws #127-235)

Mark 15

Valve, Speed Control and Regulator Plug-In Assembly



EXAMPLE

152SA401K000030

Single solenoid valve unit + speed control sandwich with 5-wire plug receptacle and extra long screws

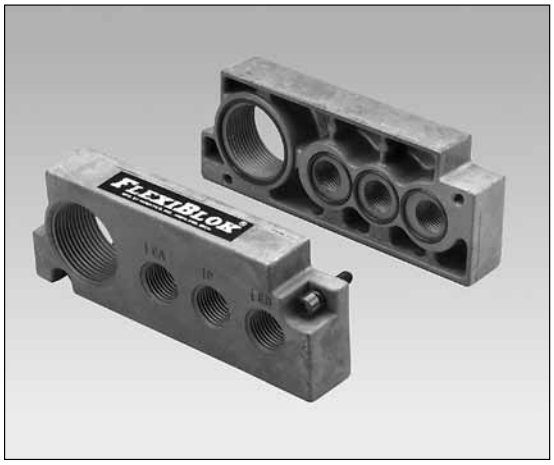
153RS131O000000

3/8 NPTF single pressure regulator (10-130 PSIG) with no receptacle mounted on an individual base with side ports and common exhaust

EXAMPLE ORDER:
Valve: 152SA401K000030
Regulator: 153RS131O000000
ASSEMBLED

Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.

End Plate Kit — NPTF 229-621



G Tap 229-993 — G galleries/metric conduit

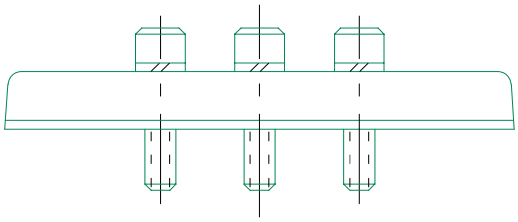
G Tap 239-530 — G galleries/NPTF conduit

Parts List

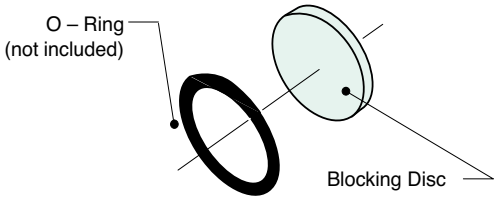
Number Required	Part Name	Part No.		
		NPTF	G Tap w/ Metric Conduit	G Tap w/ NPTF Conduit
1	Seal	126-121	126-121	126-121
1	Right End Plate	104-217	104-287	104-468
1	Nameplate	122-199	122-199	122-199
1	Left end Plate	104-218	104-288	104-288
2	Screws	127-152	127-152	127-152
3	Seal	126-209	126-209	126-209

Blank Station Plate Kit — 229-620

Includes gasket #113-264 and (3) screws #127-235



Blocking Disc Kit — 124-141



Adaptor Kits with End Plates

Mark 15 RIGHT* of Mark 8 229-695

Includes kit #229-694 (adaptor, screws, seals)
+ Mark 15 and 8 end plates

Mark 15 LEFT* of Mark 8 229-693

Includes kit #229-692 (adaptor, screws, seals)
+ Mark 15 and 8 end plates

Mark 15 RIGHT* of Mark 55 Compact 229-858

Includes kit #229-857 (adaptor, screws, seals)
+ Mark 15 and 55 end plates

Mark 15 LEFT* of Mark 55 Compact 229-860

Includes kit #229-859 (adaptor, screws, seals)
+ Mark 15 and 55 end plates

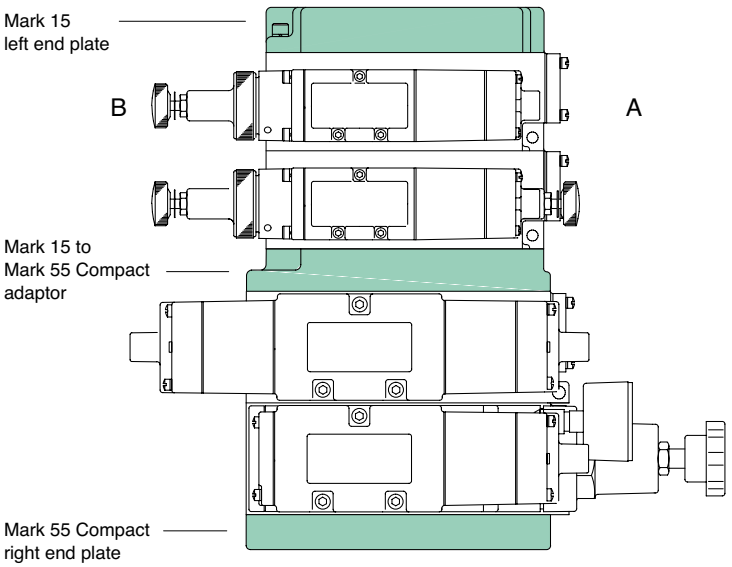
PA 55 COMPACT RIGHT* of PA 15 229-860

Includes kit #229-859 (adaptor, screws, seals)
+ Mark 55 and 15 end plates

PA 55 COMPACT LEFT* of PA 15 229-858

Includes kit #229-857 (adaptor, screws, seals)
+ Mark 55 and 15 end plates

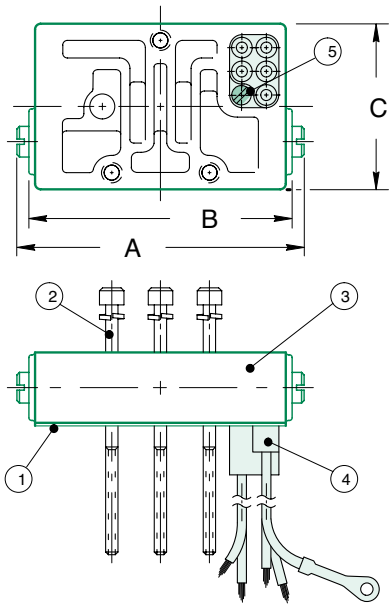
*Left/right when viewed from the cylinder ports of assembly.



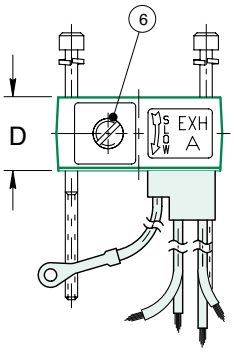
Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.

Mark 15 Speed Control Kit

229-622 **229-664** (Kit with Plug)



Mounts between valve and base.



Parts List

Port Type	Part. No.	Part Name	Part No.
1 *	1	Gasket	113-264
2 *	3	Screw Assembly	127-295
3 *	1	Speed Control (not sold separately)	
4 **	1	Receptacle Assembly	230-229
5 **	1	Receptacle Screw	127-169
6 *	2	Needle Assembly	213-180

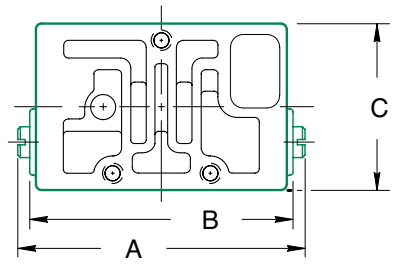
*Indicates parts included in kit.
**Included in 229-664 kit only.

Dimensions: Inches (mm)

A	B	C	D
2.94 (74.7)	2.69 (68.0)	1.69 (43.0)	0.75 (19.0)

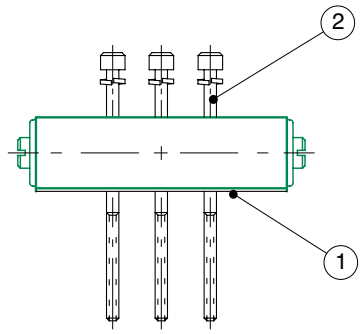
PA 15 Speed Control Kit

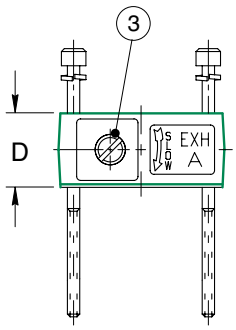
229-708



Parts List

Det. No.	No. Req'd	Part Name	Part No.
1	1	Gasket	113-264
2	3	Screw Assembly	127-323
3	2	Needle Assembly	213-180





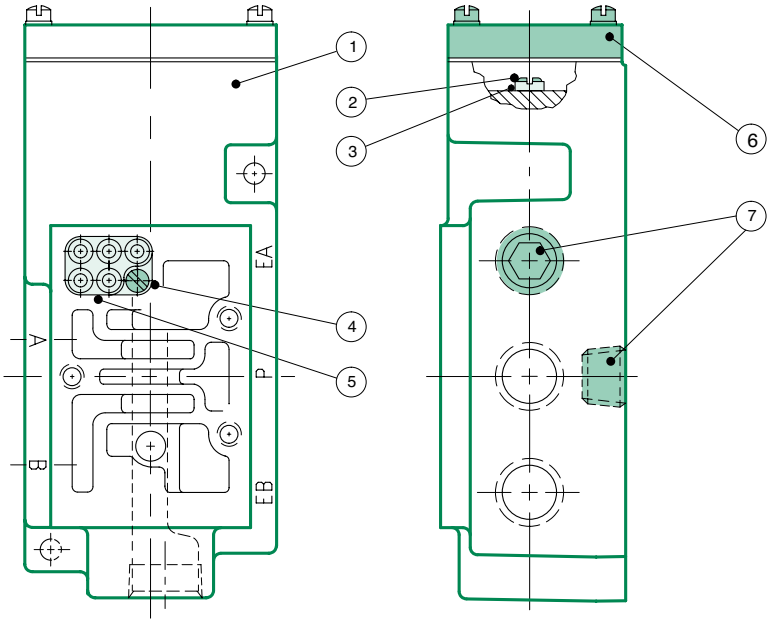
Dimensions: Inches (mm)

A	B	C	D
2.94 (74.7)	2.69 (68.0)	1.69 (43.0)	0.75 (19.0)

Mounts between valve and base.

Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.

Mark 15 Base Assembly Kits



Parts List

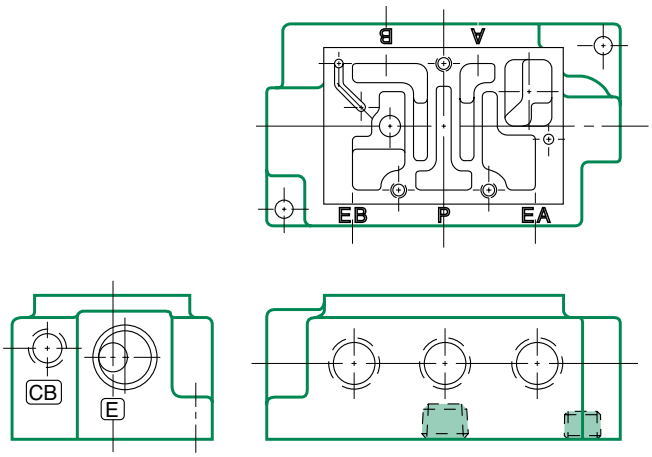
Det. No.	No. Req'd	Part Name	Part No.
1 *	1	Base (not sold separately)	
2 *	2	Screw	127-176
3 *	1	Washer	128-162
4 *	1	Screw	127-342
5 *	1	Receptacle Assembly Plug-in units only	230-229
6 *	1	Conduit Cover Assembly	205-302
7 *	**	Plug: 1/4 NPTF 3/8 NPTF G 1/4 G 3/8	129-101 129-102 129-161 129-163

*Indicates parts included in kit.
**Not used on 3A, 3C; plugs vary - consult factory.

Base	Exhaust	1/4 NPTF		3/8 NPTF		G 1/4		G 3/8	
		Plug-In	No Plug	Plug-In	No Plug	Plug-In	No Plug	Plug-In	No Plug
31 & 35: Side ports only	common	203-353	203-346	203-361	203-357	203-261	203-659	203-557	203-660
32 & 36: Side & bottom ports	common	203-354	203-350	203-362	203-358	203-663	203-661	203-664	203-662
3A & 3C: Side ports only	individual	203-351	203-347	203-359	203-355	203-611	203-665	203-612	203-645
3B & 3D: Side & bottom ports	individual	203-352	203-348	203-360	203-356	203-668	203-667	203-670	203-669

PA 15

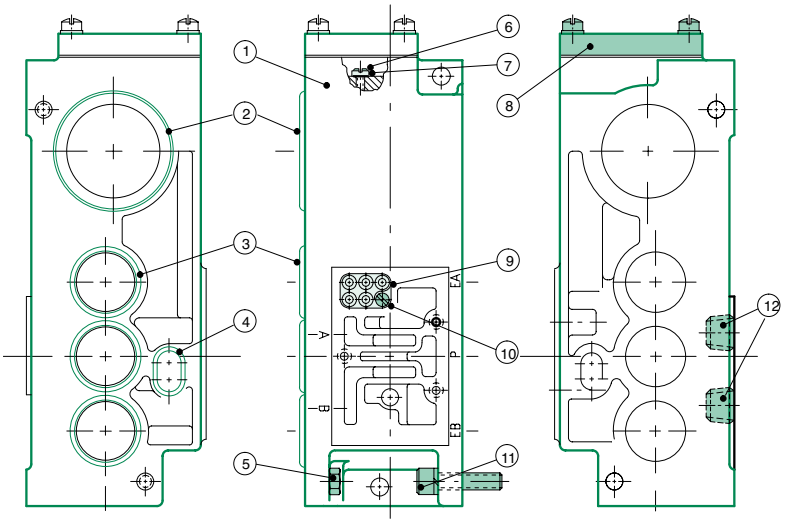
Base Assembly Kit with Tapped CA and CB Ports



Base Description	1/4 NPTF	3/8 NPTF
41 & 46: Side ports, individual exhaust	103-485	103-489
43 & 48: Side & bottom ports, individual exhaust	203-451	203-454
44 & 49: Side ports, common exhaust	203-452	203-455
54 & 55: Side & bottom ports, common exhaust	203-453	203-456

Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.

Mark 15 Flexiblok Manifold Kits



Parts List

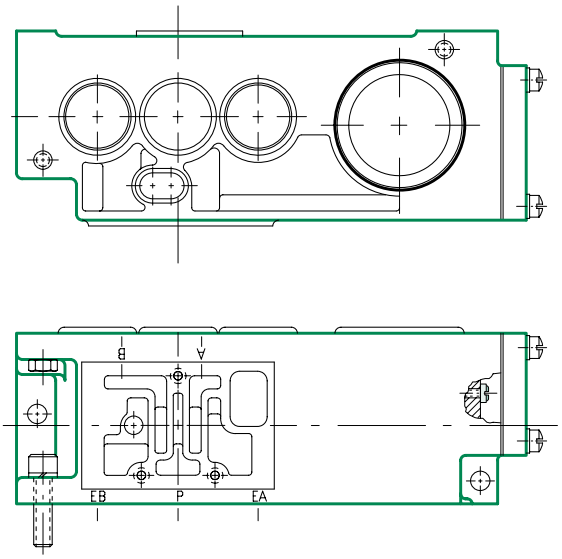
Det. No.	No. Req'd	Part Name	Part No.
1 *	1	Valve Blok (not sold separately)	
2 *	1	Seal	126-121
3 *	3	Seal	126-209
4 *	1	Seal (for 1B & 18)	126-202
5 *	2	Nut	128-103
6 *	2	Screw	127-176
7 *	1	Washer	128-162
8 *	1	Conduit Cover Assembly	205-303
9 *	1	Receptacle Assembly Plug-in units only	230-229
10 *	1	Screw - receptacle	127-342
11 *	2	Screw	127-152
12 *	2	Plug: 1/4 NPTF 3/8 NPTF G 1/4 G 3/8	129-101 129-102 129-161 129-163

*Indicates parts included in kit.

Flexiblok Description	1/4 NPTF		3/8 NPTF		G 1/4		G 3/8	
	Plug-In	No Plug	Plug-In	No Plug	Plug-In	No Plug	Plug-In	No Plug
#15: Side & bottom Cylinder ports	229-629	229-627	229-630	229-628	239-210	239-367	229-999	239-368
#15: Side & bottom cyl. ports w/bottom P port	229-632	229-631	229-634	229-633	239-371	239-369	239-372	239-370
#15 & 19M Option (Terminal Strip)	239-732	239-1863	239-1029	239-1171	239-2085	N/A	239-2086	N/A
#16: Auxiliary inlet	229-792	229-789	229-798	229-795	239-375	239-373	239-376	239-374
#1B: Alternate outlet	229-793	229-790	229-799	229-796	239-383	239-381	239-384	239-382
#18: Alternate outlet & auxiliary inlet	229-794	229-791	229-800	229-797	239-379	239-377	239-380	239-378

PA 15

Flexiblok Manifold Kits with Tapped CA and CB Ports

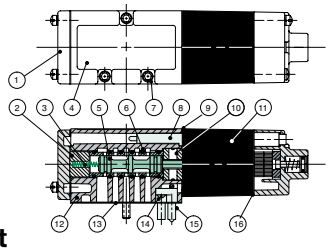


Base Description	1/4 NPTF	3/8 NPTF
15: Manifold w/side & bottom cylinder ports	229-709	229-710
15: w/side & bottom cyl. ports & bottom P port	229-711	229-712
16: Auxiliary inlet	229-896	229-899
1B: Alternate outlet	229-897	229-900
18: Alternate outlet & auxiliary inlet	229-898	229-901

Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.

Service Kits and Parts

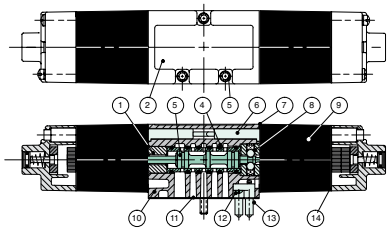
Kit No. MK15-K1* (For Models 152SA4, 153SA4)



Parts List

Det. No.	No. Req'd	Part Name	Part No.
1	1	End Plate Assembly	204-215
2*	1	Spring Retainer	116-286
3*	1	Spring	115-214
4	1	Nameplate	122-941
5	1	Sleeve Assembly w/seals	209-246**
6*	6	Seal	126-202
7	3	Screw	127-294
8	1	Electrical Receptacle	125-309
9*	2	Gasket solenoid/valve	113-268
10*	1	Detented Body	110-113
11	1	Solenoid Capsule Assembly	See p. 21
12	1	Valve Body (not sold separately)	
13*	1	Gasket body/base	113-264
14	1	Screw	127-169
15	1	3-Wire Plug Assembly	230-233
16*	1	Gasket solenoid/end cap	113-267

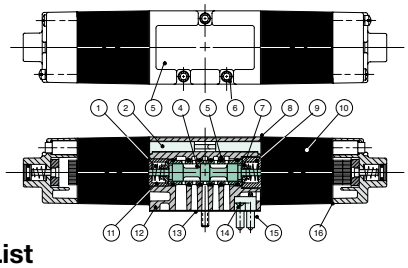
Kit No. MK15-K2* (For Models 152SS4, 153SS4)



Parts List

Det. No.	No. Req'd	Part Name	Part No.
1*	1	Spacer	116-285
2	1	Nameplate	122-941
3	1	Sleeve Assembly w/seals	209-247**
4*	6	Seal	126-202
5	3	Screw	127-294
6	2	Electrical Receptacle	125-309
7*	2	Gasket solenoid/valve	113-268
8*	1	Detented Assembly	210-116
9	2	Solenoid Capsule Assembly	See p. 21
10	1	Valve Body (not sold separately)	
11*	1	Gasket body/base	113-264
12	1	Screw	127-169
13	1	5-Wire Plug Assembly	230-234
14*	2	Gasket solenoid/end cap	113-267

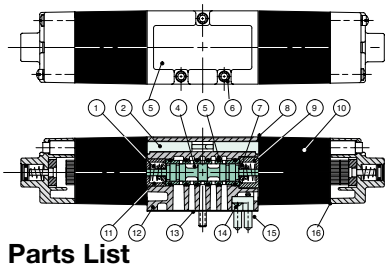
Kit No. MK15-K3* (For Models 152SS5, 153SS5)



Parts List

Det. No.	No. Req'd	Part Name	Part No.
1*	2	Spring	115-204
2	2	Electrical Receptacle	125-309
3	1	Nameplate	122-941
4	1	Sleeve Assembly w/seals	209-248**
5*	6	Seals	126-202
6	3	Screw Assembly	127-294
7*	2	Spring Retainer	116-287
8*	2	Gasket solenoid/valve	113-268
9*	1	Spacer	116-288
10	2	Solenoid Capsule Assembly	See p. 21
11*	1	Spacer	116-289
12	1	Valve Body (not sold separately)	
13*	1	Gasket body/base	113-264
14	1	Screw	127-169
15	1	5-Wire Plug Assembly	230-234
16*	2	Gasket solenoid/end cap	113-267

Kit No. MK15-K3* (For Models 152SS6, 153SS6)



Parts List

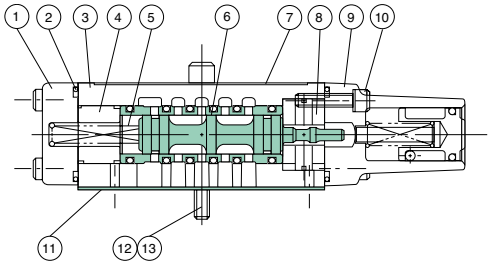
Det. No.	No. Req'd	Part Name	Part No.
1*	2	Spring	115-204
2	2	Electrical Receptacle	125-309
3	1	Nameplate	122-941
4	1	Sleeve Assembly w/seals	209-249**
5*	6	Seals	126-202
6	3	Screw Assembly	127-294
7*	2	Spring Retainer	116-287
8*	2	Gasket solenoid/valve	113-268
9*	1	Spacer	116-288
10	2	Solenoid Capsule Assembly	See p. 21
11*	1	Spacer	116-289
12	1	Valve Body (not sold separately)	
13*	1	Gasket body/base	113-264
14	1	Screw	127-169
15	1	5-Wire Plug Assembly	230-234
16*	2	Gasket solenoid/end cap	113-267

*Indicates parts included in service kit. **Spool and sleeve assemblies are precision matched set; spools are not interchangeable; and assemblies include (6) #126-202 seals.

Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.

Service Kits and Parts

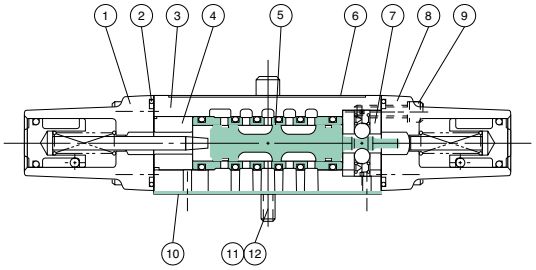
Kit No. PA15-K1* (For Models JA4, JK4)



Parts List

Det. No.	No. Req'd	Part Name	Part No.
1	1	End Cap	104-233
2*	2	O-Ring	126-208
3	1	Valve Body (not sold separately)	
4*	1	Spacer	116-313
5*	1	Spring	115-224
6	1	Sleeve Assembly w/seals	209-270**
7	1	Nameplate	122-942
8*	1	Detented Body	110-113
9	1	End Cap Assembly	204-263
10	8	Screw	127-320
11*	1	Gasket	113-264
12	3	Screw	127-227
13	3	Lockwasher	128-144

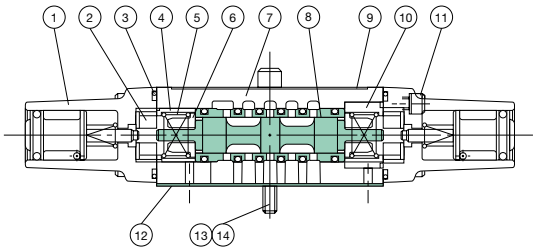
Kit No. PA15-K2* (For Model JJ4)



Parts List

Det. No.	No. Req'd	Part Name	Part No.
1	1	End Cap	204-265
2*	2	O-Ring	126-208
3	1	Valve Body (not sold separately)	
4*	1	Spacer	116-313
5	1	Sleeve Assembly w/seals	209-270**
6	1	Nameplate	122-942
7*	1	Detented Assembly JJ4	210-116
8	1	End Cap Assembly	204-263
9	8	Screw	127-320
10*	1	Gasket	113-264
11	3	Screw	127-227
12	3	Lockwasher	128-144

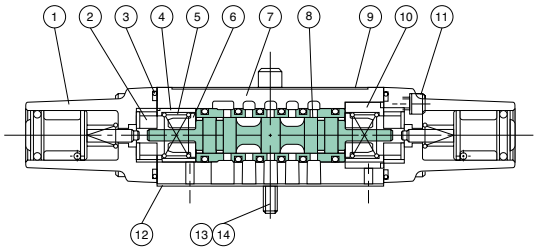
Kit No. PA15-K3* (For Model JJ5)



Parts List

Det. No.	No. Req'd	Part Name	Part No.
1	2	End Cap Assembly	204-267
2*	2	Bumper	114-100
3*	2	O-Ring	126-208
4*	1	Spacer	116-315
5*	2	Spring	115-225
6*	2	Spring Retainer	116-316
7	1	Valve Body (not sold separately)	
8	1	Sleeve Assembly w/seals	209-271**
9	1	Nameplate	122-942
10*	1	Spacer	116-314
11	8	Screw	127-320
12*	1	Gasket	113-264
13	3	Screw	127-227
14	3	Lockwasher	128-144

Kit No. PA15-K3* (For Model JJ6)



Parts List

Det. No.	No. Req'd	Part Name	Part No.
1	2	End Cap Assembly	204-267
2*	2	Bumper	114-110
3*	2	O-Ring	126-208
4*	1	Spacer	116-315
5*	2	Spring	115-225
6*	2	Spring Retainer	116-316
7	1	Valve Body (not sold separately)	
8	1	Sleeve Assembly w/seals	209-272**
9	1	Nameplate	122-942
10*	1	Spacer	116-314
11	8	Screw	127-320
12*	1	Gasket	113-264
13	3	Screw	127-227
14	3	Lockwasher	128-144

*Indicates parts included in service kit. **Spool and sleeve assemblies sold as precision matched set; spools are not interchangeable; and assemblies include (6) #126-202 seals.

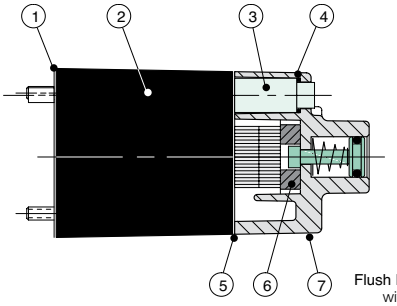
Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.

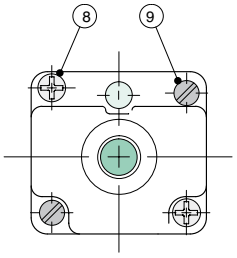
Mark 15 Solenoid Capsule Assemblies

Complete Solenoid Capsule Assemblies — End Cap Only

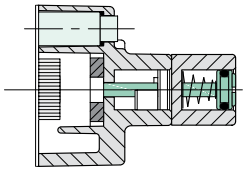
Override Type	Valve Function	Plug-In	Voltage: AC 100-115/50 110-120/60	Voltage: AC 200-230/50 220-240-60	Voltage: AC 24/50-60	Voltage: DC 12VDC	Voltage: DC 24VDC	Light Option: AC 100-130V	Light Option: AC 200-260V	Light Option: DC 8-13VDC	Light Option: DC 14-24VDC	Light Option: No Light
Flush Non-Locking Override w/Light	2 Position	Standard	237-325	237-326	237-426	226-800	226-801	204-217	204-218	204-491	204-492	204-216
	2 Position	DIN Plug-in	237-337	237-338	-	226-509*	226-510*	204-217	204-218	N/A	N/A	204-216
	3 Position	Standard	237-331	237-332	237-425	226-804	226-805	204-220	204-221		204-496	204-219
	3 Position	DIN Plug-in	237-343	237-344	-	226-515*	226-516*	204-220	204-221	N/A	N/A	204-219
Flush Locking w/Light	2 Position	Standard	237-361	237-362	-	-	226-902	204-226	204-227	-	-	204-224
	3 Position	Standard	237-363	237-364	-	-	236-213	204-228	204-229	-	-	204-225
Ext. Rod Locking w/Light	2 Position	Standard	237-365	237-366	237-612	-	226-906	204-238	204-239	-	-	204-236
	3 Position	Standard	237-365	237-368	-	-	226-553	204-240	204-241	-	-	204-237
Solenoid Only less end cap; screws & gaskets not included		Standard	228-690	228-691	228-692	225-371	225-372					
		DIN Plug-in	228-694	228-695	228-696	225-265	225-266					

*DIN DC solenoids are not available with light.

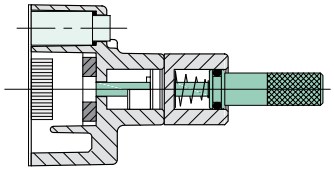




Flush Non–Locking Override with light (Standard)



Flush Locking Override with light
(Add option "011B" to model no.)
Example: 152SA400K011B30



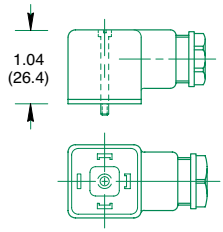
Extended Knurled Rod Locking Override with light
(Add option "011Z" to model no.)
Example: 152SA400K011Z30

Parts List

Det. No.	No. Req'd	Part Name	Part No.
1	1	Gasket solenoid/valve	113-268
2	1	Solenoid	See Chart
3	1	Light Assembly: 100-115/50 110-120/60 200-230/50 220-240/60 12VDC 24VDC	 230-235 230-235 230-236 230-236 230-283 230-284
4	1	O-Ring Seal	126-144
5	1	Gasket solenoid/end cap	113-267
6	1	Bumper: Black for 2 position Red for 3 position	 114-134 114-133
7	1	End Cap Assembly	See Chart
8	2	Screw cap/solenoid	127-297
9	2	Solenoid Screws AC Solenoid Screws DC	127-298 127-302

Plug Assemblies

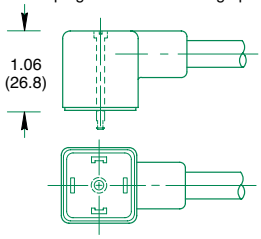
Per DIN Spec. No. 43650
Accepts cable dia. .310 – .410 For DIN plug–in solenoids wiring options 6 & 4



Part Name	Part No.
Gray (A) Plug Ass'y	230-369
Black (B) Plug Ass'y	230-370
Plug w/24VDC Light	230-371
Plug w/110VAC Light	230-372
Plug w/220VAC Light	230-373

Superstructure Plug with Cord

Per DIN Spec. No. 43650
For DIN plug–in solenoids wiring options 6 & 4



Part Name	Part No.
Plug with 4' Cord	230-213
Plug with 6' Cord	230-215

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LT-Mark15Series Rev 03/13
2.5M-TGI-10/09

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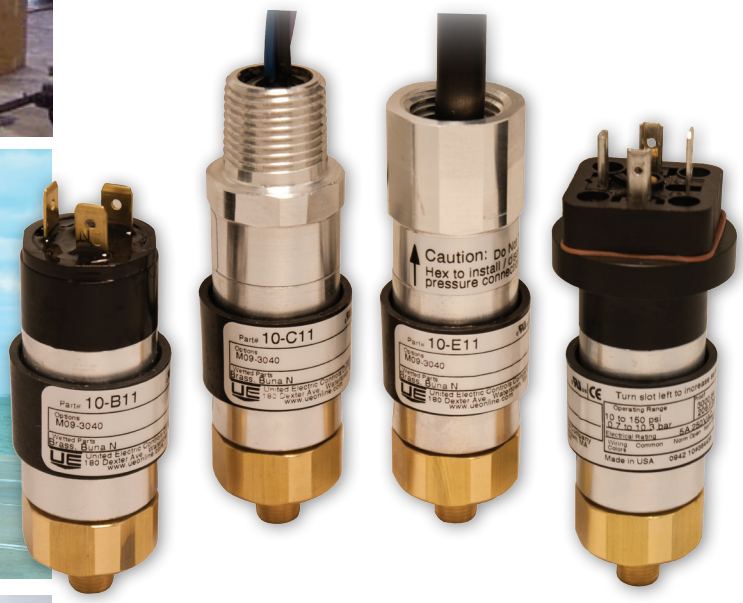
Tags:
90-PSLL-002
90-PSLL-003
20-PSH-601
20-PSH-602

PRESSURE SWITCH









FEATURES

- Tamper-Resistant Field Adjustment
- Adjustable Ranges from 4 to 7500 PSI (0,3 to 517,1 Bar)
- Choice of 7 Electrical Terminations
- 1-1/4" Diameter
- Height as Small as 3"

10 Series

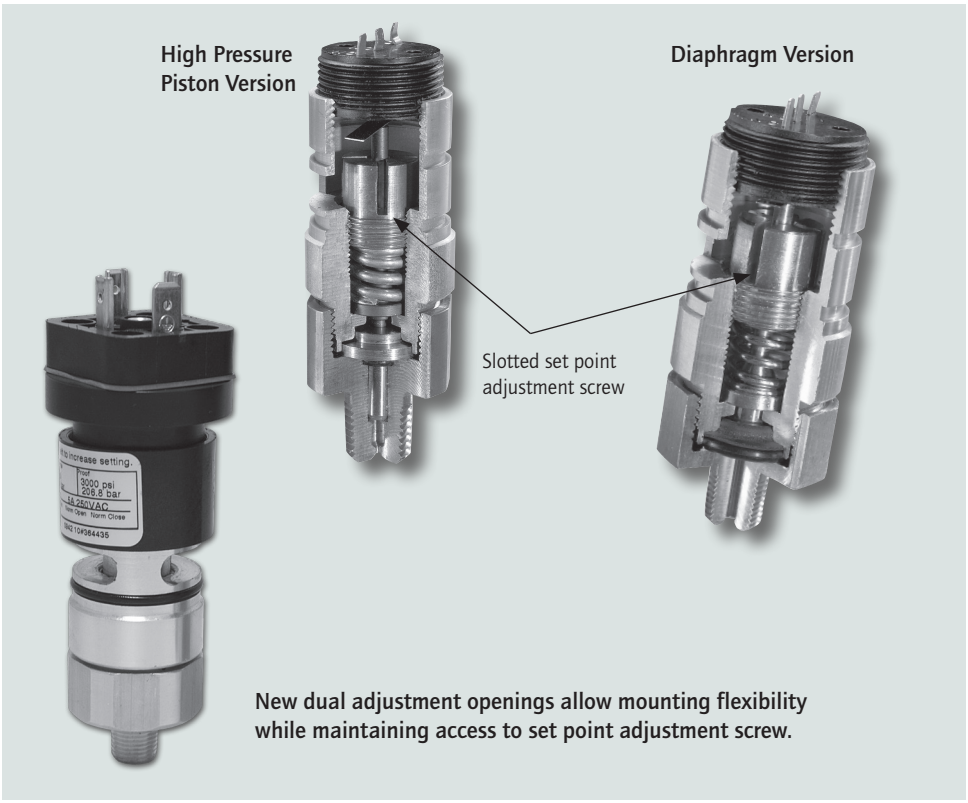
OVERVIEW

Available with seven electrical termination varieties, a choice of sensors, and several pressure connections, the 10 Series is designed to meet most requirements for a variety of OEM and industrial applications. Just 1-1/4 inches in diameter and as small as 3 inches high, this compact, cylindrical switch mounts wherever space is at a premium. A reliable and cost-effective switch, the 10 Series is ideal for applications with high settings and surges. Among the tough applications in which the product has proven itself are: mobile hydraulic units, compactors, balers and lube oil systems.

In addition to standard capabilities, modified designs or options are available to help you meet specific application requirements. Design flexibility allows for customized pressure connections, electrical terminations and pressure ranges. Consult UE for all product capabilities, order restrictions and special conditions.

FEATURES

- cULus recognized, CE compliant to low voltage directive and pressure equipment directive
- Optional ATEX intrinsic safety compliance
- NPT or SAE threaded pressure connections
- Choice of 7 electrical terminations
- Optional leadwire/cable lengths
- Rugged and vibration resistant
- Proof pressures up to 12,000 psi (827 bar)



New dual adjustment openings allow mounting flexibility while maintaining access to set point adjustment screw.

SPECIFICATIONS

STORAGE TEMPERATURE	-40 to 180°F (-40 to 82°C)
AMBIENT TEMPERATURE LIMITS	0 to 160°F (-18 to 71°C) with Buna-N construction; 0 to 180°F (-18 to 82°C) with Viton® construction; set point shifts less than 1% of range for a 50°F (28°C) ambient temperature change. Unit will operate down to -40°F (-40°C) but with reduced repeatability
MAX. MEDIA TEMPERATURE	200°F (93°C) with Buna-N sensor; 250°F (121°C) with Viton® sensor
SHOCK	Set point repeats after 50 G, 10 millisecond duration
VIBRATION	Set point repeats after 10 G, 5-500 CPS
ENCLOSURE CLASSIFICATION	Types C, D, E, F & G: Designed to meet enclosure type 4 requirements Types A & B: Not applicable
SET POINT REPEATABILITY	Models 10-12: ± 1% of full scale range; Models 13-16: ± 1.5% of full scale range
SWITCH OUTPUT	One SPDT
ELECTRICAL RATING	Rated to 5 A resistive and 5 A inductive (75% power factor), at 125 VAC & 250 VAC, 1/4 HP; 5 A resistive and 3 A inductive at 30 VDC; 0.5 A resistive and 0.25 A inductive at 125 VDC; gold flashing over silver contact for loads down to 5 mA at 6 VDC, 2 mA at 12 VDC and 1 mA at 24 VDC
ENCLOSURE	Aluminum
WEIGHT	Type A: 5 oz.; Type B: 6 oz.; Type C: 6.5 oz.; Type D: 6 oz.; Type E: 12 oz.; Type F: 6.5 oz.; Type G: 12 oz.
ELECTRICAL CONNECTION	7 electrical terminations; Refer to "How to Order"
PRESSURE CONNECTION	Models 10-12: 1/8" NPT (male); Models 13-16: 1/4" NPT (male); optional SAE threads and other connections (see options list)
MOUNTING	Via pressure connection. Surface mounting bracket kit available for field installation. (see Options list)

10 Series

APPROVALS

UNITED STATES AND CANADA
UL Recognized, cUL Recognized
Pressure: UL 508; CSA C22.2 No. 14, file # E42272

Canadian Registration Number (CRN): Refer to www.ueonline.com/certifications for list of approved models

EUROPE
ATEX Directive (94/9/EC)
II 1 G EEx ia IIC T6 **(OPTIONAL – code M405)**
Tamb = -50°C to +60°C
UL International DEMKO A/S (N.B.# 0539)
Certificate # DEMKO 03 ATEX 0335063
EN 50014, 50020 & 50284

Low Voltage Directive (LVD) (73/23/EC & 93/68/EEC)
Compliant to LVD
Products rated lower than 50 VAC and 75 VDC are outside of the scope of the LVD
The Low Voltage Directive does not apply to products for use in hazardous locations

Pressure Equipment Directive (PED) (97/23/EC)
Compliant to PED
Products rated lower than 7.5 psi are outside the scope of the PED

RUSSIA
Gosgortechnadzor Permit **(OPTIONAL – code M406)**
0ExiaIICT6
Tamb = -50°C to +60°C
NANIO CCVE Certification Center
Certificate # ROSS US.GB05.Bo2933
GOST 51330.0, 51330.1, 51330.10 & 51330.14

MODEL CHART

Range Code	Adjustable Set Point Range Low end of range on fall High end of range on rise		Deadband Narrower deadbands may be expected at bottom of range		Over Range Pressure*		Proof Pressure**	
	psi	bar	psi	bar (unless noted)	psi	bar	psi	bar
Buna-N diaphragm and O-ring with 1/8" NPT (male) brass pressure connection								
10	4 to 50	0,3 to 3,4	1 to 6	68,9 mbar to 0,4 bar	1000	68,9	3000	206,8
11	10 to 150	0,7 to 10,3	2 to 10	0,1 to 0,7	1500	103,4	3000	206,8
12	30 to 600	2,1 to 41,4	8 to 60	0,6 to 4,1	2500	172,4	3000	206,8
Stainless steel piston and Buna-N O-ring with 1/4" NPT (male) brass pressure connection								
13	100 to 1500	6,9 to 103,4	20 to 220	1,4 to 15,2	8000	551,6	10,000	689,5
14	180 to 3000	12,4 to 206,8	50 to 400	3,4 to 27,6	8000	551,6	10,000	689,5
15	400 to 4700	27,6 to 324,1	100 to 600	6,9 to 41,4	8000	551,6	10,000	689,5
16	4000 to 7500	275,8 to 517,1	400 to 950	27,6 to 65,5	10,000	689,5	12,000	827,4

* **Over Range Pressure**: The maximum pressure that may be applied continuously without causing damage and maintaining set point repeatability.
** **Proof Pressure**: The maximum pressure to which a pressure sensor may be occasionally subjected, which causes no permanent damage. The unit may require calibration (e.g., start-up, testing).

HOW TO ORDER

Build a part number by selecting appropriate code for each feature category. Example: 10-B11*M201

10	B	11	M201
Series Designation	Electrical Termination Type	Range	Misc. Options

ORDERING CODE	DESCRIPTION
SERIES DESIGNATION	
10	Designation for 10 Series product line
ELECTRICAL TERMINATION TYPE	
A	0.11" push-on terminals. Mating terminals supplied
B	0.25" push-on terminals
C	NEMA 4; 1/2" NPT (male) conduit connection; 20" leads
D	NEMA 4; 20" leads
E	NEMA 4; 1/2" NPT (female) conduit connection; 5' cable
F	NEMA 4; 4 terminal DIN connector. Mating part not supplied
G	NEMA 4; 5' cable
RANGE	
10, 11, 12, 13 14, 15, 16	See model chart on page 4
MISCELLANEOUS OPTIONS	
M201	Factory set one switch; specify increasing or decreasing pressure and set point
M277	Range indicated on nameplate in kPa or MPa, factory selected
M278	Range indicated on nameplate in kg/cm^2
M405	Intrinsic safety compliance for European Union per ATEX standards
M406	Intrinsic safety compliance for Russia per Gosgortechnadzor standards
M430	Cover lock
M444	Paper ID Tag
M446	Stainless steel ID tag & wire attachment
M449	Surface mounting bracket kit
M511	1/4" NPT (male) 316 stainless steel pressure connection
M512	1/4" NPT (male) brass pressure connection. NOT AVAILABLE ON MODELS 13, 14, 15, OR 16
M540	Viton® construction. Deadbands and low end of range may increase (consult factory). Wetted parts include Viton® diaphragm and/or O-ring plus standard pressure connection material
M541	Ethylene propylene (EPDM) construction. Deadbands may increase (consult factory). Wetted parts include EPDM diaphragm and/or O-ring plus standard pressure connection material
M550	Oxygen service cleaning (alcohol cleaning to remove residue from the process connection); Buna-N diaphragm and/or O-ring changes to Viton®
M925	7/16-20 UNF-2A, SAE male brass pressure connection
M929	G1/2 straight pipe thread pressure connection
62169-26	Surface mounting bracket kit
L040	4' leadwire/cable. NOT AVAILABLE ON TYPES A, B, E, F, G
L060	6' leadwire/cable. NOT AVAILABLE ON TYPES A, B, F
L080	8' leadwire/cable. NOT AVAILABLE ON TYPES A, B, F
L100	10' leadwire/cable. NOT AVAILABLE ON TYPES A, B, F
L120	12' leadwire/cable. NOT AVAILABLE ON TYPES A,B, F

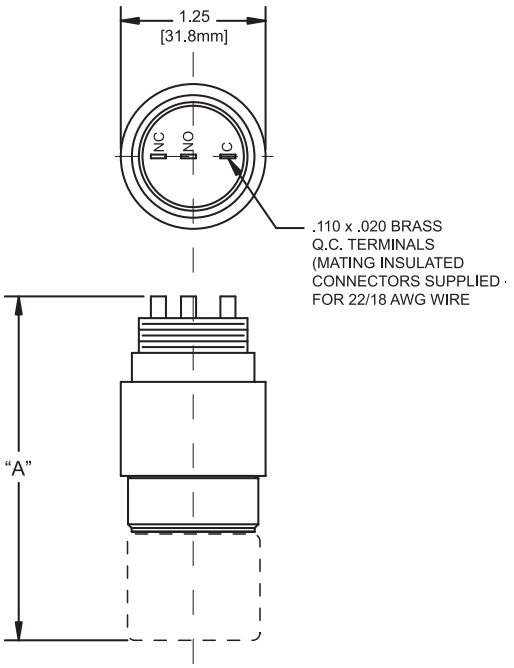
Viton® is a registered trademark of E.I. Dupont Company

10 Series

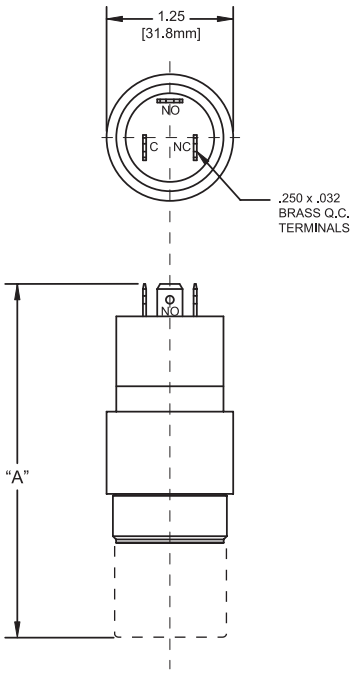
DIMENSIONAL DRAWINGS

Dimensional drawings for all models may be found at www.ueonline.com

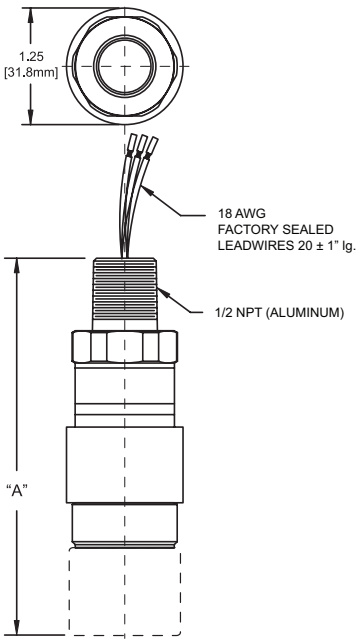
Type 10-A



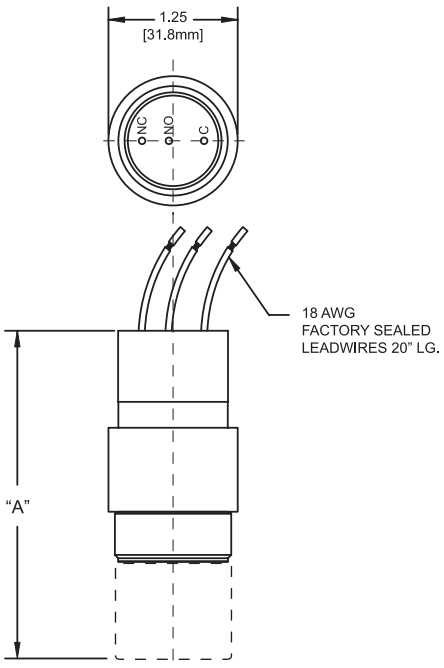
Type 10-B



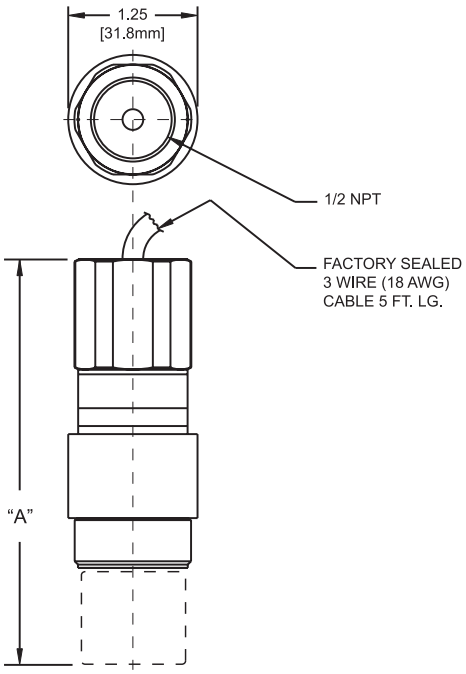
Type 10-C



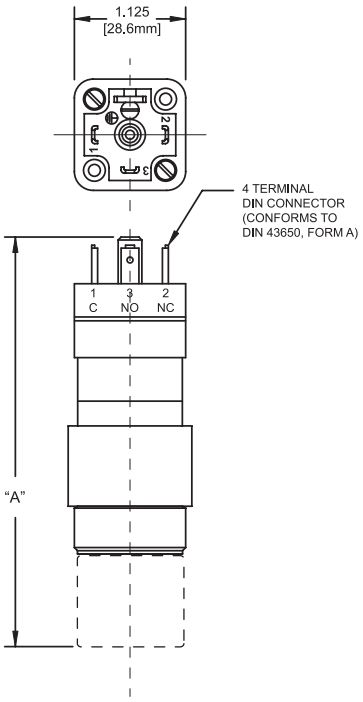
Type 10-D



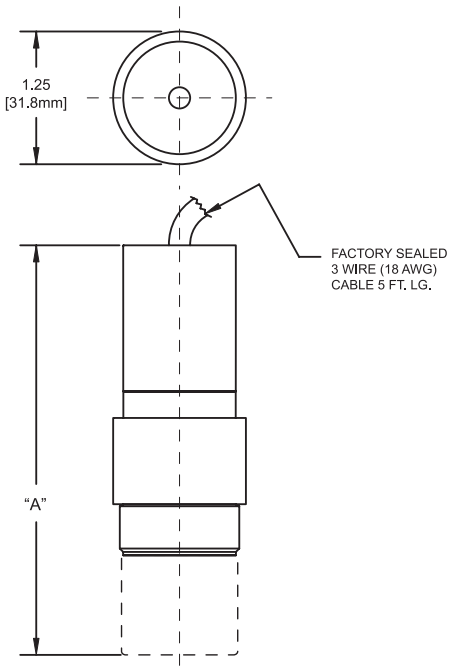
Type 10 -E



Type 10-F



Type 10-G

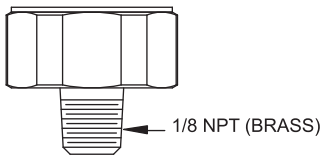


"A" Dimension Chart			
Models	**Inches**	**mm**	**NPT**
A10-12	3.00	76.2	1/8"
A13-16	3.31	84.1	1/4"
B10-12	3.50	88.9	1/8"
B13-16	3.81	96.8	1/4"
C10-12	4.06	103.2	1/8"
C13-16	4.38	111.1	1/4"
D10-12	3.19	81.0	1/8"
D13-16	3.50	88.9	1/4"
E10-12	3.94	100.0	1/8"
E13-16	4.25	108.0	1/4"
F10-12	4.13	104.8	1/8"
F13-16	4.44	112.7	1/4"
G10-12	3.88	98.4	1/8"
G13-16	4.19	106.4	1/4"

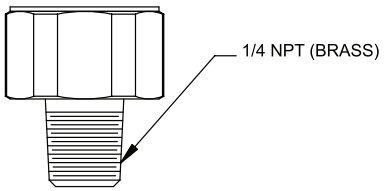
NOTE: For full size drawings, please visit our web site @www.ueonline.com

PRESSURE CONNECTION DETAILS

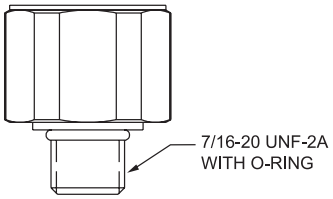
Model 10-12



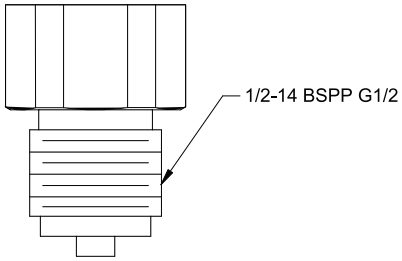
Model 13-16



Option M925



Option M929



RECOMMENDED PRACTICES AND WARNINGS

United Electric Controls Company recommends careful consideration of the following factors when specifying and installing UE pressure and temperature units. Before installing a unit, the Installation and Maintenance instructions provided with unit must be read and understood.

- To avoid damaging unit, proof pressure and maximum temperature limits stated in literature and on nameplates must never be exceeded, even by surges in the system. Operation of the unit up to maximum pressure or temperature is acceptable on a limited basis (e.g., start-up, testing) but continuous operation must be restricted to the designated adjustable range. Excessive cycling at maximum pressure or temperature limits could reduce sensor life.
- A back-up unit is necessary for applications where damage to a primary unit could endanger life, limb or property. A high or low limit switch is necessary for applications where a dangerous runaway condition could result.
- The adjustable range must be selected so that incorrect, inadvertent or malicious setting at any range point cannot result in an unsafe system condition.
- Install unit where shock, vibration and ambient temperature fluctuations will not damage unit or affect operation. When applicable, orient unit so that moisture does not enter the enclosure via the electrical connection. When appropriate, this entry point should be sealed to prevent moisture entry.
- Unit must not be altered or modified after shipment. Consult UE if modification is necessary.
- Monitor operation to observe warning signs of possible damage to unit, such as drift in set point or faulty display. Check unit immediately.
- Preventative maintenance and periodic testing is necessary for critical applications where damage could endanger property or personnel.
- Electrical ratings stated in literature and on nameplate must not be exceeded. Overload on a switch can cause damage, even on the first cycle. Wire unit according to local and national electrical codes, using wire size recommended in installation sheet.
- Do not mount unit in ambient temp. exceeding published limits.

LIMITED WARRANTY

Seller warrants that the product hereby purchased is, upon delivery, free from defects in material and workmanship and that any such product which is found to be defective in such workmanship or material will be repaired or replaced by Seller (Ex-works, Factory, Watertown, Massachusetts. INCOTERMS); provided, however, that this warranty applies only to equipment found to be so defective within a period of 24 months from the date of manufacture by the Seller. Seller shall not be obligated under this warranty for alleged defects which examination discloses are due to tampering, misuse, neglect, improper storage, and in any case where products are disassembled by anyone other than authorized Seller's representatives. EXCEPT FOR THE LIMITED WARRANTY OF REPAIR AND REPLACEMENT STATED ABOVE, SELLER DISCLAIMS ALL WARRANTIES WHATSOEVER WITH RESPECT TO THE PRODUCT, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

LIMITATION OF SELLER'S LIABILITY

Seller's liability to Buyer for any loss or claim, including liability incurred in connection with (i) breach of any warranty whatsoever, expressed or implied, (ii) a breach of contract, (iii) a negligent act or acts (or negligent failure to act) committed by Seller, or (iv) an act for which strict liability will be inputted to seller, is limited to the "limited warranty" of repair and/or replacement as so stated in our warranty of product. In no event shall the Seller be liable for any special, indirect, consequential or other damages of a like general nature, including, without limitation, loss of profits or production, or loss or expenses of any nature incurred by the buyer or any third party.

UE specifications subject to change without notice.

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Technical Information
RTD TH13, TH14 and TH15

RTD assemblies in thermowells with spring loaded insert and enclosure for process industry



Application

The TH13, TH14 and TH15 temperature sensors are RTD assemblies installed in Thermowells and designed for use in all types of process industries, including harsh environments, due to their rugged design. The sensor is made up of a measurement probe with an insulated RTD element, sheath and a thermowell made of bar-stock material.

Among other applications the sensors can be used in process industries such as:
- Chemicals & petrochemical
- Power plants
- Refineries
- Offshore platforms

Head Transmitter

All Endress+Hauser transmitters are available with enhanced accuracy and reliability compared to directly wired sensors. Instead of directly wiring your temperature sensors to your control system, use transmitters to reduce wiring and maintenance costs while increasing measurement accuracy.

Field Transmitter

Temperature field transmitters with HART® or FOUNDATION Fieldbus™ protocol for highest reliability in harsh industrial environments. Backlit display with large measured value, bargraph and fault condition indication for ease of reading.

Your benefits

- High flexibility due to modular assembly with standard terminal heads and customized immersion length
- One Source shopping for temperature measurement solutions. World class transmitter with integrated sensor offering for heavy process industry applications. - Remove and Install straight out of the box!
- Improved Galvanic Isolation on most devices (2 kV)
- Simplified Model Structure: Competitively priced, offers great value. Easy to order and reorder. A single model number includes sensor and transmitter assembly for a complete point solution
- All iTEMP transmitters provide long term stability ≤ 0.05 % per year
- Fast response time with reduced/tapered tip form

Endress+Hauser
People for Process Automation

Function and system design

Measuring principle

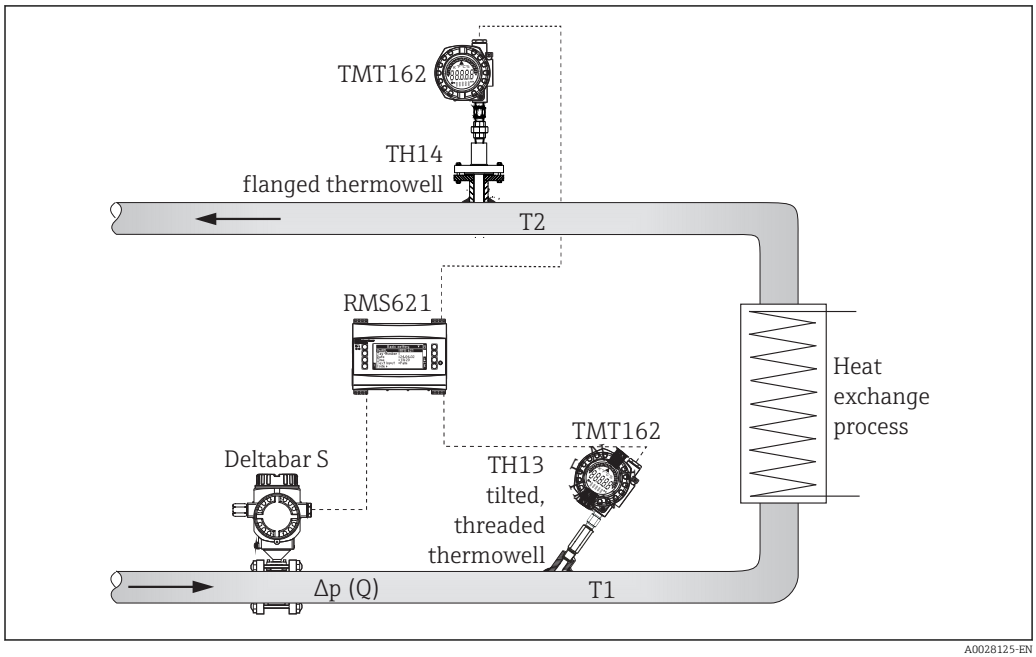
These resistance thermometers use a Pt100 temperature sensor according to IEC 60751. This temperature sensor is a temperature-sensitive platinum resistor with a resistance of 100 Ω at 0 °C (32 °F) and a temperature coefficient is $\alpha = 0.003851\ °C^{-1}$.

There are generally two different kinds of platinum resistance thermometers:

- **Wire wound (WW)**: Here, a double coil of fine, high-purity platinum wire is located in a ceramic support. This is then sealed top and bottom with a ceramic protective layer. Such resistance thermometers not only facilitate very reproducible measurements but also offer good long-term stability of the resistance/temperature characteristic within temperature ranges up to 600 °C (1 112 °F). This type of sensor is relatively large in size and it is comparatively sensitive to vibrations.
- **Thin film platinum resistance thermometers (TF)**: A very thin, ultrapure platinum layer, approx. 1 µm thick, is vaporized in a vacuum on a ceramic substrate and then structured photolithographically. The platinum conductor paths formed in this way create the measuring resistance. Additional covering and passivation layers are applied and reliably protect the thin platinum layer from contamination and oxidation even at high temperatures.

The primary advantages of thin-film temperature sensors over wire wound versions are their smaller sizes and better vibration resistance. A relatively low principle-based deviation of the resistance/temperature characteristic from the standard characteristic of IEC 60751 can frequently be observed among TF sensors at high temperatures. As a result, the tight limit values of tolerance category A as per IEC 60751 can only be observed with TF sensors at temperatures up to approx. 300 °C (572 °F). For this reason, thin-film sensors are generally only used for temperature measurements in ranges below 400 °C (932 °F).

Measuring system



1 Example of an application of the temperature assemblies

Water - heat Differential

Calculation of heat quantity which is emitted or absorbed by a water flow in a heating or cooling system. The quantity of heat is calculated from the process variable for Dp flow (Q) and the differential from the feed and return temperature (T2 - T1). Bidirectional energy calculations, such as the calculating systems with changing flow direction (charging/discharging the heat accumulator) are also possible.

Energy manager RMS621

Energy conservation and cost expenditures are significant issues in today's industry. Accurate flow monitoring and calculation is the basis for thorough analysis and billing of energy. This data can serve as a basis to maximize savings potential and help in controlling operational costs on a daily basis. Endress+Hauser's energy managers provide accurate and reliable calculations for the

monitoring and control of energy consumption (both produced and consumed) according to international standards, e.g. IAPWS-IF 97, AGA8, ISO 5167 etc. For RMS621 details see Technical Information.

iTEMP TMT162 Temperature Field Transmitter

Aluminum or stainless steel dual compartment explosion - proof enclosure and compact, fully potted electronics provide the ultimate protection in harshest environments. TMT162 prevents costly plant shutdowns by detecting corrosion on RTDs or thermocouples before it corrupts the measured value. Endress+Hauser's Field Temperature Transmitters with backlit display and sensor backup functionality are designed with safety in mind to keep your plant, equipment and personnel safe. For TMT162 details see Technical Information.

Deltabar S/Cerabar S

The evolution series of Cerabar S/Deltabar S represents a decisive step ahead in making pressure instrumentation better and safer for the process industry. The development of new products thrives especially on the knowledge, commitment and experience of staff members. Permanent high performance can only be achieved if dedicated and enthusiastic people provide their ideas. Endress +Hauser's instruments are not only supposed to distinguish themselves for customers and users by technological novelties but also by the presence of people supporting this progress, be it in service, sales or production. For Deltabar S & Cerabar S details see Technical Information.

Equipment architecture

The single and duplex element RTDs are designed to measure temperature in a variety of process and laboratory applications. These RTDs are specifically designed for use in two different process temperature ranges and they will provide accurate and repeatable temperature measurement through a broad range of −200 to 600 °C (−328 to 1 112 °F). Low range thin film RTDs −50 to 200 °C (−58 to 392 °F) are constructed using silver plated copper internal leads, PTFE wire insulations with potting compounds to resist moisture penetration. High range RTDs −200 to 600 °C (−328 to 1 112 °F) are constructed with nickel internal leads inside swaged MgO insulated cable to allow higher temperature measurements at the RTD element and to provide higher temperature lead protection along the sheath.

Input

Measured variable

Temperature (temperature-linear transmission behavior)

Measuring range

Construction	Model code (class and type of sensor)	max. range
Low temperature range	TH13-_ _ _ _ _(A/C/E/G/J/L) _ _ _ _ _	−50 to 200 °C (−58 to 392 °F)
	TH14-_ _ _ _ _(A/C/E/G/J/L) _ _ _ _ _	
	TH15-_ _ _ (A/C/E/G/J/L) _ _ _ _ _	
High temperature range	TH13-_ _ _ _ _(B/D/F/H/K/M) _ _ _ _ _	−200 to 600 °C (−328 to 1 112 °F)
	TH14-_ _ _ _ _(B/D/F/H/K/M) _ _ _ _ _	
	TH15-_ _ _ (B/D/F/H/K/M) _ _ _ _ _ _	

Options J, K, L, M are duplex platinum elements of two sensors inside the same sheath.

Output

Output signal

Generally, the measured value can be transmitted in one of two ways:

- Directly-wired sensors - sensor measured values forwarded without a transmitter.
- Via all common protocols by selecting an appropriate Endress+Hauser iTEMP temperature transmitter. All the transmitters listed below are mounted directly in the terminal head or as field transmitter and wired with the sensory mechanism.

Family of temperature transmitters

Thermometers fitted with iTEMP transmitters are an installation-ready complete solution to improve temperature measurement by significantly increasing accuracy and reliability, when compared to direct wired sensors, as well as reducing both wiring and maintenance costs.

PC programmable head transmitters
They offer a high degree of flexibility, thereby supporting universal application with low inventory storage. The iTEMP transmitters can be configured quickly and easily at a PC. Endress+Hauser offers free configuration software which can be downloaded from the Endress+Hauser Website. More information can be found in the Technical Information.

HART® programmable head transmitters
The transmitter is a 2-wire device with one or two measuring inputs and one analog output. The device not only transfers converted signals from resistance thermometers and thermocouples, it also transfers resistance and voltage signals using HART® communication. It can be installed as an intrinsically safe apparatus in Zone 1 hazardous areas and is used for instrumentation in the terminal head (flat face) as per DIN EN 50446. Swift and easy operation, visualization and maintenance using universal device configuration tools like FieldCare, DeviceCare or FieldCommunicator 375/475. For more information, see the Technical Information.

PROFIBUS® PA head transmitters
Universally programmable head transmitter with PROFIBUS® PA communication. Conversion of various input signals into digital output signals. High accuracy over the complete ambient temperature range. The configuration of PROFIBUS PA functions and of device-specific parameters is performed via fieldbus communication. For more information, see the Technical Information.

FOUNDATION Fieldbus™ head transmitters
Universally programmable head transmitter with FOUNDATION Fieldbus™ communication. Conversion of various input signals into digital output signals. High accuracy over the complete ambient temperature range. All transmitters are released for use in all important process control systems. The integration tests are performed in Endress+Hauser's "System World". For more information, see the Technical Information.

Advantages of the iTEMP transmitters:
- Dual or single sensor input (optionally for certain transmitters)
- Pluggable display (optionally for certain transmitters)
- Unsurpassed reliability, accuracy and long-term stability in critical processes
- Mathematical functions
- Monitoring of the thermometer drift, sensor backup functionality, sensor diagnostic functions
- Sensor-transmitter matching for dual sensor input transmitters, based on Callendar/Van Dusen coefficients

Galvanic isolation

Galvanic isolation of Endress+Hauser iTEMP transmitters

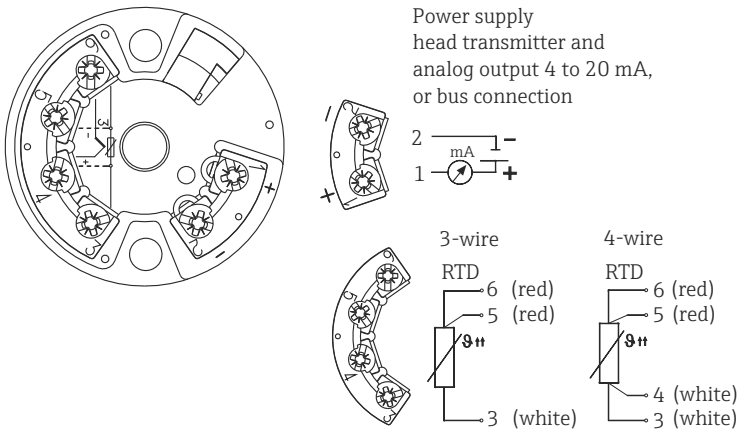
Transmitter type	Sensor
TMT181 PCP	Û = 3.75 kV AC
TMT182 HART®	U = 2 kV AC
TMT162 HART® Field transmitter	U = 2 kV AC

Power supply

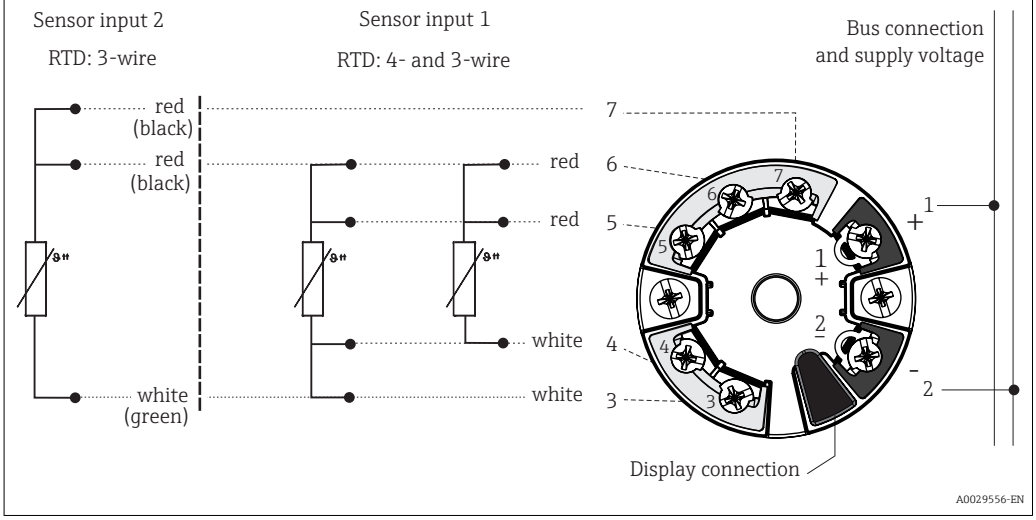
Terminal assignment

Type of sensor connection

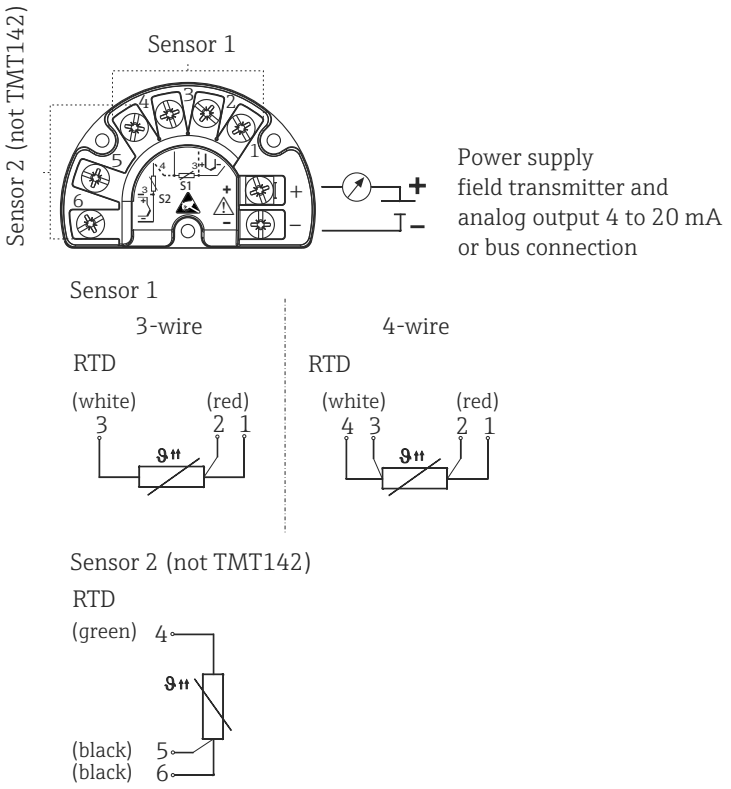
Head mounted transmitter TMT18x (single input)



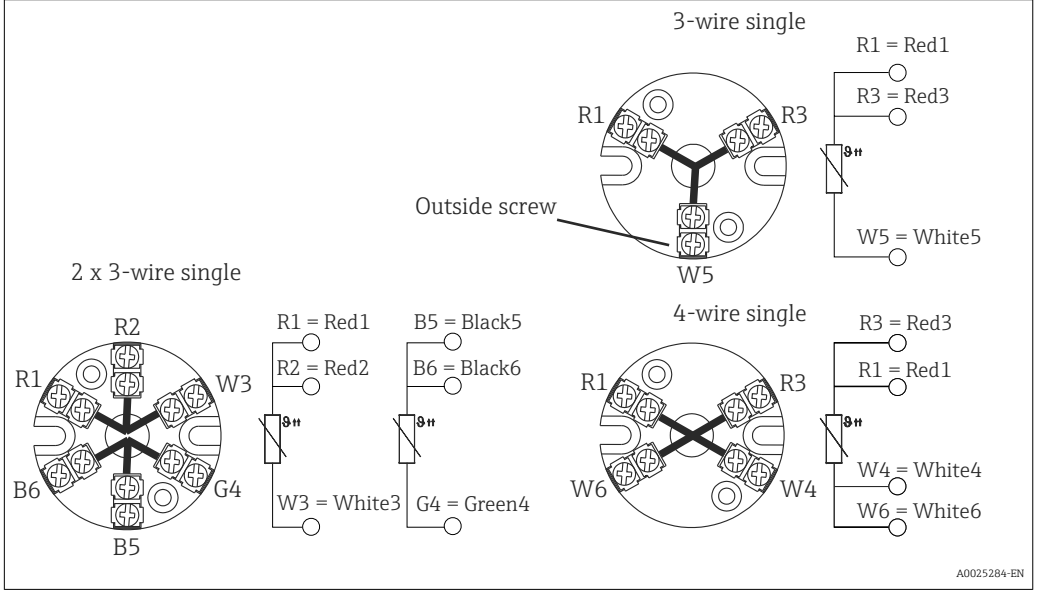
Head mounted transmitter TMT8x (dual input)



Field mounted transmitter



Terminal block mounted



The blocks and transmitters are shown as they sit inside the heads in reference to the conduit opening.

Integrated overvoltage protection

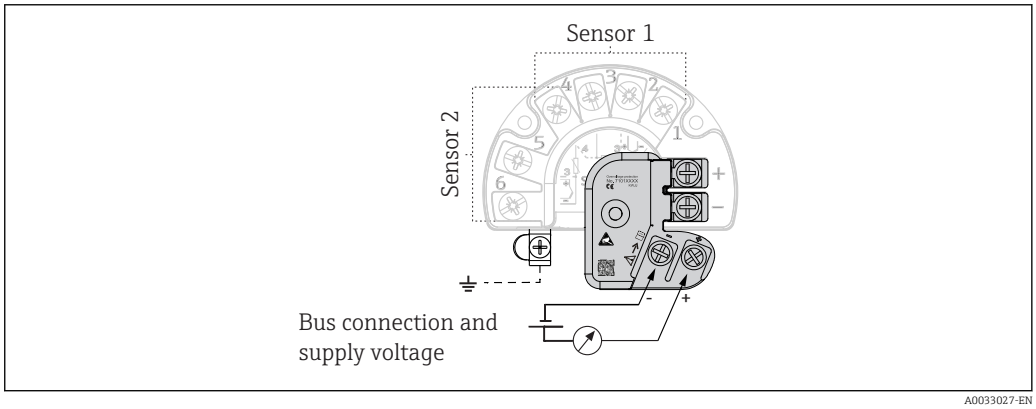
The integrated overvoltage protection module can be ordered as an optional extra [1]. The module protects the electronics from damage from overvoltage. Overvoltage occurring in signal cables (e.g.

1) Available for the field transmitter with HART® 7 specification

4 to 20 mA, communication lines (fieldbus systems) and power supply is diverted to ground. The functionality of the transmitter is not affected as no problematic voltage drop occurs.

Connection data:

Maximum continuous voltage (rated voltage)	U_C = 42 V_{DC}
Nominal current	I = 0.5 A at $T_{amb.}$ = 80 °C (176 °F)
Surge current resistance ▪ Lightning surge current D1 (10/350 µs) ▪ Nominal discharge current C1/C2 (8/20 µs)	 ▪ I_{imp} = 1 kA (per wire) ▪ I_n = 5 kA (per wire) I_n = 10 kA (total)
Temperature range	−40 to +80 °C (−40 to +176 °F)
Series resistance per wire	1.8 Ω, tolerance ±5 %

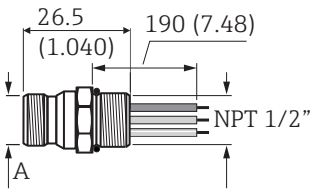
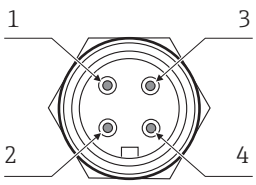


2 Electrical connection of the overvoltage protection

Grounding

The device must be connected to the potential equalization. The connection between the housing and the local ground must have a minimum cross-section of 4 mm² (13 AWG) . All ground connections must be secured tightly.

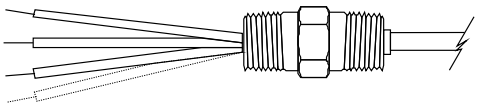
Fieldbus connector

Type (dimensions in mm (in))	Specification
Fieldbus connector to PROFIBUS® -PA or FOUNDATION Fieldbus™  *A M12 on PROFIBUS® -PA connector or 7/8-16 UNC on FOUNDATION Fieldbus™ connector*	▪ Ambient temperature: −40 to 150 °C (−40 to 300 °F) ▪ Degree of protection IP 67 Wiring diagram: 
	PROFIBUS® -PA Pos. 1: grey (shield) Pos. 2: brown (+) Pos. 3: blue (-) Pos. 4: not connected
	FOUNDATION Fieldbus™ Pos. 1: blue (-) Pos. 2: brown (+) Pos. 3: not connected Pos. 4: ground (green/ yellow)

Wire specifications

24 AWG, 19 strand silver plated copper with 0.025 mm (0.010 in) PTFE extruded outer.

Electrical connection
Flying leads, standard 3" for wiring in terminal head, head mounted transmitter or terminal block mounted
Flying leads, 5½" for wiring with TMT162 or TMT142 assemblies

Design of leads	
Flying leads 3" or 5½" with brass crimped sleeves	 A0026119

Performance characteristics

Response time

63% response time per ASTM E644

RTD assembly TH15 without thermowell

Construction	RTD Ø ¼"
High temperature range	3 s
Low temperature range	9 s

Response time for the sensor assembly without transmitter.

Response time examples for RTD assemblies with thermowell TH13 and TH14

Construction	Stepped thermowell	Tapered thermowell	¾" straight thermowell
High temperature range	20 s	25 s	30 s
Low temperature range	25 s	30 s	35 s

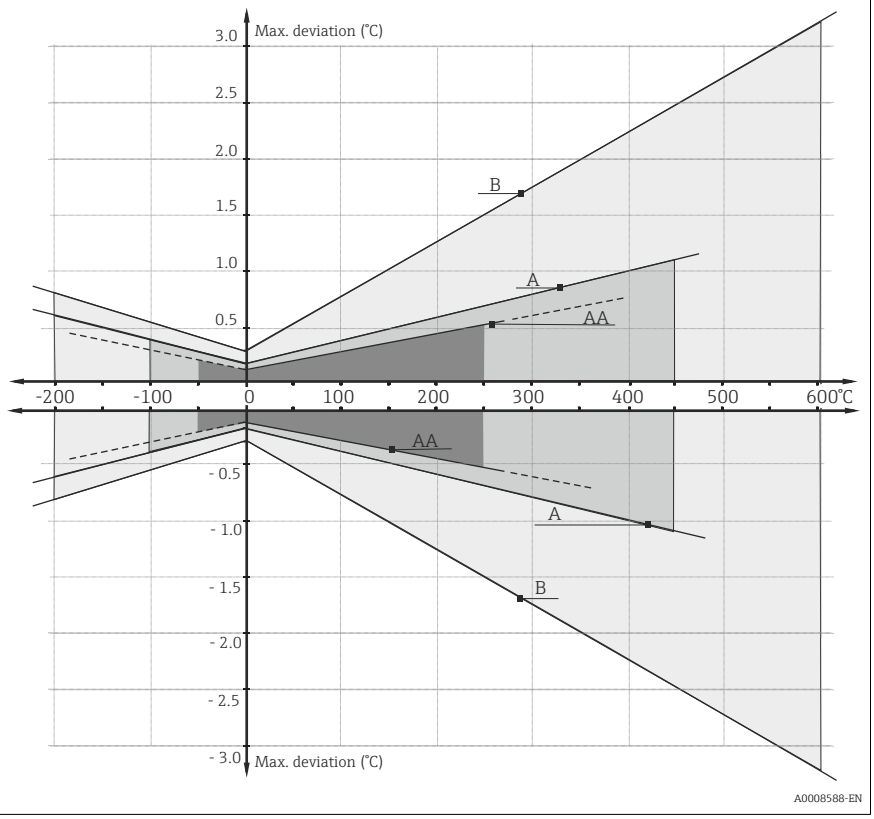
Response times for RTD assemblies with thermowell are provided for general design guidance without transmitter.

When the temperature of a process media changes, the output signal of a RTD assembly follows this change after a certain time delay. The physical cause is the time related to heat transfer from the process media through the thermowell and the insert to the sensor element (RTD). The manner in which the reading follows the change in temperature of the assembly over time is referred to as the response time. Variables that influence or impact the response time are:

- Wall thickness of thermowell
- Spacing between RTD insert and thermowell
- Sensor packaging
- Process parameters such as media, flow velocity, etc.

Accuracy

RTD corresponding to IEC 60751

Class	max. Tolerances (°C)	Temperature range	Characteristics
RTD max. error type TF - range: −50 to +500 °C			
Cl. AA, former 1/3 Cl. B	± (0.1 + 0.0017 · |t| [1])	0 to +150 °C	
Cl. A	± (0.15 + 0.002 · |t| [1])	−30 to +300 °C	
Cl. B	± (0.3 + 0.005 · |t| [1])	−50 to +500 °C	
RTD max. error type WW - range: −196 to +600 °C			
Cl. AA, former 1/3 Cl. B	± (0.1 + 0.0017 · |t| [1])	−50 to +250 °C	
Cl. A	± (0.15 + 0.002 · |t| [1])	−100 to +450 °C	
Cl. B	± (0.3 + 0.005 · |t| [1])	−196 to +600 °C	

1) |t| = absolute value °C

For measurement errors in °F, calculate using equations above in °C, then multiply the outcome by 1.8.

Transmitter specifications

	TMT82 HART®/ TMT84 PA / TMT85 FF	TMT180 Pt100 PCP	TMT181 multifunctional PCP	TMT182 HART®	TMT162 HART® Field transmitter	TMT142
Measurment accuracy	± typ. 0.25 °C (0.45 °F)	0.2 °C (0.36 °F), optional 0.1 °C (0.18 °F) or 0.08% [1]	0.5 °C (0.9 °F) or 0.08% [1]		≤ 0.105 °C (0.19 °F)	0.2 °C (0.36 °F)
Sensor current	I ≤ 0.3 mA	I ≤ 0.6 mA		I ≤ 0.2 mA	I ≤ 0.3 mA	

1) % is related to the adjusted measurement range (the larger value applies)

Transmitter long-term stabiltiy

≤ 0.1 °C (0.18 °F)/year or ≤ 0.05% / year

Data under reference conditions; % relates to the set span. The larger value applies.

Insulation resistance

Insulation resistance between terminals and probe sheath, test voltage 250 V.

- ≥ 100 MΩ at 25 °C (77 °F)
- ≥ 10 MΩ at 300 °C (572 °F)

Self heating

RTD elements are not self-powered and require a small current be passed through the device to provide a voltage that can be measured. Self-heating is the rise of temperature within the element itself, caused by the current flowing through the element. This self-heating appears as a measurement error and is affected by the thermal conductivity and velocity of the process being measured; it is negligible when an Endress+Hauser iTEMP temperature transmitter is connected.

Calibration specifications

3 point sensor calibration		
−40 to 0 °C (−40 to 32 °F)	0 to 100 °C (32 to 212 °F)	40 to 215 °C (104 to 420 °F)
Minimum length requirements for calibrated sensors = 6"		

Use option "B" (Block: Test; calibration) for RTD calibration, the three temperature points need to be specified in 5 °C (9 °F) increments.

The manufacturer provides comparison temperature calibrations from −40 to +215 °C (−40 to +420 °F) on the international temperature scale of 1990. Calibrations are traceable to standards maintained by the National Institute of Standards and Technology (NIST). Calibration services are in conformance with ASTM E220, IEC 17025 and ANSI/NCSL Z540-1-1994. The report of calibration is referenced to the serial number of the RTD assembly.

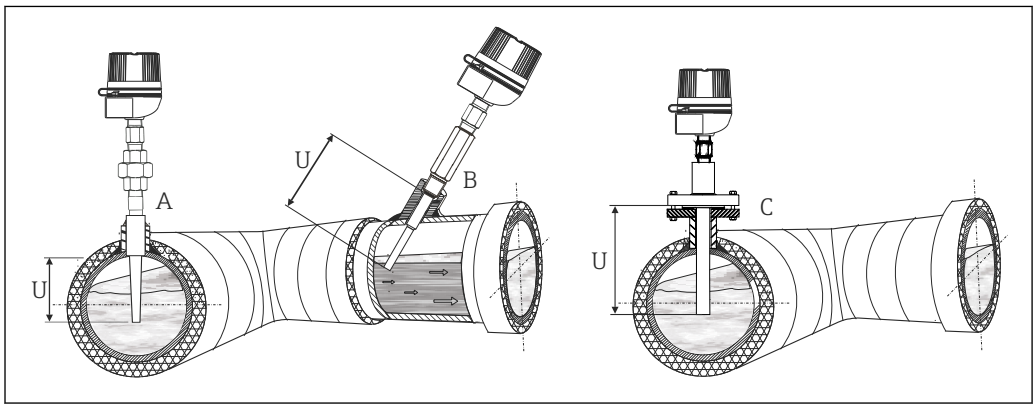
Three point calibrations are provided, given that the specified temperatures are within the recommended range and the minimum length requirements are met as specified. The minimum length is based on overall length 'x' of the spring loaded insert.

Installation

Orientation

No restrictions for installation orientation.

Installation instructions



A0025312

3 Examples for pipe installation - In pipes with a small cross section the sensor tip should reach or extend slightly past the center line of the pipe (=U).

A TH13 assembly socket weld installation
B Threaded, tilted installation of TH13 assembly
C Flange installation of TH14 assembly

Immersion

Minimum immersion per ASTM E644, ΔT ≤ 0.05 °C (0.09 °F)

Immersion RTD assembly TH15 without thermowell

Construction	RTD Insert Ø ¼" Minimum Immersion (in)
High temperature range	1¼"
Low temperature range	¾"

For temperature assemblies with themowell (TH13 and TH14) the minimum immersion is the depth to which the thermowell is immersed in the medium, measured from the tip. To minimize errors from ambient temperature the following minimum immersion lengths are recommended:

Construction	Minimum Immersion (in)
Stepped thermowell	2½"
Tapered thermowell	4½"
¾" straight thermowell	4"
Weld in thermowell	4½"

Environment

Ambient temperature range

Terminal head	Temperature in °C (°F)
Without mounted head transmitter	Depends on the terminal head used and the cable gland or fieldbus connector, see 'Terminal heads' section
With mounted head transmitter	−40 to 85 °C (−40 to 185 °F) SIL mode (HART 7 transmitter): −40 to 70 °C (−40 to 158 °F)
With mounted head transmitter and display	−20 to 70 °C (−4 to 158 °F)
With mounted field transmitter	▪ Without display: −40 to 85 °C (−40 to 185 °F) ▪ With display and/or integrated overvoltage protection module: −40 to +80 °C (−40 to +176 °F) ▪ SIL mode: −40 to +75 °C (−40 to +167 °F)

Shock and vibration resistance

4 g/2 to 150 Hz as per IEC 60068-2-6

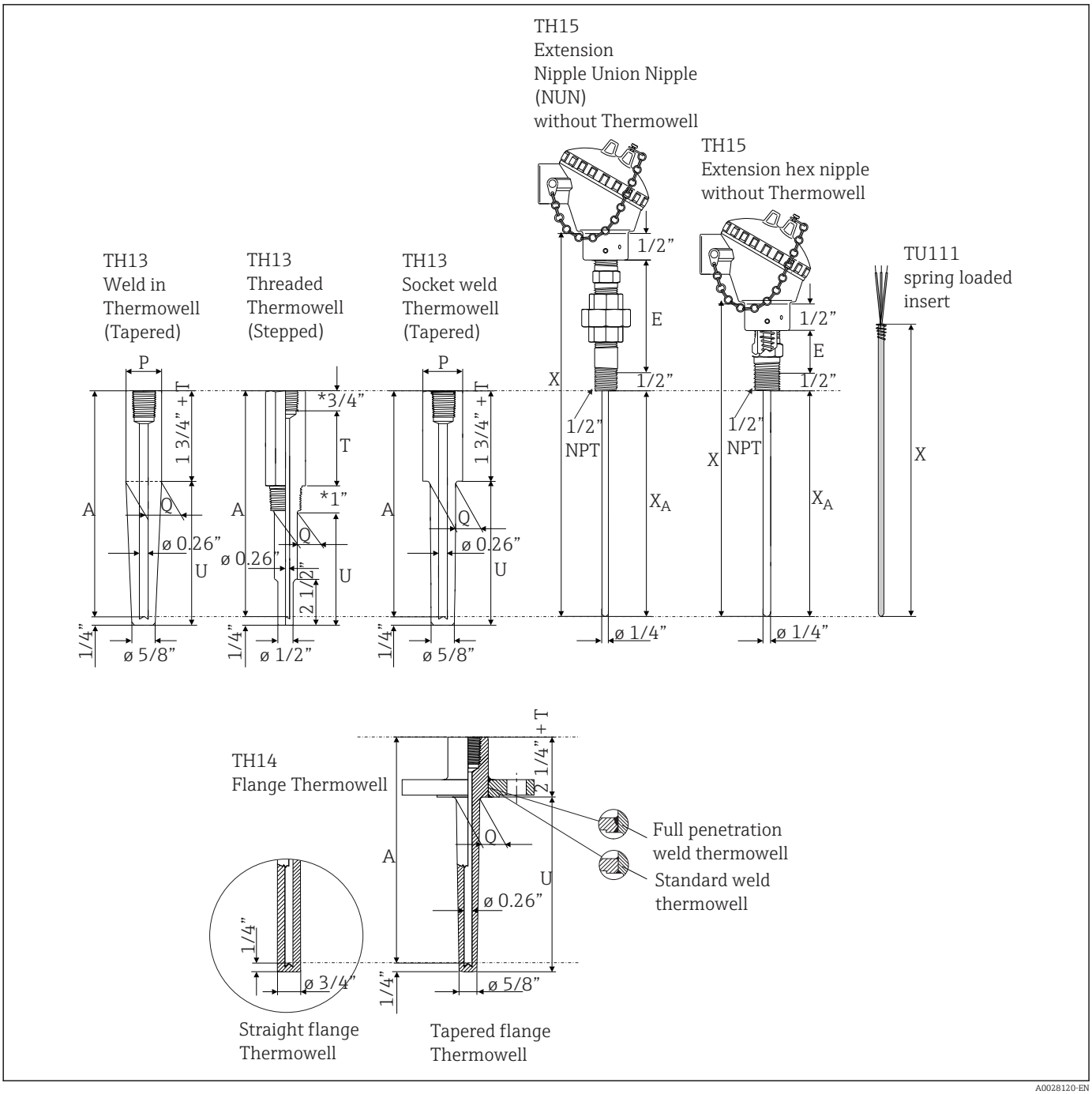
Process

Thermowells are used in measuring the temperature of a moving fluid in a conduit, where the stream exerts an appreciable force. The limiting value for the thermowells is governed by the temperature, the pressure and the speed of the medium, the immersion length, the materials of the thermowells and the medium, etc. Calculations for stress and vibration of thermowells can be done according to ASME PTC 19.3-1974 standard, please consult Endress+Hauser.

Mechanical construction

Design, dimensions

All dimensions in inches. For the values related to this graphic please refer to the tables and equations below.



A0028120-EN

All thermowells are marked with:
- Material I.D.
- CRN# (Canadian Registration Number)
- Heat No.

Dimensions of TH13					
U	**E**	**T**	**Process connection**	**Shape of Thermowell**	**ø Q**
2½", 4½", 7½", 10½" specified length 2" to 18" in ½" increments	Hex nipple = 1" or Nipple Union Nipple (NUN) = 4" or 7" Material: Steel or 316SS	3" or specified length 1" to 6" in ½" increments	½" NPT	Stepped (Standard duty) Tapered (Heavy duty)	⅝" $^{11}/_{16}$"
			¾" NPT	Stepped (Standard duty) Tapered (Heavy duty)	¾" ⅞"
			1" NPT	Stepped (Standard duty) Tapered (Heavy duty)	⅞" 1 $^{1}/_{16}$"

Dimensions of TH13					
U	**E**	**T**	**Process connection**	**Shape of Thermowell**	**Ø Q**
			¾" Socket weld	Stepped (Standard duty) Tapered (Heavy duty)	¾" ¾"
			1" Socket weld	Stepped (Standard duty) Tapered (Heavy duty)	⅞" 1"
			¾" weld in	Tapered (Heavy duty)	1.050"
			1" weld in	Tapered (Heavy duty)	1.315"
Immersion length RTD sensor = Thermowell drilled length X_A = A = U + 1½" + T Insert overall length X = A + E					
P = Pipe size ▪ Nom. ¾"; Dia. = 1.050" ▪ Nom. 1"; Dia. = 1.315"					

Dimensions of TH14 Flange rating: ASME B16.5				
U	**E**	**T**	**Flange size**	**Ø Q, Tapered version**
2", 4", 7", 10" specified length 2" to 18" in ½" increments	Hex nipple = 1" or Nipple Union Nipple (NUN) = 4" or 7" Material: Steel or 316SS	specified length 1" to 10" in ½" increments	1"	⅞"
			1 ½"	1 1/16"
			2"	1 1/16"
Immersion length RTD sensor - Thermowell drilled length X_A = A = U + 2" + T Insert overall length X = A + E				

Dimensions of TH15 (without thermowell)	
Immersion length RTD sensor X_A	
4", 6", 9", 12", 14" specified length 4" to 41" in ½" increments	Hex nipple = 1" or Nipple Union Nipple (NUN) = 4" or 7"

Weight

From 1 to 5.5 lbs

Material

Process connections, thermowells and enclosures.

The temperatures for continuous operation specified in the following table are only intended as reference values for use of the various materials in air and without any significant compressive load.

The maximum operation temperatures are reduced considerably in some cases where abnormal conditions such as high mechanical load occur or in aggressive media.

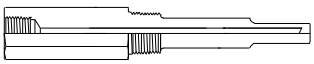
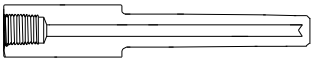
Material name	Short form	Recommended max. temperature for continuous use in air	Properties
AISI 316L/ 1.4404 1.4435	X2CrNiMo17-12-2 X2CrNiMo18-14-3	650 °C (1200 °F) [1]	▪ Austenitic, stainless steel ▪ High corrosion resistance in general ▪ Particularly high corrosion resistance in chlorine-based and acidic, non-oxidizing atmospheres through the addition of molybdenum (e.g. phosphoric and sulfuric acids, acetic and tartaric acids with a low concentration) ▪ Increased resistance to intergranular corrosion and pitting ▪ Compared to 1.4404, 1.4435 has even higher corrosion resistance and a lower delta ferrite content
AISI 316/1.4401	X2CrNiMo17-12-2	650 °C (1200 °F) [1]	▪ Austenitic, stainless steel ▪ High corrosion resistance in general ▪ Particularly high corrosion resistance in chlorine-based and acidic, non-oxidizing atmospheres through the addition of molybdenum (e.g. phosphoric and sulfuric acids, acetic and tartaric acids with a low concentration)

1) Can be used to a limited extent up to 800 °C (1472 °F) for low compressive loads and in non-corrosive media. Please contact your Endress+Hauser sales team for further information.

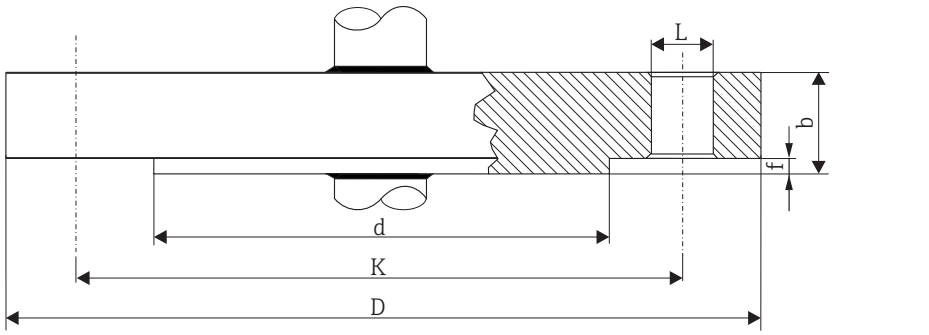
Process connection

The process connection is the means of connecting the thermometer to the process. The following process connections are available:

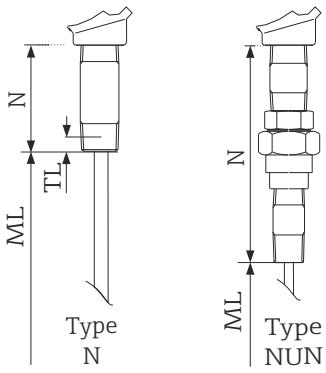
TH13

Thread	Version	
 A0026110	NPT thread	NPT 1/2"
		NPT 3/4"
		NPT 1"
 A0026111	NPS for socket weld	NPS 3/4"
		NPS 1"
 A0026108	NPS for weld-in	NPS 3/4"
		NPS 1"

TH14

Flange

For detailed information on the flange dimensions refer to the following flange standard: ANSI/ASME B16.5
The flange material must be the same as of the stem of the thermowell.

TH15

Type		Thermowell connection	Extension neck lengths in mm (in)
	Type N	½" NPT external thread	25.4 mm (1 in)
	Type NUN	½" NPT external thread	101.6 mm (4 in) 177.8 mm (7 in)

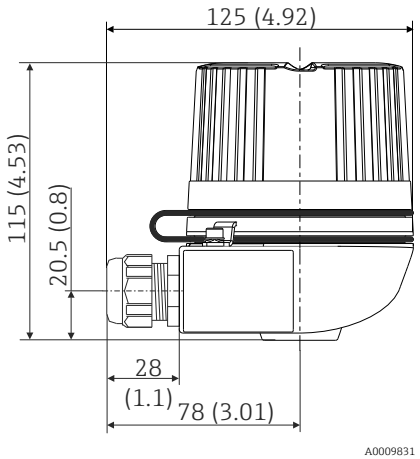
Housing

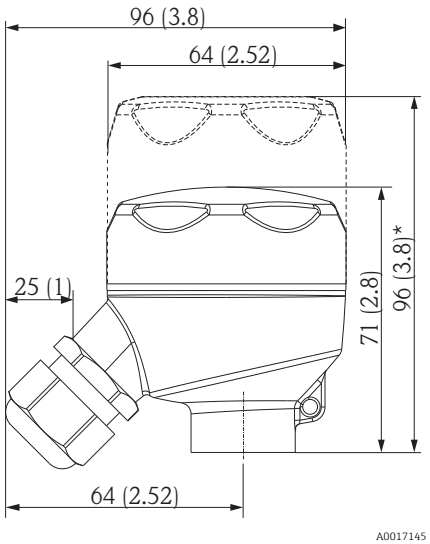
Terminal heads

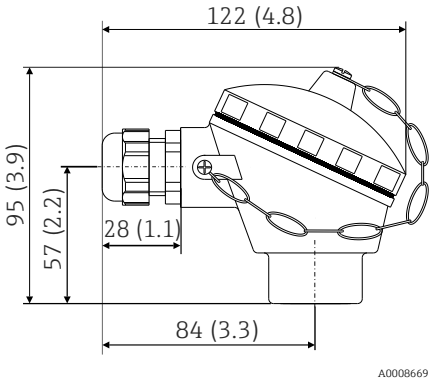
All terminal heads have an internal shape and size in accordance with DIN EN 50446, flat face and a thermometer connection with a ½" NPT thread. All dimensions in mm (in). Specifications without head transmitter installed. For ambient temperatures with head transmitter installed, see the 'Environment' section.

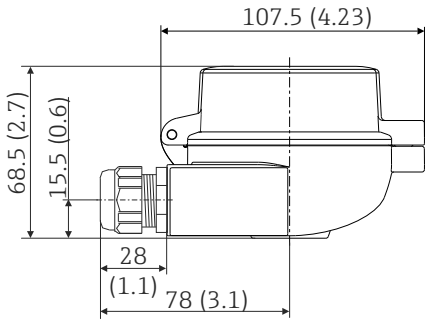
As a special feature, Endress+Hauser offers terminal heads with optimized terminal accessibility for easy installation and maintenance.

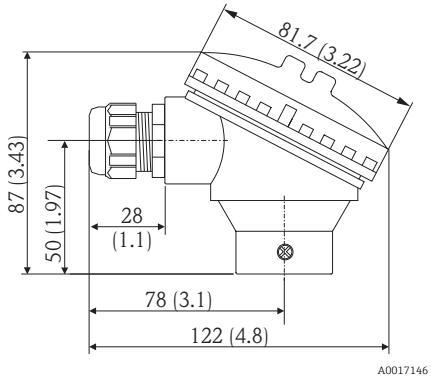
Some of the specifications listed below may not be available on this product line.

TA30H with display window in cover	Specification
	▪ Flameproof (XP) version, explosion-protected, captive screw cap, available with one or two cable entries ▪ Degree of protection: IP 66/68, NEMA Type 4x Encl. Ex-version: IP 66/67 ▪ Temperature: −50 to +150 °C (−58 to +302 °F) for rubber seal without cable gland (observe max. permitted temperature of cable gland!) ▪ Material: – Aluminum with polyester powder coating – Stainless steel 316L without coating ▪ Thread: ½" NPT, ¾" NPT, M20x1.5, G½" ▪ Extension neck/thermowell connection: ½" NPT ▪ Color of aluminum head: blue, RAL 5012 ▪ Color of aluminum cap: gray, RAL 7035 ▪ Weight: – Aluminum: approx. 860 g (30.33 oz) – Stainless steel: approx. 2 900 g (102.3 oz) ▪ Head transmitter optionally available with TID10 display

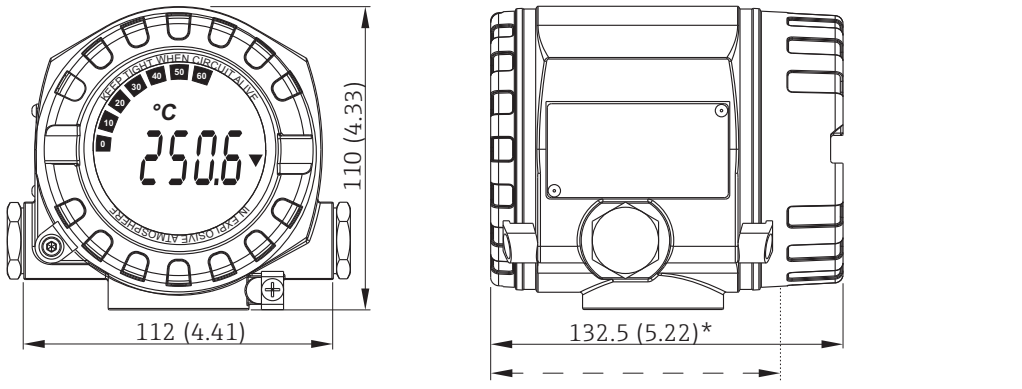
TA30R (optionally with display window in cover)	Specification
 * Dimensions of version with display window in cover	▪ Degree of protection - standard version: IP69K (NEMA Type 4x encl.) Degree of protection - version with display window: IP66/68 (NEMA Type 4x encl.) ▪ Temperature: −50 to +130 °C (−58 to +266 °F) without cable gland ▪ Material: stainless steel 316L, abrasive-blasted or polished Seals: EPDM Display window: polycarbonate (PC) ▪ Cable entry thread ½" NPT and M20x1.5 ▪ Weight – Standard version: 360 g (12.7 oz) – Version with display window: 460 g (16.23 oz) ▪ Display window in cover optionally for head transmitter with display TID10 ▪ Protection armature connection: M24x1.5 or ½" NPT ▪ Ground terminal: internal in standard version; external terminal optionally available ▪ Available in conjunction with 3-A marked sensors

TU401	Specification
	▪ Protection class: IP65 (NEMA Type 4x encl.) ▪ Temperature: −40 to 130 °C (−40 to 266 °F) silicone, up to 100 °C (212 °F) rubber seal without cable gland (observe max. permitted temperature of the cable gland!) ▪ Material: aluminum alloy with polyester or epoxy coating, rubber or silicone seal under the cover ▪ Cable entry: ½" NPT, ¾" NPT or plug 7/8" FF ▪ Protection armature connection: M24x1.5, G 1/2" or NPT 1/2" ▪ Head color: blue, RAL 5012 ▪ Cap color: gray, RAL 7035 ▪ Weight: 300 g (10.58 oz)

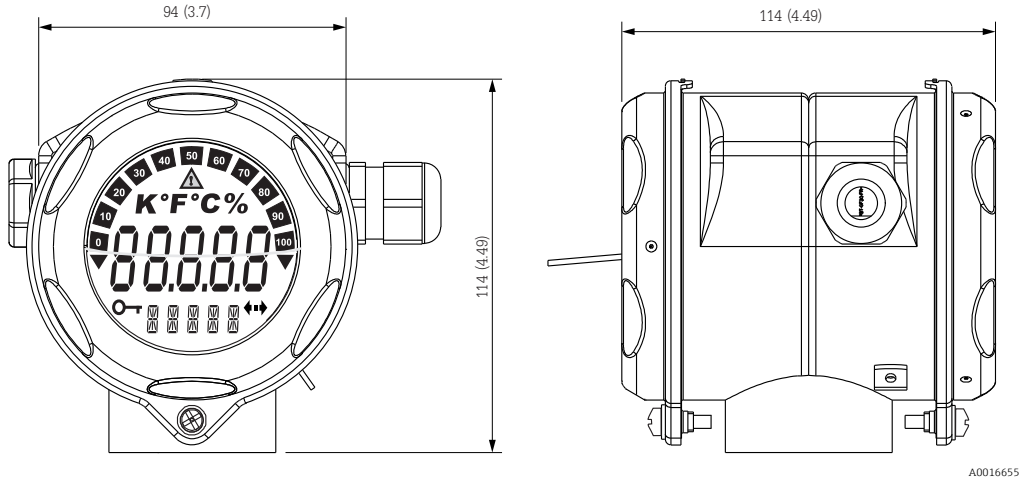
TU401 (TA30A style)	Specification
	▪ Available with one or two cable entries ▪ Protection class: IP66/68 (NEMA Type 4x encl.) ▪ Temperature: −50 to +150 °C (−58 to +302 °F) without cable gland ▪ Material: aluminum, polyester powder coated Seals: silicone ▪ Threaded cable entry: ½" NPT, ¾" NPT or plug 7/8" FF ▪ Protection armature connection: M24x1.5 ▪ Head color: blue, RAL 5012 ▪ Cap color: gray, RAL 7035 ▪ Weight: 330 g (11.64 oz) ▪ Ground terminal, internal and external ▪ With 3-A symbol

TU401 (TA30S style)	Specification
	▪ Degree of protection: IP65 (NEMA Type 4x encl.) ▪ Temperature: −40 to +85 °C (−40 to +185 °F) without cable gland ▪ Material: polypropylene (PP), FDA-compliant, seals: O-ring EPDM ▪ Cable entry thread: ¾" NPT, ½" NPT) or or plug 7/8" FF ▪ Protective assembly connection: ½" NPT ▪ Color: white ▪ Weight: approx. 100 g (3.5 oz) ▪ Ground terminal: only internal via auxiliary terminal **⚠ CAUTION** **Potential electrostatic charging hazard** ► Not recommended for use in hazardous (classified) locations.

Field transmitters

Temperature field transmitter iTEMP TMT162
 * Dimensions without display = 112 mm (4.41 in)
▪ Separate electronics compartment and connection compartment ▪ Protection class: IP67, NEMA type 4x ▪ Material: Die-cast aluminum housing AlSi10Mg with powder coating on polyester base, 316L ▪ Display rotatable in 90° increments ▪ Cable entry: 2x ½" NPT ▪ Brilliant backlit display with ease of visibility in bright sunshine or pitch darkness ▪ Gold plated terminals to avoid corrosion and additional measurement errors ▪ SIL certification as per IEC 61508:2010 (HART-protocol)

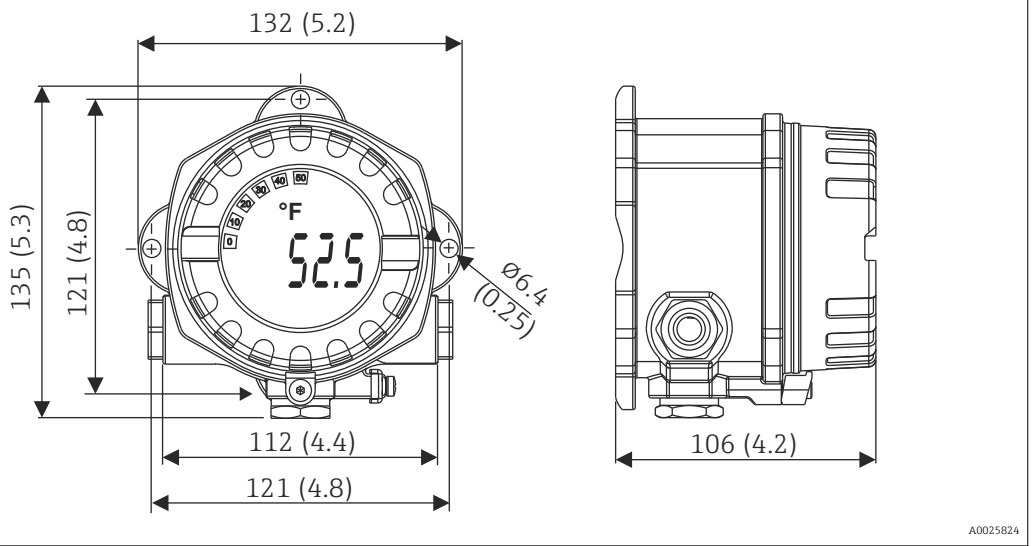
Temperature field transmitter iTEMP TMT162 for hygienic applications



* Dimensions without display = 112 mm (4.41 in)

- Material: Stainless steel 1.4435 (AISI 316L) for hygienic applications (T17 housing)
- Separate electronics compartment and connection compartment
- Display rotatable in 90° increments
- Cable entry: 2 x ½" NPT
- Degree of protection (IP69K)
- Brilliant backlit display with ease of visibility in bright sunshine or pitch darkness
- Gold plated terminals to avoid corrosion and additional measurement errors

Temperature field transmitter iTEMP HART® TMT142



- Protection class: IP67, NEMA type 4x
- Material: Die-cast aluminum housing AlSi10Mg with powder coating on polyester base
- Display rotatable in 90° increments
- Cable entry: 3x ½" NPT
- Brilliant blue backlit display with ease of visibility in bright sunshine or pitch darkness
- Gold plated terminals to avoid corrosion and additional measurement errors

Certificates and approvals

CE mark

The measuring system meets the legal requirements of the applicable EC guidelines. These are listed in the corresponding EC Declaration of Conformity together with the standards applied. The manufacturer confirms successful testing of the device by affixing to it the CE mark.

Other standards and guidelines	▪ IEC 60529: Degree of protection of housing (IP code) ▪ IEC/EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use. ▪ ASTM E644: American society for testing and materials, standard test methods for testing industrial resistance thermometers. ▪ NEMA - ANSI / NEMA 250: Standardization association for the electrical industry. ▪ IEC 60751: Industrial platinum resistance thermometer ▪ ASME PTC 19.3 - 1974: Performance test codes
CSA GP	The installed and assembled transmitters (iTEMP Series) are CSA GP approved.

Ordering information

Detailed ordering information is available from the following sources:
- In the Product Configurator on the Endress+Hauser website: www.endress.com -> Click "Corporate" -> Select your country -> Click "Products" -> Select the product using the filters and search field -> Open product page -> The "Configure" button to the right of the product image opens the Product Configurator.
- From your Endress+Hauser Sales Center: www.addresses.endress.com

Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

Accessories

Various accessories, which can be ordered with the device or subsequently from Endress+Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

Device-specific accessories

Adapter	M20x1.5 - ½" NPT cable entry Order code: 51004387
Cable gland	½" NPT, D4.5-8.5, IP 68 Order code: 51006845
Integrated overvoltage protection module	The module protects the electronics from overvoltage. Available for TMT162 housing (not T17 hygienic version).

Communication-specific accessories

Configuration kit TXU10	Configuration kit for PC-programmable transmitter with setup software and interface cable for PC with USB port Order code: TXU10-xx
Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB interface. For details, see "Technical Information" TI00404F
Commubox FXA291	Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop. For details, see "Technical Information" TI00405C
Wireless HART adapter SWA70	Is used for the wireless connection of field devices. The WirelessHART adapter can be easily integrated into field devices and existing infrastructures, offers data protection and transmission safety and can be operated in parallel with other wireless networks with minimum cabling complexity. For details, see Operating Instructions BA061S
Field Xpert SFX350	Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the **non-Ex area**. For details, see Operating Instructions BA01202S

Field Xpert SFX370	Field Xpert SFX370 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the **non-Ex area and the Ex area**. For details, see Operating Instructions BA01202S

Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: ▪ Calculation of all the necessary data for identifying the optimum measuring device: e.g. pressure loss, accuracy or process connections. ▪ Graphic illustration of the calculation results Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. Applicator is available: ▪ Via the Internet: https://portal.endress.com/webapp/applicator ▪ On CD-ROM for local PC installation.
Configurator	Product Configurator - the tool for individual product configuration ▪ Up-to-the-minute configuration data ▪ Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language ▪ Automatic verification of exclusion criteria ▪ Automatic creation of the order code and its breakdown in PDF or Excel output format ▪ Ability to order directly in the Endress+Hauser Online Shop The Configurator is available on the Endress+Hauser website: www.endress.com -> Click "Corporate" -> Select your country -> Click "Products" -> Select the product using the filters and the search field -> Open the product page -> The "Configure" button to the right of the product image opens the Product Configurator.
W@M	Life cycle management for your plant W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle. The application already contains the data of your Endress+Hauser device. Endress +Hauser also takes care of maintaining and updating the data records. W@M is available: ▪ Via the Internet: www.endress.com/lifecyclemanagement ▪ On CD-ROM for local PC installation.
FieldCare SFE500	FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition. For details, see Operating Instructions BA00027S and BA00065S
DeviceCare SFE100	Configuration tool for devices via fieldbus protocols and Endress+Hauser service protocols. DeviceCare is the tool developed by Endress+Hauser for the configuration of Endress+Hauser devices. All smart devices in a plant can be configured via a point-to-point or point-to-bus connection. The user-friendly menus enable transparent and intuitive access to the field devices. For details, see Operating Instructions BA00027S

System components

Accessories	Description
Energy manager RMS621	Accurate and reliable calculations for the monitoring and control of energy consumption (both produced and consumed) according to international standards. For details, see the "Technical Information" document TI00092R/09/EN
Deltabar S/Cerabar S	Pressure transmitters with diaphragm seal for level measurements in gases or liquids. For details, see "Technical Information"
Process display RIA15	Process display, digital loop-powered display for 4 to 20 mA circuit, panel mounting, with optional HART® communication. Displays 4 to 20 mA or up to 4 HART® process variables For details, see "Technical Information", TI01043K/09/en
Active barrier RN221N	Active barrier with power supply for safe separation of 4 to 20 mA standard signal circuits. Has bidirectional HART® transmission and optional HART® diagnostics if transmitters are connected with monitoring of 4 to 20 mA signal or HART® status byte analysis and an E+H-specific diagnostic command. For details, see "Technical Information", TI00073R/09/en

Documentation

Brief operating instructions - RTD assembly
- TH13 with thermowell (KA00190R/09/)
- TH14 with flanged thermowell (KA00192R/09/)
- TH15 spring loaded insert (KA00195R/09/)

Technical information temperature transmitter iTEMP
- HART® TMT82 (TI01010T/09/)
- PROFIBUS PA TMT84 (TI00138R/09/)
- FOUNDATION Fieldbus™ TMT85 (TI00134R/09/)
- Field transmitter:
  - TMT162 HART® 5, PROFIBUS PA and FOUNDATION Fieldbus™ (TI00086R/09/EN)
  - TMT162 HART® 7 and SIL certification (TI01344T/09/EN)
  - TMT142 HART® (TI00107R/09/EN)
- PCP TMT181 (TI00070R/09/)
- Pt TMT180 (TI00088R/09/)
- HART® TMT182 (TI00078R/09/)

Application example - Technical information
- Energy manager RMS621 (TI00092R/09/)
- Cerabar S (TI00383P/00/)
- Deltabar S (TI00384P/00/)

www.addresses.endress.com

Endress+Hauser

People for Process Automation

Tags:
20-PSH-601
20-PSH-602

J6 Series

PRESSURE AND VACUUM SWITCHES









FEATURES

- Gasketed, Die Cast Aluminum Enclosure with Epoxy Coating
- SPDT Switch Output
- Adjustable Deadband Option
- Sealed, Isolated Metal Bellows Sensors
- Adjustable Pressure Ranges: 30 "Hg Vac to 6000 psi (-1 to 414 bar)

ISO 9001 CERTIFIED COMPANY

OVERVIEW

The J6 is a reliable, sensitive pressure switch, originally designed for instrument air applications in process plants. Its compact design and combination of set-point sensitivity and narrow or optional adjustable deadband, offers cost-saving solutions for a variety of applications.

The J6 is ideally suited for a wide range of industrial processes such as alarm/shutdown and low/high service pressures. OEMs also utilize the J6 in machinery and equipment for threshold protection.



FEATURES

- UL listed and cUL certified
- Optional ATEX or GOST intrinsic safety compliance
- Designed to meet Enclosure Type 4X
- SPDT switch output
- Adjustable deadband option for precise on-off control
- Brass or welded stainless steel bellows sensors
- External manual reset option

SPECIFICATIONS

AMBIENT TEMPERATURE LIMITS	-40° to 160°F (-40 to 71°C); set point typically shifts less than 1% of range for a 50°F (28°C) ambient temperature change
SET POINT REPEATABILITY	Models S126B-S164B, 126-364, 680: ± 1% of adjustable range; models 610-614: ± 1.5% of adjustable range
SHOCK	Set point repeats after 15 G, 10 millisecond duration
VIBRATION	Set point repeats after 2.5 G, 5-500 Hz
ENCLOSURE	Die cast aluminum, epoxy powder coated, gasketed; captive cover screws
ENCLOSURE CLASSIFICATION	Designed to meet Enclosure Type 4X requirements
SWITCH OUTPUT	One SPDT; switch may be wired "normally open" or "normally closed"
ELECTRICAL RATING	15 A 125/250/480 VAC resistive. Electrical switches have limited DC capabilities. Consult factory for additional information.
WEIGHT	Approx. 1 lb., 8 oz. (0.68 kg.)
ELECTRICAL CONNECTION	1/2" NPT (female)
PRESSURE CONNECTION	All models 1/4" NPT (female) except models S126B-S164B: 1/2" NPT (female)

APPROVALS

UE declarations and third-party issued Agency certifications are available for download at www.ueonline.com/prod_approval.

UNITED STATES AND CANADA
UL Listed,
UL 508, file #E42272
cUL Certified
CSA C22.2 No. 14, file #42272
Canadian Registration Number (CRN): Refer to www.ueonline.com/certifications for list of approved models

EUROPEAN UNION
ATEX Directive (94/9/EC)
II 1 G EEx ia IIC T6 **(OPTIONAL - Code M405)**
Tamb = -50°C to +60°C
UL International DEMKO A/S (N.B.# 0539)
Certificate #DEMKO 03 ATEX 0335063
EN 50014, 50020 & 50284

Low Voltage Directive (LVD) (73/23/EC & 93/68/EEC)
Compliant to LVD
Products rated lower than 50 VAC and 75 VDC are outside of the scope of the LVD
The Low Voltage Directive does not apply to products for use in hazardous locations

Pressure Equipment Directive (PED) (97/23/EC)
Compliant to PED
Products rated below 7.5 psi are outside the scope of PED

RUSSIA
Gosgortechnadzor Permit **(OPTIONAL - Code M406)**
OExia IIC T6
Tamb. = -50°C to +60°C
NANIO CCVE Certification Center
Certificate ROSS US.GB05.Bo2933
GOST R 51330.0, 51330.1, 51330.10 & 51330.14

PRESSURE MODEL CHART

Model	Adjustable Set Point Range Low end of range on fall; High end of range on rise		Deadband		Over Range Pressure*		Proof Pressure**	
	psi (unless noted)	bar (unless noted)	psi (unless noted)	bar (unless noted)	psi (unless noted)	bar (unless noted)	psi (unless noted)	bar
Welded 316L stainless steel bellows and 1/2" NPT (female) pressure connection								
S126B	30 "Hg Vac to 0 psi	-1 to 0	0.2 to 0.8 "Hg	6,8 to 27,1 mbar	3	0,2	5	0,3
S134B	30 "Hg Vac to 20 psi	-1 to 1,4	0.2 to 0.8 "Hg	6,8 to 27,1 mbar	20	1,4	25	1,7
S136B	0 to 50" wc	0 to 124,5 mbar	3 to 6 "wc	7,5 to 14,9 mbar	50 "wc	124,5 mbar	5	0,3
S142B	0 to 18	0 to 1,2	4 to 7 "wc	10 to 17,4 mbar	18	1,2	25	1,7
S148B	0 to 40	0 to 2,8	0.1 to 0.4	6,9 to 27,6 mbar	40	2,8	40	2,8
S152B	0 to 50	0 to 3,4	0.1 to 0.5	6,9 to 34,5 mbar	50	3,4	75	5,2
S156B	3 to 100	0,2 to 6,9	0.2 to 0.8	13,8 to 55,2 mbar	100	6,9	125	8,6
S160B	50 to 180	3,4 to 12,4	0.3 to 1	20,7 to 68,9 mbar	180	12,4	180	12,4
S164B	0 to 200	0 to 13,8	0.3 to 2	20,7 to 137,9 mbar	200	13,8	200	13,8
Welded 316L stainless steel bellows and 1/4" NPT (female) pressure connection (Model 680 not recommended for rapid or high cycling pressure changes)								
354	0 to 50	0 to 3,4	1.5 to 2.5	0,1 to 0,2	50	3,4	75	5,2
356	0 to 100	0 to 6,9	2 to 4	0,1 to 0,3	100	6,9	150	10,3
358	0 to 200	0 to 13,8	3 to 5	0,2 to 0,3	200	13,8	250	17,2
360	0 to 250	0 to 17,2	3 to 5	0,2 to 0,3	250	17,2	330	22,8
362	0 to 350	0 to 24,1	2 to 8	0,1 to 0,6	350	24,1	430	29,6
364	0 to 500	0 to 34,5	3 to 9	0,2 to 0,62	500	34,5	575	39,6
680	100 to 1700	6,9 to 117,2	9 to 23	0,6 to 1,6	1700	117,2	2500	172,4
303 stainless steel piston with Buna N O-ring and 303 stainless steel 1/4" NPT (female) pressure connection (not recommended for gas service since drying of the O-ring can allow bleeding of the medium into the atmosphere)								
610	75 to 1000	5,2 to 68,9	30 to 150	2,1 to 10,3	1000	68,9	10,000	689,5
612	125 to 3000	8,6 to 206,8	40 to 250	2,8 to 17,2	3000	206,8	10,000	689,5
614	500 to 6000	34,5 to 413,7	50 to 400	3,4 to 27,6	6000	413,7	10,000	689,5

* **Over Range Pressure**: The maximum pressure that may be applied continuously without causing damage and maintaining set point repeatability.
** **Proof Pressure**: The maximum pressure to which a pressure sensor may be occasionally subjected, which causes no permanent damage. The unit may require calibration (e.g., start-up, testing).

Model	Adjustable Set Point Range Low end of range on fall; High end of range on rise		Deadband		Over Range Pressure*		Proof Pressure**	
	psi (unless noted)	bar (unless noted)	psi (unless noted)	bar (unless noted)	psi (unless noted)	bar (unless noted)	psi (unless noted)	bar
Brass bellows with nickel-plated brass 1/4" NPT (female) pressure connection†; Models 126 and 134 have zinc-plated steel spring exposed to media								
126	30 "Hg Vac to 0 psi	-1 to 0	0.2 to 0.8 "Hg	6,8 to 27,1 mbar	3	0,2	5	0,3
134	30 "Hg Vac to 20 psi	-1 to 1,4	0.2 to 0.8 "Hg	6,8 to 27,1 mbar	20	1,4	25	1,7
136	0 to 50" wc	0 to 124,5 mbar	3 to 6 "wc	7,5 to 14,9 mbar	50 "wc	124,5 mbar	5	0,3
142	0 to 18	0 to 1,2	4 to 7 "wc	10 to 17,4 mbar	18	1,2	25	1,7
148	0 to 40	0 to 2,8	0.1 to 0.4	6,9 to 27,6 mbar	40	2,8	40	2,8
152	0 to 50	0 to 3,4	0.1 to 0.5	6,9 to 34,5 mbar	50	3,4	75	5,2
156	3 to 100	0,2 to 6,9	0.2 to 0.8	13,8 to 55,2 mbar	100	6,9	125	8,6
160	50 to 180	3,4 to 12,4	0.3 to 1	20,7 to 68,9 mbar	180	12,4	180	12,4
Phosphor bronze bellows with nickel-plated brass 1/4" NPT (female) pressure connection; Model 218 has 300 series stainless steel spring exposed to media								
218	30 "Hg Vac to 0 psi	-1 to 0	1 to 2 "Hg	33,9 to 67,7 mbar	0	0	30	2,1
222	0 to 20	0 to 1,4	0.5 to 1	34,5 to 68,9 mbar	20	1,4	30	2,1
224	0 to 30	0 to 2,1	0.5 to 1	34,5 to 68,9 mbar	30	2,1	45	3,1
226	0 to 50	0 to 3,4	0.7 to 1.3	48,3 to 89,6 mbar	50	3,4	75	5,2
230	0 to 100	0 to 6,9	1 to 2	68,9 mbar to 0,1 bar	100	6,9	110	7,6
258	0 to 50	0 to 3,4	1.5 to 2.5	0,1 to 0,2	50	3,4	75	5,2
266	0 to 100	0 to 6,9	2 to 5	0,1 to 0,3	100	6,9	150	10,3
270	0 to 200	0 to 13,8	3 to 5	0,2 to 0,3	200	13,8	250	17,2
272	0 to 250	0 to 17,2	3 to 5	0,2 to 0,3	250	17,2	330	22,8
274	0 to 300	0 to 20,7	4 to 6	0,3 to 0,4	300	20,7	350	24,1

†Several of these models were previously offered with adjustable deadband as J6D. Specify option code 1520 if adjustable deadband is required.

J6 Series

HOW TO ORDER

BUILDING A PART NUMBER

Select a **Type**

Refer to the "Type" section below.

Determine type number based on switch output, enclosure, adjustment and reference.

Fill in the type portion of your part number with the corresponding number.

Select a **Model**

Refer to the "Model Charts".

Determine model based on adjustable range, deadband and proof pressure.

Fill in the model portion of your part number with the corresponding number.

Select an **Option**

Refer to the "Options" section.

Determine option number based on switch output, optional materials or other product enhancements.

Fill in the option portion of your part number with the corresponding number.

Leave "option" portion blank if no options are needed. *FOR MULTIPLE OPTIONS:* Call United Electric Controls.

TYPE	DESCRIPTION
Pressure	**Type J6 -** One SPDT output; epoxy coated enclosure; internal adjustment with no reference dial

SWITCH OPTIONS*

0140	Gold contacts, 1 A 125 VAC resistive
0500	Close deadband, 5 A 125/250 VAC resistive
1070	10 A 125 VDC resistive; deadband and minimum set point will increase
1520	Adjustable deadband, 15 A 125/250/277 VAC resistive. Adjustment wheel changes rise setting only - if adjustment on fall setting is required, use primary adjustment. NOT AVAILABLE ON MODELS 258-274, 354-364, 610-614, 680. NOTE: Must select this option for models previously listed as J6D.
1530	External manual reset, 15 A125/250/480 VAC resistive, latches on rising pressure only
2000	20 A 125/250/480 VAC resistive

SENSOR AND OTHER OPTIONS

M201	Factory set one switch; specify increasing or decreasing pressure and set point
M277	Range indicated on nameplate in kPa or MPa factory selected
M278	Range indicated on nameplate in Kg/cm^2
M405	Intrinsic safety compliance for European Union per ATEX standards
M406	Instrinsic safety compliance for Russia per Gosgortechnadzor standards
M444	Paper ID tag
M446	Stainless steel ID tag & wire attachment
M540	Viton® construction (deadband and low end of range may increase); wetted parts include Viton® O-ring and standard connection material. AVAILABLE ON MODELS 610-614 ONLY
M550	Oxygen service cleaning; alcohol cleaning to remove residue from the process connection
M913	1/4" NPT (female) 316L stainless steel pressure connection. AVAILABLE MODELS S126B-S164B
M914	1/2" NPT (female) 316L stainless steel pressure connection. AVAILABLE MODELS 354-364

***** *All switches have limited DC capabilities. Consult factory for details.*

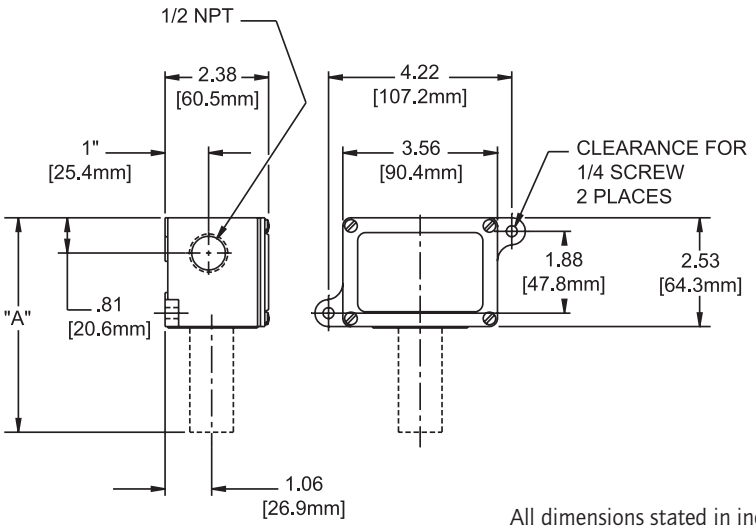
Viton® is a registered trademark of E.I. duPont de Nemours and Company

DIMENSIONAL DRAWINGS

Dimensional drawings for all models may be found at www.ueonline.com

Internal Set Point Adjustment

Types J6

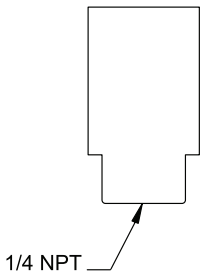


Dimension A			
Models	**Inches**	**mm**	**NPT**
126-160	5.06	128.5	1/4
S126B-S164B	5.47	138.9	1/2
218-230	4.31	109.5	1/4
258-274	4.75	120.7	1/4
354-364	4.78	121.4	1/4
610-614	5.72	145.3	1/4
680	4.97	126.2	1/4

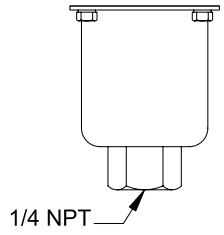
All dimensions stated in inches (millimeters)

Pressure Sensors

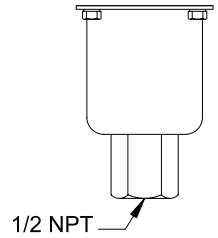
Models 218-230



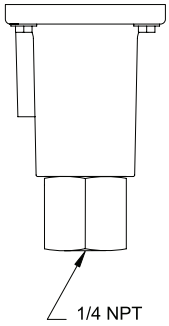
Models 126-160



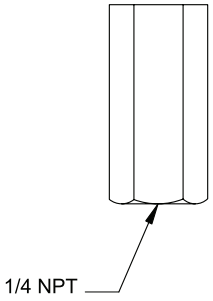
Models S126B-S164B



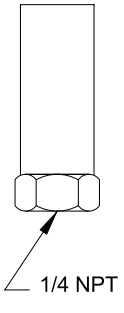
Models 610-614



Models 258-274



Models 354-364, 680



RECOMMENDED PRACTICES AND WARNINGS

United Electric Controls Company recommends careful consideration of the following factors when specifying and installing UE pressure and temperature units. Before installing a unit, the Installation and Maintenance instructions provided with unit must be read and understood.

- To avoid damaging unit, proof pressure and maximum temperature limits stated in literature and on nameplates must never be exceeded, even by surges in the system. Operation of the unit up to maximum pressure or temperature is acceptable on a limited basis (e.g., start-up, testing) but continuous operation must be restricted to the designated adjustable range. Excessive cycling at maximum pressure or temperature limits could reduce sensor life.
- A back-up unit is necessary for applications where damage to a primary unit could endanger life, limb or property. A high or low limit switch is necessary for applications where a dangerous runaway condition could result.
- The adjustable range must be selected so that incorrect, inadvertent or malicious setting at any range point cannot result in an unsafe system condition.
- Install unit where shock, vibration and ambient temperature fluctuations will not damage unit or affect operation. When applicable, orient unit so that moisture does not enter the enclosure via the electrical connection. When appropriate, this entry point should be sealed to prevent moisture entry.
- Unit must not be altered or modified after shipment. Consult UE if modification is necessary.
- Monitor operation to observe warning signs of possible damage to unit, such as drift in set point or faulty display. Check unit immediately.
- Preventative maintenance and periodic testing is necessary for critical applications where damage could endanger property or personnel.
- Electrical ratings stated in literature and on nameplate must not be exceeded. Overload on a switch can cause damage, even on the first cycle. Wire unit according to local and national electrical codes, using wire size recommended in installation sheet.
- Do not mount unit in ambient temp. exceeding published limits.

LIMITED WARRANTY

Seller warrants that the product hereby purchased is, upon delivery, free from defects in material and workmanship and that any such product which is found to be defective in such workmanship or material will be repaired or replaced by Seller (Ex-works, Factory, Watertown, Massachusetts. INCOTERMS); provided, however, that this warranty applies only to equipment found to be so defective within a period of 24 months from the date of manufacture by the Seller. Seller shall not be obligated under this warranty for alleged defects which examination discloses are due to tampering, misuse, neglect, improper storage, and in any case where products are disassembled by anyone other than authorized Seller's representatives. EXCEPT FOR THE LIMITED WARRANTY OF REPAIR AND REPLACEMENT STATED ABOVE, SELLER DISCLAIMS ALL WARRANTIES WHATSOEVER WITH RESPECT TO THE PRODUCT, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

LIMITATION OF SELLER'S LIABILITY

SELLER'S LIABILITY TO BUYER FOR ANY LOSS OR CLAIM, INCLUDING LIABILITY INCURRED IN CONNECTION WITH (I) BREACH OF ANY WARRANTY WHATSOEVER, EXPRESSED OR IMPLIED, (II) A BREACH OF CONTRACT, (III) A NEGLIGENT ACT OR ACTS (OR NEGLIGENT FAILURE TO ACT) COMMITTED BY SELLER, OR (IV) AN ACT FOR WHICH STRICT LIABILITY WILL BE INPUTTED TO SELLER, IS LIMITED TO THE "LIMITED WARRANTY" OF REPAIR AND/OR REPLACEMENT AS SO STATED IN OUR WARRANTY OF PRODUCT. IN NO EVENT SHALL THE SELLER BE LIABLE FOR ANY SPECIAL, INDIRECT, CONSEQUENTIAL OR OTHER DAMAGES OF A LIKE GENERAL NATURE, INCLUDING, WITHOUT LIMITATION, LOSS OF PROFITS OR PRODUCTION, OR LOSS OR EXPENSES OF ANY NATURE INCURRED BY THE BUYER OR ANY THIRD PARTY.

UE specifications subject to change without notice.

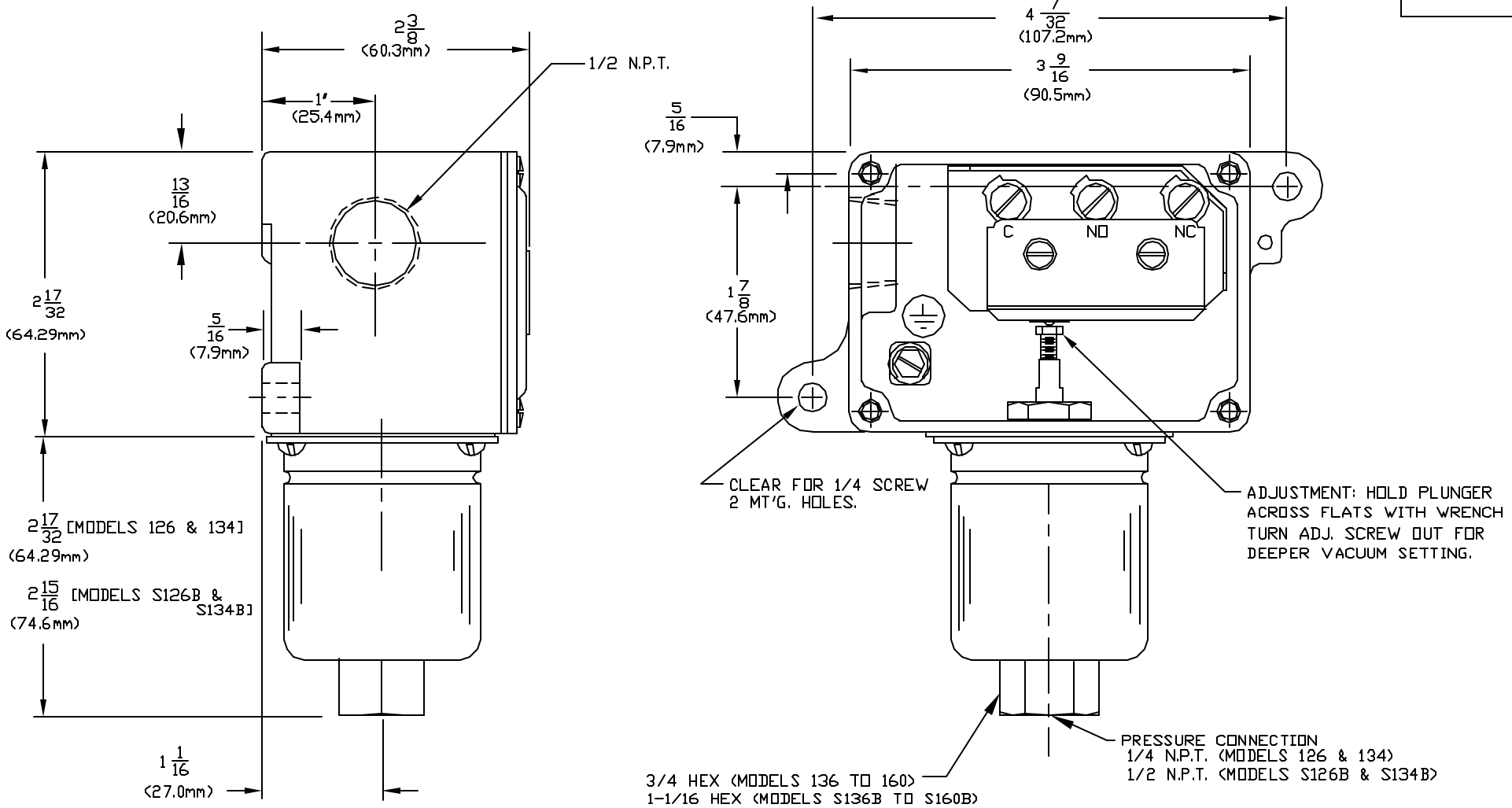
Be sure to visit www.ueonline.com for the latest information.

FOR A LIST OF OUR INTERNATIONAL AND DOMESTIC REGIONAL SALES OFFICES PLEASE VISIT OUR WEBPAGE WWW.UEONLINE.COM

UNITED ELECTRIC CONTROLS
180 Dexter Avenue, P.O. Box 9143
Watertown, MA 02471-9143 USA
Telephone: 617 926-1000 Fax: 617 926-2568
http://www.ueonline.com

CP07112000

A-4488



COVER REMOVED IN FRONT VIEW

R	REDRAWN, NO CHANGE. ECN#C5688	7/5/96	PLW	L.K.
SYM	DESCRIPTION	DATE	DWN	APPD
REVISIONS				

ORIGINAL DATE	4-7-54
DRWN	GLENN V. REIS
CHKD	A.B.
APPD	A.B.

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON FRACTIONS ±1/64
2 PLACE DEC 3 PLACE DEC ANGLES
±.010 ±.005 ±1/2°
DO NOT SCALE THIS DRAWING

TITLE

TYPE J6
MODELS:
126 & 134
S126B & S134B

SCALE 3/4:1

DF001
REV. B

UNITED ELECTRIC CONTROLS COMPANY
WATERTOWN * MASSACHUSETTS

DWG NO
A-4488

Tags :
20-FSL-201-A/B/C/D/E
16-FSL-401-A/B/C

Thermal Air Flow Switch

measuring
•
monitoring
•
analyzing

KAL-L



- Negligible Pressure Loss
- No Moving Parts
- Adjustable Response Time
- Compensated for Temperature
- Easy to Install

KOBOLD companies worldwide:

ARGENTINA, AUSTRIA, BELGIUM, BULGARIA, CANADA, CHILE, CHINA, COLOMBIA, CZECH REPUBLIC, EGYPT, FRANCE, GERMANY, GREAT BRITAIN, HUNGARY, INDIA, INDONESIA, ITALY, MALAYSIA, MEXICO, NETHERLANDS, PERU, POLAND, ROMANIA, SINGAPORE, SOUTH KOREA, SPAIN, SWITZERLAND, TAIWAN, THAILAND, TUNISIA, TURKEY, USA, VIETNAM

KOBOLD Instruments, Inc.
1801 Parkway View Drive
Pittsburgh, PA 15205
Main Office:
1.800.998.1020
1.412.788.4890
info@koboldusa.com
www.koboldusa.com

01/05-2014

Description

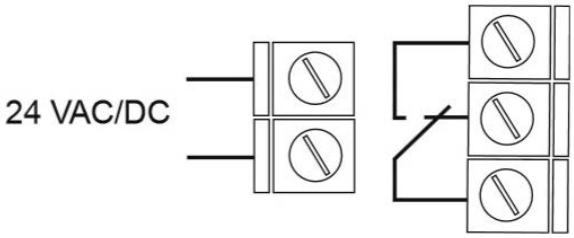
The KOBOLD KAL-L flow switch allows rapid detection of flow rate changes in non-hazardous gases. Fast reaction times are guaranteed by the electronic design. Through use of two RTD's, one to sense flow and the other to detect ambient temperature, the switch can compensate for thermal changes in its surroundings. This “smart” behavior minimizes erroneous switching due to changes caused by things such as the weather. Almost any conceivable pipe size can be accommodated by the insertion style design. Knowledge of the flow velocity in your system is all that is needed to make the KAL-L work. Typical application areas include: air conditioning systems, ventilation systems, and other non-hazardous gas flow monitoring systems.



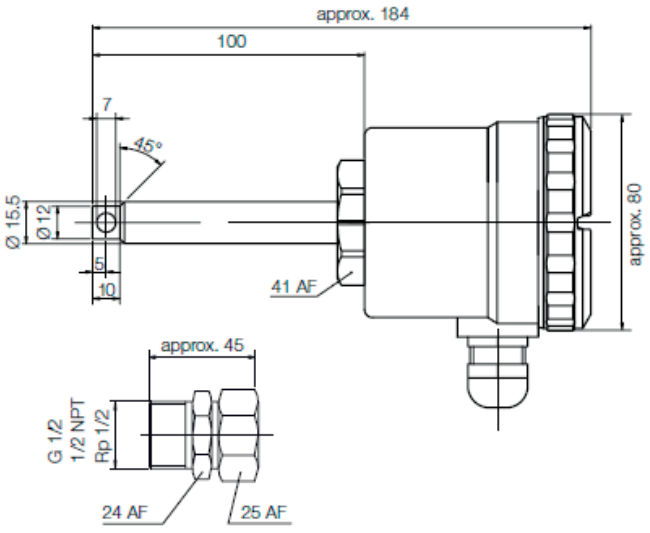
Specifications

Power Supply:	24 VAC/VDC - 15%, +10%
Max. Power:	4 VA
Ambient Temperature:	14...140 °F
Media Temperature:	-10...250 °F
Max. Pressure:	120 PSIG
Max. Warm-up Time:	30 seconds
Switching Range:	3.3...66 ft/sec at 20 °C, 14.5 PSIG (Restricted Span for other Conditions)
Switching Accuracy:	± 10% of Reading
Repeatability:	± 1% of Reading
Temperature Gradient:	30 °K (°C)/min, @ 8m/s, 90 °C
Response Time:	1...60 s, Adjustable
Flow Rate Indication:	8-Digit LED Bargraph
Switch Point Adjustment:	via Potentiometer
Output Indicator:	2-Color LED
Switch Output:	Relay, SPDT
Switch Capacity:	Max. 250 VAC / 1000 VA / 4A (Option M12: Max. 24 VAC/VDC, 3A)
Protection:	IP 65
Housing Material:	Polyamide
Sensor Material:	Ni-plated Brass

Electrical Connection



Dimensions (mm)



Order Details (Example: **KAL-8115 M12**)

Fitting	Order Number	Options
1/2" NPT	**KAL-8115**	**Suffix "C"** ½" Conduit Hub
2-Bolt Flange	**KAL-8115FL**	**Suffix "M12"** Quick Disconnect w/6' Cable

No responsibility taken for errors;
subject to change without prior notice.

VALVE DETAILS

> Series 30/31 Resilient Seated Butterfly Valve
> Wafer | Lug
> NPS 2 to 20 | DN 50 to 500

BODY

> Shall be one-piece wafer or lug design with extended neck to allow for 2" of piping insulation.
> Flange locating holes shall be provided on wafer bodies to allow for quick and precise alignment during valve installation.
> Flange hole drilling per international flange standard as specified.
> The only internal wetted parts of the valve should be the disc and seat.

DISC

> Disc edge and hub on metal discs shall be spherically machined and hand polished for torque and maximum sealing capability.

STEM

> Shall be one-piece design.
> Disc to stem connection shall be and internal double "D" design with no possible leak paths in the disc-to-stem connection. External disc-to stem connections such as disc screws or pins are not allowed.
> Stem shall be mechanically retained in the body neck and no part of the stem shall be exposed to the line media.
> Stem shall not be a wetted part.

SEAT

> Shall be tongue-and-groove seat with a primary hub seal and a molded flange O-ring for weld neck and slip-on flanges.
> The seat shall totally encapsulate the body isolating it from the line media and no flange gaskets shall be required.
> Seat shall be peroxide cured to prevent oxidation on seat surface to ensure low torques through life of the valve.

PACKING AND BEARINGS

> A non-corrosive bushing and a self-adjusting stem seal shall be provided.
> No field adjustment shall be necessary to maintain optimum field performance.

APPROVALS AND CERTIFICATIONS

> CE/PED Certification
> NSF/ANSI 61 and 372
> SIL
> ABS
> Bureau Veritas
> DNV



VALVE ACTUATOR MOUNTING PAD

> ISO 5211

TESTING

> Manufactured, assembled, and tested in compliance with a written ISO 9001 Quality Assurance Program.
> Valve shall be tested to 110% of the rated pressure.

PRESSURE RATINGS

> Valve shall be rated for bubble-tight shut-off at pressure rating shown below.

BI-DIRECTIONAL

Standard Disc

> NPS 2 to 12 | DN 50 to 300
  - 175 psi (12.0 bar)
> NPS 14 to 20 | DN 350 to 500
  - 150 psi (10.3 bar)

DEAD-END SERVICE (LUG BODY ONLY WITH DOWNSTREAM FLANGE REMOVED)

Standard Disc

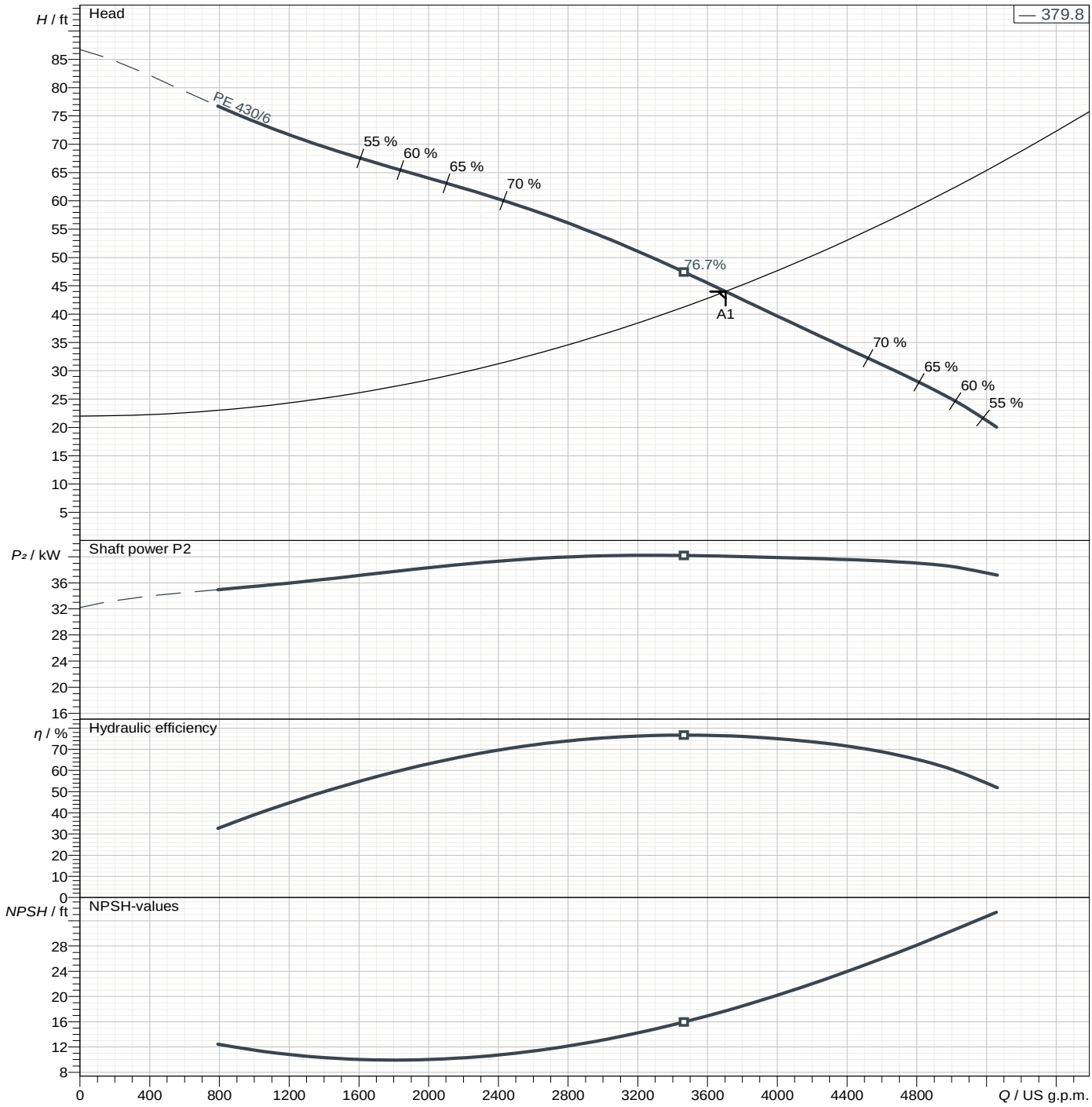
> NPS 2 to 12 | DN 50 to 300
  - 75 psi (5.2 bar)
> NPS 14 to 20 | DN 350 to 500
  - 50 psi (3.4 bar)

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Backpulse Pump
TAG: 20-P-610-A/B

Curve number	Pump performance curves	SULZER
Reference curve XFP255J-CB2 60 HZ	**XFP255J-CB2 60 HZ**	

					Discharge	Frequency
					DN250	60 Hz
Density	Viscosity	Test Standard			Rated speed	Date
62.32 lb/ft³	1.077E-5 ft²/s	ISO 9906, HI 11.6/14.6 Gr 2B			1181 rpm	2023-03-06
Flow	Head	Shaft power	Power input	Rated power P2	Hyd. efficiency	NPSH
3703 US g.p.m	44 ft	40.1 kW	42.5 kW	43 kW	76.4 %	17.7 ft



Wet well vertical installation 2"

Impeller size	N° of vanes	Impeller	Solid size	Revision
379.8 mm	2	Contrablock Plus impeller	90 x 120 mm	

Sulzer reserves the right to change any data and dimensions without prior notice
and can not be held responsible for the use of information contained in this software.

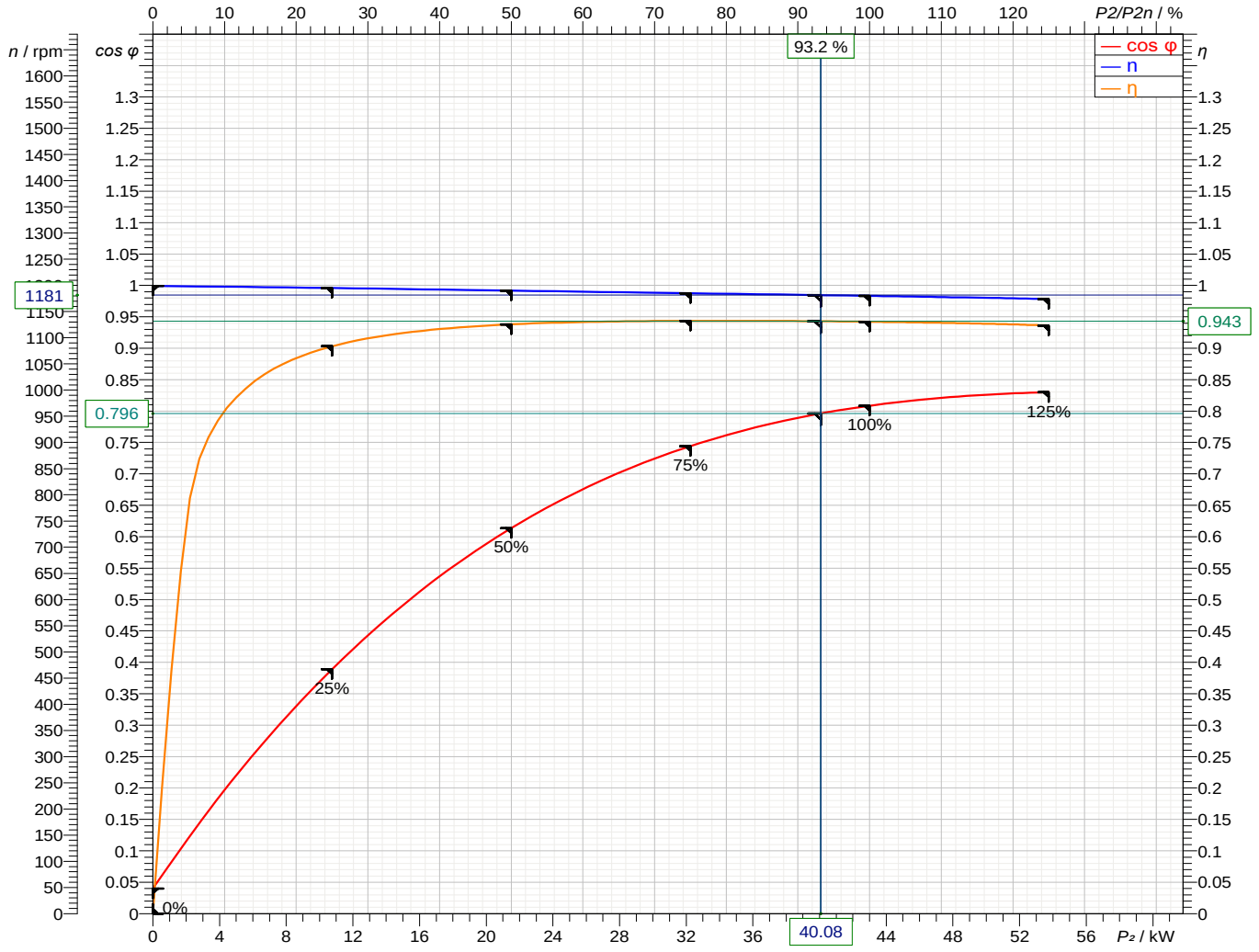
Frequency 60 Hz	PE4B

Motor performance curve

PE 430/6

SULZER

Rated power	Service factor	Nominal Speed	Number of poles	Rated voltage	Date
43 kW	1	1180 rpm	6	480 V	2023-03-06



Symbol	No load	25 %	50 %	75 %	100 %	125 %
P_2 / kW	0	10.75	21.5	32.25	43	53.75
P_1 / kW	1.02	11.9	22.92	34.18	45.64	57.41
I / A	30.7	36.79	44.92	55.23	67.9	83.2
cos φ	0.03997	0.3892	0.6137	0.7443	0.8084	0.83
n / rpm	1199	1195	1190	1185	1180	1174
s / %	0.08333	0.4167	0.8333	1.25	1.667	2.167
M / lbf ft	0	63.36	127.3	191.7	256.7	322.5

Tolerance according to VDE 0530 T1 12.84 for rated power

Starting current	Starting torque	Moment of inertia	No. starts per hour
441 A	642 lbf ft	14.5 lb ft²	15

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SULZER

Submersible Sewage Pump Type ABS XFP

XFP 255J-CB2 | 10", 6 Pole, 3-Phase, 60 Hz, PE4

Submersible Motor Specifications, PE4 Frame

Motor Design			NEMA design B, squirrel cage induction
Motor Type			Fully enclosed Premium Efficiency submersible, IP68 protection rating
Motor Efficiency Standard and Rating			IEC 60034-30, IE3 rating
Motor Efficiency Test Protocol			IEC 60034-2-1
Insulation Material			Class H, 180ºC (356ºF), copper windings
Motor Filling Medium			Air
Temperature Rise			Class A
Maximum Fluid Temperature			40ºC (104ºF) continuous, 50ºC (122ºF) intermittent
Cooling System		**OPT**	Closed-loop, non-toxic glycol/water mixture (⅓ / ⅔)
Motor Protection	**Thermal**	**STD**	Normally closed bimetallic switch in each phase, connected in series, 140ºC (284ºF) +/- 5ºC (41ºF) opening temperature
		OPT	STD plus: upper and lower bearing bimetallic switches **or** 100Ω RTD (PT100) in winding (option of one RTD or three RTDs in stator) and RTDs in lieu of upper and lower bearing bimetallic switches
	Leakage	**STD**	Moisture detection probe in seal sensing chamber (for use with appropriate relay)
		OPT	STD plus: probes in motor housing and junction chamber
Sensing Chamber Filling Medium			Oil
Bearing Type	**Upper**		Cylindrical roller, permanently lubricated
	Lower		Dual angular contact ball bearings plus single cylindrical roller bearing, permanently lubricated
Motor Starter Types			Suitable for use with electronic soft starters, and PWM type Variable Frequency Drives [1]
Maximum Starts per Hour			10 evenly spaced w/ soft starters; N/A with PWM type VFDs
Inverter Duty Rating			Motors meet NEMA MG1, part 31 requirements
Maximum Submergence			20 meters (65 feet)
Available Voltages			230, 460, 600 (consult factory for other voltages)
Voltage Tolerance from Rated			+/-10%
Agency Approvals			Factory Mutual, CSA
Explosion Proof Rating			NEC 500 Class 1, Division 1, Group C & D, Class T3C max surface temp



The picture above may differ from the actual product.
For illustrative purposes only.

[1] Output filters may be required on VFDs. See document **DS-E00-001** for details.

Motor Ratings, PE4 Frame

Motor Model	Input Power (P1)	Rated Power Output (P2)	Nominal RPM	Rated Voltage	Full Load Amps	Locked Rotor Amps	NEMA Code Letter	NEMA Service Factor	Motor Efficiency at % Load			Power Factor at % Load		
									100	75	50	100	75	50
PE 210/6	22.6 kW	21 kW 28 HP	1184	230 460 600	69.9 35.0 26.8	461 231 177	H	1.3	93.0	92.9	91.7	.811	.752	.628
PE 250/6	26.9 kW	25 kW 33.5 HP	1186	230 460 600	85.0 42.5 32.6	638 319 245	J	1.3	93.0	92.5	90.9	.794	.727	.597
PE 350/6	37.2 kW	35 kW 47 HP	1183	230 460 600	118.8 59.4 45.5	855 428 328	J	1.3	94.1	94.0	93.2	.786	.712	.576
PE 430/6	45.7 kW	43 kW 58 HP	1180	230 460 600	141.7 70.9 54.3	921 461 353	H	1.3	94.2	94.4	93.8	.808	.744	.614

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Scan For More Info

Cable Data, PE4 Frame

	Motor	Motor Voltage	Cable Qty	Cable Type	Cable Nominal Outside Diameter +/- .5mm (.02")	
					Power	Ground
Power Cable	PE 210/6	230	1	G-GC 4-3	30.2mm (1.19")	Integrated w/ Power
		460	1	G-GC 8-3	24.6mm (0.97")	Integrated w/ Power
		600	1	G-GC 8-3	24.6mm (0.97")	Integrated w/ Power
	PE 250/6	230	1	G-GC 2-3	34.0mm (1.34")	Integrated w/ Power
		460	1	G-GC 8-3	24.6mm (0.97")	Integrated w/ Power
		600	1	G-GC 8-3	24.6mm (0.97")	Integrated w/ Power
	PE 350/6	230	2	G-GC 4-3	30.2mm (1.19")	Integrated w/ Power
		460	1	G-GC 6-3	26.7mm (1.05")	Integrated w/ Power
		600	1	G-GC 8-3	24.6mm (0.97")	Integrated w/ Power
	PE 430/6	230	2	G-GC 4-3	30.2mm (1.19")	Integrated w/ Power
		460	1	G-GC 4-3	30.2mm (1.19")	Integrated w/ Power
		600	1	G-GC 6-3	26.7mm (1.05")	Integrated w/ Power

	Motor Monitoring Type [3]	Cable Qty	Cable Type	Cable Nominal Outside Diameter +/- .5mm (.02")
Control Cable	Std monitoring	1	SOOW 16/4	10.6mm (0.42")
	Opt full monitoring	1	SOOW 16/8	14.2mm (0.56")
	Opt full monitoring w/ 3 RTDs	1	SOOW 16/12	17.7mm (0.70")
	Opt full monitoring w/ 5 RTDs	2	SOOW 16/10	17.2mm (0.68")
Cable Length	Standard: 15m (49 feet)	Optional: 20m (65 feet), 30m (98 feet); Consult Factory for longer lengths		

[3] See motor protection on page 1. Optional full monitoring systems with RTD options do not include bearing bi-metallic switches.

Pump Data

Discharge Size	10" flanged, compatible with 10" class 125 ANSI flanges									
Suction Size (Wet-Pit / Dry-Pit) [5]	10" undrilled / 10" flanged, compatible with 10" class 125 ANSI flanges, threaded for 12x7/8-9 UNC screws, 30mm (1.2") deep									
Volute Pressure Rating	10 bar (145 psi)									
Impeller Type	Semi-open, 2-vane, Contrablock Plus, w/ Seal Protection System									
Impeller Code	-	-	-	-	-	-				
Impeller Diameter, mm (in.)	340 (13.4)	350 (13.8)	360 (14.2)	370 (14.6)	380 (15.0)	390 (15.4)				
Solids Passage Size, mm (in.)	90x120 (3.5x4.7)	90x120 (3.5x4.7)	90x120 (3.5x4.7)	90x120 (3.5x4.7)	90x120 (3.5x4.7)	90x120 (3.5x4.7)				
Min. Recommended Flow, GPM [6]	1400	1500	1500	1600	1700	1900				

[5] Wet-pit version can be drilled to dry-pit specifications upon request. Consult factory for details. [6] Recommend minimum continuous flow. Consult factory for applications below this flow rate.

Materials of Construction

		Standard	Optional
Power/Control Cable Jacket		Chlorinated Polyethylene (CPE)	
Lifting Hoop		Ductile Iron EN-GJS-400-18 (ASTM A-536; 60-40-18)	Duplex Stainless Steel 1.4470 (ASTM A890, CD3MN Grade 4A)
Cable Connection Chamber		Cast Iron EN-GJL-250 (ASTM A-48, Class 35B)	
Motor Housing		Cast Iron EN-GJL-250 (ASTM A-48, Class 35B)	
Cooling Jacket		Steel 1.0036 (ASTM A-570, Grade D)	
Intermediate Housing		Cast Iron EN-GJL-250 (ASTM A-48, Class 35B)	
Seal Plate/Cooling Chamber		Cast Iron EN-GJL-250 (ASTM A-48, Class 35B)	
Pump and Motor Shaft		Stainless Steel 1.4021 (AISI 420)	Duplex Stainless Steel 1.4462 (UNS S31803)
Impeller		Cast Iron EN-GJL-250 (ASTM A-48, Class 35B) [7]	Duplex Stainless Steel 1.4470 (ASTM A890, CD3MN Grade 4A)
Wear Parts	Impeller Wear Ring	N/A	
	Volute Wear Ring	N/A	
	Bottom/Wear Plate	Cast Iron EN-GJL-250 (ASTM A-48, Class 35B) [7]	Duplex Stainless Steel 1.4470 (ASTM A890, CD3MN Grade 4A)
Volute		Cast Iron EN-GJL-250 (ASTM A-48, Class 35B)	Duplex Stainless Steel 1.4470 (ASTM A890, CD3MN Grade 4A)
External Hardware		Stainless Steel 1.4401 (AISI 316)	
O-Rings and Cable Glands		Nitrile (Buna-N)	Viton®
Mechanical Seals	Lower	Silicon Carbide / Silicon Carbide, Nitrile, 316 SS	Silicon Carbide / Silicon Carbide, Viton®, 316 SS
	Upper	Silicon Carbide / Silicon Carbide, Nitrile, 316 SS	
Lower Bearing Lip Seal		Nitrile (Buna-N)	
Coating/Protection		Two-part epoxy, blue, 120µm (4.7 mil) DFT	Two-part epoxy, blue, 400µm (15.7 mil); Wet-end liquid ceramic coating, 500µm (19.7 mil); Zinc Anodes

[7] Hardening of bottom edge of impeller vane and wear plate surface available. Consult factory for details.

General Data (Standard Materials of Construction & Cable Length)

	PE 210/6	PE 250/6	PE 350/6	PE 430/6		
Overall Height	1503mm (59.2")	1503mm (59.2")	1583mm (62.3")	1583mm (62.3")		
≈ Pump Weight (Non-Cooled)	805 kg (1775 lb)	845 kg (1863 lb)	895 kg (1973 lb)	905 kg (1996 lb)		

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No: M-02.3016 - 03	2
Dat/Nam.: 18.04.2016 / K. Srb	
Cad Code: M_023016	
Technical changes reserved Änderungen vorbehalten Sous réserve de modifications	

XFP 255J-CB2

Dimension sheet PE4 WET WELL Installation

Maßblatt PE4 Nassinstallation

Plan d'encombrement PE4 installation submersible

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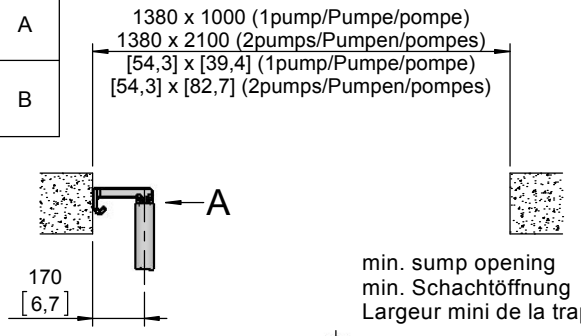
Type Typ Type 50Hz	Type Typ Type 60Hz	Weight Gewicht Poids **OK**		Weight Gewicht Poids **MK**		H		Size
		(~kg)	(~lb)	(~kg)	(~lb)	(mm)	(inch)	
PE 220/4-J		800	1764	840	1852	1503	59.2	A
PE 300/4-J		835	1841	875	1929			
PE 370/4-J		870	1918	915	2018	1583	62.3	B
PE 450/4-J		900	1985	945	2084			
PE 185/6-J	PE 210/6-J-60	805	1775	845	1863	1503	59.2	A
PE 220/6-J	PE 250/6-J-60	845	1863	885	1951			
PE 300/6-J	PE 350/6-J-60	895	1973	940	2073	1583	62.3	B
PE 370/6-J	PE 430/6-J-60	905	1996	950	2095			

Weight: Includes pump, slider bracket and 10m cable
Gewicht: Beinhaltet Pumpe, Halterung und 10m Kabel
Poids: Pompe, coulisseau et 10m de câble

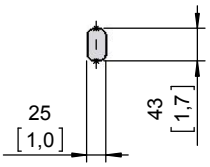
For different cable length see IOM, chapter 1.5
Für abweichende Kabellänge siehe EBA, Kapitel 1.5
Pour des longueurs supérieures, voir la section 1.5 du manuel

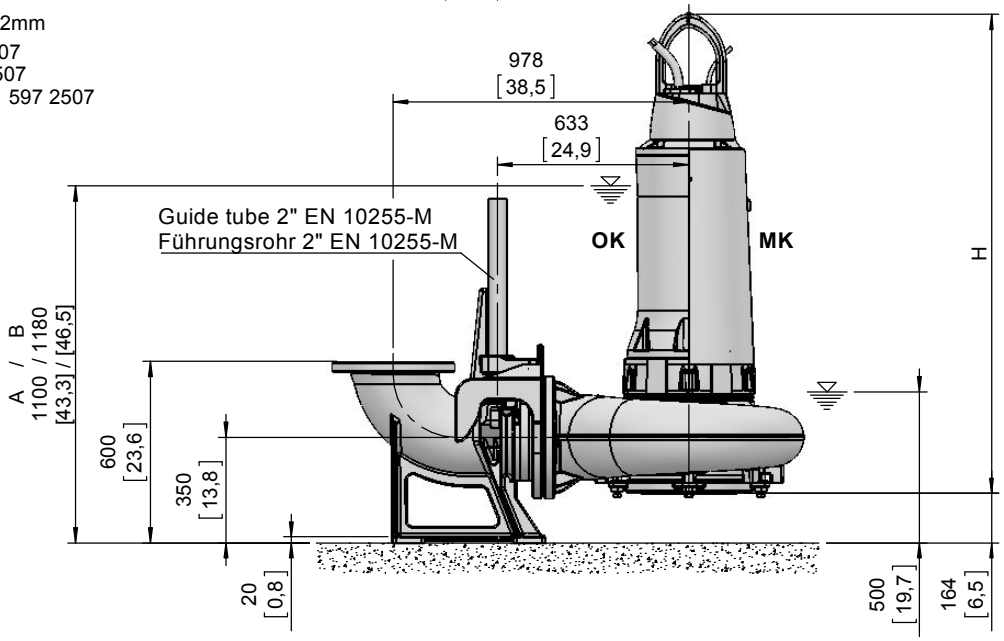
For hex.-woodscrew 0,4*2,8 plug 0,5 DIA
Für Skt.-Holzschr.10*70 Dübel Ø12mm
Pour vis à bois hexagonale 10*70 trou de 12mm

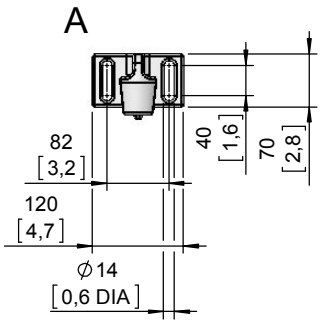
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Installationsanweisung "Fußstück" 1 597 2507
Instruction d'installation du "pied d'assise" 1 597 2507

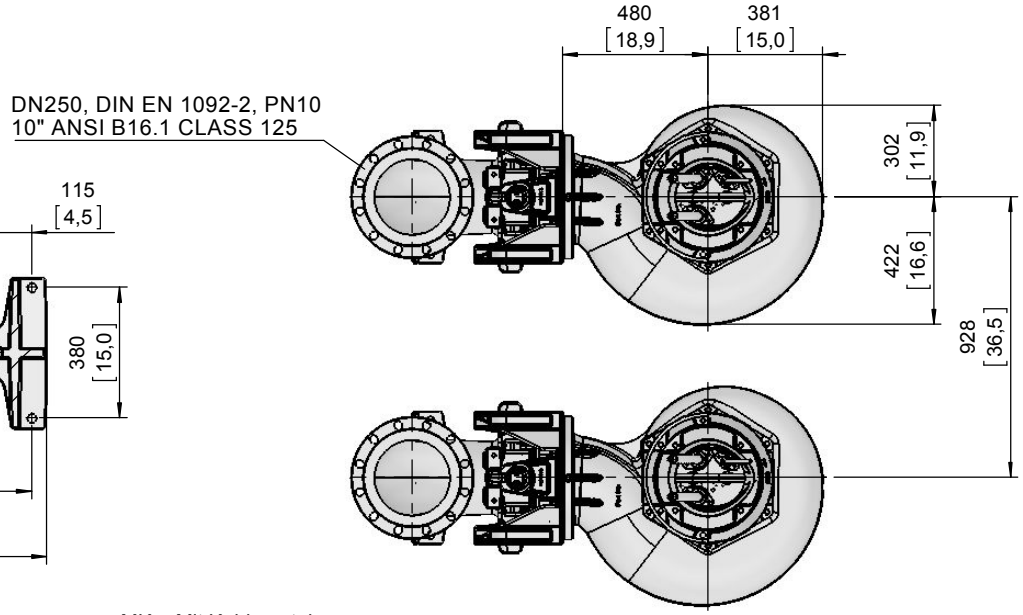


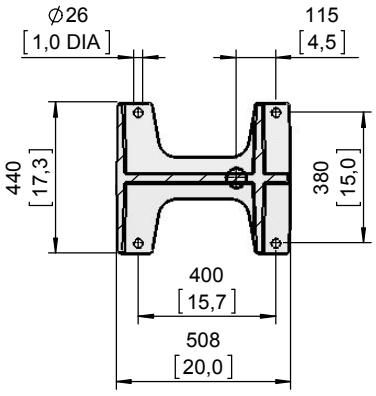
Lifting hoop cross section
Fangbügel-Querschnitt
Section de l'anse de levage











[mm / [inch]]

OK = Ohne Kühlmantel
Without cooling jacket
Sans enveloppe de refroidissement

MK = Mit Kühlmantel
With cooling jacket
Avec enveloppe de refroidissement

GF Piping Systems

+GF+

TAGS:
23-CV-130
23-CV-330

Cone Check Valves
Type 561/562



General

- **Size**: ⅜"–4"
- **Material**: PVC, CPVC, PROGEF® Standard PP, ABS, SYGEF® Standard PVDF
- **Seals**: EPDM, FPM
- **Spring:** 304 stainless steel
- **End Connection**: Solvent cement socket, threaded, flanged, fusion spigot, fusion socket

Key Certifications

- **FDA CFR 21 177.1520**: PP
- **FDA CFR 21 177.2600**: EPDM and FPM
- **FDA CFR 21 177.1550**: PTFE
- **USP 25 Class VI (physiological non-toxic)**: PP

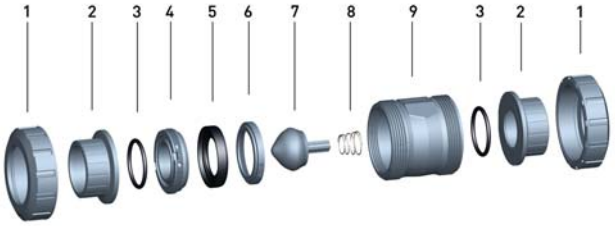
Optional Features

- **Strainer**: Foot valve applications, PVC only
- **Spring**: Nimonic 90, Halar coated Nimonic 90
- **End Connection**: Alternatives available upon request
- **Cleaned**: Silicone free/oil free

Specification

The Type 561/562 Cone Check Valve shall be true union and fully serviceable. The Type 561 shall be used in vertical applications only. The Type 562 shall be used in both horizontal and vertical applications. The cone shall be stabilized by a guide rod. The carrier shall be adjustable and reverse threaded. The valve nut threads shall be of buttress type. All elastomeric seals shall be of like material. ANSI flanged versions shall meet ANSI B16.5 150lb standards. All valves shall be tested in accordance to ISO9393 and designed to ISO16136 standards. All valves shall be manufactured under ISO9001 for Quality and ISO14001 for Environmental Management. Following assembly, every valve shall be tested and certified bubble tight exceeding Class VI standards. PVC valves shall meet ASTM D1784 cell classification 12454 standards. CPVC valves shall meet ASTM D1784 cell classification 23447-B standards. PP valves shall meet ASTM D5847-14 cell classification PP0510B66851 standards. ABS valves shall meet ASTM D3965 cell classification 42222 standards. PVDF valves shall be type 1, grade 2 according to ASTM D3222 standards. Valves of all materials shall be RoHS compliant.

Components

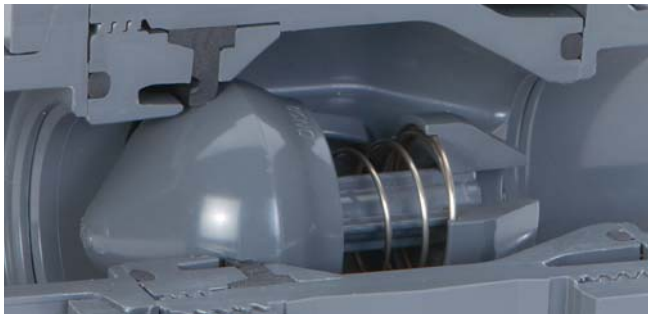


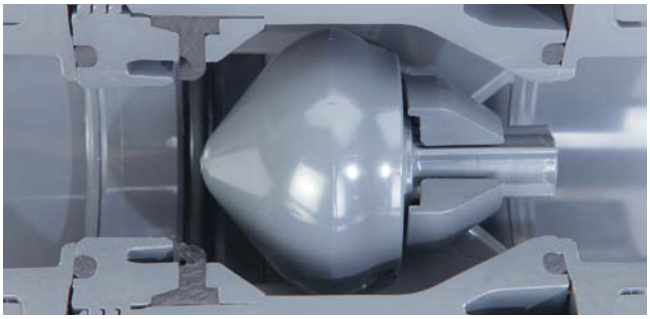
Valve Components

Part	Description	Material
1	Valve nut	PVC, CPVC, PP, ABS or PVDF
2	Valve end	PVC, CPVC, PP, PPn, ABS, PE or PVDF
3	Face seal	EPDM or FPM
4	Carrier	PVC, CPVC, PP, ABS or PVDF
5	Cone seal	EPDM or FPM
6	Backup ring	PVC, CPVC, PP, ABS or PVDF
7	Cone	PVC, CPVC, PP-TV20, ABS or PVDF
8	Spring	304 Stainless steel
9	Valve body	PVC, CPVC, PP, ABS or PVDF

Key Design Features

The Type 561/562 Cone Check Valves are designed to optimize the flow path through the valve. The streamlined cone decreases resistance and significantly improves Cv when compared to traditional ball check valves. The internal geometry of the valve body features smooth transitions and radii, the contour is designed to direct media around the cone in order decrease pressure loss.





The Type 562 Cone Check Valves are designed for both vertical and horizontal applications. A spring is seated between the cone and the guide to allow the valve to properly seal in applications where a traditional ball check valve would not.

The cone is stabilized by a guide rod, which maintains a cone's position at full stroke, preventing rattling and decreasing the potential for damage.

Technical Data

System Conditions

The following information is based on water applications at 68° F

Size (inch)	d (mm)	561 Cracking (psi)	562 Cracking (psi)	561 Sealing (psi)	562 Sealing (psi)	Full Stroke (gpm)
⅜	16	0.04	0.41	2.9	1.45	2.11
½	20	0.04	0.41	2.9	1.45	2.38
¾	25	0.04	0.44	2.9	1.45	3.43
1	32	0.07	0.44	2.9	1.45	4.76
1¼	40	0.07	0.51	2.9	1.45	9.25
1½	50	0.15	0.58	2.9	1.45	18.49
2	63	0.29	0.73	2.9	1.45	26.42
2½	75	0.36	0.87	2.9	1.45	31.70
3	90	0.44	0.87	2.9	1.45	44.91
4	110	0.44	0.87	2.9	1.45	66.05

Cracking pressure is amount of pressure on the inlet side of the valve required to unseat a closed valve and allow media to begin to pass through the valve. Sealing pressure is the amount of pressure on the outlet side of the valve required to seat an open valve and seal it so no media can pass through. The full stroke flowrate is the volume of media required to maintain the ideal position of the cone in order to optimize the valve's performance.

Cone Density

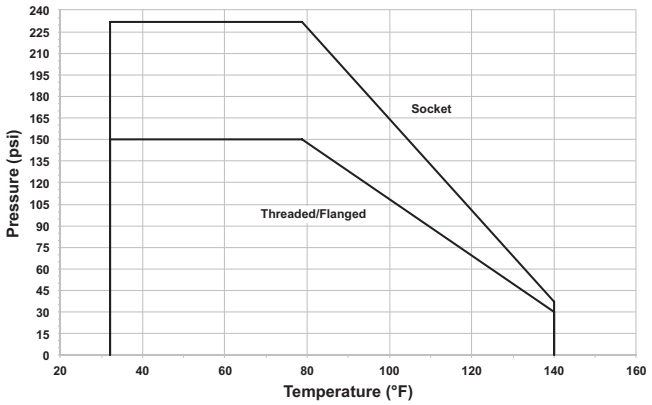
Material	Density (g/cm³)
PVC	1.38
CPVC	1.50
PP-TV20 (PPh with 20% Talc)	1.05
ABS	1.03
PVDF	1.78

It is not recommended to use Type 561/562 Cone Check Valves in applications in which the media is of greater density than the cone. This will cause the cone to float, thus interfering with the valve's ability to seal properly. PP-TV20 cone used in PP valves.

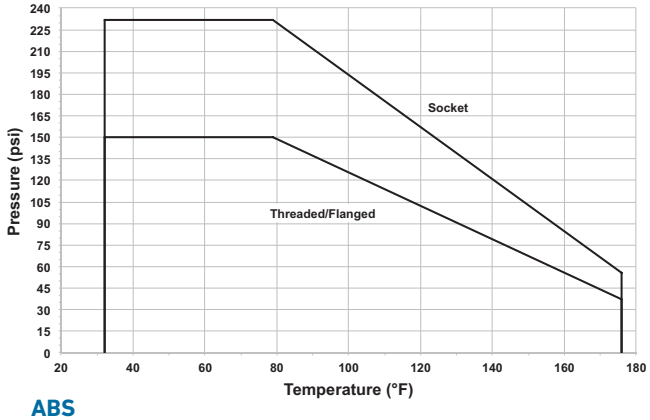
Pressure Temperature Curves

The following graphs are based on a 25 year lifetime water or similar media application

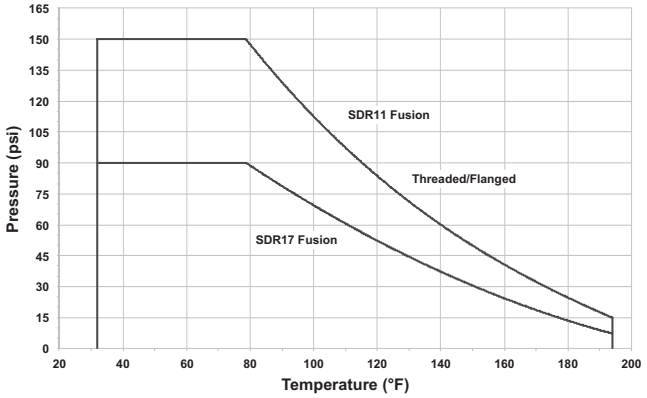
PVC



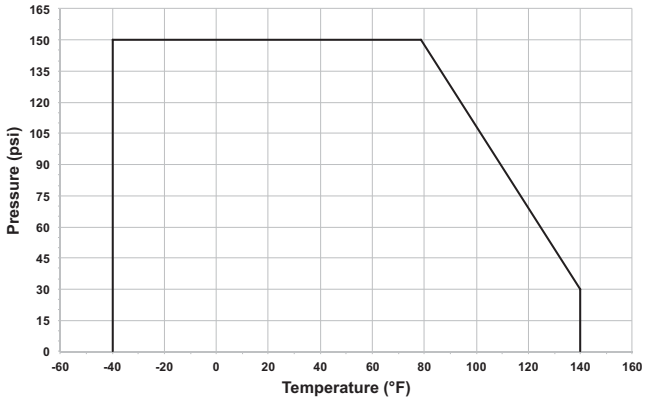
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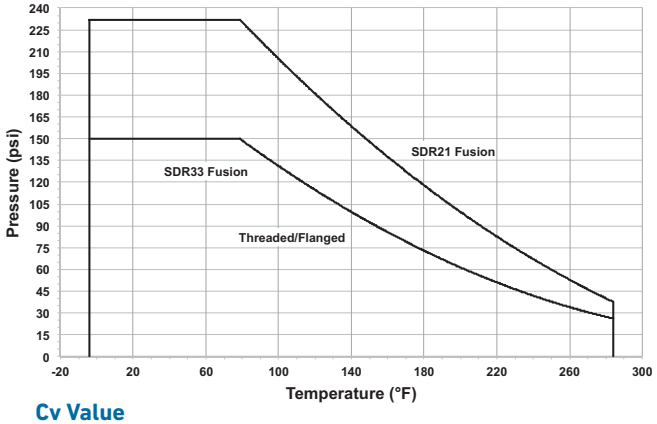
PP



ABS



PVDF



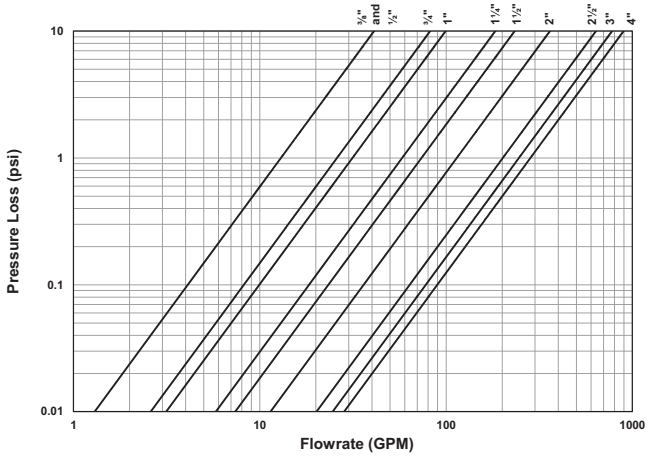
Pressure-Temperature

Material	Temperature Range (°F)	Max Pressure (psi)
PVC	32 to 140	232
CPVC	32 to 176	232
PP	32 to 176	150
ABS	-40 to 140	150
PVDF	-4 to 284	232

Cv Value

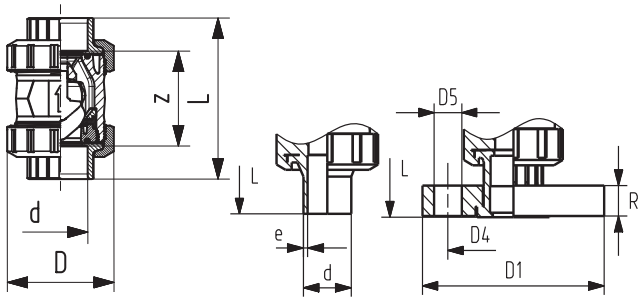
Size (inch)	d (mm)	Cv (gal/min)
⅜	16	13
½	20	13
¾	25	26
1	32	32
1¼	40	59
1½	50	75
2	63	115
2½	75	204
3	90	248
4	110	286

Pressure Loss



Dimensions

The following tables are shown in inches unless otherwise specified



All Materials

PVC/CPVC

Size	d (mm)	D	Size	Socket L	Socket z	Threaded L	Threaded z	Flanged L	Flanged D1	Flanged D4	Flanged D5	Flanged R
⅜	16	1.97	⅜	4.13	2.64	3.86	2.72	-	-	-	-	-
½	20	1.97	½	4.13	2.4	3.86	2.56	5.87	3.5	2.38	0.5	0.57
¾	25	2.28	¾	4.76	2.76	4.37	2.92	6.5	3.88	2.75	0.5	0.58
1	32	2.68	1	5.24	2.99	5	3.23	7.24	4.25	3.13	0.5	0.66
1¼	40	3.31	1¼	6.06	3.54	5.79	3.85	8.11	4.63	3.5	0.5	0.69
1½	50	3.82	1½	6.46	3.7	6.18	4.33	8.7	5	3.88	0.5	0.76
2	63	4.88	2	7.2	4.21	7.2	5.31	9.88	6	4.75	0.63	0.82
2½	75	6.54	2½	9.17	5.67	9.21	6.54	12.24	7	5.5	0.63	0.98
3	90	7.87	3	10	5.94	10.04	6.88	13.5	7.5	6	0.63	1.02
4	110	9.37	4	11.85	6.85	11.89	8.42	15.63	9	7.5	0.63	1.11

PP

d (mm)	Socket L	Socket z	IR/Butt L	IR/Butt e	Threaded L	Threaded z	Flanged L	Flanged D1	Flanged D4	Flanged D5	Flanged R
16	3.66	2.64	-	-	3.78	2.8	-	-	-	-	-
20	3.74	2.6	5.12	0.07	3.9	2.52	6.54	3.74	2.36	0.63	0.63
25	4.29	3.03	5.63	0.09	4.37	2.99	6.97	4.13	2.76	0.63	0.67
32	4.69	3.27	5.91	0.12	5	3.27	7.52	4.53	3.11	0.63	0.71
40	5.31	3.9	6.73	0.15	5.75	3.94	8.23	5.51	3.5	0.63	0.79
50	5.79	4.13	7.52	0.18	6.18	4.37	9.02	5.91	3.86	0.63	0.87
63	6.61	4.61	8.66	0.23	7.2	5.28	9.96	6.5	4.76	0.75	0.94
75	9.17	6.57	10.47	0.32	-	-	16.38	7.28	5.51	0.75	1.02
90	10	7.09	10.39	0.39	-	-	16.3	7.87	5.98	0.75	1.06
110	11.85	8.46	11.85	0.47	-	-	17.76	9.02	7.48	0.75	1.1

ABS

d (mm)	Socket L	Socket z
16	3.62	2.52
20	3.74	2.52
25	4.33	2.83
32	4.84	3.11
40	5.57	3.7
50	6.18	3.74
63	7.2	4.21
75	9.17	5.67
90	10	5.94
110	11.85	6.85

PVDF

d (mm)	Socket L	Socket z	IR/Butt L	IR/Butt e	Threaded L	Threaded z	Flanged L	Flanged D1	Flanged D4	Flanged D5	Flanged R
16	3.66	2.64	-	-	3.78	2.72	-	-	-	-	-
20	3.74	2.6	5.12	0.07	3.9	2.52	6.85	3.74	2.36	0.63	0.63
25	4.29	3.03	5.63	0.07	4.37	2.99	7.44	4.13	2.76	0.63	0.67
32	4.69	3.27	5.91	0.09	5	3.27	7.83	4.53	3.11	0.63	0.71
40	5.31	3.9	6.73	0.09	5.75	3.98	9.25	5.51	3.5	0.63	0.79
50	5.79	4.13	7.52	0.12	6.18	4.37	9.57	5.91	3.86	0.63	0.87
63	6.61	4.61	8.66	0.12	7.2	5.31	10.28	6.5	4.76	0.75	0.94
75	9.17	6.57	10.47	0.14	-	-	16.77	7.28	5.51	0.75	1.02
90	10	7.09	10.39	0.17	-	-	16.77	7.87	5.98	0.75	1.06
110	11.85	8.46	11.85	0.21	-	-	19.17	9.02	7.48	0.75	1.1

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us.ps@georgfischer.com, www.gfpiping.com

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TAG NUMBERS
20-FV-621-1/2/3/4
20-FV-622-1/2/3/4
20-FV-205-1/2/3/4



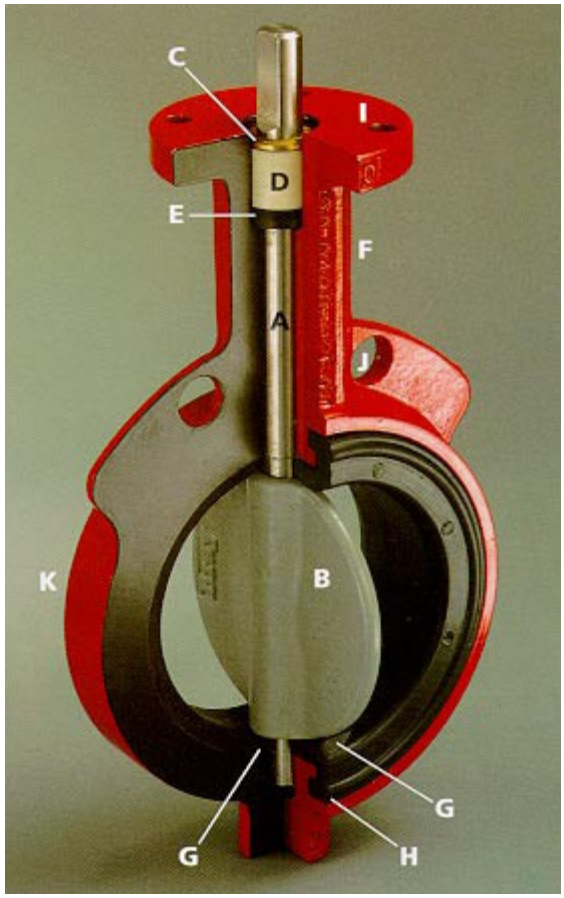
BUTTERFLY VALVES
RESILIENT SEATED

SERIES 30/31 Wafer/Lug
2”-20” (50mm-500mm)

The
High
Performance
Company

SERIES 30/31

2”-20” (50mm-500mm) Bray® Controls is proud to offer a high quality line of butterfly valves to meet the requirements of today’s market. Combining years of field experience, research and development, Bray has designed many unique features in the Series 30/31 not previously available. The results are longer service life, greater reliability, ease of parts replacement and interchangeability of components.



STEM SEAL (E)

Double "U" cup seal design is self-adjusting and gives positive sealing in both directions. Prevents external substances from entering stem bore.

NECK (F)

Extended neck length allows for 2" of piping insulation and is easily accessible for mounting actuators.

PRIMARY AND SECONDARY SEALS (G)

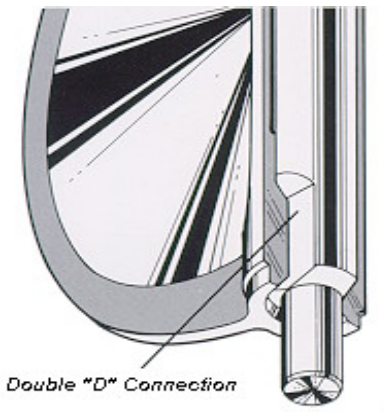
The Primary Seal is achieved by an interference fit of the molded seat flat with the disc hub. The Secondary Seal is created because the stem diameter is greater than the diameter of the seat stem hole. These seals prevent line media from coming in contact with the stem or body.

BRAY UNIQUE SEAT DESIGN (H)

One of the valve's key elements is Bray's unique "*Tongue-and-Groove*" seat design. This resilient seat features lower torque than many valves on the market today and provides complete isolation of flowing media from the body. The tongue-and-groove seat to body retention method is superior to traditional designs, making field replacement simple and fast. The seat is specifically designed to seal with slip-on or weld-neck flanges. The seat features a molded O-ring which eliminates the use of flange gaskets. An important maintenance feature is that all resilient seats for Bray butterfly valves Series 20, 21, 30, 31, 34 are completely interchangeable.

DISC AND STEM CONNECTION (A)

Features a high-strength through stem design. The close tolerance, double "D" connection that drives the valve disc is an exclusive feature of the Bray valve. It eliminates stem retention components being exposed to the line media, such as disc screws



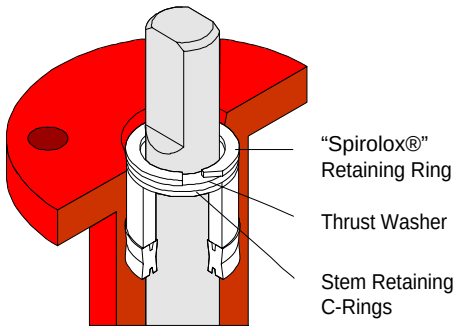
and taper pins, which commonly result in leak paths, corrosion, and vibration failures. Disc screws or taper pins, due to wear and corrosion, often require difficult machining for disassembly. Disassembly of the Bray stem is just a matter of pulling the stem out of the disc. Without fasteners obstructing the line flow, the Series 30/31 Cv values are higher than many other valves, turbulence is reduced, and pressure recovery is increased. The stem ends and top mounting flange are standardized for interchangeability with Bray actuators.

DISC (B)

Casting is spherically machined, hand polished to provide a bubble-tight shut off, minimum torque, and longer seat life. The disc O.D. clearance is designed to work with all standard piping.

"SPIROLOX*" RETAINING RING (C)

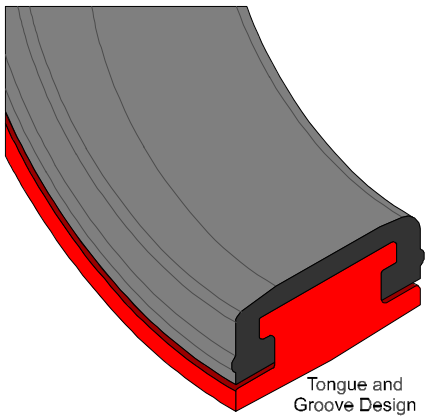
The stem is retained in the body by means of a unique Stainless Steel “Spirolox®” retaining ring, a thrust washer and two C-rings, manufactured from brass as standard, stainless steel upon request. The retaining ring may be easily removed with a standard hand tool. The stem retaining assembly prevents unintentional removal of the stem during field service.



*"Spirolox®" designation is a registered trademark of TRW, Inc.

STEM BUSHING (D)

Non-Corrosive, heavy duty acetal bushing absorbs actuator side thrusts.



SERIES 30/31

ACTUATOR MOUNTING FLANGE AND STEM CONNECTION (I)

Universally designed to ISO 5211 for direct mounting of Bray® power actuators and manual operators.

FLANGE LOCATING HOLES (J)

Provides quick and proper alignment during installation.

BODY (K)

One-piece wafer or lug style. Epoxy coating for excellent corrosion resistance. Bray valve bodies meet ANSI 150 pressure ratings for hydrostatic shell test requirements.



DESIGN FEATURES

Bray's Series 30 valve is a wafer version with flange locating holes, and the Series 31 is the companion lug version for dead-end service and other flange requirements. All Bray valves are tested to 110% of full pressure rating before shipment.
A major design advantage of Bray valve product lines is international compatibility. The same valve is compatible with most world flange standards - ANSI Class 125/150, BS 10 Tables D&E, BS4504 NP 10/16, DIN ND10/16, AS 2129 and JIS 10. In addition, the valves are designed to comply with ISO 5752 face-to-face and ISO 5211 actuator mounting flanges. Therefore, one valve design can be used in many different world markets. Due to a modular concept of design, all Bray® handles, manual gear operators and pneumatic and electric actuators mount directly to Bray valves. No brackets or adapters are required. Bray interchangeability and compatibility offers you the best in uniformity of product line and low-cost performance in the industry today.

EPOXY COATING CORROSION PROTECTION

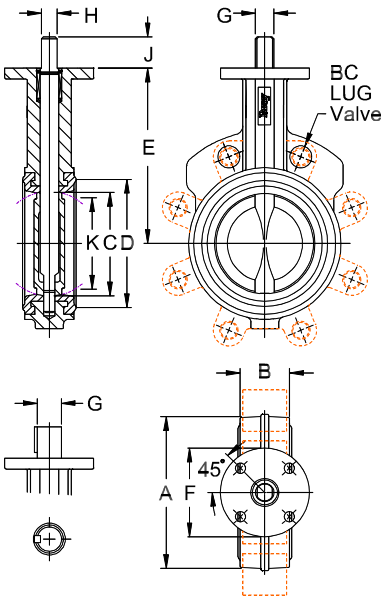
Bray's standard product offers valve bodies with an epoxy coating, providing excellent corrosion and wear resistance to the valve's surface. The Bray epoxy coating is a hard, high gloss red finish.

- Chemical Resistance - resists a broad range of chemicals including: dilute aqueous acids and alkalies, petroleum solvents, alcohols, greases and oils. Offers outstanding resistance to humidity and water.
- Weatherability - outdoor tested resistant to ultra-violet radiation.
- Abrasion Resistance - excellent resistance to abrasion.
- Impact Resistance - withstands impact without chipping or cracking.

NYLON 11 COATING

Optionally available for valve bodies where outstanding protection and performance is needed. A thermoplastic produced from a vegetable base, this coating is inert to fungus growth and molds. Nylon 11 is *USDA Approved*, as well as certified to ANSI/NSF 61 for water service.

- Corrosion Resistance - superior resistance to a broad range of chemical environments. Salt spray tested in excess of 2,000 hours and seawater immersion tested for over 10 years without corrosion to metal substrates. Nylon 11 features a very low coefficient of friction and excellent resistance to impact and ultra-violet radiation.



DIMENSIONS

SERIES 30 WAFER

SERIES 31 LUG

Valve Size								Mtg Flange Drilling						
ins	mm	A	B	C	D	E	F	BC	No. Holes	Hole Dia.	G	H	J	K
2	50	3.69	1.62	2.00	2.84	5.50	3.54	2.76	4	.39	.55	.39	1.25	1.32
2½	65	4.19	1.75	2.50	3.34	6.00	3.54	2.76	4	.39	.55	.39	1.25	1.91
3	80	4.88	1.75	3.00	4.03	6.25	3.54	2.76	4	.39	.55	.39	1.25	2.55
4	100	6.06	2.00	4.00	5.16	7.00	3.54	2.76	4	.39	.63	.43	1.25	3.57
5	125	7.12	2.12	5.00	6.16	7.50	3.54	2.76	4	.39	.75	.51	1.25	4.63
6	150	8.12	2.12	5.75	7.02	8.00	3.54	2.76	4	.39	.75	.51	1.25	5.45
8	200	10.50	2.50	7.75	9.47	9.50	5.91	4.92	4	.57	.87	.63	1.25	7.45
10	250	12.75	2.50	9.75	11.47	10.75	5.91	4.92	4	.57	1.18	.87	2.00	9.53
12	300	14.88	3.00	11.75	13.47	12.25	5.91	4.92	4	.57	1.18	.87	2.00	11.47

Lug Bolting Data		
BC	No. Holes	Thrds UNC-2B
4.75	4	5/8-11
5.50	4	5/8-11
6.00	4	5/8-11
7.50	8	5/8-11
8.50	8	3/4-10
9.50	8	3/4-10
11.75	8	3/4-10
14.25	12	7/8-9
17.00	12	7/8-9

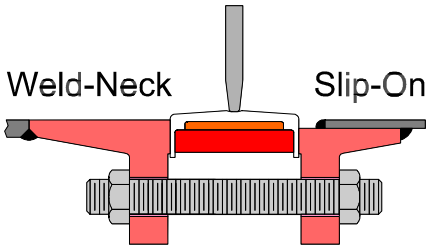
Valve Size								Mtg Flange Drilling						
ins	mm	A	B	C	D	E	F	BC	No. Holes	Hole Dia.	G	H	KEY SIZE	K
14	350	17.05	3.00	13.25	15.28	13.62	5.91	4.92	4	.57	1.38	2.00	.39x.39	13.04
16	400	19.21	4.00	15.25	17.41	14.75	5.91	4.92	4	.57	1.38	2.00	.39x.39	14.85
18	450	21.12	4.25	17.25	19.47	16.00	8.27	6.50	4	.81	1.97	2.50	.39x.47	16.85
20	500	23.25	5.00	19.25	21.59	17.25	8.27	6.50	4	.81	1.97	2.50	.39x.47	18.73

Lug Bolting Data		
BC	No. Holes	Thrds UNC-2B
18.75	12	1-8
21.25	16	1-8
22.75	16	1⅛-7
25.00	20	1⅛-7

SELECTION DATA

FLANGE REQUIREMENTS

Bray valves are designed for installation between ANSI Class 125/150 lb. weld-neck or slip-on flanges, BS 10 Tables D&E, BS 4504 NP 10/16, DIN ND 10/16, AS 2129 and JIS 10, either flat faced or raised faced. While weld-neck flanges are recommended, Bray has specifically designed its valve seat to work with slip-on flanges, thus eliminating common failures of other butterfly valve designs. When using raised face flanges be sure to properly align valve and flange. Type C stub-end flanges are not recommended.



Note: Flanges on both sides of installed valve must be the same type

PRESSURE RATINGS*

For bi-directional bubble-tight shut off, disc in closed position:

Inches	mm	psig	bar
2-12	50-300	175	12
14-20	350-500	150	10

For Dead-end Service Applications: With *downstream flanges installed* or with *vulcanized seats,* the dead-end pressure ratings are equal to valve bi-directional ratings as stated above. With no downstream flanges or with seats that are not vulcanized, the dead-end pressure rating for 2"-12" valves is 75 psi (5 bar) for 14"-20" valves, 50 psi (3.5 bar.)

* Pressure Ratings are based on standard disc diameters. For low pressure application, Bray offers a standard reduced disc diameter to decrease seating torques and to extend seat life, thus increasing the valve's performance and reducing actuator costs for the customer.

VELOCITY LIMITS

For On/Off Services

Fluids - 30 ft/sec (9m/s)

Gases - 175 ft/sec (54m/s)

Cv VALUES-VALVE SIZING COEFFICIENT

Valve Size		Disc Position (degrees)								
ins	mm	90°	80°	70°	60°	50°	40°	30°	20°	10°
2	50	144	114	84	61	43	27	16	7	1
2 1/2	65	282	223	163	107	67	43	24	11	1.5
3	80	461	364	267	154	96	61	35	15	2
4	100	841	701	496	274	171	109	62	27	3
5	125	1376	1146	775	428	268	170	98	43	5
6	150	1850	1542	1025	567	354	225	129	56	6
8	200	3316	2842	1862	1081	680	421	241	102	12
10	250	5430	4525	2948	1710	1076	667	382	162	19
12	300	8077	6731	4393	2563	1594	1005	555	235	27
14	350	10538	8874	5939	3384	2149	1320	756	299	34
16	400	13966	11761	7867	4483	2847	1749	1001	397	45
18	450	17214	14496	10065	5736	3643	2237	1281	507	58
20	500	22339	18812	12535	7144	4536	2786	1595	632	72

Cv is defined as the volume of water in U.S.G.P.M. that will flow through a given restriction or valve opening with a pressure drop of one (1) p.s.i. at room temperature. Recommended control angles are between 25°-70° open. Preferred

EXPECTED SEATING/UNSEATING TORQUES (Lb.-Ins.)

		Full-Rated Pressure Valve				Reduced Disc
Valve Size		rP (PSI)				rP (PSI)
ins	mm	50	100	150	175	50
2	50	125	130	135	140	125
2 1/2	65	195	205	215	220	195
3	80	260	275	290	297	260
4	100	400	425	450	462	267
5	125	615	670	725	755	410
6	150	783	871	953	1003	537
8	200	1475	1650	1825	1915	983
10	250	2240	2520	2800	2940	1493
12	300	3420	3870	4320	4545	2280
14	350	4950	5700	6450	-	3300
16	400	6400	7700	9000	-	4267
18	450	7850	9850	11850	-	5267
20	500	10300	12900	15500	-	6867

Valve Torque Rating - Bray has classified valve torque ratings according to 3 types: non-corrosive lubricating service, general service, and severe service. Torques listed above are for general services.Consult Bray for torque information corresponding to specific application.

TO USE TORQUE CHART, NOTE THE FOLLOWING:

1) For Bray valves, Series 20, 21, 30, 31 and 34.
2) Review Technical Bulletin No. 1001, Expected Seating/Unseating Torque's, for explanation of the 3 service classes and their related seating/unseating torque values for given pressure differentials of Full-Rated and Reduced Disc Diameter valves.
3) Dynamic Torque values are not considered. See Technical Bulletin No. 1002 for evaluation of Dynamic Torque values vs. Seating/Unseating Torque values.
4) Do not apply a safety factor to above torque values when determining actuator output torque requirement.
5) For 3 way assemblies where on valve is opening and other is closing, multiply torque by 1.5 factor.

SELECTION DATA

RECOMMENDED SPECIFICATIONS FOR BRAY SERIES 30/31 SHALL BE:

• Epoxy coated, cast iron, wafer or lug bodies.
• With flange locating holes that meet ANSI 125/150 (or BS 10 tables D&E, BS 4504 NP 10/16, DIN ND 10/16, AS 2129 and JIS 10) drillings.
• Through-stem direct drive double "D" design requiring no disc screws or pins to connect stem to disc with no possible leak paths in disc/stem connection.
• Stem mechanically retained in body neck and no part of stem or body exposed to line media.
• Tongue-and-groove seat design with primary hub seal and a molded o-ring suitable for weld-neck and slip-on flanges. Seat totally encapsulates the body with no flange gaskets required.
• Spherically machined, hand polished disc edge and hub for minimum torque and maximum sealing capability.
• Equipped with non-corrosive bushing and self-adjusting stem seal.
• Bi-directional and tested to 110% of full rating.
• Bi-directional pressure ratings:
2"-12" valves: 175 PSI
14"-20" valves: 150 PSI
Lug bodies for dead end service
With downstream flanges or vulcanized seats, pressure ratings are equal to bi-directional ratings as stated above.
With no downstream flanges or non-vulcanized seats:
2"-12" valves: 75 psi.
14"-20" valves: 50 psi.
• No field adjustment necessary to maintain optimum field performance
• The valve shall be Bray Series 30 wafer / 31 lug or equal.

TEMP. RANGE OF SEATS

Type	Maximum	Minimum
EPDM	+250°F(121°C)	-40°F(-40°C)
Buna-N	+212°F(100°C)	0°F(-18°C)
FKM*	+400°F(204°C)	0°F(-18°C)

MATERIALS SELECTION

2"-20" (50mm-500mm)

BODY:
• Cast Iron ASTM A126 Class B
• Ductile Iron ASTM A536
• Cast Steel ASTM A216 WCB
• Aluminum ASTM B26

SEAT:
• Buna-N - Food Grade
• EPDM - Food Grade
• FKM*
• White Buna-N - Food Grade

STEM:
• Coated Carbon Steel
• 416 SS ASTM A582 Type 416
• 304 SS ASTM A276 Type 304
• 316 SS ASTM A276 Type 316
• Monel

DISC:
• Aluminum Bronze ASTM B148-954
• Coated Ductile Iron ASTM A536 Gr. 65-45-12
• Ductile Iron,Nylon 11 Coated, ASTM A536 Gr. 65-45-12
• Ductile Iron, Halar® Coated, ASTM A536 Gr. 65-45-12
• 316 SS ASTM A351 CF8M
• Hastelloy® C-276 ASTM B575 Alloy N10276

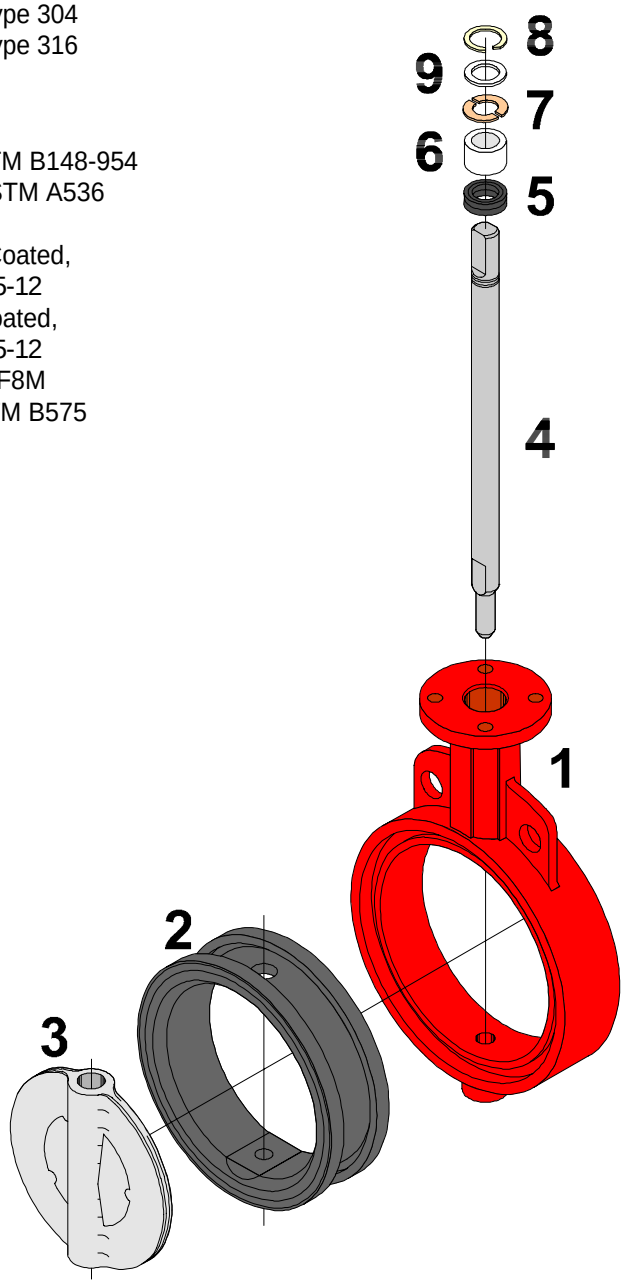
WEIGHTS

Valve Size		Series	Series
ins	mm	30	31
2	50	5.5	7.0
2 1/2	65	7.0	8.0
3	80	7.5	9.0
4	100	11.5	15.0
5	125	14.0	20.0
6	150	17.0	23.0
8	200	34.0	42.0
10	250	49.0	66.0
12	300	67.0	88.0
14	350	95.0	114.0
16	400	135.0	166.0
18	450	200.0	226.0
20	500	260.0	305.0

Weights are in lbs.

COMPONENTS

No.	Qty.	Description
1	1	Body
2	1	Seat
3	1	Disc
4	1	Stem
5	1	Stem Seal
6	1	Stem Bushing
7	2	Stem Retainer
8	1	Thrust Washer
9	1	Retaining Ring



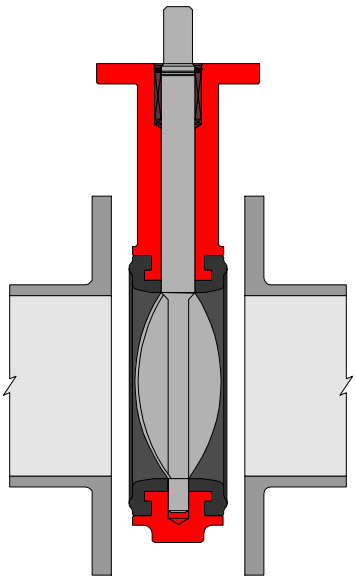
*FKM is the ASTM D1418 designation for Fluorinated Hydrocarbon Elastomers (also called Fluoroelastomers.)
Hastelloy® is a registered trademark of Haynes International, Inc.
Halar® is a registered trademark of Ausimont U.S.A., Inc.

INSTALLATION

Position the disc in the partially open position, maintaining the disc within body face-to-face. Place the body between flanges and install flange bolts. *Do not use flange gaskets.*
Before tightening flange bolts, carefully open the disc to the full open position to ensure proper alignment and clearance of the disc O.D. with the adjacent pipe I.D. Leave disc in the full open position and tighten flange bolts per required specification. Once bolts are tightened, carefully rotate disc to closed position to ensure disc O.D. clearance.

MAINTENANCE AND REPAIR

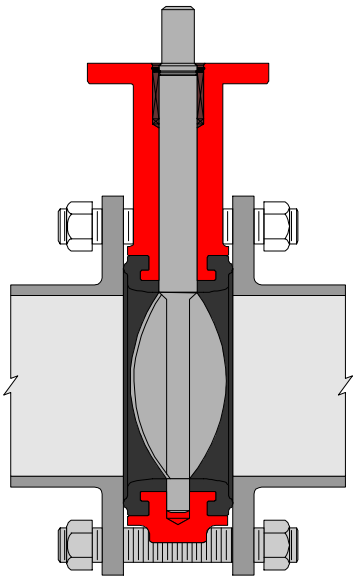
The many Bray features minimize wear and maintenance requirements. No routine lubrication is required. All components-stem, disc, seat, bushing, stem seal, etc., are field replaceable, no adjustment is needed. If components require replacement, remove the valve from the line by placing the disc near the closed position, spread the flanges, support the valve, then remove the flange bolts. No valve maintenance, including removal of manual or power actuators, should be performed until the piping system is completely depressurized.



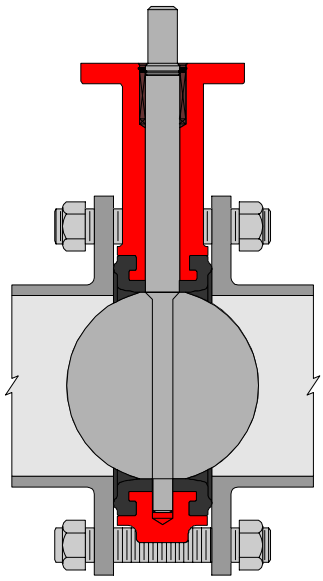
Disc in the Near Closed Position

DISASSEMBLY

Remove handle, gear operator , or actuator from actuator mounting flange. Remove “Spirolox®” retaining ring. Remove stem with its thrust washer and two C-ring stem retainers. Remove bushing and seal. Remove the disc from the seat, protecting disc edge at all times. Push the seat into an oval shape, then remove the seat from the body.



Disc in the Partially Open Position



Disc in the Full Open Position

Assembly

Push the valve seat into an oval and push it into the body with seat stem holes aligned to body stem holes. Push stem into the stem hole of body. For aid in inserting disc, slightly protrude stem beyond the I.D. of the top of the seat. Install a light coating of food grade silicone oil (for silicone free applications use soap and water) on the I.D. of seat. Insert the disc into the seat by lining up the disc hole with the stem hole of the seat. Note: the broached double “D” flats in the disc must be toward the bottom of valve body. (Take special care when lining disc up with stem.) With a downward pressure and rotating the stem back and forth, push the stem until the stem touches the bottom of the body stem hole. Make certain that when pushing the stem through disc bottom, the broached flats of stem and disc are aligned. After the stem has engaged the disc, but before the stem is firmly seated in the body, replace the stem seal and bushing. Install the two C-ring stem retainers in the groove in the stem and thrust washer on top of the C-ring. Seat the stem firmly in the body and install the “Spirolox®” retaining ring back into position.

Bray CONTROLS

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Patents applied for in u.S. and foreign countries.
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Bray®

The High Performance Company



Series 92/93 Pneumatic Actuators

Technical Manual

LLOYD'S REGISTER · LRQA
ISO 9001

CE

Bray Series 92/93
Pneumatic Actuators

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Actuator Installation Notes

These notes apply to the installation of Bray S92/93 pneumatic valve actuators.

- Verify that the valve and the actuator are both in the same position (both open or both closed) before mounting the actuator to the valve.
- Apply a light coating of grease to the inside of the actuator output bore before installing the actuator on the valve. This will allow the actuator to be more easily removed from the valve stem even after years of service.
- If stem adapters are required to match the actuator output bore to the valve stem, apply a light coating of grease to the inside of the stem adapter as well as the inside of the actuator output bore.
- Some stem adapters are kits consisting of multiple components. These kits may contain spacers that look like stem adapters, but are designed to keep the stem adapter in place during operation of the actuator. Verify that all stem adapters and spacers are installed in the proper position and sequence.

Refer to Series 92/93 Operations and Technical Manual (OM_S92-93)

- If keyed stem adapters are used, the key must be held in the keyway so that it will not work loose during operation of the actuator. The key may be retained by any one of several methods:

  If the valve stem height matches the depth of the actuator output bore, use a key that fits the full length of the keyway. Tack weld the key to the adapter before installation in the actuator.

  Upset the end of the keyway after the key has been installed in the shaft by using a punch or chisel.
- If mounting studs are used instead of bolts, thread the studs completely into the actuator before placing the actuator on the valve. This assures that the full strength of the connection is achieved.
- While the mounting bolts are only finger tight, cycle the actuator fully open and fully closed to verify proper alignment on the valve.
- Tighten the mounting bolts or nuts in a diagonal pattern to evenly distribute stress in the bolts.

Actuator Mounting Codes for S92/93 - Imperial (In)

Actuator Sizes	Valve Code	Inner Bolt Circle			Outer Bolt Circle			Stem Hole			
		Bolt Circle (+/- .005)	No. Holes	Bolt Size	Bolt Circle (+/- .005)	No. Holes	Bolt Size	Bore Diameter (+/- .004)	Across Flats (+ .002-.0)	Depth	Keyway Width (+ .002-.0)
48	AA	1.42	4	#10-32	1.97	4	1/4-20	0.4	0.32	1.3	NA
63	A	1.969	4	1/4-20	2.756	4	5/16-18	0.552	0.395	1.38	NA
83	C	1.969	4	1/4-20	2.756	4	5/16-18	0.749	0.513	1.46	NA
93	C	1.969	4	1/4-20	2.756	4	5/16-18	0.749	0.513	1.46	NA
119	E	2.756	4	5/16-18	4.921	4	1/2-13	1.182	0.867	2.2	NA
128	E	2.756	4	5/16-18	4.921	4	1/2-13	1.182	0.867	2.2	NA
160A	E	NA	NA	NA	4.921	4	1/2-13	1.182	0.867	2.2	NA
160B	F	NA	NA	NA	4.921	4	1/2-13	1.38	NA	2.38	0.394
210	G	4.921	4	1/2-13	6.496	4	5/8-11	1.97	NA	2.76	0.472
255A	H	6.496	4	M20 x 2.5P	4.724 X 7.874	4	M20 x 2.5P	2.505	NA	4.25	0.625
255B	K	6.496	4	M20 x 2.5P	4.724 X 7.874	4	M20 x 2.5P	3.006	NA	4.25	0.750

Actuator Mounting Codes for S92/93 - Metric (mm)

Actuator Sizes	Valve Code	Inner Bolt Circle			Outer Bolt Circle			Stem Hole			
		Bolt Circle (+/- .127)	No. Holes	Bolt Size	Bolt Circle (+/- .127)	No. Holes	Bolt Size	Bore Dia. (+/-.102)	Across Flats (+ .050-.0)	Depth	Keyway Width
48	AA	36	4	M5 x 0.8P	50	4	M6 x 1.0P	10	8	33	NA
63	A	50	4	M6 x 1.0P	70	4	M8 x 1.25P	14	10	35	NA
83	C	50	4	M6 x 1.0P	70	4	M8 x 1.25P	19	13	37	NA
93	C	50	4	M6 x 1.0P	70	4	M8 x 1.25P	19	13	37	NA
119	E	70	4	M8 x 1.25P	125	4	M12 x 1.75P	30	22	56	NA
128	E	70	4	M8 x 1.25P	125	4	M12 x 1.75P	30	22	56	NA
160A	E	NA	NA	NA	125	4	M12 x 1.75P	30	22	56	NA
160B	F	NA	NA	NA	125	4	M12 x 1.75P	35	NA	60	10
210	G	125	4	M12 x 1.75P	165	4	M20 x 2.5P	50	NA	70	12
255A	H	165	4	M20 x 2.5P	120 x 200	4	M20 x 2.5P	64	NA	108	16
255B	K	165	4	M20 x 2.5P	120 x 200	4	M20 x 2.5P	76	NA	108	19

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Pneumatic Actuator Data (Imperial)

Approximate Actuator Speeds (Seconds)									
Size	**48**	**63**	**83**	**93**	**119**	**128**	**160**	**210**	**255**
90° Travel	1/4	1/4	1/4	1/4	1/2	1/2	1	2	2 3/4

Note: Times shown are in seconds at 80 PSIG supply pressure with 6ft. tubing having an internal diameter of not less than approximately 1/4" using a Bray Series 62 or Series 63 solenoid. Bray S92/93 actuation times are very dependent on the flow capacity of their air supply. The use of smaller port solenoids, solenoid manifolds, smaller I.D. air supply tubing and/or extended lengths of tubing can significantly reduce the actuation time and/or initial response to the command signal.

Actuator Weights (lbs)									
Size	**48**	**63**	**83**	**93**	**119**	**128**	**160**	**210**	**255**
Double Acting	2.0	3.3	6.3	8.5	18.0	21.5	39.0	78.0	143.5
Spring Return	2.3	3.9	8.1	10.9	23.4	28.1	53.4	111.0	214.9

Weights are in lbs. Spring Return unit weights are with full set of springs on each piston.

Actuator Volumes (in^3)									
Size	**48**	**63**	**83**	**93**	**119**	**128**	**160**	**210**	**255**
Counter-Clockwise	5.7	9.6	24.8	39.0	81.0	106.5	187.5	360.0	750.0
Clockwise	4.8	13.4	32.6	50.1	102.7	140.6	259.6	450.0	900.0

Counter-clockwise: Air volume in cubic inches required to push pistons apart, full travel.
Clockwise: Air volume in cubic inches required to push pistons together, full travel.

Pneumatic Actuator Data (Metric)

Approximate Actuator Speeds (Seconds)									
Size	**48**	**63**	**83**	**93**	**119**	**128**	**160**	**210**	**255**
90° Travel	1/4	1/4	1/4	1/4	1/2	1/2	1	2	2 3/4

Note: Times shown are in seconds at 5.5 bar supply pressure with 1.8 meter tubing having an internal diameter of not less than approximately (6.35 mm)using a Bray Series 62 or Series 63 solenoid. Bray S92/93 actuation times are very dependent on the flow capacity of their air supply. The use of smaller port solenoids, solenoid manifolds, smaller I.D. air supply tubing and/or extended lengths of tubing can significantly reduce the actuation time and/or initial response to the command signal.

Actuator Weights (kg)									
Size	**48**	**63**	**83**	**93**	**119**	**128**	**160**	**210**	**255**
Double Acting	0.9	1.5	2.9	3.9	8.2	9.8	17.7	35.4	65.1
Spring Return	1.0	1.8	3.7	4.9	10.6	12.7	24.2	50.3	115.7

Weights are in kg Spring Return unit weights are with full set of springs on each piston.

Actuator Volumes (cm^3)									
Size	**48**	**63**	**83**	**93**	**119**	**128**	**160**	**210**	**255**
Counter-Clockwise	93.4	157.3	406.4	638.6	1327.5	1744.5	3072.6	5899.3	12290.3
Clockwise	78.7	219.6	534.2	820.5	1683.1	2303.3	4254.1	7374.2	14748.4

Counter-clockwise: Air volume in cubic millimeters required to push pistons apart, full travel.
Clockwise: Air volume in cubic millimeters required to push pistons together, full travel.

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STANDARD MATERIALS SELECTION	
Name	**Material**
Body	Extruded Aluminum Alloy, Anodized 316 Stainless Steel
End Caps	Die cast Aluminum Alloy with Corrosion Resistant Polyester Coating 316 Stainless Steel
Pistons	Die Cast Aluminum Alloy
Output Shaft/Pinion:	Carbon Steel, Zinc Plated
Travel Stop:	Alloy Steel
Shaft Bearings:	Acetal
Piston Guides:	Acetal
Fasteners:	Stainless Steel
Springs	Spring Steel, Protective Coating
Piston O-Ring Seals:	Buna-N
Options:	Polyester Coated Body Exterior Electroless Nickel Plated Body Exterior Hard Anodized Body Exterior Seacorr Coated Body Exterior Stainless Steel Pinion

OPERATING CONDITIONS	
Pressure Range	40 - 140 psi (2.8 - 10 bar)
Media	Dry Compressed Air/Inert Gas* **Contact Factory for other media.*
Temperature Range	Standard -4° F to 200° F (-20° C to 93° C)
	Low -40° F to 176° F (-40° to 80° C)
	High 0° F to 300° F (-18° C to 149° C)
Note: Cycle life on Low and High temperature seal kits reduced compared to Standard Buna N Seals	
Series 92 Double Acting	Available in 90°, 135°, 180° Rotation
Series 93 Spring Return	Available in 90° Rotation Operating Pressure 140 psig (10 bar) maximum

COMPLIANCES	
Torque Base	Mounting Dimensions as per ISO 5211: 2001(E)
Accessories	Shaft Driven Accessories Mounting per NAMUR-VDE
Performance Testing	EN 15714-3:2009
Ingress Protection	IP66/IP67M per IEC 60529
Safety	ATEX, SIL 3 suitable, PED

Series 92 Torque Data

Series 92 Actuator Torque Data (Lb-in)

Double Acting Pneumatic Operated, Torque Output

Actuator Size	Air Supply Pressure (PSIG)				
	40	60	80	100	120
48	75	113	150	188	225
63	145	221	297	373	449
83	351	536	721	906	1091
93	493	753	1013	1272	1532
119	1058	1615	2171	2728	3285
128	1410	2152	2894	3636	4378
160	2797	4270	5742	7214	8687
210	5783	8826	11870	14914	17957
255	14211	21691	29171	36650	44130

Series 92 Actuator Torque Data (N-m)

Double Acting Pneumatic Operated, Torque Output

Actuator Size	Air Supply Pressure (Bar)				
	2.8	4.1	5.5	6.9	8.3
48	9	13	17	21	25
63	16	25	34	42	51
83	40	61	82	102	123
93	56	85	115	144	173
119	120	183	245	308	371
128	159	243	327	411	495
160	316	482	649	815	982
210	653	997	1341	1685	2029
255	1606	2451	3296	4141	4986

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Series 93 Actuator Torque Data (Lb-In) Air Operated, With Spring Return, Torque Output

Actuator Size	No. Springs per Piston	Air Supply Pressure (PSIG)										Spring	
		40		60		80		100		120		Spring Start	Stroke End
		Start	End	Start	End	Start	End	Start	End	Start	End		
48	1	51	32	89	70	126	107	164	145	201	182	43	24
	2/1	39	10	77	48	114	85	152	123	189	160	65	36
	2			64	27	101	64	139	102	176	139	86	49
	3/2			52	5	89	42	127	80	164	117	108	61
	3					77	21	115	59	152	96	129	73
63	2	91	65	167	141	243	217	319	293	395	369	80	54
	3	64	27	140	103	216	179	292	255	368	331	118	81
	4			113	65	189	141	265	217	341	293	156	108
	5			86	27	162	103	238	179	314	255	194	135
	6					135	65	211	141	287	217	232	162
83	2	210	167	395	352	580	537	765	722	950	907	184	141
	3	156	76	341	261	526	446	711	631	896	816	275	195
	4			281	176	466	361	651	546	836	731	360	255
	5			220	97	405	282	590	467	775	652	439	316
	6					369	185	554	370	739	555	536	352
93	2	310	232	570	492	830	752	1089	1011	1349	1271	261	183
	3	218	101	478	361	738	621	997	880	1257	1140	392	275
	4			386	231	646	491	905	750	1165	1010	522	367
	5			294	94	554	354	813	613	1073	873	659	459
	6					462	229	721	488	981	748	784	551
119	2	692	469	1249	1026	1805	1582	2362	2139	2919	2696	589	366
	3	509	174	1066	731	1622	1287	2179	1844	2736	2401	884	549
	4			883	437	1439	993	1996	1550	2553	2107	1178	732
	5			700	142	1256	698	1813	1255	2370	1812	1473	915
	6					1073	404	1630	961	2187	1518	1767	1098
128	2	880	465	1622	1207	2364	1949	3106	2691	3848	3433	945	530
	3			1357	733	2099	1475	2841	2217	3583	2959	1419	795
	4			1094	261	1836	1003	2578	1745	3320	2487	1891	1058
	5					1568	529	2310	1271	3052	2013	2365	1326
	6					1302	57	2044	799	2786	1541	2837	1592
160	2	1819	1118	3292	2591	4764	4063	6236	5535	7709	7008	1679	978
	3	1399	349	2872	1822	4344	3294	5816	4766	7289	6239	2448	1398
	4			2452	1123	3924	2595	5396	4067	6869	5540	3147	1818
	5			2030	353	3502	1825	4974	3297	6447	4770	3917	2240
	6					3154	1196	4626	2668	6099	4141	4546	2588
210	2	3833	2508	6876	5551	9920	8595	12964	11639	16007	14682	3275	1950
	3	2859	868	5902	3911	8946	6955	11990	9999	15033	13042	4915	2924
	4			4930	2275	7974	5319	11018	8363	14061	11406	6551	3896
	5			3949	638	6993	3682	10037	6726	13080	9769	8188	4877
	6					6022	2031	9066	5075	12109	8118	9839	5848
255	2	9487	6747	16967	14227	24447	21707	31926	29186	39406	36666	7464	4724
	3	7125	3015	14605	10495	22085	17975	29564	25454	37044	32934	11196	7086
	4			12243	6762	19723	14242	27202	21721	34682	29201	14929	9448
	5			9880	3030	17360	10510	24839	17989	32319	25469	18661	11811
	6					14998	6778	22477	14257	29957	21737	22393	14173

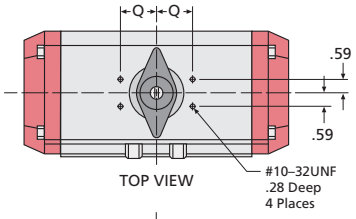
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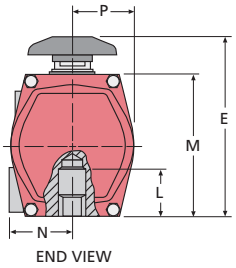
Series 93 Actuator Torque Data (N-m) Air Operated, With Spring Return, Torque Output

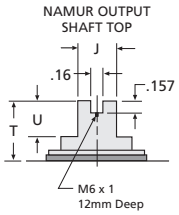
Actuator Size	No. Springs per Piston	Air Supply Pressure (Bar)										Spring	
		2.8		4.1		5.5		6.9		8.3		Spring Start	Stroke End
		Start	End	Start	End	Start	End	Start	End	Start	End		
48	1	6	4	10	8	14	12	19	16	23	21	5	3
	2/1	4	1	9	5	13	10	17	14	21	18	7	4
	2			7	3	11	7	16	12	20	16	10	6
	3/2			6	1	10	5	14	9	19	13	12	7
	3					9	2	13	7	17	11	15	8
63	2	10	7	19	16	28	25	36	33	45	42	9	6
	3	7	3	16	12	24	20	33	29	42	37	13	9
	4			13	7	21	16	30	25	39	33	18	12
	5			10	3	18	12	27	20	36	29	22	15
	6					15	7	24	16	32	25	26	18
83	2	24	19	45	40	66	61	86	82	107	103	21	16
	3	18	9	39	30	59	50	80	71	101	92	31	22
	4			32	20	53	41	74	62	95	83	41	29
	5			25	11	46	32	67	53	88	74	50	36
	6					42	21	63	42	84	63	61	40
93	2	35	26	64	56	94	85	123	114	152	144	30	21
	3	25	11	54	41	83	70	113	99	142	129	44	31
	4			44	26	73	56	102	85	132	114	59	42
	5			33	11	63	40	92	69	121	99	75	52
	6					52	26	82	55	111	85	89	62
119	2	78	53	141	116	204	179	267	242	330	305	67	41
	3	58	20	120	83	183	145	246	208	309	271	100	62
	4			100	49	163	112	226	175	289	238	133	83
	5			79	16	142	79	205	142	268	205	166	103
	6					121	46	184	109	247	172	200	124
128	2	99	53	183	136	267	220	351	304	435	388	107	60
	3			153	83	237	167	321	251	405	334	160	90
	4			124	30	207	113	291	197	375	281	214	120
	5					177	60	261	144	345	227	267	150
	6					147	6	231	90	315	174	321	180
160	2	206	126	372	293	538	459	705	625	871	792	190	111
	3	158	39	325	206	491	372	657	539	824	705	277	158
	4			277	127	443	293	610	460	776	626	356	205
	5			229	40	396	206	562	373	728	539	443	253
	6					356	135	523	301	689	468	514	292
210	2	433	283	777	627	1121	971	1465	1315	1809	1659	370	220
	3	323	98	667	442	1011	786	1355	1130	1699	1474	555	330
	4			557	257	901	601	1245	945	1589	1289	740	440
	5			446	72	790	416	1134	760	1478	1104	925	551
	6					680	230	1024	573	1368	917	1112	661
255	2	1072	762	1917	1607	2762	2453	3607	3298	4452	4143	843	534
	3	805	341	1650	1186	2495	2031	3340	2876	4185	3721	1265	801
	4			1383	764	2228	1609	3073	2454	3919	3299	1687	1068
	5			1116	342	1961	1188	2806	2033	3652	2878	2108	1335
	6					1695	766	2540	1611	3385	2456	2530	1601

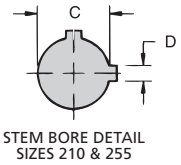
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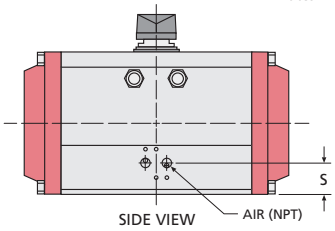
S92 Double Acting/S93 Spring Return

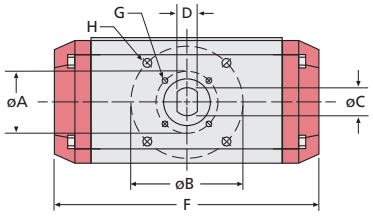


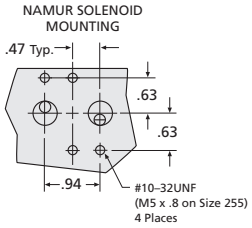


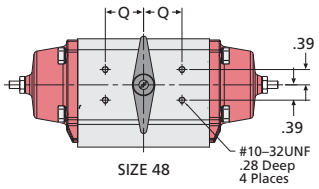












IMPERIAL DIMENSIONS - Inches

Size	48	63	83	93	119	128	160*	210	255‡
Air NPT	1/8	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
A ISO "F"†	1.42 - F 03	1.97-F 05	1.97 - F 05	1.97 - F 05	2.76 - F 07	2.76 - F 07	—	4.92 - F 12	6.50 - F 16
B ISO "F"†	1.97 - F 05	2.76 - F 07	2.76 - F 07	2.76 - F 07	4.92 - F 12	4.92 - F 12	4.92 - F 12	6.50 - F 16	7.87x4.72 Rect.
C	.55	.55	.75	.75	1.18	1.18	1.18	1.97	2.50
D	.40	.40	.51	.51	.87	.87	.87	.47	.62
E	3.88	4.53	5.43	5.78	7.28	8.09	9.36	11.62	13.49
F	4.38	5.58	7.40	9.10	12.40	12.81	15.54	19.57	28.78
G (UNC)	#10-32 x .23	1/4-20 x .32	1/4-20 x .32	1/4-20 x .32	5/16-18 x .46	5/16-18 x .46	—	1/2-13 x .78	M20 x 2.5 x 30mm
H (UNC)	1/4-20 x .25	5/16-18 x .40	5/16-18 x .40	5/16-18 x .40	1/2-13 x .69	1/2-13 x .69	1/2-13 x .75	5/8-11 x 1.11	M20 x2.5 x 30mm
J	.38	.38	.50	.50	1.12	1.12	1.12	1.12	1.12
L	1.38	1.38	1.46	1.46	2.20	2.20	2.20	4.72	6.50
M	2.50	3.46	4.27	4.61	5.52	6.32	7.80	10.16	12.06
N	1.60	1.72	2.28	2.47	2.78	2.88	3.78	4.56	5.40
P	1.18	1.38	1.79	1.97	2.37	2.70	3.39	4.41	5.39
Q	.98**	1.58	1.58	1.58	1.58	1.58	2.56	2.56	2.56
S	1.25	.89	1.26	1.32	1.64	1.64	2.26	2.45	2.48
T	1.10**	.79	.79	.79	.79	.79	1.18	1.18	1.18
U	.47	.47	.47	.47	.47	.47	.75	.75	.75

Note: Double Acting and Spring Return actuators have the same overall dimensions. The double acting unit of the size 48 actuator is optionally available with flat end caps with an F dimension of 4.00
† ISO "F" means mounting flange-drilling pattern.
* Dimensions for Size 160A in table. Size 160B (keyed stem version) has C dimension of 1.38 and D dimension of .39
‡ Dimensions for Size 255A in table. Size 255B actuator has a C dimension of 3.00 and D dimension of .75
** Size 48 has a Q dimension of 1.58 and a T dimension of .79 with use of NAMUR top plate.

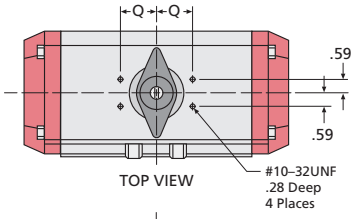
WEIGHTS - lbs - Spring Return unit weights are with full set of springs on each piston.

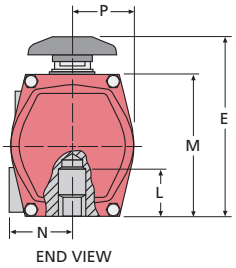
Size	48	63	83	93	119	128	160	210	255
Double Acting	2.0	3.4	6.3	8.5	16.9	21.0	38.8	77.8	167.0
Spring Return	2.4	4.10	8.1	10.8	22.3	27.6	53.2	109.6	210.8

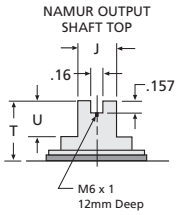
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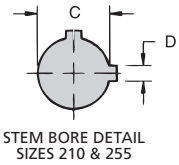
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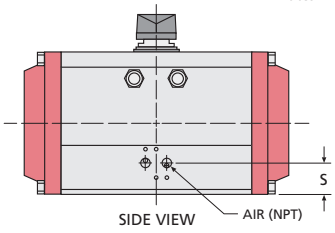
S92 Double Acting/S93 Spring Return

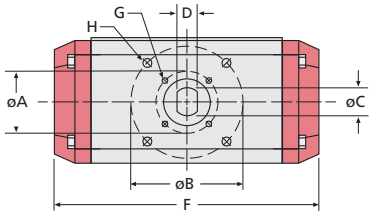


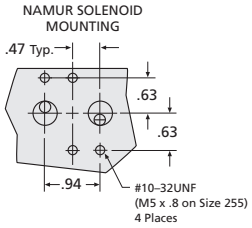


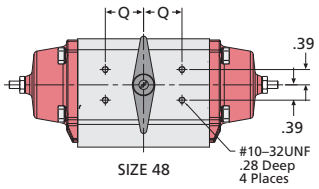












METRIC DIMENSIONS - Millimeters

Size	48	63	83	93	119	128	160*	210	255‡
Air NPT	1/8	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
A ISO "F"†	36 - F 03	50 - F 05	50 - F 05	50 - F 05	70 - F 07	70 - F 07	—	125 - F 12	165 - F 16
B ISO "F"†	50 - F 05	70 - F 07	70 - F 07	70 - F 07	125 - F 12	125 - F 12	125 - F 12	165 - F 16	200 x 120 Rect.
C	14	14	19	19	30	30	30	50	64
D	10	10	13	13	22	22	22	12	16
E	99	115	138	147	185	205	238	295	343
F	111	142	188	231	315	254	395	497	731
G	#10-32 x .23in	M6x1.0 x 8mm	M6x1.0 x 8mm	M6x1.0 x 8mm	M8x1.25P x 12 mm	M8x1.25P x 12 mm	N/A	M12x1.75P x 19m	M20x2.5P x 30mm
H	1/4-20 x .25in	M8x1.25P x 10mm	M8x1.25P x 10mm	M8x1.25P x 10mm	M12x1.75P x 18mm	M12x1.75P x 18mm	M12x1.75P x 18mm	M20x2.5P x 30mm	M20x2.5P x 30mm
J	10	10	13	13	28	28	28	28	28
L	35	35	37	37	56	56	56	120	165
M	64	88	108	117	140	161	198	258	306
N	41	44	58	63	71	73	96	116	137
P	30	35	45	50	60	69	86	112	137
Q	25**	40	40	40	40	40	65	65	65
S	32	23	32	34	42	42	57	62	63
T	28**	20	20	20	20	20	30	30	30
U	12	12	12	12	12	12	19	19	19

Note: Double Acting and Spring Return actuators have the same overall dimensions. The double acting unit of the size 48 actuator is optionally available with flat end caps with an F dimension of 102mm

† ISO "F" means mounting flange-drilling pattern.

* Dimensions for Size 160A in table. Size 160B (keyed stem version) has C dimension of 35mm and D dimension of 10mm

‡ Dimensions for Size 255A in table. Size 255B actuator has a C dimension of 76mm and D dimension of 19mm

** Size 48 has a Q dimensions of 40mm and a T dimension of 20mm with use of NAMUR top plate.

WEIGHTS - Kilograms - Spring Return unit weights are with full set of springs on each piston.

Size	48	63	83	93	119	128	160	210	255
Double Acting	0.9	1.5	3	4	8	10	18	35	76
Spring Return	1.1	1.9	4	5	10	13	24	50	96

Drawings are for reference only. Please refer to Bray ES drawings on the Bray website, www.bray.com. Bray reserves the right to change product dimensions without notice.

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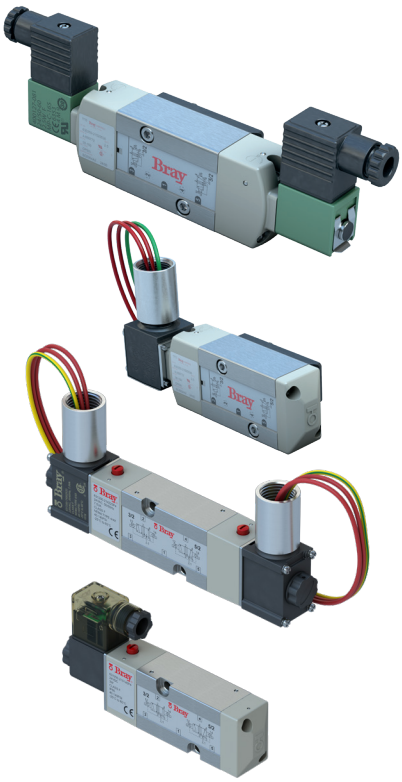
Bray®

Bray® CONTROLS

Division of BRAY INTERNATIONAL, Inc.
13333 Westland East Blvd. Houston, Texas 77041
281.894.5454 FAX 281.894.9499 www.bray.com

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Series 63 Solenoid Valve



FEATURES

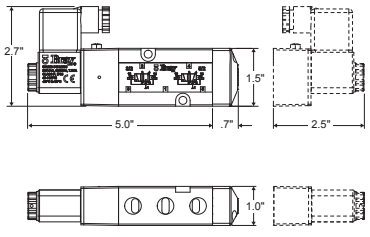
- Compact and modular design
- Pilot operated spool control valve
- Convertible from 3-way (3/2) to 4-way (5/2)
- Mechanical manual override

TECHNICAL DATA

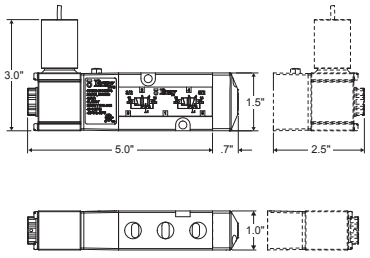
Materials of Construction		
Body	Anodized Aluminum	
Spring	Phosphate treated black steel	
Shading Coil	Copper	
Seals	NBR + PUR	
Core / Tube	Stainless / Brass	
End Covers & Plate	6/6 glass filled polyamide (PA/FV)	
Spool	Aluminum	
Internal Parts	Zamak, Steel, Acetal	
General Specifications		
Mounting	NAMUR VDI/VDE 3845, hardware included	
Pneumatic Ports	1/4" NPT G1/4 available for DIN Models	
Media	Filtered Air or Inert Gas	
Connections	NPT flying leads or DIN Form B Type I connections offered, both available with single and dual coils	
Electrical Connections	NEMA Housings: 1/2" NPT connection and flying leads	
	DIN Housing: Cable Gland PG9 and M15 threaded connector	
Coil Temperature Rating	Insulation Class "F", Max. 311°F [155°C]	
General Purpose (watertight)	NEMA 4, 4X (Flying Leads)	
	IP65 (DIN coil)	
Model Specifications	**High-flow**	**UL-Recognized**
Hazardous Locations (Optional)	—	NEMA 7, 9 Class I, Division 1 (Groups A-D) Class II, Division 1 (Groups E-G)
Temperature Range	-13°F to +140°F [-25°C to +60°C]	AC: -13°F to +140°F [-25°C to +60°C]
		DC: -13°F to +77°F [-25°C to +25°C]
Coil Voltage	Flying Leads & DIN 24, 110, 220 VAC, 50-60 HZ; 12, 24 VDC	Flying Leads: 24, 120, 220 VAC, 50-60 HZ; 12, 24 VDC
		DIN: 24, 120, 240 VAC, 50-60 HZ; 24 VDC
Nominal Power	4.5VA (24VAC); 6VA (110VAC); 7.5VA (220VAC); 4.5W (12 VDC); 3W (24VDC)	Flying Leads: 7VA (AC); 6.9W (DC)
		DIN: 3.5VA (AC); 3.0W (DC)
Flow Coefficient (1/4" pipe)	Cv=1.4	Cv=0.7
Operating Pressure	Min. 22 psi [1.5 bar] Max. 130 psi [9 bar]	Min. 30 psi [2 bar] Max. 130 psi [9 bar]
Operating Speed	5 cycles per minute	10 cycles per minute
Certifications	cCSAus (Flying Leads), CE (DIN coil)	UL, CSA, CE (DIN coil)

DIMENSIONS

DIN Solenoid



NEMA Solenoid



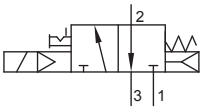
Note: Some dimensions may vary depending on model.

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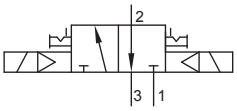
PNEUMATIC SCHEMATICS

3/2 Operation

Single Coil

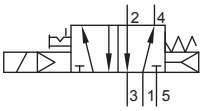


Dual Coil

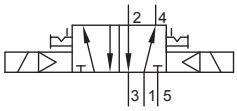


5/2 Operation

Single Coil

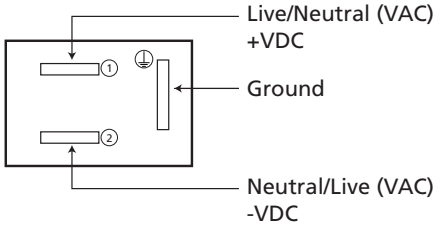


Dual Coil

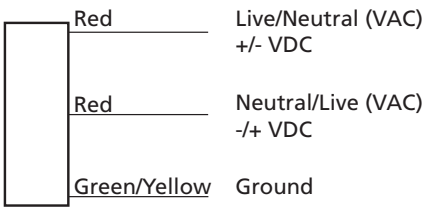


ELECTRICAL CONNECTION

DIN 43650B



Flying Leads



ACCESSORIES

Connector	Description
600250-71106533	Form B Type I Plug Connector (DIN 43650) with Cable Gland PG9
600500-71106533	Form B Type I Plug Connector (DIN 43650) with 1/2" NPT Female Connection
090004-76146533	Form B Type I Plug Connector (DIN 43650), LED and Surge Protected 110-220 VAC, to Flying Leads, 4 meters
090004-76147533	Form B Type I Plug Connector (DIN 43650), LED and Surge Protected 24-30 VDC, to Flying Leads, 4 meters
600250-23663536	Y-Connector Cordset - Form B Type I Plug Connector (DIN 43650) to M12 female straight connector (4-pin sensor side) AND M12 male straight connector (5-pin system side)
600250-23667536	Y-Connector Cordset - Form B Type I Plug Connector (DIN 43650) to 7/8" female straight connector (5- pin sensor side) AND 7/8" male straight connector (6-pin system side)
090001-76159882	S-Connector Cordset - Form B Type I Plug Connector (DIN 43650) to M12 male right angle (2-pins + PE), 0.6 meters

HEADQUARTERS
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Houston, Texas 77041
Tel: 281.894.5454
bray.com

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TAGS:
20-HV-201-A/B/C/D/E
16-HV-401-A/B/C
20-HV-303-1/2/3/4
20-HV-304-1/2/3/4
20-HV-610-1/2
16-HV-405-1/2/3
16-HV-406-1/2/3
16-HV-400-A/B/C

20-HV-310A-1/2/3/4
20-HV-310B-1/2/3/4
20-HV-310C-1/2/3/4
20-HV-310D-1/2/3/4
20-HV-310E-1/2/3/4
20-HV-310F-1/2/3/4

20-HV-204A-1/2/3/4
20-HV-204B-1/2/3/4
20-HV-204C-1/2/3/4
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20-HV-204F-1/2/3/4



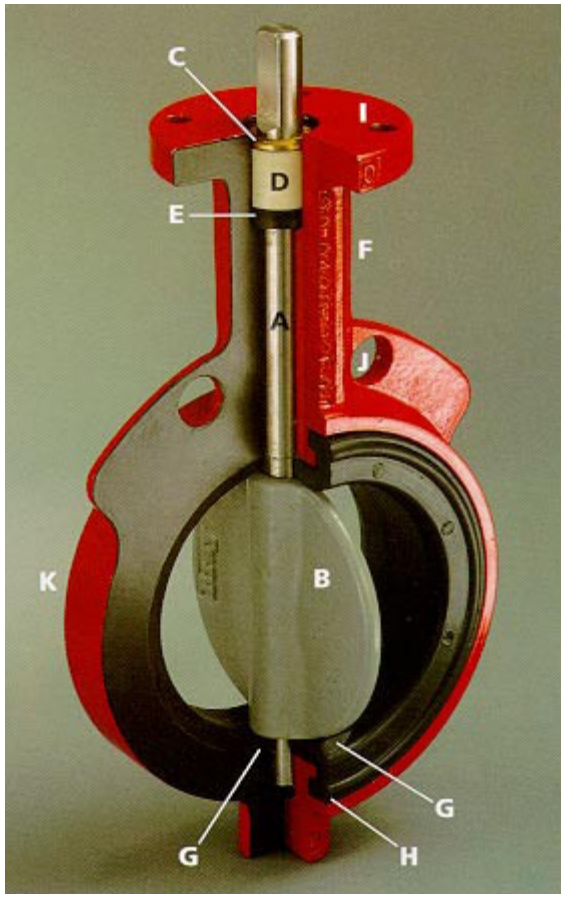
BUTTERFLY VALVES
RESILIENT SEATED

SERIES 30/31 Wafer/Lug
2”-20” (50mm-500mm)

The
High
Performance
Company

SERIES 30/31

2”-20” (50mm-500mm) Bray® Controls is proud to offer a high quality line of butterfly valves to meet the requirements of today’s market. Combining years of field experience, research and development, Bray has designed many unique features in the Series 30/31 not previously available. The results are longer service life, greater reliability, ease of parts replacement and interchangeability of components.



STEM SEAL (E)

Double "U" cup seal design is self-adjusting and gives positive sealing in both directions. Prevents external substances from entering stem bore.

NECK (F)

Extended neck length allows for 2" of piping insulation and is easily accessible for mounting actuators.

PRIMARY AND SECONDARY SEALS (G)

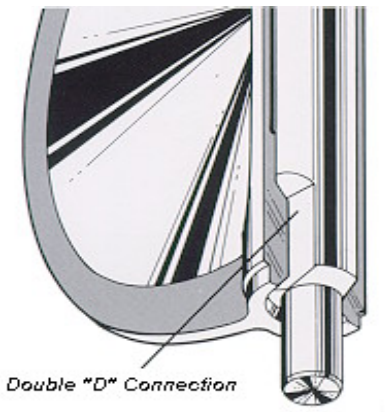
The Primary Seal is achieved by an interference fit of the molded seat flat with the disc hub. The Secondary Seal is created because the stem diameter is greater than the diameter of the seat stem hole. These seals prevent line media from coming in contact with the stem or body.

BRAY UNIQUE SEAT DESIGN (H)

One of the valve's key elements is Bray's unique "*Tongue-and-Groove*" seat design. This resilient seat features lower torque than many valves on the market today and provides complete isolation of flowing media from the body. The tongue-and-groove seat to body retention method is superior to traditional designs, making field replacement simple and fast. The seat is specifically designed to seal with slip-on or weld-neck flanges. The seat features a molded O-ring which eliminates the use of flange gaskets. An important maintenance feature is that all resilient seats for Bray butterfly valves Series 20, 21, 30, 31, 34 are completely interchangeable.

DISC AND STEM CONNECTION (A)

Features a high-strength through stem design. The close tolerance, double "D" connection that drives the valve disc is an exclusive feature of the Bray valve. It eliminates stem retention components being exposed to the line media, such as disc screws



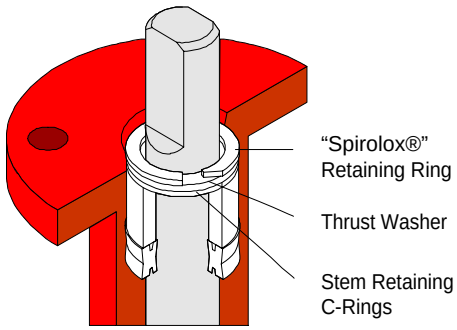
and taper pins, which commonly result in leak paths, corrosion, and vibration failures. Disc screws or taper pins, due to wear and corrosion, often require difficult machining for disassembly. Disassembly of the Bray stem is just a matter of pulling the stem out of the disc. Without fasteners obstructing the line flow, the Series 30/31 Cv values are higher than many other valves, turbulence is reduced, and pressure recovery is increased. The stem ends and top mounting flange are standardized for interchangeability with Bray actuators.

DISC (B)

Casting is spherically machined, hand polished to provide a bubble-tight shut off, minimum torque, and longer seat life. The disc O.D. clearance is designed to work with all standard piping.

"SPIROLOX*" RETAINING RING (C)

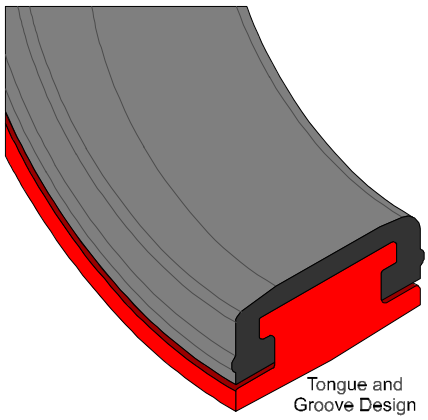
The stem is retained in the body by means of a unique Stainless Steel “Spirolox®” retaining ring, a thrust washer and two C-rings, manufactured from brass as standard, stainless steel upon request. The retaining ring may be easily removed with a standard hand tool. The stem retaining assembly prevents unintentional removal of the stem during field service.



*"Spirolox®" designation is a registered trademark of TRW, Inc.

STEM BUSHING (D)

Non-Corrosive, heavy duty acetal bushing absorbs actuator side thrusts.



SERIES 30/31

ACTUATOR MOUNTING FLANGE AND STEM CONNECTION (I)

Universally designed to ISO 5211 for direct mounting of Bray® power actuators and manual operators.

FLANGE LOCATING HOLES (J)

Provides quick and proper alignment during installation.

BODY (K)

One-piece wafer or lug style. Epoxy coating for excellent corrosion resistance. Bray valve bodies meet ANSI 150 pressure ratings for hydrostatic shell test requirements.

DESIGN FEATURES

Bray's Series 30 valve is a wafer version with flange locating holes, and the Series 31 is the companion lug version for dead-end service and other flange requirements. All Bray valves are tested to 110% of full pressure rating before shipment.
A major design advantage of Bray valve product lines is international compatibility. The same valve is compatible with most world flange standards - ANSI Class 125/150, BS 10 Tables D&E, BS4504 NP 10/16, DIN ND10/16, AS 2129 and JIS 10. In addition, the valves are designed to comply with ISO 5752 face-to-face and ISO 5211 actuator mounting flanges. Therefore, one valve design can be used in many different world markets. Due to a modular concept of design, all Bray® handles, manual gear operators and pneumatic and electric actuators mount directly to Bray valves. No brackets or adapters are required. Bray interchangeability and compatibility offers you the best in uniformity of product line and low-cost performance in the industry today.

EPOXY COATING CORROSION PROTECTION

Bray's standard product offers valve bodies with an epoxy coating, providing excellent corrosion and wear resistance to the valve's surface. The Bray epoxy coating is a hard, high gloss red finish.

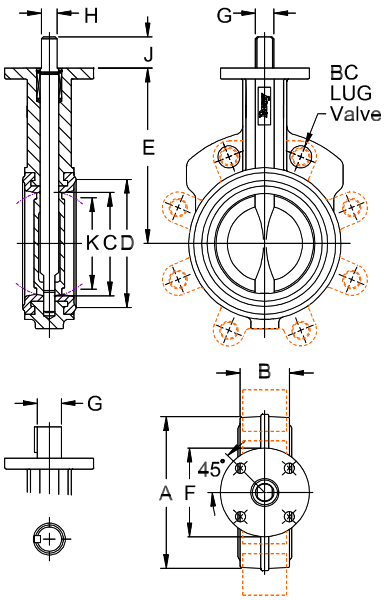
- Chemical Resistance - resists a broad range of chemicals including: dilute aqueous acids and alkalies, petroleum solvents, alcohols, greases and oils. Offers outstanding resistance to humidity and water.
- Weatherability - outdoor tested resistant to ultra-violet radiation.
- Abrasion Resistance - excellent resistance to abrasion.
- Impact Resistance - withstands impact without chipping or cracking.

NYLON 11 COATING

Optionally available for valve bodies where outstanding protection and performance is needed. A thermoplastic produced from a vegetable base, this coating is inert to fungus growth and molds. Nylon 11 is *USDA Approved*, as well as certified to ANSI/NSF 61 for water service.

- Corrosion Resistance - superior resistance to a broad range of chemical environments. Salt spray tested in excess of 2,000 hours and seawater immersion tested for over 10 years without corrosion to metal substrates. Nylon 11 features a very low coefficient of friction and excellent resistance to impact and ultra-violet radiation.





DIMENSIONS SERIES 30 WAFER

SERIES 31 LUG

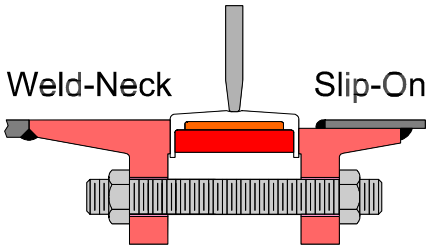
Valve Size								Mtg Flange Drilling							Lug Bolting Data		
ins	mm	A	B	C	D	E	F	BC	No. Holes	Hole Dia.	G	H	J	K	BC	No. Holes	Thrds UNC-2B
2	50	3.69	1.62	2.00	2.84	5.50	3.54	2.76	4	.39	.55	.39	1.25	1.32	4.75	4	5/8-11
2½	65	4.19	1.75	2.50	3.34	6.00	3.54	2.76	4	.39	.55	.39	1.25	1.91	5.50	4	5/8-11
3	80	4.88	1.75	3.00	4.03	6.25	3.54	2.76	4	.39	.55	.39	1.25	2.55	6.00	4	5/8-11
4	100	6.06	2.00	4.00	5.16	7.00	3.54	2.76	4	.39	.63	.43	1.25	3.57	7.50	8	5/8-11
5	125	7.12	2.12	5.00	6.16	7.50	3.54	2.76	4	.39	.75	.51	1.25	4.63	8.50	8	3/4-10
6	150	8.12	2.12	5.75	7.02	8.00	3.54	2.76	4	.39	.75	.51	1.25	5.45	9.50	8	3/4-10
8	200	10.50	2.50	7.75	9.47	9.50	5.91	4.92	4	.57	.87	.63	1.25	7.45	11.75	8	3/4-10
10	250	12.75	2.50	9.75	11.47	10.75	5.91	4.92	4	.57	1.18	.87	2.00	9.53	14.25	12	7/8-9
12	300	14.88	3.00	11.75	13.47	12.25	5.91	4.92	4	.57	1.18	.87	2.00	11.47	17.00	12	7/8-9

Valve Size								Mtg Flange Drilling							Lug Bolting Data		
ins	mm	A	B	C	D	E	F	BC	No. Holes	Hole Dia.	G	H	KEY SIZE	K	BC	No. Holes	Thrds UNC-2B
14	350	17.05	3.00	13.25	15.28	13.62	5.91	4.92	4	.57	1.38	2.00	.39x.39	13.04	18.75	12	1-8
16	400	19.21	4.00	15.25	17.41	14.75	5.91	4.92	4	.57	1.38	2.00	.39x.39	14.85	21.25	16	1-8
18	450	21.12	4.25	17.25	19.47	16.00	8.27	6.50	4	.81	1.97	2.50	.39x.47	16.85	22.75	16	1⅛-7
20	500	23.25	5.00	19.25	21.59	17.25	8.27	6.50	4	.81	1.97	2.50	.39x.47	18.73	25.00	20	1⅛-7

SELECTION DATA

FLANGE REQUIREMENTS

Bray valves are designed for installation between ANSI Class 125/150 lb. weld-neck or slip-on flanges, BS 10 Tables D&E, BS 4504 NP 10/16, DIN ND 10/16, AS 2129 and JIS 10, either flat faced or raised faced. While weld-neck flanges are recommended, Bray has specifically designed its valve seat to work with slip-on flanges, thus eliminating common failures of other butterfly valve designs. When using raised face flanges be sure to properly align valve and flange. Type C stub-end flanges are not recommended.



Note: Flanges on both sides of installed valve must be the same type

PRESSURE RATINGS*

For bi-directional bubble-tight shut off, disc in closed position:

Inches	mm	psig	bar
2-12	50-300	175	12
14-20	350-500	150	10

For Dead-end Service Applications: With *downstream flanges installed* or with *vulcanized seats,* the dead-end pressure ratings are equal to valve bi-directional ratings as stated above. With no downstream flanges or with seats that are not vulcanized, the dead-end pressure rating for 2"-12" valves is 75 psi (5 bar) for 14"-20" valves, 50 psi (3.5 bar.)

* Pressure Ratings are based on standard disc diameters. For low pressure application, Bray offers a standard reduced disc diameter to decrease seating torques and to extend seat life, thus increasing the valve's performance and reducing actuator costs for the customer.

VELOCITY LIMITS

For On/Off Services

Fluids - 30 ft/sec (9m/s)

Gases - 175 ft/sec (54m/s)

Cv VALUES-VALVE SIZING COEFFICIENT

Valve Size		Disc Position (degrees)								
ins	mm	90°	80°	70°	60°	50°	40°	30°	20°	10°
2	50	144	114	84	61	43	27	16	7	1
2 1/2	65	282	223	163	107	67	43	24	11	1.5
3	80	461	364	267	154	96	61	35	15	2
4	100	841	701	496	274	171	109	62	27	3
5	125	1376	1146	775	428	268	170	98	43	5
6	150	1850	1542	1025	567	354	225	129	56	6
8	200	3316	2842	1862	1081	680	421	241	102	12
10	250	5430	4525	2948	1710	1076	667	382	162	19
12	300	8077	6731	4393	2563	1594	1005	555	235	27
14	350	10538	8874	5939	3384	2149	1320	756	299	34
16	400	13966	11761	7867	4483	2847	1749	1001	397	45
18	450	17214	14496	10065	5736	3643	2237	1281	507	58
20	500	22339	18812	12535	7144	4536	2786	1595	632	72

Cv is defined as the volume of water in U.S.G.P.M. that will flow through a given restriction or valve opening with a pressure drop of one (1) p.s.i. at room temperature. Recommended control angles are between 25°-70° open. Preferred

EXPECTED SEATING/UNSEATING TORQUES (Lb.-Ins.)

		Full-Rated Pressure Valve				Reduced Disc
Valve Size		rP (PSI)				rP (PSI)
ins	mm	50	100	150	175	50
2	50	125	130	135	140	125
2 1/2	65	195	205	215	220	195
3	80	260	275	290	297	260
4	100	400	425	450	462	267
5	125	615	670	725	755	410
6	150	783	871	953	1003	537
8	200	1475	1650	1825	1915	983
10	250	2240	2520	2800	2940	1493
12	300	3420	3870	4320	4545	2280
14	350	4950	5700	6450	-	3300
16	400	6400	7700	9000	-	4267
18	450	7850	9850	11850	-	5267
20	500	10300	12900	15500	-	6867

Valve Torque Rating - Bray has classified valve torque ratings according to 3 types: non-corrosive lubricating service, general service, and severe service. Torques listed above are for general services.Consult Bray for torque information corresponding to specific application.

TO USE TORQUE CHART, NOTE THE FOLLOWING:

1) For Bray valves, Series 20, 21, 30, 31 and 34.
2) Review Technical Bulletin No. 1001, Expected Seating/Unseating Torque's, for explanation of the 3 service classes and their related seating/unseating torque values for given pressure differentials of Full-Rated and Reduced Disc Diameter valves.
3) Dynamic Torque values are not considered. See Technical Bulletin No. 1002 for evaluation of Dynamic Torque values vs. Seating/Unseating Torque values.
4) Do not apply a safety factor to above torque values when determining actuator output torque requirement.
5) For 3 way assemblies where on valve is opening and other is closing, multiply torque by 1.5 factor.

SELECTION DATA

RECOMMENDED SPECIFICATIONS FOR BRAY SERIES 30/31 SHALL BE:

• Epoxy coated, cast iron, wafer or lug bodies.
• With flange locating holes that meet ANSI 125/150 (or BS 10 tables D&E, BS 4504 NP 10/16, DIN ND 10/16, AS 2129 and JIS 10) drillings.
• Through-stem direct drive double "D" design requiring no disc screws or pins to connect stem to disc with no possible leak paths in disc/stem connection.
• Stem mechanically retained in body neck and no part of stem or body exposed to line media.
• Tongue-and-groove seat design with primary hub seal and a molded o-ring suitable for weld-neck and slip-on flanges. Seat totally encapsulates the body with no flange gaskets required.
• Spherically machined, hand polished disc edge and hub for minimum torque and maximum sealing capability.
• Equipped with non-corrosive bushing and self-adjusting stem seal.
• Bi-directional and tested to 110% of full rating.
• Bi-directional pressure ratings:
2"-12" valves: 175 PSI
14"-20" valves: 150 PSI
Lug bodies for dead end service
With downstream flanges or vulcanized seats, pressure ratings are equal to bi-directional ratings as stated above.
With no downstream flanges or non-vulcanized seats:
2"-12" valves: 75 psi.
14"-20" valves: 50 psi.
• No field adjustment necessary to maintain optimum field performance
• The valve shall be Bray Series 30 wafer / 31 lug or equal.

TEMP. RANGE OF SEATS

Type	Maximum	Minimum
EPDM	+250°F(121°C)	-40°F(-40°C)
Buna-N	+212°F(100°C)	0°F(-18°C)
FKM*	+400°F(204°C)	0°F(-18°C)

MATERIALS SELECTION

2"-20" (50mm-500mm)

BODY:
• Cast Iron ASTM A126 Class B
• Ductile Iron ASTM A536
• Cast Steel ASTM A216 WCB
• Aluminum ASTM B26

SEAT:
• Buna-N - Food Grade
• EPDM - Food Grade
• FKM*
• White Buna-N - Food Grade

STEM:
• Coated Carbon Steel
• 416 SS ASTM A582 Type 416
• 304 SS ASTM A276 Type 304
• 316 SS ASTM A276 Type 316
• Monel

DISC:
• Aluminum Bronze ASTM B148-954
• Coated Ductile Iron ASTM A536 Gr. 65-45-12
• Ductile Iron,Nylon 11 Coated, ASTM A536 Gr. 65-45-12
• Ductile Iron, Halar® Coated, ASTM A536 Gr. 65-45-12
• 316 SS ASTM A351 CF8M
• Hastelloy® C-276 ASTM B575 Alloy N10276

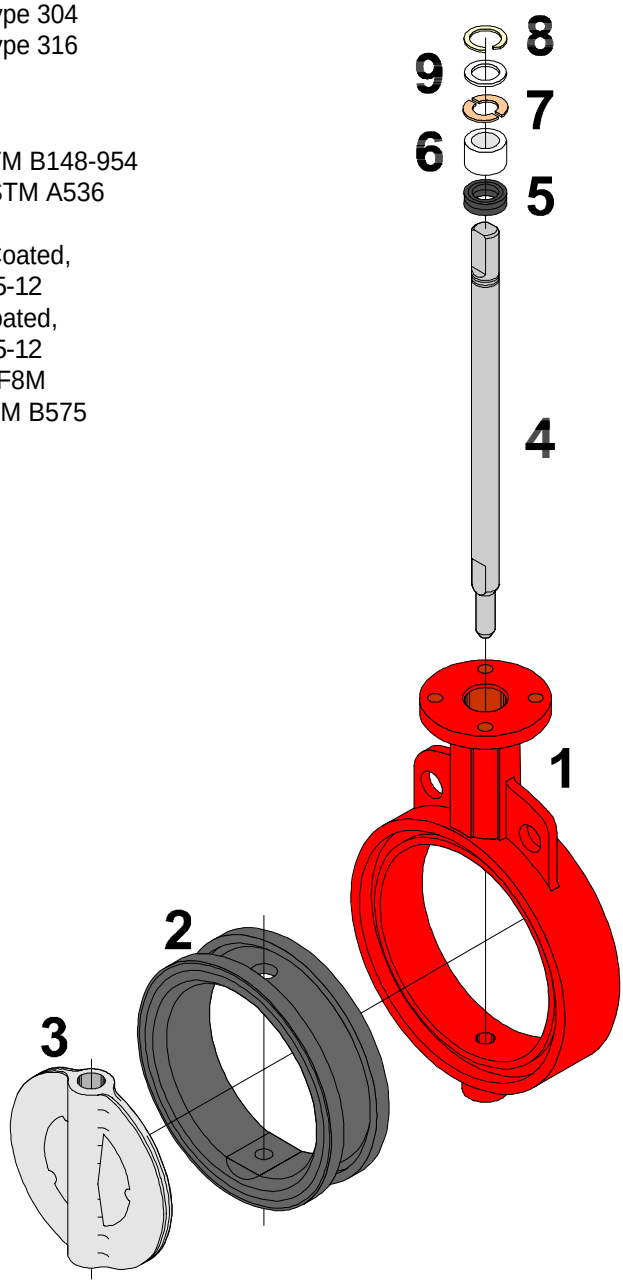
WEIGHTS

Valve Size		Series	Series
ins	mm	30	31
2	50	5.5	7.0
2 1/2	65	7.0	8.0
3	80	7.5	9.0
4	100	11.5	15.0
5	125	14.0	20.0
6	150	17.0	23.0
8	200	34.0	42.0
10	250	49.0	66.0
12	300	67.0	88.0
14	350	95.0	114.0
16	400	135.0	166.0
18	450	200.0	226.0
20	500	260.0	305.0

Weights are in lbs.

COMPONENTS

No.	Qty.	Description
1	1	Body
2	1	Seat
3	1	Disc
4	1	Stem
5	1	Stem Seal
6	1	Stem Bushing
7	2	Stem Retainer
8	1	Thrust Washer
9	1	Retaining Ring



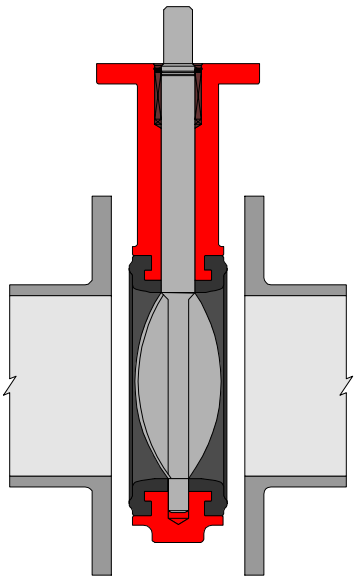
*FKM is the ASTM D1418 designation for Fluorinated Hydrocarbon Elastomers (also called Fluoroelastomers.)
Hastelloy® is a registered trademark of Haynes International, Inc.
Halar® is a registered trademark of Ausimont U.S.A., Inc.

INSTALLATION

Position the disc in the partially open position, maintaining the disc within body face-to-face. Place the body between flanges and install flange bolts. *Do not use flange gaskets.*
Before tightening flange bolts, carefully open the disc to the full open position to ensure proper alignment and clearance of the disc O.D. with the adjacent pipe I.D. Leave disc in the full open position and tighten flange bolts per required specification. Once bolts are tightened, carefully rotate disc to closed position to ensure disc O.D. clearance.

MAINTENANCE AND REPAIR

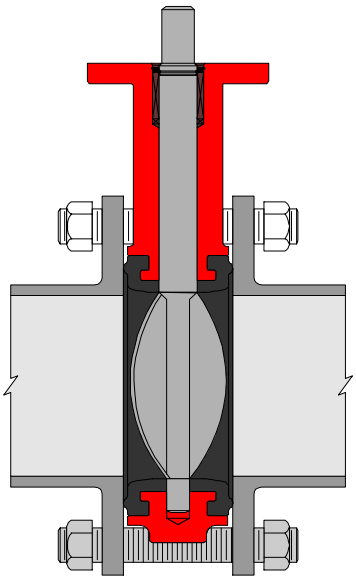
The many Bray features minimize wear and maintenance requirements. No routine lubrication is required. All components-stem, disc, seat, bushing, stem seal, etc., are field replaceable, no adjustment is needed. If components require replacement, remove the valve from the line by placing the disc near the closed position, spread the flanges, support the valve, then remove the flange bolts. No valve maintenance, including removal of manual or power actuators, should be performed until the piping system is completely depressurized.



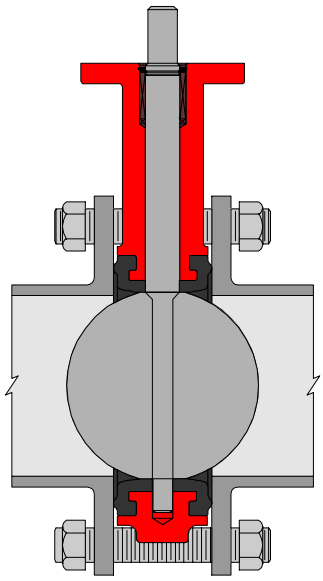
Disc in the Near Closed Position

DISASSEMBLY

Remove handle, gear operator , or actuator from actuator mounting flange. Remove “Spirolox®” retaining ring. Remove stem with its thrust washer and two C-ring stem retainers. Remove bushing and seal. Remove the disc from the seat, protecting disc edge at all times. Push the seat into an oval shape, then remove the seat from the body.



Disc in the Partially Open Position



Disc in the Full Open Position

Assembly

Push the valve seat into an oval and push it into the body with seat stem holes aligned to body stem holes. Push stem into the stem hole of body. For aid in inserting disc, slightly protrude stem beyond the I.D. of the top of the seat. Install a light coating of food grade silicone oil (for silicone free applications use soap and water) on the I.D. of seat. Insert the disc into the seat by lining up the disc hole with the stem hole of the seat. Note: the broached double “D” flats in the disc must be toward the bottom of valve body. (Take special care when lining disc up with stem.) With a downward pressure and rotating the stem back and forth, push the stem until the stem touches the bottom of the body stem hole. Make certain that when pushing the stem through disc bottom, the broached flats of stem and disc are aligned. After the stem has engaged the disc, but before the stem is firmly seated in the body, replace the stem seal and bushing. Install the two C-ring stem retainers in the groove in the stem and thrust washer on top of the C-ring. Seat the stem firmly in the body and install the “Spirolox®” retaining ring back into position.

Bray CONTROLS

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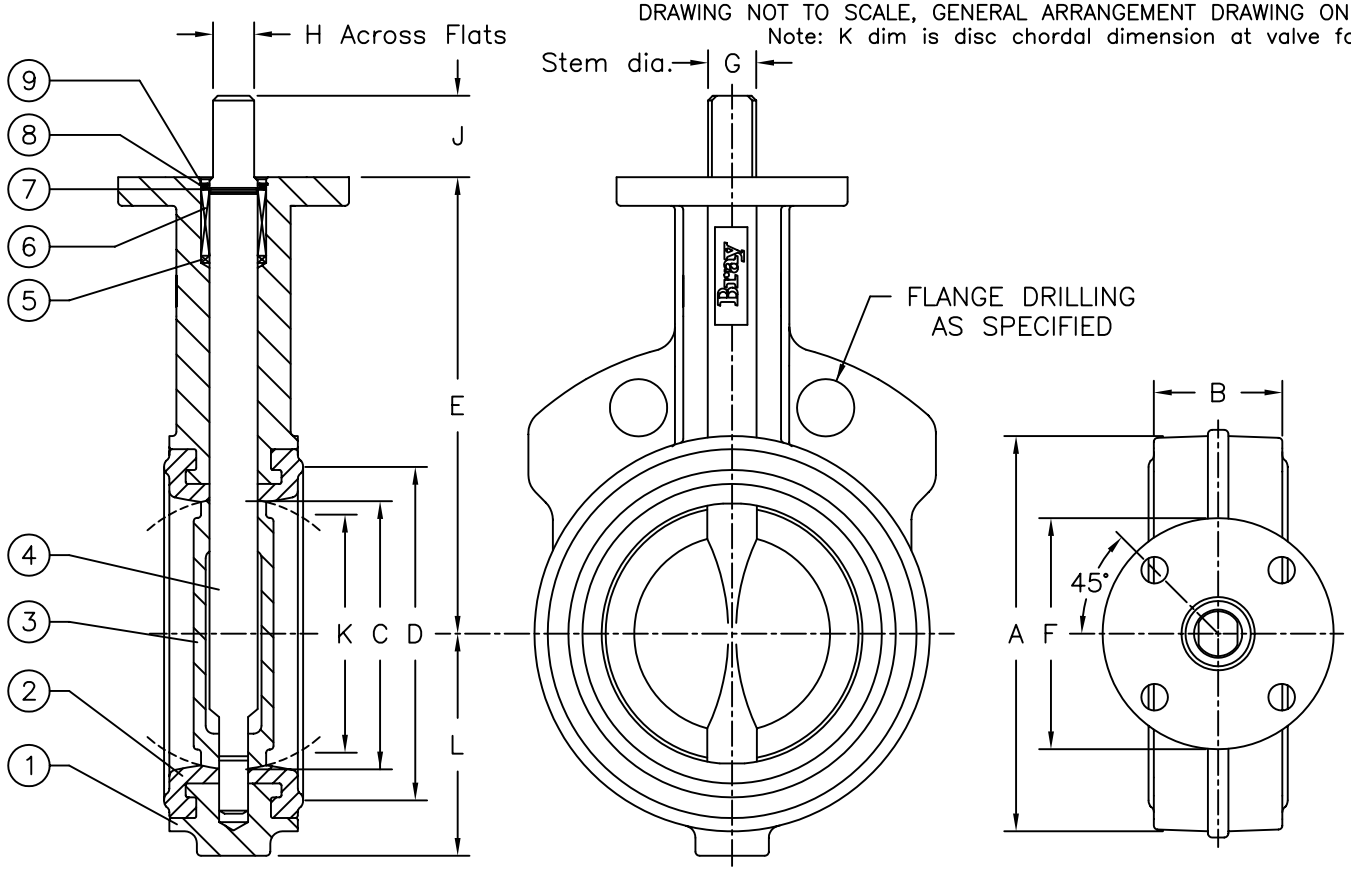
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Bray CONTROLS CANADA CORPORATION

SERIES 30
CN–070101
Date: January 2007

Valve Size	A	B	C	D	E	F	Top Plate Drilling BC	No. of Holes	Hole Diameter	G	H	J	K	L	Adapter Code	Weight (lbs)
2"	3.69	1.62	2.00	2.84	5.50	3.54	2.76	4	.39	.55	.39	1.25	1.32	2.22	A	5.5
2.5"	4.19	1.75	2.50	3.34	6.00	3.54	2.76	4	.39	.55	.39	1.25	1.91	2.47	A	7.0
3"	4.88	1.75	3.00	4.03	6.25	3.54	2.76	4	.39	.55	.39	1.25	2.55	2.81	A	7.5
4"	6.06	2.00	4.00	5.16	7.00	3.54	2.76	4	.39	.63	.43	1.25	3.57	3.41	B	11.5
5"	7.06	2.12	5.00	6.16	7.50	3.54	2.76	4	.39	.75	.51	1.25	4.63	4.03	C	14.0
6"	8.12	2.12	5.75	7.02	8.00	3.54	2.76	4	.39	.75	.51	1.25	5.45	4.53	C	17.0
8"	10.50	2.50	7.75	9.47	9.50	5.91	4.92	4	.57	.87	.63	1.25	7.45	5.75	D	34.0
10"	12.75	2.50	9.75	11.47	10.75	5.91	4.92	4	.57	1.18	.87	2.00	9.53	7.12	E	49.0
12"	14.88	3.00	11.75	13.47	12.25	5.91	4.92	4	.57	1.18	.87	2.00	11.47	8.12	E	67.0

DRAWING NOT TO SCALE, GENERAL ARRANGEMENT DRAWING ONLY.
Note: K dim is disc chordal dimension at valve face.



ITEM No.	NAME	No. REQUIRED	SERIES/PART No.	MATERIAL	SPECIFICATION/REMARKS
9	RETAINING RING	1		304SS	
8	THRUST WASHER	1		BRONZE	
7	STEM RETAINER	2		BRONZE	
6	BUSHING	1		ACETAL	
5	PACKING	1		BUNA–N	
4	STEM	1		416SS	ASTM A582 Type 416
3	DISC	1		316SS	ASTM A351 CF8M
2	SEAT	1		EPDM	FOOD GRADE
1	BODY	1		CAST IRON	ASTM A126 Class B

Valve Size _____ Flg. Drilling Ansi 150
Pressure Rating 175psi
Distributor _____
CUSTOMER G.E. ZENON
Project Number _____
Contractor _____
Bray Order _____
Certified Correct By S.S. Date Jan. 2007

The High Performance Company
BRAY CONTROLS CANADA
A Subsidiary of BRAY INTERNATIONAL, Inc.

PARTS LIST AND DIMENSIONS (inches)
SERIES 30 BUTTERFLY VALVE
SIZES 2" – 12"

Series	Size	Part No.	Material Trim Code	Drawing No.
30	XXXX	11010	169	CN–070101

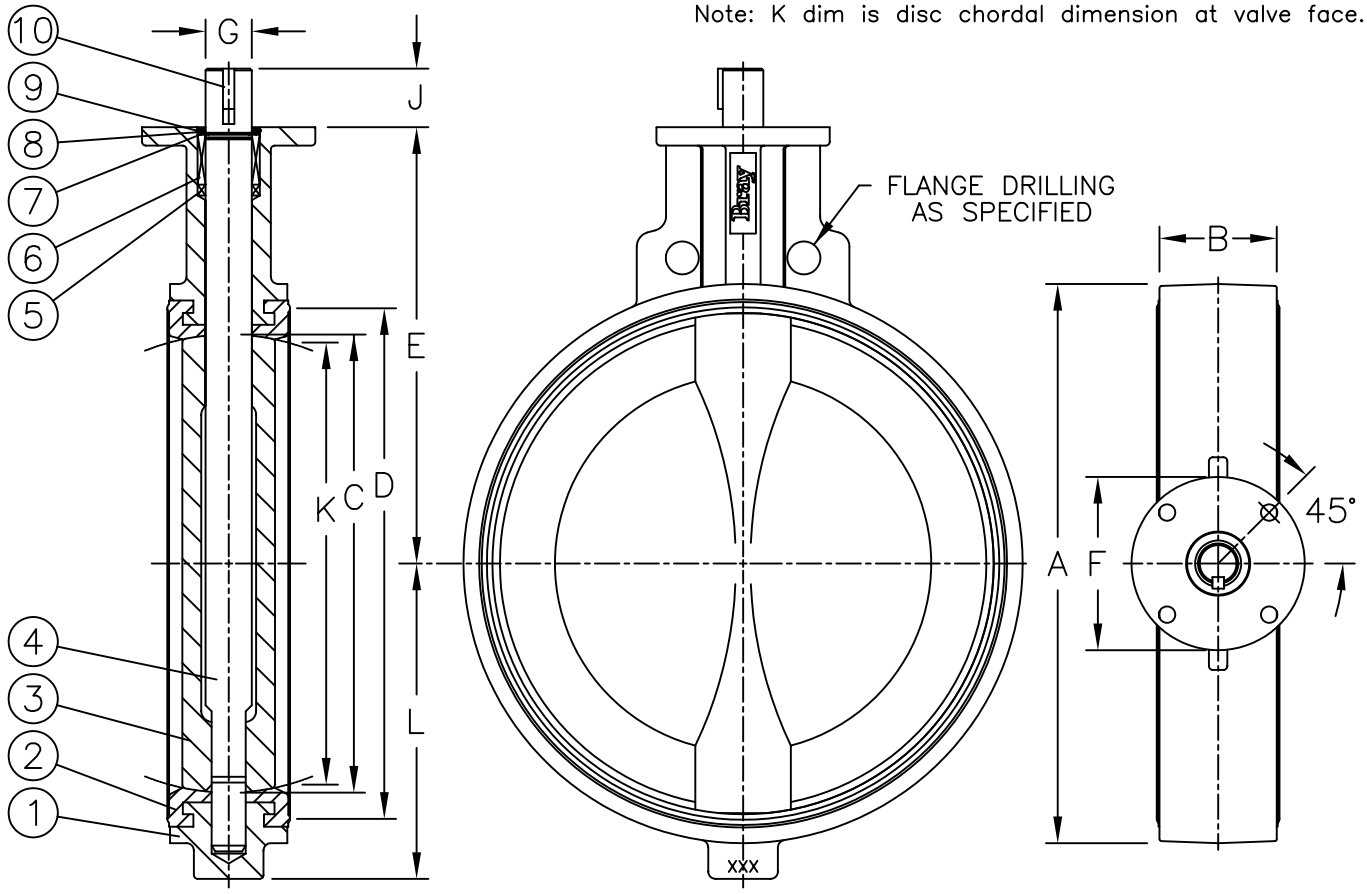
Bray

Bray CONTROLS CANADA CORPORATION

SERIES 30
CN–070102
Date: January 2007

Valve Size	A	B	C	D	E	F	Top Plate Drilling BC	Top Plate Drilling No. of Holes	Top Plate Drilling Hole Diameter	G	J	Key Size	K	L	Adapter Code	Weight (lbs)
14"	17.05	3.00	13.25	15.28	13.62	5.91	4.92	4	.57	1.38	2.00	.39x.39	13.04	9.38	F	95
16"	19.21	4.00	15.25	17.41	14.75	5.91	4.92	4	.57	1.38	2.00	.39x.39	14.85	10.75	F	135
18"	21.12	4.25	17.25	19.47	16.00	8.27	6.50	4	.81	1.97	2.50	.47x.39	16.85	12.00	G	200
20"	23.25	5.00	19.25	21.59	17.25	8.27	6.50	4	.81	1.97	2.50	.47x.39	18.73	13.72	G	260

DRAWING NOT TO SCALE, GENERAL ARRANGEMENT DRAWING ONLY.
Note: K dim is disc chordal dimension at valve face.



ITEM No.	NAME	No. REQUIRED	SERIES/PART No.	MATERIAL	SPECIFICATION/REMARKS
10	KEY	1		18–8SS	
9	RETAINING RING	1		304SS	
8	THRUST WASHER	1		BRONZE	
7	STEM RETAINER	2		BRONZE	
6	BUSHING	1		ACETAL	
5	PACKING	1		BUNA–N	
4	STEM	1		416SS	ASTM A582 Type 416
3	DISC	1		316SS	ASTM A351 CF8M
2	SEAT	1		EPDM	FOOD GRADE
1	BODY	1		CAST IRON	ASTM A126 Class B

Valve Size _____ Flg. Drilling Ansi 150
Pressure Rating 150psi
Distributor _____
CUSTOMER G.E. ZENON
Project Number _____
Contractor _____
Bray Order _____
Certified Correct By S.S. Date Jan. 2007

The High Performance Company

BRAY CONTROLS CANADA
A Subsidiary of BRAY INTERNATIONAL, Inc.

PARTS LIST AND DIMENSIONS
SERIES 30 BUTTERFLY VALVE
SIZES 16" thru 20"

Series	Size	Part No.	Material Trim Code	Drawing No.
30	XXXX	11010	169	CN–070102

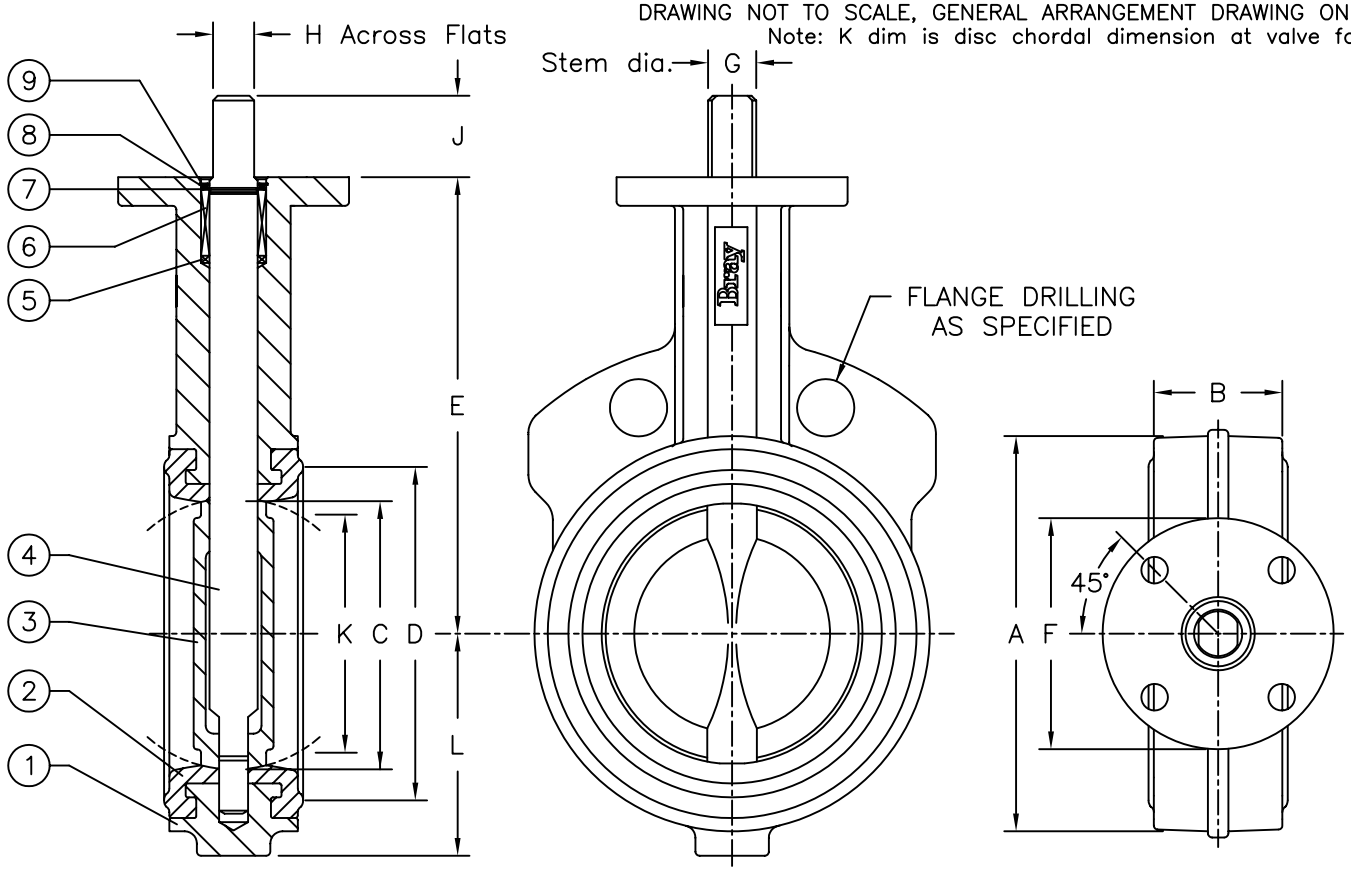
Bray

Bray CONTROLS CANADA CORPORATION

SERIES 30
CN–070105
Date: January 2007

Valve Size	A	B	C	D	E	F	Top Plate Drilling BC	No. of Holes	Hole Diameter	G	H	J	K	L	Adapter Code	Weight (lbs)
2"	3.69	1.62	2.00	2.84	5.50	3.54	2.76	4	.39	.55	.39	1.25	1.32	2.22	A	5.5
2.5"	4.19	1.75	2.50	3.34	6.00	3.54	2.76	4	.39	.55	.39	1.25	1.91	2.47	A	7.0
3"	4.88	1.75	3.00	4.03	6.25	3.54	2.76	4	.39	.55	.39	1.25	2.55	2.81	A	7.5
4"	6.06	2.00	4.00	5.16	7.00	3.54	2.76	4	.39	.63	.43	1.25	3.57	3.41	B	11.5
5"	7.06	2.12	5.00	6.16	7.50	3.54	2.76	4	.39	.75	.51	1.25	4.63	4.03	C	14.0
6"	8.12	2.12	5.75	7.02	8.00	3.54	2.76	4	.39	.75	.51	1.25	5.45	4.53	C	17.0
8"	10.50	2.50	7.75	9.47	9.50	5.91	4.92	4	.57	.87	.63	1.25	7.45	5.75	D	34.0
10"	12.75	2.50	9.75	11.47	10.75	5.91	4.92	4	.57	1.18	.87	2.00	9.53	7.12	E	49.0
12"	14.88	3.00	11.75	13.47	12.25	5.91	4.92	4	.57	1.18	.87	2.00	11.47	8.12	E	67.0

DRAWING NOT TO SCALE, GENERAL ARRANGEMENT DRAWING ONLY.
Note: K dim is disc chordal dimension at valve face.



ITEM No.	NAME	No. REQUIRED	SERIES/PART No.	MATERIAL	SPECIFICATION/REMARKS
9	RETAINING RING	1		304SS	
8	THRUST WASHER	1		BRONZE	
7	STEM RETAINER	2		BRONZE	
6	BUSHING	1		ACETAL	
5	PACKING	1		BUNA–N	
4	STEM	1		416SS	ASTM A582 Type 416
3	DISC	1		NDI	Nylon 11 coated Ductile Iron
2	SEAT	1		EPDM	FOOD GRADE
1	BODY	1		CAST IRON	ASTM A126 Class B

Valve Size _____ Flg. Drilling Ansi 150
Pressure Rating 175psi
Distributor _____
CUSTOMER G.E. ZENON
Project Number _____
Contractor _____
Bray Order _____
Certified Correct By S.S. Date Jan. 2007

The High Performance Company
BRAY CONTROLS CANADA
A Subsidiary of BRAY INTERNATIONAL, Inc.

PARTS LIST AND DIMENSIONS (inches)
SERIES 30 BUTTERFLY VALVE
SIZES 2" – 12"

Series	Size	Part No.	Material Trim Code	Drawing No.
30	XXXX	11010	119	CN–070105

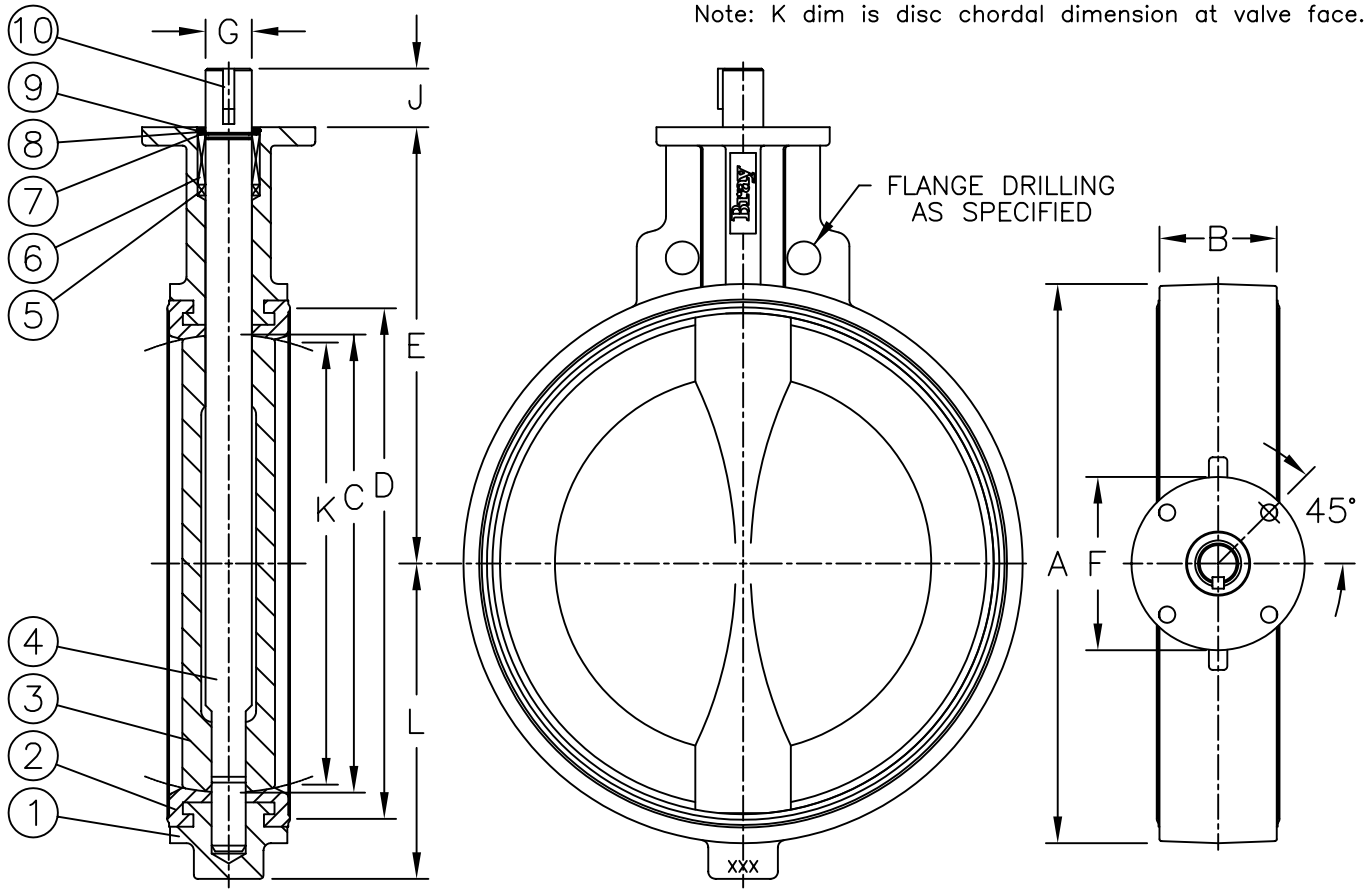
Bray

Bray CONTROLS CANADA CORPORATION

SERIES 30
CN–070106
Date: January 2007

Valve Size	A	B	C	D	E	F	Top Plate Drilling BC	Top Plate Drilling No. of Holes	Top Plate Drilling Hole Diameter	G	J	Key Size	K	L	Adapter Code	Weight (lbs)
14"	17.05	3.00	13.25	15.28	13.62	5.91	4.92	4	.57	1.38	2.00	.39x.39	13.04	9.38	F	95
16"	19.21	4.00	15.25	17.41	14.75	5.91	4.92	4	.57	1.38	2.00	.39x.39	14.85	10.75	F	135
18"	21.12	4.25	17.25	19.47	16.00	8.27	6.50	4	.81	1.97	2.50	.47x.39	16.85	12.00	G	200
20"	23.25	5.00	19.25	21.59	17.25	8.27	6.50	4	.81	1.97	2.50	.47x.39	18.73	13.72	G	260

DRAWING NOT TO SCALE, GENERAL ARRANGEMENT DRAWING ONLY.
Note: K dim is disc chordal dimension at valve face.



ITEM No.	NAME	No. REQUIRED	SERIES/PART No.	MATERIAL	SPECIFICATION/REMARKS
10	KEY	1		18–8SS	
9	RETAINING RING	1		304SS	
8	THRUST WASHER	1		BRONZE	
7	STEM RETAINER	2		BRONZE	
6	BUSHING	1		ACETAL	
5	PACKING	1		BUNA–N	
4	STEM	1		416SS	ASTM A582 Type 416
3	DISC	1		NDI	Nylon 11 coated Ductile Iron
2	SEAT	1		EPDM	FOOD GRADE
1	BODY	1		CAST IRON	ASTM A126 Class B

Valve Size _____ Flg. Drilling Ansi 150
Pressure Rating 150psi
Distributor _____
CUSTOMER G.E. ZENON
Project Number _____
Contractor _____
Bray Order _____
Certified Correct By S.S. Date Jan. 2007

The High Performance Company
BRAY CONTROLS CANADA
A Subsidiary of BRAY INTERNATIONAL, Inc.

PARTS LIST AND DIMENSIONS
SERIES 30 BUTTERFLY VALVE
SIZES 16" thru 20"

Series	Size	Part No.	Material Trim Code	Drawing No.
30	XXXX	11010	119	CN–070106

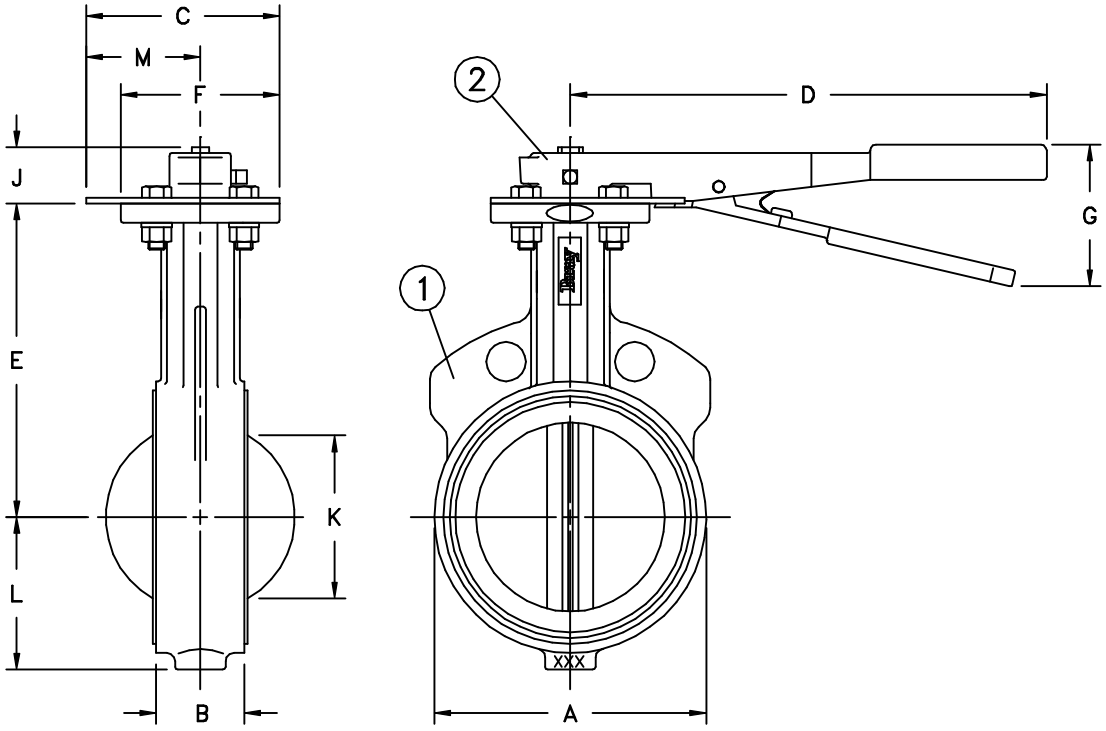
Bray

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SERIES 30
ES11A-0254
Date: JULY 1996

Valve Size	A	B	C	D	E	F	G	J	K	L	M
2"	3.69	1.62	4.32	10.62	5.50	3.54	3.16	1.25	1.32	2.22	2.55
2½"	4.19	1.75	4.32	10.62	6.00	3.54	3.16	1.25	1.91	2.47	2.55
3"	4.88	1.75	4.32	10.62	6.25	3.54	3.16	1.25	2.55	2.81	2.55
4"	6.06	2.00	4.32	10.62	7.00	3.54	3.16	1.25	3.57	3.41	2.55
5"	7.12	2.12	4.32	10.62	7.50	3.54	3.16	1.25	4.63	4.03	2.55
6"	8.12	2.12	4.32	10.62	8.00	3.54	3.16	1.25	5.45	4.53	2.55
8"	10.50	2.50	6.66	11.75	9.50	5.91	3.16	1.25	7.45	5.75	3.70
10"	12.75	2.50	6.66	11.75	10.75	5.91	3.16	2.00	9.53	7.12	3.70
12"	14.88	3.00	6.66	11.75	12.25	5.91	3.16	2.00	11.47	8.12	3.70

Note: K dim is disc chordal dimension at valve face.



ITEM No.	NAME	No. REQUIRED	SERIES/PART No.	MATERIAL	SPECIFICATION/REMARKS
2	HANDLE KIT	1			
1	VALVE	1			

Valve Size _____ Flg. Drilling _____
Pressure Rating _____
Customer/Project _____
Inq./P.O. No. _____
Bray Order No. _____
Certified Correct By _____ Date _____

The High Performance Company

BRAY VALVE & CONTROLS
A Subsidiary of BRAY INTERNATIONAL, Inc.

DIMENSIONAL DRAWING (inches)
SERIES 30, SIZES 2" THRU 12" BUTTERFLY VALVES
WITH SERIES 01 HANDLE KITS

Series	Size	Part No.	Material Trim Code	Drawing No.
				ES11A-0254

Bray

REV. RFP / ERN-2442

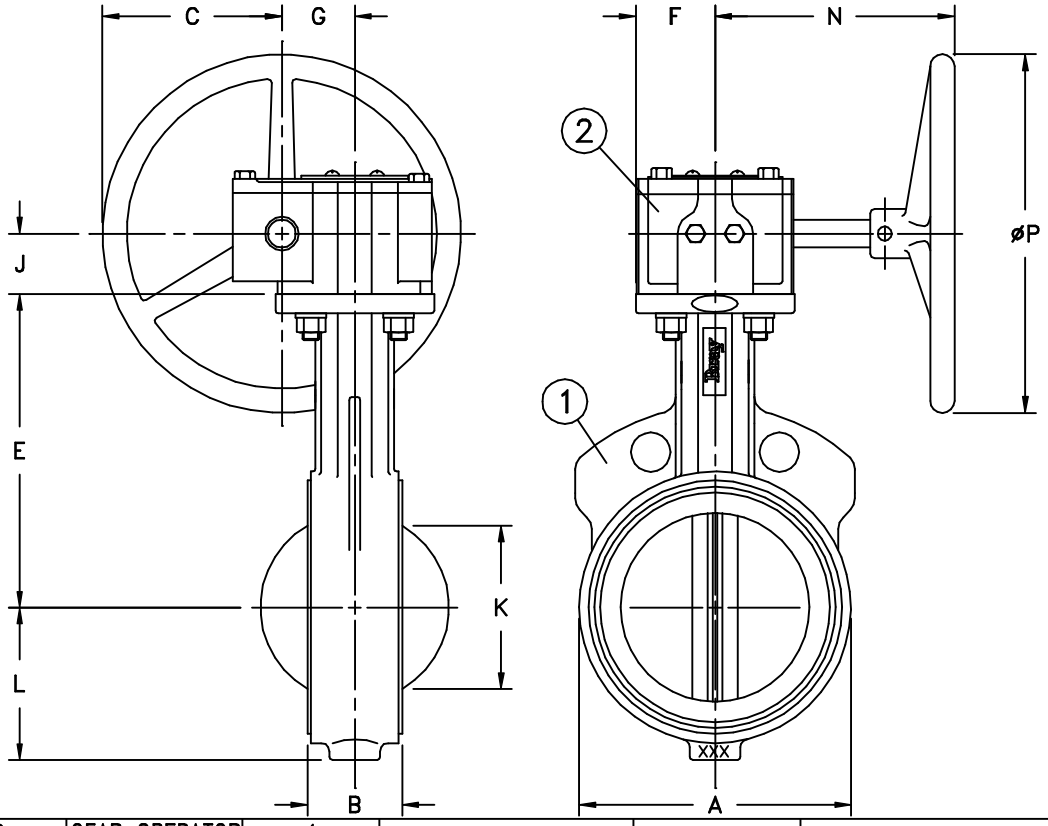
ESNUMBER

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SERIES 30
ES11A-0255
Date: JULY 1996

Valve Size	Gear Operator	A	B	C	E	F	G	J	K	L	N	P
2"	20:1	3.69	1.62	4.00	5.50	1.77	1.62	1.44	1.32	2.22	5.34	8
2½"	20:1	4.19	1.75	4.00	6.00	1.77	1.62	1.44	1.91	2.47	5.34	8
3"	20:1	4.88	1.75	4.00	6.25	1.77	1.62	1.44	2.55	2.81	5.34	8
4"	20:1	6.06	2.00	4.00	7.00	1.77	1.62	1.44	3.57	3.41	5.34	8
5"	20:1	7.06	2.12	4.00	7.50	1.77	1.62	1.44	4.63	4.03	5.34	8
6"	20:1	8.12	2.12	4.00	8.00	1.77	1.62	1.44	5.45	4.53	5.34	8
8"	30:1	10.50	2.50	4.00	9.50	2.96	2.62	1.25	7.45	5.75	7.50	8
10"	30:1	12.75	2.50	4.00	10.75	2.96	2.62	1.25	9.53	7.12	7.50	8
12"	30:1	14.88	3.00	4.00	12.25	2.96	2.62	1.25	11.47	8.12	7.50	8
14"	30:1	17.05	3.00	4.00	13.62	2.96	2.62	1.25	13.04	9.38	7.50	8
14"	50:1	17.05	3.00	6.00	13.62	2.96	3.12	1.69	13.04	9.38	11.94	12
16"	30:1	19.21	4.00	4.00	14.75	2.96	2.62	1.25	14.85	10.75	7.50	8
16"	50:1	19.21	4.00	6.00	14.75	2.96	3.12	1.69	14.85	10.75	11.94	12
18"	80:1	21.12	4.25	6.00	16.00	4.14	4.56	2.38	16.85	12.00	14.94	12
20"	80:1	23.25	5.00	6.00	17.25	4.14	4.56	2.38	18.73	13.72	14.94	12

Note: K dim is disc chordal dimension at valve face.



ITEM No.	NAME	No. REQUIRED	SERIES/PART No.	MATERIAL	SPECIFICATION/REMARKS
2	GEAR OPERATOR	1			
1	VALVE	1			

Valve Size _____ Flg. Drilling _____
Pressure Rating _____
Customer/Project _____
Inq./P.O. No. _____
Bray Order No. _____
Certified Correct By _____ Date _____

The High Performance Company

BRAY VALVE & CONTROLS
A Subsidiary of BRAY INTERNATIONAL, Inc.

DIMENSIONAL DRAWING (inches)
SERIES 30, SIZES 2" THRU 20" BUTTERFLY VALVES
WITH SERIES 04 GEAR OPERATORS

Series	Size	Part No.	Material Trim Code	Drawing No.
				ES11A-0255

Bray

REV. RFP / ERN-2442

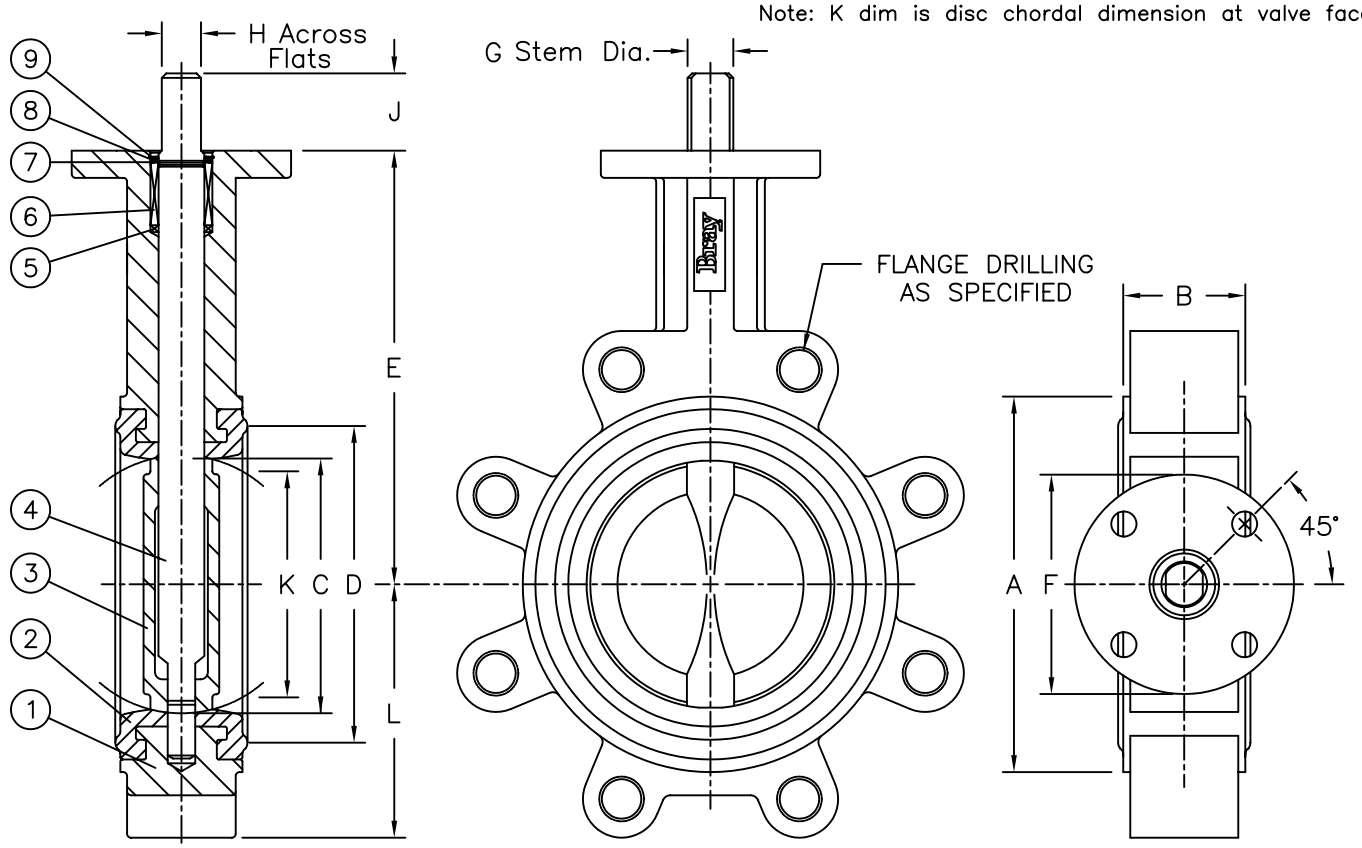
ESNUMBER

Bray CONTROLS CANADA CORPORATION

SERIES 31
CN–070103
Date: January 2007

Valve Size	A	B	C	D	E	F	Top Plate Drilling BC	Top Plate Drilling No. of Holes	Top Plate Drilling Hole Diameter	G	H	J	K	L	Lug Bolting Data BC	Lug Bolting Data No. of Holes	Lug Bolting Data Threads UNC–2B	Adapter Code	Weight (lbs)
2"	3.69	1.62	2.00	2.84	5.50	3.54	2.76	4	.39	.55	.39	1.25	1.32	2.30	4.75	4	.62–11	A	7.0
2.5"	4.19	1.75	2.50	3.34	6.00	3.54	2.76	4	.39	.55	.39	1.25	1.91	2.57	5.50	4	.62–11	A	8.0
3"	4.88	1.75	3.00	4.03	6.25	3.54	2.76	4	.39	.55	.39	1.25	2.55	2.81	6.00	4	.62–11	A	9.0
4"	6.06	2.00	4.00	5.16	7.00	3.54	2.76	4	.39	.63	.43	1.25	3.57	4.09	7.50	8	.62–11	B	15.0
5"	7.12	2.12	5.00	6.16	7.50	3.54	2.76	4	.39	.75	.51	1.25	4.63	4.61	8.50	8	.75–10	C	20.0
6"	8.12	2.12	5.75	7.02	8.00	3.54	2.76	4	.39	.75	.51	1.25	5.45	5.06	9.50	8	.75–10	C	23.0
8"	10.50	2.50	7.75	9.47	9.50	5.91	4.92	4	.57	.87	.63	1.25	7.45	6.05	11.75	8	.75–10	D	42.0
10"	12.75	2.50	9.75	11.47	10.75	5.91	4.92	4	.57	1.18	.87	2.00	9.53	7.69	14.25	12	.88–9	E	66.0
12"	14.88	3.00	11.75	13.47	12.25	5.91	4.92	4	.57	1.18	.87	2.00	11.47	9.02	17.00	12	.88–9	E	88.0

DRAWING NOT TO SCALE, GENERAL ARRANGEMENT DRAWING ONLY.
Note: K dim is disc chordal dimension at valve face.



ITEM No.	NAME	No. REQUIRED	SERIES/PART No.	MATERIAL	SPECIFICATION/REMARKS
9	RETAINING RING	1		304SS	
8	THRUST WASHER	1		BRONZE	
7	STEM RETAINER	2		BRONZE	
6	BUSHING	1		ACETAL	
5	PACKING	1		BUNA–N	
4	STEM	1		416SS	ASTM A582 Type 416
3	DISC	1		316SS	ASTM A351 CF8M
2	SEAT	1		EPDM	FOOD GRADE
1	BODY	1		CAST IRON	ASTM A126 Class B

Valve Size _____ Flg. Drilling Ansi 150
Pressure Rating 175psi
Distributor _____
CUSTOMER G.E. ZENON
Project Number _____
Contractor _____
Bray Order _____
Certified Correct By S.S. Date Jan. 2007

The High Performance Company
BRAY CONTROLS CANADA
A Subsidiary of BRAY INTERNATIONAL, Inc.

PARTS LIST AND DIMENSIONS (inches)
SERIES 31 BUTTERFLY VALVE
SIZES 2" – 12"

Series	Size	Part No.	Material Trim Code	Drawing No.
31	XXXX	11010	169	CN–070103

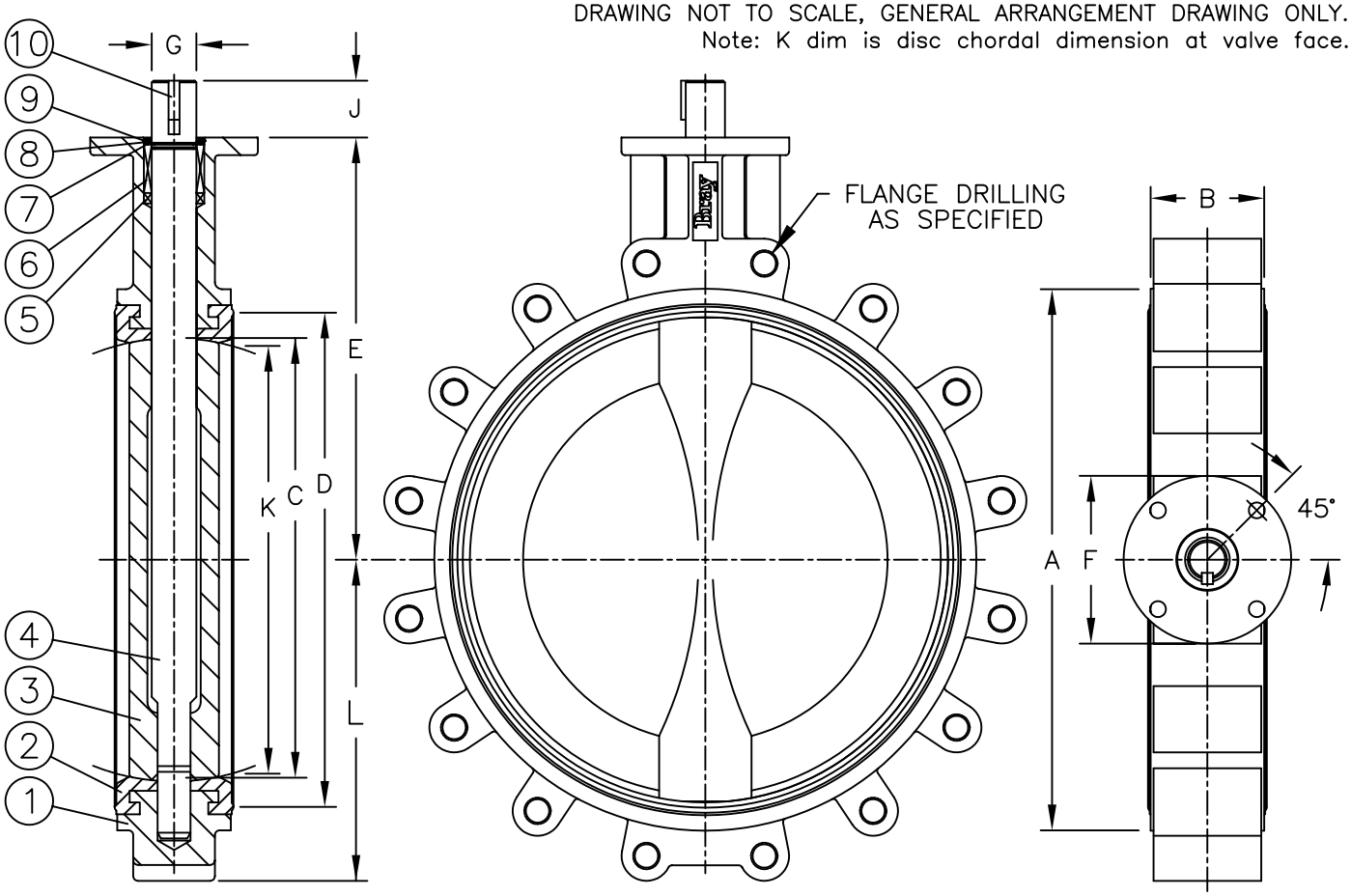
Bray

Bray CONTROLS CANADA CORPORATION

SERIES 31
CN–070104
Date: January 2007

Valve Size	A	B	C	D	E	F	Top Plate Drilling BC	Top Plate Drilling No. of Holes	Top Plate Drilling Hole Diameter	G	J	Key Size	K	L	Lug Bolting Data BC	Lug Bolting Data No. of Holes	Lug Bolting Data Threads UNC–2B	Adapter Code	Weight (lbs)
14"	17.05	3.00	13.25	15.28	13.62	5.91	4.92	4	.57	1.38	2.00	.39x.39	13.04	9.93	18.75	12	1.00–8	F	114
16"	19.21	4.00	15.25	17.14	14.75	5.91	4.92	4	.57	1.38	2.00	.39x.39	14.85	11.30	21.25	16	1.00–8	F	166
18"	21.12	4.25	17.25	19.47	16.00	8.27	6.50	4	.81	1.97	2.50	.47x.39	16.85	12.16	22.75	16	1.12–7	G	226
20"	23.25	5.00	19.25	21.59	17.25	8.27	6.50	4	.81	1.97	2.50	.47x.39	18.73	14.00	25.00	20	1.12–7	G	305

DRAWING NOT TO SCALE, GENERAL ARRANGEMENT DRAWING ONLY.
Note: K dim is disc chordal dimension at valve face.



ITEM No.	NAME	No. REQUIRED	SERIES/PART No.	MATERIAL	SPECIFICATION/REMARKS
10	KEY	1		18–8SS	
9	RETAINING RING	1		304SS	
8	THRUST WASHER	1		BRONZE	
7	STEM RETAINER	2		BRONZE	
6	BUSHING	1		ACETAL	
5	PACKING	1		BUNA–N	
4	STEM	1		416SS	ASTM A582 Type 416
3	DISC	1		316SS	ASTM A351 CF8M
2	SEAT	1		EPDM	FOOD GRADE
1	BODY	1		CAST IRON	ASTM A126 Class B

Valve Size _____ Flg. Drilling Ansi 150
Pressure Rating 150psi
Distributor _____
CUSTOMER G.E. ZENON
Project Number _____
Contractor _____
Bray Order _____
Certified Correct By S.S. Date Jan. 2007

The High Performance Company

BRAY CONTROLS CANADA
A Subsidiary of BRAY INTERNATIONAL, Inc.

PARTS LIST AND DIMENSIONS
SERIES 31 BUTTERFLY VALVE
SIZES 16" thru 20"

Series	Size	Part No.	Material Trim Code	Drawing No.
31	XXXX	11010	169	CN–070104

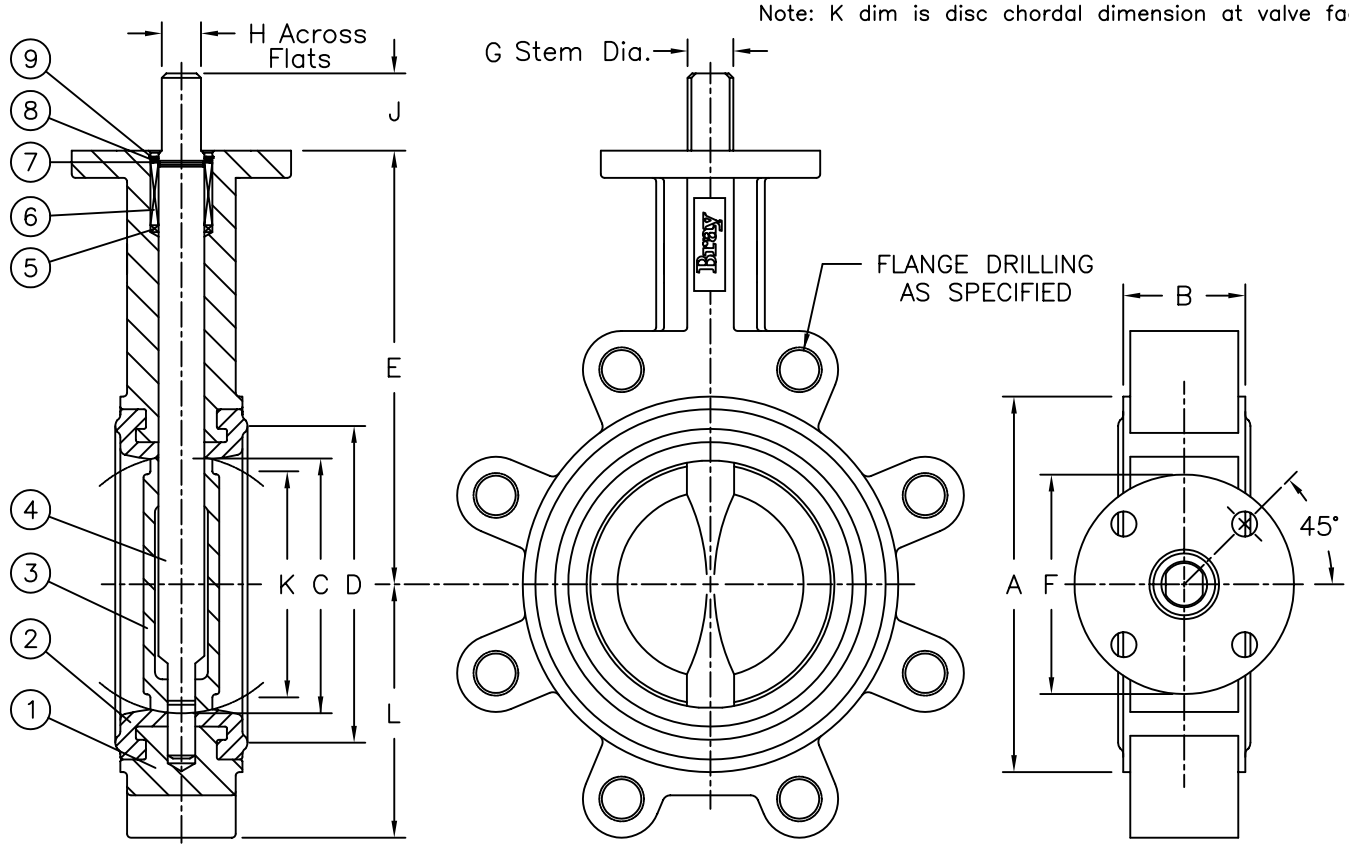
Bray

Bray CONTROLS CANADA CORPORATION

SERIES 31
CN–070107
Date: January 2007

Valve Size	A	B	C	D	E	F	Top Plate Drilling BC	Top Plate Drilling No. of Holes	Top Plate Drilling Hole Diameter	G	H	J	K	L	Lug Bolting Data BC	Lug Bolting Data No. of Holes	Lug Bolting Data Threads UNC–2B	Adapter Code	Weight (lbs)
2"	3.69	1.62	2.00	2.84	5.50	3.54	2.76	4	.39	.55	.39	1.25	1.32	2.30	4.75	4	.62–11	A	7.0
2.5"	4.19	1.75	2.50	3.34	6.00	3.54	2.76	4	.39	.55	.39	1.25	1.91	2.57	5.50	4	.62–11	A	8.0
3"	4.88	1.75	3.00	4.03	6.25	3.54	2.76	4	.39	.55	.39	1.25	2.55	2.81	6.00	4	.62–11	A	9.0
4"	6.06	2.00	4.00	5.16	7.00	3.54	2.76	4	.39	.63	.43	1.25	3.57	4.09	7.50	8	.62–11	B	15.0
5"	7.12	2.12	5.00	6.16	7.50	3.54	2.76	4	.39	.75	.51	1.25	4.63	4.61	8.50	8	.75–10	C	20.0
6"	8.12	2.12	5.75	7.02	8.00	3.54	2.76	4	.39	.75	.51	1.25	5.45	5.06	9.50	8	.75–10	C	23.0
8"	10.50	2.50	7.75	9.47	9.50	5.91	4.92	4	.57	.87	.63	1.25	7.45	6.05	11.75	8	.75–10	D	42.0
10"	12.75	2.50	9.75	11.47	10.75	5.91	4.92	4	.57	1.18	.87	2.00	9.53	7.69	14.25	12	.88–9	E	66.0
12"	14.88	3.00	11.75	13.47	12.25	5.91	4.92	4	.57	1.18	.87	2.00	11.47	9.02	17.00	12	.88–9	E	88.0

DRAWING NOT TO SCALE, GENERAL ARRANGEMENT DRAWING ONLY.
Note: K dim is disc chordal dimension at valve face.



ITEM No.	NAME	No. REQUIRED	SERIES/PART No.	MATERIAL	SPECIFICATION/REMARKS
9	RETAINING RING	1		304SS	
8	THRUST WASHER	1		BRONZE	
7	STEM RETAINER	2		BRONZE	
6	BUSHING	1		ACETAL	
5	PACKING	1		BUNA–N	
4	STEM	1		416SS	ASTM A582 Type 416
3	DISC	1		NDI	Nylon 11 coated Ductile Iron
2	SEAT	1		EPDM	FOOD GRADE
1	BODY	1		CAST IRON	ASTM A126 Class B

Valve Size _____ Flg. Drilling Ansi 150
Pressure Rating 175psi
Distributor _____
CUSTOMER G.E. ZENON
Project Number _____
Contractor _____
Bray Order _____
Certified Correct By S.S. Date Jan. 2007

The High Performance Company
BRAY CONTROLS CANADA
A Subsidiary of BRAY INTERNATIONAL, Inc.

PARTS LIST AND DIMENSIONS (inches)
SERIES 31 BUTTERFLY VALVE
SIZES 2" – 12"

Series	Size	Part No.	Material Trim Code	Drawing No.
31	XXXX	11010	119	CN–070107

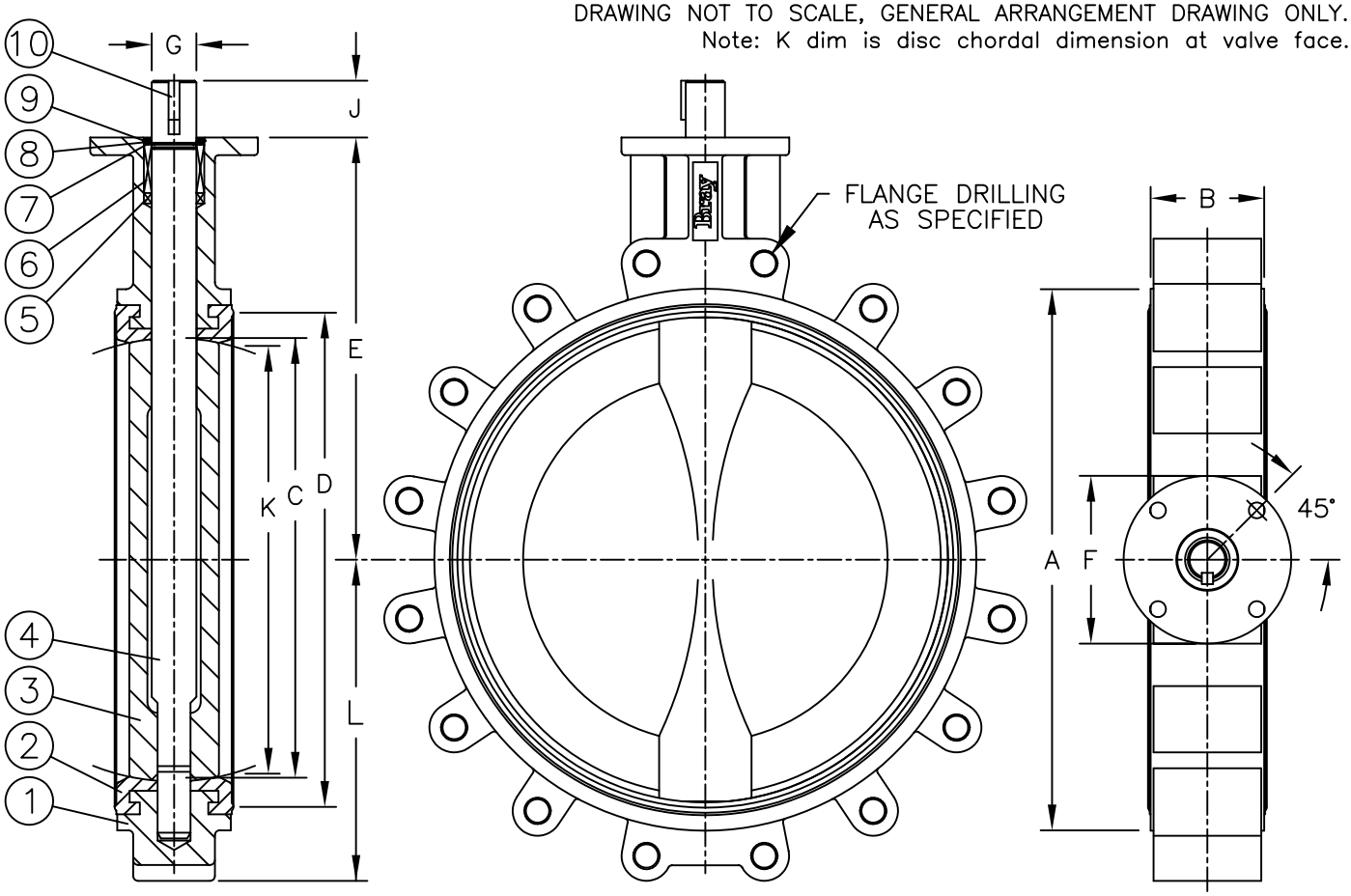
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Bray CONTROLS CANADA CORPORATION

SERIES 31
CN–070108
Date: January 2007

Valve Size	A	B	C	D	E	F	Top Plate Drilling BC	Top Plate Drilling No. of Holes	Top Plate Drilling Hole Diameter	G	J	Key Size	K	L	Lug Bolting Data BC	Lug Bolting Data No. of Holes	Lug Bolting Data Threads UNC–2B	Adapter Code	Weight (lbs)
14"	17.05	3.00	13.25	15.28	13.62	5.91	4.92	4	.57	1.38	2.00	.39x.39	13.04	9.93	18.75	12	1.00–8	F	114
16"	19.21	4.00	15.25	17.14	14.75	5.91	4.92	4	.57	1.38	2.00	.39x.39	14.85	11.30	21.25	16	1.00–8	F	166
18"	21.12	4.25	17.25	19.47	16.00	8.27	6.50	4	.81	1.97	2.50	.47x.39	16.85	12.16	22.75	16	1.12–7	G	226
20"	23.25	5.00	19.25	21.59	17.25	8.27	6.50	4	.81	1.97	2.50	.47x.39	18.73	14.00	25.00	20	1.12–7	G	305

DRAWING NOT TO SCALE, GENERAL ARRANGEMENT DRAWING ONLY.
Note: K dim is disc chordal dimension at valve face.



ITEM No.	NAME	No. REQUIRED	SERIES/PART No.	MATERIAL	SPECIFICATION/REMARKS
10	KEY	1		18–8SS	
9	RETAINING RING	1		304SS	
8	THRUST WASHER	1		BRONZE	
7	STEM RETAINER	2		BRONZE	
6	BUSHING	1		ACETAL	
5	PACKING	1		BUNA–N	
4	STEM	1		416SS	ASTM A582 Type 416
3	DISC	1		NDI	Nylon 11 coated Ductile Iron
2	SEAT	1		EPDM	FOOD GRADE
1	BODY	1		CAST IRON	ASTM A126 Class B

Valve Size _____ Flg. Drilling Ansi 150
Pressure Rating 150psi
Distributor _____
CUSTOMER G.E. ZENON
Project Number _____
Contractor _____
Bray Order _____
Certified Correct By S.S. Date Jan. 2007

The High Performance Company
BRAY CONTROLS CANADA
A Subsidiary of BRAY INTERNATIONAL, Inc.

PARTS LIST AND DIMENSIONS
SERIES 31 BUTTERFLY VALVE
SIZES 16" thru 20"

Series	Size	Part No.	Material Trim Code	Drawing No.
31	XXXX	11010	119	CN–070108

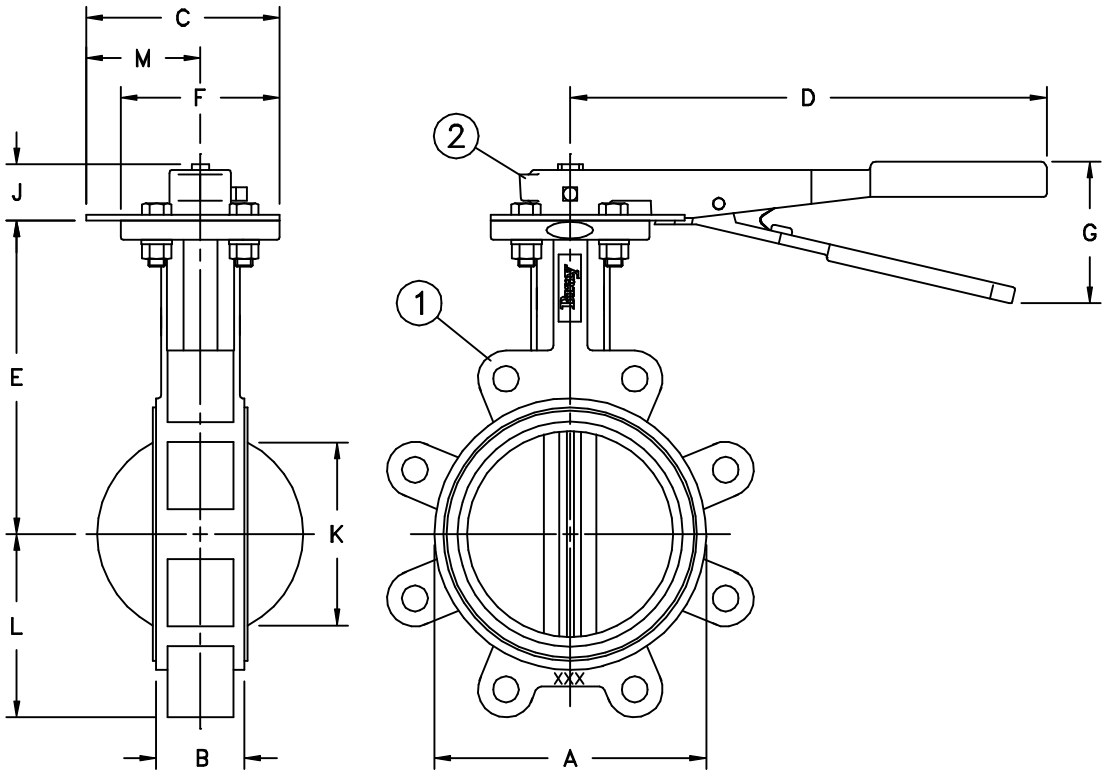
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SERIES 31
ES11A-0256
Date: JULY 1996

Valve Size	A	B	C	D	E	F	G	J	K	L	M
2"	3.69	1.62	4.32	10.62	5.50	3.54	3.16	1.25	1.32	2.30	2.55
2½"	4.19	1.75	4.32	10.62	6.00	3.54	3.16	1.25	1.91	2.57	2.55
3"	4.88	1.75	4.32	10.62	6.25	3.54	3.16	1.25	2.55	2.81	2.55
4"	6.06	2.00	4.32	10.62	7.00	3.54	3.16	1.25	3.57	4.09	2.55
5"	7.12	2.12	4.32	10.62	7.50	3.54	3.16	1.25	4.63	4.61	2.55
6"	8.12	2.12	4.32	10.62	8.00	3.54	3.16	1.25	5.45	5.06	2.55
8"	10.50	2.50	6.66	11.75	9.50	5.91	3.16	1.25	7.45	6.05	3.70
10"	12.75	2.50	6.66	11.75	10.75	5.91	3.16	2.00	9.53	7.69	3.70
12"	14.88	3.00	6.66	11.75	12.25	5.91	3.16	2.00	11.47	9.02	3.70

Note: K dim is disc chordal dimension at valve face.



ITEM No.	NAME	No. REQUIRED	SERIES/PART No.	MATERIAL	SPECIFICATION/REMARKS
2	HANDLE KIT	1			
1	VALVE	1			

Valve Size _____ Flg. Drilling _____
Pressure Rating _____
Customer/Project _____
Inq./P.O. No. _____
Bray Order No. _____
Certified Correct By _____ Date _____

The High Performance Company

BRAY VALVE & CONTROLS
A Subsidiary of BRAY INTERNATIONAL, Inc.

DIMENSIONAL DRAWING (inches)
SERIES 31, SIZES 2" THRU 12" BUTTERFLY VALVES
WITH SERIES 01 HANDLE KIT

Series	Size	Part No.	Material Trim Code	Drawing No.
				ES11A-0256

Bray

REV. RFP / ERN-2442

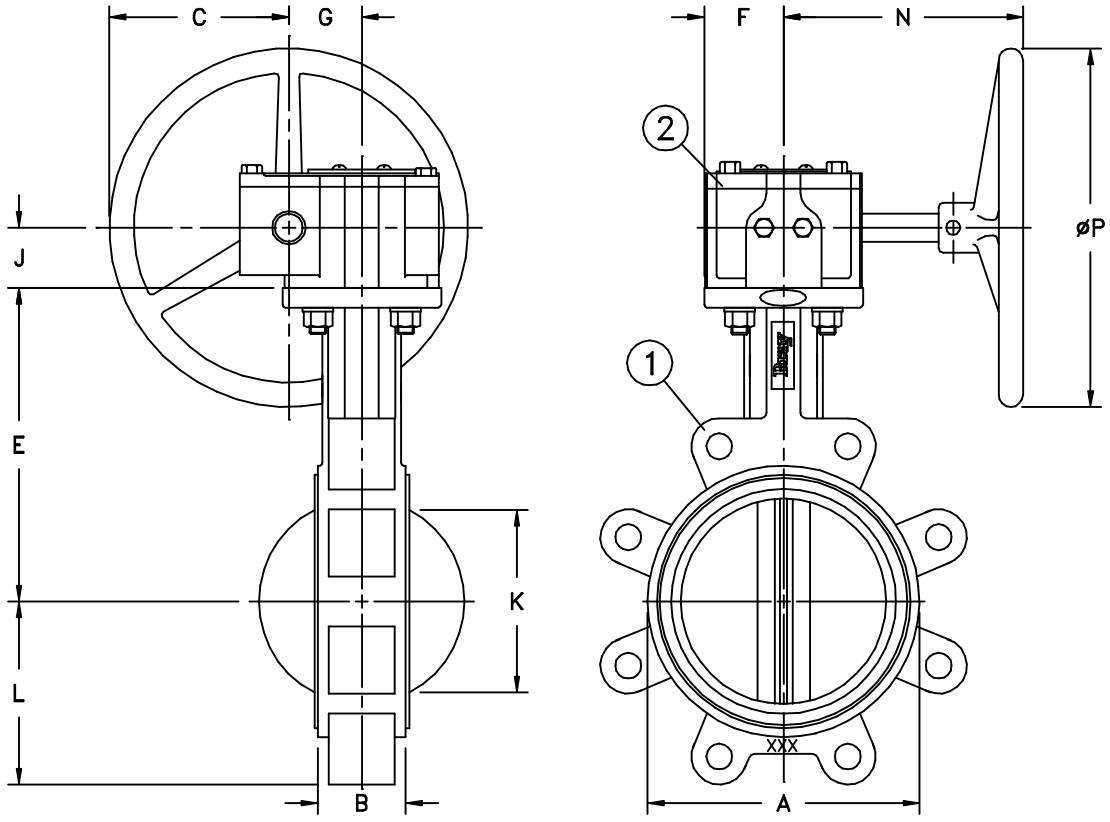
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SERIES 31
ES11A-0257
Date: JULY 1996

Valve Size	Gear Operator	A	B	C	E	F	G	J	K	L	N	P
2"	20:1	3.69	1.62	4.00	5.50	1.77	1.62	1.44	1.32	2.30	5.34	8
2½"	20:1	4.19	1.75	4.00	6.00	1.77	1.62	1.44	1.91	2.57	5.34	8
3"	20:1	4.88	1.75	4.00	6.25	1.77	1.62	1.44	2.55	2.81	5.34	8
4"	20:1	6.06	2.00	4.00	7.00	1.77	1.62	1.44	3.57	4.09	5.34	8
5"	20:1	7.06	2.12	4.00	7.50	1.77	1.62	1.44	4.63	4.61	5.34	8
6"	20:1	8.12	2.12	4.00	8.00	1.77	1.62	1.44	5.45	5.06	5.34	8
8"	30:1	10.50	2.50	4.00	9.50	2.96	2.62	1.25	7.45	6.05	7.50	8
10"	30:1	12.75	2.50	4.00	10.75	2.96	2.62	1.25	9.53	7.69	7.50	8
12"	30:1	14.88	3.00	4.00	12.25	2.96	2.62	1.25	11.47	9.02	7.50	8
14"	30:1	17.05	3.00	4.00	13.62	2.96	2.62	1.25	13.04	9.93	7.50	8
14"	50:1	17.05	3.00	6.00	13.62	2.96	3.12	1.69	13.04	9.93	11.94	12
16"	30:1	19.21	4.00	4.00	14.75	2.96	2.62	1.25	14.85	11.30	7.50	8
16"	50:1	19.21	4.00	6.00	14.75	2.96	3.12	1.69	14.85	11.30	11.94	12
18"	80:1	21.12	4.25	6.00	16.00	4.14	4.56	2.38	16.85	12.16	14.94	12
20"	80:1	23.25	5.00	6.00	17.25	4.14	4.56	2.38	18.73	14.00	14.94	12

Note: K dim is disc chordal dimension at valve face.



ITEM No.	NAME	No. REQUIRED	SERIES/PART No.	MATERIAL	SPECIFICATION/REMARKS
2	GEAR OPERATOR	1			
1	VALVE	1			

Valve Size _____ Flg. Drilling _____
Pressure Rating _____
Customer/Project _____
Inq./P.O. No. _____
Bray Order No. _____
Certified Correct By _____ Date _____

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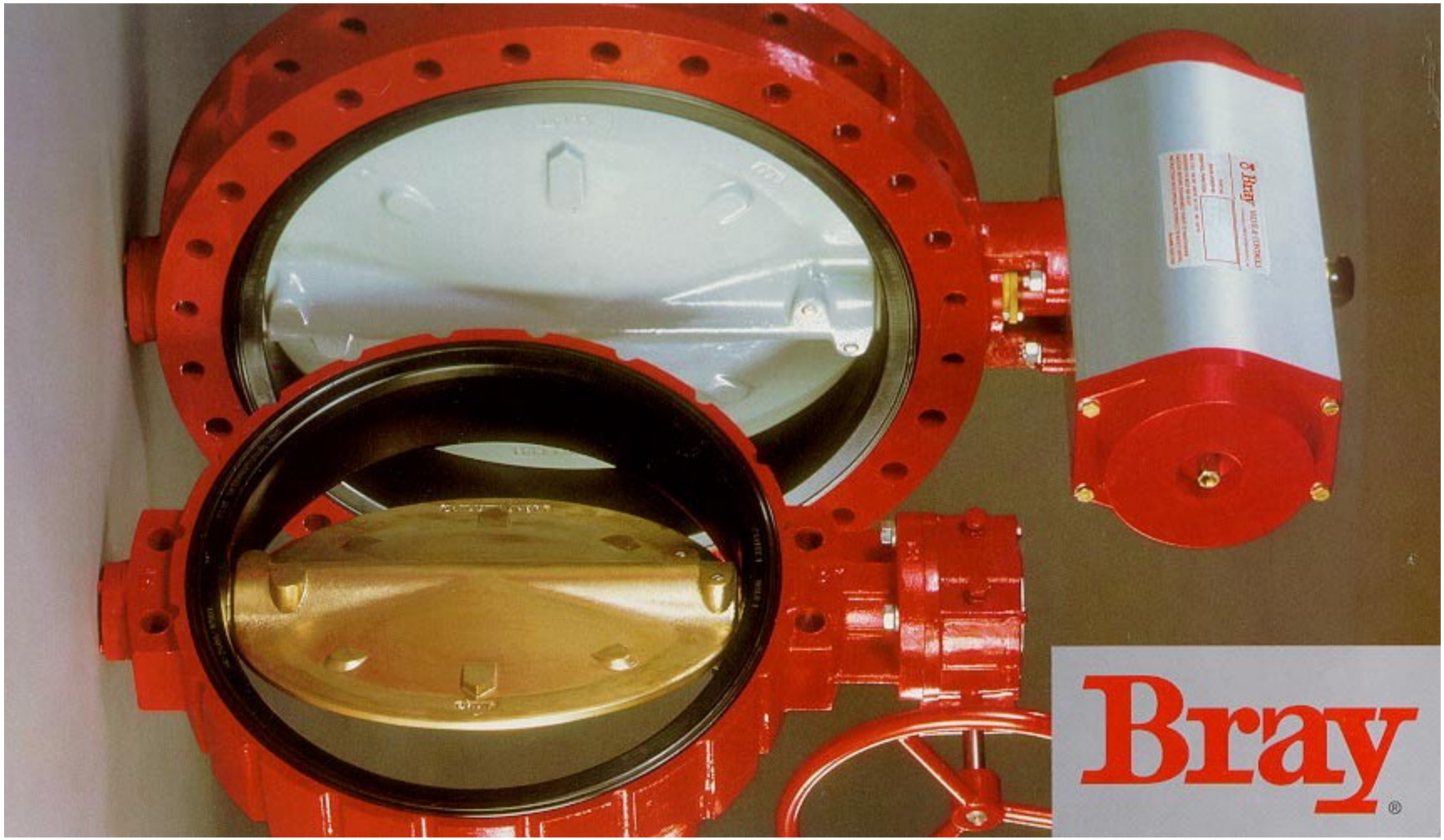
DIMENSIONAL DRAWING (inches)
SERIES 31, SIZES 2" THRU 20" BUTTERFLY VALVES
WITH SERIES 04 GEAR OPERATORS

Series	Size	Part No.	Material Trim Code	Drawing No.
				ES11A-0257

Bray

REV. RFP / ERN-2442

ESNUMBER



The High Performance Company

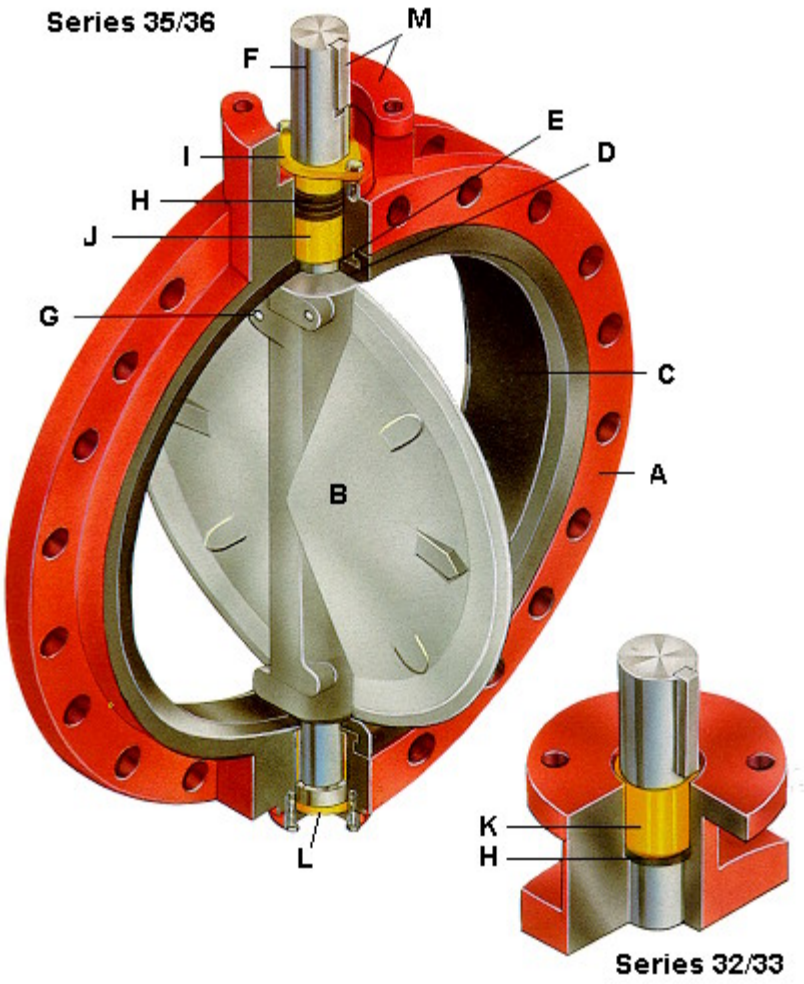
BUTTERFLY VALVES

LARGE DIAMETER / RESILIENT SEATED

SERIES 32 / 33 Wafer
22”-36” (550mm-900mm)
SERIES 35 / 36 Full Flanged
22”-72” (550mm-1800mm)

FEATURES

22”-72” (550mm-1800mm)
Bray Controls proudly offers this line of heavy duty, large diameter, resilient seated butterfly valves. The Series 32/33 valves are wafer versions with the Series 32 valve rated for 75 PSI and the Series 33 designed for a higher rating of 150 PSI. The Series 35/36 are full-flanged versions rated at 75 and 150 PSI respectively. This valve series has many of the design features and benefits of the smaller Bray valves, such as high Cv ratings, minimum parts exposed to the line media, greater reliability and a proven record of long service life. Engineering innovation and exceptional quality are the focus of Bray's unique design features.



BODY (A)
One piece wafer or full flanged style. All bodies are drilled to be compatible with ANSI 125/150 or other international flange standards. The Series 35/36 may be bolted to allow downstream flange removal or cross-bolted for maximum resistance to line stresses.

DISC (B)
The high strength casting is spherically machined, hand polished to provide 360° concentric seating bi-directional bubble-tight shut off, minimum torque and longer seat life. The symmetrical disc profile enhances valve performance - the C_v values are higher, turbulence is reduced and pressure recovery is increased. The disc O.D. clearance is designed to work with all standard piping.

SEAT (C)
One of the valve's key elements is Bray's unique *tongue and groove* seat design which fully isolates the body from line media. The Bray resilient seat offers lower torque than many valves on the market today, and is excellent for most vacuum services. The *tongue and groove* seat to body retention method is the most advanced design in the industry, making field replacement simple and fast. The strategically located molded-in O-ring completely eliminates the requirement of flange gaskets. The seat isolates the valve body and stem from line media and has been specifically designed to seal with slip-on or weld-neck flanges.

PRIMARY SEAL (D)
The primary seal is achieved by preloaded contact of spherically machined hand polished disc hubs with unique molded seat flat surfaces. This sealing method isolates the flowing media from the stem and body material at all angles of valve disc seating.

SECONDARY SEAL (E)
A secondary seal is achieved by an interference fit of the stem and seat hole diameters.

STEM (F)
Bray's one piece through stem design is completely isolated from the flowing media and achieves high torsional strength. The stem ends are standardized for direct mounting and interchangeability with Bray actuators.

TAPER PINS (G)
Tangential taper pins of 17-4 PH stainless steel are driven and mechanically locked for maximum torsional capacity and resistance to vibration. O-rings are installed with the driven-in taper pins to insure bubble-tight shutoff under pressure or vacuum conditions.

STEM PACKING (H)
This advanced V-Type packing design in the Series 35/36 is self-adjusting with bi-directional sealing which prevents external substances from entering the upper stem bore. This packing is externally adjustable and functions well for vacuum applications as well as third pressure seal in emergency situations. The stem packing in the Series 32/33 is a V-cup self-adjusting design.

ADJUSTABLE PACKING GLAND (I)
A bronze gland allows for field adjustment of stem packing without removing manual operators or power actuators. (Series 35/36 only)

STEM BEARING (J)
To minimize bearing friction and operating torque, heavy wall bronze sleeve bearings are utilized. (Series 35/36 only)

STEM BUSHING (K)
Heavy wall bronze bushing absorbs actuator side thrusts. (Series 32/33 only)

VERTICAL THRUST BEARING (L)
A bronze vertical thrust bearing eliminates disc displacement due to the weight of the stem and disc.

ACTUATOR MOUNTING FLANGE AND STEM CONNECTION (M)
Due to a modular concept of design, all Bray manual gear operators and pneumatic or electric actuators mount directly to Bray valves.

SPECIFICATIONS

RECOMMENDED SPECIFICATIONS FOR BRAY SERIES 32/33, 35/36 SHALL BE:

- Cast iron, wafer or double flanged bodies.
- Tongue-and-groove seat design with primary hub seal and a molded O-ring suitable for weld-neck and slip-on flanges.
- No field adjustments necessary to maintain optimum field performance.
- Seat totally encapsulates the body with no flange gaskets required.
- Spherically machined, hand polished disc edge and hub for minimum torque and maximum sealing capability.
- Equipped with non-corrosive bushing and self-adjusting stem seals for pressure or vaccum on wafer valves.
- On flanged valves, equipped with packing glands and upper/lower bronze bearings. The packing gland to be adjustable without removing manual operator or actuator.
- Bi-directional and tested to 110% of full pressure rating.
- Disc stem connected by 17-4 PH tangential taper pins driven, O-ring sealed, and mechanically locked.

MATERIALS SELECTION

22”-72” (550mm-1800mm)

BODY:

- Cast Iron ASTM A126 Class B
- Ductile Iron ASTM A536 Gr. 65-45-12
- Cast Steel ASTM A216 Gr. WCB
- 316 Stainless Steel ASTM A351 CF8M

DISC:

- Cast Iron ASTM A126 Class B
- Nylon 11 Coated, Cast Iron ASTM A126 Class B
- ENP Cast Iron ASTM A126 Class B
- Ductile Iron ASTM A536 Gr. 65-45-12
- Nylon 11 Coated, Ductile Iron ASTM A536
- Aluminum Bronze ASTM B148 Alloy C95400
- 316 Stainless Steel ASTM A351 CF8M
- Hastelloy® C-276 ASTM B575 Alloy N10276

SEAT:

- EPDM
- BUNA-N
- FKM*

STEM:

- Carbon Steel, Coated
- 304 Stainless Steel ASTM A276 Type 304
- Hastelloy® C-276 ASTM B575 Alloy N10276

C_v VALUES-VALVE SIZING COEFFICIENT BRAY SERIES 32/33, 35/36

Valve Size		Disc Position (degrees)								
ins	mm	90º	80º	70º	60º	50º	40º	30º	20º	10º
22	550	27,168	22,028	14,562	9,036	5,640	3,510	2,070	916	103
24	600	33,154	27,186	18,235	11,040	6,962	4,244	2,387	1,028	259
26	650	36,220	29,700	19,921	12,496	7,824	4,890	2,752	1,141	289
28	700	41,619	34,683	22,578	13,838	8,636	5,399	3,133	1,324	295
30	750	52,443	43,003	28,844	18,090	11,328	7,080	3,986	1,652	420
32	800	60,658	48,558	32,591	20,410	12,743	7,983	4,636	2,026	550
36	900	77,089	59,667	40,086	25,053	15,572	9,790	5,936	2,775	740
40	1000	90,175	73,990	50,406	30,636	19,307	11,862	6,925	2,971	757
42	1050	102,989	83,421	54,584	35,016	21,010	12,997	7,879	3,502	783
44	1100	112,960	87,430	58,740	36,712	22,818	14,346	8,698	4,066	904
48	1200	132,888	108,968	70,431	43,853	27,242	17,010	10,365	4,651	1,023
54	1400	168,700	138,334	89,411	55,671	34,583	21,594	13,158	5,904	1,299
60	1500	190,000	154,000	102,000	63,200	39,400	24,500	14,500	6,400	1,480
66	1650	211,000	171,000	113,000	70,200	43,800	27,300	16,100	7,110	1,650
72	1800	244,000	198,000	131,000	81,200	50,700	31,500	18,600	8,220	1,900

INSTALLATION

Position the disc in the partially open position, maintaining the disc within the body face-to-face. Place the body between flanges and install flange bolts. Do not use flange gaskets. Before tightening flange bolts, carefully open the disc to the full open position to ensure proper alignment and clearance of the disc O.D. with the adjacent pipe I.D. Leave the disc in the full open position and tighten flange bolts per required specification. Once bolts are tightened, carefully rotate disc to closed position to ensure disc O.D. clearance.

PRESSURE RATINGS

For bi-directional bubble tight shut off, disc in closed position.

Series 32 : 22”-36” 75 psig
Series 33 : 22”-36” 150 psig
Series 35 : 22”-72” 75 psig
Series 36 : 22”-72” 150 psig

All valves are factory tested to 110% of their specified pressure rating.

TAPER PINS:

- 17-4 PH Stainless Steel ASTM A564 Type 630 Condition H900

Packing:

- Buna-N

Bearings:

- Luberized Bronze (Series 35/36)

Bushing:

- Luberized Bronze (Series 32/33)

Thrust Bearing:

- Bronze

TEMPERATURE RANGE OF SEATS

Type	Max	Min
EPDM	+250ºF (121ºC)	-40ºF (-40ºC)
Buna-N	+212ºF (100ºC)	0ºF (-18ºC)
FKM*	+400ºF (204ºC)	0ºF (-18ºC)

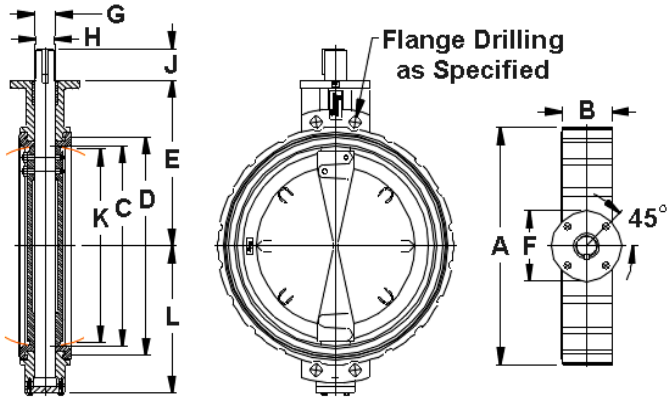
For other seat types consult factory

*FKM is the ASTM D1418 designation for Fluorinated Hydrocarbon Elastomers (also called Fluoroelastomers.)
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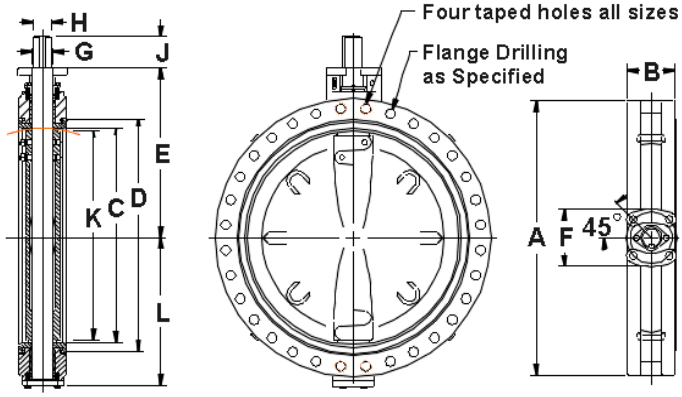
COMPONENTS

Item No.	Quantity		Item Description
	S.32/33	S.35/36	
1	1	1	Body
2	1	1	Seat
3	1	1	Disc
4	1	1	Stem
5	1	1	Bottom Plate
6	1	1	Packing
7	-	2	Bearing
8	2	2	Taper Pin
9	2	2	O-ring
10	2	2	Nut
11	2	2	Lock Washer
12	1	1	Thrust Bearing
13	1	1	Gasket
14	4	6	Screw
15	1	1	Key
16	-	1	Packing Gland
17	1	1	Retainer
18	1	-	Bushing

SERIES 32 / 33



SERIES 35 / 36



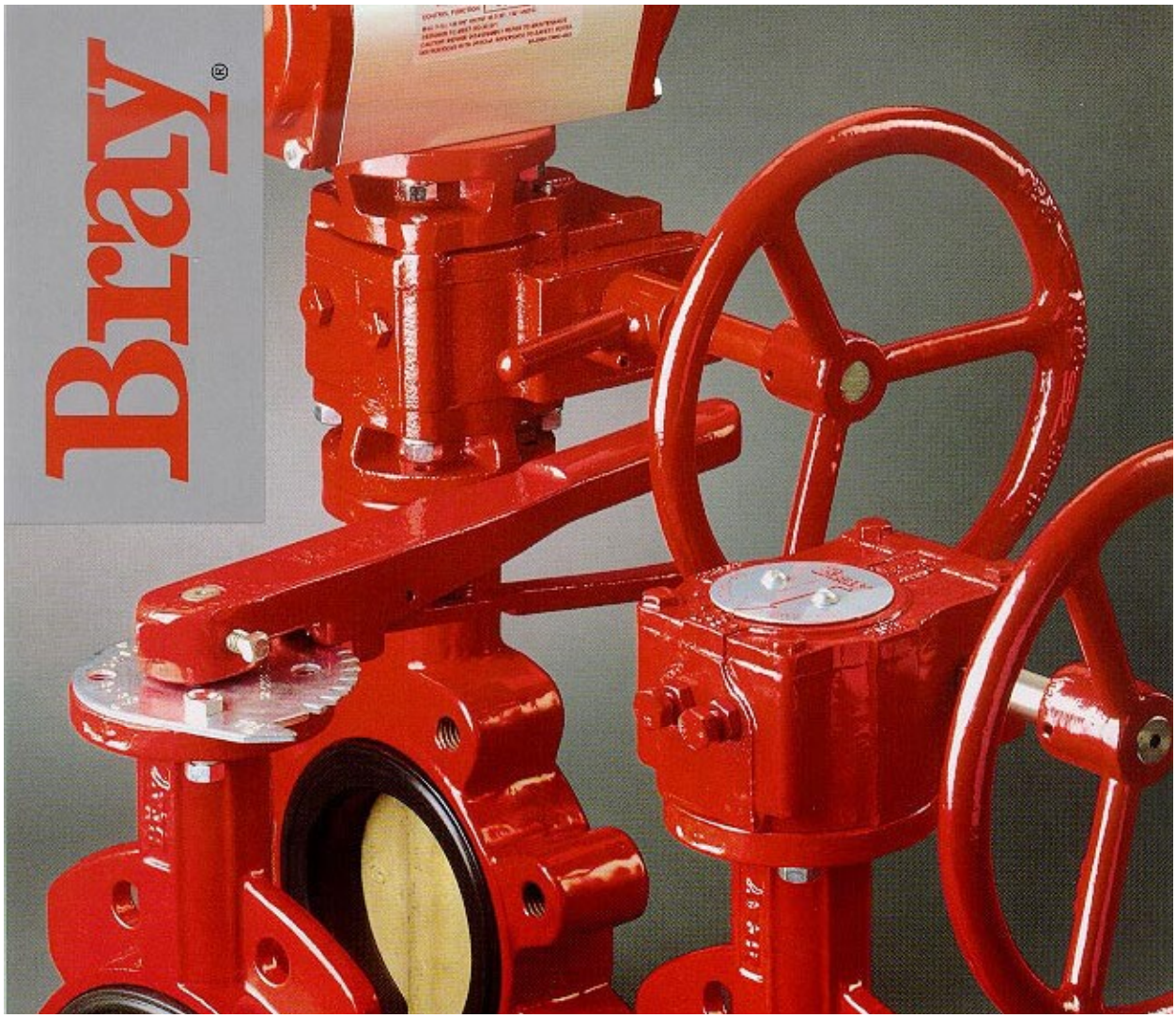
SERIES 32/33 Wafer*

Valve Size								Mtg. Flange Drig.				SERIES 32				SERIES 33					Wt (lb.)
ins	mm	A	B	C	D	E	F	PCD	No. Holes	Hole Dia.	G	H	J	Key Size	K	H	J	Key Size	K	L	
22	550	25.50	6.06	21.25	24.06	20.12	8.27	6.50	4	.81	2.50	2.50	4.00	.62x.62	20.51	2.50	4.00	.62x.62	20.56	16.50	400
24	600	27.94	5.94	23.25	25.75	19.50	8.27	6.50	4	.81	2.50	2.50	4.00	.62x.62	22.64	2.50	4.00	.62x.62	22.69	17.56	420
26	650	29.36	6.50	24.46	27.83	21.83	11.81	10.00	8	.75	2.50	2.50	4.00	.62x.62	23.67	2.50	4.00	.62x.62	23.71	18.83	540
28	700	31.34	6.50	26.59	29.76	22.82	11.81	10.00	8	.75	2.50	2.50	4.00	.62x.62	25.74	2.50	4.00	.62x.62	25.78	19.28	580
30	750	34.19	6.56	29.25	32.00	23.00	8.27	6.50	4	.81	3.00	2.50	4.00	.62x.62	28.67	3.00	4.00	.75x.75	28.73	20.81	660
32	800	35.555	7.48	30.39	33.70	26.37	11.81	10.00	8	.75	3.00	2.50	4.00	.62x.62	29.57	3.00	4.00	.75x.75	29.61	21.88	785
36	900	40.69	7.88	35.25	38.25	27.75	10.75	8.50	4	1.25	3.50	3.00	4.00	.75x.75	34.54	3.50	5.25	.88x.62	34.60	24.94	1025

SERIES 35/36 Double Flanged*

Valve Size								Mtg. Flange Drig.				SERIES 35				SERIES 36					Wt (lb.)
ins	mm	A	B	C	D	E	F	PCD	No. Holes	Hole Dia.	G	H	J	Key Size	K	H	J	Key Size	K	L	
22	550	29.50	6.06	21.25	24.06	20.12	8.27	6.50	4	.81	2.50	2.50	4.00	.62x.62	20.51	2.50	4.00	.62x.62	20.56	16.50	475
24	600	33.25	5.94	23.25	25.75	19.50	8.27	6.50	4	.81	2.50	2.50	4.00	.62x.62	22.64	2.50	4.00	.62x.62	22.69	17.56	500
26	650	35.75	6.50	24.46	27.83	21.83	11.81	10.00	8	.75	2.50	2.50	4.00	.62x.62	23.67	2.50	4.00	.62x.62	23.71	18.83	675
28	700	37.80	6.50	26.59	29.76	22.82	11.81	10.00	8	.75	2.50	2.50	4.00	.62x.62	25.74	2.50	4.00	.62x.62	25.78	19.78	735
30	750	38.75	6.56	29.25	32.00	23.00	8.27	6.50	4	.81	3.00	2.50	4.00	.62x.62	28.67	3.00	4.00	.75x.75	28.73	20.81	855
32	800	41.75	7.48	30.39	33.70	26.37	11.81	10.00	8	.75	3.00	2.50	4.00	.62x.62	29.57	3.00	4.00	.75x.75	29.61	21.88	1010
36	900	46.00	7.88	35.25	38.25	27.75	9.50	8.50	4	1.25	3.50	3.00	4.00	.75x.75	34.54	3.50	5.25	.88x.62	34.60	24.94	1320
40	1000	50.75	8.50	38.37	41.58	30.78	13.78	11.73	8	.81	4.00	3.50	5.25	.88x.62	37.45	4.00	5.25	1.0x.75	37.49	26.56	2140
42	1050	53.00	9.88	41.25	44.25	32.00	9.50	8.50	4	1.25	4.00	3.50	5.25	.88x.62	40.20	4.00	5.25	1.0x.75	40.25	27.81	2550
44	1100	55.25	9.88	43.25	46.25	33.12	13.78	11.73	8	.81	4.00	3.50	5.25	.88x.62	42.20	4.00	5.25	1.0x.75	42.25	29.06	2800
48	1200	59.50	10.88	47.25	50.62	36.00	10.75	8.50	4	1.25	5.00	4.00	5.25	1.0x.75	46.13	5.00	6.00	1.25x.88	46.18	31.06	3200
54	1400	69.00	15.36	54.12	57.50	40.62	13.78	11.73	8	.81	6.00	5.00	5.25	1.25x.88	51.88	-	-	-	-	37.19	6000
54	1400	69.00	15.36	54.12	57.50	40.62	16.34	14.02	8	1.30	6.00	-	-	-	-	6.00	6.50	1.50x1.0	51.88	37.19	6000
60^	1500	73.00	15.00	59.25	63.88	42.62	16.34	14.02	8	1.30	7.00	6.00	6.50	1.5x1.0	57.51	-	-	-	-	40.88	7000
60^	1500	73.00	15.00	59.25	63.88	42.62	18.70	15.98	8	1.56	7.00	-	-	-	-	7.00	6.50	1.75x1.5	57.56	40.88	7000
66	1650	80.00	18.00	65.14	69.89	48.62	16.34	14.02	8	1.30	7.00	6.00	6.50	1.5x1.0	62.91	-	-	-	-	44.56	8000
66	1650	80.00	18.00	65.14	69.89	48.62	18.70	15.98	8	1.56	7.00	-	-	-	-	7.00	6.50	1.75x1.5	62.98	44.56	8000
72	1800	86.50	18.00	69.24	73.75	52.25	18.70	15.98	8	1.56	8.50	7.50	8.00	1.75x1.5	67.03	-	-	-	-	47.44	11250
72	1800	86.50	18.00	69.24	73.75	52.25	22.05	19.02	12	1.56	8.50	-	-	-	-	8.50	10.00	2.0x1.5	67.08	47.44	11250

* Dimensions for the Series 36 valve are the same except for a larger key Size, H, J and K dimension. Dimensions for the 46" and 54"-72" Series 35 and Series 36 valevs differ and are listed separately.
^ Dimesions are for reference only. Consult factory for exact dimensions. Bray reserves the right to change product dimensions without notice.
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Manual Operators

Handle / Gear Operator / S.S. Gear Operator / Declutchable Gear Operator

Series 1: 1"-12" (25mm-300mm)
Series 4: 2"-54" (50mm-1400mm)
Series 4 Stainless Steel: 1"-16" (25mm-400mm)
Series 5: 2"-36" (50mm-900mm)

Bray Controls proudly offers four operators for manual control of valve position. All manual operators mount directly to Bray valves, and all are epoxy coated for excellent corrosion, abrasion and impact resistance.

SERIES 1 HANDLE & NOTCH PLATE

Bray offers two handles for on-off and throttling service - one for resilient seated valves from 1”-12" (25mm-300mm), and a high torque handle for high pressure valves from 2 ½”-8” (65mm-200mm). These quarter turn handles have a locking spring and a directional pointer for valve disc position indication. Bolted notch plates are offered. For resilient seated valves a 10 position plate is standard. For high pressure valves an 8 position plate is standard. Both contain on-off stops to prevent over rotation of the valve. Optionally available are an infinite position plate, a 180° notch plate, a memory stop, a padlock kit, and a 2” square nut version.

SERIES 4 GEAR OPERATOR

For heavy duty on-off and throttling service of 2”-54” (50mm-1400mm) valves, the Series 4 is self lubricated for smooth, trouble-free operation. The rugged, cast iron body with O-ring body seals is weatherproof to IP65. A self-locking worm and worm gear drive holds the valve in the desired position. Features include a readily accessible handwheel, a valve position indicator and mechanical travel stops which permit field adjustment of valve movement to specific degrees of rotation. Optionally available are chainwheel accessories, padlock kits and 2” square nut versions. A Gear Operator with a Stainless Steel housing is also available for valve sizes 1”-16”.

SERIES 4 STAINLESS STEEL GEAR OPERATOR

Bray Controls is proud to introduce the Series 4 quarter-turn stainless steel gear operator for manual control of valve position. The weatherproof stainless steel housing is ideal for applications in highly corrosive environments as well as in breweries, pharmaceutical and sanitary industries.

SERIES 5 DECLUTCHABLE GEAR OPERATOR

Available for 2”-36” (50mm-900mm) valves, the Series 5 offers the same superior features as the Series 4 gear operator with the added ability to manually override pneumatic actuators or rotate the valve when air pressure is not available. This operator is excellent for the safe handling of spring return actuators. During pneumatic operation, the worm of the gear unit is disengaged. Should the valve require opening or closing in the event of power loss, manual rotation of the declutch lever will provide a camming action and engage the worm to the segmented worm gear, allowing rotation of the valve using the handwheel. The Series 5 can be installed in the filed with existing Bray pneumatic actuators.

The High Performance Company



Standard 10 Position Notch Plate
has been designed to lock the handle securely in place, preventing position change of disc due to line pressure, vibration or shock. *Standard 8 Position Plate for high pressure valves is not shown*.



Infinite Position Notch Plate
for throttling applications, allows for very precise adjustments of valve disc positioning anywhere from 0° to 90°. Positioning is simply a matter of loosening the set knob, moving the handle, then retightening the knob. *For resilient seated valves only.*



Handle and 180° Notch Plate
allows the operator to switch the handle to either side without removing the notch plate from the valve.



Memory Stop
allows the operator to set the maximum amount the valve can open. When set, this limit will remain fixed until the stop is reset.



Padlock Kit
allows the customer to lock the valve in the full open or closed position, tamper proofing the valve. By drilling a new hole in the top plate, the handle can be locked in mid travel.



2" Square nut
is used where the valve is buried under the surface. To rotate valve disc position, the nut is reached with a T handle wrench.



Chainwheel for remote access to valve positioning when the handwheel is not accessible, such as valves positioned high out of reach.
A Padlock Kit and a 2" Square Nut version for buried service are also available with the Series 4 *(not shown)*.



Operation Any residual air pressure in the pneumatic actuator must be vented before operation of the Declutchable Gear Operator. Bray recommends the use of a vent valve to block the incoming air supply and vent residual air. Then engage the declutching lever and rotate the valve using the handwheel. When returning to automatic operation, disengage the manual override by rotating the declutching lever, turning the vent valve to off, then restoring air pressure to the actuator.



SERIES 04 STAINLESS STEEL
FEATURES
For on-off and throttling service of 1"-16" (25mm-400mm) butterfly valves. Torque range is 1,100 to 8,800 lb-in. The self-locking worm and worm gear drive holds the valve in the desired position. Features include an aluminum or stainless steel handwheel, a valve position indicator and mechanical travel stops that permit field adjustment of valve movement to specific degrees of rotation. Offered with a double "D" connection for 1"-12" valves and keyway for 14"-16" valves. Additionally, the Series 4 mounts directly to Bray valves, no brackets or adapters are required.

Bray® CONTROLS

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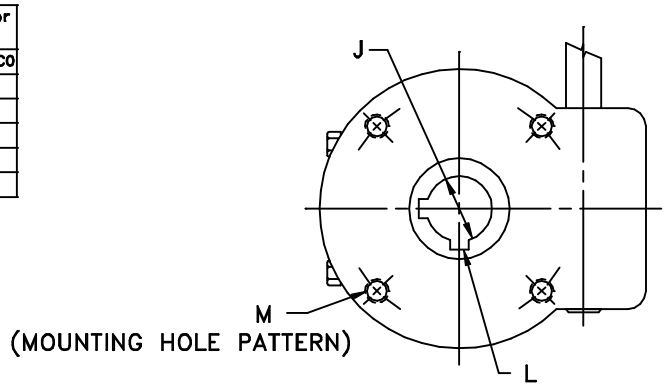
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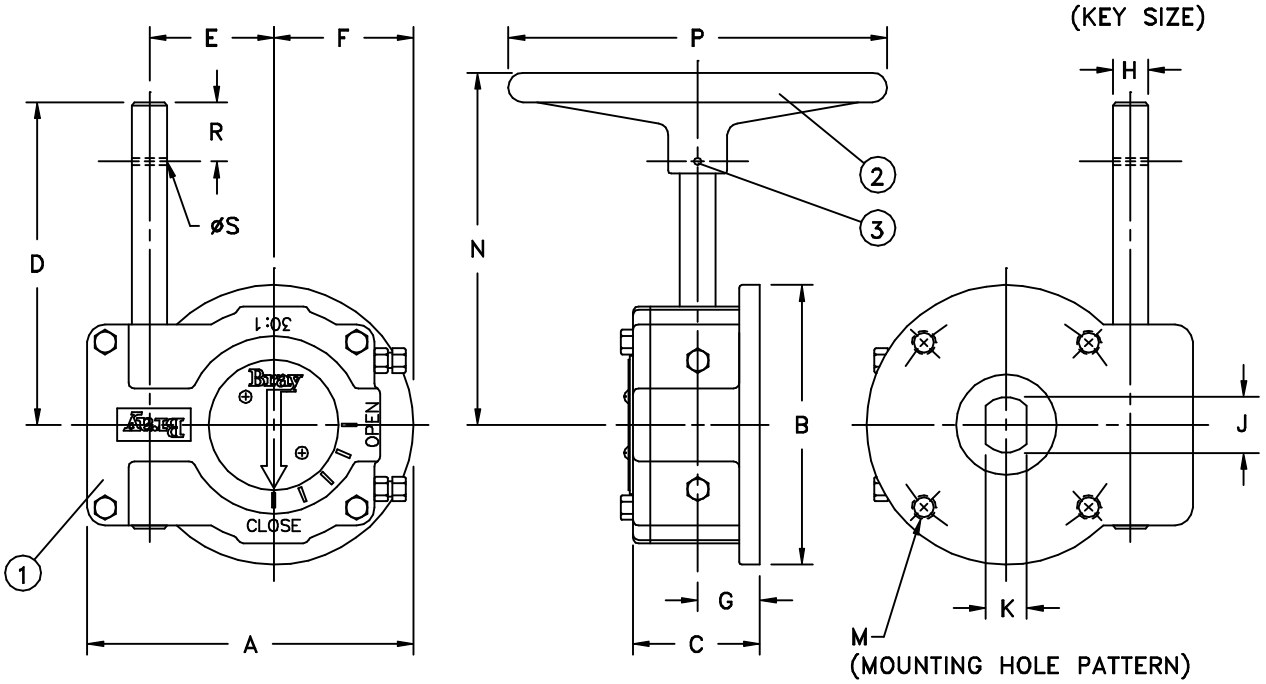
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SERIES 04
ES-0136
Date: March 1997

Size	RATIO	A	B	C	D	E	F	G	H	J	K	L	M (Mounting Hole Pattern) BC	No. of Holes	Threads UNC-2B	Depth	WT (lbs.)
0200	20:1	4.53	3.50	2.56	4.72	1.62	1.75	1.44	.63	.75	.51	---	2.76	4	.31-18	.50	9.8
0300	30:1	6.89	5.91	2.50	6.87	2.62	2.95	1.25	.75	1.18	.87	---	4.92	4	.50-13	.63	15.8
0300	30:1	6.89	5.91	2.50	6.87	2.62	2.95	1.25	.75	1.38	---	.39x.39	4.92	4	.50-13	.63	15.8
0500	50:1	7.53	5.91	3.28	11.00	3.12	2.95	1.69	.75	1.38	---	.39x.39	4.92	4	.50-13	.75	29.0
0800	80:1	10.51	8.27	4.39	14.00	4.56	4.14	2.38	1.00	1.97	---	.47x.39	6.50	4	.75-10	1.00	62.5
0800	80:1	10.51	8.27	4.39	14.00	4.56	4.14	2.38	1.00	2.50	---	.62x.62	6.50	4	.75-10	1.00	69.8

Size	N STD	N OPT	P STD	P OPT	R	øS	Torque (lb.in.)	Adaptor Code
0200	5.34	–	8	–	1.25	.156	2,000	A1,B1,C0
0300	7.50	7.69	8	12	1.25	.156	8,000	E0
0300	7.50	7.69	8	12	1.25	.156	8,000	F0
0500	11.81	–	12	–	1.62	.188	13,000	F0
0800	14.81	14.88	12	18	1.62	.188	24,000	G0
0800	14.88	–	18	–	1.50	.250	24,000	H0





ITEM No.	NAME	No. REQUIRED
3	ROLL PIN	1
2	HANDWHEEL	1
1	OPERATOR	1

Customer/Project _____
Inq./P.O. No. _____
Bray Order No. _____
Certified Correct By _____ Date _____

The High Performance Company
BRAY VALVE & CONTROLS
A Division of BRAY INTERNATIONAL, Inc.

DIMENSIONS (Inches)
GEAR OPERATOR, SERIES 04
SIZE 0200-0800

Series	Size	Part No.	Material Trim Code	Drawing No.
				ES-0136

Bray

REV. 3/ ERN 3586

Nylon 11 Coatings
Physical / Chemical Resistance Properties

The general physical properties of Nylon 11 coatings properly applied with primer and temperature are as follows:

Melting Point	363-367°F (irrespective of type of powder)
Specific Gravity at 68°F Coating in natural powders Coating in fine powder, white Coating in ES powder, white	 0.0376 lb/in^3 0.0385 lb/in^3 0.0403 lb/in^3
Solubility Solvent for tests and analysis Solvent for stripping	 metacresol; sulphuric acid, formic acid, alcohol-phenol mixtures Inpro CL, Turco 5061
Water absorption to saturation At 68°F and 65% RH At 68°F and 100% RH At 212°F and 100% RH (boiling water)	 0.9 to 1.1% (1 according) 1.6 to 1.9% (1 to the type) 2.4 to 3.0% (1 of powder)
Shore D hardness at 68°F, measured at a thickness greater than 0.2 inches to eliminate the influence of the substrate	75
Hardness measured with a Persoz pendulum at 68°F (AFNORT 30-016)	190
Rockwell hardness, R scale, ASTM D 785 at 68°F measured at a thickness greater than 0.2 inches to eliminate the influence of the substrate	106
Surface hardness according to DIN 53-456 at 68°F 10 sec. under load	11,600 PSI
Scratch resistance measured with the Clemen apparatus; load necessary to introduce a scratch which reaches the underlying metal for a coating of 0.016 inch thickness	13.3 lbf
Shear strength, ASTM D 732	5076-6092 PSI
Impact resistance Projectile with hemi-spherical head, 0.98 inches diameter, weighing 4.41 lbf., falling from height of 19.7 inches, horizontal coating 0.01 inches thick	 Excellent no fracture of the coating and metal not bared after impact

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Impact resistance (cont.) ATO test; cylindrical bar, 0.98 inches diameter, weighing 4.72 lbf, falling from 5.12 inches on to a coating 0.01 inches thick applied to a tubular substrate at a rate of 30 impacts per minute	After 4,000 impacts the coating is not fractured; the tubular substrate is deformed and the coating develops a matt finish
Abrasion resistance Taber abrasimeter (wheel type CS 17, load 2.21 lbf) loss of weight after 1,000 turns coefficient of friction	Excellent 1.76 to 2.82 x 10^{-4} oz. 0.10 – 0.30 (according to test conditions)
Tensile strength ASTM D 638 (Measured on a Stripped coating) Tensile strength at yield Elongation at yield Tensile strength at break	 4496-4786 PSI 18-24% 5656-6817 PSI
Specific heat	0.499 btu/lb °F
Thermal conductivity	2.01 btu in/ft^{2}h°F Between 323 and 443°K (122 & 338°F)
Latent heat of fusion	35.98 btu/lb
Coefficient of linear expansion ASTM D 696	5.055 x 10^{-5} / °F (-22 to 104°F) 8.33 x 10^{-5} / °F (104 to 248°F)
Inflammability ATM D 635 (measured at a Thickness greater than 0.12 inches to eliminate the influence of the substrate)	self-extinguishing
Transverse of volume resistivity ASTM D 257 at 68°F and 65% RH at 500V	8.89 x 10^{14}ohms / in^2 / in
Surface resistivity ASTM D 257 at 68°F and 65% RH at 500V	2.4 x 10^{14}ohms
Dielectric constant 10^2Hz 10^6Hz	 3.9 3.1
Tangent of the angle of loss (power factor) at 68°F and 65% RH at 1,000 V R.M.S. with a current of 1,000 Hz	0.05
Resistance to surface tracking DIN 53-480, KA method	Grade KA3c

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Dielectric strength measured at 68°F and 65% RH
Influence of the thickness studied on a natural coating:

0.008 in.	1.34 KV / .001 in.
0.017 in.	0.98 KV / .001 in.
0.028 in.	0.88 KV / .001 in.
0.035 in.	0.84 KV / .001 in.

Influence of color (pigments and colorants) studied at a thickness of 0.016 in.

Natural	0.99 KV / .001 in.
grey 49	0.775 KV / .001 in.
red 16	0.767 KV / .001 in.
black 26	0.288 KV / .001 in.

NOTE: From the point of view of electric insulation, the coating is completely satisfactory when its dielectric strength exceeds 0.457 KV / .001 in.

Resistance to boiling water	Excellent adhesion after 2,000 hours; with a special surface preparation this adhesion will be sustained for much longer; consult us for further details
Resistance to outdoor exposure And Ultra-Violet radiation	Very good in white, black Y and pastel-colored coatings Bray's red color is not subject to UV deterioration (chalking or cracking)
Resistance to salt spray	No corrosion after 2,000 hours exposure (ASTM B117 or AFNOR X 41-002)
Resistance to sea water	No corrosion after 10 years exposure

CHEMICAL PROPERTIES OF THE COATING

In general, Nylon 11 coatings have good resistance to inorganic salts, alkalis, most solvents and to organic acids. Greater caution must be observed in uses involving inorganic acids, phenols and certain chlorinated solvents. In such cases, it is advisable to consult Bray Inside Sales Department, specifying the practical problem involved; e.g. the temperature and chemical composition of the liquid or gas. Practical tests have shown that Nylon 11 coatings have excellent resistance to chemical solutions provided the material coated is properly prepared.

The following is a summary of Nylon 11 resistance to various chemicals, as a function of temperature.

A – Recommended, generally little or minor effect based on valve usage experience and recommendations from suppliers.

B – May sometimes be used depending on the conditions of application such as concentration and temperature. Testing is recommended before full scale usage.

N – Not recommended for usage.

BLANK – Insufficient evidence available.

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	Concentration	68°F	104°F	140°F	194°F
Inorganic bases					
Ammonia	Liquid or gas	A	A		
Ammonium hydroxide	Concentrated	A	A	A	A
Potassium hydroxide	50%	A	B	N	N
Sodium hydroxide	5%	A	A	B	
Sodium hydroxide	10%	A	B	B	
Sodium hydroxide	50%	A	B	N	N
Inorganic acids					
Chromic acid	10%	N	N	N	N
Hydrochloric acid	1%	A	B	N	N
Hydrochloric acid	10%	A	B	N	N
Nitric acid	all concentrations	N	N	N	N
Phosphoric acid	50%	A	B	N	N
Sulfur trioxide		B	N	N	N
Sulfuric acid	1%	A	B	B	N
Sulfuric acid	10%	A	B	N	N
Inorganic salts					
Alum	Concentrated solutions	A	A	A	
Aluminum sulfate	Or slurries	A	A	A	A
Ammonium nitrate	"	A	A	A	
Ammonium sulfate	"	N	A	B	
Barium chloride	"	A	A	A	A
Calcium arsenate	"	A	A	A	
Calcium chloride	"	A	A	A	A
Calcium sulfate	"	A	A	B	
Copper sulfate	"	A	A	A	A
Diammonium phosphate	"	A	A	B	
Magnesium chloride	50%	A	A	A	A
Potassium ferrocyanide	concentrated sclutions	A	A	A	
Potassium nitrate	or slurries	A	B	N	N
Potassium sulfate	"	A	A	A	A
Sodium silicate	"	A	A	A	A
Sodium sulfide	"	A	B	B	
Sodium carbonate	"	A	A	B	N
Sodium chloride	saturated concentrated	A	A	A	A
Trisodium phosphate	solutions or slurries	A	A	A	A
Other inorganic products					
Agricultural sprays		A	A		
Bleach solution		B	N	N	N
Bromine		N	N		
Chlorine		N	N	N	N
Fluorine		N	N	N	N
Hydrogen		A	A	A	A
Hydrogen peroxide	20 vol.	A	B		
Mercury		A	A	A	A
Oxygen		A	A	B	N
Ozone		B	N	N	N
Potassium permanganate	5%	N	N		
Sea water		A	A	A	A
Soda water		A	A	A	A
sulfur		A	A		

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	Concentration	68°F	104°F	140°F	194°F
Other inorganic products (cont'd)					
Water		A	A	A	A
Organic bases					
Aniline	Pure	B	N	N	N
Diethanolamine	20%	A	A	A	B
Pyridine	Pure	B	N	N	N
Urea		A	A	B	B
Organic acids and anhydrides					
Acetic acid		B	N	N	N
Acetic anhydride		B	N	N	N
Citric acid		A	A	B	N
Formic acid		N	N	N	N
Lactic acid		A	A	A	B
Oleic acid		A	A	A	B
Oxalic acid		A	A	B	N
Picric acid		B	N	N	N
Stearic acid		A	A	A	B
Tartaric acid	Saturated solution	A	A	A	B
Uric acid		A	A	A	B
Hydrocarbons					
Acetylene		A	A	A	
Benzene		A	A	B	
Butane		A	A	A	
Cyclohexane		A	A	B	
Decalin		A	A	A	B
Freon 12		A			
Freon 22		A			
Hexane		A	A	A	
Methane		A	A	A	
Naphthalene		A	A	A	B
Propane		A	A	A	
Styrene		A	A		
Tolunene		A	A	B	B
xylene		A	A	B	B
Alcohols					
Benzyl alcohol					
Butanol					
Ethanol					
Glycerine					
Glycol					
Methanol					
Aldehydes and Ketones					
Acetaldehyde		A	B	B	
Acetone	Pure	A	A	B	N
Benzaldehyde		A	B	N	
Cyclohexanone		A	B	N	
Formaldehyde	Technical	A	B	N	
Methylethylketone		A	A	B	N
Methylisobutylketone		A	A	B	N

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	Concentration	68°F	104°F	140°F	194°F
Chlorinated solvents					
Carbon tetrachloride		N			
Methyl bromide		A	N		
Methyl chloride		A	N		
Perchlorethylene		A	A	B	
Trichlorethane		B	N		
Trichlorethylene		A	B		
Phenols		N	N	N	N
Salts, Esters, Ethers					
Amyl acetate		A	A	A	B
Butyl acetate		A	A	A	B
Diethyl ether		A			
Dioctylphosphate		A	A	A	B
Diotylphthalate		A	A	A	
Ethyl acetate		A	A	A	
Fatty acid esters		A	A	A	A
Methyl acetate		A	A	A	
Methyl sulfate		A	B		
Tributylphosphate		A	A	A	B
Tricresylphosphate		A	A	A	B
Various organic compounds					
Anethole		A			
Carbon disulphide		A	B	N	
Diacetone alcohol		A	A	B	N
Dimethyl formamide		A	A	B	
Ethylene chlorhydrin		N	N		
Ethylene oxide		A	A	B	N
Furfurol		A	A	B	N
Glucose		A	A	A	A
Tetraethyl lead		A			
Tetrahydrofurane		A	A	B	
Various products					
Beer		A			
Cider		A			
Crude petroleum		A	A	A	
Diesel fuel		A	A	A	
Fruit juices		A	A		
Fuel oil		A	A	A	A
Greases		A	A	A	A
Ground-nut oil		A	A		
High octane petrol		A	A	A	
Kerosene (paraffin)		A	A	A	
Linseed cake		A	A	A	A
Milk		A	A	A	A
Mustard		A			
Normal petrol		A	A	A	
Oils		A	A	A	A
Sea water		A	A	A	
Sewer gas		A	A		
Soap solution		A			

All information herein is proprietary and confidential and may not be copied or reproduced without the expressed written consent of BRAY INTERNATIONAL, Inc.

	Concentration	68°F	104°F	140°F	194°F
Various Products (cont'd)					
Solutions or emulsions of:					
2.4 – D	Agricultural sprays	A			
D.D.T. or Lindane	Agricultural sprays	A			
Hydroxy-quinoline	Agricultural sprays	A			
Solvent naphtha		A	A	A	
Stearin		A	A	A	
Turpentine		A	A	A	
Vinegar		A			
Wine		A			

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Type 231, 232, 233 Pneumatically Actuated Ball Valve

TAGS:
20-FV-803-1/2/3/4
23-FV-130
23-FV-330
20-FV-803-6



Standard Features

- **Size**
  3/8"-4"
- **Material**
  PVC, CPVC, PROGEF® Standard, Polypropylene, SYGEF® PVDF
- **Connection Ends**
  Socket, Flanged, Spigot (PVDF and PP only), Threaded to 2" (up to 4" in PVC)
- **Seat**
  PTFE
- **Seals**
  EPDM or FPM
- **Mounting**
  Stainless steel threaded inserts for easy and secure mounting
- **Movement**
  Fail open, fail closed, and double acting
- **Mechanical**
  Namur compliant air connection and mounting console for accessories such as positioner and feed back switches
- **Visual position indicator**

Optional Features

- **Solenoid air control valve**
- **Stroke limiter**
- **Limit switches**
- **Declutchable Manual Override**
- **Electro-pneumatic positioner**

General

The Type 230 series pneumatically actuated ball valve from Georg Fischer is the ultimate choice for the high demands of the industrial world. It is available in PVC, CPVC, Polypropylene, and PVDF material. The valve can be configured for throttling or for simple open/close functionality. The optional declutchable manual override is ideal for applications where emergency operation of the valve is required. Additionally, the electro-pneumatic positioner, stroke limiter, and feed back switches give flexibility for integration into a wide variety of applications.

+GF+

GEORG FISCHER
PIPING SYSTEMS

Technical specifications Pneumatic Actuators 11/21 and 30-45

	PA 11/21	PA 30-45
	PA11/PA21	**PA30 - PA45**
Control Medium	neutral, non aggressive gases (max. 104°F)	neutral, non aggressive gases (max. 104°F)
Operating pressure	60 psi	see table below
Max. allowable operating pressure	100 psi	100 psi
Air connection	1/8" BSP (optional NPT adapter) Namur compliant	1/8" BSP (optional NPT adapter) Namur compliant
Actuation time	1-2 seconds	1-2 seconds
Actuation angle	90° F	90° F
Mode of operation	– Fail-safe close (FC) – Fail-safe open (FO) – Double acting (DA)	– Fail-safe close (FC) – Fail-safe open (FO) – Double acting (DA)
Operating temperature	14°F - 122°F	14°F - 176°F
Permissible humidity	0-100%	0-100%
Position indicator	visual	visual
Housing material	PP - glass filled	Aluminium hard anodized

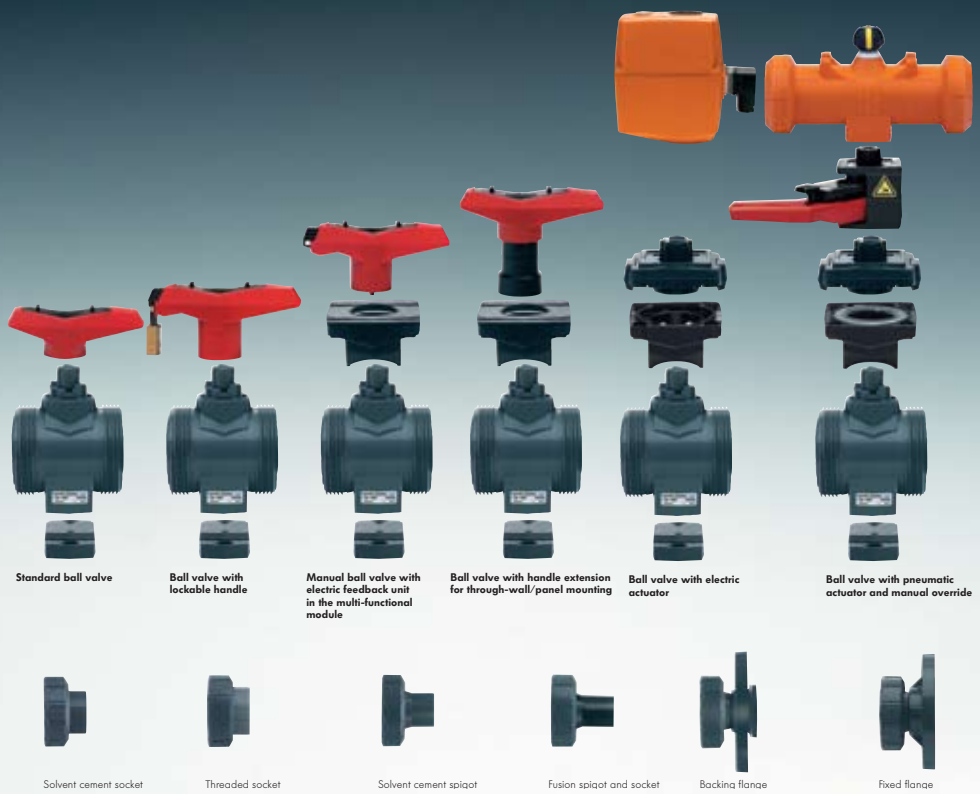
Actuator size

	3/8	½	¾	1	1¼	1½	2	2½	3	4
Fail-safe close (FC)	PA 11	PA 11	PA 11	PA 11	PA 21	PA 21	PA 21	PA 30	PA 35	PA 40
Fail-safe open (FO)	PA 11	PA 11	PA 11	PA 11	PA 21	PA 21	PA 21	PA 30	PA 35	PA 40
Double acting (DA)	PA 11	PA 11	PA 11	PA 11	PA 21	PA 21	PA 21	PA 35	PA 40	PA 45

Operating air pressure

[psi]	3/8	½	¾	1	1¼	1½	2	2½	3	4
Fail-safe close (FC)	60	60	60	60	60	60	60	43	60	60
Fail-safe open (FO)	60	60	60	60	60	60	60	43	60	60
Double acting (DA)	60	60	60	60	60	60	60	43	43	72

Ideal for Virtually any application

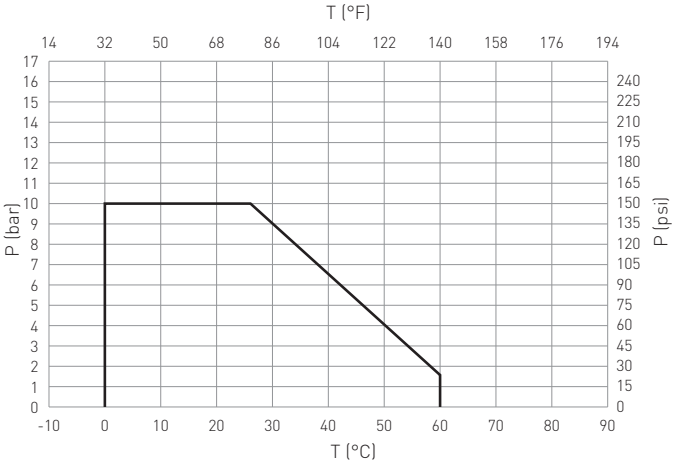


Technical Data

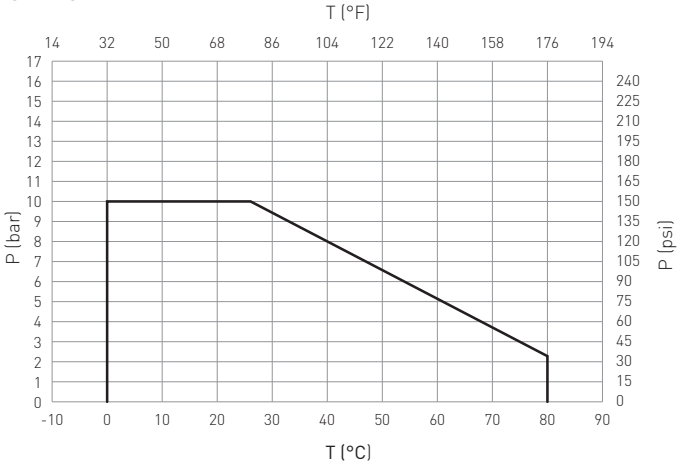
Pressure-Temperature Diagrams Technical data for Type 231, 232, 233 Ball Valves 3/8"-4"

The following pressure temperature diagrams are based on a lifetime of 25 years and the medium water or similar media

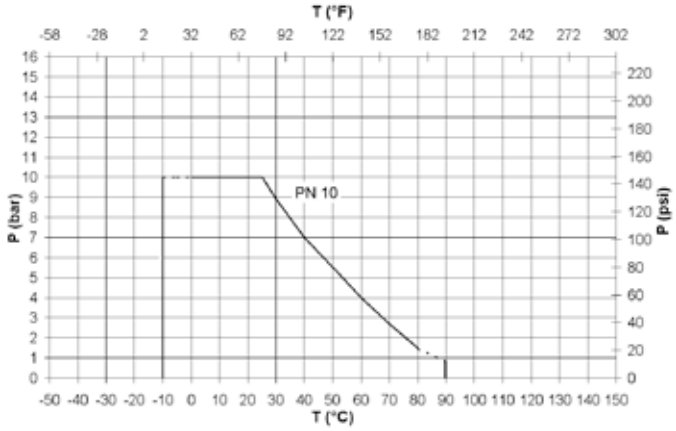
PVC



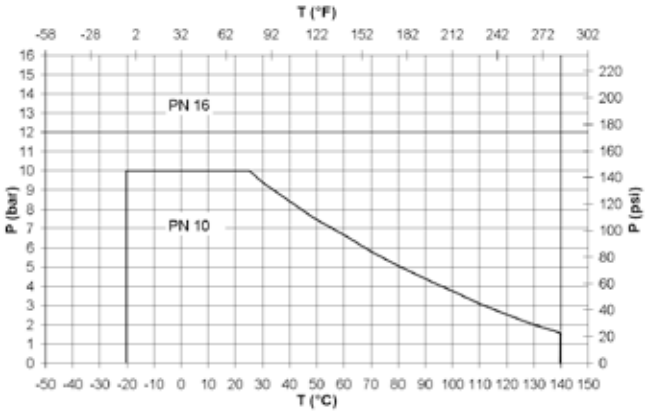
CPVC



PP

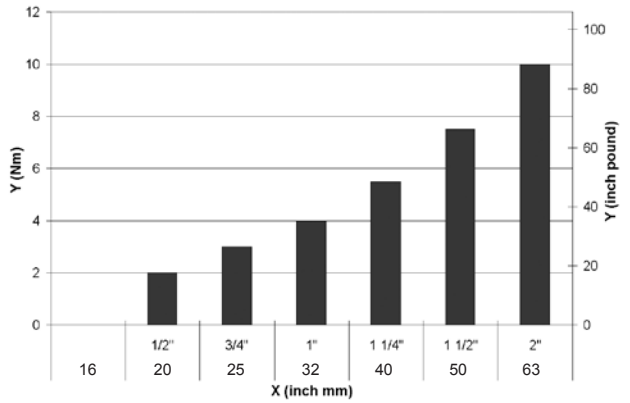


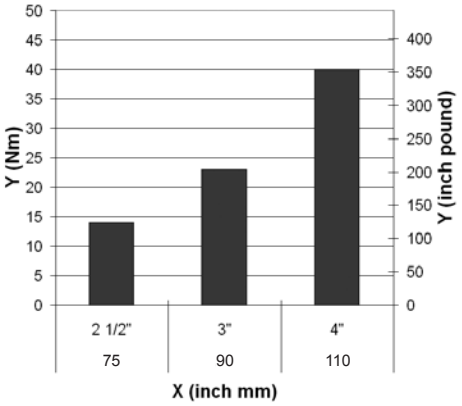
PVDF



Operating Torque

Average values at nominal pressure

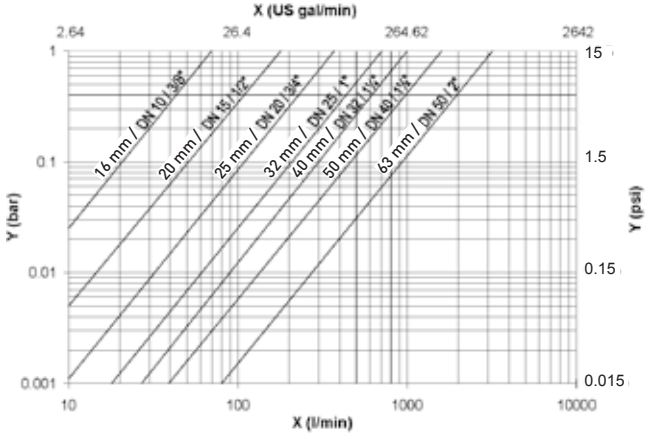


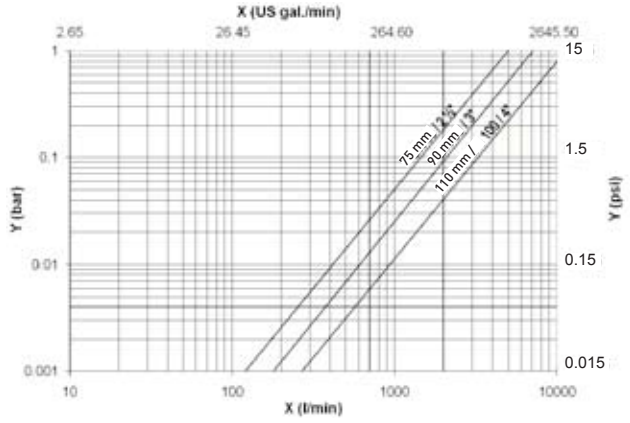


X Size (mm, inch)

Y Torque (Nm, inch pound)

Pressure loss



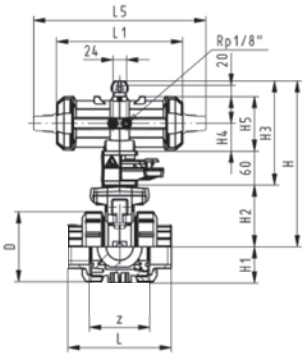


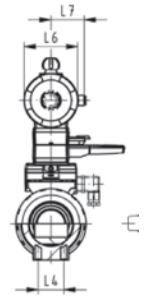
Medium: water, 20°C

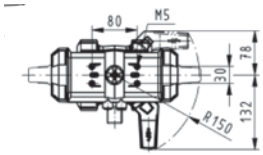
X Flow rate (l/min / U.S. gal/min)

Y Pressure loss Δp (bar / psi)

PVC/CPVC
Type 233 Pneumatically Actuated Ball Valve





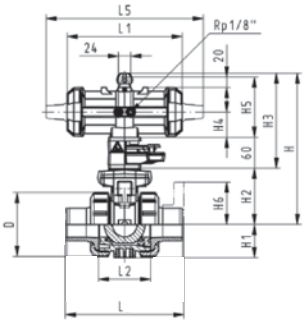


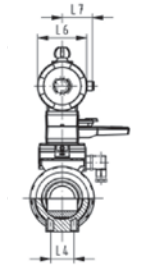
With manual override

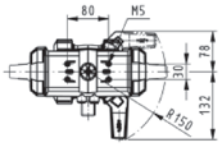
With solvent cement sockets/threaded NPT

Inch	Cv-value [gal/min]	psi		D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]
		socket	NPT						
3/8	4.9	150	150	50	230	27	62	168	40
½	12.9	150	150	50	230	27	62	168	40
¾	24.5	150	150	58	239	30	71	168	40
1	49.0	150	150	68	239	36	71	168	40
1¼	70.0	150	150	84	271	44	84	187	51
1½	112.0	150	150	97	271	51	84	187	51
2	217.1	150	150	124	293	64	106	187	51

H5 [mm]	L (mm)		L1 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	L8 [mm]	z [mm]
	Sockets	NPT							
97	105	98	194	25	261	76	48	76	64
97	105	98	194	25	261	76	48	76	64
97	121	111	194	25	261	76	48	76	72
97	133	127	194	25	261	76	48	76	79
115	154	147	224	45	305	95	59	95	94
115	164	157	224	45	305	95	59	95	95
115	183	183	224	45	305	95	59	95	107



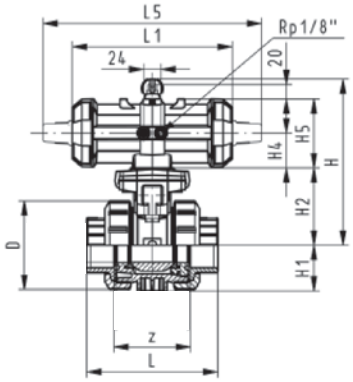


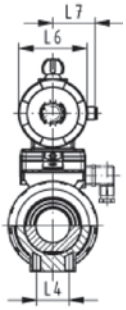


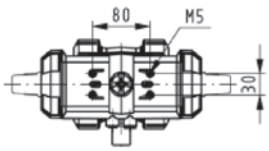
With flanges, ANSI

Inch	psi	Cv-value [gal/min]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H5 [mm]	L [mm]
½	150	12.9	50	230	27	62	168	97	149
¾	150	24.5	58	239	30	71	168	97	165
1	150	49.0	68	239	36	71	168	97	184
1¼	150	70.0	84	271	44	84	187	115	206
1½	150	112.0	97	271	51	84	187	115	221
2	150	217.0	124	293	64	106	187	115	251

L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]
194	56	25	261	76	48
194	65	25	261	76	48
194	71	25	261	76	48
224	85	45	305	95	59
224	89	45	305	95	59
224	101	45	305	95	59







Without manual override

With solvent cement sockets/threaded NPT

Inch	Cv-value [gal/min]	psi		D [mm]	H [mm]	H1 [mm]	H2 [mm]	H4 [mm]	H5 [mm]
		Socket	NPT						
3/8	4.9	150	150	50	167	27	62	40	97
½	12.9	150	150	50	167	27	62	40	97
¾	24.5	150	150	58	176	30	71	40	97
1	49.0	150	150	68	176	36	71	40	97
1¼	70.0	150	150	84	210	44	84	51	115
1½	112.0	150	150	97	210	51	84	51	115
2	217.0	150	150	124	232	64	106	51	115
2½	350.0	150	150	166	262	85	156		70
3	490.0	150	150	200	281	105	168		78
4	770.0	150	150	238	292	123	175		86

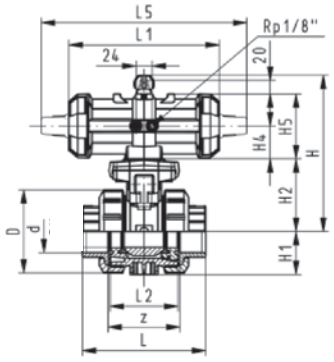
L [mm]		L1 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
Socket	NPT						
105	98	194	25	261	76	48	64
105	98	194	25	261	76	48	64
121	111	194	25	261	76	48	72
133	127	194	25	261	76	48	79
154	147	224	45	305	95	59	94
164	157	224	45	305	95	59	95
183	183	224	45	305	95	59	107
233	234	218	70	276	65		144
254	255	259	70	341	72		151
301	302	287	120	369	80		174

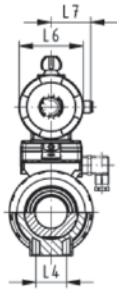
Without manual override

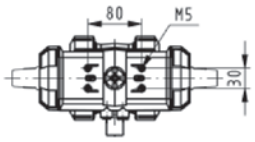
With flanges, ANSI

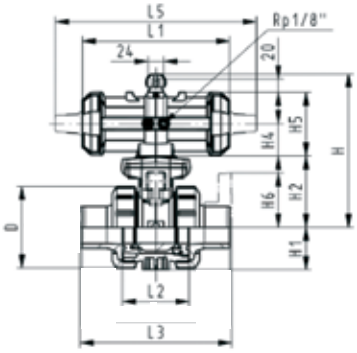
Inch	Cv-value [gal/min]	psi	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H4 [mm]	H5 [mm]
½	12.9	150	50	167	27	62	40	97
¾	24.5	150	58	176	30	71	40	97
1	49.0	150	68	176	36	71	40	97
1¼	70.0	150	84	210	44	84	51	115
1½	112.0	150	97	210	51	84	51	115
2	217.0	150	124	232	64	106	51	115
2½	350.0	150	166	262	85	156		70
3	490.0	150	200	281	105	168		78
4	770.0	150	238	292	123	175		86

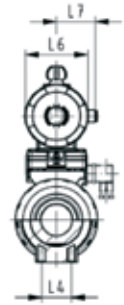
L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
149	194	56	25	261	76	48	60
165	194	65	25	261	76	48	60
184	194	71	25	261	76	48	69
206	224	85	45	305	95	59	75
221	224	89	45	305	95	59	89
251	224	101	45	305	95	59	110
311	218	136	70	276	65		144
343	259	141	70	341	72		151
397	287	164	120	369	80		174

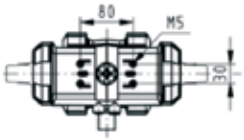












PROGEF® Standard Polypropylene Type 231 Pneumatically Actuated Ball Valve

Without manual override

With fusion sockets metric

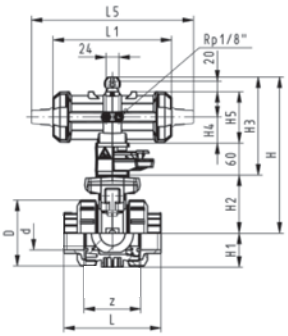
d	Cv-value [gal/min]	psi	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H4 [mm]	H5 [mm]	L [mm]
16	4.9	150	50	167	27	62	40	97	93
20	12.9	150	50	167	27	62	40	97	95
25	24.5	150	58	176	30	71	40	97	108
32	49.0	150	68	176	36	71	40	97	118
40	70.0	150	84	210	44	84	51	115	137
50	112.0	150	97	210	51	84	51	115	147
63	217.0	150	124	232	64	106	51	115	168
75	350.00	150	166	262	85	156		70	233
90	490.00	150	200	281	105	168		78	254
110	770.00	150	238	292	123	175		86	301

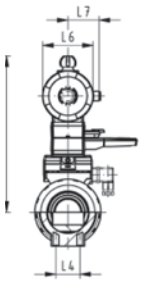
L1 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
194	25	261	76	48	67
194	25	261	76	48	66
194	25	261	76	48	77
194	25	261	76	48	83
224	45	305	95	59	99
224	45	305	95	59	105
224	45	305	95	59	117
218	70	276	65		167
259	70	341	72		180
287	120	369	80		215

With flanges ANSI

Inch	Cv-value [gal/min]	psi	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H4 [mm]	H5 [mm]	L [mm]
½	12.9	150	50	167	27	62	40	97	149
¾	24.5	150	58	176	30	71	40	97	165
1	49.0	150	68	176	36	71	40	97	184
1¼	70.0	150	84	210	44	84	51	115	206
1½	112.0	150	97	210	51	84	51	115	221
2	217.0	150	124	232	64	106	51	115	251
2½	350.0	150	166	262	85	156		70	311
3	490.0	150	200	281	105	168		78	343
4	770.0	150	238	292	123	175		86	397

L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]
56	25	261	76	48
65	25	261	76	48
71	25	261	76	48
85	45	305	95	59
89	45	305	95	59
101	45	305	95	59
136	70	276	65	
141	70	341	72	
164	120	369	80	



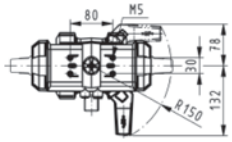


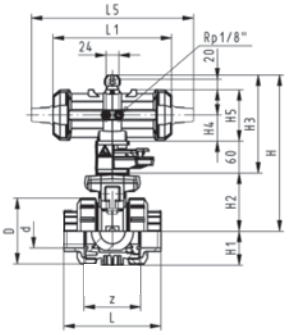
With manual override

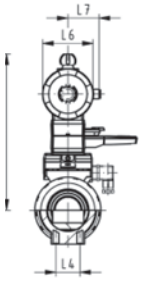
With fusion sockets metric

d	Cv-value [gal/min]	psi	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]
20	12.9	150	50	230	27	62	168	40	97
25	24.5	150	58	239	30	71	168	40	97
32	49.0	150	68	239	36	71	168	40	97
40	70.0	150	84	271	44	84	187	51	115
50	112.0	150	97	271	51	84	187	51	115
63	217.0	150	124	293	64	106	187	51	115

L [mm]	L1 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
95	194	25	261	76	48	66
108	194	25	261	76	48	77
118	194	25	261	76	48	83
137	224	45	305	95	59	99
147	224	45	305	95	59	105
168	224	45	305	95	59	117



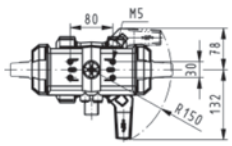


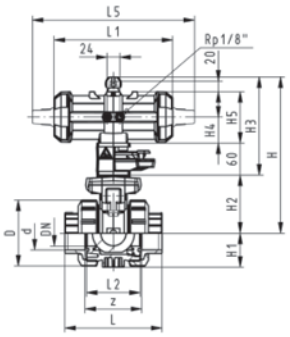


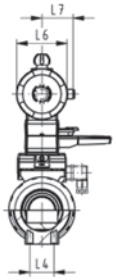
With threaded NPT

inch	Cv-value [gal/min]	psi	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]
3/8	4.9	150	50	230	27	62	168	40	97
½	12.9	150	50	230	27	62	168	40	97
¼	24.5	150	58	239	30	71	168	40	97
1	49.0	150	68	239	36	71	168	40	97
1¼	70.0	150	84	271	44	84	187	51	115
1½	112.0	150	97	271	51	84	187	51	115
2	217.0	150	124	293	64	106	187	51	115

L [mm]	L1 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
93	194	25	261	76	48	67
99	194	25	261	76	48	64
111	194	25	261	76	48	76
127	194	25	261	76	48	83
146	224	45	305	95	59	100
157	224	45	305	95	59	111
183	224	45	305	95	59	134



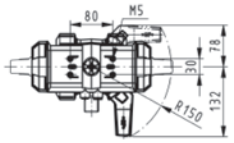




With flanges ANSI

d	Cv-value [gal/min]	psi	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]
½	12.9	150	50	230	27	62	168	40	97
¾	24.5	150	58	239	30	71	168	40	97
1	49.0	150	68	239	36	71	168	40	97
1¼	70.0	150	84	271	44	84	187	51	115
1½	112.0	150	97	271	51	84	187	51	115
2	217.0	150	124	293	64	106	187	51	115

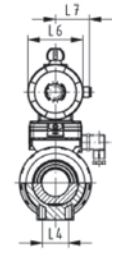
L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]
166	194	56	130	25	261	76	48
177	194	65	150	25	261	76	48
191	194	71	160	25	261	76	48
209	224	85	180	45	305	95	59
229	224	89	200	45	305	95	59
253	224	101	230	45	305	95	59

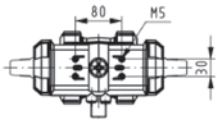


With threaded NPT

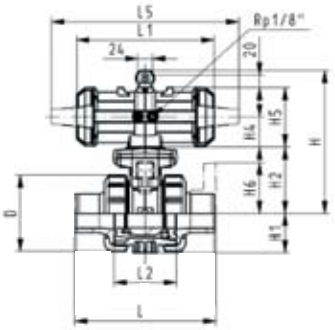
inch	Cv-value [gal/min]	psi	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H4 [mm]	H5 [mm]
3/8	4.9	150	50	167	27	62	40	97
½	12.9	150	50	167	27	62	40	97
¼	24.5	150	58	176	30	71	40	97
1	49.0	150	68	176	36	71	40	97
1¼	70.0	150	84	210	44	84	51	115
1½	112.0	150	97	210	51	84	51	115
2	217.0	150	124	232	64	106	51	115

L [mm]	L1 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
96	194	25	261	76	48	67
99	194	25	261	76	48	66
111	194	25	261	76	48	77
127	194	25	261	76	48	83
146	224	45	305	95	59	99
157	224	45	305	95	59	105
183	224	45	305	95	59	117

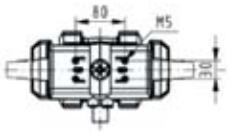




With flanges ANSI

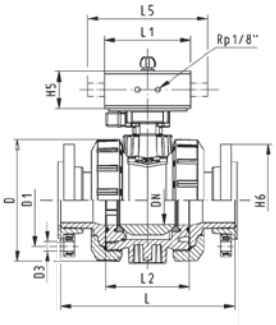


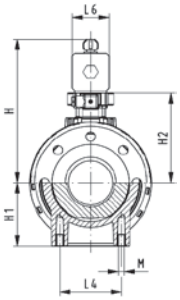




d	Cv-value [gal/min]	psi	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H4 [mm]	H5 [mm]	H5 [mm]
½	12.9	150	50	167	27	62	40	97	48
¾	24.5	150	58	176	30	71	40	97	53
1	49.0	150	68	176	36	71	40	97	58
1¼	70.0	150	84	210	44	84	51	115	70
1½	112.0	150	97	210	51	84	51	115	75
2	217.0	150	124	232	64	106	51	115	83

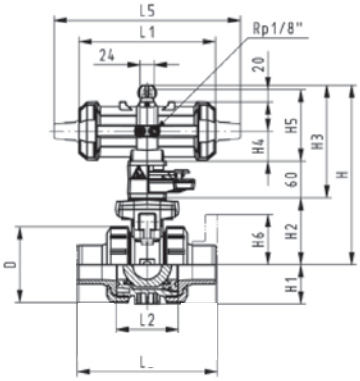
L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]
166	194	56	25	261	76	48
177	194	65	25	261	76	48
191	194	71	25	261	76	48
209	224	85	45	305	95	59
229	224	89	45	305	95	59
253	224	101	45	305	95	59





d	Cv-value [gal/min]	psi	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H5 [mm]	H6 [mm]	L [mm]
2½	350	150	166	262	85	156	70	93	416
3	490	150	200	281	105	168	78	100	414
4	770	150	238	292	123	178	86	115	451

L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]
218	136	70	276	65
259	141	70	341	72
287	164	120	369	80



SYGEF® Standard PVDF
Type 232 Pneumatically Actuated Ball Valve

With manual override
With butt fusion spigots

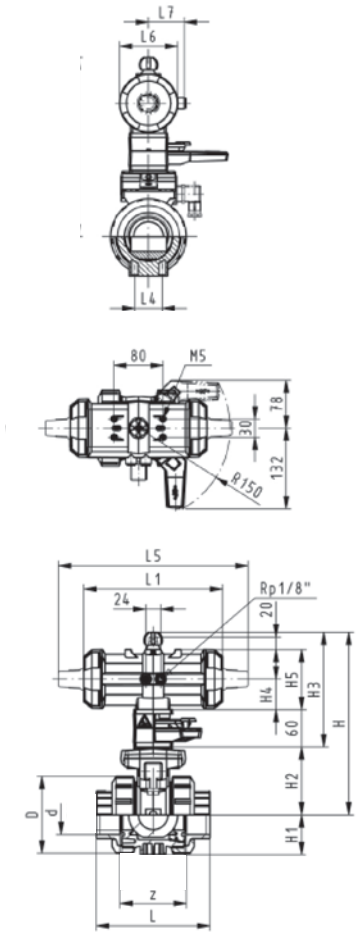
Inch	Cv-value [gal/min]	psi	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H4 [mm]	H5 [mm]	L [mm]
20	12.9	150	50	167	27	62	40	97	95
25	24.5	150	58	176	30	71	40	97	110
32	49.0	150	68	176	36	71	40	97	123
40	70.0	150	84	210	44	84	51	115	146
50	112.0	150	97	210	51	84	51	115	157
63	217.0	150	124	232	64	106	51	115	183

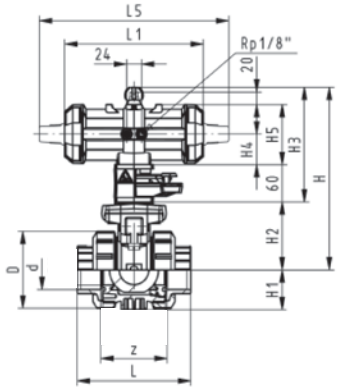
L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]
194	56	25	261	76	48
194	65	25	261	76	48
194	71	25	261	76	48
224	85	45	305	95	59
224	89	45	305	95	59
224	101	45	305	95	59

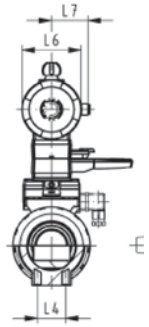
With fusion sockets metric

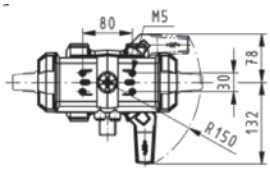
Inch	Cv-value [gal/min]	psi	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H4 [mm]	H5 [mm]	L [mm]
16	4.9	150	50	230	27	62	40	97	92
20	12.9	150	50	230	27	62	40	97	95
25	24.5	150	58	239	30	71	40	97	110
32	49.0	150	68	239	36	71	40	97	123
40	70.0	150	84	271	44	84	51	115	146
50	112.0	150	97	271	51	84	51	115	157
63	217.0	150	124	293	64	106	51	115	183

L1 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
194	25	261	76	48	64
194	25	261	76	48	64
194	25	261	76	48	72
194	25	261	76	48	79
224	45	305	95	59	94
224	45	305	95	59	95
224	45	305	95	59	107





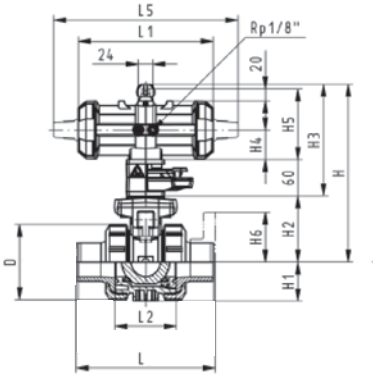


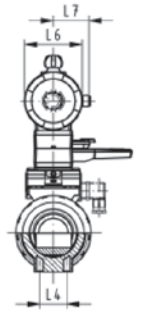


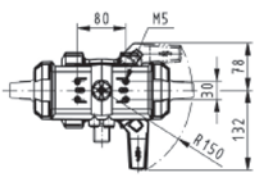
With threaded NPT

Inch	Cv-value [gal/min]	psi	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]
16	4.9	150	50	230	27	62	168	40	97
20	12.9	150	50	230	27	62	168	40	97
25	24.5	150	58	239	30	71	168	40	97
32	49.0	150	68	239	36	71	168	40	97
40	70.0	150	84	271	44	84	187	51	115
50	112.0	150	97	271	51	84	187	51	115
63	217.0	150	124	293	64	106	187	51	115

L [mm]	L1 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
96	194	25	261	76	48	69
99	194	25	261	76	48	64
111	194	25	261	76	48	76
127	194	25	261	76	48	83
146	224	45	305	95	59	101
157	224	45	305	95	59	111
183	224	45	305	95	59	135





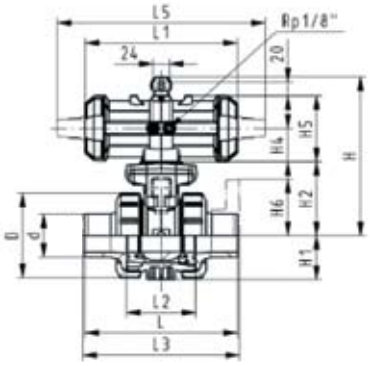


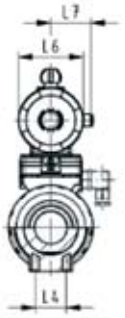
With flanges ANSI

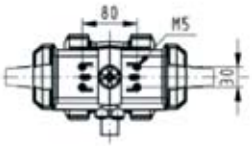
Inch	Cv-value [gal/min]	psi	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]
½	12.9	150	50	230	27	62	168	40	97
¾	24.5	150	58	239	30	71	168	40	97
1	49.0	150	68	239	36	71	168	40	97
1¼	70.0	150	84	271	44	84	187	51	115
1½	112.0	150	97	271	51	84	187	51	115
2	217.0	150	124	293	64	106	187	51	115

H6 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]
48	174	194	56	25	261	76	48
53	189	194	65	25	261	76	48
58	199	194	71	25	261	76	48
70	235	224	85	45	305	95	59
75	243	224	89	45	305	95	59
83	261	224	101	45	305	95	59

Without manual override
With butt fusion spigots



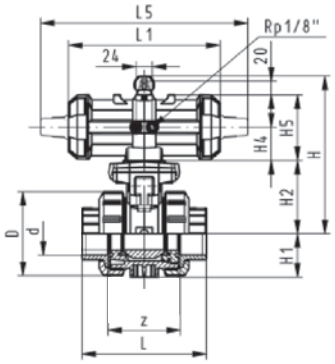


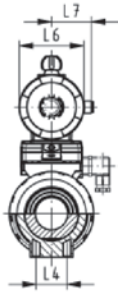


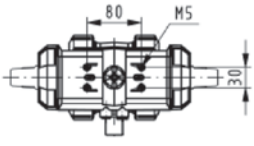
Inch	Cv-value [gal/min]	psi	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H4 [mm]	H5 [mm]
20	12.9	150	50	167	27	62	40	97
25	24.5	150	58	176	30	71	40	97
32	49.0	150	68	176	36	71	40	97
40	70.0	150	84	210	44	84	51	115
50	112.0	150	97	210	51	84	51	115
63	217.0	150	124	232	64	106	51	115

L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]
174	194	56	25	261	76	48
189	194	65	25	261	76	48
199	194	71	25	261	76	48
235	224	85	45	305	95	59
243	224	89	45	305	95	59
261	224	101	45	305	95	59

With fusion sockets metric



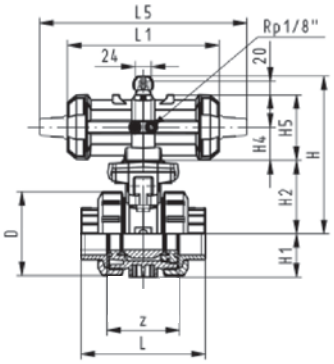


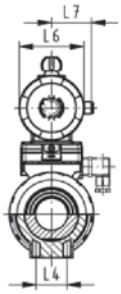


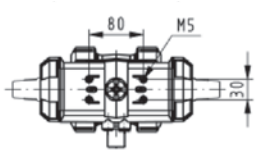
Inch	Cv-value [gal/min]	psi	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H4 [mm]	H5 [mm]
16	4.9	150	50	167	27	62	40	97
20	12.9	150	50	167	27	62	40	97
25	24.5	150	58	176	30	71	40	97
32	49.0	150	68	176	36	71	40	97
40	70.0	150	84	210	44	84	51	115
50	112.0	150	97	210	51	84	51	115
63	217.0	150	124	232	64	106	51	115

L [mm]	L1 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
92	194	25	261	76	48	64
95	194	25	261	76	48	64
110	194	25	261	76	48	72
123	194	25	261	76	48	79
164	224	45	305	95	59	94
157	224	45	305	95	59	95
183	224	45	305	95	59	107

With threaded NPT



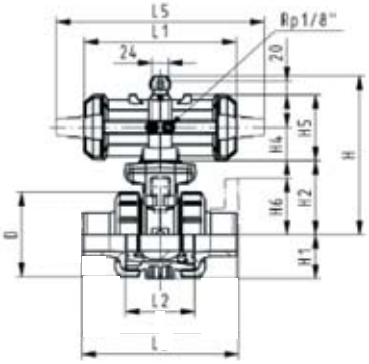


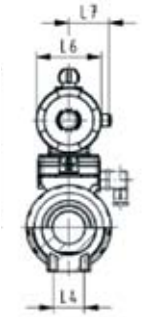


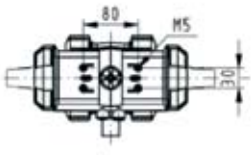
Inch	Cv-value [gal/min]	psi	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H4 [mm]	H5 [mm]
3/8	4.9	150	50	167	27	62	40	97
½	12.9	150	50	167	27	62	40	97
¾	24.5	150	58	176	30	71	40	97
1	49.0	150	68	176	36	71	40	97
1¼	70.0	150	84	210	44	84	51	115
1½	112.0	150	97	210	51	84	51	115
2	217.0	150	124	232	64	106	51	115

L [mm]	L1 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
96	194	25	261	76	48	64
99	194	25	261	76	48	64
111	194	25	261	76	48	72
127	194	25	261	76	48	79
146	224	45	305	95	59	94
157	224	45	305	95	59	95
183	224	45	305	95	59	107

With flanges ANSI







Inch	Cv-value [gal/min]	psi	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H4 [mm]	H5 [mm]
½	12.9	150	50	167	27	62	40	97
¾	24.5	150	58	176	30	71	40	97
1	49.0	150	68	176	36	71	40	97
1¼	70.0	150	84	210	44	84	51	115
1½	112.0	150	97	210	51	84	51	115
2	217.0	150	124	232	64	106	51	115

L [mm]	L1 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]
174	194	25	261	76	48
189	194	25	261	76	48
199	1194	25	261	76	48
235	224	45	305	95	59
243	224	45	305	95	59
261	224	45	305	95	59

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20-HV-506-1/2/3/4
20-HV-505-1/2/3/4
90-HV-002-A/B
90-HV-003-A/B
90-HV-005
90-HV-006
20-HV-321-1/2/3/4
20-HV-305-1/2/3/4

D

Valves



PINACLE
STAINLESS STEEL INC.

INDEX

VALVES

SPECIFICATION D1

1 PC Reduced Port *800 WOG Ball Valve, Threaded* ***D2***

2 PC Full Port *1000 WOG Ball Valve, Threaded* ***D4***

2 PC Full Port *2000/1500 WOG Ball Valve, Threaded* ***D6***

3 PC Full Port *1000 WOG Ball Valve, Buttweld* ***D8***

3 PC Full Port *1000 WOG Ball Valve, Threaded* ***D10***

3 PC Full Port *1000 WOG Ball Valve, Socketweld* ***D12***

1 PC Class 150 Regular Port *Ball Valve, Flanged* ***D14***

2 PC Class 150 Full Port *Ball Valve Flanged* ***D16***

2 PC Class 300 Full Port *Ball Valve Flanged* ***D18***

2 PC Class 150 Full Port "FS" *Ball Valve, Flanged* ***D20***

Full Port *200 WOG Swing Check Valve, Threaded* ***D22***

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Class 150 Flange End *Globe Valve*..... ***D42***

FLOW PATTERNS D44

TUBE VALVES - SEE OUR SECTION "F"



VALVES

THREADED / SOCKETWELD / FLANGED / BUTTWELD

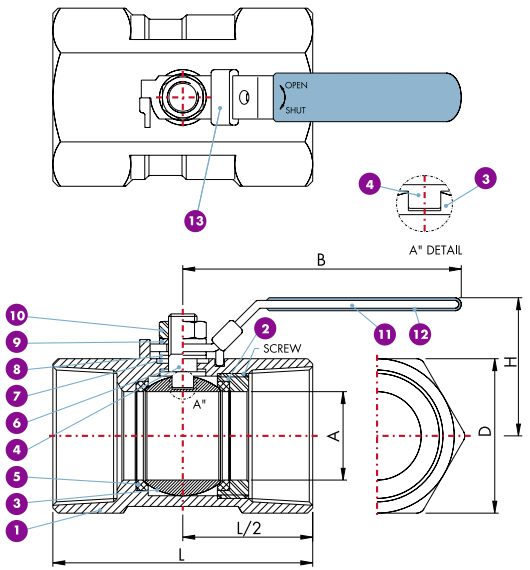
- BALL / GATE / GLOBE / CHECK
- NEEDLE
- STRAINER

PINACLE



DESIGN FEATURES

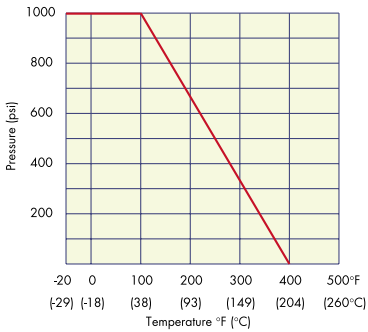
- Pressure rating: 800 PSI WOG (NON-SHOCK)
- Steam rating: 125 PSI WSP
- Investment cast body
- Bottom-loaded, Blow-out-proof stem
- Adjustable stem packing
- Stainless Steel handle with vinyl grip
- Locking device



DIMENSIONS

CODES	SIZE		A		B		D		L		H		Cv Factor	Weight lb
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm		
13TBV1025	1/4"	8	0.20	5.0	2.36	60	0.67	17.0	1.54	39.0	1.22	31	1.0	0.17
13TBV10375	3/8"	10	0.28	7.0	2.76	70	0.83	21.0	1.73	44.0	1.38	35	2.5	0.24
13TBV105	1/2"	15	0.36	9.2	3.39	86	0.98	25.0	2.22	56.0	1.69	43	5.5	0.38
13TBV1075	3/4"	20	0.49	12.5	3.39	86	1.26	32.0	2.32	59.0	1.81	46	10.0	0.55
13TBV11	1"	25	0.63	16.0	4.09	104	1.50	38.0	2.80	71.0	1.97	50	15.5	0.99
13TBV1125	11/4"	32	0.79	20.0	4.09	104	1.93	49.0	3.11	79.0	2.13	54	20.0	1.63
13TBV115	11/2"	40	0.96	24.5	4.96	126	2.09	53.0	3.27	83.0	2.56	65	37.0	1.83
13TBV12	2"	50	1.26	32.0	4.96	126	2.56	65.0	3.94	100.0	2.83	72	60.0	2.76

PRESSURE TEMPERATURE RATINGS (BODY)



MATERIALS LIST

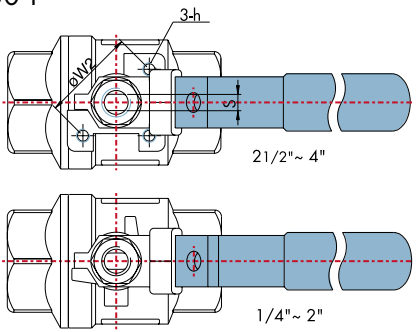
NO.	PART NAME	MATERIAL	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	CAP	ASTM A351 Gr. CF8M	1
3	BALL	ASTM A351 Gr. CF8M	1
4	STEM	ASTM A276 Gr. 316	1
5	SEAT	PTFE	2
6	THRUST WASHER	PTFE	1
7	GLAND PACKING	PTFE	1
8	WASHER	SS304	2
9	SPRING WASHER	SS304	1
10	STEM NUT	SS304	1
11	HANDLE	SS304	1
12	HANDLE SLEEVE	VINYL GRIP	1
13	LOCKING PLATE	SS304	1

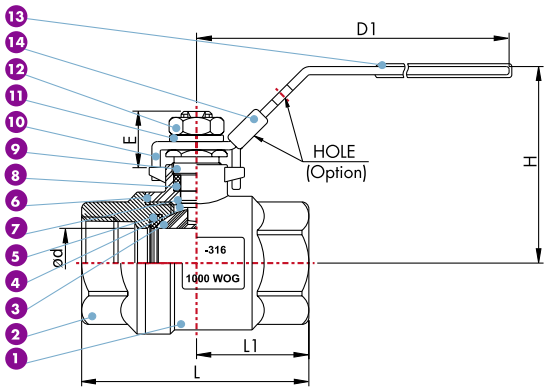
**** SIZES SHOWN ARE APPROXIMATE AND MAY VARY***



DESIGN FEATURES

- Blow-out-proof stem design
- Steam Rating: 125 PSI WSP
- Temperature range: -50°F to 450°F
- Locking device
- Threaded type:
  ANSI B1.20.1 (NPT)

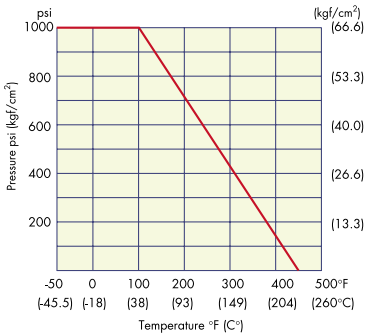




DIMENSIONS

CODES	SIZE		d		E		L		L1		H		S		D1		h	Cv	Weight
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	(Option)	Factor	Lb
13TBV2025	1/4"	8	0.43	11.0	0.61	15.5	2.28	57.8	1.13	28.8	2.25	57.2	0.21	5.45	4.06	103		16	0.57
13TBV20375	3/8"	10	0.49	12.5	0.61	15.5	2.28	57.8	1.13	28.8	2.25	57.2	0.21	5.45	4.06	103		16	0.53
13TBV205	1/2"	15	0.59	15.0	0.57	14.5	2.43	61.7	1.21	30.7	2.33	59.1	0.21	5.45	4.06	103		26	0.66
13TBV2075	3/4"	20	0.79	20.0	0.83	21.0	2.76	70.1	1.38	35.0	2.46	62.6	0.21	5.45	4.06	103		55	0.93
13TBV21	1"	25	0.98	25.0	0.77	19.5	3.20	81.3	1.58	40.2	2.78	70.7	0.24	6.20	5.00	127		110	1.53
13TBV2125	11/4"	32	1.26	32.0	1.09	27.9	3.78	96.0	1.86	47.2	3.00	76.2	0.24	6.20	5.00	127		180	2.23
13TBV215	11/2"	40	1.50	38.0	1.50	27.5	4.43	112.5	2.19	55.6	3.51	89.1	0.37	9.40	6.02	153		270	4.10
13TBV22	2"	50	2.00	50.8	1.08	26.7	4.96	126.0	2.46	62.4	3.87	98.2	0.37	9.40	7.60	193		500	6.27
13TBV225	21/2"	65	2.56	65.0	1.02	26.0	6.63	168.5	3.35	85.0	4.35	110.6	0.37	9.40	7.60	193	M8xP1.25	800	13.77
13TBV23	3"	80	3.15	80.0	1.50	38.0	7.54	191.4	3.78	95.9	4.88	124.0	0.47	12.00	10.98	279	M10xP1.5	1150	22.03
13TBV24	4"	100	3.94	100.0	1.89	48.0	8.52	216.5	4.26	108.3	6.63	168.5	0.47	16.00	13.19	335	M10xP1.5	2120	37.89

PRESSURE TEMPERATURE RATINGS
(PTFE SEATS)



MATERIALS LIST

NO.	PART NAME	MATERIAL	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	CAP	ASTM A351 Gr. CF8M	1
3	BALL	ASTM A351 Gr. CF8M	1
4	STEM	ASTM A276 Gr. 316	1
5	SEAT	PTFE+15% G/F	2
6	GASKET	PTFE	1
7	THRUST WASHER	PTFE	1
8	PACKING	PTFE	1
9	GLAND	SS304	1
10	HANDLE	SS304	1
11	SPRING WASHER	SS304	1
12	HANDLE NUT	SS304	1
13	HANDLE SLEEVE	VINYL GRIP	1
14	LOCKING PLATE*	SS304	1

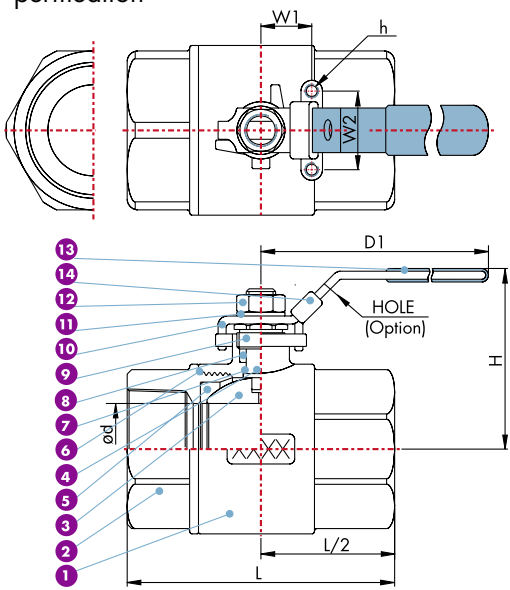
* OPTION

SIZES SHOWN ARE APPROXIMATE AND MAY VARY



DESIGN FEATURES

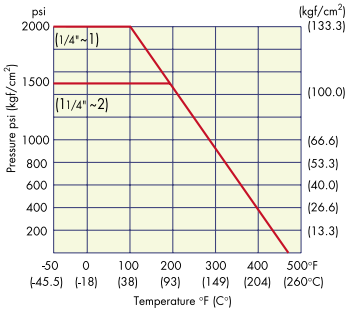
- Working pressure: 1/4"~1" 2000 PSI
  11/4"~2" 1500 PSI
- Steam Rating: 150 PSI WSP
- Investment casting body & cap
- ME-PTFE Seal Kits: Replaces PTFE, RPTFE and FPA
  Low deformation under load
  Low permeation
- Temperature rating:
  -45.5°C (-50°F) to
  246°C (475°F)
- Long cycle life
- Adjustable stem packing
- Blow-out proof stem
- Locking device
- Design specification:
  ANSI B16.34
  CLASS 900
- Test standard: API 598
- Option:
  Seal weld cap to body



DIMENSIONS

CODES	SIZE		d		L		H	D1		W1		W2		h	Cv Factor	Weight Lb
	inch	mm	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch	mm	(Option)		
13TBVMM025	1/4"	8	0.43	11.0	2.34	59.5	2.24	4.06	103	0.50	12.7	1.12	28.5	M5 x P0.8	16	0.81
13TBVMM0375	3/8"	10	0.49	12.5	2.34	59.5	2.24	4.06	103	0.50	12.7	1.12	28.5	M5 x P0.8	16	0.79
13TBVMM05	1/2"	15	0.59	15.0	2.52	64.5	2.27	4.06	103	0.50	12.7	1.12	28.5	M5 x P0.8	26	0.93
13TBVMM075	3/4"	20	0.79	20.0	3.03	77.0	2.70	5.00	127	0.88	22.4	1.38	35.0	M6 x P1.0	55	1.76
13TBVMM1	1"	25	0.98	25.0	3.56	90.5	2.86	5.00	127	0.88	22.4	1.38	35.0	M6 x P1.0	110	2.73
13TBVMM125	11/4"	32	1.26	32.0	3.92	99.5	3.45	6.14	156	1.00	25.4	1.50	38.1	M6 x P1.0	180	4.52
13TBVMM15	11/2"	40	1.50	38.0	4.65	118.0	3.66	7.60	193	1.00	25.4	1.50	38.1	M6 x P1.0	270	5.68
13TBVMM2	2"	50	2.00	50.8	5.37	136.5	4.11	7.60	193	1.00	25.4	1.50	38.1	M6 x P1.0	500	9.76

PRESSURE TEMPERATURE RATINGS (ME-PTFE SEATS)



MATERIALS LIST

NO.	PART NAME	MATERIAL	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	CAP	ASTM A351 Gr. CF8M	1
3	BALL	ASTM A351 Gr. CF8M	1
4	STEM	ASTM A276 Gr. 316	1
5	SEAT	ME-PTFE*	2
6	GASKET	ME-PTFE*	1
7	THRUST WASHER	ME-PTFE*	1
8	PACKING	ME-PTFE*	1
9	GLAND	SS304	1
10	HANDLE	SS304	1
11	SPRING WASHER	SS304	1
12	HANDLE NUT	SS304	1
13	HANDLE SLEEVE	VINYL GRIP	1
14	LOCKING PLATE	SS304	1

*ME-PTFE IS MOLECULARLY ENHANCED PTFE

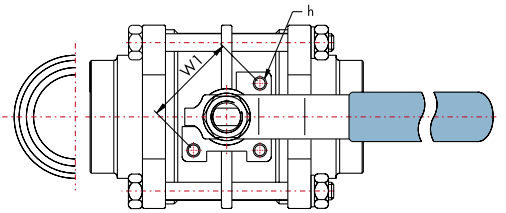
SIZES SHOWN ARE APPROXIMATE AND MAY VARY

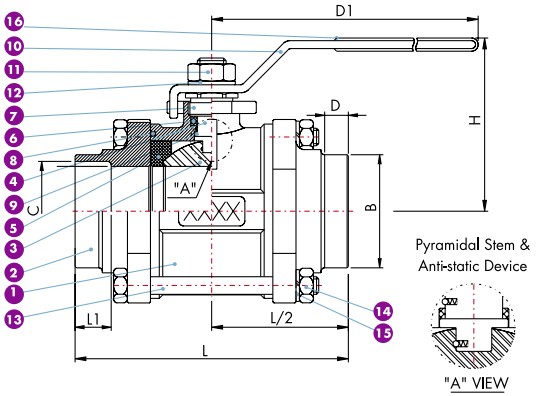
PINACLE



DESIGN FEATURES

- Pressure rating: 1000 PSI WOG (NON-SHOCK)
- Steam Rating: 150 PSI WSP
- Investment cast body & cap
- Anti-static blow-out-proof stem
- Adjustable stem packing
- Stainless Steel handle with vinyl grip

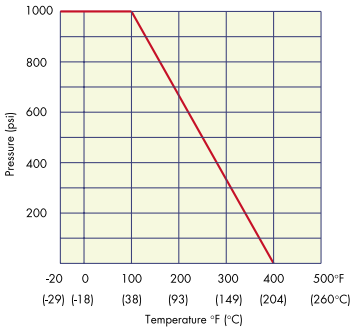




DIMENSIONS

SIZE		B		C		D		L		L1		H	D1		W1		h	Cv Factor	Weight Lb
inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	mm	inch	mm			
1/4"	8							2.56	65			4.02	4.02	102	1.42	36	M5 x P0.8	6	1.06
3/8"	10							2.56	65			4.02	4.02	102	1.42	36	M5 x P0.8	12	1.01
1/2"	15	0.67	17.0	0.55	14.0	0.24	6.0	2.80	71	0.35	9.0	4.02	4.02	102	1.42	36	M5 x P0.8	19	1.28
3/4"	20	0.94	24.0	0.83	21.0	0.24	6.0	3.35	85	0.35	9.0	4.96	4.96	126	1.42	36	M5 x P0.8	37	2.02
1"	25	1.18	30.0	1.06	27.0	0.28	7.0	3.74	95	0.41	10.5	4.96	4.96	126	1.42	36	M5 x P0.8	64	2.62
11/4"	32	1.46	37.0	1.34	34.0	0.28	7.0	4.41	112	0.41	10.5	5.91	5.91	150	1.97	50	M6 x P1.0	103	4.57
11/2"	40	1.73	44.0	1.61	41.0	0.31	8.0	4.84	123	0.47	12.0	5.91	5.91	150	1.97	50	M6 x P1.0	143	6.06
2"	50	2.20	56.0	2.09	53.0	0.31	8.0	5.55	141	0.47	12.0	7.32	7.32	186	1.97	50	M6 x P1.0	360	8.98
21/2"	65	3.00	76.1	2.84	72.1	0.31	8.0	6.81	173	0.47	12.0	10.71	10.71	272	2.76	70	M8 x P1.25	440	17.9
3"	80	3.50	89.0	3.35	85.0	0.31	8.0	7.56	192	0.47	12.0	10.71	10.71	272	4.02	102	M10 x P1.5	520	28.03
4"	100	4.25	108.0	4.09	104.0	0.31	8.0	8.86	225	0.47	12.0	13.19	13.19	335	4.02	102	M10 x P1.5	820	46.57

PRESSURE TEMPERATURE RATINGS (BODY)



MATERIALS LIST

NO.	PART NAME	MATERIAL	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	CAP	ASTM A351 Gr. CF8M	2
3	BALL	ASTM A351 Gr. CF8M	1
4	STEM	ASTM A276 Gr. 316	1
5	SEAT	PTFE	2
6	PACKING	GRAFOIL	1
7	GLAND	SS304	1
8	GASKET	GRAFOIL	2
9	THRUST WASHER	PTFE	1
10	HANDLE	SS304	1
11	HANDLE NUT	SS304	1
12	SPRING WASHER	SS304	1
13	BOLTS	ASTM A193 Gr. B8	4-6
14	BOLT NUTS	ASTM A194 Gr. 8	4-6
15	BOLT WASHERS	SS304	4-6
16	HANDLE SLEEVE	VINYL GRIP	1

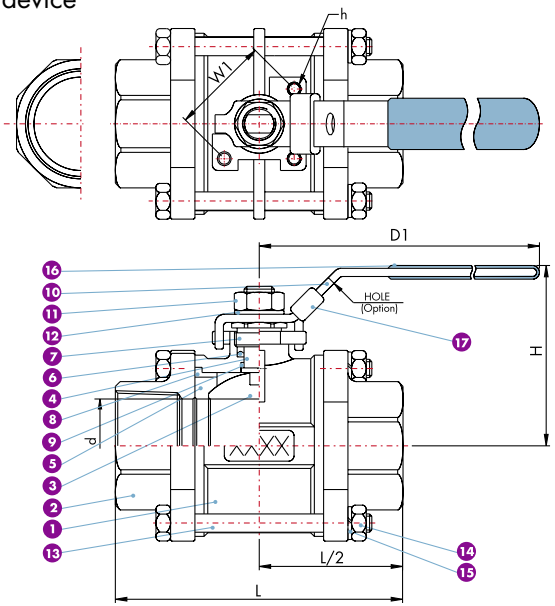
**** SIZES SHOWN ARE APPROXIMATE AND MAY VARY***

PINACLE



DESIGN FEATURES

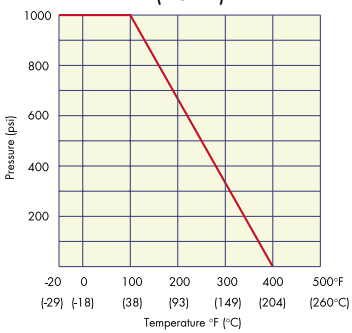
- Pressure rating: 1000 PSI WOG (NON-SHOCK)
- Steam Rating: 150 PSI WSP
- Investment cast body & cap
- Blow-out-proof stem
- Adjustable stem packing
- Stainless Steel handle with vinyl grip
- Locking device



DIMENSIONS

CODES	SIZE		d		L		D1		H		W1		h	Cv Factor	Weight Lb
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm			
13TBV3025	1/4"	8	0.43	11.0	2.56	65	4.02	102	4.02	54	1.42	36	M5 x P0.8	6	1.06
13TBV30375	3/8"	10	0.49	12.5	2.56	65	4.02	102	4.02	54	1.42	36	M5 x P0.8	12	1.01
13TBV305	1/2"	15	0.59	15.0	2.80	71	4.02	102	4.02	55	1.42	36	M5 x P0.8	19	1.28
13TBV3075	3/4"	20	0.79	20.0	3.35	85	4.96	126	4.96	65	1.42	36	M5 x P0.8	37	2.02
13TBV31	1"	25	1.00	25.4	3.74	95	4.96	126	4.96	71	1.42	36	M5 x P0.8	64	2.62
13TBV3125	11/4"	32	1.26	32.0	4.37	111	5.91	150	5.91	89	1.97	50	M6 x P1.0	103	4.57
13TBV315	11/2"	40	1.57	40.0	4.76	121	5.91	150	5.91	94	1.97	50	M6 x P1.0	143	6.06
13TBV32	2"	50	2.00	50.8	5.51	140	7.32	186	7.32	100	1.97	50	M6 x P1.0	360	8.98
13TBV325	21/2"	65	2.56	65.0	6.81	173	10.71	272	10.71	121	2.76	70	M8 x P1.25	440	17.9
13TBV33	3"	80	3.15	80.0	7.56	192	10.71	272	10.71	134	4.02	102	M10 x P1.5	520	28.03
13TBV34	4"	100	3.94	100.0	8.86	225	13.19	335	13.19	172	4.02	102	M10 x P1.5	820	46.57

PRESSURE TEMPERATURE RATINGS (BODY)



MATERIALS LIST

NO.	PART NAME	MATERIAL	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	CAP	ASTM A351 Gr. CF8M	2
3	BALL	ASTM A351 Gr. CF8M	1
4	STEM	ASTM A276 Gr. 316	1
5	SEAT	PTFE+15% G/F	2
6	PACKING	PTFE	1
7	GLAND	SS304	1
8	END SEALS	PTFE	2
9	THRUST WASHER	PTFE	1
10	HANDLE	SS304	1
11	HANDLE NUT	SS304	1
12	SPRING WASHER	SS304	1
13	BOLTS	ASTM A193 Gr. B8	4-6
14	BOLT NUTS	ASTM A194 Gr. 8	4-6
15	BOLT WASHERS	SS304	4-6
16	HANDLE SLEEVE	VINYL GRIP	1
17	LOCKING PLATE*	SS304	1

*OPTION

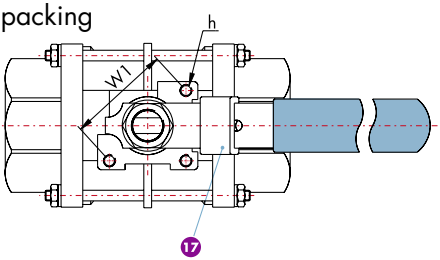
**** SIZES SHOWN ARE APPROXIMATE AND MAY VARY***

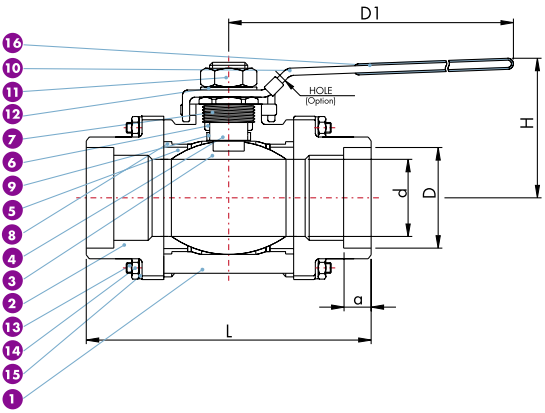
PINACLE



DESIGN FEATURES

- Pressure rating: 1000 PSI WOG (NON-SHOCK)
- Steam Rating: 150 PSI WSP
- Investment cast body & cap
- Blow-out-proof stem
- Adjustable stem packing
- Stainless Steel handle with vinyl grip
- Locking device

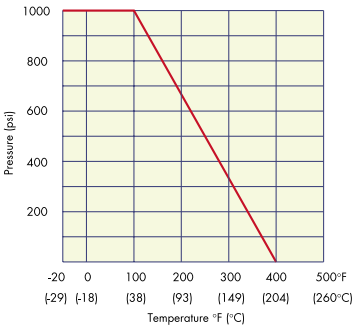




DIMENSIONS

CODES	SIZE		a		d		D		D1	H	L		W1	h	Cv Factor	Weight Lb
	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	inch	mm	inch			
13WBV3025	1/4"	8	0.39	10	0.43	11.0	0.56	14.1	4.02	2.13	2.56	65	1.42	M5 x P0.8	6	1.06
13WBV30375	3/8"	10	0.39	10	0.49	12.5	0.69	17.5	4.02	2.13	2.56	65	1.42	M5 x P0.8	12	1.01
13WBV305	1/2"	15	0.39	10	0.59	15.0	0.85	21.7	4.02	2.24	2.80	71	1.42	M5 x P0.8	19	1.28
13WBV3075	3/4"	20	0.51	13	0.79	20.0	1.07	27.1	4.96	2.64	3.35	85	1.42	M5 x P0.8	37	2.02
13WBV31	1"	25	0.51	13	1.00	25.4	1.33	33.8	5.00	2.76	3.74	95	1.42	M5 x P0.8	64	2.62
13WBV3125	11/4"	32	0.51	13	1.26	32.0	1.67	42.5	6.14	3.59	4.41	111	1.97	M6 x P1.0	103	4.57
13WBV315	11/2"	40	0.51	13	1.57	40.0	1.91	48.6	6.14	3.74	4.84	121	1.97	M6 x P1.0	143	6.06
13WBV32	2"	50	0.63	16	2.00	50.8	2.41	61.1	7.52	4.02	5.55	141	1.97	M6 x P1.0	360	8.98
13WBV325	21/2"	65	0.63	16	2.56	65.0	2.91	73.8	10.71	4.76	6.81	173	2.76	M8 x P1.25	440	17.9
13WBV33	3"	80	0.63	16	3.15	80.0	3.54	89.8	10.98	5.08	7.56	192	4.02	M10 x P1.5	520	28.03
13WBV34	4"	100	0.75	19	3.94	100.0	4.55	115.5	13.19	6.84	8.86	225	4.02	M10 x P1.5	820	46.57

PRESSURE TEMPERATURE RATINGS (BODY)



MATERIALS LIST

NO.	PART NAME	MATERIAL	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	CAP	ASTM A351 Gr. CF8M	2
3	BALL	ASTM A351 Gr. CF8M	1
4	STEM	ASTM A276 Gr. 316	1
5	SEAT	PTFE+15% G/F	2
6	PACKING	PTFE	1
7	GLAND	SS304	1
8	END SEALS	PTFE	2
9	THRUST WASHER	PTFE	1
10	HANDLE	SS304	1
11	HANDLE NUT	SS304	1
12	SPRING WASHER	SS304	1
13	BOLTS	ASTM A193 Gr. B8	4-6
14	BOLT NUTS	ASTM A194 Gr. 8	4-6
15	BOLT WASHER	SS304	4-6
16	HANDLE SLEEVE	VINYL GRIP	1
17	LOCKING PLATE	SS304	1

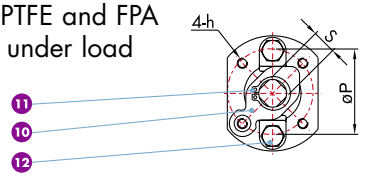
*OPTION

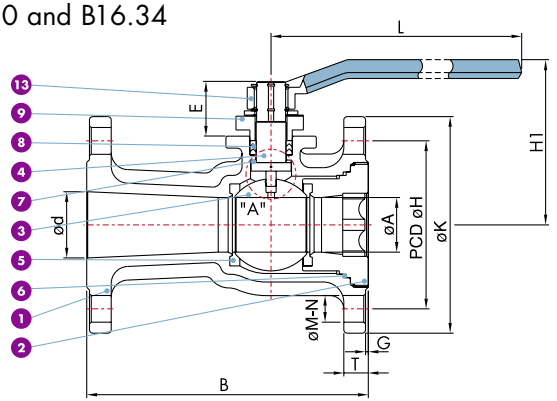
**** SIZES SHOWN ARE APPROXIMATE AND MAY VARY***



DESIGN FEATURES

- 1 PC 150# Regular Port
- ISO 5211 actuator mounting pad
- Blow-out-proof stem design
- Anti-static device
- Adjustable stem packing
- Locking device
- Body: ASTM A351 Gr.CF8M for TC-6000
- ME-PTFE Seal Kits: Replaces PTFE, RPTFE and FPA
  Low deformation under load
  Low permeation
- Temperature rating: -45.5°C (-50°F) to 246°C (475°F)
- Long cycle life
- ANSI B16.5, B16.10 and B16.34 full compliance
- Test standard: API 598



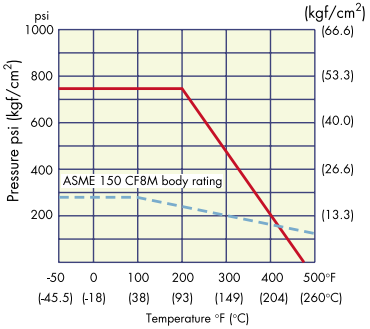




DIMENSIONS

CODES	SIZE		A	B	E	d		G	H	K	T	M	N	P	S	L	H1	h	Cv Factor	Weight Lb
	inch	mm	inch	inch	inch	inch	mm	inch	inch	inch	inch	inch		inch	inch	inch	inch			
13FVAI1	1"	25	0.79	5.0	0.98	0.98	25	0.06	3.12	4.25	0.44	0.62	4	1.65	0.43	5.18	2.95	M5xP0.8	52	5.07
13FVAI1.5	1 1/2"	40	1.26	6.5	1.24	1.57	40	0.06	3.88	5.00	0.56	0.62	4	1.97	0.55	6.42	3.81	M6xP1.0	120	9.92
13FVAI2	2"	50	1.50	7.0	1.65	1.97	50	0.06	4.75	6.00	0.62	0.75	4	2.76	0.67	9.13	4.96	M8xP1.25	170	15.66
13FVAI2.5	2 1/2"	65	1.97	7.5	1.65	2.64	67	0.06	5.50	7.00	0.69	0.75	4	2.76	0.67	9.13	5.32	M8xP1.25	255	24.00
13FVAI3	3"	80	2.56	8.0	2.20	3.15	80	0.06	6.00	7.50	0.75	0.75	4	4.02	0.87	12.87	5.98	M10xP1.5	430	31.31
13FVAI4	4"	100	3.15	9.0	2.20	3.94	100	0.06	7.50	9.00	0.94	0.75	8	4.02	0.87	12.87	6.30	M10xP1.5	565	52.00
13FVAI6	6"	150	3.94	10.5	2.20	5.91	150	0.06	9.50	11.00	1.00	0.88	8	4.02	0.87	12.87	7.01	M10xP1.5	600	78.06

PRESSURE TEMPERATURE RATINGS (ME-PTFE SEATS)



MATERIALS LIST

NO.	PART NAME	MATERIAL	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	CAP	ASTM A351 Gr. CF8M	1
3	BALL	ASTM A351 Gr. CF8M	1
4	STEM	ASTM A276 Gr. 316	1
5	SEAT	ME-PTFE*	2
6	GASKET	ME-PTFE*	1
7	THRUST WASHER	ME-PTFE*	1
8	PACKING	ME-PTFE*	1
9	GLAND	ASTM A351 Gr. CF8	1
10	STOPPER	SS304	1
11	SNAP RING	SS304	2
12	GLAND BOLT	ASTM A193 Gr. B8	2
13	HANDLE	ASTM A536 Gr. 65, 45 & 12	1

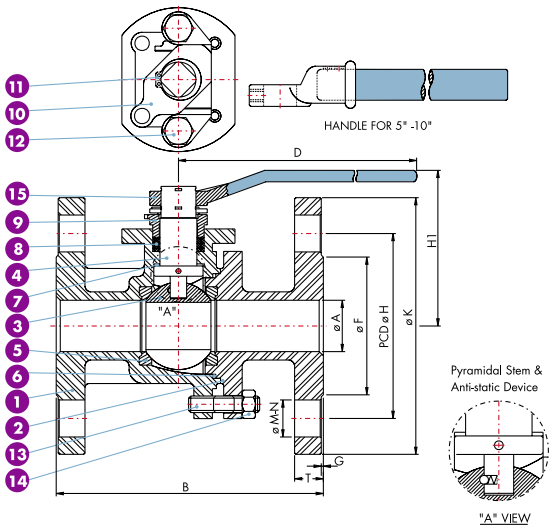
*ME-PTFE IS MOLECULARLY ENHANCED PTFE

SIZES SHOWN ARE APPROXIMATE AND MAY VARY



DESIGN FEATURES

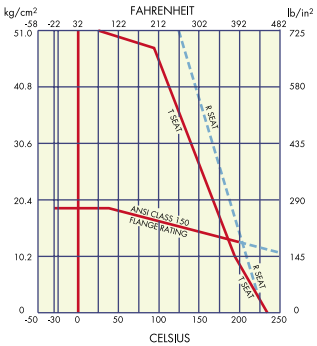
- 2 PC 150# Full Port
- Face to face: ANSI B16.10
- Flange dimension: ANSI B16.5
- Wall thickness: ANSI B16.34
- Test standard: API 598
- Option: Anti-static



DIMENSIONS

CODES	A		B		F	G	H	K	T	M	N	D	H1	Cv Factor	Weight Lb
	inch	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch		inch	inch		
13FV205	1/2"	15	0.59	15.0	4.25	107.9	1.38	0.06	2.38	3.50	0.44	0.62	4	5.12	2.9	19	4.41
13FV2075	3/4"	20	0.79	20.0	4.62	117.3	1.69	0.06	2.75	3.88	0.44	0.62	4	5.12	3.0	37	5.51
13FV21	1"	25	0.98	25.0	5.00	127.0	2.00	0.06	3.12	4.25	0.44	0.62	4	6.46	3.7	54	6.62
13FV2125	11/4"	32	1.26	32.0	5.50	139.7	2.50	0.06	3.50	4.62	0.50	0.62	4	6.46	3.9	103	9.5
13FV215	11/2"	40	1.50	38.0	6.50	165.1	2.88	0.06	3.88	5.00	0.56	0.62	4	8.07	4.7	143	13.5
13FV22	2"	50	1.97	50.0	7.00	177.8	3.62	0.06	4.75	6.00	0.62	0.75	4	8.07	5.2	360	18.74
13FV225	21/2"	65	2.56	65.0	7.50	190.5	4.12	0.06	5.50	7.00	0.69	0.75	4	8.07	5.3	440	28.67
13FV23	3"	80	3.15	80.0	8.00	203.2	5.00	0.06	6.00	7.50	0.75	0.75	4	12.83	6.1	520	39.69
13FV24	4"	100	3.94	100.0	9.00	228.6	6.19	0.06	7.50	9.00	0.94	0.75	8	12.83	6.9	820	61.74
13FV25	5"	125	4.92	125.0	14.00	355.6	7.31	0.06	8.50	10.00	0.94	0.88	8	42.20	9.4	1500	–
13FV26	6"	150	5.91	150.0	15.50	393.7	8.50	0.06	9.50	11.00	1.00	0.88	8	42.20	9.8	1920	165.38
13FV28	8"	200	7.87	200.0	18.00	457.2	10.62	0.06	11.75	13.50	1.12	0.88	8	42.52	11.7	3600	286.65

PRESSURE TEMPERATURE RATINGS (BODY)



MATERIALS LIST

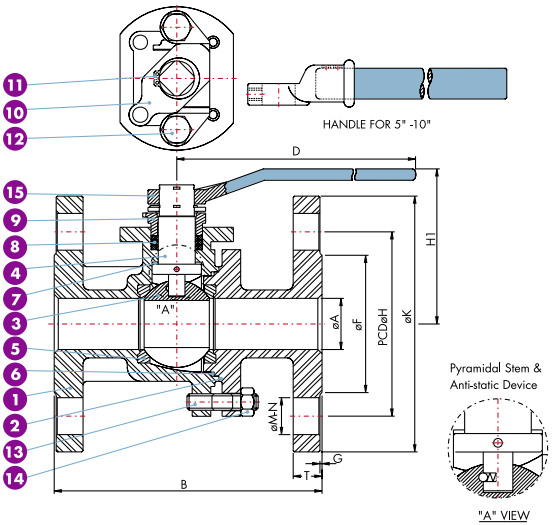
NO.	PART NAME	MATERIAL	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	CAP	ASTM A351 Gr. CF8M	1
3	BALL	ASTM A351 Gr. CF8M	1
4	STEM	ASTM A276 Gr. 316	1
5	SEAT	PTFE	2
6	GASKET	PTFE	1
7	THRUST WASHER	PTFE	1
8	PACKING	PTFE	1
9	GLAND	ASTM A351 Gr. CF8	1
10	STOPPER	SS304	1
11	SNAP RING	SS304	2
12	GLAND BOLT	ASTM A193 Gr. B8	2
13	STUD BOLT	ASTM A193 Gr. B8	4-12
14	SET NUT	ASTM A194 Gr. 8M	4-12
15	HANDLE	ASTM A536 Gr. 65, 45 & 12	1

**** SIZES SHOWN ARE APPROXIMATE AND MAY VARY***



DESIGN FEATURES

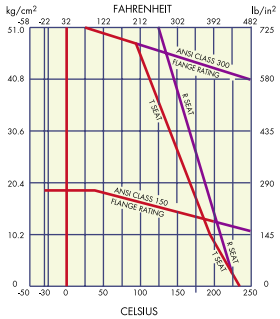
- 2 PC 300# Full Port
- Face to face: ANSI B16.10
- Flange dimension: ANSI B16.5
- Wall thickness: ANSI B16.34
- Test standard: API 598
- Option: Anti-static



DIMENSIONS

CODES	SIZE		A		B		F	G	H	K	T	M	N	D	H1	Cv Factor	Weight Lb
	inch	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch		inch	inch		
13FVB205	1/2"	15	0.59	15.0	5.50	139.7	1.38	0.06	2.62	3.75	0.56	0.62	4	5.12	2.9	19	5.58
13FVB2075	3/4"	20	0.79	20.0	6.00	152.4	1.69	0.06	3.25	4.62	0.62	0.75	4	5.12	3.0	37	7.72
13FVB21	1"	25	0.98	25.0	6.50	165.1	2.00	0.06	3.50	4.88	0.69	0.75	4	6.46	3.7	54	10.1
13FVB2125	11/4"	32	1.26	32.0	7.00	177.8	2.50	0.06	3.88	5.25	0.75	0.75	4	6.46	3.9	103	13.58
13FVB215	11/2"	40	1.50	38.1	7.50	190.5	2.88	0.06	4.50	6.12	0.81	0.88	4	8.07	4.7	143	20.95
13FVB22	2"	50	1.97	50.0	8.50	215.9	3.62	0.06	5.00	6.50	0.88	0.75	8	8.07	5.2	360	24.92
13FVB225	21/2"	65	2.56	65.0	9.50	241.3	4.12	0.06	5.88	7.50	1.00	0.88	8	8.07	5.3	440	41.45
13FVB23	3"	80	3.15	80.0	11.12	282.4	5.00	0.06	6.62	8.25	1.12	0.88	8	12.83	6.1	520	58.65
13FVB24	4"	100	3.94	100.0	12.00	304.8	6.19	0.06	7.88	10.00	1.25	0.88	8	12.83	6.9	820	91.29
13FVB25	5"	125	4.92	125.0	15.00	381.0	7.31	0.06	9.25	11.00	1.38	0.88	8	42.20	9.4	1500	–
13FVB26	6"	150	5.91	150.0	15.88	403.3	8.50	0.06	10.62	12.50	1.44	0.88	12	42.20	9.8	1920	202.86
13FVB28	8"	200	7.87	200.0	19.75	501.6	10.62	0.06	13.00	15.00	1.62	1.00	12	42.52	11.73	3600	384.33

PRESSURE TEMPERATURE RATINGS (BODY)



MATERIALS LIST

NO.	PART NAME	MATERIAL	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	CAP	ASTM A351 Gr. CF8M	1
3	BALL	ASTM A351 Gr. CF8M	1
4	STEM	ASTM A276 Gr. 316	1
5	SEAT	PTFE+15% G/F	2
6	GASKET	PTFE	1
7	THRUST WASHER	PTFE	1
8	PACKING	PTFE	1
9	GLAND	ASTM A351 Gr. CF8	1
10	STOPPER	SS304	1
11	SNAP RING	SS304	2
12	GLAND BOLT	ASTM A193 Gr. B8	2
13	STUD BOLT	ASTM A193 Gr. B8	4-12
14	SET NUT	ASTM A194 Gr. 8M	4-12
15	HANDLE	ASTM A536 Gr. 65, 45 & 12	1

**** SIZES SHOWN ARE APPROXIMATE AND MAY VARY***

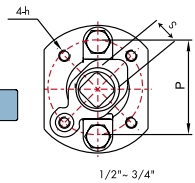
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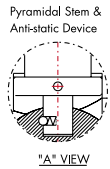


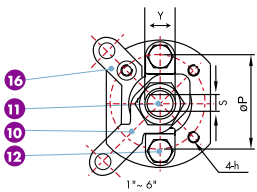
DESIGN FEATURES

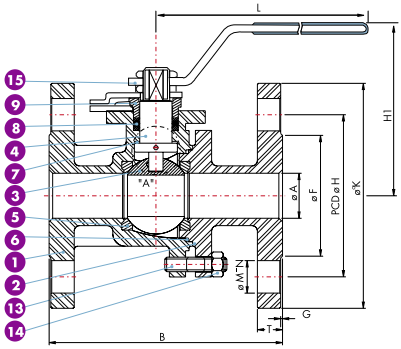
- 2 PC 150# Full Port FS
- Steam rating: 150 PSI WSP
- ISO 5211 actuator mounting pad
- Blow-out-proof stem design
- Anti-static device
- Adjustable stem packing
- Locking device
- Body: ASTM A351 Gr.CF8M for TC-5000
  ASTM A216 Gr.WCB for TC-5100
- ME-PTFE Seal Kits: Replaces PTFE, RPTFE and FPA
  Low deformation under load
  Low permeation
- Temperature rating: -45.5°C (-50°F) to 246°C (475°F)
- Long cycle life
- ANSI B16.5, B16.10 and B16.34 full compliance
- Test standard: API 598
- API 607 approval







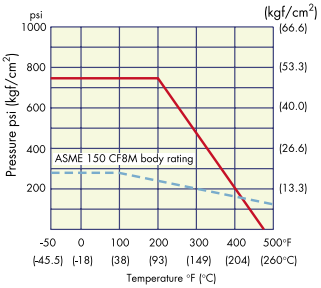




DIMENSIONS

SIZE		A	B	F	G	H	K	T	M	N	P		L	H1	h	Cv Factor	Weight Lb
inch	mm	inch	inch	inch	inch	inch	inch	inch	inch		inch	mm	inch	inch			
1/2"	15	0.59	4.25	1.38	0.06	2.38	3.50	0.44	0.62	4	1.65	42	5.18	2.91	M5xP0.8	26	4.41
3/4"	20	0.79	4.62	1.69	0.06	2.75	3.88	0.44	0.62	4	1.65	42	5.18	2.94	M5xP0.8	55	5.51
1"	25	0.98	5.00	2.00	0.06	3.12	4.25	0.44	0.62	4	1.97	50	6.42	3.44	M6xP1.0	110	6.62
11/4"	32	1.26	5.50	2.50	0.06	3.50	4.62	0.50	0.62	4	1.97	50	6.42	3.63	M6xP1.0	180	9.92
11/2"	40	1.50	6.50	2.88	0.06	3.88	5.00	0.56	0.62	4	2.76	70	9.13	4.76	M8xP1.25	270	13.23
2"	50	1.97	7.00	3.62	0.06	4.75	6.00	0.62	0.75	4	2.76	70	9.13	5.08	M8xP1.25	500	18.74
21/2"	65	2.56	7.50	4.12	0.06	5.50	7.00	0.69	0.75	4	2.76	70	9.13	5.55	M8xP1.25	800	28.67
3"	80	3.15	8.00	5.00	0.06	6.00	7.50	0.75	0.75	4	4.02	102	12.87	6.52	M10xP1.5	1150	39.69
4"	100	3.94	9.00	6.19	0.06	7.50	9.00	0.94	0.75	8	4.02	102	12.87	7.11	M10xP1.5	2120	61.74
6"	150	5.91	15.50	8.50	0.06	9.50	11.00	1.00	0.88	8	4.92	125	42.26	9.95	M12xP1.75	5100	165.38

PRESSURE TEMPERATURE RATINGS
(ME-PTFE SEATS)



MATERIALS LIST

NO.	PART NAME	MATERIAL	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	CAP	ASTM A351 Gr. CF8M	1
3	BALL	ASTM A351 Gr. CF8M	1
4	STEM	ASTM A276 Gr. 316	1
5	SEAT	ME-PTFE*	2
6	GASKET	SPIRAL-WOUND GASKET	1
7	THRUST WASHER	ME-PTFE*	1
8	PACKING	ME-PTFE*	1
9	GLAND	ASTM A351 Gr. CF8	1
10	STOPPER	SS304	1
11	SNAP RING	SS304	2
12	GLAND BOLT	ASTM A193 Gr. B8	2
13	STUD BOLT	ASTM A193 Gr. B8	4~10
14	SET NUT	ASTM A194 Gr. 8	4~10
15	HANDLE	SS304	1
16	LOCKING PLATE	SS304	1

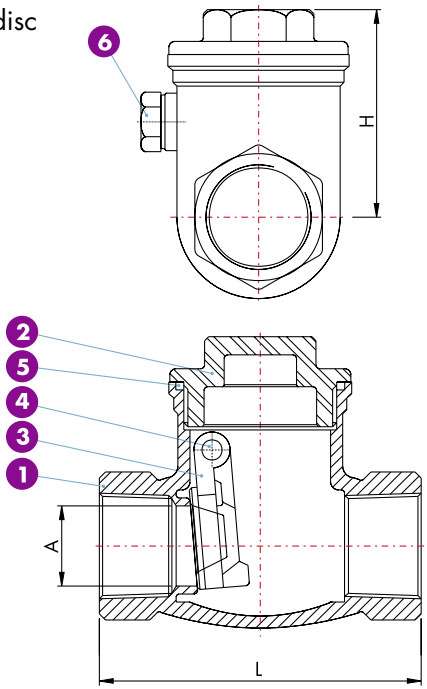
*ME-PTFE IS MOLECULARLY ENHANCED PTFE

**** SIZES SHOWN ARE APPROXIMATE AND MAY VARY***



DESIGN FEATURES

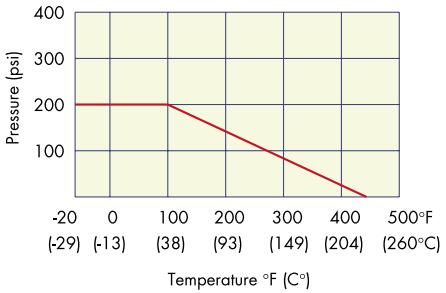
- Pressure rating: 200 PSI WOG (NON-SHOCK)
- Steam Rating: 150 PSI WSP
- Investment cast body & cap
- Screwed cap
- Swing type disc



DIMENSIONS

CODES	SIZE		A		L		H		Cv Factor	Weight Lb
	inch	mm	inch	mm	inch	mm	inch	mm		
13TCV025	1/4"	8	0.39	10	2.56	65.0	1.77	45	–	0.73
13TCV0375	3/8"	10	0.47	12	2.56	65.0	1.77	45	4	0.68
13TCV05	1/2"	15	0.59	15	2.60	66.0	1.81	46	6.5	0.64
13TCV075	3/4"	20	0.79	20	3.19	81.0	2.13	54	15	1.08
13TCV1	1"	25	0.98	25	3.58	91.0	2.36	60	28	1.52
13TCV125	11/4"	32	1.26	32	4.19	106.5	2.83	72	45	2.32
13TCV15	11/2"	40	1.57	40	4.76	121.0	2.95	75	65	3.48
13TCV2	2"	50	1.97	50	5.59	142.0	3.23	82	120	5.16
13TCV25	21/2"	65	2.56	65	6.26	159.0	3.54	90	180	8.38
13TCV3	3"	80	3.15	80	7.48	190.0	4.09	104	280	13.01

PRESSURE TEMPERATURE RATINGS (BODY)



MATERIALS LIST

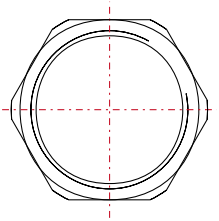
NO.	PART NAME	MATERIAL	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	CAP	ASTM A351 Gr. CF8M	1
3	DISC	ASTM A351 Gr. CF8M	1
4	HINGE PIN	SS316	1
5	GASKET	PTFE	1
6	PLUG	SS316	1

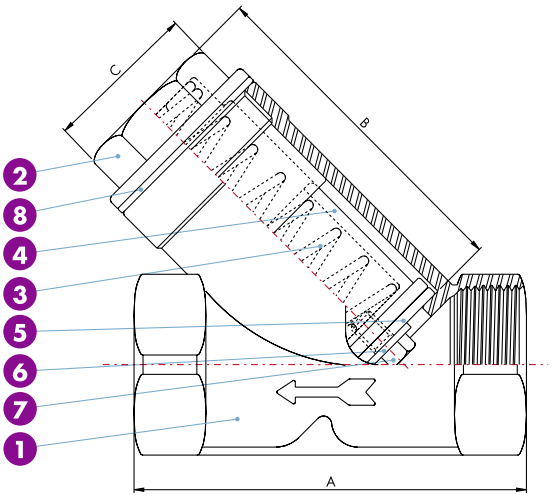
**** SIZES SHOWN ARE APPROXIMATE AND MAY VARY***



DESIGN FEATURES

- Investment cast body & cap
- Screwed-in cap
- Connecting threads: ANSI B2.1/BS21

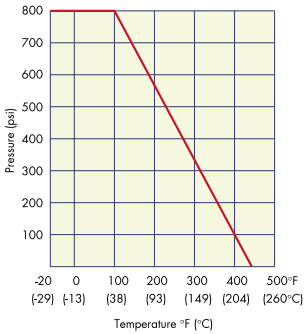




DIMENSIONS

CODES	SIZE		A		B		C		Cv Factor	Weight Lb	Cracking Pressure
	inch	mm	inch	mm	inch	mm	inch	mm			
13TYC025	1/4"	8	2.56	65	1.81	46	0.75	19	2	0.62	0.435
13TYC0375	3/8"	10	2.56	65	1.81	46	0.75	19	3.8	0.54	0.435
13TYC05	1/2"	15	2.56	65	1.81	46	0.75	19	6.3	0.71	0.435
13TYC075	3/4"	20	3.15	80	2.28	58	0.91	23	14	0.95	0.464
13TYC1	1"	25	3.54	90	2.72	69	1.06	27	27	1.62	0.464
13TYC125	11/4"	32	4.13	105	2.95	75	1.26	32	43	2.15	0.508
13TYC15	11/2"	40	4.72	120	3.35	85	1.61	41	64	3.15	0.508
13TYC2	2"	50	5.51	140	3.86	98	1.97	50	116	4.85	0.580
13TYC25	21/2"	65	6.69	170	4.62	117	2.56	65	185	9.75	0.653
13TYC3	3"	80	7.87	200	5.35	136	3.15	80	270	14.35	-

PRESSURE TEMPERATURE RATINGS (BODY)



MATERIALS LIST

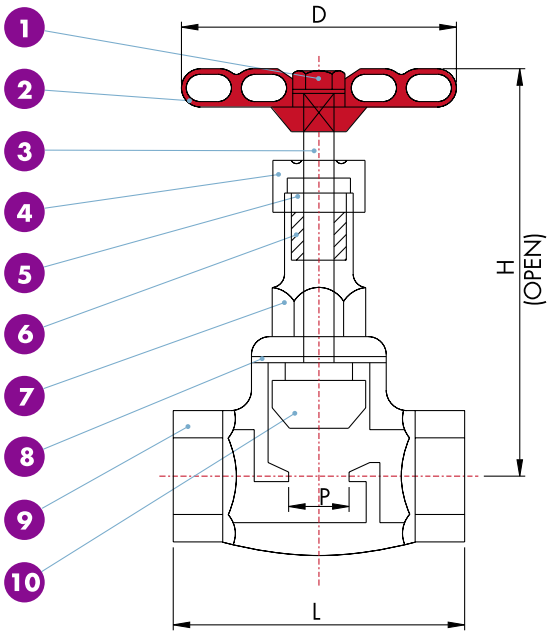
NO.	PART NAME	MATERIAL	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	CAP	ASTM A351 Gr. CF8M	1
3	SPRING	SS304	1
4	DISC	SS316	1
5	SEAT	TEFLON	1
6	WASHER	SS304	1
7	BOLT	SS304	1
8	GASKET PACKING	TEFLON	1

**** SIZES SHOWN ARE APPROXIMATE AND MAY VARY***



DESIGN FEATURES

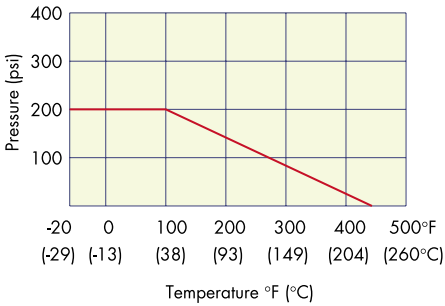
- Pressure rating: 200 PSI WOG (NON-SHOCK)
- Investment cast body & bonnet
- Screwed bonnet
- Rising stem and wheel



DIMENSIONS

CODES	SIZE		P		L		H (OPEN)		D		Cv Factor	Weight Lb
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm		
13TGLV025	1/4"	8	0.39	10	2.05	52.0	4.02	102	2.36	60.0	1	1.04
13TGLV0375	3/8"	10	0.47	12	2.05	52.0	4.02	102	2.36	60.0	1.5	1.01
13TGLV05	1/2"	15	0.47	12	2.60	66.0	3.74	95	2.76	70.0	2.5	1.46
13TGLV075	3/4"	20	0.59	15	2.70	68.5	3.90	99	2.76	70.0	5.6	1.46
13TGLV1	1"	25	0.79	20	3.08	78.3	4.02	102	3.01	76.5	10.5	2.1
13TGLV125	11/4"	32	0.98	25	3.39	86.0	4.96	126	4.07	103.5	17	3.11
13TGLV15	11/2"	40	1.30	33	3.86	98.0	5.35	136	4.07	103.5	25	4.83
13TGLV2	2"	50	1.57	40	4.35	110.5	6.14	156	4.76	121.0	46	6.09

PRESSURE TEMPERATURE RATINGS (BODY)



MATERIALS LIST

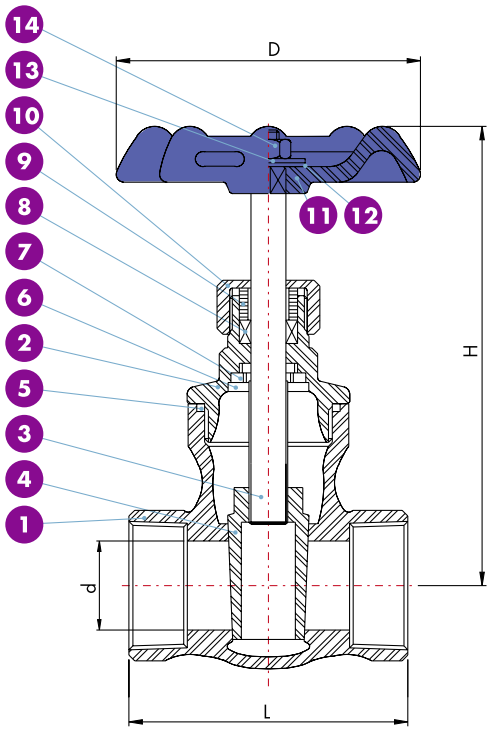
NO.	PART NAME	MATERIAL	QTY
1	NUT	SS304	1
2	HANDWHEEL	SS400	1
3	STEM	ASTM A276 Gr. 316	1
4	GLAND NUT	ASTM A351 Gr. CF8M	1
5	GLAND	ASTM A351 Gr. CF8M	1
6	GLAND PACKING	PTFE	1
7	BONNET	ASTM A351 Gr. CF8M	1
8	GASKET	PTFE	1
9	BODY	ASTM A351 Gr. CF8M	1
10	DISC	ASTM A351 Gr. CF8M	1

**** SIZES SHOWN ARE APPROXIMATE AND MAY VARY***



DESIGN FEATURES

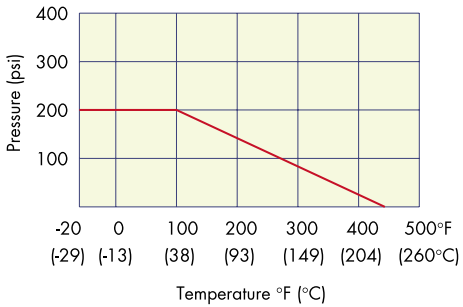
- Pressure rating: 200 PSI WOG (NON-SHOCK)
- Investment cast body & bonnet
- Non-rising stem
- Solid wedge disc



DIMENSIONS

CODES	SIZE		d		L		H		D		Cv Factor	Weight Lb
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm		
13TGAV05	1/2"	15	0.63	16.1	2.24	57.0	3.88	98.6	2.76	70.0	15	0.93
13TGAV075	3/4"	20	0.80	20.3	2.38	60.5	4.06	103.0	2.76	70.0	37	1.24
13TGAV1	1"	25	1.02	26.0	2.64	67.0	4.53	115.0	3.01	76.5	72	1.61
13TGAV125	11/4"	32	1.25	31.8	2.99	76.0	5.04	128.0	3.01	76.5	110	2.14
13TGAV15	11/2"	40	1.57	40.0	3.43	87.0	6.81	173.0	4.07	103.5	165	2.96
13TGAV2	2"	50	1.98	50.3	3.74	95.0	7.44	189.0	4.76	121.0	320	4.26

PRESSURE TEMPERATURE RATINGS (BODY)



MATERIALS LIST

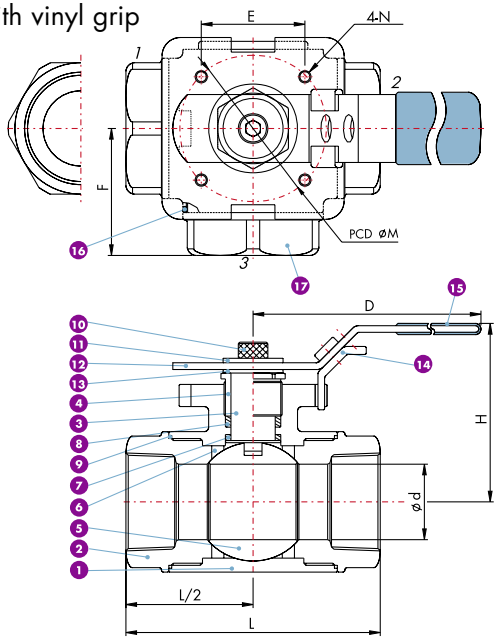
NO.	PART NAME	MATERIAL	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	BONNET	ASTM A351 Gr. CF8M	1
3	STEM	ASTM A276 Gr. 316	1
4	DISC	ASTM A351 Gr. CF8M	1
5	GASKET	PTFE	1
6	STOP RING	SS304	1
7	STEM HOLDER	SS316	1
8	STEM PACKING	PTFE	1
9	GLAND	SS304	1
10	GLAND NUT	SS316	1
11	HANDLEWHEEL	SS400	1
12	NAME PLATE	ALUMINUM	1
13	HANDLEWHEEL WASHER	SS304	1
14	HANDLEWHEEL NUT	SS304	1

**** SIZES SHOWN ARE APPROXIMATE AND MAY VARY***



DESIGN FEATURES

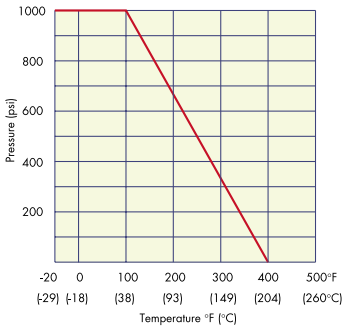
- "L" Port
- Pressure rating: 1000 PSI WOG (NON-SHOCK)
- Steam Rating: 150 PSI WSP
- Investment cast body & cap
- Bottom-loaded, Blow-out-proof stem
- Adjustable stem packing
- Stainless Steel handle with vinyl grip
- Locking device



DIMENSIONS

CODES	SIZE		d		L		H	D	E		F		M		N	Cv Factor	Weight Lb
	inch	mm	inch	mm	inch	mm	inch	inch	inch	mm	inch	mm	inch	mm			
13TBVL025	1/4"	8	0.43	11.0	2.68	68	2.28	4.17	1.17	29.7	1.34	34.0	1.65	42	M5 x P0.8	6.0	1.32
13TBVL0375	3/8"	10	0.43	11.0	2.68	68	2.28	4.17	1.17	29.7	1.34	34.0	1.65	42	M5 x P0.8	6.0	1.32
13TBVL05	1/2"	15	0.50	12.7	2.95	75	2.40	5.43	1.17	29.7	1.48	37.5	1.65	42	M5 x P0.8	12.0	1.47
13TBVL075	3/4"	20	0.63	16.0	3.39	86	2.91	5.43	1.39	35.4	1.69	43.0	1.97	50	M6 x P1.0	15.5	2.62
13TBVL1	1"	25	0.79	20.0	4.06	103	3.19	6.38	1.39	35.4	2.03	51.5	1.97	50	M6 x P1.0	20.0	3.75
13TBVL125	11/4"	32	0.98	25.0	4.53	115	3.46	6.38	1.39	35.4	2.26	57.5	1.97	50	M6 x P1.0	37.0	5.27
13TBVL15	11/2"	40	1.26	32.0	4.92	125	4.09	8.66	1.95	49.5	2.46	62.5	2.76	70	M8 x P1.25	103.0	7.5
13TBVL2	2"	50	1.50	38.1	5.75	146	4.33	8.66	1.95	49.5	2.87	73.0	2.76	70	M8 x P1.25	143.0	12.13

PRESSURE TEMPERATURE RATINGS (BODY)



MATERIALS LIST

NO.	PART NAME	MATERIAL	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	CAP2	ASTM A351 Gr. CF8M	2
3	STEM	ASTM A276 Gr. 316	1
4	GLAND NUT	SS304	1
5	BALL	ASTM A351 Gr. CF8M	1
6	SEAT	PTFE+15% G/F	4
7	THRUST WASHER	PTFE	1
8	PACKINGS	PTFE	1
9	JOINT GASKET1	PTFE	2
10	STEM BOLT	SS304	1
11	WASHER	SS304	1
12	HANDLE	SS304	1
13	STEM WASHER	SS304	1
14	LOCATING LOCK*	SS304	1
15	HANDLE SLEEVE	VINYL GRIP	1
16	JOINT GASKET	PTFE	1
17	CAP1	ASTM A351 Gr. CF8M	1

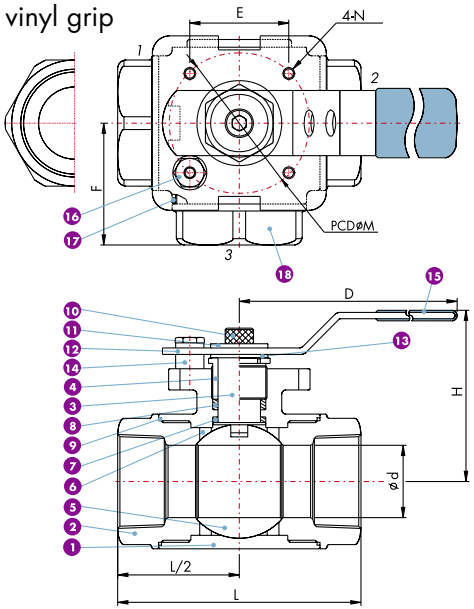
* OPTION

**** SIZES SHOWN ARE APPROXIMATE AND MAY VARY***



DESIGN FEATURES

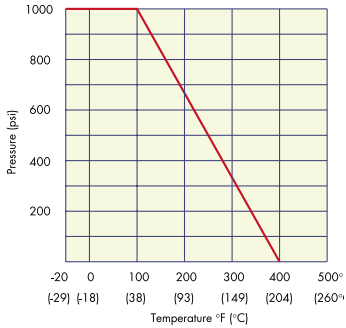
- "T" Port
- Pressure rating: 1000 PSI WOG (NON-SHOCK)
- Steam Rating: 150 PSI WSP
- Investment cast body & cap
- Bottom-loaded, Blow-out-proof stem
- Adjustable stem packing
- Actuator mounting pad
- Stainless Steel handle with vinyl grip
- Locking device



DIMENSIONS

CODES	SIZE		d		L		H	D	E		F		M		N	Cv Factor	Weight Lb
	inch	mm	inch	mm	inch	mm	inch	inch	inch	mm	inch	mm	inch	mm			
13TBVT025	1/4"	8	0.43	11.0	2.68	68	2.28	4.17	1.17	29.7	1.34	34.0	1.65	42	M5 x P0.8	6.0	1.32
13TBVT0375	3/8"	10	0.43	11.0	2.68	68	2.28	4.17	1.17	29.7	1.34	34.0	1.65	42	M5 x P0.8	6.0	1.32
13TBVT05	1/2"	15	0.50	12.7	2.95	75	2.40	5.43	1.17	29.7	1.48	37.5	1.65	42	M5 x P0.8	12.0	1.47
13TBVT075	3/4"	20	0.63	16.0	3.39	86	2.91	5.43	1.39	35.4	1.69	43.0	1.97	50	M6 x P1.0	15.5	2.62
13TBVT1	1"	25	0.79	20.0	4.06	103	3.19	6.38	1.39	35.4	2.03	51.5	1.97	50	M6 x P1.0	20.0	3.75
13TBVT125	11/4"	32	0.98	25.0	4.53	115	3.46	6.38	1.39	35.4	2.26	57.5	1.97	50	M6 x P1.0	37.0	5.27
13TBVT15	11/2"	40	1.26	32.0	4.92	125	4.09	8.66	1.95	49.5	2.46	62.5	2.76	70	M8 x P1.25	103.0	7.5
13TBVT2	2"	50	1.50	38.1	5.75	146	4.33	8.66	1.95	49.5	2.87	73.0	2.76	70	M8 x P1.25	143.0	12.13

PRESSURE TEMPERATURE RATINGS (BODY)



MATERIALS LIST

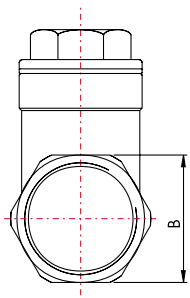
NO.	PART NAME	MATERIAL	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	CAP2	ASTM A351 Gr. CF8M	2
3	STEM	ASTM A276 Gr. 316	1
4	GLAND NUT	SS304	1
5	BALL	ASTM A351 Gr. CF8M	1
6	SEAT	PTFE+15% G/F	4
7	THRUST WASHER	PTFE	1
8	PACKINGS	PTFE	1
9	JOINT GASKET1	PTFE	2
10	STEM BOLT	SS304	1
11	WASHER	SS304	1
12	HANDLE	SS304	1
13	STEM WASHER	SS304	1
14	SET SCREW	SS304	1
15	HANDLE SLEEVE	VINYL GRIP	1
16	SET BOLT	SS304	1
17	JOINT GASKET	PTFE	1
18	CAP1	ASTM A351 Gr. CF8M	1

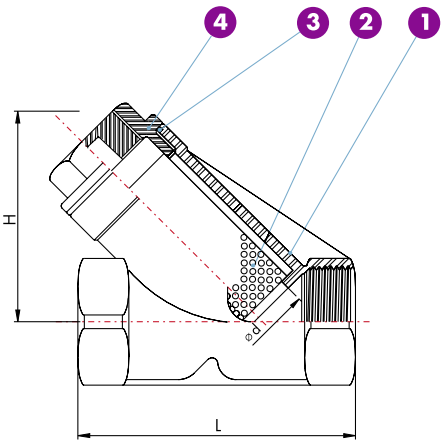
**** SIZES SHOWN ARE APPROXIMATE AND MAY VARY***



DESIGN FEATURES

- 800 WOG
- Investment cast body & cap
- SS316 screen. 4 mm thick perforated, 1.0 mm hole with 2.0 mm staggering
- Screwed-in cap
- Connecting threads: ANSI B2.1/BS21

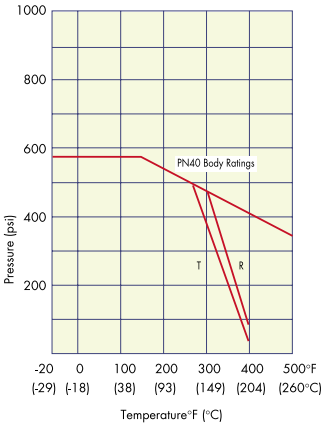




DIMENSIONS

CODES	SIZE		d		B		H		L		Weight	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	Kg	Lb
13TYS025	1/4"	8	0.31	8	1.02	26	2.01	51	2.56	65	0.26	0.57
13TYS0375	3/8"	10	0.39	10	1.02	26	2.01	51	2.56	65	0.23	0.50
13TYS05	1/2"	15	0.59	15	1.02	26	2.01	51	2.56	65	0.30	0.66
13TYS075	3/4"	20	0.79	20	1.30	33	2.36	60	3.15	80	0.40	0.88
13TYS1	1"	25	0.98	25	1.61	41	2.83	72	3.54	90	0.70	1.54
13TYS125	11/4"	32	1.26	32	1.93	49	3.03	77	4.13	105	0.90	1.99
13TYS15	11/2"	40	1.57	40	2.20	56	3.43	87	4.72	120	1.30	2.87
13TYS2	2"	50	1.97	50	2.72	69	4.06	103	5.51	140	2.10	4.63
13TYS25	21/2"	65	2.56	65	3.43	87	4.72	120	6.69	170	4.30	9.47
13TYS3	3"	80	3.15	80	4.02	102	5.51	140	7.87	200	6.30	13.88

PRESSURE TEMPERATURE RATINGS



MATERIALS LIST

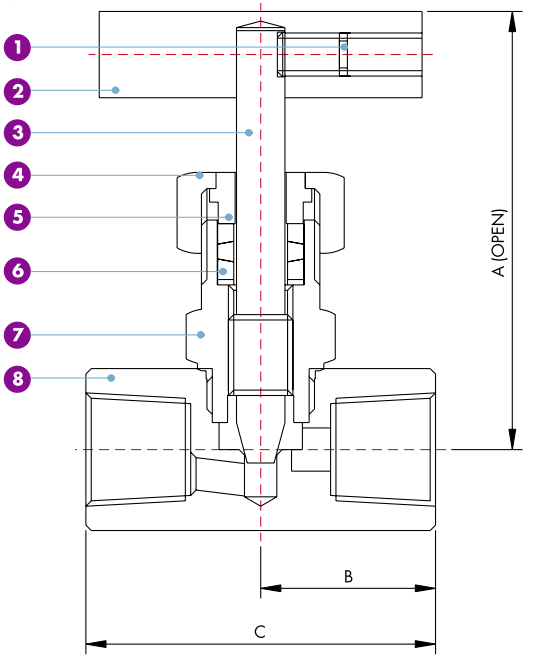
NO.	PART NAME	MATERIAL	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	SCREEN	SS316 SCREEN	1
3	GASKET	TEFLON	1
4	CAP	ASTM A351 Gr. CF8M	1

**** SIZES SHOWN ARE APPROXIMATE AND MAY VARY***



DESIGN FEATURES

- Investment casting
- Screwed-in bonnet
- Rising stem
- T handle operation
- Connecting threads ANSI B2.1, BS21 and DIN
- Working pressure: 6000 lb/IN^2



DIMENSIONS

CODES	SIZE		A		B		C		Weight
	inch	mm	inch	mm	inch	mm	inch	mm	Lb
13TNV0125	1/8"	6	2.95	75	1.15	29.0	2.28	58	0.65
13TNV025	1/4"	8	2.95	75	1.15	29.0	2.28	58	0.61
13TNV0375	3/8"	10	2.95	75	1.15	29.0	2.28	58	0.73
13TNV05	1/2"	15	3.45	87	1.28	32.5	2.56	65	1.22
13TNV075	3/4"	20	3.55	90	1.38	35.0	2.76	70	1.44
13TNV1	1"	25	4.05	103	1.58	40.0	3.15	80	3.09

MATERIALS LIST

NO.	PART NAME	SPECIFICATION	QTY
1	SET SCREW	SS304	1
2	HANDLE	SS410	1
3	STEM	SS316	1
4	GLAND NUT	SS304	1
5	GLAND	SS304	1
6	PACKING	TEFLON	1
7	BONNET	ASTM A351 Gr. CF8M	1
8	BODY	ASTM A351 Gr. CF8M	1

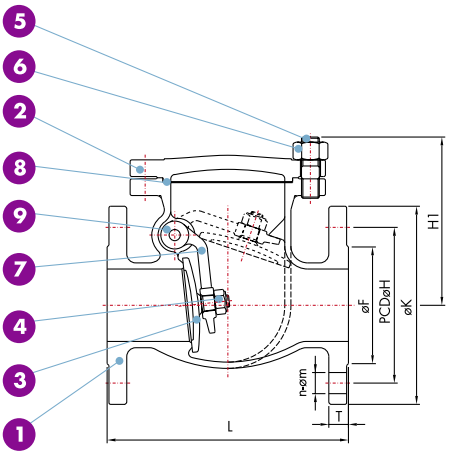
Please refer to our Section "F" from page F-12 for more needle valves.

** SIZES SHOWN ARE APPROXIMATE AND MAY VARY*



DESIGN FEATURES

- Swing type
- Body: ASTM A351 Gr. CF8M
- Disc: ASTM A351 Gr. CF8M
- End Type: Flange end
- Face to Face: ANSI B16.10
- Flange Dimensions: ANSI B16.5 Class 150
- Wall thickness: ANSI B16.34



DIMENSIONS

CODES	SIZE		L		H1		K		H	F		T		M	N	Cv	Weight
	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch		Factor	Lb
13FCV05	1/2"	15	4.25	108	2.87	73	3.50	89	2.38	1.38	35	0.44	11.1	0.62	4	9.5	5.05
13FCV075	3/4"	20	4.61	117	2.95	75	3.86	98	2.76	1.69	43	0.44	11.1	0.62	4	16	6.24
13FCV1	1	25	5.00	127	3.15	80	4.25	108	3.13	2.01	51	0.44	11.1	0.62	4	27	8.47
13FCV15	11/2"	40	6.50	165	4.37	111	5.00	127	3.88	2.87	73	0.56	14.3	0.62	4	70	10.23
13FCV2	2"	50	7.99	203	4.84	123	5.98	152	4.74	3.62	92	0.63	15.9	0.75	4	120	13.36
13FCV25	21/2"	65	8.50	216	5.28	134	7.01	178	5.49	4.13	105	0.69	17.5	0.75	4	170	27.10
13FCV3	3"	80	9.49	241	5.83	148	7.48	190	6.00	5.00	127	0.75	19.1	0.75	4	250	48.36
13FCV4	4"	100	11.50	292	6.22	158	9.02	229	7.50	6.18	157	0.94	23.9	0.75	8	470	72.81
13FCV5	5"	125	12.99	330	7.56	192	10.00	254	8.50	7.32	186	0.94	23.9	0.88	8	–	92.61
13FCV6	6"	150	14.02	356	8.78	223	10.98	279	9.51	8.50	216	1.00	25.4	0.88	8	1100	136.71
13FCV8	8"	200	19.49	495	11.14	283	13.50	343	11.75	10.63	270	1.13	28.6	0.88	8	2000	233.73
13FCV10	10"	250	24.49	622	12.52	318	15.98	406	14.25	12.76	324	1.19	30.2	1.00	12	–	359.42
13FCV12	12"	300	27.48	698	14.06	357	19.02	483	17.01	15.00	381	1.25	31.8	1.00	12	–	551.25

MATERIALS LIST

NO.	PART NAME	MATERIAL SS316	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	COVER	ASTM A351 Gr. CF8M	1
3	DISC	ASTM A351 Gr. CF8M	1
4	DISC NUT	ASTM A194 Gr. 8	1
5	COVER BOLT	ASTM A193 Gr. B8	4-12
6	COVER NUT	ASTM A194 Gr. 8	4-12
7	ARM	ASTM A351 Gr. CF8M	1
8	GASKET	PTFE	1
9	PLUG	SS316	1

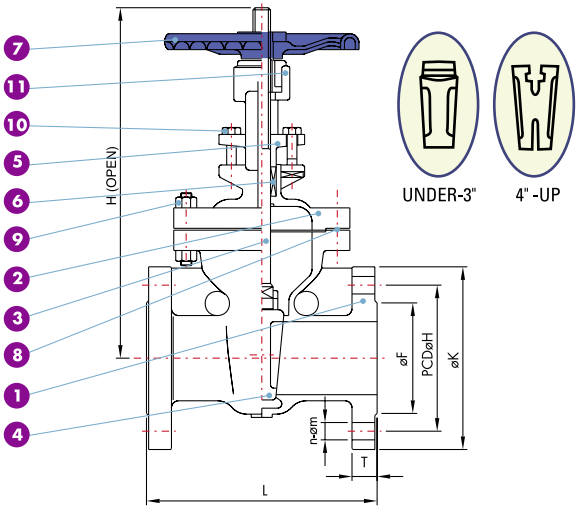
Also available in Class 300

** SIZES SHOWN ARE APPROXIMATE AND MAY VARY*



DESIGN FEATURES

- Rising stem
- Body: ASTM A351 Gr. CF8M
- Disc: ASTM A351 Gr. CF8M
- Stem: SS316
- End Type: Flange end
- Face to Face: ANSI B16.10
- Flange Dimensions: ANSI B16.5 150 lbs
- Wall thickness: ANSI B16.34



DIMENSIONS

CODES	SIZE		L		H1		K		H	F		T		M	N	Cv Factor	Weight Lb
	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch			
13FGAV05	1/2"	15	4.25	108	8.03	204	3.94	100	2.38	1.38	35	0.44	11.1	0.62	4	19	7.28
13FGAV075	3/4"	20	4.61	117	8.23	209	3.94	100	2.76	1.69	43	0.44	11.1	0.62	4	36	9.70
13FGAV1	1	25	5.00	127	9.02	229	3.94	100	3.13	2.01	51	0.44	11.1	0.62	4	57	11.31
13FGAV15	11/2"	40	6.50	165	11.14	283	5.51	140	3.88	2.87	73	0.56	14.3	0.62	4	140	17.09
13FGAV2	2"	50	7.01	178	13.07	332	6.30	160	4.74	3.62	92	0.63	15.9	0.75	4	240	25.09
13FGAV25	21/2"	65	7.48	190	15.63	397	7.09	180	5.49	4.13	105	0.69	17.5	0.75	4	360	46.31
13FGAV3	3"	80	7.99	203	17.28	439	7.87	200	6.00	5.00	127	0.75	19.1	0.75	4	580	56.56
13FGAV4	4"	100	9.02	229	20.39	518	8.82	224	7.50	6.18	157	0.94	23.9	0.75	8	950	82.42
13FGAV5	5"	125	10.00	254	24.45	621	9.84	250	8.52	7.32	186	0.94	23.9	0.88	8	NA	110.25
13FGAV6	6"	150	10.51	267	28.11	714	11.02	280	9.51	8.50	216	1.00	25.4	0.88	8	2400	119.07
13FGAV8	8"	200	11.50	292	35.98	914	11.81	300	11.75	10.63	270	1.13	28.6	0.88	8	4200	198.45
13FGAV10	10"	250	12.99	330	43.62	1108	13.98	355	14.25	12.76	324	1.19	30.2	1.00	12	6800	343.98
13FGAV12	12"	300	14.02	356	61.14	1553	23.62	600	17.01	15.00	381	1.25	31.8	1.00	12	9900	534.71

MATERIALS LIST

NO.	PART NAME	MATERIAL SS316	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	BONNET	ASTM A351 Gr. CF8M	1
3	STEM	ASTM A276 Gr. 316	1
4	DISC	ASTM A351 Gr. CF8M	1
5	GLAND	ASTM A351 Gr. CF8	1
6	GLAND PACKING	PTFE	1
7	HAND WHEEL	ASTM A536 Gr. B65, 45 & 12	1
8	GASKET	PTFE (OR NON ASBESTOS)	1
9	BONNET BOLT/NUT	ASTM A193 Gr. B8/ASTM A194 Gr. 8	4-16
10	GLAND BOLT/NUT	ASTM A193 Gr. B8/ASTM A194 Gr. 8	2
11	YOKE SLEEVE	BRONZE (OR DUCTILENI-RESIST)	1

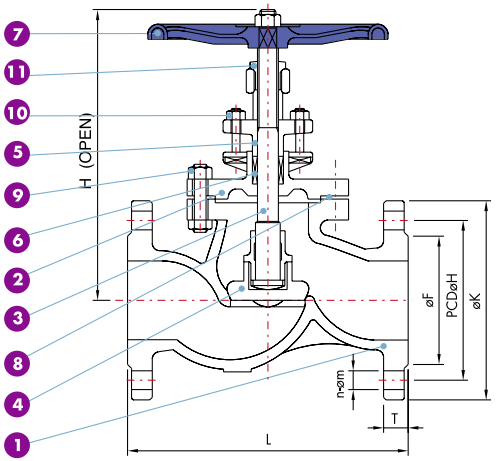
Also available in Class 300

** SIZES SHOWN ARE APPROXIMATE AND MAY VARY*



DESIGN FEATURES

- Rising stem
- O.S. & Yoke, Flexible Wedge
- Body: ASTM A351 Gr. CF8M
- Disc: ASTM A351 Gr. CF8M
- Stem: SS316
- Packing: PTFE
- End Type: Flange end
- Face to Face: ANSI B16.10
- Flange Dimensions: ANSI B16.5 150 lbs
- Wall thickness: ANSI B16.34



DIMENSIONS

CODES	SIZE		L		H1		K		H	F		T		M	N	Cv Factor	Weight Lb
	inch	mm	inch	mm	inch	mm	inch	mm	inch	inch	mm	inch	mm	inch			
13FGLV05	1/2"	15	4.25	108	6.77	172	3.94	100	2.38	1.38	35	0.44	11.1	0.62	4	5	7.67
13FGLV075	3/4"	20	4.61	117	6.77	172	3.94	100	2.76	1.69	43	0.44	11.1	0.62	4	8.5	9.31
13FGLV1	1	25	5.00	127	6.89	175	3.94	100	3.13	2.01	51	0.44	11.1	0.62	4	11	11.66
13FGLV15	11/2"	40	6.50	165	8.15	207	5.51	140	3.88	2.87	73	0.56	14.3	0.62	4	32	18.43
13FGLV2	2"	50	7.99	203	9.13	232	6.30	160	4.74	3.62	92	0.63	15.9	0.75	4	48	28.44
13FGLV25	21/2"	65	8.50	216	10.75	273	7.09	180	5.49	4.13	105	0.69	17.5	0.75	4	80	44.10
13FGLV3	3"	80	9.49	241	11.93	303	7.87	200	6.00	5.00	127	0.75	19.1	0.75	4	110	56.91
13FGLV4	4"	100	11.50	229	13.39	340	8.82	224	7.50	6.18	157	0.94	23.9	0.75	8	190	87.16
13FGLV5	5"	125	14.02	356	15.16	385	9.84	250	8.50	7.32	186	0.94	23.9	0.88	8	–	117.97
13FGLV6	6"	150	15.98	406	17.64	448	11.81	300	9.51	8.50	216	1.00	25.4	0.88	8	450	154.35
13FGLV8	8"	200	19.49	495	21.46	545	13.98	355	11.75	10.63	270	1.13	28.6	0.88	8	800	294.37
13FGLV10	10"	250	24.49	622	26.22	666	17.72	450	14.25	12.76	324	1.19	30.2	1.00	12	–	433.28

MATERIALS LIST

NO.	PART NAME	MATERIAL SS316	QTY
1	BODY	ASTM A351 Gr. CF8M	1
2	BONNET	ASTM A351 Gr. CF8M	1
3	STEM	ASTM A276 Gr. 316	1
4	DISC	ASTM A351 Gr. CF8M	1
5	GLAND	ASTM A351 Gr. CF8	1
6	GLAND PACKING	PTFE	1
7	HAND WHEEL	ASTM A536 Gr. B65, 45 & 12	1
8	GASKET	PTFE (OR NON ASBESTOS)	1
9	BONNET BOLT/NUT	ASTM A193 Gr. B8/ASTM A194 Gr. 8	4-16
10	GLAND BOLT/NUT	ASTM A193 Gr. B8/ASTM A194 Gr. 8	2
11	YOKE SLEEVE	BRONZE (OR DUCTILENI-RESIST)	1

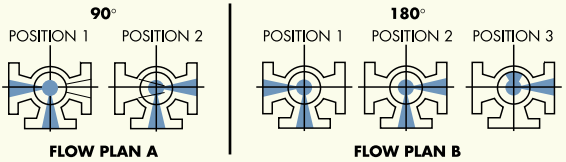
Also available in Class 300

** SIZES SHOWN ARE APPROXIMATE AND MAY VARY*

SPECIFICATIONS FLOW PATTERNS FOR 3-WAY VALVES

All flow patterns can be changed in the field without disassembling valve

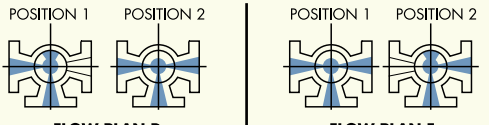
L-PORT:



FLOW PLAN A

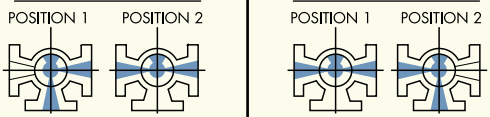
FLOW PLAN B

T-PORT: 90°



FLOW PLAN D

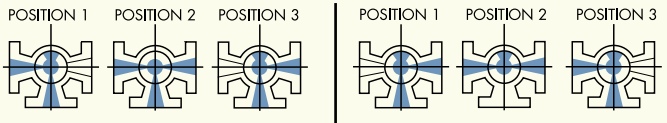
FLOW PLAN E



FLOW PLAN F

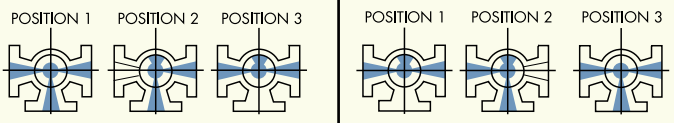
FLOW PLAN G

T-PORT: 180°



FLOW PLAN H

FLOW PLAN I



FLOW PLAN J

FLOW PLAN K

CASTING DESIGNATION

CF8 = 304
CF8M = 316
CF3 = 304-L
CF3M = 316-L

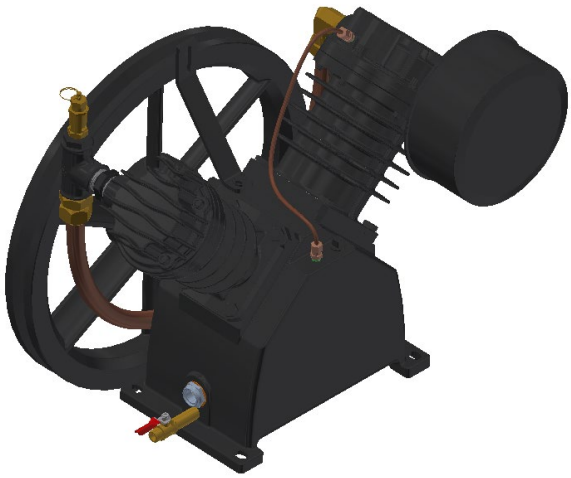
PINACLE

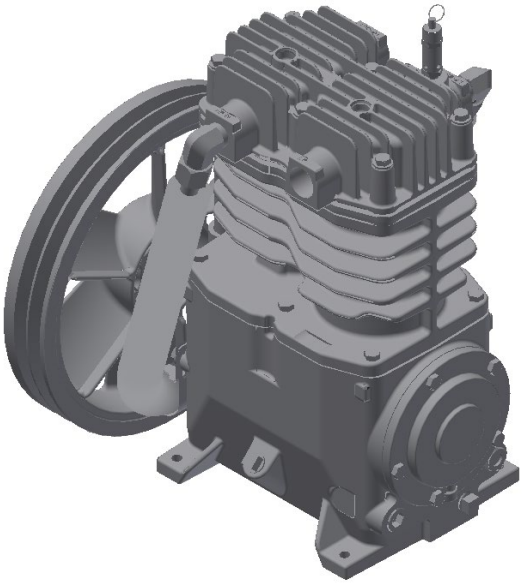
Atlas Copco

Industrial cast iron piston compressors



CR Range





Instruction book

Atlas Copco

Industrial cast iron piston compressors

CR Range

Instruction book

Original instructions

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1 Safety precautions

1.1 Safety icons

Explanation

	Danger for life
	Warning
	Important note

1.2 Safety precautions, general

General precautions

1. The operator must employ safe working practices and observe all related work safety requirements and regulations.
2. If any of the following statements does not comply with the applicable legislation, the stricter of the two shall apply.
3. Installation, operation, maintenance and repair work must only be performed by authorized, trained, specialized personnel.
4. The compressor is not considered capable of producing air of breathing quality. For air of breathing quality, the compressed air must be adequately purified according to the applicable legislation and standards.
5. Before any maintenance, repair work, adjustment or any other non-routine checks, stop the compressor, press the emergency stop button, switch off the voltage and depressurize the compressor. In addition, the power isolating switch must be opened and locked.
6. Never play with compressed air. Do not apply the air to your skin or direct an air stream at people. Never use the air to clean dirt from your clothes. When using the air to clean equipment, do so with extreme caution and wear eye protection.
7. The owner is responsible for maintaining the unit in safe operating condition. Parts and accessories shall be replaced if unsuitable for safe operation.
8. It is not allowed to walk or stand on the roof of the compressor canopy.

1.3 Safety precautions during installation

	All responsibility for any damage or injury resulting from neglecting these precautions, or non-observance of the normal caution and care required for installation, operation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.

Precautions during installation

1. The machine must only be lifted using suitable equipment in accordance with the applicable safety regulations. Loose or pivoting parts must be securely fastened before lifting. It is strictly forbidden to dwell or stay in the risk zone under a lifted load. Lifting acceleration and deceleration must be kept within safe limits. Wear a safety helmet when working in the area of overhead or lifting equipment.
2. Place the machine where the ambient air is as cool and clean as possible. If necessary, install a suction duct. Never obstruct the air inlet. Care must be taken to minimize the entry of moisture at the inlet air.
3. Any blanking flanges, plugs, caps and desiccant bags must be removed before connecting the pipes.
4. Air hoses must be of correct size and suitable for the working pressure. Never use frayed, damaged or worn hoses. Distribution pipes and connections must be of the correct size and suitable for the working pressure.
5. The aspirated air must be free of flammable fumes, vapors and particles, e.g. paint solvents, that can lead to internal fire or explosion.
6. Arrange the air intake so that loose clothing cannot be sucked in.
7. Ensure that the discharge pipe from the compressor to the aftercooler or air net is free to expand under heat and that it is not in contact with or close to flammable materials.
8. No external force may be exerted on the air outlet valve; the connected pipe must be free of strain.
9. If remote control is installed, the machine must bear a clear sign stating: DANGER: This machine is remotely controlled and may start without warning. The operator has to make sure that the machine is stopped and that the isolating switch is open and locked before any maintenance or repair. As a further safeguard, persons switching on remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the start equipment.
10. The machines must be installed in such a way that an adequate flow of cooling air is available and that the air from the exhaust does not recirculate to the compressor air inlet or cooling air inlet.
11. The electrical connections must correspond to the applicable codes. The machines must be earthed and protected against short circuits by fuses in all phases. A lockable power isolating switch must be installed near the compressor.
12. On machines with automatic start-stop system or if the automatic restart function after voltage failure is activated, a sign stating “This machine may start without warning” must be affixed near the instrument panel.
13. In multiple compressor systems, manual valves must be installed to isolate each compressor. Non-return valves (check valves) must not be relied upon for isolating pressure systems.
14. Never remove or tamper with the safety devices, guards or insulation fitted on the machine. Every pressure vessel or auxiliary installed outside the machine to contain air above atmospheric pressure must be protected by a pressure-relieving device or devices as required.
15. Pipework or other parts with a temperature in excess of 176˚F and which may be accidentally touched by personnel in normal operation must be guarded or insulated. Other high-temperature pipework must be clearly marked.
16. If the ground is not level or can be subject to variable inclinations, consult the manufacturer.

	Also consult following safety precautions: Safety precautions during operation and Safety precautions during maintenance. These precautions apply to machinery processing or consuming air or inert gas. Processing of any other gas requires additional safety precautions typical to the application which are not included herein. Some precautions are general and cover several machine types and equipment; hence some statements may not apply to your machine.

1.4 Safety precautions during operation

	All responsibility for any damage or injury resulting from neglecting these precautions, or non-observance of the normal precautions and care required for installation, operation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.

Precautions during operation

1. Use only the correct type and size of hose end fittings and connections. When blowing through a hose or air line, ensure that the open end is held securely. A free end will whip and may cause injury. Make sure that a hose is fully depressurized before disconnecting it.
2. Persons switching on remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the remote start equipment.
3. Never operate the machine when there is a possibility of taking in flammable or toxic fumes, vapors or particles.
4. Never operate the machine below or in excess of its limit ratings.
5. People staying in environments or rooms where the sound pressure level reaches or exceeds 90 dB(A) shall wear ear protectors.
6. Periodically check that:
   - All guards are in place and securely fastened
   - All hoses and/or pipes inside the machine are in good condition, secure and not rubbing
   - There are no leaks
   - All fasteners are tight
   - All electrical leads are secure and in good order
   - Pressure relief valves and other pressure-relief devices are not obstructed by dirt or paint
   - Air outlet valve and air net, i.e. pipes, couplings, manifolds, valves, hoses etc. are in good repair, free of wear or abuse
7. If warm cooling air from compressors is used in air heating systems, e.g. to warm up a workroom, take precautions against air pollution and possible contamination of the breathing air.
8. If available, do not remove any of, or tamper with, the sound-damping material.
9. Never remove or tamper with the safety devices, guards or insulations fitted on the machine. Every pressure vessel or auxiliary installed outside the machine to contain air above atmospheric pressure shall be protected by a pressure-relieving device or devices as required.

	Also consult following safety precautions: Safety precautions during installation and Safety precautions during maintenance. These precautions apply to machinery processing or consuming air or inert gas. Processing of any other gas requires additional safety precautions typical to the application which are not included herein. Some precautions are general and cover several machine types and equipment; hence some statements may not apply to your machine.

1.5 Safety precautions during maintenance or repair

	All responsibility for any damage or injury resulting from neglecting these precautions, or non-observance of the normal precautions and care required for installation, operation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.

Precautions during maintenance or repair

1. Always wear safety glasses.
2. Use only the correct tools for maintenance and repair work.
3. Use only genuine spare parts.
4. All maintenance work shall only be undertaken when the machine has cooled down.
5. A warning sign stating “work in progress; do not start” shall be attached to the starting equipment.
6. Persons switching on remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the remote start equipment.
7. Close the compressor air outlet valve before connecting or disconnecting a pipe.
8. Before removing any pressurized component, effectively isolate the machine from all sources of pressure and relieve the entire system of pressure.
9. Never use flammable solvents or carbon tetrachloride for cleaning parts. Take safety precautions against toxic vapors of cleaning liquids.
10. Scrupulously observe cleanliness during maintenance and repair. Keep dirt away by covering the parts and exposed openings with a clean cloth, paper or tape.
11. Never weld or perform any operation involving heat near the oil system. Oil tanks must be completely purged, e.g. by steam-cleaning, before carrying out such operations. Never weld on, or in any way modify, pressure vessels.
12. Whenever there is an indication or any suspicion that an internal part of a machine is overheated, the machine shall be stopped but no inspection covers shall be opened before sufficient cooling time has elapsed; this to avoid the risk of spontaneous ignition of the oil vapor when air is admitted.
13. Never use a light source with open flame for inspecting the interior of a machine, pressure vessel etc.
14. Make sure that no tools, loose parts or rags are left in or on the machine.
15. All regulating and safety devices shall be maintained with due care to ensure that they function properly. They may not be put out of action.
16. Protect the motor, air filter, electrical and regulating components etc. to prevent moisture from entering them, e.g. when steam-cleaning.
17. Make sure that all sound-damping material and vibration dampers, e.g. damping material on the bodywork and in the air inlet and outlet systems of the compressor, are in good condition. If damaged, replace it by genuine material from the manufacturer to prevent the sound pressure level from increasing.
18. Never use caustic solvents which can damage materials of the air net, e.g. polycarbonate bowls.
19. **The following safety precautions are stressed when handling refrigerant**:
    - Never inhale refrigerant vapors. Check that the working area is adequately ventilated; if required, use breathing protection.
    - Always wear special gloves. In case of refrigerant contact with the skin, rinse the skin with water. If liquid refrigerant contacts the skin through clothing, never tear off or remove the latter; flush abundantly with fresh water over the clothing until all refrigerant is flushed away; then seek medical first aid.
20. Protect hands to avoid injury from hot machine parts, e.g. during draining of oil.

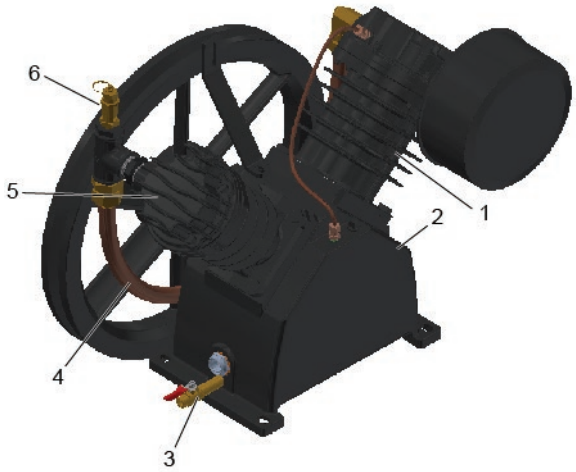
	Also consult the following safety precautions: Safety precautions during installation and Safety precautions during operation. These precautions apply to machinery processing or consuming air or inert gas. Processing of any other gas requires additional safety precautions typical to the application which are not included herein. Some precautions are general and cover several machine types and equipment; hence some statements may not apply to your machine.

2 General description

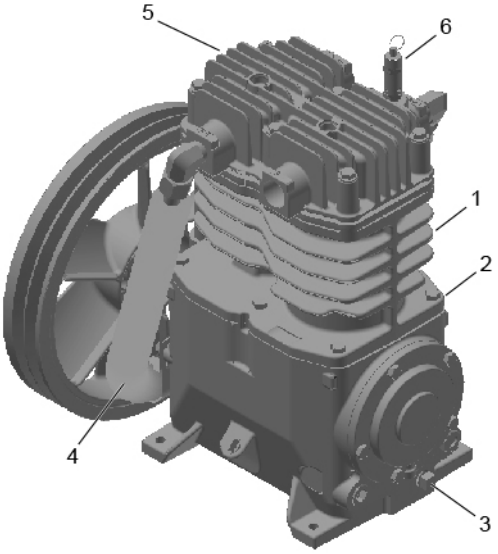
2.1 General description

Introduction

CR Range Compressors are air-cooled, two cylinder, single-stage and double-stage, lubricated piston compressors, built for effective working pressures up to 145-175 psi.

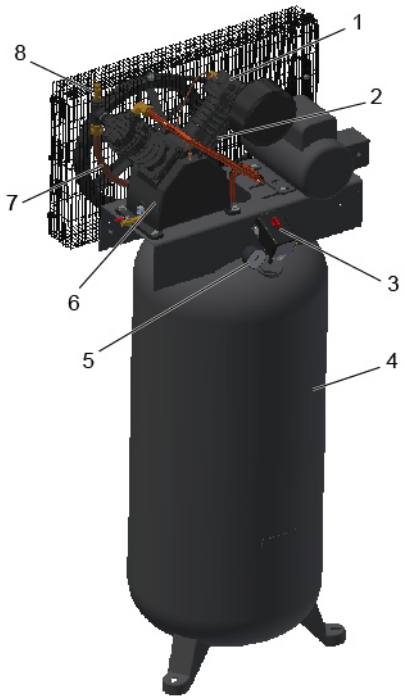


Compressor block

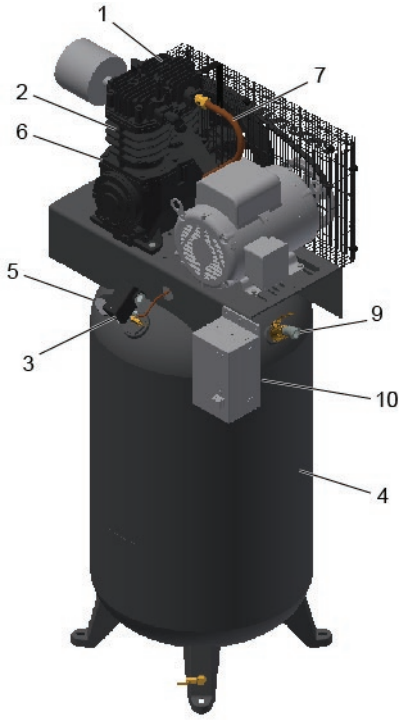


Compressor block

Reference	Description
1	Cylinder
2	Crankcase
3	Oil drain
4	Intercooler
5	Cylinder head
6	Pressure relief valve

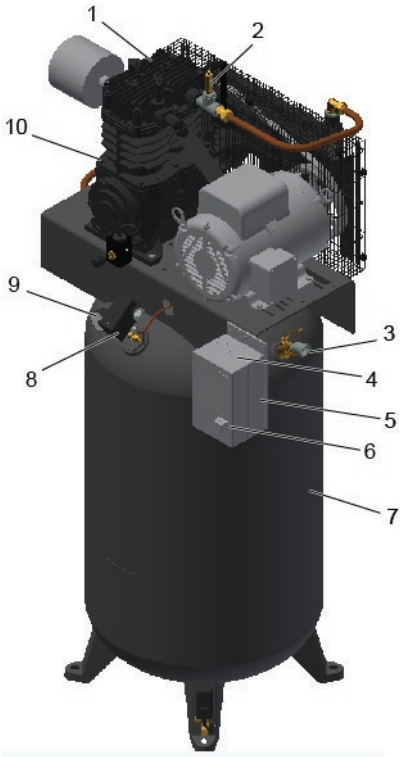


Tank-mounted, vertical receiver

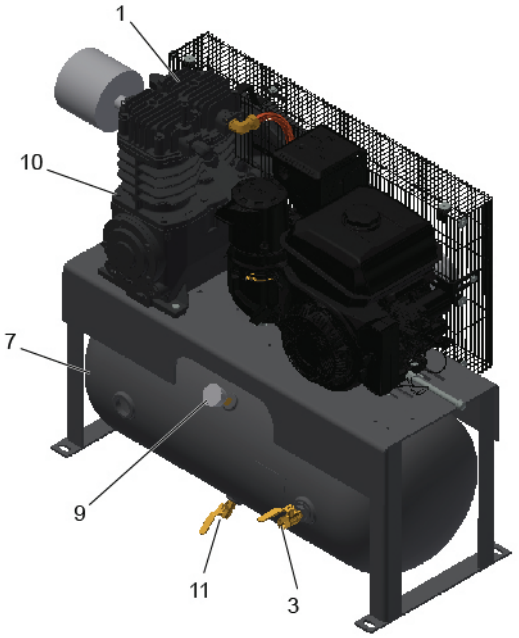


Tank-mounted, vertical receiver

Reference	Description
1	Compressor
2	Filter
3	Air pressure switch
4	Air receiver
5	Air pressure gauge
6	Crankcase
7	Intercooler
8	Pressure relief valve
9	Air outlet valve
10	Control panel



Tank-mounted, vertical receiver



Tank-mounted, horizontal receiver

Reference	Description
1	Compressor
2	Pressure relief valve
3	Air outlet valve
4	Hour meter (option)
5	Electric cabinet
6	On/off switch
7	Air receiver
8	Air pressure switch
9	Air pressure gauge
10	Compressor
11	Condensate drain valve

Compressor variants

The **compressor block** includes:

- Crankcase and cylinders
- Air cooler piping
- Check valve
- Pressure relief valve

The unit comprises:

- **Tank-mounted CR with electric motor:** The compressor on a horizontal or vertical air receiver with air outlet valve, pressure gauge, pressure relief valve, air pressure switch with an on/off button (MDR), and condensate drain valve.
- **Tank-mounted CR with gas engine:** The compressor on an air receiver with air outlet valve, pressure gauge, pressure relief valve, and condensate drain valve.
- **CR base-mounted unit** is a fully operational unit with air pressure switch and on/off switches mounted on a frame (no air receiver).
- **CR Contractor units** are mobile compressors. They are equipped with a gas engine. The compressors have two outlet connections:
  - A connection for compressed air at working pressure.
  - A connection for compressed air at reduced pressure via a pressure regulator.

2.2 Hour meter option

The hour meter is triggered by the motor's magnetic field, so the hours display actual operation. When the motor is on, the hours icon will blink on/off indicating the hour meter is active.

With solid-state technology the hour meter is built with a custom chip and with solid construction for maximum durability for harsh environments and rugged applications.



Hour meter

Features

- Large 5 segment LCD display
- Low cost and small size
- No external power required
- No shunt required
- Solid-state electronics
- Quartz crystal
- Wide operating temperature range
- High reliability
- Easy to install
- Made in the U.S.A.

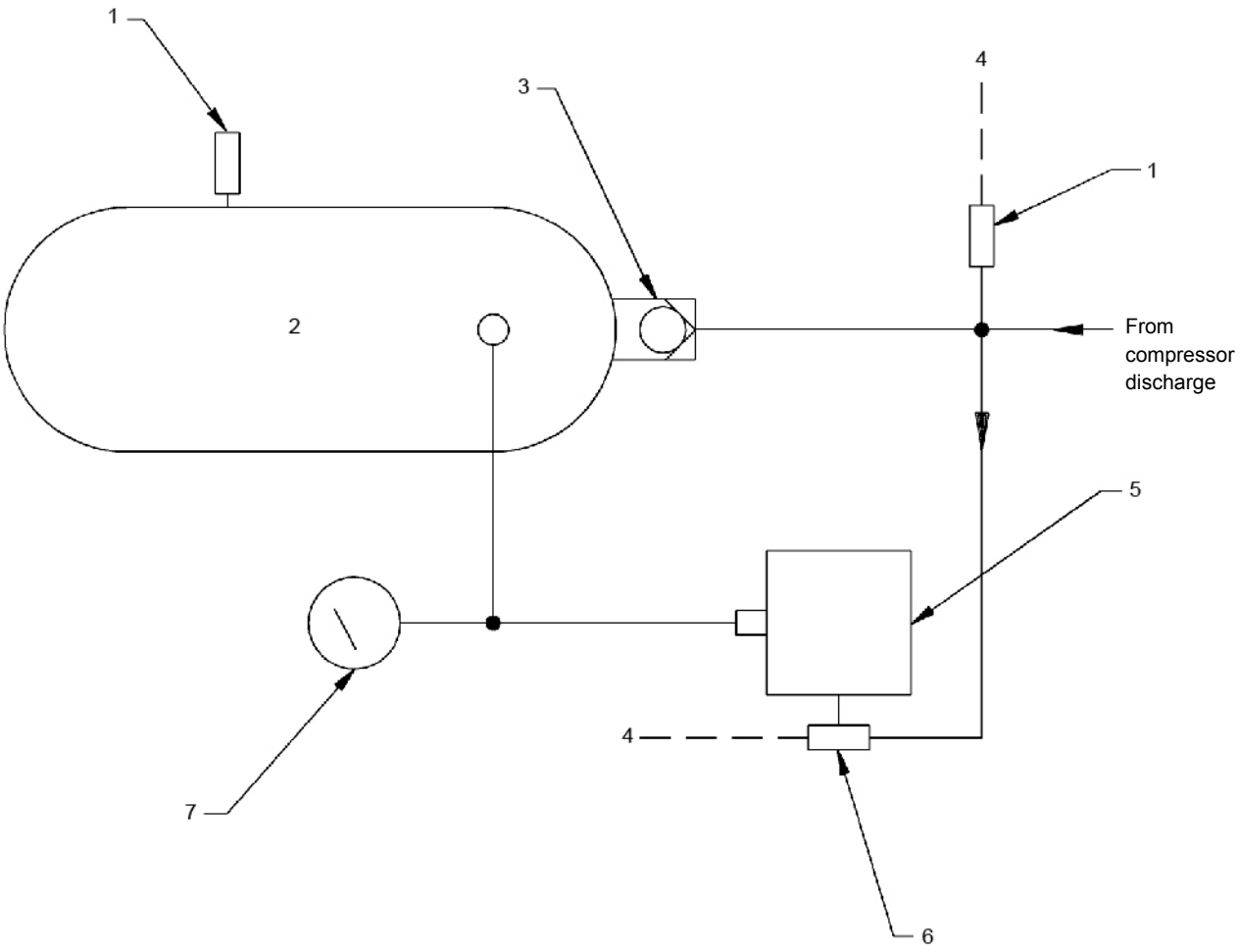
Specifications

Display Reading:	9999.9 Hour meter
Digit Height:	5-digits [8MM] LCD
Operating Voltage:	Internal lithium battery 15,000 hours continuous running
Temperature:	Standard -40°C to +85°C (-40°F to +185°F)
Vibration Resistance:	Withstands 10 to 75Hz @ 1 to 8 g's
Mounting Configuration:	Two hole base mount

2.3 Control piping

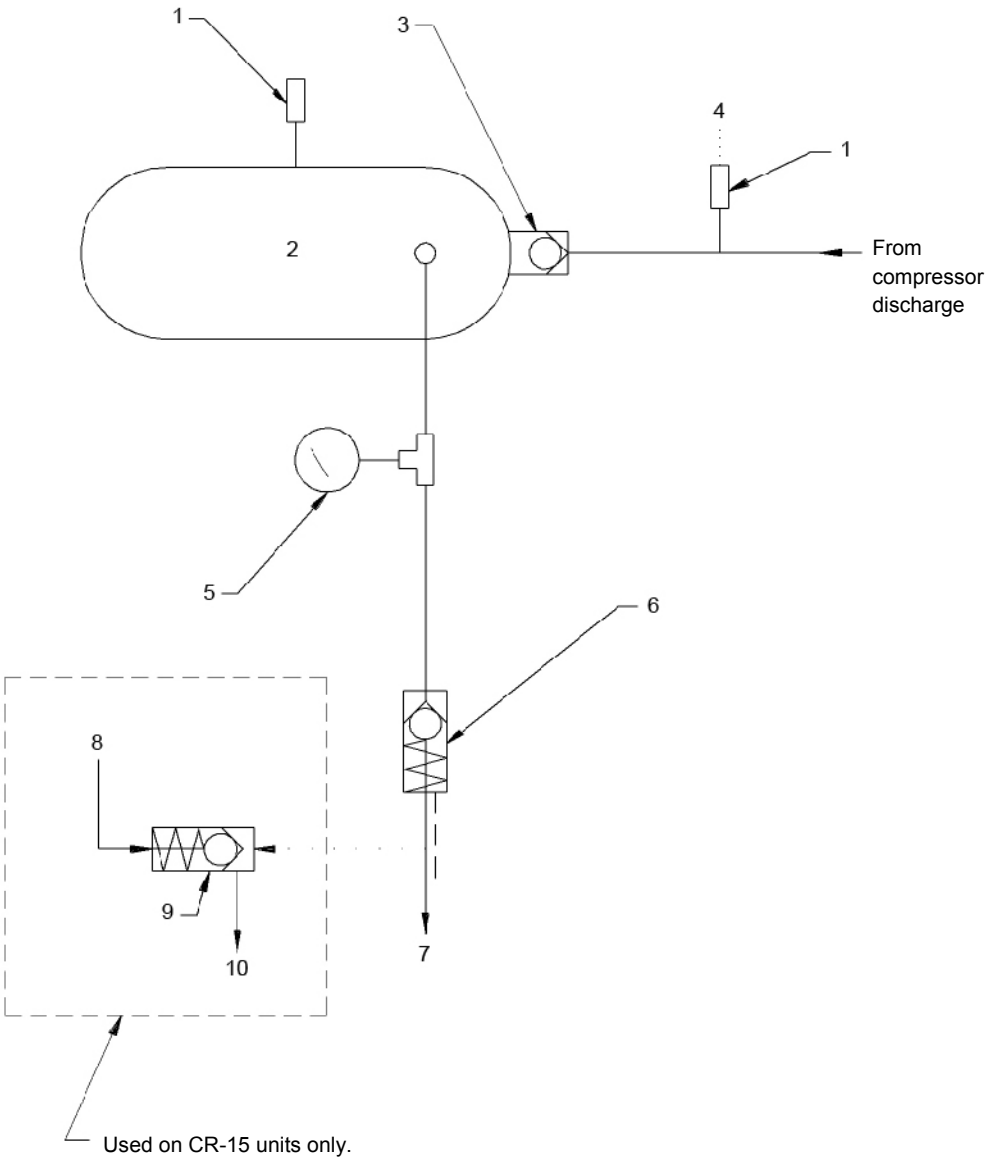
CR 2 to 15 hp

Air drawn through the air filter and inlet silencer into cylinders is compressed, then discharged through the cooler piping and “and check valve / unloader valve” into the air receiver.



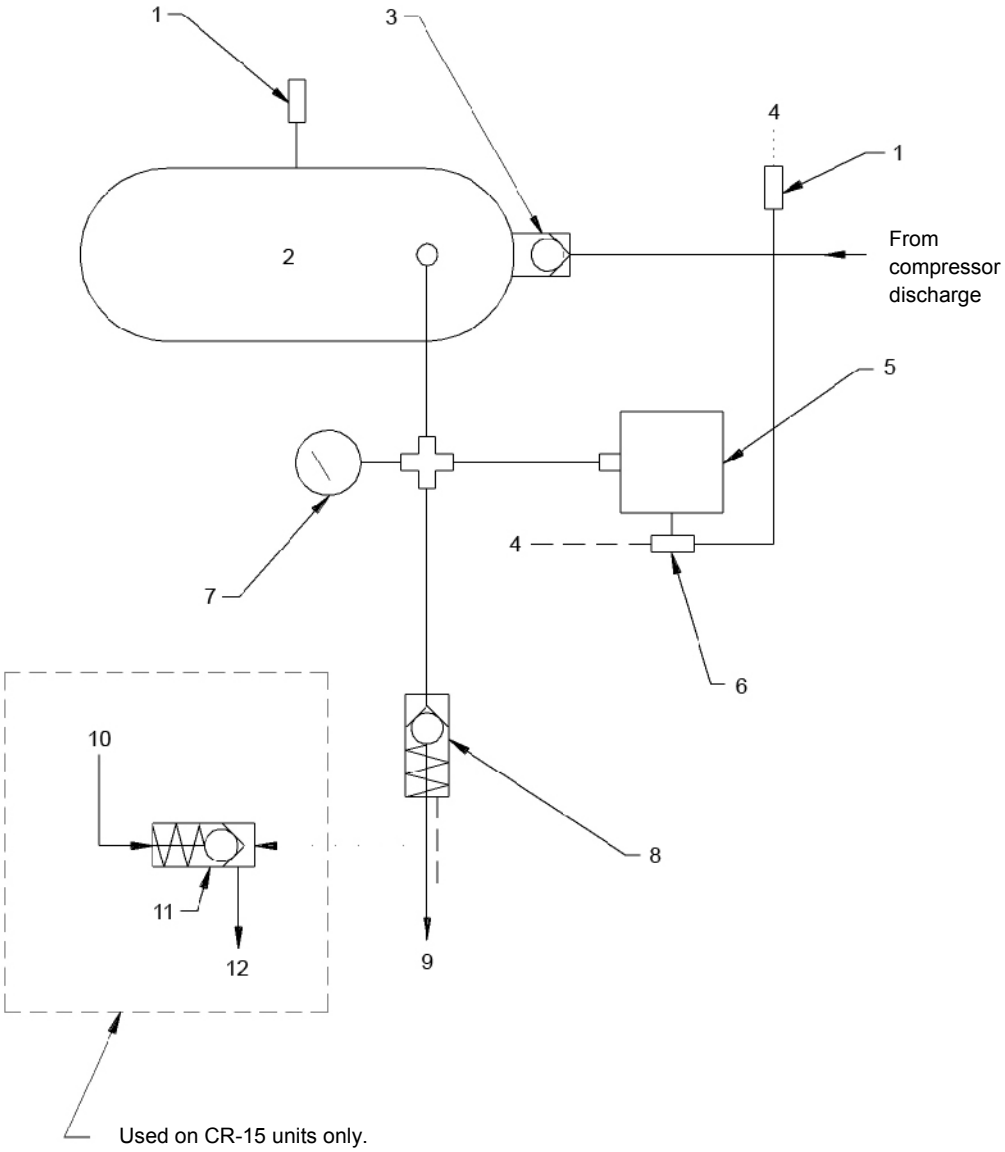
Control piping and regulating system with automatic start/stop

Reference	Description
1	Pressure relief valve
2	Air receiver
3	Discharge line check valve
4	Vent
5	Pressure switch
6	Pressure release valve on pressure switch
7	Pressure gauge



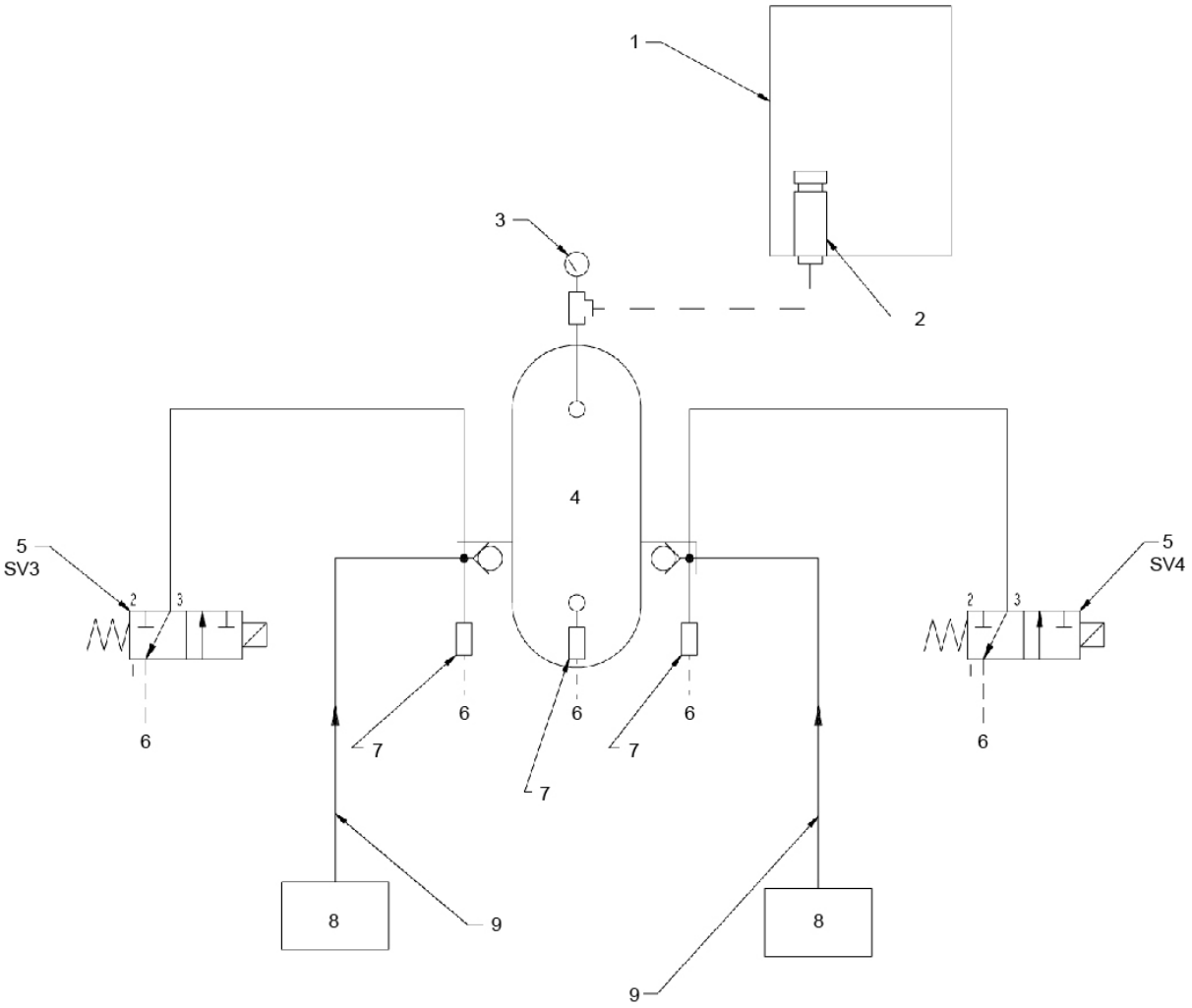
Control piping and regulating system with load/unload

Reference	Description
1	Pressure relief valve
2	Air receiver
3	Discharge line check valve
4	Vent
5	Pressure gauge
6	Pilot valve
7	Flow to head unloaders
8	Flow from compressor interstage
9	Electronic drain
10	Vent to atmosphere



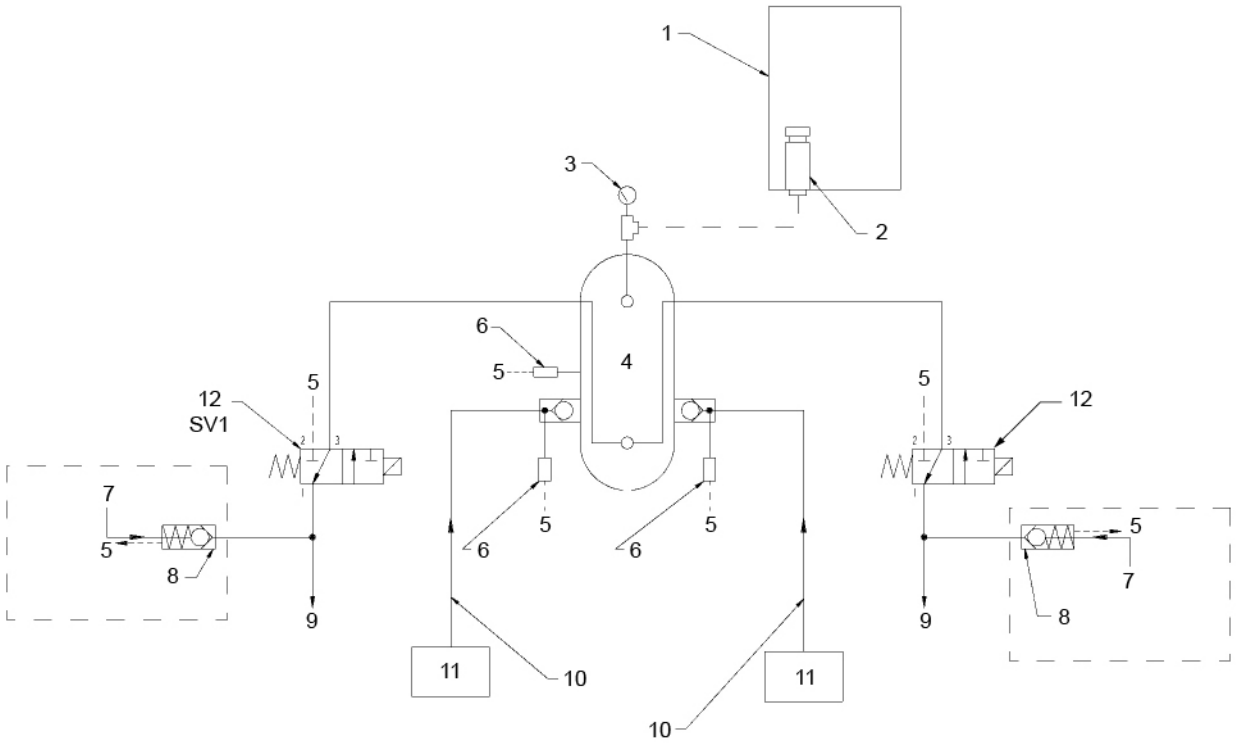
Control piping and regulating system with dual control and pilot

Reference	Description
1	Pressure relief valve
2	Air receiver
3	Discharge line check valve
4	Vent
5	Pressure switch
6	Pressure release valve on pressure switch
7	Pressure gauge
8	Pilot valve
9	Flow to head unloaders
10	Flow from compressor interstage
11	Electronic drain
12	Vent to atmosphere



Control piping and regulating system, duplex tank mount with automatic start/stop

Reference	Description
1	Control panel
2	Pressure transducer
3	Pressure gauge
4	Air receiver
5	3-way normally-open solenoid valve
6	Vent
7	Pressure relief valve
8	Compressor
9	Discharge line



Control piping and regulating system, duplex tank mount with dual control and solenoid valve

Reference	Description
1	Control panel
2	Pressure transducer
3	Pressure gauge
4	Air receiver
5	Vent
6	Pressure relief valve
7	Flow from interstage
8	Interstage dump valve (Used on CR-15 units only.)
9	Flow to compressor head unloaders
10	Discharge line
11	Compressor
12	3-way normally-open solenoid valve

2.4 Regulating system

Automatic Start/Stop

The regulating system includes:

- Check valve
- Air pressure switch (MDR) with pressure release valve and on/off button (S1).

Operation

The air pressure switch opens and closes its contacts at pre-set pressures. During loaded operation, the contacts are closed: the motor is running.

When the pressure in the air receiver reaches the pre-set maximum pressure, the contacts as well as pressure release valve are opened. The motor stops, the air at the delivery side of the compressor is vented to atmosphere and the check valve closes to prevent venting of the receiver.

When the pressure in the air receiver decreases to the pre-set minimum pressure, the contacts of the air pressure switch close and the pressure release valve closes. The motor restarts and compressed air is supplied to the receiver again.

CR Contractor

The regulating system includes:

- Pilot valve
- Unloader with integrated check valve

Operation

The pilot valve opens and closes at pre-set pressures. During loaded operation, the pilot valve is closed, preventing the compressed air from flowing to the unloader.

When the pressure in the pulsation dampers reaches the pre-set maximum pressure, the pilot valve will open. Compressed air from the pulsation dampers will flow to the plunger which causes the unloading valve to open. The air at the delivery side of the compressor is blown through the silencer to the atmosphere and the check valve closes to prevent venting of the pulsation dampers. The compressor runs unloaded.

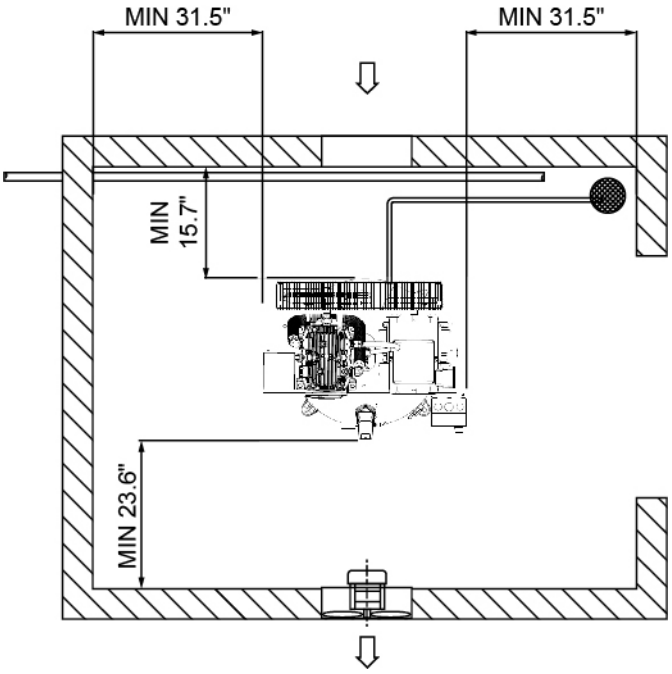
When the pressure in the pulsation dampers decreases to the pre-set minimum pressure, the pilot valve closes. Control air from the unloader plunger chamber is vented to the atmosphere. The unloading valve closes and compressed air is supplied to the pulsation dampers again.

3 Installation

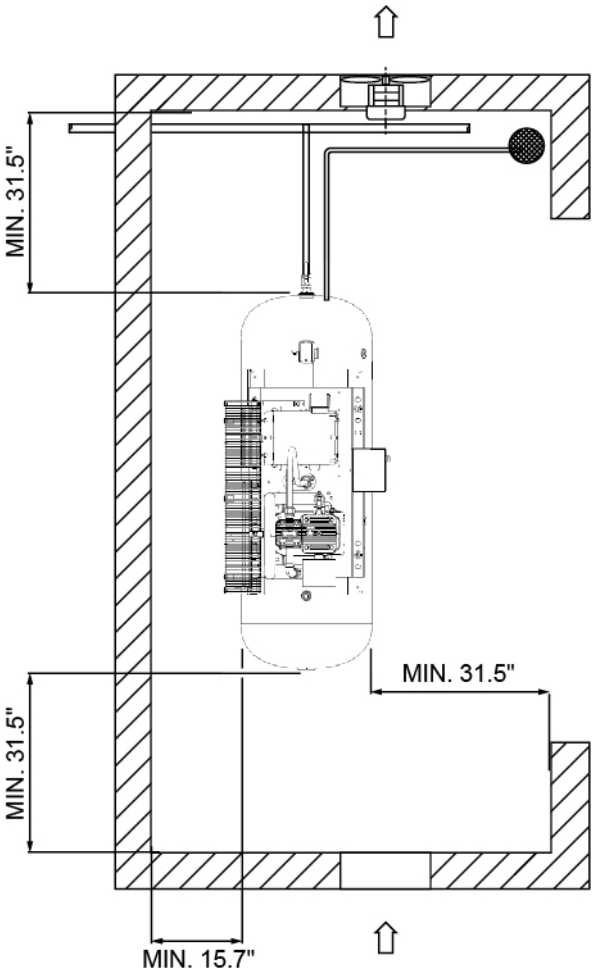
3.1 Installation instruction

Install the unit in an area where the noise levels do not cause inconvenience and adequate ventilation is available for cooling purposes.

⚠	Before commencing installation, check that the electrical data on the compressor specification plate/s are compatible with the local power supply. Before connecting the electricity, ensure that the power supply is off and correctly isolated. The electrical power supplied to the compressor unit must be connected by a qualified electrician in accordance with the wiring diagram supplied with the plant. All wiring must be in accordance with UL regulations. Cable sizes given in section. Electric data are recommendations only.



Installation proposal for CR with vertical receiver



Installation proposal for CR with horizontal receiver

CR

Install the compressor horizontally, in a cool but frost-free and well-ventilated room. Place the compressor as level as possible; however, CR can be operated with a maximum inclination of 40% (22.5 degrees) in any direction. The air should be clean.

It is recommended to install an automatic condensate drain (available as an option) on the air receiver to ensure continuous condensate removal.

CR Contractor

The compressors are equipped with a lifting eye or yoke. When running, the compressor must be installed as level as possible; however, it can be operated temporarily in an inclined plane of maximum 25% (or 20 degrees). Keep the compressor in a frost-free and well-ventilated place.

3.2 Electrical connections

Warning

	The electrical connection must be carried out by an electrician and must correspond to the local codes. The indications on the motor data plate must correspond to the power supply voltage and frequency. The installation must include an isolating switch in the power line near the unit and be protected against short-circuits by fuses for each phase. Refer to Fuses and wire sizes. The power supply and grounding lines must be of suitable size. Refer to Fuses and wire sizes in Section 3.3. For Automatic Start/Stop, connect the power supply cables as shown in the electrical diagrams. Check the setting of the overload relay.

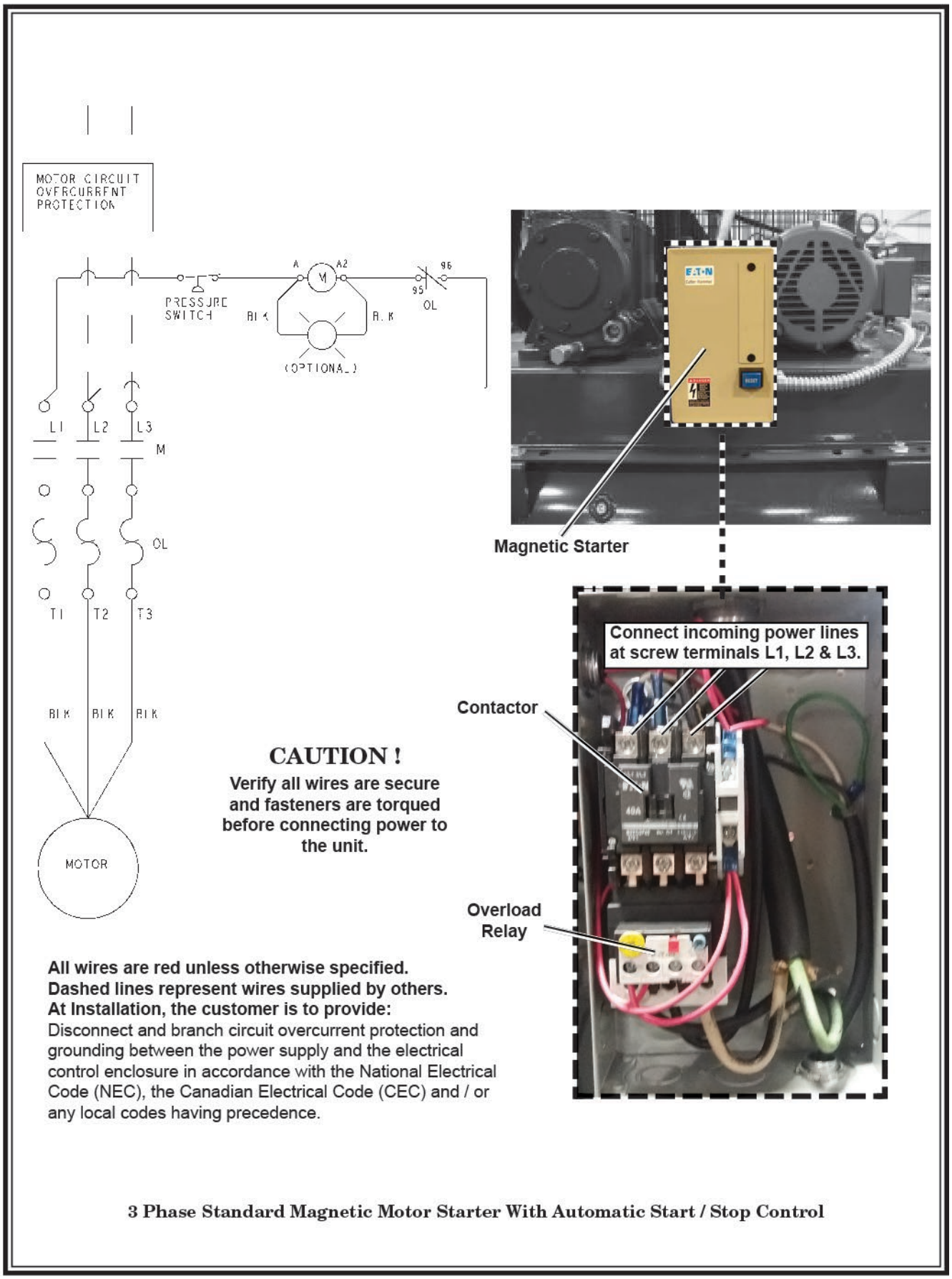

MOTOR CIRCUIT
OVERCURRENT
PROTECTION
PRESSURE
SWITCH
A
A2
96
95
OL
BLK
BLK
(OPTIONAL)
L1
L2
L3
M
OL
T1
T2
T3
BLK
BLK
BLK
MOTOR
Magnetic Starter
Connect incoming power lines
at screw terminals L1, L2 & L3.
Contactor
Overload
Relay
CAUTION !
Verify all wires are secure
and fasteners are torqued
before connecting power to
the unit.
All wires are red unless otherwise specified.
Dashed lines represent wires supplied by others.
At Installation, the customer is to provide:
Disconnect and branch circuit overcurrent protection and
grounding between the power supply and the electrical
control enclosure in accordance with the National Electrical
Code (NEC), the Canadian Electrical Code (CEC) and / or
any local codes having precedence.
3 Phase Standard Magnetic Motor Starter With Automatic Start / Stop Control

Fig. 3-1

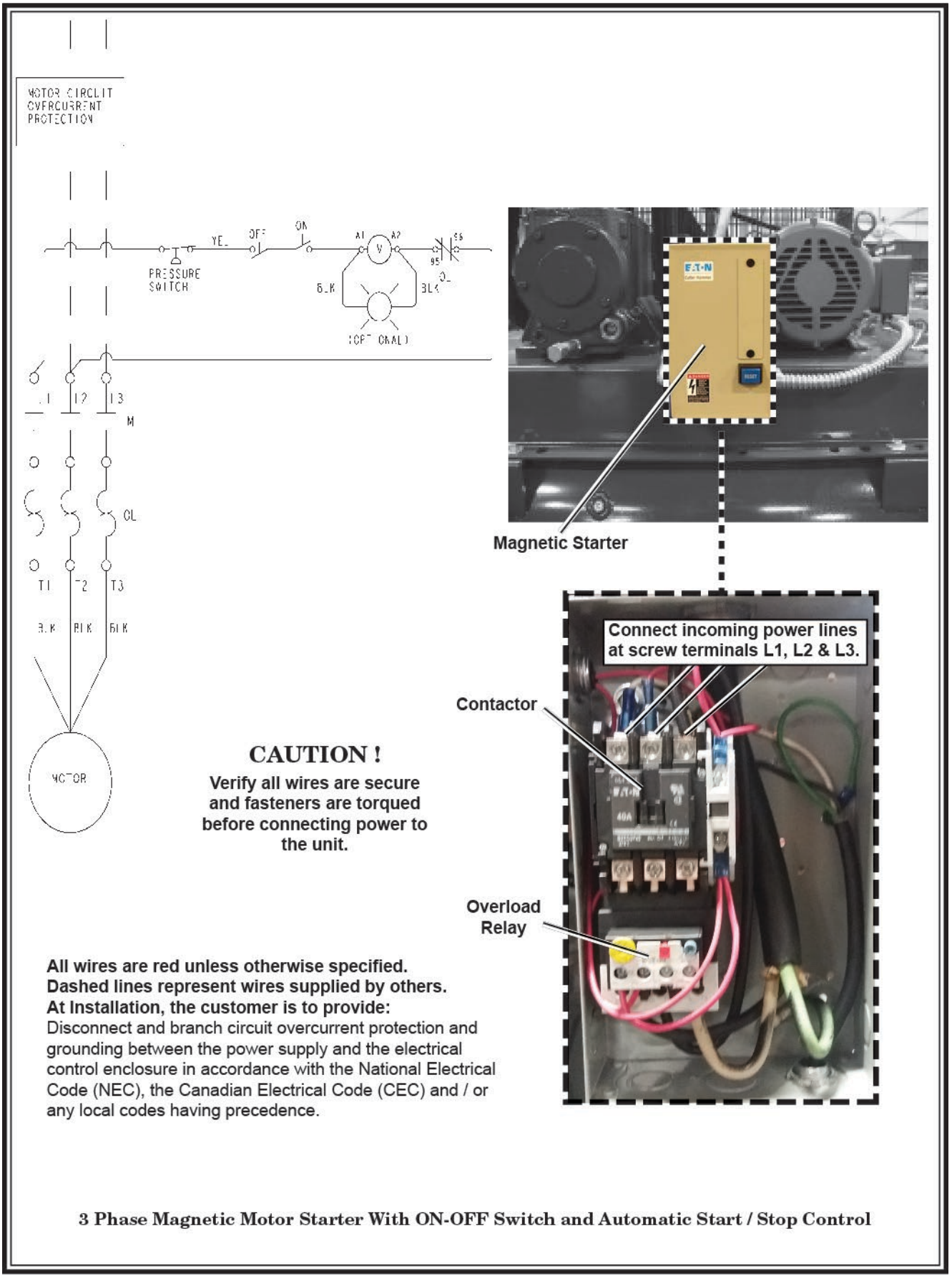

MOTOR CIRCUIT
OVERCURRENT
PROTECTION
PRESSURE
SWITCH
OFF
ON
A1
A2
95
96
L1
L2
L3
M
OL
T1
T2
T3
BLK
BLK
BLK
MOTOR
Magnetic Starter
Connect incoming power lines
at screw terminals L1, L2 & L3.
Contactor
Overload
Relay
CAUTION !
Verify all wires are secure
and fasteners are torqued
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control enclosure in accordance with the National Electrical
Code (NEC), the Canadian Electrical Code (CEC) and / or
any local codes having precedence.
3 Phase Magnetic Motor Starter With ON-OFF Switch and Automatic Start / Stop Control

Fig. 3-2

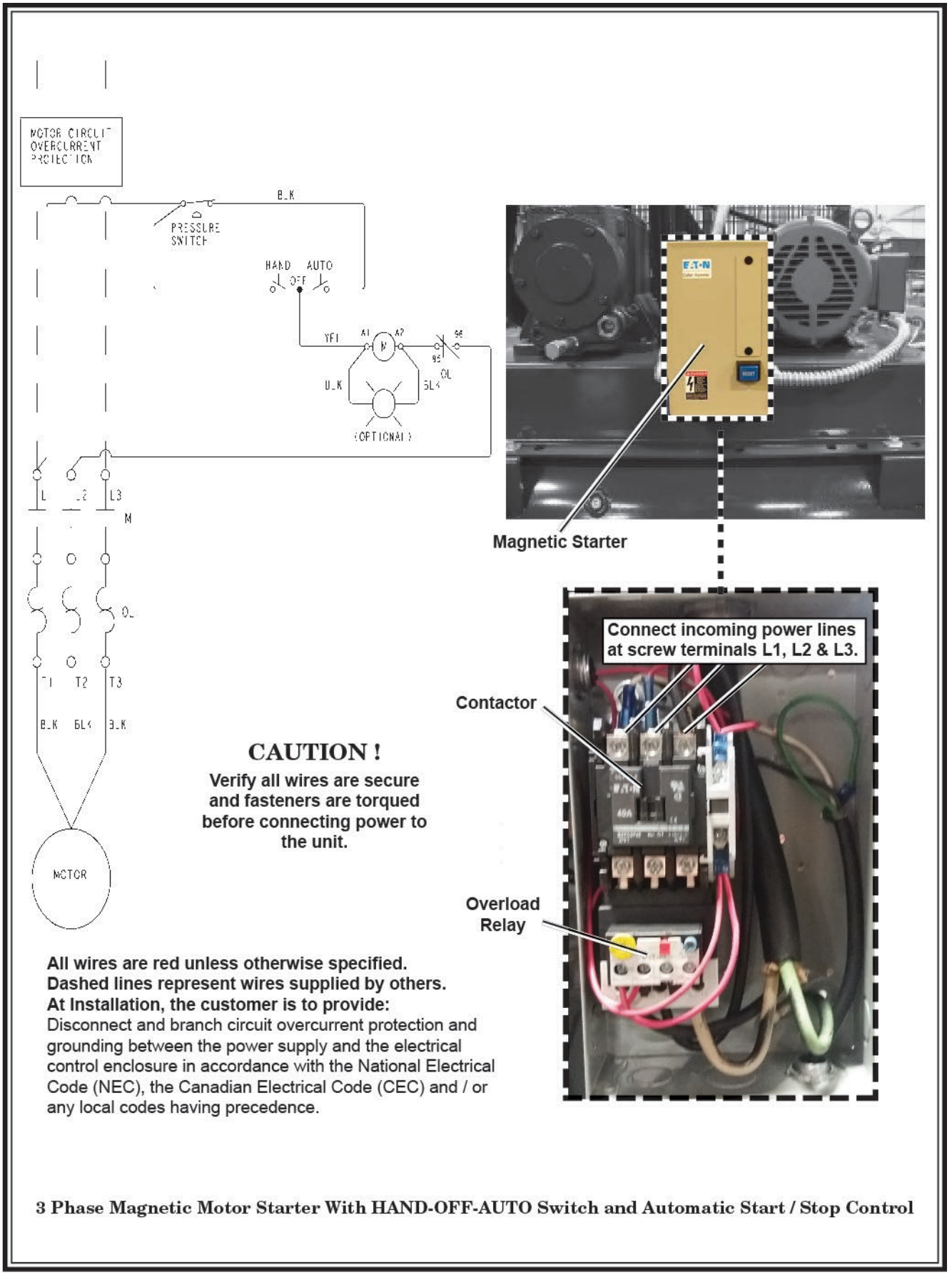

MOTOR CIRCUIT OVERCURRENT PROTECTION
BLK
PRESSURE SWITCH
HAND AUTO
OFF
YEL
A1
A2
96
95
OL
BLK
BLK
(OPTIONAL)
L1
L2
L3
M
OL
T1
T2
T3
BLK
BLK
BLK
MOTOR
Magnetic Starter
Connect incoming power lines at screw terminals L1, L2 & L3.
Contactor
Overload Relay
CAUTION !
Verify all wires are secure and fasteners are torqued before connecting power to the unit.
All wires are red unless otherwise specified.
Dashed lines represent wires supplied by others.
At Installation, the customer is to provide:
Disconnect and branch circuit overcurrent protection and grounding between the power supply and the electrical control enclosure in accordance with the National Electrical Code (NEC), the Canadian Electrical Code (CEC) and / or any local codes having precedence.
3 Phase Magnetic Motor Starter With HAND-OFF-AUTO Switch and Automatic Start / Stop Control

Fig. 3-3

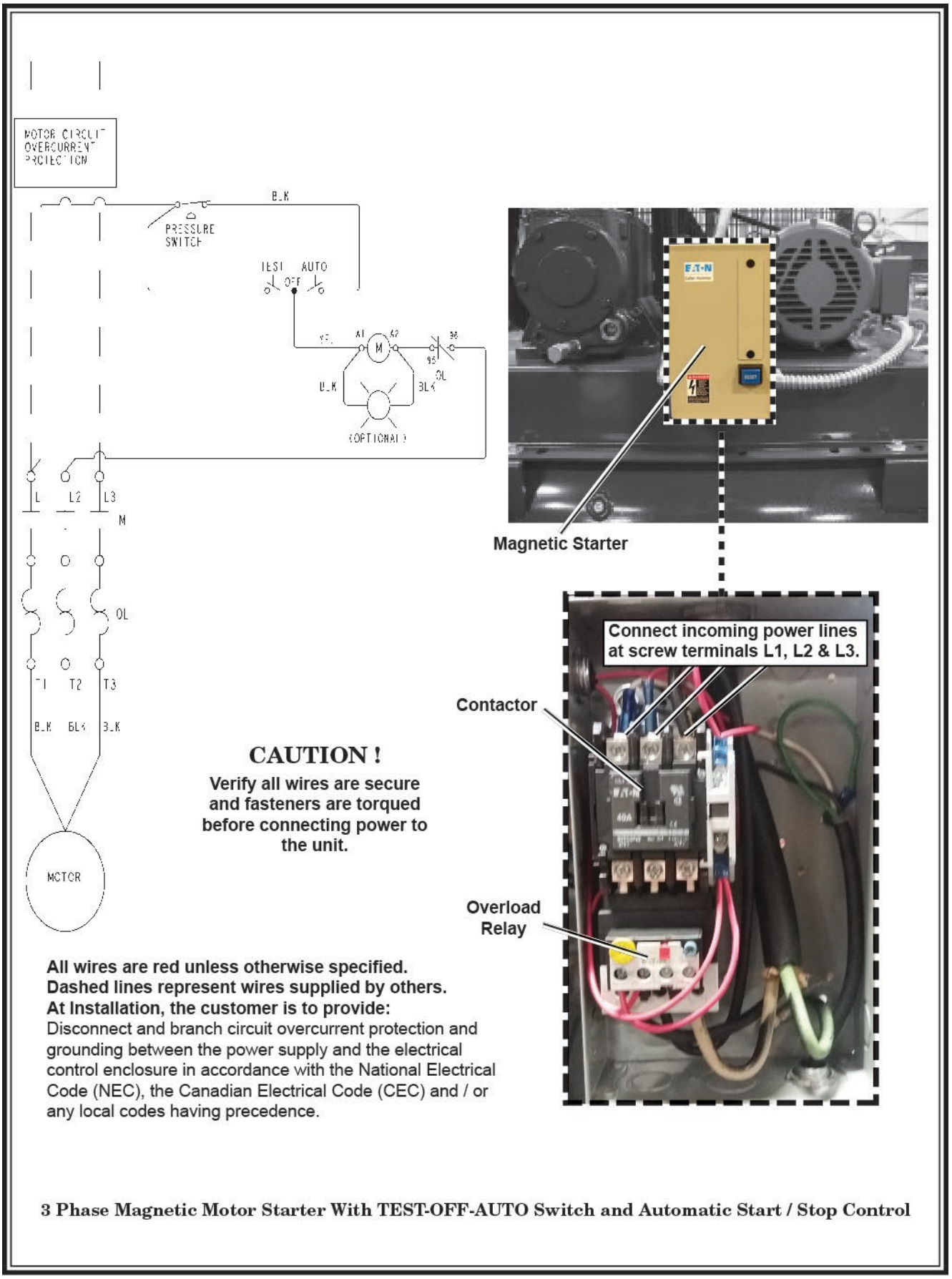

MOTOR CIRCUIT OVERCURRENT PROTECTION
B_K
PRESSURE SWITCH
TEST AUTO OFF
A1
A2
M
95
96
OL
BLK
BLK
(OPTIONAL)
L1
L2
L3
M
OL
T1
T2
T3
B_K
BLK
B_K
MOTOR
Magnetic Starter
Connect incoming power lines at screw terminals L1, L2 & L3.
Contactor
Overload Relay
CAUTION !
Verify all wires are secure and fasteners are torqued before connecting power to the unit.
All wires are red unless otherwise specified.
Dashed lines represent wires supplied by others.
At Installation, the customer is to provide:
Disconnect and branch circuit overcurrent protection and grounding between the power supply and the electrical control enclosure in accordance with the National Electrical Code (NEC), the Canadian Electrical Code (CEC) and / or any local codes having precedence.
3 Phase Magnetic Motor Starter With TEST-OFF-AUTO Switch and Automatic Start / Stop Control

Fig. 3-4

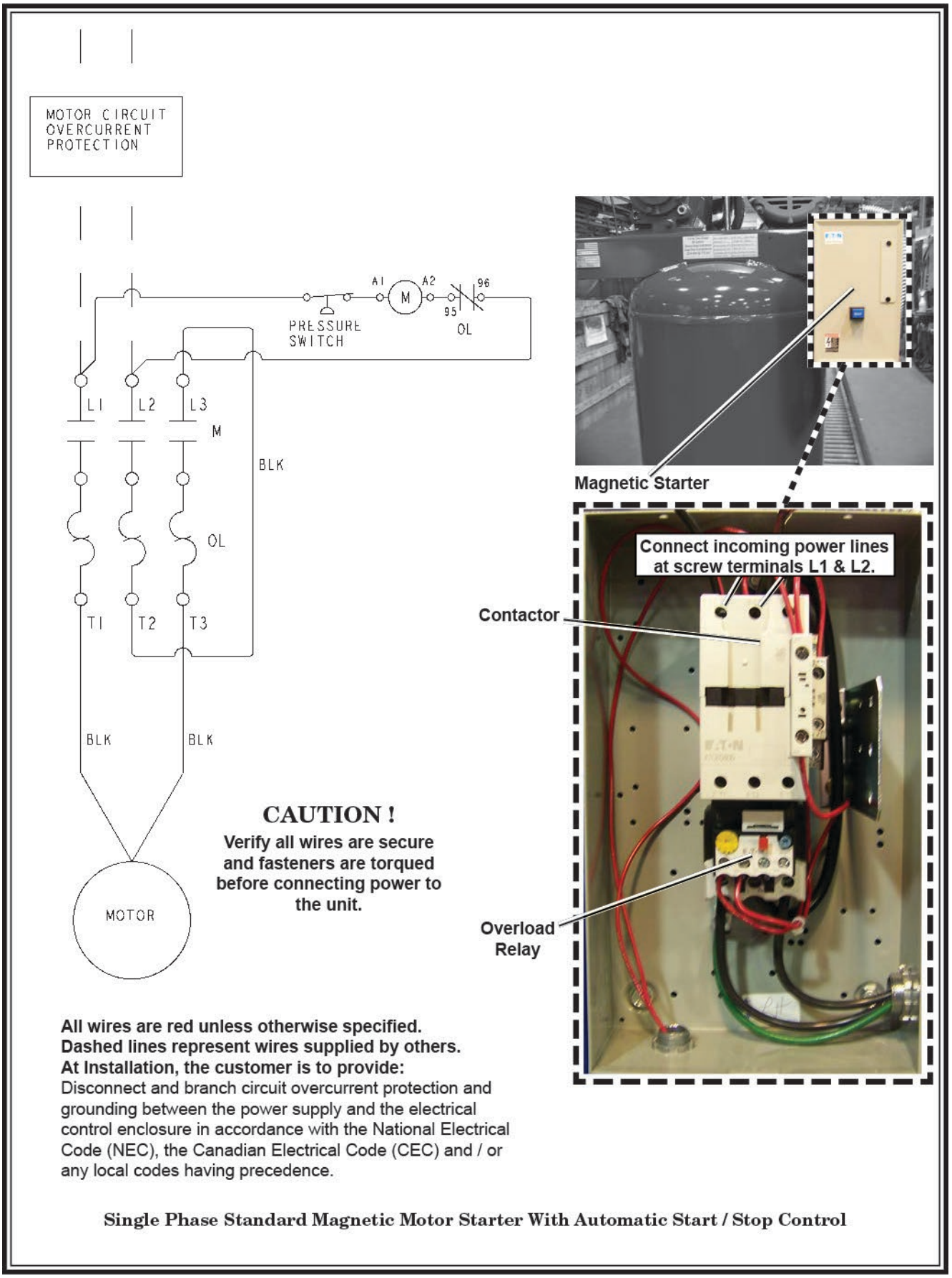

MOTOR CIRCUIT
OVERCURRENT
PROTECTION
A1
A2
M
96
95
PRESSURE
SWITCH
OL
L1
L2
L3
M
BLK
OL
T1
T2
T3
BLK
BLK
MOTOR
CAUTION !
Verify all wires are secure
and fasteners are torqued
before connecting power to
the unit.
Magnetic Starter
Connect incoming power lines
at screw terminals L1 & L2.
Contactor
Overload
Relay
All wires are red unless otherwise specified.
Dashed lines represent wires supplied by others.
At Installation, the customer is to provide:
Disconnect and branch circuit overcurrent protection and
grounding between the power supply and the electrical
control enclosure in accordance with the National Electrical
Code (NEC), the Canadian Electrical Code (CEC) and / or
any local codes having precedence.
Single Phase Standard Magnetic Motor Starter With Automatic Start / Stop Control

Fig. 3-5

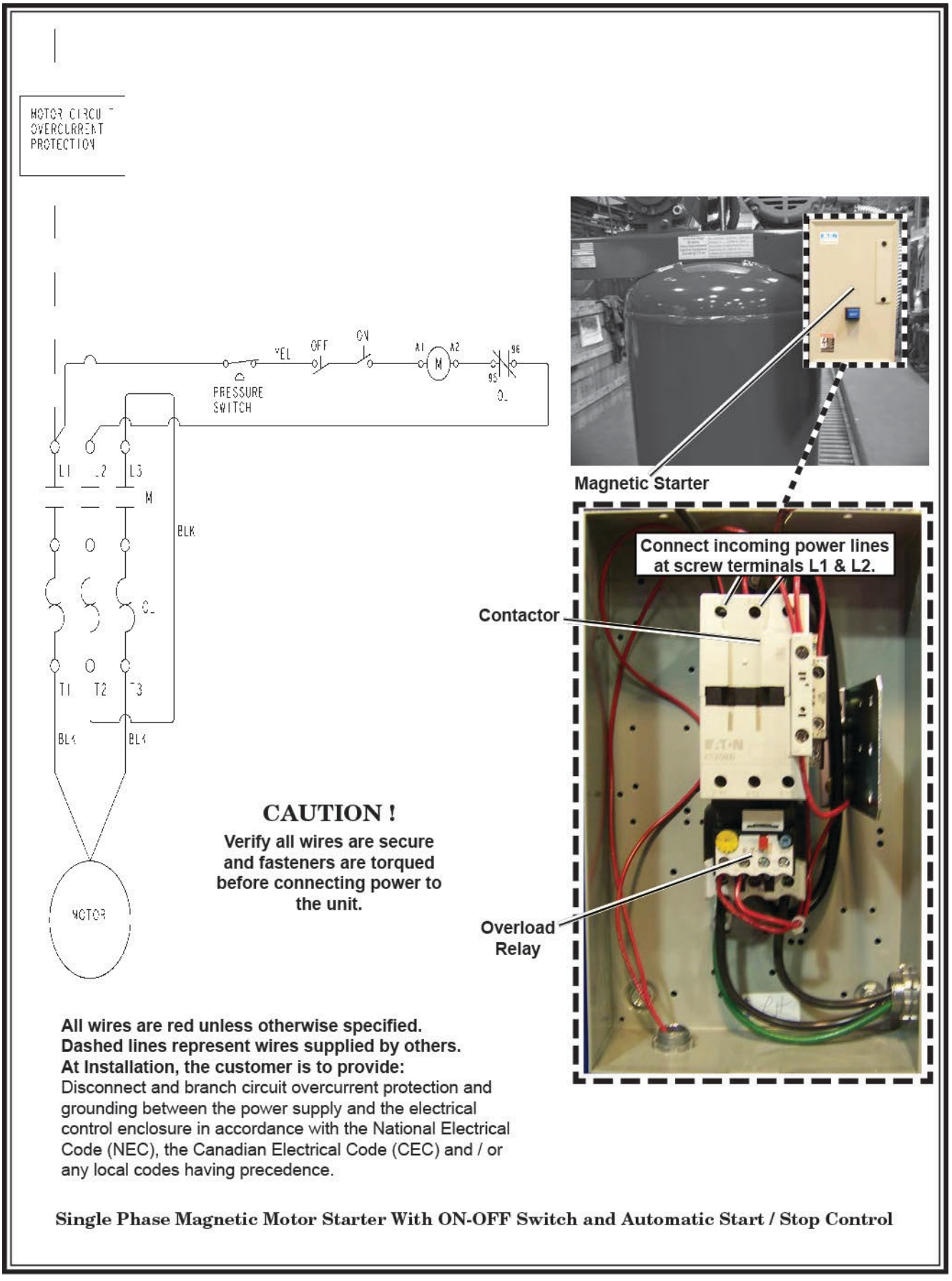

MOTOR CIRCU
OVERCURRENT
PROTECTION
PRESSURE
SWITCH
OFF
ON
A1
A2
M
95
96
L1
L2
L3
M
BLK
T1
T2
T3
MOTOR
Magnetic Starter
Connect incoming power lines
at screw terminals L1 & L2.
Contactor
Overload
Relay
CAUTION !
Verify all wires are secure
and fasteners are torqued
before connecting power to
the unit.
All wires are red unless otherwise specified.
Dashed lines represent wires supplied by others.
At Installation, the customer is to provide:
Disconnect and branch circuit overcurrent protection and
grounding between the power supply and the electrical
control enclosure in accordance with the National Electrical
Code (NEC), the Canadian Electrical Code (CEC) and / or
any local codes having precedence.
Single Phase Magnetic Motor Starter With ON-OFF Switch and Automatic Start / Stop Control

Fig. 3-6

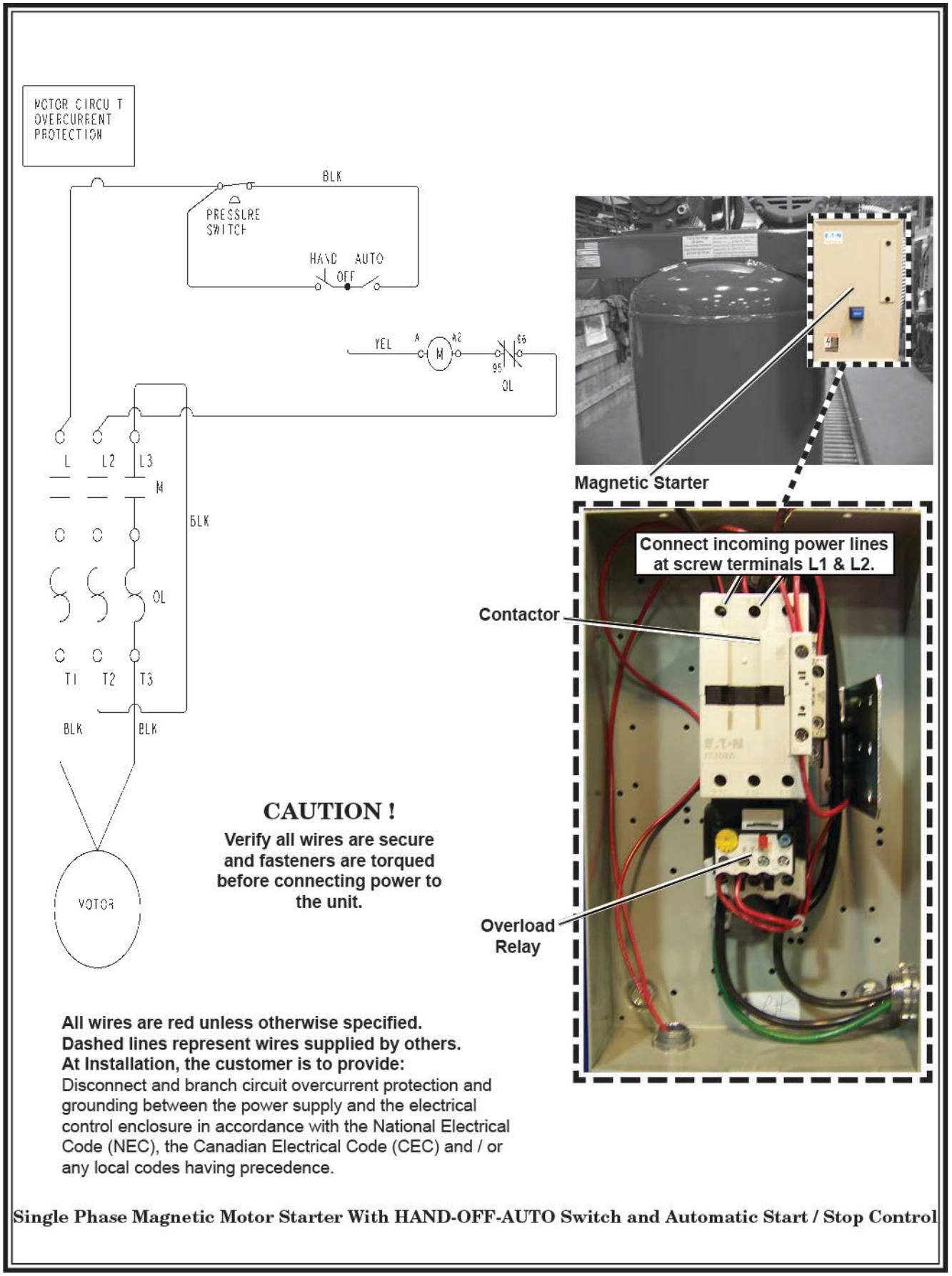

MOTOR CIRCUIT OVERCURRENT PROTECTION
BLK
PRESSURE SWITCH
HAND AUTO OFF
YEL
A
A2
M
95
96
OL
L
L2
L3
M
BLK
OL
T1
T2
T3
BLK
BLK
MOTOR
CAUTION !
Verify all wires are secure and fasteners are torqued before connecting power to the unit.
Magnetic Starter
Connect incoming power lines at screw terminals L1 & L2.
Contactor
Overload Relay
All wires are red unless otherwise specified.
Dashed lines represent wires supplied by others.
At Installation, the customer is to provide:
Disconnect and branch circuit overcurrent protection and grounding between the power supply and the electrical control enclosure in accordance with the National Electrical Code (NEC), the Canadian Electrical Code (CEC) and / or any local codes having precedence.
Single Phase Magnetic Motor Starter With HAND-OFF-AUTO Switch and Automatic Start / Stop Control

Fig. 3-7

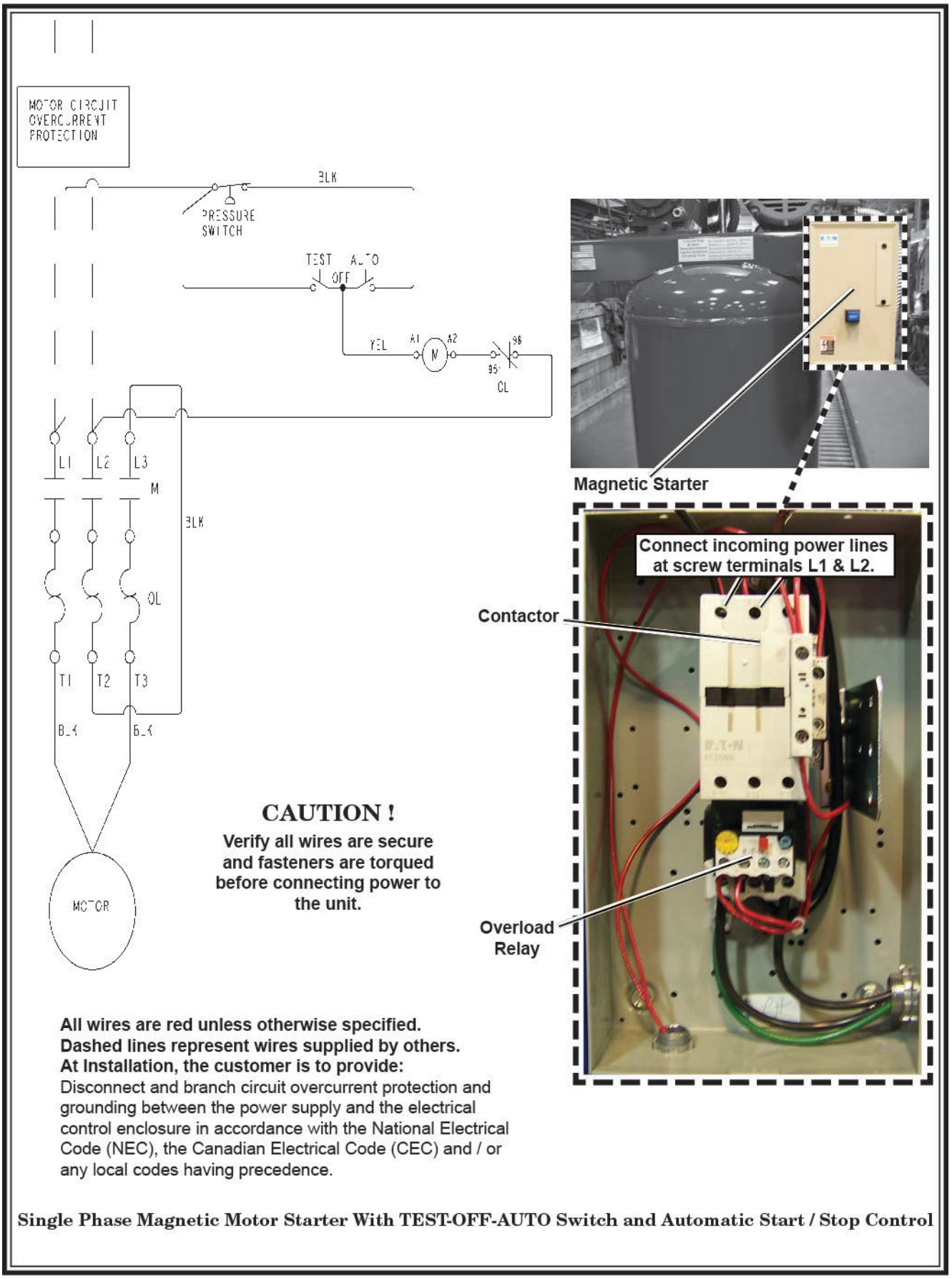

MOTOR CIRCUIT
OVERCURRENT
PROTECTION
BLK
PRESSURE
SWITCH
TEST
AUTO
OFF
YEL
A1
A2
M
96
95
OL
L1
L2
L3
M
BLK
OL
T1
T2
T3
MOTOR
Magnetic Starter
Connect incoming power lines
at screw terminals L1 & L2.
Contactor
Overload
Relay
CAUTION !
Verify all wires are secure
and fasteners are torqued
before connecting power to
the unit.
All wires are red unless otherwise specified.
Dashed lines represent wires supplied by others.
At Installation, the customer is to provide:
Disconnect and branch circuit overcurrent protection and
grounding between the power supply and the electrical
control enclosure in accordance with the National Electrical
Code (NEC), the Canadian Electrical Code (CEC) and / or
any local codes having precedence.
Single Phase Magnetic Motor Starter With TEST-OFF-AUTO Switch and Automatic Start / Stop Control

Fig. 3-8

Pressure Switch

To Remove the Cover:

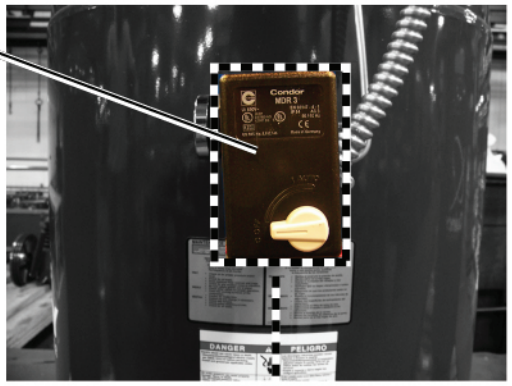
1. Turn the switch handle to "OFF" position.
2. Remove small screws on side of the cover.
3. Pull the cover away from the pressure switch.

To Re-install the Cover:

1. Make sure the switch handle is in the "OFF" position (as shown).
2. Carefully slide the cover over the pressure switch.

DO NOT FORCE!

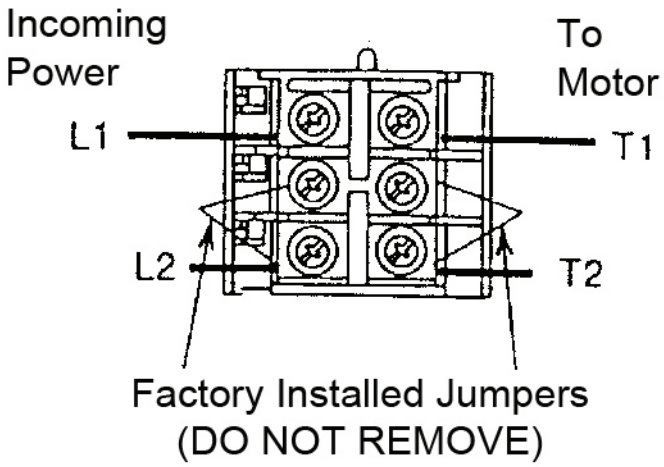
3. Re-install the small cover screws and tighten.



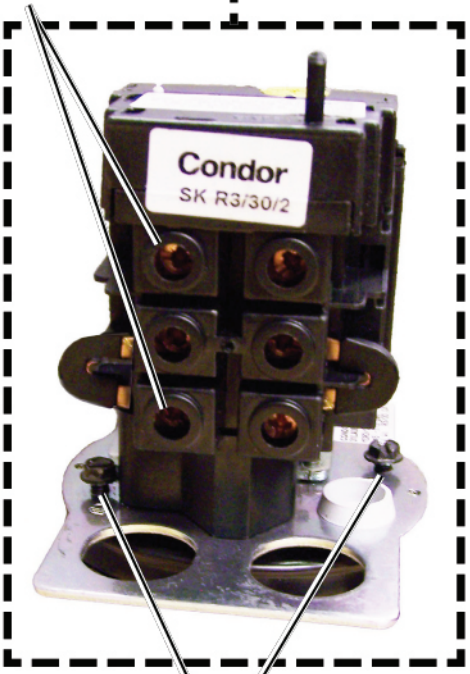
CAUTION !

Verify all wires are secure and fasteners are torqued before connecting power to the unit.

Use wire lugs on incoming power wires. Do not attempt to twist bare wire end under the screw heads.



Connect incoming power lines at screw terminals L1 & L2.

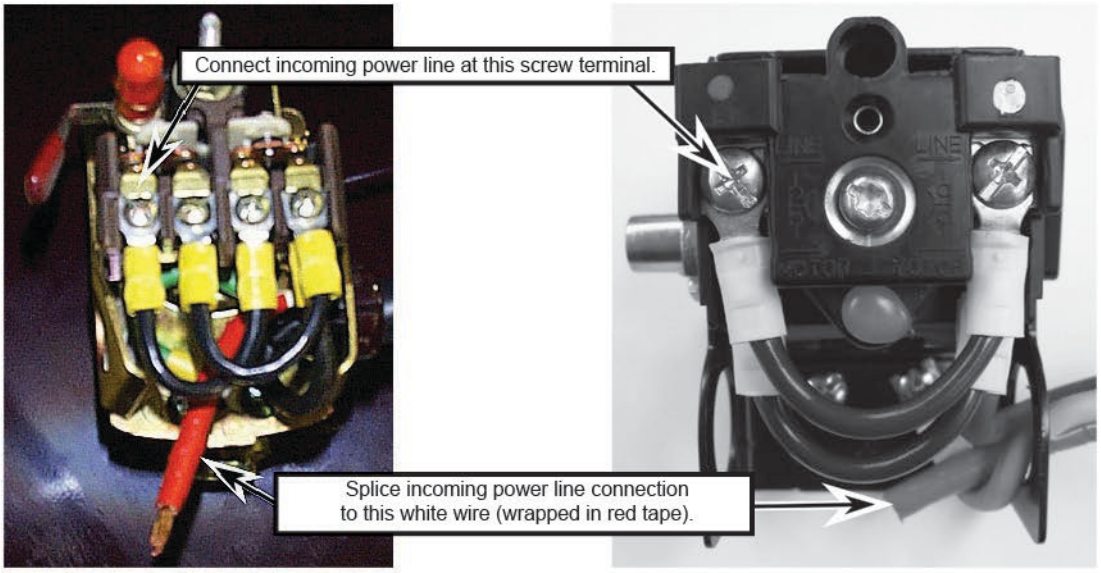


Connect ground wires.

At Installation, the customer is to provide:
Disconnect and branch circuit overcurrent protection and grounding between the power supply and the electrical control enclosure in accordance with the National Electrical Code (NEC), the Canadian Electrical Code (CEC) and / or any local codes having precedence.

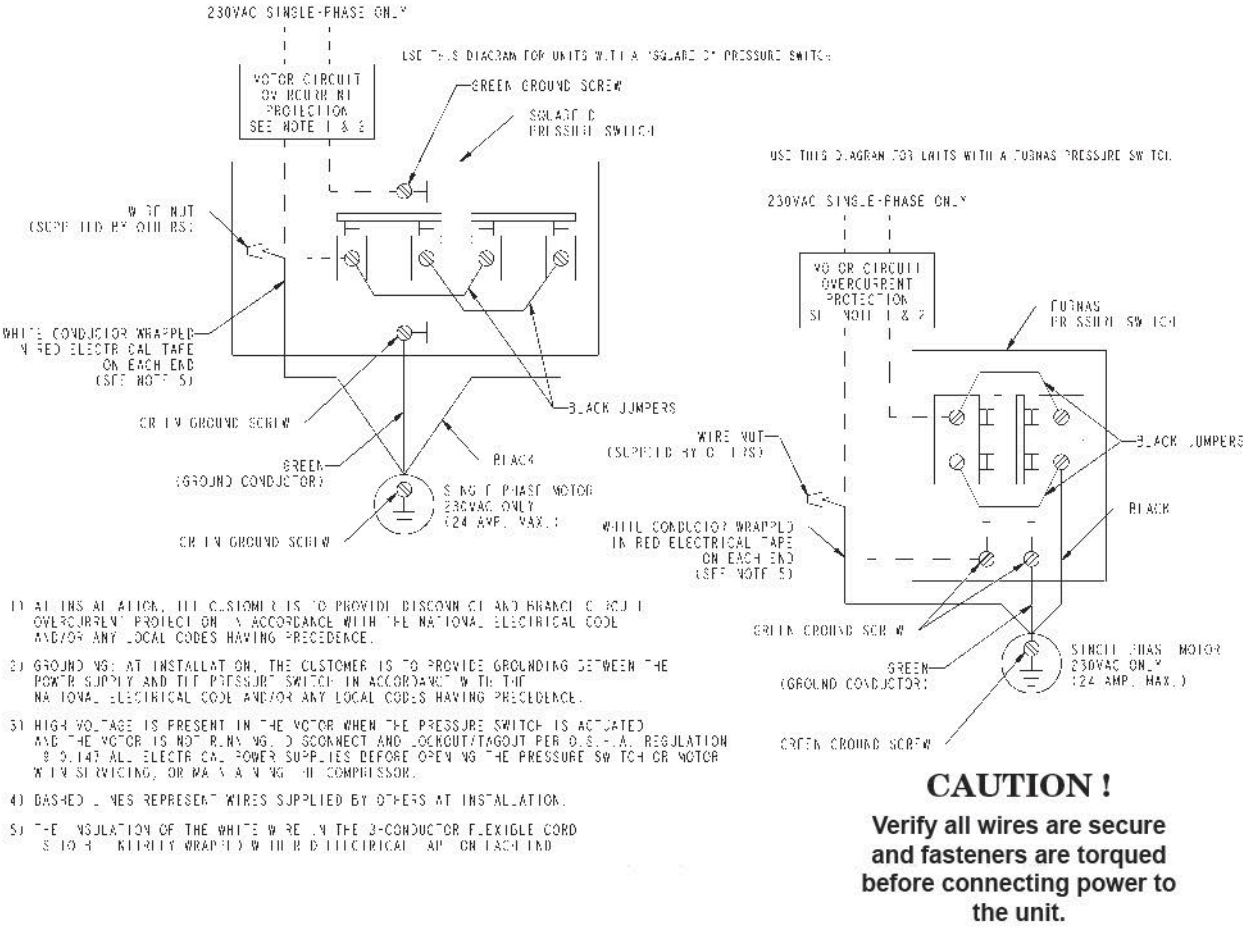
Single Phase Condor Combination Pressure Switch / Overload Relay Wired to an 1800 RPM Motor Connection Diagram

Fig. 3-9



SQUARE D PRESSURE SWITCH

FURNAS / HUBBELL PRESSURE SWITCH



Start / Stop - Pressure Switch / Motor

Fig. 3-10

Pressure Switch

To Remove the Cover:

1. Turn the switch handle to "OFF" position.
2. Remove small screws on side of the cover.
3. Pull the cover away from the pressure switch.

To Re-install the Cover:

1. Make sure the switch handle is in the "OFF" position (as shown).
2. Carefully slide the cover over the pressure switch.

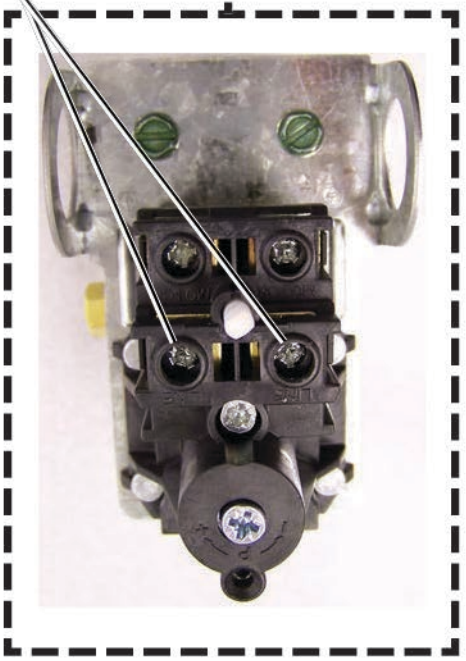
DO NOT FORCE!

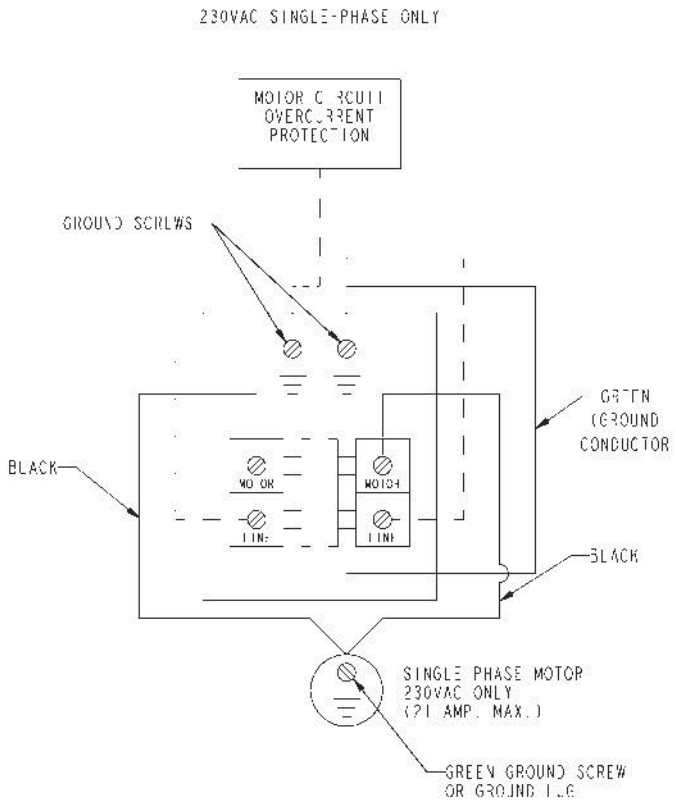
3. Re-install the small cover screws and tighten.



Use wire lugs on incoming power wires. Do not attempt to twist bare wire end under the screw heads.

Connect incoming power lines at screw terminals labeled "LINE".





CAUTION !

Verify all wires are secure and fasteners are torqued before connecting power to the unit.

At Installation, the customer is to provide:
Disconnect and branch circuit overcurrent protection and grounding between the power supply and the electrical control enclosure in accordance with the National Electrical Code (NEC), the Canadian Electrical Code (CEC) and / or any local codes having precedence.

Single Phase Condor Pressure Switch Wired to a 3600 RPM Motor Connection Diagram

Fig. 3-11

3.3 Fuses and wire sizes

Values shown here have been determined using National Electrical Code (NFPA 70). Local electrical code requirements my differ. Refer to your local electrical code.

	Volts Single Phase (V)	Volts Three Phase (V)	Fuses (Dual Element Time-Delay) (A)	Wire Size (minimum)
CR_5	230	-	50	10
CR_5	-	200	35	14
	-	230	30	14
	-	460	15	14
	-	575	15	14
CR_7.5	230	-	70	8
CR_7.5	-	200	45	10
	-	230	40	12
	-	460	20	14
	-	575	20	14
CR_10	-	200	60	10
	-	230	50	10
	-	460	25	14
	-	575	20	14
CR_15	-	200	90	6
	-	230	80	8
	-	460	40	12
	-	575	30	14

Motor Amperage
This is the maximum Full-Load Three Phase Standard Motors, 1.15 SF.
NEC Table 430.250
Single Phase Full-Load Motor Amps are from NEC Table 430-248

NEC Table 430.52 used for calculating Fuse size.

NEC 240.6 Used to select Standard Fuse Sizes
15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 110, 125, 150, 175, 200, 225, 250, 300, 350, 400, 450, 500, 600, 700, 800, 1000, 1200, 1600, 2000, 2500, 3000, 4000, 5000, and 6000 amperes.

NEC 430.24 used to determine minimum wire size needed.

4 Operating instructions

4.1 Initial start-up

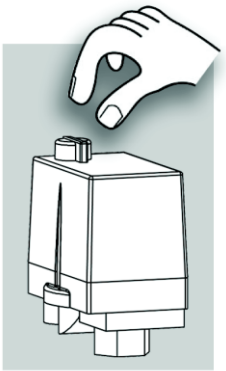
If the compressor has not run for the past 6 months (at initial start-up check the date on the data plate), it is strongly recommended to improve the lubrication of the compressor element: drain the oil, refill the compressor with the same oil while turning the crankshaft.

1. For tank-mounted and base mounted units, remove the RED transport brackets from underneath the compressor.
2. Check the electrical installation, which must be in accordance with the instructions given in Electrical connections.
3. CR units are filled with Piston Fluid compressor oil. Check that the oil level is still at the top of the red circle of sight-glass.
4. Switch on the voltage. Start the motor.
5. Check the operation of the air pressure switch. Refer to Adjustment of pressure switch. Check the operation of the pilot valve when equipped. Refer to Adjustment of pilot valve.
6. On CR 15 compressors, check for correct direction of rotation, as indicated by the arrow on the fan housing.

4.2 Starting

CR

1. Check the oil level, which must be at the top of the red circle of the sight-glass. The minimum level is the lower part of the red circle.
2. Switch on the voltage.
3. Turn the switch to position I (Auto), or turn switch (S1) to position I.





CR Contractor with electrical motor

1. Check the oil level, which must be near the top of the red circle of the sight-glass. The minimum level is the lower part of the red circle.
2. Set the pilot valve in the unload position by turning the red handle 90 degrees. Refer to Adjustment of pilot valve.
3. Attach the air lines to the air outlets.
4. Plug in and switch on the voltage at the main circuit breaker.

	**Warning:** Never move the compressor after plugging it in.

5. Move the switch to position I or turn switch (S1) to position I.
6. Open the outlet valves (AV1 and AV2).
7. Set the pilot valve in the load position by turning the red handle 90 degrees. Refer to Adjustment of pilot valve.
8. Turn the regulating knob of the pressure regulator clockwise or counter-clockwise to increase or decrease the pressure at the outlet of the pressure regulator.

	Regularly drain condensate.

CR Contractor with gas engine

1. On CR check the oil level, which must be near the top of the red circle of the sight-glass. The minimum level is the lower part of the red circle.
2. Check the engine oil level as follows:
   - Remove the oil filler cap and wipe the dipstick clean.
   - Insert the dipstick into the filler neck, but do not screw it in.
   - The oil level must show between the minimum and maximum marks on the dipstick.
3. Fill the fuel tank with unleaded or low-leaded gasoline.
4. Start the engine. Refer to the engine “Owner’s manual”.
5. Attach the air lines to the air outlets.
6. Open the outlet valves (AV1/2).
7. Set the pilot valve in the load position by turning the red handle 90 degrees. Refer to Adjustment of pilot valve.
8. Turn the regulating knob of the pressure regulator clockwise or counter-clockwise to increase or decrease the pressure at the outlet of the pressure regulator.

	Regularly drain condensate.

4.3 Stopping

CR

1. Turn the switch to position 0 (Off), or push switch (S1) to position 0.
2. Close air outlet valve.
3. Switch off the voltage.

If a compressor with pressure switch stops during operation because of a power failure, the pressure from the air outlet pipe must be released by moving the switch on top of the air pressure switch to 0 to prevent the compressor from restarting against back-pressure when the power becomes live again.

CR Contractor with Pilot Valve

1. Set the pilot valve in the unload position by turning the red handle 90 degrees. Refer to Adjustment of pilot valve.
2. On CR Contractor units with electrical motor, move switch to position 0 or push switch (S1) to position 0. If the compressor is not required for immediate further use, switch off the voltage at the main circuit breaker and unplug.
3. On CR Contractor units with gas engine, stop the engine. Refer to the engine “Owner’s manual”.
4. Close the air outlet valves (AV1 and AV2). Depressurize and disconnect the air lines from the outlet valves.

4.4 Taking out of operation

At the end of the service life of the compressor, proceed as follows:

1. Stop the compressor and close the air outlet valve(s).
2. Switch off the voltage and disconnect the compressor from the mains.
3. Depressurize the compressor.
4. Shut off and depressurize the part of the air net which is connected to the outlet valve. Disconnect the compressor from the air net.
5. Drain the oil.

4.5 Storage after installation

Procedure

	If the compressor is going to be stored without running from time to time, protective measures must be taken.

- Protect the machine against dust and moisture, if possible in a clean, cool, dry and well ventilated area.
- Make sure that the machine is not subject to vibration.
- If the machine is stored in packing, put some vapor corrosion inhibitor (VCI) paper into the packing.
- Store the machine in its normal position, not upside down or on its side.
- If the machine is stored for 1 year or more, rotate the bearings once a month to change the position of the roller balls in the bearings. Consult Atlas Copco Service.

5 Maintenance

5.1 Gas engine maintenance

Consult the engine “Owner’s manual”.

5.2 Preventive maintenance schedule

	The schedule contains a summary of the maintenance instructions. Read the respective section before taking maintenance measures. When servicing, replace all disengaged packing components, e.g. gaskets, O-rings, washers. **The “longer interval” checks must also include the “shorter interval” checks.**

Interval	Operation
Daily/8 Hours	Check lubricant levels several minutes after stopping. Drain and replace contaminated lubricant.
	Drain moisture from the receiver tank, drop legs, and air traps. (If subject to freezing, store in heated area first to remove ice.)
	Visually inspect the compressor and safety guards.
	Check for unusual noise or vibration.
	Check for lubricant leaks.
	Check pressurized components for rust, cracks, or leaks.
Weekly/40 Hours	Manually operate the pressure relief valves.
	Clean cooling surfaces of the intercooler, aftercooler, and compressor.
	Check for air leaks in the compressor and air distribution system.
	Clean or replace the air intake filter. (Use a shorter interval in humid/dirty conditions.)
Initial 100 Hours	Completely drain lubricant from the crankcase and replace.
Monthly/160 Hours	Check the belt tension.
3 Months/500 Hours	Change the lubricant. (Use a shorter interval in harsh conditions.)
	Torque the pulley clamp screws or jamnut.
6 Months/1000 Hours	Retorque the cylinder to the head capscrews.
	Inspect the compressor valves for leakage or carbon build-up. If necessary, clean with a safety solvent.
12 Months/2000 Hours	Inspect the pressure switch diaphragm and contacts.
	Inspect the contact points in the motor/starter.

5.3 Lubrication of compressors

It is strongly recommended to use the Piston Fluid compressor oil to keep the compressor in excellent operating condition.

Traditional lubricants cannot cope with the extreme conditions of piston compressors, resulting in fast oil degradation, overheating and potentially irreversible damage and high repair costs. Therefore, high performing lubricants increase the equipment lifetime.

Considering the low oil content in piston compressors, the economy of lesser quality oils simply is not worth the risk.

Piston Fluid oil can be ordered in different quantities.

5.4 Service kits

Kit	CR 5	CR 7.5	CR 10	CR 15
1 Year Maintenance Kit	2022101700	2022101700	2022101800	—
Overhaul Kit	2022100300	2022100500	2022100700	2022155201 (w/head unloaders)
Gasket Set	2022106702	2022106800	2022106900	2022104800
Intercooler Repair Kit	—	—	2023501682	—
Head Kit	—	—	—	2022154601 2022154801 (w/head unloaders)

Notes:



1. Use only authorized parts. Any damage or malfunction caused by the use of unauthorized parts is not covered by Warranty or Product Liability.
2. Whichever interval comes first. The local Sales Company may overrule the maintenance schedule, especially the service intervals, depending upon the environmental and working conditions of the compressor.
3. For the contents of all kits, consult the Parts list.

5.5 Disposal of used material

Used filters or any other used material (e.g. desiccant, lubricants, cleaning rags, machine parts, etc.) must be disposed of in an environmentally friendly and safe manner, and in line with the local recommendations and environmental legislation.

6 Servicing and adjustment procedures

Warning

⚠	Release the pressure from the compressor before starting repair or maintenance works. Switch off the voltage and isolate the compressor from the mains.

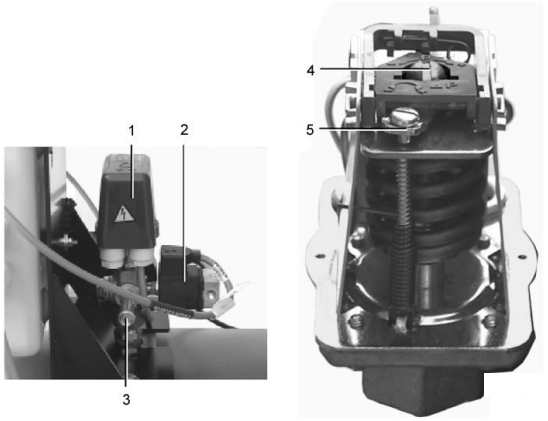
6.1 Air filter

To replace the air filter, follow these steps:

1. Stop the compressor.
2. Unscrew the cap on top of the cover. Lift off the cover and the filter element. Take care that no dirt drops inside the suction silencer.
3. Using a damp cloth, clean the filter chamber and cover. Discard damaged elements.
4. Install the new element, cover and cap.

6.2 Adjustment of MDR4 pressure switch

Views of air pressure switch MDR4



Ref	Name
1	Air pressure switch
2	Solenoid valve
3	Pressure release valve
4	Adjusting screw, stopping pressure
5	Adjusting screw, pressure difference

Function

The adjustment of the maximum or stopping pressure of the compressor is effected by means of the air pressure switch. The switch also controls the pressure difference between the maximum pressure (stopping pressure) and the pressure at which compression is resumed (starting pressure).

Adjustment

	• Adjust the air pressure switch while it is pressurized. • Switch off the voltage before removing the cover of the switch; reinstall it after an adjustment has been made and before the voltage is switched on again.

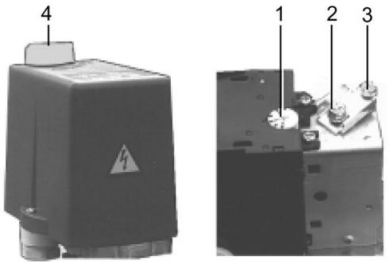
The **maximum pressure** is controlled by adjusting screw (4). Turn the screw clockwise to raise the maximum or stopping pressure, counter-clockwise to lower it.

The **pressure difference** is adjusted by means of screw (5). To reduce the difference between the stopping and starting pressures, i.e. to increase the starting pressure, turn the screw counter-clockwise. To increase the pressure difference, turn the screw clockwise.

6.3 Adjustment of MDR3 pressure switch

Views of air pressure switch MDR3 with ON/OFF switch

This pressure switch has a cover with rotary knob (4) for manual On/Off (Auto/Off).



Reference	Description
1	Dial, overload relay
2	Adjusting screw, stopping pressure
3	Adjusting screw, pressure difference
4	On/off switch (Auto/Off)

Function

The switch allows the operator to select the stopping pressure and the pressure difference between stopping and starting pressures. The stopping and starting pressures are the opening and closing pressures of the switch.

Adjustment

	• Adjust the air pressure switch while it is pressurized. • Switch off the voltage before removing the cover of the switch; reinstall it after an adjustment has been made and before the voltage is switched on again.

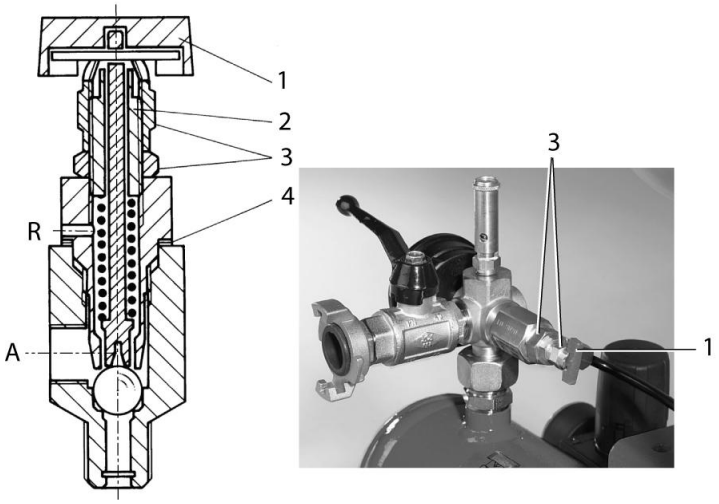
The stopping pressure is controlled by adjusting screw (2). Turn the screw clockwise to raise the stopping pressure, counter-clockwise to lower it.

The pressure difference between starting and stopping is adjusted by means of adjusting screw (3). The adjustment range is shown in the graph below. Turn the screw counter-clockwise to reduce the pressure difference, clockwise to increase it.

6.4 Adjustment of pilot valve

The adjustment of the maximum or unloading pressure of the compressor is effected by means of pilot valve. The valve also controls the difference between the preset maximum pressure and that at which compression is resumed.

Pilot valve



Reference	Description
A	Control air to unloader
R	Vent hole
1	Unloading handle
2	Pressure adjusting screw
3	Nuts
4	Shims

Unload mechanism

The pilot valve is equipped with a hand-operated unload mechanism: by turning the red handle (1) 90 degrees, the plunger of the valve will be lifted, releasing the spring force. The air pressure from the pulsation dampers will force down unloader plunger (8) and the compressor will run unloaded. By turning handle (1) 90 degrees further, the plunger returns to its original position so that the pilot valve will again unload and load the compressor at the pre-set pressures.

Setting of the pilot valve

The maximum pressure is controlled by adjusting screw (2):
1. Loosen handle (1) and the two nuts (3).
2. Turn the adjusting screw (2) clockwise to increase the maximum pressure.
3. The pressure difference can be increased by removing one or more shims (4).
4. Fit the two nuts (3) and handle (1) in their original position.

6.5 Pressure relief valve

	Replace the valve if it does not open at the correct pressure. No adjustment is allowed. **Testing:** Testing as described below shall only be carried out by competent personnel.
	If pressure relief valve is not used for longer than 6 months, pressurize for 4h to have working pressure.

Testing

1. Close the air outlet valve, depressurize and disconnect the hose or pipe from the valve.
2. Start the compressor and run it until it stops automatically.
3. Switch off the voltage.
   Remove the cover from the air pressure switch and, with the air receiver now under pressure, turn the adjusting screw one turn clockwise to increase the stopping pressure Adjustment of MDR4S pressure switch and Adjustment of MRD3 pressure switch. Reinstall the cover.
4. Switch on the voltage, slightly open the outlet valve and start the compressor.
5. Gradually close the outlet valve while checking the air pressure gauge. If the pressure relief valve has not opened at the pressure specified in Compressor data, it must be replaced by a new one. If the compressor unloads before the specified opening pressure is reached, repeat the procedure as mentioned from step 3.
6. Readjust the unloading pressure as described in sections Adjustment of MDR4S pressure switch and Adjustment of MRD3 pressure switch.
7. Reconnect the hose or pipe to the closed air outlet valve.

Testing on Contractor units

1. Close the air outlet valves, depressurize and disconnect the hoses from the valves.
2. Loosen the red handle of the pilot valve (1) and the two nuts (3).
3. Open outlet valve a fraction. Start the compressor.
4. Gradually turn adjusting screw (2) clockwise while checking pressure gauge. If the pressure relief valve has not opened at the pressure specified in Compressor data, it must be replaced by a new one.
5. Readjust the normal working pressure after testing. Consult section Adjustment of pilot valve.
6. Fit nuts (3) and handle (1) in their original positions.

7 Problem solving

Condition	Fault
Low discharge pressure	Restricted inlet
	Defective compressor valves or valve unloading mechanism
	Leaks in the compressed air distribution system at fittings, connections, etc.
	Unloader pilot valve defective or set wrong
	Pressure switch defective or set wrong
	Drive belt slipping
	Incorrect speed
	Worn piston rings or loose piston
	Leaking head gasket
	Drain valve open
	Defective pressure gauge
	Pressure relief valve leaking
	Clogged intercooler
	Compressor incorrectly sized for the altitude it is operating at
	Piston rings not seated; allow 100 hours at full pressure
Water in the crankcase (lubricant appears milky)	Compressor does not run long enough to get hot and vaporize the liquids squeezed out of the air during compression (compressor may be too large for application)
	Incorrect or inferior grade of lubricant
	System pressure leaking back through discharge valve
Rusty valves and/or cylinders	Compressor operated too infrequently
	Compressor does not run long enough to get hot and vaporize the liquids squeezed out of the air during compression (compressor may be too large for application)
	Compressor not properly prepared for storage
	Discharge line from compressor head is pointed upward allowing condensation to drain back at shutdown
Excessive vibration	Incorrect speed
	Compressor valves not functioning properly
	Loose pulley/sheave
	Compressor, motor or engine not secured tightly, or tightened into a bind
	Foundation or frame inadequate
	Piping inadequately supported or tightened into a bind
	Excessive discharge pressure
	Compressor feet may need to be leveled with shims
Excessive drive belt wear	Pulley/sheave out of alignment
	Belt too loose or too tight
	Belt slipping
	Pulley/sheave wobbling
	Pulley/sheave groove damaged or rough
	Incorrect belts

Condition	Fault
Low oil pressure	Oil sump strainer plugged
	Excessive leakage at crankshaft seals
	Low oil level
	Oil pump incorrectly assembled to the bearing carrier (“o” ring not properly located between oil pump body & bearing carrier)
	Oil pressure adjusting screw not set properly
	Defective oil pressure gauge
Compressor loads and unloads excessively	Air receiver too small
	Compressor valves or unloaders defective
	Excessive system leakage
	Compressor operating at incorrect speed
	Unloader pilot differential set too close
	Pressure switch defective
Defective pressure switch	Moisture and/or oil build-up on the pressure switch diaphragm
	Ruptured diaphragm
	Burned contact points
	Plugged air passage from the receiver to the pressure switch
	Loose electrical connection
Excessive air pressure in air receiver	Air pressure gauge inaccurate
	Leaks in unloader piping system
	Defective compressor head unloader
	Pilot valve or pressure switch set incorrectly or defective
	Pressure switch wired incorrectly
	Tube to compressor head unloader plugged
Excessive intercooler pressure	Intercooler restricted or plugged
	Compressor valves in second stage broken or not functioning properly
	Pilot valve or pressure switch set incorrectly or defective
Intercooler pressure	Compressor valves or head unloaders in first stage not functioning abnormally low properly or defective
	Restricted air inlet filter or suction line
	Pilot valve or pressure switch set incorrectly or defective
	Pressurized air at head unloader not venting properly when demand for air is required
	Compressor valve or head gasket leaking
	Worn piston rings
	Leaking air at intercooler or intercooler connections
Compressor overheats	Clogged intake system
	Defective compressor valves
	Pressure setting too high
	Clogged intercooler, internally or externally
	Inadequate ventilation, or recirculation of hot air
	Pulley/sheave rotation wrong
	Incorrect speed
	Lubrication inadequate
	Compressor incorrectly sized

Condition	Fault
High discharge temperature	Compressor valve assemblies defective
	Discharge pressure too high
	Inadequate ventilation or hot air recirculating
	Cooling surfaces of compressor or intercooler excessively dirty
	Ambient temperature too high
	Scored or excessively worn cylinder walls
Compressor knocks	Head clearance insufficient
	Piston loose in cylinder bore, cylinder bore worn, piston or piston rings worn
	Worn rods or main bearing
	Wrong pressure setting, discharge pressure excessive
	Crankcase lubrication inadequate
	Loose pulley/sheave
Excessive oil consumption	Compressor runs unloaded too long
	Worn piston rings
	Restricted intake system
	Compressor running too hot
	Breather valve not functioning properly
	Oil level in crankcase too high
	Oil viscosity wrong for the application
	Connecting rod out of alignment, bent or twisted
	Leaking oil seal
	Piston rings not seated (allow 100 hours for seating)
	Wrong oil (may be a detergent oil with a tendency to foam)
	Inferior grade of oil
Excessive current draw *(To determine maximum amperage allowed, multiply the FLA on the motor nameplate by the service factor.)* **CAUTION ! Motor surface temperature normally exceeds 170° F.**	Low voltage (must be within 10% of nameplate voltage)
	Loose electrical connection
	Wire size too small
	Incorrect oil
	Discharge pressure too high
	Intercooler plugging
	Bearings tight or seizing
	No crankshaft endplay
	Motor sized incorrectly
	Motor defective
	Drive belts too tight
Failure to start **CAUTION! Overload relays are designed to protect the motor from damage due to motor overload. If the overload relay trips persistently, DO NOT CONTINUE TO PUSH THE RESET BUTTON! Contact your local Quincy distributor for assistance.**	Power not on
	Blown circuit fuse
	Overload relay tripped
	Low voltage
	Faulty start switch
	Power failure
	Pressure switch incorrectly adjusted or faulty
	Loose or broken wire
	Motor defective
	Compressor seized
Motor stalls	Motor overloaded

8 Technical data

8.1 Reference conditions

Inlet pressure (absolute)	psi	14.5
Relative air humidity	%	0
Air inlet temperature	ºF	68
Working pressure:	psi	145-175*

* 145 psi for single stage units, 175 for two-stage units

8.2 Limitations

Minimum inlet temperature	°F	32
Maximum inlet temperature	ºF	104
Maximum working pressure	psi	See below
Only applicable for Full Feature variants. (with refrigerant dryer)		
Minimum ambient air temperature	°F	41

8.3 Compressor data

Compressor Data		**CRC10**	**CRC15**	**CRC20**	**CRP20**	**CRI5**	**CRI7.5**	**CRI10**	**CRI15**
Compressor shaft speed	RPM	1425	1117	941	1028	942	1026	968	923
Motor HP	HP	2	3	5	5	5	7.5	10	15
Motor shaft speed	RPM	3450	3450	3450	3450	1750	1750	1750	1750
Max working pressure	Psig	145	145	145	175	175	175	175	175
FAD @MWP	CFM	4.1	7.6	9.5	14.5	17.2	22.6	35	51
FAD @90psig	CFM	4.9	9.1	11.4	15.1	17.9	23.5	36.4	53
Power input @MWP	HP	2.4	3.9	5.3	6.8	6.6	8.6	12.1	18.8
Oil capacity	Gal	0.06	0.12	0.17	0.211	0.475	0.475	0.625	1
Noise level @MWP	dBA	84	86	87	83	81	82	83	83

9 Instructions for use

Air receiver (tank-mounted units)

1	**Corrosion must be prevented: depending on the conditions of use, condensate may accumulate inside the tank and must be drained every day.** This may be done manually, by opening the drain valve, or by means of the automatic drain, if fitted to the tank. Nevertheless, a weekly check of correct functioning of the automatic valve is needed. This has to be done by opening the manual drain valve and checking for condensate.
2	Periodical service inspection of the air receiver is needed, as internal corrosion can reduce the steel wall thickness with the consequent risk of bursting. Local rules need to be respected, if applicable. The use of the air receiver is forbidden once the wall thickness reaches the minimum value as indicated in the service manual of the air receiver (part of the documentation delivered with the unit).
3	Lifetime of the air receiver mainly depends on the working environment. Avoid installing the compressor in a dirty and corrosive environment, as this can reduce the vessel lifetime dramatically.
4	Do not anchor the vessel or attached components directly to the ground or fixed structures. Fit the pressure vessel with vibration dampers to avoid possible fatigue failure caused by vibration of the vessel during use.
5	Use the vessel within the pressure and temperature limits stated on the nameplate and the testing report.
6	No alterations must be made to this vessel by welding, drilling or other mechanical methods.

ATLAS COPCO
STANDARD TERMS AND CONDITIONS

LEGAL EFFECT: Except as expressly otherwise agreed to in writing by an authorized representative of Seller, the following terms and conditions shall apply to and form a part of this order and any additional and/or different terms of Buyer's purchase order or other form of acceptance are rejected in advance and shall not become a part of this order.

The rights of Buyer hereunder shall be neither assignable nor transferable except with the written consent of Seller.

This order may not be canceled or altered except with the written consent of Seller and upon terms which will indemnify Seller against all loss occasioned thereby. All additional costs incurred by Seller due to changes in design or specifications, modification of this order or revision of product must be paid for by Buyer.

In addition to the rights and remedies conferred upon Seller by this order, Seller shall have all rights and remedies conferred at law and in equity and shall not be required to proceed with the performance of this order if Buyer is in default in the performance of such order or of any other contract or order with seller.

TERMS OF PAYMENT: Unless otherwise specified in the order acknowledgment, the terms of payment shall be 1% 15, net forty-five (45) days after shipment. These terms shall apply to partial as well as complete shipments. If any proceeding be initiated by or against Buyer under any bankruptcy or insolvency law, or in the judgment of Seller the financial condition of Buyer, at the time the equipment is ready for shipment, does not justify the terms of payment specified, Seller reserves the right to require full payment in cash prior to making shipment. If such payment is not received within fifteen (15) days after notification of readiness for shipment, Seller may cancel the order as to any unshipped item and require payment of its reasonable cancellation charges.

If Buyer delays shipment, payments based on date of shipment shall become due as of the date when ready for shipment. If Buyer delays completion of manufacture, Seller may elect to require payment according to percentage of completion. Equipment held for Buyer shall be at Buyer's risk and storage charges may be applied at the discretion of Seller.

Accounts past due shall bear interest at the highest rate lawful to contract for but if there is no limit set by law, such interest shall be eighteen percent (18%). Buyer shall pay all cost and expenses, including reasonable attorney's fees, incurred in collecting the same, and no claim, except claims within Seller's warranty of material or workmanship, as stated below, will be recognized unless delivered in writing to Seller within thirty (30) days after date of shipment.

TAXES: All prices exclude present and future sales, use, occupation, license, excise, and other taxes in respect of manufacture, sales or delivery, all of which shall be paid by Buyer unless included in the purchase price at the proper rate or a proper exemption certificate is furnished.

ACCEPTANCE: All offers to purchase, quotations and contracts of sales are subject to final acceptance by an authorized representative at Seller's plant.

DELIVERY: Except as otherwise specified in this quotation, delivery will be F. O. B. point of shipment. In the absence of exact shipping instruction, Seller will use its discretion regarding best means of insured shipment. No liability will be accepted by Seller for so doing. All transportation charges are at Buyer's expense. Time of delivery is an estimate only and is based upon the receipt of all information and necessary approvals. The shipping schedule shall not be construed to limit seller in making commitments for materials or in fabricating articles under this order in accordance with Seller's normal and reasonable production schedules.

Seller shall in no event be liable for delays caused by fires, acts of God, strikes, labor difficulties, acts of governmental or military authorities, delays in transportation or procuring materials, or causes of any kind beyond Seller's control. No provision for liquidated damages for any cause shall apply under this order. Buyer shall accept delivery within thirty (30) days after receipt of notification of readiness for shipment. Claims for shortages will be deemed to have been waived if not made in writing with ten (10) days after the receipt of the material in respect of which any such shortage is claimed. Seller is not responsible for loss or damage in transit after having received "In Good Order" receipt from the carrier. All claims for loss or damage in transit should be made to the carrier.

TITLE & LIEN RIGHTS: The equipment shall remain personal property, regardless of how affixed to any realty or structure. Until the price (including any notes given therefore) of the equipment has been fully paid in cash, Seller shall, in the event of Buyer's default, have the right to repossess such equipment.

PATENT INFRINGEMENT: If properly notified and given an opportunity to do so with friendly assistance, Seller will defend Buyer and the ultimate user of the equipment from any actual or alleged infringement of any published United States patent by the equipment or any part thereof furnished pursuant hereto (other than parts of special design, construction, or manufacture specified by and originating with Buyer), and will pay all damages and costs awarded by competent court in any suit thus defended or of which it may have had notice and opportunity to defend as aforesaid.

STANDARD WARRANTY: Seller warrants that products of its own manufacture will be free from defects in workmanship and materials under normal use and service for the period specified in the product instruction manual. Warranty for service parts will be Ninety (90) days from date of factory shipment. Electric Motors, gasoline and diesel engines, electrical apparatus and all other accessories, components and parts not manufactured by Seller are warranted only to the extent of the original manufacturer's warranty.

Notice of the alleged defect must be given to the Seller, in writing with all identifying details including serial number, type of equipment and date of purchase within thirty (30) days of the discovery of the same during the warranty period.

Seller's sole obligation on this warranty shall be, at its option, to repair or replace or refund the purchase price of any product or part thereof which proves to be defective. If requested by Seller, such product or part thereof must be promptly returned to seller, freight prepaid, for inspection.

Seller warrants repaired or replaced parts of its own manufacture against defects in materials and workmanship under normal use and service for ninety (90) days or for the remainder of the warranty on the product being repaired.

This warranty shall not apply and Seller shall not be responsible or liable for:

(a) Consequential, collateral or special losses or damages;

(b) Equipment conditions caused by fair wear and tear, abnormal conditions of use, accident, neglect or misuse of equipment, improper storage or damage resulting during shipping;

(c) Deviation from operating instructions, specifications or other special terms of sale;

(d) Labor charges, loss or damage resulting from improper operation, maintenance or repairs made by person(s) other than Seller or Seller's authorized service station.

In no event shall Seller be liable for any claims whether arising from breach of contract or warranty or claims of negligence or negligent manufacture in excess of the purchase price.

THIS WARRANTY IS THE SOLE WARRANTY OF SELLER AND ANY OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED IN LAW OR IMPLIED IN FACT, INCLUDING ANY WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR USE ARE HEREBY SPECIFICALLY EXCLUDED.

LIABILITY LIMITATIONS: Under no circumstances shall the Seller have any liability for liquidated damages or for collateral, consequential or special damages or for loss of profits, or for actual losses or for loss of production or progress of construction, whether resulting from delays in delivery or performance, breach of warranty, negligent manufacture or otherwise.

ENVIRONMENTAL AND OSHA REQUIREMENTS: At the time of shipment of the equipment from the factory, Atlas Copco will comply with the various Federal, State and local laws and regulations concerning occupational health and safety and pollution. However, in the installation and operation of the equipment and other matters over which the seller has no control, the Seller assumes no responsibility for compliance with those laws and regulations, whether by the way of indemnity, warranty or otherwise.

June 30, 2003



In order to be First in Mind-First in Choice® for all your quality compressed air needs, Atlas Copco delivers the products and services that help to increase your business' efficiency and profitability.

Atlas Copco's pursuit of innovation never ceases, driven by our need for reliability and efficiency. Always working with you, we are committed to providing you the customized quality air solution that is the driving force behind your business.

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TAGS:
90-AC-001-A/B
90-PSV-001-A/B
90-HV-001-A/B
90-PSL-001-A/B
90-PI-001-A/B
90-F-001-A/B
90-FV-001-A/B
90-TK-001-A/B



CR Series

Cast Iron Piston Air Compressors

The CR Cast Iron Piston Compressor Series

Newly designed, lasting reliability

More dependable than ever with tailored options for all contractor, professional and industrial applications, Atlas Copco is pleased to introduce the newly designed CR cast iron piston compressor series. The CR range delivers a champion combination of outstanding reliability matched with robust performance, even in the most demanding conditions for a dependable piston you can count on.

Capitalizing on heavy-duty cast iron construction and a combination of computer-aided design with controlled machining processes, the new CR single stage and two-stage compressors deliver up to 175 psig with 24/7 reliability. We back this up with our bumper to bumper warranty packages, and have options for a 5 year extended warranty, depending on the model chosen.



A complete and tailored range of premium compressors at affordable prices

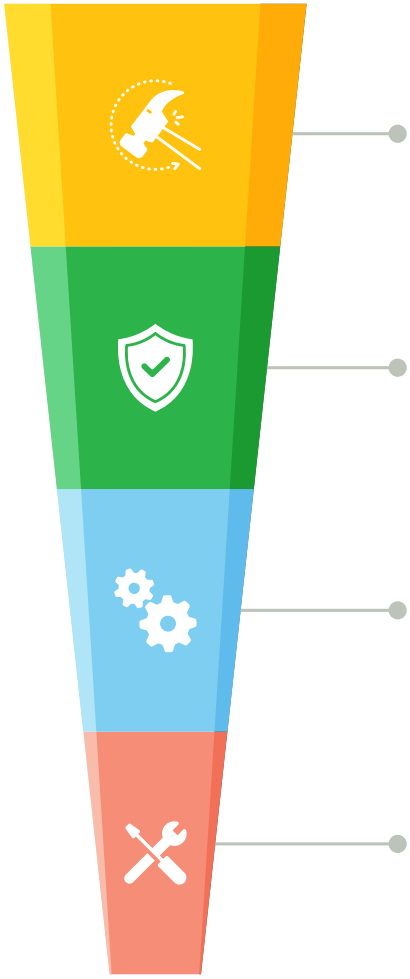
Count on Atlas Copco's cast iron piston technology to drive your production reliably and support your application demand. We can meet your exact requirements with a broad piston compressor line, whether you work in a small workshop or on a large onsite project.

A range of series with available options:



CR Series

A 60 second guide to the piston that sets the bar high



Heavy-Duty Cast Iron Construction

Ensures durability and reliability for the most demanding applications

Reliability

Engineered using the most state-of-the-art manufacturing techniques for a product of design excellence. The compressed air you need to keep your operations running efficiently with maximum uptime.

Tailored

Custom your piston to your needs. Options available include:

- Auto drain
- After cooler
- Low oil level switch
- TEFC motor
- NEMA4 control panel
- Pressure lubricated pump
- Simplex and duplex configurations
- And more...

Easy Maintenance

Every component is easily accessible allowing minimum downtime and requires only limited maintenance.



TEFC Motor



NEMA4 control panel

The CR - Contractor Series

A premium compressor at the lowest capital cost for point of use applications.

2-5.5HP/135 psi

The Contractor Series provides affordable compressed air in a small, lightweight package. The low-profile cast iron design, semi-pneumatic wheel, heavy gauge wire belt guard and rugged pump design provide the ideal solution for small, portable applications.

Features and Benefits:

- Standard 2-year Bumper to Bumper Warranty
  – No start-up kit required
- Single stage units
  – Electric or gas powered
- Fully enclosed belt guard and ASME safety valves
- Pilot valve control on gas drive units to reduce engine peed on low demand





Technical Specifications

*Voltage available from 115-230

Model	Horsepower	Tank	ACFM		LxWxH	Weight
		Gallons	@ 100psi	@ 175psi	inches	lbs.
CR C2-SS-24GV	2	24	4.9	4.1	20x21x46	150
CR C2-SS-2x4G	2	2x4	4.9	4.1	43x18x23	145
CR C2-SS-23GH	2	23	4.9	4.1	22x33x33	150
CR C3-SS-2x4G	3	2x4	9.1	7.6	43x18x25	174
CR C3-SS-60GV	3	60	9.1	7.6	28x23x67	260
CR C5-SS-60GV	5	60	11.4	9.5	28x23x67	271
CR C5.5-SS-2x4G-Honda Gas	6	2x4	11.4	9.5	43x18x26	179

The - CR Professional Series

A reliable electric compressor for rugged, stationary use.

5-20HP/135-175 psi

The Professional Series provides high pressure at the lowest cost in a small, lightweight package. The balanced counter weighed crankshaft and cast iron design provide smooth, easy operation with a range of unit options supplying an ideal solution for demanding applications.

Features and Benefits:

- 1 year bumper to bumper with 5 year extended warranty on the pump*
  – *With purchase of minor and major maintenance kits
- Duplex, Simplex or Base Mounted

- Two-stage
  - Best for high demands needing up to 175 psi
- Oversized oil reservoir for low oil temperatures, industrial class bearings and one-piece aluminum head for heat dissipation providing longevity
- Low Maintenance with 2-piece connecting rods and oil pressure gauge
- High efficiency intercooler with stainless steel valve design for highest volumetric efficiency



Technical Specifications

Standard Models

*Voltages available from 200-575 volt

Description	Horsepower	Tank	ACFM		LxWxH	Weight
		Gallons	@ 100psi	@ 175psi	inches	lbs.
CR5-OTS-80GV - Vertical	5	80V	15.1	14.5	32x26x75	554
CR5-TS-80GV - Vertical	5	80V	17.9	17.2	32x26x75	554
CR7.5-TS-80GV - Vertical	7.5	80V	23.8	22.6	32x26x75	599
CR10-TS-120GV - Vertical	10	120V	35.9	35	40x30x77	845
CR10-TS-120GH - Horizontal	10	120H	35.9	35	72x28x54	845
CR-TS-30GH-13HG - 13 HP Honda Gas Unit	13	30	23.5	22.6**	41x23x42	465
CR-TS-30GH-14KG - 14 HP Kohler Gas Unit	14	30	23.5	22.6**	42x24x41	465
CR15-TS-120GH - Horizontal	15	120H	54.4	51	70x28x54	870

Standard and Packaged TEFC Motor Upgrade/NEMA4 Control Panel Models

Description	Horsepower	Tank	ACFM		LxWxH	Weight
		Gallons	@ 100psi	@ 175psi	inches	lbs.
CR5-TS-80GV-3PH-PS,TN4 - Vertical	5	80V	17.9	17.2	32x26x75	554
CR7.5-TS-80GV-3PH-PS,TN4 - Vertical	7.5	80V	23.8	22.6	32x26x75	599
CR10-TS-120GV-3PH-PS,TN4 - Vertical	10	120V	35.9	35	40x30x77	845
CR10-TS-120GV-3PH-PS,TN4 - Horizontal	10	120H	35.9	35	72x28x54	845
CR15-TS-120GV-3PH-PS,TN4 - Horizontal	15	120H	54.4	51	70x28x54	870

Packaged Duplex Models

Description	Horsepower	Tank	ACFM		LxWxH	Weight
		Gallons	@ 100psi	@ 175psi	inches	lbs.
CR5-TS-120GH-3PH-PPS-D - Horizontal	5*2 = 10 HP	120H	35.9	35	77x30x52	1000
CR7.5-TS-120GH-3PH-PPS-D - Horizontal	7.5*2 = 15 HP	120H	54.4	51	77x30x52	1300
CR10-TS-200GH-3PH-PPS-D - Horizontal	10*2 = 20 HP	200H	71.8	70	78x46x63	2200

** - Single phase units stop at 7.5HP

The CR - Industrial Series

The most reliable piston air compressor customizable to you.

5-20HP/135-175 psi

The Industrial Series provides high pressure at low cost in a newly designed, cast iron package. The balanced counter weighed crankshaft provide a smooth, easy operation with a range of unit options supplying an ideal solution for the most robust applications.

Features and Benefits:

- 1 year bumper to bumper with 5 year extended warranty on the pump*
  - *With purchase of minor and major maintenance kits
- Duplex, simplex or base mounted
- Two-stage
  - Best for high demands needing up to 175 psi
- Oversized oil reservoir for low oil temperatures, industrial class bearings and one-piece aluminum head for heat dissipation providing longevity
- Low maintenance with 2-piece connecting rods and oil pressure gauge
- High efficiency intercooler with stainless steel valve design for highest volumetric efficiency





Technical Specifications

CR Industrial Series

The CR Series piston compressor is a cast-iron, splash lubricated, 2 stage, 175psi product. All models are equipped with magnetic starters as standard. The industrial series comes equipped with an electric drain, belt guard aftercooler, and low oil level switch on all models. The 10 and 15HP models also come equipped with head unloaders.

CR Industrial Series - Standard and TEFC motor and NEMA4 controller upgrade

Model	Horsepower	Tank	ACFM		LxWxH	Weight
		Gallons	@ 100psi	@ 175psi	inches	lbs.
CR5-TS-80GV-IS, Standard or TN4	5	80V	17.9	17.2	32x26x75	554
CR7.5-TS-80GV-IS, Standard or TN4	7.5	80V	23.8	22.6	32x26x75	599
CR10-TS-120GV-IS, Standard or TN4	10	120V	35.9	35	40x30x77	845
CR10-TS-120GH-IS, Standard or TN4	10	120H	35.9	35	72x28x54	845
CR15-TS-120GH-IS, Standard or TN4	15	120H	54.4	51	40x30x77	845

CR Industrial Series - Duplex TEFC motor and NEMA4 controller upgrade

Duplex units offer twin motors and twin pumps for additional output and redundancy.

Model	Horsepower	Tank	ACFM		LxWxH	Weight
		Gallons	@ 100psi	@ 175psi	inches	lbs.
CR5-TS-120GH-IS-D, Standard or TN4	5	120H	35.9	35	77x30x52	1000
CR7.5-TS-120GH-IS-D, Standard or TN4	7.5	120H	54.4	51	77x30x52	1300
CR10-TS-200GH-IS-D, Standard or TN4	10	200H	71.8	70	78x46x63	2200

** - Single phase units stop at 7.5HP

Buyers Guide

Looking to customize your unit?

Series	Magnetic Starter	Low oil level switch	Electronic Drain	Belt guard Aftercooler	TEFC Motor	NEMA 4 Control Panel	Pressure Lubricated Pump	Head Unloaders
Standard	✓							
Professional Package	✓		✓	✓	i	i	i	
Industrial	✓	✓	✓	✓	i	i	i	✓ *10 and 15HP

Looking to complete your package?



Optional add-ons:

In-line Filters

- Protect your tools and end-products, investments and processes
- Meet requirements for cleaner, dryer air
- Reduce your service and maintenance costs

General purpose, high efficiency and odor removal line filters to meet high quality air needs.

Dryers: Avoid condensation and chance of corrosion by removing water from your compressed air.

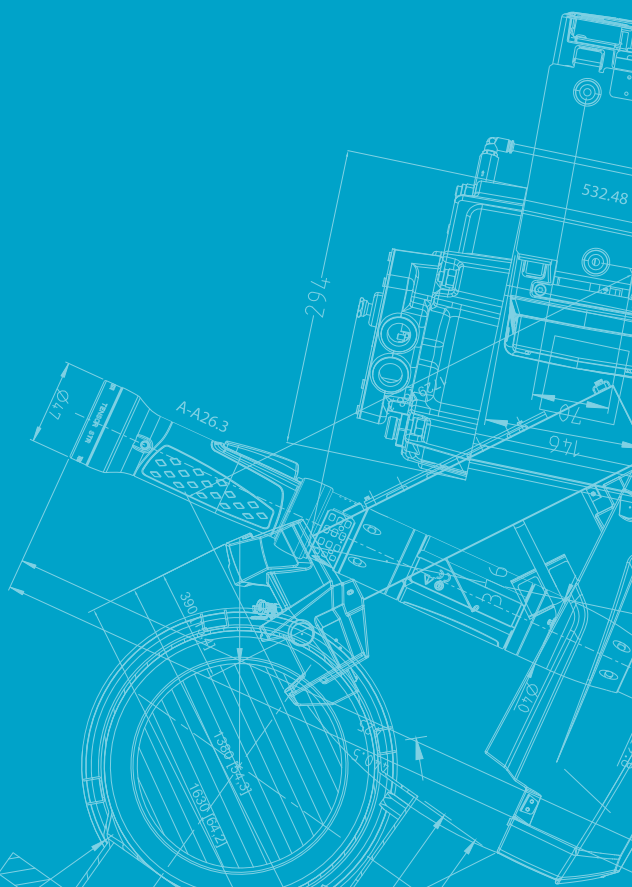
Model	SCFM
FXHT-1	25
FXHT-2	50
FXHT-3	75
FXHT-4	100
FXHT-5	125



AIRnet Aluminum or Stainless Steel Piping: Easy to install, modular piping system for air and inert gases.



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Atlas Copco

Atlas Copco Compressors

300 Technology Center Drive Ste 550
Rock Hill, South Carolina 29730
atlascopco.com

Data Sheet

ASHCROFT®
Trust the shield.®

1279 Duragauge® Pressure Gauge

Tags :
20-PI-302-1/2/3/4
20-PI-301-1/2/3/4
20-PI-602
20-PI-503-1/2/3/4
20-PI-504-1/2/3/4

FEATURES

- Custom dial printing options
- Micrometer adjustable pointer
- ***PLUS!***™ Performance option dampens vibration, shock and pulsation effects
- Pressure range from vacuum to 30,000 psi

TYPICAL USES

- Refineries
- Chemical and petrochemical plants
- Offshore oil rigs
- Water and wastewater pressure control
- Pulp and water
- Mining and metals
- Equipment skids
- Specialized OEM equipment
- Cryogenics



1279
4½″ dial size

SPECIFICATIONS

Accuracy:	±0.5% of span (ASME B40.100 Grade 2A)
Size:	4½″
Range:	Vacuum, compound to 30,000 psi
Process Connection Location:	Lower, back, side, top
Process Connection:	¼ NPT, ½ NPT, 9/16-18 UNF-2B Aminco® (high pressure connection)
Case Style:	Solid front with pressure relief back
Window:	Glass (STD.), acrylic, shatter proof glass, non-glare glass (OPT.)
Movement:	Rotary, adjustable, 400 SS, Teflon™ coated
Movement Materials:	400 SS, Teflon™ coated pinion gear and segment
Dial:	Aluminum, white background, black scale
Pointer:	Micrometer, adjustable, aluminum

Weather Protection: Case	IP Rating	Ordering Code
Dry	Case not sealed, recommended for weather protected environment only	S
Dry, field fillable	IP66	SH
Liquid filled	IP66	SL

Dampening Options:	Liquid: glycerin, silicone, Halocarbon®, ***PLUS!***™ Performance
Mounting:	Stem, surface, flush (STD.), pipe, remote (OPT.)
Approvals:	CE/UKCA, CRN

WETTED COMPONENTS

Bourdon Tube	Process Connection	Joints
316L Stainless steel	316L Stainless steel	Welded
316L Stainless steel	Steel	Welded
K-Monel® 500	Monel® 400, Steel	Welded
C510 Pho. Bronze	Brass	Silver Brazed

KEY BENEFITS

- **Available with a wide variety of accessory and diaphragm seal assemblies**
- **Available with high process temperature dissipation siphons**

MIN/MAX TEMPERATURE LIMITS

Version	Ambient	Process	Storage
Dry	-20 °F to 200 °F (-29 °C to 93 °C)	-20 °F to 250 °F (-29 °C to 121 °C)	-40 °F to 250 °F (-40 °C to 121 °C)
PLUS!™	-40 °F to 150 °F (-40 °C to 66 °C)	-40 °F to 200 °F (-40 °C to 93 °C)	-40 °F to 150 °F (-40 °C to 66 °C)
Glycerin fill	20 °F to 150 °F (-7 °C to 66 °C)	20 °F to 150 °F (-7 °C to 66 °C)	0 °F to 150 °F (-18 °C to 66 °C)
Silicone fill	-40 °F to 150 °F (-40 °C to 66 °C)	-40 °F to 200 °F (-40 °C to 93 °C)	-40 °F to 150 °F (-40 °C to 66 °C)
Halocarbon® fill	-40 °F to 150 °F (-40 °C to 66°C)	-40 °F to 200 °F (-40 °C to 93 °C)	-40 °F to 150 °F (-40 °C to 66 °C)

NON-WETTED COMPONENTS

Case	Ring	Pressure Relief Back
Phenolic	Threaded, Polycarbonate (meets UL 94 V-0)	Polycarbonate (Meets UL 94 V-0)

Note: Other than discoloration of the dial and hardening of the gasketing that may occur as ambient or process temperatures exceeds 150 °F, non-liquid-filled gauges with standard glass windows, can withstand continuous operating temperatures up to 250 °F (121 °C). Liquid-filled gauges can withstand 200 °F (93 °C) but glycerin fill and acrylic window will tend to yellow. Accuracy at temperatures above or below the reference ambient temperature of 68 °F (20 °C) will be affected by approximately .4% per 25 °F. Gauges with welded joints will withstand 750 °F (400 °C), 450 °F (232 °C) with silver brazed joints for short times without rupture, although other parts of the gauge will be destroyed and calibration will be lost. For continuous use and for process or ambient temperatures above 250 °F (121 °C), a diaphragm seal or capillary or siphon is recommended.

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ASHCROFT®
Trust the shield.®

1279 Duragauge® Pressure Gauge

ORDERING CODE Example:	451279	S	SH	04	L	XLL	15#
Dial Size/Model Code							
451279 - 4½″ solid front	451279						
System (tube and process connection)							
A - Bronze tube, brass process connection, Max. pressure connection 1,000 psi							
P - K-Monel® 500 tube, Monel® 400 process connection, Max. pressure 30,000 psi							
R - 316L SS tube, steel process connection, Max. pressure 20,000 psi							
S - 316 SS tube, 316L SS process connection, Max. pressure 20,000 psi		S					
Case Design							
S - Solid front case, dry							
SH - Solid front case, dry (IP66 NEMA 4X)			SH				
SL - Solid front case, liquid filled (glycerin STD.)							
Process Connection Sizes							
02 - ¼ NPT Male, N/A for ranges over 20,000 psi							
04 - ½ NPT Male, N/A for ranges over 20,000 psi				04			
09 - 9/16 18 UNF-2B, Aminco® high pressure fitting, pressures over 20,000 psi (STD.)							
AM - AND 10050-4 (¼ tubing connection)							
RW - SAE 7/16 & 20 Straight thread							
Process Connection Location							
L - Lower					L		
B - Back							
D - Side (3 o'clock)							
E - Side connection (9 o'clock)							
T - Top connection							
Options (If choosing an option(s) must include a "X") (See Table 1 on page 3 for more options)						–X__	
GV - Silicone case fill							
GX - Halocarbon® case fill							
LL - ***PLUS!***™ Performance						LL	
ND - PLUS! Performance, silicone free (glycerin and silicone filled gauges)							
NZ - ***PLUS!***™ Performance, silicone free dry gauges							
X1P - IP65 dry case (case cannot by liquid filled)							
NH - SS tag wired to case							
PD - Acrylic window (STD. with liquid filled or hermetically sealed cases)							
SG - Safety Glass							
C4 - Traceable calibration certificate							
6B - Cleaned for oxygen service							
5G - Attach one accessory to gauge. Applicable to PL02 pressure limiting valve, V01,V02,V03 valves, 1098, 1100, 1198, 2198 siphons, 7001, 7004 needle valves, 1115 capillary, 1106 pulsation dampner, 1112, PD02 pressure snubbers, MDV swivel adapter, 2265 electric warning contact							
Range (coding examples only, see range table on page 3 for all standard ranges)							
Single Scales							
15# - 15 psi							15#
1BR - 1 bar							
1KSC - 1 kg/cm²							
100KP - 100 kPa							
Dual Scales							
15#/BR - 15 psi inner scale, 1 bar outer scale							
1BR/# - 1 bar inner scale, 15 psi outer scale							

When selecting a diaphragm seal or isolation ring, refer to the Min/Max Guide for compatibility with this gauge or scan the QR code to the right.

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ASHCROFT®
Trust the shield.®

1279 Duragauge® Pressure Gauge

TABLE 1

CODE	OPTION
AB	Gauges calibrated to compensate for absolute pressure
DA	Dial marking (text marking on the dial)
EP	Maximum pointer (adjustable, N/A with liquid filled or hermetically sealed cases)
HY	Hydrostatic/pneumatic testing (system pressurized to 150% of rated system pressure for 5 minutes. Overload stop STD.)
NG	Non-glare glass (N/A with liquid fill or hermetically sealed cases)
OS	Overload stop
SH	Red set hand, stationary
SG	Safety glass
TS	Throttle screw (STD. with liquid filled, hermetically sealed or ***PLUS!***™ Performance)
VS	Underload stop
56	Flush mounting ring
D3	DuraVis™ retroreflective dial
TM	2″ Pipe mounting bracket
1P	IP 65 Rating (dry gauge only; lower connect only)

STANDARD PRESSURE RANGES

	psi	bar	kPa	mPa	KG (kg/cm²)
Vacuum	30IMV	N1BR	N100KP	N1MP	N1KSC
	–	N1/0.6BR	N100/60KP	0.1/0.06MP	N1/0.6KSC
Compound	V/15#	–	–	–	–
	–	N1/1.5BR	N100/150KP	N0.1/0.15MP	N1/1.5KSC
	V/30#	–	–	–	–
	–	N1/3BR	N100/300KP	N0.1/0.3MP	N1/3KSC
	V/60#	–	–	–	–
	–	N1/5BR	N100/500KP	N0.1/0.5MP	N1/5KSC
	V/100#	–	–	–	–
	–	N1/9BR	N100/900KP	N0.1/0.9MP	N1/9KSC
Positive Pressure	15#	1BR	100KP	0.1MP	1KSC
	20#	–	–	–	–
	–	1.6BR	160KP	0.16MP	1.6KSC
	30#	–	–	–	–
	–	2.5BR	250KP	0.25MP	2.5KSC
	60#	4BR	400KP	0.4MP	4KSC
	–	6BR	600KP	0.6MP	6KSC
	100#	–	–	–	–
	120#	–	–	–	–
	–	10BR	1000KP	1MP	10KSC
	160#	–	–	–	–
	200#	–	–	–	–
	–	16BR	1600KP	1.6MP	16KSC
	300#	–	–	–	–
	–	25BR	2500KP	2.5MP	25KG
	400#	–	–	–	–
	500#	–	–	–	–
	600#	40BR	4000KP	4MP	40KSC
	800#	–	–	–	–
	–	60BR	6000KP	6MP	60KSC
	1000#	–	–	–	–
	1500#	100BR	10000KP	10MP	100KG
	2000#	–	–	–	–
	–	160BR	16000KP	16MP	160KSC
	3000#	–	–	–	–
	–	250BR	25000KP	25MP	250KSC
	4000#	–	–	–	–
	5000#	–	–	–	–
	6000#	400BR	40000KP	40MP	400KSC
	8000#	–	–	–	–
	–	600BR	60000KP	60MP	600KSC
	10000#	–	–	–	–
	15000#	1000BR	100000KP	100MP	1000KSC
	20000#	-	-	-	-
	-	1600BR	-	160MP	1600KSC
	30000#	-	-	-	-

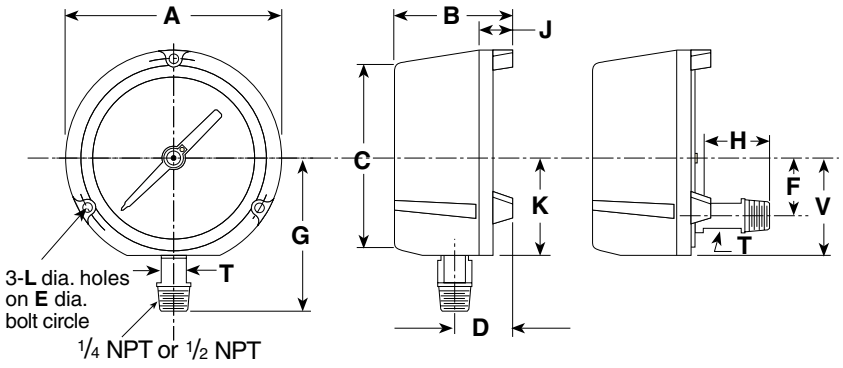
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1279 Duragauge® Pressure Gauge

DIMENSIONS in [ ] are millimeters

For reference only, consult Ashcroft for specific dimensional drawings

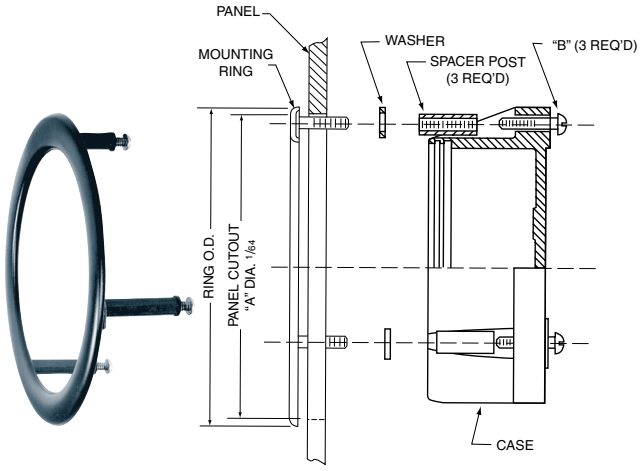
Dial Size Inches	A	B	C	D	E	F	G	H	J	K	L	T	V	Weight oz/kg
4½	5.81 [147.6]	3.36 [85.3]	5.07 [128.7]	1.60 [40.6]	5.375 [137]	1.62 [41.2]	3.92 [99.6]	0.73 [18.4]	0.94 [23.9]	2.62 [66.7]	0.218 [5.5]	0.62 [15.7]	2.62 [66.7]	2.5 (Dry) 3.5 (L.F.)



1278M Series Flush Mounting Ring

1278M Series Flush Mounting Ring. Used to flush mount gauge case 1279(*)S. Black finish (STD.); Polished SS finish (OPT.)

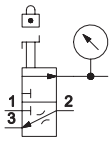
Gauge Size Inches	Ring O.D.	"A" DIA.	"B" Size of 3 Screws	"C" Size of Washers
4½	6 [152]	5.625 [148]	#10-24 x 1⅝	7/16 x 17/64 x 5/8



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SHUT OFF ISOLATION VALVE

- Robust and easy-to-operate shut off valve, with lockout (front or back) on handle
- Provides shut off to downstream machinery
- Optional low profile gauge provides clear indication of the downstream pressure, and when the downstream components can be safely removed when pressure (P2) is at zero
- Available as 3/2 or 2/2 construction
- Threaded ports allow for individual or modular mounting





Performance Data							
Series		**651**		**652**		**653**	
Port Sizes		1/8, 1/4		1/4, 3/8, 1/2		1/2, 3/4, 1	
Thread Type		NPTF, G & Rc					
Nominal Flow - Per ISO 6358 P1 = 91.4 PSI (6.3 bar) ΔP = 14.5 PSI (1 bar)		SCFM (L/min ANR)					
		1 → 2	2 → 3	1 → 2	2 → 3	1 → 2	2 → 3
	1/8	50.8 (1440)	8.8 (250)	-	-	-	-
	1/4	166.7 (4720)	8.8 (250)	151.0 (4300)	8.1 (230)	-	-
	3/8	-	-	308.0 (8800)	8.1 (230)	-	-
	1/2	-	-	400.0 (11400)	8.1 (230)	458.0 (12970)	10.6 (300)
	3/4	-	-	-	-	1165.0 (33000)	10.6 (300)
	1	-	-	-	-	1833.0 (51900)	10.6 (300)
Maximum Inlet Pressure PSIG (bar)		232 (16)				290 (20)	
Ambient Temperature Range °F (°C)		14 to 122 (-10 to 50)					
Fluid Temperature Range °F (°C)		14 to 122 (-10 to 50)					
Fluid		Air or Inert Gas					
Weight lbs. (kg)		0.57 (0.260)		0.97 (0.438)		2.08 (0.943)	

Materials in Contact with Fluid	
Body	Aluminum
Ball	Chrome Plated Brass
Seat	PTFE
Seals	NBR/FKM

How to Order - Shut Off Isolation Valve

8 651 A 3 M 0 2 F A00 00

Port Type
8 = NPTF
[1] G = ISO 228/1-G
J = ISO 7/1 Rc

Product Series
651
652
653

Revision
A

Product Type
2 = 2/2 - Shut Off Valve
3 = 3/2 - Shut Off Valve

Valve Type
M = Manually Operated Ball Valve with Lockout

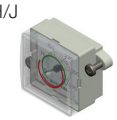
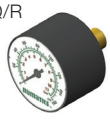
Pilot Valve/Electrical Connection
0 = No Electrical Connection

Port Size
1 = 1/8 (651 Series)
2 = 1/4 (651 or 652 Series)
3 = 3/8 (652 Series)
4 = 1/2 (652 or 653 Series)
5 = 3/4 (653 Series)
6 = 1 (653 Series)

[2] **Options**
A00 = No Options
101 = Side Mounting Brackets
109 = FKM Seals
111 = Metal Muffler
112 = Polyethylene Muffler
113 = Stainless Steel Fasteners
115 = Scissor Lock
117 = ATEX Zones 1–21
122 = Inverted Mounting
123 = Gauge Type Mounted for Right-to-Left Flow
2B9 = 111 + 115

101 
122 
123 

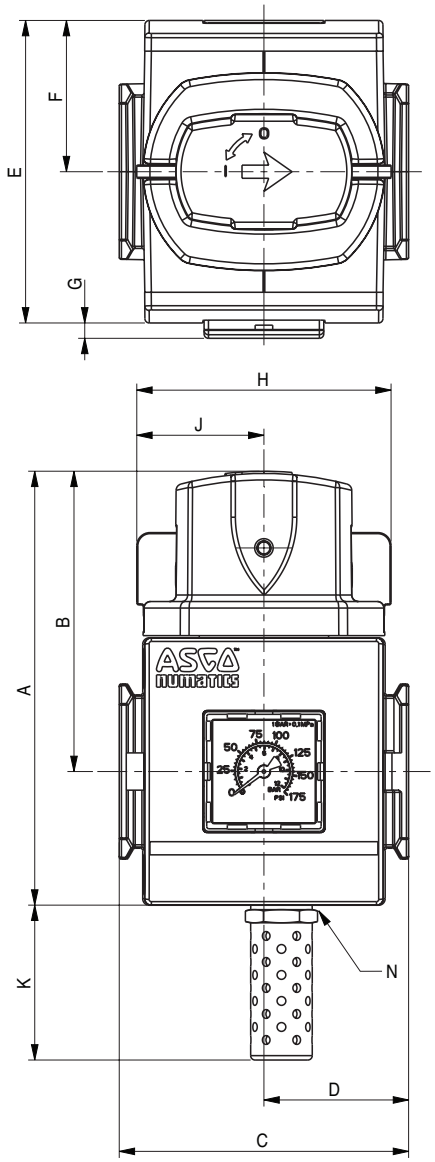
Gauge Type
F = Low Profile Gauge PSI/bar
G = Low Profile Gauge bar/PSI
H = Low Profile Gauge PSI/bar with Pressure Range Indicator
J = Low Profile Gauge bar/PSI with Pressure Range Indicator
N = No Gauge with Port Plate (1/8 NPTF)
P = No Gauge with Port Plate (1/8 ISO 7/1 Rc)
Q = Round Gauge bar/PSI
R = Round Gauge PSI/bar
0 = No Gauge Port

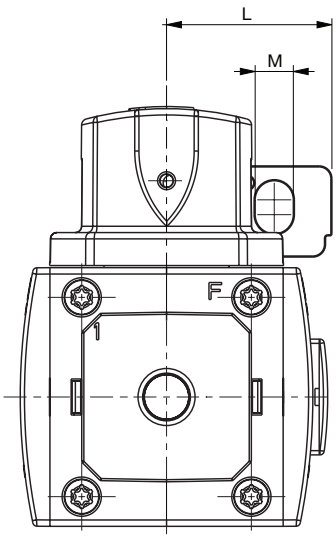
F/G 
H/J 
N/P 
Q/R 
0 

1 Conforms to ISO standards 1179-1

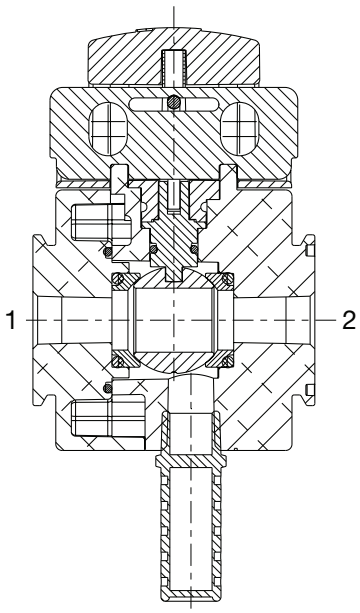
2 If multiple options are required, please use the online CAD configurator on the website to generate the part number (www.asco.com), or consult factory

Dimensions: mm (inches) 651/652/653 Series Shut Off Isolation Valve



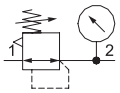


Cross Section - 651/652/653 Series Shut Off Isolation Valve



	A	B	C	D	E	F	G	H	J	K	L	M	N
651	90.5	65.5	50	25	58	29	4.4	58	29	35.5	38	9	1/4 NPTF or 1/4 ISO 228/1-G
	(3.56)	(2.58)	(1.97)	(0.98)	(2.28)	(1.14)	(0.17)	(2.28)	(1.14)	(1.40)	(1.50)	(0.35)	
652	99	68	66	33	69	34.5	2.5	58	29	35	38	9	1/4 NPTF or 1/4 ISO 228/1-G
	(3.90)	(2.68)	(2.60)	(1.30)	(2.72)	(1.36)	(0.10)	(2.28)	(1.14)	(1.38)	(1.50)	(0.35)	
653	120	79	90	45	93	46.5	1.9	58	29	46.7	38	9	3/8 NPTF or 3/8 ISO 228/1-G
	(4.72)	(3.11)	(3.54)	(1.77)	(3.66)	(1.83)	(0.07)	(2.28)	(1.14)	(1.84)	(1.50)	(0.35)	

REGULATOR





- High flow with a wide range of adjustable output pressure ranges
- Available with relieving, non-relieving and internal flow check options
- Optional low profile gauge, round gauge, digital gauge or digital pressure switch
- Optional extended temperature range of -40 °F to 176 °F (-40 °C to 80 °C)
- Threaded ports allow for individual or modular mounting
- Key lockable and tamper resistant options

Performance Data				
Series		**651**	**652**	**653**
Port Size		1/8, 1/4	1/4, 3/8, 1/2	1/2, 3/4, 1
Thread Type		NPTF, G & Rc		
Nominal Flow - Per ISO 6358 P1 = 145 PSI (10 bar) Setpoint P2 = 91.4 PSI (6.3 bar) ΔP = 14.5 PSI (1 bar)		SCFM (L/min ANR)		
	1/8	28.1 (800)	-	-
	1/4	72.6 (2060)	144.2 (4120)	-
	3/8	-	228.6 (6530)	-
	1/2	-	245.0 (7000)	245.0 (7000)
	3/4	-	-	353.1 (10000)
	1	-	-	406.1 (11500)
Maximum Inlet Pressure PSIG (bar) P1		232 (16)		290 (20)
Adjustable Pressure Ranges PSIG (bar) P2		3 to 45 (0.2 to 3)		
		3 to 60 (0.2 to 4)		
		7 to 125 (0.5 to 8)		
		7 to 145 (0.5 to 10)		
		-	-	7 to 232 (0.5 to 16)*
Pilot Operated Regulator Input-to-Output Pressure Ratio		-	1:1	-
Ambient Temperature Range °F (°C)		-4 to 122 (-20 to 50)		
Fluid Temperature Range °F (°C)		-4 to 122 (-20 to 50)		
Fluid		Air or Inert Gas		
Weight lbs. (kg)		0.47 (0.215)	0.95 (0.431)	2.43 (1.102)/2.85 (1.293)*

* High pressure assisted version

Materials in Contact with Fluid	
Body	Aluminum
Seals	NBR, FKM
Springs	Stainless Steel
Poppet	Brass
Stem	PA

How to Order - Regulator

8 651 A R 0 0 2 F A00 G 0

Port Type
- 8 = NPTF
- [1] G = ISO 228/1-G
- J = ISO 7/1 Rc

Product Series
- 651
- 652
- 653

Revision
- A

Product Type
- K = Regulator with Internal Flow Check (652 only)
- [4] R = Regulator
- W = Pilot Operated Regulator (652 only)

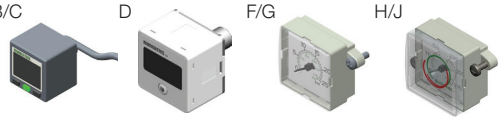
K/R W



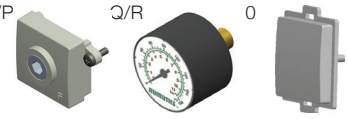
Port Size
- 1 = 1/8 (651 Series)
- 2 = 1/4 (651 or 652 Series)
- 3 = 3/8 (652 Series)
- 4 = 1/2 (652 or 653 Series)
- 5 = 3/4 (653 Series)
- 6 = 1 (653 Series)

Gauge Type
- B = Digital Pressure Switch - PNP
- C = Digital Pressure Switch - NPN
- D = Digital Gauge
- F = Low Profile Gauge PSI/bar
- G = Low Profile Gauge bar/PSI
- H = Low Profile Gauge PSI/bar with Pressure Range Indicator
- J = Low Profile Gauge bar/PSI with Pressure Range Indicator
- N = No Gauge with Port Plate (1/8 NPTF)
- P = No Gauge with Port Plate (1/8 ISO 7/1 Rc)
- Q = Round Gauge bar/PSI
- R = Round Gauge PSI/bar
- 0 = No Gauge Port

B/C D F/G H/J



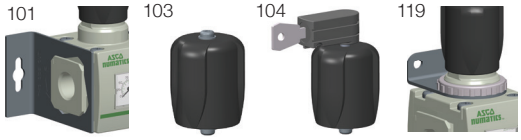
N/P Q/R 0



Pressure Range
- D = 3–45 PSIG/0.2–3 bar
- E = 3–60 PSIG/0.2–4 bar
- G = 7–125 PSIG/0.5–8 bar
- H = 7–145 PSIG/0.5–10 bar
- N = 7–232 PSIG/0.5–16 bar (653 only)*

[3] Options
- A00 = No Options
- 101 = Side Mounting Brackets
- 102 = Panel Nut (651 and 652 only)
- 103 = Tamper Resistant
- 104 = Key Lockable
- 105 = High Temperature (80 °C/176 °F)
- [4] 106 = Low Temperature (-40 °C/-40 °F)
- 109 = FKM Seals
- 113 = Stainless Steel Fasteners
- 114 = Provision for Key Lockable Option
- 117 = ATEX Zones 1–21
- 119 = Panel Bracket with Panel Nut (651 and 652 only)
- 121 = Non-relieving (Not available on Pilot Operated Regulator)
- 122 = Bottom Oriented Pressure Adjustment
- 123 = Gauge Type Mounted for Right-to-Left Flow
- 202 = 105 + 109
- 2A9 = 105 + 106

101 103 104 119

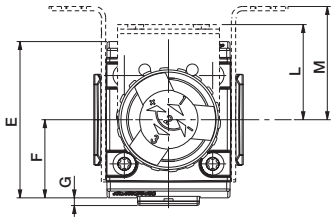


122 123

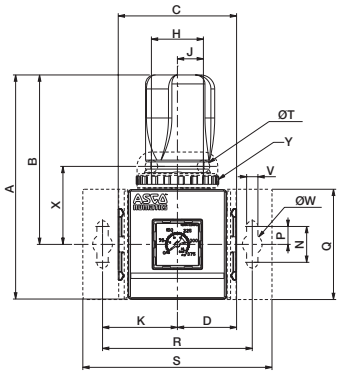


1 Conforms to ISO standards 1179-1
2 Relieving Standard; use option 121 for Non-relieving
3 If multiple options are required, please use the online CAD configurator on the website to generate the part number (www.asco.com), or consult factory
4 Compressed air must be dry enough so no ice formation is present on the product

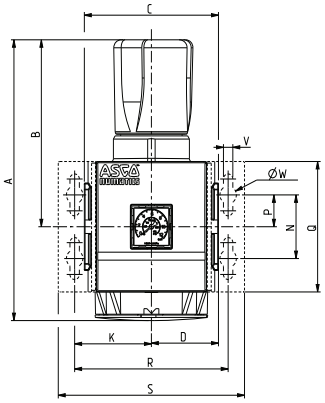
Dimensions: mm (inches) 651/652/653 Series Regulator



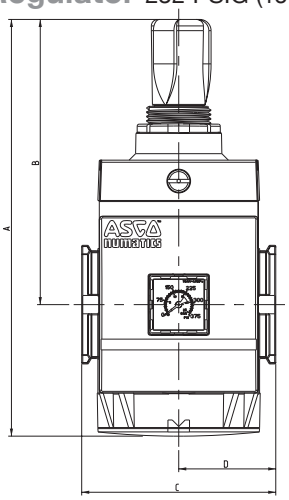
651/652 Series



653 Series



653 Series High Pressure Regulator 232 PSIG (16 bar)

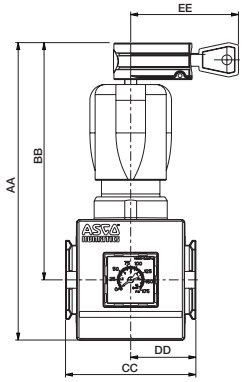


	A	B	C	D	E	F	G	H	J	K	L	M
651	103	77.5	50	25	58	29	3.4	29	14.5	35	42	44.5
	(4.06)	(3.05)	(1.97)	(0.98)	(2.28)	(1.14)	(0.13)	(1.14)	(0.57)	(1.38)	(1.65)	(1.75)
652	125	94.5	66	33	69	34.5	2.5	29	14.5	41.75	42	50
	(4.92)	(3.72)	(2.60)	(1.30)	(2.72)	(1.36)	(0.10)	(1.14)	(0.57)	(1.64)	(1.65)	(1.97)
653	178.4	117.5	90	45	93	46.5	3	-	-	52	-	62
	(7.02)	(4.63)	(3.54)	(1.77)	(3.66)	(1.83)	(0.12)	-	-	(2.05)	-	(2.44)

	N	P	Q	R	S	ØT	V	ØW	X	Y
651	20	10	50	70	92	7	6.3	11	39.1	M30 x 2
	(0.79)	(0.39)	(1.97)	(2.76)	(3.62)	(0.28)	(0.25)	(0.43)	(1.54)	
652	20	10	61.5	84	106	7	6.3	11	43.5	M37 x 2
	(0.79)	(0.39)	(2.42)	(3.31)	(4.17)	(0.28)	(0.25)	(0.43)	(1.71)	
653	40	20	82	104	126	-	6.3	11	-	-
	(1.57)	(0.79)	(3.23)	(4.09)	(4.96)	-	(0.25)	(0.43)	-	

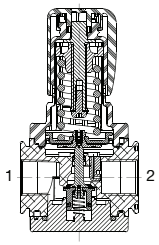
	A	B	C	D	E	F	G
653 High Pressure	193	132	90	45	93	46.5	3
	(7.60)	(6.20)	(3.54)	(1.77)	(3.66)	(1.83)	(0.12)

651/652/653 Series



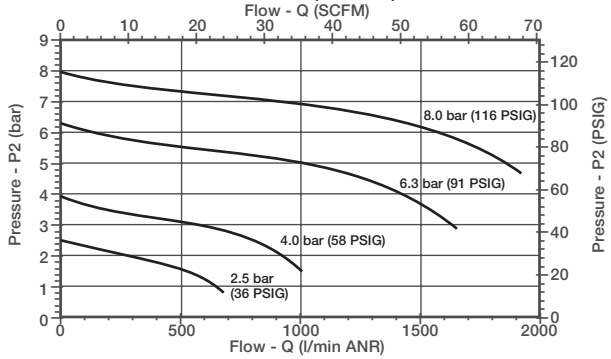
	AA	BB	CC	DD	EE
651	121.5	96	50	25	55
	(4.78)	(3.78)	(1.97)	(0.98)	(2.17)
652	151	120	66	33	55
	(5.94)	(4.72)	(2.60)	(1.30)	(2.17)
653	192	137	90	45	55
	(7.56)	(5.39)	(3.54)	(1.77)	(2.17)

Cross Section - 651/652/653 Series Regulator

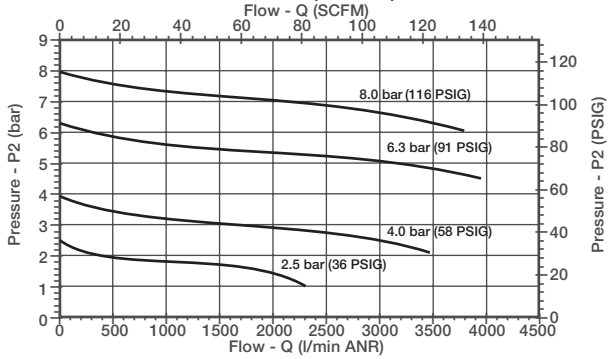


Regulator Flow Charts

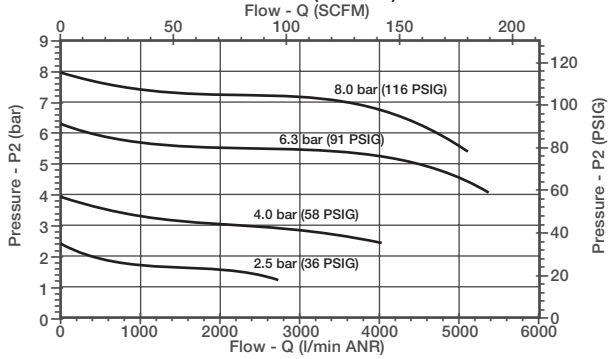
651 Regulator | 1/8 Ports
P1 = 10 bar (145 PSIG)



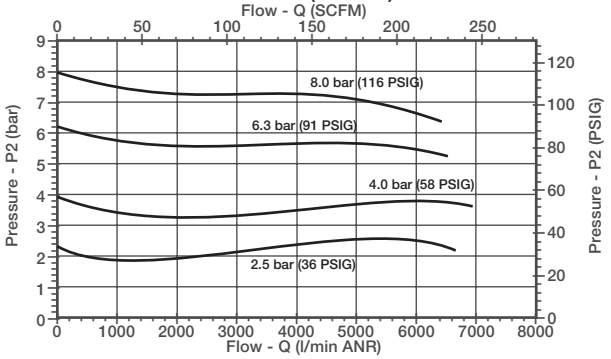
651 Regulator | 1/4 Ports
P1 = 10 bar (145 PSIG)



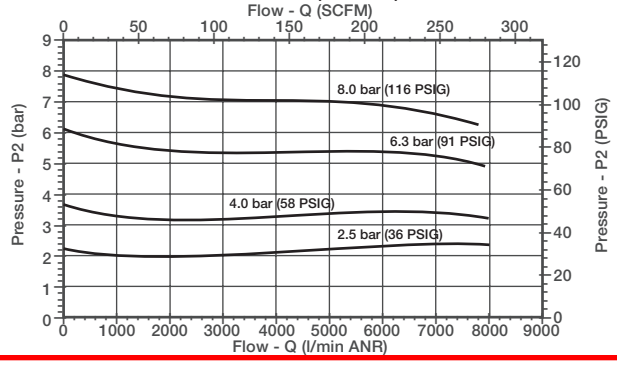
652 Regulator | 1/4 PSIG
P1 = 10 bar (145 PSIG)



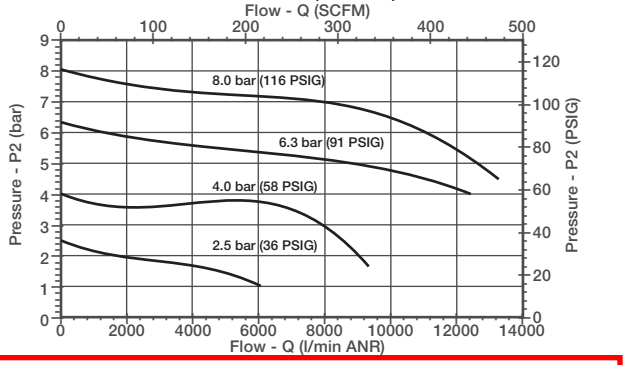
652 Regulator | 3/8 Ports
P1 = 10 bar (145 PSIG)



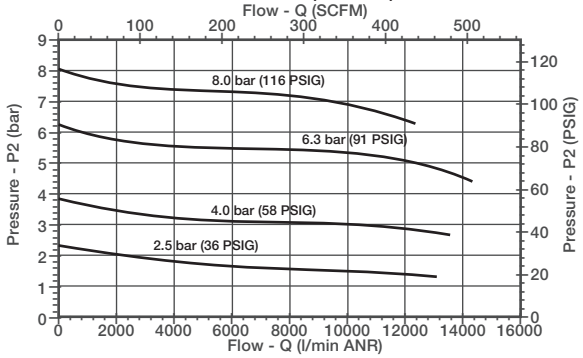
652 Regulator | 1/2 Ports
P1 = 10 bar (145 PSIG)



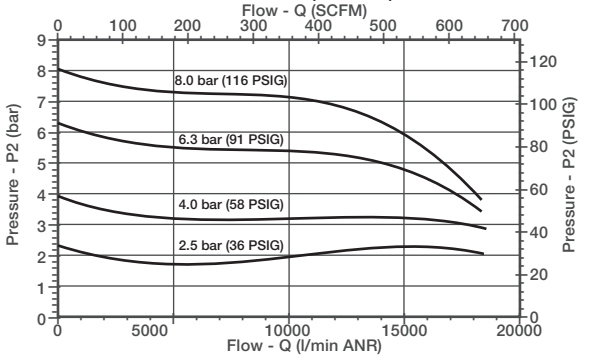
653 Regulator | 1/2 Ports
P1 = 10 bar (145 PSIG)



653 Regulator | 3/4 Ports
P1 = 10 bar (145 PSIG)



653 Regulator | 1 Ports
P1 = 10 bar (145 PSIG)

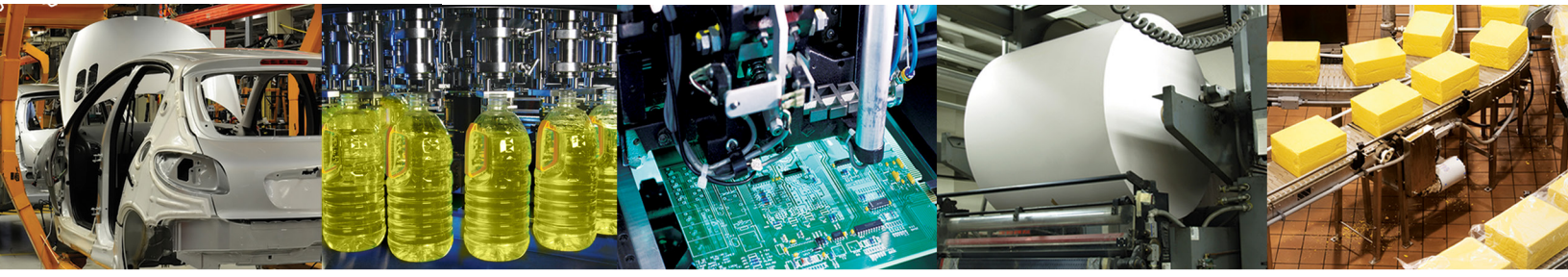


TAG: 90-F-002

Delta 901 Series

Premium Filters

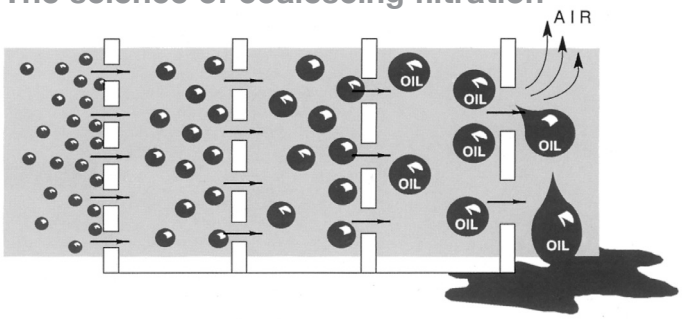




Asco™

EMERSON™

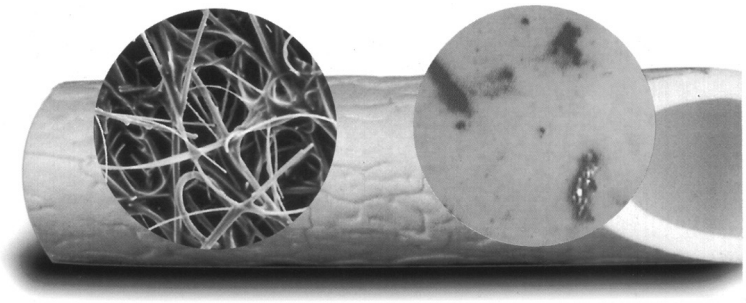
The science of coalescing filtration



Air flows from the inside to the outside of the element through progressively larger openings in the media. As contamination moves through the element, solid particles are trapped and liquids are formed into large droplets. As the air exits the element, surface tension holds the liquids and allows them to drain to the bottom.

The Numatics 0.01 micron borosilicate glass fiber element, when magnified 228x (left), shows deep, tortuous paths and large air pockets which provide high performance contaminate removal and longer life.

Contamination removal from a typical compressed air line with 0.01 micron Numatics media is shown magnified 40x (right). The contamination contains hydrocarbon (black), oil (opaque drops), and metal fragments (shiny spots).

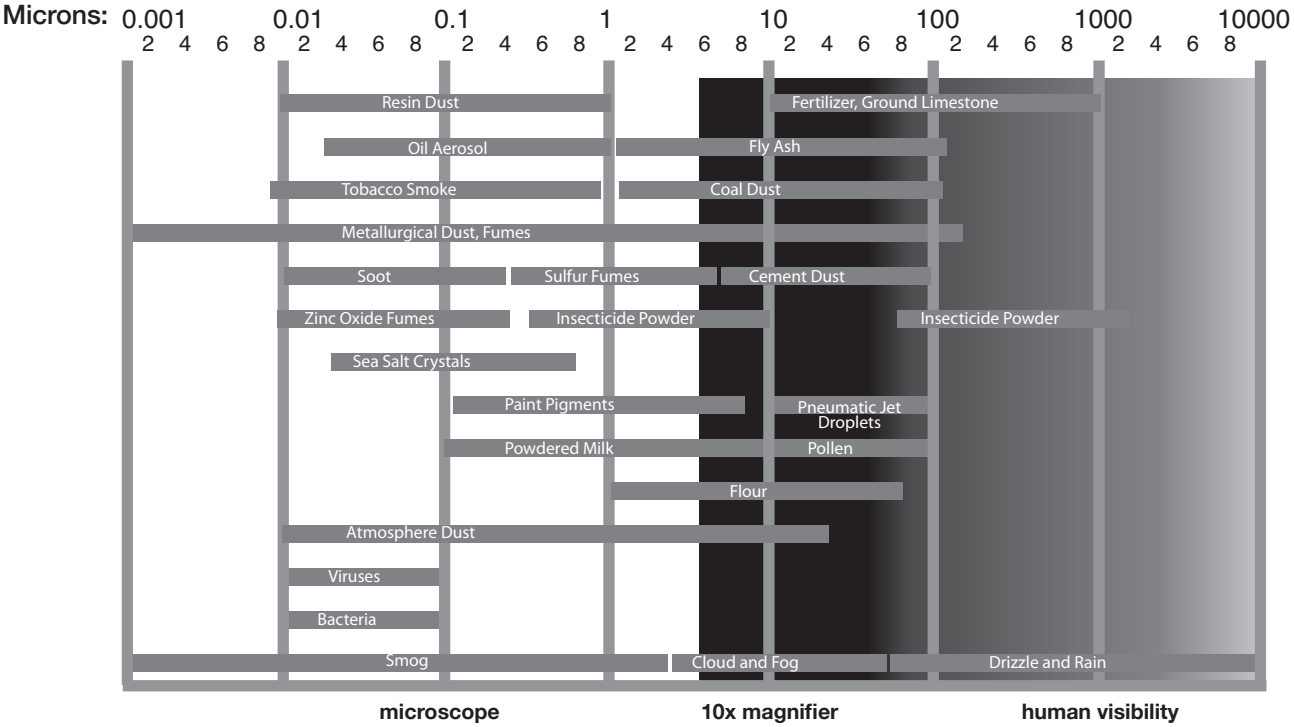


Scanning electron micrograph (at 228x)

Dirty filter magnification (at 40x)

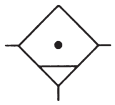
With Numatics elements like the one on the left installed in your system, the contamination on the right won't get to where it can cause damage. Your system lasts longer and costs less.

What you get is not always what you see





COARSE GRADE COALESCING FILTER



ANSI SYMBOL

ISO CLASS 3 ☐ 4

Coalescing Filter - 1.0 Micron (Coarse Grade) - F901H Series
C.R.N. Rated to 200 PSI at 180°F (1/4 to 2" Inclusive)

Application:

The coarse coalescing filter is utilized when low pressure drop or crude separation is required. The coarse filter element is preferred in low pressure and vacuum application so that the efficiency of the compressor or pump is not sacrificed. Also, the coalescing element will take out crude amounts of large liquid oil and water particles, specifically downstream of a compressor to protect a dryer. The coalescing 1.0 micron coarse grade filter element features a unique vacuum-formed process. It utilizes micro-glass fibers in raw form to create a seamless, depth-loading media. Combined with a rigid fiber-binding epoxy, the filter element has great strength and high efficiency.

Recommended Uses:

- Mainline plant filtration
- Prefilter to refrigerated air dryer
- 1 micron particle removal in 'dry' systems
- Heavy oil concentration removal

Specifications: { Per ISO 12500 at 33.2 ppm Inlet (40 mg/m³) }

- Coalescing Efficiency = 95.0%
- Maximum Solid Particle Size: 1.0 µm
- Maximum Solid Concentration: 2.8 mg/m3 / (2.3 ppm)
- Maximum Oil Concentration: 2.0 mg/m3 / (1.66 ppm)
- Flow Path: Inside to Outside Of Element

Materials of Construction:

Filter Coalescing:

Head 1/4 - 3: A380.0 Cast Aluminum
Bowl 1/4 - 1: A380.0 Cast Aluminum
Bowl 1-1/4 - 3: A356.0-T6 Cast Aluminum
Seals: Fluorocarbon (FKM)
Standard Manual Drain: Brass

Note: Heads and Bowls – Anodized

Coalescing Element:

End Caps: 6061-T6511 Anodized Aluminum
Element: Borosilicate Glass Fibers
End Cap Bonding Material: Epoxy Resin
Support Cores: Galvanized Carbon Steel
Drain Layer: Polyester

Flow Ratings:			
Port Size	SCFM	m³/h	Δ P
	Based on 100 PSI (7 bar) inlet		
1/4	49	83	1.5PSID
3/8	59	100	1.5 PSID
1/2	75	127	1.5 PSID
3/4	160	272	1.5 PSID
1	256	435	1.5 PSID
1-1/4	480	816	1.5 PSID
1-1/2	576	979	1.5 PSID
2	1120	1903	1.5 PSID
2-1/2	1440	2447	1.5 PSID
3	1800	3058	1.5 PSID

Note: Maximum efficiency occurs at stated flows

PREMIUM FILTERS

How to Order: Filters (Particulate, Coalescing & Adsorbing)

F 901 G - 04 AG Z

Model
F = Filter

Series
901 = Delta Series™

Element
G = 3.0 Micron Particulate Filter
H = 1.0 Micron Coarse Coalescer
D = 0.01 Micron Fine Coalescer
E = 0.01 Micron Ultra Fine Coalescer
F = Adsorbing Grade Element*****

Threads
- = NPTF
G = G Tap (BSPP)

Options
A = Internal Auto Float Drain *
B = Mounting Brackets**
D = Internal Pleated Prefilter***
G = Differential Pressure Gauge
W = External Auto Drain****
Z = CRN Rating

Port Size

02	= 1/4	10	= 1-1/4
03	= 3/8	12	= 1-1/2
04	= 1/2	16	= 2
06	= 3/4	20	= 2-1/2
08	= 1	24	= 3

* Applies to 1/4" to 2" Models Only
** Applies to 1/4" to 1-1/2" Models Only
*** Applies to Elements H, D and E Only
**** Applies to 2", 2-1/2" and 3" Models Only
***** Element Type F Use Only Option B

Optional Internal Pleated Prefilter (See Option D in the "How to Order" for Coalescing Filters.)

Numatics Delta Series™ filters are premium quality filters which include an optional 3.0 micron, internal pleated prefilter. This prefilter provides protection for the fine borosilicate fibers by removing over 97.5% of 3.0 micron and larger particles, extending the life of the filter element.

Pressure and Temperature Specifications – Adsorbing Grade

Filter Option - Adsorbing Element Grade - F	None	Z
		CRN
Port Size	ALL	1/4 to 2
Max. Pressure PSI (Bar)	250 (17)	200 (14)
Max. Temperature °F (°C)	200 (95)	180 (82)
Min. Temperature °F (°C)	-15F (-26C)	

Note: Option combinations default to lower pressure and temperature rating.
The only optional feature applicable for the adsorbing grade element is the mounting bracket (Option B).

Pressure and Temperature Specifications – Particulate and Coalescing Grades

Filter Option Elements - G, H, D, E	None	A	G	W	Z
		Float Drain	Delta P Gauge	Ext. Drain	CRN
Port Size	ALL	1/4 to 2	1/4 to 3	2, 2-1/2, 3	1/4 to 2
Max. Pressure PSI (Bar)	250 (17)	250 (17)	250 (17)	230 (16)	200 (14)
Max. Temperature °F (°C)	200 (95)	150 (66)	175 (80)	120 (50)	180 (82)
Min. Temperature °F (°C)*	-15F (-26C)				

Note: Option combinations default to lower pressure and temperature rating.
*Air supply must be dry enough to avoid the formation of ice at temperatures below 32°F (0°C)

Process Blowers:
Tag: 16-B-401-A/B/C

ROTARY LOBE BLOWERS

DELTA BLOWER GENERATION 5

Intake volume streams from 30 m^3/h to 15,000 m^3/h



AERZEN

THE DELTA BLOWERS. ROBUST, DURABLE MACHINES FOR COUNTLESS COMPRESSOR PROCESSES.



Delta Blower Generation 5

They are the driving force behind countless processes, the heart of a powerful machine assembly: the Delta Generation 5 rotary lobe blowers. They represent the distillation of almost 150 years of AERZEN experience and development work, but are more innovative than ever. AERZEN has packed a number of new features into its latest generation of delta blowers: oil-free conveyance of air and neutral gases; a broad control range for volume streams of from 30 m^3/h to 15,000 m^3/h; reduced life-cycle costs; easy handling; quieter operation. What hasn't changed: the extremely robust, extremely reliable, and extremely durable nature of this global success story. No wonder that their owners are so enthusiastic about putting them into continuous service – year in and year out, decade after decade.


AERZEN
Delta Blower



Applications
- Water and waste water treatment
- Aeration
- Filter backwashing
- Pneumatic conveyance of bulk materials
- Gas conveyance
- Degassing
- Dust removal
- Vacuum production
- Biogas treatment

and many others

Industries
- Sewage treatment
- Chemical and process technology
- Power plants
- Cement and lime
- Foodstuffs
- Paper

and many others

THE UNIVERSAL GENIUS FOR EVERY APPLICATION.

The versatile and compact Delta Blower units can be deployed in any climate zone on Earth. In the most challenging outdoor environments just as safely as in covered indoor spaces. They can be used as both standalone units or in complex assemblies. They are as reliable in earthquake zones as they are aboard ships or in other mobile applications.

Versatility in Detail.
Delta Blowers are powerful all-round geniuses. Miniature units can be mounted on silo vehicles, the largest machines can be used in lifting units. They are used to unload ships – at up to 1,000 tons an hour.

Control range from 25% to 100%

Intake volumes streams from 30 m^3/h to 15,000 m^3/h

Positive pressure up to 1,000 mbar

Nominal widths from DN 50 to DN 400



Indispensable for power plant



Powerful performer for loading and unloading ships

MACHINES AND SERVICES FROM AERZEN. HIGHLY ACCESSIBLE AND AVAILABLE AROUND THE WORLD.

The durability of Delta Blower units is legendary. Just like their proverbial reliability, lifespan, and intelligent operating and maintenance design. Why bring up AERZEN services at all, then? Because service is necessary. And because the service teams we have on call across the globe are an important decision criterion for plant operators: a decision for blowers "made by AERZEN".



The heart of the Delta unit: the triple-lobed AERZEN blower stage

High availability.
The best blower units are the ones you don't notice. Because they do their work reliably, year in and year out. The Delta Blowers from AERZEN are just this kind of unit. There's a reason they have a reputation for robust nature and long service life: AERZEN makes all the components itself. Right down to the control system. From the initial idea through engineering to configuration. Which is how we can guarantee the productivity of our machines. Our contribution to the "made in Germany" quality designation.



A reliable partner – the world over

There for you – the world over.
Typically AERZEN: that our solutions should be so reliably available. That means our machines, of course, but also our services. Our teams will take care of your units throughout their entire operational life, thus helping to protect the value of your investment. And the fact that we have a network of over 40 affiliates and service representatives in more than 100 countries around the world means we're never far away. We can be there for you quickly – when you need us.

AERZEN: always the right choice.
- Commissioning done by qualified personnel
- Individualized training for customer's specialists
- Customer-specific service and maintenance contracts
- Delta-real time monitoring for your unit
- On-site machine modifications (if needed)

Intelligently made.
What do they mean, the terms "compact, easy handling, maintenance-friendly"? These are our promises to you for the day-to-day operation of our products, and they're worth their weight in gold. Some concrete examples:

- Small footprint
- Flexible machine mounts
- Easy to move with a fork lift or pallet truck
- Space-saving side-by-side setup
- Plug and play installation and commissioning
- Easy access to all parts subject to wear
- Oil levels can be checked while machine is in operation
- Maintenance work such as changing oil and filters done from the front of the machine
- Low noise levels
- Belt-driven for optimal volume streams; retrofitting is fast and easy

100% clean.
How can we offer machines that can be used for handling foodstuffs, without the need for extensive cleaning that would interrupt production? By eliminating absorption material in the muffler. AERZEN designed the base support to function as a discharge muffler, reducing noise by air deflection alone. 100% free of absorption material that would otherwise cause wear and contaminate downstream systems. The base supports, by the way, are AERZEN patents and are also certified as spark arresters for use in ATEX applications.



Intelligent noise reduction: the AERZEN discharge muffler with no absorption material

BLOWERS ARE BLOWERS, RIGHT? AN END TO PRECONCEPTIONS.

AERZEN is one of the world's most innovative providers of compressor technology. For over 150 years. And it was almost 150 years ago – 1868, to be exact – that we produced Europe's first rotary lobe blower. Since then we have raised the bar for each generation of this technology. Let yourself be surprised. Discover the extraordinary blowers: the Delta Blower Generation 5.

Extremely robust
- for a broad range of applications in control ranges from 25 to 100%
- many types of possible modifications

Compact design
- space-saving side-by-side setup
- smaller engine rooms

Operation-friendly, low-maintenance design
- high availability in continuous operation under difficult environmental conditions
- control and maintenance from the front of the machine

Plug&play
- pre-configured, parameterized, ready to run
- integrated service package with funnel and initial oil fill

Oil-free per Class 0
- per ISO 8573-1, TÜV certified

No absorption material
- for use in the pneumatic conveyance of bulk food items (no contamination).
- secure, energy-efficient water treatment (no deposits of absorption material on aeration plates, no clogging of filter media, no pressure losses)

Integrated power component (optional)
- frequency inverter, delta-star, direct/soft start
- intelligent AERtronic control

Smart oil system
- oil levels can be checked with the machine running
- readable from outside the machine
- oil instead of grease: bearings lubricated with oil last longer





A plus for the environment
- energy-efficient Class IE3 motors as standard equipment
- intake on the cold side of the unit
- basic unit integrated into a highly efficient machine network with rotary lobe compressors and turbo blowers from AERZEN
- retrofitting is fast and easy

Belt-tensioning hinged motor mounting plate
- fully automatic and maintenance-free belt tensioning
- no need to monitor V-belt tension
- very easy to mount or replace V-belts

Multifunctional hinged motor mounting plate and lifting jack
- safer transport
- easy, secure V-belt installation
- mobile installation (e.g. aboard ship/ in earthquake zones)
- Hinged motor mounting plate as support for heavy motors

Low noise levels
- for easy compliance with noise level regulations near populated areas and production facilities
- minimal noise levels with optimized acoustic hood
- integrated pulsation reduction process (patented AERZEN blower stage)

Approval per PDE guidelines (pressure valve)

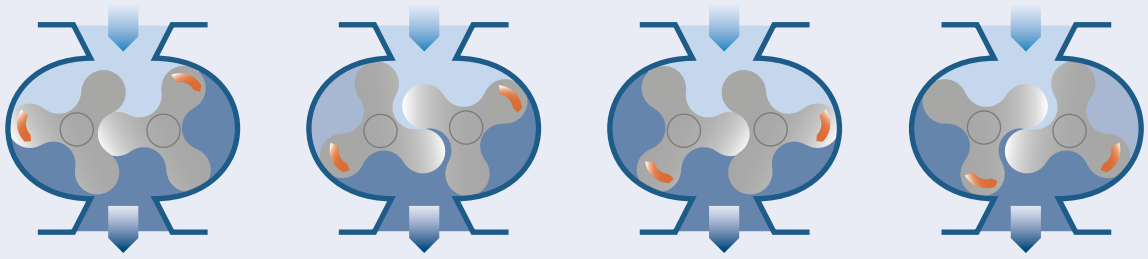
ATEX compliant
- AERZEN base plates certified as spark extinguishers for ATEX applications

TÜV-certified zone separation filter

WANT TO KNOW MORE ABOUT WHAT'S INSIDE? DESIGN AND CONSTRUCTION.

It's good to know what all is inside each and every AERZEN Delta blower unit: The wealth of experience of a global market leader. The quality expected of a family firm with a long history of excellence. The goal of providing the best solutions for our customers. And a principle that underlies thousands and thousands of successful applications: Roots.

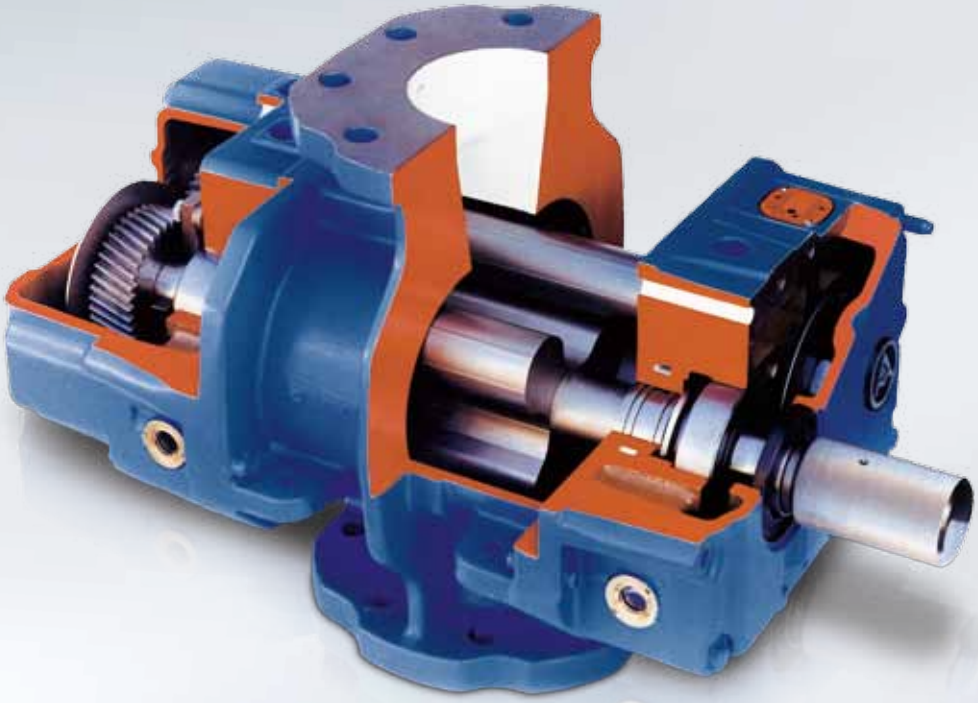
Innovative pulsation reduction.
AERZEN has developed a unique process especially for the Delta Blower series and integrated it into all its models: pulsation reduction. This patented AERZEN process prevents disruptions in the machine even before they arise. The triple-lobed rotors in the Delta blowers have two channels cast in the cylinder. These channels control backflow into the conveyance chamber to eliminate the blowback and crimping impulses that were typical of double-lobed blowers. A patented interference process that means an end to pulsation.



Conveyance process in AERZEN blowers

Intelligent technical details are your guarantee for the lasting value of the Delta blowers. One example from among many: the patented pulsation reduction process, an AERZEN innovation that increases the lifespan of the bearings.

The inner values are what count: a view into an AERZEN blower



Blower stage
- Triple-lobed blower with integrated pulsation reduction
- Housing: cylinder (with two integrated, pressure-side pre-inlet channels to reduce noise through pulsation reduction), wheel well, housing lid, and side plates
- Made of EN-GJL-200
- Ribbed surface

Rotors

Models GM 3 S to GM 80 L:
- Rotors and shafts drop forged from C45N

Models GM 90 S and GM 30 L:
- Rotors and shaft drop forged from EN-GJS-500-7

Models GM 150 S to GM 240 S:
- Rotors made of EN-GJS-400-18-LT, shafts of C45N

Drive type
- Overhung via narrow V-belt
- Direct drive

Cooling
- Convection cooling

Lubrication
- Oil bath for bearings and timing gears

Oil-free conveyance
- Oil-free operation per ISO 8573-1 Class 0 is guaranteed by using proven piston ring labyrinth seals combined with neutral chambers (open to the atmosphere)

Timing gears
- Made of case-hardening steel, hardened and ground, with helical gears
- Attached to the shaft via taper interference fit
- Extremely smooth running, very long operational life

EXCEEDING STANDARDS. AERZEN DELIVERABLES.

Some do comfortable. Others do efficient. We do both. When your Delta Blower unit is delivered, it comes completely configured, parameterized, ready to plug and run. Designed especially for your processes, of course. And including all the standardized accessories and components you'll need for flawless operation at the push of a button.

The AERZEN "All-in" concept: Standard deliverables.



1 **Triple-lobe blower stage**
- with integrated pulsation reduction (see page 10/11)

2 **Base plate with integrated discharge muffler**
- Certified as ATEX spark arrester per EU guideline 1999/92/EC
- Muffler free of absorption material

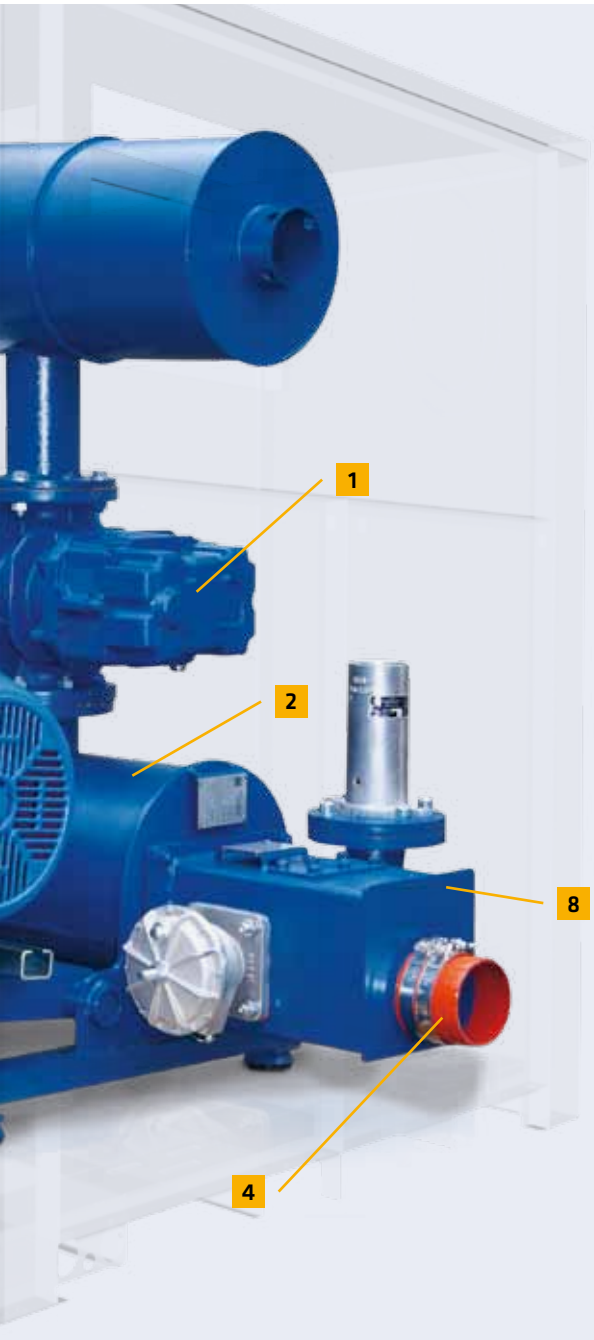


3 **Intake muffler with integrated air filter**
- Normal intake from the surrounding area
- Conduit intake optional

4 **Flexible rubber bushing**
- With clamps

5 **Flexible machine mounts**
- To decouple machine-borne noise







6 **Motor**

- High-performance narrow V-belt drive with three-phase AC motor
- Energy-efficient Class IE3 motors (up to motor size 315) as standard equipment



7 **Hinged motor mounting plate**

- Automatic V-belt tensioning
- Multifunctional hinged motor mounting plate and lifting jack

8 **Terminal box**

- With pressure valve (8) per PED guideline 97/23/EC
- built-in non-return flap

9 **Instrumentation**

- Pressure gauge for displaying conveying pressure
- Maintenance indicator for monitoring intake filter

Added value: Accessory components.

- Acoustic hood for indoor and outdoor installation, force-air ventilated via mechanical filter
- Startup load relief (10), needed with delta-star motor startup
- Pressure-side axial compensator in place of flexible rubber bushing
- Control cabinet: delta-star, frequency inverter, soft-starter
- AERZEN AERtronic blower control
- Additional accessories on demand



AERZEN startup load relief

Modifications.

- Special motors
- Special finishes
- ATEX-compliant design
- Acoustic hood with special sand collector for use in desert locations
- Acoustic hood for low temperatures (to -40° C) with heater and gravity-activated blinds
- Acoustic hood for earthquake safety and increased wind resistance
- For use aboard ships and in motor vehicles
- For conveying specialty gases by using specialized materials
- Customer-specific documentation



Always a safe choice: ATEX-compliant AERZEN design

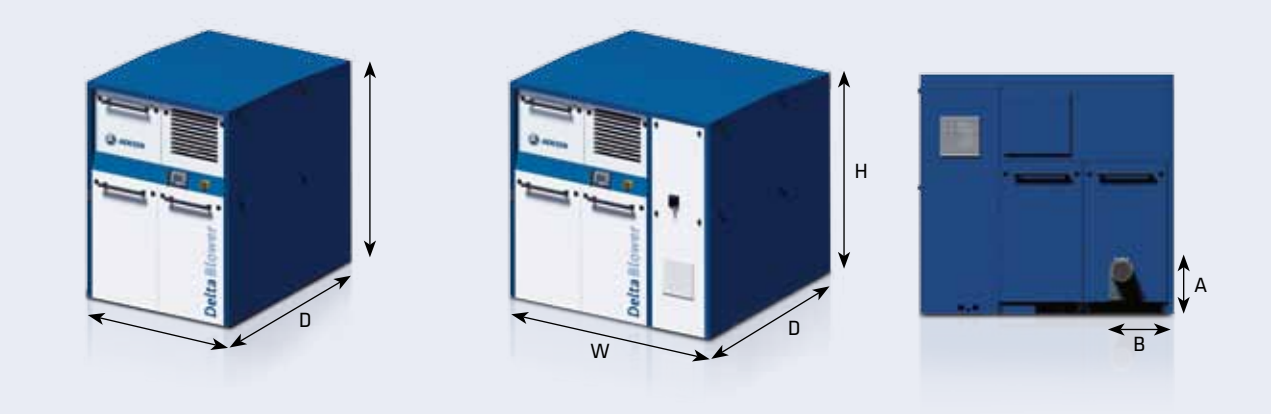
Efficient control.

AERtonic is easy to use. But above all, AERZEN's control system is an important part of the unit's safety design: it guarantees that your facility will be operating at optimal efficiency levels at all times. The AERtronic offers a broad spectrum of functions. It can visualize operational data, run the operating hours counter, provide early notifications of operational events, and save all this information in memory. AERtronic will also keep you informed about upcoming maintenance and service cycles, meaning that service calls can be planned for more efficiently, helping to increase the lifespan of your machine's components significantly.



WEIGHTY ADVANTAGES. IN A LEAN MACHINE.

Dimensions and weights (Technical data subject to change – Products subject to technical alteration).



Delta Blower.

Model	H	D	W	A	B	Nozzle size DN	Weight without acoustic hood	Weight with acoustic hood
3 S	1055	800	800	228	245	50	148 kg	212 kg
4 S	1280	1135	925	258	258	80	207 kg	299 kg
7 L	1280	1135	925	258	258	80	212 kg	304 kg
10 S	1280	1135	925	258	258	80	236 kg	328 kg
10 S	1500	1350	1250	294	375	100	336 kg	496 kg
15 L	1500	1350	1250	294	375	100	351 kg	511 kg
25 S	1500	1350	1250	294	375	125	407 kg	567 kg
30 L	1900	1800	1500	356	435	150	690 kg	1020 kg
35 S	1900	1800	1500	356	435	150	780 kg	1110 kg
50 L	1900	1800	1500	356	435	150	830 kg	1160 kg
50 L	2111	2055	1700	357	525	200	905 kg	1475 kg
60 S	2111	2055	1700	357	525	200	1035 kg	1605 kg
80 L	2308	2200	1900	456	600	250	1550 kg	2200 kg
90 S	2308	2200	1900	456	600	250	1620 kg	2270 kg
130 L	2345	2850	2100	410	635	300	2436 kg	3410 kg
150 S	2345	2850	2100	410	635	300	2796 kg	3750 kg
220 L	3500	4304	2800	410	800	400	4981 kg	8240 kg
240 S	3500	4304	2800	410	800	400	5371 kg	8630 kg

Weights without motor and belt drive

Delta Blower with integrated power supply.

Model	H	D	W	A	B	Nozzle size DN	Weight with acoustic hood
10 S	1500	1350	1850	294	375	100	619 kg
15 L	1500	1350	1850	294	375	100	661 kg
25 S	1500	1350	1850	294	375	125	717 kg
30 L	1900	1800	2100	356	435	150	1322 kg
35 S	1900	1800	2100	356	435	150	1412 kg
50 L	1900	1800	2100	356	435	150	1462 kg
50 L	2111	2055	2300	357	525	200	1825 kg
60 L	2111	2055	2300	357	525	200	1955 kg

Weights without motor, electrical equipment, and belt drive

BLOWER POWER IN DETAIL. THE PERFORMANCE TABLES.

The Delta rotary lobe blowers are high-performance products. They were designed for use in many different areas of application: 16 models in 9 nominal widths from DN 50 to DN 400, intake volume streams from about 30 to 15,000 m^3/h, positive pressures up to 1,000 mbar, negative pressures down to -500 mbar.

Noise values.
The sound pressure levels from machine noise (Lp(A)) per individual unit are based measurements taken outdoors at a distance of 1 M from the exterior of the machine (tolerance of ± 2 dB). Noise measurement per DIN 45 635, DIN ISO 3744 and DIN EN ISO 2151.

Using the performance tables.
You will find all the important performance data for the Delta series in the performance tables: intake volume stream ($\dot{V}1$), required coupling power (Pk), motor size and noise level (Lp(A)). The intake volumes shown are based on commonly available belt drive ratios in increments of about 12%. Lower drive speeds are also possible, depending on the final temperature.

Parameters.

$\dot{V}1$	[m^3/min]	Intake volume stream
p1	[bar abs]	Intake pressure
Δp	[mbar]	Pressure differential
t_1	[°C]	Intake temperature
t_2	[°C]	Final temperature
nG	[rpm]	Blower rotational speed
nM	[rpm]	Motor rotational speed
Pk	[kW]	Shaft power
P_{mot}	[kW]	Nominal motor power
Lp(A) o. H.	[dB]	Noise pressure level for blower unit without hood
Lp(A) m. H.	[dB]	Noise pressure level for blower unit with hood

Delta Blower is the driving force in countless processes. There is a good reason for the exceptional range of applications: the robust power units from AERZEN can be configured for just about any requirement, even in standard implementations.

Δp mbar	Blower size		GM 3 S / DN 50										GM 4 S / DN 80								
300	$\dot{V}_1$	[m³/min]	**0.66**	**1.1**	**1.61**	**2.13**	**2.48**	**2.94**	**3.18**	**3.66**	**3.87**	**4.12**	**1.01**	**1.66**	**2.17**	**3**	**3.54**	**4.16**	**4.78**	**5.41**	**5.7**
	t_2	[°C]	74	62	57	54	53	52	51	50	50	50	68	59	56	53	52	51	50	49	49
	nG	[rpm]	1400	1830	2330	2840	3190	3640	3880	4350	4560	4800	1400	1870	2240	2840	3230	3680	4130	4590	4800
	nM	[rpm]	2800	2800	2800	2840	2840	2840	2870	2870	2870	2890	2800	2800	2840	2840	2870	2870	2890	2890	2890
	Pk	[kW]	0.89	1.14	1.43	1.76	2.01	2.34	2.54	2.94	3.13	3.37	1.14	1.49	1.78	2.29	2.64	3.06	3.52	4.01	4.25
	P_{mot}	[kW]	1.5	1.5	2.2	3	3	3	4	4	4	5.5	1.5	2.2	3	3	4	4	5.5	5.5	5.5
	Motor size		90 S	90 S	90 L	100 L	100 L	100 L	112 M	112 M	112 M	132 S	90 S	90 L	100 L	100 L	112 M	112 M	132 S	132 S	132 S
	Lp(A)[dB]	w/o.H./w.H.	78/<65	80/<65	83/66	87/66	87/66	89/66	90/67	92/67	93/67	93/66	77/<65	78/<65	79/<65	79/<65	84/<65	86/<65	87/<65	88/<65	89/<65
400	$\dot{V}_1$	[m³/min]	**0.55**	**0.98**	**1.53**	**2.01**	**2.4**	**2.86**	**3.07**	**3.57**	**3.79**	**4**	**0.87**	**1.5**	**2.21**	**2.9**	**3.42**	**4.06**	**4.64**	**5.27**	**5.56**
	t_2	[°C]	107	83	73	68	66	64	63	62	61	61	94	77	70	66	64	62	61	60	60
	nG	[rpm]	1400	1830	2370	2840	3220	3680	3880	4380	4590	4800	1400	1860	2370	2870	3250	3710	4130	4590	4800
	nM	[rpm]	2800	2800	2840	2840	2870	2870	2870	2890	2890	2890	2800	2840	2840	2870	2890	2890	2890	2890	2890
	Pk	[kW]	1.13	1.45	1.86	2.24	2.57	3	3.19	3.71	3.94	4.18	1.46	1.91	2.43	2.97	3.4	3.94	4.47	5.07	5.35
	P_{mot}	[kW]	1.5	2.2	3	3	4	4	4	5.5	5.5	5.5	2.2	3	3	4	5.5	5.5	5.5	7.5	7.5
	Motor size		90 S	90 L	100 L	100 L	112 M	112 M	112 M	132 S	132 S	132 S	90 L	100 L	100 L	112 M	132 S	132 S	132 S	132 S	132 S
	Lp(A)[dB]	w/o.H./w.H.	80/<65	81/<65	84/66	87/66	87/67	90/67	91/67	93/67	94/67	94/67	77/<65	79/<65	81/<65	83/<65	85/<65	87/<65	88/<65	89/<65	89/<65
500	$\dot{V}_1$	[m³/min]		**0.91**	**1.43**	**1.94**	**2.29**	**2.78**	**3.04**	**3.47**	**3.68**	**3.9**	**0.77**	**1.42**	**2.11**	**2.8**	**3.3**	**3.93**	**4.51**	**5.14**	**5.43**
	t_2	[°C]		107	91	83	80	77	75	74	73	72	126	97	85	80	77	75	73	72	71
	nG	[rpm]		1860	2370	2870	3220	3700	3960	4380	4590	4800	1420	1890	2390	2890	3250	3710	4130	4590	4800
	nM	[rpm]		2840	2840	2870	2870	2890	2890	2890	2890	2890	2840	2840	2870	2890	2890	2890	2890	2890	2890
	Pk	[kW]		1.78	2.26	2.76	3.12	3.64	3.94	4.45	4.72	4.99	1.81	2.38	3	3.66	4.15	4.8	5.42	6.12	6.45
	P_{mot}	[kW]		3	3	4	4	5.5	5.5	5.5	7.5	7.5	3	3	4	5.5	5.5	7.5	7.5	7.5	7.5
	Motor size			100 L	100 L	112 M	112 M	132 S	132 S	132 S	132 S	132 S	100 L	100 L	112 M	132 S	132 S	132 S	132 S	132 S	132 S
	Lp(A)[dB]	w/o.H./w.H.		83/65	85/66	88/67	88/67	91/68	93/68	95/67	95/67	95/68	77/<65	80/<65	82/<65	85/66	87/65	88/<65	90/<65	89/<65	89/66
600	$\dot{V}_1$	[m³/min]			**1.36**	**1.84**	**2.26**	**2.69**	**2.95**	**3.38**	**3.59**	**3.8**		**1.33**	**2.02**	**2.69**	**3.39**	**3.82**	**4.4**	**5.11**	**5.32**
	t_2	[°C]			110	99	94	90	88	86	85	84		119	103	95	90	87	85	83	83
	nG	[rpm]			2390	2870	3280	3700	3960	4380	4590	4800		1910	2410	2890	3400	3710	4130	4650	4800
	nM	[rpm]			2870	2870	2890	2890	2890	2890	2890	2890		2870	2890	2890	2890	2890	2890	2930	2930
	Pk	[kW]			2.69	3.24	3.74	4.27	4.61	5.19	5.49	5.8		2.84	3.58	4.32	5.14	5.65	6.37	7.29	7.56
	P_{mot}	[kW]			4	4	5.5	5.5	7.5	7.5	7.5	7.5		4	5.5	5.5	7.5	7.5	7.5	11	11
	Motor size				112 M	112 M	132 S	132 S	132 S	132 S	132 S	132 S		112 M	132 S	132 S	132 S	132 S	132 S	160 M	160 M
	Lp(A)[dB]	w/o.H./w.H.			87/66	89/67	89/68	92/68	95/68	96/68	96/68	96/68		81/<65	84/<65	87/68	87/67	88/66	91/66	89/66	89/67
700	$\dot{V}_1$	[m³/min]			**1.27**	**1.78**	**2.17**	**2.6**	**2.86**	**3.29**	**3.5**	**3.72**			**1.92**	**2.58**	**3.28**	**3.71**	**4.37**	**5.01**	**5.22**
	t_2	[°C]			132	117	110	105	102	99	98	97			122	111	104	101	97	95	94
	nG	[rpm]			2390	2890	3280	3700	3960	4380	4590	4800			2410	2890	3400	3710	4190	4650	4800
	nM	[rpm]			2870	2890	2890	2890	2890	2890	2890	2890			2890	2890	2890	2890	2930	2930	2930
	Pk	[kW]			3.09	3.76	4.29	4.9	5.28	5.93	6.27	6.62			4.14	4.99	5.92	6.5	7.43	8.35	8.66
	P_{mot}	[kW]			4	5.5	5.5	7.5	7.5	7.5	7.5	7.5			5.5	7.5	7.5	7.5	11	11	11
	Motor size				112 M	132 S	132 S	132 S	132 S	132 S	132 S	132 S			132 S	132 S	132 S	132 S	160 M	160 M	160 M
	Lp(A)[dB]	w/o.H./w.H.			87/67	90/67	90/68	93/69	94/69	95/69	95/69	96/68			85/<6	89/68	86/68	89/67	93/67	90/68	89/69
800	$\dot{V}_1$	[m³/min]					**2.1**	**2.52**	**2.78**	**3.21**						**2.48**	**3.26**	**3.68**	**4.28**	**4.91**	**5.12**
	t_2	[°C]					126	120	117	113						128	118	114	111	107	107
	nG	[rpm]					3290	3700	3960	4380						2890	3450	3760	4190	4650	4800
	nM	[rpm]					2890	2890	2890	2890						2890	2930	2930	2930	2930	2930
	Pk	[kW]					4.86	5.52	5.95	6.68						5.65	6.81	7.46	8.4	9.42	9.77
	P_{mot}	[kW]					7.5	7.5	7.5	7.5						7.5	11	11	11	11	11
	Motor size						132 S	132 S	132 S	132 S						132 S	160 M	160 M	160 M	160 M	160 M
	Lp(A)[dB]	w/o.H./w.H.					91/68	94/69	93/69	94/70							87/68	91/68	95/68	91/70	90/70
900	$\dot{V}_1$	[m³/min]							**2.71**								**3.17**	**3.59**	**4.19**	**4.82**	**5.03**
	t_2	[°C]							132								133	129	124	120	119
	nG	[rpm]							3960								3450	3760	4190	4650	4800
	nM	[rpm]							2890								2930	2930	2930	2930	2930
	Pk	[kW]							6.63								7.6	8.33	9.36	10.5	10.9
	P_{mot}	[kW]							7.5								11	11	11	15	15
	Motor size								132 S								160 M	160 M	160 M	160 M	160 M
	Lp(A)[dB]	w/o.H./w.H.							94/70								88/69	92/69	96/69	92/70	92/70
1000	$\dot{V}_1$	[m³/min]																		**4.74**	**4.94**
	t_2	[°C]																		133	132
	nG	[rpm]																		4650	4800
	nM	[rpm]																		2930	2930
	Pk	[kW]																		11.6	12
	P_{mot}	[kW]																		15	15
	Motor size																			160 M	160 M
	Lp(A)[dB]	w/o.H./w.H.																		94/70	94/70

Lower differential pressures on request. Performance data are non-binding examples only.

Δp mbar	Blower size		GM 7 L / DN 80									GM 10 S / DN 80						GM 10 S / DN 100		
300	$\dot{V}_1$	[m³/min]	1.54	2.56	3.59	4.63	5.35	6.35	7.19	7.71	8.21	2.59	3.96	5.36	6.7	7.68	9.03	10.3	11	11.6
	t_2	[°C]	67	58	55	52	51	50	50	50	49	59	54	52	50	50	49	48	48	48
	nG	[rpm]	1400	1890	2390	2890	3240	3720	4130	4380	4620	1420	1910	2410	2890	3240	3720	4190	4440	4650
	nM	[rpm]	2800	2840	2870	2890	2890	2890	2890	2890	2890	2840	2870	2890	2890	2890	2890	2930	2930	2930
	Pk	[kW]	1.64	2.19	2.78	3.42	3.89	4.59	5.25	5.67	6.1	2.29	3.06	3.88	4.72	5.37	6.36	7.43	8.05	8.61
	P_{mot}	[kW]	2.2	3	4	5.5	5.5	7.5	7.5	7.5	7.5	3	4	5.5	7.5	7.5	7.5	11	11	11
	Motor size		90 L	100 L	112 M	132 S	132 S	132 S	132 S	132 S	132 S	100 L	112 M	132 S	132 S	132 S	132 S	160 M	160 M	160 M
	Lp(A)[dB]	w/o.H./w.H.	80/<65	82/<65	83/<65	85/68	85/67	88/66	89/66	89/<65	89/66	76/<65	78/69	80/66	82/65	84/65	86/66	91/71	91/71	92/71
400	$\dot{V}_1$	[m³/min]	1.38	2.39	3.42	4.42	5.14	6.14	7.11	7.63	8.14	2.41	3.8	5.14	6.49	7.58	8.95	10.1	10.8	11.4
	t_2	[°C]	92	75	69	65	64	62	61	60	60	76	68	64	62	61	59	59	58	58
	nG	[rpm]	1420	1910	2410	2890	3240	3720	4190	4440	4690	1435	1930	2410	2890	3280	3770	4190	4440	4650
	nM	[rpm]	2840	2870	2890	2890	2890	2890	2930	2930	2930	2870	2890	2890	2890	2930	2930	2930	2930	2930
	Pk	[kW]	2.16	2.87	3.64	4.41	5.01	5.88	6.79	7.31	7.85	2.99	3.99	5	6.07	6.98	8.23	9.39	10.1	10.8
	P_{mot}	[kW]	3	4	5.5	5.5	7.5	7.5	11	11	11	4	5.5	7.5	7.5	11	11	11	15	15
	Motor size		100 L	112 M	132 S	132 S	132 S	132 S	160M	160M	160M	112 M	132 S	132 S	132 S	160 M	160 M	160 M	160 M	160 M
	Lp(A)[dB]	w/o.H./w.H.	80/<65	82/<65	84/<65	86/68	86/68	89/67	90/67	90/67	91/68	77/<65	78/70	80/67	83/66	84/66	87/67	91/70	92/71	93/70
500	$\dot{V}_1$	[m³/min]	1.22	2.18	3.24	4.23	5.31	6.05	6.92	7.44	7.96	2.25	3.61	4.95	6.41	7.39	8.76	9.94	10.6	11.2
	t_2	[°C]	122	95	84	79	76	74	72	72	71	95	83	77	74	72	70	69	69	69
	nG	[rpm]	1435	1900	2410	2890	3410	3770	4190	4440	4690	1445	1930	2410	2930	3280	3770	4190	4440	4650
	nM	[rpm]	2870	2890	2890	2890	2890	2930	2930	2930	2930	2890	2890	2890	2930	2930	2930	2930	2930	2930
	Pk	[kW]	2.67	3.51	4.47	5.41	6.49	7.27	8.24	8.84	9.46	3.68	4.89	6.13	7.52	8.51	9.99	11.3	12.2	12.9
	P_{mot}	[kW]	4	5.5	5.5	7.5	7.5	11	11	11	11	5.5	7.5	7.5	11	11	15	15	15	15
	Motor size		112 M	132 S	132 S	132 S	132 S	160M	160M	160M	160M	132 S	132 S	132 S	160 M	160 M	160 M	160 M	160 M	160 M
	Lp(A)[dB]	w/o.H./w.H.	80/<65	82/<65	84/<65	87/68	89/68	90/68	91/68	91/69	92/70	77/<65	78/70	80/67	83/66	84/67	87/68	88/67	92/70	93/70
600	$\dot{V}_1$	[m³/min]		2.08	3.07	4.07	4.87	5.89	6.76	7.27	7.79	2.08	3.44	4.5	6.24	7.22	8.59	9.76	10.5	11.1
	t_2	[°C]		116	102	94	90	87	84	83	83	118	99	92	86	84	82	80	80	79
	nG	[rpm]		1930	2410	2890	3280	3770	4190	4440	4690	1445	1930	2310	2930	3280	3770	4190	4440	4650
	nM	[rpm]		2890	2890	2890	2930	2930	2930	2930	2930	2890	2890	2930	2930	2930	2930	2930	2930	2930
	Pk	[kW]		4.24	5.3	6.41	7.34	8.57	9.68	10.4	11.1	4.35	5.8	6.94	8.89	10	11.7	13.3	14.3	15.1
	P_{mot}	[kW]		5.5	7.5	7.5	11	11	11	15	15	5.5	7.5	11	11	15	15	15	18.5	18.5
	Motor size			132 S	132 S	132 S	160M	160M	160M	160 M	160 M	132 S	132 S	160 M	160 M	160 M	160 M	160 M	160 L	160 L
	Lp(A)[dB]	w/o.H./w.H.		84/<65	86/66	88/68	89/68	91/68	91/69	92/69	92/70	77/<65	78/71	80/68	84/67	85/68	87/69	88/68	92/70	94/70
700	$\dot{V}_1$	[m³/min]			2.92	4.00	4.72	5.71	6.60	7.12	7.64		3.28	4.34	6.08	7.06	8.43	9.61	10.3	10.9
	t_2	[°C]			120	109	104	100	97	96	94		117	107	99	96	93	92	91	90
	nG	[rpm]			2410	2930	3280	3760	4190	4440	4690		1930	2310	2930	3280	3770	4190	4440	4650
	nM	[rpm]			2890	2930	2930	2930	2930	2930	2930		2890	2930	2930	2930	2930	2930	2930	2930
	Pk	[kW]			6.13	7.51	8.47	9.84	11.1	11.9	12.7		6.7	8.02	10.3	11.6	13.5	15.3	16.3	17.3
	P_{mot}	[kW]			7.5	11	11	11	15	15	15		7.5	11	15	15	18.5	18.5	18.5	22
	Motor size				132 S	160M	160M	160M	160 M	160 M	160 M		132 S	160 M	160 M	160 M	160 L	160 L	160 L	180 M
	Lp(A)[dB]	w/o.H./w.H.			88/67	89/68	90/68	92/69	92/70	92/70	92/70		79/71	80/69	84/67	84/68	88/69	89/69	92/68	94/69
800	$\dot{V}_1$	[m³/min]												4.2	5.93	6.91	7.98	9.46	10.2	10.7
	t_2	[°C]												123	113	109	106	103	102	101
	nG	[rpm]												2310	2930	3280	3660	4190	4440	4650
	nM	[rpm]												2930	2930	2930	2930	2930	2930	2930
	Pk	[kW]												9.1	11.6	13.1	14.8	17.2	18.4	19.5
	P_{mot}	[kW]												11	15	15	18.5	22	22	22
	Motor size													160 M	160 M	160 M	160 L	180 M	180 M	180 M
	Lp(A)[dB]	w/o.H./w.H.												81/69	84/67	85/69	87/60	90/70	92/67	93/68
900	$\dot{V}_1$	[m³/min]														6.77	7.84	9.32	10.1	10.7
	t_2	[°C]														122	118	115	113	112
	nG	[rpm]														3280	3660	4190	4460	4680
	nM	[rpm]														2930	2930	2930	2945	2945
	Pk	[kW]														14.6	16.5	19.2	20.6	21.8
	P_{mot}	[kW]														18.5	18.5	22	30	30
	Motor size															160 L	160 L	180 M	200 L	200 L
	Lp(A)[dB]	w/o.H./w.H.														85/69	88/70	89/70	92/69	93/69
1000	$\dot{V}_1$	[m³/min]															7.71	8.72	9.95	10.6
	t_2	[°C]															131	128	125	124
	nG	[rpm]															3660	4020	4460	4680
	nM	[rpm]															2930	2945	2945	2945
	Pk	[kW]															18.2	20.2	22.7	24
	P_{mot}	[kW]															22	30	30	30
	Motor size																180 M	200 L	200 L	200 L
	Lp(A)[dB]	w/o.H./w.H.															89/70	89/70	92/70	93/72

Lower differential pressures on request. GM 10 S from 10 m³/min - accessories DN 100. Performance data are non-binding examples only.

Δp mbar	Blower size		GM 15 L / DN 100									GM 25 S / DN 125								
300	$\dot{V}_1$	[m³/min]	3.95	5.84	7.99	10.1	11.6	13.6	15.4	16.4	17.3	6.18	8.69	11.1	14.5	16.6	18.7	20.6	22.7	24.2
	t_2	[°C]	58	54	51	50	49	49	48	48	48	53	51	50	48	48	48	47	47	47
	nG	[rpm]	1435	1890	2410	2930	3290	3760	4190	4440	4650	1445	1890	2310	2930	3290	3660	4010	4370	4650
	nM	[rpm]	2870	2890	2890	2930	2930	2930	2930	2930	2930	2890	2890	2930	2930	2930	2930	2930	2930	2930
	Pk	[kW]	3.26	4.34	5.64	7.04	8.07	9.52	10.9	11.8	12.6	4.46	5.86	7.3	9.64	11.1	12.8	14.4	16.2	17.7
	P_{mot}	[kW]	4	5.5	7.5	11	11	11	15	15	15	5.5	7.5	11	11	15	15	18.5	18.5	22
	Motor size		112 M	132 S	132 S	160 M	160 M	160 M	160 M	160 M	160 M	132 S	132 S	160 M	160 M	160 M	160 M	160 L	160 L	180 M
	Lp(A)[dB]	w/o.H./w.H.	83/69	84/<65	86/<65	88/<65	87/65	89/66	91/67	91/68	91/69	81/66	85/66	87/70	92/69	92/69	93/69	92/69	94/71	96/72
400	$\dot{V}_1$	[m³/min]	3.69	5.53	7.27	9.84	11.3	13.3	15.1	16.1	17	5.88	8.56	10.8	14.2	16.3	18.4	20.3	22.5	24.1
	t_2	[°C]	74	67	64	61	60	59	59	58	58	66	62	60	59	58	58	57	57	57
	nG	[rpm]	1445	1890	2310	2930	3290	3760	4190	4440	4650	1445	1920	2310	2930	3290	3660	4010	4400	4680
	nM	[rpm]	2890	2890	2930	2930	2930	2930	2930	2930	2930	2890	2930	2930	2930	2930	2930	2930	2945	2950
	Pk	[kW]	4.28	5.64	6.97	9.06	10.3	12.1	13.8	14.9	15.8	5.82	7.76	9.47	12.4	14.2	16.2	18.2	20.5	22.2
	P_{mot}	[kW]	5.5	7.5	11	11	15	15	18.5	18.5	18.5	7.5	11	11	15	18.5	18.5	22	30	30
	Motor size		132 S	132 S	160 M	160 M	160 M	160 M	160 L	160 L	160 L	132 S	160 M	160 M	160 M	160 L	160 L	180 M	200 L	200 L
	Lp(A)[dB]	w/o.H./w.H.	83/68	85/<65	86/<65	88/<65	87/<65	88/67	92/67	92/69	94/71	83/67	86/67	87/71	92/69	93/69	93/70	93/70	95/71	98/72
500	$\dot{V}_1$	[m³/min]	3.42	5.38	7	9.57	11.1	12.6	14	15.8	16.7	5.73	8.29	10.5	14	16	18.1	20.2	22.3	23.8
	t_2	[°C]	93	82	77	73	72	70	69	69	68	80	75	72	69	68	68	67	67	66
	nG	[rpm]	1445	1920	2310	2930	3290	3660	4010	4440	4650	1465	1920	2310	2930	3290	3660	4030	4400	4680
	nM	[rpm]	2890	2930	2930	2930	2930	2930	2930	2930	2930	2930	2930	2930	2930	2930	2930	2945	2945	2950
	Pk	[kW]	5.28	7.06	8.57	11.1	12.6	14.3	15.9	18	19	7.27	9.56	11.6	15.1	17.3	19.6	22.1	24.6	26.6
	P_{mot}	[kW]	7.5	11	11	15	15	18.5	18.5	22	22	11	11	15	18.5	22	22	30	30	30
	Motor size		132 S	160 M	160 M	160 M	160 M	160 L	160 L	180 M	180 M	160 M	160 M	160 M	160 L	180 M	180 M	200 L	200 L	200 L
	Lp(A)[dB]	w/o.H./w.H.	84/67	87/<65	88/<65	90/<65	88/<65	88/67	91/68	94/70	96/72	85/67	88/68	88/71	93/69	93/70	94/71	94/71	97/72	99/72
600	$\dot{V}_1$	[m³/min]	3.17	5.14	6.75	9.32	10.8	12.3	14.5	15.7	16.6	5.49	8.05	10.2	13.7	15.9	18	19.9	22	23.6
	t_2	[°C]	115	98	91	85	83	82	80	79	79	95	87	84	80	79	78	77	77	76
	nG	[rpm]	1445	1920	2310	2930	3290	3660	4190	4460	4680	1465	1920	2310	2930	3310	3680	4030	4400	4680
	nM	[rpm]	2890	2930	2930	2930	2930	2930	2930	2945	2945	2930	2930	2930	2930	2945	2945	2945	2950	2950
	Pk	[kW]	6.28	8.38	10.2	13.1	14.9	16.8	19.6	21.1	22.4	8.65	11.4	13.8	17.9	20.5	23.2	25.8	28.7	31
	P_{mot}	[kW]	7.5	11	15	15	18.5	22	22	30	30	11	15	18.5	22	30	30	30	37	37
	Motor size		132 S	160 M	160 M	160 M	160 L	180 M	180 M	200 L	200 L	160 M	160 M	160 L	180 M	200 L	200 L	200 L	200 L	200 L
	Lp(A)[dB]	w/o.H./w.H.	86/68	88/<65	88/<65	89/<65	88/66	88/68	92/68	95/70	97/72	86/69	89/69	89/71	93/70	94/71	95/72	96/72	98/72	100/73
700	$\dot{V}_1$	[m³/min]		4.91	6.53	9.1	10.6	12.1	13.6	15.4	16.3	5.27	7.83	10	13.6	15.7	17.7	20.1	21.8	23.3
	t_2	[°C]		115	106	98	95	93	92	90	89	112	101	96	91	90	88	87	87	86
	nG	[rpm]		1920	2310	2930	3290	3660	4030	4460	4680	1465	1920	2310	2945	3310	3680	4100	4400	4670
	nM	[rpm]		2930	2930	2930	2930	2930	2945	2945	2945	2930	2930	2930	2945	2945	2945	2950	2950	2940
	Pk	[kW]		9.71	11.8	15.1	17.2	19.3	21.5	24.2	25.6	10	13.2	16	20.8	23.6	26.7	30.2	32.9	35.3
	P_{mot}	[kW]		11	15	18.5	22	22	30	30	30	15	15	18.5	30	30	30	37	37	45
	Motor size			160 M	160 M	160 L	180 M	180 M	200 L	200 L	200 L	160 M	160 M	160 L	200 L	200 L	200 L	200 L	200 L	225 M
	Lp(A)[dB]	w/o.H./w.H.		88/<65	88/<65	89/<65	89/67	89/70	90/68	96/70	99/72	87/69	90/69	91/72	93/70	94/70	96/71	97/71	98/72	100/73
800	$\dot{V}_1$	[m³/min]										5.06	7.68	9.8	13.4	15.4	17.6	19.8	21.5	23.1
	t_2	[°C]										129	115	109	103	101	99	98	97	96
	nG	[rpm]										1465	1930	2310	2945	3310	3690	4080	4390	4670
	nM	[rpm]										2930	2930	2930	2945	2945	2950	2940	2940	2940
	Pk	[kW]										11.4	15	18.1	23.5	26.7	30.2	33.9	36.9	39.7
	P_{mot}	[kW]										15	18.5	22	30	30	37	45	45	45
	Motor size											160 M	160 L	180 M	200 L	200 L	200 L	225 M	225 M	225 M
	Lp(A)[dB]	w/o.H./w.H.										88/70	91/70	92/73	94/71	95/70	96/70	97/70	99/71	101/73
900	$\dot{V}_1$	[m³/min]											7.49	9.68	13.2	15.3	17.3	19.6	21.4	23
	t_2	[°C]											129	122	115	112	110	108	107	106
	nG	[rpm]											1930	2320	2945	3320	3680	4080	4410	4690
	nM	[rpm]											2930	2945	2945	2950	2950	2940	2960	2960
	Pk	[kW]											16.9	20.4	26.3	30	33.6	37.7	41.2	44.3
	P_{mot}	[kW]											22	30	30	37	37	45	55	55
	Motor size												180 M	200 L	200 L	200 L	200 L	225 M	250 M	250 M
	Lp(A)[dB]	w/o.H./w.H.											92/70	94/73	95/71	96/71	97/71	97/72	99/72	101/73
1000	$\dot{V}_1$	[m³/min]													13	15.1	17.2	19.5	21.3	22.8
	t_2	[°C]													127	123	121	119	118	117
	nG	[rpm]													2950	3320	3680	4100	4410	4690
	nM	[rpm]													2950	2950	2940	2960	2960	2960
	Pk	[kW]													29.1	33.1	37	41.8	45.4	48.7
	P_{mot}	[kW]													37	37	45	55	55	55
	Motor size														200 L	200 L	225 M	250 M	250 M	250 M
	Lp(A)[dB]	w/o.H./w.H.													97/71	97/71	98/72	98/73	100/73	102/73

Lower differential pressures on request. Performance data are non-binding examples only.

Δp mbar	Blower size		GM 30 L / DN 150									GM 35 S / DN 150							
300	$\dot{V}_1$	[m³/min]	**8.68**	**11.7**	**15.6**	**20.5**	**23.3**	**26.3**	**29.2**	**32.7**	**34.7**	**14**	**18.2**	**23.6**	**27.1**	**30.6**	**34.6**	**38.8**	**40.3**
	t_2	[°C]	53	51	50	49	48	48	48	47	47	50	49	48	48	47	47	47	47
	nG	[rpm]	1445	1830	2310	2930	3280	3660	4020	4460	4710	1490	1860	2330	2640	2945	3300	3670	3800
	nM	[rpm]	2890	2930	2930	2930	2930	2930	2945	2945	2945	2930	2930	2930	2930	2945	2945	2950	2950
	Pk	[kW]	6.38	8.13	10.5	13.7	15.7	17.9	20.2	23.1	24.8	9.56	12.2	15.8	18.4	21.2	24.9	29.1	30.7
	P_{mot}	[kW]	7.5	11	15	18.5	18.5	22	30	30	30	11	15	18.5	22	30	30	37	37
	Motor size		132 S	160 M	160 M	160 M	160 L	180 M	200 L	200 L	200 L	160 M	160 M	160 L	180 M	200 L	200 L	200 L	200 L
	Lp(A)[dB]	w/o.H./w.H.	84/71	86/70	88/73	91/72	93/73	95/74	96/74	97/74	97/75	86/67	90/68	92/72	92/71	91/71	92/71	96/71	99/71
400	$\dot{V}_1$	[m³/min]	**8.41**	**12**	**15.1**	**20.1**	**23**	**26**	**28.7**	**32.3**	**34.3**	**13.6**	**17.8**	**23.2**	**26.4**	**30.1**	**34.2**	**38.2**	**39.8**
	t_2	[°C]	66	63	61	59	58	58	57	57	57	62	60	58	58	57	57	56	56
	nG	[rpm]	1465	1920	2310	2930	3300	3680	4020	4470	4720	1490	1860	2340	2620	2945	3300	3660	3800
	nM	[rpm]	2930	2930	2930	2930	2945	2945	2945	2950	2950	2930	2930	2945	2945	2945	2950	2940	2940
	Pk	[kW]	8.41	11.1	13.5	17.6	20.2	22.9	25.5	29.1	31.2	12.4	15.7	20.3	23.2	26.8	31.1	35.9	37.9
	P_{mot}	[kW]	11	15	18.5	22	30	30	30	37	37	15	18.5	30	30	30	37	45	45
	Motor size		160 M	160 M	160 L	180 M	200 L	200 L	200 L	200 L	200 L	160 M	160 L	200 L	200 L	200 L	200 L	225 M	225 M
	Lp(A)[dB]	w/o.H./w.H.	85/71	88/71	89/74	91/72	93/72	95/73	96/73	98/74	99/75	87/68	90/69	93/73	92/72	92/71	94/71	97/72	99/72
500	$\dot{V}_1$	[m³/min]	**8.02**	**11.7**	**14.7**	**19.8**	**22.6**	**25.7**	**28.4**	**31.3**	**33.8**	**12.9**	**17.4**	**22.9**	**26**	**29.8**	**33.6**	**38.1**	**39.4**
	t_2	[°C]	81	75	72	70	69	68	67	67	66	74	71	69	68	67	66	66	66
	nG	[rpm]	1465	1930	2310	2945	3300	3690	4020	4390	4700	1465	1860	2340	2620	2950	3290	3680	3800
	nM	[rpm]	2930	2930	2930	2945	2945	2950	2950	2940	2940	2930	2930	2945	2950	2950	2940	2955	2955
	Pk	[kW]	10.4	13.7	16.6	21.6	24.6	27.9	30.9	34.3	37.2	14.9	19.2	24.7	28.2	32.5	37.2	43.2	45.1
	P_{mot}	[kW]	15	18.5	22	30	30	37	37	45	45	18.5	22	30	37	37	45	55	55
	Motor size		160 M	160 L	180 M	200 L	200 L	200 L	200 L	225 M	225 M	160 L	180 M	200 L	200 L	200 L	225 M	250 M	250 M
	Lp(A)[dB]	w/o.H./w.H.	86/72	90/72	90/75	91/73	93/72	95/72	97/72	99/73	100/75	87/69	91/70	94/73	93/72	93/72	97/72	98/73	100/73
600	$\dot{V}_1$	[m³/min]	**7.68**	**10.6**	**14.6**	**19.5**	**22.3**	**25.4**	**28.5**	**31**	**33.7**	**12.6**	**16.8**	**22.5**	**25.7**	**29.3**	**33.5**	**37.9**	**39.1**
	t_2	[°C]	96	89	84	81	79	78	77	77	76	87	82	79	78	77	76	76	75
	nG	[rpm]	1465	1830	2330	2945	3300	3690	4080	4390	4730	1465	1840	2340	2620	2940	3310	3700	3800
	nM	[rpm]	2930	2930	2950	2945	2950	2950	2940	2940	2960	2930	2945	2950	2950	2940	2955	2970	2970
	Pk	[kW]	12.3	15.4	19.8	25.5	28.9	32.8	36.8	40.1	43.8	17.7	22.5	29.2	33.1	37.9	43.8	50.5	52.3
	P_{mot}	[kW]	15	18.5	30	30	37	37	45	45	55	22	30	37	37	45	55	75	75
	Motor size		160 M	160 L	200 L	200 L	200 L	200 L	225 M	225 M	250 M	180 M	200 L	200 L	200 L	225 M	250 M	280 S	280 S
	Lp(A)[dB]	w/o.H./w.H.	86/72	88/72	90/75	92/73	94/73	97/73	99/74	99/74	100/75	88/71	91/70	95/73	94/72	93/72	99/73	99/74	100/74
700	$\dot{V}_1$	[m³/min]	**7.36**	**10.3**	**14.2**	**19.2**	**22**	**24.8**	**28.3**	**30.8**	**33.6**	**12.3**	**16.5**	**22.2**	**25.7**	**29.2**	**33.4**	**37.6**	**38.8**
	t_2	[°C]	113	103	96	92	90	89	87	87	86	100	94	90	89	87	86	85	85
	nG	[rpm]	1465	1830	2330	2950	3300	3660	4100	4410	4760	1475	1840	2340	2650	2955	3330	3700	3800
	nM	[rpm]	2930	2930	2945	2950	2950	2940	2955	2960	2970	2945	2945	2950	2940	2955	2970	2970	2970
	Pk	[kW]	14.2	17.8	22.9	29.5	33.3	37.4	42.5	46.2	50.5	20.6	26	33.6	38.6	43.7	50.4	57.5	59.5
	P_{mot}	[kW]	18.5	22	30	37	37	45	55	55	75	30	30	37	45	55	75	75	75
	Motor size		160 L	180 M	200 L	200 L	200 L	225 M	250 M	250 M	280 S	200 L	200 L	200 L	225 M	250 M	280 S	280 S	280 S
	Lp(A)[dB]	w/o.H./w.H.	86/73	89/72	90/75	94/73	96/73	101/74	102/75	99/75	100/75	88/71	91/71	94/74	95/73	96/72	100/72	100/73	101/73
800	$\dot{V}_1$	[m³/min]										**12**	**16.2**	**21.7**	**25.5**	**28.8**	**33.1**	**35.3**	**38.4**
	t_2	[°C]										113	106	101	99	98	97	96	95
	nG	[rpm]										1475	1840	2330	2660	2955	3330	3520	3800
	nM	[rpm]										2945	2950	2940	2960	2955	2970	2970	2970
	Pk	[kW]										23.4	29.4	37.8	43.8	49.3	56.7	60.7	66.7
	P_{mot}	[kW]										30	37	45	55	55	75	75	75
	Motor size											200 L	200 L	225 M	250 M	250 M	280 S	280 S	280 S
	Lp(A)[dB]	w/o.H./w.H.										89/72	91/72	94/75	96/73	99/73	101/72	101/72	102/72
900	$\dot{V}_1$	[m³/min]										**11.8**	**15.9**	**21.7**	**24.9**	**28.7**	**32.8**	**37**	**38.2**
	t_2	[°C]										127	119	113	110	108	107	106	105
	nG	[rpm]										1475	1840	2350	2630	2970	3330	3700	3800
	nM	[rpm]										2945	2950	2955	2955	2970	2970	2970	2970
	Pk	[kW]										26.2	32.9	42.6	48.2	55.2	63	71.5	73.9
	P_{mot}	[kW]										30	37	55	55	75	75	90	90
	Motor size											200 L	200 L	250 M	250 M	280 S	280 S	280 M2	280 M2
	Lp(A)[dB]	w/o.H./w.H.										89/72	92/72	95/75	96/73	99/73	101/73	102/73	103/73
1000	$\dot{V}_1$	[m³/min]											**15.6**	**21.4**	**24.7**	**28.5**	**30.3**	**36.8**	**37.9**
	t_2	[°C]											132	124	122	119	118	116	115
	nG	[rpm]											1840	2350	2640	2970	3130	3700	3800
	nM	[rpm]											2940	2955	2970	2970	2970	2970	2970
	Pk	[kW]											36.4	47.1	53.4	60.9	64.6	78.5	81.1
	P_{mot}	[kW]											45	55	75	75	75	90	90
	Motor size												225 M	250 M	280 S	280 S	280 S	280 M2	280 M2
	Lp(A)[dB]	w/o.H./w.H.											92/72	95/75	97/74	100/73	101/73	102/74	104/75

Lower differential pressures on request. Performance data are non-binding examples only.

Δp mbar	Blower size		GM 50 L / DN 150							GM 50 L / DN 200			GM 60 S / DN 200								
300	$\dot{V}_1$	[m³/min]	19.7	22.5	26	33.7	38.2	41.1	43.5	49.1	52.2	55.1	20.1	26.9	30.9	35.7	40.1	45.9	52.4	55.7	59
	t_2	[°C]	50	49	49	48	48	47	47	47	47	47	51	50	49	49	48	48	47	47	47
	nG	[rpm]	1465	1640	1860	2340	2620	2800	2950	3300	3490	3670	1150	1465	1650	1870	2070	2340	2640	2790	2940
	nM	[rpm]	2930	2930	2930	2945	2945	2950	2950	2950	2940	2940	2930	2930	2945	2945	2945	2950	2940	2940	2940
	Pk	[kW]	13.2	15	17.5	23.4	27.2	29.8	32.1	32.8	35.4	38	13.4	17.4	19.9	23	26	30.1	34.9	37.4	40
	P_{mot}	[kW]	15	18.5	22	30	30	37	37	37	45	45	15	22	30	30	30	37	45	45	45
	Motor size		160 M	160 L	180 M	200 L	200 L	200 L	200 L	200 L	225 M	225 M	160 M	180 M	200 L	200 L	200 L	200 L	225 M	225 M	225 M
	Lp(A)[dB]	w/o.H./w.H.	87/71	87/70	90/70	92/70	91/70	92/69	92/70	98/71	98/72	100/74	86/73	89/73	93/73	97/74	96/74	97/75	98/75	99/76	99/76
400	$\dot{V}_1$	[m³/min]	19.1	21.9	25.1	33.2	38.1	40.4	42.8	48.7	51.4	54.8	19.3	26.4	30.2	35	39.7	45	52.1	55.2	58.8
	t_2	[°C]	61	60	59	58	57	57	57	56	56	56	63	61	60	59	58	58	57	57	57
	nG	[rpm]	1465	1640	1840	2340	2650	2790	2940	3310	3480	3690	1150	1475	1650	1870	2090	2330	2660	2800	2970
	nM	[rpm]	2930	2930	2945	2950	2940	2940	2940	2955	2955	2960	2930	2945	2945	2950	2940	2940	2955	2955	2970
	Pk	[kW]	17.1	19.4	22.2	29.6	34.7	37.2	39.8	41.8	44.6	48.1	17.5	22.9	25.9	29.8	33.9	38.4	44.9	47.7	51.2
	P_{mot}	[kW]	22	22	30	37	45	45	45	55	55	55	22	30	30	37	45	45	55	55	75
	Motor size		180 M	180 M	200 L	200 L	225 M	225 M	225 M	250 M	250 M	250 M	180 M	200 L	200 L	200 L	225 M	225 M	250 M	250 M	280 S
	Lp(A)[dB]	w/o.H./w.H.	87/69	88/69	91/70	92/71	92/71	92/71	92/70	98/71	99/73	100/75	87/74	90/73	93/73	97/74	97/74	97/75	99/76	99/76	101/76
500	$\dot{V}_1$	[m³/min]	18.8	21.6	24.6	32.5	37.8	40	42.5	48.4	51.2	54.6	18.9	25.7	29.5	34.3	39.3	44.5	51.5	54.9	58.2
	t_2	[°C]	73	71	70	68	67	67	67	66	66	66	76	72	71	70	69	68	67	67	66
	nG	[rpm]	1475	1650	1840	2330	2660	2800	2955	3320	3500	3710	1160	1475	1650	1870	2100	2340	2660	2820	2970
	nM	[rpm]	2945	2945	2945	2940	2955	2955	2955	2970	2970	2970	2945	2950	2950	2940	2955	2955	2970	2970	2970
	Pk	[kW]	21.2	24	27.1	35.7	42	44.8	48	50.9	54.3	58.4	21.9	28.2	31.9	36.6	41.6	47.1	54.5	58.3	62
	P_{mot}	[kW]	30	30	30	45	55	55	55	75	75	75	30	37	37	45	55	55	75	75	75
	Motor size		200 L	200 L	200 L	225 M	250 M	250 M	250 M	280 S	280 S	280 S	200 L	200 L	200 L	225 M	250 M	250 M	280 S	280 S	280 S
	Lp(A)[dB]	w/o.H./w.H.	88/68	90/69	92/70	93/74	92/74	92/72	93/71	99/72	99/73	101/76	88/74	91/74	93/74	97/74	97/74	97/75	100/76	100/76	102/77
600	$\dot{V}_1$	[m³/min]	18.3	21.1	24.1	32.3	37.3	39.9	42.3	47.9	50.8	54.1	18.3	25.1	28.9	33.7	38.7	44.3	50.9	53.2	57.4
	t_2	[°C]	85	83	81	79	77	77	77	76	76	75	89	84	82	80	79	78	77	77	76
	nG	[rpm]	1475	1650	1840	2350	2660	2820	2970	3320	3500	3710	1160	1475	1650	1870	2100	2360	2660	2770	2960
	nM	[rpm]	2945	2950	2950	2955	2955	2970	2970	2970	2970	2970	2945	2950	2940	2955	2955	2970	2970	2970	1480
	Pk	[kW]	25.2	28.4	32	42.3	49.1	52.8	56.3	59.7	63.6	68.3	26.1	33.6	37.8	43.3	49.2	56.1	64.1	67.2	72.5
	P_{mot}	[kW]	30	37	37	55	55	75	75	75	75	90	30	37	45	55	55	75	75	75	90
	Motor size		200 L	200 L	200 L	250 M	250 M	280 S	280 S	280 S	280 S	280 M	200 L	200 L	225 M	250 M	250 M	280 S	280 S	280 S	280 M
	Lp(A)[dB]	w/o.H./w.H.	88/69	90/69	92/70	94/75	93/74	94/74	95/73	100/72	101/74	103/76	90/75	92/75	94/74	97/74	97/75	98/75	100/76	101/77	103/78
700	$\dot{V}_1$	[m³/min]	17.9	20.7	23.7	31.7	36.6	39.4	41.8	44.7	50.3	53.7	17.7	24.5	28.2	33.4	38.4	43.8	49.9	52.5	57.2
	t_2	[°C]	98	95	93	89	88	87	87	86	85	85	103	96	94	92	90	89	87	87	86
	nG	[rpm]	1475	1650	1840	2340	2640	2820	2970	3150	3500	3710	1160	1470	1640	1880	2110	2360	2640	2760	2980
	nM	[rpm]	2950	2950	2940	2955	2970	2970	2970	2970	2970	2970	2950	2940	2955	2970	2970	2970	1480	1480	1485
	Pk	[kW]	29.1	32.8	36.9	48.4	55.7	60.3	64.2	64.6	73	78.2	30.3	38.8	43.5	50.4	57.1	64.6	73.2	76.9	83.8
	P_{mot}	[kW]	37	37	45	55	75	75	75	75	90	90	37	45	55	75	75	75	90	90	110
	Motor size		200 L	200 L	225 M	250 M	280 S	280 S	280 S	280 S	280 M	280 M	200 L	225 M	250 M	280 S	280 S	280 S	280 M	280 M	315 S
	Lp(A)[dB]	w/o.H./w.H.	89/69	91/69	92/70	95/75	95/75	95/75	97/75	99/75	102/74	105/76	91/75	94/74	95/74	98/75	98/75	99/77	100/77	102/77	103/78
800	$\dot{V}_1$	[m³/min]											17.2	24.1	27.6	32.9	37.8	43.1	49.6	52.2	56.7
	t_2	[°C]											118	109	106	103	101	99	98	97	96
	nG	[rpm]											1160	1475	1640	1880	2110	2350	2650	2770	2980
	nM	[rpm]											2940	2955	2955	2970	2970	1480	1485	1485	1485
	Pk	[kW]											34.5	44.2	49.5	57.2	64.8	72.8	83.1	87.2	94.6
	P_{mot}	[kW]											45	55	55	75	75	90	110	110	110
	Motor size												225 M	250 M	250 M	280 S	280 S	280 M	315 S	315 S	315 S
	Lp(A)[dB]	w/o.H./w.H.											92/75	98/74	98/74	101/75	100/76	101/78	102/78	103/78	104/78
900	$\dot{V}_1$	[m³/min]											16.7	23.6	27.4	32.4	37.4	42.4	49.1	51.7	56.2
	t_2	[°C]											133	122	119	115	112	110	108	108	107
	nG	[rpm]											1160	1475	1650	1880	2110	2340	2650	2770	2980
	nM	[rpm]											2940	2955	2970	2970	1480	1480	1485	1485	1485
	Pk	[kW]											38.7	49.6	55.8	64	72.4	80.9	92.6	97.2	105
	P_{mot}	[kW]											45	55	75	75	90	90	110	110	132
	Motor size												225 M	250 M	280 S	280 S	280 M	280 M	315 S	315 S	315 M
	Lp(A)[dB]	w/o.H./w.H.											92/75	97/74	99/75	101/75	101/76	100/77	102/78	103/78	104/78
1000	$\dot{V}_1$	[m³/min]												23.3	26.9	31.9	36.3	42.1	48.6	51.2	55.8
	t_2	[°C]												135	131	127	124	121	119	118	117
	nG	[rpm]												1485	1650	1880	2080	2350	2650	2770	2980
	nM	[rpm]												2970	2970	1480	1480	1485	1485	1485	1485
	Pk	[kW]												55.3	61.7	70.8	78.8	89.8	102	107	116
	P_{mot}	[kW]												75	75	90	90	110	132	132	132
	Motor size													280 S	280 S	280 M	280 M	315 S	315 M	315 M	315 M
	Lp(A)[dB]	w/o.H./w.H.												98/75	100/76	102/76	101/77	100/78	102/78	103/78	105/78

Lower differential pressures on request. GM 50 L from 45 m³/min - accessories DN 200. Performance data are non-binding examples only.

Δp mbar	Blower size		GM 80 L / DN 250									GM 90 S / DN 250								
300	$\dot{V}_1$	[m³/min]	**22.8**	**33.1**	**37.9**	**46.4**	**56.2**	**64.2**	**73.5**	**78.7**	**83.9**	**33.7**	**43.8**	**54.2**	**58.7**	**66.6**	**70.8**	**80.3**	**85.7**	**90.3**
	t_2	[°C]	53	51	50	49	48	48	48	47	47	50	49	48	48	48	48	47	47	47
	nG	[rpm]	975	1310	1465	1740	2060	2320	2620	2790	2960	978	1220	1470	1580	1770	1870	2100	2230	2340
	nM	[rpm]	1460	1465	1465	1470	1470	1475	1480	1480	1480	1465	1465	1470	1470	1475	1475	1480	1480	1480
	Pk	[kW]	15.8	21.7	24.5	29.9	36.7	42.8	50.5	55.2	60.3	21.3	27.1	33.7	36.8	42.6	45.8	53.7	58.4	62.7
	P_{mot}	[kW]	18.5	30	30	37	45	55	75	75	75	30	30	45	45	55	55	75	75	75
	Motor size		180 M	200 L	200 L	225 S	225 M	250 M	280 S	280 S	280 S	200 L	200 L	225 M	225 M	250 M	250 M	280 S	280 S	280 S
	Lp(A)[dB]	w/o.H./w.H.	86/73	89/75	90/75	94/73	97/75	96/76	97/78	98/78	101/79	88/73	91/74	94/75	94/74	100/75	101/76	100/79	99/78	100/78
400	$\dot{V}_1$	[m³/min]	**21.7**	**32.0**	**36.9**	**45.2**	**56.0**	**63.4**	**72.7**	**77.6**	**82.8**	**32.8**	**43.1**	**53.3**	**57.7**	**64.7**	**70.1**	**79.3**	**84.7**	**89.2**
	t_2	[°C]	66	62	61	60	58	58	57	57	57	62	60	58	58	58	57	57	57	56
	nG	[rpm]	975	1310	1470	1740	2090	2330	2630	2790	2960	980	1230	1475	1580	1750	1880	2100	2230	2340
	nM	[rpm]	1465	1470	1470	1470	1475	1480	1480	1480	1480	1470	1470	1475	1475	1480	1480	1480	1480	1480
	Pk	[kW]	20.8	28.4	32.2	38.8	48.1	55.0	64.3	69.6	75.5	28.1	35.9	44.1	47.8	54.1	59.1	68.2	73.9	78.9
	P_{mot}	[kW]	30	37	37	45	55	75	75	90	90	37	45	55	55	75	75	90	90	90
	Motor size		200 L	225 S	225 S	225 M	250 M	280 S	280 S	280 M	280 M	225 S	225 M	250 M	250 M	280 S	280 S	280 M	280 M	280 M
	Lp(A)[dB]	w/o.H./w.H.	86/73	90/75	92/75	95/74	96/75	96/77	98/78	99/79	102/80	89/74	92/75	95/76	97/75	100/76	101/76	100/79	100/78	100/77
500	$\dot{V}_1$	[m³/min]	**20.7**	**31.0**	**35.9**	**44.3**	**55.4**	**62.4**	**72.0**	**76.6**	**82.1**	**31.8**	**42.2**	**52.6**	**56.3**	**63.8**	**69.2**	**79.2**	**83.7**	**90.0**
	t_2	[°C]	81	74	73	71	69	68	67	67	67	74	71	69	68	68	67	67	66	66
	nG	[rpm]	975	1310	1470	1740	2100	2330	2640	2790	2970	980	1230	1480	1570	1750	1880	2120	2230	2380
	nM	[rpm]	1465	1470	1470	1475	1480	1480	1480	1485	1485	1470	1475	1480	1480	1480	1480	1485	1485	1485
	Pk	[kW]	25.8	35.1	39.7	47.8	59.2	67.0	78.2	83.9	91.1	34.9	44.4	54.5	58.3	66.2	72.1	83.7	89.3	97.2
	P_{mot}	[kW]	30	45	45	55	75	75	90	110	110	45	55	75	75	75	90	110	110	110
	Motor size		200 L	225 M	225 M	250 M	280 S	280 S	280 M	315 S	315 S	225 M	250 M	280 S	280 S	280 S	280 M	315 S	315 S	315 S
	Lp(A)[dB]	w/o.H./w.H.	87/74	92/75	93/75	95/74	95/76	96/77	99/78	101/79	103/80	89/74	92/76	96/77	97/76	101/76	102/76	101/79	100/78	101/77
600	$\dot{V}_1$	[m³/min]	**20.0**	**30.1**	**35.2**	**43.7**	**54.5**	**61.9**	**72.0**	**75.7**	**81.3**	**31.1**	**41.4**	**51.7**	**55.5**	**63.0**	**68.4**	**78.3**	**82.9**	**89.5**
	t_2	[°C]	96	87	85	82	80	79	77	77	77	86	82	80	79	78	77	76	76	76
	nG	[rpm]	980	1310	1475	1750	2100	2340	2670	2790	2970	982	1230	1480	1570	1750	1880	2120	2230	2390
	nM	[rpm]	1470	1475	1475	1480	1480	1480	1485	1485	1485	1475	1480	1480	1480	1480	1485	1485	1485	1485
	Pk	[kW]	31.0	41.8	47.4	57.1	70.0	79.3	93.0	98.2	106	41.8	52.9	64.7	69.1	78.3	85.1	98.4	105	114
	P_{mot}	[kW]	37	55	55	75	90	90	110	110	132	55	75	75	90	90	110	110	132	132
	Motor size		225 S	250 M	250 M	280 S	280 M	280 M	315 S	315 S	315 M	250 M	280 S	280 S	280 M	280 M	315 S	315 S	315 M	315 M
	Lp(A)[dB]	w/o.H./w.H.	89/74	91/75	93/75	95/75	95/76	96/78	99/78	101/79	103/80	90/74	93/77	97/78	98/77	102/76	103/76	101/79	101/78	102/77
700	$\dot{V}_1$	[m³/min]	**19.1**	**29.3**	**34.5**	**42.9**	**53.6**	**61.0**	**71.2**	**74.9**	**80.1**	**30.3**	**40.6**	**51.0**	**54.7**	**62.6**	**67.6**	**77.5**	**82.1**	**87.5**
	t_2	[°C]	112	101	97	94	91	89	88	87	87	99	94	91	90	88	88	87	86	86
	nG	[rpm]	980	1310	1480	1750	2100	2340	2670	2790	2960	982	1230	1480	1570	1760	1880	2120	2230	2360
	nM	[rpm]	1470	1475	1480	1480	1480	1485	1485	1485	1480	1475	1480	1480	1480	1485	1485	1485	1480	1480
	Pk	[kW]	36.0	48.6	55.2	66.1	80.8	91.4	107	113	121	48.6	61.4	75.0	80.0	91.0	98.2	113	120	129
	P_{mot}	[kW]	45	55	75	75	90	110	132	132	160	55	75	90	90	110	110	132	160	160
	Motor size		225 M	250 M	280 S	280 S	280 M	315 S	315 M	315 M	315 M	250 M	280 S	280 M	280 M	315 S	315 S	315 M	315 M	315 M
	Lp(A)[dB]	w/o.H./w.H.	88/75	91/75	93/75	95/76	95/77	97/78	101/79	102/79	104/80	91/75	94/77	98/78	99/77	103/77	104/76	102/78	102/78	103/79
800	$\dot{V}_1$	[m³/min]										**29.7**	**39.9**	**50.4**	**54.0**	**61.9**	**67.3**	**76.8**	**81.0**	**86.8**
	t_2	[°C]										112	106	102	101	99	98	97	96	96
	nG	[rpm]										985	1230	1485	1570	1760	1890	2120	2220	2360
	nM	[rpm]										1480	1480	1485	1485	1485	1485	1480	1480	1480
	Pk	[kW]										55.6	69.9	85.5	90.9	103	112	128	135	145
	P_{mot}	[kW]										75	90	110	110	132	132	160	160	160
	Motor size											280 S	280 M	315 S	315 S	315 M	315 M	315 M	315 M	315 M
	Lp(A)[dB]	w/o.H./w.H.										91/75	95/77	99/78	100/77	104/77	105/77	104/78	103/79	104/81
900	$\dot{V}_1$	[m³/min]										**29.0**	**39.2**	**49.8**	**53.3**	**61.2**	**66.6**	**76.1**	**80.3**	**86.1**
	t_2	[°C]										126	118	113	112	110	109	107	106	106
	nG	[rpm]										985	1230	1485	1570	1760	1890	2120	2220	2360
	nM	[rpm]										1480	1480	1485	1485	1485	1480	1480	1485	1485
	Pk	[kW]										62.4	78.4	95.8	102	115	125	142	150	161
	P_{mot}	[kW]										75	90	110	132	132	160	160	200	200
	Motor size											280 S	280 M	315 S	315 M	315 M	315 M	315 M	315 M	315 M
	Lp(A)[dB]	w/o.H./w.H.										91/75	95/77	98/79	100/78	104/79	105/78	104/78	103/80	104/81
1000	$\dot{V}_1$	[m³/min]											**38.5**	**49.1**	**52.7**	**60.5**	**65.9**	**75.5**	**79.6**	**85.5**
	t_2	[°C]											131	125	124	121	120	118	117	116
	nG	[rpm]											1230	1485	1570	1760	1890	2120	2220	2360
	nM	[rpm]											1485	1485	1485	1480	1480	1485	1485	1485
	Pk	[kW]											86.9	106	113	128	138	157	166	178
	P_{mot}	[kW]											110	132	132	160	160	200	200	200
	Motor size												315 S	315 M	315 M	315 M	315 M	315 M	315 M	315 M
	Lp(A)[dB]	w/o.H./w.H.											95/78	98/79	100/79	104/80	105/80	104/80	104/81	104/81

Lower differential pressures on request. Performance data are non-binding examples only.

Δp mbar	Blower size		GM 130 L / DN 300									GM 150 S / DN 300							
300	$\dot{V}_1$	[m³/min]	**47.8**	**62.9**	**78.0**	**82.2**	**94.3**	**102**	**115**	**131**	**134**	**77.3**	**94.4**	**102**	**116**	**122**	**132**	**147**	**152**
	t_2	[°C]	51	50	49	49	48	48	48	47	47	49	48	48	48	48	47	47	47
	nG	[rpm]	980	1230	1480	1550	1750	1880	2100	2350	2400	982	1170	1250	1410	1480	1580	1750	1800
	nM	[rpm]	1470	1470	1480	1480	1480	1480	1480	1485	1485	1475	1480	1480	1480	1480	1485	1485	1485
	Pk	[kW]	32.0	40.8	50.5	53.3	61.9	67.9	78.7	92.1	95.0	48.4	59.4	64.5	75.3	80.3	87.8	102	106
	P_{mot}	[kW]	37	45	75	75	75	75	90	110	110	55	75	75	90	90	110	132	132
	Motor size		225 S	225 M	280 S	280 S	280 S	280 S	280 M	315 S	315 S	250 M	280 S	280 S	280 M	280 M	315 S	315 M	315 M
	Lp(A)[dB]	w/o.H./w.H.	93/75	95/77	101/79	100/79	101/80	101/80	103/81	104/82	104/82	95/79	97/79	97/79	97/80	98/80	99/80	101/81	101/81
400	$\dot{V}_1$	[m³/min]	**46.2**	**61.2**	**76.3**	**80.5**	**93.2**	**100**	**115**	**130**	**132**	**75.8**	**92.6**	**101**	**114**	**121**	**130**	**146**	**150**
	t_2	[°C]	63	61	59	59	58	58	57	57	57	59	58	58	57	57	57	57	57
	nG	[rpm]	982	1230	1480	1550	1760	1880	2120	2370	2400	985	1170	1260	1410	1485	1580	1760	1800
	nM	[rpm]	1475	1480	1480	1480	1480	1485	1485	1485	1485	1480	1480	1485	1485	1485	1485	1480	1480
	Pk	[kW]	41.9	53.2	65.4	68.9	80.1	86.8	101	117	119	63.4	77.1	84.2	96.6	103	112	129	133
	P_{mot}	[kW]	55	75	75	90	90	110	132	132	132	75	90	110	110	132	132	160	160
	Motor size		250 M	280 S	280 S	280 M	280 M	315 S	315 M	315 M	315 M	280 S	280 M	315 S	315 S	315 M	315 M	315 M	315 M
	Lp(A)[dB]	w/o.H./w.H.	93/76	96/78	102/80	101/79	102/80	103/81	103/81	105/83	106/83	96/79	97/79	98/79	98/80	98/80	99/80	101/81	102/82
500	$\dot{V}_1$	[m³/min]	**44.8**	**60.8**	**74.7**	**86.2**	**91.6**	**98.9**	**113**	**128**	**130**	**74.2**	**91**	**100**	**113**	**120**	**127**	**144**	**148**
	t_2	[°C]	76	72	70	69	69	68	67	67	67	70	69	68	67	67	67	66	66
	nG	[rpm]	985	1250	1480	1670	1760	1880	2120	2370	2400	985	1170	1270	1410	1485	1570	1760	1800
	nM	[rpm]	1480	1480	1480	1485	1485	1485	1480	1480	1480	1480	1485	1485	1485	1480	1480	1485	1485
	Pk	[kW]	52.0	66.8	80.3	92.0	97.8	106	122	141	143	78.3	94.8	104	118	126	135	156	160
	P_{mot}	[kW]	75	75	90	110	110	132	160	160	160	90	110	132	132	160	160	200	200
	Motor size		280 S	280 S	280 M	315 S	315 S	315 M	315 M	315 M	315 M	280 M	315 S	315 M	315 M	315 M	315 M	315 M	315 M
	Lp(A)[dB]	w/o.H./w.H.	92/77	97/79	102/80	101/80	103/81	104/81	104/81	107/83	107/83	97/79	97/79	98/79	98/79	98/80	99/81	101/82	102/82
600	$\dot{V}_1$	[m³/min]	**43.4**	**59.4**	**73.6**	**84.8**	**90.2**	**97.5**	**112**	**119**	**126**	**72.7**	**89.5**	**101**	**110**	**118**	**126**	**143**	**147**
	t_2	[°C]	89	84	81	80	79	79	77	77	77	82	80	78	78	77	77	76	76
	nG	[rpm]	985	1250	1485	1670	1760	1880	2120	2230	2360	985	1170	1300	1400	1485	1570	1760	1800
	nM	[rpm]	1480	1480	1485	1485	1485	1480	1480	1485	1485	1485	1485	1480	1480	1485	1485	1485	1485
	Pk	[kW]	61.9	79.3	95.5	109	116	125	144	153	164	93.2	113	127	138	148	158	182	188
	P_{mot}	[kW]	75	90	110	132	132	160	160	200	200	110	132	160	160	200	200	250	250
	Motor size		280 S	280 M	315 S	315 M	315 M	315 M	315 M	315 M	315 M	315 S	315 M	315 M	315 M	315 M	315 M	315 L	315 L
	Lp(A)[dB]	w/o.H./w.H.	94/78	97/80	104/82	102/82	104/83	105/83	107/83	107/83	107/84	99/79	99/79	99/79	99/80	100/80	100/82	102/83	102/83
700	$\dot{V}_1$	[m³/min]										**71.4**	**88.2**	**96.3**	**109**	**117**	**125**	**142**	**145**
	t_2	[°C]										93	91	89	88	88	87	86	86
	nG	[rpm]										985	1170	1260	1400	1485	1580	1760	1800
	nM	[rpm]										1485	1480	1480	1485	1485	1485	1485	1485
	Pk	[kW]										108	130	141	159	170	183	209	215
	P_{mot}	[kW]										132	160	160	200	200	250	250	250
	Motor size											315 M	315 M	315 M	315 M	315 M	315 L	315 L	315 L
	Lp(A)[dB]	w/o.H./w.H.										100/80	100/80	100/80	100/80	101/81	101/82	102/83	102/83
800	$\dot{V}_1$	[m³/min]										**70.2**	**88.8**	**96.0**	**108**	**116**	**124**	**140**	**144**
	t_2	[°C]										105	101	100	99	98	97	96	96
	nG	[rpm]										985	1190	1270	1400	1488	1580	1760	1800
	nM	[rpm]										1480	1485	1485	1485	1485	1485	1490	1490
	Pk	[kW]										123	151	162	180	193	207	235	242
	P_{mot}	[kW]										160	200	200	200	250	250	315	315
	Motor size											315 M	315 M	315 M	315 M	315 L	315 L	315 L	315 L
	Lp(A)[dB]	w/o.H./w.H.										101/80	100/80	100/80	100/80	102/82	102/83	102/83	103/84
900	$\dot{V}_1$	[m³/min]										**69**	**87.6**	**94.9**	**107**	**115**	**123**	**139**	**143**
	t_2	[°C]										118	113	111	110	109	108	106	106
	nG	[rpm]										985	1190	1270	1400	1488	1580	1760	1800
	nM	[rpm]										1480	1485	1485	1485	1485	1490	1490	1490
	Pk	[kW]										138	169	181	202	216	231	262	269
	P_{mot}	[kW]										160	200	200	250	250	315	315	315
	Motor size											315 M	315 M	315 M	315 L	315 L	315 L	315 L	315 L
	Lp(A)[dB]	w/o.H./w.H.										102/81	101/80	101/80	101/81	102/83	103/84	103/84	103/84
1000	$\dot{V}_1$	[m³/min]										**68.4**	**86.5**	**93.8**	**106**	**114**	**122**	**138**	**142**
	t_2	[°C]										130	124	123	121	120	118	117	116
	nG	[rpm]										990	1190	1270	1400	1488	1580	1760	1800
	nM	[rpm]										1485	1485	1485	1485	1490	1490	1490	1490
	Pk	[kW]										154	187	200	223	238	255	289	296
	P_{mot}	[kW]										200	250	250	250	315	315	355	355
	Motor size											315 M	315 L	315 L	315 L	315 L	315 L	355 M	355 M
	Lp(A)[dB]	w/o.H./w.H.										103/82	102/81	102/80	102/81	103/84	104/84	103/84	104/84

Lower differential pressures on request. Higher intake volume flows on request. Performance data are non-binding examples only.



AERZEN. Compression as success factor.

AERZEN was founded in 1864 as Aerzener Maschinenfabrik. In 1868 we built Europe's first rotary lobe blower. The first turbo blowers followed in 1911, the first screw compressors in 1943, and in 2010 the world's first rotary lobe compressor unit. AERZEN innovations are a driving force behind the development of compressor technology. Today AERZEN is one of the world's oldest and most important manufacturers of rotary lobe blowers, rotary lobe compressors, rotary lobe gas meters, screw compressors, and turbo blowers. And in many areas of application, AERZEN is among the undisputed leaders.

There are more than 2,000 experienced AERZEN employees in over 40 affiliates worldwide working hard to advance compressor technology. Their technological expertise, our international network of experts, and the constant feedback from our customers are what make us successful. AERZEN products and services have become standards in the industry for reliability, lasting value, and efficiency. Go ahead: challenge us!

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AERZEN
EXPECT PERFORMANCE

G1-068 – 04 – EN – 2500 – 08.2014

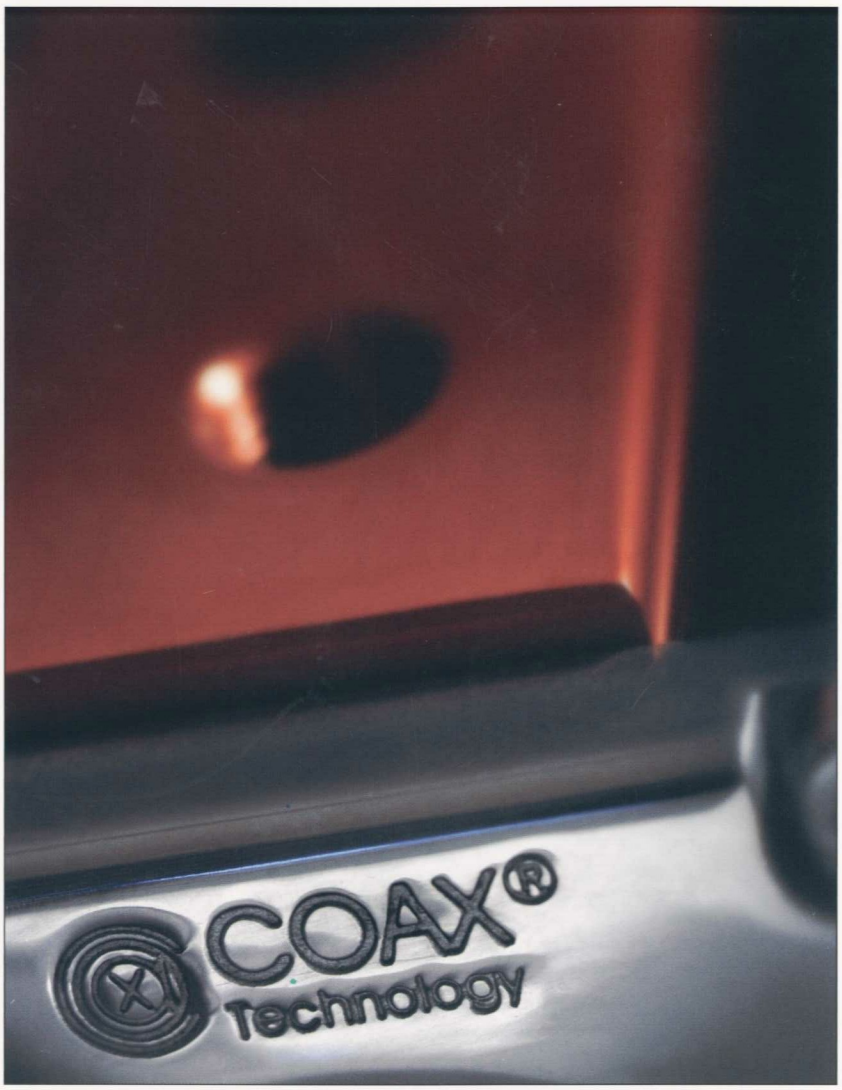
VACUUM PRODUCTS

COAX® — THE NEXT DIMENSION IN VACUUM TECHNOLOGY

Tag No:
20-E-801-1/2/3/4/5/6

P6010

A COMPACT MODULAR VACUUM PUMP WITH INTEGRATED FUNCTIONALITY





Patented COAX® technology

Energy efficient

Durable

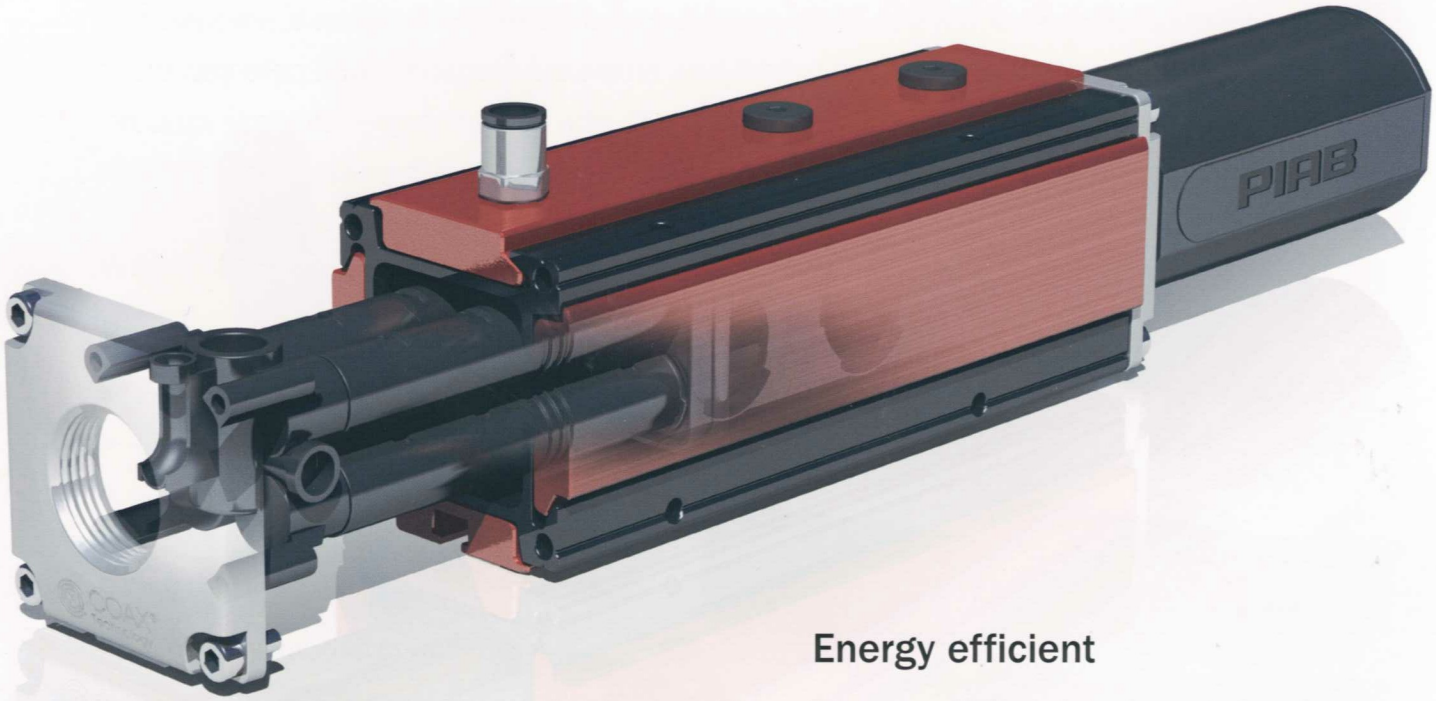
Modular design

Quiet operation

PIAB
Innovators in Vacuum Technology

P6010 —

A smart investment...



Durable

PIAB sets the standard when it comes to reliable operation. The P6010 pump range is designed for the most demanding environments. The pump housing is so strong it can be used as a support. Because there are no moving parts, there is no heat generation and virtually no maintenance. Downtime and work stoppage can be drastically reduced. Exceptional performance in a durable package – the P6010 is built to last.

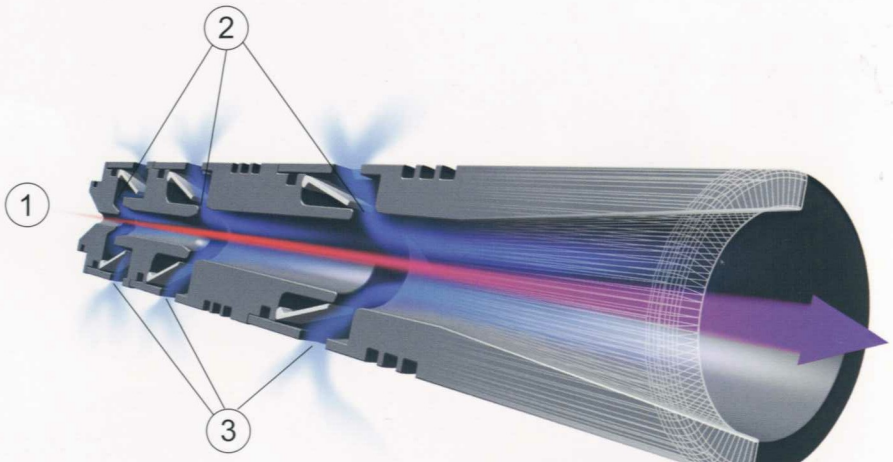
Energy efficient

Powered by COAX® technology, the P6010 can reduce energy costs up to 25% or more compared to other methods of generating vacuum. Powerful suction at low feed pressures is characteristic for this advanced design. Lower supply pressure results in a measurable decrease in energy consumption. In addition, the P6010 with COAX® maintains performance levels during periods of fluctuating supply pressure when other pumps lose suction capacity and may even drop parts. The P6010's compact size is deceiving. COAX® technology puts powerful suction in a small package and the pump can be easily mounted close to the point of suction. The result... a smaller pump requirement with lower energy needs. For the ultimate in operating efficiency, integrated control options are also available. Refer to pages 6–7 for details.

COAX® — The next dimension in vacuum technology

It's all about simplicity--- You want to save time and money. Your vacuum system should be easy to design, install, start up and maintain. It should offer operational reliability and show flexibility to changes in working conditions. This is why the COAX® technology was developed.

When compressed air (1) flows through the pump nozzles (2), air from outside the pump will be entrained by the jet of air at the nozzle outlet. Suction will be generated at the openings to the various stages (3). Exhaust then exits the pump.



Unique multistage ejector

COAX®, a patented technology, is a new and improved design on PIAB's innovative multistage concept for creating vacuum with compressed air. COAX® integrates the internal components of a multistage vacuum pump into a vacuum cartridge. The result is a smaller, more efficient, more reliable and highly flexible technology that allows you to design a modular system.

Energy is put to maximum use with the COAX® technology. The vacuum pump/cartridge consumes less air than conventional ejectors. COAX® vacuum cartridges are up to twice as fast and provide 3 times more flow than a typical conventional ejector with the same air consumption. COAX® is also designed for low and fluctuating feed pressures (25-87 psi) with sustained vacuum performance for maximum reliability.

Choose the right COAX® *cartridge* for your application

PIAB has developed two main types of COAX® *cartridges*, Pi and Si, for different applications.



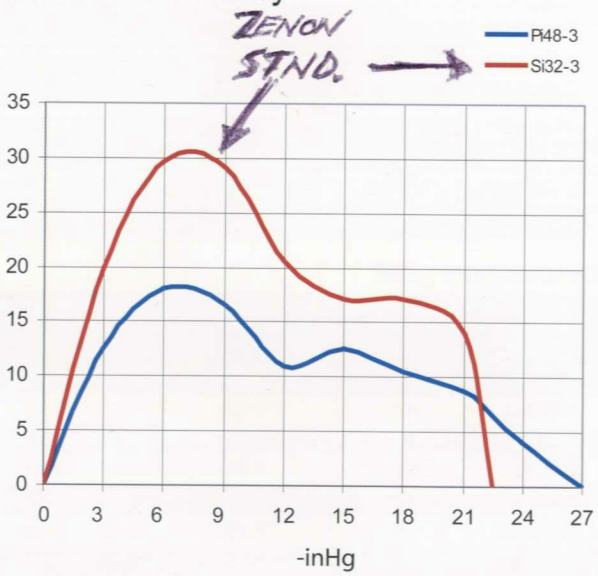
Pi

Pi cartridges have been developed to achieve a high vacuum level at low feed pressures. They are ideal when pressures in compressed air lines fluctuate. Pi cartridges are recommended in situations such as handling sheet metal or glass or other non-porous products, where you need good vacuum flow and a high-level vacuum. Pi can deliver high vacuum levels down to 27-inHg.

Si

Si cartridges are designed to provide extra vacuum flow. They are highly recommended for handling porous materials such as corrugated board and for high-volume evacuation in, for example, a fast-cycling system where it is necessary to compensate for leakage in order to maintain the vacuum level. Si cartridges can deliver moderate vacuum levels down to 22-inHg.

Vacuum efficiency



Vacuum Efficiency =
Vacuum flow/air consumption x vacuum level

P6010 SI32-3



- COAX® patented technology
- Substantially lower air-consumption as compared to conventional ejectors
- Modular design
- High flow - suitable for handling of porous objects and in case of leakage
- Short evacuation time
- "Classic" mounting style option available
- Supplied with a vacuum gauge and optional vacuum filter

TECHNICAL DATA

Description	Unit	Value
Feed pressure, max	psi	101.5
Noise level	dBA	65-70 (Classic style = 50-65)
Temperature range	°F	14-176
Weight	lb	3.74-3.96
Material		Al, PA, NBR, SS, TPE

VACUUM FLOW

P6010 Cartridge Type	Feed pressure	Air consumption	Vacuum flow (scfm) at different vacuum levels										Max vacuum
	psi	scfm	0	3	6	9	12	15	18	21	24	27	-inHg
Si32-3x1	58	2.65	10.6	6.14	4.03	2.54	1.70	0.85	0.21	—	—	—	18.0
Si32-3x1	72.5	3.18	12.1	6.99	4.66	2.97	1.80	1.27	0.74	0.38	—	—	21.0
Si32-3x1	87	3.71	12.7	7.42	5.51	3.60	1.91	1.27	1.06	0.74	—	—	22.2
Si32-3x2	58	5.30	21.2	12.3	8.05	5.09	3.39	1.70	0.42	—	—	—	18.0
Si32-3x2	72.5	6.36	24.2	14.0	9.32	5.93	3.60	2.54	1.48	0.76	—	—	21.0
Si32-3x2	87	7.42	25.4	14.8	11.0	7.20	3.81	2.54	2.12	1.48	—	—	22.2
Si32-3x3*	58	7.95	31.8	18.4	12.1	7.63	5.09	2.54	0.64	—	—	—	18.0
Si32-3x3*	72.5	9.54	36.2	21.0	14.0	8.90	5.51	3.81	2.33	1.14	—	—	21.0
Si32-3x3*	87	11.1	38.1	22.2	16.5	10.8	5.72	3.81	3.18	2.33	—	—	22.2
Si32-3x4*	58	10.6	42.4	24.6	16.1	10.2	6.78	3.39	0.85	—	—	—	18.0
Si32-3x4*	72.5	12.7	48.3	28.0	18.6	11.9	7.20	5.09	2.97	1.53	—	—	21.0
Si32-3x4*	87	14.8	50.9	29.7	22.0	14.4	7.63	5.09	4.24	2.97	—	—	22.2

Specifications subject to change without notice.

EVACUATION TIME

P6010 Cartridge Type	Feed pressure	Air consumption	Evacuation time (s/cf) to reach different vacuum levels (-inHg)									Max vacuum
	psi	scfm	3	6	9	12	15	18	21	24	27	-inHg
Si32-3x1	58	2.65	0.85	1.98	3.97	6.80	11.9	28.3	—	—	—	18.0
Si32-3x1	72.5	3.18	0.57	1.70	3.12	5.95	9.90	17.0	28.3	—	—	21.0
Si32-3x1	87	3.71	0.57	1.42	2.83	5.10	9.35	15.0	22.7	—	—	22.2
Si32-3x2	58	5.30	0.42	0.99	1.98	3.40	5.95	14.2	—	—	—	18.0
Si32-3x2	72.5	6.36	0.28	0.85	1.56	3.12	5.10	8.50	14.2	—	—	21.0
Si32-3x2	87	7.42	0.28	0.71	1.42	2.55	4.82	7.65	11.3	—	—	22.2
Si32-3x3*	58	7.95	0.28	0.65	1.33	2.27	3.97	9.35	—	—	—	18.0
Si32-3x3*	72.5	9.54	0.20	0.57	1.05	1.98	3.40	5.67	9.35	—	—	21.0
Si32-3x3*	87	11.1	0.20	0.48	0.93	1.70	3.12	5.10	7.65	—	—	22.2
Si32-3x4*	58	10.6	0.23	0.51	0.99	1.70	3.12	7.08	—	—	—	18.0
Si32-3x4*	72.5	12.7	0.14	0.42	0.79	1.50	2.49	4.25	7.08	—	—	21.0
Si32-3x4*	87	14.8	0.14	0.37	0.71	1.27	2.35	3.68	5.67	—	—	22.2

** Vacuum performance is reduced by 20-30% when using the 3/4" NPSF "Classic" style cover plate (code LK) between 0-9 -inHg.*

ORDERING INFORMATION

	1. Vacuum Cartridge Module	P6010 Code
a	Si32-3 x1	AB
b	Si32-3 x1 with non-return valve	AF
a	Si32-3 x2	AC
b	Si32-3 x2 with non-return valve	AG
a	Si32-3 x3	AD
b	Si32-3 x3 with non-return valve	AH
a	Si32-3 x4	AE
b	Si32-3 x4 with non-return valve	AI

2. Mounting and cover plate	P6010 Code
Mounting T-slot	01

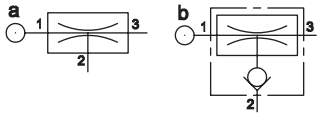
3. Function and cover plate	P6010 Code
Cover plates Standard style NPSF threads (No function)	LJ
Cover plates Classic style NPSF threads (No function)	LK

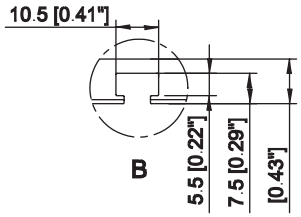
4. Connections for vacuum and exhaust	P6010 Code
2 x 1" NPSF with silencer 1" Standard style	56
2 x 3/4" NPSF with silencer 3/4" Classic style	58

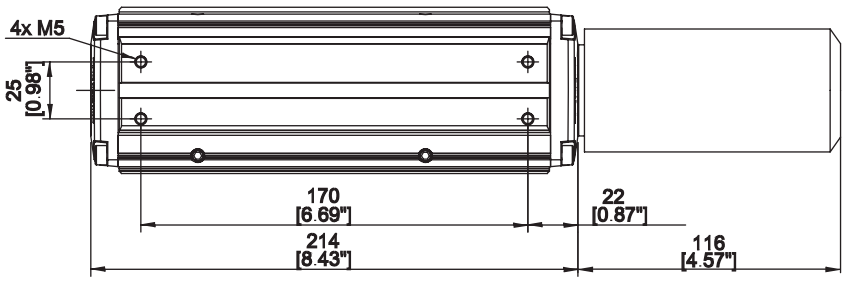
5. Vacuum filter	P6010 Code
None	XX
Vacuum filter, 1" NPT (Standard size)	FA
Vacuum filter, 3/4" NPT (Classic size)	FB

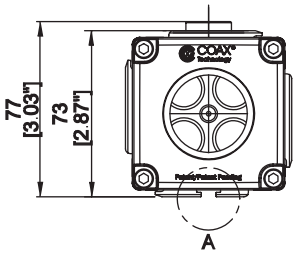
Example	Ordering number
P6010, Si32-3 x1, mounting T-slot, cover plates (Standard-no function), 2 x 1" NPSF with silencer 1" & vacuum filter 1"	P6010.AB.01.LJ.56.FA
P6010, Si32-3 x1, mounting T-slot, cover plates (Classic-no function), 2 x 3/4" NPSF with silencer 3/4" & vacuum filter 3/4"	P6010.AB.01.LK.58.FB

Specifications subject to change without notice.



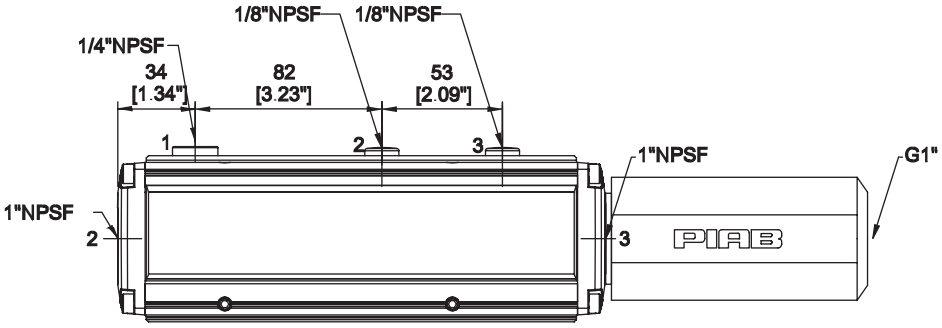








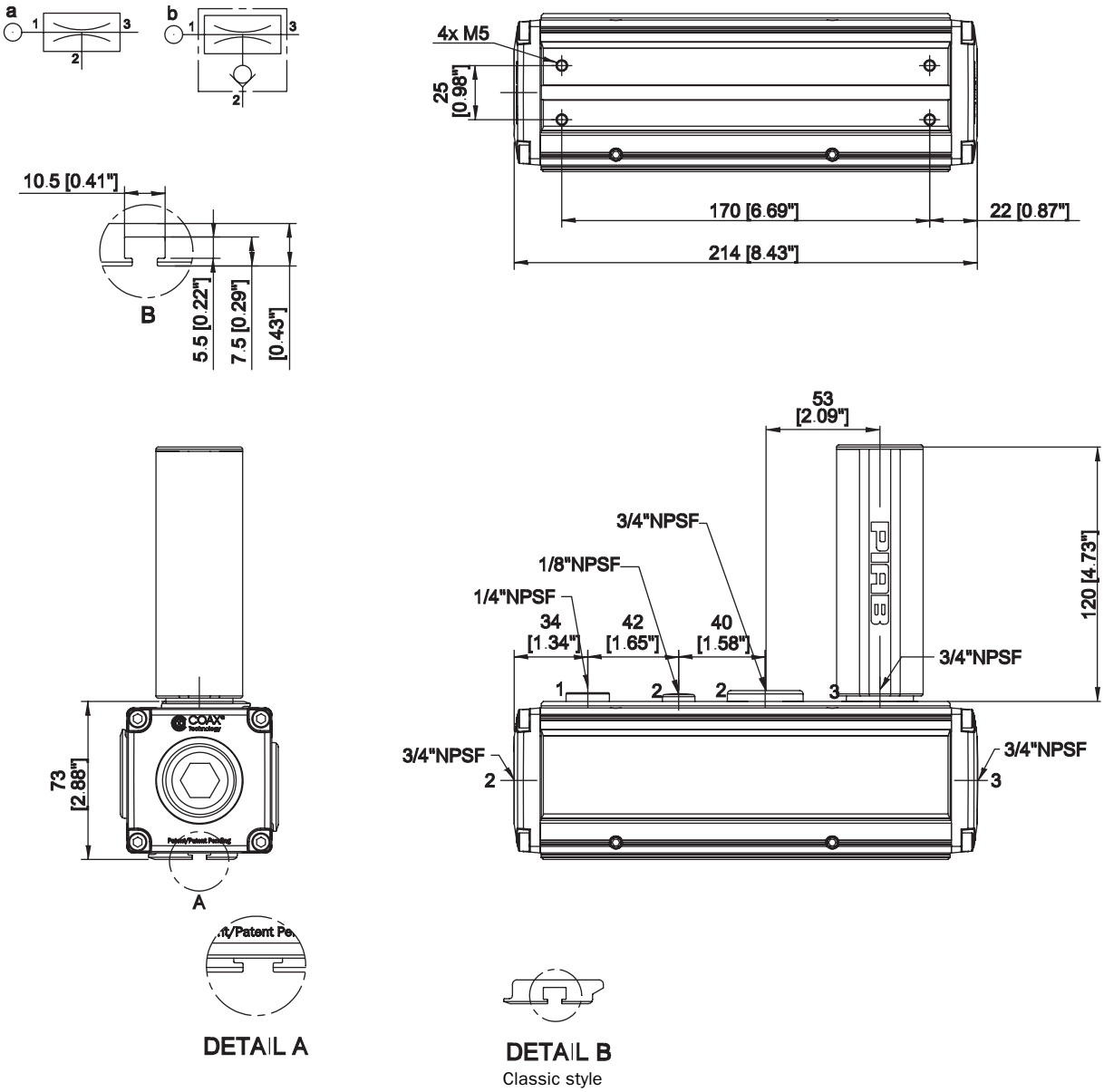
DETAIL A





DETAIL B

Standard style



ORDERING INFORMATION, ACCESSORIES

Description	PartNo
Silencer G3/4"	32.16.002
Silencer G1"	01.12.499
Manometer 250 kPa	01.12.533
Manometer 1 Mpa	01.12.532
Vacuum gauge 30 -inHg/100 -kPa	31.01.613
Vacuum filter, 3/4" NPT	PPSF.75-X35
Vacuum filter 1" NPT	PPSF1.0-X50
Seal kit P6010, NBR seals	01.12.495
Seal for vacuum & exhaust end connections, P6010, NBR seals	01.12.497

Specifications subject to change without notice.

VACUUM GAUGE AND MANOMETERS

BAAN NUMBERS
1030394



- Analog indicator, spring joint – lever system
- The instruments include nut for installation on a panel

TECHNICAL DATA

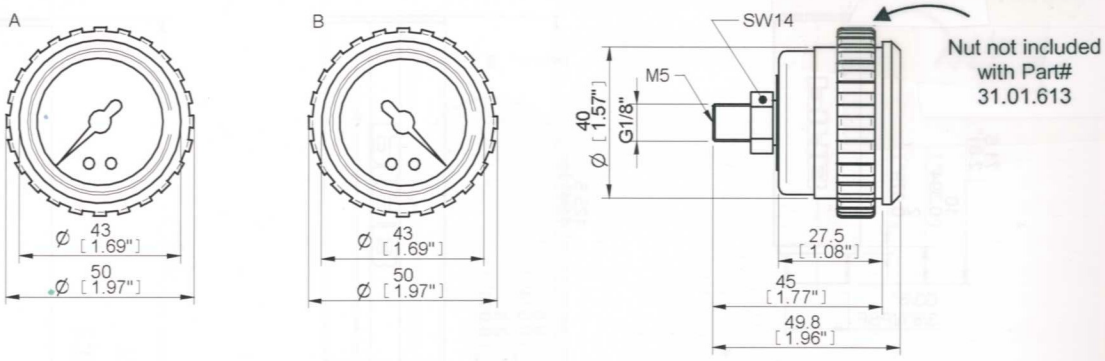
Description	Unit	Value
Accuracy, of full scale	%	2.5
Material		CuZn, ABS, PMMA

TECHNICAL DATA, SPECIFIC

		31.01.613		
Description	Unit	31.01.602	31.01.603	31.01.626
Weight	oz	3.17	1.94	1.76
Signal range		0–30 -inHg	0–145 psi	0–36.25 psi
Medium		Vacuum	Postive pressure	

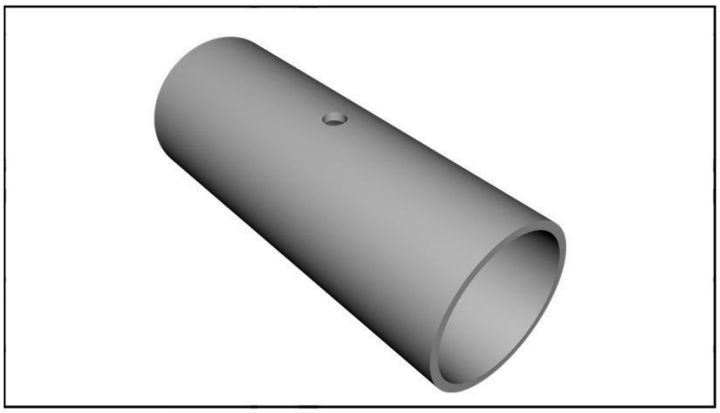
ORDERING INFORMATION

	Description		Part No.
B	Vacuum gauge 30 -inHg/100 -kPa	(Without panel mount nut)	31.01.602 (31.01.613)
A	Manometer 150 psi/1 MPa		31.01.603
A	Manometer 36.25 psi/250 -kPa		31.01.626

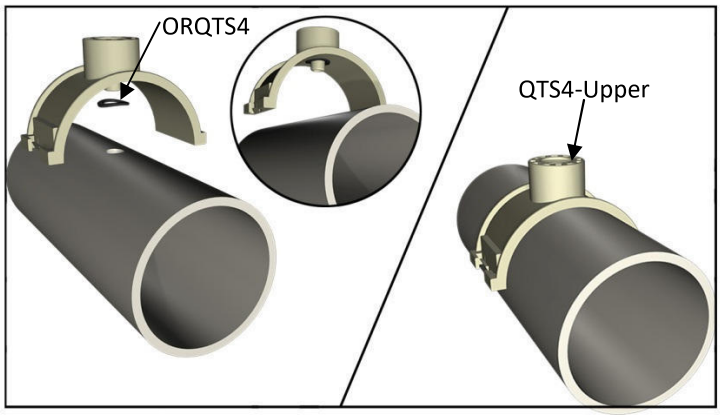


Specifications subject to change without notice.

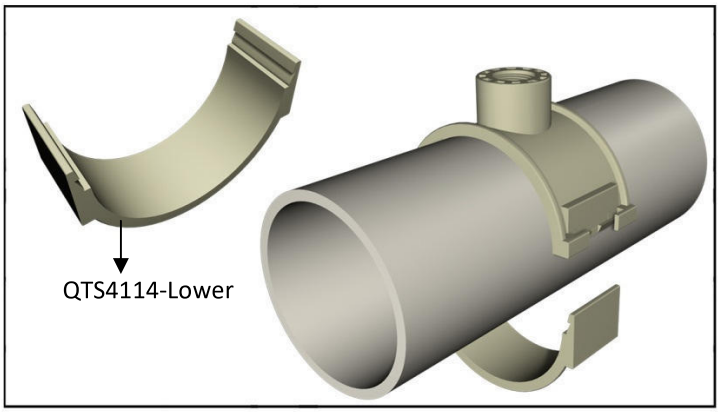
SSI's-QTS4114 NPT SADDLE INSTALLATION



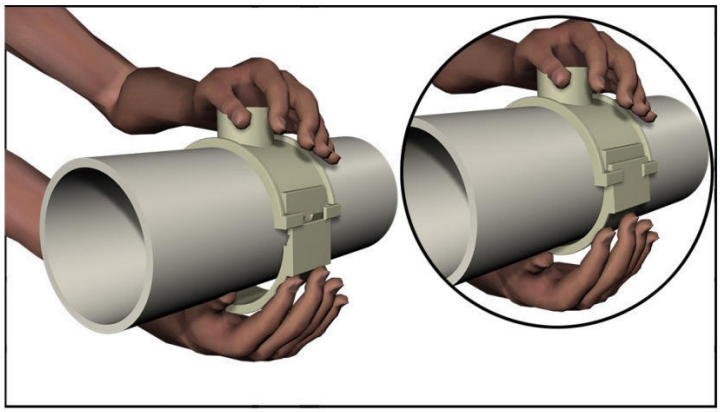
1. SSI supplies headers with factory drilled (16mm) holes for field installation of saddles.



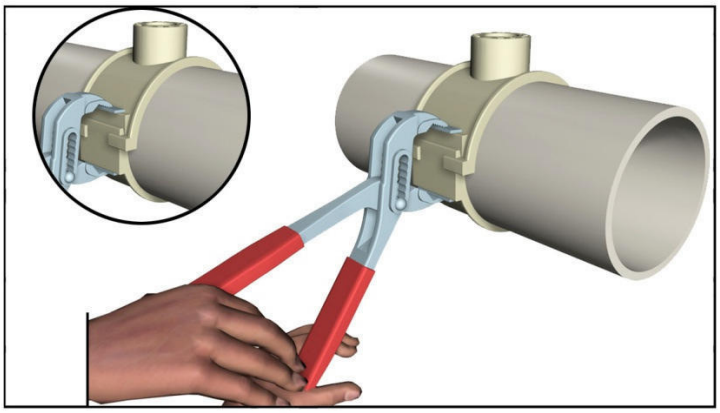
2. Insert O-ring (ORQTS4) in to the upper saddle base as shown. Next, place the upper saddle on to the pipe by inserting saddle register into the pipe hole



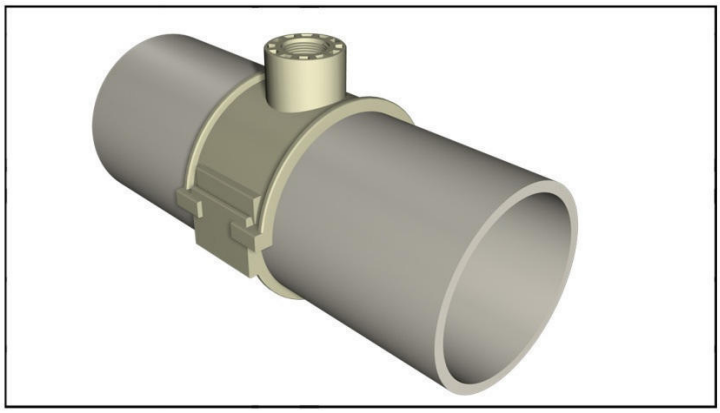
3. Next place QTS4114-Lower from under side as shown next step.



4. Hold the QTS4-upper with one hand, push one side of QTS4114- lower with other hand as shown.



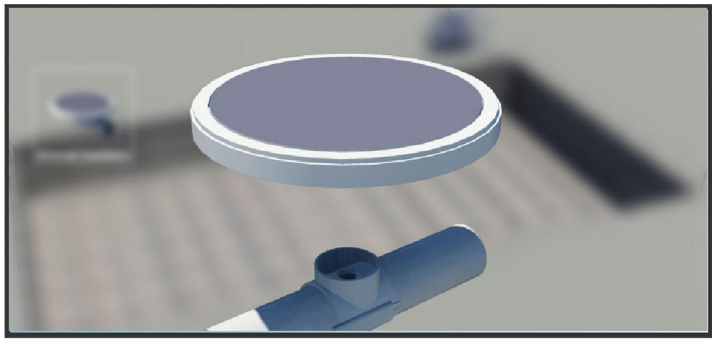
5. Use a pair of channel lock plyers in the centre of saddle as shown in above. Lock the other side of lower saddle to complete the installation (will hear the snap of the clip).



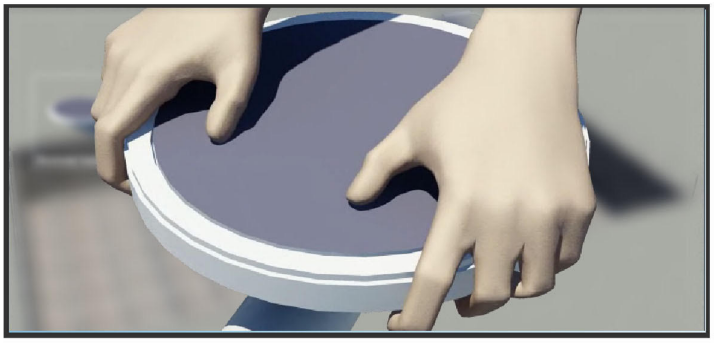
6. Make sure the lower saddle properly locked in to the upper one to complete the NPT saddle installation.

SSI Aeration

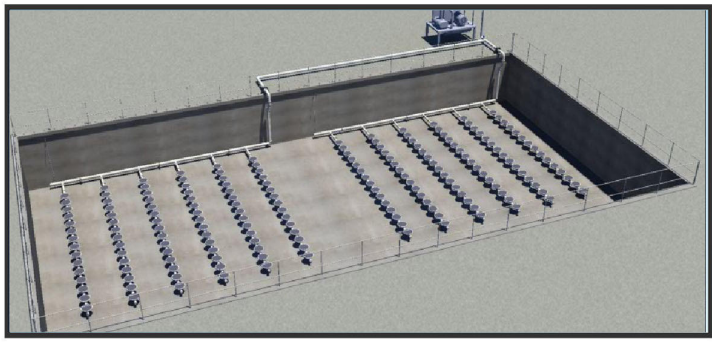
Installation Procedure of General Plant Installation (Disc with Q C)



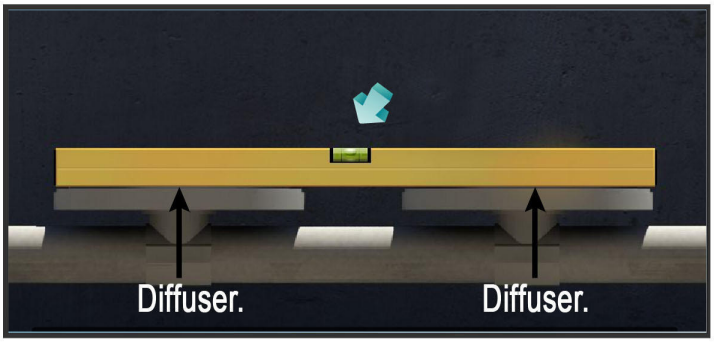
22.



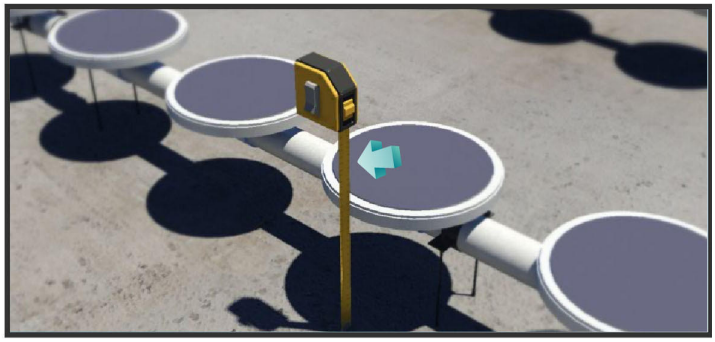
23. Push down diffuser and turn diffuser to lock.
Note: Make certain it locks.



24. Diffusers installed in tank view.



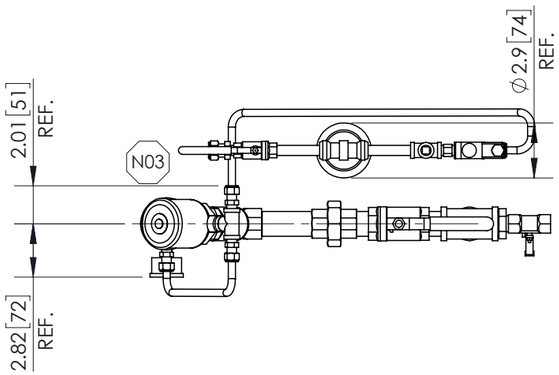
25. Diffuser should be installed on a common plane. A variance in elevation of 3/8”(10mm) is acceptable between diffuser.

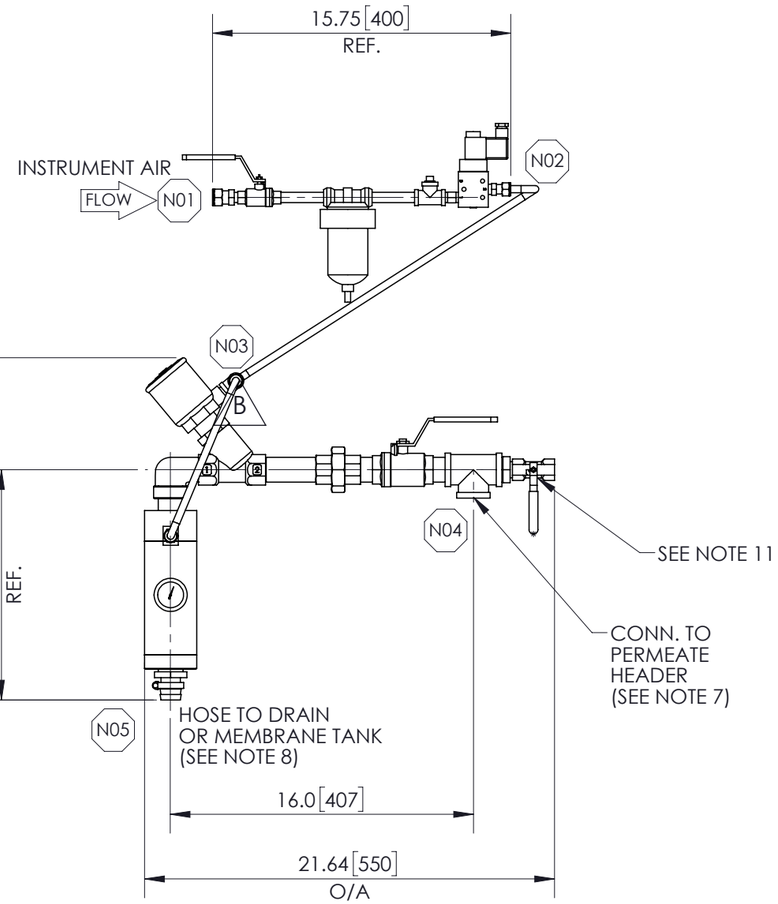


26.



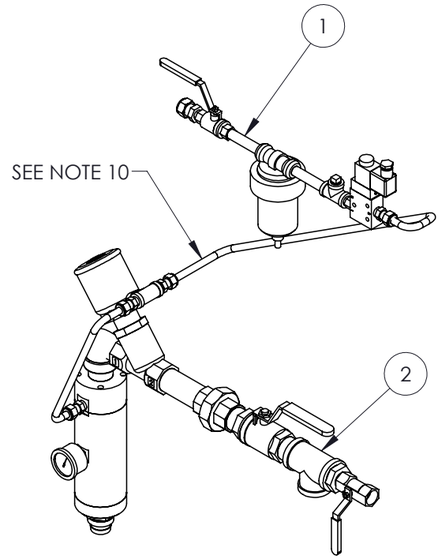
27. Fill tank with clean water. Do not fill more than 12”(300mm) above top of the diffusers at this time.





TAG NO:

20-HV-802-1/2/3/4/5/6
20-F-801-1/2/3/4/5/6
20-FV-802-1/2/3/4/5/6
20-FV-801-1/2/3/4/5/6
20-E-801-1/2/3/4/5/6
20-HV-801-1/2/3/4/5/6
20-HV-803-1/2/3/4/5/6



NOZZLE SCHEDULE

NOZZLE	DESCRIPTION	TYPE	SIZE
N01	PLANT INSTRUMENT AIR	ODT	0.50
N02	INSTRUMENT AIR TO EJECTOR SPOOL	ODT	0.38
N03	INSTRUMENT AIR FROM AIR SPOOL	ODT	0.38
N04	PERMEATE/AIR FROM TOP OF PERMEATE PIPE	F-NPT	1.00
N05	TO OPEN DRAIN/MEMBRANE TANK (AIR GAP)	BARB	1.00

NOTES:

1. SHIPPING WEIGHT OF EJECTOR SPOOL - 11.0 LB/[5 KG]
2. SHIPPING WEIGHT OF SOLENOID SPOOL - 4.5 LB/[2 KG]
3. ALL PIPING & EQUIPMENT SHOWN SHALL BE FULLY SUPPORTED BY OTHERS.
4. ALL VALVES & INSTRUMENTS TO BE PROPERLY TAGGED.
5. PIPING MATERIAL:
   - HIGH PRESSURE: SCH. 10, 316 SS / SS TUBING
   - LOW PRESSURE: SCH. 10, 316 SS / SS TUBING
6. ALL DIMENSIONS IN INCHES [MILLIMETERS]
7. CONNECTION TO BE PROVIDED AT HIGHEST POINT ON PIPING BETWEEN PERMEATE HEADER AND PUMP.
8. AIR GAP IS REQUIRED ON EJECTOR DISCHARGE LINE EXHAUST TO MEMBRANE TANK OR DRAIN. 1" BRAIDED HOSE RECOMMENDED (HOSE BY OTHERS).
9. EJECTOR MUST BE INSTALLED VERTICALLY DOWNWARD.
10. THE 3/8" SS TUBING THAT CONNECTS THE TWO SPOOLS TOGETHER IS TO BE PROVIDED AND INSTALLED ONSITE BY OTHERS.
11. VALVE USED AS AIR INLET FOR MEMBRANE PRESSURE DECAY TEST. TO BE CLOSED AT ALL OTHER TIMES WITH HANDLE LOCKED IN PLACE TO PREVENT ACCEDINTAL OPENING.

MM# 3178110 - W/ 24VDC SOLENOID - PLUMBING TABLE					
ITEM	QTY.	SAP	DOC#	DESCRIPTION	U/M
1	1	3178024	1319227	PLMB-AIR,316,0.25,24VDC,SS TUBE	EA
2	1	3178021	1319224	PLMB-EJECTOR,316,1.00X0.25,SS TUBE	EA

MM# 3178111 - W/ 120VAC SOLENOID - PLUMBING TABLE					
ITEM	QTY.	SAP	DOC#	DESCRIPTION	U/M
1	1	3178025	1319228	PLMB-AIR,316,0.25,120VAC,SS TUBE	EA
2	1	3178021	1319224	PLMB-EJECTOR,316,1.00X0.25,SS TUBE	EA

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
B	REVISED AS NOTED	136201	ES	CM	KW	10 July 20
A	INITIAL DESIGN	135731	XC	RJ	SA	08 Apr 20

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TOLERANCES UNLESS NOTED
DECIMALS: .X, .XX +/-0.50, .XXX
ANGLES: +/-0.5°
FRAC: +/- 1/2"

CUSTOMER INFORMATION

ASSY-EJECTOR,316,1.00X0.25,SS TUBE

DRAWING NUMBER	REVISION
1319244	B

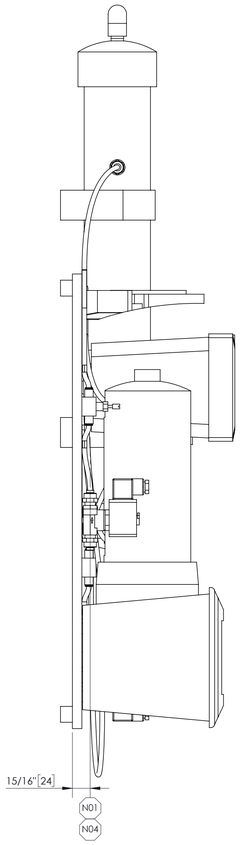
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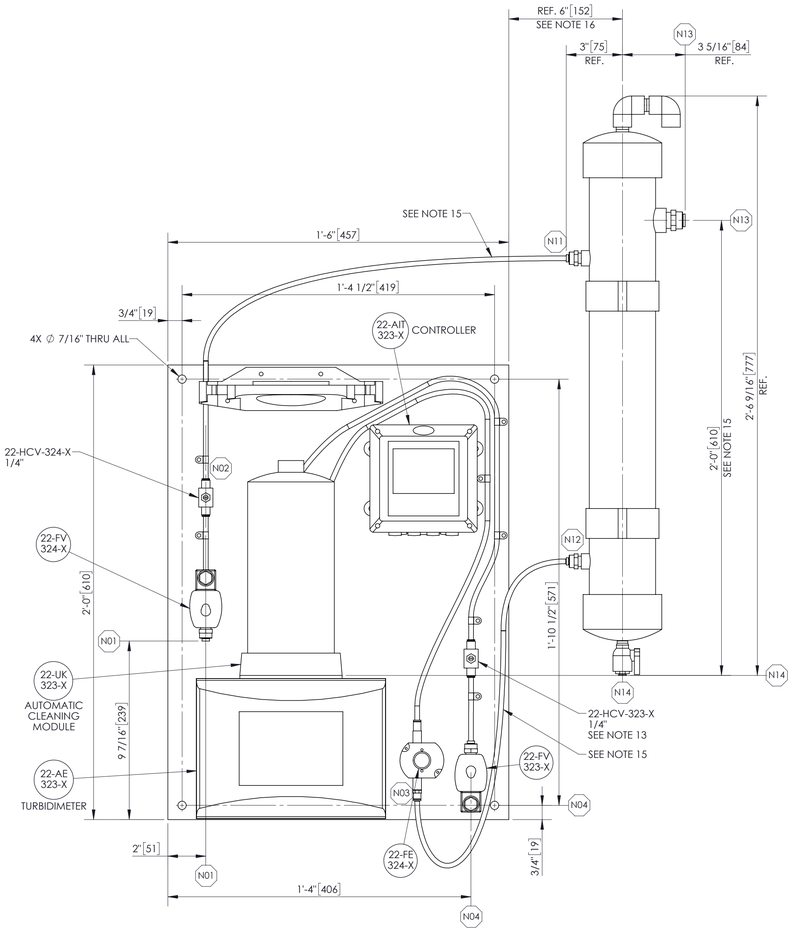
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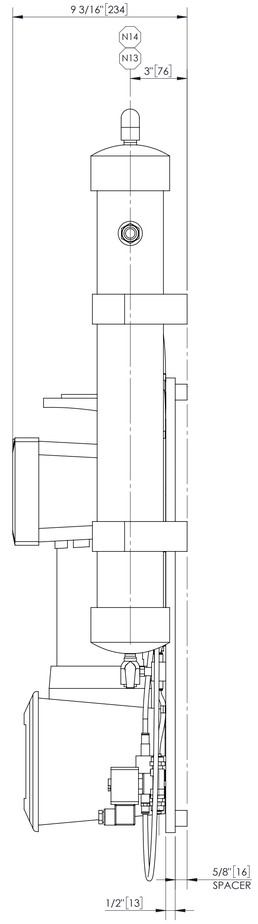
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MATERIAL #	DESCRIPTION
3177949	ASSY-TURBID,W/COLM,120V,SGL,HACH,TU5300
3178030	ASSY-TURBID,W/COLM,24V,SGL,HACH,TU5300
3178031	ASSY-TURBID,W/COLM,120V,SGL,HACH,TU5400
3178032	ASSY-TURBID,W/COLM,24V,SGL,HACH,TU5400







NOZZLE SCHEDULE			
NOZZLE	DESCRIPTION	TYPE	SIZE
N01	SAMPLE FROM PERMEATE PIPE	ODT	0.25
N02	PANEL TO DEGASSING COLUMN	ODT	0.25
N03	DEGASSING COLUMN DISCHARGE TO PANEL	ODT	0.25
N04	TO OPEN DRAIN	ODT	0.25
N11	PANEL TO DEGASSING COLUMN	ODT	0.25
N12	DEGASSING COLUMN DISCHARGE TO PANEL	ODT	0.25
N13	DEGASSING COLUMN O/F TO OPEN DRAIN	ODT	0.50
N14	DEGASSING COLUMN TO OPEN DRAIN	ODT	0.25

NOTES:

1. UNLESS NOTED OTHERWISE, DIMENSIONS GIVEN FOR INSTALLATION HAVE THE FOLLOWING TOLERANCES
   DIMENSIONS TO INTERFACE/NOZZLES: ±3/8"
   ANGLES: ±0.5°
2. TURBIDITY PANEL SHIPPING WEIGHT - 24 LB/[10.9 KG]
3. DEGASSING COLUMN SHIPPING WEIGHT - 7 LB/[3.2 KG]
4. TURBIDITY PANEL OPERATING WEIGHT - 25 LB/[11.3 KG]
5. DEGASSING COLUMN OPERATING WEIGHT - 13 LB/[5.9 KG]
6. ALL PIPING & EQUIPMENT SHOWN SHALL BE FULLY SUPPORTED BY SUEZ WT&S PRODUCTION.
7. ALL INTERCONNECTING PIPING SHALL BE FULLY & INDEPENDENTLY SUPPORTED BY OTHERS.
8. FASTENER MATERIAL:
   • SA307 GRADE B HEAVY HEX BOLTS/SA563 GRADE A HEAVY HEX NUTS
9. ALL VALVES & INSTRUMENTS TO BE PROPERLY TAGGED.
10. PIPING MATERIAL:
    • HIGH PRESSURE: N/A
    • LOW PRESSURE: SCH 80 PVC & PE TUBING
11. OPTIMAL SAMPLE FLOW RATE: 200-500 mL/min
12. THE DISTANCE FROM SAMPLE POINT MUST BE LESS THAN 12 FT [3.7 m]
13. FLOW REGULATOR VALVE IS REQUIRED TO CREATE BACK PRESSURE ON THE DRAIN LINE TO AVOID BUBBLES BEING CREATED AND EFFECTING TURBIDITY READINGS.
14. FLOW SET TO 3.3 GPH [210 ml/min]
15. 6FT (1.82m) OF 1/4" TUBING TO BE SHIPPED WITH PANEL FOR CONNECTING TO THE DEGASSING COLUMN ON SITE BY OTHERS.
16. DEGASSING COLUMN OVERFLOW CONNECTION IS TO BE MOUNTED A MINIMUM OF 24 in [610 mm] ABOVE THE TURBIDITY METER.
17. THERE IS NO SET DISTANCE THE TURBIDITY PANEL AND DEGASSING COLUMN SHOULD BE MOUNTED APPART. THIS DRAWING SHOWS THEM 6 in. [152 mm] AS REFERENCE ONLY. THE TOTAL MAXIMUM LENGTH OF TUBING CONNECTING THE PANEL AND DEGASSING COLUMN SHOULD BE UNDER 6 FT [1.82m].
18. ALL DIMENSIONS IN FEET & INCHES [MILLIMETERS]

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REDESIGN PANEL LAYOUT WITH AUTO CLEANER MODULE	139576	VC	RJ	SJ	09 Aug 22
B	CONTROLLER MODEL CHANGED TO HACH SC4500	139090	VE	VL	RJ	08 Apr 22
A	INITIAL DESIGN	135720	JR	RP	RJ	07 Apr 20

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X °
.XX FRAC
.XXX

CUSTOMER INFORMATION

ASSY-TURBID,W/COLUMN,SGL,HACH,TU5X00

DRAWING NUMBER	REVISION
1319233	C
REF.:	DOC. OWNER:

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
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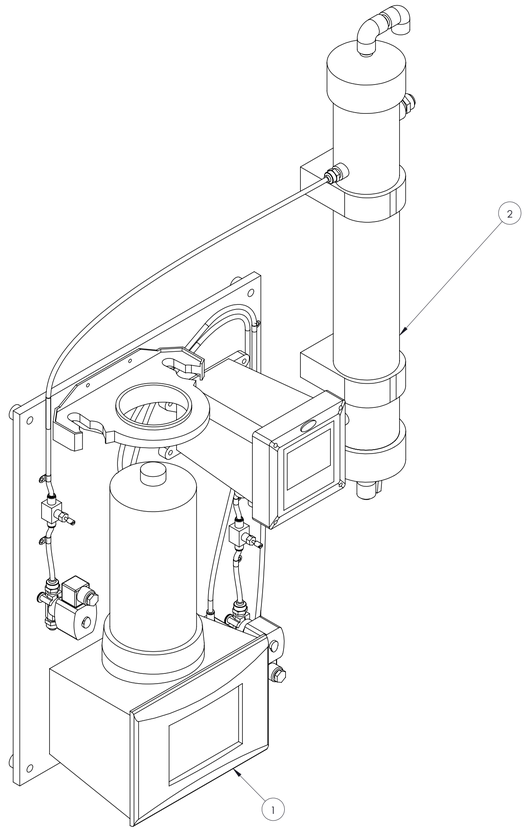
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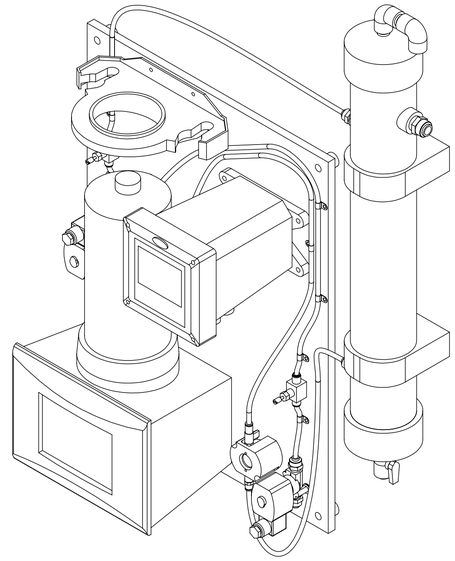
MM# 3177949 - TU5300, W/ 120V SOLENOIDS - EQUIPMENT TABLE				
ITEM	QTY.	SAP	DESCRIPTION	U/M
1	1	3177945	ASSY-TURBID,PERM,120VAC,SGL,HACH,TU5300	EA
2	1	3178033	ASSY-DESASSING,PVC,3.00,COLUMN	EA

MM# 3178030 - TU5300, W/ 24V SOLENOIDS - EQUIPMENT TABLE				
ITEM	QTY.	SAP	DESCRIPTION	U/M
1	1	3177946	ASSY-TURBID,PERM,24VDC,SGL,HACH,TU5300	EA
2	1	3178033	ASSY-DESASSING,PVC,3.00,COLUMN	EA

MM# 3178031 - TU5400, W/ 120V SOLENOIDS - EQUIPMENT TABLE				
ITEM	QTY.	SAP	DESCRIPTION	U/M
1	1	3177947	ASSY-TURBID,PERM,120VAC,SGL,HACH,TU5400	EA
2	1	3178033	ASSY-DESASSING,PVC,3.00,COLUMN	EA

MM# 3178032 - TU5400, W/ 24V SOLENOIDS - EQUIPMENT TABLE				
ITEM	QTY.	SAP	DESCRIPTION	U/M
1	1	3177948	ASSY-TURBID,PERM,24VDC,SGL,HACH,TU5400	EA
2	1	3178033	ASSY-DESASSING,PVC,3.00,COLUMN	EA





REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
C	REDESIGN PANEL LAYOUT WITH AUTO CLEANER MODULE	139576	VC	RJ	SJ	09 Aug 22
B	CONTROLLER MODEL CHANGED TO HACH SC4500	139090	VE	VL	RJ	08 Apr 22
A	INITIAL DESIGN	135720	JR	RP	RJ	07 Apr 20

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TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X °
.XX FRAC
.XXX

CUSTOMER INFORMATION

ASSY-TURBID,W/COLUMN,SGL,HACH,TU5X00

DRAWING NUMBER	REVISION
1319233	C
REF.:	DOC. OWNER:

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
	3177949, 3178030, 3178031, 3178032	1:4	D	2 OF 2

LAST SAVED: Tuesday, August 9, 2022 1:19:35 PM
FILE LOCATION: D:\SWP\DMS\SYSTEMS-PO\PO\13100001\

Engineering Sheet

E	*141105*	*UPDATED BRANDING*	*RJ*	*10-May-23*	*WM*	*10-May-22*
D	*139647*	*ADDED ADDITIONAL PSL*	*RJ*	*29-Jun-22*	*WM*	*29-Jun-22*
C	*133877*	*ADDED COVER SHEET*	*MR*	*25-Jun-20*	*WM*	*25-Jun-20*
B	*131798*	*REBRANDING*	*TG*	*14-Nov-18*	*MS*	*14-Nov-18*
A	*16481*	*INITIAL RELEASE*	*-*	*-*	*-*	*-*
REVISION	ECO	DESCRIPTION	PREP	DATE	APPD	DATE

PREPARED BY	*MR*	DATE	*25-Jun-20*	DOC NUMBER	*1314692*
CHECKED BY	*WM*	DATE	*25-Jun-20*	REVISION	*E*
APPROVER 1		DATE		PART NUMBER	*3148892*
APPROVER 2	*WM*	DATE	*25-Jun-20*	SHEET	*1 OF 2*
				PROJECT NUMBER	

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DOC NUMBER: 1314692, REV. E

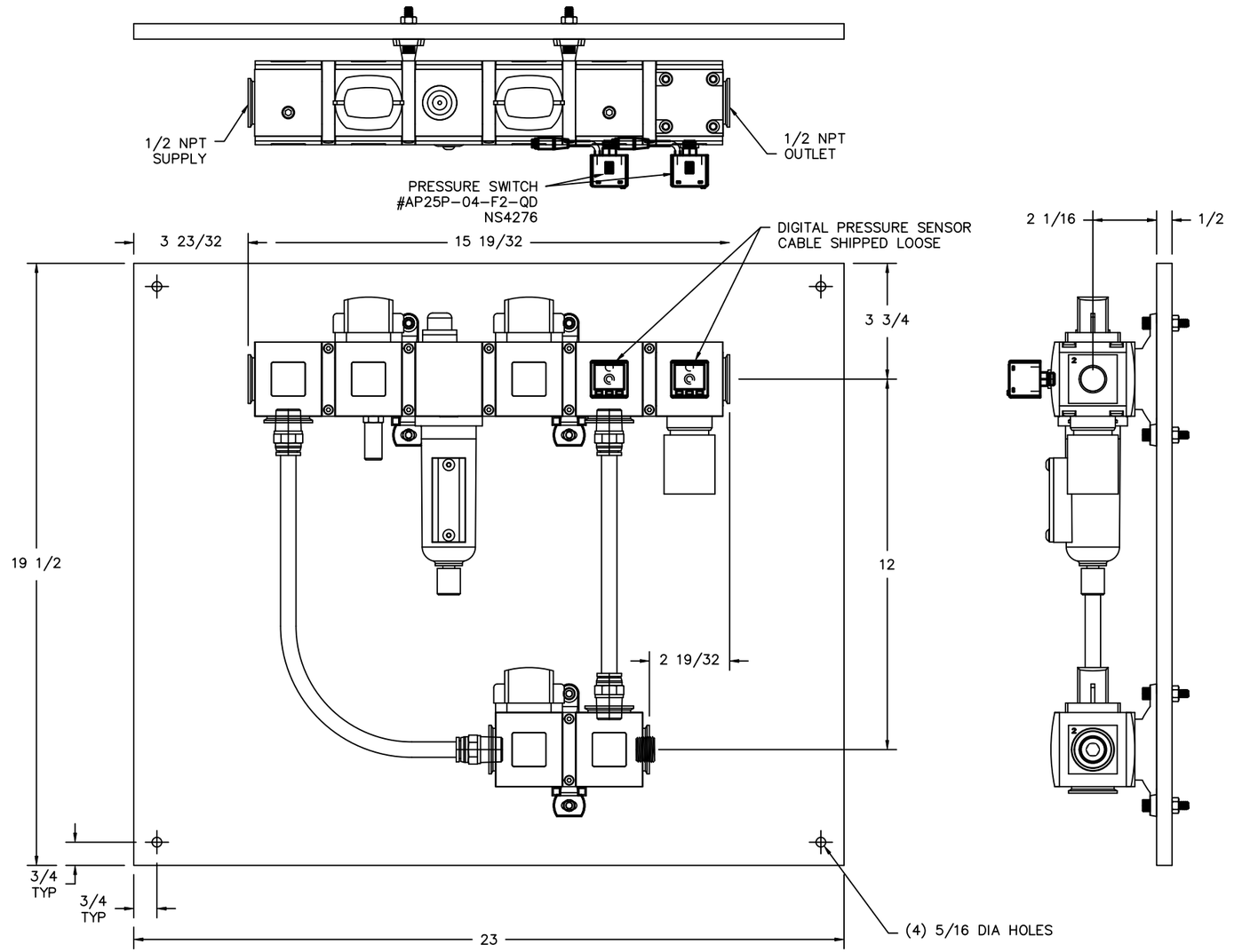
TITLE:

ASSY-INSTR,AIR,30CFM,NUM,W/ PNL

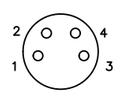
CLIENT:

LOCATION:

90-HV-005
90-HV-006
90-HV-004
90-F-002
90-PDI-001
90-PCV-001
90-PSLL-002
90-PSL-003



1NCS22-118012-2 CONSISTS OF			
PARTS LIST			
DET. NO.	NO. REQ'D	PART NAME	PART NO.
1	1	652 AIR PREP ASSEMBLY	A652A0000012901
1A	1	652 DIVERTER BLOCK	8652AD004TA0000
1B	1	652 SHUT-OFF	8652A3M04011100
1C	1	652 COAL FILTER	8652AFML4HA000N
1D	1	652 SHUT-OFF	8652A2M040A0000
1E	1	652 DIVERTER BLOCK	8652AD004TA0000
1F	1	652 REGULATOR	8652AK004N122G0
1G	2	SUPPORT BRACKET	P699AT502467001
2	1	652 AIR PREP ASSEMBLY	A652A0000012584
2A	1	652 SHUT-OFF	8652A2M040A0000
2B	1	652 DIVERTER BLOCK	8652AD004TA0000
2C	1	SUPPORT BRACKET	P699AT502467001
3	1	1/2 NPT S.S. PIPE PLUG	129-197
4	4	MALE CONNECTOR	INB103-102-023
5	1	MOUNTING PLATE	NS5752
6	6	1/4-20 X 1 1/4 SS SHCS	NS3878
7	6	1/4-20 SS HEX NUT	NS2621
8	2	PRESSURE SWITCH	NS4276
9	2	5M CABLE	NS5751
10	1	REDUCER BUSHING	NS3567
11	3	1/2 OD BLUE TUBING	QRTU50BL-1



ELECTRICAL PINOUT
PIN #1 = BROWN (+)
PIN #2 = WHITE (OUT 2)
PIN #3 = BLUE (-)
PIN #4 = BLACK (OUT 1)

MAX FLOW: 30.5 SCFM (870 L/M)
@ 91 PSI WITH 5 PSI PRESSURE DROP

VSI #118012

LET	CHANGE	NO.	DATE	BY
AA	INITIAL RELEASE	-	6/17/22	JRR

REV: AA
CRITICAL TO FUNCTION
3RD ANGLE PROJECTION
SHEET 1 OF 1
CASTING NO.

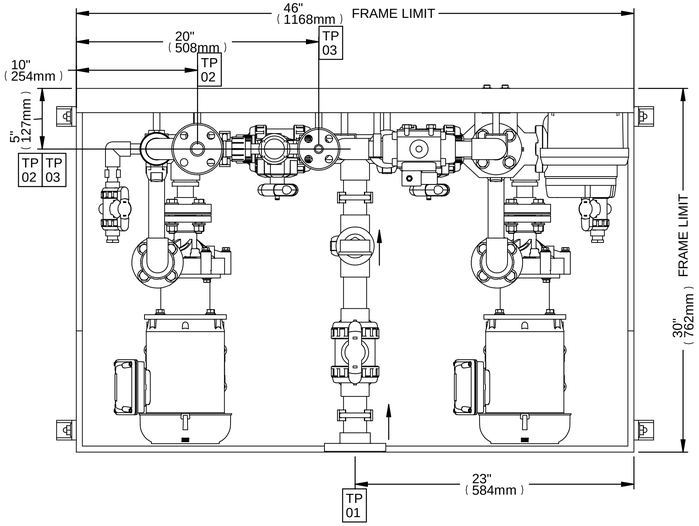
SAP #3148892

BREAK ALL SHARP EDGES EXCEPT AS SHOWN
DECIMAL TOLERANCES
2 PLACE ± .010
3 PLACE ± .005
ANGLES ± 1/2°
ALL RIGHTS RESERVED

INITIAL—
DATE—

DRAWN: JRR 6/16/22
APPROVED: - -
SCALE: 1:2
NOVI, MICHIGAN USA
EMERSON
MATERIAL: -
PART NAME: VESSA WTS SERVICES 652 AIR PREP ASSEMBLY WITH HDPE MOUNTING PLATE
PART NO.: 1NCS22-118012-2

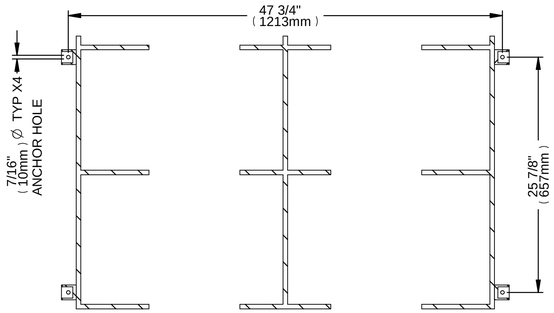
PN: 1122685



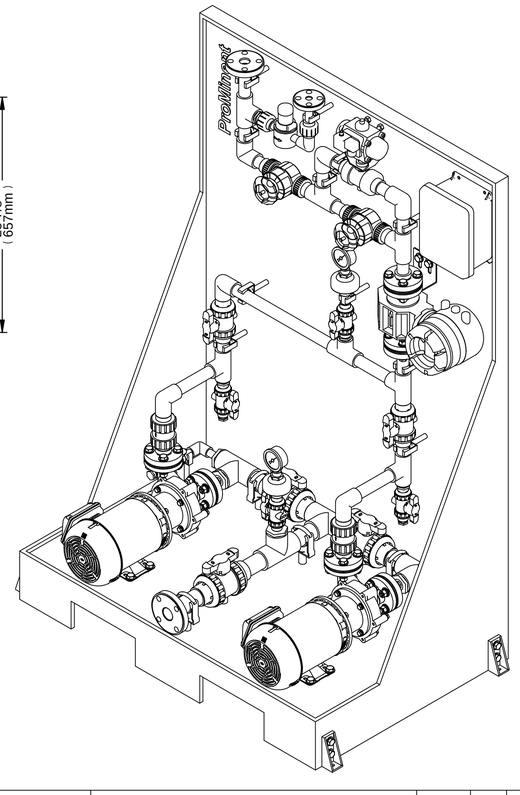
TERMINATION POINT SCHEDULE		
NOZZLE(TP)	SERVICE	CONNECTION
01	SUCTION / INLET	1-1/2" FF FLANGE, 150#, PVC
02	DISCHARGE / OUTLET	1" FF FLANGE, 150#, PVC
03	PSV RELIEF OUTLET	1/2" FF FLANGE, 150#, PVC

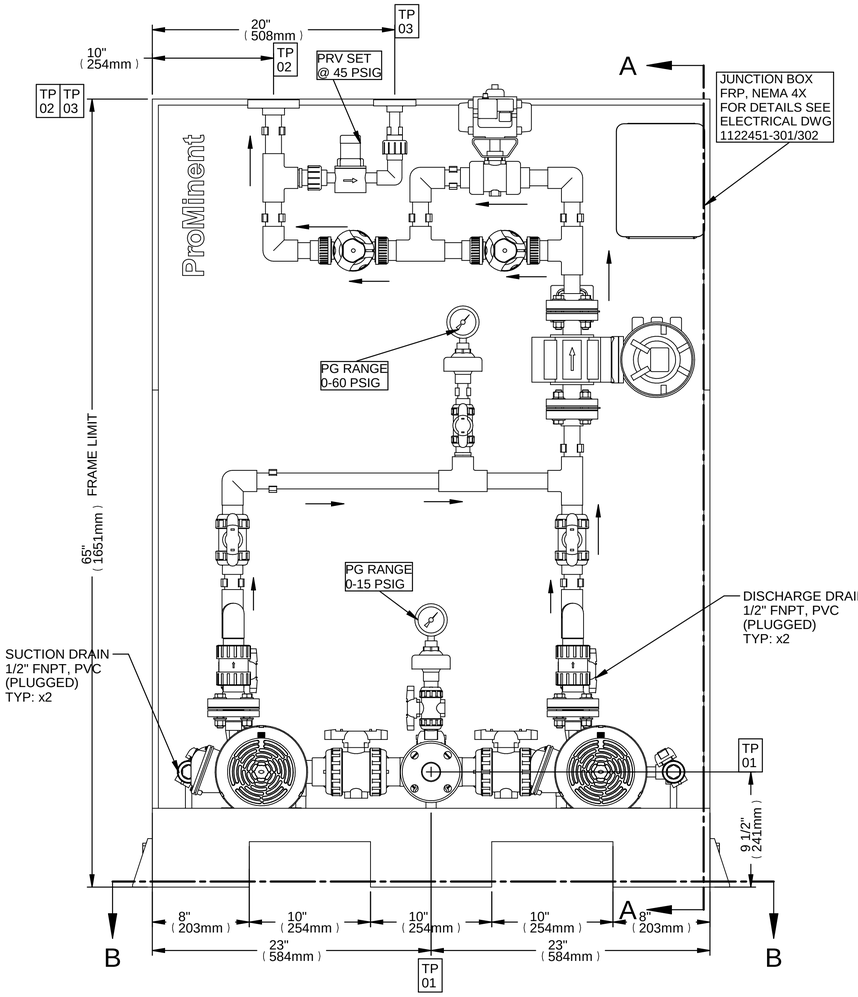
MAG DRIVE CENTRIFUGAL PUMP
MODEL: DB9V-R-E-FF-M219
MAXIMUM FLOW: 46 USGPM @ HEAD 11FT
MINMUM FLOW: 0.5 USPGM @ HEAD 67FT
CONSTRUCTION MATERIALS: PVDF/EPDM O-RING
MOTOR: 3435 RPM,1 HP (0.75 kW), 230/460V,60 Hz, 3 Ph
TYP: x2 (DUTY / STANDBY)

NOTE:SYSTEM OPERATING CONDITIONS ARE DIFFERENT FROM PUMP PERFORMANCE CURVE.
PLEASE REFER TO DRAWING NOTES ON SECOND PAGE FOR SYSTEM OPERATING & DESIGN CONDITIONS

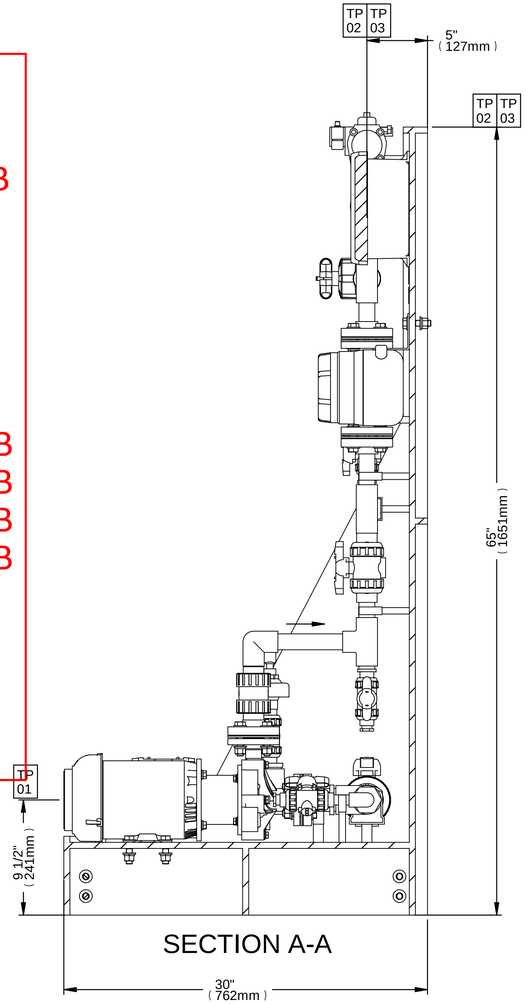


SECTION B-B
FOOTPRINT
USE QTY:4, 3/8" BOLTS
(ANCHOR BOLTS NOT IN PROMINENT SCOPE)





TAG:
23-P-301-A/B
23-CV-305-A/B
23-HCV-305
23-HCV-306
23-PSV-301
23-STR-303
23-HV-301
23-HV-302
23-HV-303-A/B
23-HV-304-A/B
23-HV-307-A/B
23-HV-306-A/B
23-HV-308
23-PI-301
23-PI-302
23-FIT-301
23-FV-305



SECTION A-A

REV	DATE (YYYY-MM-DD)	DESCRIPTION	BY	APPD	REVD
1	2022-08-19	REVISED NOTE 7	GB	RJ	
0	2022-03-15	INITIAL RELEASE	GB	RJ	

REVISIONS

CUSTOMER
SUEZ WATER TECHNOLOGIES & SOLUTIONS

SUBJECT

PFC PROSIP No
1122685

PURCHASE ORDER No
--

PURCHASER'S EQUIP. No

TITLE
SUEZ MAGDRIVE-F PVC-EPDM, 2P 460V
- GENERAL ARRANGEMENT DRAWING -

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ENGINEERS SEAL

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THE PROMINENT GROUP OF COMPANIES

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GUELPH, ONTARIO, CANADA
N1G 4P5
TEL. 519 836 5692 FAX. 519 836 5226

PROMINENT FLUID CONTROLS INC.
136 INDUSTRY DRIVE,
PITTSBURGH P.A., USA.
15275
TEL. 412 787 2484 FAX. 412 787 0704

DESIGNED	GB	APPROVED	
DRAWN	GB	SCALE	NTS
CHECKED	RJ	DATE (YYYY-MM-DD)	2022-03-15

SHEET No: 1/2

CUSTOMER DWG No

PFC DWG No
1122685-200- 1

REV
1

PN: 1122685

COMPONENT LIST

*PART IS HIDDEN FROM VIEW

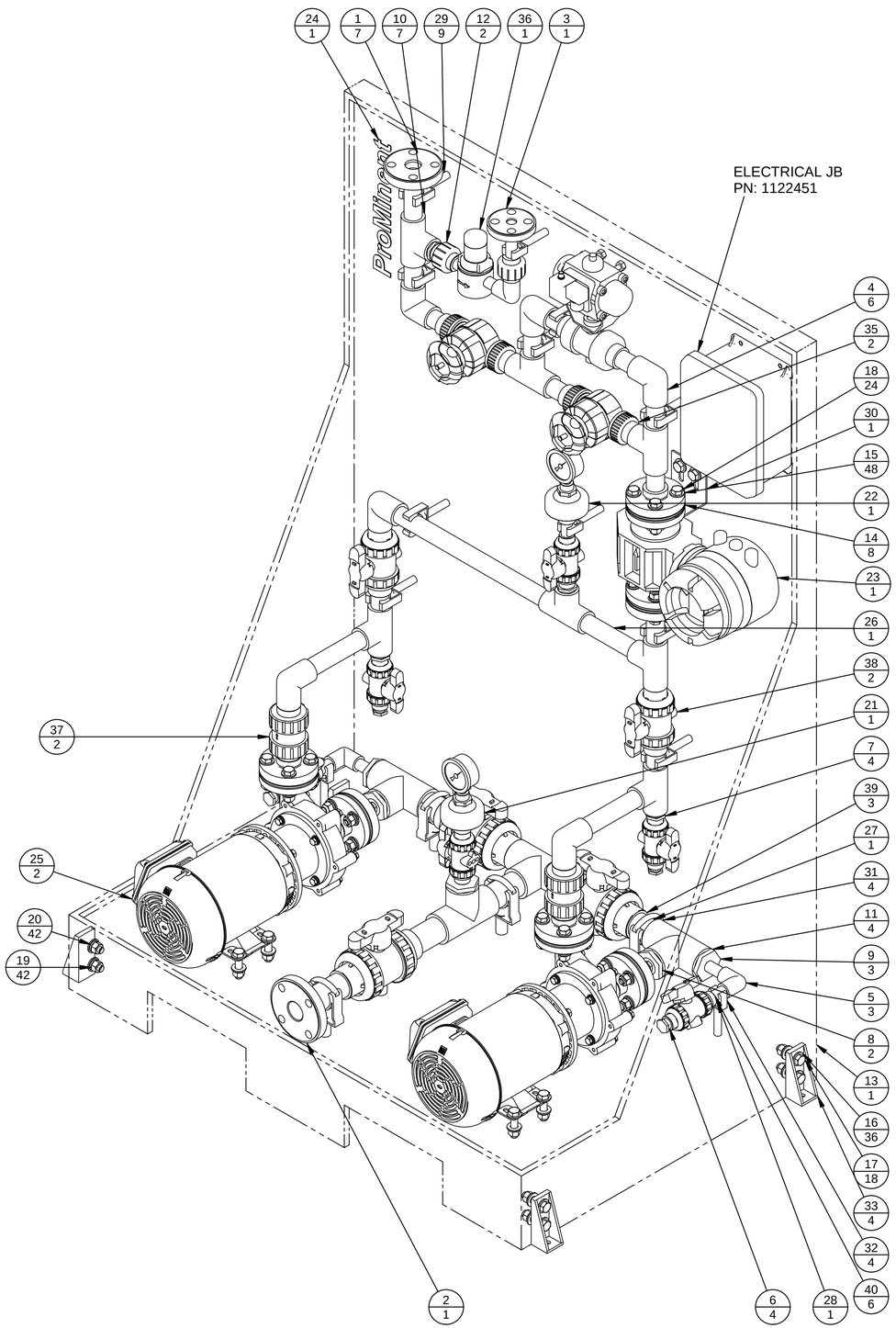
ITEM	PART #	DESCRIPTION	QTY
1	7740695	FITTING: 1" SW FLANGE, 1PC, 150#, SCH80, PVC, ASTM D 1784	7
2	7900948	FITTING: 1-1/2" SW FLANGE, 1PC, 150#, SCH80, PVC, ASTM D 1784	1
3	7741396	FITTING: 1/2" SW FLANGE, 1PC, 150#, SCH80, PVC, ASTM D 1784	1
4	7741327	FITTING: ELBOW, 1" SWxSW, PVC, SCH 80	6
5	7260006	FITTING: ELBOW, 1/2" SWxSW, PVC, SCH 80	3
6	7000325	FITTING: PLUG 1/2" MNPT PVC SCH 80	4
7	7741358	FITTING: REDUCER BUSHING, 1" SPIG x 1/2" SW, PVC SCH80	4
8	7900952	FITTING: REDUCER BUSHING, 1-1/2" SPIG x 1" SW, PVC SCH80	2
9	7900950	FITTING: REDUCER BUSHING, 1-1/2" SPIG x 1/2" SW, PVC SCH80	3
10	7741333	FITTING: TEE, 1" SWxSWxSW, PVC, SCH80	7
11	7741442	FITTING: TEE, 1-1/2" SWxSWxSW, PVC, SCH 80	4
12	7260035	FITTING: UNION, 1/2" SWxSW, PVC, EPDM, SCH80	2
13	1122575	FRAME: MAG DRIVE 2 PUMP, 65" x 46" x 30", BLACK PE	1
14	7904559	GASKET: 1", FULL FACE, 150#, 1/8" THICK, EPDM	8
15	7902194	HARDWARE: FLAT WASHER, 1/2", 1.060" OD, 316 SS	48
16	7900011	HARDWARE: FLAT WASHER, 1/2", 316 SS	36
17	7902724	HARDWARE: HEX CAP SCREW, 1/2"-13, 2" LG, 18-8 SS, 1-1/4" THREAD LG	18
18	7900847	HARDWARE: HEX CAP SCREW, 1/2"-13, 2.5"LG, 18-8 SS, 1" THREAD LG	24
19	7900015	HARDWARE: HEX NUT, 1/2"-13, 18-8 SS	42
20	7900012	HARDWARE: LOCK WASHER, 1/2", 18-8 SS	42
21	1121677	INSTRUMENT: 2 -1/2" PRESSURE GAUGE, 0-15 PSIG, 304SS CASE, 316SS INTERNALS, REMOVEABLE BEZZEL 1/4" MNPT BOTTOM MOUNT, SILICONE OIL FILL WITH PVC ISOLATOR, 1/2" SOCKETWELD PROCESS CONNECTION, 1/4" FNPT GAUGE CONNECTION, GLYCERINE FILL, WIKA	1
22	1121678	INSTRUMENT: 2 -1/2" PRESSURE GAUGE, 0-60 PSIG, 304SS CASE, 316SS INTERNALS, 1/4" MNPT BOTTOM MOUNT, SILICONE OIL FILL WITH PVC ISOLATOR, 1/2" SOCKETWELD PROCESS CONNECTION, 1/4" FNPT GAUGE CONNECTION, GLYCERINE FILL, WIKA	1
23	1122666+1122667+1122667	INSTRUMENT: MAGNETIC FLOW METER, PROMAG 10P25, DN25, INTEGRAL UNIT, 1" FLANGE 150# CONNECTIONS-SS(NON WETTED, PTFE LINER ANSI B16.5, CONNECTIONS, INTEGRAL MOUNTED NEMA-4X ENCLOSURE WITH LCD DISPLAY, 4-20mA OUTPUT, HART PROTOCOL, WITH TWO ALLOY C22 GROUND DISKS. 24VDC - ENDRESS-HAUSER	1
24	7900315	LABEL: PROMINENT LOGO, WHITE & ORANGE x 1-7/8"H, VINYL	1
25	1122453	MAG DRIVE CENTRIFUGAL PUMP, 1" 150# RFSO, PVDF IMPELLER, EPDM, 230/460V, 3 Ph, 60 Hz, FINISH THOMPSON INC	2
26	7741324	PIPE: 1", PVC, SCH80	8FT
27	7741447	PIPE: 1-1/2", PVC, SCH80	4FT
28	7741400	PIPE: 1/2", PVC, SCH80	2FT
29	7741318	SUPPORT: 1" (32mm) PIPE CLIP WITH 1/4" x 2-1/4" PVC PIPE STANDOFF	9
30	1122577	SUPPORT: 1"FLANGE SUPPORT BRACKET, TYPE 1, 304 SS	1
31	7741590	SUPPORT: 1-1/2" (50mm) PIPE CLIP WITH 1/2" x 1-1/2" PVC PIPE STANDOFF	4
32	7260010	SUPPORT: 1/2" (20mm) PIPE CLIP WITH 1/4" x 2-1/2" PVC PIPE STANDOFF	4
33	7900388	SUPPORT: FRP INSIDE CORNER GUSSET 1-5/8" x4", 3 HOLE	4
34*	1122519	VALVE: 1" ACTUATOR PNEUMATIC, PA SERIES, PAS00, ON 1" PVC/EPDM, TYPE 21 UNION BALL VALVE, WITH PAD MOUNTED SOLENOID VALVE. 24 VDC - CHEMLINE,	1
35	1116853	VALVE: 1" DIAPHRAGM VALVE, PVC/EPDM, TYPE 514 PVC-U, SOCKET WELD ASTM, TRUE UNION. - GEORG FISCHER	2
36	1019883	VALVE: BACK PRESSURE VALVE, 1/2" SW CONNECTION, BODY MATERIAL PVC, PRESSURE RANGE 0-150PSI, PROMINENT	1
37	7903817	VALVE: BALL CHECK VALVE, 1" SW, TRUE UNION, BODY MATERIAL PVC, SEALS EPDM, CHEMLINE	2
38	7152157	VALVE: BALL VALVE, 1" SW, BODY MATERIAL PVC, SEALS EPDM, (COMES WITH SOCKET & FNPT ENDS), TYPE 21, CHEMLINE	2
39	7904867	VALVE: BALL VALVE, 1-1/2" SW, BODY MATERIAL PVC, SEALS EPDM, (COMES WITH SOCKET & FNPT ENDS), TYPE 21, CHEMLINE	3
40	7901183	VALVE: BALL VALVE, 1/2" SW, BODY MATERIAL PVC, SEALS EPDM, (COMES WITH SOCKET & FNPT ENDS), TYPE 21, CHEMLINE	6

SHIPPED LOOSE ITEMS

ITEM	PART #	DESCRIPTION	QTY
SL	1062205	DEVICE: 1-1/2" TRUE UNION Y SEDIMENT STRAINER, PVC/EPDM SW	1

MAG DRIVE CENTRIFUGAL PUMP
MODEL: DB9V-R-E-FF-M219
MAXIMUM FLOW: 46 USGPM @ HEAD 11FT
MINMUM FLOW: 0.5 USPGM @ HEAD 67FT
CONSTRUCTION MATERIALS: PVDF/EPDM O-RING
MOTOR: 3435 RPM,1 HP (0.75 kW), 230/460V,60 Hz, 3 Ph
TYP: x2 (DUTY / STANDBY)

1/2 TOP SIDE = CHART NUMBER
BOTTOM SIDE = QUANTITY NUMBER



NOTES:

1. SYSTEM IS DESIGNED, FABRICATED, TESTED AND INSPECTED AS PER PROMINENT STANDARD

2. PIPING MATERIAL IS PVC SCH 80 IN CONFORMANCE WITH ASTM D 1785 (FOR PHYSICAL DIMENSIONS, TEST REQUIREMENTS AND MAXIMUM OPERATING PRESSURE) IN SIZES1-1/2",1" & 1/2" PIPE.
ALL CONNECTIONS ARE 1-1/2", 1" & 1/2" SCH 80 PVC SOCKET WELD UNLESS OTHERWISE REQUIRED BY PIPELINE DEVICES.UNIONS ARE TRUE UNION STYLE, SCH80 PVC WITH EPDM O-RING SEAL RATED FOR 150 PSIG. FLANGES ARE PVC, FULL FACE, CLASS 150, ASME/ANSI B16.5.

3.GASKETS ARE FULL FACE TYPE, CLASS 150, EPDM, 1/8" THK FOR FLANGE CONNECTION, ASME B16.20.

4. BOLTING ARE 18-8 SS HEX CAP SCREW WITH FLAT WASHER, LOCK WASHER AND 18-8 SS HEX NUT.

5. PUMP AND PIPING SUPPORT FRAME IS CONSTRUCTED OF BLACK POLYETHYLENE. MATERIAL THICKNESS: 1/2" [13MM].AND IS FABRICATED BY WELD CONSTRUCTION.

6. ALL INTERCONNECTING PIPE & FITTINGS AND WIRING BY OTHERS.

7. ALL SEAL MATERIAL IS PTFE/EPDM UNLESS OTHERWISE SPECIFIED BY CUSTOMER.

8. TOLERANCE ON ALL TERMINATION POINTS: +/-10mm (+/-3/8").

APPROX.SHIPPING WEIGHT: 285 LB (129 Kg).
APPROX.OPERATING WEIGHT: 310LB (140 Kg).

DESIGN NOTES:
SYSTEM OPERATING CONDITIONS ARE DIFFERENT FROM PUMP PERFORMANCE CURVE
MAXIMUM SYSTEM OPERATING FLOW: 30 USGPM @ 14 PSIG
MINIMUM SYSTEM OPERATING FLOW: 0.5 USGPM @ 29 PSIG

UPSTREAM INJECTION PUMP-SUCTION:

- DESIGN TEMPERATURE: MIN. 15ºC TO MAX. 25ºC
- DESIGN PRESSURE: 14.7 PSIG
- MIN. TEST PRESSURE: 25 PSIG

DOWNSTREAM INJECTION PUMP-DISCHARGE:

- DESIGN TEMPERATURE: MIN. 15ºC TO MAX. 25ºC
- DESIGN PRESSURE: 45 PSIG
- MIN. TEST PRESSURE: 55 PSIG

TESTING CONDITION:

- TEST TYPE: HYDROSTATIC
- TEST MEDIUM: WATER
- TEST TEMPERATURE: AMBIENT 68ºF (20ºC)
- TEST DURATION: 10 MIN. (MINIMUM)

CORROSION ALLOWANCE: 0.0" (0.0mm).

REV	DATE (YYYY-MM-DD)	DESCRIPTION	BY	APPD	REVD
1	2022-08-19	REVISED NOTE 7	GB	RJ	
0	2022-03-15	INITIAL RELEASE	GB	RJ	

REVISIONS

CUSTOMER
SUEZ WATER TECHNOLOGIES & SOLUTIONS

SUBJECT

PFC PROSIP No
1122685

PURCHASE ORDER No
--

PURCHASER'S EQUIP. No

TITLE
SUEZ MAGDRIVE-F PVC-EPDM, 2P 460V
- BILL OF MATERIALS -

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ENGINEERS SEAL

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GUELPH, ONTARIO, CANADA
N1G 4P5
TEL. 519 836 5692 FAX. 519 836 5226
PROMINENT FLUID CONTROLS INC.
136 INDUSTRY DRIVE,
PITTSBURGH P.A., USA.
15275
TEL. 412 787 2484 FAX. 412 787 0704

DESIGNED	GB	APPROVED	
DRAWN	GB	SCALE	NTS
CHECKED	RJ	DATE (YYYY-MM-DD)	2022-03-15

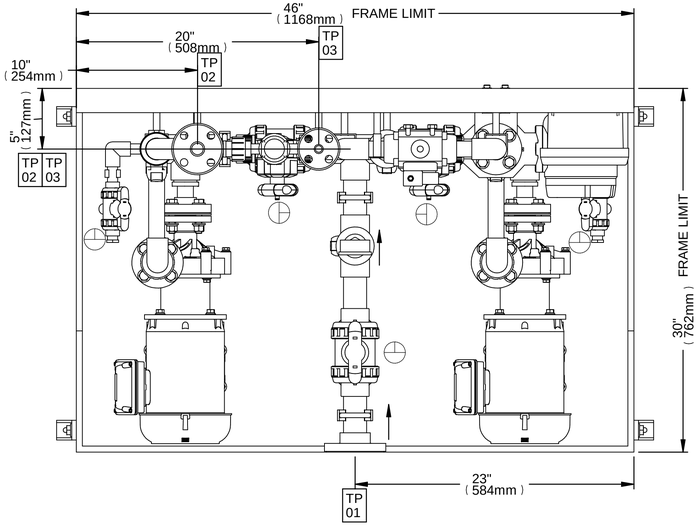
SHEET No: 2/2

CUSTOMER DWG No

PFC DWG No
1122685-200- 2

REV
1

PN: 1122683



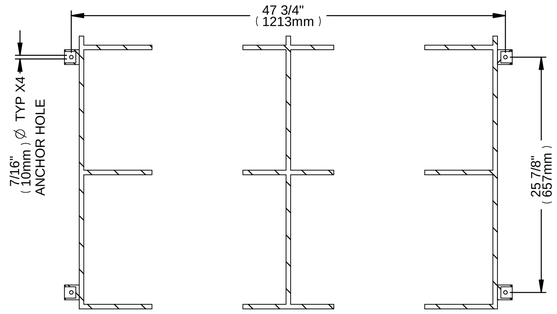
TERMINATION POINT SCHEDULE		
NOZZLE(TP)	SERVICE	CONNECTION
01	SUCTION / INLET	1-1/2" FF FLANGE, 150#, PVC
02	DISCHARGE / OUTLET	1" FF FLANGE, 150#, PVC
03	PSV RELIEF OUTLET	1/2" FF FLANGE, 150#, PVC

MAG DRIVE CENTRIFUGAL PUMP
MODEL: DB9V-R-FF-M219
MAXIMUM FLOW: 46 USGPM @ HEAD 11FT
MINMUM FLOW: 0.5 USPGM @ HEAD 67FT
CONSTRUCTION MATERIALS: PVDF/FKM O-RING
MOTOR: 3435 RPM,1 HP (0.75 kW), 230/460V,60 Hz, 3 Ph
TYP: x2 (DUTY / STANDBY)

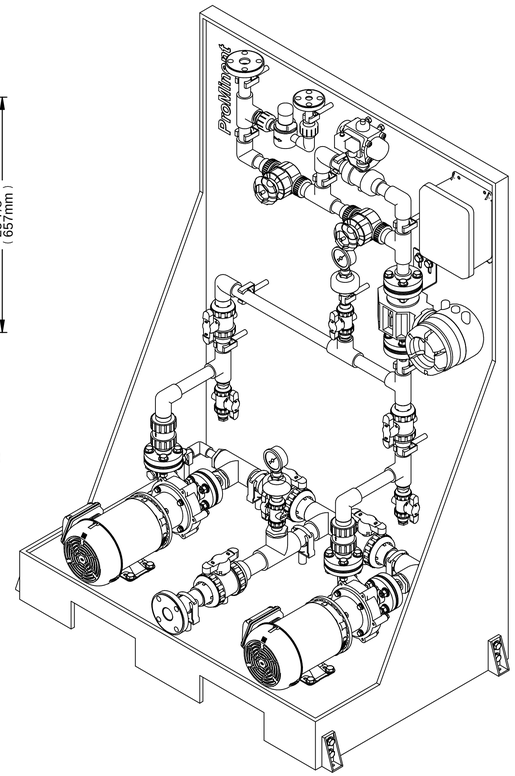
NOTE:SYSTEM OPERATING CONDITIONS ARE DIFFERENT FROM PUMP PERFORMANCE CURVE. PLEASE REFER TO DRAWING NOTES ON SECOND PAGE FOR SYSTEM OPERATING & DESIGN CONDITIONS

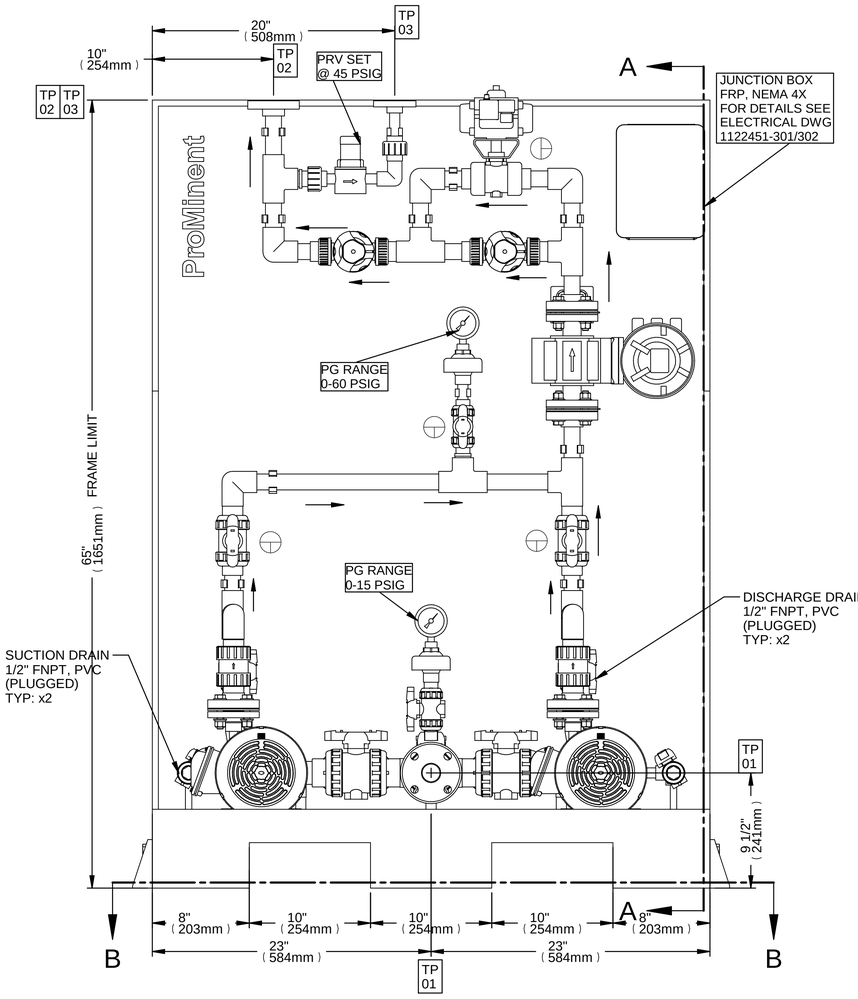
VENTED BALL VALVES REQUIRED

⊕-THIS SYMBOL INDICATES SIDE OF THE VALVE THAT THE BALL IS TO BE VENTED TO. DRILL Ø1/8" HOLE.

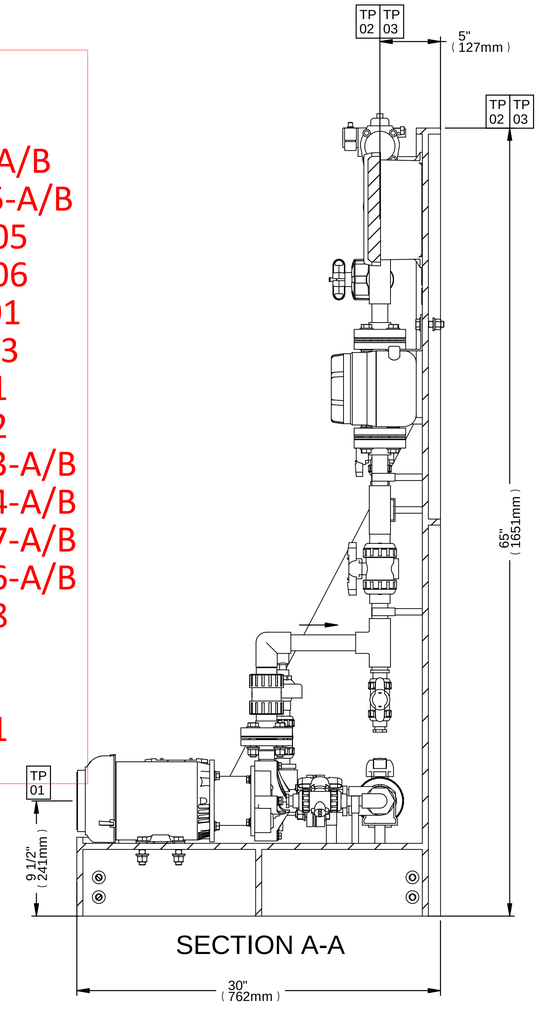


SECTION B-B
FOOTPRINT
USE QTY:4, 3/8" BOLTS
(ANCHOR BOLTS NOT IN PROMINENT SCOPE)





TAG:
23-P-101-A/B
23-CV-105-A/B
23-HCV-105
23-HCV-106
23-PSV-101
23-STR-103
23-HV-101
23-HV-102
23-HV-103-A/B
23-HV-104-A/B
23-HV-107-A/B
23-HV-106-A/B
23-HV-108
23-PI-101
23-PI-102
23-FIT-101
23-FV-105



SECTION A-A

REV	DATE (YYYY-MM-DD)	DESCRIPTION	BY	APPD	REVD
0	2022-03-14	INITIAL RELEASE	GB	RJ	

REVISIONS

CUSTOMER
SUEZ WATER TECHNOLOGIES & SOLUTIONS

SUBJECT

PFC PROSIP No
1122683

PURCHASE ORDER No
--

PURCHASER'S EQUIP. No

TITLE
SUEZ MAGDRIVE-F PVC-VITON, 2P 460V
- GENERAL ARRANGEMENT DRAWING -

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PROMINENT FLUID CONTROLS INC.
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DESIGNED	GB	APPROVED	
DRAWN	GB	SCALE	NTS
CHECKED	RJ	DATE (YYYY-MM-DD)	2022-03-14

SHEET No: 1/2

CUSTOMER DWG No

PFC DWG No
1122683-200- 1

REV
0

PN: 1122683

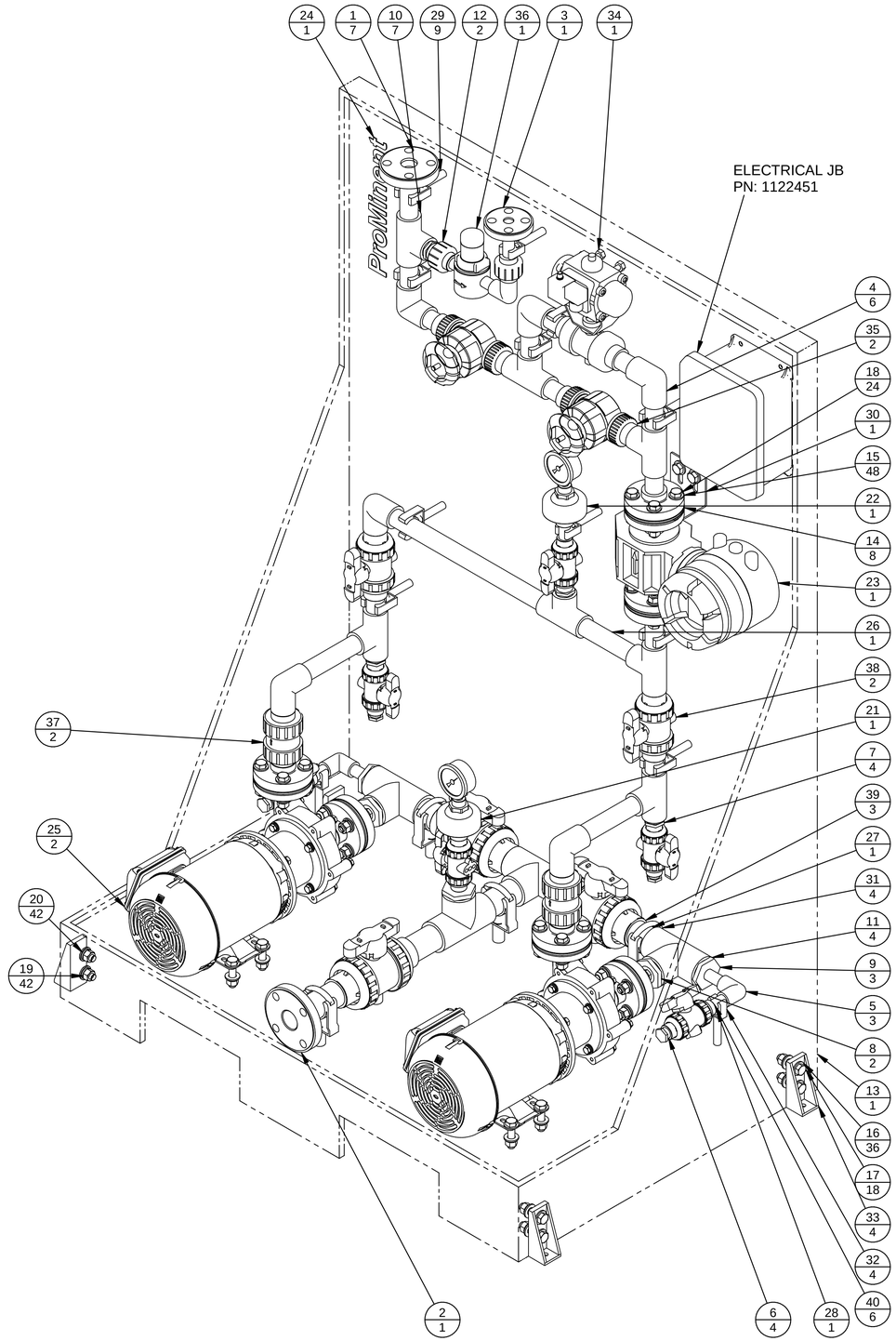
COMPONENT LIST *PART IS HIDDEN FROM VIEW

ITEM	PART #	DESCRIPTION	QTY
1	7740695	FITTING: 1" SW FLANGE, 1PC, 150#, SCH80, PVC, ASTM D 1784	7
2	7900948	FITTING: 1-1/2" SW FLANGE, 1PC, 150#, SCH80, PVC, ASTM D 1784	1
3	7741396	FITTING: 1/2" SW FLANGE, 1PC, 150#, SCH80, PVC, ASTM D 1784	1
4	7741327	FITTING: ELBOW, 1" SWxSW, PVC, SCH 80	6
5	7260006	FITTING: ELBOW, 1/2" SWxSW, PVC, SCH 80	3
6	7000325	FITTING: PLUG 1/2" MNPT PVC SCH 80	4
7	7741358	FITTING: REDUCER BUSHING, 1" SPIG x 1/2" SW, PVC SCH80	4
8	7900952	FITTING: REDUCER BUSHING, 1-1/2" SPIG x 1" SW, PVC SCH80	2
9	7900950	FITTING: REDUCER BUSHING, 1-1/2" SPIG x 1/2" SW, PVC SCH80	3
10	7741333	FITTING: TEE, 1" SWxSWxSW, PVC, SCH80	7
11	7741442	FITTING: TEE, 1-1/2" SWxSWxSW, PVC, SCH 80	4
12	7740551	FITTING: UNION, 1/2" SWxSW, PVC, VITON, SCH80	2
13	1122575	FRAME: MAG DRIVE 2 PUMP, 65" x 46" x 30", BLACK PE	1
14	7901609	GASKET: 1", FULL FACE, 150#, 1/8" THICK, FPM (VITON)	8
15	7902194	HARDWARE: FLAT WASHER, 1/2", 1.060" OD, 316 SS	48
16	7900011	HARDWARE: FLAT WASHER, 1/2", 316 SS	36
17	7902724	HARDWARE: HEX CAP SCREW, 1/2"-13, 2" LG, 18-8 SS, 1-1/4" THREAD LG	18
18	7900847	HARDWARE: HEX CAP SCREW, 1/2"-13, 2.5"LG, 18-8 SS, 1" THREAD LG	24
19	7900015	HARDWARE: HEX NUT, 1/2"-13, 18-8 SS	42
20	7900012	HARDWARE: LOCK WASHER, 1/2", 18-8 SS	42
21	1121677	INSTRUMENT: 2 -1/2" PRESSURE GAUGE, 0-15 PSIG, 304SS CASE, 316SS INTERNALS, REMOVEABLE BEZZEL 1/4" MNPT BOTTOM MOUNT, SILICONE OIL FILL WITH PVC ISOLATOR, 1/2" SOCKETWELD PROCESS CONNECTION, 1/4" FNPT GAUGE CONNECTION, GLYCERINE FILL, WIKA	1
22	1121678	INSTRUMENT: 2 -1/2" PRESSURE GAUGE, 0-60 PSIG, 304SS CASE, 316SS INTERNALS, 1/4" MNPT BOTTOM MOUNT, SILICONE OIL FILL WITH PVC ISOLATOR, 1/2" SOCKETWELD PROCESS CONNECTION, 1/4" FNPT GAUGE CONNECTION, GLYCERINE FILL, WIKA	1
23	1122666+1122667+1122667	INSTRUMENT: MAGNETIC FLOW METER, PROMAG 10P25, DN25, INTEGRAL UNIT, 1" FLANGE 150# CONNECTIONS-SS(NON WETTED, PTFE LINER ANSI B16.5, CONNECTIONS, INTEGRAL MOUNTED NEMA-4X ENCLOSURE WITH LCD DISPLAY, 4-20mA OUTPUT, HART PROTOCOL, WITH TWO ALLOY C22 GROUND DISKS. 24VDC - ENDRESS-HAUSER	1
24	7900315	LABEL: PROMINENT LOGO, WHITE & ORANGE x 1-7/8"H, VINYL	1
25	1122452	MAG DRIVE CENTRIFUGAL PUMP, 1" 150# RFSO, PVDF IMPELLER, VITON, 230/460V, 3 Ph, 60 Hz, FINISH THOMPSON INC.	2
26	7741324	PIPE: 1", PVC, SCH80	8FT
27	7741447	PIPE: 1-1/2", PVC, SCH80	4FT
28	7741400	PIPE: 1/2", PVC, SCH80	2FT
29	7741318	SUPPORT: 1" (32mm) PIPE CLIP WITH 1/4" x 2-1/4" PVC PIPE STANDOFF	9
30	1122577	SUPPORT: 1"FLANGE SUPPORT BRACKET, TYPE 1, 304 SS	1
31	7741590	SUPPORT: 1-1/2" (50mm) PIPE CLIP WITH 1/2" x 1-1/2" PVC PIPE STANDOFF	4
32	7260010	SUPPORT: 1/2" (20mm) PIPE CLIP WITH 1/4" x 2-1/2" PVC PIPE STANDOFF	4
33	7900388	SUPPORT: FRP INSIDE CORNER GUSSET 1-5/8" x4", 3 HOLE	4
34	1122518	VALVE: 1" ACTUATOR PNEUMATIC, PA SERIES, PAS00, ON 1" PVC/VITON, TYPE 21 UNION BALL VALVE, VENTED BALL WITH PAD MOUNTED SOLENOID VALVE. 24 VDC - CHEMLINE	1
35	1116851	VALVE: 1" DIAPHRAGM VALVE, PVC/VITON, TYPE 514 PVC-U, SOCKET WELD ASTM, TRUE UNION. - GEORG FISCHER	2
36	1019883	VALVE: BACK PRESSURE VALVE, 1/2" SW CONNECTION, BODY MATERIAL PVC, PRESSURE RANGE 0-150PSI, PROMINENT	1
37	7901155	VALVE: BALL CHECK VALVE, 1" SW, TRUE UNION, BODY MATERIAL PVC, SEALS VITON, CHEMLINE	2
38	7745145	VALVE: BALL VALVE, 1" SW, BODY MATERIAL PVC, SEALS VITON (FKM), VENTED BALL, (COMES WITH SOCKET & FNPT ENDS), TYPE 21, CHEMLINE	2
39	7745146	VALVE: BALL VALVE, 1-1/2" SW, BODY MATERIAL PVC, SEALS VITON (FKM), VENTED BALL, (COMES WITH SOCKET & FNPT ENDS), TYPE 21, CHEMLINE	3
40	7745143	VALVE: BALL VALVE, 1/2" SW, BODY MATERIAL PVC, SEALS VITON (FKM), VENTED BALL, (COMES WITH SOCKET & FNPT ENDS), TYPE 21, CHEMLINE	6

SHIPPED LOOSE ITEMS			
ITEM	PART #	DESCRIPTION	QTY
SL	1049960	DEVICE: 1-1/2" TRUE UNION Y SEDIMENT STRAINER, PVC/VITON SW	1

MAG DRIVE CENTRIFUGAL PUMP
MODEL: DB9V-R-FF-M219
MAXIMUM FLOW: 46 USGPM @ HEAD 11FT
MINMUM FLOW: 0.5 USPGM @ HEAD 67FT
CONSTRUCTION MATERIALS: PVDF/FKM O-RING
MOTOR: 3435 RPM,1 HP (0.75 kW), 230/460V,60 Hz, 3 Ph
TYP: x2 (DUTY / STANDBY)

1/2 TOP SIDE = CHART NUMBER
BOTTOM SIDE = QUANTITY NUMBER



NOTES:

1. SYSTEM IS DESIGNED, FABRICATED, TESTED AND INSPECTED AS PER PROMINENT STANDARD

2. PIPING MATERIAL IS PVC SCH 80 IN CONFORMANCE WITH ASTM D 1785 (FOR PHYSICAL DIMENSIONS, TEST REQUIREMENTS AND MAXIMUM OPERATING PRESSURE) IN SIZES1-1/2",1" & 1/2" PIPE.
ALL CONNECTIONS ARE 1-1/2", 1" & 1/2" SCH 80 PVC SOCKET WELD UNLESS OTHERWISE REQUIRED BY PIPELINE DEVICES.UNIONS ARE TRUE UNION STYLE, SCH80 PVC WITH VITON O-RING SEAL RATED FOR 150 PSIG. FLANGES ARE PVC, FULL FACE, CLASS 150, ASME/ANSI B16.5.

3.GASKETS ARE FULL FACE TYPE, CLASS 150, VITON, 1/8" THK FOR FLANGE CONNECTION, ASME B16.20.

4. BOLTING ARE 18-8 SS HEX CAP SCREW WITH FLAT WASHER, LOCK WASHER AND 18-8 SS HEX NUT.

5. PUMP AND PIPING SUPPORT FRAME IS CONSTRUCTED OF BLACK POLYETHYLENE. MATERIAL THICKNESS: 1/2" [13MM].AND IS FABRICATED BY WELD CONSTRUCTION.

6. ALL INTERCONNECTING PIPE & FITTINGS AND WIRING BY OTHERS.

7. ALL SEAL MATERIAL IS PTFE/VITON OTHERWISE SPECIFIED BY CUSTOMER.

8. TOLERANCE ON ALL TERMINATION POINTS: +/-10mm (+/-3/8").

APPROX.SHIPPING WEIGHT: 285 LB (129 Kg).
APPROX.OPERATING WEIGHT: 310LB (140 Kg).

DESIGN NOTES:
SYSTEM OPERATING CONDITIONS ARE DIFFERENT FROM PUMP PERFORMANCE CURVE
MAXIMUM SYSTEM OPERATING FLOW: 30 USGPM @ 14 PSIG
MINIMUM SYSTEM OPERATING FLOW: 0.5 USGPM @ 29 PSIG

UPSTREAM INJECTION PUMP-SUCTION:

- DESIGN TEMPERATURE: MIN. 15ºC TO MAX. 25ºC
- DESIGN PRESSURE: 14.7 PSIG
- MIN. TEST PRESSURE: 25 PSIG

DOWNSTREAM INJECTION PUMP-DISCHARGE:

- DESIGN TEMPERATURE: MIN. 15ºC TO MAX. 25ºC
- DESIGN PRESSURE: 45 PSIG
- MIN. TEST PRESSURE: 55 PSIG

TESTING CONDITION:

- TEST TYPE: HYDROSTATIC
- TEST MEDIUM: WATER
- TEST TEMPERATURE: AMBIENT 68ºF (20ºC)
- TEST DURATION: 10 MIN. (MINIMUM)

CORROSION ALLOWANCE: 0.0" (0.0mm).

REV	DATE (YYYY-MM-DD)	DESCRIPTION	BY	APPD	REVD
0	2022-03-14	INITIAL RELEASE	GB	RJ	

REVISIONS

CUSTOMER
SUEZ WATER TECHNOLOGIES & SOLUTIONS

SUBJECT

PFC PROSIP No
1122683

PURCHASE ORDER No
--

PURCHASER'S EQUIP. No

TITLE
SUEZ MAGDRIVE-F PVC-VITON, 2P 460V
- BILL OF MATERIALS -

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PROMINENT FLUID CONTROLS INC.
136 INDUSTRY DRIVE,
PITTSBURGH P.A., USA.
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TEL. 412 787 2484 FAX. 412 787 0704

DESIGNED	GB	APPROVED	
DRAWN	GB	SCALE	NTS
CHECKED	RJ	DATE (YYYY-MM-DD)	2022-03-14

SHEET No: 2/2

CUSTOMER DWG No

PFC DWG No
1122683-200- 2

REV
0

PN: 1061538

PROMINENT METERING PUMP:

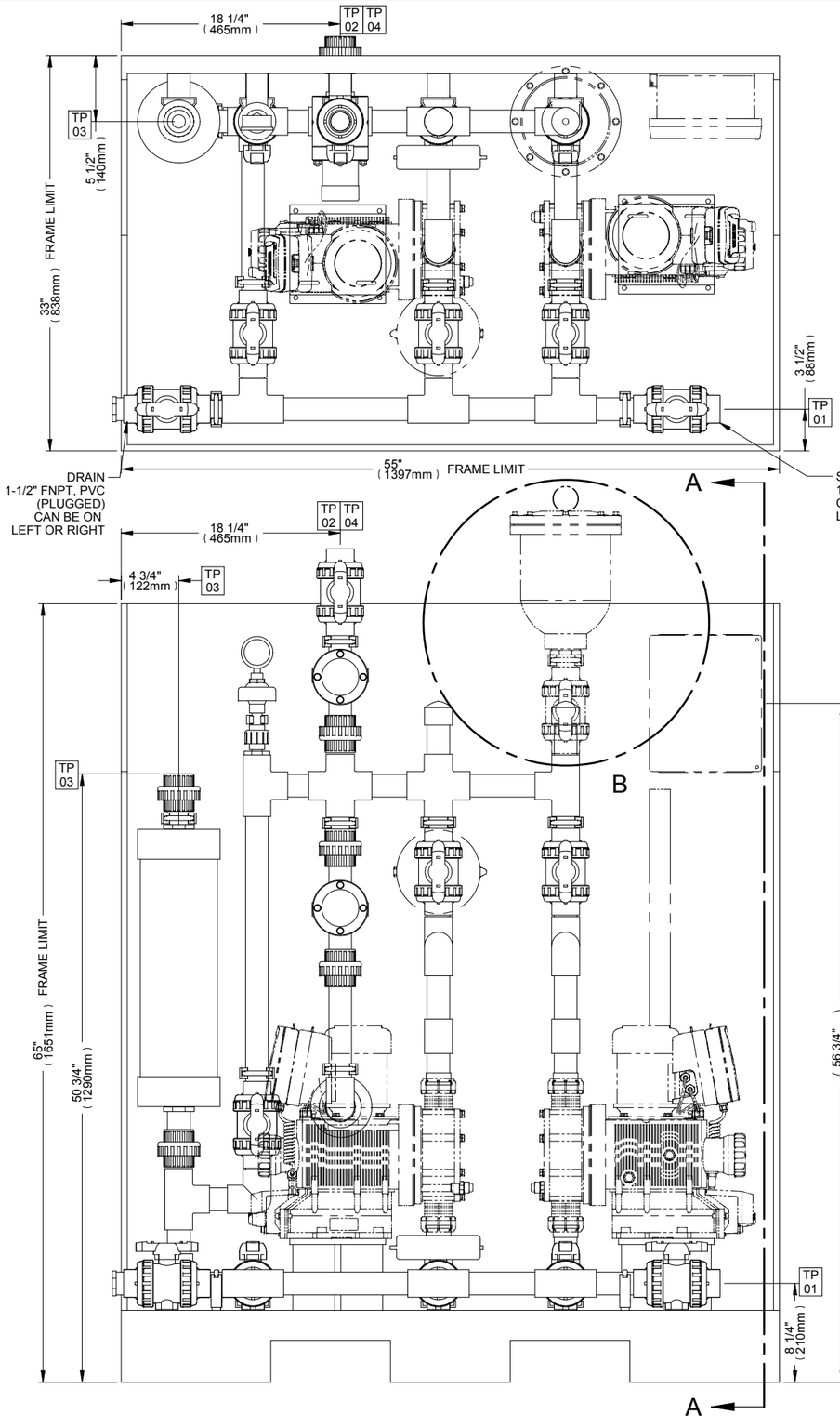
MODEL: _____

CAPACITY RATED: _____L/h (_____USGPH) @ _____kPag (_____ PSI);

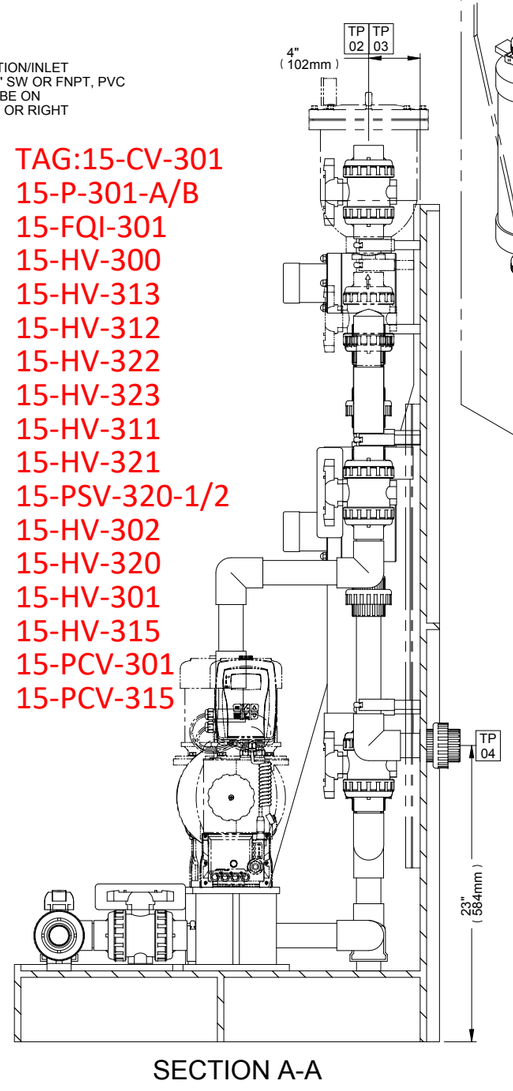
MAX PROCESS FLOW REQUIRED: _____ L/h (_____ USGPH) @ _____ kPag (_____ PSI)

LIQUID END MATERIAL: _____

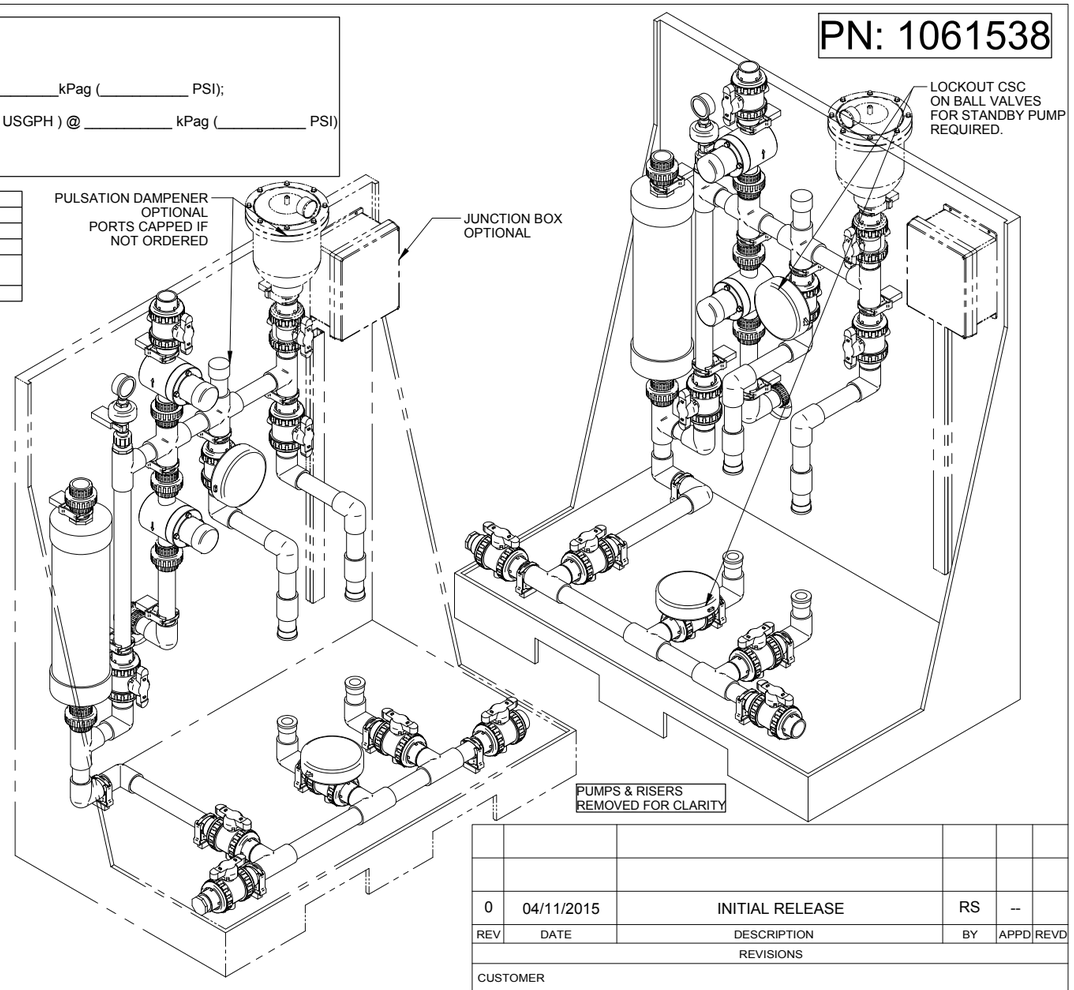
TERMINATION POINT SCHEDULE		
TP	SERVICE	CONNECTION
01	SUCTION	1-1/2" SW OR FNPT, PVC
02	DISCHARGE	1-1/2" SW OR FNPT, PVC
03	CALIBRATION COLUMN VENT BACK TO TANK	1-1/2" SW OR FNPT, PVC
04	P.R.V. VENT BACK TO TANK	1-1/2" SW OR FNPT, PVC



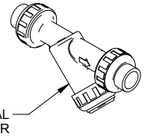
TAG:15-CV-301
15-P-301-A/B
15-FQI-301
15-HV-300
15-HV-313
15-HV-312
15-HV-322
15-HV-323
15-HV-311
15-HV-321
15-PSV-320-1/2
15-HV-302
15-HV-320
15-HV-301
15-HV-315
15-PCV-301
15-PCV-315



SECTION A-A



SHIP LOOSE MATERIALS



OPTIONAL
SEDIMENT Y-STRAINER
1-1/2" SOCKETWELD-PVC/EPDM
PN: 1062205, QTY: 1PC
INSTALLED ON SITE BY OTHERS

REV	DATE	DESCRIPTION	BY	APPD	REVD
0	04/11/2015	INITIAL RELEASE	RS	--	

REVISIONS

CUSTOMER: --

SUBJECT

JOB No: --

PURCHASE ORDER No: --

PURCHASER'S EQUIP. No: --

TITLE: PROSIP FMB-S TWO PUMP 1-1/2" PVC-EPDM DN32 - GENERAL ARRANGEMENT -

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DESIGNED	RS	APPROVED	
DRAWN	RS	SCALE	NTS
CHECKED	--	DATE	16/09/2015

Scale based on: SHEET SIZE D

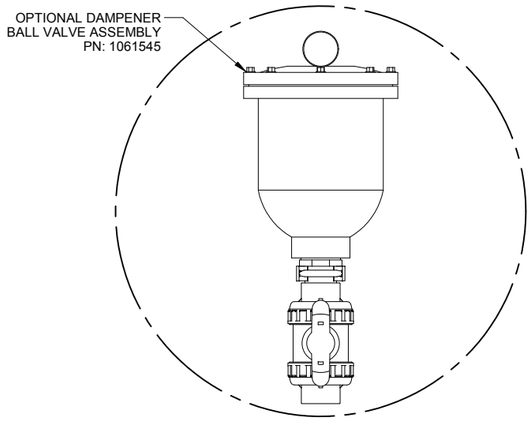
SHEET: 1/2

DWG No: 1061538-200

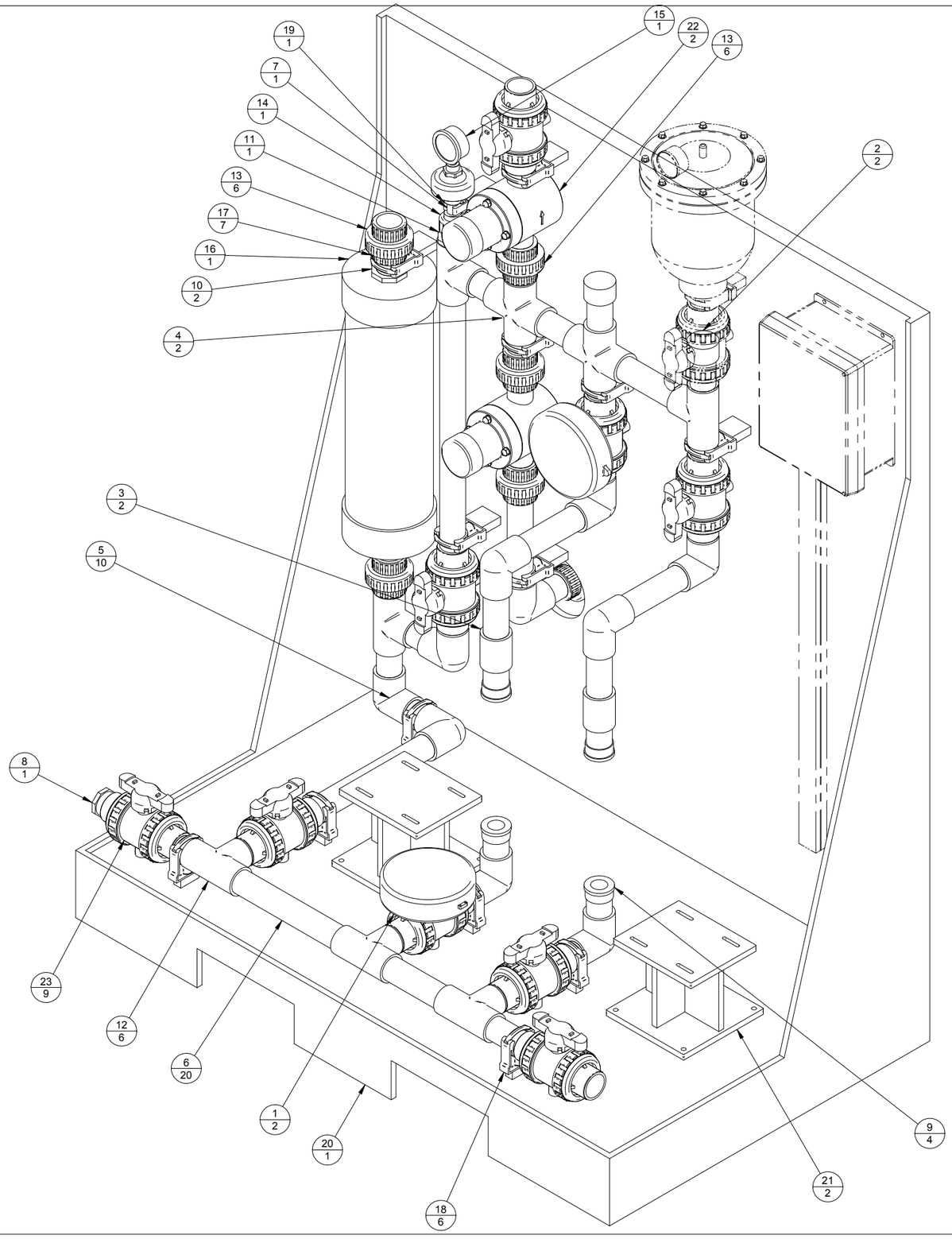
REV: 0

Item Number	Document Number	Title	Quantity
1	1061921	DEVICE: LOCKOUT FOR BALL VALVE HANDLE 5" - 6.5", RED	2
2	7904859	FITIING: CAP 1-1/2" SW, PVC, SCH 80	2
3	7904862	FITTING: COUPLING, 1-1/2" SW, PVC-SCH80	2
4	7904188	FITTING: CROSS, 1-1/2" SxSxSxS, PVC, SCH 80	2
5	7741440	FITTING: ELBOW-90, 1-1/2" SxS, PVC, SCH 80	10
6	7741447	FITTING: PIPE 1-1/2" PVC, SCH 80	20
7	7741400	FITTING: PIPE 1/2" PVC, SCH 80	1
8	1059919	FITTING: PLUG, 1-1/2" MNPT, PVC-SCH80	1
9	7904865	FITTING: PUMP ADAPTER, DN32 x 1-1/2" SPIG, PVC	4
10	7900963	FITTING: REDUCER BUSHING, 2" SPIG x 1-1/2" SW, PVC, SCH80	2
11	7740815	FITTING: REDUCER BUSHING, 2" SPIG x 1/2" SW, PVC, SCH80	1
12	7741442	FITTING: TEE 1-1/2" SxSxS, PVC, SCH 80	6
13	7904864	FITTING: UNION 1-1/2" SxS, PVC, EPDM, SCH 80	6
14	7260035	FITTING: UNION, 1/2" SxS, PVC, EPDM, SCH80	1
15	7903819	INSTRUMENT: 2 -1/2" PRESSURE GAUGE,0-160 PSIG, 316SS CASE, BRASS INTERNALS, BOTTOM MOUNT, GLYCERINE FILL WITH PVC ISOLATOR, 1/2" SW PROCEES CONNECTION, 1/4" FNPT GAUGE CONNECTION, GLYCERINE FILL, SG SERIES, CHEMLINE	1
16	7904854	INSTRUMENT: CALIBRATION COLUMN 10000ml, 2" SW, PVC	1
17	7741590 7901683	SUPPORT: 1-1/2" (50mm) PIPE CLIP WITH 2" STANDOFF	7
18	7741590 7900312	SUPPORT: 1-1/2" (50mm) PIPE CLIP WITH 3/4" STANDOFF	6
19	7260010 7900310 7901683	SUPPORT: 1/2" (20mm) PIPE CLIP WITH 1" & 2" STANDOFFS	1
20	1061561	SUPPORT: FRAME BLACK PE, 33" x 55" x 65"	1
21	1028759	SUPPORT: RISER, MS, 6.5", BLACK PP	2
22	1019889	VALVE: BACK PRESSURE/PRESSURE RELIEF VALVE, 1-1/2" SOCKETWELD CONNECTION, PVC WITH PRESSURE ADJUSTMENT SPRING 10-150PSI	2
23	7904867	VALVE: BALL VALVE, 1-1/2" PVC/EPDM, TYPE 21 (SOCKET & THREADED ENDS) CHEMLINE	9

SHIP LOOSE PARTS:
1-1/2" UNION FNPT x FNPT, PVC/EPDM - 1061942- 1PC
(FOR CAL. COLUMN & P.R.V. VENTS)
1-1/2" x 1-1/2" HOSE BARB ELBOW - 7904861 - 1PC
1-1/2" ID PVC BRAIDED TUBE - 7904105 - 10FT
GEAR CLAMP - 1059974 - 1PC
(FOR CAL. COLUMN VENT)
1-1/2"x1-1/2" MNPT, DN32 INJECTION VALVE, PVDF/PTFE - 1002783 - 1PC
1-1/2" SW/FNPT ENDS FOR BALL VALVES - 1PC Ea



DETAIL B



PN: 1061538

NOTES:

1. ALL PIPING MATERIAL IS SCHEDULE 80 PVC, SIZE 1/2" & 1-1/2". CONNECTIONS ARE SOCKETWELD UNLESS OTHERWISE REQUIRED BY PIPELINE DEVICES. PVC PRIMER IS IPS P70 PRIMER WITH 724 CEMENT.

2. ALL SEAL MATERIAL IS PTFE & EPDM UNLESS OTHERWISE SPECIFIED BY PIPELINE DEVICES.

3. PIPE SUPPORT IS MADE FROM 1/2" THICK POLYEHYLENE SHEET AND IS MADE FROM WELDED CONSTRUCTION.

4. ALL HARDWARE IS 18-8SS. ALL PIPE CLIPS/SUPPORTS ARE PLASTIC.

5. ALL INTERCONNECTING PIPE & FITTINGS, HARDWARE, GASKETS, SEALS AND WIRING ARE DONE ON SITE BY OTHERS.

6. AREA CLASSIFICATION: NON HAZARDOUS.

7. TOLERANCE ON ALL TERMINATION POINTS IS +/- 3/8" (10mm) UNLESS SPECIFIED BY CUSTOMER.

8. APPROX. SHIPPING WEIGHT: 91Kg (200 Lb)
APPROX. OPERATING WEIGHT: 100Kg (220 Lb)

9. SYSTEM IS FOR INDOOR INSTALLATION ONLY.

DESIGN NOTES:

CHEMICAL SERVICE: _____

- DESIGN TEMPERATURE: MAX: 86ºF (30ºC), MIN: 41ºF (5ºC)

UPSTREAM INJECTION PUMP-SUCTION:

- DESIGN PRESSURE: 14.5 PSIG (100kPa)
- MIN. TEST PRESSURE: 25 PSIG (172kPa)

DOWNSTREAM INJECTION PUMP-DISCHARGE:

- DESING PRESSURE: 150 PSIG (1034 kPa)
- MIN. TEST PRESSURE: 150 PSIG (1034 kPa)

TESTING CONDITION:

- TEST TYPE: HYDORSTATIC
- TEST MEDIUM: WATER
- TEST TEMPERATURE: AMBIENT 68ºF (20ºC)
- TEST DURATION: 10 MIN. (MINIMUM)

CORROSION ALLOWANCE: 0.0" (0.0mm).

REV	DATE	DESCRIPTION	BY	APPD	REVD
0	04/11/2015	INITIAL RELEASE	RS	--	

REVISIONS

CUSTOMER: --

SUBJECT

JOB No: --
PURCHASE ORDER No: --
PURCHASER'S EQUIP. No: --

TITLE PROSIP FMB-S TWO PUMP 1-1/2" PVC-EPDM DN32 - BILL OF MATERIALS-

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DESIGNED	RS
DRAWN	RS
CHECKED	--
APPROVED	
SCALE	NTS
DATE	16/09/2015

Scale based on: SHEET SIZE D

SHEET: 2/2

DWG No: 1061538-200

REV: 0

FOR CONTINUATION SEE SHEET C-116

FOR CONTINUATION SEE SHEET C-118

FOR CONTINUATION SEE SHEET C-114

FOR CONTINUATION SEE SHEET C-113

ANOXIC ZONE 1 TOP OF TANK 40.75

PROPOSED INFLUENT DRY WELL TOP OF TANK 33.0

PROPOSED WET WELL & DIST. CHANNEL TOP OF TANK 33.0

PROPOSED FINE SCREENS F.F. 30.0

INV. IN 32.5

INV. OUT 17.17

INV. 24.67'

PROP. 18"Ø SDR35 PVC, TYP. OF 4, INV. 22.52, TYP.

CB-5C

8"Ø HDPE

CONNECT TO EXISTING, TYP.

PROP. 18"Ø SDR35 PVC

PROP. 18"Ø SDR35 PVC OVERFLOW

PROP. TEMP. 4"Ø DI W.A.S.

PROP. 6"Ø DI SLUDGE DISCHARGE

CONNECT PRIMARY #4 - 4"Ø SCUM LINE TO TEMP. W.A.S. LINE, DISCONNECT 4" TEMP. W.A.S. LINE UPSTREAM OF PROPOSED CONNECTION

EXISTING PRIMARY SETTLING TANK #2 (TO BE UPGRADED (SEE 300-SERIES DWGS.)

INV. 12.13

INV. 24.32

EXISTING PRIMARY SLUDGE VALVE VAULT (SEE C-320 FOR IMPROVEMENTS)

EXIST. 8"Ø CI VENT

EXIST. 6"Ø CI

INV. 24.67

EXISTING PRIMARY SETTLING TANK #1 (TO BE UPGRADED (SEE 300-SERIES DWGS.)

EXIST. 6" PVC VENT

EXISTING PRIMARY SLUDGE PIT (SEE C-321)

INV. 12.13

PROP. MODIFICATIONS TO EXIST. GRIT SYSTEM (SEE 200-SERIES DWGS.)

INV. 24.67

EXIST. 18"Ø DI TO PRIMARY SETTLING TANK #4 (TO REMAIN)

EXIST. 18"Ø DI TO PRIMARY SETTLING TANK #1 (TO REMAIN)

PROP. SLUDGE VAULT W/ VALVE, RIM. 28.5, SEE C-320

INV. IN 24

INV. IN 12.18

INV. IN 24

INV. OUT 24

6"Ø DI PRIMARY SLUDGE TO SLUDGE HOLDING

TW=25.5 BW=25.0

TW=25.0 BW=24.0

TW=26.0 BW=24.0

TW=26.0 BW=25.0

TW=26.5 BW=26.0

4"Ø PVC INV. IN 20.5

4"Ø PERF. PIPE BEHIND WALL, DISCHARGE TO BASIN CB-13C

GRASS-LINED EMERGENCY SPILLWAY, EL. 32.5, L=10'

EXIST. 6"Ø SLUDGE RETURN LINES CAN BE ABANDONED IN PLACE OR REMOVED WHERE REQUIRED FOR PROPOSED UTILITIES

CB-13C

12"Ø HDPE

CONNECT PROPOSED 4" SCUM LINE TO EXISTING

6"Ø HDPE

6" DR9

CB-2

PROP. 4"Ø DI SCUM

PROP. CUT & CAP

PROP. CONCRETE BLOCK RETAINING WALL

PROP. 4"Ø DI FILTRATE/ SUPERNATANT

18"Ø HDPE

EXIST. 12" VENTS

NTROL BUILDING
ONVERTED TO
DEWATERING
SERIES DWGS.)

T.O.W. 44.25

T.O.W. 42.75

BEND

2+50

2+00

1+50

1+00

0+50

0+00

RETAINING WALL

WATER MAIN PHASE 2B - PROPOSED 8" DI CONNECTION TO BLIND FLANGE @ STA. 1+92± (TO BE CONSTRUCTED DURING THE CONSTRUCTION OF THE MBR BLDG. - 500 SERIES), SEE SHEET C-127

HYD

8x6 TEE

GATE VALVE, TYP.

8"Ø DI W.M.

45° BEND

CB-5B

CB-5A

CB-5

CB-6

12"Ø HDPE

X'ING 26.0'

T.O.W. 39.75

T.O.W. 38.25

T.O.W. 36.75

T.O.W. 35.25

RIP-RAP CHANNEL, D_{50} = 6", THICKNESS = 18" OVER NON-WOVEN GEOTEXTILE

GRASS-LINED BYPASS SWALE

EXIST. S.M.H. RIM ELEV. 43.01 INV. IN 33.02 INV. OUT 32.89

EXIST. 24"Ø CIP SEWER PIPE

PROPOSED MODULAR BLOCK RETAINING WALL (SEE STRUCTURAL PLANS FOR DETAILS)

PROPOSED GUIDE RAIL, 2' CLEAR FROM E.O.P. TO FACE

EXISTING PRIMARY SETTLING TANK #3 (TO BE UPGRADED (SEE 300-SERIES DWGS.)

INV. 12.13

INV. 24.32

PROP. PRECAST CONC. PRIMARY DISTRIBUTION BOX (SEE 200-SERIES DWGS.)

EXIST. GRATE

INV. 24.67

PROP. 18"Ø SDR-35 PVC SEWER TO PRIMARY SETTLING TANK #3

CB-4

CB-4A

CB-4B

12"Ø HDPE

INV. 26.35

CONNECT TO EXISTING

INV. 29.40

TOP OF TANK 33.15

PROP. 30"Ø SDR35 PVC

EXIST. GRIT SYSTEM

INV. 29.48

TOP OF TANK 33.56

PROP. 4"Ø DI 11.2%

CB-3

PROP. INSULATED SCH80 PVC TO BE SUPPORTED FROM GROUND, SEE C-250

NON-FREEZE HOSE BIBB

4"Ø DI TO GRIT WASHER #2, SEE SHEET C-210

EXISTING 8" WATER MAIN GATE VALVE & BLIND FLANGE CONSTRUCTED IN PHASE 1 (CONNECT NEW 8"Ø DI WATER MAIN - PHASE 2A)

PROP. GRIT SYSTEM (SEE 200-SERIES DWGS.)

PROP. HEADWORKS BLDG. (SEE 200-SERIES DWGS.)

F.F. 32.73

ELEC. PANEL

EXIST. INFLUENT STRUCTURE

BYPASS

PROP. INV. IN 30.41

SPLASHBLOCK, TYP.

CONNECT EXIST. 24"Ø CI SEWER INTO PROPOSED INFLUENT SPLITTER BOX, INV. 31.04

PROP. INFLUENT SPLITTER BOXES (SEE 200-SERIES DWGS.)

T.O.W. 36.0, 30" INV. IN 31.05, 24" INVS. OUT 31.04

PROP. 24"Ø SDR35 PVC

PROPOSED 5'Ø SMH-3 RIM. 36.4 EX. 24" INV. IN 32.06 PR. 24" INV. OUT 31.86

PROP. 30"Ø SDR35 PVC

INV. 31.08

PROP. INFLUENT PARSHALL FLUME (SEE 200-SERIES DWGS.)

INV. 31.68

INV. IN 33.0

INV. 31.34

T.O.W. 36.5

PROP. 24"Ø SDR35 PVC

EXIST. 24"Ø CIP SEWER TO BE CUT AND CONNECTED TO PROPOSED 5'Ø CONC. MANHOLE

INV. 31.16

END CAP

C.O. TO EL. 33.0'

Q_{100} EL. 31.59

6"Ø UNDERDRAIN

BIO-BASIN 2

PROPOSED 6' HIGH PERIMETER CHAIN LINK FENCE TO MEET EXISTING FENCE

EXIST. OUTLET STRUCTURE BB1 RIM. 35.0 24" INV. IN 29.0 INV. OUT 28.0

EXIST. CB RIM. 36.0 INV. IN 32.5 INV. OUT 30.0

INV. IN 32.5

INV. IN 35.0

15"Ø HDPE

18"Ø HDPE

C.O. TO EL. 35.0'

EXISTING 24"Ø HDPE

6"Ø UNDERDRAIN

END CAP

INV. 30.0

BIO-BASIN 1

Q_{100} EL. 34.79

PROPOSED PAVEMENT, SEE SHEET C-153

EXIST. LAWN

EXIST. 8"Ø CLASS 52 DI WATER MAIN

EXIST. 8"Ø DI SCUM

EXIST. 6"Ø DI SCUM

EXIST. 18"Ø DI

EXIST. 8"Ø CLASS 52 DI WATER MAIN

EXISTING 30"Ø HDPE

EXIST. 8"Ø PVC SEWER

BIO-BASIN 1 NOTES :

1. EXCAVATE AND REMOVE THE EXISTING BOTTOM OF BIO-BASIN 1 TO INSTALL NON-WOVEN GEOTEXTILE, CRUSHED STONE, 6" UNDERDRAIN, BIO-BASIN SOIL, HARDWOOD MULCH AND PLANTINGS AS SHOWN IN THE DETAILS.
2. CONTRACTOR IS TO CAREFULLY EXCAVATE AROUND THE 24"Ø HDPE PIPE.
3. THE CONSTRUCTION IS TO TAKE PLACE AFTER THE ENTIRE DRAINAGE AREA TO THE BIO-BASIN IS STABILIZED.

NOTES :

1. REFER TO STORMWATER STRUCTURE SCHEDULE ON SHEET C-120 FOR DESIGN INFORMATION.
2. REFER TO PROCESS PIPE PROFILE SHEETS C-123, C-124, C-125 AND C-126.
3. REFER TO WATER MAIN PROFILE SHEET C-127.

GRAPHIC SCALE

10 0 5 10 20 40

1 inch = 10 feet

1 / C-115 PARTIAL SITE PIPING / UTILITY PLAN #3

SCALE: 1" = 10'

MHE ENGINEERING

33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100

111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

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UDIG·NY SAFE DIGGING STARTS HERE CALL 811

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2

145 CAESARS LN.
NEW WINDSOR, NY 12553

FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

PARTIAL SITE PIPING / UTILITY PLAN #3

REVISIONS

NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

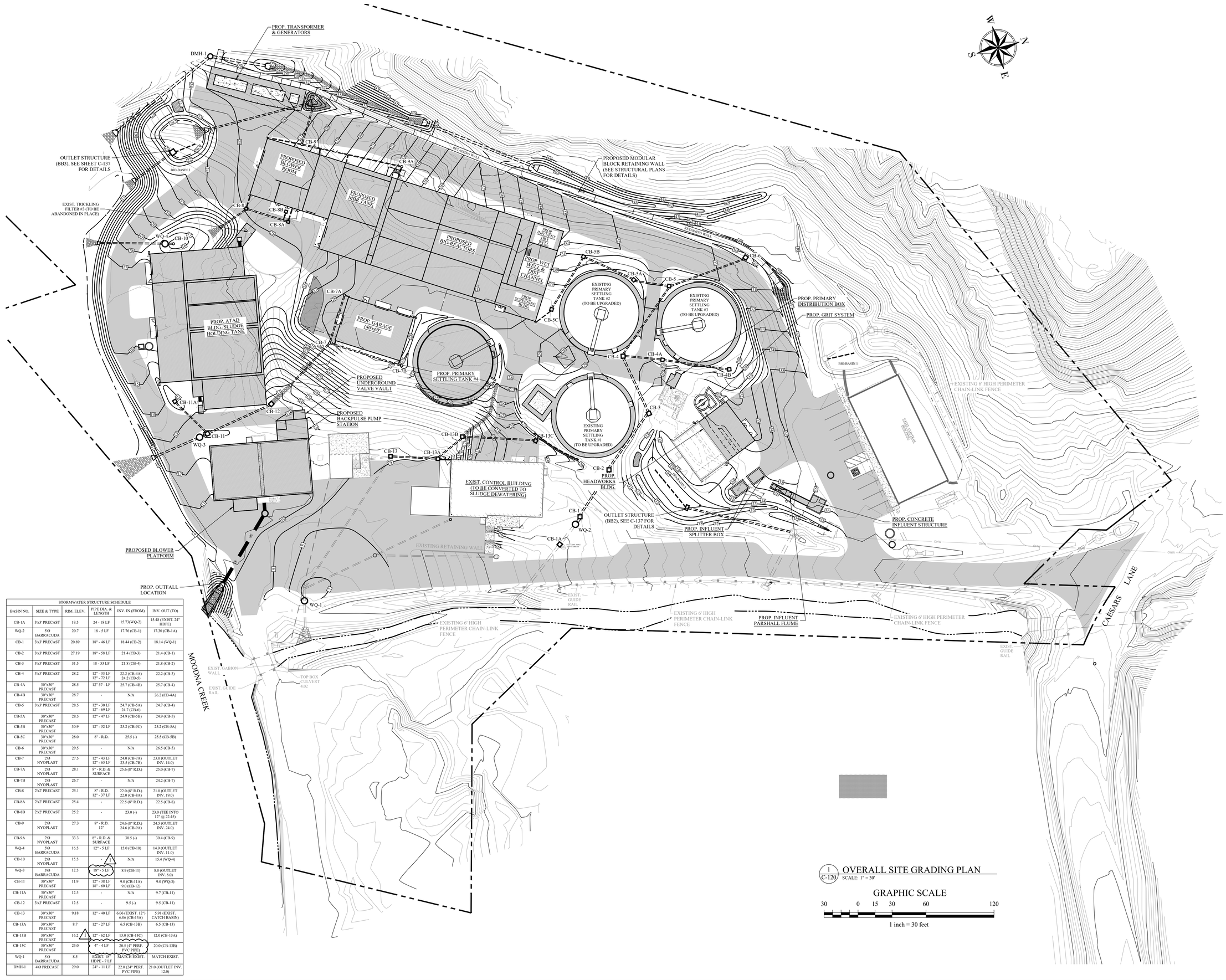
ISSUED DATE:	18 APR, 2025
DESIGN BY:	SMQ, JTW
DRAWN BY:	HPBJr
CHECKED BY:	MWW
REVIEWED BY:	MJS, JZ

SHEET NO.

C-115

PROJECT # 18-732 PHASE #

F:\2018\18-732 Caesar Lane WWTP Improvements\Expansion Phase\Drafting\1 - Site Work & Outfall\Addendum 4\18-732 Caesars Lane WWTP Site Plan Phase 2.dwg, C-115, 7/9/2025 2:16:14 PM



STORMWATER STRUCTURE SCHEDULE					
BASIN NO.	SIZE & TYPE	RIM. ELEV.	PIPE DIA. & LENGTH	INV. IN (FROM)	INV. OUT (TO)
CB-1A	3'x3' PRECAST	19.5	24 - 18 LF	15.73(WQ-2)	15.48 (EXIST. 24" HDPE)
WQ-2	5'Ø BARRACUDA	20.7	18 - 5 LF	17.76 (CB-1)	17.30 (CB-1A)
CB-1	3'x3' PRECAST	20.89	18" - 46 LF	18.44 (CB-2)	18.14 (WQ-1)
CB-2	3'x3' PRECAST	27.19	18" - 58 LF	21.4 (CB-3)	21.4 (CB-1)
CB-3	3'x3' PRECAST	31.5	18 - 53 LF	21.8 (CB-4)	21.8 (CB-2)
CB-4	3'x3' PRECAST	28.2	12" - 33 LF 12" - 72 LF	22.2 (CB-4A) 24.2 (CB-5)	22.2 (CB-3)
CB-4A	30"x30" PRECAST	28.5	12" 57 - LF	25.7 (CB-4B)	25.7 (CB-4)
CB-4B	30"x30" PRECAST	28.7	-	N/A	26.2 (CB-4A)
CB-5	3'x3' PRECAST	28.5	12" - 30 LF 12" - 69 LF	24.7 (CB-5A) 24.7 (CB-6)	24.7 (CB-4)
CB-5A	30"x30" PRECAST	28.5	12" - 47 LF	24.9 (CB-5B)	24.9 (CB-5)
CB-5B	30"x30" PRECAST	30.9	12" - 52 LF	25.2 (CB-5C)	25.2 (CB-5A)
CB-5C	30"x30" PRECAST	28.0	8" - R.D.	25.5 (-)	25.5 (CB-5B)
CB-6	30"x30" PRECAST	29.5	-	N/A	26.5 (CB-5)
CB-7	2'Ø NYOPLAST	27.5	12" - 43 LF 12" - 65 LF	24.0 (CB-7A) 23.5 (CB-7B)	23.0 (OUTLET INV. 14.0)
CB-7A	2'Ø NYOPLAST	28.1	8" - R.D. & SURFACE	25.6 (8" R.D.)	25.0 (CB-7)
CB-7B	2'Ø NYOPLAST	26.7	-	N/A	24.2 (CB-7)
CB-8	2'x2' PRECAST	25.1	8" - R.D. 12" - 37 LF	22.0 (8" R.D.) 22.0 (CB-8A)	21.0 (OUTLET INV. 19.0)
CB-8A	2'x2' PRECAST	25.4	-	22.5 (8" R.D.)	22.5 (CB-8)
CB-8B	2'x2' PRECAST	25.2	-	23.0 (-)	23.0 (TEE INTO 12" @ 22.45)
CB-9	2'Ø NYOPLAST	27.3	8" - R.D. 12"	24.6 (8" R.D.) 24.6 (CB-9A)	24.5 (OUTLET INV. 24.0)
CB-9A	2'Ø NYOPLAST	33.3	8" - R.D. & SURFACE	30.5 (-)	30.4 (CB-9)
WQ-4	5'Ø BARRACUDA	16.5	12" - 5 LF	15.0 (CB-10)	14.9 (OUTLET INV. 11.0)
CB-10	2'Ø NYOPLAST	15.5	1 18" - 5 LF	N/A	15.4 (WQ-4)
WQ-3	5'Ø BARRACUDA	12.5		8.9 (CB-11)	8.8 (OUTLET INV. 8.0)
CB-11	30"x30" PRECAST	11.9	12" - 38 LF 18" - 60 LF	9.0 (CB-11A) 9.0 (CB-12)	9.0 (WQ-3)
CB-11A	30"x30" PRECAST	12.5	-	N/A	9.7 (CB-11)
CB-12	3'x3' PRECAST	12.5	-	9.5 (-)	9.5 (CB-11)
CB-13	30"x30" PRECAST	9.18	12" - 40 LF	6.06 (EXIST. 12") 6.06 (CB-13A)	5.91 (EXIST. CATCH BASIN)
CB-13A	30"x30" PRECAST	8.7	12" - 27 LF	6.5 (CB-13B)	6.5 (CB-13)
CB-13B	30"x30" PRECAST	16.2	1 12" - 62 LF	13.0 (CB-13C)	12.0 (CB-13A)
CB-13C	30"x30" PRECAST	23.0	4" - 4 LF	20.5 (4" PERF. PVC PIPE)	20.0 (CB-13B)
WQ-1	5'Ø BARRACUDA	8.5	EXIST. 18" HDPE - 7 LF	MATCH EXIST.	MATCH EXIST.
DMH-1	4'Ø PRECAST	29.0	24" - 11 LF	22.0 (24" PERF. PVC PIPE)	21.0 (OUTLET INV. 12.0)

1 C-120 OVERALL SITE GRADING PLAN
SCALE: 1" = 30'

GRAPHIC SCALE
30 0 15 30 60 120
1 inch = 30 feet

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
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UDIG·NY SAFE DIGGING STARTS HERE
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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

OVERALL SITE GRADING PLAN & STORMWATER SCHEDULE

REVISIONS

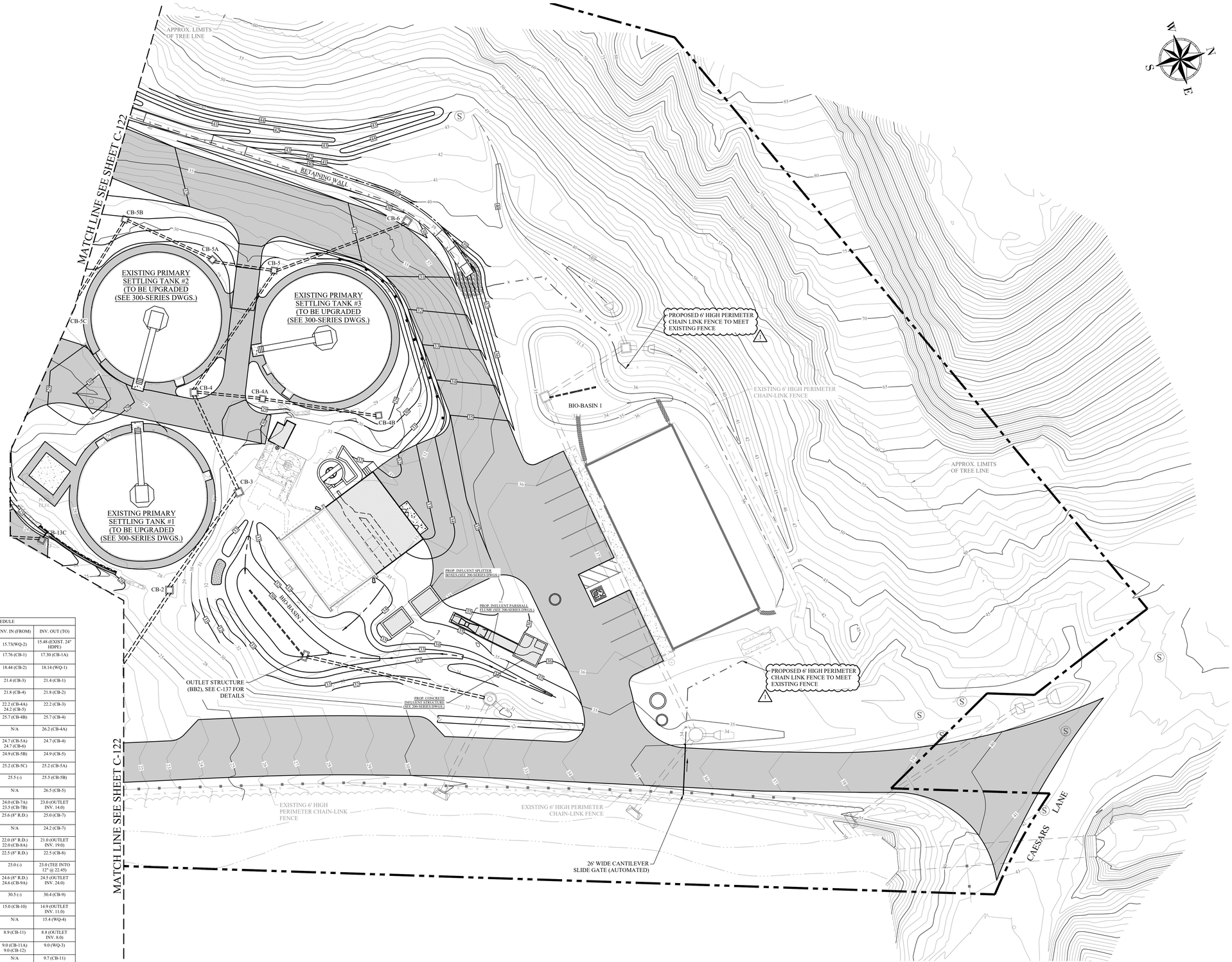
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	SMQ, JTW
DRAWN BY:	HPBJr
CHECKED BY:	MWW
REVIEWED BY:	MJS, JZ

SHEET NO.
C-120

PROJECT # 18-732 PHASE #

F:\2018\18-732 Caesar Lane WWTP Improvements\Expansion Phase\Drafting\1 - Site Work & Outfall\Addendum 4\18-732 Caesars Lane WWTP Site Plan Phase 2.dwg, C-120, 7/9/2025 2:18:14 PM



STORMWATER STRUCTURE SCHEDULE					
BASIN NO.	SIZE & TYPE	RIM. ELEV.	PIPE DIA. & LENGTH	INV. IN (FROM)	INV. OUT (TO)
CB-1A	3'x3' PRECAST	19.5	24 - 18 LF	15.73(WQ-2)	15.48 (EXIST. 24" HDPE)
WQ-2	5'Ø BARRACUDA	20.7	18 - 5 LF	17.76 (CB-1)	17.30 (CB-1A)
CB-1	3'x3' PRECAST	20.89	18" - 46 LF	18.44 (CB-2)	18.14 (WQ-1)
CB-2	3'x3' PRECAST	27.19	18" - 58 LF	21.4 (CB-3)	21.4 (CB-1)
CB-3	3'x3' PRECAST	31.5	18 - 53 LF	21.8 (CB-4)	21.8 (CB-2)
CB-4	3'x3' PRECAST	28.2	12" - 33 LF 12" - 72 LF	22.2 (CB-4A) 24.2 (CB-5)	22.2 (CB-3)
CB-4A	30"x30" PRECAST	28.5	12" 57 - LF	25.7 (CB-4B)	25.7 (CB-4)
CB-4B	30"x30" PRECAST	28.7	-	N/A	26.2 (CB-4A)
CB-5	3'x3' PRECAST	28.5	12" - 30 LF 12" - 69 LF	24.7 (CB-5A) 24.7 (CB-6)	24.7 (CB-4)
CB-5A	30"x30" PRECAST	28.5	12" - 47 LF	24.9 (CB-5B)	24.9 (CB-5)
CB-5B	30"x30" PRECAST	30.9	12" - 52 LF	25.2 (CB-5C)	25.2 (CB-5A)
CB-5C	30"x30" PRECAST	28.0	8" - R.D.	25.5 (-)	25.5 (CB-5B)
CB-6	30"x30" PRECAST	29.5	-	N/A	26.5 (CB-5)
CB-7	2'Ø NYOPLAST	27.5	12" - 43 LF 12" - 65 LF	24.0 (CB-7A) 23.5 (CB-7B)	23.0 (OUTLET INV. 14.0)
CB-7A	2'Ø NYOPLAST	28.1	8" - R.D. & SURFACE	25.6 (8" R.D.)	25.0 (CB-7)
CB-7B	2'Ø NYOPLAST	26.7	-	N/A	24.2 (CB-7)
CB-8	2'x2' PRECAST	25.1	8" - R.D. 12" - 37 LF	22.0 (8" R.D.) 22.0 (CB-8A)	21.0 (OUTLET INV. 19.0)
CB-8A	2'x2' PRECAST	25.4	-	22.5 (8" R.D.)	22.5 (CB-8)
CB-8B	2'x2' PRECAST	25.2	-	23.0 (-)	23.0 (TEE INTO 12" @ 22.45)
CB-9	2'Ø NYOPLAST	27.3	8" - R.D. 12"	24.6 (8" R.D.) 24.6 (CB-9A)	24.5 (OUTLET INV. 24.0)
CB-9A	2'Ø NYOPLAST	33.3	8" - R.D. & SURFACE	30.5 (-)	30.4 (CB-9)
WQ-4	5'Ø BARRACUDA	16.5	12" - 5 LF	15.0 (CB-10)	14.9 (OUTLET INV. 11.0)
CB-10	2'Ø NYOPLAST	15.5	-	N/A	15.4 (WQ-4)
WQ-3	5'Ø BARRACUDA	12.5	18" - 5 LF	8.9 (CB-11)	8.8 (OUTLET INV. 8.0)
CB-11	30"x30" PRECAST	11.9	12" - 38 LF 18" - 60 LF	9.0 (CB-11A) 9.0 (CB-12)	9.0 (WQ-3)
CB-11A	30"x30" PRECAST	12.5	-	N/A	9.7 (CB-11)
CB-12	3'x3' PRECAST	12.5	-	9.5 (-)	9.5 (CB-11)
CB-13	30"x30" PRECAST	9.18	12" - 40 LF	6.06 (EXIST. 12") 6.06 (CB-13A)	5.91 (EXIST. CATCH BASIN)
CB-13A	30"x30" PRECAST	8.7	12" - 27 LF	6.5 (CB-13B)	6.5 (CB-13)
CB-13B	30"x30" PRECAST	16.2	12" - 62 LF	13.0 (CB-13C)	12.0 (CB-13A)
CB-13C	30"x30" PRECAST	23.0	4" - 4 LF	20.5 (4" PERF. PVC PIPE)	20.0 (CB-13B)
WQ-1	5'Ø BARRACUDA	8.5	EXIST.-18" HDPE - 7 LF	MATCH EXIST.	MATCH EXIST.
DMH-1	4'Ø PRECAST	29.0	24" - 11 LF	22.0 (24" PERF. PVC PIPE)	21.0 (OUTLET INV. 12.0)

1 C-121 PARTIAL SITE GRADING PLAN #1
SCALE: 1" = 20'

GRAPHIC SCALE
20 0 10 20 40 80
1 inch = 20 feet

BIO-BASIN 1 NOTES :
1. EXCAVATE AND REMOVE THE EXISTING BOTTOM OF BIO-BASIN 1 TO INSTALL NON-WOVEN GEOTEXTILE, CRUSHED STONE, 6" UNDERDRAIN, BIO-BASIN SOIL, HARDWOOD MULCH AND PLANTINGS AS SHOWN IN THE DETAILS.
2. CONTRACTOR IS TO CAREFULLY EXCAVATE AROUND THE 24"Ø HDPE PIPE.
3. THE CONSTRUCTION IS TO TAKE PLACE AFTER THE ENTIRE DRAINAGE AREA TO THE BIO-BASIN IS STABILIZED.

MHE ENGINEERING
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BID SET

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

PARTIAL SITE GRADING PLAN #1

REVISIONS

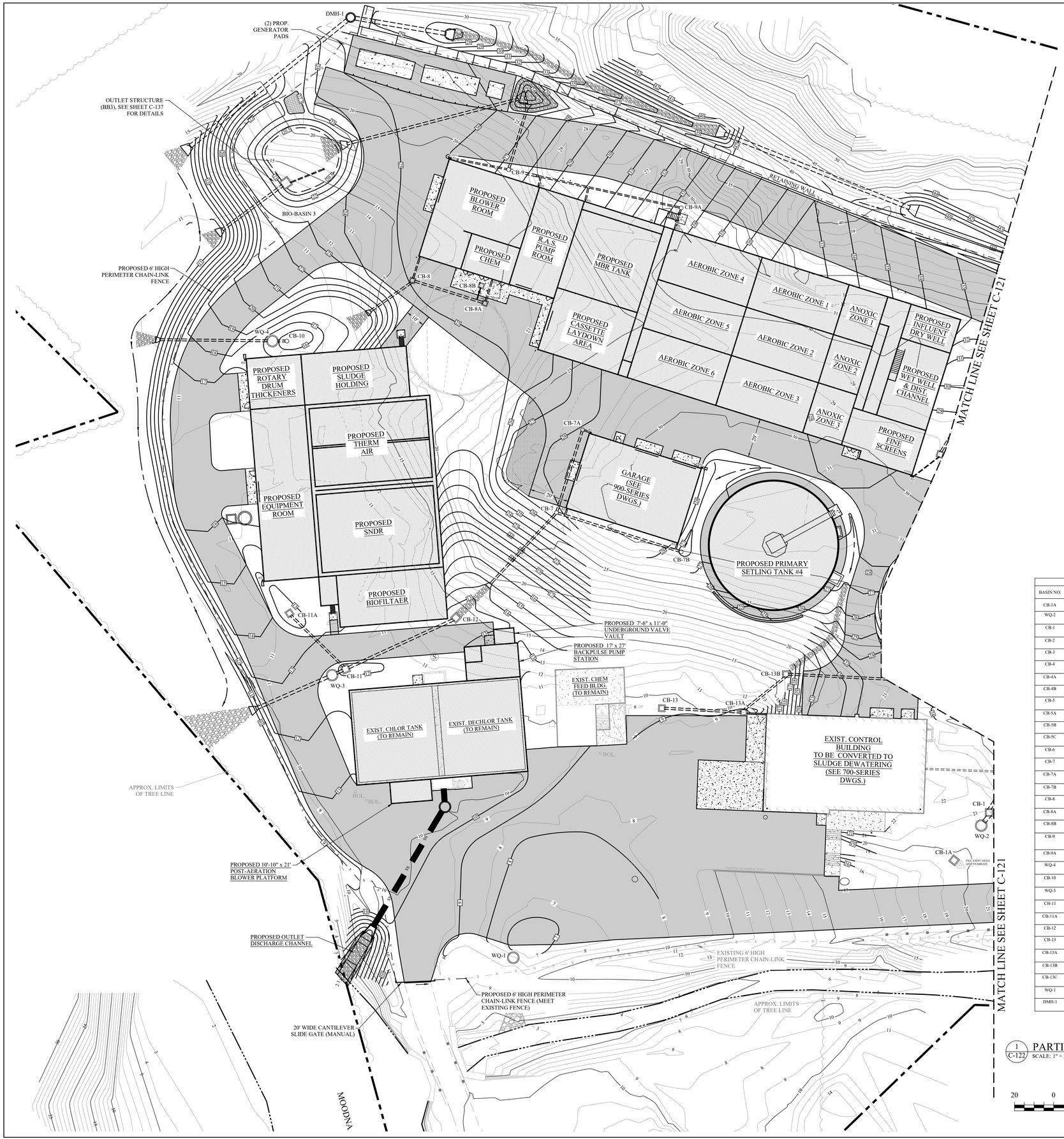
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	SMQ, JTW
DRAWN BY:	HPBJr
CHECKED BY:	MWW
REVIEWED BY:	MJS, JZ

SHEET NO.
C-121

PROJECT # 18-732 PHASE #

F:\2018\18-732 Caesar Lane WWTP Improvements\Expansion Phase\Drafing\1 - Site Work & Outfall\Addendum 4\18-732 Caesars Lane WWTP Site Plan Phase 2.dwg, C-121, 7/9/2025 2:18:14 PM



1 C-122 PARTIAL SITE GRADING PLAN #2
SCALE: 1" = 20'

GRAPHIC SCALE
20 0 10 20 40 80
1 inch = 20 feet

STORMWATER STRUCTURE SCHEDULE

BASIN NO.	SIZE & TYPE	RIM. ELEV.	PIPE DIA. & LENGTH	INV. IN (FROM)	INV. OUT (TO)
CB-1A	3'x3' PRECAST	19.5	24 - 18 LF	15.73(WQ-2)	15.48 (EXIST. 24" HDPE)
WQ-2	5'Ø BARRACUDA	20.7	18 - 5 LF	17.76 (CB-1)	17.30 (CB-1A)
CB-1	3'x3' PRECAST	20.89	18" - 46 LF	18.44 (CB-2)	18.14 (WQ-1)
CB-2	3'x3' PRECAST	27.19	18" - 58 LF	21.4 (CB-3)	21.4 (CB-1)
CB-3	3'x3' PRECAST	31.5	18 - 53 LF	21.8 (CB-4)	21.8 (CB-2)
CB-4	3'x3' PRECAST	28.2	12" - 33 LF 12" - 72 LF	22.2 (CB-4A) 24.2 (CB-5)	22.2 (CB-3)
CB-4A	30"x30" PRECAST	28.5	12" 57 - LF	25.7 (CB-4B)	25.7 (CB-4)
CB-4B	30"x30" PRECAST	28.7	-	N/A	26.2 (CB-4A)
CB-5	3'x3' PRECAST	28.5	12" - 30 LF 12" - 69 LF	24.7 (CB-5A) 24.7 (CB-6)	24.7 (CB-4)
CB-5A	30"x30" PRECAST	28.5	12" - 47 LF	24.9 (CB-5B)	24.9 (CB-5)
CB-5B	30"x30" PRECAST	30.9	12" - 52 LF	25.2 (CB-5C)	25.2 (CB-5A)
CB-5C	30"x30" PRECAST	28.0	8" - R.D.	25.5 (-)	25.5 (CB-5B)
CB-6	30"x30" PRECAST	29.5	-	N/A	26.5 (CB-5)
CB-7	7'Ø NYOPLAST	27.5	12" - 43 LF 12" - 65 LF	24.0 (CB-7A) 23.5 (CB-7B)	23.0 (OUTLET INV. 14.0)
CB-7A	7'Ø NYOPLAST	28.1	8" - R.D. & SURFACE	25.6 (8" R.D.)	25.0 (CB-7)
CB-7B	7'Ø NYOPLAST	26.7	-	N/A	24.2 (CB-7)
CB-8	2'x2' PRECAST	25.1	8" - R.D. 12" - 37 LF	22.0 (8" R.D.) 22.0 (CB-8A)	21.0 (OUTLET INV. 19.0)
CB-8A	2'x2' PRECAST	25.4	-	22.5 (8" R.D.)	22.5 (CB-8)
CB-8B	2'x2' PRECAST	25.2	-	23.0 (-)	23.0 (TEE INTO 12" @ 22.45)
CB-9	7'Ø NYOPLAST	27.3	8" - R.D. 12"	24.6 (8" R.D.) 24.6 (CB-9A)	24.5 (OUTLET INV. 24.0)
CB-9A	7'Ø NYOPLAST	33.3	8" - R.D. & SURFACE	30.5 (-)	30.4 (CB-9)
WQ-4	5'Ø BARRACUDA	16.5	12" - 5 LF	15.0 (CB-10)	14.9 (OUTLET INV. 11.0)
CB-10	7'Ø NYOPLAST	15.5	1	N/A	15.4 (WQ-4)
WQ-3	5'Ø BARRACUDA	12.5	18" - 5 LF	8.9 (CB-11)	8.8 (OUTLET INV. 8.0)
CB-11	30"x30" PRECAST	11.9	12" - 38 LF 18" - 60 LF	9.0 (CB-11A) 9.0 (CB-12)	9.0 (WQ-3)
CB-11A	30"x30" PRECAST	12.5	-	N/A	9.7 (CB-11)
CB-12	3'x3' PRECAST	12.5	-	9.5 (-)	9.5 (CB-11)
CB-13	30"x30" PRECAST	9.18	12" - 40 LF	6.06 (EXIST. 12") 6.06 (CB-13A)	5.91 (EXIST. CATCH BASIN)
CB-13A	30"x30" PRECAST	8.7	12" - 27 LF	6.5 (CB-13B)	6.5 (CB-13)
CB-13B	30"x30" PRECAST	16.2	1 12" - 62 LF	13.0 (CB-13C)	12.0 (CB-13A)
CB-13C	30"x30" PRECAST	23.0	1 4" - 4 LF	20.5 (4" PERF. PVC PIPE)	20.0 (CB-13B)
WQ-1	5'Ø BARRACUDA	8.5	EXIST. 18" HDPE - 7 LF	MATCH EXIST.	MATCH EXIST.
DMH-1	4'Ø PRECAST	29.0	24" - 11 LF	22.0 (24" PERF. PVC PIPE)	21.0 (OUTLET INV. 12.0)

MHE ENGINEERING

33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100

111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

PARTIAL SITE GRADING PLAN #2

REVISIONS

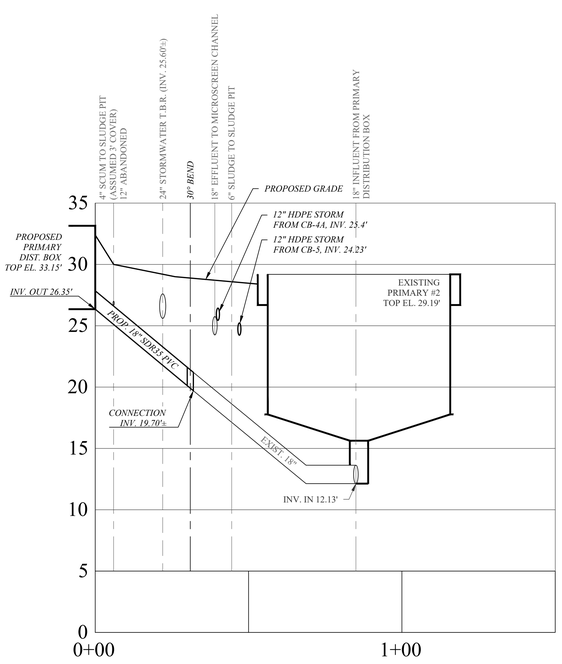
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE: 18 APR, 2025
DESIGN BY: SMQ, JTW
DRAWN BY: HPBJr
CHECKED BY: MWW
REVIEWED BY: **MJS, JZ**

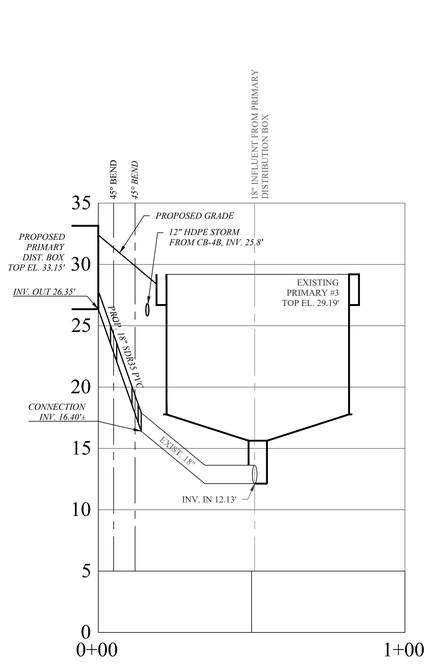
SHEET NO.
C-122

PROJECT # 18-732 PHASE #

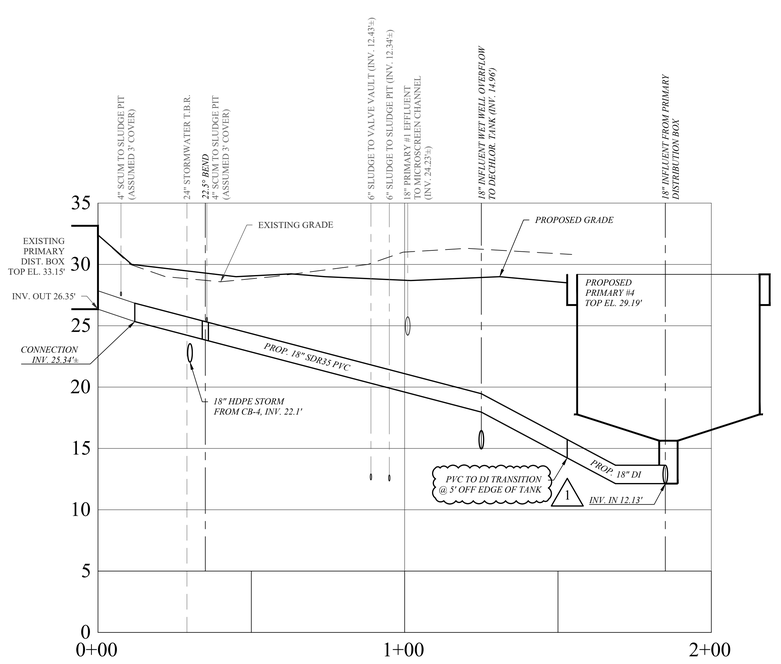
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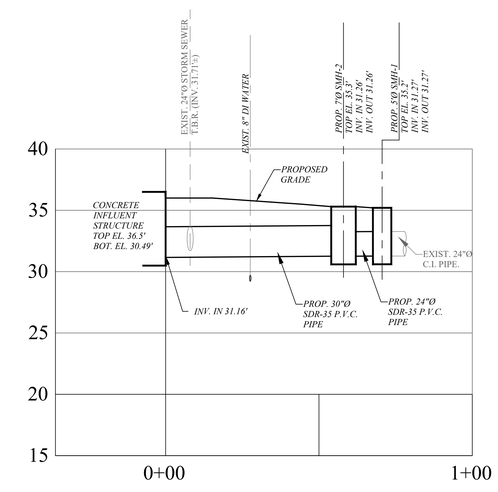
18" SDR35 PVC INFLUENT
TO PRIMARY #2



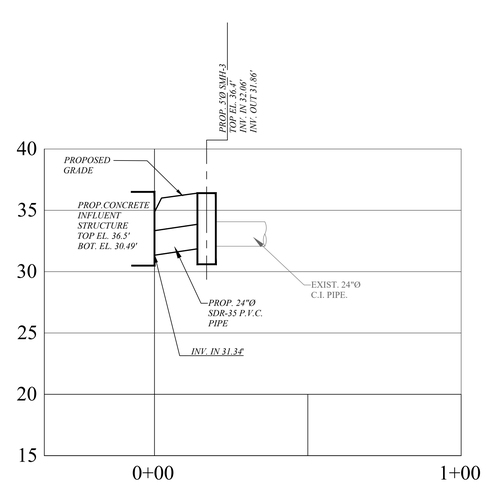
18" SDR35 PVC INFLUENT
TO PRIMARY #3



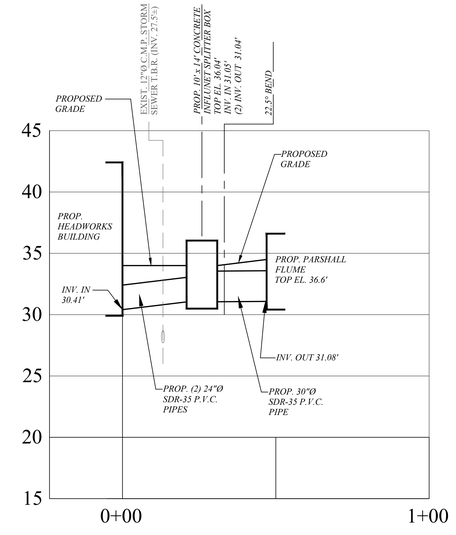
18" SDR35 PVC INFLUENT
TO PRIMARY #4



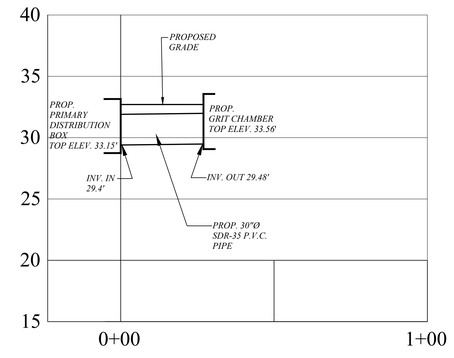
24" SDR35 PVC - SMH-1 TO SMH-2 AND
30" SDR35 PVC - SHM-2 TO INFLUENT STRUCTURE



24" SDR35 PVC - SMH-3
TO INFLUENT STRUCTURE



30" SDR35 PVC - PARSHALL FLUME
EFFLUENT TO INFLUENT SPLITTER BOX
AND 24" SDR35 PVC SPLITTER BOX
EFFLUENT TO HEADWORKS BUILDING



30" SDR35 PVC - GRIT CHAMBER
TO PRIMARY DISTRIBUTION BOX

SHADED TEXT = EXISTING PIPING
ITALICIZED TEXT = PROPOSED PIPING

NOTE: PIPE CROSSINGS ARE SHOWN FOR INFORMATIONAL PURPOSES. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PIPE LOCATIONS AND DEPTHS VIA. TEST PITS PRIOR TO ANY REMOVAL OR PLACEMENT OF NEW PIPING.

1 / C-124 YARD PIPING PROFILES
SCALE: HORIZ. 1" = 20', VERT. 1"=5'

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111 Wheatfield Drive, Suite 1, Milford, PA 18337, (570) 296-2765

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PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

PROCESS PIPE PROFILES

REVISIONS

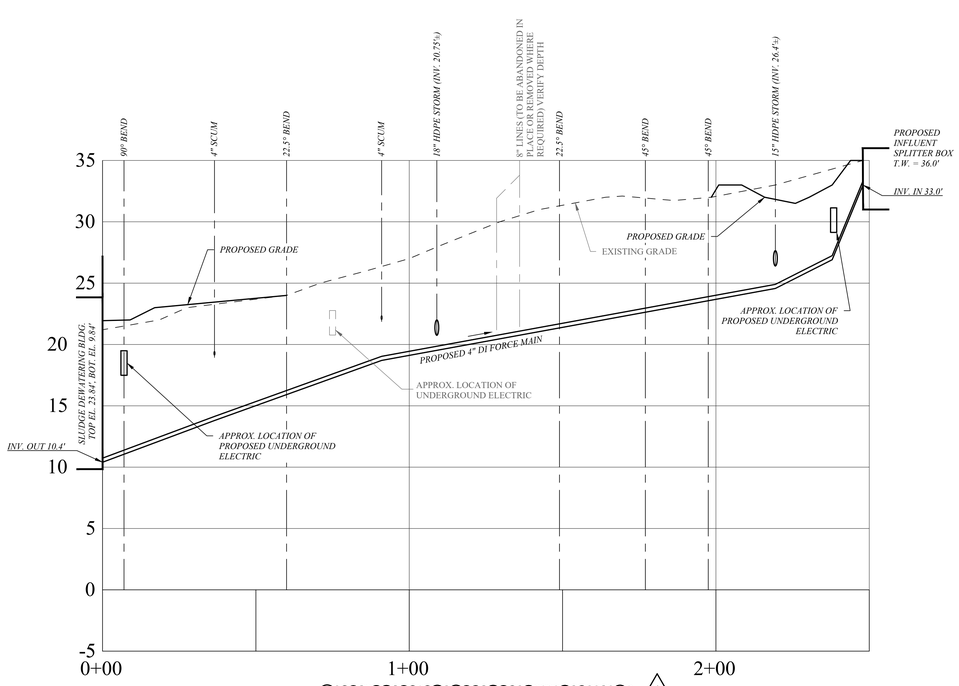
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	SMQ, JTW
DRAWN BY:	HPBJr
CHECKED BY:	MWW
REVIEWED BY:	**MJS, JZ**

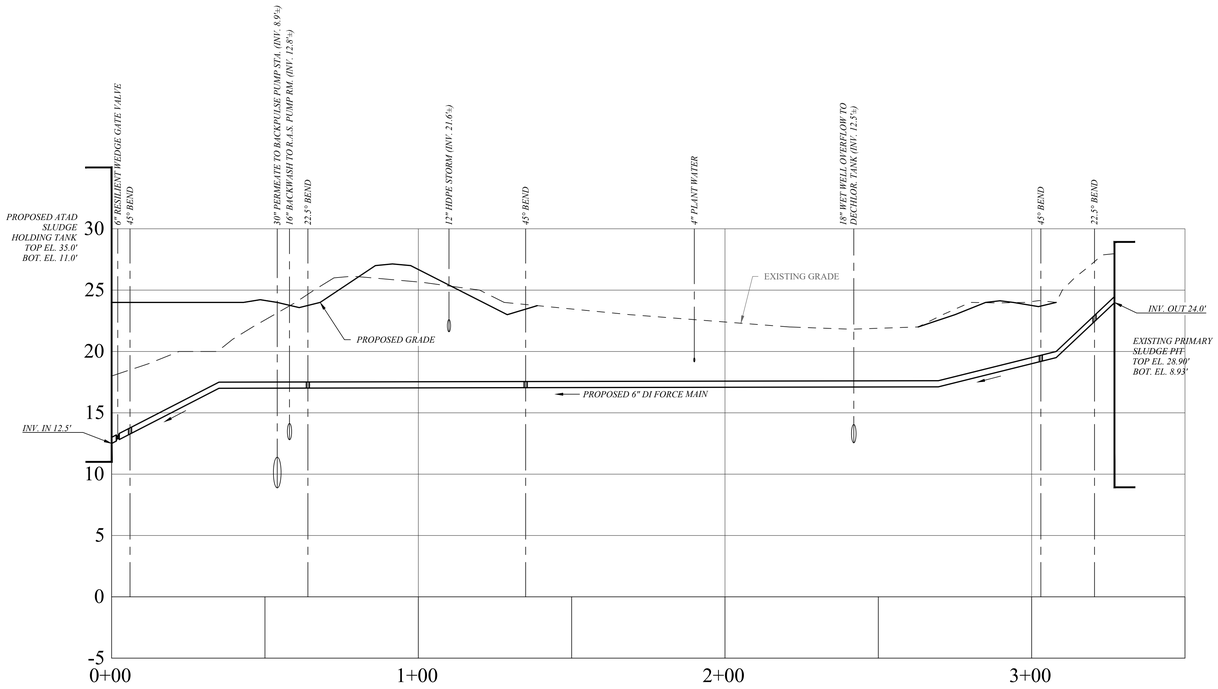
SHEET NO.
C-124

PROJECT # 18-732 PHASE #

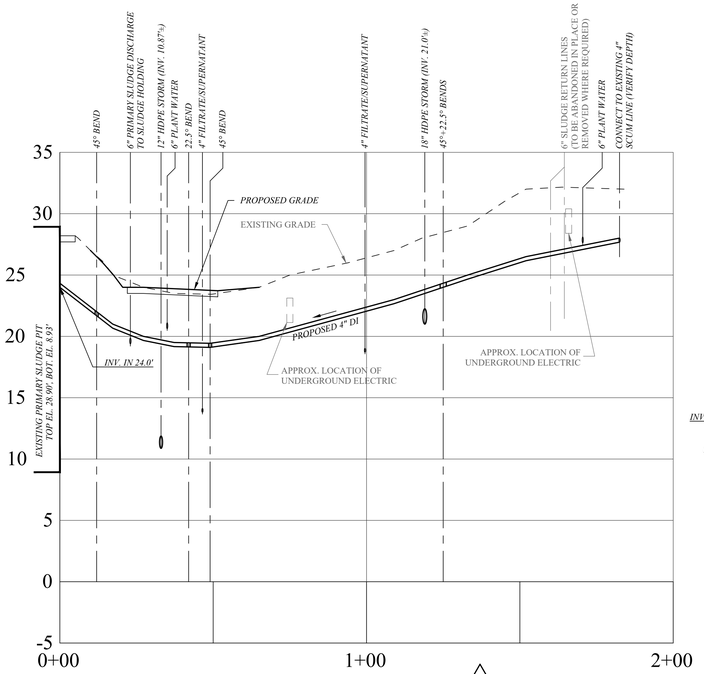
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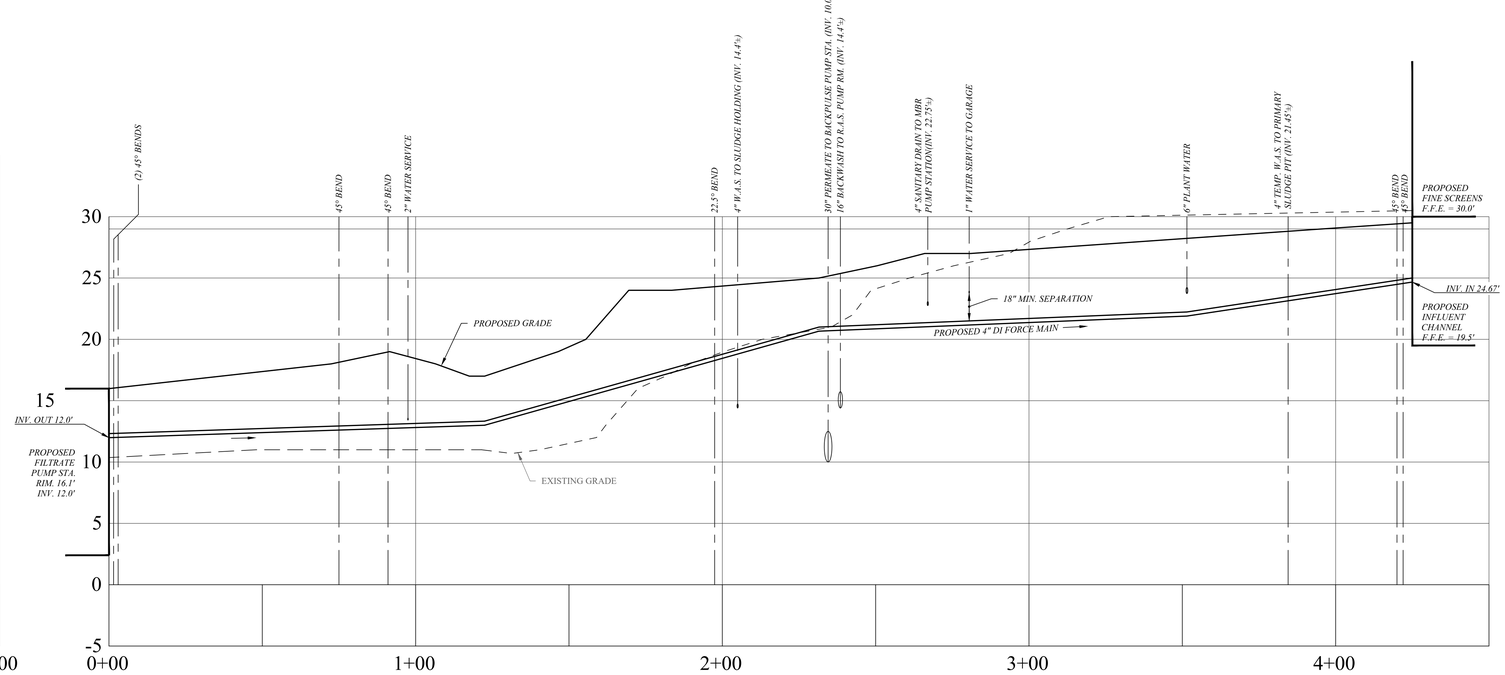
4" DI FILTRATE/SUPERNATANT 1



6" DI PRIMARY SLUDGE FEED LINE



4" DI SCUM LINE 1



4" DI RDT FILTRATE LINE

SHADED TEXT = EXISTING PIPING
ITALICIZED TEXT = PROPOSED PIPING

NOTE: PIPE CROSSINGS ARE SHOWN FOR INFORMATIONAL PURPOSES. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PIPE LOCATIONS AND DEPTHS VIA. TEST PITS PRIOR TO ANY REMOVAL OR PLACEMENT OF NEW PIPING.

1 / C-126 YARD PIPING PROFILES
SCALE: HORIZ. 1" = 20', VERT. 1"=5'

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(845) 567-3100
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(570) 296-2765

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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

PROCESS PIPE PROFILES

REVISIONS

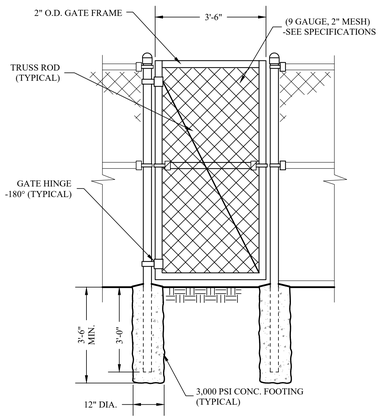
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	SMQ, JTW
DRAWN BY:	HPBJr
CHECKED BY:	MWW
REVIEWED BY:	**MJS, JZ**

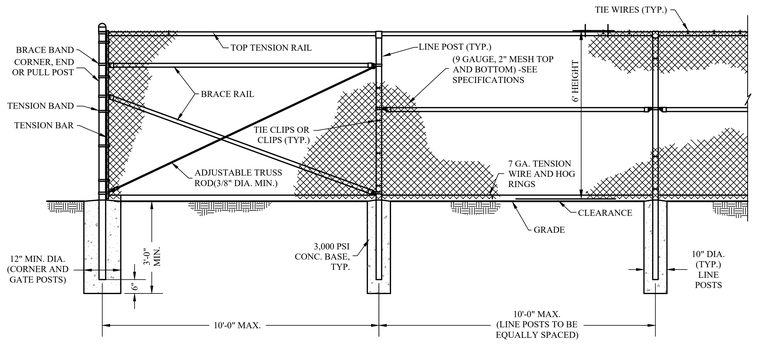
SHEET NO.
C-126

PROJECT # 18-732 PHASE #

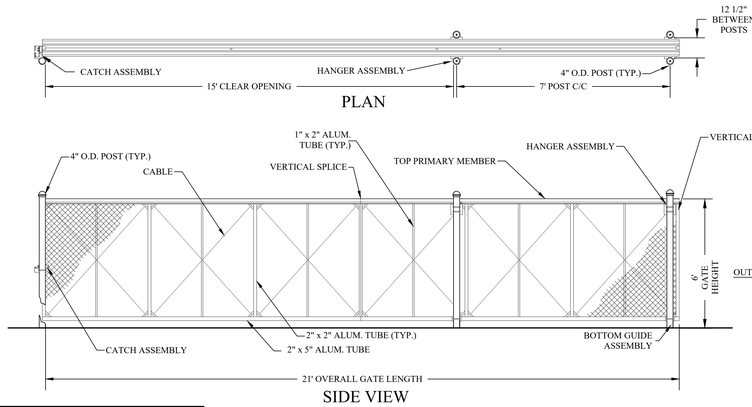
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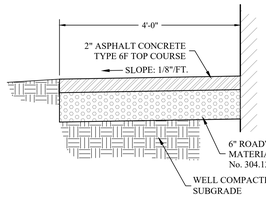
1 C-142 CHAIN LINK MAN GATE DETAIL
SCALE: NONE



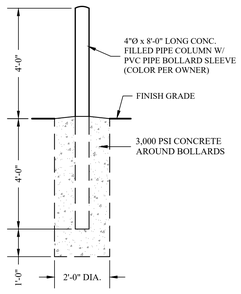
2 C-142 CHAIN LINK FENCE DETAIL
SCALE: NONE



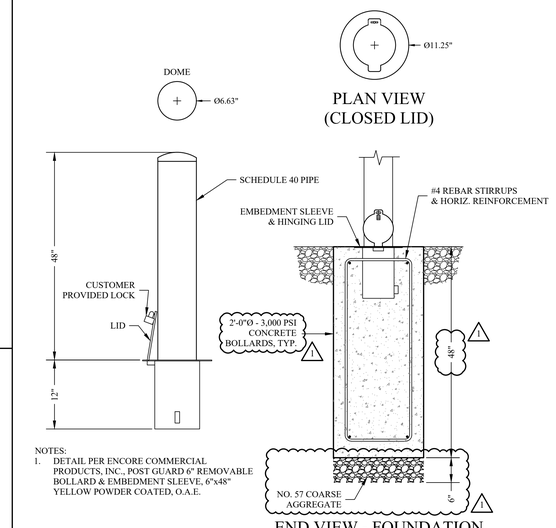
3 C-142 TYP. SLIDING GATE DETAIL
SCALE: NONE



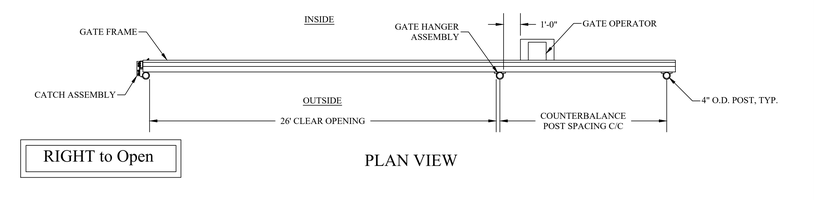
4 C-142 TYP. ASPHALT PAVEMENT WALKWAY SECTION
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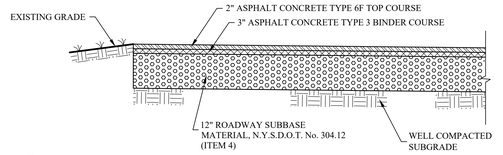
5 C-142 CONCRETE BOLLARD DETAIL
SCALE: NONE



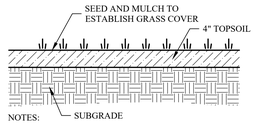
6 C-142 REMOVABLE BOLLARD DETAIL
SCALE: NONE



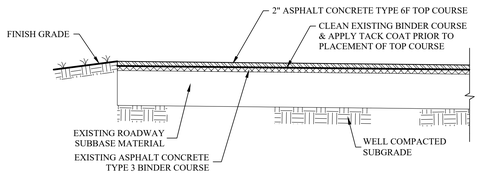
7 C-142 HEAVY DUTY CANTILEVER SLIDE GATE DETAILS
SCALE: NONE



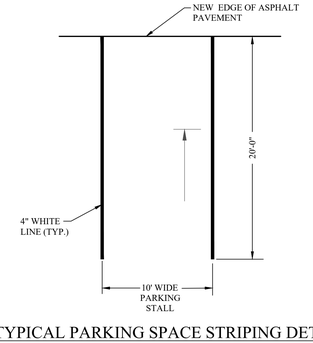
8 C-142 TYPICAL FULL DEPTH ASPHALT PAVEMENT SECTION
SCALE: NONE



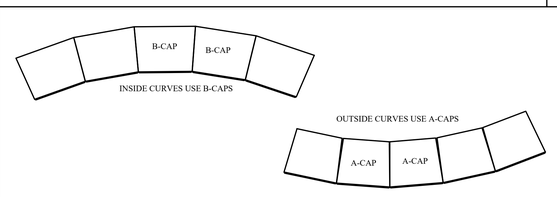
9 C-142 TOPSOIL RESTORATION DETAIL
SCALE: NONE



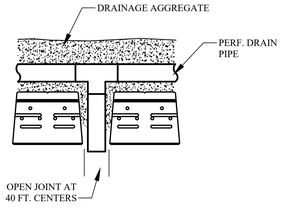
10 C-142 TYPICAL FINAL PAVEMENT ACCESS DRIVE SECTION
SCALE: NONE



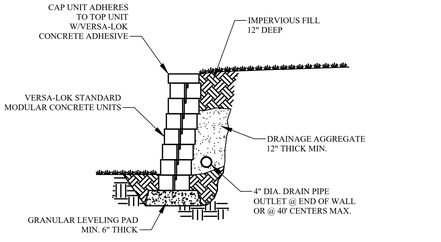
11 C-142 TYPICAL PARKING SPACE STRIPING DETAIL
SCALE: N.T.S.



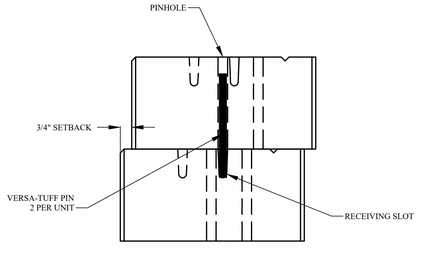
CAPPING DETAIL-PLAN VIEW
CURVES
SCALE: NONE



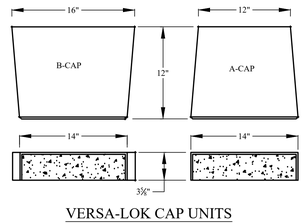
DRAIN DETAIL
SCALE: NONE



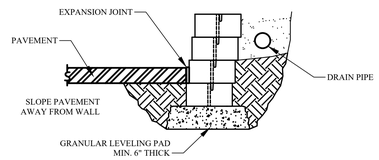
TYPICAL SECTION-UNREINFORCED RETAINING WALL
SCALE: NONE



PINNING DETAIL
CROSS SECTION
SCALE: NONE



VERSA-LOK CAP UNITS
UNIT DIMENSIONS
SCALE: NONE



PAVEMENT AT BASE OF WALL
SCALE: NONE

NOTE:
1. DETAILS PER VERSA-LOK RETAINING WALL SYSTEMS, O.A.E.

12 C-142 CONCRETE BLOCK RETAINING WALL DETAILS
SCALE: N.T.S.

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SITE DETAILS

REVISIONS

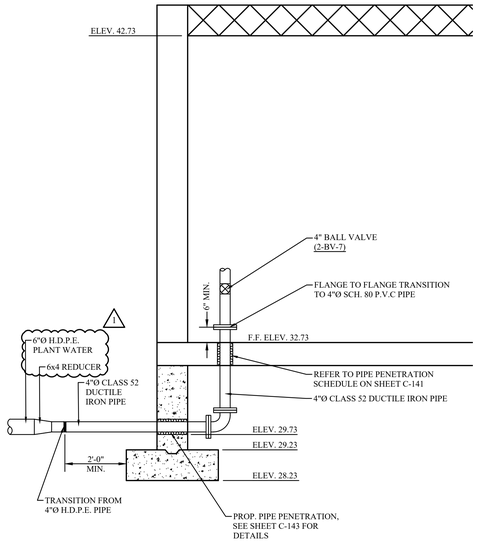
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ISSUED DATE:	18 APR, 2025
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DRAWN BY:	HPBJr
CHECKED BY:	MWW
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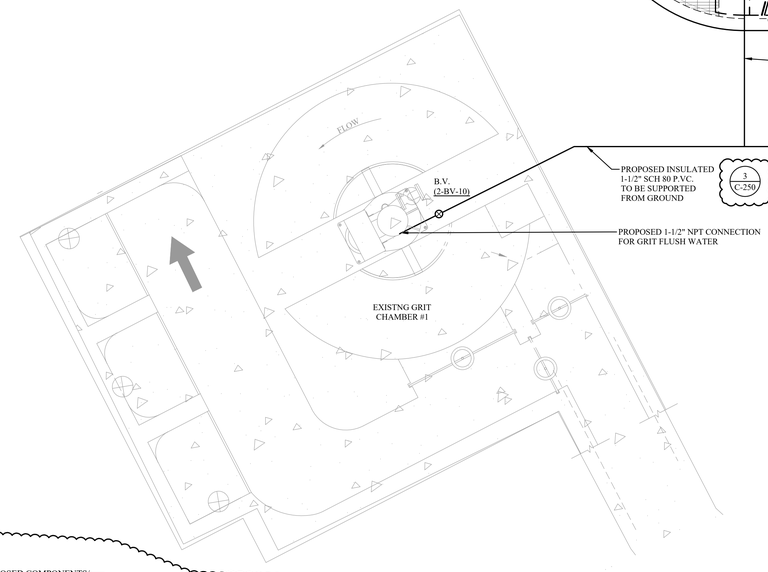
SHEET NO.
C-142

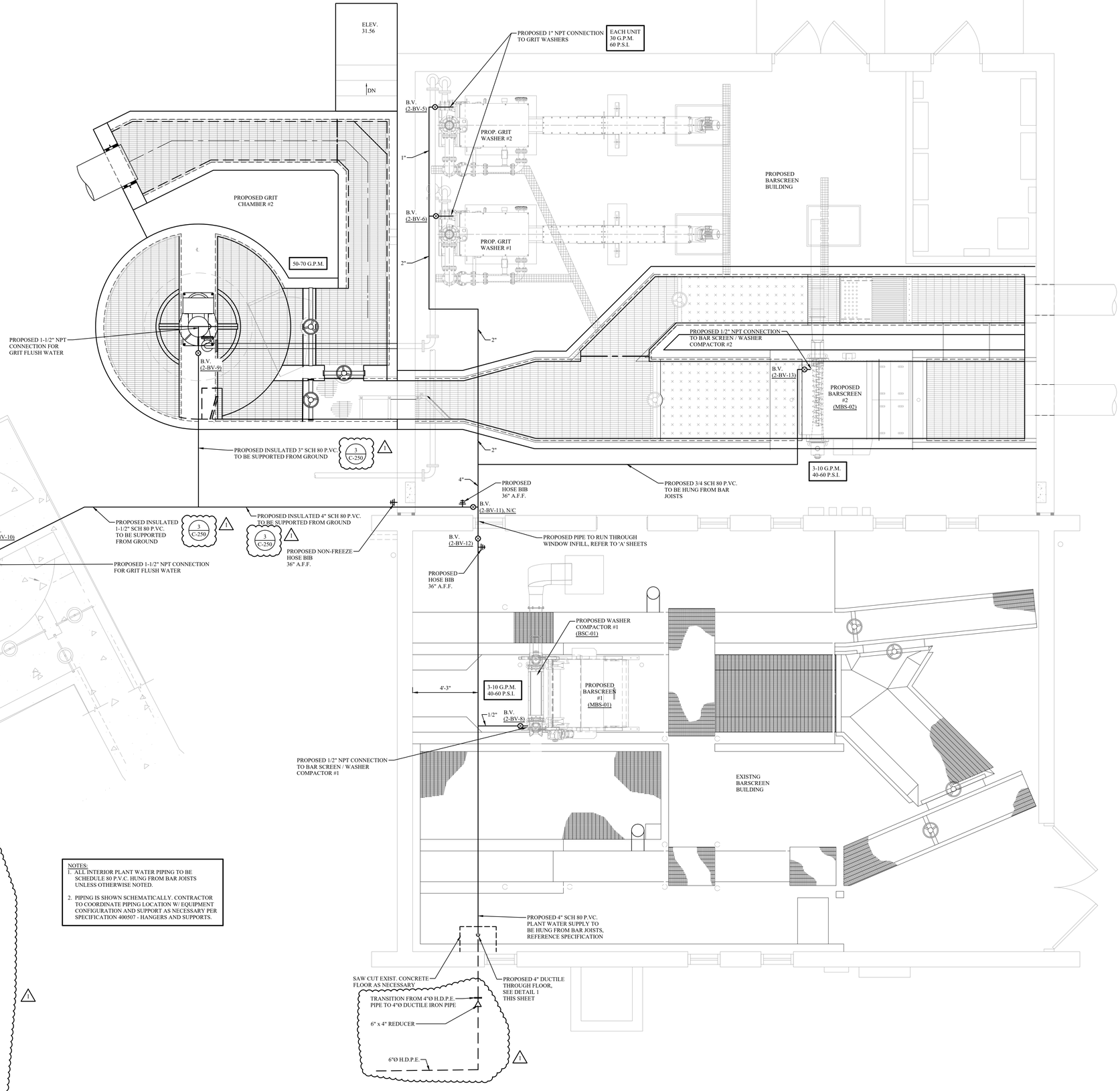
PROJECT # 18-732 PHASE #

F:\2018\18-732 Caesar Lane WWTP Improvements\Expansion Phase\Drafting\1 - Site Work & Outfall\Addendum 4\18-732 Caesars Lane WWTP Site Plan Phase 2.dwg, C-142, 7/10/2025 9:42:37 AM

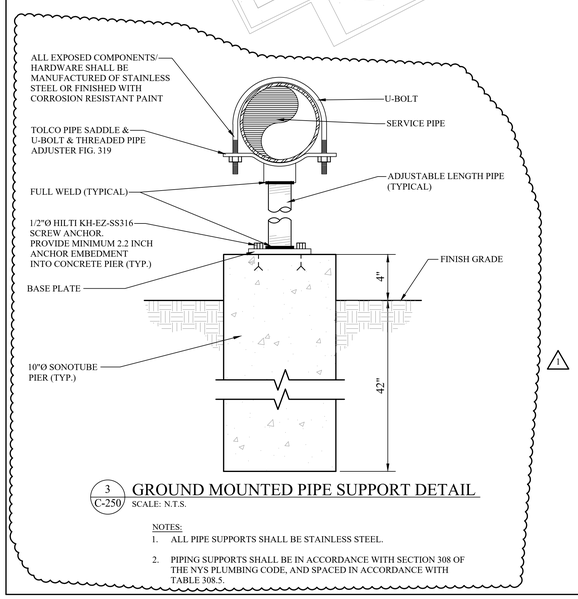


1 C-250 PLANT WATER FLOOR PENETRATION DETAIL
SCALE: 1/2" = 1'-0"





2 C-250 PROPOSED HEADWORKS PLANT WATER SUPPLY - PLAN VIEW
SCALE: 3/8" = 1'-0"



3 C-250 GROUND MOUNTED PIPE SUPPORT DETAIL
SCALE: N.T.S.

NOTES:
1. ALL PIPE SUPPORTS SHALL BE STAINLESS STEEL.
2. PIPING SUPPORTS SHALL BE IN ACCORDANCE WITH SECTION 308 OF THE NYS PLUMBING CODE, AND SPACED IN ACCORDANCE WITH TABLE 308.5.

NOTES:
1. ALL INTERIOR PLANT WATER PIPING TO BE SCHEDULE 80 P.V.C. HUNG FROM BAR JOISTS UNLESS OTHERWISE NOTED.
2. PIPING IS SHOWN SCHEMATICALLY. CONTRACTOR TO COORDINATE PIPING LOCATION W/ EQUIPMENT CONFIGURATION AND SUPPORT AS NECESSARY PER SPECIFICATION 400507 - HANGERS AND SUPPORTS.

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PROPOSED
HEADWORKS
PLANT WATER SUPPLY -
PLAN VIEW

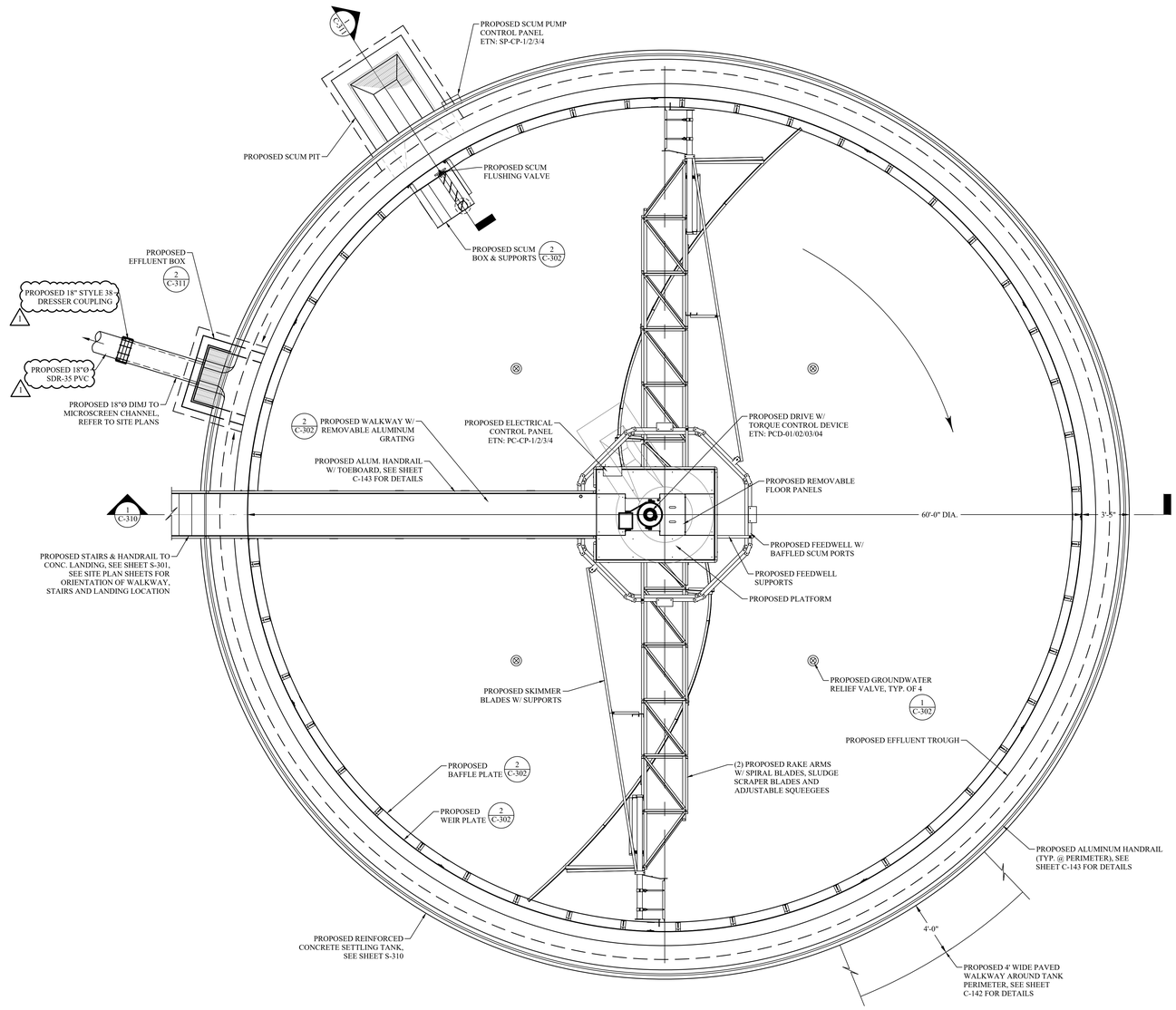
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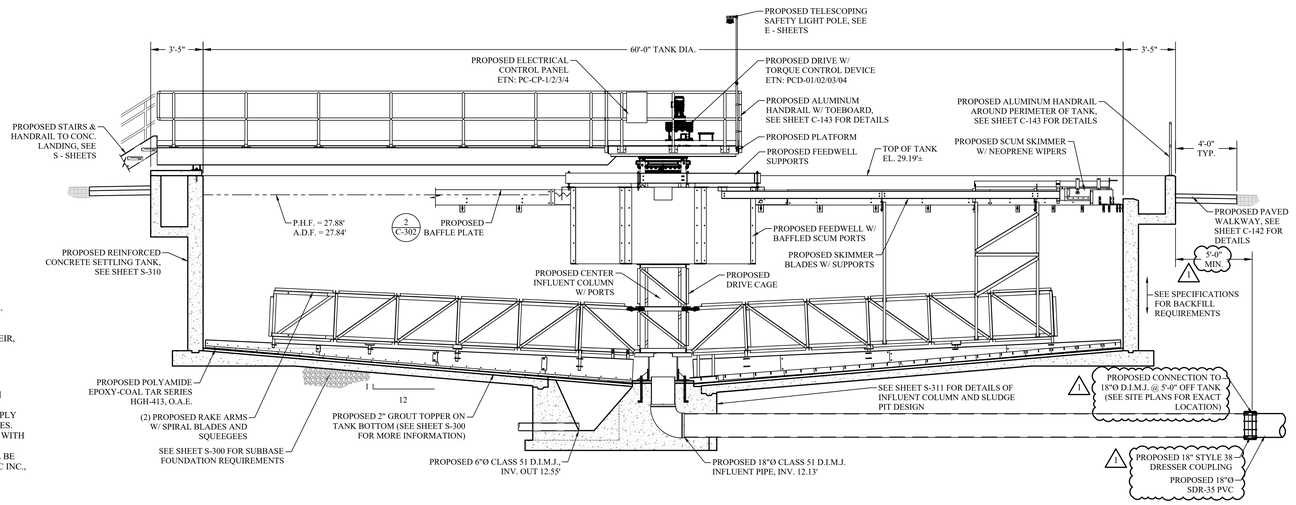
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REVIEWED BY:	MJS, JZ

SHEET NO.
C-250

PROJECT # 18-732 PHASE #



A C-310 PROPOSED PRIMARY SETTLING TANK #4 PLAN
SCALE: 1/4" = 1'-0"



1 C-310 PROPOSED PRIMARY SETTLING TANK #4 ELEVATION/SECTION
SCALE: 1/4" = 1'-0"

GENERAL NOTES:

1. FOR PIPE CONFIGURATION OF ALL SETTLING TANKS REFER TO SITE PLANS.
2. FOR SPECIFICATIONS REGARDING DIMENSIONS AND LAYOUT OF ALL CLARIFIER EQUIPMENT, REFER TO SPECIFICATION SECTION 464321.
3. CONTRACTOR SHALL FIELD VERIFY AND MATCH ALL ELEVATIONS FOR WEIR, BAFFLES, INVERTS AND TANK ETC. WITH EXISTING PRIMARY TANKS.

COATING NOTES:

1. ALL CONCRETE SURFACES OF THE PRIMARY CLARIFIER IN CONTACT WITH WASTEWATER SHALL BE COATED WITH 2 COATS OF HI-BUILD TNEME-TAR (SERIES 46H-413) POLYAMIDE EPOXY-COAL TAR, OR APPROVED EQUAL. APPLY COATINGS IN STRICT ADHERENCE WITH THE MANUFACTURER'S GUIDELINES.
2. SURFACE PREPARATION FOR COATINGS SHALL BE DONE IN ACCORDANCE WITH SSPC-SP13/NACE 6 AND THE MANUFACTURER'S RECOMMENDATIONS.
3. CORED OR CUT CONCRETE SURFACES WITH EXPOSED REINF. STEEL SHALL BE PRIMED WITH OMNITHANE SERIES 1 POLYURETHANE PRIMER BY TENEMEC INC., OR APPROVED EQUAL, PRIOR TO COATING WITH EPOXY-COAL TAR.

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PROPOSED PRIMARY SETTLING TANK #4 PLAN & SECTION

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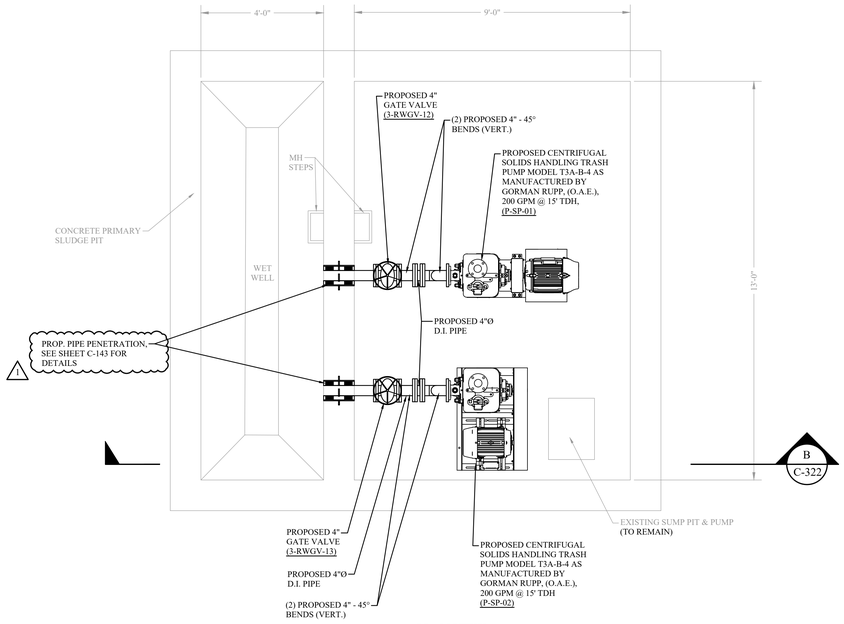
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C-310

PROJECT # 18-732 PHASE #

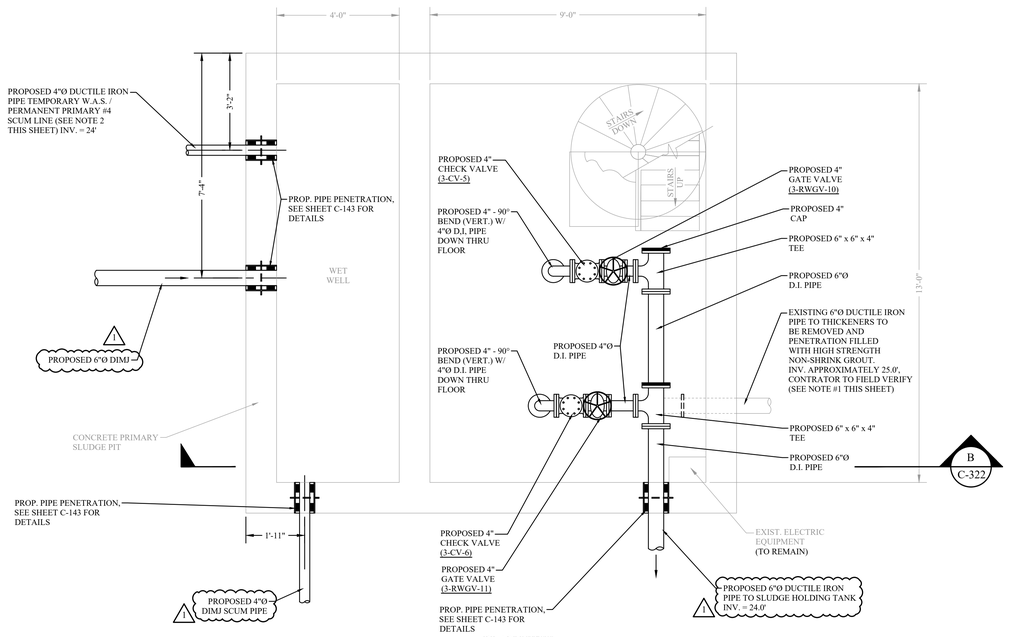
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PLAN VIEW

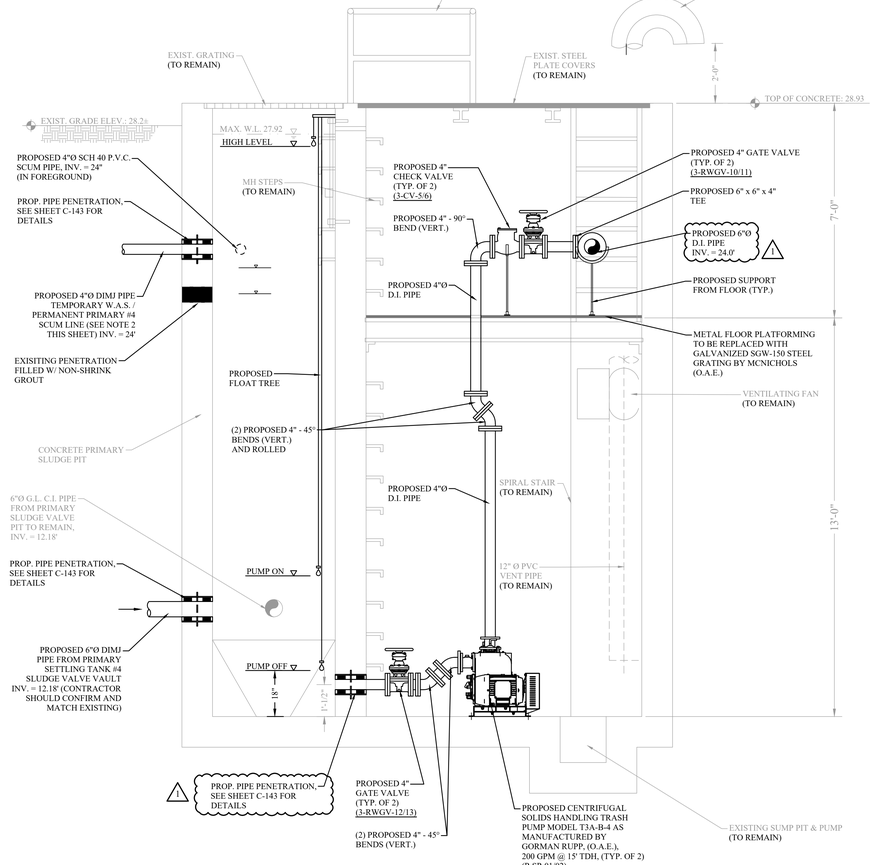
1 C-322 EXISTING PRIMARY SLUDGE PIT LOWER LEVEL MODIFICATIONS
SCALE: 1/2" = 1'-0"

NOTES:
1. NEW SLUDGE PUMPS AND PIPING TO BE REPLACED PRIOR TO M.B.R. STARTUP. SLUDGE DISCHARGE TO REMAIN TO GRAVITY THICKENERS UNTIL A.T.A.D. STARTUP, AT WHICH TIME THE PIPING SHALL BE TIED INTO DISCHARGE TO SLUDGE HOLDING TANK.
2. TEMPORARY 4"Ø DUCTILE W.A.S. LINE TO BE OPERATIONAL UPON INITIAL MBR STARTUP. ONCE PROPOSED A.T.A.D. SYSTEM IS OPERATIONAL, LINE TO BE REUSED AS PRIMARY #4 SCUM LINE. REFER TO SITE PLAN FOR TIE IN LOCATION.
3. ITEMS NOTED AS "T.B.R." SHALL BE TOTALLY REMOVED AND PROPERLY DISPOSED OF BY THE CONTRACTOR.
4. REFER TO SHEET E-031 FOR CONTROL PANEL MOUNTING.



PLAN VIEW

2 C-322 EXISTING PRIMARY SLUDGE PIT UPPER LEVEL MODIFICATIONS
SCALE: 1/2" = 1'-0"



SECTION B

3 C-322 EXISTING PRIMARY SLUDGE PIT LOWER / UPPER LEVEL MODIFICATIONS
SCALE: 1/2" = 1'-0"

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EXISTING PRIMARY SLUDGE PIT MODIFICATIONS

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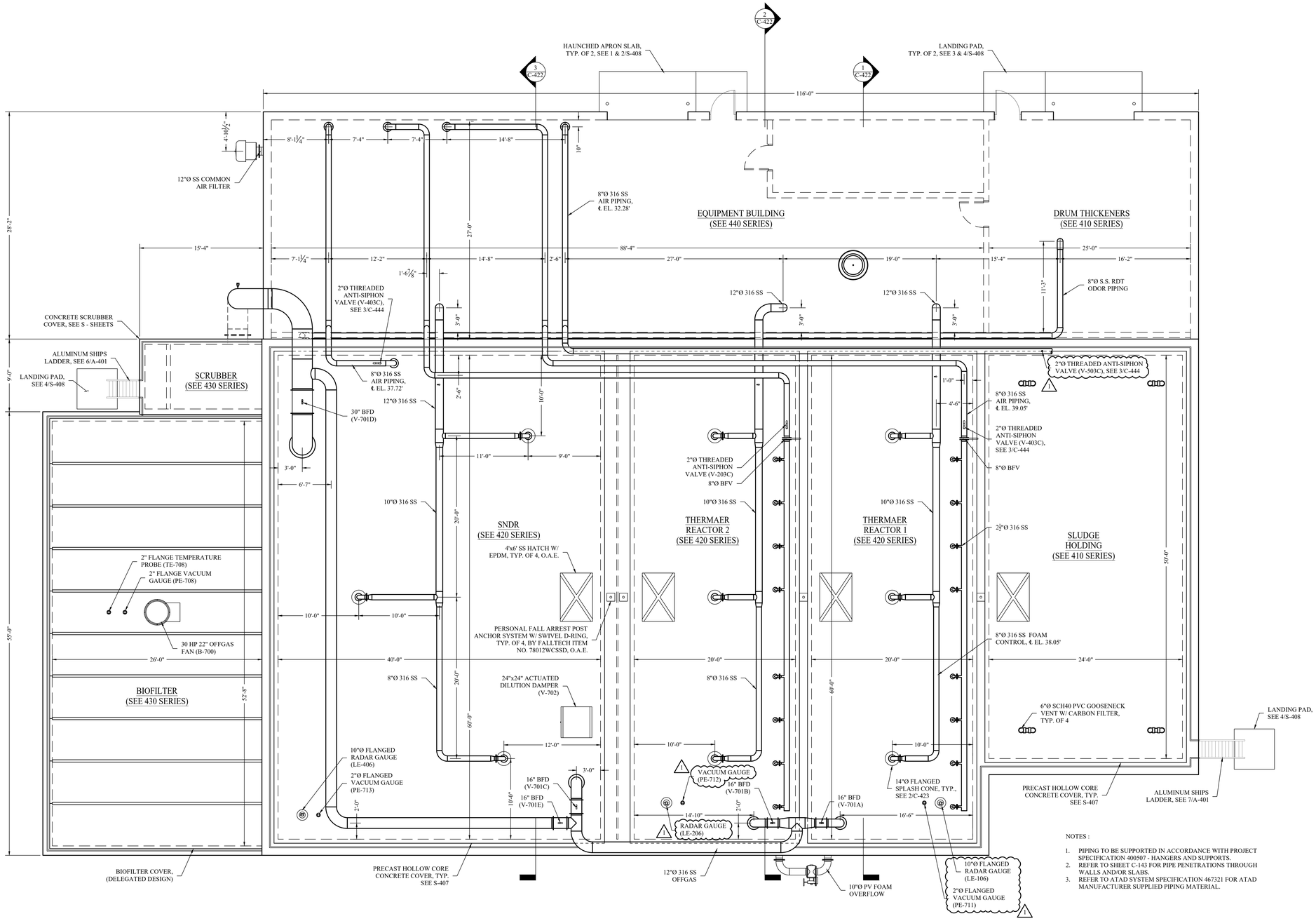
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SHEET NO.
C-322

PROJECT # 18-732 PHASE #

F:\2018\18-732 Caesar Lane WWTP Improvements\Expansion Phase\Drafting\3 - Primary Settling\Civil-Process\Addendum #4\Main and secondary Sludge pit.dwg, C-322, 7/15/2025 10:26:59 AM



NOTES :

1. PIPING TO BE SUPPORTED IN ACCORDANCE WITH PROJECT SPECIFICATION 400507 - HANGERS AND SUPPORTS.
2. REFER TO SHEET C-143 FOR PIPE PENETRATIONS THROUGH WALLS AND/OR SLABS.
3. REFER TO ATAD SYSTEM SPECIFICATION 467321 FOR ATAD MANUFACTURER SUPPLIED PIPING MATERIAL.

A C-420 A.T.A.D. BioSolid SYSTEM PLAN
SCALE: $\frac{3}{16}$" = 1'-0"

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A.T.A.D.
OVERALL PLAN

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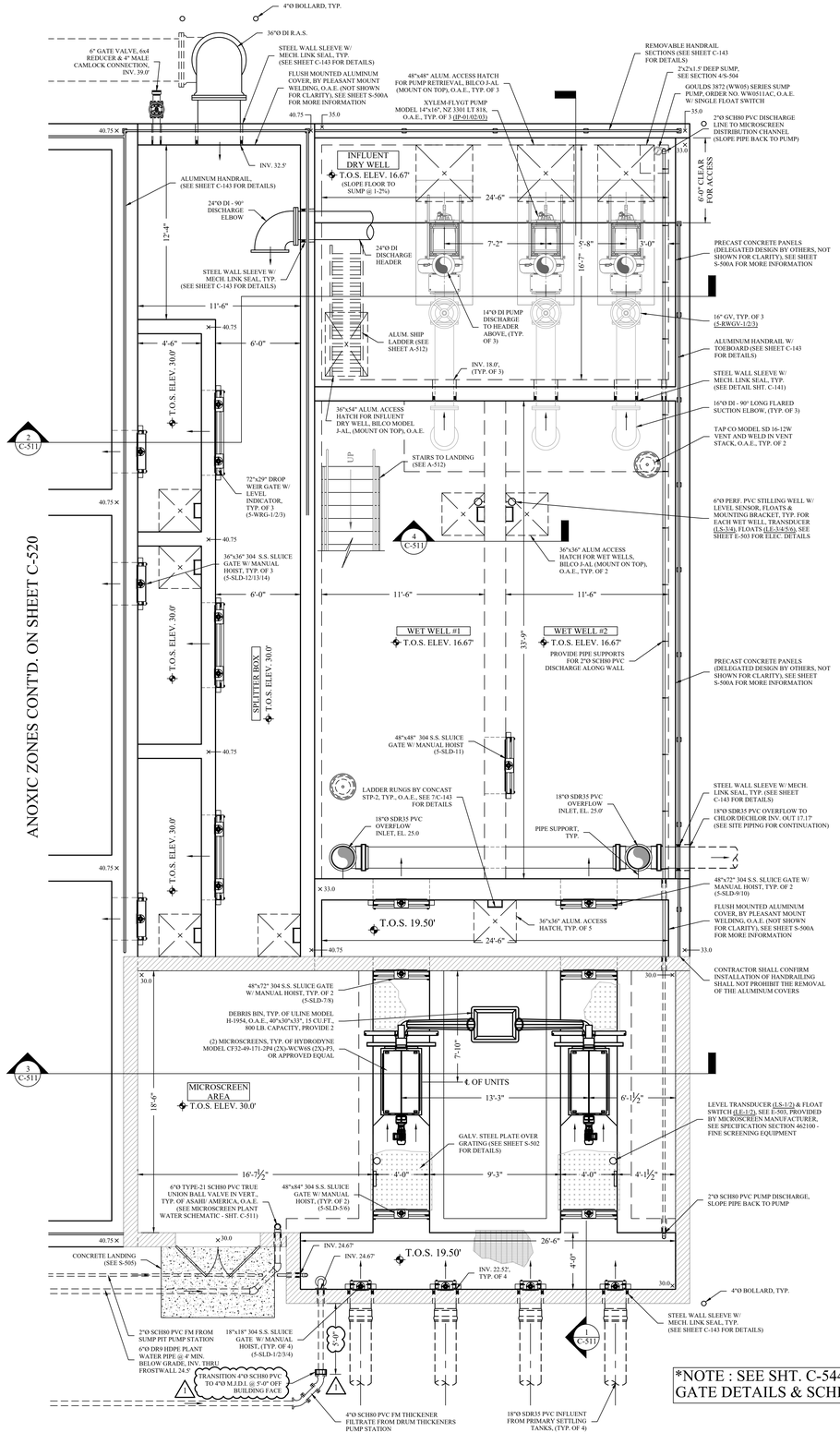
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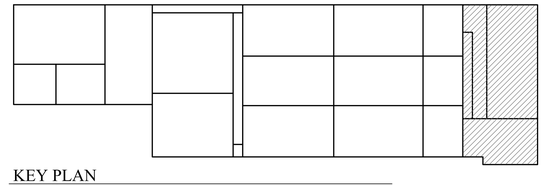
SHEET NO.
C-420

PROJECT # 18-732 PHASE #

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A C-510 MBR - INFLUENT PUMPS & MICROSCREEN PLAN
SCALE: 1/4" = 1'-0"



KEY PLAN
SCALE: 1/32" = 1'-0"

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MBR - INFLUENT PUMPS & MICROSCREEN PLAN

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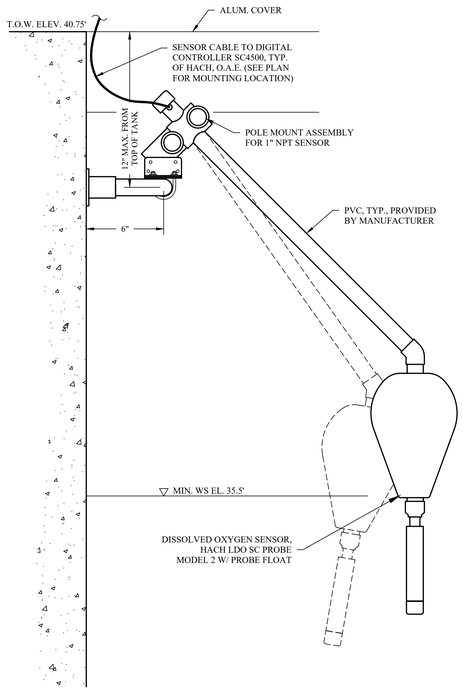
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SHEET NO.
C-510

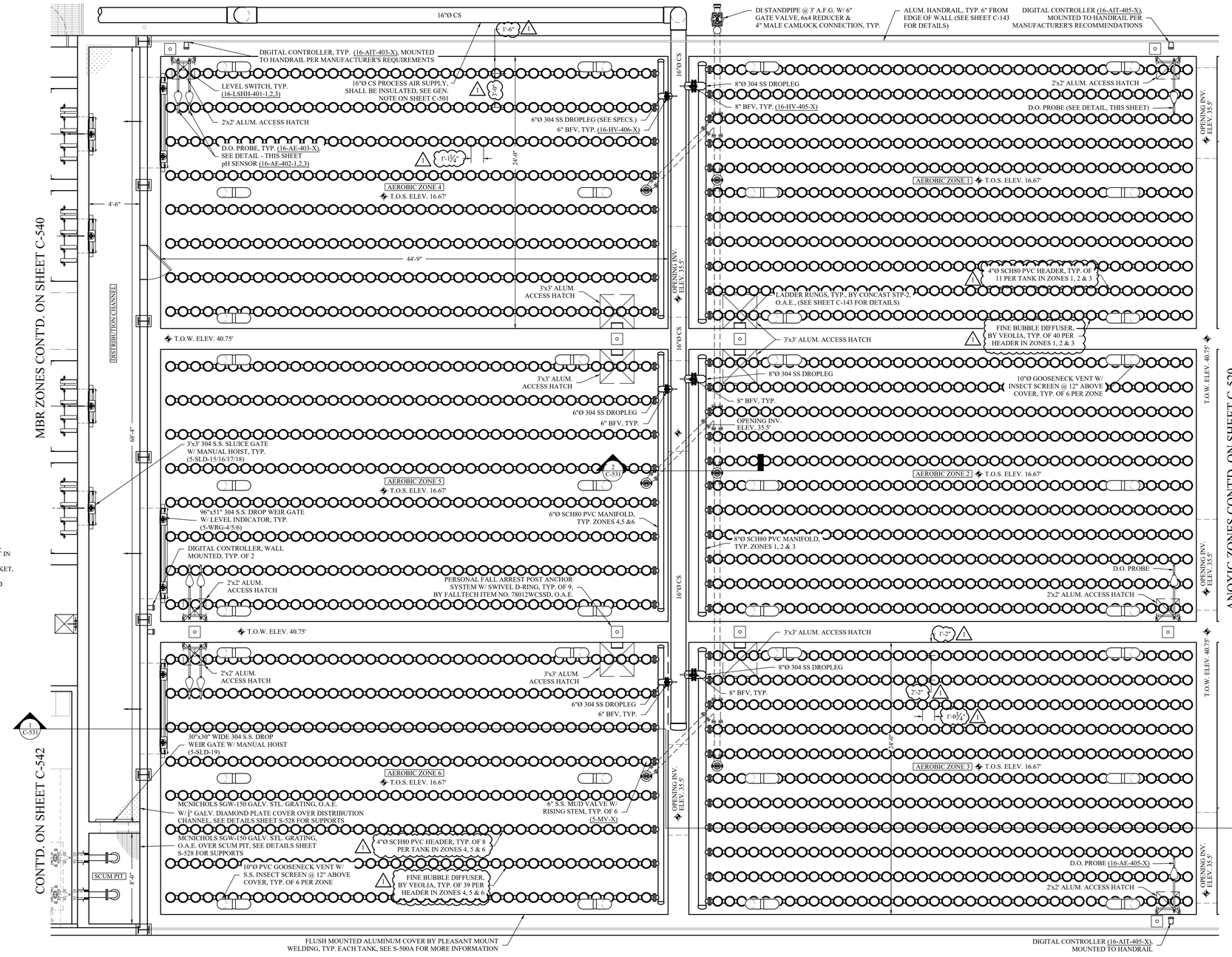
PROJECT # 18-732 PHASE #

P:\2018\18-732 Caesar Lane WWTP Improvements\Expansion Phase\Drafting\S - MBR\Process\Addendum 4\PLANS AND SECTIONS2.dwg, C-510, 7/10/2025 10:17:36 AM



1 / C-530 D.O. PROBE/pH SENSOR FLOAT MOUNT DETAIL
SCALE: NONE (PROVIDED BY VEOLIA)

NOTE: CONTRACTOR TO INSTALL AND MOUNT IN ACCORDANCE WITH MANUFACTURER'S MOUNTING INSTALLATION. MOUNTING BRACKET, ANCHORS AND HARDWARE SUPPLIED BY MANUFACTURER. FURNISHED BY VEOLIA AND SUPPLIED BY MANUFACTURER.

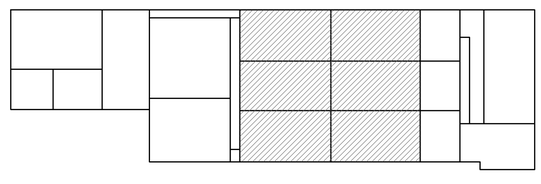


A / C-530 MBR - AEROBIC ZONE TANK PLAN
SCALE: 1/4" = 1'-0"

NOTES :

1. ALL CARBON STEEL AND STAINLESS STEEL PIPE SHALL COMPLY WITH ASTM A53.
2. ALL CARBON STEEL AND STAINLESS STEEL PIPE SHALL BE WELDED.
3. ALL FITTINGS SHALL COMPLY WITH ASTM A234-WPB.

*NOTE : SEE SHT. C-544 FOR GATE DETAILS & SCHEDULE)



KEY PLAN
SCALE: 1/32" = 1'-0"

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID SET

HAZARDOUS MATERIAL NOTE:
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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

MBR - AEROBIC ZONE TANK PLAN

REVISIONS

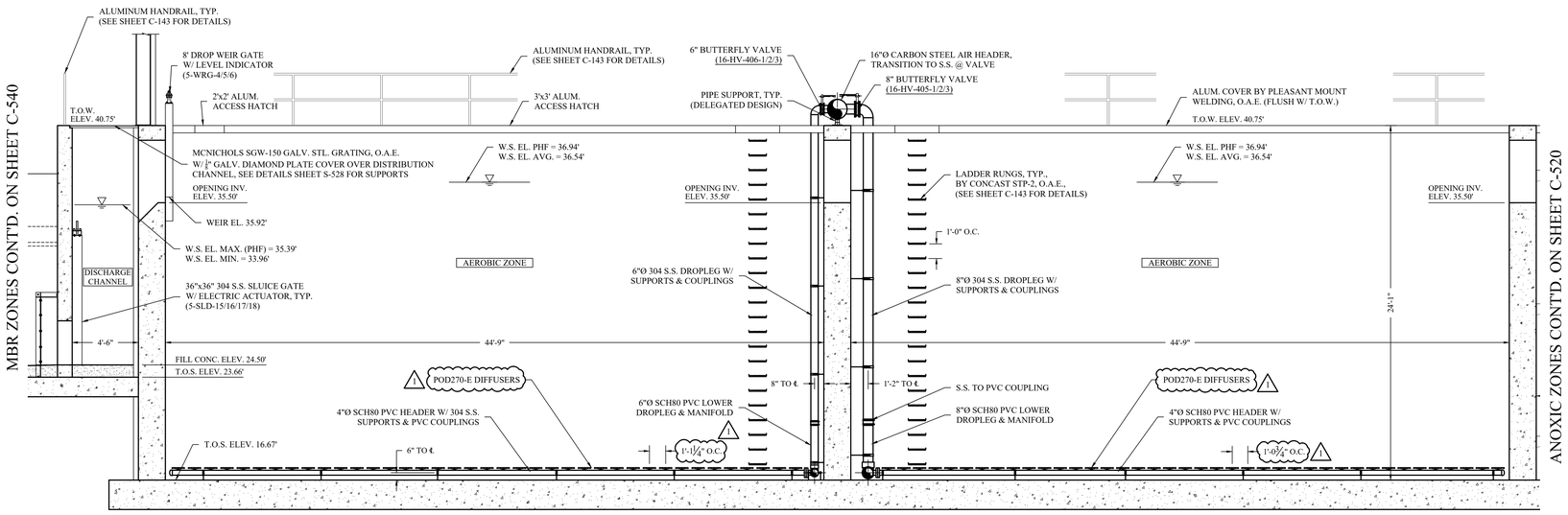
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	JTW
DRAWN BY:	HPBJr
CHECKED BY:	MWW
REVIEWED BY:	MJS, JZ

SHEET NO.
C-530

PROJECT # 18-732 PHASE #

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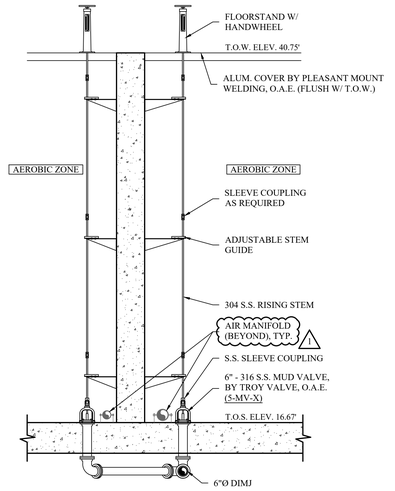


1 / C-531 MBR - AEROBIC ZONE TANK SECTION

SCALE: 1/4" = 1'-0"

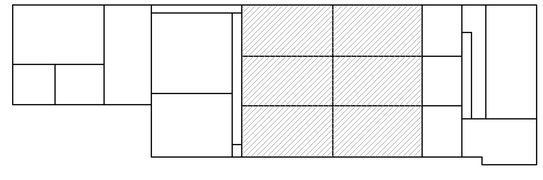
NOTE : CONTRACTOR TO REFER TO VEOLIA'S P&ID AND BILL OF MATERIALS TO CONFIRM SCOPE OF SUPPLY FOR THE FINE BUBBLE DIFFUSER GRIDS.

*NOTE : SEE SHT. C-544 FOR GATE DETAILS & SCHEDULE)



2 / C-531 TYP. TANK WALL SECTION @ MUD VALVES

SCALE: 1/4" = 1'-0"



KEY PLAN

SCALE: 1/32" = 1'-0"

ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID SET

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145 CAESARS LN.
NEW WINDSOR, NY 12553

FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

MBR - AEROBIC ZONE TANK SECTIONS

REVISIONS

NO.	DESCRIPTION	DATE
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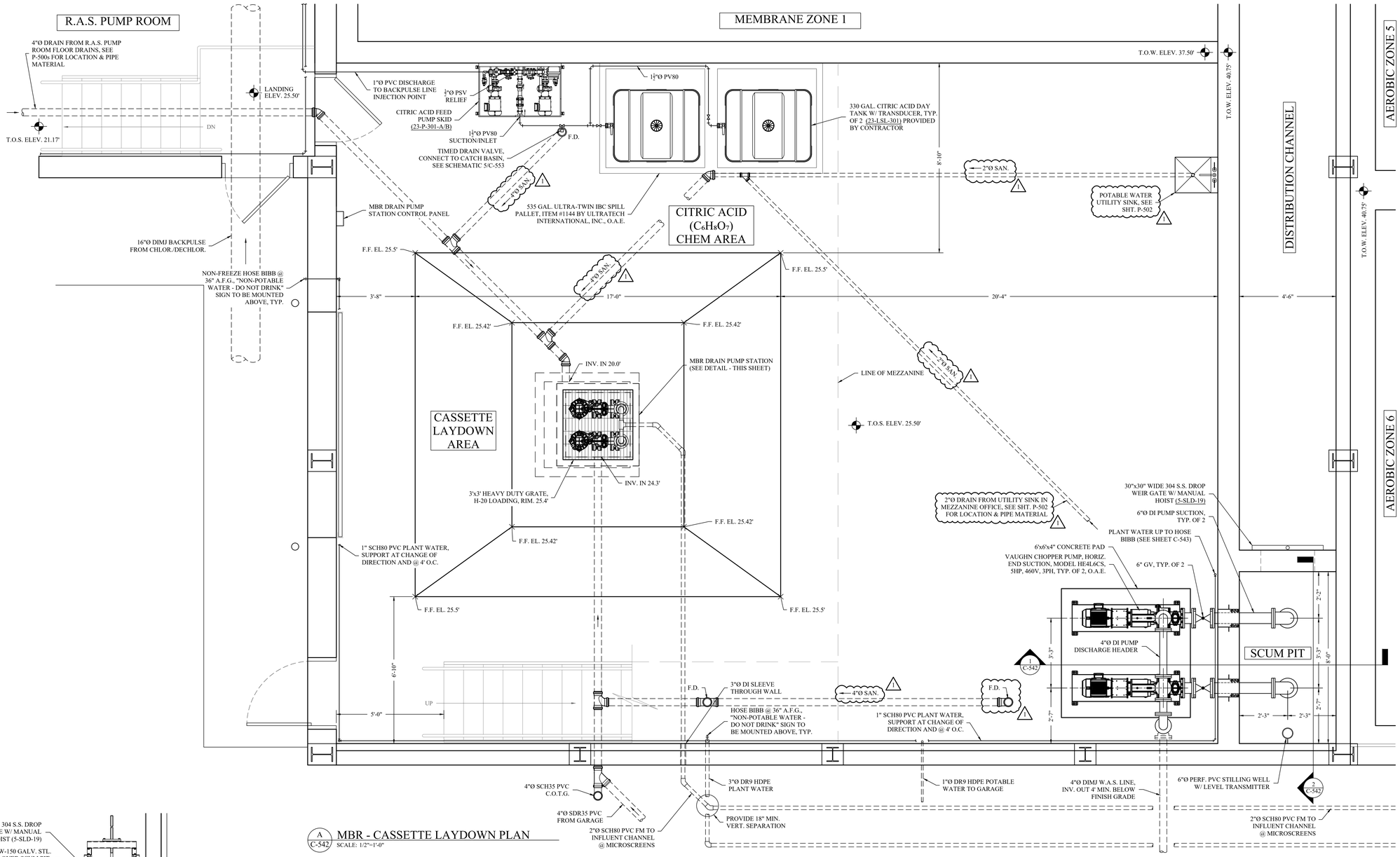
ISSUED DATE:	18 APR, 2025
DESIGN BY:	JTW
DRAWN BY:	HPBJr
CHECKED BY:	MWW
REVIEWED BY:	MJS, JZ

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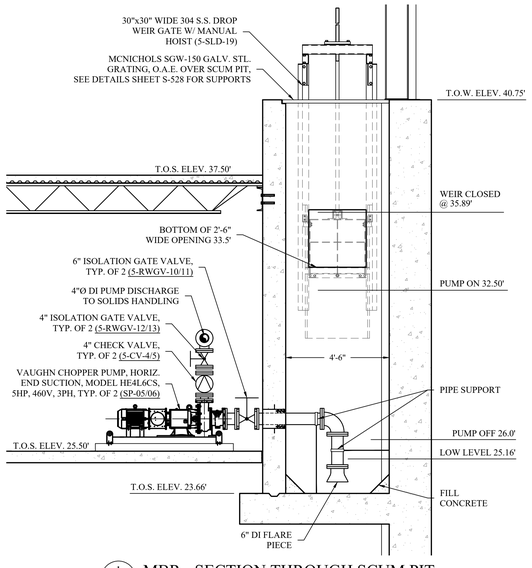
C-531

PROJECT # 18-732 PHASE #

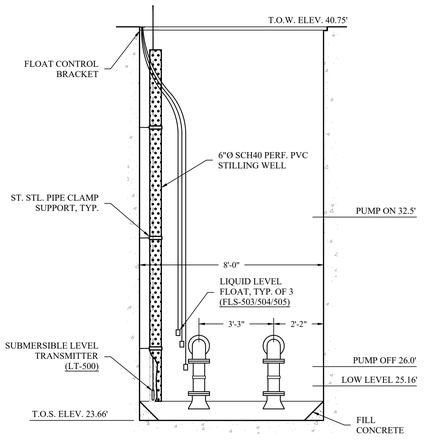
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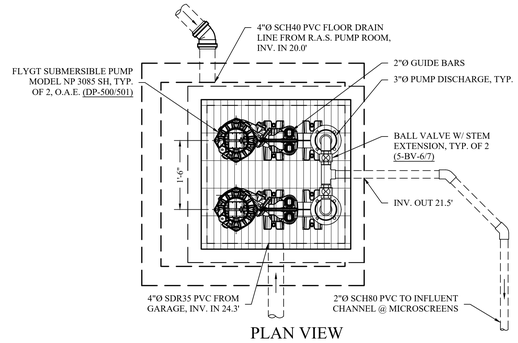
A C-542 MBR - CASSETTE LAYDOWN PLAN
SCALE: 1/2"=1'-0"



1 C-542 MBR - SECTION THROUGH SCUM PIT
SCALE: 3/8"=1'-0"



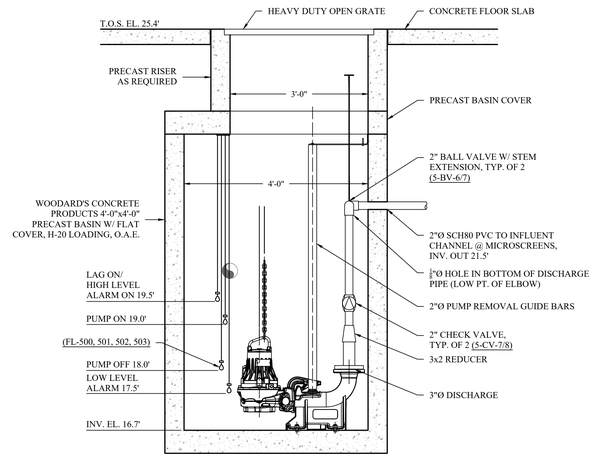
2 C-542 MBR - SECTION THROUGH SCUM PIT
SCALE: 3/8"=1'-0"



PLAN VIEW

NOTES:

1. ALL CONSTRUCTION JOINTS AND PIPE CONNECTIONS SHALL BE WATERTIGHT.
2. PUMPS TO ALTERNATE AND ALARM TO SOUND IF EITHER PUMP FAILS TO CYCLE PROPERLY.
3. ALL APPLICABLE N.E.C. REQUIREMENTS MUST BE MET.



SECTION VIEW

3 C-542 MBR - PRECAST DRAIN PUMP STATION
SCALE: N.T.S.

MHE ENGINEERING

33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100

111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID SET

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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

MBR - CASSETTE LAYDOWN AREA, CHEM AREA & SCUM PIT SECTIONS

REVISIONS

NO.	DESCRIPTION	DATE
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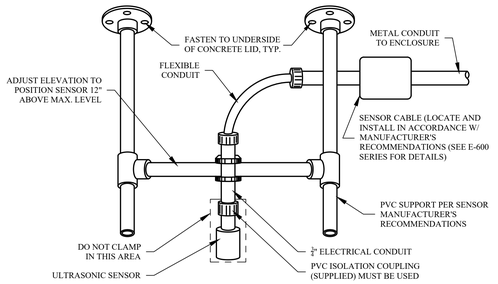
ISSUED DATE:	18 APR. 2025
DESIGN BY:	JTW
DRAWN BY:	HPBJr
CHECKED BY:	MWW
REVIEWED BY:	MJS, JZ

SHEET NO.

C-542

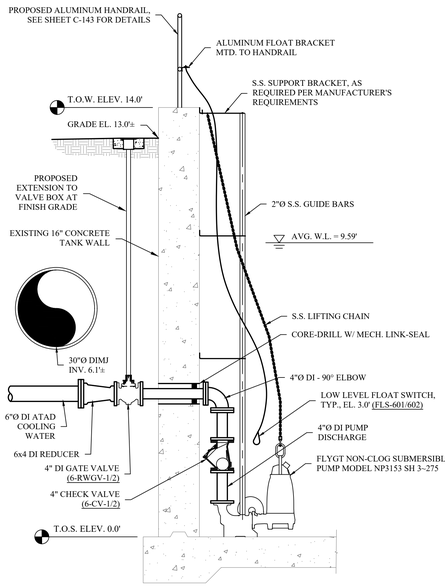
PROJECT # 18-732 PHASE #

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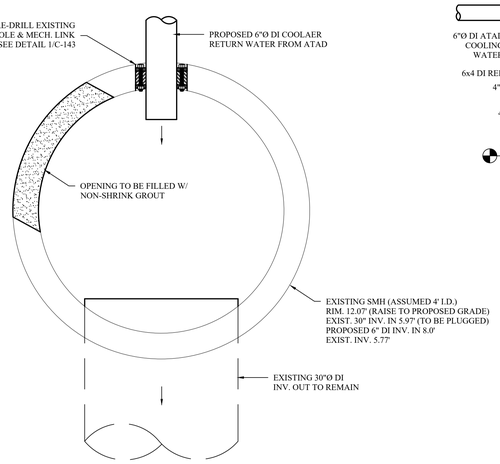


3 C-604 ULTRASONIC FLOW SENSOR MOUNTING DETAIL
SCALE: NONE

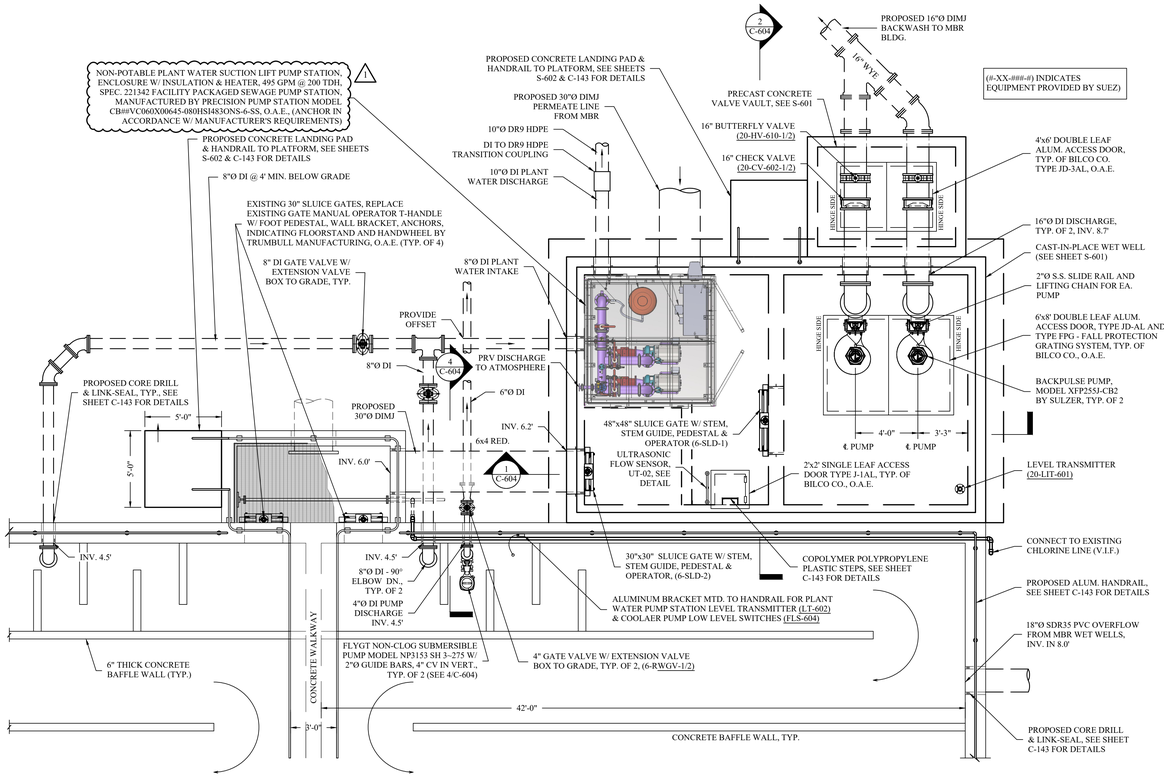
TAG NO. UT-02/03/04, PROVIDED BY AQUALOGICS & CONTRACTOR TO INSTALL



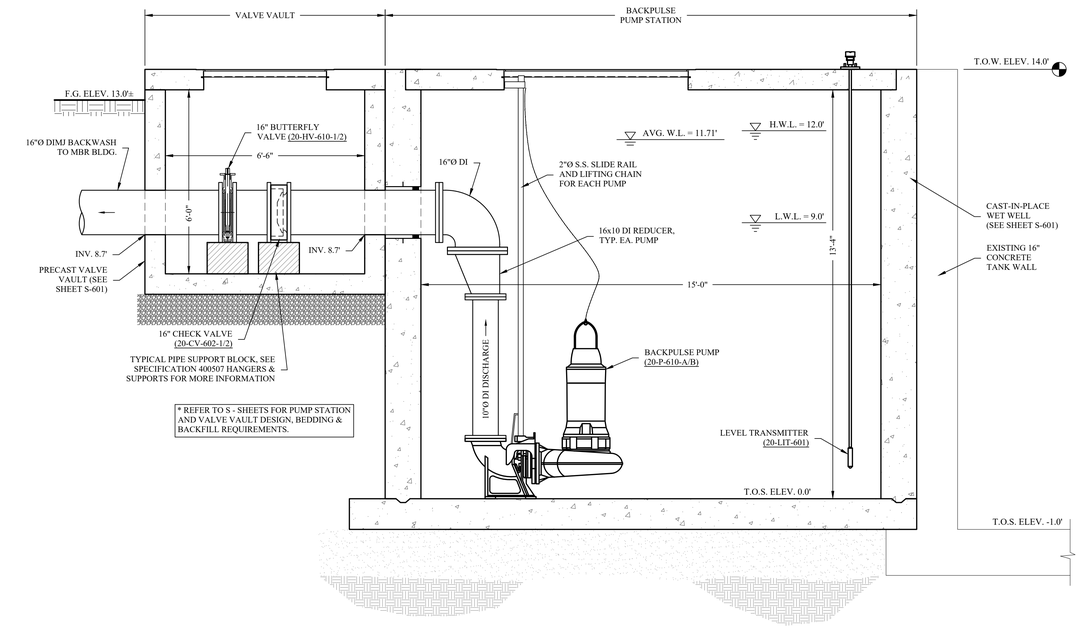
4 C-604 SECTION
SCALE: 1/2" = 1'-0"



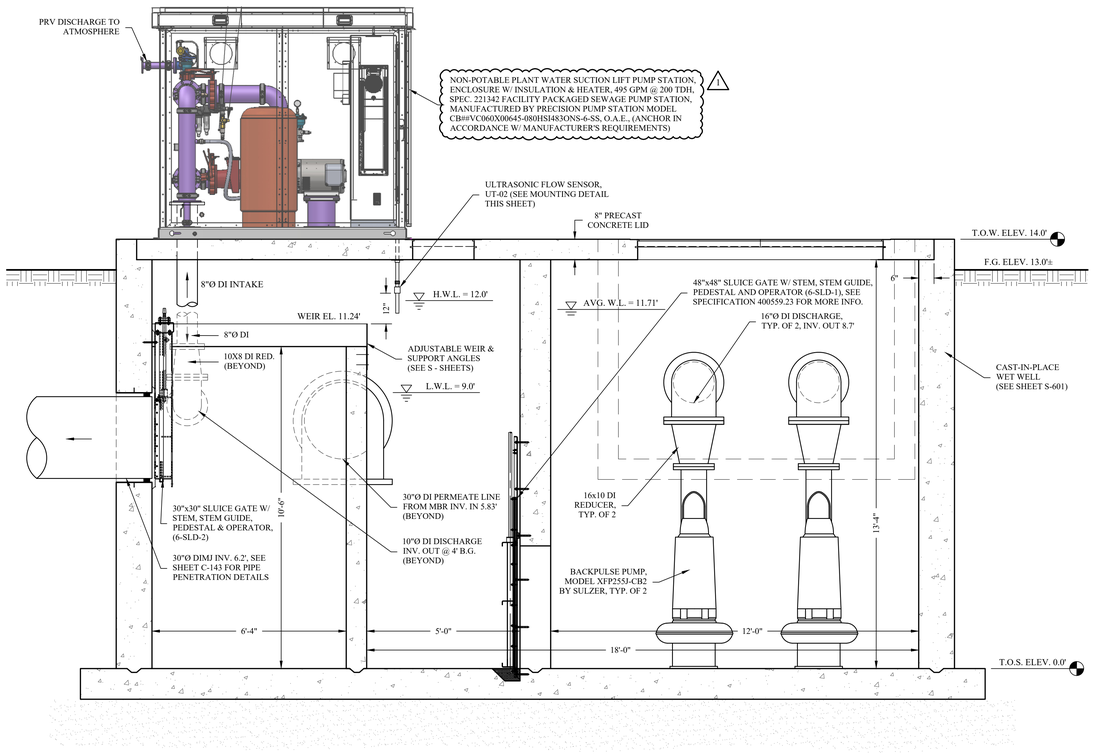
5 C-604 COOLAER RETURN WATER MANHOLE CONNECTION DETAIL
SCALE: NONE



A C-604 PROPOSED PLAN VIEW
SCALE: 1/4" = 1'-0"



2 C-604 SECTION
SCALE: 1/2" = 1'-0"



1 C-604 SECTION
SCALE: 1/2" = 1'-0"

MHE ENGINEERING
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NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

BACKPULSE PUMP STATION AND VALVE VAULT

REVISIONS

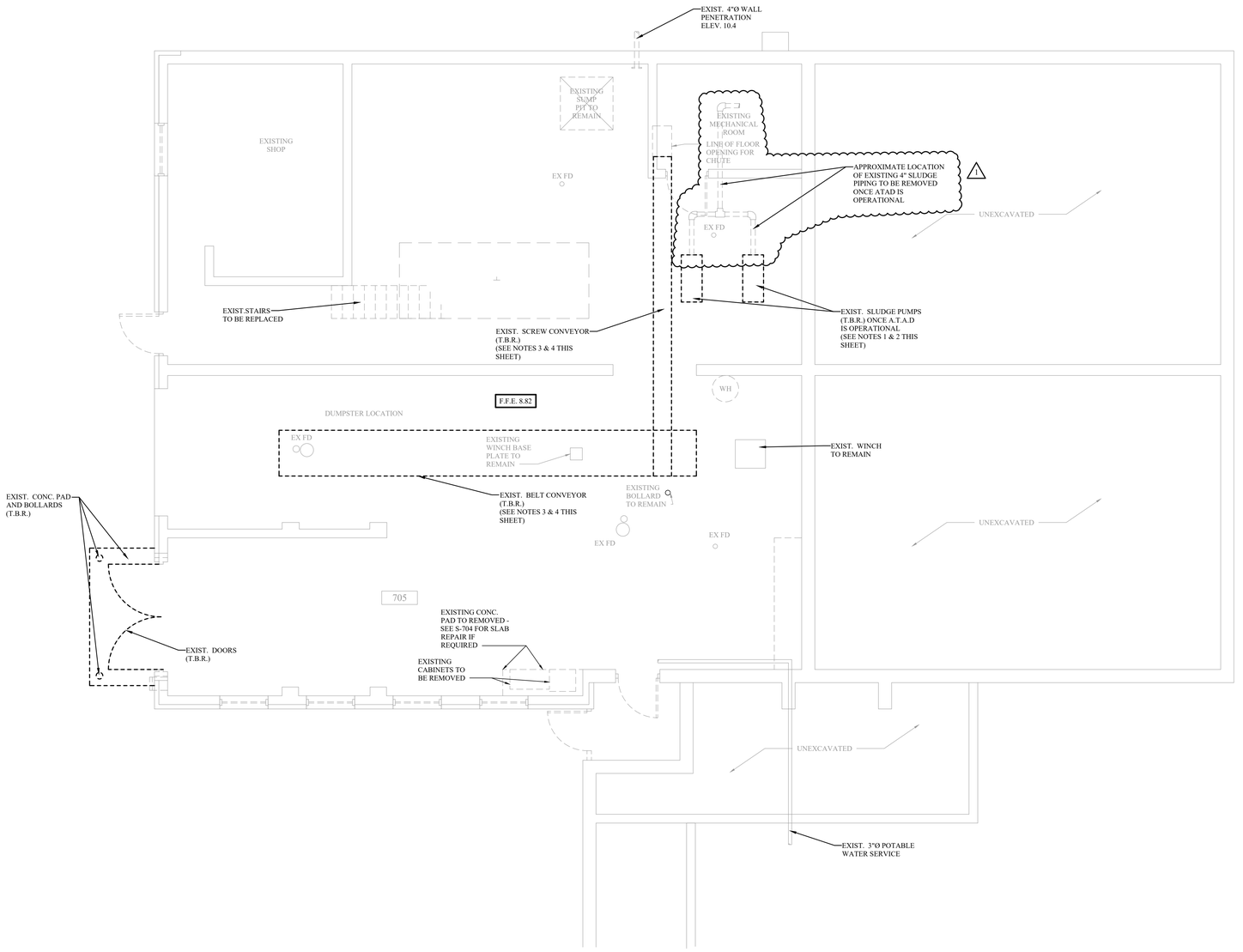
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE: 18 APR, 2025
DESIGN BY: JTW
DRAWN BY: HPBJr
CHECKED BY: MWW
REVIEWED BY: MJS, JZ

SHEET NO.
C-604

PROJECT # 18-732 PHASE #

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1 CD-701 EXISTING CONDITIONS / DEMO PLAN DEWATERING BUILDING - LOWER LEVEL
SCALE: 1/4" = 1'-0"

NOTES:

1. EXISTING SLUDGE PUMPS TO BE CONNECTED TO NEW BELT PRESS TEMPORARILY WHEN EXISTING PRESS IS TAKEN OFF-LINE.
2. ONCE BOTH PRESSES ARE OPERATIONAL, AN EXISTING SLUDGE PUMP SHALL BE DEDICATED TO EACH PRESS TO ALLOW FOR SIMULTANEOUS OPERATION.
3. CONTRACTOR TO PROVIDE AT A MINIMUM TWO WEEKS NOTICE TO ENGINEER AND OPERATOR PRIOR TO REMOVING THE EXISTING CONVEYOR. NEW CONVEYOR SHALL BE INSTALLED AND OPERATIONAL NO MORE THAN FOUR WEEKS AFTER EXISTING CONVEYOR IS TAKEN OFF-LINE.
4. CONTRACTOR IS RESPONSIBLE FOR PROVIDING A TEMPORARY CONVEYOR FROM THE EXISTING DISCHARGE CHUTE OF THE EXISTING PRESS. CONTRACTOR TO PROVIDE A MINIMUM OF THREE 1 C.Y. DUMPING CARTS (THAT CAN BE HANDLED BY THE OPERATOR) FOR USE WHEN THE EXISTING CONVEYOR SYSTEM IS TAKEN OFFLINE UNTIL THE NEW CONVEYOR IS COMPLETELY OPERATIONAL.
5. ITEMS NOTED AS "T.B.R." SHALL BE TOTALLY REMOVED AND PROPERLY DISPOSED OF BY THE CONTRACTOR.

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

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FOR TOWN OF NEW WINDSOR
555 UNION AVE.
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EXISTING CONDITIONS / DEMO PLAN DEWATERING BUILDING - LOWER LEVEL

REVISIONS

NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	QMM
DRAWN BY:	JRJ
CHECKED BY:	MJS
REVIEWED BY:	MJS, JZ

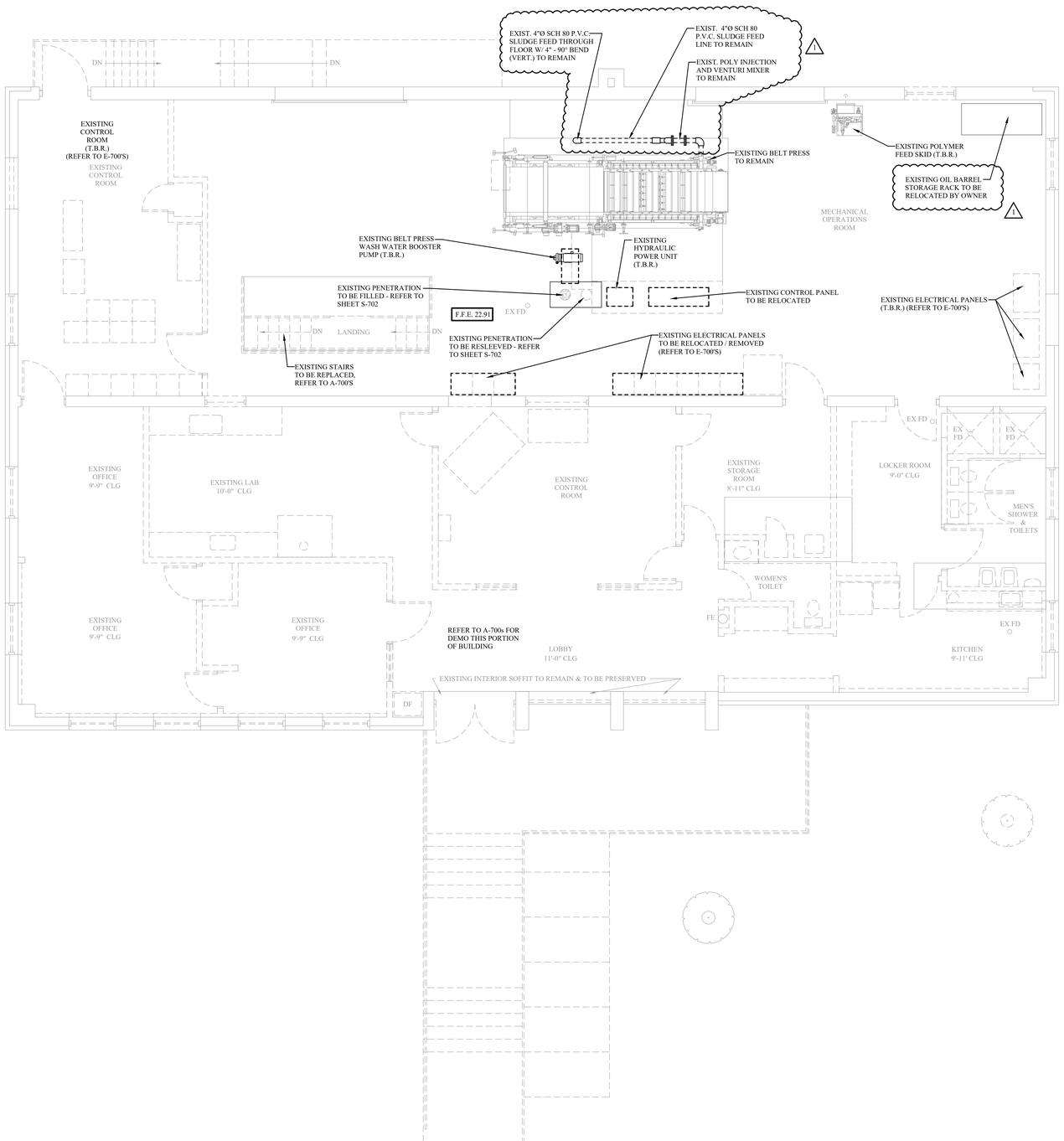
SHEET NO.
CD-701

PROJECT # 18-732 PHASE #

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NOTES:

1. ALL DEMO / RELOCATION IDENTIFIED ON THIS SHEET SHALL BE COMPLETED AFTER NEW BELT PRESS IS OPERATIONAL.
2. ITEMS NOTED AS "T.B.R." SHALL BE TOTALLY REMOVED AND PROPERLY DISPOSED OF BY THE CONTRACTOR.



1 CD-702 EXISTING CONDITIONS / DEMO PLAN DEWATERING BUILDING - UPPER LEVEL
SCALE: 1/4" = 1'-0"

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New Windsor, NY 12553
(845) 567-3100
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Milford, PA 18337
(570) 296-2765

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NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

EXISTING CONDITIONS / DEMO PLAN DEWATERING BUILDING - UPPER LEVEL

REVISIONS

NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

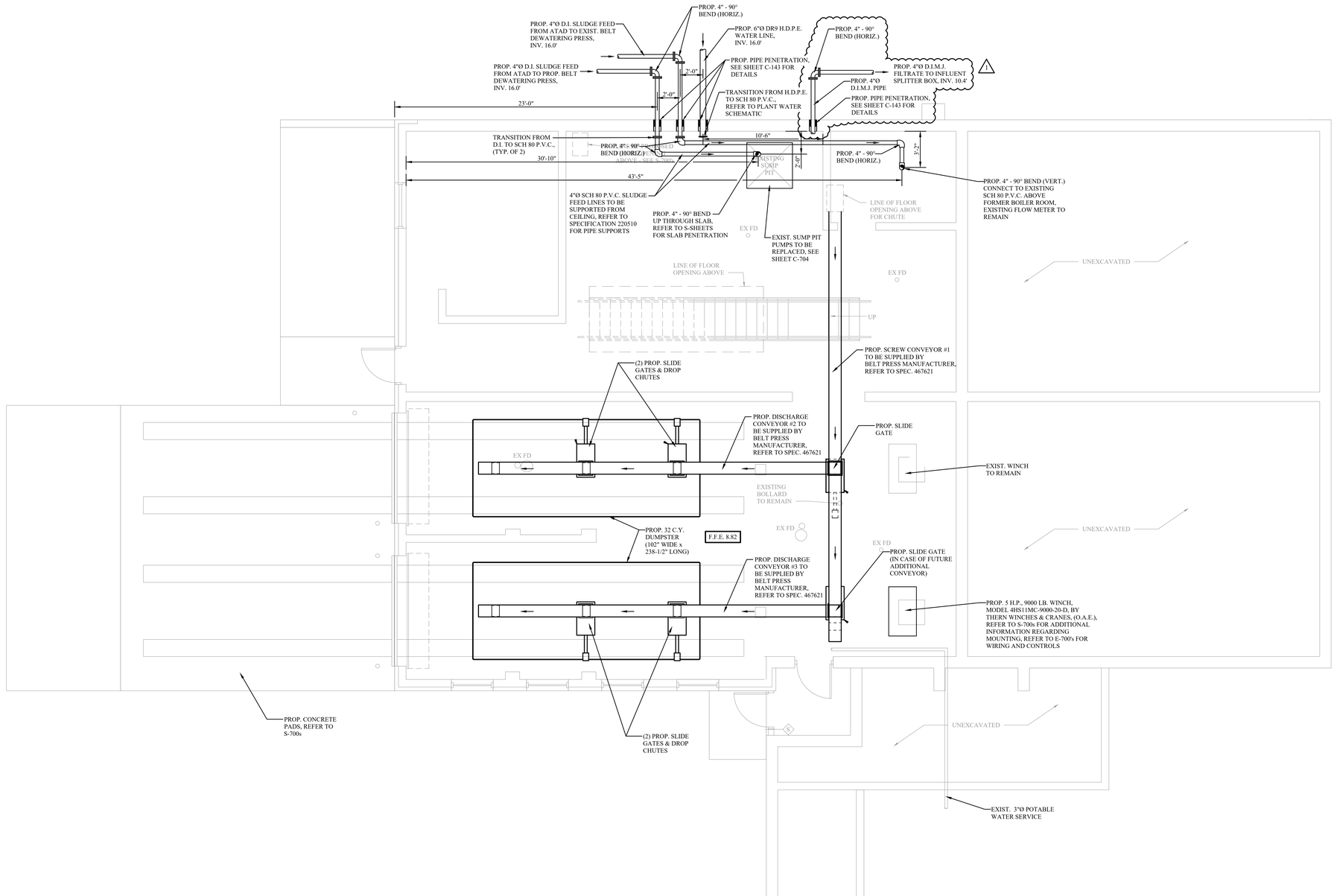
ISSUED DATE:	18 APR, 2025
DESIGN BY:	QMM
DRAWN BY:	JRJ
CHECKED BY:	MJS
REVIEWED BY:	MJS, JZ

SHEET NO.

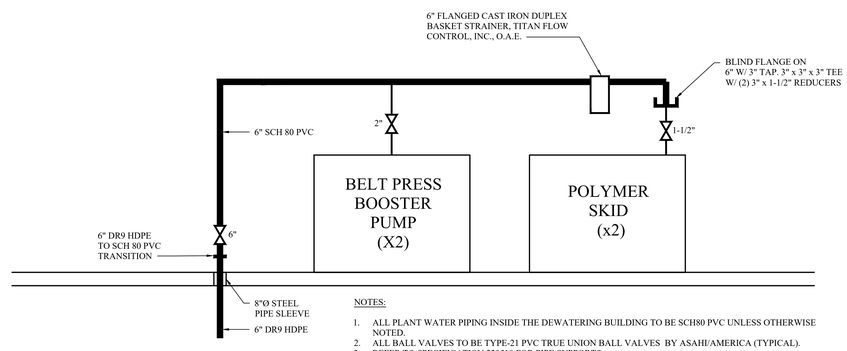
CD-702

PROJECT # 18-732 PHASE #

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1 C-701 PROPOSED LAYOUT PLAN DEWATERING BUILDING - LOWER LEVEL
SCALE: 1/4" = 1'-0"



NOTES:
1. ALL PLANT WATER PIPING INSIDE THE DEWATERING BUILDING TO BE SCH80 PVC UNLESS OTHERWISE NOTED.
2. ALL BALL VALVES TO BE TYPE-21 PVC TRUE UNION BALL VALVES BY ASAHI/AMERICA (TYPICAL).
3. REFER TO SPECIFICATION 220510 FOR PIPE SUPPORTS.

2 C-701 DEWATERING BUILDING WATER PROCESS SCHEMATIC
SCALE: NONE

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID SET

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NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

PROPOSED LAYOUT PLAN DEWATERING BUILDING - LOWER LEVEL

REVISIONS

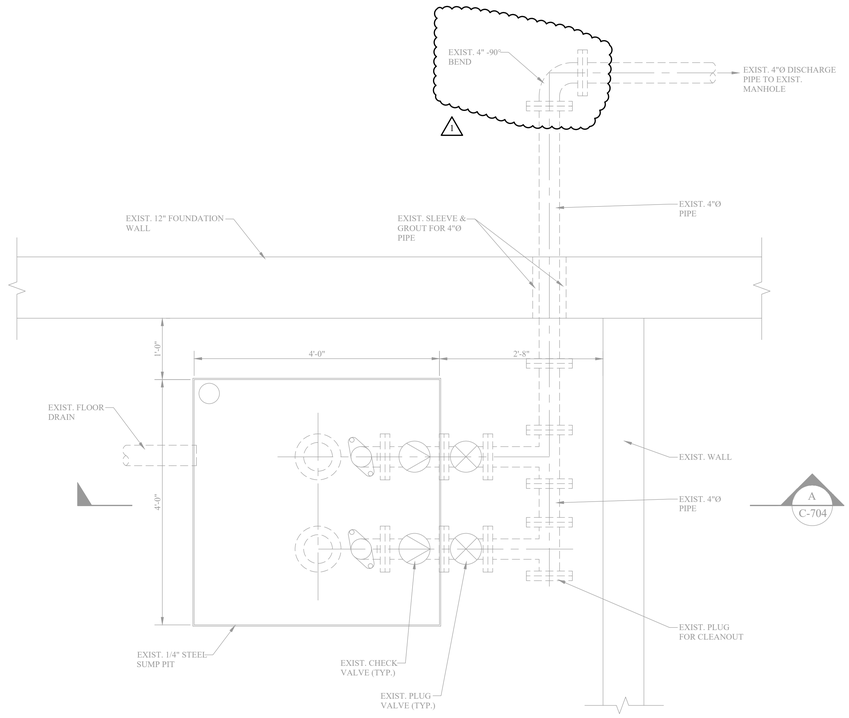
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	QMM
DRAWN BY:	JRJ
CHECKED BY:	MJS
REVIEWED BY:	MJS, JZ

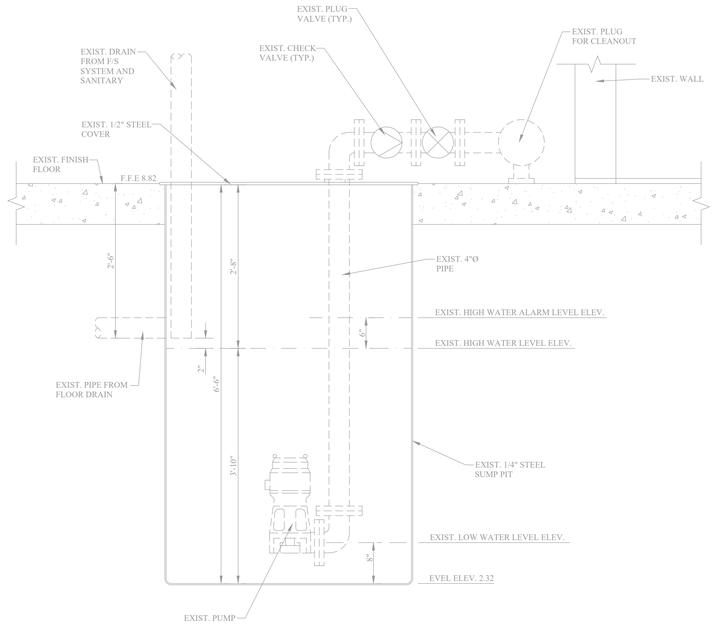
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C-701

PROJECT # 18-732 PHASE #

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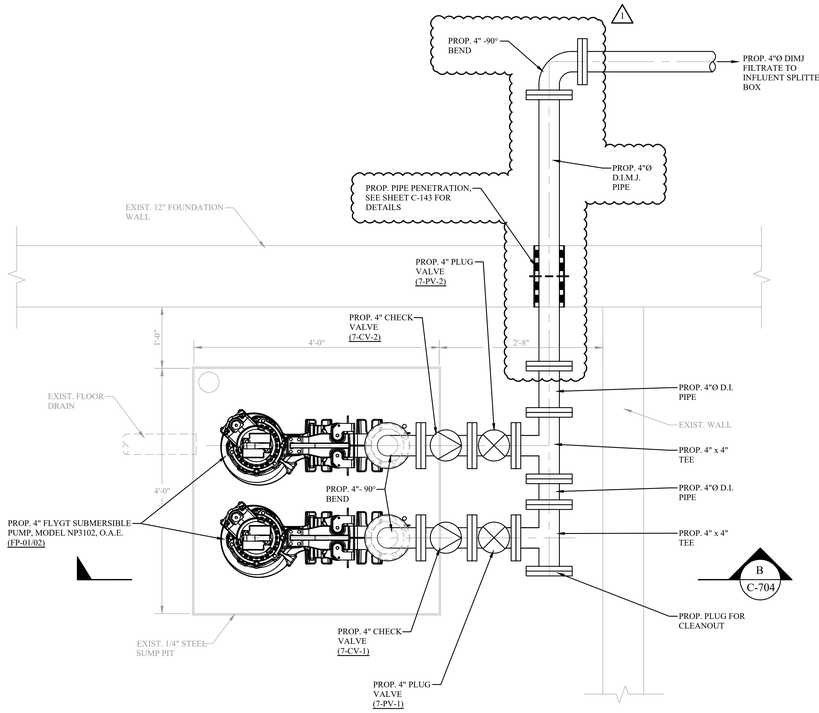


PLAN VIEW

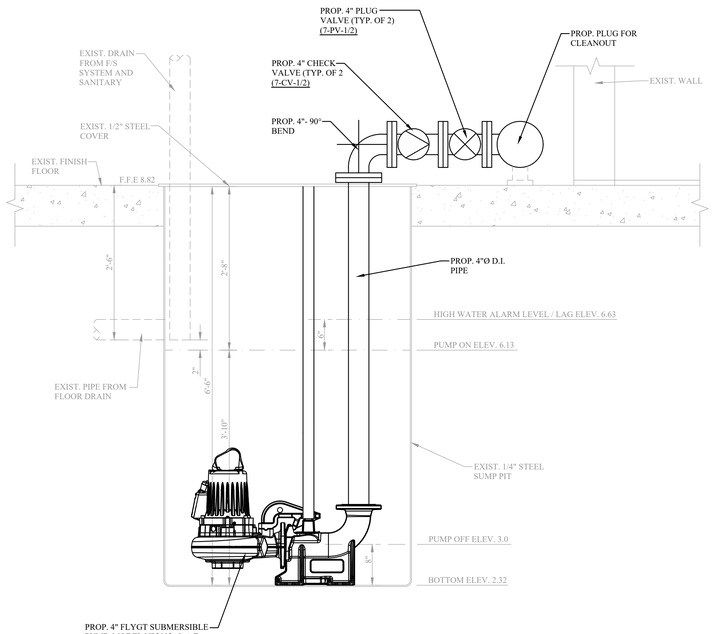


SECTION 'A'

1 C-704 DEWATERING BUILDING EXISTING SUMP PIT
SCALE: 1" = 1'-0"



PLAN VIEW



SECTION 'B'

2 C-704 DEWATERING BUILDING EXISTING SUMP PIT MODIFICATIONS
SCALE: 1" = 1'-0"

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New Windsor, NY 12553
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Milford, PA 18337
(570) 296-2765

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DEWATERING BUILDING EXISTING SUMP PIT DETAIL

REVISIONS

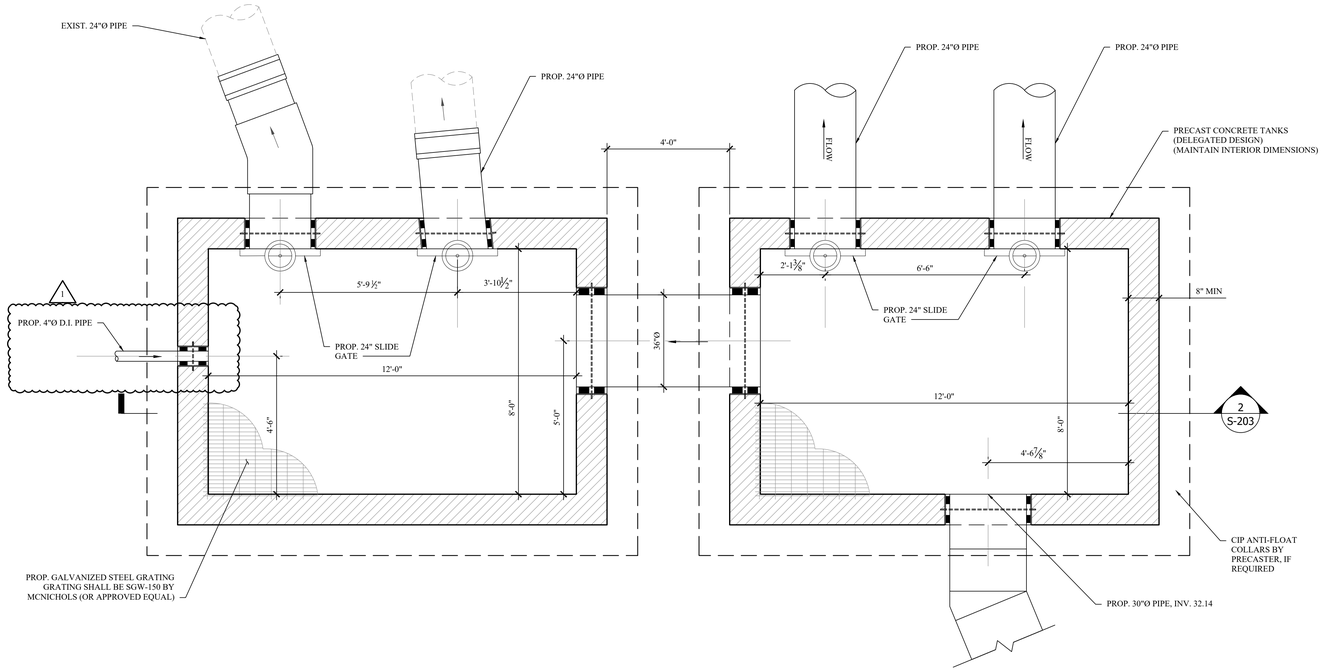
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1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
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DRAWN BY:	JRJ
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C-704

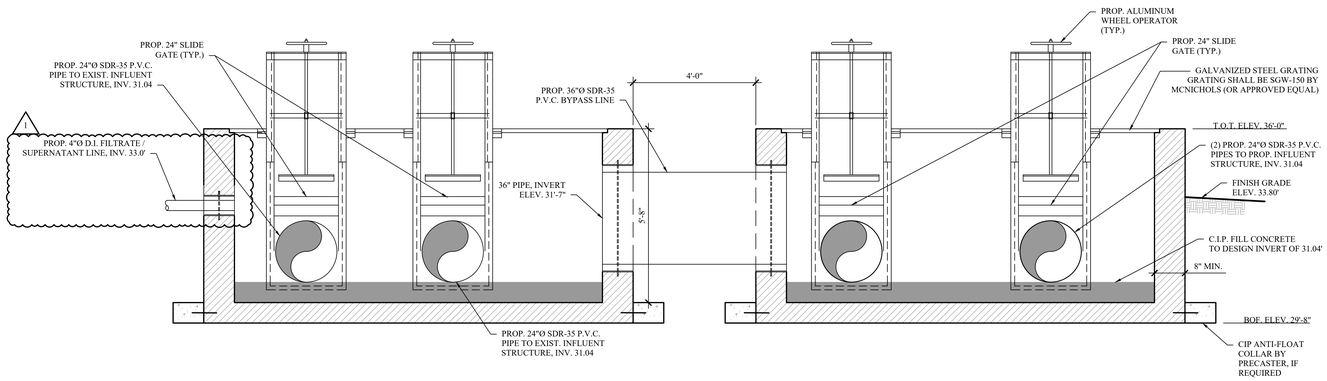
PROJECT # 18-732 PHASE #

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1 S-202 PROPOSED INFLUENT COLLECTION BOX WALL AND FOUNDATION PLAN

SCALE: 1/2" = 1'-0"



2 S-202 PROPOSED INFLUENT COLLECTION BOX / SPLITTER STATION SECTION

SCALE: 1/2" = 1'-0"

MHE ENGINEERING

33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100

111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID SET

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145 CAESARS LN.
NEW WINDSOR, NY 12553

FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

INFLUENT SPLITTER BOX PLAN AND SECTION

REVISIONS

NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
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DRAWN BY:	WPG, NEM, PJW
CHECKED BY:	PJW
REVIEWED BY:	JSS

SHEET NO.

S-202

PROJECT # 18-732 PHASE #

GENERAL NOTES (STRUCTURAL):

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE CAUSED BY THE CONTRACTOR OR HIS AGENTS TO STRUCTURES OR SURROUNDING AREAS. DAMAGE WILL BE REPAIRED OR REPLACED AS DIRECTED BY THE ENGINEER OF RECORD (E.O.R.) AT NO ADDITIONAL COST TO THE OWNER.

2. EXCAVATION SUPPORT, IF REQUIRED, IS THE RESPONSIBILITY OF THE CONTRACTOR, INCLUDING THE STABILITY OF THE EXCAVATION AND ITS INFLUENCE ON ADJACENT PROPERTIES AND STRUCTURES. EXCAVATION SUPPORT MAY ALSO BE UTILIZED TO MINIMIZE EXCAVATION LIMITS. THE CONTRACTOR SHALL SUBMIT SIGNED AND SEALED CALCULATIONS BY A NEW YORK STATE LICENSED PROFESSIONAL ENGINEER TO THE E.O.R. PRIOR TO INSTALLATION OF EXCAVATION SUPPORT MEASURES.

3. ALL ITEMS NOT INDICATED TO BE EXISTING SHALL BE PROVIDED AND INSTALLED UNDER THE REQUIREMENTS OF THIS CONTRACT.

4. THE STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH THE CIVIL, ARCHITECTURAL, PROCESS, MECHANICAL AND ELECTRICAL DRAWINGS. THE CONTRACTOR SHALL VERIFY THE REQUIREMENTS OF OTHER TRADES REGARDING SLEEVES, CHASES, HANGERS, INSERTS, ANCHORS, HOLES, AND ADDITIONAL ITEMS TO BE PLACED OR SET IN STRUCTURAL WORK.

5. THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS PRIOR TO BEGINNING CONSTRUCTION. ANY DISCREPANCIES BETWEEN FIELD CONDITIONS AND THE CONTRACT DRAWINGS SHALL BE BROUGHT TO THE ATTENTION OF THE E.O.R.

6. ANY ITEMS INDICATED TO BE REPLACED-IN-KIND SHALL BE INSTALLED TO MATCH EXISTING LOCATIONS, CONFIGURATIONS, AND ELEVATIONS UNLESS OTHERWISE NOTED.

7. ALL MATERIALS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS. IF MANUFACTURER'S SPECIFICATIONS CONFLICT WITH CONTRACT DRAWINGS OR SPECIFICATIONS, THE E.O.R. SHALL BE NOTIFIED IMMEDIATELY.

8. THE CONTRACTOR SHALL PROVIDE TEMPORARY SHORING AND BRACING REQUIRED TO ERECT AND HOLD THE STRUCTURE IN PROPER ALIGNMENT. NEITHER THE STRUCTURE NOR INDIVIDUAL STRUCTURAL ELEMENTS SUCH AS WALLS, BEAMS, JOISTS, AND COLUMNS WILL BE LATERALLY STABLE UNTIL ALL WORK INDICATED ON THE STRUCTURAL DRAWINGS IS COMPLETE.

9. ALL SUBSURFACE UTILITIES SHALL BE IDENTIFIED PRIOR TO EXCAVATION. THE CONTRACTOR SHALL EXERCISE EXTREME CAUTION DURING EXCAVATION. IF UNIDENTIFIED UTILITIES ARE ENCOUNTERED, THE E.O.R. SHALL BE NOTIFIED IMMEDIATELY.

10. ALL ITEMS SHOWN TO BE REMOVED SHALL BE PROPERLY HANDLED AND DISPOSED OF OFF SITE.

11. NO BACKFILLING OF THE STRUCTURE SHALL OCCUR UNTIL CONCRETE BREAKS SATISFACTORY TO THE E.O.R. ARE OBTAINED OR UNTIL THE CONTAINMENT STRUCTURE HAS SUCCESSFULLY PASSED HYDROSTATIC TESTING IF APPLICABLE.

12. ALL ITEMS INDICATED TO BE A DELEGATED DESIGN SHALL BE SUBMITTED TO THE E.O.R. PRIOR TO ORDERING MATERIALS. SUBMITTALS SHALL INCLUDE PLANS AND CALCULATIONS SIGNED AND SEALED BY A NEW YORK STATE LICENSED PROFESSIONAL ENGINEER.

13. ELEVATIONS SHOWN ARE BASED ON SURVEY BY CTMALE DATED APRIL 3, 2023.

SPECIAL INSPECTIONS:

ALL SPECIAL INSPECTIONS LISTED ARE IN ADDITION TO ALL INSPECTION REQUIRED BY STATE AND LOCAL BUILDING CODES. ALL SPECIAL INSPECTIONS SHALL BE PERFORMED BY AN AGENCY RETAINED AND PAID BY THE OWNER OR OWNER'S REPRESENTATIVE. THE APPROVED AGENCY SHALL PROVIDE ALL INFORMATION AS NECESSARY FOR THE BUILDING OFFICIAL TO DETERMINE THAT THE AGENCY MEETS THE APPLICABLE REQUIREMENTS. COPIES OF NECESSARY TEST AND INSPECTION RECORDS SHALL BE FILED WITH THE BUILDING OFFICIAL AND REGISTERED DESIGN PROFESSIONAL. ALL SPECIAL INSPECTIONS AND REPORTS SHALL BE IN ACCORDANCE WITH CHAPTER 17 OF THE 2020 NEW YORK STATE BUILDING CODE LATEST REVISION.

CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH OWNER'S DESIGNATED INSPECTOR FOR SCHEDULING OF ALL SPECIAL INSPECTIONS. CONTRACTOR SHALL NOTIFY INSPECTOR MINIMUM 48 HOURS PRIOR TO NEED OF INSPECTION.

THE OWNER RESERVES THE RIGHT TO BACK CHARGE THE CONTRACTOR FOR ANY COSTS ASSOCIATED WITH ADDITIONAL SPECIAL INSPECTIONS REQUIRED DUE TO CANCELLATION OF SCHEDULED INSPECTIONS AND RE-INSPECTION OF PREVIOUSLY FAILED INSPECTIONS.

SPECIAL INSPECTIONS REQUIRED INCLUDE BUT ARE NOT LIMITED TO:

STEEL:

1. STRUCTURAL STEEL:
   - 1.1. SPECIAL INSPECTIONS AND NONDESTRUCTIVE TESTING OF STRUCTURAL STEEL ELEMENTS IN BUILDINGS, STRUCTURES AND PORTIONS THEREOF SHALL BE IN ACCORDANCE WITH THE QUALITY ASSURANCE INSPECTION REQUIREMENTS OF AISC 360-16.
2. COLD-FORMED STEEL DECK:
   - 2.1. SPECIAL INSPECTIONS AND QUALIFICATION OF WELDING SPECIAL INSPECTORS FOR COLD-FORMED STEEL FLOOR AND ROOF DECK SHALL BE IN ACCORDANCE WITH THE QUALITY ASSURANCE INSPECTION REQUIREMENTS OF SDI QA/QC.
3. INSTALLATION OF OPEN-WEB STEEL JOISTS AND JOIST GIRDERS:
   - 3.1. PERIODIC SPECIAL INSPECTION OF END CONNECTIONS - WELDED OR BOLTED.
   - 3.2. PERIODIC SPECIAL INSPECTION OF BRIDGING - HORIZONTAL OR DIAGONAL

CONCRETE:

1. PERIODIC INSPECTION OF REINFORCING STEEL.
2. PERIODIC INSPECTION OF ANCHORS CAST IN CONCRETE.
3. INSPECTION OF ANCHORS POST-INSTALLED IN HARDENED CONCRETE.
   - 3.1. CONTINUOUS INSPECTION OF ADHESIVE ANCHORS INSTALLED IN HORIZONTALLY OR UPWARDLY INCLINED ORIENTATIONS TO RESIST SUSTAINED TENSION LOADS.
   - 3.2. PERIODIC INSPECTION OF MECHANICAL ANCHORS AND ADHESIVE ANCHORS NOT DEFINED IN 3.1.
4. PERIODIC VERIFICATION OF DESIGN MIX.
5. PRIOR TO CONCRETE PLACEMENT, FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP, AIR, AND TEMPERATURE TESTS; CONTINUOUS.
6. CONTINUOUS INSPECTION OF PLACEMENT & FOR PROPER APPLICATION TECHNIQUES.
7. PERIODIC INSPECTION OF ERECTION OF PRECAST CONCRETE MEMBERS.
8. PERIODIC INSPECTION FOR MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES.
9. PERIODIC VERIFICATION OF IN-SITU CONCRETE STRENGTH, PRIOR TO STRESSING OF TENDONS IN POST-TENSIONED CONCRETE AND PRIOR TO REMOVAL OF SHORES AND FORMS FROM BEAMS AND STRUCTURAL SLABS.
10. PERIODIC INSPECTION OF FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS, OF THE CONCRETE MEMBER BEING FORMED.

MASONRY:

1. SPECIAL INSPECTIONS AND TESTS OF MASONRY CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH THE QUALITY ASSURANCE PROGRAM REQUIREMENTS OF TMS 402 AND TMS 602.

SOILS:

1. CONTINUOUS INSPECTION OF
   - 1.1. PROPER MATERIALS
   - 1.2. DENSITIES
   - 1.3. LIFT THICKNESSES DURING PLACEMENT
   - 1.4. COMPACTION OF CONTROLLED FILL
2. PERIODIC INSPECTION OF
   - 2.1. MATERIALS BELOW FOOTINGS ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY
   - 2.2. EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL
   - 2.3. CLASSIFICATION AND TESTING OF CONTROLLED FILL MATERIALS
   - 2.4. SUBGRADE PRIOR TO PLACEMENT OF COMPACTED FILL
3. THE APPROVED SOILS REPORT, IF ANY EXISTS, SHALL BE USED TO DETERMINE COMPLIANCE.

CONCRETE NOTES:

1. CONCRETE SHALL CONFORM TO ACI 211.1, ACI 301, ACI 304R (WHEN PUMPING), AND ACI 318-14. AGGREGATE SHALL CONFORM TO ASTM C33. COMPRESSIVE STRENGTH, RANGE OF SLUMP, WATER-TO-CEMENT RATIO, AND AIR ENTRAINMENT SHALL BE PER THE CONCRETE CLASS SPECIFIED HEREIN AND IN ACCORDANCE WITH CAST-IN-PLACE CONCRETE SPECIFICATION 033000. SUBMIT COPIES OF TEST REPORTS SHOWING THAT THE MIX HAS BEEN SUCCESSFULLY TESTED TO PRODUCE CONCRETE WITH THE PROPERTIES SPECIFIED. TEST REPORTS SHALL BE SUBMITTED TO THE ENGINEER OF RECORD (E.O.R.) FOR APPROVAL PRIOR TO CONCRETE PLACEMENT.
   - 1.1. CONCRETE CLASSIFICATIONS PER SPECIFICATION SECTION 033000:
     - 1.1.1. FOOTINGS & FROST WALLS: CLASS A
     - 1.1.2. ABOVE GRADE WALLS, EXPOSED FOUNDATION WALLS, TANK AND CHANNEL WALLS: CLASS B
     - 1.1.3. INTERIOR SLABS-ON-GROUND: CLASS C
     - 1.1.4. TANK AND CHANNEL FOUNDATIONS: CLASS D
     - 1.1.5. INTERIOR SUSPENDED SLABS: CLASS E
     - 1.1.6. L.W. CONCRETE INTERIOR SUSPENDED SLABS: CLASS F
     - 1.1.7. APRONS, LANDINGS, EQUIPMENT PADS, SIDEWALKS & CURBS: CLASS H
     - 1.1.8. FILL CONCRETE: CLASS G
   - 1.2. CONCRETE FINISHES PER SPECIFICATION SECTION 033000:
     - 1.2.1. FOUNDATIONS BELOW GRADE: AS-CAST SF-2.0 FINISH
     - 1.2.2. EXPOSED FOUNDATION WALLS: GROUT-CLEANED FINISH
     - 1.2.3. TANK WALLS & SLABS: AS-CAST SF-3.0 FINISH
     - 1.2.4. EXTERIOR SLABS: FINE BROOM FINISH
     - 1.2.5. INTERIOR SLABS: TROWEL FINISH
2. CEMENT SHALL CONFORM TO ASTM C150, TYPE I/II AND SHALL HAVE A CURING PERIOD OF NOT LESS THAN 7 DAYS.
3. CONCRETE SHALL BE WET CURED, USING BURLAP OR COTTON CURING MATS, OR CURED USING ASTM D4397 POLYETHYLENE SHEETING IN ACCORDANCE WITH ASTM C171. WET THE ENTIRE EXPOSED SURFACE OF THE CONCRETE THOROUGHLY WITH A FINE SPRAY OF WATER AND COVER WITH SHEETING THROUGHOUT THE CURING PERIOD. LAY SHEETING DIRECTLY ON CONCRETE SURFACE. PROVIDE SHEETING NOT LESS THAN 18 INCHES WIDER THAN CONCRETE SURFACE. OVERLAP EDGES 12 INCHES AND CONTINUOUSLY TAPE JOINTS.
4. PUMPING SHALL NOT RESULT IN SEPARATION OR LOSS OF MATERIALS NOR CAUSE INTERRUPTIONS SUFFICIENT TO PERMIT LOSS OF PLASTICITY BETWEEN SUCCESSIVE INCREMENTS. LOSS OF SLUMP IN PUMPING EQUIPMENT SHALL NOT EXCEED 2 INCHES. CONCRETE SHALL NOT BE CONVEYED THROUGH PIPE MADE OF ALUMINUM OR ALUMINUM ALLOY. RAPID CHANGES IN PIPE SIZES SHALL BE AVOIDED. MAXIMUM SIZE OF COURSE AGGREGATE SHALL BE LIMITED TO 33 PERCENT OF THE DIAMETER OF THE PIPE. MAXIMUM SIZE OF WELL ROUNDED AGGREGATE SHALL BE LIMITED TO 40 PERCENT OF THE PIPE DIAMETER. SAMPLES FOR TESTING SHALL BE TAKEN AT BOTH THE POINT OF DELIVERY TO THE PUMP AND AT THE DISCHARGE END.
5. CONCRETE SHALL NOT BE PLACED WHEN WEATHER CONDITIONS PREVENT PROPER PLACEMENT AND CONSOLIDATION INCLUDING PERIODS OF PRECIPITATION. TRANSPORT CONCRETE AS RAPIDLY AS PRACTICABLE TAKING PRECAUTION TO PREVENT SEGREGATION OR LOSS OF INGREDIENTS. PUMPING IN ACCORDANCE WITH ACI 304 SHALL BE PERMITTED. DO NOT EXCEED A FREE VERTICAL DROP OF 3 FEET FROM THE POINT OF DISCHARGE. PLACE CONCRETE IN ONE CONTINUOUS OPERATIONS FROM ONE SIDE OF SLAB TO THE OTHER. POSITION GRADE STAKES AT 12 FEET ON CENTER MAXIMUM IN EACH DIRECTION.
6. UNLESS OTHERWISE NOTED, REINFORCEMENT BARS SHALL BE BLACK STEEL. REINFORCING BARS SHALL CONFORM TO ASTM A615 AND SHALL HAVE A MINIMUM YIELD STRENGTH OF 60 KSI. WELDED WIRE FABRIC REINFORCEMENT SHALL CONFORM TO ASTM A1064. REINFORCEMENT SHALL NOT CONTAIN RUST, SCALE, OIL, GREASE, CLAY, OR FOREIGN SUBSTANCES THAT WOULD REDUCE THE CONCRETE BONDING STRENGTH. REMOVE LOOSE RUST PRIOR TO PLACEMENT OF REINFORCEMENT.
7. REINFORCEMENT SPLICES SHALL BE KEPT TO A PRACTICAL MINIMUM. SEE THE LAP SLICE TABLE ON THIS SHEET FOR MINIMUM LAP SPLICE LENGTHS.
8. PROVIDE MINIMUM 2" OF CONCRETE COVER FOR ALL REINFORCING STEEL WHEN CAST AGAINST FORMS OR 3" OF CONCRETE COVER FOR ALL REINFORCING STEEL WHEN CAST AGAINST EARTH, UNLESS OTHERWISE INDICATED.
9. CONCRETE FOOTINGS AND MAT FOUNDATIONS SHALL BE PLACED MONOLITHICALLY WITH THE EXCEPTION THAT VERTICAL CONSTRUCTION JOINTS WILL BE ALLOWED IF EPOXY BONDING COMPOUND IS APPLIED TO THE ROUGHENED SURFACE OF THE HARDENED CONCRETE.
10. INTERIOR SLABS: THE CONTRACTOR SHALL PROVIDE CONTRACTION JOINTS AS INDICATED. JOINTS MAY BE SAWCUT OR CUT WITH A JOINTING TOOL. SAWED JOINTS SHALL BE COMPLETED WITHIN 4 TO 12 HOURS AFTER PLACEMENT OF CONCRETE. JOINTS SHALL INTERSECT WITH THE CORNERS OF ISOLATION JOINT AT COLUMN LOCATIONS, IF ANY ARE PRESENT, AND BE SPACED A MAXIMUM OF 15 FEET ON CENTER, UNLESS NOTED OTHERWISE.
11. REINFORCEMENT SUPPORTS SHALL BE CONCRETE OR OTHER NON-CORRODIBLE MATERIAL HAVING A COMPRESSIVE STRENGTH EQUAL TO OR GREATER THAN THE COMPRESSIVE STRENGTH OF THE CONCRETE BEING PLACED.
12. PROVIDE A ½" ROUNDED EDGE ON ALL EXPOSED SLAB EDGES. PROVIDE A ¾" CHAMFER ON ALL OTHER EXPOSED CONCRETE CORNERS.
13. EPOXY BONDING COMPOUND SHALL BE USED ON ALL CONTACTING SURFACES BETWEEN EXISTING CONCRETE AND NEW CONCRETE. EPOXY BONDING COMPOUND SHALL CONFORM TO ASTM C881, TYPE AND GRADE TO BE IN ACCORDANCE WITH APPROPRIATE USE INDICATED IN SPECIFICATION 033000 CAST-IN-PLACE CONCRETE. DO NOT ALLOW COMPOUND TO HARDEN PRIOR TO CONCRETE PLACEMENT. BONDING AGENT USED SHALL BE NSF 61 APPROVED.
14. PLACE, CONSOLIDATE AND IMMEDIATELY STRIKE OFF CONCRETE TO OBTAIN PROPER CONTOUR GRADE AND ELEVATION BEFORE BLEEDWATER APPEARS. PERMIT CONCRETE TO ATTAIN A SET SUFFICIENT FOR FLOATING AND SUPPORTING THE WEIGHT OF THE FINISHER AND EQUIPMENT. IF BLEEDWATER IS PRESENT PRIOR TO FLOATING THE SURFACE, DRAG THE EXCESS WATER OFF OR REMOVE BY ABSORPTION WITH POROUS MATERIALS. DO NOT USE DRY CEMENT TO ABSORB BLEEDWATER.
15. UNLESS OTHERWISE NOTED, ALL CONCRETE CONSTRUCTION SHALL MEET THE SPECIFIED TOLERANCES OF ACI 117. TOP ELEVATIONS SHALL MATCH THE SPECIFIED ELEVATIONS WITHIN A TOLERANCE OF ±¼"
16. THE REQUIREMENTS OF ACI 302.1R CLASS 4 SHALL BE IN EFFECT FOR THE CONSTRUCTION OF ALL FLOORS AND SLABS. THE REQUIREMENTS OF ACI 360.R-10 SHALL BE IN EFFECT FOR THE CONSTRUCTION OF ALL SLABS-ON-GROUND.
    - 16.1. SLABS-ON-GRADE: FF = 25 AND FL = 20
    - 16.2. SUSPENDED SLABS: FF = 25 AND FL = 20
17. NO CONCRETE SHALL BE PLACED UNTIL ALL EMBEDDED ITEMS (I.E. PROCESS, ELECTRICAL, MECHANICAL, ETC) HAVE BEEN SET. CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL TRADES.
18. ALL BAR PLACING AND BENDING SHALL BE IN ACCORDANCE WITH ACI 315.
19. PERFORM COMPRESSIVE TESTS IN ACCORDANCE WITH ASTM C39. OBTAIN ONE COMPOSITE SAMPLE FOR EACH DAY'S POUR OF EACH CONCRETE MIXTURE EXCEEDING 5 CU. YD., BUT LESS THAN 25 CU. YD., PLUS ONE SET FOR EACH ADDITIONAL 50 CU. YD. OR FRACTION THEREOF. TAKE PRECAUTIONS TO PREVENT EVAPORATION AND LOSS OF WATER FROM SPECIMENS. TEST ONE CYLINDER AT 3 DAYS, ONE CYLINDER AT 7 DAYS, AND TWO (THREE FOR 4"x8" CYLINDERS) CYLINDERS AT 28 DAYS AND HOLD ONE IN RESERVE. PERFORM SLUMP TESTS IN ACCORDANCE WITH ASTM C143. PERFORM AIR CONTENT TESTS IN ACCORDANCE WITH ASTM C173 OR ASTM C231. SUBMIT ALL TEST DATA TO THE E.O.R.
20. CONSOLIDATE CONCRETE WITH HIGH FREQUENCY, INTERNAL, MECHANICAL VIBRATING EQUIPMENT SUPPLEMENTED BY HAND SPADING AND TAMPING. FURNISH A SPARE VIBRATOR ON THE JOB SITE WHENEVER CONCRETE IS PLACED. OPERATE VIBRATORS WITH VIBRATORY ELEMENT SUBMERGED IN THE CONCRETE, WITH A MINIMUM FREQUENCY OF NOT LESS THAN 6000 IMPULSES PER MINUTE WHEN SUBMERGED. INSERT AND WITHDRAW VIBRATORS AT INTERVALS APPROXIMATELY 18 INCHES APART.
21. ELASTOMERIC JOINT SEALANT SHALL CONFORM TO ASTM C920, TYPE S, GRADE P, CLASS 25. JOINT SEALANT IN CONTACT WITH POTABLE WATER SHALL BE NSF 61 APPROVED.
22. CONTROLLED DENSITY FILL SHALL BE IN ACCORDANCE WITH SPECIFICATION 033110.
23. CRYSTALLINE WATERPROOFING ADMIXTURES SHALL BE IN ACCORDANCE WITH CAST-IN-PLACE CONCRETE SPECIFICATION 033000 AND THE CRYSTALLINE WATERPROOFING SPECIFICATION 071616.
    APPLICABLE LOCATIONS (EXCLUDING FILL CONCRETE):
    - MICROSCREEN CHANNELS
    - WET WELLS
    - DRY WELL
    - SPLITTER BOX
    - ANOXIC TANKS
    - AEROBIC TANKS
    - DISTRIBUTION CHANNEL
    - MBR TRAINS

STRUCTURAL STEEL NOTES:

1. STRUCTURAL STEEL SYSTEMS INCLUDING MATERIALS, INSTALLATION, WORKMANSHIP, FABRICATION, ASSEMBLY, ERECTION, INSPECTION, QUALITY CONTROL, AND TESTING SHALL BE PROVIDED IN ACCORDANCE WITH AISC MANUAL OF STEEL CONSTRUCTION, LATEST EDITION.
2. ALL STEEL SHALL CONFORM TO THE FOLLOWING UNLESS OTHERWISE NOTED:
   - W SHAPES: ASTM A992, Fy = 50KSI
   - HSS: ASTM A500 GR. C, Fy = 50KSI
   - PLATES AND OTHER STEEL SHAPES: ASTM A36, Fy = 36KSI
3. ALL HOLES IN STEEL SHALL BE STANDARD SIZE 1/16" LARGER THAN BOLT DIAMETER UNLESS OTHERWISE NOTED. ALL HOLES SHALL BE DRILLED OR PUNCHED. BURNING IS NOT ALLOWED. COLUMN BASEPLATE HOLES FOR ANCHOR BOLTS ARE PERMITTED TO BE OVERSIZED.
4. COPES SHALL BE PROVIDED WITH 1/2" RADIUS MINIMUM, SMOOTH CORNERS, AND FREE OF NOTCHES. DEPTH AND LENGTH OF COPES SHALL BE AS INDICATED.
5. UNLESS OTHERWISE NOTED, ALL BOLTS SHALL CONFORM TO ASTM A325, EXCEPT ANCHOR BOLTS SHALL CONFORM TO ASTM F1554. ALL NUTS SHALL CONFORM TO ASTM A563, GRADE AND STYLE FOR APPLICABLE ASTM BOLT STANDARD. ALL WASHERS SHALL CONFORM TO ASTM F436 FOR ASTM A325 BOLTS AND F1554 ANCHOR BOLTS.
6. UNLESS OTHERWISE NOTED, ALL BOLTS SHALL BE SNUG-TIGHT. BOLTS SPECIFIED AS PRE-TENSIONED (PT) SHALL BE PRE-TENSIONED USING THE TURN-OF-NUT METHOD. CONNECTIONS SPECIFIED AS SLIP-CRITICAL (SC) SHALL HAVE BOLTS PRE-TENSIONED USING THE TURN-OF-NUT METHOD AND FAYING SURFACES PREPARED IN ACCORDANCE WITH THE CLASSIFICATION INDICATED. BOLTS INDICATED TO USE A JAM NUT SHALL BE INSTALLED USING THE FOLLOWING SEQUENCE:
   - INSTALL THIN NUT (JAM NUT) FIRST AND TORQUE TO 50% OF TORQUE VALUE
   - INSTALL THICK NUT (STANDARD HEX) SECOND AND TORQUE TO 100% OF TORQUE VALUE WHILE HOLDING THE JAM NUT TO PREVENT ROTATION
7. STEEL DETAILER SHALL PROVIDE CONNECTION DESIGN IN ACCORDANCE WITH ANSI/AISC 303. DETAILER SHALL SELECT AND COMPLETE CONNECTIONS USING SCHEMATIC DETAILS INDICATED ON PLANS AND ANSI/AISC 360.
8. UNLESS NOTED OTHERWISE, ALL STRUCTURAL STEEL MEMBERS SHALL BE HOT DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A123 AND ALL STRUCTURAL STEEL FASTENERS (INCLUDING NUTS, BOLTS, WASHERS, ETC.) SHALL BE HOT DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A153. REPAIR AREAS OF DAMAGED GALVANIZATION IN ACCORDANCE WITH ASTM A780.
9. UNLESS NOTED OTHERWISE, ALL MBR ENCLOSURE COLUMNS SHALL BE PROVIDED WITH A ½" THICK CAP PLATE.
10. STEEL GRATING SHALL BE GALVANIZED SGW-150 BY MCNICHOLS OR APPROVED EQUAL.

STEEL JOISTS NOTES:

1. STEEL JOISTS SHALL BE DESIGNED, FABRICATED, AND INSTALLED IN ACCORDANCE WITH STEEL JOIST INSTITUTE (SJI) "STANDARD SPECIFICATIONS LOAD TABLES AND WEIGHT TABLES FOR STEEL JOISTS AND JOIST GIRDERS" LATEST EDITION AND SJI "CODE OF STANDARD PRACTICE" LATEST EDITION.
2. STEEL JOIST FABRICATOR SHALL SUPPLY AN AFFIDAVIT STATING COMPLIANCE WITH ALL APPLICABLE AISC, SJI AND AISI REQUIREMENTS.
3. STEEL JOIST SUPPLIER MUST BE A MEMBER OF SJI.
4. ALL STEEL JOISTS SHALL BE BRACED IN ACCORDANCE WITH SJI. JOIST BRIDGING SHALL BE FURNISHED BY THE JOIST MANUFACTURER.
5. JOIST LAYOUTS SHOWN ON PLANS ARE CONCEPTUAL, WITH MAXIMUM SPACING AS INDICATED, ACTUAL JOIST LAYOUT SHALL BE PER APPROVED SHOP DRAWINGS.
6. UNLESS NOTED OTHERWISE ALL STEEL JOISTS SHALL BE HOT DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A123.
7. UNLESS OTHERWISE NOTED, ALL M.E.P. FIXTURES SUPPORTED BELOW JOISTS SHALL BE SUPPORTED BY A MINIMUM OF TWO JOISTS.

WELDING NOTES:

1. ALL WELDING SHALL BE CONDUCTED BY CERTIFIED WELDERS IN ACCORDANCE WITH AWS D1.1, LATEST EDITION FOR STRUCTURAL STEEL AND AWS D1.3, LATEST EDITION FOR STRUCTURAL SHEET STEEL.
2. THE CONTRACTOR SHALL BEAR FULL RESPONSIBILITY FOR PROTECTING EXISTING EQUIPMENT, MATERIALS, BUILDING STRUCTURES, AND BUILDING COMPONENTS DURING ANY FIELD WELDING OPERATIONS.
3. WELDS OF HEADED STUDS SHALL MATCH STRENGTH OF STUDS.

GEOTECHNICAL NOTES:

1. THE FOLLOWING BEARING PRESSURE VALUES WERE RECOMMENDED PER THE GEOTECHNICAL REPORT PREPARED BY TECTONIC ENGINEERING CONSULTANTS, GEOLOGISTS & LAND SURVEYORS, D.P.C. DATED JANUARY 15, 2020:
   - MAX NET ALLOWABLE BEARING OF UNDISTURBED NATIVE SOIL: 4000PSF
   - MAX NET ALLOWABLE BEARING OF SHALE OR SANDSTONE BEDROCK: 8000PSF
2. BOTTOM OF EXCAVATION IS DEFINED AS THE ELEVATION BENEATH THE SUBBASE. SUBBASE PREPARATION SHALL BE AS FOLLOWS:
   - BENEATH SLABS-ON-GRADE: 6" COMPACTED LIFT OF CLEAN STONE
   - BENEATH FOUNDATIONS/MAT SLABS: 6" COMPACTED LIFT OF CRUSHED STONE
3. IF UNSUITABLE MATERIAL IS ENCOUNTERED AT OR UNDER THE PROPOSED BOTTOM OF EXCAVATION, THE UNSUITABLE MATERIAL SHALL BE REMOVED FROM WITHIN THE ZONE OF INFLUENCE OF THE BEARING ELEMENT AND REPLACED IN ACCORDANCE WITH NOTE 4.
4. ZONE OF INFLUENCE IS DEFINED AS A 1V:1H PLANE EXTENDING DOWNWARD FROM THE BOTTOM PERIMETER OF THE FOUNDATION ELEMENT TO WITHIN A SUITABLE DISTANCE BELOW, TO BE DETERMINED BY THE ENGINEER OF RECORD (E.O.R.) BASED ON FIELD CONDITIONS AND MATERIAL TYPE.
5. OVER EXCAVATION IS DEFINED AS ANY EXCAVATION BELOW THE PROPOSED BOTTOM OF EXCAVATION IDENTIFIED ON THE PLANS OR AS DESCRIBED WITHIN THE PROJECT SPECIFICATIONS; OVER EXCAVATION SHALL BE RE-ESTABLISHED AS FOLLOWS:
   - BENEATH FOUNDATIONS AND SLABS-ON-GRADE: COMPACTED SELECT FILL
   - BENEATH TANKS: CONTROLLED DENSITY FILL
6. SELECT FILL SHALL BE UTILIZED FOR BACKFILL OF ALL STRUCTURES (UNLESS OTHERWISE NOTED).
7. THE MINIMUM SELECT FILL PROPERTIES LISTED BELOW WERE RECOMMENDED PER THE GEOTECHNICAL REPORT PREPARED BY TECTONIC ENGINEERING CONSULTANTS, GEOLOGISTS & LAND SURVEYORS, D.P.C. DATED JANUARY 15, 2020:
   - UNIT WEIGHT = 130 PSF
   - FRICTION ANGLE = 35°
   - Ka = 0.27
   - Ko = 0.43
   - Kp = 3.69
8. THE CONTRACTOR SHALL SUBMIT DESIRED BACKFILL MATERIAL SPECIFICATION MEETING ALL DESIGN CRITERIA LISTED ABOVE, AT A MINIMUM, TO THE ENGINEER OF RECORD PRIOR TO USE ON SITE. ALTERNATIVELY, THE CONTRACTOR SHALL ELECT TO PERFORM A FIELD PROCTOR OF THE EXISTING SITE SOILS TO VERIFY THAT EXISTING SOILS MEET THE MINIMUM DESIGN VALUES STATED ABOVE.
9. IN-SITU COMPACTION TESTING OF SUBGRADE AND BACKFILL MATERIAL SHALL BE PERFORMED BY THE OWNER'S SPECIAL INSPECTOR.
10. FOR ADDITIONAL GEOTECHNICAL INFORMATION, SEE THE SITE SPECIFIC GEOTECHNICAL REPORT PREPARED BY TECTONIC PROVIDED IN THE CONTRACT.

TRUSS NOTES:

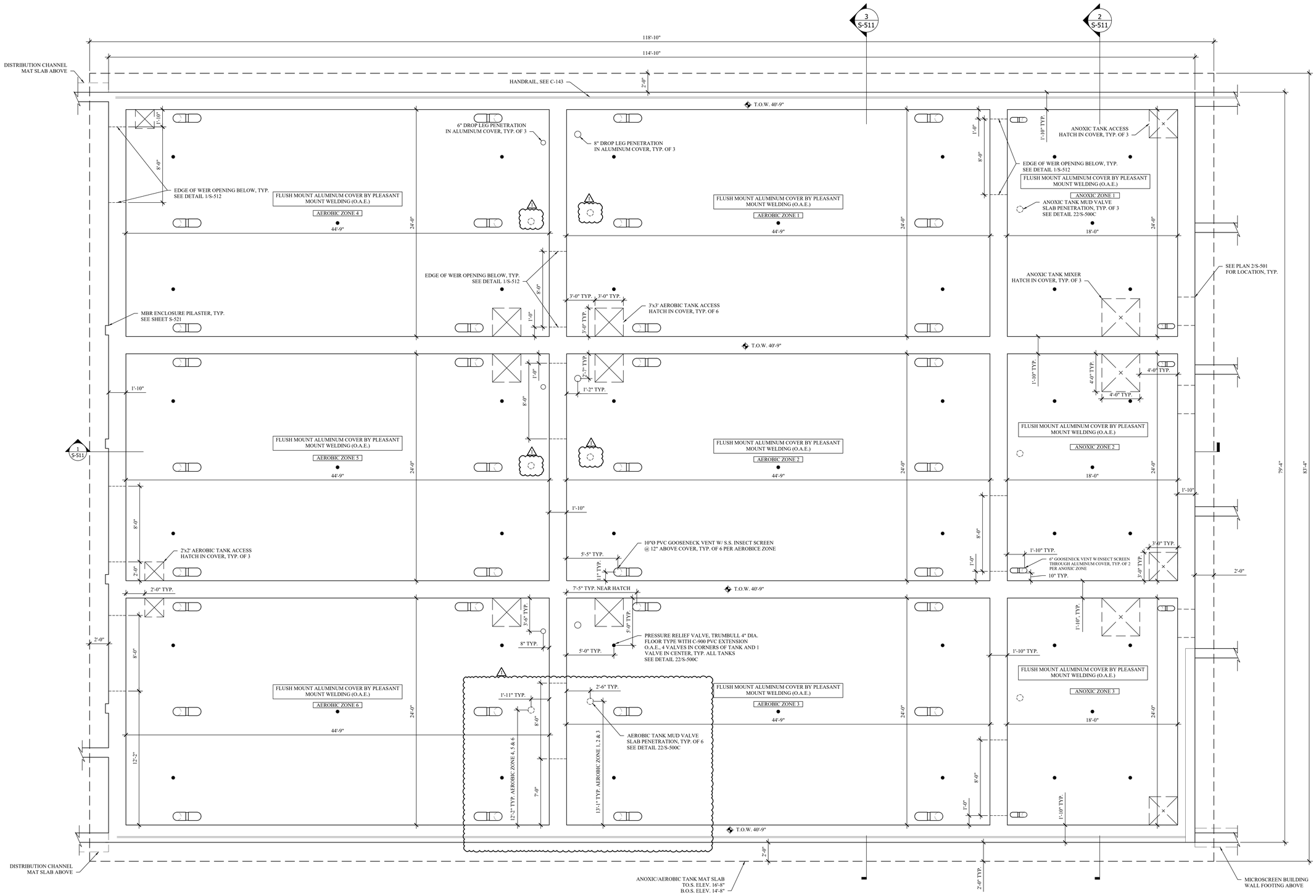
1. ALL TRUSSES SHALL BE DESIGNED AND SEALED BY A REGISTERED PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW YORK. ROOF TRUSSES SHALL BE DESIGNED FOR THE FOLLOWING LOADS:

   GROUND SNOW LOAD = 30 PSF
   FLAT ROOF SNOW LOAD = 22 PSF
   UNBALANCED SNOW LOAD SHALL BE PER ASCE-7, LATEST EDITION
   DEAD LOAD TOP CHORD = 10 PSF
   LIVE LOAD BOTTOM CHORD = 10 PSF
   DEAD LOAD BOTTOM CHORD = 10 PSF
   UPLIFT FROM WIND = 26 PSF
   CARBON STEEL PIPE LOAD = 60PLF

2. LOADS DO NOT INCLUDE TRUSS SELF WEIGHT. LOADS DO NOT INCLUDE NON-UNIFORM OR UNBALANCED SNOW LOADS. CARBON STEEL PIPE LOADS WILL BE MODELED AS POINT LOADS SUPPORTED BY THE TRUSS VIA HANGERS. EACH HANGER SHALL BE SUPPORTED BY A MINIMUM OF 3 TRUSSES. TRUSSES SHALL BE DESIGNED UTILIZING THE REQUIREMENTS OF ASCE-7; LATEST ADDITION FOR UNBALANCED SNOW LOADS.
3. EACH TRUSS SHALL BE RESTRAINED AGAINST UPLIFT UTILIZING AN APPROVED CLIP WITH A MINIMUM CAPACITY OF 500 LBS.
4. UNLESS NOTED OTHERWISE ALL TRUSSES AND THEIR CONNECTIONS SHALL BE GALVANIZED AND SHALL COMPLY WITH THE REQUIREMENTS OF AISI SPECIFICATION FOR THE DESIGN OF COLD FORM STEEL STRUCTURAL MEMBERS, LATEST EDITION.
5. TRUSS LAYOUTS SHOWN ON PLANS ARE CONCEPTUAL, WITH MAXIMUM SPACING AS INDICATED, ACTUAL TRUSS LAYOUT SHALL BE PER APPROVED SHOP DRAWINGS.

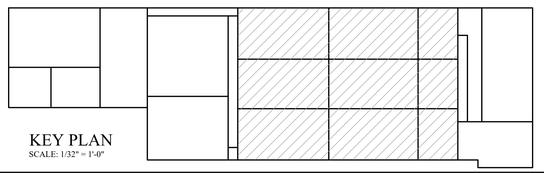
AISI COLD FORMED FRAMING NOTES:

1. METAL STUD SIZES SHOWN ON PLANS AND DETAILS ARE BASED ON CLARKDIETRICH GALVANIZED STEEL STUDS. ALL FRAMING MATERIALS AND CONNECTIONS SHALL BE EQUIVALENT TO THOSE MANUFACTURED BY CLARKDIETRICH. ALL STUDS AND THEIR CONNECTIONS SHALL BE GALVANIZED AND SHALL COMPLY WITH THE REQUIREMENTS OF AISI SPECIFICATION FOR THE DESIGN OF COLD FORM STEEL STRUCTURAL MEMBERS, LATEST EDITION.
2. METAL PURLIN AND GIRT SIZES SHOWN ON PLANS AND DETAILS ARE BASED ON FLEXOSPAN GALVANIZED STEEL FRAMING. ALL FRAMING MATERIALS AND CONNECTIONS SHALL BE EQUIVALENT TO THOSE MANUFACTURED BY FLEXOSPAN. ALL ROOF FRAMING MEMBERS AND THEIR CONNECTIONS SHALL BE GALVANIZED OR PAINTED AND SHALL COMPLY WITH THE REQUIREMENTS OF AISI SPECIFICATION FOR THE DESIGN OF COLD FORM STEEL STRUCTURAL MEMBERS, LATEST EDITION.
3. ALL METAL STUDS SHALL HAVE A MINIMUM YIELD STRENGTH OF 50 KSI. METAL PURLINS SHALL HAVE A MINIMUM YIELD STRENGTH OF 55 KSI.
4. STEEL STUDS: MANUFACTURER'S STANDARD C-SHAPED STEEL STUDS, OF WEB DEPTHS INDICATED, PUNCHED, WITH STIFFENED FLANGES, AND AS FOLLOWS:
   - MINIMUM BASE-MTAL THICKNESS: 16 GA. (54 MILS)
   - MINIMUM FLANGE WIDTH: 1-5/8 INCHES
5. INSTALL CONTINUOUS U-SHAPED STEEL TRACKS SIZED TO MATCH STUDS. ALIGN TRACKS ACCURATELY AND SECURELY ANCHOR TO SUPPORTING STRUCTURE AT EACH STUD LOCATION. TRACKS SHALL BE UNPUNCHED WITH STRAIGHT FLANGES AND MATCH MINIMUM BASE METAL THICKNESS OF STUDS.
6. FASTEN BOTH FLANGES OF STUDS TO BOTTOM TRACK UNLESS OTHERWISE INDICATED. SPACE STUDS AS FOLLOWS:
   - STUD SPACING: 24" O.C. MAX
7. SET STUDS PLUMB, EXCEPT AS NEEDED FOR DIAGONAL BRACING OR REQUIRED FOR NON-PLUMB WALLS O



1 S-510 SLAB, WALL AND COVER PLAN

SCALE: 1/4" = 1'-0"



KEY PLAN

SCALE: 1/32" = 1'-0"

MHE ENGINEERING

33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100

111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID SET

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NEW WINDSOR, NY 12553

FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ANOXIC AND AEROBIC TANK PLAN

REVISIONS

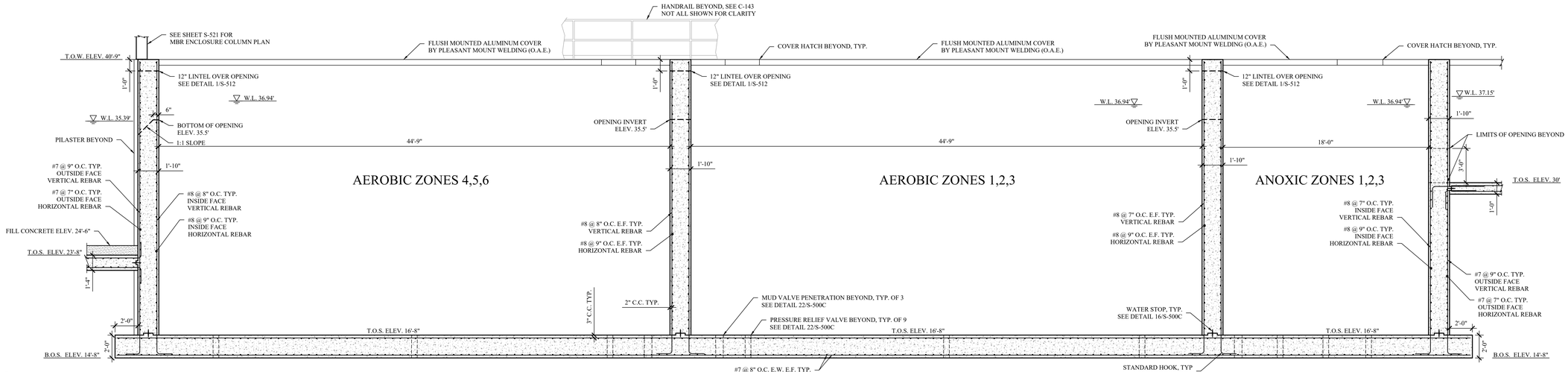
NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
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DRAWN BY:	WPG, NEM, PJW
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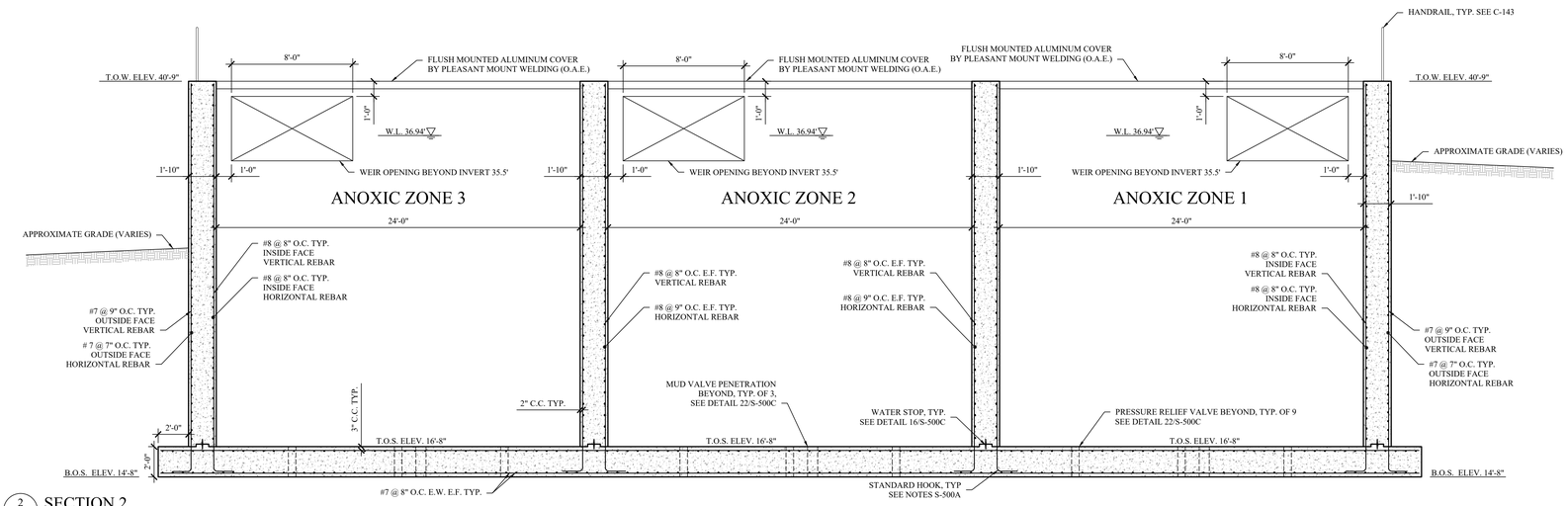
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S-510

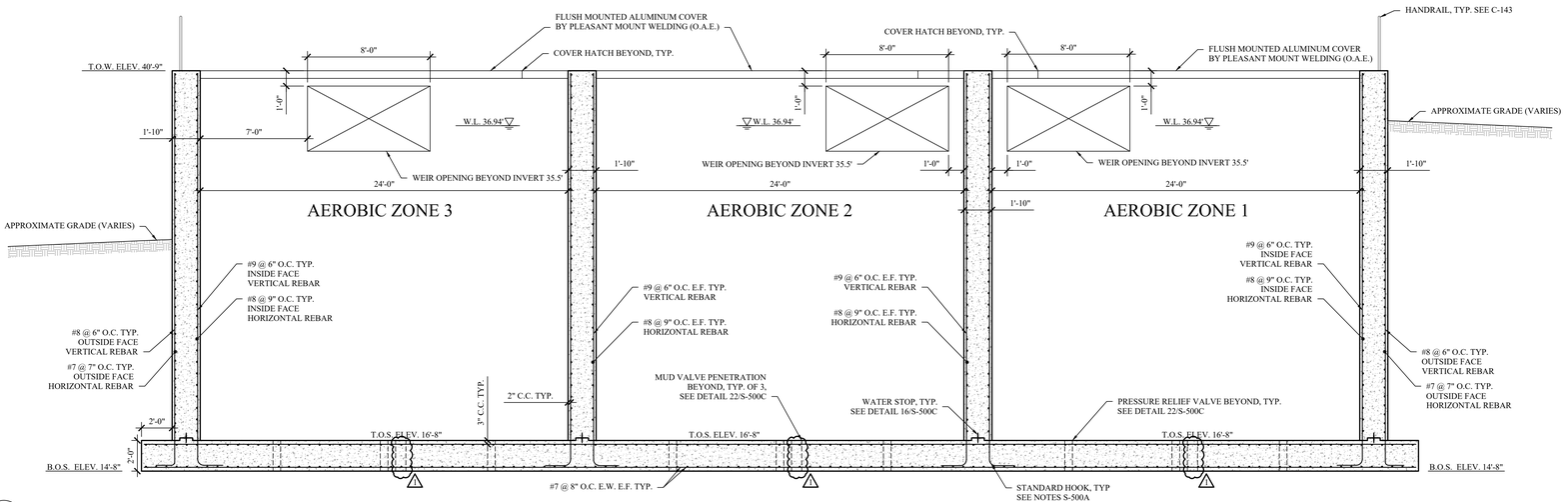
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1 S-511 SECTION 1
SCALE: 1/4" = 1'-0"



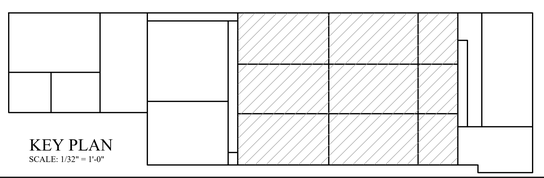
2 S-511 SECTION 2
SCALE: 1/4" = 1'-0"



3 S-511 SECTION 3 (AEROBIC ZONES 4,5,6 SIMILAR TO ABOVE, WEIR OPENINGS VARY SEE SHEET S-510 FOR LOCATIONS)
SCALE: 1/4" = 1'-0"

SUBBASE AND BACKFILL NOTES:

1. SUBBASE PREPARATION SHALL BE AS FOLLOWS:
   - BENEATH SLABS-ON-GRADE: 6" COMPACTED LIFT OF CLEAN STONE
   - BENEATH FOUNDATIONS/MAT SLABS: 6" COMPACTED LIFT OF CRUSHED STONE
2. BACKFILL ALL STRUCTURES WITH SOIL THAT MEETS MINIMUM PROPERTIES IDENTIFIED IN THE GEOTECHNICAL NOTES AND PROJECT GEOTECHNICAL REPORT.



KEY PLAN
SCALE: 1/32" = 1'-0"

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID SET

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ANOXIC AND AEROBIC TANK SECTIONS

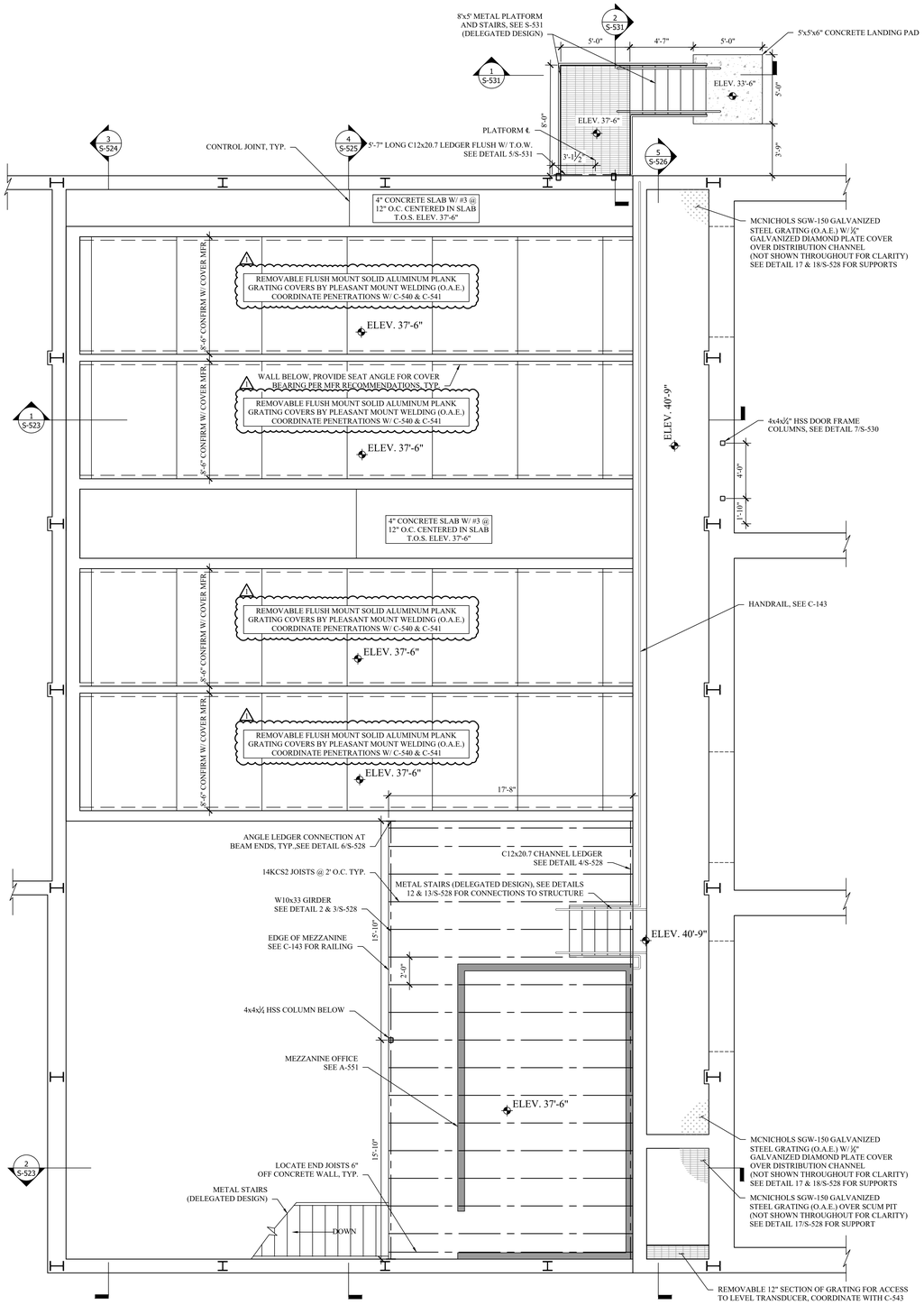
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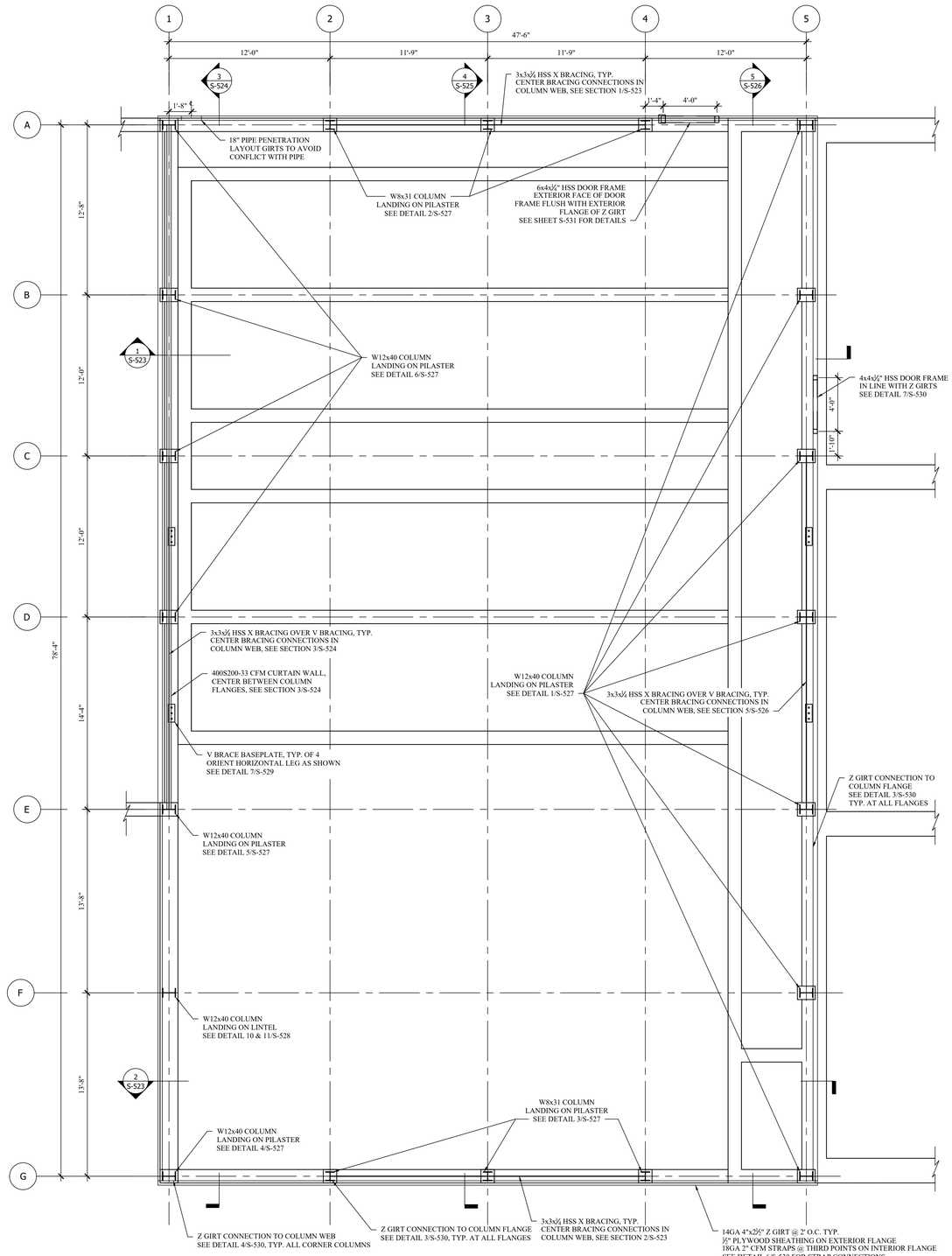
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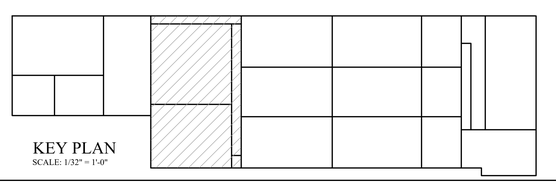


3 S-521 MBR BASIN GRATING, COVERS AND MEZZANINE FRAMING PLAN
SCALE: 1/4" = 1'-0"

NOTE: ALL M.E.P. FIXTURES SUPPORTED BY JOISTS SHALL BE SUPPORTED BY A MINIMUM OF TWO JOISTS



4 S-521 MBR ENCLOSURE COLUMN, BRACING AND WALL FRAMING PLAN
SCALE: 1/4" = 1'-0"



KEY PLAN
SCALE: 1/32" = 1'-0"

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
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BID SET

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MBR BASIN AND ENCLOSURE PLANS

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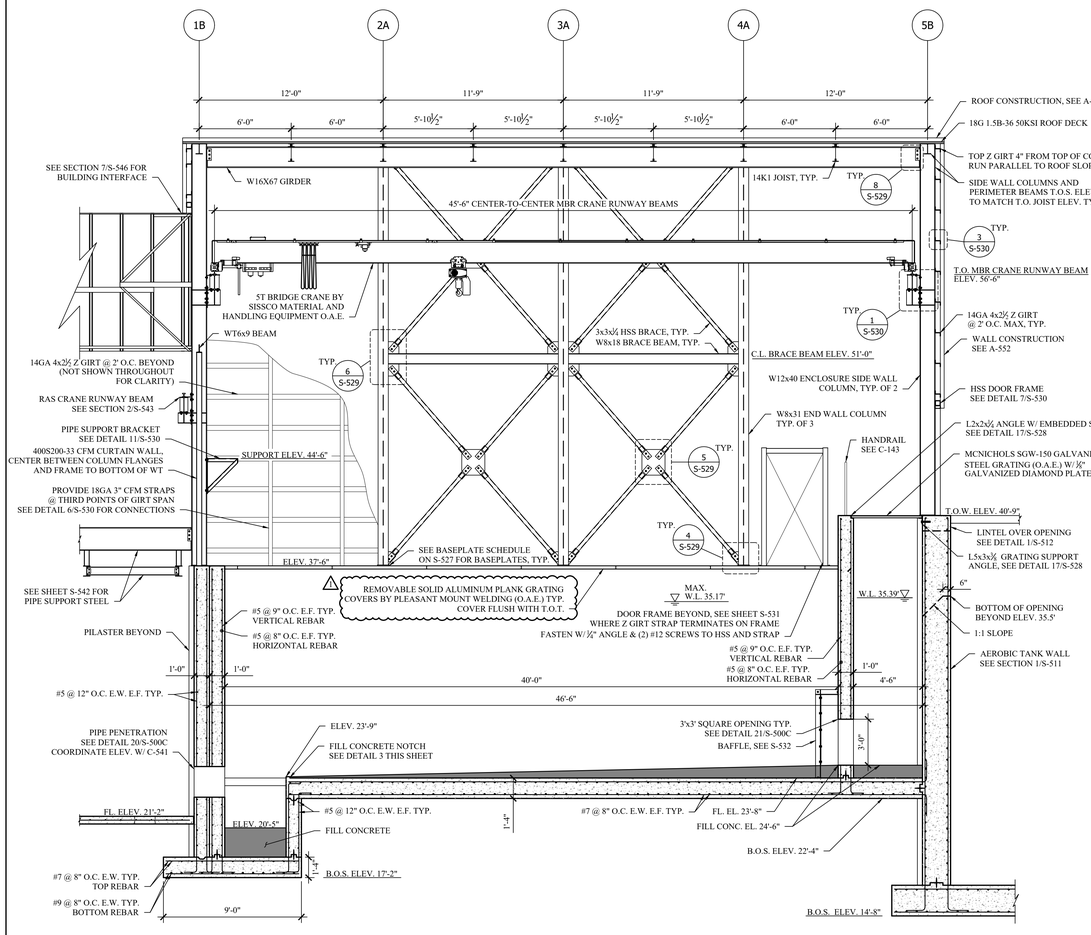
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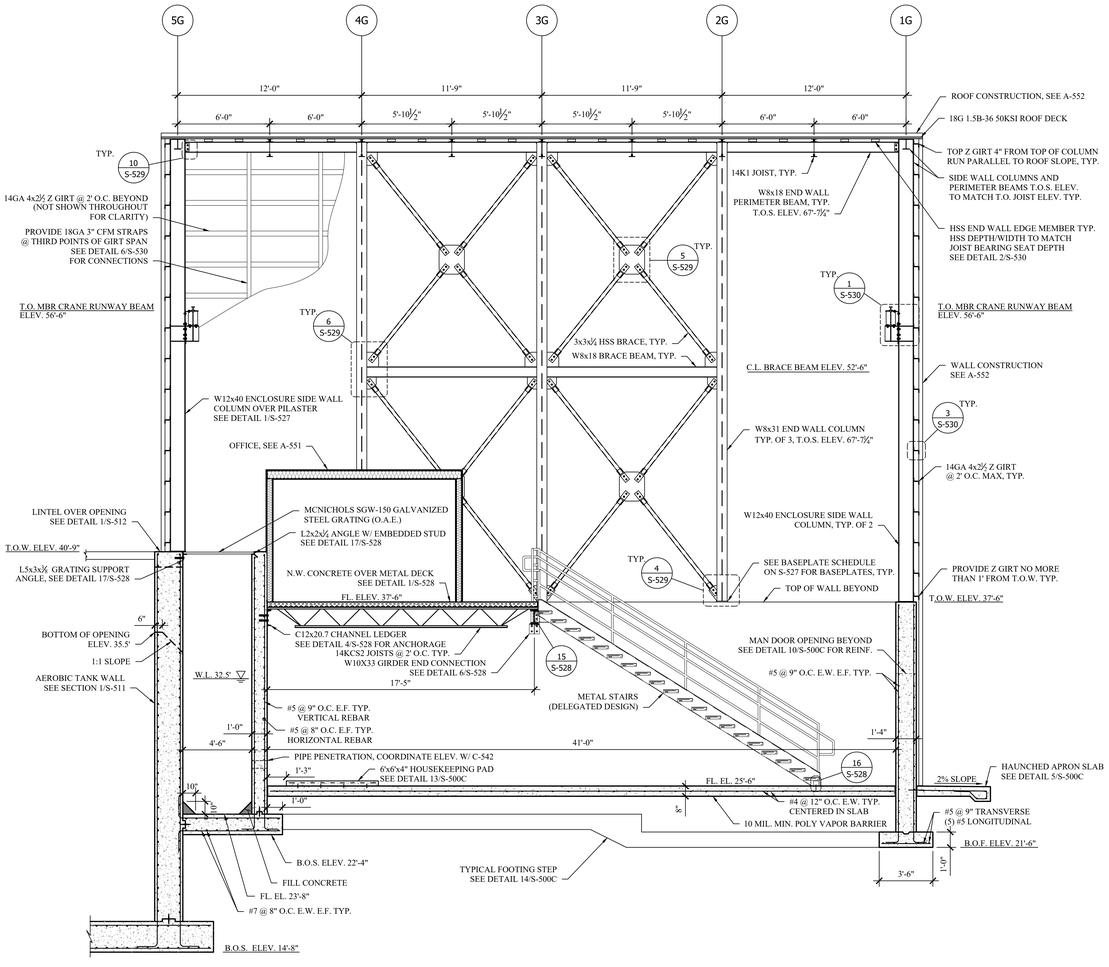
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SUBBASE AND BACKFILL NOTES:

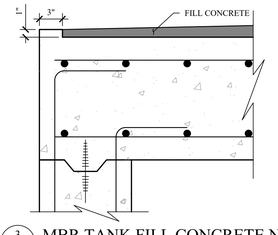
1. SUBBASE PREPARATION SHALL BE AS FOLLOWS:
   - BENEATH SLABS-ON-GRADE: 6" COMPACTED LIFT OF CLEAN STONE
   - BENEATH FOUNDATIONS/MAT SLABS: 6" COMPACTED LIFT OF CRUSHED STONE
2. BACKFILL ALL STRUCTURES WITH SOIL THAT MEETS MINIMUM PROPERTIES IDENTIFIED IN THE GEOTECHNICAL NOTES AND PROJECT GEOTECHNICAL REPORT.



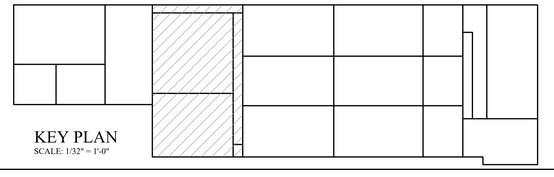
1 S-523 SECTION 1
SCALE: 1/4" = 1'-0"



2 S-523 SECTION 2
SCALE: 1/4" = 1'-0"



3 S-523 MBR TANK FILL CONCRETE NOTCH
SCALE: 3" = 1'-0"



KEY PLAN
SCALE: 1/32" = 1'-0"

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID SET

HAZARDOUS MATERIAL NOTE:

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CALL 811

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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

MBR BASIN AND ENCLOSURE SECTIONS

REVISIONS

NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

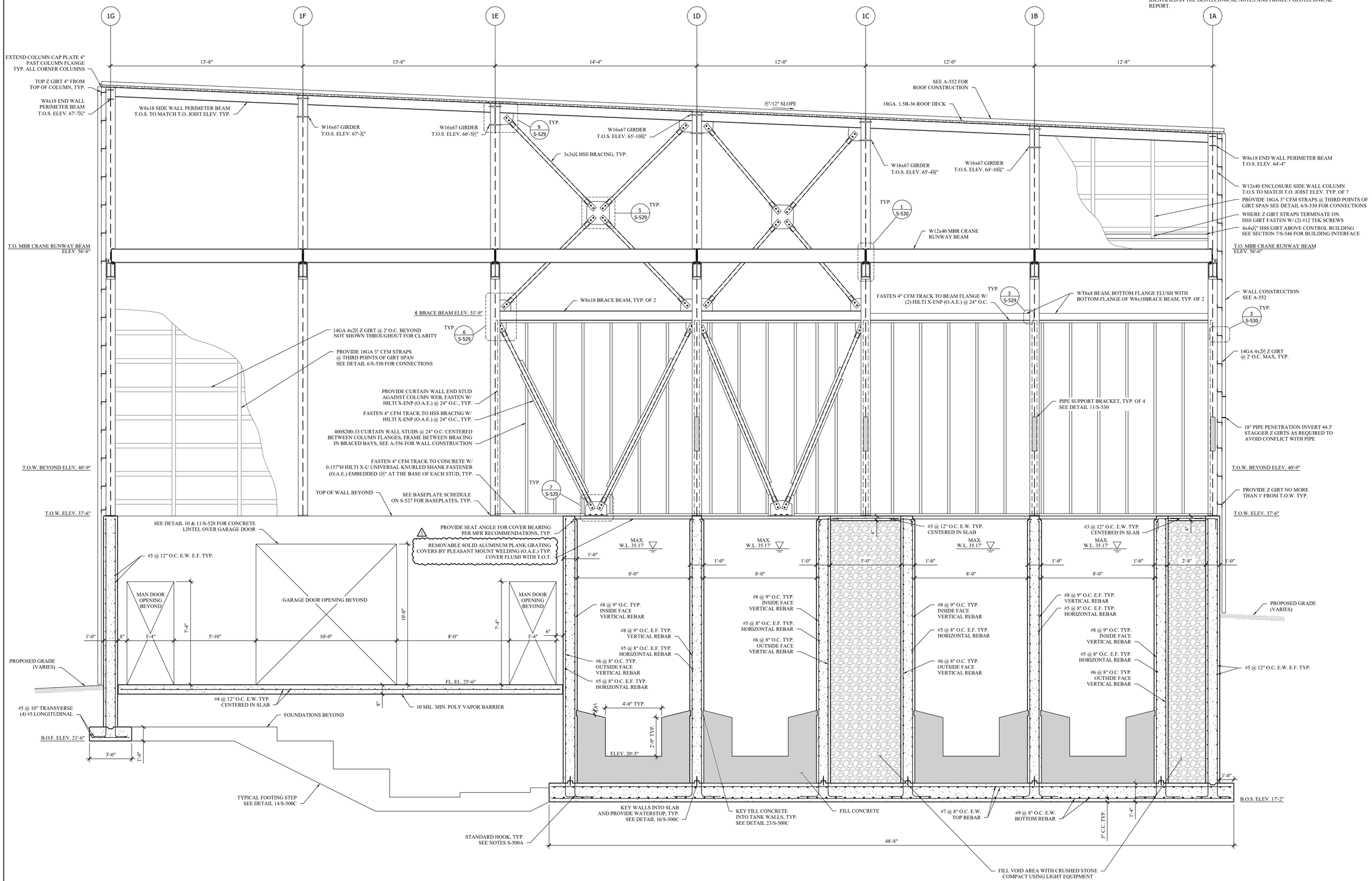
ISSUED DATE:	18 APR, 2025
DESIGN BY:	WPG, NEM, PJW
DRAWN BY:	WPG, NEM, PJW
CHECKED BY:	PJW
REVIEWED BY:	JSS

SHEET NO.
S-523

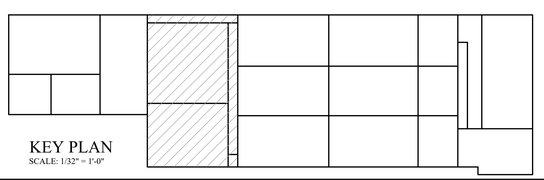
PROJECT # 18-732 PHASE #

SUBBASE AND BACKFILL NOTES:

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3 / S-524 SECTION 3
SCALE: 3/8" = 1'-0"



KEY PLAN
SCALE: 1/32" = 1'-0"

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID SET

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NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

MBR BASIN AND ENCLOSURE SECTIONS CONTINUED

REVISIONS

NO.	DESCRIPTION	DATE
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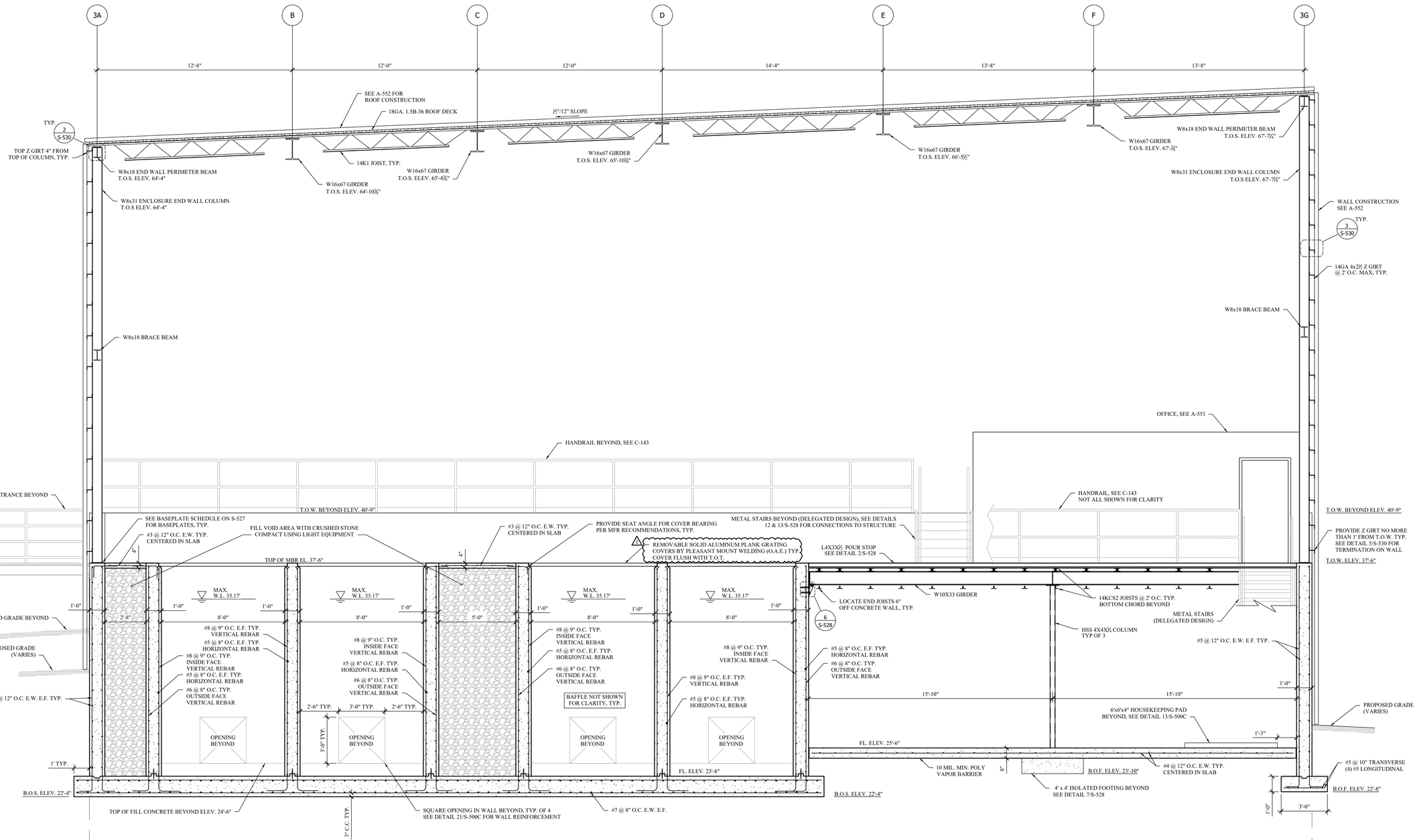
ISSUED DATE:	18 APR, 2025
DESIGN BY:	WPG, NEM, PJW
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CHECKED BY:	PJW
REVIEWED BY:	JSS

SHEET NO.
S-524

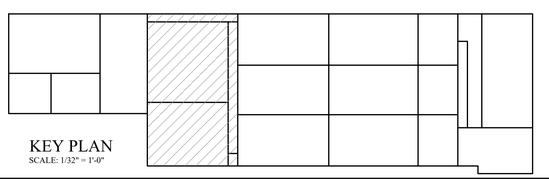
PROJECT # 18-732 PHASE #

SUBBASE AND BACKFILL NOTES:

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4 S-525 SECTION 4
SCALE: 3/8" = 1'-0"



KEY PLAN
SCALE: 1/32" = 1'-0"

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
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FOR TOWN OF NEW WINDSOR
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NEW WINDSOR, NY 12553

MBR BASIN AND ENCLOSURE SECTIONS CONTINUED

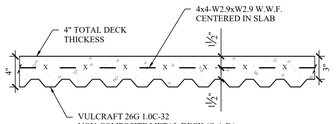
REVISIONS

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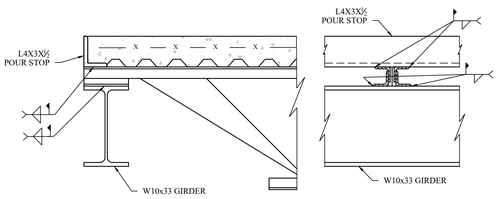
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DRAWN BY:	WPG, NEM, PJW
CHECKED BY:	PJW
REVIEWED BY:	JSS

SHEET NO.
S-525

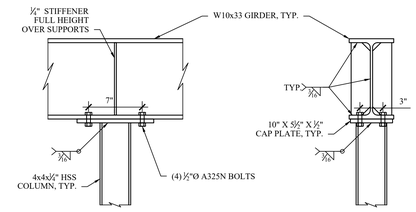
PROJECT # 18-732 PHASE #



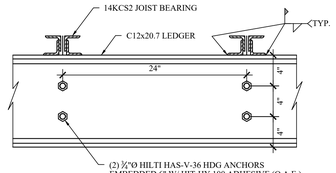
1 S-528 MEZZANINE SLAB REINFORCEMENT
SCALE: 1-1/2" = 1'-0"



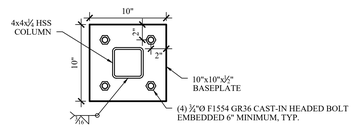
2 S-528 MEZZANINE POUR STOP AND GIRDER TO JOIST CONNECTION
SCALE: 1-1/2" = 1'-0"



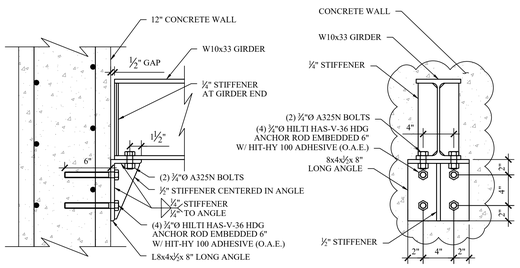
3 S-528 MEZZANINE GIRDER TO COLUMN CONNECTION
SCALE: 1-1/2" = 1'-0"



4 S-528 MEZZANINE CHANNEL LEDGER CONNECTIONS
SCALE: 1-1/2" = 1'-0"

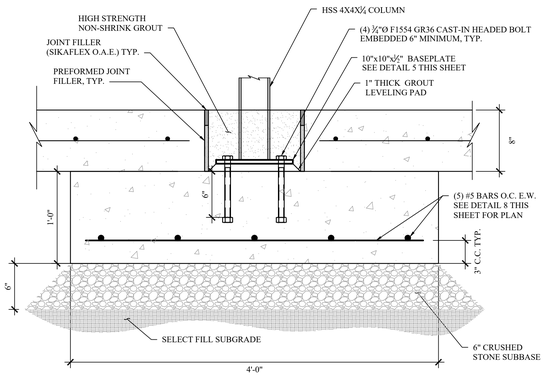


5 S-528 MEZZANINE COLUMN BASEPLATE
SCALE: 1-1/2" = 1'-0"

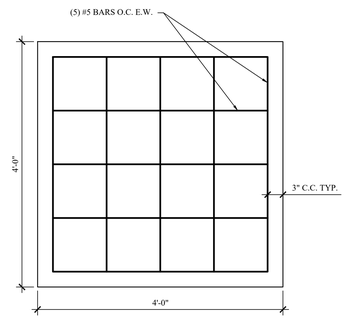


NOTE: METAL DECK, POUR STOP AND SUSPENDED SLAB NOT SHOWN FOR CLARITY

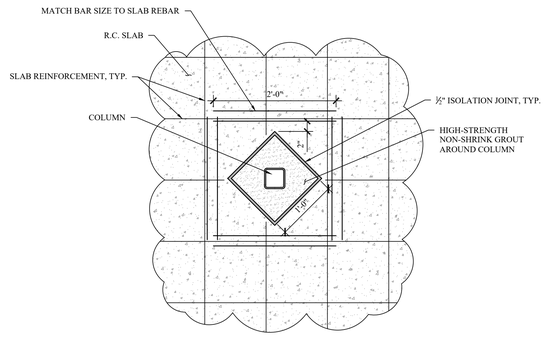
6 S-528 MEZZANINE GIRDER END CONNECTION
SCALE: 1-1/2" = 1'-0"



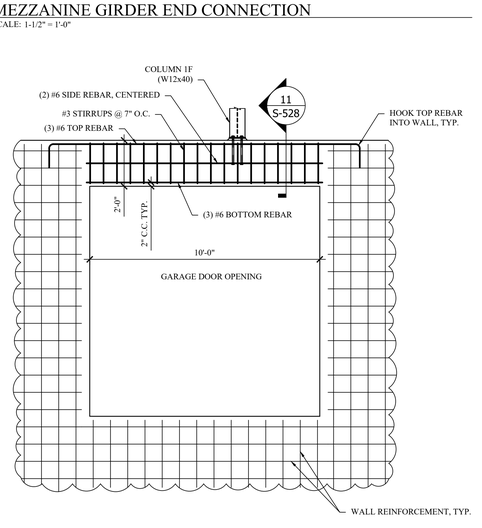
7 S-528 MEZZANINE CENTER COLUMN AND 4'x4' ISOLATED FOOTING
SCALE: 1-1/2" = 1'-0"



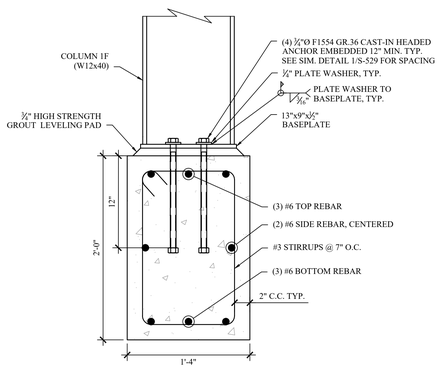
8 S-528 4'x4' ISOLATED FOOTING REINF. PLAN
SCALE: 1" = 1'-0"



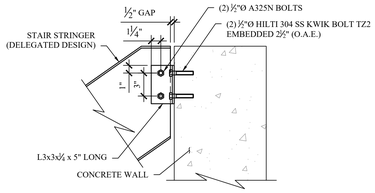
9 S-528 SLAB REINFORCEMENT AROUND COLUMN PENETRATION
SCALE: 1" = 1'-0"



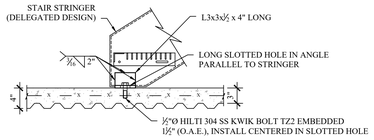
10 S-528 CONCRETE LINTEL OVER GARAGE DOOR
SCALE: 3/8" = 1'-0"



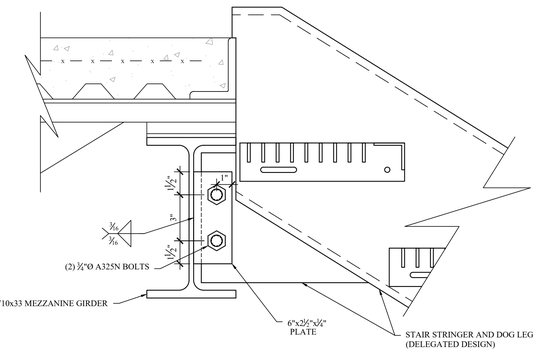
11 S-528 CONCRETE LINTEL OVER GARAGE DOOR
SCALE: 1-1/2" = 1'-0"



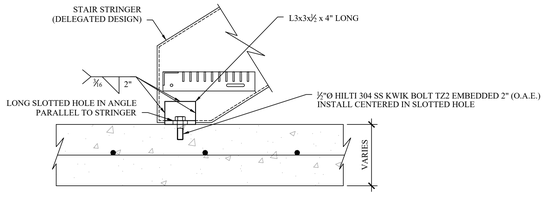
12 S-528 STAIR TO CONCRETE WALL CONN.
SCALE: 1-1/2" = 1'-0"



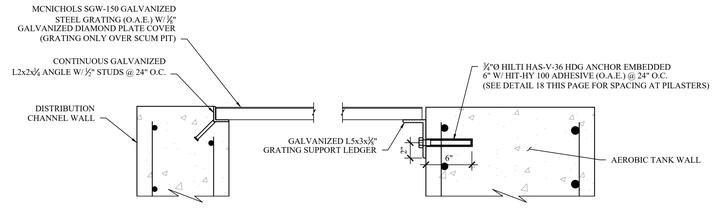
13 S-528 STAIR TO SUSPENDED SLAB CONN.
SCALE: 1-1/2" = 1'-0"



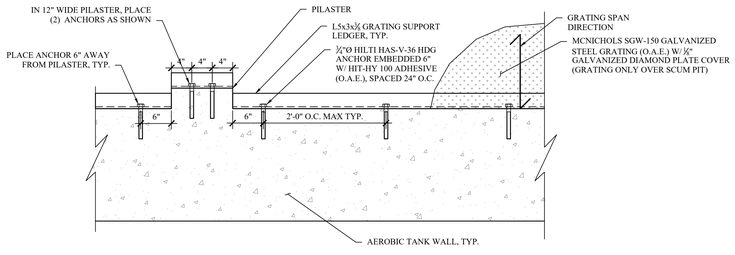
15 S-528 STAIR TO MEZZANINE GIRDER CONNECTION
SCALE: 3" = 1'-0"



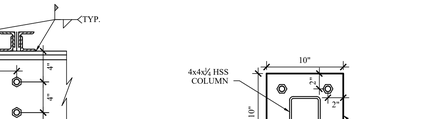
16 S-528 TYPICAL METAL STAIR CONNECTION TO SLAB-ON-GRADE
SCALE: 1-1/2" = 1'-0"



17 S-528 DISTRIBUTION CHANNEL/SCUM PIT GRATING SUPPORTS
SCALE: 1-1/2" = 1'-0"



18 S-528 GRATING SUPPORT ANGLE LEDGER ALONG AEROBIC TANK WALL DETAILS
SCALE: 1" = 1'-0"



14 S-528 MBR TANK REINFORCEMENT AT COVER BEARING
SCALE: 1-1/2" = 1'-0"

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
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NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

MBR BASIN AND ENCLOSURE DETAILS

REVISIONS

NO.	DESCRIPTION	DATE
1	ADDENDUM 4	07/10/25

ISSUED DATE:	18 APR, 2025
DESIGN BY:	WPG, NEM, PJW
DRAWN BY:	WPG, NEM, PJW
CHECKED BY:	PJW
REVIEWED BY:	JSS

SHEET NO.
S-528

PROJECT # 18-732 PHASE #

BOILER SCHEDULE

UNIT TAG	LOCATION	SYSTEM FLUID	NATURAL GAS		OUTPUT MBH	BOILER HP	% EFF	RELIEF VALVE (PSI)	ELECTRICAL		FLUE OUTLET CONNECTION	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
			INPUT (MBH)	RATE (CFH)					VOLTS/ PH	MOP (AMPS)				
B-700	MECHANICAL	WATER	399	399	383	N/A	95	12	120/1	20	4"	WEIL-MCLAIN	EVG-399	1 2
B-701	MECHANICAL	WATER	399	399	383	N/A	95	12	120/1	20	4"	WEIL-MCLAIN	EVG-399	1 2

1. PROVIDE WITH CONCENTRIC VENT AND CONDENSATE NEUTRALIZER KIT.
2. PROVIDE WITH BOILER CONTROLS/PUMP CONTROLLERS AS NECESSARY FOR OPERATION OF CIRCULATING PUMPS.

PUMP SCHEDULE

UNIT TAG	LOCATION	SERVICE	SYSTEM FLUID	GPM	HEAD FT. WG.	RPM	ELECTRICAL			BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
							HP	VOLTS	PHASE			
P-700	MECHANICAL	HWS&R LOOP	WATER	56	40	1578	2	460	3	BELL&GOSSETT	E-90	1 2
P-701	MECHANICAL	HWS&R LOOP	WATER	56	40	1579	2	460	3	BELL&GOSSETT	E-90	1 2
BP-700	MECHANICAL	B-700	WATER	29	25	1725	1/2	460	3	TACO	0013	3
BP-701	MECHANICAL	B-701	WATER	29	25	1725	1/2	460	3	TACO	0013	3

1. PROVIDE W/ VFD.
2. PUMPS TO OPERATE AS DUTY/STANDBY.
3. BOILER PUMPS TO BE PROVIDED BY BOILER MANUFACTURER.

EXPANSION TANK SCHEDULE

UNIT TAG	SERVICE	TYPE	ACCEPTANCE VOLUME (GAL)	TANK VOLUME (GAL)	DIAMETER (IN)	LENGTH (IN)	FILL PRESSURE (PSI)	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
EXT-700	BOILER SYSTEM	DIAPHRAGM	6.3	7.8	12	19	12	BELL & GOSSETT	D-15	

AIR SEPARATOR SCHEDULE

UNIT TAG	LOCATION	SERVICE	TYPE	GPM	WPD FT-H_2O	CONN. SIZE (IN)	VELOCITY FPM	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
AS-700	MECHANICAL	BOILER SYSTEM	TANGENTIAL	56	0.2	3	144	BELL&GOSSETT	ROLAIRTROL RL-3F	

STATIONARY ROOF VENTILATOR SCHEDULE

UNIT TAG	LOCATION	SERVICE	CFM	THROAT DIMENSIONS	FREE AREA (SQ. FT.)	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
SRV-300	SLUDGE PIT	SLUDGE PIT	250	8X8	0.44	GREENHECK	FGI	1
SRV-400	ATAD BUILDING	EQUIPMENT ROOM	3000	30X30	6.25	GREENHECK	FGI	1
SRV-500	MBR BUILDING	INFLUENT DRY WELL	675	14X14	1.36	GREENHECK	FGI	1

1. PROVIDE WITH 14" HIGH INSULATED ALUMINUM ROOF CURB AND 120V AAD (NEMA 4X ACTUATOR/ENCLOSURE).

AIR INLET AND OUTLET SCHEDULE

TYPE	DESCRIPTION	SERVICE	FACE SIZE (NECK SIZE)	MOUNTING TYPE	BASIS OF DESIGN MANUFACTURER AND MODEL	REMARKS
S1	DIFFUSER	SUPPLY	24X24	LAY-IN	PRICE SCD	1
S2	GRILLE	SUPPLY	SEE PLANS	TO DUCT	PRICE 720 SERIES	1
R1	GRILLE	RETURN	24X24/12X12	LAY-IN	PRICE 80 SERIES	1
E1	GRILLE	EXHAUST	SEE PLANS	TO DUCT	PRICE 730 SERIES	1

1. PROVIDE WITH BALANCING DAMPER

DUCTLESS SPLIT SYSTEM SCHEDULE

INDOOR UNIT												OUTDOOR UNIT									
UNIT TAG	LOCATION	ARRANGEMENT	INSTALLATION HEIGHT AFF (APPROX)	TOTAL COOLING (BTUH)	MIN SEER	HEATING CAPACITY (BTUH)	SUPPLY CFM HIGH/LOW	ELECTRICAL			REMARKS	UNIT TAG	LOCATION	INSTALLATION HEIGHT AFG (APPROX)	SERVICE	ELECTRICAL			BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER INDOOR UNIT	BASIS OF DESIGN MODEL NUMBER OUTDOOR UNIT	REMARKS
								VOLTS	PHASE	MOP						VOLTS	PHASE	MOP				
HWU-400	ATAD BUILDING	HIGH WALL MOUNT	7'-0"	33,000	18.5	35,200	883/601	208	1	30	1	DSCU-400	ROOF	-	HWU-400	208	1	30	LG	LSN36HLV3	LSU36HLV3	1 3
HWU-500	MBR BUILDING	HIGH WALL MOUNT	7'-0"	12,000	22.7	13,600	282/177	208	1	20	1	DSCU-500	EXTERIOR WALL	8'-0"	HWU-500	208	1	20	LG	LSN120HSVR	LSU120HSV5	1 2
HWU-700	DEWATERING BUILDING	HIGH WALL MOUNT	7'-0"	12,000	22.7	13,600	282/177	208	1	20	1	DSCU-700	ROOF	-	HWU-700	208	1	20	LG	LSN120HSVR	LSU120HSV5	1 2
HWU-701	DEWATERING BUILDING	HIGH WALL MOUNT	7'-0"	12,000	22.7	13,600	282/177	208	1	20	1	DSCU-701	ROOF	-	HWU-700	208	1	20	LG	LSN120HSVR	LSU120HSV5	1 2
F-700 CC	DEWATERING BUILDING	CASED COIL	-	60,000	13	-	1575	-	-	-	1	DSCU-702	ROOF	-	F-700 CC	208	1	50	COMFORTAIRE	-	RSG1360S1M	1 3

1. PROVIDE WITH LOW AMBIENT WIND BAFFLE KIT, REMOTE CONTROLLER, BASE PAN HEATER, AND HIGH LIFT CONDENSATE PUMP.
2. MOUNT EXTERIOR DUCTLESS SPLIT CONDENSING UNIT ON WALL MOUNT BRACKET/STAND PER MANUFACTURER RECOMMENDATIONS.
3. MOUNT EXTERIOR DUCTLESS SPLIT CONDENSING UNIT ON ROOF MOUNT QUICKSLING (NON-PENETRATING) STAND AND INSTALL PER MANUFACTURER RECOMMENDATIONS.

FURNACE SCHEDULE

UNIT TAG	LOCATION	SERVICE	SA CFM	OA CFM (MIN)	ESP (IN WG)	ELECTRICAL				DX COOLING COIL	GAS HEATING				SEER	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
						MOP	VOLTS	PHASE	FLA	NOMINAL TONNAGE	INPUT MBH	OUTPUT MBH	RISE (°F)	AFUE				
F-700	DEWATERING BUILDING	OFFICE/LOCKER AREA	1575	175	0.8	20	120	1	12.8	5	110	106	80	97	14	COMFORT-AIRE	GUH97M	1

1. PROVIDE WITH LP CONVERSION KIT, LOW VOLTAGE HONEYWELL PRESTIGE 2.0 THERMOSTAT, AND CONCENTRIC VENT KIT.

EXHAUST FAN SCHEDULE

UNIT TAG	LOCATION	SERVICE	ARRANGEMENT	DRIVE	CFM	SP (IN WG)	FAN RPM	MAX SONES	WALL / ROOF OPENING SIZE (MAX)	BOTTOM OF FAN HEIGHT AFF (APPROX)	ELECTRICAL			BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
											HP (W)	VOLTS	PHASE			
EF-200	HEADWORKS BUILDING	BAR SCREEN ROOM	IN-LINE	BELT	2650	0.3	1235	-	-	8'-4"	1/2	120	1	GREENHECK	QEI-15	1
EF-201	HEADWORKS BUILDING	ELECTRICAL ROOM	IN-LINE	DIRECT	500	0.3	1522	-	-	9'-4"	1/10	120	1	GREENHECK	SQ-90-VG	2 5
EF-300	SLUDGE PIT	SLUDGE PIT	ROOF MOUNT	DIRECT	250	0.3	1569	5	13.5"X13.5"	-	1/15	120	1	GREENHECK	G-070-VG	7
EF-301	SLUDGE VALVE PIT	SLUDGE VALVE PIT	IN-LINE	DIRECT	400	0.3	1379	-	-	2'-0"	1/10	120	1	GREENHECK	SQ-90-VG	10
EF-400	ATAD BUILDING	EQUIPMENT ROOM	IN-LINE	DIRECT	3000	0.3	1139	-	-	9'-0"	3/4	208	1	GREENHECK	SQ-160-VG	4 3
EF-401	ATAD BUILDING	THICKENING ROOM	IN-LINE	DIRECT	925	0.3	1318	-	-	9'-4"	1/4	120	1	GREENHECK	SQ-100-VG	5
EF-500	MBR BUILDING	CHEMICAL ROOMS	IN-LINE	DIRECT	600	0.5	1689	-	-	8'-6"	1/6	120	1	GREENHECK	SQ-95-VG	5
EF-501	MBR BUILDING	RAS PUMP ROOM	WALL MOUNT	DIRECT	3900	0.3	1434	21	18"X18"	25'-0"	2	208	1	GREENHECK	CUE-160-VG	6
EF-502	MBR BUILDING	BLOWER ROOM	WALL MOUNT	DIRECT	5000	0.3	982	19	26"X26"	13'-0"	2	208	1	GREENHECK	CUE-200-VG	6 3
EF-503	MBR BUILDING	BLOWER ROOM	WALL MOUNT	DIRECT	5000	0.3	982	19	26"X26"	13'-0"	2	208	1	GREENHECK	CUE-200-VG	6 3
EF-504	MBR BUILDING	ELECTRICAL ROOM	CEILING	DIRECT	500	0.3	1212	7	-	8'-0"	(121)	120	1	GREENHECK	SP-A510-VG	9 3
EF-505	MBR BUILDING	MEMBRANE AREA	WALL MOUNT	DIRECT	2500	0.3	1479	16	18"X18"	24'-0"	3/4	208	1	GREENHECK	CUE-140-VG	6 3
EF-506	MBR BUILDING	MEMBRANE AREA	WALL MOUNT	DIRECT	2500	0.3	1479	16	18"X18"	24'-0"	3/4	208	1	GREENHECK	CUE-140-VG	6 3
EF-507	MBR BUILDING	MEMBRANE AREA	WALL MOUNT	DIRECT	2500	0.3	1479	16	18"X18"	24'-0"	3/4	208	1	GREENHECK	CUE-140-VG	6 3
EF-508	MBR BUILDING	MEMBRANE AREA	WALL MOUNT	DIRECT	2500	0.3	1479	16	18"X18"	24'-0"	3/4	208	1	GREENHECK	CUE-140-VG	6 3
EF-509	MBR BUILDING	FINE SCREEN ROOM	IN-LINE	DIRECT	1100	0.3	1488	-	-	9'-0"	1/4	120	1	GREENHECK	SQ-100-VG	4
EF-510	MBR BUILDING	INFLUENT DRY WELL	ROOF MOUNT	DIRECT	675	0.3	1670	9	13"X13"	-	1/10	120	1	GREENHECK	G-090-VG	7
EF-700	DEWATERING BUILDING	DUMPSTER AREA & MECHANICAL	IN-LINE	DIRECT	2700	0.6	1147	-	-	8'-0"	3/4	208	1	GREENHECK	SQ-160-VG	4
EF-701	DEWATERING BUILDING	MECHANICAL OPERATIONS ROOM	IN-LINE	DIRECT	2600	0.3	1019	-	-	8'-0"	3/4	208	1	GREENHECK	SQ-160-VG	4
EF-702	DEWATERING BUILDING	LOCKER ROOMS	ROOF MOUNT	DIRECT	445	0.6	1550	-	12.5"X12.5"	-	1/8	120	1	GREENHECK	G-095-VG	7
EF-950	GARAGE	GARAGE	WALL MOUNT	DIRECT	1800	0.3	1107	-	27.38"X27.38"	8'-0"	1/2	120	1	GREENHECK	AER-20-03-0615-VG	8

1. PROVIDE WITH ALUMINUM/SPARK RESISTANT CONSTRUCTION, EXPLOSION PROOF MOTOR, EXPLOSION PROOF DISCONNECT SWITCH (NEMA-7), ALUMINUM MOTOR COVER, MOUNTING RAIL/VIBRATION ISOLATORS, EPOXY COATING, AND SPARE BELT. EQUIPMENT AND ACCESSORIES TO BE RATED FOR USE IN A CLASS 1, DIV 1 SPACE.
2. PROVIDE WITH ALUMINUM CONSTRUCTION, SPEED CONTROLLER (VG MOTOR), UNIT MOUNTED DISCONNECT SWITCH, INLET GUARD, AND VIBRATION ISOLATORS.
3. CONTROL BY LINE VOLTAGE REVERSE-ACTING (COOLING) THERMOSTAT. UPON A RISE IN TEMPERATURE ABOVE 85°F (ADJUSTABLE), FAN SHALL ENABLE.
4. PROVIDE WITH ALUMINUM CONSTRUCTION, SPEED CONTROLLER (VG MOTOR), UNIT MOUNTED DISCONNECT SWITCH (NEMA-4X), INLET GUARD, VIBRATION ISOLATORS, AND EPOXY COATING.
5. PROVIDE WITH ALUMINUM CONSTRUCTION, SPEED CONTROLLER (VG MOTOR), UNIT MOUNTED DISCONNECT SWITCH (NEMA-4X), VIBRATION ISOLATORS, AND EPOXY COATING.
6. PROVIDE WITH ALUMINUM CONSTRUCTION, SPEED CONTROLLER (VG MOTOR), UNIT MOUNTED DISCONNECT SWITCH (NEMA-4X), WALL BRACKET, AND 120V AAD (NEMA 4X ACTUATOR/ENCLOSURE).
7. PROVIDE WITH ALUMINUM CONSTRUCTION, SPEED CONTROLLER (VG MOTOR), UNIT MOUNTED DISCONNECT SWITCH (NEMA-4X), 12" HIGH ROOF CURB, AND 120V ADD (NEMA 4X ACTUATOR/ENCLOSURE).
8. PROVIDE WITH ALUMINUM CONSTRUCTION, SPEED CONTROLLER (VG MOTOR), UNIT MOUNTED DISCONNECT SWITCH (NEMA-4X), WALL HOUSING/SLEEVE, OSHA APPROVED MOTOR/FAN GUARD, 120V AAD (NEMA 4X ACTUATOR/ENCLOSURE), AND 45° WEATHERHOOD.
9. PROVIDE WITH SPEED CONTROLLER, DISCONNECT SWITCH, AND VIBRATION ISOLATORS.
10. PROVIDE WITH ALUMINUM CONSTRUCTION, SPEED CONTROLLER (VG MOTOR), UNIT MOUNTED DISCONNECT SWITCH (NEMA-4X), INLET GUARD, VIBRATION ISOLATORS, GRAVITY BACKDRAFT DAMPER, AND EPOXY COATING.

SUPPLY FAN SCHEDULE

UNIT TAG	LOCATION	SERVICE	ARRANGEMENT	DRIVE	CFM	SP (IN WG)	FAN RPM	MAX SONES	WALL OPENING SIZE	BOTTOM OF FAN HEIGHT AFF (APPROX)	ELECTRICAL			BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
											HP (W)	VOLTS	PHASE			
SF-200	HEADWORKS BUILDING	BAR SCREEN ROOM	IN-LINE	BELT	2525	0.5	1270	-	-	7'-10"	1/2	120	1	GREENHECK	QEI-15	1
SF-400	ATAD BUILDING	THICKENING ROOM	IN-LINE	DIRECT	875	0.3	1270	-	-	9'-4"	1/4	120	1	GREENHECK	SQ-100-VG	2
SF-500	MBR BUILDING	RAS PUMP ROOM	WALL	DIRECT	3700	0.3	1655	-	27.38"X27.38"	16'-4"	3/4	120	1	GREENHECK	AER-20-03-0320-VG	3
SF-700	DEWATERING BUILDING	DUMPSTER AREA & MECHANICAL	WALL	DIRECT	2700	0.3	1710	-	27.33"X27.33"	9'-0"	1/2	120	1	GREENHECK	AER-20-03-0315-VG	3
SF-701	DEWATERING BUILDING	MECHANICAL OPERATIONS ROOM	WALL	DIRECT	2600	0.3	1674	-	27.33"X27.33"	4'-0"	1/2	120	1	GREENHECK	AER-20-03-0315-VG	3

1. PROVIDE WITH ALUMINUM/SPARK RESISTANT CONSTRUCTION, EXPLOSION PROOF INSULATED MOTOR, EXPLOSION PROOF DISCONNECT SWITCH (NEMA-7), ALUMINUM MOTOR COVER, MOUNTING RAIL/VIBRATION ISOLATORS, DRAIN WITH PLUG, AND EPOXY COATING. EQUIPMENT AND ACCESSORIES TO BE RATED FOR USE IN A CLASS 1, DIV 1 SPACE.
2. PROVIDE WITH ALUMINUM CONSTRUCTION, DISCONNECT SWITCH (NEMA-4X), SPEED CONTROLLER (VG MOTOR), INSULATED HOUSING, MOTOR COVER, EPOXY COATING, AND VIBRATION ISOLATORS.
3. PROVIDE WITH ALUMINUM CONSTRUCTION, OSHA APPROVED MOTOR GUARD/HOUSING, DISCONNECT SWITCH (NEMA-4X), SPEED CONTROLLER (VG MOTOR), 120V AAD (NEMA 4X ACTUATOR/ENCLOSURE), ALUMINUM 90° WEATHERHOOD KIT WITH BIRD SCREEN, AND EPOXY COATING.

LOUVER SCHEDULE

UNIT TAG	LOCATION	SERVICE	WIDTH	HEIGHT	BOTTOM OF LOUVER HEIGHT AFF (APPROX)	CFM	FREE AREA (SQ FT)	FACE VELOCITY (FPM)	BIRD SCREEN	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL NUMBER	REMARKS
LV-200	HEADWORKS BUILDING	INTAKE	40	32	7'-4"	2525	4.52	559	YES	GREENHECK	ESD-435	2
LV-201	HEADWORKS BUILDING	EXHAUST	40	32	8'-0"	2525	4.52	559	YES	GREENHECK	ESD-435	2
LV-202	HEADWORKS BUILDING	INTAKE	24	16	8'-0"	500	0.99	504	YES	GREENHECK	ESD-435	1 2
LV-203	HEADWORKS BUILDING	EXHAUST	24	16	9'-4"	500	0.99	504	YES	GREENHECK	ESD-435	1 2
LV-400	ATAD BUILDING	EXHAUST	36	40	8'-0"	3000	5.28	568	YES	GREENHECK	ESD-435	1 2
LV-401	ATAD BUILDING	INTAKE	24	24	9'-4"	875	1.75	502	YES	GREENHECK	ESD-435	1 2
LV-402	ATAD BUILDING	EXHAUST	24	24	9'-4"	875	1.75	502	YES	GREENHECK	ESD-435	1 2
LV-500	MBR BUILDING	INTAKE	18	18	8'-6"	510	0.84	608	YES	GREENHECK	ESD-435	2
LV-501	MBR BUILDING	EXHAUST	18	18	8'-6"	510	0.84	608	YES	GREENHECK	ESD-435	2
LV-502	MBR BUILDING	INTAKE	42	48	12'-0"	5000	7.74	646	YES	GREENHECK	ESD-435	1 2
LV-503	MBR BUILDING	INTAKE	42	48	12'-0"	5000	7.74	646	YES	GREENHECK	ESD-435	1 2
LV-504	MBR BUILDING	INTAKE	18	18	2'-0"	500	0.84	596	YES	GREENHECK	ESD-435	1 2
LV-505	MBR BUILDING	EXHAUST	18	18	8'-0"	500	0.84	596	YES	GREENHECK	ESD-435	1 2
LV-506	MBR BUILDING	INTAKE	42	48	2'-0"	5000	7.74	646	YES	GREENHECK	ESD-435	1 2
LV-507	MBR BUILDING	INTAKE	42	48	2'-0"	5000	7.74	646	YES	GREENHECK	ESD-435	1 2
LV-508	MBR BUILDING	INTAKE	24	24	5'-4"	1100	1.81	609	YES	GREENHECK	ESD-435	1 2
LV-509	MBR BUILDING	EXHAUST	24	24	8'-8"	1100	1.81	609	YES	GREENHECK	ESD-435	1 2
LV-700	DEWATERING BUILDING	EXHAUST	45	32	6'-4 1/2"	2700	5.10	498	YES	GREENHECK	ESD-435	1 2
LV-701	DEWATERING BUILDING	EXHAUST	45	32	3'-4 1/2"	2600	5.10	480	YES	GREENHECK	ESD-435	1 2
LV-950	GARAGE	INTAKE	32	32	3'-0"	1800	3.55	507	YES	GREENHECK	ESD-435	1 2

1. WITH FACTORY PROVIDED 120V AAD (NEMA 4X ACTUATOR/ENCLOSURE).
2. PROVIDE WITH 1-1/2" EXTERIOR PERIMETER FLANGE AND MOUNTING CLIPS.

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK · RYAN J. KEEFER · LICENSED PROFESSIONAL ENGINEER · 093390

HAZARDOUS MATERIAL NOTE:

THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE CALL 811

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

MECHANICAL SCHEDULES

REVISIONS

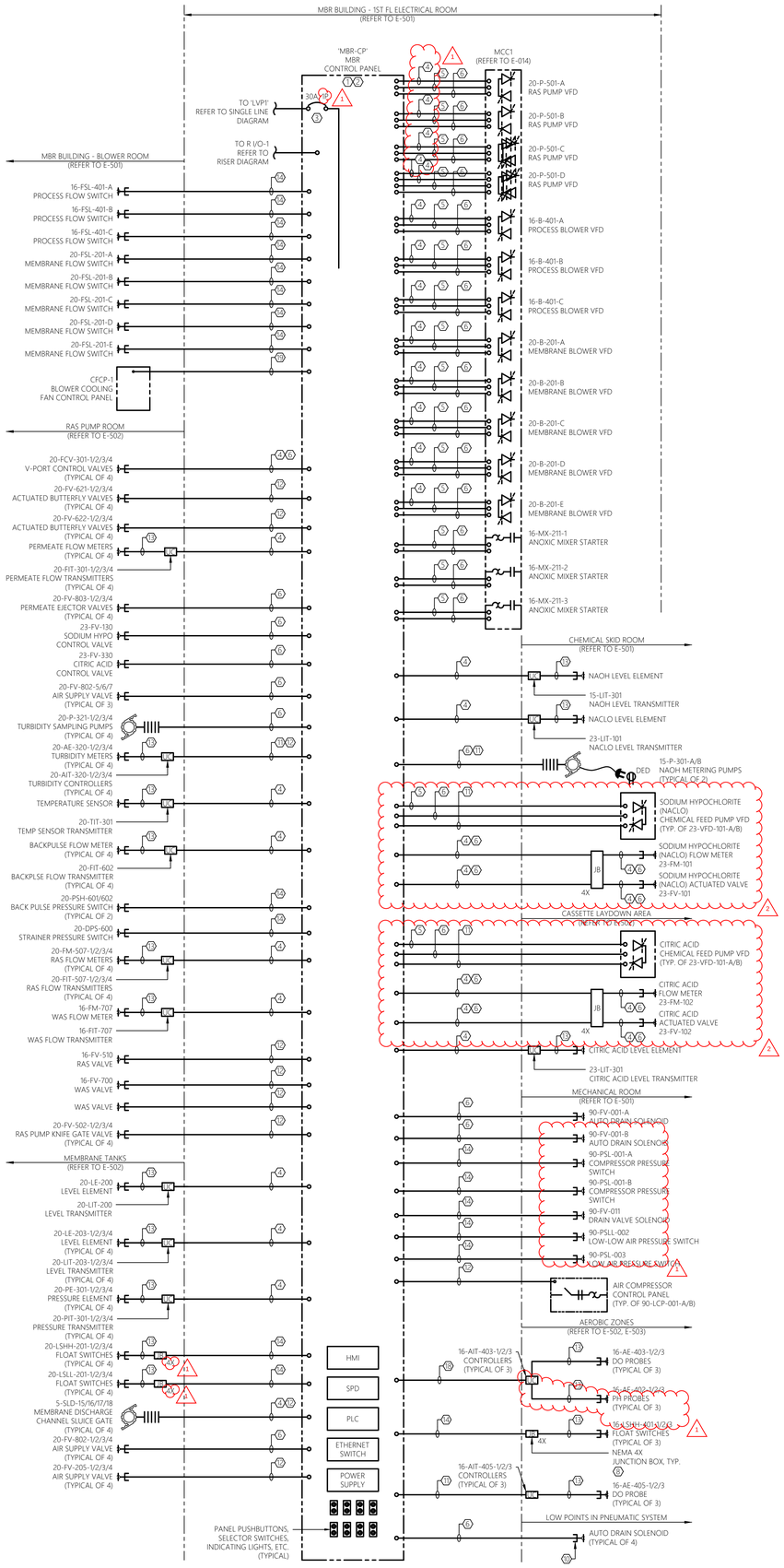
NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	RJK
REVIEWED BY:	RJK

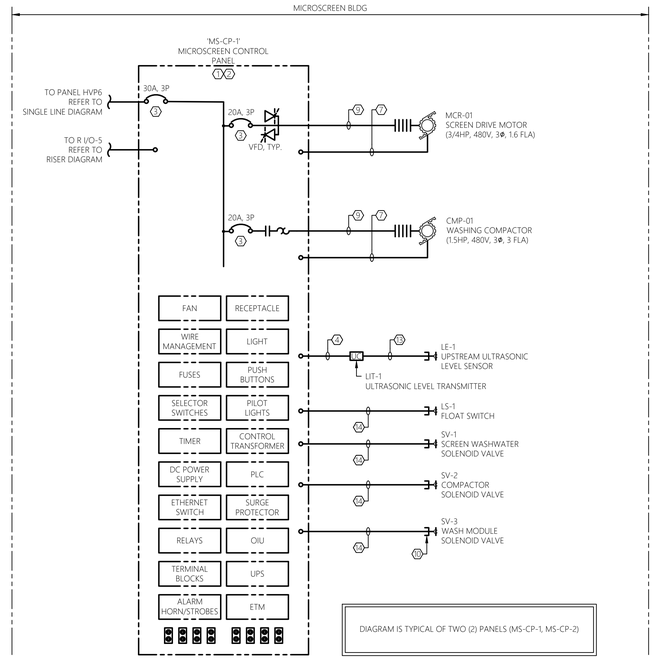
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M-040

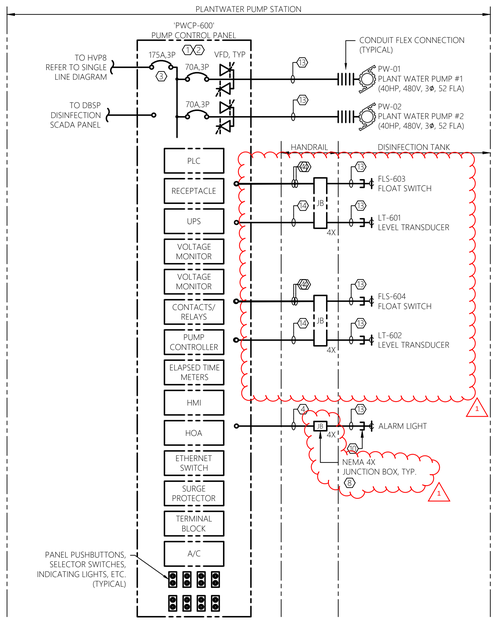
PROJECT # 18-732 PHASE #



1 E-020 SCALE: NTS — MBR CONTROL PANEL RISER DIAGRAM



2 E-020 SCALE: NTS — MICROSCREEN CONTROL PANEL RISER DIAGRAM — MICROSCREEN BUILDING



3 E-020 SCALE: NTS — PLANT WATER SYSTEM CONTROL PANEL — PLANTWATER PUMP STATION

GENERAL SHEET NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE GROUNDING PER NEC FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT.
3. ALL CONDUCTORS NOT SHOWN FOR CLARITY. COORDINATE WITH ALL PRIME CONTRACTORS AND PROVIDE COMPLETE ELECTRICAL CIRCUITING FOR ALL INSTALLED EQUIPMENT. ALL REQUIREMENTS TO BE PER NEC.
4. REFER TO FLOOR PLANS FOR GENERAL DEVICE/EQUIPMENT LOCATIONS. COORDINATE FINAL LOCATIONS WITH PROCESS MECHANICAL DRAWINGS. REFER TO SITE PLAN FOR DUCT BANK INFORMATION.
5. REFER TO SINGLE LINE DIAGRAMS, SPECIFICATIONS, AND SUBMITTAL DOCUMENTATION FOR ADDITIONAL INFORMATION/REQUIREMENTS.
6. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH OWNER ALL OTHER TRADE CONTRACTORS.
7. CIRCUITS SHOWN ARE POWER, CONTROL, INSTRUMENTATION, AND CONTROL CIRCUIT POWER. REFER TO SINGLE LINE DIAGRAMS, SCHEDULES, AND DETAILS FOR ADDITIONAL CIRCUITS.
8. ALL WIRING REQUIREMENTS INCLUDING BUT NOT LIMITED TO WIRE SIZE, TYPE, AND QUANTITY OF CONDUCTORS TO BE VERIFIED WITH EQUIPMENT MANUFACTURER.
9. QUANTITY OF CONDUCTORS CALLED FOR MAY INCLUDE SPARE CONDUCTORS. PROVIDE CONDUCTORS SHOWN OR MINIMUM NUMBER REQUIRED PER MANUFACTURERS WRITTEN INSTRUCTIONS. ALL REQUIREMENTS TO BE PER NEC.
10. CONTRACTOR TO PROVIDE ARC FLASH WARNING LABELS FOR ALL NEW OR MODIFIED ELECTRICAL EQUIPMENT. REFER TO SPECIFICATIONS FOR REQUIREMENTS.
11. REFER TO ELECTRICAL DETAIL SHEETS AND SCHEDULE SHEETS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
12. CONTRACTOR TO COORDINATE MOUNTING LOCATIONS OF ALL PANELS WITH OWNER AND ALL OTHER TRADE CONTRACTORS. PROVIDE ALL NECESSARY MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC..
13. PROVIDE INTRINSICALLY SAFE BARRIERS AS REQUIRED INTERNAL TO CONTROL PANELS. ALL REQUIREMENTS TO BE PER NEC.
14. NOT ALL REQUIRED CLASSIFIED SPACE WIRING METHODS INCLUDING, BUT NOT LIMITED TO SEAL-OFFS MAY BE SHOWN. PROVIDE WIRING METHODS PER NEC (LATEST EDITION). PROVIDE CONDUIT UNION WITHIN 6" OF EACH SEAL-OFF AT CONTROL PANELS, DISTRIBUTION PANELS, VFDS, STARTERS, DISCONNECTS, OR SOURCE OF SUPPLY WHERE FEASIBLE.
15. NOT ALL REQUIRED THRU-WALL, WATERTIGHT, CONDUIT PENETRATIONS SHOWN FOR CLARITY. CONTRACTOR TO PROVIDE A THRU-WALL, WATERTIGHT, CONDUIT PENETRATION FOR ALL CONDUIT PENETRATIONS WITHIN BUILDING INTERIOR/EXTERIOR WALLS AND FLOORS. REFER TO ELECTRICAL DETAILS FOR ADDITIONAL INFORMATION. COORDINATE WITH OWNER AND ALL OTHER TRADE CONTRACTORS PRIOR TO ROUGH-IN
16. CONTRACTOR TO COORDINATE ALL CONDUIT PENETRATIONS AND CONDUIT ROUTING WITH ALL OTHER TRADE CONTRACTORS AND OWNER PRIOR TO ROUGH-IN.
17. ALL CONDUCTORS TO BE COPPER AND CONTAIN THWN OR XHHW INSULATION.
18. ALL CONTROL/COMMUNICATION WIRING REQUIREMENTS INCLUDING BUT NOT LIMITED TO WIRE SIZE, TYPE, AND QUANTITY OF CONDUCTORS TO BE VERIFIED WITH EQUIPMENT MANUFACTURER.
19. ALL PROPOSED EQUIPMENT LOCATIONS/INSTALLATIONS TO COMPLY WITH NEC ARTICLE 110.26 'SPACES ABOUT ELECTRICAL EQUIPMENT'.

SHEET KEY NOTES:

1. NOT ALL INTERNAL COMPONENTS SHOWN FOR CLARITY. DIAGRAM IS INTENDED TO SHOW ALL REQUIRED FIELD CIRCUITING REQUIRED UNDER THIS CONTRACT. REFERENCE SUBMITTAL DOCUMENTATION FOR ALL PANEL INTERNAL COMPONENTS. CONTRACTOR TO PROVIDE ADDITIONAL INTERNAL CONTACTS AND JUMPERS PER CONTROL PANEL MANUFACTURERS RECOMMENDATIONS FOR AN OVERALL COMPLETE AND OPERABLE SYSTEM.
2. CONTROL PANEL AND ALL INTERNAL COMPONENTS ARE BY THIS CONTRACT. THIS CONTRACT IS RESPONSIBLE FOR ALL FIELD WIRING BETWEEN DEVICES, TERMINATIONS, AND MOUNTING/INSTALLATION OF PANEL AS SHOWN/INDICATED. REFER TO SUBMITTAL DOCUMENTATION AND COORDINATE WITH ALL OTHER TRADE CONTRACTORS TO PROVIDE COMPLETE SYSTEM FIELD CIRCUITRY AND TERMINATIONS AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
3. DISCONNECT SIZE SHOWN FOR BIDDING PURPOSES ONLY. COORDINATE DISCONNECT SIZE WITH EQUIPMENT MANUFACTURERS RECOMMENDATIONS. COORDINATE CONDUCTOR/CONDUIT SIZE WITH MANUFACTURERS RECOMMENDED DISCONNECT SIZE. ALL REQUIREMENTS TO BE PER NEC.
4. (2)#18STP, 3/4"C.
5. (1) CAT 6A PREMIUM ETHERNET CABLE, 1"C. PROVIDE AS PLENUM RATED WITH 4 BONDED PAIRS. TO BE BELDEN #3633 OR APPROVED EQUAL.
6. (12)#14, 1"C.
7. (4)#14, 3/4"C. CIRCUIT TO BE UTILIZED FOR THE ASSOCIATED MOTOR THERMAL SAFETY SWITCH. CIRCUIT TO CONTROL TERMINALS OF PROPOSED VFD. IN THE EVENT OF A MOTOR HIGH TEMPERATURE, THE UNIT IS TO BE SHUT DOWN TO PREVENT DAMAGE. NOTE: TWO CONDUCTORS TO BE UTILIZED AS SPARES.
8. CONTRACTOR TO PROVIDE JUNCTION/PULL BOXES AS REQUIRED. COORDINATE FINAL LOCATIONS WITH OTHER TRADE CONTRACTORS (NOTE, JUNCTION BOXES ARE NOT ALWAYS SHOWN ON FLOOR PLANS. CONTRACTOR TO FIELD LOCATE AS NECESSARY). JUNCTION BOXES ARE TO BE RATED FOR ENVIRONMENT INSTALLED, INCLUDING BUT NOT LIMITED TO HAZARDOUS ENVIRONMENTS, CORROSIVE AREAS AND OUTDOORS INSTALLATIONS. CONTRACTOR TO SIZE JUNCTION BOXES PER NEC ARTICLE 314, TYPICAL OF ALL JUNCTION BOXES SHOWN ON THIS DRAWING.
9. (3)#12, 1"C. PROVIDE AS VFD SHIELDED CABLE. CONDUIT SIZE IS LISTED AS MINIMUM. PROVIDE LARGER DIAMETER AS REQUIRED PER MANUFACTURER. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION. ALL REQUIREMENTS TO BE PER NEC.
10. PROVIDE CONDUIT BUSHING, FITTING, OR FLEX CONNECTION AS REQUIRED FOR PROPER CONNECTION OF DEVICE. ALL BUSHINGS, FITTINGS, OR FLEX CONNECTIONS TO BE SUITED FOR ENVIRONMENT INSTALLED WITHIN. COORDINATE WITH EQUIPMENT MANUFACTURER. FLEX CONNECTION LENGTHS TO BE MINIMIZED TO GREATEST EXTENT POSSIBLE. TYPICAL
11. (4)#18STP, 3/4"C.
12. (20)#14, 1"C.
13. FACTORY CABLE BY THIS CONTRACT. THIS CONTRACT RESPONSIBLE FOR ALL TERMINATIONS PER MANUFACTURERS RECOMMENDATIONS. PROVIDE 3/4" CONDUIT WHERE EXPOSED TO PHYSICAL DAMAGE AND RECOMMENDED BY THE EQUIPMENT MANUFACTURER. CONDUIT SIZE IS LISTED AS MINIMUM. PROVIDE LARGER AS REQUIRED PER MANUFACTURER. COORDINATE FINAL INSTALLATION REQUIREMENTS WITH ALL OTHER TRADE CONTRACTORS.
14. (4)#14, 3/4"C.

CONTROL DIAGRAMS ARE SCHEMATIC IN NATURE AND SHOWS ALL INTERCONNECTIONS. CONTRACTOR MAY GROUP POWER CIRCUITS INTO LARGER CONDUIT AND GROUP CONTROL CIRCUITS INTO SEPARATE LARGER CONDUIT. GROUPING OF CIRCUITS INTO LARGER CONDUITS MUST COMPLY WITH NEC FILL AND DERATING REQUIREMENTS. VFD INPUT & OUTPUT CONDUCTORS MUST BE RUN INDEPENDENT OF OTHER CONDUCTORS.

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK
JEFFREY E. ROBINSON
098896
LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:

THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE
CALL 811

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CAESARS LANE WWTP
EXPANSION PROJECT:
PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL
RISER DIAGRAMS

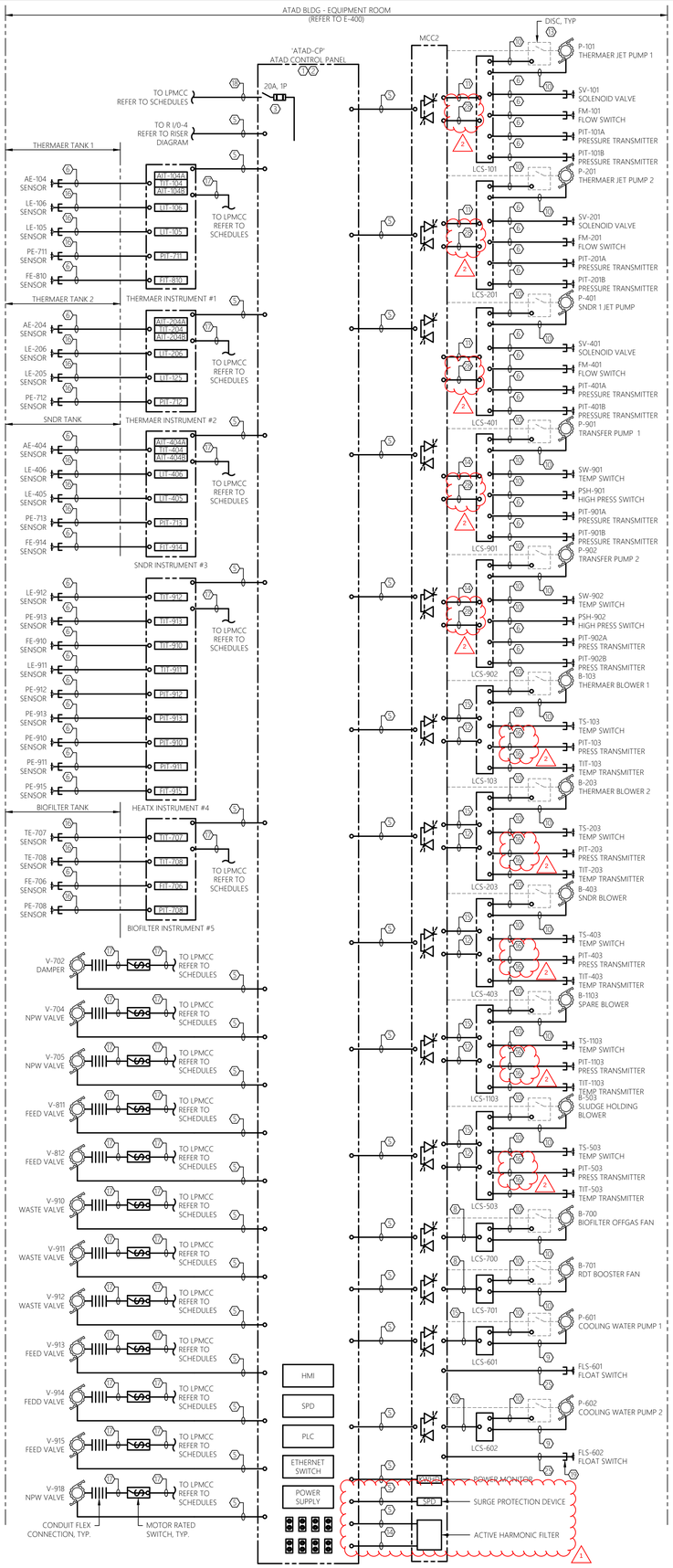
REVISIONS

NO.	DESCRIPTION	DATE
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1	BID ADDENDUM	06/27/2025

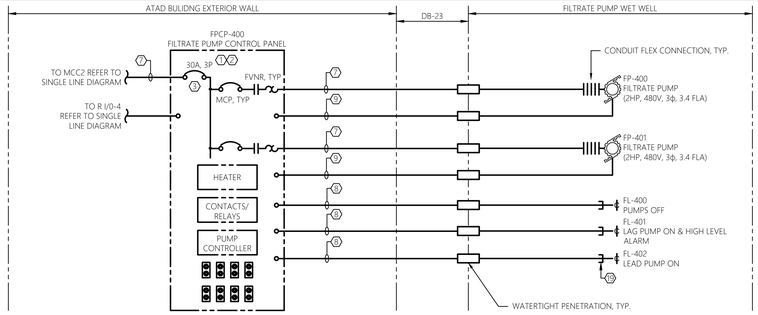
ISSUED DATE:	10 JULY, 2025
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REVIEWED BY:	JER

SHEET NO.
E-020

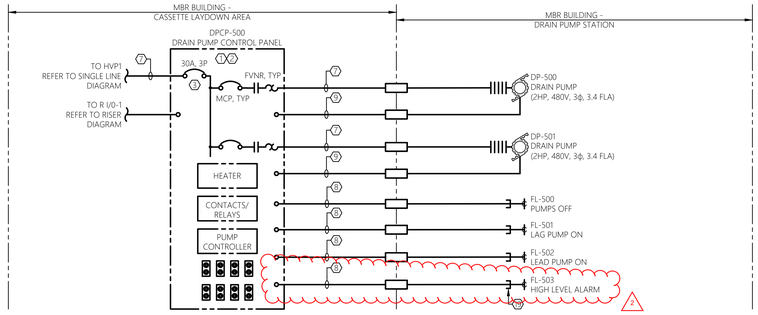
PROJECT # 18-732 PHASE #



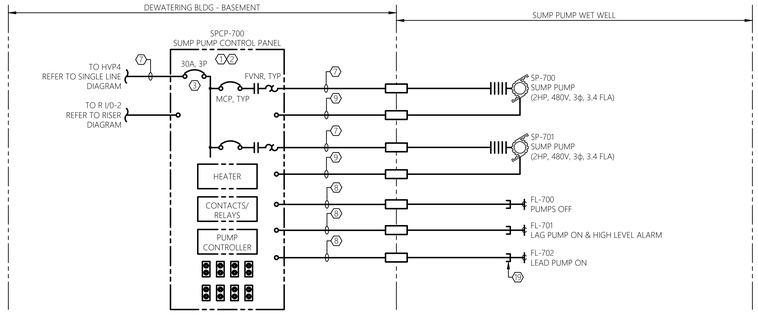
1 E-022 SCALE: NTS — ATAD CONTROL PANEL RISER DIAGRAM — ATAD EQUIPMENT ROOM



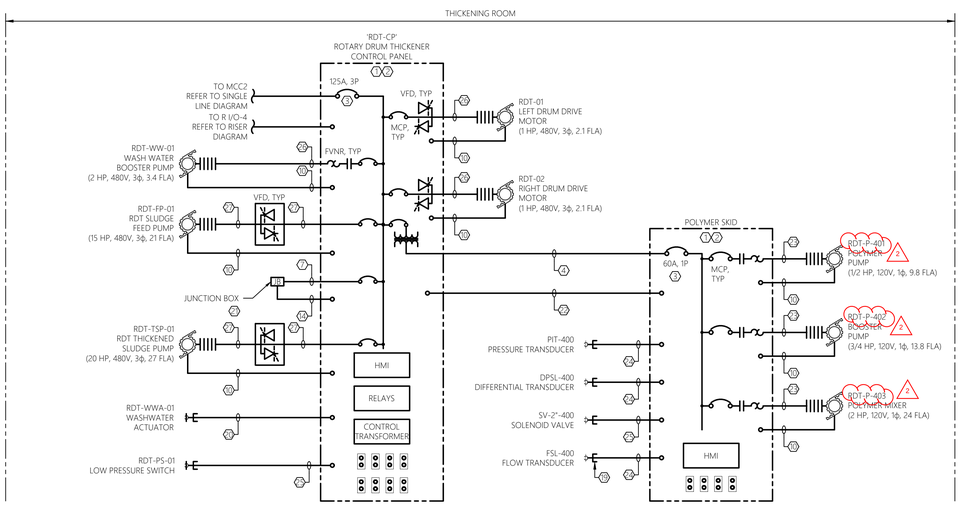
2 E-022 SCALE: NTS — FILTRATE PUMP CONTROL PANEL RISER DIAGRAM — ATAD BULIDING



3 E-022 SCALE: NTS — DRAIN PUMP CONTROL PANEL RISER DIAGRAM — MBR BUILDING



4 E-022 SCALE: NTS — SUMP PUMP CONTROL PANEL RISER DIAGRAM — DEWATERING BUILDING



5 E-022 SCALE: NTS — RDT CONTROL PANEL RISER DIAGRAM — RDT ROOM

GENERAL SHEET NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE GROUNDING PER NEC FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT.
3. ALL CONDUCTORS NOT SHOWN FOR CLARITY. COORDINATE WITH ALL PRIME CONTRACTORS AND PROVIDE COMPLETE ELECTRICAL CIRCUITING FOR ALL INSTALLED EQUIPMENT. ALL REQUIREMENTS TO BE PER NEC.
4. REFER TO FLOOR PLANS FOR GENERAL DEVICE/EQUIPMENT LOCATIONS. COORDINATE FINAL LOCATIONS WITH PROCESS MECHANICAL DRAWINGS. REFER TO SITE PLAN FOR DUCT BANK INFORMATION.
5. REFER TO SINGLE LINE DIAGRAMS, SPECIFICATIONS, AND SUBMITTAL DOCUMENTATION FOR ADDITIONAL INFORMATION/REQUIREMENTS.
6. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH OWNER ALL OTHER TRADE CONTRACTORS.
7. CIRCUITS SHOWN ARE POWER, CONTROL, INSTRUMENTATION, AND CONTROL CIRCUIT POWER. REFER TO SINGLE LINE DIAGRAMS, SCHEDULES, AND DETAILS FOR ADDITIONAL CIRCUITS.
8. ALL WIRING REQUIREMENTS INCLUDING BUT NOT LIMITED TO WIRE SIZE, TYPE, AND QUANTITY OF CONDUCTORS TO BE VERIFIED WITH EQUIPMENT MANUFACTURER.
9. QUANTITY OF CONDUCTORS CALLED FOR MAY INCLUDE SPARE CONDUCTORS. PROVIDE CONDUCTORS SHOWN OR MINIMUM NUMBER REQUIRED PER MANUFACTURERS WRITTEN INSTRUCTIONS. ALL REQUIREMENTS TO BE PER NEC.
10. CONTRACTOR TO PROVIDE ARC FLASH WARNING LABELS FOR ALL NEW OR MODIFIED ELECTRICAL EQUIPMENT. REFER TO SPECIFICATIONS FOR REQUIREMENTS.
11. REFER TO ELECTRICAL DETAIL SHEETS AND SCHEDULE SHEETS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
12. CONTRACTOR TO COORDINATE MOUNTING LOCATIONS OF ALL PANELS WITH OWNER AND ALL OTHER TRADE CONTRACTORS. PROVIDE ALL NECESSARY MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC..
13. PROVIDE INTRINSICALLY SAFE BARRIERS AS REQUIRED INTERNAL TO CONTROL PANELS. ALL REQUIREMENTS TO BE PER NEC.
14. NOT ALL REQUIRED CLASSIFIED SPACE WIRING METHODS INCLUDING, BUT NOT LIMITED TO SEAL-OFFS MAY BE SHOWN. PROVIDE WIRING METHODS PER NEC (LATEST EDITION). PROVIDE CONDUIT UNION WITHIN 6" OF EACH SEAL-OFF AT CONTROL PANELS, DISTRIBUTION PANELS, VFDS, STARTERS, DISCONNECTS, OR SOURCE OF SUPPLY WHERE FEASIBLE.
15. NOT ALL REQUIRED THRU-WALL, WATERTIGHT, CONDUIT PENETRATIONS SHOWN FOR CLARITY. CONTRACTOR TO PROVIDE A THRU-WALL, WATERTIGHT, CONDUIT PENETRATION FOR ALL CONDUIT PENETRATIONS WITHIN BUILDING INTERIOR/EXTERIOR WALLS AND FLOORS. REFER TO ELECTRICAL DETAILS FOR ADDITIONAL INFORMATION. COORDINATE WITH OWNER AND ALL OTHER TRADE CONTRACTORS PRIOR TO ROUGH-IN
16. CONTRACTOR TO COORDINATE ALL CONDUIT PENETRATIONS AND CONDUIT ROUTING WITH ALL OTHER TRADE CONTRACTORS AND OWNER PRIOR TO ROUGH-IN.
17. ALL CONDUCTORS TO BE COPPER AND CONTAIN THWN OR XHHW INSULATION.
18. ALL CONTROL/COMMUNICATION WIRING REQUIREMENTS INCLUDING BUT NOT LIMITED TO WIRE SIZE, TYPE, AND QUANTITY OF CONDUCTORS TO BE VERIFIED WITH EQUIPMENT MANUFACTURER.
19. ALL PROPOSED EQUIPMENT LOCATIONS/INSTALLATIONS TO COMPLY WITH NEC ARTICLE 110.26 'SPACES ABOUT ELECTRICAL EQUIPMENT'.

SHEET KEY NOTES:

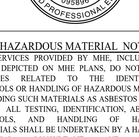
1. NOT ALL INTERNAL COMPONENTS SHOWN FOR CLARITY. DIAGRAM IS INTENDED TO SHOW ALL REQUIRED FIELD CIRCUITING REQUIRED UNDER THIS CONTRACT. REFERENCE SUBMITTAL DOCUMENTATION FOR ALL PANEL INTERNAL COMPONENTS. CONTRACTOR TO PROVIDE ADDITIONAL INTERNAL CONTACTS AND JUMPERS PER CONTROL PANEL MANUFACTURERS RECOMMENDATIONS FOR AN OVERALL COMPLETE AND OPERABLE SYSTEM.
2. CONTROL PANEL AND ALL INTERNAL COMPONENTS ARE BY THIS CONTRACT. THIS CONTRACT IS RESPONSIBLE FOR ALL FIELD WIRING BETWEEN DEVICES, TERMINATIONS, AND MOUNTING/INSTALLATION OF PANEL AS SHOWN/INDICATED. REFER TO SUBMITTAL DOCUMENTATION AND COORDINATE WITH ALL OTHER TRADE CONTRACTORS TO PROVIDE COMPLETE SYSTEM FIELD CIRCUITRY AND TERMINATIONS AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
3. DISCONNECT SIZE SHOWN FOR BIDDING PURPOSES ONLY. COORDINATE DISCONNECT SIZE WITH EQUIPMENT MANUFACTURERS RECOMMENDATIONS. COORDINATE CONDUCTOR/CONDUIT SIZE WITH MANUFACTURERS RECOMMENDED DISCONNECT SIZE. ALL REQUIREMENTS TO BE PER NEC.
4. (2)#8 & #10G, 1-1/2"C.
5. (1) CAT 6A PREMIUM ETHERNET CABLE, 1"C. PROVIDE AS PLENUM RATED WITH 4 BONDED PAIRS. TO BE BELDEN #3633 OR APPROVED EQUAL.
6. FACTORY CABLE. THIS CONTRACT RESPONSIBLE FOR ALL TERMINATIONS PER MANUFACTURERS RECOMMENDATIONS. PROVIDE 1" CONDUIT WHERE EXPOSED TO PHYSICAL DAMAGE AND RECOMMENDED BY THE EQUIPMENT MANUFACTURER. CONDUIT SIZE IS LISTED AS MINIMUM. PROVIDE LARGER AS REQUIRED PER MANUFACTURER. COORDINATE FINAL INSTALLATION REQUIREMENTS WITH MANUFACTURER.
7. (3)#10 & #10G, 1"C.
8. (4)#14, 3/4"C.
9. (6)#14, 3/4"C. CIRCUIT TO BE UTILIZED FOR THE ASSOCIATED MOTOR THERMAL SAFETY AND SEAL LEAK SWITCH. CIRCUIT TO CONTROL TERMINALS OF PROPOSED VFD. IN THE EVENT OF A MOTOR HIGH TEMPERATURE OR SEAL LEAKAGE, THE UNIT IS TO BE SHUT DOWN TO PREVENT DAMAGE. NOTE, TWO CONDUCTORS TO BE UTILIZED AS SPARES.
10. (4)#14, 3/4"C.
11. (10)#14, 1"C
12. (3)#18STP, 3/4"C
13. REFER TO SINGLE LINE DIAGRAM SHEET E-015 FOR POWER AND DISCONNECT INFORMATION/DETAILS.
14. (12)#14, 1"C
15. (8)#14, 1"C
16. (3)#18STP, 3/4"C
17. (2)#12 & #12G, 3/4"C.
18. (2)#10 & #10G, 1"C.
19. PROVIDE CONDUIT BUSHING, FITTING, OR FLEX CONNECTION AS REQUIRED FOR PROPER CONNECTION OF DEVICE. ALL BUSHINGS, FITTINGS, OR FLEX CONNECTIONS TO BE SUITED FOR ENVIRONMENT INSTALLED WITHIN. COORDINATE WITH OTHER TRADE CONTRACTORS AND EQUIPMENT MANUFACTURER. FLEX CONNECTIONS TO BE MINIMIZED TO THE GREATEST EXTENT POSSIBLE. TYPICAL.
20. (8)#14, 3/4"C.
21. JUNCTION BOX BY EQUIPMENT MANUFACTURER. COORDINATE FINAL LOCATION WITH EQUIPMENT MANUFACTURER. JUNCTION BOX FACTORY WIRED TO RDT SYSTEM CONTROL INSTRUMENTATION/DEVICES. THIS CONTRACT RESPONSIBLE FOR PROVIDING CIRCUITRY (CONDUIT & CONDUCTORS) AND TERMINATIONS AS SHOWN/SPECIFIED AS A MINIMUM. PROVIDE ADDITIONAL CIRCUITRY AS REQUIRED PER MANUFACTURERS RECOMMENDATIONS. REFER TO SUBMITTAL DOCUMENTATION FOR ADDITIONAL INFORMATION AND COORDINATE FINAL REQUIREMENTS WITH EQUIPMENT MANUFACTURER. REFER TO FLOOR PLAN FOR GENERAL LOCATION.
22. (10)#14, (2)#18STP, 1"C
23. (3)#12 & #12G, 3/4"C
24. (2)#18STP, 3/4"C.
25. (4)#14, 3/4"C
26. (3)#10 & #10G, 3/4"C. PROVIDE AS VFD SHIELDED CABLE. CONDUIT SIZE IS LISTED AS MINIMUM, PROVIDE LARGER DIAMETER AS REQUIRED PER MANUFACTURER. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION. ALL REQUIREMENTS TO BE PER NEC.
27. (3)#8 & #10G, 3/4"C. PROVIDE AS VFD SHIELDED CABLE. CONDUIT SIZE IS LISTED AS MINIMUM, PROVIDE LARGER DIAMETER AS REQUIRED PER MANUFACTURER. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION. ALL REQUIREMENTS TO BE PER NEC.
28. (3)#18STT, 3/4"C.

CONTROL DIAGRAMS ARE SCHEMATIC IN NATURE AND SHOWS ALL INTERCONNECTIONS. CONTRACTOR MAY GROUP POWER CIRCUITS INTO LARGER CONDUIT AND GROUP CONTROL CIRCUITS INTO SEPARATE LARGER CONDUIT. GROUPING OF CIRCUITS INTO LARGER CONDUITS MUST COMPLY WITH NEC FILL AND DERATING REQUIREMENTS. VFD INPUT & OUTPUT CONDUCTORS MUST BE RUN INDEPENDENT OF OTHER CONDUCTORS.

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JSE
JADE STONE ENGINEERING



HAZARDOUS MATERIAL NOTE:
THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL RISER DIAGRAMS

REVISIONS

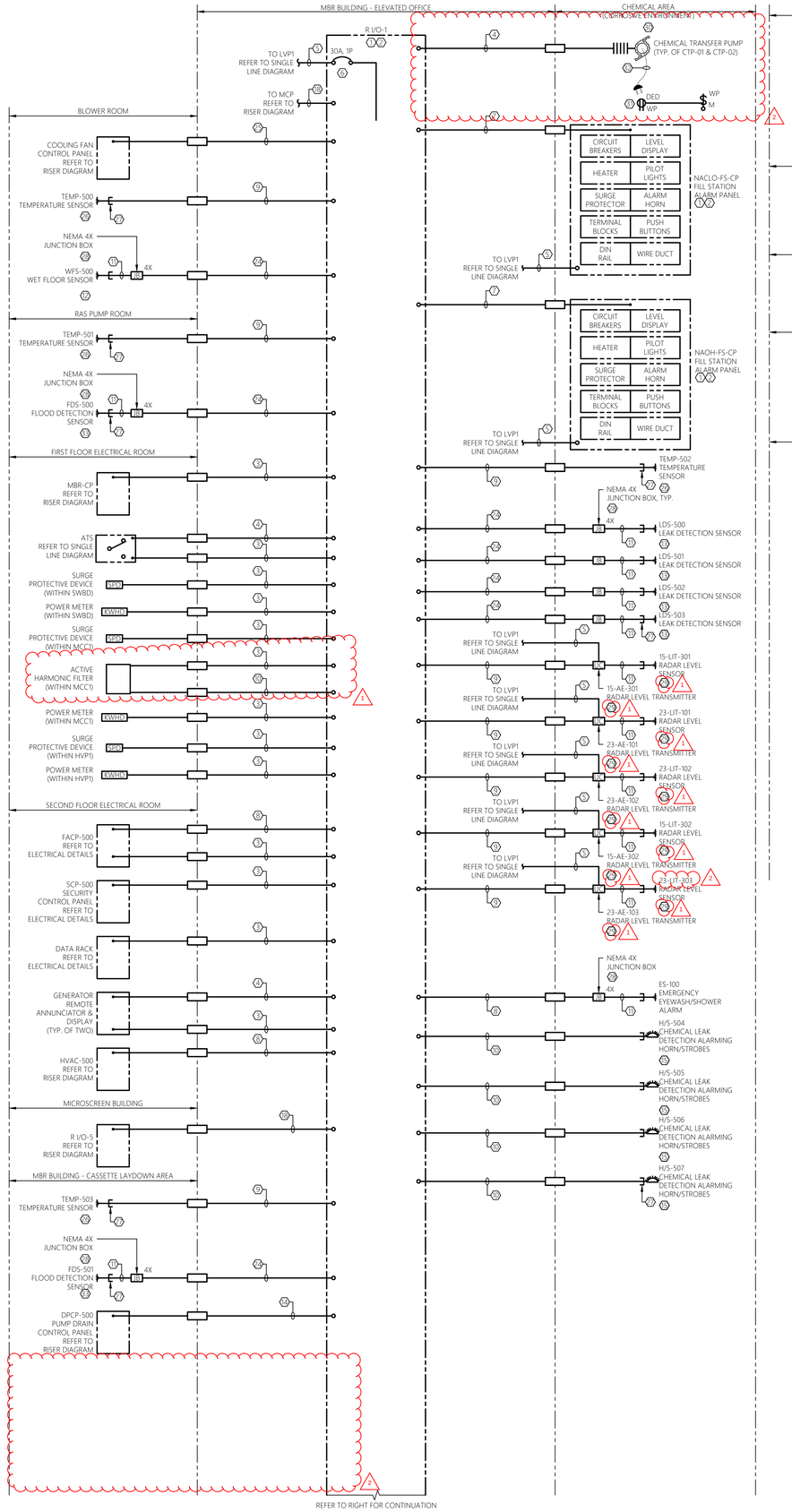
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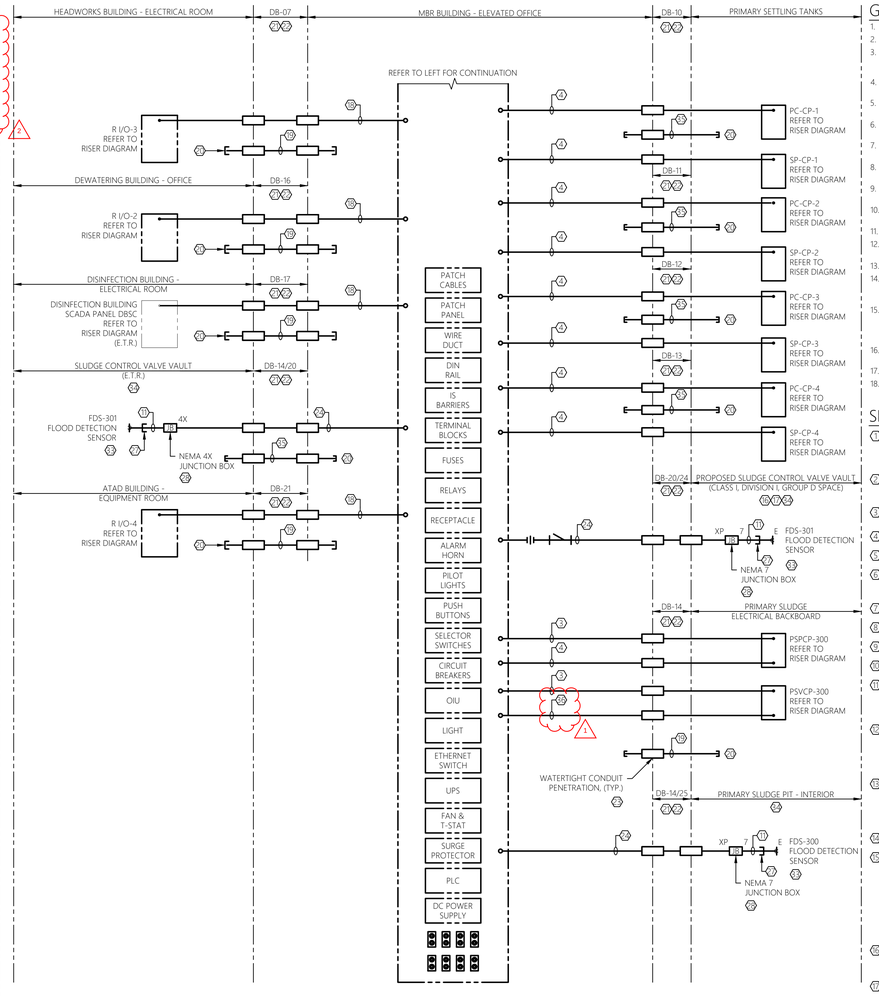
ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.

E-022

PROJECT # 18-732 PHASE #





GENERAL SHEET NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE GROUNDING PER NEC FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT.
3. ALL CONDUCTORS, EQUIPMENT, COMPONENTS, AND DEVICES NOT SHOWN FOR CLARITY. COORDINATE WITH ALL PRIME CONTRACTORS AND PROVIDE COMPLETE ELECTRICAL CIRCUITING FOR ALL INSTALLED EQUIPMENT. ALL REQUIREMENTS TO BE PER NEC.
4. REFER TO ELECTRICAL PLANS FOR GENERAL DEVICE/EQUIPMENT LOCATIONS. COORDINATE FINAL LOCATIONS WITH ALL PRIME CONTRACT DRAWINGS. REFER TO ELECTRICAL SITE PLAN FOR DUCT BANK INFORMATION
5. REFER TO SINGLE LINE DIAGRAMS, SPECIFICATIONS, AND SUBMITTAL DOCUMENTATION FOR ADDITIONAL INFORMATION/REQUIREMENTS.
6. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH OWNER AND ALL OTHER TRADE CONTRACTORS.
7. CIRCUITS SHOWN ARE POWER, CONTROL, INSTRUMENTATION, AND CONTROL CIRCUIT POWER. REFER TO SINGLE LINE DIAGRAMS, SCHEDULES, AND DETAILS FOR ADDITIONAL CIRCUITS.
8. ALL WIRING REQUIREMENTS INCLUDING BUT NOT LIMITED TO WIRE SIZE, TYPE, AND QUANTITY OF CONDUCTORS TO BE VERIFIED WITH EQUIPMENT MANUFACTURER.
9. QUANTITY OF CONDUCTORS CALLED FOR MAY INCLUDE SPARE CONDUCTORS. PROVIDE CONDUCTORS SHOWN OR MINIMUM NUMBER REQUIRED PER MANUFACTURERS WRITTEN INSTRUCTIONS. ALL REQUIREMENTS TO BE PER NEC.
10. CONTRACTOR TO PROVIDE ARC FLASH WARNING LABELS FOR ALL NEW OR MODIFIED ELECTRICAL EQUIPMENT. REFER TO SPECIFICATIONS FOR REQUIREMENTS.
11. REFER TO ELECTRICAL DETAIL SHEETS AND SCHEDULE SHEETS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
12. CONTRACTOR TO COORDINATE MOUNTING LOCATIONS OF ALL PANELS WITH OWNER AND ALL OTHER TRADE CONTRACTORS. PROVIDE ALL NECESSARY MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC..
13. PROVIDE INTRINSICALLY SAFE BARRIERS AS REQUIRED INTERNAL TO CONTROL PANELS. ALL REQUIREMENTS TO BE PER NEC.
14. NOT ALL REQUIRED CLASSIFIED SPACE WIRING METHODS INCLUDING, BUT NOT LIMITED TO SEAL-OFFS MAY BE SHOWN. PROVIDE WIRING METHODS PER NEC (LATEST EDITION). PROVIDE CONDUIT UNION WITHIN 6" OF EACH SEAL-OFF AT CONTROL PANELS, DISTRIBUTION PANELS, VFDS, STARTERS, DISCONNECTS, OR SOURCE OF SUPPLY WHERE FEASIBLE.
15. NOT ALL REQUIRED THRU-WALL, WATERTIGHT, CONDUIT PENETRATIONS SHOWN FOR CLARITY. CONTRACTOR TO PROVIDE A THRU-WALL, WATERTIGHT, CONDUIT PENETRATION FOR ALL CONDUIT PENETRATIONS WITHIN BUILDING INTERIOR/EXTERIOR WALLS AND FLOORS. REFER TO ELECTRICAL DETAILS FOR ADDITIONAL INFORMATION. COORDINATE WITH OWNER AND ALL OTHER TRADE CONTRACTORS PRIOR TO ROUGH-IN
16. CONTRACTOR TO COORDINATE ALL CONDUIT PENETRATIONS AND CONDUIT ROUTING WITH ALL OTHER TRADE CONTRACTORS AND OWNER PRIOR TO ROUGH-IN.
17. ALL CONDUCTORS TO BE COPPER AND CONTAIN XHHW-2 INSULATION.
18. ALL PROPOSED EQUIPMENT LOCATIONS/INSTALLATIONS TO COMPLY WITH NEC ARTICLE 110.26 'SPACES ABOUT ELECTRICAL EQUIPMENT'.

SHEET KEY NOTES:

1. CONTROL PANEL AND ALL INTERNAL COMPONENTS TO BE FURNISHED BY CONTRACTOR THRU BID ALLOWANCE. THIS CONTRACT IS RESPONSIBLE FOR ALL FIELD WIRING BETWEEN DEVICES, AND MOUNTING/INSTALLATION/WIRING OF PANEL AS SHOWN/INDICATED. REFER TO SUBMITTAL DOCUMENTATION AND COORDINATE WITH OWNER AND ENGINEER TO PROVIDE COMPLETE SYSTEM FIELD CIRCUITRY AND TERMINATIONS AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
2. NOT ALL INTERNAL COMPONENTS SHOWN FOR CLARITY. DIAGRAM IS INTENDED TO SHOW ALL REQUIRED FIELD CIRCUITING REQUIRED UNDER THIS CONTRACT. REFERENCE SUBMITTAL DOCUMENTATION AND SPECIFICATION SECTION 260912 CONTROL PANELS AND INTEGRATION FOR ALL PANEL INTERNAL COMPONENTS.
3. (1) CAT 6A PREMIUM ETHERNET CABLE, 1"C. PROVIDE AS PLENUM RATED WITH 4 BONDED PAIRS. TO BE BELDEN #3633 OR APPROVED EQUAL.
4. (12)#14 & (2)#18STP, 1"C.
5. (2)#10 & #10G, 1"C.
6. DISCONNECT SIZE SHOWN FOR BIDDING PURPOSES ONLY. COORDINATE DISCONNECT SIZE WITH EQUIPMENT MANUFACTURERS RECOMMENDATIONS. COORDINATE CONDUCTOR/CONDUIT SIZE WITH MANUFACTURERS RECOMMENDED DISCONNECT SIZE. ALL REQUIREMENTS TO BE PER NEC.
7. (24)#14 & (4)#18STP, 1-1/2"C.
8. (4)#14, 1"C
9. (2)#18STP, 1"C
10. (12)#14, 1"C
11. FACTORY CABLE. THIS CONTRACT RESPONSIBLE FOR ALL TERMINATIONS PER MANUFACTURERS RECOMMENDATIONS. PROVIDE 1" CONDUIT WHERE EXPOSED TO PHYSICAL DAMAGE AND RECOMMENDED BY THE EQUIPMENT MANUFACTURER. CONDUIT SIZE IS LISTED AS MINIMUM. PROVIDE LARGER AS REQUIRED PER MANUFACTURER. COORDINATE FINAL INSTALLATION REQUIREMENTS WITH MANUFACTURER.
12. WET FLOOR SENSOR TO BE PROVIDED FINDER MODEL 07.2.2.0 OR APPROVED EQUAL THRU BID ALLOWANCE. PROVIDE ALL REQUIRED MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC... AND CIRCUITRY (CONDUIT AND CONDUCTORS) FOR AN OVERALL COMPLETE AND OPERABLE LEAK DETECTION SYSTEM. REFER TO SPECIFICATION SECTION 260912 CONTROL PANELS AND INTEGRATION FOR ADDITIONAL INFORMATION/REQUIREMENTS. PROVIDE LABEL PER SPECIFICATION SECTION 260553 INDENTIFICATION FOR ELECTRICAL SYSTEMS. 1
13. LEAK DETECTION SENSOR TO BE PROVIDED AS PAINTEK CLS200 CAPACITANCE PROBE AS MANUFACTURED BY SIEMENS, OR APPROVED EQUAL THRU BID ALLOWANCE. PROVIDE ALL REQUIRED MOUNTING HARDWARE, BRACKETTS, ACCESSORIES, ETC... AND CIRCUITRY (CONDUIT AND CONDUCTORS) FOR AN OVERALL COMPLETE AND OPERABLE LEAK DETECTION SYSTEM. REFER TO SPECIFICATION SECTION 260912 CONTROL PANELS AND INTEGRATION FOR ADDITIONAL INFORMATION/REQUIREMENTS. PROVIDE LABEL PER SPECIFICATION SECTION 260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS.
14. (6)#14, 3/4"C.
15. CHEMICAL LEAK DETECTION ALARMING LIGHTS AND HORNS (HORN/STROBE) TO BE PROVIDED AS FEDERAL SIGNAL GLOBAL SERIES CUSTOM CONFIGURED FIXTURES MODEL #C-MSC-3A-120-NN-LG-SR OR APPROVED EQUAL THRU BID ALLOWANCE. TO BE 3 POSITION VERTICAL STACK, SOUNDER HORN, GREEN 'OK' LED LIGHT, & RED 'LEAK DETECTED' LED LIGHT), RATED NEMA 4X, AND POWERED BY 120V AC CONTACT CLOSURES WITHIN CONTROL PANEL. PROVIDE ALL REQUIRED POWER SUPPLIES, CONTROL TRANSFORMERS, AND RELAYS, AS WELL AS, DOME GUARDS TO PROTECT LED LIGHTS FROM PHYSICAL DAMAGE, CONDUIT ADAPTORS, INDICATOR RINGS AND LEGEND PLATE KITS AS NECESSARY. PROVIDE ALL REQUIRED MOUNTING HARDWARE, BRACKETTS, ACCESSORIES, ETC... AND CIRCUITRY (CONDUIT AND CONDUCTORS) FOR AN OVERALL COMPLETE AND OPERABLE LEAK DETECTION SYSTEM. REFER TO SPECIFICATION SECTION 260912 CONTROL PANELS AND INTEGRATION FOR ADDITIONAL INFORMATION/REQUIREMENTS. PROVIDE LABEL PER SPECIFICATION SECTION 260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS.
16. AREA IS A CLASS I, DIVISION I, GROUP D SPACE. ALL WIRING METHODS WITHIN THIS SPACE TO COMPLY WITH NEC ARTICLE 501. ALL ELECTRICAL EQUIPMENT AND DEVICES WITHIN THIS SPACE TO BE EXPLOSION PROOF RATED FOR USE IN A CLASS I, DIVISION I, GROUP D ENVIRONMENT. NOTE, NOT ALL REQUIRED SEAL-OFFS SHOWN FOR CLARITY. PROVIDE PER NEC.
17. ALL ELECTRICAL EQUIPMENT, COMPONENTS, DEVICES, AND RACEWAY SYSTEMS TO BE KEPT OUT OF CLASSIFIED AREAS TO GREATEST EXTENT POSSIBLE.
18. 8-STRAND, MULTI-MODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C. PROVIDE MAXCELL FABRIC INNERDUCT WITHIN 4" CONDUIT. PROVIDE AS MAXCELL 4" 3-CELL PRODUCT. INSTALL PROPOSED FIBER OPTIC CABLE WITHIN 1-CELL OF THE PROPOSED INNERDUCT AND A PULL STRING THROUGH THE OTHER TWO (2) CELLS. FIBER OPTIC CABLE TO BE CONTINUOUS (NO SPLICE) AND SUITABLE FOR INDOOR/OUTDOOR APPLICATIONS ALONG WITH SUITABLE FOR DIRECT BURIAL APPLICATIONS. FIBER OPTIC CABLE TO BE MODEL CLEARCURVE AS MANUFACTURED BY CORNING OR APPROVED EQUAL. SUBMIT PRODUCT DATA TO ENGINEER FOR REVIEW DURING SUBMITTAL PHASE. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
19. SPARE 4"C.
20. PROVIDE SPARE CONDUIT AS SHOWN. STUB CONDUIT ADJACENT TO EQUIPMENT, OR AS DIRECTED BY THE OWNER. PROVIDE PULL ROPE AND CAP BOTH ENDS. CONTRACTOR TO PROVIDE LABEL FOR ALL SPARE CONDUITS INDICATING CONDUIT DESTINATION. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
21. CONTRACTOR RESPONSIBLE TO RESTORE ALL DISTURBED SURFACES AS PART OF THIS CONTRACT. COORDINATE FINAL REQUIREMENTS WITH THE OWNER AND ENGINEER. REFER TO TYPICAL DUCT BANK SECTION DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
22. CONTRACTOR TO COORDINATE FINAL DUCT BANK ROUTING/REQUIREMENTS WITH EXISTING FIELD CONDITIONS, PROPOSED WORK, OWNER AND ENGINEER PRIOR TO ROUGH-IN TO AVOID CONFLICTS.
23. REFER TO ELECTRICAL DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS. CLOSELY COORDINATE FINAL PENETRATION LOCATIONS/REQUIREMENTS WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER. TYPICAL.
24. (2)#18STP & (4)#14, 1"C
25. (64)#14, 1-1/2"C.
26. TEMPERATURE SENSOR TO BE PROVIDED AS OMEGA EWS-TX SERIES WALL MOUNT SENSOR, OR APPROVED EQUAL THRU BID ALLOWANCE #1. PROVIDE ELECTRICAL BOX, 24V OC POWER SUPPLY, CIRCUITRY (CONDUIT AND CONDUCTORS), WALL PLATE, AND MOUNTING BRACKETS AS REQUIRED FOR AN OVERALL COMPLETE AND OPERABLE ROOM TEMPERATURE SENSING DEVICE PER MANUFACTURER'S RECOMMENDATIONS. REFER TO SPECIFICATION SECTION 260912 CONTROL PANELS AND INTEGRATION FOR ADDITIONAL INFORMATION/REQUIREMENTS. PROVIDE LABEL PER SPECIFICATION SECTION 260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS.
27. PROVIDE CONDUIT BUSHING, FITTING, OR FLEX CONNECTION AS REQUIRED FOR PROPER CONNECTION OF DEVICE. ALL BUSHINGS, FITTINGS, OR FLEX CONNECTIONS TO BE SUITED FOR ENVIRONMENT INSTALLED WITHIN, INCLUDING BUT NOT LIMITED TO, HAZARDOUS ENVIRONMENTS, CORROSIVE ENVIRONMENTS, AND OUTDOOR INSTALLATIONS. COORDINATE WITH APPLICABLE CONTRACTOR AND EQUIPMENT MANUFACTURER. FLEX CONNECTION LENGTHS TO BE MINIMIZED TO GREATEST EXTENT POSSIBLE. TYPICAL.
28. CONTRACTOR TO PROVIDE JUNCTION/PULL BOXES FOR SPLICING, OR EXTENDING CIRCUITRY AS REQUIRED. PROVIDE NECESSARY TERMINAL STRIPS, OR SPLICE KITS WITHIN JUNCTION BOX TO EXTEND CIRCUITRY AS SHOWN. (NOTE, JUNCTION BOXES ARE NOT ALWAYS SHOWN ON FLOOR PLANS. CONTRACTOR TO FIELD LOCATE AS NECESSARY). JUNCTION BOXES ARE TO BE RATED FOR ENVIRONMENT INSTALLED, INCLUDING BUT NOT LIMITED TO HAZARDOUS ENVIRONMENTS, CORROSIVE ENVIRONMENTS, AND OUTDOOR INSTALLATIONS. CONTRACTOR TO FIELD VERIFY AND COORDINATE CONDUIT ARRANGEMENT ENTERING/LEAVING JUNCTION BOX AS REQUIRED. CONTRACTOR TO SIZE JUNCTION BOXES PER NEC ARTICLE 314. JUNCTION BOXES TO BE MANUFACTURED BY EATON, OR APPROVED EQUAL. TYPICAL OF ALL JUNCTION BOXES SHOWN ON THIS DRAWING.
29. RADAR LEVEL SENSOR TO BE PROVIDED AS VEGAPLUS 31, OR APPROVED EQUAL THRU BID ALLOWANCE. PROVIDE REQUIRED MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC... AND CIRCUITRY (CONDUIT AND CONDUCTORS) FOR AN OVERALL COMPLETE AND OPERABLE LIQUID LEVEL MEASURING SYSTEM. REFER TO SPECIFICATIONS SECTION 260912 CONTROL PANELS AND INTEGRATION FOR ADDITIONAL INFORMATION/REQUIREMENTS. PROVIDE LABEL PER SPECIFICATION SECTION 260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS. 1
30. ROOM INTERIOR IS A CORROSIVE ENVIRONMENT. ALL WIRING METHODS, EQUIPMENT, AND DEVICES WITHIN THIS SPACE ARE TO BE OF CORROSION RESISTANT MATERIALS/METHODS. ALL RACEWAY TO BE PVC COATED RGS BY PLASTI-BOND, OR APPROVED EQUAL. ALL MOUNTING HARDWARE, BRACKETS, SUPPORTS, CHANNELS, FITTINGS, CLAMPS, ETC... TO BE A CORROSION RESISTANT PRODUCT LINE AS MANUFACTURED BY POWER-STRUT DEFENDER, OR APPROVED EQUAL. SUBMIT PRODUCT DATA TO ENGINEER DURING SUBMITTAL PHASE FOR APPROVAL. REFER TO RACEWAY SCHEDULE FOR ADDITIONAL INFORMATION. UTILIZE NEMA 4X (NON-METALLIC) ENCLOSURES FOR ALL ELECTRICAL EQUIPMENT, SWITCHES, RECEPTACLES, DISCONNECTS, BOXES, ETC...
31. CONTRACTOR TO PROVIDE 125-VOLT, 2-POLE, 3-WIRE, 20-AMP, HEAVY DUTY, DUPLEX WEATHERPROOF RECEPTACLE EQUIPPED WITH INTEGRAL GROUND FAULT CIRCUIT INTERRUPTER (GFI) MOUNTED ADJACENT TO EQUIPMENT. PROVIDE ALL REQUIRED MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC...PROVIDE DEDICATED CIRCUIT FROM PROPOSED PANEL 'LVP1'. PROVIDE AS SWITCHED RECEPTACLE.
32. EQUIPMENT WHIP (CORD) AND PLUG PROVIDED BY EQUIPMENT MANUFACTURER. CONTRACTOR TO SUBSTITUTE HARD WIRED CONNECTION IN LIEU OF RECEPTACLE (CORD & PLUG) PER MANUFACTURERS RECOMMENDATIONS. COORDINATE FINAL REQUIREMENTS WITH EQUIPMENT MANUFACTURER, OWNER, AND ENGINEER. REFER TO EQUIPMENT CONNECTION SCHEDULE FOR ADDITIONAL INFORMATION/REQUIREMENTS.
33. FLOAT SWITCH TO BE PROVIDED AS SJE RHOMBUS MIL-AMP-MASTER, OR APPROVED EQUAL THRU BID ALLOWANCE. PROVIDE REQUIRED MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC... AND CIRCUITRY (CONDUIT AND CONDUCTORS) FOR AN OVERALL COMPLETE AND OPERABLE FLOAT SWITCH SYSTEM. REFER TO SPECIFICATIONS SECTION 260912 CONTROL PANELS AND INTEGRATION FOR ADDITIONAL INFORMATION/REQUIREMENTS. PROVIDE LABEL PER SPECIFICATION SECTION 260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS. 1
34. ROUTING AND ATTACHMENT METHODS OF ALL CONDUITS WITHIN STRUCTURE ARE TO BE CLOSELY COORDINATED WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER TO AVOID CONFLICTS. ALL RACEWAY TO BE PVC COATED RGS BY PLASTI-BOND, OR APPROVED EQUAL. ALL MOUNTING HARDWARE, BRACKETS, SUPPORTS, CHANNELS, FITTINGS, CLAMPS, ETC... TO BE A CORROSION RESISTANT PRODUCT LINE AS MANUFACTURED BY POWER-STRUT DEFENDER, OR APPROVED EQUAL. SUBMIT PRODUCT DATA TO ENGINEER DURING SUBMITTAL PHASE FOR APPROVAL. REFER TO RACEWAY SCHEDULE FOR ADDITIONAL INFORMATION.
35. SPARE 2"C.
36. (48)#14 & (8)#18STP, 2"C. 1

CONTROL DIAGRAMS ARE SCHEMATIC IN NATURE AND SHOWS ALL INTERCONNECTIONS. CONTRACTOR MAY GROUP POWER CIRCUITS INTO LARGER CONDUIT AND GROUP CONTROL CIRCUITS INTO SEPARATE LARGER CONDUIT. GROUPING OF CIRCUITS INTO LARGER CONDUITS MUST COMPLY WITH NEC FILL AND DERATING REQUIREMENTS. VFD INPUT & OUTPUT CONDUCTORS MUST BE RUN INDEPENDENT OF OTHER CONDUCTORS.

1 E-023 REMOTE I/O PANEL #1 RISER DIAGRAM
SCALE: NTS — MBR BUILDING

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JADE STONE ENGINEERING

HAZARDOUS MATERIAL NOTE:
THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL RISER DIAGRAMS

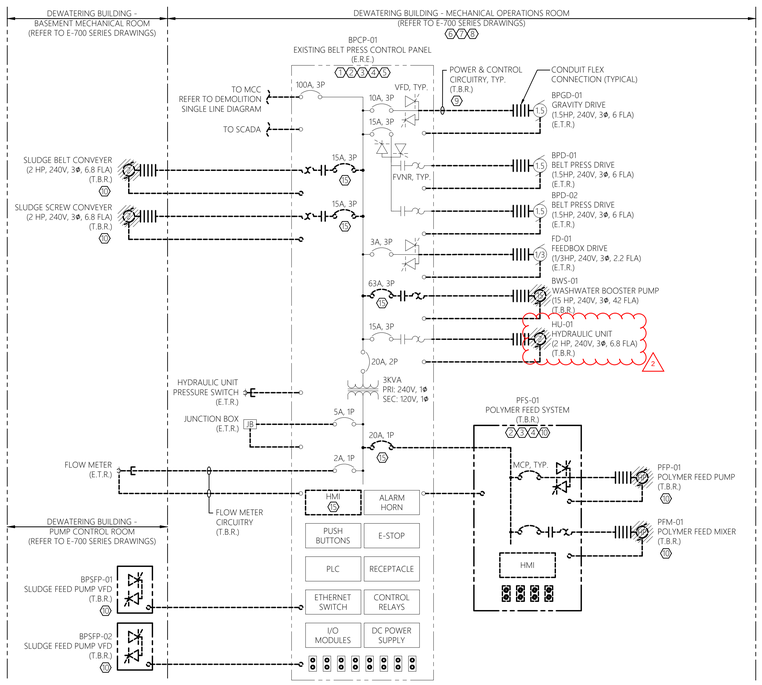
REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

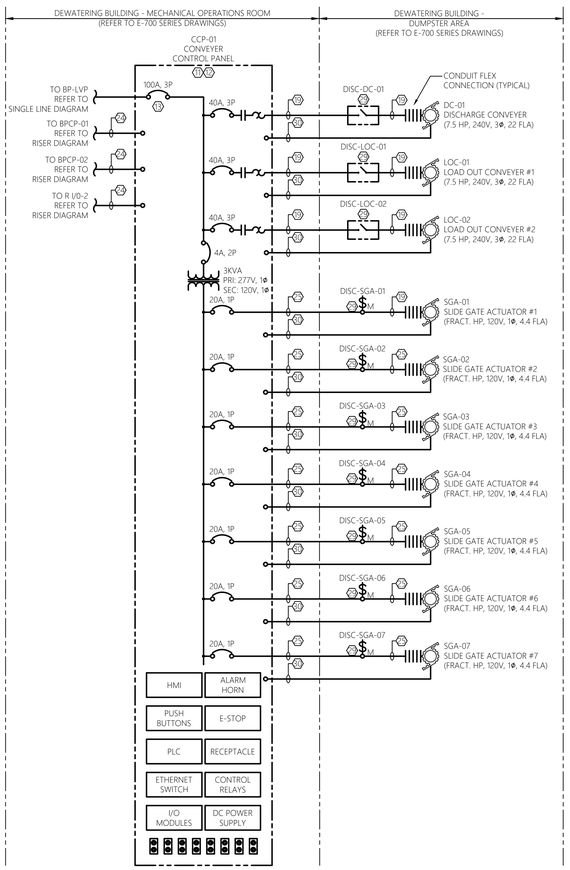
SHEET NO.
E-023

PROJECT # 18-732 PHASE #



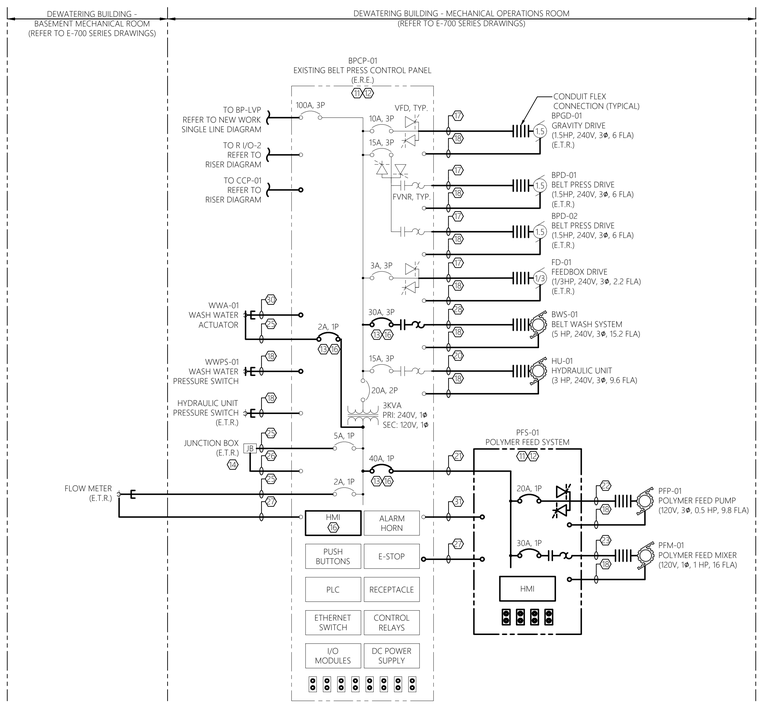
1 / E-028 — EXISTING BELT FILTER PRESS CONTROL PANEL RISER DIAGRAM - DEMOLITION

SCALE: NTS — DEWATERING BLDG



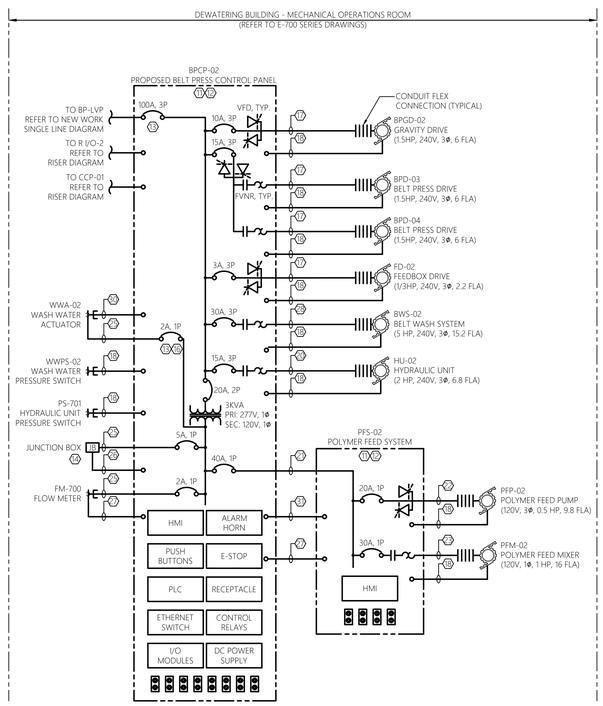
2 / E-028 — CONVEYER CONTROL PANEL RISER DIAGRAM

SCALE: NTS — DEWATERING BLDG



2 / E-028 — EXISTING BELT FILTER PRESS CONTROL PANEL RISER DIAGRAM - NEW WORK

SCALE: NTS — DEWATERING BLDG



4 / E-028 — PROPOSED BELT FILTER PRESS CONTROL PANEL RISER DIAGRAM

SCALE: NTS — DEWATERING BLDG

GENERAL SHEET NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE GROUNDING PER NEC FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT.
3. ALL CONDUCTORS NOT SHOWN FOR CLARITY. COORDINATE WITH OTHER TRADE CONTRACTORS AND PROVIDE COMPLETE ELECTRICAL CIRCUITING FOR ALL INSTALLED EQUIPMENT. ALL REQUIREMENTS TO BE PER NEC.
4. REFER TO FLOOR PLANS FOR GENERAL DEVICE/EQUIPMENT LOCATIONS. COORDINATE FINAL LOCATIONS WITH PROCESS MECHANICAL DRAWINGS. REFER TO SITE PLAN FOR DUCT BANK INFORMATION AS REQUIRED.
5. REFER TO SINGLE LINE DIAGRAMS, SPECIFICATIONS, AND SUBMITTAL DOCUMENTATION FOR ADDITIONAL INFORMATION/REQUIREMENTS.
6. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH OWNER ALL OTHER TRADE CONTRACTORS.
7. CIRCUITS SHOWN ARE POWER, CONTROL, INSTRUMENTATION, AND CONTROL CIRCUIT POWER. REFER TO SINGLE LINE DIAGRAMS, SCHEDULES, AND DETAILS FOR ADDITIONAL CIRCUITS.
8. ALL WIRING REQUIREMENTS INCLUDING BUT NOT LIMITED TO WIRE SIZE, TYPE, AND QUANTITY OF CONDUCTORS TO BE VERIFIED WITH EQUIPMENT MANUFACTURER.
9. QUANTITY OF CONDUCTORS CALLED FOR MAY INCLUDE SPARE CONDUCTORS. PROVIDE CONDUCTORS SHOWN OR MINIMUM NUMBER REQUIRED PER MANUFACTURERS WRITTEN INSTRUCTIONS. ALL REQUIREMENTS TO BE PER NEC.
10. CONTRACTOR TO PROVIDE ARC FLASH WARNING LABELS FOR ALL NEW OR MODIFIED ELECTRICAL EQUIPMENT. REFER TO SPECIFICATIONS FOR REQUIREMENTS.
11. REFER TO ELECTRICAL DETAIL SHEETS AND SCHEDULE SHEETS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
12. CONTRACTOR TO COORDINATE MOUNTING LOCATIONS OF ALL PANELS WITH OWNER AND ALL OTHER TRADE CONTRACTORS. PROVIDE ALL NECESSARY MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC..
13. PROVIDE INTRINSICALLY SAFE BARRIERS AS REQUIRED INTERNAL TO CONTROL PANELS. ALL REQUIREMENTS TO BE PER NEC.
14. NOT ALL REQUIRED CLASSIFIED SPACE WIRING METHODS INCLUDING, BUT NOT LIMITED TO SEAL-OFFS MAY BE SHOWN. PROVIDE WIRING METHODS PER NEC (LATEST EDITION). PROVIDE CONDUIT UNION WITHIN 6" OF EACH SEAL-OFF AT CONTROL PANELS, DISTRIBUTION PANELS, VFDS, STARTERS, DISCONNECTS, OR SOURCE OF SUPPLY WHERE FEASIBLE.
15. NOT ALL REQUIRED THRU-WALL, WATERTIGHT, CONDUIT PENETRATIONS SHOWN FOR CLARITY. CONTRACTOR TO PROVIDE A THRU-WALL WATERTIGHT, CONDUIT PENETRATION FOR ALL CONDUIT PENETRATIONS WITHIN BUILDING INTERIOR/EXTERIOR WALLS AND FLOORS. REFER TO ELECTRICAL DETAILS FOR ADDITIONAL INFORMATION. COORDINATE WITH OWNER AND ALL OTHER TRADE CONTRACTORS PRIOR TO ROUGH-IN
16. CONTRACTOR TO COORDINATE ALL CONDUIT PENETRATIONS AND CONDUIT ROUTING WITH ALL OTHER TRADE CONTRACTORS AND OWNER PRIOR TO ROUGH-IN.
17. ALL CONDUCTORS TO BE COPPER AND CONTAIN XHHW INSULATION.
18. ALL CONTROL/COMMUNICATION WIRING REQUIREMENTS INCLUDING BUT NOT LIMITED TO WIRE SIZE, TYPE, AND QUANTITY OF CONDUCTORS TO BE VERIFIED WITH EQUIPMENT MANUFACTURER.
19. ALL PROPOSED EQUIPMENT LOCATIONS/INSTALLATIONS TO COMPLY WITH NEC ARTICLE 110.26 'SPACES ABOUT ELECTRICAL EQUIPMENT'.

SHEET KEY NOTES:

1. CONTRACTOR TO DISCONNECT FROM POWER SOURCE AND ALL CONNECTED EQUIPMENT, MAKE ELECTRICALLY SAFE, AND RELOCATE EXISTING BELT PRESS CONTROL PANEL "BPCP-01" AS SHOWN ON E-700 SERIES DRAWINGS. EQUIPMENT TO BE REMOVED IS TO BECOME PROPERTY OF THE CONTRACTOR AND REMOVED FROM THE SITE IN ITS ENTIRETY. OWNER HAS THE RIGHT TO MAINTAIN ANY EQUIPMENT, COMPONENTS, DEVICES, CONTROLS, ETC... SCHEDULED FOR REMOVAL. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION AND COORDINATE FINAL REQUIREMENTS WITH APPLICABLE TRADE CONTRACTOR, OWNER, BELT PRESS CONTROL PANEL MANUFACTURE, AND ENGINEER.
2. NOT ALL ASSOCIATED CONTROLS, STARTERS, DISCONNECTS & CIRCUITRY MAY BE SHOWN FOR CLARITY. CONTRACTOR TO FIELD VERIFY AND COMPLETELY REMOVE ALL ASSOCIATED CONTROLS, STARTERS, DISCONNECTS, CONTROLS, CONTROLS CIRCUITRY (CONDUIT & CONDUCTORS), ALL MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC... ASSOCIATED WITH EQUIPMENT/CIRCUITING SCHEDULED FOR REMOVAL. COORDINATE FINAL REQUIREMENTS WITH APPLICABLE TRADE CONTRACTOR, OWNER, BELT PRESS CONTROL PANEL MANUFACTURE, AND ENGINEER.
3. NOT ALL INTERNAL COMPONENTS SHOWN FOR CLARITY. DIAGRAM IS INTENDED TO SHOW ALL REQUIRED FIELD CIRCUITING AND EQUIPMENT TO BE REMOVED AS REQUIRED BY THE CONTRACTOR. CONTRACTOR TO REMOVE ANY EXISTING CIRCUITING ASSOCIATED WITH THE BELT PRESS SYSTEM. CLOSELY COORDINATE ALL REQUIREMENTS WITH APPLICABLE TRADE CONTRACTOR, OWNER, BELT PRESS CONTROL PANEL MANUFACTURE, AND ENGINEER.
4. REFER TO ELECTRICAL DEMOLITION PLANS, SCHEDULES AND DETAILS FOR ADDITIONAL DEMOLITION INFORMATION/REQUIREMENTS. CONTRACTOR TO COORDINATE ALL EQUIPMENT/CIRCUITING SCHEDULED FOR REMOVAL AND FINAL SEQUENCE OF REMOVAL REQUIREMENTS WITH APPLICABLE TRADE CONTRACTOR, OWNER, BELT PRESS CONTROL PANEL MANUFACTURE, AND ENGINEER PRIOR TO COMMENCEMENT OF DEMOLITION. CONTRACTOR TO FIELD VERIFY AND PROVIDE AS REQUIRED.
5. FOR EXISTING TO REMAIN EQUIPMENT, CONTRACTOR TO DISCONNECT, MAKE ELECTRICALLY SAFE, AND LABEL TO BE RECONNECTED AS SHOW ON NEW WORK.
6. WWTP IS TO BE OPERATIONAL AT ALL TIMES. PROVIDE TEMPORARY POWER PROVISIONS AS REQUIRED TO FACILITATE WWTP OPERATION DURING ELECTRICAL DEMOLITION AND INSTALLATION. PROVIDE ALL NECESSARY EQUIPMENT, DEVICES, CABLING, ETC... AS REQUIRED FOR AN OVERALL COMPLETE AND OPERABLE TEMPORARY POWER SYSTEM. CONTRACTOR TO MINIMIZE DOWN TIMES TO THE GREATEST EXTENT POSSIBLE. COORDINATE ALL REQUIREMENTS WITH APPLICABLE TRADE CONTRACTOR, OWNER, AND ENGINEER. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION REGARDING TEMPORARY POWER.
7. CONTRACTOR TO PROVIDE TEMPORARY POWER PLAN IN WRITING TO ENGINEER FOR APPROVAL PRIOR TO PERFORMING ELECTRICAL SERVICE DISRUPTIONS.
8. CONTRACTOR TO NOT COMMENCE ELECTRICAL DEMOLITION UNTIL TEMPORARY POWER PROVISIONS HAVE BEEN ESTABLISHED AND APPROVED BY THE ENGINEER. NOTE, IT IS THE INTENTION THAT THE NEW ELECTRICAL SERVICE BE INSTALLED, TESTED, AND OPERATIONAL BEFORE THE EXISTING ELECTRICAL SERVICE BE REMOVED.
9. CONTRACTOR TO REMOVE ALL POWER AND CONTROL CIRCUITRY (CONDUIT AND CONDUCTORS) IN IT'S ENTIRETY AS SHOWN. CONTRACTOR TO FIELD VERIFY.
10. CONTRACTOR TO DISCONNECT/REMOVE ALL POWER AND CONTROL CIRCUITRY (CONDUIT & CONDUCTORS) IN ITS ENTIRETY BACK TO SOURCE AS WELL AS DEMOLISH ASSOCIATED JUNCTION BOXES, DISCONNECTS, STARTERS, ASSOCIATED CONTROL DEVICES, ALL MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC... ALL ITEMS REMOVED TO BECOME PROPERTY OF THE CONTRACTOR AND REMOVED FROM THE PROJECT SITE. CONTRACTOR TO FIELD VERIFY.
11. NOT ALL INTERNAL COMPONENTS SHOWN FOR CLARITY. DIAGRAM IS INTENDED TO SHOW ALL REQUIRED FIELD CIRCUITING AND TERMINATION REQUIRED BY THE CONTRACTOR. REFERENCE SUBMITTAL DOCUMENTATION FOR ALL PANEL INTERNAL COMPONENTS. CONTRACTOR TO PROVIDE ADDITIONAL INTERNAL COMPONENTS, CONTACTS, AND JUMPERS PER CONTROL PANEL MANUFACTURERS RECOMMENDATIONS FOR AN OVERALL COMPLETE AND OPERABLE SYSTEM. CLOSELY COORDINATE ALL REQUIREMENTS WITH ALL OTHER TRADE CONTRACTORS AND PANEL MANUFACTURE.
12. CONTROL PANEL AND ALL INTERNAL COMPONENTS (IF NOT EXISTING) ARE BY TO BE PROVIDED BY THE CONTRACTOR. CONTRACTOR IS RESPONSIBLE FOR ALL FIELD WIRING BETWEEN DEVICES, AND MOUNTING/INSTALLATION OF PANEL AS SHOWN/INDICATED. REFER TO SUBMITTAL DOCUMENTATION AND COORDINATE WITH APPLICABLE TRADE CONTRACTOR, OWNER, CONTROL PANEL MANUFACTURE, AND ENGINEER TO PROVIDE COMPLETE SYSTEM FIELD CIRCUITRY AND TERMINATIONS AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
13. DISCONNECT SIZE SHOWN FOR BIDDING PURPOSES ONLY. COORDINATE DISCONNECT SIZE WITH EQUIPMENT MANUFACTURERS RECOMMENDATIONS. COORDINATE CONDUCTOR/CONDUIT SIZE WITH MANUFACTURERS RECOMMENDED DISCONNECT SIZE. ALL REQUIREMENTS TO BE PER NEC. TYPICAL.
14. COORDINATE TERMINATIONS OF CIRCUITRY AT BELT PRESS MANUFACTURE PROVIDED (IF NOT EXISTING) JUNCTION BOX CLOSELY WITH MANUFACTURER & OTHER TRADE CONTRACTORS.
15. COMPONENT INTERNAL TO CONTROL PANEL IS TO BE REMOVED BY BELT PRESS CONTROL PANEL MANUFACTURE. NOT ALL PROPOSED COMPONENTS INTERNAL TO CONTROL PANEL MAY BE SHOWN FOR CLARITY. COORDINATE WITH BELT PRESS CONTROL PANEL MANUFACTURE AS NEEDED.
16. COMPONENT INTERNAL TO CONTROL PANEL IS TO BE INSTALLED BY BELT PRESS CONTROL PANEL MANUFACTURE. NOT ALL PROPOSED COMPONENTS INTERNAL TO CONTROL PANEL MAY BE SHOWN FOR CLARITY. COORDINATE WITH BELT PRESS CONTROL PANEL MANUFACTURE AS NEEDED.
17. (3)#12 & #12G, 3/4"C. PROVIDE AS VFD SHIELDED CABLE. CONDUIT SIZE IS LISTED AS MINIMUM, PROVIDE LARGER DIAMETER AS REQUIRED PER MANUFACTURER. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION. ALL REQUIREMENTS TO BE PER NEC.
18. (4)#14, 3/4"C.
19. (3)#8 & #10G, 1"C.
20. (3)#12 & #12G, 3/4"C.
21. (2)#8 & #10G, 3/4"C.
22. (2)#12 & #12G, 3/4"C. PROVIDE AS VFD SHIELDED CABLE. CONDUIT SIZE IS LISTED AS MINIMUM, PROVIDE LARGER DIAMETER AS REQUIRED PER MANUFACTURER. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION. ALL REQUIREMENTS TO BE PER NEC.
23. (2)#10 & #10G, 3/4"C.
24. (1) CAT 6A PREMIUM ETHERNET CABLE, 1"C. PROVIDE AS PLENUM RATED WITH 4 BONDED PAIRS. TO BE BELDEN #3633 OR APPROVED EQUAL.
25. (2)#12 & #12G, 3/4"C.
26. (20)#14, 1"C.
27. (2)#18STP, 3/4"C.
28. (3)#10 & #10G, 3/4"C.
29. REFER TO EQUIPMENT CONNECTION SCHEDULE FOR ADDITIONAL INFORMATION/REQUIREMENTS. TYPICAL.
30. (6)#14, 3/4"C.
31. (10)#14, 3/4"C.

CONTROL DIAGRAMS ARE SCHEMATIC IN NATURE AND SHOWS ALL INTERCONNECTIONS. CONTRACTOR MAY GROUP POWER CIRCUITS INTO LARGER CONDUIT AND GROUP CONTROL CIRCUITS INTO SEPARATE LARGER CONDUIT. GROUPING OF CIRCUITS INTO LARGER CONDUITS MUST COMPLY WITH NEC FILL AND DERATING REQUIREMENTS. VFD INPUT & OUTPUT CONDUCTORS MUST BE RUN INDEPENDENT OF OTHER CONDUCTORS.

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JSE JADE STONE ENGINEERING

STATE OF NEW YORK — JEFFREY E. ROBINSON — 095896 — LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:

THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

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FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL RISER DIAGRAMS

REVISIONS

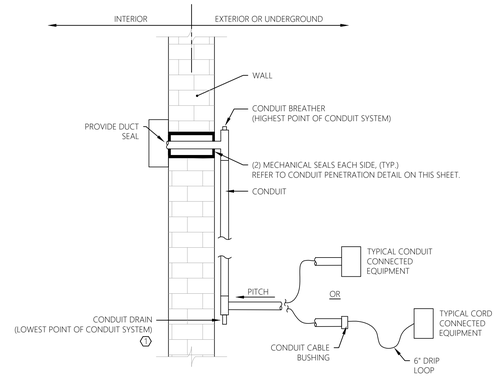
NO.	DESCRIPTION	DATE
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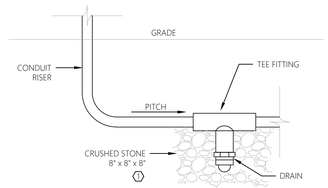
SHEET NO.

E-028

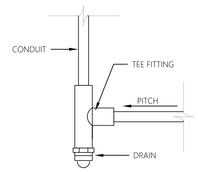
PROJECT # 18-732 — PHASE #



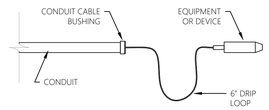
DRAIN ABOVE GRADE



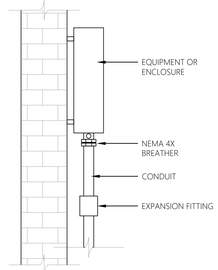
DRAIN BELOW GRADE



DRAIN ABOVE GRADE



CORD/CABLE CONNECTED EQUIPMENT



CONDUIT CONNECTED EQUIPMENT

GENERAL NOTES:

1. ALL CONDUIT SYSTEMS EXPOSED TO TEMPERATURE DIFFERENTIALS, IN POTENTIAL CONDENSING ATMOSPHERES, EXTERIOR INSTALLED, OR INSTALLED UNDERGROUND SHALL HAVE PROVISIONS FOR DRAINING WATER OUT OF CONDUIT SYSTEMS. PROVIDE DRAIN IN CONDUIT SYSTEMS AT LOW POINTS, LOW POINT SHALL NOT BE AT EQUIPMENT OR DEVICE. A BREATHER SHALL BE PROVIDED AT THE HIGH POINT OF THE SYSTEM.
2. ALL DRAIN FITTINGS TO BE STAINLESS STEEL AND ALL TEE FITTINGS TO BE OF RIGID GALVANIZED STEEL MATERIAL.
3. CONDENSATION PREVENTION - WHERE CONDUITS CROSS BARRIERS BETWEEN AREAS OF POTENTIAL SUBSTANTIAL TEMPERATURE DIFFERENTIAL, PROVIDE SEALING FITTING OR APPROVED SEALING COMPOUND AT AN ACCESSIBLE POINT NEAR THE PENETRATION TO PREVENT CONDENSATION. THIS INCLUDES, BUT IS NOT LIMITED TO:
   3.1. WHERE CONDUITS PASS FROM OUTDOORS INTO CONDITIONED INTERIOR SPACES.
   3.2. WHERE CONDUITS PASS FROM UNCONDITIONED INTERIOR SPACES INTO CONDITIONED INTERIOR SPACES.
4. CONTRACTOR TO FIELD VERIFY ALL UNDERGROUND CONDUIT DRAINS AND COORDINATE WITH THE OWNER/ENGINEER. ELEVATIONS TO BE COORDINATED SO THAT CONDUIT SYSTEMS DO NOT DRAIN TO EQUIPMENT/BUILDINGS.

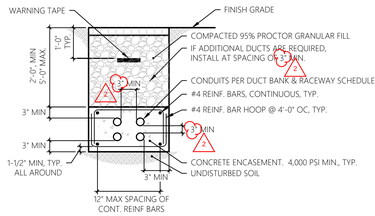
KEY NOTES:

1 PROVIDE CRUSHED STONE (MIN. 8" x 8" x 8") WHERE LOWEST POINT IS LOCATED BENEATH GRADE.

1 E-030 SCALE: NTS — TYPICAL CONDUIT DRAIN DETAILS

GENERAL NOTES:

1. COORDINATE DUCT BANK REQUIREMENTS (IF ANY) FOR NEW SERVICE WITH THE UTILITY.
2. POWER AND CONTROL CONDUITS TO HAVE SEPARATION OF 6" MINIMUM
3. DETAIL IS TYPICAL AND MAY REFLECT CONDUITS NOT REQUIRED FOR PROJECT.
4. FINISHED SURFACE TO MATCH SURFACE BEING DISTURBED.
   - IN AREA OF GRASS: USE 4" TOP SOIL & SEEDING, AND COVER WITH MULCH.
   - IN ROADWAY OR NON-GRASS: USE COMPACTED 95% PROCTOR GRANULAR FILL.
5. CONTRACTOR TO UTILIZE CONDUIT SPACERS FOR ALL DUCT BANKS, NOT SHOWN ON DETAIL FOR CLARITY.



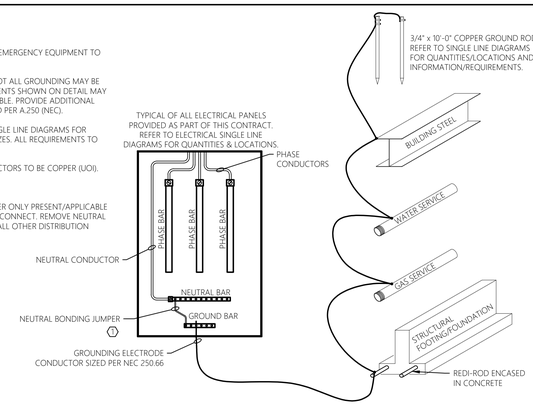
2 E-030 SCALE: NTS — TYPICAL REINFORCED CONCRETE DUCT BANK SECTION DETAIL

GENERAL NOTES:

1. BOND ALL NORMAL AND EMERGENCY EQUIPMENT TO GROUND SYSTEM.
2. DETAIL IS TYPICAL AND NOT ALL GROUNDING MAY BE SHOWN. SOME COMPONENTS SHOWN ON DETAIL MAY NOT BE PRESENT/APPLICABLE. PROVIDE ADDITIONAL GROUNDING AS REQUIRED PER A.250 (NEC).
3. REFER TO ELECTRICAL SINGLE LINE DIAGRAMS FOR GROUND CONDUCTOR SIZES. ALL REQUIREMENTS TO BE PER NEC.
4. ALL GROUNDING CONDUCTORS TO BE COPPER (UOI).

KEY NOTES:

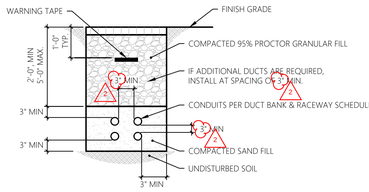
1. NEUTRAL BONDING JUMPER ONLY PRESENT/APPLICABLE WITHIN MAIN SERVICE DISCONNECT. REMOVE NEUTRAL BONDING JUMPER FROM ALL OTHER DISTRIBUTION PANELS.



3 E-030 SCALE: NTS — TYPICAL PANEL GROUNDING DETAIL

GENERAL NOTES:

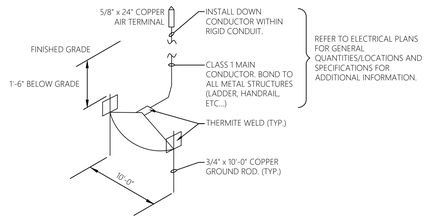
1. COORDINATE DUCT BANK REQUIREMENTS (IF ANY) FOR NEW SERVICE WITH THE UTILITY.
2. POWER AND COMMUNICATION CONDUITS TO HAVE SEPARATION OF 6" MINIMUM
3. DETAIL IS TYPICAL AND MAY REFLECT CONDUITS NOT REQUIRED FOR PROJECT.
4. FINISHED SURFACE TO MATCH SURFACE BEING DISTURBED.
   - IN AREA OF GRASS: USE 4" TOP SOIL & SEEDING, AND COVER WITH MULCH.
   - IN ROADWAY OR NON-GRASS: USE COMPACTED 95% PROCTOR GRANULAR FILL.
5. CONTRACTOR TO UTILIZE CONDUIT SPACERS FOR ALL DUCT BANKS, NOT SHOWN ON DETAIL FOR CLARITY.



4 E-030 SCALE: NTS — TYPICAL SAND FILL DUCT BANK SECTION DETAIL

GENERAL NOTES:

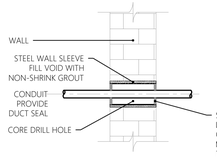
1. REFER TO ELECTRICAL PLANS FOR GENERAL QUANTITIES/LOCATIONS. COORDINATE FINAL QUANTITIES/LOCATIONS WITH OWNER, ENGINEER, AND EQUIPMENT MANUFACTURER.
2. BOND ALL NORMAL AND EMERGENCY EQUIPMENT TO GROUND SYSTEM.
3. DETAIL IS TYPICAL AND NOT ALL GROUNDING MAY BE SHOWN. SOME COMPONENTS SHOWN ON DETAIL MAY NOT BE PRESENT/APPLICABLE. PROVIDE ADDITIONAL GROUNDING AS REQUIRED PER A.250 (NEC).
4. ALL GROUND CONDUCTORS SHALL BE IN ACCORDANCE WITH THE NEC.
5. INSTALL AIR TERMINAL/DOWN CONDUCTOR PER MANUFACTURERS RECOMMENDATIONS.
6. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS.



5 E-030 SCALE: NTS — TYPICAL LIGHTNING PROTECTION GROUNDING DETAIL

GENERAL NOTES:

1. ALL CONDUIT MOVEMENT PROVISIONS - WHERE CONDUITS ARE SUBJECT TO MOVEMENT, PROVIDE EXPANSION AND EXPANSION/DEFLECTIONS FITTINGS TO PREVENT DAMAGE TO ENCLOSED CONDUCTORS OR CONNECTED EQUIPMENT. THIS INCLUDES, BUT IS NOT LIMITED TO:
   1.1. WHERE CONDUITS CROSS STRUCTURAL JOINTS INTENDED FOR EXPANSION, CONTRACTION, OR DEFLECTION.
   1.2. WHERE CONDUITS ARE SUBJECT TO EARTH MOVEMENT BY SETTLEMENT OR FROST.
3. CONDENSATION PREVENTION - WHERE CONDUITS CROSS BARRIERS BETWEEN AREAS OF POTENTIAL SUBSTANTIAL TEMPERATURE DIFFERENTIAL, PROVIDE SEALING FITTING OR APPROVED SEALING COMPOUND AT AN ACCESSIBLE POINT NEAR THE PENETRATION TO PREVENT CONDENSATION. THIS INCLUDES, BUT IS NOT LIMITED TO:
   3.1. WHERE CONDUITS PASS FROM OUTDOORS INTO CONDITIONED INTERIOR SPACES.
   3.2. WHERE CONDUITS PASS FROM UNCONDITIONED INTERIOR SPACES INTO CONDITIONED INTERIOR SPACES.

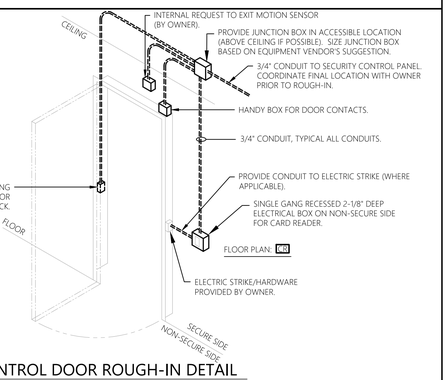


TYPICAL BLOCK/BRICK/CAST-IN PLACE CONDUIT PENETRATION DETAIL

6 E-030 SCALE: NTS

CARD ACCESS CONTROL PROJECT REQUIREMENTS:

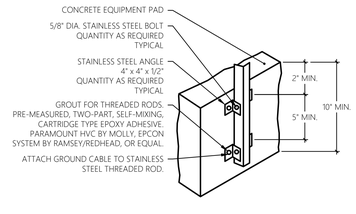
1. GENERIC ROUGH-IN REQUIREMENTS ARE ILLUSTRATED IN THE ADJACENT DETAIL. CONTRACTOR SHALL COORDINATE WITH OWNER TO PROVIDE ACTUAL ROUGH-IN REQUIRED FOR EACH SPECIFIC DOOR INSTALLATION. THIS DETAIL IS NOT INTENDED TO SHOW ALL CONDITIONS/INSTALLATION REQUIREMENTS.
2. ACCESS CONTROL SYSTEM AND ASSOCIATED EQUIPMENT, CABLING, COMPONENTS, AND DEVICES ARE PROVIDED BY THE OWNER. THIS CONTRACT TO PROVIDE ALL REQUIRED RACEWAY AND BOXES FOR AN OVERALL COMPLETE AND OPERABLE SYSTEM. COORDINATE FINAL REQUIREMENTS CLOSELY WITH THE OWNER.



7 E-030 SCALE: NTS — TYPICAL ACCESS CONTROL DOOR ROUGH-IN DETAIL

GENERAL NOTES

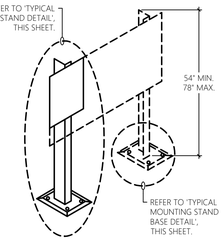
EQUIPMENT/ENCLOSURES LARGER THAN 4" x 4" SHALL BE INSTALLED ON A 1/4" THICK STAINLESS STEEL MOUNTING PLATE. TWO POSTS ARE REQUIRED FOR EQUIPMENT/ENCLOSURES WIDER THAN 8". MOUNTING PLATE SHALL BE 2" GREATER ON EACH SIDE THAN DIMENSION OF EQUIPMENT/ENCLOSURE TO BE MOUNTED. ROUND AND GRIND ALL CORNERS AND EDGES OF PLATE. FASTEN EQUIPMENT/ENCLOSURE TO PLATE AND FASTEN PLATE TO SUPPORT ANGLES WITH 3/8" STAINLESS STEEL FASTENERS. QUANTITY AS REQUIRED. PROVIDE #6 GROUND TO GROUND GRID.



SIDE MOUNTED ON CONCRETE EQUIPMENT PAD

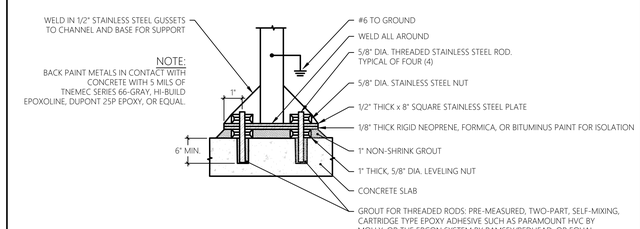
GENERAL NOTES:

1. BACK PAINT METALS IN CONTACT WITH CONCRETE WITH 5 MILS OF TNEMEC SETIES 66-GRAY, HIGH BUILD EPOXOLINE, DUPONT 25P EPOXY, OR EQUAL.
2. ALL MOUNTING HARDWARE TO BE STAINLESS STEEL.
3. COORDINATE REQUIREMENTS CLOSELY WITH OWNER, ENGINEER, AND APPLICABLE TRADE CONTRACTOR.



FREE STANDING

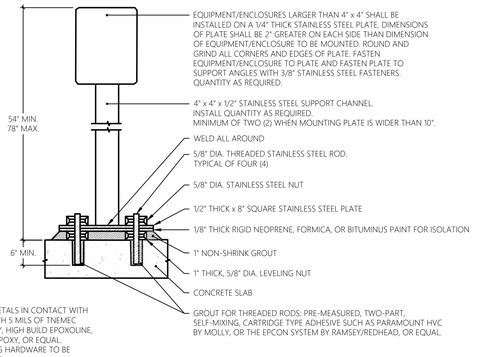
8 E-030 SCALE: NTS — TYPICAL MOUNTING STAND INSTALLATION DETAIL



GENERAL NOTES:

1. BACK PAINT METALS IN CONTACT WITH CONCRETE WITH 5 MILS OF TNEMEC SETIES 66-GRAY, HIGH BUILD EPOXOLINE, DUPONT 25P EPOXY, OR EQUAL.
2. ALL MOUNTING HARDWARE TO BE STAINLESS STEEL.
3. COORDINATE REQUIREMENTS CLOSELY WITH OWNER, ENGINEER, AND APPLICABLE TRADE CONTRACTOR.

9 E-030 SCALE: NTS — TYPICAL MOUNTING STAND BASE DETAIL



GENERAL NOTES:

1. BACK PAINT METALS IN CONTACT WITH CONCRETE WITH 5 MILS OF TNEMEC SETIES 66-GRAY, HIGH BUILD EPOXOLINE, DUPONT 25P EPOXY, OR EQUAL.
2. ALL MOUNTING HARDWARE TO BE STAINLESS STEEL.
3. COORDINATE REQUIREMENTS CLOSELY WITH OWNER, ENGINEER, AND APPLICABLE TRADE CONTRACTOR.

10 E-030 SCALE: NTS — TYPICAL MOUNTING STAND DETAIL

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK — JEFFREY E ROBINSON — 095896 — LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:
THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE CALL 811

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL DETAILS

REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

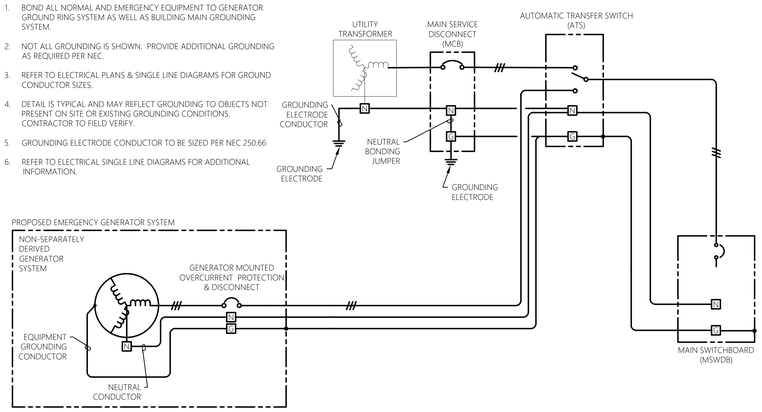
ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.
E-030

PROJECT # 18-732 PHASE #

GENERAL NOTES:

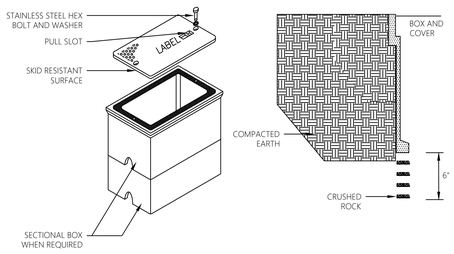
1. BOND ALL NORMAL AND EMERGENCY EQUIPMENT TO GENERATOR GROUND RING SYSTEM AS WELL AS BUILDING MAIN GROUNDING SYSTEM.
2. NOT ALL GROUNDING IS SHOWN. PROVIDE ADDITIONAL GROUNDING AS REQUIRED PER NEC.
3. REFER TO ELECTRICAL PLANS & SINGLE LINE DIAGRAMS FOR GROUND CONDUCTOR SIZES.
4. DETAIL IS TYPICAL AND MAY REFLECT GROUNDING TO OBJECTS NOT PRESENT ON SITE OR EXISTING GROUNDING CONDITIONS. CONTRACTOR TO FIELD VERIFY.
5. GROUNDING ELECTRODE CONDUCTOR TO BE SIZED PER NEC 250.66
6. REFER TO ELECTRICAL SINGLE LINE DIAGRAMS FOR ADDITIONAL INFORMATION.



1 E-031 SCALE: NTS — TYPICAL NON-SEPERATELY DERIVED GENERATOR SYSTEM DETAIL

GENERAL NOTES:

1. CONSTRUCTION SHALL BE A POLYMER CONCRETE.
2. HAND HOLE TO HAVE A MINIMUM TIER 15 RATING.
3. ALL HARDWARE SHALL BE STAINLESS STEEL. PROVIDE SLEEVES AND SEALS FOR ALL PENETRATIONS.
4. BOTTOM SHALL BE OPEN FOR DRAINAGE.
5. PROVIDE LOGO ON COVER 'ELECTRIC', OR 'COMMUNICATIONS'. COVER TO BE SECURED WITH STAINLESS STEEL PENTA BOLTS AND BE GASKETED.
6. HAND HOLES MUST MEET ALL APPLICABLE REQUIREMENTS OF ANSI/SCTE 77-2013 PER TIER 15 (2)
7. PROVIDE HAND HOLE AS 60" x 60" x 60". HAND HOLES SHALL MEET MINIMUM SIZE REQUIREMENTS IN ACCORDANCE WITH NEC ARTICLE 314.30. CONTRACTOR TO FIELD VERIFY.
8. PROVIDE AS SPLIT HANDHOLE SEPARATING VOLTAGE, OR SIGNAL TYPE.
9. HAND HOLE TO BE AS MANUFACTURED BY QUAZITE (HUBBELL POWER SYSTEMS), OLDCASTLE, OR APPROVED EQUAL.
10. PROVIDE HEAVY DUTY FIBERGLASS CABLE RACKS AND SUPPORTS ON EACH INTERIOR WALL OF HANDHOLE.

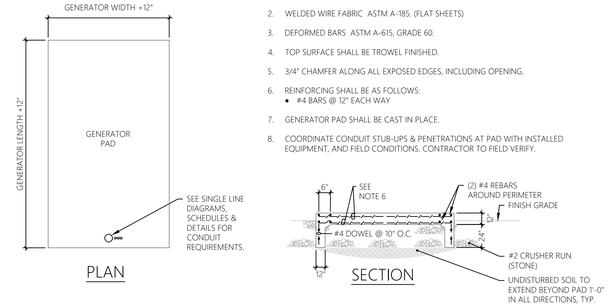


2 E-031 SCALE: NTS — TYPICAL HANDHOLE DETAIL

REFER TO SHEET C-142 FOR CONCRETE BOLLARD DETAIL 2

GENERAL NOTES:

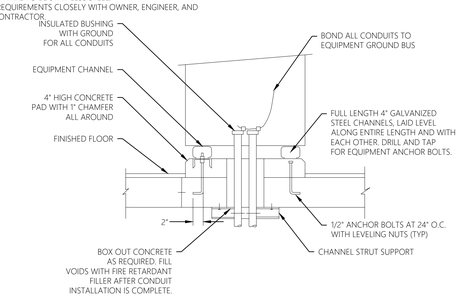
1. CONCRETE 4,000 PSI @ 28 DAYS.
2. WELDED WIRE FABRIC ASTM A-185. (FLAT SHEETS)
3. DEFORMED BARS ASTM A-615, GRADE 60.
4. TOP SURFACE SHALL BE TROWEL FINISHED.
5. 3/4" CHAMFER ALONG ALL EXPOSED EDGES, INCLUDING OPENING.
6. REINFORCING SHALL BE AS FOLLOWS:
   - #4 BARS @ 12" EACH WAY
7. GENERATOR PAD SHALL BE CAST IN PLACE.
8. COORDINATE CONDUIT STUB-UPS & PENETRATIONS AT PAD WITH INSTALLED EQUIPMENT, AND FIELD CONDITIONS. CONTRACTOR TO FIELD VERIFY.



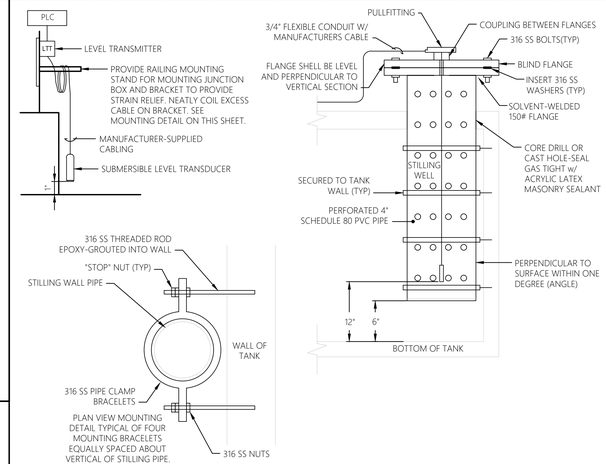
4 E-031 SCALE: NTS — TYPICAL GENERATOR PAD DETAIL

GENERAL NOTES:

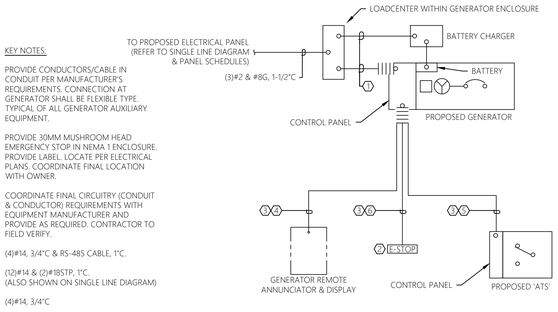
1. BACK PAINT METALS IN CONTACT WITH CONCRETE WITH 5 MILS OF TNEMEC SERIES 66-GRAY, HIGH BUILD EPOXOLINE, DUPONT 25P EPOXY, OR EQUAL.
2. ALL MOUNTING HARDWARE TO BE STAINLESS STEEL.
3. COORDINATE FINAL REQUIREMENTS CLOSELY WITH OWNER, ENGINEER, AND APPLICABLE TRADE CONTRACTOR.



5 E-031 SCALE: NTS — TYPICAL MOTOR CONTROL CENTER EQUIPMENT PAD DETAIL



6 E-031 SCALE: NTS — SUBMERSIBLE LEVEL TRANSDUCER WIRING DETAIL



KEY NOTES:

1. PROVIDE CONDUCTORS/CABLE IN CONDUIT PER MANUFACTURER'S REQUIREMENTS. CONNECTION AT GENERATOR SHALL BE FLEXIBLE TYPE. TYPICAL OF ALL GENERATOR AUXILIARY EQUIPMENT.
2. PROVIDE 30MM MUSHROOM HEAD EMERGENCY STOP IN NEMA 1 ENCLOSURE. PROVIDE LABEL. LOCATE PER ELECTRICAL PLANS. COORDINATE FINAL LOCATION WITH OWNER.
3. COORDINATE FINAL CIRCUITRY (CONDUIT & CONDUCTOR) REQUIREMENTS WITH EQUIPMENT MANUFACTURER AND PROVIDE AS REQUIRED. CONTRACTOR TO FIELD VERIFY.
4. (4)#14, 3/4"C & RS-485 CABLE, 1"C.
5. (12)#14 & (2)#18STP, 1"C. (ALSO SHOWN ON SINGLE LINE DIAGRAM)
6. (4)#14, 3/4"C

TYPICAL GENERATOR CONTROL AND AUXILIARY EQUIPMENT RISER DIAGRAM

7 E-031 SCALE: NTS

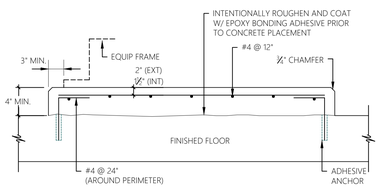
GENERAL NOTES:

1. BACKBOARD TO BE FABRICATED/CONSTRUCTED OF STEEL MATERIALS.
2. ALL DISCONNECTS, PANELBOARDS, AND ELECTRICAL EQUIPMENT SHALL BE LOCATED FIVE (5) FEET ABOVE GRADE (ON CENTER) AND COMPLY WITH NEC REQUIREMENTS, UNLESS OTHERWISE INDICATED.
3. CONDUIT AND ELECTRICAL EQUIPMENT TO BE SUPPORTED/BRACED (UNISTRUT CROSS MEMBER) AT MINIMUM EVERY 12".
4. NOT ALL ELECTRICAL EQUIPMENT MOUNTED TO BACKBOARD MAY BE SHOWN. DETAIL IS DIAGRAMMATIC IN NATURE. SIZE AND ARRANGE PANELS AND ELECTRICAL EQUIPMENT TO FIT BACKBOARD. UTILIZE BOTH SIDES OF ELECTRICAL BACKBOARD AS REQUIRED.
5. ALL REQUIREMENTS TO BE PER NEC.
6. QUANTITY OF CONDUITS/CIRCUITS SHOWN IN DETAIL IS DIAGRAMMATIC IN NATURE. REFER TO ELECTRICAL SITE PLAN, SCHEDULES, AND SINGLE LINE DIAGRAMS FOR SPECIFIC QUANTITIES.
7. COORDINATE ALL ELECTRICAL EQUIPMENT MOUNTED TO ELECTRICAL BACKBOARD AND FINAL LOCATION WITH THE OWNER/ENGINEER.
8. CONTRACTOR TO PROVIDE NAMEPLATE FOR ALL EQUIPMENT MOUNTED TO BACKBOARD.
9. ALL EQUIPMENT TO BE RATED NEMA 4X AND PAD LOCKABLE.

CONTRACTOR TO SIZE AND ARRANGE ELECTRICAL EQUIPMENT TO FIT BACKBOARD.

GENERAL NOTES:

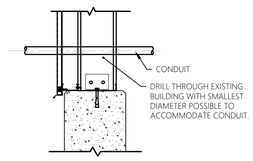
1. CONCRETE 4,000 PSI @ 28 DAYS.
2. PROVIDE AS 4" MIN. PAD UNLESS OTHERWISE NOTED.
3. DEFORMED BARS ASTM A-615, GRADE 60.
4. TOP SURFACE SHALL BE TROWEL FINISHED.
5. 3/4" CHAMFER ALONG ALL EXPOSED EDGES, INCLUDING OPENING.
6. REINFORCING SHALL BE AS FOLLOWS:
   - #4 BARS @ 12" EACH WAY
7. COORDINATE CONDUIT PENETRATIONS AT PAD WITH INSTALLED EQUIPMENT, AND FIELD CONDITIONS. CONTRACTOR TO FIELD VERIFY.



8 E-031 SCALE: NTS — TYPICAL INTERIOR EQUIPMENT PAD DETAIL

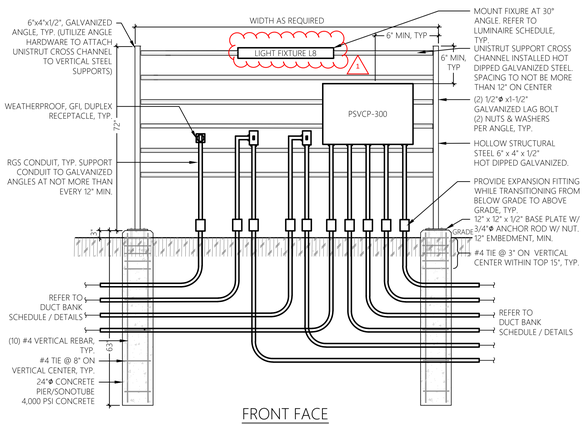
GENERAL NOTES:

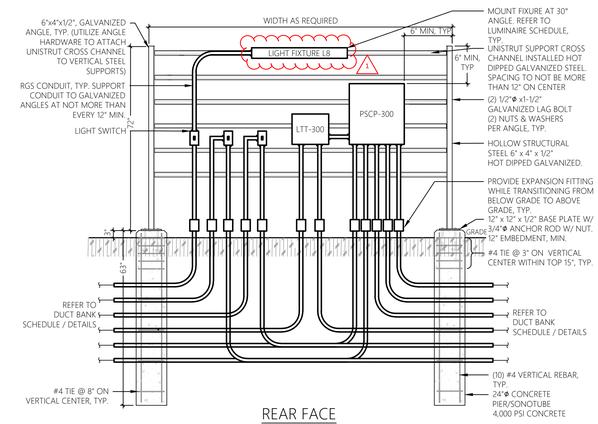
1. WHEN BORING THROUGH BUILDING, USE SMALLEST DIAMETER POSSIBLE TO ACCOMMODATE CONDUIT.
2. SEAL PENETRATIONS WITH POLYURETHANE CAULK. PATCH & MATCH DISTURBED SURFACES.



TYPICAL METAL BUILDING CONDUIT PENETRATION DETAIL

9 E-031 SCALE: NTS





10 E-031 SCALE: NTS — SLUDGE CONTROL ELECTRICAL BACKBOARD DETAIL

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BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK — JEFFREY E ROBINSON — 095896 — LICENSED PROFESSIONAL ENGINEER

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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL DETAILS

REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.

E-031

PROJECT # 18-732 PHASE #

DUCT BANK SCHEDULE (1 OF 4)

DESIGNATION [DB-XX]	TYPE	ORIGIN	DESTINATION	CIRCUIT				REMARKS
				CONDUCTORS/CONDUIT	ORIGIN	DESTINATION	POWER/CONTROL	
DB-01	REINFORCED CONCRETE	PRIMARY METERING RISER POLE	PAD-MOUNTED TRANSFORMER	(4)#4/0, 4"C 15KV PRIMARY ALUMINUM FEEDER	PRIMARY METERING RISER POLE	PAD-MOUNTED TRANSFORMER	POWER	
				4"C. SPARE	PRIMARY METERING RISER POLE	PAD-MOUNTED TRANSFORMER	POWER	2
				4"C. SPARE	PRIMARY METERING RISER POLE	MBR BUILDING DATA RACK	CONTROL	
DB-02	REINFORCED CONCRETE	PAD-MOUNTED TRANSFORMER	MBR BUILDING	EIGHT (8) SETS OF [(4)#500, 4"C.]	PAD-MOUNTED TRANSFORMER	MAIN CIRCUIT BREAKER MCB	POWER	
				4"C. SPARE	PAD-MOUNTED TRANSFORMER	ADJACENT TO MCB	POWER	2
				4"C. SPARE	PRIMARY METERING RISER POLE	MBR BUILDING DATA RACK	CONTROL	
DB-03	REINFORCED CONCRETE	MBR BUILDING	EMERGENCY GENERATOR #1	4 SETS OF [(4)#500 & #4/0G, 4" C]	AUTOMATIC TRANSFER SWITCH ATS	EMERGENCY GENERATOR #1	POWER	
				(12)#14 & (2)#18STP, 1"C.	AUTOMATIC TRANSFER SWITCH ATS	EMERGENCY GENERATOR #1	CONTROL	
				(3)#2 & #8G, 1-1/2"C.	PANEL LVP1	EMERGENCY GENERATOR #1 LOAD CENTER	POWER	2
				BELDEN 9729, 1"C. (4)#14, 3/4"C.	REMOTE ANNUNCIATOR & DISPLAY	EMERGENCY GENERATOR #1	CONTROL	
				(4)#14, 3/4"C.	EMERGENCY STOP	EMERGENCY GENERATOR #1	CONTROL	
				4"C. SPARE	ADJACENT TO ATS	EMERGENCY GENERATOR #1	POWER	
DB-04	REINFORCED CONCRETE	MBR BUILDING	EMERGENCY GENERATOR #2	4 SETS OF [(4)#500 & #4/0G, 4" C]	AUTOMATIC TRANSFER SWITCH ATS	EMERGENCY GENERATOR #2	POWER	
				(12)#14 & (2)#18STP, 1"C.	AUTOMATIC TRANSFER SWITCH ATS	EMERGENCY GENERATOR #2	CONTROL	
				(3)#2 & #8G, 1-1/2"C.	PANEL LVP1	EMERGENCY GENERATOR #2 LOAD CENTER	POWER	2
				BELDEN 9729, 1"C. (4)#14, 3/4"C.	REMOTE ANNUNCIATOR & DISPLAY	EMERGENCY GENERATOR #2	CONTROL	
				(4)#14, 3/4"C.	EMERGENCY STOP	EMERGENCY GENERATOR #2	CONTROL	
				4"C. SPARE	ADJACENT TO ATS	EMERGENCY GENERATOR #2	POWER	
DB-05	REINFORCED CONCRETE	EMERGENCY GENERATOR #1	EMERGENCY GENERATOR #2	(12)#14 & (2)#18STP, 1"C.	EMERGENCY GENERATOR #1	EMERGENCY GENERATOR #2	CONTROL	
				BELDEN 9729, 1"C.	EMERGENCY GENERATOR #1	EMERGENCY GENERATOR #2	CONTROL	2
				4"C. SPARE	EMERGENCY GENERATOR #1	EMERGENCY GENERATOR #2	CONTROL	
DB-06	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	CONTROL BUILDING	8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	R I/O-1	MCP	CONTROL	
				4" C. SPARE	ADJACENT TO R I/O-1	ADJACENT TO MCP	CONTROL	
				8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	DATA RACK	DATA RACK	CONTROL	1 2
				(4)#4/0 & #4G, 4"C.	SWBD	HVP2	POWER	
				4" C. SPARE	ADJACENT TO SWBD	ADJACENT TO HVP2	POWER	
DB-07	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	HEADWORKS BUILDING	8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	R I/O-1	R I/O-3	CONTROL	
				4" C. SPARE	ADJACENT TO R I/O-1	ADJACENT TO R I/O-3	CONTROL	
				8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	DATA RACK	DATA RACK	CONTROL	1 2
				(4)#4/0 & #4G, 4"C.	SWBD	HVP3	POWER	
				4" C. SPARE	ADJACENT TO SWBD	ADJACENT TO HVP3	POWER	
DB-08	SAND FILL	HEADWORKS BUILDING	INFLUENT STRUCTURE/PARSHALL FLUME	(2)#18STP & (4)#14, 1"C.	R I/O-3	PARSHALL FLUME FLOW METER	CONTROL	
				(2)#10 & #10G, 1"C.	LVP3	PARSHALL FLUME FLOW METER	POWER	2
				2" C. SPARE	ADJACENT TO R I/O-3	ADJACENT TO PARSHALL FLUME	CONTROL	
DB-09	SAND FILL	HEADWORKS BUILDING	GRIT CHAMBER	(3)#10 & #10G, 1"C.	DISCONNECT SWITCH	GRIT PROPELLER DRIVE GRTPD-01	POWER	
				(4)#14, 3/4"C.	DISCONNECT SWITCH	GRIT PROPELLER DRIVE GRTPD-01	CONTROL	
				(3)#10 & #10G, 1"C.	DISCONNECT SWITCH	GRIT PUMP GRTP-01	POWER	
				(4)#14, 3/4"C.	DISCONNECT SWITCH	GRIT PUMP GRTP-01	CONTROL	
				(4)#14, 3/4"C.	GRIT CONTROL PANEL GRT-CP-01	SOLENOID VALVE SOL-203	CONTROL	2 3
				(24)#14, 1"C.	GRIT CONTROL PANEL GRT-CP-01	VACUUM PRIME CONTROL PANEL	CONTROL	
				(3)#10 & #10G, 1"C.	LVP3	VACUUM PRIME CONTROL PANEL	POWER	
				2" C. SPARE	ADJACENT TO GRT-CP-01	GRIT CHAMBER	CONTROL	
DB-10	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	PRIMARY SETTLING TANK NO. 1	(4)#10 & #10G, 1"C.	HVP1	PC-CP-1	POWER	
				(4)#10 & #10G, 1"C.	HVP1	SP-CP-1	POWER	
				2" C. SPARE	ADJACENT TO HVP1	ADJACENT TO PC-CP-1	POWER	
				(12)#14 & (2)#18STP, 1"C.	R I/O-1	PC-CP-1	CONTROL	1 2 3
				(12)#14 & (2)#18STP, 1"C.	R I/O-1	SP-CP-1	CONTROL	
				2" C. SPARE	ADJACENT TO R I/O-1	ADJACENT TO PC-CP-1	CONTROL	
				(2)#10 & #10G, 1"C.	LVP1	RECEPTACLES	POWER	
				(2)#10 & #10G, 1"C.	LVP1	LIGHTS	POWER	
DB-11 (CONTINUED ON RIGHT)	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	PRIMARY SETTLING TANK NO. 2	(4)#10 & #10G, 1"C.	HVP1	PC-CP-2	POWER	
				(4)#10 & #10G, 1"C.	HVP1	SP-CP-2	POWER	
				2" C. SPARE	ADJACENT TO HVP1	ADJACENT TO PC-CP-2	POWER	1 2 3
				(12)#14 & (2)#18STP, 1"C.	R I/O-1	PC-CP-2	CONTROL	
				(12)#14 & (2)#18STP, 1"C.	R I/O-1	SP-CP-2	CONTROL	2

DUCT BANK SCHEDULE (2 OF 4)

DESIGNATION [DB-XX]	TYPE	ORIGIN	DESTINATION	CIRCUIT				REMARKS
				CONDUCTORS/CONDUIT	ORIGIN	DESTINATION	POWER/CONTROL	
DB-11 (CONTINUED)	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	PRIMARY SETTLING TANK NO. 2	2" C. SPARE	ADJACENT TO R I/O-1	ADJACENT TO PC-CP-2	CONTROL	
				(2)#10 & #10G, 1"C.	LVP1	RECEPTACLES	POWER	1 2 3
				(2)#10 & #10G, 1"C.	LVP1	LIGHTS	POWER	
DB-12	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	PRIMARY SETTLING TANK NO. 3	(4)#10 & #10G, 1"C.	HVP1	PC-CP-3	POWER	
				(4)#10 & #10G, 1"C.	HVP1	SP-CP-3	POWER	
				2" C. SPARE	ADJACENT TO HVP1	ADJACENT TO PC-CP-3	POWER	
				(12)#14 & (2)#18STP, 1"C.	R I/O-1	PC-CP-3	CONTROL	1 2 3
				(12)#14 & (2)#18STP, 1"C.	R I/O-1	SP-CP-3	CONTROL	
				2" C. SPARE	ADJACENT TO R I/O-1	ADJACENT TO PC-CP-3	CONTROL	
				(2)#10 & #10G, 1"C.	LVP1	RECEPTACLES	POWER	
				(2)#10 & #10G, 1"C.	LVP1	LIGHTS	POWER	
DB-13	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	PRIMARY SETTLING TANK NO. 4	(4)#10 & #10G, 1"C.	HVP1	PC-CP-4	POWER	
				(4)#10 & #10G, 1"C.	HVP1	SP-CP-4	POWER	
				2" C. SPARE	ADJACENT TO HVP1	ADJACENT TO PC-CP-4	POWER	
				(12)#14 & (2)#18STP, 1"C.	R I/O-1	PC-CP-4	CONTROL	1 2 3
				(12)#14 & (2)#18STP, 1"C.	R I/O-1	SP-CP-4	CONTROL	
				2" C. SPARE	ADJACENT TO R I/O-1	ADJACENT TO PC-CP-4	CONTROL	
				(2)#10 & #10G, 1"C.	LVP1	RECEPTACLES	POWER	
				(2)#10 & #10G, 1"C.	LVP1	LIGHTS	POWER	
DB-14	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	ELECTRICAL BACKBOARD	(3)#8 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE VALVE CONTROL PANEL	POWER	
				(48)#14 & (8)#18STP, 2"C. CAT 6 CABLE, 1"C.	R I/O-1	PRIMARY SLUDGE VALVE CONTROL PANEL	CONTROL	
				(2)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE CONTROL VALVE VAULT LIGHT	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE CONTROL VALVE VAULT SUMP PUMP	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE CONTROL VALVE VAULT EXHAUST FAN	POWER	
				(3)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE CONTROL VALVE VAULT UNIT HEATER	POWER	
				(4)#14 & (2)#18STP, 1"C.	R I/O-1	SLUDGE CONTROL VALVE VAULT FLOOD DETECTION	CONTROL	
				(2)#10 & #10G, 1"C.	PANEL HVP1	SLUDGE VALVE PIT SUMP PUMP	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE VALVE PIT LIGHT	POWER	
				(4)#14 & (2)#18STP, 1"C.	R I/O-1	SLUDGE VALVE PIT FLOOD DETECTION	CONTROL	
				(4)#6 & #10G, 2"C.	PANEL HVP1	PRIMARY SLUDGE PUMP CONTROL PANEL	POWER	
				(12)#14 & (2)#18STP, 1"C. CAT 6 CABLE, 1"C.	R I/O-1	PRIMARY SLUDGE PUMP CONTROL PANEL	CONTROL	1 2 3
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT LIGHT	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT SUMP PUMP	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT EXHAUST FAN	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT SRV	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT DEHUMIDIFIER	POWER	
				(3)#10 & #10G, 1"C.	PANEL HVP1	PRIMARY SLUDGE PIT UNIT HEATER	POWER	
				(4)#14 & (2)#18STP, 1"C.	R I/O-1	PRIMARY SLUDGE PIT FLOOD DETECTION	CONTROL	
				(2)#10 & #10G, 1"C.	PANEL LVP1	ELECTRICAL BACKBOARD LIGHT	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	ELECTRICAL BACKBOARD RECEPTACLE	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	LEVEL TRANSDUCER TRANSMITTER	POWER	
				2"C. SPARE	ADJACENT TO LVP1	ELECTRICAL BACKBOARD	POWER	
				2"C. SPARE	ADJACENT TO R I/O-1	ELECTRICAL BACKBOARD	CONTROL	
DB-15	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	GARAGE	8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	DATA RACK	DATA RACK	CONTROL	
				(4)#4/0 & #4G, 4"C.	SWBD	HVP7	POWER	1 2
				4" C. SPARE	ADJACENT TO SWBD	ADJACENT TO HVP7	POWER	
DB-16	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	DEWATERING BUILDING	8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	R I/O-1	R I/O-2	CONTROL	
				4" C. SPARE	ADJACENT TO R I/O-1	ADJACENT TO R I/O-2	CONTROL	
				8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	DATA RACK	DATA RACK	CONTROL	1 2
				TWO (2) SETS OF [(4)#4/0 & #2G, 4"C.]	SWBD	HVP4	POWER	
				4" C. SPARE	ADJACENT TO SWBD	ADJACENT TO HVP4	POWER	2

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BID ADDENDUM

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STATE OF NEW YORK
JEFFREY E. ROBINSON
095896
LICENSED PROFESSIONAL ENGINEER

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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL SCHEDULES

REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.

E-040

PROJECT # 18-732 PHASE #

DUCT BANK SCHEDULE (3 OF 4)

DESIGNATION DB-XX	TYPE	ORIGIN	DESTINATION	CIRCUIT				REMARKS
				CONDUCTORS/CONDUIT	ORIGIN	DESTINATION	POWER/CONTROL	
DB-17	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	DISINFECTION BUILDING	8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	R I/O-1	DBSP	CONTROL	
				4" C. SPARE	ADJACENT TO R I/O-1	ADJACENT TO DBSP	CONTROL	
				TWO (2) SETS OF [(4)#4/0 & #2G, 4"C.]	SWBD	HVP8	POWER	1 2
				4" C. SPARE	ADJACENT TO SWBD	ADJACENT TO HVP8	POWER	
DB-18	SAND FILL	DISINFECTION BUILDING	DISINFECTION TANK	(2)#10 & #10G, 1"C.	PANEL PP1	BLOWER PLATFORM LIGHTS	POWER	
				(2)#10 & #10G, 1"C.	PANEL PP1	BLOWER PLATFORM RECEPTACLES	POWER	
				(2)#10 & #10G, 1"C.	PANEL PP1	BACK PULSE PUMP STATION RECEPTACLES	POWER	
				(2)#10 & #10G, 1"C.	PANEL PP1	DISSOLVED OXYGEN DOA-01	POWER	
				(2)#10 & #10G, 1"C.	PANEL PP1	DISSOLVED OXYGEN DOA-02	POWER	
				(2)#10 & #10G, 1"C.	PANEL PP1	ULTRASONIC TRANSMITTER UTT-02	POWER	
				(2)#10 & #10G, 1"C.	PANEL PP1	ULTRASONIC TRANSMITTER UTT-03	POWER	
				(2)#10 & #10G, 1"C.	PANEL PP1	ULTRASONIC TRANSMITTER UTT-04	POWER	
				(2)#10 & #10G, 1"C.	PANEL PP1	BACK PULSE TANK LEVEL TRANSDUCER	POWER	
				CAT 6 CABLE, 1"C. (4)#14, 1"C. & (4)#18STP, 1"C.	DISINFECTION BUILDING SCADA PANEL	DISSOLVED OXYGEN DOA-01	CONTROL	
				CAT 6 CABLE, 1"C. (4)#14, 1"C. & (4)#18STP, 1"C.	DISINFECTION BUILDING SCADA PANEL	DISSOLVED OXYGEN DOA-02	CONTROL	
				CAT 6 CABLE, 1"C. (4)#14, 1"C. & (4)#18STP, 1"C.	DISINFECTION BUILDING SCADA PANEL	ULTRASONIC TRANSMITTER UTT-02	CONTROL	
				CAT 6 CABLE, 1"C. (4)#14, 1"C. & (4)#18STP, 1"C.	DISINFECTION BUILDING SCADA PANEL	ULTRASONIC TRANSMITTER UTT-03	CONTROL	
				CAT 6 CABLE, 1"C. (4)#14, 1"C. & (4)#18STP, 1"C.	DISINFECTION BUILDING SCADA PANEL	ULTRASONIC TRANSMITTER UTT-04	CONTROL	
				CAT 6 CABLE, 1"C. (4)#14, 1"C. & (4)#18STP, 1"C.	DISINFECTION BUILDING SCADA PANEL	BACK PULSE TANK LEVEL TRANSDUCER	CONTROL	
				CAT 6 CABLE, 1"C. (4)#14, 1"C. & (4)#18STP, 1"C.	DISINFECTION BUILDING SCADA PANEL	PLANT WATER CONTROL PANEL PWCP-600	CONTROL	
				(3)#6 & #10G, 2"C.	VFD-BL1	BLOWER NO. 1	POWER	
				(4)#14, 3/4"C.	VFD-BL1	BLOWER NO. 1 DISCONNECT	CONTROL	2 3
				(12)#14 & (4)#18STP, 1"C.	VFD-BL1	BLOWER NO. 1	CONTROL	
				(3)#6 & #10G, 2"C.	VFD-BL2	BLOWER NO. 2	POWER	
				(4)#14, 3/4"C.	VFD-BL2	BLOWER NO. 2 DISCONNECT	CONTROL	
				(12)#14 & (4)#18STP, 1"C.	VFD-BL2	BLOWER NO. 2	CONTROL	
				(3)#1/0 & #6G, 3"C.	VFD-BP1	BACK PULSE PUMP NO. 1	POWER	
				(4)#14, 3/4"C.	VFD-BP1	BACK PULSE PUMP NO. 1 DISCONNECT	CONTROL	
				(12)#14 & (4)#18STP, 1"C.	VFD-BP1	BACK PULSE PUMP NO. 1	CONTROL	
				(12)#14 & (2)#18STP, 1"C.	VFD-BP1	BACK PULSE PUMP NO. 1 LOCAL CONTROL STATION	CONTROL	
				(4)#14, 3/4"C.	VFD-BP1	BACK PULSE PUMP NO. 1 PRESSURE SWITCH	CONTROL	
				(3)#1/0 & #6G, 3"C.	VFD-BP2	BACK PULSE PUMP NO. 2	POWER	
				(4)#14, 3/4"C.	VFD-BP2	BACK PULSE PUMP NO. 2 DISCONNECT	CONTROL	
				(12)#14 & (4)#18STP, 1"C.	VFD-BP2	BACK PULSE PUMP NO. 2	CONTROL	
				(12)#14 & (2)#18STP, 1"C.	VFD-BP2	BACK PULSE PUMP NO. 2 LOCAL CONTROL STATION	CONTROL	
				(4)#14, 3/4"C.	VFD-BP2	BACK PULSE PUMP NO. 2 PRESSURE SWITCH	CONTROL	
				(4)#4/0 & #4G, 4"C.	PANEL HVP8	PLANT WATER CONTROL PANEL PWCP-600	POWER	
				4"C. SPARE	ADJACENT TO HVP8	DISINFECTION TANK	POWER	
				4"C. SPARE	ADJACENT TO DBSP	DISINFECTION TANK	CONTROL	
DB-19	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	SITE LIGHTING	(2)#8 & #10G, 1"C.	PANEL HVP1	POLE-MOUNTED SITE LIGHTS	POWER	1
DB-20 (CONTINUED ON RIGHT)	SAND FILL/ REINFORCED CONCRETE	ELECTRICAL BACKBOARD	SLUDGE CONTROL VALVE VAULT	(2)#10 & #10G, 1"C.	PRIMARY SLUDGE VALVE CONTROL PANEL	PRIMARY SLUDGE VALVE NO. 1	POWER	
				(12)#14 & (2)#18STP, 1"C. CAT 6 CABLE, 1"C.	PRIMARY SLUDGE VALVE CONTROL PANEL	PRIMARY SLUDGE VALVE NO. 1	CONTROL	
				(2)#10 & #10G, 1"C.	PRIMARY SLUDGE VALVE CONTROL PANEL	PRIMARY SLUDGE VALVE NO. 2	POWER	
				(12)#14 & (2)#18STP, 1"C. CAT 6 CABLE, 1"C.	PRIMARY SLUDGE VALVE CONTROL PANEL	PRIMARY SLUDGE VALVE NO. 2	CONTROL	
				(2)#10 & #10G, 1"C.	PRIMARY SLUDGE VALVE CONTROL PANEL	PRIMARY SLUDGE VALVE NO. 3	POWER	
				(12)#14 & (2)#18STP, 1"C. CAT 6 CABLE, 1"C.	PRIMARY SLUDGE VALVE CONTROL PANEL	PRIMARY SLUDGE VALVE NO. 3	CONTROL	
				(2)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE CONTROL VALVE VAULT LIGHT	POWER	1 2 3
				(2)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE CONTROL VALVE VAULT SUMP PUMP	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE CONTROL VALVE VAULT EXHAUST FAN	POWER	
				(3)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE CONTROL VALVE VAULT UNIT HEATER	POWER	
				(4)#14 & (2)#18STP, 1"C.	R I/O-1	SLUDGE CONTROL VALVE VAULT FLOOD DETECTION	CONTROL	
				2"C. SPARE	ELECTRICAL BACKBOARD	SLUDGE CONTROL VALVE VAULT	POWER	
				2"C. SPARE	ELECTRICAL BACKBOARD	SLUDGE CONTROL VALVE VAULT	CONTROL	

DUCT BANK SCHEDULE (4 OF 4)

DESIGNATION DB-XX	TYPE	ORIGIN	DESTINATION	CIRCUIT				REMARKS
				CONDUCTORS/CONDUIT	ORIGIN	DESTINATION	POWER/CONTROL	
DB-21	SAND FILL/ REINFORCED CONCRETE	MBR BUILDING	ATAD BUILDING	8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	R I/O-1	R I/O-4	CONTROL	
				4" C. SPARE	ADJACENT TO R I/O-1	ADJACENT TO R I/O-4	CONTROL	
				8STRAND MULTIMODE (50 MICRON CORE / 125 MICRON CLADDING DIAMETER), FIBER OPTIC CABLE, 4"C	DATA RACK	DATA RACK	CONTROL	1 2
				FOUR (4) SETS OF [(4)#500 & #4/0G, 4"C.]	SWBD	MCC2	POWER	
				4" C. SPARE	ADJACENT TO SWBD	ADJACENT TO MCC2	POWER	
DB-22	SAND FILL/ REINFORCED CONCRETE	CONTROL BUILDING	MOTORIZED ENTRANCE GATE	(3)#6 & #10G, 1"C.	PANEL LVP2	MOTORIZED ENTRANCE GATE	POWER	
				CAT 6 CABLE, 1"C.	DATA RACK	MOTORIZED ENTRANCE GATE	CONTROL	1 2
				2"C. SPARE	ADJACENT TO DATA RACK	MOTORIZED ENTRANCE GATE	CONTROL	
DB-23	REINFORCED CONCRETE	ATAD BUILDING	FILTRATE PUMP WET WELL	(3)#10 & #10G, 1"C.	FILTRATE PUMP CONTROL PANEL	FILTRATE PUMP FP-400	POWER	
				(6)#14, 3/4"C.	FILTRATE PUMP CONTROL PANEL	FILTRATE PUMP FP-400	CONTROL	
				(3)#10 & #10G, 1"C.	FILTRATE PUMP CONTROL PANEL	FILTRATE PUMP FP-401	POWER	
				(6)#14, 3/4"C.	FILTRATE PUMP CONTROL PANEL	FILTRATE PUMP FP-401	CONTROL	
				(4)#14, 3/4"C.	FILTRATE PUMP CONTROL PANEL	FLOAT FL-400	CONTROL	2 3
				(4)#14, 3/4"C.	FILTRATE PUMP CONTROL PANEL	FLOAT FL-401	CONTROL	
				(4)#14, 3/4"C.	FILTRATE PUMP CONTROL PANEL	FLOAT FL-402	CONTROL	
				2"C. SPARE	ADJACENT TO CONTROL PANEL	FILTRATE PUMP WET WELL	POWER	
DB-24	SAND FILL/ REINFORCED CONCRETE	ELECTRICAL BACKBOARD	SLUDGE VALVE PIT	(2)#10 & #10G, 1"C.	PRIMARY SLUDGE VALVE CONTROL PANEL	PRIMARY SLUDGE VALVE NO. 4	POWER	
				(12)#14 & (2)#18STP, 1"C. CAT 6 CABLE, 1"C.	PRIMARY SLUDGE VALVE CONTROL PANEL	PRIMARY SLUDGE VALVE NO. 4	CONTROL	
				(2)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE VALVE PIT SUMP PUMP	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	SLUDGE VALVE PIT LIGHT	POWER	1 2 3
				(4)#14 & (2)#18STP, 1"C.	R I/O-1	SLUDGE VALVE PIT FLOOD DETECTION	CONTROL	
				2"C. SPARE	ELECTRICAL BACKBOARD	SLUDGE VALVE PIT	POWER	
				2"C. SPARE	ELECTRICAL BACKBOARD	SLUDGE VALVE PIT	CONTROL	
DB-25	SAND FILL	ELECTRICAL BACKBOARD	PRIMARY SLUDGE PUMP PIT	(3)#10 & #10G, 1"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	PRIMARY SLUDGE PUMP NO. 1	POWER	
				(6)#14, 1"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	PRIMARY SLUDGE PUMP NO. 1	CONTROL	
				(3)#10 & #10G, 1"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	PRIMARY SLUDGE PUMP NO. 2	POWER	
				(6)#14, 1"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	PRIMARY SLUDGE PUMP NO. 2	CONTROL	
				(4)#14, 3/4"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	PRESSURE SWITCH PS-SP-01	CONTROL	
				(4)#14, 3/4"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	PRESSURE SWITCH PS-SP-02	CONTROL	
				(4)#14, 3/4"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	BACKUP FLOAT FLS-300	CONTROL	
				(4)#14, 3/4"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	BACKUP FLOAT FLS-301	CONTROL	
				(4)#14, 3/4"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	BACKUP FLOAT FLS-302	CONTROL	
				(4)#14, 3/4"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	BACKUP FLOAT FLS-303	CONTROL	2 3
				(2)#18STP, 3/4"C.	PRIMARY SLUDGE PUMP CONTROL PANEL	LEVEL TRANSDUCER LT-300	CONTROL	
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT LIGHT	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT SUMP PUMP	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT EXHAUST FAN	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT SRV	POWER	
				(2)#10 & #10G, 1"C.	PANEL LVP1	PRIMARY SLUDGE PIT DEHUMIDIFIER	POWER	
				(3)#10 & #10G, 1"C.	PANEL HVP1	PRIMARY SLUDGE PIT UNIT HEATER	POWER	
				(4)#14 & (2)#18STP, 1"C.	R I/O-1	PRIMARY SLUDGE PIT FLOOD DETECTION	CONTROL	
				2"C. SPARE	ELECTRICAL BACKBOARD	PRIMARY SLUDGE PIT	POWER	
				2"C. SPARE	ELECTRICAL BACKBOARD	PRIMARY SLUDGE PIT	CONTROL	
DB-26	SAND FILL / REINFORCED CONCRETE	ATAD BUILDING	DISINFECTION TANK	(3)#6 & #10G, 2"C.	MCC2	COOLING WATER PUMP NO. 1	POWER	
				(8)#14, 1"C.	MCC2	COOLING WATER PUMP NO. 1	CONTROL	
				(4)#14, 3/4"C.	MCC2	FLOAT SWITCH FLS-601	CONTROL	
				(3)#6 & #10G, 2"C.	MCC2	COOLING WATER PUMP NO. 1	POWER	1 2 3
				(8)#14, 1"C.	MCC2	COOLING WATER PUMP NO. 1	CONTROL	
				(4)#14, 3/4"C.	MCC2	FLOAT SWITCH FLS-602	CONTROL	
				2"C. SPARE	ADJACENT TO MCC2	DISINFECTION TANK	POWER	
				2"C. SPARE	ADJACENT TO MCC2	DISINFECTION TANK	CONTROL	

GENERAL SCHEDULE NOTES:

1. VERIFY CIRCUIT REQUIREMENTS WITH APPLICABLE EQUIPMENT MANUFACTURERS. PROVIDE CONDUCTORS AND CONDUIT AS REQUIRED.
2. COORDINATE DUCT BANK LOCATIONS AND INSTALLATIONS WITH EXISTING AND PROPOSED STRUCTURES, EQUIPMENT, PIPING SYSTEMS, AND WITH OWNER / ENGINEER.
3. REFER TO THE TYPICAL DUCT BANK DETAILS FOR ADDITIONAL REQUIREMENTS.
4. REFER TO THE ELECTRICAL SITE PLANS FOR GENERAL LOCATIONS, ROUTING AND ADDITIONAL INFORMATION.
5. REFER TO THE ELECTRICAL SINGLE LINE DIAGRAMS AND RISER DIAGRAMS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
6. CONTRACTOR RESPONSIBLE FOR ALL ASPHALT REPAIR (IF ANY). COORDINATE FINAL REQUIREMENTS WITH THE OWNER AND ENGINEER.
7. CONTRACTOR TO CLOSELY COORDINATE FINAL DUCT BANK REQUIREMENTS WITH OWNER / ENGINEER AND SHARE A COMMON TRENCH WHERE FEASIBLE/PRACTICAL. WHERE A COMMON TRENCH BETWEEN UTILITIES IS USED CONTRACTOR TO MAINTAIN NESC SEPARATION BETWEEN UTILITIES AT ALL TIMES.
8. REFER TO ELECTRICAL SITE PLAN FOR PROPOSED HAND HOLE LOCATIONS (IF ANY). WHERE HAND HOLES ARE REQUIRED, LOCATE IN GRASSY AREAS NOT SUBJECT TO VEHICLE LOADING. REFER TO ELECTRICAL SINGLE LINE DIAGRAMS, RISER DIAGRAMS, SPECIFICATIONS, & DETAILS FOR ADDITIONAL INFORMATION. COORDINATE FINAL REQUIREMENTS WITH OVERALL SITE PLANS AND WITH OWNER / ENGINEER.
9. DUCT BANK SCHEDULES ARE NOT INTENDED TO INDICATE ALL REQUIRED UNDERGROUND CIRCUITRY, BUT RATHER A GENERAL IDEA/MAGNITUDE OF OVERALL DUCT BANK SIZE. REFER TO ELECTRICAL SINGLE LINE DIAGRAMS, RISER DIAGRAMS, DETAILS, AND FLOOR PLANS FOR ADDITIONAL INFORMATION/REQUIREMENTS.

REMARKS:

1. PROVIDE AS SAND FILLED DUCT BANK WHERE BENEATH GRASSY AREAS, OR AREAS NOT SUBJECT TO VEHICLE LOADING. PROVIDE AS REINFORCED CONCRETE DUCT BANK WHERE BENEATH PAVED AREAS, OR AREAS SUBJECT TO VEHICLE LOADING. COORDINATE FINAL REQUIREMENTS WITH THE OVERALL SITE PLANS AND WITH OWNER / ENGINEER
2. FINAL SPARE CONDUIT STUB-UP LOCATION TO BE COORDINATED WITH THE OWNER AND ENGINEER. PROVIDE PULL STRING AND CAP BOTH ENDS. CONTRACTOR TO PROVIDE LABEL FOR ALL SPARE CONDUITS INDICATING CONDUIT DESTINATION. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
3. CONTRACTOR MAY GROUP POWER CIRCUITS INTO LARGER CONDUIT AND GROUP CONTROL CIRCUITS INTO SEPARATE LARGER CONDUIT. GROUPING OF CIRCUITS INTO LARGER CONDUITS MUST COMPLY WITH NEC FILL AND DERATING REQUIREMENTS. REFER TO ELECTRICAL RISER DIAGRAMS FOR ADDITIONAL INFORMATION/REQUIREMENTS.

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JSE
JADE STONE ENGINEERING

STATE OF NEW YORK
JEFFREY E. ROBINSON
095896
LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:

THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE
CALL 811

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL SCHEDULES

REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.

E-041

PROJECT # 18-732 PHASE #

INDICATED BY ⊘ ON PLAN SHEETS

EQUIPMENT CONNECTION SCHEDULE (SHEET 1 OF 4)

SPECIFIC NOTES:

1. WHEN LOCATION IS NOT REFERENCED ON 'E' SHEETS, REFER TO ASSOCIATED CONTRACT DRAWINGS.
2. LOCATIONS SHOWN ARE GENERAL IN NATURE. COORDINATE WITH ALL TRADE CONTRACTORS PRIOR TO ROUGH-IN.

TYPES:
A: NON-FUSED
B: FUSED
M: MOTOR RATED SWITCH
R: RECEPTACLE/CORD/PLUG
N: NOT REQUIRED
C: CKT BREAKER WITHIN SIGHT

SIZES:
AF: AMPERE FRAME
NF: NON-FUSED
AT: FUSE SIZE (RK5, UON)

TYPES:
VFD: VARIABLE FREQUENCY DRIVE
CMS: COMBINATION MOTOR STARTER WITH DISCONNECT
ATL: ACROSS THE LINE, FVNR MAGNETIC STARTER
M: MOTOR RATED SWITCH - MANUAL STARTER
P: PACKAGED CONTROLLER BY MANUFACTURER
LVT: THERMOSTAT

EQUIPMENT			ELECTRICAL LOAD				POWER CONNECTION			CONTROL CONNECTION		DISCONNECT/SAFETY SWITCH		STARTER		REMARKS
EQUIPMENT TAG	EQUIPMENT TYPE	LOCATION ON PLAN	FLA	HP (KW)	V	PH	HOMERUN TO	CIRCUIT BREAKER	CONDUCTORS & CONDUIT	HOMERUN / INTERLOCK TO	CONDUCTORS & CONDUIT	DISCONNECT TYPE/SIZE	NEMA ENCLOSURE TYPE	STARTER TYPE	NEMA ENCLOSURE TYPE	
PCD-01	PRIMARY DRIVE #1	PRIMARY SETTLING TANK #1	2.1	1	480	3	PC-CP-1	REFER TO RISER DIAGRAM		PC-CP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
PCD-02	PRIMARY DRIVE #2	PRIMARY SETTLING TANK #2	2.1	1	480	3	PC-CP-2	REFER TO RISER DIAGRAM		PC-CP-2	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
PCD-03	PRIMARY DRIVE #3	PRIMARY SETTLING TANK #3	2.1	1	480	3	PC-CP-3	REFER TO RISER DIAGRAM		PC-CP-3	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
PCD-04	PRIMARY DRIVE #4	PRIMARY SETTLING TANK #4	2.1	1	480	3	PC-CP-4	REFER TO RISER DIAGRAM		PC-CP-4	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
PC-CP-1	CLARIFIER CONTROL PANEL #1	PRIMARY SETTLING TANK #1	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
PC-CP-2	CLARIFIER CONTROL PANEL #2	PRIMARY SETTLING TANK #2	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
PC-CP-3	CLARIFIER CONTROL PANEL #3	PRIMARY SETTLING TANK #3	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
PC-CP-4	CLARIFIER CONTROL PANEL #4	PRIMARY SETTLING TANK #4	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
SP-01	SCUM PUMP #1	PRIMARY SETTLING TANK #1	7.6	5	480	3	SP-CP-1	REFER TO RISER DIAGRAM		SP-CP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
SP-02	SCUM PUMP #2	PRIMARY SETTLING TANK #2	7.6	5	480	3	SP-CP-1	REFER TO RISER DIAGRAM		SP-CP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
SP-03	SCUM PUMP #3	PRIMARY SETTLING TANK #3	7.6	5	480	3	SP-CP-1	REFER TO RISER DIAGRAM		SP-CP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
SP-04	SCUM PUMP #4	PRIMARY SETTLING TANK #4	7.6	5	480	3	SP-CP-1	REFER TO RISER DIAGRAM		SP-CP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
SP-CP-1	SCUM PUMP CONTROL PANEL #1	PRIMARY SETTLING TANK #1	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
SP-CP-2	SCUM PUMP CONTROL PANEL #2	PRIMARY SETTLING TANK #2	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
SP-CP-3	SCUM PUMP CONTROL PANEL #3	PRIMARY SETTLING TANK #3	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
SP-CP-4	SCUM PUMP CONTROL PANEL #4	PRIMARY SETTLING TANK #4	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
P-SP-01	PRIMARY CLARIFIER SLUDGE PUMP #1	PRIMARY SLUDGE PUMP PIT	3	4.8	480	3	PSPCP-300	REFER TO RISER DIAGRAM		PSPCP-300	REFER TO RISER DIAGRAM	-	-	ATL	-	1
P-SP-02	PRIMARY CLARIFIER SLUDGE PUMP #2	PRIMARY SLUDGE PUMP PIT	3	4.8	480	3	PSPCP-300	REFER TO RISER DIAGRAM		PSPCP-300	REFER TO RISER DIAGRAM	-	-	ATL	-	1
PSPCP-300	PRIMARY SLUDGE PUMP CONTROL PANEL	PRIMARY SLUDGE ELECTRICAL BACKBOARD	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
PS-AV-01	PRIMARY SLUDGE VALVE #1	SLUDGE CONTROL VALVE VAULT	4.4	FRACT.	120	1	PSVCP-300	REFER TO RISER DIAGRAM		PSVCP-300	REFER TO RISER DIAGRAM	-	-	ATL	-	1
PS-AV-02	PRIMARY SLUDGE VALVE #2	SLUDGE CONTROL VALVE VAULT	4.4	FRACT.	120	1	PSVCP-300	REFER TO RISER DIAGRAM		PSVCP-300	REFER TO RISER DIAGRAM	-	-	ATL	-	1
PS-AV-03	PRIMARY SLUDGE VALVE #3	SLUDGE CONTROL VALVE VAULT	4.4	FRACT.	120	1	PSVCP-300	REFER TO RISER DIAGRAM		PSVCP-300	REFER TO RISER DIAGRAM	-	-	ATL	-	1
PS-AV-04	PRIMARY SLUDGE VALVE #4	PROPOSED SLUDGE VALVE PIT	4.4	FRACT.	120	1	PSVCP-300	REFER TO RISER DIAGRAM		PSVCP-300	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
PSVCP-300	PRIMARY SLUDGE VALVE CONTROL PANEL	PRIMARY SLUDGE ELECTRICAL BACKBOARD	-	-	120	1	LVP1	20A/1P	(2)#10 & #10G, 1"C.	R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
SP-300	SUMP PUMP	PRIMARY SLUDGE PUMP PIT	9.8	1/2	120	1	LVP1	20A/1P	(2)#10 & #10G, 1"C.	LOCAL CONTROL ONLY		R	WP	M	4X	3,4,5
SP-301	SUMP PUMP	SLUDGE CONTROL VALVE VAULT	9.8	1/2	120	1	LVP1	20A/1P	(2)#10 & #10G, 1"C.	LOCAL CONTROL ONLY		R	WP	M	4X	3,4,5
SP-302	SUMP PUMP	PROPOSED SLUDGE VALVE PIT	9.8	1/2	120	1	LVP1	20A/1P	(2)#10 & #10G, 1"C.	LOCAL CONTROL ONLY		R	WP	M	7	2,3,4,5
SP-05	SCUM PUMP #5	MBR BUILDING - SCUM PUMP AREA	7.6	5	480	3	SP-CP-5	REFER TO RISER DIAGRAM		SP-CP-5	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
SP-06	SCUM PUMP #6	MBR BUILDING - SCUM PUMP AREA	7.6	5	480	3	SP-CP-5	REFER TO RISER DIAGRAM		SP-CP-5	REFER TO RISER DIAGRAM	-	-	ATL	-	1,2
SP-CP-5	SCUM PUMP CONTROL PANEL #5	MBR BUILDING - SCUM PUMP AREA	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
20-B-201-A	MEMBRANE BLOWER #1	MBR BUILDING - BLOWER ROOM	77	60	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	-	-	VFD	-	6
20-B-201-B	MEMBRANE BLOWER #2	MBR BUILDING - BLOWER ROOM	77	60	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	-	-	VFD	-	6
20-B-201-C	MEMBRANE BLOWER #3	MBR BUILDING - BLOWER ROOM	77	60	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	-	-	VFD	-	6
20-B-201-D	MEMBRANE BLOWER #4	MBR BUILDING - BLOWER ROOM	77	60	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	-	-	VFD	-	6
20-B-201-E	MEMBRANE BLOWER #5	MBR BUILDING - BLOWER ROOM	77	60	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	-	-	VFD	-	6
20-P-501-A	RAS PUMP #1	MBR BUILDING - RAS PUMP ROOM	40	30	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
20-P-501-B	RAS PUMP #2	MBR BUILDING - RAS PUMP ROOM	40	30	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
20-P-501-C	RAS PUMP #3	MBR BUILDING - RAS PUMP ROOM	40	30	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
20-P-501-D	RAS PUMP #4	MBR BUILDING - RAS PUMP ROOM	40	30	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
16-B-401-A	PROCESS BLOWER #1	MBR BUILDING - BLOWER ROOM	180	150	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	-	-	VFD	-	6
16-B-401-B	PROCESS BLOWER #2	MBR BUILDING - BLOWER ROOM	180	150	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	-	-	VFD	-	6
16-B-401-C	PROCESS BLOWER #3	MBR BUILDING - BLOWER ROOM	180	150	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	-	-	VFD	-	6
16-MX-211-1	ANOXIC SUBMERSIBLE MIXER #1	ANOXIC ZONE #1	16	10.7	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	A (30AF/NF)	4X	ATL	-	7
16-MX-211-2	ANOXIC SUBMERSIBLE MIXER #2	ANOXIC ZONE #2	16	10.7	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	A (30AF/NF)	4X	ATL	-	7
16-MX-211-3	ANOXIC SUBMERSIBLE MIXER #3	ANOXIC ZONE #3	16	10.7	480	3	MCC1	REFER TO SINGLE LINE DIAGRAM		MCC1	REFER TO SINGLE LINE DIAGRAM	A (30AF/NF)	4X	ATL	-	7
90-AC-001-A	AIR COMPRESSOR #1	MBR BUILDING - MECHANICAL ROOM	14	10	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		MBR-CP	REFER TO RISER DIAGRAM	-	-	CMS	-	1
90-AC-001-B	AIR COMPRESSOR #2	MBR BUILDING - MECHANICAL ROOM	14	10	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		MBR-CP	REFER TO RISER DIAGRAM	-	-	CMS	-	1
90-DR-001-A	REFRIGERATED DRYER #1	MBR BUILDING - MECHANICAL ROOM	3.4	-	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5
90-DR-001-B	REFRIGERATED DRYER #2	MBR BUILDING - MECHANICAL ROOM	3.4	-	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5
15-P-301-A	NAOH METERING PUMP	MBR BUILDING - CHEMICAL SKID ROOM	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5,14
15-P-301-B	NAOH METERING PUMP	MBR BUILDING - CHEMICAL SKID ROOM	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5,14
23-P-101-A	NACLO METERING PUMP	MBR BUILDING - CHEMICAL SKID ROOM	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5,14
23-P-101-B	NACLO METERING PUMP	MBR BUILDING - CHEMICAL SKID ROOM	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5,14
23-P-301-A	CITRIC ACID METERING PUMPS	MBR BUILDING - CASSETTE LAYDOWN AREA	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5,14
23-P-301-B	CITRIC ACID METERING PUMPS	MBR BUILDING - CASSETTE LAYDOWN AREA	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5,14
20-P-321-1	TURBIDITY SAMPLING PUMPS #1	MBR BUILDING - RAS PUMP ROOM	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5
20-P-321-2	TURBIDITY SAMPLING PUMPS #2	MBR BUILDING - RAS PUMP ROOM	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5
20-P-321-3	TURBIDITY SAMPLING PUMPS #3	MBR BUILDING - RAS PUMP ROOM	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5
20-P-321-4	TURBIDITY SAMPLING PUMPS #4	MBR BUILDING - RAS PUMP ROOM	4.4	FRACTIONAL	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	R	WP	M	4X	3,4,5
CTP-01	NAOH CHEMICAL TRANSFER PUMP	MBR BUILDING - CHEMICAL SKID ROOM	9.8	0.5	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	LOCAL CONTROL ONLY		R	WP	M	4X	3,4,5,14
CTP-02	NACLO CHEMICAL TRANSFER PUMP	MBR BUILDING - CHEMICAL SKID ROOM	9.8	0.5	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	LOCAL CONTROL ONLY		R	WP	M	4X	3,4,5,14
F-1	COOLING FAN #1	MBR BUILDING - BLOWER ROOM	4.4	FRACTIONAL	120	1	CFCP-1	REFER TO RISER DIAGRAM		CFCP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1
F-2	COOLING FAN #2	MBR BUILDING - BLOWER ROOM	4.4	FRACTIONAL	120	1	CFCP-1	REFER TO RISER DIAGRAM		CFCP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1
F-3	COOLING FAN #3	MBR BUILDING - BLOWER ROOM	4.4	FRACTIONAL	120	1	CFCP-1	REFER TO RISER DIAGRAM		CFCP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1
F-4	COOLING FAN #4	MBR BUILDING - BLOWER ROOM	4.4	FRACTIONAL	120	1	CFCP-1	REFER TO RISER DIAGRAM		CFCP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1
F-5	COOLING FAN #5	MBR BUILDING - BLOWER ROOM	4.4	FRACTIONAL	120	1	CFCP-1	REFER TO RISER DIAGRAM		CFCP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1
F-6	COOLING FAN #6	MBR BUILDING - BLOWER ROOM	4.4	FRACTIONAL	120	1	CFCP-1	REFER TO RISER DIAGRAM		CFCP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1
F-7	COOLING FAN #7	MBR BUILDING - BLOWER ROOM	4.4	FRACTIONAL	120	1	CFCP-1	REFER TO RISER DIAGRAM		CFCP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1
F-8	COOLING FAN #8	MBR BUILDING - BLOWER ROOM	4.4	FRACTIONAL	120	1	CFCP-1	REFER TO RISER DIAGRAM		CFCP-1	REFER TO RISER DIAGRAM	-	-	ATL	-	1
CFCP-1	BLOWER COOLING FAN CONTROL PANEL	MBR BUILDING - BLOWER ROOM	-	-	120	1	LVP1	30A/1P	(2)#10 & #10G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	-	-	-	-	-
DP-500	DRAIN PUMP #1	MBR BUILDING - MBR DRAIN PUMP STATION	3.4	2	480	3	DPCP-500	REFER TO RISER DIAGRAM		DPCP-500	REFER TO RISER DIAGRAM	-	-	ATL	-	1
DP-501	DRAIN PUMP #2	MBR BUILDING - MBR DRAIN PUMP STATION	3.4	2	480	3	DPCP-500	REFER TO RISER DIAGRAM		DPCP-500	REFER TO RISER DIAGRAM	-	-	ATL	-	1
DPCP-500	DRAIN PUMP CONTROL PANEL	MBR BUILDING - CASSETTE LAYDOWN AREA	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
HST-1	BRIDGE CRANE HOIST	MBR BUILDING - RAS ROOM	11	7.2	480	3	BCCP-1	REFER TO RISER DIAGRAM		BCCP-1	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
TRLY-1	BRIDGE CRANE TROLLEY	MBR BUILDING - RAS ROOM	2.1	0.6	480	3	BCCP-1	REFER TO RISER DIAGRAM		BCCP-1	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
TRVL-1L	BRIDGE CRANE END TRUCK	MBR BUILDING - RAS ROOM	1.1	0.4	480	3	BCCP-1	REFER TO RISER DIAGRAM		BCCP-1	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
TRVL-1R	BRIDGE CRANE END TRUCK	MBR BUILDING - RAS ROOM	1.1	0.4	480	3	BCCP-1	REFER TO RISER DIAGRAM		BCCP-1	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
BCCP-1	BRIDGE CRANE CONTROL PANEL	MBR BUILDING - RAS ROOM	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		LOCAL CONTROL ONLY		-	-	-	-	-
HST-2	BRIDGE CRANE HOIST	MBR BUILDING - CASSETTE LAYDOWN AREA	11	7.2	480	3	BCCP-2	REFER TO RISER DIAGRAM		BCCP-2	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
TRLY-2	BRIDGE CRANE TROLLEY	MBR BUILDING - CASSETTE LAYDOWN AREA	2.1	0.6	480	3	BCCP-2	REFER TO RISER DIAGRAM		BCCP-2	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
TRVL-2L	BRIDGE CRANE END TRUCK	MBR BUILDING - CASSETTE LAYDOWN AREA	1.1	0.4	480	3	BCCP-2	REFER TO RISER DIAGRAM		BCCP-2	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
TRVL-2R	BRIDGE CRANE END TRUCK	MBR BUILDING - CASSETTE LAYDOWN AREA	1.1	0.4	480	3	BCCP-2	REFER TO RISER DIAGRAM		BCCP-2	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
BCCP-2	BRIDGE CRANE CONTROL PANEL	MBR BUILDING - CASSETTE LAYDOWN AREA	-	-	480	3	HVP1	REFER TO SINGLE LINE DIAGRAM		LOCAL CONTROL ONLY		-	-	-	-	-
HVAC-500	HVAC MONITORING CONTROL PANEL	MBR BUILDING - 2ND FLOOR ELECTRICAL ROOM	-	-	120	1	LVP1	20A/1P	(2)#12 & #12G, 3/4"C.	R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
R I/O-1	REMOTE I/O PANEL #1	MBR BUILDING - ELEVATED OFFICE	-	-	120	1	LVP1	30A/1P	(2)#10 & #10G, 1"C.	MCP	REFER TO RISER DIAGRAM	-	-	-	-	-
5-SLD-15	SLUICE GATE #1	MBR BUILDING - MEMBRANE DISCHARGE CHANNEL	5	-	480	3	HVP1	20A/3P	(3)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	A (30AF/NF)	4X	P	-	-
5-SLD-16	SLUICE GATE #2	MBR BUILDING - MEMBRANE DISCHARGE CHANNEL	5	-	480	3	HVP1	20A/3P	(3)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	A (30AF/NF)	4X	P	-	-
5-SLD-17	SLUICE GATE #3	MBR BUILDING - MEMBRANE DISCHARGE CHANNEL	5	-	480	3	HVP1	20A/3P	(3)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	A (30AF/NF)	4X	P	-	-
5-SLD-18	SLUICE GATE #4	MBR BUILDING - MEMBRANE DISCHARGE CHANNEL	5	-	480	3	HVP1	20A/3P	(3)#12 & #12G, 3/4"C.	MBR-CP	REFER TO RISER DIAGRAM	A (30AF/NF)	4X	P	-	-

REFER TO SHEET E-046 FOR SCHEDULE CONTINUATION

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK · JEFFREY E ROBINSON · 095896 · LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:
THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE
CALL 811

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL SCHEDULES

REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.
E-045

PROJECT # 18-732 PHASE #

INDICATED BY ⟨1⟩ ON PLAN SHEETS

EQUIPMENT CONNECTION SCHEDULE (SHEET 2 OF 4)

SPECIFIC NOTES:

1. WHEN LOCATION IS NOT REFERENCED ON 'E' SHEETS, REFER TO ASSOCIATED CONTRACT DRAWINGS.
2. LOCATIONS SHOWN ARE GENERAL IN NATURE. COORDINATE WITH ALL TRADE CONTRACTORS PRIOR TO ROUGH-IN.

TYPES:
A: NON-FUSED
B: FUSED
M: MOTOR RATED SWITCH
R: RECEPTACLE/CORD/PLUG
N: NOT REQUIRED
C: CKT BREAKER WITHIN SIGHT

SIZES:
AF: AMPERE FRAME
NF: NON-FUSED
AT: FUSE SIZE (RK5, UON)

TYPES:
VFD: VARIABLE FREQUENCY DRIVE
CMS: COMBINATION MOTOR STARTER WITH DISCONNECT
ATL: ACROSS THE LINE, FVNR MAGNETIC STARTER
M: MOTOR RATED SWITCH - MANUAL STARTER
P: PACKAGED CONTROLLER BY MANUFACTURER
LVT: THERMOSTAT

EQUIPMENT			ELECTRICAL LOAD				POWER CONNECTION			CONTROL CONNECTION		DISCONNECT/SAFETY SWITCH		STARTER		REMARKS
EQUIPMENT TAG	EQUIPMENT TYPE	LOCATION ON PLAN	FLA	HP (KW)	V	PH	HOMERUN TO	CIRCUIT BREAKER	CONDUCTORS & CONDUIT	HOMERUN / INTERLOCK TO	CONDUCTORS & CONDUIT	DISCONNECT TYPE/SIZE	NEMA ENCLOSURE TYPE	STARTER TYPE	NEMA ENCLOSURE TYPE	
IP-01	INFLUENT PUMP #1	INFLUENT DRY WELL	77	60	480	3	HVP6	150A/3P	(3)#1/0 & #6G, 2" C.	R I/O-5	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
IP-02	INFLUENT PUMP #2	INFLUENT DRY WELL	77	60	480	3	HVP6	150A/3P	(3)#1/0 & #6G, 2" C.	R I/O-5	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
IP-03	INFLUENT PUMP #3	INFLUENT DRY WELL	77	60	480	3	HVP6	150A/3P	(3)#1/0 & #6G, 2" C.	R I/O-5	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
ISP-01	SUMP PUMP	INFLUENT DRY WELL	9.8	1/2	120	1	LVP6	20A/1P	(2)#10 & #10G, 1"C.	LOCAL CONTROL ONLY		R	WP	M	4X	3,4,5
MAS-801	PUMP MONITORING SYSTEM	MICROSCREEN BUILDING - ELECTRICAL AREA	-	-	120	1	LVP6	30A/1P	(2)#10 & #10G, 1"C.	R I/O-5	REFER TO RISER DIAGRAM	-	-	-	-	-
R I/O-5	INFLUENT PUMP CONTROL PANEL	MICROSCREEN BUILDING - ELECTRICAL AREA	-	-	120	1	LVP6	30A/1P	(2)#10 & #10G, 1"C.	R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
MCR-01	SCREEN DRIVE MOTOR #1	MICROSCREEN BUILDING - FINE SCREEN AREA	1.6	3/4	480	3	MS-CP-1		REFER TO RISER DIAGRAM	MC-CP-1	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
CMP-01	WASHING COMPACTOR #1	MICROSCREEN BUILDING - FINE SCREEN AREA	3	1.5	480	3	MS-CP-1		REFER TO RISER DIAGRAM	MC-CP-1	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
MS-CP-1	MICROSCREEN CONTROL PANEL #1	MICROSCREEN BUILDING - ELECTRICAL AREA	-	-	480	3	HVP6		REFER TO SINGLE LINE DIAGRAM	R I/O-5	REFER TO RISER DIAGRAM	-	-	-	-	-
MCR-02	SCREEN DRIVE MOTOR #2	MICROSCREEN BUILDING - FINE SCREEN AREA	1.6	3/4	480	3	MS-CP-2		REFER TO RISER DIAGRAM	MS-CP-2	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
CMP-02	WASHING COMPACTOR #2	MICROSCREEN BUILDING - FINE SCREEN AREA	3	1.5	480	3	MS-CP-2		REFER TO RISER DIAGRAM	MS-CP-2	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
MS-CP-2	MICROSCREEN CONTROL PANEL #2	MICROSCREEN BUILDING - ELECTRICAL AREA	-	-	480	3	HVP6		REFER TO SINGLE LINE DIAGRAM	R I/O-5	REFER TO RISER DIAGRAM	-	-	-	-	-
AC-1	AIR COMPRESSOR	GARAGE	44	7.5	208	1	LVP7	60A/2P	(2)#6 & 10G, 1"C.	LOCAL CONTROL ONLY		-	-	-	-	-
EHS-1	ELECTRONIC HOIST SYSTEM	GARAGE	16.7	5	208	3	LVP7	40A/3P	(4)#8 & 10G, 1"C.	LOCAL CONTROL ONLY		-	-	-	-	-
LMM-1	LATHE MILLING MACHINE	GARAGE	13.2	2	208	1	LVP7	30A/2P	(2)#10 & #10G, 1"C.	LOCAL CONTROL ONLY		-	-	-	-	-
ASBC-1	ABRASIVE SAND BLASTING CABINET	GARAGE	10	(1.2KW)	120	1	LVP7	20A/1P	(2)#12 & #12G, 3/4"C.	LOCAL CONTROL ONLY		-	-	-	-	-
PAB-01	BLOWER #1	POST-AERATION PLATFORM & CANOPY	27	20	480	3	HVP8		REFER TO SINGLE LINE DIAGRAM	DBSP	REFER TO RISER DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
PAB-02	BLOWER #2	POST-AERATION PLATFORM & CANOPY	27	20	480	4	HVP8		REFER TO SINGLE LINE DIAGRAM	DBSP	REFER TO RISER DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
20-P-610-A	BACKPULSE PUMP #1	DECHLORINATION BUILDING	77	60	480	3	HVP8		REFER TO SINGLE LINE DIAGRAM	DBSP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
20-P-610-B	BACKPULSE PUMP #2	DECHLORINATION BUILDING	77	60	480	3	HVP8		REFER TO SINGLE LINE DIAGRAM	DBSP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
PW-01	PLANT WATER PUMP #1	PREFAB NON-POTABLE WATER SUCTION LIFT STATION	52	40	480	3	PWCP-600		REFER TO RISER DIAGRAM	PWCP-400	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
PW-02	PLANT WATER PUMP #2	PREFAB NON-POTABLE WATER SUCTION LIFT STATION	52	40	480	3	PWCP-600		REFER TO RISER DIAGRAM	PWCP-400	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
PWCP-600	PUMP CONTROL PANEL	PREFAB NON-POTABLE WATER SUCTION LIFT STATION	-	-	480	3	HVP8		REFER TO SINGLE LINE DIAGRAM	DBSP	REFER TO RISER DIAGRAM	-	-	-	-	-
P-601	COOLING WATER PUMP #1	DISINFECTION TANK	40	30	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
P-602	COOLING WATER PUMP #2	DISINFECTION TANK	40	30	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
RDT-01	LEFT DRUM DRIVE MOTOR	ATAD BUILDING - THICKENING ROOM	2.1	1	480	3	RDT-CP		REFER TO RISER DIAGRAM	RDT-CP	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
RDT-02	LEFT DRUM DRIVE MOTOR	ATAD BUILDING - THICKENING ROOM	2.1	1	480	3	RDT-CP		REFER TO RISER DIAGRAM	RDT-CP	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
RDT-WW-01	WASH WATER BOOSTER PUMP	ATAD BUILDING - THICKENING ROOM	3.4	2	480	3	RDT-CP		REFER TO RISER DIAGRAM	RDT-CP	REFER TO RISER DIAGRAM	-	-	ATL	-	1
RDT-FP-01	RTD SLUDGE FEED PUMP	ATAD BUILDING - THICKENING ROOM	21	15	480	3	RDT-CP		REFER TO RISER DIAGRAM	RDT-CP	REFER TO RISER DIAGRAM	-	-	VFD	-	6
RTD-TSP-01	RTD THICKENED SLUDGE PUMP	ATAD BUILDING - THICKENING ROOM	27	20	480	3	RDT-CP		REFER TO RISER DIAGRAM	RDT-CP	REFER TO RISER DIAGRAM	-	-	VFD	-	6
RDT-P-401	POLYMER PUMP	ATAD BUILDING - THICKENING ROOM	9.8	0.5	120	1	RDT-CP		REFER TO RISER DIAGRAM	RDT-CP	REFER TO RISER DIAGRAM	-	-	ATL	-	1
RDT-P-402	BOOSTER PUMP	ATAD BUILDING - THICKENING ROOM	13.8	0.75	120	2	RDT-CP		REFER TO RISER DIAGRAM	RDT-CP	REFER TO RISER DIAGRAM	-	-	ATL	-	1
RDT-P-403	POLYMER MIXER	ATAD BUILDING - THICKENING ROOM	24	2	120	3	RDT-CP		REFER TO RISER DIAGRAM	RDT-CP	REFER TO RISER DIAGRAM	-	-	ATL	-	1
RDT-CP	ROTARY DRUM THICKENER CONTROL PANEL	ATAD BUILDING - THICKENING ROOM	-	-	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	R I/O-2	REFER TO RISER DIAGRAM	-	-	-	-	-
R-101	THERMAER JET PUMP 1	ATAD BUILDING - EQUIPMENT ROOM	124	100	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
P-201	THERMAER JET PUMP 2	ATAD BUILDING - EQUIPMENT ROOM	125	100	480	4	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
P-401	SNDR JET PUMP	ATAD BUILDING - EQUIPMENT ROOM	77	60	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
B-103	THERMAER 1 BLOWER	ATAD BUILDING - EQUIPMENT ROOM	52	40	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
B-203	THERMAER 2 BLOWER	ATAD BUILDING - EQUIPMENT ROOM	52	40	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
B-403	SNDR BLOWER	ATAD BUILDING - EQUIPMENT ROOM	52	40	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
B-503	SLUDGE HOLDING BLOWER	ATAD BUILDING - EQUIPMENT ROOM	77	60	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
B-1103	SPARE BLOWER	ATAD BUILDING - EQUIPMENT ROOM	77	60	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (200AF/NF)	4X	VFD	-	6,7
P-901	TRANSFER PUMP 1	ATAD BUILDING - EQUIPMENT ROOM	14	10	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (30AF/NF)	4X	VFD	-	6,7
P-902	TRANSFER PUMP	ATAD BUILDING - EQUIPMENT ROOM	14	10	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (30AF/NF)	4X	VFD	-	6,7
B-700	BIOFILTER OFFGAS FAN	BIOFILTER - EXTERIOR	40	30	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
B-701	RDT BOOSTER FAN	BIOFILTER - EXTERIOR	2.1	1	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (30AF/NF)	4X	VFD	-	6,7
P-601	COOLING WATER PUMP 1	ATAD BUILDING - EQUIPMENT ROOM	40	30	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
P-601	COOLING WATER PUMP 2	ATAD BUILDING - EQUIPMENT ROOM	40	30	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	ATAD-CP	REFER TO RISER DIAGRAM	A (60AF/NF)	4X	VFD	-	6,7
V-702	DAMPER	SNDR TANK	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-704	NPW VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-705	NPW VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-811	FEED VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-812	FEED VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-910	WASTE VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-911	WASTE VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-912	WASTE VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-913	FEED VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-914	FEED VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-915	FEED VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
V-918	NPW VALVE	ATAD BUILDING - EQUIPMENT ROOM	4.4	FRACTIONAL	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	M	4X	-	-	-
-	THERMAER INSTRUMENT CABINET #1	ATAD BUILDING - EQUIPMENT ROOM	-	-	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	-	-	-	-	-
-	THERMAER INSTRUMENT CABINET #2	ATAD BUILDING - EQUIPMENT ROOM	-	-	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	-	-	-	-	-
-	SNDR INSTRUMENT CABINET #3	ATAD BUILDING - EQUIPMENT ROOM	-	-	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	-	-	-	-	-
-	HEATX INSTRUMENT CABINET #4	ATAD BUILDING - EQUIPMENT ROOM	-	-	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	-	-	-	-	-
-	BIOFILTER INSTRUMENT CABINET #5	ATAD BUILDING - EQUIPMENT ROOM	-	-	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	ATAD-CP	REFER TO RISER DIAGRAM	-	-	-	-	-
ATAD-CP	ATAD CONTROL PANEL	ATAD BUILDING - ELECTRICAL ROOM	-	-	120	1	LPMCC	20A/1P	(2)#12 & #12G, 3/4"C.	R I/O-4	REFER TO RISER DIAGRAM	-	-	-	-	-
FP-400	FILTRATE PUMP 1	FILTRATE PUMP WET WELL	3.4	2	480	3	FPCP-400		REFER TO RISER DIAGRAM	FPCP-400	REFER TO RISER DIAGRAM	-	-	ATL	-	1
FP-401	FILTRATE PUMP 2	FILTRATE PUMP WET WELL	3.4	2	480	3	FPCP-400		REFER TO RISER DIAGRAM	FPCP-400	REFER TO RISER DIAGRAM	-	-	ATL	-	1
FPCP-400	FILTRATE PUMP CONTROL PANEL	ATAD BUILDING - EXTERIOR WALL	-	-	480	3	MCC2		REFER TO SINGLE LINE DIAGRAM	R I/O-4	REFER TO RISER DIAGRAM	-	-	-	-	-
BPSFP-03	BELT PRESS #1 SLUDGE FEED PUMP	ATAD BUILDING - EQUIPMENT ROOM	21	15	480	3	HVP5		REFER TO SINGLE LINE DIAGRAM	R I/O-4	REFER TO RISER DIAGRAM	-	-	VFD	-	6
BPSFP-04	BELT PRESS #2 SLUDGE FEED PUMP	ATAD BUILDING - EQUIPMENT ROOM	21	15	480	3	HVP5		REFER TO SINGLE LINE DIAGRAM	R I/O-4	REFER TO RISER DIAGRAM	-	-	VFD	-	6
FP-01	FERRIC PUMP/SKID #1	ATAD BUILDING - EQUIPMENT ROOM	1.1	0.5	480	3	HVP5		REFER TO SINGLE LINE DIAGRAM	R I/O-4	REFER TO RISER DIAGRAM	-	-	VFD	-	6
FP-02	FERRIC PUMP/SKID #2	ATAD BUILDING - EQUIPMENT ROOM	1.1	0.5	480	3	HVP5		REFER TO SINGLE LINE DIAGRAM	R I/O-4	REFER TO RISER DIAGRAM	-	-	VFD	-	6
HVAC-AC-1	HVAC AIR CONDITIONING CONDENSER	ATAD BUILDING - ELECTRICAL ROOM	-	-	208	3	LVP5	30A/3P	(3)#10 & #10G, 1"C.	R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
R I/O-4	REMOTE I/O PANEL #4	ATAD BUILDING - ELECTRICAL ROOM	-		120	1	LVP5	30A/1P	(2)#10 & #10G, 1"C.	R I/O-1	REFER TO RISER DIAGRAM	-	-	-	-	-
BPGD-01	GRAVITY DRIVE #1 (E.T.R.)	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	6	1.5	240	3	BPCP-01		REFER TO RISER DIAGRAM	BPCP-01	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
BDP-01	BELT PRESS DRIVE #1 (E.T.R.)	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	6	1.5	240	3	BPCP-01		REFER TO RISER DIAGRAM	BPCP-01	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
BDP-02	BELT PRESS DRIVE #2 (E.T.R.)	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	6	1.5	240	3	BPCP-01		REFER TO RISER DIAGRAM	BPCP-01	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
FD-01	FEEDBOX DRIVE #1 (E.T.R.)	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	2.2	1/3	240	3	BPCP-01		REFER TO RISER DIAGRAM	BPCP-01	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
BWS-01	BELT WASH SYSTEM #1	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	15.2	5	240	3	BPCP-01		REFER TO RISER DIAGRAM	BPCP-01	REFER TO RISER DIAGRAM	-	-	ATL	-	1
HU-01	HYDRAULIC UNIT #1 (E.T.R.)	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	6.8	2	240	3	BPCP-01		REFER TO RISER DIAGRAM	BPCP-01	REFER TO RISER DIAGRAM	-	-	ATL	-	1
PFP-01	POLYMER FEED PUMP #1	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	9.8	0.5	120	1	PFS-01		REFER TO RISER DIAGRAM	PFS-01	REFER TO RISER DIAGRAM	-	-	VFD	-	1,6
PFM-01	POLYMER FEED MIXER #1	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	16	1	120	1	PFS-01		REFER TO RISER DIAGRAM	PFS-01	REFER TO RISER DIAGRAM	-	-	ATL	-	1
PFS-01	POLYMER FEED SYSTEM #1	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	-	-	120	1	BPCP-01		REFER TO RISER DIAGRAM	BPCP-01	REFER TO RISER DIAGRAM	-	-	ATL	-	1
BPCP-01	BELT PRESS CONTROL PANEL #1 (E.R.E.)	DEWATERING BUILDING - MECHANICAL OPERATIONS ROOM	-	-	240	3	BP-LVP	100A/3P	(4)1/0 & #6G, 2"C.	R I/O -2	REFER TO RISER DIAGRAM	-	-	-	-	-

REFER TO SHEET E-047 FOR SCHEDULE CONTINUATION

MHE ENGINEERING
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111 Wheatfield Drive, Suite 1
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(570) 296-2765

BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK · JEFFREY E ROBINSON · 095690 · LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:
THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE CALL 811

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL SCHEDULES

REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE: 10 JULY, 2025
DESIGN BY: RRM
DRAWN BY: CDJ
CHECKED BY: MGR
REVIEWED BY: JER

SHEET NO.
E-046

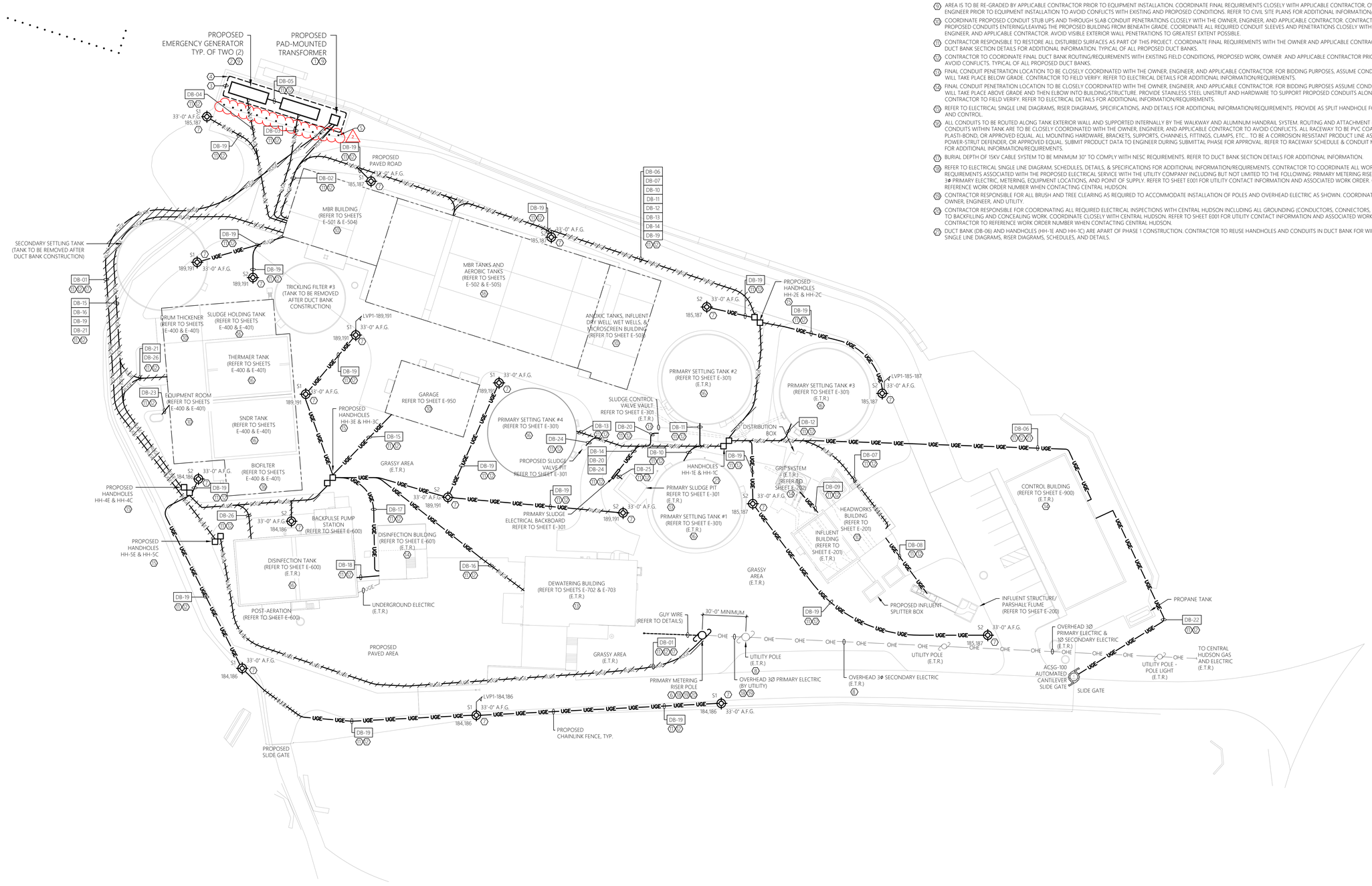
PROJECT # 18-732 PHASE #

GENERAL NEW WORK NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROPOSED UG DUCT BANKS AND STRUCTURES SHOWN ARE APPROXIMATE IN LOCATION. ROUTE UG DUCT BANKS WITH GENERAL ROUTING AS SHOWN ON PLANS. ROUTE DUCT BANKS AS NECESSARY TO AVOID CONFLICTS WITH SITE CONDITIONS AND PROPOSED PIPING SYSTEMS.
3. DUCT BANKS SHALL NOT BE LOCATED ABOVE OTHER PIPING SYSTEMS EXCEPT WHERE CROSSING. MAINTAIN NESC SEPARATION BETWEEN UTILITIES.
4. REFER TO UNDERGROUND UTILITIES (GENERAL NOTES) ON SHEET E-001 FOR ADDITIONAL INFORMATION.
5. COORDINATE FINAL DUCT BANK LOCATIONS (PRIOR TO ROUGH-IN) WITH APPLICABLE CONTRACTOR AND THE OWNER TO AVOID CONFLICT WITH PROPOSED WORK AND EXISTING CONDITIONS.
6. REFER TO DUCT BANK SCHEDULE FOR ADDITIONAL INFORMATION REGARDING DUCT BANK ROUTING, PURPOSE, AND CONTENTS.
7. PROVIDE A DEDICATED GROUNDING CONDUCTOR FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT/DEVICES.
8. EQUIPMENT AND DEVICE LOCATIONS ARE SHOWN AS GENERAL IN NATURE. REFER TO GENERAL SHEETS AND COORDINATE WITH APPLICABLE CONTRACTOR FOR EXACT LOCATIONS.
9. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH THE OWNER AND APPLICABLE CONTRACTOR.
10. REFER TO ELECTRICAL SINGLE LINE DIAGRAMS, FLOOR PLANS, RISER DIAGRAMS, SCHEDULES, DETAILS, & SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
11. REFER TO OVERALL SITE PLANS ON CIVIL/GENERAL SHEETS FOR ADDITIONAL SITE INFORMATION.
12. NOT ALL EXISTING/PROPOSED SITE UTILITIES SHOWN FOR CLARITY. REFER TO GENERAL/CIVIL SHEETS FOR ADDITIONAL SITE INFORMATION.
13. CONTRACTOR IS RESPONSIBLE FOR ALL SITE RESTORATION. REFER TO TYPICAL DUCT BANK SECTION DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
14. CONTRACTOR TO COORDINATE PARKING & LAYDOWN AREA WITH THE OWNER AND APPLICABLE CONTRACTOR.
15. CONTRACTOR TO ADJUST FINAL AIMING ANGLE OF EXTERIOR LIGHT FIXTURES TO LIGHT DESIRED AREAS AND MINIMIZE LIGHT POLLUTION. COORDINATE WITH THE OWNER AND APPLICABLE CONTRACTOR. REFER TO THE LUMINAIRE SCHEDULE FOR ADDITIONAL INFORMATION/REQUIREMENTS.
16. NOT ALL HAND-HOLES AND PULL POINTS SHOWN FOR CLARITY. CONTRACTOR TO PROVIDE HAND-HOLES AND PULL POINTS AS REQUIRED AND PER NEC. CONTRACTOR TO FIELD VERIFY. REFER TO TYPICAL HANDHOLE DETAIL FOR ADDITIONAL INFORMATION/REQUIREMENTS.
17. ALL UTILITY CHARGES RESULTING FROM THE PROPOSED SERVICE ENTRANCE DESIGN SHALL BE BILLED DIRECTLY TO THE OWNER FROM THE UTILITY COMPANY.

SHEET KEY NOTES:

1. PROPOSED PAD-MOUNTED TRANSFORMER BY THIS CONTRACT. THIS CONTRACT RESPONSIBLE FOR THE TRANSFORMER, CONCRETE PAD, CONCRETE VAULT, AND GROUNDING AS SHOWN. REFER TO 'TYPICAL UTILITY TRANSFORMER PAD AND VAULT DETAIL' FOR ADDITIONAL INFORMATION. TRANSFORMER TO BE KEPT A MINIMUM OF 10'-0" FROM ALL STRUCTURES, ACCESS DRIVES, BUILDINGS, UNDERGROUND UTILITIES, AND ALL OTHER ABOVE GRADE EQUIPMENT. IN ADDITION, TRANSFORMER TO BE KEPT A MINIMUM OF 25'-0" FROM ABOVE GRADE EXPOSED GAS LINES, GAS METERS, WATER LINES, AND SEWER LINES. FINAL LOCATION TO BE COORDINATED IN THE FIELD WITH THE UTILITY, OWNER, ENGINEER AND APPLICABLE CONTRACTOR TO AVOID CONFLICT WITH EXISTING SITE CONDITIONS AND PROPOSED WORK, AS WELL AS COMPLY WITH ALL UTILITY REQUIREMENTS. REFER TO THE ELECTRICAL SINGLE LINE DIAGRAM & SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
2. PROPOSED EMERGENCY GENERATOR, ENCLOSURE AND CONCRETE EQUIPMENT PAD. TYPICAL OF TWO (2). GENERATORS TO BE KEPT A MINIMUM OF 10'-0" FROM ALL STRUCTURES, ACCESS DRIVES, BUILDINGS, AND EQUIPMENT. FINAL LOCATION TO BE ADJUSTED TO AVOID CONFLICT AND COMPLY WITH NEC ARTICLE 110.26 'SPACE ABOUT ELECTRICAL EQUIPMENT'. COORDINATE FINAL LOCATION AND ORIENTATION IN THE FIELD WITH THE OWNER, ENGINEER, AND APPLICABLE CONTRACTOR. REFER TO THE ELECTRICAL SINGLE LINE DIAGRAM, SPECIFICATIONS AND 'TYPICAL GENERATOR PAD DETAIL' FOR ADDITIONAL INFORMATION/REQUIREMENTS.
3. EQUIPMENT GROUND RING. GROUND RING TO BE BURIED AT MINIMUM 3 FEET BELOW FINISHED GRADE. GROUND RING TO BE KEPT AT MINIMUM OF 3 FEET AWAY FROM EQUIPMENT (GENERATORS & TRANSFORMER) AT ALL TIMES. PROVIDE AND INSTALL 3/4" Ø X 10' GROUND RODS AT EACH CORNER OF GROUND RING FOR A TOTAL OF FOUR (4) GROUND RODS. BOND ALL PROPOSED EQUIPMENT (GENERATORS & TRANSFORMER) TO GROUND RING. ALL GROUND CONDUCTORS SHALL BE #4/0 COPPER, U.O.N.
4. 3/4"Ø x 10'-0" COPPER GROUND ROD. TYPICAL OF 4. ONE AT EACH CORNER OF THE GROUND RING.
5. PROTECTIVE BOLLARD. TYPICAL OF FOURTEEN (14). DISTANCE FROM BOLLARD TO EQUIPMENT PAD (GENERATOR AND TRANSFORMER) TO BE 5'-0" MINIMUM TO COMPLY WITH NEC REQUIRED WORKING CLEARANCES AND ALLOW FOR ROUTINE MAINTENANCE. BOLLARDS TO BE SPACED 6'-0" APART ON CENTER. REFER TO TYPICAL BOLLARD DETAIL ON SHEET C-142 FOR ADDITIONAL INFORMATION/REQUIREMENTS. COORDINATE FINAL QUANTITIES / LOCATIONS IN THE FIELD WITH THE OWNER, UTILITY, ENGINEER, AND APPLICABLE CONTRACTOR PRIOR TO ROUGH-IN. 2
6. PROVIDE GROUND ROD AT EACH HANDHOLE, PULL BOX, OR ELECTRICAL EQUIPMENT ENCLOSURE. REFER TO SHEET E-001 FOR ADDITIONAL INFORMATION. GROUND ROD IS NOT REQUIRED BY THE UTILITY. GROUND ROD TO BE BURIED AT MINIMUM 3 FEET BELOW FINISHED GRADE. GROUND RING TO BE KEPT AT MINIMUM OF 3 FEET AWAY FROM POLES AT ALL TIMES. ALL GROUND CONDUCTORS SHALL BE #1/0 COPPER, U.O.N.
7. CONTRACTOR TO COORDINATE FINAL LOCATION WITH OWNER, ENGINEER, AND APPLICABLE CONTRACTOR TO AVOID POTENTIAL CONFLICTS WITH EXISTING AND PROPOSED CONDITIONS. ADJUST FIXTURE TO LIGHT DESIRED AREAS AND MINIMIZE LIGHT POLLUTION. REFER TO ELECTRICAL DETAILS AND SCHEDULES FOR ADDITIONAL INSTALLATION, CONTROL, AND WIRING INFORMATION/REQUIREMENTS.
8. CONTRACTOR TO COMPLY WITH THE HIGH VOLTAGE PROXIMITY ACT AND ALL NESC REQUIREMENTS WHEN ERECTING STRUCTURES NEAR ENERGIZED UTILITY LINES. ALL EQUIPMENT, CRANES, ETC. TO BE KEPT A MINIMUM OF 10'-0" FROM ENERGIZED UTILITY LINES. COORDINATE WITH UTILITY PRIOR TO COMMENCING WORK. TYPICAL.
9. AREA IS TO BE RE-GRADED BY APPLICABLE CONTRACTOR PRIOR TO EQUIPMENT INSTALLATION. COORDINATE FINAL REQUIREMENTS CLOSELY WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER PRIOR TO EQUIPMENT INSTALLATION TO AVOID CONFLICTS WITH EXISTING AND PROPOSED CONDITIONS. REFER TO CIVIL SITE PLANS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
10. COORDINATE PROPOSED CONDUIT STUB UPS AND THROUGH SLAB CONDUIT PENETRATIONS CLOSELY WITH THE OWNER, ENGINEER, AND APPLICABLE CONTRACTOR. CONTRACTOR TO ROUTE ALL PROPOSED CONDUITS ENTERING/LEAVING THE PROPOSED BUILDING FROM BENEATH GRADE. COORDINATE ALL REQUIRED CONDUIT SLEEVES AND PENETRATIONS CLOSELY WITH THE OWNER, ENGINEER, AND APPLICABLE CONTRACTOR. AVOID VISIBLE EXTERIOR WALL PENETRATIONS TO GREATEST EXTENT POSSIBLE.
11. CONTRACTOR RESPONSIBLE TO RESTORE ALL DISTURBED SURFACES AS PART OF THIS PROJECT. COORDINATE FINAL REQUIREMENTS WITH THE OWNER AND APPLICABLE CONTRACTOR. REFER TO DUCT BANK SECTION DETAILS FOR ADDITIONAL INFORMATION. TYPICAL OF ALL PROPOSED DUCT BANKS.
12. CONTRACTOR TO COORDINATE FINAL DUCT BANK ROUTING/REQUIREMENTS WITH EXISTING FIELD CONDITIONS, PROPOSED WORK, OWNER AND APPLICABLE CONTRACTOR PRIOR TO ROUGH-IN TO AVOID CONFLICTS. TYPICAL OF ALL PROPOSED DUCT BANKS.
13. FINAL CONDUIT PENETRATION LOCATION TO BE CLOSELY COORDINATED WITH THE OWNER, ENGINEER, AND APPLICABLE CONTRACTOR. FOR BIDDING PURPOSES, ASSUME CONDUIT PENETRATIONS WILL TAKE PLACE BELOW GRADE. CONTRACTOR TO FIELD VERIFY. REFER TO ELECTRICAL DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
14. FINAL CONDUIT PENETRATION LOCATION TO BE CLOSELY COORDINATED WITH THE OWNER, ENGINEER, AND APPLICABLE CONTRACTOR. FOR BIDDING PURPOSES ASSUME CONDUIT PENETRATIONS WILL TAKE PLACE ABOVE GRADE AND THEN ELBOW INTO BUILDING/STRUCTURE. PROVIDE STAINLESS STEEL UNISTRUT AND HARDWARE TO SUPPORT PROPOSED CONDUITS ALONG EXTERIOR WALL. CONTRACTOR TO FIELD VERIFY. REFER TO ELECTRICAL DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
15. REFER TO ELECTRICAL SINGLE LINE DIAGRAMS, RISER DIAGRAMS, SPECIFICATIONS, AND DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS. PROVIDE AS SPLIT HANDHOLE FOR BOTH POWER AND CONTROL.
16. ALL CONDUITS TO BE ROUTED ALONG TANK EXTERIOR WALL AND SUPPORTED INTERNALLY BY THE WALKWAY AND ALUMINUM HANDRAIL SYSTEM. ROUTING AND ATTACHMENT METHODS OF ALL CONDUITS WITHIN TANK ARE TO BE CLOSELY COORDINATED WITH THE OWNER, ENGINEER, AND APPLICABLE CONTRACTOR TO AVOID CONFLICTS. ALL RACEWAY TO BE PVC COATED RGS BY PLASTI-BOND, OR APPROVED EQUAL. ALL MOUNTING HARDWARE, BRACKETS, SUPPORTS, CHANNELS, FITTINGS, CLAMPS, ETC., TO BE A CORROSION RESISTANT PRODUCT LINE AS MANUFACTURED BY POWER-STRUT DEFENDER, OR APPROVED EQUAL. SUBMIT PRODUCT DATA TO ENGINEER DURING SUBMITTAL PHASE FOR APPROVAL. REFER TO RACEWAY SCHEDULE & CONDUIT MOUNTING DETAIL FOR ADDITIONAL INFORMATION/REQUIREMENTS.
17. BURIAL DEPTH OF 15KV CABLE SYSTEM TO BE MINIMUM 30" TO COMPLY WITH NESC REQUIREMENTS. REFER TO DUCT BANK SECTION DETAILS FOR ADDITIONAL INFORMATION.
18. REFER TO ELECTRICAL SINGLE LINE DIAGRAM, SCHEDULES, DETAILS, & SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS. CONTRACTOR TO COORDINATE ALL WORK AND REQUIREMENTS ASSOCIATED WITH THE PROPOSED ELECTRICAL SERVICE WITH THE UTILITY COMPANY INCLUDING BUT NOT LIMITED TO THE FOLLOWING: PRIMARY METERING RISER POLE, OVERHEAD 3Ø PRIMARY ELECTRIC, METERING, EQUIPMENT LOCATIONS, AND POINT OF SUPPLY. REFER TO SHEET E001 FOR UTILITY CONTACT INFORMATION AND ASSOCIATED WORK ORDER. CONTRACTOR TO REFERENCE WORK ORDER NUMBER WHEN CONTACTING CENTRAL HUDSON.
19. CONTRACTOR RESPONSIBLE FOR ALL BRUSH AND TREE CLEARING AS REQUIRED TO ACCOMMODATE INSTALLATION OF POLES AND OVERHEAD ELECTRIC AS SHOWN. COORDINATE CLOSELY WITH OWNER, ENGINEER, AND UTILITY.
20. CONTRACTOR RESPONSIBLE FOR COORDINATING ALL REQUIRED ELECTRICAL INSPECTIONS WITH CENTRAL HUDSON INCLUDING ALL GROUNDING (CONDUCTORS, CONNECTORS, RODS, ETC...) PRIOR TO BACKFILLING AND CONCEALING WORK. COORDINATE CLOSELY WITH CENTRAL HUDSON. REFER TO SHEET E001 FOR UTILITY CONTACT INFORMATION AND ASSOCIATED WORK ORDER. CONTRACTOR TO REFERENCE WORK ORDER NUMBER WHEN CONTACTING CENTRAL HUDSON.
21. DUCT BANK (DB-06) AND HANDHOLES (HH-1E AND HH-1C) ARE APART OF PHASE 1 CONSTRUCTION. CONTRACTOR TO REUSE HANDHOLES AND CONDUITS IN DUCT BANK FOR WIRING SHOWN ON SINGLE LINE DIAGRAMS, RISER DIAGRAMS, SCHEDULES, AND DETAILS.



0 30' 60'
SCALE: 1" = 30'-0"

1 E-101 ELECTRICAL SITE PLAN - NEW WORK
SCALE: 1" = 30'-0" CAESARS LANE WASTEWATER TREATMENT PLANT

MHE ENGINEERING
33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
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(570) 296-2765

BID ADDENDUM

JADE STONE ENGINEERING

HAZARDOUS MATERIAL NOTE:
THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE CALL 811

UNAUTHORIZED ADDITION OR ALTERATION OF THIS PLAN IS A VIOLATION OF SECTION 7209(2) OF THE NEW YORK STATE EDUCATION LAW.

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CAESARS LANE WWTP EXPANSION PROJECT: PHASE 2
145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL SITE PLAN - NEW WORK

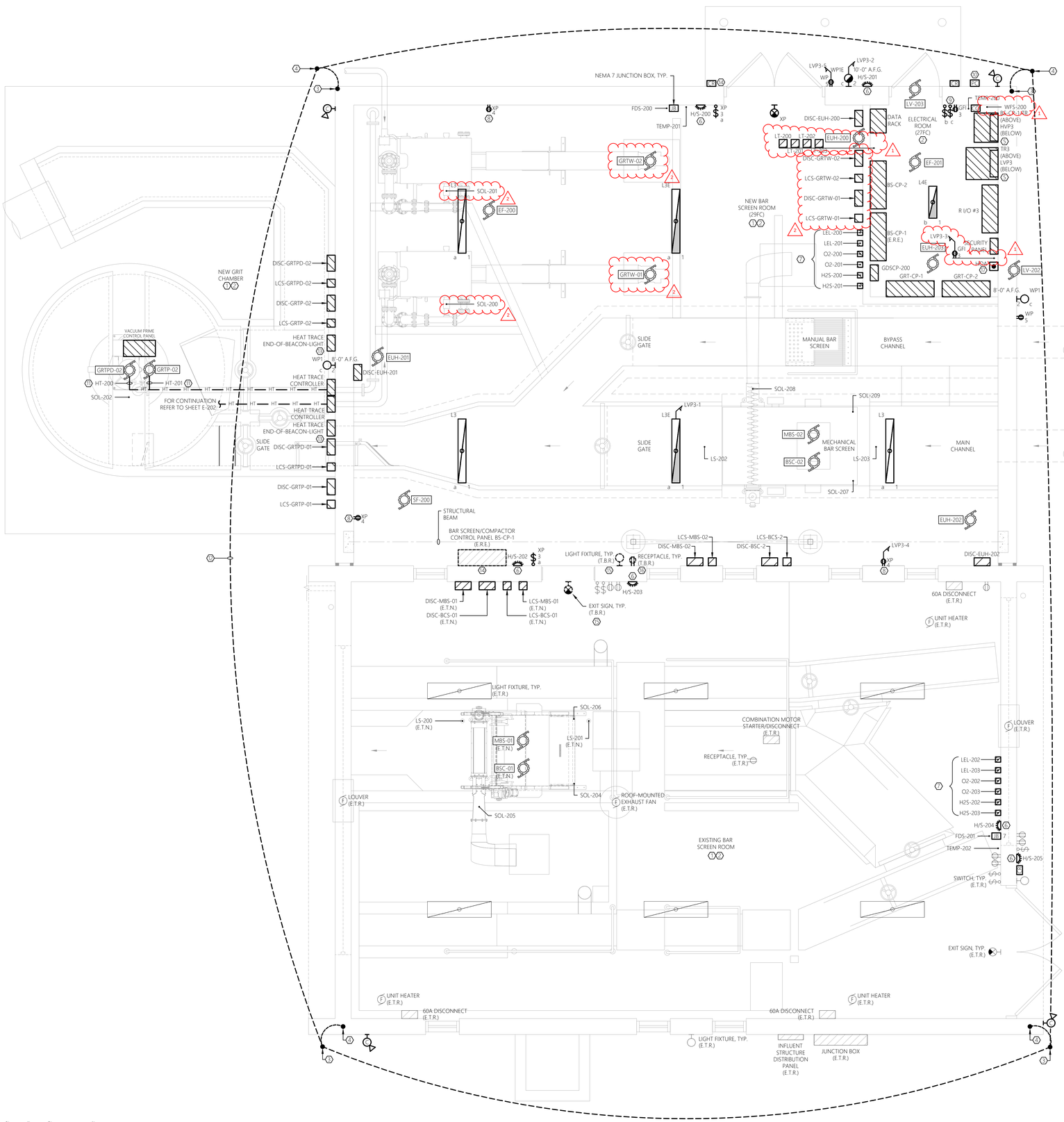
REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.
E-101

PROJECT # 18-732 PHASE #



0' 1' 2' 4'
SCALE: 1/2" = 1'-0"

1 E-201 ELECTRICAL POWER, SYSTEMS, & LGHTING PLAN
SCALE: 1/2" = 1'-0"
HEADWORKS BUILDING

GENERAL DEMOLITION NOTES:

MECHANICAL EQUIPMENT & MISC. ELECTRICAL EQUIPMENT:
WHERE INDICATED TO BE DEMOLISHED:
- REFER TO GENERAL CONTRACT DRAWINGS FOR AN ACCURATE DEPICTION OF ALL DEMOLITION REQUIRED AS PART OF THIS CONTRACT.
- REMOVE ALL WIRE (POWER & CONTROLS) & EXPOSED CONDUIT BACK TO SOURCE PANEL, UNLESS OTHERWISE INDICATED (UOI).
- REMOVE ANY ASSOCIATED MOTOR STARTERS, CONTROL STATIONS, &/OR DISCONNECTS, UOI.
- REMOVE CIRCUIT WIRING FROM SOURCE PANEL AND REMOVE ASSOCIATED SOURCE CIRCUIT BREAKER; UOI.
- REMOVE ALL INTERLOCK CIRCUITRY, UOI.
- PROVIDE REVISED TYPED PANELBOARD DIRECTORIES FOR ALL EXISTING TO REMAIN PANELS WHERE CIRCUITS ARE TO BE REMOVED.
- REMOVE ALL ASSOCIATED MOUNTING HARDWARE, BRACKETS, AND EQUIPMENT, UOI.

RECEPTACLES:
WHERE INDICATED TO BE DEMOLISHED:
- REMOVE ALL RECEPTACLES IMPACTED BY WALL MODIFICATIONS AND OVERALL PROJECT IMPROVEMENTS. **NOTE** ALL EXISTING RECEPTACLES MAY NOT BE SHOWN ON THESE DEMOLITION PLANS. MINOR FIELD VERIFICATION REQUIRED.
- REMOVE DEVICE, AND ALL ASSOCIATED WIRE & CONDUIT BACK TO SOURCE OR NEAREST ACTIVE JUNCTION BOX, UOI.

LIGHTING:
WHERE INDICATED TO BE DEMOLISHED:
- REMOVE ALL FIXTURES THROUGHOUT SPACE. **NOTE** ALL EXISTING LIGHTING FIXTURES MAY NOT BE SHOWN ON THESE DEMOLITION PLANS. MINOR FIELD VERIFICATION REQUIRED.
- REMOVE ALL ASSOCIATED WIRING BACK TO SOURCE, UOI.
- REMOVE SWITCHING AND CONTROL DEVICES, UOI.
- REMOVE CONTACTORS ASSOCIATED WITH LOW VOLTAGE SWITCHING DEVICES, UOI.
- DISPOSE OF ALL LAMPS IN ACCORDANCE WITH STATE/FEDERAL AND EPA REQUIREMENTS.

PANELBOARD REMOVAL AND REPLACEMENT:
- REFER TO SINGLE LINE DIAGRAMS FOR SCOPE OF WORK.

CIRCUIT AND FEEDER REMOVAL AND REPLACEMENT:
- MAINTAIN ANY EXISTING NON-IMPACTED PANELBOARDS AND ANY NON-IMPACTED CIRCUITS WHICH ARE EXISTING TO REMAIN.
- WHERE CIRCUITS ARE AFFECTED BY MODIFICATION/REMOVAL ACTIVITIES, PROVIDE NECESSARY CIRCUIT EXTENSIONS AND ALL NECESSARY LABOR/MATERIALS AS NECESSARY TO REPAIR AND RE-CONNECT CIRCUIT(S).
- ANY CIRCUITS/FEEDERS WHICH REQUIRE SHUTDOWN TO ACCOMMODATE WORK SHALL BE COORDINATED WITH THE OWNER WELL IN ADVANCE.

BUILDING/STRUCTURE GROUND SYSTEM:
- CONTRACTOR TO CAREFULLY PROTECT AND MAINTAIN ALL GROUND SYSTEMS ASSOCIATED WITH BUILDINGS/STRUCTURES EXISTING TO REMAIN.
- CONTRACTOR TO REMOVE ALL GROUND SYSTEMS ASSOCIATED WITH BUILDING/STRUCTURES TO BE REMOVED.
- GROUND SYSTEM COMPONENTS MAY INCLUDE, BUT ARE NOT LIMITED TO, GROUNDING CONDUCTORS, JUMPERS, TERMINATIONS, RODS, AND AIR TERMINALS. CONTRACTOR TO FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCEMENT OF DEMOLITION.

HAZARDOUS MATERIAL REMOVAL:
PERFORM WORK FOR REMOVAL AND DISPOSAL OF EQUIPMENT AND MATERIALS CONTAINING TOXIC SUBSTANCES REGULATED UNDER THE FEDERAL TOXIC SUBSTANCES CONTROL ACT (TSCA) IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS. APPLICABLE EQUIPMENT AND MATERIALS INCLUDE, BUT ARE NOT LIMITED TO:
- PCB-CONTAINING ELECTRICAL EQUIPMENT, INCLUDING TRANSFORMERS, CAPACITORS, AND SWITCHES.
- PCB- AND DEHP-CONTAINING LIGHTING BALLASTS.
- MERCURY-CONTAINING LAMPS AND TUBES, INCLUDING FLUORESCENT LAMPS, HIGH INTENSITY DISCHARGE (HID), ARC LAMPS, ULTRA-VIOLET, HIGH PRESSURE SODIUM, MERCURY VAPOR, IGNITRON TUBES, NEON, AND INCANDESCENT.
- CONTRACTOR TO COORDINATE ANY REQUIRED HAZARDOUS MATERIAL REMOVAL WITH THE OWNER, ENGINEER, AND APPLICABLE TRADE CONTRACTOR.

GENERAL SHEET NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS, AND GENERAL PROJECT NOTES.
2. ITEMS INDICATED TO BE REMOVED:
2.1. REMOVE ALL CONDUCTORS AND EXPOSED CONDUIT BACK TO SOURCE (UOI).
2.2. REMOVE CIRCUIT WIRING AND CIRCUIT BREAKER FROM SOURCE PANEL (UOI).
2.3. REMOVE ALL ASSOCIATED CONTROL CONDUCTORS, CONDUITS, AND DEVICES (UOI).
2.4. REMOVE ASSOCIATED STARTERS, DISCONNECTS, AND ASSOCIATED CIRCUITRY (UOI).
2.5. REMOVE EQUIPMENT PADS & MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC... (UOI).
2.6. REVISE PANELBOARD AND MOTOR CONTROL CENTER DIRECTORIES/NAME PLATES AS CHANGES OCCUR (UOI).
3. THESE DEMOLITION DRAWINGS ARE SCHEMATIC IN NATURE AND ARE BASED ON CURSORY FIELD OBSERVATION AND EXISTING DRAWINGS. IT IS NOT THE INTENTION OF THESE DRAWINGS TO INDICATE EVERY DEVICE/FIXTURE REQUIRING REMOVAL/DEMO RATHER GENERAL SYSTEMS WHICH ARE TO BE REMOVED.
4. CIRCUITS NOT IN AREA OF WORK THAT ARE AFFECTED BY WORK SHALL BE OPERATIONAL DURING PROJECT. PROVIDE TEMPORARY CIRCUITS AS NECESSARY.
5. CIRCUIT, EQUIPMENT, AND DEVICE REMOVAL SHALL NOT AFFECT THE INTEGRITY OR FUNCTIONALITY OF CIRCUITS TO REMAIN. ALL CIRCUITS TO REMAIN SHALL BE MAINTAINED. PROVIDE ALL NECESSARY CIRCUIT MODIFICATIONS AND EXTENSIONS.
6. WHERE REMOVALS LEAVE HOLES AND DAMAGED SURFACES EXPOSED IN THE FINISHED WORK, PATCH AND REPAIR THESE HOLES AND DAMAGED SURFACES TO MATCH ADJACENT FINISHED SURFACES. WHERE NEW WORK IS TO BE APPLIED TO EXISTING SURFACES, PERFORM REMOVALS, AND PATCHING IN A MANNER TO PRODUCE SURFACES SUITABLE FOR RECEIVING NEW WORK. COORDINATE ALL WORK WITH APPLICABLE TRADE CONTRACTOR, OWNER, AND ENGINEER.
7. COORDINATE WITH ALL CONTRACT DRAWINGS AND TRADE CONTRACTORS FOR ADDITIONAL EQUIPMENT THAT IS TO BE DEMOLISHED. FOR ALL EQUIPMENT DOWNGRADED FOR REMOVAL, DISCONNECT AND REMOVE ELECTRICAL CIRCUIT INCLUDING CONDUCTORS AND CONDUIT BACK TO SOURCE.
8. NOT ALL EQUIPMENT/DEVICES ARE SHOWN FOR CLARITY. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS AND REPORT DISCREPANCIES TO ENGINEER PRIOR TO COMMENCEMENT OF DEMOLITION.
9. REFER TO THE ELECTRICAL SINGLE LINE DIAGRAMS, SCHEDULES & DETAILS FOR ADDITIONAL DEMOLITION INFORMATION/REQUIREMENTS.
10. COORDINATE ALL ASPECTS OF SEQUENCE OF REMOVAL WITH THE OWNER, ENGINEER, AND APPLICABLE TRADE CONTRACTOR. REFER TO SPECIFICATIONS AND DEMOLITION SINGLE LINE DIAGRAM FOR ADDITIONAL INFORMATION.
11. WHERE REMOVAL OF CONDUIT SYSTEM IS NOT FEASIBLE, REMOVE ALL CONDUCTORS FROM CONDUIT SYSTEM, CUT FLUSH, CAP CONDUIT SYSTEM, AND ABANDON IN PLACE. FEASIBLE IS DEFINED AS BEING LOCATED WITHIN A CONCRETE DUCT BANK OR CONCRETE SLAB. ALL OTHER INSTANCES TO HAVE THE CONDUIT & CIRCUITRY TO BE REMOVED IN THERE ENTIRETY. FIELD VERIFY AND COORDINATE FINAL REQUIREMENTS WITH THE OWNER, TYPICAL.

GENERAL NEW WORK NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE A DEDICATED GROUNDING CONDUCTOR FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT/DEVICES.
3. EQUIPMENT & DEVICE LOCATIONS ARE SHOWN AS GENERAL IN NATURE. REFER TO ALL TRADE CONTRACT DRAWINGS AND COORDINATE WITH ALL TRADE CONTRACTORS FOR EXACT LOCATIONS. CLOSE CONTRACTOR COORDINATION REQUIRED.
4. ALL PROPOSED EQUIPMENT LOCATIONS/INSTALLATIONS TO COMPLY WITH NEC ARTICLE 110.26 'SPACES ABOUT ELECTRICAL EQUIPMENT'.
5. CONTRACTOR TO PROVIDE ALL REQUIRED MOUNTING HARDWARE, EQUIPMENT, BRACKETS, SUPPORTS, ACCESSORIES, ETC... PROVIDE AS STAINLESS STEEL IN CORROSIVE ENVIRONMENTS, EXTERIOR APPLICATIONS, OR WHERE INDICATED ON THE CONTRACT DRAWINGS.
6. NOT ALL EQUIPMENT/DEVICES MAY BE SHOWN FOR CLARITY. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING AND PROPOSED CONDITIONS PRIOR TO COMMENCEMENT OF CONSTRUCTION. COORDINATE WITH ALL TRADES, OWNER, AND ENGINEER.
7. CONTRACTOR RESPONSIBLE FOR MOUNTING OF ALL PANELS FURNISHED BY OTHERS. COORDINATE WITH OWNER, ENGINEER, AND APPLICABLE TRADE CONTRACTOR AND PROVIDE ALL NECESSARY MOUNTING HARDWARE/EQUIPMENT.
8. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH THE OWNER, ENGINEER, AND ALL TRADE CONTRACTORS.
9. CONTRACTOR TO ADJUST FINAL INTERIOR LIGHT FIXTURE LOCATIONS TO AVOID CONFLICTS WITH EQUIPMENT, PIPING SYSTEMS, AND DUCTWORK. COORDINATE WITH ALL TRADES.
10. CONTRACTOR TO ADJUST FINAL AIMING ANGLE OF EXTERIOR LIGHT FIXTURES TO LIGHT DESIRED AREAS AND MINIMIZE LIGHT POLLUTION. COORDINATE WITH THE OWNER. REFER TO THE LUMINAIRE SCHEDULE FOR ADDITIONAL INFORMATION/REQUIREMENTS.
11. ALL WEATHERPROOF RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 36" A.F.G.
12. CONTRACTOR TO COORDINATE ALL CONDUIT PENETRATIONS AND CONDUIT ROUTING WITH ALL TRADES, OWNER, AND ENGINEER PRIOR TO ROUGH-IN.
13. REFER TO ELECTRICAL SINGLE LINE DIAGRAMS, SPECIFICATIONS, RISER DIAGRAMS, SCHEDULES & DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
14. CONTRACTOR TO PROVIDE LABEL FOR ALL PROPOSED ELECTRICAL EQUIPMENT. REFER TO SPECIFICATIONS FOR LABELING INFORMATION/REQUIREMENTS. PROVIDE LABEL FOR ALL LIGHT SWITCHES/TIME SWITCHES INDICATING LOAD SERVED, AS WELL AS ALARM LIGHTS/HORNS.
15. ALL EQUIPMENT/DEVICES INSTALLED ON EXTERIOR WALLS OF THE HEADWORKS ROOM TO BE INSTALLED 3'-0" MINIMUM FROM ANY OPENINGS (DOORS, LOUVERS, ETC.). FINAL REQUIREMENTS TO BE IN COMPLIANCE WITH THE LATEST EDITION OF NFPA 820.

SHEET KEY NOTES:

1. AREA IS A CLASS I, DIVISION II, GROUP D SPACE. ALL WIRING METHODS TO COMPLY WITH NEC ARTICLE 501. ALL ELECTRICAL EQUIPMENT AND DEVICES INTERIOR TO THIS AREA ARE TO BE EXPLOSION PROOF RATED FOR USE IN A CLASS I, DIVISION II, GROUP D ENVIRONMENT. ALL RACEWAY AND BOXES TO BE PVC COATED RGS BY PLASTI-BOND, OR APPROVED EQUAL. ALL MOUNTING HARDWARE, BRACKETS, SUPPORTS, CHANNELS, FITTINGS, CLAMPS, ETC., TO BE A CORROSION RESISTANT PRODUCT LINE AS MANUFACTURED BY POWER-STRUT DEFENDER, OR APPROVED EQUAL. SUBMIT PRODUCT DATA TO ENGINEER DURING SUBMITTAL PHASE FOR APPROVAL. REFER TO RACEWAY SCHEDULE FOR ADDITIONAL INFORMATION/REQUIREMENTS.
2. ROUTING & ATTACHMENT METHODS OF ALL CONDUITS TO BE CLOSELY COORDINATED WITH APPLICABLE TRADE CONTRACTOR & OWNER PRIOR TO ROUGH-IN AND VERIFIED IN FIELD TO AVOID POTENTIAL CONFLICTS WITH PROPOSED EQUIPMENT, DUCT WORK, AND PIPING SYSTEMS.
3. CONTRACTOR TO PROVIDE 3/4"ø x 10' COPPER GROUND ROD. BOND ALL METAL STRUCTURES, EQUIPMENT, AND LIGHTING PROTECTION DOWN CONDUCTOR TO GROUND ROD USING #2 COPPER CONDUCTOR WITHIN RGS CONDUIT. REFER TO 'TYPICAL LIGHTNING PROTECTION GROUNDING DETAIL' AND 'TYPICAL PANEL GROUNDING DETAIL' FOR ADDITIONAL INFORMATION/REQUIREMENTS.
4. LIGHTNING PROTECTION DOWN CONDUCTOR. CONCEAL IN RGS CONDUIT AND ATTACH TO EXTERIOR WALL. CONTRACTOR TO WORK WITH CERTIFIED LIGHTNING PROTECTION INSTALLER TO PROVIDE COMPLETE BUILDING LIGHTNING PROTECTION SYSTEM IN ACCORDANCE WITH NFPA. UPON COMPLETION PROVIDE UL MASTER LABEL. REFER TO LIGHTNING PROTECTION FOR STRUCTURES SPECIFICATIONS FOR REQUIREMENTS AND ADDITIONAL INFORMATION.
5. CONTRACTOR TO PROVIDE WALL MOUNT BRACKETS FOR INSTALLATION OF TRANSFORMER ON WALL ABOVE PANEL.
6. GAS DETECTION SYSTEM MONITORING ALARM HORN/STROBES. INSTALL DEVICES (HORN/STROBES) AT 8'-0" ABOVE FINISHED FLOOR/GRADE, TYPICAL OF SIX (6). REFER TO SPECIFICATIONS AND RISER DIAGRAM FOR ADDITIONAL INFORMATION/REQUIREMENTS.
7. GAS DETECTION SYSTEM SENSORS AND TRANSMITTERS. INSTALL SENSORS PER MANUFACTURER'S RECOMMENDATIONS. INSTALL TRANSMITTERS AT 48" A.F.F. ON CENTER. REFER TO RISER DIAGRAM AND SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
8. CONTRACTOR TO PROVIDE 20 AMP, 125 VOLT RECEPTACLE (NEMA 5-20R) SUITABLE FOR USE IN A CLASS I DIVISION I GROUP D SPACE. PROVIDE AS CATALOG # ENR21201 M4 AS MANUFACTURED BY CROUSE-HINDS OR APPROVED EQUAL. IN ADDITION, CONTRACTOR TO PROVIDE CORRESPONDING PLUG CATALOG # ENPS201 AS MANUFACTURED BY CROUSE-HINDS, OR APPROVED EQUAL. TURN PLUG OVER TO OWNER. MOUNT RECEPTACLE AT 36" A.F.F.
9. CONTRACTOR TO PROVIDE AS WATTSTOPPER RT-200 ASTRONOMICAL TIME SWITCH OR APPROVED EQUAL WITHIN NEMA 1 ENCLOSURE. SWITCH TO CONTROL PROPOSED EXTERIOR WALL MOUNTED LIGHT FIXTURES TYPES 'WP1' & 'WP1E'. PROGRAM TIME SWITCH FOR LIGHTING 'ON' AT ASTRONOMICAL SUNSET AND 'OFF' AT ASTRONOMICAL SUNRISE. FINAL ON/OFF PROGRAMMING PARAMETERS TO BE COORDINATED WITH THE OWNER.
10. CONTRACTOR TO PROVIDE ONE (1) 120V, 20A PHOTO CONTROL WITH ADJUSTABLE SHIELD FOR CONTROL OF EXTERIOR LIGHTING CIRCUIT. INTERLOCK WITH ASTRONOMICAL TIME SWITCH. CONFIRM FINAL LOCATION WITH THE OWNER PRIOR TO ROUGH-IN. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
11. EXTERIOR 4" DUCTILE DISCHARGE AND EXTERIOR 1-1/2" POTABLE FLUSH WATER BETWEEN THE BUILDING AND GRIT CHAMBER TO HAVE HEAT TRACE SYSTEM APPLIED. PROVIDE HEAT TRACING CABLES, INSULATION, AND JACKET. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS. THIS CONTRACT RESPONSIBLE FOR ALL HEATING CABLES, PIPE INSULATION/JACKET, AND ANCILLARY EQUIPMENT AS SHOWN/SPECIFIED FOR AN OVERALL COMPLETE AND OPERABLE HEAT TRACE SYSTEM. PROVIDE 30A, 208V/1P DEDICATED CIRCUIT (2)#10 & #10G, 3/4"C) FROM PANEL 'LVP3' AS SHOWN ON PANEL SCHEDULE. NOTE, THE PIPING WILL BE PROVIDED/INSTALLED BY APPLICABLE CONTRACTOR. COORDINATE ALL EFFORTS AND FINAL REQUIREMENTS CLOSELY WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER.
12. GROUND RING. GROUND RING TO BE BURIED AT MINIMUM 3 FEET BELOW FINISHED GRADE. GROUND RING TO BE KEPT AT MINIMUM OF 3 FEET AWAY FROM BUILDING AT ALL TIMES. PROVIDE AND INSTALL 3/4"Ø x 10' GROUND RODS AT EACH CORNER OF GROUND RING FOR A TOTAL OF FOUR (4) GROUND RODS. ALL GROUND CONDUCTORS SHALL BE #2 COPPER, U.O.N.
13. CONTRACTOR TO INSTALL END OF BEACON LIGHT ASSOCIATED WITH HEAT TRACE SYSTEM ON BUILDING EXTERIOR WALL (VISIBLE TO OWNER). COORDINATE FINAL LOCATIONS IN FIELD WITH THE OWNER (PRIOR TO ROUGH-IN) AND PROVIDE ALL NECESSARY STAINLESS STEEL MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC... REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION/REQUIREMENTS. TYPICAL OF FOUR (4).
14A. PANEL TO BE RELOCATED TO ELECTRICAL ROOM BY THIS CONTRACT. DISCONNECT ELECTRICAL PANEL, MAKE ELECTRICALLY SAFE AND REMOVE ALL CIRCUITRY (CONDUIT & CONDUCTORS) BACK TO SOURCE.
15. CONTRACTOR TO DISCONNECT & REMOVE LIGHT FIXTURE IN ITS ENTIRETY. REMOVE CONDUIT AND CONDUCTORS BACK TO SOURCE. CONTRACTOR TO FIELD VERIFY.
16. CONTRACTOR TO DISCONNECT & REMOVE RECEPTACLE IN ITS ENTIRETY. REMOVE CONDUIT AND CONDUCTORS BACK TO SOURCE. CONTRACTOR TO FIELD VERIFY.
17. CONTRACTOR TO PROVIDE HAND-OFF-AUTO (H-O-A) SWITCH FOR CONTROL OF EXHAUST FAN 'EF-201' AND LOUVERS 'LV-202', 'LV-203'. IN HAND MODE FAN IS TO BE ON. IN OFF MODE FAN IS TO BE OFF. IN AUTO MODE FAN IS TO OPERATE VIA REVERSE ACTING THERMOSTAT. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL NECESSARY INTERLOCK CIRCUITRY. PROVIDE CONTROL POWER TRANSFORMER AND ENCLOSURE AS REQUIRED TO OBTAIN NECESSARY VOLTAGE FOR THERMOSTAT. REFER TO HVAC DRAWINGS AND COORDINATE WITH APPLICABLE TRADE CONTRACTORS FOR THERMOSTAT LOCATIONS AND FINAL REQUIREMENTS. REFER TO VENTILATION SYSTEM INTERLOCK DETAIL FOR ADDITIONAL INFORMATION.

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BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK JEFFREY E. ROBINSON 095896 LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:

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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL FLOOR PLANS - HEADWORKS BUILDING

REVISIONS

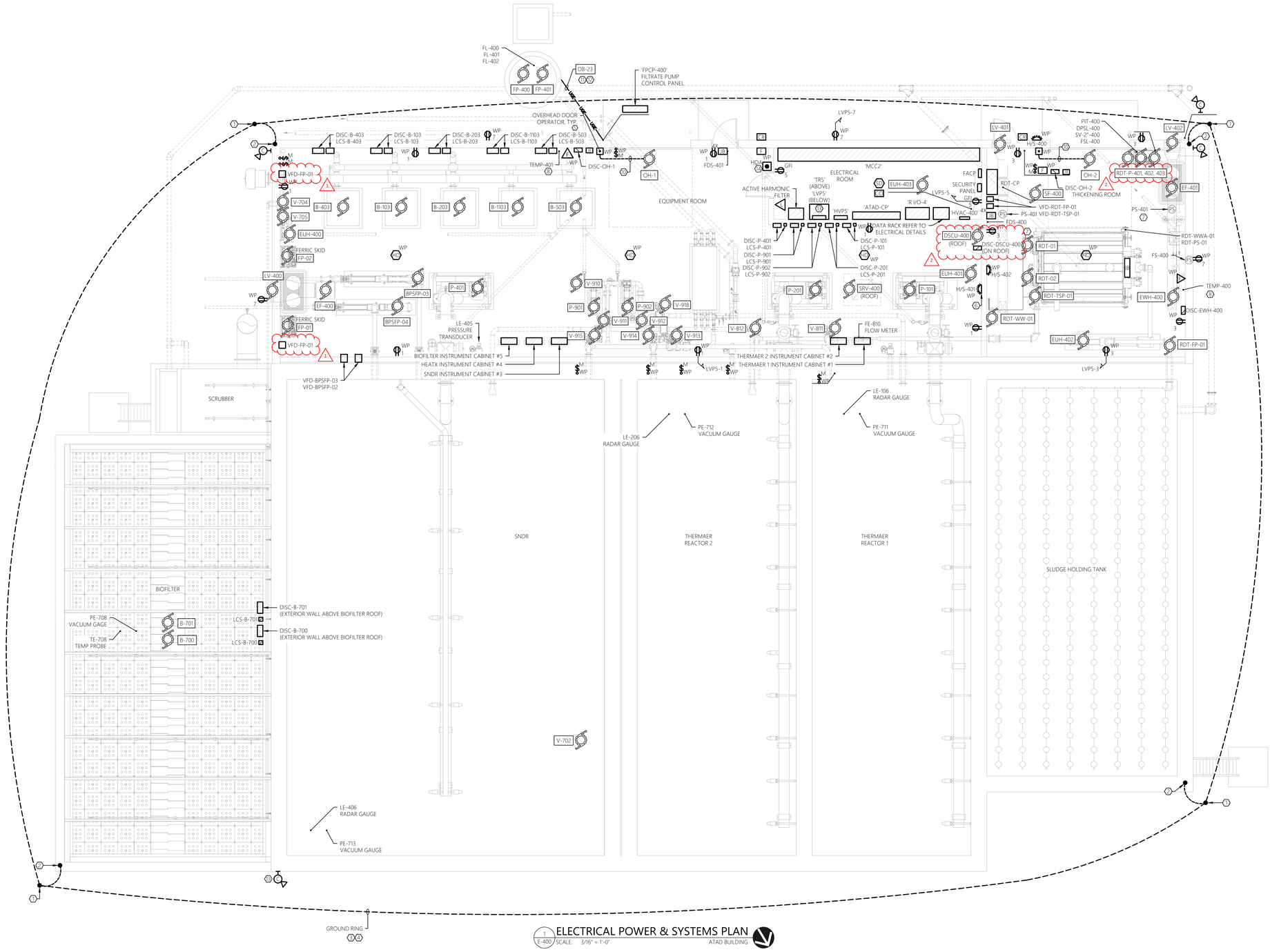
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2	BID ADDENDUM	07/10/2025
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SHEET NO.

E-201

PROJECT # 18-732 PHASE #



ELECTRICAL POWER & SYSTEMS PLAN

1 / E-400 SCALE: 3/16" = 1'-0" — ATAD BUILDING

GENERAL NEW WORK NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE A DEDICATED GROUNDING CONDUCTOR FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT AND DEVICES.
3. EQUIPMENT & DEVICE LOCATIONS ARE SHOWN AS GENERAL IN NATURE. REFER TO MECHANICAL, PROCESS AND HVAC DRAWINGS FOR EXACT LOCATIONS.
4. ALL PROPOSED EQUIPMENT LOCATIONS/INSTALLATIONS TO COMPLY WITH NEC ARTICLE 110.26 'SPACES ABOUT ELECTRICAL EQUIPMENT'. CONTRACTOR TO COORDINATE INSTALLATION LOCATIONS OF ALL EQUIPMENT WITH ALL OTHER TRADE CONTRACTORS PRIOR TO ROUGH IN.
5. CONTRACTOR RESPONSIBLE FOR MOUNTING OF ALL CONTROL PANELS, CONTROLLERS, TRANSMITTERS, ETC... THAT ARE FURNISHED AS PART OF THIS PROJECT (INCLUDING GENERAL CONTRACTOR). PROVIDE ALL NECESSARY MOUNTING HARDWARE/EQUIPMENT. ALL MOUNTING HARDWARE/EQUIPMENT TO BE STAINLESS STEEL. REFERENCE TYPICAL MOUNTING DETAILS FOR ADDITIONAL INFORMATION.
6. REFER TO ELECTRICAL SINGLE LINE DIAGRAM, SCHEDULES, AND DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
7. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH OWNER AND GENERAL CONTRACTOR.
8. ALL EXTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 36" A.F.G. ALL INTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 24" A.F.F. UNLESS NOTED OTHERWISE.
9. CONTRACTOR TO PROVIDE LABEL FOR ALL PROPOSED ELECTRICAL EQUIPMENT AND DEVICES. COORDINATE FINAL LABELING REQUIREMENTS WITH THE OWNER AND ALL OTHER TRADE CONTRACTORS.
10. COORDINATE CONDUIT PENETRATION LOCATIONS THRU EXTERIOR BUILDING WALLS CLOSELY WITH GENERAL CONTRACTOR PRIOR TO PERFORMING WORK.
11. REFER TO DATA DETAILS FOR COMMUNICATION SCOPE OF WORK.

0' 2' 4' 8' 16'
SCALE: 3/16" = 1'-0"

SHEET KEY NOTE:

1. CONTRACTOR TO PROVIDE 3/4"Ø x 10' COPPER GROUND ROD. BOND ALL METAL STRUCTURES AND LIGHTING PROTECTION DOWN CONDUCTOR TO GROUND ROD USING #2/0 COPPER CONDUCTOR WITHIN RGS CONDUIT. REFER TO TYPICAL LIGHTNING PROTECTION GROUNDING DETAILS AND TYPICAL PANEL GROUNDING DETAIL FOR ADDITIONAL INFORMATION/REQUIREMENTS.
2. LIGHTNING PROTECTION DOWN CONDUCTOR. CONCEAL IN RGS CONDUIT WITHIN EXTERIOR WALL CONSTRUCTION. CONTRACTOR TO WORK WITH CERTIFIED LIGHTNING PROTECTION INSTALLER TO PROVIDE COMPLETE BUILDING LIGHTNING PROTECTION SYSTEM IN ACCORDANCE WITH NFPA. UPON COMPLETION PROVIDE UL MASTER LABEL. REFER TO LIGHTNING PROTECTION FOR STRUCTURES SPECIFICATIONS FOR REQUIREMENTS AND ADDITIONAL INFORMATION.
3. GROUND RING. GROUND RING TO BE BURIED AT MINIMUM 3 FEET BELOW FINISHED GRADE. GROUND RING TO BE KEPT AT MINIMUM OF 3 FEET AWAY FROM BUILDING AT ALL TIMES. PROVIDE AND INSTALL 3/4"Ø x 10' GROUND RODS AT EACH CORNER OF GROUND RING FOR A TOTAL OF SIX (6) GROUND RODS. ALL GROUND CONDUCTORS SHALL BE #2/0 COPPER, U.O.N.
4. CONTRACTOR TO ADDITIONALLY BOND GROUND RING TO ADJACENT BUILDING GROUND SYSTEM. UTILIZE #2/0 COPPER GROUND CONDUCTOR.
5. REFER TO EQUIPMENT CONNECTION SCHEDULE AND 'TYPICAL OVERHEAD DOOR RISER DIAGRAM' FOR ADDITIONAL INFORMATION/REQUIREMENTS.
6. HVAC MONITORING SYSTEM ALARM HORN/STROBES. INSTALL DEVICES (HORN/STROBES) AT 8'-0" ABOVE FINISHED FLOOR/GRADE. TYPICAL OF TWO (2). REFER TO RISER DIAGRAM FOR ADDITIONAL INFORMATION/REQUIREMENTS.
7. PRESSURE SENSOR FOR MONITORING. COORDINATE FINAL CIRCUITRY REQUIREMENTS WITH THE HVAC CONTRACTOR. CONNECT TO 'HVAC-400'.
8. TEMPERATURE SENSOR FOR MONITORING. COORDINATE FINAL CIRCUITRY REQUIREMENTS WITH THE APPLICABLE TRADE CONTRACTOR. CONNECT TO 'R I/O-4'. TYPICAL OF TWO (2)
9. CONTRACTOR TO PROVIDE COMBINATION CARBON MONOXIDE/SMOKE DETECTOR MODEL GN-503F AS MANUFACTURED BY GENTEX OR APPROVED EQUAL. DETECTOR TO BE 120V POWERED BY BUILDING ELECTRICAL SYSTEM, CONTAIN BATTERY BACKUP, AND BE UL LISTED. DETECTOR TO FEATURE ONE (1) SET OF CONTACTS THAT ACTIVATE UPON DETECTION OF SMOKE, OR CARBON MONOXIDE. INSTALL ON WALL PER MANUFACTURER'S RECOMMENDATIONS AND IN ACCORDANCE WITH NFPA 720.
10. PROVIDE LOW VOLTAGE CONDUCTORS IN 1/2" CONDUIT PER MANUFACTURERS RECOMMENDATIONS FOR AN OVERALL COMPLETE AND OPERABLE SYSTEM. COORDINATE FINAL REQUIREMENTS WITH ALL OTHER TRADE CONTRACTORS AND THE OWNER.
11. CONTRACTOR RESPONSIBLE TO RESTORE ALL DISTURBED SURFACES AS PART OF THIS PROJECT. COORDINATE FINAL REQUIREMENTS WITH THE OWNER AND APPLICABLE CONTRACTOR. REFER TO DUCT BANK SECTION DETAILS FOR ADDITIONAL INFORMATION. TYPICAL OF ALL PROPOSED DUCT BANKS.
12. CONTRACTOR TO COORDINATE FINAL DUCT BANK ROUTING/REQUIREMENTS WITH EXISTING FIELD CONDITIONS, PROPOSED WORK, OWNER AND APPLICABLE CONTRACTOR PRIOR TO ROUGH-IN TO AVOID CONFLICTS. TYPICAL OF ALL PROPOSED DUCT BANKS.
13. CONTRACTOR TO PROVIDE WALL MOUNT BRACKETS FOR INSTALLATION ON WALL ABOVE PANEL LVP5.
14. CONTRACTOR TO PROVIDE HAND-OFF-AUTO (H-O-A) SWITCH FOR CONTROL OF EXHAUST FAN 'EF-400' AND LOUVER 'LV-400'. IN HAND MODE FAN IS TO BE ON. IN OFF MODE FAN IS TO BE OFF. IN AUTO MODE FAN IS TO OPERATE VIA REVERSE ACTING THERMOSTAT. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL NECESSARY INTERLOCK CIRCUITRY. PROVIDE CONTROL POWER TRANSFORMER AND ENCLOSURE AS REQUIRED TO OBTAIN NECESSARY VOLTAGE FOR THERMOSTAT. REFER TO HVAC DRAWINGS AND COORDINATE WITH APPLICABLE TRADE CONTRACTORS FOR THERMOSTAT LOCATIONS AND FINAL REQUIREMENTS. REFER TO VENTILATION SYSTEM INTERLOCK DETAIL FOR ADDITIONAL INFORMATION.

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111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK
JEFFREY E ROBINSON
095896
LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:
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FOR TOWN OF NEW WINDSOR
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NEW WINDSOR, NY 12553

ELECTRICAL POWER & SYSTEMS PLAN - ATAD BUILDING

REVISIONS

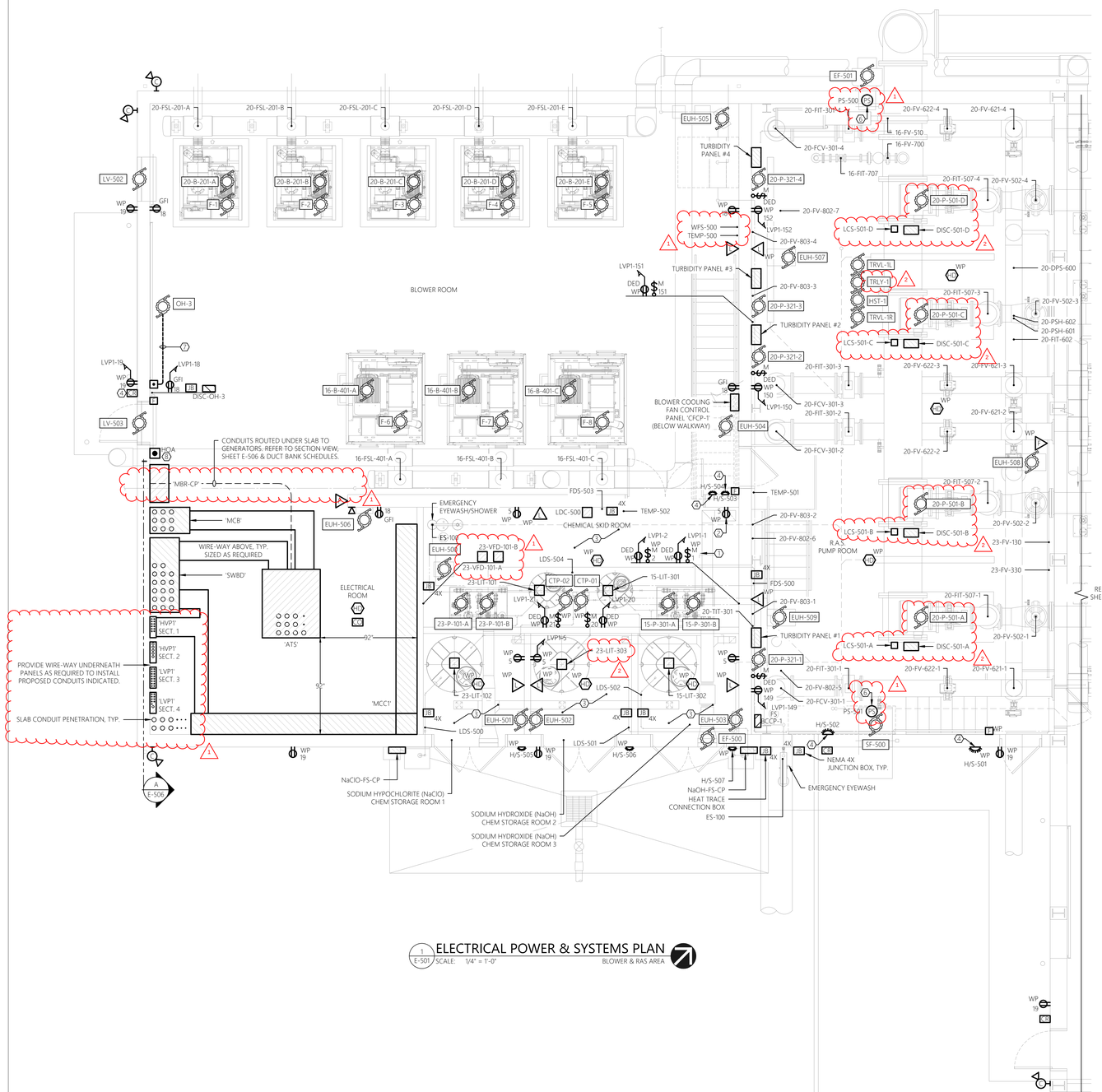
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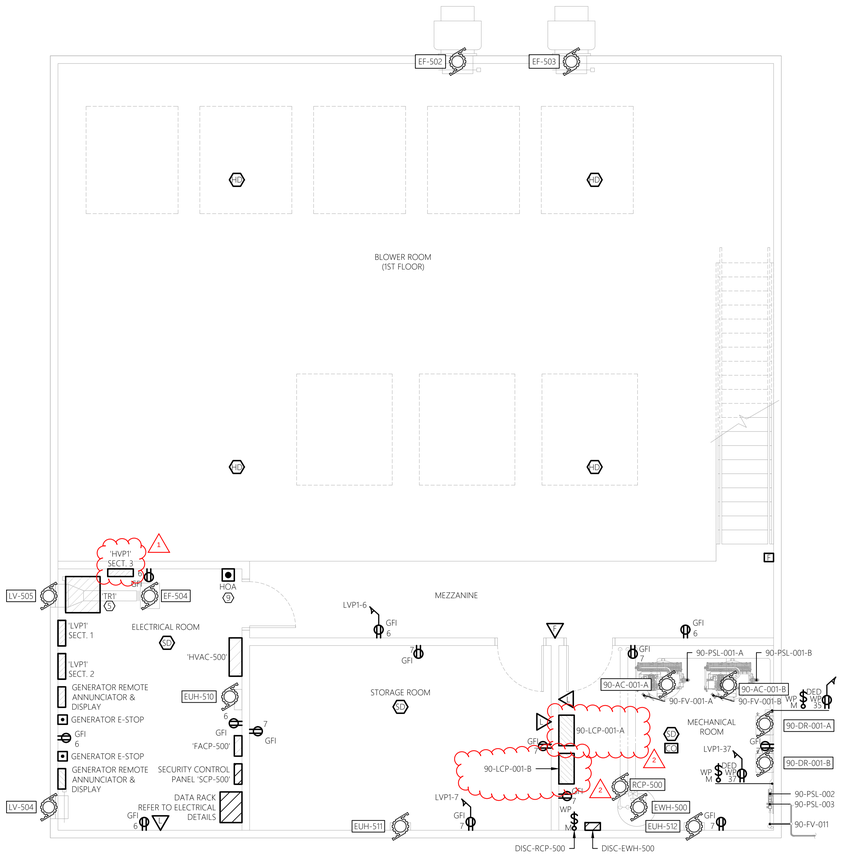
SHEET NO.

E-400

PROJECT # 18-732 PHASE #



1 ELECTRICAL POWER & SYSTEMS PLAN
E-501 SCALE: 1/4" = 1'-0" BLOWER & RAS AREA



2 ELECTRICAL POWER & SYSTEMS PLAN
E-501 SCALE: 1/4" = 1'-0" 2ND FLOOR



3 OVERALL PLAN KEY
E-501 SCALE: NTS MBR BUILDING

GENERAL NEW WORK NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE A DEDICATED GROUNDING CONDUCTOR FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT AND DEVICES.
3. EQUIPMENT & DEVICE LOCATIONS ARE SHOWN AS GENERAL IN NATURE. REFER TO MECHANICAL, PROCESS AND HVAC DRAWINGS FOR EXACT LOCATIONS.
4. ALL PROPOSED EQUIPMENT LOCATIONS/INSTALLATIONS TO COMPLY WITH NEC ARTICLE 110.26 'SPACES ABOUT ELECTRICAL EQUIPMENT'. CONTRACTOR TO COORDINATE INSTALLATION LOCATIONS OF ALL EQUIPMENT WITH ALL OTHER TRADE CONTRACTORS PRIOR TO ROUGH IN.
5. CONTRACTOR RESPONSIBLE FOR MOUNTING OF ALL CONTROL PANELS, CONTROLLERS, TRANSMITTERS, ETC., THAT ARE FURNISHED AS PART OF THIS PROJECT (INCLUDING GENERAL CONTRACTOR). PROVIDE ALL NECESSARY MOUNTING HARDWARE/EQUIPMENT. ALL MOUNTING HARDWARE/EQUIPMENT TO BE STAINLESS STEEL. REFERENCE TYPICAL MOUNTING DETAILS FOR ADDITIONAL INFORMATION.
6. REFER TO ELECTRICAL SINGLE LINE DIAGRAM, SCHEDULES, AND DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
7. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH OWNER AND ALL OTHER TRADE CONTRACTORS.
8. ALL EXTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 36" A.F.G. ALL INTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 24" A.F.F. UNLESS NOTED OTHERWISE.
9. CONTRACTOR TO PROVIDE LABEL FOR ALL PROPOSED ELECTRICAL EQUIPMENT AND DEVICES. COORDINATE FINAL LABELING REQUIREMENTS WITH THE OWNER AND ALL OTHER TRADE CONTRACTORS.
10. COORDINATE CONDUIT PENETRATION LOCATIONS THRU EXTERIOR BUILDING WALLS CLOSELY WITH GENERAL CONTRACTOR PRIOR TO PERFORMING WORK.
11. REFER TO DATA DETAILS FOR COMMUNICATION SCOPE OF WORK.

0' 2' 4' 8'
SCALE: 1/4" = 1'-0"

SHEET KEY NOTES:

1. EACH CHEMICAL PUMP TO BE PROVIDED WITH A SWITCHED RECEPTACLE FOR ON/OFF CONTROL OF CHEMICAL PUMP. REFER TO EQUIPMENT CONNECTION SCHEDULE FOR ADDITIONAL INFORMATION. TYPICAL.
2. ALL RECEPTACLES WITHIN CHEMICAL ROOM TO BE PROVIDED WITH PVC COATED BOX AND COVER SYSTEM. TYPICAL.
3. CHEMICAL ROOM INTERIOR IS A CORROSIVE ENVIRONMENT. ALL ELECTRICAL EQUIPMENT, WIRING METHODS, AND DEVICES INTERIOR TO THE CHEMICAL ROOM TO BE OF CORROSION RESISTANT MATERIALS/METHODS. UTILIZE NEMA 4X (NON-METALLIC) ENCLOSURES FOR DISCONNECTS AND LOCAL CONTROL STATIONS. UTILIZED TITANIUM FOR ALL SUPPORTS, ANCHORS, AND FASTENERS.
4. HVAC MONITORING SYSTEM ALARM HORN/STROBES. INSTALL DEVICES (HORN/STROBES) AT 8'-0" ABOVE FINISHED FLOOR/GRADE. REFER TO RISER DIAGRAM FOR ADDITIONAL INFORMATION/REQUIREMENTS.
5. CONTRACTOR TO PROVIDE CONCRETE EQUIPMENT PAD. REFER TO TYPICAL EQUIPMENT PAD DETAIL.
6. AIRFLOW PROVING SWITCH/PRESSURE SENSOR TO BE PROVIDED AND INSTALLED IN DUCTWORK FOR AIRFLOW MONITORING PER MANUFACTURER RECOMMENDATIONS. REFER TO RISER HVAC MONITORING CONTROL PANEL FOR ADDITIONAL INFORMATION/REQUIREMENTS.
7. ANOKA OVERHEAD DOOR SYSTEM SHALL BE FURNISHED, INSTALLED, AND TESTED AS AN OVERALL COMPLETE AND OPERABLE SYSTEM. COORDINATE FINAL REQUIREMENTS WITH ALL OTHER TRADE CONTRACTORS AND THE OWNER.
8. CONTRACTOR TO PROVIDE HAND-OFF-AUTO (H-O-A) SWITCH FOR CONTROL OF EXHAUST FANS 'EF-502' AND 'EF-503' AND LOUVERS 'LV-502' AND 'LV-503'. IN HAND MODE FAN IS TO BE ON. IN OFF MODE FAN IS TO BE OFF. IN AUTO MODE FAN IS TO OPERATE VIA REVERSE ACTING THERMOSTAT. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL NECESSARY INTERLOCK CIRCUITRY. PROVIDE CONTROL POWER TRANSFORMER AND ENCLOSURE AS REQUIRED TO OBTAIN NECESSARY VOLTAGE FOR THERMOSTAT. REFER TO HVAC DRAWINGS AND COORDINATE WITH APPLICABLE TRADE CONTRACTORS FOR THERMOSTAT LOCATIONS AND FINAL REQUIREMENTS.
9. CONTRACTOR TO PROVIDE HAND-OFF-AUTO (H-O-A) SWITCH FOR CONTROL OF EXHAUST FAN 'EF-504' AND LOUVERS 'LV-504' AND 'LV-505'. IN HAND MODE FAN IS TO BE ON. IN OFF MODE FAN IS TO BE OFF. IN AUTO MODE FAN IS TO OPERATE VIA REVERSE ACTING THERMOSTAT. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL NECESSARY INTERLOCK CIRCUITRY. PROVIDE CONTROL POWER TRANSFORMER AND ENCLOSURE AS REQUIRED TO OBTAIN NECESSARY VOLTAGE FOR THERMOSTAT. REFER TO HVAC DRAWINGS AND COORDINATE WITH APPLICABLE TRADE CONTRACTORS FOR THERMOSTAT LOCATIONS AND FINAL REQUIREMENTS.

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111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK JEFFREY E ROBINSON 095896 LICENSED PROFESSIONAL ENGINEER

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ELECTRICAL POWER & SYSTEMS PLAN - BLOWER & RAS AREA

REVISIONS

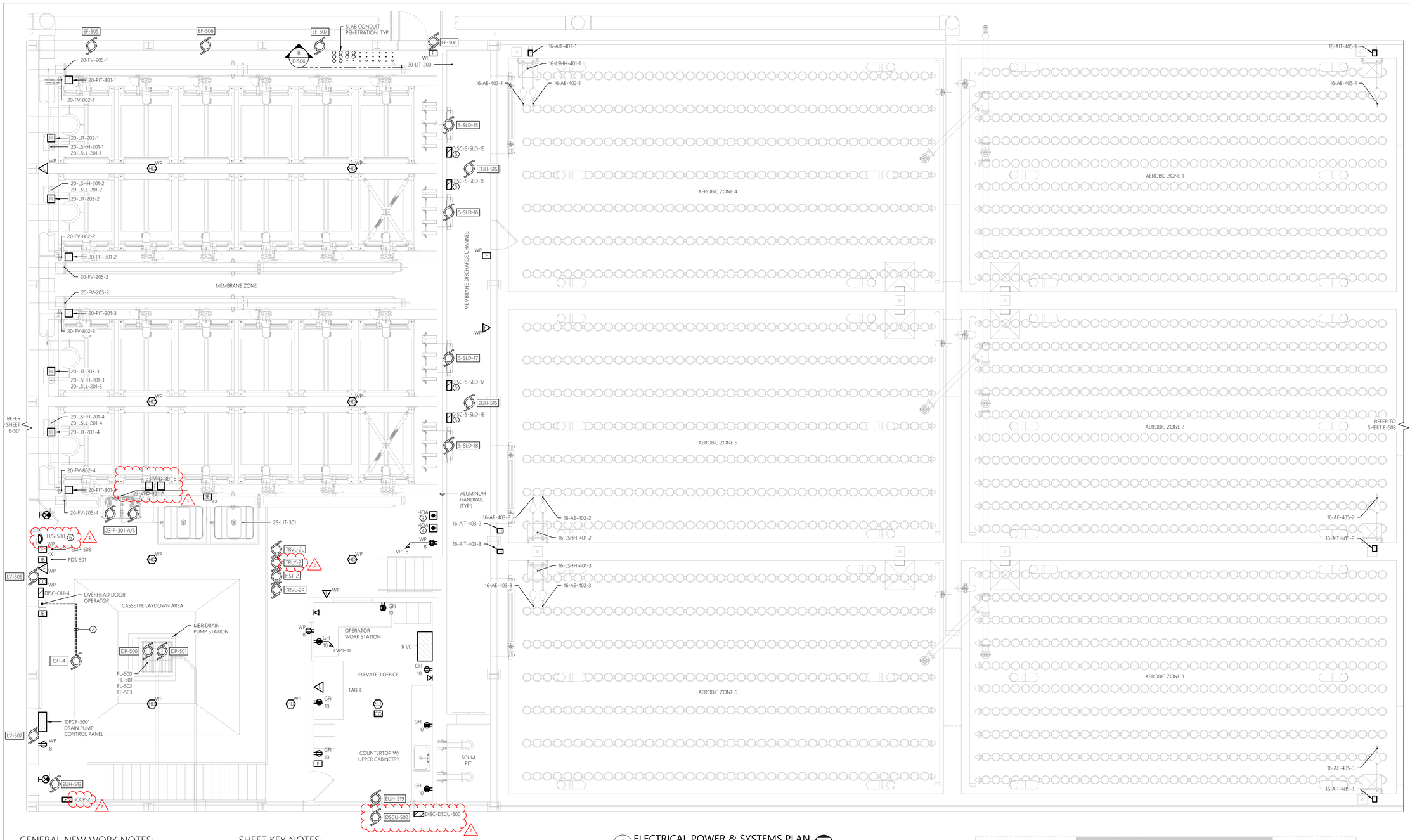
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SHEET NO.

E-501

PROJECT # 18-732 PHASE #



1 E-502 ELECTRICAL POWER & SYSTEMS PLAN — MEMBRANE & AEROBIC ZONES
SCALE: 1/4" = 1'-0"

GENERAL NEW WORK NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE A DEDICATED GROUNDING CONDUCTOR FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT AND DEVICES.
3. EQUIPMENT & DEVICE LOCATIONS ARE SHOWN AS GENERAL IN NATURE. REFER TO MECHANICAL, PROCESS AND HVAC DRAWINGS FOR EXACT LOCATIONS.
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5. CONTRACTOR RESPONSIBLE FOR MOUNTING OF ALL CONTROL PANELS, CONTROLLERS, TRANSMITTERS, ETC., THAT ARE FURNISHED AS PART OF THIS PROJECT (INCLUDING GENERAL CONTRACTOR). PROVIDE ALL NECESSARY MOUNTING HARDWARE/EQUIPMENT. ALL MOUNTING HARDWARE/EQUIPMENT TO BE STAINLESS STEEL. REFERENCE TYPICAL MOUNTING DETAILS FOR ADDITIONAL INFORMATION.
6. REFER TO ELECTRICAL SINGLE LINE DIAGRAM, SCHEDULES, AND DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
7. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH OWNER AND ALL OTHER TRADE CONTRACTORS.
8. ALL EXTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 36" A.F.G. ALL INTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 24" A.F.F. UNLESS NOTED OTHERWISE.
9. CONTRACTOR TO PROVIDE LABEL FOR ALL PROPOSED ELECTRICAL EQUIPMENT AND DEVICES. COORDINATE FINAL LABELING REQUIREMENTS WITH THE OWNER AND ALL OTHER TRADE CONTRACTORS.
10. COORDINATE CONDUIT PENETRATION LOCATIONS THRU EXTERIOR BUILDING WALLS CLOSELY WITH GENERAL CONTRACTOR PRIOR TO PERFORMING WORK.
11. REFER TO DATA DETAILS FOR COMMUNICATION SCOPE OF WORK.

SHEET KEY NOTES:

1. HVAC MONITORING SYSTEM ALARM HORN/STROBE SERVING RAS PUMP ROOM. INSTALL DEVICE (HORN/STROBE) AT 8'-0" ABOVE FINISHED FLOOR/GRADE. REFER TO RISER DIAGRAM FOR ADDITIONAL INFORMATION/REQUIREMENTS.
2. CONTRACTOR TO PROVIDE ALL REQUIRED STAINLESS STEEL UNISTRUT AND ASSOCIATED MOUNTING BRACKETS, ACCESSORIES, ETC., TO MOUNT ELECTRICAL EQUIPMENT TO HANDRAIL. COORDINATE FINAL LOCATION WITH OWNER AND APPLICABLE TRADE CONTRACTORS. ALL REQUIREMENTS TO BE PER NEC.
3. CONTRACTOR TO PROVIDE HAND-OFF-AUTO (H-O-A) SWITCH FOR CONTROL OF EXHAUST FANS 'EF-505' AND 'EF-506' AND LOUVER 'LV-506'. IN HAND MODE FAN IS TO BE ON. IN OFF MODE FAN IS TO BE OFF. IN AUTO MODE FAN IS TO OPERATE VIA REVERSE ACTING THERMOSTAT. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL NECESSARY INTERLOCK CIRCUITRY. PROVIDE CONTROL POWER TRANSFORMER AND ENCLOSURE AS REQUIRED TO OBTAIN NECESSARY VOLTAGE FOR THERMOSTAT. REFER TO HVAC DRAWINGS AND COORDINATE WITH APPLICABLE TRADE CONTRACTORS FOR THERMOSTAT LOCATIONS AND FINAL REQUIREMENTS.
4. CONTRACTOR TO PROVIDE HAND-OFF-AUTO (H-O-A) SWITCH FOR CONTROL OF EXHAUST FANS 'EF-507' AND 'EF-508' AND LOUVER 'LV-507'. IN HAND MODE FAN IS TO BE ON. IN OFF MODE FAN IS TO BE OFF. IN AUTO MODE FAN IS TO OPERATE VIA REVERSE ACTING THERMOSTAT. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL NECESSARY INTERLOCK CIRCUITRY. PROVIDE CONTROL POWER TRANSFORMER AND ENCLOSURE AS REQUIRED TO OBTAIN NECESSARY VOLTAGE FOR THERMOSTAT. REFER TO HVAC DRAWINGS AND COORDINATE WITH APPLICABLE TRADE CONTRACTORS FOR THERMOSTAT LOCATIONS AND FINAL REQUIREMENTS.
5. CONTRACTOR TO PROVIDE ALL REQUIRED STAINLESS STEEL UNISTRUT AND ASSOCIATED MOUNTING BRACKETS, ACCESSORIES, ETC., TO MOUNT ELECTRICAL EQUIPMENT TO HANDRAIL. COORDINATE FINAL LOCATION WITH OWNER AND APPLICABLE TRADE CONTRACTORS. ALL REQUIREMENTS TO BE PER NEC.



2 E-502 OVERALL PLAN KEY — MBR BUILDING
SCALE: NTS

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111 Wheatfield Drive, Suite 1
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BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK
JEFFREY E ROBINSON
098896
LICENSED PROFESSIONAL ENGINEER

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ELECTRICAL POWER & SYSTEMS PLAN - MEMBRANE & AEROBIC AREA

REVISIONS

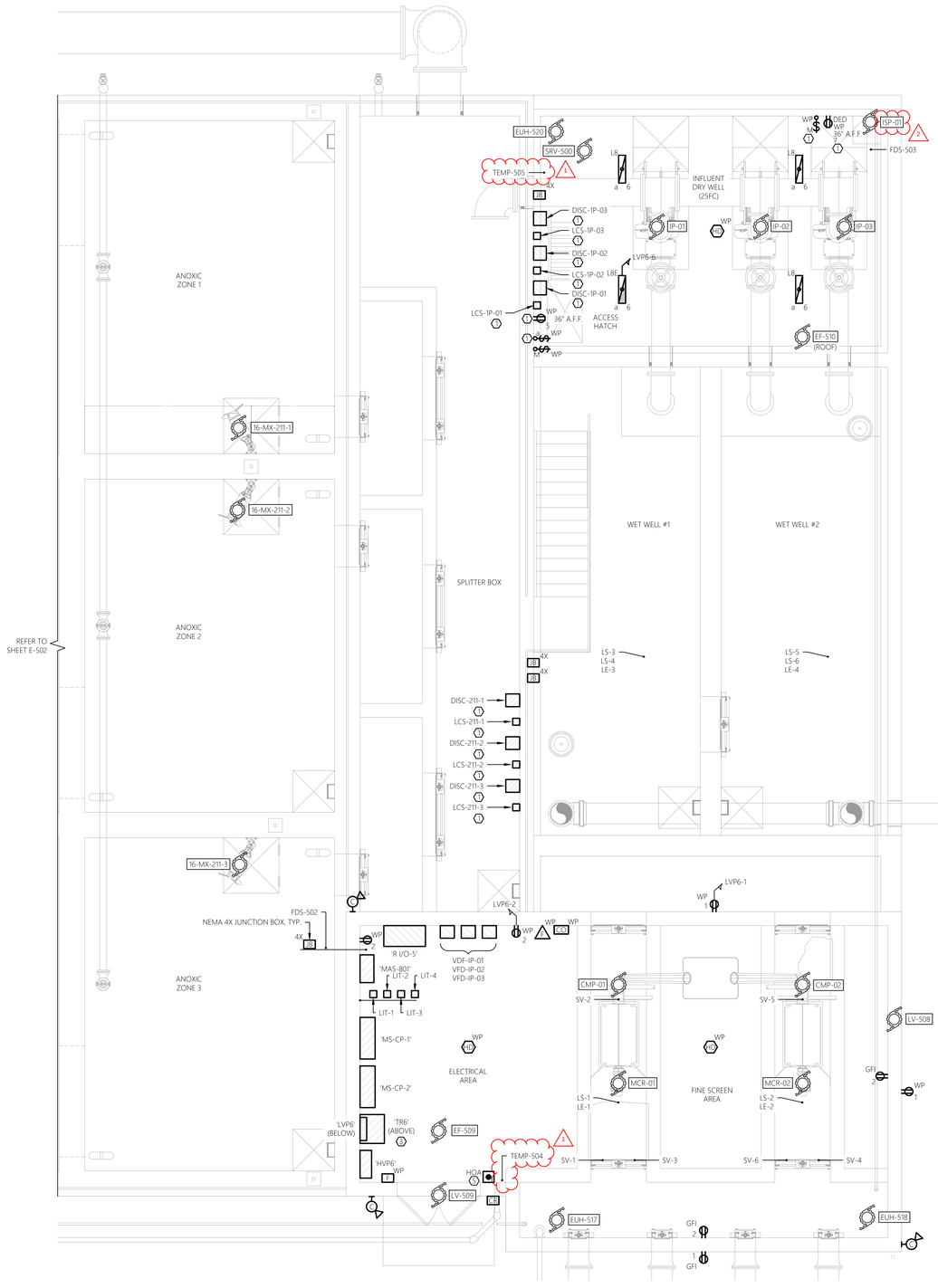
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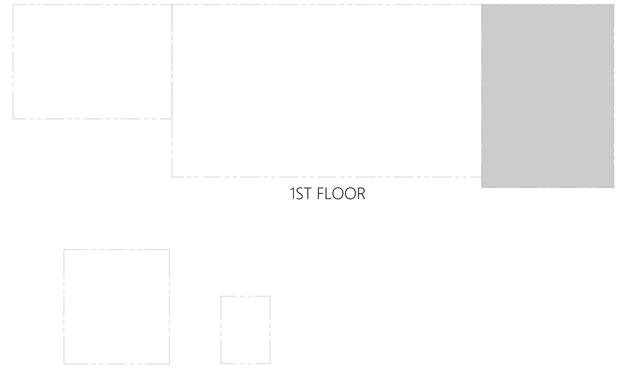
SHEET NO.

E-502

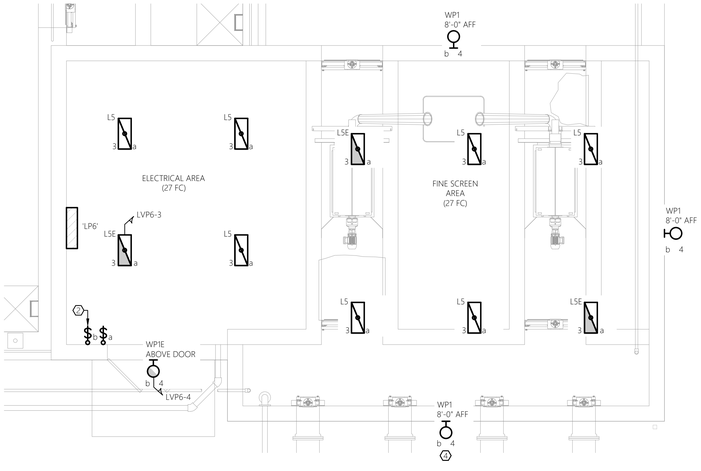
PROJECT # 18-732 PHASE #



1 E-503 ELECTRICAL POWER & SYSTEMS PLAN
SCALE: 1/4" = 1'-0" SCREENING & INFLUENT AREA



2 E-503 OVERALL PLAN KEY
SCALE: NTS MBR BUILDING



3 E-503 ELECTRICAL LIGHTING PLAN
SCALE: 1/4" = 1'-0" SCREENING & INFLUENT AREA

0' 2' 4' 8'
SCALE: 1/4" = 1'-0"

GENERAL NEW WORK NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE A DEDICATED GROUNDING CONDUCTOR FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT AND DEVICES.
3. EQUIPMENT & DEVICE LOCATIONS ARE SHOWN AS GENERAL IN NATURE. REFER TO MECHANICAL, PROCESS AND HVAC DRAWINGS FOR EXACT LOCATIONS.
4. ALL PROPOSED EQUIPMENT LOCATIONS/INSTALLATIONS TO COMPLY WITH NEC ARTICLE 110.26 'SPACES ABOUT ELECTRICAL EQUIPMENT'. CONTRACTOR TO COORDINATE INSTALLATION LOCATIONS OF ALL EQUIPMENT WITH ALL OTHER TRADE CONTRACTORS PRIOR TO ROUGH IN.
5. CONTRACTOR RESPONSIBLE FOR MOUNTING OF ALL CONTROL PANELS, CONTROLLERS, TRANSMITTERS, ETC... THAT ARE FURNISHED AS PART OF THIS PROJECT (INCLUDING GENERAL CONTRACTOR). PROVIDE ALL NECESSARY MOUNTING HARDWARE/EQUIPMENT. ALL MOUNTING HARDWARE/EQUIPMENT TO BE STAINLESS STEEL. REFERENCE TYPICAL MOUNTING DETAILS FOR ADDITIONAL INFORMATION.
6. REFER TO ELECTRICAL SINGLE LINE DIAGRAM, SCHEDULES, AND DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
7. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH OWNER AND APPLICABLE TRADE CONTRACTORS.
8. ALL EXTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 36" A.F.G. ALL INTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 24" A.F.F. UNLESS NOTED OTHERWISE.
9. CONTRACTOR TO PROVIDE LABEL FOR ALL PROPOSED ELECTRICAL EQUIPMENT AND DEVICES. COORDINATE FINAL LABELING REQUIREMENTS WITH THE OWNER AND ALL OTHER TRADE CONTRACTORS.
10. COORDINATE CONDUIT PENETRATION LOCATIONS THRU EXTERIOR BUILDING WALLS CLOSELY WITH GENERAL CONTRACTOR PRIOR TO PERFORMING WORK.
11. REFER TO DATA DETAILS FOR COMMUNICATION SCOPE OF WORK.
12. CONTRACTOR TO ADJUST FINAL PROPOSED INTERIOR LIGHT FIXTURE LOCATIONS TO AVOID CONFLICTS WITH PROPOSED EQUIPMENT, AND PIPING SYSTEMS.
13. CONTRACTOR TO ADJUST FINAL AIMING ANGLE OF EXTERIOR LIGHT FIXTURES TO LIGHT DESIRED AREAS AND MINIMIZE LIGHT POLLUTION. COORDINATE WITH ALL OTHER TRADE CONTRACTORS. REFER TO THE LUMINAIRE SCHEDULE FOR ADDITIONAL INFORMATION/REQUIREMENTS.

SHEET KEY NOTES:

1. PROVIDE ALL REQUIRED STAINLESS STEEL UNISTRUT, MOUNTING HARDWARE, BRACKETS, SUPPORTS, ACCESSORIES, ETC... FOR STANCHION MOUNTING ABOVE TANK WALKWAY AS SHOWN/INDICATED. COORDINATE WITH ALL OTHER TRADE CONTRACTORS AND INSTALL TO HANDRAIL SYSTEM. TYPICAL.
2. CONTRACTOR TO PROVIDE TIME SWITCH AS WATTSTOPPER RT-200 ASTRONOMICAL TIME SWITCH OR APPROVED EQUAL. TIME SWITCH TO CONTROL PROPOSED EXTERIOR LIGHTING FIXTURES TYPE WP1/WP1E. PROGRAM THE SWITCH FOR LIGHTING 'ON' AT ASTRONOMICAL SUNSET AND 'OFF' AT ASTRONOMICAL SUN RISE. FINAL ON/OFF PARAMETERS TO BE COORDINATED WITH THE OWNER.
3. CONTRACTOR TO PROVIDE WALL MOUNT BRACKETS FOR INSTALLATION ON WALL ABOVE PANEL LVP6.
4. COORDINATE FINAL INSTALLATION LOCATION WITH OWNER AND ALL OTHER TRADE CONTRACTORS PRIOR TO ROUGH-IN. TYPICAL OF FOUR (4) WALL PACK LIGHTING FIXTURES.

CONTRACTOR TO PROVIDE HAND-OFF-AUTO (H-O-A) SWITCH FOR CONTROL OF EXHAUST FAN 'EF-509' AND LOUVERS 'LV-508' AND 'LV-509'. IN HAND MODE FAN IS TO BE ON. IN OFF MODE FAN IS TO BE OFF. IN AUTO MODE FAN IS TO OPERATE VIA REVERSE ACTING THERMOSTAT. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL NECESSARY INTERLOCK CIRCUITRY. PROVIDE CONTROL POWER TRANSFORMER AND ENCLOSURE AS REQUIRED TO OBTAIN NECESSARY VOLTAGE FOR THERMOSTAT. REFER TO HVAC DRAWINGS AND COORDINATE WITH APPLICABLE TRADE CONTRACTORS FOR THERMOSTAT LOCATIONS AND FINAL REQUIREMENTS.

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HAZARDOUS MATERIAL NOTE:
THE SERVICES PROVIDED BY MHE, INCLUDING ALL WORK DEPICTED ON MHE PLANS, DO NOT INCLUDE SERVICES RELATED TO THE IDENTIFICATION, CONTROLS OR HANDLING OF HAZARDOUS MATERIALS, INCLUDING SUCH MATERIALS AS ASBESTOS AND LEAD PAINT. ALL TESTING, IDENTIFICATION, ABATEMENT, CONTROLS, AND HANDLING OF HAZARDOUS MATERIALS SHALL BE UNDERTAKEN BY A HAZARDOUS MATERIAL CONSULTANT AND CERTIFIED PROFESSIONALS. IF SUCH MATERIALS HAVE BEEN IDENTIFIED, CONTRACTOR WILL COMMUNICATE DIRECTLY WITH HAZARDOUS MATERIAL PROFESSIONAL FOR THE PERFORMANCE OF ANY WORK ON OR ADJACENT TO SAID MATERIALS. IF UNIDENTIFIED MATERIALS OF CONCERN ARE ENCOUNTERED WHILE UNDERTAKING THE WORK SHOWN HEREON, CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER AND OWNER, AND SHALL OBTAIN DIRECTION FROM THE HAZARDOUS MATERIAL CONSULTANT PRIOR TO THE CONTINUATION OF WORK INVOLVING SUSPECTED MATERIAL.

UDIG·NY SAFE DIGGING STARTS HERE CALL 811

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145 CAESARS LN.
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FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL POWER, SYSTEMS, & LIGHTING PLAN - SCREENING & INFLUENT AREA

REVISIONS

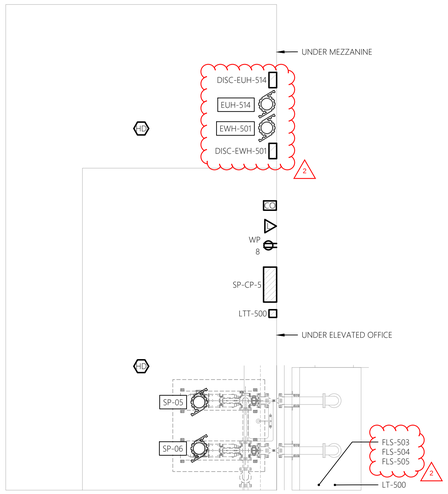
NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	RJK
REVIEWED BY:	RJK

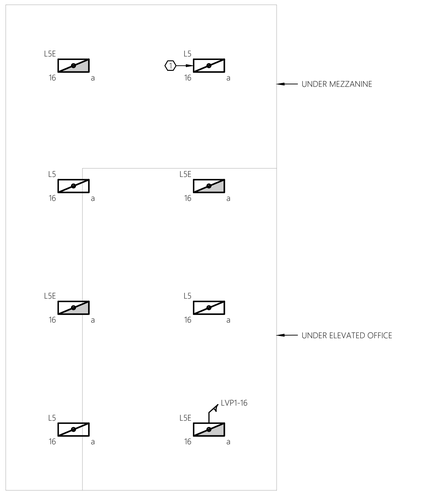
SHEET NO.

E-503

PROJECT # 18-732 PHASE #



1 E-506 ELECTRICAL - POWER & SYSTEMS PLAN
SCALE: 1/4" = 1'-0" SCUM PUMP AREA AND SCUM PIT

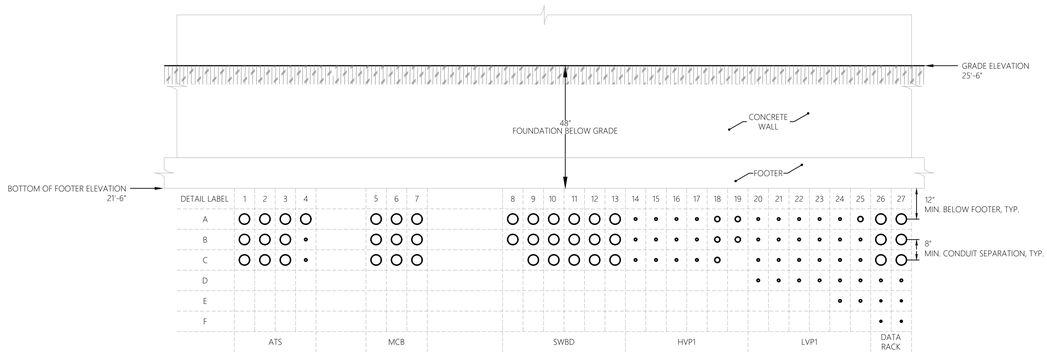


2 E-506 ELECTRICAL - LIGHTING PLAN
SCALE: 1/4" = 1'-0" SCUM PUMP AREA AND SCUM PIT

0' 2' 4' 8'
SCALE: 1/4" = 1'-0"



3 E-501 OVERALL PLAN KEY
SCALE: NTS MBR BUILDING



1ST FLOOR ELECTRICAL ROOM
UNDERGROUND CONDUIT ROUTING SCHEDULE

DETAIL LABLE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
	DUCT BANK (REFER TO DUCT BANK SCHEDULE)																										
A	DB-03	DB-03	DB-04	DB-04	DB-02	DB-02	DB-02	DB-21	DB-21	DB-17	DB-16	DB-06	DB-06	DB-10	DB-11	DB-12	DB-13	DB-10	DB-11	DB-10	DB-11	DB-12	DB-13	DB-14	DB-14	DB-06	DB-02
B	DB-03	DB-03	DB-04	DB-3	DB-02	DB-02	DB-02	DB-21	DB-21	DB-17	DB-16	DB-07	DB-07	DB-10	DB-11	DB-12	DB-13	DB-12	DB-13	DB-10	DB-11	DB-12	DB-13	DB-14	DB-14	DB-07	DB-21
C	DB-03	DB-04	DB-04	DB-04	DB-02	DB-02	DB-02	-	DB-21	DB-17	DB-16	DB-15	DB-15	DB-19	DB-19	DB-19	DB-14	DB-14	-	DB-14	DB-14	DB-14	DB-14	DB-14	DB-14	DB-16	DB-15
D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DB-14	DB-14	DB-14	DB-14	DB-14	DB-14	DB-04	DB-03
E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DB-03	DB-04	DB-04	DB-03
F	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DB-04	DB-03
	ATS				MCB			SWBD						HVP1						LVP1						DATA RACK	

A E-506 ELECTRICAL WALL SECTION DETAIL
SCALE: 1/2" = 1'-0" 1ST FLOOR ELECTRICAL ROOM

MEMBRANE ZONE
UNDERGROUND CONDUIT ROUTING SCHEDULE

DETAIL LABLE	1	2	3	4	5	6	7	8	9	10
	DUCT BANK (REFER TO DUCT BANK SCHEDULE)									
A	DB-06	DB-06	DB-16	DB-16	DB-14	DB-14	DB-13	DB-12	DB-11	DB-10
B	DB-07	DB-07	DB-17	DB-17	DB-14	DB-14	DB-13	DB-12	DB-11	DB-10
C	DB-21	DB-21	DB-14	DB-14	DB-14	DB-14	DB-13	DB-12	DB-11	DB-10
	R I/O-1									

B E-506 ELECTRICAL WALL SECTION DETAIL
SCALE: 1/2" = 1'-0" MEMBRANE ZONE

0' 1' 2' 4'
SCALE: 1/2" = 1'-0"

GENERAL SHEET NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS AND GENERAL PROJECT NOTES.
2. PROVIDE A DEDICATED GROUNDING CONDUCTOR FOR ALL ELECTRICAL EQUIPMENT AND ASSOCIATED EQUIPMENT AND DEVICES.
3. EQUIPMENT & DEVICE LOCATIONS ARE SHOWN AS GENERAL IN NATURE. REFER TO MECHANICAL, PROCESS AND HVAC DRAWINGS FOR EXACT LOCATIONS.
4. ALL PROPOSED EQUIPMENT LOCATIONS/INSTALLATIONS TO COMPLY WITH NEC ARTICLE 110.26 'SPACES ABOUT ELECTRICAL EQUIPMENT'. CONTRACTOR TO COORDINATE INSTALLATION LOCATIONS OF ALL EQUIPMENT WITH ALL OTHER TRADE CONTRACTORS PRIOR TO ROUGH IN.
5. CONTRACTOR RESPONSIBLE FOR MOUNTING OF ALL CONTROL PANELS, CONTROLLERS, TRANSMITTERS, ETC., THAT ARE FURNISHED AS PART OF THIS PROJECT (INCLUDING GENERAL CONTRACTOR). PROVIDE ALL NECESSARY MOUNTING HARDWARE/EQUIPMENT. ALL MOUNTING HARDWARE/EQUIPMENT TO BE STAINLESS STEEL. REFERENCE TYPICAL MOUNTING DETAILS FOR ADDITIONAL INFORMATION.
6. REFER TO ELECTRICAL SINGLE LINE DIAGRAM, SCHEDULES, AND DETAILS FOR ADDITIONAL INFORMATION/REQUIREMENTS.
7. CONTRACTOR TO COORDINATE ALL ASPECTS OF SEQUENCE OF CONSTRUCTION WITH OWNER AND GENERAL CONTRACTOR.
8. ALL EXTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 36" A.F.G. ALL INTERIOR RECEPTACLES TO BE INSTALLED AT A HEIGHT OF 24" A.F.F. UNLESS NOTED OTHERWISE.
9. CONTRACTOR TO PROVIDE LABEL FOR ALL PROPOSED ELECTRICAL EQUIPMENT AND DEVICES. COORDINATE FINAL LABELING REQUIREMENTS WITH THE OWNER AND ALL OTHER TRADE CONTRACTORS.
10. COORDINATE CONDUIT PENETRATION LOCATIONS THRU EXTERIOR BUILDING WALLS CLOSELY WITH GENERAL CONTRACTOR PRIOR TO PERFORMING WORK.

SHEET KEY NOTE:

1. CONTROLLED BY SWITCH ON SHEET E-505.

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HAZARDOUS MATERIAL NOTE:
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FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL FLOOR PLANS - SCUM PUMP AREA, 1ST FLOOR ELECTRICAL ROOM, & MEMBRANE ZONE

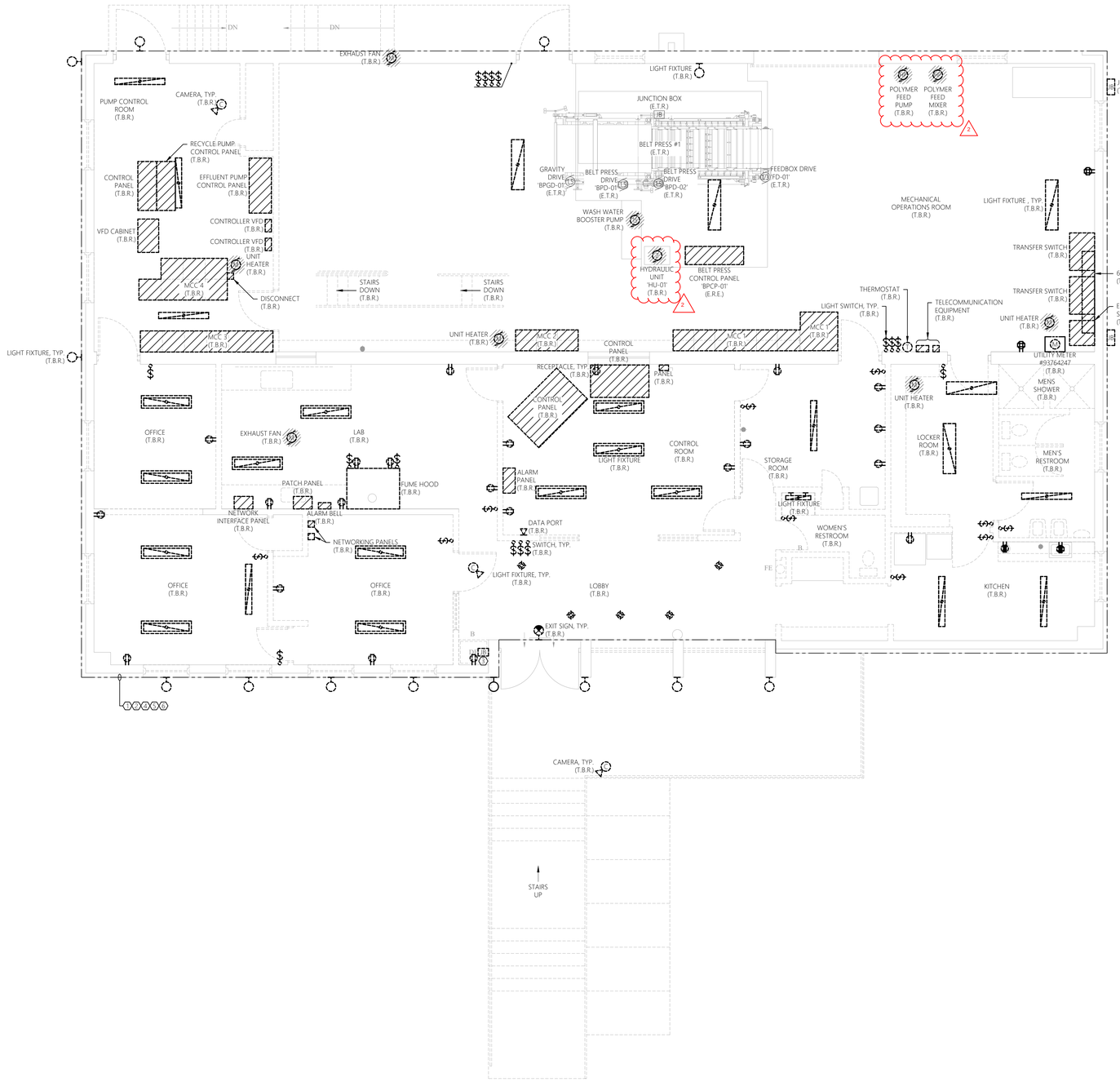
REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.
E-506

PROJECT # 18-732 PHASE #



0' 2' 4' 8'
SCALE: 1/4" = 1'-0"

1 E-701 ELECTRICAL DEMOLITION PLAN
SCALE: 1/4" = 1'-0" DEWATERING BUILDING - UPPER LEVEL

GENERAL DEMOLITION NOTES:

MECHANICAL EQUIPMENT & MISC. ELECTRICAL EQUIPMENT:
WHERE INDICATED TO BE DEMOLISHED:
- REFER TO GENERAL CONTRACT DRAWINGS FOR AN ACCURATE DEPICTION OF ALL DEMOLITION REQUIRED AS PART OF THIS CONTRACT.
- REMOVE ALL WIRE (POWER & CONTROLS) & EXPOSED CONDUIT BACK TO SOURCE PANEL, UNLESS OTHERWISE INDICATED, UOI.
- REMOVE ANY ASSOCIATED MOTOR STARTERS, CONTROL STATIONS, &/OR DISCONNECTS, UOI.
- REMOVE CIRCUIT WIRING FROM SOURCE PANEL AND REMOVE ASSOCIATED SOURCE CIRCUIT BREAKER; UOI.
- REMOVE ALL INTERLOCK CIRCUITRY, UOI.
- PROVIDE REVISED TYPED PANELBOARD DIRECTORIES FOR ALL EXISTING TO REMAIN PANELS WHERE CIRCUITS ARE TO BE REMOVED.
- REMOVE ALL ASSOCIATED MOUNTING HARDWARE, BRACKETS, AND EQUIPMENT, UOI.

RECEPTACLES:
WHERE INDICATED TO BE DEMOLISHED:
- REMOVE ALL RECEPTACLES IMPACTED BY WALL MODIFICATIONS AND OVERALL PROJECT IMPROVEMENTS. **NOTE** ALL EXISTING RECEPTACLES MAY NOT BE SHOWN ON THESE DEMOLITION PLANS. MINOR FIELD VERIFICATION REQUIRED.
- REMOVE DEVICE, AND ALL ASSOCIATED WIRE & CONDUIT BACK TO SOURCE OR NEAREST ACTIVE JUNCTION BOX, UOI.

LIGHTING:
WHERE INDICATED TO BE DEMOLISHED:
- REMOVE ALL FIXTURES THROUGHOUT SPACE. **NOTE** ALL EXISTING LIGHTING FIXTURES MAY NOT BE SHOWN ON THESE DEMOLITION PLANS. MINOR FIELD VERIFICATION REQUIRED.
- REMOVE ALL ASSOCIATED WIRING BACK TO SOURCE, UOI.
- REMOVE SWITCHING AND CONTROL DEVICES, UOI.
- REMOVE CONTACTORS ASSOCIATED WITH LOW VOLTAGE SWITCHING DEVICES, UOI.
- DISPOSE OF ALL LAMPS IN ACCORDANCE WITH STATE/FEDERAL AND EPA REQUIREMENTS.

PANELBOARD REMOVAL AND REPLACEMENT:
- REFER TO SINGLE LINE DIAGRAMS FOR SCOPE OF WORK.

CIRCUIT AND FEEDER REMOVAL AND REPLACEMENT:
- MAINTAIN ANY EXISTING NON-IMPACTED PANELBOARDS AND ANY NON-IMPACTED CIRCUITS WHICH ARE EXISTING TO REMAIN.
- WHERE CIRCUITS ARE AFFECTED BY MODIFICATION/REMOVAL ACTIVITIES, PROVIDE NECESSARY CIRCUIT EXTENSIONS AND ALL NECESSARY LABOR/MATERIALS AS NECESSARY TO REPAIR AND RE-CONNECT CIRCUIT(S).
- ANY CIRCUITS/FEEDERS WHICH REQUIRE SHUTDOWN TO ACCOMMODATE WORK SHALL BE COORDINATED WITH THE OWNER WELL IN ADVANCE.

BUILDING/STRUCTURE GROUND SYSTEM:
- CONTRACTOR TO CAREFULLY PROTECT AND MAINTAIN ALL GROUND SYSTEMS ASSOCIATED WITH BUILDINGS/STRUCTURES EXISTING TO REMAIN.
- CONTRACTOR TO REMOVE ALL GROUND SYSTEMS ASSOCIATED WITH BUILDING/STRUCTURES TO BE REMOVED.
- GROUND SYSTEM COMPONENTS MAY INCLUDE, BUT ARE NOT LIMITED TO, GROUNDING CONDUCTORS, JUMPERS, TERMINATIONS, RODS, AND AIR TERMINALS. CONTRACTOR TO FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCEMENT OF DEMOLITION.

HAZARDOUS MATERIAL REMOVAL:
PERFORM WORK FOR REMOVAL AND DISPOSAL OF EQUIPMENT AND MATERIALS CONTAINING TOXIC SUBSTANCES REGULATED UNDER THE FEDERAL TOXIC SUBSTANCES CONTROL ACT (TSCA) IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS. APPLICABLE EQUIPMENT AND MATERIALS INCLUDE, BUT ARE NOT LIMITED TO:
- PCB-CONTAINING ELECTRICAL EQUIPMENT, INCLUDING TRANSFORMERS, CAPACITORS, AND SWITCHES.
- PCB- AND DEHP-CONTAINING LIGHTING BALLASTS.
- MERCURY-CONTAINING LAMPS AND TUBES, INCLUDING FLUORESCENT LAMPS, HIGH INTENSITY DISCHARGE (HID), ARC LAMPS, ULTRA-VIOLET, HIGH PRESSURE SODIUM, MERCURY VAPOR, IGNITRON TUBES, NEON, AND INCANDESCENT.
- CONTRACTOR TO COORDINATE ANY REQUIRED HAZARDOUS MATERIAL REMOVAL WITH THE APPLICABLE CONTRACTOR, OWNER, AND ENGINEER.

GENERAL SHEET NOTES:

1. REFER TO E-001 FOR ELECTRICAL LEGENDS, ABBREVIATIONS, AND GENERAL PROJECT NOTES.
2. ITEMS INDICATED TO BE REMOVED:
   2.1. REMOVE ALL CONDUCTORS AND EXPOSED CONDUIT BACK TO SOURCE (UOI).
   2.2. REMOVE CIRCUIT WIRING AND CIRCUIT BREAKER FROM SOURCE PANEL (UOI).
   2.3. REMOVE ALL ASSOCIATED CONTROL CONDUCTORS, CONDUITS, AND DEVICES (UOI).
   2.4. REMOVE ASSOCIATED STARTERS, DISCONNECTS, AND ASSOCIATED CIRCUITRY (UOI).
   2.5. REMOVE EQUIPMENT PADS & MOUNTING HARDWARE, BRACKETS, ACCESSORIES, ETC... (UOI).
   2.6. REVISE PANELBOARD AND MOTOR CONTROL CENTER DIRECTORIES/NAME PLATES AS CHANGES OCCUR (UOI).
3. THESE DEMOLITION DRAWINGS ARE SCHEMATIC IN NATURE AND ARE BASED ON CURSORY FIELD OBSERVATION AND EXISTING DRAWINGS. IT IS NOT THE INTENTION OF THESE DRAWINGS TO INDICATE EVERY DEVICE/FIXTURE REQUIRING REMOVAL/DEMO RATHER GENERAL SYSTEMS WHICH ARE TO BE REMOVED.
4. CIRCUITS NOT IN AREA OF WORK THAT ARE AFFECTED BY WORK SHALL BE OPERATIONAL DURING PROJECT. PROVIDE TEMPORARY CIRCUITS AS NECESSARY.
5. CIRCUIT, EQUIPMENT, AND DEVICE REMOVAL SHALL NOT AFFECT THE INTEGRITY OR FUNCTIONALITY OF CIRCUITS TO REMAIN. ALL CIRCUITS TO REMAIN SHALL BE MAINTAINED. PROVIDE ALL NECESSARY CIRCUIT MODIFICATIONS AND EXTENSIONS.
6. WHERE REMOVALS LEAVE HOLES AND DAMAGED SURFACES EXPOSED IN THE FINISHED WORK, PATCH AND REPAIR THESE HOLES AND DAMAGED SURFACES TO MATCH ADJACENT FINISHED SURFACES. WHERE NEW WORK IS TO BE APPLIED TO EXISTING SURFACES, PERFORM REMOVALS, AND PATCHING IN A MANNER TO PRODUCE SURFACES SUITABLE FOR RECEIVING NEW WORK. COORDINATE ALL WORK WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER.
7. COORDINATE WITH ALL CONTRACT DRAWINGS AND TRADE CONTRACTORS FOR ADDITIONAL EQUIPMENT THAT IS TO BE DEMOLISHED. FOR ALL EQUIPMENT SHOWN/INDICATED FOR REMOVAL, DISCONNECT AND REMOVE ELECTRICAL CIRCUIT INCLUDING CONDUCTORS AND CONDUIT BACK TO SOURCE.
8. NOT ALL EQUIPMENT/DEVICES ARE SHOWN FOR CLARITY. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS AND REPORT DISCREPANCIES TO ENGINEER PRIOR TO COMMENCEMENT OF DEMOLITION.
9. REFER TO THE ELECTRICAL SINGLE LINE DIAGRAMS, SCHEDULES & DETAILS FOR ADDITIONAL DEMOLITION INFORMATION/REQUIREMENTS.
10. COORDINATE ALL ASPECTS OF SEQUENCE OF REMOVAL WITH THE OWNER AND APPLICABLE CONTRACTOR. REFER TO SPECIFICATIONS AND DEMOLITION SINGLE LINE DIAGRAM FOR ADDITIONAL INFORMATION.
11. WHERE REMOVAL OF CONDUIT SYSTEM IS NOT FEASIBLE, REMOVE ALL CONDUCTORS FROM CONDUIT SYSTEM, CUT FLUSH, CAP CONDUIT SYSTEM, AND ABANDON IN PLACE. FEASIBLE IS DEFINED AS BEING LOCATED WITHIN A CONCRETE DUCT BANK OR CONCRETE SLAB. ALL OTHER INSTANCES TO HAVE THE CONDUIT & CIRCUITRY TO BE REMOVED IN THERE ENTIRETY. FIELD VERIFY AND COORDINATE FINAL REQUIREMENTS WITH THE OWNER, TYPICAL.

SHEET KEY NOTES:

1. CONTRACTOR TO PROVIDE COMPLETE ELECTRICAL DEMOLITION FOR THIS AREA (UNLESS OTHERWISE INDICATED); REMOVE THE FOLLOWING DEVICES INCLUDING BUT NOT LIMITED TO; ALL ELECTRICAL DISTRIBUTION EQUIPMENT, CONTROLLERS, CONTROL PANELS, DISCONNECTS, MOTOR STARTERS, RECEPTACLES, INTERIOR/EXTERIOR LIGHTING, JUNCTION BOXES, BONDING/GROUNDING EQUIPMENT, ELECTRIC VALVES, MOTORS (DISCONNECT & REMOVE BRANCH CIRCUITRY), AND INSTRUMENTATION/CONTROLS. REMOVE ALL ASSOCIATED CIRCUITRY (CONDUIT & CONDUCTORS) BACK TO SOURCE. COORDINATE REMOVAL EFFORTS CLOSELY WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER.
2. CONTRACTOR TO CLOSELY COORDINATE THE REMOVAL EFFORTS OF ALL PLANT PROCESS EQUIPMENT/DEVICES SCHEDULED FOR REMOVAL WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER. CONTRACTOR TO CLOSELY COORDINATE THE REMOVAL EFFORTS OF ALL HVAC EQUIPMENT SCHEDULED FOR REMOVAL WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER. CONTRACTOR TO CLOSELY COORDINATE THE REMOVAL EFFORTS OF ALL PLUMBING EQUIPMENT SCHEDULED FOR REMOVAL WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER.
3. JUNCTION BOX IS TO BE REMOVED. NOTE, ALL BOXES AND RACEWAY SYSTEMS ASSOCIATED WITH EQUIPMENT SCHEDULED FOR REMOVAL ARE TO BE REMOVED IN THEIR ENTIRETY.
4. CONTRACTOR TO DISCONNECT & REMOVE ALL EXISTING LIGHT FIXTURES, LIGHT SWITCHES, LIGHTING CONTROL DEVICES, MOUNTING HARDWARE, AND ASSOCIATED COMPONENTS IN THEIR ENTIRETY. REMOVE CIRCUITRY (CONDUIT & CONDUCTORS) BACK TO SOURCE. CONTRACTOR TO FIELD VERIFY.
5. CONTRACTOR TO PROVIDE TEMPORARY LIGHTING INCLUDING ALL CIRCUITING AND CONTROLS FOR A COMPLETE AND OPERABLE TEMPORARY LIGHTING SYSTEM THROUGHOUT THE DURATION OF PROJECT. CONTRACTOR TO COORDINATE FINAL TEMPORARY LIGHTING REQUIREMENTS WITH THE OWNER AND PROVIDE AS NECESSARY. TEMPORARY LIGHTING SYSTEMS TO BE PROVIDED FOR ALL AREAS IN WHICH THE EXISTING LIGHTING SYSTEMS ARE DISTURBED AS PART OF THIS PROJECT.
6. NOTE, CONTRACTOR TO ENSURE ALL ELECTRICAL BRANCH CIRCUITS AND CONDUITS ARE REMOVED IN THIS AREA ASSOCIATED WITH EQUIPMENT SCHEDULED FOR REMOVAL, TO AVOID CONFLICT WITH PROPOSED EQUIPMENT, DUCT WORK, AND PIPING SYSTEMS. COORDINATE ALL EFFORTS CLOSELY WITH APPLICABLE CONTRACTOR, OWNER, AND ENGINEER.

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STATE OF NEW YORK
JEFFREY E ROBINSON
098696
LICENSED PROFESSIONAL ENGINEER

HAZARDOUS MATERIAL NOTE:

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145 CAESARS LN.
NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

ELECTRICAL DEMOLITION PLAN - DEWATERING BUILDING UPPER LEVEL

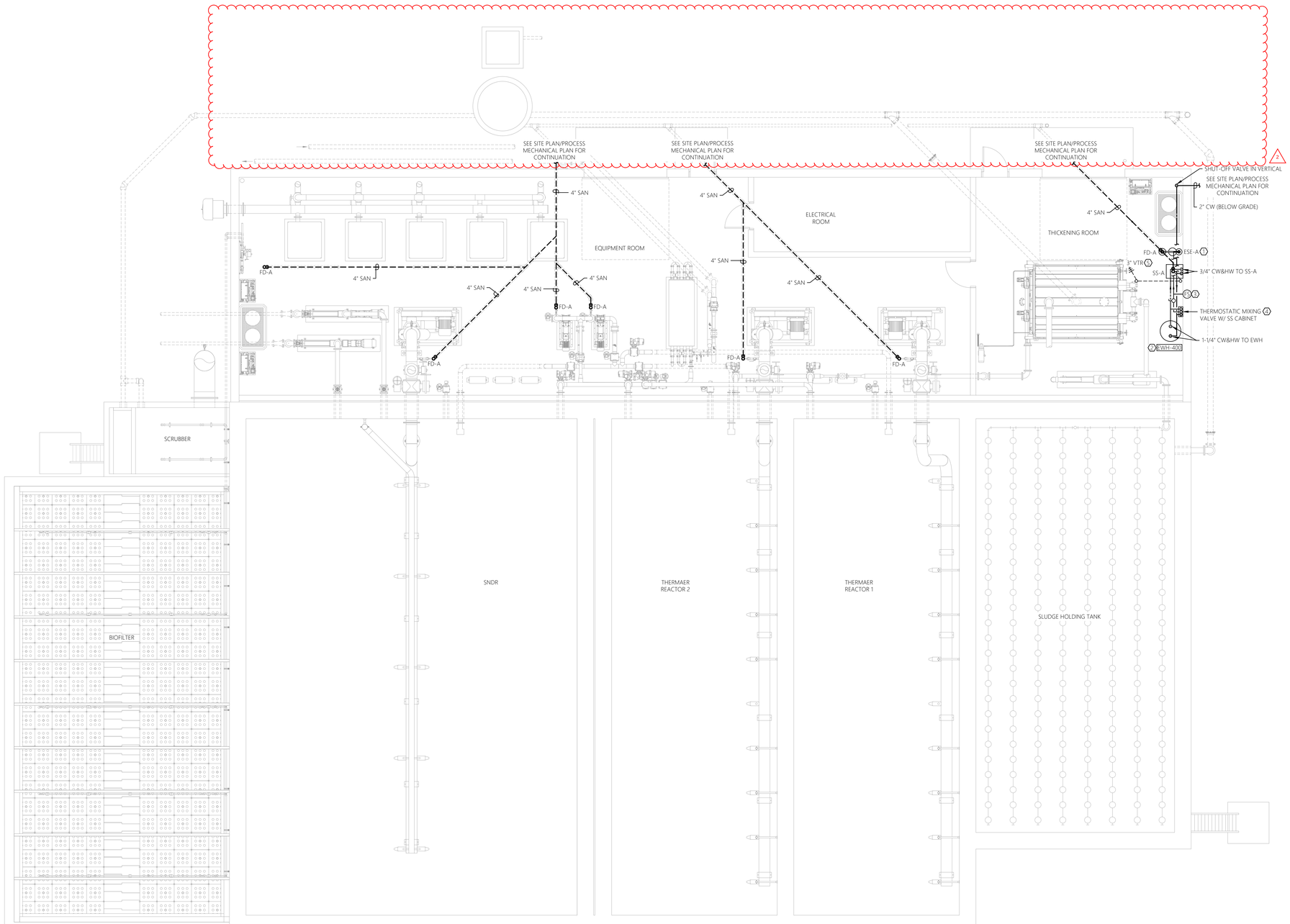
REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025
1	BID ADDENDUM	06/27/2025

ISSUED DATE:	10 JULY, 2025
DESIGN BY:	RRM
DRAWN BY:	CDJ
CHECKED BY:	MGR
REVIEWED BY:	JER

SHEET NO.
E-701

PROJECT # 18-732 PHASE #



1 P-400 PLUMBING FLOOR PLAN - NEW WORK
SCALE: 3/16" = 1'-0"
ATAD BUILDING

0' 2' 4' 8' 16'
SCALE: 3/16" = 1'-0"

GENERAL SHEET NOTES:

1. REFER TO P-001 FOR PLUMBING LEGEND, ABBREVIATIONS, AND GENERAL PROJECT NOTES.
2. UNLESS OTHERWISE NOTED, PLUMBING ITEMS SHOWN HEAVY SOLID (▬) SHALL BE NEW.
3. COORDINATE PLUMBING PIPING/FIXTURE/EQUIPMENT/ETC. LAYOUT WITH ALL OTHER TRADES TO AVOID CONFLICT.
4. AVOID ROUTING WATER PIPING OVER ELECTRICAL EQUIPMENT WHRE POSSIBLE. PROVIDE DRIP SHIELD IN LOCATIONS WHERE WATER PIPING IS ROUTED ABOVE ELECTRICAL EQUIPMENT.
5. ALL HANGERS AND SUPPORTS SHALL BE TYPE 316 STAINLESS STEEL.

SHEET KEY NOTES:

1. NEW EMERGENCY EYEWASH/SHOWER TO BE INSTALLED AT LOCATION SHOWN PER DETAIL ON SHEET P-030 AND PER MANUFACTURER RECOMMENDATIONS. COORDINATE FINAL LOCATION WITH OWNER AND ALL OTHER TRADES TO AVOID CONFLICT. PROVIDE ALL FITTINGS/ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
2. NEW ELECTRIC WATER HEATER TO BE INSTALLED AT LOCATION SHOWN PER DETAIL ON SHEET P-030 AND PER MANUFACTURER RECOMMENDATIONS. COORDINATE FINAL LOCATION WITH OWNER AND ALL OTHER TRADES TO AVOID CONFLICT. PROVIDE 4" HIGH HOUSEKEEPING PAD. PROVIDE ALL FITTINGS/ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
3. PROVIDE NEW FLOW SWITCH (GUARDIAN AP275-615 OR EQUAL) AND INSTALL PER MANUFACTURER RECOMMENDATIONS. PROVIDE ALL FITTINGS/ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
4. NEW THERMOSTATIC MIXING VALVE (GUARDIAN 6040 OR EQUAL) TO PROVIDE TEPID WATER (85°F) TO EMERGENCY FIXTURE
5. FIELD ROUTE PLUMBING VENT AND EXTEND THOUGH ROOF.

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111 Wheatfield Drive, Suite 1
Milford, PA 18337
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BID ADDENDUM

JADE STONE ENGINEERING

STATE OF NEW YORK · RYAN J. KEEFER · LICENSED PROFESSIONAL ENGINEER · 093390

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PLUMBING FLOOR PLAN - ATAD BUILDING

REVISIONS

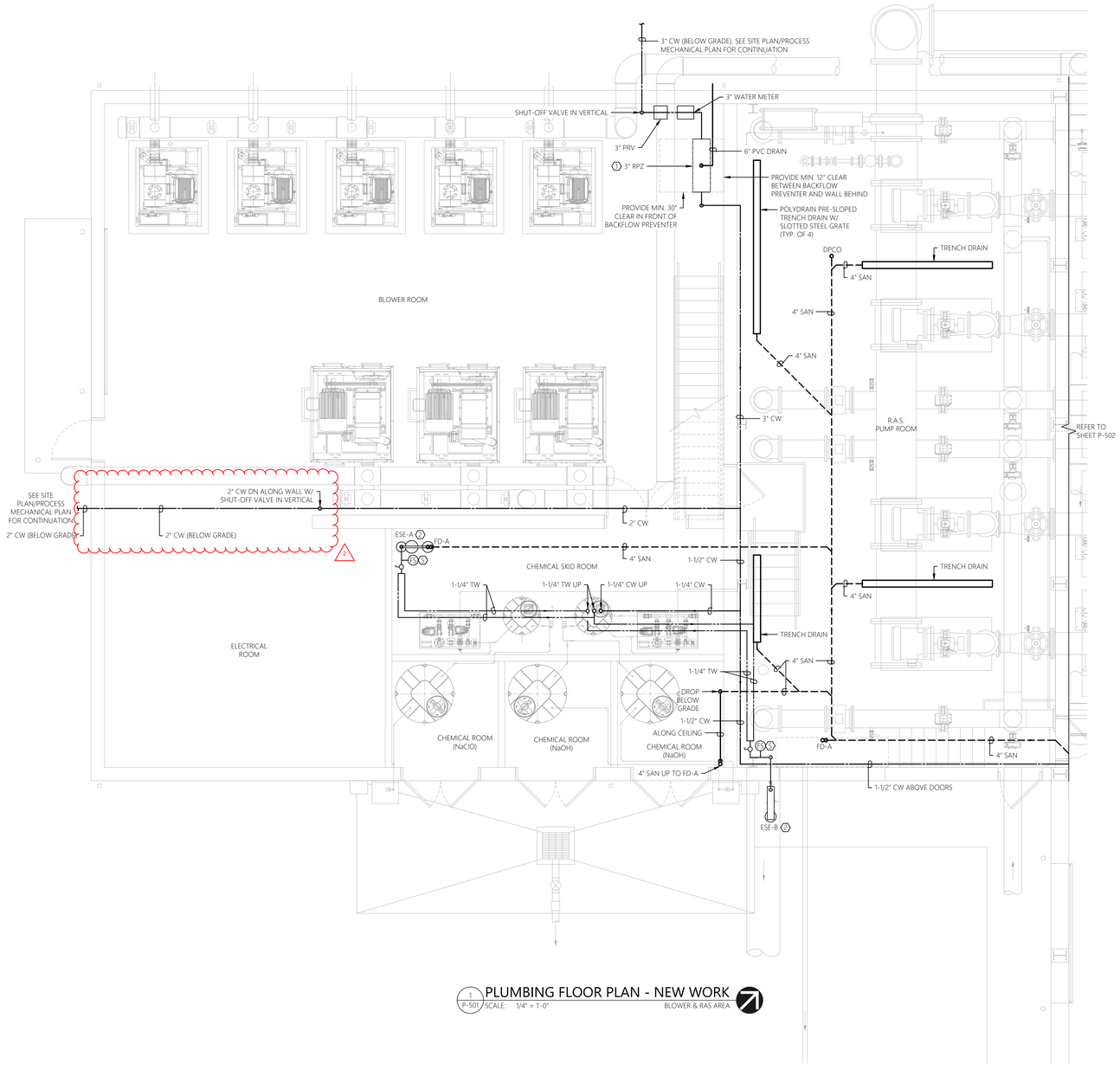
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DRAWN BY:	CDJ
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REVIEWED BY:	RJK

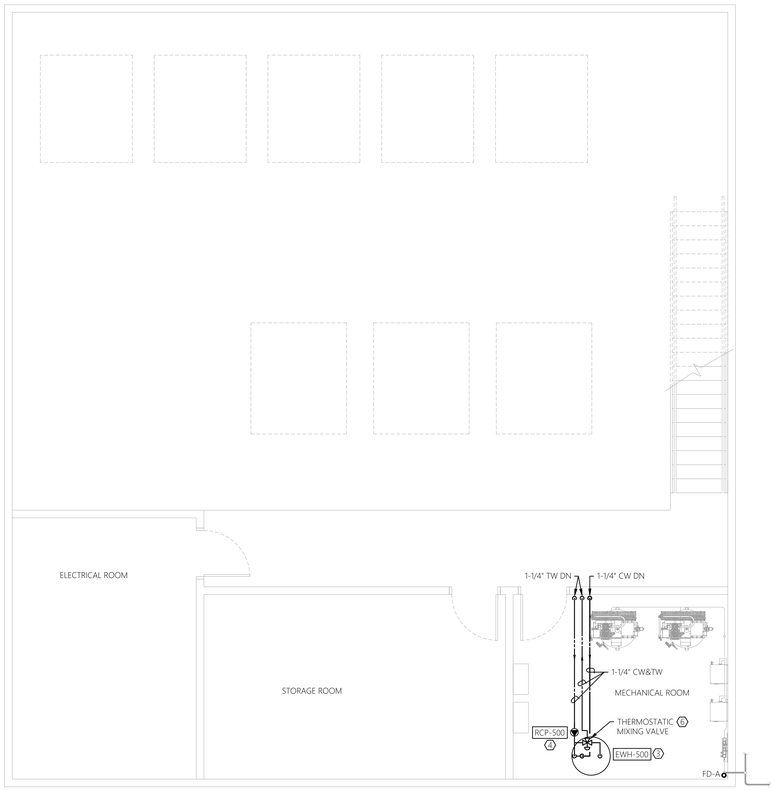
SHEET NO.

P-400

PROJECT # 18-732 PHASE #



1 P-501 PLUMBING FLOOR PLAN - NEW WORK
SCALE: 1/4" = 1'-0" BLOWER & RAS AREA



2 P-501 PLUMBING FLOOR PLAN - NEW WORK
SCALE: 1/4" = 1'-0" 2ND FLOOR

GENERAL SHEET NOTES:

1. REFER TO P-001 FOR PLUMBING LEGEND, ABBREVIATIONS, AND GENERAL PROJECT NOTES.
2. UNLESS OTHERWISE NOTED, PLUMBING ITEMS SHOWN HEAVY SOLID (▬) SHALL BE NEW.
3. COORDINATE PLUMBING PIPING/FIXTURE/EQUIPMENT/ETC. LAYOUT WITH ALL OTHER TRADES TO AVOID CONFLICT.
4. AVOID ROUTING WATER PIPING OVER ELECTRICAL EQUIPMENT WHRE POSSIBLE. PROVIDE DRIP SHIELD IN LOCATIONS WHERE WATER PIPING IS ROUTED ABOVE ELECTRICAL EQUIPMENT.
5. ALL HANGERS AND SUPPORTS IN THE R.A.S. PUMP ROOM SHALL BE TYPE 316 STAINLESS STEEL. ALL HANGERS AND SUPPORTS IN THE CHEMICAL SKID ROOM AND CHEMICAL ROOMS SHALL BE PVC COATED.

SHEET KEY NOTES:

1. NEW RPZ BACKFLOW PREVENTER (WATTS LF009) TO BE INSTALLED AT LOCATION SHOWN PER SECTION VIEW ON THIS SHEET AND PER MANUFACTURER RECOMMENDATIONS. COORDINATE FINAL LOCATION WITH OWNER AND ALL OTHER TRADES TO AVOID CONFLICT. PROVIDE ALL FITTINGS/ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM. PROVIDE AIR GAP AND FUNNEL DRAIN CONNECTION BELOW RPZ AND ROUTE PVC DRAIN PIPE OUT EXTERIOR WALL WITH FLAP VALVE.
2. NEW EMERGENCY EYEWASH/SHOWER TO BE INSTALLED AT LOCATION SHOWN PER DETAIL ON SHEET P-030 AND PER MANUFACTURER RECOMMENDATIONS. COORDINATE FINAL LOCATION WITH OWNER AND ALL OTHER TRADES TO AVOID CONFLICT. PROVIDE ALL FITTINGS/ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
3. NEW ELECTRIC WATER HEATER TO BE INSTALLED AT LOCATION SHOWN PER DETAIL ON SHEET P-030 AND PER MANUFACTURER RECOMMENDATIONS. COORDINATE FINAL LOCATION WITH OWNER AND ALL OTHER TRADES TO AVOID CONFLICT. PROVIDE 4" HIGH HOUSEKEEPING PAD. PROVIDE ALL FITTINGS/ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.

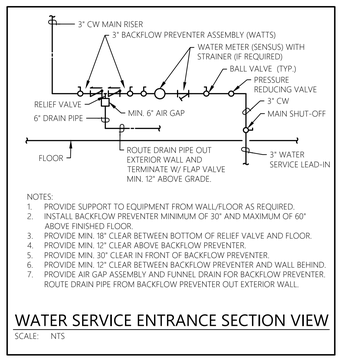
0' 2' 4' 8'
SCALE: 1/4" = 1'-0"

SHEET KEY NOTES:

4. NEW IN-LINE CIRCULATING PUMP TO BE INSTALLED AT LOCATION SHOWN PER DETAIL ON SHEET P-030 AND PER MANUFACTURER RECOMMENDATIONS. COORDINATE FINAL LOCATION WITH OWNER AND ALL OTHER TRADES TO AVOID CONFLICT. PROVIDE ALL FITTINGS/ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
5. NEW FLOW SWITCH (GUARDIAN AP275-615) AND INSTALL PER MANUFACTURER RECOMMENDATIONS. PROVIDE ALL FITTINGS/ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.
6. NEW THERMOSTATIC MIXING VALVE (GUARDIAN 6040) TO PROVIDE TEPID WATER (85°F) TO EMERGENCY FIXTURE.

BACKFLOW PREVENTER NOTES:

1. NEW AND REPLACEMENT DEVICES MUST BE TESTED AFTER INSTALLATION AND BEFORE ENTERING SERVICE. DEVICES MUST BE TESTED ANNUALLY THEREAFTER.
2. STRAINERS ARE RECOMMENDED PRIOR TO EACH BACKFLOW DEVICE ON NON-FIRE FIGHTING LINES ONLY. NO STRAINER IS TO BE USED ON A FIRE LINE WITHOUT INSURANCE UNDERWRITER APPROVAL.
3. ASSEMBLIES SHOULD BE SPECIFIED AND INSTALLED WITH MANUFACTURER SUPPLIED VALVES.
4. WATER LINES SHOULD BE THOROUGHLY FLUSHED BEFORE INSTALLATION OF DEVICE TO PREVENT DEBRIS FOULING THE DEVICE CHECK VALVES.
5. DEVICES MUST BE MOUNTED HORIZONTALLY UNLESS APPROVED FOR VERTICAL INSTALLATION.
6. ASSEMBLIES SHOULD NOT BE INSTALLED IN AREAS CONTAINING CORROSIVE OR TOXIC GASES WHICH COULD RENDER THE DEVICE INOPERABLE.
7. DUE TO INHERENT DESIGN OF RPZ ASSEMBLIES, FLUCTUATING SUPPLY PRESSURE ON A LOW FLOW CONDITION MAY CAUSE NUISANCE DRIPPING. INSTALLATION OF A SOFT SEATED CHECK VALVE AHEAD OF THE RPZ WILL OFTEN HOLD PRESSURE CONSTANT DURING PERIODS OF LOW FLOW.
8. WHERE THE DISTANCE BETWEEN THE WATER METER AND DEVICE IS GREATER THAN 10 FEET, ALL EXPOSED PIPING SHOULD BE MARKED "FEED LINE TO BACKFLOW PREVENTER - DO NOT TAP" AT 5-FOOT INTERVALS.
9. ORANGE COUNTY DEPARTMENT OF HEALTH PLAN APPROVAL IS LIMITED TO 5 YEARS. TIME EXTENSIONS FOR PLAN APPROVAL MAY BE GRANTED BY THE ORANGE COUNTY DEPARTMENT OF HEALTH BASED UPON DEVELOPMENT FACTS AND ANY NEW REGULATIONS, OR GUIDANCE, IN EFFECT AT THAT TIME. A NEW PLAN SUBMISSION MAY BE REQUIRED TO OBTAIN A TIME EXTENSION.
10. ADEQUATE HEAT WILL BE PROVIDED TO PREVENT FREEZING AND ADEQUATE LIGHTING WILL BE PROVIDED TO FACILITATE SERVICING OF THE DEVICE.

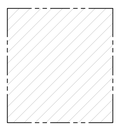


NOTES:
1. PROVIDE SUPPORT TO EQUIPMENT FROM WALL/FLOOR AS REQUIRED.
2. INSTALL BACKFLOW PREVENTER MINIMUM OF 30" AND MAXIMUM OF 60" ABOVE FINISHED FLOOR.
3. PROVIDE MIN. 18" CLEAR BETWEEN BOTTOM OF RELIEF VALVE AND FLOOR.
4. PROVIDE MIN. 12" CLEAR ABOVE BACKFLOW PREVENTER.
5. PROVIDE MIN. 30" CLEAR IN FRONT OF BACKFLOW PREVENTER.
6. PROVIDE MIN. 12" CLEAR BETWEEN BACKFLOW PREVENTER AND WALL BEHIND.
7. PROVIDE AIR GAP ASSEMBLY AND FUNNEL DRAIN FOR BACKFLOW PREVENTER. ROUTE DRAIN PIPE FROM BACKFLOW PREVENTER OUT EXTERIOR WALL.

WATER SERVICE ENTRANCE SECTION VIEW
SCALE: NTS

SHADED AREA SIGNIFIES CURRENT VIEW IN THE MBR BUILDING





2ND FLOOR

3 P-501 OVERALL PLAN KEY
SCALE: NTS MBR BUILDING

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33 Airport Center Drive, Suite 202
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(845) 587-3100
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NEW WINDSOR, NY 12553
FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

BACKFLOW PREVENTION DEVICE (DOMESTIC) TO SERVE MBR, ATAD, AND MAINTENANCE GARAGE

REVISIONS

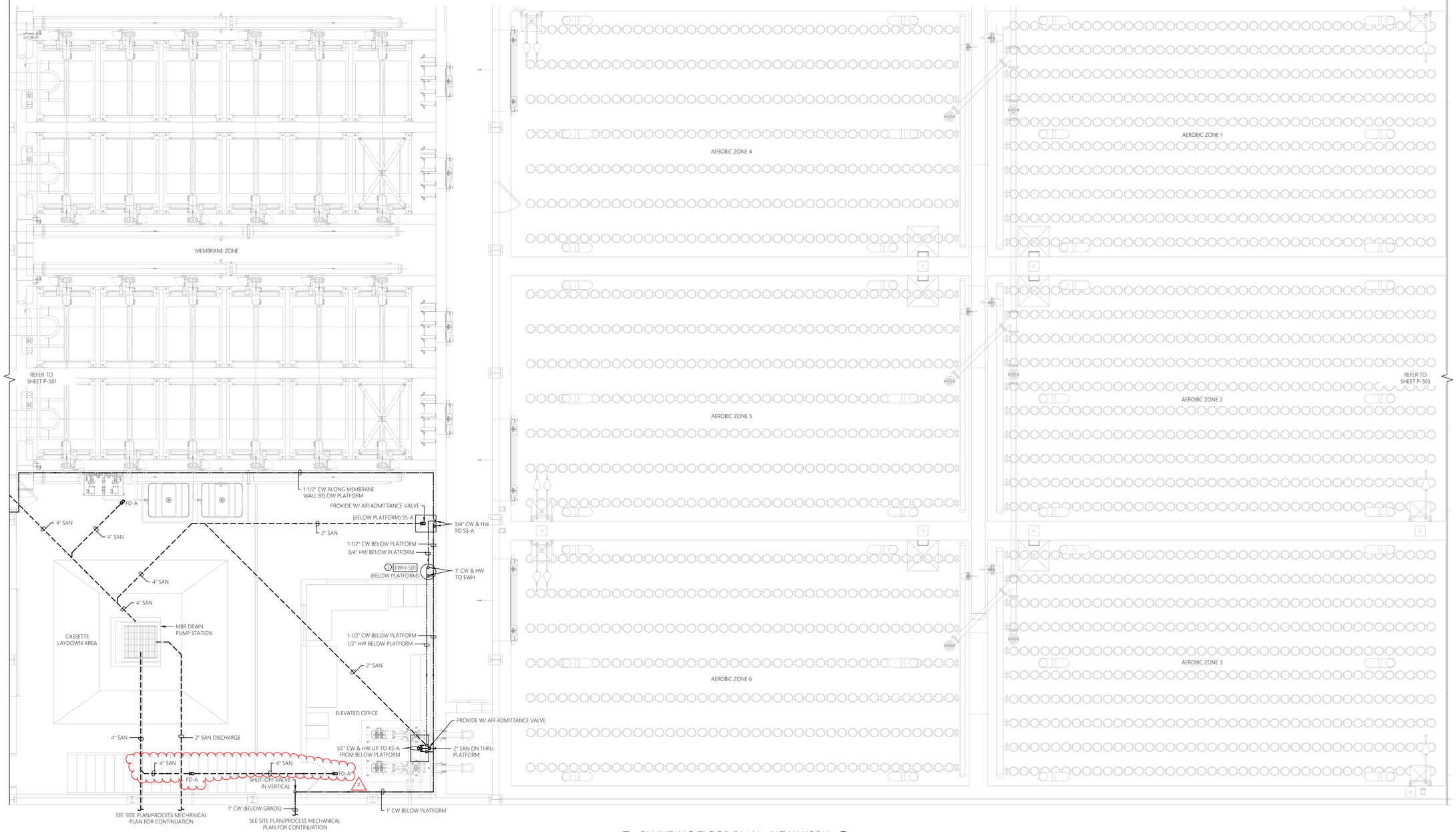
NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025

ISSUED DATE:	10 JULY, 2025
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DRAWN BY:	CDJ
CHECKED BY:	RJK
REVIEWED BY:	RJK

SHEET NO.

P-501

PROJECT # 18-732 PHASE #



1 P-502 PLUMBING FLOOR PLAN - NEW WORK
SCALE: 1/4" = 1'-0" MEMBRANE & AEROBIC ZONES

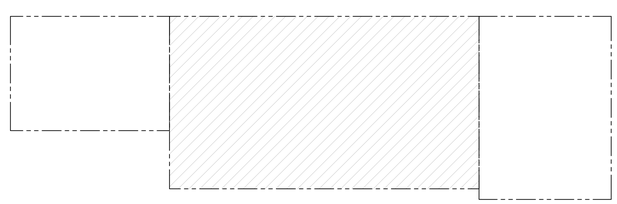
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4. AVOID ROUTING WATER PIPING OVER ELECTRICAL EQUIPMENT WHRE POSSIBLE. PROVIDE DRIP SHIELD IN LOCATIONS WHERE WATER PIPING IS ROUTED ABOVE ELECTRICAL EQUIPMENT.
5. ALL HANGERS AND SUPPORTS IN THE CASSETTE LAYDOWN AREA AND BELOW THE ELEVATED OFFICE/BELOW PLATFORM SHALL BE TYPE 316 STAINLESS STEEL.

SHEET KEY NOTES:

(1) NEW ELECTRIC WATER HEATER TO BE INSTALLED AT LOCATION SHOWN PER DETAIL ON SHEET P-030 AND PER MANUFACTURER RECOMMENDATIONS. COORDINATE FINAL LOCATION WITH OWNER AND ALL OTHER TRADES TO AVOID CONFLICT. PROVIDE 4" HIGH HOUSEKEEPING PAD. PROVIDE ALL FITTINGS/ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM.

0' 2' 4' 8'
SCALE: 1/4" = 1'-0"



2ND FLOOR

SHADED AREA SIGNIFIES CURRENT VIEW IN THE MBR BUILDING

2 P-502 OVERALL PLAN KEY
SCALE: NTS MBR BUILDING

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33 Airport Center Drive, Suite 202
New Windsor, NY 12553
(845) 587-3100
111 Wheatfield Drive, Suite 1
Milford, PA 18337
(570) 296-2765

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JADE STONE ENGINEERING



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FOR TOWN OF NEW WINDSOR
555 UNION AVE.
NEW WINDSOR, NY 12553

BACKFLOW PREVENTION DEVICE (DOMESTIC) TO SERVE MBR, ATAD, AND MAINTENANCE GARAGE

REVISIONS

NO.	DESCRIPTION	DATE
2	BID ADDENDUM	07/10/2025

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SHEET NO.
P-502

PROJECT # 18-732 PHASE #

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Concrete building brick.
3. Decorative concrete masonry units.
4. Pre-faced concrete masonry units.
5. Concrete face brick.
6. Insulated concrete masonry units.
7. Clay face brick.
8. Building (common) brick.
9. Hollow brick.
10. Structural clay facing tile.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For reinforcing steel. Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.

C. Samples for Verification: For each type and color of exposed masonry unit and colored mortar.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of product. For masonry units, include material test reports substantiating compliance with requirements.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

1.5 QUALITY ASSURANCE

A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.

1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 48 inches long by 48 inches high by full thickness.

1.6 FIELD CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

B. Integral Water Repellent: Provide units made with integral water repellent for exposed units and where indicated.

C. CMUs: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
2. Density Classification: Normal weight unless otherwise indicated.

D. Concrete Building Brick: ASTM C55.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 4950 psi.
2. Density Classification: Lightweight.

E. Decorative CMUs: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
2. Density Classification: Medium weight.
3. Pattern and Texture: as indicated on the project plans.

F. Pre-faced CMUs: Lightweight hollow concrete units complying with ASTM C90, with manufacturer's standard smooth resinous facing complying with ASTM C744.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
2. Size: Manufactured with pre-faced surfaces having 1/16-inch-wide returns of facing to create 1/4-inch-wide mortar joints.
3. Colors and Patterns: As selected by Architect from manufacturer's full range.

G. Concrete Face Brick: ASTM C1634.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 4950 psi.
2. Density Classification: Normal weight.
3. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 15-5/8 inches long.
4. Texture: Ground-face finish.

    a. Match Architect's samples.

5. Colors: As selected by Architect from manufacturer's full range.

H. Insulated CMUs: ASTM C90 for load bearing & ASTM C578 for rigid polystyrene insulation. Basis of Design: Korfil Hi-R H insulated concrete masonry unit as manufactured by Concrete Products Group or equal product by other manufacturers.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
2. Density of 10” width: 105 pounds per cubic foot. R-value = 10.82 for 2-1/2” insert
3. Density of 12” width: 105 pounds per cubic foot. R value = 11.56 for 2-1/2” insert
4. Pattern and Texture: standard face texture.

2.3 CONCRETE LINTELS

A. Concrete Lintels: ASTM C1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than that of CMUs.

2.4 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Clay Face Brick: Facing brick complying with ASTM C216 or hollow brick complying with ASTM C652, Class H40V (void areas between 25 and 40 percent of gross cross-sectional area).

1. Grade: SW.
2. Type: HBS.
3. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 4950 psi.
4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C67.
5. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."
6. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing according to ASTM C67 with no observable difference in the applied finish when viewed from 10 feet.
7. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.

C. Building (Common) Brick: ASTM C62, Grade SW.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 4950 psi.
2. Size: Match size of face brick.

D. Hollow Brick: ASTM C652, Grade SW, Class H40V (void areas between 25 and 40 percent of gross cross-sectional area), Type HBS.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 4950 psi.
2. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."
3. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing according to ASTM C67 with no observable difference in the applied finish when viewed from 10 feet.
4. Size (Actual Dimensions): 5-5/8 inches wide by 3-5/8 inches high by 11-5/8 inches long.

2.5 STRUCTURAL CLAY FACING TILE

A. General:

1. Where reinforced masonry is indicated, provide multicored units designed for use in reinforced, grouted masonry, either with vertical cores and with webs notched to receive horizontal reinforcement, or with horizontal cores and with holes in bed shells for placement of grout and to receive vertical reinforcement.
2. Provide special shapes where required for corners, jambs, coved bases, sills, and other special conditions indicated, including applications that cannot be produced by sawing standard units.

B. Glazed Structural Clay Facing Tile: ASTM C126, Grade S (Select).

1. Sizes: 6T Series with actual face dimensions of 5 inches high by 11-11/16 inches long by widths indicated.
2. Sizes: 8W Series with actual face dimensions of 7-5/8 inches high by 15-5/8 inches long by widths indicated.
3. Provide Type I (single-faced units) where only one finished face is exposed when units are installed, and Type II (double-faced units) where two opposite finished faces are exposed when units are installed.
4. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.6 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C91/C91M.

E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.

F. Colored Cement Products: Packaged blend made from portland cement and hydrated lime or masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Colored Portland Cement-Lime Mix

2. Colored Masonry Cement

G. Aggregate for Mortar: ASTM C144.

1. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

2. White-Mortar Aggregates: Natural white sand or crushed white stone.
3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

H. Aggregate for Grout: ASTM C404.

I. Epoxy Pointing Mortar: ASTM C395, epoxy-resin-based material formulated for use as pointing mortar for glazed or pre-faced masonry units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect or owner from manufacturer's colors.

J. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

K. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.

L. Water: Potable.

2.7 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.

B. Masonry-Joint Reinforcement, General: ASTM A951/A951M.

1. Interior Walls: Hot-dip galvanized carbon steel.
2. Exterior Walls: Hot-dip galvanized carbon steel.
3. Wire Size for Side Rods: 0.148-inch diameter.
4. Wire Size for Cross Rods: 0.148-inch diameter.
5. Wire Size for Veneer Ties: 0.148-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.

D. Masonry-Joint Reinforcement for Multiwythe Masonry:

1. Ladder type with one side rod at each face shell of hollow masonry units more than 4 inches wide, plus one side rod at each wythe of masonry 4 inches wide or less.
2. Tab type, either ladder or truss design, with one side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe, but with at least 5/8-inch cover on outside face.
3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch and maximum vertical adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

E. Masonry-Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.187-inch-diameter, hot-dip galvanized carbon steel continuous wire.

2.8 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
3. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.

1. Wire: Fabricate from 3/16-inch-diameter, hot-dip galvanized-steel wire.

D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized-steel wire.
2. Tie Section: Triangular-shaped wire tie made from 0.187-inch-diameter, hot-dip galvanized-steel wire.

E. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch-thick steel sheet, galvanized after fabrication
2. Tie Section: Triangular-shaped wire tie made from 0.187-inch-diameter, hot-dip galvanized-steel wire.
3. Corrugated-Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.060-inch-thick steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete.

F. Partition Top Anchors: 0.105-inch-thick metal plate with a 3/8-inch-diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

G. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153/A153M.

H. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch-thick steel sheet, galvanized after fabrication.
3. Fabricate wire ties from 0.187-inch-diameter, hot-dip galvanized-steel wire unless otherwise indicated.
4. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section.
5. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a gasketed sheet metal anchor section, with pronged legs of length to match thickness of insulation or sheathing and raised rib-stiffened strap to provide a slot for inserting wire tie.
6. Seismic Masonry-Veneer Anchors: Connector section and rib-stiffened, sheet metal anchor section with screw holes top and bottom, and having slotted holes for inserting connector section. Connector section consists of a rib-stiffened, sheet metal bent plate, sheet metal clip, or wire tie with rigid PVC extrusion designed to engage continuous wire.
7. Coated, Steel Drill Screws for Steel Studs: ASTM C954 except with hex washer head and neoprene or EPDM washer, No. 10 diameter, and with coating with salt-spray resistance to red rust of more than 800 hours according to ASTM B117.

2.9 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.016 inch thick.
2. Copper: ASTM B370, Temper H00, cold-rolled copper sheet, 16-oz./sq. ft. weight or 0.0216 inch thick or ASTM B370, Temper H01, high-yield copper sheet, 12-oz./sq. ft. weight or 0.0162 inch thick.
3. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
4. Fabricate metal drip edges from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
5. Fabricate metal sealant stops from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
6. Fabricate metal expansion-joint strips from stainless steel or copper to shapes indicated.

B. Flexible Flashing: Use one of the following unless otherwise indicated:
1. Copper-Laminated Flashing: 5-oz./sq. ft. copper sheet bonded between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
2. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch.
3. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.040 inch.
4. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.

5. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D4637/D4637M, 0.040 inch thick.

C. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

D. Weep/Cavity Vent Products: Use one of the following unless otherwise indicated:
1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
2. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.
3. Vinyl Weep Hole/Vent: Units made from flexible PVC, designed to fit into a head joint and consisting of a louvered vertical leg, flexible wings to seal against ends of masonry units, and a top flap to keep mortar out of the head joint; in color selected by Architect.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Configuration: Provide one of the following:

a. Strips, full depth of cavity and 10 inches high, with dovetail shaped notches 7 inches deep that prevent clogging with mortar droppings.
b. Strips, not less than 3/4 inch thick and 10 inches high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
c. Sheets or strips full depth of cavity and installed to full height of cavity.
d. Sheets or strips not less than 3/4 inch thick and installed to full height of cavity, with additional strips 4 inches high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from clogging with mortar.

2.11 MASONRY-CELL FILL

A. Loose-Fill Insulation: Perlite complying with ASTM C549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).

B. Lightweight-Aggregate Fill: ASTM C331/C331M.

2.12 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.13 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime or masonry cement mortar unless otherwise indicated.
3. For exterior masonry, use portland cement-lime or masonry cement mortar.
4. For reinforced masonry, use portland cement-lime or masonry cement mortar.
5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the mortar strength indicated on the project plans.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
3. Mix to match Architect's sample.
4. Application: Use pigmented mortar for exposed mortar joints with the following units:

    a. Decorative CMUs.
    b. Pre-faced CMUs.
    c. Concrete face brick.
    d. Clay face brick.
    e. Hollow brick.
    f. Glazed structural clay facing tile.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Mix to match Architect's sample.
2. Application: Use colored-aggregate mortar for exposed mortar joints with the following units:

a. Decorative CMUs.
b. Pre-faced CMUs.
c. Concrete face brick.
d. Clay face brick.
e. Hollow brick.
f. Glazed structural clay facing tile.

F. Grout for Unit Masonry: Comply with ASTM C476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.

G. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.

1. Application: Use epoxy pointing mortar for exposed mortar joints with the following units:

a. Pre-faced CMUs.
b. Glazed structural clay facing tile.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

E. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow brick and CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Lay solid masonry units and hollow brick with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Lay structural clay tile as follows:

1. Lay vertical-cell units with full head joints unless otherwise indicated. Provide bed joints with full mortar coverage on face shells and webs.
2. Lay horizontal-cell units with full bed joints unless otherwise indicated. Keep drainage channels, if any, free of mortar. Form head joints with sufficient mortar so excess will be squeezed out as units are placed in position. Butter both sides of units to be placed, or butter one side of unit already in place and one side of unit to be placed.
3. Maintain joint thicknesses indicated except for minor variations required to maintain bond alignment. If not indicated, lay walls with 1/4- to 3/8-inch-thick joints.

D. Rake out mortar joints at pre-faced CMUs and glazed structural clay tile to a uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.

E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

F. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 COMPOSITE MASONRY

A. Bond wythes of composite masonry together using one of the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.

    a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
    b. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties.

B. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.

C. Collar Joints in Clay Tile Masonry: After each course is laid, fill the vertical, longitudinal joint between wythes solidly with mortar at exterior walls, except cavity walls, and interior walls and partitions.

D. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.

E. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide individual metal ties not more than 16 inches o.c.
2. Provide continuity with masonry-joint reinforcement by using prefabricated T-shaped units.
3. Provide rigid metal anchors not more than 24 inches o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

3.6 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.

    a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
    b. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties.
    c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.

B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

C. Parge cavity face of backup wythe in a single coat approximately 3/8 inch thick. Trowel face of parge coat smooth.

D. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

3.7 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to wall framing and concrete and masonry backup with seismic masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached and seismic anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed tie sections, connector sections and continuous wire in masonry joints.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 18 inches o.c. vertically and 24 inches o.c. horizontally, with not less than one anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.
5. Space anchors as indicated, but not more than 16 inches o.c. vertically and 25 inches o.c. horizontally, with not less than one anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.
6. Space anchors as indicated, but not more than 18 inches o.c. vertically and horizontally. Install additional anchors within 12 inches of openings and at intervals, not exceeding 24 inches, around perimeter.

3.8 MASONRY-CELL FILL

A. Pour lightweight-aggregate fill into cavities to fill void spaces. Maintain inspection ports to show presence of fill at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of fill to one story high, but not more than 20 feet.

3.9 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.10 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:

1. Provide an open space not less than 1 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.11 FLASHING, WEEP HOLES, AND CAVITY VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and through inner wythe to within 1/2 inch of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches on interior face.
3. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
4. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
5. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.

C. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use specified weep/cavity vent products to form weep holes.
2. Space weep holes 24 inches o.c. unless otherwise indicated.
3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.

D. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

E. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.12 REINFORCED UNIT MASONRY

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.13 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level B & C in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C67 for compressive strength.

F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140 for compressive strength.

G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.

H. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for mortar air content and compressive strength.

I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

3.14 PARGING

A. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat, and scarify first coat to ensure full bond to subsequent coat.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.

C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.15 REPAIRING, POINTING, AND CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
3. Protect adjacent surfaces from contact with cleaner.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.16 MASONRY WASTE DISPOSAL

A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18 inches of finished grade.

B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 312334 - STRUCTURAL EXCAVATION, BACKFILL AND COMPACTION

PART 1 – DESCRIPTION

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 DESCRIPTION OF WORK:

A. This Section pertains to an area bound by the exterior limit of excavation of each structure. including, but not limited to buildings, tanks, channels, troughs, precast box culverts. bridge abutments, wingwalls, and elements attached to structures.

B. This work includes the following:

1. Preparing subgrade for structures, slabs, walks, and pavements.
2. Preparing subbase and drainage fill beneath foundation footings, slabs, and pavements.
3. Excavating and backfilling for structure.
4. Excavating and backfilling of trenches within structure lines.
5. Excavating and backfilling for underground mechanical utilities and buried mechanical appurtenances.
6. Excavating and Backfilling for Mechanical, Electrical, and Plumbing Work: Refer to Divisions 22, 23 and 26 sections for excavation and backfill required in conjunction with underground mechanical, electrical and plumbing utilities and buried mechanical, electrical, and plumbing appurtenances.
7. Final Grading, together with placement and preparation for topsoil for lawns and planting, is specified in Division 32 Sections.

1.3 RELATED SECTIONS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Rock Excavation – Section 312316

C. Backfill (Selected Borrow Backfill) - Section 312323.13.02

D. Trenching, Backfill and Compaction Work – Section 312333

E. Backfill (Subbase Material) – Section 312323.13.03

F. Topsoil Placement and Grading (Topsoil) - Section 329119.13

G. All other sections of this document for which excavation, backfilling or compaction work is

called for or required or is related and applicable.

1.4 REFERENCE STANDARDS:

A. The following test standards apply to the work under this section:

1. ASTM D2216, “Laboratory Determination of Moisture Content of Soil.”
2. ASTM D422, “Particle-Size Analysis of Soils.”
3. ASTM D698, “Test method for Laboratory Compaction Characteristics of Soil Using Standard Effort. (Standard Proctor)
4. ASTM D1557, “Test method for Laboratory Compaction Characteristics of Soil Using Modified Effort. (Modified Proctor)
5. ASTM D2922, “Density of Soil and Soil Aggregate in Place by nuclear Methods.”
6. ASTM D2937, “Density of Soil in Place by the Drive-Cylinder Method.”
7. ASTM D6938, “Test for Moisture Content of Soil and Soil Aggregate in Place by Nuclear Methods.”
8. ASTM D4253 “Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.”

1.5 QUALITY ASSURANCE:

A. Comply With: NYSDOT "Standard Specification for Construction and Materials".

B. Routine testing of existing soils, and compacted material for compliance with these Specifications shall be performed by a testing agency acceptable to Engineer.

C. Compacted material which does not meet density requirements shall be removed and/or re-compacted, and re-tested.

D. Testing agency shall be employed by contractor to perform the following services:

1. Test materials proposed for use by Contractor to verify specified requirements and determine optimum moisture at which maximum density can be obtained in accordance with ASTM D 1557, Modified Proctor.

2. Perform field density tests for any fill material outside of the structure area.

E. Testing agency shall be employed by Owner to perform Special Inspections noted on the drawings and the following services:

1. Perform field density and bearing capacity tests for footing subgrade, and field density tests for all fill material within structure area.

a. For footing subgrade and for each stratum of soil on which footings will be placed, conduct minimum of one field density test of each spread footing, and one test per 20-foot length of strip footing.

b. For structure subgrade and for each lift of compacted material, conduct one field density test for every 1,000 sq. ft. of structure area, but not less than four tests.

2. Verify placement of each layer of drainage course and subbase to required cross sections and thicknesses and compaction.

3. The testing agency shall inspect and approve each subgrade and fill layer before further backfill or construction work is performed. Approval shall be based on satisfactory achievement of compaction criteria and achievement of required bearing strength. Notify Engineer of any remedial action required prior to performance of work.

4. Testing agencies shall submit copies of reports within 7 days of test to Owner, Contractor, Geotechnical Engineer, and Engineer. Include dates of site visit, description of work observed and summary of observations. Include dates of testing, location, elevation, and readings of all tests performed.

F. A licensed professional Geotechnical Engineer will be employed by the Owner/Engineer for quality control and to review test data provided by the testing agency.

1. Geotechnical Engineer shall be present during proof-rolling and when subgrade is exposed to identify soils requiring undercutting and replacement.

2. Geotechnical Engineer shall review and approve all materials proposed by Contractor for use as compacted fill based on test data and information submitted by testing agency.

3. Geotechnical Engineer shall verify footing bearing stratums; review and approve filling and compaction procedures; and be present to review and approve preparation of slab-on-grade subgrade and subbase.

1.6 DEFINITIONS:

A. Excavation consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.

B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be at Contractor's expense.

1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Engineer.
2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.

C. Additional Excavation: When excavation has reached required subgrade elevations, notify Engineer and Geotechnical Engineer, who will make an inspection of conditions. If

Geotechnical Engineer determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Geotechnical Engineer/Engineer. The Contract Sum may be adjusted by an appropriate contract modification.

D. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.

E. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular subbase, base of structure, or topsoil materials.

F. Structure: Buildings, foundations, slabs, tanks, curbs, walks, or other man-made stationary features occurring above or below ground surface.

1.7 RESPONSIBILITIES OF CONTRACTOR:

A. Advise testing agency/Special Inspector sufficiently in advance of operation to allow assignment of personnel. Coordinate daily testing requirements with testing service.

B. Advise Geotechnical Engineer sufficiently in advance of operation to schedule inspections and review of work specified.

C. Use of testing services and review by Geotechnical Engineer shall in no way relieve Contractor of his responsibility to furnish materials and construction as specified.

1.8 PROJECT CONDITIONS:

A. Site Information: Subsurface investigation reports were used for the basis of the design and are available to the Contractor for information only. Conditions are not intended as representations or warranties of accuracy or continuity between soil borings. The Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.

1. Additional test borings and other exploratory operations may be performed by Contractor, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional exploration.

B. Existing Utilities: Locate existing underground utilities in area of Work before starting earthwork operations. Where utilities are to remain in place, provide adequate means of protection during earthwork operations.

1. If uncharted, or incorrectly charted, piping or other utilities are encountered during excavation, consult utility owner and Engineer immediately for directions. Cooperate with Owner, and public and private utility companies to keep their respective services and facilities in operation. Repair damaged utilities as required by utility owner, at the sole expense of the Contractor.
2. Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by Engineer and then only after

acceptable temporary utility services have been provided.

3. Provide minimum of 48-hour notice to Engineer and Owner, and receive written notice to proceed before interrupting any utility.
4. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.

C. Use of Explosives: is not permitted.

D. Protection of Property: Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

E. Perform excavation by hand within dripline of large trees to remain. Protect root systems from damage or dry out to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.

PART 2 - MATERIALS

2.1 SELECT FILL:

A. Select fill shall meet the minimum design criteria indicated on the project plans.
B. Select fill shall be free of organics and other deleterious materials.
C. Select fill material specification shall be submitted to the Engineer for approval prior to use on site.

2.2 SUBBASE MATERIAL (CRUSHED STONE):

A. Typical of NYSDOT Item #4 or;
B. Sand and gravel which is sound, durable, and free of organic and other deleterious materials conforming to the following limits of gradation:

Percent Passing by Weight	Sieve Size
100	2"
30 to 65	1/4"
5 to 40	No. 40
0 to 10	No. 200

2.3 DRAINAGE FILL (CLEAN STONE):

A. Typical of AASHTO #57 Stone or;
B. Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2 inch sieve and not more than 5 percent passing a No. 4 sieve.

2.4 FILTER FABRIC:

A. Mirafi 140N by Mirafi, Inc., or accepted equivalent.

2.5 DRAINAGE PIPE:

A. 4-inch diameter perforated pipe.

2.6 EXCAVATED MATERIALS:

A. Do not use as select fill or subbase material, unless approved by engineer. The contractor's testing agency shall sample materials and perform testing to determine compliance with fill specifications listed in this section. Submit testing results to engineer for approval.

2.7 VAPOR BARRIER: Provide vapor barrier cover over prepared base material where indicated below slabs on grade. Use only materials that are resistant to deterioration when tested in accordance with ASTM E 154, as follows:

A. Polyethylene sheet not less than 10 mils thick, or as indicated on the plans.

B. Water-resistant barrier consisting of heavy Kraft papers laminated together with glass-fiber reinforcement and overcoated with black polyethylene on each side. Moistop by Fortifiber Corp. or accepted equivalent.

PART 3 – EXECUTION

3.1 JOB CONDITIONS:

A. Examine all substrates and conditions under which Work shall be performed. Do not proceed with Work until all unsatisfactory conditions are corrected.

B. Drainage shall be maintained and traffic within building area shall be restricted during construction to maintain integrity of subgrade. Failure to observe these precautions will require Contractor, at his own expense, to remove disturbed areas and correct.

3.2 COLD WEATHER PROTECTION:

A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.3 REMOVALS:

A. Clear, grub, and strip site of vegetation, topsoil, and other organic materials per specific specification.

B. Remove all brick fragments and other construction debris. Plow, strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

C. When existing ground surface has a density less than that specified for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

D. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of it off Owner's property, at the Contractor's expense.

3.4 EXCAVATION:

A. Excavation shall be considered unclassified and understood to mean any and all materials encountered during excavation.

B. Excavation Classifications: The following classifications of excavation will be made when rock is encountered:

1. Earth excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.
2. Rock excavation for trenches and pits includes removal and disposal of materials and obstructions encountered in accordance with the specific technical specifications.

C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

3.5 DEWATERING:

A. As specified in Division 31 “Dewatering”.

3.6 PROOF ROLLING:

A. Following stripping and removal of miscellaneous fill, grade, and compact exposed subgrade.

B. Proof roll subgrade by making five passes across the building area in each direction using a

smooth drum vibrating roller having a static weight of at least 10 tons.

C. All soft spots which develop during proof rolling shall be undercut and replaced with compacted select fill if under slabs or compacted subbase material if under foundations and footings.

D. Proof rolling shall not be performed during or immediately after periods of inclement weather.

3.7 FILLING, BACKFILLING AND COMPACTION:

A. Do not place fill material on surfaces that are muddy, frozen, or contain frost or ice.

B. Place soil stabilization geotextile below structural fill if required after subgrade has been approved and before placement of fill material.

C. Use select fill to increase grades within structure areas, as interior backfill against foundations and in trenches, as exterior backfill against walls, as exterior backfill where pavement or walkways abut the structure, and where indicated on Drawings.

D. Use subbase material to increase grades and establish bearing elevation above exposed subgrade beneath footings and foundations, and where indicated on Drawings.

E. Use drainage material directly below slabs and pad as indicated on Drawings.

F. Use select fill material to increase grades outside the structure area, except as otherwise specified.

G. Use drainage fill around footing drains or as detailed on Drawings. Wrap footing drains and drainage fill with filter fabric. Prewrapped footing drains shall not be used. Where the perimeter pipe is bedded in native soil, the bottom of the trench should be left uncompacted.

H. Backfill trenches with lean concrete where trench excavations pass within 18 inches footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.

I. Backfill foundation excavations as soon as possible following construction of foundations and foundation walls.

J. Backfill and fill against foundation walls evenly on both sides to prevent any displacement of construction. Do not backfill walls with fill on one side only until concrete has achieved its design strength.

K. Begin filling in the lowest section of the area.

L. Place fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

M. Scarify the surface of the subgrade and of each lift of fill, prior to placing the next lift to promote

vertical drainage.

N. Any lift or portion thereof, which is not compacted in accordance with Specifications shall be re-compacted or removed and replaced to meet compaction requirements.

O. Percentage of Maximum Density Requirements: Compact soil and fill to not less than the following percentages of maximum density, in accordance with ASTM D 1557:

1. Under structures, building slabs and steps, and pavements, compact top 12 inches of subgrade and each layer of fill material at 95 percent maximum density.
2. Under walkways, compact top 6 inches of subgrade and each layer of fill material at 95 percent maximum density.

P. Where a power roller is used for compaction, do not approach nearer than 10 feet from the walls of new or existing construction.

Q. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade of layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

R. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

S. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

3.8 DRAINAGE FILL:

A. Place drainage fill material on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade and precast concrete structures as follows:

1. Place drainage course 6 inches or less in compacted thickness in a single layer.
2. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
3. Compact each layer of drainage course to required cross sections and thicknesses to not less than 70 percent of relative density according to ASTM D 4253.

C. Where footings and foundations bear directly on native subgrade materials, contractor may over-excavate and cap subgrade with compacted drainage fill to protect native materials from disturbance and mitigate mud from forming in the excavation.

D. Place soil stabilization geotextile above drainage fill if required additional fill material is to be placed above it to prevent loss of fines.

3.9 VAPOR BARRIER INSTALLATION:

A. General: Following leveling and tamping of granular base for slabs on grade, place vapor retarder/barrier sheeting with longest dimension parallel with direction of pour, as shown in the Drawings.

B. Lap joints 6 inches and seal vapor barrier joints with manufacturers' recommended mastic and pressure-sensitive tape.

C. After placement of vapor retarder, cover with sand cushion and compact to depth as shown on Drawings.

3.10 TOLERANCES:

A. Excavation for structures shall conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot except to facilitate drainage during construction stage.

B. Surface of subbase under structure slabs shall be graded smooth and even, free of voids, and rolled to required elevation. Provide final grades within a tolerance of 1/2 inch when tested with a 10-foot straightedge.

END OF SECTION 312334

SECTION 333213 – PLANT WATER PUMP STATION

PART 1 - GENERAL

1.0 SCOPE OF WORK

A. PACKAGED PUMP STATION

The Packaged Pump Station supplier shall provide an END-SUCTION CENTRIFUGAL SELF PRIMING, non-potable water pump station complete with pumps, piping, valves, sensors, Variable Frequency Drives, programmable logic controller (PLC), UL 508A listed control panel, and all appurtenances necessary for a complete and functioning pumping system.

The pump station—including the pump control panel—shall be designed and manufactured within the confines of a UL 508A, UL QCZJ, & ISO 9001:2015 certified facility. Electrical connection, by purchaser, shall consist of a single conduit from owners disconnect to the pump station main disconnect. Packaged pump station supplier shall have certified factory trained technicians within 100 miles of project location. The service technician will be available no more than 48 hours after the time of the initial call. The packaged pump station manufacturer shall have 24-hour, on-call service lines and the ability to remotely make changes and troubleshoot.

B. FACTORY TESTING

The pump station manufacturer shall conduct and document a complete factory dynamic test of the pump station prior to shipment. Pump stations shall be tested throughout the entire operating range at the net discharge pressure called for in the technical specifications. Individual pump pressure, flow, RPMs, volts, amps, KW, and power factor shall be documented for verification by the Owners' Representative prior to delivery upon request.

1. Hydrostatic Testing. The packaged pump station shall undergo hydrostatic testing that meets ANSI/HI specifications and standards.
2. Vibration Testing. The packaged pump station shall undergo vibration testing that meets ANSI/HI 9.6.4—Vibration Measurement and Allowable Values—specifications and standards.
3. Flow Testing. The packaged pump station shall undergo Hydraulic Performance Acceptance testing that meets ANSI/HI 14.6 specifications and standards.
4. Wet Test. The entire pump station shall be completely wet tested at the manufacturing facility prior to shipping.

C. ONSITE PUMP STATION START-UP

Technical start-up shall be furnished by the Packaged Pump Station Manufacturer or a qualified service agent. Location and mounting details shall be furnished by the Packaged Pump Station Manufacturer.

Electrical connection, by purchaser, shall consist of a single conduit from owners disconnect to the pump station main disconnect. Additional purchaser responsibility shall include confirming correct motor rotation and securing local inspection/approval.

Technical start-up procedures by the pump station technician shall include the following:

1. Station start-up and pressurization.
2. Pressure, flow, and programming adjustments.
3. Monitoring of complete operational cycle when possible.
4. Testing of all alarms and fault conditions.
5. System automation tuning for field conditions.
6. Customer training and the presentation of the station operation and maintenance manual.

D. WARRANTY

The Manufacturer shall warrant the original buyer that the packaged pump station shall be free from defects in material and workmanship for a period of twelve (12) months from the date of placing the Equipment in operation or fifteen (15) months from the date of completion of manufacture of the Equipment, whichever shall occur first. The Manufacturer shall provide a 25-year rust-through corrosion warranty on the piping and skid base for Hot Dipped Galvanizing.

E. SUBMITTALS

Submittals shall be well organized, labeled, and presented in a professional manner. Sloppy or poorly presented submittals shall be rejected. The pump station manufacturer shall submit the following items as part of a complete submittal package:

1. Shop Drawings, including 3D models of the proposed pump station. The manufacturer shall also provide digital models that can be viewable from any angle.
2. Electrical Schematics
3. Control Panel Layout Drawing
4. Manufacturers complete packaged pump system UL category QCZJ file number.
5. Technical data sheets for all major system components, including:
    a. Pump performance curves and datasheets
    b. Control Panel Components: VFD, PLC, Touchscreen Interface, Panel Enclosure, & UL 508A Certification
    c. Powder Coating Data
    d. Galvanizing Data
    e. Valves
    f. Instrumentation

F. OPERATIONS AND MAINTENANCE MANUAL

An electronic operation and maintenance manual shall be furnished at the time of start-up and initial training. The owner shall also receive training specific to the pump station. Operation and maintenance instructions shall contain the following as a minimum:

1. Complete operating instructions, including HMI screenshots with detailed instructions on adjust system parameters and settings.
2. Service and Maintenance instructions.
3. Equipment and driver nameplate data.
4. Electrical schematics.
5. Factory start-up and test data, including pump curves.

1.1 MANUFACTURER QUALIFICATIONS

A. Single Source Responsibility

The entire pump station and the control panel shall be designed, assembled, programmed, and tested by a single manufacturer.

B. Certifications

The Manufacturer shall be a UL QCZJ Listed Packaged Pump Station Manufacturer, a UL 508A Listed Control Panel Manufacturer, and an ISO 9001:2015 Certified Manufacturer. The Manufacturer shall provide a Certification signed by the owners providing free phone technical support for the lifetime of the product.

C. Manufacturer Personnel

The Manufacturer shall employ service personnel who are trained and certified in every aspect of service that may be required at the pump station. It shall not be acceptable for the control panel to be designed, manufactured, programmed, or tested by any entity other than the Packaged Pump Manufacturer.

D. Approved Manufacturer

The pumping system shall be manufactured by Precision Pumping Systems of Boise, Idaho—or approved equal. To be considered an equal manufacturer, proposed manufacturers shall meet the above conditions shall submit the following:

1. Shop Drawings of Mechanical System
2. Theory of Operation
3. Installation List of 10 similar pumping systems which have been in operation for a minimum of 3 years.
4. Process & Instrumentation Diagram
5. Electrical Schematics: One-line diagrams shall not be accepted. A full-color, diagrammatic wiring schematic required.
6. Control Panel Layout Drawing
7. Technical data sheets for all major system components, including:
    a. UL QCZJ Certification, UL 508A Certification, and ISO 9001:2015 Certification
    b. Pump performance curves and datasheets
    c. Control Panel Components: VFD, PLC, Touchscreen Interface, Panel Enclosure, and Cooling Method.
    d. Powder coating or Hot Dipped Galvanizing.
    e. Valves
    f. Filtration
    g. Instrumentation
    h. Pump station enclosure

1.2 REFERENCE STANDARDS

A. NEMA – National Electrical Manufacturers Association
B. NEC – National Electrical Code
C. UL – Underwriters Laboratories, Inc.
D. AWWA – American Water Works Association
E. ANSI – American National Standards Institute
F. ANSI/HI – American National Standards Institute/Hydraulic Institute
G. ASTM – American Society of Testing & Materials

PRODUCTS

1.0 PUMPS AND MOTORS

A. END-SUCTION CENTRIFUGAL PUMPS

1. Horizontally mounted, single stage, end-suction centrifugal pumps shall be designed for continuous operating service and shall have a continuously rising performance curve.
2. The pump(s) shall meet the following design criteria;
   a. Design Flow Rate: 495 GPM @ 87 PSI
   b. Horsepower: 40 HP
   c. Minimum Power : 480 Volt / 3 Phase
   d. Pump Size: 3 x 4 – 10
   e. Installation: Close Coupled
   f. Frequency: 60 Hz
   g. Poles: 2
   h. Service Factor: 1.15
3. Construction. The pump casing shall be constructed of close grain cast iron with replaceable wear ring. All casing sections shall have heavy wall thickness to provide long life under abrasive and corrosive operating conditions. Casing shall be capable of withstanding a hydrostatic pressure test of at least 125 percent of shutoff pressure or 150 percent of design head. Piping connections shall be ASA 125# flat face drilled flange. All pumps shall be of a back pull-out design so that the rotating element can be removed from the casing without disconnecting the suction or discharge piping.
4. Impeller. Pump impellers shall be constructed of bronze, fully machined on all exterior surfaces, and statically balanced.
5. Seal. Shaft seal shall be a mechanical seal with NI-resist stationary seat, carbon washer, Buna rubber flexible members, and 18-8 stainless steel metal parts and spring.
6. Manufacturer. Pumps shall be manufactured by Xylem or approved equal.
7. Motors:
   a. Motors shall be a standard ODP IP55 NEMA type, induction style, premium efficient, and inverter duty suitable for variable speed operations per NEMA MG1 Part 31.4.4.2.

b. Motor frame shall be steel or cast iron, aluminum shall not be permitted.

c. Motors shall be rated for operation at 208-240/480 VAC, 3 phase, 60 hertz, and service factor of 1.15 or greater.

d. Duty Pump Motors shall be 3,600 RPM maximum.

e. The motor shall be of proper size to drive the pump at any point on the operation curve without exceeding the percent of the motor horsepower nameplate rating.

1.1 MECHANICAL SYSTEM

A. GENERAL REQUIREMENTS

1. System manifold and appurtenances shall be engineered such that each joint is a union, with all fittings and pipe sections removable without cutting or welding. All piping, fittings, and valves shall have roll-formed grooved connections, with grooved flange adapters provided where connecting to flanged equipment.
2. For ease of maintenance and replacement, each mechanical component, including all fittings and spools, shall include unique part numbers and shall be of a standardized design per ISO 9001:2015.
3. Threaded connections in the piping network are not acceptable.
4. No piping shall be welded to the skid base.

B. PIPING AND FITTINGS

1. All piping, fittings, and pipe supports shall be constructed of 304 stainless steel.
2. All process piping and fittings shall have a CLASS D pressure rating.
3. Manifolds shall be grooved, or cope welded per AWWA standards. Grooved couplers shall be 304 Stainless Steel. All welded flanges shall be Class D forged stainless-steel slip-on or welded neck type. All welded fittings shall be seamless, conforming to ASTM Specification A234. Threaded connections in the piping network are not acceptable.

C. STATION BASE

1. The system base frame shall be structurally engineered to provide rigid support for the entire pumping system equipment, including but not limited to pumps & motors, manifold, valves, control panel, and station enclosure. The base frame shall enable the entire pump station to withstand all stresses related to transportation, installation, and operation as carried out by qualified personnel.
2. The base frame shall be press-brake formed and fabricated ASTM A36 Steel plate with a minimum thickness of 3/16 inch. The legs of the frame shall be press-brake formed with a minimum riser height of 4 inches and shall include lifting eyes for site offloading and installation, as well as a bent flange with 3/8-inch bolt holes for on-site anchoring to a concrete pad. The frame shall be structurally reinforced with 3/16-inch-thick ASTM A36 Steel Flat Bar skip-welded to the underside of the frame.
3. The frame deck shall include an integral level sensing equipment access cap.
4. After all fabrication has been completed, the entire base frame shall be grit-blasted to bare steel and HOT-DIP GALVANIZED per ASTM-123 Standards. No welding shall be performed after the base frame is galvanized.

5. Open rail type structural support systems shall not be accepted.
6. Station frame shall have forklift slots for transportation.
7. Drain shall be provided on skid and plumbed to outside of skid.
8. Proposed alternate systems with base frame coatings that are not warrantied for 25 years shall not be accepted.

1.2 PUMP STATION ENCLOSURE

A. The pump station enclosure shall be constructed of marine grade aluminum, with all surfaces coated in thermosetting epoxy powder coating with a minimum thickness of 3 mils. The enclosure shall be suitable for outdoor use, providing protection from wind-blown rain and dust, as well as preventing ice formation.

B. The enclosure shall consist of a frame built out of structural folded aluminum. The aluminum panels shall be mounted to the enclosure frame with pan head Torx tamper resistant stainless-steel screws.

C. Enclosure shall consist of 2 hinged minimum, lockable entry doors, with SCE-41 Grade Neoprene gasketing with aggressive rubber-based adhesive. The enclosure shall have a removable roof; it shall be sloped to prevent moisture build-up, and it shall include a brake-press formed drip-edge, aluminum flashing, and SCE-41 Grade Neoprene gasket with aggressive rubber-based adhesive.

D. Enclosure Accessories

1. Insulation

The enclosure shall be insulated with rigid foam plastic thermal insulation board composed of polyisocyanurate foam core bonded to reinforced aluminum foil facers on each side. The insulation shall be 1″ thick, with an R-Value of no less than 6.0.

2. Heater – 500 WATT

The enclosure shall be equipped with a 500-Watt radiant heater with stainless steel element, built-in snap-action thermostat, and steel housing with baked enamel protective coating. It shall come equipped with a capillary tube running the full length of the element to provide over-temperature protection, which shall automatically reset when temperature drops.

3. Building Temp Sensor

The enclosure shall be equipped with a 4/20MA temperature transmitter. The sensor shall be housed in a Nema1 Plastic Enclosure. The sensor shall be capable of temperatures between -50 to 150 degrees Fahrenheit. The sensor shall be capable of User Adjustable Alarms, High Temp Alert and Low Temp Alert.

1.3 VALVES

A. Butterfly Isolation Valves – Wafer Type

Provide isolation valves as shown on the drawing. Valves shall be butterfly type with Wafer connections, Cast Iron Body, Ductile Iron Disc, EPDM Seat, 400 SS Valve Stem, and Hand-wheel Gear-Operators with 10-position indicator. Valves have a maximum pressure rating of 200 PSI.

B. Wafer Check Valves

A spring-loaded non-slam type check valve shall be installed on the discharge of each pump. The valve shall be wafer style typed fitted between two flanges. The head loss through the check valve shall not exceed 5 PSI at the pump design capacity. Check valves shall be Val-Matic 1400A series or approved equal.

C. Air Vent Valves

Air relief valves shall continuously discharge entrapped air in the system and shall be constructed of a cast iron body with stainless steel float and trim. The discharge shall be piped to the floor drain. Air vent shall have a maximum working pressure of 175PSI. Air relief valves shall be manufactured by Val-Matic or approved equal.

D. Diaphragm Style Pressure Relief Valve

The valve shall protect the piping network by bypassing or relieving excess pressure and shall maintain close pressure limits without causing surges. If upstream pressure decreases below the spring setting, the valve shall close. Relief piping shall be plumbed to the system wet well. The valve shall be a Cla-Val Co. Model No. 50-01/650-01 Pressure Relief and Pressure Sustaining Valve as manufactured by Cla-Val or approved equal.

1.4 INTAKE H-STYLE STRAINER

A. General Requirements

1. The station shall include an H-style strainer for low pressure drop applications, made with ductile iron NSF/ANSI 61 fusion bonded epoxy coated construction and 316 stainless steel strainers. H-style strainer must be serviceable without removal from the line.
2. The H-style strainer shall be CLA-VAL X43H series or approved equal.

1.5 INSTRUMENTATION

A. Pressure Gauges

Pressure gauges shall be located as shown on the technical drawing. Pressure gauges shall have a 304 stainless steel case and bezel construction. Gauges shall be 2.5” diameter, liquid filled. Pressure sensing connection shall be 1/4" NPT lower gauge connection.

B. Pressure Transmitters

The station shall have pressure transmitters located as shown in the technical drawing. The pressure transmitters shall provide noise free, linear output that is proportional to pressure. Transmitter shall be solid-state, strain gauge type with integral voltage regulation and output accuracy not less than 0.4%. Transmitter shall be constructed of stainless steel and rated for the pump station discharge pressure called out in the technical specifications. The pressure transmitter shall be manufactured by IFM or approved equal.

C. Wet Switch

1. The wet switch shall be 316L stainless steel with ½” NPT connection, IP68 rated and have two switching outputs with overload protection.
2. The wet switch shall be Efector160 series or approved equal.

D. Level Transmitters

A solid-state level transmitter shall provide a noise free, linear output proportional to reservoir level. Transmitter shall be solid-state, strain gauge type with integral voltage regulation and output accuracy not less than 0.25%. Transmitters shall be constructed of stainless steel.

E. Low Water Float Switch

The system shall have a float switch to be used to signal the pump station to shut down if the intake source water level becomes too low. The switch shall work in conjunction with the PLC (programmable logic controller). In the event the supply drops below a safe operating level, the PLC will shut down the pump system. The PLC shall be programmed to attempt to restart the pumping system two times. If after two attempts the water supply is still too low, the system will require a manual reset. The Low Water Float switch shall be 2900 Mercury series manufactured by Conery or equal.

F. Insertion Type Flow Sensors

1. The pump station shall have a non-magnetic flow sensor located as shown on the technical drawing. By using the system operator interface, an operator shall have access to flow meter data—including current flow rates and total gallons pumped—as well as adjustable settings for flow meter calibration and system flow fault setpoints.
2. The flow meter sensing mechanism shall be a six-bladed impeller.
3. The flow meter shall read flows from 0.5 - 30 fps, with a worst-case inaccuracy of +/-1.0% of reading with +/- 0.3% repeatability.
4. The meter shall be fully tested during the pump station full run performance testing while at the factory prior to shipment. The flow sensor on the pump station shall be calibrated against a master meter.
5. The flow meter shall be Badger Series 200 or equal.

1.6 PRESSURE TANK

A. The pump station shall include a 62 GALLON pre-pressurized diaphragm-type well tank. Tank shall be factory pre-charged. It shall be constructed of a steel shell and have a stainless-steel system connection. Manufactured by WELL-X-TROLL or equal.

1.7 MOTOR CONTROL PANEL

A. General Requirements

1. The Motor Control Panel shall incorporate all circuits and necessary protections required to operate the pump station, including motors, controls, and heating and ventilation circuits. All wiring shall conform to NEC and UL 508A standards for safety.
2. The control panel shall be designed, built, tested, and UL 508A listed by the pump station manufacturer. The control panel shall be UL labeled as an "Enclosed Industrial Control Panel". The pump control panel shall be completely manufactured, tested, and programmed prior to delivery to the job site.
3. Electrical connection, by purchaser, shall consist of a single conduit from owners disconnect to the pump station main disconnect.

4. The control panel shall be installed inside the pump station enclosure. Control panels mounted outside of the pump station enclosure shall not be accepted.
5. The following shall be permanently affixed to the inside of the control panel enclosure:
    a. A full-color, diagrammatic wiring schematic.
    b. Pump and motor nameplate information.
    c. Factory calibrated control setpoints.

B. Panel Construction

The pumping station electrical controls, including variable frequency drives and operator interface, shall be housed in a NEMA 4X enclosure.

1. The enclosure shall be fabricated from 304 stainless steel, 12 gauge minimum, brushed finish.
2. All internal components of the enclosure shall be mounted on a removable sub-panel, which shall be powder coated white. Mounting screws for components shall not be tapped into the enclosure wall.
3. The electrical panel doors shall be removable and interchangeable, with concealed hinges and integral latches. Door gasket seals shall be oil-resistant and shall be sufficient to protect interior components from weather and dust.
4. All external operating devices shall be dustproof and weatherproof.
5. No pressure gauges, pressure switches, water activated devices, or water lines of any sort shall be installed in the control panel.
6. MCP Temperature Regulation
    a. The PLC shall monitor the internal temperature of the control panel using an internal temperature probe. The controller shall automatically fault or send an alarm when the internal temperature reaches user adjustable high/low temperature settings.
    b. The cooling system shall interface with the pump station controller for alarms and notifications.
    c. The cooling system shall be sized for local maximum ambient conditions, plus component cooling requirements. Cooling should be designed such that the internal panel temperature does not exceed 104F.
    d. Control panel temperature regulation shall be via a self-contained, closed loop AC cooling unit. The cooling unit shall utilize compressor-based refrigeration technology with two independent air paths – one which circulates enclosure-side air across the evaporator to displace unwanted heat within the enclosure, and one which circulates ambient air across the condenser to transfer waste heat to the ambient environment.
    e. The cooling Unit shall be NEMA 4X listed and constructed with 316 stainless steel.
    f. AC Units shall include a mechanical thermostat, digital temperature display, R134A earth-friendly refrigerant, and a cleanable & reusable aluminum mesh coil-protection filter.
    g. The cooling unit shall be Hoffman Spectra cool series or approved equal.

C. Service Rated Main Disconnect

A three-pole, main station disconnect shall be contained within the control enclosure. The main disconnect shall be non-fused and isolate all power to the control enclosure. The main disconnect shall have an operating handle mounted in the enclosure door, mechanically interlocked to prevent entry while disconnect is in the ON position.

D. Control Transformer

The control transformer shall provide 120-volt power to the pump station controls. The control transformer shall be protected on the primary side with appropriately sized fuses. The secondary side shall be protected by a group of supplementary miniature circuit breakers.

E. Surge Protection

The control panel shall include an industrial grade surge protective device with individual thermally fused and protected MOVs. The surge protector shall provide 50kA per phase protection and shall be UL Listed 1449 for Type 1 SPD applications.

F. Secondary Control Circuit Breakers

Single-pole secondary distribution breakers with appropriate ratings shall supply power to each pump starter coil circuit, and control system.

G. Door-Mounted Pilot Devices

1. General Requirements

   All devices shall be IP66 rated, providing complete protection from dust, as well as complete protection from high pressure water jets from any direction.

2. Motor Selector Switches

   An HOA switch shall be provided for each motor circuit. Switches shall be modular, 3-position maintained, illuminated with green light, and include chrome metal bezel.

3. Speed Potentiometer

   A speed potentiometer shall be provided for manual speed control of VFD driven motors. Potentiometer shall be a modular knob-type with chrome metal bezel and rated 5 kOhm.

4. Pilot Lights

   System status indicating lights shall be provided, with a red light to indicate system faults and a green light to indicate when a pump is running. Lights shall be 22mm diameter and equipped with a light diffusing lens.

H. Uninterruptable Power Supply (UPS)

1. UPS shall be provided as a standby unit to support during short times when the power may be interrupted.
2. UPS shall provide a 24V output.
3. Manufacturer – PULS Model UB 10.241

I. Variable Frequency Drives (VFDs)

1. Provide a dedicated VFD for all Motors.

2. Variable Frequency Drive(s) shall be mounted inside the control panel enclosure, with each VFD isolated from main input power by use of a contactor to protect the VFD from power outside of tolerances.
3. The variable frequency drive shall be IGBT based with selectable carrier frequency up to 15 KHZ. The VFD shall include terminals for incoming power, motor output power and control terminals. All VFDs shall include an RS485 port built-in to the VFD for dedicated communication to the PLC.
4. The VFD shall generate a sine-coded, variable voltage/ frequency, three phase output for optimum speed control. The VFD shall incorporate power loss ride-through for a minimum of 2 seconds. VFD protective features shall include current limit, auto restart, short circuit protection, electronic motor overload protection, and ground fault protection. The VFD shall have a push button programming display for easy access to operation parameters. The VFD shall be protected on the primary side by a breaker of the appropriate amperage.
    a. Overload capacity: 120% rated output current for one minute.
    b. Voltage fluctuation: +10%, -15%.
    c. Sine wave, PWM, with full range, and automatic torque boost.
    d. Frequency control range: 0 to 500 Hz.
    e. Frequency accuracy: digital, 0.01 Hz, analog, .1%. Motor overload protection, instantaneous over current of 180% of rated output current.
    f. Over voltage at 820vdc if 460v input.
    g. Under voltage shall be user adjustable.
    h. Momentary power loss: up to 2 second ride through.
    i. Electronic ground fault.
    j. Led capacitor charge indicator.
    k. Input phase loss alarm.
    l. Ambient temperature ranges of 0 to 40 degrees c.
    m. Humidity of 95% non- condensing allowed.
5. Manufacturer: ABB ACQ580 with ISO 9001 certification or pre-approved equal.

1.8 PUMP SYSTEM CONTROLLER

A. General Requirements

1. Non-Proprietary, Open-Source Programming

   To better facilitate owner access to system servicing, the control system shall be non-proprietary and open source. Proprietary control systems shall not be accepted.

2. Controller User Guide

   The pump station manufacturer shall supply an owner's manual in digital form that includes graphic images of all touch screens, complete with explanations of all settings and modes.

3. Controller Technology

   The system shall be capable of sending alerts and warnings via a cellular modem.

B. Programmable Logic Controller (PLC)

1. PLC shall consist of a central processor with built-in dual port Ethernet and USB connection. Processor shall be capable of expanding up to 4 I/O expansion modules and include the following features:
    a. High-speed counter with 100 kHz maximum input frequency
    b. Pulse output with 100 kHz maximum output frequency
    c. Supply Power shall be 24V DC with a maximum 35A inrush current.
    d. Environmental Ratings
        1) Class 1, Division 2 Hazardous Location
        2) Operating Temperature: -25 to 65 degrees Celsius
        3) 10 – 95% Relative Humidity
    e. Program Storage
        1) Serial Flash Memory using embedded SD Card Slot
        2) RAM Backup via lithium battery capable of up to 4 years battery life.
    f. Communications Interface
        1) 1-USB Mini-B USB Standard 2.0
        2) 2 Ethernet Ports with RJ45 Connector
        3) Protocols
            a) Modbus TCP
            b) Modbus RTU
            c) Ethernet/IP
            d) BACnet
2. Manufacturer/Series
    a. IDEC MicroSmart FC6A Plus

C. Operator Interface

1. General Requirements
    a. The touchscreen shall allow operator access to all system settings and monitoring data.
    b. The operator interface shall be a Color TFT LCD touchscreen.
    c. The touchscreen shall be mounted to the motor control panel door.
    d. A VFD control keypad is not an acceptable substitution for the digital operator interface.
    e. The operator interface shall allow the user to adjust the system parameters & settings to the PLC program locally without requiring any additional equipment such as a laptop computer.
    f. System must be capable of programming VFD’s via touchscreen (for 3-phase systems only)
2. Hardware Features
    a. High Resolution Display with 640 x 480 pixels, with a minimum screen diagonal length of 7.0″.
    b. Backlight with 100,000 hours

c. Supply Power shall be 24V DC with maximum 30A maximum inrush current.

d. Environmental Ratings

1) NEMA 4X

2) Class 1, Division 2 Hazardous Location

3) Operating Temperature: -20 to 60 degrees Celsius

4) 10 to 90% Relative Humidity, non-condensing

e. Communications Interface:

1) 1 Mini-B USB Standard 2.0

2) 1 Ethernet Port with RJ-45 Connector

3) RS232C or RS485

f. Program Memory Storage

1) 2GB SD Memory Card

3. Manufacturer/Series: IDEC High Performance Series or Pre-Approved Equal.

D. Monitoring Functions

1. System Dashboard

a. Pressure, flow, and level status.

b. Pump status, including lead pump designation, VFD frequency, torque, kw and current draw.

c. Alarm conditions, with the ability to manually reset alarms.

d. Current values of all system sensors, including pressure and flow.

e. User selectable language icon.

2. Fault Log

The controller shall have a system fault log that displays the precise times of fault occurrences and recoveries, as well as message indicating the fault type. The fault log shall include a fault diagnosis utility that provides possible causes of and solutions to all system faults and warnings.

3. Trend Log

Trend graphing screen capable of detailing pressure, flow, and current data. Graphing function shall give the option to graph and plot a point at user adjustable intervals. All data shall be capable of being downloaded to a USB drive and accessible over Ethernet through FTP server. The trend log shall be .csv format.

4. Advance I/O diagnostics

HMI display must include utility screen that displays the current status of all digital and analog inputs/outputs, including device tag name (i.e., pump #1 auto). This function must be accomplished without opening the control panel.

E. Control Functions

1. Control system must be capable of adding industry standard components without program modifications. Including but not limited to:

a. Fill valve

b. High level float

2. Pressure Settings

   Pressure transmitter calibration, discharge pressure setpoint, and high/low pressure alarm/fault conditions.

3. Flow Settings

   Low and high flow alarm conditions, flow meter sensor calibration settings, and total gallons pumped with user reset button and time/date stamp of last reset. In addition, a non-resettable flow totalizer.

4. Level Settings

   Low- and high-level alarm conditions, level transmitter calibration settings, and level-based pressure setpoint manipulation.

5. Pump Settings

   Pump detail screens showing total run hours of each pump since last reset and any modes, options, or functions specific to that pump. Must include troubleshooting utility as a visual display of pump permissive.

6. Remote Start/Stop Signal Relay

   The PLC shall be able to start and stop the system based on a remote signal 24VAC relay provided in the control panel.

7. Pre-programmed Start-Up Routines
   a. The PLC shall be programmed with various start-up routines that limit and/or delay the starting and acceleration of the pump—ensuring that excessive velocity and pressure do not damage the distribution system.
   b. The program shall include individual routines for initial start-up, mainline fill, re-start after a power outage, and re-start after a system fault.
   c. The operator shall be able to adjust the timing of the routines via the operator interface.

8. Password Protection
   a. Unique user selectable password.

9. Loading and Saving System Default Settings

   The system shall allow the operator to Load Factory Default PLC settings, Save New Operator settings, and Load previously saved Operator PLC settings.

10. The PLC shall allow the operator to change the system date and time.

11. System Protections
    a. Controls shall shut down the pump station in the event of the alarm conditions described in this section, as well as otherwise indicated. The system controls shall attempt to restart the system after alarm shutdown or loss of power. After a user-adjustable number of attempts to re-pressurize the system, the controls shall go into hard shut down and remain so until manually reset.
    b. Low Flow Shutdown. The PLC shall automatically shut down the system if there is no, or too little flow, based on signals received from a flow switch. The low flow shutdown shall have a user adjustable time delay.
    c. Low Level Shutdown. The controller shall automatically shut-down the system based on low level signals from a level transmitter.

d. High Pressure Shutdown. In addition to the pressure data received from the pressure transmitter, the PLC shall automatically shut down the system based on signals from a high-pressure switch.

e. Electrical Fault Shutdowns. Incoming power high, low, and imbalance limits. Shut-down and restart time delays shall be user-adjustable.

f. Analog Transmitter Failure. Input levels of all connected transmitters and meters shall be monitored for failures.

g. Motor starter failure. Circuit breaker and/or motor overload contacts shall be monitored to indicate a motor failure.

F. Communications

1. Web-Based Remote Monitoring and Control

a. The pump station control panel shall include a web-based remote control and monitoring system.

b. Remote Monitoring must be capable of alternating between English and Spanish during operation by an end-user.

c. Remote monitoring and control system shall be non-proprietary and not require a 3rd Party Application.

d. The pump station shall be capable of being remotely monitored from any device with a web browser, such as a PC, tablet, or smart phone.

e. Monitoring of pump station shall be seamless to the user via a web browser that shall be started by simply clicking on a hyperlink. Software shall not be required to be installed or configured on the user's computer.

f. The web page shall include full graphic representation of the pump station and its features and shall be capable of remotely changing all operating parameters of the pump station.

g. The pump station shall automatically send email or text alerts regarding warnings and faults and specify the station and specific fault/alarm.

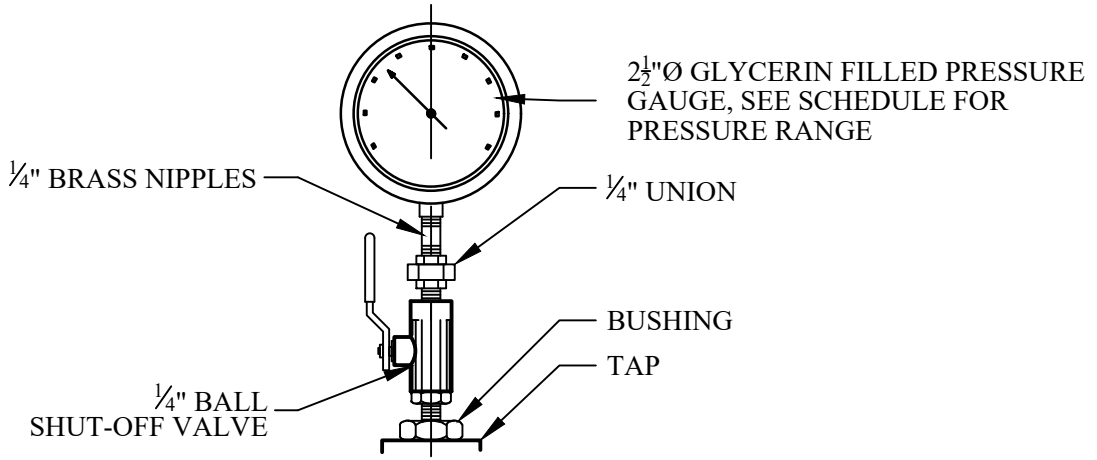
h. The pump station manufacturer shall supply all required communication hardware except computer and computer accessories, including all necessary direct burial cable and antennas.

i. A cellular modem shall be mounted and wired inside control panel enclosure.

j. The connection shall be capable of communicating to the pump station over cellular modem, high speed Ethernet, or fiber optic cable.

END OF SECTION 333213

Location	Description	Equipment Tag ID	Pressure Gauge Model and Range (O.A.E)		Quantity		Working Pressure Range (psi)
			Suction	Discharge	Suction	Discharge	
Headworks/Screening/Grit	Grit Pump #2	GRTP-02	McMaster-Carr 4066K41 304 SS Case 0 PSI to 30 PSI, O.A.E.	McMaster-Carr 4066K41 304 SS 0 PSI to 100 PSI, O.A.E.	2	2	0-80
Headworks/Screening/Grit	Grit Pump #1	GRTP-01	McMaster-Carr 4066K41 304 SS Case 0 PSI to 30 PSI , O.A.E.	McMaster-Carr 4066K41 304 SS 0 PSI to 100 PSI, O.A.E.	2	2	0-80
Primary Clarifier Sludge Pump Station	Cent. Solids Handling Trash Pump	P-SP-01/02	McMaster-Carr 4066K41 304 SS 0 PSI to 30 PSI , O.A.E.	McMaster-Carr 4066K41 304 SS 0 PSI to 100 PSI, O.A.E.	2	2	0-60
ATAD Building	RDT Plant Water Booster Pump	RDT-WW-01	McMaster-Carr 4066K41 304SS 0 PSI to 100 PSI, O.A.E.	N/A	1	N/A	0-80
ATAD Building	Progressive Cavity RDT Feed Pump	RDT-FP-01	McMaster-Carr 4066K41 304 SS 0 PSI to 30 PSI , O.A.E.	McMaster-Carr 4066K41 304 SS 0 PSI to 100 PSI , O.A.E.	1	1	0-60
ATAD Filtrate Pump Station	Sulzer Submersible Sewage Pump	FP-400/401	N/A	McMaster-Carr 4066K41 304 SS 0 PSI to 100 PSI, O.A.E.	N/A	2	0-20
ATAD Building	Progressive Cavity Sludge Belt Press Feed Pump	BPS-SFP-03/04	McMaster-Carr 4066K41 304 SS 0 PSI to 30 PSI , O.A.E.	McMaster-Carr 4066K41 304 SS 0 PSI to 100 PSI, O.A.E.	2	2	0-60
MBR Influent Drywell	Xylem FLYGT Pump	IP-01/02/03	McMaster-Carr 4066K41 304 SS 0 PSI to 30 PSI , O.A.E.	McMaster-Carr 4066K41 304 SS 0 PSI to 300 PSI , O.A.E.	3	3	0-203
MBR Cassette Laydown Area	Chopper Pump Vaughn	SP-05/06	McMaster-Carr 4066K41 304 SS 0 PSI to 30 PSI , O.A.E.	McMaster-Carr 4066K41 304 SS 0 PSI to 200 PSI, O.A.E.	2	2	0-150
Dewatering Building Belt Press	Belt Press Plant Water Booster Pump	BWS-01/02	McMaster-Carr 4066K41 304 SS 0 PSI to 100 PSI, O.A.E.	N/A	2	N/A	0-80
Dewatering Building	Sump Pit Pumps	FP-01/02	N/A	McMaster-Carr 4066K41 304 SS 0 PSI to 200 PSI, O.A.E.	N/A	2	0-120



1 / SK-2 PRESSURE GAUGE DETAIL

SCALE: NONE

ADDENDUM #4

ENGINEERING
33 Airport Center Drive
Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive
Suite 1
Milford, PA 18337
(570) 296-2765

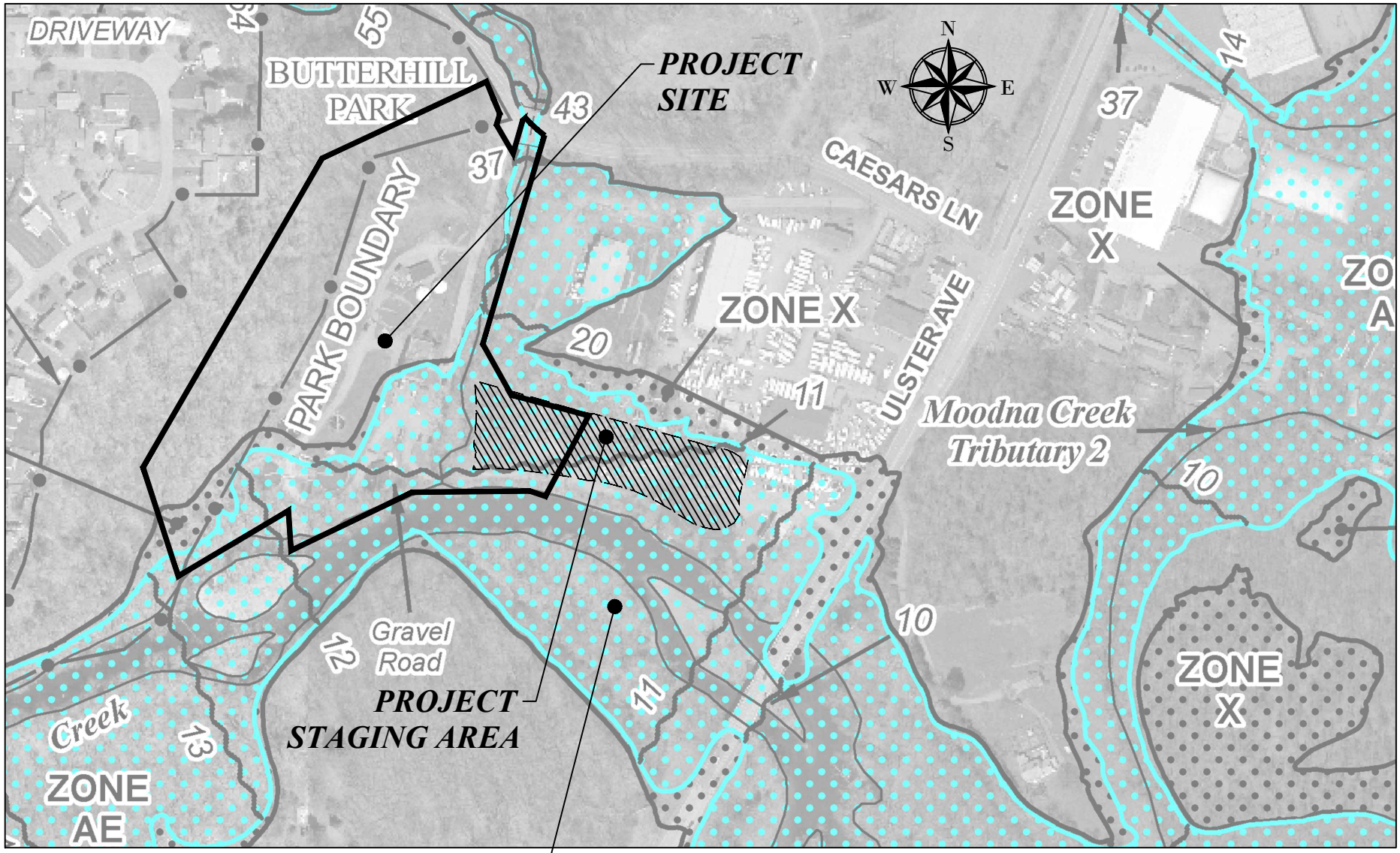
PRESSURE GAUGE DETAIL

CAESERS LANE WWTP EXPANSION PROJECT : PHASE 2

FOR TOWN OF NEW WINDSOR - 555 UNION AVE. - NEW WINDSOR, NY 12553

DRAWN BY: HPBJr
REVIEWED BY: JTW
PROJECT # 18-732
PHASE # -
DATE: 07/10/25

SK-2



SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

ADDENDUM #4

MHE ENGINEERING
33 Airport Center Drive
Suite 202
New Windsor, NY 12553
(845) 567-3100
111 Wheatfield Drive
Suite 1
Milford, PA 18337
(570) 296-2765

FLOOD HAZARD PER FIRM MAP NUMBER 36071C0334E

CAESERS LANE WWTP EXPANSION PROJECT : PHASE 2

FOR TOWN OF NEW WINDSOR - 555 UNION AVE. - NEW WINDSOR, NY 12553

DRAWN BY:	HPBJr
REVIEWED BY:	JTW
PROJECT #	18-732
PHASE #	-
DATE:	07/10/25

SK-3

INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACT

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ARTICLE 1—DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. *Issuing Office*—The office from which the Bidding Documents are to be issued, and which registers plan holders.

ARTICLE 2—BIDDING DOCUMENTS

2.01 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents). See the Agreement for a list of the Contract Documents. It is Bidder's responsibility to determine that it is using a complete set of documents in the preparation of a Bid. Bidder assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete documents, by Bidder itself or by its prospective Subcontractors and Suppliers.

2.02 Bidding Documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download or distribution of the Bidding Documents does not confer a license or grant permission or authorization for any other use. Authorization to download documents, or other distribution, includes the right for plan holders to print documents solely for their use, and the use of their prospective Subcontractors and Suppliers, provided the plan holder pays all costs associated with printing or reproduction. Printed documents may not be re-sold under any circumstances.

2.03 Bidder may register as a plan holder and obtain complete sets of Bidding Documents, in the number and format stated in the Advertisement or invitation to bid, from the Issuing Office. Bidders may rely that sets of Bidding Documents obtained from the Issuing Office are complete, unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.

2.04 Partial sets of Bidding Documents will not be available from the Issuing Office. Neither Owner nor Engineer will be responsible for full or partial sets of Bidding Documents, including addenda, if any, obtained from sources other than the Issuing Office. Only those persons whose name and address are on record of having obtained the Contract Documents will be permitted to bid and issued the Addendums, if any.

2.05 *Electronic Documents*

A. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to the Bidders as Electronic Documents in the manner specified.

1. Bidding Documents will be provided in Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader Version **2017** or later. It is the intent of the Engineer and Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents. However, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor the Contractor's means of reproduction of such documents, the Owner and Engineer cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.

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B. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in Paragraph 2.05.A above. However, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents and reproductions prepared from those versions and, further, assumes all risks, costs, and responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in printed paper versions of the documents, and for Bidder's reliance upon such derived information.

ARTICLE 3—QUALIFICATIONS OF BIDDERS

3.01 Bidder is to submit the following information with its Bid to demonstrate Bidder's qualifications to perform the Work:

A. Written evidence establishing its qualifications such as financial data, previous experience, and present commitments.

B. A written statement that Bidder is authorized to do business in the state where the Project is located, or a written certification that Bidder will obtain such authority prior to the Effective Date of the Contract.

C. Bidder's state or other contractor license number, if applicable.

~~D. Subcontractor and Supplier qualification information.~~

E. Other required information regarding qualifications.

3.02 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.

3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

ARTICLE 4—PRE-BID CONFERENCE

4.01 A pre-bid conference will be held for this Project on **May 22, 2025 at 10:00 AM at the project site, Caesars Lane WWTP, 145 Caesars Lane, New Windsor, NY 12553.**

4.02 A non-mandatory pre-bid conference will be held at the time and location indicated in the Advertisement or invitation to bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference; however, attendance at this conference is not required to submit a Bid.

4.03 Information presented at the pre-Bid conference does not alter the Contract Documents. Owner will issue Addenda to make any changes to the Contract Documents that result from discussions

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at the pre-Bid conference. Information presented, and statements made at the pre-bid conference will not be binding or legally effective unless incorporated in an Addendum.

ARTICLE 5—SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

5.01 *Site and Other Areas*

A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

5.02 *Existing Site Conditions*

A. *Subsurface and Physical Conditions; Hazardous Environmental Conditions*

1. The Supplementary Conditions identify the following regarding existing conditions at or adjacent to the Site:

a. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data.

b. Those drawings known to Owner of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data.

c. Reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.

d. Technical Data contained in such reports and drawings.

2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.

4. *Geotechnical Baseline Report/Geotechnical Data Report:* The Bidding Documents contain a Geotechnical Engineering Report (GER).

a. As set forth in the Supplementary Conditions, the GER describes certain select subsurface conditions that are anticipated to be encountered by Contractor during construction in specified locations ("Baseline Conditions"). The GER is a Contract Document.

b. The Baseline Conditions in the GER are intended to reduce uncertainty and the degree of contingency in submitted Bids. However, Bidders cannot rely solely on

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the Baseline Conditions. Bids should be based on a comprehensive approach that includes an independent review and analysis of the GER, all other Contract Documents, Technical Data, other available information, and observable surface conditions. Not all potential subsurface conditions are baselined.

c. Nothing in the GER is intended to relieve Bidders of the responsibility to make their own determinations regarding construction costs, bidding strategies, and Bid prices, nor of the responsibility to select and be responsible for the means, methods, techniques, sequences, and procedures of construction, and for safety precautions and programs incident thereto.

d. As set forth in the Supplementary Conditions, the GER is a Contract Document containing data prepared by or for the Owner in support of the GER.

B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05 of the General Conditions, and not in the drawings referred to in Paragraph 5.02.A of these Instructions to Bidders. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

5.03 *Other Site-related Documents*

A. In addition to the documents regarding existing Site conditions referred to in Paragraph 5.02.A, the following other documents relating to conditions at or adjacent to the Site are known to Owner and made available to Bidders for reference:

1. **No additional site related documents.**

Owner will make copies of these other Site-related documents available to any Bidder on request.

B. Owner has not verified the contents of these other Site-related documents, and Bidder may not rely on the accuracy of any data or information in such documents. Bidder is responsible for any interpretation or conclusion Bidder draws from the other Site-related documents.

C. The other Site-related documents are not part of the Contract Documents.

D. Bidders are encouraged to review the other Site-related documents, but Bidders will not be held accountable for any data or information in such documents. The requirement to review and take responsibility for documentary Site information is limited to information in (1) the Contract Documents and (2) the Technical Data.

E. No other Site-related documents are available.

5.04 *Site Visit and Testing by Bidders*

A. Bidder is required to visit the Site and conduct a thorough visual examination of the Site and adjacent areas. During the visit the Bidder must not disturb any ongoing operations at the Site.

B. A Site visit is scheduled following the pre-bid conference.

C. Bidders visiting the Site are required to arrange their own transportation to the Site.

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D. All access to the Site other than during a regularly scheduled Site visit must be coordinated through the Owner or Engineer. Bidder must conduct any Site visit during normal working hours.

E. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.

5.05 *Owner's Safety Program*

A. Site visits and work at the Site may be governed by an Owner safety program. If an Owner safety program exists, it will be noted in the Supplementary Conditions.

5.06 *Other Work at the Site*

A. Reference is made to Article 8 of the General Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Express Representations and Certifications in Bid Form, Agreement*

A. The Bid Form that each Bidder will submit contains express representations regarding the Bidder's examination of Project documentation, Site visit, and preparation of the Bid, and certifications regarding lack of collusion or fraud in connection with the Bid. Bidder should review these representations and certifications, and assure that Bidder can make the representations and certifications in good faith, before executing and submitting its Bid.

B. If Bidder is awarded the Contract, Bidder (as Contractor) will make similar express representations and certifications when it executes the Agreement.

ARTICLE 7—INTERPRETATIONS AND ADDENDA

7.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.

7.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing. Contact information and submittal procedures for such questions are as follows:

A. **Email: mhepa@mhepc.com**

7.03 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all registered plan holders. Questions received less than seven (7) working days prior to the date for opening of Bids will not be answered. Addenda will be issued no later than five (5) working days prior to the date for opening bids.

7.04 Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract

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Documents unless set forth in an Addendum that expressly modifies or supplements the Contract Documents.

ARTICLE 8—BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of **five** percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a Bid bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions. Such Bid bond will be issued in the form included in the Bidding Documents. **Bid security must be at least 5% of the Bidder's maximum Bid price.**

8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract, furnished the required Contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract and furnish the required Contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited, in whole in the case of a penal sum bid bond, and to the extent of Owner's damages in the case of a damages-form bond. Such forfeiture will be Owner's exclusive remedy if Bidder defaults.

8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of 7 days after the Effective Date of the Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

8.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within 7 days after the Bid opening.

ARTICLE 9—CONTRACT TIMES

9.01 The number of days within which, or the dates by which, the Work is to be (a) substantially completed and (b) ready for final payment, and (c) Milestones (if any) are to be achieved, are set forth in the Agreement.

9.02 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 10—SUBSTITUTE AND "OR EQUAL" ITEMS

10.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration during the bidding and Contract award process of possible substitute or "or-equal" items. In cases in which the Contract allows the Contractor to request that Engineer authorize the use of a substitute or "or-equal" item of material or equipment, application for such acceptance may not be made to and will not be considered by Engineer until after the Effective Date of the Contract.

10.02 All prices that Bidder sets forth in its Bid will be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as

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supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of "or-equal" or substitution requests are made at Bidder's sole risk.

ARTICLE 11—SUBCONTRACTORS, SUPPLIERS, AND OTHERS

11.01 The Contractor shall not award work to Subcontractor(s) in excess of the 50% of the contract value.

ARTICLE 12—PREPARATION OF BID

12.01 The Bid Form is included with the Bidding Documents.

A. All blanks on the Bid Form must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form. A Bid price must be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.

B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."

12.02 If Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8½ inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.

12.03 A Bid by a corporation must be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation must be shown.

12.04 A Bid by a partnership must be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership must be shown.

12.05 A Bid by a limited liability company must be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown.

12.06 A Bid by an individual must show the Bidder's name and official address.

12.07 A Bid by a joint venture must be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture must have been formally established prior to submittal of a Bid, and the official address of the joint venture must be shown.

12.08 All names must be printed in ink below the signatures.

12.09 The Bid must contain an acknowledgment of receipt of all Addenda, the numbers of which must be filled in on the Bid Form.

12.10 Postal and e-mail addresses and telephone number for communications regarding the Bid must be shown.

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12.11 The Bid must contain evidence of Bidder's authority to do business in the state where the Project is located, or Bidder must certify in writing that it will obtain such authority within the time for acceptance of Bids and attach such certification to the Bid.

12.12 If Bidder is required to be licensed to submit a Bid or perform the Work in the state where the Project is located, the Bid must contain evidence of Bidder's licensure, or Bidder must certify in writing that it will obtain such licensure within the time for acceptance of Bids and attach such certification to the Bid. Bidder's state contractor license number, if any, must also be shown on the Bid Form.

ARTICLE 13—BASIS OF BID

13.01 *Lump Sum*

A. Bidders must submit a Bid on a lump sum basis as set forth in the Bid Form.

13.02 *Base Bid with Alternates*

A. Bidders must submit a Bid on a lump sum basis for the base Bid and include a separate price for each alternate described in the Bidding Documents and as provided for in the Bid Form. The price for each alternate will be the amount added to or deleted from the base Bid if Owner selects the alternate.

B. In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form.

13.03 *Unit Price*

A. Bidders must submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.

B. The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity", which Owner or its representative has set forth in the Bid Form, for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.

C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

13.04 *Allowances*

A. For allowances the Bid price must include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 13.02.B of the General Conditions.

ARTICLE 14—SUBMITTAL OF BID

14.01 The Bidding Documents include one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid

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security and the other documents required to be submitted under the terms of Article 2 of the Bid Form.

14.02 A Bid must be received no later than the date and time prescribed and at the place indicated in the Advertisement or invitation to bid and must be enclosed in a plainly marked package with the Project title, and, if applicable, the designated portion of the Project for which the Bid is submitted, the name and address of Bidder, and must be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid must be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid must be addressed to the location designated in the Advertisement.

14.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

ARTICLE 15—MODIFICATION AND WITHDRAWAL OF BID

15.01 An unopened Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.

15.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 15.01 and submit a new Bid prior to the date and time for the opening of Bids.

ARTICLE 16—OPENING OF BIDS

16.01 Bids will be opened at the time and place indicated in the advertisement or invitation to bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 17—BIDS TO REMAIN SUBJECT TO ACCEPTANCE

17.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 18—EVALUATION OF BIDS AND AWARD OF CONTRACT

18.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner also reserves the right to waive all minor Bid informalities not involving price, time, or changes in the Work.

18.02 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible.

18.03 If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of

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the Bid, whether in the Bid itself or in a separate communication to Owner or Engineer, then Owner will reject the Bid as nonresponsive.

18.04 If Owner awards the contract for the Work, such award will be to the responsible Bidder submitting the lowest responsive Bid.

18.05 *Evaluation of Bids*

A. In evaluating Bids, Owner will consider whether the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.

B. In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form. To determine the Bid prices for purposes of comparison, Owner will announce to all bidders a "Base Bid plus alternates" budget after receiving all Bids, but prior to opening them. For comparison purposes alternates will be accepted, following the order of priority established in the Bid Form, until doing so would cause the budget to be exceeded. After determination of the Successful Bidder based on this comparative process and on the responsiveness, responsibility, and other factors set forth in these Instructions, the award may be made to said Successful Bidder on its base Bid and any combination of its additive alternate Bids for which Owner determines funds will be available at the time of award.

C. For determination of the apparent low Bidder(s) when sectional bids are submitted, Bids will be compared on the basis of the aggregate of the Bids for separate sections and the Bids for combined sections that result in the lowest total amount for all of the Work.

D. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.

18.06 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.

18.07 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

The Contract will be awarded to that responsible Bidder or Bidders whose Bid, so determined within the Base Bid or Alternate Bids, totals the lowest number of dollars, if said Bidder or Bidders are otherwise satisfactory to the Owner. The Owner reserves the right to waive any informalities in or reject any or all Bids.

In the event that there is a discrepancy between the unit prices and the extended totals, unit prices shall govern. In the event that there is a discrepancy between the unit prices or the extended totals written in words and written in figures, the unit prices or extended totals written in words shall govern. No Bid will be accepted which does not contain a unit price for every item in the proposal form.

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ARTICLE 19—BONDS AND INSURANCE

19.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds, other required bonds (if any), and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by required bonds and insurance documentation.

19.02 Article 8, Bid Security, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

ARTICLE 20—SIGNING OF AGREEMENT

20.01 When Owner issues a Notice of Award to the Successful Bidder, it will be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder must execute and deliver the required number of counterparts of the Agreement and any bonds and insurance documentation required to be delivered by the Contract Documents to Owner. Within 10 days thereafter, Owner will deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 21—SALES AND USE TAXES

21.01 Owner is exempt from **New York** state sales and use taxes on materials and equipment to be incorporated in the Work. Said taxes must not be included in the Bid.

ARTICLE 22—ADDITIONAL REQUIREMENTS

22.01 **Agreement to be Assigned**. Bidder acknowledges the provisions of the Agreement as to the assignment of the specified contract for procurement of goods and special services for Suez WTS USA, Inc.

The contract between Owner as "Buyer" and Suez WTS USA, Inc. as "Seller" for procurement of goods and special services ("Procurement Contract") for MBR equipment will be assigned to Contractor by Owner, and Contractor will accept such assignment. A form documenting the assignment is attached as an exhibit to this Agreement.

This assignment will occur on **[the Effective Date of the Agreement]** and will relieve the Owner as Buyer from all further obligations and liabilities under the Procurement Contract. Contractor, as Buyer (Contractor/Assignee) following assignment, will assume full responsibility to Owner for the performance of obligations by Seller, which will be Contractor's Subcontractor or Supplier. Notwithstanding this assignment, all performance guarantees and warranties required by the Procurement Contract will continue to run for the benefit of the Owner and, in addition, for the benefit of the Contractor. Except as noted in the Procurement Contract, all rights, duties, and obligations of Engineer to Buyer and Seller under the Procurement Contract will cease upon assignment.

A copy of the assigned Procurement Contract is attached as Exhibit I.

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