



Napanee WPCP Upgrades, ON

2 Fine Screens, 2 Wash Presses, 1 Grit Vortex & Grit Classifier c/w 2 Hydrocyclones, Electrical Controls & Auxiliary Equipment

Technical Submittal (R0)

Municipal Authority: Town of Greater Napanee, ON

RFP Number: RFP-IS-2023-01

Spec. Sections: 46 43 00 & 46 53 00

Consulting Engineer: EVB Engineering

Installation Contractor: TBD

Contractor PO Number: TBD

Claro Ref.: 20048-P-00



Electronic Copy
(Bookmarked PDF)



Napanee WPCP Upgrades, ON

2 Fine Screens, 2 Wash Presses, 1 Grit Vortex & Grit Classifier c/w 2 Hydrocyclones, Electrical Controls & Auxiliary Equipment Technical Submittal (R0)

Contents

1. Submittal Cover Letter
2. Scope of Supply & 'Open Items' Listing / Checklist
 - A. Scope of Supply
 - B. Capacities & Hydraulic Levels Table & Calculation Data Sheets (R1)
 - C. 'Open Items' to Be Discussed Listing / Checklist
3. Mechanical & Auxiliary Equipment Catalog Cuts
 - A. Fine Step Screen – Brochure
 - B. Screenings Wash Press – Brochure
 - C. Vortex Grit Removal Unit – Brochure
 - D. Grit Classifier – Brochure
 - E. Hygienic Bagger Unit – Brochure
 - F. Hydrocyclone (FLSmidth / Krebs) – Catalog Cuts
 - G. Grit Pumps Selection / Performance Curve Piping Head Loss Calculation & Auxiliary Equipment
 - i. Grit Pump Selection / Performance Curve
 - ii. Discharge Piping Head Loss Calculation
 - iii. Grit Pump Catalog Cuts
 - iv. Grit Pump Skid Drawing
 - v. Grit Pump Check Valves
 - vi. Grit Pump Suction / Discharge Gauge Package
 - vii. Air Release Valve (Self-Priming Application)
 - H. Motors & Gear Drives Data
 - i. Fine Screens – Baldor & SEW (Class I, Div. 1)
 - ii. Wash Presses – Baldor & SEW (Class I, Div. 1)
 - iii. Vortex Grit Removal Unit – Baldor & Nord (Class I, Div. 1)
 - iv. Grit Pumps – WEG (Class I, Div. 1)
 - v. Grit Classifier – Baldor & SEW (Class I, Div. 1)
 - I. Screen Home Position (Proximity) Switch – Turck (Class I, Div. 1)

Napanee WPCP Upgrades, ON – RFP N° RFP-IS-2023-01 – Claro Technical Submittal (R0)

- J. Ultrasonic Level Transmitters & Level Probes Model Numbers & Specification Data
 - i. Endress + Hauser Prosonic S FDU91 Level Sensor (Class I, Div. 1)
 - ii. Endress + Hauser Transmitter Prosonic S FMU90 – (Din-Rail Mount Inside Control Panel)
- K. Float Switches – Flygt ENM-10 (Class I, Div. 1)
- L. Solenoid Valves – ASCO RedHat II (Class I, Div. 1)
- M. Ball Valves – NVC (Full Port)
- N. Pressure Gauge & Snubber – WIKA & Chemiquip
- O. Wye Strainer – IFC
- P. High Liquid Level Sensor – Liquiphant FTL51B (Class I, Div. 1)
- Q. Grit Classifier Conveyor Rotation Sensor – Milltronics (Siemens; Class I, Div. 1)
 - i. Rotation Probe Din-Rail Transmitter (Installed within Control Panel Enclosure)
 - ii. Rotation Probe – XPP-5 (Class I, Div. 1) c/w 10m of sealed cable
- R. Classifier Cable-Actuated Emergency Stop Switch – CCC (Class I, Div. 1)

4. Project Mechanical Drawings & Other Supporting Information

- A. Project Submittal Drawings – Mechanical Equipment Arrangement
 - i. Fine Screening & Grit Removal Layout Drawings (Option 1 – Offset Wash Press Discharges)
 - ii. Fine Screening & Grit Removal Layout Drawings (Option 2 – Near-Parallel Wash Press Discharges)
 - iii. Fine Screening System Arrangement Drawings (Option 1 Layout)
 - iv. Fine Screening System Arrangement Drawings (Option 2 Layout – Near Parallel Wash Press Disch.)
 - v. Forced Vortex Grit Removal Unit Layout Drawings (including Tank Geometry)
 - vi. Forced Vortex Grit Removal System Mechanical Arrangement Drawings
 - vii. Forced Vortex Grit Removal Unit (including Tank Geometry) – 3D Drawing Views
 - viii. Grit Pump Skid Arrangement Drawing
 - ix. Grit Classifier Arrangement Drawings Including Hydrocyclones
 - x. Grit Classifier Arrangement Drawings – 3D Drawing Views
- B. Project Submittal Drawing – Fine Screening System P&ID
- C. Project Submittal Drawing – Grit Removal System P&ID
- D. Step Screen – Typical Components Drawing (Exploded 3D View)
- E. Wash Press – Model TP200 Exploded View 3-D Components Drawing & Listing
- F. Wash Press – Water Supply Piping Arrangement (Suggested)
- G. Wash Press – Drainage Connection & Piping
- H. Channels & Checker Plate / Grating Design
- I. Channels (General Note)
- J. Wiring (General Note)
- K. Ultrasonic Level Sensor Probe – Endress + Hauser Wiring Recommendation
- L. Work Outline (Install & Supply) to Be Completed by Installing Contractor
- M. Equipment Storage (Prior to Installation)
- N. Offloading Instruction – Mechanical Equipment (Preliminary)

5. Preliminary/Sample O&M Manuals

- A. Fine Step Screen Manual (Preliminary)
- B. Wash Press Manual (Preliminary)
- C. Vortex Grit Removal Unit Manual (Preliminary)
- D. Gorman-Rupp T4 Grit Pump Manual
- E. Grit Classifier Manual (Preliminary)

- F. Hygienic Bagger Instructions
6. Control Narrative Sequence & SCADA Exchange Table
- A. Control Sequence Operation Description for Fine Screening System
 - B. Control Sequence Operation Description for Grit Removal System
 - C. Scada Data Exchange Table – Napanee WPCP
7. Electronic Controls Submittal Drawings & Component Catalog Cuts
- A. Fine Screening & Grit Removal Control Panel Drawings
 - B. Control Panel Enclosure Heat Dissipation Calculation
 - C. Field Wiring & Wire Weights Diagram
 - D. Components Catalog Cuts (Annotated) & Index
8. Appendices (for additional information or reference documentation)
- A. Warranty Certificate (5 Years)
 - B. Training Agenda – Napanee WPCP (Duration: approx. 3.0 hours)
 - i. Fine Screening System
 - i. Grit Removal System



1. Submittal Cover Letter

Napanee WPCP Upgrades, ON Screening & Grit Removal System

Municipal Authority: Town of Greater Napanee, ON

RFP Number: RFP-IS-2023-01

Spec. Sections: 46 43 00 & 46 53 00

Consulting Engineer: EVB Engineering

Installation Contractor: TBD

Contractor PO Number: TBD

Claro Ref.: 20048-P-00





Project: Napanee WPCP Upgrades, ON **29 July 2024 (R0)**
Municipal Authority: Town of Greater Napanee, ON **Ref#: Napanee, ON; 20048-P-00**
Consultant Contact: Jamie Baker, P.Eng., Sr. Municipal Engineer, EVB Engineering; 800 Second St. W, Cornwall, ON K6J 1H6; T.: 613.935.3775 x220, C.: 613.363.7802; jamie.baker@evbengineering.com
Claro Representative: Scott Lenhardt, P.Eng., Pro Aqua Inc., 264 Bronte Street South, Milton, ON (Ontario) L9T 5A3; C: 905.330.9244; scott@proaquasales.com
Subject: Technical Submittal (R0): Napanee WPCP, ON; RFP No. RFP-IS-2023-01: ‘Equipment Preselection for the Napanee WPCP Upgrade’
Equipment: Two (2) model 2400-1400-2mm fine step screens, two (2) model TP200-1400 wash presses, one (1) model FV4000-43 in-concrete vortex grit removal unit, one (1) 4x4 self-priming Gorman-Rupp ADI wetted-construction model T4A71S-B grit pump c/w accessories, one (1) model CL-250H(2) grit classifier c/w 2 hydrocyclones, & specified spare parts for common control panel & grit removal system. Including PLC-based main control panel & local stations.
Specification Sections: 46 43 00 – Fine Screens & Compactor
46 53 00 – Vortex Grit Removal Including Grit Pumps & Classifier
Peak Flow: 490 L/s (42,336 m³/d).

Claro has the pleasure of providing its technical submittal (R0) for the specified fine step screening & grit removal systems including PLC-based controls for the Napanee WPCP influent works project. Note: This submittal document is bookmarked for ease of navigation.

The submitted equipment conforms to the specified quality, performance, warranty, & footprint requirements. The system defined below will provide for high separation performance, an exceptional maintenance history, low runtimes, and a hygienic operator environment.

The control panel reflects the discussed alternate configuration that integrates the control for both the screening & grit systems and incorporates a value-engineered slate of name-brand alternate components including WEG, Siemens & others.

The grit classifier has been updated to incorporate a liner configuration that enables an eventual PM replacement procedure that avoids welding/a hot permit and reduces the storage footprint of spare liners. In lieu of grinding and subsequent tack welding of liner segments into the extraction conveyor trough, we have implemented an approach utilized in other Claro grit classification systems including the inclined grit classification & extraction conveyor @ Deseronto WWTP, ON (2016). Liners are bolted into place. Please see procedure illustrated in section 3.D.



Thank you for reviewing our submittal materials. If you have comments or questions, please feel free to contact us at any time. We look forward to helping EVB implement a model and cost-effective installation.

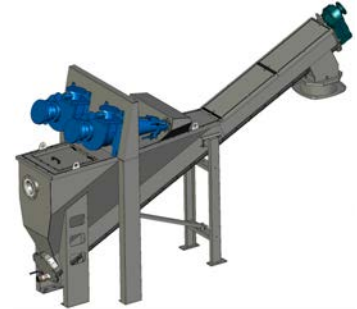
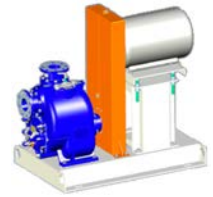
Thank you & best regards,

Peter Lipert Jr.

Peter Lipert Jr.
General Manager
Claro Administrative Office
125 Elmire, Suite 311
Montreal, QC H2T 1J9.
Cell.: 514.562.4575
pjr@claroglobal.com

www.claroglobal.com

- Claro Design Office – Downtown Montreal
- Claro Warehouse – St. Roch-de-L’Achigan, QC



2. Scope of Supply & 'Open Items' Listing / Checklist

Napanee WPCP Upgrades, ON Screening & Grit Removal System

Municipal Authority: Town of Greater Napanee, ON

RFP Number: RFP-IS-2023-01

Spec. Sections: 46 43 00 & 46 53 00

Consulting Engineer: EVB Engineering

Installation Contractor: TBD

Contractor PO Number: TBD

Claro Ref.: 20048-P-00



A. Scope of Supply

Napanee WPCP Upgrades Fine Screening System, Grit Removal System & Controls

Fine Screening System

Item 1: Two (2) Claro Fine Step Screens — Model 2100-1400-2mm

- Tag No./Label (Preliminary): SCR-1 & SCR-2
- Quantity: Two (2)
- Discharge height: 2140 mm
- Effective width: 1400 mm
- Screen frame width (without channel seals): 1540 mm
- Screen frame width (with channel seals): 1600 mm;
Neoprene side seals will seal against channel walls (30 mm to each side)
- Channel dims. (Width x Depth): 1600 mm x 1500 mm (depth as specified)
- Aperture between bars: 2 mm + screenings filter mat
- Lamella bar thickness: 3 mm
- Frame components: 5 mm
- Installation angle: 50 degrees
- Frame: AISI 316L stainless steel
- Covers material: AISI 316L stainless steel
- Bars material: AISI 316L stainless steel
- Drive shaft material: AISI 316L stainless steel
- Drive unit: SEW c/w NEMA adapter; directly-driven; Drive unit is painted according to SEW standard OS2, in RAL 6005. Model SA77 c/w NEMA adapter AMS 145 – Service Factor: 1.4.
- Electric motor: Baldor – 1.5 kW (2.0 HP), CSA 600V (575V), 3 phase, 60 Hz; Class 1, Div. I, Group D; Premium Efficiency; motor Service Factor: 1.15 but reduced to 1.0 on nameplate due to being inverter-rated. Equipped with integral, externally wired electrical brake, also Class I, Div. 1.
- Home position (proximity sensor) switch by Turck: Class I, Div. 1 compliant c/w intrinsic barrier pre-installed in Claro control panel.



- Patented stainless steel bottom step moving deflector arrangement, no plastic end shoe bar spacers required at the bottom of the screen. Bottom of screen resistant to grit deposition. No bearings or chains exposed to grit deposition or screenings debris. Bottom of screen does not enable by-pass since the design does not require a bottom sealing brush or rubber seal.
 - All AISI 316L stainless steel linkage drive system (no chains, sprockets, belts or tensioners; linkage drive system is on the clean side of the screen & elevated relative to the bottom of the channel).
 - All AISI 316L stainless steel discharge without plastic end bar spacers and without screenings cutter, scrapers, or rotating brushes – screenings discharge with no wrapping of wet wipes or plugging. Screen uses a single motor & drive.
 - Easy/quick pivot of out of channel with linkage system; no disassembly of screen, inlet chute or movement of downstream equipment required. Screen pivots out of channel to workbench level. Supports are ergonomically arranged to have a footprint that does not obstruct access to the machine.
 - Lifting lugs for pivoting of screen out of channel; also, additional lifting lugs inside motor compartment for four-point lifting of screen into channel during installation.
 - Standard odour control connection in AISI 316L stainless steel (100 mm dia.) on screen for direct negative venting of channel & screening equipment in the present phase or in the future. Stainless steel or rubber cap provided for each fine screen if not utilized.
 - Screen total weight: 2 mm approx. 2240 kg. empty including Class I, Div. 1 motor. Approx. 2540 when full of screenings.
 - Fasteners: AISI 316.
 - Anchoring / Embedment: no elements of the proposed fine screens require embedment in concrete.
 - Anchors: 316; supplied & installed by installer as specified. Total of six (6) for each fine screen (three [3] per support). Base plates provided with 25 mm holes for 7/8" dia. or 3/4 dia. anchors.
 - Fine step screen built under ISO 9001:2015 & ISO 14001:2015 certification.
 - Capacities: Model 2100-1400-2 mm.
- Peak Flow: 490 L/sec (1764 m³/h; 42,336 m³/d) each screen @ 35% screen blockage. Please see hydraulic levels & capacities table in section 2.B 'Capacities & Hydraulic Levels Table' below for complete design data portrait at peak flow & average daily flow.

Item 2: Two (2) Claro Wash Presses — Model TP200-1400

- Tag No./Label (Preliminary): WP-1 & WP-2
- Quantity: Two (2)
- Press diameter: Ø 200 mm
- Inlet: L x W x H: 1400 mm x 280 mm x 330 mm. Inlet chute matches fine screen discharge dimensions.
- Discharge tube connection flange: DN200, PN10.



- Material of construction: AISI 316L, shafted spiral screw in special high-tensile abrasion-resistant Swedish micro alloy; last flight double thickness for increased strength. Last flight is equipped with a Hardox plate (10 mm thick; 400 Brinell Hardness), a more resilient approach than hard-facing (i.e. spot welds). Resilient bolt-on Nylon brush with stainless steel retainer provided/pre-installed. Anti-rotation slide wear bars in Hardox – 400 Brinell Hardness (significantly superior to carbon steel or stainless steel).
- Drive unit: SEW helical bevel for reduced footprint c/w NEMA adapter); directly-driven. Drive unit painted according to SEW standard OS2, in RAL 6005; Model SEW KAF77 c/w NEMA AMS 145 adapter – Service Factor 1.49.
- Electric motor, Baldor – 1.5 kW (2 HP), CSA 600V (575V), 3 Phase, 60 Hz; Class 1, Div. I, Group D; Service Factor: 1.15. Premium Efficiency. Helical bevel arrangement for reduced footprint.
- Water connections, 2 x ½” dia.; including two (2) x Class 1, Div. I, AISI 304 stainless full port solenoid valves (ASCO RedHat II) & two (2) x full port ½” dia. ball valves in 316 stainless steel; one (1) x 65 mm dia. AISI 316 stainless steel pressure gauge & ¼” dia. AISI 316 isolating ball valve; additional ½” dia. stainless steel Y-strainer & ½” dia. 316 ball valve provided if service water is not potable (e.g. well water or final effluent (FE)). Please see section 2.C ‘Open Items’, item 3 for confirmation of service water type & strainer implementation.
- Service water requirements: approx. 0.67 L/s (40 L/min) @ 50 – 80 psig dynamic; operation of service water is intermittent and only when there is sufficient screenings material accumulated within the wash press inlet to justify a treatment cycle, mechanical movement and electrical / wash water resource use.
- Capacity for optimal washing, compaction, & dewatering: input of wet screenings: 1 m³/h; intermittent operation. Significantly higher capacity if screen and wash press automatically switch to continuous run (e.g. although rare, a temporary continuous run is possible, for instance, in response to a collection system voiding event where spring rains & snow melt flash-flush high volumes of sedimented material after low winter flows).
- Reject water outlet, Ø 3” (76 mm O.D.); 3” dia. Fernco rubber sleeve c/w 2 stainless steel gear clamps & 3” dia. PVC piping to channel downstream of screen by installing contractor.
- Wash press total weight: 320 kg. with Class I. Div. 1 motor; not including discharge tube. Wash press body approx. 440 kg. when full of screenings.
- Fasteners: AISI 316.
- Anchors: 316; supplied & installed by installer as specified. Total of four (4) for each wash press.
- Wash press built under ISO 9001:2015 & ISO 14001:2015 certification.

Item 3: Two (2) Inlet Chutes & Covers; Provided In-between Each Fine Screen Discharge & Wash Press Inlet

- Material: screen cover AISI 316L & wash press inlet chute AISI 316L, thickness 1.5 mm; including stainless nuts and bolts with a gasket between the inlet chute and press inlet; inlet chute includes cover with handle and view ports designed to protect operators from moving parts hazard.

Item 4: Two (2) Claro Outloading Discharge Tube Systems for Wash Press including Hygienic Bagger – Model 200

- Quantity: Two (2); one discharge tube shorter & the opposite discharge tube marginally longer for discharge to same side of the influent works as shown on the Claro layout drawings included in section 4.A. Two (2) discharge arrangement options are provided for review.
- Ø200mm to 250mm (& to 300 mm dia. as required depending on discharge configuration option) flared discharge tubes for compaction, dewatering, & delivery of screenings into hygienic bagger and to separate 2 cy screenings bins (GFL standard; dimensions: 71.5" L x 36" W x 36" T + 6" dia. casters; 1816 mm L x 915 mm W x 915 mm T + 150 mm dia. casters; plus two (2) side lifting pockets of approx. 6" / 150 mm on each side of the bin for a total length of 77.5" / 1966 mm as shown in layout drawings provided in section 4.A) adjacent to screening systems (screenings bin[s] by others); total capacity 4 cy. Please see section 2.C 'Open Items', item 4 for discussion of bin suggestion.
- Material AISI 316L incl. bolts, gaskets & supports. Supports enable the removal of first discharge tube elbow while balance of tube assembly is held in place. Flanges in AISI 316L stainless steel.
- Anchors: 316; supplied & installed by installer as specified. Total of four (4) for wash press discharge tube supports (option B arrangement). Base plates provided with 25 mm holes for 7/8" dia. or 3/4" dia. anchors.
- Hygienic bagging system material of construction: AISI 316L & ABS plastic bag holder assembly, stainless steel retaining ring and aluminum crib nut. One (1) bagging system for each wash press (total of 2).
- Bagging system provided with a hygienic bags starter kit: three (3) x 90 m-long, 3-ply hygienic bags for wastewater applications for each wash press (total of six [6] hygienic bag magazines).



2 Yard Box

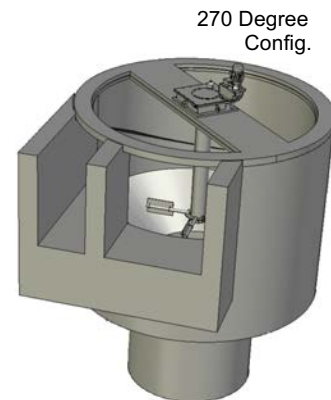


- Continued following page →

Grit Removal System

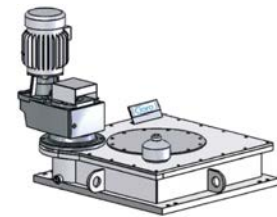
Item 5: One (1) VortiClar™ Vortex Unit — Model FV4000-43 (270-Degree Config.)

- Tag No./Label (Preliminary): VTX-1
- Quantity: One (1).
- Capacity for optimal removal: up to 45,300 m³/day. Napanee facility peak flow of 42,336 m³/day. Thus, the proposed vortex unit will provide for additional retention time & augmented separation efficiency. The 2mm fine step screens will also further help to ensure a clean and dry grit material product – in conjunction with its screenings filter mat, the 2mm aperture filter media will remove fine contaminants, reduce grease content and capture a significant fraction of the entrained grit.



- 5a) Forced Vortex Components – Concrete Tank Config.:

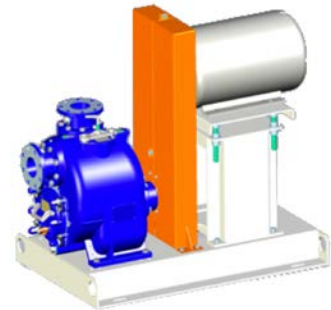
- Vortex paddle system config: Baldor motor – 2.2 kW (3 HP), CSA 600V (575V), 3 Phase, 60 Hz; Class I, Div. 1, Group D mounted on planetary gear drive unit with hardened gears (service factor of >20; casing 1” thick top & bottom structural plates) that drives the vortex paddle system & supports the grit extraction piping assembly. Planetary gear drive, paddle system & grit extraction piping assembly is bolted on a concrete bridge that forms an integrated part of the concrete tank (concrete tank & bridge by others). Top of tank also includes half-moon cut-out(s) for installation of chosen grating or checker plate for tank access/inspection (chosen grating or checker plate by others in order to maintain consistency with other channel coverings).
- One (1) paddle mixer drive tube assembly including 4 adjustable bolt-on paddles; AISI 316L.
- One (1) grit extraction piping (4” dia.) & water fluidization piping 1.5” dia. assembly; AISI 316/316L stainless steel configured for self-priming grit pump layout. Flanged for modular, ease of assembly without conflict with influent works ceiling height clearance. AISI 316 hardware & gaskets provided.
- Drive unit painted according to SEW/Nord std.; vortex planetary gear drive painted with Primer: Tnemec, Omnithane Series 1, Modified Aromatic Polyurethane, Grayish-Green Finish Coat: Tnemec, Endurashield II 1074, Aliphatic Acrylic Polyurethane, ANSI 70 Light Gray.
- One (1) 1.5” dia. solenoid valve (ASCO RedHat II) for water scour in AISI 304 stainless steel, Class I, Div. 1. & one (1) corresponding 1/5” dia. isolation ball valve in AISI 316 stainless steel.
- Special Claro teardrop deflector plate for bolting to inside of concrete grit tank at tank inlet as shown in submittal & installation instruction drawings (installation drawings provided to installer); AISI 316L.
- Weight of planetary gear drive & paddle system:



- Continued following page →

- 5b) Two (2) x Gorman-Rupp Grit Pumps – Model T4A71S-B/F 4”x4” (ADI Wetted)

- Equipment Tag Numbers/Labels (Preliminary): GP-01 & GP-02 (100% redundancy for single forced vortex unit).
- Two (2) Gorman-Rupp Super-T pump skidded assemblies. Pump Model T4A71S-B/F, 4”x4” inch flanged, pump of wetted Austempered Ductile Iron (ADI) construction; self-priming arrangement.
- Capacity: 250 USGPM to match hydrocyclone; TDH: approx. 10.668 m (35 ft) including 7 psig head loss across the hydrocyclone; Motor 7.5 HP (note: HP to be re-confirmed after piping & broader layout are finalized; please see preliminary piping head loss calculation in section 3.G, item ii); belt-driven, (600V) 575 V / 3 Ph / 60 Hz. Class I, Div. 1., Group D; CSA.;
- Size Inlet/Outlet: 4” x 4”; flanged.
- Maximum Operating Pressure 86 psi (593 kPa).
- Semi-Open Type, Two Vane Impeller: G-R Hard Iron upgraded (ASTM 897 ADI Grade 200) from standard grey iron.
- Handles 3” (72,6 mm) Diameter Spherical Solids; 4” Dia. Inlet/Outlet.
- Impeller Shaft: Stainless Steel.
- Shaft Sleeve: Alloy Steel 4130.
- Replaceable Wear Plate: Hardened Alloy Steel AR400 (ADI).
- Removable Adjustable Cover Plate: Gray Iron 30; 35 lbs. (16 kg).
- Flap Valve: Neoprene w/Nylon & Steel Reinforcing.
- Seal Plate: Hardened Alloy Steel (ADI).
- Bearing Housing: Gray Iron 30; Pump casing in Gray Iron.
- Radial/Thrust Bearings: Open Single Row Ball.
- Bearing and Seal Cavity Lubrication: SAE 30 Non-Detergent Oil.
- Flanges: Gray Iron 30.
- Gaskets: Buna-N, Compressed Synthetic Fibres, Veg. Fibre, PTFE, Cork & Rubber.
- O-Rings: Buna-N.
- Hardware: Standard Plated Steel.
- Brass Pressure Relief Valve.
- Bearing and Seal Cavity Oil Level Sight Gauges.
- Seals: Cartridge Type, Mechanical, Silicon Carbide; Stainless Steel 316 Stationary Seat. Fluorocarbon Elastomers (DuPont Viton). Stainless Steel 18-8 Cage and Spring.



G-R 4x4 Pump Skid



Also Including:

- Two (2) 4” Check-valves; Apollo (Tag: CV-1 & CV-2); one (1) installed on each pump discharge.
- Two (2) Gorman-Rupp Air-Release valves (Tag: ARV-1 & ARV-2) for self-priming applications. 1” dia. flexible hose drain directed back to vortex tank. Hose for each grit pump can be run

Check Valve



G-R Air-Release Valve



along & attached to grit extraction piping for minimal footprint and a neat appearance.

- Two (2) Gorman-Rupp pressure-gauge kit assemblies (Tag: PI-1 & PI-2); 4-½” gauge set, glycerine filled inlet and discharge gauge kit including mounting plate assembly & flexible tubing; provided loose for installation on each pump skid [shipped loose to protect against shipping damage]).



- The grit pump equipment is fabricated under ISO 9001:2015 & 14001:2015 certification.

Item 6: One (1) Claro Shaftless Spiral Grit Classifier – Model CL-320H(2)

- Tag No./Label (Preliminary): GC-01
- Quantity: One (1); equipped with two (2) hydrocyclones (100% redundancy) & independent hydrocyclone stand. Sizing upgraded at no additional cost.
- Pump Capacity/Peak: 250 USGPM. Coordinated with hydrocyclones (Item 7 below). Hydrocyclones reduce grit slurry flow by 95% - 97% (5% - 3% concentrated grit slurry enters into sedimentation tank with balance exiting via hydrocyclone over flow); please see hydrocyclone piping requirements in section 4.L).
- Grit slurry extraction capacity: 1.2 m3/hr intermittent operation
- Volume Sedimentation Tank: approx. 560 L, AISI 316L c/w:
 - Bolt-on covers including hinged inspection lid at outlet weir
- Necessary supports, bolts & gaskets, for tank & conveyor.
- Material: AISI 316 – tank (3 mm thk.), trough, lids (2 mm thk.), & supports (3 mm thk. including structural bends).
- Total Length Trough excl. drive unit: approx. 4270 mm; please see equipment arrangement & layout submittal drawings included in section 4.A.
- Inclination Conveyor: 25°.
- Width Tank: approx. 715 mm.
- Conveyor Height Approx.: 2400 mm (excl. drive unit).
- Sediment Outlet Chute: 320 mm x 320 mm & prepared for hygienic bagger unit.
- Fluid Inlet: Two (2) x inlets to classifier sedimentation tank are adapted to accept the hydrocyclone apex c/w Neoprene rubber seal.
- Fluid Outlet (from Classifier): ANSI B16.5 – 6” (150 mm). Fluid outlet from hydrocyclone overflow also 6” dia.
- Drain 2” NPT male pipe thread; complete with AISI 316 full port 2” dia. ball valve.
- Optional vent 100 mm dia. (similar to screening system) foul air stub end connection as preferred in AISI 316 to the exhaust/evacuation piping (odor system and flexible piping by others if preferred). If direct from classifier piping implemented, odour-



- control piping to include damper and flow-control valve to ensure that hygienic bag is not drawn into classifier spiral under vacuum (damper/flow control by others).
- Trough Liner (Ease of Replacement Config.): Threaded Hardox bars (400 Brinell Hardness) installed on stainless steel trough; attached with stainless steel hardware including sealing system, for ease of eventual replacement as outlined in the provided film and sequenced overview images provided in section 3.D. No welding or grinding required. Each Hardox bar is approx. 1.2 m long max. for ease of handling during replacement. Liners preinstalled in classifier.
 - Spiral of special high-tensile, abrasion-resistant Swedish micro alloy with coupling disc: nominal 220 BH (cold rolled; non-quenched); Dia.; 280 mm; estimated service life 15 – 20+ years.
 - Drive station c/w motor mounting flange: SEW
 - Motor: SEW, 0.75 kW (1.0 HP); CSA 600V (575V), 3 Phase, 60 Hz; Class I, Div. 1, Group D.
 - Gear drive: SEW, AGMA II; final gearbox speed: approx. 6 rpm.
 - Weight: Empty: 715 kg; 2600 kg full of liquid; N.B. not including hydrocyclones & independent hydrocyclones stand weight); hydrocyclone stand weight is approx.: 110 kg; each hydrocyclone weighs: 140 kg each.
 - Hygienic bagging system material of construction: AISI 316L & ABS plastic bag holder assembly, stainless steel retaining ring and aluminum crib nut.
 - Automatic bagging system provided with a hygienic bags starter kit: three (3) x 90 m-long, 3-ply hygienic bags for wastewater applications for classifier.
 - Also including the following Instrumentation:
 - Washing Jet Assembly: classifier equipped with washing jet at waterline for additional prewashing of grit, if preferred. Wash jet includes AISI 304 ASCO RedHat II ½” dia. solenoid & AISI 316 isolation ball valve, 2.5” dia. stainless steel pressure gauge & ¼” AISI 316 isolation ball. If service water not potable, an AISI 316 Y-strainer and isolation ball valve are also included. One (1) flexible ½” dia. braid hose provided (male NPT ends & including 2 x ½” stainless steel couplings).
 - High Liquid Level Indicator (Vibronic-Type): grit classifier equipped with a vibronic fork high liquid level sensor; Endress+Hauser Liquiphant FTL51, Class I, Div. 1, Group D; CSA.
 - One (1) Zero Speed / Motion Rotation Sensor (Milltronics) including:
 - One (1) motion failure alarm controller WMA300MFA din-rail mounted transmitter located within grit system control panel that enables adjustment of setpoints from HMI (elimination of potentiometers)
 - One (1) motion sensing probe XPP-5 with 15m (49.2 ft) cable, CSA Class I, Div. 1, Group D enclosure for mounting on conveyor. Mounting bracket supplied loose (weld 4 x threaded ¼” rod to conveyor in order to bolt sensor bracket onto conveyor trough or extraction conveyor trough cover; position to be indicated by Claro); installation on site by others.
 - Grit classifier equipment fabricated under ISO 9001:2015 certification.



Item 7: Two (2) FLSmith-Krebs Hydrocyclones – Model D10LB-844-SDM c/w Instruments & Independent AISI 316 Support Stand

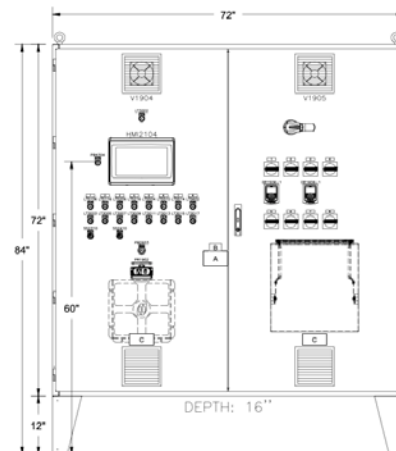
- Two (2) Krebs Model D10LB-844-SDM hydrocyclones including AISI 316 independent support stand.
- Required flow: 250 USGPM; reduction of pumped flow to classifier by 95% - 97%.
- Complete with fabricated carbon steel housings, replaceable neoprene liners for all housing sections (Neoprene liners are selected due to their resistance to degradation when in contact with oils, fats & greases), a Ni-Hard vortex finder, a 9.6 sq. in. neoprene inlet head liner and a manually adjustable 2.0” neoprene apex liner. The inlet (4”) and overflow (6”) connections are standard Victaulic grooved connections. Victaulic flange provided for cyclone inlet. Victaulic flange, elbow & coupling provided for overflow – Victaulic elbow enables overflow drainage piping to return to horizontal (counteracts 11.25 degree hydrocyclone installation angle as shown at right). Also included are quick release toggle clamps for the apex, a 0.25” pressure gauge connection on the inlet adapter, and 316 SS hardware.
- Instrumentation for each hydrocyclone: one (1) Pressure Gauge Assembly; complete with a protective diaphragm, 0 to 30 psi dial and 0.25” connection. Diaphragm to be filled with light machine oil (e.g. 10W-30); Claro will fill at start-up.
- Cyclone supply piping & liquid overflow outlet piping by others.
- Including AISI 316 stainless steel hydrocyclone stand; proposed design provides for a footprint that is independent of the classifier in order to provide unencumbered access to all elements/covers of the classifier & to enable ease of eventual liner replacement procedure.
- Hydrocyclone equipment fabricated under ISO 9001:2015 certification.



1
Controls System

Item 8: One (1) Control Panel, Local HOA Stations & Local Motor Disconnects

- General Overview: Proposed double-door panel provides for the automatic and manual control of the screening & grit removal system including intuitively designed graphic touch screen interface based on the Napanee project drawings for ease of system optimization & use. Graphic interface provides a real-time overview of the system’s operation: e.g. stage of



operational sequence (mode), all set-points, real-time values as the system approaches current timer set points, real-time influent levels & start-level setpoints, real-time motor amperage readings, solenoid on/off status, record of alarm conditions etc. The HMI also provides for a fully adjustable grit extraction schedule that enables optimization & a 'high-flow' mode that is cued to an adjustable influent flow value. This flexibility of settings & automated response enables the reduction of system runtimes & an assurance that the system will address collection system grit voiding events if/as required.

- The plug-&-play design includes all PLC, HMI, VFDs/starters, torque & amperage protection, surge protection, UPS, loss-of-phase detector, lights, selectors and other components by the specified major component manufacturers for a fully-functional system in Automatic & Manual modes. The panel is built under CSA & 9001:2015 certification. Components incorporate the specified Allen-Bradley PLC & HMI complemented by standard name brand elements including WEG VFDs & Siemens/Adalet lights and operators. For a complete portrait of the control system, please see control panel submittal drawings, enclosure heat dissipation calculation, field wiring & wire weights diagram, & annotated component catalog cuts in Section 7 & control narrative description & SCADA exchange table in Section 6.
 - NEMA 12 epoxy-painted steel enclosure (Bel Products) for installation outside of explosion-proof requirement area. Panel dimensions: 72" + 12" support base Tall x 72" Wide x 16" Deep (2134 mm Tall x 1829 mm Wide x 407 mm Deep); double door enclosure with each side of the panel dedicated to high voltage (600V) and low voltage components (120V & 24 VDC) respectively c/w with red coloured polycarbonate divider separating the 2 sides of the panel; drawings pocket 12" x 12", folding shelf, network receptacle on exterior door & interior lighting system; 15% spare interior enclosure space as specified – please see control panel submittal drawings in Section 7.
 - Allen-Bradley CompactLogix PLC model L3 – L33ER (1769) including 2 Mbyte, Dual Ethernet, 2 MB user memory, & USB port, all required I/O modules including 10% spare capacity as specified, power supply & Ethernet connectivity; communications protocol Ethernet/IP as specified;
 - One (1) Allen-Bradley PanelView Plus 7 intuitively-designed 12" colour graphic touch screen interface HMI based on project / final submittal drawings; Ethernet/IP protocol;
 - One (1) Ethernet switch 5 ports & unmanaged (Siemens); including data exchange table ('Read' & 'Write' as preferred). Jpegs/screen shots of constituent graphics and/or final interface screens provided to facility network programmer as preferred.
 - **Additional Back-up Feature:** Analog timer for timer back-up screen operation in a PLC fault scenario (back-up for worst-case scenario – keeps the facility functioning). Implemented at Sault Ste. Marie WWTP (ON) & Tillsonburg WWTP (ON).
 - Two (2) WEG CFW500 reversing VFDs for each fine screen for soft start and additional speed control as specified; 2 HP, 600V & including all accessories. Speed control setpoints via control panel HMI in addition to VFD interface display (x2) mounted on control panel door.

- VFDs report torque/amperage for monitoring / protection of each fine screen motor. VFD amperage/torque protection performs the function of an Emotron M20 torque sensor including prompting an automated reverse 'anti-jam' function;
- Eight (8) starters, full voltage & reversing for two (2) fine screens (control via reversing VFDs) & two (2) wash presses + forward-only for one (1) forced vortex paddle system & two (2) grit pumps & reversing for one (1) grit classifier (Siemens);
- Eight (8) thermal overloads (Siemens) for additional amperage protection of fine screens (x2), wash presses (x2), forced vortex paddle system (x1), grit pumps (x2) & grit classifier (x1) motors including rearmament buttons (back-up to fast-acting electronic amperage/torque detection);
- Loss-of-phase detector in order to further protect all motors (Siemens);
- Six (6) current transformers (CT; Hawkeye) for amperage monitoring / protection of wash presses (x2), forced vortex paddle system (x1), grit pumps (x2) & grit classifier (x1) motors c/w 4-20mA signal reporting to HMI;
- Feed voltage 600V/3Ph/60Hz; including step-down transformers (Hammond) located within the control panel enclosure. Also 24 VDC power supply (Siemens);
- UPS; Liebert GXT5; 1500VA; UPS integrates surge protector function;
- One (1) din-rail-mounted duplex 120V power outlet for laptop or other (Weidmueller);
- Two (2) ventilation louvres & associated filters, 8" x 8"; NEMA 12; including two (2) 105 CFM 4" dia. ventilator fans & thermostat (0 - 60°C). Enclosure size & ventilation system ensures proper temperature control without the use of refrigeration. Please see heat dissipation calculations for the fine screening & grit removal control panel in section 7.B.
- LED light kit (CFI), 305 mm long including door switch for illumination of panel interior;
- Lights, selectors & buttons – Siemens Sirius ACT, 22 mm dia. Colours as preferred:
 - Control Panel Doors:
 - One (1) 'Power On' (White);
 - Eight (8) motors 'Running' in forward or reverse (Green);
 - Eight (8) 'Fault' (Red);
 - One (1) 'Reset' push button (black);
 - One (1) 'Alarm Reset' push button (black); 1NO/1NC;
 - One (1) E-Stop (Red) – latching; and,
 - Additional real-time status / location-in-sequence indications & operational values (timers, torque, amperage, liquid levels, & instantaneous flow) represented on the HMI;
 - HOA Stations:
 - Man/Off/Auto selector (black);
 - Forward/Reverse selector (black; fine screens x2; wash presses x2; classifier x1); and,
 - E-Stop (Red) – latching;

- Main fused disconnect & associated components;
- Two (2) intrinsic relays (Turck) including enclosure with translucent polycarbonate cover; each with 2 channels (2 channels for the 2 fine screen home position sensors & 2 channels for the 2 upstream float switches).

Also including the following local stations:

- Five (5) combination local Man/Off/Auto + Forward/Reverse + E-Stop switches in Class I, Div. 1, Group D enclosures (for 2 fine screens, 2 wash presses & 1 grit classifier) including Adalet operators within Adalet cast aluminum enclosure.
- Three (3) combination local Man/Off/Auto + E-Stop switches (forward only) in Class I, Div. 1, Group D enclosures (for 1 vortex & 2 grit pumps) including Adalet operators within Adalet cast aluminum enclosure.
- Eight (8) local motor disconnects in Class I Div. 1, Gr. D cast aluminum enclosures in addition to motor disconnect switches on control panel door; including auxiliary contact status reporting to screening system control panel; Siemens internal components within Adalet cast aluminum enclosure.

Also including the following instrumentation:

- Ultrasonic Level Detection: Includes Endress + Hauser ProSonic S ultrasonic level detection upstream / downstream of the screen; two (2) FDU91 level detectors c/w 15m of sealed Class I, Div. 1, Group D cable for each fine screen (total of 4 sensors) + two (2) din-rail-mounted transmitters FMU90 installed inside control panel. All setpoints adjustment via control panel HMI. Including ABS & PVC mounting tubes prepared for sensors c/w stainless steel hardware for installation on top of selected channel covering (checker plate or grating); mounting tubes locate sensors above channel in order to enable reading of full channel height without loss of echo;
- Float Switches: Two (2) ENM-10 (Flygt) Class I, Div. 1, Group D float switches c/w 10 m of factory-sealed Class I, Div.1 cable; including stainless steel stabilization rings with threaded support extension.
- Classifier Tank Level Sensor: One (1) vibronic level sensor for classifier tank level monitoring as specified; please see E+H FTL51 description in classifier scope listing (item 6);
- One (1) zero speed / motion rotation sensor; please see Milltronics MWA300MFA & XXP-5 description in classifier scope listing (item 6);
- One (1) grit washing jet: please see description of jet assembly including solenoid, isolation ball valves, pressure gauge & flexible braided hose description in classifier scope listing (item 6);



Claro Sensor Mounting Tube

- Controls equipment fabricated under CSA & ISO 9001:2015 certification.

- Continued following page →



Supplementary Equipment

Item 9: Specified Spare Parts for Fine Screening & Grit System (Mechanical)

- Six (6) 90 m-long, 3-ply hygienic bag cartridges for screening & grit removal system hygienic bagging systems.
- One (1) Set of Classifier Liners as specified (threaded Hardox bars) & hardware / seals.

Item 10: Specified Spare Parts for Screening & Grit Removal Control Panel

- One (1) set of control panel indicator bulbs (LED)
- Two (2) sets of control panel fuses in a fuse holder or appropriate, labelled container / tool box for storage within control panel enclosure.

Services & Shipping

Item 11: Claro Technical Submittal, Installation Instructions & Commissioning Services, and O&M Manuals

- Complete technical submittal including Acad layout drawings & design calculations.
- Operation & maintenance manuals in print format & bookmarked PDF.
- Installation supervision, commissioning, and operator training instructions for fine screening & grit removal systems by experienced Claro technicians (experienced process & controls personnel) for start-up (total 9 – 11 person days; total number of trips 8 + Teams support as preferred / required). N.B. Claro will not invoice for extra days or trips if required.

Item 12: DDP Shipping, Insurance & Brokerage to Napanee WPCP, ON (Project Site) Included



B. Capacities & Hydraulic Levels Table & Calculation Data Sheets (R1)

• Capacities & Hydraulic Levels Table

Napanee, ON

Fine Screen Model 2100-1400-2mm (Channel 1600 mm Wide x 1500 mm Deep)

WWTP Peak Flow: 42,336 m³/day (1764 m³/hour; 490 L/sec) per fine screen

WWTP Average Max Day Flow: 11,500 m³/day (480 m³/hour; 134 L/sec) per fine screen

10 July 2024/PJR; R0

[Part A]: Hydraulic & Capacities Summary Table

Technical Submittal Project Data

	Flow Scenarios	Upstream (mm) @ 2.42 Interbar Co-Eff (Conservative)	Estimated In-Practice Downstream Liquid Level Ahead of Single 270-Degree Vortex (mm)	18" Parshall Flume Level (Common Flume @ Exit of Influent Works)	Head Loss (mm)	Channel Velocity (m/sec) in 1600 mm Wide Channel**	Screen Blockage (%)	Freeboard to Top of Channel (mm)	Freeboard to Max. Upstream Liquid Level (mm)	Maximum Upstream Liquid Level (H.W.L.: 79.80)	Channel Depth (mm)
2mm Peak	Scenario 1: 42,336 m ³ /day (1764 m ³ /hour; 490 L/sec) (i.e. Peak via 1 Screen)	924	632	607	292	0.48	35%	576	76	1000	1500
	Scenario 2: 21,168 m ³ /day (882 m ³ /hour; 245 L/sec) (i.e. Peak 490 L/sec divided via 2 Screens)	726	632	607	94	0.24	35%	774	274	1000	1500
2mm ADF	Scenario 4: 11,500 m ³ /day (480 m ³ /hour; 134 L/sec) (i.e. ADF via 1 Screen)	503	268	262	235	0.31	35%	997	497	1000	1500
	Scenario 5: 5,750 m ³ /day (240 m ³ /hour; 67 L/sec) (i.e. ADF via 2 Screens)	420	268	262	152	0.16	35%	1080	580	1000	1500

- **Note:** Channel velocities will be significantly higher in the fine screen approach and downstream channels since their width is 750 mm in lieu of 1600 mm (i.e. above the EPA recommended 0.3 m/sec even at average flow & 50% / 50% split flow conditions). The fine screens also enable a channel flushing function at every actuation. A precautionary channel flushing subroutine is also included as part of the Claro control panel control logic.


• One (1) Fine Screen @ Peak Flow (490 L/sec)

Napanee, ON

Hydraulic & Capacities Calculation – Fine Step Screen

Peter Lipert / Claro


10 July 2024

Project Data:			
Flow rate	Q	490	[l/sec.]
Channel width	b channel	1600	[mm]
Selected screen effective width	br	1400	[mm]
Water level behind screen	hu	632	[mm]
Flow velocity in channel	vg	0.48	[m/sec.]
Specific Screen Data:			
Bar spacing / aperture	e	2	[mm]
Bar thickness - fixed lamella	s	3	[mm]
Bar thickness - moveable lamella	s	3	[mm]
Bar geometry coefficient	β	2.42	[-]
Installation angle	α	50	[°]
Calculated Results:			
Blinding b	Delta h / head loss	Upstream head ho	
[%]	[mm]	[mm]	
0	52	684	
10	106	738	
20	164	796	
30	229	861	
35	292	924	

• **Two (2) Fine Screens @ Peak Flow (490 L/sec)**

Hydraulic & Capacities Calculation – Fine Step Screen


Napanee, ON
Peter Lipert / Claro
10 July 2024

Project Data:			
Flow rate	Q	245	[l/sec.]
Channel width	b channel	1600	[mm]
Selected screen effective width	br	1400	[mm]
Water level behind screen	hu	632	[mm]
Flow velocity in channel	vg	0.24	[m/sec.]
Specific Screen Data:			
Bar spacing / aperture	e	2	[mm]
Bar thickness - fixed lamella	s	3	[mm]
Bar thickness - moveable lamella	s	3	[mm]
Bar geometry coefficient	β	2.42	[-]
Installation angle	α	50	[°]
Calculated Results:			
Blinding b	Delta h / head loss	Upstream head ho	
[%]	[mm]	[mm]	
0	15	647	
10	30	662	
20	48	680	
35	94	726	

• **One (1) Fine Screen @ Average Flow (134 L/sec)**

Hydraulic & Capacities Calculation – Fine Step Screen


Napanee, ON
Peter Lipert / Claro
10 July 2024

Project Data:			
Flow rate	Q	134	[l/sec.]
Channel width	b channel	1600	[mm]
Selected screen effective width	br	1400	[mm]
Water level behind screen	hu	268	[mm]
Flow velocity in channel	vg	0.31	[m/sec.]
Specific Screen Data:			
Bar spacing / aperture	e	2	[mm]
Bar thickness - fixed lamella	s	3	[mm]
Bar thickness - moveable lamella	s	3	[mm]
Bar geometry coefficient	β	2.42	[-]
Installation angle	α	50	[°]
Calculated Results:			
Blinding b	Delta h / head loss	Upstream head ho	
[%]	[mm]	[mm]	
0	135	403	
10	157	425	
20	181	449	
35	235	503	

• **Two (2) Fine Screen @ Average Flow (134 L/sec)**

Hydraulic & Capacities Calculation – Fine Step Screen

Napanee, ON
 Peter Lipert / Claro
 10 July 2024

Project Data:			
Flow rate	Q	67	[l/sec.]
Channel width	b channel	1600	[mm]
Selected screen effective width	br	1400	[mm]
Water level behind screen	hu	268	[mm]
Flow velocity in channel	vg	0.16	[m/sec.]
Specific Screen Data:			
Bar spacing / aperture	e	2	[mm]
Bar thickness - fixed lamella	s	3	[mm]
Bar thickness - moveable lamella	s	3	[mm]
Bar geometry coefficient	β	2.42	[-]
Installation angle	α	50	[°]
Calculated Results:			
Blinding b	Delta h / head loss	Upstream head ho	
[%]	[mm]	[mm]	
0	119	387	
10	125	393	
20	133	401	
30	142	410	
35	152	420	

• • •

C. ‘Open Items’ to Be Discussed Listing / Checklist

The following is a list of items that may require coordination and/or discussion. These are listed here for information and/or as checklist items. Claro requests comment from the Town or the consultant (EVB) on items below when amenable to the project schedule.

1. Network Addresses / SCADA Connectivity: please provide the following preferred SCADA network addresses for the Claro control panel PLC & HMI at your earliest convenience. Ideally, Claro should have these before the control panel ships to site.

A. Control Panel PLC – Network Configuration

Ethernet Address (MAC):

IP Address:

Subnet Mask:

Gateway:

B. Control Panel HMI – Network Configuration

Ethernet Address (MAC):

IP Address:

Subnet Mask:

Gateway:

2. Flow Reporting Data Exchange / 18” Parshall:

We would appreciate receiving the instantaneous flow data produced by the 18” Parshall at the Claro control panel. The control panel data exchange table includes write addresses for this purpose. We will represent this instantaneous flow on our HMI and log data over time for operator convenience as shown at right & below →

Claro		Daily Volume						12/31/2000 10:59:39 AM			
Archive of the Last 32 Days											
Today	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	
00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³
00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³
00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³
00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³
00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³
00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³
00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³
00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³
00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³
00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³
00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³
00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³
00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³
00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³
00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³
00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³
00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³	00	September	0000000 m³

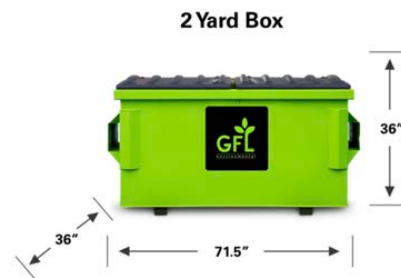
Claro		Monthly Volume				12/31/2000 10:59:39 AM	
Archive of the Last 12 Months							
This Month		000000000 m³					
0000	January	000000000 m³	0000	July	000000000 m³		
0000	February	000000000 m³	0000	August	000000000 m³		
0000	March	000000000 m³	0000	September	000000000 m³		
0000	April	000000000 m³	0000	October	000000000 m³		
0000	May	000000000 m³	0000	November	000000000 m³		
0000	June	000000000 m³	0000	December	000000000 m³		

Claro		Yearly Volume				12/31/2000 10:59:39 AM	
Archive of the Last 6 Years							
This Year		0000	0000000000 m³				
Last Year		0000	0000000000 m³				
2 years ago		0000	0000000000 m³				
3 years ago		0000	0000000000 m³				
4 years ago		0000	0000000000 m³				
5 years ago		0000	0000000000 m³				
6 years ago		0000	0000000000 m³				

3. Service Water Source: we would appreciate if EVB/Napanee staff could confirm if the service water that will be supplied to the wash presses & vortex is potable water, Final Effluent (FE) or other. If not potable and expected to carry solids, we will provide a 50 Mesh Y-strainer including associated ball valves for pre-filtration of the service water upstream of each wash press. If the service waster is expected to

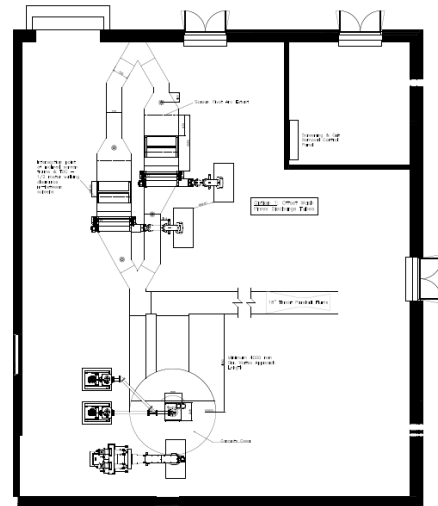
have significant solids, it is advisable to implement a self-cleaning in-line filtration system in order to reduce the frequency of Y-strainer cleaning.

4. Layout Options / GFL Standard Bin Selection: We have selected the 2 cy bins available from GFL (dimensions shown at right). These bins provide a total of 4 cy capacity at the screening system (1 bin per wash press system) & 2 cy capacity at the grit classifier. We would recommend having at least 1 or possibly 2 (depending on experience) spare available for replacement of a full bin as needed either at the screenings or grit system. Since all captured and treated material – screenings plugs and discharged grit – will be dry, not decant liquid into the bin/bag and by sequestered by the hygienic bagging system, material can be stored in a full bin until a convenient pick-up time. Note: Larger bins could be implemented if experience suggests an upgrade in capacity.



GFL standard dimensions – 2 cy bin: 71.5" L x 36" W x 36" T + 6" dia. casters; 1816 mm L x 915 mm W x 915 mm T + 150 mm dia. casters; plus two (2) side lifting pockets of approx. 6" / 150 mm on each side of the bin for a total length of 77.5" / 1966 mm.

The offset bin layout shown in the submittal drawings (Option 1) was developed to enable the movement of the bins for even/efficient material distribution & to provide for operator walking clearance between the screening systems. The offset arrangement at the screening systems relative to the envisioned location of the roll-up door provide for a direct path to the pick-up point. We would recommend Option 1 in lieu of Option 2, which incorporates a near-parallel/aligned bin arrangement.



The Option 1 arrangement would not require ceiling support of the wash press discharge tube(s). A cross-channel bracket would need to be added by Claro or Others to support the discharge end of the wash press & a short tube support over the adjacent channel. Updated drawings to follow discussion.

5. Pump Lead/Lag Duty Oscillation / Isolation Valves: The control panel can be configured to automatically alternate the lead/lag position of the grit pumps (e.g. based on operation time or days of the week). An automated oscillation, however, would likely require automated valves since, in a self-priming application, the duty pump would be more likely to draw a portion of the flow from the adjacent lag duty pump (it is not possible to run 2 separate 4" dia. grit extraction piping runs via the vortex planetary gear drive centre opening). If manual valves are implemented, the control panel could signal to Scada when the duty/lag positions are to be switched. This aspect to be discussed.



6. Wash Press Drain Piping: The Wash Press Drainage Piping: The wash press has a wash & flush water reject drain. This drain is 3 inches (76 mm O.D) in diameter for the Napanee WPCP application. This stub drain is available on either side of the wash press. Since the project incorporates a 2mm aperture screen, we recommend running the wash press pressate drain to the upstream side of the screen for additional polishing. Since the influent works building is new, perhaps it would be possible to embed the drain in a manner that allows it to be shorter and removed from the walking area.
7. Fine Screens Lifting System: A lifting system for pivoting screens out of channel is required for inspection & eventual PM. An A-frame gantry, ceiling I-beam & trolley, davit crane or other approaches are acceptable. This aspect to be discussed coordinated.



3. Mechanical & Auxiliary Equipment Catalog Cuts

Napanee WPCP Upgrades, ON Screening & Grit Removal System

Municipal Authority: Town of Greater Napanee, ON

RFP Number: RFP-IS-2023-01

Sections: 46 43 00 & 46 53 00

Consulting Engineer: EVB Engineering

Installation Contractor: TBD

Contractor PO Number: TBD

Claro Ref.: 20048-P-00



A. Fine Step Screen – Brochure

Claro™

Screening & Grit Removal

Fine Step Screens

Claro is pleased to offer the X-Screen—a high quality fine step screen that delivers exceptional screening capabilities, long-term reliability, and an ultra-hygienic & odor-free working environment. Removes hair & fine grit to protect downstream equipment & processes without the possibility of screenings carry-over.

A preferred separation technology in water & wastewater screening applications, the step screen's superior design is backed by over 25 years of practical design & installation experience. Hundreds of installations.

Design features & advantages

- Water & wastewater screening, septage receiving stations, & raw sludge screening applications
- Protects pumps, digester tanks, & other equipment from hair & other debris build-up
- Bar space opening / aperture: 0.5 to 6 mm (0.039" to 1/4"); discharge height up to 5 meters (16.5 ft.)
- 6 mm (1/4") screen achieves separation equivalent to a 1 mm aperture screen with use of accumulated screenings filter mat on bar screen
- Low headloss / high flow-through capacities / no possibility of screenings downstream carry-over
- Proven anti-overflow control even with large debris influx (e.g. spring leaves etc.)
- Self-cleaning, low-friction, anti-distortion design bar screen (no wearable brushes & no scrapers)
- Fully-enclosed, odor-controlled, ultra-hygienic operation
- Durable, self-lubricating linkage system with no maintenance-prone chain drives, sprockets, or belts
- Modular, bolted, all-stainless-steel construction
- Unique step design ensures effective screenings transfer
- Screen pivots out of channel in minutes for inspection—without moving receiving wash press compactor or conveyor
- New patented bottom deflector-plate ensures constant screening aperture throughout the whole operating cycle & eliminates plastic end-shoes / spacers
- For installation in channel or in dedicated stainless steel tank
- Very low equipment height profile—ideal for constricted headroom applications
- Equipment life especially long due to low wear-&-tear control approach—screen only operates mechanically when necessary (not continuously)
- Increase capacity of existing channels with screen-in-tank unit adjacent to existing installation without modification of channel
- Municipal wastewater & water headworks, industrial wastewater, pulp & paper, pharmaceutical, food processing, mining, & many more industrial applications including reject material recovery
- Complete systems for sole-supplier responsibility



Fine Step Screen (0.5 to 6 mm Bar Spacing)



Fine Step Screen, Wash Press, & Hygienic Bagger (Assomption WWTP, QC)



Fine Step Screen and Wash Press (Repentigny WWTP, QC)



Fine Step Screen and Shaftless Screenings Transfer Conveyor

B. Screenings Wash Press – Brochure



Screening & Grit Removal

Wash Press Screw Compactor

Claro is pleased to offer a high-quality wash press screw compactor for the effective washing, dewatering, compaction, & transport of screenings. Screenings are well-cleaned of organics, dry, diminished in disposal volume, & deposited into an optional hygienic bagger that automatically unfolds into receiving bin. Robust & versatile construction. Fully-enclosed & odor-controlled.

Standard capacity sizes & configurations are available to meet a broad range of application scenarios. Hundreds of installations. Screw press compactor also available without washing feature.

Design features & advantages

- Effective washing with a very compact footprint
- Integrated heavy-duty thrust bearings & a high-torque drive unit to assure optimal dryness & compaction of screenings material
- Slow transportation of screenings for gentle, thorough washing without maceration
- Completely enclosed, odor-controlled hygienic operation
- Robust screw press compactor unit including double-body construction
- Tight tolerances between screw & trough delivers superior process performance
- Only one moving part: a special alloy steel spiral
- Easy access for inspection / maintenance of wash & press zone: unit easily dismantles at both front & back end
- No maintenance-prone wedgewire & no wearable brushes to replace
- Long compaction tubes up to 6 m. (20 ft.) in length for transport of screenings – can eliminate conveyor
- Optional hygienic bagger
- Complete systems for sole-supplier responsibility



Wash Press Screw Compactor



Wash Press Screw Compactor
(Assomption WWTP, QC)

C. Vortex Grit Removal Unit – Brochure

Claro

Screening & Grit Removal

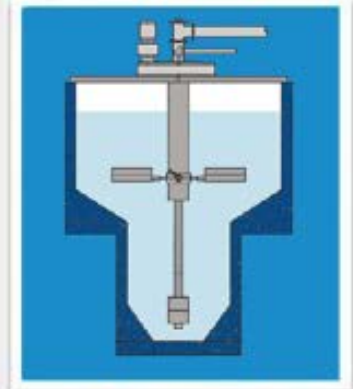
VortiClar™ Forced Vortex Grit Chamber / Sand Trap

Claro VortiClar™ forced vortex grit removal systems deliver high grit removal efficiencies across a wide range of daily flow capacities. An engineered hydraulic design removes fine grit & other debris particles, separates organic from inorganic material, & reduces grit accumulation in downstream basins, channels, weirs, & piping. The extraction of grit also significantly reduces wear on mechanical equipment.

The unit is composed of a centrifugal flow chamber; weir baffles; an energy-efficient axial flow impeller with a single, dual speed, or VFD motor; a quiescent sediment collection chamber & a choice of grit extraction approaches: airlift, high quality grit pump, or a patented grit extraction system that eliminates the need for a grit classifier or grit washer. Ideal for small footprint requirements.

Design features & advantages

- Efficient organics/inorganics separation & fine grit capture
- Exceptionally small foot print & variety of configurations available:
 - elevated, stand-alone config.: stainless steel tank with all components of unit accessible from support platform c/w optional operator-safe walkways
 - low-profile config.: all components of unit accessible & concrete-embedded vortex
- Low maintenance, low operating cost, low energy consumption
- Fully automated & fully-enclosed hygienic operation
- Optional variable frequency drive (VFD) on vortex for performance optimization
- Small & large capacities
- Indoor & outdoor installation
- No submerged bearings
- Optional vortex air and/or water grit scouring system
- For cost-effective retrofits/conversion of aerated grit tanks please see Claro Aerated Grit Tank Extraction Spiral Systems



VortiClar™ Forced Vortex Grit Chamber with airlift arrangement (other grit extraction approaches available)



VortiClar™ Forced Vortex Grit Chamber gear drive and airlift arrangement

D. Grit Classifier – Brochure



Screening & Grit Removal

Shaftless Spiral Grit Classifiers, In-Line Grit Screws, & Cyclones

Claro grit classifiers effectively separate, settle, & wash grit contained in wastewater flows. The trapezoidal sedimentation tank, internal baffle arrangement, & low RPM of the shaftless spiral minimizes turbulence for optimal fine particle sedimentation & extraction. Odor-control is achieved by scrubbing the grit of organics and by the installation of a totally enclosed hygienic bagger. The unit is totally enclosed. The overflow weir, where treated liquid is returned to the plant, is also conveniently positioned outside of the sedimentation tank & equipped with a hinged inspection cover—no need to open the settling tank cover for inspection.

Mounted above the fluid & submerged spiral, the drive unit has very low power requirements. Also, no maintenance-prone bearings or seals under water. Low spiral RPM, special alloy shaftless spiral (Brinell 220 min.), & low friction trough liners deliver extended, maintenance-free operation. Special liners & quick-release clips make liner replacement a snap and eliminate expensive & difficult-to-change hardox bars.

Hydrocyclones: Integrated single & double hydrocyclones in a broad range of sizes & configurations are available for higher flows. Hydrocyclone units range from 3- 24 inches (80 -600 mm) in diameter and are supplied in a variety of housings, liners, & component materials to suit application requirements.

In-Line Grit Screws: In-line grit & scum extraction conveyor systems that share many of the advantages of Claro's classifier design also available.

Design features & advantages

- high performance design for better protection of downstream equipment from grit abrasion & sedimentation
- Broad range of flow capacities
- Heavy duty construction in stainless steel, special steel, or acid-resistant steel.
- No bearings or seals under water
- Low installation & maintenance costs
- Special low-friction grit collection trough liners with quick-release hold-down clips
- Totally enclosed design, organics scrubbing, & hygienic bagger for effective odor control
- Easily-accessible weir c/w inspection cover
- More effective sedimentation & less maintenance than shafted screw units
- Complete systems for sole-supplier responsibility



Shaftless Spiral Grit Classifier (front view)



Shaftless Spiral Grit Classifier (discharge view with hygienic bagger)

• Classifier liners PM Hardox Liners Replacement Procedure (Interval: approx. 15 years)

1. Classifier drained of liquid and awaiting disassembly. Drainage piping flange is unbolted to enable a free pivot of the classifier to the floor slab.
2. Classifier discharge-end supports removed, hygienic bagger (not shown) removed & the classifier rotated to the floor slab via lifting lugs at the discharge end support brackets (lugs not shown). Classifier grit extraction conveyor is braced/supported temporarily on 4x4 wood blocks. Stability is assured by the wide-stance and welded inlet-end classifier tank supports.
3. Classifier covers removed. Grit extraction conveyor end plate with drain ball valve can also be removed – the spiral could be pulled horizontally out via this opening in addition to the option shown: spiral lifted out with the aid of a 6”x6” wood beam or other spread-bar-like approach & A-frame gantry.
4. Classifier drive plate unbolted from trough flange & drive shaft coupling disc unbolted from spiral coupling plate. In this rendering, the spiral is lifted up/out of the trough with an A-frame gantry and the spiral attached to a 6”x6” wood beam or other spread-bar-like approach. Each 3rd spiral flight to be strapped to the supporting beam in order to ensure against distorting/bending the spiral.
5. Classifier inlet-end baseplate anchor bolts slots will enable the classifier to pivot to the floor without moving the unit off of its anchors (no lifting required). A simple sealing system that has been successfully employed in other applications is implemented at each Hardox bar mounting bolt on the outside surface of the inclined grit extraction conveyor.

E. Hygienic Bagger Unit – Brochure



Screening & Grit Removal

Hygienic Bagger System

Claro provides hygienic baggers that isolate screenings or other reject materials in a continuous, tubular plastic bag that automatically unfolds into a standard receiving bin. Favored by facility operators, the bagging unit prevents contact with reject materials & promotes a hygienic, odor-controlled working environment.

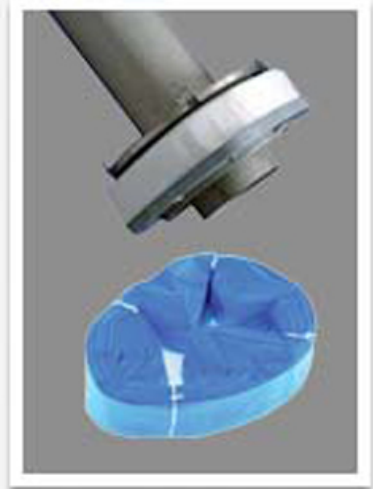
Composed of a stainless steel & resilient ABS plastic dispenser and a 3-ply 80 m. (263 ft.) bag magazine cartridge, hygienic baggers are mounted at the end of wash press compactor, grit classifier, conveyor, & other discharge tubes and chutes. When the bin is filled, the bag ties off at both ends with a tie-wrap similar to a sausage—closing the filled bag & providing the new bag section with a closed bottom.

Design features & advantages

- Used for screenings, grit, & other reject materials
- Isolates operators & work environment from reject material & odors
- Bag magazines 90 m.
- Automatic operation—bag unfolds/unwinds into bin under weight of bagged material
- Standard & custom dimensions available
- Mounted on wash press compactor, grit classifier, conveyor, & other discharge points
- Bag easily ties off at both ends when bin is filled & ready for disposal



Hygienic Bagger with 80 m. / 263 ft. Long Bag Magazine



Hygienic Bagger Dispenser and Bag Magazine

F. Hydrocyclone (FLSmidth / Krebs) – Catalog Cuts

One Source

Krebs® gMAX® Hydrocyclones



Krebs® gMAX® Hydrocyclone
Finer particle separation with
patented technology.

FLSMIDTH
KREBS

Krebs® gMAX® hydrocyclones

gMAX performance

- Finer, sharper particle separations at high capacities
- Fewer cyclones needed for optimal performance
- Easy maintenance
- Works with existing installations

gMAX applications

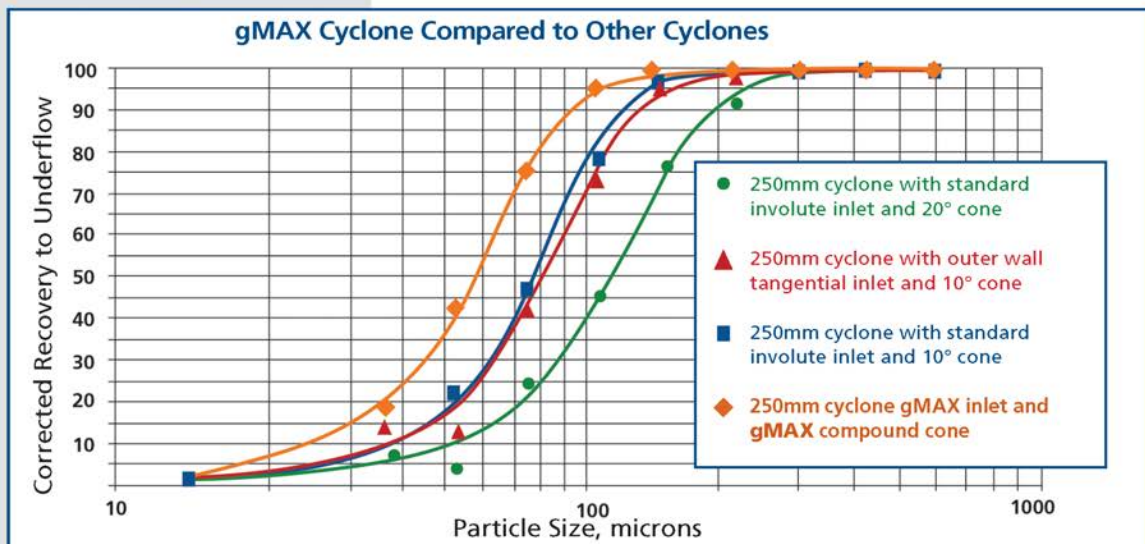
- Minerals processing
- Oil Sands
- Water Treatment
- Chemicals
- Pulp & Paper
- Automotive
- Oil Refining



FLSmidth Krebs leads the separation technology for mining and industrial applications since 1952.

Optimum cyclone performance relies on minimizing turbulence while maximizing tangential velocity. The gMAX® cyclone focuses on these two important factors, significantly

advancing cyclone performance. To achieve these two design criteria, the gMAX incorporates performance-enhancing improvements to the inlet head, cylinder section, cones, and apex.



Innovative hydrocyclone design

gMAX inlet head

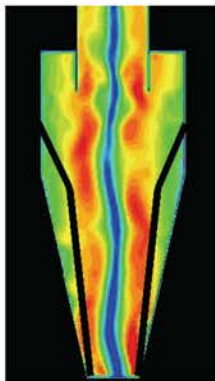
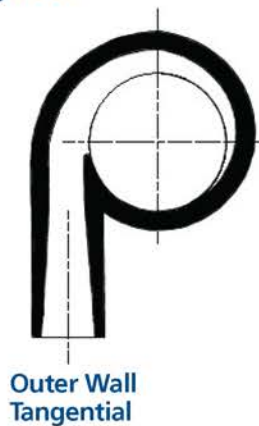
- Contoured ramped inlet pre-classifies feed and reduces turbulence
- Reduced turbulence minimizes coarse solids bypass to overflow
- Less turbulence reduces wear

Inlet head design

The innovative gMAX® inlet has replaced the former Krebs involute feed inlet design improving upon what had been the state-of-the-art design for over 30 years. A commitment to continuous improvement like this is why FLSmidth Krebs is the world leader in cyclones, and why we continue to push the limits of separation technology.

The outer wall involute design entrance pre-classifies the feed solids prior to entering the main body of the cyclone. The inlet head of the gMAX also includes an improved vortex finder and top cover plate liner design.

These improvements result in less misplaced material to the overflow and dramatically increased wear life. This longer wear life combined with premium ceramics in the lower parts of the cyclone, will greatly increase intervals between complete cyclone rebuilds.



Cone design

Through the use of CFD analysis, FLSmidth Krebs has designed the gMAX® cyclone with sharper upper cones followed by longer angled lower cones.

This combination maximizes tangential velocity in the upper part of the cyclone. It also provides a long residence time in the critical separation zones in the lower part of the cyclone. This results in a substantially finer separation with fewer fines in the underflow and less coarse bypass to overflow.

One Source

Krebs® gMAX® Hydrocyclones

www.flsmidthkrebs.com

04-204 Rev. 10/19/2016 ljr-us

Optional Liner Materials Available

- BPC rubber
- Neoprene
- Nitrile
- Chlorobutyl
- Alumina
- Nitride bonded silicon carbide ceramic
- Reaction bonded silicon carbide ceramic
- Sintered alpha silicon carbide ceramic

Fabricated/Cast/Molded Unlined Cyclone Materials

- 304L/316L SS
- Duplex 2205
- CD4MCU
- Monel
- Inconel
- Nickel
- Hastelloy
- Other metal alloys
- Polyurethane*

* see bulletin #9-201 molded polyurethane cyclones



PAINT WEAR TESTS: gMAX vs. Outer Wall Tangential

To validate the reduced turbulence and wear characteristics predicted using computational fluid dynamics (CFD) on the gMAX inlet head design, layers of paint in different colors were applied to the gMAX inlet head liner (left insert) and to a competitor's outer wall tangential inlet head liner (right insert). The components were assembled onto cyclones and slurry was pumped through them in FLSmidth Krebs' cyclone laboratory. The resulting wear patterns show a dramatic reduction and wear as a result of the improved gMAX geometry.

World-class Service & Hydrocyclone Test Facilities

FLSmidth Krebs has provided superior classification and separation solutions using hydrocyclone technology since 1952. Our unparalleled technical staff of experienced engineers will quickly and thoroughly evaluate your potential applications and provide detailed recommendations and performance estimates. In the event you have an application that requires testing for validation, our hydrocyclone test lab is equipped and staffed to provide prompt testing at low cost. Arrangements can be also be made to run test cyclones at your site.



For more information on any of our products please contact one of our **Regional Sales Offices** below.

Tucson, Arizona USA
Tel: +1 520 744 8200
E-mail: krebs@flsmidth.com

Neusiedl am See, Austria
Tel: +43 2167 3345
krebseurope@flsmidth.com

Beijing P.R. China
Tel: +86-10 8468 9100
krebschina@flsmidth.com

Johannesburg, South Africa
Tel: +27 (0)10 210 4750
krebsafrica@flsmidth.com

Queensland, Australia
Tel: +61 7 5519 5700
krebsaustralia@flsmidth.com

Sao Paulo, Brasil
Tel: +55-15-3416-7400
krebsbrasil@flsmidth.com

Chennai, India
Tel: +91 44 4748 1000
krebsindia@flsmidth.com

www.flsmidthkrebs.com

Western Australia
Tel: +61 8 6258 4800
krebsaustralia@flsmidth.com

Santiago, Chile
Tel: +56 2 2463 8350
krebschile@flsmidth.com

Manila, Philippines
Tel: +63-2-687-9251
Krebs-Philippines@flsmidth.com

Copyright © 2016 FLSmidth AIS. ALL RIGHTS RESERVED. FLSmidth is a (registered) trademark of FLSmidth AIS. This brochure makes no offers, representations or warranties (express or implied), and information and data contained in this brochure are for general reference only and may change at any time.

FLSMIDTH
KREBS



KREBS® HYDROCYCLONES FOR SEWAGE / WASTE WATER TREATMENT

Excelling in separation solutions since 1952

INDUSTRIAL SEPARATION INSERT # WWT

FLSmidth Krebs Sewage Degritting Cyclones, are simple, yet highly effective equipment for removing grit, sand and other inorganic solids from primary clarifier and grit chamber underflow streams in sewage treatment plants.

FLSmidth Krebs cyclones form the foundation of any sound separation process and deliver proven, durable and reliable operation for maximum solids recovery and protection of downstream operations at minimal cost. Think FLSmidth Krebs when you are looking for ways to optimize your plant's performance.

Cost Effective Protection:

Solid debris such as sand, rocks, glass, pencils, bottle caps, and other debris found in the sewage plant feed cause abrasive wear on process equipment and can damage and adversely affect the operation of the digester. Deposited inorganic material causes loss of digester capacity and will eventually result in a complete plant shutdown for cleaning and renovation.

High Performance, Small Footprint, and Minimal Cost:

FLSmidth Krebs cyclones are designed for superior separation and worry-free operation to remove solids from raw sewage and are less expensive than gravity based sedimentation systems. Our Sewage Degritting cyclones are designed to remove 98% or more of the grit entering the feed inlet that is larger than 150 mesh (105 µm). This performance advantage also comes with low footprint requirements. The cost savings are amplified when accounting for total installed costs versus gravity systems.



Krebs® Sewage Degritting Cyclone

KREBS® CYCLONES DELIVER

- Low cost with fabricated carbon steel housings
- High performance efficiency with an involuted feed entry
- High capacity in small footprint
- Effective protection of downstream equipment
- Easily replaced neoprene liners with other liner materials available on request
- Improved maintenance with a hinged apex housing to allow access for clean-out without disconnecting any piping
- Long life with a Nihard vortex finder and abrasion resistant liners
- Flexibility with manually adjustable or fixed apex assembly

FLSmidth Krebs Service

Award winning customer service sets FLSmidth Krebs apart from our competition. From our technical staff to maximize your system process performance to mechanical support to keep your process running smoothly. Krebs works hard to help our clients in municipal and waste water treatment facilities. For over six decades FLSmidth Krebs has been the leader in hydrocyclone solutions. Our engineering support is recognized throughout the process industry for exceptional technical competence and responsive customer service.

Visit us on the web: www.flsmidthkrebs.com

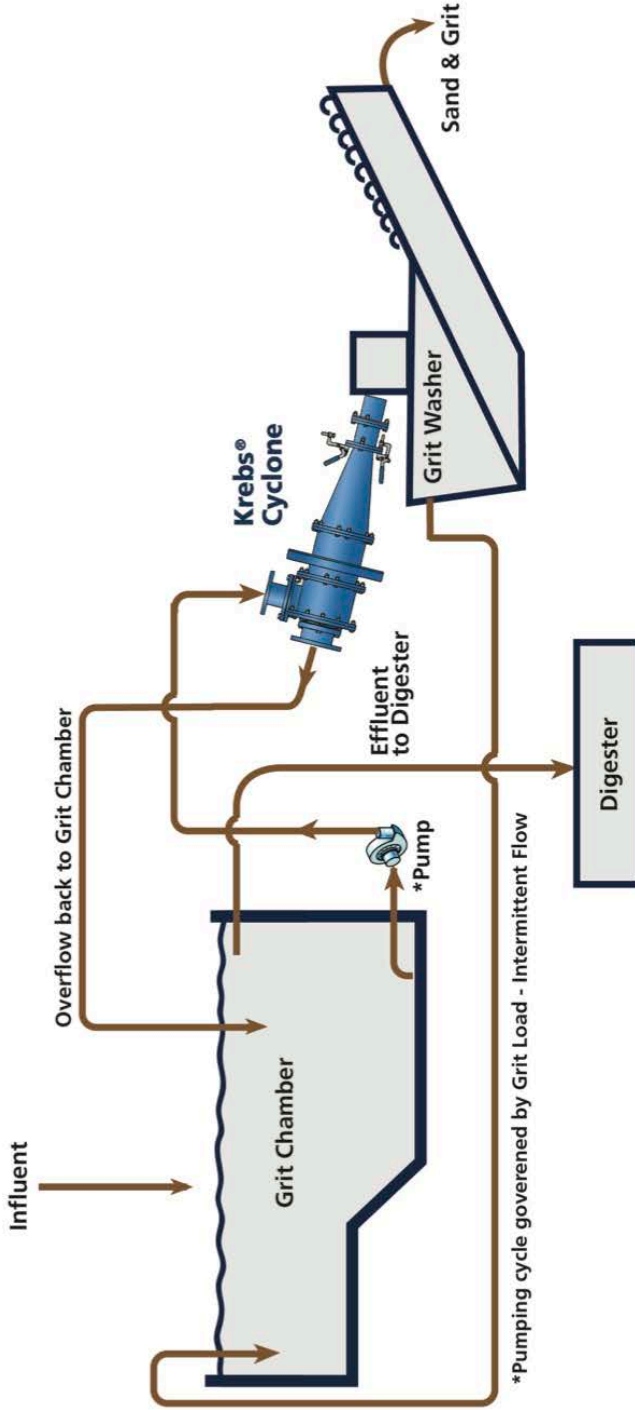


KREBS® HYDROCYCLONES FOR SEWAGE / WASTE WATER TREATMENT

Excelling in separation solutions since 1952

INDUSTRIAL SEPARATION INSERT # WWT
REV_10/20/2016_Ljr-us

SEWAGE / WASTE WATER TREATMENT PROCESS



www.flsmidthkrebs.com

For more information on any of our products please contact one of our Regional Sales Offices below.

Tucson, Arizona USA
Tel: +1 520 744 8200
E-mail: krebs@flsmidth.com

Queensland, Australia
Tel: +61 7 5519 5700
krebsaustralia@flsmidth.com

Sao Paulo, Brasil
Tel: +55-15-3416-7400
krebsbrasil@flsmidth.com

Beijing P.R. China
Tel: +86-10 8468 9100
krebschina@flsmidth.com

Manila, Philippines
Tel: +63-2-687-9251
krebs-Philippines@flsmidth.com

Neusiedl am See, Austria
Tel: +43 2167 3345
krebs-europe@flsmidth.com

Western Australia
Tel: +61 8 6258 4800
krebsaustralia@flsmidth.com

Santiago, Chile
Tel: +56 2 2463 8350
krebschile@flsmidth.com

Chennai, India
Tel: +91 44 4748 1000
krebsindia@flsmidth.com

Johannesburg, South Africa
Tel: +27 (0)10 210 4750
krebsafrica@flsmidth.com

www.flsmidthkrebs.com

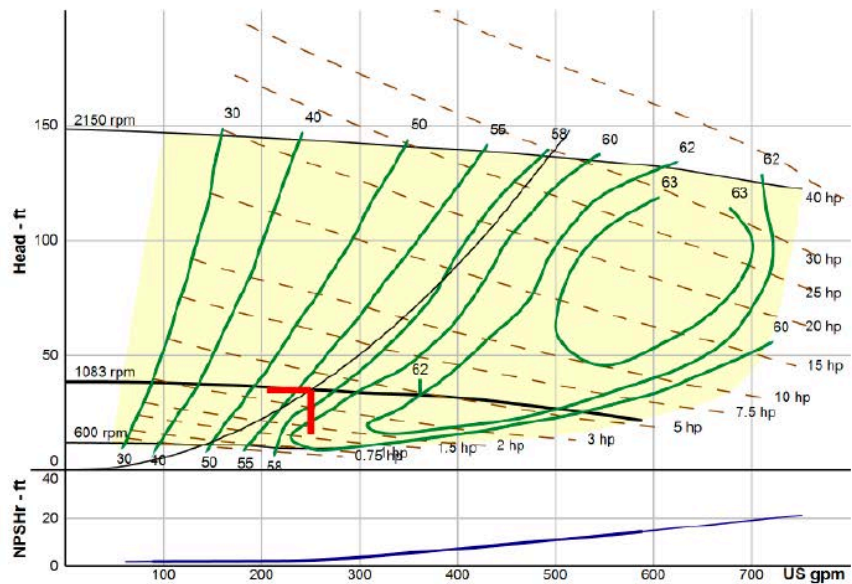
Copyright © 2016 FLSMIDTH, A/S. ALL RIGHTS RESERVED. FLSMIDTH is a (registered) trademark of FLSMIDTH, A/S. This brochure makes no offers, representations or warranties (express or implied), and information and data contained in this brochure are for general reference only and may change at any time.

G. Grit Pumps Selection / Performance Curve Piping Head Loss Calculation & Auxiliary Equipment

i. Grit Pump Selection / Performance Curve

Pump:			Fluid:		
Size:	T4B-B-6	Dimensions:	Name:	Water	
Type:	T-SERIES	Suction:	SG:	1	Vapor Pressure:
Synch Speed:	Adjustable	Discharge:	Density:	62.4 lb/ft ³	0.256 psi a
Dia:	9.75 in		Viscosity:	1.1 cP	Atm Pressure:
Curve:	T4B-B-6		Temperature:	60 °F	14.7 psi a
Impeller:	38618-002				Margin Ratio:
					1
Search Criteria:			Pump Limits:		
Flow:	250 US gpm	Near Miss:	---	Sphere Size:	0.81 in
Head:	35 ft	Static Head:	0 ft		
Pump Selection Warnings:			Motor:		
None			Consult Gorman-Rupp IND 60Hz to select a motor for this pump.		

--- Duty Point ---	
Flow:	250 US gpm
Head:	35.1 ft
Eff:	56.1%
Power:	3.95 hp
NPSHr:	2.67 ft
Speed:	1083 rpm
--- Design Curve ---	
Shutoff Head:	38.6 ft
Shutoff dP:	16.7 psi
Min Flow:	--- US gpm
BEP:	62% @ 362 US gpm
NOL Power:	5.65 hp @ 528 US gpm
--- Max Curve ---	
Max Power:	38.6 hp @ 752 US gpm



ii. Discharge Piping Head Loss Calculation

2024-07-29			
SL			
135366			
Pipe Run	Length (mm)	Length (ft)	
1	4740	15.55	
2	575	1.89	
3	1757	5.76	
4	275	0.90	
5	2204	7.23	
6	4308	14.13	
7	640	2.10	
Total	14499	47.57	
			Static Head ft
			4548 14.9212598
			Suction Lift ft
			2097 6.87992126
	Number	Equivalent L	Tot Equiv L
90 Elbows	3	10	30
45 Elbows	2	3	6
Check Valve	1	32	32
Knife Valve	1	3	3
	ft		Total L
Friction Loss	3.634	3.965031058	118.57
	Online calc	Calc	
	Hazen-Williams	See below right	
		Hazen-Williams	
	ft	PSI	
Cyclone	16.14	7	
	L (m)	Q (m3/s)	C
	36.14	0.01577	145
			D (m)
			0.102
Conclusion:			
TDH	35.026 ft		
TDH Selection	35 ft		
		1.20854147 m	
		3.96503106 ft	



iii. Grit Pumps Catalog Cuts – Model T4A71S-B/F 4”x4” (Flanged Suction/Discharge; ADI Wetted Construction)

SPECIFICATION DATA

Section 55 | Page 2140
January 2024



Super
T SERIES

G-R HARD IRON FITTED BASIC SELF-PRIMING CENTRIFUGAL PUMP



Model: T4A71S-B
Various Patents Apply

PUMP SPECIFICATIONS

Size	4”x 4”(101 mm x 101 mm) NPT - Female
Impeller Type	Semi-Open, Two Vane
Solids-Handling Capability	3” (76.2 mm) Spherical Diameter
Seal Type	Cartridge Type, Mechanical, Oil-Lubricated, Double Floating, Self-Aligning
Radial Bearing	Open Single Row Ball
Thrust Bearing	Open Double Row Ball
Bearing and Seal Cavity Lubrication	SAE 30 Non-Detergent Oil
Maximum Operating Pressure	86 psi (593 kPa)*
Max Temp of Liquid Pumped	160°F (71°C),*

PUMP MATERIALS

Casing	Gray Iron 30
Impeller	G-R Hard Iron
Impeller Shaft	Alloy Steel 4150
Shaft Sleeve	Alloy Steel 4130
Seal: Stationary Face	Silicon Carbide
Rotating Face	Silicon Carbide
Elastomer	Fluorocarbon FKM, (Viton® or Equivalent)
Replaceable Wear Plate:	Hardened Alloy Steel
Removable Adjustable Cover Plate	Gray Iron 30
Removable Inspection Cover Plate	Gray Iron 30 – 12 lbs. (5.4 kg.)
Flap Valve	Neoprene with Nylon and Steel Reinforcing
Seal Plate	G-R Hard Iron
Bearing Housing	Gray Iron 30
Flanges	Gray Iron 30
Gaskets	Buna-N, with Compressed Synthetic Fiber, Vegetable Fiber, PTFE, Cork and Rubber
O-Rings	Buna-N
Hardware	Standard Plated Steel

**Consult Factory for Applications Exceeding Maximum Pressure and/or Temperature Indicated.*

Standard Equipment: Brass Pressure Relief Valve, Bearing and Seal Cavity Oil Level Sight Gauges.

Optional Equipment: Automatic Air Release Valve, Metal Bellows Seal, 120V/240V Casing Heater, High Pump Temperature Shutdown Kit, G-R Hard Iron Casing, High Chrome Cast Iron Impeller, Drain Kit, Gauge Kit.
 Gray Iron 30 Suction and Discharge Spool Flanges:
 4” ASA (Specify Model T4A71S-B /F)
 100 mm DIN 2527 – PN 16 (Specify Model T4A71S-B /FM).



Shown with Optional Suction and Discharge Spool Flanges (Available in ASA or DIN Standard Sizes).

Super T Series Features and Benefits

Easy To Service And Maintain – Pump is mounted above liquid being pumped with only the suction line down in liquid.

Dual Bearing Protection – An atmospheric barrier along with two lip seals provide additional protection of the pump bearings (not available on 2” models).

Inspection Cover – Patented, lightweight inspection cover for easy access to the impeller without removing the entire backcover plate or piping (2” – 8” models).

5 Year Super T Series Warranty

Up To 3” Diameter Spherical Solids Handling (4” – 10” models).

Removable Rotating Assembly – The entire rotating assembly can be removed without disturbing the pump volute or piping allowing the rotating assembly to be easily repaired or quickly replaced with a new ready to drop in assembly.

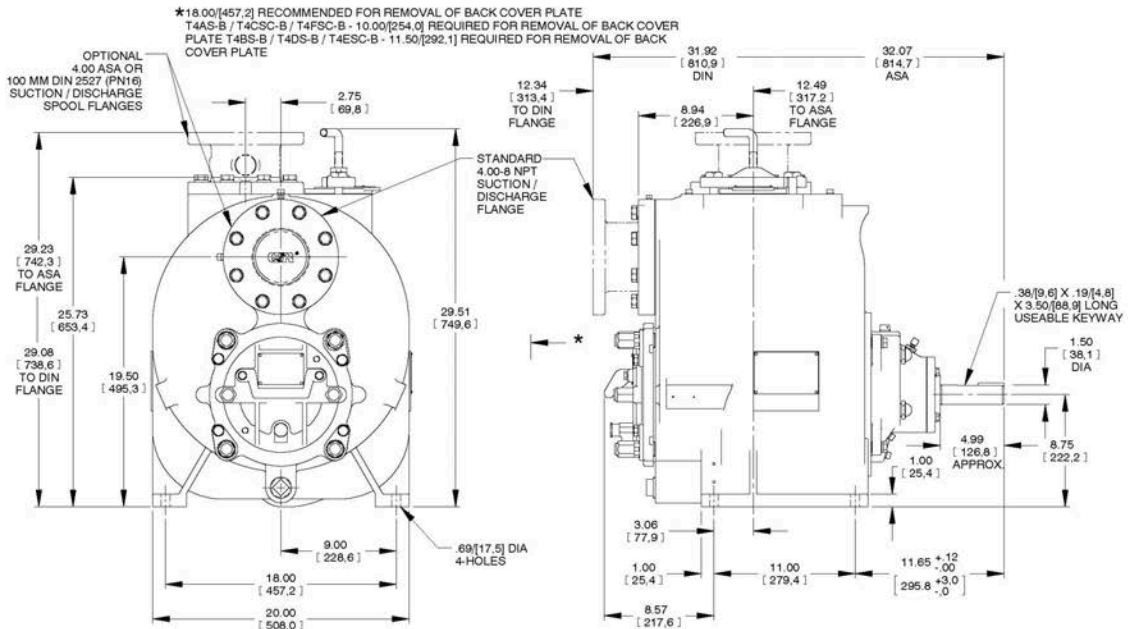
GORMAN-RUPP PUMPS | GRPUMPS.COM

© 2024 The Gorman-Rupp Company. Specifications subject to change without notice

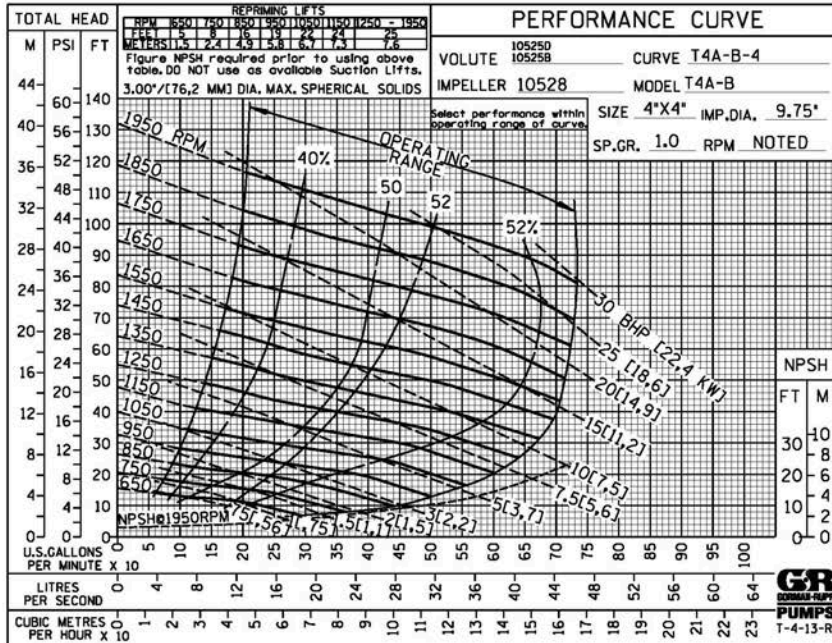
APPROXIMATE DIMENSIONS AND WEIGHTS

NET WEIGHT	581 LBS. (264 KG.)*
SHIPPING WEIGHT	635 LBS. (288 KG.)*
EXPORT CRATE	22.7 CU. FT. (0,64 CU. M.)

*Add 15 LBS. (6,8 KG.) w/each spool flange



NOTE: OPTIONAL ASA OR DIN STANDARD SUCTION & DISCHARGE SPOOL FLANGES AVAILABLE



GORMAN-RUPP PUMPS | GRPUMPS.COM

© 2024 The Gorman-Rupp Company. Specifications subject to change without notice

v. Grit Pump Check Valves – 4” dia. (x2; 1 for Each Pump)



910F-LFA
Class 125, Swing Check Valve
LEAD FREE



Job Name:	
Job Location:	
Engineer:	
Contractor:	
Tag:	
PO#:	
Rep:	
Wholesale Dist:	

DESCRIPTION

The Apollo International™ Model 910F-LFA Flanged Cast Swing Check Valve provides full flow capabilities. It provides reliable and economical protection against reverse flow. The Model 910F-LFA Swing Check Valve can be reliably installed in plumbing and heating systems (or building service piping). Valves are MSS SP-71 compliant and include NSF lead free certifications.

FEATURES

- Compatible with ANSI 125# & 150# Flanges
- Full Port
- Minimal Pressure Drop
- Flanged Connection
- Bolted Bonnet
- Integral Bronze Seat
- FDA Food Grade Epoxy Powder Coat Finish

STANDARDS

- MSS SP-71 - Gray Iron Swing Check Valves Flanged and Threaded - Type 1
- ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves

APPROVALS

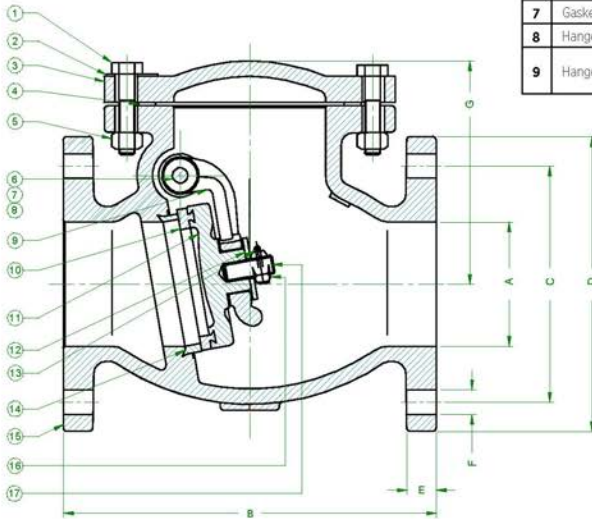
- NSF/ANSI 372 Lead Free
- NSF/AND 61 Water Quality

PERFORMANCE RATING

- Cold Working Pressure:
200 psi (13.8 Bar) at 100°F (2"-12")
150 psi (10.3 Bar) at 100°F (14"-20")
- Saturated Steam:
125 psi (8.6 Bar) at 353°F (2"-12")
100 psi (6.9 Bar) at 338°F (14"-20")
- Temperature Range: -20°F to 406°F Max

STANDARD MATERIALS LIST

1	Bolts	Steel (ASTM A307 B)	10	Disc Ring	Cast Lead Free Bronze (2"-6") Cast Iron (ASTM A126 CL B) (8"-20")
2	Nameplate	Aluminum	11	Disc	Cast Iron (ASTM A126 CL B)
3	Bonnet	Cast Iron (ASTM A126 CL B)	12	Washer	Steel (ASTM A307 B)
4	Body Gasket	Graphite	13	Split Pin	Stainless Steel (ASTM 420 S42000)
5	Nuts	Steel (ASTM A307 B)	14	Seat Ring	Cast Lead Free Bronze (2"-6") Cast Iron (ASTM A126 CL B) (8"-20")
6	Side Plug	Cast Lead Free Bronze	15	Body	Cast Iron (ASTM A126 CL B)
7	Gasket	PTFE	16	Disc Nut	Steel (ASTM A307 B)
8	Hanger Pin	Cast Lead Free Bronze	17	Stud Bolt	Steel (ASTM A307 B)
9	Hanger	Ductile Iron (ASTM A536 65-45-12)			



DIMENSIONS

PART NUMBER	SIZE (IN.)	DIMENSIONS (IN.)							WT. (LB.)	CV (TYP)
		A	B	C	D	E	F	G		
6SCI08BILFA	2"	2.00	8.00	4.75	6.00	0.62	0.75	4.41	26	132
6SCI09BILFA	2.5"	2.50	8.50	5.50	7.00	0.69	0.75	5.24	39	192
6SCI10BILFA	3"	3.00	9.50	6.00	7.50	0.75	0.75	5.67	47	298
6SCI0ABILFA	4"	4.00	11.50	7.50	9.00	0.94	0.75	6.61	82	526
6SCI0BBILFA	5"	5.00	13.00	8.50	10.00	0.94	0.88	7.80	124	852
6SCI0CBILFA	6"	6.00	14.00	9.50	11.00	1.00	0.88	8.54	160	1272
6SCI0E0ILFA	8"	8.00	19.50	11.75	13.50	1.12	0.88	10.28	271	2278
6SCI0G0ILFA	10"	10.00	24.50	14.25	16.00	1.19	1.00	11.30	437	3588
6SCI0H0ILFA	12"	12.00	27.50	17.00	19.00	1.25	1.00	12.56	644	5342
6SCI0J0ILFA	14"	14.00	31.00	18.75	21.00	1.38	1.14	17.50	950	6512
6SCI0K0ILFA	16"	16.00	36.00	21.25	23.50	1.44	1.14	23.45	1160	8626
6SCI0M0ILFA	18"	18.00	36.00	22.75	25.00	1.56	1.25	27.50	1720	11488
6SCI0N0ILFA	20"	20.00	40.00	25.00	27.50	1.69	1.25	29.25	2094	14304

CV = GPM @ 1 psi pressure drop, 60°F water
*CV values are estimates only
**LFA models replace LF models

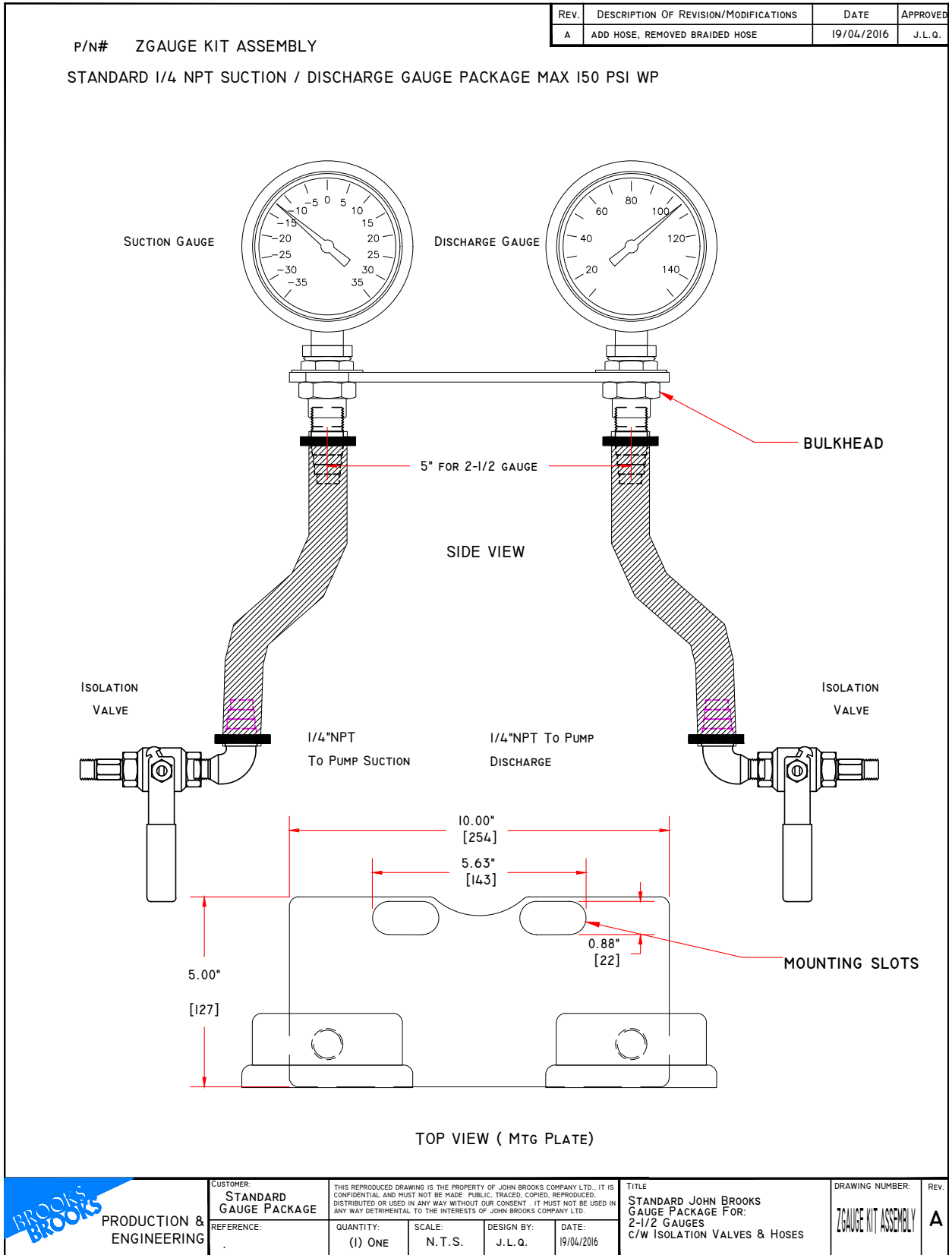
*LEAD FREE: The wetted surfaces of this product shall contain no more than 0.25% lead by weighted average. Complies with Federal Public Law 111-380. ANSI 3rd party approved and listed.

(704) 841-6000
apollovalves.com
SS1434 © 07/18 Page 1 of 1

This specification is provided for reference only. Apollo reserves the right to change any portion of this specification without notice and without incurring obligation to make such changes to Apollo products previously or subsequently sold. Most current information available at apollovalves.com.



vi. Grit Pump Suction / Discharge Gauge Package (x2; 1 for Each Pump)



BROOKS
PRODUCTION & ENGINEERING

CUSTOMER: **STANDARD GAUGE PACKAGE**

REFERENCE:

QUANTITY: (1) ONE

SCALE: N.T.S.

DESIGN BY: J.L.Q.

DATE: 19/04/2016

TITLE: **STANDARD JOHN BROOKS GAUGE PACKAGE FOR: 2-1/2 GAUGES C/W ISOLATION VALVES & HOSES**


DRAWING NUMBER: ZGAUGE KIT ASSEMBLY

Rev. A

vii. Air Release Valve (Self-Priming Application)

Specification Data	Sec. 10	PAGE 1500 JULY 2013
---------------------------	----------------	--------------------------------------

CDS

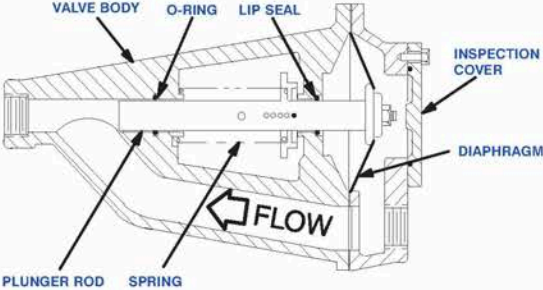



AUTOMATIC AIR RELEASE VALVES

GRP33-07 Models

Size 1" x 1" NPT

AUTOMATIC AIR RELEASE VALVES
 Gorman-Rupp Automatic Air Release Valves are designed to release air from a self-priming pump during the priming cycle. After the pump primes and begins to deliver liquid, the valve closes to restrict by-pass flow. When the pump stops, the valve automatically opens and is ready for the next priming cycle.






*** Valve P/N	Static Discharge Head			Materials of Construction						Spring Color/ Compression		
	4-17 (1,2-5,2)	18-49 (5,4-14,9)	50 Up (15,2 Up)	Valve Body	Elasto- mers	Plunger Rod	Insp. Cover	Internal Hdwr	External Hdwr	10 lbs. (4,5 kg)	25 lbs. (11,3 kg)	80 lbs. (36,2 kg)
GRP33-07		X		C.I. 30	Buna-N	SST 304	C.I. 30	SST 304	Plated Stil.		Plain	
GRP33-07A	X			C.I. 30	Buna-N	SST 304	C.I. 30	SST 304	Plated Stil.	Red		
GRP33-07B			X	C.I. 30	Buna-N	SST 304	C.I. 30	SST 304	Plated Stil.			Black
GRP33-07C		X		SST 316	Buna-N	SST 316	SST 316	SST 316	SST 316		Plain	
GRP33-07D	X			SST 316	Buna-N	SST 316	SST 316	SST 316	SST 316	Red		
GRP33-07E			X	SST 316	Buna-N	SST 316	SST 316	SST 316	SST 316			Black
GRP33-07G			X	SST 316	EPDM	SST 316	SST 316	SST 316	SST 316			Black
GRP33-07H		X		SST 316	EPDM	SST 316	SST 316	SST 316	SST 316		Plain	
GRP33-07J			X	C.I. 30	*Fluoro	SST 304	C.I. 30	SST 304	Plated Stil.			Black
GRP33-07K		X		C.I. 30	**TFE	SST 304	C.I. 30	SST 304	Plated Stil.		Plain	
GRP33-07L			X	SST 316	*Fluoro	SST 316	SST 316	SST 316	SST 316			Black
GRP33-07M	X			C.I. 30	*Fluoro	SST 304	C.I. 30	SST 304	Plated Stil.	Red		
GRP33-07N		X		SST 316	*Fluoro	SST 316	SST 316	SST 316	SST 316		Plain	
GRP33-07P		X		C.I. 30	*Fluoro	SST 304	C.I. 30	SST 304	Plated Stil.		Plain	
GRP33-07R	X			SST 316	EPDM	SST 316	SST 316	SST 316	SST 316	Red		
GRP33-07S		X		SST 316	**TFE	SST 316	SST 316	SST 316	SST 316		Plain	

* DuPont Viton® or Equivalent.
 ** 3M Corporation Atlas® or Equivalent.
 *** Consult Factory for Material/Discharge Head Combinations Not Listed.

Optional: Spring Removal Tool P/N 48781-003



THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA

www.grpumps.com

Specifications Subject to Change Without Notice

Printed in U.S.A.

INSTALLATION – SECTION B

Review all SAFETY information in Section A.

Since pump installations are seldom identical, this section offers only general recommendations and practices required to inspect and install the Automatic Air Release Valve. Refer to the literature accompanying the pump or contact the factory for specific pump installation instructions. Refer to **MAINTENANCE AND REPAIR**, Section E in this manual for disassembly and reassembly of the Automatic Air Release Valve.

- b. Check for and tighten loose attaching hardware at mating surfaces.
- c. Check the plunger rod for free movement by compressing the spring with an appropriate tool. Note the color code on the spring for future reference.
- d. If the valve has been in stock for over 1 year, re-lubricate the shaft as indicated in **LUBRICATION**, Section E.

PREINSTALLATION INSPECTION

The Automatic Air Release Valve was fully assembled and inspected before shipment from the factory. Before installation, inspect the valve for damage which may have occurred during shipment. Check as follows:

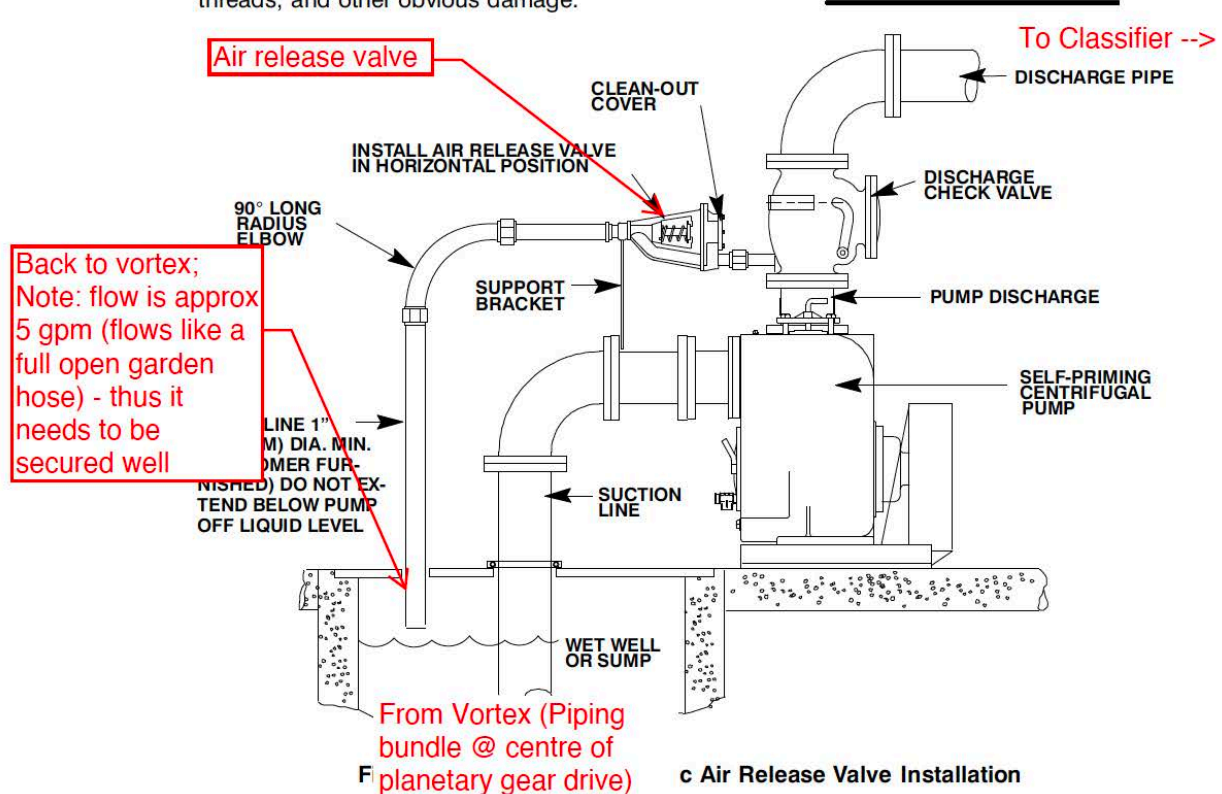
- a. Inspect the valve for cracks, dents, damaged threads, and other obvious damage.

AIR RELEASE VALVE INSTALLATION

The Automatic Air Release Valve must be independently mounted in a horizontal position and connected to the discharge line of the self-priming centrifugal pump (see Figure B-1).

NOTE

If the Air Release Valve is to be installed on a **staged** pump application, contact the factory for specific installation instructions.







H. Motors & Gear Drives Data

i. Fine Screens

- SEW Gear Drive – SA77 AMS145
- Baldor Motor – 1.5 kW; 1800 RPM; 575V/3Ph/60Hz; Class I, Div. 1

Description:	Helical-worm GU with adapter
Type:	SA77 AMS145
Speed [r/min]	: 1755 / 11
Total ratio [i]	: 161,60 / finite
No. of teeth nom./denominator	: 808/5
Ma max [Nm]	: 1220
Mou. pos. / Pivoting angle [°]	: M1-M4A / 45
Lubricant / -volume [l]	: CLP HC 460 Synth.Oil / 3,80
Corrosion protection	: Yes
Surface protection	: OS2 to technical data sheet 01802__94
Paint coat	: Top coat RAL5020 ocean blue
Gear unit	: SA77
Ma max G [Nm]	: 1220
Hollow shaft	: 50mm
Design	: Hollow shaft
Safety cover	: None
Documentation no. A	: 26875438 27775399
Parts list	: 282571796
Adapter	: AMS145
Input flange	: Centering diameter 114.3mm, hole circle 149.2mm, bore 10.5 (NEMA)
Bore on input side	: 0.875 inch (22.225mm)
Max. insertion depth (mot. SE)	: 53.85mm
Spare parts list	: You can find the SWPL (spare and wearing parts list) under the serial number in the Online Support.
Nameplate	: English
Nameplate position	: Attached to the gear unit





Customer information packet

35E3836M840G1

2HP, 1755RPM, 3PH, 60HZ, 145TC, 3530M, XPFC, F1

CLARO ENVIRONMENTAL TECH.

Class - CLI GP C,D

Division - Division I

Specifications

Enclosure	XPFC
Frame	145TC
Frame Material	Steel
Frequency	60.00 Hz
Output @ Frequency	2.000 HP @ 60 HZ
Phase	3
Synchronous Speed @ Frequency	1800 RPM @ 60 HZ
Voltage @ Frequency	575.0 V @ 60 HZ
XP Class and Group	CLI GP C,D
XP Division	Division I
Agency Approvals	CSA EEV CSA UR
Ambient Temperature	40 °C
Auxillary Box	No Auxillary Box
Auxillary Box Lead Termination	None
Base Indicator	No Mounting
Bearing Grease Type	Polyrex EM (-20F +300F)
Blower	None
Current @ Voltage	2.400 A @ 575.0 V
Design Code	B
Drip Cover	No Drip Cover
Duty Rating	CONT
Efficiency @ 100% Load	86.5 %
Electrically Isolated Bearing	Not Electrically Isolated
Feedback Device	NO FEEDBACK
Front Face Code	Brake Mounting
Front Shaft Indicator	None
Heater Indicator	No Heater
High Voltage Full Load Amps	2.4 a
Insulation Class	F
Inverter Code	Not Inverter

Part detail

Revision	C
Type	AC
Mech. spec.	35E3836
Base	
Status	PRD/A
Elec. spec.	35WGM840
Layout	35LYE3836
Eff. date	04-29-2020
CD Diagram	CD0006
Poles	04
Leads	3#18
Proprietary	False
Created date	09-21-2017

KVA Code	L
Lifting Lugs	No Lifting Lugs
Locked Bearing Indicator	Locked Bearing
Motor Lead Exit	Ko Box
Motor Lead Quantity/Wire Size	3 @ 18 AWG
Motor Lead Termination	Flying Leads
Motor Standards	NEMA
Motor Type	3530M
Mounting Arrangement	F1
Number of Poles	4
Overall Length	25.17 IN
Power Factor	73
Product Family	General Purpose
Pulley End Bearing Type	Ball
Pulley Face Code	C-Face
Pulley Shaft Indicator	Standard
Rodent Screen	None
RoHS Status	ROHS COMPLIANT
Service Factor	1.15
Shaft Diameter	0.875 IN
Shaft Extension Location	Pulley End
Shaft Ground Indicator	No Shaft Grounding
Shaft Rotation	Reversible
Shaft Slinger Indicator	Shaft Slinger
Speed	1755 rpm
Speed Code	Single Speed
Starting Method	Direct on line
Thermal Device - Bearing	None
Thermal Device - Winding	Normally Closed Thermostat
Vibration Sensor Indicator	No Vibration Sensor
Winding Thermal 1	None
Winding Thermal 2	None
XP Temp Code	T3C

Nameplate

NP0977XPSLEV									
NO.		CC	010A						
SER.		TEMP CODE	T3C						
SPEC.	35E3836M840G1								
CAT.NO.									
HP	2								
VOLTS	575								
AMPS	2.4								
RPM	1755		MOTOR WEIGHT	51					
HERTZ	60	PH	3	CL	F	DE BRG	6205		
SER.F.	1.15	DES	B	CODE	L	ODE BRG	6203		
FRAME	145TC	GREASE	POLYREX EM						
RATING	40C AMB-CONT								
USABLE AT 208V		NEMA-NOM-EFF	86.5		PF	73			
	VEBM7037T-I-5								

AC Induction Motor Performance Data

Record # 58146

Typical performance - not guaranteed values

Winding: 35WGM840-R010		Type: 3530M		Enclosure: XPFC	
Nameplate Data			575 V, 60 Hz: Single Voltage Motor		
Rated Output (HP)		2	Full Load Torque		5.95 LB-FT
Volts		575	Start Configuration		direct on line
Full Load Amps		2.4	Breakdown Torque		24.1 LB-FT
R.P.M.		1755	Pull-up Torque		16 LB-FT
Hz	60 Phase	3	Locked-rotor Torque		18.3 LB-FT
NEMA Design Code	B KVA Code	L	Starting Current		19.6 A
Service Factor (S.F.)		1.15	No-load Current		1.48 A
NEMA Nom. Eff.	86.5 Power Factor	73	Line-line Res. @ 25°C		11 Ω
Rating - Duty		40C AMB-CONT	Temp. Rise @ Rated Load		62°C
S.F. Amps			Temp. Rise @ S.F. Load		73°C
			Locked-rotor Power Factor		50.4
			Rotor inertia		0.177 LB-FT ²

Load Characteristics 575 V, 60 Hz, 2 HP

% of Rated Load	25	50	75	100	125	150	S.F.
Power Factor	31	50	64	73	78	82	76
Efficiency	75.1	83.8	86.4	86.6	86.1	85	86.3
Speed	1789	1778	1767	1755	1741	1727	1747
Line amperes	1.56	1.76	2.03	2.37	2.78	3.22	2.62

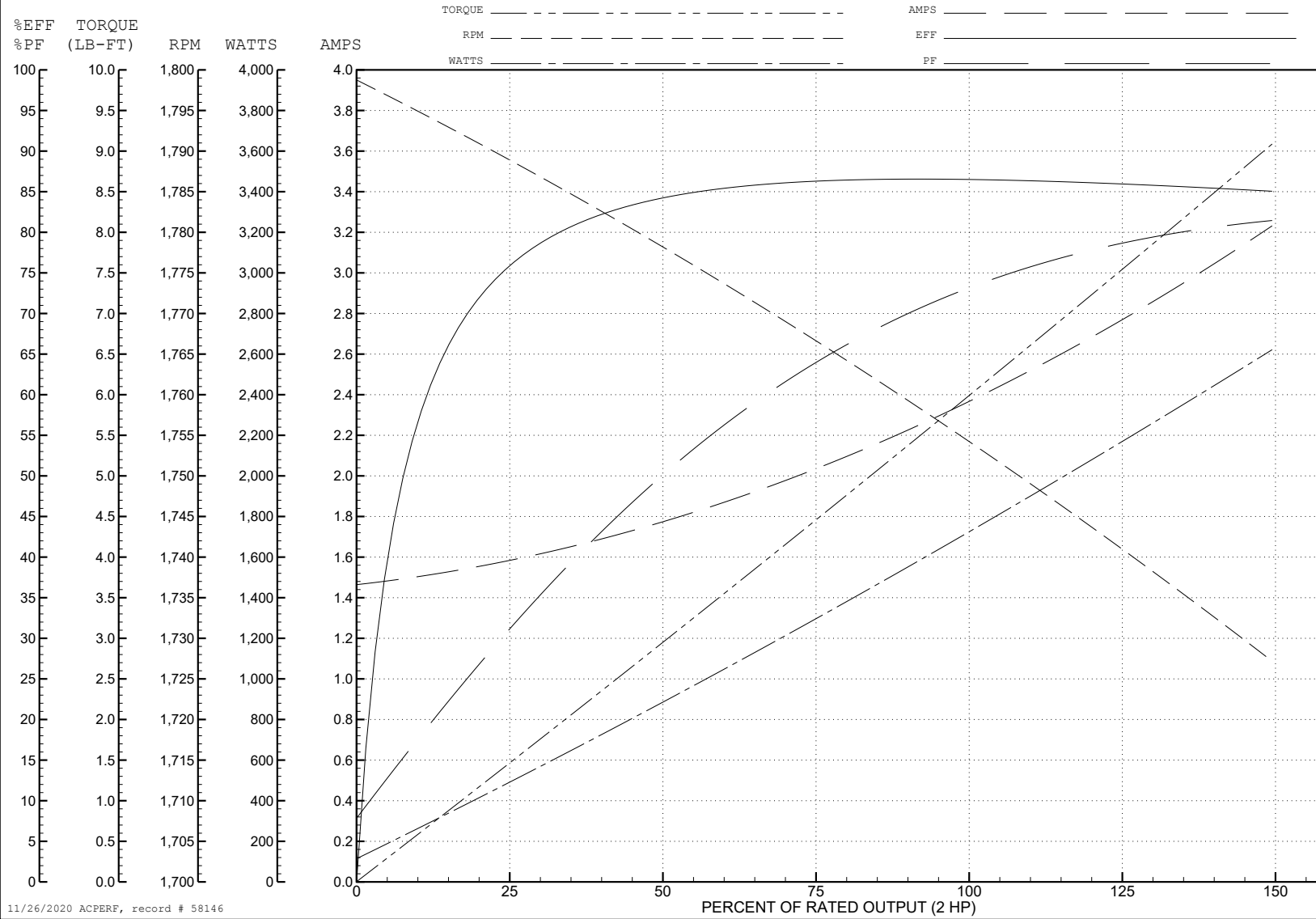
ABB Motors and Mechanical Inc.

WINDING # 35WGM840

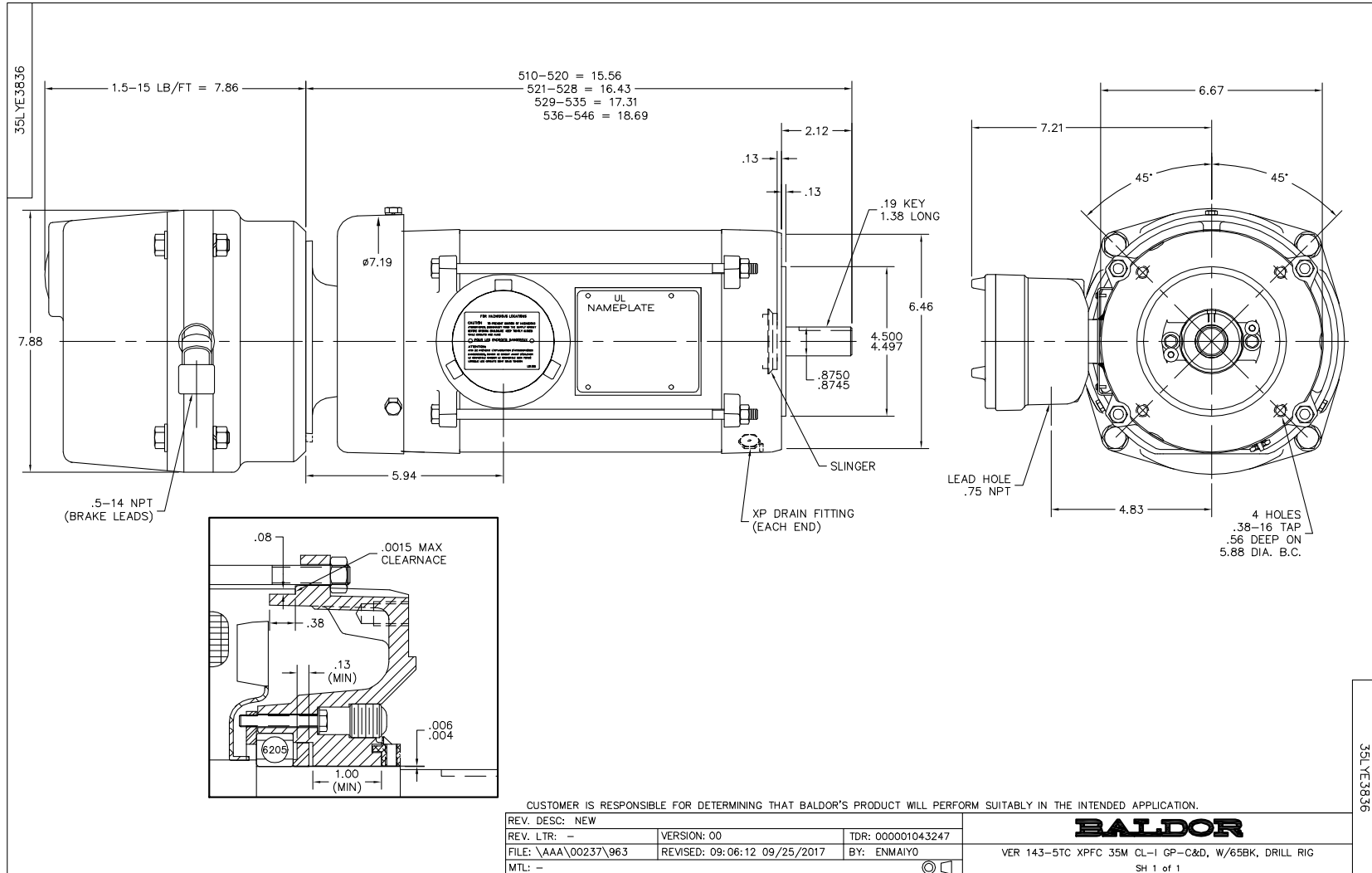
Typical performance - not guaranteed values.

2 HP 3 PH 60 HZ 1755 RPM 575 V 3530M

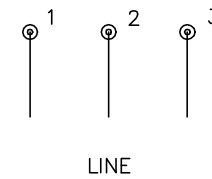
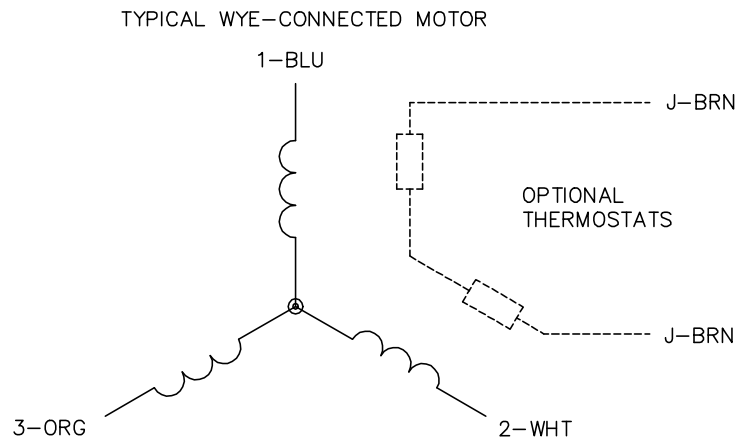
TORQUES (LB-FT): PO=24.1 PU=16 LR=18.3 LRA=19.6



11/26/2020 ACPERF, record # 58146



CD0006



NOTES:

1. THREE LEAD MOTOR MAY BE EITHER WYE CONNECTED OR DELTA CONNECTED.
2. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
3. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
4. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY VARY.
5. LEAD COLORS ARE OPTIONAL. LEADS MUST BE NUMBERED AS SHOWN.

CD0006

REV. DESC: ADD CLASS CONN00000007		
REV. LTR: E	VERSION: 01	TDR: 000001099922
FILE: \AAA\00005\141	REVISED: 10:24:49 02/19/2019	BY: ENBRIRO
MTL: -	© □	

BALDOR - RELIANCE®

3PH, SV, 3 LEADS, WYE OR DELTA CONNECTED

SH 1 of 1

ii. Wash Press

- SEW Gear Drive – KAF77 AMS145
- Baldor Motor – 1.5 kW; 1800 RPM; 575V/3Ph/60Hz; Class I, Div. 1

KAF77 AMS145	
Bevel-helical gear units K	
Speed [r/min]	: 1755 / 13
Total ratio [i]	: 135,28 / infinite
Ma max [Nm]	: 1.550
Mounting position	: M4A
Lubricant / -volume [l]	: GLP HC 220 Synth.Oil / 5,70
Corrosion protection	: Yes
Surface protection	: OS2 to technical data sheet 01802__94
Paint coat	: Top coat RAL5020 ocean blue
Gear unit	: KAF77
Ma max G [Nm]	: 1550
Hollow shaft	: 50mm
Design	: B5-flange-mounted version and hollow : shaft
Safety cover	: None
Flange	: 300mm
Output oil seal	: 2 oil seals
Documentation no. A	: 26875438 : 27775399
Parts list	: 382611695
Adapter	: AMS145
Input flange	: Centering diameter 114.3mm, : hole circle 149.2mm, bore 10.5 (NEMA)
Bore on input side	: 0.875 inch (22.225mm)
Max. insertion depth (mot. SE)	: 53.85MM
Spare parts list	: You can find the SWPL (spare and wearing : parts list) under the serial number in : the Online Support.
Nameplate	: English
Nameplate position	: Attached to the gear unit
Text of gear unit nameplate	: 10015061 TP
Commodity code	: 84834023
COO	: SE
Weight	: 65.00 KG



SEW
EURODRIVE



Customer information packet

VXM14242T-5

2HP, 1765RPM, 3PH, 60HZ, 145TC, 3528M, XPFC, F1

CLARO ENVIRONMENTAL TECH.

Class - CLI GP D; CLII GP F,G

Division - Division I

Specifications

Enclosure	XPFC
Frame	145TC
Frame Material	Steel
Frequency	60.00 Hz
Haz Area Class and Group	CLI GP D; CLII GP F,G
Haz Area Division	Division I
Motor Letter Type	Three Phase
Output @ Frequency	2.000 HP @ 60 HZ
Phase	3
Synchronous Speed @ Frequency	1800 RPM @ 60 HZ
Voltage @ Frequency	575.0 V @ 60 HZ
Agency Approvals	CSA EEV UL
Ambient Temperature	40 °C
Auxillary Box	No Auxillary Box
Auxillary Box Lead Termination	None
Base Indicator	No Mounting
Bearing Grease Type	Polyrex EM (-20F +300F)
Blower	None
Current @ Voltage	2.150 A @ 575.0 V
Design Code	B
Drip Cover	No Drip Cover
Duty Rating	CONT
Efficiency @ 100% Load	86.5 %
Electrically Isolated Bearing	Not Electrically Isolated
Feedback Device	NO FEEDBACK
Front Shaft Indicator	None
Heater Indicator	No Heater
High Voltage Full Load Amps	2.2 a
Insulation Class	F
Inverter Code	Not Inverter
KVA Code	L

Part detail

Revision	B
Type	AC
Mech. spec.	35E380
Base	
Status	PRD/A
Elec. spec.	35WGW823
Layout	35LYE380
Eff. date	09-25-2023
CD Diagram	CD0006
Poles	04
Leads	3#18
Proprietary	False
Created date	02-23-2023

Lifting Lugs	No Lifting Lugs
Locked Bearing Indicator	Locked Bearing
Max Speed	2700 rpm
Motor Lead Quantity/Wire Size	3 @ 18 AWG
Motor Lead Termination	Flying Leads
Motor Standards	NEMA
Motor Type	3540M
Mounting Arrangement	F1
Number of Poles	4
Overall Length	13.84 IN
Power Factor	81
Product Family	General Purpose
Pulley End Bearing Type	Ball
Pulley Face Code	C-Face
Pulley Shaft Indicator	Standard
Rodent Screen	None
Service Factor	1.00
Shaft Diameter	0.875 IN
Shaft Ground Indicator	No Shaft Grounding
Shaft Rotation	Reversible
Speed	1765 rpm
Speed Code	Single Speed
Starting Method	Direct on line
Thermal Device - Bearing	None
Thermal Device - Winding	Normally Closed Thermostat
Vibration Sensor Indicator	No Vibration Sensor
Winding Thermal 1	None
Winding Thermal 2	None

Nameplate

NP0887XPSLEV

NO.		CC	010A						
S/N		TEMP CODE	T3C						
SPEC.	35E380Z823	INV.TYPE	PWM						
CAT.NO.	VXM14242T-5	C HP FR	60	C HP TO	90				
HP	2	CT HZ FROM	6	CT HZ TO	60				
VOLTS	575	VT HZ FROM	6	VT HZ TO	60				
AMPS	2.15	MAG CUR	1.15						
RPM	1765	MX RPM	2700						
HZ	60	PH	3	CL	F	NOM.EFF.	86.5		
SER.F.	1.00	DES	B	SL HZ	1.17	WK2	0.202		
FRAME	145TC	RATING	40C AMB-CONT						
	NEMA MG-1 PART 5, IP54								
	1.15 SF ON SINE WAVE								

AC Induction Motor Performance Data

Record # 88444

Preliminary Data Sheet

Winding: 35WGZ823-R001		Type: 3528M	Enclosure: TEFC	
Nameplate Data			575 V, 60 Hz: Single Voltage Motor	
Rated Output (HP)	2	Full Load Torque	5.95 LB-FT	
Volts	575	Start Configuration	direct on line	
Full Load Amps	2.15	Breakdown Torque	22.1 LB-FT	
R.P.M.	1765	Pull-up Torque	13.1 LB-FT	
Hz	60 Phase	3	Locked-rotor Torque	15.85 LB-FT
NEMA Design Code	B KVA Code	K	Starting Current	18.31 A
Service Factor (S.F.)	1.15	No-load Current	1.15 A	
NEMA Nom. Eff.	86.5 Power Factor	81	Line-line Res. @ 25°C	15.5 Ω
Rating - Duty	40C AMB-CONT	Temp. Rise @ Rated Load	81°C	
S.F. Amps	2.45	Temp. Rise @ S.F. Load	98°C	
		Locked-rotor Power Factor	57	
		Rotor inertia	0.202 lb-ft ²	

Load Characteristics 575 V, 60 Hz, 2 HP

% of Rated Load	25	50	75	100	125	150	S.F.
Power Factor	39	60	73	80	84	86	82
Efficiency	80.1	86.2	87.3	86.9	85.6	83.9	86.1
Speed	1791	1783	1773	1765	1755	1742	1759
Line amperes	1.23	1.45	1.76	2.15	2.62	3.1	2.43

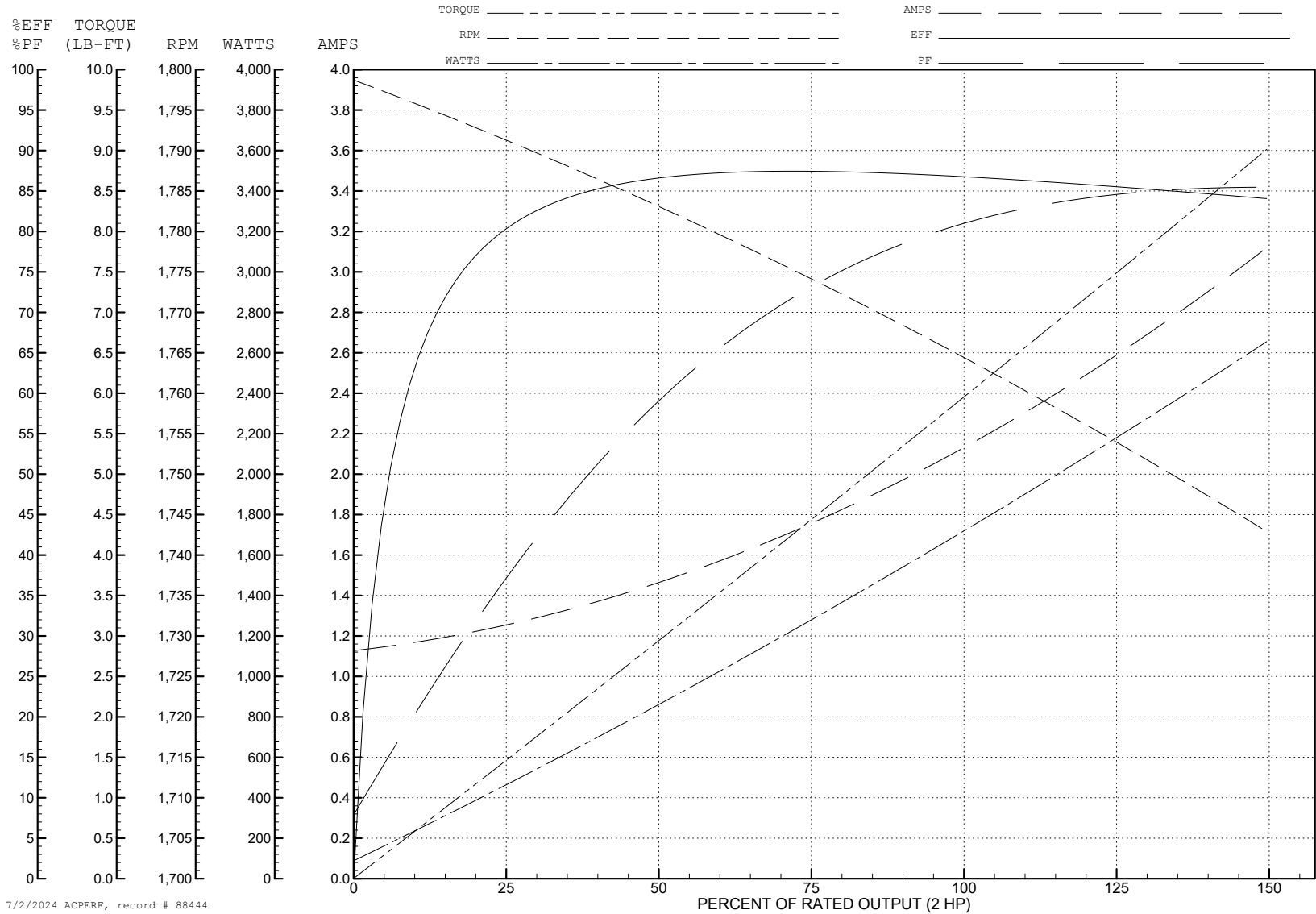
ABB Motors and Mechanical Inc.

WINDING # 35WGZ823

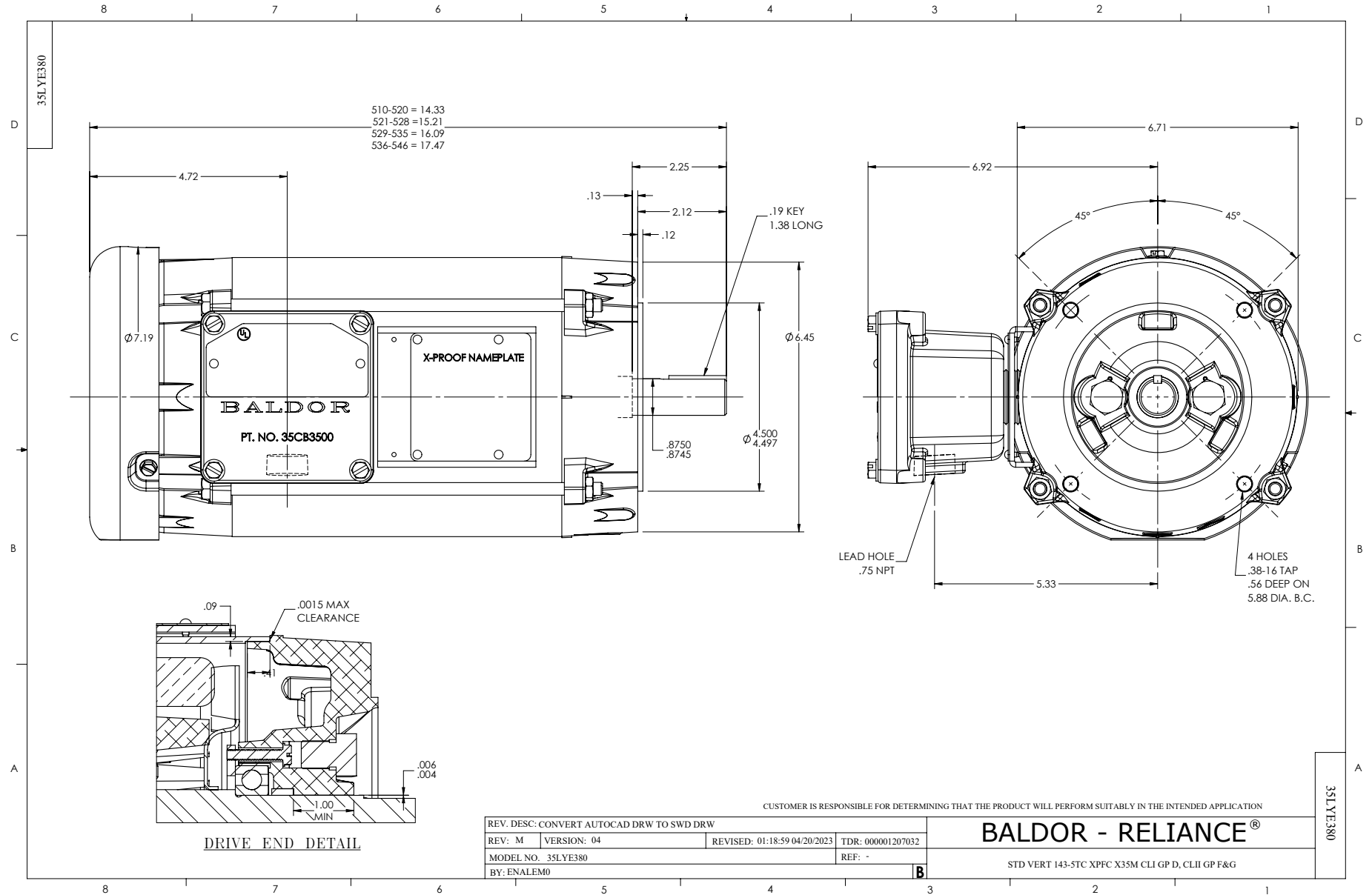
Typical performance - not guaranteed values.

2 HP 3 PH 60 HZ 1765 RPM 575 V 3528M

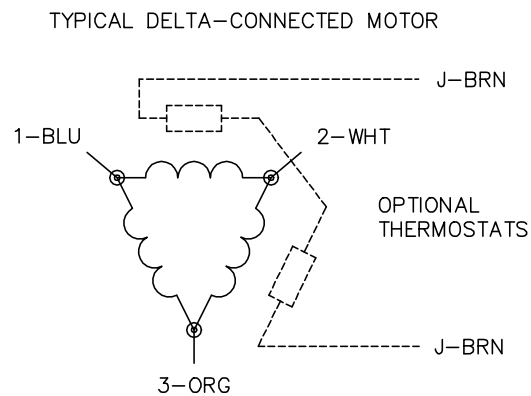
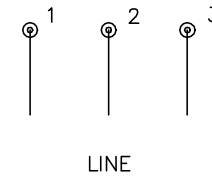
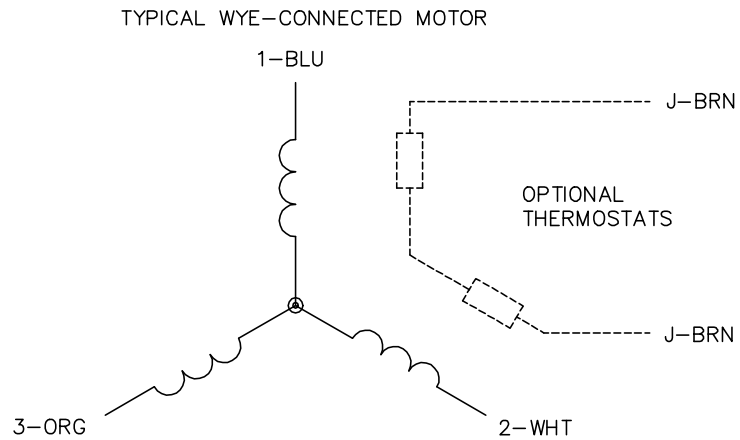
TORQUES (LB-FT): PO=22.1 PU=13.1 LR=15.85 LRA=18.31



7/2/2024 ACPERF, record # 88444



CD0006



NOTES:

1. THREE LEAD MOTOR MAY BE EITHER WYE CONNECTED OR DELTA CONNECTED.
2. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
3. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
4. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY VARY.
5. LEAD COLORS ARE OPTIONAL. LEADS MUST BE NUMBERED AS SHOWN.

CD0006

REV. DESC: ADD CLASS CONN00000007		
REV. LTR: E	VERSION: 01	TDR: 000001099922
FILE: \AAA\00005\141	REVISED: 10:24:49 02/19/2019	BY: ENBRIRO
MTL: -	© □	

BALDOR - RELIANCE®

3PH, SV, 3 LEADS, WYE OR DELTA CONNECTED

SH 1 of 1

**iii. Vortex Grit Removal Unit – Baldor & Nord (Class I, Div. 1) including
Claro Vortex Grit Chamber Planetary Gear
Drive Mechanism**

- Baldor Motor 3 Hp (575V, 3 Phase, 60 Hz); Class I, Div. 1; Nord Gear Drive SK3282 & Claro Planetary Gear Drive

BALDOR • RELIANCE

ABB

**Customer information packet
VXM18342T-5**

3HP, 1760RPM, 3PH, 60HZ, 182TC, 3632M, XPFC, F1
Class - CLI GP D; CLII GP F,G
Division - Division I

Copyright © All product information within this document is subject to ABB Motors and Mechanical Inc. copyright © protection, unless otherwise noted.
11/17/2021 12:05:02 PM

BALDOR
A MEMBER OF THE ABB GROUP

BALDOR • RELIANCE CUSTOMER INFORMATION PACKET VXMI18342T-5 - 3HP, 1760RPM, 3PH, 60HZ, 182TC, 3632M, XPFC, FI

Specifications	Part detail
Enclosure	XPFC
Frame	182TC
Frame Material	Steel
Frequency	60.00 Hz
Output @ Frequency	3,000 HP @ 60 HZ
Phase	3
Synchronous Speed @ Frequency	1800 RPM @ 60 HZ
Voltage @ Frequency	575.0 V @ 60 HZ
XP Class and Group	CL I GP D; CL II GP F,G
XP Division	Division I
Agency Approvals	CSA CSA EEV UR
Ambient Temperature	40 °C
Auxiliary Box	No Auxiliary Box
Auxiliary Box Lead Termination	None
Base Indicator	No Mounting
Bearing Grease Type	Polyrex EM (-20F +300F)
Blower	None
Constant Torque Speed Range	6
Current @ Voltage	3,300 A @ 575.0 V
Design Code	B
Drip Cover	No Drip Cover
Duty Rating	CONT
Efficiency @ 100% Load	89.5 %
Electrically Isolated Bearing	Not Electrically Isolated
Feedback Device	NO FEEDBACK
Heater Indicator	No Heater
High Voltage Full Load Amps	3.3 a
Insulation Class	F
Inverter Code	Inverter Duty
IP Rating	NONE
Revision	-
Type	AC
Mech. spec.	
Base	
Status	PRD/A
Elec. spec.	36WGS582
Layout	36LYQ330
Eff. date	03-11-2021
CD Diagram	CD0006
Poles	04
Leads	3#16
Proprietary	False
Created date	03-02-2021



BALDOR • RELIANCE CUSTOMER INFORMATION PACKET VXM18342T-5 - 3HP, 1760RPM, 3PH, 60HZ, 182TC, 3632M, XPFC, F1

KVA Code	L
Lifting Lugs	No Lifting Lugs
Locked Bearing Indicator	Locked Bearing
Max Speed	2700 rpm
Motor Lead Termination	Flying Leads
Motor Standards	NEMA
Motor Type	3632M
Mounting Arrangement	F1
Number of Poles	4
Overall Length	18.86 IN
Power Factor	73
Product Family	General Purpose
Pulley Face Code	C-Face
Rodent Screen	None
Service Factor	1.00
Shaft Diameter	1.125 IN
Shaft Ground Indicator	No Shaft Grounding
Shaft Rotation	Reversible
Speed	1760 rpm
Speed Code	Single Speed
Starting Method	Direct on line
Thermal Device - Bearing	None
Thermal Device - Winding	Normally Closed Thermostat
Vibration Sensor Indicator	No Vibration Sensor
Winding Thermal 1	None
Winding Thermal 2	None
XP Temp Code	T3C





CUSTOMER INFORMATION PACKET

VXM18342T-5 - 3HP, 1760RPM, 3PH, 60HZ, 182TC, 36

Nameplate

NP0887XPSLEV									
NO.		CC	010A						
S/N		TEMP CODE	T3C						
SPEC.	36-0000-0473	INV. TYPE	PWM						
CAT.NO.	VXM18342T-5	C HP FR	60	C HP TO	90				
HP	3	CT HZ FROM	6	CT HZ TO	60				
VOLTS	575	VT HZ FROM	6	VT HZ TO	60				
AMPS	3.3	MAG CUR	1.9						
RPM	1760	MX RPM	2700						
HZ	60	PH	3	CL	F	NOM.EFF.	89.5		
SER.F.	1.00	DES	B	SL HZ	1.6	WK2	0.3		
FRAME	182TC	RATING	40C AMB-CONT						
	NEMA MG-1 PART 5, IP54								
	1.15 SF ON SINE WAVE								



Part number	Description	Quantity
SA391633	SA 36-0000-0473	1.000 ea
RA382136	RA 36-0000-0473	1.000 ea
LB1119N	WARNING LABEL	1.000 ea
LC0006	CONNECTION LABEL	1.000 ea
PK3082	STYROFOAM CRADLE	1.000 ea
NP0887XP SLEV	SS XP INV UL CSA-EEV CC CL-I GP-D	1.000 ea
85XU0407S04	4X1/4 U DRIVE PIN STAINLESS	2.000 ea
85XU0407S04	4X1/4 U DRIVE PIN STAINLESS	4.000 ea
MN416A01	TAG-INSTAL-MAINT no wire (1200/box) 1/21	1.000 ea
NP0018F	ALUM UL XP CONDUIT BOX NAMEPLATE	1.000 ea
36FH4009A02	FAN COVER FOR VM7042T,PRIMER	1.000 ea
51XW1032A06	10-32 X .38, TAPTITE II, HEX WSHR SLTD S	3.000 ea
36FN3000C01SP	EXFN, PLASTIC, 5.25 OD, .912 ID	1.000 ea
51XB1214A16	12-14X1.00 HXWSSLD SERTYB	1.000 ea
MJ1000A02	GREASE, MOBIL POLYREX EM - 124047	0.050 lb
HA3105A06	THRUBOLT - 3/8-16 X 10.500 X	4.000 ea
36EP3700A01	FRENDPLATE, MACH	1.000 ea
HW5100A05	WVY WSHR F/205 & 304 BRGS	1.000 ea
HW4500A19	1/4-28X1/4 SLOTTED PLUG F/S	2.000 ea
36EP1703A01	PU ENDPLATE, MACH	1.000 ea
84XN1032J20	SCREW, SOC 10-32 X 1 1/4"BMH4602	2.000 ea
HW4001A01	1/4 HX SOC PIPE PLG (F/S) ALLOY STEEL W/	2.000 ea
60XN1032A07	10-32 X .4375 TRUSS HEAD, TORX SERRATED	2.000 ea
HW3022E05	.125 DIA X .500 ROLLED SPRING PIN	1.000 ea
35CB3001A02SP	EXPL PROOF CONDUIT BOX, 3/4"PIPE TAP LEA	1.000 ea
11XW1032G06	10-32 X .38, TAPTITE II, HEX WSHR SLTD U	1.000 ea
HW3001B01	BRASS CUP WASHER, FOR #10 SCREW	1.000 ea
35CB3500A01SP	CONDUIT BOX LID, MACH	1.000 ea
51XN2520A16	SCREW, HEX WS SLT, ZN, 1/4-20 X 1.00	4.000 ea
MG1500Y02	WILKOPON PRIMER YELLOW	0.022 ga
MG1025G29	WILKOFAS, 789.229, DARK CHARCOAL GRAY	0.022 ga

BALDOR • RELIANCE CUSTOMER INFORMATION PACKET VXM18342T-5- 3HP, 1760RPM, 3PH, 60HZ, 182TC, 3632M, XPFC, F1

36PA1001	PKG GRP, PRINT PK1017A06	1.000 ea
HW2501E19	STD SQUARE KEY .25 SQUARE X 2.125 LONG	1.000 ea
HA7000A02	KEY RETAINER RING, 1 1/8 DIA, 1 3/8 DIA	1.000 ea



BALDOR • RELIANCE CUSTOMER INFORMATION PACKET VXM18342T-5 - 3HP, 1760RPM, 3PH, 60HZ, 182TC, 3632M, XPFC, F1

AC Induction Motor Performance Data

Record # 68835

Typical performance - not guaranteed values

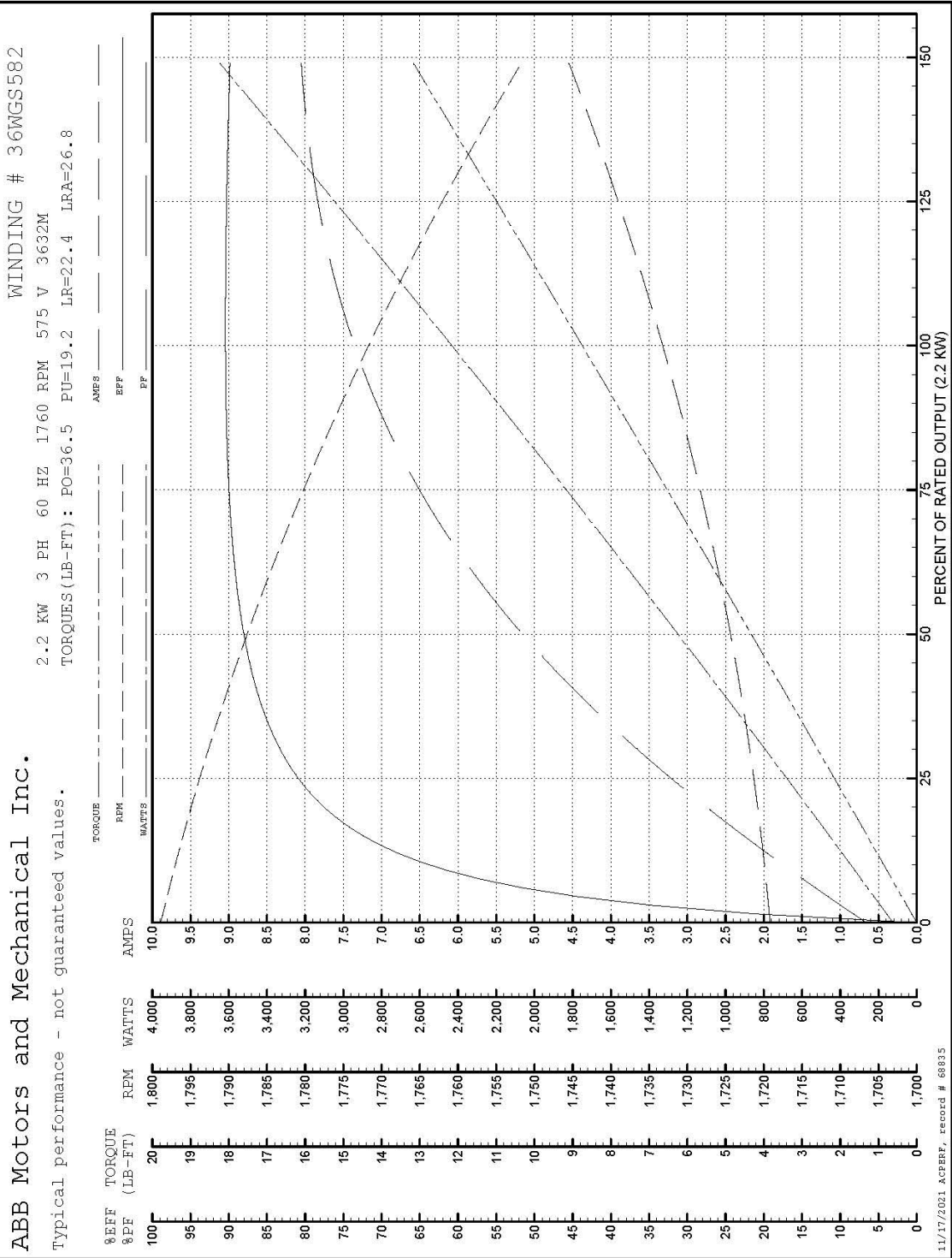
Winding: 36WGS582-R020	Type: 3632M	Enclosure: TEFC
-------------------------------	--------------------	------------------------

Nameplate Data		575 V, 60 Hz: Single Voltage Motor	
Rated Output (KW)	2.2	Full Load Torque	8.8 LB-FT
Volts	575	Start Configuration	direct on line
Full Load Amps	3.3	Breakdown Torque	36.5 LB-FT
R.P.M.	1760	Pull-up Torque	19.2 LB-FT
Hz	60	Locked-rotor Torque	22.4 LB-FT
NEMA Design Code	B	Starting Current	26.8 A
Service Factor (S.F.)	1	No-load Current	1.95 A
NEMA Nom. Eff.	89.5	Line-line Res. @ 25°C	5.97 Ω
Rating - Duty	40C AMB-CONT	Temp. Rise @ Rated Load	42.5
		Locked-rotor Power Factor	0.298 LB-FT2
		Rotor inertia	

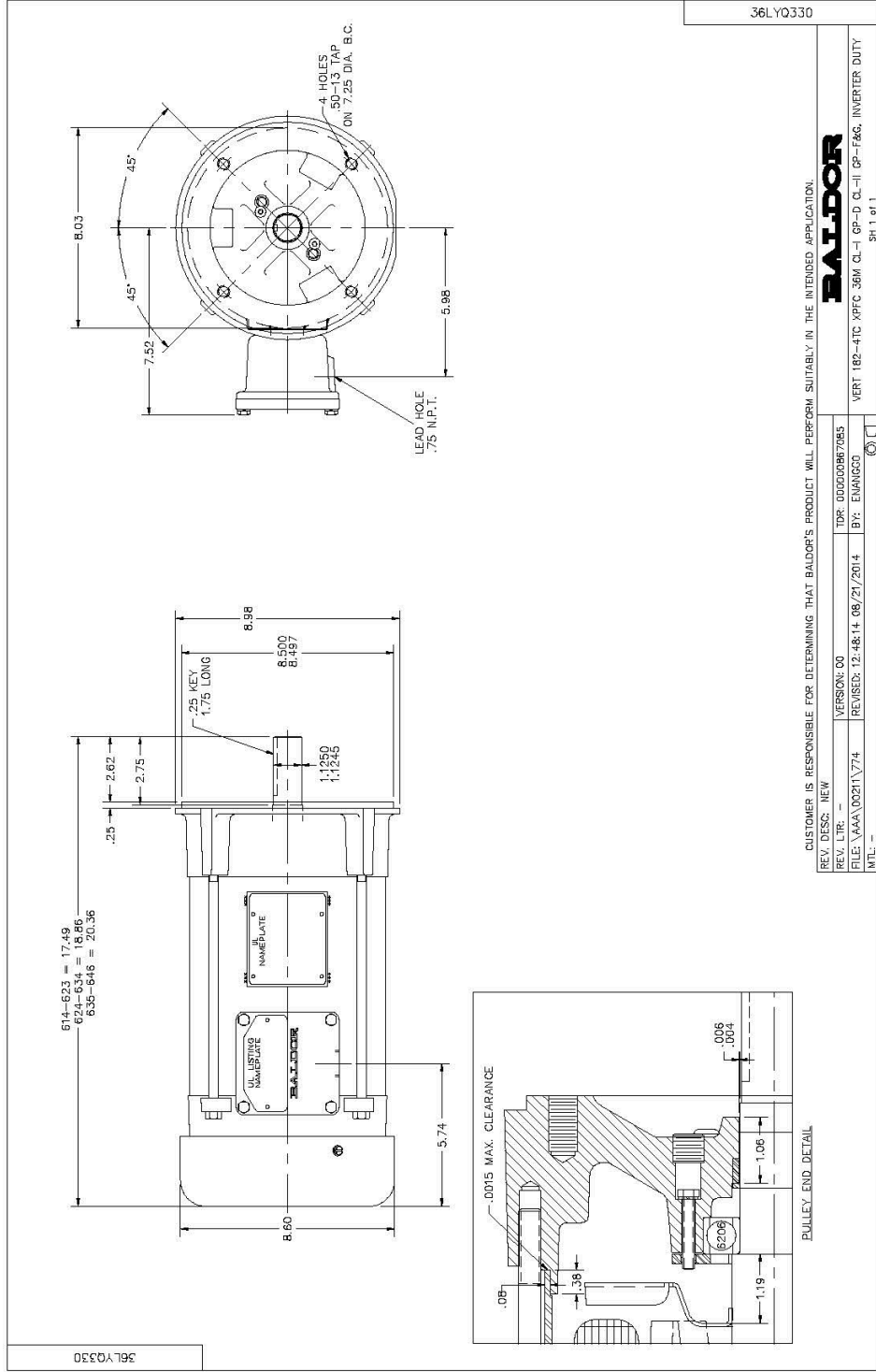
Load Characteristics 575 V, 60 Hz, 2.2 KW

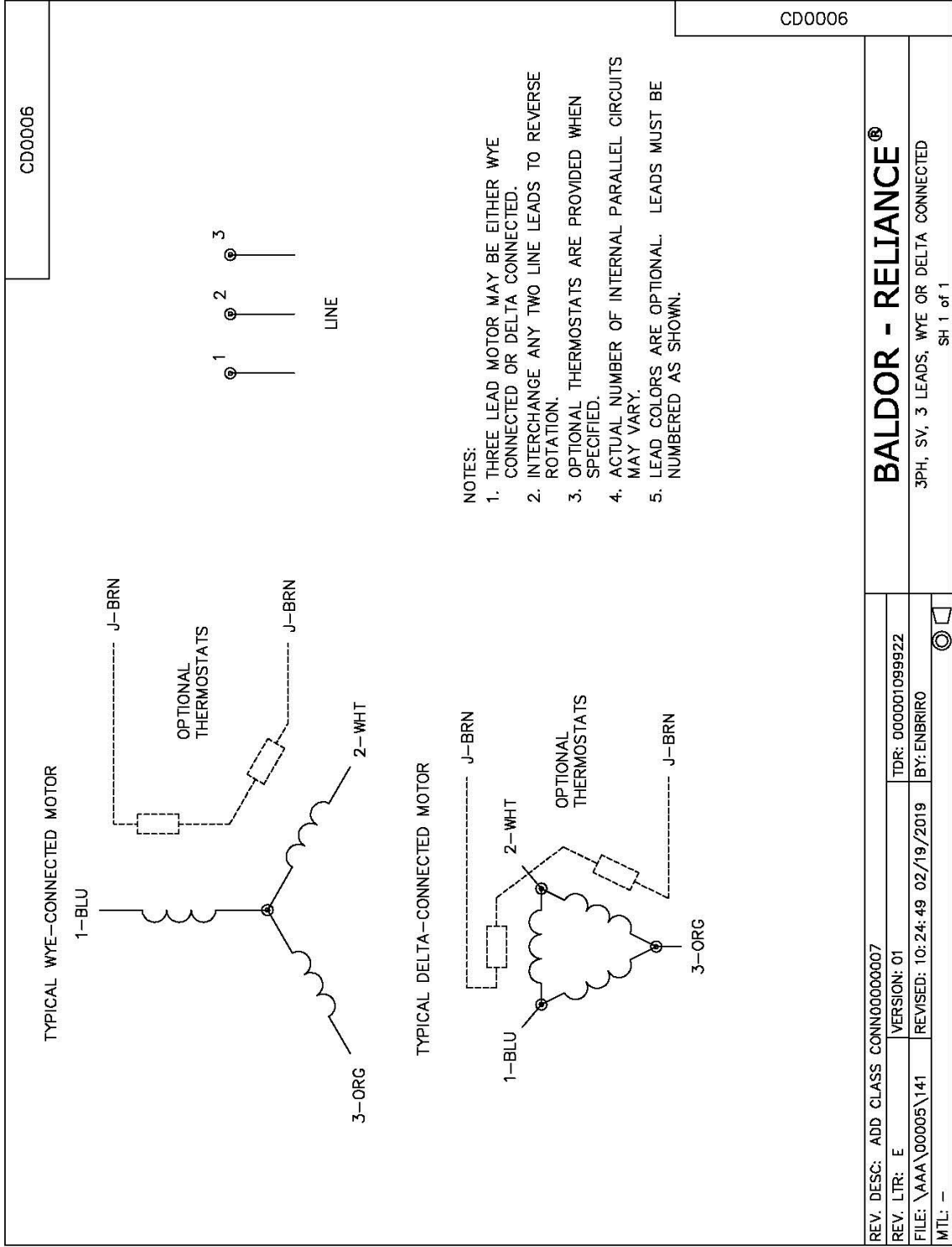
% of Rated Load	25	50	75	100	125	150
Power Factor	33	53	65	73	78	81
Efficiency	81.2	87.9	90.1	90.4	90.3	89.8
Speed	1795	1788	1779	1771	1762	1752
Line amperes	2.09	2.43	2.85	3.36	3.94	4.52

BALDOR • RELIANCE CUSTOMER INFORMATION PACKET VXM18342T-5 - 3HP, 1760RPM, 3PH, 60HZ, 182TC, 3632M, XPFC, F1



BALDOR • RELIANCE CUSTOMER INFORMATION PACKET VXM18342T-5 - 3HP, 1760RPM, 3PH, 60HZ, 182TC, 3632M, XPFC, F1







PARALLEL HELICAL CLINCHER™

PERFORMANCE SPECIFICATIONS

- configuration: offset parallel
- integral motor HP (min. / max.): 0.16 / 200
- integral motor kW (min. / max.): 0.12 / 160
- typical efficiency: 97%
- # of gear reductions: 2 to 6

RATIO AND SPEED

- minimum standard ratio: 4.03:1
- maximum standard ratio: 6616.79
- minimum output speed from 1750 rpm motor: 0.26 rpm
- maximum output speed from 1750 rpm motor: 434 rpm

MOUNTING STYLES

- shaft mount housing style: standard
- integral torque tab: standard
- B5 flange outside diameter range [in]: 5.51 to 25.98
- B5 flange outside diameter range [mm]: 140 to 660
- footed housing style available
- B14 flange outside diameter range [in]: 3.94 to 17.72
- B14 flange outside diameter range [mm]: 100 to 450

OPTIONS

- custom adapter flange
- flange pilot removed
- shock dampeners
- effective drywell with flange

1,866 lb-in is required for the Napanee application



Unit Size	Torque Max.		Ratio Range min.-max.	Keyed Hollow Shaft Dia.				Solid Shaft Dia.		Shrink Disc Shaft Dia.	
	[lb-in]	[Nm]		Std-[in]	Opt-[in]	Opt-[in]	Opt-[in]	[mm]	[in]	[mm]	[in]
SK 0182	1,027	116	4.24 - 81.71	0.750	0.500			25	0.750		
SK 0282	1,460	165	4.03 - 139.16	1.000	1.1875	0.750		30	1.000	25	1.188
SK 1282	2,620	296	4.79 - 109.50	1.188	1.250	1.000	0.750	30			1.250
SK 1382	3,275	370	16.28 - 381.45	1.375	1.4375	1.250		35	1.250	30	1.500
SK 2282	4,983	563	4.51 - 127.51								
SK 2382	4,983	563	82.22 - 763.41	1.438	1.500	1.375	1.250	35	1.375	35	1.500
SK 3282	8,983	1,015	4.48 - 112.23								
SK 3382	9,195	1,039	89.60 - 1022.42	1.625	1.500	1.438		40	1.875	45	1.625
SK 4282	17,700	2,000	4.70 - 155.40								
SK 4382	18,381	2,077	86.83 - 1585.08	2.062	2.000	1.938	1.688	50	2.250	55	2.000
SK 5282	28,630	3,235	4.32 - 134.03								
SK 5382	28,320	3,200	82.72 - 1367.08	2.438	2.375	2.188		60	2.500	65	2.500
SK 6282	40,152	4,537	4.39 - 80.33								
SK 6382	53,100	6,000	24.42 - 551.58	2.750	2.938	2.438		70	3.000	75	3.000
SK 7282	57,266	6,471	4.26 - 69.73								
SK 7382	73,455	8,300	22.67 - 338.79	3.188	3.250	2.938		80	3.500	90	3.188
SK 8282	93,969	10,618	4.52 - 72.21								
SK 8382	116,820	13,200	30.92 - 386.68	4.062	4.000	3.938	3.438	100	4.250	110	4.000
SK 9282	158,681	17,930	5.34 - 34.38								
SK 9382	224,790	25,400	35.61 - 352.36	4.750	4.938	4.438		120	5.250	140	4.750
SK 10282	283,200	32,000	5.20 - 18.24								
SK 10382	329,220	37,200	21.00 - 357.40					160	6.250	160	6.250
SK 11282	371,700	42,000	7.67 - 34.85								
SK 11382	610,650	69,000	31.96 - 224.76					180	7.000	180	7.000
SK 12382	796,500	90,000	69.12 - 201.75					180	7.000	180	7.000

SHAFT DATA

- input and output shaft material: AISI 1045 or 4140
- input and output shaft key dimensions [in]: according to ANSI B17
- input and output shaft key dimensions [mm]: according to DIN 747
- output shaft drill and tap: standard
- number of hollow shaft keys: 2
- shrink disc size range [in]: 1.188 to 7.000
- shrink disc size range [mm]: 30 to 180
- minimum gripping safety factor range [h6 fit]: 2.2 to 5.9

OPTIONS

- double solid output shaft
- shaft fixing element
- custom shaft diameters
- hollow spline per DIN 5480
- custom spline
- cross drilled holes
- 304 stainless steel

MOTOR MOUNTING

- integral motor: 1/6 to 250 HP
- C-face adapter frame size range: 56C to 360TC
- IEC adapter (B5) frame size range: IEC 63 to IEC 315
- sugar scoop motor availability: 56 to 365T
- top mount platform motor availability: 56 to 405T

OPTIONS

- custom motor adapter
- custom coupling diameter

GEARING

- quality rating on gears: up to AGMA Class 13
- minimum hardness of steel gears: 58 Rockwell C
- hard finishing of gear teeth: grinding or slive hob
- drop forged gear blanks: standard
- momentary overload capacity: 275%
- hunting tooth ratios: standard

HOUSING

- typical housing material: Class 35 gray iron (smallest sizes have aluminum alloy material)
- machining method: single setup
- main housing design: UNICASE™ one piece
- seal carrier: direct to main housing
- housing torsional stiffness: exceptional
- housing wall section: thick
- casting sealing method: dip seal

BEARINGS

- bearing quality: ABEC-1
- standard output bearing: ball
- heavy-duty output bearing: tapered or spherical

LUBRICANT AND SEALING COMPONENTS

- factory filled lubricant type: ISO 220 mineral oil (smallest sizes have synthetic oil as standard)
- typical breather vent style: AUTOVENT (except smallest sizes)
- output seal design: QUADRILIP™ Seal System
- output shaft oil seals: 1 double lip and 1 single lip
- oil seal lip material: nitrile rubber
- oil seal to housing gasket: nitrile rubber

OPTIONS

- custom synthetic lubricating oil
- custom temperature lubricating oil
- fluid grease lubricant
- food grade lubricating oil
- long term storage preparation
- magnetic drain plug
- bullseye sight glass
- custom drain plug
- fluorinated rubber oil seal material
- custom oil seals

INTERNAL PARTS ASSEMBLY

- assembly method: heavy press fit
 - reversing duty: standard
 - typical backlash range [arc minutes]: 6 to 11
- #### OPTION
- internal backstop

ENVIRONMENTAL PROTECTION

- exterior primer coverage: all metal exterior surfaces
 - paint type: Water Based Resin
 - paint additive: 316 stainless steel flakes
 - USDA incidental contact exposure: H1
- #### OPTIONS
- NSD+ protection
 - custom paint
 - high pressure washdown IP66 oil seals
 - shaft seal covers

MECHANICAL VARIABLE SPEED COMPATIBILITY

- HP range with TITAN™ belt box: 0.33 to 150
- speed range with TITAN™ belt box: 6.1 to 883
- HP range with NORDISC® traction drive: 0.25 to 7.5
- speed range with NORDISC® traction drive: 0.3 to 485

THE INTELLIGENT CHOICE

NORD Gear Corporation

National Customer Service Toll Free 888.314.NORD

WEST

1121 Railroad Street, Bldg. 101
Corona, CA 92882
Phone: 909.279.2600
Fax: 888.GOT.NORD (408.6673)

MIDWEST

800 Nord Dr., P.O. Box 367
Wauunakee, WI 535 97-03 67
Phone: 608.849.7300
Fax: 800.373.NORD (6673)

SOUTH

647 Michael Wylie Drive
Charlotte, NC 28217
Phone: 704.529.1255
Fax: 888.259.NORD (6673)

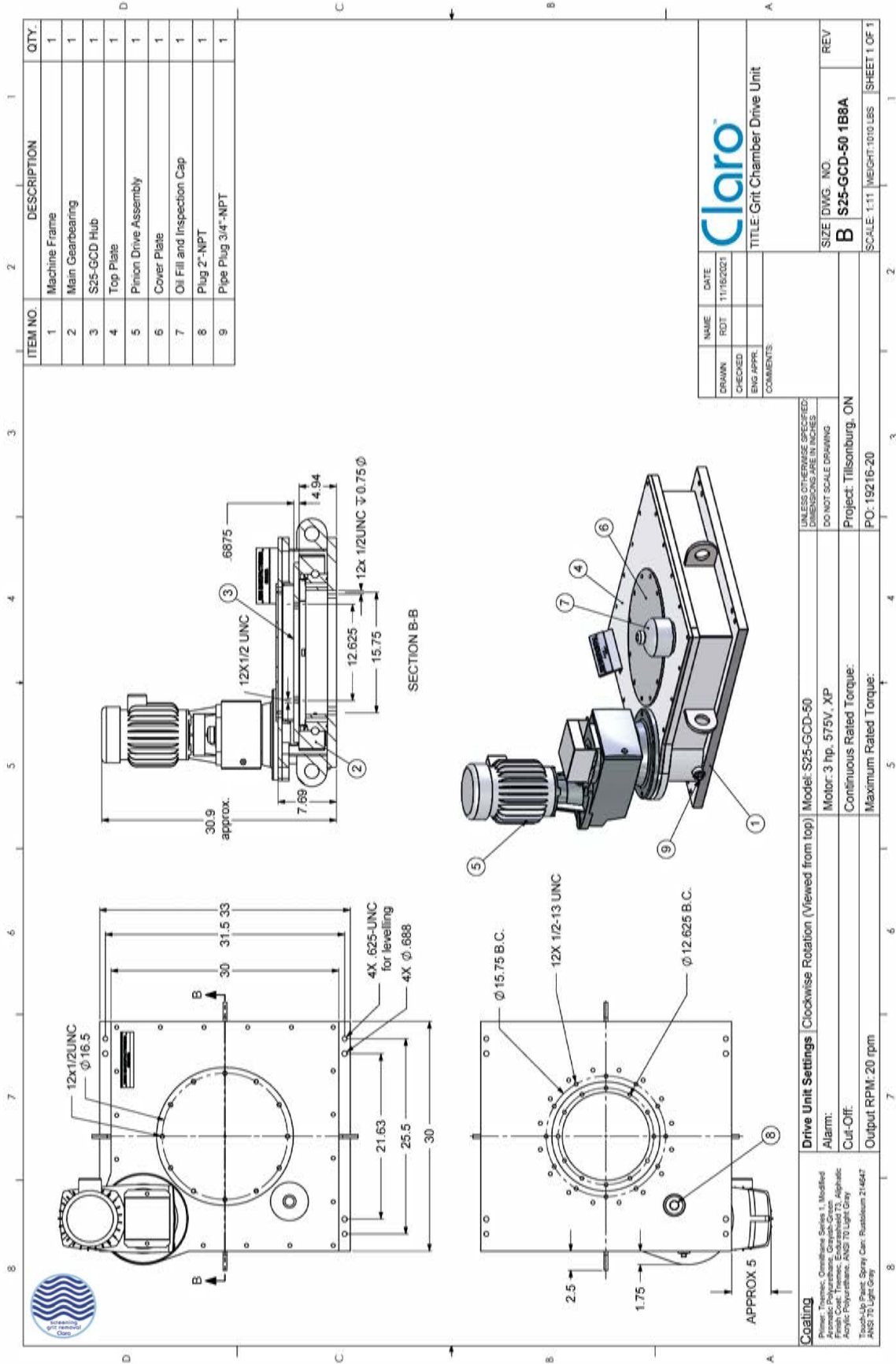
NORD Gear Limited

Toll Free in Canada 800.668.4378

CANADA

41 West Drive
Brampton, Ontario L6T 4A1
Phone: 905.796.3606
Fax: 905.796.8130

www.nord.com



ITEM NO.	DESCRIPTION	QTY.
1	Machine Frame	1
2	Main Gearbearing	1
3	S25-GCD Hub	1
4	Top Plate	1
5	Pinion Drive Assembly	1
6	Cover Plate	1
7	Oil Fill and Inspection Cap	1
8	Plug 2" NPT	1
9	Pipe Plug 3/4" NPT	1



TITLE: Grit Chamber Drive Unit

NAME	DATE
DRAWN	11/16/2021
CHECKED	
ENG APPR	
COMMENTS	

SIZE	DWG. NO.	REV
B	S25-GCD-50 1B8A	

SCALE: 1:11 | WEIGHT: 1010 LBS | SHEET 1 OF 1

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES. DO NOT SCALE DRAWING.

Project: Tilsonburg, ON
 PC: 19216-20

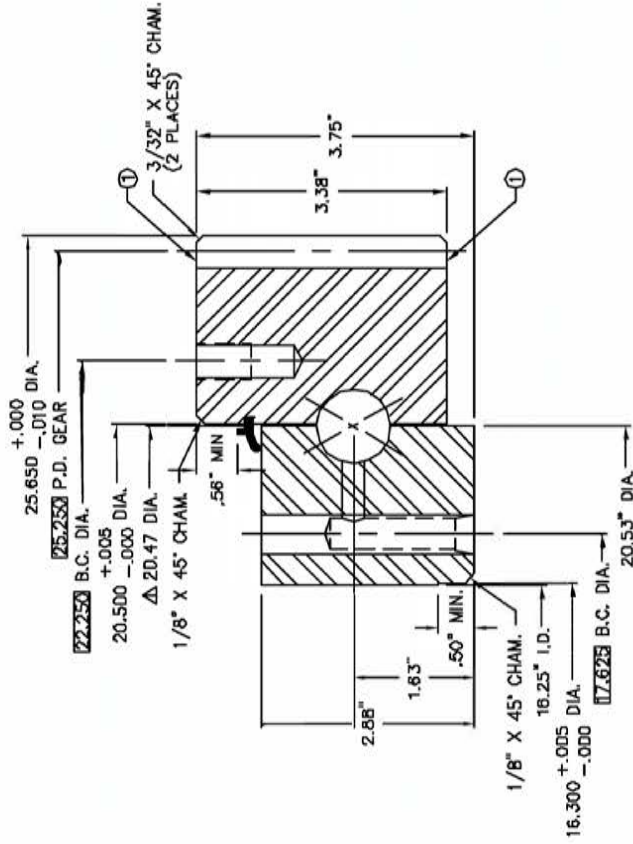
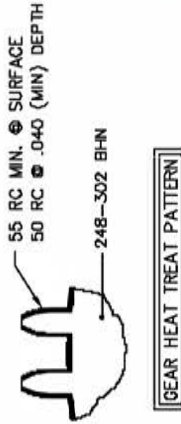
Drive Unit Settings | Clockwise Rotation (Viewed from top) | Model: S25-GCD-50
 Motor: 3 hp, 575V, XP
 Continuous Rated Torque:
 Maximum Rated Torque:

Coating
 Primer: 3M Dymec Oxidation Series 1, Modified
 Finish Coat: Truarc Enkashield T3, Aliphatic
 Acrylic Polyurethane, ANSI 70 Light Gray
 Touch-Up Paint: Spray Can: Rustolux 21-647
 ANSI 70 Light Gray





GEAR DATA	
TOOTH FORM	INV. STUB
PITCH DIAMETER	25.250
DIAMETRAL PITCH	4
PRESSURE ANGLE	20°
NUMBER OF TEETH	101
ADDENDUM	.2000
DEDENDUM	.2500
HARDNESS	SEE GEAR HEAT TREAT PATTERN
DIMENSION BETWEEN .4320 DIA. PINS	25.811±.011
CHORDAL TOOTH THICKNESS	.3787–.3707
ABOVE TOOTH THICKNESS WILL PRODUCE	
0.014"–0.022" BACKLASH CUT INTO GEAR	



BEARING DATA	
INNER RACE HOLE PATTERN	16 HOLES EQUALLY SPACED 17/32 DIA. DRILL THRU Φ .030
(1) 1/8–27 NPT VERTICAL LUBE HOLE LOCATED 22.5" COUNTERCLOCKWISE FROM LOADING PLUG AND 11.25" FROM MTG. HOLE AS VIEWED FROM MTG. FACE.	
OUTER RACE HOLE PATTERN	18 HOLES EQUALLY SPACED 1/2–13 UNC–2B TAP X 3/4 DEEP Φ .030
BEARING CONTACT ANGLE	60°
BEARING RACE HEAT TREAT	INDUCTION HARDENED AND GROUND
LUBRICATION	OIL BATH
NOTES:	

- NOTES:
- POINT OF MINIMUM GEAR BACKLASH TO BE PUNCH MARKED ON TOP & BOTTOM OF GEAR TOOTH.
 - LOADING PLUG TO BE SEALED WITH 'O' RING & RTV ADHESIVE SEALANT
 - FREE STATE TURNING TORQUE 25 FT. LBS. MAX.
 - BEARING TO BE PACKAGED AND RUST PROOFED FOR ONE YEAR INSIDE STORAGE.

NO.	REVISIONS	DATE	APPD. BY
Δ	REVISED FORMAT/ADDED BEARING DATA	01/04/98	
Δ	ADDITION OF DIMENSION	06/10/94	

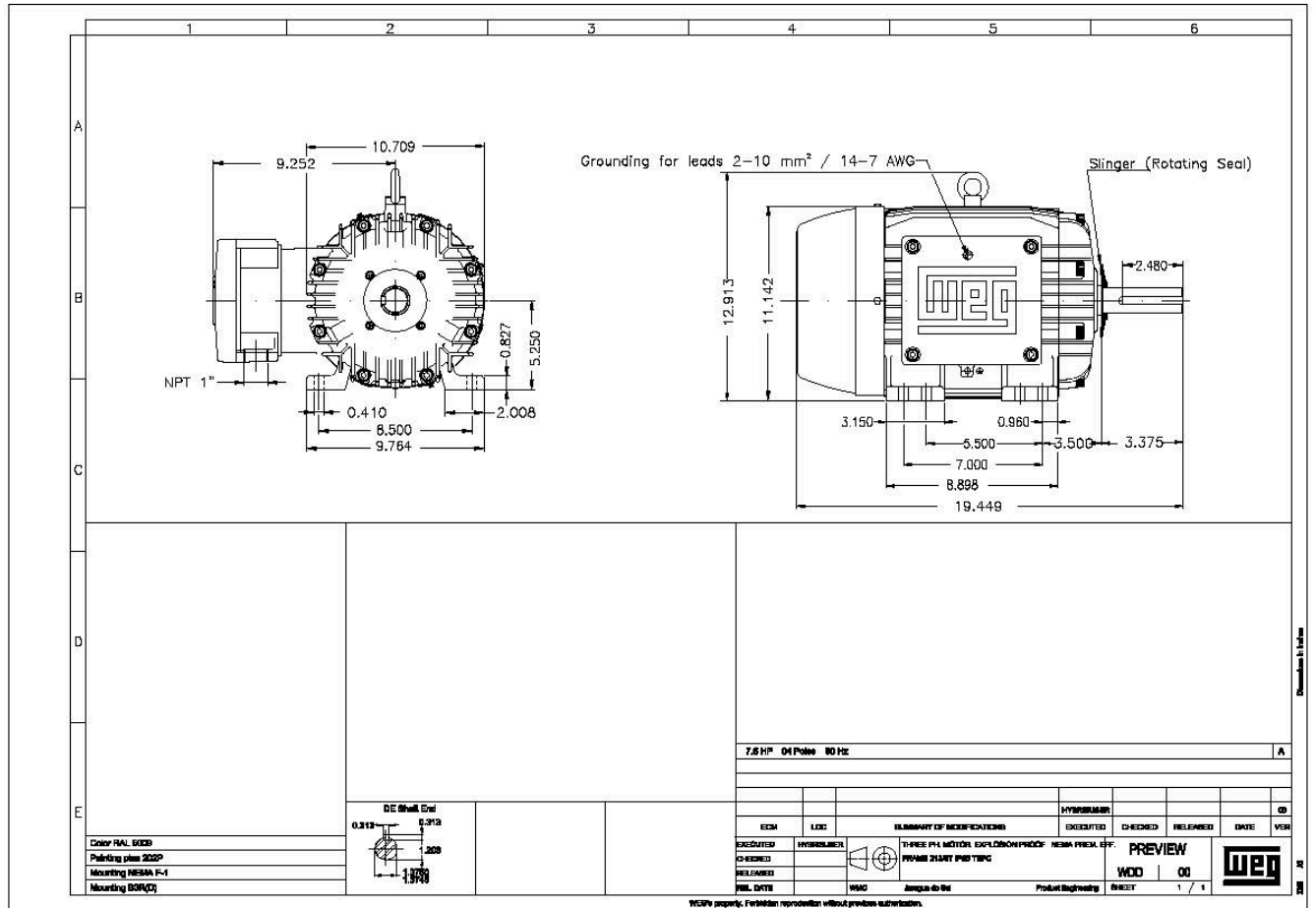
Claro

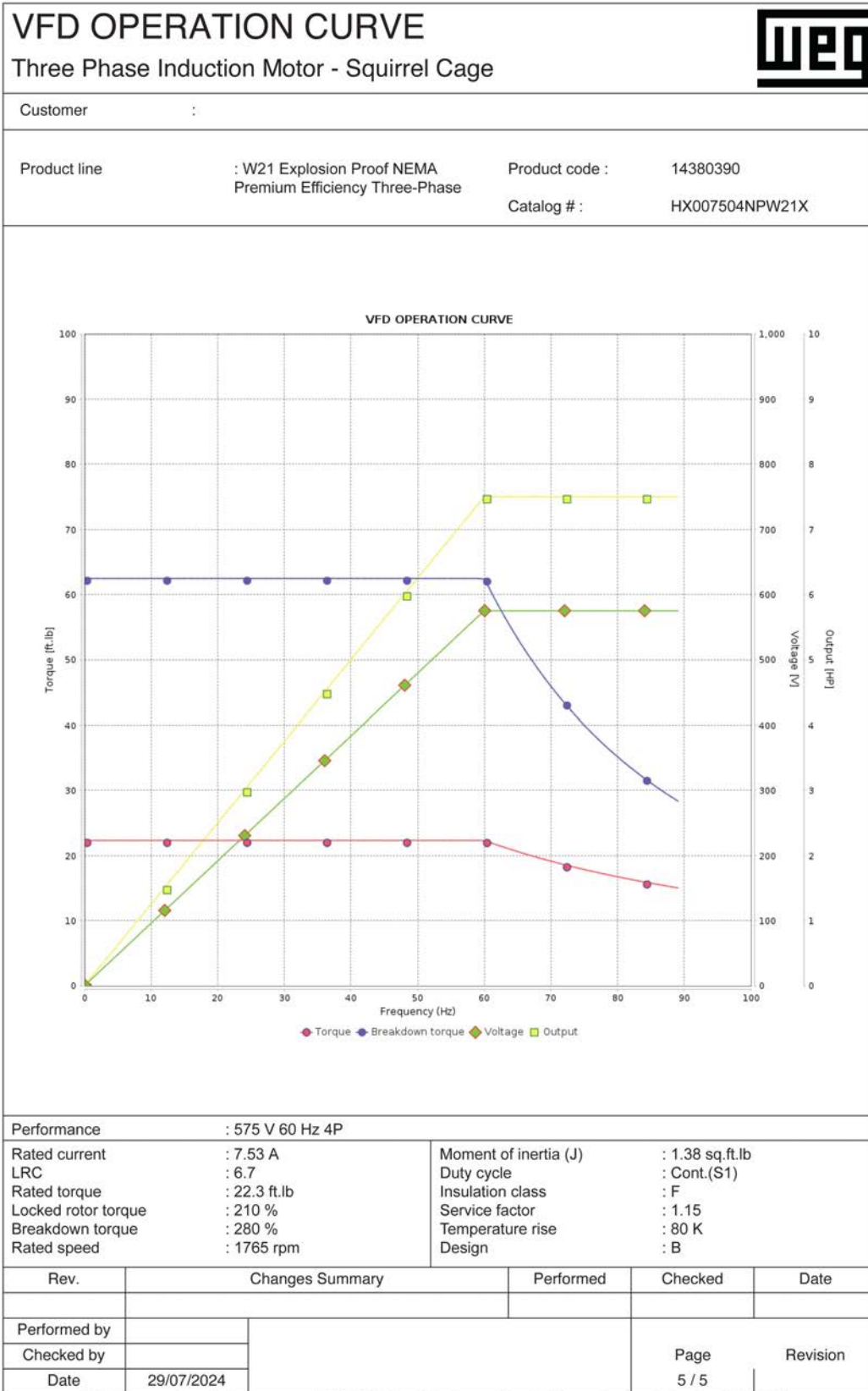
25.25" P.D. EXTERNAL GEAR/BEARING

MODEL	PART #	APPRO BY	OPERATION	JOB REF.	SHEET #
	138-0300-025				1 OF 1
MATERIAL	DATE APPD	DATE	DRAWN BY	SCALE	DWG. #
		03/10/94		0.75" = 1"	00000290



iv. Grit Pumps – WEG (Class I, Div. 1; Belt-Driven Reduction)





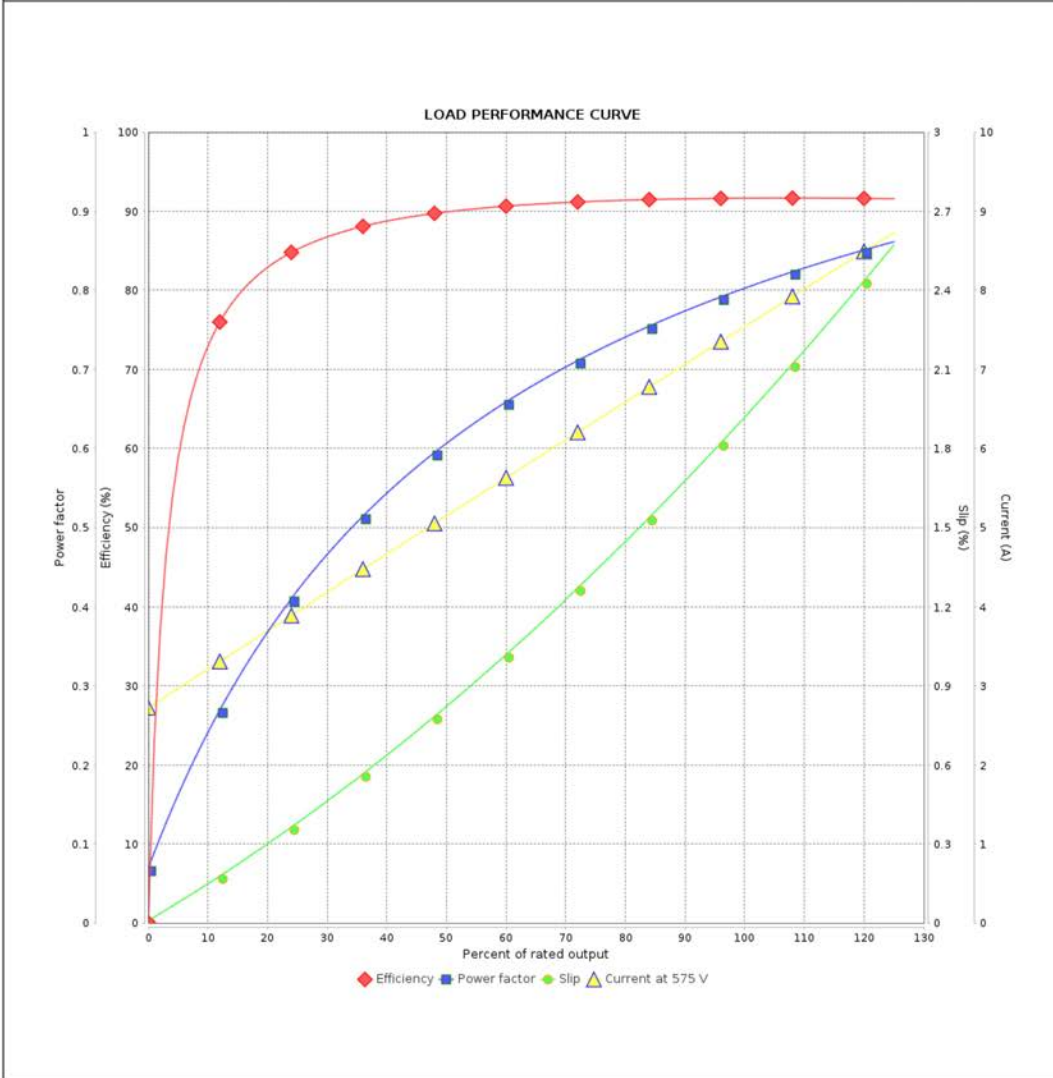
This document is exclusive property of WEG S/A. Reprinting is not allowed without written authorization of WEG S/A.
Subject to change without notice

LOAD PERFORMANCE CURVE

Three Phase Induction Motor - Squirrel Cage



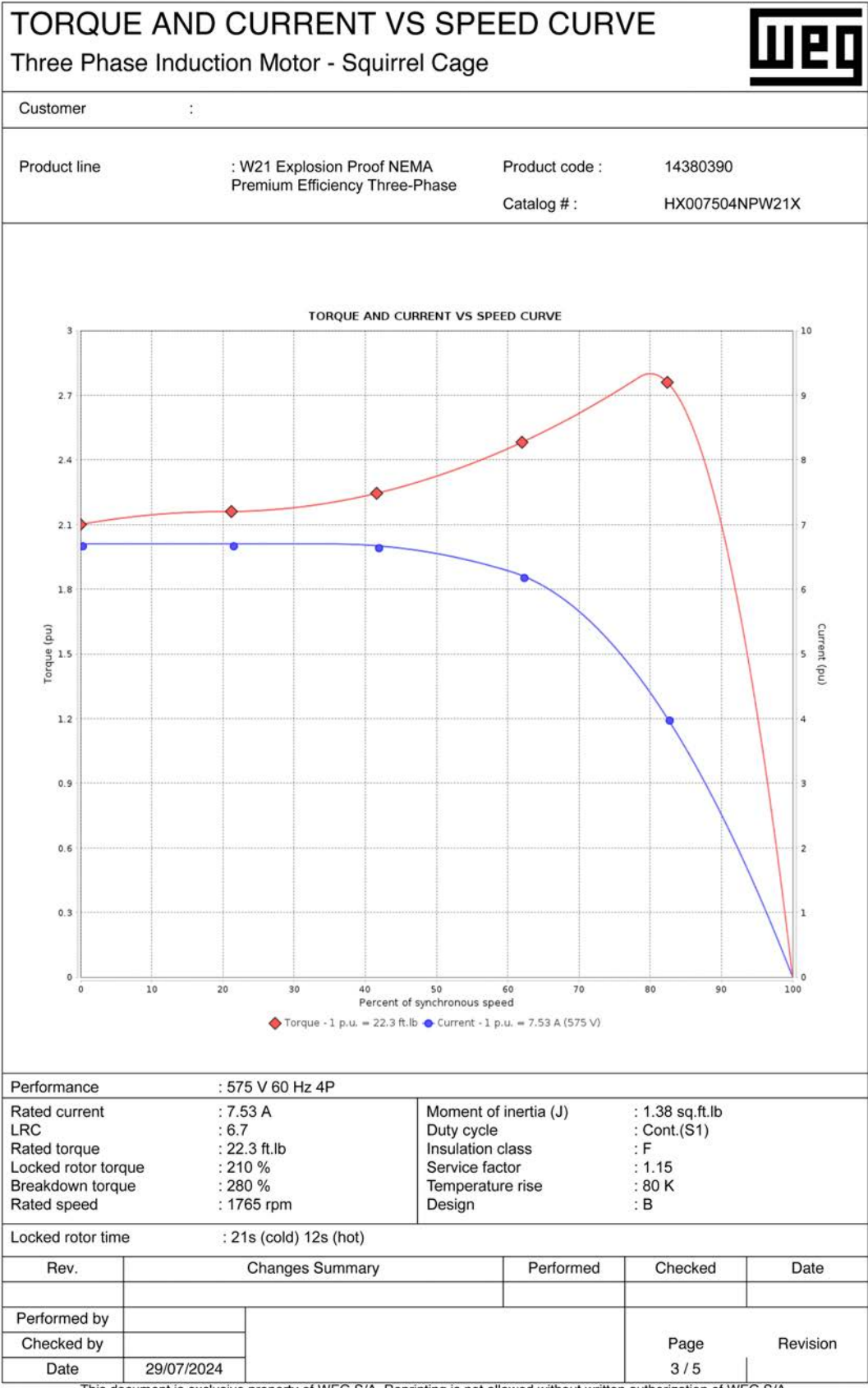
Customer	:	
Product line	: W21 Explosion Proof NEMA Premium Efficiency Three-Phase	Product code : 14380390
		Catalog # : HX007504NPW21X




Performance	: 575 V 60 Hz 4P		
Rated current	: 7.53 A	Moment of inertia (J)	: 1.38 sq.ft.lb
LRC	: 6.7	Duty cycle	: Cont.(S1)
Rated torque	: 22.3 ft.lb	Insulation class	: F
Locked rotor torque	: 210 %	Service factor	: 1.15
Breakdown torque	: 280 %	Temperature rise	: 80 K
Rated speed	: 1765 rpm	Design	: B

Rev.	Changes Summary	Performed	Checked	Date
Performed by			Page	Revision
Checked by			4 / 5	
Date	29/07/2024			

This document is exclusive property of WEG S/A. Reprinting is not allowed without written authorization of WEG S/A. Subject to change without notice



This document is exclusive property of WEG S/A. Reprinting is not allowed without written authorization of WEG S/A. Subject to change without notice

DATA SHEET				
Three Phase Induction Motor - Squirrel Cage				
Customer : _____				
Thermal protection				
ID	Application	Type	Quantity	Sensing Temperature
1	Winding	Thermostat - 2 wires	1 x Phase	155 °C
Rev.	Changes Summary	Performed	Checked	Date
Performed by		Page 2 / 5		Revision
Checked by				
Date	29/07/2024			

This document is exclusive property of WEG S/A. Reprinting is not allowed without written authorization of WEG S/A.
Subject to change without notice

DATA SHEET																					
Three Phase Induction Motor - Squirrel Cage																					
Customer : _____																					
Product line : W21 Explosion Proof NEMA Premium Efficiency Three-Phase			Product code : 14380390																		
			Catalog # : HX007504NPW21X																		
Frame : 213/5T Output : 7.5 HP (5.5 kW) Poles : 4 Frequency : 60 Hz Rated voltage : 575 V Rated current : 7.53 A L. R. Amperes : 50.4 A LRC : 6.7x(Code H) No load current : 2.72 A Rated speed : 1765 rpm Slip : 1.94 % Rated torque : 22.3 ft.lb Locked rotor torque : 210 % Breakdown torque : 280 % Insulation class : F Service factor : 1.15 Moment of inertia (J) : 1.38 sq.ft.lb Design : B			Locked rotor time : 21s (cold) 12s (hot) Temperature rise : 80 K Duty cycle : Cont.(S1) Ambient temperature : -20°C to +40°C Altitude : 1000 m.a.s.l. Protection degree : IP55 Cooling method : IC411 - TEFC Mounting : F-1 Rotation ¹ : Both (CW and CCW) Noise level ² : 58.0 dB(A) Starting method : Direct On Line Approx. weight ³ : 198 lb																		
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Output</td> <td style="width: 15%;">25%</td> <td style="width: 15%;">50%</td> <td style="width: 15%;">75%</td> <td style="width: 15%;">100%</td> </tr> <tr> <td>Efficiency (%)</td> <td>89.4</td> <td>90.2</td> <td>91.0</td> <td>91.7</td> </tr> <tr> <td>Power Factor</td> <td>0.40</td> <td>0.60</td> <td>0.73</td> <td>0.80</td> </tr> </table>			Output	25%	50%	75%	100%	Efficiency (%)	89.4	90.2	91.0	91.7	Power Factor	0.40	0.60	0.73	0.80	Foundation loads Max. traction : 254 lb Max. compression : 451 lb			
Output	25%	50%	75%	100%																	
Efficiency (%)	89.4	90.2	91.0	91.7																	
Power Factor	0.40	0.60	0.73	0.80																	
Losses at normative operating points (speed;torque), in percentage of rated output power																					
P1 (0,9;1,0)	P2 (0,5;1,0)	P3 (0,25;1,0)	P4 (0,9;0,5)	P5 (0,5;0,5)	P6 (0,5;0,25)	P7 (0,25;0,25)															
8.8	7.3	6.4	4.4	2.9	1.9	1.3															
Bearing type : _____ Sealing : _____ Lubrication interval : _____ Lubricant amount : _____ Lubricant type : _____			<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center; border-bottom: 1px solid black;">Drive end</td> <td style="width: 50%; text-align: center; border-bottom: 1px solid black;">Non drive end</td> </tr> <tr> <td style="text-align: center;">6308 2RS</td> <td style="text-align: center;">6207 2RS</td> </tr> <tr> <td style="text-align: center;">Oil Seal</td> <td style="text-align: center;">Lip Seal</td> </tr> <tr> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> </tr> <tr> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> </tr> <tr> <td colspan="2" style="text-align: center;">Mobil Polyrex EM</td> </tr> </table>				Drive end	Non drive end	6308 2RS	6207 2RS	Oil Seal	Lip Seal	-	-	-	-	Mobil Polyrex EM				
Drive end	Non drive end																				
6308 2RS	6207 2RS																				
Oil Seal	Lip Seal																				
-	-																				
-	-																				
Mobil Polyrex EM																					
Notes																					
This revision replaces and cancel the previous one, which must be eliminated. (1) Looking the motor from the shaft end. (2) Measured at 1m and with tolerance of +3dB(A). (3) Approximate weight subject to changes after manufacturing process. (4) At 100% of full load.			These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG-1.																		
Rev.	Changes Summary			Performed	Checked	Date															
Performed by																					
Checked by				Page		Revision															
Date	29/07/2024			1 / 5																	

This document is exclusive property of WEG S/A. Reprinting is not allowed without written authorization of WEG S/A. Subject to change without notice

iv. Grit Classifier – Baldor & SEW (Class I, Div. 1)

- SEW Gear Drive – FAZ77 AMS143
- Baldor Motor – 0.75 kW; 1800 RPM; 575V / 3 Phase / 60 Hz; Class I, Div. 1, Gr. D

**Par.shaft helical gear unit with adapter
FAZ77 AMS143**



Remark:

Colour and technical specifications may vary from the picture shown. The technical specification is according to the following data.

Links to documentation:



Technical data

Speed [r/min]	: 1760 / 7.8
Total ratio [i]	: 225,79 / infinite
Ma max [Nm]	: 1500
Mou. pos. / Pivoting angle [°]	: M1-M4 / 45
Lubricant / -volume [l]	: CLP 220 Miner.Oil / 6,90
Corrosion protection	: Yes
Surface protection	: OS2 to technical data sheet 01802__94
Paint coat	: Top coat RAL6005 moss green
Gear unit	: FAZ77
Ma max G [Nm]	: 1500
Hollow shaft	: 50mm
Design	: B14-flange-mounted version and hollow shaft
Safety cover	: None
Flange	: 125mm centering shoulder
Documentation no. A	: 26856956

Parts list	: 422681595
Adapter	: AMS143
Input flange	: Centering diameter 114.3mm, hole circle 149.2mm, bore 10.5 (NEMA)
Bore on input side	: 0.875 inch (22.225mm)
Max. insertion depth (mot. SE)	: 53.85mm
Spare parts list	: You can find the SWPL (spare and wearing parts list) under the serial number in the Online Support.
Nameplate	: English
Nameplate position	: Attached to the gear unit
Opera.instr. A lang./quantity	: English / 0
Parts list/language/quantity	: English / 0
Commodity code	: 84834021

net weight [KG] : approx. 64/PC 64/Pos.



Customer information packet

VXM14142T-5

1HP, 1770RPM, 3PH, 60HZ, 143TC, 3522M, XPFC, F1
CLARO ENVIRONMENTAL TECH.
Class - CLI GP D; CLII GP F,G
Division - Division I

Specifications

Enclosure	XPFC
Frame	143TC
Frame Material	Steel
Frequency	60.00 Hz
Haz Area Class and Group	CLI GP D; CLII GP F,G
Haz Area Division	Division I
Motor Letter Type	Three Phase
Output @ Frequency	1.000 HP @ 60 HZ
Phase	3
Synchronous Speed @ Frequency	1800 RPM @ 60 HZ
Voltage @ Frequency	575.0 V @ 60 HZ
Agency Approvals	UL CSA EEV
Ambient Temperature	40 °C
Auxillary Box	No Auxillary Box
Auxillary Box Lead Termination	None
Base Indicator	No Mounting
Bearing Grease Type	Polyrex EM (-20F +300F)
Blower	None
Constant Torque Speed Range	6
Current @ Voltage	1.250 A @ 575.0 V
Design Code	B
Drip Cover	No Drip Cover
Duty Rating	CONT
Efficiency @ 100% Load	85.5 %
Electrically Isolated Bearing	Not Electrically Isolated
Feedback Device	NO FEEDBACK
Haz Area Temp Code	T3C
Heater Indicator	No Heater
High Voltage Full Load Amps	1.3 a
Insulation Class	F
Inverter Code	Inverter Duty

Part detail

Revision	A
Type	AC
Mech. spec.	
Base	
Status	PRD/A
Elec. spec.	35WGG119
Layout	35LYE380
Eff. date	07-14-2022
CD Diagram	CD0006
Poles	04
Leads	3#18
Proprietary	False
Created date	10-28-2021

KVA Code	M
Lifting Lugs	No Lifting Lugs
Locked Bearing Indicator	Locked Bearing
Max Speed	2700 rpm
Motor Lead Termination	Flying Leads
Motor Standards	NEMA
Motor Type	3522M
Mounting Arrangement	F1
Number of Poles	4
Overall Length	16.09 IN
Power Factor	71
Product Family	General Purpose
Pulley Face Code	C-Face
Rodent Screen	None
Service Factor	1.00
Shaft Diameter	0.875 IN
Shaft Ground Indicator	No Shaft Grounding
Shaft Rotation	Reversible
Speed	1770 rpm
Speed Code	Single Speed
Starting Method	Direct on line
Thermal Device - Bearing	None
Thermal Device - Winding	Normally Closed Thermostat
Vibration Sensor Indicator	No Vibration Sensor
Winding Thermal 1	None
Winding Thermal 2	None

Nameplate

NP0887XPSLEV

NO.		CC	010A						
S/N		TEMP CODE	T3C						
SPEC.	35-0000-1376	INV.TYPE	PWM						
CAT.NO.	VXM14142T-5	C HP FR	60	C HP TO	90				
HP	1	CT HZ FROM	6	CT HZ TO	60				
VOLTS	575	VT HZ FROM	6	VT HZ TO	60				
AMPS	1.25	MAG CUR	.82						
RPM	1770	MX RPM	2700						
HZ	60	PH	3	CL	F	NOM.EFF.	85.5		
SER.F.	1.00	DES	B	SL HZ	1	WK2	0.159		
FRAME	143TC	RATING	40C AMB-CONT						
	NEMA MG-1 PART 5, IP54								
	1.15 SF ON SINE WAVE								

AC Induction Motor Performance Data

Record # 87429

Typical performance - not guaranteed values

Winding: 35WGG119-R003		Type: 3522M		Enclosure: XPFC	
Nameplate Data			575 V, 60 Hz: Single Voltage Motor		
Rated Output (HP)		1	Full Load Torque		2.99 LB-FT
Volts		575	Start Configuration		direct on line
Full Load Amps		1.3	Breakdown Torque		13.4 LB-FT
R.P.M.		1775	Pull-up Torque		6.8 LB-FT
Hz	60	Phase	3	Locked-rotor Torque	8.3 LB-FT
NEMA Design Code	B	KVA Code	M	Starting Current	10.9 A
Service Factor (S.F.)		1	No-load Current		0.87 A
NEMA Nom. Eff.	85.5	Power Factor	70	Line-line Res. @ 25°C	30.1 Ω
Rating - Duty		40C	AMB-CONT	Temp. Rise @ Rated Load	36°C
S.F. Amps				Temp. Rise @ S.F. Load	43°C
				Locked-rotor Power Factor	63.4
				Rotor inertia	0.159 lb-ft ²

Load Characteristics 575 V, 60 Hz, 1 HP

% of Rated Load	25	50	75	100	125	150
Power Factor	31	48	61	70	76	80
Efficiency	72.1	81.6	84.9	85.8	85.7	85
Speed	1794	1787	1781	1774	1767	1758
Line amperes	0.89	0.97	1.1	1.26	1.44	1.65

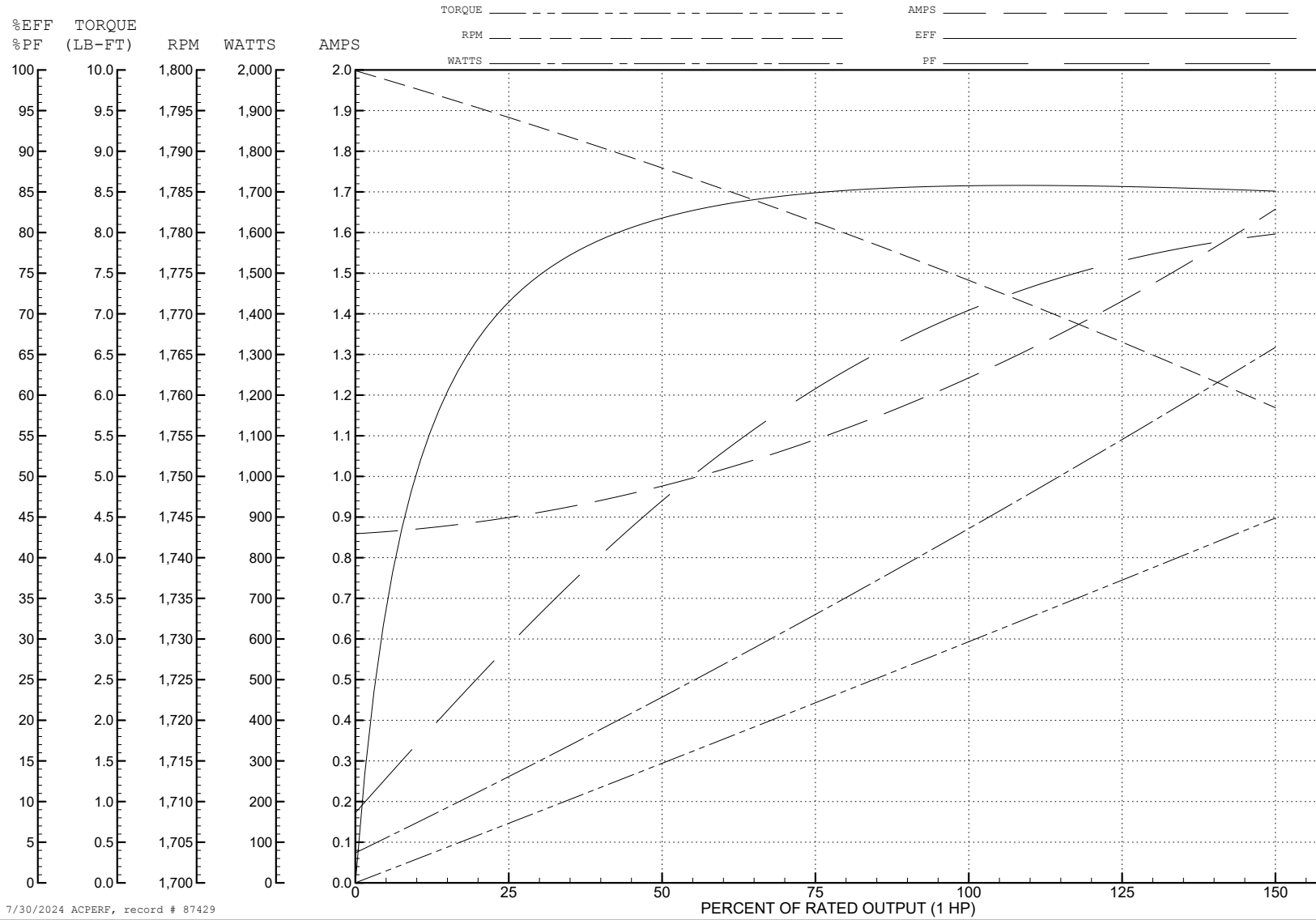
ABB Motors and Mechanical Inc.

WINDING # 35WGG119

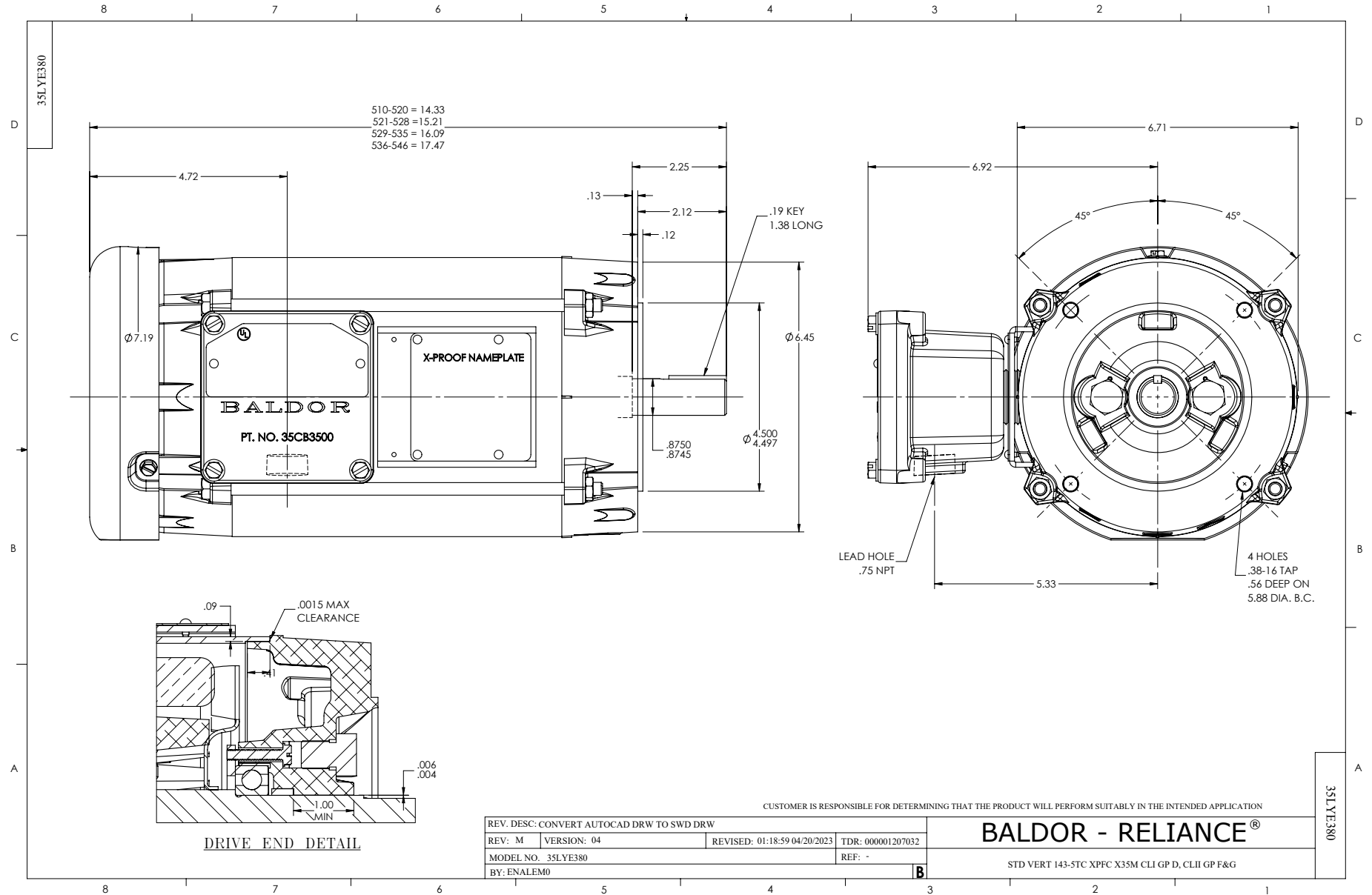
Typical performance - not guaranteed values.

1 HP 3 PH 60 HZ 1775 RPM 575 V 3522M

TORQUES (LB-FT): PO=13.4 PU=6.8 LR=8.3 LRA=10.9



7/30/2024 ACPERF, record # 87429



CD0006



NOTES:

1. THREE LEAD MOTOR MAY BE EITHER WYE CONNECTED OR DELTA CONNECTED.
2. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
3. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
4. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY VARY.
5. LEAD COLORS ARE OPTIONAL. LEADS MUST BE NUMBERED AS SHOWN.

CD0006

REV. DESC: ADD CLASS CONN00000007		
REV. LTR: E	VERSION: 01	TDR: 000001099922
FILE: \AAA\00005\141	REVISED: 10:24:49 02/19/2019	BY: ENBRIRO
MTL: -	© □	

BALDOR - RELIANCE®

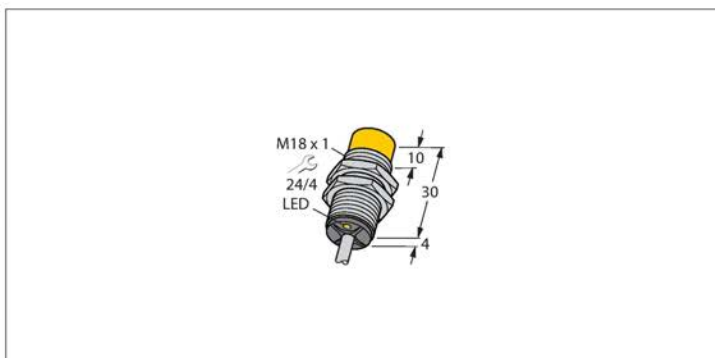
3PH, SV, 3 LEADS, WYE OR DELTA CONNECTED

SH 1 of 1

I. Screen Home Position (Proximity) Switch (Class I, Div. 1; Connected to Control Panel Intrinsic Panel)

TURCK

NI10-G18-Y1X Inductive sensor



Features

- Threaded barrel, M18 x 1
- Chrome-plated brass
- DC 2-wire, nom. 8.2 VDC
- Output acc. to DIN EN 60947-5-6 (NAMUR)
- Cable connection
- ATEX category II 1 G, Ex zone 0
- ATEX category II 1 D, Ex zone 20
- SIL2 (Low Demand Mode) acc. to IEC 61508, PL c acc. to ISO 13849-1 at HFT0
- SIL3 (All Demand Mode) acc. to IEC 61508, PL e acc. to ISO 13849-1 with redundant configuration HFT1

Technical data

Type	NI10-G18-Y1X
Ident. no.	40151
Rated switching distance	10 mm
Mounting conditions	Non-flush
Secured operating distance	$\leq (0.81 \times S_n)$ mm
Correction factors	St37 = 1; Al = 0.3; stainless steel = 0.7; Ms = 0.4
Repeat accuracy	$\leq 2\%$ of full scale
Temperature drift	$\leq \pm 10\%$
Hysteresis	1...10 %
Ambient temperature	-25...+70 °C
Output function	2-wire, NAMUR
Switching frequency	0.5 kHz
Voltage	Nom. 8.2 VDC
Non-actuated current consumption	≥ 2.1 mA
Actuated current consumption	≤ 1.2 mA
Approval acc. to	KEMA 02 ATEX 1090X
Internal capacitance (C)/inductance (L)	150 nF/150 μ H
Device marking	Ⓢ II 1 G Ex ia IIC T6 Ga/II 1 D Ex ia IIC T115 °C Da (max. U _i = 20 V, I _i = 20 mA, P _i = 200 mW)
Design	Threaded barrel, M18 x 1
Dimensions	34 mm
Housing material	Metal, CuZn, Chrome-plated
Active area material	Plastic, PA12-GF30
End cap	Plastic, EPTR
Max. tightening torque housing nut	25 Nm
Electrical connection	Cable

Wiring diagram



Functional principle

Inductive sensors detect metal objects contactless and wear-free. For this, they use a high-frequency electromagnetic AC field that interacts with the target. Inductive sensors generate this field via an RLC circuit with a ferrite coil.

NI10-G18-Y1X|05-03-2020|19-47|Technical modifications reserved

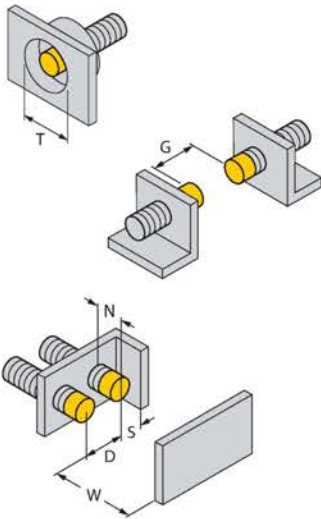


Technical data

Cable quality	Ø 5.2 mm, Blue, LifYY, PVC, 2 m
Core cross-section	2 x 0.34 mm ²
Vibration resistance	55 Hz (1 mm)
Shock resistance	30 g (11 ms)
Protection class	IP67
MTTF	6198 years acc. to SN 29500 (Ed. 99) 40 °C
Switching state	LED, Yellow

Mounting instructions

Mounting instructions/Description

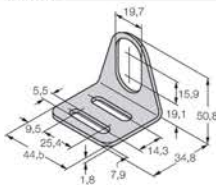


Distance D	3 x B
Distance W	3 x Sn
Distance T	3 x B
Distance S	1.5 x B
Distance G	6 x Sn
Distance N	2 x Sn
Diameter active area B	Ø 18 mm

Accessories

MW18

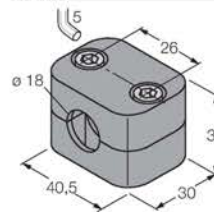
6945004



Mounting bracket for threaded barrel sensors; material: Stainless steel A2 1.4301 (AISI 304)

BSS-18

6901320



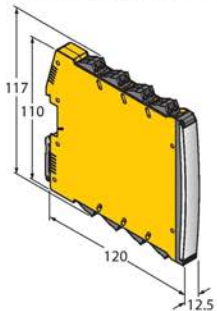
Mounting clamp for smooth and threaded barrel sensors; material: Polypropylene

N110-G18-Y1X| 05-03-2020 19-47 | Technical modifications reserved



IMX12-DI01-2S-2T-0/24VDC

7580020



Isolating switching amplifier, 2-channel; SIL2 acc. to IEC 61508; Ex-proof version; 2 transistor outputs; input Namur signal; ON/OFF switchable monitoring of wire-break and short-circuit; toggle between NO/NC mode; signal doubling; removable screw terminals; 12.5 mm wide; 24 VDC power supply

NI10-G18-Y1X| 05-03-2020 19-47 | Technical modifications reserved



Operating Instructions

Intended use	This device fulfills the directive 2014/34/EC and is suited for use in explosion hazardous areas according to EN 60079-0:2012 + A11 and EN 60079-11:2012. Further it is suited for use in safety-related systems, including SIL2 as per IEC 61508. In order to ensure correct operation to the intended purpose it is required to observe the national regulations and directives.
For use in explosion hazardous areas conform to classification	II 1 G and II 1 D (Group II, Category 1 G, electrical equipment for gaseous atmospheres and category 1 D, electrical equipment for dust atmospheres).
Marking (see device or technical data sheet)	Ⓜ II 1 G and Ex ia IIC T6 Ga acc. to EN60079-0 and -26 and Ⓜ II 1 D Ex ia IIIC T115°C Da acc. to EN60079-0
Local admissible ambient temperature	-25...+70 °C
Installation/Commissioning	These devices may only be installed, connected and operated by trained and qualified staff. Qualified staff must have knowledge of protection classes, directives and regulations concerning electrical equipment designed for use in explosion hazardous areas. Please verify that the classification and the marking on the device comply with the actual application conditions. This device is only suited for connection to approved Exi circuits according to EN 60079-0 and EN 60079-11. Please observe the maximum admissible electrical values. After connection to other circuits the sensor may no longer be used in Exi installations. When interconnected to (associated) electrical equipment, it is required to perform the "Proof of intrinsic safety" (EN60079-14). Attention! When used in safety systems, all content of the security manual must be observed.
Installation and mounting instructions	Avoid static charging of cables and plastic devices. Please only clean the device with a damp cloth. Do not install the device in a dust flow and avoid build-up of dust deposits on the device. If the devices and the cable could be subject to mechanical damage, they must be protected accordingly. They must also be shielded against strong electro-magnetic fields. The pin configuration and the electrical specifications can be taken from the device marking or the technical data sheet.
Service/Maintenance	Repairs are not possible. The approval expires if the device is repaired or modified by a person other than the manufacturer. The most important data from the approval are listed.

N110-G18-Y1X|05-03-2020 19:47 | Technical modifications reserved



J. Ultrasonic Level Transmitters & Level Probes Model Numbers & Specification Data

- i. **Endress+Hauser Level Sensors Model: FDU91-SN3AA (x4; 2 for Each Screen)**



Prosonic S FDU91

FDU91-SN3AA

Approval:	S	CSA Cl.I,II,III Div.1+2 Gr.A-G, zone 1,2
Process Connection:	N	Thread ANSI NPT1, PVDF
Cable Length:	3	15m/49ft
Heater:	A	W/o
Additional Option:	A	Basic version



Endress+Hauser

- ii. **Endress+Hauser Transmitter Model: FMU90-N12CB232AA1A (x2; 1 for Each fine Screen**



**Din Rail-Mount (Located inside Control Panel)
All Setpoint Adjustments from Control Panel HMI**

FMU90-N12CB232AA1A

Approval:	N	CSA General Purpose
Application:	1	Level + pump control, alternating
Housing, Material:	2	DIN Rail mounting PBT, IP20
Operation:	C	Illuminated display + keypad
Power Supply:	B	10.5-32VDC
Level Input:	2	2x sensor FDU9x/8x
Switch Output:	3	3x relay, SPDT
Output:	2	2x 0/4-20mA HART
Additional Input:	A	W/o
Datalog Function:	A	Basic version
Language:	1	DE, EN, NL, FR, ES, IT, PT
Additional Option:	A	Basic version



Endress+Hauser

Technical Information

Prosonic S

FDU90/91/91F/92/93/95

Ultrasonic measurement
Time-of-Flight



Ultrasonic sensors for level and flow measurement for connection to FMU9x

Field of application

- Continuous, non-contact level measurement of fluids and bulk material in silos, on belts, stockpiles and in crushers
- Flow measurement in open channels and at weirs
- Maximum measuring range
 - FDU90: 3 m (9.8 ft) in fluids
1.2 m (3.9 ft) in bulk materials
 - FDU91/FDU91F: 10 m (33 ft) in fluids
5 m (16 ft) in bulk materials
 - FDU92: 20 m (66 ft) in fluids
10 m (33 ft) in bulk materials
 - FDU93: 25 m (82 ft) in fluids
15 m (49 ft) in bulk materials
 - FDU95: 45 m (148 ft) in bulk materials
- International explosion protection certificates





Benefits




- Integrated temperature sensor for Time-of-Flight correction. Accurate measurements are possible, even if temperature changes are present
- Hermetically welded PVDF sensors FDU91/92 for highest chemical resistance
- Suited for rough ambient conditions thanks to separate installation from the transmitter (up to 300 m (984 ft))
- Reduced build-up formation because of the self-cleaning effect
- Weather resistant and flood-proof (IP68)
- Dust-Ex and Gas-Ex certificates available

Table of Contents

Safety symbols	3	Certificates and Approvals	21
Function and system design	3	CE mark	21
Measuring principle	3	Ex approval	21
Time-of-flight correction	4	External standards and directives	21
Blocking distance	4	Ordering information	21
Transmitter	4	Ordering information	21
Input	5	5-point linearity protocol	22
Measuring range	5	Scope of delivery	22
Operating frequency	6	Accessories	23
Output	6	Extension cable for sensors	23
Signal transmission	6	Protective cover for FDU90 and FDU91	23
Power supply	6	Screw in flange FAX50	24
Power supply	6	Flooding protection tube for FDU90	25
Sensor heater (for FDU91)	6	Cantilever with mounting frame or wall bracket	26
Electrical connection	7	Mounting bracket for ceiling mounting	28
Connection diagram	7	Alignment unit FAU40	29
Connection hints	8	Power supply RNB130 for the FDU90/FDU91 sensor heater	30
Extension cables for the sensors	8	IP66 protective housing for the power supply RNB130	30
Shortening the sensor cable	9	Documentation	30
Installation	10	Technical Information	30
Installation options (Examples)	10	Operating instructions (for transmitter FMU90)	30
Installation conditions for level measurements	11	Description of Instrument Functions (for transmitter FMU90)	31
Installation conditions for flow measurements	12	Safety Instructions	31
Flush mounting with slip-on flange FAU80	13		
Nozzle installation	14		
Ultrasound guide pipe	15		
Environment	16		
Ingress protection	16		
Vibration resistance	16		
Storage temperature	16		
Thermal shock resistance	16		
Electromagnetic compatibility	16		
Explosion hazardous area	16		
Process	16		
Process temperature, Process pressure	16		
Mechanical construction	17		
Counter nut G 1"	17		
Dimensions FDU90	17		
Dimensions FDU91	17		
Dimensions FDU91F	18		
Dimensions FDU92	18		
Dimensions FDU93	18		
Dimensions FDU95	19		
Weight	19		
Materials	19		
Connecting cable	20		

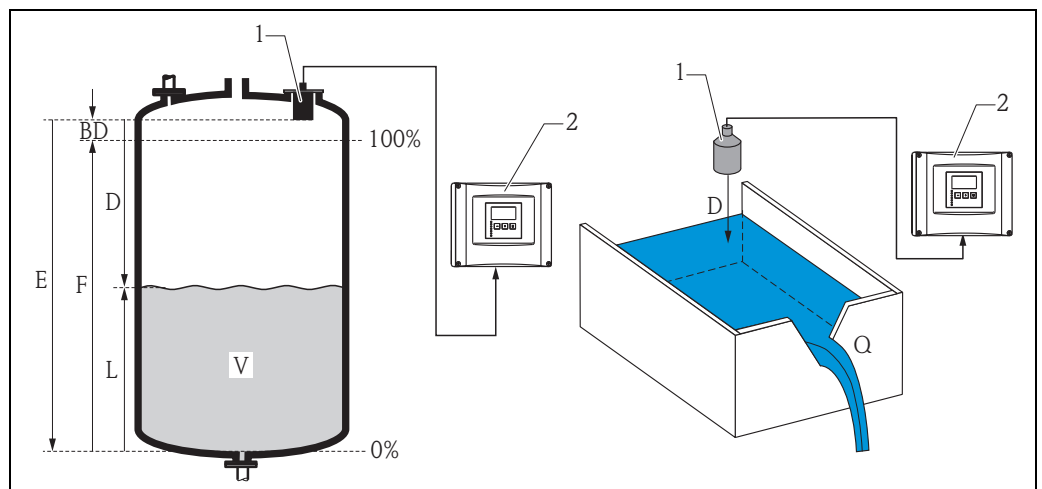
Safety symbols

Symbol	Meaning
 A0011189-DE	DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
 A0011190-DE	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
 A0011191-DE	CAUTION! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
 A0011192-DE	NOTICE! This symbol contains information on procedures and other facts which do not result in personal injury.

Explosion protection	Meaning
	Device certified for use in explosion hazardous area If the device has this symbol embossed on its name plate it can be installed in an explosion hazardous area
	Explosion hazardous area Symbol used in drawings to indicate explosion hazardous areas. Devices located in and wiring entering areas with the designation "explosion hazardous areas" must conform with the stated type of protection.
	Safe area (non-explosion hazardous area) Symbol used in drawings to indicate, if necessary, non-explosion hazardous areas. Devices located in safe areas still require a certificate if their outputs run into explosion hazardous areas

Function and system design

Measuring principle



1 FDU9x

2 Prosonic S FMU90

BD: blocking distance, **D:** distance from sensor membrane to fluid surface, **E:** empty distance **F:** span (full distance), **L:** level, **V:** volume (or mass), **Q:** flow

L00-FMU90xxx-15-00-08-xx-900

Sensor	BD	Maximum range fluids	Maximum range bulk materials
FDU90	0.07 (0.2)	3 (9.8)	1.2 (3.9)
FDU91 (F)	0.3 (1.0)	10 (33)	5 (16)
FDU92	0.4 (1.3)	20 (66)	10 (33)
FDU93	0.6 (2.0)	25 (82)	15 (49)
FDU95 (low temperature version)	0.7 (2.3)	–	45 (148)
FDU95 (high temperature version)	0.9	–	45 (148)

m (ft)

Time-of-flight method

The sensor transmits ultrasonic pulses in the direction of the product surface. There, they are reflected back and received by the sensor. The transmitter Prosonic S measures the time *t* between pulse transmission and reception. From *t* (and the velocity of sound *c*) it calculates the distance *D* from the reference point (see the figure → 4) to the product surface:

$$D = c \cdot t / 2$$

From *D* results the desired measuring value:

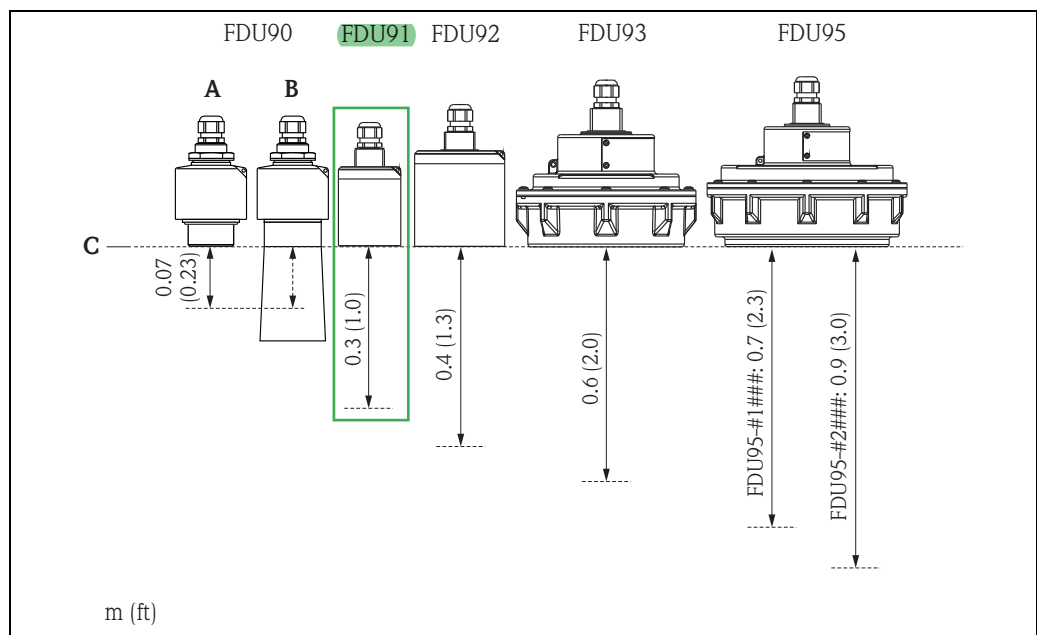
- Level *L*
- Volume *V*
- Flow *Q* across measuring weirs or open channels

Time-of-flight correction

In order to compensate for temperature dependent time-of-flight changes, a temperature sensor (NTC) is integrated in the ultrasonic sensors.

Blocking distance

The level *L* may not extend into the blocking distance *BD*. Level echoes within the blocking distance can not be evaluated due to the transient characteristics of the sensor and thus a reliable measurement is not possible. The blocking distance *BD* is dependent on the type of sensor:



A: Without flooding protection tube, B: With flooding protection tube, C: Reference point of the sensor

Transmitter

The sensors can be connected to the transmitter FMU90 and FMU95. The transmitter recognizes the type of sensor automatically.

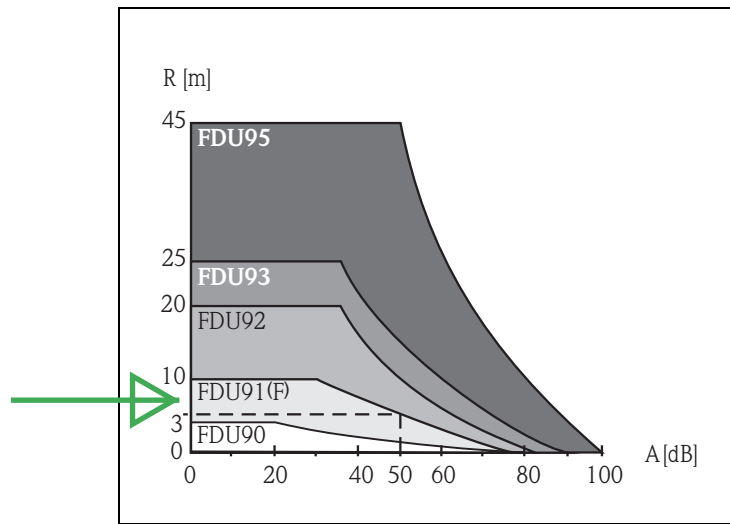
Input

Measuring range

The effective range of the sensors is dependent on the operating conditions. To estimate the range, proceed as follows (see also the example):

1. Determine which of the influences shown in the following table are appropriate for your process.
2. Add the corresponding attenuation values.
3. From the total attenuation, use the diagram to calculate the range.

Fluid surface	Attenuation
calm	0 dB
waves	5 to 10 dB
strong turbulence (e.g. stirrers)	10 to 20 dB
foaming	Please contact your Endress+Hauser sales representative.
Bulk material surface	Attenuation
hard, rough (e.g. rubble)	40 dB
soft (e.g. peat, dust-covered clinker)	40 to 60 dB
Dust	Attenuation
no dust formation	0 dB
little dust formation	5 dB
heavy dust formation	5 to 20 dB
Filling curtain in detection range	Attenuation
none	0 dB
small quantities	5 dB
large quantities	5 to 20 dB
Temperature difference between sensor and product surface	Attenuation
to 20 °C (68 °F)	0 dB
to 40 °C (104 °F)	5 to 10 dB
to 80 °C (176 °F)	10 to 20 dB



Example for FDU91(F)

- Silo with rubble: ~ 40 dB
- Small quantities of filling curtain: ~ 5 dB
- Little dust: ~ 5 dB

Attenuation total: ~ 50 dB

⇒ Range approx. 5 m (16 ft)

A: Attenuation (dB)
R: Range (m)

These measuring conditions have been taken into account during the calculation of the maximum measuring range in solid applications.

Operating frequency

Sensor	Operating frequency
FDU90	90 kHz
FDU91	43 kHz
FDU91F	42 kHz
FDU92	30 kHz
FDU93	27 kHz
FDU95 - *1*** (low temperature version)	17 kHz
FDU95 - *2*** (high temperature version)	18 kHz

Output**Signal transmission**

analogue voltages

Power supply**Power supply**

supplied by the transmitter FMU90

Sensor heater (for FDU91)

The FDU90 and FDU91 sensors are optionally available in a version with sensor heater.



The sensor heater needs an external power supply.

The power for the heater can be supplied by the power supply RNB130 from Endress+Hauser (→ 30).

The power supply for the sensor heater is connected to the brown (BN) and blue (BU) strand of the sensor cable.

Technical data

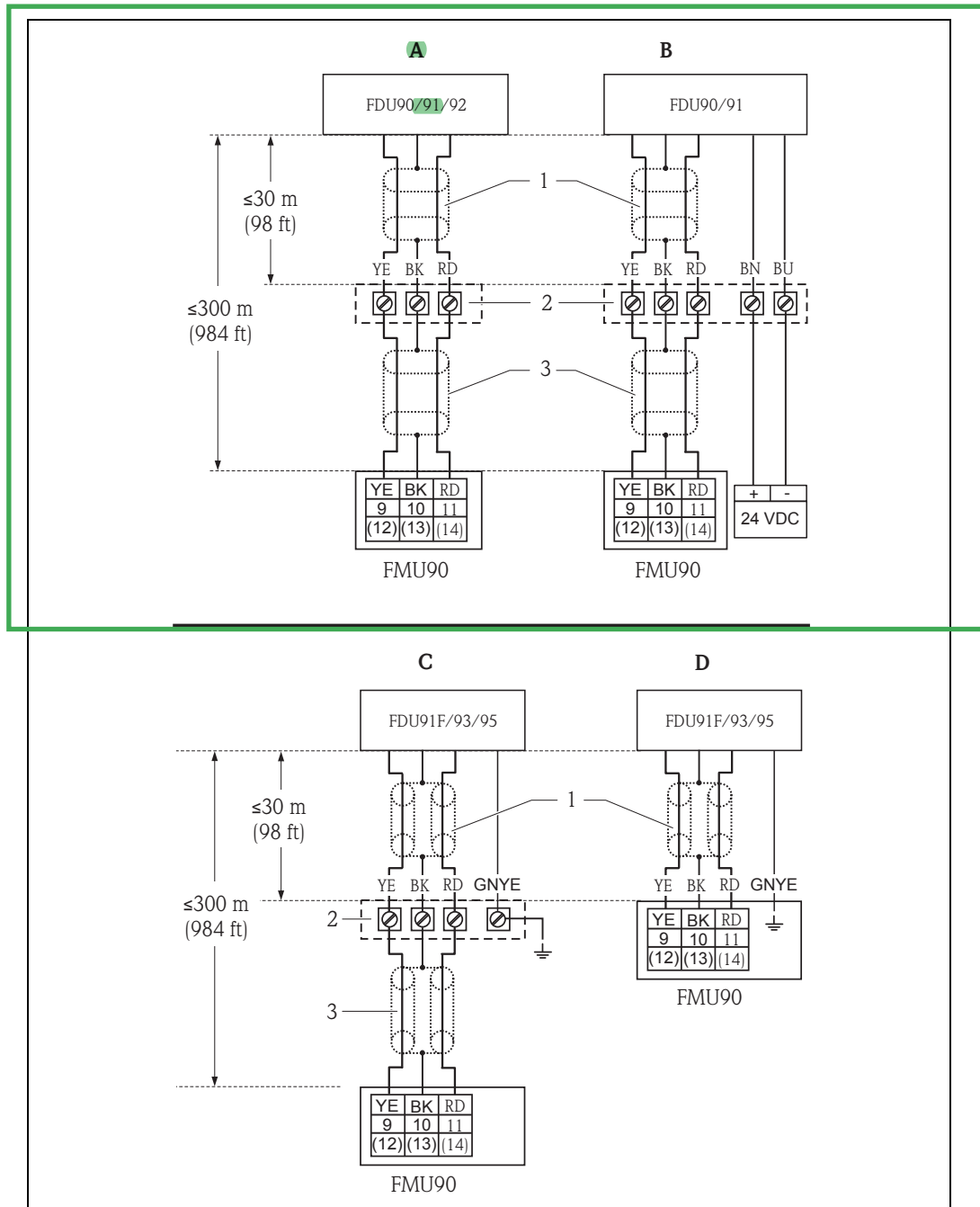
- 24 VDC ±10 %; residual ripple < 100 mV
- 250 mA per sensor



- If the sensor heater is applied, the integrated temperature sensor can not be used. Instead, an external temperature sensor (Pt100 or FMT131 from Endress+Hauser) must be used.
- The transmitter FMU90 is available in a version with an input for the external temperature sensor. For details refer to Technical Information TI00397F.

Electrical connection

Connection diagram



L00-FDU9xxxx-04-00-00-xx-002

- A** Without sensor heater
- B** With sensor heater
- C** Grounding at the terminal box
- D** Grounding at the transmitter FMU90

- 1 Shield of the sensor cable
- 2 Terminal box
- 3 Shield of the extension cable

Colours of the strands: YE = yellow; BK = black; RD = red; BU = blue; BN = brown; GNYE = green-yellow

Connection hints

In order to avoid interference, do not route the sensor cables parallel to high-voltage or electric power lines and not close to frequency converters.

⚠ WARNING**Limitation of electrical safety.**

- ▶ The protective conductor (GNYE) of the sensors FDU91F/93/95 must be connected to the local potential equalization **after a maximum distance of 30 m (98 ft)**.

The protective conductor (GNYE) of the sensors can be connected at this locations:

- Terminal box
- Transmitter FMU90
- Cabinet



The cable shield serves as a return cable and must be connected to the transmitter without any electrical break. With the preassembled cables, the shield ends in a black strand (BK). With the extension cable, the shield must be twisted together and connected to the "BK" terminal. The cable shield must not be connected to the local potential equalization.

For easier mounting it is advisable to use the sensors FDU90/91/92 with a maximum cable length of 30 m (98 ft) as well. For longer distances an extension cable with a terminal box should be used.

Extension cables for the sensors

For distances up to 30 m (98 ft) the sensor can be directly connected by the sensor cable. For longer distances, it is recommended to use an extension cable. The extension cable is connected via a terminal box. The total length (sensor cable + extension cable) may be up to 300 m (984 ft).

⚠ WARNING**Explosion hazard!**

In explosion hazardous areas, sparks can cause explosions. This may lead to serious or fatal injury. Additionally, the device and installation may be seriously damaged.

- ▶ If the terminal box is installed in explosion hazardous areas, all applicable national guidelines must be observed.
- ▶ Pay attention to the measures and notes in Chapter **Certificates and Approvals** → 21.

Suitable extension cables can be obtained from Endress+Hauser (→ 23 "Accessories")
Alternatively, cables with the following properties can be used:

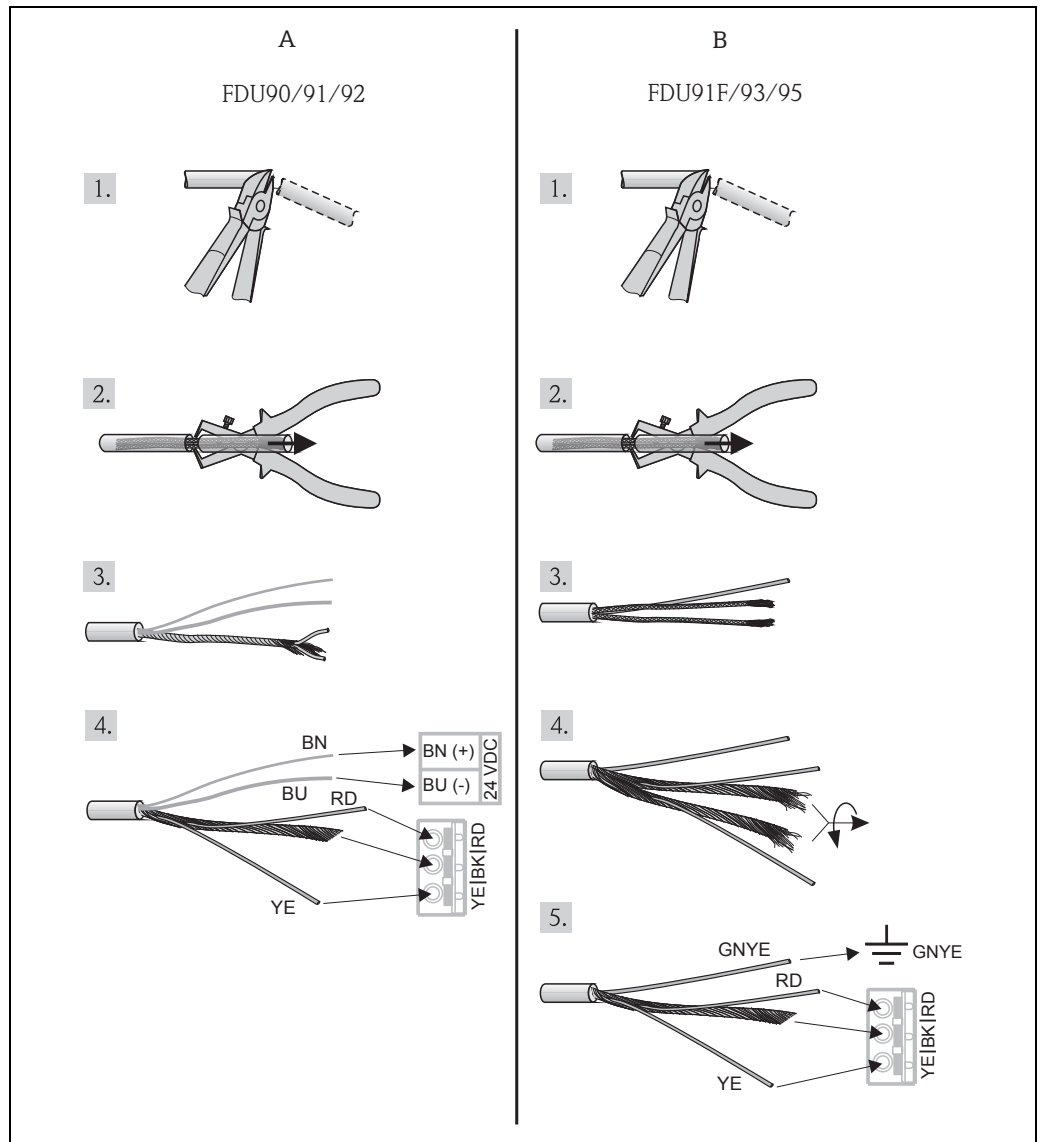
- Number of cores according to the connection diagram (→ 7 "Connection diagram")
- Braided wire shield for the yellow (YE) and red (RD) core (no foil shield)
- Length: up to 300 m (984 ft), sensor cable + extension cable
- Cross section: 0.75 mm² to 2.5 mm² (18 to 14 AWG)
- Up to 8 Ω per core
- Max. 60 nF (between core and shield)
- For FDU91F/93/95: The protective conductor (GNYE) must not be within the shield.

Shortening the sensor cable

If required, the sensor cable can be shortened. Please note:

- Do not damage the cores when removing the insulation.
- The cable is shielded by a metallic braiding. This shielding serves as a return cable and corresponds to the black (BK) strand of the unshortened cable. After shortening the cable, loosen the metallic braiding, twist it together securely and connect it to the "BK" terminal.

i The protective conductor (GNYE), which is present in some of the sensor cables, may **not** be electrically connected to the cable shield.



L00-FMU90xxx-04-00-00-xx-015

Colours of the strands: YE = yellow; BK = black; RD = red; BU = blue; BN = brown; GNYE = green-yellow

i The blue (BU) and brown (BN) strands is only present for sensors with heater.

Installation

⚠ WARNING

Hazard of accidents!

If sensors are not fastened properly, they can fall down and cause serious injury and property damage.

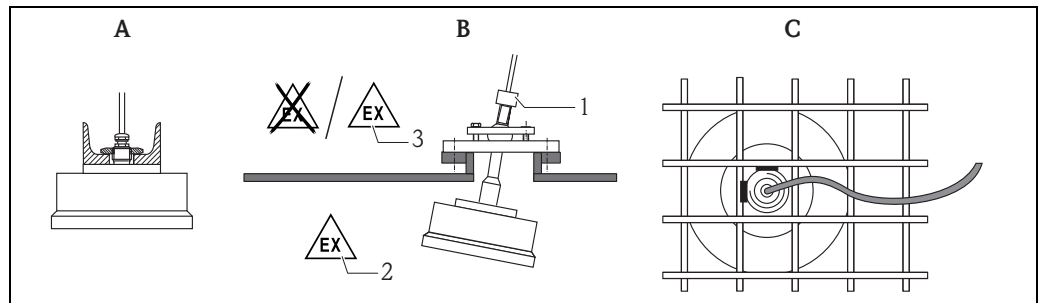
- ▶ Only install sensors in areas that are stable and sufficiently able to take the load.
- ▶ Fasten sensors only with fastening material that is proper and suited for the environment.

NOTICE

Risk of sensor damage.

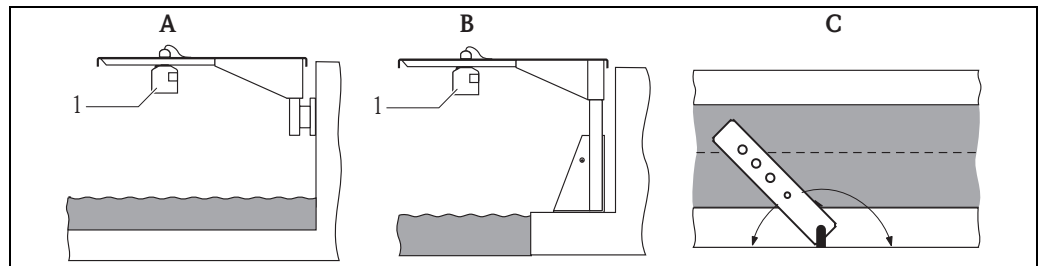
- ▶ Do not use the sensor cable for suspension.
- ▶ Protect sensor membrane from damage during installation.

Installation options (Examples)



- 1 FAU40
2 Zone 20
3 Zone 21

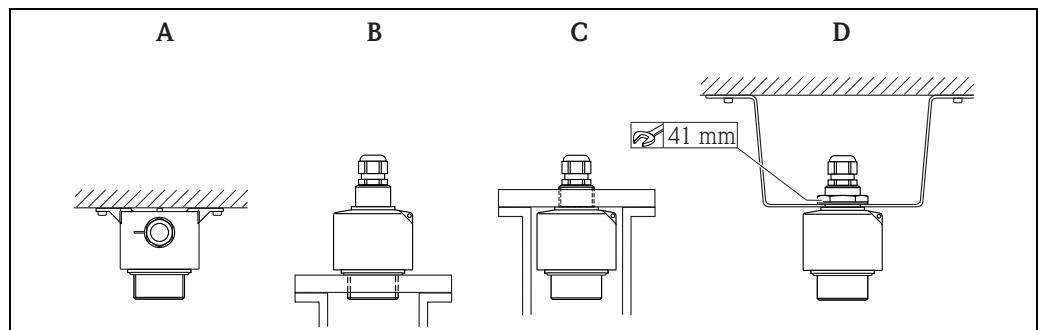
A: at girder or angle bracket, **B:** with alignment unit FAU40, in ATEX Zone 20 the alignment unit can be used for zone separation, **C:** with a 1" sleeve welded to a grating



- 1 FDU9x

A: Installation with cantilever and wall bracket, **B:** Installation with cantilever and mounting frame, **C:** The cantilever can be turned in order to position the sensor over the centre of the flume.

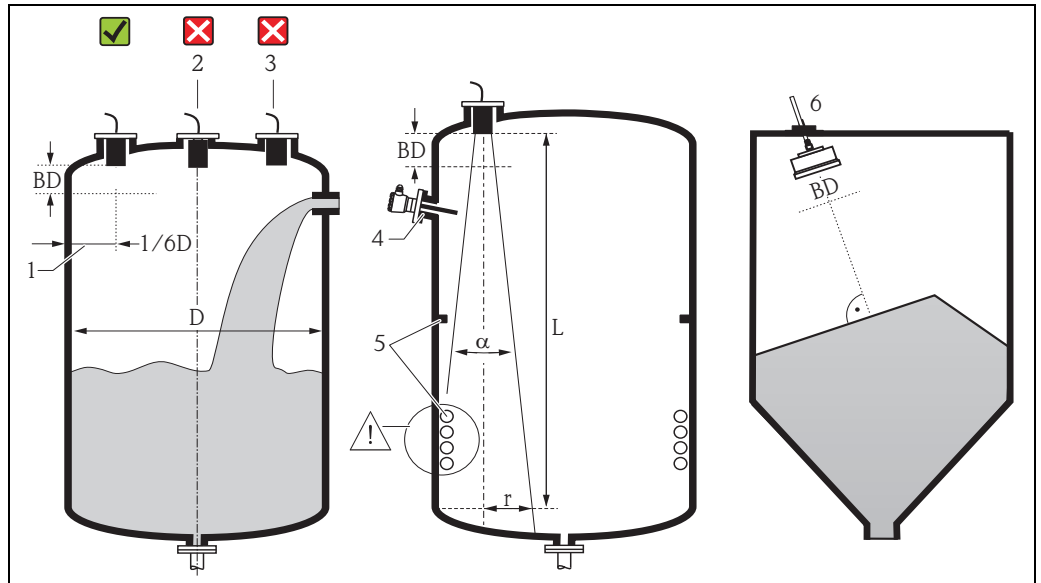
Cantilever, wall bracket and mounting frame are available as accessories (→ 23).



- A:** FDU90: Ceiling mounting
B: FDU90: Mounted at front thread (G 1½" or NPT 1½")
C: FDU9x: Mounted at rear thread (G 1" or NPT 1")
D: FDU90, FDU91, FDU92: Mounting with G 1" counter nut ¹⁾

1) The counter nut with gasket is supplied for the sensors FDU90, FDU91 and FDU92 with a metric thread G 1" at the process connection.

Installation conditions for level measurements



L00-FDU9xxxx-17-00-00-xx-003

- If possible, install the sensor so that its lower edge projects into the vessel.
- Make sure, that the maximum level does not reach into the blocking distance (BD, see table).
- Do not install the sensor in the middle of the tank (2). We recommend leaving a distance (1) between the sensor and the tank wall measuring 1/6 of the tank diameter.
- Avoid measurements through the filling curtain (3).
- Make sure that equipment (4) such as limit switches, temperature sensors, baffles etc. are not located within the emitting angle α . Emitting angles of the individual sensors are given in the table below. In particular, symmetrical equipment (5) such as heating coils etc. can influence the measurement.
- Align the sensor vertically to the product surface (6). An alignment unit (FAU40) is available as an accessory (→ 23).
- If the two-channel version of the transmitter FMU90 or the multi-channel version of the transmitter FMU90 is used, both sensors can be mounted in one vessel.
- To estimate the detection range, use the 3 dB emitting angle α :

Sensor	α (typically)	L (max)	r (max)
FDU90	12°	3 (9.8)	0.31 (1.0)
FDU91	9°	10 (33)	0.79 (2.6)
FDU91F	12°	10 (33)	1.05 (3.4)
FDU92	11°	20 (66)	1.92 (6.3)
FDU93	4°	25 (82)	0.87 (2.9)
FDU95	5°	45 (148)	1.96 (6.4)

m (ft)

▲ WARNING

Explosion hazard!

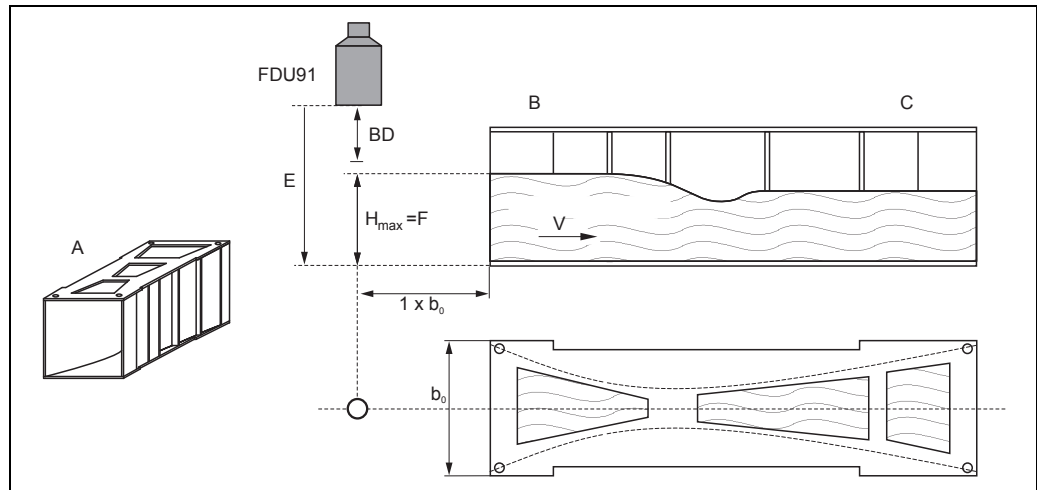
In explosion hazardous areas, sparks can cause explosions. This may lead to serious or fatal injury. Additionally, the device and installation may be seriously damaged.

- ▶ Pay attention to the measures and notes in Chapter **Certificates and Approvals** (see → 21).

Installation conditions for flow measurements

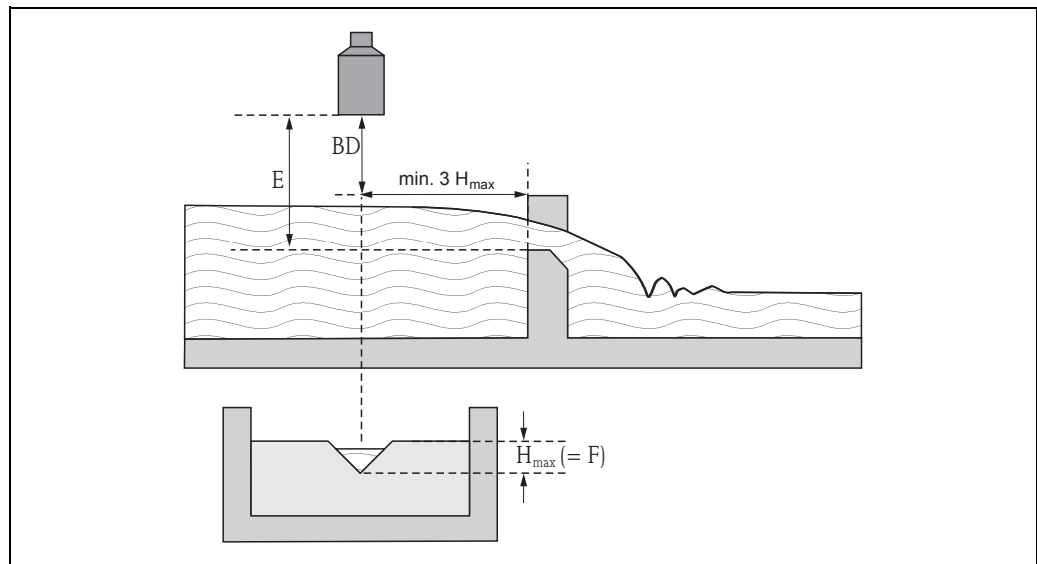
- Install the sensor at the inflow side (B), above the maximum water level H_{\max} (=F) plus the blocking distance BD.
- Position the sensor in the middle of the channel or weir.
- Align the sensor vertically to the water surface.
- Comply to the installation distance of the channel or weir.²⁾
- Use a protective cover, in order to protect the sensor from direct sun or rain. A protective cover is available for the sensors FDU90 and FDU91 (→ 23).

Example: Khafagi-Venturi flume



A: Khafagi-Venturi flume, B: inflow, C: outflow, BD: blocking distance, E: empty calibration, F: full calibration, V: direction of flow

Example: V-notch weir

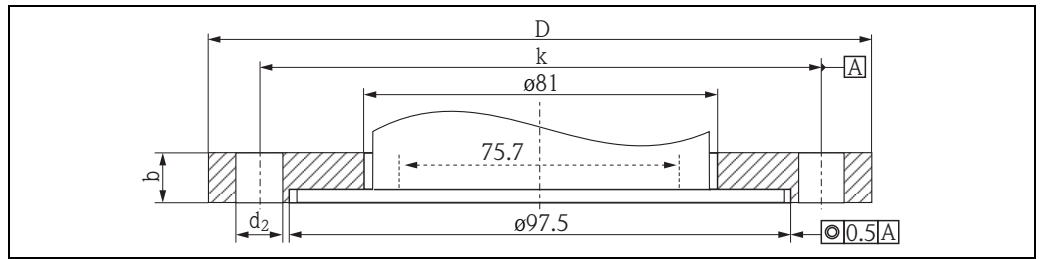


BD: blocking distance, E: empty calibration, F: full calibration

2) The installation distances of important flumes and weirs are specified in the Operating Instructions BA00289F (FMU90 with HART) and BA00293F (FMU90 with PROFIBUS).

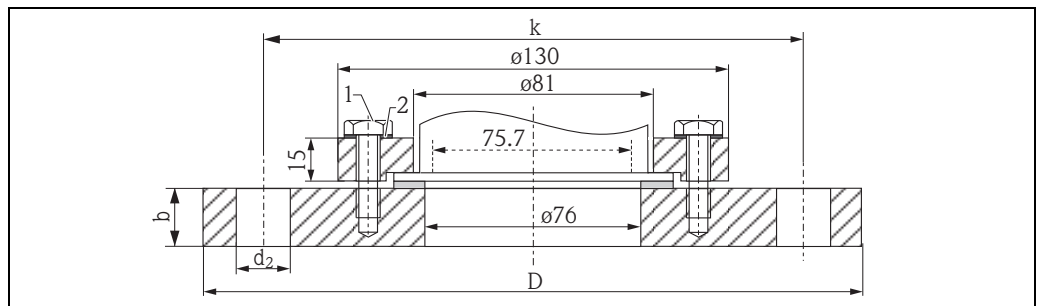
Flush mounting with slip-on flange FAU80

The FDU91F sensor can be flush mounted using a FAU80 slip-on flange. Flanges in polypropylene (PP-FR) should only be used with pressures up to 1.5 bar_{abs} (22 psi abs), flanges in 316L also above.



L00-FDU9xxxx-17-00-00-xx-009

Order code	Material	b [mm (in)]	øD [mm (in)]	ød2 [mm (in)]	k [mm (in)]	No. d2	Standard
FAU80 - CAP	PP-FR	20 (0.79)	200 (7.87)	18 (0.71)	160 (6.3)	8	DN80 PN16 A (DIN EN 1092-1 (DIN2527 B))
FAU80 - CAJ	316L (1.4435)						
FAU80 - AAP	PP-FR	23.9 (0.94)	190.5 (7.5)	19.1 (0.75)	152.4 (6.0)	4	ANSI 3" 150 lbs FF (ANSI B 16.5)
FAU80 - AAJ	316L (1.4435)						
FAU80 - KAP	PP-FR	18 (0.71)	185 (7.28)	19 (0.75)	150 (5.9)	8	JIS 10K 80A FF (JIS B 2220)
FAU80 - KAJ	316L (1.4435)						



L00-FDU9xxxx-17-00-00-xx-010

The adapter flange and the screws are included in the delivery.

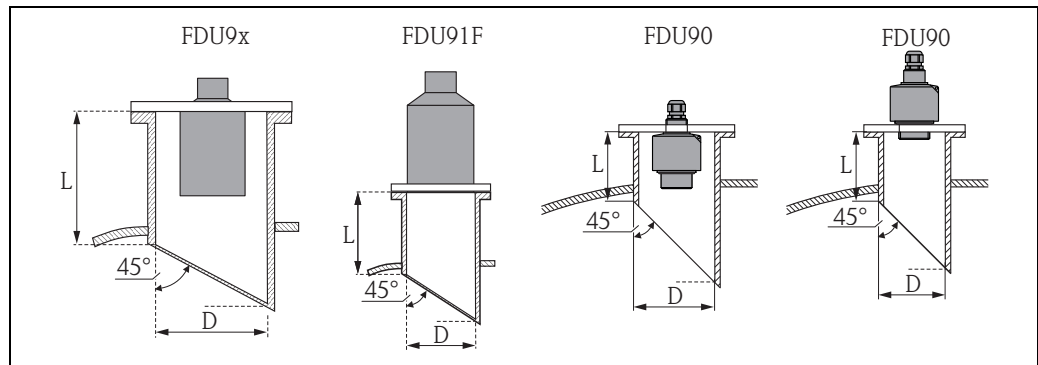
Position	Part	Material
1	Screws	V2A
2	Washer	PP-FR or 316/316L (1.4435)

Order code	Material	b [mm]	øD [mm]	ød2 [mm]	k [mm]	No. d2	Standard
FAU80 - CHP	PP-FR	20 (0.79)	220 (8.66)	18 (0.71)	180 (7.09)	8	DN100 PN16 A (DIN EN 1092-1 (DIN2527 B))
FAU80 - CHJ	316L (1.4435)						
FAU80 - AHP	PP-FR	23.9 (0.94)	228.6 (9.0)	19.1 (0.75)	190.5 (7.5)	4	ANSI 4" 150 lbs FF (ANSI B 16.5)
FAU80 - AHJ	316L (1.4435)						
FAU80 - KHP	PP-FR	18 (0.71)	210 (8.27)	19 (0.75)	175 (6.89)	8	JIS 10K 100A FF (JIS B 2220)
FAU80 - KHJ	316L (1.4435)						

- i** The **process seal** is not included in the delivery.
- Endress+Hauser supplies **DIN/EN flanges made of stainless steel** AISI 316L with the material number 1.4404 or 1.4435. With regard to their temperature stability properties, the materials 1.4404 and 1.4435 are grouped under 13EO in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.
- For **3A-applications**: The internal diameter of the nozzle should be selected according to the valid allowable limits for 3A applications. Usually, the internal diameter of the nozzle should be larger than or equal to the internal diameter of the sensor.

Nozzle installation

Install the sensor at a height so that the blocking distance BD is not undershot, even at maximum fill level. Use a pipe nozzle if you cannot maintain the blocking distance in any other way. The interior of the nozzle must be smooth and may not contain any edges or welded joints. In particular, there should be no burr on the inside of the tank side nozzle end. Note the specified limits for nozzle diameter and length. To minimise disturbing factors, we recommend an angled socket edge (ideally 45°).



L00-FDU9xxxx-17-00-00-xx-006

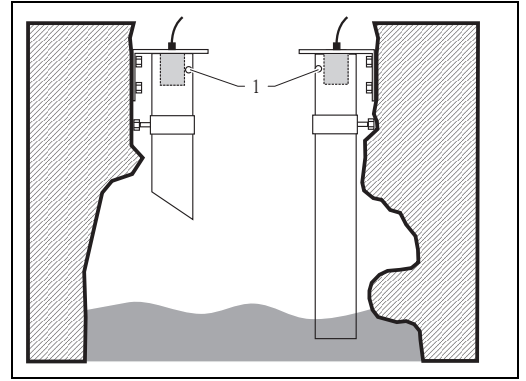
Nozzle diameter	Maximum nozzle length [mm (in)]						
	FDU90 ¹⁾	FDU90 ²⁾	FDU91	FDU91F	FDU92	FDU93	FDU95
DN50/2"	–	50 (1.97)	–	–	–	–	–
DN80/3"	340 (13.4)	250 (9.84)	340 (13.4)	250 (9.84) ³⁾	–	–	–
DN100/4"	390 (15.4)	300 (11.8)	390 (15.4)	300 (11.8) ³⁾	–	–	–
DN150/6"	400 (15.7)	300 (11.8)	400 (15.7)	300(11.8) ³⁾	400 (15.7)	–	–
DN200/8"	400 (15.7)	300 (11.8)	400 (15.7)	300(11.8) ³⁾	400 (15.7)	520 (20.5)	–
DN250/10"	400 (15.7)	300 (11.8)	400 (15.7)	300(11.8) ³⁾	400 (15.7)	520 (20.5)	630 (24.8)
DN300/12"	400 (15.7)	300 (11.8)	400 (15.7)	300(11.8) ³⁾	400 (15.7)	520 (20.5)	630 (24.8)
Sensor characteristics							
Emission angle α	12°	12°	9°	12°	11°	4°	5°
Blocking distance [m (ft)]	0.07 (0.2)	0.07 (0.2)	0.3 (1)	0.3 (1)	0.4 (1.3)	0.6 (2)	0.7 (2.3)
Max. measuring range [m (ft)] in liquids	3 (9.8)	3 (9.8)	10 (33)	10 (33)	20 (66)	25 (82)	–
Max. measuring range [m] in solids	1.2 (3.9)	1.2 (3.9)	5 (16)	5 (16)	10 (33)	15 (49)	45 (148)

- 1) mounted at the rear side thread
- 2) mounted at the front side thread (flush mounting)
- 3) Valid for flush mounting; for mounting with G/NPT 1" and DN100 or higher see FDU91.

Ultrasound guide pipe

In narrow shafts with strong interference echoes, we recommend using an ultrasound guide pipe (e.g. PE or PVC wastewater pipe) with a minimum diameter of DN80 for FDU90, DN100 for FDU91, DN200 for FDU92.

Make sure that the pipe is not soiled by accumulated dirt. If necessary, clean the pipe at regular intervals



L00-FDU9xxxx-17-00-00-xx-008

1 Venting hole

Environment

Ingress protection	Tested according to IP68/NEMA6P (24 h at 6 ft under water surface)
Vibration resistance	DIN EN 600068-2-64; 20 to 2000 Hz; 1 (m/s ²) ² /Hz; 3x100 min.
Storage temperature	Identical to process temperature, see below
Thermal shock resistance	According to DIN EN 60068-2-14; examination to min/max process temperature; 0.5 K/min; 1000 h
Electromagnetic compatibility	Electromagnetic compatibility according to all relevant requirements of the EN 61326- series and NAMUR recommendation EMC (NE21). For details see declaration of conformity. With respect to interference emission the devices meet the requirements of class A and are only provided for use in an "industrial environment"!
Explosion hazardous area	Pay attention to the measures and notes in Chapter Certificates and Approvals → 21.

Process

Process temperature,
Process pressure

Sensor	Process temperature	Process pressure (abs.)
FDU90	-40 to +80 °C (-40 to +176 °F) ¹	0.7 to 4 bar (10.15 to 58 psi)
FDU91	-40 to +80 °C (-40 to +176 °F)¹	0.7 to 4 bar (10.15 to 58 psi)
FDU91F	-40 to +105 °C (-40 to +221 °F) (30 min/135 °C (275 °F)) ² for Ex instruments: -40 to +80 °C (-40 to +176 °F)	0.7 to 4 bar (10.15 to 58 psi)
FDU92	-40 to +95 °C (-40 to +203 °F) for Ex instruments: -40 to +80 °C (-40 to +176 °F)	0.7 to 4 bar (10.15 to 58 psi)
FDU93	-40 to +95 °C (-40 to +203 °F) for Ex instruments: -40 to +80 °C (-40 to +176 °F)	0.7 to 3 bar (10.15 to 43.5 psi)
FDU95 - *1*** (low temperature version)	-40 to +80 °C (-40 to +176 °F)	0.7 to 1.5 bar (10.15 to 22 psi)
FDU95 - *2*** (high temperature version)	-40 to +150 °C (-40 to +302 °F) for Dust-Ex versions: -40 to +130 °C	0.7 to 1.5 bar (10.15 to 22 psi)

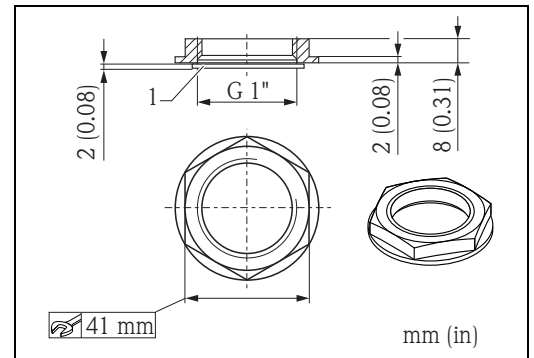
- 1) In order to avoid ice build-up, the sensors FDU90 and FDU91 are available in a version with integrated sensor heater (→ 6). If this heater is used, an external temperature sensor has to be applied for time-of-flight correction. The transmitter FMU90 is available in a version with an input for the external temperature sensor. For details refer to Technical Information TI00397F.
- 2) Only valid for Tri-clamp and flush mounting

Mechanical construction

Counter nut G 1"

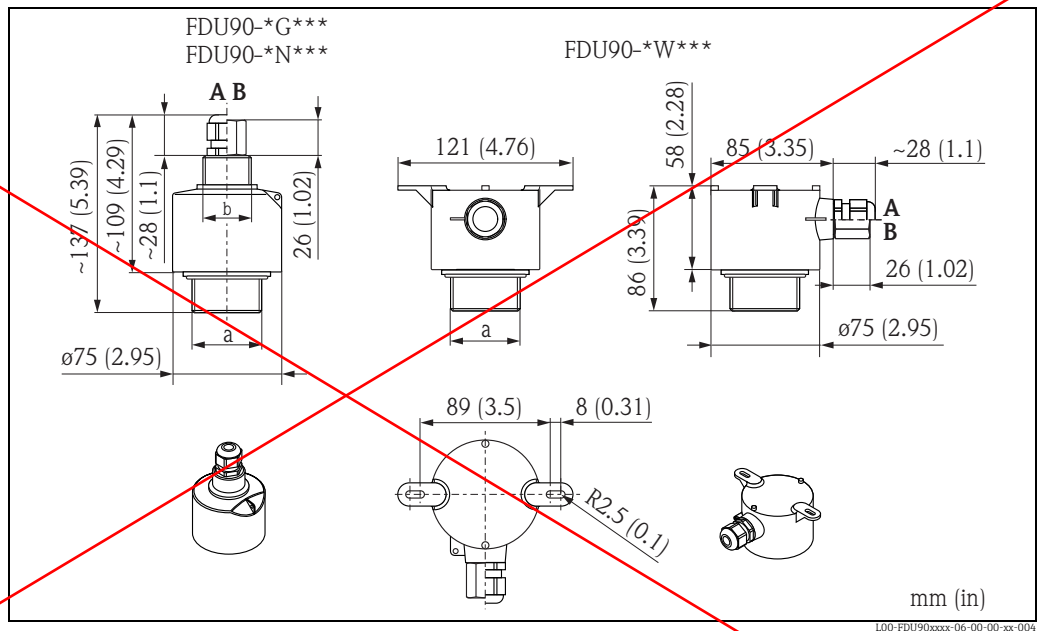
- Is supplied for the sensor FDU90, FDU91 and FDU92 with a metric G 1" thread.
- Material: PA6.6
- Gasket (EPDM) is supplied

Note!
The counter nut is not for NPT thread.



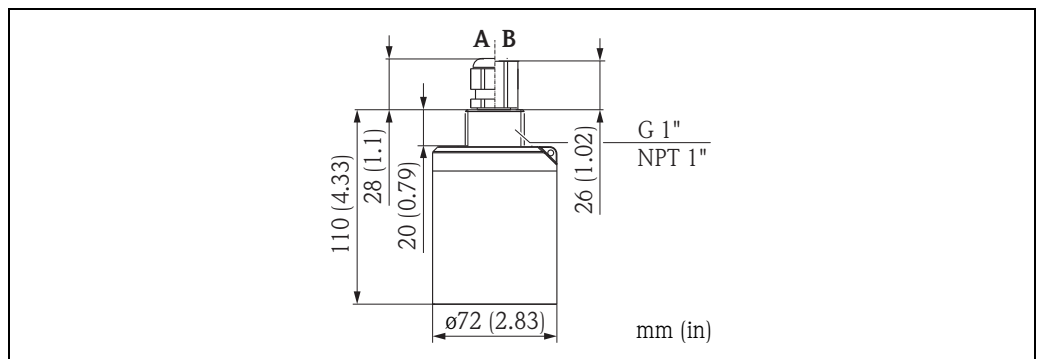
1 Gasket

Dimensions FDU90



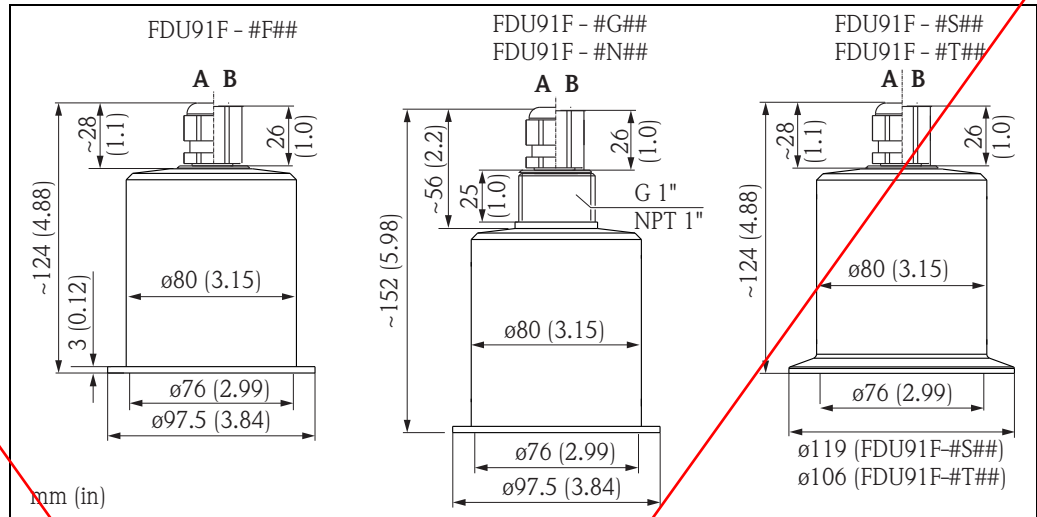
- A: Cable gland for approval versions FDU90-C/D/E/G/H/J/R/U/V/1
 B: Conduit connection NPT 1/2" for approval versions FDU90-Q/S
 The conduit connection is partly potted (half-filled)
 a: G 1-1/2" or NPT 1-1/2" (see product structure: 020 "Process connection" → 21)
 b: G 1" or NPT 1" (see product structure: 020 "Process connection" → 21)

Dimensions FDU91



- A: Cable gland for approval versions FDU91-C/D/E/G/H/J/R/U/V/1
 B: Conduit connection NPT 1/2" for approval versions FDU91-Q/S
 The conduit connection is partly potted (half-filled).

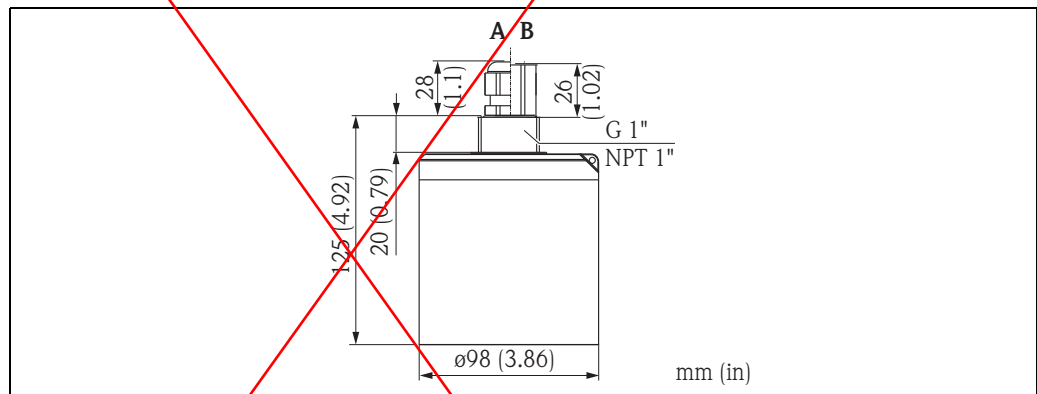
Dimensions FDU91F



L00-FDU91Fxxx-06-00-00-xx-001

A: Cable gland for approval versions FDU91F-C/D/E/G/H/J/R/U/V
B: Conduit connection NPT 1/2" for approval versions FDU91F-Q/S
 The conduit connection is partly potted (half-filled).

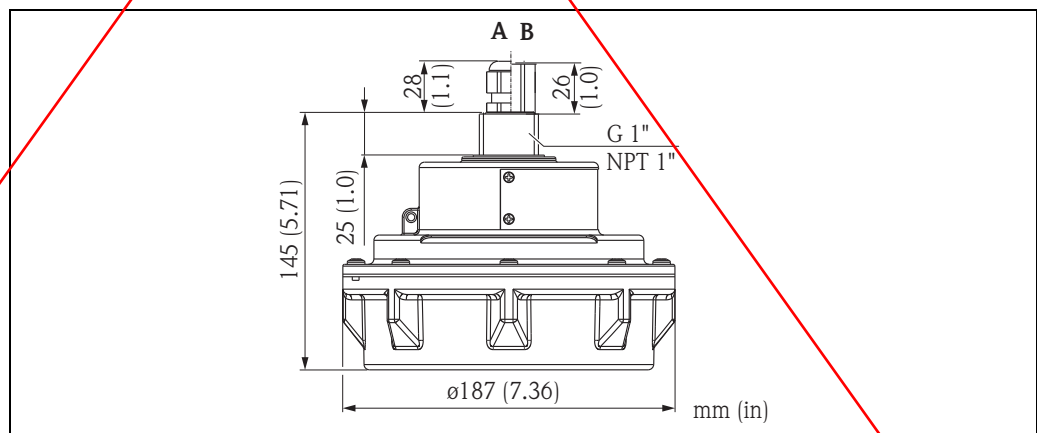
Dimensions FDU92



L00-FDU92xxx-06-00-00-xx-001

A: Cable gland for approval versions FDU92-C/D/E/G/H/J/R/U/V/1
B: Conduit connection NPT 1/2" for approval versions FDU92-Q/S
 The conduit connection is partly potted (half-filled).

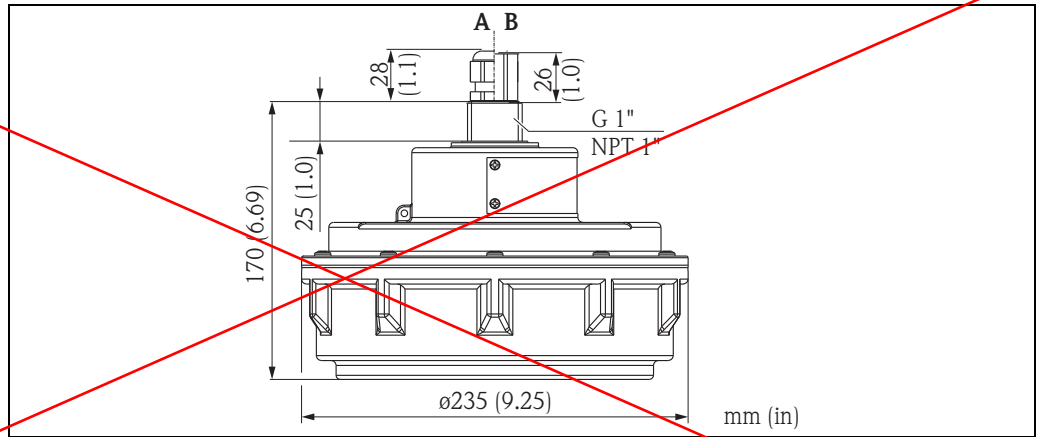
Dimensions FDU93



L00-FDU93xxx-06-00-00-xx-001

A: Cable gland for approval version FDU93-C/D/E/G/H/J/R/U/W/1
B: Conduit connection NPT 1/2" for approval versions FDU93-P/T
 The conduit connection is partly potted (half-filled).

Dimensions FDU95



A: Cable gland for approval versions FDU95-C/D/E/H/J/R/U/W/1
 B: Conduit connection NPT 1/2" for approval versions FDU95-P/T
 The conduit connection is partly potted (half-filled).

L00-FDU95xxx-06-00-00-xx-001

Weight

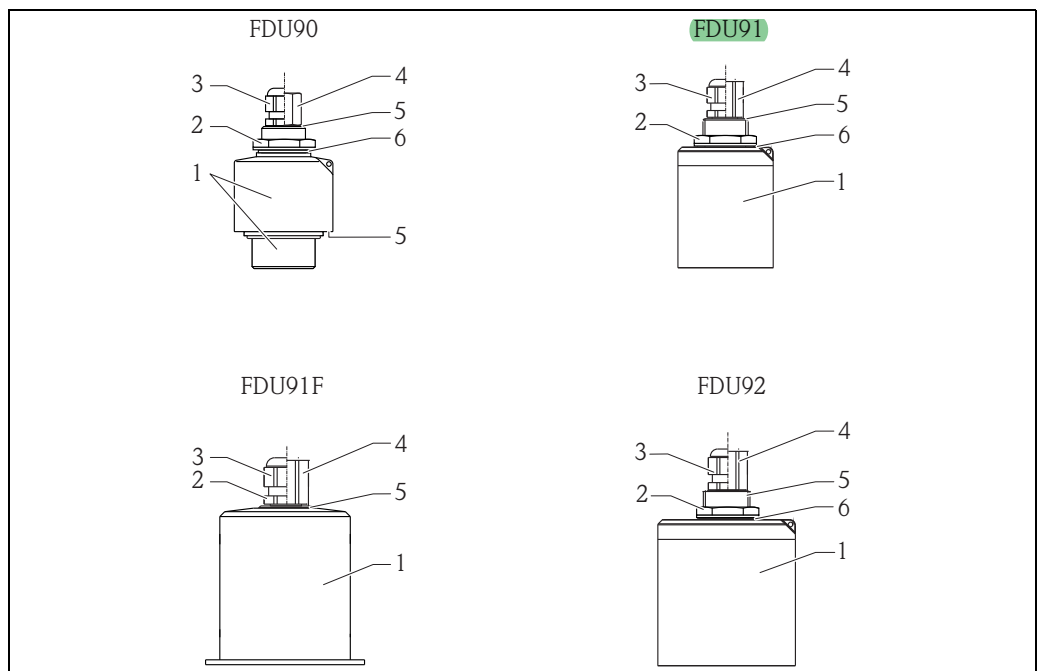
Sensor	Weight (including 5 m (16 ft) cable)
FDU90	<ul style="list-style-type: none"> ■ approx. 0.9 kg (1.98 lbs) without flooding protection tube ■ approx. 1.0 kg (2.21 lbs) with flooding protection tube
FDU91	approx. 1.1 kg (2.43 lbs)
FDU91F	approx. 1.6 kg (3.53 lbs)
FDU92	approx. 2 kg (4.41 lbs)
FDU93	approx. 2.9 kg (6.39 lbs)
FDU95	approx. 4.5 kg (9.92 lbs)

Materials

NOTICE

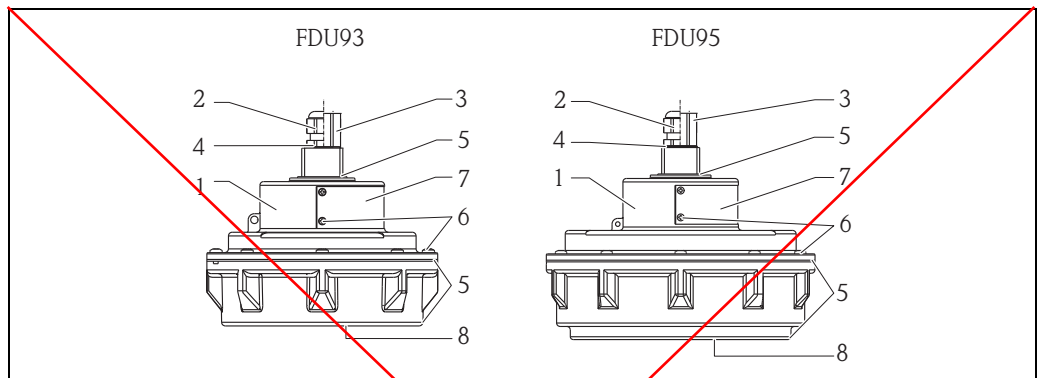
Risk of sensor damage caused by chemical substances.

- ▶ Prior to application, check the chemical compatibility of the sensors with compatibility charts.



L00-FDU9xxx-16-00-00-xx-001

Pos.	Part	FDU90	FDU91	FDU91F	FDU92
1	Sensor housing	PVDF		316L (1.4404/1.4435)	PVDF
2	Counter nut	PA6.6		–	PA6.6
3	Cable gland	PA			
4	Adpater	CuZn nickel-plated			
5	O-ring	EPDM			
6	Sealing				



L00-FDU9xxxx-16-00-00-xx-002

Pos.	Part	FDU93	FDU95
1	Sensor	UP (Unsaturated polyester resin)	
2	Cable gland	CuZn nickel-plated	
3	Adpater	CuZn nickel-plated	
4	O-ring	VMQ	
5	Sealing	VMQ	
6	Screws	V2A	
7	Nameplate	304 (1.4301)	
8	Membrane	ALU with PFA coated	FDU95 - *1*** (low temperature version): 316L (1.4404) and PE coated FDU95 - *2*** (high temperature version): 316L (1.4404)

Connecting cable

5 to 300 m (16 to 984 ft)

For cable length > 30 m (> 98 ft), an extension cable is recommended.


In this case, the total length (sensor cable + extension cable) must not exceed 300 m (984 ft).

Cable	Material
for FDU90/91/91F/92/93	PVC
for FDU95	VMQ

Certificates and Approvals

CE mark	The measuring system meets the legal requirements of the EC-guidelines. Endress+Hauser confirms the instrument passing the required tests by attaching the CE-mark.
Ex approval	<p>The available certificates are listed in the ordering information. Note the associated safety instructions (XA) and control or installation drawings (ZD).</p> <p>Warning!</p> <ul style="list-style-type: none"> ■ Measuring systems for use in hazardous environments are accompanied by separate "Ex documentation", which is an integral part of this Operating Manual. Strict compliance with the installation instructions and ratings as stated in this supplementary documentation is mandatory. <ul style="list-style-type: none"> – Ensure that all personnel are suitably qualified. – Observe the specifications in the certificate as well as national and local standards and regulations. ■ The transmitter may only be installed in suitable areas. ■ Sensors with a certificate for hazardous areas may be connected to a transmitter without a certificate. ■ For FM approvals: Unauthorized substitution of components may impair the suitability for Division 1 or Division 2. ■ Do not disconnect equipment unless the area is known to be non-hazardous. <p>Note!</p> <p>The sensor must be installed and used in a way that eliminates any danger. Possible installation positions: in tanks, vessels, silos, over stockpiles, open channels, weirs or other bins.</p>
External standards and directives	<p>EN 60529 Protection class of housing (IP code)</p> <p>EN 61326 series EMC product family standard for electrical equipment for measurement, control and laboratory use</p> <p>NAMUR User association for automation technology in process industries</p>

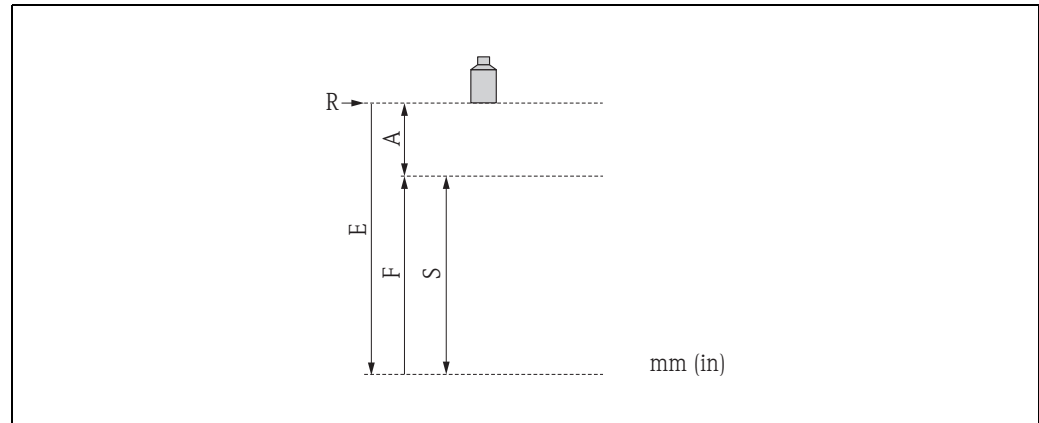
Ordering information

Ordering information	<p>Detailed ordering information is available from the following sources:</p> <ul style="list-style-type: none"> ■ 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 <p> Product Configurator - the tool for individual product configuration</p> <ul style="list-style-type: none"> ■ 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
-----------------------------	---

5-point linearity protocol

The following must be taken into account if option "5 point linearity protocol" has been selected:

- The five points of the linearity protocol are evenly distributed 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.³⁾
- The following restrictions have to be taken into account when defining E and F:



A0019526

Pos.	Measuring range	FDU90	FDU91/ FDU91F	FDU92	FDU93	FDU95
E	Maximum value for the empty calibration	3000 (118)	10000 (394)	20000 (787)	20000 (787)	20000 (787)
F	Maximum value for the full calibration	2900 (114)	9700 (382)	19600 (772)	19400 (764)	18000 (709)
S	Minimum span (E-F)	100 (3.94)	100 (3.94)	200 (7.87)	250 (9.84)	450 (17.7)
A	Minimum distance between reference point R from sensor and 100 % level	160 (6.30)	300 (11.8)	400 (15.7)	600 (23.6)	2000 (78.7)

mm (in)



- The linearity is checked under reference conditions.
- The 5-point linearity protocol is always carried out for the complete measuring system (consisting of the sensor FDU9x and transmitter FMU9x) and it is valid for this combination. It must be defined, at which sensor channel the sensor is to be tested. There are up to 2 channels for FMU90 and up to 5 or 10 channels for FMU95.
- The selected values of **Empty calibration** and **Full calibration** are only used to record the linearity protocol and are reset to default values thereafter.

For details see the Technical Information TI00397F or TI00398F.

Scope of delivery

- Instrument according to the version ordered
- This Technical Information (TI00396F/00/EN, serves as installation and operating instruction)
- For certified instrument versions: Safety Instructions (XA) and/or Control Drawings (ZD)
- For FDU90/91 with sensor heater: terminal module, to be mounted in the field housing of the transmitter FMU90
- For FDU90/91/92 with G 1" process connection: counter nut (PA6.6) + seal (EPDM)
- For FDU93/95 with Ex-certificate: process seal (VMQ)

3) If the values for the full calibration and empty calibration are missing or outside the specified area, the devices are tested with the maximum value according to the table.

Accessories

Extension cable for sensors

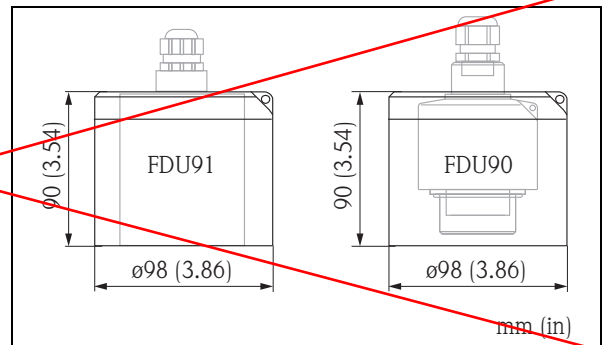
for Sensor	Material	Cable type	Order code
<ul style="list-style-type: none"> ▪ FDU90 ▪ FDU91 ▪ FDU92 	PVC	LiYCY 2x(0.75)	71027742
<ul style="list-style-type: none"> ▪ FDU91F ▪ FDU93 ▪ FDU95 	PVC (-40 to +105 °C) (-40 to +221 °F)	LiYY 2x(0.75)D+1x0.75	71027743
<ul style="list-style-type: none"> ▪ FDU95 	Silicone (-40 to +150 °C) (-40 to +302 °F)	Li2G2G 2x(0.75)D+1x0.75	71027745
<ul style="list-style-type: none"> ▪ FDU90/FDU91 with heater 	PVC	LiYY 2x(0.75)D+2x0.75	71027746

Total length (sensor cable + extension cable)*: up to 300 m (984 ft)

* The sensor cable and the extension cable are of the same type.

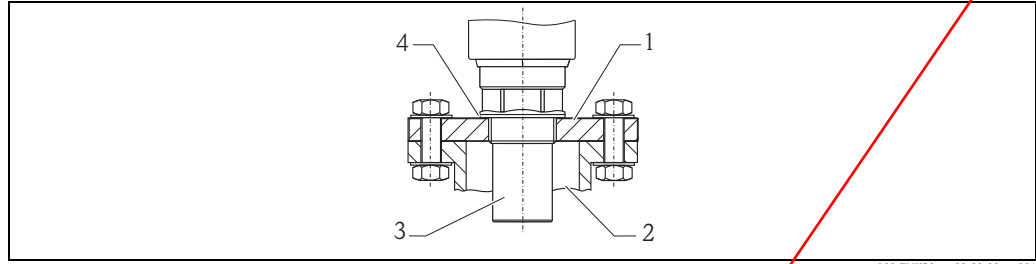
Protective cover for FDU90 and FDU91

- Material: PVDF
- Order code: 52025686



L00-FDU9:xxxx-06-00-00-xx-003

Screw in flange FAX50



L00-FMU30xxxx-00-00-00-xx-001

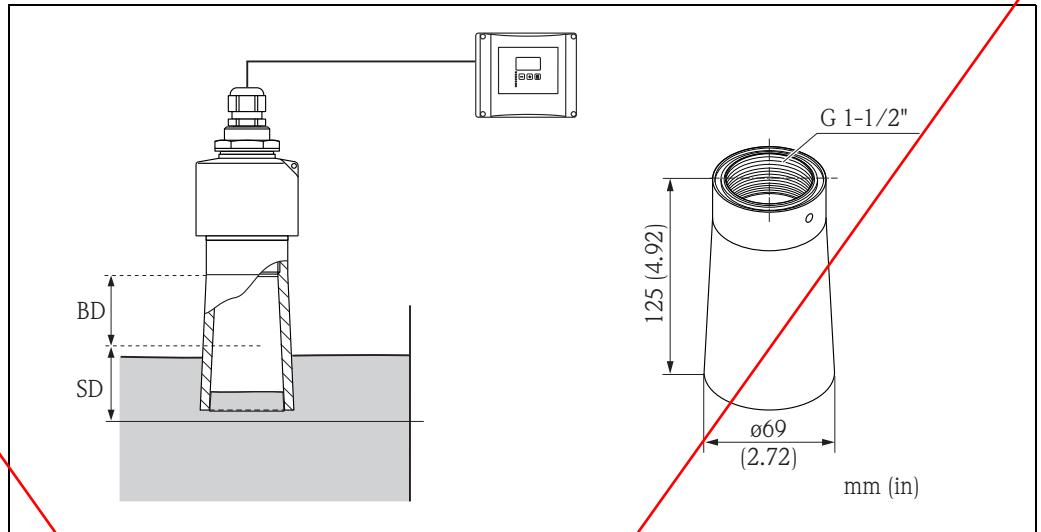
- 1 Screw in flange
- 2 Nozzle
- 3 Sensor
- 4 Sealing ring EPDM (supplied)

Product structure FAX50

01 Material:	
5	
BR1	DN50 PN10/16 A, steel flange EN1092-1
BS1	DN80 PN10/16 A, steel flange EN1092-1
BT1	DN100 PN10/16 A, steel flange EN1092-1
JF1	2" 150lbs FF, steel flange ANSI B16.5
JG1	3" 150lbs FF, steel flange ANSI B16.5
JH1	4" 150lbs FF, steel flange ANSI B16.5
JK2	8" 150lbs FF, PP max 3bar abs/44psia flange ANSI B16.5
XIF	UNI flange 2"/DN50/50, PVDF max 4bar abs/58psia, suitable for 2" 150lbs/DN50 PN16/10K 50
XIG	UNI flange 2"/DN50/50, PP max 4bar abs/58psia, suitable for 2" 150lbs/DN50 PN16/10K 50
XIJ	UNI flange 2"/DN50/50, 316L max 4bar abs/58psia suitable for 2" 150lbs/DN50 PN16/10K 50
XJF	UNI flange 3"/DN80/80, max 4bar abs/58psia, suitable for 3" 150lbs/DN80 PN16/10K 80
XJG	UNI flange 3"/DN80/80, PP max 4bar abs/58psia, suitable for 3" 150lbs/DN80 PN16/10K 80
XJJ	UNI flange 3"/DN80/80, 316L max 4bar abs/58psia, suitable for 3" 150lbs/DN80 PN16/10K 80
XKF	UNI flange 4"/DN100/100, PVDF max 4bar abs/58psia, suitable for 4" 150lbs/DN100 PN16/10K 100
XKG	UNI flange 4"/DN100/100, PP max 4bar abs/58psia, suitable for 4" 150lbs/DN100 PN16/10K 100
XKJ	UNI flange 4"/DN100/100, 316L max 4bar abs/58psia, suitable for 4" 150lbs/DN100 PN16/10K 100
XLF	UNI flange 6"/DN150/150, PVDF max 4bar abs/58psia, suitable for 6" 150lbs/DN150 PN16/10K 150
XLG	UNI flange 6"/DN150/150, PP max 4bar abs/58psia, suitable for 6" 150lbs/DN150 PN16/10K 150
XLJ	UNI flange 6"/DN150/150, 316L max 4bar abs/58psia, suitable for 6" 150lbs/DN150 PN16/10K 150
XMG	UNI flange DN200/200, PP max 4bar abs/58psia, suitable for DN200 PN16/10K 200
XNG	UNI flange DN250/250, PP max 4bar abs/58psia, suitable for DN250 PN16/10K 250
YYY	Special version
020 Sensor Connection:	
A	Thread ISO228 G3/4
B	Thread ISO228 G1
C	Thread ISO228 G1-1/2
D	Thread ISO228 G2
E	Thread ANSI NPT3/4
F	Thread ANSI NPT1
G	Thread ANSI NPT1-1/2
H	Thread ANSI NPT2
Y	Special version

	015	020
FAX50 -		

Flooding protection tube for FDU90



BD: Blocking distance, **SD:** Safety distance

Usage

The flooding protection tube prevents the level to rise into the blocking distance of the FDU90 sensor even if the sensor is flooded.

The user can set a safety distance SD in the transmitter FMU90/FMU95 and define that a warning signal is generated as soon as the level rises into the safety distance.

Mounting hints

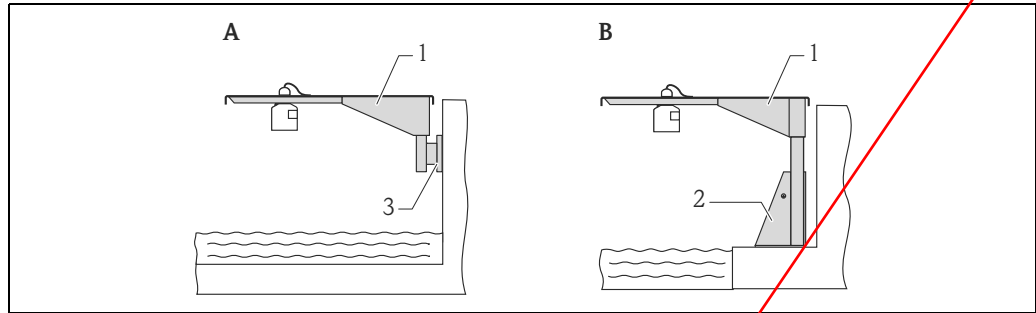
In order to ensure tightness, the supplied gasket has to be applied and the flooding protection tube must be screwed hand tight up to limit stop. When re-equipping the flooding protection tube, repeat the basic setup including the mapping

Note!

- The flooding protection tube has a G 1-1/2" thread.
- If it is ordered together with the FDU90 sensor in the product structure, the sensor always has a G 1-1/2" thread at its front side, irrespective of the selection in feature 020, "Process connection".
- If the flooding protection tube is ordered as an accessory, it can only be used for sensors with a G 1-1/2" thread at the front side.

Material	Weight	Order code
PP	0.12 kg (0.26 lbs)	71091216
Gasket EPDM		

Cantilever with mounting frame or wall bracket

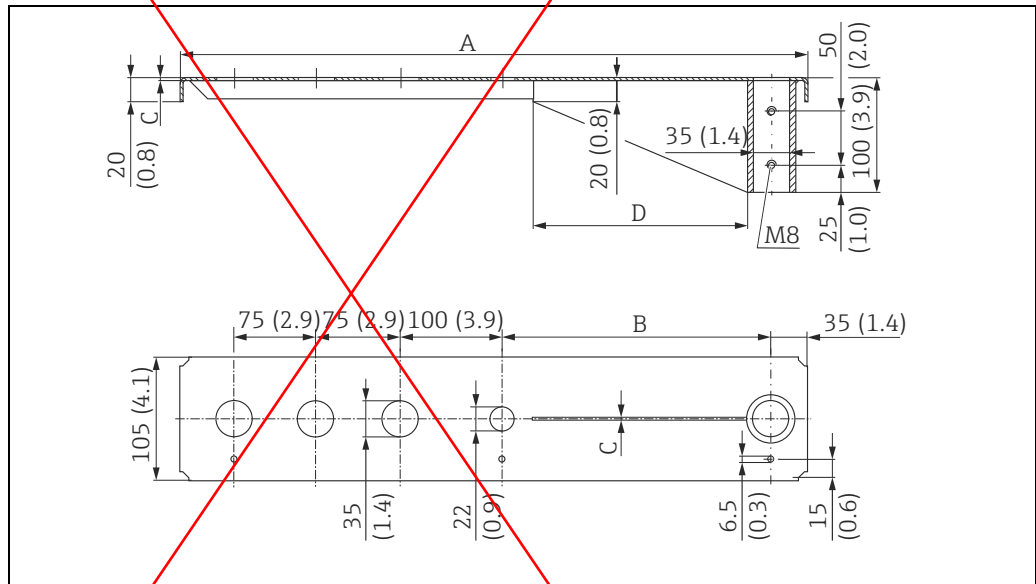


A0019589

- A** Installation with cantilever and wall bracket
- B** Installation with cantilever and mounting frame
- 1** Cantilever
- 2** Mounting frame
- 3** Wall bracket

Cantilever

The cantilever is used to mount the sensors FDU90, FDU91 and FDU92 above open channels for example.



A0019592

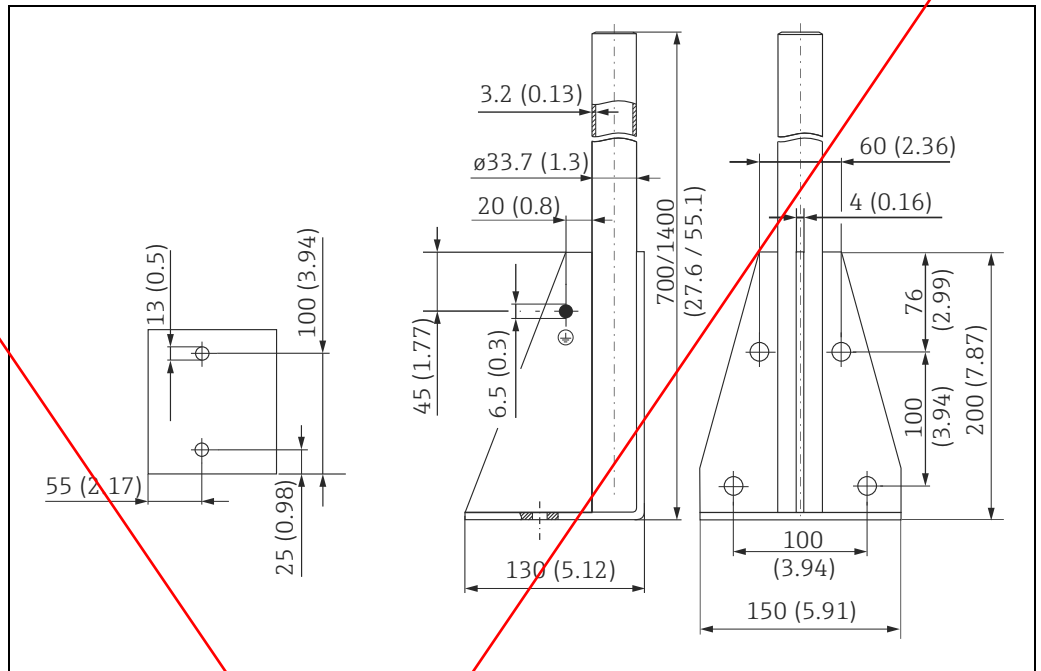
A	B	C	D	Material	Weight	Order code
585 (23)	250 (9.84)	2 (0.08)	200 (7.87)	galvanised steel	2.1 kg (4.63 lbs)	919790-0000
				316Ti (1.4571)	2.0 kg (4.41 lbs)	919790-0001
1085 (42.7)	750 (29.5)	3 (0.12)	300 (11.8)	galvanised steel	4.5 kg (9.92 lbs)	919790-0002
				316Ti (1.4571)	4.3 kg (9.48 lbs)	919790-0003

mm (in)

- The 35 mm (1.38 in) orifices are for the sensors FDU9x.
- The 22 mm (0.87 in) orifice may be used for an external temperature sensor (e.g. FMT131).

Fixing screws are supplied.

Mounting Frame

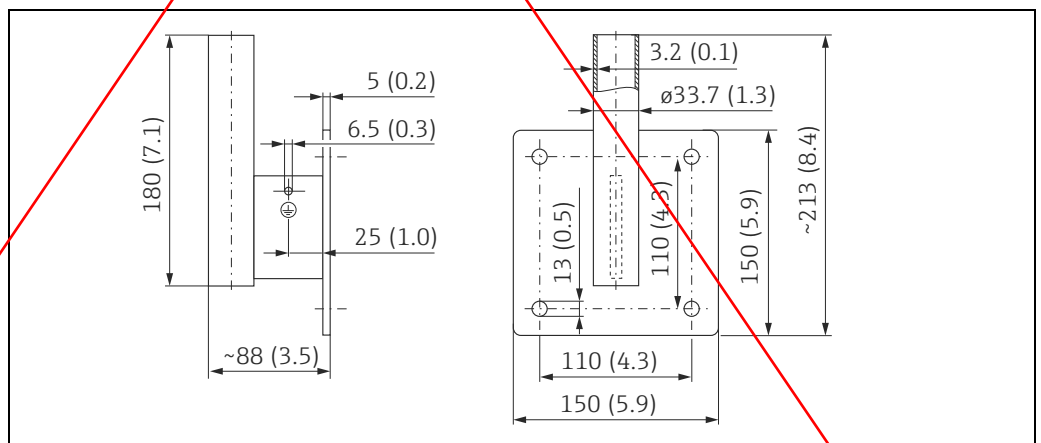


A0019279

Height	Material	Weight	Order Code
700 (27.6)	Steel, galvanized	3.2 kg (7.06 lbs)	919791-0000
700 (27.6)	316Ti (1.4571)		919791-0001
1400 (55.1)	Steel, galvanized	4.9 kg (10,08 lbs)	919791-0002
1400 (55.1)	316Ti (1.4571)		919791-0003

mm (in)

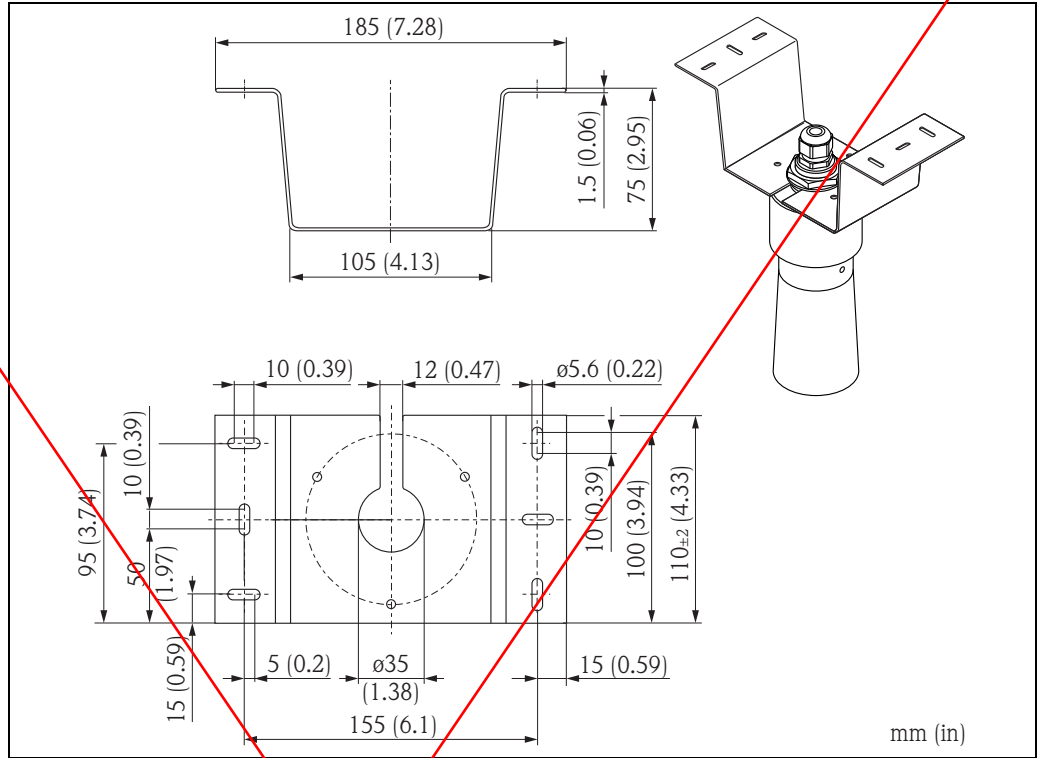
Wall Bracket



A0019350

Material	Weight	Order Code
Steel, galvanized	1.4 kg (3.09 lbs)	919792-0000
316Ti (1.4571)		919792-0001

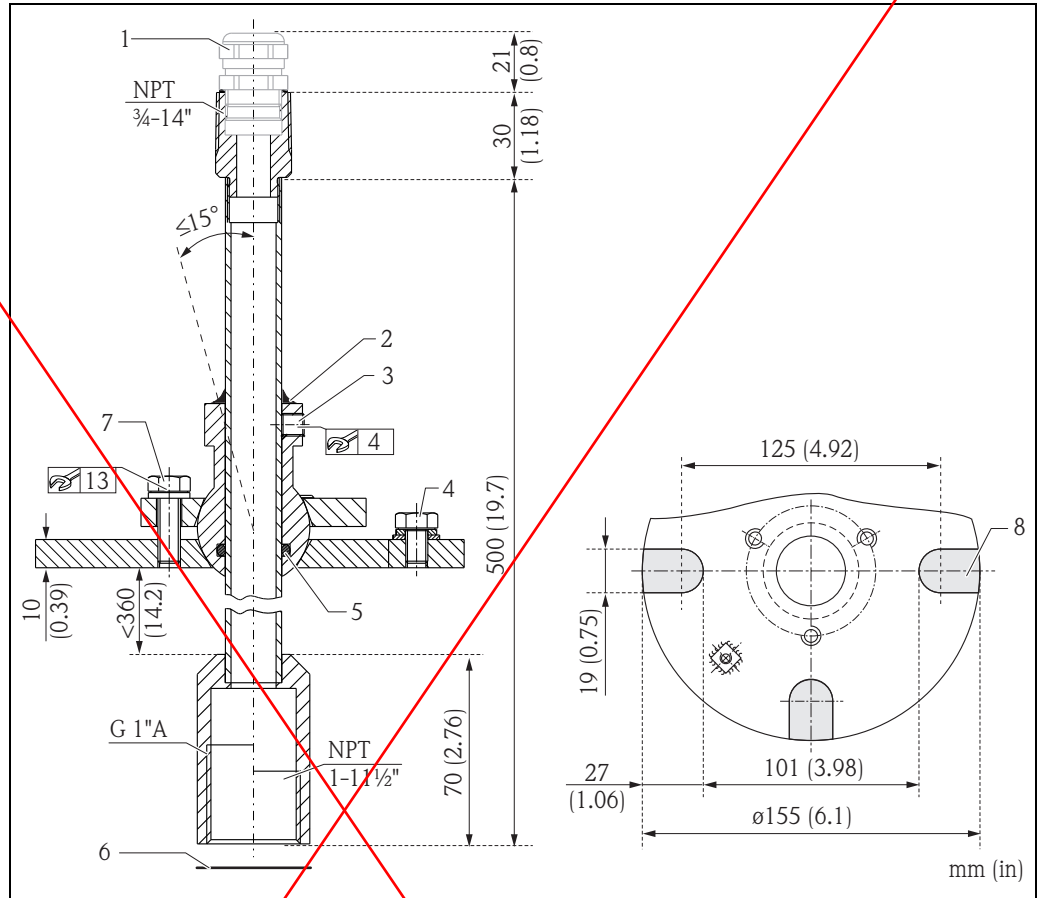
Mounting bracket for ceiling mounting



Suited for sensors:	Material	Order No.
FDU90, FDU91, FDU91F, FDU92	316L (1.4404)	71093130

Alignment unit FAU40

For measurements in solids, usage of the alignment unit FAU40 is recommended. It is designed for simple mounting and alignment of a FDU sensor on the product surface and can be used for zone separation in explosion hazardous areas.



- 1 Cable gland M20x1.5 (present if selected in the product structure)
- 2 Sealant here
- 3 Two Allen screws for height adjustment [8 Nm ±2 (5,900 lbf ft)]
- 4 Ground pin
- 5 O-ring
- 6 Seal supplied with the sensor, must be used for applications in ATEX zone 20
- 7 Screw for lateral movement [18 Nm ±2 (13,276 lbf ft)]
- 8 Mounting grooves (present in the UNI flange)

The alignment unit can be rotated up to 15°. For further information see Technical Information T00179F.

Product structure

010	Process connection (Flange)	
	1	Welding flange, 304/1.4301
	2	UNI flange 2"/DN50/50, 304, max. 1.5 bar abs./22psia suitable for 2" 150lbs / DN50 PN16 / 10K 50
020	Sensor connection	
	S	Thread G1, cable gland M20, 304/1.4301
	G	Thread G1, cable gland M20, galvanized steel
	N	Thread NPT1, cable entry 3/4, galvanized steel
FAU40 -		product designation

Power supply RNB130 for the FDU90/FDU91 sensor heater

Technical data

- Primary switched-mode power supply
- Input: 100 - 240 V AC
- Output: 24 V DC connection, max. 30 V in the event of a fault
- Connection to monophased a.c. networks or to two phase conductors of three-phase supply networks
(TN, TT or IT networks as per VDE 0100 T 300/IEC 364-3) with 100 - 240 V AC nominal voltage

For further information see Technical Information TI00120R.

Product structure

010	Approvals	
	A	Non-hazardous area
020	Connection	
	1	Screw strip
	3	Screw connection, power terminal block
030	Version	
	A	Standard
RNB130 -		complete product designation

IP66 protective housing for the power supply RNB130

Order code: 51002468

For additional information refer to Technical Information TI00080R.

Documentation

Technical Information

TI00397F

Technical Information for the transmitter Prosonic S FMU90

TI00179F

Technical Information for the alignment unit FAU40

Operating instructions (for transmitter FMU90)

Depending on the instrument version, the following operating instructions are supplied with the Prosonic S FMU90:

Operating instructions	Output	Application	Instrument version
BA00288F		<ul style="list-style-type: none"> ■ level measurement ■ alternating pump control ■ screen and rake control 	FMU90 - *****1**** FMU90 - *****2****
BA00289F	HART	<ul style="list-style-type: none"> ■ flow measurement ■ backwater and dirt detection ■ totalizers and counters 	FMU90 - *2*****1**** FMU90 - *4*****1**** FMU90 - *2*****2**** FMU90 - *4*****2****
BA00292F		<ul style="list-style-type: none"> ■ level measurement ■ alternating pump control ■ screen and rake control 	FMU90 - *****3****
BA00293F	PROFIBUS DP	<ul style="list-style-type: none"> ■ flow measurement ■ backwater and dirt detection ■ totalizers and counters 	FMU90 - *2*****3**** FMU90 - *4*****3****

These operating instructions describe installation and commissioning of the respective version of the Prosonic S. It contains those functions from the operating menu, which are required for a standard measuring task. Additional functions are described in this document: Description of Instrument Functions for Prosonic S FMU90, document number BA00290F.

Description of Instrument Functions (for transmitter FMU90)**BA00290F**

The document BA00290F contains a detailed description of **all** functions of the Prosonic S and is valid for all instrument versions.

You will find this document in the Download Area of the Endress+Hauser Internet site:

www.endress.com → Download

Safety Instructions

The following Safety Instructions are supplied with certified versions of the sensors. If the sensors are used in hazardous areas, comply with all the specifications in these Safety Instructions.

Sensor version	Certificate	Safety Instructions
ATEX		
<ul style="list-style-type: none"> ▪ FDU90 - J... ▪ FDU91 - J... ▪ FDU91F - J... ▪ FDU92 - J... 	<ul style="list-style-type: none"> ▪ II 2 G Ex ma IIC T5 Gb (FDU90) ▪ II 2 G Ex ma IIC T6 Gb (FDU91/91F/92) 	XA00321F
<ul style="list-style-type: none"> ▪ FDU90 - E... ▪ FDU91 - E... ▪ FDU91F - E... ▪ FDU92 - E... ▪ FDU93 - J... ▪ FDU95 - J... 	<ul style="list-style-type: none"> ▪ II 2 G Ex ma IIC T5 Gb (FDU90) ▪ II 2 G Ex ma IIC T6 Gb (FDU91/91F/92/93/95) ▪ II 1/2 D Ex ta/tb IIIC Txx°C Da/Db IP68 ▪ II 2 D Ex tb IIIC Txx°C Db IP68 	XA00322F
<ul style="list-style-type: none"> ▪ FDU93 - E... ▪ FDU95 - E... 	<ul style="list-style-type: none"> ▪ II 1/2 D Ex ta/tb IIIC Txx°C Da/Db IP68 ▪ II 2 D Ex tb IIIC Txx°C Db IP68 	XA00323F
IEC Ex		
<ul style="list-style-type: none"> ▪ FDU90 - C... ▪ FDU91 - C... ▪ FDU91F - C... ▪ FDU92 - C... ▪ FDU93 - D... ▪ FDU95 - D... 	<ul style="list-style-type: none"> ▪ IEC Ex ma IIC T5 Gb (FDU90) ▪ IEC Ex ma IIC T6 Gb (FDU91/91F/92/93/95) ▪ IEC Ex ta/tb IIIC Txx°C Da/Db IP68 ▪ IEC Ex tbIIIC Txx°C DbIP68 	XA00481F
<ul style="list-style-type: none"> ▪ FDU90 - D... ▪ FDU91 - D... ▪ FDU91F - D... ▪ FDU92 - D... 	<ul style="list-style-type: none"> ▪ IEC Ex ma IIC T5 Gb (FDU90) ▪ IEC Ex ma IIC T6 Gb (FDU91, FDU91F, FDU92) 	XA00482F
<ul style="list-style-type: none"> ▪ FDU93 - C... ▪ FDU95 - C... 	<ul style="list-style-type: none"> ▪ IEC Ex ta/tb IIIC Txx°C Da/Db IP68 ▪ IEC Ex tbIIIC Txx°C Db IP68 	XA00483F



www.addresses.endress.com

Technical Information

Prosonic S FMU90

Ultrasonic measurement

A universal device for level/flow measurement and pump control

Transmitter for up to 2 sensors FDU90/91/91F/92/93/95



Field of application

Level measurement of fluids and bulk materials with 1 or 2 sensors for measuring of up to 45 m (148 ft) and level limit detection. Pump control, rake control and as option: additional pump control function.

- Calculations: average, difference, sum
- Application flow: Flow measurement in open channels and weirs with 1 or 2 sensors
- Flow measurement with back water or sludge detection
- Up to 3 totalizers and 3 counters
- Counting or time pulse output for control of external units
- Transmitter available with field housing or top hat rail housing for control cabinet instrumentation





Benefits




- Simple, menu-guided operation with 6-line plain text display, 15 languages selectable
- Envelope curves on the display for simple diagnosis
- Easy operation, diagnosis and measuring point documentation with the supplied "FieldCare" operating program
- Time-of-flight correction via integrated or external temperature sensors
- Linearisation (up to 32 points, freely configurable) for the most common flumes and weirs pre-programmed and selectable
- Online calculation of the flume-/weir-flows via integrated flow curves
- Field housing aluminium with ATEX II 3D certificate

Table of Contents

Safety symbols	3	Vibration resistance	24
Function and system design	4	Ingress protection	25
Measuring principle	4	Electromagnetic compatibility (EMC)	25
Blocking distance	4	Mechanical construction	25
Time-of-flight correction	4	Housing versions	25
Interference echo suppression	4	Dimensions of the field housing polycarbonate	25
Pump control	4	Dimensions of the field housing aluminium	26
Linearization	5	Dimensions of the DIN-rail housing	26
Special functions	5	Dimensions of the separate display and operating module ..	28
Datalog functions	5	Weight	28
Application examples for level measurements	6	Materials	28
Application examples for flow measurements	7	Operability	30
System integration HART	8	Display and operating module	30
System integration PROFIBUS DP	8	Operating menu	30
Input	9	Basic setup	31
Sensor inputs	9	Locking of the instrument	31
External limit switches (option)	9	Certificates and Approvals	32
External temperature sensor	9	CE mark	32
Output	10	RoHS	32
Analog outputs	10	RCM-tick mark	32
Relay outputs	10	EAC conformity	32
PROFIBUS DP interface	11	Ex approval	32
Power supply	11	External standards and guidelines	32
Supply voltage / Power consumption / Current consumption	11	Ordering information	33
Galvanic isolation	11	Scope of delivery	33
Fuse	11	Accessories	33
Electrical connection	12	Commubox FXA195 HART	33
Terminal compartment of the field housing polycarbonate ..	12	Commubox FXA291	33
Cable entries of the field housing polycarbonate	12	Protection cover for the field housing polycarbonate	33
Terminal compartment of the field housing aluminium	12	Mounting plate for the field housing polycarbonate	34
Terminal compartment of the DIN-rail housing	13	Mounting bracket	34
Terminal assignment	15	Adaption plate for remote display	35
Connection of the sensors FDU9x	18	Overvoltage protection HAW562	35
Synchronization line	19	Temperature sensor Omnigrad S TR61	38
Connection of the separate display and operating module ..	19	Documentation	39
Connection of external switches (for FMU90-*****B***)	20	Technical Information	39
Connection of a temperature sensor	20	Operating instructions (for transmitter FMU90)	39
Performance characteristics	24	Description of Instrument Functions	39
Reference operating conditions	24	Safety Instructions	39
Maximum measuring error	24		
Measuring error ⁹⁾	24		
Measured value resolution	24		
Measuring frequency	24		
Influence of the vapor pressure	24		
Environment	24		
Ambient temperature	24		
Storage temperature	24		
Climate class	24		

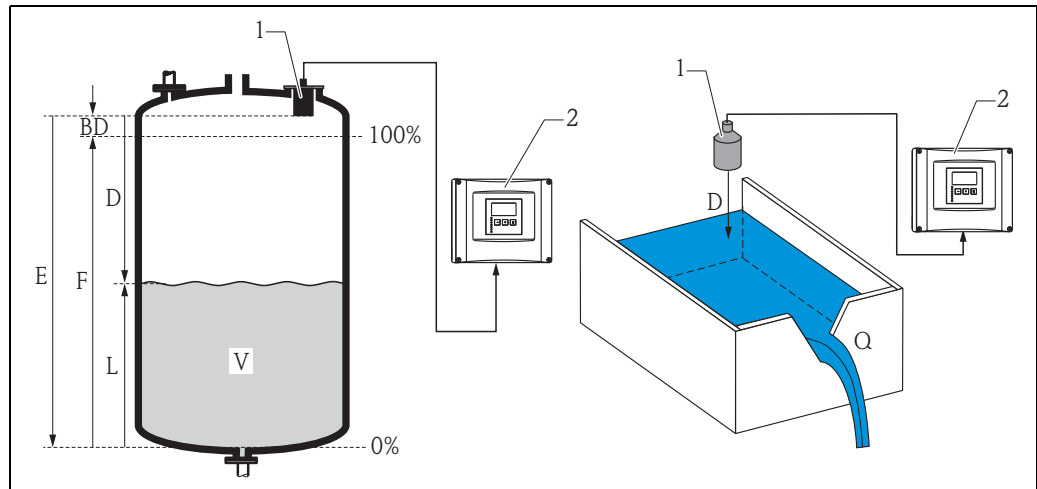
Safety symbols

Symbol	Meaning
 <small>A0011189-DE</small>	DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
 <small>A0011190-DE</small>	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
 <small>A0011191-DE</small>	CAUTION! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
 <small>A0011192-DE</small>	NOTICE! This symbol contains information on procedures and other facts which do not result in personal injury.

Explosion protection	Meaning
	Device certified for use in explosion hazardous area If the device has this symbol embossed on its name plate it can be installed in an explosion hazardous area
	Explosion hazardous area Symbol used in drawings to indicate explosion hazardous areas. Devices located in and wiring entering areas with the designation "explosion hazardous areas" must conform with the stated type of protection.
	Safe area (non-explosion hazardous area) Symbol used in drawings to indicate, if necessary, non-explosion hazardous areas. Devices located in safe areas still require a certificate if their outputs run into explosion hazardous areas

Function and system design

Measuring principle



1 FDU9x

2 Prosonic S FMU90

BD: blocking distance, **D:** distance from sensor membrane to fluid surface, **E:** empty distance **F:** span (full distance), **L:** level, **V:** volume (or mass), **Q:** flow

L00-FMU90xxx-15-00-08-xx-900

The sensor transmits ultrasonic pulses in the direction of the product surface. There, they are reflected back and received by the sensor. The transmitter Prosonic S measures the time t between pulse transmission and reception. From t (and the velocity of sound c) it calculates the distance D from the sensor membrane to the product surface:

$$D = c \cdot t / 2$$

From D results the desired measuring value:

- Level L
- Volume V
- Flow Q across measuring weirs or open channels

Blocking distance

The span F may not extend into the blocking distance BD . Level echoes within the blocking distance range can not be evaluated due to the transient characteristics of the sensor. The blocking distances of the individual sensors are given in the following documents:

The blocking distances of the individual sensors are given in the following documents:

- TI00396F for the sensors FDU90/91/91F/92/93/95¹⁾

Time-of-flight correction

In order to compensate for temperature dependent time-of-flight changes, a temperature sensor (NTC) is integrated in the ultrasonic sensors.

Optionally, the Prosonic S FMU90 has an input for an external temperature sensor (FMU90-*****B***). The following sensor can be connected:

- Pt100
- Omnigrad S TR61 from Endress+Hauser

The external sensor must be used for the heated version of the ultrasonic sensors FDU90 and FDU91.

Interference echo suppression

The interference echo suppression feature of the Prosonic S ensures that interference echoes (e.g. from edges, welded joints and installations) are not interpreted as a level echo.

Pump control

Individually configurable for each pump:

- Pump switching delay, e.g. to prevent overload of the power supply system
- Backlash time and backlash interval, e.g. for complete draining of shafts or channels
- Crust reduction at pump shaft walls by fine adjustment of the switch point

1) The sensors FDU80/80F/81F/81F/82/83/84/85/86/96 are not available anymore.
Use the serial number of your device to access the documentation for your device via www.endress.com.

Linearization**Pre-programmed linearization curves***Types of vessels*

- Horizontal, cylindrical tank
- Spherical tank
- Tank with pyramidal bottom
- Tank with conical bottom
- Tank with flat, inclined bottom

Flow curves for flumes and weirs²⁾

- Khafagi-Venturi flume
- ISO-Venturi flume
- BST³⁾-Venturi flume
- Parshall flume
- Palmer-Bowlus flume
- Rectangular weir
- Rectangular constricted weir
- NFX⁴⁾ rectangular weir
- NFX⁴⁾ rectangular constricted weir
- Trapezoidal weir
- V-notch weir
- BST³⁾ V-notch weir
- NFX⁴⁾ V-notch weir

The pre-programmed linearization curves are calculated on-line.

Linearization formula for flow measurements²

$$Q = C (h^\alpha + \gamma h^\beta)$$

"h" is the upstream level. The parameters α , β , γ and C can be freely programmed.

Linearization table

consisting of up to 32 linearization points; to be entered manually or half-automatically.

Special functions

- limit detection
- rake control
- alternating pump control or control according to pump rate (standard)
- option: additional pump control functions⁵⁾:
 - Alternation according to runtime or starts
 - pump feedback via the optional digital inputs; stand-by pump configurable
 - pump function test after resting time
 - storm function to prevent unnecessary pump running times
 - flush control for regular pump shaft cleaning
 - pump control according to tariff times via digital input
 - output of operating hours alarm or pump alarm
 - recording of pump data (operating hours, number of starts, last running time)
- totalising of the flow volume with (resettable) counters and (non-resettable) totalisers²
- triggering of a sampler by time or quantity pulses²
- low flow cut off²
- backwater detection in flumes²
- sludge detection in flumes²
- trend detection

Datalog functions

- Peak hold indicator of the min./max. levels or flows and the min./max. temperatures at the sensors
- Recording of the last 10 alarms
- Indication of the operating status
- Trend indication of the outputs on the on-site display
- Indication of the operating hours

2) for instrument versions with flow software (FMU90 - *2***** or FMU90-*4*****)

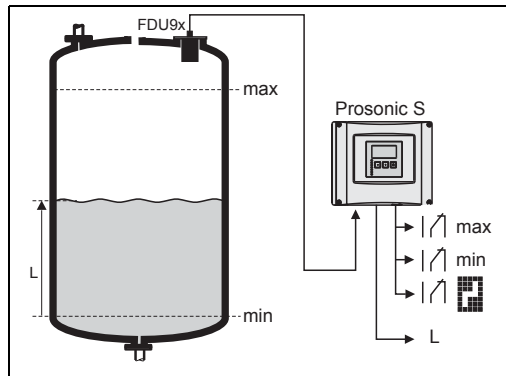
3) BST: British Standard

4) French standard NFX 10-311

5) for instruments with software for additional pump control (FMU90-*3***** or FMU90-*4*****)

Application examples for level measurements

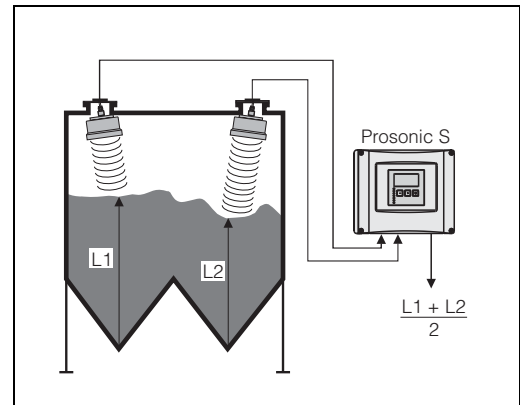
Level measurement with limit detection and alarm output



L00-FMU90xxx-15-00-00-xx-010

Order code e.g.: FMU90 - *1***131****
(1 input, 3 relays, 1 outputs)

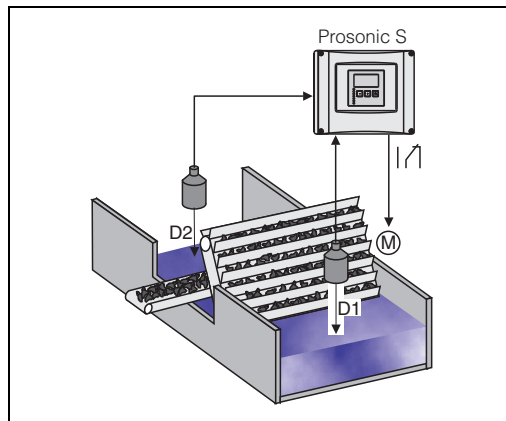
Average level measurement



L00-FMU90xxx-15-00-00-xx-003

Order code e.g.: FMU90 - *1***212****
(2 inputs, 2 outputs)

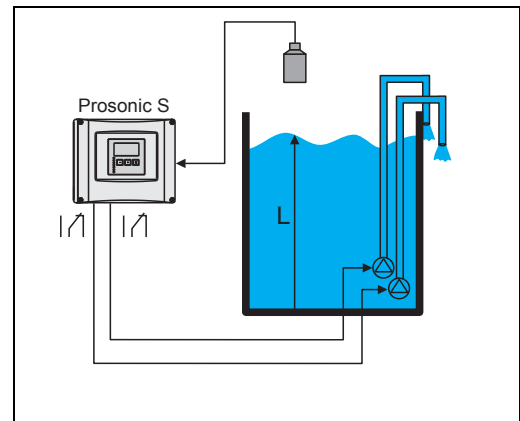
Rake control (differential measurement)



L00-FMU90xxx-15-00-00-xx-004

Order code e.g.: FMU90 - *1***212****
(2 inputs, 1 relay, 2 outputs)

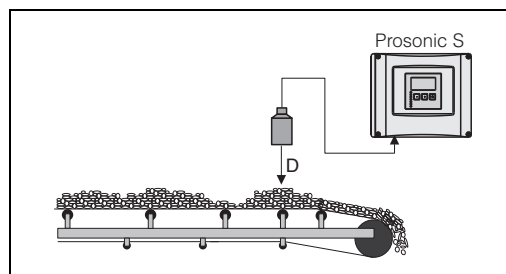
Alternating pump control (up to 6 pumps)



L00-FMU90xxx-15-00-00-xx-007

Order code e.g.: FMU90 - *1***131****
(1 input, 3 relays)

Conveyor belt

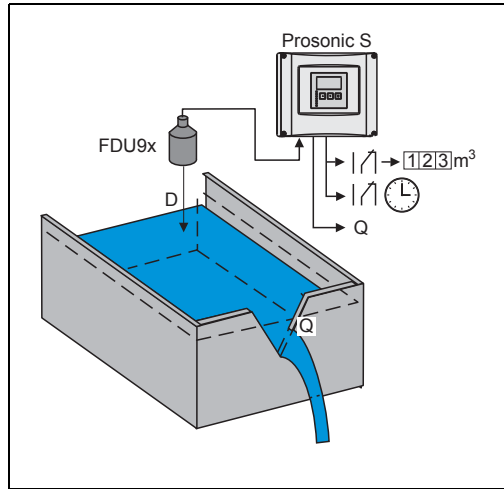


L00-FMU90xxx-15-00-00-xx-005

Order code e.g.: FMU90 - *1***111****
(1 input, 1 output)

Application examples for flow measurements

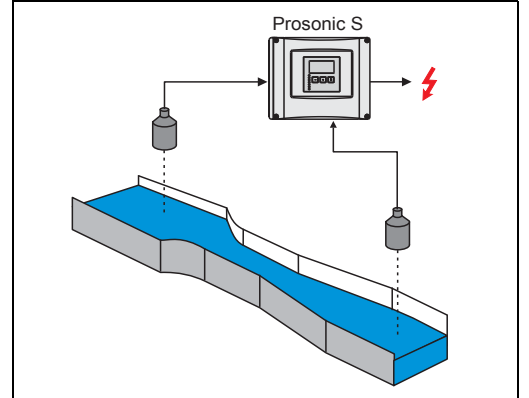
Pulses for volume counter + time pulses (e.g. for sampler)



Order code e.g.: FMU90 - *2***131****
(1 input, 3 relays, 1 output)

Flow measurement with backwater alarm or sludge detection

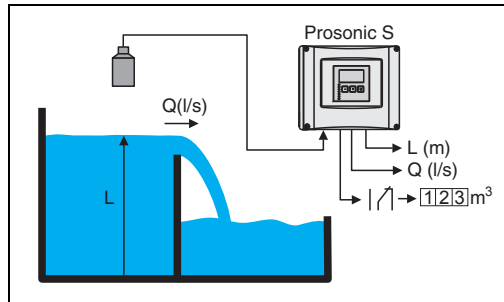
If the ratio "downstream level:upstream level" rises above or falls below a critical value, an alarm will be generated.



Order code e.g.: FMU90 - *2***212****
(2 inputs, 1 relay, 2 outputs)

Stormwater overflow bassin

Simultaneous measurement of level L and flow Q with 1 sensor.

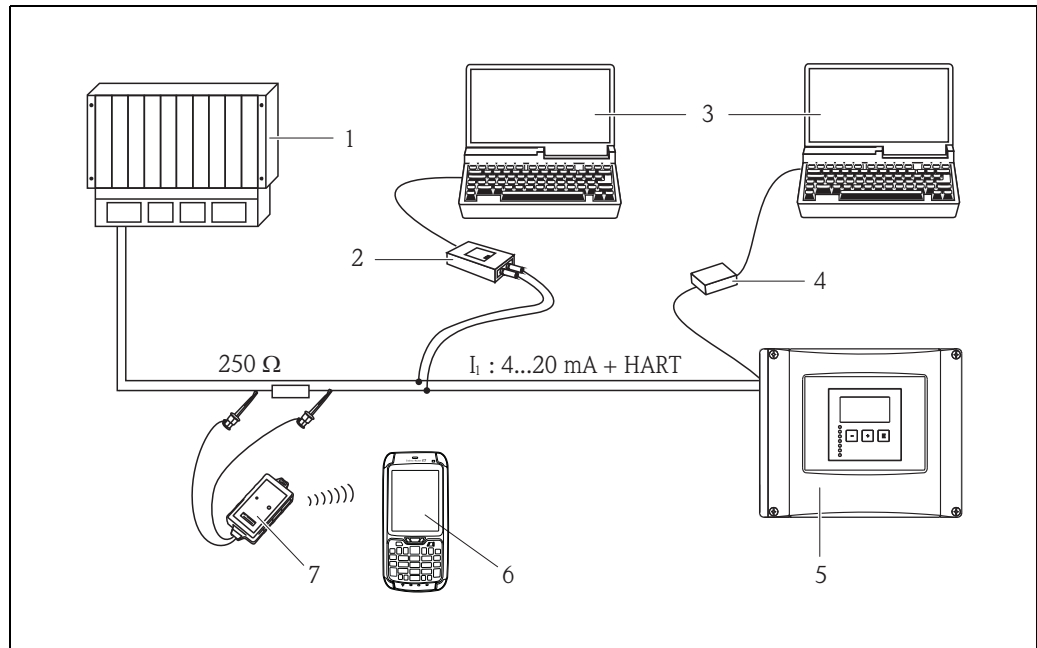


Order code e.g.: FMU90 - *2***112****
(1 input, 2 outputs)

System integration HART

Operating options

In the standard version a HART signal is superimposed onto the first output current. In order to use the HART communication, the circuit must contain a communication resistor of 250 Ω.



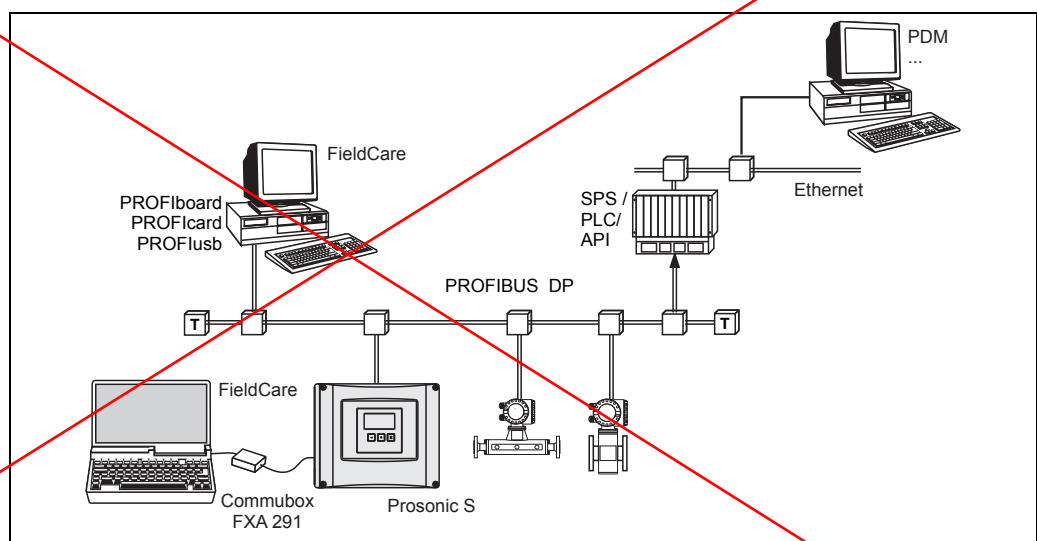
L00-FMU90xxxx-14-00-00-xx-020

- 1 SPS, PLC, API
- 2 Commubox FXA195 (USB), HART-Protocol
- 3 FieldCare
- 4 Commubox FXA291 (service interface)
- 5 Operating and display module at the Prosonic S (if present)
- 6 Field Xpert SFX350/SFX370
- 7 VIATOR Bluetooth-Modem with connection cable

System integration PROFIBUS DP

Operating options

- Via the display and operating module at the Prosonic S
- Via the service interface with the Commubox FXA291 and the operating program FieldCare
- Via PROFIBUS DP with PROFIboard, PROFIcard or PROFIusb and the operating program FieldCare



L00-FMU90xxxx-14-00-00-xx-021

Input

Sensor inputs

Depending on the instrument version, 1 or 2 of the sensors FDU90, FDU91, FDU91F, FDU92, FDU93, FDU95 can be connected. The Prosonic S identifies these sensors automatically.

Sensor	FDU90	FDU91 FDU91F	FDU92	FDU93	FDU95
Max. range ¹⁾ in liquids	3 (9.8)	10 (33)	20 (66)	25 (82)	-
Max. range ¹⁾ in solids	1.2 (3.9)	5 (16)	10 (33)	15 (49)	45 (148)

m (ft)

- 1) This table gives the maximum range. The range depends on the measuring conditions. For an estimation see Technical Information TI00396F, Chapter "Input".

In order to support existing installations, the following sensors can be connected as well.⁶⁾ The type of sensor must be entered manually (except FDU96).

Sensor	FDU80 FDU80F	FDU81 FDU81F	FDU82	FDU83	FDU84	FDU85	FDU86	FDU96
Max. range ¹⁾ in liquids	5 (16)	10 (33)	20 (66)	25 (82)	-	-	-	-
Max. range ¹⁾ in solids	2 (6.6)	5 (16)	10 (33)	15 (49)	25 (82)	45 (148)	70 (230)	70 (230)

m (ft)

- 1) This table gives the maximum range. The range depends on the measuring conditions. For an estimation see Technical Information TI00189F, Chapter "Planning Recommendations".



The sensors FDU83, FDU84, FDU85 and FDU86 with an ATEX, FM or CSA certificate are not certified for connection to the FMU90 transmitter.

External limit switches (option)

Optionally, the Prosonic S FMU90 has 4 inputs for external limit switches (FMU90-*****B***).

Switching options

- External passive limit switch (NC/NO switch)
- 0: < 8 V; 1: > 16 V

Usage (examples)

- Pump feedback (for FMU90-3*****B*** and FMU90-4*****B***)
- Pump tariff control (for FMU90-3*****B*** and FMU90-4*****B***)
- Start/stop/reset of daily counters for flow measurements (for FMU90-2*****B*** and FMU90-4*****B***)
- Min/max level detection, e.g. by Liquiphant

External temperature sensor

Optionally, the Prosonic S FMU90 has an input for an external temperature sensor (FMU90-*****B***).

Connectable sensors

- Pt100 (3-wire or 4-wire connection)
A Pt100 with 2-wire connection may not be used due to its insufficient accuracy.
- Omnigrad S TR61 (from Endress+Hauser) → 33, "Accessories"

Usage (example)

- Time-of-flight correction for a heated sensor (FDU90-***B*, FDU91-***B*).

6) The sensors FDU80/80F/81/81F/82/83/84/85/86/96 are not available anymore.
Use the serial number of your device to access the documentation for your device via www.endress.com.

Output

Analog outputs

Number	1 or 2, depending on instrument version
Output signal	Active current output output values configurable at the instrument: <ul style="list-style-type: none"> ▪ 4 to 20 mA with HART¹⁾ ▪ 0 to 20 mA without HART
Signal on alarm	<ul style="list-style-type: none"> ▪ For setting 4 to 20 mA, selectable: <ul style="list-style-type: none"> - MIN: -10 % (3,6 mA) - MAX: 110 % (22 mA) - HOLD (last current value is held) - User specific ▪ For setting 0 to 20 mA: <ul style="list-style-type: none"> - MIN: 110 % (21,6 mA) - HOLD (last current value is held) - User specific
Output damping	Freely selectable, 0 to 1000 s
Load	Max. 600 Ω, influence negligible
Max. ripple	$U_{SS} = 200 \text{ mV}$ at 47 to 125 Hz (measured at 500 Ω)
Max. noise	$U_{eff} = 2,2 \text{ mV}$ at 500 Hz to 10 kHz (measured at 500 Ω)

- 1) The HART signal is assigned to the first analog output. The second analog output does not carry a HART signal.

Relay outputs

Number	1, 3 or 6; depending on the instrument version
Type	Potential-free relay, SPDT, can be inverted
Assignable functions	<ul style="list-style-type: none"> ▪ Limit (inband, out-of-band, trend, level limit) ▪ Counting pulse¹ for flow counting (max. frequency 2 Hz; pulse width adjustable) ▪ Time pulse¹ (max. frequency 2 Hz; pulse width adjustable) ▪ Alarm/diagnosis (e.g. indication of backwater¹⁾, sludge¹, echo loss etc.) ▪ Pump control (alternating/fixed limit/pump rate) ▪ For FMU90-*3***** and FMU90-*4*****): additional pump control (standby pump, storm function to avoid unnecessary run times of the pumps, pump function test, flush control to clean pump shafts, operating hours alarm, pump alarm) ▪ Rake control (difference or relative measurement) ▪ Fieldbus relay (to be switched directly from the PROFIBUS DP-bus)
Switching power	<ul style="list-style-type: none"> ▪ DC voltage: 35 V_{DC}, 100 W ▪ AC voltage: 4 A, 250 V, 1000 VA at $\cos\phi = 0,7$
State on error	Selectable: <ul style="list-style-type: none"> ▪ HOLD (last value is held) ▪ Energized ▪ Ee-energized ▪ Present value is used
Behaviour after power failure	Switch-on delay selectable
LEDs ²⁾	A yellow LED on the front panel is allocated to each relay, which lights if the relay is energized. The LED of an alarm relay lights during normal operation. The LED for a pulse relay briefly flashes at every pulse.

- 1) For instrument versions with flow software (FMU90 - *2*****)
2) For instrument versions with display and operating module

PROFIBUS DP interface	Profile	3.0
	Transmittable values	<ul style="list-style-type: none"> ■ Main value (level or flow, depending on the instrument version) ■ Distances ■ Counters ■ Temperatures ■ Average/difference/sum ■ Relay states ■ Rake control ■ Pump control
	Function blocks	<ul style="list-style-type: none"> ■ 10 Analog Input Blocks (AI) ■ 10 Digital Input Blocks (DI) ■ 10 Digital Output Blocks (DO)
	Supported baud rates	<ul style="list-style-type: none"> ■ 9.6 kbaud ■ 19.2 kbaud ■ 45.45 kbaud ■ 93.75 kbaud ■ 187.5 kbaud ■ 500 kbaud ■ 1.5 Mbaud ■ 3 Mbaud ■ 6 Mbaud ■ 12 Mbaud
	Service Access Points (SAPs)	1
	ID number 1540 (hex)	1540 (hex) = 5440 (dec)
	GSD file	EH3x1540.gsd
	Addressing	Via dip switches at the instrument or via software (e.g. FieldCare). Default address: 126 per software
	Termination	Can be activated/deactivated in the instrument.
	Locking	The device can be locked by hardware or software.

Power supply

Supply voltage / Power consumption / Current consumption	Instrument version	Supply voltage	Power consumption	Current consumption
	AC voltage (FMU90 - ****A****)	90 to 253 V _{AC} (50/60 Hz)	Max. 23 VA	Max. 100 mA at 230 V _{AC}
	DC voltage (FMU90 - ****B****)	10,5 to 32 V _{DC}	Max. 14 W (typically 8 W)	Max. 580 mA at 24 V _{DC}

Galvanic isolation

The following terminals are galvanically isolated from each other:

- Auxiliary energy
- Sensor inputs
- Analog output 1
- Analog output 2
- Relay outputs
- Bus connection (PROFIBUS DP)

Fuse

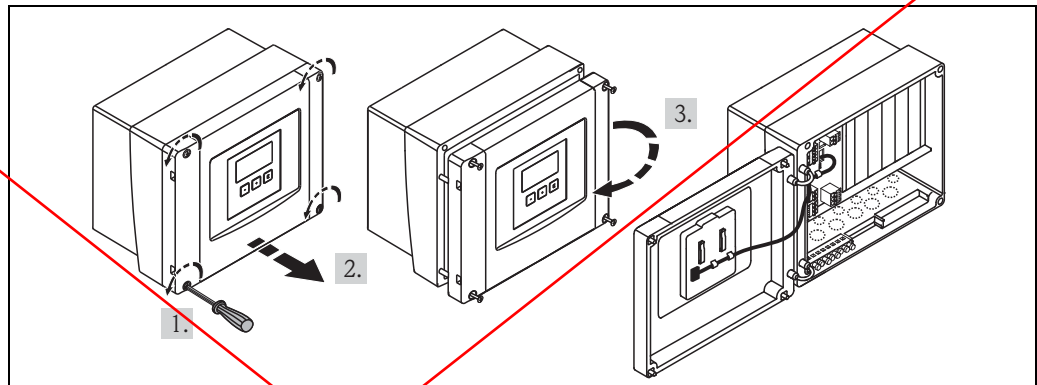
- 2 A T /DC
- 400 mA T /AC

Accessible in the terminal compartment

Electrical connection

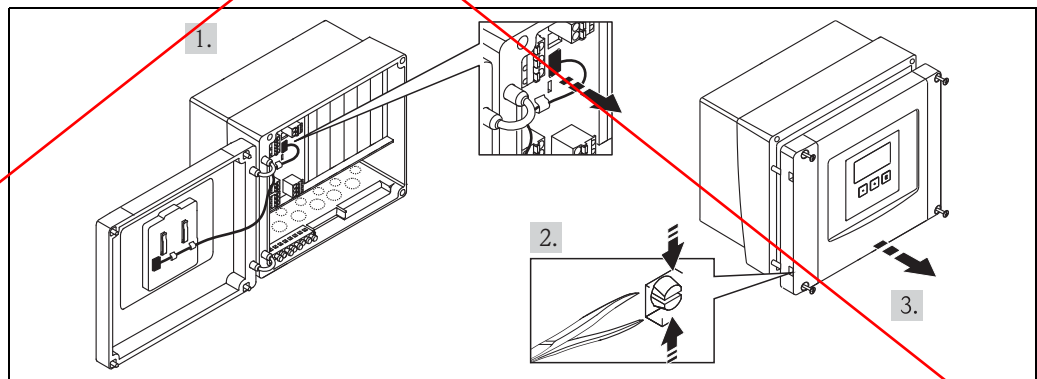
Terminal compartment of the field housing polycarbonate

The field housing has a separate terminal compartment. It can be opened after loosening the 4 screws of the lid.



L00-FMU90xxx-04-00-00-xx-002

For easier wiring, the lid can be completely removed by unplugging the display plug and loosening the hinges:



L00-FMU90Kxx-04-00-00-xx-009

Cable entries of the field housing polycarbonate

On the bottom of the housing the following openings for cable entries are prestamped:

- M20x1.5 (10 openings)
- M16x1.5 (5 openings)
- M25x1.5 (1 opening)

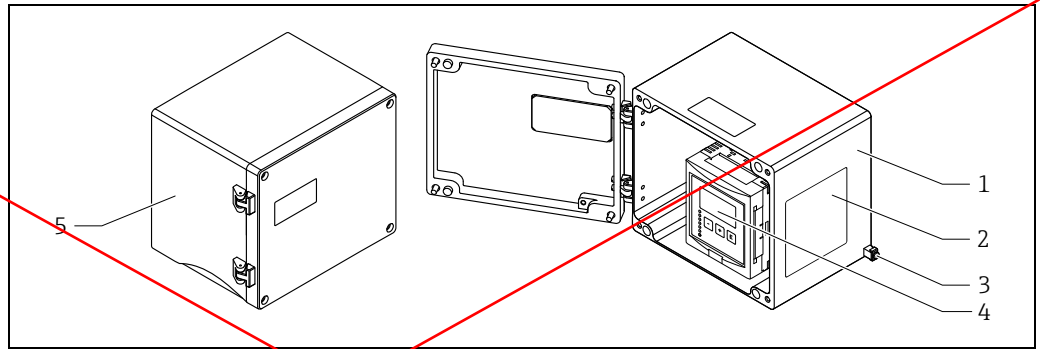
A suitable cutting device must be used for cutting out the openings.

Terminal compartment of the field housing aluminium

The field housing aluminium is wired almost the same way as the FMU90 in the DIN-rail housing → 13.

Pay attention to the following differences:

- In explosion-hazardous areas, all connections must be located inside the field housing aluminium.
 - . Exception: For potential equalization, there's a terminal block inside the housing that is wired to the FMU90 ex works. The terminal block is connected to the protective earth terminal, which is accessible on the outside of the field housing aluminium.
- For wiring inside the housing, the cables are routed into the housing through the cable entries in the bottom and are connected there with either the device or a terminal block. When routing the cables through the cable entries, use cable glands that are appropriate for the ignition protection type!
- If the distance to the sensors is greater than 30 m (98 ft), an extension cable must be used.



- 1 Field housing aluminium, housing opened
- 2 Nameplate
- 3 Protective earth terminal
- 4 Display and operating module
- 5 Field housing aluminium, housing closed

Cable entries

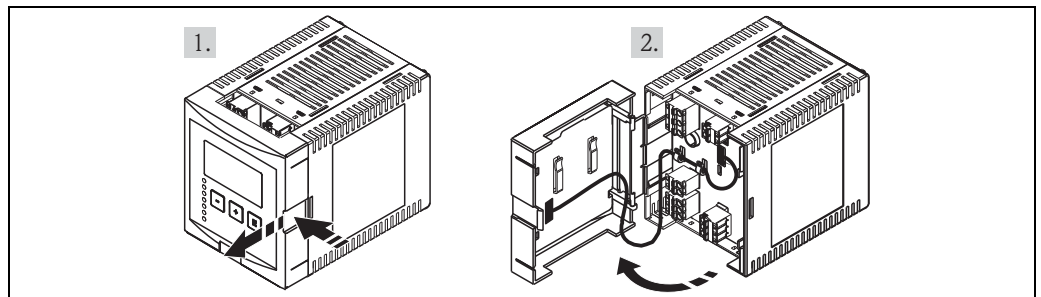
At the bottom of the housing are 12 cable entries M20x1,5 located :

HINWEIS

When routing the cables through the cable entries, use cable glands that are appropriate for the ignition protection type!

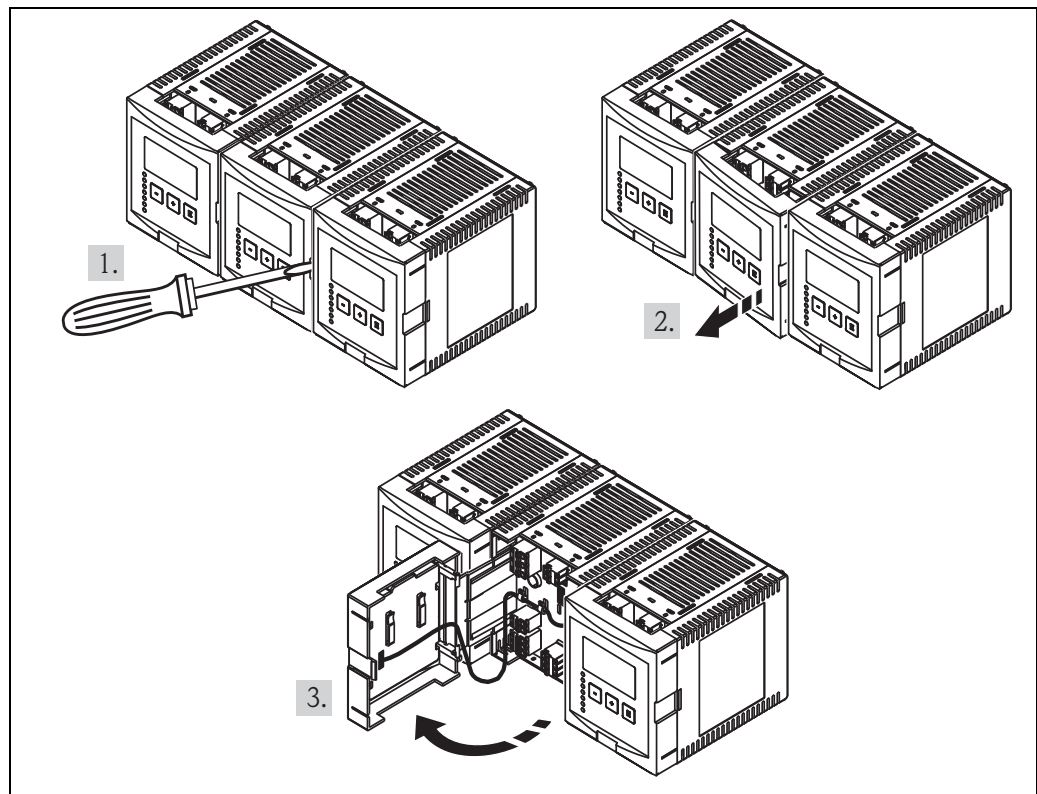
Terminal compartment of the DIN-rail housing

Single instrument



The catch can be unlocked by slightly pressing onto the clip. Then, the cover of the terminal compartment can be opened.

Several instruments mounted side by side



L00-FMU90xxx-04-00-00-xx-012

1. Open the catch of the cover (e.g. by a screwdriver).
2. Pull the cover out by approx. 20 mm (0.79 in) .
3. The cover can now be opened.
 - The cables can be inserted into the housing from above or from below.
 - The pictures show the smallest housing version but are valid for the larger versions as well.
 - If the instruments are mounted next to each other and if the sensor cables run in parallel, the synchronization terminals (39 and 40) must be interconnected (see sections → [15](#) "Terminal assignment" and → [19](#) "Synchronization line").

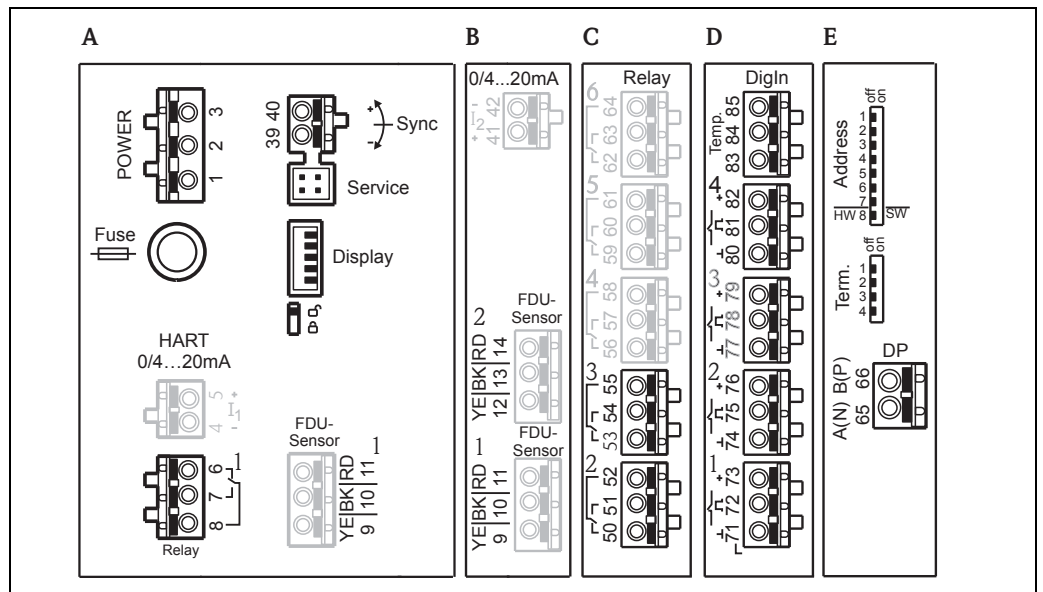
Terminal assignment

Pluggable spring-force terminals for connection of the cables are supplied in the terminal compartment. Rigid conductors or flexible conductors with cable sleeve can directly be inserted and are contacted automatically.

Feature	Value
Conductor cross section	0,2 mm ² to 2,5 mm ² (26 to 14 AWG)
Cable and sleeve cross section	0,25 mm ² to 2,5 mm ² (24 to 14 AWG)
Min. stripping length	10 mm (0.39 in)

The terminal configuration depends on the instrument version ordered. There is a basic terminal area, which is present in every instrument version. Additional optional terminal areas are only present if the respective option has been selected in the product structure.

Terminal area	Present for the following instrument versions
Basic area	A For all versions
Optional areas	B For instrument versions with 2 sensor inputs and/or 2 analog outputs (FMU90 - *****2***** and/or FMU90 - *****2*****)
	C For instrument versions with 3 or 6 relays (FMU90 - *****3***** oder FMU90 - *****6*****)
	D For instruments with external switch inputs and external temperature input (FMU90 - *****B*****)
	E For instrument versions with PROFIBUS DP interface (FMU90 - *****3*****)



L00-FMU90xxx-04-00-00-xx-001

Terminals of the Prosonic S (the terminals depicted in grey are not present in every instrument version)

A Basic terminal area

B - E Optional terminal areas (present if the respective option has been selected in the product structure)



The depicted switching states of the relays refer to the de-energized state.

Terminals	Meaning	Terminal area	Remarks
Auxiliary energy			
1, 2	<ul style="list-style-type: none"> ▪ L (für AC version) ▪ L+ (for DC version) 	A	Depending on instrument version: <ul style="list-style-type: none"> ▪ 90 to 253 V_{AC} ▪ 10,5 to 32 V_{DC}
2	<ul style="list-style-type: none"> ▪ N (for AC version) ▪ L- (for DC version) 	A	
3	Potential equalization	A	
Fuse		A	Depending on instrument version: <ul style="list-style-type: none"> ▪ 400 mA T (for AC) ▪ 2 A T (for DC)
Analog outputs (not available for PROFIBUS DP instruments)			
4, 5	Analog output 1; 4 to 20 mA with HART/ 0 to 20 mA w/o HART	A	Not present for the PROFIBUS DP version
41, 42	Analog output 2 (optional); 4 to 20 mA/ 0 to 20 mA	B	Only for the version with two analog outputs; no HART signal at this output
Relay outputs			
6, 7, 8	Relay 1	A	
50, 51, 52	Relay 2 (optional)	C	Only for the versions with 3 or 6 relays
53, 54, 55	Relay 3 (optional)	C	Only for the versions with 3 or 6 relays
56, 57, 58	Relay 4 (optional)	C	Only for the version with 6 relays
59, 60, 61	Relay 5 (optional)	C	Only for the version with 6 relays
62, 63, 64	Relay 6 (optional)	C	Only for the version with 6 relays
Bus communication (only available for PROFIBUS DP instruments)			
65	PROFIBUS A (RxT/TxD - N)	D	Only for the PROFIBUS DP version
66	PROFIBUS B (RxT/TxD - P)	D	
Synchronization			
39, 40	Synchronization	A	See section 4.6, "Synchronization line"
Level inputs			
9 (YE), 10 (BK), 11 (RD)	Sensor 1 (FDU8x/9x) YE: yellow strand BK: black strand RD: red strand		<ul style="list-style-type: none"> ▪ A: for versions with 1 sensor input ▪ B: for versions with 2 sensor inputs¹⁾
12 (YE), 13 (BK), 14 (RD)	Sensor 2 (FDU8x/9x) (optional) YE: yellow strand BK: black strand RD: red strand	B	Only for the version with 2 sensor inputs
External switch inputs			
71, 72, 73	External switch input 1	D	0: < 8 V or 72 and 73 interconnected 1: > 16 V or 72 and 73 not interconnected
74, 75, 76	External switch input 2	D	0: < 8 V or 75 and 76 interconnected 1: > 16 V or 75 and 76 not interconnected
77, 78, 79	External switch input 3	D	0: < 8 V or 78 and 79 interconnected 1: > 16 V or 78 and 79 not interconnected
80, 81, 82	External switch input 4	D	0: < 8 V or 81 and 82 interconnected 1: > 16 V or 81 and 82 not interconnected

Terminals	Meaning	Terminal area	Remarks
Temperature input			
83, 84, 85	Temperature input: <ul style="list-style-type: none"> ▪ PT100 ▪ Omnigrad S TR61 (Endress+Hauser) 	D	See section "Connection of a temperature sensor"

1) In this case, terminals 9/10/11 are not present on terminal area A.

CAUTION


Limitation of electrical safety.

- ▶ When using the public supply mains, an easily accessible power switch must be installed in the proximity of the device. The power switch must be marked as a disconnecter for the device (IEC/EN 61010).

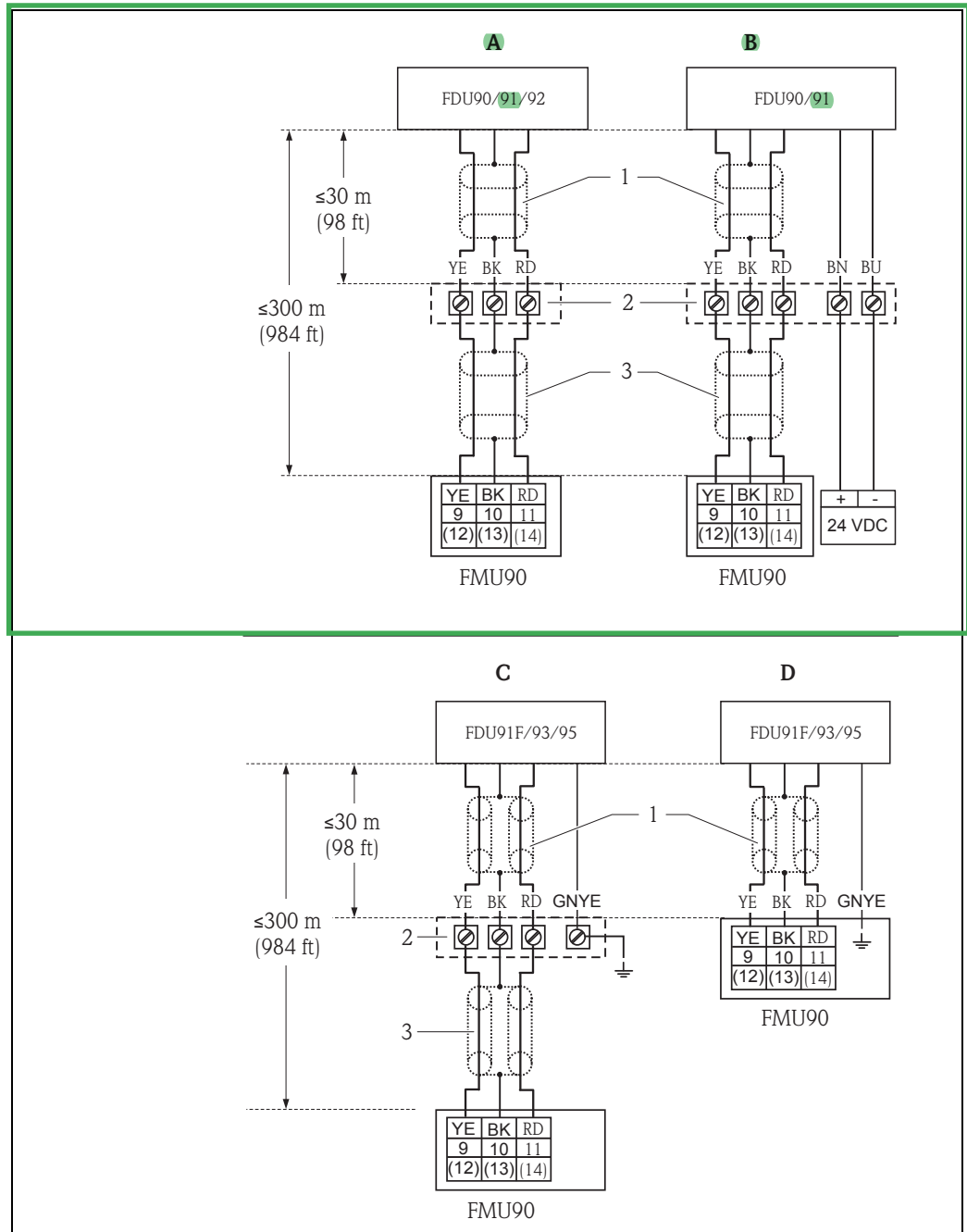


In order to avoid interference, do not route the sensor cables parallel to high-voltage or electric power lines and not close to frequency converters.

Additional elements on the terminal areas

Designation	Meaning/Remarks
Fuse	Fuse: 2 A T /DC or 400 mA T/AC
Display	Connection of the display or the remote display and operating module
Service	Service interface for connection of a PC/Notebook via Commubox FXA291
	Locking switch
Term.	Bus termination (only applicable for instruments with PROFIBUS interface)
Address	Bus address (only applicable for instruments with PROFIBUS interface)

Connection of the sensors
FDU9x



- A** Without sensor heater
- B** With sensor heater
- C** Grounding at the terminal box
- D** Grounding at the transmitter FMU90

- 1 Screen of the sensor cable
- 2 Terminal box
- 3 Screen of the extension cable

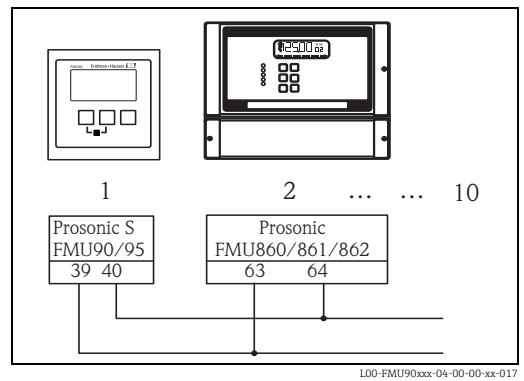
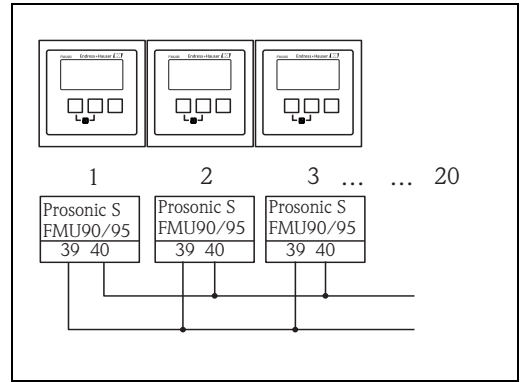
Colours of the strands: YE = yellow; BK = black; RD = red; BU = blue; BN = brown; GNYE = green-yellow

For details refer to Technical Information TI00396F⁷⁾.

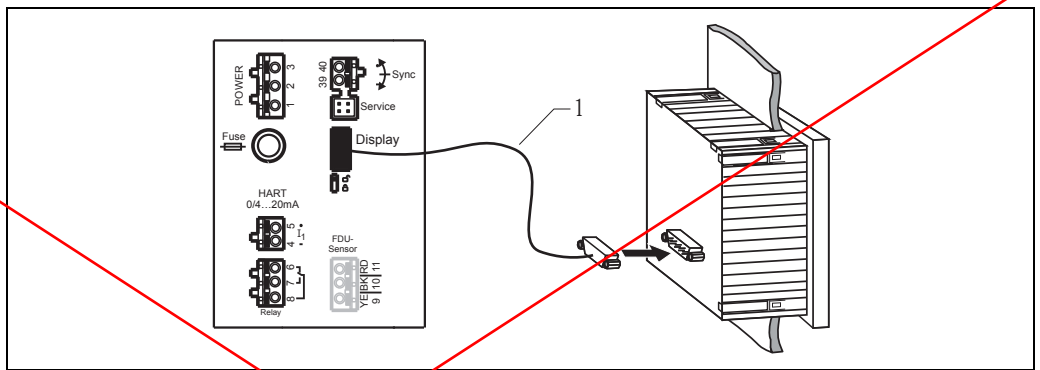
7) The sensors FDU80/80F/81/81F/82/83/84/85/86/96 are not available anymore.
Use the serial number of your device to access the documentation for your device via www.endress.com.

Synchronization line

- If wiring several Prosonic S (FMU90/FMU95) which are mounted in a common cabinet and if the sensor cables run in parallel, the synchronization terminals (39 and 40) must be interconnected.
- Up to 20 instruments can be synchronized in this way.
- The synchronization prevents an evaluation unit from receiving a signal while a different evaluation unit is emitting a signal. This prevents pulses in the sensor cable of one sensor from influencing the received signal on the cable of a different sensor.
- If there are more than 20 instruments, groups must be formed, each containing a maximum of 20 instruments. For the instruments within each group, the sensor cables may run in parallel. The sensor cables of different groups must be separated from each other.
- Usual commercial screened cable can be used for synchronization
 - Max. length: 10 m (33 ft) between the individual instruments
 - cross section: 2 x (0.75 to 2.5 mm² (18 to 14 AWG))
 - for lengths up to 1 m (3.3 ft), an unshielded cable can be used; for lengths exceeding 1 m (3.3 ft), screening is required. The screen must be connected to ground
- Instruments of the Prosonic FMU86x family can be connected to the synchronization line as well. In this case a maximum of 10 instruments can be connected to each synchronisation line.



Connection of the separate display and operating module



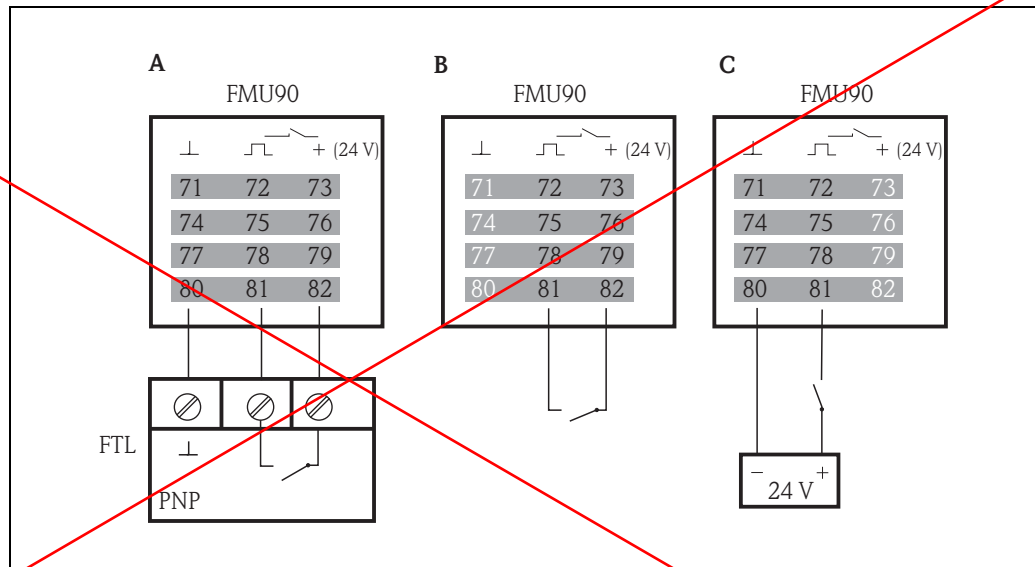
1 Connection of the display plug with the cable (3 m (9.8 ft))

For the version of the Prosonic S with a separate display for panel mounting, a pre-assembled connecting cable (3 m (9.8 ft)) is supplied. The cable must be connected to the display plug of the Prosonic S.



Minimum diameter for cable bushing: 20 mm (0.79 in)

Connection of external switches (for FMU90-*****B***)



- A *Liquiphant*
 B *External switch*
 C *External switch with external supply voltage*

The maximum short-circuit current at 24 V is 20 mA.

Connection of a temperature sensor

The Prosonic S FMU90 transmitter has an optional input for an external temperature probe (in the product structure: feature 90 "Additional input", option B, → 33). The following probes can be connected:

- a Omnigrad S TR61 temperature probe from Endress+Hauser
- a Pt100 temperature probe



- After connecting an external temperature sensor, the following is required:
 1. The type of the connected sensor (Pt100 or Omnigrad S TR61) must be selected in "sensor management/ext. temp. sensor" in the "sensor type" parameter.
 2. The external temperature sensor must be assigned to an ultrasonic sensor in "sensor management/FDU sensor/US sensor N" in the "temp. measurement" parameter.

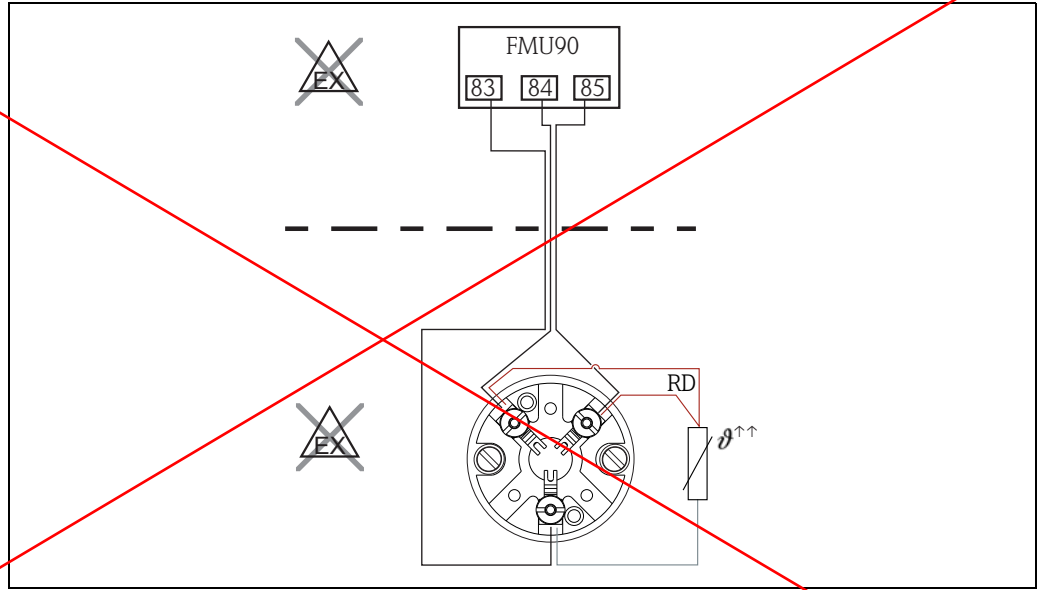
If the option "alarm" has been selected for the case of an error in external temperature sensor, this alarm is indicated by the alarm relay.

Omnigrad S TR61 (Endress+Hauser) (connectable to FMU90-*****B***)

In case an external temperature sensor is needed, an Omnigrad S TR61 can be used. See → 38 for examples for exact order codes for a TR61 temperature sensor.

Outside of explosion-hazardous areas, the following types of Omnigrad S TR61 with ceramic terminal block (no head transmitter) can be used:

- TR61-A*****



RD Cable color = Red

More information can be found in the following documents:

- TI01029T

~~Omnigrad S TR61 for explosion-hazardous areas (Endress+Hauser) (connectable to FMU90-*****P***)~~

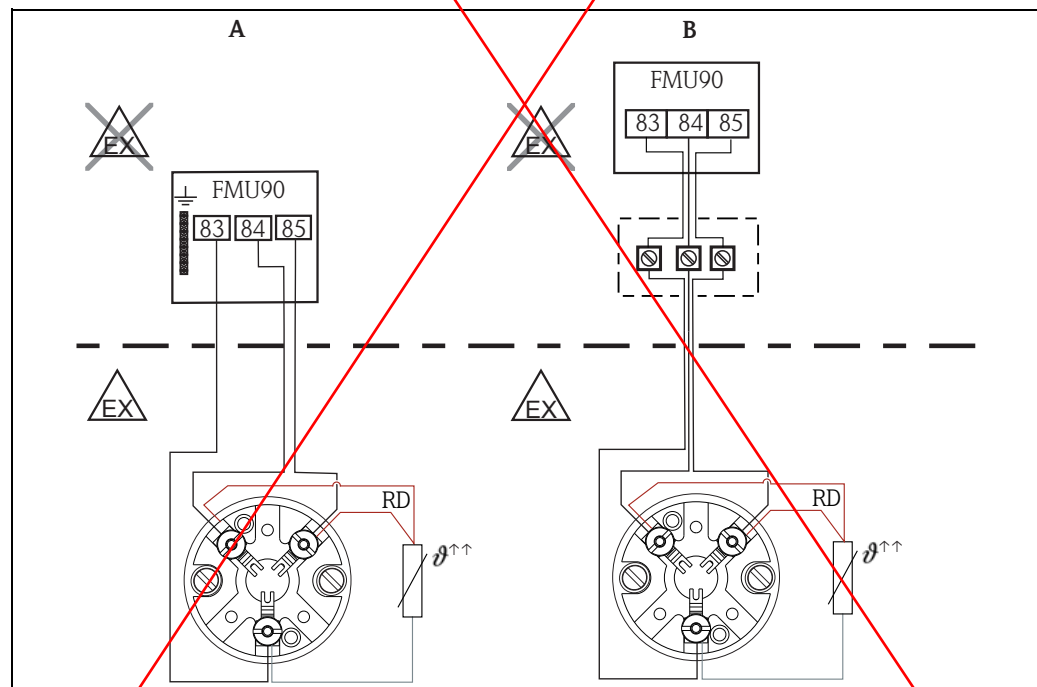
~~For explosion-hazardous areas, an Omnigrad S TR61 with ceramic terminal block (no head transmitter) can be used, which has appropriate approval for the corresponding area.~~

~~In connection with the FMU90, only those variants of the Omnigrad S TR61 can be used which do not rely on intrinsic safety. Depending on the conditions of the individual explosion-hazardous area, suitable types can be for instance the following:~~

- ~~■ TR61-E*****~~
- ~~■ TR61-H*****~~
- ~~■ TR61-M*****~~
- ~~■ TR61-N*****~~
- ~~■ TR61-R*****~~
- ~~■ TR61-S*****~~
- ~~■ TR61-2*****~~
- ~~■ TR61-3*****~~

HINWEIS

Devices for use in hazardous environments are accompanied by separate "Ex documentation" (XA), which is an integral part of the documentation. Strict compliance with the installation instructions and ratings as stated in this Additional documentation is mandatory.

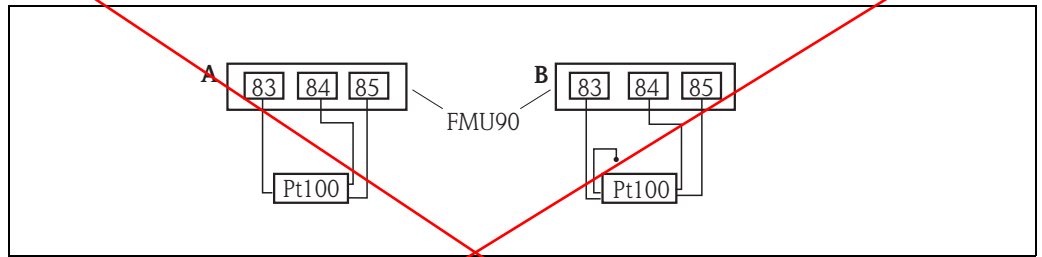


- A Ex area
 B Ex area, with connection via terminal box
 RD Cable color = Red

More information can be found in the following documents:

- TI01029T

Pt100 (connectable to FMU90-***B***)**



L00-FMU90xxx-04-00-00-xx-020

A Pt100 with 3-wire connection

B Pt100 with 4-wire connection (one connector remains unused)



A Pt100 with 2-wire-connection may not be used due to its insufficient measuring accuracy.


⚠ WARNING

Explosion hazard!


A Pt100 must not be connected in explosion hazardous areas.

- In explosion hazardous areas, use an Omnigrad S TR61.

Performance characteristics

Reference operating conditions	<ul style="list-style-type: none"> ■ Temperature = 24±5 °C (75±9 °F) ■ Pressure = 960±100 mbar (14±1.45 psi) ■ Relative humidity = 60±15 % ■ Ideally reflecting surface, sensor vertically aligned (e.g. calm, plane liquid surface of 1 m² (10.76 ft²)) ■ No interference echoes within the signal beam ■ Settings of the application parameters: <ul style="list-style-type: none"> - Tank shape = flat ceiling - Medium property = liquid - Process condition = calm surface
Maximum measuring error^{8) 9)}	±0.2 % of the maximum span of the sensor
Measuring error⁹⁾	Includes linearity, repeatability, and hysteresis ±2 mm (0.08 in) + 0.17 % of the measured distance
Measured value resolution	1 mm (0.04 in) with FDU90/FDU91
Measuring frequency	Max. 3 Hz The exact value depends on the settings of the application parameters and the instrument version.
	 The maximum measuring frequency is obtained for "empty E" ≤ 2 m (≤ 6.6 ft) and "process condition" = "test: no filter".
Influence of the vapor pressure	The vapor pressure at 20 °C (68 °F) gives a hint on the accuracy of the ultrasonic level measurement. If the vapor pressure at 20 °C (68 °F) is below 50 mbar (1 psi), ultrasonic level measurement is possible with a very high accuracy. This is valid for water, aqueous solutions, water-solid-solutions, dilute acids (hydrochloric acid, sulfuric acid, ...), dilute bases (caustic soda, ...), oils, greases, slurries, pastes, ... High vapor pressures or outgassing media (ethanol, acetone, ammonia, ...) can influence the accuracy. If conditions like these are present, please contact Endress+Hauser: http://www.endress.com/contact

Environment

Ambient temperature	−40 to 60 °C (−40 to 140 °F) The functionality of the LC display becomes restricted at T _U < −20 °C (T _U < −4 °F). If the device is operated outdoors in strong sunlight, a protective cover should be used (→  33).
Storage temperature	−40 to 60 °C (−40 to 140 °F)
Climate class	<ul style="list-style-type: none"> ■ Field housing polycarbonate: according to DIN EN 60721-3 4K2/4K5/4K6/4Z2/4Z5/4C3/4S4/4M2 (DIN 60721-3 4K2 corresponds to DIN 60654-1 D1) ■ Field housing aluminium: according to DIN EN 60721-3 4K2/4K5/4K6/4Z2/4Z5/4C3/4S4/4M2 (DIN 60721-3 4K2 corresponds to DIN 60654-1 D1) ■ Housing for DIN rail mounting: according to DIN EN 60721-3 3K3/3Z2/3Z5/3B1/3C2/3S3/3M1 (DIN 60721-3 3K3 corresponds to DIN 60654-1 B2)
Vibration resistance	<ul style="list-style-type: none"> ■ Housing for DIN rail: DIN EN 60068-2-64 / IEC 68-2-64; 20 to 2000 Hz; 0,5 (m/s²)²/Hz ■ Field housing polycarbonate: DIN EN 60068-2-64 / IEC 68-2-64; 20 to 2000 Hz; 1,0 (m/s²)²/Hz ■ Field housing aluminium: DIN EN 60068-2-64 / IEC 68-2-64; 20 to 2000 Hz; 1,0 (m/s²)²/Hz

8) according to EN 61298-2

9) with reference operating conditions

Ingress protection

- Field housing polycarbonate: IP66 / NEMA 4x
- Field housing aluminium: IP66 / NEMA 4x
- Housing for DIN rail: IP20
- Separate display:
 - IP65 / NEMA 4 (front panel, if mounted in cabinet door)
 - IP20 (rear panel, if mounted in cabinet door)

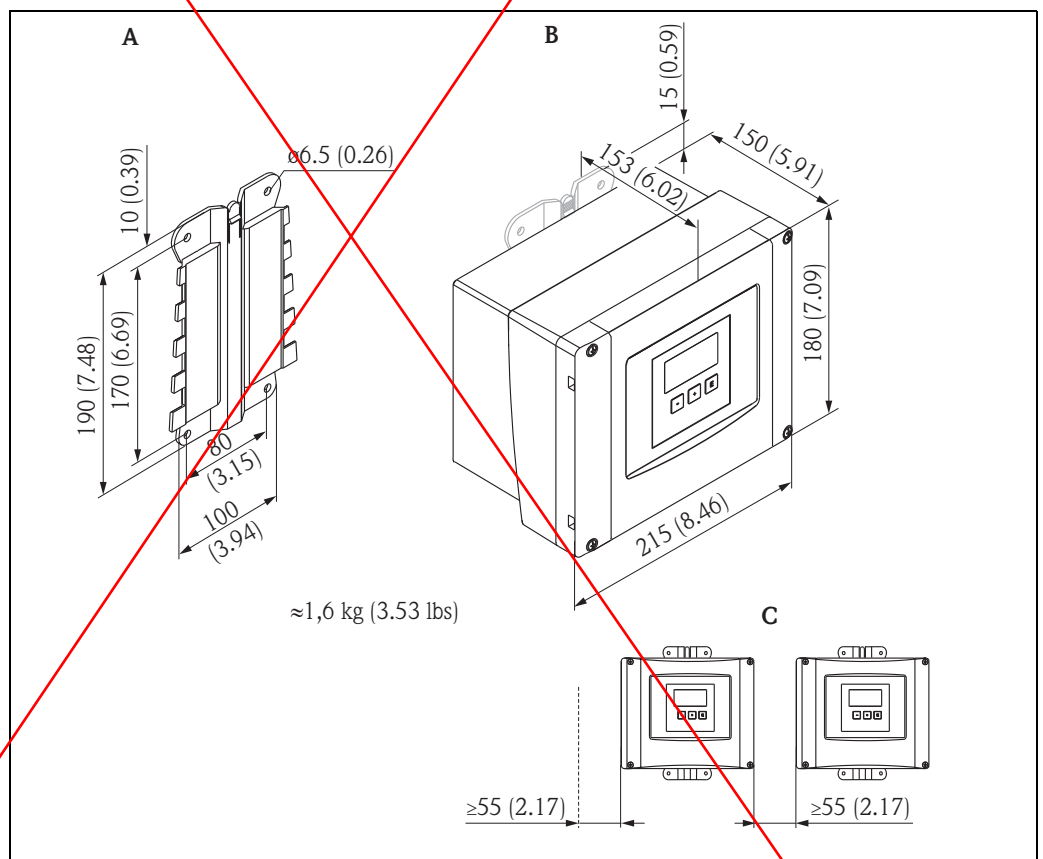
Electromagnetic compatibility (EMC)

Electromagnetic compatibility according to all relevant requirements of the EN 61326- series and NAMUR recommendation EMC (NE21). For details see declaration of conformity.
With respect to interference emission the devices meet the requirements of class A and are only provided for use in an "industrial environment"!

Mechanical construction

Housing versions

- Field housing polycarbonate; optionally with integrated display and operating module
- Field housing aluminium; optionally with integrated display and operating module
- Housing for top-hat rail mounting; optionally with integrated display and operating module
- Housing for top-hat rail mounting with separated display and operating module for cabinet door mounting

Dimensions of the field housing polycarbonate

L00-FMU90xxx-06-00-00-xx-001

Dimensions in mm (in)

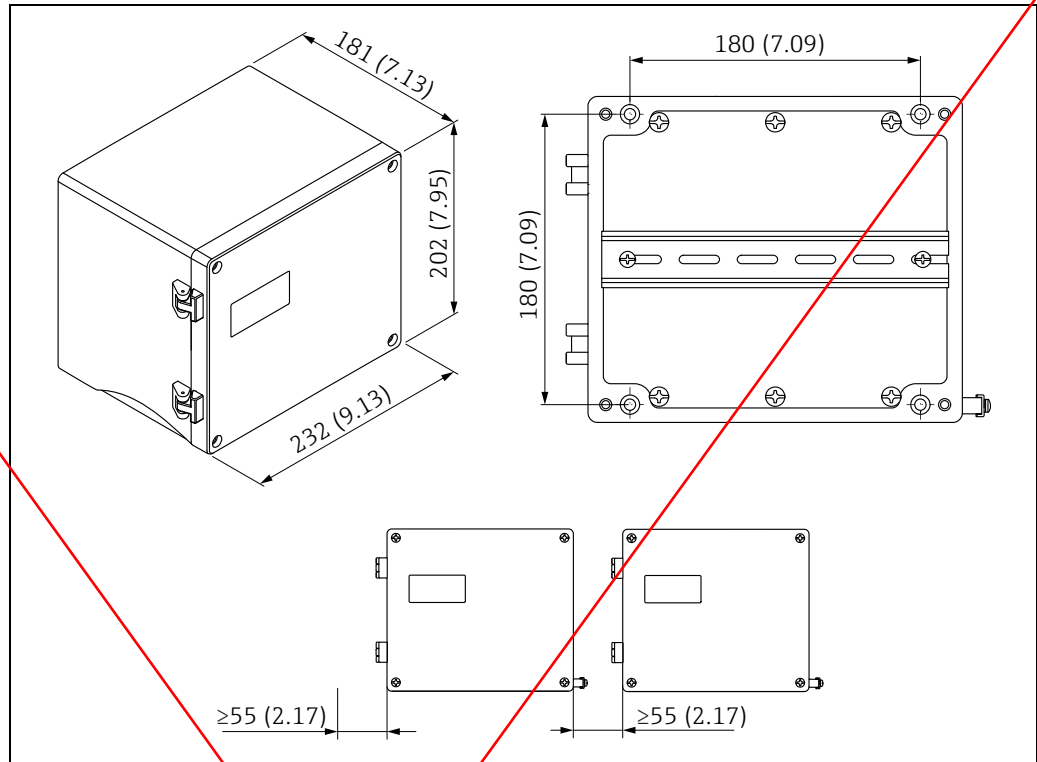
- A Mounting help (supplied); can also be used as drilling template
 B Field housing polycarbonate
 C Minimum mounting distance

The dimensions of the field housing polycarbonate are the same for all instrument versions.
To open the housing, a minimum mounting distance of 55 mm (2.17 in) is required on the left.



The mounting help must be mounted on a plane surface and must not become bent. Otherwise the mounting of the field housing polycarbonate may be difficult or impossible.

Dimensions of the field housing aluminium



Dimensions in mm (in)

The dimensions of the field housing aluminium are the same for all instrument versions. To open the housing, a minimum mounting distance of 55 mm (2.17 in) is required on the left.

Dimensions of the DIN-rail housing

The dimensions of the DIN-rail housing depend on the instrument version. The version determines, which terminal areas the Prosonic S contains. The dimensions are influenced by the following features of the product structure:

- 60: Level Input
- 70: Switch Output
- 80: Output

In order to determine the dimensions of a specific version, perform the following steps (see the example → 27):

1. Using the product structure, determine the options of the features 60, 70 and 80 of the instrument version in question.

	10	20	30	40	50	60	70	80	90	100	110	120
FMU90 -												

2. Using the following table, determine how many optional terminal areas this instrument version contains.

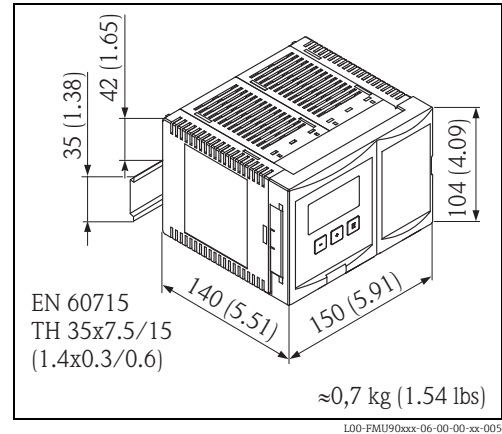
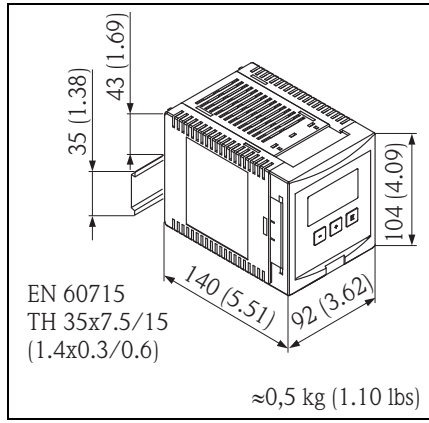
Feature and option of the product structure	Corresponds to the following terminal area	Present? yes = 1 no = 0
Feature 60; option 2 and/or feature 80, option 2	2 sensor inputs and/or 2 analog outputs	
Feature 70, option 3 or 6	3 or 6 relays	

Feature 80, option 3	PROFIBUS DP interface	
Feature 90, option B	Inputs for external switches and external temperature sensor	
Sum =		

3. The appropriate dimensions are given in the following diagram:

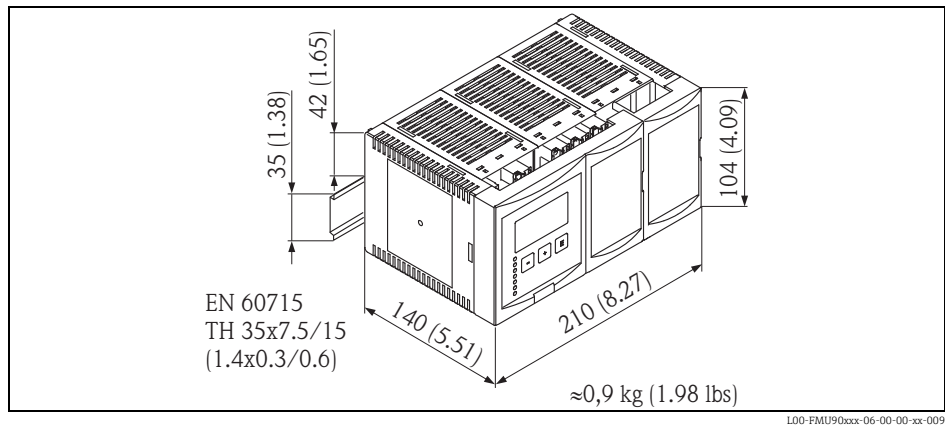
Sum = 0
(only basic terminal area)

Sum = 1, 2 or 3
(1-3 optional terminal areas)



Dimensions in mm (in)

Sum = 4
(4 optional terminal areas)



Dimensions in mm (in)

Example

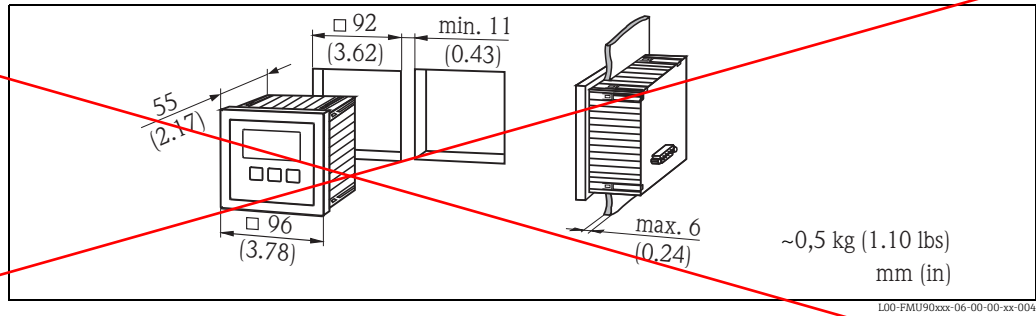
		10	20	30	40	50	60	70	80	90	100	110	120
FMU90 -	R	1	2	A	A	2	3	2	A	A	1	A	

Feature and option of the product structure	Corresponds to the following terminal area	Present?
Feature 60; option 2 and/or Feature 80, option 2	2 sensor inputs and/or 2 analog outputs	1 (yes)
Feature 70, option 3 or 6	3 or 6 relays	1 (yes)
Feature 80, option 3	PROFIBUS DP interface	0 (no)

Feature 90, option B	Inputs for external switches and external temperature sensor	0 (no)
Sum =		2

Sum = 2
=> 104 mm x 150 mm x 140 mm (4.09 x 5.91 x 5.51 in)

~~Dimensions of the separate display and operating module~~

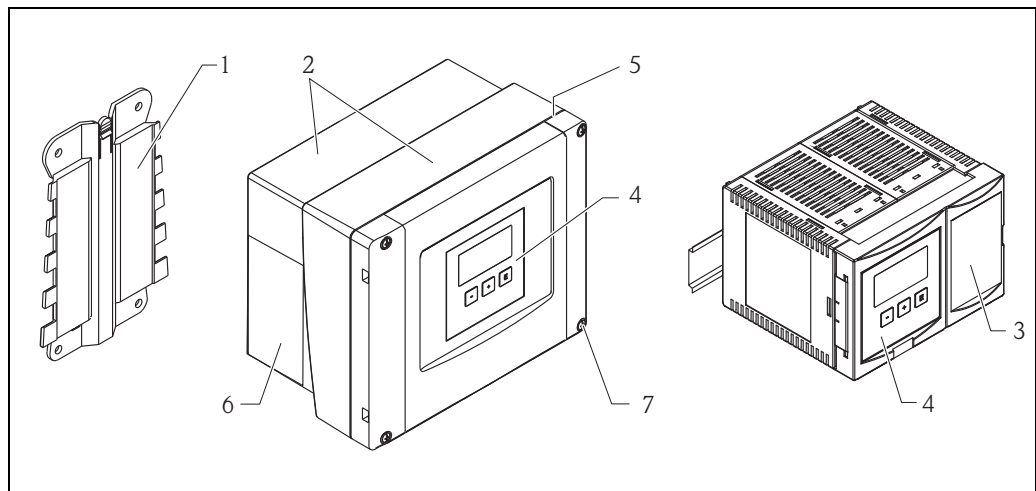


Weight

Housing version	Weight
Field housing polycarbonate	Approx. 1.6 to 1.8 kg (3.53 to 3.97 lbs); depending on instrument version
Field housing aluminium	Approx. 6,0 kg (13.23 lbs); depending on instrument version
Housing for DIN rail	Approx. 0.5 to 0.7 kg (1.10 to 1.54 lbs); depending on instrument version (→ 26 "Dimensions of the DIN-rail housing")
Separate display and operating module	Approx. 0.5 kg (1.10 lbs)

Materials

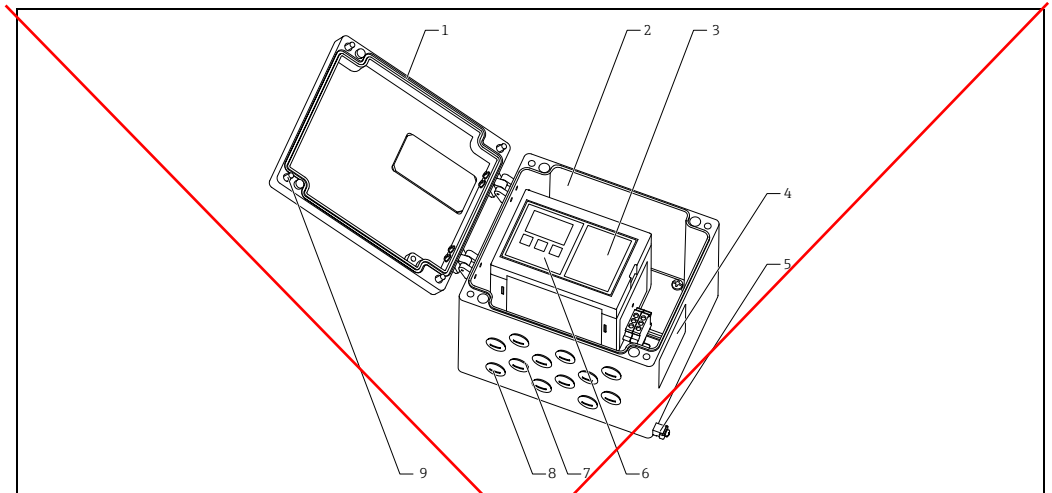
Field housing polycarbonate with DIN rail



Pos.	Part	Material
1	Housing bracket	PC-FR
2	Field housing	PC-FR
3	Housing for DIN rail	PBT-GF
4	Separate display and operating module	PC
5	Sealing	PUR foam

Pos.	Part	Material
6	Nameplate	Polyester
7	Screws	A4 (1.4578)

Field housing aluminium with DIN rail

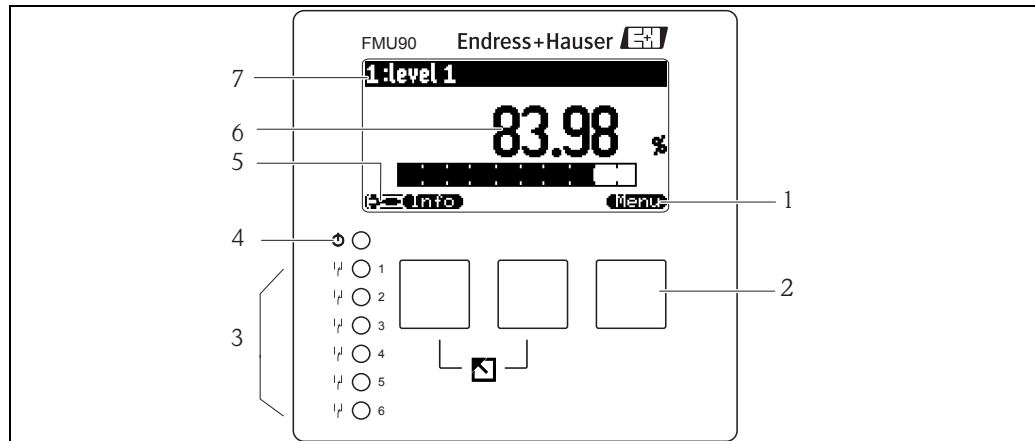


L00-FMU90xxx-06-00-00-xx-001

Pos.	Bauteil	Werkstoff
1	Sealing	Silicone
2	Field housing aluminium	EN AC-AISi12 (Fe)
3	Housing for DIN rail	PBT-GF
4	Nameplate	Polyester
5	Ground connection	Base: A2 1.4305 Clamp: A2 1.4301 Spring ring: A2 1.4310 Screw M5: A2
6	Display and operating module	PC
7	Blind plugs	Ms, plated
8	O-Ring	EPDM 70 + PTFE
9	Screws	A2

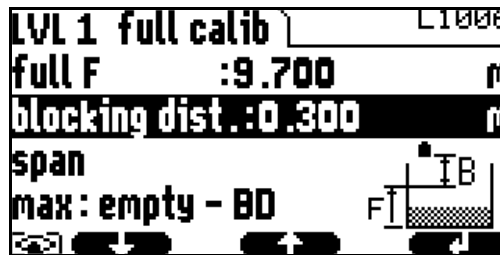
Operability

Display and operating module

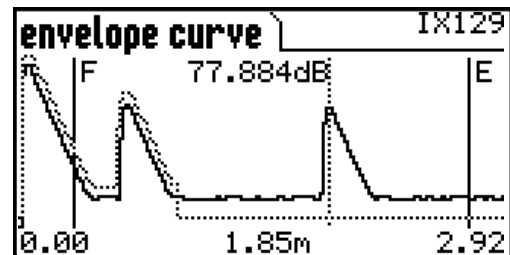


- 1 Softkey symbol
- 2 Key
- 3 LEDs indicating the switching states of the relays
- 4 LED indicating the operating state
- 5 Display symbols
- 6 Value of the parameter, including unit
- 7 Name of the parameter

Display (Examples)



Display of a function including help text and descriptive graphic



Display of the envelope curve including the mapping. The level echo and the empty distance are marked.

Keys (softkey operation)

The function of the keys depends on the current position within the operating menu (softkey functionality). The key functions are indicated by softkey symbols in the bottom line of the display.

HINWEIS

Field housing aluminium: The softkeys are covered from a cover with sight glass. To use the softkeys the cover must be removed.

LEDs

- 1 LED indicates the operating state ("normal operation", "alarm" or "warning")
- 6 LEDs indicate the switching state of the relays (LED glows if the respective relay is energised)

HINWEIS

Field housing aluminium: The LEDs are covered from the cover with sight glass. Only the display can be seen through the sight glass.

Display

An illuminated display is available as an option (s. feature 40 of the product structure → 33)

Operating menu

The Prosonic S has got a dynamical operating menu. Only those functions are visible which are relevant for the instrument version and installation environment at hand.

Basic setup	The operating menu contains basic setups for easy commissioning of level and flow measurements. The basic setups guide the user through the complete commissioning procedure.
Locking of the instrument	The instrument can be locked against parameter changes in the following ways: <ul style="list-style-type: none">■ Locking switch in the terminal compartment■ Key combination at the operating module■ Input of a locking code via software (e.g. "FieldCare")

Certificates and Approvals

CE mark	The measuring system meets the legal requirements of the EC-guidelines. Endress+Hauser confirms the instrument passing the required tests by attaching the CE-mark.
RoHS	The measuring system complies with the substance restrictions of the EU Directive on the restriction of the use of certain hazardous substances 2011/65/EU (RoHS 2).
RCM-tick mark	The product or measuring system supplied complies with the regulations of the Australian Communications and Media Authority (ACMA) for network integrity, performance characteristics and health and safety requirements. The specifications for electromagnetic compatibility, in particular, are observed. The products bear the RCM-tick mark on their nameplate.



A0029561

EAC conformity	<p>The measuring system meets the legal requirements of the applicable EAC Directives. These are listed in the corresponding EAC Declaration of Conformity along with the standards applied.</p> <p>Endress+Hauser confirms successful testing of the device by affixing to it the EAC mark.</p>
-----------------------	--

Ex approval	The available certificates are listed in the ordering information. Note the associated safety instructions (XA) and control or installation drawings (ZD).
--------------------	--

Warning!

- Measuring systems for use in hazardous environments are accompanied by separate "Ex documentation", which is an integral part of this Operating Manual. Strict compliance with the installation instructions and ratings as stated in this supplementary documentation is mandatory.
 - Ensure that all personnel are suitably qualified.
 - Observe the specifications in the certificate as well as national and local standards and regulations.
- The transmitter may only be installed in suitable areas.
- Sensors with a certificate for hazardous areas may be connected to a transmitter without a certificate.
- For FM approvals:
 - Unauthorized substitution of components may impair the suitability for Division 1 or Division 2.
- Do not disconnect equipment unless the area is known to be non-hazardous.

Note!

- The sensor must be installed and used in a way that eliminates any danger. Possible installation positions: in tanks, vessels, silos, over stockpiles, open channels, weirs or other bins.
- Sensors FDU9x with Ex-approval can be connected to the transmitter FMU90 without Ex-approval.

External standards and guidelines	<p>EN 60529 Protection class of housing (IP code)</p> <p>EN 61326 series EMC product family standard for electrical equipment for measurement, control and laboratory use</p> <p>NAMUR User association for automation technology in process industries</p> <p>US Standard UL 61010-1 CSA General Purpose Units FMU9x-N***** are tested according to US standard UL 61010-1, 2nd edition</p>
--	--

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 mask → Open the product page → The "Configuration" 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 from the Endress+Hauser online shop

Scope of delivery

- Instrument according to the version ordered
- Operating program: FieldCare
- Operating Instructions (depending on communication version → 39, "Documentation")
- For certified instrument versions: Safety Instructions (XAs) or Control Drawings (ZDs) → 39, "Documentation"
- Field housing units for flow measurement FMU90-*21***** are delivered with 2 screws for plumbing the device

Accessories

Commubox FXA195 HART

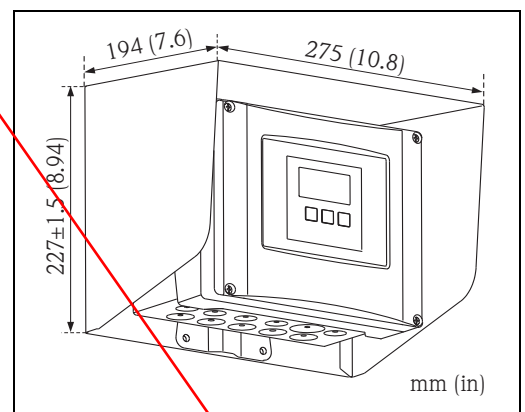
For intrinsically safe communication with FieldCare via the USB interface. For details refer to TI00404F/00/EN.

Commubox FXA291

The Commubox FXA291 connects Endress+Hauser field instruments with service interface to the USB interface of a personal computer or a notebook. For details refer to TI00405C/07/EN.

Protection cover for the field housing polycarbonate

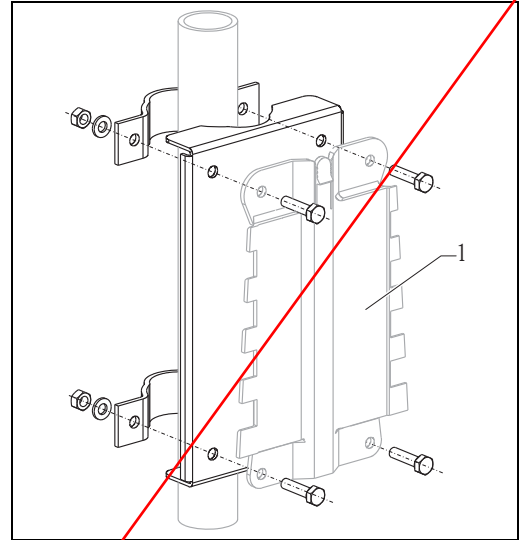
- Material: 316Ti (1.4571)
- is mounted by the mounting help of the Prosonic S
- Order-Code: 52024477



L00-FMU90xxx-06-00-00-xx-003

Mounting plate for the field housing polycarbonate

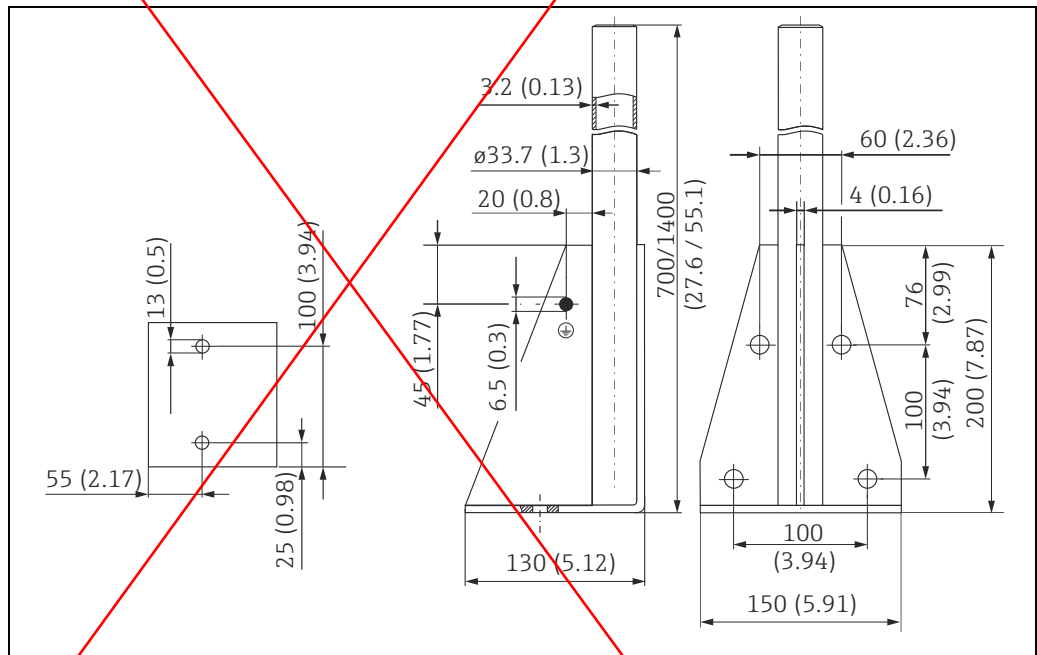
- suited for the mounting help of the Prosonic S
- for 1" - 2" tubes
- Dimensions: 210 mm x 110 mm (8.27 x 4.33 in)
- Material: 316Ti (1.4571)
- fixing clips, screws and nuts are supplied
- Order code: 52024478



L00-FMU90xxx-00-00-00-xx-001

1 Mounting help of the field housing

Mounting bracket



A0019279

Dimensions in mm (in)

Height	Material	Weight	Order Code
700 (27.6)	Galvanized steel	3.2 kg (7.06 lbs)	919791-0000
700 (27.6)	316Ti (1.4571)		919791-0001
1400 (55.1)	Galvanized steel	4.9 kg (10,08 lbs)	919791-0002
1400 (55.1)	316Ti (1.4571)		919791-0003

mm (in)

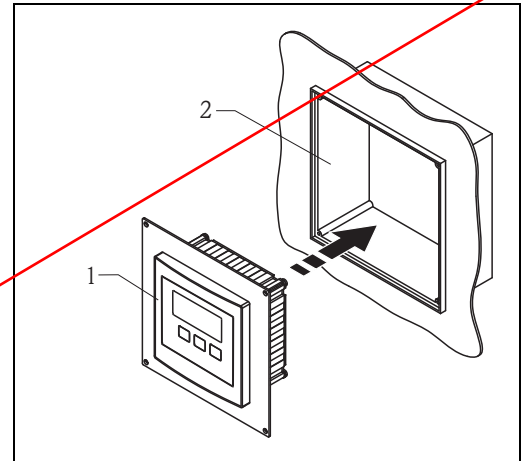
Adaption plate for remote display

Used to mount the remote display into the opening 138 x 138 mm (5.43 x 5.43 in)) of the remote display module of the Prosonic FMU860/861/862 (Display size: 144 x 44 mm (5.67 x 5.67 in)).

Order-Code: 52027441

Note!

The adapter plate can be mounted directly in the housing of the old remote display of the FMU86x series. The housing of the remote display of FMU860/861/862 is the holder for the adapter plate and the new remote display of the FMU90/95 in the format 96 x 96 mm (3.78 x 3.78 in).



L00-FMU90xxx-00-00-00-xx-001

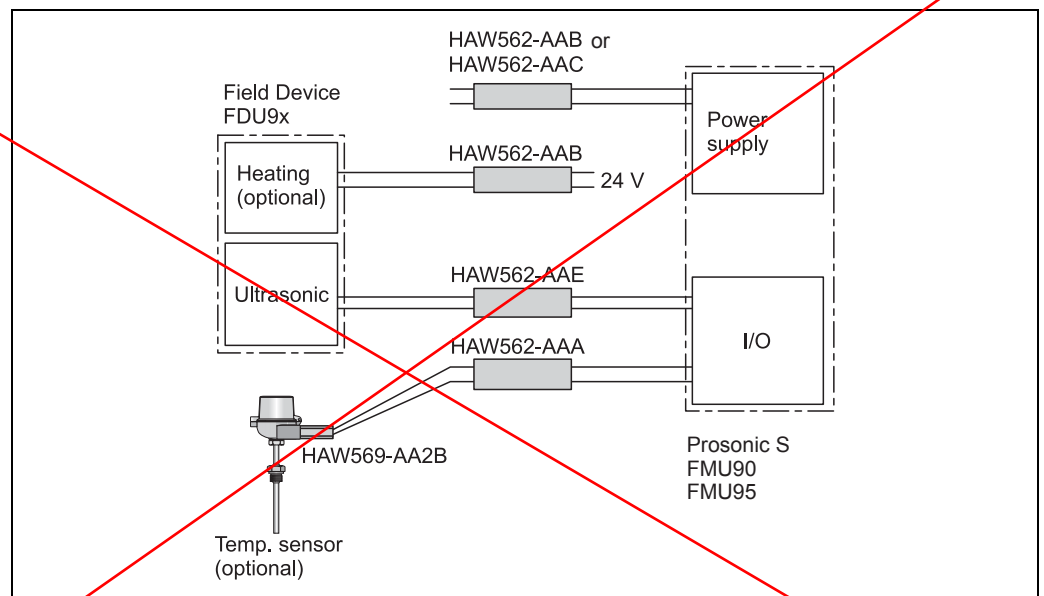
- 1 Remote display of the Prosonic S with adaption plate
- 2 Opening of the remote display FMU860/861/862

Option:

- Adaption plate 160 x 160 mm (6.3 x 6.3 in), thickness 3 mm (0.12 in), aluminum, opening 92 x 92 mm (3.62 x 3.62 in) for remote display of the FMU90 (size of the display: 96 x 96 mm (3.78 x 3.78 in)).
- Can be used to replace the FMU86x remote display or DMU2160/2260.
- Order Code: TSPFU 0390
- Contact Endress+Hauser: <http://www.endress.com/contact>

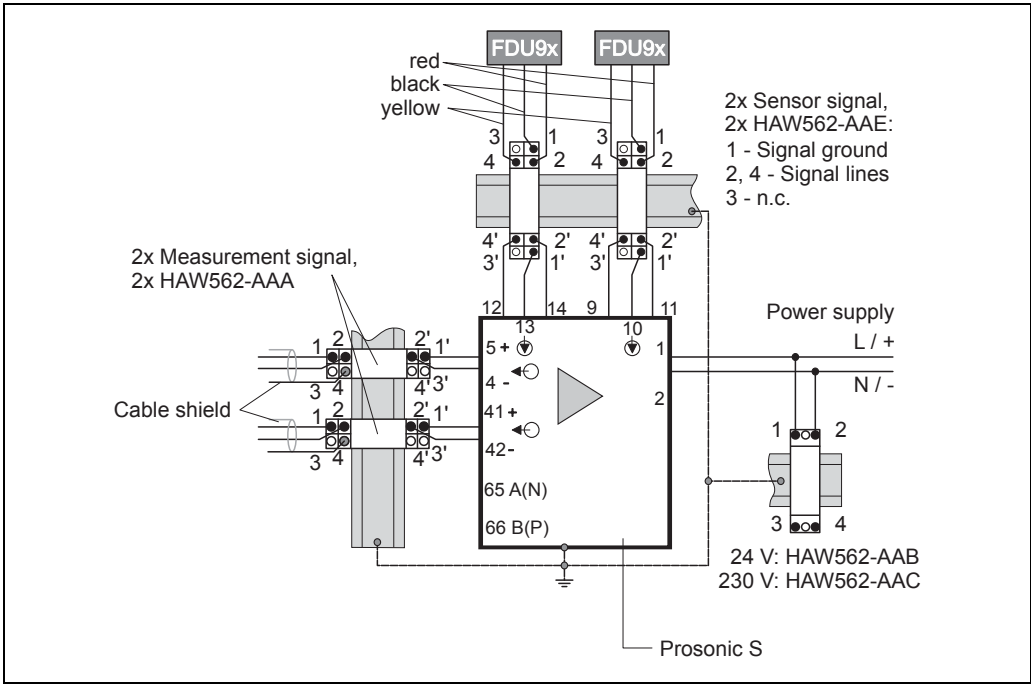
Overvoltage protection HAW562

System principle

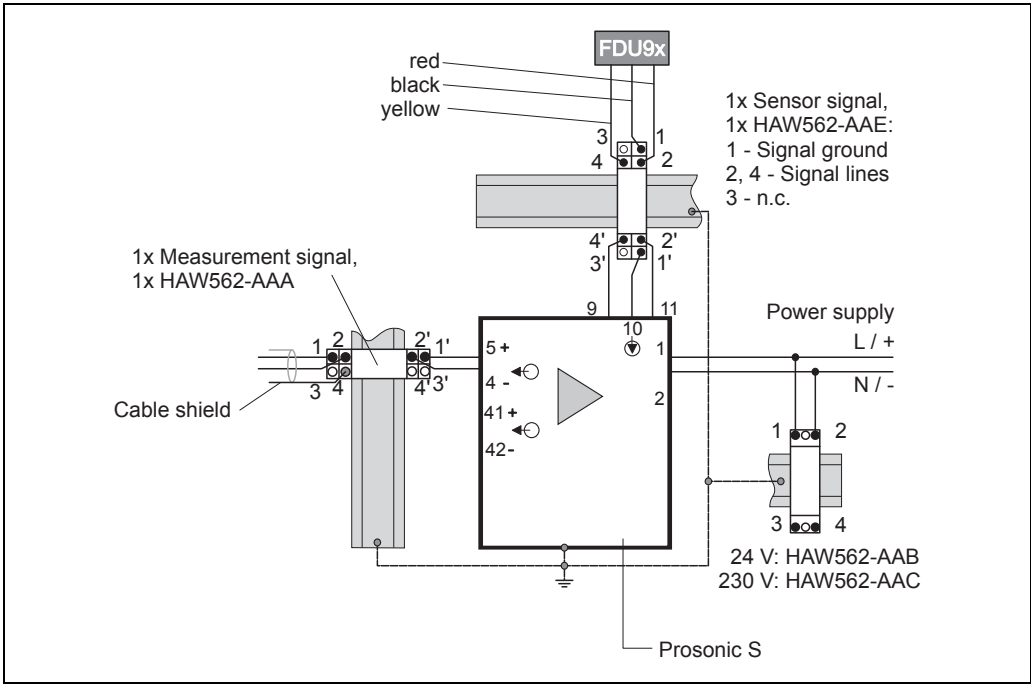


L00-FMU9x-15-00-00-en-001

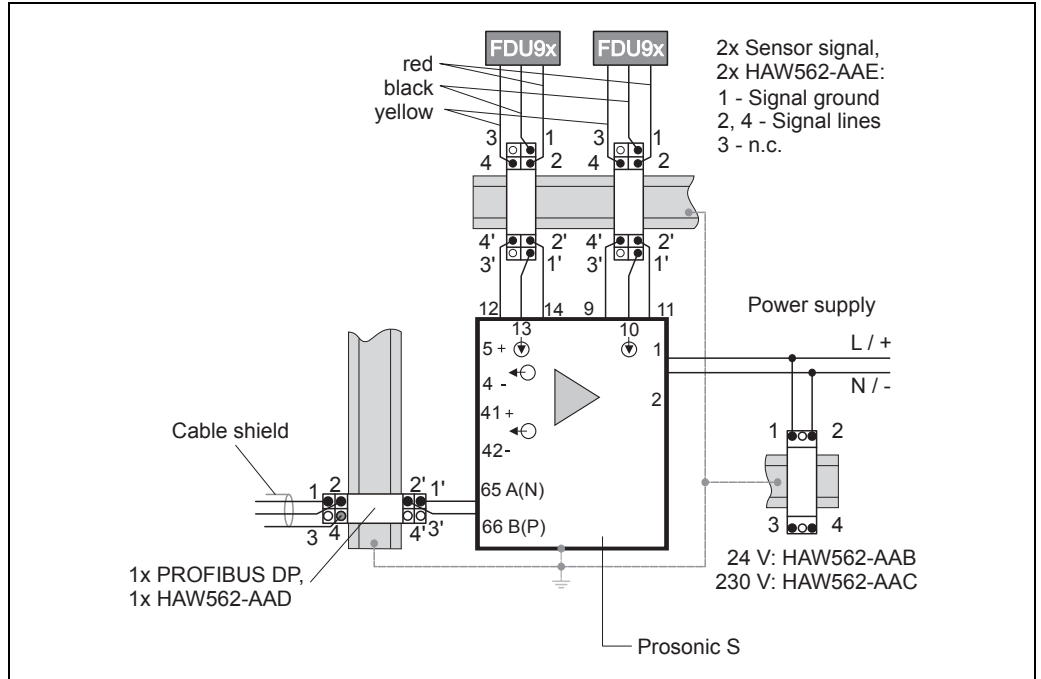
Application examples



Level measurement with 2 Prosonic FDU9x level sensors, version 4 to 20 mA HART



Level measurement with 1 Prosonic FDU9x level sensor, version 4 to 20 mA HART



G09-HAW562xx-04-10-01-en-003

Level measurement with 2 Prosonic FDU9x level sensors, version PROFIBUS DP

Ordering information

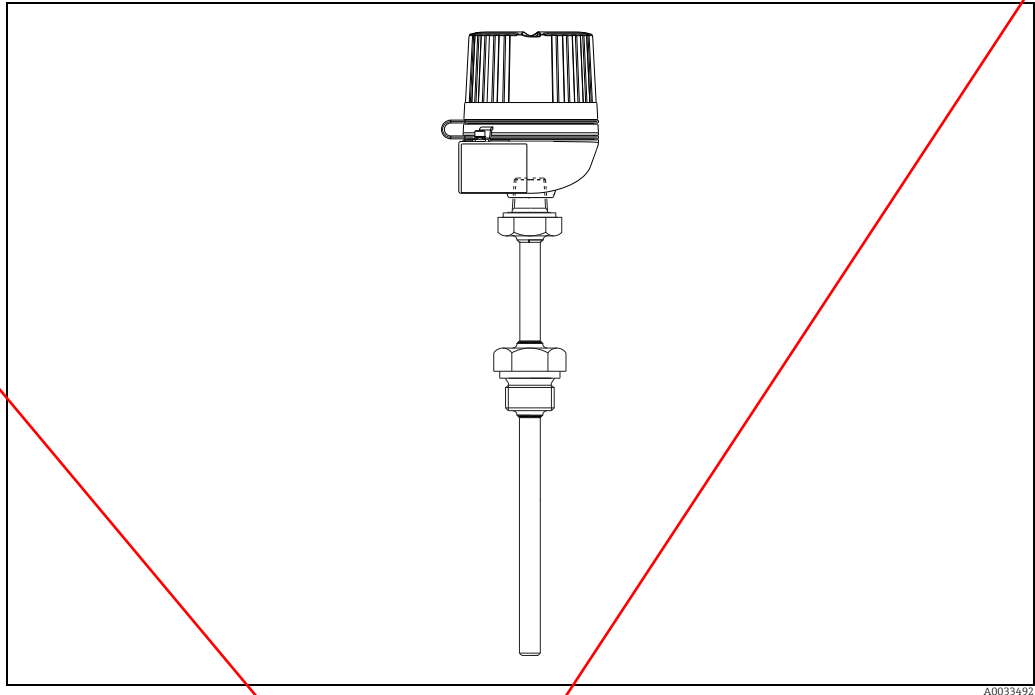
Surge Arrester HAW562, compact device for DINrail installation in signal and power supply lines and communication lines protecting field devices and systems against overvoltage and magnetic induction.

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 mask → Open the product page → The "Configuration" button to the right of the product image opens the Product Configurator.
- From your Endress+Hauser Sales Center: www.addresses.endress.com

For details see Technical Informations TI01012K and TI01013K and the Operating Instruction BA00306K.

Temperature sensor Omnigrad S TR61



A0033492

The temperature sensor Omnigrad S TR61 can be used with the FMU90, see also → [20](#) and → [22](#). More information can be found in the following documents:

- TI01029T

HINWEIS

For an overview of the scope of the associated Technical Documentation, refer to the following:

- The W@M Device Viewer: Enter the serial number from the nameplate
www.endress.com/deviceviewer
- The Endress+Hauser Operations App: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

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

Replacement for FMT131

As a replacement for the temperature sensor FMT131, the following configurations of the temperature sensor Omnigrad S TR61 can be used with the FMU90:

- Replacement for FMT131-R*: TR61-ABAD0BHSCC2B
- Replacement for FMT131-J*: TR61-EBAD0BHSCC2B

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

Documentation

Technical Information **TI00396F**
 Technical Information for the ultrasonic sensors FDU90/FDU91/FDU91F/FDU92/FDU93/FDU95¹⁰⁾

Operating instructions (for transmitter FMU90) Depending on the instrument version, the following operating instructions are supplied with the Prosonic S FMU90:

Operating instructions	Output	Application	Instrument version
BA00288F	HART	<ul style="list-style-type: none"> ■ level measurement ■ alternating pump control ■ screen and rake control 	FMU90 - *****1**** FMU90 - *****2****
BA00289F		<ul style="list-style-type: none"> ■ flow measurement ■ backwater and dirt detection ■ totalizers and counters 	FMU90 - *2*****1**** FMU90 - *4*****1**** FMU90 - *2*****2**** FMU90 - *4*****2****
BA00292F	PROFIBUS DP	<ul style="list-style-type: none"> ■ level measurement ■ alternating pump control ■ screen and rake control 	FMU90 - *****3****
BA00293F		<ul style="list-style-type: none"> ■ flow measurement ■ backwater and dirt detection ■ totalizers and counters 	FMU90 - *2*****3**** FMU90 - *4*****3****

These operating instructions describe installation and commissioning of the respective version of the Prosonic S. It contains those functions from the operating menu, which are required for a standard measuring task. Additional functions are described in this document: Description of Instrument Functions for Prosonic S FMU90, document number BA00290F.

Description of Instrument Functions **BA00290F**
 The document BA00290F contains a detailed description of **all** functions of the Prosonic S and is valid for all instrument versions.
 You will find this document in the Download Area of the Endress+Hauser Internet site:
www.endress.com → Download

Safety Instructions **XA00326F**
 Safety Instructions for ATEX II 3D

10) The sensors FDU80/80F/81/81F/82/83/84/85/86/96 are not available anymore.
 Use the serial number of your device to access the documentation for your device via www.endress.com.



www.addresses.endress.com

K. Float Switches – Flygt ENM-10 (Class I, Div. 1; x2; 1 for Each Fine Screen)



Technical specification

ENM-10 Level regulator



Flygt



PRODUCT DESCRIPTION

The simplest possible method for level control! A mechanical switch in a plastic casing, freely suspended at the desired height from its own cable. When the liquid level reaches the regulator, the casing will tilt and the mechanical switch will close or break the circuit, thereby starting or stopping a pump or actuating an alarm device. No wear, no maintenance! In sewage pumping stations, for ground water and drainage pumping — in fact, for most level control applications — the ENM-10 is the ideal solution.

The regulator casing is made of polypropylene and the cable is sheathed with a special PVC compound. The plastic components are welded and screwed together. Adhesive is never used. Impurities and deposits will not adhere to the smooth casing.

This level regulator is available in different versions, depending upon the medium in which it is to be used. As standard, the regulator can be obtained with 6, 13, 20, 30 or 50 metres (20, 42, 65, 100 or 167 feet) of cable for liquids with specific density between 0.95 and 1.10 g/cm³; for other specific densities, the regulator is only available with 20 metres (65 ft) of cable. The regulator can withstand up to 60°C (140°F).

Dimensions

For density g/cm ³	Regulator length mm (in)	Diameter mm (in)
0.65—0.80	194 (7 ¹¹ / ₁₆)	100 (4)
0.80—0.95	177 (7)	100 (4)
0.95—1.10	162 (6 ³ / ₈)	100 (4)
1.05—1.20	142 (5 ⁹ / ₁₆)	100 (4)
1.20—1.30	133 (5 ¹ / ₄)	100 (4)
1.30—1.40	130 (5 ² / ₁₆)	100 (4)
1.40—1.50	126 (5)	100 (4)

Technical data

Liquid temperature:	min. 0°C (32°F) max. 60°C (140°F)
Liquid density:	min. 0.65 g/cm ³ max. 1.5 g/cm ³
Degree of protection:	IP68, 20 m (65 ft)
Interrupting capacity of micro switch:	AC, resistive load, 250V 10A AC, inductive load, 250V 3A cos φ = 0.5 DC, 30V 5A

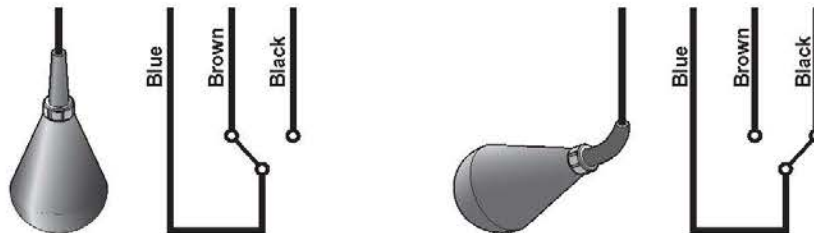
Note that local regulations may limit the voltage.

Approvals:	CSA, SEMKO, NEMKO, CE Approved according to EN61058
Weight:	approx. 2 kg (4.5 lb) for a standard density regulator with 20 m cable.

Materials

Body:	polypropylene
Bending relief:	EPDM rubber
Cable:	special compound PVC or chlorinated polyethylene CPE rubber

Colour code



CHEMICAL RESISTANCE LIST

The liquid in which level regulation is practiced most frequently is, of course, water. Of the millions of regulators in use all over the world today, it is estimated that nine out of ten work in water.

However, with a float body of polypropylene, a cable of PVC or CPE and a bending relief of EPDM rubber, the ENM-10 is virtually insensitive to many aggressive liquids.

The table shows how resistant the ENM-10 equipped with either PVC or CPE cable, is to different chemicals at two different temperatures. The classification is broken down into the following categories:

0 = No effect, 1 = Minor to moderate and 2 = Severe effect. The sign — means that information is not available.

Keep in mind also that the density of the liquid determines the buoyancy of the regulator. The ENM-10 is made for seven different densities. See page 2.

Always observe local regulations:

Take particular note of:

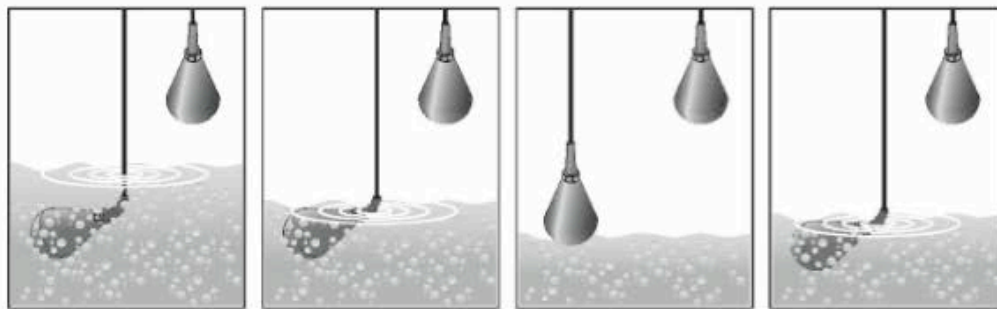
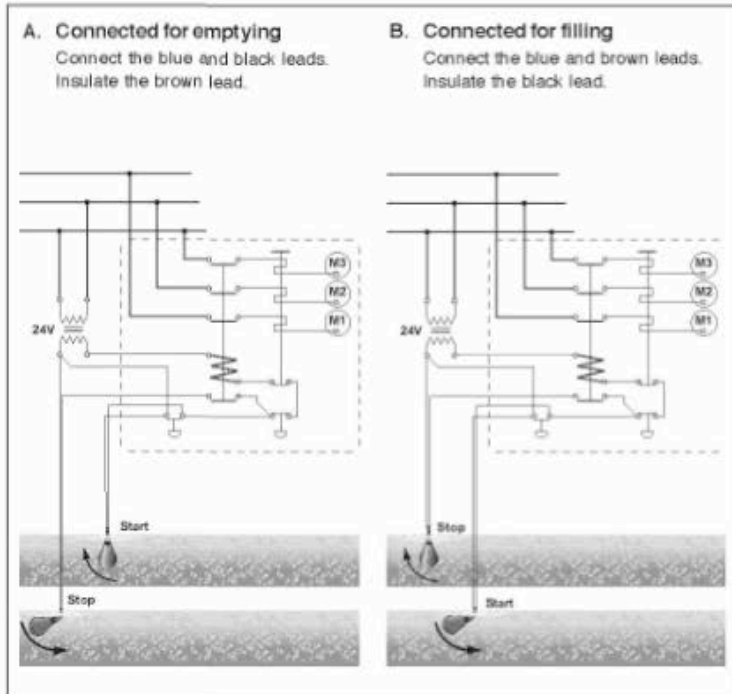
- risk of fire/explosion
- hygiene requirements

Acids	PVC cable		CPE cable		Salts	PVC cable		CPE cable		Solvents and miscellaneous	PVC cable		CPE cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)		20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)		20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Acetic Acid 50%	1	2	0	0	Aluminium Chloride	0	0	0	0	Aceton	2	2	2	2
Acetic Acid 75%	2	2	0	0	Calcium Sulphate	0	0	0	0	Aniline	2	2	1	2
Benzoic Acid	2	2	0	0	Calcium Chloride	0	0	0	0	Benzene	2	2	2	2
Boric Acid 5%	0	—	0	0	Calcium Nitrate	0	0	0	0	Butyl Alcohol	2	2	0	1
Butyric Acid	2	2	2	2	Copper Chloride	0	0	0	0	Carbon Tetrachloride	2	2	2	2
Chromic Acid 10%	0	2	2	2	Copper Sulphate	0	0	0	0	Chlorobenzene	2	2	2	2
Citric Acid	0	1	0	0	Ferric Chloride	0	0	0	0	Chloroform	2	2	2	2
Hydrobromic Acid 5%	1	2	0	0	Ferrous Sulphate	0	0	0	0	Ethyl Alcohol	2	2	0	1
Hydrochloric Acid 10%	0	1	0	1	Magnesium Chloride	0	0	0	0	Ethyl Ether	2	2	2	2
Hydrochloric Acid 37%	1	2	0	2	Potassium Sulphate	0	0	0	0	Ethyl Acetate	2	2	2	2
Hydrocyanic Acid 10%	0	0	1	2	Potassium Nitrate	0	0	0	0	Ethylene Dichloride	2	2	2	2
Hydrofluoric Acid 5%	0	2	0	1	Potassium Carbonate	1	1	1	1	Ethylene Chloride	2	2	2	2
Hypochloric Acid	1	2	2	2	Potassium Bicarbonate	0	0	0	0	Formaldehyde 37%	1	2	0	0
Maleic Acid	2	2	2	2	Sodium Sulphate	0	0	0	0	Gasoline	2	2	2	2
Nitric Acid 5%	1	1	1	1	Sodium Chloride	0	0	0	0	Kerosene	2	2	2	2
Nitric Acid 65%	2	2	2	2	Sodium Nitrate	0	0	0	0	Methyl Alcohol	2	2	0	0
Oleic Acid	1	2	2	2	Sodium Bicarbonate	0	0	0	0	Methyl Ethyl Ketone	2	2	2	2
Oxalic Acid 50%	1	1	1	2	Sodium Carbonate	0	0	0	0	Methylene Chloride	2	2	2	2
Phosphoric Acid 25%	0	0	1	2	Tin Chloride	1	1	1	1	Nitrobenzene	2	2	2	2
Phosphoric Acid 85%	0	0	1	2	Zinc Chloride	0	0	0	0	Phenol	2	2	2	2
Sulphuric Acid 10%	1	2	1	2	Zinc Sulphate	0	0	0	0	Toluene	2	2	2	2
Sulphuric Acid 78%	2	2	2	2	Zinc Chloride	0	0	0	0	Trichlorethylene	2	2	2	2
Tannic Acid	0	0	0	0						Turpentine	2	2	2	2
Tartaric Acid	1	1	1	1						Xylene	2	2	2	2
Bases					Oils					Gases				
Ammonium Hydroxide	0	—	0	0	Caster Oil	1	1	1	1	Carbon Dioxide	0	0	0	0
Calcium Hydroxide	0	0	0	0	Cocconut Oil	0	—	0	2	Carbon Monoxide	0	0	0	0
Potassium Hydroxide	1	2	0	0	Corn Oil	2	2	2	2	Chlorine (wet)	2	2	2	2
Sodium Hydroxide	1	2	0	0	Diesel Oil	2	2	2	2	Hydrogen Sulphide	0	0	1	1
					Linseed Oil	2	2	2	2	Sulphur Dioxide (wet)	1	1	2	2
					Mineral Oils	2	2	2	2					
					Olive Oil	1	1	1	1					
					Silicone Oils	0	0	0	0					

0 = No effect, 1 = Minor to moderate, 2 = Severe effect. — = No information available.

Wiring alternative

To conform to local regulations, the level regulators are normally connected through a transformer to a low-tension control circuit. Two regulators are used – one for starting and one for stopping. A third regulator can be connected if an alarm is required at a given level. Identical regulators can be used for all functions.

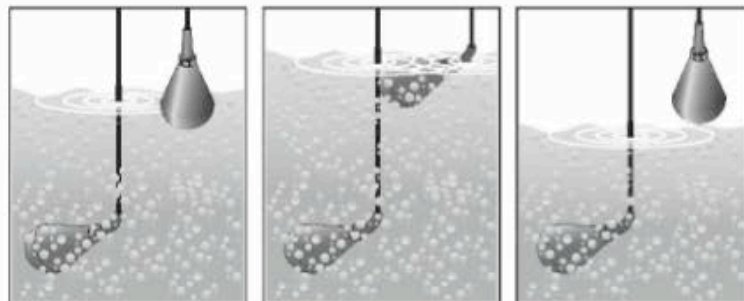


Let the level drop ...

... to the lowest permissible point.

The regulator will then react ...

... so the process is reversed.



At the highest permissible point ...

... level regulator II reacts ...

... in the opposite fashion.

The manufacturers reserve the right to alter performance specification or design without notice.



SP11-430

10.04.07, Eng. 2M, 11.03 © IIT FLYGT AB

L. Solenoid Valves – ASCO RedHat II (Class I, Div. 1)

- 2 x 1/2" for each wash press washing & flushing connections (EF8210G087)
- 1 x 1-1/2" for grit vortex fluidization (EF8210G127)



General Service Solenoid Valves
 Pilot Operated
 Brass or Stainless Steel Bodies
 3/8" to 2 1/2" NPT

**2/2
 SERIES
 8210**

2-WAY

Features

- Wide range of pressure ratings, sizes, and resilient materials provide long service life and low internal leakage
- High flow valves for liquid, corrosive, and air/inert gas service
- Lead-free versions available for Safe Drinking Water Act Compliance
- Industrial applications include:
 - Car wash
 - Laundry equipment
 - Air compressors
 - Industrial water control
 - Pumps

Construction

Valve Parts in Contact with Fluids		
Body	Brass	304 Stainless Steel*
Seals and Discs	NBR or PTFE	
Disc-Holder	PA	
Core Tube	305 Stainless Steel	
Core and Plugnut	430F Stainless Steel	
Springs	302 Stainless Steel	
Shading Coil	Copper	Silver

*Catalog Numbers 8210G127, 8210G129, 8210G132, 8210G133 have 316L Stainless Steel bodies.

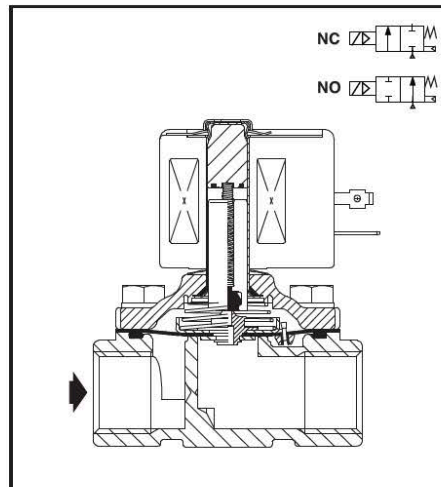
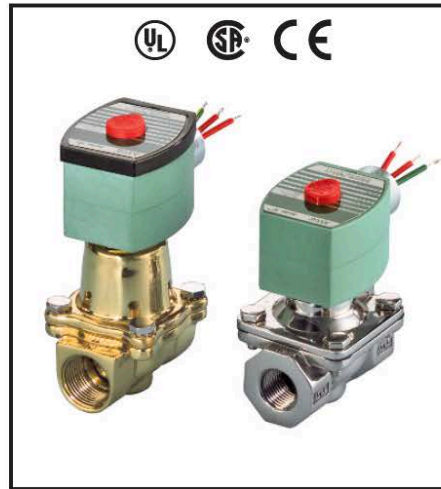
Electrical

Standard Coil and Class of Insulation	Watt Rating and Power Consumption				Spare Coil Part Number			
	DC Watts	AC			General Purpose		Explosionproof	
		Watts	VA Holding	VA Inrush	AC	DC	AC	DC
F	-	6.1	16	40	238210	-	238214	-
F	11.6	10.1	25	70	238610	238710	238614	238714
F	16.8	16.1	35	180	272610	97617	272614	97617
F	-	17.1	40	93	238610	-	238614	-
F	-	20	43	240	-	99257	-	99257
F	-	20.1	48	240	272610	-	272614	-
F	30.8	-	-	-	-	501695	-	501696
H	11.6	-	-	-	-	238910	-	238914
H	40.6	-	-	-	-	238910	-	238914

Standard Voltages: 24, 120, 240, 480 volts AC, 60 Hz (or 110, 220 volts AC, 50 Hz). 6, 12, 24, 120, 240 volts DC. Must be specified when ordering.
 Other voltages available when required.

Solenoid Enclosures

Standard: RedHat II - Watertight, Types 1, 2, 3, 3S, 4, and 4X; RedHat - Type I.
Optional: RedHat II - Explosionproof and Watertight, Types 3, 3S, 4, 4X, 6, 6P, 7, and 9; Red-Hat - Explosionproof and Watertight, Types 3, 4, 4X, 7, and 9.
 (To order, add prefix "EF" to catalog number, except Catalog Numbers 8210B057, 8210B058, and 8210B059, which are not available with Explosionproof enclosures.)
 See *Optional Features Section* for other available options.



Nominal Ambient Temp. Ranges

RedHat II/RedHat AC: 32°F to 125°F (0°C to 52°C)
 RedHat II DC: 32°F to 104°F (0°C to 40°C)
 RedHat DC: 32°F to 77°F (0°C to 25°C) (104°F/40°C occasionally)
 8210G227 AC: 32°F to 130°F (0°C to 54°C)
 DC: 32°F to 90°F (0°C to 32°C)

Refer to *Engineering Section* for details.

Approvals

UL listed as indicated. CSA certified.
 RedHat II meets applicable CE directives.
 Refer to *Engineering Section* for details.
 ATEX/IECEx certified with prefix "EV" as listed. Refer to *Optional Features Electrical Section* for details.

• ASCO RedHat II ½” dia. Class I, Div. 1 Solenoids – Technical Information

<h1 style="margin: 0;">Installation & Maintenance Instructions</h1>  <p style="margin: 0;">OPEN-FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS</p>	<p>SERIES 8003G/H 8202G/H I&M No.V6584R11 (Section 1 of 2)</p>
--	---

— SERVICE NOTICE —

ASCO® solenoid valves with design change letter “G” or “H” in the catalog number (ex. 8210G1) have an epoxy encapsulated ASCO® Red Hat II® solenoid. This solenoid replaces some of the solenoids with metal enclosures and open-frame constructions. Follow these installation and maintenance instructions if your valve or operator uses this solenoid.

See separate instructions for basic valve.

DESCRIPTION

Catalog numbers 8003G/H and 8202G/H are epoxy encapsulated pull-type solenoids. The green solenoid with lead wires and 1/2” conduit connection is designed to meet Enclosure Type 1–General Purpose, Type 2–Dripproof, Types 3 and 3S–Raintight, and Types 4 and 4X–Watertight. The black solenoid on catalog numbers prefixed “EF” or “EV” is designed to meet Enclosure Types 3 and 3S–Raintight, Types 4 and 4X–Watertight, Types 6 and 6P–Submersible, Type 7, Explosionproof Class I, Division 1 Groups A, B, C, & D and Type 9, –Dust–Ignitionproof Class II, Division 1 Groups E, F & G. The Class II, Groups F & G Dust Locations designation is not applicable for solenoids or solenoid valves used for steam service or when a class “H” solenoid is used. See *Temperature Limitations* section for solenoid identification and nameplate/retainer for service. When installed just as a solenoid and not attached to an ASCO valve, the core has a 0.250–28 UNF–2B tapped hole, 0.38 or 0.63 minimum full thread.

NOTE: Catalog number prefix “EV” denotes stainless steel construction.

Solenoid catalog numbers 8202G/H1, 8202G/H3, 8202G/H5 and 8202G/H7 are epoxy encapsulated push-type, reverse-acting solenoids having the same enclosure types as previously stated for Catalog numbers 8003G/H1 and 8003G/H2.

Series 8003G/H and 8202G/H solenoids are available in:

- **Open–Frame Construction:** The green solenoid may be supplied with 1/4” spade, screw or DIN terminals. (Refer to Figure 4)
- **Panel Mounted Construction:** These solenoids are specifically designed to be panel mounted by the customer. Refer to Figures specified in this I&M and the section on *Installation of Panel Mounted Solenoid* for details.

Optional Features For Type 1 – General Purpose Construction Only

- **Junction Box:** This junction box construction meets Enclosure Types 2, 3, 3S, 4, and 4X. Only solenoids with 1/4” spade or screw terminals may have a junction box. The junction box provides a 1/2” conduit connection, grounding and spade or screw terminal connections within the junction box (See Figure 5).

- **DIN Plug Connector Kit No.K236034:** Use this kit only for solenoids with DIN terminals. The DIN plug connector kit provides a two pole with grounding contact DIN Type 43650 construction (See Figure 6).

OPERATION

Series 8003G/H – When the solenoid is energized, the core is drawn into the solenoid base sub-assembly. **IMPORTANT: When the solenoid is de-energized, the initial return force for the core, whether developed by spring, pressure, or weight, must exert a minimum force to overcome residual magnetism created by the solenoid. Minimum return force for AC construction is 11 ounces, and 5 ounces for DC construction.**

Series 8202G/H – When the solenoid is energized, the disc holder assembly seats against the orifice. When the solenoid is de-energized, the disc holder assembly returns. **IMPORTANT: Initial return force for the disc or disc holder assembly, whether developed by spring, pressure, or weight, must exert a minimum force to overcome residual magnetism created by the solenoid. Minimum return force is 1 pound, 5 ounces.**

INSTALLATION

Check nameplate for correct catalog number, service, and wattage. Check front of solenoid for voltage and frequency.

▲ WARNING: Electrical hazard from the accessibility of live parts. To prevent the possibility of death, serious injury or property damage, install the open – frame solenoid in an enclosure.

FOR BLACK ENCLOSURE TYPES 7 AND 9 ONLY

▲ CAUTION: To prevent fire or explosion, do not install solenoid and/or valve where ignition temperature of hazardous atmosphere is less than 165° C. On valves used for steam service or when a class “H” solenoid is used, do not install in hazardous atmosphere where ignition temperature is less than 180° C. See nameplate/retainer for service.

NOTE: These solenoids have an internal non–resettable thermal fuse to limit solenoid temperature in the event that extraordinary conditions occur which could cause excessive temperatures. These conditions include high input voltage, a jammed core, excessive ambient temperature or a shorted solenoid, etc. This unique feature is a standard feature only in solenoids with black explosionproof/dust–ignitionproof enclosures (Types 7 & 9).

▲ CAUTION: To protect the solenoid valve or operator, install a strainer or filter, suitable for the service involved in the inlet side as close to the valve or operator as possible. Clean periodically depending on service conditions. See ASCO Series 8600 and 8601 for strainers.

Temperature Limitations

For maximum valve ambient temperatures, refer to chart. The temperature limitations listed, only indicate maximum application temperatures for field wiring rated at 90°C. Check catalog number prefix and watt rating on nameplate to determine maximum ambient temperature. See valve installation and maintenance instructions for maximum fluid temperature.

NOTE: For steam service, refer to *Wiring* section, *Junction Box* for temperature rating of supply wires.

Watt Rating	Catalog Number Coil Prefix	Class of Insulation	Maximum † Ambient Temp.
10.1 & 17.1	None, FB, KF, KP, SC, SD, SF, & SP.	F	125°F (51.7°C)
10.1 & 17.1	HB, HT, KB, KH, SS, ST, SU,	H	140°F (60°C)
11.6 & 22.6	None, FB, KF, KP, SC, SD, SF, & SP.	F	104°F (40°C)
11.6 & 22.6	HP, HT, KB, KH, SS, ST, SU, & SV	H	104°F (40°C)

† Minimum ambient temperature -40° F (-40° C).

Prefix ①	Coil Class	Wattage Ratings		DC	Max. Ambient Temperature			
		AC			Normally Closed 8003 solenoid		Normally Open 8202 solenoid	
		60 Hz	50 Hz		(°C)	(°F)	(°C)	(°F)
EF, EV	FT	10.1	10.1	—	—	—	52	125
EF, EV	FB	17.1	17.1	—	52	125	—	—
	FT	10.1	10.1	—	55	131	55	131
	FB	17.1	17.1	—			—	—
	HT	—	—	11.6			—	—
	HB	—	—	22.6			—	—
EF, EV	HT	—	—	11.6	②	②	55	131
EF, EV	HB	—	—	22.6	—	—	—	—
	HT	10.1	10.1	—	60	140	60	140
	HB	17.1	17.1	—			55	131
EF, EV	HT	10.1	10.1	—	60	140	60	140
EF, EV	HB	17.1	17.1	—			—	—

① = EF, EV data applies to Explosionproof coils only.

② = DC solenoid valves can be operated at maximum ambient temperature of 55°C / 131°F with reduced pressure ratings. See valve I&M for maximum operating pressure differential ratings.

Positioning

This solenoid is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the solenoid base sub-assembly area.

Wiring

Wiring must comply with local codes and the National Electrical Code. All solenoids supplied with lead wires are provided with a grounding wire which is green or green with yellow stripes and a 1/2" conduit connection. To facilitate wiring, the solenoid may be rotated 360°. For the watertight and explosionproof solenoid, electrical fittings must be approved for use in the approved hazardous locations.

▲ CAUTION: Cryogenic Applications – Solenoid lead wire insulation should not be subjected to cryogenic temperatures. Adequate lead wire protection and routing must be provided.

Additional Wiring Instructions For Optional Features:

- **Open-Frame solenoid with 1/4" spade terminals.**
For solenoids supplied with screw terminal connections use #12-18 AWG stranded copper wire rated at 90°C or greater. Torque terminal block screws to 10±2 in-lbs [1,0±1,2 Nm]. A tapped hole is provided in the solenoid for grounding, use a #10-32 machine screw. Torque grounding screw to 15-20 in-lbs [1,7-2,3 Nm]. On solenoids with screw terminals, the socket head screw holding the terminal block to the solenoid is the grounding screw. Torque the screw to 15-20 in-lbs [1,7-2,3 Nm] with a 5/32" hex key wrench.

• **Junction Box**

The junction box is used with spade or screw terminal solenoids only and is provided with a grounding screw and a 1/2" conduit connection. Connect #12-18 AWG standard copper wire only to the screw terminals. Within the junction box use field wire that is rated 90°C or greater for connections. For steam service use 105°C rated wire up to 50 psi or use 125°C rated wire above 50 psi. After electrical hookup, replace cover gasket, cover, and screws. Tighten screws evenly in a crisscross manner.

• **DIN Plug Connector Kit No.K236034**

1. The open-frame solenoid is provided with DIN terminals to accommodate the plug connector kit.
 2. Remove center screw from plug connector. Using a small screwdriver, pry terminal block from connector cover.
 3. Use #12-18 AWG stranded copper wire rated at 90°C or greater for connections. Strip wire leads back approximately 1/4" for installation in socket terminals. The use of wire-end sleeves is also recommended for these socket terminals. Maximum length of wire-end sleeves to be approximately 1/4". Tinning of the ends of the lead wires is not recommended.
 4. Thread wire through gland nut, gland gasket, washer and connector cover.
- NOTE: Connector housing may be rotated in 90° increments from position shown for alternate positioning of cable entry.
5. Check DIN connector terminal block for electrical markings. Then make electrical hookup to terminal block according to markings on it. Snap terminal block into connector cover and install center screw.
 6. Position connector gasket on solenoid and install plug connector. Torque center screw to 5±1 in-lbs [0,6±1,1 Nm].

NOTE: Alternating current (AC) and direct current (DC) solenoids are built differently and cannot be converted from one to the other by changing the coil.

Installation of Solenoid

Solenoids may be assembled as a complete unit. Tightening is accomplished by means of a hex flange at the base of the solenoid.

Installation of Panel Mounted Solenoid (See Figures 1 and 2)

1. Disassemble solenoid following instruction under *Solenoid Replacement* then proceed.
2. Install solenoid base sub-assembly through customer panel. 8202H panel mounted solenoids include a retainer to adapt the solenoid base sub-assembly to the customer panel. (See Figure 2)
3. Position finger washer on opposite side of panel over solenoid base sub-assembly.
4. Replace solenoid, nameplate/retainer and red cap.
5. Make electrical hookup, see *Wiring* section.

Solenoid Temperature

Standard solenoids are designed for continuous duty service. When the solenoid is energized for a long period, the solenoid becomes hot and can be touched by hand only for an instant. This is a safe operating temperature.

MAINTENANCE

▲ WARNING: To prevent the possibility of death, serious injury or property damage, turn off electrical power, depressurize solenoid operator and/or valve, and vent fluid to a safe area before servicing.

Cleaning

All solenoid operators and valves should be cleaned periodically. The time between cleaning will vary depending on medium and service conditions. In general, if the voltage to the solenoid is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. Clean strainer or filter when cleaning the valve.

Preventive Maintenance

- Keep the medium flowing through the solenoid operator or valve as free from dirt and foreign material as possible.
- Periodic exercise of the valve should be considered if ambient or fluid conditions are such that corrosion, elastomer degradation, fluid contamination build up, or other conditions that could impede solenoid valve shifting are possible. The actual frequency of exercise necessary will depend on specific operating conditions. A successful operating history is the best indication of a proper interval between exercise cycles.
- Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any worn or damaged parts.

Causes of Improper Operation

- **Faulty Control Circuit:** Check the electrical system by energizing the solenoid. A metallic *click* signifies that the solenoid is operating. Absence of the *click* indicates loss of power supply. Check for loose or blown fuses, open-circuited or grounded solenoid, broken lead wires or splice connections.
- **Burned-Out Solenoid:** Check for open-circuited solenoid. Replace if necessary. Check supply voltage; it must be the same as specified on nameplate/retainer and marked on the solenoid. Check ambient temperature and check that the core is not jammed.
- **Low Voltage:** Check voltage across the solenoid leads. Voltage must be at least 85% of rated voltage.



Solenoid Replacement

1. Disconnect conduit, coil leads, and grounding wire.

NOTE: Any optional parts attached to the old solenoid must be reinstalled on the new solenoid. For 3–way construction, piping or tubing must be removed from pipe adapter.

2. Disassemble solenoids with optional features as follows:

- **Spade or Screw Terminals**

Remove terminal connections, grounding screw, grounding wire, and terminal block (screw terminal type only).

NOTE: For screw terminals, the socket head screw holding the terminal block serves as a grounding screw.

- **Junction Box**

- Remove conduit and socket head screw (use 5/32" hex key wrench) from center of junction box. Disconnect junction box from solenoid.

- **DIN Plug Connector**

Remove center screw from DIN plug connector. Disconnect DIN plug connector from adapter. Remove socket head screw (use 5/32" hex key wrench), DIN terminal adapter, and gasket from solenoid.

3. Snap off red cap from top of solenoid base sub–assembly. For 3–way construction with pipe adapter (Figure 3), remove pipe adapter, nameplate and solenoid. Omit steps 4 and 5.

4. Push down on solenoid. Then using a suitable screwdriver, insert blade between solenoid and nameplate/retainer. Pry up slightly and push to remove.

NOTE: Series 8202G/H solenoids have a spacer between the nameplate/retainer and solenoid.

5. Remove solenoid from solenoid base sub–assembly.
6. Reassemble in reverse order of disassembly. Use exploded views for identification and placement of parts.
7. Torque pipe adapter to 90 inch–pounds maximum [10,2 Nm maximum]. Then make up piping or tubing to pipe adapter on solenoid.

Disassembly and Reassembly of Solenoids

1. Remove solenoid, see *Solenoid Replacement*.
2. Remove springwasher from solenoid base sub–assembly. For 3–way construction, remove pipe adapter and plugnut gasket.
3. Unscrew solenoid base sub–assembly from valve body.
4. Remove internal solenoid parts for cleaning or replacement. Use exploded views for identification and placement of parts.
5. If the solenoid is part of a valve, refer to basic valve installation and maintenance instructions for further disassembly.
6. Torque solenoid base sub–assembly and adapter to 175 ± 25 in–lbs [19,8 ± 2,8 Nm].

ORDERING INFORMATION FOR ASCO SOLENOIDS

When Ordering Solenoids for ASCO Solenoid Operators or Valves, order the number stamped on the solenoid. Also specify voltage and frequency.

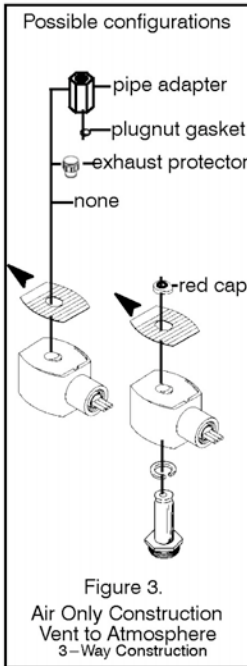
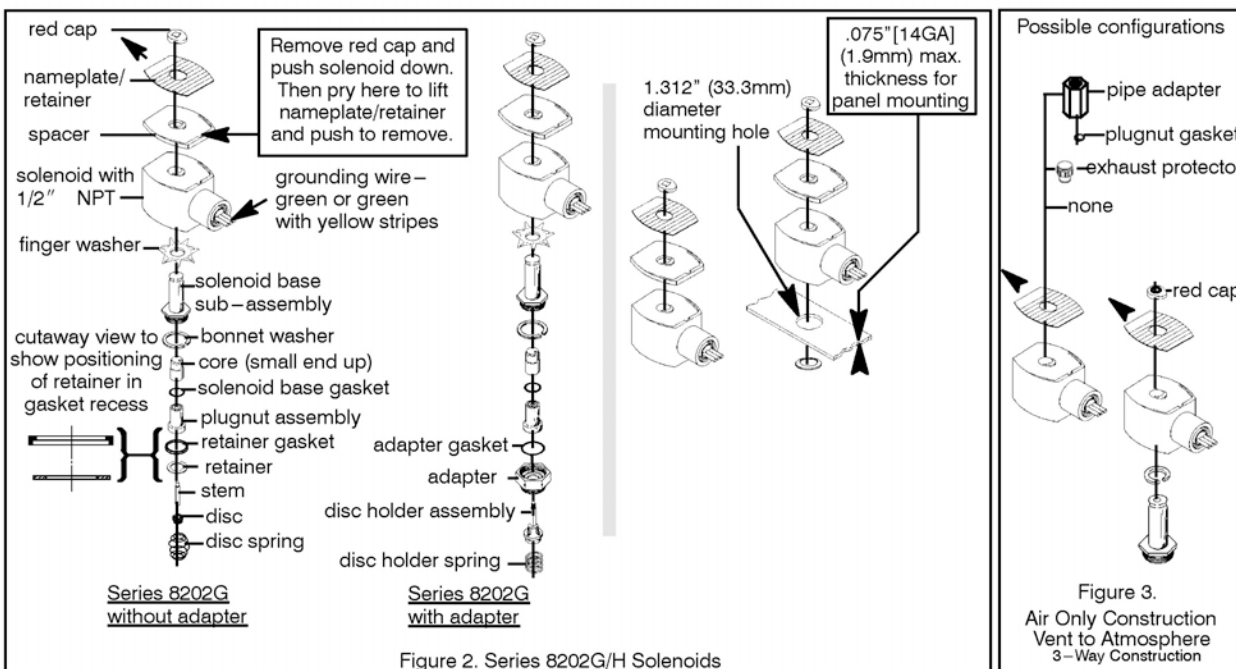
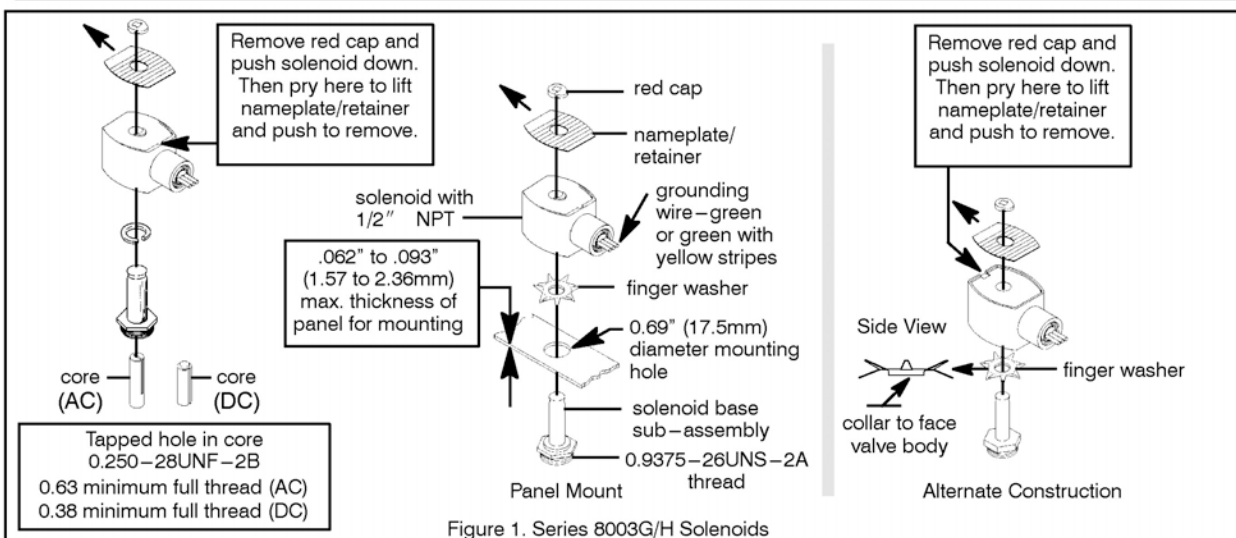


<h1 style="margin: 0;">Installation & Maintenance Instructions</h1> <p style="margin: 0;">OPEN-FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS</p>	<p>SERIES</p> <p>8003G/H 8202G/H</p> <p>I&M No.V6584R11 (Section 2 of 2)</p>
---	---

NOTICE: See Installation and Maintenance Instructions, I&M No. V6584R11 – Section 1 of 2 for detailed instructions.

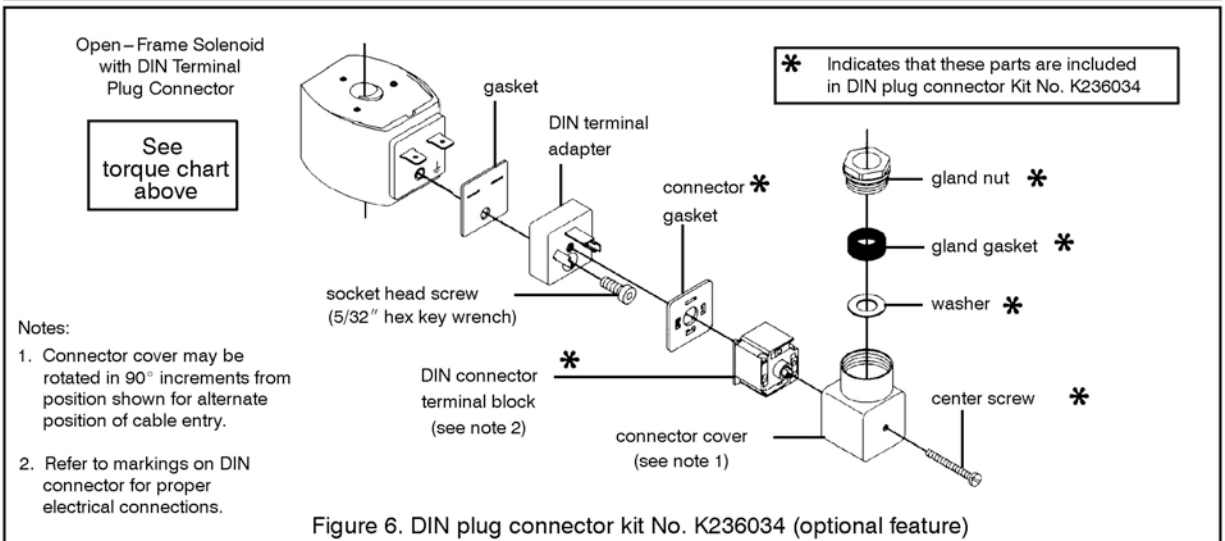
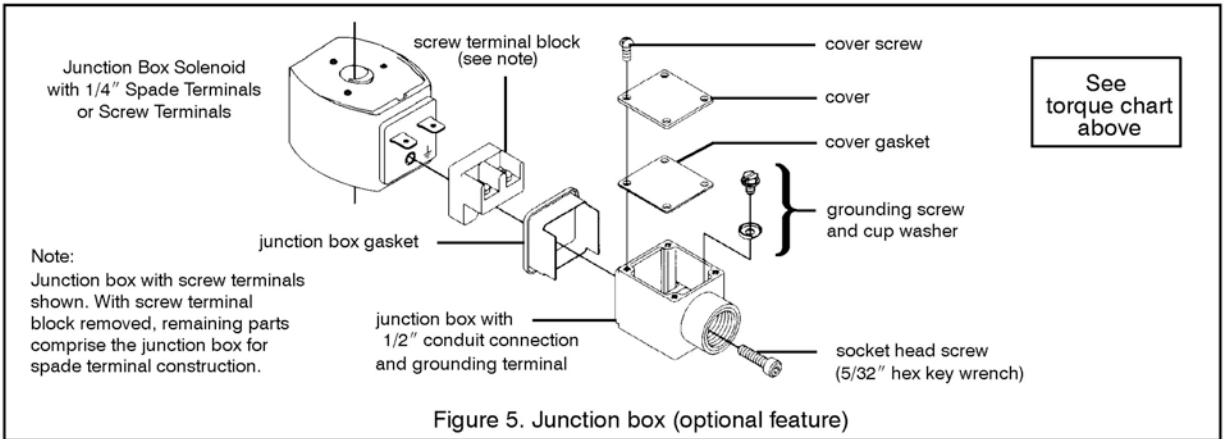
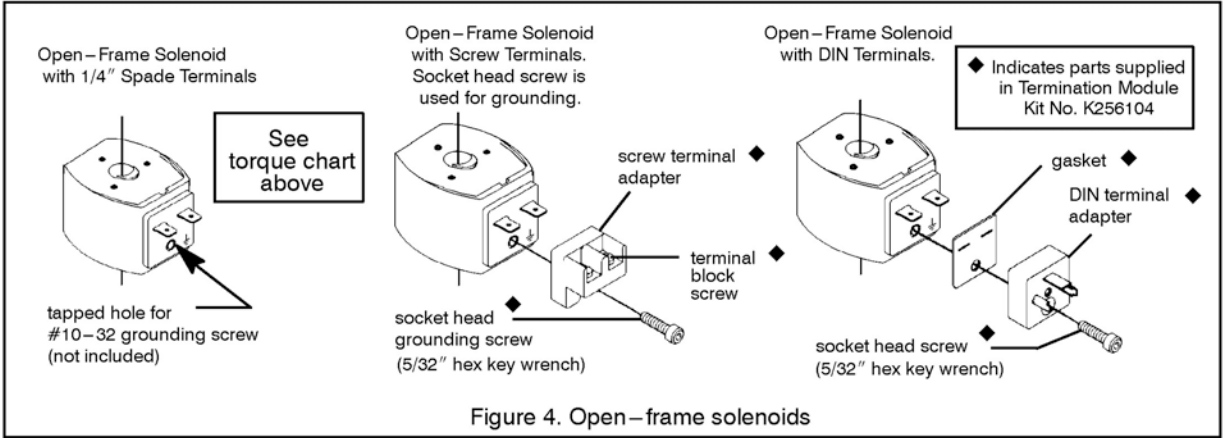
Torque Chart

Part Name	Torque Value in Inch-Pounds	Torque Value in Newton-Meters
solenoid base sub-assembly	175 ± 25	19,8 ± 2,8
pipe adapter	90 maximum	10,2 maximum



Torque Chart

Part Name	Torque Value in Inch-Pounds	Torque Value in Newton-Meters
terminal block screws	10 ± 2	1,1 ± 0,2
socket head screw	15 – 20	1,7 – 2,3
center screw	5 ± 1	0,6 ± 0,1



• ASCO RedHat II 1 1/2" dia. Class I, Div. 1 Solenoids – Technical Information

<h2 style="margin: 0;">Installation & Maintenance Instructions</h2> <p style="margin: 5px 0 0 0;">2-WAY INTERNAL PILOT-OPERATED SOLENOID VALVES NORMALLY CLOSED OPERATION — GENERAL SERVICE 1", 1 1/4" OR 1 1/2" NPT</p>	<p style="margin: 0;">SERIES</p> <p style="margin: 5px 0 0 0;">8210</p> <p style="margin: 5px 0 0 0;">8211</p> <p style="margin: 10px 0 0 0;">I&M No.V5436R7</p>
---	--

NOTICE: See separate solenoid installation and maintenance instructions for information on: Wiring, Solenoid Temperature, Cause of Improper Operation, Coil or Solenoid Replacement.

DESCRIPTION

Series 8210 valves are 2-way normally closed internal pilot-operated solenoid valves designed for general service. Valves are made of rugged forged brass. Series 8210 valves are provided with a general purpose solenoid enclosure. Series EF8210 and 8211 are the same as Series 8210 except they are provided with an explosionproof or explosionproof/watertight solenoid enclosure.

OPERATION

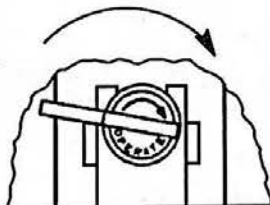
Normally Closed: Valve is closed when solenoid is de-energized; open when energized.

IMPORTANT: Minimum operating pressure differential is 5 psi.

Manual Operator (optional feature)

Manual operator allows manual operation when desired or during an electrical power outage. To engage manual operator (open the valve), turn lever clockwise until it hits a stop. Valve will now be in the same position as when the solenoid is energized. To disengage manual operator (close the valve), turn lever counterclockwise until it hits a stop.

To engage, turn lever clockwise until it hits a stop.



Partial view of Manual Operator

CAUTION: For valve to operate electrically, manual operator lever must be fully rotated counterclockwise.

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage, frequency, and service. Never apply incompatible fluids or exceed pressure rating of the valve. Installation and valve maintenance to be performed by qualified personnel.

Future Service Considerations

Provision should be made for performing seat leakage, external leakage, and operational tests on the valve with a nonhazardous, noncombustible fluid after disassembly and reassembly.

Temperature Limitations

For maximum valve ambient and fluid temperatures, refer to chart below. Check catalog number prefix and watt rating on nameplate.

Watt Rating AC/DC	Catalog Number Prefix	Solenoid Class	Maximum Ambient Temp.	Maximum Fluid Temp.
6	None or DF	F	122°F (50°C)	180°F (82°C)
AC	HT	H	140°F (60°C)	180°F (82°C)
6.1	None, KF, SF or SC	F	125°F (54°C)	180°F (82°C)
AC	HT, KH, ST or SU	H	140°F (60°C)	180°F (82°C)
11.2	None or HT	F or H	77°F (25°C)	150°F (65°C)
DC	None, HT, KF, KH, SC, SF or ST	F or H	104°F (40°C)	150°F (65°C)
11.6	None, HT, KF, KH, SC, SF or ST	F or H	104°F (40°C)	150°F (65°C)
DC	None, HT, KF, KH, SC, SF or ST	F or H	104°F (40°C)	150°F (65°C)

Positioning

This valve is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the solenoid base sub-assembly area.

Piping

Connect piping to valve according to markings on valve body. Apply pipe compound sparingly to male pipe threads only. If applied to valve threads, the compound may enter the valve and cause operational difficulty. Avoid pipe strain by properly supporting and aligning piping. When tightening the pipe, do not use valve or solenoid as a lever. Locate wrenches applied to valve body or piping as close as possible to connection point.

CAUTION: To protect the solenoid valve, install a strainer or filter suitable for the service involved in the inlet side as close to the valve as possible. Clean periodically depending on service conditions. See ASCO Series 8600, 8601 and 8602 for strainers.

MAINTENANCE

WARNING: To prevent the possibility of death, serious injury or property damage, turn off electrical power, depressurize valve, and vent fluid to a safe area before servicing the valve.

NOTE: It is not necessary to remove the valve from the pipeline for repairs.



Cleaning

All solenoid valves should be cleaned periodically. The time between cleanings will vary depending on the medium and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. In the extreme case, faulty valve operation will occur and the valve may fail to open or close. Clean strainer or filter when cleaning the valve.

Preventive Maintenance

- Keep medium flowing through the valve as free from dirt and foreign material as possible.
- Periodic exercise of the valve should be considered if ambient or fluid conditions are such that corrosion, elastomer degradation, fluid contamination build up, or other conditions that could impede solenoid valve shifting are possible. The actual frequency of exercise necessary will depend on specific operating conditions. A successful operating history is the best indication of a proper interval between exercise cycles.
- Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. If parts are worn or damaged, install a complete rebuild kit.

Causes of Improper Operation

- **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
- **Excessive Leakage:** Disassemble valve and clean all parts. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

Valve Disassembly

1. Disassemble valve in an orderly fashion using exploded views for identification and placement of parts. Refer to Figure 1 for AC construction; Figure 2 for DC construction. For 1" or 1 1/4" NPT valve construction, see Figure 1; for 1 1/2" NPT valve construction, see Figure 2.
 2. Remove solenoid enclosure. See separate instructions.
- For valves supplied with optional manual operators, see section on *Disassembly of Manual Operator*.
3. Unscrew solenoid base sub-assembly from valve body. Then remove core assembly with core spring and solenoid base gasket. For AC construction (Figure 1) core spring is a loose piece.
 4. For normal maintenance (cleaning) it is not necessary to remove the valve seat. However, for valve seat removal use a 7/16" thin wall socket wrench
 5. Remove bonnet screws, valve bonnet, diaphragm spring, diaphragm assembly, body gasket, body passage eyelet (present on current valve constructions only) and body passage gasket.
 6. All parts are now accessible for cleaning or replacement. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

– Service Notice –

When installing a new ASCO Rebuild Kit, please be aware that the diaphragm assembly may not be identical to the diaphragm assembly in the valve. See Figure 1 for alternate diaphragm constructions. The two diaphragm constructions are interchangeable and will perform equally well.

▲ CAUTION: To ensure proper valve operation, install all parts supplied in ASCO Rebuild Kit. Do not mix old and new parts.

Valve Reassembly

1. Lubricate body gasket, body passage gasket, bonnet gasket and solenoid base gasket with DOW CORNING® 200 Fluid lubricant or an equivalent high-grade silicone fluid.

2. Install body passage gasket, body passage eyelet, diaphragm assembly, diaphragm spring, valve bonnet and bonnet screws. Hand thread screws as far as possible. Then torque bonnet screws in a crisscross manner to 144 ± 15 in-lbs [$16,3 \pm 1,7$ Nm].
 3. If removed, install valve seat in valve body. Apply a small amount of thread compound compatible with valve media to valve seat threads. Torque valve seat to 75 ± 10 in-lbs [$8,5 \pm 1,1$ Nm].
- For valves supplied with optional manual operator, see section on *Reassembly of Manual Operator*.
4. For AC construction (Figure 1), install core spring in core assembly. Wide end of core spring in core first, closed end protrudes from top of core.
 5. Install solenoid base gasket, core assembly with core spring and solenoid base sub-assembly in valve body. Torque solenoid base sub-assembly to 175 ± 25 in-lbs [$19,8 \pm 2,8$ Nm].
 6. Install solenoid. See separate instructions.

▲ WARNING: To prevent the possibility of death, serious injury or property damage, check valve for proper operation before returning to service. Also perform internal seat and external leakage tests with a nonhazardous, noncombustible fluid.

7. Restore line pressure and electrical power supply to valve.
8. After maintenance is completed, operate the valve a few times to be sure of proper operation. A metallic *click* indicates the solenoid is operating.

Disassembly of Manual Operator

1. Unscrew solenoid base sub-assembly from manual operator body.
2. Unscrew manual operator body from valve body. Then remove stem retainer from base of manual operator body and stem/spacer sub-assembly.
3. Pull stem/spacer sub-assembly with stem gasket from side of manual operator body. Then remove core assembly with core spring, solenoid base gasket and manual operator bonnet gasket.
4. For further disassembly refer to section on *Valve Disassembly* step 4.

Reassembly of Manual Operator

1. Lubricate stem gasket with DOW CORNING® 111 Compound lubricant or an equivalent high-grade silicone grease.
2. For AC construction (Figure 1), install core spring in core assembly. Wide end of core spring in core first, closed end protrudes from top of core.
3. Holding the manual operator body in a horizontal position, install core assembly with core spring from the bottom end.
4. Insert the stem/spacer sub-assembly with the stem gasket into the side hole of the manual operator body. Rotate the lever of the stem/spacer sub-assembly to the 12 o'clock position.
5. Install stem retainer on base of manual operator body and simultaneously engage it into the slot provided on the stem/spacer sub-assembly.

IMPORTANT: The spacer on the stem/spacer sub-assembly must be inside of the stem retainer for AC construction (Figure 1) and outside of the stem retainer for DC construction (Figure 2).

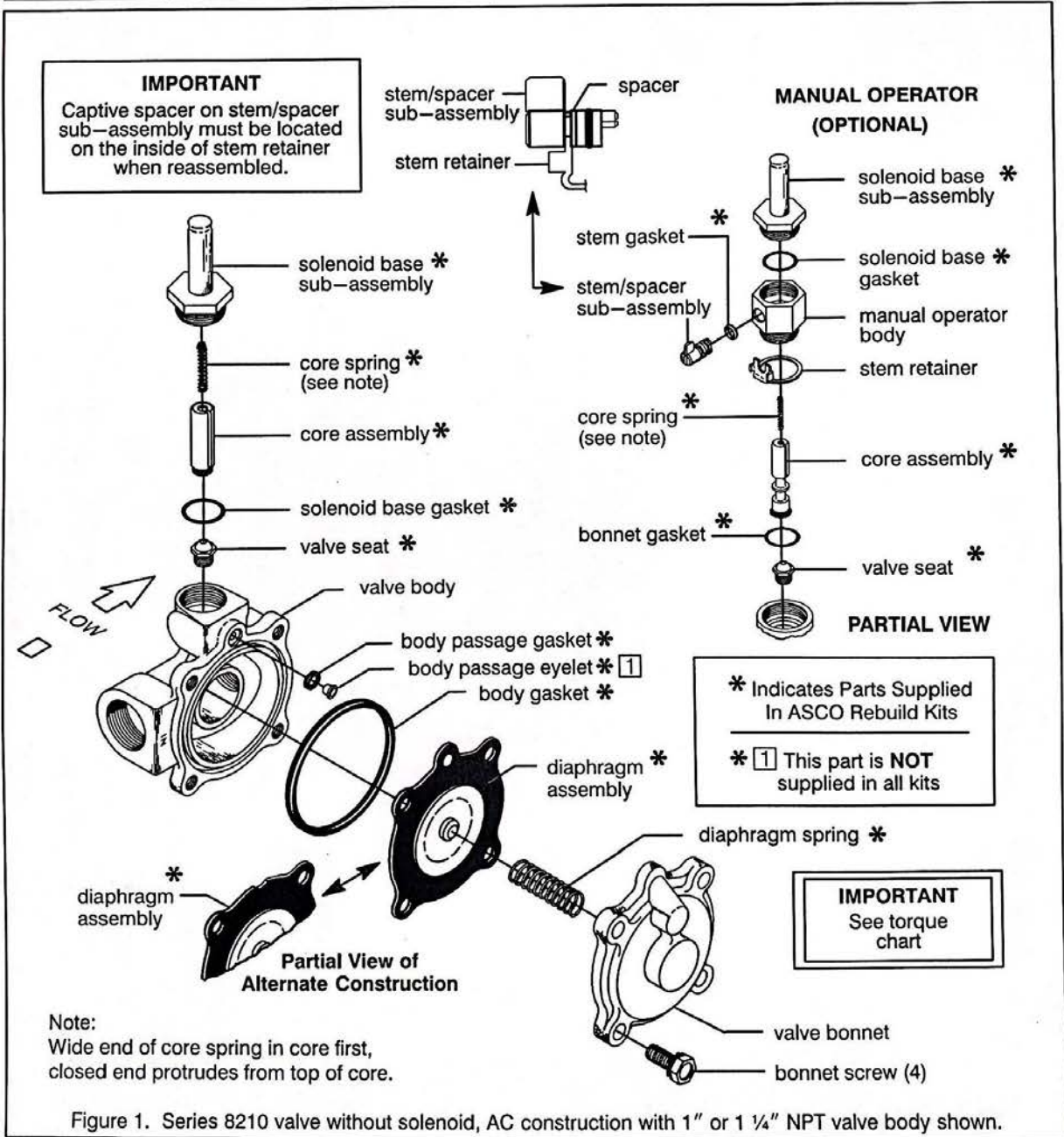
6. Install manual operator bonnet gasket and body with preassembled parts into valve body. Torque manual operator body to 175 ± 25 in-lbs [$19,8 \pm 2,8$ Nm].
7. Replace solenoid base gasket and solenoid base sub-assembly. Torque solenoid base sub-assembly to 175 ± 25 in-lbs [$19,8 \pm 2,8$ Nm].
8. For further reassembly, refer to *Valve Reassembly* step 6.

Torque Chart

Part Name	Torque Value Inch-Pounds	Torque Value Newton-Meters
Solenoid base sub-assembly	175 ± 25	19,8 ± 2,8
Manual operator body		
Bonnet screw	144 ± 15	16,3 ± 1,7
Valve seat	75 ± 10	8,5 ± 1,1

**ORDERING INFORMATION
FOR ASCO REBUILD KITS**

Parts marked with an asterisk (*) in the exploded view are supplied in Rebuild Kits. When Ordering Rebuild Kits for ASCO valves, order the Rebuild Kit number stamped on the valve nameplate. If the number of the kit is not visible, order by indicating the number of kits required, and the Catalog Number and Serial Number of the valve(s) for which they are intended.



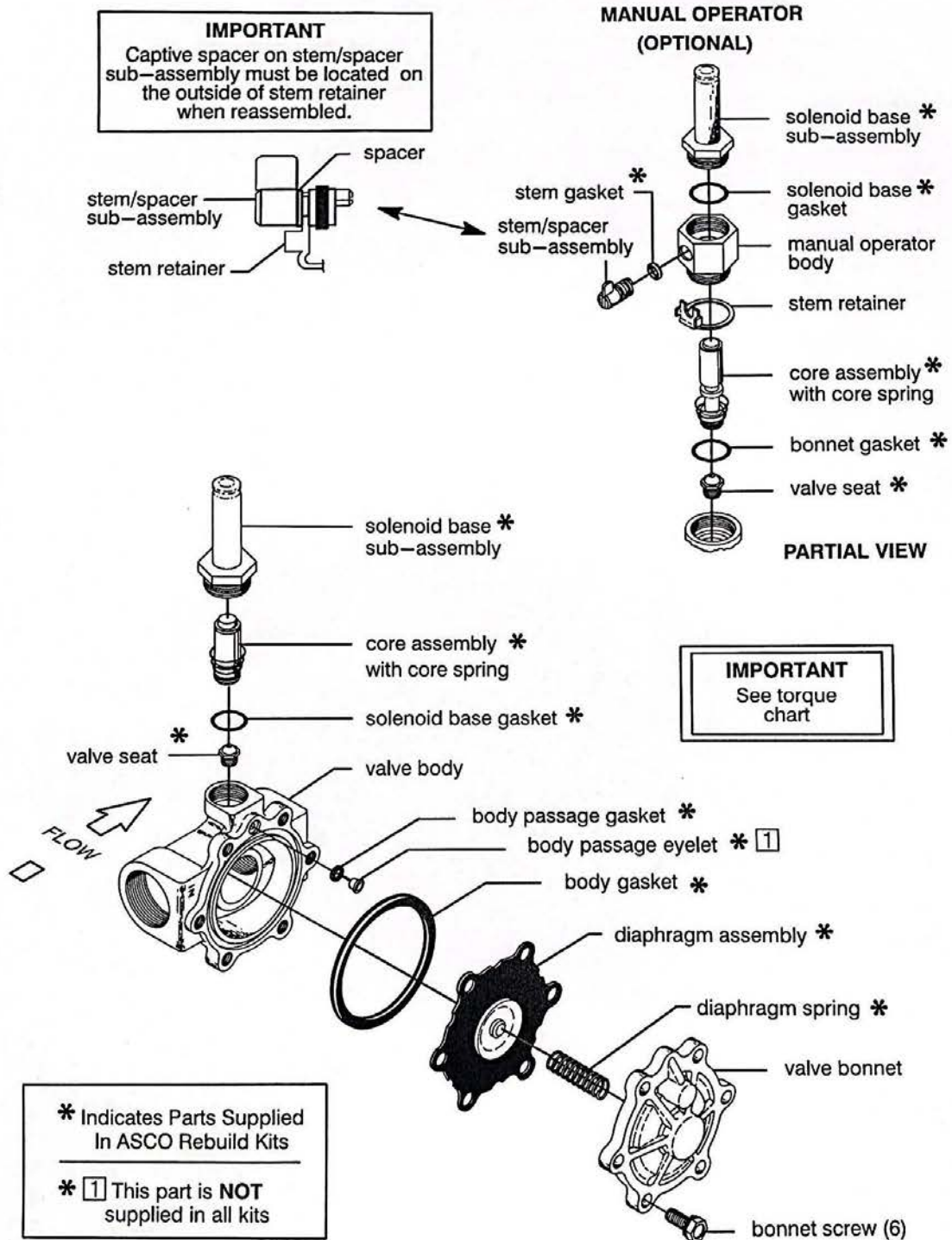


Figure 2. Series 8210 valve without solenoid, DC construction with 1 1/2" NPT valve body shown.

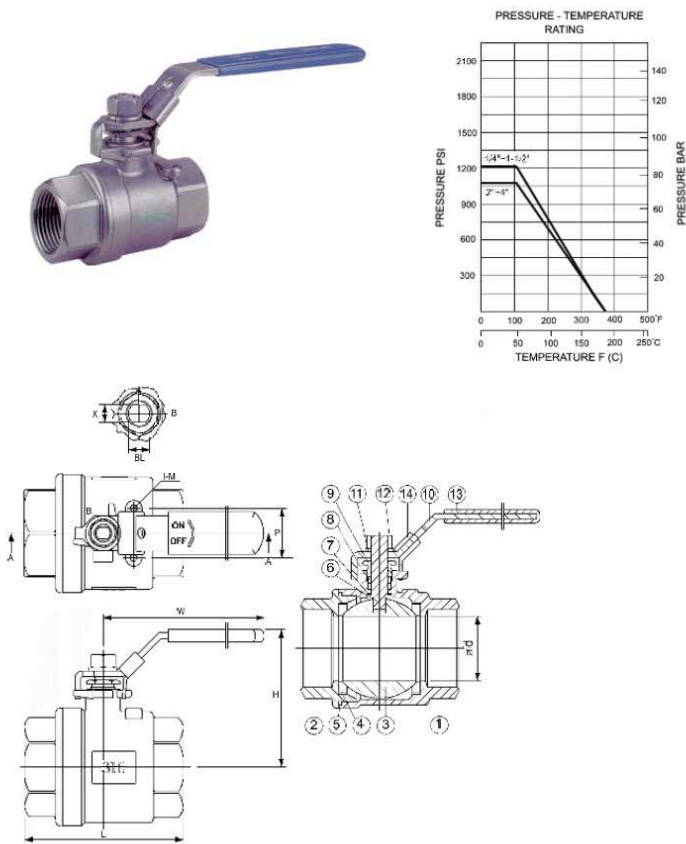
M. Ball Valves (Full Port; AISI 316) – NVC (Full Port)

- 3 x ¼” WOG for Pressure Gauges Isolation
- 2 x ½” WOG for Wash Press Isolation + 1 x ½” WOG for Y-Strainer Isolation, if implemented (2 or 3 per Wash Press)
- 1 x ½” WOG for Grit Classifier Wash Jet
- 1 x 1-½” WOG for Vortex Fluidization + 1 x 1-½” WOG for Y-Strainer Isolation, if implemented
- 1 x 2” WOG for Grit Classifier sedimentation tank drain



1000 WOG - 2 PIECE FULL PORT STAINLESS STEEL BALL VALVE

FIG. V-21



Compliance: MSS SP-110
 Blow-out proof stem
 Threaded ends: ANSI B1.20.1
 Size range: ¼” to 4”
 Pressure ¼” to 4”: 1000 psi (WOG)

Materials:

No.	Part Name	Specification
1	Body	ASTM A351-CF8M
2	End Cap	ASTM A351-CF8M
3	Ball	ASTM A351-CF8M
4	Seat	PTFE
5	Joint Gasket	PTFE
6	Stem	ANSI 316
7	Thrust Washer	PTFE
8	Stem Packing	PTFE
9	Gland Nut	ANSI 304
10	Handle	ANSI 430
11	Stem Washer	AISI 304
12	Stem Nut	AISI 304
13	Handle Sleeve	Plastic
14	Lock Device	AISI 304

Options:

- M: Tapped Mounting pad
- P: equipped with Pneumatic actuator
- U: UNC or UNF threads for mounting pad
- L: Locking Device

Dimensions:

Size	ød		L		H		P		W		X	BL	I-M	CV	Weights		
	in	mm	in	mm	in	mm	in	mm	in	mm	mm	in			lb	kg	
¼"	8	0.46	11.6	1.75	44.5	2.01	51	.98	25	3.74	95	5	5/16"	2-M6xP1.0	6.8	.46	.21
½"	10	0.50	12.7	1.75	44.5	2.01	51	.98	25	3.74	95	5	5/16"	2-M6xP1.0	7.9	.48	.22
¾"	15	0.59	15	2.24	57	2.09	53	.98	25	3.74	95	5	5/16"	2-M6xP1.0	11.2	.50	.228
1"	20	0.79	20	2.56	65	2.34	59.5	.94	24	4.33	110	6.5	¾"	2-M6xP1.0	21	.93	.442
1½"	25	0.96	25	2.99	76	2.87	73	1.32	33.5	5.31	135	8	7/16"	2-M6xP1.0	35	1.55	.708
2"	32	1.26	32	3.44	87.5	3.11	79	1.50	38.1	5.31	135	8	7/16"	2-M6xP1.0	57	2.33	1.06
2½"	40	1.50	38	4.02	102	3.56	90.5	1.50	38.1	6.50	165	9	½"	2-M6xP1.0	80	3.70	1.68
3"	50	1.97	50	4.84	123	3.88	98.5	1.50	38.1	6.50	165	9	½"	2-M6xP1.0	150	5.96	2.71
3½"	65	2.56	65	6.14	156	5.14	130.5	2.20	56	8.46	215	12	¾"	4-M6xP1.0	265	11.55	5.25
4"	80	3.15	80	7.24	184	5.61	142.5	2.20	56	8.46	215	12	¾"	4-M6xP1.0	415	18.92	8.60
4"	100	3.94	100	9.84	250	6.83	173.5	2.48	63	12.80	325	16	1"	4-M6xP1.0	780	42.6	19.32

N. Pressure Gauge – WIKA (Glycerine-Filled) + Chemiquip Snubber (Final 1/4" Female NPT Connection Provided); 3 Units – Wash Presses (x2) & Vortex (x1)

**Mechanical
Pressure Measurement**

**Bourdon Tube Pressure Gauges
Stainless Steel Series
Type 232.53 - Dry Case
Type 233.53 - Liquid-filled Case**

WIKA Datasheet 23X.53

Applications

- With liquid filled case for applications with high dynamic pressure pulsations or vibration
- Suitable for corrosive environments and gaseous or liquid media that will not obstruct the pressure system
- Process industry: chemical/petrochemical, power stations, mining, on and offshore, environmental technology, mechanical engineering and plant construction

Product features

- Excellent load-cycle stability and shock resistance
- All stainless steel construction
- Positive pressure ranges to 15,000 psi (1,000 bar)

Specifications

Design

ASME B40.100 & EN 837-1

Sizes

2", 2 1/2" & 4" (50, 63 and 100 mm)

Accuracy class

2" & 2 1/2": ± 2/1.2% of span (ASME B40.100 Grade A)

4": ± 1.0% of span (ASME B40.100 Grade 1A)

Ranges

Vacuum / compound to 200 psi (16 bar)

Pressure from 15 psi (1 bar) to 15,000 psi (1,000 bar) or other equivalent units of pressure or vacuum

Working pressure

2" & 2 1/2":	Steady:	3/4 scale value
	Fluctuating:	2/3 full scale value
	Short time:	full scale value

4 ":	Steady:	full scale value
	Fluctuating:	0.9 x full scale value
	Short time:	1.3 x full scale value

Operating temperature

Ambient: -40°F to +140°F (-40°C to +60°C) - dry
 -4°F to +140°F (-20°C to +60°C) - glycerine filled
 -40°F to +140°F (-40°C to +60°C) - silicone filled
 Medium: +212°F (+100°C) maximum



Bourdon Tube Pressure Gauge Model 232.53 - 2 1/2"

Temperature error

Additional error when temperature changes from reference temperature of 68°F (20°C) ±0.4% of span for every 18°F (10°K) rising or falling.

Weather protection

Weather tight (NEMA 4X / IP65)

Pressure connection

Material: 316 stainless steel
 Lower mount (LM) or center back mount (CBM)
 Lower back mount (LBM) for 4" size
 1/8" NPT, 1/4" NPT or 1/2" NPT limited to wrench flat area

Bourdon tube

Material: 316 stainless steel
 > 1,500 psi (100 bar): C-shape,
 ≤ 1,500 psi (100 bar): Helical type

Movement

Stainless steel

Dial

White aluminum with black lettering, 2" and 2 1/2" with stop pin



Pointer

Black aluminum

Case

304 stainless steel with vent plug and SS crimp ring
Welded case / socket connection

Window

Polycarbonate

Liquid filling

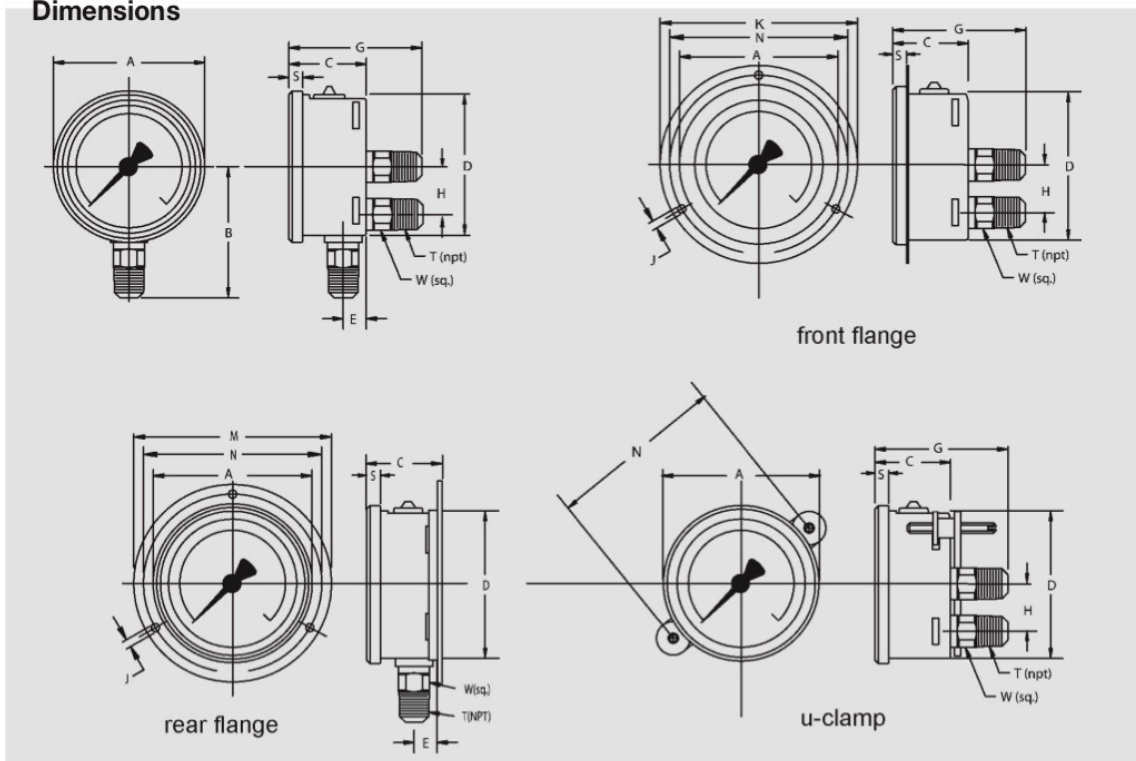
Glycerine 99.7% - Type 233.53

Optional extras

- SS restrictor
- SS front flange
- SS rear flange (2½" and 4" only)
- Zinc-plated steel or SS u-clamp bracket (field installable - see note)
- Cleaned for oxygen service
- Red drag pointer or mark pointer (2½" and 4" only)
- External zero adjustment (4" size only)
- Other pressure connections
- Silicone or Halocarbon Oil case filling
- Other pressure scales available:
bar, kPa, MPa, kg/cm² and dual scales

Note: U-clamp bracket for 2" must be ordered with gauge

Dimensions



Size	A	B	C	D	E	G	H	J	K	M	N	S	T	W	Weight
2" mm	55	48	30	50	12	53	-	3.6	71	71	60	5.5	14	0.27 lb. dry	
in	2.17	1.89	1.18	1.97	0.47	2.09	-	0.14	2.80	2.80	2.36	0.22	1/4"	0.55	0.33 lb. filled
2.5" mm	69	54	32	62	13	54	-	3.6	85	88.1	75	6.5	14	0.36 lb. dry	
in	2.69	2.13	1.26	2.45	0.51	2.13	-	0.14	3.35	3.47	2.95	0.26	1/4"	0.55	0.44 lb. filled
4" mm	107	87	48	100	15.5	79.5	30	4.8	132	132	116	8	22	1.10 lb. dry	
in	4.21	3.43	1.89	3.91	0.61	3.13	1.18	0.19	5.20	5.20	4.57	0.31	1/2"	0.87	1.76 lb. filled

Recommended panel cutout is dimension D + 3 mm

Ordering information

Pressure gauge model / Nominal size / Scale range / Size of connection / Optional extras required
Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing.
Modifications may take place and materials specified may be replaced by others without prior notice.



WIKAI Instrument Corporation

1000 Wiegand Boulevard
Lawrenceville, GA 30043
Tel (770) 513-8200 Toll-free 1-888-WIKA-USA
Fax (770) 338-5118
E-Mail info@wika.com
www.wika.com



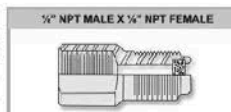
Technical Data

Standard Industrial Pressure Snubbers

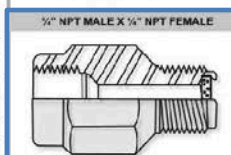
- Increase instrument Life
- Assure steady average pressure readings
- Smooth out pressure impulses and fluctuations
- Remove harmful solids from actuating fluid
- Eliminate pressure instrument failure due to hydraulic or pneumatic shock



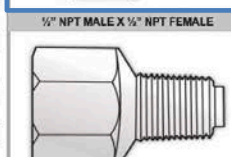
1/4" NPT Male x 1/4" NPT Female					
Model No.	Material	Length	Hex	Net weight	Maximum Pressure Rating
12B	Brass	1.1"	3/8"	1/2 oz.	3,000 psi
12S	Stainless Steel (303)	1.1"	3/8"	1/2 oz.	5,000 psi
12S6	316 Stainless Steel	1.1"	3/8"	1/2 oz.	5,000 psi



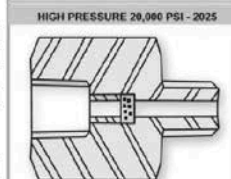
1/4" NPT Male x 1/4" NPT Female					
Model No.	Material	Length	Hex	Net weight	Maximum Pressure Rating
25B	Brass	1.5"	3/8"	2 oz.	10,000 psi
25S	Stainless Steel (303)	1.5"	3/8"	2 oz.	15,000 psi
25S6	316 Stainless Steel	1.5"	3/8"	2 oz.	15,000 psi
25M	Monel	1.5"	3/8"	2 oz.	15,000 psi



1/2" NPT Male x 1/2" NPT Female					
Model No.	Material	Length	Hex	Net weight	Maximum Pressure Rating
50B	Brass	2.2"	1 1/4"	8 oz.	10,000 psi
50S	Stainless Steel (303)	2.2"	1 1/4"	8 oz.	15,000 psi
50S6	316 Stainless Steel	2.2"	1 1/4"	8 oz.	15,000 psi
50M	Monel	2.2"	1 1/4"	8 oz.	15,000 psi



High Pressure 20,000 psi - Stainless Steel					
Model No.	Connections	Length	Hex	Net weight	Maximum Pressure Rating
2025	1/4" NPT Male x 1/4" NPT Female	2"	1 1/4"		20,000 psi
2050	1/2" NPT Male x 1/2" NPT Female	2.5"	2"	12 oz.	20,000 psi



Add suffix to model no. to indicate desired porosity (e.g. 12BE)		
Suffix	Porosity	Approx. micron rating
C	Highly Viscous Fluids (over 500 S.S.U.)	75
D	Oil (225 S.S.U. to 500 S.S.U.)	40-45
E	Water & Light Oils (30 to 225 S.S.U.)	10
F	Vapor and Low Viscosity Fluids (under 30 S.S.U.)	7
G	Air or other Gases	2-5
HX	Pulsating Gas	1
HXX	Extreme Gas Pulsation	1/2
	Special porosity <i>Special discs to repel water or smaller micron ratings</i>	



Suffix	Other Threaded Connections
BSPP	British Pipe thread parallel (Example: 25B-BSPP)
BSPT	British Pipe thread taper (Example: 25B-BSPT)
NPS	NPS (Example: 25B-NPS)
	Metric (Specify)

Suffix	Options
	{Special} Monel porous disc (With monel housing)
XS	Cleaned for oxygen service
LF	Lead free

316 S.S. Hex complies to ASTM-A276, ASTM-A182 or QQ-S-763 Specifications

Monel Hex. Complies to QQ-N-281 Specifications



Special NPT pressure Snubbers

Design your customized snubber in any shape, design, thread, End connection, material, porosity.

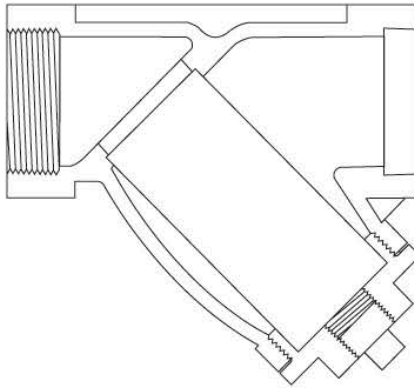
If your design is listed select the number listed otherwise specify your requirements.

Example:	75	S	E
1. Body			
40	3/8" NPT Male Inlet & 3/8" NPT Female outlet		
75	3/4" NPT Male Inlet & 3/4" NPT Female outlet		
1M2	1/8" NPT Male Inlet & 1/4" NPT Female outlet		
5M2	1/2" NPT Male Inlet & 1/4" NPT Female outlet		
2M5	1/4" NPT Male Inlet & 1/2" NPT Female outlet		
90	Other Configuration Male x Female		
25MXM	1/4" NPT Male x 1/4" NPT Male		
50MXM	1/2" NPT Male x 1/2" NPT Male		
90MXM	Other Configurations Male x Male		
F25	1/4" NPT Female x 1/4" NPT Female		
F50	1/2" NPT Female x 1/2" NPT Female		
F90	Other Configurations Female x Female		
2. Material			
B	Brass		
S	303 Stainless Steel		
S6	316 Stainless Steel		
M	Monel		
Z	Other (Specify)		
3. Porosity			
C	High Viscosity Fluids		
D	Heavy Oil		
E	Water & Light Oils		
F	Vapor and Low Viscosity Fluids		
G	Air or other Gases		
HX	Pulsating Gas		
HXX	Extreme Gas Pulsation		
SPECIAL	Special discs		
4. Options			
BSPP	British pipe thread parallel (Example: 40B-BSPP)		
BSPT	British pipe thread taper (Example: 40B-BSPT)		
NPS	NPS (Example: 40B-NPS)		
BT	Bite-Type Flareless (Example: 40B-BT)		
FT	Flared Tubing (Example: 40B-FT)		
XS	Cleaned for oxygen service		
LF	Lead Free		
Note: The designs specified on this page are not standard snubbers for standard snubbers see page 1			

O. Wye-Strainer – IFC



IFC Series Y150 and Y300 Cast Steel Threaded and Socket Weld Y-Strainers



Design Features:

- Strainers are available with threaded (N.P.T.) or socket weld inlet/outlet connections.
- Strainer body meets applicable ASME Standard.
- One piece precision investment cast body.
- Strainers equipped with threaded cover cap that utilize a flat gasket seal.
- Upper and lower machined seats.
- 304 SS perforated screens are standard.
- Drain/Blow-off connection furnished with plug as standard.
- Generous screen area and properly proportioned straining chamber to minimize initial pressure drop while maximizing time between cleanings.



Parts List and Standard Materials		
Part	Carbon Steel	Stainless Steel
Body	A216-WCB	A351-CF8M
Cap	A216-WCB	A351-CF8M
Screen ¹	304SS	304SS
Plug ²	A105	A182-316
Gasket ¹	Teflon	Teflon

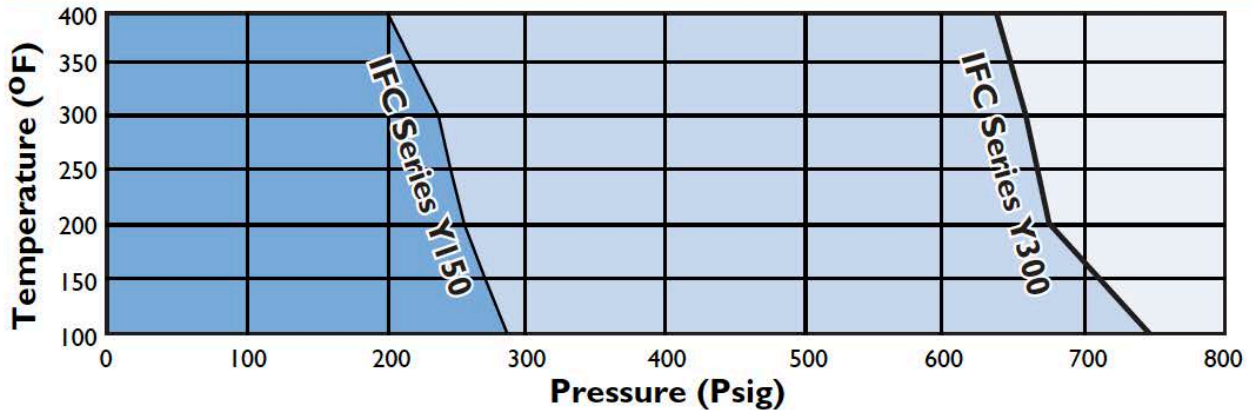
Notes: 1. Recommended Spares.

2. Materials of equivalent strength may be substituted at manufacturer's option.

Upper Pressure Limits (Non-Shock)		
IFC Model (Threaded)	Body Material	M.A.W.P. psig (Bars)
Y150TST	WCB	285 (19.65)
Y150TSST	CF8M	275 (18.96)
Y300TST	WCB	740 (51.02)
Y300TSST	CF8M	720 (49.64)

Lower Temperature Limits	
Body Material	Lower Limit °F (°C)
WCB	-20 (-28.9)
CF8M	-20 (-28.9)

Pressure Temperature Chart (in accordance with ASME B16.34, WCB)

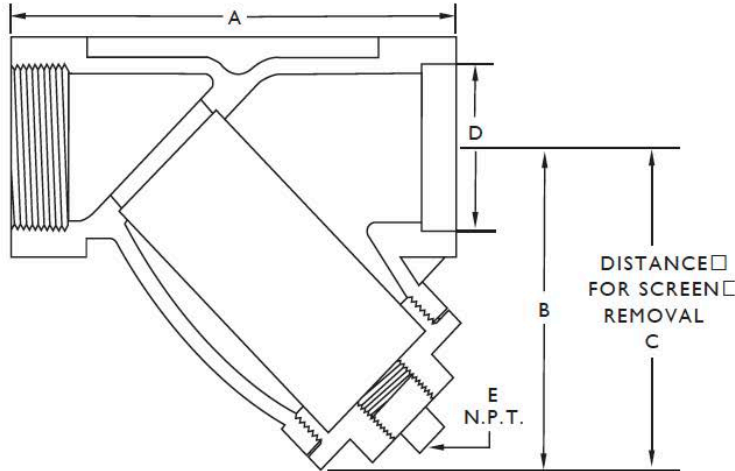


Note: Teflon limited to 400°F maximum sustained operating temperature.

When operating IFC series Y150 and Y300 cast steel strainers at higher temperatures please consult factory.



IFC Series Y150 and Y300 Cast Steel Threaded and Socket Weld Y-Strainers



Standard Screens	
Size range	Opening
1/2" - 2"	0.032 in.
10mm - 50mm	0.8 mm
2 1/2" - 3"	0.045 in.
65mm - 80mm	1.2 mm

Dimensional Data (Class 150, 300)

Size in (mm)	A in (mm)		B in (mm)		C in (mm)		D in (mm)		E NPT in (mm)		Weight Lb. (Kg.)	
	Y150	Y300	Y150	Y300	Y150	Y300	Y150	Y300	Y150	Y300	Y150	Y300
1/2" 15	-	2.31 59	-	1.56 40	-	2.38 60	-	0.855 21.72	-	3/8 10	-	0.50 0.22
3/4" 20	-	3.13 80	-	2.13 54	-	3.19 81	-	1.065 27.05	-	3/8 10	-	0.82 0.37
1" 25	-	3.31 84	-	2.63 67	-	4.00 102	-	1.330 33.78	-	1/2 15	-	1.50 0.68
1 1/4" 32	-	4.13 105	-	3.00 76	-	4.50 114	-	1.675 42.55	-	1/2 15	-	2.0 0.90
1 1/2" 40	-	4.69 119	-	3.19 81	-	4.75 121	-	1.915 48.64	-	1/2 15	-	2.75 1.25
2" 50	-	5.44 138	-	3.81 97	-	5.75 146	-	2.406 61.11	-	1/2 15	-	4.25 1.90
2 1/2" 65	7.19 183	7.19 183	4.88 124	4.88 124	7.25 184	7.25 184	2.906 73.81	2.906 73.81	1/2 15	1/2 15	10 4.54	10 4.54
3" 80	8.00 203	8.00 203	5.25 133	5.25 133	7.50 190	7.50 190	3.535 89.79	3.535 89.79	1/2 15	1/2 15	14 6.35	14 6.35

General:

- For further optional features see page 19.
- Other perforations and screen materials available. Please see page 20.
- For pressure loss information see page 21 and 23.
- For ordering information please see page 30.
- Dimensions shown are subject to change. Contact factory for certified prints when required.

P. High Liquid Level Sensor – Liquiphant FTL51B, Class I, Div. 1; Endress + Hauser Model FTL51B-CDA1ACIAA2CJA1VCJ + Sliding sleeve (PN: 52003979)

- 1 for Each Grit Classifier; for Installation on Top Cover (Total of three [3])

10



F L E X

Liquiphant FTL51B

- 1 + PC ☆ 🗑️

🕒 Delivery time: 1 week(s)

^ Hide details

FTL51B-77MU6/0





FTL51B-CDA1ACIAA2CJA1VCJ

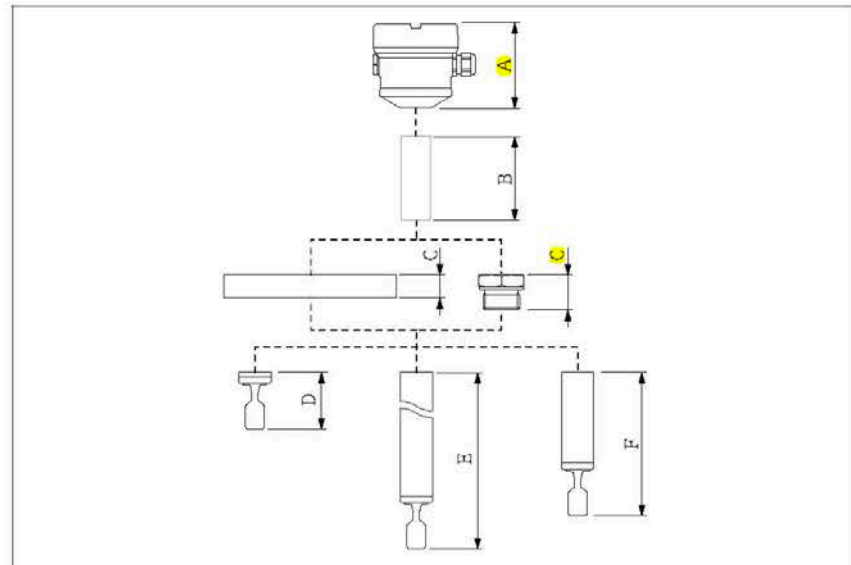
Approval:	CD	CSA C/US XP Cl.I Div.1 Gr.A-D, Cl.II,III Div.1 Gr.E-G,Cl.I Div.2 Gr.A-D Cl.I zone 1, AEx/Ex d IIC T6
Output:	A1	FEL61, 2-wire 19-253VAC + test button
Display; Operation:	A	W/o; switch
Housing; Material:	C	Single compartment; 316L
Electrical Connection:	I	Thread NPT3/4, IP66/68 NEMA Type 4X/6P
Application:	A	Process max 150oC/302oF, max 64bar
Surface Refinement:	A	Standard Ra<3,2µm/126µin
Type Of Probe:	2	Tube extension
Sensor Length; Material:	CJ	200.00 mm mm L, Ra<3,2um/126uin; 316L
Process Connection, Sealing Surface:	A1	Thread ASME B1.20.1, NPT
Process Connection:	VCJ	1", 316L



Endress+Hauser

Liquiphant FTL51B

	<p>Hazardous area</p> <p>In the hazardous area, the permitted ambient temperature can be limited depending on the zones and gas groups. Pay attention to the information in the Ex documentation (XA).</p>
Storage temperature	<p>-40 to +80 °C (-40 to +176 °F) Optional: -50 °C (-58 °F), -60 °C (-76 °F)</p>
Humidity	<p>Operation up to 100 %. Do not open in a condensing atmosphere.</p>
Operating altitude	<p>As per IEC 61010-1 Ed.3:</p> <ul style="list-style-type: none"> Up to 2 000 m (6 600 ft) above sea level Can be extended to 3 000 m (9 800 ft) above sea level if overvoltage protection is used
Climate class	<p>As per IEC 60068-2-38 test Z/AD</p>
Degree of protection	<p>Testing according to IEC 60529 and NEMA 250</p> <p>IP68 test condition: 1.83 m H₂O for 24 h</p> <p>Housing See cable entries</p> <p>Cable entries</p> <ul style="list-style-type: none"> M20 threaded joint, plastic, IP66/68 NEMA Type 4X/6P M20 threaded joint, nickel-plated brass, IP66/68 NEMA Type 4X/6P M20 threaded joint, 316L, IP66/68 NEMA Type 4X/6P M20 thread, IP66/68 NEMA Type 4X/6P G ½ thread,  NPT ¾ IP66/68 NEMA Type 4X/6P <p>Degree of protection for M12 plug</p> <ul style="list-style-type: none"> When housing is closed and connecting cable is plugged in: IP66/67 NEMA Type 4X When housing is open or connecting cable is not plugged in: IP20, NEMA Type 1 <p>NOTICE</p> <p>M12 plug: Loss of IP protection class due to incorrect installation!</p> <ul style="list-style-type: none"> The degree of protection only applies if the connecting cable used is plugged in and screwed tight. The degree of protection only applies if the connecting cable used is specified according to IP67 NEMA Type 4X. <p> If the "M12 plug" option is selected as the electrical connection, IP66/67 NEMA Type 4X applies for all housing types.</p>
Vibration resistance	<p>As per IEC60068-2-64-2008 a(RMS) = 50 m/s², f = 5 to 2 000 Hz, t = 3 axes x 2 h</p> <p>For increased oscillations or vibrations, the additional option of the order code for "Application" option "B" 100 bar (1 450 psi) pressure is recommended.</p>
Shock resistance	<p>In accordance with IEC60068-2-27-2008: 300 m/s² [= 30 g_n] + 18 ms</p> <p>g_n: standard acceleration of gravity</p>
Mechanical load	<p>Support the device in the event of severe dynamic load. Maximum lateral loading capacity of the pipe extensions and sensors: 75 Nm (55 lbf ft).</p> <p> For more details, see the "Supporting the device" section.</p>
Pollution degree	<p>Pollution degree 2</p>
Electromagnetic compatibility (EMC)	<ul style="list-style-type: none"> Electromagnetic compatibility as per EN 61326 series and NAMUR recommendation EMC (NE21) With regard to the safety function (SIL), the requirements of EN 61326-3-x are satisfied <p> For more details, refer to the EU Declaration of Conformity.</p>



A0034841

31 Components to determine the device height

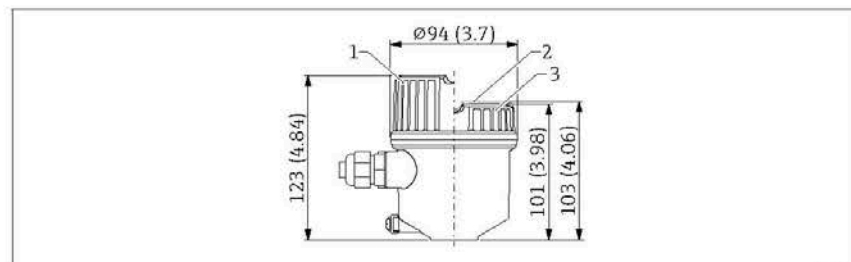
- ➔ A Housing including cover
- ➔ B Temperature spacer, pressure-tight feedthrough (optional)
- ➔ C Process connection
- ➔ D Probe design: compact version with tuning fork
- ➔ E Probe design: pipe extension with tuning fork
- ➔ F Probe design: short pipe version with tuning fork

Dimensions

Housing and cover

All housings can be aligned. The housing alignment can be fixed on housings with a locking screw. Devices with a Bluetooth or LED module require a tall cover (transparent plastic cover or cover with sight glass). The Bluetooth or LED module cannot be used in conjunction with the 316L single compartment housing.

Single compartment housing, plastic



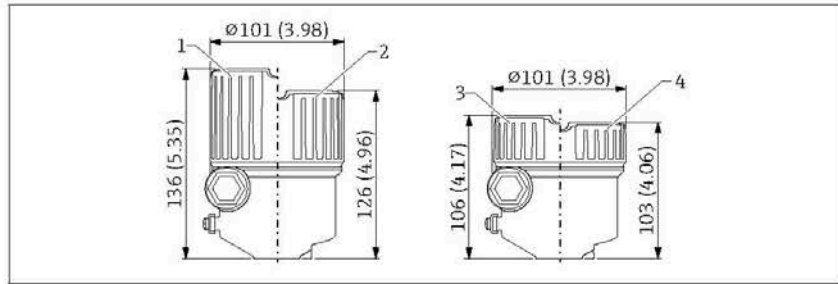
A0035911

32 Dimensions of single compartment housing, plastic. Unit of measurement mm (in)

- 1 Height with plastic cover (transparent)
- 2 Height with cover with plastic sight glass (optional)
- 3 Height with cover without sight glass

Liquiphant FTL51B

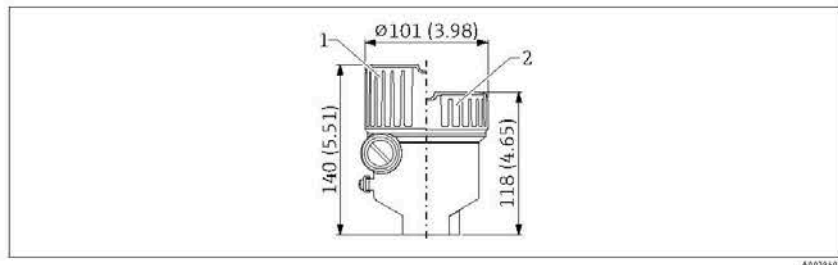
Single compartment housing, aluminium, coated



33 Dimensions of single compartment housing, aluminum, coated. Unit of measurement mm (in)

- 1 Height with cover with sight glass made of glass for Ex ec approval
- 2 Height with cover with plastic sight glass
- 3 Height with cover without sight glass
- 4 Height with cover with plastic sight glass (optional)

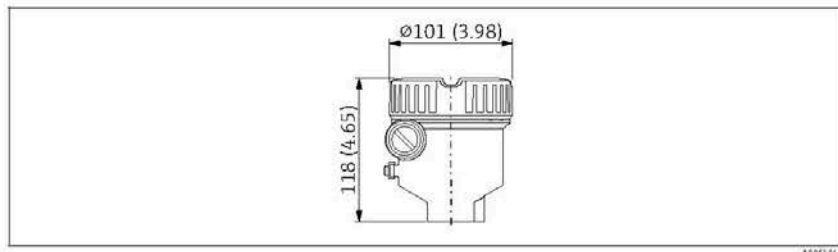
Single compartment housing, aluminum, coated (Ex d/XP, dust ignition-proof)



34 Dimensions of single compartment housing, aluminum, coated; with Ex d/XP, dust ignition-proof. Unit of measurement mm (in)

- 1 Height with cover with sight glass made of glass
- 2 Height with cover without sight glass

Single compartment housing, 316L

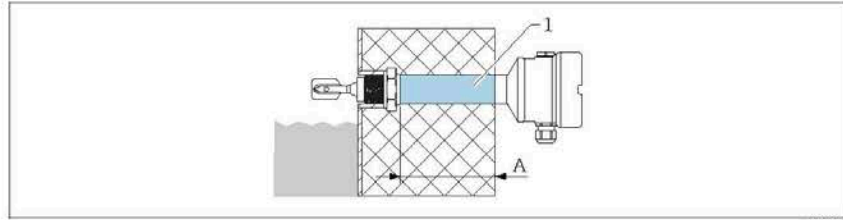


35 Dimensions of single compartment 316L housing; with Ex d/XP also, dust ignition-proof; cover without sight glass. Unit of measurement mm (in)

316L single compartment housing, hygienic

i The housing with ground terminal and cover with cover lock are required for use in hazardous areas with a certain type of protection.


Liquiphant FTL51B



1 Temperature spacer and/or pressure-tight feedthrough with maximum insulation length
 A 140 mm (5.51 in)

Product Configurator, feature "Sensor design":


- Temperature spacer
- Pressure-tight feedthrough (second line of defense)
 If the sensor is damaged, this protects the housing from vessel pressures up to 100 bar (1450 psi).

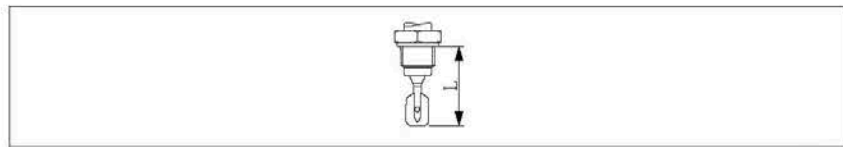
 The "Pressure-tight feedthrough" version can only be selected in conjunction with the "Temperature spacer" option.


Probe design

Compact version

Sensor length L: depends on process connection

 For further details, see the "Process connections" section.




 38 Probe design: compact version, sensor length L

Short pipe version

Sensor length L: depends on process connection

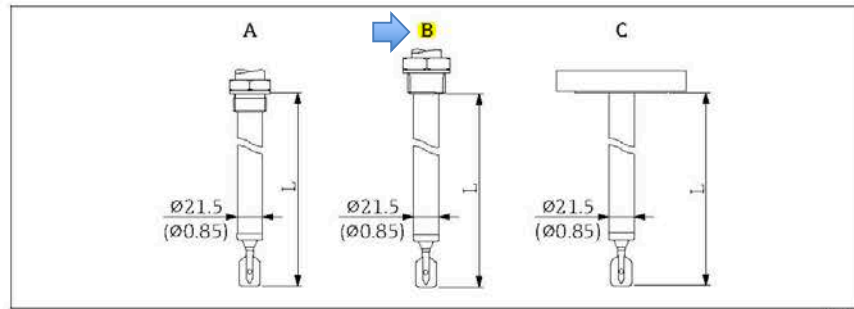
- Flange approx. 115 mm (4.53 in)
- Thread G 3/4 approx. 115 mm (4.53 in)
- Thread G 1 approx. 118 mm (4.65 in)
- Thread NPT, R approx. 99 mm (3.9 in)
- Tri-Clamp approx. 115 mm (4.53 in)
- Flush-mounted I* (G 1 welding boss from Endress+Hauser) approx. 104 mm (4.09 in)

 **Pipe extension**

- Sensor lengths L: 200 mm or 4.61 to 236.22 in (material: 316 L)
- Sensor lengths L: 148 to 3000 mm or 5.83 to 118.11 in (material: Alloy C)
- Length tolerances L: < 1 m (3.3 ft) = -5 mm (-0.2 in), 1 to 3 m (3.3 to 9.8 ft) = -10 mm (-0.39 in)



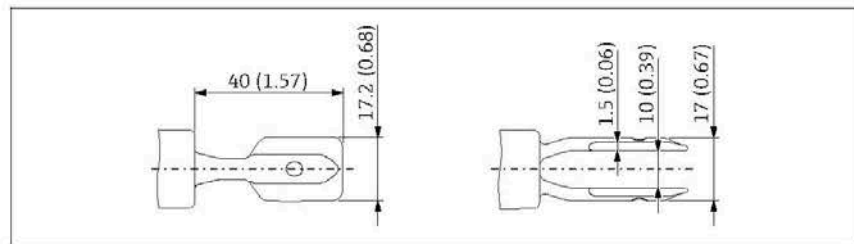
Endress+Hauser



39 Probe designs: pipe extension, short pipe (sensor length L). Unit of measurement mm (in)

- A G ¾, G 1
- ➔ B NPT ¾, NPT 1, R ¾, R 1
- C Flange, clamp/Tri-Clamp

Tuning fork



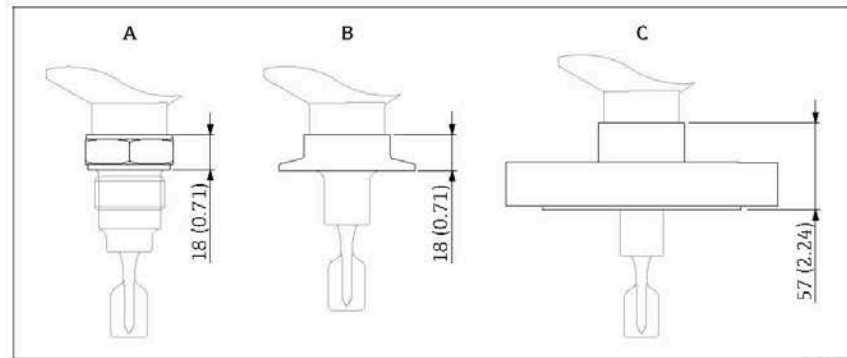
40 Tuning fork. Unit of measurement mm (in)

Process connections

Process connection, sealing surface

- ➔ Thread ISO228, G
- Thread ASME B1.20.01, NPT
- Thread EN10226, R
- Clamp/Tri-Clamp
- Flange ASME B16.5, RF (Raised Face)
- Flange ASME B16.5, FF (Flat Face)
- Flange ASME B16.5, RTJ (Ring Type Joint)
- Flange EN1092-1, Form A
- Flange EN1092-1, Form B1
- Flange EN1092-1, Form C
- Flange EN1092-1, Form D
- Flange EN1092-1, Form E
- Flange JIS B2220, RF (Raised Face)
- Flange HG/T20592, RF (Raised Face)
- Flange HG/T20615, RF (Raised Face)
- Flange HG/T20615, RJ (Ring Joint)

Height of process connection



41 Maximum height specification for the process connections. Unit of measurement mm (in)

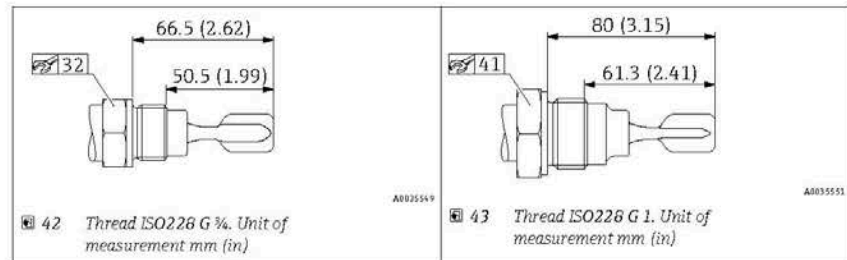
- ➔ **A** Process connection with threaded connection
- B Process connection with clamp/Tri-Clamp
- C Process connection with flange

Thread ISO228 G for installing in weld-in adapter

G ¾, G 1 suitable for installation in weld-in adapter

- Material: 316L
- Pressure rating, temperature: ≤ 40 bar (580 psi), ≤ +100 °C (+212 °F)
- Pressure rating, temperature: ≤ 25 bar (363 psi), ≤ +150 °C (+302 °F)
- Weight G ¾: 0.2 kg (0.44 lb)
- Weight G 1: 0.33 kg (0.73 lb)
- Accessory: weld-in adapter

i The weld-in adapter is not included in the scope of delivery. It can optionally be ordered as an accessory.



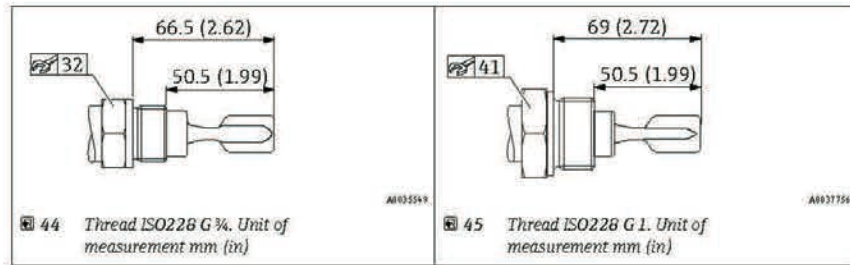
42 Thread ISO228 G ¾. Unit of measurement mm (in)

43 Thread ISO228 G 1. Unit of measurement mm (in)

Thread ISO228 G with flat seal

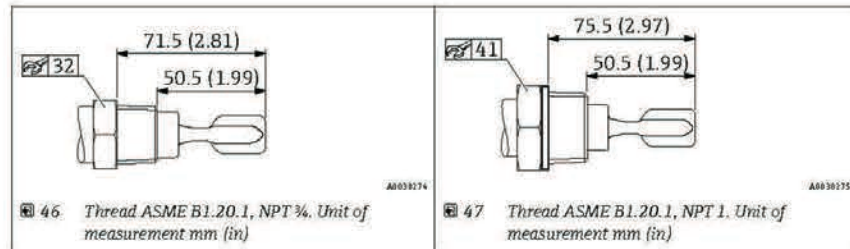
G ¾, G 1

- Material: 316L
- Pressure rating: ≤ 25 bar (363 psi)
- Temperature: ≤ 150 °C (302 °F)
- Weight G ¾: 0.2 kg (0.44 lb)
- Weight G 1: 0.33 kg (0.73 lb)



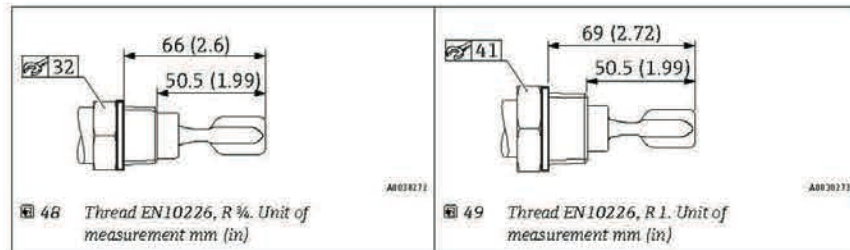
Thread ASME B1.20.1, NPT

- Material: 316L
- Pressure rating: ≤ 100 bar (1450 psi)
- Temperature: ≤ 150 °C (302 °F)
- Weight: 0.3 kg (0.66 lb)



Thread EN10226, R

- Material: 316L
- Pressure rating: ≤ 100 bar (1450 psi)
- Temperature: ≤ 150 °C (302 °F)
- Weight: 0.3 kg (0.66 lb)




Tri-Clamp

ISO2852 DN25-38 (1 to 1 ½"), DIN32676 DN25-40

- Material: 316L
- Pressure rating: ≤ 25 bar (363 psi)
- Temperature: ≤ 150 °C (302 °F)
- Weight: 0.22 kg (0.49 lb)

ISO2852 DN40-51 (2"), DIN32676 DN50

- Material: 316L
- Pressure rating: ≤ 25 bar (363 psi)
- Temperature: ≤ 150 °C (302 °F)
- Weight: 0.3 kg (0.66 lb)

 The maximum temperature and the maximum pressure are dependent on the clamping ring and the seal used. The lowest value applies in each case.

Pipe extension

- 1000 mm: 0.9 kg (1.98 lb)
- 50 in: 1.15 kg (2.54 lb)

Process connection

See "Process connections" section

Protective cover, plastic

0.2 kg (0.44 lb)

Protective cover, 316L

0.93 kg (2.05 lb)

Materials

Materials in contact with process

Process connection and pipe extension

- ▶ **316L** (1.4404 or 1.4435)
- Optional Alloy C22 (2.4602)

Tuning fork

- ▶ **316L** (1.4435)
- Optional Alloy C22 (2.4602)

Flanges

- Flanges, ☒ mechanical construction
- Flange plating: Alloy C22 (2.4602)

Seals

Flat seal for process connection G ¾ or G 1: fiber-reinforced elastomer seal, asbestos-free according to DIN 7603

- ☒ Scope of delivery with flat seal according to DIN7603
 - Metric thread G ¾, G 1 standard
 - Metric thread G ¾, G 1 for installation in weld-in adapter
- ☒ Scope of delivery without seal
 - Tri-Clamp
 - Flanges
 - R and NPT thread

Materials not in contact with process

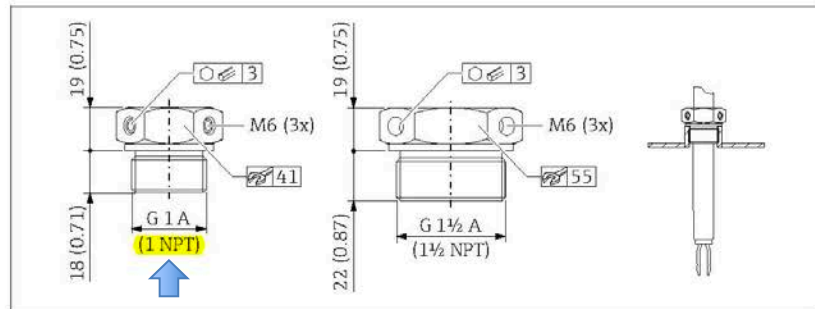
Plastic housing

- Housing: PBT/PC
- Dummy cover: PBT/PC
- Transparent cover: PA12
- Cover with sight glass: PBT/PC and PC
- Cover seal: EPDM
- Potential equalization: 316L
- Seal under potential equalization: EPDM
- Plug: PBT-GF30-FR
- M20 cable gland: PA
- Seal on plug and cable gland: EPDM
- Threaded adapter as substitute for cable glands: PA66-GF30
- Nameplate: plastic foil
- TAG plate: plastic foil, metal or provided by customer

Aluminum housing, coated

- Housing: aluminum EN AC 43400
- Dummy cover: aluminum EN AC 43400
- Cover with sight glass: aluminum EN AC 43400, PC Lexan 943A synthetic glass
 - Cover with polycarbonate sight glass, optionally available to order
 - In the case of Ex d, the sight glass is made of borosilicate
- Cover seal materials: HNBR

Liquiphant FTL51B



64 Sliding sleeves for unpressurized operation $p_p = 0$ bar (0 psi). Unit of measurement mm (in)

G 1, DIN ISO 228/1

- Material: 1.4435 (AISI 316L)
- Weight: 0.21 kg (0.46 lb)
- Order number: 52003978
- Order number: 52011888, approval: with inspection certificate EN 10204 - 3.1 material

→ NPT 1, ASME B 1.20.1

- Material: 1.4435 (AISI 316L)
- Weight: 0.21 kg (0.46 lb)
- Order number: 52003979
- Order number: 52011889, approval: with inspection certificate EN 10204 - 3.1 material

G 1 1/2, DIN ISO 228/1

- Material: 1.4435 (AISI 316L)
- Weight: 0.54 kg (1.19 lb)
- Order number: 52003980
- Order number: 52011890, approval: with inspection certificate EN 10204 - 3.1 material

NPT 1 1/2, ASME B 1.20.1

- Material: 1.4435 (AISI 316L)
- Weight: 0.54 kg (1.19 lb)
- Order number: 52003981
- Order number: 52011891, approval: with inspection certificate EN 10204 - 3.1 material

More detailed information and documentation are available:

- Product Configurator on the Endress+Hauser website www.endress.com
- Endress+Hauser sales organization www.addresses.endress.com

High pressure sliding sleeves

i Suitable for use in explosive atmospheres.

- Switch point, infinitely adjustable
- Seal package made of graphite
- Graphite seal available as spare part 71078875
- For G 1, G 1 1/2: seal is included in the delivery



Endress+Hauser

Performance characteristics


Reference operating conditions

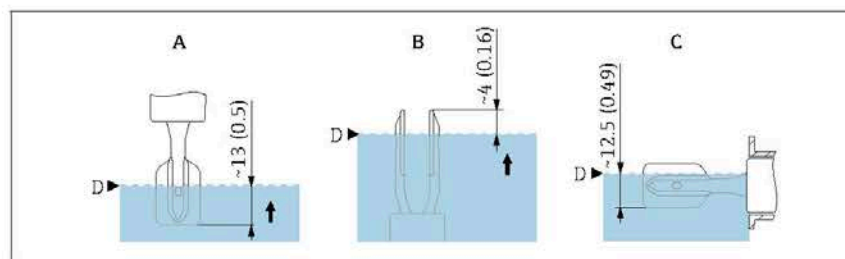
- As per IEC 62828-2
- Ambient temperature: +23 °C (+73 °F)
- Process temperature: +23 °C (+73 °F)
- Humidity ϕ = constant, in range: 5 to 80 % rF \pm 5 %
- Medium density (water): 1 g/cm³ (62.4 lb/ft³)
- Medium viscosity: 1 mPa·s
- Atmospheric pressure p_{01} = constant, in range: 860 to 1060 mbar (12.47 to 15.37 psi)
- Process pressure: atmospheric pressure/unpressurized
- Sensor installation: vertically from above
- Switch direction of sensor: uncovered to covered
- Load with HART: 250 Ω
- Supply voltage: 24 V DC \pm 3 V DC


Take switch point into consideration


The following are typical switch points, depending on the orientation of the point level switch.

Water +23 °C (+73 °F)

 Minimum distance between the tuning fork and the tank wall or pipe wall: 10 mm (0.39 in)



 17 Typical switch points. Unit of measurement mm (in)

-  **A** Installation from above
- B Installation from below
- C Installation from the side
- D Switch point

Maximum measured error

At reference operating conditions: max. \pm 1 mm (0.04 in) at switch point

Hysteresis

Typically 2.5 mm (0.1 in)

Non-repeatability

0.5 mm (0.02 in)

Influence of the process temperature

The switch point moves from +1.4 to -2.6 mm (+0.06 to -0.1 in) in the temperature range of -50 to +150 °C (-58 to +302 °F)

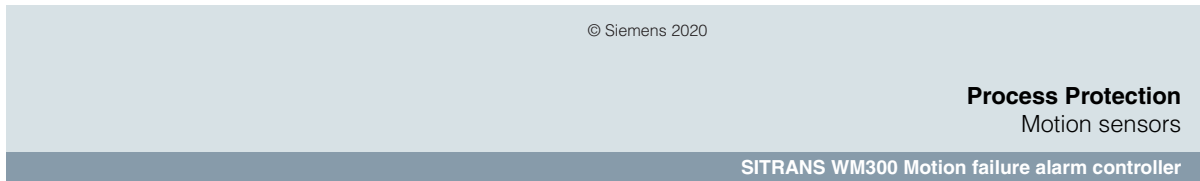
Influence of the process pressure

The switch point moves from 0 to 2.6 mm (0 to 0.1 in) in the pressure range of -1 to +64 bar (-14.5 to +928 psi)



Endress+Hauser

Q. Grit Classifier Conveyor Rotation Sensor – Class I, Div. 1; Milltronics (Siemens)
• i. Rotation Probe Din-Rail Transmitter (Installed within Control Panel Enclosure)



Overview



SITRANS WM300 MFA motion failure alarm controller is a highly sensitive dual setpoint motion sensor system, used with Milltronics MSP probes.

Benefits

- Up to 100 mm (4 inch) gap between target and probe.
- Over and under speed setpoint detection.
- Setpoint adjustment range 2 to 5 000 Hz (120 to 300 000 ppm).
- Adjustable start-up time delay.
- Visual indication of probe operation and relay status.
- General purpose, suitable for majority of industrial applications; rugged probe designs provide unmatched reliability.

Application

The SITRANS WM300 MFA detects changes in the motion and speed of rotating, reciprocating or conveying equipment. It warns of equipment malfunction and signals through contacts to shut down machinery in case of a slowdown or failure. Its reliability makes it a cost-effective way to protect valuable process equipment.

The dual setpoint system suits most industrial applications. This versatile unit can be used on tail pulley shafts, driven pulleys, motor shaft sensing, belt or drag conveyors, screw conveyor flights, bucket elevators, fans and pumps.

Multiple machines can be monitored with twin, independent probe inputs as well as an additional 2 inputs for differential speed detection (DSD) within a machine monitoring solution such as a belt conveyor comparing the head to tail pulley speeds. An optional analog output module can convert the WM300 into a non-contacting tachometer (NCT) with 2 mA outputs.

A special feature is the adjustable 0 to 60 second time delay, allowing the monitored device to accelerate to normal running speed before monitoring begins. A wide range of probes are available to suit specific needs, including high temperatures and corrosive installations. SITRANS WM300 MFA consistently meets the needs of mining aggregate, cement and other primary and secondary industries.

- Key Applications: tail pulleys, motor shaft sensing, screw conveyor flights, bucket elevators



ii. Rotation Probe – XPP-5 (Class I, Div. 1) c/w 10m of sealed cable

© Siemens AG 2011

Process Protection
Motion sensors

Milltronics MFA 4p

Probes

Standard Milltronics MSP-12

- Heavy-duty general purpose motion probe
- Long lasting phenolic body with internal amplifier
- Convenient mounting flange and locknut for fast installation and setup
- Temperature rating: -40 to 60 °C (-40 to 140 °F)
- Enclosure rating: Type/NEMA 4X, 6, IP67

High temperature Milltronics MSP-3

- Heavy-duty, high temperature aluminum probe designed to withstand operating temperatures to 260 °C (500 °F)
- Cast aluminum probe with convenient mounting flange and locknut
- 1.5 m (5 ft) of high temperature PTFE cable provided. Up to 30 m (100 ft) may be used.
- Amplifier remote mounted in enclosure 140 x 140 x 100 mm (5.5 x 5.5 x 4"), available in cast aluminum (½" NPT conduit entry), painted steel (NEMA 4 rating), or stainless steel (NEMA 4X rating)
- Amplifier temperature rating -40 to 60 °C (-40 to 140 °F)
- Enclosure rating: Type/NEMA 4X, 6, IP67

Stainless high temperature Milltronics MSP-9

- Heavy-duty, high temperature 304 stainless steel probe
- Special construction allows operation of probe in environment up to 260 °C (500 °F)
- 1.5 m (5 ft) special high temperature PTFE cable provided. Up to 30 m (100 ft) may be used.
- Amplifier remote mounted in enclosure 140 x 140 x 100 mm (5.5 x 5.5 x 4"), available in cast aluminum (½" NPT conduit entry), painted steel (NEMA 4 rating), or stainless steel (NEMA 4X rating)
- Enclosure rating: Type/NEMA 4X, 6, IP67

Miniature Milltronics MSP-1

- Miniature probe for installations with limited mounting space
- CPVC probe body complete with locknuts
- 1.8 m (6 ft) cable provided. Up to 30 m (100 ft) may be used.
- Amplifier remote mounted in enclosure 140 x 140 x 100 mm (5.5 x 5.5 x 4"), available in cast aluminum (½" NPT conduit entry), painted steel (NEMA 4 rating), or stainless steel (NEMA 4X rating)
- Enclosure rating: Type/NEMA 4X, 6, IP67
- Due to smaller size, probe sensitivity is reduced, gap max. 13 mm (0.5")

Milltronics XPP-5

- CSA hazardous approval (Class I, Div. 1, Groups A, B, C & D; Class II, Div. 1, Groups E, F & G; Class III)
- Phenolic / aluminum body that is fully potted
- Convenient mounting flange and locknut
- 3/4" NPT male hub connection
- Operating temp. from -40 to 60 °C (-40 to 140 °F)
- Enclosure rating: Type/NEMA 4X, 6, IP67

Milltronics RMA (Remote Mounted Amplifier)

- Available for internal mounting within Probe, or in enclosure for remote mounting
- Enclosures available in cast aluminum (½" NPT entry), painted steel (Type/NEMA 4 rating) or stainless steel (Type/NEMA 4X, IP65 rating)
- Operating temp. from -40 to 60 °C (-40 to 140 °F)
- Enclosure rating: Type/NEMA 4X, 6, IP67

MFA 4p motion probes

Technical specifications

Mode of operation	
Measuring principle	Motion monitor and alarm
Typical application	Monitoring loss of motion in tail pulley, screw flights, bucket elevators
Features	
	<ul style="list-style-type: none"> • Switch selectable overspeed or underspeed detection • Setpoint adjustment: 2 to 3000 PPM • Adjustable start-up time delay: 0 to 60 seconds • Visual indication of probe operation and relay status
Output	
	2 relays working in unison, each providing 1 SPDT Form C relay contact, rated 8 A @ 250 V AC resistive
Performance	
Repeatability	± 1 %
Dead band	± 0.25 %
Dynamic Range	0 ... 7200 PPM
Ambient Temperature Range	-20 ... +50 °C (-5 ... +122 °F)
Design	
Enclosure rating	Type 4X/NEMA 4X/IP65 (standard and optional stainless steel) Type 4/NEMA 4/IP65 (optional mild steel)
Enclosure dimensions	160 x 240 x 82 mm (6.3 x 9.5 x 3.2")
Enclosure material	Polycarbonate [optional: mild steel or stainless steel, [203 x 254 x 102 mm (8 x 10 x 4")]
Power Supply	
	100/115/200/230 V AC switch selectable, 50/60 Hz, 15 VA ± 10 % of rated voltage
Certificates and approvals	
	CE, C-TICK, CSA US/CA , FM

7



Process Protection Motion sensors

Milltronics MFA 4p

Selection and Ordering data	Order No.
Milltronics Motion Sensing Probes A series of motion sensing probes used with the MFA 4p. Milltronics MSP-1: miniature motion sensing probe Milltronics MSP-3: heavy-duty, high temperature aluminum Milltronics MSP-9: heavy-duty, high temperature stainless steel Milltronics MSP-12: heavy-duty, general purpose Milltronics XPP-5: hazardous rate Note: Milltronics MSP-1, MSP-3 and MSP-9 probes require the use of Milltronics RMA (amplifier)	C) 7MH7146-
Cable Length Standard length (as described in Model options) ¹⁾ Add order code Y01 and plain text: "Total cable length... m" Extended cable length 2 to 30 m (6.6 to 98.4 ft) Extended cable length 31 to 50 m (101.7 to 164 ft) ²⁾ Extended cable length 51 to 100 m (167.3 to 328.1 ft) ²⁾ Model (standard cable length/type) MSP-1 [1.8 m (6 ft)] MSP-3, ½" NPT cable inlet [1.5 m (5 ft) high temperature cable] MSP-9 [1.5 m (5 ft) high temperature cable] MSP-12, ½" NPT cable inlet XPP-5 [1.5 m (5 ft) cable, (CSA Class I, Group A, B, C and D; Class II Group E, F and G)] XPP-5 [10 m (32.8 ft) cable, (CSA Class I, Group A, B, C and D; Class II Group E, F and G)] XPP-5 [15 m (49.2 ft) cable, (CSA Class I, Group A, B, C and D; Class II Group E, F and G)]	0 1 2 3 A B D E G H J A
Approvals CE 1) No Y01 needed in order code for standard length 2) Available with Model options G, H, and J only	



7

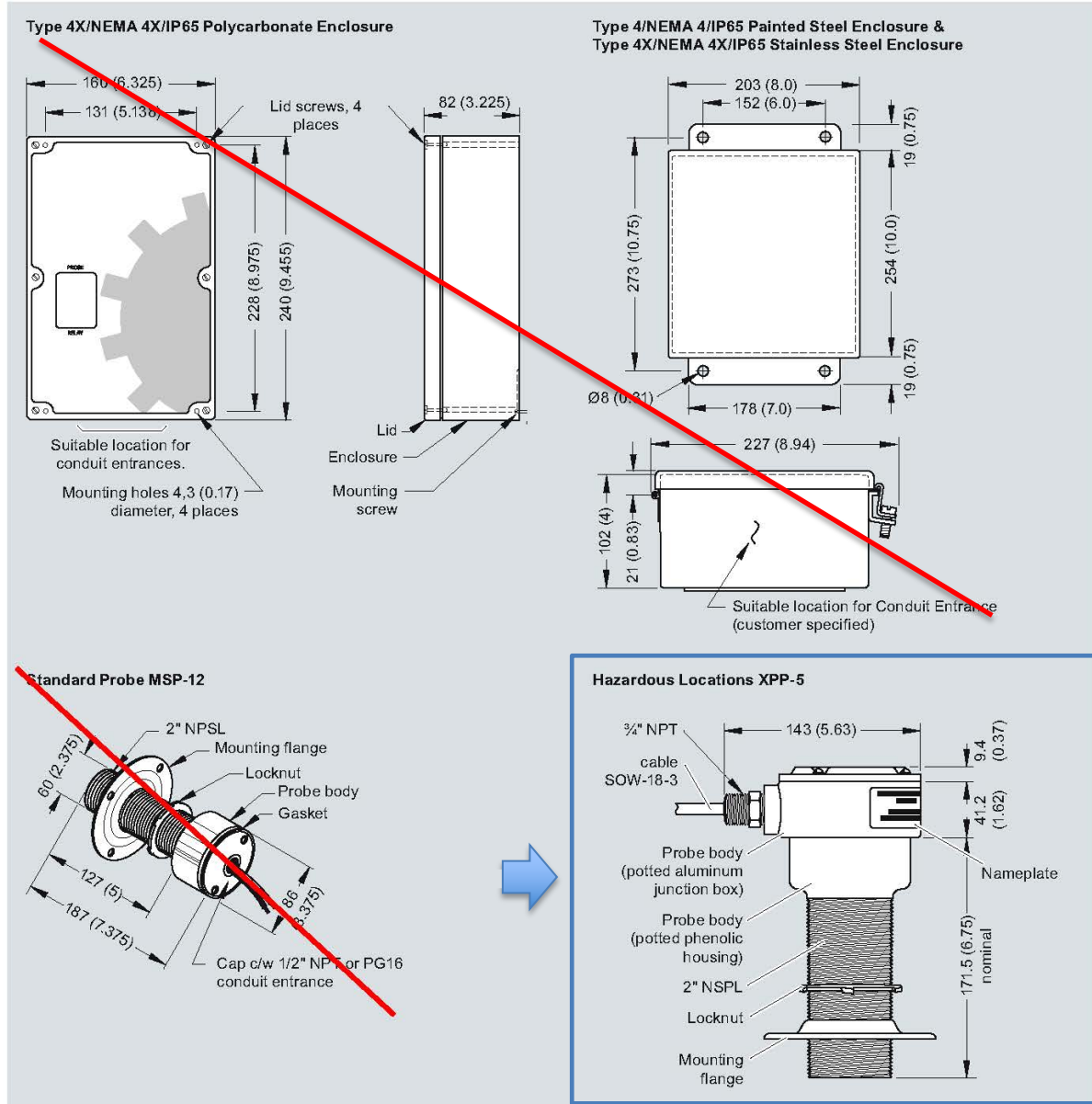
Selection and Ordering data	Order code
Further designs Please add "-Z" to Order No. and specify Order code(s). Total cable length: enter the total cable length in plain text description Acrylic coated, stainless steel tag [13 x 45 mm (0.5 x 1.75")]: Measuring-point number/identification (max. 16 characters), specify in plain text Cable gland kit Total cable length: enter the total cable length in plain text description	C11 Y01 Y17 A57
Operating Instructions English French Spanish German Note: The operating instructions should be ordered as a separate item on the order. This device is shipped with the Siemens Milltronics manual CD containing the complete operating instructions library.	Order No. C) 7ML1998-5FM01 C) 7ML1998-5FM11 C) 7ML1998-5FM21 C) 7ML1998-5FM31
Spare Parts Locknut, for MSP-1 Locknut, for MSP-3, MSP-4, MSP-12, XPP-5 Mounting flange, for MSP-3, MSP-4, MSP-12, XPP-5 Mounting bracket for MSP-9 Lid, 1/2" NPT cable inlet, for MSP-3, MSP-12 Lid for MSP-9 Lid gasket, for MSP-3, MSP-9 Lid gasket, for MSP-12 Cable gland kit	7MH7723-1CQ C) 7MH7723-1CR 7MH7723-1CS 7MH7723-1CT 7MH7723-1CU 7MH7723-1CV F) 7MH7723-1CW F) 7MH7723-1CX 7MH7723-1JN
C) Subject to export regulations AL: N, ECCN: EAR99. F) Subject to export regulations AL: 91999, ECCN: N.	

SIEMENS

Process Protection
Motion sensors

Milltronics MFA 4p

Dimensional drawings



MFA 4p and probe, dimensions in mm (inch)



- **Rotation Sensor Installation Photograph** – 4 x ¼” threaded rods tack-welded to underside of conveyor that enables installation of provided sensor probe bracket and threaded probe with addition of ¼” nuts and washers as shown. Note: Installation may be on grit extraction conveyor lid.



R. Classifier Cable-Actuated Emergency Stop Switch – CCC (Class I, Div. 1)



MODEL RS

WHAT IT IS, AND WHAT IT DOES

The Model RS is a rugged safety control that provides a quick positive shut off of dangerous equipment in emergencies or normal operation. It is actuated by a cable pulled by endangered personnel. The output contacts of the Model RS can control up to two separated circuits, one for machinery shutdown and one for alarm.

WHY IS IT NECESSARY?

Safety minded operators of conveyors, production lines, elevator equipment, assembly lines, material handling systems, cranes, etc. consider it a must for employee protection. Most states have safety statutes that require these controls on conveyor and related equipment. American National Standard institute recommends their use (ANSI Standard No. ASME B20.1).

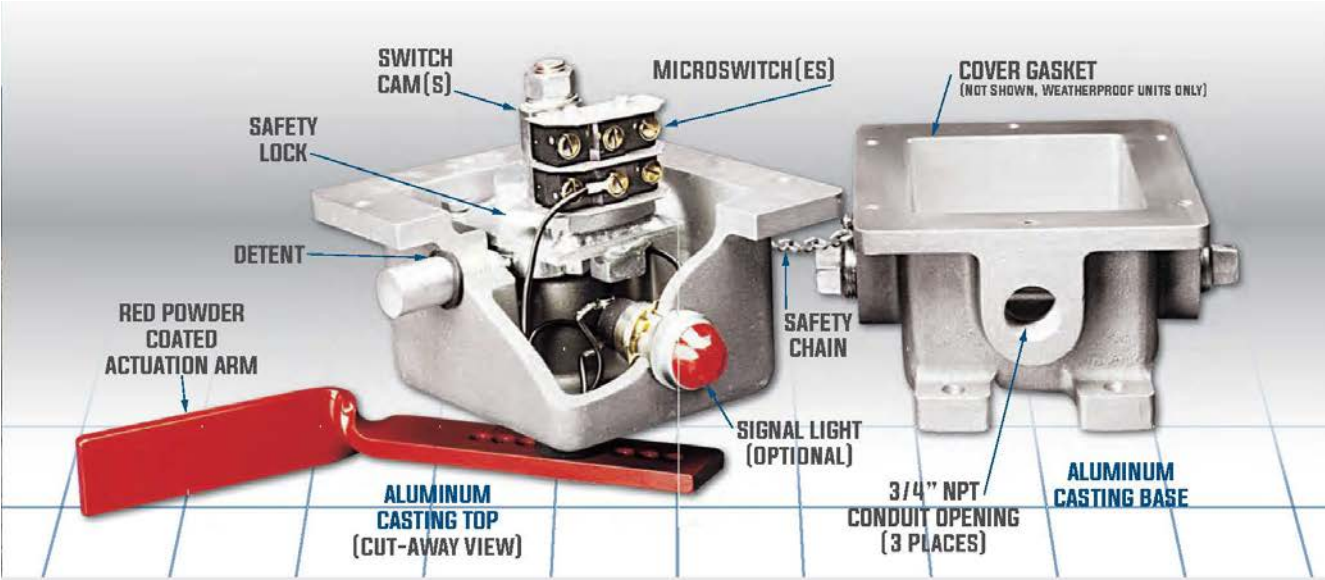
RS TECHNICAL INFORMATION

MODEL	DESCRIPTION
RS-1	General Purpose, 1 SP/DT microswitch
RS-1X	Explosion proof with 1 SP/DT microswitch, NEMA type 7 and 9
RS-2	General Purpose, 2 SP/DT microswitches
RS-2L	2 SP/DT microswitches with external signal light, includes 120V lamp, weatherproof
RS-2X	Explosion proof with 2 SP/DT microswitches, NEMA type 7 and 9
RS-5	General Purpose, 2 DP/DT microswitches
RS-5X	Explosion proof with 2 DP/DT microswitches, NEMA type 7 and 9

Note: Dual-Rated enclosures also available. Contact Sales for details.

EXCLUSIVE FEATURES

1. The Model RS is equipped with a positive safety lock. Having once been actuated, it cannot be accidentally reset causing dangerous equipment to restart. In order to reset the control, the actuation arm must be pushed in and turned. It takes no longer and it makes this a true "safety" control.
2. The Model RS is installed with cable extending in both directions from the actuating handle. There is one electrical connection inside. This simple arrangement eliminates the double electrical connections required in two ended units employing a separate microswitch for cable in each direction.
3. The actuation force required is simply adjusted in the field by a change in the position of the cable in holes provided in the actuation arm. One of our units will handle as much cable length as a double ended competitive unit and there is no longer a need to specify actuating force or right or left handed units.
4. The standard construction of the unit is a corrosion resistant aluminum housing complete with stainless steel hardware and red powder coated actuation handle. The actuation shaft is of stainless steel. Epoxy coating is also available if required.
5. The Model RS controls are listed by UL, Inc. and CSA Group. The general purpose models are listed for non-hazardous atmospheres. Explosion proof models are listed for use in hazardous atmospheres as defined by the National Electric Code handbook and the National Electrical Manufacturers Association Standards for NEMA type 7 and 9 hazardous locations. Specifically, they are listed for Class I, Div 1, Groups C and D; and Class II, Div. 1, Groups E, F and G.
6. The Model RS offers the lowest cost per foot of protection because it incorporates fewer switches and less wiring is required. Cable may be extended in either or both directions with no changes required in the internal mechanism of the unit and the wiring is still of a simple uncomplicated nature.
7. The unit is available with a warning light that may be wired to indicate actuation. This permits easy identification of actuated units in areas where visual identification is difficult.



OPERATION OF THE UNIT

The Unit is usually installed with cable running in both directions from the crank type actuating arm. Each of the two sections of the cable runs to a fixed point through eyebolts spaced at regular intervals.

A pull on the cable at any point along its run will rotate the red actuation arm approximately 60°. The actuation arm will end in a position that is easily seen from a distance, thus identifying the actuated unit. Two spring loaded detents riding on a hardened steel cam provide resistance to arm rotation. When the actuation force overcomes this resistance the assembly rotates 60° and is locked in place by the detents. Affixed to the rotating shaft is a cam mechanism which actuates up to two microswitches during rotation. The microswitches are held in the actuated position by the detents.

To reset the unit and deactivate the microswitches, the actuation arm is pushed in and rotated backwards.

DETERMINATION OF NUMBER OF UNITS REQUIRED

The Model RS control is designed so that a maximum of 100 feet (30m) of cable can be used on each side of the unit. A single control can therefore cover a maximum of 200 feet of conveyor belt or other machinery. Of course, if necessary, cable can be extended in only one direction from either side of the unit. The electrical characteristics of the application will determine the numbers of microswitches to be specified in the unit: either one, or two. The environmental considerations will determine whether or not the unit is to be explosion proof or to have special paint or coatings. The possibility of a light to aid in identification or actuated units should be considered.

We recommend that high quality cable be used with the control to assure proper actuation with no stretching. We recommend our own galvanized aircraft cable which is available with either vinyl or nylon coating. It is orange in color and weighs 0.03 lbs. per foot and has an outside jacketed diameter of 3/16\".

SWITCH ACTUATING ARM

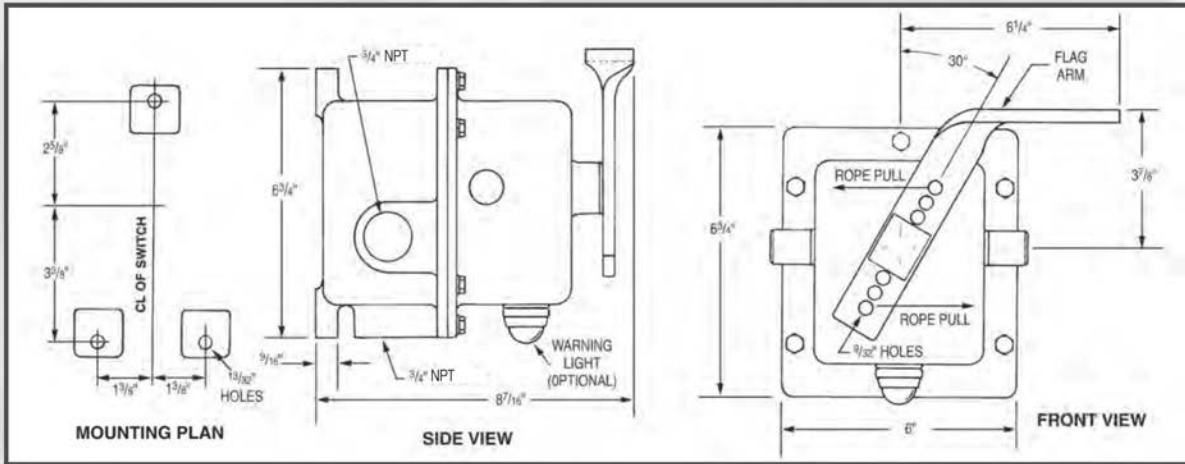
POSITION	TOTAL ACTUATION FORCE REQUIRED (LBS)
1	40
2	28
3	20



As shown in the chart and picture of the actuating arm, the actuation force can be varied by attaching the cable at any one of the three positions.

The cable should be supported by eyebolts every 8-10 feet (3m). These supports ensure that the weight of the cable alone will not actuate the control.

MODEL RS/RSB DIMENSIONAL INFORMATION



Standard Construction - Rubber gaskets seal unit for outside applications listed by UL for NEMA 4/4X dust-tight and rain tight construction. Applies to general purpose units.

Housing - Cast aluminum. Epoxy coating available.

Conduit Opening - 3/4" NPT standard. 1" NPT optional (non UL). All units have three conduit openings.

Actuating Arm - Red powder-coated steel handle with stainless steel shaft.

Internal Cam and Wear Plate - Hardened steel.

External Hardware - Stainless steel.

Switches - SP/DT microswitches. Rated 20A @ 120 VAC, 240VAC, and 480 VAC; 1/2 amp at 125 VDC and 1/4 amp at 250 VDC. Switches may be wired for single throw operation, either normally open or normally closed as required. DP/DT (15A) microswitches also available.

RS & RSB INSTALLATION INSTRUCTIONS

1. The controls should be mounted on a flat surface using the three mounting holes on the bottom half of the housing. The holes are designed for 3/8" bolts.
2. Each unit can cover a maximum of 200' of conveyor – 100' in each direction. Safety considerations dictate that not more than 100' of cable be attached on each side. More cable might result in too much slack, delaying actuation. **NOTE:** Model RSB must have cable on both sides of the unit.
3. The eyebolts supporting the cable should be placed at intervals from 8-10'. Care must be taken that the cable does not become too slack. However, if the cable is too tight, false actuation of the switch might occur.
4. The Model RS/RSB controls are designed for pilot duty. The control circuit should be wired through the motor starter circuit of the conveyor or other equipment to be controlled. Do not wire the unit directly into a heavy duty motor circuit.
5. The unit should be tested after installation by actuation of the cable. The protected equipment should stop and alarms should sound as required with a minimum of effort on the cable. Cable tension can be adjusted if necessary by changing the location of the cable on the handle.



CABLE SUPPORT EYE BOLT
1/2" x 6" plated 2-1/2" long
N.C. thread, 1" eye, two nuts
and one lockwasher.
Item # RS-27



**THREADLESS CABLE
SUPPORT EYE BOLT**
Item # RS-23



CABLE END FITTING
Secures protective cable to
switch hand and supports.
Item # RS-28



SAFETY CABLE
3/32" x 7x7 preformed,
galvanized aircraft cable.
Protective coating in either
orange coated vinyl or nylon.
3/16" O.D.
Item # RS-25 (vinyl)
RS-26 (nylon)




CONDUIT PLUG
3/4" metal, socket
head conduit plug.
Item # RS-29



- Stainless steel eye bolts also provided (obtained from an alternate source).

Instrument Data Sheet

General	1	Product	Safety Stop Switch / Pull Cord Switch (Explosion Proof)
	2	Model Number	RS-2X, RS-2XL
	3	Manufacturer	Conveyor Components Company
	4		
Environment	5	Certified Ambient Temperature	-25 to 40 °C [-13 to 104 °F]
	6	Functional Ambient Temperature	-50 to 40 °C [-58 to 104 °F] (increased actuation force may be required below -30 °C [-22 °F])
	7	Enclosure Material	319 cast aluminum
	8	Enclosure Rating	NEMA Type 7: Class I (Div. 1 & 2), Groups C & D; Type 9: Class II (Div. 1 & 2), Groups E, F & G
	9	Mounting	3 holes at $\varnothing^{13/32}$ [10 mm] (Vertical surface mounting standard, bracket available for horizontal surfaces)
	10		
Switch	11	Switch Type	SPDT x 2
	12	Contact Type	Dry contact
	13	Contact Rating	20A @ 125V, 250V or 480V AC; 1 hp @ 125V AC; 2 hp @ 250V AC; ½ A @ 125V DC; ¼ A @ 250V DC
	14	Electrical Action	Latching (via actuator)
	15	Electrical Connection	¾" NPT x 3
	16	Indicating Lamp	RS-2XL: See datasheet DATA-0149 for explosion proof lamp
	17		
	18		
	19		
Actuator	20	Type	Pull cord switch
	21	Cable Length	Maximum 100' [30.5 m] on each side of the unit (maximum 200' [61 m] total)
	22	Cable Material	$\varnothing^{3/32}$ [2 mm] 7x7 galvanized aircraft cable: orange vinyl or nylon coated to $\varnothing^{3/16}$ [5 mm] OD
	23	Mechanism	Lever with rotating cam
	24	Non-activated Position	Rotated fully clockwise
	25	Activated Position	Rotated fully counter-clockwise
	26	Range of Travel	60° counter-clockwise from non-activated position
	27	Action	Latching (To reset, push lever inward and rotate clockwise)
	28	Actuation Force	Field adjustable
29			
Options	30	Finish	Uncoated (standard) or epoxy coating (option E)
Accessories	31	Safety Cable	Orange vinyl (RS-25) or nylon (RS-26) coated cable available
	32	Cable Support Eye Bolt	RS-27: 1" eye X 6" [150 mm] long, two nuts and lockwasher included
	33	Cable End Fitting	RS-28
	34	Conduit Plug	RS 29: ¾" metal conduit plug; square head
	35	Mounting Bracket	RS-30 available for horizontal surface mount
	36		
Certifications	37	UL Certification File	NOIV.E71075
	38	CSA Certification File	71204
	39		
Manufacturer	40		Conveyor Components Company Division of Material Control, Inc. 130 Seltzer Road, PO Box 167 Croswell, MI 48422 USA (810) 679-4211 info@conveyorcomponents.com www.conveyorcomponents.com
Notes: 1. Cable must be supported with eyebolts. Maximum spacing: 10' [3 m]. 2. Maximum of 100' [30.5 m] of cable may be attached to each side of the unit; 200' [61 m] total.			



CONVEYOR COMPONENTS COMPANY

Division of Material Control, Inc.

130 Seltzer Road, PO Box 167 • Crowell, MI 48422 USA

PHONE: (810) 679-4211 • TOLL FREE (800) 233-3233 • FAX: (810) 679-4510

Email: info@conveyorcomponents.com • <http://www.conveyorcomponents.com>

MODEL RS: ROPE SAFETY CONTROL INSTALLATION INSTRUCTIONS

WARNING:

DEATH or SERIOUS INJURY may occur.

Before installing or adjusting, shut down and physically lock-out the conveyor system.

TECHNICAL INFORMATION

Raintight units (standard):

- Enclosure type 1, 3, 3R, 4 and 4X dust-tight and rain-tight construction with corrosion resistance.
- Gasket sealed for indoor/outdoor applications.
- Aluminum housing with 3 conduit openings in base casting.

Dual Rated Units:

- Enclosure type 1, 3, 3R, 4 and 4X dust-tight and rain-tight construction, also for use in Class II, Groups E, F & G and Class III Hazardous Locations.
- Aluminum housing with 3 conduit openings in base casting.

Explosion Proof units:

- Enclosure for use in Class I, Groups C & D; and Class II, Groups E, F & G, and Class III Hazardous Locations.
- Aluminum housing with 3 conduit openings in base casting.
- Ambient Temperature Range (hazardous locations units): -50°C to 40°; -58°F to 104°

Electrical Ratings:

SPDT switches:	DPDT switches:
20 Amps, 125/250/480 VAC	15 Amps, 125/250 VAC
10 Amps, 125 VAC Inductive	N/A
1 hp, 125 VAC	3/4 hp, 125 VAC
2 hp, 250 VAC	1 1/2 hp, 250 VAC
½ Amp, 24 VDC	N/A
½ Amp, 125 VDC	N/A
¼ Amp, 250 VDC	N/A

Note: Special units with gold plated micro-switch contacts rated 0.1 Amps at 125 VAC. Micro-switch(es) may be wired for single throw operation, either normally open or normally closed as required. See figure 1.

Figure 2: Electrical Terminals

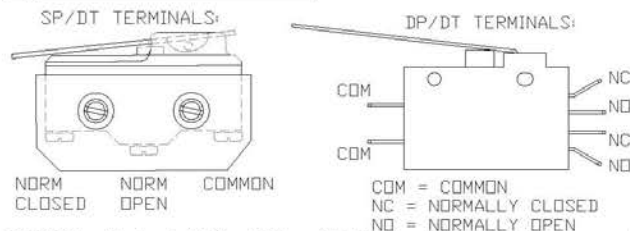
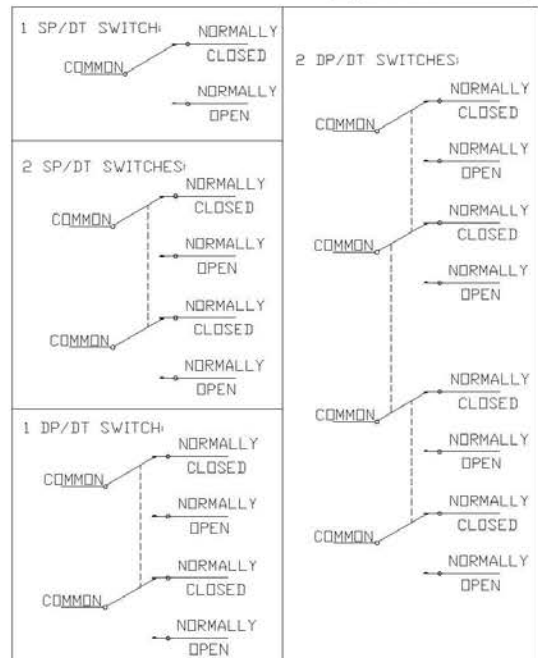


Figure 1: Contacts



INSTALLATION INSTRUCTIONS

1. The base should be mounted on a flat surface using the three (3) mounting holes in the base casting (see figure 3). The holes in the base are manufactured for 3/8" bolts.
2. Each unit can cover a maximum of 200 feet of conveyor – 100 feet in each direction. Safety considerations dictate that not more than 100 feet of cable should be attached to each side.
3. The eyebolts supporting the cable should be placed at intervals from 8' – 10'. Care must be taken that the cable does not become too slack. However, if the cable is too tight, false actuation of the unit may occur.
4. Field wiring must meet or exceed the requirements of the National Electrical Code and any other agency or authority having jurisdiction over the installation. Conduit fittings must meet applicable CSA and UL standards.
5. This unit is designed for pilot duty. The control circuit should be wired through the motor starter circuit of the conveyor or other equipment to be controlled. Do not wire the unit directly into a heavy duty motor circuit. See "Switch" information on front page. Note: TWIST WIRES TOGETHER BEFORE INSERTING IN TERMINAL (ENROULEZ LES FILS ENSEMBLE AVANT LES INTRODUIRE DANS LA BORNE.).
6. The control should be tested after installation by actuation of the cable. The protected equipment should stop and alarms should sound as required with a minimum effort on the cable. Cable tension can be adjusted as necessary by changing the location of the cable on the handle (see figure 4).

Figure 4: Cable Positions

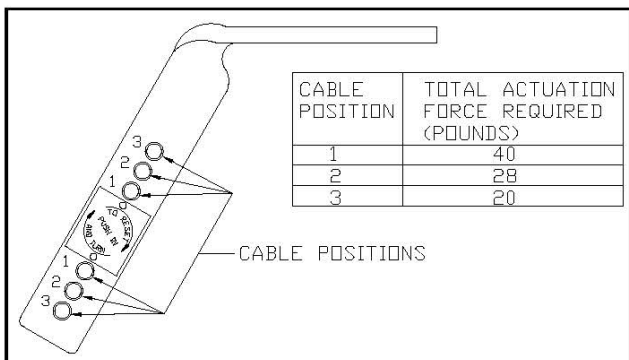
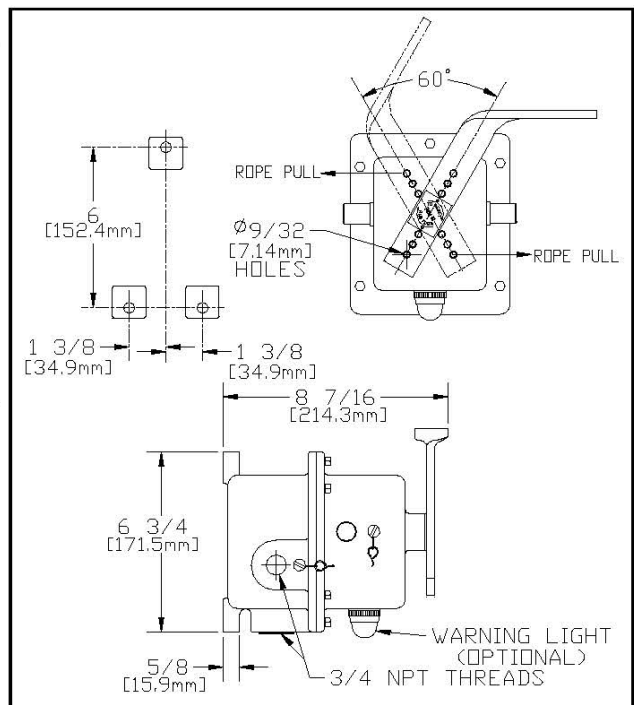


Figure 3: Control Dimensions



4. Project Mechanical Drawings & Other Supporting Information

Napanee WPCP Upgrades, ON Screening & Grit Removal System

Municipal Authority: Town of Greater Napanee, ON

RFP Number: RFP-IS-2023-01

Sections: 46 43 00 & 46 53 00

Consulting Engineer: EVB Engineering

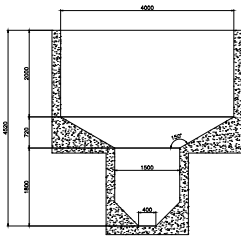
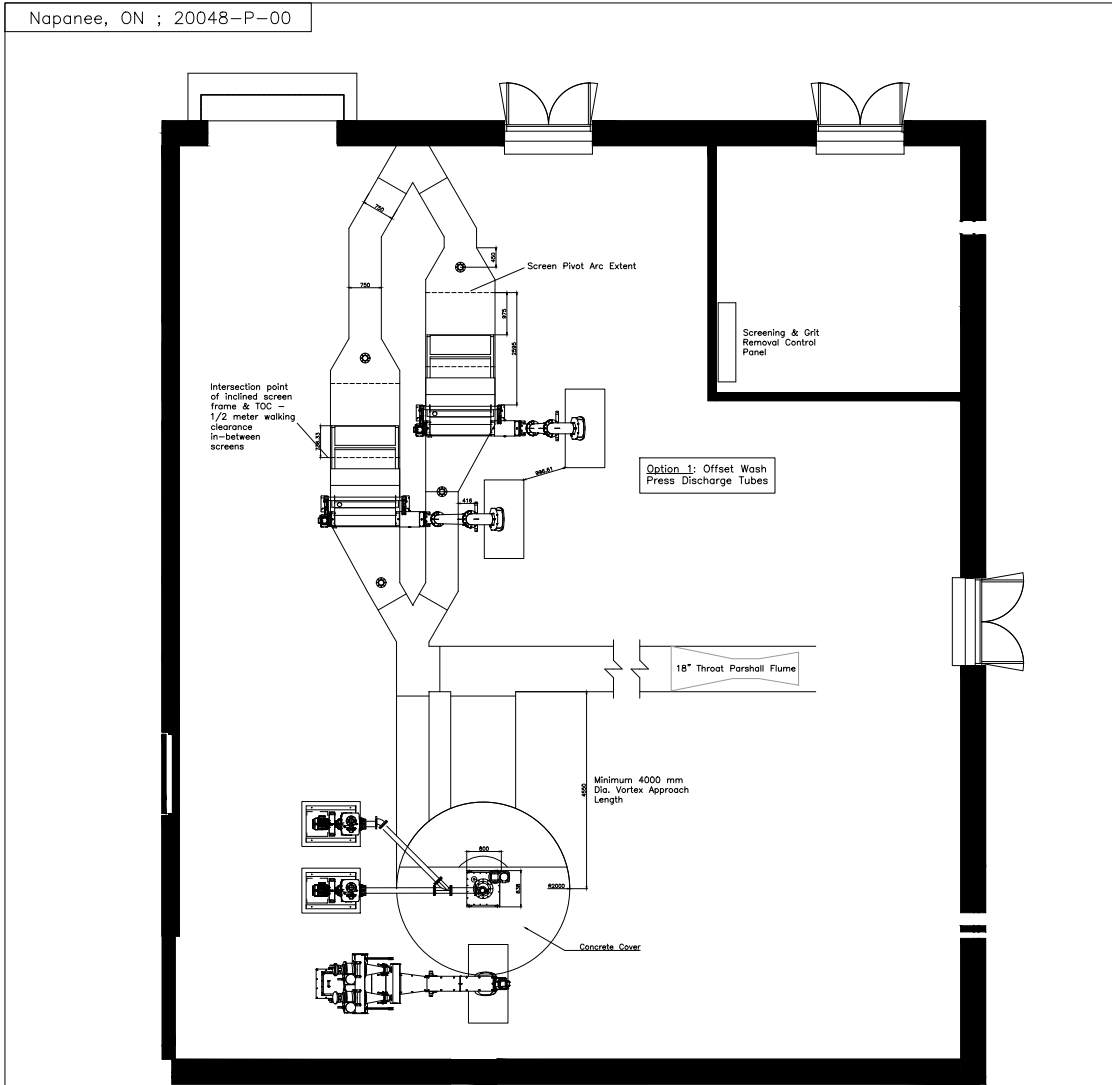
Installation Contractor: TBD

Contractor PO Number: TBD

Claro Ref.: 20048-P-00



A. Project Submittal Drawings – Mechanical Equipment Arrangement
i. Fine Screening & Grit Removal Layout Drawings (Option 1 – Offset Wash Press Discharges)



Vortex Tank Side View

• Please see large format drawing following page →

Rev	Date	Description
1	2024-07-22	Layout Option 1 - For Review
0	2024-05-24	For Submittal Development

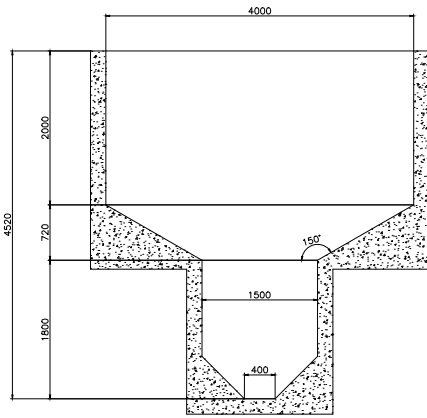
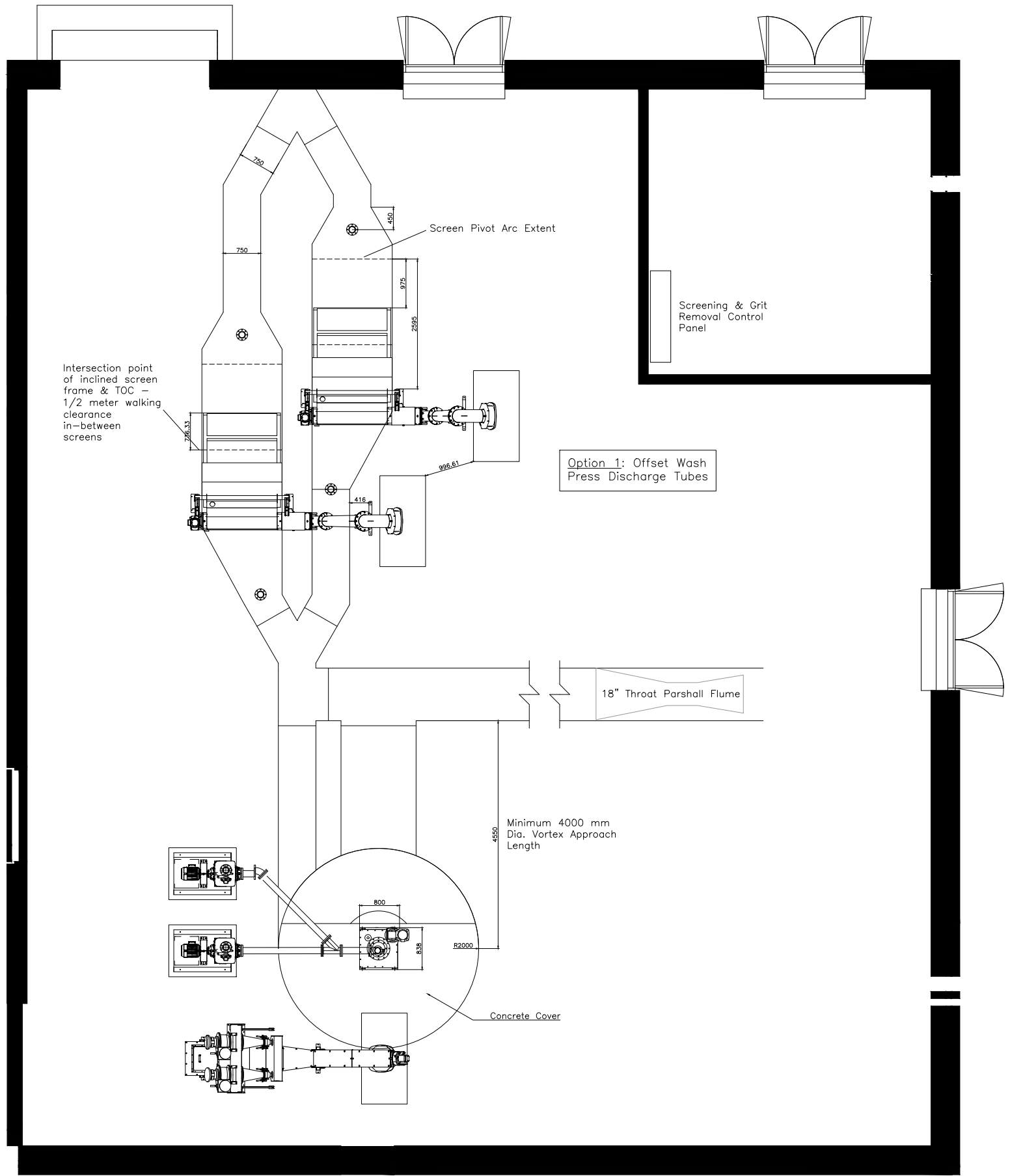
Claro™
 www.claroglobal.com

Napanee, ON
 Headworks Layout –
 Option 1
 Fine Screening & 270-Degree
 Vortex Grit Removal System

DRAWN BY	DATE	SCALE	DRAWING	REV
SL / PJR	2024-07-22	NTS	20048-01-V	1

© 2024, Claro Environmental Technologies & Equipment Inc.

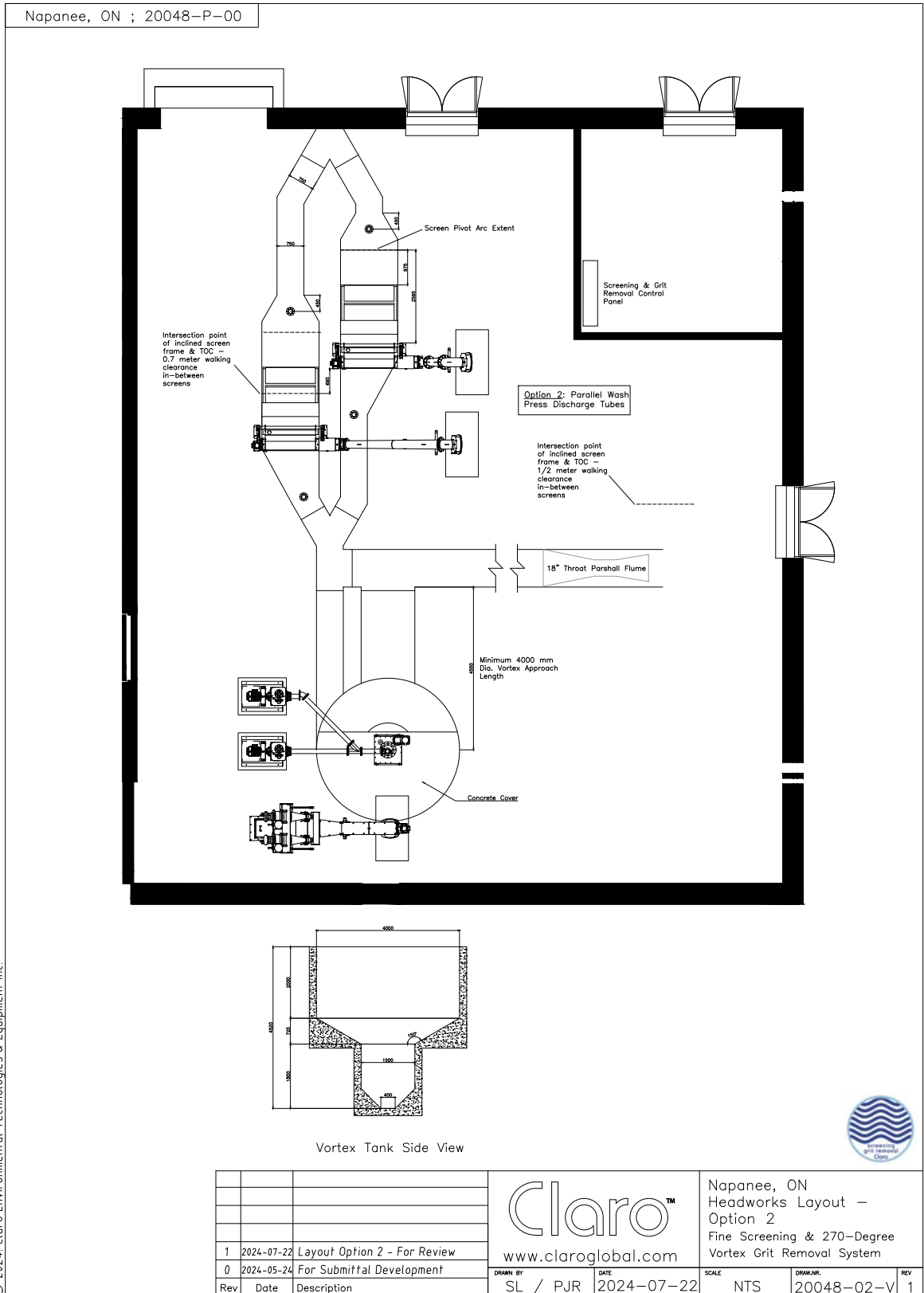


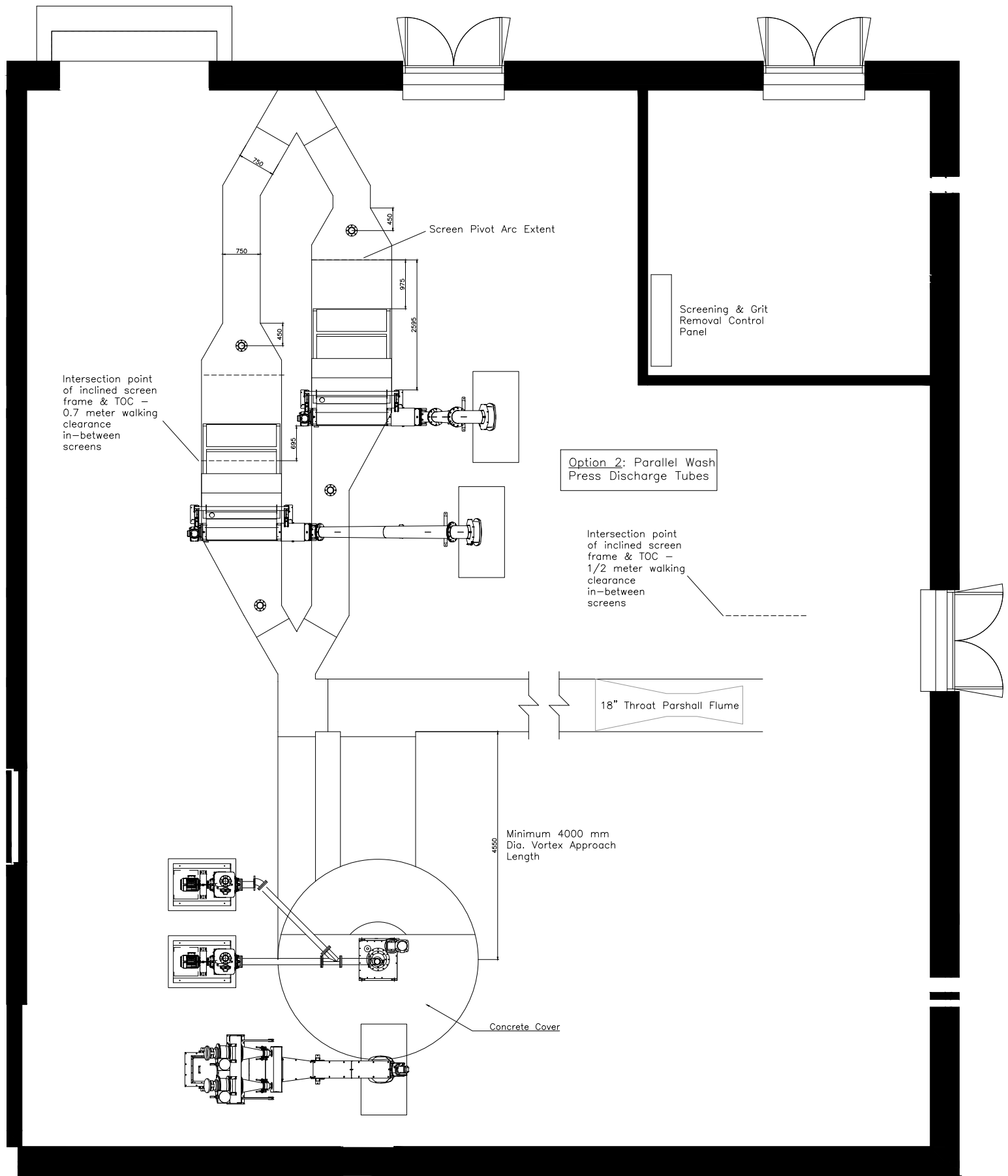


Vortex Tank Side View

			 www.claroglobal.com	Napanee, ON Headworks Layout - Option 1 Fine Screening & 270-Degree Vortex Grit Removal System			
1	2024-07-22	Layout Option 1 - For Review		DRAWN BY	DATE	SCALE	DRAW.NR.
0	2024-05-24	For Submittal Development	SL / PJR	2024-07-22	NTS	20048-01-V	1
Rev	Date	Description					

ii. Fine Screening & Grit Removal Layout Drawings (Option 2 – Near-Parallel Wash Press Discharges)





Intersection point of inclined screen frame & TOC - 0.7 meter walking clearance in-between screens

Screen Pivot Arc Extent

Screening & Grit Removal Control Panel

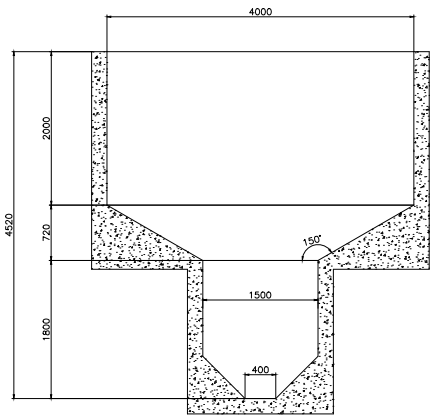
Option 2: Parallel Wash Press Discharge Tubes

Intersection point of inclined screen frame & TOC - 1/2 meter walking clearance in-between screens

18" Throat Parshall Flume

Minimum 4000 mm Dia. Vortex Approach Length

Concrete Cover



Vortex Tank Side View

			 www.claroglobal.com	Napanee, ON Headworks Layout - Option 2 Fine Screening & 270-Degree Vortex Grit Removal System		
1	2024-07-22	Layout Option 2 - For Review		DRAWN BY	DATE	SCALE
0	2024-05-24	For Submittal Development	SL / PJR	2024-07-22	NTS	1
Rev	Date	Description				

iii. Fine Screening System Arrangement Drawings (Option 1 Layout)

- Mechanical drawings including additional cross-channel support for wash press to follow if selected



iv. Fine Screening System Arrangement Drawings (Option 2 Layout – Near Parallel Wash Press Discharges)

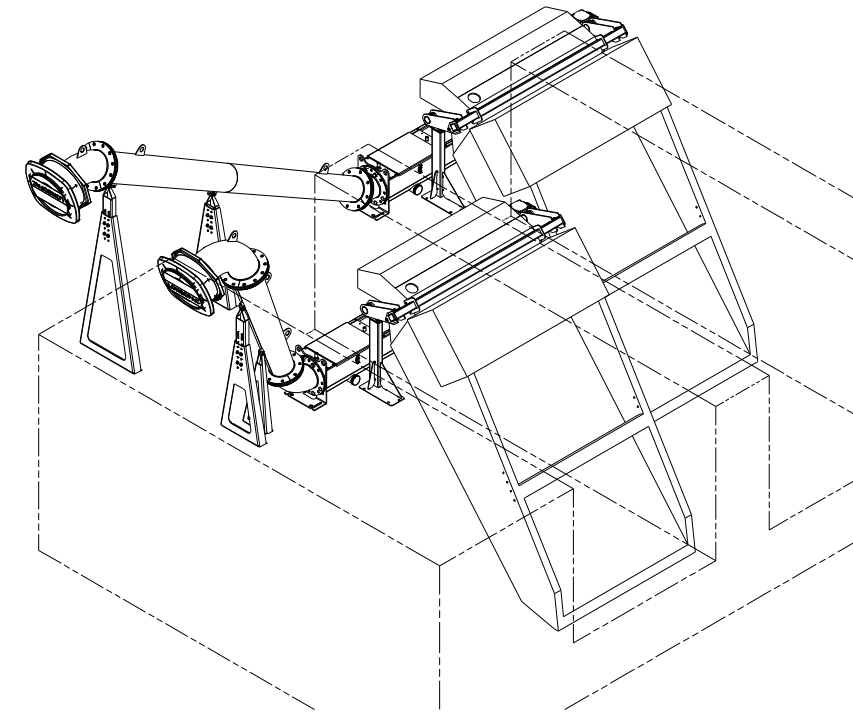
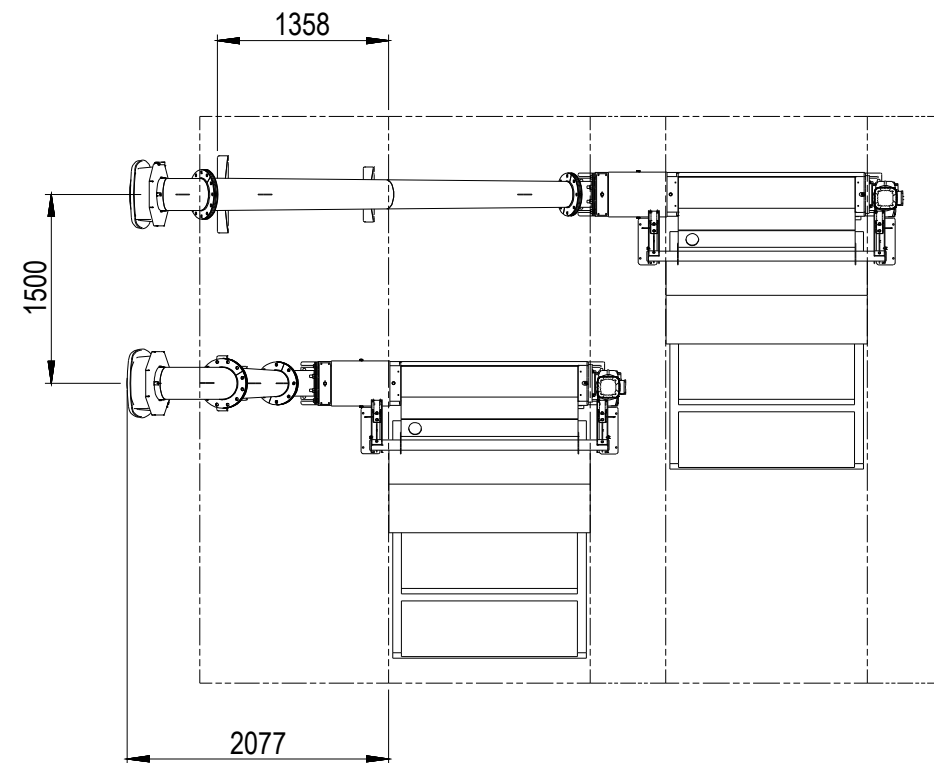
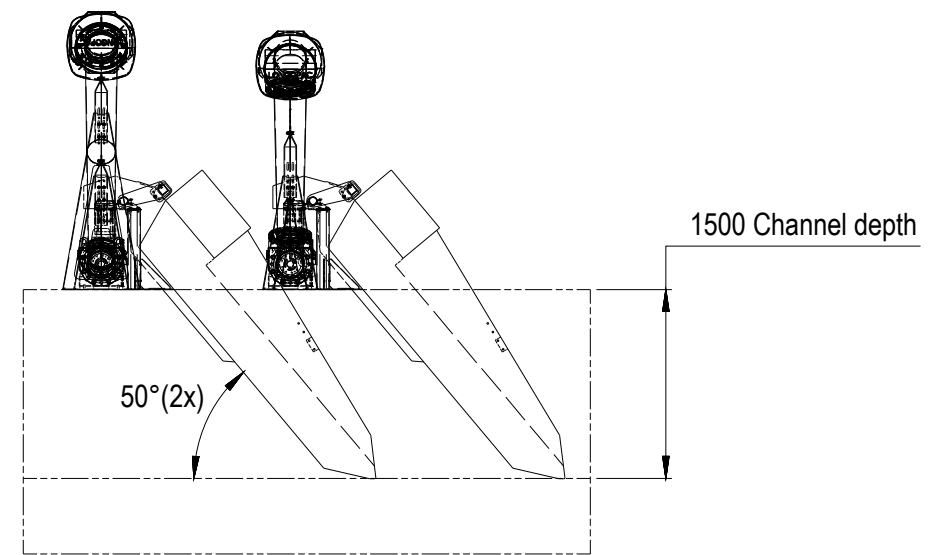
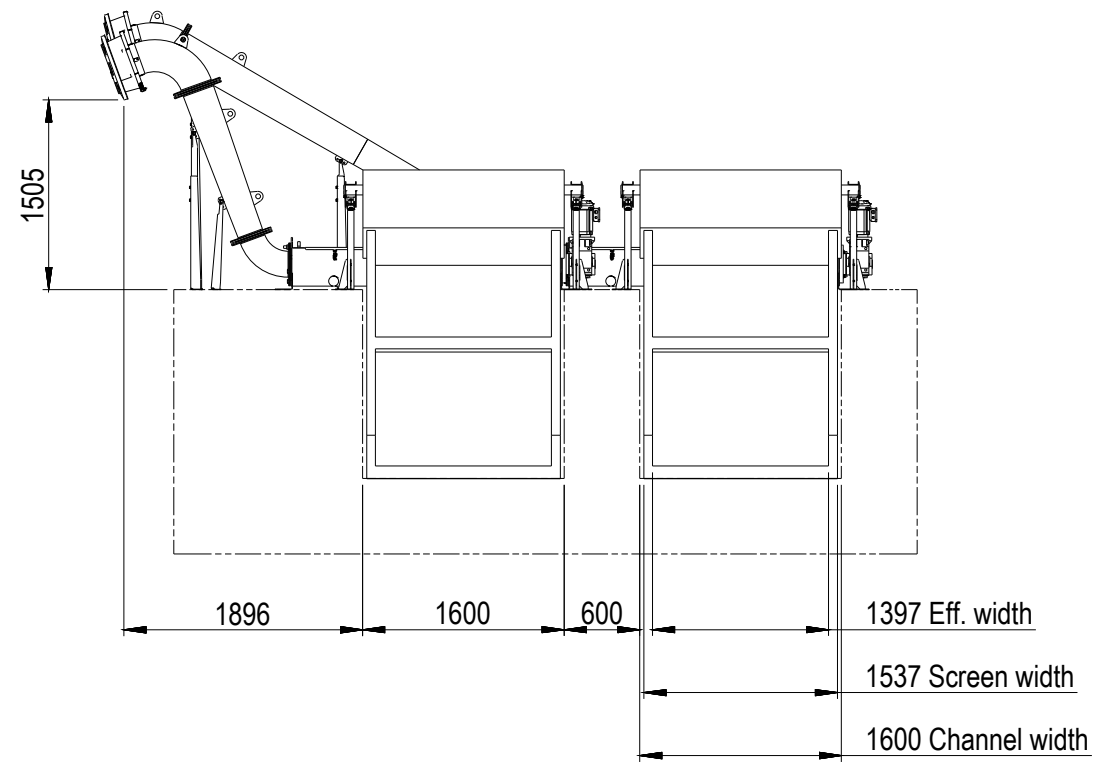
© 2024, Claro Environmental Technologies & Equipment Inc.

Notes:

1. Wash press discharge tubes to be modified to match final size of selected screenings bin.
2. Separate screenings and grit bins recommended.
3. Represented channel design optimized to better maintain channel velocities and to protect against grit deposition.

			 www.claroglobal.com	Napanee, ON Equipment Drawings 2x fine step screens XS2100-14.00-2 2x wash presses TP200-14.00		
0	2024-06-27	For review		DRAWN BY: EE DATE: 2024-06-27 SCALE: 1:80 DRAWING: 20048-SS-01 REV: 0		



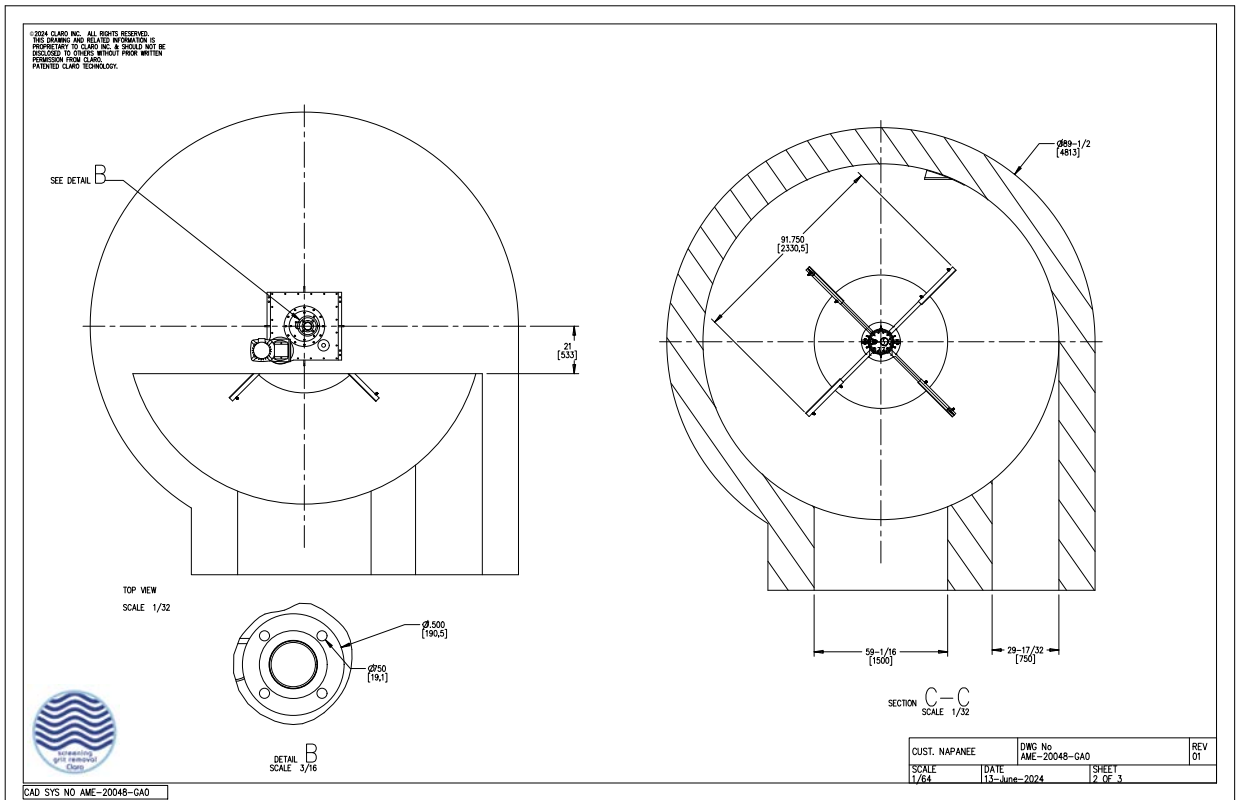
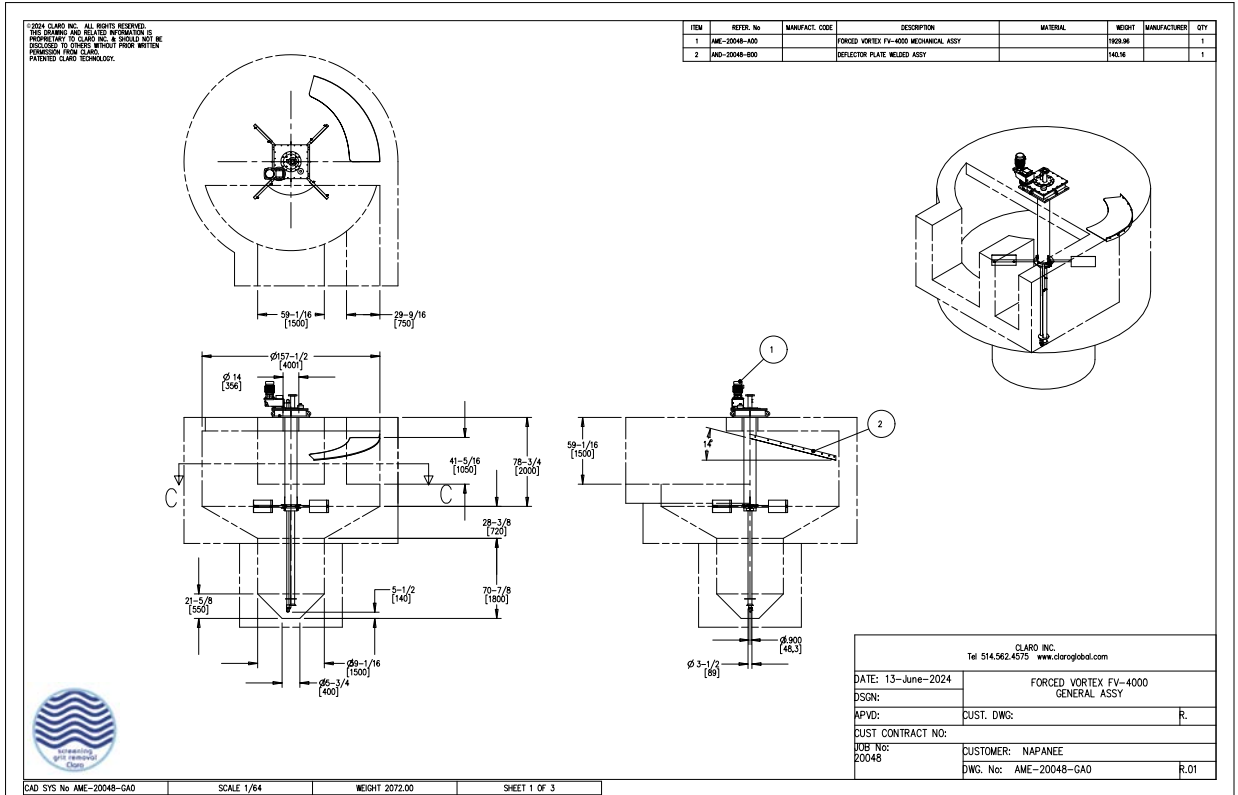


Notes:

1. Wash press discharge tubes to be modified to match final size of selected screenings bin.
2. Separate screenings and grit bins recommended.
3. Represented channel design optimized to better maintain channel velocities and to protect against grit deposition.

			 www.claroglobal.com		Napanee, ON		
					Equipment Drawings		
					2x fine step screens XS2100-1400-2		
					2x wash presses TP200-1400		
0	2024-06-27	For review	DRAWN BY	DATE	SCALE	DRAWNR.	REV
Rev	Date	Description	EE	2024-06-27	1:60	20048-SS-01	0

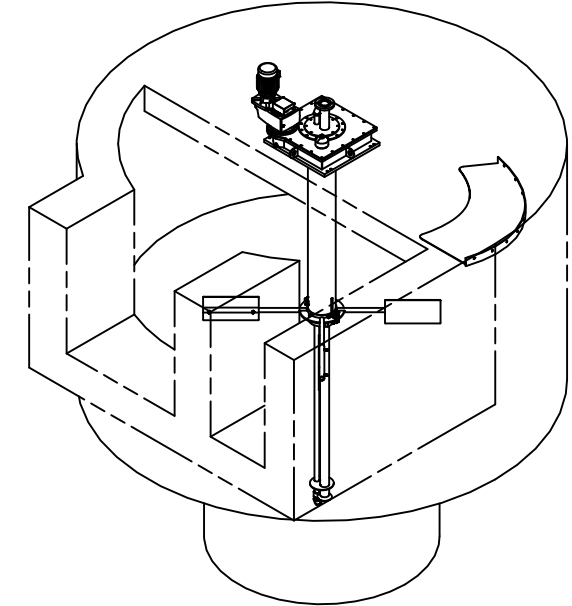
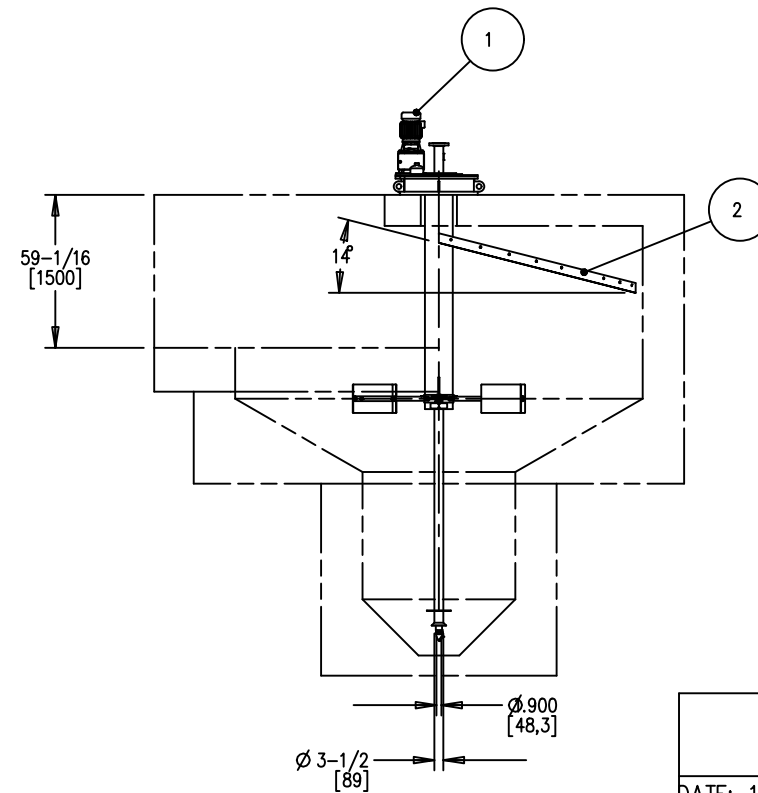
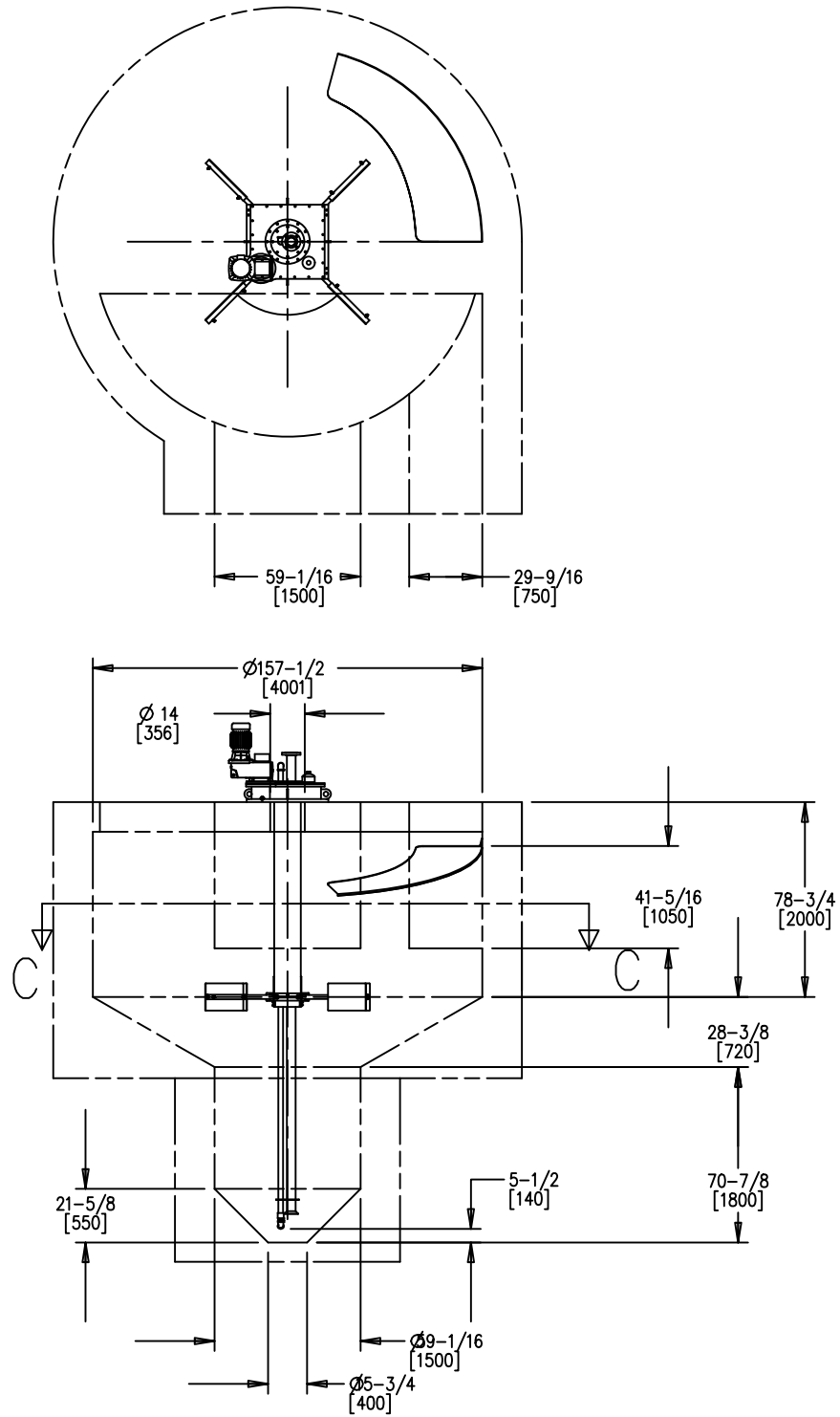
v. Forced Vortex Grit Removal Unit Layout Drawings (including Tank Geometry)



• Please see following pages for larger format drawing →

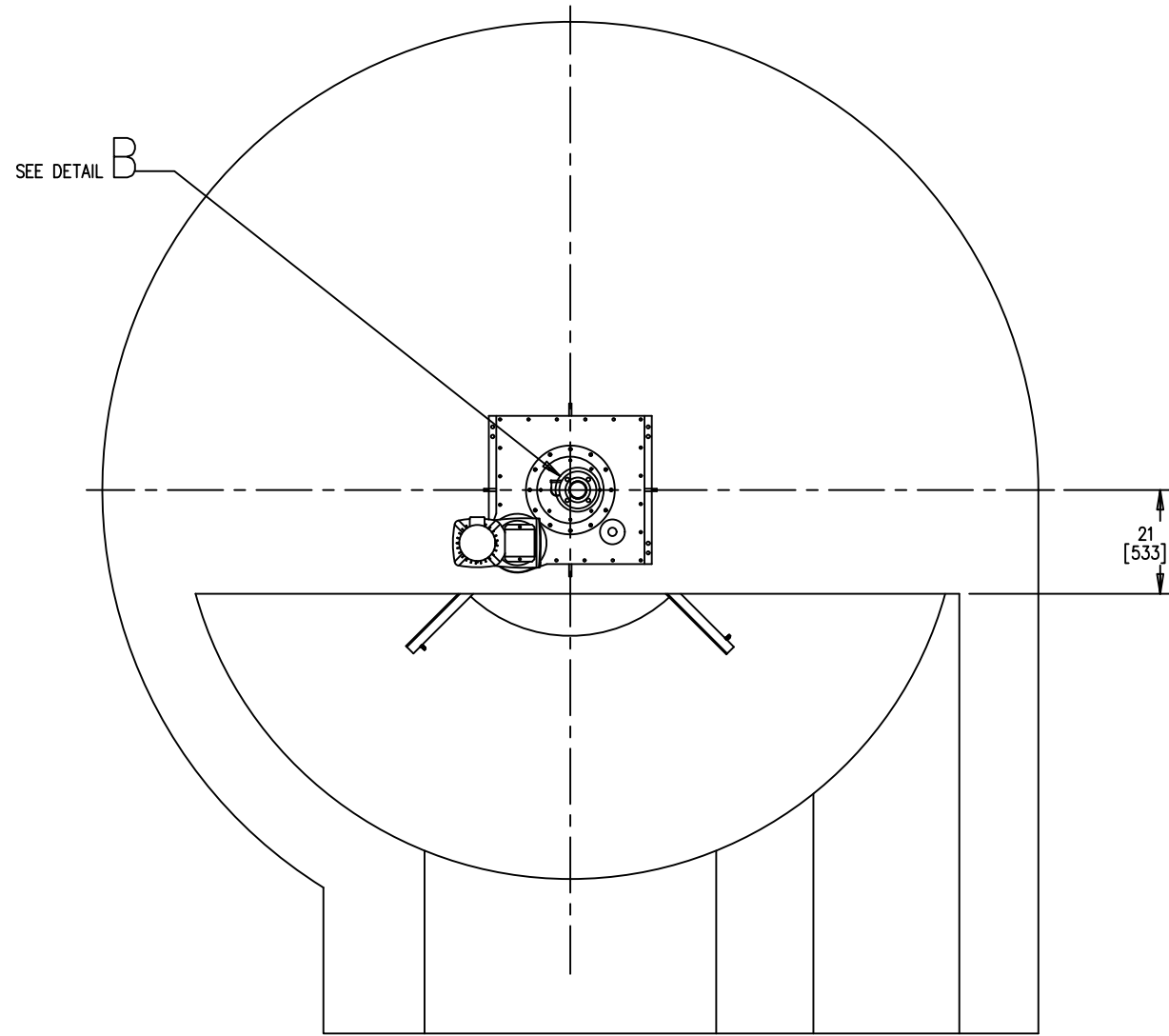
©2024 CLARO INC. ALL RIGHTS RESERVED.
 THIS DRAWING AND RELATED INFORMATION IS
 PROPRIETARY TO CLARO INC. & SHOULD NOT BE
 DISCLOSED TO OTHERS WITHOUT PRIOR WRITTEN
 PERMISSION FROM CLARO.
 PATENTED CLARO TECHNOLOGY.

ITEM	REFER. No	MANUFACT. CODE	DESCRIPTION	MATERIAL	WEIGHT	MANUFACTURER	QTY
1	AME-20048-A00		FORCED VORTEX FV-4000 MECHANICAL ASSY		1929.96		1
2	AND-20048-B00		DEFLECTOR PLATE WELDED ASSY		140.16		1

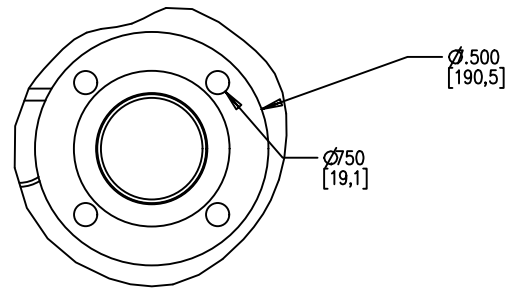


CLARO INC. Tel 514.562.4575 www.claroglobal.com	
DATE: 13-June-2024	FORCED VORTEX FV-4000 GENERAL ASSY
DSGN:	
APVD:	CUST. DWG: R.
CUST CONTRACT NO:	
JOB No: 20048	CUSTOMER: NAPANEE
	DWG. No: AME-20048-GA0 R.01

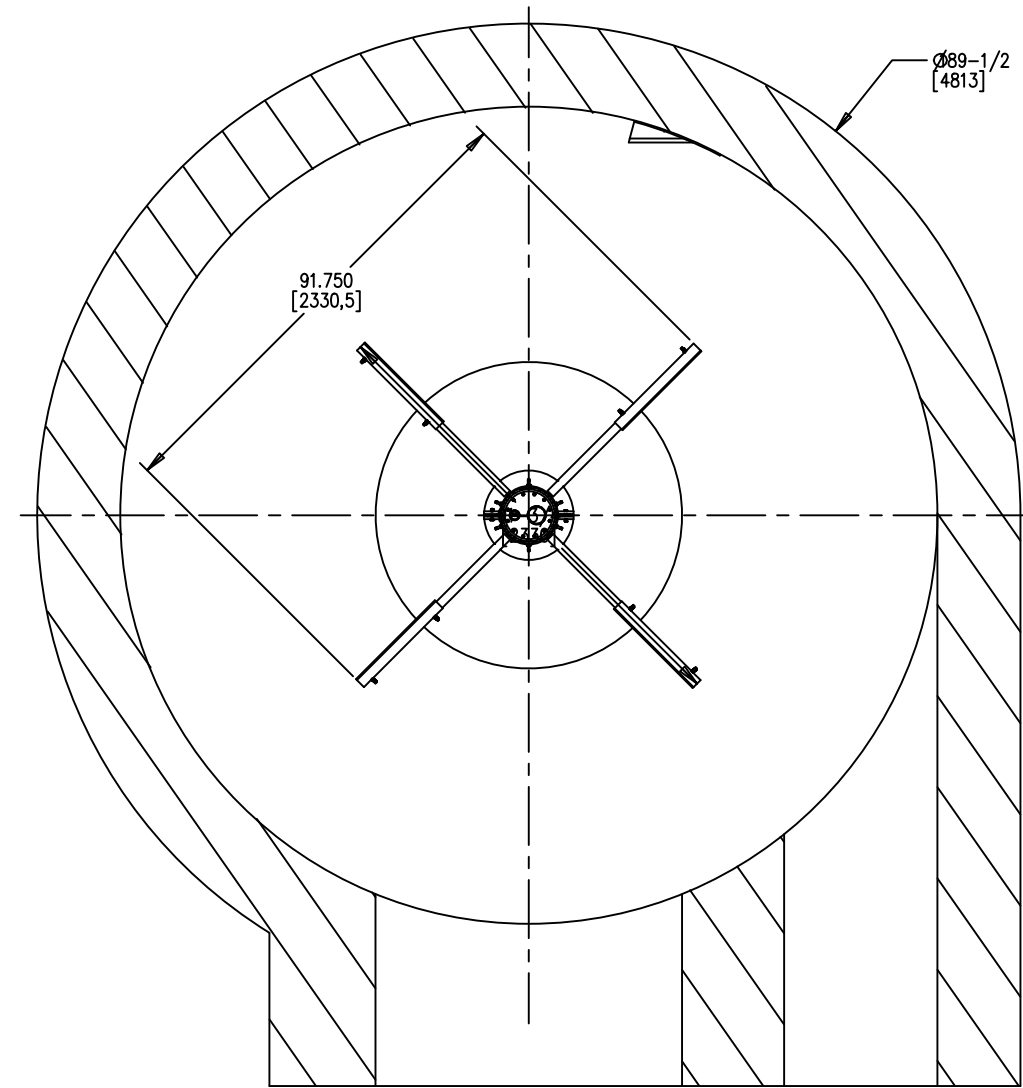
©2024 CLARO INC. ALL RIGHTS RESERVED.
 THIS DRAWING AND RELATED INFORMATION IS
 PROPRIETARY TO CLARO INC. & SHOULD NOT BE
 DISCLOSED TO OTHERS WITHOUT PRIOR WRITTEN
 PERMISSION FROM CLARO.
 PATENTED CLARO TECHNOLOGY.



TOP VIEW
 SCALE 1/32



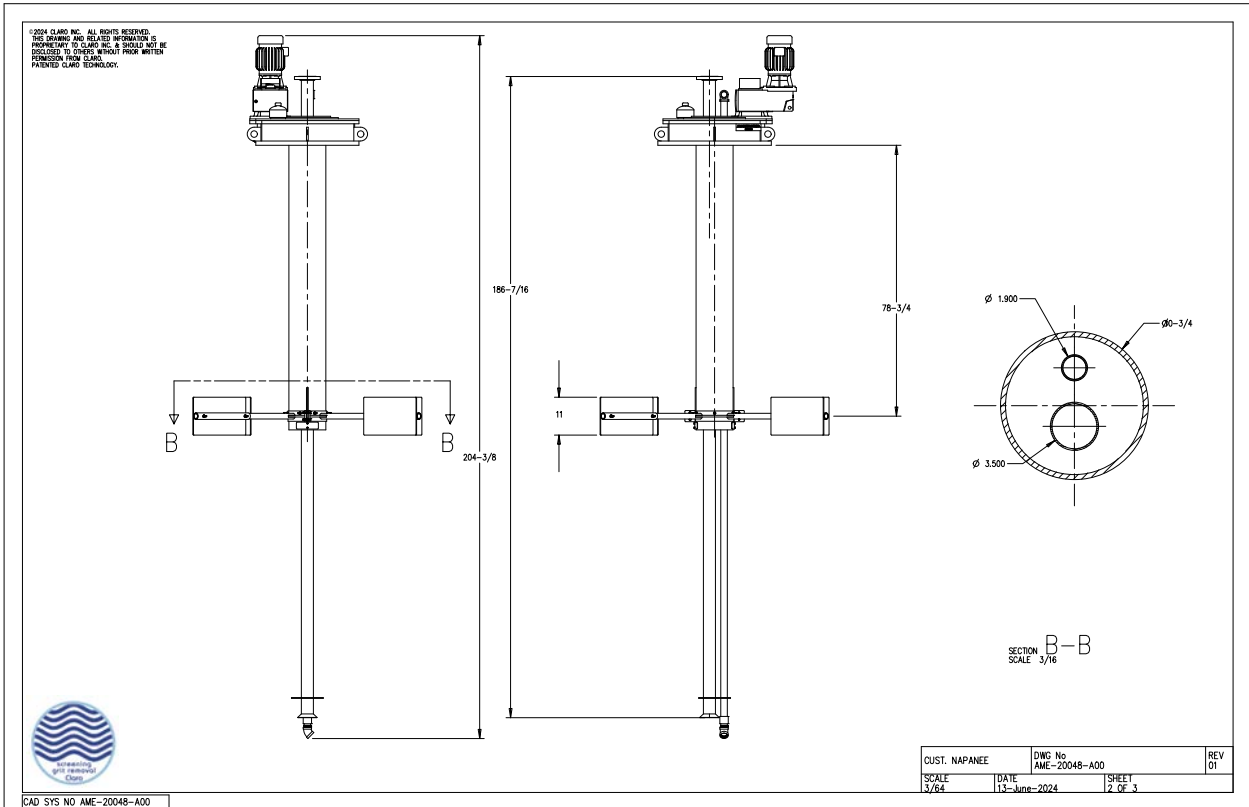
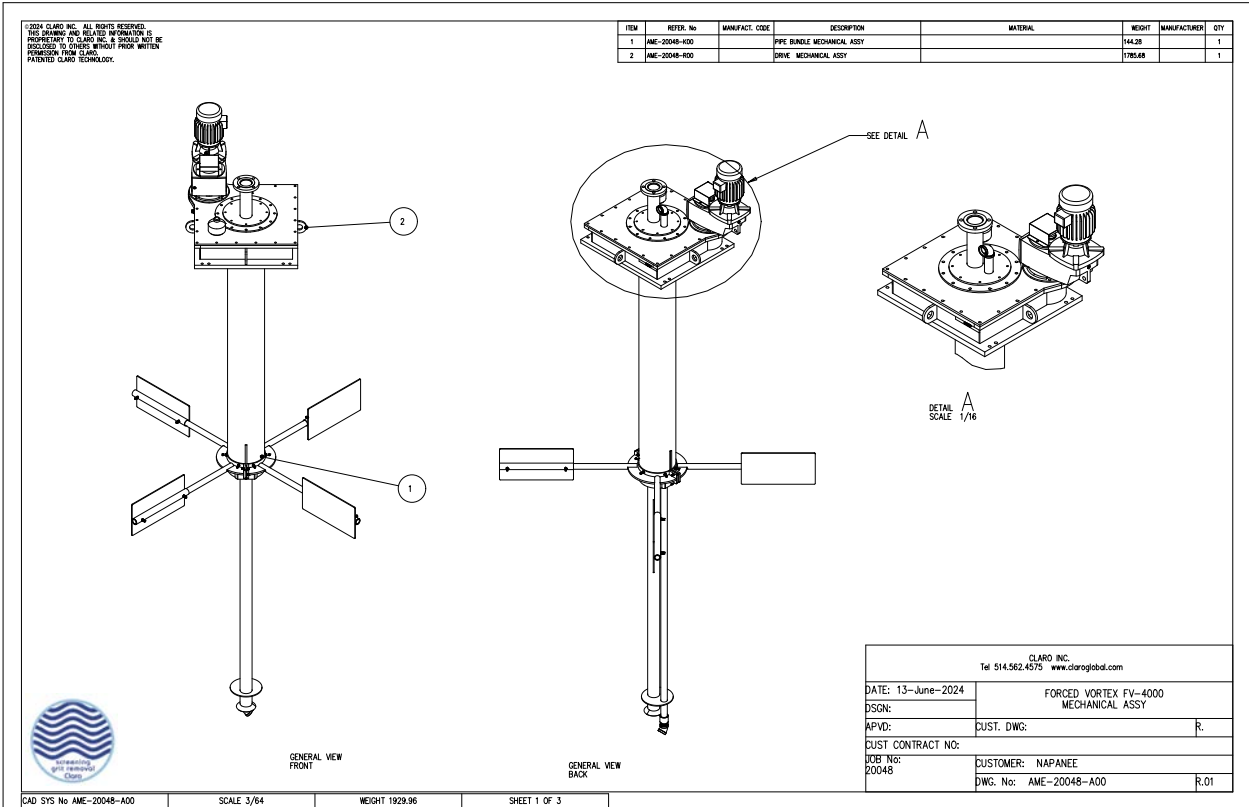
DETAIL B
 SCALE 3/16



SECTION C-C
 SCALE 1/32

CUST. NAPANEE		DWG No AME-20048-GAO	REV 01
SCALE 1/64	DATE 13-June-2024	SHEET 2 OF 3	

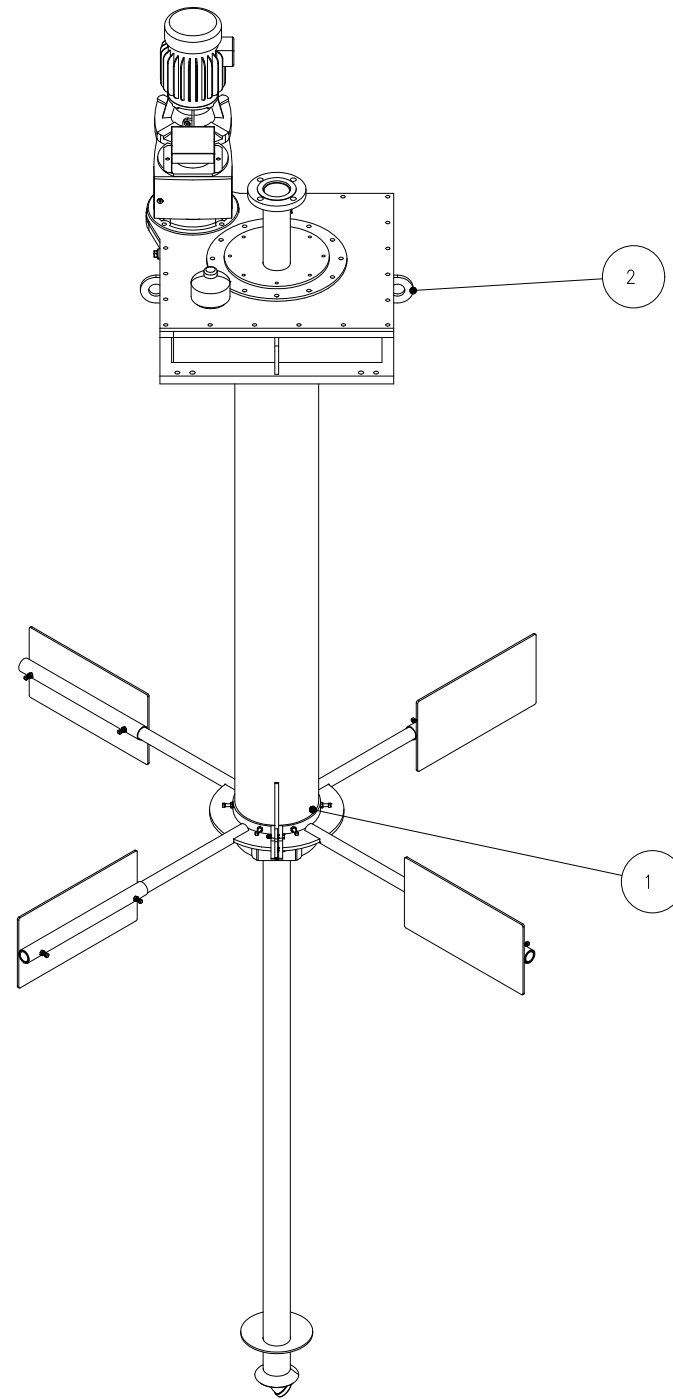
vi. Forced Vortex Grit Removal System Mechanical Arrangement Drawings



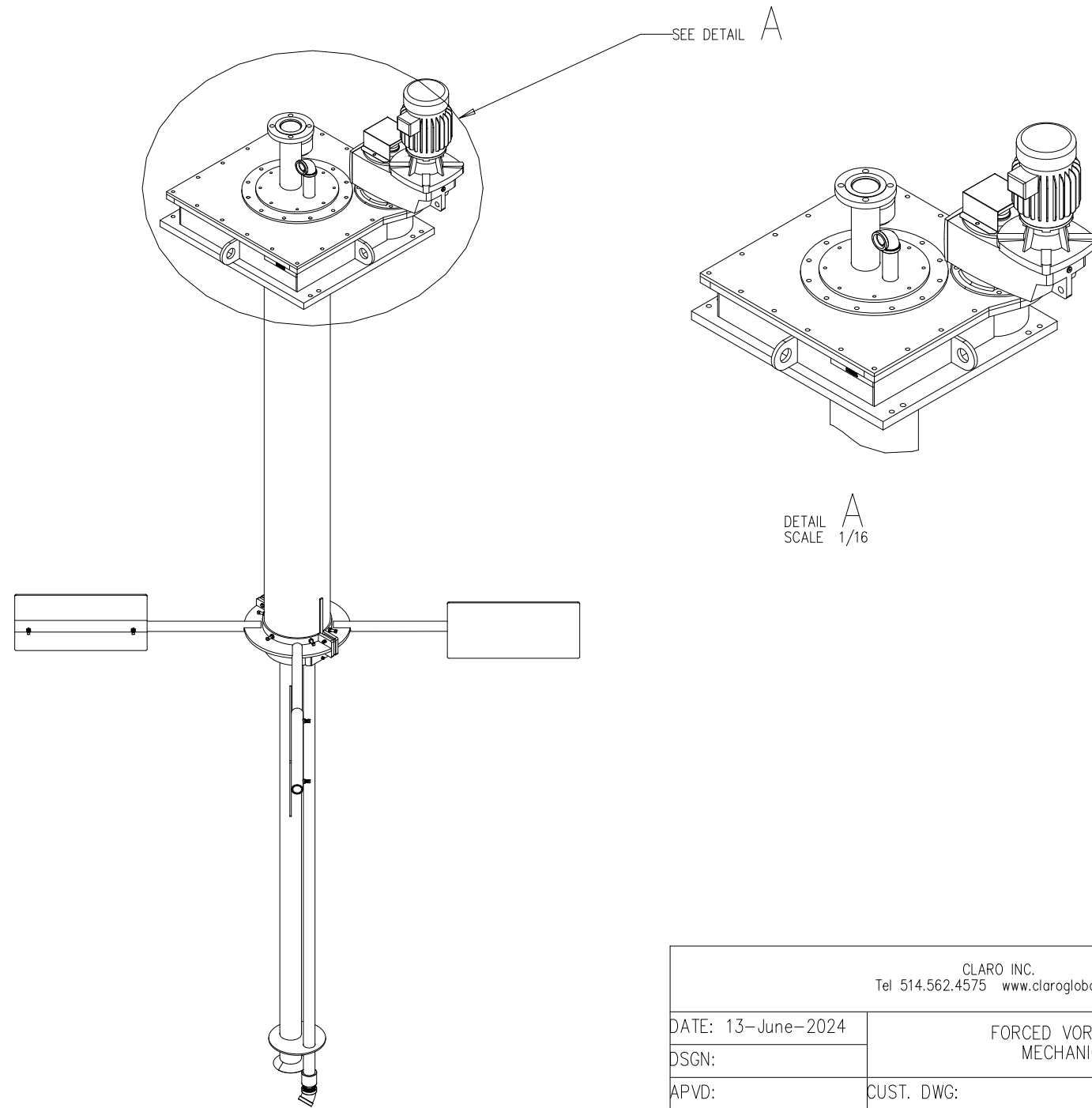
• Please see following pages for larger format drawings →

©2024 CLARO INC. ALL RIGHTS RESERVED.
 THIS DRAWING AND RELATED INFORMATION IS
 PROPRIETARY TO CLARO INC. & SHOULD NOT BE
 DISCLOSED TO OTHERS WITHOUT PRIOR WRITTEN
 PERMISSION FROM CLARO.
 PATENTED CLARO TECHNOLOGY.

ITEM	REFER. No	MANUFACT. CODE	DESCRIPTION	MATERIAL	WEIGHT	MANUFACTURER	QTY
1	AME-20048-K00		PIPE BUNDLE MECHANICAL ASSY		144.28		1
2	AME-20048-R00		DRIVE MECHANICAL ASSY		1785.68		1



GENERAL VIEW
FRONT



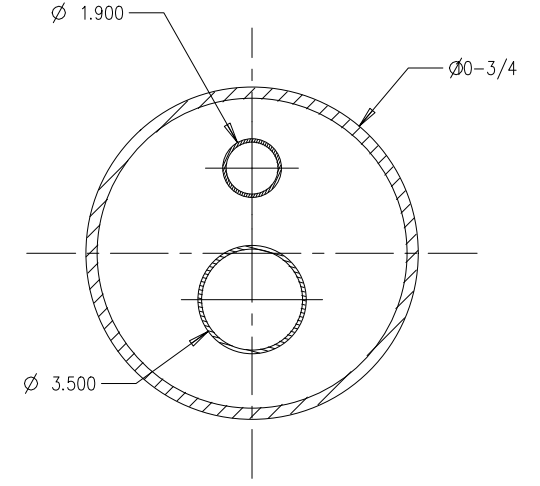
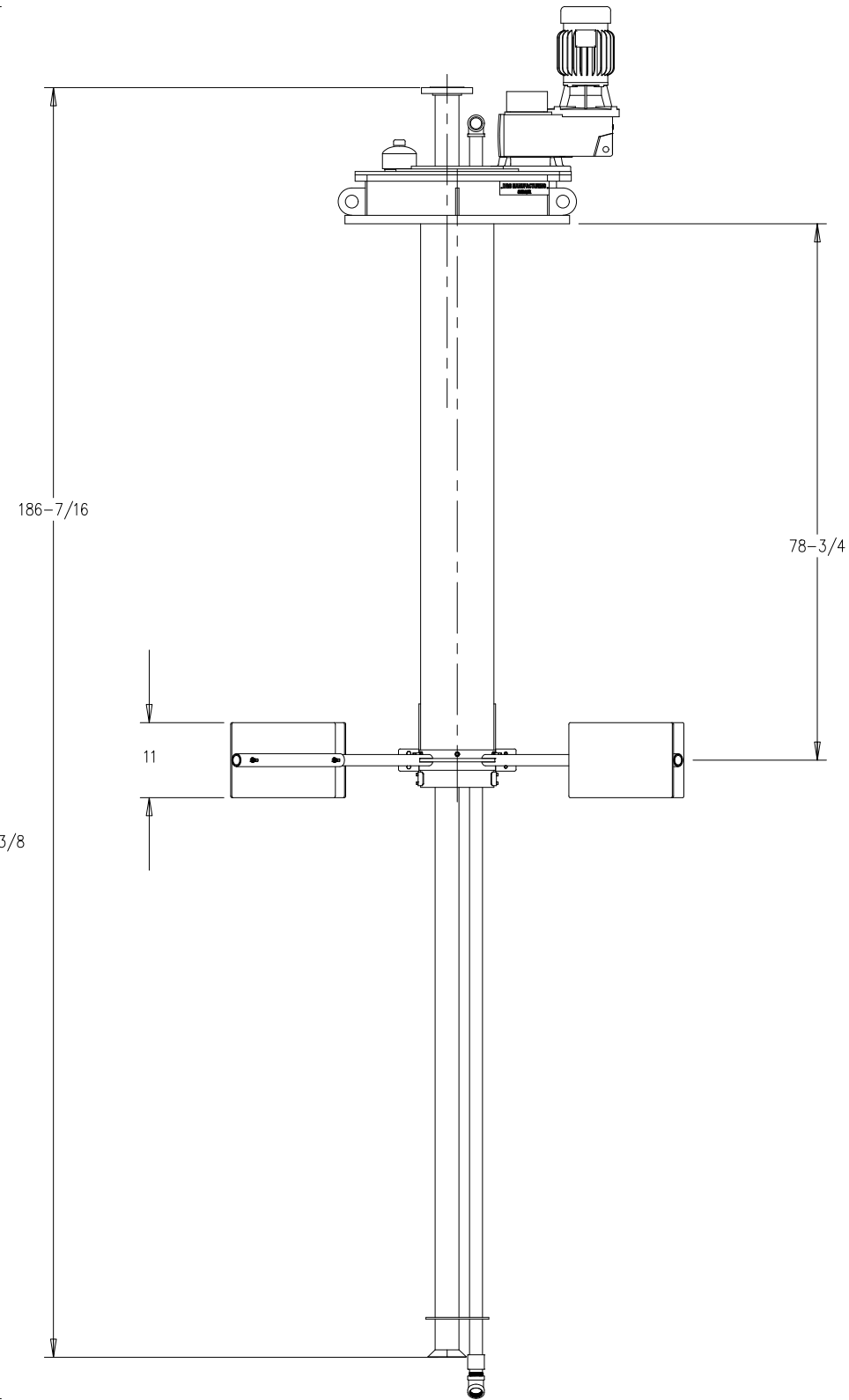
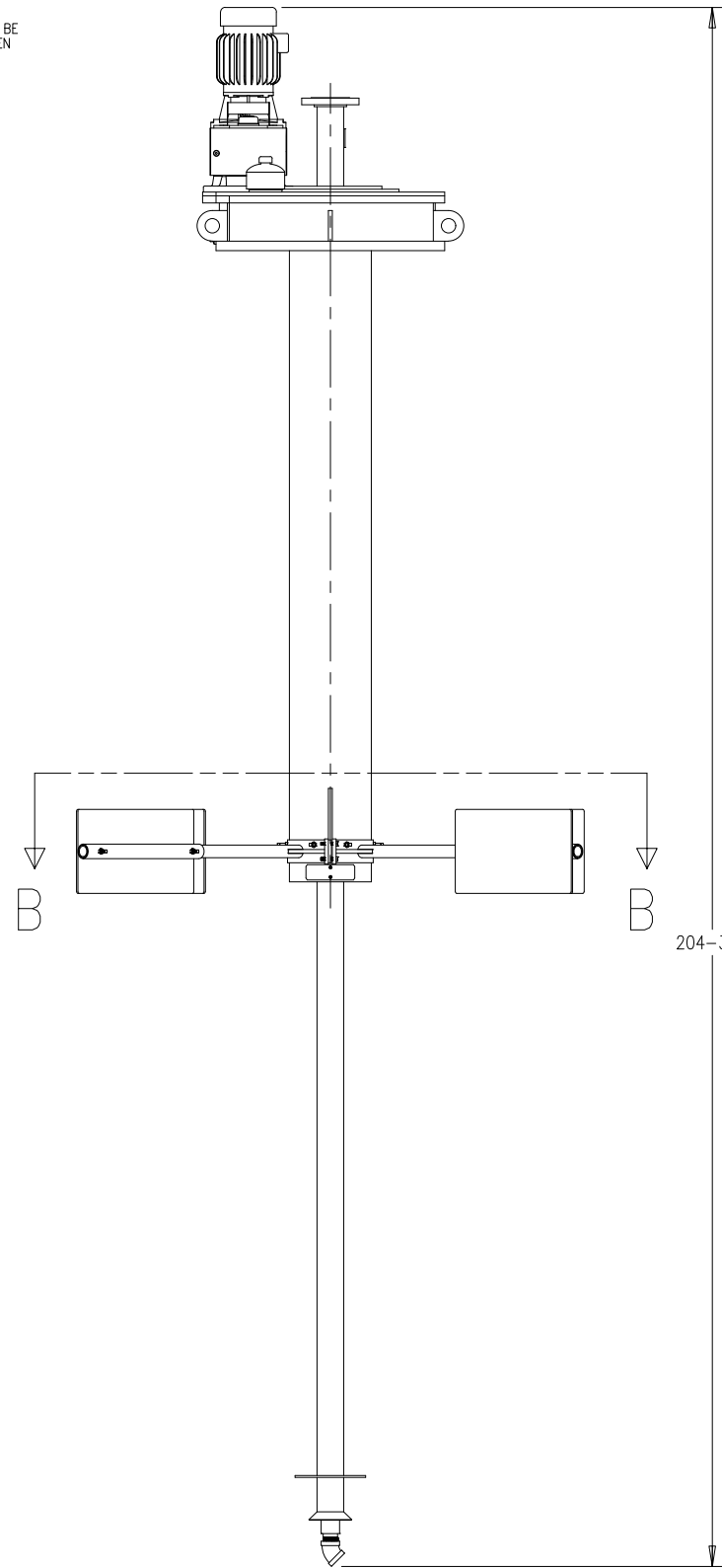
GENERAL VIEW
BACK

SEE DETAIL A

DETAIL A
SCALE 1/16

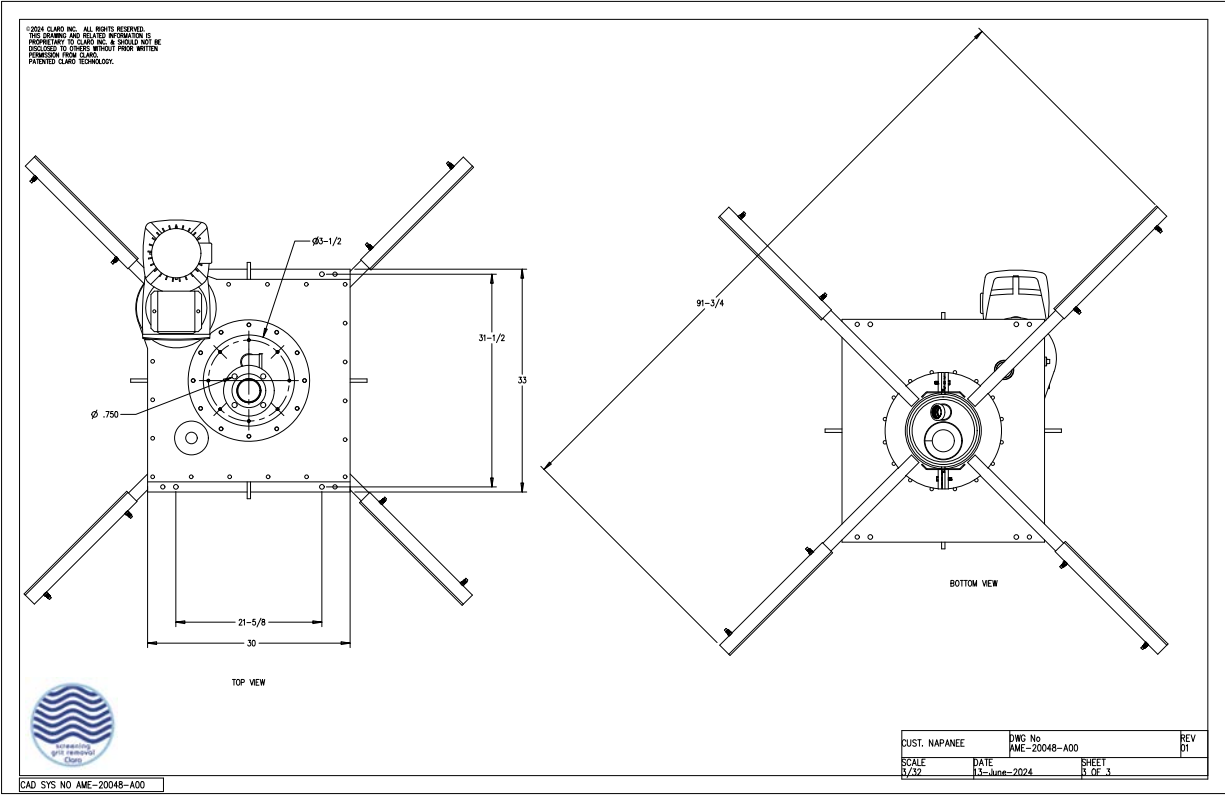
CLARO INC. Tel 514.562.4575 www.claroglobal.com		
DATE: 13-June-2024	FORCED VORTEX FV-4000 MECHANICAL ASSY	
DSGN:	CUST. DWG:	R.
APVD:	CUST CONTRACT NO:	
JOB No: 20048	CUSTOMER: NAPANEE	
	DWG. No: AME-20048-A00	R.01

©2024 CLARO INC. ALL RIGHTS RESERVED.
 THIS DRAWING AND RELATED INFORMATION IS
 PROPRIETARY TO CLARO INC. & SHOULD NOT BE
 DISCLOSED TO OTHERS WITHOUT PRIOR WRITTEN
 PERMISSION FROM CLARO.
 PATENTED CLARO TECHNOLOGY.



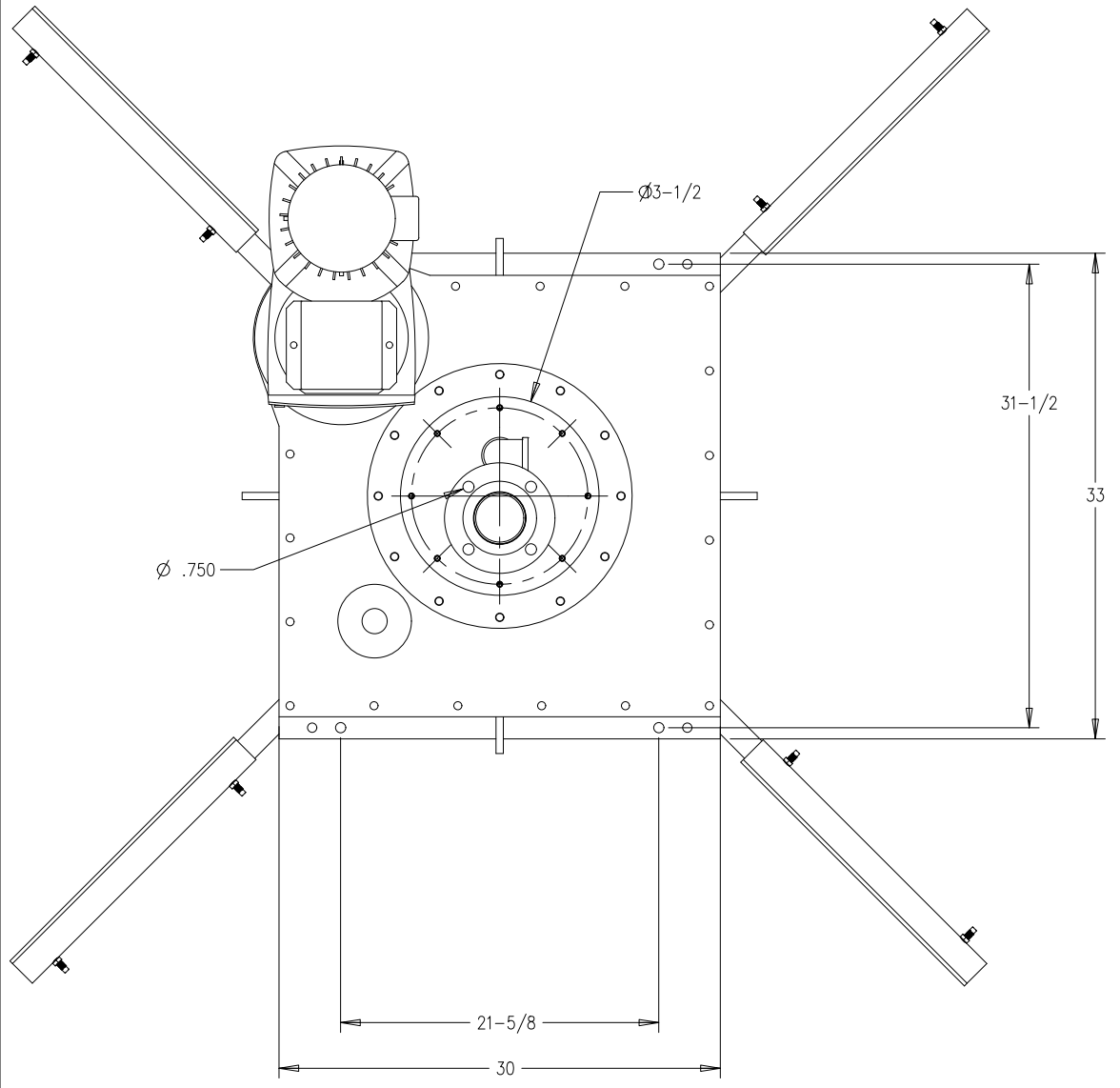
SECTION B-B
 SCALE 3/16

CUST. NAPANEE	DWG No AME-20048-A00	REV 01
SCALE 3/64	DATE 13-June-2024	SHEET 2 OF 3

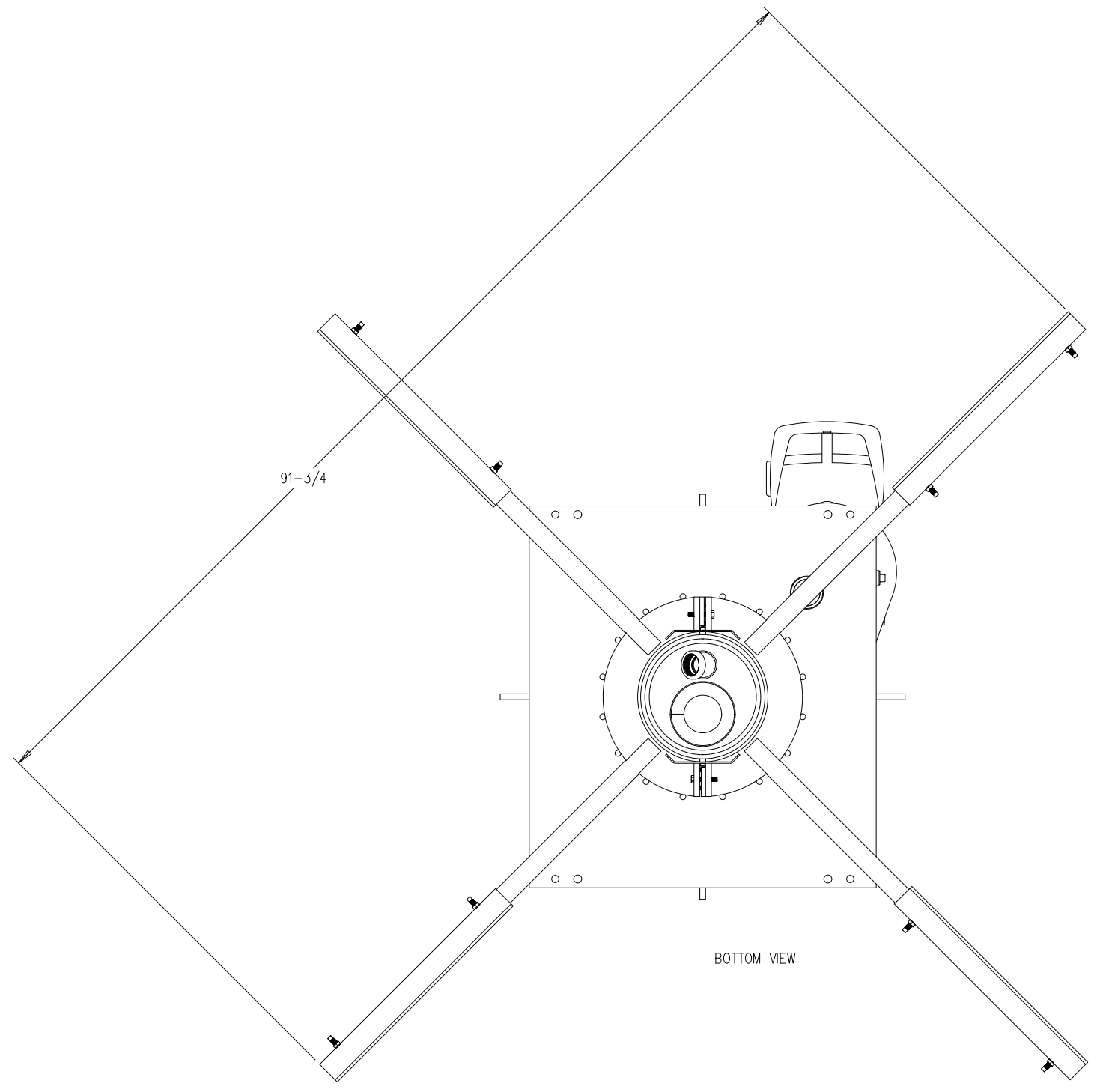


• Please see following pages for larger format drawings →

©2024 CLARO INC. ALL RIGHTS RESERVED.
 THIS DRAWING AND RELATED INFORMATION IS
 PROPRIETARY TO CLARO INC. & SHOULD NOT BE
 DISCLOSED TO OTHERS WITHOUT PRIOR WRITTEN
 PERMISSION FROM CLARO.
 PATENTED CLARO TECHNOLOGY.



TOP VIEW

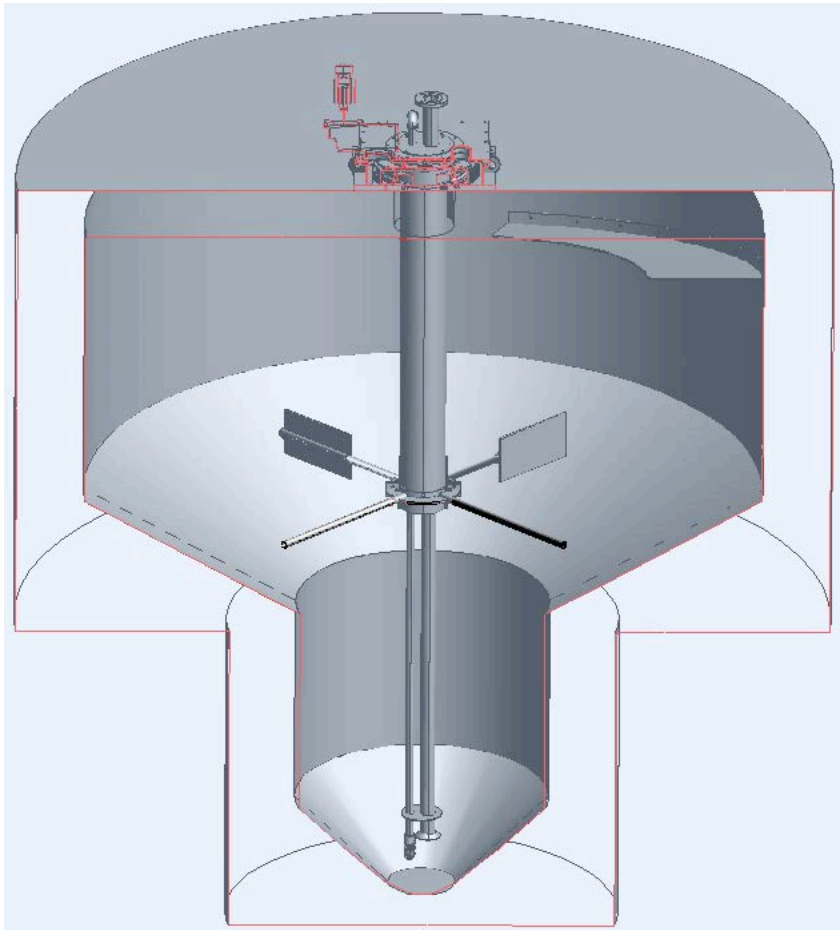
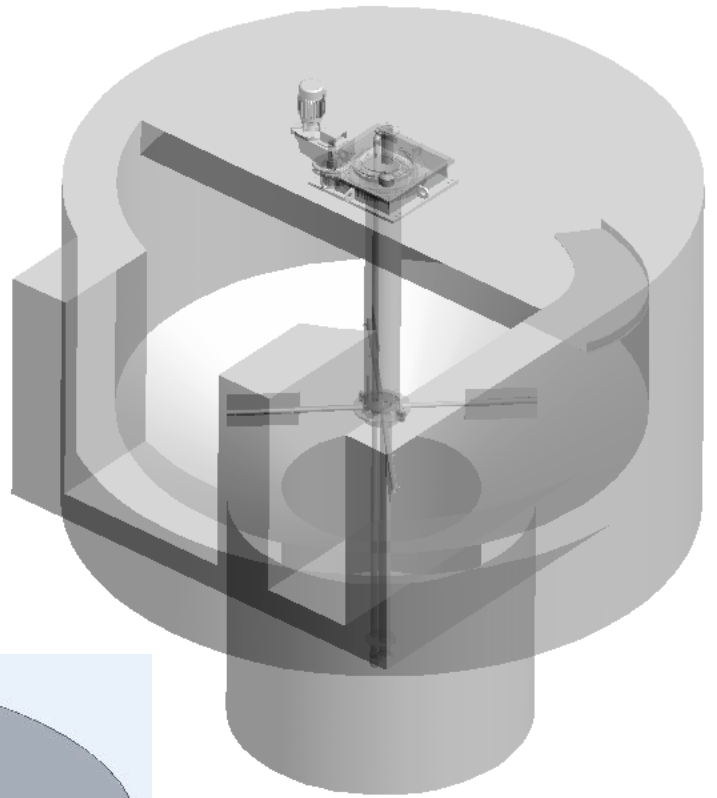


BOTTOM VIEW

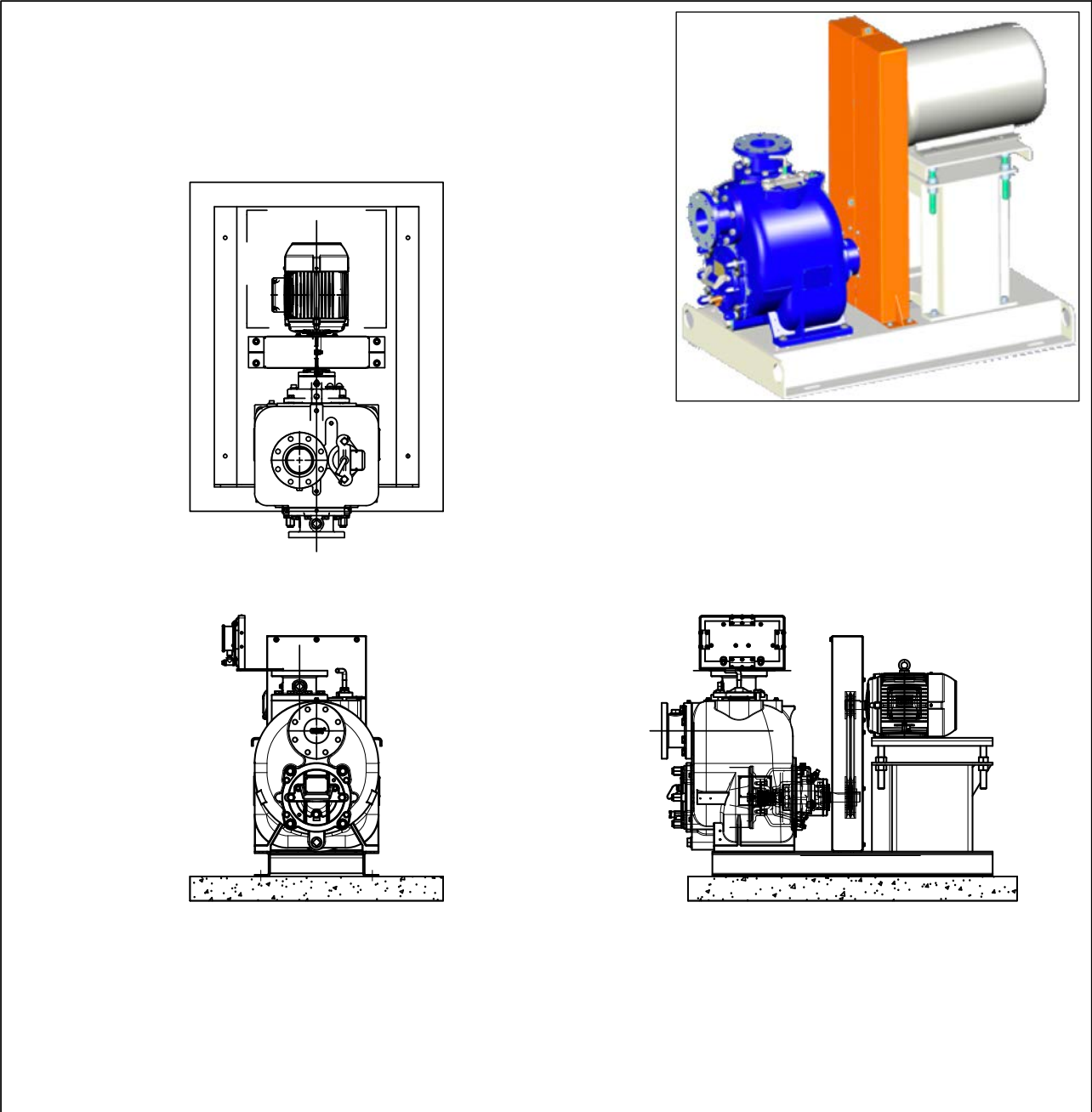
CUST. NAPANEE	DWG No AME-20048-A00	REV 01
SCALE 3/32	DATE 13-June-2024	SHEET 3 OF 3


vii. Forced Vortex Grit Removal Unit (including Tank Geometry) – 3D Drawing Views

- X-Ray & Section 3D Views

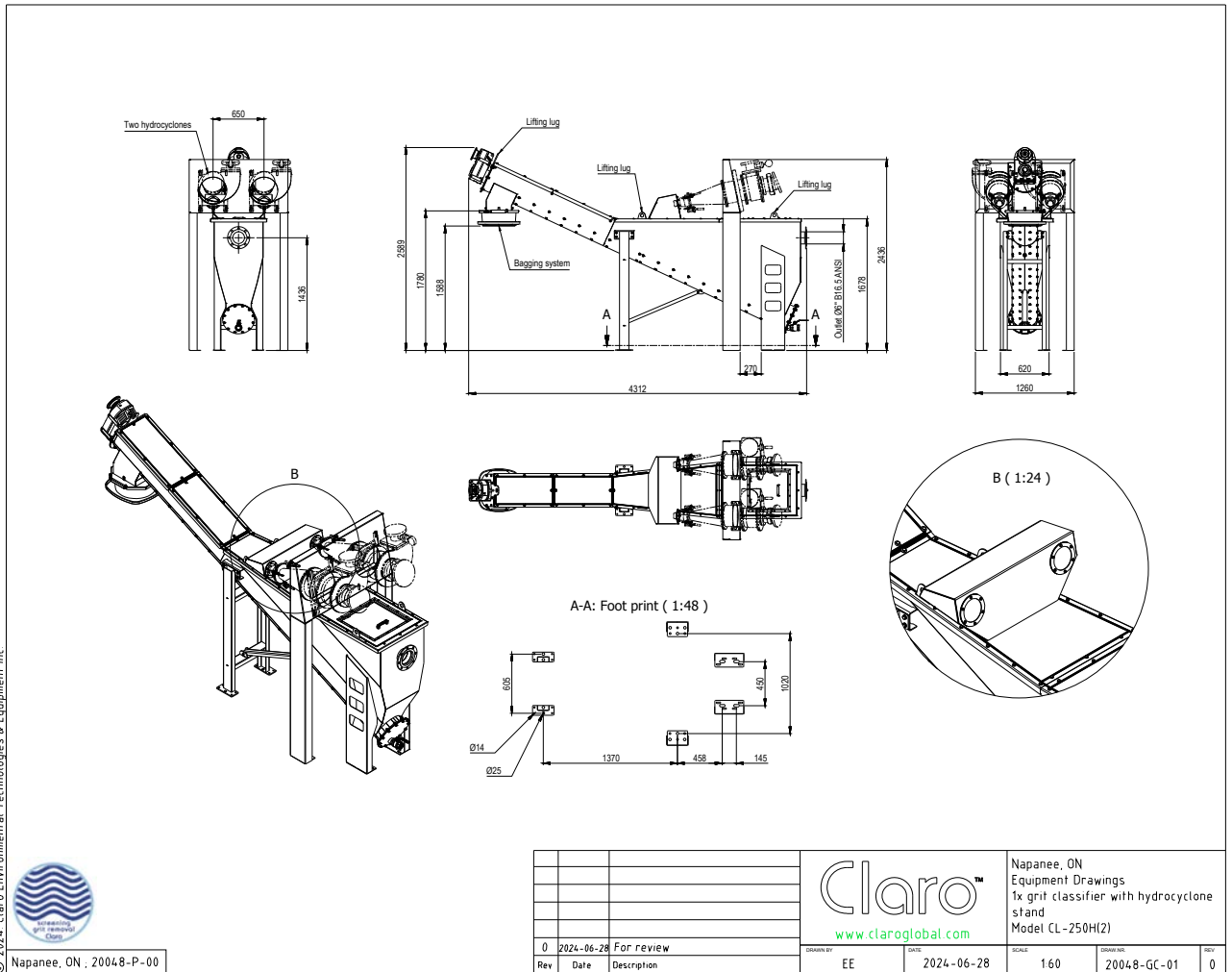


viii. Grit Pump Skid Arrangement Drawing



 www.claroglobal.com		Napanee, ON Gorman-Rupp Super-T 4x4 Grit Pump with Gauge Set		
		DRAWN BY GR/DDC	DATE (YYYYMMDD) 240715	SCALE

ix. Grit Classifier Arrangement Drawings Including Hydrocyclones



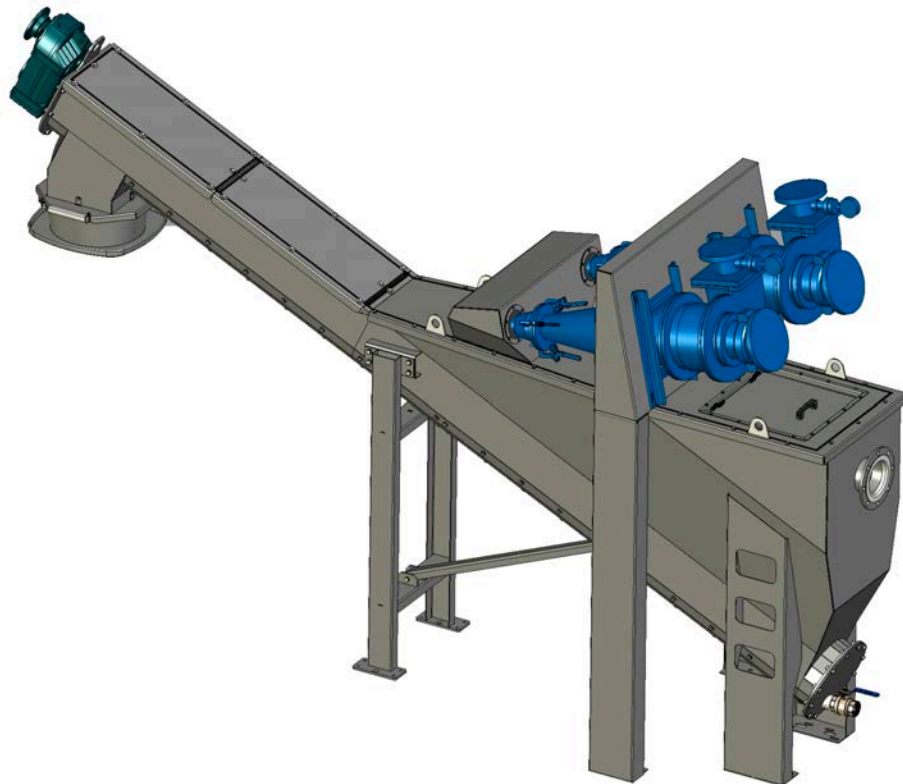
• Please see following pages for 3D & large format drawings →

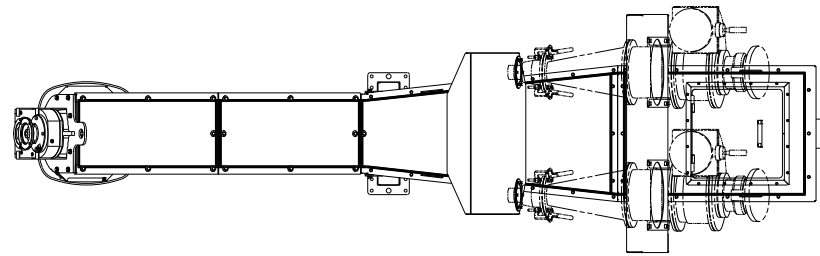
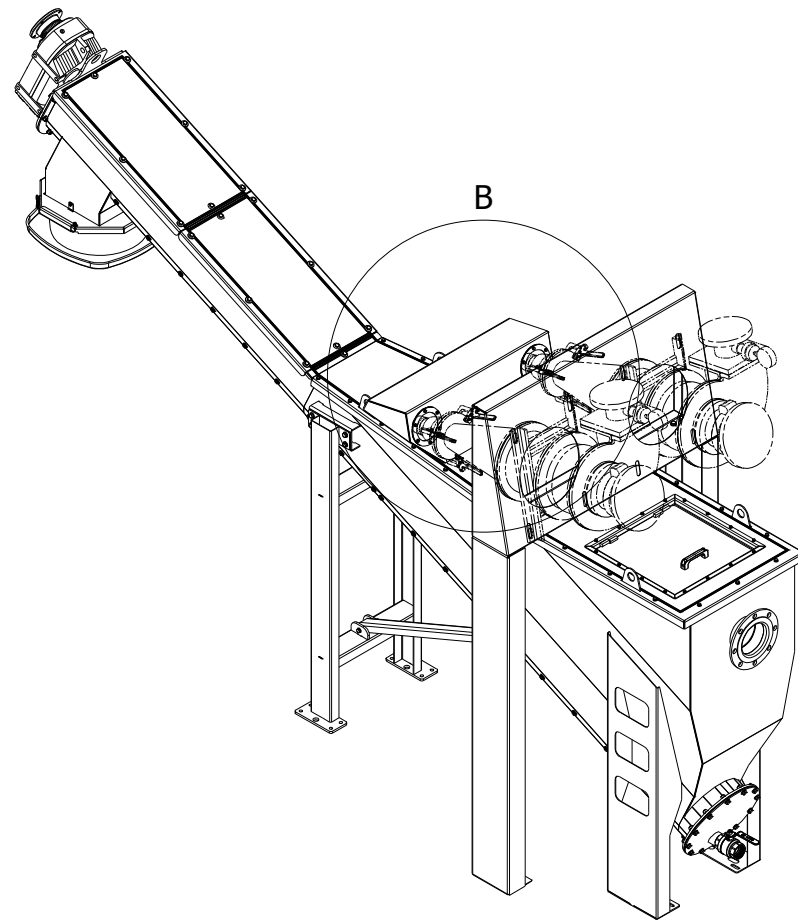
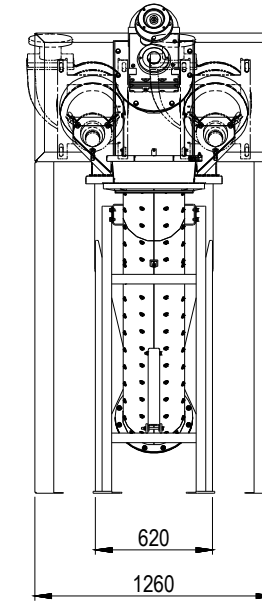
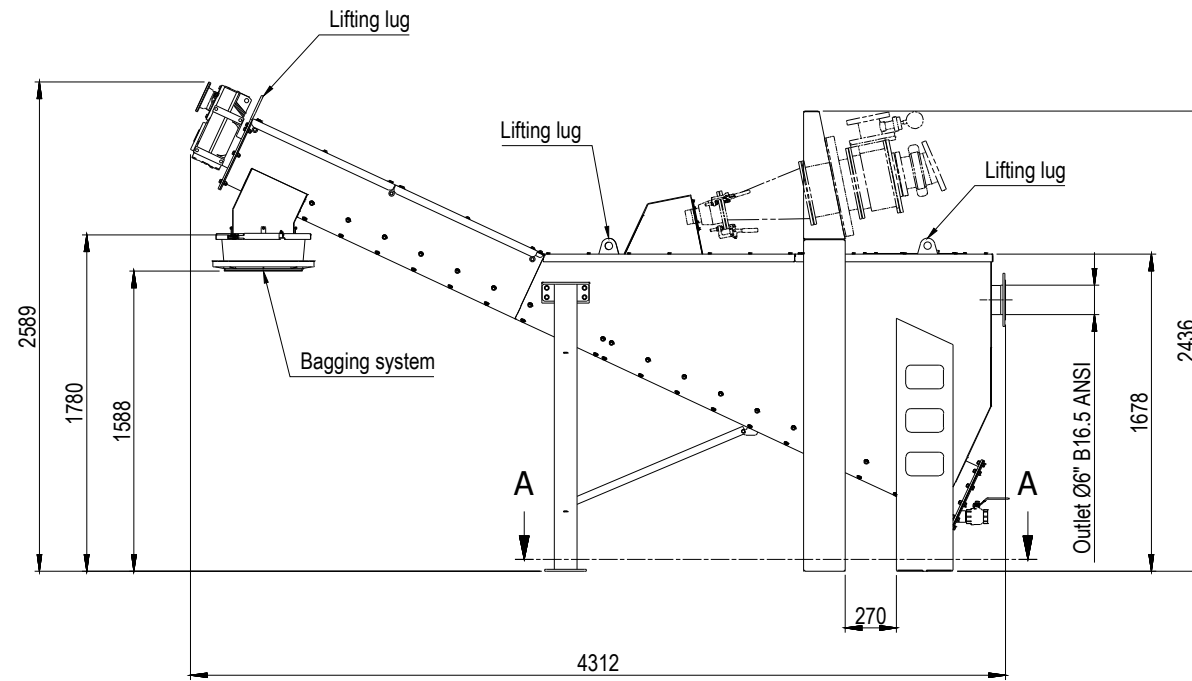
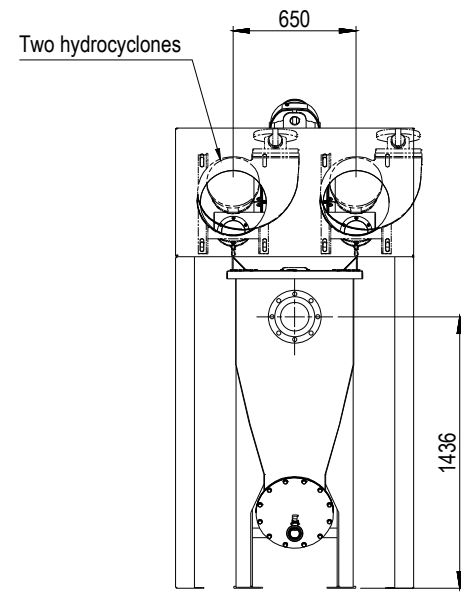


x. Grit Classifier Arrangement Drawings – 3D Drawing Views

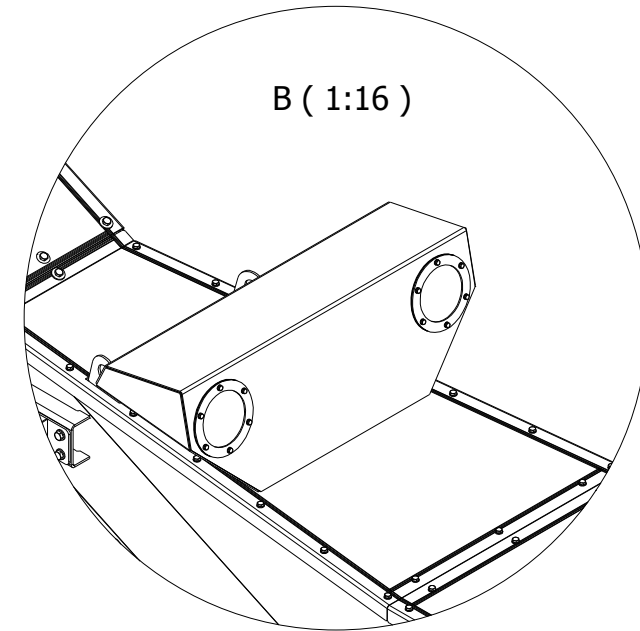
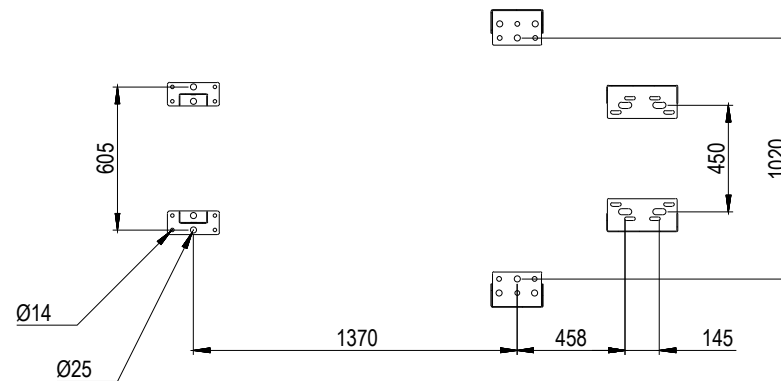



Note: Motor not shown.



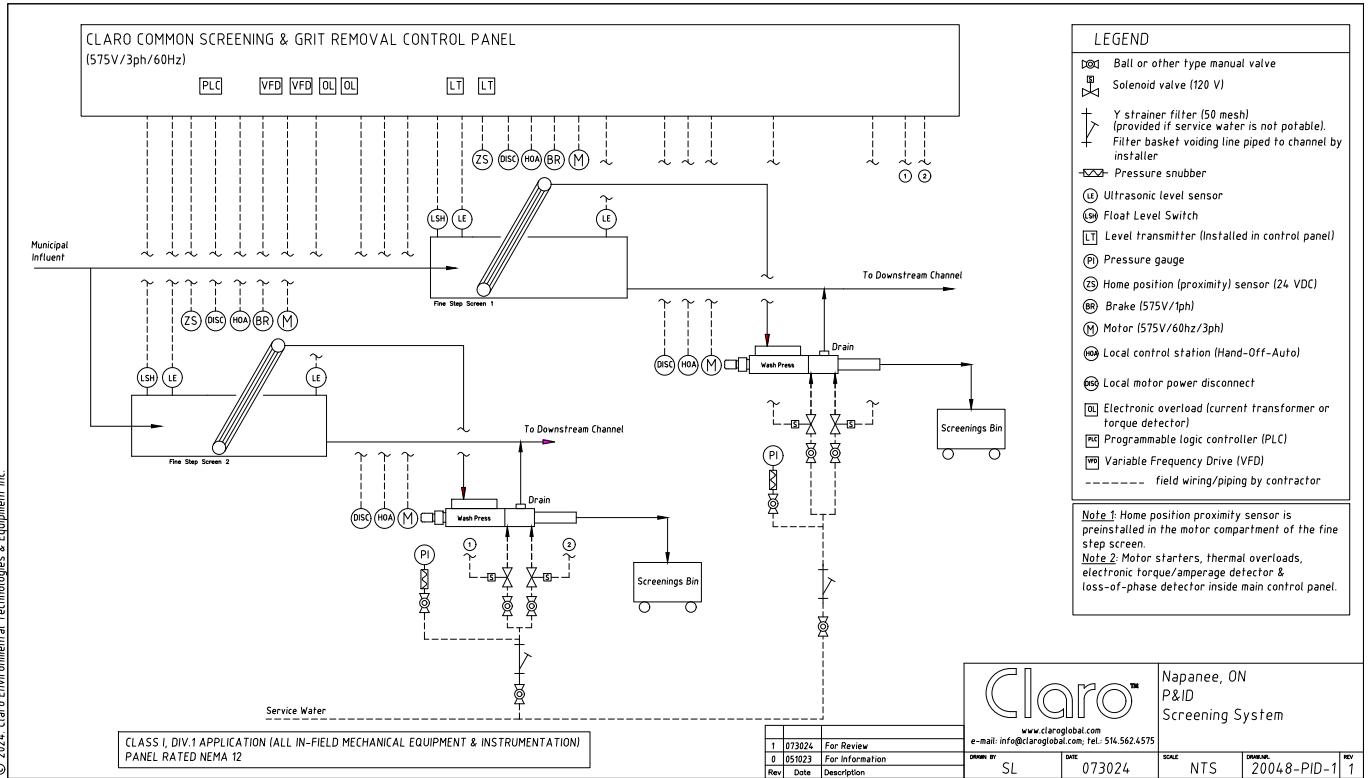


A-A: Foot print (1:32)



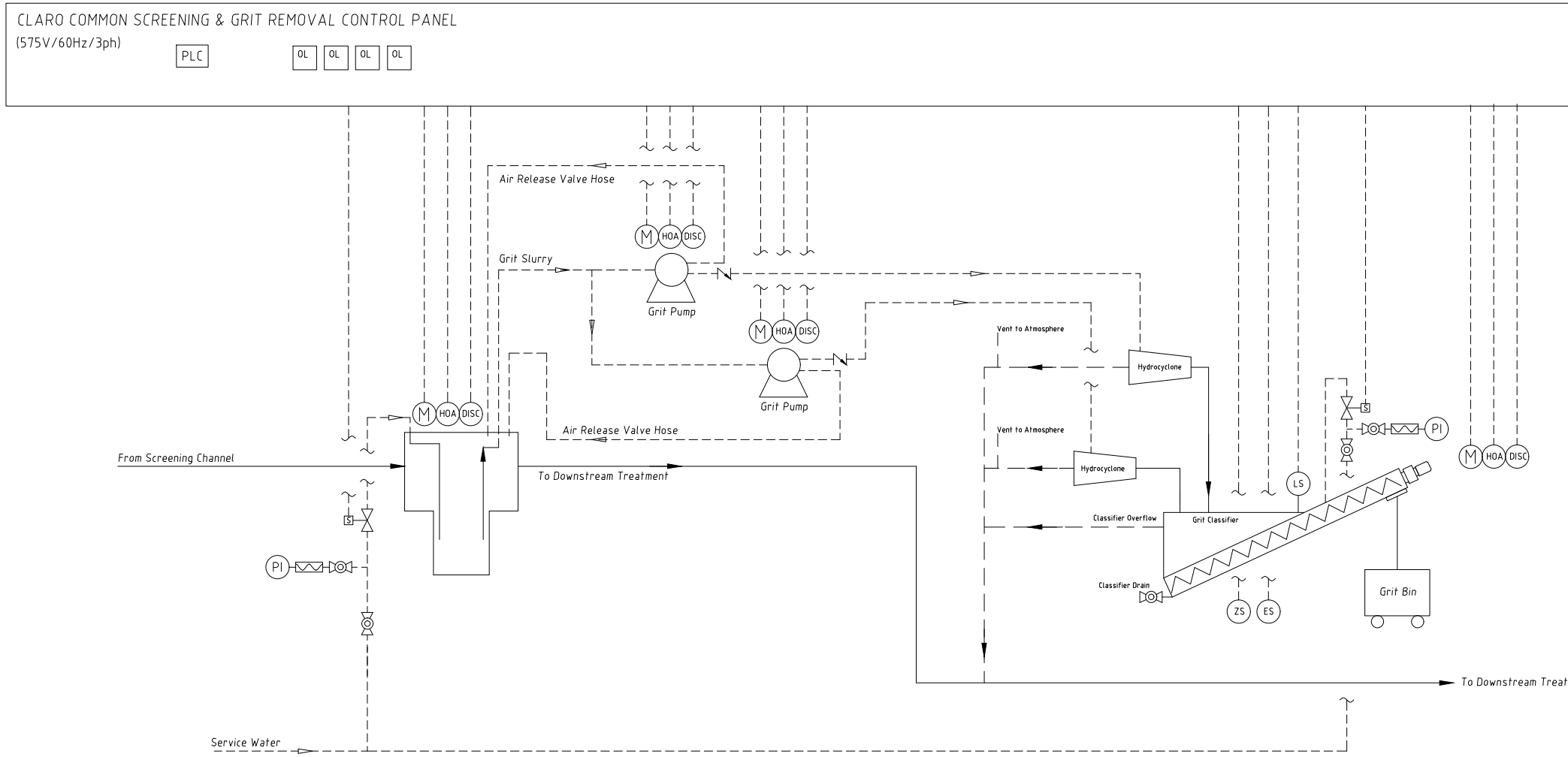
			 www.claroglobal.com		Napanee, ON	
					Equipment Drawings	
					1x grit classifier with hydrocyclone stand	
					Model CL-250H(2)	
0	2024-06-28	For review	DRAWN BY	DATE	SCALE	DRAW.NR.
Rev	Date	Description	EE	2024-06-28	1:40	20048-GC-01
						REV
						0

B. Project Submittal Drawing – Fine Screening System P&ID



• Please see following page for large format drawing →





Legend

- Ball Valve
- Solenoid Valve (120V)
- Y strainer filter (50 mesh) with ball valve (if final effluent/well water is used)
- Check Valve
- Pressure snubber
- Pressure Gauge
- Motor (575V/3ph/60Hz)
- Local HOA Station
- Local Motor Disconnect
- Level Switch
- Pull Cable Emergency Stop Switch
- Rotation Sensor
- Grit Extraction Pump (575V/3ph/60Hz)
- Programmable Logic Controller
- Electronic overload (current transformer)
- Field Wiring*
- Field Service Water*
- Grit Extraction Piping*

* Dashed lines indicate piping/wiring by contractor

Note 1: Motor starters, thermal overloads, electronic torque/amperage detector, loss-of-phase detector inside main control panel.

CLASS I, DIV.1 APPLICATION (ALL IN-FIELD MECHANICAL EQUIPMENT & INSTRUMENTATION)
CONTROL PANEL RATED NEMA 12

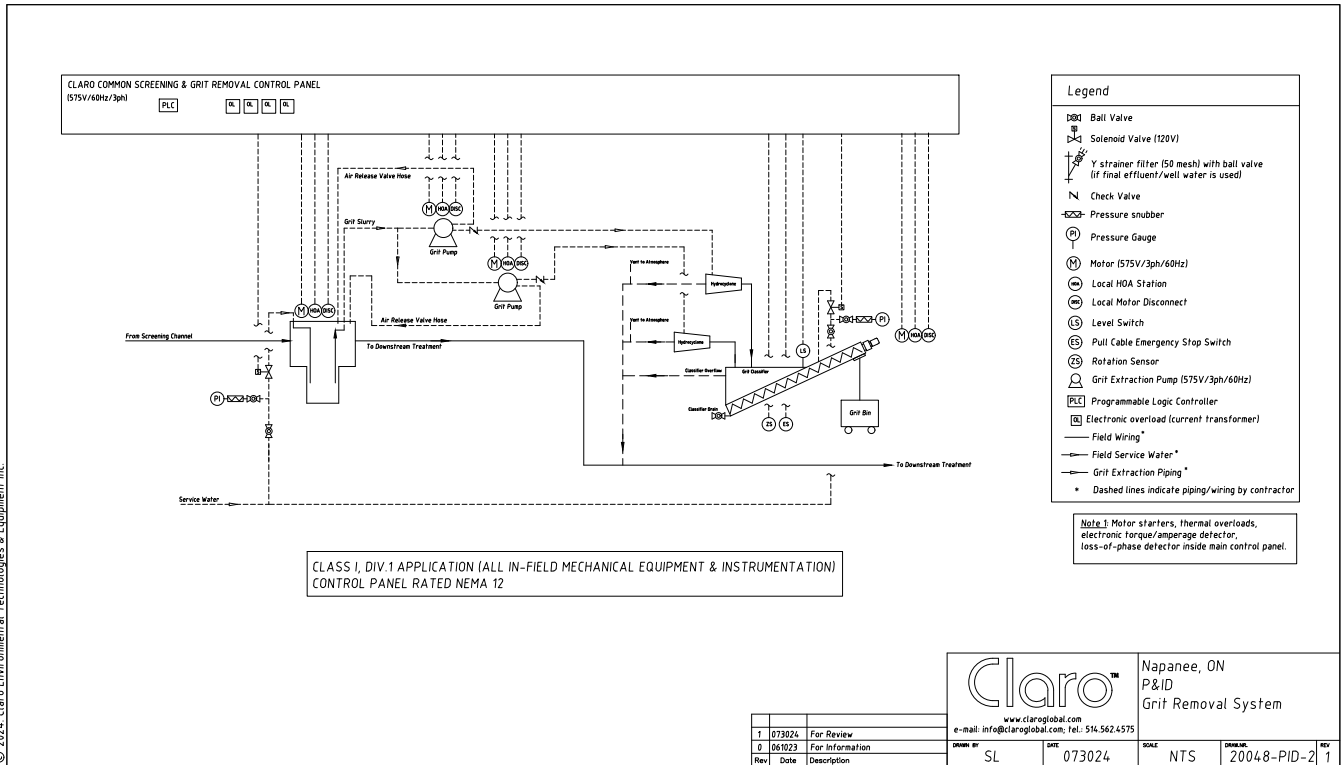
Rev	Date	Description
1	073024	For Review
0	061023	For Information

www.claroglobal.com
e-mail: info@claroglobal.com; tel.: 514.562.4575

Napanee, ON
P&ID
Grit Removal System

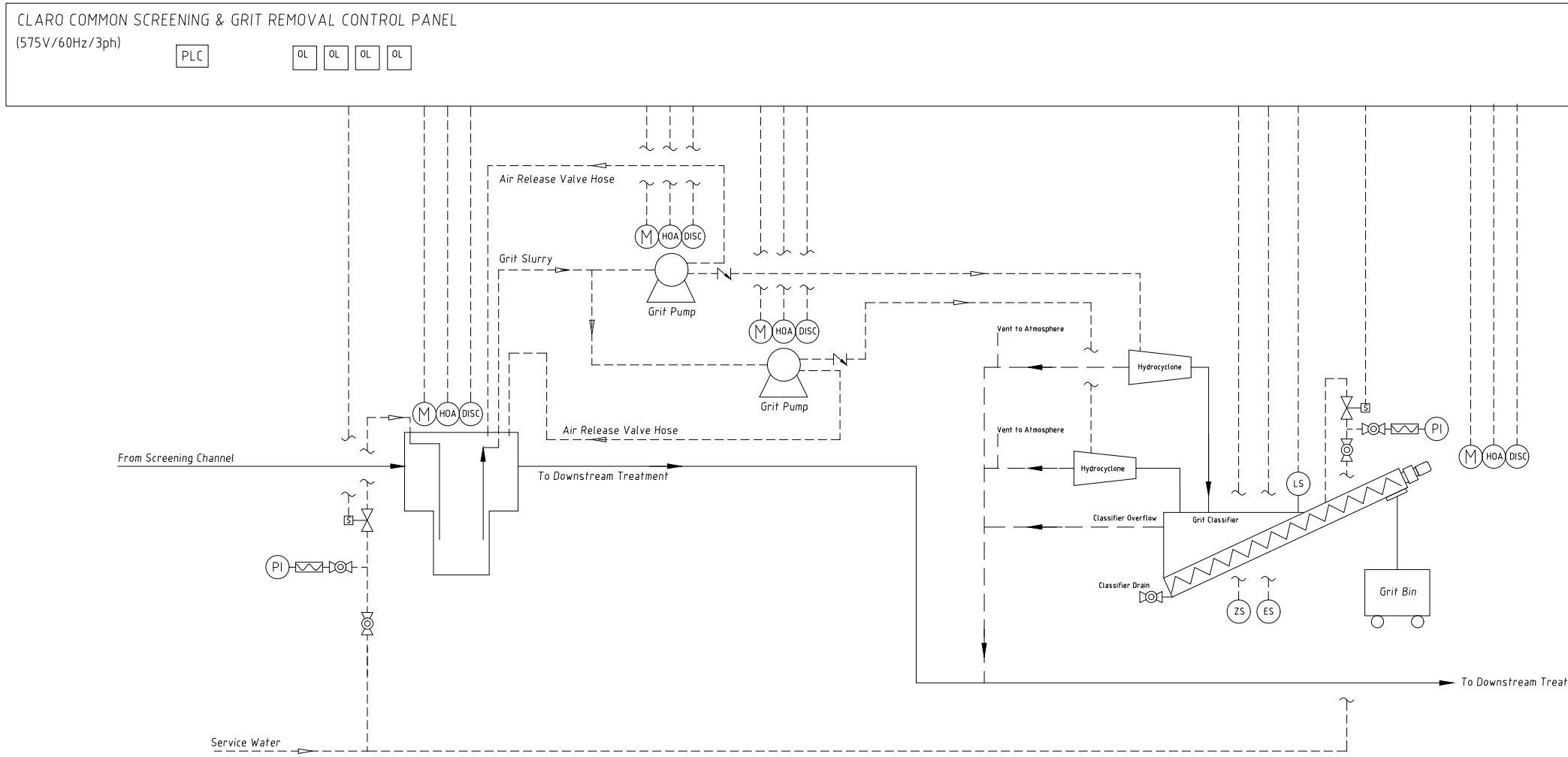
DRAWN BY	SL	DATE	073024	SCALE	NTS	DRAW.NR.	20048-PID-2	REV	1
----------	----	------	--------	-------	-----	----------	-------------	-----	---

C. Project Submittal Drawing – Grit Removal System P&ID



• Please see following page for large format drawing →





Legend

- Ball Valve
- Solenoid Valve (120V)
- Y strainer filter (50 mesh) with ball valve (if final effluent/well water is used)
- Check Valve
- Pressure snubber
- Pressure Gauge
- Motor (575V/3ph/60Hz)
- Local HOA Station
- Local Motor Disconnect
- Level Switch
- Pull Cable Emergency Stop Switch
- Rotation Sensor
- Grit Extraction Pump (575V/3ph/60Hz)
- Programmable Logic Controller
- Electronic overload (current transformer)
- Field Wiring*
- Field Service Water*
- Grit Extraction Piping*

* Dashed lines indicate piping/wiring by contractor

Note 1: Motor starters, thermal overloads, electronic torque/amperage detector, loss-of-phase detector inside main control panel.

CLASS I, DIV.1 APPLICATION (ALL IN-FIELD MECHANICAL EQUIPMENT & INSTRUMENTATION)
CONTROL PANEL RATED NEMA 12

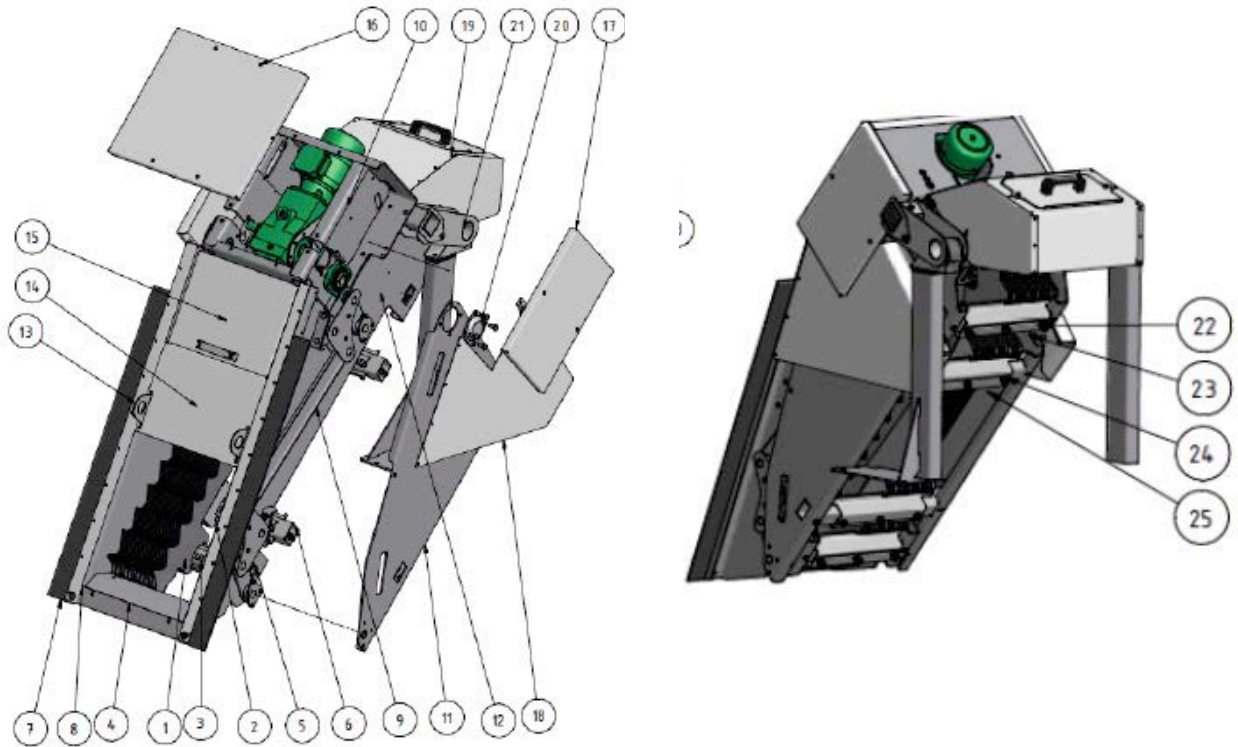
Rev	Date	Description
1	073024	For Review
0	061023	For Information

www.claroglobal.com
e-mail: info@claroglobal.com; tel.: 514.562.4575

Napanee, ON
P&ID
Grit Removal System

DRAWN BY	SL	DATE	073024	SCALE	NTS	DRAW.NR.	20048-PID-2	REV	1
----------	----	------	--------	-------	-----	----------	-------------	-----	---

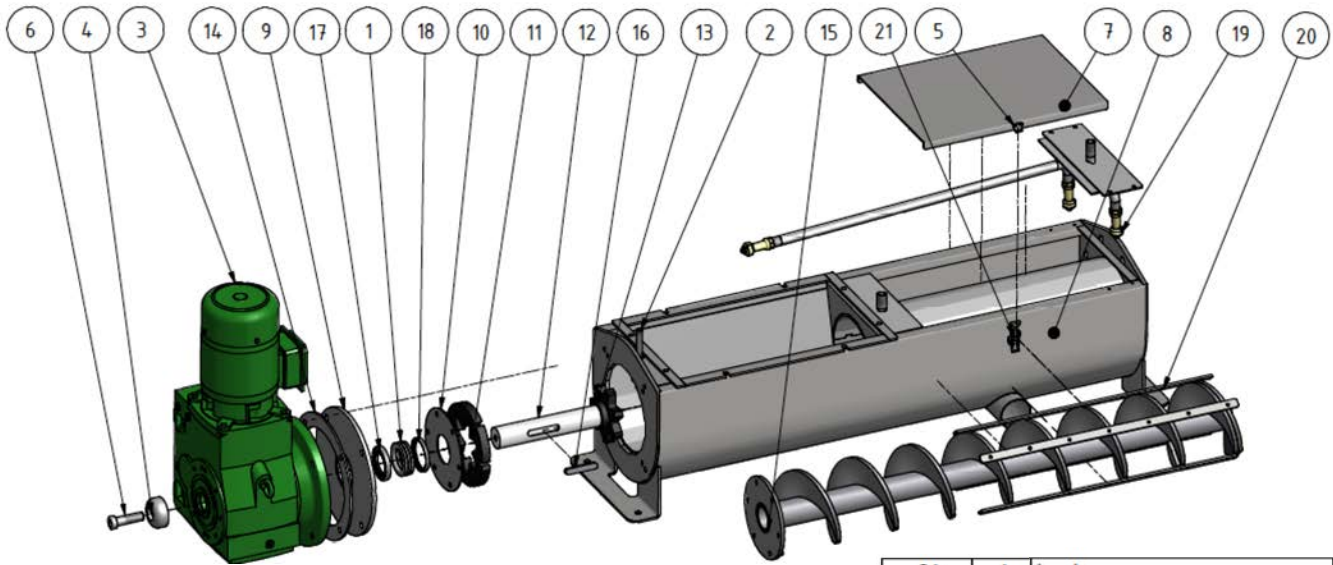
D. Step Screen – Typical Components Drawing (Exploded 3D View)



Item	Quantity	Name
1	Varies	Fixed bar with discharge detail
2	Varies	Movable bar
3	4	Positioning spacer depending on spacing
4	1	Bottom flap
5	2	Fixed cross member
6	2	Movable crossmember
7	2	Rubber – seal
8	2	Rubber clamp
9	2	Linkage system
10	1	Power train housing
11	2	Connecting plate
12	2	Side plate
13	2	Lifting lugs
14	1	Cover
15	1	Inspection lid
16	1	Gearbox cover
17	2	Gearbox cover
18	2	Cover
19	1	Discharge access cover
20	2	Cover – bearing
21	2	Linkage system for supports
22	2	Inner bar fixing channel – fixed
23	2	Outer bar fixing channel – fixed
24	2	Inner bar fixing channel – movable
25	2	Outer bar fixing channel – movable



E. Wash Press – Model TP200 Exploded View 3-D Components Drawing & Listing



21	1	Lock
20	1	Wear liner
19	1	Spray nozzle
18	1	Sealing
17	1	Sealing
16	1	Key
15	1	Spiral
14	1	Distance
13	1	Sleeve
12	1	Shaft assembly
11	1	Carrier
10	1	Bracket
9	1	Drive unit flange
8	1	Press house
7	1	Cover
6	1	Screw
5	2	Lockplate
4	1	Sleeve
3	1	Drive unit
2	1	Pipe
1	1	Bearing

• Materials of Construction

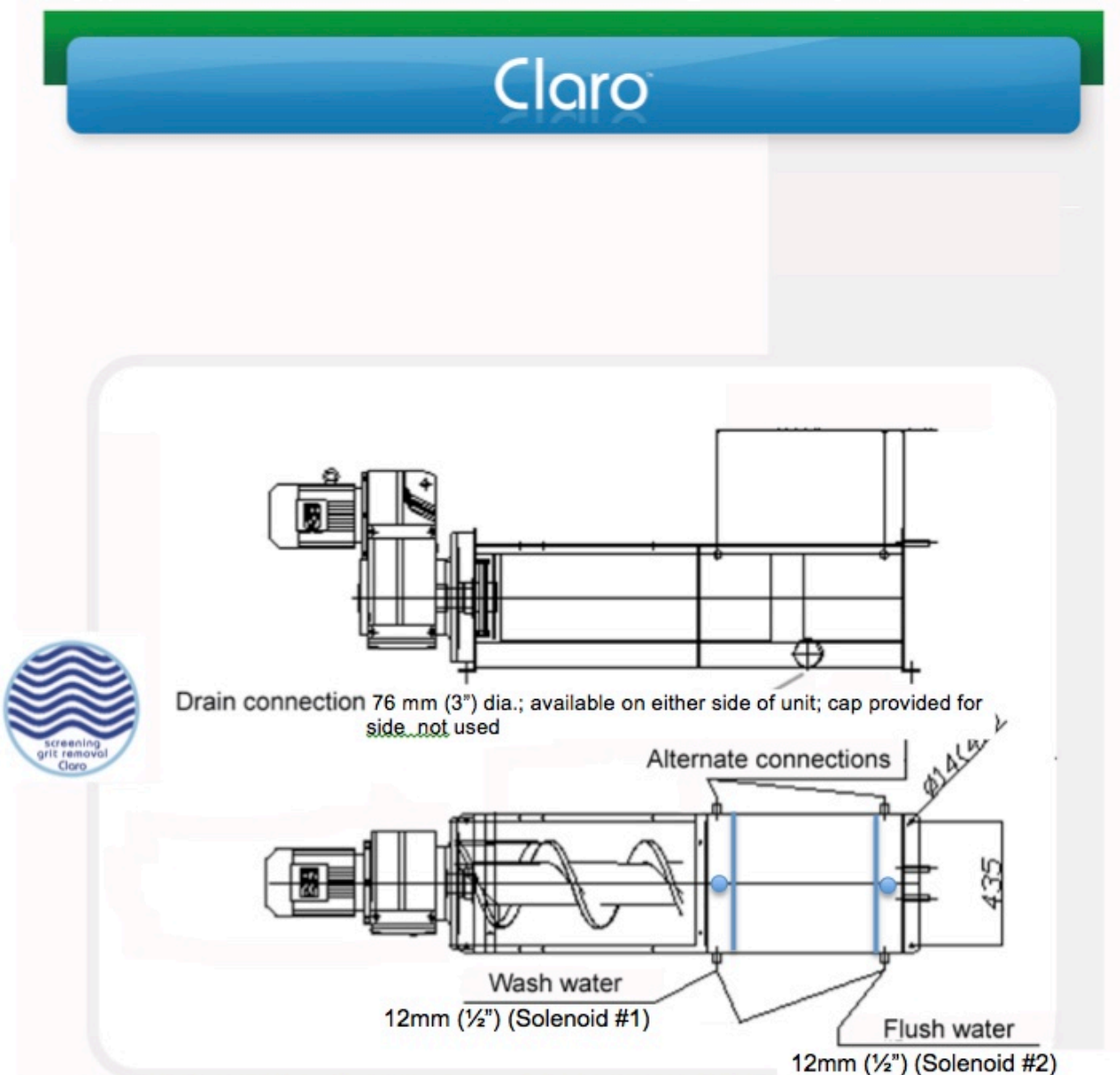
Wash Press is constructed of the following materials:

- Inner & Outer Trough
5 mm AISI 316L stainless steel
- Discharge/Compaction Tube
2 mm AISI 316L stainless steel;
- Shafted Screw
progressively flared
high-tensile & abrasion-resistant micro alloy steel. 220 – 250 Brinell Hardness.



F. Wash Press – Water Supply Piping Arrangement (Suggested)

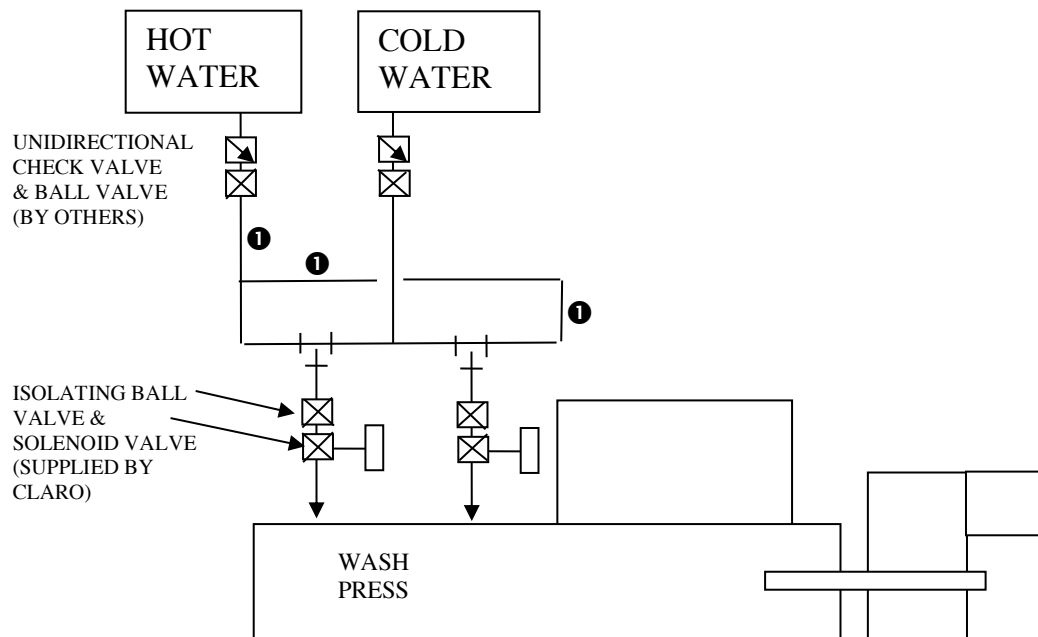
- The wash press has 2 water connections for washing of screenings debris inside the perforated tube and for washing the removed organics from the outside of the perforated tube. These are referred to as solenoid #1 (Washing) and solenoid #2 (Flushing) respectively. For the Napanee application, the 2 connections are 13mm (1/2") & are available on the top of the unit.



- Note: The washing & flushing connections are supplied on the top of the unit as indicated by the blue circles above: ● Note: wash press quick release top cover is easily removable without removing/moving water connections.

F. Continued: Wash Press – Wash Water Piping Arrangement (Suggested)

- The wash press is supplied with water to its 2 water connections as outlined above. At a minimum, these connections are supplied with unheated water. Some applications also include an option for the selection of hot water supply during the winter months for more thorough removal of grease. The schematic below shows suggested piping for both the base unheated and heated water options. Claro supplies 2 stainless steel solenoid valves and 2 stainless steel full port ball valves. The ball valves are used to isolate the solenoids and thus are installed upstream of the solenoids. Please also see additional notes & photograph below.



- SOLENOID #1 CONNECTS TO THE WASH PRESS WASHING CONNECTION
- SOLENOID #2 CONNECTS TO TUBE FLUSHING CONNECTION

- Note 1: For cold-water-only arrangement, eliminate the hot water supply and loop indicated with the following: ❶
- Note 2: Unidirectional check-valve or double back-flow preventer are optional; please refer to project drawings, client preferences, and/or local codes regarding the isolation of potable water supply from contamination zones. If plant Final Effluent (FE) is used for wash & flushing water supply, unidirectional valves are not required.
- Note 3: **N.B.** If reuse water is to be used, a 50 mesh minimum line strainer must be used in order to protect the wash press spray nozzles & to prevent fouling of the solenoid valves. Claro to provide this strainer and corresponding isolating ball valves. Alternately, a self-cleaning strainer is recommended.
- Note 4: Pressure gauge should be installed on the main water supply pipe before the piping branches to the 2 solenoids. The pressure gauge is isolated with a 6 mm (1/4") dia. ball valve. Pressure gauge c/w protective diaphragm or snubber & isolating ball valve are provided by Claro.

- **Sample Solenoid, Ball Valve & Pressure Gauge Arrangement Photograph:** The main principles of wash press instrumentation & piping arrangement are:
 1. Ensure that the solenoids, piping, electrical boxes and wiring do not obstruct an operator's ability to open and remove the wash press inspection cover (indicated in blue below) via the quick release clasps. Thus, the area immediately above the cover should be left free of obstruction.
 2. Piping and wiring should be brought to the connection locations in a manner that minimizes footprint and maximizes an operator's ability to reach/access the equipment. In the photo below the utilities arrive close to the back of the wash press. Depending on the source location of utilities, we can help with routing for this project.



Please note that the ball valves provided for the present project shall be stainless steel. PVC valves are pictured above.



G. Wash Press – Drainage Connection & Piping

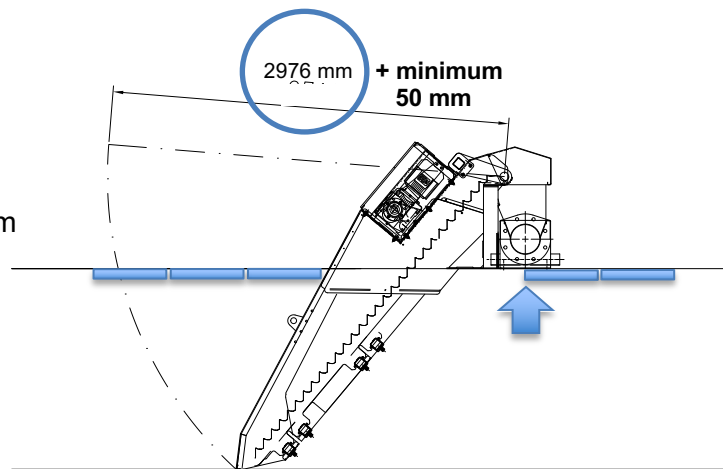
- Each wash press has a wash & flush water reject drain. This drain is 3 inches (76 mm O.D) in diameter for the Napanee WPCP application. This stub drain is available on either side of the wash press. Since the project incorporates a 2mm aperture screen, we recommend running the wash press pressate drain to the upstream side of the screen for additional polishing. Since the influent works building is new, perhaps it would be possible to embed the drain in a manner that allows it to be shorter and removed from the walking area.

H. Channels & Checker Plate / Grating Design

- The sections of checker plate or grating that are installed in front of the fine step screen need to be installed/designed in a manner that will enable the free pivot of the screen out of the channel. The covering should thus be held in place by notches/embedded angles in the concrete at top-of-slab level rather than by angles bolted to the inside walls of the channel. The embedded angles should be flush with the channel (not protrude into the channel) in order to ensure that the screen can be pivoted out of channel with ease and without vailang the neoprene side seals (watch for sharp edges & uneven concrete). This checker plate/grating design should be implemented for the full distance required for the screen to pivot fully out of the channel. This distance for Napanee WPCP is suggested in the drawing inserted immediately below & in the submittal drawings.

2976 mm from screen pivot point + **minimum 50 mm** margin (screen should easily clear upstream level detector sensor equipment). Or, 2595 mm + 50mm measured from the upstream edge of the screen baseplate

Also: downstream channel coverings should extend to wash press centreline in order to avoid an opening under the U-trough of the wash press. No channel covering should be located under the fine screen.



• •

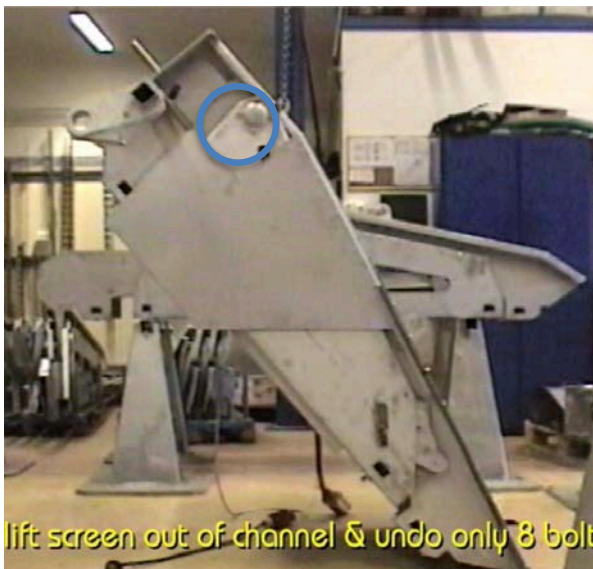
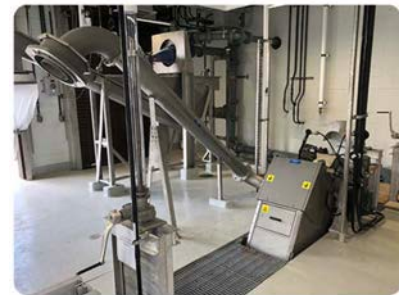
I. Channels (General Note)

- The concrete channel must be true and straight (i.e. does not narrow or take the shape of a parallelogram, trapezoid, or other shape) and the channel invert/bottom is straight & level.

- N.B. ensure that the channel is the specified width and that this width is not overly diminished after channel finishing coatings/epoxy paints etc. are applied. The final/finished width of the channel should leave a minimum of 15 mm of space between the screen frame and the channel walls on each side of the screen. The screen frame or protective side panels should not be in contact with the channel walls. Maximum gap is 40 mm.
- Note: It is important not to confuse the total width of the screen with the width of the channel, which will be wider in order to accommodate the screen's side channel seals. The maximum gap between the screen frame and the channel walls is typically 40 mm on each side.

J. Wiring (General Note)

- The step screen pivots out of channel (please see example photographs at right) – thus, the wiring to the screen motor and home position proximity switch need to have sufficient slack length to enable this pivot to be effected without stressing the electrical connections. Junction boxes should not be attached to the screen or its covers without prior discussion. Screen system wiring should pass through the openings in the motor compartment – either via the motor cut-out or via the round holes pre-cut in the motor compartment. Remember that removable covers will be re-installed on the screen after the installation is complete. Wiring should not conflict with these covers. Also, please be aware that the linkage drive system rotates underneath the side protective covers.
- Wiring should take into account that the approximate area indicated by the blue circle is occupied by moving parts:



K. Ultrasonic Level Sensor Probe – Endress + Hauser Wiring Recommendation

- Endress + Hauser recommends Belden 8208 wiring if the sensor cabling needs to be extended to reach the control panel and transmitter (level transmitter is installed inside the panel rather than outside the panel). Please see Belden 8208 catalog cuts in the following pages for ease of reference. It is important to connect the 2 instrumentation wires & the shield – all three (3) wires are required for the sensors to function properly.
- **N.B. As is the custom and best-practice for field wiring, please run the level sensor and other low voltage instrumentation in conduits, in trays and/or along walls with adequate separation from the potential interference of high voltage supply wires and especially VFD/frequency inverter power supply lines. High voltage lines can disrupt proper signalling and/or damage the ultrasonic level sensors.**
- Belden 8208 cut sheets have been provided as a courtesy to the electrical installer.

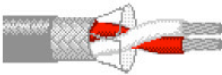



- Belden 8208 catalog cuts following pages →

Detailed Specifications & Technical Data



8208 Paired - Audio, Control and Instrumentation Cable

		<p style="text-align: center;">For more information please call 1-800-Belden1</p> <p style="text-align: center;"><u>See Put-ups and Colors</u></p>
---	--	---

Description:

Overall braid, 18 AWG stranded (16x30) tinned copper conductors, rubber insulation, twisted pair, separator + TC braid shield (73% coverage), PVC jacket.

PHYSICAL CHARACTERISTICS:

CONDUCTOR:

Number of Pairs	1
Total Number of Conductors	2
AWG	18
Stranding	16x30
Conductor Material	TC - Tinned Copper

INSULATION:

Insulation Material	Rubber
Nom. Insulation Wall Thickness	.022 in.
Lay Length	2 in.
Twists/ft.	6

Pair Color Code Chart :

Number	Color
1	Red & White

OVERALL CABLING:

Overall Cabling Separator Material	Polyester Tape
------------------------------------	----------------

OUTER SHIELD:

Outer Shield Type	Braid
Outer Shield Material	TC - Tinned Copper
Outer Shield %Coverage	73 %

OUTER JACKET:

Outer Jacket Material	PVC - Polyvinyl Chloride
Outer Jacket Nominal Wall Thickness	.025 in.

OVERALL NOMINAL DIAMETER:

Overall Nominal Diameter	.257 in.
--------------------------	----------

MECHANICAL CHARACTERISTICS:

Detailed Specifications & Technical Data



8208 Paired - Audio, Control and Instrumentation Cable

Operating Temperature Range	-20°C To +80°C
Non-UL Temperature Rating	80°C
Bulk Cable Weight	36 lbs/1000 ft.
Max. Recommended Pulling Tension	69 lbs.
Min. Bend Radius (Install)	2.6 in.

APPLICABLE SPECIFICATIONS AND AGENCY COMPLIANCE:

APPLICABLE STANDARDS:

EU CE Mark (Y/N)	Yes
EU RoHS Compliant (Y/N)	Yes
EU RoHS Compliance Date (mm/dd/yyyy):	01/01/2004

PLENUM/NON-PLENUM:

Plenum (Y/N)	N
--------------	---

ELECTRICAL CHARACTERISTICS:

Nom. Characteristic Impedance	44 Ohms
Nom. Inductance	0.20 µH/ft
Nom. Capacitance Conductor to Conductor @ 1 KHz	46 pF/ft
Nom. Cap. Cond. to Other Cond. & Shield @ 1 KHz	77 pF/ft
Nom. Conductor DC Resistance @ 20 Deg. C	6.5 Ohms/1000 ft
Max. Operating Voltage - Non-UL	300 V RMS
Max. Recommended Current	5.2 Amps per conductor @ 25°C

PUT-UPS AND COLORS:

Item	Description	Put-Up (ft.)	Ship Weight (lbs.)	Jacket Color	Notes
8208 060100	1PR #18 EPDM SHLD FRPVC	100	4.7	CHROME	
8208 0601000	1 PR #18 EPDM SHLD FRPVC	1000	43	CHROME	C
8208 060500	1PR #18 EPDM SHLD FRPVC	500	20	CHROME	C
8208 060U1000	1 PR #18 EPDM SHLD FRPVC	U1000	42	CHROME	
8208 060U500	1PR #18 EPDM SHLD FRPVC	U500	21.5	CHROME	

C = CRATE REEL PUT-UP.

Revision Number: 1 Revision Date: 07-21-2005

**Detailed Specifications &
Technical Data**



8208 Paired - Audio, Control and Instrumentation Cable

© Copyright 2006 Belden, Inc
All Rights Reserved.

Although Belden ("Belden") makes every reasonable effort to ensure their accuracy at the time of this publication, information and specifications described herein are subject to error or omission and to change without notice, and the listing of such information and specifications does not ensure product availability.

Belden provides the information and specifications herein on an "AS IS" basis, with no representations or warranties, whether express, statutory or implied. In no event will Belden be liable for any damages (including consequential, indirect, incidental, special, punitive, or exemplary damages) whatsoever, even if Belden has been advised of the possibility of such damages, whether in an action under contract, negligence or any other theory, arising out of or in connection with the use, or inability to use, the information or specifications described herein.

All sales of Belden products are subject to Belden's standard terms and conditions of sale.

Belden believes this product to be in compliance with the following environmental regulations: California Proposition 65 Consent Judgment For Wire & Cable Mfgs.(San Francisco Superior Court Nos. 312962 And 320342); EU RoHS (Directive 2002/95/EC, 27-Jan-2003);Material manufactured prior to the compliance date may still be in stock at Belden facilities and in our Distributor's inventory. EU ELV (Directive 2000/53/EC, 18-Sept-2000); EU WEEE (Directive 2002/96/EC, 27-Jan-2003); And EU BFR (Directive 2003/11/EC, 6-Feb-2003). The information provided in this Product Disclosure, and the identification of materials listed as reportable or restricted within the Product Disclosure, is correct to the best of Belden's knowledge, information and belief at the date of its publication. The information provided in the Product Disclosure is designed only as a general guide for the safe handling, storage, and any other operation of the product itself or the one that it becomes a part of. This Product Disclosure is not to be considered a warranty or quality specification. Regulatory information is for guidance purposes only. Product users are responsible for determining the applicability of legislation and regulations based on their individual usage of the product.

Belden declares this product to be in compliance with EU LVD (Low Voltage Directive 73/23/EEC), as amended by directive 93/68/EEC.



L. Work Outline (Install & Supply) to Be Completed by Installing Contractor

Contractor Installation Requirements Outline

Introduction: The following is an outline of the key installation requirements for the Claro fine screening and vortex grit removal systems equipment for the Napanee WWTP application (note: not an exhaustive listing). An installation information package will be provided to the installer. A Claro representative will be on site to provide final installation advice and check the installation. Claro would also be keen to provide an installation requirements/tips overview to the installation foreman/personnel via Teams.

Part 1: Installation of Mechanical Equipment – Outline:

A. Fine Screen

- Each screen has two vertical supports — one on each side of the screen. Each support column is anchored to the screening room floor slab with 3 bolts for each support. Height adjustment, if required, is accomplished by adding manufacturer-provided shims that are installed on the top of the screen support columns. Vertical supports are installed flush with the opening of the channel (or near flush and avoiding the grating channel notches). Claro on-site installation inspection/assistance will ensure proper alignment, plumbness etc.

Each screen arrives with the gear drive preinstalled and filled with oil as required. As Napanee WWTP is a Class I, Div. 1 installation, the CSA Class I, Div. 1 motor will need to be installed onto the gear drive on-site within the motor compartment of the screen. Please see 'Part 3: Class I, Div. 1 Motor Installation & Connection Instructions' below in this section. Stainless steel mounting hardware is provided by Claro.

There are no special modifications to the channels that are required e.g. no channel indentations or embedded steel/frame for the new screens. The channels, however, need to be straight & square. The bottoms of the channels must be level, straight & parallel with the floor slab. The Neoprene side skirts of the screen create a seal against the channel's vertical walls. The screen can be pivoted out of channel @ its lifting lugs.

- Screen-to-wash press chute cover c/w operator-safe removable inspection lid is shipped loose for bolting on to each screen on site (4 retaining bolts) or the cover is already attached with hinges.

B. Wash Press

- As the Napanee WWTP is a Class I, Div. 1 installation, each wash press arrives with gear drive preinstalled & filled with oil as required. The CSA Class I, Div. 1 motor will be shipped separately and will need to be installed on the gear drive. Please see 'Part 3: Class I, Div. 1 Motor Installation & Connection Instructions' below in this section. Stainless steel mounting hardware is provided by Claro.

The wash press is anchored to the concrete floor slab (or) support beams/bracket. The inlet hopper is typically already preinstalled on the wash

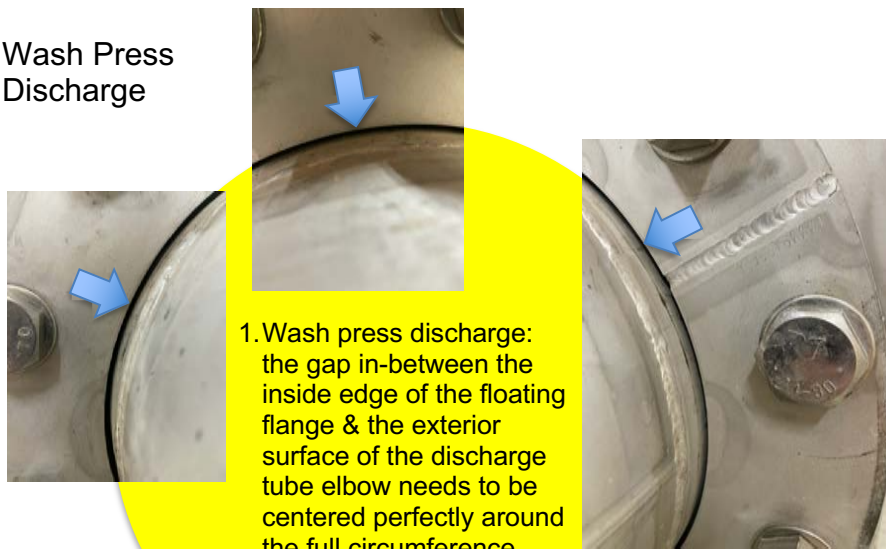
press inlet flange. The wash press discharge tube floating flange is bolted onto the outlet flange of the wash press (with the provided gasket also installed). Discharge tube supports are also provided and bolted to the floor. Vertical drop chute portion of the discharge tube is bolted to the vertical steel utility corridor columns.

- **N.B.:** Each segment of wash press discharge tube must be perfectly centered in a manner that ensures a smooth internal transition between the wash press discharge and the first elbow and between the exit flange of the first elbow and all subsequent discharge tube segments – compacted screenings must not encounter an offset pipe segment as it is pushed from the wash press discharge to the pipe system outlet/bagging system.

At the wash press discharge, the welded Vanstone ring must land perfectly centered within the floating flange that is supported by two (2) threaded rods projecting from the wash press discharge flange (i.e. equal gap between the outer diameter of the Vanstone ring and the inner diameter of the floating flange (please see photographs below for illustration). Subsequent discharge tube sections are centered by matching the Vanstone ring perimeters of each discharge tube (observed by looking in-between the floating flanges from their side edges). It is strongly recommended to leave the wash press and its tube unanchored until a Claro representative can validate the discharge tube installation.

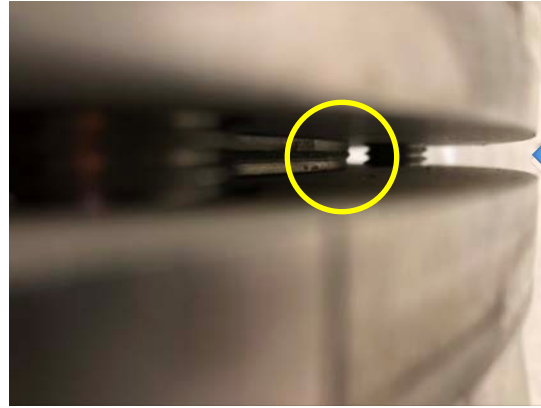
Wash Press Discharge Tube Alignment Requirements Overview:

Wash Press Discharge



2. Perimeter of welded Vanstone rings at each subsequent discharge tube flange area also to be aligned / centered perfectly including the provided gasket in-between. Note: The 2 floating flanges can be centered for aesthetics, however, the Vanstone rings are the critical element for a smooth internal transition between tube segments. Please see following page for further illustration.





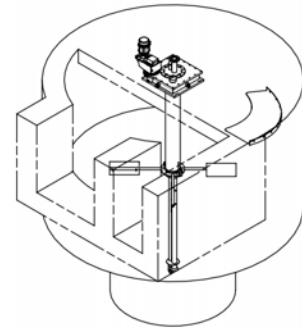
- Perimeter of welded Vanstone rings at each subsequent discharge tube flange also to be aligned / centered perfectly including the provided gasket in-between. Alignment can be checked by inspecting the Vanstone rings in-between the floating stainless steel flanges as shown above & at right.



- Service water piping to the wash press (1/2" dia.): One (1) isolating ball valve and one (1) solenoid valve are connected to the wash press washing and flushing water connections (total of 2 isolating ball valves and 2 solenoids provided by Claro). A pressure gauge, diaphragm / snubber and isolating 1/4" ball valve are also installed on the feed line to the wash press (gauge and valve supplied by Claro). Note: If piping is copper piping, we recommend that it be coated with a clear coat of Varathane or equivalent in order to protect piping from H2S corrosion. PVC or stainless steel piping is also satisfactory. Please see project specifications for required pipe material type.
- Each wash press drain (76 mm O.D.) is piped from one side of the unit (a cap is provided for the opposite unused drain connection). Typically, a Fernco rubber sleeve is used to join the drain stub to a PVC drain pipe. At Napanee, however, the drain should likely direct pressate to the upstream side of the fine screen for polishing. Please see section 3.C 'Open items', item 6 for discussion. Each wash press is installed level with the screening room floor. Fernco rubber sleeve c/w 2 x stainless steel gear clamps and PVC piping by installing contractor. The cap for the unused drain connection may need a silicone seal for water tightness.
- If service water is not potable, install provided Y-strainers & flushing ball valves. Or, employ an upstream automatic strainer.

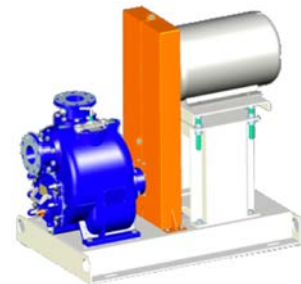
C. Vortex Grit Removal Unit

- The paddle system arrives loose including all required stainless steel hardware.
- The paddle drive system arrives partially assembled. The drive shaft and paddles will arrive on a pallet. The drive unit (Class I, Div. 1 motor + planetary gear reducer assembly) will arrive on a pallet or in a crate. The gear reducer is pre-filled with oil as required. The planetary drive unit is to be installed plumb and level on the concrete bridge that is integral to the vortex tank (by others). Oil, provided by Claro, is added to the planetary gear drive casing by Claro personnel prior to start-up. The paddle system is adjusted to the height indicated on the installation instruction drawings that will be provided with or in advance of the system delivery. Paddle vertical elevation and angle can be modified in order to adjust the performance of the system. As a basis, the paddles are installed at the indicated vertical elevation and at an angle of 45 degrees from horizontal in order to promote an upward flow of influent when rotating. Elevation, angle and rotational direction will be indicated on the installation instructions drawings that will be provided with or in advance of the system delivery.
- The tear drop / crescent vortex inlet baffle is provided loose. The baffle is attached to the vortex tank concrete wall with stainless steel anchors (anchors by others).
- Detailed instructions to complete the assembly will be provided prior to delivery.



D. Grit Pumps

- Each grit pump will arrive on site as an assembled skid complete with motor, belt drive and pump. The skids are to be installed plumb and level. Levelling is accomplished by adjusting the contractor supplied bolts anchoring the skid to the level & smooth concrete floor slab / housekeeping pad. Claro provides a suggested piping layout drawing to guide the installer in the piping design. This suggested piping is shown in the submittal drawings. The installer should, however, develop their own drawings/site measurements to ensure that the piping runs are manufactured as needed. We recommend that elbows be flanged for ease of replacement in the future if required. The installer also implements the discharge check valve & air release valve provided by Claro (please see catalog cuts provided in this submittal in section 3.G. item v & vii).



E. Grit Classifier

- As the Napanee WWTP is a Class I, Div. 1 installation, the classifier arrives with gear drive preinstalled & filled with oil as required. The CSA Class I, Div. 1 motor will be shipped separately and will need to be installed on



- the gear drive. Please see 'Part 3: Class I, Div. 1 Motor Installation & Connection Instructions' below in this Section. Stainless steel mounting hardware is provided by Claro.
- The classifier is provided with support legs that are to be bolted to the screening room floor slab. Each leg is to be mounted with/on one bolt/anchor. Levelling of the classifier is accomplished by adjusting the bolts or adding shims, if required.
 - The classifier is provided with an independent hydrocyclone stand and one (1) hydrocyclone. The hydrocyclone is mounted on the stand with the provided stainless steel hardware. The stand is adjusted in order to enable the apex outlet of the hydrocyclone to fit into the input point on the classifier inlet box. The outlet piping of the hydrocyclones require a specific configuration and vent in order to function effectively. Please see below for additional hydrocyclone piping instructions.
 - The classifier is provided with a degritted influent weir overflow drain that, at Napanee WWTP, is to be routed to the channel upstream of the vortex grit removal tank. The most practical drain pipe routing is to be discussed. The classifier is provided with a flanged outlet. All piping from this outlet is by the contractor and is typically provided in PVC or stainless steel (please verify the specification for required piping material type).
 - The classifier is provided with a maintenance drain connection at the bottom of the unit. The connection is 2" and a ball valve is provided by Claro.

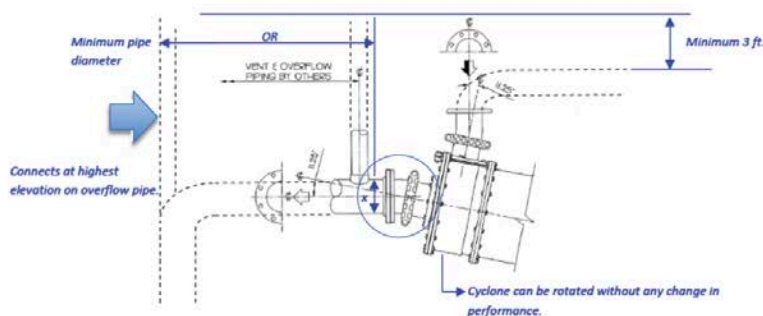
F. Hydrocyclone Piping Requirements

Classifier Hydrocyclone Outlet/Overflow Piping & Vent Arrangement: Classifier outlet drain & hydrocyclone overflow/outlet piping have specific arrangement requirements in order to ensure proper function. Here are the hydrocyclone manufacturer's piping recommendations:

****Important note**** siphon prevention. Siphoning can occur if the overflow pipe (stream with water with grit removed) path goes below the elevation of the cyclone inlet/inlet pipe. Siphoning disrupts cyclone operation and must be prevented. The most common method is a vent pipe. The vent should connect on the run from the cyclone overflow to the elbow (the highest elevation on the cyclone overflow pipe). The vent pipe should be at least half of the overflow pipe diameter and extend at least 3 feet above the level of the pipe top elevation on the inlet to the cyclone.

Below sketch showing the siphon vent setup as it relates to the cyclone.

Siphon vent setup or some siphon prevention required to prevent siphoning if overflow pipe goes below cyclone inlet maximum elevation.



Claro provides the Victaulic pipe elbow that brings the 11.25 degree inclination of the hydrocyclone overflow outlet flange to horizontal (indicated with blue circle above). This elbow enables the piping to be run horizontally as per the hydrocyclone manufacturer's recommendations. A vent is also required as shown above. We would recommend a 3" or 4" pipe dia. for the vent. The arrangement shown in photographs from Bracebridge WWTP (Muskoka, ON) on the following page reflect the vent location indicated with a blue arrow above.

- © :
- Please see following page for photographs of an installation including the piping arrangement described above.



Vent (either to atmosphere or connected to odour control)

Part 2: Power Supply & Control Wiring Summary:

- Please also see 'Field Wiring & Wire Weights Diagram' including in this technical submittal (section 7.C).
- Each fine screen (x2) has the following electrical elements:
 - a) One (1) reversible motor (575V/3Ph/60Hz) c/w (1) integrated electrical brake; in Class I, Div. 1 environments, the screen motor & brake are wired separately i.e. each has separate 575V leads back to the Claro control panel. Please see Stearns brake wiring diagram included below (only the two [2] black coil wires are brought back to the Claro control panel – the other wires are capped/unused in this application).
 - b) One (1) home position proximity switch (24 VDC) preinstalled in the screen motor compartment (wired back to the Claro control panel). The electrician is asked to provide a Teck cable sheath/covering on the 24VDC cable for protection against physical damage.
 - c) Two (2) ultrasonic level detector probes that sense liquid level in the screening channel upstream and downstream of the step screen. The level sensor probes are wired back to the transmitter installed in the Claro control panel via the designated terminal blocks shown in the As-Built control panel drawings.
 - d) One (1) float switch (24VDC) Class I, Div. 1 upstream of each fine screen for high level indication wired back to the Claro control panel (protected by intrinsic barrier).
 - e) One (1) combination Man/Off/Auto + Forward/Off/Reverse + latchable E-Stop button local station. Rated Class I, Div. 1 (wired back to the Claro control panel).
 - f) One (1) motor power lock-out station. Rated Class I, Div. 1 (wired back to the Claro control panel).
- Each wash press (x2) has the following electrical elements:
 - g) One (1) reversible motor (575V/3Ph/60Hz) (wired back to the Claro control panel).
 - h) Two (2) solenoid valves 2 x ½", Class I, Div. 1 (120V/1Ph) (wired back to the Claro control panel).
 - i) One (1) combination Man/Off/Auto + Forward/Off/Reverse + latchable E-Stop button local station. Rated Class I, Div. 1 (wired back to the Claro control panel).
 - j) One (1) motor power lock-out station. Rated Class I, Div. 1 (wired back to the Claro control panel).
- The vortex grit removal unit (x1) has the following electrical elements:
 - k) One (1) forward-only motor (575V/3Ph/60Hz) (wired back to the Claro control panel).
 - l) One (1) solenoid valve 1 x 1½", Class I, Div. 1 (120V/1Ph) (wired back to the Claro control panel).

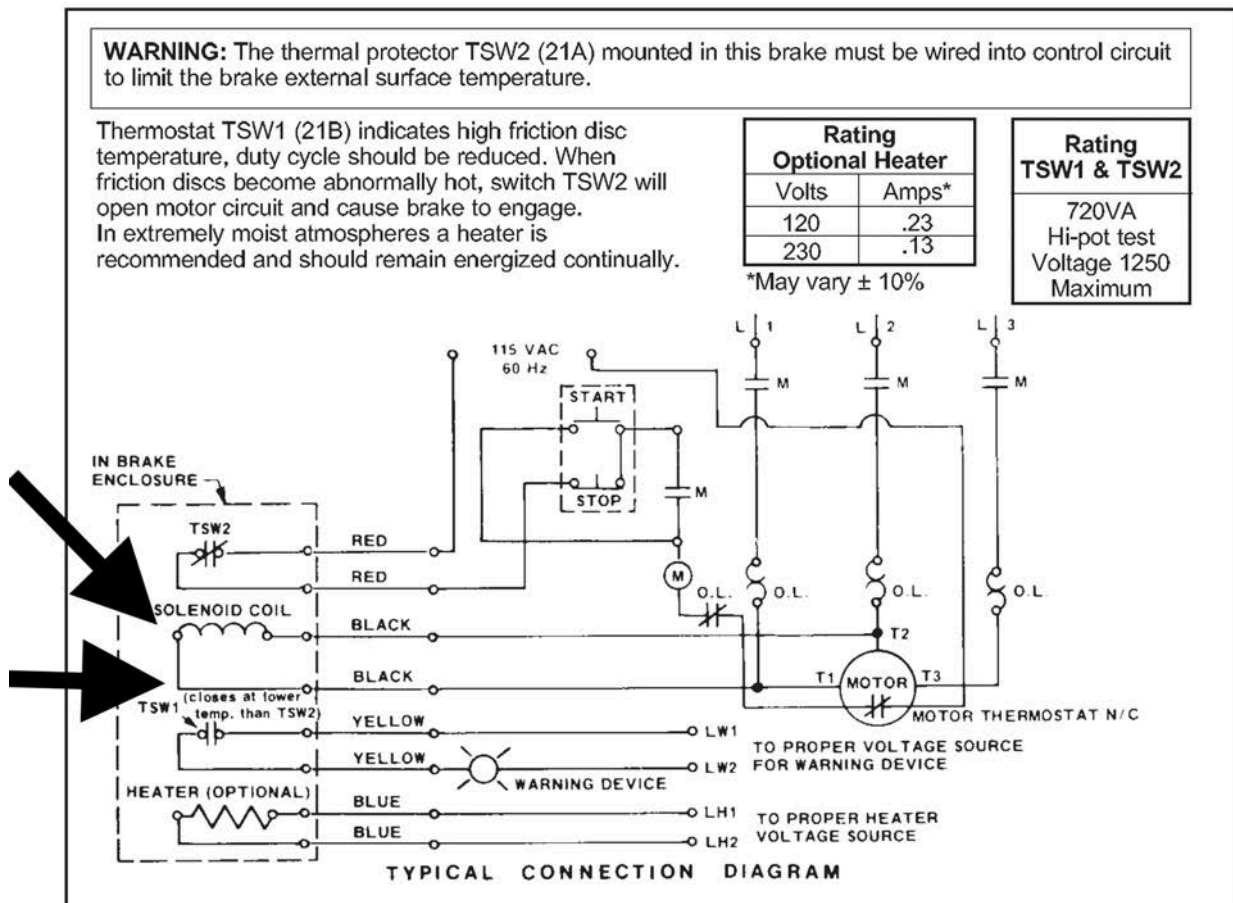
- m) One (1) combination Man/Off/Auto + Forward/Off/Reverse + latchable E-Stop button local station. Rated Class I, Div. 1 (wired back to the Claro control panel).
- n) One (1) motor power lock-out station. Rated Class I, Div. 1 (wired back to the Claro control panel).
- Each grit pump (x2) has the following electrical elements:
 - o) One (1) forward only motor (575V/3Ph/60Hz) (wired back to the Claro control panel).
 - p) One (1) combination Man/Off/Auto + Forward/Off/Reverse + latchable E-Stop button local station. Rated Class I, Div. 1 (wired back to the Claro control panel).
 - q) One (1) motor power lock-out station. Rated Class I, Div. 1 (wired back to the Claro control panel).
- The classifier unit (x1) has the following electrical elements:
 - r) One (1) reversible motor (575V/3Ph/60Hz) (wired back to the Claro control panel).
 - s) One (1) rotation sensor (wired back to the Claro control panel).
 - t) One (1) pull-cable safety switch (wired back to the Claro control panel).
 - u) One (1) Vibronic level sensor (wired back to the Claro control panel).
 - v) One (1) combination Man/Off/Auto + Forward/Off/Reverse + latchable E-Stop button local station. Rated Class I, Div. 1 (wired back to the Claro control panel).
 - q) One (1) motor power lock-out station. Rated Class I, Div. 1 (wired back to the Claro control panel).
- Note: A field wiring and wire weights diagram is provided in section 7.C of the present submittal that illustrates electrical connections to be made and the number of conductors for each connection.



• Continued on following page →

• Fine Screen Motor Electrical Brake – Wiring Diagram

Note: Please connect the two black wires (powering the brake coil). Other wires are capped / marretted – i.e. red, yellow & blue wires not used. Here is a wiring diagram representing the brake coil wires.



• Continued on following page →

Part 3: Class I, Div. 1 Motor Installation & Connection Instructions

- Part 1: Location of Motor Half Coupling: the Baldor Class I, Div. 1 motors for the equipment arrive on site for bolting to the NEMA flange that is pre-installed on the SEW gear drive. The coupling half of the Baldor motor (Item 479 on the drawing at right; Fig. A.) needs to be adjusted to mate perfectly with its corresponding half, which is at a fixed position as part of the NEMA flange. Either the NEMA flange will be supplied with a kit that includes a shorter stepped key and a spacer ring for the positioning of the motor's coupling half (or) the position of the coupling half will need to be set by the installer as shown in Fig. B.

To measure the required location of the coupling half, the installer will measure the distance from the flange face of the NEMA flange to the lower area of the NEMA flange half coupling (Measurement A; Fig. B.). The lower area of the motor half coupling will be located at Measurement A from the flange face of the motor in order that the two coupling halves mate fully. The motor half coupling is secured with its set screw.

Fig. A

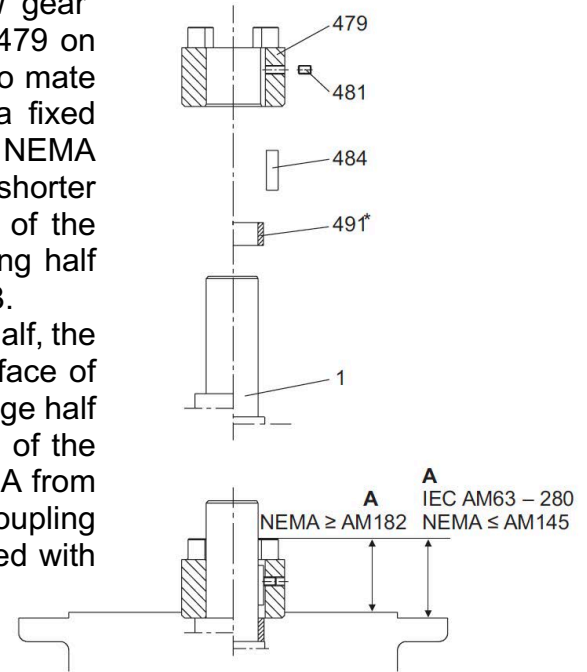
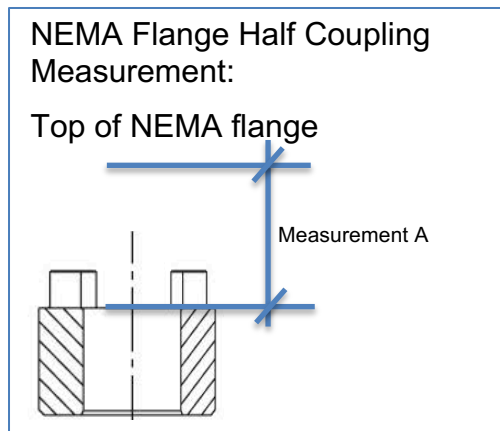


Fig. B



NEMA flange Half Coupling

- [1] Motor shaft
- [479] Coupling half
- [481] Set screw

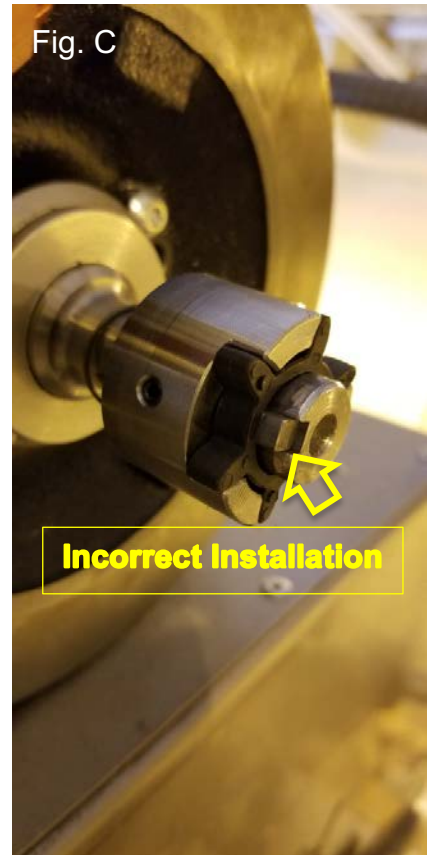
- [484] Key
- [491] Spacer tube



• Continued on following page →

- **Part 2 – Installation of Key:** The key must also be the length of the motor's half coupling and must not protrude beyond the plastic/rubber 'spider' or 'star'-shaped shock absorber. The photo shows a key that has not been trimmed sufficiently. The key should be trimmed in order to fit within the footprint of the motor half coupling. The key should not run under or beyond the plastic/rubber 'star' shock absorber as shown here (shown by a yellow arrow; Fig. C). The key should be trimmed in order to end flush with the end of the half coupling (Fig. D).

Note: The NEMA flange may be accompanied by a stepped key that will accommodate the requirements outlined in this installation description. If this key is not appropriate, please trim the key that ships with each Baldor motor as shown (key will be attached to the shaft of each motor).



- **Correct Installation of Key:** (key is flush with upper coupling footprint; hex set screw tightened & shock absorber installed into coupling after key properly installed & coupling position on shaft is installed as per Part 1 instructions outlined above)



- Continued on following page →

Part 4: Service Water Supply Requirements Summary:

Wash Press: Required water supply to the wash press is one (1) x ½” dia. supply that splits via a T to: a) a washing connection & b) a flushing connection on the top of the wash press. Claro supplies solenoids and ball valves that are installed onto this piping near the wash press.

Service water requirements: approx. 0.7 L/s @ 3.8-4.5 bar (55 – 65 psig) dynamic (when the respective solenoid is open). Static pressure showing on the gauge is typically approx. 10 -15 psig higher to achieve the dynamic pressures cited above. If the pressure is higher, Claro would be happy to discuss. It is rare that a pressure regulator is needed since plant pressure is typically at most 75 – 80 psig.

Vortex Unit: Required water supply to the vortex unit is one (1) x 1-½” dia. supply that connects to a threaded pipe end provided at the planetary gear drive. Claro supplies a solenoid and isolating ball valve that are installed onto this piping near the threaded pipe end. A flushing connection on the line between the grit pumps and the vortex tank is also suggested.

Service water requirements: approx. 4-6 L/s @ 3.8-4.5 bar (55 – 65 psig) dynamic.



M. Equipment Storage (Prior to Installation)

Screening & Grit Removal Equipment Including Control Panels:

- Mechanical equipment (except grit pumps) can be stored indoors or outdoors.
- For either indoor or outdoor storage the mechanical equipment should be stored on its original pallet(s) in order to prevent contact with the soil/floor and secured against theft.
- If stored outdoors, the mechanical equipment should also be covered with new tarps to protect equipment from the elements. New tarps are recommended in order to protect stainless steel from surface contamination.
- Control panel equipment & instrumentation should be stored indoors in a dry, heated environment and protected from accidental collision damage and theft.
- If storage is envisioned to exceed 6 months, please contact Claro for additional instructions.

Grit Pump Skid:

- The grit pump skid must be stored indoors in a secured location in its original packaging in order to protect against theft and damage. In order to ensure preservation of paint finishes on the pump casing & the belt guard enclosure, the grit pump should be stored indoors in a heated and humidity-controlled storage environment.



N. Offloading Instructions – Mechanical Equipment (Preliminary)

Screens, Wash Press & Grit Classifier

1. The screening equipment and grit classifier arrives in a marine container and on a chassis truck. Each piece of equipment is mounted on a specially-built wooden pallet that is screwed to the floor of the container with Torx-type screws. The locations of the screws are indicated with a dot of spray paint. The screws must be removed before unloading otherwise the pallets can break on removal. Having a fully-charged cordless drill with Torx bits at offload is recommended. The Torx bit size is 25 or 30, however, having a standard set of Torx bits is recommended in case the size varies from the expected size. Also, having a grinder available may also be helpful in case a Torx screw is difficult to remove (the grinder can be used to cut the screw head). If the head of the Torx screw snaps (the plastic slide flooring of the container is typically high density and anchors the screw solidly and can snap the shaft of the screw on attempted removal), one can place a pry bar under the pallet to pull it up and further snap the screw, if required.
2. There are also white nylon straps securing the equipment. These straps are cut and then disposed of.
3. Unloading will require a boom crane or extended fork telehandler that can reach into the container and pick-up the equipment by its lifting lugs or other approach. Each screen has four lifting lugs for a 4-point lift: 2 on the forward part of the screen & 2 within the screen engine compartment (the engine compartment covers need to be removed for access — cover bolts are 13mm head size). The lifting lugs have holes that are 50mm dia. The boom crane or telehandler must be rated for the full weight of the heaviest piece of equipment. Weights and a container layout drawing will be provided at time of shipping. Here is a photograph of a large screen lifted in this manner:

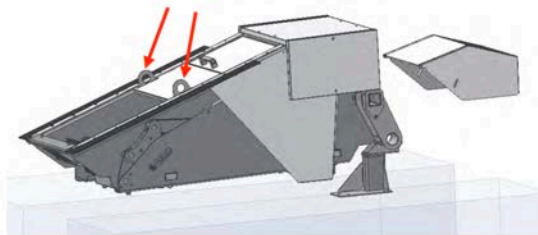


Figure 4. Lifting the screen, arrows showing lifting lugs.

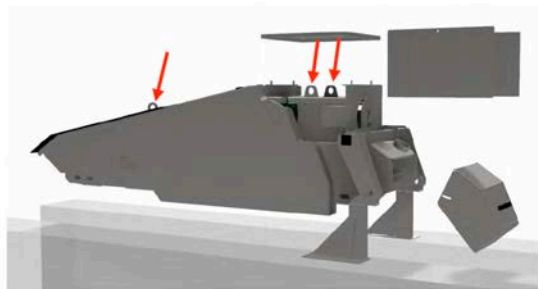


Figure 5. Lifting lugs for fine screens with a model number from 1700 to 4500



The wash press has lifting lugs at each end. The lifting lugs can be used for offloading from the container. Alternatively, the pallet can be used to offload. Due to the overall length of the wash press, care should be taken to ensure the pallet is properly balanced if being offloaded by a forklift.

Offloading can also be assisted by the use of a forklift with extended forks or a telehandler with extension as shown in the following photographs. Note: In these photographs, the telehandler operator has not used the screen lifting lugs – rather the entire assembly including the pallet was lifted with straps:



4. The unloading is referred to by the transport company as a “live-unload”, which means that the container arrives and the driver waits until the unloading process is complete. The driver will usually quote the number of free hours allowed before charges accrue. The unloading crew can ignore this time limit, however, as Claro will cover any extra costs. We want to ensure that everyone takes their time and is comfortable with the unloading process.
5. The delivery is made by appointment with the site foreman. The transport company will call you to schedule delivery on site (we will also track the shipment, however, you may hear the last-stage delivery news before we do as your offloading personnel contact information will be in the possession of the transport company). We will also update as the equipment nears Port of Montreal, when it loads to rail (if applicable) and when it arrives at the local CN Yard. The last step will be the delivery appointment.
6. The equipment can be stored outside on their original pallets and beneath an uncontaminated tarp in a secured area (to protect against scrap metal thieves). No other preparation or weather protection is required unless the storage is envisioned to be longer than 6 months.

Vortex Paddle System, Planetary Gear Drive

7. The vortex gear drive is delivered on a pallet or in a crate. The grit extraction & fluidization piping and the paddle system components are shipped on pallets in a conventional, closed transport truck or a flatbed. Components are offloaded with a forklift or telehandler.

Grit Pumps

8. Grit pump skids are delivered on individual, specially-built pallets and shrink-wrapped. Pump skids are offloaded from a conventional, closed transport truck by forklift or telehandler.

Hydrocyclones

9. Hydrocyclones arrive in their own special-built protective crates.



5. Preliminary/Sample O&M Manuals

Napanee WPCP Upgrades, ON Screening & Grit Removal System

Municipal Authority: Town of Greater Napanee, ON

RFP Number: RFP-IS-2023-01

Sections: 46 43 00 & 46 53 00

Consulting Engineer: EVB Engineering

Installation Contractor: TBD

Contractor PO Number: TBD

Claro Ref.: 20048-P-00





Claro Fine Step Screen

O&M Manual

Installation – Operation – Care



Electronic Copy
Bookmarked PDF

Claro

Screening & Grit Removal

Fine Step Screens

Claro is pleased to offer a high quality fine step screen that delivers exceptional screening capabilities, long-term reliability, and an ultra-hygienic & odor-free working environment. Removes hair & fine grit to protect downstream equipment & processes without the possibility of screenings carry-over.

A preferred separation technology in water & wastewater screening applications, the step screen's superior design is backed by over 25 years of practical design & installation experience. Hundreds of installations.

Design features & advantages

- Water & wastewater screening, septage receiving stations, & raw sludge screening applications
- Protects pumps, digester tanks, & other equipment from hair & other debris build-up
- Bar space opening / aperture: 0.5 to 6 mm (0.039" to 1/4"); discharge height up to 5 meters (16.5 ft.)
- 6 mm (1/4") screen achieves separation equivalent to a 1 mm aperture screen with use of accumulated screenings filter mat on bar screen
- Low headloss / high flow-through capacities / no possibility of screenings downstream carry-over
- Proven anti-overflow control even with large debris influx (e.g. spring leaves etc.)
- Self-cleaning, low-friction, anti-distortion design bar screen (no wearable brushes & no scrapers)
- Fully-enclosed, odor-controlled, ultra-hygienic operation
- Durable, self-lubricating linkage system with no maintenance-prone chain drives, sprockets, or belts
- Modular, bolted, all-stainless-steel construction
- Unique step design ensures effective screenings transfer
- All stainless steel discharge with no plastic discharge spacers
- Screen pivots out of channel in minutes for inspection—without moving receiving wash press compactor or conveyor
- Patented bottom deflector-plate ensures constant screening aperture throughout the whole operating cycle & eliminates plastic end-shoes / spacers
- For installation in channel or in dedicated stainless steel tank
- Very low equipment height profile—ideal for constricted headroom applications
- Equipment life especially long due to low wear-&-tear control approach—screen only operates mechanically when necessary (not continuously)
- Increase capacity of existing channels with screen-in-tank unit adjacent to existing installation without modification of channel
- Municipal wastewater & water headworks, industrial wastewater, pulp & paper, pharmaceutical, food processing, mining, & many more industrial applications including reject material recovery
- Complete systems for sole-supplier responsibility



Fine Step Screen (0.5 to 6 mm Bar Spacing)



Fine Step Screen, Wash Press, & Hygienic Bagger (Assumption WWTP, QC)



Fine Step Screen and Wash Press (Repentigny WWTP, QC)



Fine Step Screen and Shaftless Screenings Transfer Conveyor

Contents

1. About the Screen.....	5
1.1 Structure & Function.....	5
1.2 Use.....	6
2. Safety.....	7
2.1 General.....	7
2.2 During Operation.....	8
2.3 Lifting / Pivoting the Screen – General.....	8
2.4 Machine Safety Protections.....	8
2.5 Electrical Work.....	9
3. Storage, Transportation & Packaging.....	9
3.1 Scope of Delivery.....	9
3.2 Storage.....	10
3.3 Transportation.....	10
3.4 Packaging.....	10
4. Functional Description.....	10
4.1 Principle of Operation.....	10
4.2 Operation.....	11
5. Assembly & installation.....	11
5.1 Assembly.....	12
5.2 Channel Installation.....	14
5.3 Channel Wall Seals.....	17
5.4 Automatic Greaser Cartridge.....	17
5.5 Tank Installation (e.g. for Septage Stations).....	17
5.6 Downstream Equipment.....	17
5.7 Installation of Level Sensor.....	18

5.8	Electrical Installation	19
6.	Operation.....	20
6.1	Automatic Operation – Step-by-Step Mode (Level Sensor).....	20
6.2	Automatic Operation – Timer (& Level Sensor) Mode	21
6.3	Manual Operation	21
6.4	Overload/Alarms	22
6.5	Reverse Operation.....	22
6.6	Other Elements	22
7.	Settings	23
7.1	Default Values.....	23
7.2	Additional Settings	23
7.3	Operation Modes.....	23
8.	Settings	25
8.1	Test Run without Water (Dry Start-Up).....	25
8.2	Test Run with Influent/Water (Wet Start-Up).....	26
8.3	Adjusting the Start Level.....	26
9.	Regular Verifications & Maintenance	27
9.1	Weekly	27
9.2	Monthly	27
9.3	Yearly	28
9.4	Before Starting the Disassembly	30
9.5	Disassembly.....	30
9.6	Disposal.....	30
10.	Components / Spare Parts Drawings & Spare Parts List	30

Introduction

The Claro Operation & Maintenance manual is intended to provide operations staff with a clear description of the fine step screen and its parts. This manual also contains important instructions on how to install & start-up the fine screen and maintenance advice. All who come in contact with the screening system shall comply with the safety precautions, warnings, regulations and other instructions in this manual as well as local provincial/state and facility regulations and safety practices.

This Operation & Maintenance manual must be available to all personnel involved in the screening system's installation, commissioning, operation, service / maintenance and transportation.

Claro Environmental Technologies assumes that the personnel responsible for or working with this equipment are familiar with local regulations regarding the work safety environment and especially safety regulations and practices for sewage treatment plants and other applicable regulations.



Never start installation or assembly prior to reading and fully understanding the contents of this manual. The safety instructions and warnings are especially important. If personnel have any comments or questions, please feel free to contact Claro.



It is forbidden to use the fine screen in any other manner or for purposes other than those described in this manual.



N.B. Claro cannot be held responsible for damage caused by negligent handling of the machine or neglect of the directives outlined in this manual. If personnel have comments or questions, please feel free to contact Claro. We are here to help !

Claro's responsibility is limited or ceases once:

- The machine or any individual component is loosened or disassembled without Claro consent and/or advice

- Parts that do not belong to the screen are integrated into the machine
- Parts that are not original spare parts are installed without Claro's approval

Modification, renovation or re-build of the machine is not permitted without written consent of Claro Environmental Technologies. Please feel free to contact Claro for advice. We are here to help !

1. About the Screen

The Claro fine step screen is designed to mechanically separate solids from wastewater or process water. The machine is designed for automatic operation and starts automatically depending on operational settings.

The Claro fine step screen is available in different models with discharge heights from 0,8 to 5,5 m. For each model, custom screen widths and aperture widths (from 0.5 to 6 mm) are available

The model number format is as follows:

e.g. 1700-500-3 (model – effective width of the bar screen – aperture width)

1.1 Structure & Function

The machine consists of three main parts:

1. Motor including gearbox, bearings and eccentric assembly (Figure 1).
2. Lamellae bar rack package (made of moveable and stationary bars (Figure 2)).
3. Side plates including linkage drive mechanism (Figure 3).



Figure 1, Drive unit

The machine consists of a separate drive unit package that includes gear drive & torque arm, electric motor, frame, crank bearings and electrical equipment. The electrical equipment consists of a home position (proximity) sensor, overload protection (installed in the control panel or MCC) and connection terminals / junction boxes for external connection.

The drive unit is bolted to two robust side frame elements that serve as guide plates for incoming influent and as the supporting frame for the “fixed” lamellae bar package.

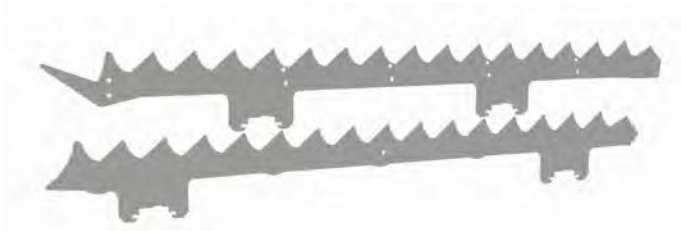


Figure 2, lamellae bar package elements (fixed & moveable)

The bar package consists of two sets of parallel-positioned and individually-attached bars. One set is fixed and the other is moveable. The bars have steps that have a curved run element, are roughly 1:1 ratio of rise-to-run, and are designed to optimize screenings conveying capacity. The fixed bars are bolted to structural cross members & to the frame of the screen. The moveable lamellae bar package is interposed within the fixed package – thus, every other bar is moving and every other is fixed. The distance between a fixed and a movable lamella bar is the aperture width.



The moving lamellae bar package is suspended by a side-frame mounted linkage mechanism (one on each side of the screen), which is connected to the motor & gear drive mechanism. The movable bars effect a circular motion (a “rotation”).

Figure 3, side plates including linkage mechanism

1.2 Use

The Claro step screen is used for separation of solids from waste or process water.

Typically, the Claro step screen is employed in one of the following scenarios: municipal and industrial wastewater treatment plants, paper industry, food industry, tanneries and textile industries.



It is forbidden to use the fine screen for any purpose other than the above without written consent from Claro.



2. Safety

The safety section contains important safety information and should be followed closely. There is a risk of personal injury or other damage if the safety instructions are not followed.

Before any work is started, the personnel who will perform the work or related personnel must read this safety section.

2.1 General

- It is forbidden to use the fine screen for other than its intended purpose.
- Personnel can be injured if the fine screen is employed for other than its intended use and when personnel with inadequate knowledge of the system manipulate, engage with or operate the machinery and/or control elements.
- All personnel who operate the machine must have read and understood this manual, especially the safety section.
- Rebuilding and/or modification of the machine is prohibited without written consent from Claro. Please feel free to contact Claro – we are here to help !
- Exercise caution when lifting; never walk under a suspended load.
- Before cleaning, servicing or dismantling, the motor power lock-out switch and/or the control panel must be turned off and a padlock installed.
- In addition to the directives specified herein, the safety regulations and practices that apply at the local plant shall be followed. State, provincial and/or country regulations shall also be followed.
- All warning signs shall be maintained in the same condition as when the fine screening system was delivered.
- All fine screen protecting elements and covers must be mounted and locked / bolted in position before starting the fine screening system.
- The fine screen supports must be firmly attached to the machine and to the floor slab (or to the tank) before starting the machine.

2.2 During Operation

- Work on the fine screen is forbidden when it is in operation.
- Keep in mind that the machine starts automatically without notice.
- Protective plates and covers for the drive linkage system & gear drive and motor shall be installed and bolted in position.
- Inspection cover at the fine screen discharge can be opened, however, it is forbidden to touch or otherwise engage with moving parts.

2.3 Lifting / Pivoting the Screen – General

- Use only approved lifting equipment and check the maximum load of the lifting equipment before lifting begins.
- Use caution – do not work or walk under suspended loads.
- The machine must only be lifted at the designated lifting lugs.
- Lifting equipment must not be removed before the machine is properly bolted to the floor slab (or stainless steel tank).
- For details on the lifting procedure, please see "Lifting the Equipment – Details," Section 5.1.1.

2.4 Machine Safety Protections

The fine screen is equipped with bolted protective lids &, depending on the application, inspection covers or other operator-safe access points. These should always be installed, locked/bolted in position when the machine is in operation.

Loose items that are not typical screenings debris (such as tools and other items) can cause injury as well as damage to the machine.

Inspection covers and bolted protective plates are placed over the linkage drive package units. There are also one or more inspection covers under which parts of the screen, incoming water and the screenings filter mat will be visible.

At the discharge, there is an inspection lid. Under this lid with handle there is a safety grating that prevents access to moving parts. When the inspection lid is removed, the operator can see the screen discharge to the downstream equipment such as a wash press or conveyor.

WARNING: The screen and downstream equipment starts automatically and without notice. An HOA station for manual operation shall be provided local to the fine screen. Ideally, the operator will be able to see the effect of manual operation.



It is forbidden to clean the fine screen discharge or the downstream equipment's inlet by hand or with a tool without the safety power lock-out switch turned off and locked with a padlock.



2.5 Electrical Work

Electrical work must be performed by a licensed electrician and in accordance with applicable laws, regulations and rules. Work shall also be carried out in accordance with local regulations.

- To avoid accidents including fatal electrical shock, it is important that the electric motors, instruments and cables are in good working order with no breaks or other anomalies.
- Electrical cables should be routed so that there is no risk of wear against the fine screen's stationary or moveable parts.
- All equipment and instruments should be grounded. Humid environments and water screening applications carry an increased risk of accidents caused by electric current. Remember that the screening system is a high voltage system.
- When replacing or repairing an electrical component, the power supply must always be turned off and the relevant switch and/or breaker element padlocked before starting work.

It is forbidden to connect the machine to a live electrical power source while installation or other work on the machine is in progress.

3. Storage, Transportation & Packaging

3.1 Scope of Delivery

In addition to the screen, the following is included in a standard in-channel fine step screen delivery. Note: an in-tank screening unit, such as a septage receiving station, arrives on site with the screen pre-installed within its stainless steel tank and thus eliminates some of the installation requirements. Typical delivery items include:

- Two (2) support legs.
- Two (2) support leg linkages.
- One (1) torque guard. If a control panel is also part of the supply, the torque guard is pre-installed within the control panel.
- One (1) discharge cover (sometimes already mounted on the screen).
- One (1) square fine screen suspension beam (sometimes already mounted on the screen).

3.2 Storage

Storage of the machine may be made for a short period and only in / on its original packaging. Ensure that the fine screen is stored in an indoor environment and not exposed to freezing. If outdoor storage is unavoidable, please contact Claro. Before the fine screening unit is kept in storage for a longer period, please contact Claro for storage instructions.

3.3 Transportation

Transportation shall be made in a manner in order that the fine screen is secured from falling or other mishap damage. Lifting the machine over personnel is absolutely forbidden. Suitably trained staff should perform lifting, loading, load securing, unloading and driving of the transport truck.

3.4 Packaging

The packaging (pallets or crating) is specially designed and adapted for the delivered fine screening equipment and provides maximum protection. Ensure that the packaging is not damaged when you receive the delivery. If the packaging is damaged, please document with photographs & contact Claro.

4. Functional Description

4.1 Principle of Operation

The screen is installed at an installation angle of between 45 - 50 ° in a channel or in a stainless steel tank. The sides of the screen that are adjacent to the channel or stainless steel tank walls are sealed with neoprene rubber seal strips. This ensures that all liquid & solids (i.e. screenings) must pass through the screen filter media, which is composed of a number of moving and fixed lamellae bars. As the influent passes through the lamellae bars, the solid particles (i.e. the screenings) remain on the bars and form a 'screenings filter' mat. The thicker the mat, the better the separation of small particles. The size of the captured particles depends on the screen aperture width and the screenings filter mat thickness.

As the screenings filter mat accumulates and becomes thicker, it causes the water level in the channel or stainless steel tank to rise upstream of the screen. Once the upstream liquid level reaches the adjustable pre-set liquid start level, the screen will start and the moveable lamellae bars will run for one rotation. When the machine makes one rotation of the lamellae bars, the screenings will be transported upwards towards the fine screen discharge. When this rotation and screenings transport occurs, the bottom area of the lamellae bars are cleaned of screenings material, which enables the passage of liquid. The step-shaped lamellae bars will transport the screenings filter mat step-by-step upwards towards the screen discharge where it will be deposited into the downstream equipment.

Typically, the screen will rotate only once in response to an upstream start level signal. Since a thicker screenings filter mat helps to increase separation efficiency, it is important that the screen does not run more than necessary. Therefore, make sure that the adjustable start level setpoint is at the correct value. Claro will set this level or advise on the recommended value. If you have any comments or questions, please feel free to call Claro.

4.2 Operation

The fine screen is operated via a control panel, which is typically included in the equipment delivery from Claro

The level sensor mounted in the channel/tank upstream of the screen provides a signal to the control panel that indicates that the upstream water level has risen to the adjustable pre-set start level. The screen will start and run one rotation, which will cause the upstream water level to fall. If the level does not fall, the fine screen will respond to a maintained start level signal and will rotate again until it shifts into continuous run mode. Continuous run mode will cease once the upstream liquid level returns to just underneath the normal start level (adjustable Continuous Run Mode Shut Off Level). This level is typically 50mm (2 inches) below the normal fine screen start level.

5. Assembly & installation

Experienced installation personnel must carry out the installation in a professional manner. All electrical wiring must be performed by a qualified electrician and must comply with current CSA, UL or other applicable regulations.

5.1 Assembly

For ease of installation, maintenance inspection and maintenance work, it must be possible to pivot the fine step screen. The lifting device (overhead beam, davit crane, or other) must be approved and adapted to the machine weight. The weight of this machine is indicated on the screen nameplate.

Before lifting the machine, check the following:

- Verify the channel width and compare it to the total width of the machine. Ensure that there are no obstructions that could damage the screen or its neoprene side seals when the screen is pivoted out of channel.
- The fine screen support legs should not be installed too close to the channel edge. Follow the project drawings regarding the placement of screen supports. Ensure that the concrete is in good condition for the purpose of supporting the screen weight.
- Power must be switched off and the power lock-out switch locked with a padlock. All cables should be disconnected.
- Attach the fine screen support legs to the floor slab with appropriate fasteners (e.g. expanding bolts or chemical anchors). If a screen-in-tank unit has been supplied, anchor the tank to the floor slab.

5.1.1 Lifting the Equipment

- Use only approved lifting equipment and check the maximum load of the lifting equipment before lifting is initiated.
- Use caution – do not stand or extend limbs under suspended loads.
- The machine must only be lifted at the designated lifting lugs – please see Figure 4 below.
- Lifting equipment must not be removed before the fine screen is fastened to the floor slab.
- If the machine shaft bearings are fitted with grease cartridges (for taller models), these shall be unscrewed & removed before lifting/pivoting in order to avoid accidental damage to the automatic greasers.
- The machine must be lifted with approved steel shackles or hooks or similar in order to avoid slings or other lifting elements from being damaged by the fine screen steel frame or lifting lugs.
- For screens with a model number of 1700 to 4500, there are also lifting lugs under the motor covers. These must also be used during lifting if the entire screen is to be raised out of the channel (Please see figure 5).

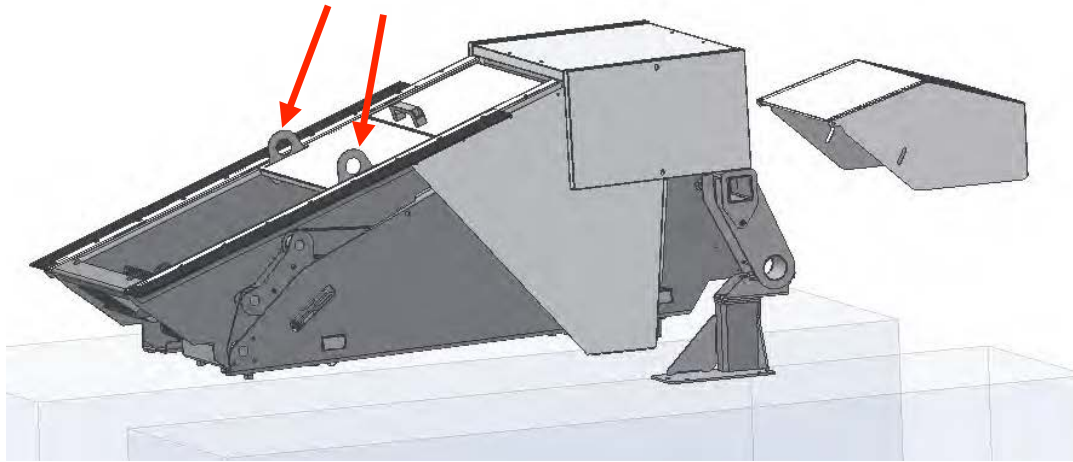


Figure 4. Lifting the screen, arrows showing lifting lugs.

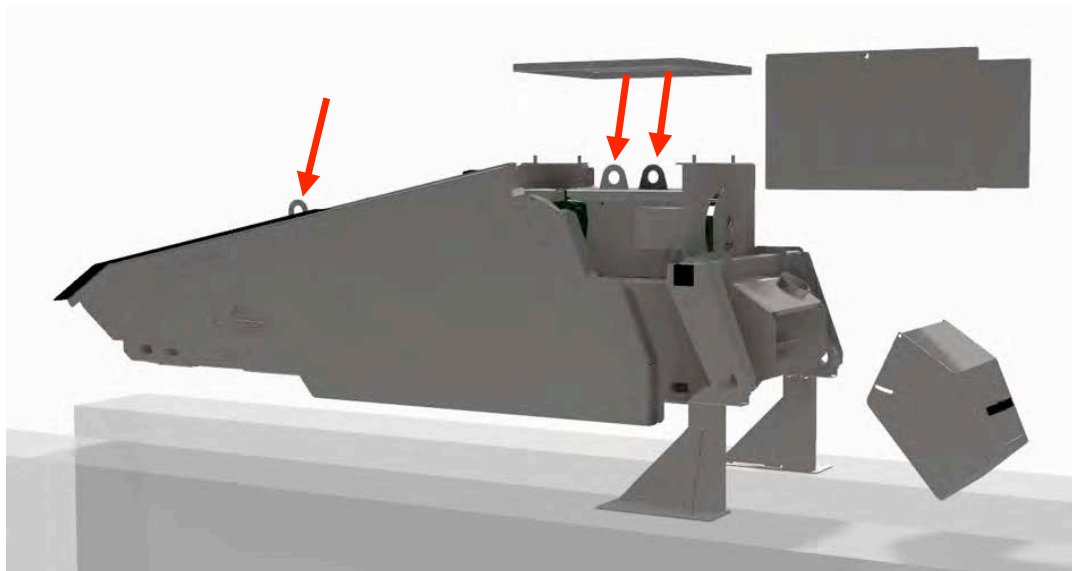


Figure 5. Lifting lugs for fine screens with a model number from 1700 to 4500; use all 4 lifting lugs for a 4-point controlled lift if lifting the entire screen out of channel or during installation.

- Please see following page →

5.2 Channel Installation

Carefully lower the screen into the channel.

ALWAYS use the supplied bolts for mounting the discharge cover because longer screws can damage the machine (conflict with moveable lamellae, which can cause lamellae damage/breakage (please see Figure 6)). The bolt No. 1 (M8x8 with washer) shall terminate in line with the inside 2 in order to prevent contact with movable lamellae.

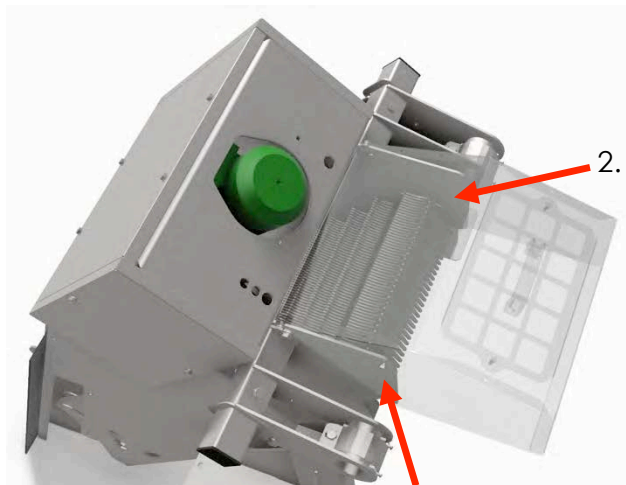


Figure 6. 1.

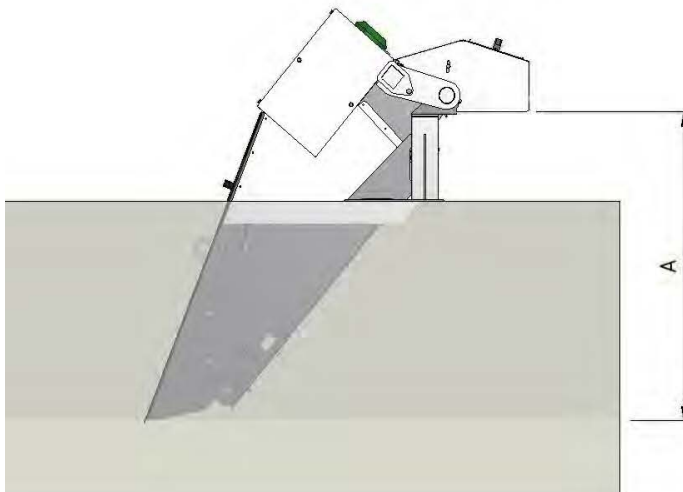


Figure 7. Discharge height measurement

Place the screen in the correct position, measure the correct discharge height A. Please see figure 7.

Check that the channel is level (please see figure 8). Also verify that the channel bottom where the bottom of the machine is to be placed is level & parallel to the floor slab. Check that the bottom corners of the channel are not chamfered. The sides of the channel should also be square and smooth. Channel covers (i.e. checker plate or grating) should have no supporting structure attached to the inside wall of the channel in order to ensure that the fine screen can pivot out of channel un-impeded. Instead, channel covers should be suspended from notches at the top corners of the inner channel walls.

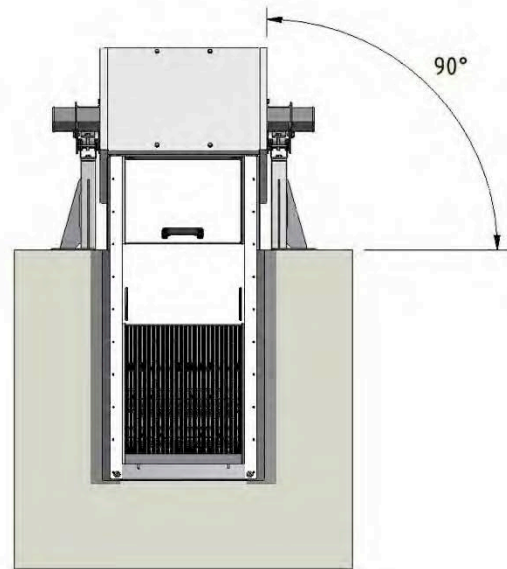
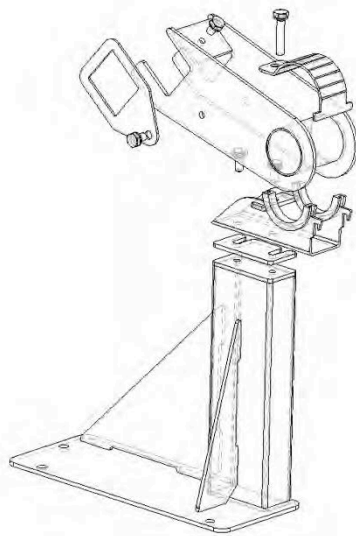


Figure 8.

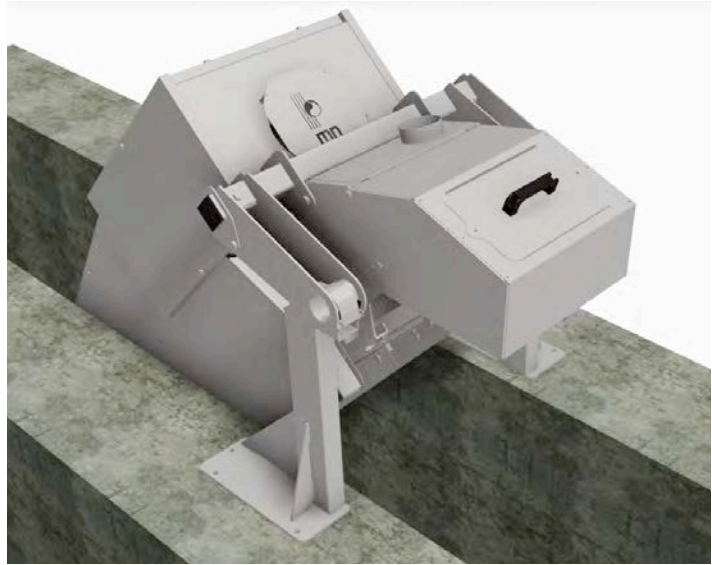
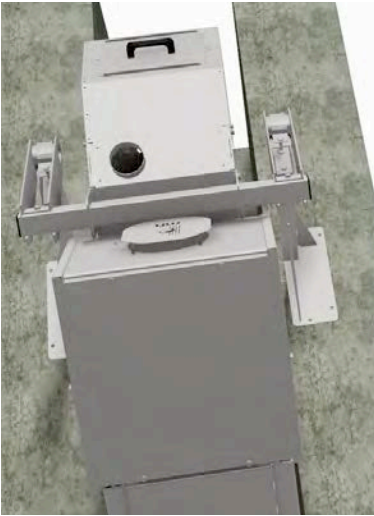
Install the support legs on the fine screen and fasten them to the floor slab.

There are various types of pivoting screen support mechanisms depending on the unit size/model. Support legs and pivoting mechanisms shall be mounted as shown below. Typically, installation guide stickers are placed on the supports in order to aid in assembly.

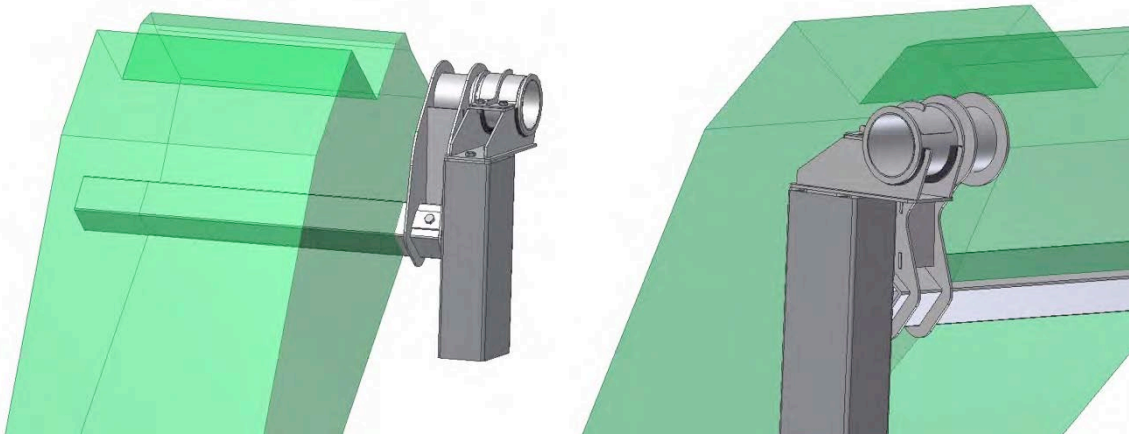
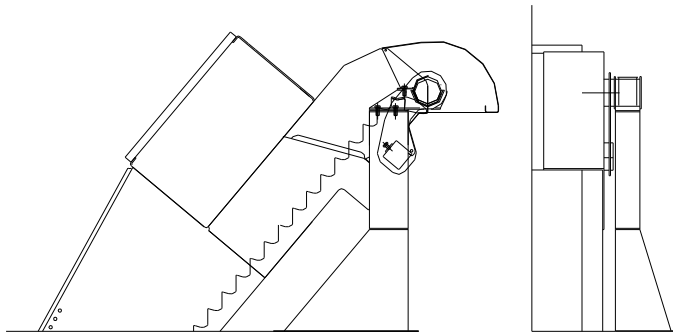
5.2.1 Support Leg Installation – Fine Screen Models 1100 - 1400



5.2.2 Support Leg Installation – Fine Screen Models 1700 - 2100



5.2.3 Support Leg Installation – Fine Screen Models 2200 - 4500



5.3 Channel Wall Seals

On the screen frame, neoprene rubber strips are mounted for the purpose of sealing the gap between the screen frame and the channel or tank walls. Typically, the gap between the screen frame and channel walls is 15 to 40 mm. Please contact Claro if the gap is smaller or larger. Channel width is to include the screen frame width plus channel side seals width.

5.4 Automatic Greaser Cartridge

Shaft and eccentric bearings may be equipped with grease cartridges for automatic lubrication (option on larger units). The cartridges shall be set to 12 months by turning the adjustable selector on the top of the cartridge to number 12.

5.5 Tank Installation (e.g. for Septage Stations)

- Check that the floor slab is level.
- Place the tank in the correct position and make sure that the tank is level. Fasten the tank to the floor slab.
- Connect the inlet and outlet pipes.
- Connect the overflow outlet (if present).
- Connect the downstream screenings handling/treatment equipment, if present

5.6 Downstream Equipment

After the screen, screenings handling and/or treatment equipment is installed, e.g. wash press or screw conveyor. Any gaps between the screen and subsequent equipment must be sealed with plates or rubber strips in order to prevent access to moving parts. If downstream equipment has been supplied by Claro, these protective elements will already be in place / supplied. Subsequent equipment shall be mounted as close to the screen discharge as possible and in the proper relationship in order to not conflict with the movable lamellae bar rack.

The downstream equipment inlet chute must be designed in order that edges or flanges do not promote screenings debris collection/hang-up or compaction in the discharge area.

- Please see following page →

N.B. Ensure a minimum of five (5) millimetres free passage between the movable bars and the inlet chute when the screen is in motion (i.e. when the lamellae bars are in their lowest rotation position) to prevent mechanical conflict, wear and noise. Claro can advise on relative positioning.

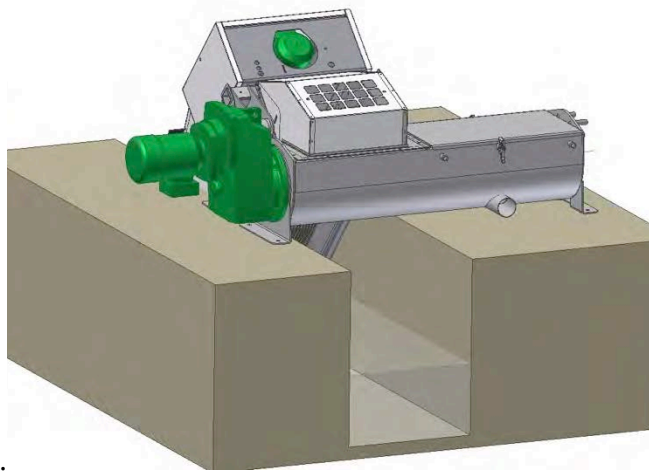


Figure 9. Wash press installed after screen

If the inlet to the wash press / conveyor is narrower than the screen discharge, the chute must be tapered. In order to avoid screenings bridging / blockage, however, the chute must have a minimum of 60° degree side walls.

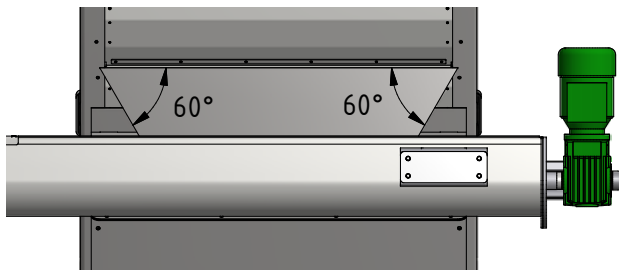


Figure 10. Tapered chute installed at discharge of screen. Typically, chute walls are 90 degrees.

5.7 Installation of Level Sensor

- A level sensor measuring the upstream water level shall control screen operation. Ultrasonic level sensors are typically furnished with the Claro control panel.
- The start level shall, for most installations, be as high as possible. Claro will suggest the recommended start level.

- The level sensor must be installed in order that the screen can be removed / pivoted out of channel for inspection and other maintenance requirements. The sensor should be installed in a location that does not experience significant turbulence or splashing. Claro will advise on sensor placement. In some installations, both an upstream & a downstream sensor are used for a differential back-up start signal.

5.8 Electrical Installation

Electrical work must be performed by a licensed electrician and in accordance with applicable rules, regulations & laws.

Before reading and acting on the information in this section, please read section 2.5 in its entirety in order to ensure personnel safety. Please also see As-Built control panel drawings if a control panel has been supplied by Claro.

- The screen home position switch is connected via the junction box mounted on the side of the screen (located under removable side panel).
- Motor is connected via its own junction box.
- If a Class 1, Div. 1 (or equivalent Class 1, Zone 0) environment, the fine screen's integrated electrical brake will have a separate single phase supply. By contrast, in lower explosion-proof rating classification contexts, the brake will tend to be powered from the motor's junction box. Note: please observe local electrical codes as required and review Claro control panel drawings.
- Torque Guard is supplied for installation in the control panel or, if the control panel is supplied by Claro, this and other safety equipment is typically already pre-installed in this supplied control system.
- Please arrange cable lengths in order to enable the screen to pivot out of channel without over-tensioning the connections. Also, ensure that cables do not block easy access to discharge covers or other elements regularly accessed by operators.
- Physically install & connect the level sensor as shown in the project drawings and/or Claro installation instructions. Typically, the level sensor transmitter is pre-installed inside the Claro control panel, if furnished.

6. Operation

6.1 Automatic Operation – Step-by-Step Mode (Level Sensor)

1. Please also see description of control narrative and HMI touch screen images included in the appendices section of this O&M manual.
2. When all selectors are in Auto and the system is “Ready” or “Waiting”, the fine step screen will initiate a rotation of its moveable bars once the adjustable upstream start level is reached or, in applications that have an upstream & a downstream sensor, once the adjustable differential level value is attained.
3. When the liquid level drops after a start signal & moveable lamellae bars rotation, the screen will stop at its “home” position (i.e. moveable & fixed bars aligned), which is indicated to the control panel by the home position proximity sensor located inside the fine screen motor compartment.
4. If the upstream liquid level is maintained at or above the adjustable upstream start level (or differential value) after a rotation, the screen will initiate another moveable bars rotation. If the upstream liquid level (or differential value) remains at or above the adjustable start level after 3 consecutive starts without an intervening pause, the screen will shift into continuous run mode. The number of consecutive starts without pause to initiate a continuous run is adjustable. The typical setting, however, is three (3) consecutive rotations. The maintained level indicates to the controls that the screen is experiencing exceptionally high flow/solids in the flow. The continuous run enables the screen to cope with these conditions automatically. The continuous run will stop once the upstream level (or the differential value) falls to an adjustable level below the start level or differential start value. This indicates to the controls that normal conditions have resumed and causes the screen to shift back into regular step-by-step level sensor mode. The typical continuous mode stop level is 50 mm (2 inches) lower than the upstream start level and, if present, 50 mm (2 inches) below the level differential start level value. Claro will advise on the optimal set points for your application. This controls approach diminishes the run time of the screen to a minimum.
5. Once the upstream level (& back-up differential level, if implemented) is set, the screenings filter mat will be consistent in its thickness. This enables the low wear-&-tear controls philosophy of the screen to be generalized to downstream equipment since the volume of each

screen discharge is consistent – each rotation of the screen's steps will discharge a consistent volume of captured screenings material. Thus, the downstream equipment is started based on an adjustable number of screen moveable bar rotations/discharges. Claro will advise on the optimal start value for downstream equipment.

6.2 Automatic Operation – Timer (& Level Sensor) Mode

If the level sensor(s) should fall into fault or loose echo, the control panel will automatically shift the screen into timer mode. In this mode, the screen will continually initiate a rotation after an adjustable timer delay. Once the level sensor(s) have returned to normal operation (i.e. fault condition is no longer present), the controls will return the screen to regular step-by-step timer mode. Since timer mode is a back-up mode, the screen actuation interval time is short in order to ensure that the level in the channel remains at an acceptable level. Typical setting is 2 minutes. Claro will suggest the optimal setting for your application.

An operator can also switch the screen into timer mode at the controls. In timer mode the screen will continually initiate a rotation after an adjustable timer delay until the start mode is changed back to level mode. If the level sensor(s) are functional, the regular upstream start level (or differential level, if applicable) will also actuate the screen if the upstream liquid level reaches the adjustable set point. In timer mode, the level sensor(s) act as a back-up.

6.3 Manual Operation

When the local HOA control station selectors are in Manual & Forward, the screen will function in forward until the spring-loaded selector is released. When the local HOA control station selectors are in Manual & Reverse, the screen will function in reverse until the spring-loaded selector is released. The spring returns are implemented in order to ensure that the screen is not left running continuously and unattended for extended periods of time in forward and especially in reverse. When operating in reverse, ensure that the screen does not produce any unusual noise. When running in reverse, proceed with caution – start by jogging the screen in small reverse runs in order to verify that a possible issue does not cause damage to the screen. Note: The local HOA station also typically incorporates an E-stop push button that stops the respective fine screen for operator safety.

6.4 Overload/Alarms

- If the screen torque detector is triggered, the screen will initiate a reverse run sequence that attempts to clear a possible jam. The screen will attempt to run in reverse for an adjustable time (typically 2 seconds). The screen will then re-attempt to respond to its start level signal by running in forward. If the torque detector senses a high torque condition again, the screen will repeat this reverse run sequence. The screen will attempt the reverse run sequence for an adjustable number of attempts within an adjustable timeframe (typically 2 times within 60 seconds). If the screen fails to resume normal operation at under the high torque setpoint, the screen will fall into fault, shut down and alarm. If supplied, the Claro control panel will contain a record of the reverse run attempt(s) in the alarm history (and at Scada, if this alarm recording function is implemented) even if the screen does not fall into fault/shut down. Operators should inspect the screen and channel if the screen initiates a reverse run. Please feel free to call Claro for advice/help. Claro will set the torque detector at start-up.
- High Level Alarm: The control panel monitors the upstream level for a high liquid level. An alarm is issued if this setpoint is met (alarm signal available to Scada). The screening system continues to function in this scenario (i.e. no screen shut down).
- If present, an independent float switch may also be present, which can provide a back-up start signal, a high liquid level alarm or other function.

6.5 Reverse Operation

When the local HOA control station selectors are in Manual & Reverse, the screen will function in reverse until the spring-loaded selector is released. The spring return is implemented in order to ensure that the screen is not left running continuously and unattended for extended periods of time. When running in reverse, proceed with caution – start by jogging the screen in small reverse runs in order to verify that a possible issue does not cause damage to the screen. When operating in reverse ensure that the screen does not produce any unusual noise.

6.6 Other Elements

The local HOA control station should enable the screen to run in both forward and reverse. If the control panel has been supplied by Claro, this functionality will be available to the operator.

Manual operation should also be independent of PLC functionality. N.B. In this case, the thermal overloads function as the amperage/torque protection. As thermal overloads are not as sensitive as the electronic

safety equipment (Emotron / current transformer), manual operation should be effected with caution and with attention paid to the respective screen. Each piece of equipment should be supplied with its own local HOA station.

7. Settings

7.1 Default Values

Claro will provide initial start-up settings for your application. If you have comments or questions about control settings, please contact Claro – we would be glad to help and further outline the nature and rationales informing the controls equipment and controls set points. A record of final set points will be provided a short time after start-up once the screen has been submitted to the full range of flows at the facility.

7.2 Additional Settings

Intentionally Left Blank.

7.2.1 Septic Sludge Receiving Station

Claro will provide initial start-up settings for your septage application. If you have comments or questions about control settings, please contact Claro – we would be glad to help and further outline the nature and rationales informing the controls equipment and control settings.

7.2.2 Level Sensors

Please see catalog cut information describing the nature and typical installation configuration of the provided level sensor(s). If Claro has supplied the control panel & instrumentation, the level sensor(s) will be calibrated at start-up. Changing level settings is effected via the control panel HMI touch screen rather than at the level sensor or level sensor transmitter. Please only change level settings via the control panel touch screen since making alterations at the sensor probe or transmitter can disrupt the coordination between the control panel HMI and the level sensing equipment.

7.3 Operation Modes

The fine screen has four modes:

- Level Start Mode: the screen initiates a rotation based on the adjustable upstream start level.
- Timer & Level Mode: the screen initiates a rotation after an adjustable time delay. If the level sensor is functional/not in fault, the level sensor will also

provide a back-up start signal if the upstream level (or differential value) is met.

- Continuous Run Mode: the screen will run continuously if the upstream start level (or differential value) is maintained to the point where the screen makes a series of consecutive starts without an intervening pause. The screen will shift to continuous run after an adjustable number of these consecutive starts. Continuous run will end and the screen will shift back to normal operation once the upstream start level (or differential value) falls to an adjustable level that is lower than the start level.
 - Differential Mode: Typically, the fine screen will operate on an upstream start level only. In certain cases, the design will call for a back-up differential start signal in addition to the upstream start level. In this case, the screen will start if the level differential (difference between the upstream level and downstream level value) is equal to or higher than the adjustable differential set point value.
- Please see HMI graphic touch screen shots & control narrative description in the appendices section included in this manual.



8. Settings

Check the following items before putting the fine screen into operation:

- Support legs are mounted and the screen is properly connected to the floor slab.
- The gap to each side of the screen frame and the channel walls (stainless steel tank) are effectively sealed by the screen's neoprene rubber seal strips.
- Chute between screen and downstream equipment is installed correctly & that there is no conflict between the moveable lamellae bar rack and the downstream equipment chute or other items.
- All electrical connections are complete according to local codes and tested, including the level sensor.
- All covers and protective plates are installed correctly.
- Warning signs are mounted on the fine screening system.
- Personnel have been instructed in the appropriate safety directives & procedures.

8.1 Test Run without Water (Dry Start-Up)

- Wet the screen with water in order to wash out dust that may have infiltrated in-between the spacers during construction. Use a regular hose with plant water pressure flow (e.g. 40 to 70 psi). Never use a pressure washer on the front of the screen since high pressure can dislodge the interspacers.
- Close the inlet gate in front of the screen (and the downstream gate, if applicable).
- Start the fine screen in manual: i.e. local HOA control station selectors in Man & Forward. Be prepared to stop the screen immediately if any concerning noise is heard. Note: One can use food grade spray-on cooking grease on the fine screen discharge in order to eliminate the temporary squeaking noise (if present) before actual screenings material will lubricate the discharge.
- Verify that the screen rotation is correct and that solids will travel toward the discharge when the screen is run in forward.
- Run the screen in forward continuously for a minute or two while checking the screen movement and for concerning noises.
- Switch the system to AUTO mode, simulate a level with a piece of cardboard or similar in order to trigger the screen, and verify that the screen stops in the home position (i.e. moveable lamellae and fixed lamellae aligned). In the home position, the fixed and movable bars shall be level – a deviation of a few millimetres, however, is satisfactory. The home position switch can be adjusted by moving the steel plate that is located in the cam that rotates under the home position switch

(inside the motor compartment). Ensure that the screen is locked out before adjusting the metal plate.

- Check that the downstream equipment starts after the pre-set number of screen rotations.

8.2 Test Run with Influent/Water (Wet Start-Up)

- Ensure that construction debris, tools & sand are removed from the channel before start-up. The Claro screen is very well-adapted to handle typical municipal influent, which contains sand, rags and other debris. If there is a wet well, however, ensure that it has not accumulated significant quantities of sedimented sand while it has been out of service. A high concentration of sand without a mixture of screenings that is pumped to the screen all at once can overwhelm the screen and cause the screen to jam. Contact Claro if you suspect this scenario is present. At start-up the Claro technician will verify for normal debris conditions: i.e. sand, rags, baby wipes, and other screenings, etc.
- Start the screen in Manual & Forward at the local HOA control station.
- Open the channel inlet gates or start the inlet pumps. Start the pumps gently if a VFD is present. If there are significant quantities of sand and other settled material, this initial start-up debris should be removed from in front of the screen. Pivot the screen out of channel with the aim of cleaning the channel. Debris, and especially rocks, should not be resident in front of the screen or in the area of the channel underneath the screen.
- N.B. Never lower the screen down on top of debris or rocks.
- Change from HAND to AUTO when the screen is judged to run properly. Observe that the screen runs normally and follows the correct control sequence.

8.3 Adjusting the Start Level

- The level sensor sends the signal to start the screen.
- Set the upstream start level to the value indicated in the technical submittal or installation drawings. Claro personnel will indicate the optimal start level. If the control panel is supplied by Claro, the start level is adjusted via the control panel HMI.

9. Regular Verifications & Maintenance



For maintenance inspection and/or maintenance work, all safety regulations must be followed. It is absolutely forbidden to carry out service or maintenance work on the fine screen while it is operation. Main power lock-out switch must be turned off and locked with a padlock.



9.1 Weekly

Check for the following items:

- There are no abnormal noises.
- There is no screenings accumulation at the screen discharge / downstream equipment inlet - clean if necessary.
- Home position proximity sensor is adjusted correctly (moveable bars align with the stationary bars after a screen rotation).
- There is no screenings material trapped in between the lamellae bars – clean if necessary.
- The bars do not have grease accumulation, especially on the curved step area – fat can cause screening material to roll back into the channel.
- The level sensor is actuating the screen at the correct level and that no debris, cobwebs or other element at the sensor interferes with proper operation.

9.2 Monthly

Check for the following items:

- No large accumulation of stones and gravel are found in the channel in front or underneath the screen. Pivot screen & clean channel as required. Check for accumulation on a monthly basis until a schedule can be determined. In most wastewater treatment plants, cleaning of the channel is performed every 8 to 12 weeks. It is the responsibility of the facility, however, to determine the proper schedule in order to avoid excessive grit and stone accumulation at the base and under the screen. If you have comments or questions on this point, please feel free to contact Claro. N.B. Never lower a fine step screen on top of rocks or

other debris. N.B. Never shovel accumulated sand and rocks from the channel bottom onto the screen as this can cause significant damage to the unit.

- Seals between the screen and the channel walls are in good working order.
- Screws and bolts are tight - tighten if necessary.
- The gear box does not leak oil.
- If present (on some taller screen models), automatic greaser at the upper bearings is filled with a satisfactory level of grease.

9.3 Yearly

A thorough review of the fine screen should be performed once a year.

Put the fine screen in manual mode and run the unit until all screenings material is removed from the lamellae bar rack. Lock out the power and clean the fine step screen – clean the lamellae, the side linkage system & the discharge area. Remove any accumulated grease and other debris. Clean the outside shell & covers of the screen for aesthetic and hygienic appearance.

N.B. When cleaning the screen never use a power washer on the lamellae bar rack since high pressure can remove UHMW interspacers.

In addition to the weekly & monthly verification tasks, please also check the following. Please contact Claro if you have any comments or questions regarding any aspect of the weekly, monthly or yearly inspection.

- All slide bushings and bearings are in good order.
- The gear box functions properly and does not leak oil. Change the gear drive oil if required. Please see attached gear drive O&M manual.
- Remove sediment present in the channel ahead and underneath the screen.
- Verify the aperture width and straightness of the lamellae bars – straighten bars if necessary. Verify the general health of the bars.
- Check the lower part of the fine screen lamellae bar rack – the deflector plate, hinge pins, springs, retaining washers & cotter pins. Replace any of the elements if required. Check also for missing UHMW interspacers – replace any that are missing.
- Test the operation of the torque guard (i.e. by lowering its set point via the control panel HMI and observing the screen shift to its reverse run sequence).
- Check the movement of the screen lamellae i.e. make certain that the top of the fixed bars are aligned with the movable bar package when the moveable bars are in their home position. Verify that the moveable

bar rack makes a smooth circular motion with no sudden drop or irregular movement. Irregular movement can indicate bushings or stub shaft wear. Inspect linkage drive system.

- Check if there is wear on the stub shafts or other linkage system elements.
- Check for corrosion on stainless steel parts. Corrosion of stainless steel may occur as a result of externally occurring rust or coatings, dirt, chemicals, H₂S or other residues. Claro can recommend an easy-to-use and ecological passivator (based on citric acid) if corrosion is a concern.
- Verify protective paint coatings on motors, gear drive and related equipment. If present, repair damage with appropriate touch-up paint.
- Check for damage to electrical cables, cable connectors and seals, junction boxes or similar. Electrical cabling or other damage must be repaired by a certified electrician before putting the fine screen back in operation.

The Claro fine screen's wearable parts typically have an exceptionally long service life. Life span of wear parts, however, will depend on the machine's working load, the amount of sand and gravel, etc. Always strive to restrain the operation of the screen when setting the controls for the lowest possible run times. If you have comments or questions, please feel free to contact Claro – we are here to help !

Before restarting operation of the fine step screen, all protective covers must be reinstalled & safety equipment operational.



Disassembly

N.B. Before reading or acting on this section, personnel must review Section 2: Safety.

9.4 Before Starting the Disassembly

- Put the screen in manual mode and run until the machine is free of screenings debris.
- Turn the screen off and lock out power in order to ensure that the screen does not start while maintenance/disassembly is being performed.
- Clean the machine.

9.5 Disassembly

- Disconnect all electrical connections and cables. Follow the instructions in the section that covers electrical installation.
- Remove covers and protective plates.
- If necessary, disassemble chutes to the downstream screenings handling equipment.
- Connect the lifting device as instructed in the section that covers pivoting/lifting the screen.
- Remove the support legs assemblies.
- Gently lift the screen up from the channel and check that the screen is not damaged while it is being lifted out of the channel.

We recommend that disassembly and significant repairs be carried out by the manufacturer or manufacturer's qualified service representative.

Please contact Claro for any questions regarding service & maintenance.

9.6 Disposal

All parts should be recycled/disposed of in accordance to the applicable regulations. Stainless steel parts can be recycled according to the governing regulations. Disposal of consumables, such as oil, shall be in accordance with applicable local regulations

10. Components / Spare Parts Drawings & Spare Parts List

Please see appendices section for equipment drawings, spare parts drawings & project layout drawings.



Claro Wash Press

O&M Manual

Installation – Operation – Care



Claro

Screening & Grit Removal

Wash Press Screw Compactor

Claro is pleased to offer a high-quality wash press screw compactor for the effective washing, dewatering, compaction, & transport of screenings. Screenings are well-cleaned of organics, dry, diminished in disposal volume, & deposited into an optional hygienic bagger that automatically unfolds into receiving bin. Robust & versatile construction. Fully-enclosed & odor-controlled.

Standard capacity sizes & configurations are available to meet a broad range of application scenarios. Hundreds of installations. Screw press compactor also available without washing feature.

Design features & advantages

- Effective washing with a very compact footprint
- Integrated heavy-duty thrust bearings & a high-torque drive unit to assure optimal dryness & compaction of screenings material
- Slow transportation of screenings for gentle, thorough washing without maceration
- Completely enclosed, odor-controlled hygienic operation
- Robust screw press compactor unit including double-body construction
- Tight tolerances between screw & trough delivers superior process performance
- Only one moving part: a special alloy steel spiral
- Easy access for inspection / maintenance of wash & press zone: unit easily dismantles at both front & back end
- No maintenance-prone wedgewire & no wearable brushes to replace
- Long compaction tubes up to 6 m. (20 ft.) in length for transport of screenings – can eliminate conveyor
- Optional hygienic bagger
- Complete systems for sole-supplier responsibility



Wash Press Screw Compactor



Wash Press Screw Compactor
(Assumption WWTP, QC)

Claro

Screening & Grit Removal

Hygienic Bagger System

Claro provides hygienic baggers that isolate screenings or other reject materials in a continuous, tubular plastic bag that automatically unfolds into a standard receiving bin. Favored by facility operators, the bagging unit prevents contact with reject materials & promotes a hygienic, odor-controlled working environment.

Composed of a stainless steel & resilient ABS plastic dispenser and a 3-ply 90 m. (295 ft.) bag magazine cartridge, hygienic baggers are mounted at the end of wash press compactor, grit classifier, conveyor, & other discharge tubes and chutes. When the bin is filled, the bag ties off at both ends with a tie-wrap similar to a sausage—closing the filled bag & providing the new bag section with a closed bottom.

Design features & advantages

- Used for screenings, grit, & other reject materials
- Isolates operators & work environment from reject material & odors
- Bag magazines 90 m. (295 ft.)
- Automatic operation—bag unfolds/unwinds into bin under weight of bagged material
- Standard & custom dimensions available
- Mounted on wash press compactor, grit classifier, conveyor, & other discharge points
- Bag easily ties off at both ends when bin is filled & ready for disposal



Hygienic Bagger with 90 m. / 295 ft. Long Bag Magazine



Hygienic Bagger Dispenser and Bag Magazine

Contents

1. About the Wash Press	5
1.1 Structure & Function	5
1.2 Use	6
2. Safety	6
2.1 General.....	6
2.2 During Operation	7
2.3 Lifting the Equipment – General	7
2.4 Machine Safety Protections	7
2.5 Electrical Work	8
3. Storage, Transportation & Packaging.....	9
3.1 Scope of Delivery.....	9
3.2 Storage.....	9
3.3 Transportation.....	9
3.4 Packaging.....	9
4. Functional Description.....	9
4.1 Principle of Operation.....	9
4.2 Operation.....	10
4.3 Manual Operation	11
5. Assembly & Installation.....	13
5.2 Electrical Installation	16
6. Start-up.....	17
7. Trouble-Shooting.....	18
7.1 Warning or High Amperage Alarm.....	18
7.2 DS Content of Treated Screenings Too Low.....	19
7.3 Water Remaining in the Wash Press Inlet or Drainage Area.....	19
7.4 Back-up of Screenings Material in Wash Press Inlet.....	19
8. Regular Verifications & Maintenance	20
8.1 Weekly	20
8.2 Monthly	20
8.3 Yearly	21
9. Disassembly	22
9.1 Before Starting the Disassembly	22
9.2 Disassembly.....	22
9.3 Disposal.....	22
10. Components / Spare Parts Drawings	23

Introduction

The Claro Operation & Maintenance manual is intended to provide operations staff a clear description of the wash press and its parts. This manual also contains important instructions on how to install & start-up the wash press as well as maintenance advice. All who come in contact with the wash press system shall comply with the safety precautions, warnings, regulations and other instructions in this manual as well as local provincial/state and facility regulations and safety practices.

This Operation & Maintenance manual must be available to all personnel involved in the wash press system's installation, commissioning, operation, service / maintenance and transportation.

Claro Environmental Technologies assumes that the personnel responsible for or working with this equipment are familiar with local regulations regarding the work safety environment and especially safety regulations and practices for sewage treatment plants and other applicable regulations.



Never start installation or assembly prior to reading and fully understanding the contents of this manual. The safety instructions and warnings are especially important. If personnel have any comments or questions, please feel free to contact Claro.



It is forbidden to use the wash press in any other manner or for purposes other than those described in this manual.



N.B. Claro cannot be held responsible for damage caused by negligent handling of the machine or neglect of the directives outlined in this manual. If personnel have comments or questions, please feel free to contact Claro. We are here to help !

Claro's responsibility is limited or ceases once:

- The machine or any individual component is loosened or disassembled without Claro consent and/or advice

- Parts that do not belong to the wash press are integrated into the machine
- Parts that are not original spare parts are installed without Claro's approval

Modification, renovation or re-build of the machine is not permitted without written consent of Claro Environmental Technologies. Please feel free to contact Claro for advice. We are here to help !

1. About the Wash Press

The Claro wash press, model TP, is designed to wash, dewater and transport captured material (i.e. screenings) from mechanically screened wastewater or process water. The wash press is designed for automatic operation and starts automatically based on the control narrative and set point value settings.

The model TP wash press is available in different sizings/models – the diameter of the unit can vary and the inlet length can also vary.

The model number format is as follows:

e.g. TP 150-500 (model diameter - inlet opening length in mm)

1.1 Structure & Function

The machine consists of two main parts:

1. Motor including gear drive unit, Figure 1.
2. Machine body including wear bars and transport screw, Figure 2.



Figure 1, drive unit

The machine consists of a separate drive station package that includes gear drive and motor. Between the gear drive and transport screw is an axial bearing. The bearing is lubricated automatically with an automatic greaser cartridge.

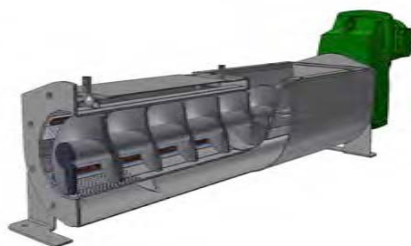


Figure 2, Wash press body incl. wear bars and transport screw

The screenings are accumulated in the inlet and are then transported by the screw into the washing zone where soluble organic material is washed off the captured debris. Then the screenings are dewatered in the press zone and finally transported out through the discharge pipe.

1.2 Use

The Claro wash press TP is used to wash, dewater and transport captured material (i.e. screenings) from mechanically screened wastewater or process water. The screenings typically are discharged into the wash press from a mechanical screen or filter.

The wash press is typically used in one of the following applications: municipal and industrial wastewater treatment plants, paper industry, food industry, tanneries and textile industries.



It is forbidden to use the wash press for any other purpose than the above without written consent from Claro.



2. Safety

The safety section contains important safety information and should be followed closely. There is a risk of personal injury or other damage if the safety instructions are not followed.

Before any work is started, the personnel who will perform the work or related personnel must read this safety section.

2.1 General

- It is forbidden to use the wash press for other than its intended purpose.
- Personnel can be injured if the wash press is employed for other than its intended use and when personnel with inadequate knowledge of the system manipulate, engage with or operate the machinery and/or control elements.
- All personnel who operate the machine must have read and understood this manual, especially the safety section.
- Rebuilding and/or modification of the machine is prohibited without written consent from Claro. Please feel free to contact Claro – we are here to help !
- Exercise caution when lifting the unit; never walk under a suspended load. Also be careful when disassembling/manipulating a full wash tube – the tube is heavy when full of screenings.

- Before cleaning, servicing or dismantling, the motor power lock-out switch and/or the control panel must be turned off and a padlock installed.
- In addition to the directives specified herein, the safety regulations and practices that apply at the local plant shall be followed. State, provincial and/or country regulations shall also be followed.
- All warning signs shall be maintained in the same condition as when the screening, conveyor &/or wash press system was delivered.
- All wash press protecting elements and covers must be mounted and locked / bolted in position before starting the wash press system.
- The wash press, including the discharge tube support(s), must be firmly attached to the machine and to the floor slab (or to the back of the stainless steel tank) before starting the machine.

2.2 During Operation

- Work on the wash press is forbidden when it is in operation.
- Keep in mind that the machine starts automatically without notice.
- Protective plates and covers shall be installed and bolted in position.
- Inspection cover at the fine screen discharge/wash press inlet can be opened, however, it is forbidden to touch or otherwise engage with moving parts such as the wash press spiral.

2.3 Lifting the Equipment – General

- Use only approved lifting equipment and check the maximum load of the lifting equipment before lifting begins.
- Use caution – do not work or walk under suspended loads.
- The machine must only be lifted at the designated lifting lugs.
- Lifting equipment must not be removed before the machine is properly bolted to the floor slab (or stainless steel tank).
- For details on the lifting procedure, please see "Lifting the Equipment – Details," Section 5.1.1.

2.4 Machine Safety Protections

The wash press is equipped with an easily-removable (quick-release) cover located above the washing and dewatering zone. The inlet is provided with a frame flange that can be used as the basis of an inlet chute if not already supplied with the wash press unit. The inlet must always be provided with an inlet chute, which will also protect against contact with moving parts of the machine while it is in operation.

The wash press is equipped with inspection covers. These should always be mounted and secured when the machine is in operation.

Loose items that are not typical screenings debris (such as tools and other items) can cause injury as well as damage to the machine.

WARNING: The wash press and connected equipment start automatically and without notice. An HOA station for manual operation shall be provided local to the wash press. Ideally, the operator will be able to see the effect of manual operation.



It is forbidden to clean the fine screen discharge or the downstream equipment's (i.e. wash press) inlet by hand or with a tool without the safety power lock-out switch turned off and locked with a padlock.



2.5 Electrical Work

Electrical work must be performed by a licensed electrician and in accordance with applicable laws, regulations and rules. Work shall also be carried out in accordance with local regulations.

- To avoid accidents including fatal electrical shock, it is important that the electric motors, instruments and cables are in good working order with no breaks or other anomalies.
- Electrical cables should be routed so that there is no risk of wear against the fine screen's stationary or moveable parts.
- All equipment and instruments should be grounded. Humid environments and water screening applications carry an increased risk of accidents caused by electric current. Remember that the screening system is a high voltage system.
- When replacing or repairing an electrical component, the power supply must always be turned off and the relevant switch and/or breaker element padlocked before starting work.

It is forbidden to connect the machine to a live electrical power source while installation or other work on the machine is in progress.

3. Storage, Transportation & Packaging

3.1 Scope of Delivery

In addition to the wash press the following elements are included in a typical delivery:

- One (1) plastic or rubber plug for the wash press reject water outlet / drain.
- One (1) automatic greaser cartridge for the axial bearing.
- Two (2) solenoid valves for wash / flush water (option: other valve type).
- Two (2) ball valves for wash / flush water and solenoid isolation (option: other valve type).

3.2 Storage

Storage of the machine may be made for a short period and only in / on its original packaging. Ensure that the wash press is stored in an indoor environment and not exposed to freezing. If outdoor storage is unavoidable, please contact Claro. Before the wash press unit is kept in storage for a longer period, please contact Claro for storage instructions.

3.3 Transportation

Transportation shall be made in a manner in order that the fine screen is secured from falling or other mishap damage. Lifting the machine over personnel is absolutely forbidden. Suitably trained staff should perform lifting, loading, load securing, unloading and driving of the transport truck.

3.4 Packaging

The packaging (pallets or crating) is specially designed and adapted for the delivered wash press equipment and provides maximum protection. Ensure that the packaging is not damaged when you receive the delivery. If the packaging is damaged, please document with photographs & contact Claro.

4. Functional Description

4.1 Principle of Operation

Captured screenings are discharged from a mechanical screening device, such as a step screen, and deposited into the inlet of the wash press. This captured material is then transported by the wash press screw to the washing zone where organic material is washed off the screenings. The screenings are subsequently dewatered in the press zone as they are pushed against an already extant screenings plug in the wash press

discharge tube. These treated screenings are transported via the discharge tube to an optional hygienic bagger and into an associated receiving bin. When the screenings are pushed against the screening plug, organics are pushed through perforations that are located at the discharge end of the washing zone tube. These removed organics are then conveyed down the drain by flushing jets. Washing and flush water connections are found on the top or on the sides of the wash press body (please see drawings in the appendices sections of this O&M manual).

4.2 Operation

The wash press is operated via a control panel, which is typically included in the equipment delivery from Claro

In order to obtain a clean high and consistent DS content product, it is important to know the amount of screenings being inputted into the wash press inlet. With a step screen this volume is predicable and the washing settings of the wash press can be determined in consequence. An adjustable number of fine screen rotations/discharges cue the operation of the wash press. Since the volume of each rotation is consistent, wash press operation can be optimized. A level sensor positioned in the wash press inlet can be used when other screen types are utilized.

4.2.1 Automatic Operation

1. When all selectors are in Auto and the screen reaches the adjustable wash press start set point (i.e. number of screen rotations/discharges), the wash press will start its treatment cycle (or a level sensor will sense the level of screenings material in the wash press inlet if a level sensor start signal approach is implemented). Please see control narrative in the appendices section for an itemized breakdown of the wash press treatment cycle. The general control pattern and principal of operation, however, is as follows:
2. At its start signal, the wash press will begin with an initial screw feed time that moves the screenings located in its inlet to the edge of the washing tube. This initial washing time is effected without wash water usage in order to diminish water resource use.
3. Next, the washing solenoid (Solenoid #1) is turned on while the screenings material travels through the washing tube. The solenoid pummels the material and removes soluble organic material. The operator can choose between a washing mode without pauses or with pauses. The with-pauses mode increases the washing residence time of the screenings.
4. Next, the washing solenoid is turned off and the screenings are transited by the screw and pressed against the already present screenings plug that is

located in the wash press discharge tube. These already treated screenings present counter pressure to the new transited screenings. This enables the compaction and dewatering of screenings and the evacuation of organics material through the washing tube's perforations under pressure.

5. Next, the screw stops while the flushing solenoid (Solenoid #2) flushes the outside of the washing tube and thus conveys the organics material down the wash press drain and to the screening channel or an appropriately designed floor drain. This organics material is subsequently treated by the downstream unit process(es). The wash press then ends its treatment cycle and waits for the next start signal.

4.3 Manual Operation

When the local HOA control station selectors are in Manual & Forward, the wash press will function in forward until the spring-loaded selector is released. When the local HOA control station selectors are in Manual & Reverse, the wash press will function in reverse until the spring-loaded selector is released. The spring returns are implemented in order to ensure that the wash press is not left running continuously and unattended for extended periods of time in forward and especially in reverse.

The washing & flushing solenoids can be operated from the Claro-supplied control panel HMI when the wash press's local HOA control station is in the Manual position (i.e. buttons appear for manual operation on the respective HMI graphic touch screen).

Note: The local HOA station also typically incorporates an E-stop push button that stops the wash press for operator safety.

4.3.1 Overload/Alarms

- If the overload protection (current transformer or, secondarily, the thermal overload) is tripped, the wash press stops and the control panel signals an alarm. There are two high amperage alarms, a warning level and a high shut-off level.
- A low amperage alarm may also be employed. Low amperage alarms can detect a broken coupling or spiral detachment.
- If the E-stop is pressed on the local HOA control station, the wash press stops and the control panel signals an alarm.
- If a level sensor is employed, a high material level in the inlet will cause the control panel to signal an alarm. In some applications, the wash press will also shift into continuous run mode.

4.3.2 Other Elements

The local HOA control station should enable the wash press to run in both forward and reverse. If the control panel has been supplied by Claro, this functionality will be available to the operator.

Manual operation should also be independent of PLC functionality. N.B. In this case, the thermal overloads function as the amperage/torque protection. As thermal overloads are not as sensitive as the electronic safety equipment (Emotron / current transformer), manual operation should be effected with caution and with attention paid to the wash press.

Each piece of equipment should be supplied with its own local HOA station.

4.3.3 Pre-Set Values

Claro will provide initial start-up settings for your application. If you have comments or questions about control settings, please contact Claro – we would be glad to help and further outline the nature and rationales informing the controls equipment and controls set points. A record of final set points will be provided a short time after start-up once the wash press, and the screening system as a whole, has been submitted to the full range of flows at the facility.

4.3.3.1 *Operating modes*

The wash press has two modes:

With-Pauses Mode: a control sequence that transports the screenings through the washing zone via an adjustable number of adjustable screw run/pause cycles in order to increase the residence time of the screenings under the washing influence of the solenoid #1 water jet.

Without-Pauses Mode: a control sequence that moves the material through the washing zone and under the influence of the washing jet without pauses. Typically the without-pauses approach effectively cleans the screenings. The with-pauses mode is provided in order to better address especially high loads of organics that have not been broken up during its transport by the collection system (e.g. when waste arrives whole from domestic toilets close to the facility).

Adjustment of wash press settings is an incremental process since the results of a controls adjustment will only be fully seen several weeks after the change. When screenings are washed more, they experience more friction against the inner surface of the discharge tube. With more friction, the screenings will be drier and then, in turn, experience additional friction. This feedback loop will continue until a natural stabilized level is established. The lead time for this type of stabilization can be between 2 and 4 weeks.

When starting the wash press it is best to start with minimal washing and then follow with incremental augmentations in organics removal. This is especially important with long discharge tubes of 4 to 6 meters in length. Claro will advise on the initial settings for the wash press. If you have comments or questions, please feel free to contact Claro.

5. Assembly & Installation

Experienced installation personnel must carry out the installation in a professional manner. All electrical wiring must be performed by a qualified electrician and must comply with current CSA, UL or other applicable regulations.

For ease of installation and future service and maintenance it must be possible to lift the machine (overhead beam, overhead lifting lugs, davit crane or equivalent). The lifting device must be approved and adapted to the machine weight. The weight of this machine is indicated on the nameplate.

Before lifting the machine, check the following:

- The wash press supports should not be installed too close to the channel edge. Follow the project drawings regarding the placement of wash press supports. Ensure that the concrete is in good condition for the purpose of supporting the wash press weight.
- Power must be switched off and the switch locked with a padlock. Cabling must be disconnected.

5.1.1 Lifting the Equipment -- Details

- Use only approved lifting equipment and check the maximum load of the lifting equipment before lifting begins
- Use caution – do not stand or extend limbs under suspended loads.
- The machine must only be lifted at the designated lifting lugs or lifting points – please see Figure 3 (lifting lugs are located on the gear drive & a strap/belt can be used at the wash press discharge flange).
- Lifting equipment must not be removed before the wash press is fastened to the floor slab.

- Please following page →

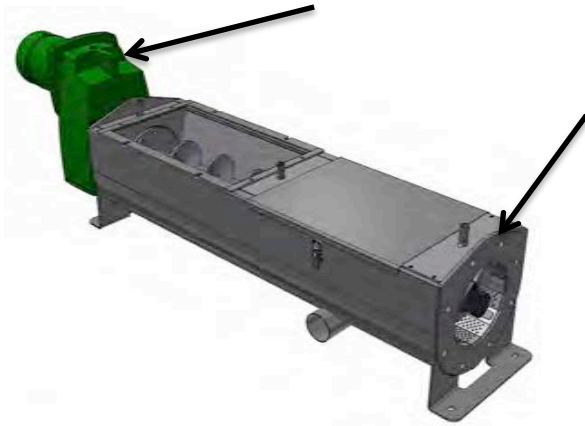


Figure 3 Lifting the machine, arrows showing lifting lug and placement of lifting belt

5.1.2 Installation

Position the wash press in the desired location (as per contract drawings) and bolt it onto the floor slab (or, for in-tank configurations such as septage stations, install the wash press onto the provided support that is typically an integrated part of the screen tank). Install any other loose supports. Please see project drawings included in the appendices section of this manual.

Connect the drain pipe for reject water on the desired side of the wash press. Install the provided plastic or rubber plug on the un-used drain. Add a bead of silicone to create a water-tight seal, if required. Note: drain is not under pressure. The drain piping for an in-channel screening system installation typically consists of a rubber sleeve, two (2) stainless steel gear clamps & a short length of PVC tube. These elements are supplied by the installing contractor.

The drain pipe should be installed with as large a slope as possible in order to best promote drainage. The drainage pipe should also be as short as possible and drain downstream of the screen & wash press. Note: for systems with two screens that discharge screenings into a common wash press, please contact Claro for advice on the drainage pipe configuration. The configuration should enable drainage to either of the 2 channels as preferred. This flexibility will allow operators to shut down either channel and to direct drainage water to the remaining duty channel.

For wash presses that form part of a Claro in-tank screening system (e.g. septage stations), the wash press will either drain back into the tank or into a separate drain. If drainage is to the tank, Claro will have provided a flexible drain pipe & gear clamps for installation. If the drain is to a separate drain, the contractor provides the requisite piping. Note: the drain must be

designed to accommodate reject water that will contain organic solids i.e. with sufficient slope and a minimum number of elbows in order to avoid solids sedimentation and the risk of blockage.

The wash press must be installed perfectly level. The wash press must not be installed at an inclination that promotes wash water to run towards the drive end of the unit.

Connect the wash water for washing and flushing. The washing connection is located towards the drive end of the unit. The flushing connection is located towards the discharge of the wash press unit. The wash/flush water supply is configured as follows: a main wash water supply is equipped with a pressure gauge and its isolation valve and then splits into two lines via a T connection. These two lines are each equipped with an isolating ball valve & a solenoid valve. Note: if the wash/flushing water is non-potable (e.g. plant final effluent (FE) or well water), a 50 mesh filter must be installed on the supply line upstream of the pressure gauge. This filter can be a Y-strainer or other in-line filter. If a Y-strainer, the filter basket voiding connection should be equipped with a ball valve and a drain pipe that empties into the channel, appropriate drain or tank. Y-strainer voiding can be automated via the Claro control panel.

The diameter of the wash/flush connections are provided in the scope of supply section of this manual (please see appendices section below) & in the technical submittal. Solenoids, isolating ball valves, pressure gauge & isolating ball valve, and Y-strainer & ball valve (if applicable) are typically provided by Claro. Please check scope of supply section and the project technical submittal.

The recommended minimum/maximum water pressure is 55 to 75 PSIG (4 – 5.2 bar). Higher pressures should be regulated by a pressure regulator provided by others.

Install the automatic greaser cartridge on the provided connection near the wash press gear drive. The automatic greaser lubricates the axial bearing. Set the automatic greaser cartridge to 12 by turning the selector located on the top of the cartridge.

5.1.3 Installing Auxiliary Equipment

The wash press must be equipped with an inlet chute and a protective discharge/inlet cover that precludes operator contact with moving parts of the wash press. The unit must not be placed into operation before this and other protective safety elements are properly installed.

The wash press pipe is connected to the outlet via a PN10 flange. The wash press piping system design must be developed in coordination with Claro and will be provided with either a floor support or lifting lugs for support from the ceiling. If a ceiling-mount configuration, the ceiling brackets and supporting cable/chain are provided by others.



5.2 Electrical Installation

Electrical work must be performed by a licensed electrician and in accordance with applicable rules, regulations & laws.

Before reading and acting on the information in this section, please read section 2.5 in its entirety in order to ensure personnel safety. Please also see Claro As-Built control panel drawings, if a control panel has been supplied by Claro.

5.2.1 Electrical Connections

Please review control panel As-Built drawings. The wash press typically has the following electrical connections:

- Wash press motor.
- Two (2) solenoid valves.
- Typically there is also a local HOA control station with MAN/Off/Auto + Forward/Reverse selectors + E-Stop.
- The wash press will also have a motor lock-out located either on the control panel door or as a separate local station.
- Note: install all electrical wiring connections in a manner that provides clear access to the wash press and in a manner that does not obstruct the removable cover or its quick-release clips.

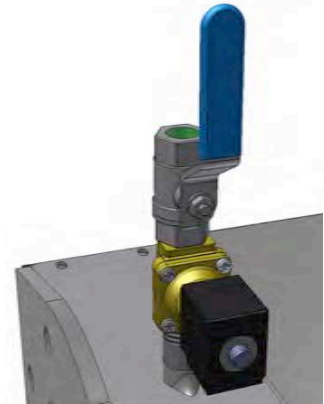


Figure 4 (above right). Solenoid & ball valve mounted on flushing connection of wash press; alternate placements are also acceptable – please ensure that the ball valves can be opened and closed without obstruction & that the removable cover of the wash press and its quick-release clips are not obstructed.

6. Start-up

Check the following items before putting the wash press into operation:

- All connections are properly fastened and that the machine is properly bolted to the floor slab or screen tank.
- Washing/flushing water connections, solenoids & auxiliary equipment are connected and functional. Also, ensure that wash/flush water is available. Verify for leaks.
- Wash press drain piping and drain plug are installed. Verify for leaks.
- All electrical connections are complete and verified.
- Check the rotation of the screw - screenings should be transported towards the discharge of the unit when run in forward.
- Inlet chute is installed.
- Press pipe including support is installed and properly bolted to the floor slab.
- All covers and protective plates are fitted & installed correctly.
- All warning signs are installed.
- The wash press inlet chute is located in the proper relationship to the discharge of the upstream screening equipment. Captured screenings should fall into the wash press inlet without hang-up and the inlet chute should not obstruct the screen's moving parts. Claro will suggest the proper location of the fine screen in relation to the downstream equipment. If you have comments or questions, please feel free to contact Claro.
- If applicable, please also see screen manual for additional start-up instructions.



7. Trouble-Shooting

General: The wash press's motor amperage is monitored with a current transformer (CT) that is installed in the control panel or in the Motor Control Center (MCC). Please see As-Built control panel drawings for more information regarding amperage protection equipment. The following trouble shooting comments are fully applicable if Claro has supplied the control panel. If you have comments or questions, please feel free to contact Claro. We are here to help !

7.1 Warning or High Amperage Alarm

If the warning amperage level is attained and the high amperage shut off level alarm is not triggered, the wash press has not reached its full FLA. Only an alarm will be issued and the wash press will continue to function. If the shut-off level has been attained, the wash press will automatically fall into fault, shut-down and alarm.

In either of these conditions, verify that no over-size debris has entered into the wash press inlet. Before removing debris, lock the wash press out of operation in order to ensure against personnel injury.

If the inlet is free of debris, verify that all wash press tube flanges are perfectly centered, including at the wash press discharge. The pipe system should not present a raised inner lip to the compacted screenings. The inner lip, which results from a flange offset, will counteract the flared design of the wash press tube & can cause over-compaction and plugging of the discharge tube. Note: incorrect installation of the wash press tube typically does not present higher amperage readings immediately. Amperage may reach alarm levels only after a period of operation.

If the wash press has not reached its shut-off level, it may be possible to push material through the tube after its installation is corrected. If this is not possible, disassemble and empty the tube of screenings.

If all discharge tube flanges are centered perfectly and the shut-off alarm level has been attained, the tube must be disassembled and emptied of screenings material. After the tube is correctly reinstalled, reduce washing time and/or increase the number of screen rotations/discharges set point (i.e. allow a larger volume of screenings to enter into the wash press inlet before the wash press initiates its treatment cycle). This will diminish washing, friction and backpressure against the wash press motor. Washing can be augmented slowly, however, the effect of each change in settings should be observed for 2 - 3 weeks before settings are changed again. Monitor motor amperage. If there are comments or questions, please feel free to contact Claro.

7.2 DS Content of Treated Screenings Too Low

Increase washing residence time and / or decrease the number of screen rotations/discharges between each wash press treatment cycle. N.B. Change only one parameter at a time and observe results over time. Remember that the screenings has a residence time in the discharge tube. If there are comments or questions, please feel free to contact Claro. We are here is help !

7.3 Water Remaining in the Wash Press Inlet or Drainage Area

Water may be backing up in the inlet due to clogged wash press washing tube perforations or a clogged drain. In this instance, perform the following maintenance:

Open the cover above the washing / pressing zone and clean/remove all debris from around the tube, the drainage area, and the drain pipe.

If this area has accumulated material, increase the flushing time (solenoid #2).

Ensure that wash water pressure is adequate and that the washing jets located under the cover of the wash zone and the inlet perforated plate drain are in good working order.

A small amount of water in the trough after the end of a wash cycle is normal. This area, however, should not experience flooding.

7.4 Back-up of Screenings Material in Wash Press Inlet

If screenings build-up in the wash press inlet verify the following:

Ensure that the wash press starts its treatment cycle after a reasonable volume of material enters into the inlet. Claro will advise on correct volume in your application.

Ensure that the screenings material does not include an atypically large plug/quantity of grease (e.g. illegal discharge from restaurant grease trap), congealed plugs of polymer or similarly gelatinous material. If present, remove material and/or contact Claro for advice.

If the screenings are normal and fail to be transported out of the inlet, remove the discharge tube and verify the health of the wash press wear bars and screw. Worn wear bars and/or screw can cause screenings to accumulate within the wash press inlet.

8. Regular Verifications & Maintenance



For maintenance inspection and/or maintenance work, all safety regulations must be followed. It is absolutely forbidden to carry out service or maintenance work on the fine screen while it is in operation. Main power lock-out switch must be turned off and locked with a padlock.



8.1 Weekly

- During the initial start-up period, remove the cover above the wash / press zone in order to adjust the flushing time (Solenoid #2). If debris build-up is experienced, flushing time can be increased.
- The machine runs without irregular noise.
- Remove the cover above the wash / press zone and rinse/clean, if necessary. Make sure the reject water drain is free from debris. Clean if necessary.
- Check that the wash press inlet & inlet chute are free of screenings material. Clean if necessary.
- If implemented, check how much hygienic bag length remains on the automatic bagger unit. Ensure that a replacement bag is available if the bag is nearing full use. Additional bags can be ordered from Claro.

8.2 Monthly

- Verify that there is grease in the automatic greaser cartridge. Replace if necessary and set the lubrication cartridge setting to 12 months by turning the selector on top of the cartridge. Grease cartridges can be ordered from Claro.
- Verify that no oil is leaking from the gear drive unit.
- Verify the function of the solenoid valves.
- Clean the wash press as required for proper function and hygienic appearance.

-

8.3 Yearly

A thorough review of the wash press should be performed once a year.

Run the machine in manual (or) trigger wash press sequence(s) at the Claro control panel until the inlet and washing/compaction tube is completely empty.

Shut down & lock-out the wash press for operator safety.

In addition to the weekly & monthly verification tasks, please also check the following. Please contact Claro if you have any comments or questions regarding any aspect of the weekly, monthly or yearly inspection.

- Gear box functions properly. Change oil if required. Please review gear drive manual included in this manual.
- Remove wash press tube from wash press discharge in order to inspect the health of the screw and the wear bars. Also, inspect screw and wear bars from the perspective of the wash press inlet. Ensure that all wear bar retaining bolts are in position. Retaining bolts are visible by removing the wash press quick release cover. Note: verify wear bar bolts for wear bars located on the lower portion of the wash/press tube.
- For models TP 250 & TP 300, verify wear on the cog sprockets & double chain where the drive shaft and spiral coupling disc meet. For models TP 150 & TP 200, verify the drive shaft/spiral coupling disc star coupling and its opposite mating plate. Please see drawings in the appendices section of this O&M manual.
- Check for corrosion on stainless steel parts. Corrosion of stainless steel may occur as a result of externally occurring rust or coatings, dirt, chemicals, H₂S or other residues. Claro can recommend an easy-to-use and ecological passivator (based on citric acid) if corrosion is a concern.
- Protective coating on motors, gear drive and related equipment. Repair damage. Touch-up with paint as required.
- Check for damage to electrical cables, cable connectors and seals, junction boxes or similar. Electrical cabling or other damage must be repaired by a certified electrician before putting the wash press back in operation.

Before restarting operation of the wash press, all protective covers must be reinstalled & safety equipment operational.

9. Disassembly

N.B. Before reading or acting on this section, personnel must review Section 2: Safety.

9.1 Before Starting the Disassembly

- Put the wash press in manual mode (or) trigger wash press sequence(s) and run until the machine is free of screenings debris.
- Turn the wash press off and lock out power in order to ensure that the wash press does not start while maintenance is being performed.
- Clean the machine.

9.2 Disassembly

- Disconnect all electrical connections and cables. Follow all safety rules and precautions.
- Remove all water supply pipe connections and chutes.
- Carefully remove the discharge tube & empty of screenings – N.B. tube is heavy when full of screenings. Ensure that the proper lifting equipment and personnel are available.
- Connect the lifting device as described in the equipment lifting section.
- Unbolt the wash press from the floor slab or screen stainless steel tank.

We recommend that disassembly and significant repairs be carried out by the manufacturer or manufacturer's qualified service representative. Please contact Claro for any questions regarding service & maintenance.

9.3 Disposal

All parts should be recycled/disposed of in accordance to the applicable regulations. Stainless steel parts can be recycled according to the governing regulations. Disposal of consumables, such as oil, shall be in accordance with applicable local regulations



10. Components / Spare Parts Drawings

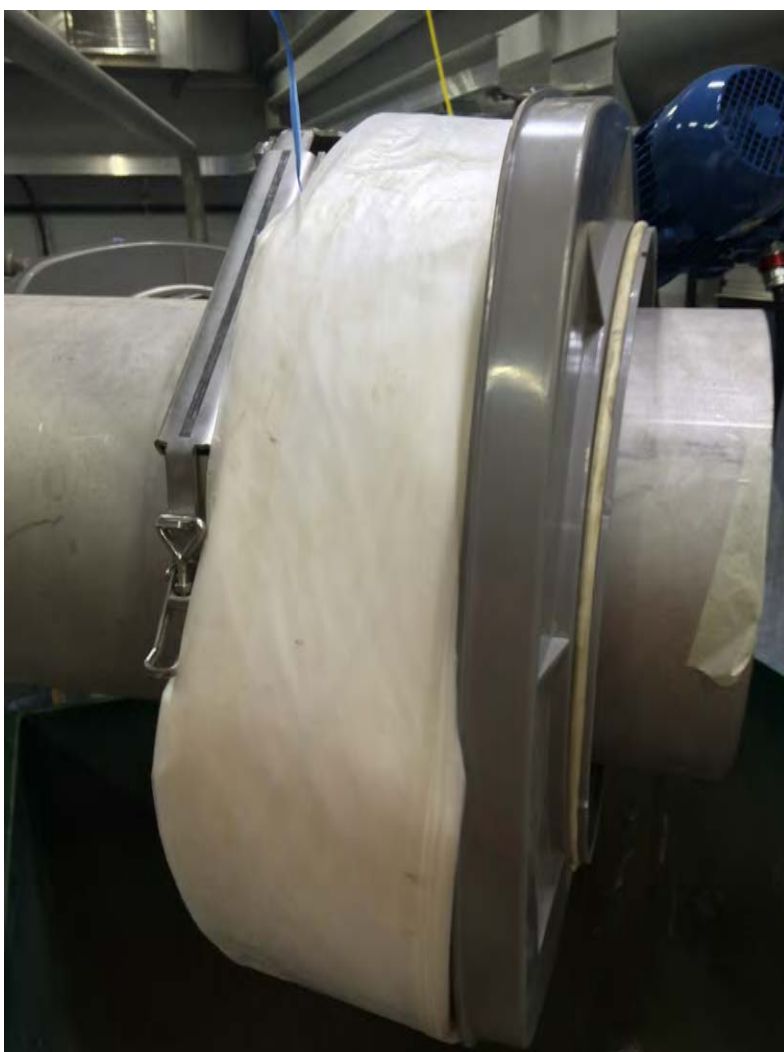
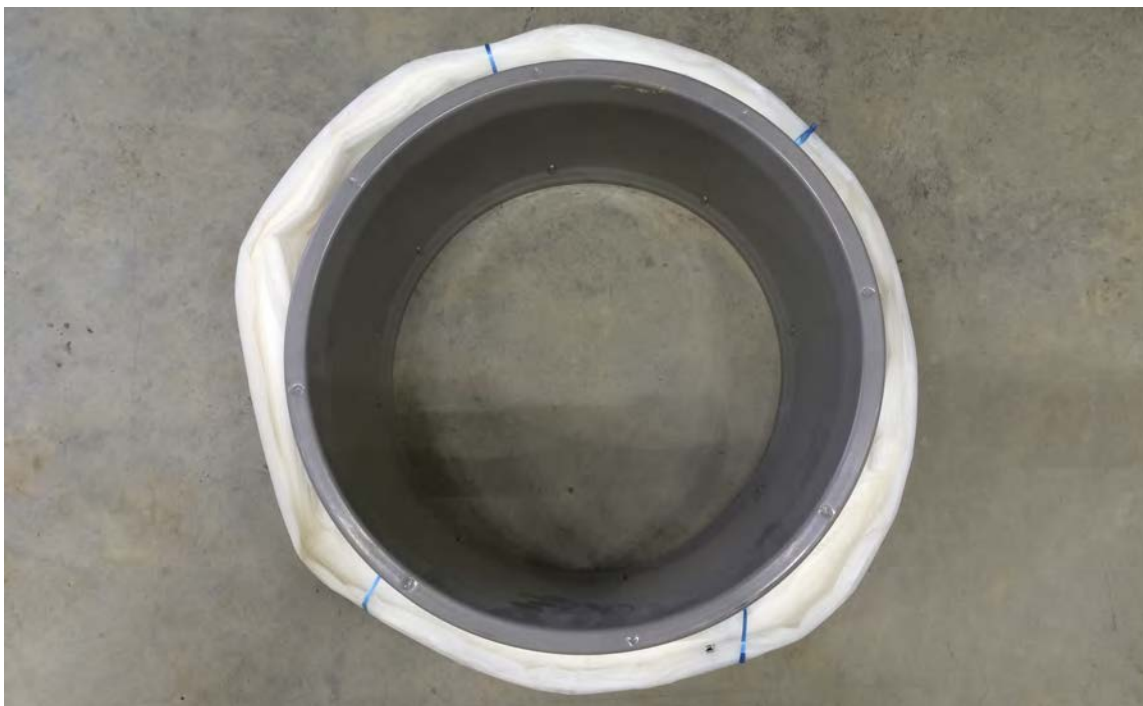
Please see appendices section for equipment drawings, spare parts drawings & project layout drawings.





Hygienic Bagger Cartridge Installation Instructions (Visual)





- Cut off blue retaining string after mounting the bag holder with cartridge



- Secure bagger holder either with quick release clasp (or) with spring clasps (on classifier bagger)



- Tie-wrap bag end



- Pull off bag length in order that it touches the bottom of the bin



Sample Manual - Project-Specific Manual to Follow



VortiClar™ Forced Grit Vortex O&M Manual

Installation – Operation – Care



Fort St. John, BC



Screening & Grit Removal

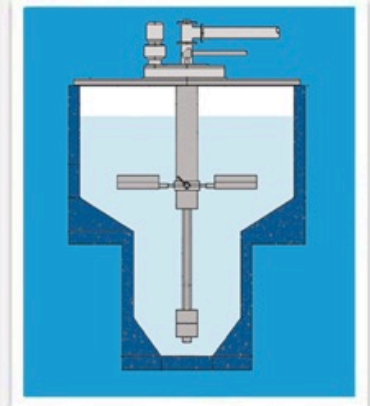
VortiClar™ Forced Vortex Grit Chamber / Sand Trap

Claro VortiClar™ forced vortex grit removal systems deliver high grit removal efficiencies across a wide range of daily flow capacities. An engineered hydraulic design removes fine grit & other debris particles, separates organic from inorganic material, & reduces grit accumulation in downstream basins, channels, weirs, & piping. The extraction of grit also significantly reduces wear on mechanical equipment.

The unit is composed of a centrifugal flow chamber; weir baffles; an energy-efficient axial flow impeller with a single, dual speed, or VFD motor; a quiescent sediment collection chamber & a choice of grit extraction approaches: airlift, high quality grit pump, or a patented grit extraction system that eliminates the need for a grit classifier or grit washer. Ideal for small footprint requirements.

Design features & advantages

- Efficient organics/inorganics separation & fine grit capture
- Exceptionally small foot print & variety of configurations available:
 - elevated, stand-alone config.: stainless steel tank with all components of unit accessible from support platform c/w optional operator-safe walkways
 - low-profile config.: all components of unit accessible & concrete-embedded vortex
- Low maintenance, low operating cost, low energy consumption
- Fully automated & fully-enclosed hygienic operation
- Optional variable frequency drive (VFD) on vortex for performance optimization
- Small & large capacities
- Indoor & outdoor installation
- No submerged bearings
- Optional vortex air and/or water grit scouring system
- For cost-effective retrofits/conversion of aerated grit tanks please see Claro Aerated Grit Tank Extraction Spiral Systems



VortiClar™ Forced Vortex Grit Chamber with airlift arrangement (other grit extraction approaches available)



VortiClar™ Forced Vortex Grit Chamber gear drive and airlift arrangement



Contents

Introduction	5
1. About the Grit Vortex Unit	6
1.1 Structure & Function	7
1.2 Use.....	9
2. Safety	9
2.1 General Safety Precautions	9
2.2 During Operation.....	10
2.3 Machine Safety Protections.....	10
2.4 Electrical Work.....	11
3. Storage, Transportation & Packaging	12
3.1 Scope of Delivery (Typical)	12
3.2 Storage	12
3.3 Transportation	12
3.4 Packaging	12
4. Assembly & Installation	13
4.1 Assembly / Installation.....	13
4.2 Electrical Installation.....	15
5. Operation	16
5.1 Automatic Operation.....	16
5.2 Manual Operation	17
5.3 Overload/Alarms	18
5.4 Other Elements.....	19

6. Settings 19

6.1 Default Values 19

7. Regular Verifications & Maintenance 20

7.1 Weekly 20

7.2 Monthly 20

7.3 Yearly 21

7.4 Vortex Planetary Gear Drive Assembly Information – Model Claro S25-GCD-5023

- Please see Appendices section of the global O&M manual for additional arrangement / layout drawings & motor/gear drive specification information.



Introduction

The Claro Operation & Maintenance manual is intended to provide operations staff with a clear description of the vortex grit chamber and its components. This manual also contains important instructions on how to install & start-up the vortex unit and maintenance advice. All who come in contact with the vortex grit removal system including its auxiliary equipment including blower, grit pump and/or classifier/grit washer equipment should comply with the safety precautions, warnings, regulations and other instructions in this manual as well as local provincial/state and facility regulations and safety practices.

This Operation & Maintenance manual must be available to all personnel involved in the vortex system's installation, commissioning, operation, service / maintenance and transportation.

Claro Environmental Technologies assumes that the personnel responsible for or working with this equipment are familiar with local regulations regarding the work safety environment and especially safety regulations and practices for sewage treatment plants and other applicable regulations.



Never start installation or assembly prior to reading and fully understanding the contents of this manual. The safety instructions and warnings are especially important. If personnel have any comments or questions, please feel free to contact Claro. Personnel should never enter into the tank or be in proximity to openings on the tank covers where a fall risk is present without turning the vortex paddle system 'Off' and locking out power at the control panel. Serious injury or death will result if the paddle system should start in the presence of personnel within the tank.



It is forbidden to use the vortex tank in any other manner or for purposes other than those described in this manual.



N.B. Claro cannot be held responsible for damage caused by negligent handling of the machine or neglect of the directives outlined in this manual. If personnel have comments or questions, please feel free to contact Claro. We are here to help !

Claro's responsibility is limited or ceases once:

- The machine or any individual component is loosened or disassembled without Claro consent and/or advice
- Parts that do not belong to the vortex are integrated into the machine

- Parts that are not original spare parts are installed without Claro's approval
- Lubrication schedules are not followed

Modification, renovation or re-build of the machine is not permitted without written consent of Claro Environmental Technologies. Please feel free to contact Claro for advice. We are here to help !

Note: The vortex system is composed of several major components including a grit pump, an air blower, and a grit classifier. The respective O&M manuals included in this global manual should be reviewed and understood before operation / maintenance of the system.

1. About the Grit Vortex Unit

General: The Claro VortiClar™ forced grit vortex unit is designed to mechanically separate fine & larger particle sand and grit from wastewater or process water. The vortex paddle system operates continuously for the purpose of grit removal. Auxiliary equipment such as water scour, air scour (if applicable), grit pump (or, alternately, a grit air lift), and grit classifier (or, alternately a grit washer) run intermittently on a schedule controlled by the Claro control panel.

Grit includes sand, gravel, cinder, or other heavy solid materials that are “heavier” (higher specific gravity) than the organic biodegradable solids found in municipal or other wastewaters. Grit also includes eggshells, bone chips, seeds, coffee grounds, and large organic particles, such as corn niblets or other food waste that have the aforementioned higher specific gravity. Removal of grit prevents unnecessary abrasion and wear of mechanical equipment, grit deposition in pipelines and channels, and accumulation of grit in anaerobic digesters and aeration or other basins.

Principle of Operation:

1. Vortex Grit Chamber

The influent is introduced tangentially into one side of the vortex chamber where impeller paddles turn at a predetermined rate and thus create a ‘forced vortex’ hydraulic pattern. This circular hydraulic motion in conjunction with the installation angle of the paddle system causes the organics to separate from the grit, be drawn upwards with the effluent and subsequently exit the tank via the vortex outlet. Heavier grit particles drop &, via centrifugal forces, migrate to the tank walls where they drop to a lower collection chamber. The grit slurry material is scoured with air before removal in an effort to further remove & re-suspend organics and enable an exit from the tank for downstream treatment. After the air scour, a water scour is introduced. Water scour has 2 functions: 1) further remove and re-suspend organics and 2) fluidize the grit slurry to a lower Dry Solids percentage (DS) content in order that the grit pump will be able to successfully

pump the slurry. Note: the air scour stops & pauses before the grit pump operates in order to avoid the pump drawing in air. Also, the water scour runs for a short time before the grit pump is called upon to start in order to ensure that air has dissipated and that the grit is suitably fluidized. The water scour continues to run during the full grit pump run time. Grit pump run time has been set by the Claro Technician in order to ensure that no grit accumulation takes place in the vortex's lower sedimentation chamber and to ensure that the grit piping between the vortex & pump and between the pump & the grit classifier are clear of grit slurry.

An inclined deflector plate is bolted to the inside of the vortex tank immediately downstream of the tank's inlet. The deflector plate directs incoming influent flow downwards into the middle section of the vortex tank as a means of preventing short-circuiting of flow that could otherwise interfere with optimal grit removal. By avoiding short-circuiting of flow to the vortex's outlet, the influent flow and its entrained grit stays within the vortex tank for the recommended retention/sedimentation time among other design criteria.

The pumped grit slurry enters into the grit classifier where the grit is allowed to sediment into the shaftless spiral conveyor at its base. The shaftless spiral conveyor removes the captured grit slurry and deposits this material into a continuous hygienic bag and grit bin. Operation of the grit classifier extraction conveyor is typically intermittent in order to decant as much moisture from the slurry as possible. A grit washing jet can also be actuated in order to further wash organics from the grit slurry before discharge, if required.

The Claro grit vortex & auxiliary equipment are designed for fully automatic operation. Please see the annotated HMI screens section in the Appendices section of this manual for a description of control system setpoint flexibility. Please also see control panel drawings and component catalog cuts for a full As-Built documentation of the physical aspects of the control system.

Claro grit vortex systems are designed in a range of model sizes in order to suit the peak plant flow. The model number is expressed as follows: [Diameter]-[Rated Capacity]. Thus, the vortex at Fort St. John, model FV 4250-53.2, has a diameter of 3050 mm & a rated capacity of 53,200 m³/day.

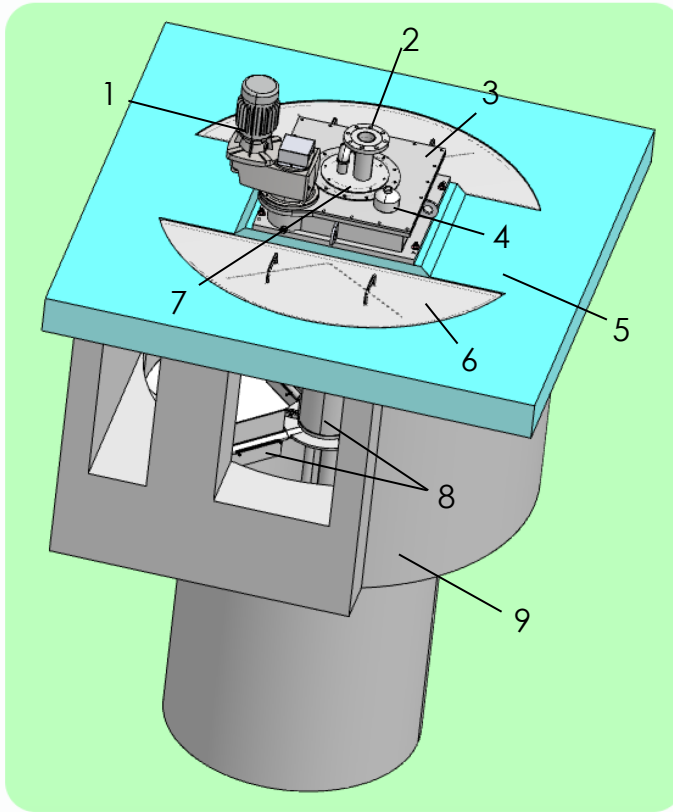
1.1 Structure & Function

The Claro grit vortex consists of the following components:

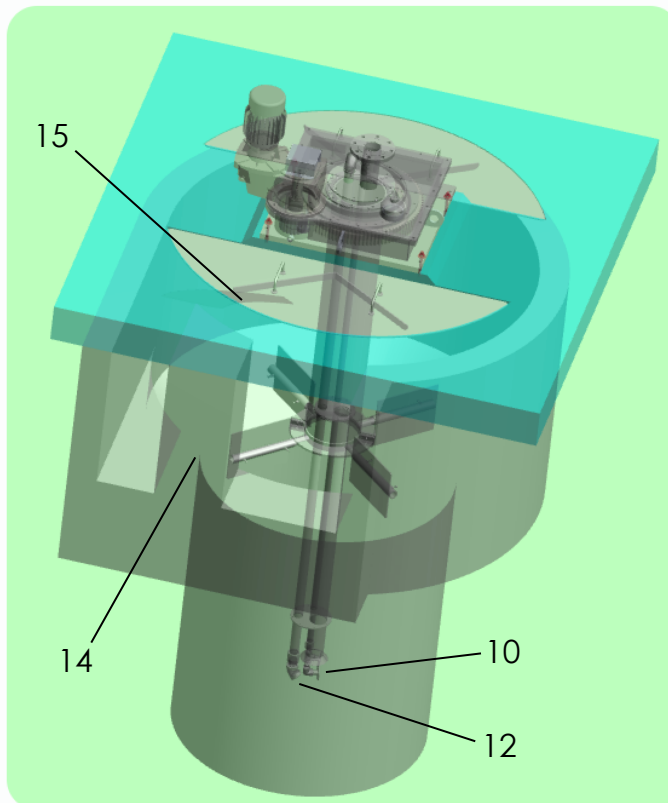
- Please see following page →



Forced Grit Vortex – Typical In-Concrete Arrangement



1. Motor & gear drive
2. Grit extraction piping
3. Planetary gear drive (also can include a stainless steel H-support bridge that supports the planetary gear drive above the vortex tank)
4. Oil fill & oil level verification dip stick
5. Concrete support bridge (or) HSS stainless steel H-support bridge
6. Removable checker plate with drop handles
7. Circular stainless steel top plate with air scour (if present) & grit scour / fluidization line connections
8. Paddle system drive Tube & Adjustable Paddles
9. Conical concrete tank according to Claro dimensions



10. Air Scour System piping inside the vortex tank & including solenoid, ball valve, & 'Snap Cap' coarse bubble diffusers. Air supply is from a blower or, alternately, can originate from a tapped aeration system or other equipment blower supply line
11. Air Scour Blower (not shown)
12. Water Scour piping inside the vortex tank & including solenoid, ball valve
13. Grit pump (or, alternately, an air lift assembly) (not shown)
14. Vortex tank in concrete (by contractor) or supplied as a modular stainless tank with supports
15. Deflector Plate

• Vortex General Arrangement – please see equipment drawings in the appendices section of this manual for more information.

Claro

1.2 Use

The Claro grit vortex system is designed to mechanically separate fine & larger particle sand and grit from wastewater or process water.



It is forbidden to use the grit vortex for any purpose other than the purpose cited above without written consent from Claro. Please also inform Claro if design conditions change significantly or if a change in performance is noted. Claro would be pleased to help.



2. Safety

The safety section in this manual contains important safety information and should be followed closely. There is a risk of personal injury or other damage if the safety instructions are not followed.



Before any work is started, the personnel who will perform the work or related personnel must read this safety section.



2.1 General Safety Precautions

- It is forbidden to use the vortex for other than its intended purpose.
- All personnel who operate the vortex & its auxiliary equipment must have read and understood this manual, especially the safety section.
- Rebuilding and/or modification of the machine is prohibited without written consent from Claro. Please feel free to contact Claro – we are here to help !
- Exercise caution when walking on top of the vortex tank when checker plate hatches are open or when opening hatches. Use certified safety restraints, safety area isolation tape, and procedures in accordance with local and facility regulations when working near the vortex tank when covers are open or removed. Consider turning the rotating paddles off at the HOA (Selector to 'Off' & press E-stop) and locking out power with a padlock at the main control panel in these circumstances. Serious injury or death can result from a fall into an operating vortex tank.
- Before cleaning, servicing or dismantling any aspect of the system, the Vortex HOA selector switch selector should be 'Off',

Claro

the E-stop engaged and, most importantly, the vortex motor power locked out at the main control panel. Serious injury or death can result from an operator coming into contact with the operating paddles of the vortex tank.

- N.B. Remember that the vortex system works in conjunction with other machines/systems. These machines/systems – including the grit pump, air blower, water scour & the grit classifier – can start without warning. It is important to read the manuals of this auxiliary equipment and to ensure that this equipment is 'Off' and locked-out when working on the machine.
- In addition to the directives specified herein, the safety regulations and practices that apply at the local plant level shall be followed. State, provincial and/or national regulations shall also be followed.
- All vortex protecting elements and covers must be mounted and locked / bolted in position before starting the vortex grit removal system.
- All anchor bolts, safety instrumentation (e.g. amperage protection), local control stations including E-stop and, if applicable, safety railings must be present and in good/operable condition before starting the vortex system.

2.2 During Operation

- Work on the vortex is forbidden when it is in operation.
- Keep in mind that the vortex paddle system can be started from a stopped position remotely and that the grit pump (or, alternately, air lift), grit air scour blower, grit water scour, & classifier can start automatically and without notice.
- Protective plates and covers for the top of the vortex and all piping shall be installed and bolted in position. All guards on the grit pump shall also be in position
- The oil dip stick & cover of the vortex planetary gear drive shall be secured in place during operation.

2.3 Machine Safety Protections

- The grit vortex system is equipped with bolted & hinged protective checker plate lids. These elements should always be installed when the machine is in operation.
- Avoid dropping tools or other unscreened debris into the vortex as this material can cause injury, damage the machine and/or

block the grit extraction piping inlet positioned at the bottom of the tank.

- Change planetary gear drive & drive station gear drive oil with the recommended oil type on the schedule shown in the respective sections included in this manual. The main control panel reports operation times of all equipment, including the vortex, in order to help coordinate inspection & maintenance routines. Well-maintained equipment provides for a safer system that is less likely to be out of service.

WARNING: The vortex can be started remotely and major auxiliary equipment such as the grit pump, blower/air scour, water scour, and grit classifier starts automatically and without notice. An HOA station for manual operation & E-stop capability is provided local to the vortex. Ideally, the operator will be able to see the effect of manual operation when using the HOA.



It is forbidden to clean the vortex paddles or other elements while the unit is in operation or not positively lock-out of operation with a padlock.



2.4 Electrical Work

Electrical work must be performed by a licensed electrician and in accordance with applicable laws, regulations and rules. Work shall also be carried out in accordance with facility regulations.

- To avoid accidents including fatal electrical shock, it is important that the electric motors, instruments and cables are in good working order with no breaks or other anomalies.
- Electrical cables should be routed so that there is no risk of wear against any moving or sharp/abrasive parts.
- All equipment and instruments should be grounded. Humid environments and wastewater applications carry an increased risk of accidents caused by electric current. Remember that the vortex system is a high voltage system.
- When replacing or repairing an electrical component, the power supply must always be turned off and the relevant switch and/or breaker element padlocked before starting work.

It is forbidden to connect the machine to a live electrical power source while installation or other work on the machine is in progress.

3. Storage, Transportation & Packaging

3.1 Scope of Delivery (Typical)

The typical vortex supply includes:

1. Motor & Gear Drive (typically pre-installed on the planetary gear drive)
2. Planetary Gear Drive (also can include a stainless steel H-support bridge that supports the planetary gear drive above the vortex tank)
3. Paddle System Drive Tube & Adjustable Paddles
4. Air Scour System piping inside the vortex tank & including solenoid, ball valve, & 'Snap Cap' coarse bubble diffusers. Air supply is from a blower or, alternately, can originate from a tapped aeration system or other equipment blower supply line
5. Air Scour Blower
6. Water Scour piping inside the vortex tank & including solenoid, ball valve
7. Grit pump (or, alternately, an air lift assembly)
8. Deflector Plate
9. Vortex tank in concrete (by contractor) or supplied as a modular stainless tank with supports

3.2 Storage

Storage of the vortex components may be made for a short period and only in / on its original packaging/pallet(s). Ensure that the vortex components are stored in an indoor environment and not exposed to freezing. If outdoor storage is unavoidable, please contact Claro. Before the vortex components are kept in storage / out-of-service for an extended period, please contact Claro for additional storage instructions and advice.

3.3 Transportation

Transportation shall be made in a manner that ensures that the vortex components are secured from falling or other mishap damage. Typically, the vortex components are delivered to the project site on a flat bed truck and secured on a specially-built pallet. N.B. Lifting the machine components over personnel is absolutely forbidden. Suitably trained staff should perform lifting, loading, load securing, unloading and driving of the transport truck.

3.4 Packaging

The packaging (pallets or crating) is specially-designed and adapted for the delivered vortex equipment and provides maximum protection. Ensure that the packaging is not damaged when the delivery is received. If the packaging or equipment is damaged, please document with photographs & contact Claro.

4. Assembly & Installation

Experienced installation personnel must carry out the installation in a professional manner. All electrical wiring must be performed by a qualified electrician and must comply with current CSA, UL or other applicable regulations.

4.1 Assembly / Installation

Please refer to the equipment drawings included in the Appendices section of the global O&M manual. Additional installation instructions for each project are provided to the installer in advance of delivery. The following outlines the central principles of a correctly installed vortex system:

- The vortex planetary gear drive, paddle system & grit extraction piping must be installed at the center of the vortex tank and perfectly level & plumb. This assembly must also be at the level/position indicated on the project & submittal drawings.
- The elevations of the air scour coarse bubble diffusers and the water scour piping assembly within the lower grit collection area of the vortex tank must reflect the levels shown in the project & submittal drawings.
- Small final adjustments of elevation, level & plumb-ness can be effected at the planetary gear drive levelling bolts that are located on each corner of the unit. The unit is secured with bolts to the stainless steel H-beam support (or, alternately, to the reinforced concrete vortex bridge that forms part of the concrete tank and floor).
- If installed on a reinforced concrete vortex bridge, the gap that remains between the planetary gear drive and the bridge should be filled with non-shrink grout once proper positioning is achieved.
- The air scour, if present, has a stainless steel ANSI B16.5 flange located near the center of the planetary gear drive that is accessible from the top of the vortex tank. Piping from the blower is attached to this flange as shown on the project & submittal drawings including a pressure gauge with isolating ball valve.
- The water scour has a stainless steel ANSI B16.5 flange located near the center of the planetary gear drive that is accessible from the top of the vortex tank. Piping from the plant service water source is attached to this flange as shown on the project & submittal drawings including a pressure gauge with isolating ball valve. The minimum pressure at the water scour

input point at the base of the vortex tank is 40 psi. If service air is being tapped from an alternate air supply line (as opposed to a dedicated blower/compressor), air flow must be measured & if necessary, trimmed in order to match the capacity of the 'Snap Cap' coarse air diffusers.

- Depending on the depth of the vortex unit and the available ceiling height above the tank, the grit extraction, air scour (if present), & water scour piping can be provided in modular bolt-together sections including intermediary gaskets. The paddle system drive tube can also be unbolted from the planetary gear drive. The paddles are typically supplied loose. Thus, either most of the assembly including planetary gear drive, drive tube and all piping elements are installed into the vortex tank in one piece (& paddles installed subsequently) or these modular components can be bolted into place and/or bolted together, one-by-one, and lowered via the center of the planetary gear drive into final position. All hardware & gaskets are provided for this assembly. A stainless steel top plate integrates the grit extraction piping flange, the air scour flange (if present), and the water scour connecting flange.
- Once the drive tube is properly secured and the entire assembly is installed, the paddles system is bolted onto the drive tube at the elevation indicated on the Claro submittal drawings/installation instructions. Paddles are bolted into position by having the installer enter the vortex tank. N.B. follow all safety precautions for this installation procedure including power lock-out, fall prevention procedures, and the provision of a temporary walking surface for the installer in the conical vortex tank.
- Bolt the deflector plate at the inlet to the vortex tank at the location, elevation and angle shown in the Claro submittal drawings/installation instructions. In concrete tanks, the deflector is bolted to the inner wall surface of the tank. If a modular steel vortex tank application, an integrated flange & bolts will be provided for securing the deflector plate.
- In order to ensure that no influent enters into a blower unit, air scour piping (if present) must be at an elevation that is above the maximum liquid level in the vortex tank.

- All grit extraction, air scour (if present), & water scour piping must be properly supported. It is also recommended that grit extraction piping be supplied either in flanged sections or with Victaulic-type couplings for ease of disassembly/inspection. Long-radius elbows are recommended where elbows are required. Use two x 45 degree elbows in lieu of 90 degree elbows where possible. Also, remember to make provision for the grit pump pressure gauges on the piping both upstream and downstream of the grit pump – these are typically ½” couplings that are then reduced to match the pressure gauge diameter. Please see technical submittal for information on pressure gauges, pipe diameters and other pertinent information.
- Install all electrical connections as per project drawings & Claro technical submittal (mechanical & electrical sections).
- Ensure all bolts are properly tightened & that debris has been removed from the vortex tank at the end of installation and before start-up.

4.2 Electrical Installation

Electrical work must be performed by a licensed electrician and in accordance with applicable rules, regulations & laws.

Before reading and acting on the information in this section, please read section 2.4 in its entirety in order to ensure personnel safety. Please also see the As-Built control panel drawings included in the Appendices section of this manual. The following overview indicates the typical connections for a system that includes a Claro-designed control panel.

- The vortex motor is connected to the Claro control panel (typically 575/60/3 or 460/60/3 or, alternately, other voltages as specified/required such as 208/60/3).
- The air scour solenoid, if present, is connected to the Claro control panel (either 24VDC or 120V).
- The water scour solenoid is connected to the Claro control panel (either 24VDC or 120V).
- All auxiliary equipment is typically connected to the Claro control panel including: grit pump, blower (if present), and grit classifier. Local HOA stations are also typically connected to the Claro control panel. Please see As-Built control panel drawings for a summary of all field connections.
- Ensure that all connections follow all applicable electrical codes and conform to the project explosion-proof classification.

Claro

5. Operation

5.1 Automatic Operation

1. The vortex paddle system operates continuously 24/7.
2. Grit extraction routines are effected via the 'Schedule of Grit Extraction' sequences input screen, which can be accessed via the 'Classifier & Vortex Configuration (2/2)' input screen (button located at bottom of aforementioned screen). A maximum of 12 extraction sequences per 24 hours can be selected. Each extraction sequence enables the operator to select precisely the nature of the sequence including limiting the sequence to an air scour and/or water scour (i.e. without grit extraction). Please see annotated HMI screens included in the Appendices section for additional information.
3. A typical sequence begins with an air scour of the accumulated grit in an effort to further remove & re-suspend organics.
4. After the air scour, a water scour is introduced. Water scour has 2 functions: 1) further remove and re-suspend organics and 2) fluidize the grit slurry to a lower Dry Solids percentage (DS) content in order that the grit pump will be able to successfully pump the slurry. Note: the air scour stops before the grit pump operates in order to avoid the pump drawing in air. Also, the water scour runs for a short time before the grit pump is called upon to start in order to ensure that air has dissipated and that the grit is suitably fluidized. The water scour continues to run during the full grit pump run time.
5. The grit pump starts a short time after water scour/fluidization begins. The grit pump's run time has been set by the Claro Technician in order to ensure that no grit accumulation takes place in the vortex's lower sedimentation chamber and to ensure that the grit piping between the vortex & pump and between the pump & the classifier are clear of grit slurry. The grit pump system is powered by a VFD in the Claro control panel that enables operators to optimize the flow capacity of the grit pump. The Claro Technician has set the VFD/pump speed at an optimal level. The aim of this VFD setting is to enable the grit pump to effectively remove the fluidized grit at the base of the vortex while providing for a low liquid crest at the grit classifier weir, which provides for the minimum amount of turbulence within the grit classifier and thus the maximum removal of

material. Note: the grit pump will take some time to prime before influent is visible in the grit classifier. At Fort St. John, the priming time was observed to be approximately 0.5 - 1 minute. The discharge of influent at between 1 - 5 gallons per minute via the Gorman-Rupp air release valve is normal during pump operation. Please refer to the Gorman-Rupp O&M manual included in this global O&M manual for further details on pump operation & maintenance.

6. The grit classifier starts shortly after the grit pump starts and continues to operate intermittently until after the completion of the grit pumping routine. One of the key objectives of grit classifier operation is to produce a clean grit product with a minimum of liquid content. To this end, the Claro control panel enables the grit classifier to run intermittently – with pause times that enable the grit moisture to run back into the sedimentation tank before grit discharges into the bagger. A grit washing jet is also available for additional washing of the grit before discharge, if required.
7. Please also see description of control narrative and annotated HMI touch screen images included in the Appendices section of this O&M manual.

5.2 Manual Operation

- When the local HOA control station selector is in Manual, the vortex will function in forward until the selector is returned to Off or Auto.
- When the E-Stop is pressed at the local HOA station, the vortex paddle system will stop. If the E-stop is pull-out / disengaged, the vortex will not start of its own accord. The operator must return the HOA to 'Auto' and then press 'Start' at the Claro control panel. The 'Start' button is located on the 'Grit System Control' HMI screen. Please also see description of control narrative and annotated HMI touch screen images included in the Appendices section of this O&M manual.
- The vortex solenoids can be operated manually from the 'Grit Manual Valves Operation' HMI screen. The Vortex HOA must be in 'Manual' position for this manual control of the valves to be enabled.
- The blower, grit pump & grit classifier can be operated in manual from their respective HOA stations. The blower & grit pump can be

operated in forward only. The grit classifier can be operated in forward or reverse. N.B. Do not run the classifier in reverse for more than required short spiral operation bumps since grit will be pushed and cycle at the base of the classifier and cause unnecessary wear and material accumulation. Classifier equipment should void after each grit extraction sequence. Avoid grit material build-up within the grit classifier.

- The blower, grit pump & grit classifier have E-stops on their respective local HOA stations that will shut down the respective piece of equipment. N.B. Equipment can automatically restart when the E-stop pushbutton is pulled back into non-engaged position. Alternately, equipment may need to be restarted at the 'Grit System Control' HMI screen.
- The blower can be turned On or Off from the 'Grit System Control' HMI screen. The local HOA of the blower, however, must be in 'Auto' position.
- The grit pump can be turned On or Off from the 'Grit System Control' HMI screen. The local HOA of the grit pump, however, must be in 'Auto' position.
- The grit classifier can be turned On or Off from the 'Grit System Control' HMI screen. The local HOA of the grit pump, however, must be in 'Auto' position.
- General Note: Daily operation of all grit removal equipment must be in automatic mode rather than in manual mode. Manual mode operation at the HMI or at the HOA stations is provided for short/temporary oversight, testing & maintenance tasks only. Manual operation must also be under continual operator supervision. Follow all best-practice safety routines & regulations including motor lock-out during inspection & maintenance tasks as required.

5.3 Overload/Alarms

- The grit vortex motor is protected by an amperage detector that is integrated within the VFD. The alarm setting is effected on the 'Alarms Configuration (2/4)' page.
- Reset of all alarms is effected by clearing the alarm on the HMI screen. Alarms are recorded in the 'Alarms History' HMI page. Alarms that remain active are listed on the 'Active Alarms' page. Date & time of each alarm is indicated on each respective page.

5.4 Other Elements

The local HOA control station should enable the Vortex to run in manual and integrate an emergency E-stop that stops the vortex paddle system. If Claro has furnished the control panel system these elements will be present. Please see control panel drawings included in the Appendices section.

6. Settings

6.1 Default Values

Claro will provide initial start-up settings for all of the component equipment that constitute your application. If you have comments or questions about control settings, please contact Claro – we would be glad to help and further outline the nature and rationales informing the controls equipment and controls set points. A record of final set points (completed at start-up) will be furnished as an appendix to this manual. Please also see description of control narrative and annotated HMI touch screen images included in the Appendices section of this O&M manual.



7. Regular Verifications & Maintenance



For maintenance inspection and/or maintenance work, all safety regulations must be followed. It is absolutely forbidden to carry out service or maintenance work on the vortex (or auxiliary component equipment) while it is operation. Main power lock-out switch(es) must be turned off and locked with a padlock.



- Please also see Gorman-Rupp grit pump, blower (if present) & grit classifier O&M manuals for supplementary inspection & maintenance schedules/practices.

7.1 Weekly

Check for the following items:

- Ensure that there are no abnormal noises during operation.
- Ensure that grit is being discharged by the grit classifier – if not, verify that the grit classifier is operating correctly, that the grit vortex grit extraction piping and/or the grit pump is clear of blockage and, lastly, that the lower grit accumulation chamber is free of debris.
- Verify that there is no visible oil leakage from the vortex gear drive or from the planetary gear drive. Please see planetary gear drive section below for additional information on the operation and maintenance of this core component of the vortex system.

7.2 Monthly

- Although rare, verify that the paddle system has not accumulated excess screenings debris on its paddles. Some debris is not critical to the operation of the system. Shut down & lock-out the power of the system & auxiliary equipment components and remove excess debris with a rake or other tool. If the system is protected by a Claro fine screen, debris removal should be rare, however, checking the operation of the paddle system should be effected on a monthly basis.
- Check oil level in planetary gear drive via oil dip stick. Shut off & lock-out equipment when checking oil. Add oil as necessary. Do not overfill.

7.3 Yearly

- A thorough review of the vortex grit tank system should be performed once a year. Please also see Gorman-Rupp grit pump, blower (if present) & grit classifier for yearly maintenance inspection recommendations.
 - Redirect flow away from the vortex by opening the by-pass gate and by closing the vortex inlet and outlet gates.
 - Drain the vortex tank to its bottom with a submersible pump.
 - Verify if there is large debris or residual finer debris in the bottom collection area of the vortex tank. Some smaller residual material is normal. The grit extraction piping inlet should not be obstructed with material and the collection well area should be majority empty / clean. Remove accumulated large stones or other debris, if present. Consider using a vacuum truck as a means of drawing out large debris since entering the tank is considered a closed space entry and the conical walls of the tank will be slippery. If a significant amount of debris is found in the lower collection well, please document with photographs & contact Claro. We will suggest increasing the grit pumping & fluidization time and/or other remedies.
 - Verify the state of the paddle system – that the paddles blades remain at 45 degrees and that they are free of debris. Clean as required.
 - Verify the tightness of all bolts at the planetary gear drive.
 - Verify the tightness of all bolts that retain the grit extraction piping and the air (if present) and water scour flanged connections.
 - Check for oil leakage at the vortex gear drive & the planetary gear drive.
 - Inspect oil & check oil level in the vortex planetary gear drive by checking the drip stick. Stop & lock-out equipment when effecting oil verifications. Verify the operating hours of the vortex gear drive and the planetary gear drive relative to the recommended oil change schedule. Drain and replace oil as recommended. Note the operating hours at which the oil was changed. Note the next recommended oil change requirement. Change oil before the scheduled oil change date rather than after the recommended date.
 - Change planetary gear drive oil a minimum of every two (2) years as suggested in the oil change schedule.
 - Clean surface of motor, gear drive & planetary gear drive of accumulated dirt, if present. Clean checker plate of debris.

- Safety Instrumentation: Test the vortex motor high torque alarm signal by setting the alarm to a level under the normal operating amperage e.g. 0.5 Amps. Verify that no equipment, tool or personnel are present in the tank. Observe all recommended safety practices and beware of fall risk as serious injury or death can result from falling into an operating vortex tank. Consider closing all checker plate hatches and the use of area isolation 'Danger' safety tape. Start the vortex paddle system and observe if the high torque alarm is issued by the control panel. Return the alarm setting to the regular amperage value once the test is complete.
- Safety Instrumentation: Start the vortex and test the HOA E-stop push button.
- Refill the vortex tank by opening the outlet gate, the inlet gate and closing the by-pass gate. Once full of screened influent & all safety covers are in closed/bolted/locked position, restart the vortex paddle system. Verify that all auxiliary equipment including the grit pump, blower (if present) & grit classifier are in 'Auto' and ready for service (i.e. no Faults or other condition/status).

Please review 'Vortex Planetary Gear Drive Assembly Information – Model Claro S25-GCD-50' included below for detailed information on the Vortex planetary gear drive, a core component of the grit vortex system.

If you have comments or questions, please feel free to contact Claro – we are here to help !

Before restarting operation of the vortex, all protective covers must be reinstalled & safety equipment operational.



7.4 Vortex Planetary Gear Drive Assembly Information – Model Claro S25-GCD-50

A. General Information & Maintenance Schedule

1. Lubrication & Maintenance Schedule

The Claro planetary drive unit supports & rotates the drive tube and paddle system. The planetary gear drive unit will be affixed either to the vortex tank concrete bridge that forms an integrated part of the facility's floor slab structure or to an H-support bridge made of HSS beam that straddles the concrete or stainless steel tank structure.

The planetary gear unit is made up of several speed reducers coupled together. Each speed reducer is entirely enclosed and lubricated. The recommended lubricants and lubrication change intervals are listed in this sub-section. Proper care of your drive unit will ensure long, trouble free machine life. Always maintain proper oil levels and follow the recommendations in this manual. Remember to also check the regular (Nord) gear drive manual for the recommended oil change schedule. The Nord gear drive, which forms part of the drive station, and the planetary gear drive are different pieces of equipment requiring different maintenance attention /oil change schedules.

The model number of your planetary gear drive unit is: **Claro S25-GCD-50**.

Lubrication Schedule*		
	Primary Speed Reducer	Main Gear Housing
Storage (>90 days)	Check for spills.	Rotate the main gear-bearing
Every Month	Inspect oil and oil level. Add or change if necessary.	Inspect oil and oil level. Add or change if necessary.
Every 1 Year	Inspect oil.	Change oil.
Every 2 Years	Change lubricant. Overhaul if required.	

Lubricant Quantities					
	Model	Lubricant Quantity	Level (Depth)	Lubricant Type	As Shipped
Helical (Nord) Gearbox	SK3282	4.3 qt / 4.06 l.	Full	Type 3	Full
Main Gear Housing	S25-GCD-50	2 gal 7.57 l.	2.25"	Type 5	Empty

- Please see oil 'Type' table included below.



* Service intervals should be reduced if the drive is exposed to severe environment conditions such as high humidity, dust, dirt, and corrosive atmospheres. In high humidity atmospheres, periodically check the main gear housing for condensate accumulation and drain as necessary. The screening & grit removal room air change/ventilation system will help preclude this type of condensation.

- Main Planetary Gear Housing Oil Change Procedure:

Turn the vortex paddle drive system off & positively cut control and power supply connections by locking out the vortex motor at the control panel (and at the local in-field lock-out station, if applicable). For further safety, adjust the vortex local HOA switch to 'Off' & press the E-Stop.

Drain the oil by opening the drain valve or removing the drain plug. Replace plug/valve before adding new oil. Dispose of old oil according to local regulations / best practices. Add new oil through the oil fill cap located on the top plate of the planetary gear drive until the level reaches the recommended range on the dipstick. Do not overfill.

- Storage:

If the vortex planetary drive unit is to be stored for longer than 90 days, fill main gear housing with recommended lubricant. Drain before installation & refill before start-up.



2. Recommended Lubricants

Oil Type	Temperature Range	ISO / NLGI Grade	Castrol		Mobil		Chevron		Shell	Citgo	(Others)
1	See Note 1	32	Hyspin AWH-M 32	Hyspin HVI 32	DTE 13M	Univis N 32	-----	-----	Tellus Oils T 32	-----	-----
2	0 to 125 °F (-17 to 51 °C)	00	HD Lithium 00		Mobilgrease XHP 005		Delo Grease EP 00		-----	-----	Mystik: Centra-Lube
	-30 to 125 °F (-34 to 51 °C)	00	SHL 00**		Mobilith SHC 007**		-----		-----	-----	Amsoil: Semi-Fluid 00 Synth. EP**
3	15 to 105 °F (-10 to 40 °C)	220	EP Gear Lubricant 220	Alpha SP 220	Mobilgear 600 XP 220		Meropa 220	Gear Compounds EP 220	Omala Oil 220	EP Compounds 220	-----
	-30 to 125 °F (-34 to 51 °C)	220	Isolube EP 220**	Alphasyn EP 220**	Mobilgear SHC 220**		Tegra Gear Oil 220**		Omala Fluid HD 220**	Citgear Synthetic EP 220**	-----
4	0 to 125 °F (-17 to 51 °C)	2	Castrol Molub-Alloy 4086/460-2	Castrol Molub-Alloy 860/460-2 ES	-----		-----	-----	Retinax CMX 2	Lithoplex CM 2	Exxon: Ronex Extra Duty Moly 2
5	30 to 125 °F (-1 to 51 °C)	680	EP Gear Lubricant 680	Alpha SP 680	Mobilgear 600 XP 680		Meropa 680	Gear Compounds EP 680	Omala Oil 680	EP Compounds 680	-----
	0 to 50 °F (-17 to 10 °C)	150	EP Gear Lubricant 150	Alpha SP 150	Mobilgear 600 XP 150		Meropa 150	Gear Compounds EP 150	Omala Oil 150	EP Compounds 150	-----
	0 to 125 °F (-17 to 51 °C)	680	Isolube EP 680**		Mobilgear SHC 680**		Tegra Gear Oil 680**		-----	Citgear Synthetic EP 680**	-----
6	-30 to 50 °F (-34 to 10 °C)	150	Alphasyn EP 150**		Mobilgear SHC 150**		Tegra Gear Oil 150**		Omala Fluid HD 150**	Citgear Synthetic EP 150**	-----
	-30 to 125 °F (-34 to 51 °C)	2	Spheerol EPL 2		Mobilux EP 2		Multifak EP 2		Alvania EP 2	Premium Lithium EP-2	Mobil: Mobilith SHC-100
7	-30 to 125 °F (-34 to 51 °C)	2	-----		Polyrex EM		SRI 2		Stamina RLS	-----	Chevron: Black Pearl EP 2

Note 1: The minimum startup oil temperature for the listed Type 1 oils is 20°F. The maximum allowable operating oil temperature is 130°F for these oils.

Note 2: ** Indicates optional synthetic lubricants



Claro

Claro

3. Components List

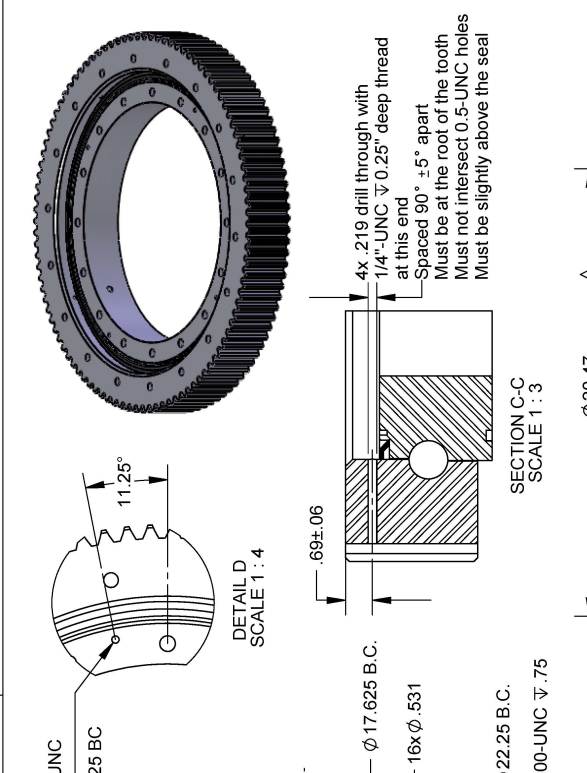
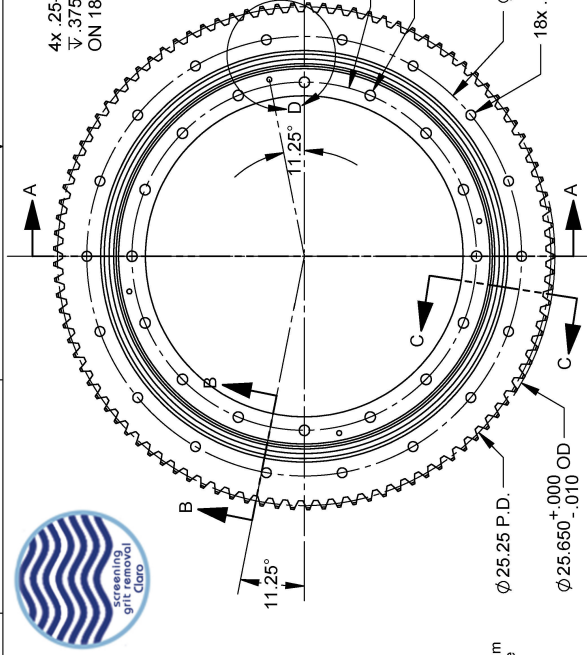
Planetary Gear Drive – Model Number: S25-GCD-50

Item #	Description	Manufacturer	CLARO (D) PN	Manufacturer PN	Qty.	Ref. Dwg
1	Machine Frame	CLARO (D)	175-8003-S25GCD		1	
2	Main Gear Bearing, 25.25" PD, 101T	CLARO (D)	138-0300-025		1	
3	Output Hub	CLARO (D)	175-8300-S25GCD		1	
4	Top Plate	CLARO (D)	175-6001-S25GCD		1	
5	Primary Speed	CLARO (D)			1	
5.1	Electric Motor, 2 hp, 208/3/60. Exp Proof	Baldor	149-IDXM7037T-5	IDXM7037T-5	1	
5.2	Pinion, 21T, 4DP	CLARO (D)	143-0021-4		1	
5.3	Helical Gearbox,	Nord	162-SK3282AF11	SK3282	1	
5.4	Pinion Shaft	CLARO (D)	175-SH4814100		1	
5.5	Snpring, 3" External	Waldes	120-5100-300	5100-300	1	
6	Cover Plate	CLARO (D)	175-8000-0D68		1	

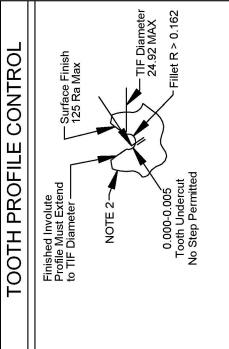
- Please see Appendices section of this global O&M manual for additional arrangement / layout drawings & motor/gear drive specification information.



GEAR DATA	
TOOTH FORM	Involute Stub
PITCH DIAMETER	25.25"
DIAMETRAL PITCH	4
PRESSURE ANGLE	20 deg
NUMBER OF TEETH	101
ADDENDUM	0.200"
DEDENDUM	0.250"
DIMENSION OVER - 0.420" DIA. PINS	25.753"-25.774"
SPAN ACROSS 12 TEETH	8.820"-8.827"
ARCH TOOTH THICKNESS	0.370"-0.376"
ABOVE TOOTH THICKNESS WILL PRODUCE 0.014"-0.022" BACKLASH CUT INTO GEAR	
AGMA QUALITY NO.	6
BEARING DATA	
BEARING CONTACT ANGLE	60°
BALL SIZE	1" WITH SPAGERS
BEARING RACE HEAT TREATMENT	IND. HARDENED HRC 58-62, GROUND
LUBRICATION	OIL BATH
FREE STATE TURNING TORQUE	<25 FT-LBS
CLEARANCE AXIAL AND RADIAL	<0.010"



- NOTES:**
- All diameters on a common centerline to have a maximum total runout to each other of 0.010" FIM unless otherwise noted.
 - Break all sharp edges not specified to a radius or a chamfer of 0.010"-0.020". Visual inspection of this dimension is satisfactory.
 - Permanently mark point of minimum backlash on gear.
 - Gears to be bi-directional.
 - Maximum machined surface roughness 125AA, except as noted.
 - Heat treatment induction harden:
 - A. Tooth to tooth induction harden per AGMA 2004-B89
 - B. Flank and root pattern Type A per AGMA 2001-C95
 - C. Surface hardness HRC 52-60 after finishing.
 - D. Effective case depth 0.080"-0.125" after finishing.
 - E. Core Hardness 248-302 BHN.
 - Unless otherwise noted, dimension apply to completely finished parts.
 - Stamp or etch:
 - (ex. PO12345-01)
 - PO and serial number on this surface.
 - Corrosion protection adequate for one year storage to be supplied by vendor.
 - Shipping protection adequate to guard against physical damage to be supplied by vendor.
 - Provide quality inspection report verifying compliance with this drawing. Must specify material used, teeth and raceway hardness, tru involute form TIR, and Ball loading plug must be sealed oil tight.
 - Unspecified tolerance ±0.010"



REV.	DESCRIPTION	DATE	APPROVED
A	ADDITION OF DIMENSION	08/10/94	
B	REVISED FORMAT/ADDED BEARING DATA BLOCK	01/04/99	
C	REMOVE 20.5 INCH PILOT	10/08/09	AJB
D	Converted to SW, new format. New heat treatment details updated. Removed inner raceway pilot. Removed vertical lubrication holes.	6/21/2012	PMK
E	Added oil dam groove, o-ring groove, oil return holes. recessed seal.	3/26/2013	PMK

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES TOLERANCING PER	NAME	DATE
DO NOT SCALE DRAWING	DWE	03/10/94
P/N 138-0300-025	CHECKED	
MATERIAL 4140 or approved equal	ENG APPR.	
COMMENTS		

Claro™

TITLE: 25.25" PD External Gear-Bearing, 4 DP, 101T, Involute Stub

SIZE DWG. NO. **B 00000290**

SCALE: 1:6 WEIGHT: 236.87 lbs SHEET 1 OF 1

9296B9

- Please see Appendices section of the global O&M manual for additional arrangement / layout drawings & motor/gear drive specification information.

Claro™



**INSTALLATION, OPERATION,
AND MAINTENANCE MANUAL**
WITH PARTS LIST



SUPER T SERIES® PUMPS

MODELS
T4A3S-B INCLUDING: /F, /FM, /WW, /WWS

GORMAN-RUPP PUMPS

www.grpumps.com

Register your new
Gorman-Rupp pump online at
www.grpumps.com

Valid serial number and e-mail address required.

RECORD YOUR PUMP MODEL AND SERIAL NUMBER

Please record your pump model and serial number in the spaces provided below. Your Gorman-Rupp distributor needs this information when you require parts or service.

Pump Model: _____

Serial Number: _____

TABLE OF CONTENTS

INTRODUCTION	PAGE I – 1
SAFETY – SECTION A	PAGE A – 1
INSTALLATION – SECTION B	PAGE B – 1
Pump Dimensions	PAGE B – 1
PREINSTALLATION INSPECTION	PAGE B – 2
POSITIONING PUMP	PAGE B – 2
Lifting	PAGE B – 2
Mounting	PAGE B – 2
Clearance	PAGE B – 2
SUCTION AND DISCHARGE PIPING	PAGE B – 2
Materials	PAGE B – 2
Line Configuration	PAGE B – 3
Connections to Pump	PAGE B – 3
Gauges	PAGE B – 3
SUCTION LINES	PAGE B – 3
Fittings	PAGE B – 3
Strainers	PAGE B – 3
Sealing	PAGE B – 3
Suction Lines In Sumps	PAGE B – 3
Suction Line Positioning	PAGE B – 4
DISCHARGE LINES	PAGE B – 4
Siphoning	PAGE B – 4
Valves	PAGE B – 4
Bypass Lines	PAGE B – 5
AUTOMATIC AIR RELEASE VALVE	PAGE B – 6
Air Release Valve Installation	PAGE B – 6
ALIGNMENT	PAGE B – 7
Coupled Drives	PAGE B – 7
Drive Belts	PAGE B – 7
DRIVE BELT TENSIONING	PAGE B – 8
General Rules of Tensioning	PAGE B – 8
OPERATION – SECTION C	PAGE C – 1
PRIMING	PAGE C – 1
STARTING	PAGE C – 1
Rotation	PAGE C – 1
OPERATION	PAGE C – 2
Lines With a Bypass	PAGE C – 2
Lines Without a Bypass	PAGE C – 2
Leakage	PAGE C – 2
Liquid Temperature And Overheating	PAGE C – 2
Strainer Check	PAGE C – 3
Pump Vacuum Check	PAGE C – 3
STOPPING	PAGE C – 3
Cold Weather Preservation	PAGE C – 3
BEARING TEMPERATURE CHECK	PAGE C – 3

TABLE OF CONTENTS
(continued)

TROUBLESHOOTING – SECTION D	PAGE D – 1
PREVENTIVE MAINTENANCE	PAGE D – 3
PUMP MAINTENANCE AND REPAIR – SECTION E	PAGE E – 1
PERFORMANCE CURVE	PAGE E – 1
PARTS LISTS:	
Pump Model	PAGE E – 3
Repair Rotating Assembly	PAGE E – 5
PUMP AND SEAL DISASSEMBLY AND REASSEMBLY	PAGE E – 6
Back Cover And Wear Plate Removal	PAGE E – 6
Suction Check Valve Removal	PAGE E – 7
Rotating Assembly Removal	PAGE E – 7
Impeller Removal	PAGE E – 8
Seal Removal	PAGE E – 8
Shaft and Bearing Removal and Disassembly	PAGE E – 8
Shaft and Bearing Reassembly and Installation	PAGE E – 9
Seal Installation	PAGE E – 10
Impeller Installation	PAGE E – 13
Rotating Assembly Installation	PAGE E – 13
Suction Check Valve Installation	PAGE E – 13
Back Cover Installation And Adjustment	PAGE E – 14
PRESSURE RELIEF VALVE MAINTENANCE	PAGE E – 15
Final Pump Assembly	PAGE E – 15
LUBRICATION	PAGE E – 15
Seal Assembly	PAGE E – 15
Bearings	PAGE E – 15
Power Source	PAGE E – 16

INTRODUCTION

Thank You for purchasing a Gorman-Rupp pump. **Read this manual** carefully to learn how to safely install and operate your pump. Failure to do so could result in personal injury or damage to the pump.

Because pump installations are seldom identical, this manual cannot possibly provide detailed instructions and precautions for every aspect of each specific application. Therefore, it is the responsibility of the owner/installer of the pump to ensure that applications not addressed in this manual are performed **only** after establishing that neither operator safety nor pump integrity are compromised by the installation. Pumps and related equipment **must** be installed and operated according to all national, local and industry standards.

If there are any questions regarding the pump or its application which are not covered in this manual or in other literature accompanying this unit, please contact your Gorman-Rupp distributor, or The Gorman-Rupp Company:

The Gorman-Rupp Company
P.O. Box 1217
Mansfield, Ohio 44901—1217
Phone: (419) 755—1011
 or:
Gorman-Rupp of Canada Limited
70 Burwell Road
St. Thomas, Ontario N5P 3R7
Phone: (519) 631—2870

For information or technical assistance on the power source, contact the power source manufacturer's local dealer or representative.

HAZARD AND INSTRUCTION DEFINITIONS

The following are used to alert maintenance personnel to procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel:



Immediate hazards which WILL result in severe personal injury or death. These instructions describe the procedure required and the injury which will result from failure to follow the procedure.



Hazards or unsafe practices which COULD result in severe personal injury or death. These instructions describe the procedure required and the injury which could result from failure to follow the procedure.



Hazards or unsafe practices which COULD result in minor personal injury or product or property damage. These instructions describe the requirements and the possible damage which could result from failure to follow the procedure.

NOTE

Instructions to aid in installation, operation, and maintenance or which clarify a procedure.

SAFETY – SECTION A

This information applies to Super T Series basic pumps. Gorman-Rupp has no control over or particular knowledge of the power source which will be used. Refer to the manual accompanying the power source before attempting to begin operation.

Because pump installations are seldom identical, this manual cannot possibly provide detailed instructions and precautions for each specific application. Therefore, it is the owner/installer's responsibility to ensure that applications not addressed in this manual are performed only after establishing that neither operator safety nor pump integrity are compromised by the installation.



Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Disconnect or lock out the power source to ensure that the pump will remain inoperative.
3. Allow the pump to completely cool if overheated.
4. Check the temperature before opening any covers, plates, or plugs.
5. Close the suction and discharge valves.
6. Vent the pump slowly and cautiously.
7. Drain the pump.



This pump is designed to handle liquids containing large entrained solids or slurries. Do not attempt to pump volatile, corrosive, or flammable materials

which may damage the pump or endanger personnel as a result of pump failure.



After the pump has been positioned, make certain that the pump and all piping connections are tight, properly supported and secure before operation.



Do not operate the pump without the guards in place over the rotating parts. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.



Do not remove plates, covers, gauges, pipe plugs, or fittings from an overheated pump. Vapor pressure within the pump can cause parts being disengaged to be ejected with great force. Allow the pump to cool before servicing.



Do not operate the pump against a closed discharge valve for long periods of time. If operated against a closed discharge valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump casing to rupture or explode.



Death or serious personal injury and damage to the pump or components can occur if proper lifting procedures

are not observed. Make certain that hoists, chains, slings or cables are in good working condition and of sufficient capacity and that they are positioned so that loads will be balanced and the pump or components will not be damaged when lifting. Suction and discharge hoses and piping must be removed from the pump before lifting. Lift the pump or component only as high as necessary and keep personnel away from suspended objects.



Do not attempt to disengage any part of an overheated pump unit. Vapor pressure within the pump casing can eject

these parts with great force when they are disengaged. Allow the pump to completely cool before servicing it.



This pump may be used to handle materials which could cause illness through direct exposure or emitted fumes. Wear adequate protective clothing when working on the pump or piping.



Pumps and related equipment must be installed and operated according to all national, local and industry standards.

INSTALLATION – SECTION B

Review all SAFETY information in Section A.

Since pump installations are seldom identical, this section offers only general recommendations and practices required to inspect, position, and arrange the pump and piping.

Most of the information pertains to a standard **static lift application** where the pump is positioned above the free level of liquid to be pumped.

If installed in a **flooded suction application** where the liquid is supplied to the pump under pressure, some of the information such as mounting, line configuration, and priming must be tailored to the

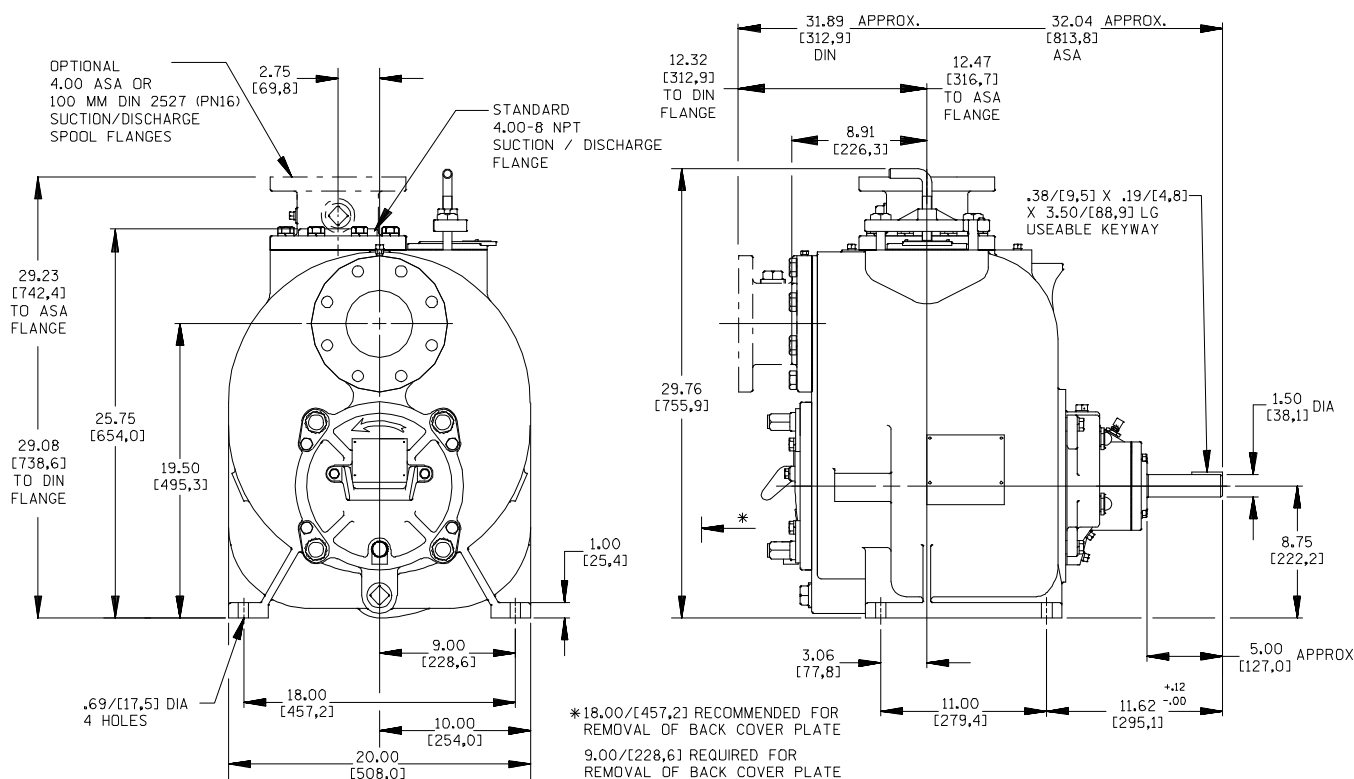
specific application. Since the pressure supplied to the pump is critical to performance and safety, **be sure** to limit the incoming pressure to **50%** of the maximum permissible operating pressure as shown on the pump performance curve.

For further assistance, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

Pump Dimensions

See Figure 1 for the approximate physical dimensions of this pump.

OUTLINE DRAWING



NOTE: OPTIONAL ASA OR DIN STANDARD SUCTION & DISCHARGE SPOOL FLANGES AVAILABLE

Figure 1. Pump Model T4A3S-B, Including /F, /FM, /WW and /WWS

PREINSTALLATION INSPECTION

The pump assembly was inspected and tested before shipment from the factory. Before installation, inspect the pump for damage which may have occurred during shipment. Check as follows:

- a. Inspect the pump for cracks, dents, damaged threads, and other obvious damage.
- b. Check for and tighten loose attaching hardware. Since gaskets tend to shrink after drying, check for loose hardware at mating surfaces.
- c. Carefully read all warnings and cautions contained in this manual or affixed to the pump, and perform all duties indicated. Note the direction of rotation indicated on the pump. Check that the pump shaft rotates counter-clockwise when facing the impeller.



Only operate this pump in the direction indicated by the arrow on the pump body and on the accompanying decal. Refer to **ROTATION** in **OPERATION**, Section C.

- d. Check levels and lubricate as necessary. Refer to **LUBRICATION** in the **MAINTENANCE AND REPAIR** section of this manual and perform duties as instructed.
- e. If the pump and power source have been stored for more than 12 months, some of the components or lubricants may have exceeded their maximum shelf life. These **must be inspected or replaced** to ensure maximum pump service.

If the maximum shelf life has been exceeded, or if anything appears to be abnormal, contact your Gorman-Rupp distributor or the factory to determine the repair or updating policy. **Do not** put the pump into service until appropriate action has been taken.

POSITIONING PUMP

Lifting



Death or serious personal injury and damage to the pump or components can occur if proper lifting procedures are not observed. Make certain that hoists, chains, slings or cables are in good working condition and of sufficient capacity and that they are positioned so that loads will be balanced and the pump or components will not be damaged when lifting. Suction and discharge hoses and piping must be removed from the pump before lifting. Lift the pump or component only as high as necessary and keep personnel away from suspended objects.

Pump unit weights will vary depending on the mounting and drive provided. Check the shipping tag on the unit packaging for the actual weight, and use lifting equipment with appropriate capacity. Drain the pump and remove all customer-installed equipment such as suction and discharge hoses or piping before attempting to lift existing, installed units.

Mounting

Locate the pump in an accessible place as close as practical to the liquid being pumped. Level mounting is essential for proper operation.

The pump may have to be supported or shimmed to provide for level operation or to eliminate vibration.

Clearance

It is recommended that **18 inches (457 mm)** of clearance be provided in front of the back cover to permit removal of the cover and easy access to the pump interior. A **minimum** clearance of **10.5 in-**

ches (267 mm) must be maintained to permit removal of the cover.

SUCTION AND DISCHARGE PIPING

Pump performance is adversely effected by increased suction lift, discharge elevation, and friction losses. See the performance curve and operating range shown on Page E-1 to be sure your overall application allows pump to operate within the safe operation range.

Materials

Either pipe or hose may be used for suction and discharge lines; however, the materials must be compatible with the liquid being pumped. If hose is used in suction lines, it must be the rigid-wall, reinforced type to prevent collapse under suction. Using piping couplings in suction lines is not recommended.

Line Configuration

Keep suction and discharge lines as straight as possible to minimize friction losses. Make minimum use of elbows and fittings, which substantially increase friction loss. If elbows are necessary, use the long-radius type to minimize friction loss.

Connections to Pump

Before tightening a connecting flange, align it exactly with the pump port. Never pull a pipe line into place by tightening the flange bolts and/or couplings.

Lines near the pump must be independently supported to avoid strain on the pump which could cause excessive vibration, decreased bearing life, and increased shaft and seal wear. If hose-type lines are used, they should have adequate support to secure them when filled with liquid and under pressure.

Gauges

Most pumps are drilled and tapped for installing discharge pressure and vacuum suction gauges. If

these gauges are desired for pumps that are not tapped, drill and tap the suction and discharge lines not less than 18 inches (457,2 mm) from the suction and discharge ports and install the lines. Installation closer to the pump may result in erratic readings.

SUCTION LINES

To avoid air pockets which could affect pump priming, the suction line must be as short and direct as possible. When operation involves a suction lift, the line must always slope upward to the pump from the source of the liquid being pumped; if the line slopes down to the pump at any point along the suction run, air pockets will be created.

Fittings

Suction lines should be the same size as the pump inlet. If reducers are used in suction lines, they should be the eccentric type, and should be installed with the flat part of the reducers uppermost to avoid creating air pockets. Valves are not normally used in suction lines, but if a valve is used, install it with the stem horizontal to avoid air pockets.

Strainers

If a strainer is furnished with the pump, be certain to use it; any spherical solids which pass through a strainer furnished with the pump will also pass through the pump itself.

If a strainer is not furnished with the pump, but is installed by the pump user, make certain that the total area of the openings in the strainer is at least three or four times the cross section of the suction line, and that the openings will not permit passage of solids larger than the solids handling capability of the pump.

This pump is designed to handle up to 3-inch (76,2 mm) diameter spherical solids.

Sealing

Since even a slight leak will affect priming, head, and capacity, especially when operating with a high suction lift, all connections in the suction line should be sealed with pipe dope to ensure an air-

tight seal. Follow the sealant manufacturer’s recommendations when selecting and applying the pipe dope. The pipe dope should be compatible with the liquid being pumped.

Suction Lines In Sumps

If a single suction line is installed in a sump, it should be positioned away from the wall of the sump at a distance equal to 1 1/2 times the diameter of the suction line.

If there is a liquid flow from an open pipe into the sump, the flow should be kept away from the suction inlet because the inflow will carry air down into the sump, and air entering the suction line will reduce pump efficiency.

If it is necessary to position inflow close to the suction inlet, install a baffle between the inflow and the suction inlet at a distance 1 1/2 times the diameter of the suction pipe. The baffle will allow entrained air to escape from the liquid before it is drawn into the suction inlet.

If two suction lines are installed in a single sump, the flow paths may interact, reducing the efficiency of one or both pumps. To avoid this, position the suction inlets so that they are separated by a distance equal to at least 3 times the diameter of the suction pipe.

Suction Line Positioning

The depth of submergence of the suction line is critical to efficient pump operation. Figure 2 shows recommended minimum submergence vs. velocity.

NOTE

The pipe submergence required may be reduced by installing a standard pipe increaser fitting at the end of the suction line. The larger opening size will reduce the inlet velocity. Calculate the required submergence using the following formula based on the increased opening size (area or diameter).

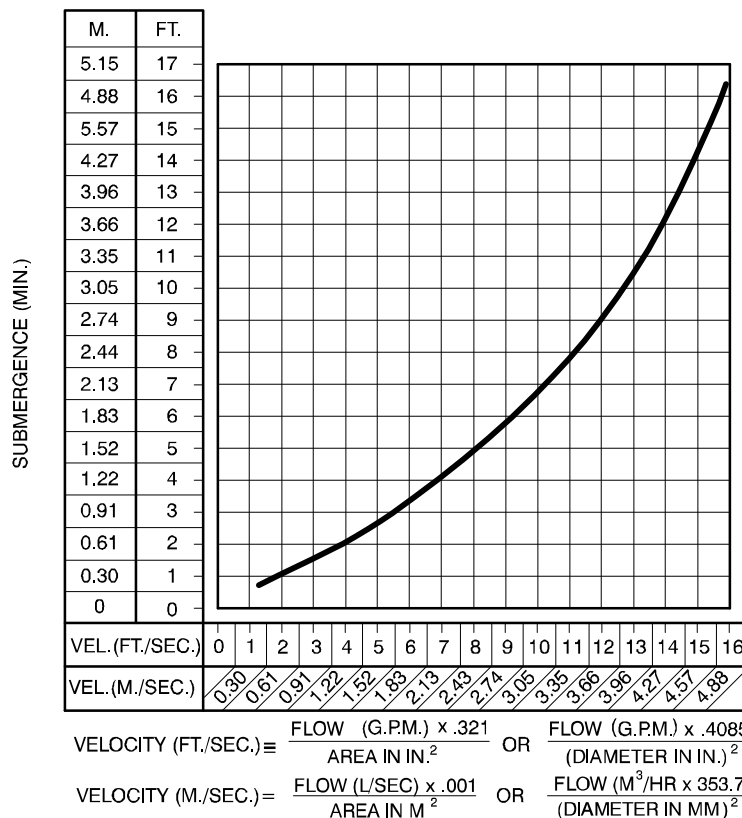


Figure 2. Recommended Minimum Suction Line Submergence vs. Velocity

DISCHARGE LINES

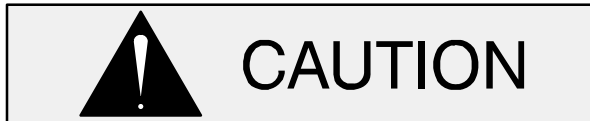
Siphoning

Do not terminate the discharge line at a level lower than that of the liquid being pumped unless a siphon breaker is used in the line. Otherwise, a siphoning action causing damage to the pump could result.

Valves

If a throttling valve is desired in the discharge line, use a valve as large as the largest pipe to minimize friction losses. Never install a throttling valve in a suction line.

With high discharge heads, it is recommended that a throttling valve and a system check valve be installed in the discharge line to protect the pump from excessive shock pressure and reverse rotation when it is stopped.



If the application involves a high discharge head, gradually close the discharge throttling valve before stopping the pump.

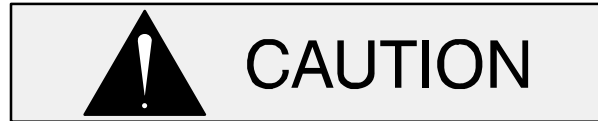
Bypass Lines

Self-priming pumps are not air compressors. During the priming cycle, air from the suction line must be vented to atmosphere on the discharge side. If the discharge line is open, this air will be vented through the discharge. However, if a check valve has been installed in the discharge line, the discharge side of the pump must be opened to atmospheric pressure through a bypass line installed between the pump discharge and the check valve. A self-priming centrifugal pump **will not prime** if there is sufficient static liquid head to hold the discharge check valve closed.

NOTE

The bypass line should be sized so that it does not affect pump discharge capacity; however, the bypass line should be at least 1 inch in diameter to minimize the chance of plugging.

In **low discharge head applications** (less than 30 feet or 9 meters), it is recommended that the bypass line be run back to the wet well, and located 6 inches below the water level or cut-off point of the low level pump. In some installations, this bypass line may be terminated with a six-to-eight foot length of 1 1/4 inch I.D. **smooth-bore** hose; air and liquid vented during the priming process will then agitate the hose and break up any solids, grease, or other substances likely to cause clogging.



A bypass line that is returned to a wet well must be secured against being drawn into the pump suction inlet.

It is also recommended that pipe unions be installed at each 90° elbow in a bypass line to ease disassembly and maintenance.

In **high discharge head applications** (more than 30 feet), an excessive amount of liquid may be bypassed and forced back to the wet well under the full working pressure of the pump; this will reduce overall pumping efficiency. **Therefore, it is recommended that a Gorman-Rupp Automatic Air Release Valve be installed in the bypass line.**

Gorman-Rupp Automatic Air Release Valves are reliable, and require minimum maintenance. See **AUTOMATIC AIR RELEASE VALVE** in this section for installation and theory of operation of the Automatic Air Release Valve. Consult your Gorman-Rupp distributor, or contact the Gorman-Rupp Company for selection of an Automatic Air Release Valve to fit your application.

If the installation involves a flooded suction such as a below-ground lift station. A pipe union and manual shut-off valve may be installed in the bleed line to allow service of the valve without shutting down the station, and to eliminate the possibility of flooding. If a manual shut-off valve is installed **anywhere** in the air release piping, it **must** be a full-opening **ball type** valve to prevent plugging by solids.



If a manual shut-off valve is installed in a bypass line, it must not be left closed

during operation. A closed manual shut-off valve may cause a pump which has lost prime to continue to operate without reaching prime, causing dangerous overheating and possible explosive rupture of the pump casing. Personnel could be severely injured.

Allow an over-heated pump to completely cool before servicing. Do not remove plates, covers, gauges, or fittings from an over-heated pump. Liquid within the pump can reach boiling temperatures, and vapor pressure within the pump can cause parts being disengaged to be ejected with great force. After the pump completely cools, drain the liquid from the pump by removing the casing drain plug. Use caution when removing the plug to prevent injury to personnel from hot liquid.

AUTOMATIC AIR RELEASE VALVE

When properly installed, a Gorman-Rupp Auto-

matic Air Release Valve will permit air to escape through the bypass line and then close automatically when the pump is fully primed and pumping at full capacity.



Some leakage (1 to 5 gallons [3.8 to 19 liters] per minute) will occur when the valve is fully closed. Be sure the bypass line is directed back to the wet well or tank to prevent hazardous spills.

Consult the manual accompanying the Air Release Valve for additional information on valve installation and performance.

Air Release Valve Installation

The Automatic Air Release Valve must be independently mounted in a horizontal position between the pump discharge port and the inlet side of the discharge check valve (see Figure 3). The inlet opening in the Air Release Valve is equipped with standard 1-inch NPT pipe threads.

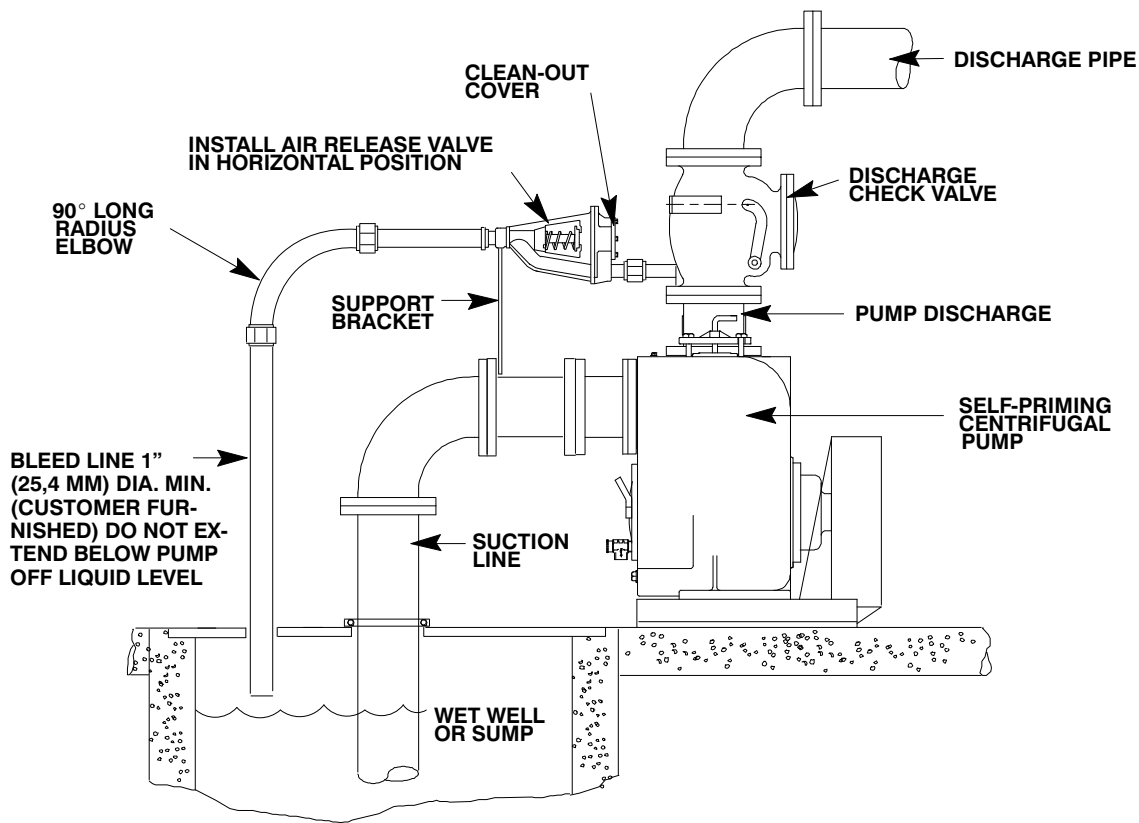


Figure 3. Typical Automatic Air Release Valve Installation

Connect the valve outlet to a bleed line which slopes back to the wet well or sump. The bleed line must be the same size as the outlet opening or larger, depending on which Air Release Valve is being used. If **piping** is used for the bleed line, avoid the use of elbows whenever possible.

NOTE

*For multiple pump installations, it is recommended that each Air Release Valve be fitted with an independent bleeder line directed back to the wet well. If multiple Air Release Valves are installed in a system, **do not** direct bleeder lines to a common manifold pipe. Contact your Gorman-Rupp distributor or the Gorman-Rupp Company for information about installation of an Automatic Air Release Valve for your specific application.*

shafts are aligned with and parallel to each other. It is imperative that alignment be checked after the pump and piping are installed, and before operation.

NOTE

*Check **Rotation**, Section C, before final alignment of the pump.*

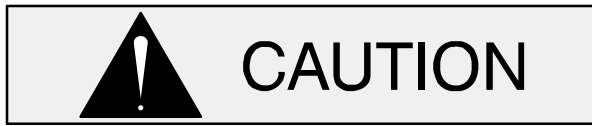
When mounted at the Gorman-Rupp factory, driver and pump are aligned before shipment. Misalignment will occur in transit and handling. Pumps **must** be checked and realigned before operation. Before checking alignment, tighten the foundation bolts. The pump casing feet and/or pedestal feet, and the driver mounting bolts should also be tightly secured.

ALIGNMENT

The alignment of the pump and its power source is critical for trouble-free mechanical operation. In either a flexible coupling or V-belt driven system, the driver and pump must be mounted so that their



When checking alignment, disconnect the power source to ensure that the pump will remain inoperative.



Adjusting the alignment in one direction may alter the alignment in another direction. Check each procedure after altering alignment.

Coupled Drives

When using couplings, the axis of the power source must be aligned to the axis of the pump shaft in both the horizontal and vertical planes. Most couplings require a specific gap or clearance between the driving and the driven shafts. Refer to the coupling manufacturer's service literature.

Align spider insert type couplings by using calipers to measure the dimensions on the circumference of the outer ends of the coupling hub every 90°. The coupling is in alignment when the hub ends are the same distance apart at all points (see Figure 4).

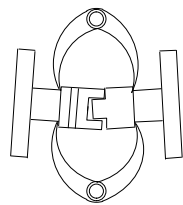


Figure 4. Aligning Spider-Type Couplings

Align non-spider type couplings by using a feeler gauge or taper gauge between the coupling halves every 90°. The coupling is in alignment when the hubs are the same distance apart at all points (see Figure 5).

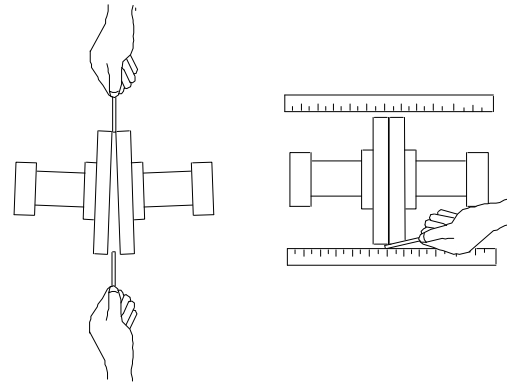
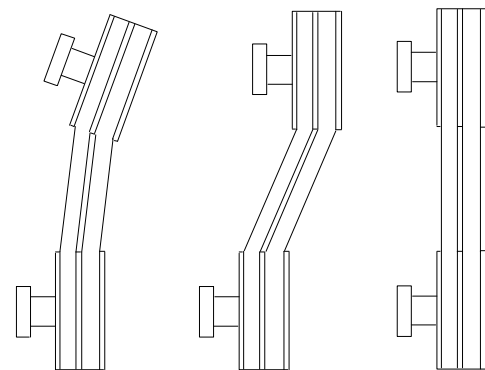


Figure 5. Aligning Non-Spider Type Couplings

Check parallel adjustment by laying a straightedge across both coupling rims at the top, bottom, and side. When the straightedge rests evenly on both halves of the coupling, the coupling is in horizontal parallel alignment. If the coupling is misaligned, use a feeler gauge between the coupling and the straightedge to measure the amount of misalignment.

Drive Belts

When using drive belts, the power source and the pump must be parallel. Use a straightedge along the sides of the pulleys to ensure that the pulleys are properly aligned (see Figure 6). In drive systems using two or more belts, make certain that the belts are a matched set; unmatched sets will cause accelerated belt wear.



MISALIGNED: SHAFTS NOT PARALLEL MISALIGNED: SHAFTS NOT IN LINE ALIGNED: SHAFTS PARALLEL AND SHEAVES IN LINE

Figure 6. Alignment of V-Belt Driven Pumps

Tighten the belts in accordance with the belt manufacturer's instructions. If the belts are too loose, they will slip; if the belts are too tight, there will be excessive power loss and possible bearing failure.

Select pulleys that will match the proper speed ratio; overspeeding the pump may damage both pump and power source.



Do not operate the pump without the guard in place over the rotating parts. exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

DRIVE BELT TENSIONING

General Rules of Tensioning

For new drive belts, check the tension after 5, 20 and 50 hours of operation and re-tension as required (see the following procedure for measuring belt tension). Thereafter, check and re-tension if required monthly or at 500 hour intervals, whichever comes first.

Ideal drive belt tension is the **lowest** tension at which the belt will not slip under peak load conditions. Do not over-tension drive belts. Over-tensioning will shorten both drive belt and bearing life. Under-tensioning will cause belt slippage. Always keep belts free from dirt, grease, oil and other foreign material which may cause slippage.

OPERATION – SECTION C

Review all **SAFETY** information in Section A.

Follow the instructions on all tags, labels and decals attached to the pump.



This pump is designed to handle liquids containing large entrained solids and slurries. Do not attempt to pump volatile, corrosive, or flammable liquids which may damage the pump or endanger personnel as a result of pump failure.

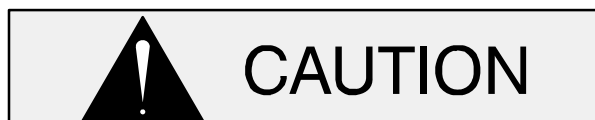


Pump speed and operating conditions must be within the performance range shown on page E-1.

PRIMING

Install the pump and piping as described in **INSTALLATION**. Make sure that the piping connections are tight, and that the pump is securely mounted. Check that the pump is properly lubricated (see **LUBRICATION** in **MAINTENANCE AND REPAIR**).

This pump is self-priming, but the pump should never be operated unless there is liquid in the pump casing.



Never operate this pump unless there is liquid in the pump casing. The pump will not prime when dry. extended operation of a dry pump will destroy the seal assembly.

Add liquid to the pump casing when:

1. The pump is being put into service for the first time.
2. The pump has not been used for a considerable length of time.
3. The liquid in the pump casing has evaporated.

Once the pump casing has been filled, the pump will prime and reprime as necessary.



After filling the pump casing, reinstall and tighten the fill plug. Do not attempt to operate the pump unless all connecting piping is securely installed. Otherwise, liquid in the pump forced out under pressure could cause injury to personnel.

To fill the pump, remove the pump casing fill cover or fill plug in the top of the casing, and add clean liquid until the casing is filled. Replace the fill cover or fill plug before operating the pump.

STARTING

Consult the operations manual furnished with the power source.

Rotation

The correct direction of pump rotation is counter-clockwise when facing the impeller. The pump could be damaged and performance adversely affected by incorrect rotation. If pump performance is not within the specified limits (see the curve on page E-1), check the direction of power source rotation before further troubleshooting.



Only operate this pump in the direction in-

indicated by the arrow on the pump body and on the accompanying decal. Otherwise, the impeller could become loosened from the shaft and seriously damage the pump.

Consult the operating manual furnished with the power source before attempting to start the power source.

If an electric motor is used to drive the pump, remove V-belts, couplings, or otherwise disconnect the pump from the motor before checking motor rotation. Operate the motor independently while observing the direction of the motor shaft, or cooling fan.

If rotation is incorrect on a three-phase motor, have a qualified electrician interchange any two of the three phase wires to change direction. If rotation is incorrect on a single-phase motor, consult the literature supplied with the motor for specific instructions.

OPERATION

Lines With a Bypass

If a Gorman-Rupp Automatic Air Release Valve has been installed, the valve will automatically open to allow the pump to prime, and automatically close after priming is complete (see **INSTALLATION** for Air Release Valve operation).

If the bypass line is open, air from the suction line will be discharged through the bypass line back to the wet well during the priming cycle. Liquid will then continue to circulate through the bypass line while the pump is in operation.

Lines Without a Bypass

Open all valves in the discharge line and start the power source. Priming is indicated by a positive reading on the discharge pressure gauge or by a quieter operation. The pump may not prime immediately because the suction line must first fill with liquid. If the pump fails to prime within five minutes, stop it and check the suction line for leaks.

After the pump has been primed, partially close the discharge line throttling valve in order to fill the line slowly and guard against excessive shock pressure which could damage pipe ends, gaskets, sprinkler heads, and any other fixtures connected to the line. When the discharge line is completely filled, adjust the throttling valve to the required flow rate.



Do not operate the pump against a closed discharge throttling valve for long periods of time. If operated against a closed discharge throttling valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump casing to rupture or explode.

Leakage

No leakage should be visible at pump mating surfaces, or at pump connections or fittings. Keep all line connections and fittings tight to maintain maximum pump efficiency.

Liquid Temperature And Overheating

The **maximum** liquid temperature for this pump is 160°F (71°C). Do not apply it at a higher operating temperature.

Overheating can occur if operated with the valves in the suction or discharge lines closed. Operating against closed valves could bring the liquid to a boil, build pressure, and cause the pump to rupture or explode. If overheating occurs, stop the pump and allow it to cool before servicing it. Refill the pump casing with cool liquid.



Allow an over-heated pump to completely cool before servicing. Do not remove plates, covers, gauges, or fittings from an over-heated pump. Liquid with-

in the pump can reach boiling temperatures, and vapor pressure within the pump can cause parts being disengaged to be ejected with great force. After the pump completely cools, drain the liquid from the pump by removing the casing drain plug. Use caution when removing the plug to prevent injury to personnel from hot liquid.

As a safeguard against rupture or explosion due to heat, this pump is equipped with a pressure relief valve which will open if vapor pressure within the pump casing reaches a critical point. If overheating does occur, stop the pump immediately and allow it to cool before servicing it. **Approach any overheated pump cautiously.** It is recommended that the pressure relief valve assembly be replaced at each overhaul, or any time the pump casing overheats and activates the valve. **Never** replace this valve with a substitute which has not been specified or provided by the Gorman-Rupp Company.

Strainer Check

If a suction strainer has been shipped with the pump or installed by the user, check the strainer regularly, and clean it as necessary. The strainer should also be checked if pump flow rate begins to drop. If a vacuum suction gauge has been installed, monitor and record the readings regularly to detect strainer blockage.

Never introduce air or steam pressure into the pump casing or piping to remove a blockage. This could result in personal injury or damage to the equipment. If backflushing is absolutely necessary, liquid pressure **must** be limited to 50% of the maximum permissible operating pressure shown on the pump performance curve.

Pump Vacuum Check

With the pump inoperative, install a vacuum gauge in the system, using pipe dope on the threads. Block the suction line and start the pump. At operating speed the pump should pull a vacuum of 20 inches (508,0 mm) or more of mercury. If it does

not, check for air leaks in the seal, gasket, or discharge valve.

Open the suction line, and read the vacuum gauge with the pump primed and at operation speed. Shut off the pump. The vacuum gauge reading will immediately drop proportionate to static suction lift, and should then stabilize. If the vacuum reading falls off rapidly after stabilization, an air leak exists. Before checking for the source of the leak, check the point of installation of the vacuum gauge.

STOPPING

Never halt the flow of liquid suddenly. If the liquid being pumped is stopped abruptly, damaging shock waves can be transmitted to the pump and piping system. Close all connecting valves slowly.

On engine driven pumps, reduce the throttle speed slowly and allow the engine to idle briefly before stopping.



If the application involves a high discharge head, gradually close the discharge throttling valve before stopping the pump.

After stopping the pump, lock out or disconnect the power source to ensure that the pump will remain inoperative.



Do not operate the pump against a closed discharge throttling valve for long periods of time. If operated against a closed discharge throttling valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump casing to rupture or explode.

Cold Weather Preservation

In below freezing conditions, drain the pump to prevent damage from freezing. Also, clean out any solids by flushing with a hose. Operate the pump

for approximately one minute; this will remove any remaining liquid that could freeze the pump rotating parts. If the pump will be idle for more than a few hours, or if it has been pumping liquids containing a large amount of solids, drain the pump, and flush it thoroughly with clean water. To prevent large solids from clogging the drain port and preventing the pump from completely draining, insert a rod or stiff wire in the drain port, and agitate the liquid during the draining process. Clean out any remaining solids by flushing with a hose.

BEARING TEMPERATURE CHECK

Bearings normally run at higher than ambient temperatures because of heat generated by friction. Temperatures up to 160°F (71°C) are considered normal for bearings, and they can operate safely to at least 180°F (82°C).

Checking bearing temperatures by hand is inaccurate. Bearing temperatures can be measured accurately by placing a contact-type thermometer against the housing. Record this temperature for future reference.

A sudden increase in bearing temperature is a warning that the bearings are at the point of failing to operate properly. Make certain that the bearing lubricant is of the proper viscosity and at the correct level (see **LUBRICATION** in **MAINTENANCE AND REPAIR**). Bearing overheating can also be caused by shaft misalignment and/or excessive vibration.

When pumps are first started, the bearings may seem to run at temperatures above normal. Continued operation should bring the temperatures down to normal levels.

TROUBLESHOOTING – SECTION D

Review all SAFETY information in Section A.



Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Lock out or disconnect the power source to ensure that the pump will remain inoperative.
3. Allow the pump to completely cool if overheated.
4. Check the temperature before opening any covers, plates, or plugs.
5. Close the suction and discharge valves.
6. Vent the pump slowly and cautiously.
7. Drain the pump.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO PRIME	Not enough liquid in casing. Suction check valve contaminated or damaged. Air leak in suction line. Lining of suction hose collapsed. Leaking or worn seal or pump gasket. Suction check valve or foot valve clogged or binding. Suction lift or discharge head too high. Strainer clogged.	Add liquid to casing. See PRIMING . Clean or replace check valve. Correct leak. Replace suction hose. Check pump vacuum. Replace leaking or worn seal or gasket. Clean valve. Check piping installation and install bypass line if needed. See INSTALLATION . Check strainer and clean if necessary.
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	Air leak in suction line. Lining of suction hose collapsed. Leaking or worn seal or pump gasket. Plugged or malfunctioning air release line or air release valve (if so equipped).	Correct leak. Replace suction hose. Check pump vacuum. Replace leaking or worn seal or gasket. Check, clean and/or repair air release valve and piping.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
<p>PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE (cont.)</p>	<p>Suction intake not submerged at proper level or sump too small.</p> <p>Impeller or other wearing parts worn or damaged.</p> <p>Strainer clogged.</p> <p>Impeller clogged.</p> <p>Suction lift or discharge head too high.</p> <p>Pump speed too slow.</p>	<p>Check installation and correct submergence as needed.</p> <p>Replace worn or damaged parts. Check that impeller is properly centered and rotates freely.</p> <p>Check strainer and clean if necessary.</p> <p>Free impeller of debris.</p> <p>Check piping installation and install bypass line if needed. See INSTALLATION.</p> <p>Check driver output; check belts or couplings for slippage.</p>
<p>PUMP REQUIRES TOO MUCH POWER</p>	<p>Pump speed too high.</p> <p>Discharge head too low.</p> <p>Liquid solution too thick.</p>	<p>Check driver output; check that sheaves or couplings are correctly sized.</p> <p>Adjust discharge valve.</p> <p>Dilute if possible.</p>
<p>PUMP CLOGS FREQUENTLY</p>	<p>Discharge flow too slow.</p> <p>Suction check valve or foot valve clogged or binding.</p>	<p>Open discharge valve fully to increase flow rate, and run engine at maximum governed speed.</p> <p>Clean valve.</p>
<p>EXCESSIVE NOISE</p>	<p>Cavitation in pump.</p> <p>Pumping entrained air.</p> <p>Pump or drive not securely mounted.</p> <p>Impeller clogged or damaged.</p> <p>Suction and discharge lines not properly supported.</p>	<p>Reduce suction lift and/or friction losses in suction line. Record vacuum and pressure gauge readings and consult local representative or factory.</p> <p>Locate and eliminate source of air bubble.</p> <p>Secure mounting hardware.</p> <p>Clean out debris; replace damaged parts.</p> <p>Check piping installation for proper support.</p>
<p>BEARINGS RUN TOO HOT</p>	<p>Bearing temperature is high, but within limits.</p> <p>Low or incorrect lubricant.</p> <p>Drive misaligned.</p> <p>Pump speed too high.</p> <p>Bearing(s) frozen.</p>	<p>Check bearing temperature regularly to monitor any increase.</p> <p>Check for proper type and level of lubricant.</p> <p>Align drive properly.</p> <p>Reduce speed of power source.</p> <p>Disassemble pump and check bearing(s).</p>

PREVENTIVE MAINTENANCE

Since pump applications are seldom identical, and pump wear is directly affected by such things as the abrasive qualities, pressure and temperature of the liquid being pumped, this section is intended only to provide general recommendations and practices for preventive maintenance. Regardless of the application however, following a routine preventive maintenance schedule will help assure trouble-free performance and long life from your Gorman-Rupp pump. For specific questions concerning your application, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

Record keeping is an essential component of a good preventive maintenance program. Changes in suction and discharge gauge readings (if so

equipped) between regularly scheduled inspections can indicate problems that can be corrected before system damage or catastrophic failure occurs. The appearance of wearing parts should also be documented at each inspection for comparison as well. Also, if records indicate that a certain part (such as the seal) fails at approximately the same duty cycle, the part can be checked and replaced before failure occurs, reducing unscheduled down time.

For new applications, a first inspection of wearing parts at 250 hours will give insight into the wear rate for your particular application. Subsequent inspections should be performed at the intervals shown on the chart below. Critical applications should be inspected more frequently.

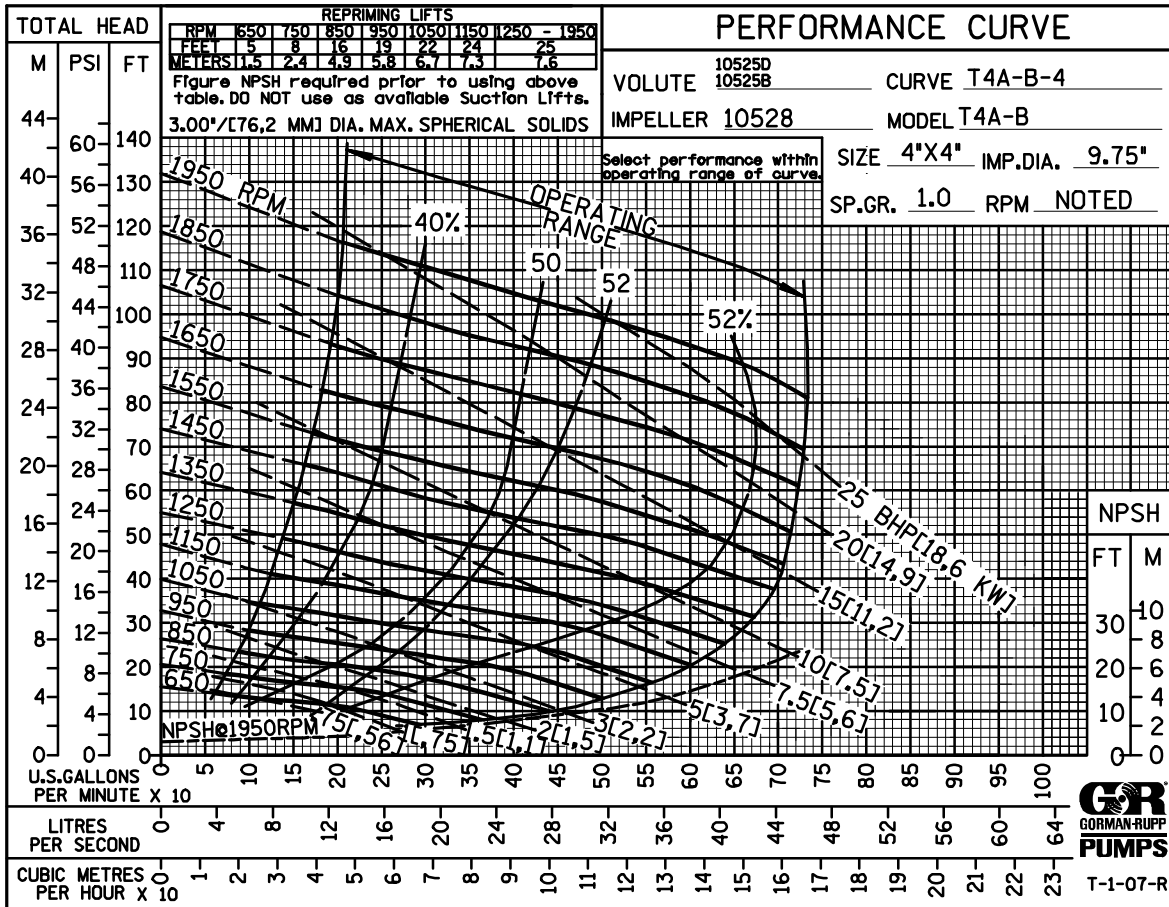
Preventive Maintenance Schedule					
Item	Service Interval*				
	Daily	Weekly	Monthly	Semi-Annually	Annually
General Condition (Temperature, Unusual Noises or Vibrations, Cracks, Leaks, Loose Hardware, Etc.)	I				
Pump Performance (Gauges, Speed, Flow)	I				
Bearing Lubrication		I			R
Seal Lubrication (And Packing Adjustment, If So Equipped)		I			R
V-Belts (If So Equipped)			I		
Air Release Valve Plunger Rod (If So Equipped)			I	C	
Front Impeller Clearance (Wear Plate)				I	
Rear Impeller Clearance (Seal Plate)				I	
Check Valve					I
Pressure Relief Valve (If So Equipped)					C
Pump and Driver Alignment					I
Shaft Deflection					I
Bearings					I
Bearing Housing					I
Piping					I
Driver Lubrication – See Mfgr’s Literature					I

Legend:
 I = Inspect, Clean, Adjust, Repair or Replace as Necessary
 C = Clean
 R = Replace

* Service interval based on an intermittent duty cycle equal to approximately 4000 hours annually. Adjust schedule as required for lower or higher duty cycles or extreme operating conditions.

PUMP MAINTENANCE AND REPAIR – SECTION E

MAINTENANCE AND REPAIR OF THE WEARING PARTS OF THE PUMP WILL MAINTAIN PEAK OPERATING PERFORMANCE.



*** STANDARD PERFORMANCE FOR PUMP MODEL T4A3S-B, Including /F, /FM, /WW, /WWS**

* Based on 70°F (21°C) clear water at sea level with minimum suction lift. Since pump installations are seldom identical, your performance may be different due to such factors as viscosity, specific gravity, elevation, temperature, and impeller trim.

Contact the Gorman-Rupp Company to verify performance or part numbers.



Pump speed and operating condition points must be within the continuous performance range shown on the curve.

If your pump serial number is followed by an "N", your pump is **NOT** a standard production model.

ILLUSTRATION

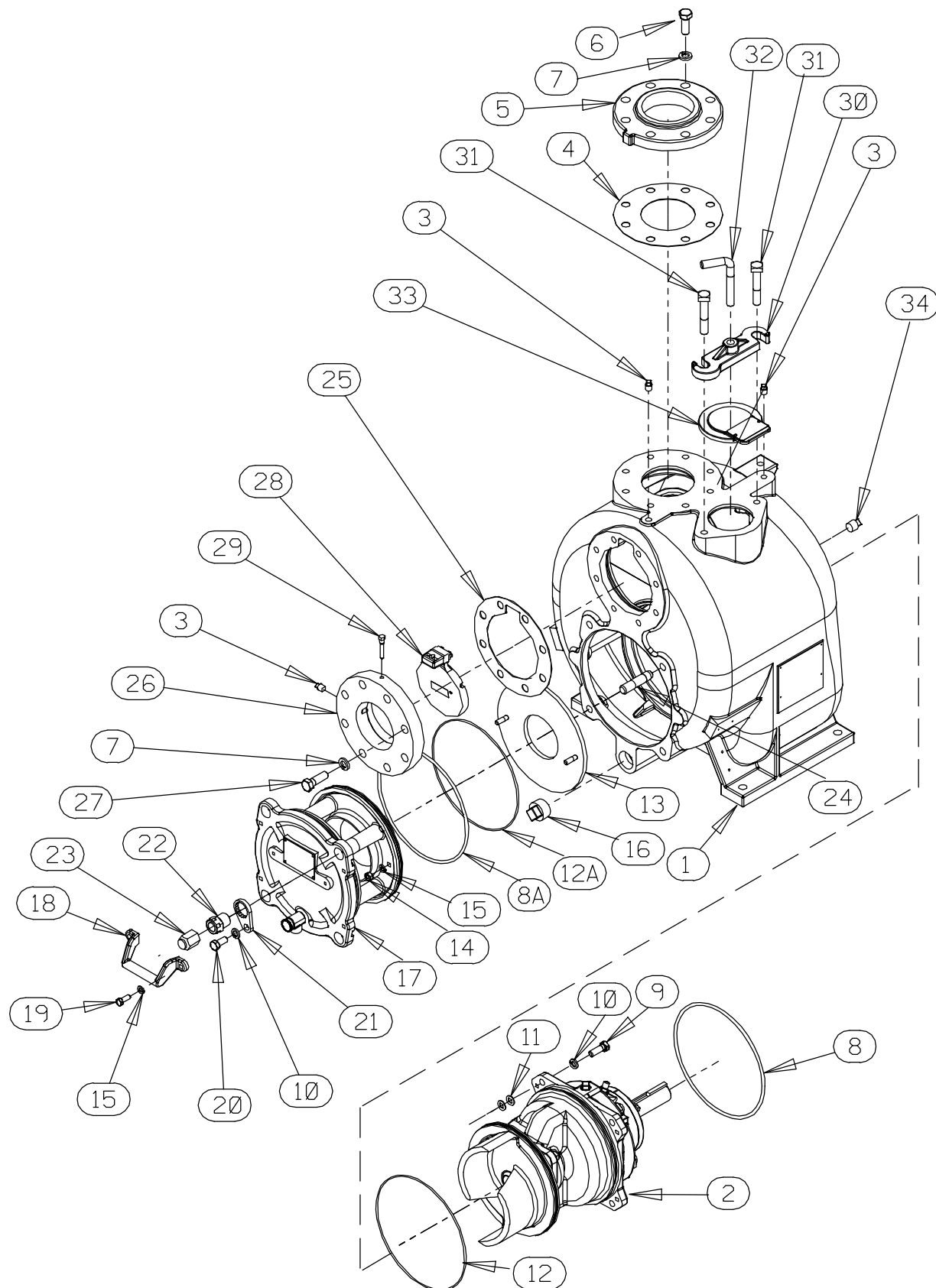


Figure 1. Pump Model T4A3S-B, Including /F, /FM, /WW, /WWS

PARTS LIST
Pump Model T4A3S-B, Including /F, /FM, /WW, /WWS
 (From S/N 1206396 Up)

If your pump serial number is followed by an "N", your pump is **NOT** a standard production model. Contact the Gorman-Rupp Company to verify part numbers.

ITEM NO.	PART NAME	PART NUMBER	QTY	ITEM NO.	PART NAME	PART NUMBER	QTY
1	☐ PUMP CASING	SEE NOTE BELOW	1	NOT SHOWN:			
2	REPAIR ROTATING ASSY				DRIVE SCREW	BM#04-03 17000	4
	T4A3S-B, /F, /FM	44163-261	1		NAMEPLATE	38818-040 13990	1
	T4A3S-B /WW	44163-305	1		LUBRICATION DECAL	38817-084	1
	T4A3S-B /WWS	44163-276	1		ROTATION DECAL	2613M	1
3	☐ PIPE PLUG	P04 15079	3		WARNING DECAL	2613FE	1
4	* GASKET	25113-034	1		SUCTION STICKER	6588AG	1
5	DISCHARGE FLANGE	1756 10010	1		PRIMING STICKER	6588AH	1
6	HEX HEAD CAP SCREW	B1007 15991	8		DISCHARGE STICKER	6588BJ	1
7	LOCK WASHER	J10 15991	16		SUPER T DECAL	38812-089	1
8	* O-RING	S1674	1		G-R DECAL	GR-03	1
8A	* O-RING	S1674	1		INSTRUCTION TAG	38817-023	1
9	HEX HEAD CAP SCREW	B0806 15991	4		INSTRUCTION TAG	38817-011	1
10	LOCK WASHER	J08 15991	8	OPTIONAL:			
11	ROT ASSY ADJ SHIM	13130-3 17040	8		SELF CLEANING		
12	* O-RING	25152-273	1		WEAR PLATE	46451-763 24160	1
12A	* O-RING	25152-273	1		DISASSEMBLY TOOL	48711-020	1
13	* WEAR PLATE ASSY	10532A 15990	1		/F FLANGE KIT	48213-039	1
14	HEX NUT	D06 15991	2		-SUCTION	12066 10010	1
15	LOCK WASHER	J06 15991	4		-DISCHARGE	12066A 10010	1
16	☐ CASING DRAIN PLUG	P20 10009	1		/FM METRIC FLANGE KIT	48213-077	1
17	BACK CVR PLATE ASSY	42111-802	1		-SUCTION	38642-210 10000	1
	-WARNING PLATE	2613EV 13990	1		-DISCHARGE	38642-211 10000	1
	-DRIVE SCREW	BM#04-03 17000	4		WEAR PLATE ASSY:		
	* -PRESS RELIEF VALVE	26662-005	1		-STAINLESS STEEL	10532A 1718H	1
18	HANDLE	12354 13010	1		-ALLOY STEEL	46451-361 24160	1
19	HEX HEAD CAP SCREW	B0604 15991	2		CASING HEATERS:		
20	HEX HEAD CAP SCREW	B0804-1/2 15991	4		-120V	47811-078	1
21	LOCK COLLAR	38115-551 15001	4		-240V	47811-079	1
22	ADJUSTING SCREW	31871-070 1500G	4		CHECK VALVE ASSYS:		
23	BACK COVER NUT	31871-073 15000	4		-NEO SOLID TYPE	46411-020	1
24	☐ STUD	C1213 15991	4		☑ -VITON BLOW-OUT	46411-072	1
25	* GASKET	11389G 19370	1		-BUNA-N	46411-104	1
26	SUCTION FLANGE				-EPDM	46411-114	1
	T4A3S-B	11389 10010	1		PRESS RELIEF VALVES:		
	T4A3S-B /F, /WW, /WWS	12066 10010	1		-SEWAGE TYPE	46431-628	1
	T4A3S-B /FM	38642-210 10000	1		-STAINLESS STEEL	46431-629	1
27	HEX HEAD CAP SCREW				HI TEMP SHUT-DOWN KITS:		
	T4A3S-B	B1008 15991	8		-145°F	48313-186	1
	/F, /FM, /WW, /WWS	B1007 15991	6		-130°F	48313-256	1
	/F, /FM, /WW, /WWS	B1008 15991	2		-120°F	48313-257	1
28	* FLAP VALVE ASSY	46411-062	1		HI TEMP SHUT-DOWN THERMOSTAT KIT		
29	CHECK VALVE PIN	11557 17010	1		-145°F	48313-172	1
30	CLAMP BAR	38111-004 11010	1		AIR RELEASE VALVES:		
31	☐ SQUARE HEAD BOLT	A1014 15991	2		-10# COMP SPRING	GRP33-07A	1
32	CLAMP BAR SCREW	31912-009 15000	1		-25# COMP SPRING	GRP33-07	1
33	FILL COVER ASSY	42111-344	1		-80# COMP SPRING	GRP33-07B	1
	-WARNING PLATE	38816-097 13990	1		AIR REL VVL MNTG KIT	46331-515	1
	-DRIVE SCREW	BM#04-03 17000	2		BACK COVER O-RINGS		
	-COVER GASKET	50G 19210	1		★ -AFLAS	25150-409	1
34	☐ PIPE PLUG	P08 15079	1		☑ -VITON	25154-449	1

* INDICATES PARTS RECOMMENDED FOR STOCK

☐ INCLUDED WITH REPAIR 46472-721 1
 PUMP CASING ASSY

☑ VITON® IS A REGISTERED TRADEMARK OF THE DUPONT CORP.

★ AFLAS® IS A PRODUCT OF THE 3M CORP.

ILLUSTRATION

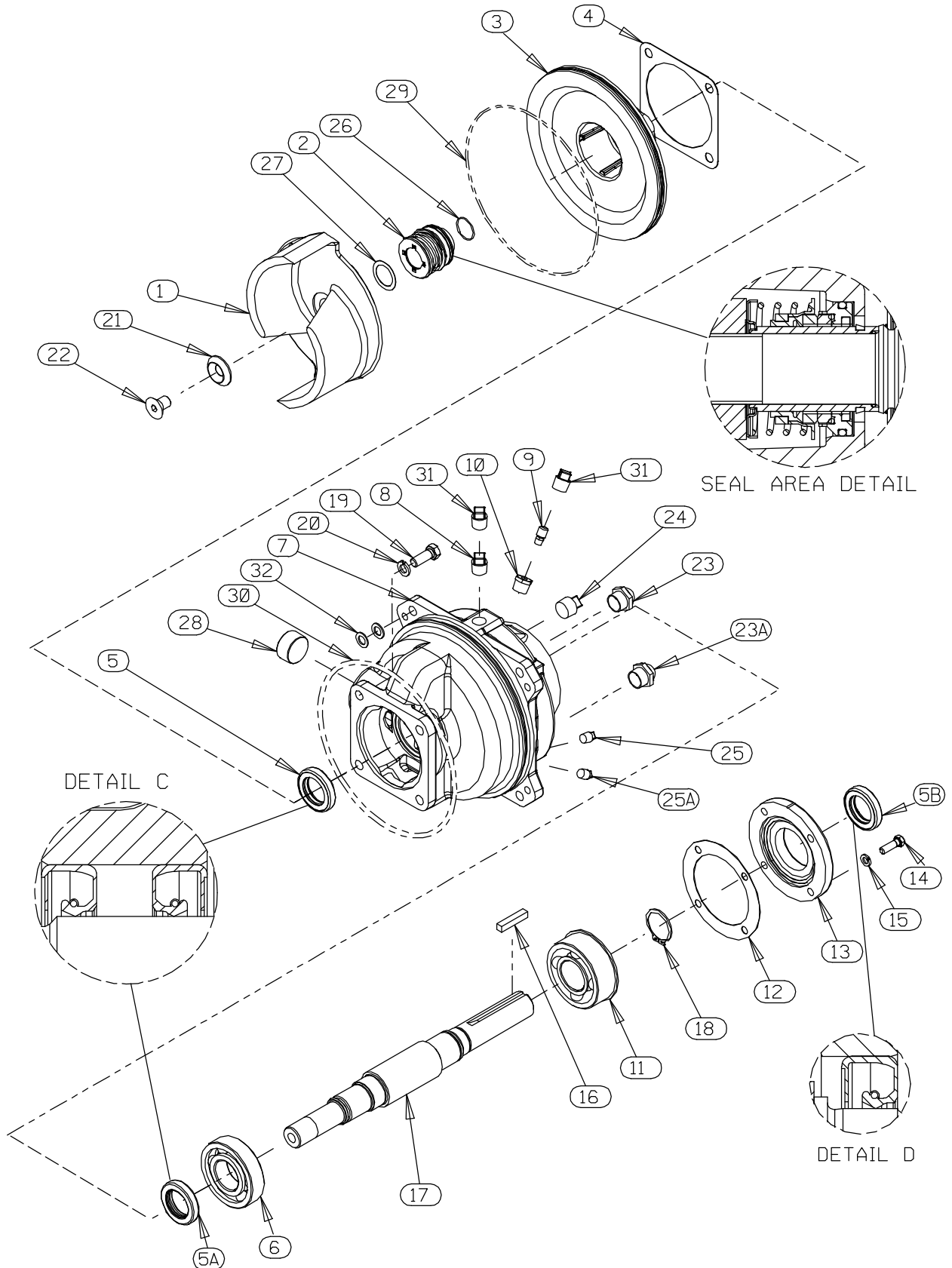


Figure 2. Repair Rotating Assemblies

PARTS LIST
Repair Rotating Assemblies

ITEM NO.	PART NAME	PART NUMBER	QTY	ITEM NO.	PART NAME	PART NUMBER	QTY
1 *	IMPELLER	10528 11010	1	26	SHAFT SLEEVE O-RING	25154-022	REF
2 *	CART SEAL ASSY	46513-150	1	27	IMP ADJ SHIM SET	37J 17090	REF
	*/WWS MECH SEAL ASSY	12364D	1	28	PIPE PLUG	PC20 10009	1
3	SEAL PLATE	38272-234 10010	1	29 *	O-RING	25152-273	1
4 *	GASKET	10959G 20000	1	30 *	O-RING	S1674	1
5 *	OIL SEAL	S1352	1	31	SHIPPING PLUG	11495B 15079	2
5A *	OIL SEAL	S1352	1	32	ROT ASSY ADJ SHIM	13130-3 17040	8
5B *	OIL SEAL	S1352	1	NOT SHOWN:			
6 *	BALL BEARING	S1088	1		S/N PLATE	2613GG 13990	1
7	BEARING HOUSING	38251-411 10000	1		DRIVE SCREW	BM#04-03 17000	2
8	VENTED PIPE PLUG	4823A 15079	1		ROTATION DECAL	2613M	1
9	VENT	S1530	1		INSTRUCTION TAG	6588U	1
10	RED PIPE BUSHING	AP0802 15079	1	OPTIONAL:			
11 *	BALL BEARING	S375	1	STAINLESS STEEL PARTS:			
12 *	GASKET	38683-271 18000	1		SEAL PLATE	38272-234 1718H	1
13	BEARING CAP	38322-220 10000	1		CART SEAL ASSY	46513-156	1
14	HEX HEAD CAP SCREW	B0605 15991	4		IMPELLER WASHER	31167-029 1706H	1
15	LOCK WASHER	J06 15991	4		IMP CAPSCREW	F1004S 1704G	1
16 *	KEY	N0608 15990	1		MECH SEAL ASSY	46512-074	1
17 *	IMPELLER SHAFT	38514-817 16040	1	†	MECHANICAL SEAL		
	*/WWS IMPELLER SHAFT	38514-819 1706H	1		SHAFT SLEEVE	11876A 1706H	1
18	RETAINING RING	S442	1	† ★	AFLAS SEAL	46512-194	1
19	HEX HEAD CAP SCREW	B0805-1/2 15991	4	†	METAL BELLOWS MECH SEAL ASSY		
20	LOCK WASHER	J08 15991	4		-SEAL PLATE	38272-241 10010	1
21 *	IMPELLER WASHER	31167-029 16000	1	✓	-VITON OR EQUAL	46512-147	1
22 *	IMPELLER SCREW	F1004S 1500G	1	✓	-KALREZ	46512-142	1
23	SEAL CVTY SIGHT GAUGE	S1471	1	BEARING HSG O-RING:			
23A	BRG CVTY SIGHT GAUGE	S1471	1	★	-AFLAS	25150-409	1
24	PIPE PLUG	P12 15079	1	✓	-VITON	25154-449	1
25	BRG CVTY DRAIN PLUG	P04 15079	1				
25A	SEAL CVTY DRAIN PLUG	P04 15079	1				

* INDICATES PARTS RECOMMENDED FOR STOCK

† OPTIONAL MECHANICAL SEAL(S) MUST BE USED WITH MECHANICAL SEAL SHAFT SLEEVE OR SOLID SST SHAFT.

✓ KALREZ® AND VITON™ ARE REGISTERED TRADEMARKS OF THE DUPONT CORP.

★ AFLAS® IS A REGISTERED TRADEMARK OF THE 3M CORP.

PUMP AND SEAL DISASSEMBLY AND REASSEMBLY

Review all **SAFETY** information in Section A.

Follow the instructions on all tags, label and decals attached to the pump.

This pump requires little service due to its rugged, minimum-maintenance design. However, if it becomes necessary to inspect or replace the wearing parts, follow these instructions which are keyed to the illustrations (see Figures 1 and 2) and the accompanying parts lists.

This manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed precautions for every situation that might occur during maintenance of the unit. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that **only** safe, established maintenance procedures are used, and that any procedures not addressed in this manual are performed **only** after establishing that neither personal safety nor pump integrity are compromised by such practices.

Many service functions may be performed by draining the pump and removing the back cover assembly. If major repair is required, the piping and/or power source must be disconnected. The following instructions assume complete disassembly is required.

Before attempting to service the pump, disconnect or lock out the power source and take precautions to ensure that it will remain inoperative. Close all valves in the suction and discharge lines.

For power source disassembly and repair, consult the literature supplied with the power source, or contact your local power source representative.



Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Disconnect or lock out the power source to ensure that the pump will remain inoperative.
3. Allow the pump to completely cool if overheated.
4. Check the temperature before opening any covers, plates, or plugs.
5. Close the suction and discharge valves.
6. Vent the pump slowly and cautiously.
7. Drain the pump.



Death or serious personal injury and damage to the pump or components can occur if proper lifting procedures are not observed. Make certain that hoists, chains, slings or cables are in good working condition and of sufficient capacity and that they are positioned so that loads will be balanced and the pump or components will not be damaged when lifting. Suction and discharge hoses and piping must be removed from the pump before lifting. Lift the pump or component only as high as necessary and keep personnel away from suspended objects.

Back Cover And Wear Plate Removal

(Figure 1)

The wear plate (13) is easily accessible and may be serviced by removing the back cover assembly (10). Before attempting to service the pump, remove the pump casing drain plug (16) and drain the pump. Clean and reinstall the drain plug.

Remove the back cover nuts (23) and pry the back cover and assembled wear plate from the pump casing (1).

NOTE

An alternate method of removing the back cover from the pump casing is to remove the back cover nuts (23) and two diagonally opposing locking collars (21). Install two 1/2–13 UNC x 2-inch long screws in the tapped holes in the back cover and use them to press the back cover out of the pump casing.

Inspect the wear plate and replace it if badly scored or worn. To remove the wear plate, disengage the hardware (14 and 15).

Inspect the back cover O-rings (8A and 12A) and replace them if damaged or worn.

Suction Check Valve Removal

(Figure 1)

If the check valve assembly (28) is to be serviced, remove the check valve pin (29), reach through the back cover opening and pull the complete assembly from the suction flange (26).

NOTE

Further disassembly of the check valve is not required since it must be replaced as a complete unit. Individual parts are not sold separately.

Rotating Assembly Removal

(Figure 2)

The rotating assembly may be serviced without disconnecting the suction or discharge piping; however, the power source must be removed to provide clearance.

The impeller (1) should be loosened while the rotating assembly is still secured to the pump casing. Before loosening the impeller, remove the seal cavity drain plug (25A) and drain the seal lubricant. This will prevent the oil in the seal cavity from escaping when the impeller is loosened. Clean and reinstall the seal cavity drain plug.

Immobilize the impeller by wedging a block wood between the vanes and the pump casing, and remove the impeller capscrew and washer (21 and 22).

Install the shaft key (16). Install a lathe dog on the drive end of the shaft (17) with the “V” notch positioned over the shaft key.

With the impeller rotation still blocked, see Figure 3 and use a long piece of heavy bar stock to pry against the arm of the lathe dog in a counterclockwise direction (when facing the drive end of the shaft). **Use caution** not to damage the shaft or keyway. When the impeller breaks loose, remove the lathe dog, key and wood block.

NOTE

Do not remove the impeller until the rotating assembly has been removed from the pump casing.

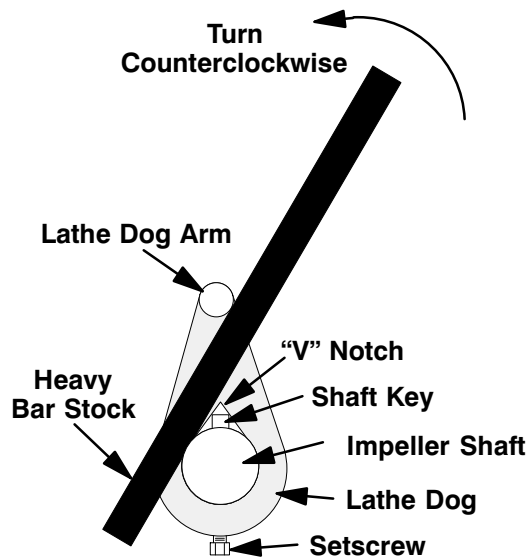


Figure 3. Loosening Impeller

(Figure 1)

Remove the hardware (9 and 10) securing the rotating assembly to the pump casing. Separate the rotating assembly by pulling straight away from the pump casing. Tie and tag the rotating assembly shims (11) for ease of reassembly.

NOTE

An optional disassembly tool is available from the factory. If the tool is used, follow the instructions packed with it. A similar tool may be assembled using 1/2-inch pipe (schedule 80 steel or malleable

iron) and a standard tee (see Figure 4). All threads are 1/2-inch NPT. **Do not pre-assemble the tool.**

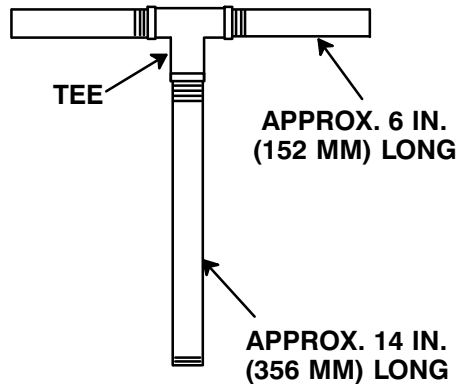


Figure 4. Rotating Assembly Tool

To install the tool, remove the vented plug (10, Figure 2) from the bearing housing, and screw the longest length of pipe into the vent hole until fully engaged. Install the tee, and screw the handles into the tee. Use caution when lifting the rotating assembly to avoid injury to personnel or damage to the assembly.

Remove the bearing housing O-ring (9).

Impeller Removal

(Figure 2)

With the rotating assembly removed from the pump casing, unscrew the impeller from the shaft. Use caution when unscrewing the impeller; tension on the shaft seal spring will be released as the impeller is removed. Inspect the impeller and replace if cracked or badly worn.

Remove the impeller adjusting shims (3); tie and tag the shims, or measure and record their thickness for ease of reassembly.

Seal Removal

(Figure 2)

Slide the integral shaft sleeve and rotating portion of the seal off the shaft as a unit.

Use a pair of stiff wires with hooked ends to remove the stationary element and seat.

An alternate method of removing the stationary seal components is to remove the hardware (19 and 20) and separate the seal plate (3) and gasket (4) from the bearing housing (7). Position the seal plate on a flat surface with the impeller side down. Use a wooden dowel or other suitable tool to press on the back side of the stationary seat until the seat, O-rings, and stationary element can be removed.

Remove the shaft sleeve O-ring (26).

If no further disassembly is required, refer to **Seal Installation**.

Shaft and Bearing Removal and Disassembly

(Figure 2)

When the pump is properly operated and maintained, the bearing housing should not require disassembly. Disassemble the shaft and bearings **only** when there is evidence of wear or damage.



Shaft and bearing disassembly in the field is not recommended. These operations should be performed only in a properly-equipped shop by qualified personnel.

Remove the bearing housing drain plug (25A) and drain the lubricant. Clean and reinstall the drain plug.

Disengage the hardware (14 and 15) and slide the bearing cap (13) and oil seal (5B) off the shaft. Remove the bearing cap gasket (12) and press the oil seal from the bearing cap.

Place a block of wood against the impeller end of the shaft and tap the shaft (17) and assembled bearings (6 and 11) from the bearing housing.

Pry or press the oil seals (5 and 5A) from the bearing housing.

After removing the shaft and bearings, clean and inspect the bearings **in place** as follows.



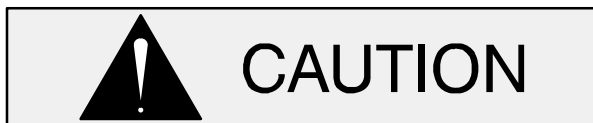
To prevent damage during removal from the shaft, it is recommended that bearings be cleaned and inspected **in place**. It is **strongly** recommended that the bearings be replaced **any** time the shaft and bearings are removed.

Clean the bearing housing, shaft and all component parts (except the bearings) with a soft cloth soaked in cleaning solvent. Inspect the parts for wear or damage and replace as necessary.



Most cleaning solvents are toxic and flammable. Use them only in a well ventilated area free from excessive heat, sparks, and flame. Read and follow all precautions printed on solvent containers.

Clean the bearings thoroughly in **fresh** cleaning solvent. Dry the bearings with filtered compressed air and coat with light oil.



Bearings must be kept free of all dirt and foreign material. Failure to do so will greatly shorten bearing life. **Do not** spin dry bearings. This may scratch the balls or races and cause premature bearing failure.

Rotate the bearings by hand to check for roughness or binding and inspect the bearing balls. If rotation is rough or the bearing balls are discolored, replace the bearings.

The bearing tolerances provide a tight press fit onto the shaft and a snug slip fit into the bearing housing. Replace the bearings, shaft, or bearing housing if the proper bearing fit is not achieved.

If bearing replacement is required, remove the outboard bearing snap ring (18) and use a bearing puller to remove the bearings from the shaft.

Shaft and Bearing Reassembly and Installation (Figure 2)

Clean the bearing housing, shaft and all component parts (except the bearings) with a soft cloth soaked in cleaning solvent. Inspect the parts for wear or damage as necessary.



Most cleaning solvents are toxic and flammable. Use them only in a well ventilated area free from excessive heat, sparks, and flame. Read and follow all precautions printed on solvent containers.

Inspect the shaft for distortion, nicks or scratches, or for thread damage on the impeller end. Dress small nicks and burrs with a fine file or emery cloth. Replace the shaft if defective.

Position the inboard oil seal (5A) in the bearing housing bore with the lip positioned as shown in Figure 2. Press the oil seal into the housing until the face is **just flush** with the counterbored surface toward the inside of the housing.



To prevent damage during removal from the shaft, it is recommended that bearings be cleaned and inspected **in place**. It is **strongly** recommended that the bearings be replaced **any** time the shaft and bearings are removed.

NOTE

Position the outboard bearing (11) on the shaft with the integral retaining ring on the bearing O.D. toward the drive end of the shaft.

The bearings may be heated to ease installation. An induction heater, hot oil bath, electric oven, or

hot plate may be used to heat the bearings. Bearings should **never** be heated with a direct flame or directly on a hot plate.

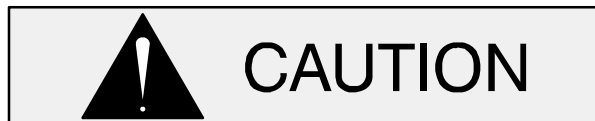
NOTE

*If a hot oil bath is used to heat the bearings, both the oil and the container must be **absolutely** clean. If the oil has been previously used, it must be **thoroughly** filtered.*

Heat the bearings to a uniform temperature **no higher than** 250°F (120°C) and slide the bearings onto the shaft, one at a time, until they are fully seated. This should be done quickly, in one continuous motion, to prevent the bearings from cooling and sticking on the shaft.

After the bearings have been installed and allowed to cool, check to ensure that they have not moved away from the shaft shoulders in shrinking. If movement has occurred, use a suitably sized sleeve and a press to reposition the bearings against the shaft shoulders.

If heating the bearings is not practical, use a suitably sized sleeve, and an arbor (or hydraulic) press to install the bearings on the shaft.



When installing the bearings onto the shaft, **never** press or hit against the outer race, balls, or ball cage. Press **only** on the inner race.

Secure the outboard bearing on the shaft with the bearing snap ring (18).

It is recommended that a sleeve be positioned against the inboard oil seal (5A) to prevent the lip of the oil seal from rolling as the shaft and bearings are installed in the bearing housing. The O.D. of the sleeve should be just smaller than the bearing housing bore, while the I.D. of the sleeve should be just larger than the O.D. of the lip seal area of the shaft.

With the lip seal sleeve in place, lubricate the lip seal area of the shaft, and slide the shaft and assembled bearings into the bearing housing until the retaining ring on the outboard bearing seats

against the bearing housing. Remove the lip seal sleeve.

Position the outboard oil seal (6) in the bearing housing bore with the lip positioned as shown in Figure 2. Press the oil seal into the housing until the face is **just flush** with the counterbored surface toward the outside of the housing.



When installing the shaft and bearings into the bearing bore, push against the outer race. **Never** hit the balls or ball cage.

Press the oil seal (5B) into the bearing cap (13) with the lip positioned as shown in Figure 2. Replace the bearing cap gasket (12) and secure the bearing cap with the hardware (14 and 15). **Be careful** not to damage the oil seal lip on the shaft keyway.

Lubricate the bearing housing as indicated in **LUBRICATION**.

Seal Installation

(Figures 2, 5, 6 and 7)



Most cleaning solvents are toxic and flammable. Use them only in a well ventilated area free from excessive heat, sparks, and flame. Read and follow all precautions printed on solvent containers.

Clean the seal cavity and shaft with a cloth soaked in fresh cleaning solvent. Inspect the stationary seat bore in the seal plate for dirt, nicks and burrs, and remove any that exist. The stationary seat bore **must** be completely clean before installing the seal.



A new seal assembly should be installed **any time** the old seal is removed from the pump. Wear patterns on the finished faces cannot be realigned during reassembly.

Reusing an old seal could result in premature failure.

To ease installation of the seal, lubricate the shaft

sleeve O-ring and the external stationary seat O-ring with a very **small** amount of light lubricating oil. See Figure 5 for seal part identification.

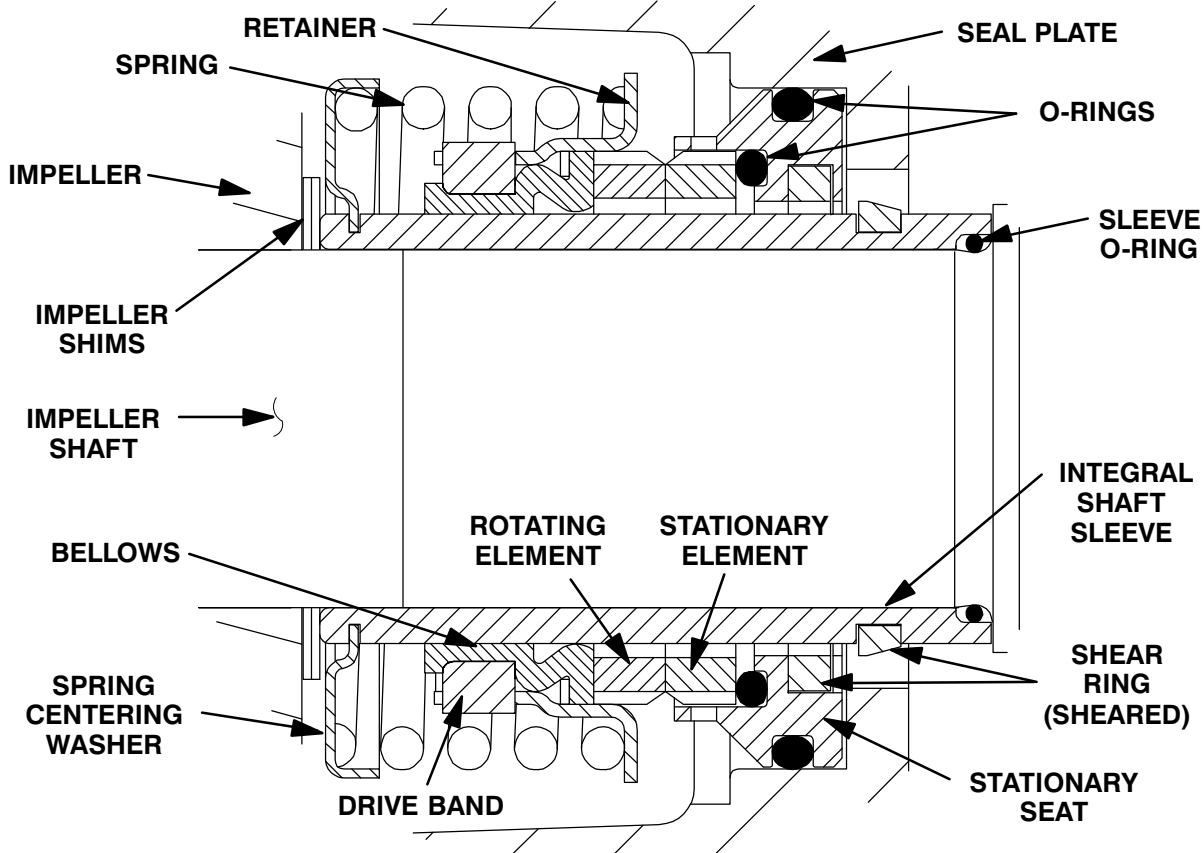


Figure 5. Cartridge Seal Assembly



This seal is not designed for operation at temperatures above 160°F (71°C). Do not use at higher operating temperatures.

If the seal plate (3) was removed, install the seal plate gasket (4). Position the seal plate over the shaft and secure it to the bearing housing with the hardware (19 and 20).

To prevent damaging the shaft sleeve O-ring (not shown) on the shaft threads, cover the threads with electrical or duct tape. Slide the O-ring over the shaft until it seats against the shaft shoulder. Remove the tape covering the threads. Check to en-

sure that the shaft threads are free of any tape residue and clean as required before proceeding with seal installation.

When installing a new cartridge seal assembly, remove the seal from the container and lubricate the external stationary seat O-ring with light oil. Slide the seal assembly onto the shaft until the external stationary seat O-ring engages the bore in the seal plate.

Clean and inspect the impeller as described in **Impeller Installation and Adjustment.** Install the full set of impeller shims (27) provided with the seal, and screw the impeller onto the shaft until it is seated against the seal (see Figure 6).

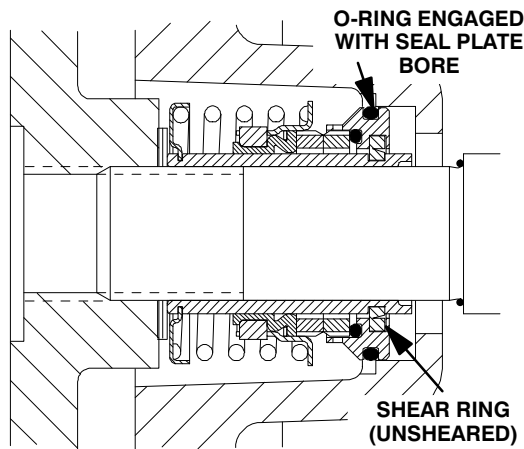


Figure 6. Seal Partially Installed

Continue to screw the impeller onto the shaft. This will press the stationary seat into the seal plate bore.

NOTE

A firm resistance will be felt as the impeller presses the stationary seat into the seal plate bore.

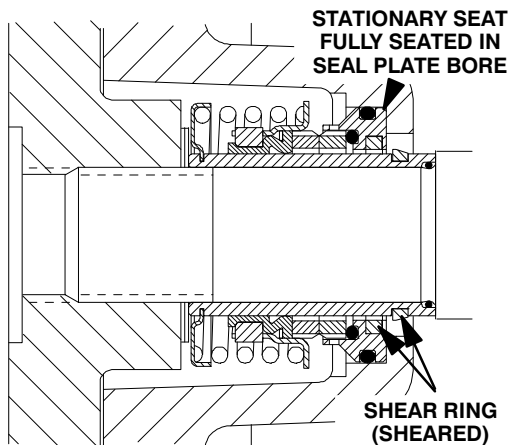


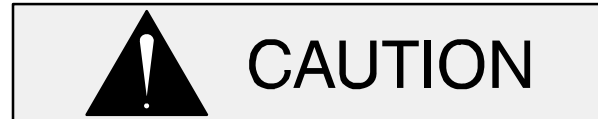
Figure 7. Seal Fully Installed

As the stationary seat becomes fully seated, the seal spring compresses, and the shaft sleeve will break the nylon shear ring. This allows the sleeve to slide down the shaft until seated against the shaft shoulder. Continue to screw the impeller onto the shaft until the impeller, shims, and sleeve are fully seated against the shaft shoulder (see Figure 7).

Measure the impeller-to-seal plate clearance, and remove impeller adjusting shims to obtain the

proper clearance as described in **Impeller Installation and Adjustment**.

If necessary to reuse an old seal in an emergency, carefully separate the rotating and stationary seal faces from the bellows retainer and stationary seat.



A new seal assembly should be installed **any time** the old seal is removed from the pump. Wear patterns on the finished faces cannot be realigned during reassembly. Reusing an old seal could result in premature failure.

Handle the seal parts with extreme care to prevent damage. Be careful not to contaminate precision finished faces; even fingerprints on the faces can shorten seal life. If necessary, clean the faces with a non-oil based solvent and a clean, lint-free tissue. Wipe **lightly** in a concentric pattern to avoid scratching the faces.

Carefully wash all metallic parts in fresh cleaning solvent and allow to dry thoroughly.



Do not attempt to separate the rotating portion of the seal from the shaft sleeve when reusing an old seal. The rubber bellows will adhere to the sleeve during use, and attempting to separate them could damage the bellows.

Inspect the seal components for wear, scoring, grooves, and other damage that might cause leakage. Inspect the integral shaft sleeve for nicks or cuts on either end. If any components are worn, or the sleeve is damaged, replace the complete seal; **never mix old and new seal parts**.

Install the stationary seal element in the stationary seat. Press this stationary subassembly into the seal plate bore until it seats squarely against the bore shoulder. A push tube made from a piece of plastic pipe would aid this installation. The I.D. of the pipe should be slightly larger than the O.D. of the shaft sleeve.

Slide the rotating portion of the seal (consisting of the integral shaft sleeve, spring centering washer, spring, bellows and retainer, and rotating element) onto the shaft until the seal faces contact.

Proceed with **Impeller Installation and Adjustment**.

Impeller Installation

(Figure 2)

Inspect the impeller and replace it if cracked or badly worn. Inspect the impeller and shaft threads for dirt or damage, and clean or dress the threads as required.



The shaft and impeller threads **must** be completely clean before reinstalling the impeller. Even the slightest amount of dirt on the threads can cause the impeller to seize to the shaft, making future removal difficult or impossible without damage to the impeller or shaft.

Install the same thickness of impeller adjusting shims (27) as previously removed. Apply 'Never-Seez' or equivalent to the shaft threads and screw the impeller onto the shaft until tight.

NOTE

At the slightest sign of binding, immediately back the impeller off, and check the threads for dirt. Do not try to force the impeller onto the shaft.

A clearance of .025 to .040 inch (0,64 to 1,02 mm) between the impeller and the seal plate is recommended for maximum pump efficiency. Measure this clearance, and add or remove impeller adjusting shims as required.

NOTE

If the rotating assembly has been installed in the pump casing, this clearance may be measured by reaching through the priming port with a feeler gauge.

Proceed with **Rotating Assembly Installation** before installing the impeller capscrew and washer

(21 and 22). *The rotating assembly must be installed in the pump casing in order to torque the impeller capscrew.*

After the rotating assembly is installed in the pump casing, coat the threads of the impeller capscrew (22) with 'Never-Seez' or equivalent compound, and install the impeller washer (21) and capscrew; torque the capscrew to 90 ft. lbs. (1080 in. lbs. or 12,4 m. kg.).

Rotating Assembly Installation

(Figure 1)

NOTE

There is a 1-1/2 inch diameter socket head pipe plug (28, Figure 2) located in the side of the bearing housing. This hole is required for manufacturing purposes only; therefore the pipe plug should never require removal.

Install the bearing housing O-ring (30) and lubricate it with light grease. Ease the rotating assembly into the pump casing using the installation tool. **Be careful** not to damage the O-ring.

Install the same thickness of rotating assembly adjusting shims (32) as previously removed, and secure the rotating assembly to the pump casing with the hardware (19 and 20).

To set the impeller and wear plate clearance, refer to the **Back Cover Installation And Adjustment**.

Suction Check Valve Installation

(Figure 1)

Inspect the check valve assembly (28) and replace it if badly worn.

NOTE

The check valve assembly must be replaced as a complete unit. Individual parts are not sold separately.

Reach through the back cover opening with the check valve (28) and position the check valve adaptor in the mounting slot in the suction flange (26). Align the adaptor with the flange hole and secure the assembly with the check valve pin (29).

NOTE

If the suction or discharge flanges were removed,

replace the respective gaskets, apply 'Permatex Aviation No. 3 Form-A-Gasket' or equivalent compound to the mating surfaces, and secure them to the pump casing with the attaching hardware.

Back Cover Installation and Adjustment

(Figure 1 and 8)

If the wear plate (13) was removed for replacement, carefully center it on the back cover and secure it with the hardware (14 and 15). The wear plate **must** be concentric to prevent binding when the back cover is installed.

Clearance between the impeller and wear plate is adjusted using four adjusting screws and locking collars (21 and 22). There are 18 detents on the I.D. of each locking collar. Indexing the collars one detent on the adjusting screws represents approximately .005 inch (0,13 mm) of wear plate clearance. The recommended clearance between the wear plate and the impeller is .010 to .020 inch (0,25 to 0,50 mm).

Replace the back cover O-rings (8A and 12A) and lubricate them with a generous amount of No. 2 grease. Clean any scale or debris from the contacting surfaces in the pump casing that might interfere or prevent a good seal with the back cover.

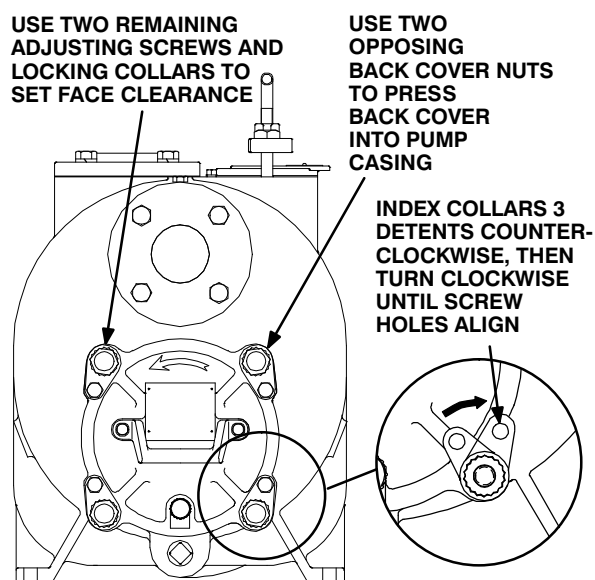


Figure 8. Installing and Adjusting Back Cover

Screw the four adjusting screws (22) into the tapped holes in the back cover plate until they are

just flush with the machined surface on the back side of the cover plate.

Align the back cover plate over the studs (24) and slide it into the pump casing. Use two back cover nuts (23) on diagonally opposing studs to press the back cover into the pump casing until the wear plate **just touches** the impeller when the shaft is turned by hand. **Tighten the back cover nuts evenly to avoid binding.**

With the wear plate just touching the impeller, turn the two free adjusting screws until they engage the pump casing. Position the locking collars over the adjusting screws so the holes in the collars for the locking screws align approximately with the holes in the cover plate.

Loosen the back cover nuts used to press the back cover into the pump casing one full turn.

Pull the collars off the adjusting screws, index them three detents counterclockwise, and reinstall the collars on the adjusting screws. Use the collars to turn the adjusting screws clockwise until the holes in the locking collars realign with the tapped screw holes in the back cover plate. Secure the locking collars to the back cover plate with the hardware (10 and 20). Install the two remaining back cover nuts snugly against the adjusting screws.

Remove the first two back cover nuts from their studs. Turn the adjusting screws clockwise until they engage the pump casing. Install the locking collars and hardware (10 and 10). Reinstall the back cover nuts.

Be sure the wear plate does not scrape against the impeller.

Over time it may be necessary to repeat the adjustment process to compensate for normal wear between the impeller and wear plate. When all of the adjustment has been used on the back cover side of the pump, an additional 0.125 inch (3,2 mm) of adjustment may be obtained by removing the rotating assembly adjusting shims (11).

Allow an installed pump to completely cool before draining liquid from the pump casing. Remove the back cover. Remove the rotating assembly adjusting shims, then reinstall the hardware securing the rotating assembly to the pump casing. Perform the

back cover adjustment procedure described above to obtain the proper face clearance.

PRESSURE RELIEF VALVE MAINTENANCE

(Figure 1)

The back cover is equipped with a pressure relief valve (not shown) to provide additional safety for the pump and operator (refer to **Liquid Temperature and Overheating** in **OPERATION**).

It is recommended that the pressure relief valve assembly be replaced at each overhaul, or any time the pump overheats and activates the valve. **Never** replace this valve with a substitute which has not been specified or provided by the Gorman-Rupp Company.

Periodically, the valve should be removed for inspection and cleaning. When reinstalling the relief valve, apply 'Loctite Pipe Sealant With Teflon No. 592', or equivalent compound, on the relief valve threads. Position the valve as shown in Figure 1 with the discharge port pointing down.

Final Pump Assembly

(Figure 1)

Install the shaft key (16, Figure 2) and reconnect the power source. Be sure to install any guards used over the rotating members.



Do not operate the pump without the guards in place over the rotating parts. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

Install the suction and discharge lines and open all valves. Make certain that all piping connections are tight, properly supported and secure.

Be sure the pump and power source have been properly lubricated, see **LUBRICATION**.

Remove the fill cover assembly (33) and fill the pump casing with clean liquid. Reinstall the fill

cover and tighten it. Refer to **OPERATION**, Section C, before putting the pump back into service.

LUBRICATION

Seal Assembly

(Figure 2)

Before starting the pump, remove the vented plug (8) and fill the seal cavity with SAE No. 30 non-detergent oil to the middle of the sight gauge (23) and maintain it at the middle of the gauge. Clean and reinstall the vented plug. Maintain the oil at this level.

NOTE

The white reflector in the sight gauge must be positioned horizontally to provide proper drainage.

Bearings

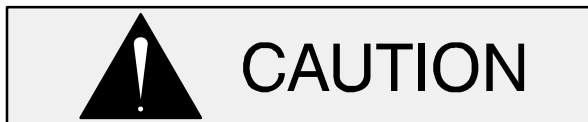
(Figure 2)

The bearing housing was fully lubricated when shipped from the factory. Check the oil level regularly through the sight gauge (23A) and maintain it at the middle of the gauge. When lubrication is required, add SAE No. 30 non-detergent oil through the hole for the air vent (9). **Do not** over-lubricate. Over-lubrication can cause the bearings to over-heat, resulting in premature bearing failure.

NOTE

The white reflector in the sight gauge must be positioned horizontally to provide proper drainage.

Under normal conditions, drain the bearing housing once each year and refill with clean oil. Change the oil more frequently if the pump is operated continuously or installed in an environment with rapid temperature change.



Monitor the condition of the bearing lubricant regularly for evidence of rust or moisture condensation. This is especially important in areas where variable hot and cold temperatures are common.

For cold weather operation, consult the factory or a lubricant supplier for the recommended grade of oil.

Power Source

Consult the literature supplied with the power source, or contact your local power source representative.

**For U.S. and International Warranty Information,
Please Visit www.grpumps.com/warranty
or call:**

**U.S.: 419-755-1280
International: +1-419-755-1352**

**For Canadian Warranty Information,
Please Visit www.grcanada.com/warranty
or call:**

519-631-2870

Sample Manual - Project-Specific Manual to Follow



Shaftless Spiral Grit Classifier

O&M Manual

Installation – Operation – Care

Uxbridge WWTP, MA



Claro™

Claro Shaftless Spiral Classifier

Table of Contents

I. Personal safety	4
A. Personal safety – general	4
B. Personal safety – starting up	5
C. Personal safety – classifier operation	5
D. Personal safety – installation, maintenance, & service	6
II. Protection against mechanical damage	6
III. Preparation for installation	7
A. Off-loading the equipment	7
B. Other preparations	7
IV. Installation	8
A. Installation of flanged classifier conveyor trough (if required)	8
B. Installation of leg supports	9
C. Splice welding of spiral	10
D. Installation of drive unit (flat gear with drive shaft hole type)	12
E. Other aspects of installation	13
V. Commissioning	14
A. Preparations	14
B. Test operation & normal operation	14
VI. Maintenance inspection & maintenance	15
A. Daily	15
B. Weekly	15
C. Every six months	15
D. Annually	16
VII. Service and repairs	16
A. General	16
B. Replacement of plastic or Hardox wear liners	16
C. Replacement of spiral	17
D. Replacement of drive shaft	18
VIII. Spares	20

www.claroglobal.com

Claro[™]

Claro Shaftless Spiral Classifier

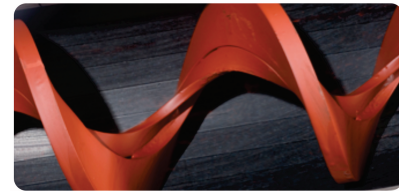
O&M Manual Installation, operation and care instructions



I. Personal safety

A. Personal safety - general

1. Safety matters are regulated by national, state/provincial, and local entities including the facility's safety directives. All safety regulations must be followed. Shaftless Spiral Classifiers should be operated by personnel trained in their operation and safety.
2. Starting and stopping is typically effected by means of remote control—either from a manual station that may not be in the immediate vicinity of the rotating elements of the classifier or via an automated control system (PLC or Scada). A classifier can start without warning. All the personnel shall be informed about this movement hazard. Clear signs shall be displayed in suitable locations that warn that grit classifier can start and stop without prior warning.
3. All unprotected openings – such as inlets and outlets as well as inspection covers – shall be fitted with clear warning signs.
4. Claro recommends that manual power lock-outs that are connected to the main power supply of the motor be present in the immediate vicinity of the drive unit for operator safety. Lock-outs can also be provided on the front of the control panel door for reduced footprint and/or because the control enclosure is in close proximity to the classifier unit. Local E-stop stations and/or emergency pull-cable switches are also recommended.
5. **N.B.** Observe local regulations for emergency stop and other safety equipment. The classifier's emergency stop shall stop all machinery working in conjunction with the classifier that may otherwise constitute a danger to personnel or equipment.
6. All work that involves or is performed in the vicinity of classifier without a cover or where another forms of injury risk is present, necessitates that the operating switch shall be **in the <<Off>> position and locked** and that the corresponding key shall be carried by the personnel who work with the



Claro

machine. This should also be the case regarding other equipment that is connected to the classifier and that can constitute a hazard during inspection or maintenance.

7. Protective equipment shall be worn in contexts where there is a risk of contact with dangerous – i.e. toxic, corrosive, noxious, dusty or other – materials.
8. Instructions relating to the classifier must be included. All installation, operation, service and all repairs shall be carried out by personnel with corresponding professional expertise. We cannot accept liability for injuries that have arisen as a result of third parties having carried out work in an unprofessional manner or employing sub-standard material.

• •

B. Personnel safety – starting up

1. Ensure that no personnel are to be found in locations where a risk of injury exists!
2. All safety arrangements/equipment shall have been made operative.
3. All covers shall be in position and inspection covers shall be closed.
4. In order to avoid spillage and splashing, the position of the classifier, inlet, and outlet and drain location (e.g. channel) shall be checked before start-up.
5. If work is carried out on mounting brackets, leg supports, struts etc., these shall be checked before start up.

• •

C. Personal safety – classifier operation

1. All personnel who operate equipment shall be fully acquainted with its function and the current rules governing operation and safety.
2. Temporary or replacement personnel, visitors, and/or other persons who come into the vicinity of the conveyor equipment shall be advised of the injury risk. A safety & operations orientation may be required.

• •

D. Personnel safety – installation, maintenance, & service

1. In addition to the general rules in section 1A, the following applies:
2. In the event of welding, cutting or other fire-risk activity, the applicable rules governing fire safety shall be observed.
3. Only approved lifting devices, ladders, scaffolding etc. shall be employed.
4. Long spirals that have been in operation may, in certain cases, have a tendency to spring back. Take care when removing the cover. Look out for pinching injuries.
5. Upon lifting a trough section or trough with an open end and/or a removed cover(s), the spiral shall be secured so that it cannot slide out and cause injury.

• •

II. Protection against mechanical damage

1. The classifier may only be employed for the type of material for which it has been designed and sized. In the event of significant change in the characteristics of the transported material and/or capacity, please contact Claro (www.claroglobal.com). N.B. The guarantee will apply only in the event of prompt communication of material characteristic/capacity change.
2. If the outlet of the classifier's conveyor is connected up to a downstream conveyor, the drive units shall be interlocked so that the units start in the correct order. The conveyor that is last in the chain shall start first. Thereafter the next-to-last in the chain shall start up in turn. Upon stopping, the reverse shall take place, with the first conveyor stopping first etc. Alternatively, all the conveyors can stop simultaneously. The emergency stop shall always stop the classifier & downstream conveyors. Under no circumstances may an immobile conveyor be fed with material.
3. The classifier's conveyor has a pulling spiral. If stringy or rag-like objects are present in the incoming fluid, these may eventually twist around the drive shaft and/or spiral at the classifier outlet. Check regularly in order to verify that the conveyor's outlet is not blocked. A blocked outlet can pose a risk of damage. Overload protection (typically electronic) is recommended.
4. For the care of the drive units, we refer operations personnel to the respective manufacturer's manuals included at the end of this manual.

Claro

5. In contexts where there is a risk of freezing, insulation of the classifier should be considered. Heat tracing may also be required. Anticipated ambient temperature, the temperature of the material, the length of the conveyor, standstill times etc., are key factors to be considered in the design & automatic control of heating equipment.
6. For lengthy stoppages the conveyor should be run empty. This is especially important in cases where the transported material can stiffen, freeze solid, or otherwise inhibit start-up. The tank may be emptied through the drain at the bottom end of the conveyor if required.

• •

III. Preparation for installation

A. Off-loading the equipment

1. Verify that no equipment components are missing and that no damage has been suffered during transportation. If goods are missing or if there is visible damage, these conditions shall be noted on the consignment notes and reported immediately to the transport company and the supplier.
2. Off-load all goods with a secure lifting device that does not scratch or otherwise damage the goods. Be extra careful upon off-loading by means of a forklift truck. Locate the center of gravity location and fix the lifting device in a secure way in relation to the center of gravity. Employ braces and other items to distribute weight and to avoid damage.
3. Enclosed loose parts, such as electronic components or other humidity-sensitive equipment, should be stored indoors.

• •

B. Other preparations

1. Check that the building's dimensions, access routes, perforations, and connecting machines accord with the installation/submittal drawing and that there are no unforeseen obstacles.
2. Ensure that the lifting of equipment can be carried out to the full extent required where the installation is to take place. If a temporary lifting device must be employed, consult with the responsible supervisory staff where and how securing the lift/conveyor equipment in the building should be effected.
3. Plan for the erection of scaffolding, if required.



4. Prepare for a free and unencumbered path between the classifier's storage or unloading location and the final installation location/ Also, arrange for suitable transportation/lifting equipment.
5. Verify the location of the main power supply and that the correct voltage and reserve amperage draw is available.
6. Ensure that sufficient lighting is available.
7. Consult with supervisory staff regarding the correct temporary storage and final disposal of equipment packaging.
8. Address the issues of safety rules, working hours, responsible personnel and other items relating to safe operations with supervisory staff.

• •

IV. Installation

A. Installation of flanged classifier trough (if required)

1. The classifier consists of a trapezoidal sedimentation tank that is equipped with a welded-on shaftless spiral grit collection conveyor at its base. The upper part of the grit extraction conveyor has a profile that rises above the water line of the sedimentation tank and has an outlet that discharges the extracted grit at a small distance from the tank and a sufficient height for a grit collection bin. The pulling motor and gear drive is located at the top end of the grit extraction conveyor.

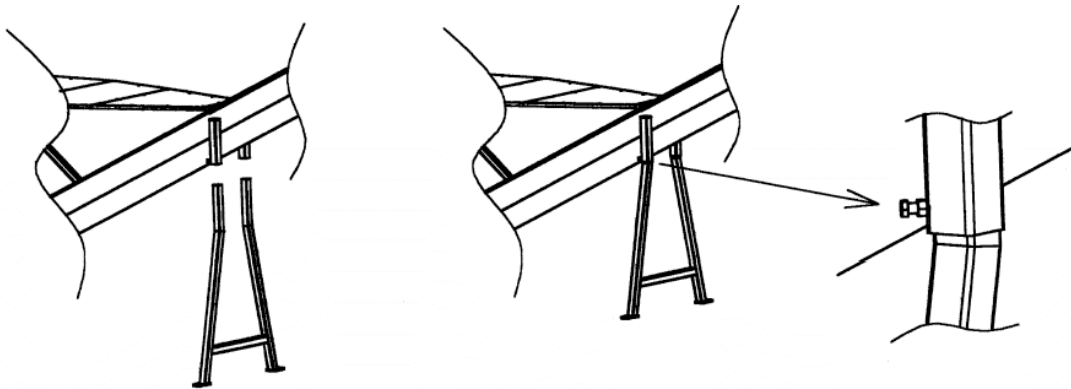
The classifier is typically supplied as a complete unit. It may also be supplied with the upper part of the conveyor as a separate bolt-on section if the grit conveyor is custom made for the application and is longer than the standard length. In this case, the conveyor sections are supplied with flanges (Alternative 1). Although rare, the conveyor section can also be supplied without flanges for field welding (Alternative 2).

2. Be certain to insert the seals between the flanges before bolting of the sections is effected. Line up the trough sections and their respective flanges, insert the bolts, and then tighten the nuts to the appropriate torque for the bolt size.

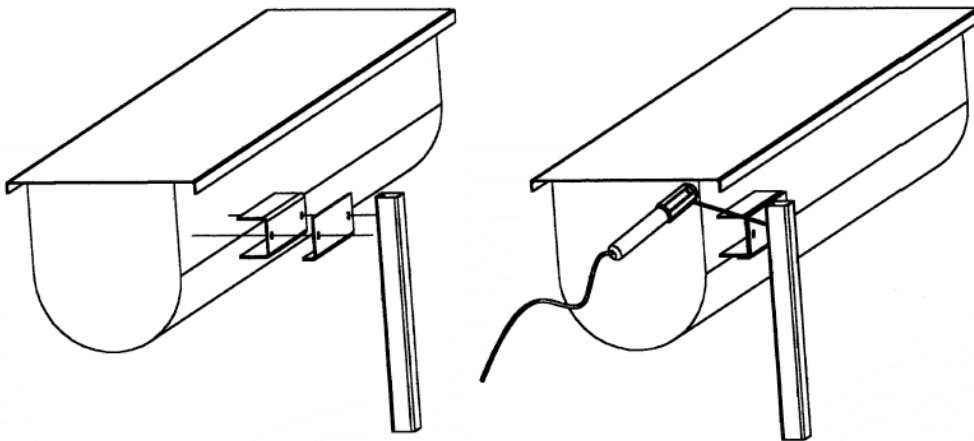
• •

B. Installation of leg supports

1. The classifier is typically supplied as a complete unit with all supports provided. If the supports are supplied loose for field bolting instead of welded or already bolted to the tank, please follow these instructions:
 - i. When the classifier is in position, lift up the drive end sufficiently for the drive end support legs to be fitted and bolted on.
 - ii. Check that the classifier is in the correct position relative to the connecting downstream equipment (e.g. conveyor, chute, or bin).
 - iii. Position a support beneath the classifier drive-end support's base plates until the tank is exactly balanced.
 - iv. Attach the base plates to the concrete slab by means of leveling bolts and/or chemical anchors. Use locking bolts were required.



2. The drive end support may be supplied for field bolting. For assembly, please see illustration above.

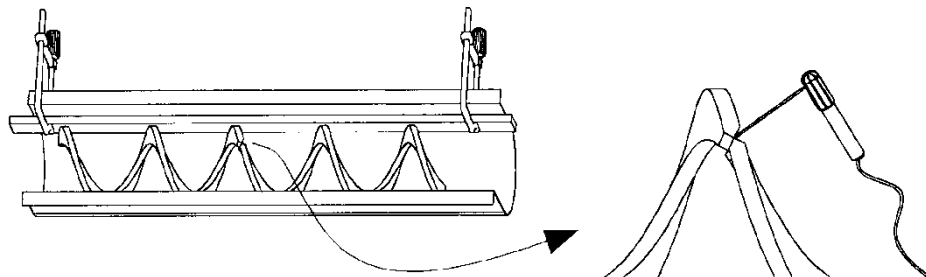


3. Extra leg supports and mounting brackets are typically only required if an extended length grit extraction conveyor is supplied. The conveyor trough that is to be supported is equipped with special support brackets. The supports shall be welded to these brackets. Please see illustration above.
4. Lift the trough to exact, correct position before the support is welded. Verify that the weld is completed correctly and that the support is properly anchored before the lifting device or any temporary support is removed.
5. In certain cases, for example with extended grit extraction conveyors, the support leg brackets are supplied loose and are welded on to the trough at the appropriate installation location as indicated in the equipment layout drawing. Follow the welding instructions in section III B.

• •

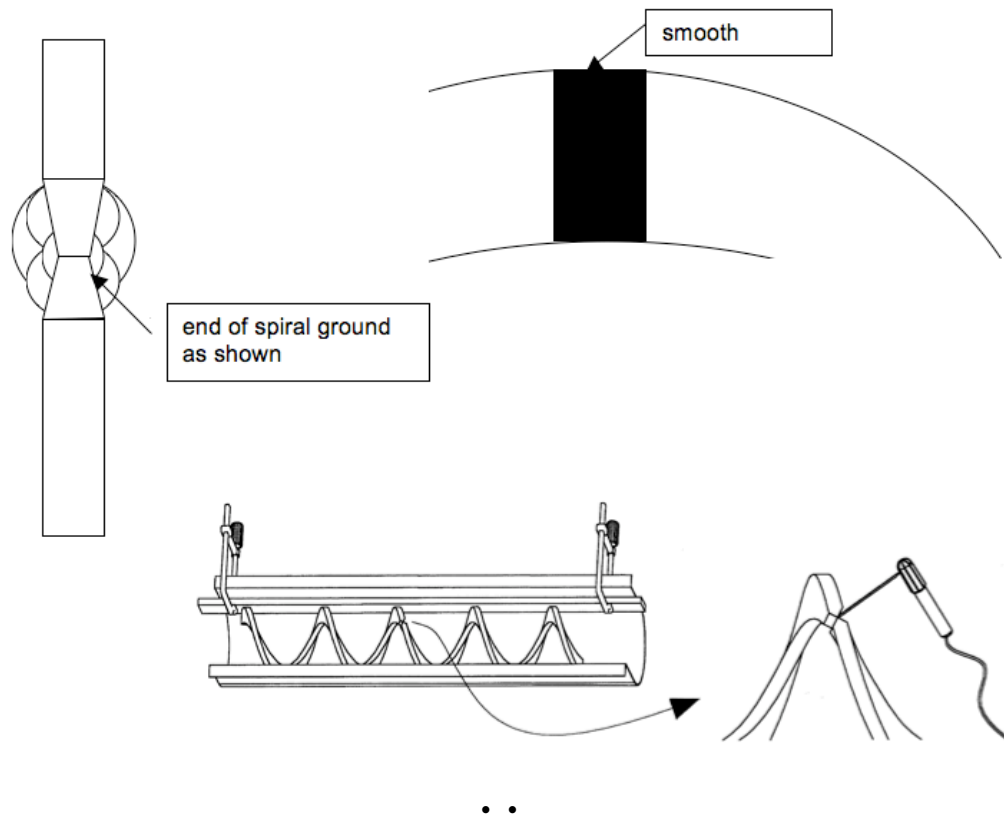
C. Splice welding of a spiral

1. Spirals may be welded together while they are positioned in their trough. Careful alignment and fixing/bracing must be undertaken before the work commences. Employ strong wooden or steel braces and adequate fixing/clamping tools.



2. Protect heat-sensitive wear liners and other parts that may be damaged during welding work.
3. Spiral end seam surfaces are chamfered for symmetrical X-welding before alignment.
4. For spirals of special microalloy steel, type OK 48.00 electrodes, or equivalent, with a maximum diameter of 2.5 mm, are employed. For spirals of other materials, electrodes are selected that are approved for the respective material. The Uxbridge classifier conveyor spiral is special microalloy steel.

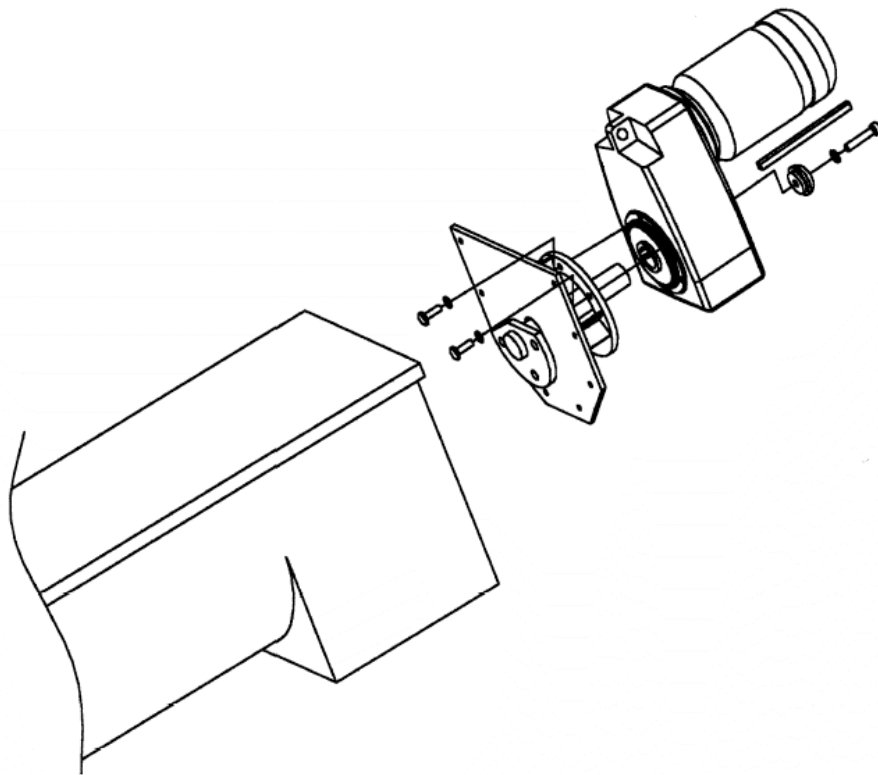
5. Weld alternately on both sides of the spiral and avoid overheating. Retain fixing/bracing of the spiral until it has cooled.
6. After welding, the weld seams are smoothed so that no sharp edges or unevenness remains. The surface on the outer edge of the spiral that is adjacent to the wear liner must, in particular, be completely even. Otherwise point wear may occur. Checks shall also be made to ensure that the spiral does not wobble when rotating.
7. Ensure that all spiral coils are in place between the weld joint and drive. Otherwise there is a risk of incorrect centering or alignment. Check that the spiral's total length is correct according to the data-sheet, specifications, and/or project drawing.
8. Please see below for illustrated recommendations of the welding process.



D. Installation of drive unit (flat gear with drive shaft hole type)

Unless otherwise specified, the classifier is supplied with the drive unit attached. In cases where the drive unit is to be installed on site, the following applies.

1. Ensure that the correct drive unit is attached to the classifier. It may be that different other conveyor or classifier units that may form part of the project have the same flange and drive shaft measurements, but different rpm and outputs.
2. Check that the correct volume of oil is present. The oil volume depends on the installation position of the drive unit. Follow the manufacturer's manual for the correct oil quality and volume. These manuals are located at the end of this manual.
3. Remove any rust protection from the classifier conveyor's drive shaft and check that the drive unit's drive shaft hole is clean. Grease the drive shaft. Fix the spiral so that the drive shaft cannot be pushed back into the trough.
4. Dismantle the fan cover and the protection for the drive shaft end on the gear drive.



5. Check that the packing box in the conveyor is correctly adjusted. Adjust as required.
 6. Lift up the drive unit and guide the gear drive shaft hole onto the conveyor's drive shaft until the gear drive reaches the conveyor's mounting flange. Turn the drive unit so that the drive shaft's threaded bottom hole is in line with the hole in the mounting flange. Insert and screw in the appropriate bolts loosely. Check that the gear lies flush with the entire mounting flange. Tighten the bolts to the correct torque.
 7. Rotate the drive shaft hole by means of the motor fan in order that the key grooves in the drive shaft and the drive shaft hole are positioned exactly opposite each other. Press in the relevant key to the correct position. N.B. Do not force in the key or shaft.
 8. Set the center washer in the drive shaft hole and screw in the supplied bolt with the spring washer in the drive shaft's threaded hole. Turn the bolt to the correct position and check that the bigger part of the drive shaft lies next to the drive shaft hole. Note: There can be variants with different makes of drive unit. See motor & gear drive manuals at the end of this manual. Replace the fan cover and the protection over the axle end.
 9. Verify the packing box in the mounting flange and adjust as required.
- After assembly: Treat the visible part of the drive shaft and the seal housing with a rust protection agent.

• •

E. Other aspects of installation

1. Connect inlet and outlet piping as per the project drawings. If required, an extension from the drain at the base of the grit extraction conveyor may need to be installed depending on the location of the nearest channel or drainage well.

• •

V. Commissioning

A. Preparations

1. Run through the measures as set out above under section I, personnel safety and section II, protection against machine damage.
2. Ensure that no tools or other foreign objects remain in the classifier conveyor.
3. Check that all electrical items are connected and calibrated. The work shall be carried out by authorized personnel only.
4. Start the classifier's grit extraction conveyor and check the spiral's rotation direction according to the arrow on the drive unit. The protection cover may possibly have to be removed.
5. Let the spiral rotate for a short period and listen for abnormal sounds. An incorrectly joined spiral, an incorrectly fitted wear liner, etc., may give rise to discordant sounds. A certain "knocking" noise is, however, normal when running an empty conveyor that has not been lubricated with material.
6. A typical final schedule for pump actuation & grit extraction spiral runtimes cannot be reliably determined in advance since conditions will vary from one application to another. Runtimes and stop times are to be varied according to local conditions in order to achieve optimal results. The control sequence should be designed in order to enable a flexible schedule of run and stop times.

• •

B. Test operation & normal operation

1. If more than one conveyor is involved, then Start the classifier and conveyors as described in section I D. item 2.
2. Check that the amperage for each drive unit is normal.
3. Monitor the classifier and associated equipment over the next few hours. Monitoring time varies according to the complexity & size of the installation.
4. When all functions are determined to be normal, the installation may be handed over for continuous operation.

• •

The logo for Claro, featuring the word "Claro" in a blue, sans-serif font with a registered trademark symbol.

VI. Maintenance inspection & maintenance

A. Daily

1. Inspect the equipment and make note of any abnormal vibrations or discordant sounds or if any leakage occurs.

B. Weekly

1. Verify that all the safety equipment, both mechanical & electrical, is functioning correctly.
2. Verify the outlet weir, which is accessible via the hinged door and remove floating material of material that may have hung-up on the weir.
3. As needed clean the tank and the grit extraction conveyor's exterior surface with a special attention to removing corrosive or other potentially damaging substances. Do not allow stainless steel surfaces to come into contact with mild steel since discoloration/contamination can occur.

C. Every six months

1. Check the oil level in the drive unit & motor. Fill with oil according to the manufacturer's recommendations.
2. Take the lid off of the grit extraction spiral in order to assess the degree of wear on the visible part of the spiral. If unexpected wear is visible, then inspect the rest of the conveyor & spiral. Empty the tank and clean inside.
3. Lubricate the drive shaft's greased packing box if this equipment is present. Alternatively, the drive shaft may have a radial seal that is lubricated upon installation. Employ waterproof grease.
4. Inspect the drive unit, electric motor and, especially, the seals for the drive shaft hole. If leakage from the gear drive housing should occur, the seals shall be replaced and oil added according to manufacturer's recommendations
5. Please refer to the motor and gear drive manufacturer's instructions for complete maintenance inspection and maintenance details,

D. Annually

1. Empty the tank and clean its internals of any accumulated debris. Check that no bolts have loosened, especially in the drive unit and drive shaft.
2. Inspect the entire set of wear liners (either plastic UHMW or Hardox bars and the entire spiral in order to determine the degree of wear since the last inspection. This record of liner and spiral wear will provide an accurate predictive schedule for when wear parts will require replacement.
3. Make a thorough examination of the electronic/electrical safety monitoring system including overload protection, emergency stop, rotation guards, etc.
4. In the event of deficient function, damage, abnormal wear or other deviation, contact the supplier as soon as possible for advice regarding maintenance approaches and the installation of spare parts.

• •

VII. Service and repairs

A. General

1. Service and repair work shall be carried out by qualified personnel with knowledge of the safety regulations (please also see (see item I A 6). Only use spares in accordance with Claro's recommendations.
2. Protect the equipment from sparks issuing from grinding machines or welding and do not expose sensitive parts to high temperatures.
3. Check that the correct spares are available.

• •

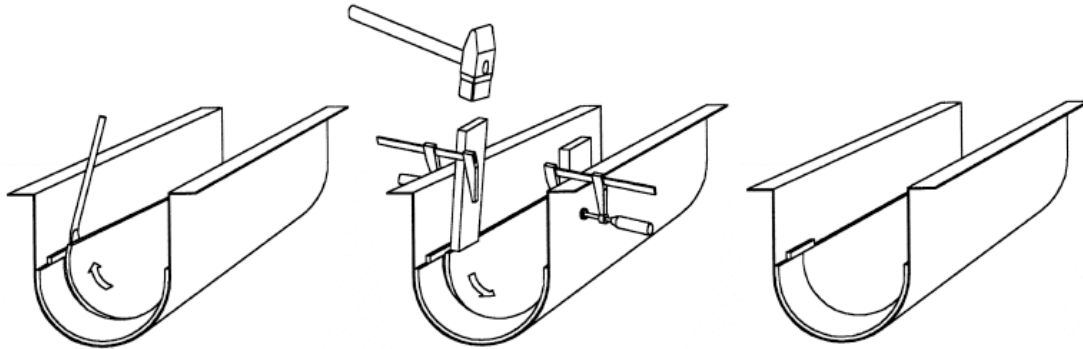
B. Replacement of plastic (or) Hardox \bar wear liners

Plastic UHMW Liners:

1. Remove the required number of covers.
2. Lift out the entire spiral.
3. The wear liner is kept in position by longitudinal square bar(s) welded on to the inside of the trough (retaining clip bars on each side of the trough). The wear liner's U-shape and sizing is fabricated in order that its sides press



against the underside of the retaining clip bars on both sides of the trough when fitted/snapped into place. The liner's shape is pre-formed to fit inside the trough when pushed under the clips on both sides of the trough.



4. Removal: Place a large screwdriver or similar between the liner and the trough on one side of the trough. Bend out and draw up the liner's edge past the clips. At the same time, a colleague should assist in pressing down on the liner's opposite edge.
5. When the liner is removed, the trough must be cleaned of any dirt or debris since the liner's U-shape length must accord with the U-shaped length between the steel clips.
6. New liners are pushed in until they fit properly under all clips. The edge of the plastic may need to be adjusted. See figure above for recommended approach to installation.
7. Replace the spiral and cover(s) and test run the conveyor.

Hardox Bar Liners:

1. The procedure for the replacement of Hardox bar liners is similar to the procedure described above except for the following:
 - a. Step 3 is concerned with the removal of a stainless steel subliner that is equipped with Hardox bars that are welded at spaced intervals from one side of the U shape to the other (i.e. oriented in parallel with the spiral). The gaps between the bars promote material drainage. The subliner is either held in position with square retaining bars to each side of the liner and/or tack welds for further security. If tack welds are present, these are ground and the subliner is rotated or lifted out of the trough. A new liner is rotated into position. It may be easier to install the liner with the spiral

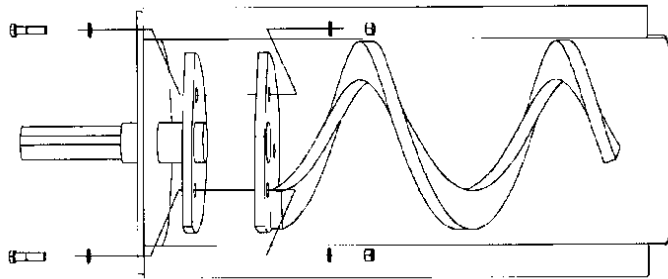
Claro

pulled out of position. If you have comments or questions, please feel free to contact Claro for additional advice.

• •

C. Replacement of spiral

1. Remove the cover(s) and the number of cross reinforcement holddown bars as required and as applicable.
2. The way of dismantling spirals differs from case to case and depending on the length of the unit. Long spirals that cannot be handled as one piece are divided/cut in the trough and taken out piece by piece. In certain cases, the spiral may be pulled out through one end of the conveyor in one complete length or lifted vertically out of the classifier tank.
3. Remove the bolts that keep the spiral and the drive shaft together and take out the spiral.



4. Clean the trough, drive shaft, and the drive plate.
5. Put in the new spiral with drive plate. Apply aluminum paste or equivalent to the drive plate's contact surfaces (note: does not apply to stainless steel drive plates). Bring the spiral and the drive shaft's plates together. Rotate the spiral or drive shaft so that the bolt holes in the flanges are lined up with each other. Check that the alignment is correct. Use new bolts and nuts and tighten to the correct torque.
6. If the spiral is supplied in segments then splicing by means of welding shall be carried out. See instructions for installation of spirals above.
7. Reinstall the cover(s) and test run the new spiral and check that it rotates without abnormal wobble or discordant noises.

• •

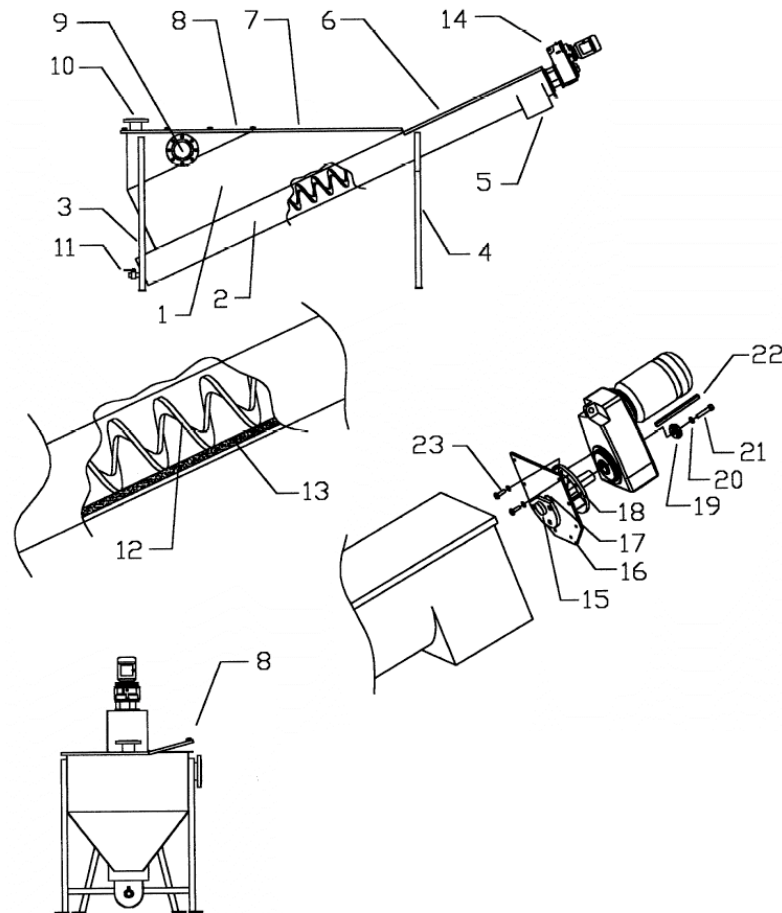
D Replacement of drive shaft

1. Replacement of the drive shaft should be effected only after the drive unit has been removed and brought down to a comfortable and safe working height. Drive shafts that are supplied with rust protection should be cleaned prior to installation.
2. Remove the cover located on the drive end. Remove the bolts that hold the spiral coupling plate and the drive shaft together. Suspend the drive unit in a secure manner. Loosen and remove the bolts in the drive end and lower the drive unit.
3. Dismantle the protective head of the drive shaft end of the drive unit and unscrew the central bolt in the drive shaft. Remove the washer in the drive shaft hole.
4. If the drive shaft has an adjustable packing box. Loosen the screws in order that the pressure of the packing box braids against the axle is eliminated. The braids should be replaced when a new axle is installed. If the drive shaft has a radial seal then this should be replaced and filled with grease as part of the installation of a new shaft.
5. Guide the new drive shaft into position.
6. Fit the shaft's central bolt, protection etc.
7. Replace the packing between the drive shaft and flange or use sealing compound as required.
8. Re-install the drive end and drive unit.
9. Fit the spiral and drive unit's connection plates together in accordance with the instructions that govern the replacement of spirals.
10. Replace cover(s) and then test-run and ensure that the classifier functions normally.

• •

VIII. Spares

Always ensure that you have enough spares in stock to be able to quickly accommodate wearable part replacement needs. Consult with Claro regarding which spares are recommended. Different applications have different requirements. The most accurate determination of spares stock is made once normal wear is noted and recorded. Please see the drawings section & classifier equipment card – the equipment card is the preferred reference for the ordering of spare parts. Please see hydrocyclone manual included in the Uxbridge O&M Manual for advice relating to the hydrocyclone and its recommended spares.



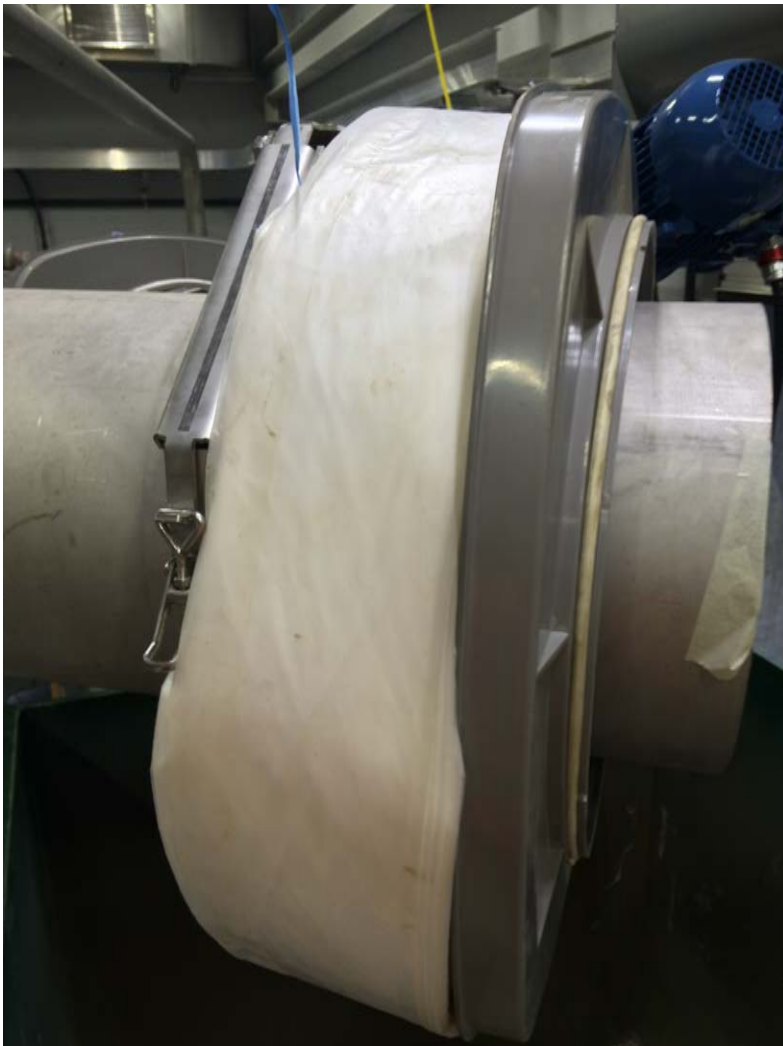
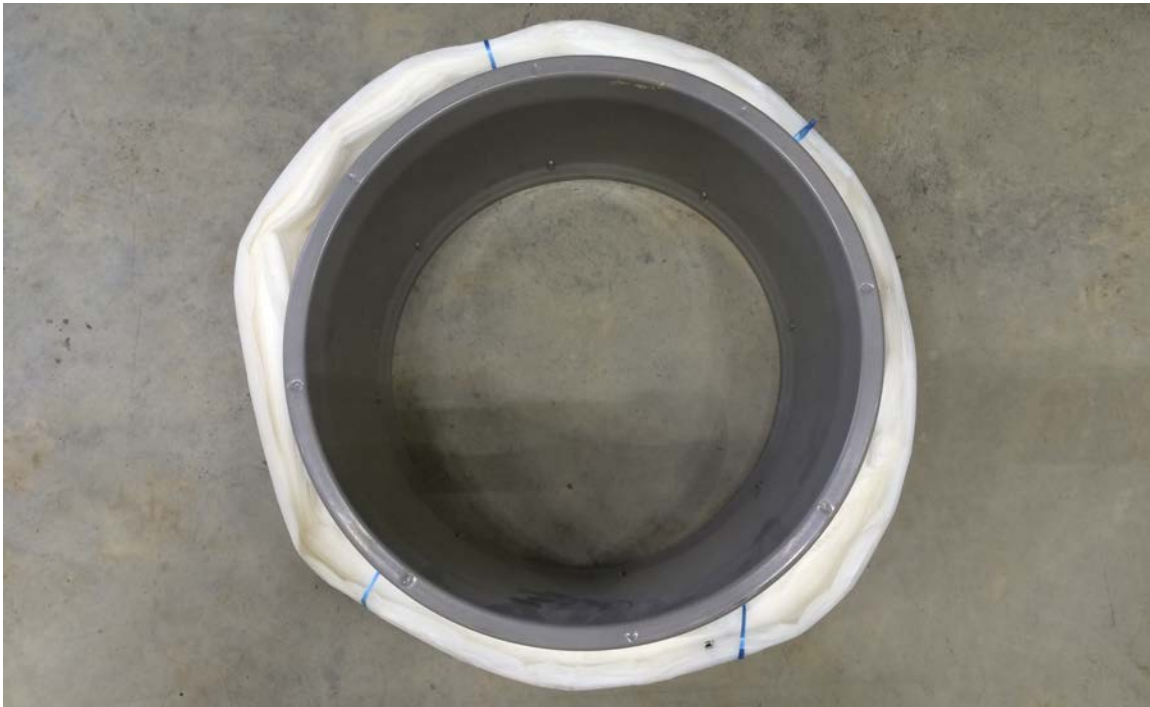
- | | | |
|---------------------|----------------------|---------------------------|
| 1 Tank | 9 Outlet, fluid | 16 Drive end |
| 2 U-trough | 10 Inlet, fluid | 17 shaft seal (not shown) |
| 3 Rear support | 11 Drawing off valve | 18 Mounting flange |
| 4 Front support | 12 Spiral | 19 Center washer |
| 5 Outlet, sediment | 13 Wear liner | 20 Spring washer |
| 6 Cover, U-trough | 14 Drive unit | 21 Socket head bolt |
| 7 Cover, tank | 15 Drive shaft | 22 Key |
| 8 Cover, inspection | | 23 Bolts for drive unit |

Claro



Hygienic Bagger Cartridge Installation Instructions (Visual)





- Cut off blue retaining string after mounting the bag holder with cartridge



- Secure bagger holder either with quick release clasp (or) with spring clasps (on classifier bagger)



- Tie-wrap bag end



- Pull off bag length in order that it touches the bottom of the bin





Spare Hygienic Bag Cartridges – 90 meter-long '3-Ply Wastewater Type' are available from Claro – Same Day or Next Day Shipping

info@claroglobal.com

pjr@claroglobal.com

(or)

514.562.4575

www.claroglobal.com



Claro™

6. Control Narrative Sequence & Scada Exchange Table

Napanee WPCP Upgrades, ON Screening & Grit Removal System

Municipal Authority: Town of Greater Napanee, ON

RFP Number: RFP-IS-2023-01

Sections: 46 43 00 & 46 53 00

Consulting Engineer: EVB Engineering

Installation Contractor: TBD

Contractor PO Number: TBD

Claro Ref.: 20048-P-00





A. Control Sequence Operation Description for 2 Fine Step Screens & 2 Wash Presses

Project Outline: Two (2) fine step screens filter screenings debris from municipal influent. In response to progressive screen blinding and influent liquid level rise, the fine screens discharge intermittently into their respective wash press units that subsequently wash, dewater, compact and transport material to their hygienic baggers, which are each positioned above a dedicated screenings receiving bin. The hygienic baggers unfold their bags' length under the weight of the discharged, treated screenings plugs.

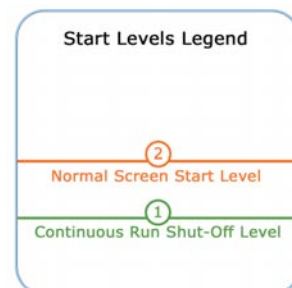
The programming & HMI design aims to provide an easy-to-use intuitive graphic interface that provides a real-time overview of the system's operation.

The control system is constituted of one (1) common fine screening & grit removal systems control panel that includes all electrical components and logic for a fully functional system in Automatic and Manual modes. Facility read/write data exchange functionality is achieved via Ethernet communication. Selected hard-wire alarms are also provided as a temporary back-up in case Scada programming is not complete at time of wet start-up.

A. Automatic Operation:

- **Fine Screens:** The following fine step screen control sequence applies to each fine screen, which operates independently in response to its respective upstream & downstream ultrasonic level detector-indicated levels. The only intervening control logic is the "Alternating Start Subroutine" as defined in Section E below.

1. All HOA duty operation selectors in position AUTO.
2. The fine screen will start when the start criteria reaches its preset value — either:
 - a. Normal screen start liquid level preset value (**Normal Screen Start Level**②) measured by an ultrasonic level detector upstream of the fine screen unit;
 - b. Liquid differential preset value measured by ultrasonic level detectors upstream and downstream of the fine screen unit & calculated by the control panel PLC;
 - c. High Liquid Level preset (or) max pause time preset value has been reached.



- Notes: Controls shall allow for operator adjustment of preset screen liquid start level, differential & max. pause time. Approach ‘a’ & ‘b’ (i.e. both conditions activated) is the standard approach that delivers the highest level of separation by encouraging the formation of a screenings filter mat. Also, this mode minimizes the function time of the screen – it will actuate only when necessary, which significantly reduces energy usage, wash press water usage, and mechanical wear-&-tear /runtime on the screens, wash press & outloading conveyor. Typically, the max. preset time interval approach “c” is turned ‘OFF’ and only the level detectors prompt the movement of each screen. The timer function is provided as a precaution in case a level sensor(s) is out of service or in ‘Fault’.

Precautionary timer back-up routine: A relay on the level transmitter (i.e. Endress & Hauser Prosonic S FMU90) will also automatically switch to timer mode if the transmitter happens to fall into ‘Fault’ or a sensor experiences a loss of echo or other issue. The control panel will return the system to normal operation mode automatically once the level sensor returns to normal operation. The automatic, precautionary switch to Timer Mode will be indicated at the Claro control panel, recorded on the Alarms History page on the HMI, & communicated to the facility network. The operator can also select Timer Mode from the control panel visualization screens as preferred. The upstream float switches further provide an option at the HMI to trigger screen operation.

3. The fine screen will make one moveable lamellae bars rotation and then stop in its initial position (i.e. moveable and stationary bars will return to an aligned position). A home position proximity sensor switch, pre-installed on the cam located within the motor compartment, indicates where the motor must stop for perfect bar & steps alignment. The fine screen motor incorporates an electrical brake that releases on energization, which enables motor operation, & reengages upon de-energization. The approx. 10 lbs brake ensures that the moveable bar rack does not rotate backwards under the influence of its own weight after stopping in aligned position.
Once the start setpoints are determined, a consistent volume of captured material will reside on each of the fine screen’s filter screen steps. Every moveable bar rotation will thus discharge a consistent volume of material into the downstream receiving/treatment equipment. The filter screen cleaning mechanism is also the solids transport and discharge mechanism.
4. Coping with Extreme Peak Flows/Solids Loadings: after the screen has completed its initial rotation and is stopped, the following subroutine will begin:
 - a. If the start signal is still active above **Normal Screen Start Level**② or above the **Differential Start Value**, the screen will start after a 1 to 10 second delay (typical setting is 5 sec.) and complete one moveable bars rotation.
 - b. If the start signal is still active for another 1-10 second delay period (typical setting is 5 sec.), the screen will be locked in running mode during the next start until the level readings are below two preset start levels, a) the **‘Upstream Mode’ Continuous Run Shut-Off Level**①, which is typically 50 mm below the normal start level preset, & the **‘Differential Mode’ Continuous Run Shut-Off Level** –

also 50 mm below the differential value start level. Both of these liquid level criteria need to be met to return to regular operating mode.

- Note: Controls shall allow for operator adjustment of the delay settings, the number of consecutive rotations before continuous run mode is initiated, the continuous run mode shut-off levels, and will enable subroutine <> to be turned ON or OFF. Typically, the differential mode is left ON.

- Wash Press

5. The wash press will begin its treatment sequence once a preset number of screen moveable bar rack rotations / discharges has been achieved or if the screen switches into continuous run mode. Screen rotation count is correlated with a consistent screenings volume. Once either condition is met, the wash press will perform the following standard cycle:



- a. Wash Cycle Sequences (Alternative 1, 2 & 3):

- Alternative 1 – With Pauses Setting:

- The screw runs for a preset time interval and then pauses for a preset time interval.
- The number of these run and pause cycles is adjustable (1 or more times).
- The wash water valve (solenoid #1) is open for an adjustable preset duration during the selected number of run/pause sequences (i.e. over top of these run/pauses cycles)
- Note: Wash water time is not allowed to be greater than the total amount of time of the run/pause sequences (equal or shorter than this combined value only).

- Alternative 2 – Without Pauses Setting:

- The wash press screw is running in forward during the whole wash cycle for an adjustable preset run time (i.e. no pause).
- The wash water valve (solenoid #1) is open for an adjustable time value while screw is operating.
- Note: Wash water time is not allowed to be greater than the total amount of time of the washing sequence (equal or shorter than this runtime value only).

- Alternative 3 – Reverse Mode Setting:

- The wash press screw runs forward for an adjustable time, pauses for an adjustable time, and then runs in reverse for an adjustable time.
- The operator can repeat the number of forward/reverse cycles via an adjustable setpoint. In-between forward/reverse cycles, the screw will pause in order to come to a full stop for an adjustable time before changing its direction from reverse to forward. A pause will also be present in between forward/reverse sets in order to enable the screw to come to a full stop. Note: Forward run time must be longer than reverse runtime in order to ensure that material moves forward toward washing, compaction, dewatering and transport to the bagging system.

- The wash water valve (solenoid #1) is open for an adjustable time value while the screw is effecting its forward/reverse sequence including pauses.
- Note: Wash water time is not allowed to be greater than the total amount of time of the washing sequence (equal or shorter than this combined value only).
- Note: Controls shall allow for operator selection between Alternative 1, 2 or 3 and adjustment of all set points in each of the alternatives. All values can be adjusted and optimized.
 - b. When the washing time sequence (step a) has elapsed. The wash press screw runs continuously for a preset time (dewatering/compaction time). The wash water valves (solenoid #1 & #2) are closed.
 - c. When a preset number of complete wash press time/cycles has been reached (typically the adjustable value is 1), the flush water valve (solenoid #2) opens for a preset time and cleans outside the perforated wash/compaction cylinder and flushes removed organics down the drain and into the channel for treatment downstream.
 - Note: Flushing water time is not allowed to be greater than the total amount of time of the flushing sequence (equal or shorter than this runtime value only – control panel automatically limits setpoints to calculated allowable maximums).
- Note: Controls shall allow for operator adjustment of wash press time/cycles [i.e. number of times the wash press has completed a full sequence before effecting a flushing cycle (for reduction of water use in jurisdictions where water availability is limited)] & adjustment of preset solenoid #2 on time.
- Low Flow Channel Flushing Sub-Routine: The control logic design will also provide a precautionary sub-routine that will allow the operator to program/actuate a channel invert flushing routine if required. Setpoints for 4 potential flushing times within a 24 hour period will trigger the screen an adjustable number of rotations (e.g. 5 – 7 rotations). These actuations would temporarily accelerate the channel velocity for the purpose of channel invert flushing. This sub-routine can be turned On/Off and is provided as a precaution/possible convenience only.

• •

B. Manual Operation:

1. Fine Screen – Manual Forward: When fine screen #1 or #2 MAN / OFF / AUTO & FORWARD / OFF / REVERSE selector switches are in the <<Manual>> & <<Forward>> positions, the respective fine screen will operate continuously in forward until the spring-loaded <<Forward>> selector is released.
2. Wash Press – Manual Forward: When wash press #1 or #2 MAN / OFF / AUTO & FORWARD / OFF / REVERSE selector switches are in the <<Manual>> and <<Forward>> positions, the respective wash press will function continuously in forward until the spring-loaded selector is released. Solenoid #1 & #2 are OFF.
3. Fine Screen – Manual Reverse: When fine screen #1 or #2 MAN/OFF/AUTO & FORWARD/OFF/REVERSE selector switches are in the <<Manual>> & <<Reverse>> positions, the respective fine screen will operate continuously in reverse

until the spring-loaded <<Reverse>> selector is released. N.B. Reverse run is provided as a courtesy to operators in case it is helpful during inspections or in other scenarios. Reverse runs should normally be short since material is re-delivered back into the channel when the screen is in service. N.B. If the screen experiences a high torque/amperage condition, it is best to pivot the screen out of channel to complete a full mechanical inspection before running the unit in reverse. High torque/amperage alarms and exceedingly rare and should be approached as a cue to inspection since the screen will have already have effected an automatic reverse run sequence.

4. Wash Press – Manual Reverse When wash press #1 or #2 MAN/OFF/AUTO & FORWARD/OFF/REVERSE selector switches are in the <<Manual>> & <<Reverse>> positions, the respective wash press will function continuously in reverse until the spring-loaded selector is released. Solenoid #1 & #2 are OFF.
5. Wash Press Solenoids – Manual Operation: The wash press solenoids can be operated manually via the control panel HMI control screens. When the Solenoid #1 or Solenoid #2 manual operation button for the either wash press is pressed, the respective solenoid will open until the button is pressed a second time. These buttons only appear/are active on the facility control screen if the wash press MAN/OFF/AUTO selector is in the <<Manual>> position. These instructions are represented on the facility control screen. N.B. Remember that running the washing solenoid (Solenoid #1) while the screw (& its brush) are stationary can start to flood the inlet of the wash press. The flushing solenoid (solenoid #2) can be run for an extended time without risk of flooding unless the drain is blocked.
8. Fine Screen – Trigger Sequence: The operator can trigger a fine screen sequence for either screen by pressing on the appropriate button on the control panel HMI screen (located on each fine screen’s visualization/status HMI screen).
9. Wash Press – Trigger Sequence: The operator can trigger a complete wash press treatment cycle for the wash press unit by pressing on the control panel HMI screen (located on each wash press’s visualization/status screen).

• •

C. Alarms:

1. Fine Screen – High Torque/Amperage: During overload or jamming of a screen, the torque sensor integrated within the VFD is triggered. If the torque overload signals an overload, the screen will run in reverse for 1 to 2 sec. Overload setting & reverse time is adjustable. If overload occurs equal to 2 times / 60 seconds, the screen will stop and signal an alarm. These settings are adjustable.
2. Wash Press – High Amperage: A current transformer (CT) in the control panel system senses the amperage readings on the wash press motor in order to protect the unit from possible jam. There is a warning amperage level alarm & a high amperage shutdown alarm. If the warning level alarm setpoint of the amperage sensor is reached, the control panel issues only an alarm with no equipment shutdown. If the amperage sensor reaches the high amperage shutdown setpoint, the wash press is shut down and an alarm is issued. A low current reading during spiral operation indicates a possible spiral detachment/breakage. In this scenario an alarm is issued, however, the wash press is allowed to continue operating (i.e. no shut-down).

3. E-Stops: Any emergency stop (i.e. fine screen #1 or #2 or wash press #1 or #2) halts the respective machine in both Manual & Auto modes.
4. Resetting/Clearing Alarms: Reset by push button (RESET) on the control panel, clearing the alarm at the control panel visualization screen and/or by pulling mushroom E-stop into original position, if it was depressed. Thermal overloads at the control panel system are cleared by turning the motor switch to the ‘Off’ position and then back to ‘On’ position & pressing the reset button on the panel enclosure door.
5. High Liquid Level Warning Alarm – Ultrasonic Level Sensor: A high level warning message linked to each upstream ultrasonic level sensor reading is provided at the control panel visualization screen suggesting that the level in the channel has risen to an adjustable level setpoint that is equivalent to a by-pass weir level or other high level. This level setpoint is adjustable. A fine screen will effect a rotation at this level.
6. Active Alarms & Alarms History: An ‘Active Alarms’ page lists current active alarm conditions. An ‘Alarms History’ page logs a history of alarms complete with date & time stamp. The alarm passes to Alarms History only once it has been cleared from Active Alarms.
7. Wash Press Back-in-Service Courtesy Alarm: If the wash press is left in OFF or MAN at the local HOA while one or both fine screens are also in Auto/service, an alarm will sound after an adjustable time delay.

• •

D. Real-Time Readings/Trends

- The proposed control panel system interface will have a page(s) graphically & numerically representing the real-time values for upstream liquid level for each screen, the torque/current motor(s) torque readings for all equipment, all the respective set points, and the current stage in the operational sequence for each screen & each wash press. Note: The graphics representing the screens & wash presses are adapted from the project drawings in order to faithfully reflect the Napanee screening & grit removal systems layout & models. Claro would be pleased to provide graphics or HMI screenshots to the facility network programmer for use in the facility SCADA design if this is preferred. Claro would be happy to discuss facility SCADA network data trending design.
- Suggested facility network trends page(s) records the following operational data:
 - a) the upstream liquid levels & differential levels
 - b) each screen & each wash press torque/amperage levels
 - c) the instantaneous flow data
- Suggested facility network trends page(s) records the following runtime data:
 - a) the number of motor starts for each screen & each wash press
 - b) the total amount of time each motor has run
 - c) the total number of treatment cycles completed for each wash press
- General Note: Facility network can log this activity across time and provide graphs representing activity over time on a separate trends page(s).

• •

E. Additional Control Narrative Element (Two Connected Channels – Alternating Start Subroutine):

1. In applications where two or more channels are joined and thus where the upstream level in the channels can rise in parallel and at approximately the same rate, the following controls subroutine is implemented. The aim of this subroutine is to avoid having both screens actuate at nearly the same time & to the same shared upstream water level. The subroutine will ensure the least wear-&-tear and the best separation efficiency in this type of configuration. The automatic alternation of the fine screens also ensures an equalized flow though the channels and the fine screens for similar/balanced runtimes.
N.B. This standard subroutine can be turned ON or OFF at the HMI touch screen (and via Scada, if selected).
2. With this subroutine ON, the controls program should keep 1 screen (e.g. screen 1) inhibited from responding to a start signal until the other screen (e.g. screen 2) has been triggered first and has run 1 complete bar rotation plus an adjustable delay.¹ Once screen 1 has completed its cycle, it will be inhibited until screen 2 has responded to the upstream level start (or differential) signal. The inhibition switches back and forth from one screen to the other.
3. The inhibition subroutine will be turned OFF if the level in at least one of the channels rises above an adjustable high level set point, which is marginally higher than the regular start level set point. This will allow both screens to respond to a particularly high flow and/or debris influx while also preserving the formation of a filter mat for as long as possible across the system's flow conditions. This subroutine shut off also accommodates a scenario where one screen channel was closed by a gate. The subroutine will be reactivated once both levels in the channels are below the continuous run shut off level.
4. The inhibition or "Alternating Start" subroutine would be turned OFF when one of the screens is not in <<Automatic>> mode or is in fault.
5. The inhibition subroutine can be turned ON or OFF.
6. In other words, in this approach:
 - a) One screen will actuate first and clean its bottom step area;
 - b) Then, this screen would be inhibited until the other screen responds to a liquid level start point. And so on back and forth so that each screen responds once in every two start signals;
 - c) The effect of this approach is that we ensure that one screen does not keep responding to the high liquid level to the exclusion of the other (this could happen due to some irregularity in the flow & perhaps a slight difference in the level measurement in each channel). By having only one screen respond, the controls ensure that the screenings filter matting is kept on the screens for as long as possible and that the system experiences the least wear-&-tear while providing the best separation efficiency.
 - d) A high flow or debris influx condition, indicated by an adjustable higher level set point, will turn this routine OFF until the levels in both channels fall below continuous run shut-off level.
 - e) This subroutine can be turned On/Off @ the control panel HMI.

¹ The adjustable delay provides time for the level to fall after a screen's moveable bar rotation.

B. Control Sequence Operation Description for 1 Vortex Unit, 2 Grit Pumps & 1 Grit Classifier

Project Outline: One (1) complete mechanical forced vortex grit removal system comprised of one (1) forced vortex tank c/w modular paddle drive & grit extraction/fluidization piping, two (2) wet suction centrifugal grit pumps & one (1) shaftless spiral grit classifier equipped with two (2) hydrocyclones and c/w an automatic hygienic bagger.

The forced vortex is constituted of a circular tank with an upper cylindrical centrifugal chamber, an inclined/conical intermediary transition area, and a lower sedimentation cylindrical quiescence chamber with conical bottom. The tank also includes a rotating 4-paddle assembly, a grit extraction pipe that reaches into the lower chamber and 1.5” dia. service water scour system that directs flow into the lower chamber.

Screened influent enters into the vortex and follows a circular path for 270 degrees around the perimeter of the tank until it reaches the outlet. The tank is sized in order to provide for a target volume & associated influent retention time that will promote the sedimentation of entrained grit particles. Grit sediments through a trajectory decay (i.e imagine a baseball falling to the ground as it moves forward in space) & by being thrown to the circular tank wall under the influence of centrifugal force. Once at the tank wall, the grit particles slide down the surface of the wall to the smaller diameter grit accumulation/quiescence chamber below since velocity at the tank wall is near zero.

The paddle system ensures that the velocity of the flow is constant within the vortex across the full spectrum of the facility’s flows from low to peak capacity. This consistency of flow speed and retention time ensures consistent grit removal while avoiding sedimentation of organics that should be treated by the downstream process and would otherwise yield a difficult-to-handle organics-laden grit slurry. The paddles are set at an adjustable angle that help to promote re-suspension of lighter organics and their exit from the tank for treatment downstream as intended. The paddle movement also induces shear upon the travelling grit particles.

The service water scour is turned ‘On’ before one of the grit pumps extracts the accumulated grit from the lower accumulation chamber (note: only one pump permitted to function at a time –parallel operation not permitted). Water scour introduces shear upon the grit particles that helps to separate organics from the sand. This scour line also helps to fluidize the sedimented grit — the water re-suspends the sand into a water & grit particle cloud thereby lowering its overall DS% — in order to enable either grit pump to successfully pump the grit to the grit classifier without blockage within the pump or the grit extraction transfer piping. Water scour can be potable or Final Effluent (FE) or other re-use water. If re-use water, it should be pre-screened to 50 Mesh to avoid fouling of solenoid membranes..

The self-priming ADI hardened steel pump (No.1 or No. 2) withdraws the grit sending it to the grit classifier while the fluidization water remains ‘On.’

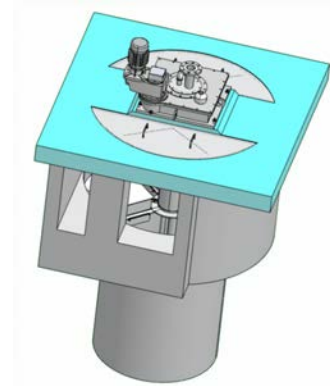
Since the pump moves the particles through its impeller, another round of shear is applied to the grit that further cleans the material of grease and organic coatings.

The grit classifier is constituted of i) 2 hydrocyclones (1 per grit pump), ii) an inlet to the sedimentation tank that is separated from the clarified liquid outlet by an weir / baffle, iii) a trapezoidal grit sedimentation chamber and iv) an inclined grit extraction spiral conveyor that is equipped with a special micro alloy spiral that rides on bolt-on Hardox bar liners. The hydrocyclone submits the grit particles to another round of shear that further separates the grit granules from organic coatings and lighter specific gravity contaminants. The reduction of liquid volume by the hydrocyclone, classifier sedimentation tank volume, quiescent liquid surface area, internal overflow baffle length/crest speed and overall retention time of the classifier prompts grit sedimentation. Once the grit has sedimented, the grit classifier will actuate its inclined conveyor in order to move the material to its outlet & bagger. This extraction process augments the dryness of the grit material by running intermittently — the material is moved in small forward runs followed by pauses that allow the material to decant moisture in the inclined conveyor while above the tank water line. These small actuations also break the bonds between the material and the trough surface further promoting dryness. The space in-between the Hardox bars enable a pathway for liquid drainage back to the classifier sedimentation tank. The dry grit is collected in an automatically unfolding hygienic bagger equipped with a 90m long continuous bag. The outlet is positioned above a receiving bin. The hygienic bagger unfolds its bag length under the weight of the discharged, treated grit product.

The automatic and manual control logic of the Napanee grit removal system is proposed to be as follows:

A. Automatic Operation:

1. All duty operation switches in position AUTO.
2. The fine screening & grit removal control panel system incorporates HMI system visualization and setpoint input screens representing the vortex grit chamber mechanism, the grit pumps and the grit classifier. The proposed sequence includes the following control elements:
3. The vortex tank paddle system & motor runs continuously in order to maintain a constant internal flow velocity and retention time within the vortex tank across the full range of flow conditions. The paddles also produce a toroidal flow that both resuspends & separates lighter organics & induces centrifugal force upon the heavier grit particles that are thrown towards the outer perimeter of the vortex tank where velocities approach zero. Grit particle trajectory decays across the



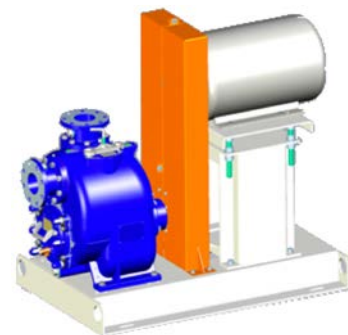
diameter of the tank and at the tank outer perimeter. Grit sediments into the vortex's lower sedimentation tank.

4. Grit Extraction Sequence:

- The screening & grit removal system control panel includes the PLC programming and HMI screens for the grit extraction system. The grit extraction sequence provides full flexibility to the operator with up to twelve (12) scheduled grit extraction sequences per day and a capability to skip days as required. A 'High Flow Mode' sequence is also available for high flow & high loading collection system voiding events based on adjustable high flow data input from the immediately downstream 18" throat Parshall flume (note: instantaneous flow data written from facility network).
- The control panel also controls the grit pumps and a service water fluidization solenoid valve directing flow to the base of the vortex tank.
- A grit extraction sequence includes three phases. For each phase the duration and pause periods are adjustable by the operator:
 - a) Fluidization;
 - b) Fluidized Grit Pumping; and,
 - c) Classifier Operation.

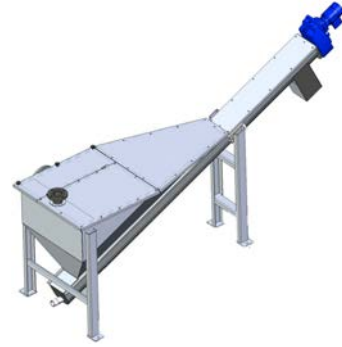
a. **Fluidization:** The screening & grit removal system control panel system is connected to the fluidization solenoid valve that injects water at the base of the grit vortex chamber's quiescence zone (grit accumulation well). This step also promotes separation of organic matter and grit by subjecting the captured material to physical shear. Water scour/fluidization also facilitates grit extraction pumping by lowering the DS% of the slurry. The timing and duration of the water scour/fluidization solenoid valve before the grit pumping period is adjustable by the operator. Grit fluidization subsequently continues to remain 'On' during a grit pumping sequence as described below (i.e. solenoid open time is equal to the pre-pump run time + the pump run time).

b. **Pumping Fluidized Grit:** After the start of the water fluidization (delay adjustable by the operator), one of 2 grit pumps is started for an adjustable period of time (pumps oscillate service based on a run timer or number of grit extractions). In automatic mode, fluidization begins before the start of the pump. In manual mode, the pump can also be operated without fluidization at the pump HOA station.



• Continued following page →

Grit Classifier Operation: Once the duty grit pump has completed its extraction sequence, the classifier is then started for an operator-adjustable duration. An adjustable delay between the extraction sequence starting and the operation of the classifier can be implemented to further enable grit settling in the classifier settling tank. The classifier can be operated according to 2 different discharge modes:




- i. **Regular (Immediate) Classifier Voiding Mode:**
The classifier shaftless spiral runs for an operator adjustable time equivalent to the time required to completely void the classifier of sedimented grit.
- ii. **Intermittent Classifier Voiding Mode:** The classifier runs for a series of short run and pause cycles (the run & pause time is adjustable as is the number of run/pause cycles). The aim of the intermittent mode classifier settings is to extend the retention time of the grit above water line in the inclined classifier grit conveyor. Extending this decantation time promotes maximum dryness of the material. The overall runtime of the shaftless spiral must be sufficient to keep pace with grit volumes. The overall time of the pause/run cycles should maximize the time in-between grit extraction cycles while remaining within this time frame (i.e. avoid conflict between extraction cycle sequences).
- d. **Grit Extraction Sequence Schedule:** The grit extraction schedule is determined according to the following timed grit extraction schedule:
 - i. **Timed Grit Extraction Schedule:** an operator-adjustable timed schedule that can be targeted and optimized based on season and day vs. night flows. Each scheduled extraction can be turned On/Off. A total of 12 possible grit extractions in one day are provided by the PLC control system. Here is an example of this type of schedule and its internal setpoints adjustment pop-up window. All actuations are timed from a common starting point. Sample screens are drawn from Bracebridge WWTP (Muskoka, ON):



Claro		Grit Extraction System #1		1/6/2022	
		s...s		9:56:30 PM	
Enter start & stop times from the beginning of the sequence					
		Start		Stop	
Fluidization	NNNNN	sec.	NNNNN	sec.	
Fluidized Grit Pumping	NNNNN	sec.	NNNNN	sec.	
Grit Classifier Sequence	NNNNN	sec.	NNNNN	sec.	
Sequence Frequency Every <input type="text" value="NN"/> day(s)					
INSTRUCTIONS (Press)					
					Close

Grit Extraction Sequence Set-Points Pop-Up
(1 of 12)

• Continued following page →


Grit Extraction Schedule Configuration - System #1

1/6/2022
 9:49:01 PM

Sequences Configuration / Activation		Start Time		Starting Delay
Sequence 01	ON	NN hr	NN min.	## day(s)
Sequence 02	ON	NN hr	NN min.	## day(s)
Sequence 03	OFF	NN hr	NN min.	## day(s)
Sequence 04	ON	NN hr	NN min.	## day(s)
Sequence 05	ON	NN hr	NN min.	## day(s)
Sequence 06	OFF	NN hr	NN min.	## day(s)
Sequence 07	OFF	NN hr	NN min.	## day(s)
Sequence 08	ON	NN hr	NN min.	## day(s)
Sequence 09	OFF	NN hr	NN min.	## day(s)
Sequence 10	ON	NN hr	NN min.	## day(s)
Sequence 11	ON	NN hr	NN min.	## day(s)
Sequence 12	ON	NN hr	NN min.	## day(s)

Menu

General View

Fine Screening System 1 & 2

Grit Removal System 1

Grit Removal System 2

Instructions

◀

Alarms

ii. Automatic High Flow Mode: The control panel is also designed to accept the instantaneous flow data provided by the facility SCADA network (flow data issuing from 18” throat Parshall flume). With this data, the grit system can shift into an alternate set of grit extraction set points that will increase frequency of operation. ‘High Flow Mode’ would start automatically on the basis of an adjustable flow value that is sustained for an adjustable time. Controls would return the system to ‘Regular Mode’ once the flow value fell below a second adjustable setpoint for an adjustable time. This process control intelligence would enable regular operation to further restrain system operation by avoiding precautionary settings that would accommodate extreme flows/loadings of rare incidence.

5. Grit Pump Lead/Lag (Oscillating Service) Routine: The Napanee WWTP application is equipped with two (2) grit pumps. According to an operator-adjustable schedule, the 2 pumps can oscillate service on a runtime setpoint or number of extraction cycle setpoint basis. The operator can also designate a duty pump manually without modification by automatic oscillation. If a pump is in Fault, it is automatically removed from the pump oscillating service routine.

- **N.B. An automated oscillation, however, would likely require automated valves since, in a self-priming application, the duty pump would be more likely to draw a portion of the flow from the adjacent lag duty pump (it is not possible to run 2 separate 4” dia. grit extraction piping runs via the vortex planetary gear drive centre opening. This aspect to be discussed and is cited in section 2.C Open Items, item 5.**

• Continued following page →

B. Manual Operation:

1. Vortex – Forward: When the vortex's local HOA station selector switch (MAN / OFF / AUTO + EMERGENCY STOP) is in << Manual >> position, the vortex grit chamber paddles rotate in forward. Note: provision for reverse rotation is not provided/permitted.
2. Grit Pumps – Forward: When the grit pump #1 or #2 local HOA station selector switch (MAN / OFF / AUTO + EMERGENCY STOP) is in << Manual >> position, the grit pump operates in forward. Note: provision for reverse rotation is not provided/permitted. N.B. Do not operate both grit pumps at the same time.
3. Classifier – Forward: When the classifier's local HOA station selector switches (MAN / OFF / AUTO + FORWARD/REVERSE + EMERGENCY STOP) are in the << Manual >> & << Forward >> position, the shaftless spiral classifier operates in forward.
4. Classifier – Momentary Reverse JOG: When the classifier's local HOA station selector switches (MAN / OFF / AUTO + FORWARD/REVERSE + EMERGENCY STOP) are in << Manual >> & << Reverse >> position, the shaftless spiral classifier operates in reverse until the spring-loaded selector is released. Operator to be careful when operating the classifier in reverse since the spiral can rise out of the trough or be damaged if forcing against grit material present in the trough. Reverse run to be used judiciously, with caution (JOGs only) and when the classifier is empty or near-empty only.
5. E-Stops: When a mushroom push-button (EMERGENCY STOP) of a device is pressed on an HOA station, only the equipment associated with this local station stops immediately whether in Auto or Manual mode. The PLC control panel system common E-Stop stops all equipment immediately in Auto or Manual mode.
6. Fluidization Water – Manual Automatic Override Operation from HMI: The vortex's fluidization/water scour solenoid can be operated manually via the HMI. When the water scour solenoid manual operation button is pressed on the HMI, the solenoid will open until the button is pressed a second time. The solenoid On/Off button will only be represented/accessible, however, when the vortex local HOA station selector switch (MAN / OFF / AUTO + EMERGENCY STOP) is in << Manual >> position.
7. Grit Pump Manual Automatic Override Operation – One Pump @ a Time Operation Only: One grit pump at a time can be turned ON or OFF at the HMI when the grit pump is in Auto mode.
8. Classifier Manual Automatic Override Operation from HMI: The classifier can be turned ON or OFF at the HMI when the classifier is in Auto mode.
9. Vortex Rotating Paddle System Re-Start: For safety, the vortex needs to be started by pressing a << Start >> button on the control panel HMI. The vortex can also be stopped by pressing a << Stop >> button on the control panel HMI. For any work or inspection within the vortex tank, however, the motor should be positively locked out at the motor lock-out at the main control panel. The vortex paddle system presents a serious risk of injury or death if it starts while an operator is within the tank.

N.B.: At the resumption of power after a power failure, the vortex will automatically restart in order to assure against sedimentation of organics and possible plugging of the grit extraction piping. Operators shall never enter the unit without complete lock-out provisions completed & closed-space entry protocols assiduously followed.

C. Alarms/Faults:

1. Vortex: A current transformer (CT) in the control panel reports the amperage readings on the vortex paddle drive motor in order to protect the unit from possible jam. There is a warning amperage level alarm & a high amperage shutdown alarm. If the warning level alarm setpoint is attained, the PLC issues only an alarm with no equipment shutdown. If the amperage sensor reaches the adjustable high amperage shutdown setpoint, the vortex is shut down and an alarm is issued. A low current reading during operation indicates a possible detachment/breakage. In this scenario an alarm is issued, however, the vortex is allowed to continue operating (i.e. no shut-down).
2. Grit Pumps: A starter for each grit pump located in the control panel reports the amperage readings of each pump motor in order to protect each unit from possible damage. There is a warning amperage level alarm & a high amperage shutdown alarm. If the warning level alarm setpoint of the current transformer is reached, the control panel issues only an alarm with no equipment shutdown. If a VFD sensor reaches the adjustable high amperage shutdown setpoint, the respective pump is shut down and an alarm is issued. A low amperage reading during operation indicates a possible coupling detachment/breakage of the belts and/or pulleys. In this scenario an alarm is issued, however, the pump is allowed to continue operating (i.e. no immediate shut-down). The next & subsequent pump extraction will be completed by the alternate pump (i.e. if lead/lag switch is effected).
3. Grit Classifier: A current transformer (CT) in the control panel senses the amperage reading on the classifier motor in order to protect the unit from possible jam. There is a warning amperage level alarm & a high amperage shutdown alarm. If the warning level alarm setpoint of the amperage sensor is reached, the PLC issues an alarm only with no equipment shutdown. If the amperage sensor reaches the adjustable high amperage shutdown setpoint, the classifier is shut down and an alarm is issued. A low current reading during spiral operation indicates a possible spiral detachment/breakage. In this scenario an alarm is issued, however, the classifier is allowed to continue operating (i.e. no shut-down).
4. E-Stops: Any in-field emergency stop halts the respective machine in both Manual & Auto modes. The main control panel door E-stop shuts down all influent works equipment.
5. Resetting/Clearing Alarms: Reset by push button (RESET) on the Claro control panel, clearing the alarm at the visualization screen and/or by pulling mushroom E-stop into original position, if it was depressed. E-stop design will conform to local facility & provincial safety standards/protocols. Thermal overloads at the control panel system are cleared by turning the motor switch to the 'Off' position and then back to 'On' position & pressing the reset button on the panel enclosure door.
6. Active Alarms & Alarms History: An 'Active Alarms' page lists current active alarm conditions. An 'Alarms History' page logs a history of alarms complete with date & time stamp. The alarm passes to Alarms History only once it has been cleared from Active Alarms.
7. Vortex Back-in-Service Courtesy Alarm: If the vortex is left in OFF or MAN at the local HOA, an alarm will sound after an adjustable time delay.
8. Grit Pump #1 & #2 Back-in-Service Courtesy Alarm: If a grit pump is left in OFF or MAN at the local HOA while the vortex is also in service and a duty pump is not

available, an alarm will sound after an adjustable time delay. If the grit pump is turned OFF at the HMI, the courtesy alarm will not sound.

9. Classifier Back-in-Service Courtesy Alarm: If the grit classifier is left in OFF or MAN at the local HOA while either grit pump is in service, an alarm will sound after an adjustable time delay.

D. Real-Time Readings/Trends

- The Claro PLC control system will have a page(s) graphically & numerically representing the real-time values for the torque/current motor readings, all the respective set points, and the current stage in the operational sequence for the grit removal system. Note: The graphics representing the vortex, pumps & grit classifier are adapted from the project drawings in order to faithfully reflect the Napanee WWTP grit removal system. Claro would be pleased to provide graphics or HMI screenshots to the facility network programmer for use in the facility SCADA design if this is preferred.
- A trends page records:
 - a) torque/amperage draw for all grit system motors
- A runtimes page records:
 - a) the number of motor starts for the grit pumps & classifier
 - b) the total amount of time each motor has run
 - c) total number of grit extraction cycles
 - d) Facility network can log this activity across time and provide graphs representing activity over time on a separate trends page(s) – Claro would be happy to discuss facility SCADA network data trending design.



C. SCADA Data Exchange Table – Napanee WPCP, ON

Napanee WWTP, ON											
Exchange Data Table											
Fine Screening & Grit Removal Systems											
PLC Network Configuration				Rev. : 1 (2024-07-29)							
Ethernet Address (MAC) : _____ IP Address : 1.0.0.1 * Network addresses are preliminary. Final preferred addresses to be provided by client. Mask : 255.255.255.0 Gateway : 0.0.0.0				PLC-[TBD] ControlLogix L30ER							
Ethernet Address (MAC) : _____ IP Address : 1.0.0.2 * Network addresses are preliminary. Final preferred addresses to be provided by client. Mask : 255.255.255.0 Gateway : 0.0.0.0											
Reading Data Only							Data Type	PLC Address	Dec. Point	PLC Map Address	Modbus Address
Fine Screen #1							Word	Bit	Word	Bit	
Fine Screen - Selector Switch in Manual Position				BOOL			SCADA [0]		0		
Fine Screen - Selector Switch in Auto Position				BOOL			SCADA [0]		1		
Fine Screen - Selector Switch in OFF Position				BOOL			SCADA [0]		2		
Fine Screen - Running Status				BOOL			SCADA [0]		3		
Fine Screen - Local E-Stop Activated				BOOL			SCADA [0]		4		
Fine Screen - Ready				BOOL			SCADA [0]		5		
Fine Screen - Collective Fault				BOOL			SCADA [0]		6		
Fine Screen - Motor Overload				BOOL			SCADA [0]		7		
Fine Screen - Mechanical Blocking Alarm				BOOL			SCADA [0]		8		
Fine Screen - Fail to Start alarm				BOOL			SCADA [0]		9		
Fine Screen - High Level Warning (Upstream)				BOOL			SCADA [0]		10		
Fine Screen - Upstream Level Probe Echo Loss				BOOL			SCADA [0]		11		
Fine Screen - Start Mode (0=Level 1=Level&Timer)				BOOL			SCADA [0]		12		
Fine Screen - Home Position Switch Alarm				BOOL			SCADA [0]		13		
Fine Screen - Downstream Level Probe Echo Loss				BOOL			SCADA [0]		14		
Fine Screen - VFD Fault				BOOL			SCADA [0]		15		
Fine Screen #2							Word	Bit	Word	Bit	
Fine Screen - Selector Switch in Manual Position				BOOL			SCADA [1]		0		
Fine Screen - Selector Switch in Auto Position				BOOL			SCADA [1]		1		
Fine Screen - Selector Switch in OFF Position				BOOL			SCADA [1]		2		
Fine Screen - Running Status				BOOL			SCADA [1]		3		
Fine Screen - Local E-Stop Activated				BOOL			SCADA [1]		4		
Fine Screen - Ready				BOOL			SCADA [1]		5		
Fine Screen - Collective Fault				BOOL			SCADA [1]		6		
Fine Screen - Motor Overload				BOOL			SCADA [1]		7		
Fine Screen - Mechanical Blocking Alarm				BOOL			SCADA [1]		8		
Fine Screen - Fail to Start alarm				BOOL			SCADA [1]		9		
Fine Screen - High Level Warning (Upstream)				BOOL			SCADA [1]		10		
Fine Screen - Upstream Level Probe Echo Loss				BOOL			SCADA [1]		11		
Fine Screen - Start Mode (0=Level 1=Level&Timer)				BOOL			SCADA [1]		12		
Fine Screen - Home Position Switch Alarm				BOOL			SCADA [1]		13		
Fine Screen - Downstream Level Probe Echo Loss				BOOL			SCADA [1]		14		
Fine Screen - VFD Fault				BOOL			SCADA [1]		15		
Washpress #1							Word	Bit	Word	Bit	
Selector Switch in Manual Position				BOOL			SCADA [2]		0		
Selector Switch in Auto Position				BOOL			SCADA [2]		1		
Selector Switch in Off Position				BOOL			SCADA [2]		2		
Running Status				BOOL			SCADA [2]		3		
Local E-Stop Pushbutton Pushed				BOOL			SCADA [2]		4		
Ready				BOOL			SCADA [2]		5		
Collective Fault				BOOL			SCADA [2]		6		
Low Amperage Alarm (Low Torque)				BOOL			SCADA [2]		7		
High Amperage Alarm (High Torque)				BOOL			SCADA [2]		8		

Motor Overload	BOOL		SCADA_ 2	9
Motor Fail to Start	BOOL		SCADA_ 2	10
High Amperage Warning (High Torque)	BOOL		SCADA_ 2	11
Washpress #1 - Washing Alternative #1	BOOL		SCADA_ 2	12
Washpress #1 - Washing Alternative #2	BOOL		SCADA_ 2	13
Washpress #1 - Washing Alternative #3	BOOL		SCADA_ 2	14
Back-in-Service Alarm	BOOL		SCADA_ 2	15
Washpress #2				
Selector Switch in Manual Position	BOOL		SCADA_ 7	0
Selector Switch in Auto Position	BOOL		SCADA_ 7	1
Selector Switch in Off Position	BOOL		SCADA_ 7	2
Running Status	BOOL		SCADA_ 7	3
Local E-Stop Pushbutton Pushed	BOOL		SCADA_ 7	4
Ready	BOOL		SCADA_ 7	5
Collective Fault	BOOL		SCADA_ 7	6
Low Amperage Alarm (Low Torque)	BOOL		SCADA_ 7	7
High Amperage Alarm (High Torque)	BOOL		SCADA_ 7	8
Motor Overload	BOOL		SCADA_ 7	9
Motor Fail to Start	BOOL		SCADA_ 7	10
High Amperage Warning (High Torque)	BOOL		SCADA_ 7	11
Washpress #1 - Washing Alternative #1	BOOL		SCADA_ 7	12
Washpress #1 - Washing Alternative #2	BOOL		SCADA_ 7	13
Washpress #1 - Washing Alternative #3	BOOL		SCADA_ 7	14
Back-in-Service Alarm	BOOL		SCADA_ 7	15
Vortex				
Selector Switch in Manual Position	BOOL		SCADA_ 3	0
Selector Switch in Auto Position	BOOL		SCADA_ 3	1
Selector Switch in Off Position	BOOL		SCADA_ 3	2
Running Status	BOOL		SCADA_ 3	3
Local E-Stop Pushbutton Pushed	BOOL		SCADA_ 3	4
Ready	BOOL		SCADA_ 3	5
Collective Fault	BOOL		SCADA_ 3	6
Low Amperage Alarm (Low Torque)	BOOL		SCADA_ 3	7
High Amperage Alarm (High Torque)	BOOL		SCADA_ 3	8
Motor Overload	BOOL		SCADA_ 3	9
Motor Fail to Start	BOOL		SCADA_ 3	10
High Amperage Warning	BOOL		SCADA_ 3	11
Fluidization Solenoid ON/OFF Status	BOOL		SCADA_ 3	12
	BOOL		SCADA_ 3	13
	BOOL		SCADA_ 3	14
	BOOL		SCADA_ 3	15
Grit Pump #1				
Selector Switch in Manual Position	BOOL		SCADA_ 4	0
Selector Switch in Auto Position	BOOL		SCADA_ 4	1
Selector Switch in Off Position	BOOL		SCADA_ 4	2
Running Status	BOOL		SCADA_ 4	3
Local E-Stop Pushbutton Pushed	BOOL		SCADA_ 4	4
Ready	BOOL		SCADA_ 4	5
Collective Fault	BOOL		SCADA_ 4	6
Low Amperage Alarm (Low Torque)	BOOL		SCADA_ 4	7
High Amperage Alarm (High Torque)	BOOL		SCADA_ 4	8
Motor Overload	BOOL		SCADA_ 4	9
Motor Fail to Start	BOOL		SCADA_ 4	10
High Amperage Warning (High Torque)	BOOL		SCADA_ 4	11
	BOOL		SCADA_ 4	12
	BOOL		SCADA_ 4	13
	BOOL		SCADA_ 4	14
	BOOL		SCADA_ 4	15

Grit Pump #2				
Selector Switch in Manual Position	BOOL		SCADA_I[5]	0
Selector Switch in Auto Position	BOOL		SCADA_I[5]	1
Selector Switch in Off Position	BOOL		SCADA_I[5]	2
Running Status	BOOL		SCADA_I[5]	3
Local E-Stop Pushbutton Pushed	BOOL		SCADA_I[5]	4
Ready	BOOL		SCADA_I[5]	5
Collective Fault	BOOL		SCADA_I[5]	6
Low Amperage Alarm (Low Torque)	BOOL		SCADA_I[5]	7
High Amperage Alarm (High Torque)	BOOL		SCADA_I[5]	8
Motor Overload	BOOL		SCADA_I[5]	9
Motor Fail to Start	BOOL		SCADA_I[5]	10
High Amperage Warning (High Torque)	BOOL		SCADA_I[5]	11
	BOOL		SCADA_I[5]	12
	BOOL		SCADA_I[5]	13
	BOOL		SCADA_I[5]	14
	BOOL		SCADA_I[5]	15
Classifier				
Selector Switch in Manual Position	BOOL		SCADA_I[6]	0
Selector Switch in Auto Position	BOOL		SCADA_I[6]	1
Selector Switch in Off Position	BOOL		SCADA_I[6]	2
Running Status	BOOL		SCADA_I[6]	3
Local E-Stop Pushbutton Pushed	BOOL		SCADA_I[6]	4
Ready	BOOL		SCADA_I[6]	5
Collective Fault	BOOL		SCADA_I[6]	6
Low Amperage Alarm (Low Torque)	BOOL		SCADA_I[6]	7
High Amperage Alarm (High Torque)	BOOL		SCADA_I[6]	8
Motor Overload	BOOL		SCADA_I[6]	9
Motor Fail to Start	BOOL		SCADA_I[6]	10
High Amperage Warning (High Torque)	BOOL		SCADA_I[6]	11
High Level Alarm	BOOL		SCADA_I[6]	12
Alarm Zero Rotation	BOOL		SCADA_I[6]	13
Grit Washing Solenoid ON/OFF Status	BOOL		SCADA_I[6]	14
	BOOL		SCADA_I[6]	15
Misc.				
Main Panel E-Stop Pushbutton Pushed	BOOL		SCADA_I[8]	0
Power Outage or Loss of Phase Alarm	BOOL		SCADA_I[8]	1
Washpress #1 - Sol. 1 ON/OFF Status (Washing)	BOOL		SCADA_I[8]	2
Washpress #1 - Sol. 2 ON/OFF Status (Flushing)	BOOL		SCADA_I[8]	3
Washpress #2 - Sol. 1 ON/OFF Status (Washing)	BOOL		SCADA_I[8]	4
Washpress #2 - Sol. 2 ON/OFF Status (Flushing)	BOOL		SCADA_I[8]	5
UPS Fault	BOOL		SCADA_I[8]	6
UPS ON Battery	BOOL		SCADA_I[8]	7
UPS Low Battery	BOOL		SCADA_I[8]	8
	BOOL		SCADA_I[8]	9
	BOOL		SCADA_I[8]	10
	BOOL		SCADA_I[8]	11
	BOOL		SCADA_I[8]	12
	BOOL		SCADA_I[8]	13
	BOOL		SCADA_I[8]	14
	BOOL		SCADA_I[8]	15
Watchdog - PLC Seconds	INTEGER		SCADA_I[9]	
Instrumentation				
Fine Screen #1 Upstream Level	REAL		SCADA_R[0]	
Fine Screen #1 Downstream Level	REAL		SCADA_R[1]	
Fine Screen #1 Torque (%)	REAL		SCADA_R[2]	
Fine Screen #2 Upstream Level	REAL		SCADA_R[3]	
Fine Screen #2 Downstream Level	REAL		SCADA_R[4]	

Fine Screen #2 Torque (%)	REAL			SCADA_R[5]		
Washpress #1 Motor Amperage (Amps)	REAL			SCADA_R[6]		
Washpress #2 Motor Amperage (Amps)	REAL			SCADA_R[7]		
Vortex Motor Torque (Amps)	REAL			SCADA_R[8]		
Grit Pump #1 Motor Torque (Amps)	REAL			SCADA_R[9]		
Grit Pump #2 Motor Torque (Amps)	REAL			SCADA_R[10]		
Classifier Motor Amperage (Amps)	REAL			SCADA_R[11]		
	REAL			SCADA_R[12]		
	REAL			SCADA_R[13]		
	REAL			SCADA_R[14]		
	REAL			SCADA_R[15]		
Screen 1 - Total Runtime	DINT		1	SCADA_D[0]		
Screen 1 - Total Rotation Number	DINT		0	SCADA_D[1]		
Screen 1 - Total Cycles Number	DINT		0	SCADA_D[2]		
Screen 2 - Total Runtime	DINT		1	SCADA_D[3]		
Screen 2 - Total Starts Number	DINT		0	SCADA_D[4]		
Screen 2 - Total Rotations Number	DINT		0	SCADA_D[5]		
Washpress 1 - Total Runtime	DINT		1	SCADA_D[6]		
Washpress 1 - Total Starts Number	DINT		0	SCADA_D[7]		
Washpress 1 - Total Treatment Cycles	DINT		0	SCADA_D[8]		
Washpress 2 - Total Runtime	DINT		1	SCADA_D[9]		
Washpress 2 - Total Starts Number	DINT		0	SCADA_D[10]		
Washpress 2 - Total Treatment Cycles	DINT		1	SCADA_D[11]		
Vortex - Total Runtime	DINT		0	SCADA_D[12]		
Vortex - Total Starts Number	DINT		1	SCADA_D[13]		
Grit Pump 1 - Total Run time	DINT		0	SCADA_D[14]		
Grit Pump 1 - Total Starts Number	DINT		1	SCADA_D[15]		
Grit Pump 2 - Total Run time	DINT		0	SCADA_D[16]		
Grit Pump 2 - Total Starts Number	DINT		0	SCADA_D[17]		
Classifier - Total Runtime	DINT		0	SCADA_D[18]		
Classifier - Total Starts Number	DINT		0	SCADA_D[19]		
Classifier - Total Treatment Cycles	DINT		0	SCADA_D[20]		
Write Data						
Influent Flow (Instantaneous)	REAL			SCADA_R[50]		
(Unit selection on HMI: L/s, m3/hr, m3/day or GPM)	REAL			SCADA_R[51]		
	REAL			SCADA_R[52]		



7. Electronic Controls Submittal Drawings & Component Catalog Cuts

Napanee WPCP Upgrades, ON Screening & Grit Removal System

Municipal Authority: Town of Greater Napanee, ON

RFP Number: RFP-IS-2023-01

Sections: 46 43 00 & 46 53 00

Consulting Engineer: EVB Engineering

Installation Contractor: TBD

Contractor PO Number: TBD

Claro Ref.: 20048-P-00



A. Fine Screening & Grit Removal Control Panel Drawings – Napanee WPCP, ON

- Please see following pages →



SHTS	TITLE
1	TABLE OF CONTENT
2	TABLE OF CONTENT (NEXT)
3	BILL OF MATERIAL
4	BILL OF MATERIAL (NEXT)
5	BILL OF MATERIAL (NEXT)
6	BILL OF MATERIAL (NEXT)
7	BLANK PAGE
8	EXTERNAL PANEL LAYOUT
9	INTERNAL PANEL LAYOUT
10	LOCAL CONTROL STATIONS
11	LOCAL CONTROL STATIONS (NEXT)
12	LOCAL CONTROL STATIONS (NEXT)
13	LOCAL CONTROL STATIONS (NEXT)
14	PLC CONFIGURATION
15	POWER DIAGRAM
16	POWER DIAGRAM (NEXT)
17	POWER DIAGRAM (NEXT)
18	POWER DIAGRAM (NEXT)
19	120VAC DISTRIBUTION
20	120VAC DISTRIBUTION (NEXT)
21	24VDC DISTRIBUTION
22	24VDC DISTRIBUTION (NEXT)
23	120VAC CONTROL DIAGRAM
24	120VAC CONTROL DIAGRAM (NEXT)
25	120VAC CONTROL DIAGRAM (NEXT)

SHTS	TITLE
26	24VDC CONTROL DIAGRAM
27	24VDC CONTROL DIAGRAM (NEXT)
28	24VDC CONTROL DIAGRAM (NEXT)
29	24VDC CONTROL DIAGRAM (NEXT)
30	24VDC CONTROL DIAGRAM (NEXT)
31	BLANK PAGE
32	INTRINSIC RELAY
33	SITRANS WM300 WIRING
34	BLANK PAGE
35	MOD1 - DIGITAL INPUTS
36	MOD1 - DIGITAL INPUTS (NEXT)
37	MOD1 - DIGITAL INPUTS (NEXT)
38	MOD1 - DIGITAL INPUTS (NEXT)
39	MOD2 - DIGITAL INPUTS
40	MOD2 - DIGITAL INPUTS (NEXT)
41	MOD2 - DIGITAL INPUTS (NEXT)
42	MOD2 - DIGITAL INPUTS (NEXT)
43	MOD3 - DIGITAL INPUTS
44	MOD3 - DIGITAL INPUTS (NEXT)

	IN THE PANEL
-----	OUT OF PANEL
0-90 VDC	+ ORANGE, - BLUE
24 VAC	L-N YELLOW
120 VAC	L RED, N WHITE
240 VAC	L1-L2 RED, N WHITE
347 VAC	L BLACK, N WHITE
TRIPHASE 208-600 V	L1-L2-L3 BLACK

TERMINAL	DESCRIPTION
■	20A 2.5mm ² (1SNK 705 010 R0000)
☑	GND (1SNK 705/708 150 R0000)
☑	ISOL. GND (1SNK 705 061 R0000)
□	50A 6mm ² (1SNK 708 010 R0000)
■	2 LEVEL (1SNK 705 210 R0000)
☑	OTHERS

LEG.	DESCRIPTION
▲	
▲	
△	
△	OUT OF THE ENCLOSURE, INCLUDED
▲	OUT OF THE ENCLOSURE, NOT INCLUDED

SOURCE / DESTINATION DRAWING REFERENCE	
XXXX	→ WIRE NUMBER
XX	→ SHEET NUMBER
XX	→ LINE NUMBER

CONTACT REFERENCE	
XXXX	→ SHEET NUMBER
XXXX	→ LINE NUMBER
NOXXXX	
NC	

 REMOVE THE JUMPER IF AN INSTRUMENTATION GROUND IS SUPPLIED


QTY: 1X

REV	DATE	DESCRIPTION	VOLT.	H.P.	TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	SCALING:	DATE:
			600	27	TABLE OF CONTENT	NONE	JULY 2024
			PHASE 3	KVAR N/A	CUSTOMER: CLARO	DRAWING#	12031331
			FREQ. 60 (HZ)	KW N/A	REF.: 22XXX-Q-00 PROJECT: NAPANEE, ON	PAGE	1 OF 73
			AMP. 34	TYPE 12	DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON		
00	2024-07-30	X.M. FOR APPROVAL					

H:_PROJETS\12031331\CLARO_NAPANEE_CONDUITS\DESIGN\12031331_ROW12031331_ROW1.DWG

SHTS	TITLE
45	MOD4 - ANALOG INPUTS
46	MOD4 - ANALOG INPUTS (NEXT)
47	MOD4 - ANALOG INPUTS (NEXT)
48	MOD4 - ANALOG INPUTS (NEXT)
49	MOD5 - ANALOG INPUTS
50	MOD5 - ANALOG INPUTS (NEXT)
51	MOD6 - DIGITAL OUTPUTS
52	MOD6 - DIGITAL OUTPUTS (NEXT)
53	MOD6 - DIGITAL OUTPUTS (NEXT)
54	MOD6 - DIGITAL OUTPUTS (NEXT)
55	MOD7 - DIGITAL OUTPUTS
56	MOD7 - DIGITAL OUTPUTS (NEXT)
57	MOD8 - ANALOG OUTPUTS
58	FINE SCREEN 1 - I/O DRIVE MODULE
59	FINE SCREEN 1 - I/O DRIVE MODULE (NEXT)
60	FINE SCREEN 2 - I/O DRIVE MODULE
61	FINE SCREEN 2 - I/O DRIVE MODULE (NEXT)
62	EXTERNAL CONTACTS
63	TERMINALS
64	TERMINALS (NEXT)
65	TERMINALS (NEXT)

SHTS	TITLE
66	WIRING DIAGRAM
67	WIRING DIAGRAM (NEXT)
68	WIRING DIAGRAM (NEXT)
69	WIRING DIAGRAM (NEXT)
70	WIRING DIAGRAM (NEXT)
71	WIRING DIAGRAM (NEXT)
72	WIRING DIAGRAM (NEXT)
73	WIRING DIAGRAM (NEXT)

REV	DATE	DESCRIPTION	VOLT.	H.P.	TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		
			600	27	TABLE OF CONTENT (NEXT)		
			PHASE 3	KVAR N/A	CUSTOMER: CLARO		
			FREQ. 60	KW N/A	REF.: 22XXX-Q-00 PROJECT: NAPANEE, ON	SCALING: NONE	DRAWING# 12031331
00	2024-07-30	X.M. FOR APPROVAL	AMP. 34	TYPE 12	DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON	DATE: JULY 2024	PAGE 2 OF 73


H:\PROJECTS\12031331\22031331-CLARO-NAPANEE-CONDENSINGDESIGNS\12031331-RO_P2.DWG

A					B					C					D					E				
TAGS	DESCRIPTION				CATALOG	MFG	QTY	TAGS	DESCRIPTION				CATALOG	MFG	QTY									
	DOUBLE DOOR ENCLOSURES WITH 12" MOUNTING FEET, NEMA12, GRAY, 72"x72"x16"				HDM727216	BEL Products	1	CB1602	THERMAL MAGNETIC CIRCUIT BREAKER FOR MOTOR PROTECTION, CLASS 10, 30, BREAKING CAP. 30kA @ 600V, RATED CURRENT 2.2 - 3.2AMPS, S00				3RV20 11-1DA10	SIEMENS	2									
	LARGE LITERATURE PCKET, PLASTIC, BLACK, 12" X 12", 1 1/2" DEPTH				PKT1212S	HAMMOND	1	CB1602B	AUXILIARY CONTACT, FRONT MOUNT, SIZE 00, S0 TO S3 MOTOR STARTER PROTECTORS, 1ND & 1NC				3RV29 01-1E	SIEMENS	2									
	FOLD DOWN UTILITY SHELF 18"x18", ANSI 61 GRAY				FDS1818GY	HAMMOND	1	CB1802	THERMAL MAGNETIC CIRCUIT BREAKER FOR MOTOR PROTECTION, CLASS 10, 30, BREAKING CAP. 30kA @ 600V, RATED CURRENT 1.1 - 1.6AMPS, S00				3RV20 11-1AA10	SIEMENS	1									
TH1904	THERMOSTAT 0-60°C, FOR COOLING, CONTACT ND				SKT011419ND-C	HAMMOND	1		AUXILIARY CONTACT, FRONT MOUNT, SIZE 00, S0 TO S3 MOTOR STARTER PROTECTORS, 1ND & 1NC				3RV29 01-1E	SIEMENS	1									
V1904 V1905	FAN 120VAC, 22W, 105CFM, 4" DIAMETER				4115B	SUMO	2		SHAFT AND HANDLE FOR STARTER 3RV S00 & S0, IP65, NEMA 1&12&3R				3RV2926-2B	SIEMENS	3									
	8"X8" GRID AND FILTER, NEMA 12				PFA3000BK	HAMMOND	4	M2312	CONTACTOR FOR SWITCHING MOTOR SIZE S00 3P, 7.5HP @ 600V, 9A IND.(22A RES.), 1ND, COIL 50/60HZ 120VAC				3RT20 16-1AK61	SIEMENS	6									
DS1501	FUSE DISCONNECT SWITCH, 60A, 600VAC, CLASS J, FRAME SIZE 5				3861 3006	SOCOME	1	M2315	AUX. SWITCH BLOCK SNAP. ONTO FRONT, 2NC+2ND, S00, S0 TO S3				3RH29 11-1FA22	SIEMENS	6									
	HPC FUSE CLASS J, 40A, 600VAC, TIME DELAY				AJT-40	FERRAZ SHAWMUT	3	M2412	MECHANICAL INTERLOCKS FOR 3P CONTACTOR ASSEMBLIES, SIZE S00				3RA2912-2H	SIEMENS	3									
	EXTERNAL PISTOL HANDLE, S2 TYPE, BLACK, NEMA 3R, 12, 4X				142D 2111	SOCOME	1	M2415	CURRENT TRANSFORMER 0-10/20/40A TO 4-20mA OUTPUT				H721LC	HAWKEYE	6									
	400mm SHAFT FOR DISCONNECT SWITCHES FOR B4 & B5 FRAME SIZE, S2 HANDLE TYPE				1400 1040	SOCOME	1	M2512	FUSE HOLDER, 30A, 600V, 3P, CC ULTRA-SAFE				USCC3	FERRAZ SHAWMUT	1									
CB1502 CB1602A	THERMAL MAGNETIC CIRCUIT BREAKER FOR MOTOR PROTECTION, CLASS 10, 30, BREAKING CAP. 30kA @ 600V, RATED CURRENT 2.8 - 4AMPS, S00				3RV20 11-1EA10	SIEMENS	2	M2515	HPC FUSE CLASS CC, 10A, 600VAC, TIME DELAY				ATDR-10	FERRAZ SHAWMUT	3									
	AUXILIARY CONTACT, FRONT MOUNT, SIZE 00, S0 TO S3 MOTOR STARTER PROTECTORS, 1ND & 1NC				3RV29 01-1E	SIEMENS	2	DPP1506	LINE MONITORING- PHASE TRDOUBLE - ANALOG -DIGITAL ADJUSTABLE - 160-690VAC				3UG45 13-1BR20	SIEMENS	1									
	SHAFT AND HANDLE FOR STARTER 3RV S00 & S0, IP65, NEMA 1&12&3R				3RV2926-2B	SIEMENS	2	XF1506	1PH CONTROL TRANSFORMER, 480/600V X 120/240V, 2000VA				SP2000ACP	HAMMOND	1									
IND1505 IND1605	REACTOR 600VAC, 60HZ 5%, 2.7A, 2HP				CRX02D7BC	HAMMOND	2		SNAP-ON TERMINAL TOUCH-SAFE COVER KIT FOR HAMMOND TRANSFORMER				SPFG1	HAMMOND	2									
DR1506 DR1606	CFW500 DRIVE, 3AC 500-600V, 2HP, 3A, W/D FILTER, C FRAME				CFW500C03P0T5DB20H0	WEG	2	CB1508 CB2006	SU200 MINIATURE MOLDED CASE CIRCUIT BREAKER, 15A, 230VAC, 1 POLE, 10kA				SU201M-C15	ABB	2									
DR1506-ID DR1606-ID	CFW500 DRIVE PLUG IN I/O MODULE, 4DI, 3DO, 2AI, 1AD				CFW500-CRS485	WEG	2	CB1902	SU200 MINIATURE MOLDED CASE CIRCUIT BREAKER, 2A, 230VAC, 1 POLE, 10kA				SU201M-C2	ABB	1									
DR1506-1 DR1606-1	CFW500 REMOTE KEYPAD, OPERATION INTERFACE				CFW500-HMIR	WEG	2	CB2018	SU200 MINIATURE MOLDED CASE CIRCUIT BREAKER, 20A, 230VAC, 1 POLE, 10kA				SU201M-C20	ABB	1									
	EXTENSION CABLE RS485 FOR CFW500 REMOTE KEYPAD, 16 Ft (5 m) long				CFW500-CCHMIR05M	WEG	2	FU2109 FU2114 FU2202 FU2203 FU2204	SCREW CLAMP FUSE HOLDER, 1 POLE, 10A, 300V, 24-10AWG, ZS4-SF1, FOR 5X20 & 5X25 FUSES				1SNK 508 410 R0000	ABB	5									
IND1508 IND1608	REACTOR 600VAC, 60HZ 3%, 2.7A, 2HP				CRX02D7AC	HAMMOND	2		ELECTRONIC / GLASS FUSE (20x5mm), 1A, 250VAC, TIME DELAY				GDG1	FERRAZ SHAWMUT	5									
M2308 M2408	CONTACTOR FOR SWITCHING MOTOR SIZE S00 3P, 7.5HP @ 600V, 9A IND.(22A RES.), 1ND, COIL 50/60HZ 120VAC				3RT20 16-1AK61	SIEMENS	2	FU2017	SCREW CLAMP FUSE HOLDER, 1 POLE, 10A, 300V, 24-10AWG, ZS4-SF1, FOR 5X20 & 5X25 FUSES				1SNK 508 410 R0000	ABB	1									
CB1702	THERMAL MAGNETIC CIRCUIT BREAKER FOR MOTOR PROTECTION, CLASS 10, 30, BREAKING CAP. 30kA @ 600V, RATED CURRENT 2.8 - 4AMPS, S00				3RV20 11-1EA10	SIEMENS	1		ELECTRONIC / GLASS FUSE (20x5mm), 10A, 250VAC, TIME DELAY				GDG10	FERRAZ SHAWMUT	1									
	AUXILIARY CONTACT, FRONT MOUNT, SIZE 00, S0 TO S3 MOTOR STARTER PROTECTORS, 1ND & 1NC				3RV29 01-1E	SIEMENS	1	FU1918 FU2108	SCREW CLAMP FUSE HOLDER, 1 POLE, 10A, 300V, 24-10AWG, ZS4-SF1, FOR 5X20 & 5X25 FUSES				1SNK 508 410 R0000	ABB	2									
CB1702A CB1702B	THERMAL MAGNETIC CIRCUIT BREAKER FOR MOTOR PROTECTION, CLASS 10, 30, BREAKING CAP. 30kA @ 600V, RATED CURRENT 5.5 -8AMPS, S00				3RV20 11-1HA10	SIEMENS	2		ELECTRONIC / GLASS FUSE (20x5mm), 5A, 250VAC, TIME DELAY				GDG5	FERRAZ SHAWMUT	2									
	AUXILIARY CONTACT, FRONT MOUNT, SIZE 00, S0 TO S3 MOTOR STARTER PROTECTORS, 1ND & 1NC				3RV29 01-1E	SIEMENS	2																	
M2503 M2506 M2509	CONTACTOR FOR SWITCHING MOTOR SIZE S00 3P, 7.5HP @ 600V, 9A IND.(22A RES.), 1ND, COIL 50/60HZ 120VAC				3RT20 16-1AK61	SIEMENS	6																	
	AUX. SWITCH BLOCK SNAP. ONTO FRONT, 2NC+2ND, S00, S0 TO S3				3RH29 11-1FA22	SIEMENS	6																	

REV	DATE	DESCRIPTION				VOLT.	H.P.	TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL				Claro™	
						600	27	BILL OF MATERIAL					
						PHASE	KVAR	CUSTOMER: CLARO					
						3	N/A	REF.: 22XXX-Q-00 PROJECT: NAPANEE, ON					
						FREQ. (HZ)	KW	DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON				SCALING: NONE	DRAWING# 12031331
00	2024-07-30	X.M.	FOR APPROVAL			AMP.	TYPE					DATE: JULY 2024	PAGE 3 OF 73
					34	12							

H:\PROJECTS\22031XXX\22031331-CLARO-NAPANEE-CONDENSINGDESIGN\22031331-IND020-0331-RR_F3.DWG

A					B					C					D					E				
TAGS	DESCRIPTION				CATALOG	MFG	QTY	TAGS	DESCRIPTION				CATALOG	MFG	QTY									
FU1909 FU1910 FU1911 FU1912 FU1913 FU1914 FU2106 FU2110 FU2212 FU5810 FU6010	SCREW CLAMP FUSE HOLDER, 1 POLE, 10A, 300V, 24-10AWG, ZS4-SF1, FDR 5X20 & 5X25 FUSES				1SNK 508 410 R0000	ABB	11	CPU	1769 COMPACTLOGIX CONTROLLER, 2MB, ETHERNET/IP PORT				1769-L33ER	AB	1									
	ELECTRONIC / GLASS FUSE (20x5mm), 0.5A, 250VAC, TIME DELAY				GDG.5	FERRAZ SHAWMUT	11	MOD1 MOD2	DIGITAL INPUT MODULE FOR 1769 COMPACTLOGIX, 32 INPUT, 24VDC				1769-IQ32	AB	2									
FU1904 FU2102 FU2104 FU2111 FU2112 FU2205 FU2206	SCREW CLAMP FUSE HOLDER, 1 POLE, 10A, 300V, 24-10AWG, ZS4-SF1, FDR 5X20 & 5X25 FUSES				1SNK 508 410 R0000	ABB	7	PS2102	POWER SUPPLY 24VDC INPUT				1769-PB4	AB	1									
	ELECTRONIC / GLASS FUSE (20x5mm), 2A, 250VAC, TIME DELAY				GDG2	FERRAZ SHAWMUT	7	MOD3	DIGITAL INPUT MODULE FOR 1769 COMPACTLOGIX, 16 INPUT, 24VDC				1769-IQ16	AB	1									
LS1906 LS1907	REMOTE DOOR SWITCH				FLKDS	HAMMOND	2	MOD4 MOD5	ANALOG INPUT MODULE FOR COMPACTLOGIX- 8AI, 4-20mA & 0-10V				1769-IF8	AB	2									
LT1906	12" FLUORESCENT LIGHT KIT, 120VAC				UC120-LED12-NW	RAB DESIGN	1	MOD6	DIGITAL OUTPUT MODULE FOR 1769 COMPACTLOGIX, 32 OUTPUT, 24VDC				1769-DB32	AB	1									
	5' POWER CORD, NEMA 1-15P TO IEC C7 (8-SHAPED HEAD)				UC120 60" CORD END PLUG	RAB DESIGN	1	MOD7	DIGITAL OUTPUT MODULE FOR 1769 COMPACTLOGIX, 16 OUTPUT, 24VDC				1769-DB16	AB	1									
PR1902	PANEL INTERFACE CONNECTOR WITH SIMPLEX OUTLET, RJ45, 15A, 125VAC, TYPE 4, 4X, 12				DP1-RJ45-16LS	MENCOM	1	MOD8	ANALOG OUTPUT MODULE FOR COMPACTLOGIX- 4AD, 0-20mA, 0-10V				1769-DF4	AB	1									
PR2003	DIN RAIL MOUNTED DUPLEX RECEPTACLE, 15A, 120VAC, WITH LED				6720005430	WEIDMULLER	1		RIGHT END CAP				1769-ECR	AB	1									
UPS2005	UNINTERRUPTIBLE POWER SUPPLY, 1500VA, 1500 W, SUPPLY 120VAC				GXT5-1500LVRT2UXL	LIEBERT	1	ES2106	5 PORTS ETHERNET SWITCH 10/100 MBITS, 24VDC POWER SUPPLY				6GK5005-0BA00-1AB2	SIEMENS	1									
PWC4308	INTERFACE CARD FOR UPS				IS-RELAY	LIEBERT	1		PATCH CABLE CAT-5E, LENGTH 5'				MP-54RJ45DNNE-005	AMPHENOL	1									
PS2017	SITDP PSU100S 24 V/20A STABILIZED POWER SUPPLY, 1-PHASE POWER SUPPLY, INPUT: 120/230 V AC OUTPUT: 24 V DC/20 A				6EP1 336-2BA10	SIEMENS	1		PATCH CABLE CAT-5E, LENGTH 15'				MP-54RJ45DNNE-015	AMPHENOL	2									
								HMI2104	PANELVIEW PLUS 7 COLOR TFT LCD TERMINALS - TOUCH - ETHERNET, SUPPLY 24VDC				2711P-T12W21D8S	AB	1									
								LT3002	INDICATOR LIGHT, 22mm, CLEAR				3SU1051-6AA70-0AA0	SIEMENS	1									
									HOLDER FOR THREE MODULES, 22mm				3SU1550-0AA10-0AA0	SIEMENS	1									
									MODULE WITH INTEGRATED LED 24Vac/dc, WHITE				3SU1401-1BB60-1AA0	SIEMENS	1									
								LT5106 LT5116 LT5206 LT5216 LT5504 LT5510 LT5514 LT5602	INDICATOR LIGHT, 22mm, RED				3SU1051-6AA20-0AA0	SIEMENS	8									
									HOLDER FOR THREE MODULES, 22mm				3SU1550-0AA10-0AA0	SIEMENS	8									
									MODULE WITH INTEGRATED LED 24Vac/dc, RED				3SU1401-1BB20-1AA0	SIEMENS	8									
								LT3003 LT3005 LT3007 LT3009 LT3011 LT3013 LT3015 LT3017	INDICATOR LIGHT, 22mm, GREEN				3SU1051-6AA40-0AA0	SIEMENS	8									
									HOLDER FOR THREE MODULES, 22mm				3SU1550-0AA10-0AA0	SIEMENS	8									
									MODULE WITH INTEGRATED LED 24Vac/dc, GREEN				3SU1401-1BB40-1AA0	SIEMENS	8									
								PB4304	PUSHBUTTON, MOMENTARY, 22mm, FLAT, BLACK				3SU1050-0AB10-0AA0	SIEMENS	1									
									HOLDER FOR THREE MODULES, 22mm				3SU1550-0AA10-0AA0	SIEMENS	1									
									CONTACT MODULE, 1NO				3SU1400-1AA10-1BA0	SIEMENS	1									
								PB2603	EMERGENCY STOP 40mm MUSHROOM PUSHBUTTON, LATCHING, 22mm, ROTATE TO UNLATCH				3SU1050-1HB20-0AA0	SIEMENS	1									
									HOLDER FOR THREE MODULES, 22mm				3SU1550-0AA10-0AA0	SIEMENS	1									
									CONTACT MODULE, 1NC, WITH MONITORING				3SU1400-1AA10-1HA0	SIEMENS	1									
									CONTACT MODULE, 1NC				3SU1400-1AA10-1CA0	SIEMENS	1									
								SS2310 SS2410	2 POSITIONS SELECTOR SWITCH, LATCHING, 22mm				3SU1052-2BF60-0AA0	SIEMENS	2									
									HOLDER FOR THREE MODULES, 22mm				3SU1550-0AA10-0AA0	SIEMENS	2									
									CONTACT MODULE, 1NO				3SU1400-1AA10-1BA0	SIEMENS	2									

REV	DATE		DESCRIPTION	VOLT.	H.P.	TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	
				600	27	BILL OF MATERIAL (NEXT)	
				PHASE	KVAR	CUSTOMER: CLARO	
				3	N/A	REF.: 22XXX-Q-00 PROJECT: NAPANEE, ON	
				FREQ. (HZ)	KW	DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON	
00	2024-07-30	X.M.	FOR APPROVAL	AMP.	TYPE	SCALING: NONE DRAWING# 12031331	
				34	12	DATE: JULY 2024 PAGE 4 OF 73	

H:\PROJECTS\2203\XXX\22031331-CLARO-NAPANEE-CONDENSINGDESIGN\22031331-01\22031331-RO_P4.DWG

A	B	C	D	E
TAGS	DESCRIPTION	CATALOG	MFG	QTY
CR2603, CR2605, CR2607, CR2609, CR2611, CR2613, CR2615, CR2619, CR2703, CR2704, CR2705, CR2706, CR2713, CR2714, CR2715, CR2716, CR2803, CR2804, CR2805, CR2806, CR2813, CR2814, CR2815, CR2816, CR2902, CR2903, CR2906, CR2907, CR2910, CR2911, CR2914, CR2915, CR2916, CR2917, CR3310, CR5609	MINI INDUSTRIAL RELAY WITH TEST BRACKET AND MECHANICAL SWITCH POSITION INDICATOR - 4P/DT 24VDC 6A(RES)/1A(IND)@230V, CR-M	1SVR405613R1000	ABB	36
	PLUG-IN BASE FOR 2/4 CD CR-M RELAYS, MOUNTING ONTO STANDARD MOUNTING RAIL, SCREW TERMINALS	1SVR405651R3000	ABB	36
	FIXING/EJECTION BRACKET, CR-M TYPE	1SVR405659R1000	ABB	36
CR2303, CR2306, CR2403, CR2406	MINI INDUSTRIAL RELAY WITH TEST BRACKET AND MECHANICAL SWITCH POSITION INDICATOR - 4P/DT 120VAC 6A(RES)/1A(IND)@230V, CR-M	1SVR405613R2000	ABB	4
	PLUG-IN BASE FOR 2/4 CD CR-M RELAYS, MOUNTING ONTO STANDARD MOUNTING RAIL, SCREW TERMINALS	1SVR405651R3000	ABB	4
	FIXING/EJECTION BRACKET, CR-M TYPE	1SVR405659R1000	ABB	4
CR2213, CR5103, CR5105, CR5107, CR5109, CR5111, CR5113, CR5115, CR5117, CR5203, CR5205, CR5207, CR5209, CR5211, CR5213, CR5215, CR5217, CR5303, CR5503, CR5505, CR5507, CR5509, CR5511, CR5513, CR5515, CR5517, CR5603, CR5605, CR5607, CR5611, CR5802, CR5906, CR6002, CR6106	OUTPUT COUPLING DEVICE, RELAY 1CD DRY CONTACT, 3A, COIL 24VDC, SCREW TERMINAL	3RQ3118-1AM00	SIEMENS	34
	CONNECTING COMB FOR 3RQ COUPLING DEVICE, 16-POLE	3RQ3901-0D	SIEMENS	2
TD2307, TD2407	TIME RELAY, ON DELAY, SP/DT, 12-240VAC/DC 50-60Hz, 0.05s @ 100h	3RP2525-1AW30	SIEMENS	2
TD2310, TD2410	TIME RELAY, FLASHER RELAY ASYMETRICAL, 1 SP/DT, 12-240VAC/DC 50-60Hz, 0.05s @ 100h	3RP2555-1AW30	SIEMENS	2
R13202, R13211	INTRINSIC RELAY, 2 CHANNELS, UNIVERSAL VOLTAGE SUPPLY	IMI-22EX-R	TURCK	2
	WALL SECTION FOR INTRINSIC RELAY	SUP INT U	E-M	1
	LEXAN PLATE FOR INTRINSIC ZONE, 7 7/8" X 9" X 1/8"	LEXAN CLAIR 7-7/8X9X1/8	ALTO	1
MI3304	MOTION TRANSMITTER SITRANS WM300 MFA, 10.8-28.8VDC	7MH7701-0AA00-0A	SIEMENS	1
MI3313	REMOTE MOUNTED AMPLIFIER RMA, 2 SENSORS, 10.8-28.8VDC	7MH7702-0B	SIEMENS	1
TRANS4502, TRANS4702	ULTRASONIC LEVEL TRANSDUCER, 2 SENSOR, 3 ALARM RELAY, 2x 4-20mA HART, SUPPLY 10.5-32VDC	FMU90-N12CB232AA1A	ENDRESS_HAUSER	2
LS4506, LS4511, LS4706, LS4711	ULTRASONIC LEVEL PROBE CLASS 1 DIV 1, 30M CABLE	FDU91-SN6AA	ENDRESS_HAUSER	4

A	B	C	D	E
TAGS	DESCRIPTION	CATALOG	MFG	QTY
	SCREWLESS END STOP, DARK GREY, DIN 3, BAZ1	1SNK 900 002 R0000	ABB	54
	END SECTION, DARK GREY, EK2.5 FOR ZK2.5, ZK4 AND ZK6 TERMINAL	1SNK 705 910 R0000	ABB	15
	END SECTION, DARK GREY, ES4-SF FOR ZS4-SF1 FUSE HOLDER	1SNK 508 960 R0000	ABB	5
	JUMPER BAR, 50 POLES, ORANGE, 32A, JB5-50 FOR ZK2.5 TERMINAL	1SNK 905 350 R0000	ABB	3
	JUMPER BAR, 10 POLES, GRAY, 35A, PC81-10 FOR ZS4-SF1 FUSE HOLDER	017352311	ABB	3
	PI-SPRING TERMINAL BLOCK, FEED-THROUGH WITH 2 CONNECTIONS, GREY BODY, 20A, 600V, 26-12AWG, ZK2.5	1SNK 705 010 R0000	ABB	460
	PI-SPRING TERMINAL BLOCK, FEED-THROUGH WITH 2 CONNECTIONS, BLUE BODY, 20A, 600V, 26-12AWG, ZK2.5-BL	1SNK 705 020 R0000	ABB	8
	PI-SPRING TERMINAL BLOCK, FEED-THROUGH WITH 2 CONNECTIONS, GREEN BODY, 20A, 600V, 26-12AWG, ZK2.5-GN	1SNK 705 061 R0000	ABB	29
	PI-SPRING TERMINAL BLOCK, FEED-THROUGH WITH 2 CONNECTIONS, RED BODY, 20A, 600V, 26-12AWG, ZK2.5-RD	1SNK 705 062 R0000	ABB	28
	PI-SPRING TERMINAL BLOCK FOR GROUND WIRES, FEED-THROUGH WITH 2 CONNECTIONS, GREEN/YELLOW BODY, 600V, 26-12AWG, ZK2.5-PE	1SNK 705 150 R0000	ABB	12
	PI-SPRING TERMINAL BLOCK, FEED-THROUGH WITH 2 CONNECTIONS, GREY BODY, 50A, 600V, 24-8AWG, ZK6	1SNK 708 010 R0000	ABB	28
	PI-SPRING TERMINAL BLOCK FOR GROUND WIRES, FEED-THROUGH WITH 2 CONNECTIONS, GREEN/YELLOW BODY, 600V, 24-8AWG, ZK6-PE	1SNK 708 150 R0000	ABB	9
	SYMETRICAL DIN RAIL, TS35/F6	0173 220.05	ENTRELEC	15
LT3002, LT3003, LT3005, LT3007, LT3009, LT3011, LT3013, LT3015, LT3017, LT5106, LT5116, LT5206, LT5216, LT5504, LT5510, LT5514, LT5602, PB2603, PB4304, SS2310, SS2410	LABEL HOLDER, 22mm, BLACK	3SUI900-0AG10-0AA0	SIEMENS	21

REV	DATE	DESCRIPTION	VOLT.	H.P.	TITLE	SCALING	DRAWING#
			600	27	TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	NONE	12031331
			PHASE 3	KVAR N/A	BILL OF MATERIAL (NEXT)		
			FREQ. (HZ) 60	KW N/A	CUSTOMER: CLARO		
			AMP.	TYPE	REF.: 22XXX-Q-00 PROJECT: NAPANEE, ON		
00	2024-07-30	X.M. FOR APPROVAL	34	12	DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON	DATE: JULY 2024	PAGE 5 OF 73


H:\PROJECTS\12031331\12031331-CLARO-NAPANEE-ONDESIGN\DESIGN\12031331-1R012031331-1R0_P5.DWG

LOCK-OUT SWITCH

TAGS	DESCRIPTION	CATALOG	MFG	QTY
DS1510 DS1610A	LOCKABLE MANUAL SWITCH ENCLOSURE CLASS1 DIV1, NEMA 4	SA5762	ADALET	2
	THERMAL MAGNETIC CIRCUIT BREAKER, CLASS 10, 3Ø, BREAKING CAP. 2kA @ 690V, RATED CURRENT 20AMPS, SØ	3RV23 21-4BC10	SIEMENS	2
	AUXILIARY CONTACT, FRONT MOUNT, SIZE 00, 0 & 2 MOTOR STARTER PROTECTORS, 1ND & 1NC	3RV29 01-1E	SIEMENS	2
	AUXILIARY CONTACT, SIDE MOUNT, SIZE 00, 0, 2, 3 MOTOR STARTER PROTECTORS, 2ND	3RV29 01-1B	SIEMENS	2
	PUSH-IN LUG, SIZE 00, 0	3RV29 28-0B	SIEMENS	8
DS1610 DS1610B DS1710 DS1710A DS1710B DS1810	LOCKABLE MANUAL SWITCH ENCLOSURE CLASS1 DIV1, NEMA 4	SA5762	ADALET	6
	THERMAL MAGNETIC CIRCUIT BREAKER, CLASS 10, 3Ø, BREAKING CAP. 2kA @ 690V, RATED CURRENT 20AMPS, SØ	3RV23 21-4BC10	SIEMENS	6
	AUXILIARY CONTACT, FRONT MOUNT, SIZE 00, 0 & 2 MOTOR STARTER PROTECTORS, 1ND & 1NC	3RV29 01-1E	SIEMENS	6
	PUSH-IN LUG, SIZE 00, 0	3RV29 28-0B	SIEMENS	24

LOCAL CONTROL STATIONS

TAGS	DESCRIPTION	CATALOG	MFG	QTY
	EXPLOSIONPROOF CONTROL STATION, CLASS I DIV 1, CAST ALUMINUM, NEMA 4, 7, 9, 2 UNITS, WALL-MOUNT	X2-N4-10-462	ADALET	3
SS2902 SS2906 SS2910	3 POSITION SELECTOR, MAINTAINED OPERATORS, 2ND	1SS	ADALET	3
PB2603A PB2607 PB2617	2 POSITION PUSH PULL MAINTAINED, RED, 1ND&1NC	1PB	ADALET	3
	NAMEPLATE	XNPWB	ADALET	3
	EXPLOSIONPROOF CONTROL STATION, CLASS I DIV 1, CAST ALUMINUM, NEMA 4, 7, 9, 3 UNITS, WALL-MOUNT	X3-N4-10-111-462	ADALET	5
SS2703 SS2713 SS2803 SS2813 SS2914	3 POSITION SELECTOR, MAINTAINED OPERATORS, 2ND	1SS	ADALET	5
SS2705 SS2715 SS2805 SS2815 SS2916	3 POSITION SELECTOR, SPRING RETURN OPERATORS, 2ND	1SSS	ADALET	5
PB2605 PB2609 PB2611 PB2613 PB2615	2 POSITION PUSH PULL MAINTAINED, RED, 1ND&1NC	1PB	ADALET	5
	NAMEPLATE	XNPWB	ADALET	15

REV		DATE		DESCRIPTION		VOLT.	H.P.	TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		
						600	27	BILL OF MATERIAL (NEXT)		
						PHASE	KVAR			
						3	N/A	CUSTOMER: CLARO		
						FREQ.	KW	REF.: 22XXX-Q-00 PROJECT: NAPANEE, ON		
						(HZ)	N/A	DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON		
00	2024-07-30	X.M.	FOR APPROVAL			AMP.	TYPE	SCALING: NONE DRAWING# 12031331		
						34	12	DATE: JULY 2024 PAGE 6 OF 73		

H:\PROJECTS\22031XXX\22031331-CLARO-NAPANEE-CONDENSINGDESIGN\22031331-RD\22031331-RD_P&IDWG

A

B

C

D

E

1

1

2

2

3

3

4


4

BLANK PAGE

5

5

H:\PROJECTS\12031331\12031331-CLARO-NAPANEE-ONDESIGN\DESIGN\12031331-RO_P7.DWG

REV	DATE		DESCRIPTION	VOLT.	H.P.	TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	
				600	27	BLANK PAGE	
				PHASE	KVAR	CUSTOMER: CLARO	
				3	N/A	REF.: 22XXX-Q-00 PROJECT: NAPANEE, ON	
				FREQ.	KW	DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON	SCALING: NONE DRAWING# 12031331
				(HZ) 60	N/A		DATE: JULY 2024 PAGE 7 OF 73
00	2024-07-30	X.M.	FOR APPROVAL	AMP.	TYPE		
				34	12		

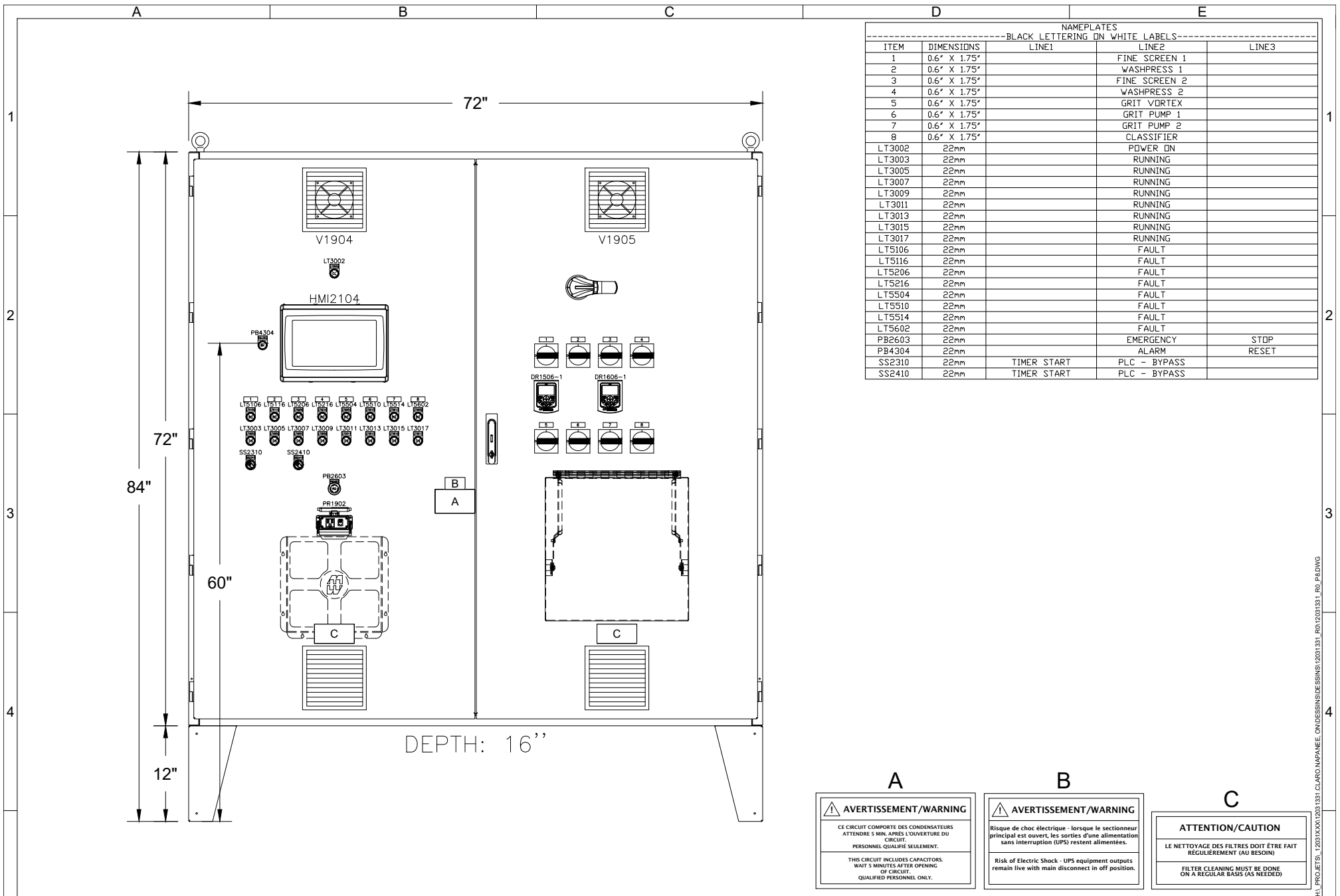
A

B

C

D

E



A

⚠️ **AVERTISSEMENT/WARNING**

CE CIRCUIT COMPORTE DES CONDENSATEURS
ATTENDRE 5 MIN. APRES L'OUVERTURE DU
CIRCUIT.
PERSONNEL QUALIFIE SEULEMENT.

THIS CIRCUIT INCLUDES CAPACITORS.
WAIT 5 MINUTES AFTER OPENING
OF CIRCUIT.
QUALIFIED PERSONNEL ONLY.

B

⚠️ **AVERTISSEMENT/WARNING**

Risque de choc électrique - lorsque le sectionneur
principal est ouvert, les sorties d'une alimentation
sans interruption (UPS) restent alimentées.

Risk of Electric Shock - UPS equipment outputs
remain live with main disconnect in off position.

C

ATTENTION/CAUTION

LE NETTOYAGE DES FILTRES DOIT ÊTRE FAIT
RÉGULIÈREMENT (AU BESOIN)

FILTER CLEANING MUST BE DONE
ON A REGULAR BASIS (AS NEEDED)

5	REV	DATE	DESCRIPTION	VOLT.	H.P.	TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	
				600	27	EXTERNAL PANEL LAYOUT	
				PHASE	KVAR	CUSTOMER: CLARO	
				3	N/A	REF.: 22XXX-Q-00	
				FREQ.	KW	PROJECT: NAPANEE, ON	
				(HZ)	N/A	DRAWN BY: X.MONTAMBAULT	
				AMP.	TYPE	CHECKED BY: C.SAMSON	
				34	12		
	00	2024-07-30	X.M. FOR APPROVAL				

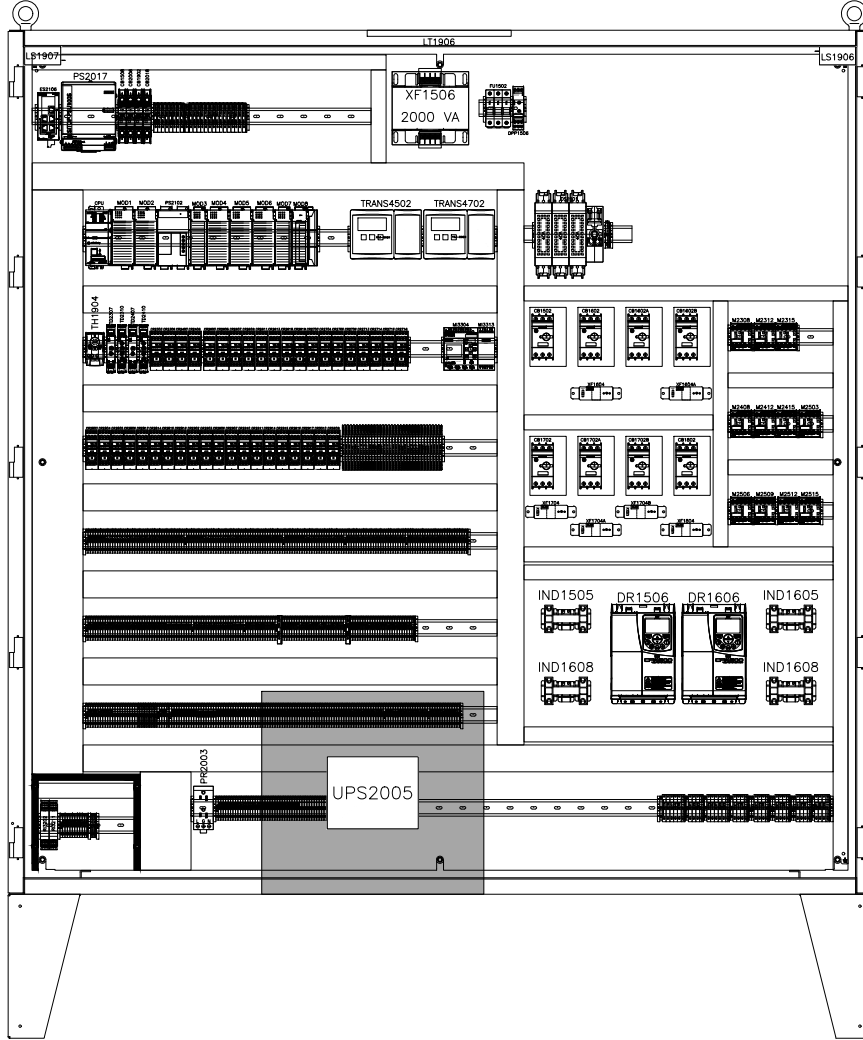
SCALING: **1 - 16**

DATE: **JULY 2024**

DRAWING# **12031331**

PAGE **8** OF **73**

H:_PROJETS_12031331\CLARO_NAPANEE_CONDENSINIS\2031331_ROW\2031331_ROW_PBDWG



REV	DATE	DESCRIPTION	VOLT.	H.P.
00	2024-07-30	X.M. FOR APPROVAL	600	27
			PHASE 3	KVAR N/A
			FREQ. (HZ) 60	KW N/A
			AMP. 34	TYPE 12

TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL
INTERNAL PANEL LAYOUT
CUSTOMER: CLARO
REF.: 22XXX-Q-00 **PROJECT:** NAPANEE, ON
DRAWN BY: X.MONTAMBAULT **CHECKED BY:** C.SAMSON

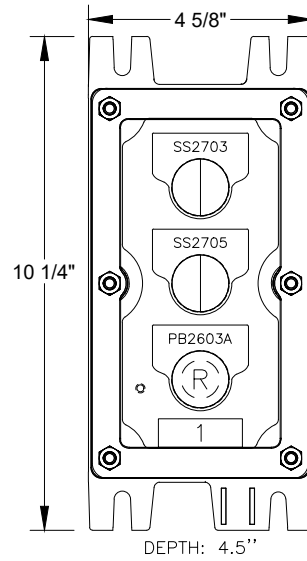
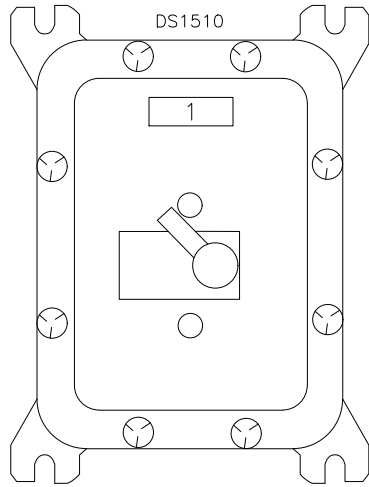
SCALING: **1 - 16**

DATE: **JULY 2024**

DRAWING: **12031331**

PAGE **9** OF **73**

H:_PROJETS\12031331\CLARO_NAPANEE_ONDESINS\DESINS\12031331_R01\2031331_R01.PRDWG

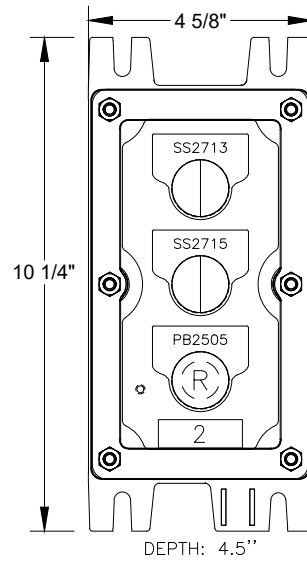
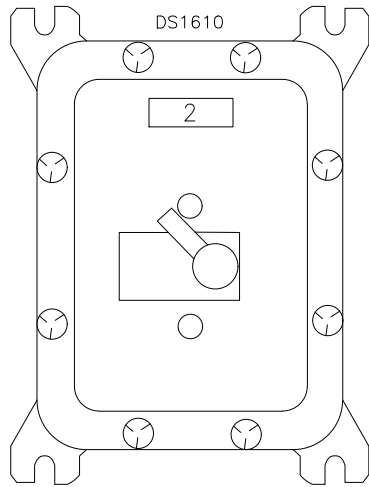


FINE SCREEN 1
LOCAL CONTROL STATION

HAND - OFF - AUTO

REVERSE - STOP - FORWARD

EMERGENCY STOP



WASHPRESS 1
LOCAL CONTROL STATION

HAND - OFF - AUTO

REVERSE - STOP - FORWARD

EMERGENCY STOP

NAMEPLATES				
---BLACK LETTERING ON WHITE LABELS---				
ITEM	DIMENSIONS	LIGNE1	LIGNE2	LIGNE3
1	0.6' X 1.75'		FINE SCREEN 1	
2	0.6' X 1.75'		WASHPRESS 1	
SS2603	30mm	-OFF-	HAND AUTO	
SS2605	30mm	-STOP-	REVERSE FORWARD	
SS2613	30mm	-OFF-	HAND AUTO	
SS2615	30mm	-STOP-	REVERSE FORWARD	
PB2605A	30mm	EMERGENCY	STOP	
PB2607	30mm	EMERGENCY	STOP	

CLASS 1 DIV 1
GROUP C & D

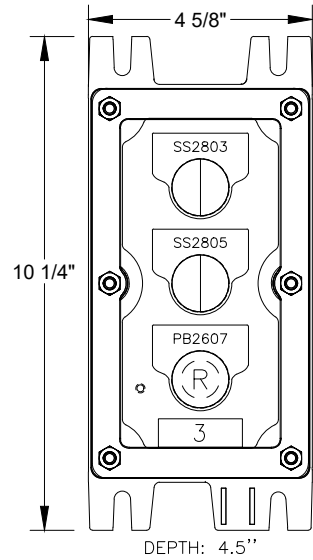
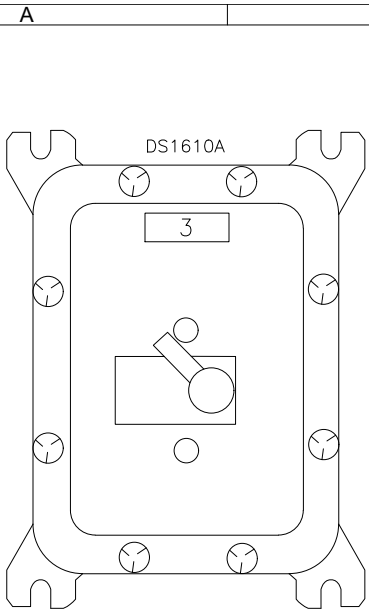
-INSTALL IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) OR CANADIAN ELECTRICAL CODE (CEC), AND ANY APPLICABLE LOCAL CODES, BASED ON THE INSTALLATION LOCATION

REV	DATE	DESCRIPTION	VOLT.	H.P.
00	2024-07-30	X.M. FOR APPROVAL	600	27
			PHASE	KVAR
			3	N/A
			FREQ.	KW
			(HZ) 60	N/A
			AMP.	TYPE
			34	12

TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	
LOCAL CONTROL STATIONS	
CUSTOMER: CLARO	
REF.: 22XXX-Q-00	PROJECT: NAPANEE, ON
DRAWN BY: X.MONTAMBAULT	CHECKED BY: C.SAMSON

SCALING: 1 - 4	DRAWING# 12031331
DATE: JULY 2024	PAGE 10 OF 73

H:\PROJETS\12031331\CLARO\NAPANEE_CND\SSINS\DESSINS\12031331_R01\2031331_R01_P10.DWG

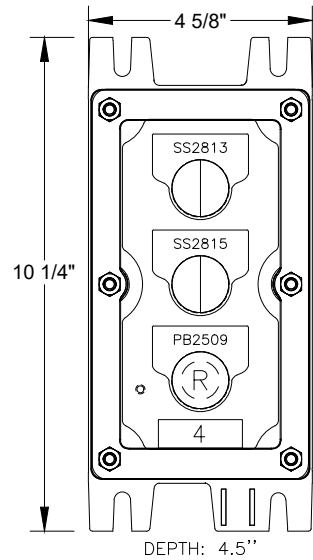
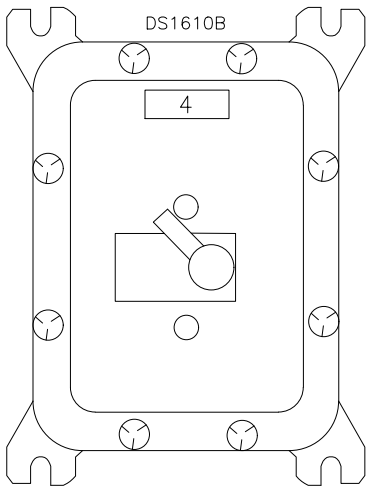


FINE SCREEN 2
LOCAL CONTROL STATION

HAND - OFF - AUTO

REVERSE - STOP - FORWARD

EMERGENCY STOP



WASHPRESS 2
LOCAL CONTROL STATION

HAND - OFF - AUTO

REVERSE - STOP - FORWARD

EMERGENCY STOP

NAMEPLATES				
---BLACK LETTERING ON WHITE LABELS---				
ITEM	DIMENSIONS	LIGNE1	LIGNE2	LIGNE3
1	0.6' X 1.75'		FINE SCREEN 2	
2	0.6' X 1.75'		WASHPRESS 2	
SS2803	30mm	-OFF-	HAND AUTO	
SS2805	30mm	-STOP-	REVERSE FORWARD	
SS2813	30mm	-OFF-	HAND AUTO	
SS2815	30mm	-STOP-	REVERSE FORWARD	
PB2607	30mm	EMERGENCY	STOP	
PB2609	30mm	EMERGENCY	STOP	

CLASS 1 DIV 1
GROUP C & D

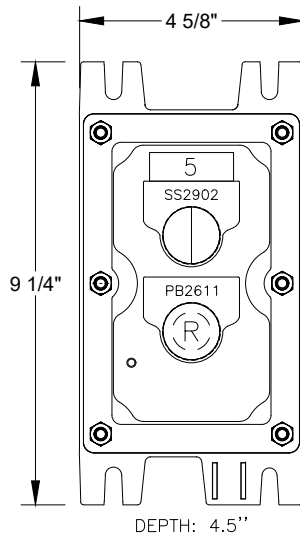
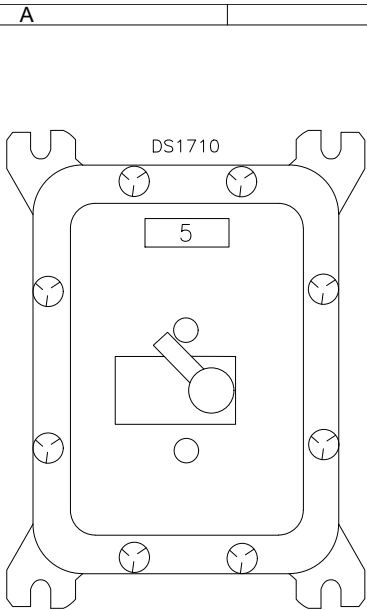
-INSTALL IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) OR CANADIAN ELECTRICAL CODE (CEC), AND ANY APPLICABLE LOCAL CODES, BASED ON THE INSTALLATION LOCATION

REV	DATE	DESCRIPTION	VOLT.	H.P.
00	2024-07-30	X.M. FOR APPROVAL	600	27
			PHASE	KVAR
			3	N/A
			FREQ.	KW
			60 (HZ)	N/A
			AMP.	TYPE
			34	12

TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	
LOCAL CONTROL STATIONS (NEXT)	
CUSTOMER: CLARO	
REF.: 22XXX-Q-00	PROJECT: NAPANEE, ON
DRAWN BY: X.MONTAMBAULT	CHECKED BY: C.SAMSON

SCALING: 1 - 4	DRAWING# 12031331
DATE: JULY 2024	PAGE 11 OF 73

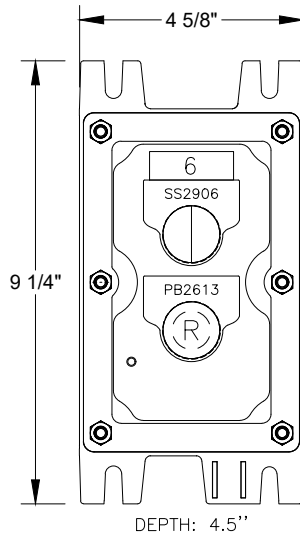
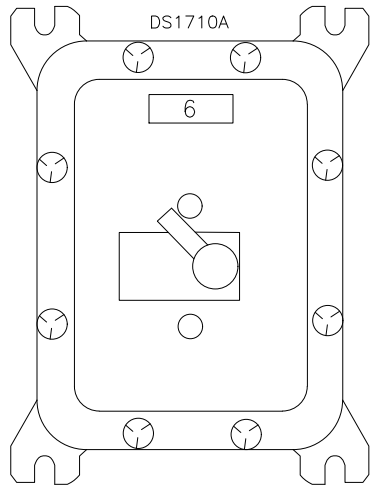
H:\PROJETS\12031331\CLARO\NAPANEE_CNDISSINS\DESSINS\12031331_R01\2031331_R01.DWG



GRIT VORTEX
LOCAL CONTROL STATION

HAND - OFF - AUTO

REVERSE - STOP - FORWARD



GRIT PUMP 1
LOCAL CONTROL STATION

HAND - OFF - AUTO

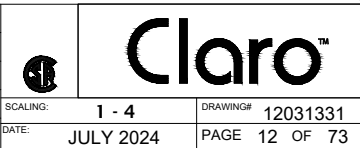
REVERSE - STOP - FORWARD

NAMEPLATES				
-----BLACK LETTERING ON WHITE LABELS-----				
ITEM	DIMENSIONS	LIGNE1	LIGNE2	LIGNE3
1	0.6' X 1.75'		GRIT VORTEX	
2	0.6' X 1.75'		GRIT PUMP 1	
SS2902	30mm	-OFF-	HAND AUTO	
SS2906	30mm	-OFF-	HAND AUTO	
PB2611	30mm	EMERGENCY	STOP	
PB2613	30mm	EMERGENCY	STOP	

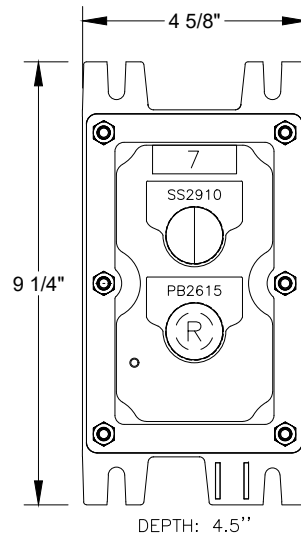
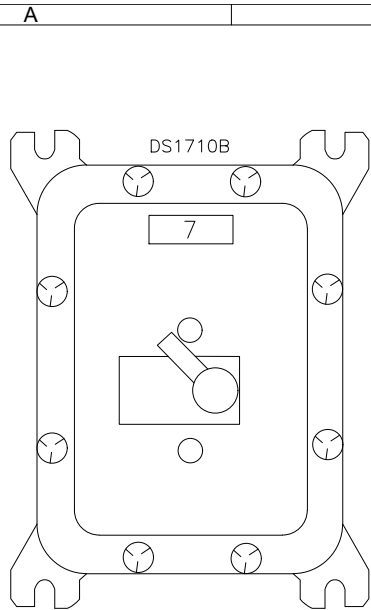
CLASS 1 DIV 1
GROUP C & D

-INSTALL IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) OR
CANADIAN ELECTRICAL CODE (CEC), AND ANY APPLICABLE LOCAL CODES,
BASED ON THE INSTALLATION LOCATION

REV	DATE	DESCRIPTION	VOLT.	H.P.	TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL
			600	27	LOCAL CONTROL STATIONS (NEXT)
			PHASE 3	KVAR N/A	CUSTOMER: CLARO
			FREQ. 60 (HZ)	KW N/A	REF.: 22XXX-Q-00 PROJECT: NAPANEE, ON
			AMP. 34	TYPE 12	DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON
00	2024-07-30	X.M. FOR APPROVAL			SCALING: 1 - 4 DRAWING# 12031331
					DATE: JULY 2024 PAGE 12 OF 73



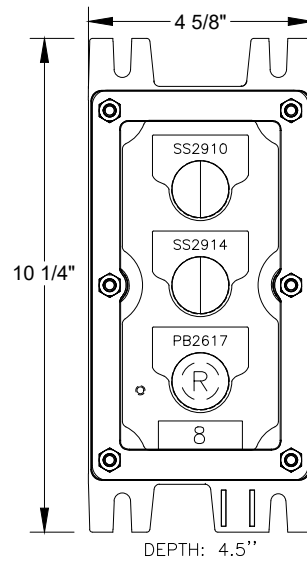
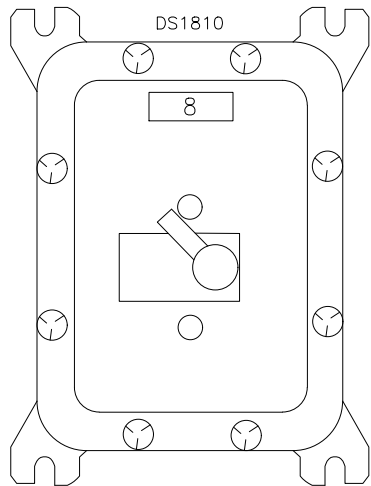
H:_PROJETS\12031331\CLARO\NAPANEE_CNDISSINS\DESSINS\12031331_R01\2031331_R01.P12.DWG



GRIT PUMP 2
LOCAL CONTROL STATION

HAND - OFF - AUTO

REVERSE - STOP - FORWARD



CLASSIFIER
LOCAL CONTROL STATION

HAND - OFF - AUTO

REVERSE - STOP - FORWARD

EMERGENCY STOP

NAMEPLATES				
---BLACK LETTERING ON WHITE LABELS---				
ITEM	DIMENSIONS	LIGNE1	LIGNE2	LIGNE3
7	0.6" X 1.75"		GRIT PUMP 2	
8	0.6" X 1.75"		CLASSIFIER	
SS2910	30mm	-OFF-	HAND AUTO	
SS2914	30mm	-OFF-	HAND AUTO	
SS2916	30mm	-STOP-	REVERSE FORWARD	
PB2607	30mm	EMERGENCY	STOP	
PB2609	30mm	EMERGENCY	STOP	

CLASS 1 DIV 1
GROUP C & D

-INSTALL IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) OR
CANADIAN ELECTRICAL CODE (CEC), AND ANY APPLICABLE LOCAL CODES,
BASED ON THE INSTALLATION LOCATION

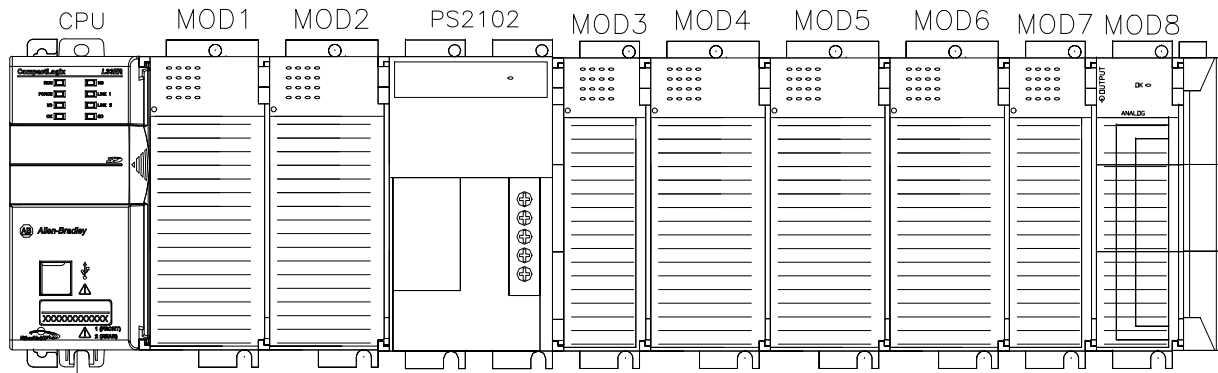
REV	DATE	DESCRIPTION	VOLT.	H.P.
00	2024-07-30	X.M. FOR APPROVAL	600	27
			PHASE	KVAR
			3	N/A
			FREQ.	KW
			60	N/A
			AMP.	TYPE
			34	12

TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	
LOCAL CONTROL STATIONS (NEXT)	
CUSTOMER: CLARO	
REF.: 22XXX-Q-00	PROJECT: NAPANEE, ON
DRAWN BY: X.MONTAMBAULT	CHECKED BY: C.SAMSON

SCALING: 1 - 4	DRAWING# 12031331
DATE: JULY 2024	PAGE 13 OF 73

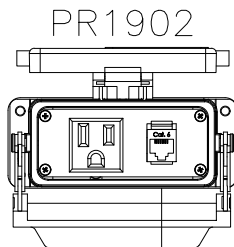
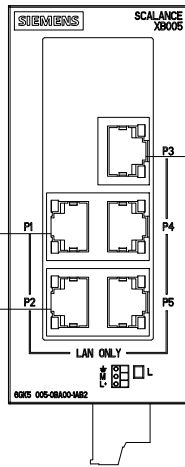


H:_PROJETS\12031331\CLARO_NAPANEE_CNDISSINS\2031331_R012031331_R0_P13.DWG



P2
MP-54RJ45DNNE-015

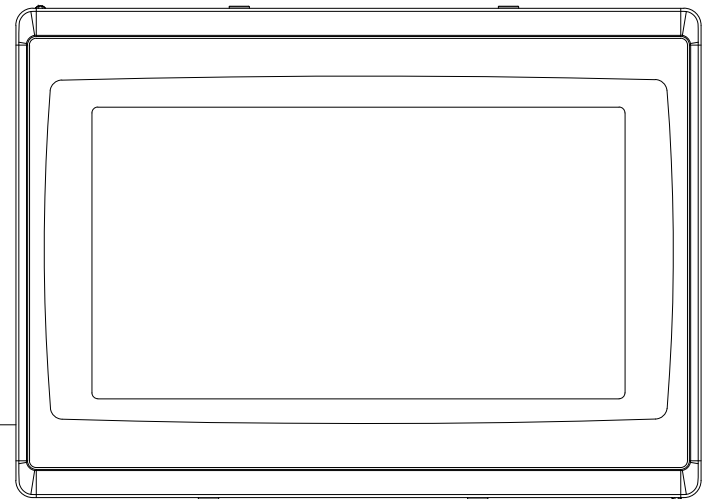
ES2106



P3
MP-54RJ45DNNE-015

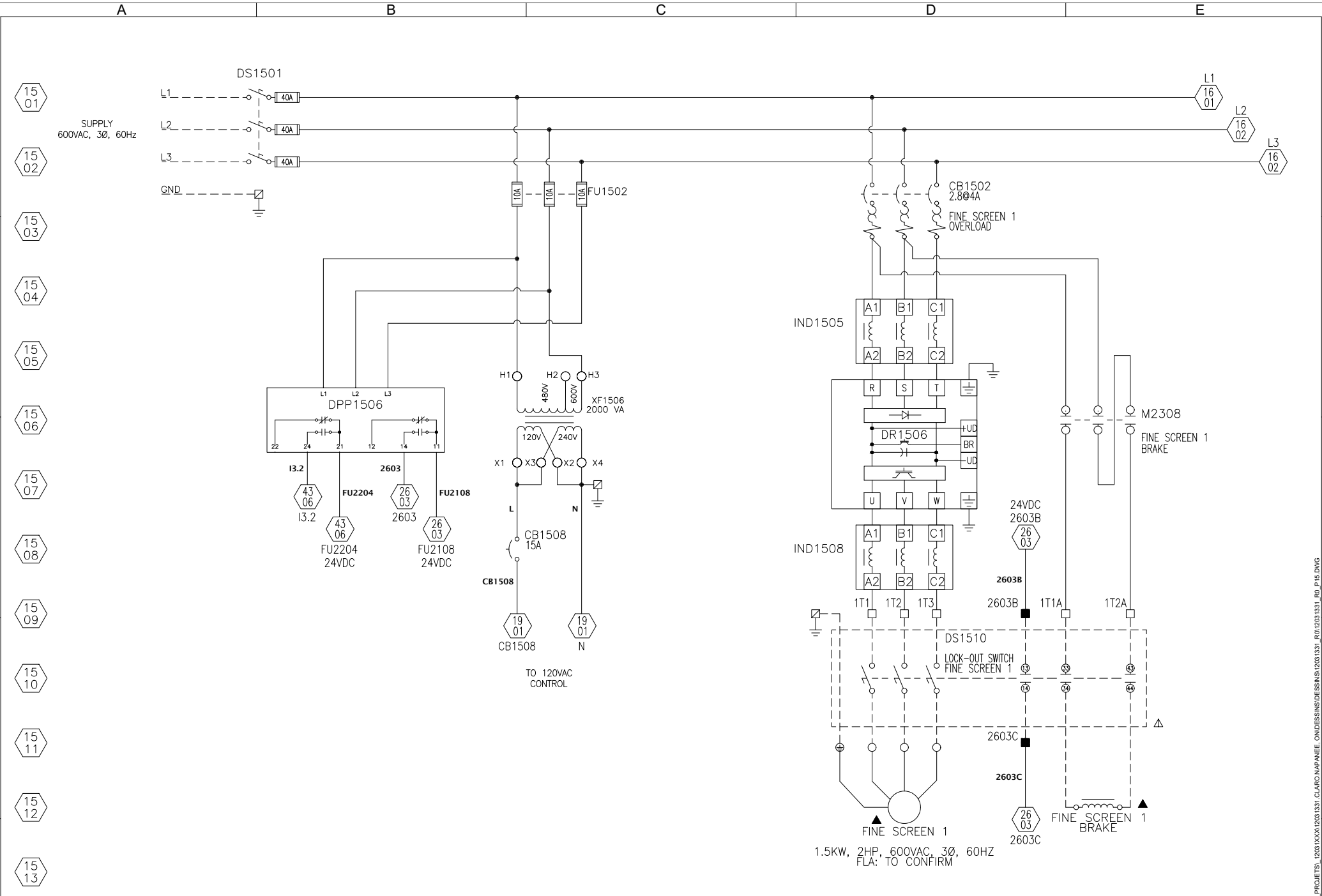
P2
MP-54RJ45DNNE-015

HMI2104



REV	DATE	DESCRIPTION	VOLT.	H.P.	TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	
			600	27	PLC CONFIGURATION	
			PHASE 3	KVAR N/A	CUSTOMER: CLARO	
			FREQ. 60 (HZ)	KW N/A	REF.: 22XXX-Q-00 PROJECT: NAPANEE, ON	
			AMP. 34	TYPE 12	DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON	
00	2024-07-30	X.M. FOR APPROVAL				SCALING: NONE DATE: JULY 2024 DRAWING# 12031331 PAGE 14 OF 73

H:\PROJETS\12031331\12031331-CLARO-NAPANEE_ONDESIGN\DESIGN\12031331-RD12031331-RD_P14.DWG

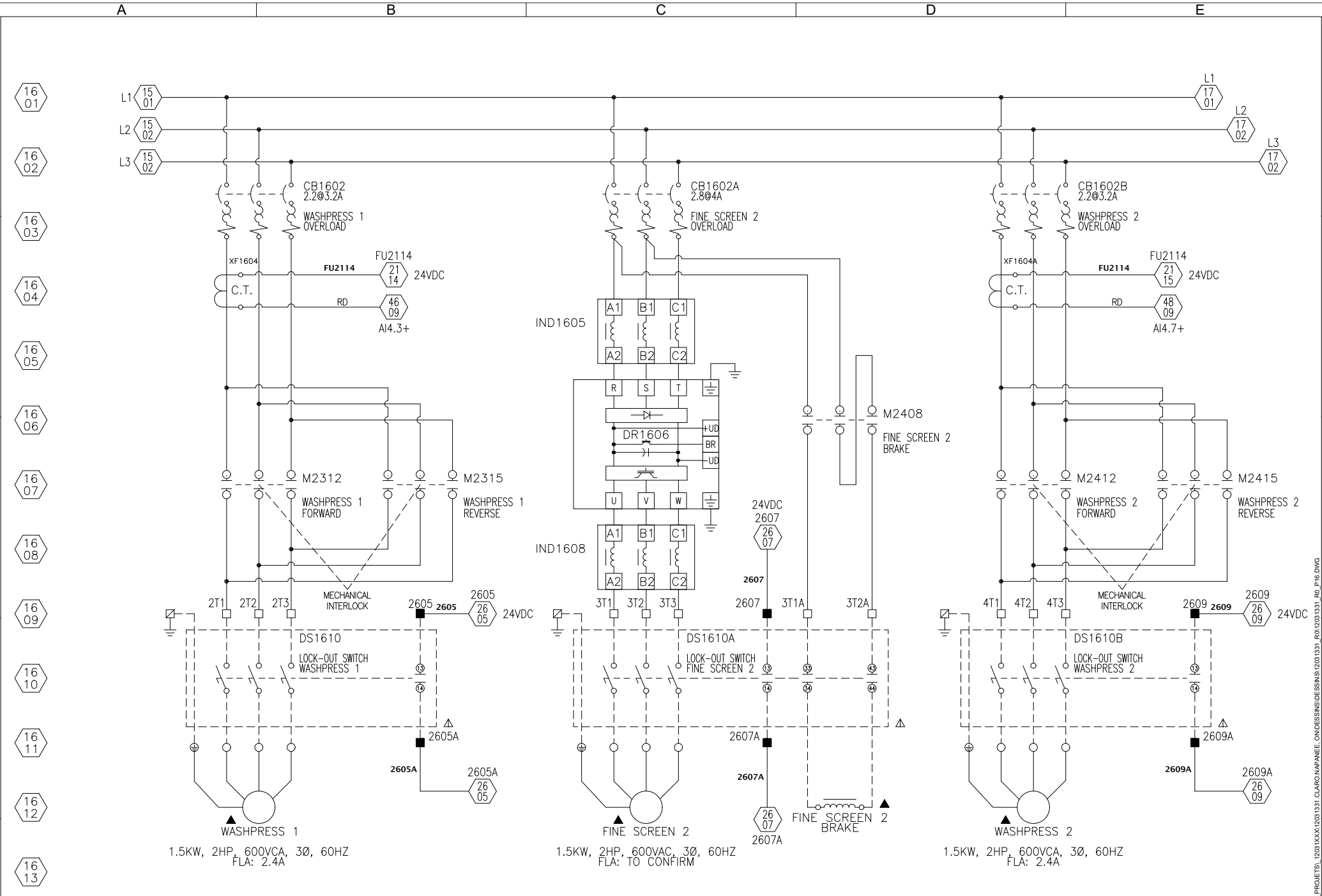


REV	DATE	DESCRIPTION	VOLT.	H.P.	TITLE	SCALING:	DATE:
			600	27	SCREENING & GRIT REMOVAL CONTROL PANEL	NONE	JULY 2024
			3	N/A	POWER DIAGRAM		
			60	N/A	CUSTOMER: CLARO		
			34	12	REF.: 22XXX-Q-00 PROJECT: NAPANEE, ON		
00	2024-07-30	X.M. FOR APPROVAL			DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON		

CLARO™

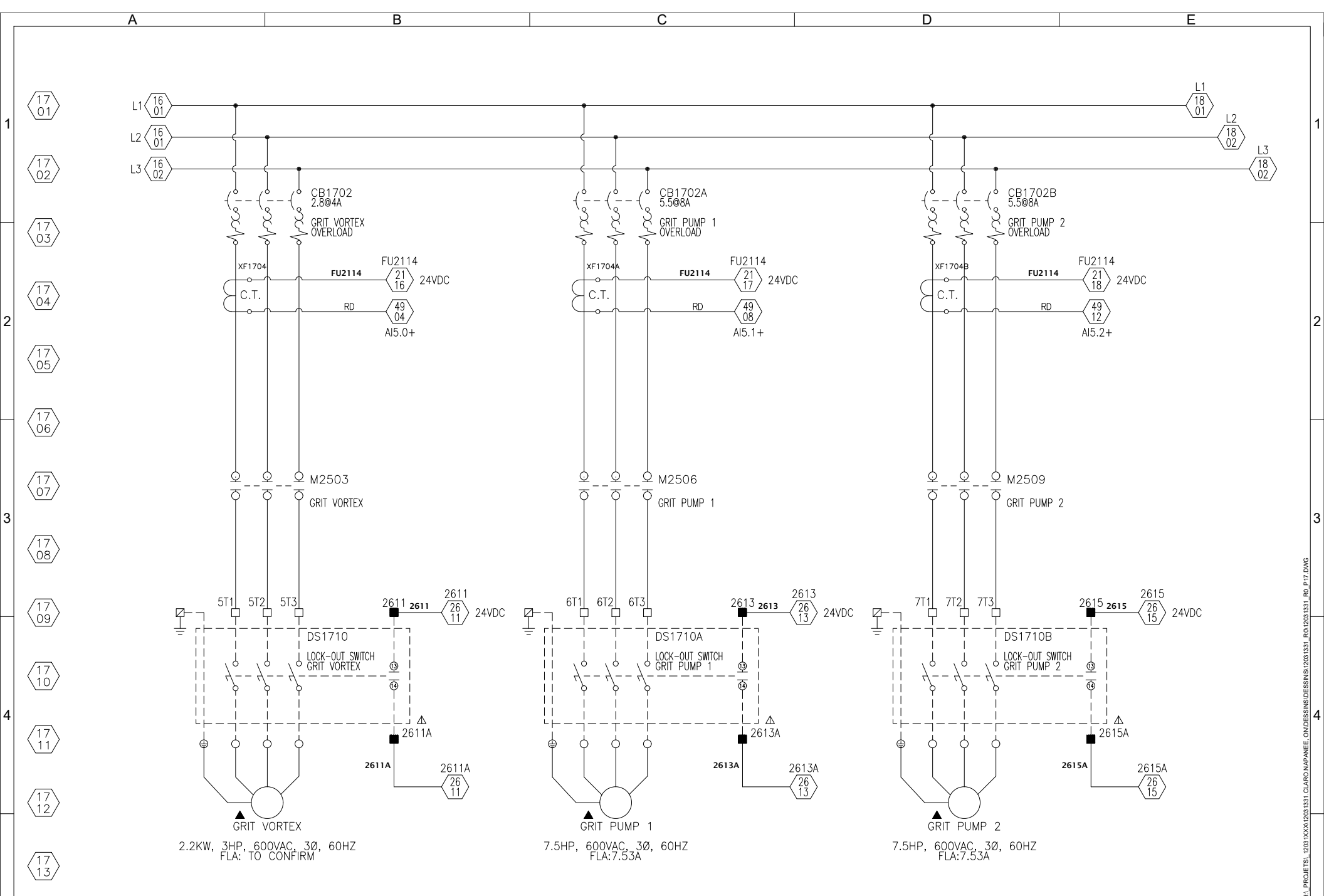
DRAWING# 12031331
PAGE 15 OF 73

H:\PROJECTS\12031331\2024\12031331-CLARO-NAPANEE-ONDESIGN\DESIGN\12031331-RO12031331-RO_P15.DWG



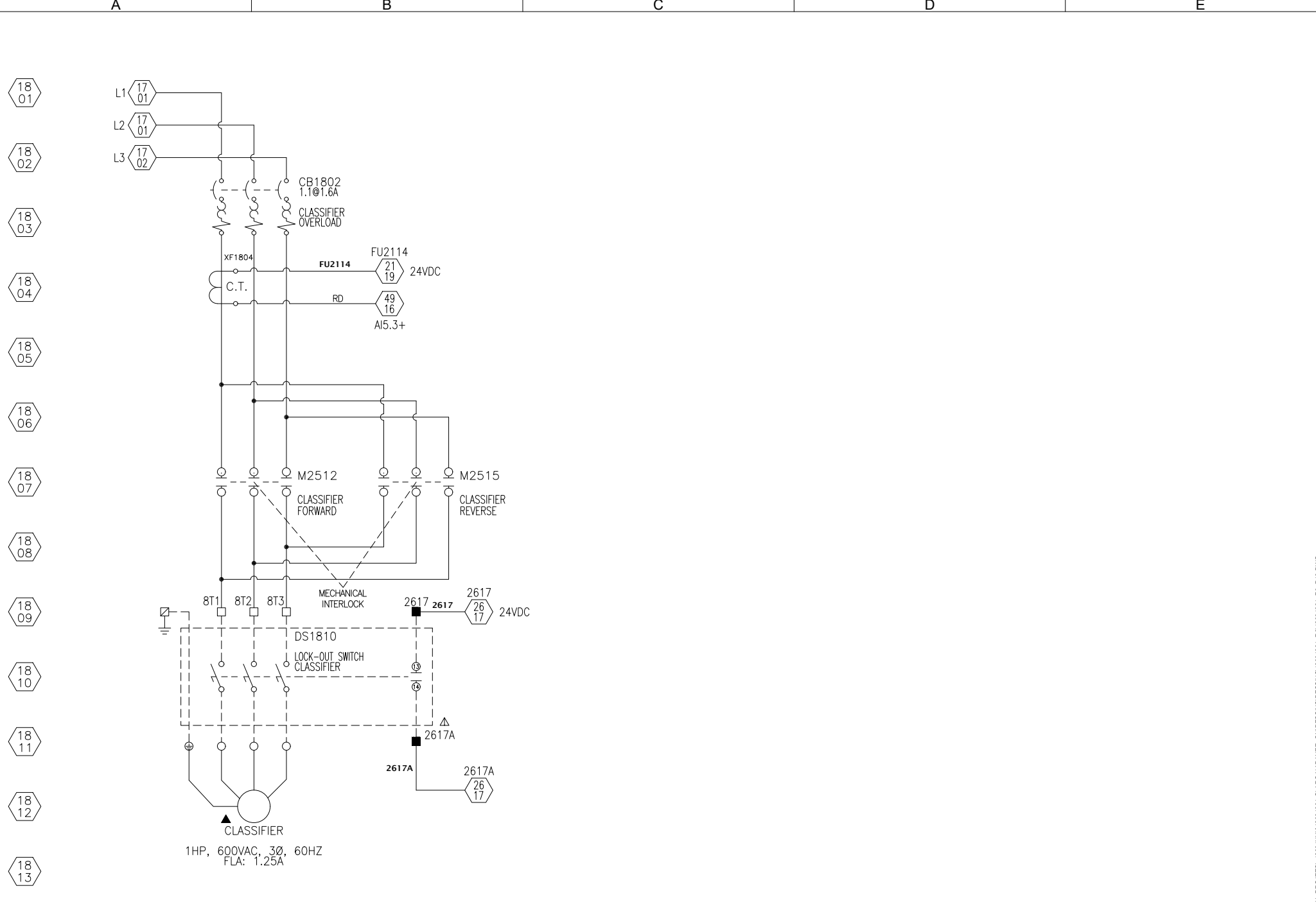
<table border="1"> <tr> <th>REV</th> <th>DATE</th> <th>DESCRIPTION</th> <th>VOLT.</th> <th>H.P.</th> <th>TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL</th> </tr> <tr> <td></td> <td></td> <td></td> <td>600</td> <td>27</td> <td>POWER DIAGRAM (NEXT)</td> </tr> <tr> <td></td> <td></td> <td></td> <td>PHASE 3</td> <td>KVAR N/A</td> <td>CUSTOMER: CLARO</td> </tr> <tr> <td></td> <td></td> <td></td> <td>FREQ. 60 (HZ)</td> <td>KW N/A</td> <td>REF.: 22XXX-Q-00 PROJECT: NAPANEE, ON</td> </tr> <tr> <td></td> <td></td> <td></td> <td>AMP. 34</td> <td>TYPE 12</td> <td>DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON</td> </tr> </table>				REV	DATE	DESCRIPTION	VOLT.	H.P.	TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL				600	27	POWER DIAGRAM (NEXT)				PHASE 3	KVAR N/A	CUSTOMER: CLARO				FREQ. 60 (HZ)	KW N/A	REF.: 22XXX-Q-00 PROJECT: NAPANEE, ON				AMP. 34	TYPE 12	DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON		
REV	DATE	DESCRIPTION	VOLT.	H.P.	TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL																														
			600	27	POWER DIAGRAM (NEXT)																														
			PHASE 3	KVAR N/A	CUSTOMER: CLARO																														
			FREQ. 60 (HZ)	KW N/A	REF.: 22XXX-Q-00 PROJECT: NAPANEE, ON																														
			AMP. 34	TYPE 12	DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON																														
<table border="1"> <tr> <td>SCALING: NONE</td> <td>DRAWING# 12031331</td> </tr> <tr> <td>DATE: JULY 2024</td> <td>PAGE 16 OF 73</td> </tr> </table>						SCALING: NONE	DRAWING# 12031331	DATE: JULY 2024	PAGE 16 OF 73																										
SCALING: NONE	DRAWING# 12031331																																		
DATE: JULY 2024	PAGE 16 OF 73																																		

H:\PROJECTS\22031XXX\22031331-CLARO-NAPANEE-ONDESIGN\DESIGN\22031331-REF\22031331-REF_P16.DWG




<table border="1"> <tr> <th>REV</th> <th>DATE</th> <th></th> <th>DESCRIPTION</th> </tr> <tr> <td>00</td> <td>2024-07-30</td> <td>X.M.</td> <td>FOR APPROVAL</td> </tr> </table>				REV	DATE		DESCRIPTION	00	2024-07-30	X.M.	FOR APPROVAL	<table border="1"> <tr> <td>VOLT.</td> <td>600</td> </tr> <tr> <td>PHASE</td> <td>3</td> </tr> <tr> <td>FREQ. (HZ)</td> <td>60</td> </tr> <tr> <td>AMP.</td> <td>34</td> </tr> </table>		VOLT.	600	PHASE	3	FREQ. (HZ)	60	AMP.	34	<table border="1"> <tr> <td>H.P.</td> <td>27</td> </tr> <tr> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>KW</td> <td>N/A</td> </tr> <tr> <td>TYPE</td> <td>12</td> </tr> </table>		H.P.	27	KVAR	N/A	KW	N/A	TYPE	12	<table border="1"> <tr> <td colspan="2">TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL</td> </tr> <tr> <td colspan="2">POWER DIAGRAM (NEXT)</td> </tr> <tr> <td colspan="2">CUSTOMER: CLARO</td> </tr> <tr> <td>REF.: 22XXX-Q-00</td> <td>PROJECT: NAPANEE, ON</td> </tr> <tr> <td>DRAWN BY: X.MONTAMBAULT</td> <td>CHECKED BY: C.SAMSON</td> </tr> </table>		TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		POWER DIAGRAM (NEXT)		CUSTOMER: CLARO		REF.: 22XXX-Q-00	PROJECT: NAPANEE, ON	DRAWN BY: X.MONTAMBAULT	CHECKED BY: C.SAMSON	<table border="1"> <tr> <td colspan="2"> </td> </tr> <tr> <td>SCALING:</td> <td>NONE</td> </tr> <tr> <td>DATE:</td> <td>JULY 2024</td> </tr> <tr> <td>DRAWING#</td> <td>12031331</td> </tr> <tr> <td colspan="2">PAGE 17 OF 73</td> </tr> </table>				SCALING:	NONE	DATE:	JULY 2024	DRAWING#	12031331	PAGE 17 OF 73	
REV	DATE		DESCRIPTION																																																				
00	2024-07-30	X.M.	FOR APPROVAL																																																				
VOLT.	600																																																						
PHASE	3																																																						
FREQ. (HZ)	60																																																						
AMP.	34																																																						
H.P.	27																																																						
KVAR	N/A																																																						
KW	N/A																																																						
TYPE	12																																																						
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL																																																							
POWER DIAGRAM (NEXT)																																																							
CUSTOMER: CLARO																																																							
REF.: 22XXX-Q-00	PROJECT: NAPANEE, ON																																																						
DRAWN BY: X.MONTAMBAULT	CHECKED BY: C.SAMSON																																																						
SCALING:	NONE																																																						
DATE:	JULY 2024																																																						
DRAWING#	12031331																																																						
PAGE 17 OF 73																																																							

H:\PROJECTS\12031331\22031331-CLARO-NAPANEE-ONDESIGN\DESIGN\12031331-RO12031331-RO_P17.DWG




REV	DATE	DESCRIPTION	VOLT.	H.P.	TITLE
			600	27	SCREENING & GRIT REMOVAL CONTROL PANEL
			3	N/A	POWER DIAGRAM (NEXT)
			60	N/A	CUSTOMER: CLARO
			34	12	REF.: 22XXX-Q-00 PROJECT: NAPANEE, ON
00	2024-07-30	X.M. FOR APPROVAL			DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

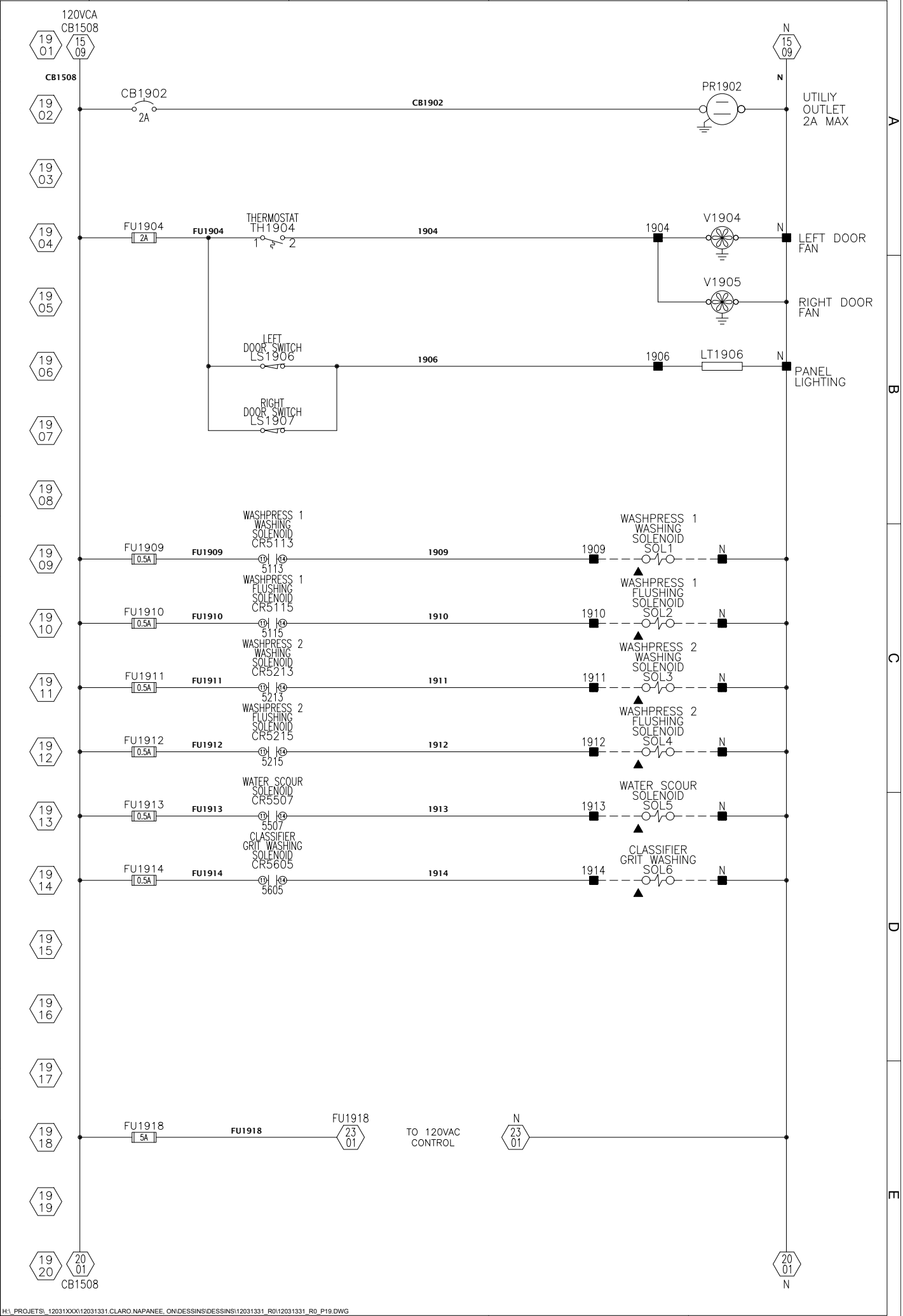


 SCALING: NONE DRAWING# 12031331

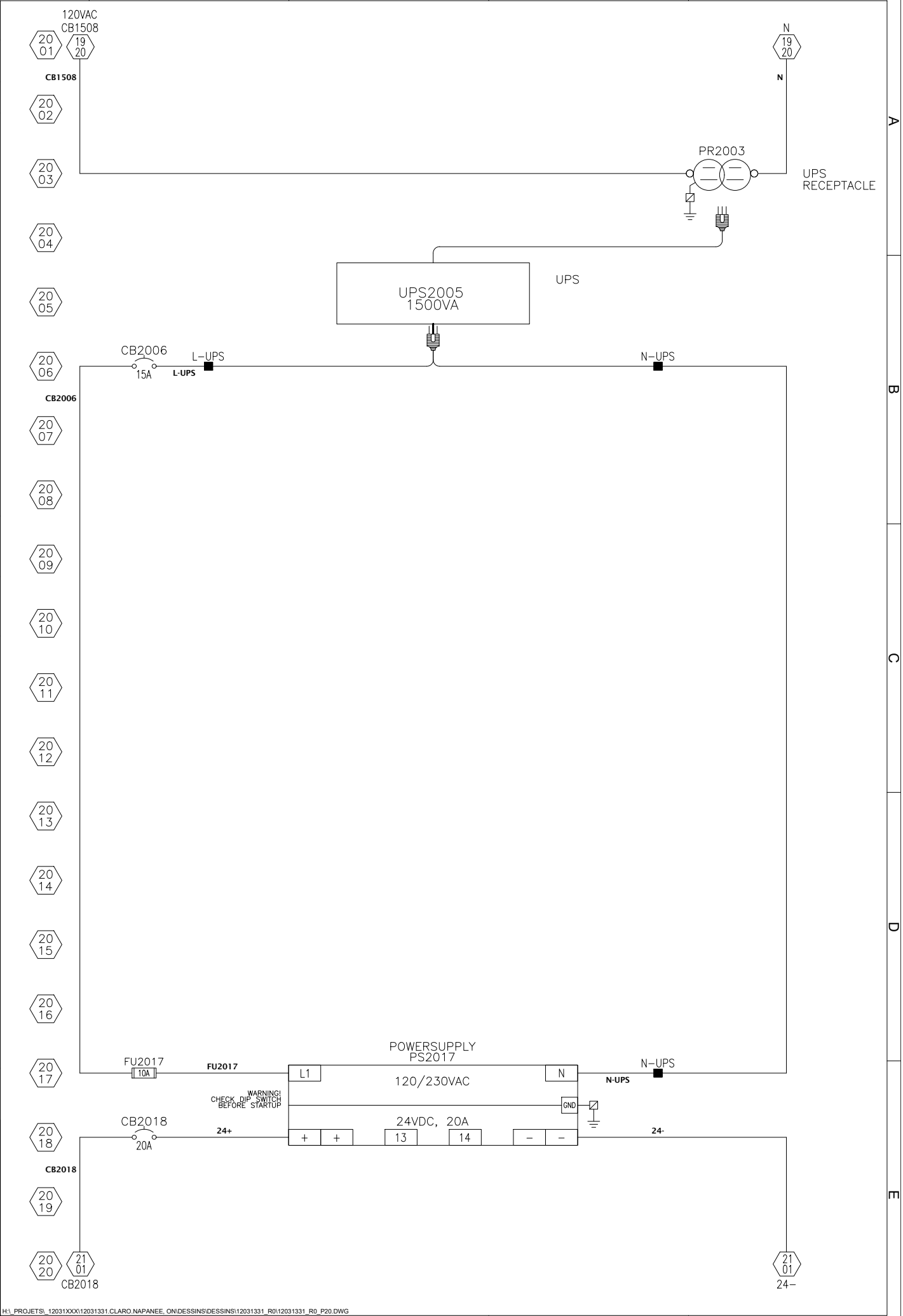
 DATE: JULY 2024 PAGE 18 OF 73

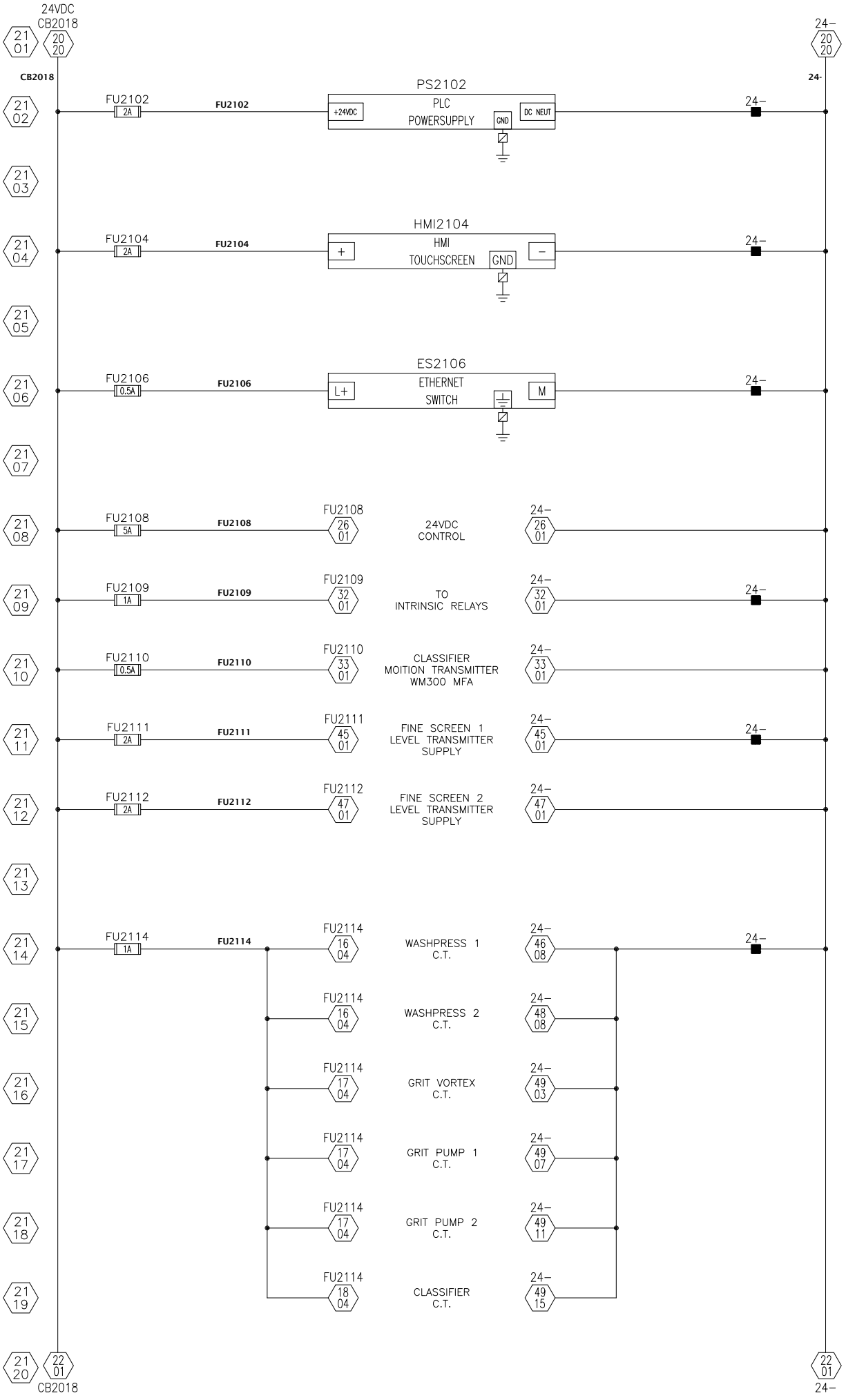
H:\PROJECTS\12031331\CLARO\NAPANEE_ON\DESIGNS\DESIGNS\12031331_R01\2031331_RD_P18.DWG

REV	DATE	DESCRIPTION																				
00	2024-07-30	FOR APPROVAL																				
<table border="1"> <tr> <td>VOLT</td> <td>600</td> <td>H.P.</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>HZ</td> <td></td> <td></td> <td></td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	H.P.	27	PHASE	3	KVAR	N/A	FREQ	60	KW	N/A	HZ				AMP	34	TYPE	12
VOLT	600	H.P.	27																			
PHASE	3	KVAR	N/A																			
FREQ	60	KW	N/A																			
HZ																						
AMP	34	TYPE	12																			
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL 120VAC DISTRIBUTION CUSTOMER: CLARO PROJECT: NAPANEE, ON <small>DRAWN BY: X.MONTAMBALTT</small> <small>CHECKED BY: C.SAMSON</small>																						
																						
DATE	SCALING	DRAWING #																				
JULY 2024	NONE	12031331																				
		PAGE 19 OF 73																				



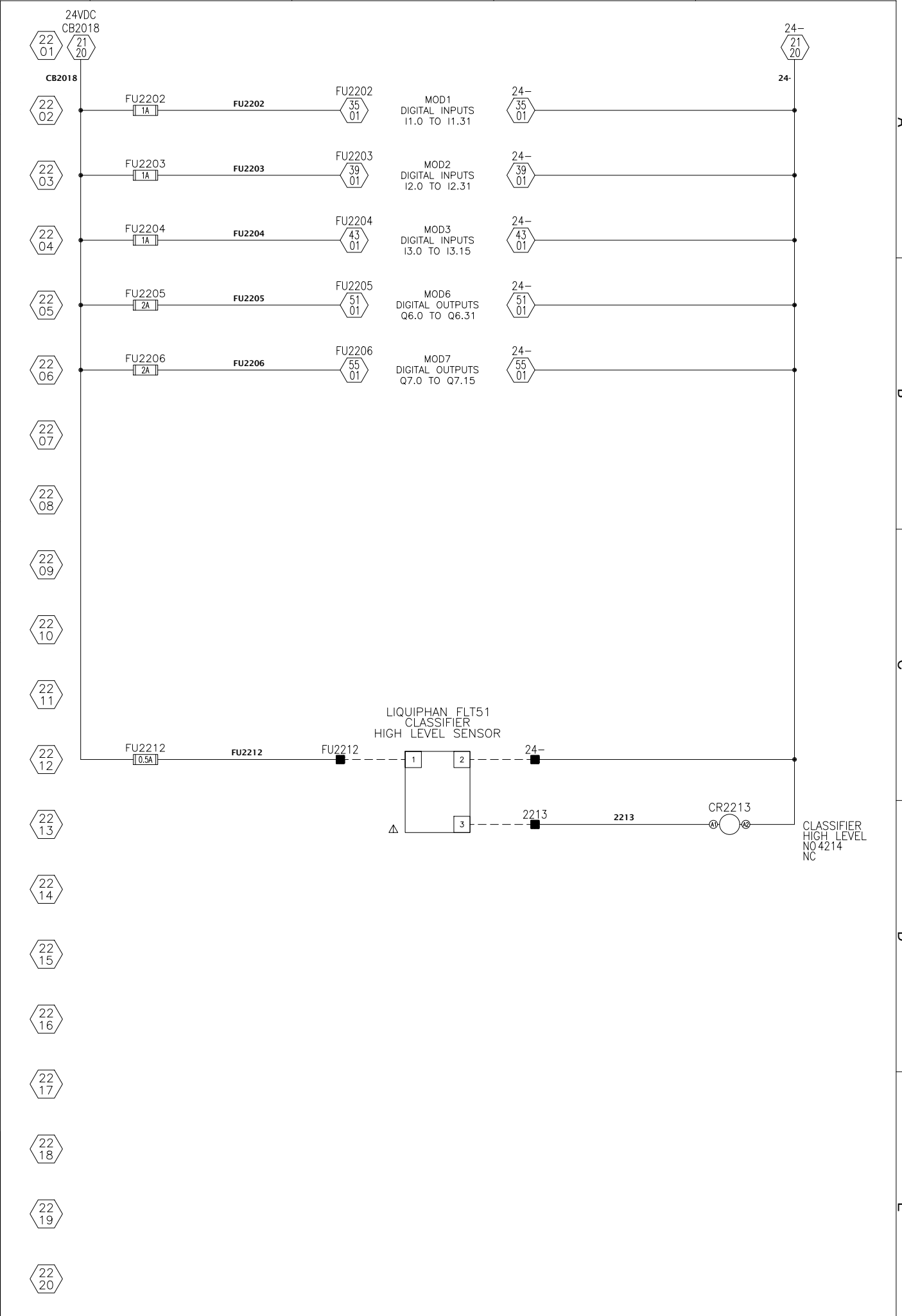
REV	DATE	DESCRIPTION
00	2024-07-30	
FOR APPROVAL		
X.M.		
A		
B		
C		
D		
E		
VOL.T	600	H.P.
PHASE	3	KVAR
FREQ.	60	KW
(HZ)		N/A
AMP.	34	TYPE
		12
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		
120VAC DISTRIBUTION (NEXT)		
CUSTOMER: CLARO		
PROJECT: NAPANEE, ON		
DRAWN BY: X.MONTAMBAULT		
CHECKED BY: C.SAMSON		
DATE	SCALING:	
JULY 2024	NONE	
DRAWING #		12031331
PAGE		20 OF 73



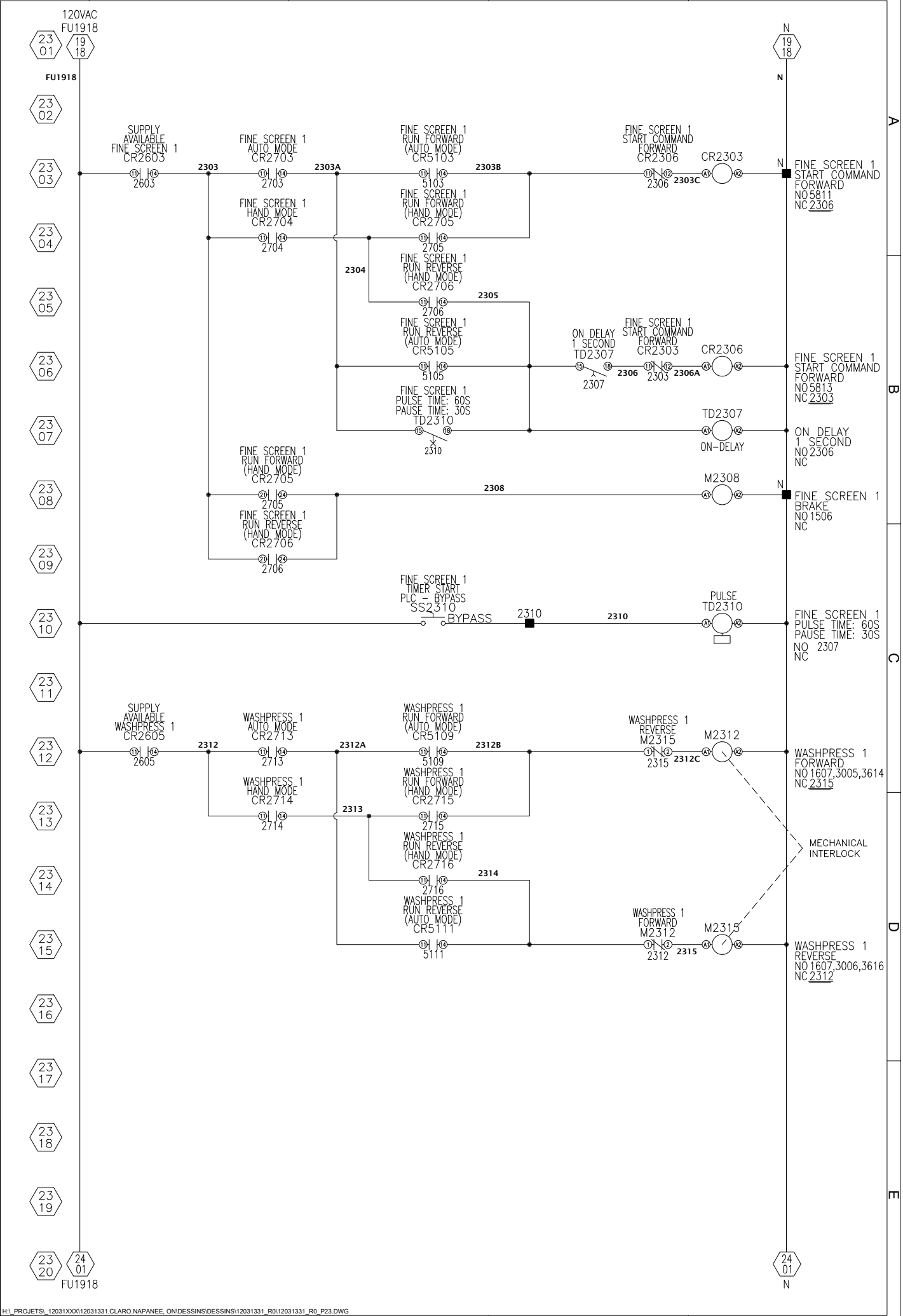


REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOL T</td> <td>600</td> <td>H.P</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOL T	600	H.P	27	PHASE	3	KVAR	N/A	FREQ	60	KW	N/A	AMP	34	TYPE	12
VOL T	600	H.P	27															
PHASE	3	KVAR	N/A															
FREQ	60	KW	N/A															
AMP	34	TYPE	12															
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL 24VDC DISTRIBUTION CUSTOMER: CLARO REF.: 22XXX-Q-00 PROJECT: NAPANEE, ON DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON																		
DATE	SCALING	DRAWING#																
JULY 2024	NONE	12031331																
PAGE 21 OF 73																		

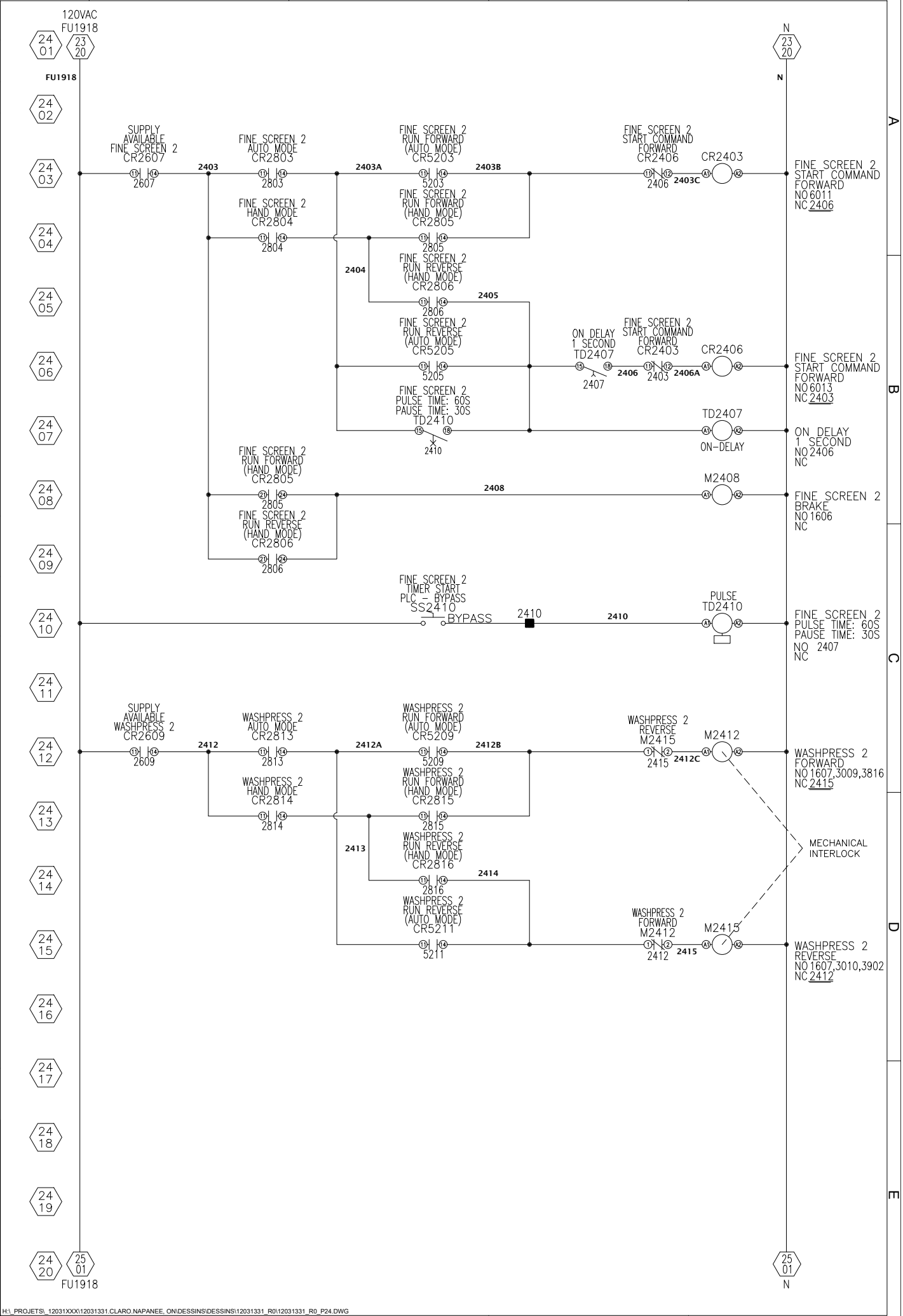
REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOL T</td> <td>600</td> <td>H.P</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOL T	600	H.P	27	PHASE	3	KVAR	N/A	FREQ (HZ)	60	KW	N/A	AMP	34	TYPE	12
VOL T	600	H.P	27															
PHASE	3	KVAR	N/A															
FREQ (HZ)	60	KW	N/A															
AMP	34	TYPE	12															
<table border="1"> <tr> <td>TITLE:</td> <td>SCREENING & GRIT REMOVAL CONTROL PANEL</td> </tr> <tr> <td>CUSTOMER:</td> <td>CLARO</td> </tr> <tr> <td>PROJECT:</td> <td>NAPANEE, ON</td> </tr> <tr> <td>REF.:</td> <td>22XXX-Q-00</td> </tr> <tr> <td>DRAWN BY:</td> <td>X.MONTAMBAULT</td> </tr> <tr> <td>CHECKED BY:</td> <td>C.SAMSON</td> </tr> </table>			TITLE:	SCREENING & GRIT REMOVAL CONTROL PANEL	CUSTOMER:	CLARO	PROJECT:	NAPANEE, ON	REF.:	22XXX-Q-00	DRAWN BY:	X.MONTAMBAULT	CHECKED BY:	C.SAMSON				
TITLE:	SCREENING & GRIT REMOVAL CONTROL PANEL																	
CUSTOMER:	CLARO																	
PROJECT:	NAPANEE, ON																	
REF.:	22XXX-Q-00																	
DRAWN BY:	X.MONTAMBAULT																	
CHECKED BY:	C.SAMSON																	
<table border="1"> <tr> <td>SCALING:</td> <td>NONE</td> </tr> <tr> <td>DATE:</td> <td>JULY 2024</td> </tr> <tr> <td>DRAWING #:</td> <td>12031331</td> </tr> <tr> <td>PAGE:</td> <td>22 OF 73</td> </tr> </table>			SCALING:	NONE	DATE:	JULY 2024	DRAWING #:	12031331	PAGE:	22 OF 73								
SCALING:	NONE																	
DATE:	JULY 2024																	
DRAWING #:	12031331																	
PAGE:	22 OF 73																	




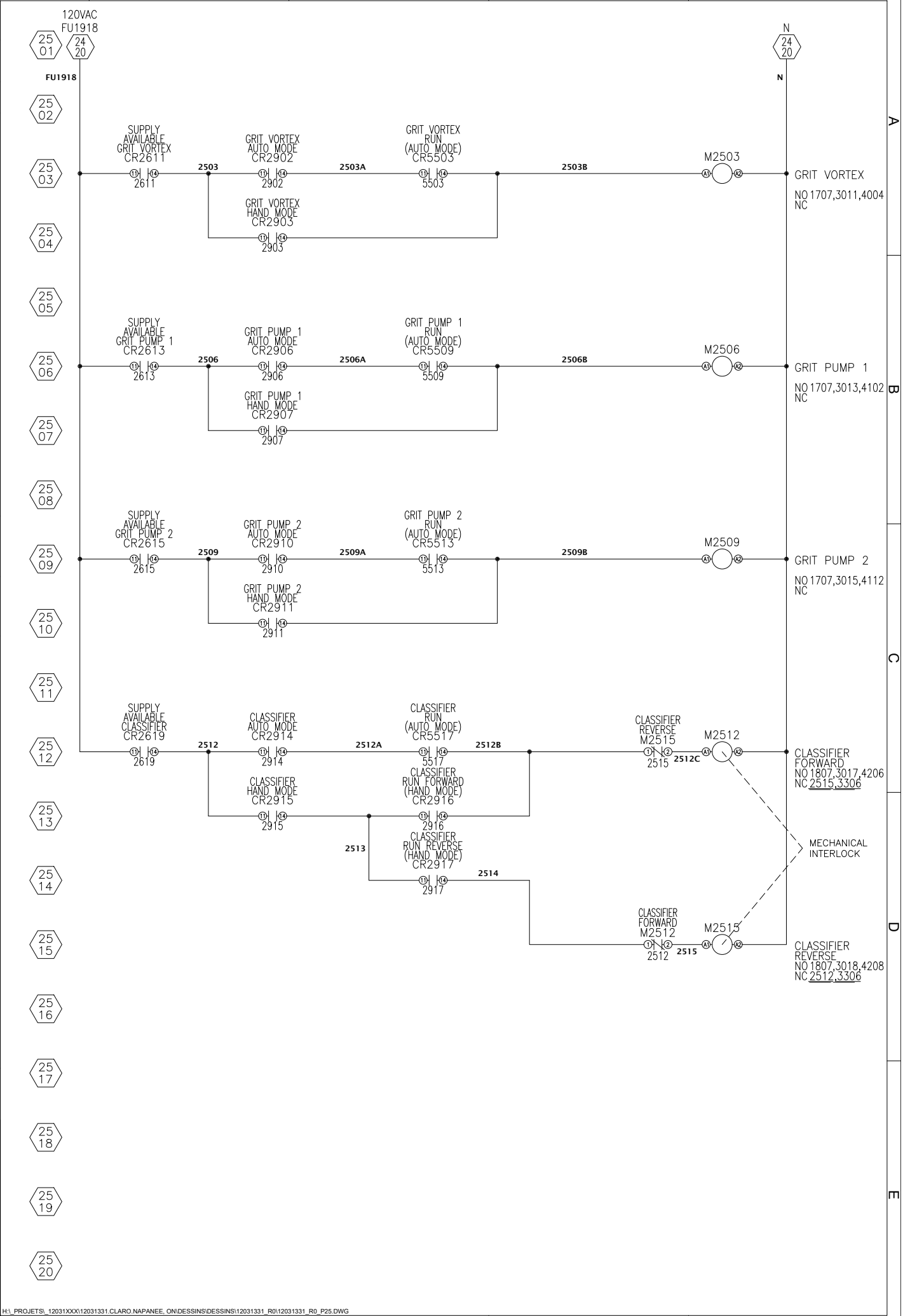
REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> <td>H.P.</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	H.P.	27	PHASE	3	KVAR	N/A	FREQ	60	KW	N/A	AMP	34	TYPE	12
VOLT	600	H.P.	27															
PHASE	3	KVAR	N/A															
FREQ	60	KW	N/A															
AMP	34	TYPE	12															
<table border="1"> <tr> <td>TITLE:</td> <td>SCREENING & GRIT REMOVAL CONTROL PANEL</td> </tr> <tr> <td>CUSTOMER:</td> <td>CLARO</td> </tr> <tr> <td>PROJECT:</td> <td>NAPANEE, ON</td> </tr> <tr> <td>REF.:</td> <td>22XXX-Q-00</td> </tr> <tr> <td>DRAWN BY:</td> <td>X.MONTAMBAULT</td> </tr> <tr> <td>CHECKED BY:</td> <td>C.SAMSON</td> </tr> </table>			TITLE:	SCREENING & GRIT REMOVAL CONTROL PANEL	CUSTOMER:	CLARO	PROJECT:	NAPANEE, ON	REF.:	22XXX-Q-00	DRAWN BY:	X.MONTAMBAULT	CHECKED BY:	C.SAMSON				
TITLE:	SCREENING & GRIT REMOVAL CONTROL PANEL																	
CUSTOMER:	CLARO																	
PROJECT:	NAPANEE, ON																	
REF.:	22XXX-Q-00																	
DRAWN BY:	X.MONTAMBAULT																	
CHECKED BY:	C.SAMSON																	
<table border="1"> <tr> <td>SCALING:</td> <td>NONE</td> </tr> <tr> <td>DATE:</td> <td>JULY 2024</td> </tr> <tr> <td>DRAWING#:</td> <td>12031331</td> </tr> <tr> <td>PAGE:</td> <td>23 OF 73</td> </tr> </table>			SCALING:	NONE	DATE:	JULY 2024	DRAWING#:	12031331	PAGE:	23 OF 73								
SCALING:	NONE																	
DATE:	JULY 2024																	
DRAWING#:	12031331																	
PAGE:	23 OF 73																	




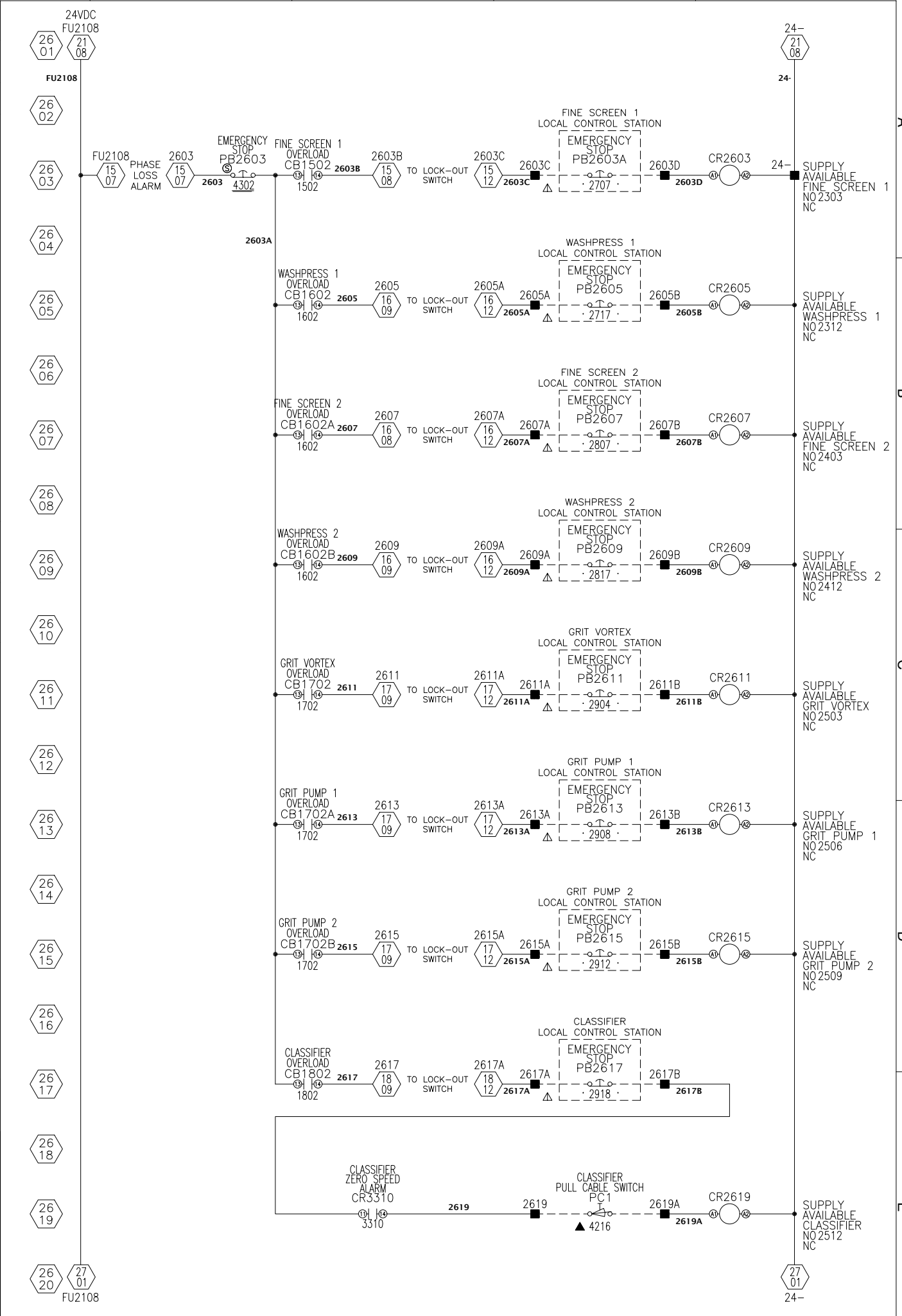
REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> </tr> <tr> <td>PHASE</td> <td>3</td> </tr> <tr> <td>FREQ</td> <td>60</td> </tr> <tr> <td>AMP</td> <td>34</td> </tr> <tr> <td>H.P.</td> <td>27</td> </tr> <tr> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>KW</td> <td>N/A</td> </tr> <tr> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	PHASE	3	FREQ	60	AMP	34	H.P.	27	KVAR	N/A	KW	N/A	TYPE	12
VOLT	600																	
PHASE	3																	
FREQ	60																	
AMP	34																	
H.P.	27																	
KVAR	N/A																	
KW	N/A																	
TYPE	12																	
<table border="1"> <tr> <td>TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL</td> </tr> <tr> <td>120VAC CONTROL DIAGRAM (NEXT)</td> </tr> <tr> <td>CUSTOMER: CLARO</td> </tr> <tr> <td>PROJECT: NAPANEE, ON</td> </tr> <tr> <td>DRAWN BY: X.MONTAMBAULT</td> </tr> <tr> <td>CHECKED BY: C.SAMSON</td> </tr> <tr> <td>REF.: 22XXX-Q-00</td> </tr> </table>			TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	120VAC CONTROL DIAGRAM (NEXT)	CUSTOMER: CLARO	PROJECT: NAPANEE, ON	DRAWN BY: X.MONTAMBAULT	CHECKED BY: C.SAMSON	REF.: 22XXX-Q-00									
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL																		
120VAC CONTROL DIAGRAM (NEXT)																		
CUSTOMER: CLARO																		
PROJECT: NAPANEE, ON																		
DRAWN BY: X.MONTAMBAULT																		
CHECKED BY: C.SAMSON																		
REF.: 22XXX-Q-00																		
<table border="1"> <tr> <td>SCALING:</td> <td>NONE</td> </tr> <tr> <td>DATE:</td> <td>JULY 2024</td> </tr> <tr> <td>DRAWING NO:</td> <td>12031331</td> </tr> <tr> <td>PAGE:</td> <td>24 OF 73</td> </tr> </table>			SCALING:	NONE	DATE:	JULY 2024	DRAWING NO:	12031331	PAGE:	24 OF 73								
SCALING:	NONE																	
DATE:	JULY 2024																	
DRAWING NO:	12031331																	
PAGE:	24 OF 73																	



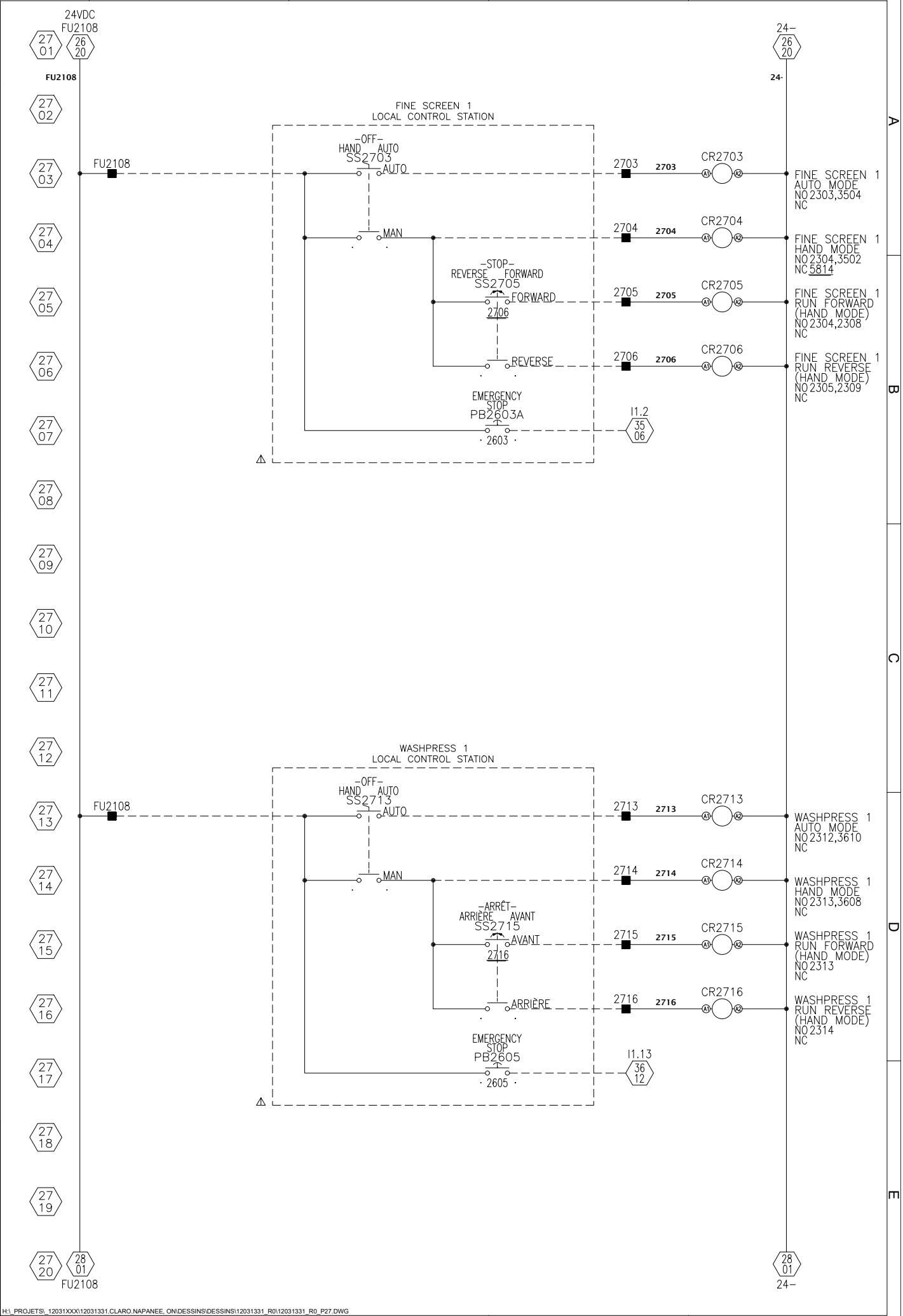
REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> <td>H.P.</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	H.P.	27	PHASE	3	KVAR	N/A	FREQ (HZ)	60	KW	N/A	AMP	34	TYPE	12
VOLT	600	H.P.	27															
PHASE	3	KVAR	N/A															
FREQ (HZ)	60	KW	N/A															
AMP	34	TYPE	12															
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL 120VAC CONTROL DIAGRAM (NEXT) CUSTOMER: CLARO PROJECT: NAPANEE, ON REF.: 22XXX-Q-00 DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON																		
																		
DATE	SCALING	DRAWING #																
JULY 2024	NONE	12031331																
		PAGE 25 OF 73																



REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> </tr> <tr> <td>PHASE</td> <td>3</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> </tr> <tr> <td>AMP</td> <td>34</td> </tr> <tr> <td>HP</td> <td>27</td> </tr> <tr> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>KW</td> <td>N/A</td> </tr> <tr> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	PHASE	3	FREQ (HZ)	60	AMP	34	HP	27	KVAR	N/A	KW	N/A	TYPE	12
VOLT	600																	
PHASE	3																	
FREQ (HZ)	60																	
AMP	34																	
HP	27																	
KVAR	N/A																	
KW	N/A																	
TYPE	12																	
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL CUSTOMER: CLARO PROJECT: NAPANEE, ON REF.: 22XXX-Q-00 DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON																		
<table border="1"> <tr> <td>DATE</td> <td>SCALING</td> </tr> <tr> <td>JULY 2024</td> <td>NONE</td> </tr> </table>			DATE	SCALING	JULY 2024	NONE												
DATE	SCALING																	
JULY 2024	NONE																	
																		
DRAWING# 12031331 PAGE 26 OF 73																		

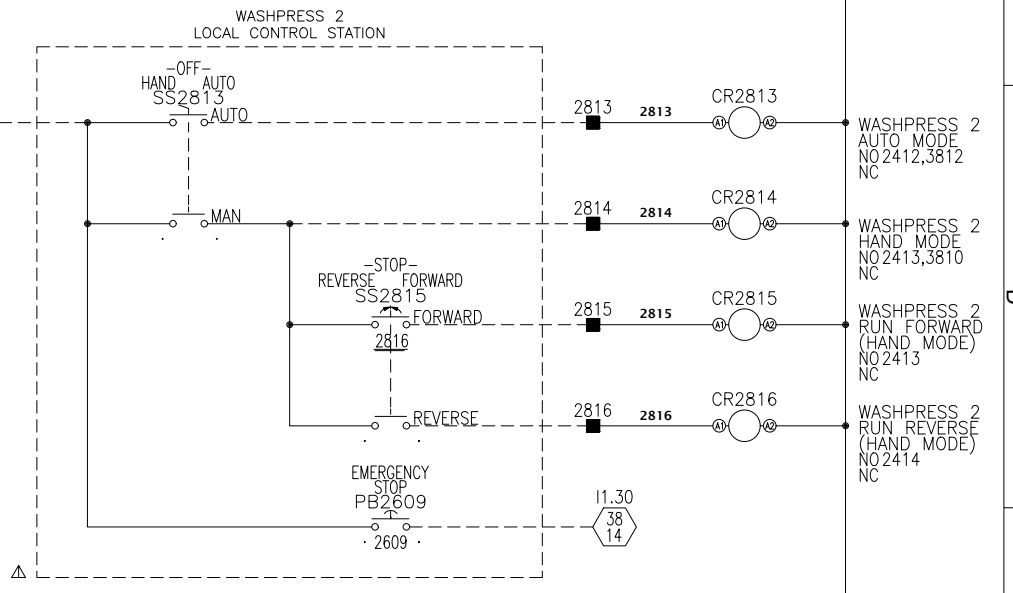
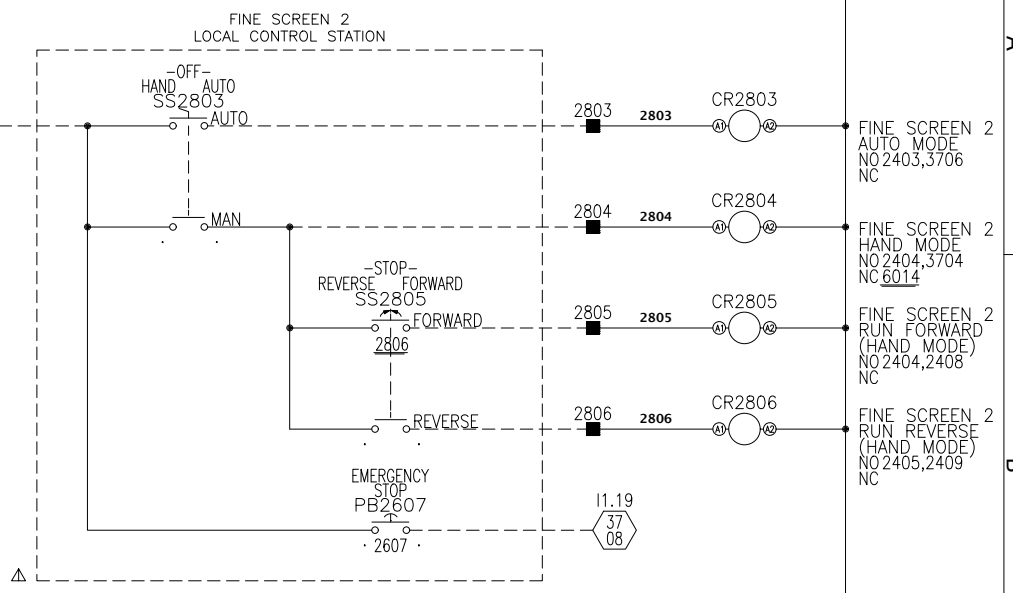


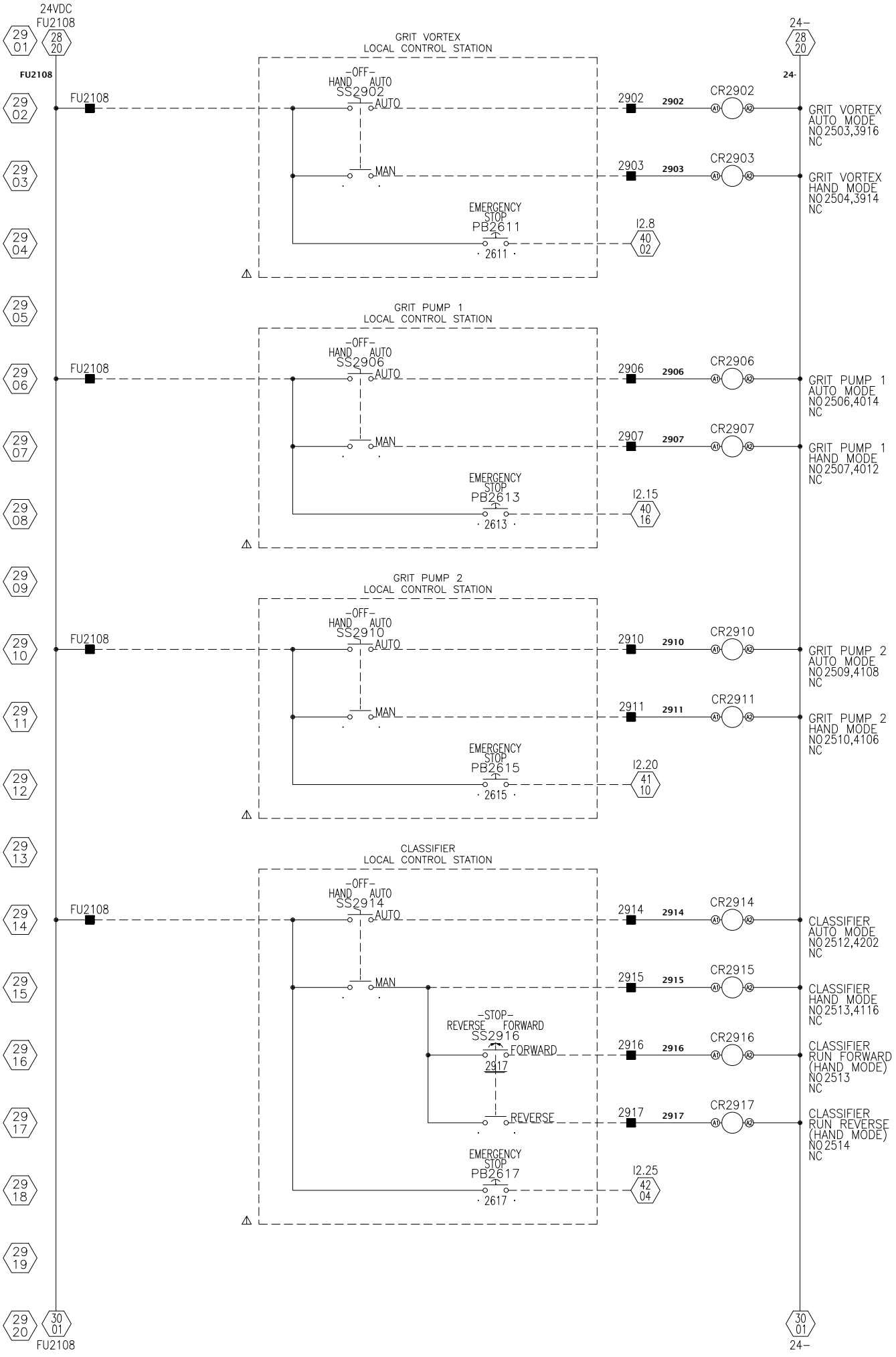
REV	DATE	DESCRIPTION
00	2024-07-30	
FOR APPROVAL		
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		
24VDC CONTROL DIAGRAM (NEXT)		
CUSTOMER: CLARO		
PROJECT: NAPANEE, ON		
REF.: 22XXX-Q-00		
DRAWN BY: X.MONTAMBAULT		
CHECKED BY: C.SAMSON		
SCALE:	DATE:	
NONE	JULY 2024	
DRAWING #		
12031331		
PAGE		
27 OF 73		



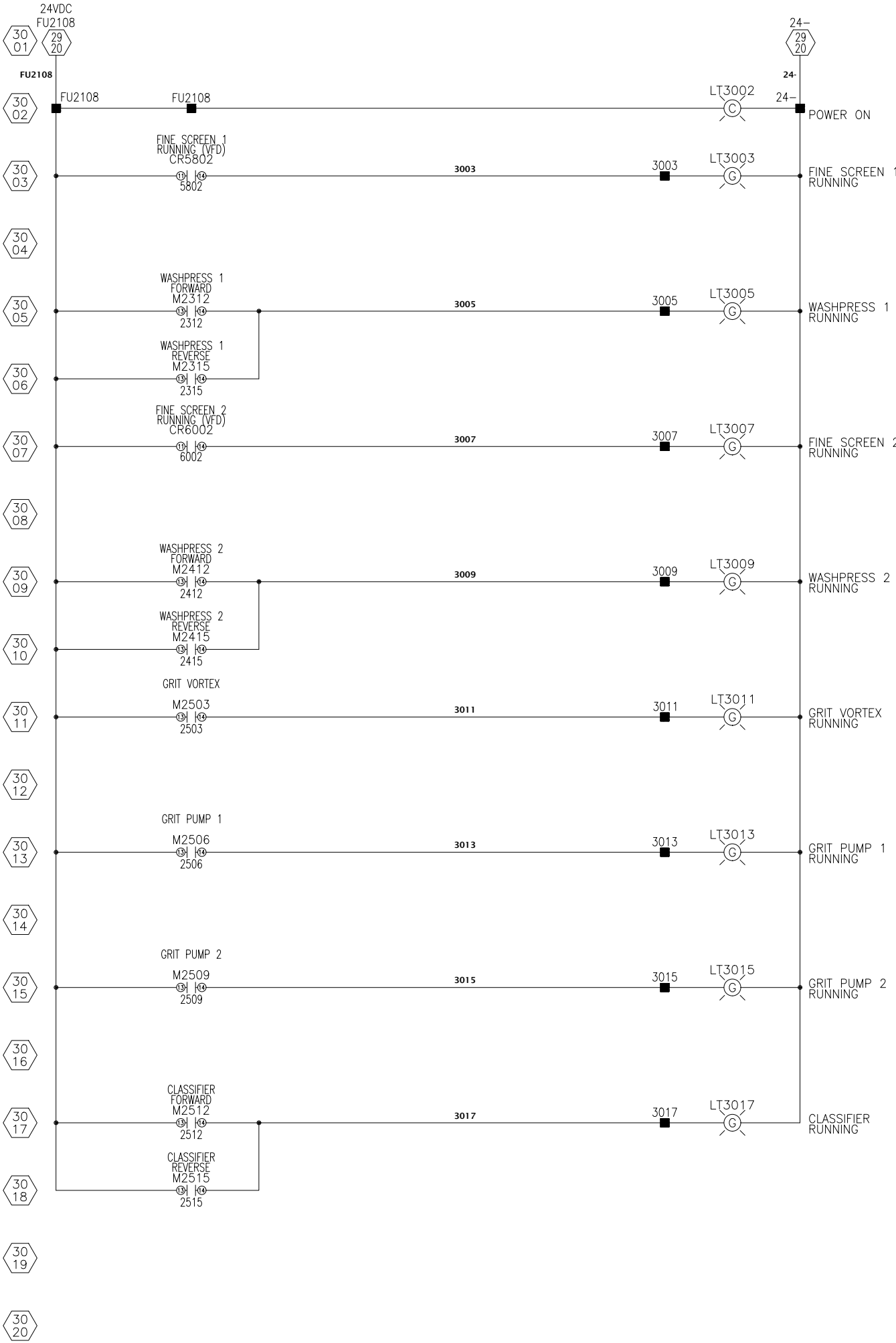
REV	DATE	DESCRIPTION
00	2024-07-30	
FOR APPROVAL		
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		
24VDC CONTROL DIAGRAM (NEXT)		
CUSTOMER: CLARO		
PROJECT: NAPANEE, ON		
REF.: 22XXX-Q-00		
DRAWN BY: X.MONTAMBAULT		
CHECKED BY: C.SAMSON		
VOL.T	600	H.P.
PHASE	3	KVAR
FREQ (HZ)	60	KW
AMP	34	N/A
		TYPE
		12
DATE: JULY 2024		
SCALING: NONE		
DRAWING # 12031331		
PAGE 28 OF 73		

24VDC FU2108	28 01	27 20
FU2108	28 02	
FU2108	28 03	
	28 04	
	28 05	
	28 06	
	28 07	
	28 08	
	28 09	
	28 10	
	28 11	
	28 12	
FU2108	28 13	
	28 14	
	28 15	
	28 16	
	28 17	
	28 18	
	28 19	
FU2108	28 20	29 01





REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> <td>H.P.</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	H.P.	27	PHASE	3	KVAR	N/A	FREQ (HZ)	60	KW	N/A	AMP	34	TYPE	12
VOLT	600	H.P.	27															
PHASE	3	KVAR	N/A															
FREQ (HZ)	60	KW	N/A															
AMP	34	TYPE	12															
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL 24VDC CONTROL DIAGRAM (NEXT) CUSTOMER: CLARO PROJECT: NAPANEE, ON DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON																		
<table border="1"> <tr> <td>SCALING:</td> <td>NONE</td> <td>DRAWING #:</td> <td>12031331</td> </tr> <tr> <td>DATE:</td> <td>JULY 2024</td> <td>PAGE</td> <td>29 OF 73</td> </tr> </table>			SCALING:	NONE	DRAWING #:	12031331	DATE:	JULY 2024	PAGE	29 OF 73								
SCALING:	NONE	DRAWING #:	12031331															
DATE:	JULY 2024	PAGE	29 OF 73															



REV	DATE	DESCRIPTION
00	2024-07-30	
FOR APPROVAL		
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		
24VDC CONTROL DIAGRAM (NEXT)		
CUSTOMER: CLARO		
PROJECT: NAPANEE, ON		
REF.: 22XXX-Q-00		
DRAWN BY: X.MONTAMBAULT		
CHECKED BY: C.SAMSON		
VOLT	600	H.P.
PHASE	3	KVAR
FREQ	60	KW
AMP	34	N/A
		TYPE
		12
DATE: JULY 2024		
SCALING: NONE		
DRAWING # 12031331		
PAGE 30 OF 73		

A B C D E

1

1

2

2

3

3

4

4

REV	DATE	DESCRIPTION	VOL T	H.P	TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	SCALING:	DATE:	DRAWING#
			600	27	BLANK PAGE			12031331
			PHASE	kVAR	CUSTOMER: CLARO	NONE	JULY 2024	PAGE 31 OF 73
			3	N/A	PROJECT: NAPANEE, ON			
			FREQ (HZ)	kV	REF.: 22XXX-Q-00			
			60	N/A	DRAWN BY: X.MONTAMBAULT			
			AMP	TYPE	CHECKED BY: C.SAMSON			
00	2024-07-30	FOR APPROVAL	34	12				

- 31 01
- 31 02
- 31 03
- 31 04
- 31 05
- 31 06
- 31 07
- 31 08
- 31 09
- 31 10
- 31 11
- 31 12
- 31 13
- 31 14
- 31 15
- 31 16
- 31 17
- 31 18
- 31 19
- 31 20

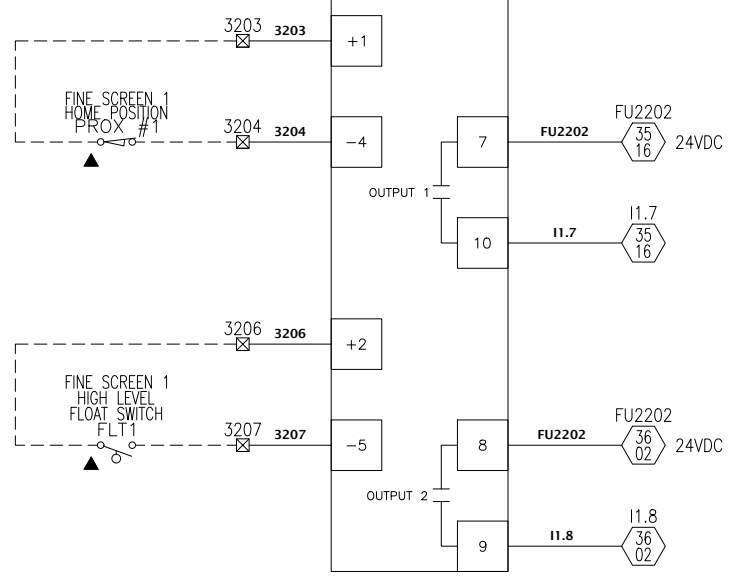
BLANK PAGE

REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> <td>H.P.</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	H.P.	27	PHASE	3	KVAR	N/A	FREQ (HZ)	60	KW	N/A	AMP	34	TYPE	12
VOLT	600	H.P.	27															
PHASE	3	KVAR	N/A															
FREQ (HZ)	60	KW	N/A															
AMP	34	TYPE	12															
<table border="1"> <tr> <td>TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL</td> </tr> <tr> <td>INTRINSIC RELAY</td> </tr> <tr> <td>CUSTOMER: CLARO</td> </tr> <tr> <td>PROJECT: NAPANEE, ON</td> </tr> <tr> <td>REF.: 22XXX-Q-00</td> </tr> <tr> <td>DRAWN BY: X.MONTAMBAULT</td> </tr> <tr> <td>CHECKED BY: C.SAMSON</td> </tr> </table>			TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	INTRINSIC RELAY	CUSTOMER: CLARO	PROJECT: NAPANEE, ON	REF.: 22XXX-Q-00	DRAWN BY: X.MONTAMBAULT	CHECKED BY: C.SAMSON									
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL																		
INTRINSIC RELAY																		
CUSTOMER: CLARO																		
PROJECT: NAPANEE, ON																		
REF.: 22XXX-Q-00																		
DRAWN BY: X.MONTAMBAULT																		
CHECKED BY: C.SAMSON																		
<table border="1"> <tr> <td>SCALING:</td> <td>NONE</td> </tr> <tr> <td>DATE:</td> <td>JULY 2024</td> </tr> <tr> <td>DRAWING #:</td> <td>12031331</td> </tr> <tr> <td>PAGE:</td> <td>32 OF 73</td> </tr> </table>			SCALING:	NONE	DATE:	JULY 2024	DRAWING #:	12031331	PAGE:	32 OF 73								
SCALING:	NONE																	
DATE:	JULY 2024																	
DRAWING #:	12031331																	
PAGE:	32 OF 73																	

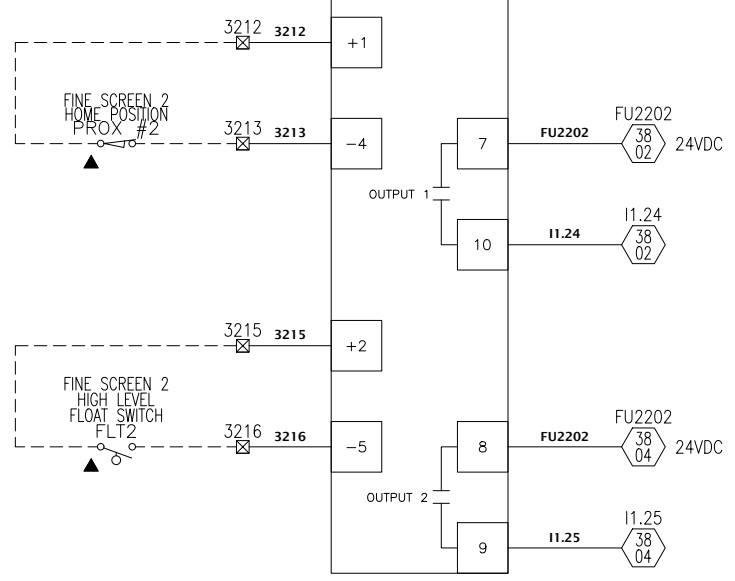
- 32 01
- 32 02
- 32 03
- 32 04
- 32 05
- 32 06
- 32 07
- 32 08
- 32 09
- 32 10
- 32 11
- 32 12
- 32 13
- 32 14
- 32 15
- 32 16
- 32 17
- 32 18
- 32 19
- 32 20


24VDC
FU2109

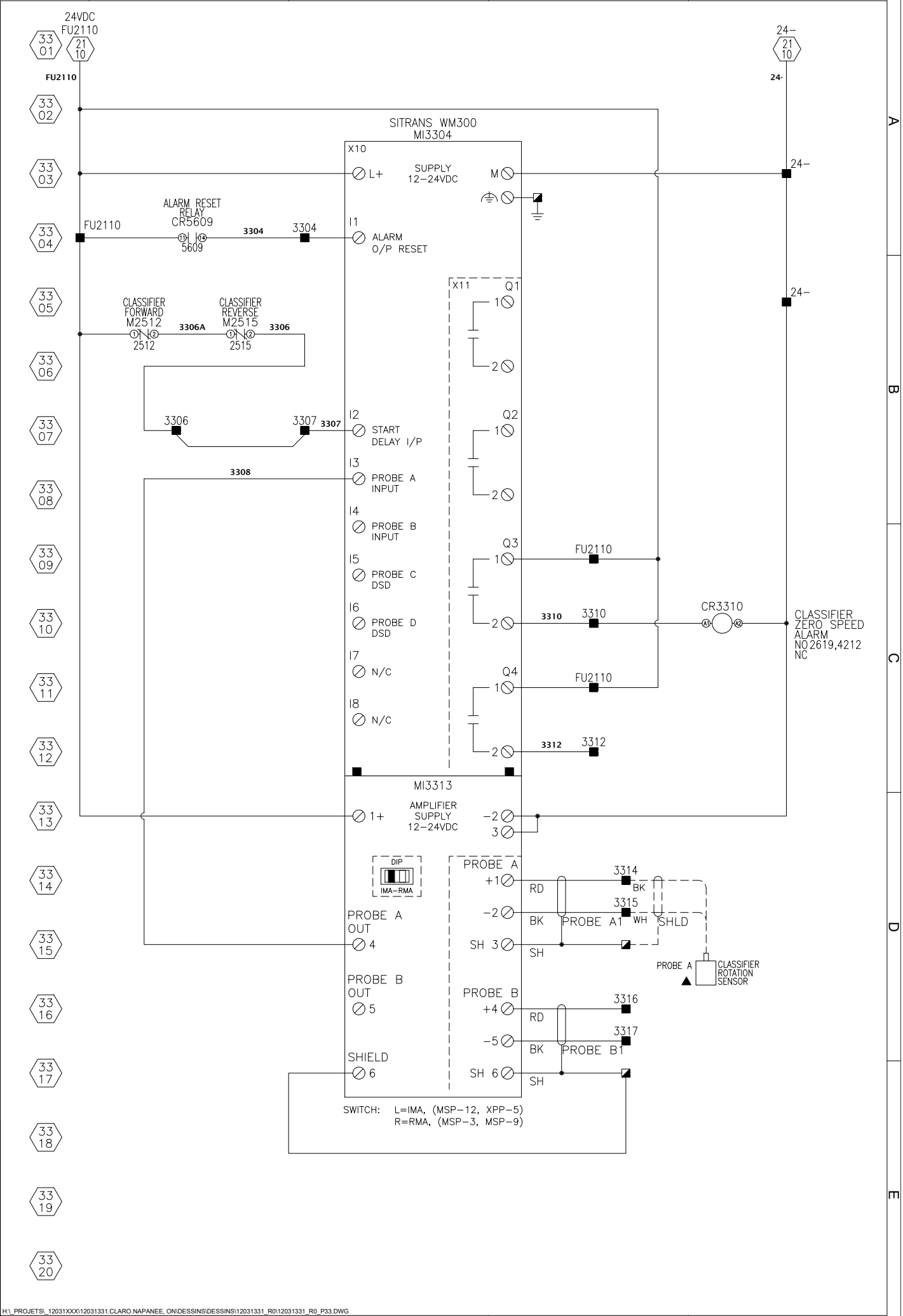
FINE SCREEN 1
INTRINSIC RELAY
RI3202



FINE SCREEN 2
INTRINSIC RELAY
RI3211




REV	DATE	DESCRIPTION																				
00	2024-07-30	FOR APPROVAL																				
<table border="1"> <tr> <td>VOLT</td> <td>600</td> <td>H.P.</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>(HZ)</td> <td></td> <td>TYPE</td> <td>12</td> </tr> <tr> <td>AMP</td> <td>34</td> <td></td> <td></td> </tr> </table>			VOLT	600	H.P.	27	PHASE	3	KVAR	N/A	FREQ	60	KW	N/A	(HZ)		TYPE	12	AMP	34		
VOLT	600	H.P.	27																			
PHASE	3	KVAR	N/A																			
FREQ	60	KW	N/A																			
(HZ)		TYPE	12																			
AMP	34																					
<table border="1"> <tr> <td>TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL</td> </tr> <tr> <td>SITRANS WM300 WIRING</td> </tr> <tr> <td>CUSTOMER: CLARO</td> </tr> <tr> <td>PROJECT: NAPANEE, ON</td> </tr> <tr> <td>REF.: 22XXX-Q-00</td> </tr> <tr> <td>DRAWN BY: X.MONTAMBAULT</td> </tr> <tr> <td>CHECKED BY: C.SAMSON</td> </tr> </table>			TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	SITRANS WM300 WIRING	CUSTOMER: CLARO	PROJECT: NAPANEE, ON	REF.: 22XXX-Q-00	DRAWN BY: X.MONTAMBAULT	CHECKED BY: C.SAMSON													
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL																						
SITRANS WM300 WIRING																						
CUSTOMER: CLARO																						
PROJECT: NAPANEE, ON																						
REF.: 22XXX-Q-00																						
DRAWN BY: X.MONTAMBAULT																						
CHECKED BY: C.SAMSON																						
DATE	SCALING	DRAWING #																				
JULY 2024	NONE	12031331																				
		PAGE 33 OF 73																				

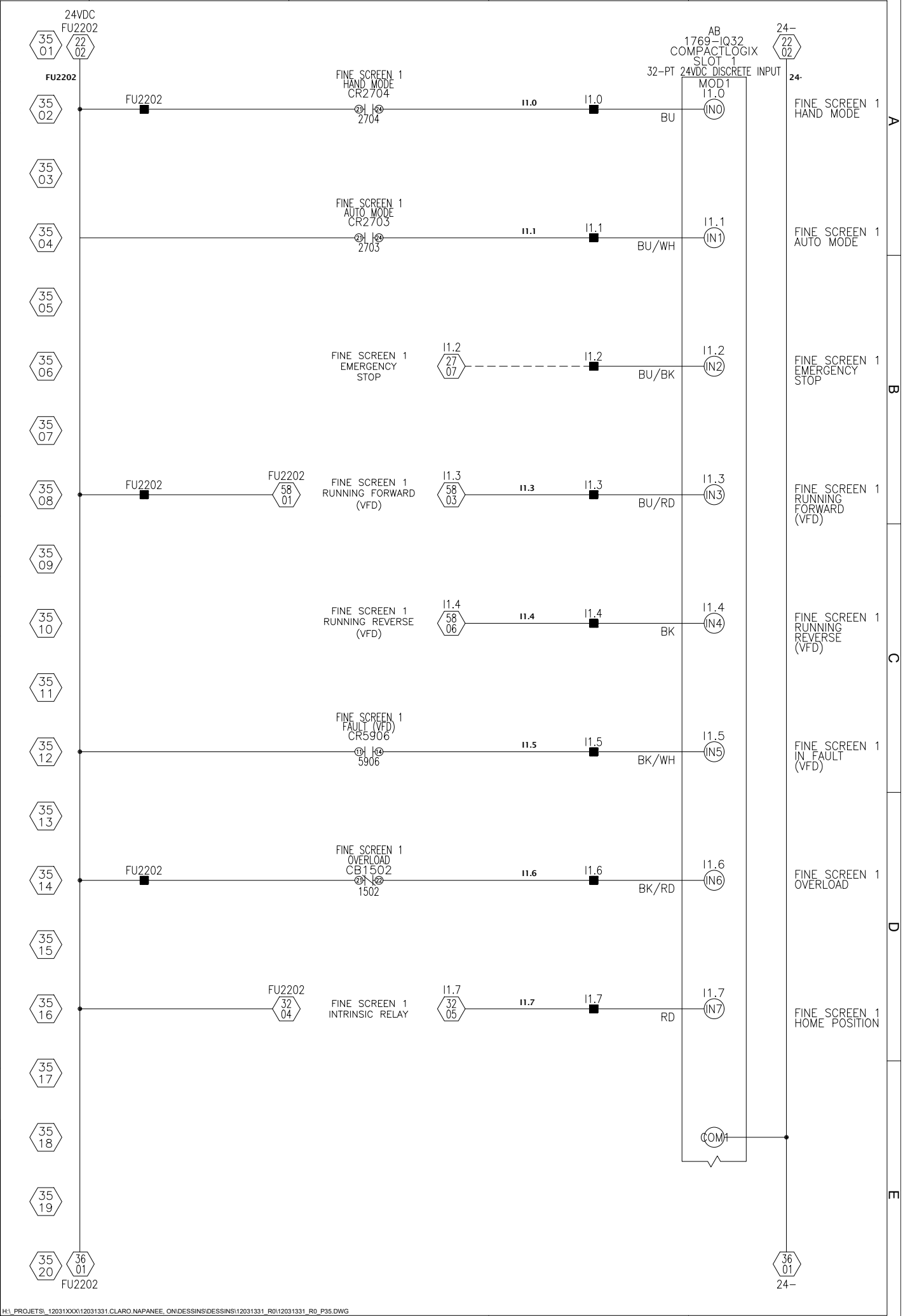



BLANK PAGE

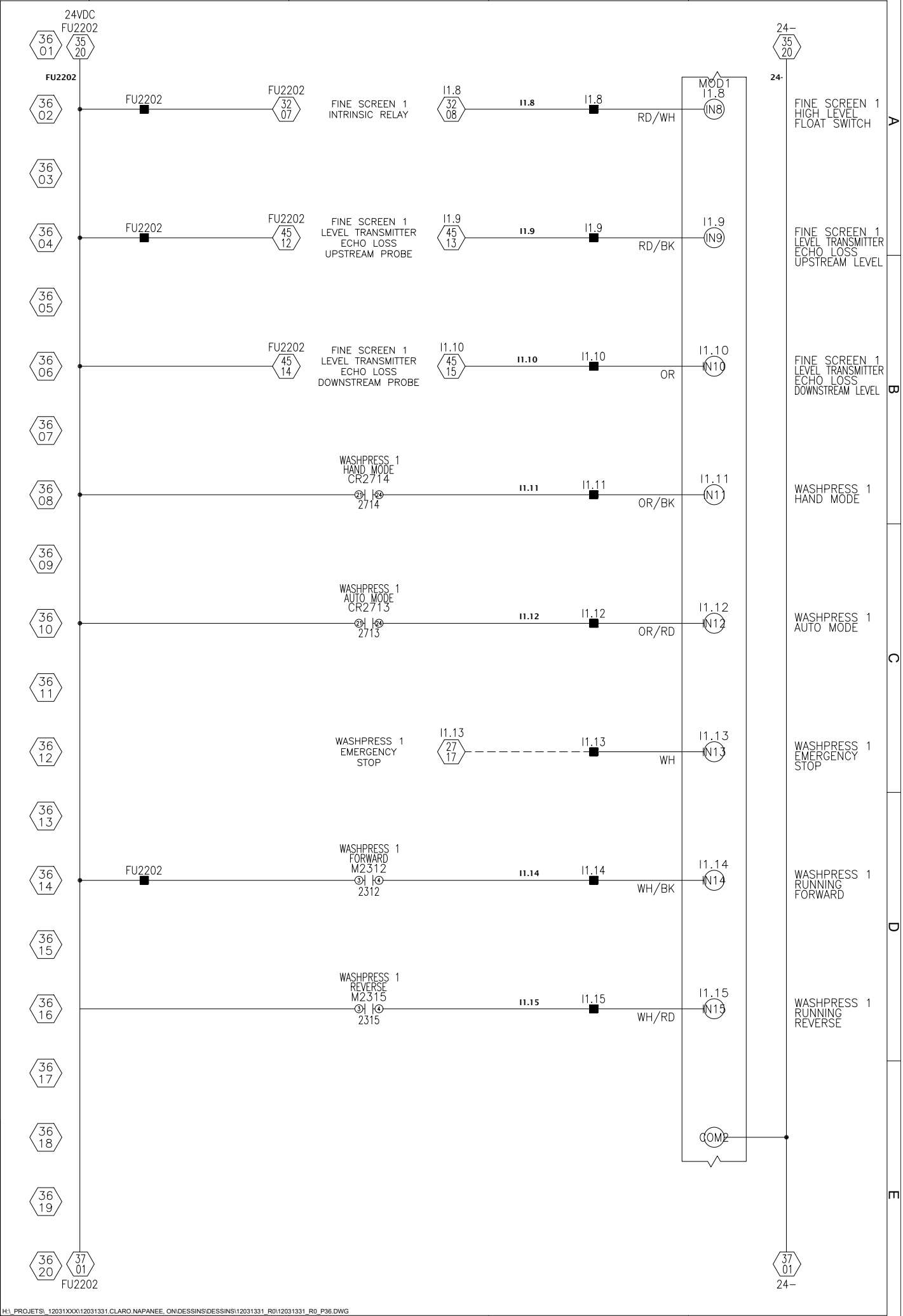
- 34 01
- 34 02
- 34 03
- 34 04
- 34 05
- 34 06
- 34 07
- 34 08
- 34 09
- 34 10
- 34 11
- 34 12
- 34 13
- 34 14
- 34 15
- 34 16
- 34 17
- 34 18
- 34 19
- 34 20

REV	DATE	DESCRIPTION		VOLT	H.P.	TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		SCALING:		
00	2024-07-30	X.M.	FOR APPROVAL	600	27	BLANK PAGE	DATE:	NONE JULY 2024		
				PHASE	KVAR	CUSTOMER: CLARO	CHECKED BY:			DRAWING# 12031331 PAGE 34 OF 73
				FREQ	KW	PROJECT: NAPANEE, ON				
				(HZ)	N/A	DRAWN BY: X.MONTAMBAULT				
				AMP	12	CHECKED BY: C.SAMSON				

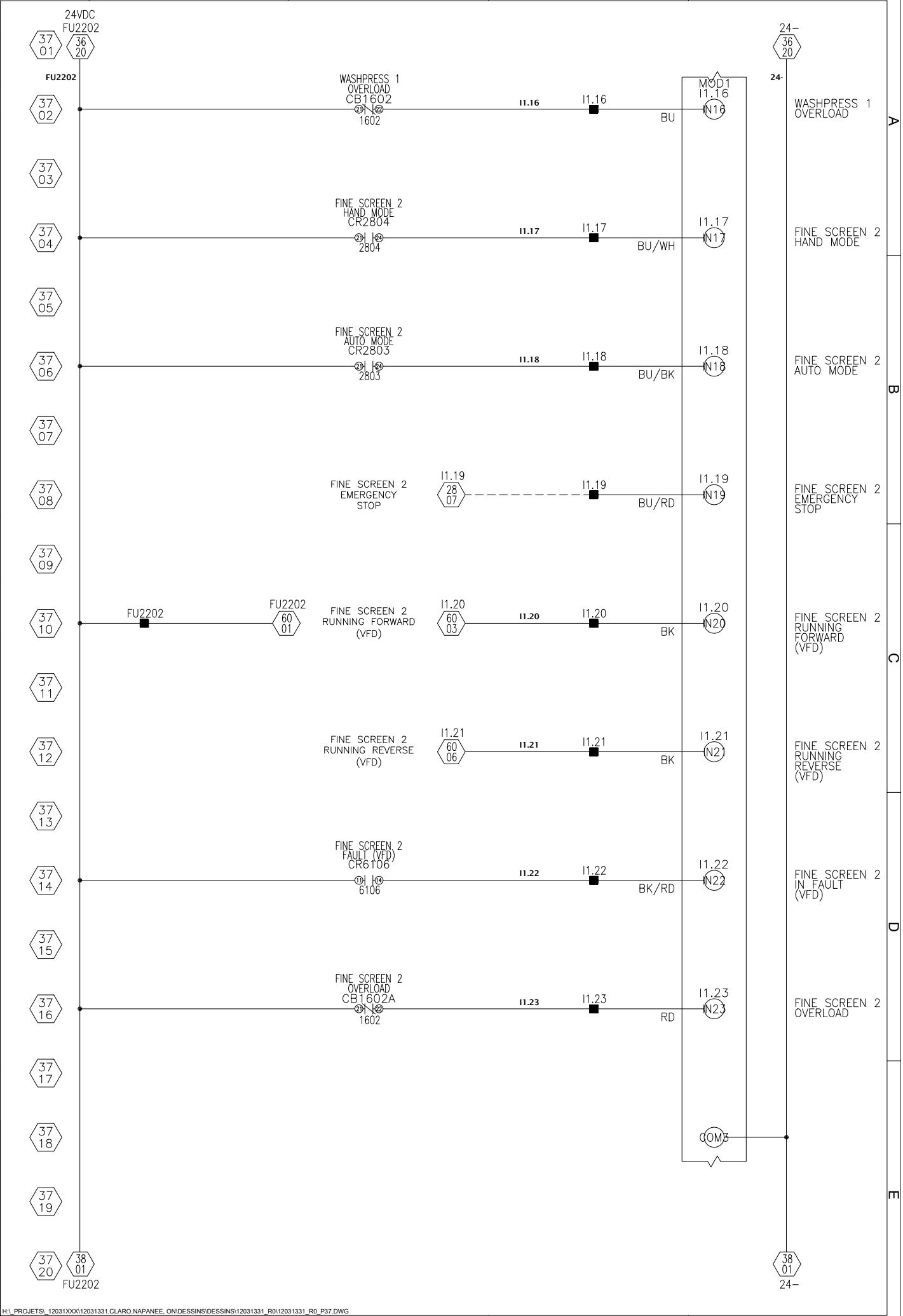
REV	DATE	DESCRIPTION
00	2024-07-30	
FOR APPROVAL		
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		
MOD1 - DIGITAL INPUTS		
CUSTOMER: CLARO		
PROJECT: NAPANEE, ON		
REF.: 22XXX-Q-00		
DRAWN BY: X.MONTAMBAULT		
CHECKED BY: C.SAMSON		
DATE: JULY 2024		
SCALING: NONE		
DRAWING # 12031331		
PAGE 35 OF 73		



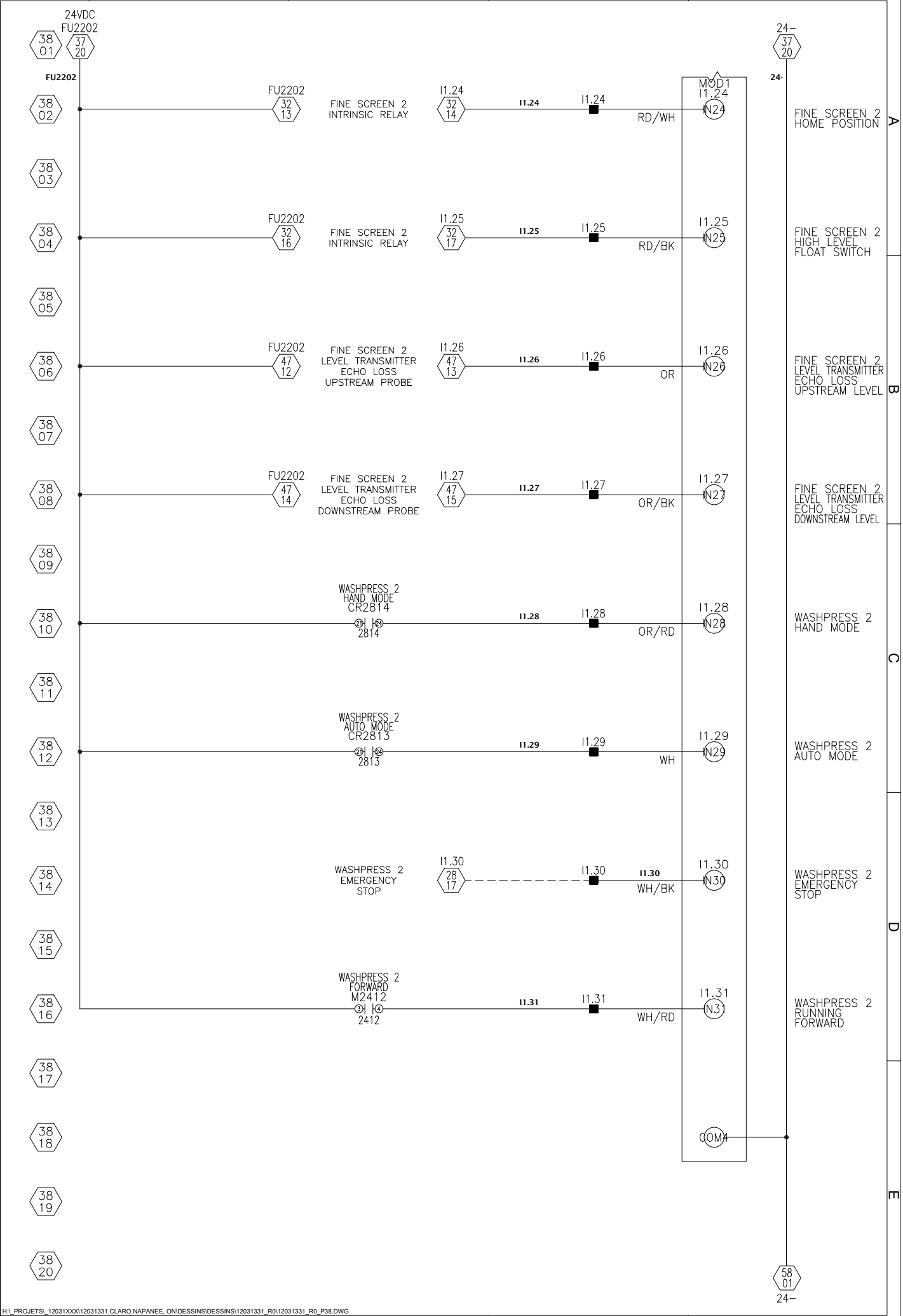
REV	DATE	DESCRIPTION
00	2024-07-30	
FOR APPROVAL		
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		
MOD1 - DIGITAL INPUTS (NEXT)		
CUSTOMER: CLARO		
PROJECT: NAPANEE, ON		
REF.: 22XXX-Q-00		
DRAWN BY: X.MONTAMBAULT		
CHECKED BY: C.SAMSON		
VOLT	600	H.P.
PHASE	3	KVAR
FREQ (HZ)	60	KW
AMP	34	N/A
		TYPE
		12
		
DATE	JULY 2024	DRAWING #
		12031331
		PAGE 36 OF 73




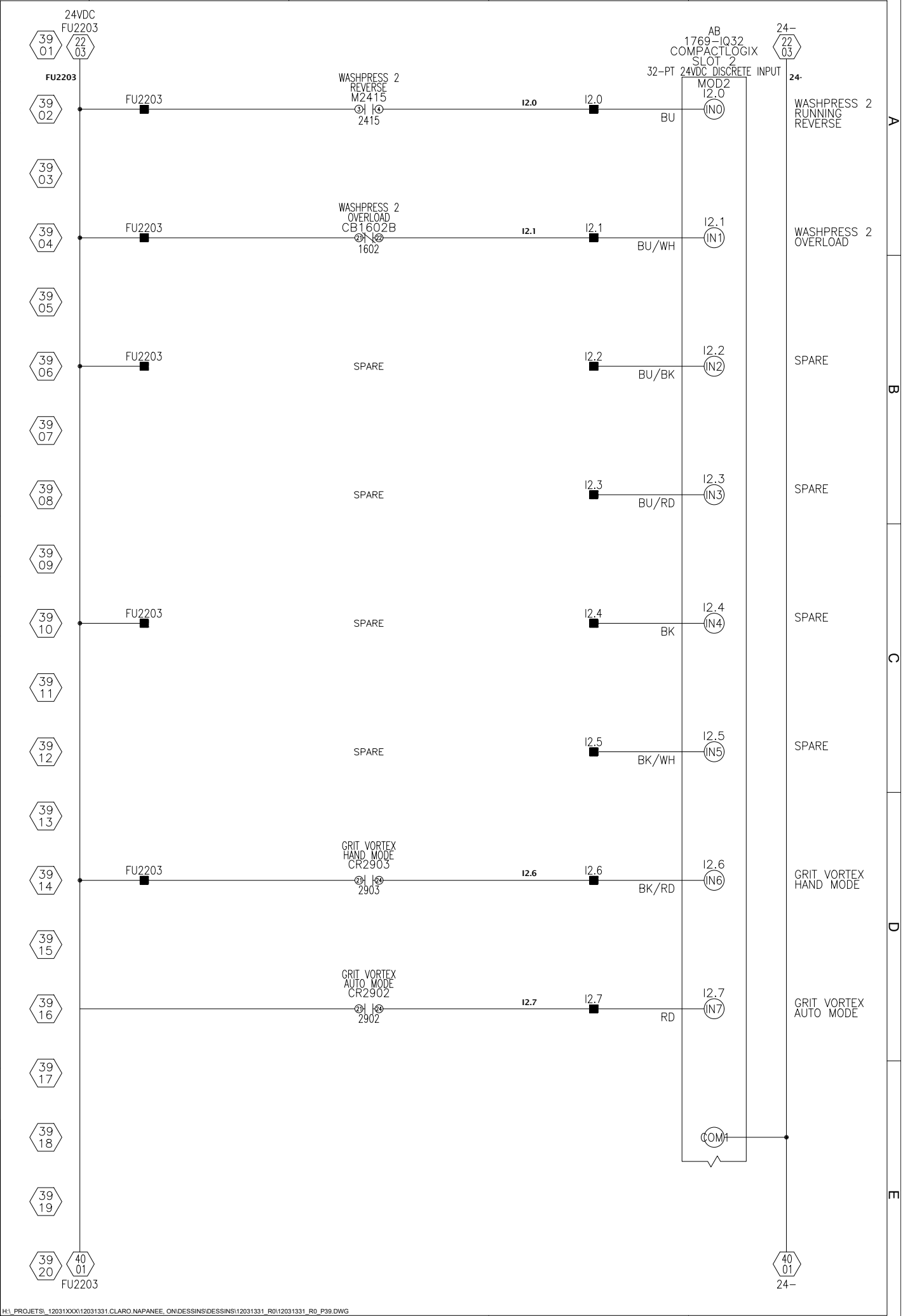
REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOL T</td> <td>600</td> <td>H.P.</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOL T	600	H.P.	27	PHASE	3	KVAR	N/A	FREQ (HZ)	60	KW	N/A	AMP	34	TYPE	12
VOL T	600	H.P.	27															
PHASE	3	KVAR	N/A															
FREQ (HZ)	60	KW	N/A															
AMP	34	TYPE	12															
<table border="1"> <tr> <td>TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL</td> </tr> <tr> <td>MOD1 - DIGITAL INPUTS (NEXT)</td> </tr> <tr> <td>CUSTOMER: CLARO</td> </tr> <tr> <td>PROJECT: NAPANEE, ON</td> </tr> <tr> <td>REF.: 22XXX-Q-00</td> </tr> <tr> <td>DRAWN BY: X.MONTAMBAULT</td> </tr> <tr> <td>CHECKED BY: C.SAMSON</td> </tr> </table>			TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	MOD1 - DIGITAL INPUTS (NEXT)	CUSTOMER: CLARO	PROJECT: NAPANEE, ON	REF.: 22XXX-Q-00	DRAWN BY: X.MONTAMBAULT	CHECKED BY: C.SAMSON									
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL																		
MOD1 - DIGITAL INPUTS (NEXT)																		
CUSTOMER: CLARO																		
PROJECT: NAPANEE, ON																		
REF.: 22XXX-Q-00																		
DRAWN BY: X.MONTAMBAULT																		
CHECKED BY: C.SAMSON																		
<table border="1"> <tr> <td>SCALING:</td> <td>NONE</td> </tr> <tr> <td>DATE:</td> <td>JULY 2024</td> </tr> <tr> <td>DRAWING #:</td> <td>12031331</td> </tr> <tr> <td>PAGE:</td> <td>37 OF 73</td> </tr> </table>			SCALING:	NONE	DATE:	JULY 2024	DRAWING #:	12031331	PAGE:	37 OF 73								
SCALING:	NONE																	
DATE:	JULY 2024																	
DRAWING #:	12031331																	
PAGE:	37 OF 73																	



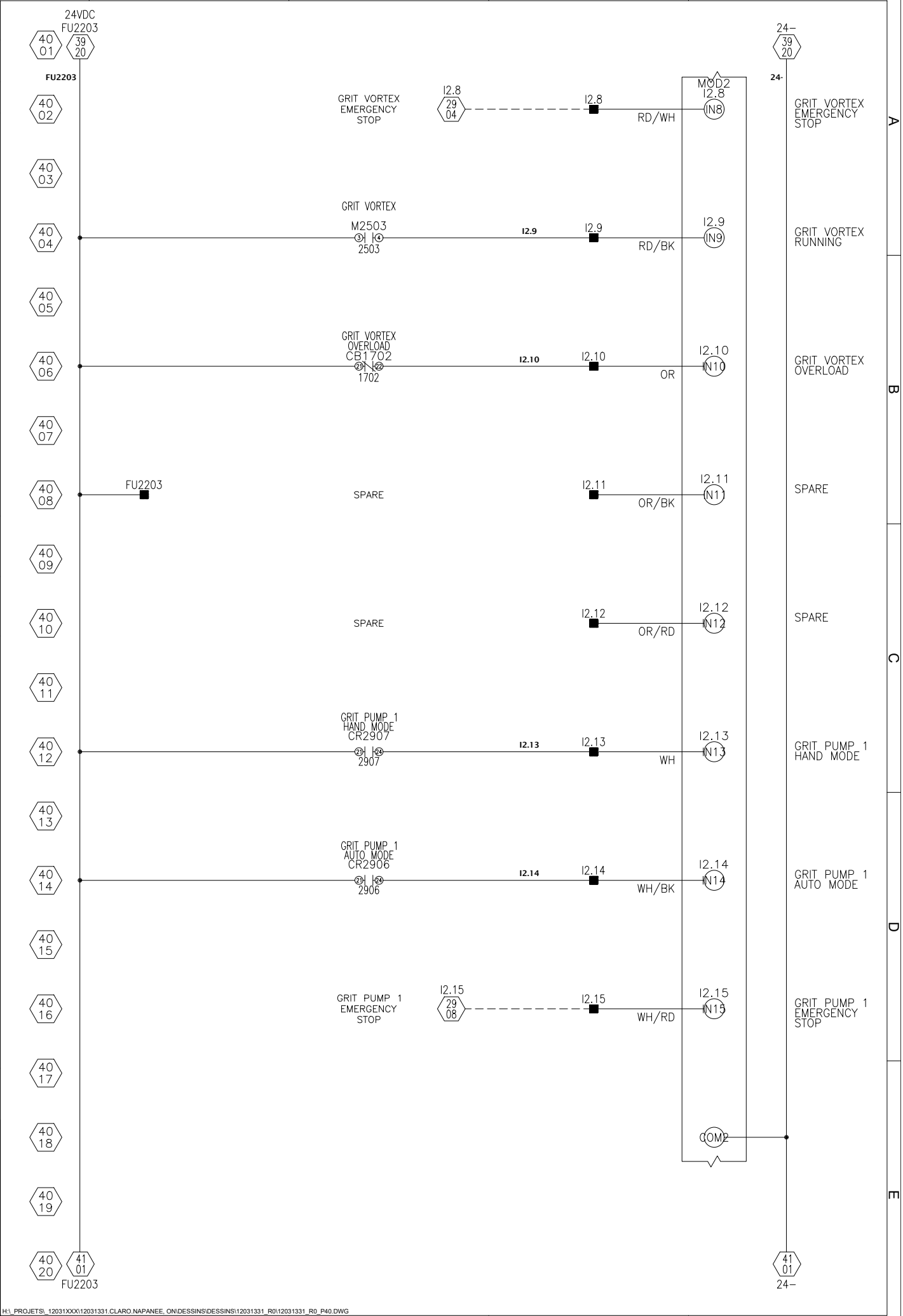
REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> </tr> <tr> <td>PHASE</td> <td>3</td> </tr> <tr> <td>FREQ</td> <td>60</td> </tr> <tr> <td>AMP</td> <td>34</td> </tr> <tr> <td>H.P.</td> <td>27</td> </tr> <tr> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>KW</td> <td>N/A</td> </tr> <tr> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	PHASE	3	FREQ	60	AMP	34	H.P.	27	KVAR	N/A	KW	N/A	TYPE	12
VOLT	600																	
PHASE	3																	
FREQ	60																	
AMP	34																	
H.P.	27																	
KVAR	N/A																	
KW	N/A																	
TYPE	12																	
<table border="1"> <tr> <td>TITLE:</td> <td>SCREENING & GRIT REMOVAL CONTROL PANEL</td> </tr> <tr> <td>MOD1 - DIGITAL INPUTS (NEXT)</td> <td></td> </tr> <tr> <td>CUSTOMER:</td> <td>CLARO</td> </tr> <tr> <td>PROJECT:</td> <td>NAPANEE, ON</td> </tr> <tr> <td>REF.:</td> <td>22XXX-Q-00</td> </tr> <tr> <td>DRAWN BY:</td> <td>X.MONTAMBAULT</td> </tr> <tr> <td>CHECKED BY:</td> <td>C.SAMSON</td> </tr> </table>			TITLE:	SCREENING & GRIT REMOVAL CONTROL PANEL	MOD1 - DIGITAL INPUTS (NEXT)		CUSTOMER:	CLARO	PROJECT:	NAPANEE, ON	REF.:	22XXX-Q-00	DRAWN BY:	X.MONTAMBAULT	CHECKED BY:	C.SAMSON		
TITLE:	SCREENING & GRIT REMOVAL CONTROL PANEL																	
MOD1 - DIGITAL INPUTS (NEXT)																		
CUSTOMER:	CLARO																	
PROJECT:	NAPANEE, ON																	
REF.:	22XXX-Q-00																	
DRAWN BY:	X.MONTAMBAULT																	
CHECKED BY:	C.SAMSON																	
<table border="1"> <tr> <td>SCALING:</td> <td>NONE</td> </tr> <tr> <td>DATE:</td> <td>JULY 2024</td> </tr> <tr> <td>DRAWING #:</td> <td>12031331</td> </tr> <tr> <td>PAGE</td> <td>38 OF 73</td> </tr> </table>			SCALING:	NONE	DATE:	JULY 2024	DRAWING #:	12031331	PAGE	38 OF 73								
SCALING:	NONE																	
DATE:	JULY 2024																	
DRAWING #:	12031331																	
PAGE	38 OF 73																	



REV	DATE	DESCRIPTION																				
00	2024-07-30	FOR APPROVAL																				
<table border="1"> <tr> <td>VOL T</td> <td>600</td> <td>H.P.</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>(HZ)</td> <td></td> <td>TYPE</td> <td>12</td> </tr> <tr> <td>AMP</td> <td>34</td> <td></td> <td></td> </tr> </table>			VOL T	600	H.P.	27	PHASE	3	KVAR	N/A	FREQ	60	KW	N/A	(HZ)		TYPE	12	AMP	34		
VOL T	600	H.P.	27																			
PHASE	3	KVAR	N/A																			
FREQ	60	KW	N/A																			
(HZ)		TYPE	12																			
AMP	34																					
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL MOD2 - DIGITAL INPUTS CUSTOMER: CLARO PROJECT: NAPANEE, ON REF.: 22XXX-Q-00 DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON																						
		SCALING: NONE DATE: JULY 2024 DRAWING # 12031331 PAGE 39 OF 73																				



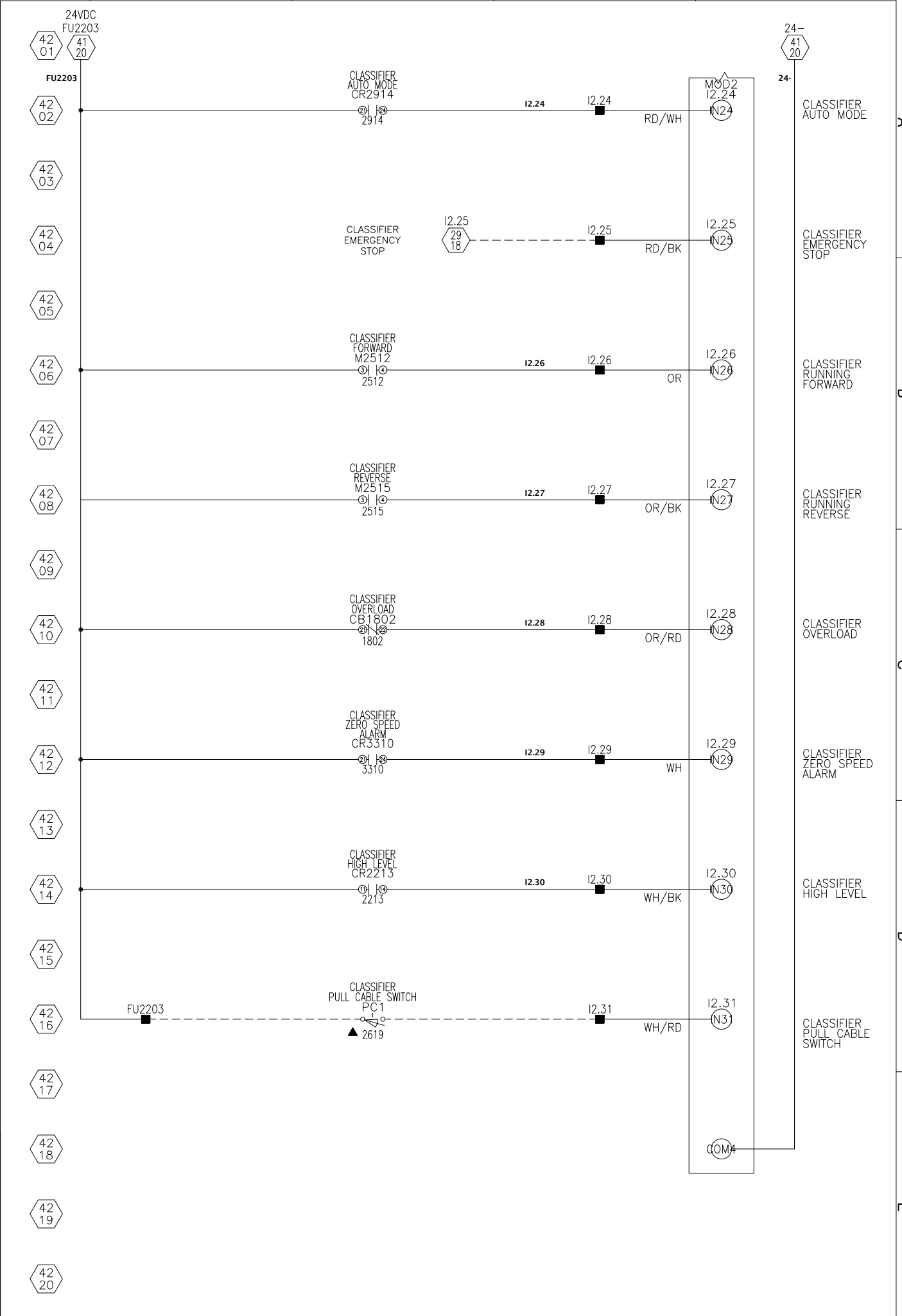
REV	DATE	DESCRIPTION
00	2024-07-30	
FOR APPROVAL		
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		
MOD2 - DIGITAL INPUTS (NEXT)		
CUSTOMER: CLARO		
PROJECT: NAPANEE, ON		
REF.: 22XXX-Q-00		
DRAWN BY: X.MONTAMBAULT		
CHECKED BY: C.SAMSON		
DATE: JULY 2024		
SCALING: NONE		
DRAWING # 12031331		
PAGE 40 OF 73		



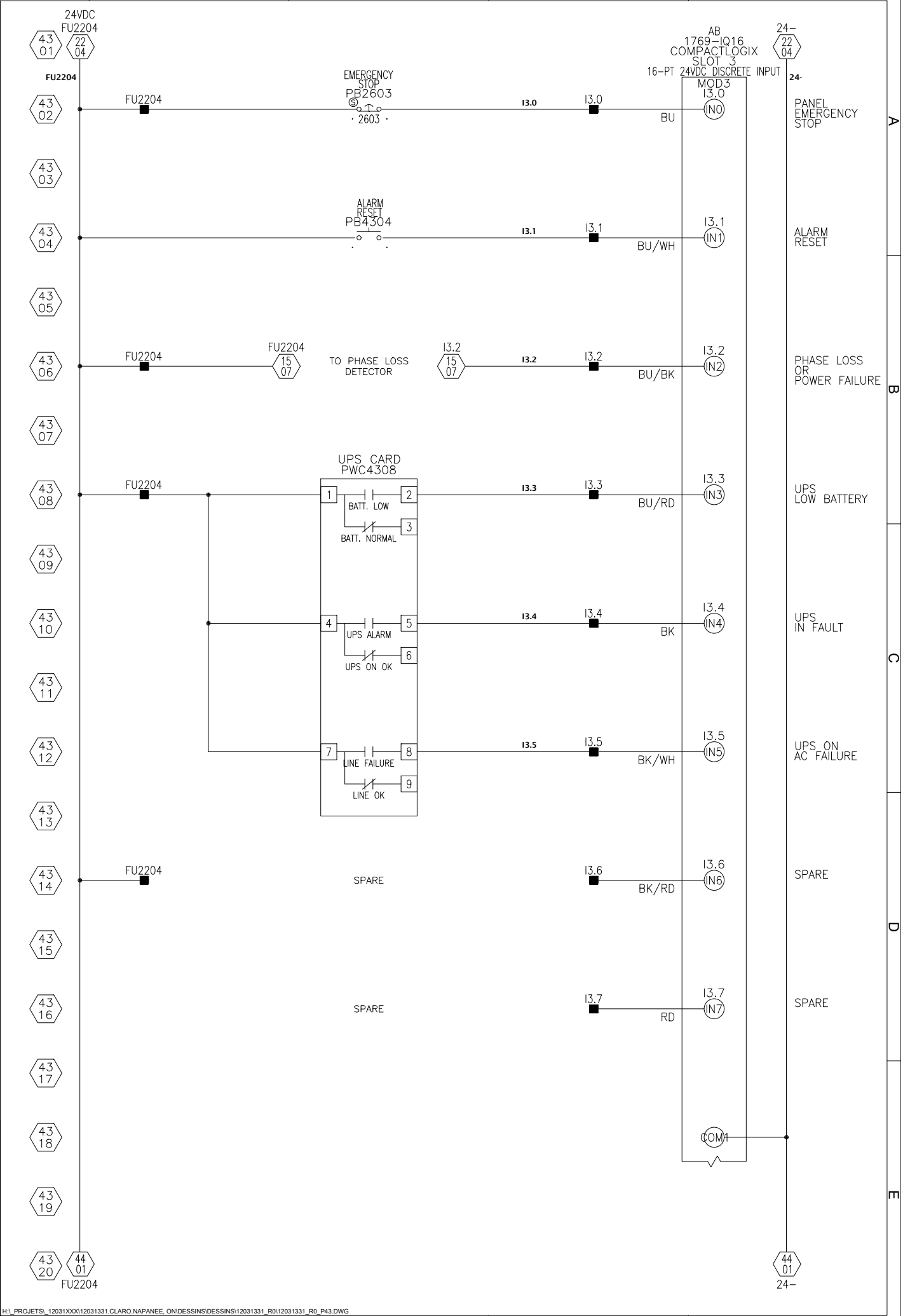
REV	DATE	DESCRIPTION																		
00	2024-07-30	FOR APPROVAL																		
<table border="1"> <tr> <td>VOLT</td> <td>600</td> </tr> <tr> <td>PHASE</td> <td>3</td> </tr> <tr> <td>FREQ</td> <td>60</td> </tr> <tr> <td>(HZ)</td> <td></td> </tr> <tr> <td>AMP</td> <td>34</td> </tr> <tr> <td>H.P.</td> <td>27</td> </tr> <tr> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>KW</td> <td>N/A</td> </tr> <tr> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	PHASE	3	FREQ	60	(HZ)		AMP	34	H.P.	27	KVAR	N/A	KW	N/A	TYPE	12
VOLT	600																			
PHASE	3																			
FREQ	60																			
(HZ)																				
AMP	34																			
H.P.	27																			
KVAR	N/A																			
KW	N/A																			
TYPE	12																			
<table border="1"> <tr> <td>TITLE:</td> <td>SCREENING & GRIT REMOVAL CONTROL PANEL</td> </tr> <tr> <td>MOD2 - DIGITAL INPUTS (NEXT)</td> <td></td> </tr> <tr> <td>CUSTOMER:</td> <td>CLARO</td> </tr> <tr> <td>PROJECT:</td> <td>NAPANEE, ON</td> </tr> <tr> <td>DRAWN BY:</td> <td>X.MONTAMBAULT</td> </tr> <tr> <td>CHECKED BY:</td> <td>C.SAMSON</td> </tr> </table>			TITLE:	SCREENING & GRIT REMOVAL CONTROL PANEL	MOD2 - DIGITAL INPUTS (NEXT)		CUSTOMER:	CLARO	PROJECT:	NAPANEE, ON	DRAWN BY:	X.MONTAMBAULT	CHECKED BY:	C.SAMSON						
TITLE:	SCREENING & GRIT REMOVAL CONTROL PANEL																			
MOD2 - DIGITAL INPUTS (NEXT)																				
CUSTOMER:	CLARO																			
PROJECT:	NAPANEE, ON																			
DRAWN BY:	X.MONTAMBAULT																			
CHECKED BY:	C.SAMSON																			
<table border="1"> <tr> <td>SCALING:</td> <td>NONE</td> </tr> <tr> <td>DATE:</td> <td>JULY 2024</td> </tr> <tr> <td>DRAWING #:</td> <td>12031331</td> </tr> <tr> <td>PAGE</td> <td>41 OF 73</td> </tr> </table>			SCALING:	NONE	DATE:	JULY 2024	DRAWING #:	12031331	PAGE	41 OF 73										
SCALING:	NONE																			
DATE:	JULY 2024																			
DRAWING #:	12031331																			
PAGE	41 OF 73																			



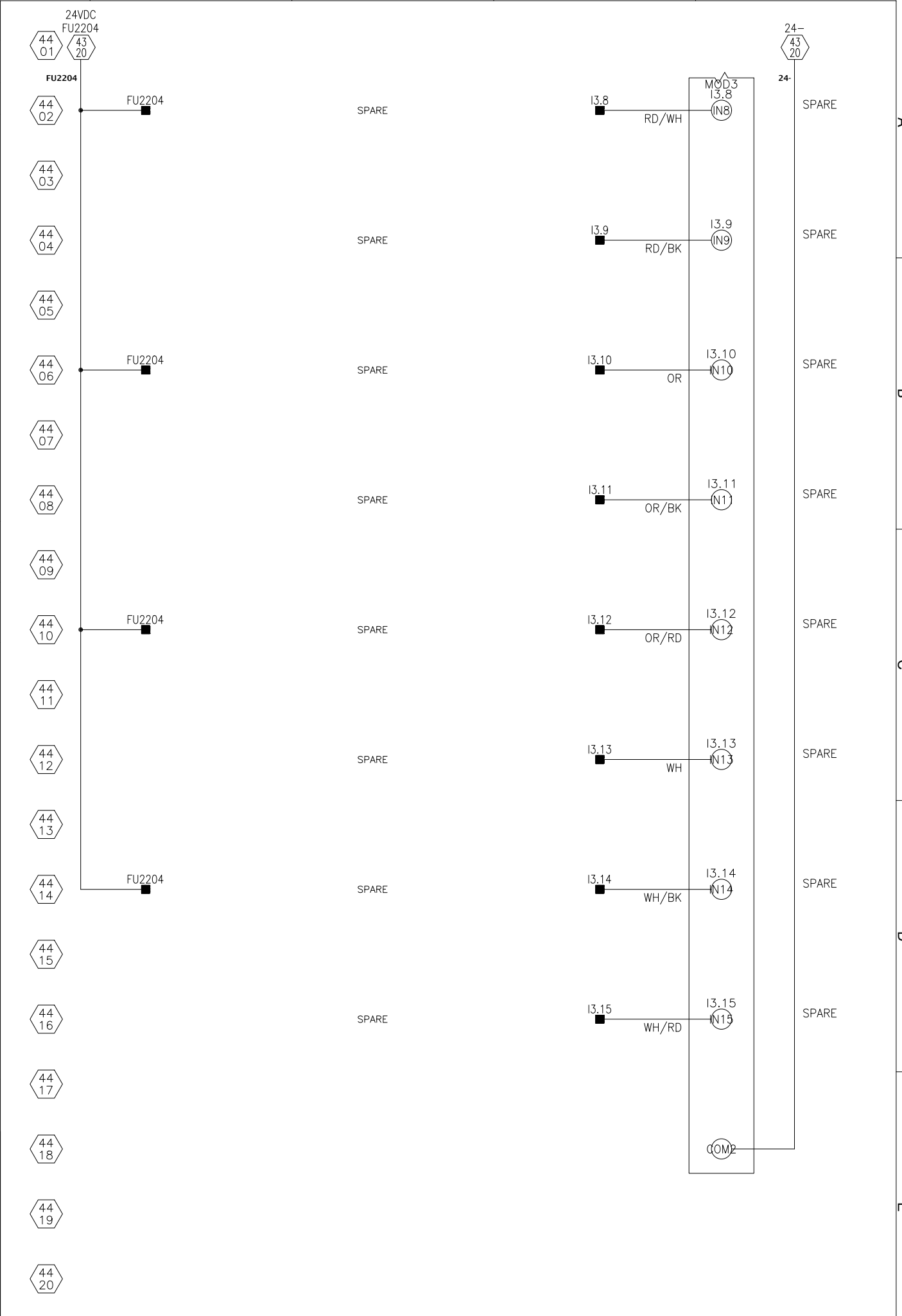
REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOL T</td> <td>600</td> </tr> <tr> <td>PHASE</td> <td>3</td> </tr> <tr> <td>FREQ</td> <td>60</td> </tr> <tr> <td>AMP</td> <td>34</td> </tr> <tr> <td>H.P.</td> <td>27</td> </tr> <tr> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>KW</td> <td>N/A</td> </tr> <tr> <td>TYPE</td> <td>12</td> </tr> </table>			VOL T	600	PHASE	3	FREQ	60	AMP	34	H.P.	27	KVAR	N/A	KW	N/A	TYPE	12
VOL T	600																	
PHASE	3																	
FREQ	60																	
AMP	34																	
H.P.	27																	
KVAR	N/A																	
KW	N/A																	
TYPE	12																	
<table border="1"> <tr> <td>TITLE:</td> <td>SCREENING & GRIT REMOVAL CONTROL PANEL</td> </tr> <tr> <td>MOD2 - DIGITAL INPUTS (NEXT)</td> <td></td> </tr> <tr> <td>CUSTOMER:</td> <td>CLARO</td> </tr> <tr> <td>PROJECT:</td> <td>NAPANEE, ON</td> </tr> <tr> <td>REF.:</td> <td>22XXX-Q-00</td> </tr> <tr> <td>DRAWN BY:</td> <td>X.MONTAMBAULT</td> </tr> <tr> <td>CHECKED BY:</td> <td>C.SAMSON</td> </tr> </table>			TITLE:	SCREENING & GRIT REMOVAL CONTROL PANEL	MOD2 - DIGITAL INPUTS (NEXT)		CUSTOMER:	CLARO	PROJECT:	NAPANEE, ON	REF.:	22XXX-Q-00	DRAWN BY:	X.MONTAMBAULT	CHECKED BY:	C.SAMSON		
TITLE:	SCREENING & GRIT REMOVAL CONTROL PANEL																	
MOD2 - DIGITAL INPUTS (NEXT)																		
CUSTOMER:	CLARO																	
PROJECT:	NAPANEE, ON																	
REF.:	22XXX-Q-00																	
DRAWN BY:	X.MONTAMBAULT																	
CHECKED BY:	C.SAMSON																	
SCALING:	NONE																	
DATE:	JULY 2024																	
DRAWING #:	12031331																	
PAGE	42 OF 73																	



REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> </tr> <tr> <td>PHASE</td> <td>3</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> </tr> <tr> <td>AMP</td> <td>34</td> </tr> <tr> <td>H.P.</td> <td>27</td> </tr> <tr> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>KVA</td> <td>N/A</td> </tr> <tr> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	PHASE	3	FREQ (HZ)	60	AMP	34	H.P.	27	KVAR	N/A	KVA	N/A	TYPE	12
VOLT	600																	
PHASE	3																	
FREQ (HZ)	60																	
AMP	34																	
H.P.	27																	
KVAR	N/A																	
KVA	N/A																	
TYPE	12																	
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL MOD3 - DIGITAL INPUTS CUSTOMER: CLARO PROJECT: NAPANEE, ON REF.: 22XXX-Q-00 DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON																		
DATE	SCALING	DRAWING #																
JULY 2024	NONE	12031331																
		PAGE 43 OF 73																



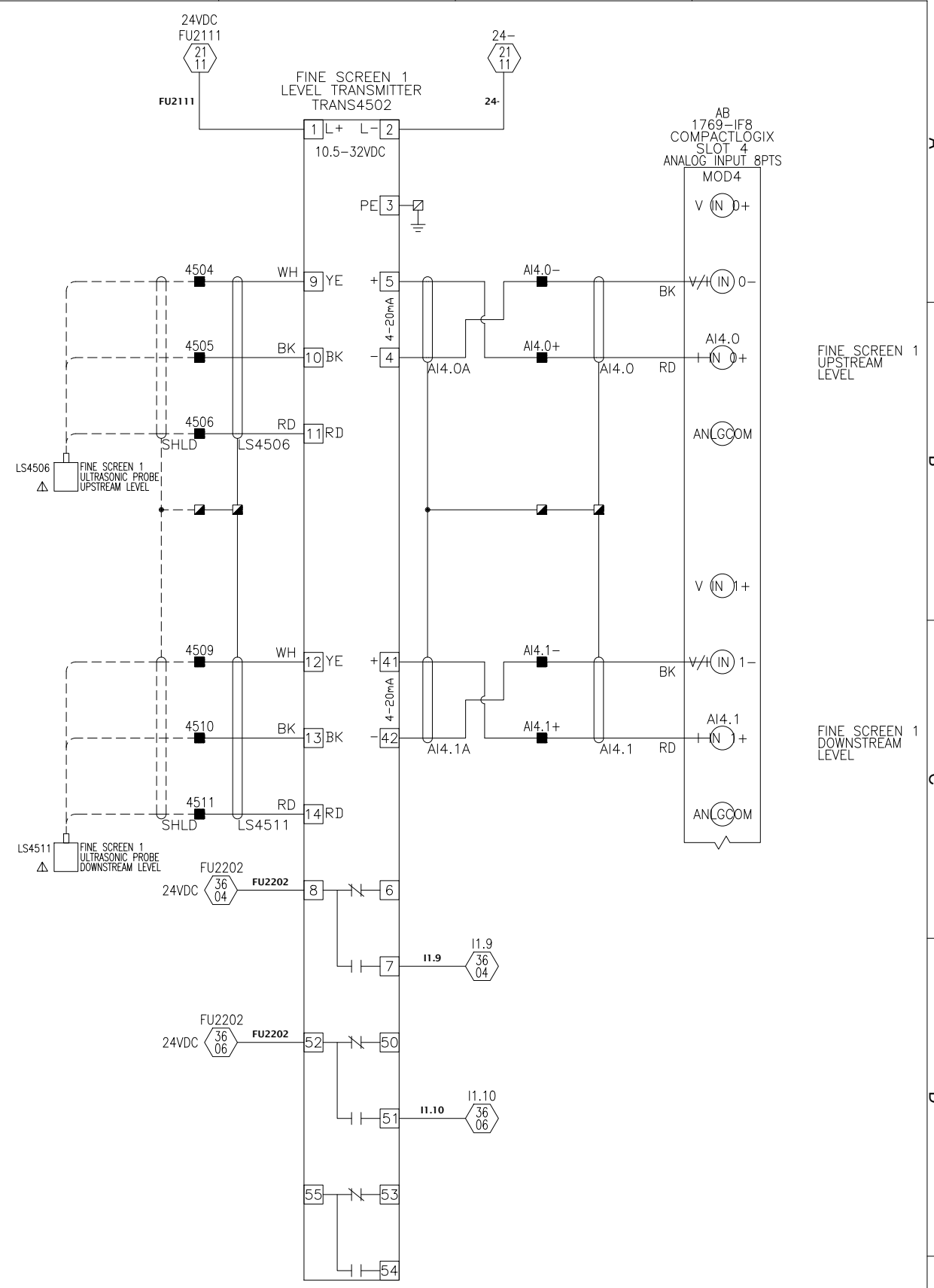
REV	DATE	DESCRIPTION	VOLT	H.P.	TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL
00	2024-07-30		600	27	MOD3 - DIGITAL INPUTS (NEXT)
			PHASE	KVAR	CUSTOMER: CLARO
			3	N/A	PROJECT: NAPANEE, ON
			FREQ	KW	REF.: 22XXX-Q-00
			60	N/A	DRAWN BY: X.MONTAMBAULT
			(HZ)		CHECKED BY: C.SAMSON
			AMP	TYPE	
			34	12	



SCALING: NONE
DATE: JULY 2024
DRAWING # 12031331
PAGE 44 OF 73

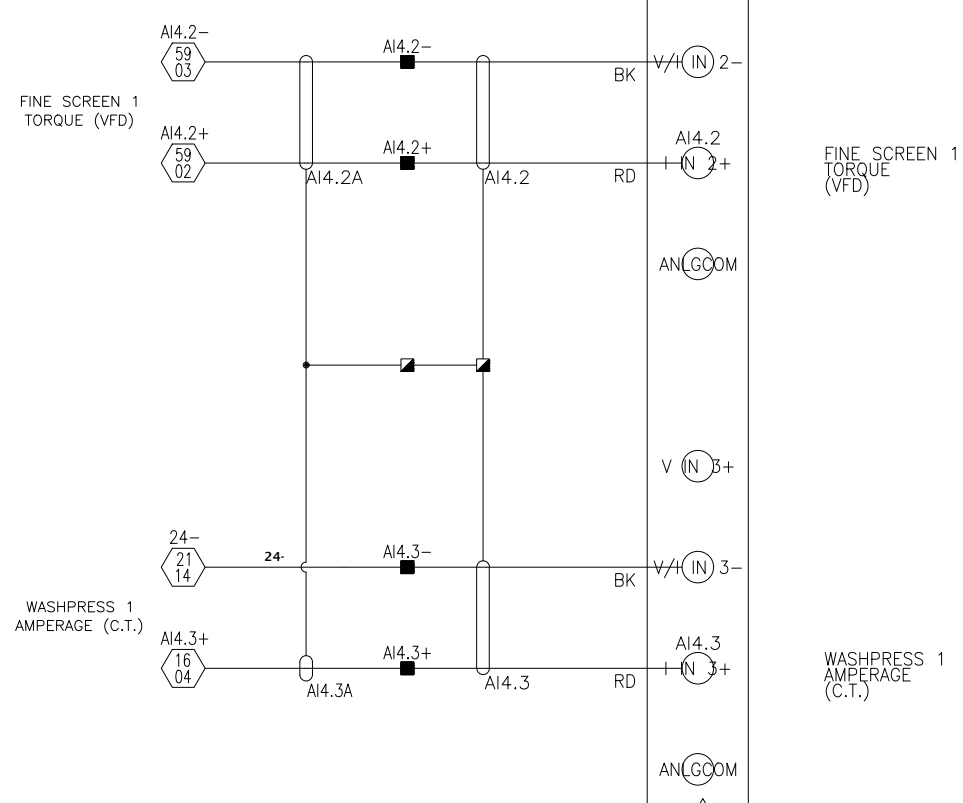
REV	DATE	DESCRIPTION
00	2024-07-30	
FOR APPROVAL		
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		
MOD4 - ANALOG INPUTS		
CUSTOMER: CLARO		
PROJECT: NAPANEE, ON		
DRAWN BY: X.MONTAMBAULT		
CHECKED BY: C.SAMSON		
SCALE:	DATE:	
NONE	JULY 2024	
DRAWING #		12031331
PAGE		45 OF 73

- 45 01
- 45 02
- 45 03
- 45 04
- 45 05
- 45 06
- 45 07
- 45 08
- 45 09
- 45 10
- 45 11
- 45 12
- 45 13
- 45 14
- 45 15
- 45 16
- 45 17
- 45 18
- 45 19
- 45 20

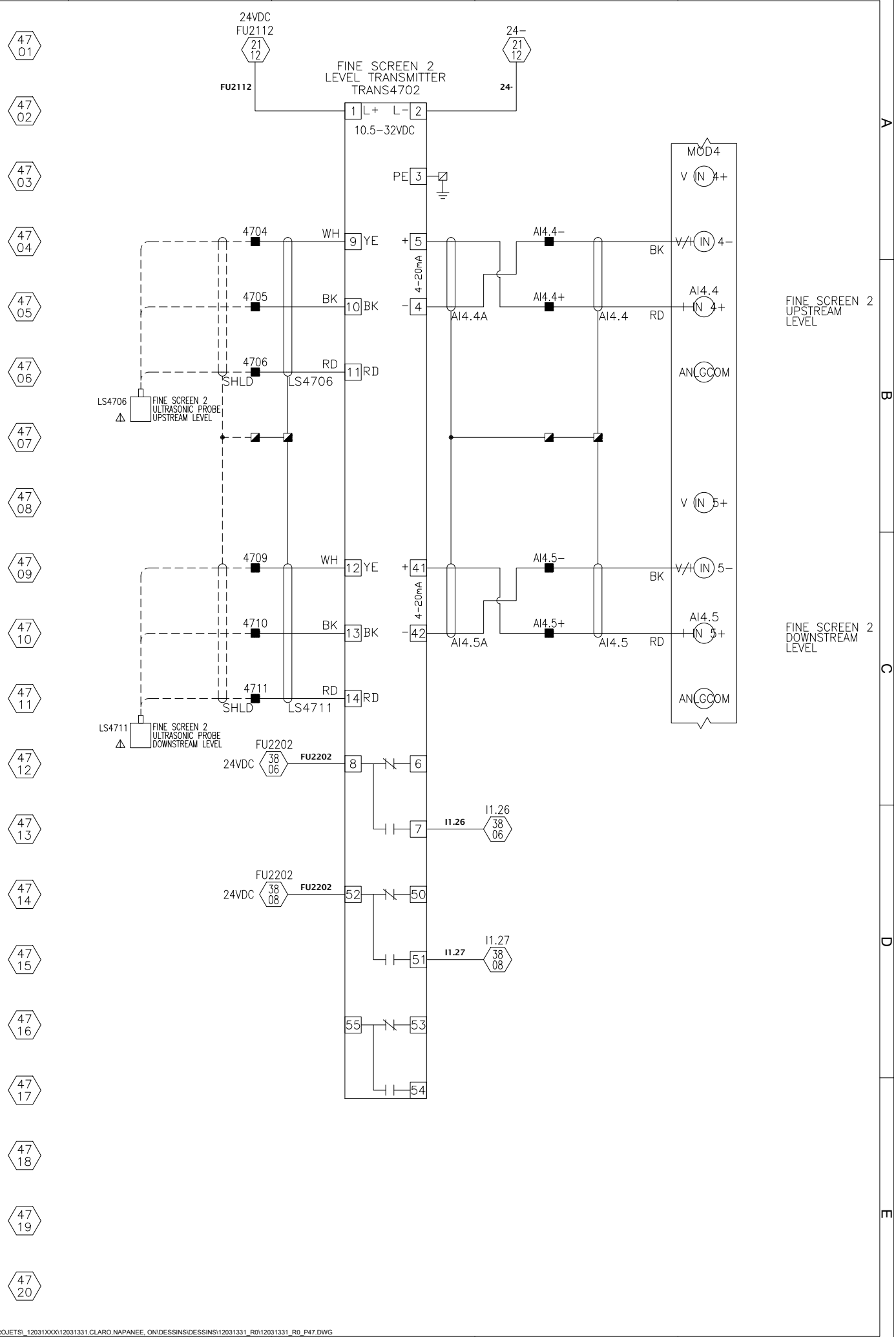


REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> <td>H.P.</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	H.P.	27	PHASE	3	KVAR	N/A	FREQ (HZ)	60	KW	N/A	AMP	34	TYPE	12
VOLT	600	H.P.	27															
PHASE	3	KVAR	N/A															
FREQ (HZ)	60	KW	N/A															
AMP	34	TYPE	12															
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL MOD4 - ANALOG INPUTS (NEXT) CUSTOMER: CLARO PROJECT: NAPANEE, ON REF.: 22XXX-Q-00 DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON																		
SCALING: NONE DATE: JULY 2024		DRAWING# 12031331 PAGE 46 OF 73																

- 46 01
- 46 02
- 46 03
- 46 04
- 46 05
- 46 06
- 46 07
- 46 08
- 46 09
- 46 10
- 46 11
- 46 12
- 46 13
- 46 14
- 46 15
- 46 16
- 46 17
- 46 18
- 46 19
- 46 20



REV	DATE	DESCRIPTION
00	2024-07-30	
FOR APPROVAL		
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		
MOD4 - ANALOG INPUTS (NEXT)		
CUSTOMER: CLARO		
PROJECT: NAPANEE, ON		
REF.: 22XXX-Q-00		
DRAWN BY: X.MONTAMBALULT		
CHECKED BY: C.SAMSON		
SCALE:	DATE:	
NONE	JULY 2024	
DRAWING #		12031331
PAGE		47 OF 73

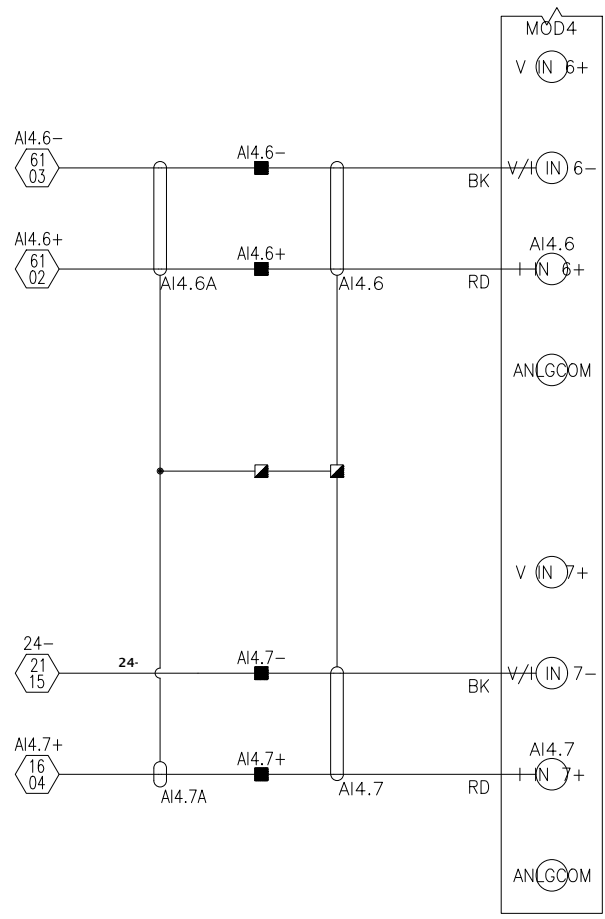


REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> <td>H.P.</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	H.P.	27	PHASE	3	KVAR	N/A	FREQ (HZ)	60	KW	N/A	AMP	34	TYPE	12
VOLT	600	H.P.	27															
PHASE	3	KVAR	N/A															
FREQ (HZ)	60	KW	N/A															
AMP	34	TYPE	12															
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL MOD4 - ANALOG INPUTS (NEXT) CUSTOMER: CLARO PROJECT: NAPANEE, ON REF.: 22XXX-Q-00 DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON																		
SCALING: NONE DATE: JULY 2024		DRAWING# 12031331 PAGE 48 OF 73																

- 48 01
- 48 02
- 48 03
- 48 04
- 48 05
- 48 06
- 48 07
- 48 08
- 48 09
- 48 10
- 48 11
- 48 12
- 48 13
- 48 14
- 48 15
- 48 16
- 48 17
- 48 18
- 48 19
- 48 20

FINE SCREEN 2
TORQUE (VFD)

WASHPRESS 2
AMPERAGE (C.T.)

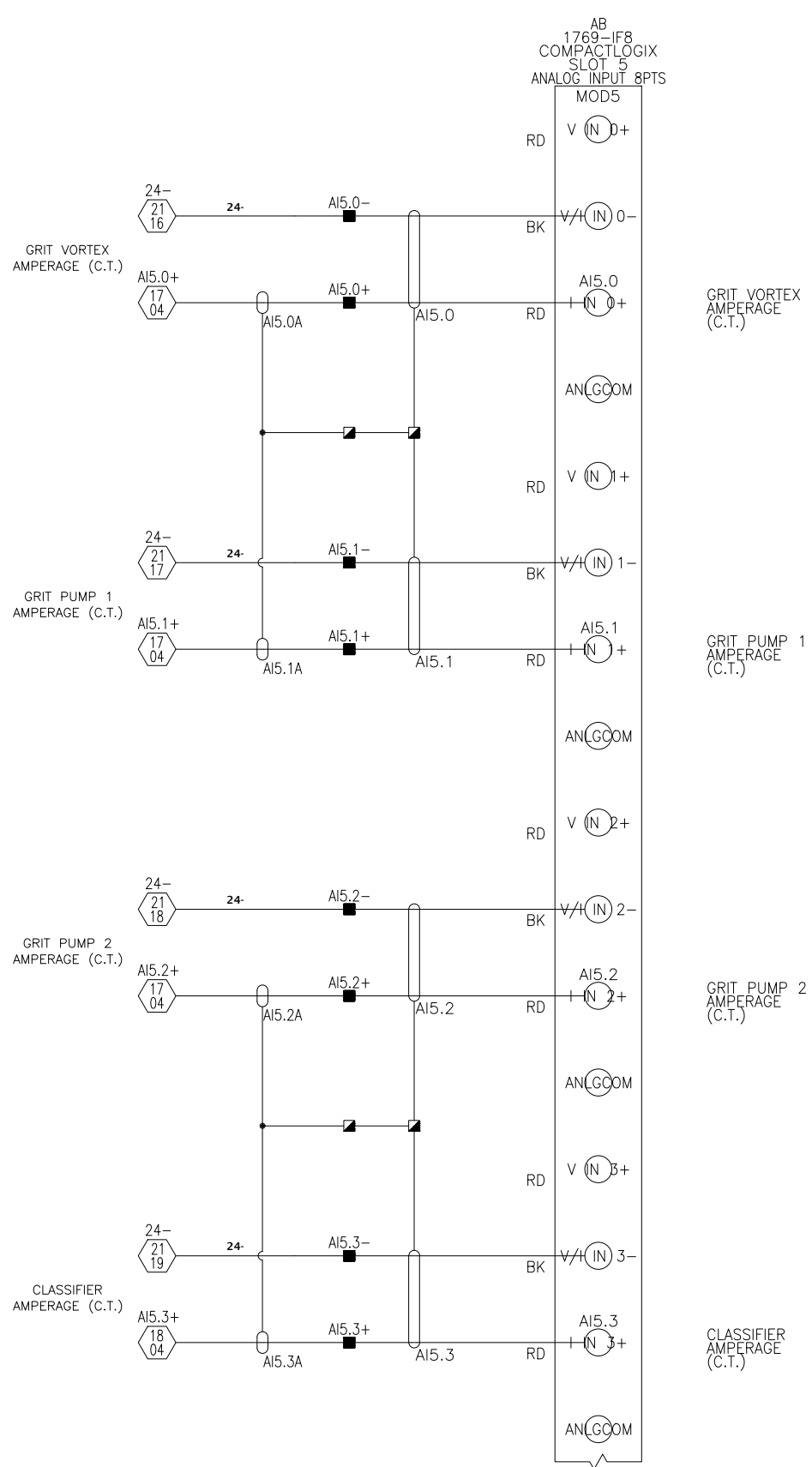


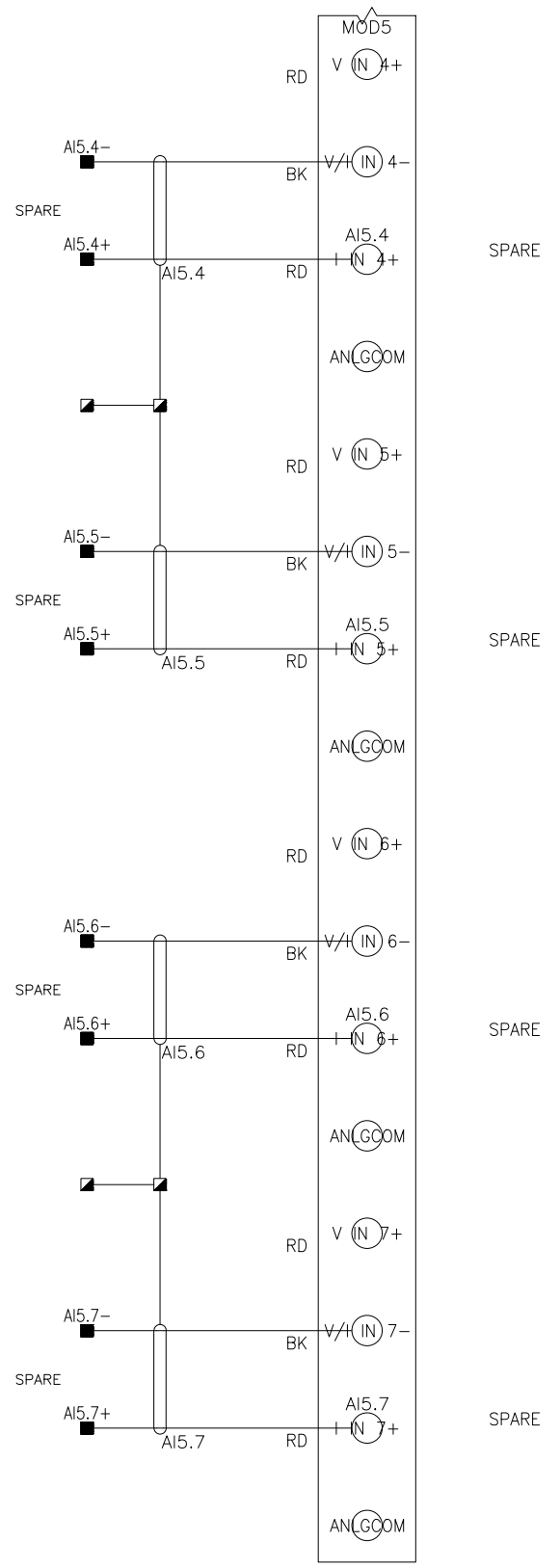
FINE SCREEN 2
TORQUE
(VFD)

WASHPRESS 2
AMPERAGE
(C.T.)

REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> </tr> <tr> <td>PHASE</td> <td>3</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> </tr> <tr> <td>AMP</td> <td>34</td> </tr> <tr> <td>H.P.</td> <td>27</td> </tr> <tr> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>KW</td> <td>N/A</td> </tr> <tr> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	PHASE	3	FREQ (HZ)	60	AMP	34	H.P.	27	KVAR	N/A	KW	N/A	TYPE	12
VOLT	600																	
PHASE	3																	
FREQ (HZ)	60																	
AMP	34																	
H.P.	27																	
KVAR	N/A																	
KW	N/A																	
TYPE	12																	
<table border="1"> <tr> <td>TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL</td> </tr> <tr> <td>MOD5 - ANALOG INPUTS</td> </tr> <tr> <td>CUSTOMER: CLARO</td> </tr> <tr> <td>PROJECT: NAPANEE, ON</td> </tr> <tr> <td>REF.: 22XXX-Q-00</td> </tr> <tr> <td>DRAWN BY: X.MONTAMBAULT</td> </tr> <tr> <td>CHECKED BY: C.SAMSON</td> </tr> </table>			TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	MOD5 - ANALOG INPUTS	CUSTOMER: CLARO	PROJECT: NAPANEE, ON	REF.: 22XXX-Q-00	DRAWN BY: X.MONTAMBAULT	CHECKED BY: C.SAMSON									
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL																		
MOD5 - ANALOG INPUTS																		
CUSTOMER: CLARO																		
PROJECT: NAPANEE, ON																		
REF.: 22XXX-Q-00																		
DRAWN BY: X.MONTAMBAULT																		
CHECKED BY: C.SAMSON																		
SCALING:	NONE																	
DATE:	JULY 2024																	
DRAWING #:	12031331																	
PAGE	49 OF 73																	

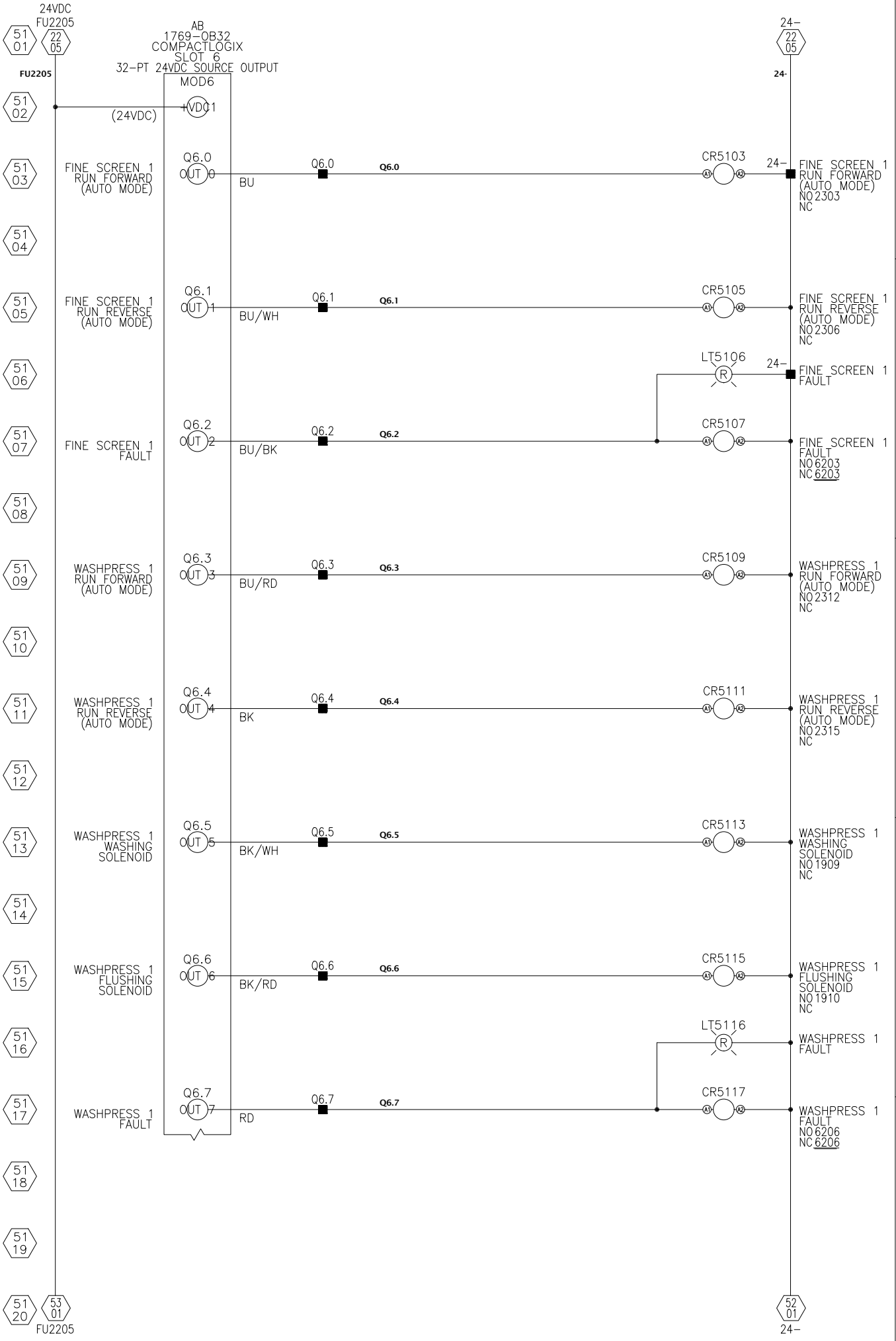
- 49 01
- 49 02
- 49 03
- 49 04
- 49 05
- 49 06
- 49 07
- 49 08
- 49 09
- 49 10
- 49 11
- 49 12
- 49 13
- 49 14
- 49 15
- 49 16
- 49 17
- 49 18
- 49 19
- 49 20





- 50 01
- 50 02
- 50 03
- 50 04
- 50 05
- 50 06
- 50 07
- 50 08
- 50 09
- 50 10
- 50 11
- 50 12
- 50 13
- 50 14
- 50 15
- 50 16
- 50 17
- 50 18
- 50 19
- 50 20

REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> <td>H.P.</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	H.P.	27	PHASE	3	KVAR	N/A	FREQ (HZ)	60	KW	N/A	AMP	34	TYPE	12
VOLT	600	H.P.	27															
PHASE	3	KVAR	N/A															
FREQ (HZ)	60	KW	N/A															
AMP	34	TYPE	12															
<table border="1"> <tr> <td>TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL</td> <td>MOD5 - ANALOG INPUTS (NEXT)</td> </tr> <tr> <td>CUSTOMER: CLARO</td> <td>PROJECT: NAPANEE, ON</td> </tr> <tr> <td>REF.: 22XXX-Q-00</td> <td>CHECKED BY: C. SAMSON</td> </tr> <tr> <td>DRAWN BY: X. MONTAMBAULT</td> <td></td> </tr> </table>			TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	MOD5 - ANALOG INPUTS (NEXT)	CUSTOMER: CLARO	PROJECT: NAPANEE, ON	REF.: 22XXX-Q-00	CHECKED BY: C. SAMSON	DRAWN BY: X. MONTAMBAULT									
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	MOD5 - ANALOG INPUTS (NEXT)																	
CUSTOMER: CLARO	PROJECT: NAPANEE, ON																	
REF.: 22XXX-Q-00	CHECKED BY: C. SAMSON																	
DRAWN BY: X. MONTAMBAULT																		
<table border="1"> <tr> <td>SCALING:</td> <td>NONE</td> <td>DRAWING#</td> <td>12031331</td> </tr> <tr> <td>DATE:</td> <td>JULY 2024</td> <td>PAGE</td> <td>50 OF 73</td> </tr> </table>			SCALING:	NONE	DRAWING#	12031331	DATE:	JULY 2024	PAGE	50 OF 73								
SCALING:	NONE	DRAWING#	12031331															
DATE:	JULY 2024	PAGE	50 OF 73															



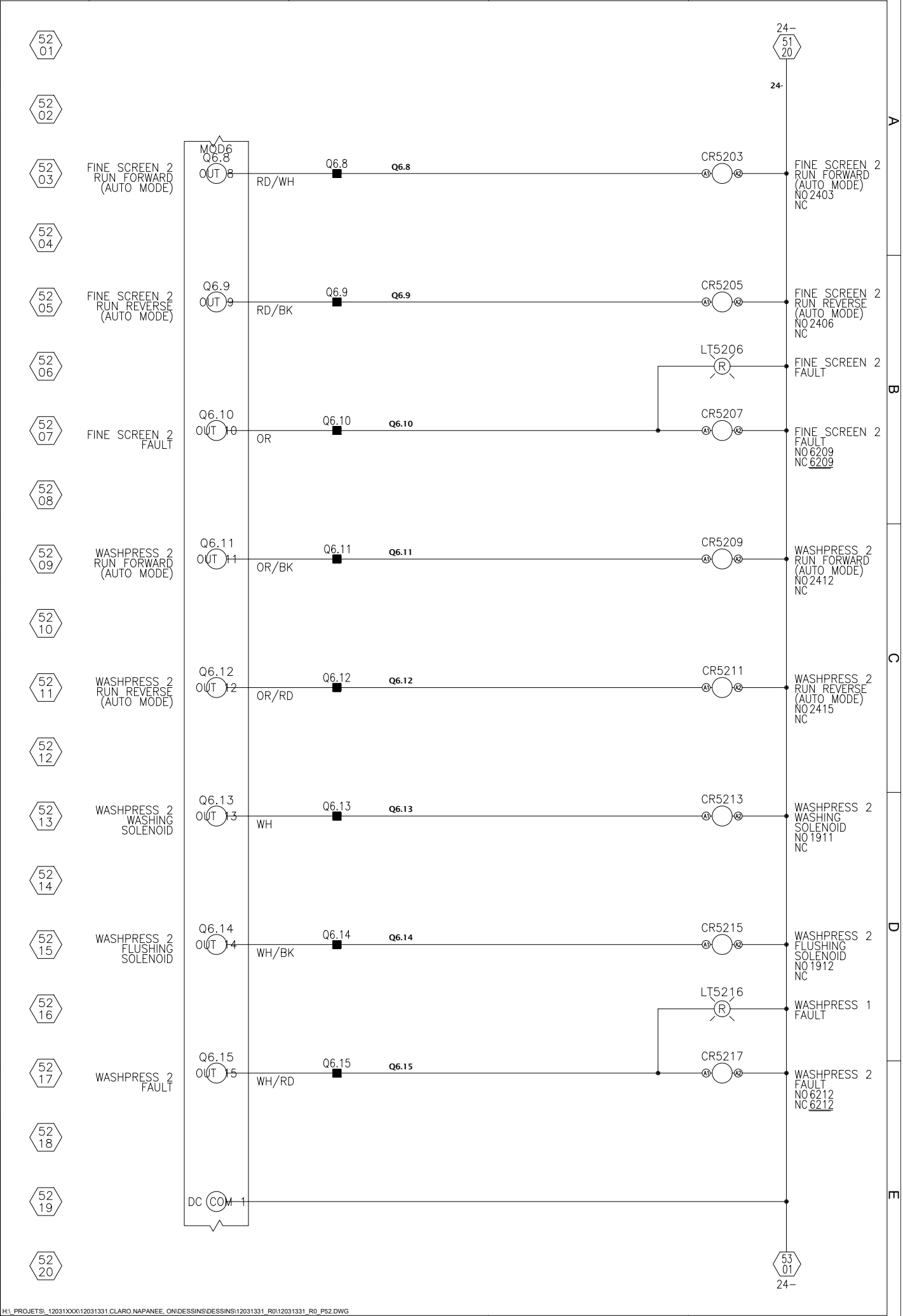
REV	DATE	DESCRIPTION
00	2024-07-30	FOR APPROVAL
51 01		
51 02		
51 03		
51 04		
51 05		
51 06		
51 07		
51 08		
51 09		
51 10		
51 11		
51 12		
51 13		
51 14		
51 15		
51 16		
51 17		
51 18		
51 19		
51 20		

VOLT	600
PHASE	3
FREQ	60
AMP	34
H.P.	27
KVAR	N/A
KVA	N/A
TYPE	12

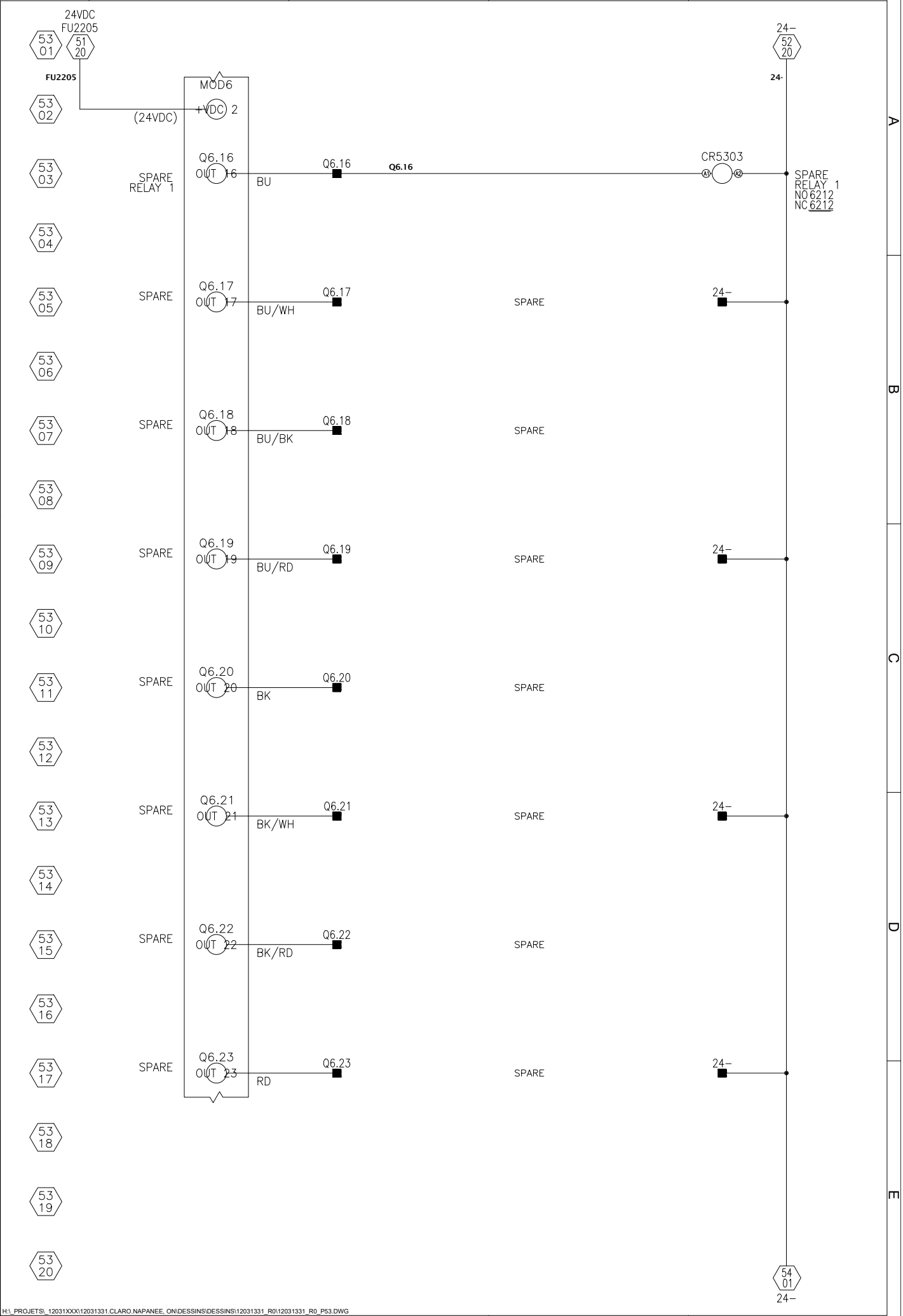
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL
MOD6 - DIGITAL OUTPUTS
CUSTOMER: CLARO
PROJECT: NAPANEE, ON
REF.: 22XXX-Q-00
DRAWN BY: X.MONTAMBAULT
CHECKED BY: C.SAMSON

SCALING:	NONE
DATE:	JULY 2024
DRAWING #:	12031331
PAGE:	51 OF 73

REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> </tr> <tr> <td>PHASE</td> <td>3</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> </tr> <tr> <td>AMP</td> <td>34</td> </tr> <tr> <td>H.P.</td> <td>27</td> </tr> <tr> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>KVA</td> <td>N/A</td> </tr> <tr> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	PHASE	3	FREQ (HZ)	60	AMP	34	H.P.	27	KVAR	N/A	KVA	N/A	TYPE	12
VOLT	600																	
PHASE	3																	
FREQ (HZ)	60																	
AMP	34																	
H.P.	27																	
KVAR	N/A																	
KVA	N/A																	
TYPE	12																	
<table border="1"> <tr> <td>TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL</td> </tr> <tr> <td>MOD6 - DIGITAL OUTPUTS (NEXT)</td> </tr> <tr> <td>CUSTOMER: CLARO</td> </tr> <tr> <td>PROJECT: NAPANEE, ON</td> </tr> <tr> <td>REF.: 22XXX-Q-00</td> </tr> <tr> <td>DRAWN BY: X.MONTAMBAULT</td> </tr> <tr> <td>CHECKED BY: C.SAMSON</td> </tr> </table>			TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	MOD6 - DIGITAL OUTPUTS (NEXT)	CUSTOMER: CLARO	PROJECT: NAPANEE, ON	REF.: 22XXX-Q-00	DRAWN BY: X.MONTAMBAULT	CHECKED BY: C.SAMSON									
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL																		
MOD6 - DIGITAL OUTPUTS (NEXT)																		
CUSTOMER: CLARO																		
PROJECT: NAPANEE, ON																		
REF.: 22XXX-Q-00																		
DRAWN BY: X.MONTAMBAULT																		
CHECKED BY: C.SAMSON																		
DATE	SCALING	DRAWING#																
JULY 2024	NONE	12031331																
PAGE	52	OF 73																

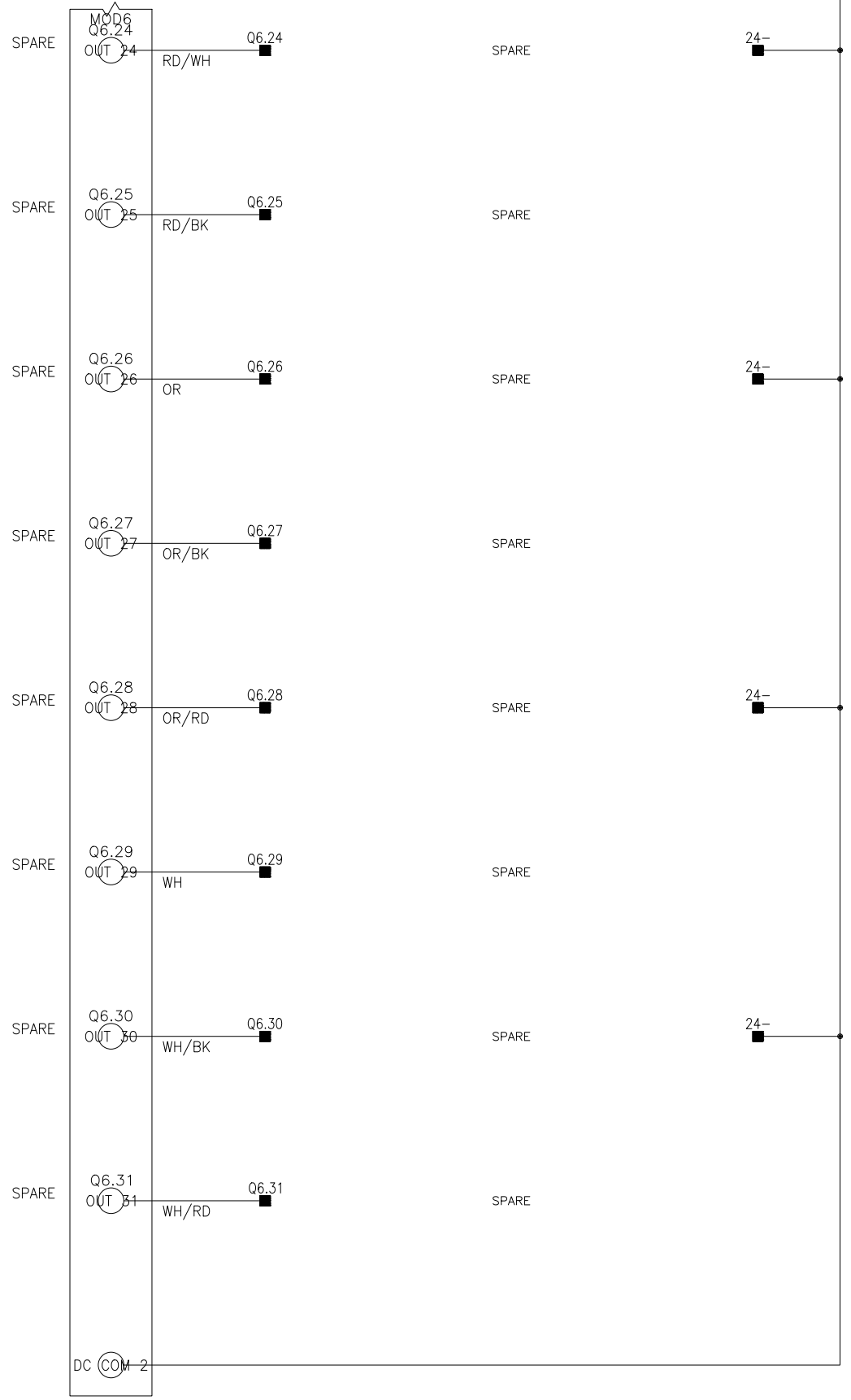


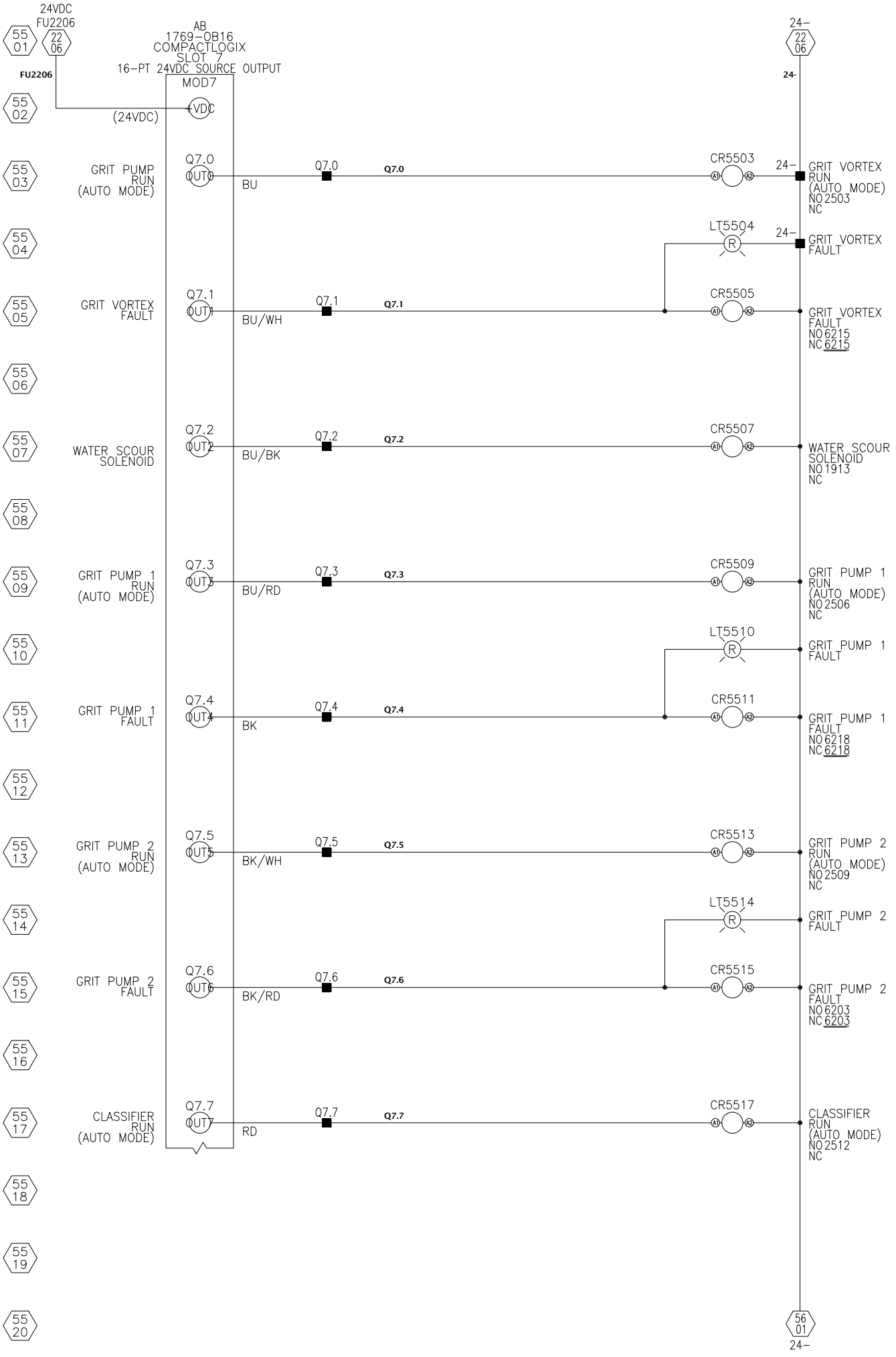
REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> </tr> <tr> <td>PHASE</td> <td>3</td> </tr> <tr> <td>FREQ</td> <td>60</td> </tr> <tr> <td>AMP</td> <td>34</td> </tr> <tr> <td>H.P.</td> <td>27</td> </tr> <tr> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>KW</td> <td>N/A</td> </tr> <tr> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	PHASE	3	FREQ	60	AMP	34	H.P.	27	KVAR	N/A	KW	N/A	TYPE	12
VOLT	600																	
PHASE	3																	
FREQ	60																	
AMP	34																	
H.P.	27																	
KVAR	N/A																	
KW	N/A																	
TYPE	12																	
<table border="1"> <tr> <td>TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL</td> </tr> <tr> <td>MOD6 - DIGITAL OUTPUTS (NEXT)</td> </tr> <tr> <td>CUSTOMER: CLARO</td> </tr> <tr> <td>PROJECT: NAPANEE, ON</td> </tr> <tr> <td>REF.: 22XXX-Q-00</td> </tr> <tr> <td>DRAWN BY: X.MONTAMBAULT</td> </tr> <tr> <td>CHECKED BY: C.SAMSON</td> </tr> </table>			TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	MOD6 - DIGITAL OUTPUTS (NEXT)	CUSTOMER: CLARO	PROJECT: NAPANEE, ON	REF.: 22XXX-Q-00	DRAWN BY: X.MONTAMBAULT	CHECKED BY: C.SAMSON									
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL																		
MOD6 - DIGITAL OUTPUTS (NEXT)																		
CUSTOMER: CLARO																		
PROJECT: NAPANEE, ON																		
REF.: 22XXX-Q-00																		
DRAWN BY: X.MONTAMBAULT																		
CHECKED BY: C.SAMSON																		
SCALING:	NONE	DATE: JULY 2024																
DRAWING #:	12031331	PAGE 53 OF 73																



REV	DATE	DESCRIPTION		VOLT	H.P.	TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	
00	2024-07-30			600	27	MOD6 - DIGITAL OUTPUTS (NEXT)	
				PHASE		CUSTOMER: CLARO	
				FREQ		PROJECT: NAPANEE, ON	
				(HZ)		REF.: 22XXX-Q-00	
				AMP		CHECKED BY: C. SAMSON	
						DRAWING # 12031331	
						PAGE 54 OF 73	
						DATE: JULY 2024	

- 54 01
- 54 02
- 54 03
- 54 04
- 54 05
- 54 06
- 54 07
- 54 08
- 54 09
- 54 10
- 54 11
- 54 12
- 54 13
- 54 14
- 54 15
- 54 16
- 54 17
- 54 18
- 54 19
- 54 20





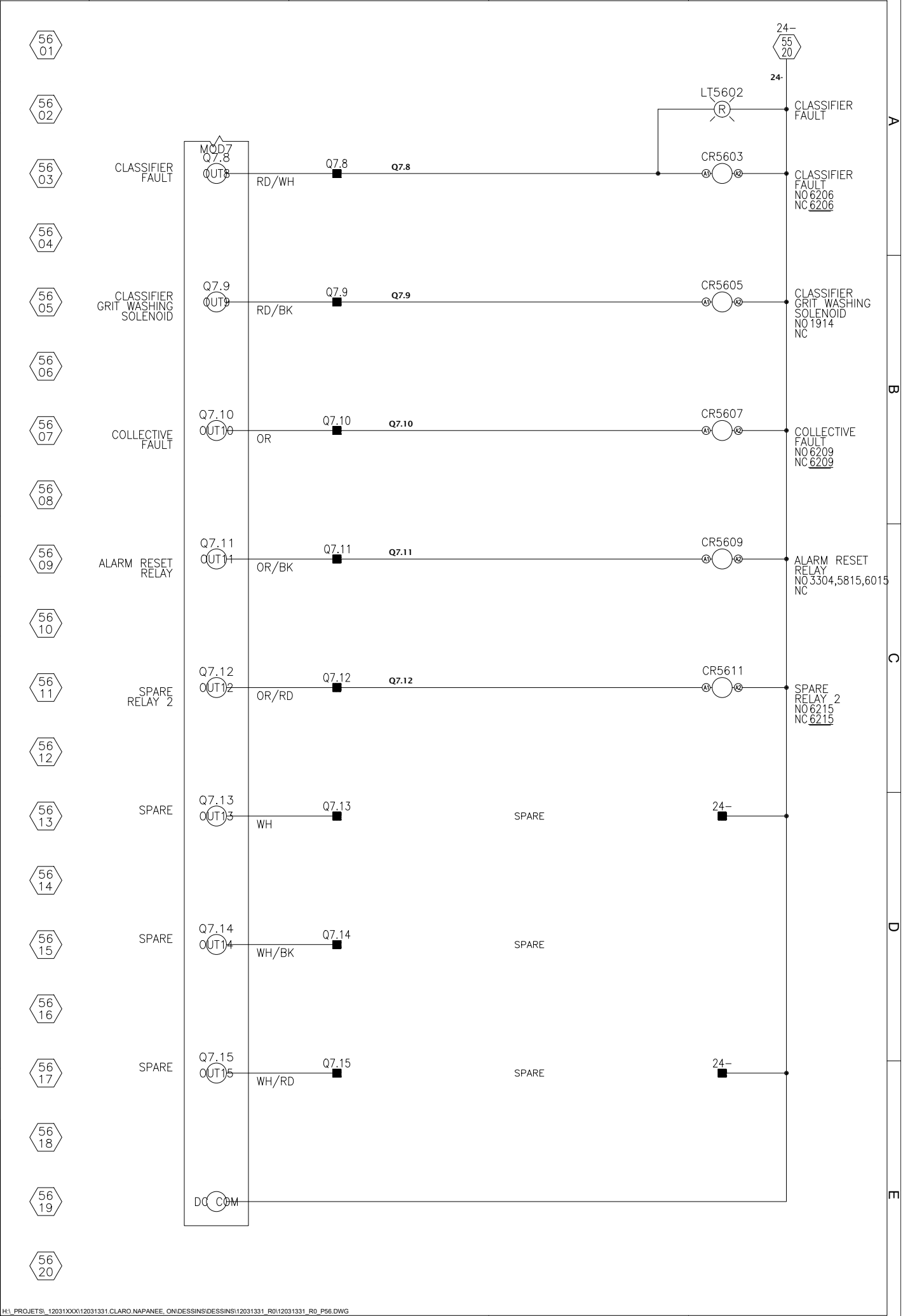
REV	DATE	DESCRIPTION
00	2024-07-30	FOR APPROVAL
55 01		
55 02		
55 03		
55 04		
55 05		
55 06		
55 07		
55 08		
55 09		
55 10		
55 11		
55 12		
55 13		
55 14		
55 15		
55 16		
55 17		
55 18		
55 19		
55 20		

VOLT	600
PHASE	3
FREQ (HZ)	60
AMP	34
H.P.	27
KVAR	N/A
KW	N/A
TYPE	12

TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL
MOD7 - DIGITAL OUTPUTS
CUSTOMER: CLARO
PROJECT: NAPANEE, ON
DRAWN BY: X.MONTAMBAULT
CHECKED BY: C.SAMSON
DATE: JULY 2024

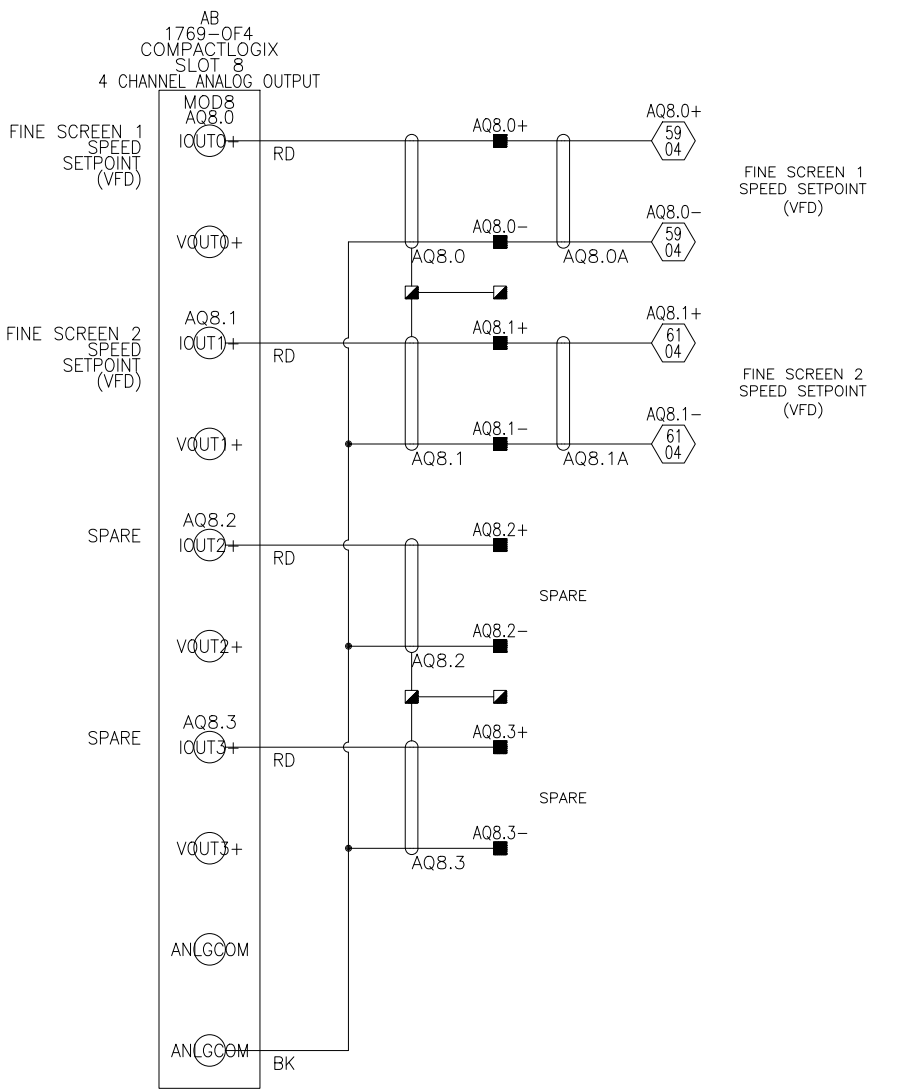
SCALING: NONE
DRAWING#: 12031331
PAGE 35 OF 73


REV	DATE	DESCRIPTION
00	2024-07-30	
FOR APPROVAL		
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		
MOD7 - DIGITAL OUTPUTS (NEXT)		
CUSTOMER: CLARO		
PROJECT: NAPANEE, ON		
REF.: 22XXX-Q-00		
DRAWN BY: X.MONTAMBAULT		
CHECKED BY: C.SAMSON		
DATE: JULY 2024		
SCALING: NONE		
DRAWING # 12031331		
PAGE 56 OF 73		



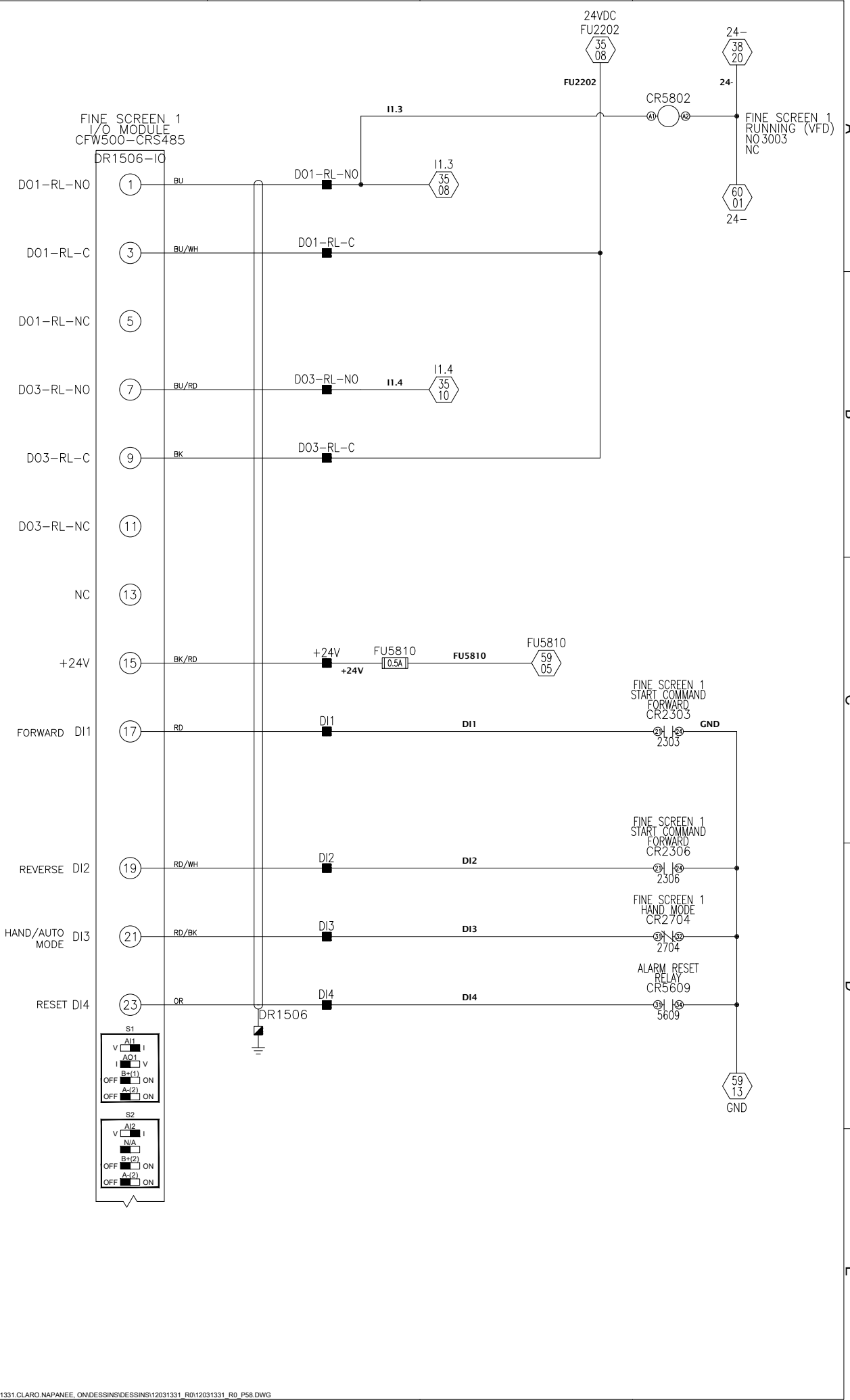
REV	DATE	DESCRIPTION
00	2024-07-30	
FOR APPROVAL		
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		
MOD8 - ANALOG OUTPUTS		
CUSTOMER: CLARO		
PROJECT: NAPANEE, ON		
REF.: 22XXX-Q-00		
DRAWN BY: X.MONTAMBAULT		
CHECKED BY: C.SAMSON		
VOLT	600	H.P.
PHASE	3	KVAR
FREQ	60	KW
AMP	34	N/A
		TYPE
		12
SCALING: NONE		
DATE: JULY 2024		
DRAWING# 12031331		
PAGE 57 OF 73		

- 57 01
- 57 02
- 57 03
- 57 04
- 57 05
- 57 06
- 57 07
- 57 08
- 57 09
- 57 10
- 57 11
- 57 12
- 57 13
- 57 14
- 57 15
- 57 16
- 57 17
- 57 18
- 57 19
- 57 20

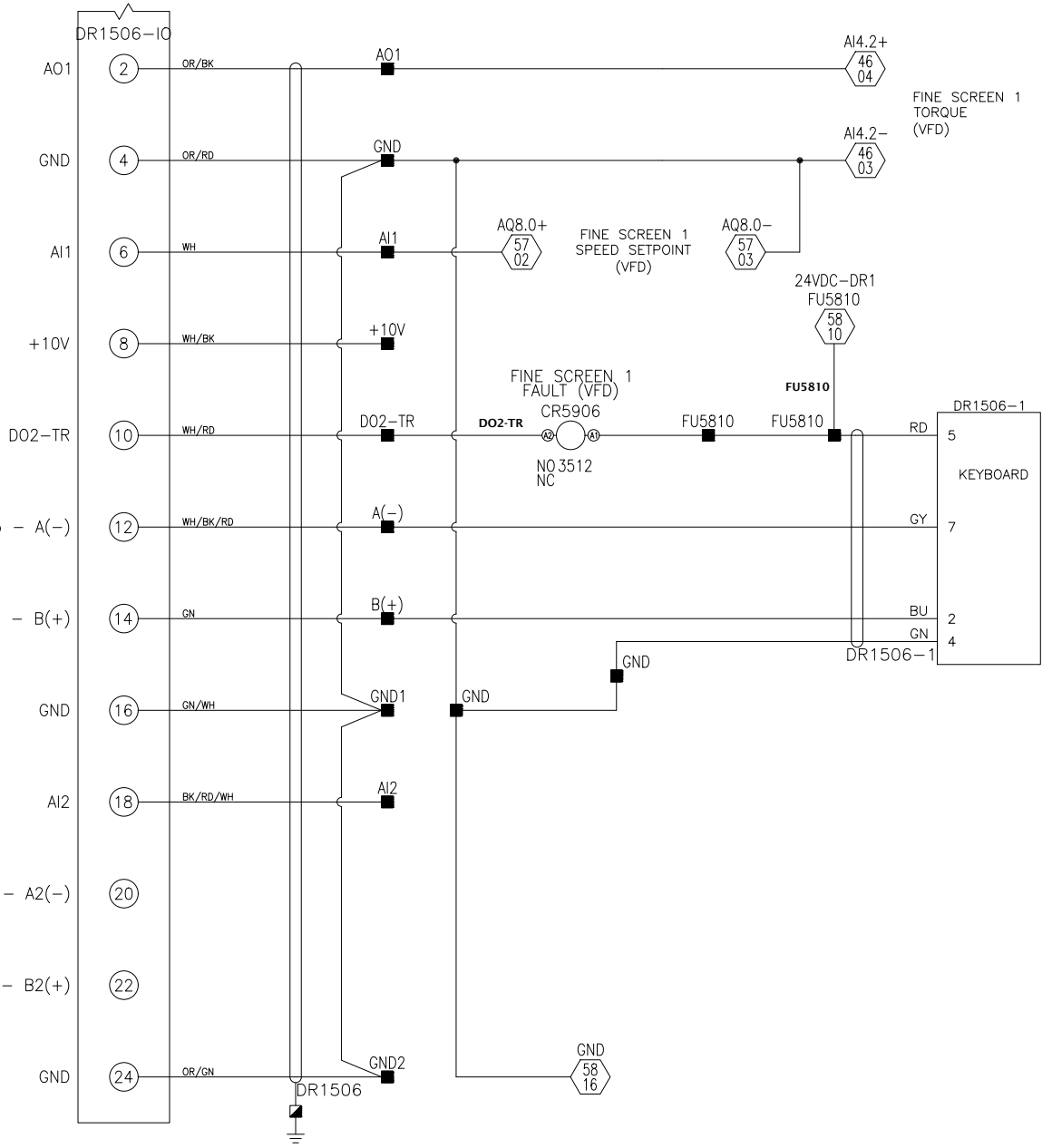


REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOL T</td> <td>600</td> <td>H.P</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOL T	600	H.P	27	PHASE	3	KVAR	N/A	FREQ (HZ)	60	KW	N/A	AMP	34	TYPE	12
VOL T	600	H.P	27															
PHASE	3	KVAR	N/A															
FREQ (HZ)	60	KW	N/A															
AMP	34	TYPE	12															
<table border="1"> <tr> <td>TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL</td> </tr> <tr> <td>PROJECT: NAPANEE, ON</td> </tr> <tr> <td>CUSTOMER: CLARO</td> </tr> <tr> <td>REF.: 22XXX-Q-00</td> </tr> <tr> <td>DRAWN BY: X.MONTAMBAULT</td> </tr> <tr> <td>CHECKED BY: C.SAMSON</td> </tr> </table>			TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	PROJECT: NAPANEE, ON	CUSTOMER: CLARO	REF.: 22XXX-Q-00	DRAWN BY: X.MONTAMBAULT	CHECKED BY: C.SAMSON										
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL																		
PROJECT: NAPANEE, ON																		
CUSTOMER: CLARO																		
REF.: 22XXX-Q-00																		
DRAWN BY: X.MONTAMBAULT																		
CHECKED BY: C.SAMSON																		
DATE	SCALE	DRAWING #																
JULY 2024	NONE	12031331																
		PAGE 58 OF 73																

- 58 01
- 58 02
- 58 03
- 58 04
- 58 05
- 58 06
- 58 07
- 58 08
- 58 09
- 58 10
- 58 11
- 58 12
- 58 13
- 58 14
- 58 15
- 58 16
- 58 17
- 58 18
- 58 19
- 58 20



FINE SCREEN 1
I/O MODULE
CFW500-CRS485




- 59 01
- 59 02
- 59 03
- 59 04
- 59 05
- 59 06
- 59 07
- 59 08
- 59 09
- 59 10
- 59 11
- 59 12
- 59 13
- 59 14
- 59 15
- 59 16
- 59 17
- 59 18
- 59 19
- 59 20

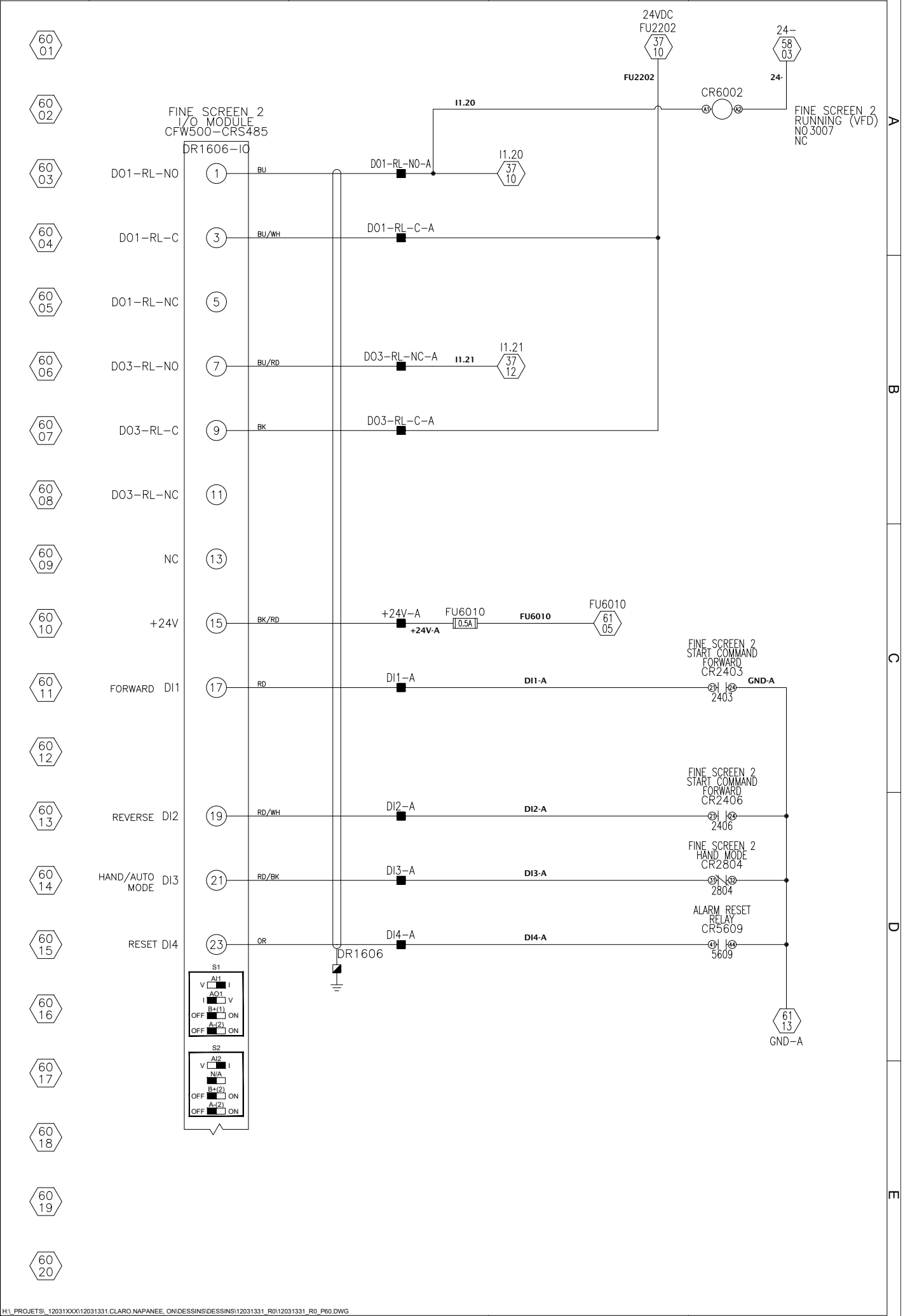
REV	DATE	DESCRIPTION
00	2024-07-30	FOR APPROVAL

VOL T	600	H.P	27
PHASE	3	KVAR	N/A
FREQ	60	KW	N/A
AMP	34	TYPE	12

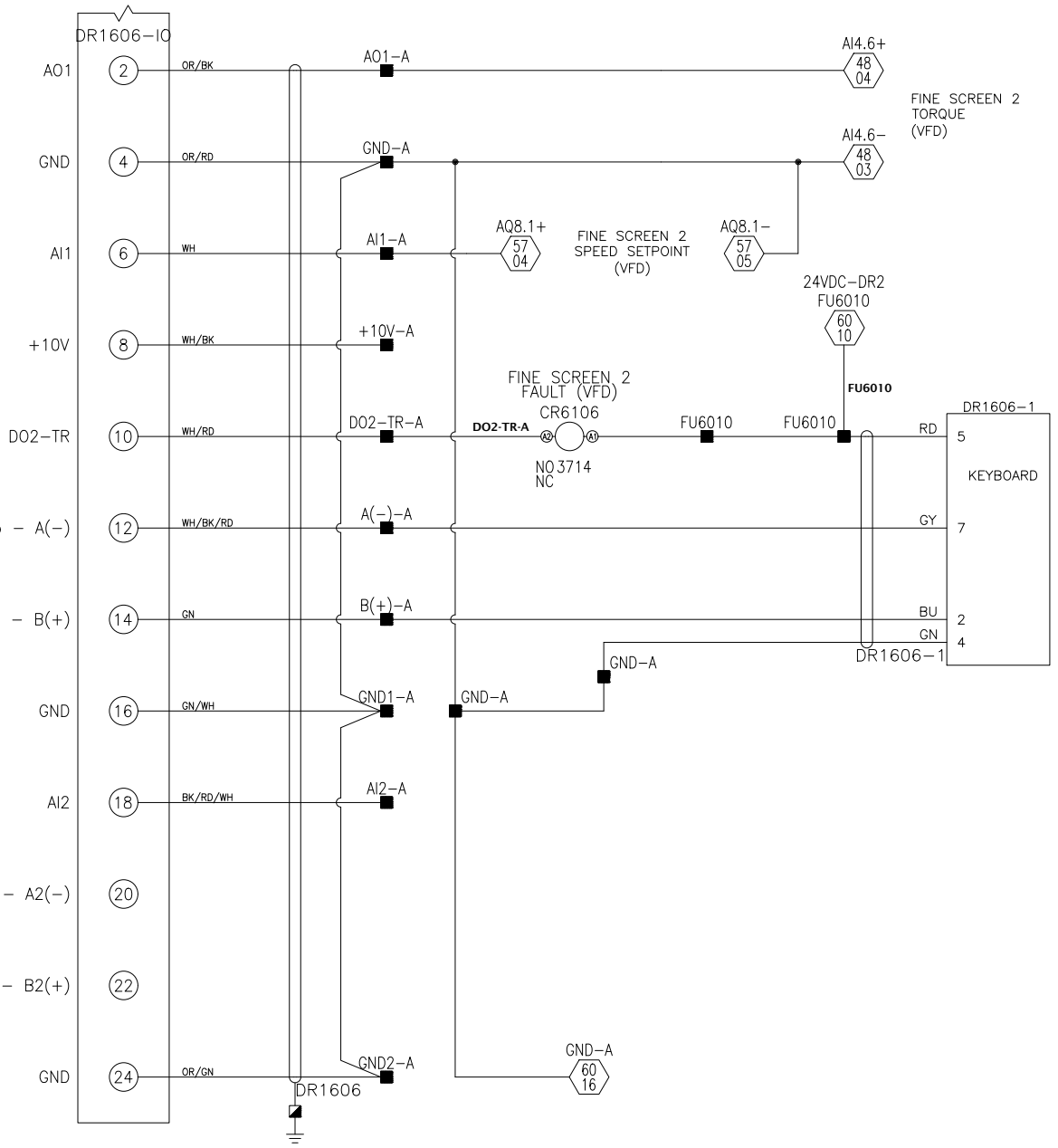
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	
FINE SCREEN 1 - I/O DRIVE MODULE (NEXT)	
CUSTOMER: CLARO	PROJECT: NAPANEE, ON
REF.: 22XXX-Q-00	CHECKED BY: C. SAMSON
DRAWN BY: X. MONTAMBAULT	DATE: JULY 2024

SCALING:	NONE
DRAWING #:	12031331
PAGE	59 OF 73

REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOL T</td> <td>600</td> <td>H.P</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOL T	600	H.P	27	PHASE	3	KVAR	N/A	FREQ (HZ)	60	KW	N/A	AMP	34	TYPE	12
VOL T	600	H.P	27															
PHASE	3	KVAR	N/A															
FREQ (HZ)	60	KW	N/A															
AMP	34	TYPE	12															
<table border="1"> <tr> <td>TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL</td> </tr> <tr> <td>FINE SCREEN 2 - I/O DRIVE MODULE</td> </tr> <tr> <td>CUSTOMER: CLARO</td> </tr> <tr> <td>PROJECT: NAPANEE, ON</td> </tr> <tr> <td>REF.: 22XXX-Q-00</td> </tr> <tr> <td>DRAWN BY: X.MONTAMBAULT</td> </tr> <tr> <td>CHECKED BY: C.SAMSON</td> </tr> </table>			TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	FINE SCREEN 2 - I/O DRIVE MODULE	CUSTOMER: CLARO	PROJECT: NAPANEE, ON	REF.: 22XXX-Q-00	DRAWN BY: X.MONTAMBAULT	CHECKED BY: C.SAMSON									
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL																		
FINE SCREEN 2 - I/O DRIVE MODULE																		
CUSTOMER: CLARO																		
PROJECT: NAPANEE, ON																		
REF.: 22XXX-Q-00																		
DRAWN BY: X.MONTAMBAULT																		
CHECKED BY: C.SAMSON																		
DATE	SCALE	DRAWING #																
JULY 2024	NONE	12031331																
		PAGE 60 OF 73																



FINE SCREEN 2
I/O MODULE
CFW500-CRS485



- 61 01
- 61 02
- 61 03
- 61 04
- 61 05
- 61 06
- 61 07
- 61 08
- 61 09
- 61 10
- 61 11
- 61 12
- 61 13
- 61 14
- 61 15
- 61 16
- 61 17
- 61 18
- 61 19
- 61 20

REV	DATE	DESCRIPTION	VOLT	H.P.	PHASE	FRREQ	KVAR	KVA	TYPE
00	2024-07-30		600	27	3	60	N/A	N/A	12

TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	
FINE SCREEN 2 - I/O DRIVE MODULE (NEXT)	
CUSTOMER: CLARO	PROJECT: NAPANEE, ON
REF.: 22XXX-Q-00	CHECKED BY: C. SAMSON
DRAWN BY: X. MONTAMBAULT	DATE: JULY 2024

SCALING: NONE	DRAWING # 12031331
PAGE 61 OF 73	

62
01

62
02

62
03

62
04

62
05

62
06

62
07

62
08

62
09

62
10

62
11

62
12

62
13

62
14

62
15

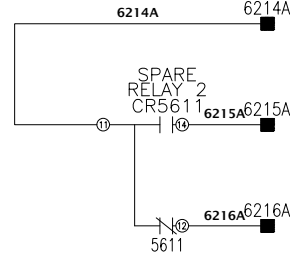
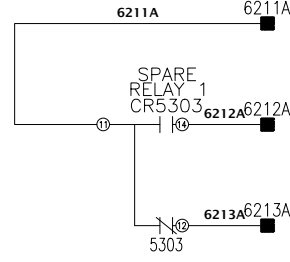
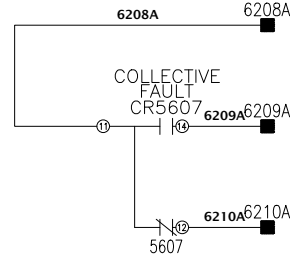
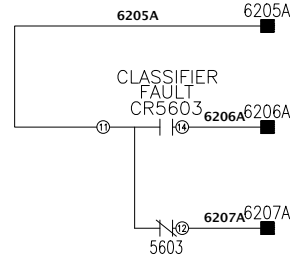
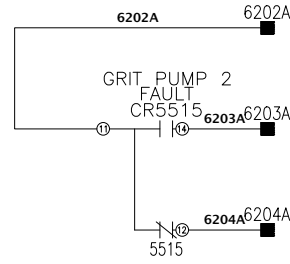
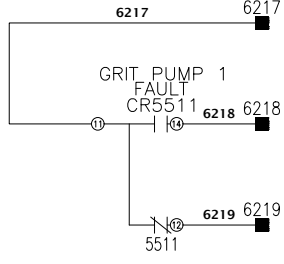
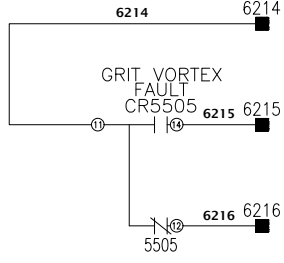
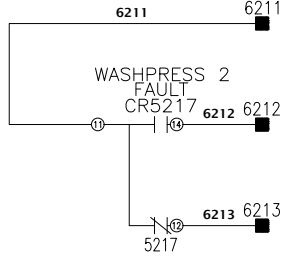
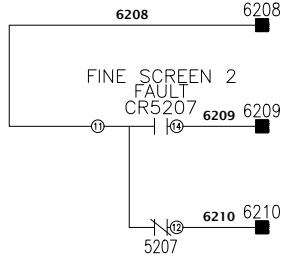
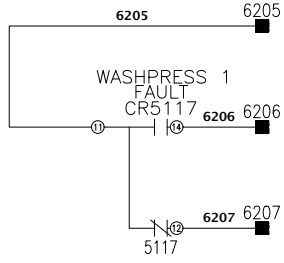
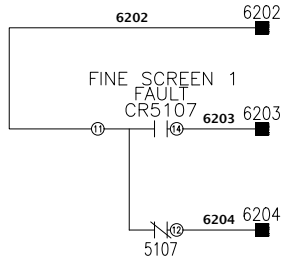
62
16

62
17

62
18

62
19

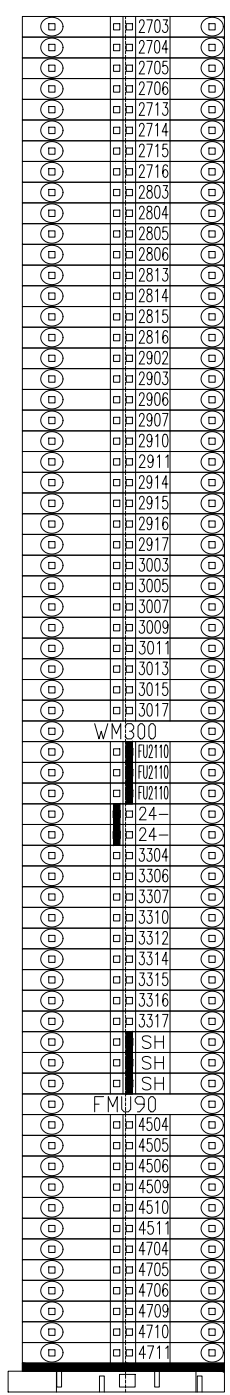
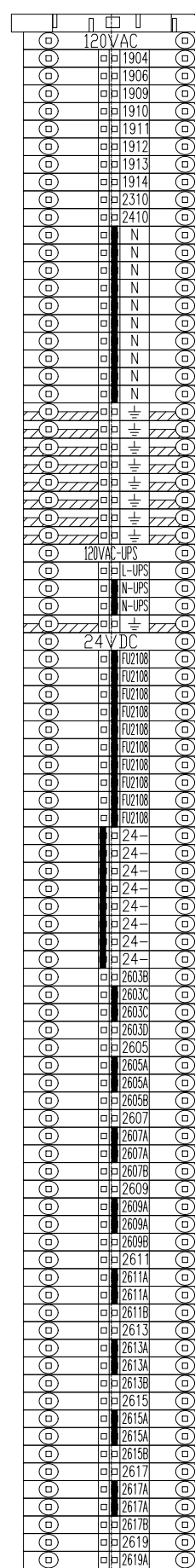
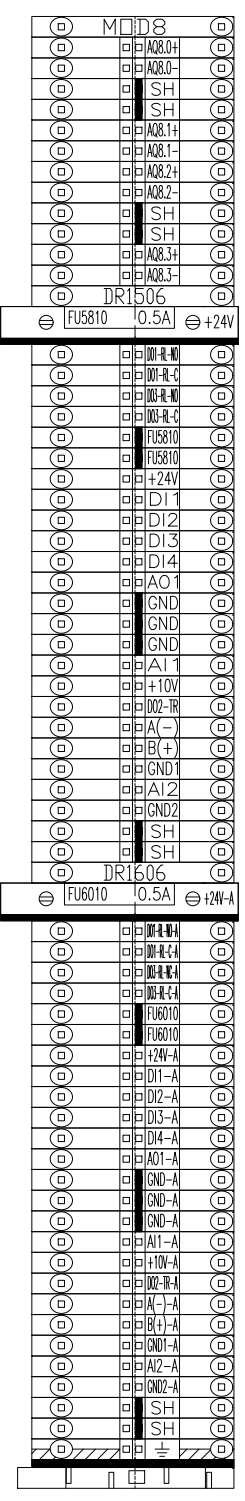
62
20

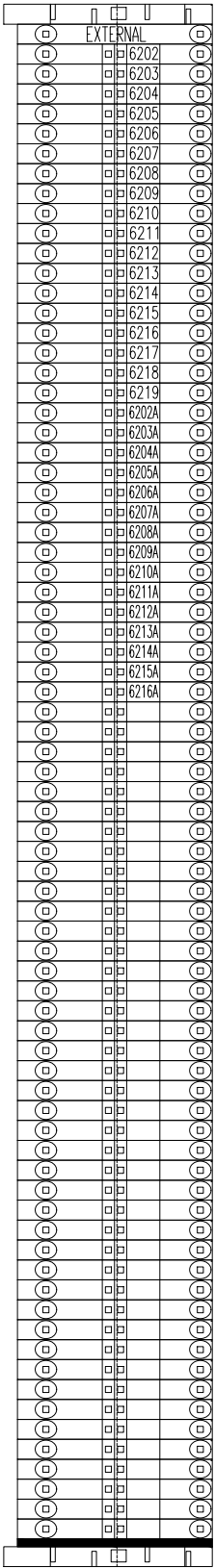
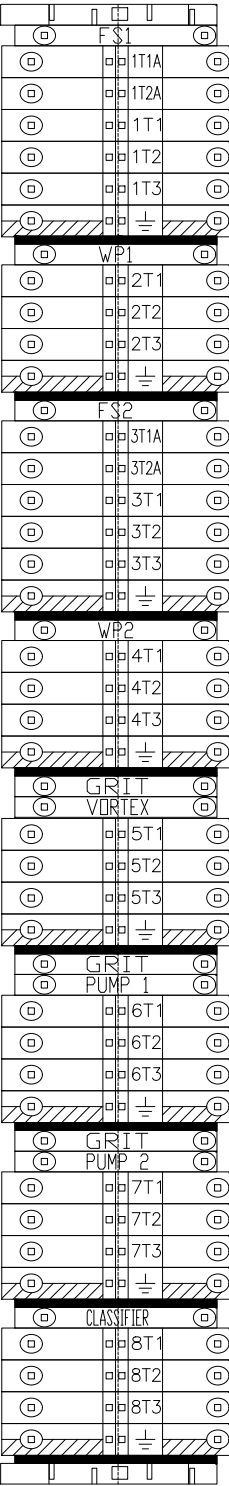
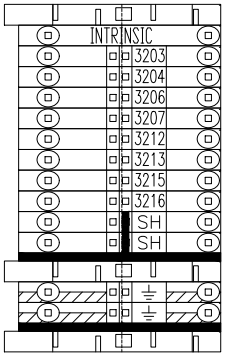


REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> <td>H.P.</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	H.P.	27	PHASE	3	KVAR	N/A	FREQ (HZ)	60	KW	N/A	AMP	34	TYPE	12
VOLT	600	H.P.	27															
PHASE	3	KVAR	N/A															
FREQ (HZ)	60	KW	N/A															
AMP	34	TYPE	12															
<table border="1"> <tr> <td>TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL</td> </tr> <tr> <td>EXTERNAL CONTACTS</td> </tr> <tr> <td>CUSTOMER: CLARO</td> </tr> <tr> <td>PROJECT: NAPANEE, ON</td> </tr> <tr> <td>DRAWN BY: X.MONTAMBAULT</td> </tr> <tr> <td>CHECKED BY: C.SAMSON</td> </tr> </table>			TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	EXTERNAL CONTACTS	CUSTOMER: CLARO	PROJECT: NAPANEE, ON	DRAWN BY: X.MONTAMBAULT	CHECKED BY: C.SAMSON										
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL																		
EXTERNAL CONTACTS																		
CUSTOMER: CLARO																		
PROJECT: NAPANEE, ON																		
DRAWN BY: X.MONTAMBAULT																		
CHECKED BY: C.SAMSON																		
<table border="1"> <tr> <td>SCALING:</td> <td>NONE</td> </tr> <tr> <td>DATE:</td> <td>JULY 2024</td> </tr> <tr> <td>DRAWING #:</td> <td>12031331</td> </tr> <tr> <td>PAGE:</td> <td>62 OF 73</td> </tr> </table>			SCALING:	NONE	DATE:	JULY 2024	DRAWING #:	12031331	PAGE:	62 OF 73								
SCALING:	NONE																	
DATE:	JULY 2024																	
DRAWING #:	12031331																	
PAGE:	62 OF 73																	

REV	DATE	DESCRIPTION																				
00	2024-07-30	FOR APPROVAL																				
<table border="1"> <tr> <td>VOLT</td> <td>600</td> <td>H.P.</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ</td> <td>60</td> <td>KVA</td> <td>N/A</td> </tr> <tr> <td>(HZ)</td> <td></td> <td></td> <td></td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	H.P.	27	PHASE	3	KVAR	N/A	FREQ	60	KVA	N/A	(HZ)				AMP	34	TYPE	12
VOLT	600	H.P.	27																			
PHASE	3	KVAR	N/A																			
FREQ	60	KVA	N/A																			
(HZ)																						
AMP	34	TYPE	12																			
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL TERMINALS (NEXT) CUSTOMER: CLARO PROJECT: NAPANEE, ON REF.: Z2XXX-Q-00 DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON																						
DATE	SCALE	DRAWING#																				
JULY 2024	NONE	12031331																				
		PAGE 64 OF 73																				

- 64 01
- 64 02
- 64 03
- 64 04
- 64 05
- 64 06
- 64 07
- 64 08
- 64 09
- 64 10
- 64 11
- 64 12
- 64 13
- 64 14
- 64 15
- 64 16
- 64 17
- 64 18
- 64 19
- 64 20



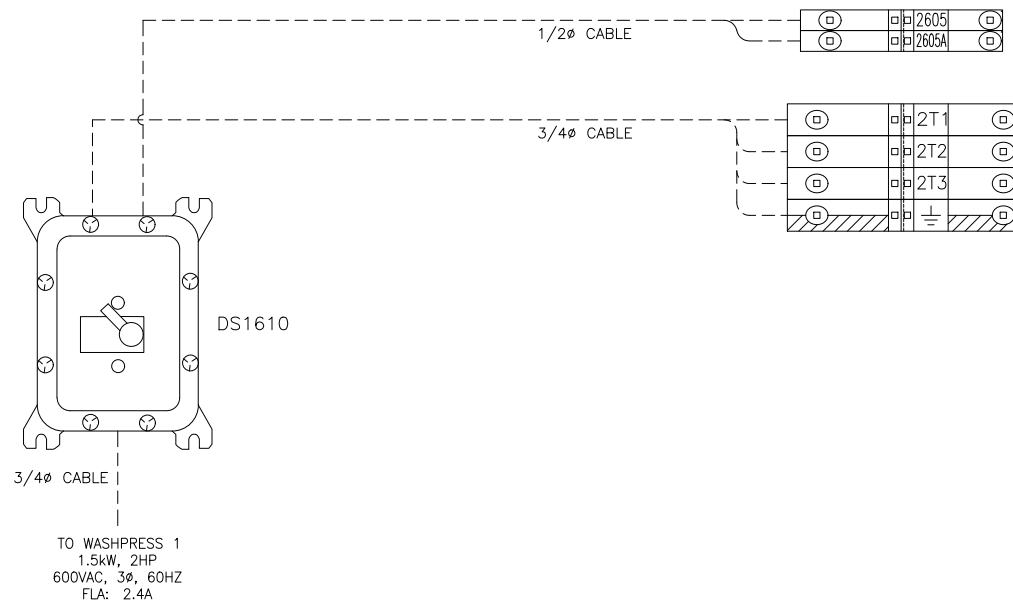
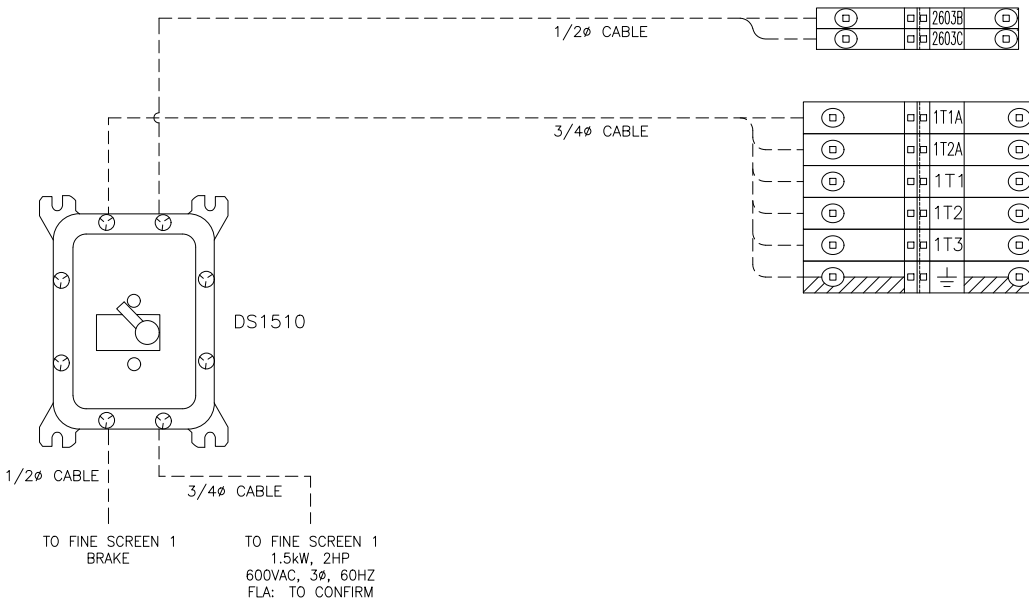
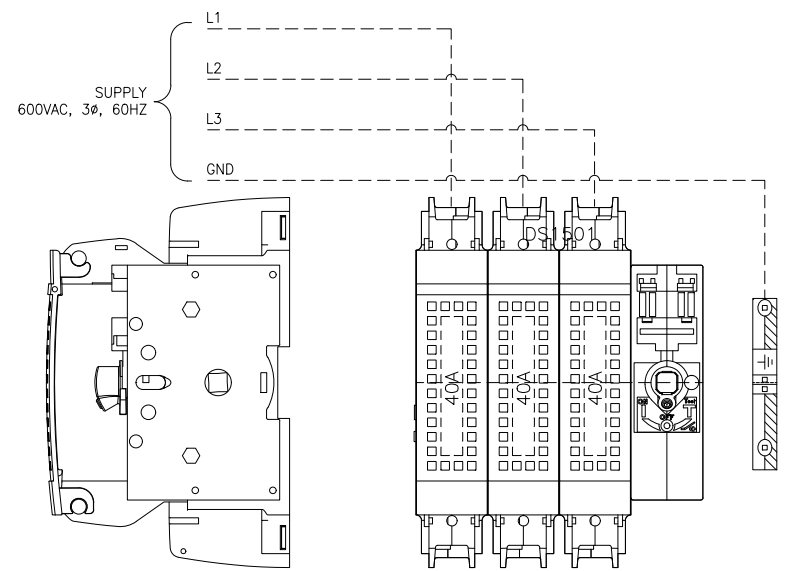



- 65 01
- 65 02
- 65 03
- 65 04
- 65 05
- 65 06
- 65 07
- 65 08
- 65 09
- 65 10
- 65 11
- 65 12
- 65 13
- 65 14
- 65 15
- 65 16
- 65 17
- 65 18
- 65 19
- 65 20

REV	DATE	DESCRIPTION		VOLT	HP	TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		SCALING:	
00	2024-07-30			600	27			NONE	
FOR APPROVAL				PHASE	KVAR	TERMINALS (NEXT)		DATE	
X.M.				3	N/A	CUSTOMER: CLARO		JULY 2024	
				FREQ	KW	PROJECT: NAPANEE, ON		DRAWING#	
				60	N/A	REF.: 22XXX-Q-00		12031331	
				AMP	TYPE	DRAWN BY: X.MONTAMBAULT		PAGE	
				34	12	CHECKED BY: C.SAMSON		65 OF 73	

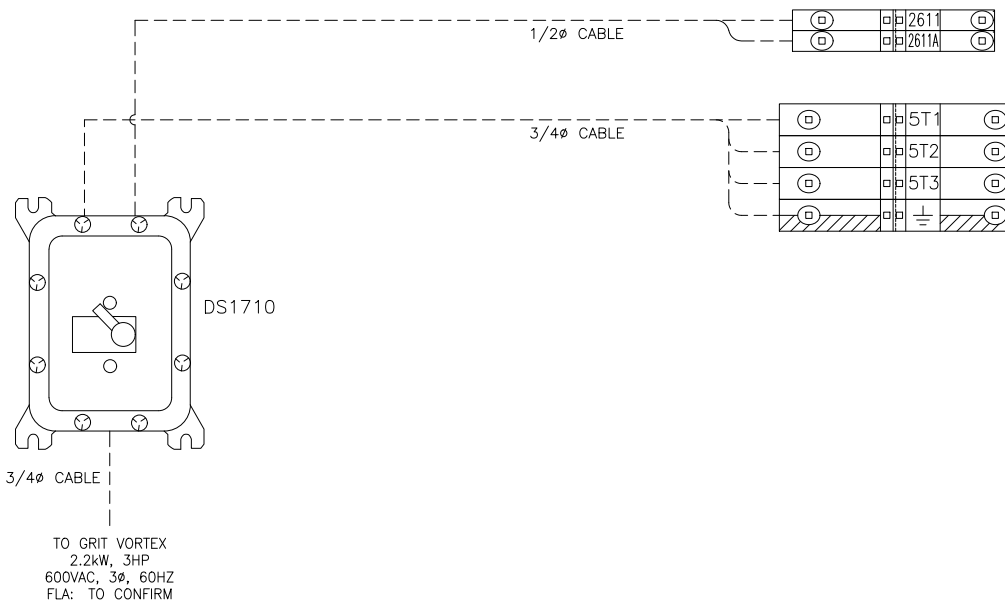
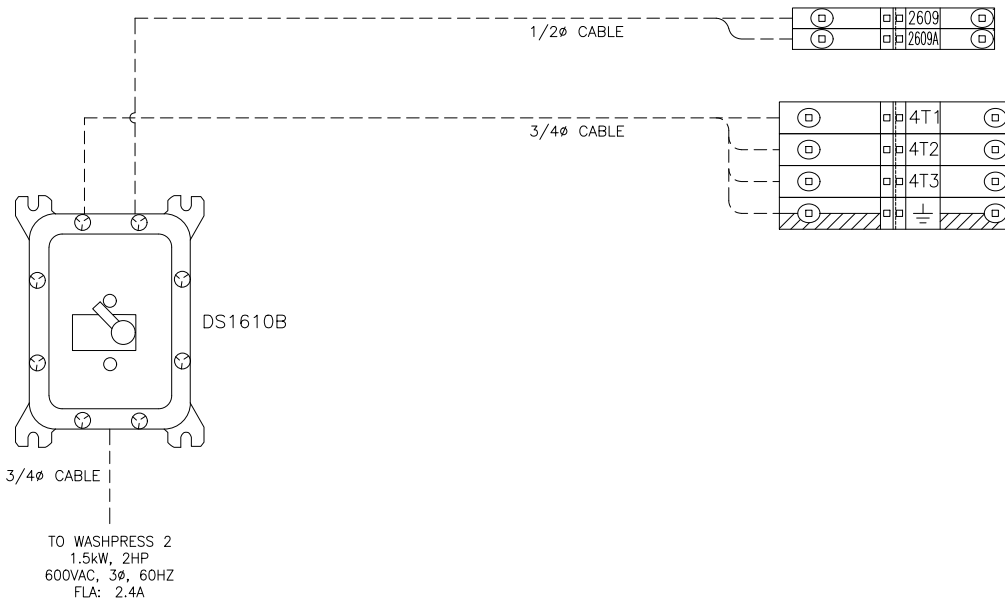
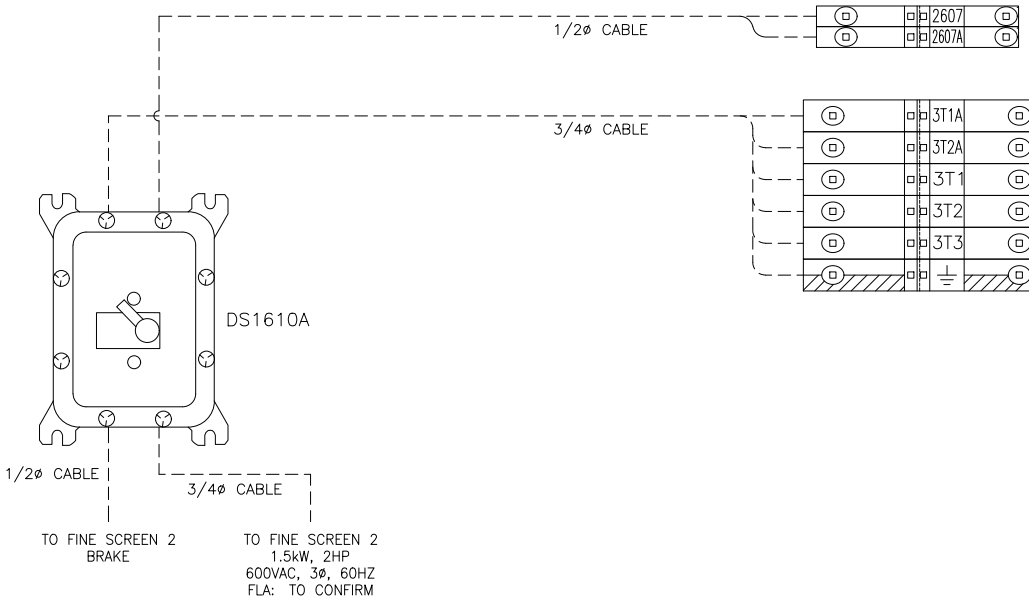
REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> <td>H.P.</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	H.P.	27	PHASE	3	KVAR	N/A	FREQ (HZ)	60	KW	N/A	AMP	34	TYPE	12
VOLT	600	H.P.	27															
PHASE	3	KVAR	N/A															
FREQ (HZ)	60	KW	N/A															
AMP	34	TYPE	12															
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL WIRING DIAGRAM CUSTOMER: CLARO PROJECT: NAPANEE, ON DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON																		
DATE	SCALING	DRAWING #																
JULY 2024	NONE	12031331																
PAGE	OF																	
66	73																	


- 66 01
- 66 02
- 66 03
- 66 04
- 66 05
- 66 06
- 66 07
- 66 08
- 66 09
- 66 10
- 66 11
- 66 12
- 66 13
- 66 14
- 66 15
- 66 16
- 66 17
- 66 18
- 66 19
- 66 20



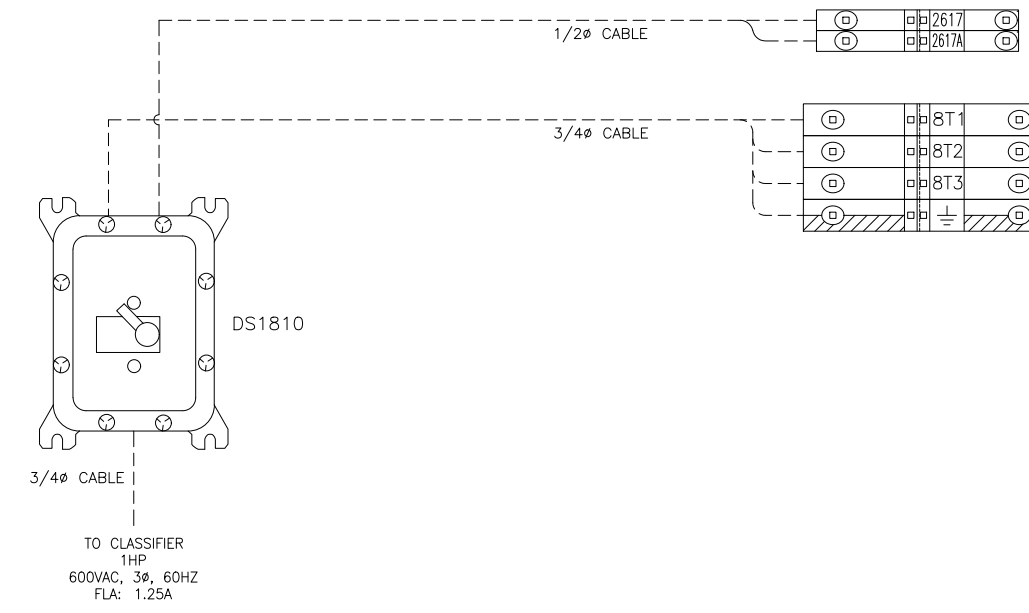
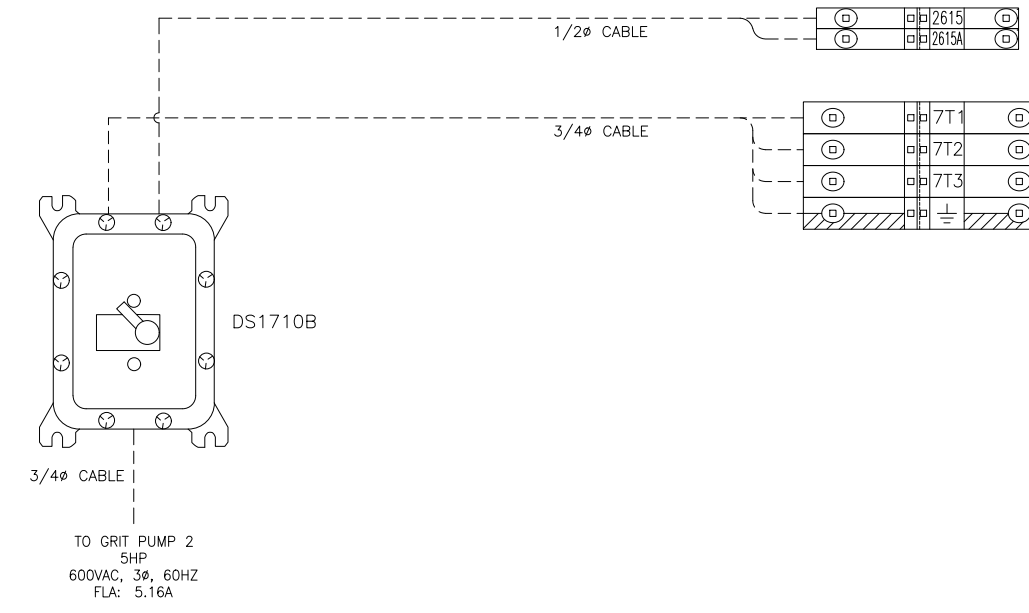
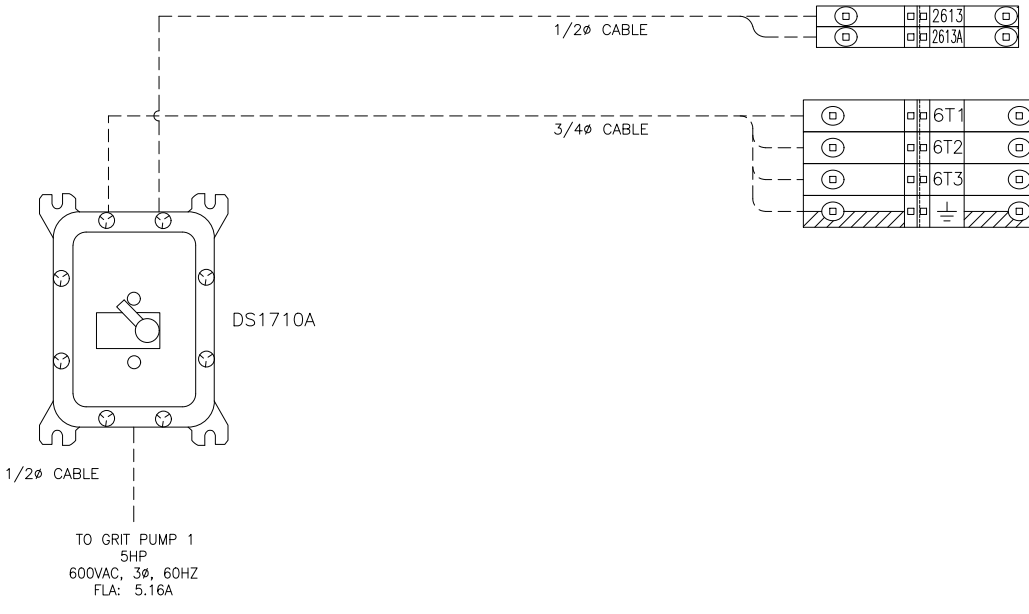
REV	DATE	DESCRIPTION																
00	2024-07-30	X.M. FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> <td>H.P.</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	H.P.	27	PHASE	3	KVAR	N/A	FREQ (HZ)	60	KW	N/A	AMP	34	TYPE	12
VOLT	600	H.P.	27															
PHASE	3	KVAR	N/A															
FREQ (HZ)	60	KW	N/A															
AMP	34	TYPE	12															
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL WIRING DIAGRAM (NEXT) CUSTOMER: CLARO REF.: 22XXX-Q-00 PROJECT: NAPANEE, ON DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON																		
DATE	SCALING	DRAWING #																
JULY 2024	NONE	12031331																
		PAGE 67 OF 73																


- 67 01
- 67 02
- 67 03
- 67 04
- 67 05
- 67 06
- 67 07
- 67 08
- 67 09
- 67 10
- 67 11
- 67 12
- 67 13
- 67 14
- 67 15
- 67 16
- 67 17
- 67 18
- 67 19
- 67 20



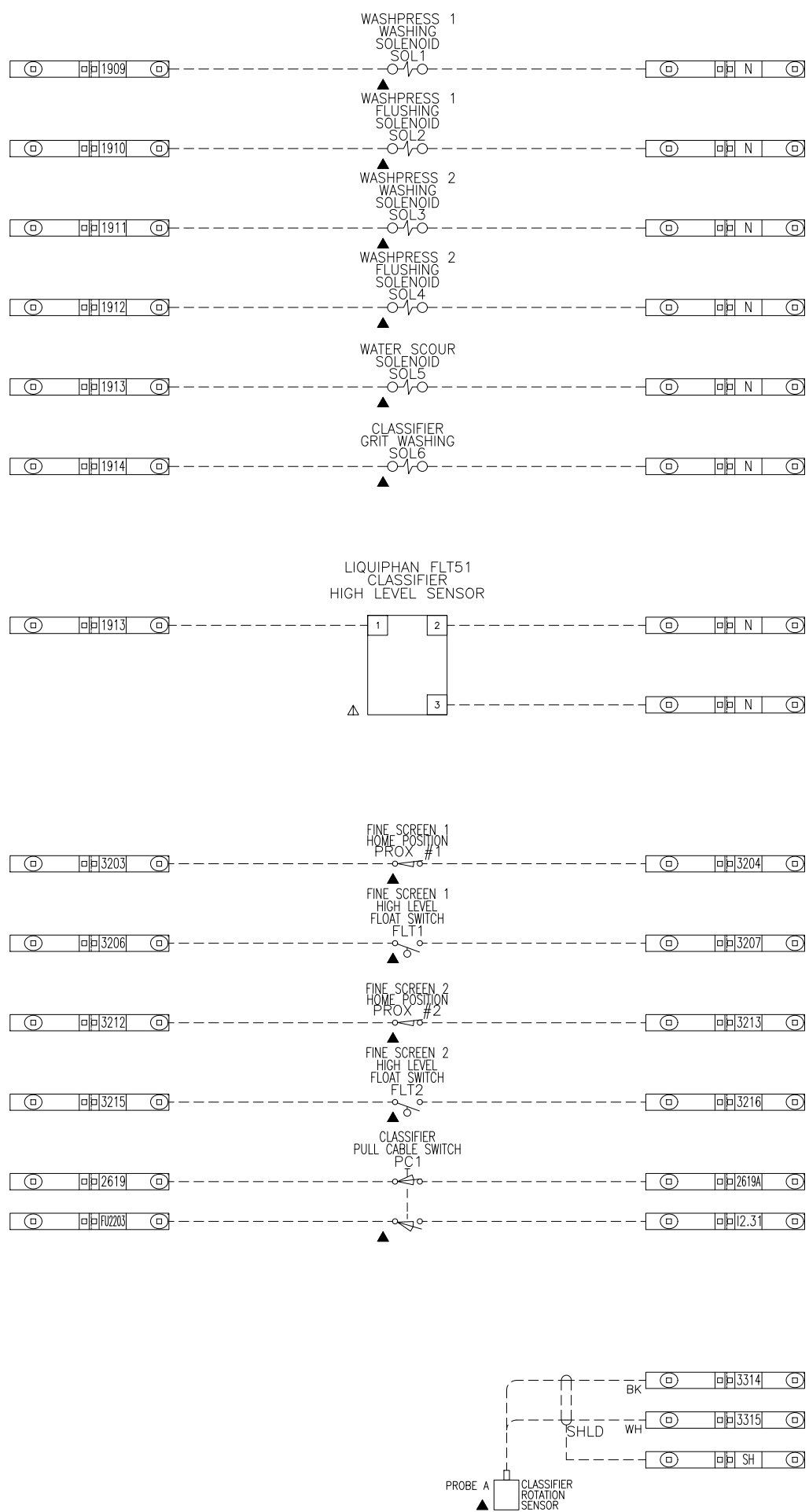
REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> <td>H.P.</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	H.P.	27	PHASE	3	KVAR	N/A	FREQ (HZ)	60	KW	N/A	AMP	34	TYPE	12
VOLT	600	H.P.	27															
PHASE	3	KVAR	N/A															
FREQ (HZ)	60	KW	N/A															
AMP	34	TYPE	12															
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL WIRING DIAGRAM (NEXT) CUSTOMER: CLARO PROJECT: NAPANEE, ON REF.: 22XXX-Q-00 DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON																		
		DRAWING # 12031331 DATE: JULY 2024 NONE PAGE 68 OF 73																

- 68 01
- 68 02
- 68 03
- 68 04
- 68 05
- 68 06
- 68 07
- 68 08
- 68 09
- 68 10
- 68 11
- 68 12
- 68 13
- 68 14
- 68 15
- 68 16
- 68 17
- 68 18
- 68 19
- 68 20



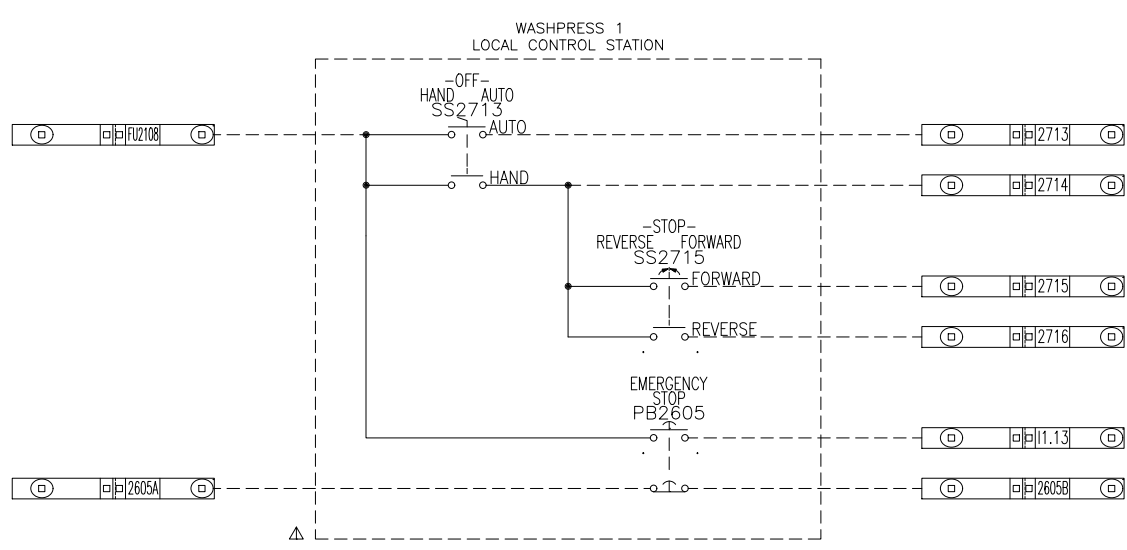
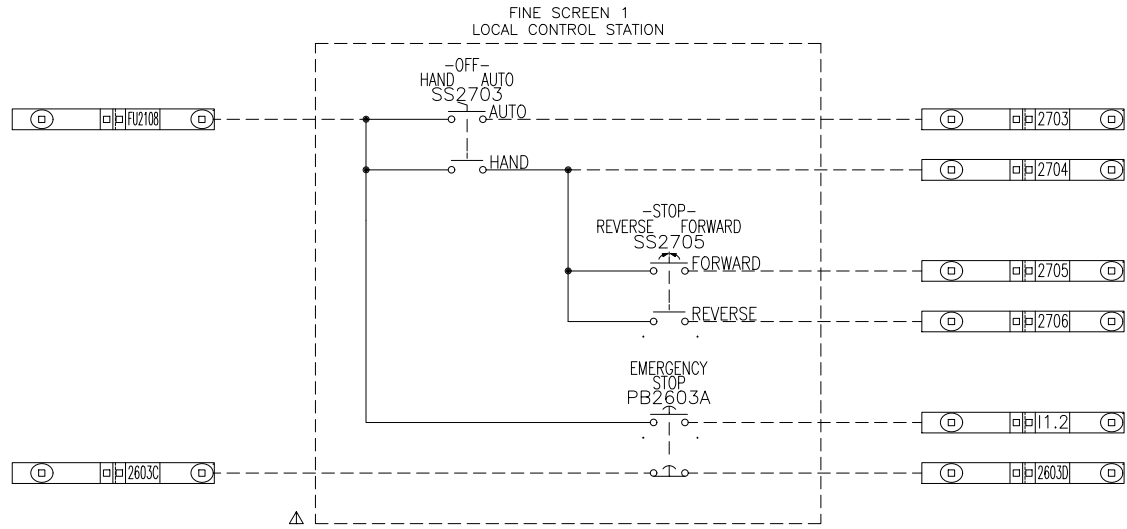
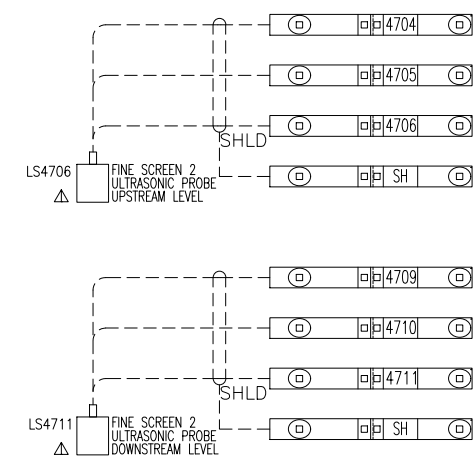
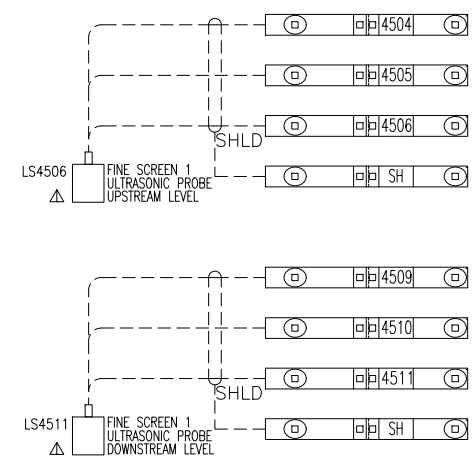
REV	DATE	DESCRIPTION
00	2024-07-30	
FOR APPROVAL		
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		
WIRING DIAGRAM (NEXT)		
CUSTOMER: CLARO		
PROJECT: NAPANEE, ON		
REF.: 22XXX-Q-00		
DRAWN BY: X.MONTAMBAULT		
CHECKED BY: C.SAMSON		
VOLT	600	H.P.
PHASE	3	KVAR
FREQ	60	KW
(HZ)		N/A
AMP	34	TYPE
		12
		
SCALING:	NONE	DRAWING#
DATE:	JULY 2024	12031331
PAGE 69 OF 73		

- 69 01
- 69 02
- 69 03
- 69 04
- 69 05
- 69 06
- 69 07
- 69 08
- 69 09
- 69 10
- 69 11
- 69 12
- 69 13
- 69 14
- 69 15
- 69 16
- 69 17
- 69 18
- 69 19
- 69 20



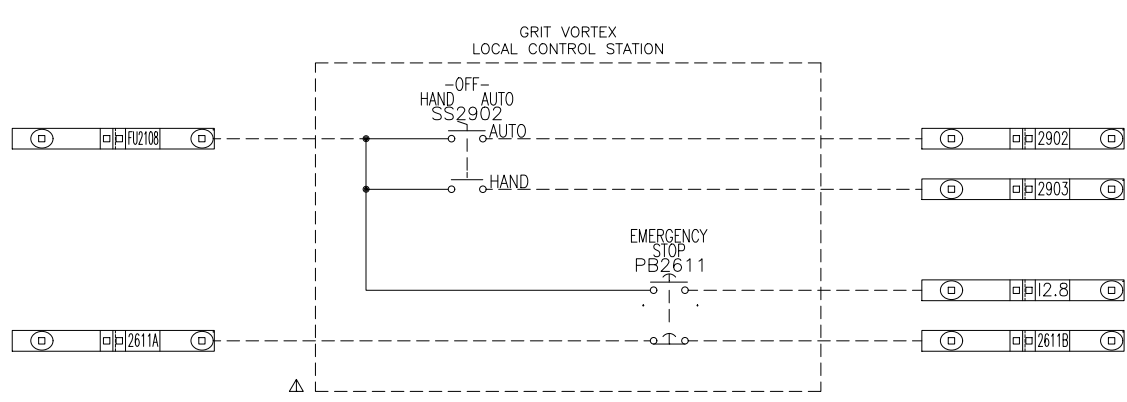
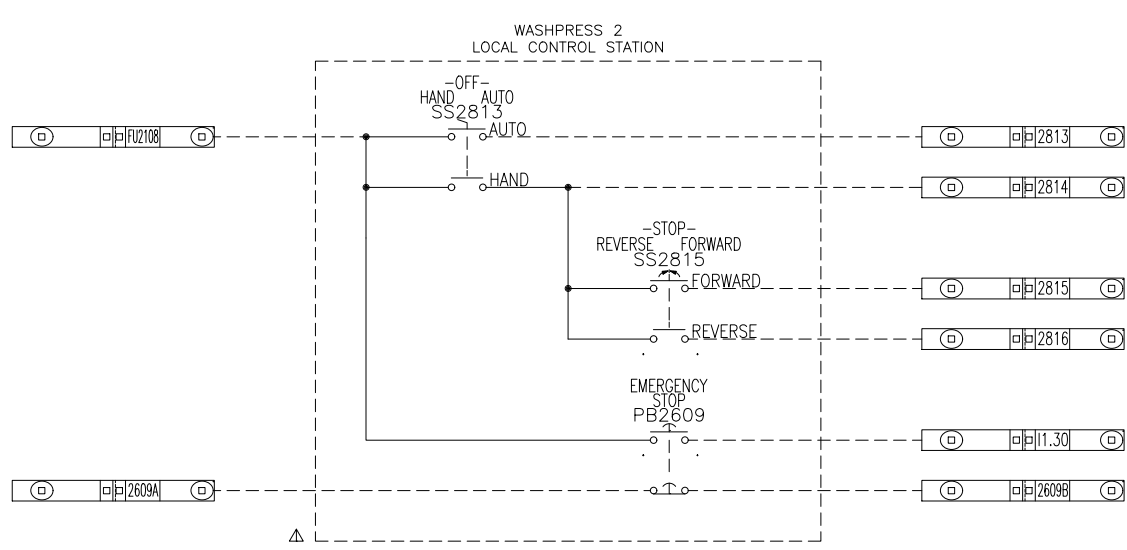
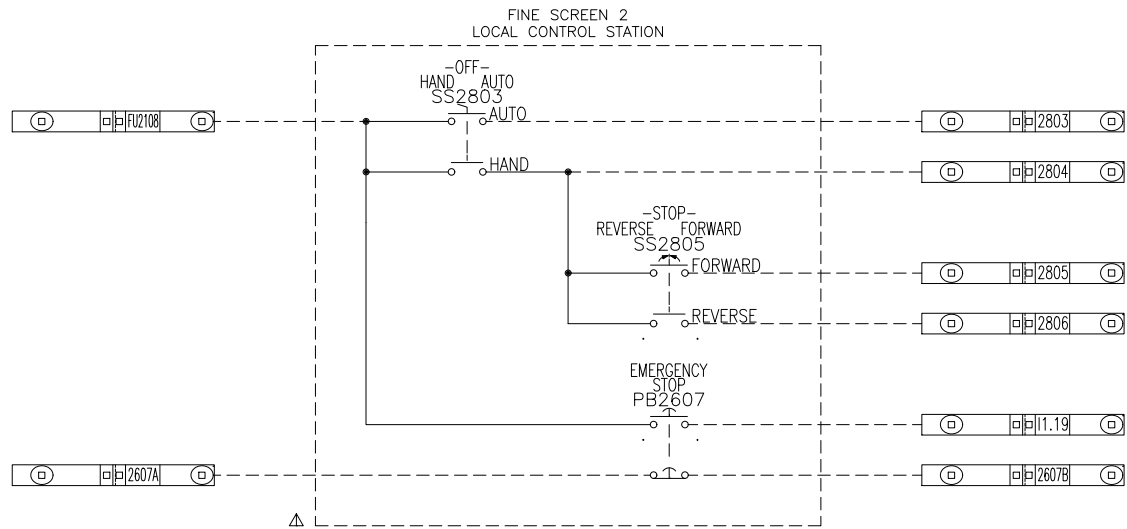
REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> <td>H.P.</td> <td>27</td> </tr> <tr> <td>PHASE</td> <td>3</td> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>FREQ (HZ)</td> <td>60</td> <td>KW</td> <td>N/A</td> </tr> <tr> <td>AMP</td> <td>34</td> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	H.P.	27	PHASE	3	KVAR	N/A	FREQ (HZ)	60	KW	N/A	AMP	34	TYPE	12
VOLT	600	H.P.	27															
PHASE	3	KVAR	N/A															
FREQ (HZ)	60	KW	N/A															
AMP	34	TYPE	12															
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL WIRING DIAGRAM (NEXT) CUSTOMER: CLARO PROJECT: NAPANEE, ON REF.: 22XXX-Q-00 DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON																		
SCALING: NONE DATE: JULY 2024		DRAWING # 12031331 PAGE 70 OF 73																

- 70 01
- 70 02
- 70 03
- 70 04
- 70 05
- 70 06
- 70 07
- 70 08
- 70 09
- 70 10
- 70 11
- 70 12
- 70 13
- 70 14
- 70 15
- 70 16
- 70 17
- 70 18
- 70 19
- 70 20



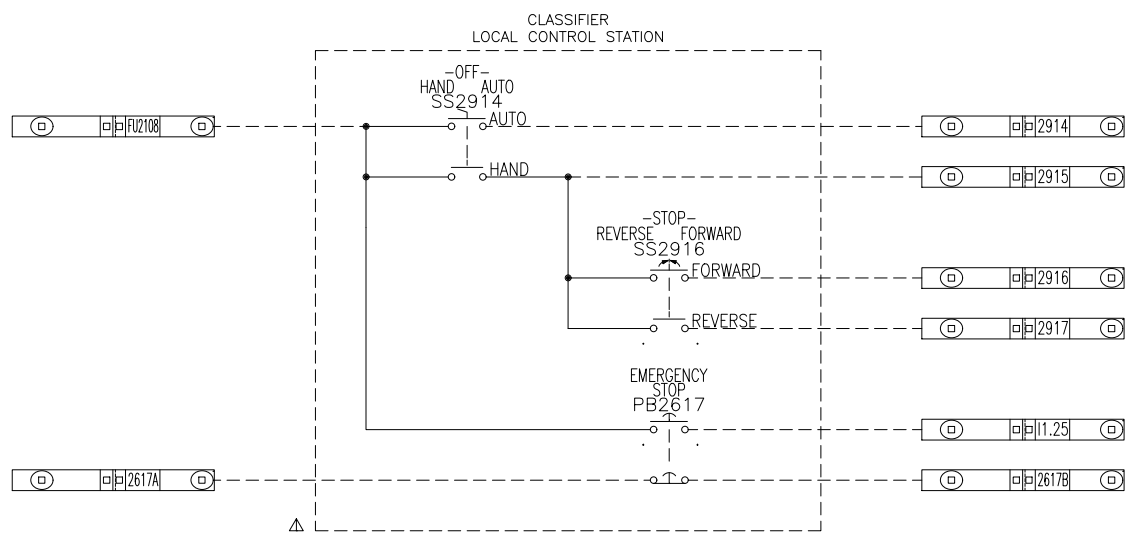
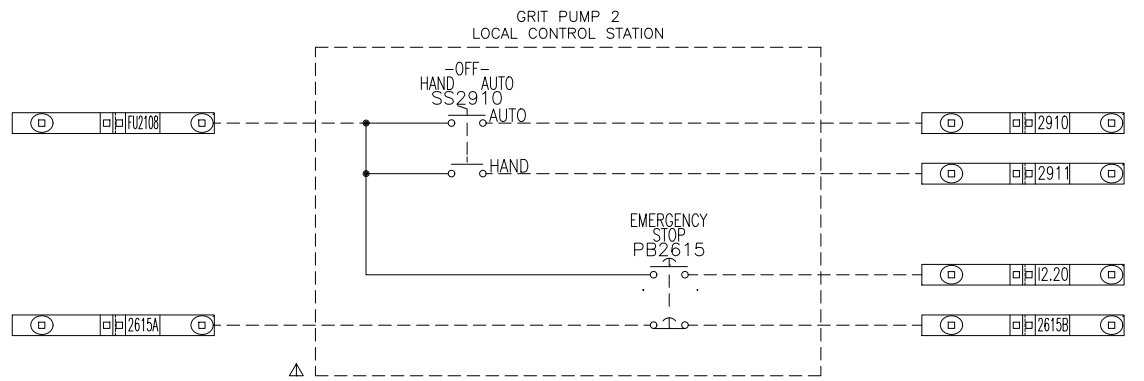
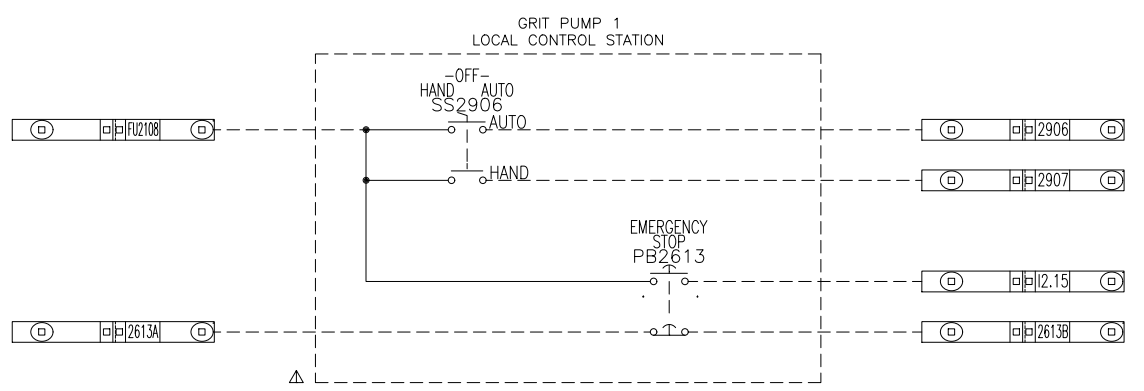
REV	DATE	DESCRIPTION
00	2024-07-30	
FOR APPROVAL		
VOLT	600	H.P.
PHASE	3	KVAR
FREQ	60	KW
AMP	34	N/A
TYPE	12	N/A
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		
WIRING DIAGRAM (NEXT)		
CUSTOMER: CLARO		
PROJECT: NAPANEE, ON		
DRAWN BY: X.MONTAMBAULT		
CHECKED BY: C.SAMSON		
SCALING:	NONE	DRAWING#
DATE:	JULY 2024	12031331
		PAGE 71 OF 73

- 71 01
- 71 02
- 71 03
- 71 04
- 71 05
- 71 06
- 71 07
- 71 08
- 71 09
- 71 10
- 71 11
- 71 12
- 71 13
- 71 14
- 71 15
- 71 16
- 71 17
- 71 18
- 71 19
- 71 20



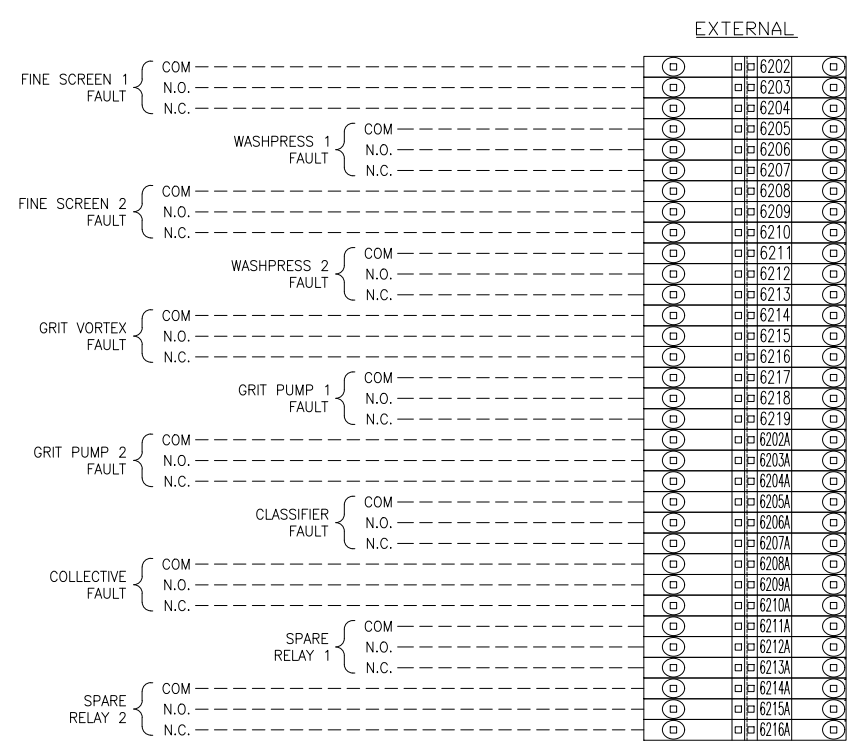
REV	DATE	DESCRIPTION
00	2024-07-30	
FOR APPROVAL		
VOLT	600	H.P.
PHASE	3	KVAR
FREQ	60	KW
AMP	34	TYPE
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL		
WIRING DIAGRAM (NEXT)		
CUSTOMER: CLARO		
PROJECT: NAPANEE, ON		
DRAWN BY: X.MONTAMBAULT		
CHECKED BY: C.SAMSON		
SCALING:	NONE	DRAWING #
DATE:	JULY 2024	12031331
PAGE 72 OF 73		

- 72 01
- 72 02
- 72 03
- 72 04
- 72 05
- 72 06
- 72 07
- 72 08
- 72 09
- 72 10
- 72 11
- 72 12
- 72 13
- 72 14
- 72 15
- 72 16
- 72 17
- 72 18
- 72 19
- 72 20



REV	DATE	DESCRIPTION																
00	2024-07-30	FOR APPROVAL																
<table border="1"> <tr> <td>VOLT</td> <td>600</td> </tr> <tr> <td>PHASE</td> <td>3</td> </tr> <tr> <td>FREQ</td> <td>60</td> </tr> <tr> <td>AMP</td> <td>34</td> </tr> <tr> <td>H.P.</td> <td>27</td> </tr> <tr> <td>KVAR</td> <td>N/A</td> </tr> <tr> <td>KW</td> <td>N/A</td> </tr> <tr> <td>TYPE</td> <td>12</td> </tr> </table>			VOLT	600	PHASE	3	FREQ	60	AMP	34	H.P.	27	KVAR	N/A	KW	N/A	TYPE	12
VOLT	600																	
PHASE	3																	
FREQ	60																	
AMP	34																	
H.P.	27																	
KVAR	N/A																	
KW	N/A																	
TYPE	12																	
<table border="1"> <tr> <td>TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL</td> </tr> <tr> <td>WIRING DIAGRAM (NEXT)</td> </tr> <tr> <td>CUSTOMER: CLARO</td> </tr> <tr> <td>PROJECT: NAPANEE, ON</td> </tr> <tr> <td>REF.: 22XXX-Q-00</td> </tr> <tr> <td>DRAWN BY: X.MONTAMBAULT</td> </tr> <tr> <td>CHECKED BY: C.SAMSON</td> </tr> </table>			TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL	WIRING DIAGRAM (NEXT)	CUSTOMER: CLARO	PROJECT: NAPANEE, ON	REF.: 22XXX-Q-00	DRAWN BY: X.MONTAMBAULT	CHECKED BY: C.SAMSON									
TITLE: SCREENING & GRIT REMOVAL CONTROL PANEL																		
WIRING DIAGRAM (NEXT)																		
CUSTOMER: CLARO																		
PROJECT: NAPANEE, ON																		
REF.: 22XXX-Q-00																		
DRAWN BY: X.MONTAMBAULT																		
CHECKED BY: C.SAMSON																		
<table border="1"> <tr> <td>SCALING:</td> <td>NONE</td> </tr> <tr> <td>DATE:</td> <td>JULY 2024</td> </tr> <tr> <td>DRAWING #:</td> <td>12031331</td> </tr> <tr> <td>PAGE</td> <td>73 OF 73</td> </tr> </table>			SCALING:	NONE	DATE:	JULY 2024	DRAWING #:	12031331	PAGE	73 OF 73								
SCALING:	NONE																	
DATE:	JULY 2024																	
DRAWING #:	12031331																	
PAGE	73 OF 73																	

- 73 01
- 73 02
- 73 03
- 73 04
- 73 05
- 73 06
- 73 07
- 73 08
- 73 09
- 73 10
- 73 11
- 73 12
- 73 13
- 73 14
- 73 15
- 73 16
- 73 17
- 73 18
- 73 19
- 73 20



 151015		215, FORTIN QUÉBEC (QUÉBEC) CANADA G1M 3M2 TÉL.: 418-683-1725
		DIVISION DE FRANKLIN EMPIRE INC.

PANNEAU INDUSTRIEL DE COMMANDE / INDUSTRIAL CONTROL PANEL
 No.Dessin / Drawing No. DATE (Y/A - M - D/J)

12031331	2024-MM-DD
----------	------------

#1	TENSION/VOLTAGE (V)	HERTZ (Hz)	PHASES (φ)	TYPE DE BOITIER ENCLOSURE TYPE
	600	60	3	12
	AMPERAGE (A)	WIRES/FILS		
	34	3		

#2	TENSION/VOLTAGE (V)	HERTZ (Hz)	PHASES (φ)
	N/A	N/A	N/A
	AMPERAGE (A)	WIRES/FILS	
	N/A	N/A	

HP (TOTAL)	kw (TOTAL)	KVAR (TOTAL)
27	N/A	N/A

MINIMUM	MAXIMUM	TEMPÉRATURE AMBIANTE RECOMMANDÉE RECOMMENDED AMBIENT TEMPERATURE
0°C	40°C	

CONVIENT À UN CIRCUIT POUVANT DÉBITER UN COURANT DE DÉFAUT
 SUITABLE FOR USE ON A CIRCUIT CAPABLE OF DELIVERING

	#1	#2	
MAXIMUM DE MAXIMUM OF	30k	N/A	AMPS EFFICACES SYMÉTRIQUE RMS SYMETRICAL AMPS
TENSION DE TENSION OF	600	N/A	VOLT MAX.

Fabriqué au Canada Made in Canada

LOCK-OUT SWITCH

 LISTED 3E11		215, FORTIN QUÉBEC (QUÉBEC) CANADA G1M-3M2 TEL.: 418-683-1725
		DIVISION DE FRANKLIN EMPIRE INC.

PANNEAU DE CONTRÔLE POUR EMPLACEMENT
 DANGEREUX
 CONTROL PANEL FOR HAZARDOUS LOCATIONS
 FACTORY/MANUFACTURE ID : Q
 No.Dessin / Drawing No.

12031331	TYPE DE BOITIER ENCLOSURE TYPE
DATE (Y/A - M - D/J)	

2024-MM-DD	4
------------	---

#1	TENSION/VOLTAGE (V)	HERTZ (Hz)	PHASES (φ)
	600	60	3
	FLA (A)	WIRES/FILS	
	10 MAX	3	

#2	TENSION/VOLTAGE (V)	HERTZ (Hz)	PHASES (φ)
	N/A	N/A	N/A
	FLA (A)	WIRES/FILS	
	N/A	N/A	

HP (TOTAL)	kw (TOTAL)
7.5 MAX	N/A

HAZARDOUS AREA	GROUPES / GROUPS
CL I DIV.1	C, D

TEMPERATURE CODE
T4

-LE PANNEAU DOIT ÊTRE SCELLÉ CONFORMÉMENT
 AUX MARQUAGES FOURNIS PAR LE FABRICANT
 SEAL IN ACCORDANCE WITH THE MARKINGS
 PROVIDED BY THE ENCLOSURE MANUFACTURER

-CONVIENT À UN CIRCUIT POUVANT DÉBITER
 UN COURANT DE DÉFAUT
 SUITABLE FOR USE ON A CIRCUIT CAPABLE
 OF DELIVERING

	#1	#2	EFFICACES SYMÉTRIQUE RMS SYM.
MAXIMUM DE MAXIMUM OF	10k	N/A	

TENSION DE TENSION OF	600	N/A	VOLT MAX.
--------------------------	-----	-----	-----------

Fabriqué au Canada Made in Canada

B. Control Panel Enclosure Heat Dissipation Calculation – Napanee WPCP, ON



Product selection result

Project

- Title: Napanee - Screen & Grit Panel
- Create date: Jul 29, 2024
- Amend date: Jul 29, 2024

User

- Company:
- Name:
- Address:
- City:

Enclosure	Wall	Location
Type	Material Mild Steel	for Indoor environments / NEMA Type 12
Height 72 inch	k 5.5 W/m²K	Single housing for wall mount
Width 72 inch	Insulation R0 = 0 inch	Surface according to VDE 0660 part 600 76ft²
Depth 16 inch		

Temperature	Rated connection value
Min. ambient temperature 20 °C	Rated voltage: 115 V
Max. ambient temperature 30 °C	Frequency 60 Hz
Min. admissible temperature 10 °C	
Max. admissible temperature 40 °C	

Dissipation based on manual input 800 W

Switch cabinet acclimatisation

Total dissipation in enclosure	800 W
Heat Dissipation from environment	0 W
Heat Dissipation to environment	388 W
Required cooling capacity	412 W
Required heating capacity	0 W
Required air flow	75 CFM

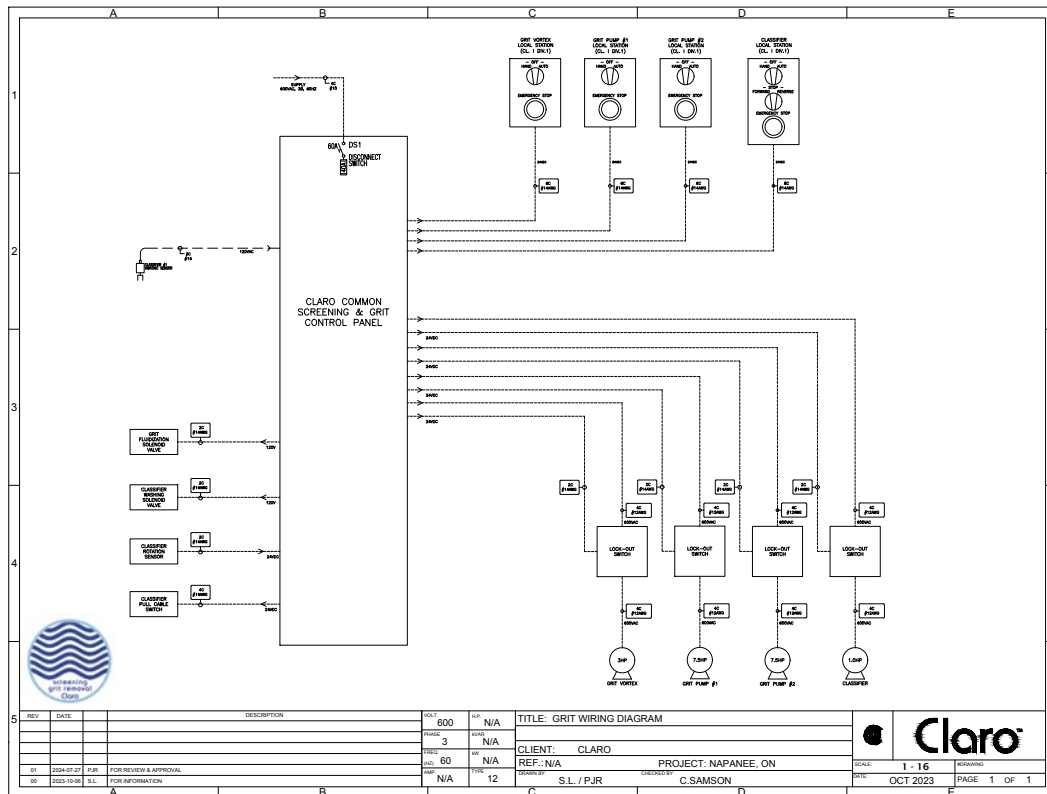
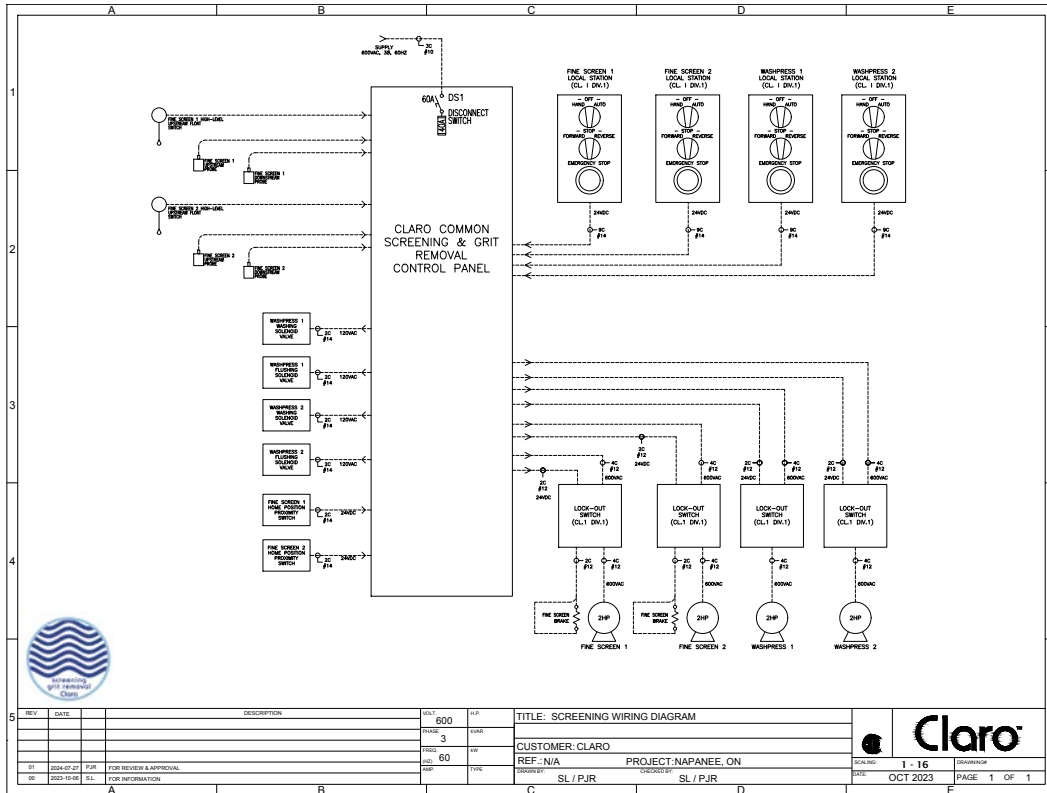
Product selection result

A fan type PF33000T12LGSL with filter PFA30000LG and an air flow rate of 125 CFM *

Warning
 Ensure there is sufficient clearance for air flow around the cooling unit to prevent a so-called air short-circuit. There should be a minimum distance of approximately 200 mm (7.9 inches) to the next component in the housing and 400 mm (15.7 inches) outside the housing

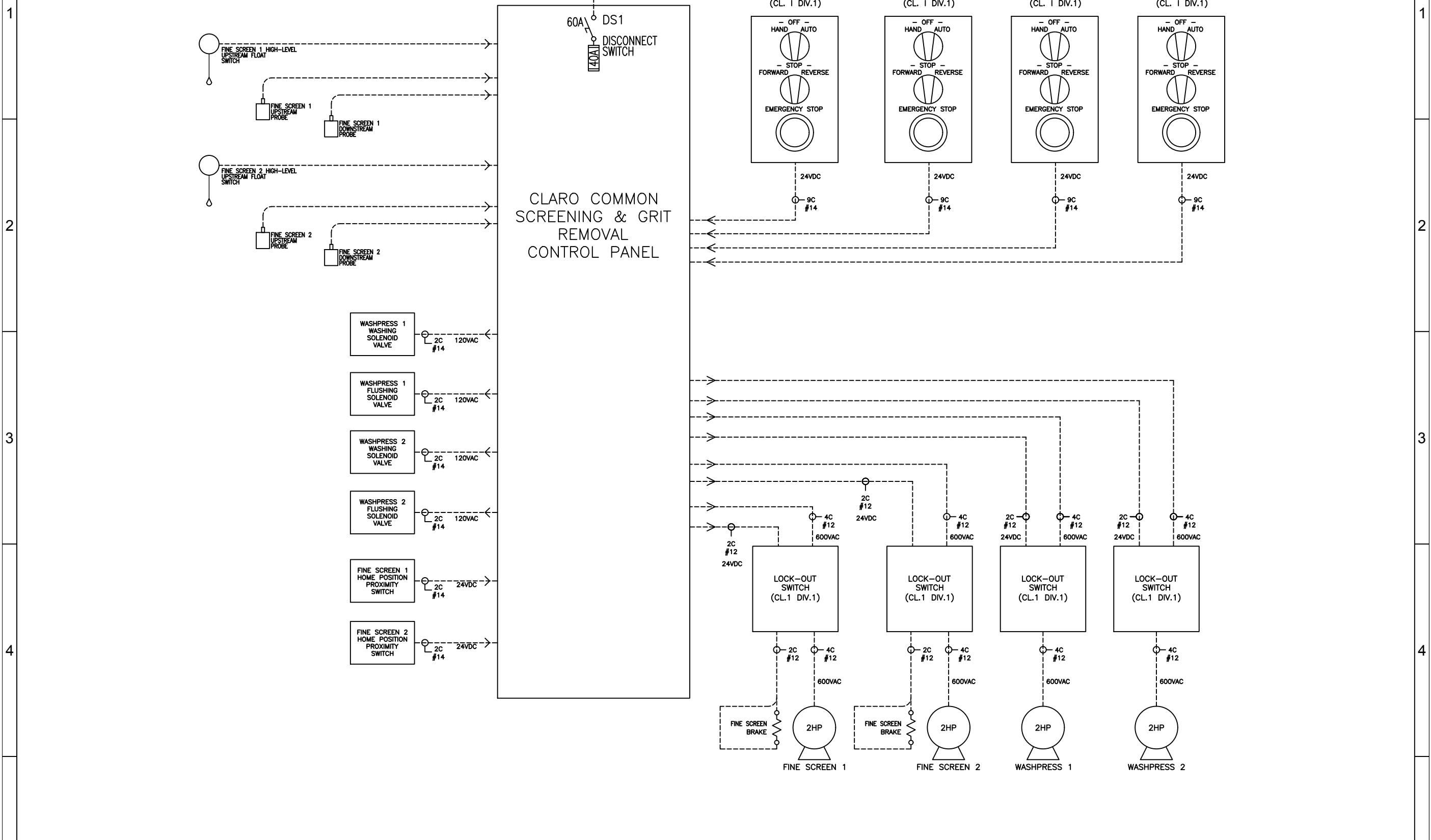
* Capacity at above specified conditions.

C. Field Wiring & Wire Weights Diagrams (Fine Screening & Grit Systems) – Napanee, ON



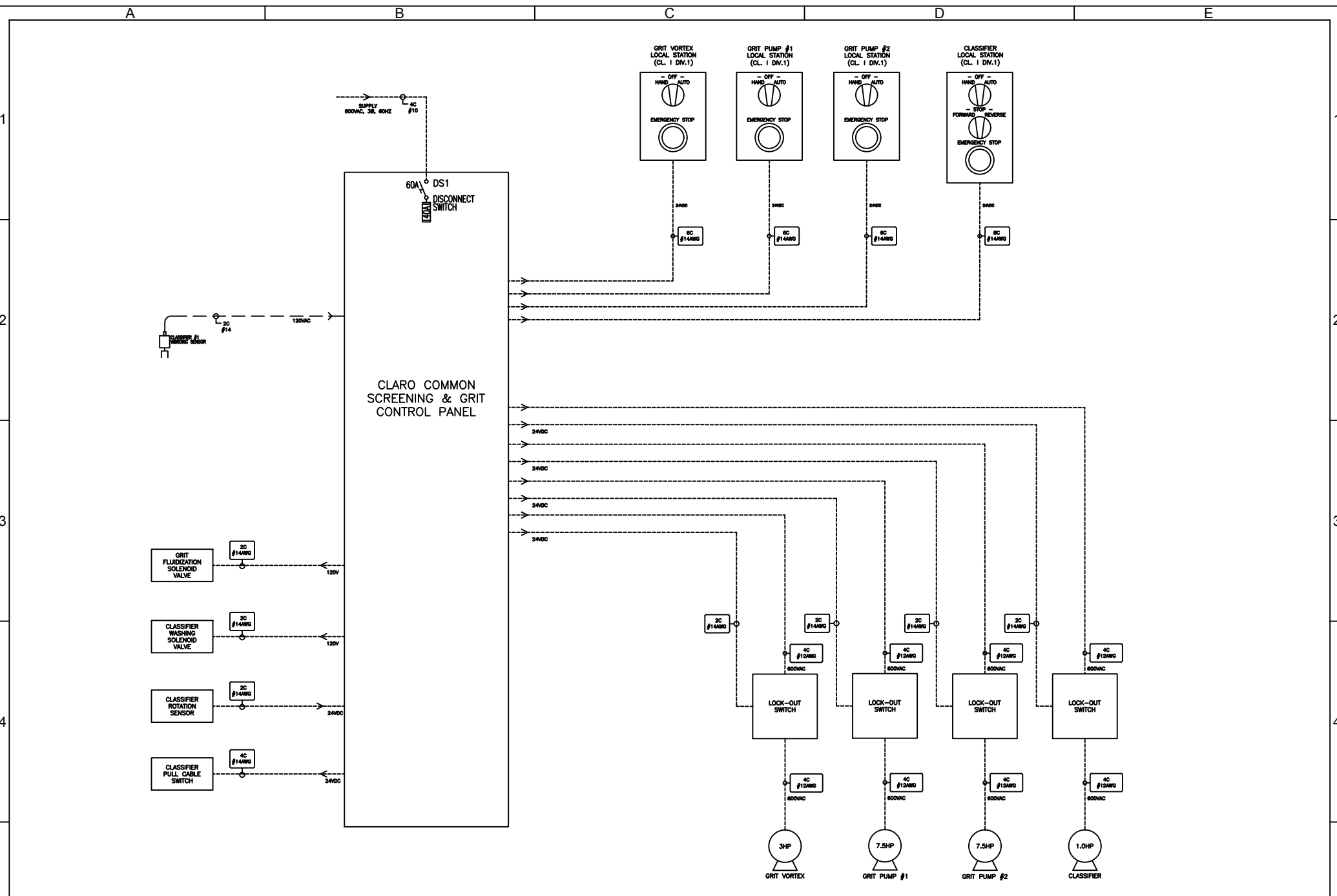
• Please see following pages for large format drawings →

A B C D E



5	REV	DATE	DESCRIPTION	VOLT.	H.P.	TITLE: SCREENING WIRING DIAGRAM			SCALING: 1 - 16 DRAWING#
				600		CUSTOMER: CLARO			
				PHASE	KVAR	REF.: N/A		DATE: OCT 2023 PAGE 1 OF 1	
				3		PROJECT: NAPANEE, ON			
				FREQ.	KW	DRAWN BY: SL / PJR			
	01	2024-07-27	PJR	60		CHECKED BY: SL / PJR			
	00	2023-10-06	S.L.	AMP.	TYPE				

A B C D E



REV	DATE	DESCRIPTION
01	2024-07-27	PJR FOR REVIEW & APPROVAL
00	2023-10-06	S.L. FOR INFORMATION

VOLT.	600	H.P.	N/A
PHASE	3	KVAR	N/A
FREQ. (HZ)	60	KW	N/A
AMP.	N/A	TYPE	12

TITLE:	GRIT WIRING DIAGRAM	
CLIENT:	CLARO	
REF.:	N/A	
PROJECT:	NAPANEE, ON	
DRAWN BY:	S.L. / PJR	CHECKED BY:
		C.SAMSON

	SCALE:	1 - 16	#DRAWING
	DATE:	OCT 2023	PAGE 1 OF 1

D. Component Catalog Cuts (Annotated) & Index – Napanee WPCP, ON

Index

000A_Bel_Panel_HDM727216
000B_Thermostat_SKT011409NC-C
000C_Fan_4115B
000D_PFA_Filters
000E_FLKDS_Remote Door Switch
000F_UC120-LED12-NW_Light_kit
001A_Prise_Simple_Weidmueller_9915480001
001B_Receptacle_6720005430
002A_38613004_Disc_switch
002B_Main_Fuses_Type_J_Time_Delay_AJT
003A_Control Transformer_Hammond
003B_GXT5_UPS
003C_IS-RELAY_UPS_Relay_Card
003D_Phase_Relay_3UG4513-1BR20
004A_WEG_DRIVE_CFW500 3A, 2HP_CFW500C03P0T5DB20H00
004B_WEG_MODULE IO RS485_CFW500-CRS485
004C_WEG_HMI REMOTE KEYPAD_CFW500-HMIR
004D_HPS_INPUT REACTOR
005A_HAWKEYE_CURRENT TRANSFORMER 0,10,20,40A_H721LC
005A_Motor_Protectors_3RV2011
005B_Auxiliary_Contacts_3RV2901-1E
005C_Motor_Starter_Handle_3RV2926-2B
005D_Motor_Contactor_3RT2016-1AK61
005E_Aux_Contacts_3RH2911-1FA22
005F_Mechanical_Interlock_3RA2913-2AA1
006A_Power_Supply_6EP13362BA10
007B_USCC_Fuserholder
007C_ATDR_Midget_Fuses
007C_Branch_Mini_Breaker_SU201M
007D_ABB_2x50_Fuses_Holder
007E_GSB_GDG_5x20_Fuses
008A_Coupling_Relay_3RQ3118-1AM00
008B_Jumper_Bar_3RQ
008C_ABB_Control relay 1SVR405 and accessories
008D_Siemens_3RP25_Time_Relay
008E_Turck intrinsic relay IM1-22EX-R 2-Channels Inputs
011A_Siemens_Ethernet_switch_6GK5005-0BA00-1AB2
011B_AB_HMI_2711P-T12W21D8S
012A_AB_1769-L33ER_AB_CompactLogix_5370_L3
012B_AB_1769-IQ32_DI_Module
012C_AB_1769-PB4_Powersupply
012D_AB_1769-IQ16_Digital_Inputs
012E_AB_1769-IF8_Analog_Inputs
012F_AB_1769-OB32_DO_Module
012G_AB_1769-OB16_Digital_Outputs
012H_AB_1769-OF4_Analog_Outputs
012I_AB_1769-ECR_EndCaps
013A_SIEMENS_INDICATOR LITHT WHITE_3SU1051-6AA70-0AA0
013B_SIEMENS_LED WHITE_3SU1401-1BB40-1AA0
013C_SIEMENS_INDICATOR LITHT RED_3SU1051-6AA20-0AA0
013D_SIEMENS_LED RED_3SU1401-1BB20-1AA0
013E_SIEMENS_INDICATOR LITHT GREEN_3SU1051-6AA40-0AA0

013F_SIEMENS_LED GREEN_3SU1401-1BB40-1AA0
014A_SIEMENS_EMERGENCY STOP MUSHROOM_3SU1050-1HB20-0AA0
014B_SIEMENS_PUSHBOTTON MOMENTARY 22mm_3SU1050-0AB10-0AA0
014C_SIEMENS_CONTACT NO_3SU1400-1AA10-1BA0
014D_SIEMENS_CONTACT SAFETY_NC_3SU1400-1AA10-1HA0
014E_SIEMENS HOLDER MODULE_3SU1550-0AA10-0AA0
015A_ABB_ZK2.5яPI-Spring terminal blocks
015B_ZK6яPI-Spring terminal blocks
020A_Endress & Hauser Level transducer FMU90_Tech_Info
020B_Endress & Hauser Prosonic Level Sensor FDU91
020C_SIEMENS_MOTION TRANSMETTER_7MH7701-0AA00-0A
031A_Lockout_Switch
031B_Auxiliary_contact_sidemount
031C_Adalet_SA5762_Motor_Station
031D_Closure_Plug

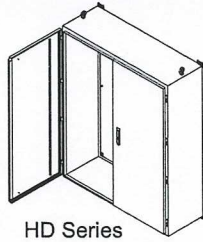
- Please see following pages for control panel component catalog cuts.



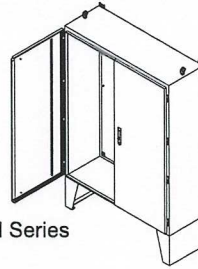


HD/HDM Series

EEMAC / NEMA 12 Double Door Enclosures



HD Series



HDM Series

TECHNICAL READOUT

Catalog No.		Dimensions			Panel		Weight	
Without Feet	With Feet	A	B	C	D	E	Without Feet	With Feet
HD544208	HDM544208	54	42	8	50	x 38	260	275
HD604808	HDM604808	60	48	8	56	x 44	425	440
HD604810	HDM604810	60	48	10	56	x 44	430	447
HD606010	HDM606010	60	60	10	56	x 56	520	537
HD726010	HDM726010	72	60	10	68	x 56	595	612
HD727210	HDM727210	72	72	10	68	x 68	710	736
HD484812	HDM484812	48	48	12	44	x 44	396	416
HD604812	HDM604812	60	48	12	56	x 44	456	476
HD606012	HDM606012	60	60	12	56	x 56	532	552
HD726012	HDM726012	72	60	12	68	x 56	615	635
HD727212	HDM727212	72	72	12	68	x 68	710	730
HD604816	HDM604816	60	48	16	56	x 44	480	504
HD606016	HDM606016	60	60	16	56	x 56	500	524
HD726016	HDM726016	72	60	16	68	x 56	700	724
HD727216	HDM727216	72	72	16	68	x 68	745	769
HD604820	HDM604820	60	48	20	56	x 44	456	486
HD726020	HDM726020	72	60	20	68	x 56	700	730
HD727220	HDM727220	72	72	20	68	x 68	855	885
HD604824	HDM604824	60	48	24	56	x 44	500	538
HD606024	HDM606024	60	60	24	56	x 56	600	638
HD726024	HDM726024	72	60	24	68	x 56	760	790
HD727224	HDM727224	72	72	24	68	x 68	890	928

Wide Models

HD244210	HDM244210	24	42	10	20	x 38	125	142
HD304210	HDM304210	30	42	10	26	x 38	150	167
HD364812	HDM364812	36	48	12	32	x 44	227	244

Application:

Type 12 enclosure designed to house and protect pneumatic, hydraulic or electrical equipment.

Construction:

- 14 or 12 steel gauge
- Slip hinges enabling door removal for easier access and mounting
- Continuously welded and ground smooth seams
- Three point lock flush handle
- Grounding stud on inner door surface and hole on back panel
- 2 or 4 lifting eye bolts
- 12 gauge galvanized back panel (HD7272 will be steel painted smooth white)
- Galvanized mounting rail
- Self-adhesive polymer BEL data pocket
- 12" high mounting feet on HDM model
- ANSI/ASA61 grey polyester textured powder coating inside out

Also Available:

- TYPE 3R and 4 construction (drip shield, stainless hinges)
- Cutouts, louvers, hubs and windows
- Set of rail for door mounting
- Aluminium, SS, galvanized steel
- Special finishes & sizes

Standards:

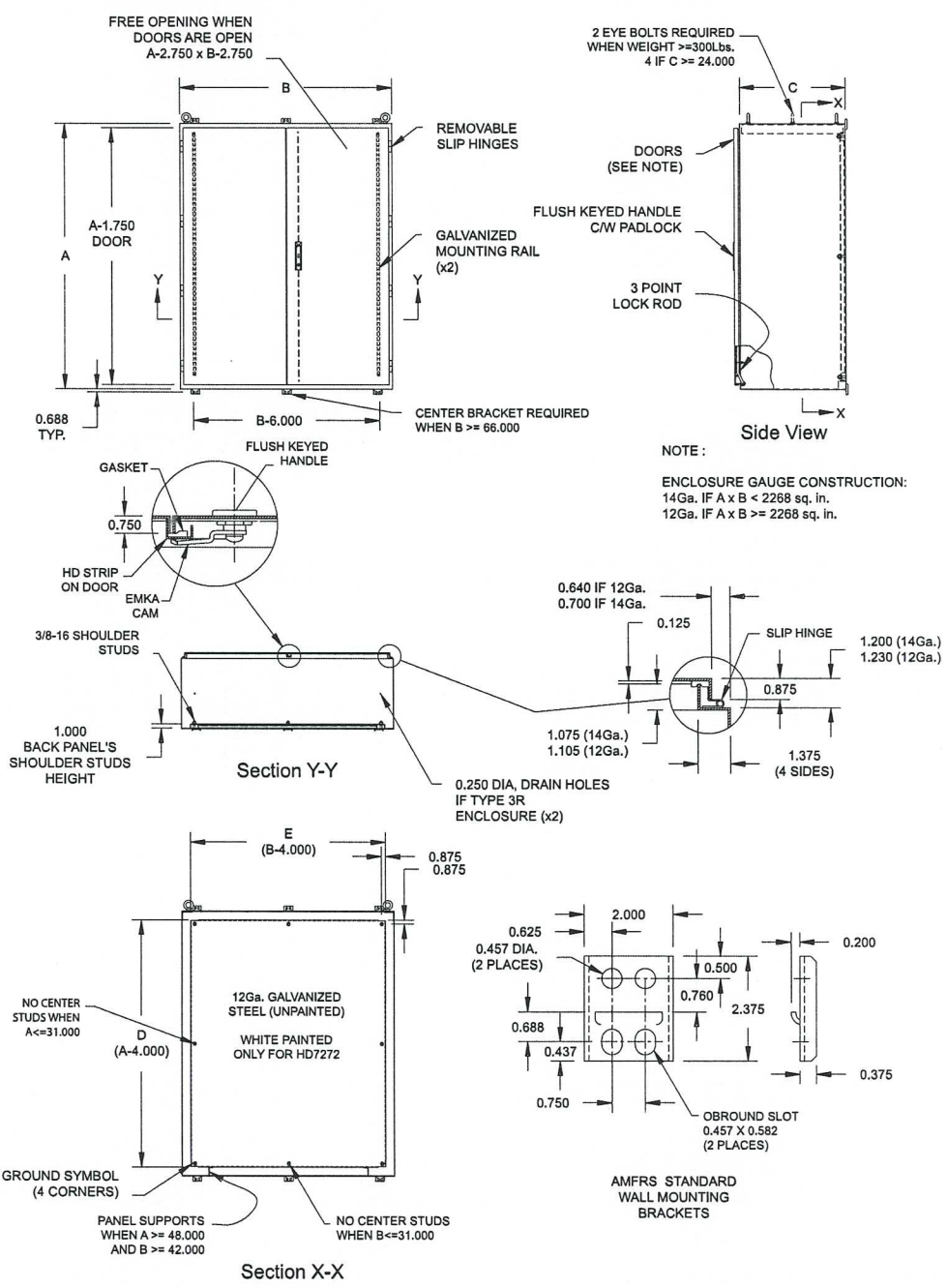
- CSA certified 150359
- UL listed E109310





HD/HDM Series

EEMAC / NEMA 12 Double Door Enclosures





Accessories

Panels For HD and FRS Enclosures

TECHNICAL READOUT

Catalog No.	Box Size		Panel Size		Weight lbs.
	Height	Width	Height	Width	
AHDP2442	24	x 42	20	x 38	26
AHDP3042	30	x 42	26	x 38	36
AHDP3648	36	x 48	32	x 44	50
AHDP4848	48	x 48	44	x 44	58
AHDP5442	54	x 42	50	x 38	80
AHDP6048	60	x 48	56	x 44	103
AHDP6060	60	x 60	56	x 56	130
AHDP7260	72	x 60	68	x 56	157
AHDP7272	72	x 72	68	x 68	192

TECHNICAL READOUT

Catalog No.	Description	Cabinet Size		Panel Size		Weight lbs.
		Height	Width	Height	Width	
AFH6024	half height	60	x 24	24.875x	20	15.6
AFF6024	full height	60	x 24	48	x 20	29.9
AFH7224	half height	72	x 24	30.875x	20	19.3
AFF7224	full height	72	x 24	60	x 20	37.4
AFH9024	half height	90	x 24	39.875x	20	24.9
AFF9024	full height	90	x 24	78	x 20	48.5
AFH7230	half height	72	x 30	30.875x	26	25.0
AFF7230	full height	72	x 30	60	x 26	48.3
AFH6036	half height	60	x 36	24.875x	32	24.8
AFF6036	full height	60	x 36	48	x 32	47.5
AFH7236	half height	72	x 36	30.875x	32	30.7
AFF7236	full height	72	x 36	60	x 32	59.2
AFH9036	half height	90	x 36	39.875x	32	30.7
AFF9036	full height	90	x 36	78	x 32	76.9

TECHNICAL READOUT

Catalog No.	Cabinet Height	Panel Size		Weight lbs
		Height	Width	
AFFSP6024	60	48	x 14	21
AFFSP6036	60	48	x 26	38
AFFSP7224	72	60	x 14	26
AFFSP7230	72	60	x 20	36
AFFSP7236	72	60	x 26	47
AFFSP9024	90	78	x 14	33
AFFSP9036	90	78	x 26	61

AHDP SERIES

Application:

Spare inner panels for all HD double door enclosures

Construction:

- Made from 12 gauge Galvanized steel unpainted
- Ground symbols and holes. (AHDP7272 will be 12 gauge steel painted white polyester powder coating)

AFF& AFH SERIES

Application:

Spare inner panels for FRS series, single door enclosures

Construction:

- Made from 12 gauge Galvanized steel unpainted
- Ground symbols and holes.

AFFSP SERIES

Application:

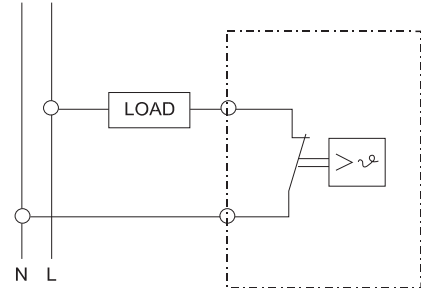
Side mounted panels for FRS series, single door enclosures

Construction:

- Made from 12 gauge Galvanized steel unpainted
- Ground symbols and holes
- Flat construction.



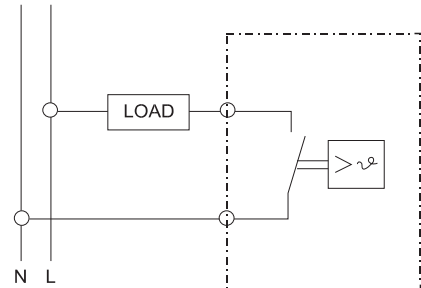
Accessory Products



NC - Normally Closed (Red)

Used in conjunction with heaters.

Contact opens when rising temperatures reach the set point temperature shutting heater off.



NO - Normally Open (Blue)

Used in conjunction with fans.

Contact closes when rising temperatures reach the set point temperature turning fan on.

Thermostat

- Designed to provide air temperature control and monitoring in cabinets.
- Thermostat NC (Normally Closed) for the control of heaters and heater fans.
- Thermostat NO (Normally Open) for the control of cooling units, or for switching signal transmitters in case of overheating.
- Available in Fahrenheit or Celsius.

Sensor Element:	Thermostatic bi-metal
Switching difference (hysteresis):	±4°F (±3°K)
Adjustment Range:	30-140°F / 0-60°C
Connection:	2 pole terminal for AWG 14 (2.5mm ²)
Mounting:	Easily installed by clip mounting on 35 mm or 38 mm DIN rails (included)
Housing:	Flame retardant plastic UL94VO
Color:	Gray (SB)
Protection:	IP20
Approval:	UL Recognized Component , cUL Recognized Component, CE, CSA Listed

Climate Control

Part No.	Scale	Contact Type	Dimensions Height x Width x Depth	Switching Capacity	Ship Wt. lbs
SKT011409NC	°F	Normally Closed	2.83 x 1.57 x 1.4	15 A (1) AC 120 V, 10 A (1) AC 250 V	1
SKT011409NC-C	°C	Normally Closed	2.83 x 1.57 x 1.4	15 A (1) AC 120 V, 10 A (1) AC 250 V	1
SKT011419NO	°F	Normally Open	2.83 x 1.57 x 1.4	15 A (1) AC 120 V, 10 A (1) AC 250 V	1
SKT011419NO-C	°C	Normally Open	2.83 x 1.57 x 1.4	15 A (1) AC 120 V, 10 A (1) AC 250 V	1

AC4 SUMO

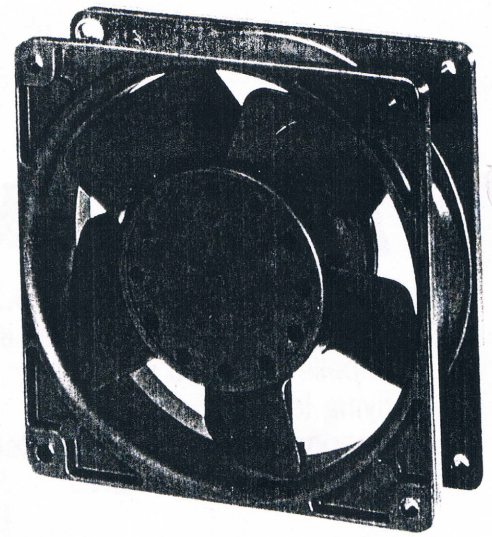
SIZE: 119X119X38mm (4.69"X4.69"X1.5")

CONSTRUCTION: All metal, die-cast aluminum housing, steel impeller, shaded pole motor, impedance protected, terminal block (290mm (12") flying leads also available.)

BEARING: Sintered bronze sleeve bearing or ball bearings

OPERATING TEMPERATURE: Sleeve bearing -10°C to 75°C
Ball bearing -10°C to 75°C

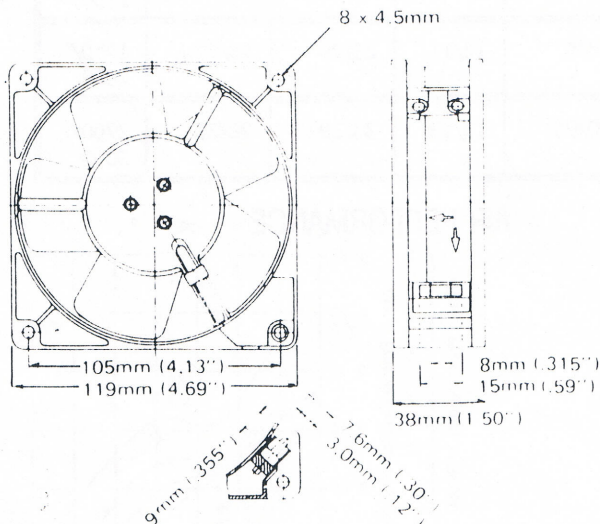
WEIGHT: 600 Grams



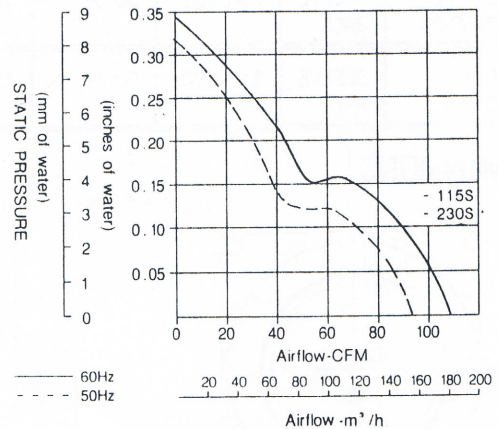
Specifications

model no	bearing	voltage (vac)	frequency (hz)	current (ma) running lock		power (w)	noise db(a)	air flow cfm	speed rpm
4115S	SLEEVE	115	50/60	250/240	260/250	24/22	45/50	94/105	2650/3000
4115B	BALL								
4115S-25 4115B-25	SLEEVE BALL	115	50/60	240/230	250/240	23/21	38/42	70/78	2250/2500
4115S-21 4115B-21	SLEEVE BALL	115	50/60	230/220	240/230	22/20	36/38	60/65	1800/2100
4115S-17 4115B-17	SLEEVE BALL	115	50/60	210/200	220/210	21/19	32/35	50/55	1600/1700
4230S 4230B	SLEEVE BALL	230/220	50/60	140/130	180/170	22/21	45/50	94/105	2650/3000
4230S-25 4230B-25	SLEEVE BALL	230/220	50/60	130/120	170/160	21/20	38/42	70/78	2250/2500
4230S-21 4230B-21	SLEEVE BALL	230/220	50/60	130/120	140/130	20/19	36/38	60/65	1800/2100
4230S-17 4230B-17	SLEEVE BALL	230/220	50/60	120/110	130/120	19/18	32/35	50/55	1600/1700
4DVS 4DVB	SLEEVE BALL	115/230	50/60	250/130	260/170	22/21	45/50	94/105	2650/3000

DIMENSIONS



AIR PERFORMANCE





Quality Products. Service Excellence.

Exhaust Filters *PFAG4 Series*

4th Generation



- Maintains a UL Tested NEMA
- Type 12 seal against enclosure
- UL Recognized to UL 508A, category NITW2/8, UL File #E175229
- CSA #246217
- Patented "Click & Fit" design
- provides a hardware free installation!
- Plastic made from strong, heat resistant (ABS-FR) UL 94 VO fire approved material

Part Number Light Gray (RAL7035)	Part Number Black (RAL9011)	Filtration Efficiency %
PFA10000LG	PFA10000BK	88
PFA20000LG	PFA20000BK	91
PFA30000LG	PFA30000BK	91
PFA40000LG	PFA40000BK	91
PFA60000LG	PFA60000BK	91



Data subject to change without notice

© 2018. Hammond Manufacturing Ltd. All rights reserved.



Des produits de qualité. L'excellence du service.

Interrupteurs à distance pour montage sur porte

Caractéristiques

- Permet d'activer les fonctions marche-arrêt des climatiseurs à l'ouverture et à la fermeture de la porte.
- Peut fonctionner comme interrupteur normalement ouvert ou normalement fermé.
- 115/230 V c.a.



Part No.	For use with
FLKDS	1418, 1422, 1447, 2UD, UHD, HN4
FDS1	Eclipse, HME



Les données sont sujettes à changement sans préavis



UC120-LED

Under Cabinet Light

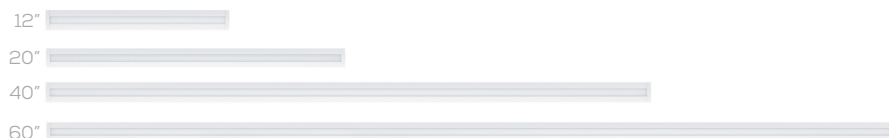
	12"	20"	40"	60"
Watts	3.67	8.38	15.92	21.47
Lumens	263	679	1,240	1,577
Efficacy (Lm/W)	71.6	81.0	77.9	73.3

SPECIFICATIONS

Colour Temp	4K, 3K
Certification	cULus, IP20, Energy Star
Operating Temp	-20°C to +40°C
Voltage	120V (Line Voltage)
LED Life	50,000 hours
Housing Material	Aluminum
Lens Material	Polycarbonate
Accessories	90°, Straight Interconnect, Interconnect cables, 5' Power cord with Plug (with or without On/Off Switch), Wiring Compartment
Compatible Dimmers	COOPER DAL06P COOPER D106P Pass&Seymour HCL453PW
Dimming Range	100% to 2%



All Sizes:



DESCRIPTION

The UC120-LED under cabinet light fixtures have direct 120V AC dimmable driver eliminating the need for an external power source. These fixtures are easy to install and can be used in plugin installations.

APPLICATIONS



Cove Lighting



Kitchen Cabinet



Task Lighting



Closets

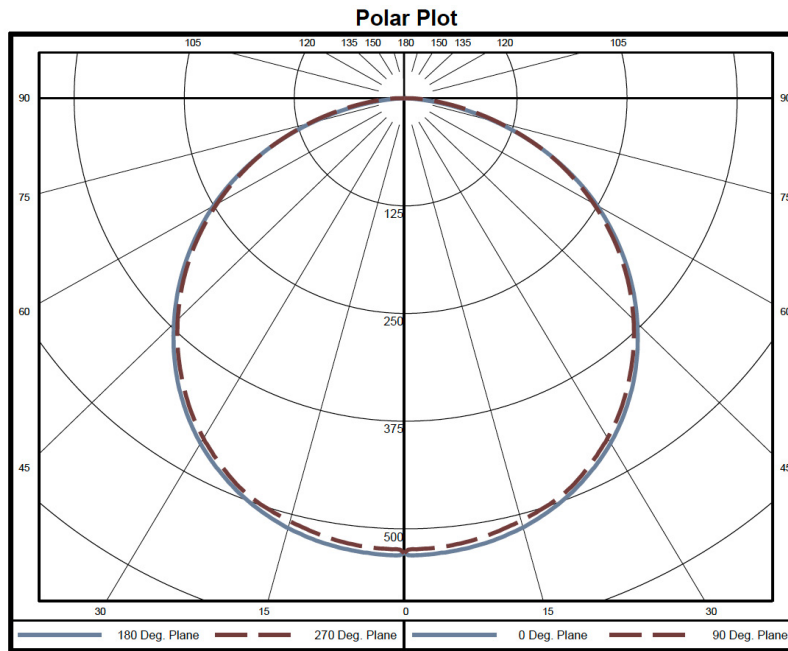


Offices

FEATURES

- Line voltage under cabinet fixture with built in 120V dimming driver.
- Extruded aluminum housing with frosted lens in white finish.
- Available in lengths of 12", 20", 40" and 60".
- Available in 3,000K or 4,000K.
- 400W maximum on one run.

POLAR PLOT

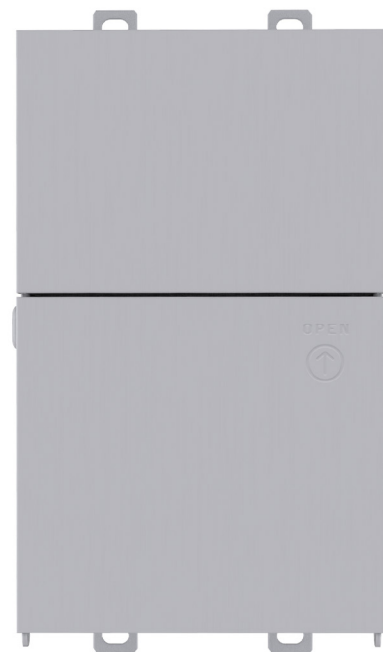


HARDWIRE OPTION (SOLD SEPARATELY)

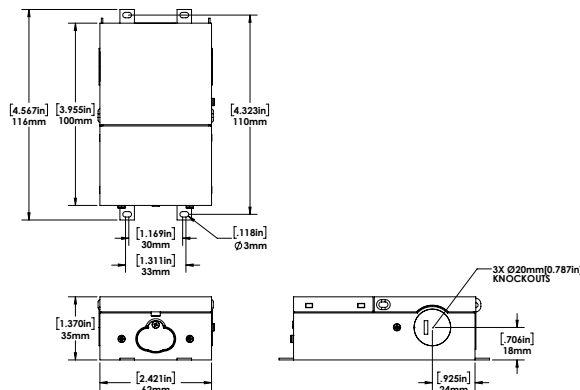
WIRING COMPARTMENT

The UC120 Wiring Compartment allows direct wiring connections when installing UC120-LED series under cabinet lights instead of using a plug-in option.

- Connect up to 400W per run.
- Entries are for use with NMD90 14AWG and 3/8" cable clamp.
- Interconnect cable to connect multiple compartments is available.
- The compartment can be opened from the top for easy access.
- Can be mounted under a cabinet with four screws.
- The box has four entries to suit any wiring option.






DIMENSIONS:





ACCESSORIES (SOLD SEPARATELY)

We offer a wide range of accessories to facilitate plugin or hardwired installations.

INTERCONNECT

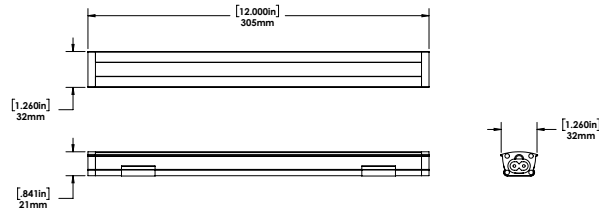
	<p>STRAIGHT INTERCONNECT - (INCLUDED IN EVERY BOX) The straight interconnect connects fixtures and accessories in a single run.</p>
	<p>90° INTERCONNECT The 90° interconnect directly connects fixtures and accessories around a corner.</p>
	<p>INTERCONNECT CABLE Available in various lengths, the interconnect cable connects fixtures and accessories in a single run.</p> <p>AVAILABLE IN: 6" 12" 24" 36"</p>

POWER CORDS

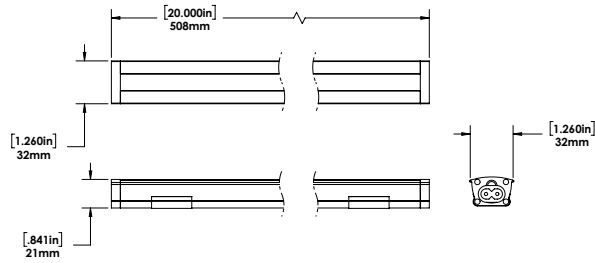
	<p>5' POWER CORD WITH PLUG 5' power cord with plug allows fixtures to directly connect to a power source.</p>
	<p>5' POWER CORD WITH PLUG AND ON/OFF SWITCH 5' power cord with plug and on/off switch allows you to turn lights on/off through the switch on the power cord.</p>

DIMENSIONS

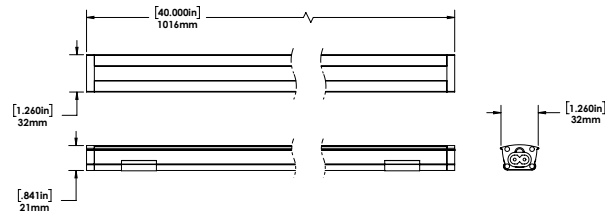
UC120-LED12



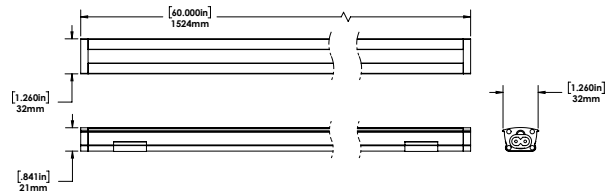
UC120-LED 20



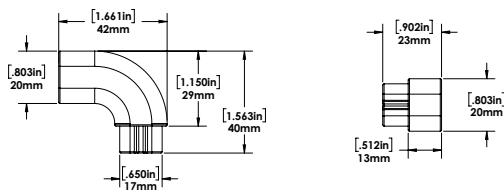
UC120-LED 40



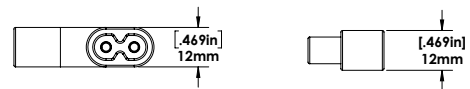
UC120-LED 60



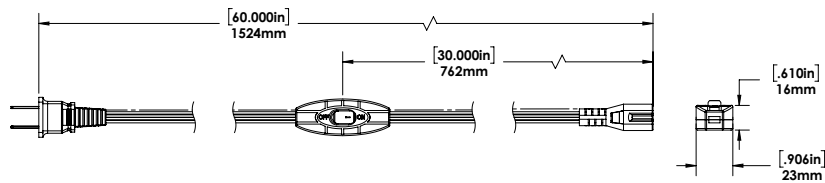
90° INTERCONNECT



STRAIGHT INTERCONNECT



5' POWER CORD WITH PLUG



MODEL SPECIFICATIONS

MODEL DESCRIPTION	VOLTAGE (V)	INPUT POWER (W)	LIGHT OUTPUT	EFFICACY (Lm/W)	PF
UC120-LED12	120	3.67	263	71.6	0.980
UC120-LED20	120	8.38	679	81.0	0.973
UC120-LED40	120	15.92	1240	77.9	0.993
UC120-LED60	120	21.47	1577	73.3	0.995

ORDERING GUIDE

UC120	LENGTH	COLOUR TEMP.
	LED12 - 12"	NW - 4000K
	LED20 - 20"	WW - 3000K
	LED40 - 40"	
	LED60 - 60"	

FIELD INSTALLED ACCESSORIES:

CHECK THE ACCESSORIES YOU WISH TO ORDER:




90° Interconnect - 089992



5' Power Cord with Plug - 089998




5' Power Cord with Plug and On/Off Switch - 089999



Interconnect Cable:

- 6" Cable - 089994
- 12" Cable - 089995
- 24" Cable - 089996
- 36" Cable - 089997



Wiring Compartment - 092929

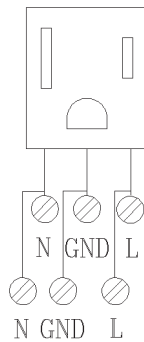
DIN-Rail Receptacles

These modules are intended for use within cabinets and enclosures as 120 VAC outlets for power tools, lights, computers or test equipment for troubleshooting.

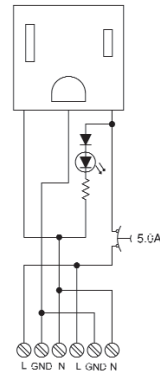
- Compact and easily snaps onto 35mm DIN-rail
- CSA, UL508A and cULus approved
- Available with ground fault current interrupt (GFCI) or standard simplex and duplex outlets
- Option for visual indication of power included with GFCI versions
- Enclosed versions feature NEMA rated enclosure with UL94 VO flammability rating



Schematic diagram



Schematic diagram

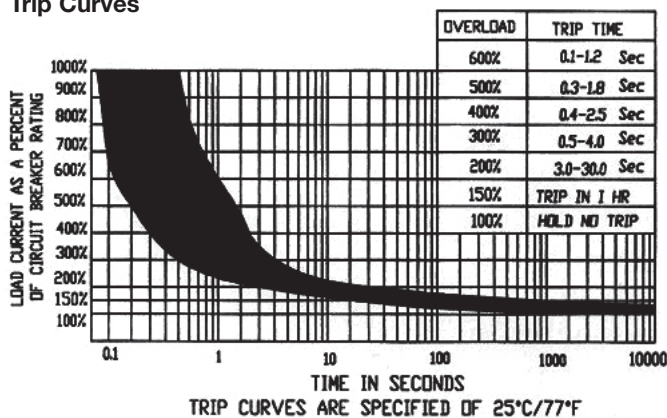


Rated data

Input voltage	Rated current	Wire range	Type	Part No.
120Vac	5A max via outlet 10A via redundant terminals	26 - 12 AWG (0.14 0 4.0mm ²)	Single outlet without circuit breaker	9915480000
120Vac	5A max via outlet 10A via redundant terminals	26 - 12 AWG (0.14 0 4.0mm ²)	Single outlet with circuit breaker (supplemental protector with manual reset via push button)	9915480001
Width	35mm			
Length	70mm			
Height	55mm			
Approvals	® LR-229352, © E252394			

Input voltage	Rated current	Wire range	Type	Part No.
120Vac	5A max via outlet 10A via redundant terminals	26 - 12 AWG (0.14 0 4.0mm ²)	Single outlet with circuit breaker (supplemental protector with manual reset via push button)	9915480001
Width	35mm			
Length	70mm			
Height	55mm			
Approvals	® LR-229352, © E252394			

Trip Curves



Compact AC Outlet - Duplex

DUPLEX 120VAC OUTLET W/LED

This new DIN rail mountable duplex receptacle makes adding a 120V maintenance AC outlet to control cabinets quick and easy. It mounts on standard 35mm DIN rail and requires just 42mm of rail space. An LED indicates that 120V is applied to the module. The terminations accept slotted or Phillips screwdrivers. The mounting foot includes a latching lock - slide it open, mount the module on the DIN rail and slide the lock closed.

- requires just 42mm of DIN rail
- includes power status LED
- latching mounting foot makes installation and removal from DIN rail easy
- CSA certified and cRUus recognized



Technical Data/Dimensions/Approvals

Voltage	120Vac nominal
Current	15A maximum
Wire Size	14-12AWG (Solid or stranded, copper only)
Stripping Length	8.8 to 11.0mm / 0.347" to 0.433"
Tightening Torque	0.5Nm / 4.4lb-in
Terminations	Screw terminals, slotted or Phillips
	Line L
	Neutral W
	Ground G
Mounting	TS35 DIN Rail
Width	42mm / 1.65"
Length	99mm / 3.90"
Height	51mm / 2.01"
Approvals/Certifications	

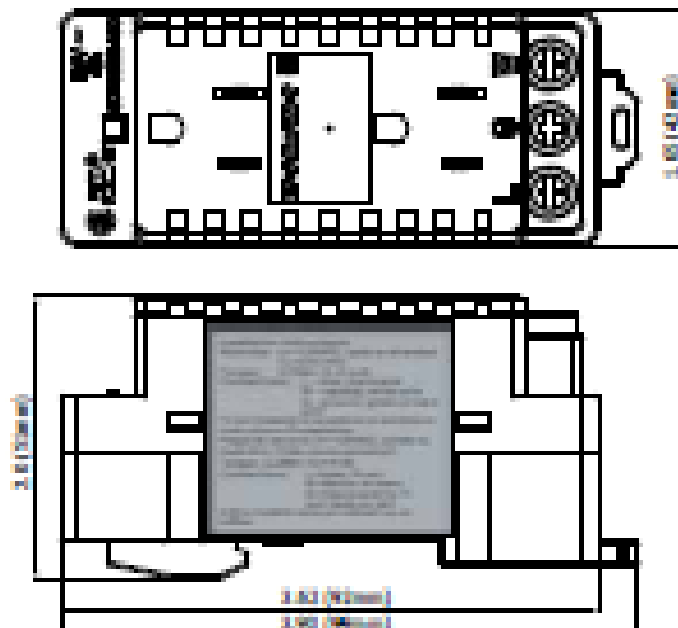


CSA certified, file 251163, Project 2345434, according to C22.2 No.42
 cRUus recognized, file E340886, according to UL498 and C22.2 No. 182.3

Ordering Data

Type	Description	Qty	Part No.
Compact AC Outlet - Duplex	DUPLEX 120VAC OUTLET W/LED	1	6720005430

Dimensional Drawing





FUSERBLOC UL

Fusible disconnect switches UL and CSA
30 to 800 A

Fuse protection



ul_004_a



fuser-ul_006_a



fuser-ul_005_a

The solution for

- > Motor load break.
- > Protection of industrial cabinet.
- > Electrical distribution.



Strong points

- > Improved safety.
- > High breaking capacity.
- > A complet range of functions.

Conformity to standards⁽¹⁾

- > IEC 60947-3
- > NFPA79 (2002 Edition)
- > UL489, Guide WJAZ, file E255272 (Frame size 1 and 2)
- > UL98, Guide WHTY, file E201138 (Frame sizes 3 to 8)
- > CSA22.2 #5, Class 4652-06, file 112964 (Frame size 1 and 2)
- > CSA22.2 #4, Class 4651-02, file 112964 (Frame sizes 3 to 8)



(1) Product reference on request.

Function

FUSERBLOC UL fusible disconnect switches are heavy duty switches that break and make power circuits on and off load. The switches employ double break contacts per pole that ensure complete isolation of the fuse when the switch is in the "OFF" position. These switches are extremely durable and are tested and approved for use in the most demanding applications. The TEST position function is enabled with handles with the TEST position. This function tests the control circuit auxiliaries without switching the main contacts. It is a simple alternative to a separately wired push button.

Advantages

Improved safety

- On load make and break power circuit applications.
- Double break by phase.
- Touch safe covers.

High breaking capacity.

- Up to 200 kA Short circuit rating.

A complet range of functions

- Compact footprints.
- Front or side operation.
- Flange operation.
- NFPA 79 compliant kits.
- Voltage sensing terminals.

References

Fusible disconnect

Rating (A) Fuses Frame size	No. of poles	Switch body	Direct handle	Front external handle	External right side handle	Shaft external handle	NFPA79 kit	U type auxiliary contacts	Terminal shrouds
CD 30 A CC 1	3 P	3710 3003	Black 3729 4012	S0 type Black IP65 I - 0 1, 3R, 12 1493 0111 4, 4X 149D 0111		S0 type 200 mm 7.9 inches 1405 0620 320 mm 12.6 inches 1405 0632 400 mm 15.7 inches 1405 0640	3729 4532		
	3 P + switched neutral	3710 4003							
	3 P + solid neutral	3710 5003							
CD 30 A J 2	3 P	3710 3004	3729 4014	S1 type Black IP65 I - 0 1, 3R, 12 141F 2111 4, 4X 141D 2111		S1 type 200 mm 7.9 inches 1401 0520 320 mm 12.6 inches 1401 0532 400 mm 15.7 inches 1401 0540		1 contact NC 3999 0701 1 contact NO 3999 0702	standard
	3 P + switched neutral	3710 4004							
	3 P + solid neutral	3710 5004							
30 A J 4	2 P	3861 2004	Black 3629 7910	S1 type Black I - 0 1, 3R, 12 Defeatable 141F 2111 I - 0 4, 4X Defeatable 141D 2111 I - 0 - Test 4, 4X Defeatable 141D 2115	S1 type Black I - 0 4, 4X 141H 6111 S1 type Red / yellow I - 0 4, 4X 141I 6111	S1 type 200 mm 7.9 inches 1400 1020	3729 7540		
	3 P	3861 3004							
	4 P	3861 6004							
60 A J 4	2 P	3861 2005	Black 3629 7910	S1 type Black I - 0 1, 3R, 12 Defeatable 141F 2111 I - 0 4, 4X Defeatable 141D 2111 I - 0 - Test 4, 4X Defeatable 141D 2115	S1 type Black I - 0 4, 4X 141H 6111 S1 type Red / yellow I - 0 4, 4X 141I 6111	320 mm 12.6 inches 1400 1032	3729 7540		
	3 P	3861 3005							
	4 P	3861 6005							

FUSERBLOC UL

Fusible disconnect switches UL and CSA

30 to 800 A

References (continued)

Rating (A) fuses Frame size	No. of poles	Switch body	Direct handle	Front external handles	External right side handle ⁽¹⁾	Shaft for external handle	NFPA79 kit	U type auxiliary contacts	Terminal shrouds
60 A J 5	2 P	3861 2006	Black 3629 7910	S2 type Black I - 0 1, 3R, 12 Defeatable 142F 2111 Black I - 0 4, 4X Defeatable 142D 2111 Black I - 0 - Test 4, 4X Defeatable 142D 2115	S2 type Black I - 0 4, 4X 142H 6111 Red / yellow I - 0 4, 4X 142I 6111	1400 1040 400mm Shaft	3729 7540	1 contact type NC 3999 0701 1 contact type NO 3999 0702	standard
	3 P	3861 3006							
	4 P	3861 6006							
100 A J 5	2 P	3861 2010							
	3 P	3861 3010							
	4 P	3861 6010							
200 A J 6	2 P	3861 2020							
	3 P	3861 3020							
	4 P	3861 6020							
400 A J 7	2 P	3861 2038							
	3 P	3861 3038							
	4 P	3861 6038							
600 A J 8	2 P	3850 2060							
	3 P	3850 3060							
	4 P	3850 6060							
800 A L 8	2 P	3850 2080							
	3 P	3850 3080							
	4 P	3850 6080							

(1) No door interlocking.

AJT

TIME DELAY / CLASS J



HIGHLIGHTS:

- Smart Spot Indicator
- Time Delay
- Highly Current Limiting
- DC Ratings
- Optional Mechanical Indicator (70 to 600A fuses)

APPLICATIONS:

- Motor Circuits
- Mains
- Feeders
- Branch Circuits
- Lighting, Heating & General Loads
- Transformers
- Control Panels
- Circuit Breaker Back-up
- Bus Duct
- Load Centers

SMARTSPOT™ WITH MAXIMUM CIRCUIT PROTECTION

Amp-trap 2000® SmartSpot™ AJT fuses now provide a visual open fuse indicator. With advanced material technology added to the existing product line the AJT fuse provides IEC Type “2” (No Damage) protection to main, feeder, and branch circuits, for all types of loads — yet, they require only half the mounting space needed for 600VAC Class RK fuses. AJT’s time delay characteristics for handling harmless in-rush currents, its current limiting ability (the most current limiting UL fuse class!), and wide range of ratings (from 1 to 600 Amperes) — give excellent protection for all your applications.

Features/Benefits

- **Solid State SmartSpot Indicator**
- **Time delay** for motor starting and transformer inrush
- **300kA interrupting rating** - self-certified, UL witnessed tests
- **Extremely current limiting** for low peak let-thru current
- **Most current limiting UL class fuse**
- **Small footprint** requires less mounting space and allows smaller, more economical fuse blocks
- **Easy 2-to-1 selectivity** for prevention of nuisance shutdowns
- **Unique Class J dimensions** prevent replacement errors
- **High-visibility orange label** gives instant recognition
- **Metal-embossed date and catalog number** for traceability and lasting identification
- **Fiberglass body** provides dimensional stability in harsh industrial settings
- **High-grade silica filler** ensures fast arc quenching
- **Optional EI Indicator/Switch mount** for AJT70 to 600 open fuse indication

Ratings

- **AC:** 1 to 600A
600VAC, 200kA I.R.
(self certified for 600VAC, 300kA I.R., UL witnessed)
- **DC:** 1 to 600A
500VDC, 100kA I.R.

Approvals

- **AJT (1-600):**
 - UL Listed to Standard 248-8
 - DC Listed to UL Standard 198L
 - CSA Certified to Standard C22.2 No. 248.8
 - IEC 269-2-1
- **AJT (70-600) EI:**
 - UL Component Recognized
 - DC Tested to UL Standard 198L



TIME DELAY / CLASS J FUSES

AJT

Standard Fuse Ampere Ratings, Catalog Numbers

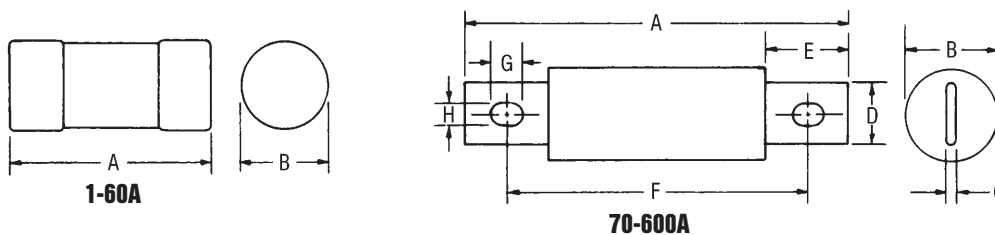
AMPERE RATING	CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER
1	AJT1	4-1/2	AJT4-1/2	25	AJT25	125	AJT125
1-1/4	AJT1-1/4	5	AJT5	30	AJT30	150	AJT150
1-1/2	AJT1-1/2	5-6/10	AJT5-6/10	35	AJT35	175	AJT175
1-6/10	AJT1-6/10	6	AJT6	40	AJT40	200	AJT200
1-8/10	AJT1-8/10	6-1/4	AJT6-1/4	45	AJT45	225	AJT225
2	AJT2	7	AJT7	50	AJT50	250	AJT250
2-1/4	AJT2-1/4	8	AJT8	60	AJT60	300	AJT300
2-1/2	AJT2-1/2	9	AJT9	70	AJT70	350	AJT350
2-8/10	AJT2-8/10	10	AJT10	80	AJT80	400	AJT400
3	AJT3	12	AJT12	90	AJT90	450	AJT450
3-2/10	AJT3-2/10	15	AJT15	100	AJT100	500	AJT500
3-1/2	AJT3-1/2	17-1/2	AJT17-1/2	110	AJT110	600	AJT600
4	AJT4	20	AJT20				

Recommended Fuse Blocks With Box Connectors for Amp-trap® Class J Fuses

Fuse Ampere Rating	Catalog Number	
	600V OR LESS	
	1 Pole	3 pole
0-30	US3J1I	US3J3I
31-60	US6J1I	US6J3I
61-100	61036J	61038J
101-200	62001J	62003J
201-400	64031J	64033J
401-600	6631J	6633J

A variety of pole configurations and termination provisions is available.

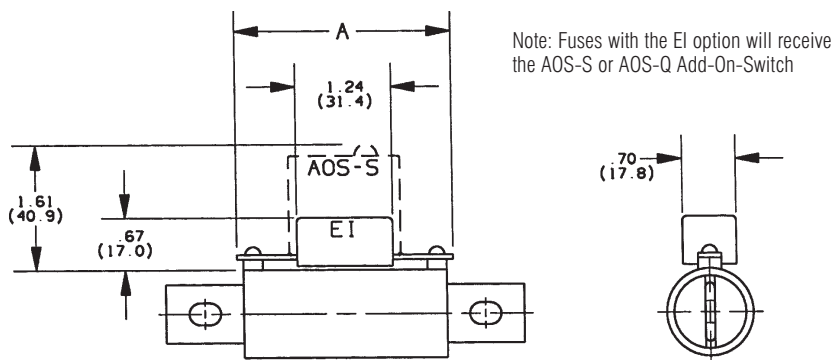
Note: Indicator Not available (1-7a)



Dimensions

AMPERE RATING	A		B		C		D		E		F		G		H	
	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm
1-30	2-1/4	57	13/16	21	-	-	-	-	-	-	-	-	-	-	-	-
31-60	2-3/8	60	1-1/16	27	-	-	-	-	-	-	-	-	-	-	-	-
61-100	4-5/8	117	1-1/16	27	1/8	3.2	3/4	19	1	25	3-5/8	92	3/8	10	9/32	7
101-200	5-3/4	146	1-5/8	41	3/16	4.8	1-1/8	29	1-3/8	35	4-3/8	111	3/8	10	9/32	7
201-400	7-1/8	181	2-1/8	54	1/4	6.3	1-5/8	41	1-7/8	48	5-1/4	133	17/32	14	13/32	10
401-600	8	203	2-1/2	64	3/8	9.5	2	51	2-1/8	54	6	152	11/16	18	17/32	13

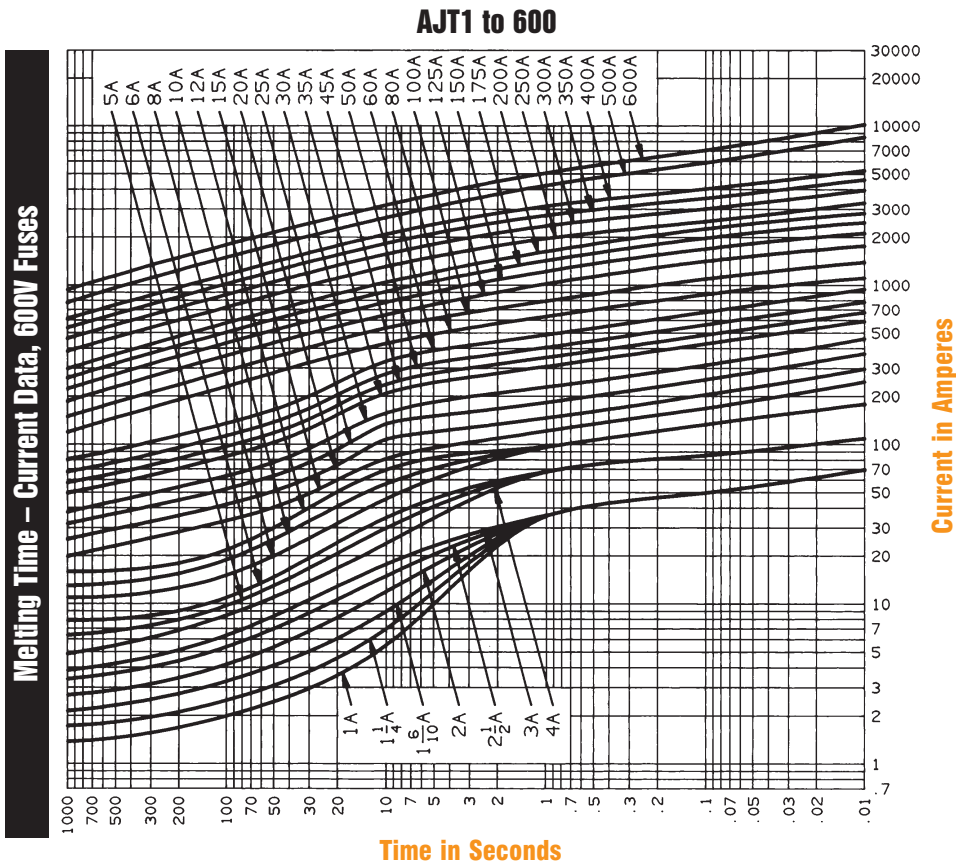
Optional Indicator/Microswitch Mount (EI) dimensions:



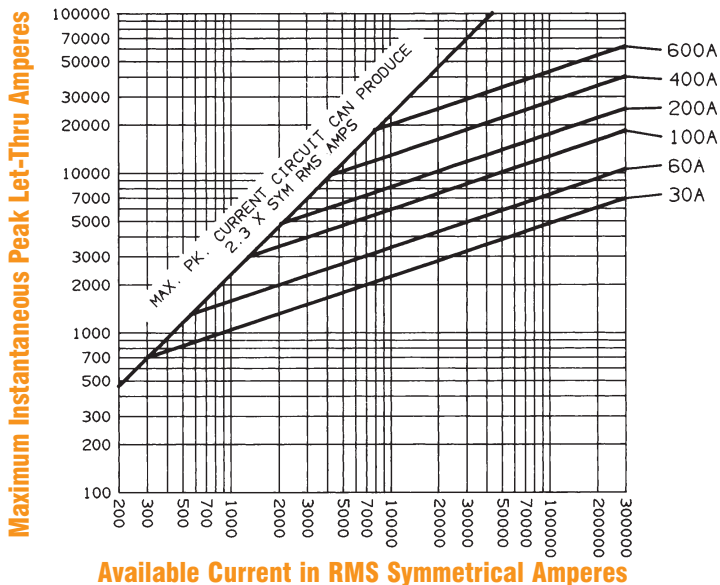
CATALOG NUMBER	A
AJT(70-100)-EI	2.80 (71.0)
AJT(110-200)-EI	3.22 (81.8)
AJT(225-400)-EI	3.24 (82.2)
AJT(450-600)-EI	3.61 (91.8)

TIME DELAY / CLASS J FUSES

AJT



Peak Let-Through Current Data – AJT30 to 600, 600 Volts AC



Note: See Application Tables page L9 for Three Phase Class J AJT Fuses.

Votre unique fournisseur de transformateurs



Hammond Power Solutions Inc.



HPS SPARTAN®

Transformateur de contrôle
type ouvert





NOTRE ENTREPRISE

Hammond Power Solutions Inc. (HPS) a été fondée en 1917 à Guelph en Ontario. Au début, l'entreprise familiale spécialisée dans le marché de la radio à ondes courtes est devenue chef de file dans la conception et la fabrication de transformateurs magnétiques. HPS possède des usines de fabrication à Compton en Californie, à Guelph et à Walkerton en Ontario, à Granby au Québec ainsi qu'à Monterrey au Mexique. Aujourd'hui, HPS exploite de multiples centres de distribution régionaux situés partout en Amérique du Nord.

APPLICATIONS

Le HPS Spartan® constitue la solution idéale pour les applications en CVAC, les systèmes de signalisation et d'alarme, les circuits de contrôle de moteur, l'éclairage et l'isolation de circuits.

Valeur

Économie

INDUSTRIES

- Commercial
- Agriculture
- Sécurité
- Automatisation
- Solaire

VALEUR

La nouvelle gamme de transformateurs de contrôle industriels HPS Spartan convient parfaitement aux charges d'usage général, industriel et de service léger.

Conçu pour des applications où un courant d'appel élevé ou une application machine-outil ne sont pas requises, le transformateur de contrôle HPS Spartan constitue une solution efficace et économique.



CARACTÉRISTIQUES ET AVANTAGES

- Borniers moulés pour connexions primaires et secondaires jusqu'à 3 000 VA ou 30 A. Connexion sur la bobine de plus de 3 000 VA ou 30 A.
- Tous les borniers sont munis de trous de fixation avec vis cruciformes n° 6 et rondelle SEMS (Convient pour 18 AWG à 14 AWG pour un conducteur plein et 18 AWG 12 AWG pour un conducteur toronné). Les connexions des bobines sont équipées de trous de fixation avec vis cruciforme ¼-20 UNC x 0,50 po et rondelle ressort à becs.
- 50/60 Hz (60 Hz sur SP***ACP et SP***AR).
- Bobines de cuivre enroulé avec isolation diélectrique supérieur.
- Homologué CSA (dossier LR 3902), répertorié par l'UL (dossier E50394), homologué CE et conforme RoHS.
- Respecte les normes NEMA.
- Matériaux isolants de qualité supérieure. HPS Spartan propose les systèmes d'isolation suivants :
 - Jusqu'à 1 500 VA : échauffement de 80 °C
Classe de température de 130 °C (B)
 - 2 000 à 5 000 VA : 115 °C
Classe de température de 180 °C (F)
- La plupart des appareils HPS Spartan sont livrés dans un emballage supérieur avec :
 - des cartons ondulés de qualité supérieure
 - des coussins en mousse moulés sur mesure
 - un système facilitant le déballage et le réemballage
 - les meilleures étiquettes de boîte de l'industrie
- Tous les HPS Spartan® sont proposés avec des fiches d'installation et des consignes de câblage trilingues.
- Tous les appareils sont fournis avec des cavaliers de jonction de tension primaires et secondaires.
- Tous les transformateurs HPS Spartan sont imprégnés à vide de résine de polyester durcie à chaud.
- Noyau magnétique boulonné en usine.
- Supports de montage boulonnés.
- Garantie de 15 ans.





Groupe A

Tension primaire : 600/480 || 575/460 || 550/440
 Tension secondaire : 120 x 240 || 115 x 230 || 110 x 220



60 Hz

Puiss. VA	Puiss. VA CE	Numéro de catalogue	Fig. de mont.	Amp. de sortie	Encombrement			Centres de montage		Trous de fixation	Hauteur avec couv. de sécur.	Hauteur avec adaptat. de boîte à fusibles	Poids approx. à l'exp. Lb
					A	B	C	D	E	G X H			
50	50	SP50ACP	A	0,42/0,21	2,60	3,82	2,60	2,13	2,64	0,22 x 0,44	2,98	2,79	2,2
100	100	SP100ACP	A	0,83/0,42	2,99	3,74	2,85	2,52	2,60	0,22 x 0,44	3,23	3,04	3,3
150	150	SP150ACP	A	1,25/0,63	2,99	4,29	2,85	2,52	3,15	0,22 x 0,44	3,23	3,04	4,4
250	160	SP250ACP	A	2,08/1,04	3,78	4,09	3,40	3,31	2,99	0,22 x 0,44	3,78	3,59	6,4
350	250	SP350ACP	A	2,92/1,46	3,78	4,49	3,40	3,31	3,39	0,22 x 0,44	3,78	3,59	7,5
500	300	SP500ACP	A	4,17/2,08	4,49	4,69	3,78	3,78	3,66	0,31 x 0,81	4,16	3,97	11
750	500	SP750ACP	A	6,25/3,13	5,25	5,08 ¹	4,37	4,50	4,06	0,31 x 0,81	4,75	4,56	18
1 000	650	SP1000ACP	A	8,33/4,17	5,25	5,47 ¹	4,37	4,50	4,45	0,31 x 0,81	4,75	4,56	21
1 500	1 000	SP1500ACP	A	12,5/6,25	5,25	6,85 ¹	4,37	4,50	5,83	0,31 x 0,81	4,56	4,37	28
2 000	1 300	SP2000ACP	A	16,7/8,33	6,38	5,87 ¹	5,31	5,75	4,84	0,31 x 0,81	5,69	5,50	34
3 000	2 000	SP3000ACP	A	25,0/12,5	7,50	7,50	6,50	6,30	6,85	0,44 x 1,00	6,50	6,50	60
5 000	3 000	SP5000ACP	C	41,7/20,8	8,98	9,88	7,76	7,40	7,13	0,44 x 1,00	SO	SO	93

Cavalières de jonction de tension primaires et secondaires de série avec tous les transformateurs.

Tensions et puissances VA spéciales disponibles sur demande.

¹ Remarque : Pour les appareils de 750 à 2 000 VA, la profondeur totale réelle est de 0,24 po, plus la valeur de la colonne B.

* Voir les plans dimensionnels de la page 10.

Toutes les dimensions sont en pouces

1 lb = 0,45 kg

Groupe B

Tension primaire : 600 || 575 || 550
 Tension secondaire : 12 x 24 || 11.5 x 23 || 11 x 22



60 Hz

Puiss. VA	Puiss. VA CE	Numéro de catalogue	Fig. de mont.	Amp. de sortie	Encombrement			Centres de montage		Trous de fixation	Haut. avec couv. de sécur.	Hauteur avec adaptat. de boîte à fusibles	Poids approx. à l'exp. Lb
					A	B	C	D	E	G X H			
50	50	SP50AR	A	4,17/2,08	2,60	3,23	2,60	2,13	2,05	0,22 x 0,44	2,98	2,79	1,5
100	100	SP100AR	A	8,33/4,17	2,99	3,74	2,85	2,52	2,60	0,22 x 0,44	3,23	3,04	3,3
150	150	SP150AR	A	12,5/6,25	2,99	4,09	2,85	2,52	2,95	0,22 x 0,44	3,23	3,04	3,9
250	160	SP250AR	A	20,8/10,4	3,78	3,70	3,40	3,31	2,60	0,22 x 0,44	3,78	3,59	5,2
350	250	SP350AR	A	29,2/14,6	3,78	4,29	3,40	3,31	3,19	0,22 x 0,44	3,78	3,59	7,1
500	300	SP500AR	B	41,7/20,8	4,49	5,08	3,78	3,78	3,27	0,31 x 0,81	4,16	3,97	9,9

Cavalières de jonction de tension primaires et secondaires de série avec tous les transformateurs.

Tensions et puissances VA spéciales disponibles sur demande.

* Voir les plans dimensionnels de la page 10.

Toutes les dimensions sont en pouces

1 lb = 0,45 kg



Groupe C

Tension primaire : 240 x 480 || 230 x 460 || 220 x 440
 Tension secondaire : 120 x 240 || 115 x 230 || 110 x 220




 50/60 Hz

Puiss. VA	Puiss. VA CE	Numéro de catalogue	Fig. de mont.	Amp. de sortie	Encombrement			Centres de montage		Trous de fixation	Haut. avec couv. de sécur.	Hauteur avec adaptat. de boîte à fusibles	Poids approx. à l'exp. Lb
					A	B	C	D	E	G X H			
50	50	SP50MQMJ	A	0,42/0,21	2,60	3,35	2,60	2,13	2,17	0,22 x 0,44	2,98	2,79	1,7
100	100	SP100MQMJ	A	0,83/0,42	2,99	3,74	2,85	2,52	2,60	0,22 x 0,44	3,23	3,04	3
150	150	SP150MQMJ	A	1,25/0,63	2,99	4,29	2,85	2,52	3,15	0,22 x 0,44	3,23	3,04	4,3
250	160	SP250MQMJ	A	2,08/1,04	3,78	4,09	3,40	3,31	2,99	0,22 x 0,44	3,78	3,59	6,5
350	250	SP350MQMJ	A	2,92/1,46	3,78	4,69	3,40	3,31	3,58	0,22 x 0,44	3,78	3,59	8,2
500	300	SP500MQMJ	A	4,17/2,08	4,49	4,69	3,78	3,78	3,66	0,31 x 0,81	4,16	3,97	11
750	500	SP750MQMJ	A	6,25/3,13	5,25	4,69 ¹	4,37	4,50	3,66	0,31 x 0,81	4,75	4,56	16
1 000	650	SP1000MQMJ	A	8,33/4,17	5,25	5,47 ¹	4,37	4,50	4,45	0,31 x 0,81	4,75	4,56	21
1 500	1 000	SP1500MQMJ	A	12,5/6,25	5,25	6,85 ¹	4,37	4,50	5,83	0,31 x 0,81	4,75	4,56	28
2 000	1 300	SP2000MQMJ	A	16,7/8,33	6,38	5,87 ¹	5,31	5,75	4,84	0,31 x 0,81	5,50	5,31	35
3 000	2 000	SP3000MQMJ	A	25,0/12,5	7,50	7,50	6,50	6,30	7,28	0,44 x 1,00	6,50	6,50	64
5 000	3 000	SP5000MQMJ	C	41,7/20,8	8,98	9,88	7,76	7,40	7,28	0,44 x 1,00	SO	SO	97

Cavaliers de jonction de tension primaires et secondaires de série avec tous les transformateurs.

Tensions et puissances VA spéciales disponibles sur demande.

¹ Remarque : Pour les appareils de 750 à 2 000 VA, la profondeur totale réelle est de 0,24 po, plus la valeur de la colonne B.

* Voir les plans dimensionnels de la page 10.

Toutes les dimensions sont en pouces

1 lb = 0,45 kg

Groupe D

Tension primaire : 240 x 480 || 230 x 460 || 220 x 440
 Tension secondaire : 12 x 24 || 11.5 x 23 || 11 x 22




 50/60 Hz

Puiss. VA	Puiss. VA CE	Numéro de catalogue	Fig. de mont.	Amp. de sortie	Encombrement			Centres de montage		Trous de fixation	Haut. avec couv. de sécur.	Hauteur avec adaptat. de boîte à fusibles	Poids approx. à l'exp. Lb
					A	B	C	D	E	G X H			
50	50	SP50QR	A	4,17/2,08	2,60	3,35	2,60	2,13	2,17	0,22 x 0,44	2,98	2,79	1,7
100	100	SP100QR	A	8,33/4,17	2,99	3,54	2,85	2,52	2,40	0,22 x 0,44	3,23	3,04	3
150	150	SP150QR	A	12,5/6,25	2,99	4,29	2,85	2,52	3,15	0,22 x 0,44	3,23	3,04	4,3
250	160	SP250QR	A	20,8/10,4	3,78	4,09	3,40	3,31	2,99	0,22 x 0,44	3,78	3,59	6,5
350	250	SP350QR	A	29,2/14,6	3,78	4,69	3,40	3,31	3,58	0,22 x 0,44	3,78	3,59	8,3
500	300	SP500QR	B	41,7/20,8	4,49	5,47	3,78	3,78	3,66	0,31 x 0,81	4,16	3,97	11

Cavaliers de jonction de tension primaires et secondaires de série avec tous les transformateurs.

Tensions et puissances VA spéciales disponibles sur demande.

* Voir les plans dimensionnels de la page 10.

Toutes les dimensions sont en pouces

1 lb = 0,45 kg



Groupe E

Tension primaire : 380/347
Tension secondaire : 120 x 240



Puiss. VA	Puiss. VA CE	Numéro de catalogue	Fig. de mont.	Amp. de sortie	Encombrement			Centres de montage		Trous de fixation	Hauteur avec cov. de sécur.	Hauteur avec adaptat. de boîte à fusibles	Poids approx. à l'exp. Lb
					A	B	C	D	E	G X H			
50	50	SP50KHP	A	0,42/0,21	2,60	3,35	2,60	2,13	2,17	0,22 x 0,44	2,98	2,79	1,7
100	100	SP100KHP	A	0,83/0,42	2,99	3,74	2,85	2,52	2,60	0,22 x 0,44	3,23	3,04	3,4
150	150	SP150KHP	A	1,25/0,63	2,99	4,29	2,85	2,52	3,15	0,22 x 0,44	3,23	3,04	4,4
250	160	SP250KHP	A	2,08/1,04	3,78	4,09	3,40	3,31	2,99	0,22 x 0,44	3,78	3,59	6,7
350	250	SP350KHP	A	2,92/1,46	3,78	4,69	3,40	3,31	3,58	0,22 x 0,44	3,78	3,59	8,4
500	300	SP500KHP	A	4,17/2,08	4,49	4,69	3,78	3,78	3,66	0,31 x 0,81	4,16	3,97	12
750	500	SP750KHP	A	6,25/3,13	5,25	4,69 ¹	4,37	4,50	3,66	0,31 x 0,81	4,75	4,56	17
1 000	650	SP1000KHP	A	8,33/4,17	5,25	5,47 ¹	4,37	4,50	4,45	0,31 x 0,81	4,75	4,56	21
1 500	1 000	SP1500KHP	A	12,5/6,25	6,38	4,88 ¹	5,31	5,75	3,86	0,31 x 0,81	5,50	5,31	29

Cavaliers de jonction de tension primaires et secondaires de série avec tous les transformateurs.

Tensions et puissances VA spéciales disponibles sur demande.

¹ Remarque : Pour les appareils de 750 à 1 500 VA, la profondeur totale réelle est de 0,24 po, plus la valeur de la colonne B.

* Voir les plans dimensionnels de la page 10.

Toutes les dimensions sont en pouces

1 lb = 0,45 kg

Groupe F

Tension primaire : 380/347
Tension secondaire : 12 x 24



Puiss. VA	Puiss. VA CE	Numéro de catalogue	Fig. de mont.	Amp. de sortie	Encombrement			Centres de montage		Trous de fixation	Haut. avec cov. de sécur.	Hauteur avec adaptat. de boîte à fusibles	Poids approx. à l'exp. Lb
					A	B	C	D	E	G X H			
50	50	SP50KHR	A	4,17/2,08	2,60	3,35	2,60	2,13	2,17	0,22 x 0,44	2,98	2,79	1,7
100	100	SP100KHR	A	8,33/4,17	2,99	3,74	2,85	2,52	2,60	0,22 x 0,44	3,23	3,04	3,3
150	150	SP150KHR	A	12,5/6,25	2,99	4,29	2,85	2,52	3,15	0,22 x 0,44	3,23	3,04	4,4
250	160	SP250KHR	A	20,8/10,4	3,78	4,09	3,40	3,31	2,99	0,22 x 0,44	3,78	3,59	6,4
350	250	SP350KHR	A	29,2/14,6	3,78	4,69	3,40	3,31	3,58	0,22 x 0,44	3,78	3,59	8,1
500	300	SP500KHR	B	41,7/20,8	4,49	5,47	3,78	3,78	3,66	0,31 x 0,81	4,16	3,97	11

Cavaliers de jonction de tension primaires et secondaires de série avec tous les transformateurs.

Tensions et puissances VA spéciales disponibles sur demande.

* Voir les plans dimensionnels de la page 10.

Toutes les dimensions sont en pouces

1 lb = 0,45 kg



Groupe G

Tension primaire : 277
Tension secondaire : 120




 50/60 Hz

Puiss. VA	Puiss. VA CE	Numéro de catalogue	Fig. de mont.	Amp. de sortie	Encombrement			Centres de montage		Trous de fixation	Hauteur avec cov. de sécur.	Hauteur avec adaptat. de boîte à fusibles	Poids approx. à l'exp. Lb
					A	B	C	D	E	G X H			
50	50	SP50NJ	A	0,42	2,60	3,35	2,60	2,13	2,17	0,22 x 0,44	2,98	2,79	1,6
100	100	SP100NJ	A	0,83	2,99	3,54	2,85	2,52	2,40	0,22 x 0,44	3,23	3,04	3,2
150	150	SP150NJ	A	1,25	2,99	4,29	2,85	2,52	3,15	0,22 x 0,44	3,23	3,04	4,3
250	160	SP250NJ	A	2,08	3,78	4,09	3,40	3,31	2,99	0,22 x 0,44	3,78	3,59	6,4
350	250	SP350NJ	A	2,92	3,78	4,69	3,40	3,31	3,58	0,22 x 0,44	3,78	3,59	8,1
500	300	SP500NJ	A	4,17	4,49	4,69	3,78	3,78	3,66	0,31 x 0,81	4,16	3,97	11
750	500	SP750NJ	A	6,25	5,25	5,08 ¹	4,37	4,50	4,06	0,31 x 0,81	4,75	4,56	18
1 000	650	SP1000NJ	A	8,33	5,25	5,47 ¹	4,37	4,50	4,45	0,31 x 0,81	4,75	4,56	20
1 500	1 000	SP1500NJ	A	12,50	5,25	6,85 ¹	4,37	4,50	5,83	0,31 x 0,81	4,75	4,56	29

Cavaliers de jonction de tension primaires et secondaires de série avec tous les transformateurs.
Tensions et puissances VA spéciales disponibles sur demande.

Toutes les dimensions sont en pouces

¹ Remarque : Pour les appareils de 750 à 1 500 VA, la profondeur totale réelle est de 0,24 po, plus la valeur de la colonne B.

1 lb = 0,45 kg

* Voir les plans dimensionnels de la page 10.

Groupe H

Tension primaire : 120 x 240 || 115 x 230 || 110 x 220
Tension secondaire : 12 x 24 || 11.5 x 23 || 11 x 22




 50/60 Hz

Puiss. VA	Puiss. VA CE	Numéro de catalogue	Fig. de mont.	Amp. de sortie	Encombrement			Centres de montage		Trous de fixation	Hauteur avec cov. de sécur.	Hauteur avec adaptat. de boîte à fusibles	Poids approx. à l'exp. Lb
					A	B	C	D	E	G X H			
50	50	SP50PR	A	4,17/2,08	2,60	3,35	2,60	2,13	2,17	0,22 x 0,44	2,98	2,79	1,7
100	100	SP100PR	A	8,33/4,17	2,99	3,74	2,85	2,52	2,60	0,22 x 0,44	3,23	3,04	3
150	150	SP150PR	A	12,5/6,25	2,99	4,29	2,85	2,52	3,15	0,22 x 0,44	3,23	3,04	4,3
250	160	SP250PR	A	20,8/10,4	3,78	3,90	3,40	3,31	2,80	0,22 x 0,44	3,78	3,59	5,9
350	250	SP350PR	A	29,2/14,6	3,78	4,69	3,40	3,31	3,58	0,22 x 0,44	3,78	3,59	8,2
500	300	SP500PR	B	41,7/20,8	4,49	5,47	3,78	3,78	3,66	0,31 x 0,81	4,16	3,97	11

Cavaliers de jonction de tension primaires et secondaires de série avec tous les transformateurs.
Tensions et puissances VA spéciales disponibles sur demande.

Toutes les dimensions sont en pouces

* Voir les plans dimensionnels de la page 10.

1 lb = 0,45 kg



Groupe I

Tension primaire : 208 x 416 || 200 x 400 || 190 x 380
 Tension secondaire : 120 x 240 || 115 x 230 || 110 x 220



Puiss. VA	Puiss. VA CE	Numéro de catalogue	Fig. de mont.	Amp. de sortie	Encombrement			Centres de montage		Trous de fixation	Hauteur avec couv. de sécur.	Hauteur avec adaptat. de boîte à fusibles	Poids approx. à l'exp. Lb
					A	B	C	D	E	G X H			
50	50	SP50SP	A	0,42/0,21	2,60	3,35	2,60	2,13	2,17	0,22 x 0,44	1,6	2,60	1,6
100	100	SP100SP	A	0,83/0,42	2,99	3,54	2,85	2,52	2,40	0,22 x 0,44	3	2,85	3
150	150	SP150SP	A	1,25/0,63	2,99	4,29	2,85	2,52	3,15	0,22 x 0,44	4,3	2,85	4,3
250	160	SP250SP	A	2,08/1,04	3,78	4,09	3,40	3,31	2,99	0,22 x 0,44	6,5	3,40	6,5
350	250	SP350SP	A	2,92/1,46	3,78	4,69	3,40	3,31	3,58	0,22 x 0,44	8,3	3,40	8,3
500	300	SP500SP	A	4,17/2,08	4,49	4,69	3,78	3,78	3,66	0,31 x 0,81	11	3,78	11
750	500	SP750SP	A	6,25/3,13	5,25	4,69 ¹	4,37	4,50	3,66	0,31 x 0,81	16	4,75	16
1 000	650	SP1000SP	A	8,33/4,17	5,25	5,47 ¹	4,37	4,50	4,45	0,31 x 0,81	20	4,75	20
1 500	1 000	SP1500SP	A	12,5/6,25	6,38	4,88 ¹	5,31	5,75	3,86	0,31 x 0,81	27	5,69	27

Cavaliers de jonction de tension primaires et secondaires de série avec tous les transformateurs.

Tensions et puissances VA spéciales disponibles sur demande.

¹ Remarque : Pour les appareils de 750 à 1 500 VA, la profondeur totale réelle est de 0,24 po, plus la valeur de la colonne B.

* Voir les plans dimensionnels de la page 10.

Toutes les dimensions sont en pouces

1 lb = 0,45 kg

Groupe J

Tension primaire : 208 x 416 || 200 x 400 || 190 x 380
 Tension secondaire : 12 x 24 || 11.5 x 23 || 11 x 22



Puiss. VA	Puiss. VA CE	Numéro de catalogue	Fig. de mont.	Amp. de sortie	Encombrement			Centres de montage		Trous de fixation	Hauteur avec couv. de sécur.	Hauteur avec adaptat. de boîte à fusibles	Poids approx. à l'exp. Lb
					A	B	C	D	E	G X H			
50	50	SP50SR	A	4,17/2,08	2,60	3,35	2,60	2,13	2,17	0,22 x 0,44	2,98	2,79	1,6
100	100	SP100SR	A	8,33/4,17	2,99	3,54	2,85	2,52	2,40	0,22 x 0,44	3,23	3,04	3,1
150	150	SP150SR	A	12,5/6,25	2,99	4,29	2,85	2,52	3,15	0,22 x 0,44	3,23	3,04	4,3
250	160	SP250SR	A	20,8/10,4	3,78	4,09	3,40	3,31	2,99	0,22 x 0,44	3,78	3,59	6,5
350	250	SP350SR	A	29,2/14,6	3,78	4,69	3,40	3,31	3,58	0,22 x 0,44	3,78	3,59	8,3
500	300	SP500SR	B	41,7/20,8	4,49	5,47	3,78	3,78	3,66	0,31 x 0,81	4,16	3,97	11

Cavaliers de jonction de tension primaires et secondaires de série avec tous les transformateurs.

Tensions et puissances VA spéciales disponibles sur demande.

* Voir les plans dimensionnels de la page 10.

Toutes les dimensions sont en pouces

1 lb = 0,45 kg

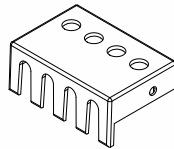
ACCESSOIRES EN OPTION

Couvercles de sécurité

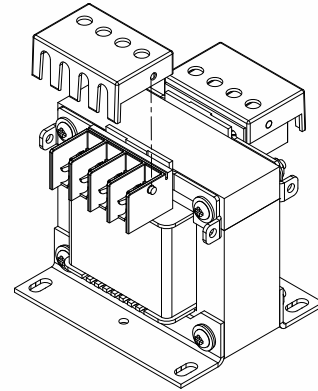
Des couvercles de sécurité en option sont proposés avec les transformateurs de contrôle industriels HPS Spartan jusqu'à 3 000 VA ou 30 A.

Numéro de pièce	Suffixe du numéro de pièce du transformateur applicable	Puissance VA applicable
SPFG1	AR, QR, PR, KHR, SR	50 à 500
SPFG1	KHP, SP, NJ	50 à 1 500
SPFG1	ACP, MQMJ	50 à 3 000

Remarque : Chaque couvercle de sécurité peut être installé soit du côté primaire ou de côté secondaire. Le couvercle de sécurité n'est pas disponible avec les unités standard SP5000ACP et SP5000MQMJ. En cas d'installation d'un couvercle de sécurité, ajoutez 0,38 po par couvercle de sécurité à la profondeur totale (colonne B) des appareils de 50 à 500 VA et 0,31 po à celle des appareils de 750 à 2 000 VA. En ce qui concerne les appareils personnalisés, les couvercles de sécurité en option ne sont disponibles que sur les appareils jusqu'à 3 000 VA ou 30 A.



Couvercle de sécurité (En option)



Exemple de dessin d'assemblage pour l'installation du couvercle de sécurité en option
(Uniquement sur les appareils équipés d'un bornier moulé primaire ou secondaire)

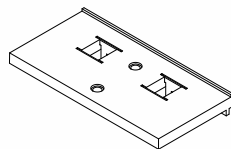
Ensemble d'adaptateur de boîte à fusibles

Des ensembles d'adaptateurs de boîtes à fusibles en option sont proposés avec les transformateurs de contrôle industriels HPS Spartan jusqu'à 3 000 VA ou 30 A. Cet ensemble est conçu pour permettre après achat l'installation d'une boîte à fusibles d'un fabricant tiers sur le transformateur de contrôle industriel. Le transformateur doit cependant être équipé d'un bornier moulé sur le côté primaire ou secondaire.

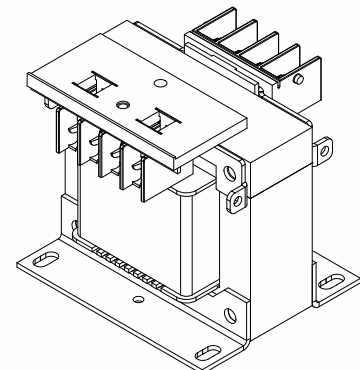
Remarque : HPS ne fournit pas de cavaliers ni de fusibles destinés à des boîtes à fusibles installées après l'achat sur les transformateurs de contrôle industriels HPS Spartan. L'ensemble d'adaptateur de boîte à fusibles ne constitue qu'un moyen mécanique de fixer une boîte à fusibles d'un fabricant tiers après l'achat du transformateur. HPS ne recommande aucun fournisseur de boîtes à fusibles ou de fusibles en particulier. Pour connaître la taille de fusible recommandée, consultez la page 32 du catalogue HTP-10 des transformateurs.

Numéro de pièce de l'ensemble	Suffixes du numéro de pièce du transformateur applicable	Puissance VA applicable
SPFBAK1	AR, QR, PR, KHR, SR	50 à 500
SPFBAK1	KHP, SP, NJ	50 à 1 500
SPFBAK1	ACP, MQMJ	50 à 3 000

Remarque : Un seul ensemble d'adaptateur de boîte à fusibles par transformateur. L'ensemble d'adaptateur de boîte à fusibles n'est pas disponible pour les unités standard SP5000ACP et SP5000MQMJ. Ajoutez 0,38 po à la profondeur globale par adaptateur de boîte à fusibles (colonne B) pour les appareils de 750 à 3 000 VA sur lesquels un ensemble d'adaptateur de boîte à fusibles est installé. En ce qui concerne les appareils personnalisés, l'ensemble d'adaptateur de boîte à fusibles en option n'est disponible que sur les appareils jusqu'à 3 000 VA ou 30 A.



Ensemble d'adaptateur de boîte à fusibles (En option)



Exemple de dessin d'assemblage pour l'installation de l'ensemble d'adaptateur de boîte à fusibles en option

Pour obtenir des consignes d'installation détaillées des transformateurs HPS Spartan, des couvercles de sécurité ou des ensembles d'adaptateurs de boîtes à fusibles en option, consultez, dans notre site Web, la section Products and Services, Literature & Resources, Instruction Sheets et Control Transformers (en anglais seulement). Vous pouvez aussi utiliser le lien suivant :

http://www.hammondpowersolutions.com/products/product_literature/instruction_sheets/control_transformers.php (en anglais seulement).



PLANS DIMENSIONNELS

Certains transformateurs peuvent différer des plans dimensionnels illustrés ci-dessous.

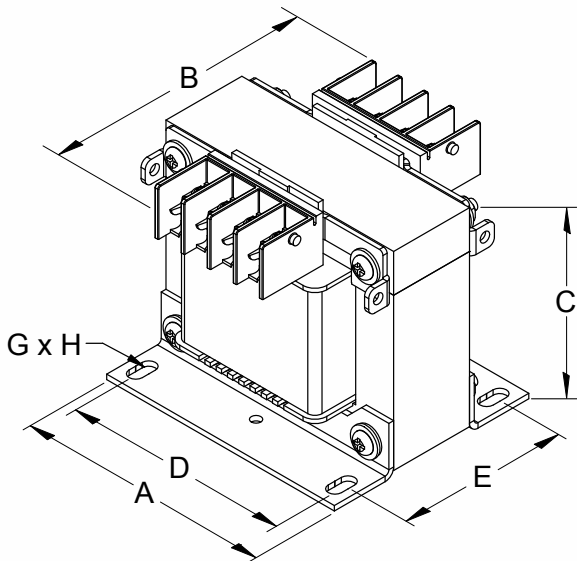


FIGURE A

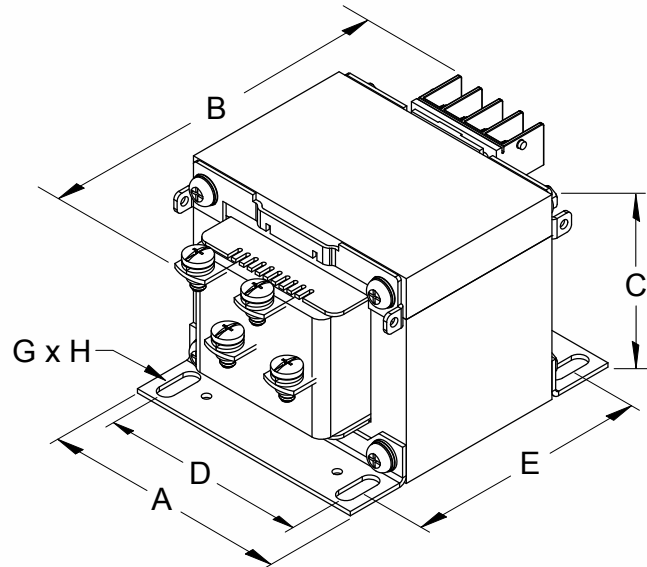


FIGURE B

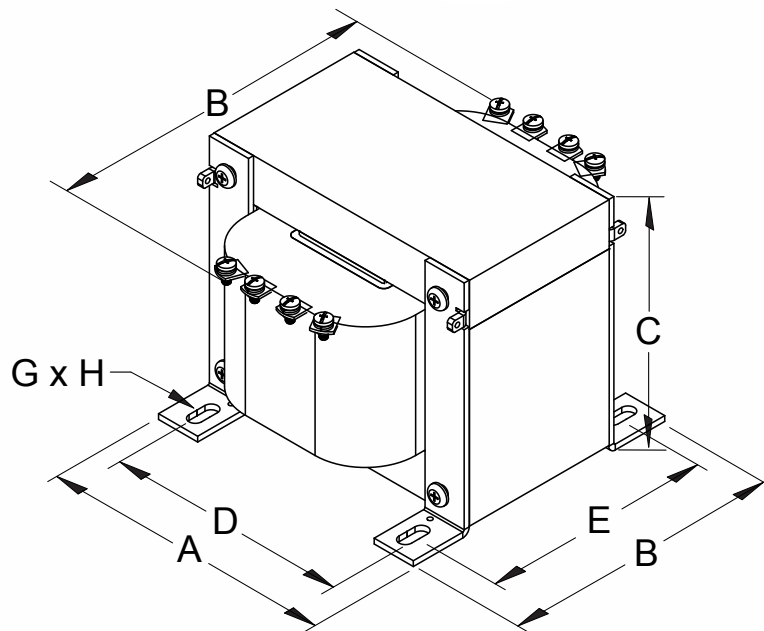


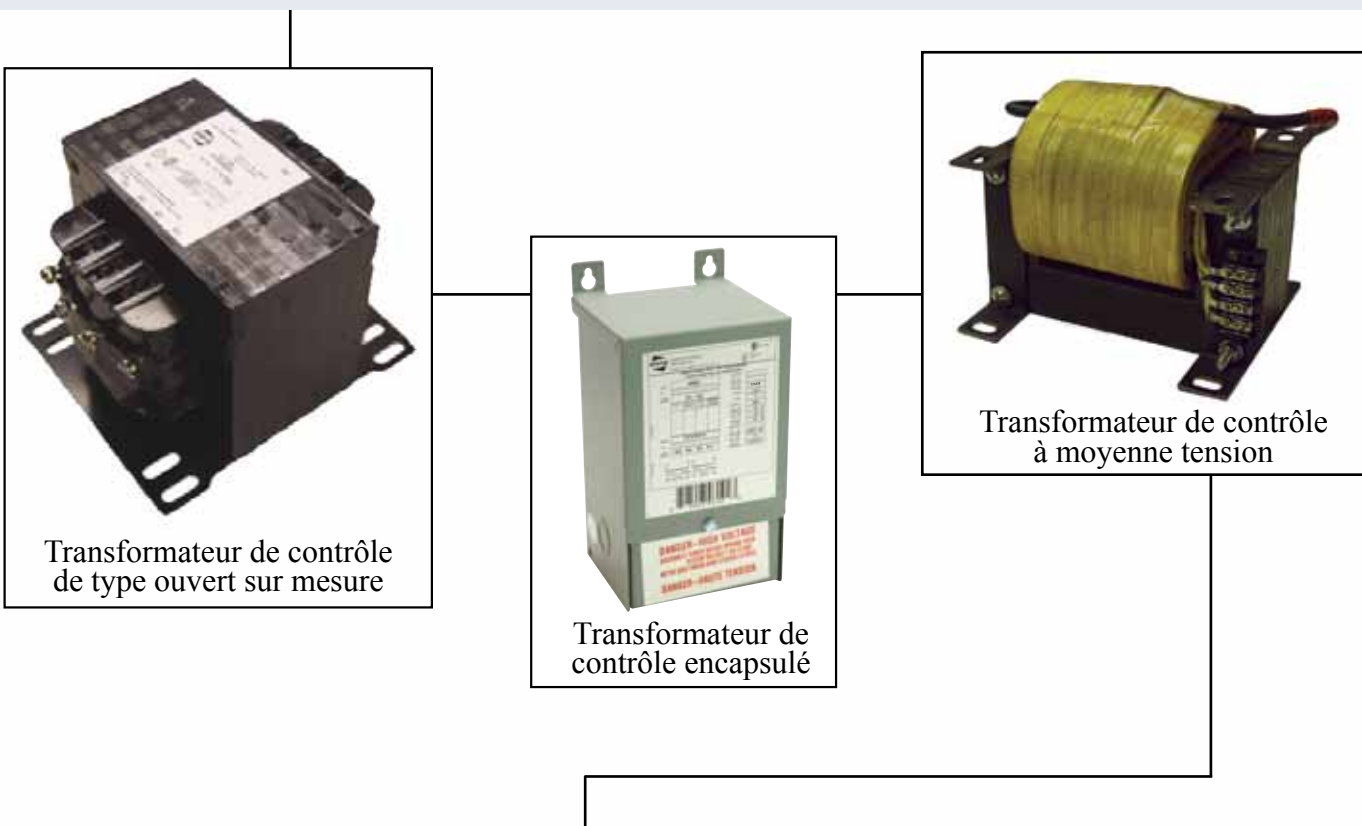
FIGURE C



CAPACITÉS DE CONTRÔLE PERSONNALISÉES

HPS est l'un des fabricants du secteur les plus qualifiés pour produire la plus vaste et la plus concurrentielle gamme de transformateurs secs personnalisés et de produits magnétiques associés de toute l'Amérique du Nord. Nos procédés de conception sont économiques et nos transformateurs sont fabriqués suivant des techniques modernes. Nous mettons l'accent sur notre ingénierie à valeur ajoutée dans le cadre duquel notre personnel de conception travaillera de concert avec vous pour fabriquer un transformateur qui répondra pleinement à vos besoins. Notre modélisation en 3D et conception assistée par ordinateur facilitent une communication rapide et efficace lorsque vient le temps de passer rapidement à l'action.

HPS peut fabriquer des transformateurs de contrôle personnalisés qui satisferont vos exigences de conception pour la plupart des applications standard ou spécialisées. Du transformateur moyenne tension personnalisé au transformateur de contrôle encapsulé, HPS possède les ressources de conception et de fabrication nécessaires pour vous fournir le transformateur que vous voulez, au moment où vous le voulez.



Communiquez directement avec votre représentant HPS ou avec le service des ventes au : sales@hammondpowersolutions.com



CANADA

Hammond Power Solutions Inc.
595 Southgate Drive
Guelph, Ontario N1G 3W6
Tél. : (519) 822-2441
Télééc. : (519) 822-9701
Sans frais au Canada : 1-888-798-8882

É.-U.

Hammond Power Solutions, Inc.
1100 Lake Street
Baraboo, Wisconsin 53913-2866
Tél. : (608) 356-3921
Télééc. : (608) 355-7623
Sans frais aux États-Unis : 1-866-705-4684

Courriel : sales@hammondpowersolutions.com

www.hammondpowersolutions.com



Pour en savoir plus sur ce prix, consultez la section News de notre site Web ou allez à : <http://www.hammondpowersolutions.com/news>



Hammond Power
Solutions Inc.

N° de document : SPACON-F
Date de publication : Novembre 2010



Vertiv™ Liebert® GXT5 UPS

500 - 3000VA 120V

Intelligent and Efficient UPS
for Protection of Your
Mission-Critical Applications



Intelligent and Efficient UPS for Protection of Your Mission-Critical Applications

The Vertiv™ Liebert® GXT5 UPS is an online double conversion UPS solution which offers premium power outage protection and continuous power conditioning in a compact and flexible rack/tower form factor.

The Liebert GXT5 single-phase UPS operates with high power efficiency, making it ideally suited to protect critical infrastructure in both centralized and edge network applications.

Scalable runtime options with matching external battery cabinets offer additional flexibility when extended uninterrupted power is required. Plus, the Liebert GXT5 provides battery health status and replacement date prediction for intelligent battery health management.

Liebert GXT5 Features

Leading UPS Technology

- High output power factor = up to 1.0
- Full-color graphic LCD with gravity sensing orientation
- Individually controllable output power sockets
- External battery cabinets with auto-detection
- Battery health status and replacement date prediction
- Remote management, update, and configuration capabilities
- Optimized thermal management and variable speed fan

The UPS system is easy to deploy and maintain due to its user-friendly LCD interface and remote management capabilities supported by the Vertiv RDU101 communications card which makes the Liebert GXT5 compatible with Vertiv infrastructure management solutions such as LIFE™ Services, environmental sensors, *Trellis™* Power Insight, and more.

With market leading efficiency and unity power factor operation, the Liebert GXT5 will meet your critical application needs. And you can rest assured that your business is protected with this Vertiv solution that includes a standard, three-year advanced exchange product warranty.

Efficient and Green Product

- High efficiency in online mode
- Energy Star® 2.0 certified
- Even higher efficiency (up to 98%) in Active ECO mode
- Programmable outlets for power cycling hung equipment and optimum battery usage
- Compliance with Restriction of Hazardous Substances (RoHS) directive and the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) regulation

What's in the box

- UPS
- Tower stand
- 4-Post Rack Mounting Kit
- USB Cable
- Quick Start Guide
- Safety Manual
- Power Insight management software (free download from Vertiv.com)



Solutions Wide

- Compact rack/tower design
- Broad range of services and extended warranty
- Easy to install, configure and operate
- Vertiv RDU101 network communications card with advanced features
- Compatibility with environmental sensors
- Integrated dry-contacts with selectable definition
- Free *Trellis™* Power Insight management software
- Serial port for out-of-band management with Avocent® serial consoles
- Automatic internal bypass and external maintenance bypass options

Vertiv™ Liebert® GXT5 Features



High power factor (0.9-1.0)
More usable power enables more connected loads saving space and costs.

**Efficiency (up to 95%)
in online mode**

Energy Star 2.0 certification. Higher efficiency means an optimized energy management and lower heat dissipation, for energy savings and improved reliability.



**Efficiency (up to 98%)
in Active ECO mode**
Superior protection with maximum efficiency.

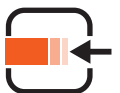
**Colored graphic
LCD with gravity
sensitive orientation**

User-friendly interface provides insight to UPS status for easy installation, configuration and operation.



**Compact
rack/tower design**

Space-saving UPS provides rack space optimization and flexible installation.



**Battery cabinets
with auto-detection**
Be confident the UPS is set up correctly to report available runtime when used with external battery cabinets.



Product warranty
Comprehensive coverage through a standard three-year advanced exchange warranty.



How You Benefit from the Vertiv™ Liebert® GXT5 UPS

Designed for high availability



- The higher power factor (0.9 - 1.0) ensures the connection of more loads and IT equipment
- With individually controlled output receptacles, you can manage power to individual devices without impacting other critical network equipment operation
- Minimum downtime of the device provided by hot-swappable, user-replaceable battery modules which can be changed during operation
- LIFE™ Services helps to enhance uptime, as well as operational efficiency with continuous remote monitoring, expert analysis, and proactive response
- Automatic self-test

User-friendly installation and operation



- Easy-to-read, gravity-sensing graphical color display
- Intuitive user interface for local configuration and management
- Support for the Vertiv suite of remote management tools (Trellis™ Power Insight, RDU101 network interface card, and serial connectivity support)
- Auto-detection of external battery cabinets enables faster deployment and accurate runtime information
- Remote UPS firmware upgrade capability ensures the UPS has the latest features and enhancements

Longer service life and runtime of the batteries



- Extended runtimes provided by the addition of external battery cabinets
- Improved battery care by temperature-compensated battery charging
- Intelligent battery health management ensures a longer service life (optimized battery maintenance and replacement when needed)

Optimized energy and capacity management



- Active ECO operating mode with up to 98% efficiency
- Efficiency in online double conversion mode up to 95%
- Energy Star 2.0 certified
- Four individually programmable output receptacles can be used to extend runtime for the most critical loads and smart disconnection of the less critical ones

Seamless connectivity



- Four onboard, user-definable dry contact I/O for integration of support management systems
- Supports SNMP, web, and environmental sensors with the optional RDU101 communications card
- Serial connection for integration of Avocent® ACS product or direct serial management and control of the UPS

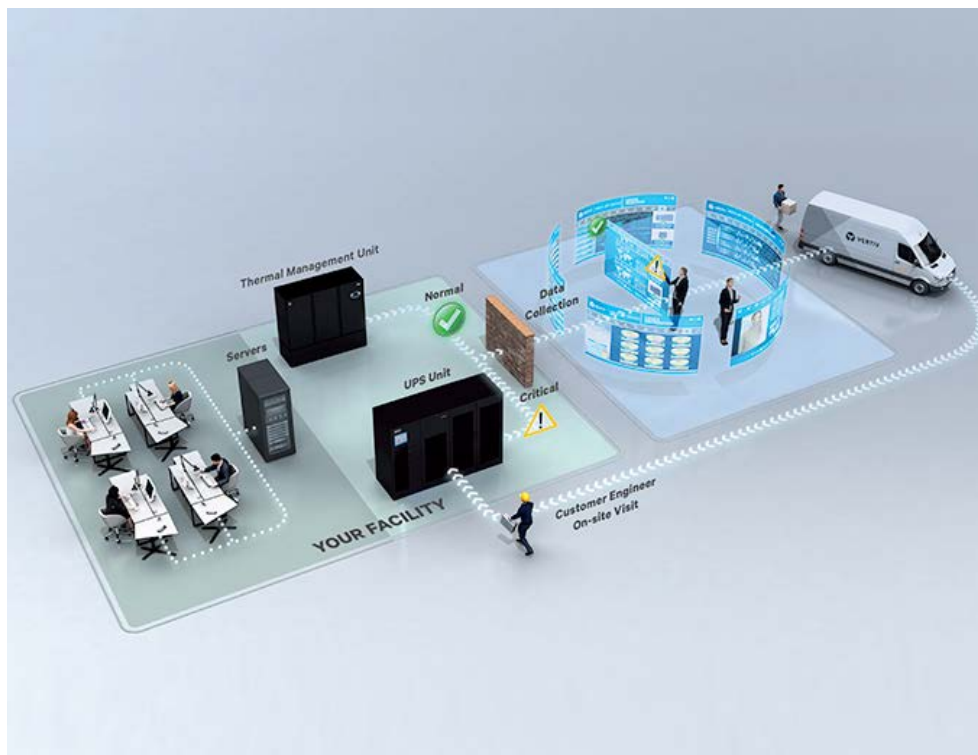
Power Assurance Package: Comprehensive Service Support for Critical Systems

- **Five-year protection plan** with 100% parts coverage and 24x7 emergency service
- **On-site installation and startup** of UPS and internal batteries (excludes hard-wired applications); configuration of new UPS and accessories; and if purchased, safe removal and disposal of legacy UPS and batteries
- **On-site service support** available 24x7 (within 150 miles of regional service center) and includes 100% labor and travel coverage
- **100% parts coverage** for UPS and includes internal batteries, POD (power output distribution), and web card
- **24x7 access** to customer resolution center and online access to Customer Services Network

Key benefits:

- Hassle-free management of multi-site rollouts
- Frees up time-strapped IT staff by managing and tracking UPS health, maintenance and service
- Reduces the worry of critical equipment downtime
- Ensures rapid recovery in the event of failure (within 24-48 hours)
- Frees you from the responsibility of handling and documenting the disposal of legacy UPS and batteries

Remote Diagnostic Services for Rapid Response



Refer to page 11 for service offerings' SKUs

Uptime assurance

- Continuous monitoring for early detection of trends and operating anomalies
- Analysis and interpretation of alarm and status messages

Rapid incident response

- Automatic transmission of data for analysis
- Concurrent diagnosis and dispatch of engineer to site
- Shipment of parts for corrective maintenance

Increased insight and ease of management

- Notification of operating conditions that may impact system health
- Periodic trend and analysis reports
- Integration of remote and on-site services to ensure business continuity

Vertiv™ Liebert® GXT5 | 500 - 3000VA 120V UPS

Technical Specifications

	GXT5-500LVRT2UXL	GXT5-750LVRT2UXL	GXT5-1000LVRT2UXL	GXT5-1500LVRT2UXL	GXT5-2000LVRT2UXL	GXT5-3000LVRT2UXL
Ratings (VA/W)	500VA/500W	750VA/750W	1000VA/1000W	1500VA/1350W	2000VA/1800W	3000VA/2700W
Dimensions, inches (mm)						
Unit W x D x H	16.9 x 15.7 x 3.4 (430 x 400 x 85)	16.9 x 15.7 x 3.4 (430 x 400 x 85)	16.9 x 15.7 x 3.4 (430 x 400 x 85)	16.9 x 18.5 x 3.4 (430 x 470 x 85)	16.9 x 18.5 x 3.4 (430 x 470 x 85)	16.9 x 21.3 x 3.4 (430 x 540 x 85)
Weight, pounds (kg)						
Unit	37 (16.8)	37 (16.8)	37 (16.8)	46.2 (21)	47.5 (21.6)	66(30)
Input AC Parameters						
Range	Typical 120V Range: 60-150V	Typical 120V Range: 60-150V	Typical 120V Range: 60-150V	Typical 120V Range: 60-150V	Typical 120V Range: 60-150V	Typical 120V Range: 60-150V
Frequency	40-70Hz; Auto Sensing	40-70Hz; Auto Sensing	40-70Hz; Auto Sensing	40-70Hz; Auto Sensing	40-70Hz; Auto Sensing	40-70Hz; Auto Sensing
Input Power Cord	10 ft. attached w/ NEMA 5-15P plug	10 ft. attached w/ NEMA 5-15P plug	10 ft. attached w/ NEMA 5-15P plug	10 ft. attached w/ NEMA 5-15P A plug	10 ft. attached w/ NEMA L5-20P A plug	10 ft. attached w/ NEMA L5-30P plug
Output AC Parameters						
Output Receptacles	5-15R x 6	5-15R x 6	5-15R x 6	5-15R x 6	L5-20R+5-20R x 6	L5-30R+5-20R x 6
Typical 120V User selectable output	110/115/120/125VAC (user-configurable); ±3%	110/115/120/125VAC (user-configurable); ±3%	110/115/120/125VAC (user-configurable); ±3%	110/115/120VAC (user-configurable); ±3%	110/115/120VAC (user-configurable); ±3%	110/115/120VAC (user-configurable); ±3%
Waveform	Sine wave	Sine wave	Sine wave	Sine wave	Sine wave	Sine wave
Utility (AC) Mode Overload	>200% for 250ms; 150- 200% for 50 seconds; 125- 150% for 60 seconds; 105-125% for 60 seconds	>200% for 250ms; 150- 200% for 50 seconds; 125- 150% for 60 seconds; 105-125% for 60 seconds	>200% for 250ms; 150- 200% for 50 seconds; 125- 150% for 60 seconds; 105-125% for 60 seconds	>200% for 250ms; 150- 200% for 2 seconds; 125- 150% for 50 seconds; 105-125% for 60 seconds	>200% for 250ms; 150- 200% for 2 seconds; 125- 150% for 50 seconds; 105-125% for 60 seconds	>200% for 250ms; 150- 200% for 2 seconds; 125- 150% for 10 seconds; 105-125% for 15 seconds
Battery						
Type	Valve-regulated, non-spillable, lead acid	Valve-regulated, non-spillable, lead acid	Valve-regulated, non-spillable, lead acid	Valve-regulated, non-spillable, lead acid	Valve-regulated, non-spillable, lead acid	Valve-regulated, non-spillable, lead acid
Backup Time (100% Load)	17.9	10.4	6.7	6.7	4	4
Backup Time (50% Load)	40.4	25.5	17.9	18.8	12.3	12.6
+1 External Battery Cabinet (100% Load)	76.3	45.4	32.6	32.4	22	22.2
+1 External Battery Cabinet (50% Load)	147.8	102.4	76.5	79.7	53.6	54.6
Environmental Requirements						
Operating Temperature, °F (°C)	+32 to +104 (0 to 40)	+32 to +104 (0 to 40)	+32 to +104 (0 to 40)	+32 to +104 (0 to 40)	+32 to +104 (0 to 40)	+32 to +104 (0 to 40)
Storage Temperature, °F (°C)	-4 to +140 (-20 to 60) contain batteries will be from -15 to 40°C.	-4 to +140 (-20 to 60) contain batteries will be from -15 to 40°C.	-4 to +140 (-20 to 60) contain batteries will be from -15 to 40°C.	-4 to +140 (-20 to 60) contain batteries will be from -15 to 40°C.	-4 to +140 (-20 to 60) contain batteries will be from -15 to 40°C.	-4 to +140 (-20 to 60) contain batteries will be from -15 to 40°C.
Relative Humidity	0% to 95%, non-condensing	0% to 95%, non-condensing	0% to 95%, non-condensing	0% to 95%, non-condensing	0% to 95%, non-condensing	0% to 95%, non-condensing
Operating Elevation	10,000 ft. (3,000m)	10,000 ft. (3,000m)	10,000 ft. (3,000m)	10,000 ft. (3,000m)	10,000 ft. (3,000m)	10,000 ft. (3,000m)
Storage Elevation	50,000 ft. (15,000m)	50,000 ft. (15,000m)	50,000 ft. (15,000m)	50,000 ft. (15,000m)	50,000 ft. (15,000m)	50,000 ft. (15,000m)
Audible Noise	<46dBA max @ 3 ft. (1m) front and sides < 43dBA, at 3 ft. (1m) rear	<46dBA max @ 3 ft. (1m) front and sides < 43dBA, at 3 ft. (1m) rear	<46dBA max @ 3 ft. (1m) front and sides < 43dBA, at 3 ft. (1m) rear	< 46dBA at 3 ft. (1m) front and side < 45dBA at 3 ft. (1m) rear	<48dBA max @ 3 ft. (1m) front and side <48dBA max @ 3 ft. (1m) rear	<48dBA max @ 3 ft. (1m) front and side <48dBA max @ 3 ft. (1m) rear
Agency						
Surge Immunity	ANSI C62.41 Category B	ANSI C62.41 Category B	ANSI C62.41 Category B	ANSI C62.41 Category B	ANSI C62.41 Category B	ANSI C62.41 Category B
Transportation	ISTA Procedure 1A	ISTA Procedure 1A	ISTA Procedure 1A	ISTA Procedure 1A	ISTA Procedure 1A	ISTA Procedure 1A
Safety	UL 1778 4th Edition and CSA 22.2 No. 1071	UL 1778 4th Edition and CSA 22.2 No. 1071	UL 1778 4th Edition and CSA 22.2 No. 1071	UL 1778 4th Edition and CSA 22.2 No. 1071	UL 1778 4th Edition and CSA 22.2 No. 1071	UL 1778 4th Edition and CSA 22.2 No. 1071
Emissions	FCC Part 15 (Class A) - CISPR22 Class A (RFI)	FCC Part 15 (Class A) - CISPR22 Class A (RFI)	FCC Part 15 (Class A) - CISPR22 Class A (RFI)	FCC Part 15 (Class A) - CISPR22 Class A (RFI)	FCC Part 15 (Class A) - CISPR22 Class A (RFI)	FCC Part 15 (Class A) - CISPR22 Class A (RFI)
Environmental	WEEE and ROHS2 REACH	WEEE and ROHS2 REACH	WEEE and ROHS2 REACH	WEEE and ROHS2 REACH	WEEE and ROHS2 REACH	WEEE and ROHS2 REACH
Warranty						
	Std. 3 year; Opt. 2 year	Std. 3 year; Opt. 2 year	Std. 3 year; Opt. 2 year	Std. 3 year; Opt. 2 year	Std. 3 year; Opt. 2 year	Std. 3 year; Opt. 2 year

GXT5 UPS + RDU101 Network Communication card bundles available — Add an "N" to the end of the model number. Available through select distributors.

Vertiv™ VR Rack

Supports a wide variety of equipment and gives you the flexibility you need with easy installation

Vertiv™ Geist™ rPDU

Reliably distributes power to the rack, supporting dynamic data center operations and DCIM

Vertiv™ SwitchAir

Prevents overheating of network switches by directing cool air to switch intakes, keeping hot exhaust air out

Vertiv™ ACS Console

Enables integrated remote monitoring, out-of-band management, and IoT connectivity

Vertiv™ KVM Switch

Enables single-point access for switching between multiple computers

Vertiv™ Rack Cooling

Provides energy-efficient cooling close to the IT equipment and UPS units

Vertiv™ Liebert® GXT5

Helps protect mission-critical equipment from all power disturbances due to blackouts, brownouts, sags, surges or noise interference

Accessories

Racks and enclosures: Support a wide variety of equipment with the Vertiv™ VR Rack including servers, storage, switches, routers, PDUs, UPS units, console port servers, and KVM switches.

Rails and mounting hardware: Install equipment with a four-post rail kit and hardware for mounting in a 19- or 23-inch rack or choose a two-post telecom rack for front- or mid-chassis, wall, or Zero U configuration.

Rack mount PDUs: For basic or intelligent power distribution that helps prevent overloaded circuits in the data center, choose from products such as upgradable PDUs, inline power meters, transfer switches, and monitoring sensors.

Extended battery modules: Enable scalable runtime for support during extended power outage situations by adding reliable power and protection to new or existing deployments.

Environmental sensor: Maintain knowledge of remote environments with temperature, humidity and leak detection, or monitor available dry-contact sensors for security access control or smoke detection.



Available Accessories for the Vertiv™ Liebert® GXT5 UPS



External battery cabinets and replacement battery kits

UPS	External battery cabinets	Replacement battery kits
GXT5-500LVRT2UXL	GXT5-EBC36VRT2U	GXT5-36VBATKIT
GXT5-750LVRT2UXL	GXT5-EBC36VRT2U	GXT5-36VBATKIT
GXT5-1000LVRT2UXL	GXT5-EBC36VRT2U	GXT5-36VBATKIT
GXT5-1500LVRT2UXL	GXT5-EBC48VRT2U	GXT5-48VBATKIT
GXT5-2000LVRT2UXL	GXT5-EBC48VRT2U	GXT5-48VBATKIT
GXT5-3000LVRT2UXL	GXT5-EBC72VRT2U	GXT5-72VBATKIT



Network communications and environmental sensors

Network Communications	RDU101	Intellislot web card for SNMP and web management. Supports environmental sensors.
	IS-RELAY	Intellislot Interface Kit for Relay Contacts
Environmental Sensors	SN-Z01	Integrated cable with single temperature sensor
	SN-Z02	Integrated cable with three temperature sensors
	SN-Z03	Integrated cable with three temperature and one humidity sensors
	SN-T	Modular with single temperature sensor
	SN-TH	Modular with single temperature and single humidity sensor
	SN-2D	Modular with two door contact inputs
	SN-3C	Modular with three dry contact inputs
	SN-L20	Modular leak zone sensor with 20 foot cable (Liebert RDU-S only)
UPS manageability options	Trellis™ Power Insight Software Management	Trellis™ Power Insight is a complimentary web-based software designed to monitor up to 100 Vertiv™ UPSs and rPDUs



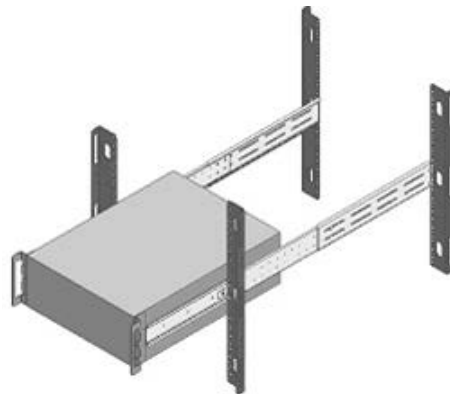
MicroPOD - Maintenance bypass and output distribution

The Liebert® MicroPOD (Power Output Distribution) is a maintenance bypass option for UPS products, 3 kVA and below. It allows removal of the UPS without powering down the connected equipment. The 2U POD's can be installed on the floor or mounted to a Liebert GXT5 UPS using the included mounting brackets.

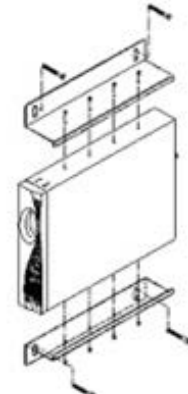
UPS VA rating	POD model number	Output receptacles	Plug to utility
500-1500VA UPS	MP2-115HW	Hard Wired	Hardwired
	MP2-115A	8 x 5-15R	5-15P
2000VA UPS	MP2-120HW	Hard Wired	Hardwired
	MP2-120C	8 x 5-15/20R	5-20P
	MP2-120E	4 x 5-15/20R; 1 x L5-20R	5-20P
3000VA UPS	MP2-130HW	Hard Wired	Hardwired
	MP2-130C	8 x 5-15/20R	L5-30P
	MP2-130E	2 x 5-15/20R; 1 x L5-30R; 4 x 5-15/20R	L5-30P
	MP2-130P	4 x 5-15R; 2 x L5-20R	L5-30P



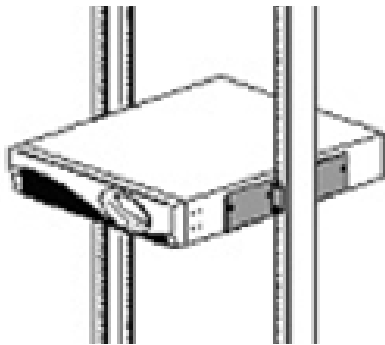
2POSTRMKIT



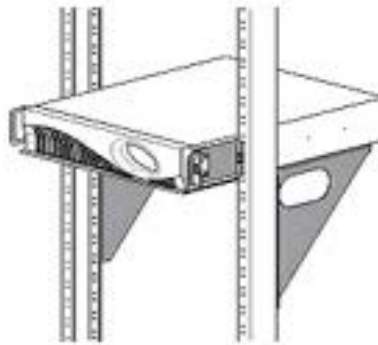
Rack Slide Kits for all Liebert GXT5
Rack Tower Models (RMKIT 18-32)



Wall Mount Bracket Kit for
GXT5 500VA – 3000VA models
WMBKT2U and WMBKT2U-SS



2UTELECOMRKIT



Rack Shelves - Center mount shown
RS600 / RS800



Standard Kit included
inside the UPS box
201193G1L

Mounting Kit Options

Application	Model Supported	Style	Model	Description
2 Post- Telecom rack	Entire GXT5 UPS family (500VA to 10kVA)	Shelf	RS500	Flush-mount shelf for 19" rack wide
		Shelf	RS600	Center-mount shelf for 19" rack wide
		Shelf	RS700	Flush-mount shelf for 23" rack wide
		Shelf	RS800	Center-mount shelf for 23" rack wide
	GXT5 up to 3kVA	Bracket	2UTELECOMRKIT	Only center-mount bracket for 19" rack wide
		Bracket	2POSTRMKIT	Front flush/ center-mount bracket - 4-piece design
Wall Mount	GXT5 up to 3kVA	Bracket	WMBKT2U	Wall mount bracket holds (1) GXT5 2U or (1) PSI5 2U product, steel painted black
		Bracket	WMBKT2USS	Wall mount bracket holds (1) GXT5 2U or (1) PSI5 2U product, stainless steel
4 Post rack	Entire GXT5 UPS family (500VA to 10kVA)	Bracket	RMKIT18-32	Cabinet/racks with 18" - 32" deep support rails - Telescopic rail

Note: RS600 and RS800 kits include adapter brackets for installation of up to (2) Liebert GXT5 2U model

Liebert® GXT5 UPS - Power Assurance Services

Power Assurance Package

Bundled Start-up Service AND 5-Year On-site Emergency Response	Standard	With LIFE™ Services	With Removal	With LIFE and Removal
Equipment Model / Type	Part Number	Part Number	Part Number	Part Number
Liebert GXT5 UP TO 3 KVA	PAPGXT-1K3K	PAPGXT-1K3KLF	PAPGXT-1K3KRMV	PAPGXT-1K3KRFLF
External Battery Cabinet (36V or 48V or 72V)	PAPGXT-BATT	PAPGXT-	N/A	N/A

Power Startup Services

Startup Service Only	Standard	With Removal
Equipment Model / Type	Part Number	Part Number
Liebert GXT5 UP TO 3 KVA	SUGXT-1K3K	SUGXT-1K3KRMV
External Battery Cabinet (36V or 48V or 72V)	SUGXT-EXTBTBCTB	SUGXT-EXTBTBCTBRMV

Power Emergency Services

5-Year On-site Emergency Coverage - Only	Standard	With LIFE Services
Equipment Model / Type	Part Number	Part Number
Liebert GXT5 UP TO 1 KVA	PEPGXT-1K5YR	PEPGXT-1KLF
Liebert GXT5 1.5 kVA	PEPGXT-15005YR	PEPGXT-1500LF
Liebert GXT5 2.0 kVA	PEPGXT-20005YR	PEPGXT-2000LF
Liebert GXT5 3.0 kVA	PEPGXT-30005YR	PEPGXT-3000LF
External Battery Cabinet 36V	PEPGXT-36VBAT5YR	N/A
External Battery Cabinet 48V	PEPGXT-48VBAT5YR	N/A
External Battery Cabinet 72V	PEPGXT-72VBAT5YR	N/A

Power Assurance Package - Summary

- Includes all below "Power Start-up Services" and "Power Emergency Services" support
- One Preventative Maintenance visit after 3rd year (5-10kVA UPS only)

Power Startup Services - Summary

- Installation includes mounting and start-up of new UPS or EBC (excludes hard-wired applications)
- Services performed by Vertiv factory trained technician
- Services performed 7 X 24, excluding national holidays within the 48 contiguous states and Hawaii
- Removal and disposal of existing UPS or EBC equipment, if selected

Power Emergency Services - Summary

- On Site Service Support
- Full-service five (5) year contract term commencing upon the start-up date
- 100% parts coverage, including internal batteries, POD and web card
- 100% labor and travel coverage 7 days/week, 24 hours/day
- 24-Hour Customer Resolution Center via 1-800-LIEBERT
- Access to Customer Services Network portal

LIFE Services includes above plus:

- Continuous Monitoring, Expert Analysis, and Proactive Response

Note: LIFE Services requires an RDU101 card, which is included on all 5000VA to 10000VA models.

Please refer to the [Scopes of Work](#) for full and additional details.

500-1500VA – 120V Rack/Tower

External Battery Connector

Scalable runtime solution supported for extended outage protection

4 x Individually Controllable Receptacle

Manage load on battery and control unauthorized access to UPS receptacle



Communications

SNMP, Serial, Dry contact, Local USB
Local and remote configuration and UPS Management

NEMA 5/15P input with over current protection

Simple installation and power on with connected input cord

2000VA – 120V Rack/Tower

External Battery Connector

Scalable runtime solution supported for extended outage protection

NEMA L5-20R

Support larger devices or rack PDU

4x Individually Controllable Receptacle, 2x Always on Receptacles

Manage load on battery and control unauthorized access to UPS receptacle



Communications

SNMP, Serial, Dry contact, Local USB
Local and remote configuration and UPS Management

NEMA L5-20P input with over current protection

Includes NEMA 5-20 Adapter Cable for non-locking receptacles

3000VA – 120V Rack/Tower

External Battery Connector

Scalable runtime solution supported for extended outage protection

NEMA L5-30R

Support larger devices or rack PDU

4x Individually Controllable Receptacle, 2x Always on Receptacles

Manage load on battery and control unauthorized access to UPS receptacle



Communications

SNMP, Serial, Dry contact, Local USB
Local and remote configuration and UPS Management

NEMA L5-30P input with over current protection

Simple installation and power on with connected input cord



Vertiv.com | Vertiv Headquarters, 1050 Dearborn Drive, Columbus, OH, 43085, USA

© 2020 Vertiv Group Corp. All rights reserved. Vertiv™ and the Vertiv logo are trademarks or registered trademarks of Vertiv Group Corp. All other names and logos referred to are trade names, trademarks or registered trademarks of their respective owners. While every precaution has been taken to ensure accuracy and completeness here, Vertiv Group Corp. assumes no responsibility, and disclaims all liability, for damages resulting from use of this information or for any errors or omissions. Specifications, rebates and other promotional offers are subject to change at Vertiv's sole discretion upon notice.

IntelliSlot® Relay Card

User Manual



Contents

- 1.0 Introduction** **3**
 - 1.1 Inspecting Shipment on Receipt3

- 2.0 Installation** **4**
 - 2.1 Required Parts & Tools4
 - 2.2 Installation Instructions4

- 3.0 PIN Configuration** **5**
 - Table 1: IntelliSlot Relay Card PIN Configuration5

- 4.0 Jumper Setup** **6**
 - Table 2: Jumper Connections6

- 5.0 Technical Support** **7**
 - 5.1 Contact Information.7

1.0 Introduction

The IntelliSlot relay card (IS-RELAY) provides contact closure for remote monitoring of alarm conditions in your SolaHD UPS. The IntelliSlot relay card is easy to install and integrates with other relay contact monitoring systems.

This advanced power management device is designed to function in units with a IntelliSlot port, such as:

- S4KC Series
- S5K Series

Please visit our Web site at www.solahd.com for the current list of supported products.

On supported units, the inverter shut-off command can be controlled from the computer directly connected to the UPS (via the factory-installed DB9 connector) and will conserve battery power after the workstation shutdown is complete.

The IntelliSlot relay card is rated for 24 V ac/V dc at 1 A.

1.1 Inspecting Shipment on Receipt

Upon accepting shipment, inspect the packaging and product for any damaged or missing parts. If any damage is observed, report it to the shipping company and your local SolaHD representative immediately. If any components are missing, contact your local SolaHD representative for replacement.

Items included with the shipment are:

- IntelliSlot relay card protected by an anti-static bag
- User manual

2.0 Installation

2.1 Required Parts & Tools

NOTE: Make sure you have the following parts and tools before you begin the installation.

- IntelliSlot relay card (provided)
- #2 (medium) Phillips or small flathead screwdriver

2.2 Installation Instructions

1. Turning off the UPS prior to installation is suggested, although not required.
2. Locate the IntelliSlot port. (See examples in Figure 1.) Refer to the UPS user manual for port location and orientation.
3. Remove the two retaining screws from the IntelliSlot port cover plate (see Figure 1). Save the screws for reassembly in Step 5.
4. Insert the IntelliSlot relay card. Make sure the holes are aligned with those on the UPS. Initially, the card should slide in freely as you carefully align the screw holes. As you feel it click into place, press firmly to ensure solid seating in the slot.
5. Use the screwdriver to secure the IntelliSlot relay card to the UPS chassis with the two retaining screws removed in Step 3. Make sure the screws are snug, not tight, to avoid damage to the device.

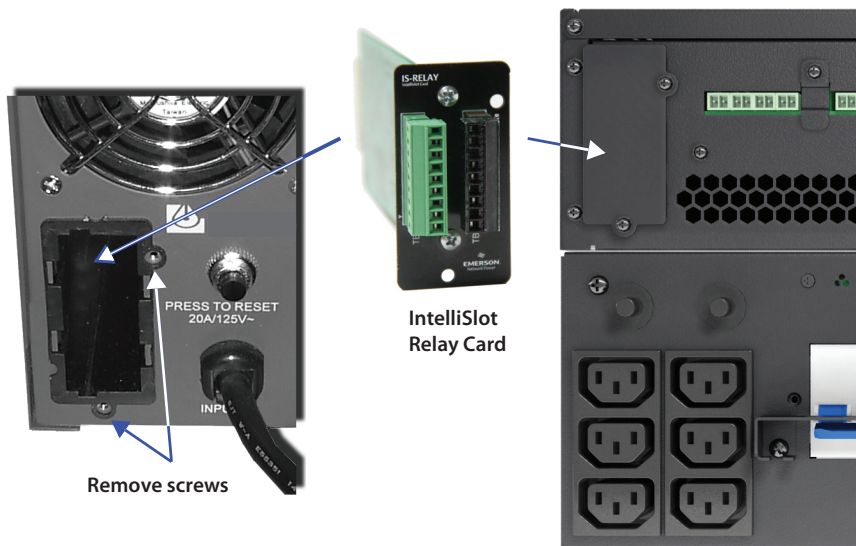


Figure 1: Installation

6. Use these guidelines for terminal block specifications:

Acceptable wire size: 24–16 AWG

Wire strip length: 0.24–0.28 in. (6–7 mm)

Please proceed to Sections “3.0 Pin Configuration” and “4.0 Jumper Setup” to configure the terminal blocks and jumpers.

3.0 PIN Configuration

The IntelliSlot relay card has two terminals blocks, TB1 (green, numbered 1–9) and TB2 (black, numbered 10–18), as shown in Figure 2.

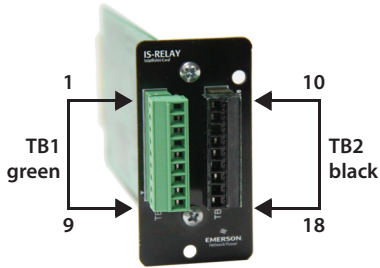


Figure 2: PIN location & numbering

Please refer to the UPS User manual for the UPS terminal block configuration. The PIN functions in Table 1 apply only to the SolaHD units listed in Section “1.0 Introduction”.

Table 1: IntelliSlot Relay Card PIN Configuration		
PIN	Function	Operation
1	Common — Low Battery	
2	Low Battery	Closed if Low Battery point occurs
3	Low Battery	Closed if battery is OK
4	Common — UPS Fault	
5	UPS Fault	Closed if UPS Fault occurs
6	UPS Fault	Closed if no UPS failure
7	Common — On Battery	
8	On Battery	Closed if On Battery power (utility failure)
9	On Battery	Closed if not On Battery power (utility OK)
10	Signal Ground	Use for UPS Any-Mode Shutdown
11	Signal Ground	Use for UPS Any-Mode Shutdown
12	UPS Any-Mode Shutdown	Turn UPS output off when shorted to PIN 10 or 11
13	Summary Alarm	Closed if no alarm conditions are present
14	Summary Alarm	Closed if Summary Alarm occurs
15	Common — Summary Alarm	
16	On UPS	Closed if ON UPS (inverter) power
17	On Bypass	Closed if On Bypass
18	Common — On Bypass	

4.0 Jumper Setup

The IntelliSlot relay card has five jumpers, P3 through P7, as shown in Figure 2. Each jumper connects two PINs.

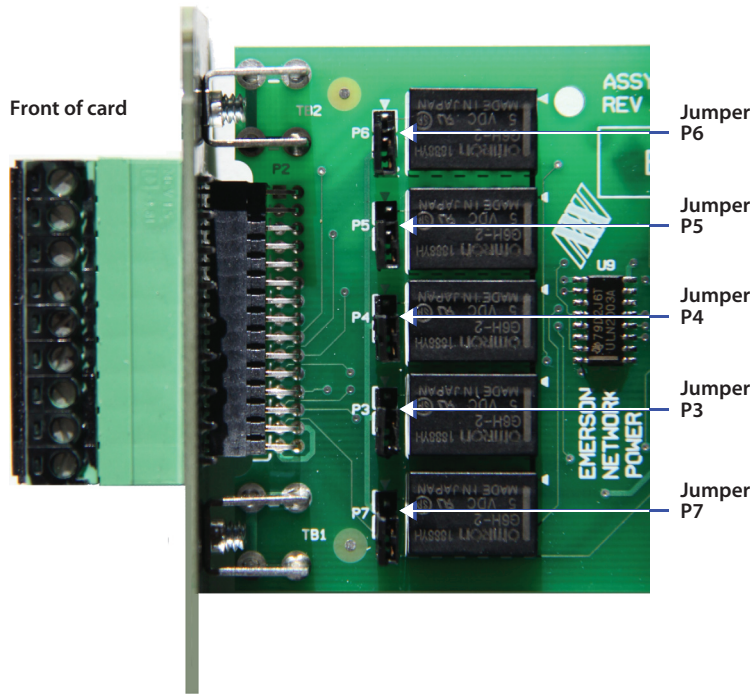


Figure 3: Jumper location & numbering

By default, all five jumpers have shunts installed. The two PINs are shunted together to provide the functions shown in Table 2, allowing relay commons to be tied together.

NOTE: The jumpers should be removed if there are any external voltage sources that may intentionally or inadvertently be connected to the relay. Removing the shunt from any two PINs breaks the connection between the relay commons so they are not tied together.

Jumper	Relay
P6	On Battery
P5	UPS Fault
P4	Low Battery
P3	On Bypass
P7	Summary Alarm

5.0 Technical Support

5.1 Contact Information

To contact SolaHD technical support, please use one of the following methods:

- **Phone:** 1.800.377.4384 (US) or 1.847.268.6651 (International)
- **E-mail:** solahd.technicalservices@emerson.com
- **Web site:** www.solahd.com



SolaHD • 1.800.377.4384 (US) • 1.847.268.6651 (International) • www.solahd.com



P/N: A272-240 Rev 0
May 2011

6.4 3UG4513 line monitoring relay

6.4.1 Operator controls and connection terminals

Front view / terminal labeling 3UG4513

Front view	Description	
	Position digits	
	①	Terminal block (removable) Connection is possible using screw-type terminals or spring-loaded terminals.
	②	Rotary button for setting the nominal line voltage ($3\sim U_n$)
	③	Rotary button for setting the tripping delay (Delay)
	④	Device order number
	⑤	Label
	⑥	Function symbol
	⑦	Status display: LED phase failure / phase sequence (red)
	⑧	Status display: LED coil symbol (green)
	Terminal labels	
	L1, L2, L3	Rated control supply voltage
	12	Output relay K1 CO contact NC contact
	11	Output relay K1 CO contact root
	14	Output relay K1 CO contact NO contact
	22	Output relay K2 CO contact NC contact
21	Output relay K2 CO contact root	
24	Output relay K2 CO contact NO contact	

You will find additional information on the connection terminals and the permissible conductor cross-sections in Chapter "Connection methods (Page 19)."

You will find information on connecting in Chapter "Circuit diagrams (Page 112)."

6.4.2 Function

General functionality

The 3UG4513 line monitoring relays monitor for **phase sequence**, **phase failure** of one of the three phases, and **undershoot** of at least one line-to-line voltage of the set nominal line voltage by 20 % in a three-phase system.

The devices are **self-powered** (measuring voltage = rated control supply voltage) and work on the closed-circuit principle. The 3UG4513 line monitoring relays monitor all phases of three-phase AC networks from 160 to 690 V through terminals L1 / L2 / L3 and also draw power from all three phases simultaneously.

The 3UG4513 line monitoring relay features two rotary buttons for setting the trip delay (Delay) and the nominal line voltage (U_n 3AC).

The hysteresis is 5 % of the set value of the nominal line voltage.

The 3UG4513 line monitoring relays feature 2 output relays (output relay K1 and output relay K2). The relays work synchronously.

Note

The specified voltages represent the absolute thresholds.

Monitoring

If the line voltage is switched on, the LED "coil symbol" will light up green. If the correct phase sequence is applied to terminals L1-L2-L3 and if the monitored line-to-line voltage is in the permissible range of the set nominal line voltage (U_n 3AC), the output relays pick up.

If the phase sequence is incorrect, the "phase failure / phase sequence" LED flashes red and the output relays remain in their quiescent position.

If the monitored line-to-line voltage falls symmetrically (all three phase voltages at the same time) or asymmetrically (only one phase voltage) to more than 20 % below the value for the nominal line voltage set on the front of the device, after the time set on the front has elapsed (Delay), the output relays will drop out and the "phase failure / phase sequence" LED will light up red continuously. On a phase failure, the "phase failure / phase sequence" LED lights up red continuously and the output relays drop out to protect the application from any damage that may result. The set delay time has no effect on the phase failure monitoring.

Thanks to a special measuring method, a phase failure is detected with certainty despite wide-range voltage from 160 to 690 V AC and reverse power of up to 80 % from the load in the case of regenerative power recovery.

You will find the switching states of the output relays below in section "Function diagrams" and in Chapter "Diagnostics (Page 111)."

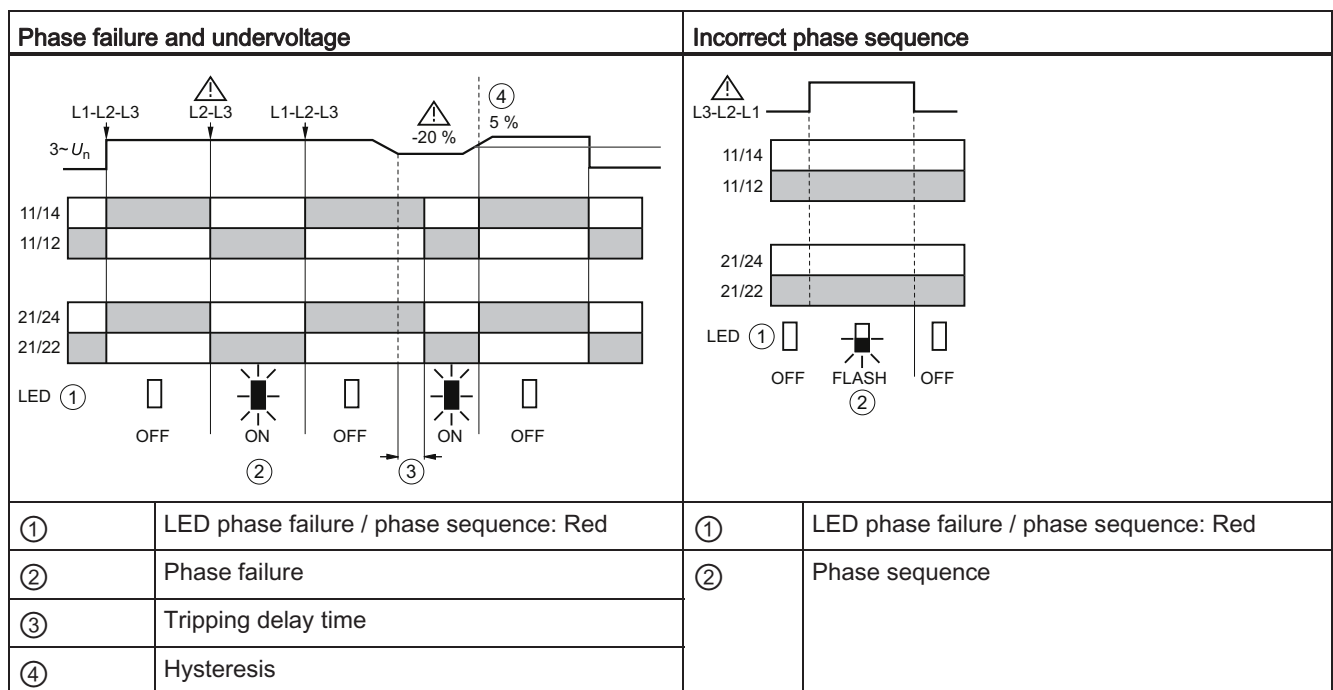
Reset response

The device features an autoreset that resets the output relays to their original state after an error message and rectification of the fault that has occurred.

Note

The red LED is a fault diagnostics display and does not indicate the current state of the relay!

Function diagrams 3UG4513



6.4.3 Operation

Parameters

The following parameters can be set on the relevant rotary button using a screwdriver:

Table 6- 2 Parameter information, 3UG4513 line monitoring relay

Parameters	Control element ¹⁾	Setting range		Increment
		Minimum value	Maximum value	
Tripping delay time (Delay)	3	0.1 s	20 s	Continuous
Nominal line voltage (3~U _n)	2	200 V	690 V ²⁾	Continuous

¹⁾ The position digits refer to the front view in Chapter "Operator controls and connection terminals (Page 107)."

²⁾ absolute threshold

The parameters are described in Chapter "Parameters (Page 351)."

Required tools

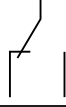
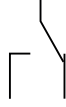

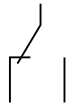
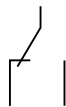
The same screwdriver can be used to set the parameters as for mounting the line monitoring relays.

6.4.4 Diagnostics

6.4.4.1 Diagnostics with LED

Status display

The following information about the operating state is displayed on the 3UG4513 line monitoring relays:

Operating status	LED		State of the output relays
	Coil symbol (green)	Phase failure / phase sequence (red)	12/ 11/ 14 22/ 21/ 24
<ul style="list-style-type: none"> Supply voltage not present 	Off	Off	
<ul style="list-style-type: none"> Supply voltage present Correct phase sequence All phases available Line-to-line voltage OK 	On	Off	
<ul style="list-style-type: none"> Supply voltage present Incorrect phase sequence 	On	flashing	
<ul style="list-style-type: none"> Supply voltage present Phase failure 	On	On	
<ul style="list-style-type: none"> Supply voltage present Line-to-line voltage undershot 	On	On	

You will find more information about the switching behavior of the output relays in Chapter "Function (Page 108)."

6.4.5 Circuit diagrams

Internal circuit diagrams 3UG4513

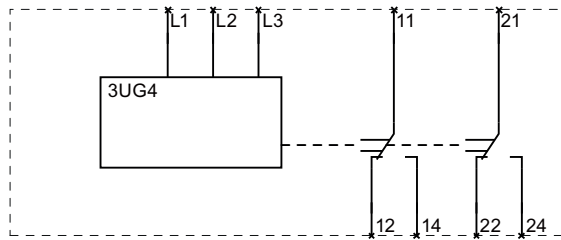


Figure 6-1 3UG4513 line monitoring relay

Note

It is not necessary to fuse the measuring circuit to protect the device. Fusing for line protection depends on the cross-section used.

Note

The 3UG4513 line monitoring relays are only suitable for line frequencies of 50 / 60 Hz!

6.4.6 Technical data

Measuring circuit

		3UG4513-.....
Type of voltage for monitoring		AC
Number of poles for main current circuit		3
Measurable voltage		
• for AC	V	160 ... 690
Adjustable voltage range	V	200 ... 690

General technical details

		3UG4513-.....
Product function		Phase monitoring relay
Type of display LED		Yes
Product function		
• undervoltage recognition		Yes
• overvoltage recognition		No
• phase sequence recognition		Yes
• phase disturbance recognition		Yes
• asymmetry recognition		Yes
• overvoltage recognition of 3 phases		No
• undervoltage recognition of 3 phases		Yes
• tension window recognition of 3 phases		No
• reset external		—
• self-reset		Yes
• open-circuit or closed-circuit current principle		No
Starting time after the control supply voltage has been applied	s	1
Response time maximum	s	0.45
Relative adjustment accuracy	%	—
Relative repeat accuracy	%	1

		3UG4513-.....
Type of voltage of the controlled supply voltage		AC
Control supply voltage		
• at 50 Hz at AC rated value	V	160 ... 690
• at 60 Hz at AC rated value	V	160 ... 690
Working range factor supply voltage rated value		
• at 50 Hz for AC		1
• at 60 Hz for AC		1
Impulse voltage resistance rated value	kV	6
Recorded real power	W	2
Protection class IP		IP20
Electromagnetic compatibility		IEC 60947-1 / IEC 61000-6-2 / IEC 61000-6-4
Operating current at 17 V minimum	mA	5
Continuous current of the DIAZED fuse link of the output relay	A	4
Resistance against vibration according to IEC 60068-2-6		1 ... 6 Hz: 15 mm, 6 ... 500 Hz: 2g
Resistance against shock according to IEC 60068-2-27		sinusoidal half-wave 15g / 11 ms
Current carrying capacity of output relay		
• at AC-15		
– at 250 V at 50/60 Hz	A	3
– at 400 V at 50/60 Hz	A	3
• at DC-13		
– at 24 V	A	1
– at 125 V	A	0.2
– at 250 V	A	0.1
Installation altitude at a height over sea level maximum	m	2 000
Conductor-bound parasitic coupling BURST according to IEC 61000-4-4		2 kV
Conductor-bound parasitic coupling conductor-earth SURGE according to IEC 61000-4-5		2 kV
Conductor-bound parasitic coupling conductor-conductor SURGE according to IEC 61000-4-5		1 kV
Electrostatic discharge according to IEC 61000-4-2		6 kV contact discharge / 8 kV air discharge
Field-bound parasitic coupling according to IEC 61000-4-3		10 V/m
Thermal current of the contact-affected switching element maximum	A	5
Insulation voltage for overvoltage category III according to IEC 60664 with degree of pollution 3 rated value	V	690
Degree of pollution		3

		3UG4513-.....
Ambient temperature		
• during operating	°C	-25 ... +60
• during storage	°C	-40 ... +85
• during transport	°C	-40 ... +85
Galvanic isolation		
• between entrance and outlet		Yes
• between the outputs		Yes
• between the voltage supply and other circuits		Yes
Mechanical operating cycles as operating time typical		10 000 000
Electrical operating cycles as operating time at AC-15 at 230 V typical		100 000
Operating cycles with 3RT2 contactor maximum	1/h	5 000

Mechanical design

		3UG4513-1....	3UG4513-2....
Width	mm	22.5	
Height	mm	92	94
Depth	mm	91	
Built in orientation		any	
Distance, to be maintained, to earthed part			
• forwards	mm	0	
• backwards	mm	0	
• sideways	mm	0	
• upwards	mm	0	
• downwards	mm	0	
Distance, to be maintained, to the ranks assembly			
• forwards	mm	0	
• backwards	mm	0	
• sideways	mm	0	
• upwards	mm	0	
• downwards	mm	0	

		3UG4513-1....	3UG4513-2....
Distance, to be maintained, conductive elements			
• forwards	mm	0	
• backwards	mm	0	
• sideways	mm	0	
• upwards	mm	0	
• downwards	mm	0	
Type of mounting		snap-on mounting	
Product function removable terminal for auxiliary and control circuit		Yes	
Design of the electrical connection		screw-type terminals	spring-loaded terminals
Type of the connectable conductor cross-section			
• solid		1x (0.5 ... 4 mm ²), 2x (0.5 ... 2.5 mm ²)	2x (0.25 ... 1.5 mm ²)
• finely stranded			
– with wire end processing		1x (0.5 ... 2.5 mm ²), 2x (0.5 ... 1.5 mm ²)	2 x (0.25 ... 1.5 mm ²)
– without wire end processing		—	2x (0.25 ... 1.5 mm ²)
• for AWG conductors			
– solid		2x (20 ... 14)	2x (24 ... 16)
– stranded		2x (20 ... 14)	2x (24 ... 16)
Tightening torque			
• with screw-type terminals	N·m	0.8 ... 1.2	— ...
Number of change-over switches delayed switching		2	

DATASHEET

Variable Speed Drives



Main Features

Reference	: CFW500C03P0T5DB20H00
Product code	: 12954767
Product reference	: CFW500
Accessory module (control)	: Without plug-in

Basic data

Power supply	: 500-600 V
Input minimum-maximum voltage	: 425-660 V
- Input	: 3
- Output	: 3

Supply voltage range	500-600 V	
Overload cycle	Normal Overload (ND)	Heavy Overload (HD)
Rated current	00001	3A
Overload current for 60 sec	Not applicable	4,5 A
Overload current for 3 sec	Not applicable	6,0 A

Maximum applicable motor:

Voltage/Frequency	Power (HP/kW) [1]	
	Normal Overload (ND)	Heavy Overload (HD)
525V / 50Hz	Not applicable	2 / 1,5
575V / 60Hz	Not applicable	2 / 1,5
Not applicable	Not applicable	Not applicable
Not applicable	Not applicable	Not applicable
Not applicable	Not applicable	Not applicable
Not applicable	Not applicable	Not applicable
Not applicable	Not applicable	Not applicable

Accessory module (control)	: Without plug-in
Dynamic braking [2]	: Standard with braking
External electronic supply 24Vcc	: Not available
Safety Stop	: Not available
Internal RFI filter	: Without filter
External RFI filter	: Not available
Link Inductor	: No
Memory card	: Not included in the product
USB port	: Only with plug-in
Line frequency	: 50/60Hz
Line frequency range (minimum - maximum)	: 48-62 Hz
Phase unbalance	: Less or equal to 3% of input rated line voltage
Transient voltage and overvoltage	: Category III
Single-phase input current [3]	: Not applicable
Three-phase input current [3]	: 3,7 A
Typical input power factor	: 0,75
Displacement factor	: 0,98
Rated efficiency	: ≥ 97%
Maximum connections (power up cycles - on/off) per hour	: 10 (1 each 6 minutes)
DC power supply	: Allow
Standard switching frequency	: 5 kHz
Selectable switching frequency	: 2,5 and 15 kHz
Real-time clock	: Not available
Copy Function	: Yes, by MMF ou plug-in
Dissipated power:	

Mounting type	Overload	
	ND	HD
Surface	Not applicable	70 W
Flange	Not applicable	Not applicable

Source available to the user

Output voltage	: 24 Vcc
Maximum capacity	: 150 mA

Control/performance data

Power supply	: Switched-mode power supply
Control method - induction motor	: V/f, VVW, Sensorless, Encoder and VVW PM
Encoder interface	: Only with plug-in
Control output frequency [5]	: 0-500 Hz
Frequency resolution	: 0,015 Hz

DATASHEET

Variable Speed Drives



Control/performance data

V/F Control	
- Speed regulation	: 1% of rated speed
- Speed variation	: 1:20
VVW Control	
- Speed regulation	: 1% of rated speed
- Speed variation	: 1:30
Sensorless vector control	
- Speed regulation	: 0,5% of rated speed
- Speed variation	: 1:100
Vector control with Encoder	
- Speed regulation	: 0,1% of nominal speed
- Speed variation	: Up to 0 rpm

Analog Inputs

Quantity (standard)	: Only with plug-in
Levels	: Not applicable
Impedance for voltage input	: Not applicable
Impedance for current input	: Not applicable
Function	: Not applicable
Maximum allowed voltage	: Not applicable

Digital inputs

Quantity (standard)	: Only with plug-in
Activation	: Not applicable
Maximum low level	: Not applicable
Minimum high level	: Not applicable
Input current	: Not applicable
Maximum input current	: Not applicable
Function	: Not applicable
Maximum allowed voltage	: Not applicable

Analog outputs

Quantity (standard)	: Only with plug-in
Levels	: Not applicable
RL for voltage output	: Not applicable
RL for current output	: Not applicable
Function	: Not applicable

Digital outputs

Quantity (standard)	: Only with plug-in
Maximum voltage	: Not applicable
Maximum current	: Not applicable
Function	: Not applicable

Communication

- Modbus-RTU (with accessory: Any plug-in module)
- Modbus/TCP (with accessory CFW500-CEMB-TCP)
- Profibus DP (with accessory: CFW500-CPDP)
- Profibus DPV1 (with accessory: CFW500-CPDP)
- Profinet (with accessory CFW500-CEPN-IO)
- CANopen (with accessory: CFW500-CCAN)
- DeviceNet (with accessory: CFW500-CCAN)
- EtherNet/IP (with accessory CFW500-CETH-IP)
- EtherCAT (Not available)
- BACnet (CFW500 G2 / CFW501 G2 / MW500 G2 with accessory: Any plug-in module)

Available protection

- Output phase-phase overcurrente/Short
- Overcurrent/Short circuit phase-ground
- Under/Overvoltage in power
- Heat sink overtemperature
- Motor overload
- IGBT's modules overload
- Fault/External alarm
- Programming error

Operation interface (HMI)

Avaiability	: Included in the product
HMI installation	: Fixed HMI
Number of HMI buttons	: 9
Display	: Numeric LCD
Indication accuracy	: 5% of rated current
Speed resolution	: 0,1 Hz

DATASHEET

Variable Speed Drives



Operation interface (HMI)

Standard HMI degree of protection	: IP20
HMI battery type	: Not applicable
HMI battery life expectancy	: Not applicable
Remote HMI type	: Accessory
Remote HMI frame	: Not applicable
Remote HMI degree of protection	: IP54

Ambient conditions

Enclosure	: IP20
Pollution degree	: 2 (EN50178 and UL508C)
Temperature around the inverter: of -10 °C / 14 °F to 50 °C / 122 °F. For temperatures above the specified is necessary to apply current reduction of 2 % per °C of 50 (122) o 60 °C (140 °F).	
Relative humidity: 5% to 95% without condensation.	
Altitude: up to 1000 m (3281 ft) under normal conditions. Of 1000 m (3281 ft) to 4000 m (13123 ft) reduce the current in 1% for each 100 m above (0,3% for each 100 ft above) of 1000 m (3281 ft). Reduce the maximum voltage (240 V for models 200...240 V, 480 V for models 380...480 V and 600 V for models 500...600 V) in 1,1% for each 100 m above (0,33% for each 100 ft above) of 2000 m.	

Sustainability policies

RoHS	: Yes
Conformal Coating	: 3C2 (IEC 60721-3-3:2002)

Dimensions and weight

- Size	: C
- Height	: 210 mm / 8.3 in
- Width	: 135 mm / 5.31 in
- Depth	: 165 mm / 6.5 in
- Weight	: 2,0 kg / 4.4 lb

Mechanical Installation

Mounting position	: Surface or DIN rail
Fixing screw	: M5
Tightening torque	: 3 N.m / 2.21 lb.ft
Allows side-by-side assembly	: No
Minimum spacing around the inverter:	
- Top	: 40 mm / 1.57 in
- Bottom	: 50 mm / 1.97 in
- Front	: 50 mm / 1.97 in
- Between inverters (IP20)	: 30 mm / 1.18 in

Electrical connections

Cable gauges and tightening torques:

	Recommended cable gauge	Recommended tightening torque
Power	1,5 mm ² (16 AWG)	1 N.m / 0.74 lb.ft
Braking	1,5 mm ² (16 AWG)	1 N.m / 0.74 lb.ft
Grounding	2,5 mm ² (14 AWG)	0.5 N.m / 0.37 lb.ft
Control	0,5 to 1,5 mm ² (20 to 14 AWG)	0,5 N.m / 0.37 lb.ft

SoftPLC	: Yes, incorporated
Maximum breaking current	: 2,6 A
Minimum resistance for the brake resistor	: 392 Ω
Recommended aR fuse [6]	: FNH00-20K-A
Recommended circuit breaker [6]	: Contact WEG
Disconnect switch	: Not applicable
Motor coupling box	: Not applicable

Standards

Safety	<ul style="list-style-type: none"> - UL 508C - Power conversion equipment. - UL 840 - Insulation coordination including clearances and creepage distances for electrical equipment. - EN 61800-5-1 - Safety requirements electrical, thermal and energy. - EN 50178 - Electronic equipment for use in power installations. - EN 60204-1-Safety of machinery. Electrical equipment of machines. Part 1: General requirements. Note: To have a machine in accordance with that standard, the manufacturer of the machine is responsible for the installation of an emergency-stop device and a network switching equipment. - EN 60146 (IEC 146) - Semiconductor converters. - EN 61800-2 - Adjustable speed electrical power drive systems - Part 2: General requirements - Rating specifications for low voltage adjustable frequency AC power drive systems.
Electromagnetic Compatibility	<ul style="list-style-type: none"> - EN 61800-3 - Adjustable speed electrical power drive systems - Part 3: EMC product standard including specific test methods. - EN 55011 - Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.

DATASHEET

Variable Speed Drives



Standards

- CISPR 11 - Industrial, scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement.
- EN 61000-4-2 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 2: Electrostatic discharge immunity test.
- EN 61000-4-3 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 3: Radiated, radio-frequency, electromagnetic field immunity test.
- EN 61000-4-4 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 4: Electrical fast transient/burst immunity test.
- EN 61000-4-5 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 5: Surge immunity test.
- EN 61000-4-6 - Electromagnetic compatibility (EMC)- Part 4: Testing and measurement techniques - Section 6: Immunity to conducted disturbances, induced by radio-frequency fields.

Mechanical Construction

- EN 60529, UL 50 and IEC 60721-3-3

Certifications

UL, CE, RCM, CS/IRAM, EAC, UKCA and RoHS
CHINA

Notes

- 1) Motor power is orientative, valid for standard WEG Motors of IV poles. The correct sizing must be done according to the nominal current of the motor used, which must be less than or equal to the rated output current of the inverter;
- 2) Braking resistor is not included;
- 3) Considering minimum line impedance of 1%;
- 4) For more information, refer to the user manual of CFW500;
- 5) All images are merely illustrative.
- 6) For operation with switching frequency above nominal, apply derating to the output current (refer to the user manual).

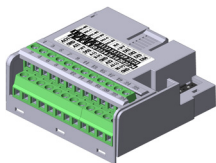
RS485 Communication Plug-in Module

Módulo Plug-in Comunicación RS485

Módulo Plug-in Comunicação RS485

CFW500

Installation, Configuration and Operation Guide
Guía de Instalación, Configuración y Operación
Guia de Instalação, Configuração e Operação



SUMMARY

1 SAFETY INFORMATION.....	5
1.1 SAFETY WARNINGS	5
1.2 PRELIMINARY RECOMMENDATIONS	5
2 GENERAL INFORMATION	5
3 CONTENTS OF THE PACKAGE.....	5
4 ACCESSORY INSTALLATION	6
5 SETTINGS.....	7
APPENDIX A – FIGURES.....	20

ÍNDICE

1 INFORMACIONES DE SEGURIDAD	10
1.1 AVISOS DE SEGURIDAD	10
1.2 RECOMENDACIONES PRELIMINARES... 10	10
2 INFORMACIONES GENERALES	10
3 CONTENIDO DEL EMBALAJE	10
4 INSTALACIÓN DEL ACCESORIO	11
5 CONFIGURACIONES.....	12
ANEXO A – FIGURAS.....	20

ÍNDICE

1 INFORMAÇÕES DE SEGURANÇA.....	15
1.1 AVISOS DE SEGURANÇA	15
1.2 RECOMENDAÇÕES PRELIMINARES..... 15	15
2 INFORMAÇÕES GERAIS	15
3 CONTEÚDO DA EMBALAGEM	15
4 INSTALAÇÃO DO ACESSÓRIO	16
5 CONFIGURAÇÕES.....	17
ANEXO A – FIGURAS.....	20

1 SAFETY INFORMATION

1.1 SAFETY WARNINGS



NOTE!

- Only use the CFW500-CRS485 Plug-in Module in CFW500 WEG inverters.
- We recommend reading the CFW500 user's manual before installing or operating this accessory.
- This guide contains important information for the correct understanding and proper operation of this module.

1.2 PRELIMINARY RECOMMENDATIONS



ATTENTION!

- Always disconnect the general power supply before connecting or disconnecting the accessories of the frequency inverter CFW500.
- Wait for at least 10 minutes to guarantee complete de-energization of the inverter.

2 GENERAL INFORMATION

This guide shows how to install, configure and operate the CFW500-CRS485 Plug-in Module.

3 CONTENTS OF THE PACKAGE

When receiving the product, check if this package contains:

- Accessory in anti-static packaging.
- Installation, configuration and operation guide.

4 ACCESSORY INSTALLATION

The accessory is easily installed or replaced. For correct installation of the accessory execute the following steps:

Step 1: With the inverter power supply off, remove the front cover of the Inverter ([figure A.1 \(a\)](#)).

Step 2: Remove the accessory (connected plug-in module) if any, as in [figure A.1 \(a\)](#).

Step 3: Fit and press the accessory to be installed as indicated in [figure A.1 \(b\)](#) and then assemble the front cover of the inverter.

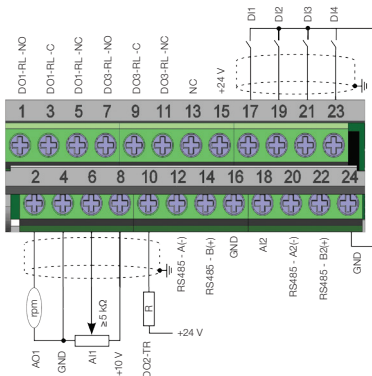
Step 4: Power up the inverter and check if parameter P0027 shows value 9 (P0027 = 9). If this information is not true, check if the module used is actually the CFW500-CRS485 and repeat steps 1-4.

5 SETTINGS

The control connections (analogical input / output, digital inputs / outputs and RS485 interface) must be performed as shown in [figure 1](#).

	Connector	Description
Superior Terminal	1	DO1-RL-NO Digital output 1 (NO contact of relay 1)
	3	DO1-RL-C Digital output 1 (common point of relay 1)
	5	DO1-RL-NC Digital output 1 (NC contact of relay 1)
	7	DO3-RL-NO Digital output 3 (NO contact of relay 2)
	9	DO3-RL-C Digital output 3 (common point of relay 2)
	11	DO3-RL-NC Digital output 3 (NC contact of relay 2)
	13	NC Not connected
	15	+24 V +24 Vdc Power supply
	17	DI1 Digital input 1
	19	DI2 Digital input 2
	21	DI3 Digital input 3
	23	DI4 Digital input 4
Inferior Terminal	2	AO1 Analogical output 1
	4	GND Reference 0 V
	6	AI1 Analogical input 1
	8	+10 V Reference +10 Vdc for potentiometer
	10	DO2-TR Digital output 2 (transistor)
	12	RS485 - A(-) RS485 (Terminal A(-))
	14	RS485 - B(+) RS485 (Terminal B(+))
	16	GND Reference 0 V
	18	AI2 Analogical input 2
	20	RS485 - A2(-) RS485 (Terminal A2(-))
22	RS485 - B2(+) RS485 (Terminal B2(+))	
24	GND Reference 0 V	

Figure 1: Signals of control connector



The location of the DIP-switches for selecting the type of analog input and output signal and termination of the RS485 line can be better visualized in [figure A.2](#). To use the analog inputs and/ or outputs with signal in current, switch S1 and related parameters must be set as indicated in [table 1](#). For further details about the control connections see chapter 3 - Installation and Connection of the CFW500 user's manual.

Table 1: Settings of switches to select the type of analog input and output signal of the RS485

Input / Output	Signal	Setting of Switch S1	Range of Signal	Parameter Settings
AI1	Voltage	S1.1 = OFF	0...10 V	P0233 = 0 or 2
	Current	S1.1 = ON	0...20 mA	P0233 = 0 or 2
4...20 mA			P0233 = 1 or 3	
AI2	Voltage	S2.1 = OFF	0...10 V	P0238 = 0 or 2
	Current	S2.1 = ON	0...20 mA	P0238 = 0 or 2
4...20 mA			P0238 = 1 or 3	
AO1	Voltage	S1.2 = ON	0...10 V	P0253 = 0 or 3
	Current	S1.2 = OFF	0...20 mA	P0253 = 1 or 4
4...20 mA			P0253 = 2 or 5	

**NOTE!**

- Configurations for activation of RS485:
- S1.3 = ON and S1.4 = ON: RS485 termination ON
- S1.3 = OFF and S1.4 = OFF: RS485 termination OFF

Any other combinations of the switches are not allowed

**NOTE!**

- Configurations for activation of RS485(2):
- S2.3 = ON and S2.4 = ON: RS485(2) termination ON
- S2.3 = OFF and S2.4 = OFF: RS485(2) termination OFF

Any other combinations of the switches are not allowed

This module has a connector ([figure A.2](#)) to enable the use of the Flash Memory Module (CFW500-MMF), which allows data transfer between inverters. For further details on this accessory, refer to the installation, configuration and operation guide of the CFW500-MMF.

1 INFORMACIONES DE SEGURIDAD

1.1 AVISOS DE SEGURIDAD



¡NOTA!

- Solamente utilice el Módulo Plug-in CFW500-CRS485 en los convertidores WEG línea CFW500.
- Se recomienda la lectura del manual del usuario del CFW500 antes de instalar u operar este accesorio.
- El contenido de esta guía fornece informaciones importantes para el correcto entendimiento y buen funcionamiento de este módulo.

1.2 RECOMENDACIONES PRELIMINARES



¡ATENCIÓN!

- Siempre desconecte la alimentación general antes de conectar o desconectar los accesorios del convertidor de frecuencia CFW500.
- Espere por lo menos 10 minutos para garantizar la desenergización completa del convertidor.

2 INFORMACIONES GENERALES

Esta guía orienta en la instalación, configuración y operación del Módulo Plug-in CFW500-CRS485.

3 CONTENIDO DEL EMBALAJE

Al recibir el producto, verifique si el embalaje contiene:

- Accesorio en embalaje antiestático.
- Guía de instalación, configuración y operación.

4 INSTALACIÓN DEL ACCESORIO

El accesorio es fácilmente instalado o sustituido. Para la correcta instalación del accesorio, ejecute los pasos a seguir:

Paso 1: Con el convertidor desenergizado, retire la tapa frontal del mismo ([figura A.1 \(a\)](#)).

Paso 2: Retire, si existe, el accesorio (módulo plug-in conectado) conforme la [figura A.1 \(a\)](#).

Paso 3: Encaje y presione el accesorio a ser instalado conforme indicado en la [figura A.1 \(b\)](#) y después conecte la tapa frontal del convertidor.

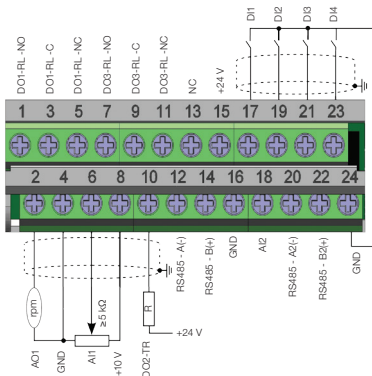
Paso 4: Energice el convertidor y verifique si el parámetro P0027 indica el valor 9 ($P0027 = 9$). En caso de que esa información no sea verdadera, verifique si el módulo utilizado realmente es el CFW500-CRS485 y repita los pasos 1-4.

5 CONFIGURACIONES

Las conexiones de control (entrada/salida analógica, entradas/salidas digitales e interfaz RS485) deben ser hechas en el conector conforme [figura 1](#).

		Conector	Descripción
Borne Superior	1	DO1-RL-NO	Salida digital 1 (contacto NA del relé 1)
	3	DO1-RL-C	Salida digital 1 (punto común del relé 1)
	5	DO1-RL-NC	Salida digital 1 (contacto NC del relé 1)
	7	DO3-RL-NO	Salida digital 3 (contacto NA del relé 2)
	9	DO3-RL-C	Salida digital 3 (punto común del relé 2)
	11	DO3-RL-NC	Salida digital 3 (contacto NC del relé 2)
	13	NC	No conectado
	15	+24 V	Fuente +24 Vcc
	17	DI1	Entrada digital 1
	19	DI2	Entrada digital 2
	21	DI3	Entrada digital 3
	23	DI4	Entrada digital 4
Borne Inferior	2	AO1	Salida analógica 1
	4	GND	Referencia 0 V
	6	AI1	Entrada analógica 1
	8	+10 V	Referencia +10 Vcc para potenciómetro
	10	DO2-TR	Salida digital 2 (transistor)
	12	RS485 - A(-)	RS485 (Terminal A(-))
	14	RS485 - B(+)	RS485 (Terminal B(+))
	16	GND	Referencia 0 V
	18	AI2	Entrada Analógica 2
	20	RS485 - A2(-)	RS485 (Terminal A2(-))
22	RS485 - B2(+)	RS485 (Terminal B2(+))	
24	GND	Referencia 0 V	

Figura 1: Señales del conector de control



La localización de las DIP-switches para selección del tipo de señal de la entrada y salida analógica y de la terminación de la red RS485 pueden ser mejor visualizadas en la [figura A.2](#). Para utilizar las entradas y/u salidas analógicas con señal en corriente, se debe ajustar la llave S1 y los parámetros relacionados conforme [tabla 1](#). Para más detalles sobre las conexiones de control consulte el capítulo 3 - Instalación y Conexión del manual del usuario del CFW500.

Español

Tabla 1: Configuraciones de las llaves para selección del tipo de señal en la entrada y salida analógica en el RS485

Entrada/Salida	Señal	Ajuste de la Llave S1	Rango de la Señal	Ajuste de Parámetros
AI1	Tensión	S1.1 = OFF	0...10 V	P0233 = 0 o 2
	Corriente	S1.1 = ON	0...20 mA	P0233 = 0 o 2
4...20 mA			P0233 = 1 o 3	
AI2	Tensión	S2.1 = OFF	0...10 V	P0238 = 0 o 2
	Corriente	S2.1 = ON	0...20 mA	P0238 = 0 o 2
4...20 mA			P0238 = 1 o 3	
AO1	Tensión	S1.2 = ON	0...10 V	P0253 = 0 o 3
	Corriente	S1.2 = OFF	0...20 mA	P0253 = 1 o 4
4...20 mA			P0253 = 2 o 5	

**¡NOTA!**

- Configuraciones para encendido de la RS485:
- S1.3 = ON y S1.4 = ON: terminación RS485 encendida
- S1.3 = OFF y S1.4 = OFF: terminación RS485 apagada

Cualquier otra combinación de las claves no es permitida

**¡NOTA!**

- Configuraciones para encendido de la RS485(2):
- S2.3 = ON y S2.4 = ON: terminación RS485(2) encendida
- S2.3 = OFF y S2.4 = OFF: terminación RS485(2) apagada

Cualquier otra combinación de las claves no es permitida

Este módulo posee un conector ([figura A.2](#)) para utilización del Módulo de Memoria Flash (CFW500-MMF), el cual permite la transferencia de datos entre los convertidores. Para más detalles sobre este accesorio consulte la guía de instalación, configuración y operación del CFW500-MMF.

1 INFORMAÇÕES DE SEGURANÇA

1.1 AVISOS DE SEGURANÇA



NOTA!

- Somente utilizar o Módulo Plug-in CFW500-CRS485 nos inversores WEG linha CFW500.
- Recomenda-se a leitura do Manual do Usuário do CFW500 antes de instalar ou operar esse acessório.
- O conteúdo deste guia fornece informações importantes para o correto entendimento e bom funcionamento deste módulo.

1.2 RECOMENDAÇÕES PRELIMINARES



ATENÇÃO!

- Sempre desconecte a alimentação geral antes de conectar ou desconectar os acessórios do inversor de frequência CFW500.
- Aguarde pelo menos 10 minutos para garantir a desenergização completa do inversor.

2 INFORMAÇÕES GERAIS

Este guia orienta na instalação, configuração e operação do Módulo Plug-in CFW500-CRS485.

3 CONTEÚDO DA EMBALAGEM

Ao receber o produto, verificar se a embalagem contém:

- Acessório em embalagem anti-estática.
- Guia de instalação, configuração e operação.

4 INSTALAÇÃO DO ACESSÓRIO

O acessório é facilmente instalado ou substituído. Para a correta instalação do acessório execute os passos a seguir:

Passo 1: Com o inversor desenergizado, retire a tampa frontal do Inversor ([figura A.1 \(a\)](#)).

Passo 2: Retire, se houver, o acessório (módulo plug-in conectado) conforme a [figura A.1 \(a\)](#).

Passo 3: Encaixe e pressione o acessório a ser instalado conforme indicado na [figura A.1 \(b\)](#) e após conecte a tampa frontal do inversor.

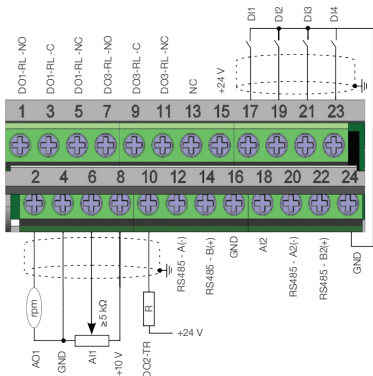
Passo 4: Energize o inversor e verifique se o parâmetro P0027 indica o valor 9 ($P0027 = 9$). Caso essa informação não for verdadeira, verifique se o módulo utilizado realmente é o CFW500-CRS485 e repita os passos 1-4.

5 CONFIGURAÇÕES

As conexões de controle (entrada/saída analógica, entradas/saídas digitais e interface RS485) devem ser feitas no conector conforme [figura 1](#).

		Conector	Descrição
Borne Superior	1	DO1-RL-NO	Saída Digital 1 (contato NA do Relé 1)
	3	DO1-RL-C	Saída Digital 1 (Ponto comum do Relé 1)
	5	DO1-RL-NC	Saída Digital 1 (Contato NF do Relé 1)
	7	DO3-RL-NO	Saída Digital 3 (contato NA do Relé 2)
	9	DO3-RL-C	Saída Digital 3 (Ponto comum do Relé 2)
	11	DO3-RL-NC	Saída Digital 3 (Contato NF do Relé 2)
	13	NC	Não conectado
	15	+24 V	Fonte +24 Vcc
	17	DI1	Entrada Digital 1
	19	DI2	Entrada Digital 2
	21	DI3	Entrada Digital 3
	23	DI4	Entrada Digital 4
Borne Inferior	2	AO1	Saída Analógica 1
	4	GND	Referência 0 V
	6	AI1	Entrada Analógica 1
	8	+10 V	Referência +10 Vcc para Potenciômetro
	10	DO2-TR	Saída Digital 2 (Transistor)
	12	RS485 - A(-)	RS485 (Terminal A(-))
	14	RS485 - B(+)	RS485 (Terminal B(+))
	16	GND	Referência 0 V
	18	AI2	Entrada Analógica 2
	20	RS485 - A2(-)	RS485 (Terminal A2(-))
22	RS485 - B2(+)	RS485 (Terminal B2(+))	
24	GND	Referência 0 V	

Figura 1: Sinais do conector de controle



A localização das DIP-switches para seleção do tipo de sinal da entrada e saída analógica e da terminação da rede RS485 podem ser melhor visualizadas na [figura A.2](#). Para utilizar as entradas e/ou saídas analógicas com sinal em corrente deve-se ajustar a chave S1 e os parâmetros relacionados conforme [tabela 1](#). Para mais detalhes sobre as conexões de controle consulte o capítulo 3 do Manual do Usuário do CFW500.

Tabela 1: Configurações das chaves para seleção do tipo de sinal na entrada e saída analógica no J RS485

Entrada / Saída	Sinal	Ajuste da Chave S1	Faixa do Sinal	Ajuste de Parâmetros
AI1	Tensão	S1.1 = OFF	0...10 V	P0233 = 0 ou 2
	Corrente	S1.1 = ON	0...20 mA	P0233 = 0 ou 2
4...20 mA			P0233 = 1 ou 3	
AI2	Tensão	S2.1 = OFF	0...10 V	P0238 = 0 ou 2
	Corrente	S2.1 = ON	0...20 mA	P0238 = 0 ou 2
4...20 mA			P0238 = 1 ou 3	
AO1	Tensão	S1.2 = ON	0...10 V	P0253 = 0 ou 3
	Corrente	S1.2 = OFF	0...20 mA	P0253 = 1 ou 4
			4...20 mA	P0253 = 2 ou 5

**NOTA!**

- Configurações para ligação da RS485:
- S1.3 = ON e S1.4 = ON: terminação RS485 ligada
- S1.3 = OFF e S1.4 = OFF: terminação RS485 desligada

Qualquer outra combinação das chaves não é permitida

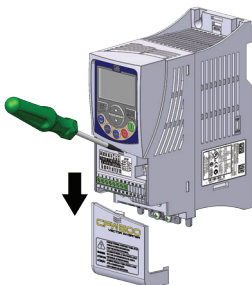
**NOTA!**

- Configurações para ligação da RS485(2):
- S2.3 = ON e S2.4 = ON: terminação RS485(2) ligada
- S2.3 = OFF e S2.4 = OFF: terminação RS485(2) desligada

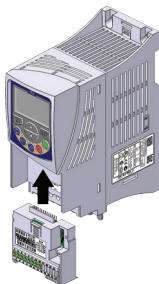
Qualquer outra combinação das chaves não é permitida

Este módulo possui um conector ([figura A.2](#)) para utilização do Módulo de Memória Flash (CFW500-MMF), o qual permite a transferência de dados entre inversores. Para mais detalhes sobre esse acessório consulte o guia de instalação, configuração e operação do CFW500-MMF.

APPENDIX A – FIGURES ANEXO A – FIGURAS



a) Removal of front cover and accessory
(a) Remoción de la tapa frontal y del accesorio
(a) Remoção da tampa frontal e de acessório



b) Accessory connection
(b) Conexión del accesorio
(b) Conexão de acessório

Figure A.1 (a) to (b): Installation of accessory
Figura A.1 (a) a (b): Instalación de accesorio
Figura A.1 (a) a (b): Instalação de acessório

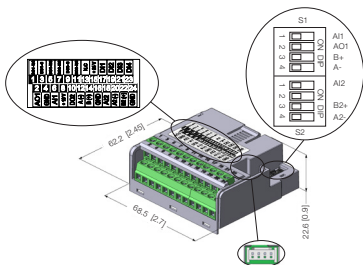


Figure A.2: CRS485 dimensions in mm [in], DIP-switches location and MCard connector

Figura A.2: Dimensiones del CRS485 en mm [in], localización de las DIP-switches y conector de MCard

Figura A.2: Dimensões do CRS485 em mm [in], localização das DIP-switches e conector do MCard



WEG Drives & Controls - Automação LTDA.
Jaraguá do Sul - SC - Brazil
Phone 55 (47) 3276-4000 - Fax 55 (47) 3276-4020
São Paulo - SP - Brazil
Phone 55 (11) 5053-2300 - Fax 55 (11) 5052-4212
automacao@weg.net
www.weg.net



11771108

Document: 10002041533 / 01

Serial Remote HMI

HMI Remota Serial

HMI Remota Serial

CFW500

Installation, Configuration and Operation Guide
Guía de Instalación, Configuración y Operación
Guia de Instalação, Configuração e Operação



SUMMARY

1 SAFETY INFORMATION.....	5
1.1 SAFETY WARNINGS	5
1.2 PRELIMINARY RECOMMENDATIONS	5
2 GENERAL INFORMATION	5
3 PACKAGE CONTENT	5
4 ACCESSORY INSTALLATION	6
5 CONFIGURATIONS.....	6
APPENDIX A – FIGURES.....	17

ÍNDICE

1 INFORMACIONES DE SEGURIDAD	9
1.1 AVISOS DE SEGURIDAD	9
1.2 RECOMENDACIONES PRELIMINARES	9
2 INFORMACIONES GENERALES.....	9
3 CONTENIDO DEL EMBALAJE	9
4 INSTALACIÓN DEL ACCESORIO.....	10
5 CONFIGURACIONES.....	10
ANEXO A – FIGURAS.....	17

ÍNDICE

1 INFORMAÇÕES DE SEGURANÇA.....	13
1.1 AVISOS DE SEGURANÇA	13
1.2 RECOMENDAÇÕES PRELIMINARES.....	13
2 INFORMAÇÕES GERAIS	13
3 CONTEÚDO DA EMBALAGEM.....	13
4 INSTALAÇÃO DO ACESSÓRIO	14
5 CONFIGURAÇÕES.....	14
ANEXO A – FIGURAS.....	17

1 SAFETY INFORMATION

1.1 SAFETY WARNINGS



NOTE!

- This guide contains important information for the correct understanding and proper operation of the CFW500-HMIR Serial Remote Human-Machine Interface.
- Only use the CFW500-HMIR Serial Remote Human-Machine Interface in WEG CFW500 inverters only.
- We recommend reading the CFW500 user's manual before installing or operating this accessory.

1.2 PRELIMINARY RECOMMENDATIONS



ATTENTION!

- Always disconnect the general power supply before connecting or disconnecting the accessories of the CFW500 frequency inverter.
- Wait at least 10 minutes to guarantee complete de-energization of the inverter.

2 GENERAL INFORMATION

This guide shows how to install, configure and operate the CFW500-HMIR Serial Remote Human-Machine Interface. This optional allow the mounting of CFW500 human machine interface at the electrical panel door.

3 PACKAGE CONTENT

When receiving the product, check if the package contains:

- Accessory in anti-static package.
- Installation, configuration and operation guide.

4 ACCESSORY INSTALLATION

The accessory is easily installed or replaced. For the proper installation of the accessory, follow steps below:

Step 1: The CFW500-HMIR can be connected to any CFW500 plug-in module. With the inverter de-energized, remove the front cover of the Inverter ([Figure A1 on page 17](#)).

Step 2: Connect the wires of the **CFW500-CCHMIRxxM** cable to the RS485 connection on plug-in module according to the [Table 2 on page 7](#). The [Figure A1 on page 17](#) shows an example with the CFW500-IOS plug-in module. If you are using a different plug-in module, refer to its installation, configuration and operation guide to identify the terminals for the RS485 Serial Connection.

Step 3: Close the inverter front cover.

Step 4: Power up the inverter and check if the CFW500-HMIR as show the following message on the display:



Conn
Lost

Step 5: Configure the parameter P0312 to HMIR option. Thus, the Serial Remote HMI will show the same display data as the inverter local HMI. Otherwise, repeat steps 1-5, checking the **CFW500-CCHMIRxxM** cable connections.

5 CONFIGURATIONS

- It is mounted externally to the inverters on the panel door ([Figure A2 on page 18](#)) or control desk with a maximum cable length of 10 m. However, for cables longer than 10 m, it is necessary an external power supply of 24 Vdc to power up the Serial Remote HMI. Protection rate: IP54 / Nema 12.
- The CFW500-HMIR works with the **CFW500-CCHMIRxxM** cable only. The available lengths are presented in [Table 1 on page 7](#). For the proper connection of this cable, check [Table 2 on page 7](#).

Table 1: Available lengths for CFW500-CCHMIRxxM cable

Description	Name	Length (m) [in]	WEG Item
HMI serial cable CFW500	CFW500-CCHMIR01M	1 [39.37]	12330016
HMI serial cable CFW500	CFW500-CCHMIR02M	2 [78.74]	12330459
HMI serial cable CFW500	CFW500-CCHMIR03M	3 [118.11]	12330460
HMI serial cable CFW500	CFW500-CCHMIR05M	5 [196.85]	12330461
HMI serial cable CFW500	CFW500-CCHMIR75M	7.5 [295.28]	12330462
HMI serial cable CFW500	CFW500-CCHMIR10M	10 [393.70]	12330463

Table 2: CFW500-CCHMIRxxM cable connection

DB9 Connector	Color (Wire)	Plug-in Module Pin:
2	Blue	B (+)
4	Green	GND
5	Red	+24 V
7	Gray	A (-)

1 INFORMACIONES DE SEGURIDAD

1.1 AVISOS DE SEGURIDAD



¡NOTA!

- El contenido de esta guía provee informaciones importantes para el correcto entendimiento y buen funcionamiento de la CFW500-HMIR Interface Hombre-Maquina Remota Serial.
- Solamente utilizar la CFW500-HMIR Interface Hombre-Maquina Remota Serial en los convertidores WEG línea CFW500.
- Se recomienda la lectura del manual del usuario del CFW500 antes de instalar o operar este accesorio.

1.2 RECOMENDACIONES PRELIMINARES



¡ATENCIÓN!

- Siempre desconecte la alimentación general antes de conectar o desconectar los accesorios de lo convertidor de frecuencia CFW500.
- Aguarde por lo menos 10 minutos para garantizar la desenergización completa del convertidor.

2 INFORMACIONES GENERALES

Esta guía orienta en la instalación, configuración y operación de la CFW500-HMIR Interface Hombre-Maquina Remota Serial. Este opcional permite la montaje de la inface hombre-maquina del CFW500 en la puerta del tablero electrico.

3 CONTENIDO DEL EMBALAJE

Al recibir el producto, verifique si el embalaje contiene:

- Accesorio en embalaje antiestático.
- Guía de instalación, configuración y operación.

4 INSTALACIÓN DEL ACCESORIO

El accesorio es fácilmente instalado o sustituido. Para la correcta instalación del accesorio ejecute los pasos a seguir:

Paso 1: La CFW500-HMIR puede ser conectada a cualquier módulo plug-in del convertidor CFW500. Con el convertidor desenergizado, retire la tapa frontal del convertidor ([Figura A1 en la página 17](#)).

Paso 2: Efectúe la conexión de los alambres (terminales) del cable **CFW500-CCHMIRxxM** en la interface RS485 del modulo plug-in conforme [Tabla 2 en la página 11](#). La [Figura A1 en la página 17](#) muestra un ejemplo con el módulo plug-in CFW500-IOS. Si está utilizando un módulo plug-in diferente, verifique en la guía de instalación, configuración y operación del módulo plug-in utilizado, los bornes referentes a la conexión de la interface serial RS485.

Paso 3: Conecte la tapa frontal del convertidor.

Paso 4: Energice el convertidor y verifique si la CFW500-HMIR presenta la siguiente mensaje en el display:



Conn
Lost

Paso 5: Configure el parámetro P0312 para la opción HMIR. Con eso, la HMI Remota Serial presentará, en el display, la misma mensaje de la HMI del convertidor. En caso contrario, repita los pasos 1-5 verificando las conexiones del cable **CFW500-CCHMIRxxM**.

5 CONFIGURACIONES

- Es montada externamente a los convertidores en la puerta del tablero ([Figura A2 en la página 18](#)) o mesa de comando con una longitud de cable máxima de 10 m. Sin embargo, para cables mayores que 10 m es necesario una fuente externa de 24 Vcc alimentando la HMI Remota Serial. Grado de protección: IP54 / Nema 12.
- La CFW500-HMIR funciona solamente con el cable **CFW500-CCHMIRxxM**. Las longitudes disponibles son presentadas en la [Tabla 1 en la página 11](#). Para la correcta conexión de este cable verifique la [Tabla 2 en la página 11](#).

Tabla 1: Longitudes disponibles del cable CFW500-CCHMIRxxM

Descripción	Nombre	Longitud (m) [in]	Item WEG
Cable de la HMI serial del CFW500	CFW500-CCHMIR01M	1 [39,37]	12330016
Cable de la HMI serial del CFW500	CFW500-CCHMIR02M	2 [78,74]	12330459
Cable de la HMI serial del CFW500	CFW500-CCHMIR03M	3 [118,11]	12330460
Cable de la HMI serial del CFW500	CFW500-CCHMIR05M	5 [196,85]	12330461
Cable de la HMI serial del CFW500	CFW500-CCHMIR75M	7,5 [295,28]	12330462
Cable de la HMI serial del CFW500	CFW500-CCHMIR10M	10 [393,70]	12330463

Tabla 2: Conexión del cable CFW500-CCHMIRxxM

Perno do Conector DB9	Color (Alambre)	Perno del Módulo Plug-in
2	Azul	B (+)
4	Verde	GND
5	Rojo	+24 V
7	Gris	A (-)

1 INFORMAÇÕES DE SEGURANÇA

1.1 AVISOS DE SEGURANÇA



NOTA!

- O conteúdo deste guia fornece informações importantes para o correto entendimento e bom funcionamento da CFW500-HMIR Interface Homem-Máquina Remota Serial.
- Somente utilizar a CFW500-HMIR Interface Homem-Máquina Remota Serial nos inversores WEG linha CFW500.
- Recomenda-se a leitura do manual do usuário do CFW500 antes de instalar ou operar esse acessório.

1.2 RECOMENDAÇÕES PRELIMINARES



ATENÇÃO!

- Sempre desconecte a alimentação geral antes de conectar ou desconectar os acessórios do inversor de frequência CFW500.
- Aguarde pelo menos 10 minutos para garantir a desenergização completa do inversor.

2 INFORMAÇÕES GERAIS

Este guia orienta na instalação, configuração e operação da CFW500-HMIR Interface Homem-Máquina. Este opcional permite a montagem da interface homem-máquina do CFW500 na porta do painel elétrico.

3 CONTEÚDO DA EMBALAGEM

Ao receber o produto, verificar se a embalagem contém:

- Acessório em embalagem anti estática.
- Guia de instalação, configuração e operação.

4 INSTALAÇÃO DO ACESSÓRIO

O acessório é facilmente instalado ou substituído. Para a correta instalação do acessório execute os passos a seguir:

Passo 1: A CFW500-HMIR pode ser conectada a qualquer módulo plug-in do inversor CFW500. Com o inversor desenergizado, retire a tampa frontal do Inversor ([Figura A1 na página 17](#)).

Passo 2: Faça a conexão dos terminais do cabo **CFW500-CCHMIRxxM** na interface RS485 do módulo plug-in, conforme [Tabela 2 na página 15](#). A [Figura A1 na página 17](#) mostra um exemplo com o módulo plug-in CFW500-IO5. Se estiver utilizando um módulo plug-in diferente, verifique no guia de instalação, configuração e operação do módulo plug-in utilizado, os bornes referentes à conexão da HMI remota serial CFW500-HMIR (RS485).

Passo 3: Conecte a tampa frontal do inversor.

Passo 4: Energize o inversor e verifique se a CFW500-HMIR apresenta a seguinte mensagem no display:



Passo 5: Configure o parâmetro P0312 para a opção HMIR. Com isso, a HMI remota serial CFW500-HMIR apresentará no display a mesma mensagem da HMI do inversor. Caso contrário, repita os passos 1-5 verificando as conexões do cabo **CFW500-CCHMIRxxM**.

5 CONFIGURAÇÕES

- É montada externamente aos inversores na porta do painel ([Figura A2 na página 18](#)) ou mesa de comando com um comprimento de cabo máximo de 10 m. Porém, para cabos maiores que 10 m é necessário uma fonte externa de 24 Vcc alimentando a HMI remota serial CFW500-HMIR. Grau de proteção: IP54 / Nema 12.
- A CFW500-HMIR funciona somente com o cabo **CFW500-CCHMIRxxM**. Os comprimentos disponíveis são apresentados na [Tabela 1 na página 15](#). Para a correta ligação deste cabo verifique a [Tabela 2 na página 15](#).

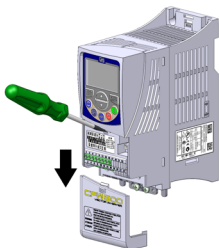
Tabela 1: Comprimentos disponíveis do cabo
CFW500-CCHMIRxxM

Descrição	Nome	Comprimento (m) [in]	Item WEG
Cabo da HMI serial do CFW500	CFW500-CCHMIR01M	1 [39,37]	12330016
Cabo da HMI serial do CFW500	CFW500-CCHMIR02M	2 [78,74]	12330459
Cabo da HMI serial do CFW500	CFW500-CCHMIR03M	3 [118,11]	12330460
Cabo da HMI serial do CFW500	CFW500-CCHMIR05M	5 [196,85]	12330461
Cabo da HMI serial do CFW500	CFW500-CCHMIR75M	7,5 [295,28]	12330462
Cabo da HMI serial do CFW500	CFW500-CCHMIR10M	10 [393,70]	12330463

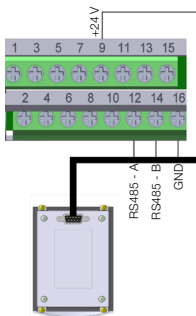
Tabela 2: Ligação do cabo CFW500-CCHMIRxxM

Pino do Conector DB9	Cor (Fio)	Pino do Módulo Plug-in
2	Azul	B (+)
4	Verde	GND
5	Vermelho	+24 V
7	Cinza	A (-)

APPENDIX A – FIGURES ANEXO A – FIGURAS



(a) Removal of front cover
(a) Remoción de la tapa frontal
(a) Remoção da tampa frontal



(b) Accessory connection
(b) Conexión de lo accesorio
(b) Conexão do acessório

Figure A1: (a) to (b) Installation of accessory
Figura A1: (a) a (b) Instalación de lo accesorio
Figura A1: (a) a (b) Instalação do acessório

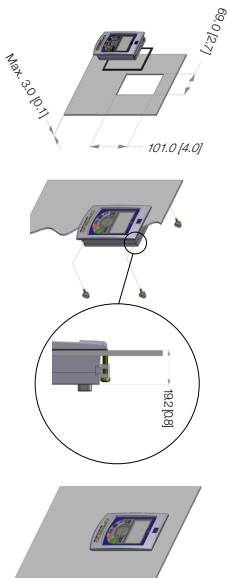


Figure A2: CFW500-HMIR dimensions in mm [in] and panel mounting

Figura A2: Dimensiones del CFW500-HMIR en mm [in] y montaje en tablero

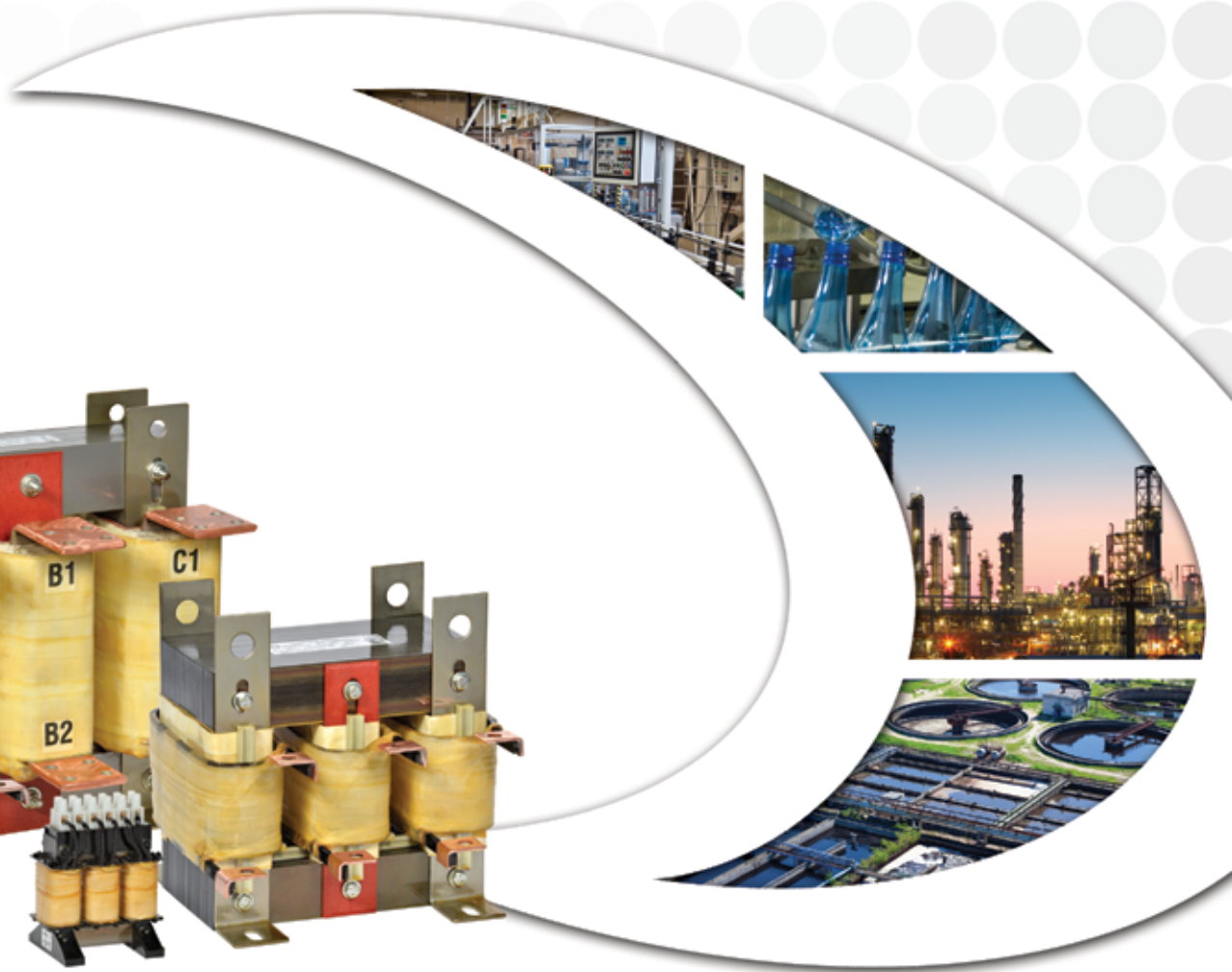
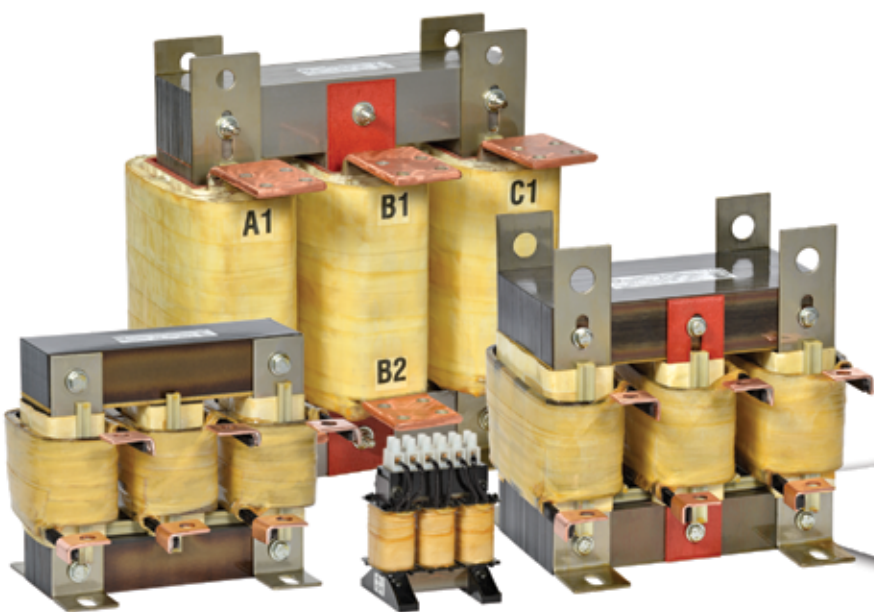
Figura A2: Dimensões do CFW500-HMIR em mm [in] e montagem em painel



WEG Drives & Controls - Automação LTDA.
Jaraguá do Sul - SC - Brazil
Phone 55 (47) 3276-4000 - Fax 55 (47) 3276-4020
São Paulo - SP - Brazil
Phone 55 (11) 5053-2300 - Fax 55 (11) 5052-4212
automacao@weg.net
www.weg.net



11770706



HPS Centurion[®] R Reactors

power to perform

HPS Centurion® R Line Reactor

HPS Centurion® R Reactor

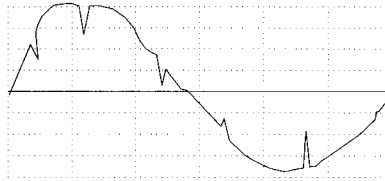
The new HPS Centurion® R reactor provides a unique blend of improved performance and reliability while reducing the product footprint. HPS Centurion® R reactors deliver protection for your motors and AC drives, while minimizing power system harmonics. They are available in standard ratings from 0.5 HP (373 Watts) to 1000 HP (746 kilowatts), up to 690 V and are fully compliant with UL, CSA, CE, IEC, and NEMA standards.

The efficient and cost effective HPS Centurion® R reactors are built to satisfy the power quality needs of demanding AC drive applications.

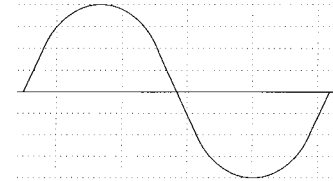


Why Choose a Reactor?

HPS reactors are designed to address line-side issues associated with variable frequency drives. They attenuate voltage and current transients that can cause nuisance tripping of a drive. Reactors also minimize harmonic current levels within the drive supply circuit. When used on the output side of IGBT-based, PWM-type AC drives, HPS reactors reduce the motor operating temperature and audible noise by moderating line transients seen by the motor. The use of HPS reactors enhances the overall system performance, life expectancy, and efficiency of the motor.



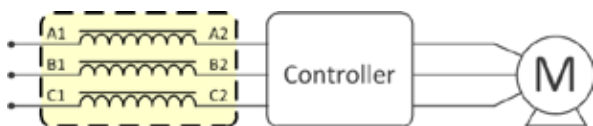
Voltage waveform illustrating line notching caused by the DC rectifier in typical AC drives



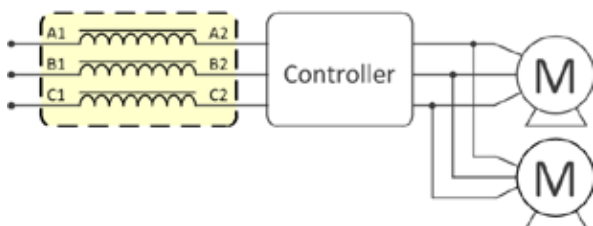
Ideal sine wave from the utility supply

Connection Diagram

(a) single motor

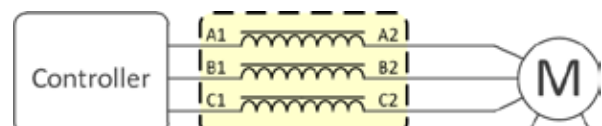


(b) multiple motors

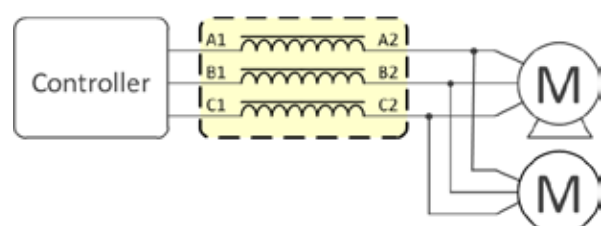


Input Side

(a) single motor



(b) multiple motors



Output Side

CONSTRUCTION

Assembly

- The impedance of the reactors is accurately controlled by maintaining the core gaps in the flux path.
- In some HP ranges, bobbins are used to provide exceptional mechanical strength and increase the product reliability.
- Every reactor is vacuum pressure impregnated (VPI) with VT (vinyl-toluene) Polyester Resin to minimize audible noise.

Terminations

- Finger-proof terminal blocks are provided on rated currents of approximately below 65 Amps.
- Terminal pads are supplied on approximately 65 Amps and above.
 - Terminal pads are brazed to ensure electrical integrity.

Mounting

- Core and Coil: Floor mounting available on all units. Wall and ceiling mounting available on units up to 200lbs.
- Enclosed: Floor mounting available on all units. Wall and ceiling mounting available on enclosure style N1, N2, CH2 and CH4 only.

SPECIFICATIONS

Power Rating:	0.5 to 1250 HP (0.37 - 932 kW)	
Impedance Rating:	1.5%, 3% and 5%	
System Frequency:	50/60 Hertz*	
System Voltage Ratings:	120 V, 208 V, 240 V, 480 V, 600 V and 690 V (de-rated) at 60 Hz	
	380 V, 525 V and 690 V at 50 Hz	
Altitude (de-rating):	Comply with NEMA ST20	
Inductance Tolerance:	+15/-10%	
Inductance Curve:	% Nominal Inductance	% Rated Current
	100	100
	95	110
	80	150
	50	200
Dielectric strength to ground:	4000 volts for 1 minute or equivalent	
Cooling Method:	Natural convection	
Insulation System:	- 70°C rise over average 50°C ambient for 130°C Temperature Class with Temperature Insulation Class up to 40A - 115°C rise over average 50°C ambient for 180°C and 220°C Temperature Classes with Temperature Insulation Classes on units larger than 40A	
Warranty:	10 year limited warranty	

* Impedance levels are for 60 Hz operation

specifications subject to change

Enclosures

- Type 1 standard (3R available; consult HPS for availability of enclosed units)
- Rugged steel enclosures with UL50 ANSI 61 grey paint
- Enclosure Kits are available separately allowing assembly in an approved facility.

Specials

- For special applications or for any features that you may require beyond the standard line listed, please contact our sales office.

BENEFITS

- Mitigate nuisance tripping
- Extend the life of switching components and motors
- Reduce audible motor noise and motor operating temperature
- Mitigate the effect of long lead length
- Minimize harmonic distortion
- Reduce line notching

APPLICATIONS



Oil & Gas



Irrigation Fields



Wastewater



Food Processing



HVAC



Pharmaceutical



Steel



Pulp & Paper



Automotive

COMPLIANCE & APPROVALS

HPS Centurion® R is certified to the following standards:

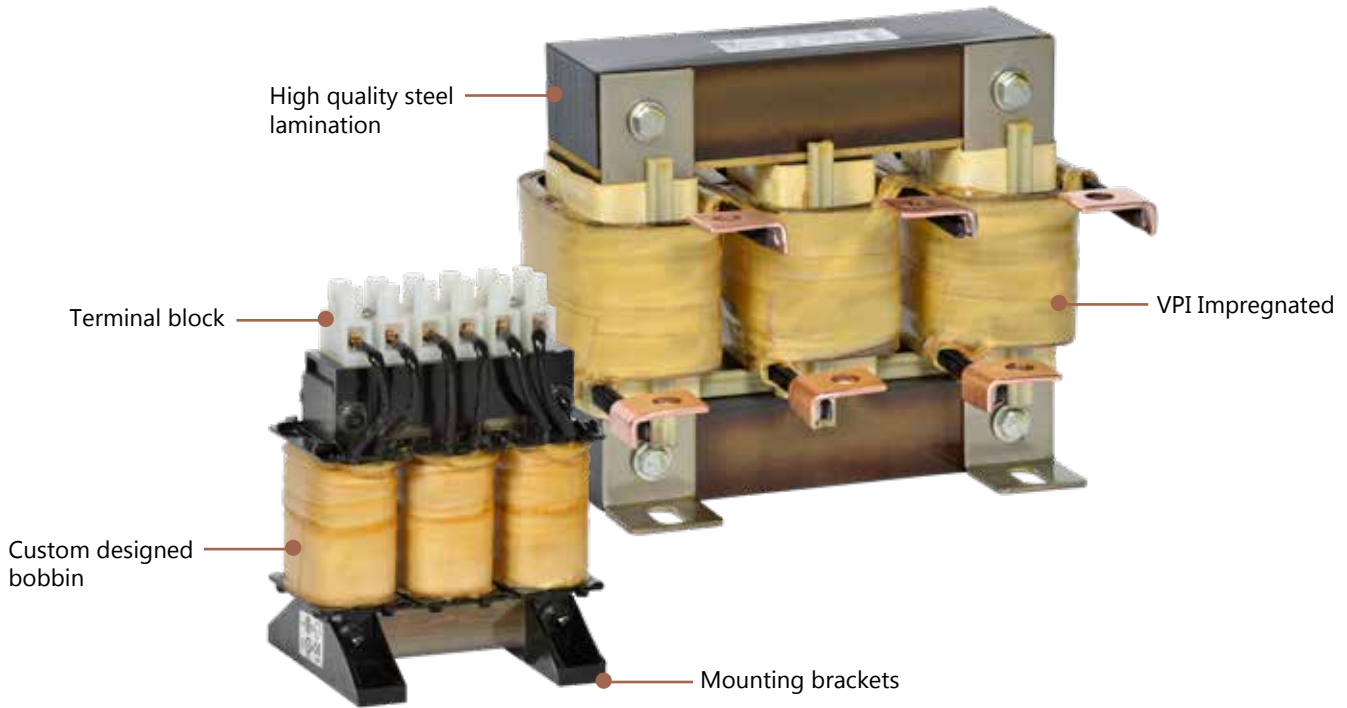
- UL 508
- CSA C9
- CSA C22.2 No. 47 standards
- CE Mark (IEC 61558-2-20:2000)
- UL Listed (up to 600 V), file No. E61431
- CSA Certified file No. LR3902
- IEC 61558-2-20



HPS Centurion® R

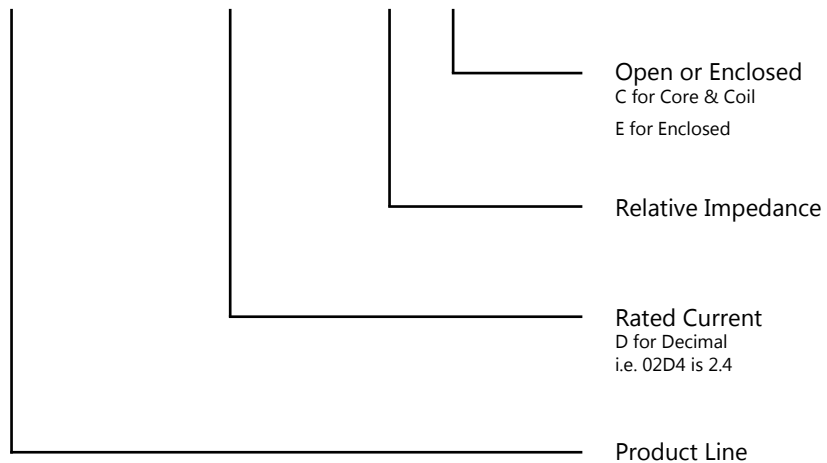
Line Reactor

HPS Centurion® R Features



HPS Centurion® R Part Number Guide

C	R	X	1	2	3	4	A	E
----------	----------	----------	----------	----------	----------	----------	----------	----------



HPS Centurion® R

Line Reactor

SELECTION TABLES Continued...

HP Rating (kW)	380 Volt - 50Hz					
	3% Impedance*			5% Impedance*		
	Amps	Core & Coil Part Num.	Enclosed Part Num.	Amps	Core & Coil Part Num.	Enclosed Part Num.
1 (0.75)	2.1	CRX02D1NC	CRX02D1NE	2.1	CRX02D1PC	CRX02D1PE
1.5 (1.1)	3.0	CRX0003NC	CRX0003NE	3.0	CRX0003PC	CRX0003PE
2 (1.5)	3.7	Consult Factory	Consult Factory	3.7	Consult Factory	Consult Factory
3	4.8	CRX04D8NC	CRX04D8NE	4.8	CRX04D8PC	CRX04D8PE
5	8.0	CRX0008NC	CRX0008NE	8.0	CRX0008PC	CRX0008PE
7.5	11.8	CRX11D8NC	CRX11D8NE	11.8	CRX11D8PC	CRX11D8PE
10	15.6	CRX15D6NC	CRX15D6NE	15.6	CRX15D6PC	CRX15D6PE
15	23.0	CRX0023NC	CRX0023NE	23.0	CRX0023PC	CRX0023PE
20	30.5	CRX30D5NC	CRX30D5NE	30.5	CRX30D5PC	CRX30D5PE
25	37.8	CRX37D8NC	CRX37D8NE	37.8	CRX37D8PC	CRX37D8PE
30	45.2	CRX45D2NC	CRX45D2NE	45.2	CRX45D2PC	CRX45D2PE
40	59.8	CRX59D8NC	CRX59D8NE	59.8	CRX59D8PC	CRX59D8PE
50	74.4	CRX74D4NC	CRX74D4NE	74.4	CRX74D4PC	CRX74D4PE
60	89.0	CRX0089NC	CRX0089NE	89.0	CRX0089PC	CRX0089PE
75	110.7	Consult Factory	Consult Factory	110.7	CRX0111PC	CRX0111PE
100	147.0	CRX0147NC	CRX0147NE	147	CRX0147PC	CRX0147PE
125	183.0	CRX0183NC	CRX0183NE	183	CRX0183PC	CRX0183PE
150	219.0	CRX0219NC	CRX0219NE	219	CRX0219PC	CRX0219PE
200	291.0	CRX0291NC	CRX0291NE	291	CRX0291PC	CRX0291PE

HP Rating	525 Volt - 50Hz					
	3% Impedance*			5% Impedance*		
	Amps	Core & Coil Part Num.	Enclosed Part Num.	Amps	Core & Coil Part Num.	Enclosed Part Num.
1	2.0	Consult Factory	Consult Factory	2.0	Consult Factory	Consult Factory
1.5	2.0	Consult Factory	Consult Factory	2.0	Consult Factory	Consult Factory
2	4.0	Consult Factory	Consult Factory	4.0	Consult Factory	Consult Factory
3	4.0	Consult Factory	Consult Factory	4.0	Consult Factory	Consult Factory
5	8.0	Consult Factory	Consult Factory	8.0	Consult Factory	Consult Factory
7.5	12.0	Consult Factory	Consult Factory	12.0	Consult Factory	Consult Factory
10	12.0	Consult Factory	Consult Factory	12.0	Consult Factory	Consult Factory
15	18.0	Consult Factory	Consult Factory	18.0	Consult Factory	Consult Factory
20	25.0	Consult Factory	Consult Factory	25.0	Consult Factory	Consult Factory
25	35.0	Consult Factory	Consult Factory	35.0	Consult Factory	Consult Factory
30	35.0	Consult Factory	Consult Factory	35.0	Consult Factory	Consult Factory
40	45.0	Consult Factory	Consult Factory	45.0	Consult Factory	Consult Factory
50	55.0	Consult Factory	Consult Factory	55.0	Consult Factory	Consult Factory
60	80.0	Consult Factory	Consult Factory	80.0	Consult Factory	Consult Factory
75	80.0	Consult Factory	Consult Factory	80.0	Consult Factory	Consult Factory
100	110.0	Consult Factory	Consult Factory	110.0	Consult Factory	Consult Factory
125	130.0	Consult Factory	Consult Factory	130.0	Consult Factory	Consult Factory
150	160.0	Consult Factory	Consult Factory	160.0	Consult Factory	Consult Factory
200	200.0	Consult Factory	Consult Factory	200.0	Consult Factory	Consult Factory

HP Rating	690 Volt - 50Hz					
	3% Impedance*			5% Impedance*		
	Amps	Core & Coil Part Num.	Enclosed Part Num.	Amps	Core & Coil Part Num.	Enclosed Part Num.
1	1.2	CRX01D2NC	CRX01D2NE	1.2	Consult Factory	Consult Factory
1.5	1.6	CRX01D6NC	CRX01D6NE	1.7	Consult Factory	Consult Factory
2	2.0	CRX0002NC	CRX0002NE	2.0	Consult Factory	Consult Factory
3	3.4	CRX03D4NC	CRX03D4NE	3.4	Consult Factory	Consult Factory
5	4.5	Consult Factory	Consult Factory	4.5	Consult Factory	Consult Factory
7.5	7.5	CRX07D5NC	CRX07D5NE	7.5	Consult Factory	Consult Factory
10	11.0	CRX0011NC	CRX0011NE	11.0	Consult Factory	Consult Factory
15	14.0	CRX0014NC	CRX0014NE	14.0	Consult Factory	Consult Factory
20	18.0	CRX0018NC	CRX0018NE	18.0	Consult Factory	Consult Factory
25	21.0	CRX0021NC	CRX0021NE	21.0	Consult Factory	Consult Factory
30	25.0	CRX0025NC	CRX0025NE	25.0	Consult Factory	Consult Factory
40	33.0	CRX0033NC	CRX0033NE	33.0	Consult Factory	Consult Factory
50	45.0	CRX0045NC	CRX0045NE	45.0	Consult Factory	Consult Factory
60	55.0	CRX0055NC	CRX0055NE	55.0	Consult Factory	Consult Factory
75	65.0	CRX0065NC	CRX0065NE	65.0	Consult Factory	Consult Factory
100	80.0	CRX0080NC	CRX0080NE	80.0	Consult Factory	Consult Factory
125	96.0	CRX0096NC	CRX0096NE	100.0	Consult Factory	Consult Factory
150	130.0	CRX0130NC	CRX0130NE	130.0	Consult Factory	Consult Factory
200	160.0	CRX0160NC	CRX0160NE	160.0	Consult Factory	Consult Factory

All dimensions in inches
Refer to page 18 for drawings

60 Hz

RMS Amp	Core & Coil	Inductance (mH)	Watts Loss	Width	Depth	Height	Mtg. Width	Mtg. Depth	Mtg. Slot w x d	Diagram Figure	Termination Style Ref.	Frame Size	Enclosure Kit (Optional for Field Install)	Weight (lb)
75	CRX0075AC	0.12	70	7.25	5.88	5.63	4.8	3.27	0.38 x 0.50	3	4	3A	CREN2	17
	CRX0075BC	0.19	95	7.25	5.88	5.63	4.8	3.27	0.38 x 0.50	3	4	3A	CREN2	18
	CRX0075CC	0.22	85	7.25	5.88	5.63	4.8	3.27	0.38 x 0.50	3	4	3A	CREN2	18
	CRX0075DC	0.29	105	7.25	6	5.63	4.8	3.77	0.38 x 0.50	3	4	3C	CREN2	21
77	CRX0077AC	0.29	105	7.25	6	5.63	4.8	3.77	0.38 x 0.50	3	4	3C	CREN2	21
	CRX0077BC	0.36	110	7.25	6	5.63	4.8	3.77	0.38 x 0.50	3	4	3C	CREN2	25
	CRX0077CC	0.6	216	9.25	6.25	7	6	3.7	0.44 x 1.0	3	4	3E	CREN2	30
	CRX0077DC	0.49	160	7.25	6	5.63	4.8	3.77	0.38 x 0.50	3	4	3C	CREN2	24
88	CRX0088AC	0.12	70	7.25	5.88	5.63	4.8	3.27	0.38 x 0.50	3	4	3A	CREN2	17
	CRX0088BC	0.12	70	7.25	5.88	5.63	4.8	3.27	0.38 x 0.50	3	4	3A	CREN2	17
	CRX0088CC	0.19	95	7.25	5.88	5.63	4.8	3.27	0.38 x 0.50	3	4	3A	CREN2	18
	CRX0088DC	0.24	120	7.25	6	5.63	4.8	3.77	0.38 x 0.50	3	4	3C	CREN2	24
96	CRX0096AC	0.24	120	7.25	6	5.63	4.8	3.77	0.38 x 0.50	3	4	3C	CREN2	24
	CRX0096BC	0.39	170	9.25	8.25	7	6	5.7	0.44 x 1.0	3	4	3N	CREN2	49
99	CRX0099AC	0.28	125	7.25	6	5.63	4.8	3.77	0.38 x 0.50	3	4	3C	CREN2	26
	CRX0099BC	0.48	210	9.25	8	7	6	5.45	0.44 x 1.0	3	4	3L	CREN2	48
114	CRX0114AC	0.09	70	7.25	6	5.63	4.8	3.27	0.38 x 0.50	3	5	3B	CREN2	18
	CRX0114BC	0.11	140	9.25	6.75	7	6	3.83	0.44 x 1.0	3	5	3F	CREN2	28
	CRX0114CC	0.14	110	9.25	7.25	7	6	4.33	0.44 x 1.0	3	5	3J	CREN2	33
	CRX0114DC	0.19	190	10.8	8.25	10	7.2	5.21	0.44 x 1.0	4	5	4A	CRECH2	52
124	CRX0124AC	0.19	190	10.8	8.25	10	7.2	5.21	0.44 x 1.0	4	5	4A	CRECH2	52
	CRX0124BC	0.3	185	9.25	8.63	7	6	5.2	0.44 x 1.0	3	5	3Q	CREN2	48
125	CRX0125AC	0.23	160	9.25	7.63	7	6	4.7	0.44 x 1.0	3	5	3K	CREN2	41
	CRX0125BC	0.38	250	10.8	9.13	10	7.2	6.08	0.44 x 1.0	4	5	4C	CRECH2	67
143	CRX0143AC	0.07	88	7.25	6	5.63	4.8	3.27	0.38 x 0.50	3	5	3B	CREN2	20
	CRX0143BC	0.1	130	9.25	7	7	6	3.95	0.44 x 1.0	3	5	3H	CREN2	34
	CRX0143CC	0.11	140	9.25	6.75	7	6	3.83	0.44 x 1.0	3	5	3F	CREN2	28
	CRX0143DC	0.11	140	9.25	6.75	7	6	3.83	0.44 x 1.0	3	5	3F	CREN2	28
144	CRX0144AC	0.19	190	10.8	8.25	10	7.2	5.21	0.44 x 1.0	4	5	4A	CRECH2	52
	CRX0144BC	0.35	240	10.8	9.5	10	7.2	6.33	0.44 x 1.0	4	5	4D	CRECH4	74
156	CRX0156AC	0.15	210	9.25	7	7	6	4.08	0.44 x 1.0	3	5	3G	CREN2	32
	CRX0156BC	0.24	260	9.25	8.63	7	6	5.7	0.44 x 1.0	3	5	3R	CRECH2	52
170	CRX0170AC	0.06	100	7.25	6.25	5.63	4.8	3.77	0.38 x 0.50	3	5	3D	CREN2	23
	CRX0170BC	0.06	100	7.25	6.25	5.63	4.8	3.77	0.38 x 0.50	3	5	3D	CREN2	23
	CRX0170CC	0.1	130	9.25	7	7	6	3.95	0.44 x 1.0	3	5	3H	CREN2	34
	CRX0170DC	0.1	130	9.25	7	7	6	3.95	0.44 x 1.0	3	5	3H	CREN2	34
180	CRX0180AC	0.13	180	9.25	8.88	7	6	5.95	0.44 x 1.0	3	5	3S	CRECH2	54
	CRX0180BC	0.21	250	10.8	8.38	10	7.2	5.33	0.44 x 1.0	4	5	4B	CRECH2	63
192	CRX0192AC	0.15	200	9.25	8.25	7	6	5.45	0.44 x 1.0	3	5	3P	CRECH2	53
	CRX0192BC	0.25	325	10.8	10.5	10	7.2	7.33	0.44 x 1.0	4	5	4E	CRECH2	90
200	CRX0200CC	0.11	195	9.25	7.63	7	6	4.7	0.44 x 1.0	3	5	3K	CRECH2	44
211	CRX0211AC	0.05	125	7.25	6.25	5.63	4.80	3.77	0.38 x 0.50	3	5	3D	CREN2	24
	CRX0211BC	0.05	125	7.25	6.25	5.63	4.80	3.77	0.38 x 0.50	3	5	3D	CREN2	24
	CRX0211CC	0.08	180	9.25	7.63	7.00	6.00	4.70	0.44 x 1.0	3	5	3K	CRECH2	39
	CRX0211DC	0.10	225	11.05	8.25	10.00	7.20	5.21	0.44 x 1.0	4	5	4G	CRECH2	58
240	CRX0240AC	0.10	225	11.05	8.25	10.00	7.20	5.21	0.44 x 1.0	4	5	4G	CRECH2	58
	CRX0240BC	0.16	435	13.75	11.63	12.50	9.00	8.70	0.44 x 1.0	4	5	4V	CRECH4	155
242	CRX0242AC	0.12	275	11.05	8.25	10.00	7.20	5.08	0.44 x 1.0	4	5	4F	CRECH2	59
	CRX0242BC	0.20	360	11.05	9.50	10.00	7.20	6.46	0.44 x 1.0	4	5	4M	CRECH4	87
273	CRX0273AC	0.04	130	9.25	8.13	7.00	6.00	5.20	0.44 x 1.0	3	5	3M	CRECH2	43
	CRX0273BC	0.04	130	9.25	8.13	7.00	6.00	5.20	0.44 x 1.0	3	5	3M	CRECH2	43
	CRX0273CC	0.06	200	11.05	9.13	10.00	7.20	6.08	0.44 x 1.0	4	5	4L	CRECH4	67
	CRX0273DC	0.08	310	13.75	9.00	12.50	9.00	6.05	0.44 x 1.0	4	5	4M	CRECH4	84

50 Hz

RMS Amp	Core & Coil	Inductance (mH)	Watts Loss	Width	Depth	Height	Mtg. Width	Mtg. Depth	Mtg. Slot w x d	Diagram Figure	Termination Style Ref.	Frame Size	Enclosure Kit (Optional for Field Install)	Weight (lb)
1.2	CRX01D2NC	33.94	15	4.13	2.29	5.13	2.81	1.79	0.28 x 0.38	1	1	1A	CREN1	2.5
1.6	CRX01D6NC	23.55	12	4.13	2.29	5.13	2.81	1.79	0.28 x 0.38	1	1	1A	CREN1	2.5
2	CRX0002NC	17.83	21	4.13	2.29	5.13	2.81	1.79	0.28 x 0.38	1	1	1A	CREN1	3
2.1	CRX02D1NC	10.61	19	4.13	2.29	5.13	2.81	1.79	0.28 x 0.38	1	1	1A	CREN1	2.5
	CRX02D1PC	17.83	21	4.13	2.29	5.13	2.81	1.79	0.28 x 0.38	1	1	1A	CREN1	3
3	CRX0003NC	7.058	22	4.13	2.29	5.13	2.81	1.79	0.28 x 0.38	1	1	1A	CREN1	3
	CRX0003PC	10.61	35	4.13	2.29	5.13	2.81	1.79	0.28 x 0.38	1	1	1A	CREN1	3
3.4	CRX03D4NC	10.61	35	4.13	2.29	5.13	2.81	1.79	0.28 x 0.38	1	1	1A	CREN1	3
3.7	Consult Factory													
4.5	Consult Factory													
4.8	CRX04D8NC	4.7	22	4.13	2.29	5.13	2.81	1.79	0.28 x 0.38	1	1	1A	CREN1	3
	CRX04D8PC	7.784	35	4.13	3.51	5.13	2.87	2.63	0.28 x 0.38	1	1	1B	CREN1	4.5
7.5	CRX07D5NC	5.09	40	6.5	5	6.13	4.38	4	0.28 x 0.38	1	2	1D	CREN1	11
8	CRX0008NC	2.569	36	4.13	3.51	5.38	2.87	2.63	0.28 x 0.38	1	2	1C	CREN1	5
	CRX0008PC	4.67	29	4.13	2.29	5.13	2.81	1.79	0.28 x 0.38	1	1	1A	CREN1	3
11	CRX0011NC	3.4	39	6.5	5	6.13	4.38	4	0.28 x 0.38	1	2	1D	CREN1	11
11.8	CRX11D8NC	1.66	51	6.5	5	6.13	4.38	4	0.28 x 0.38	1	2	1D	CREN1	10.5
	CRX11D8PC	2.73	57	6.5	5	6.13	4.38	4	0.28 x 0.38	1	2	1D	CREN1	11.5
14	CRX0014NC	2.73	57	6.5	5	6.13	4.38	4	0.28 x 0.38	1	2	1D	CREN1	11.5
15.6	CRX15D6NC	1.284	51	6.5	5	6.13	4.38	4	0.28 x 0.38	1	2	1D	CREN1	11
	CRX15D6PC	2.14	77	6.5	5	6.13	4.38	4	0.28 x 0.38	1	2	1D	CREN1	12
18	CRX0018NC	2.14	77	6.5	5	6.13	4.38	4	0.28 x 0.38	1	2	1D	CREN1	12
21	CRX0021NC	2.14	77	6.5	5	6.13	4.38	4	0.28 x 0.38	1	2	1D	CREN1	12
23	CRX0023NC	1.061	57	6.5	5	6.13	4.38	4	0.28 x 0.38	1	3	1D	CREN1	11.5
	CRX0023PC	1.433	80	7.12	4.69	6.38	4.8	3.27	0.38 x 0.50	2	3	2A	CREN2	12.5
25	CRX0025NC	1.769	93	7.12	4.69	6.38	4.8	3.27	0.38 x 0.50	2	3	2A	CREN2	11.5
30.5	CRX30D5NC	0.677	80	6.5	5	6.13	4.38	4	0.28 x 0.38	1	3	1D	CREN1	12.5
	CRX30D5PC	1.128	115	7.12	5.19	6.38	4.8	3.77	0.38 x 0.50	2	3	2B	CREN2	12
33	CRX0033NC	1.128	115	7.12	5.19	6.38	4.8	3.77	0.38 x 0.50	2	3	2B	CREN2	12
37.8	CRX37D8NC	0.546	68	6.5	5	6.13	4.38	4	0.28 x 0.38	1	3	1D	CREN1	12
	CRX37D8PC	0.942	105	7.12	4.69	6.38	4.8	3.27	0.38 x 0.50	2	3	2A	CREN2	12.5
45.2	CRX45D2NC	0.445	130	7.12	4.69	6.38	4.8	3.27	0.38 x 0.50	2	3	2A	CREN2	19
	CRX45D2PC	0.742	170	7.12	5.19	6.38	4.8	3.77	0.38 x 0.50	2	3	2B	CREN2	25
45	CRX0045NC	0.905	130	7.12	5.19	6.38	4.8	3.77	0.38 x 0.50	2	3	2B	CREN2	25
55	CRX0055NC	0.742	170	7.12	5.19	6.38	4.8	3.77	0.38 x 0.50	2	3	2B	CREN2	25
59.8	CRX59D8NC	0.357	110	7.25	6	5.63	4.8	3.77	0.38 x 0.50	3	4	3C	CREN2	25
	CRX59D8PC	0.595	216	9.25	6.25	7	6	3.7	0.44 x 1.0	3	4	3E	CREN2	30
65	CRX0065NC	0.595	216	9.25	6.25	7	6	3.7	0.44 x 1.0	3	4	3E	CREN2	30
74.4	CRX74D4NC	0.285	105	7.25	6	5.63	4.8	3.77	0.38 x 0.50	3	4	3C	CREN2	21
	CRX74D4PC	0.49	160	7.25	6	5.63	4.8	3.77	0.38 x 0.50	3	4	3C	CREN2	24
80	CRX0080NC	0.475	210	9.25	8	7	6	5.45	0.44 x 1.0	3	4	3L	CREN2	48
89	CRX0089NC	0.235	120	7.25	6	5.63	4.8	3.77	0.38 x 0.50	3	4	3C	CREN2	24
	CRX0089PC	0.392	170	9.25	8.25	7	6	5.7	0.44 x 1.0	3	4	3N	CREN2	49
96	CRX0096NC	0.392	170	9.25	8.25	7	6	5.7	0.44 x 1.0	3	4	3N	CREN2	49
111	Consult Factory													
	CRX0111PC	0.295	185	9.25	8.63	7	6	5.2	0.44 x 1.0	3	5	3Q	CREN2	48
130	CRX0130NC	0.3475	240	10.8	9.5	10	7.2	6.33	0.44 x 1.0	4	5	4D	CRECH4	74
147	CRX0147NC	0.145	210	9.25	7	7	6	4.08	0.44 x 1.0	3	5	3G	CREN2	32
	CRX0147PC	0.242	260	9.25	8.63	7	6	5.7	0.44 x 1.0	3	5	3R	CRECH2	32
160	CRX0160NC	0.242	260	9.25	8.63	7	6	5.7	0.44 x 1.0	3	5	3R	CRECH2	32

HPS Centurion® R

Line Reactor

Open Core & Coil Specification Charts Continued

50 Hz

RMS Amp	Core & Coil	Inductance (mH)	Watts Loss	Width	Depth	Height	Mtg. Width	Mtg. Depth	Mtg. Slot w x d	Diagram Figure	Termination Style Ref.	Frame Size	Enclosure Kit (Optional for Field Install)	Weight (lb)
183	CRX0183NC	0.1255	180	9.25	8.88	7	6	5.95	0.44 x 1.0	3	5	3S	CRECH2	54
	CRX0183PC	0.195	360	11.05	9.5	10	7.2	6.46	0.44 x 1.0	4	5	4M	CRECH4	87
219	CRX0219NC	0.096	225	11.05	8.25	10	7.2	5.21	0.44 x 1.0	4	5	4G	CRECH2	58
	CRX0219PC	0.16	435	13.75	11.63	12.5	9	8.7	0.44 x 1.0	4	5	4V	CRECH4	155
291	CRX0291NC	0.0795	310	13.75	9	12.5	9	6.05	0.44 x 1.0	4	5	4M	CRECH4	84
	CRX0291PC	0.123	580	13.75	11.5	14.5	9	8.67	0.44 x 1.0	4	5	4AB	CRECH5	180

Enclosed Specification Charts

60 Hz

RMS Amp	Enclosed	Inductance (mH)	Watts Loss	Width	Depth	Height	Mtg. Width	Mtg. Depth	Mtg. Slot w x d	Enclosure Style	Termination Style Ref.	Weight (lb)
1	CRX0001AE	27.20	21	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
	CRX0001BE	47.09	12	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
1.1	CRX01D1AE	20.36	12	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
	CRX01D1BE	33.94	15	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
1.4	CRX01D4AE	20.36	12	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
	CRX01D4BE	33.94	15	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
1.6	CRX01D6AE	14.91	15	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
	CRX01D6BE	23.55	12	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
1.8	CRX01D8AE	14.91	15	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
	CRX01D8BE	27.20	21	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
2	CRX0002CE	20.00	15	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
2.1	CRX02D1AE	10.61	19	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
	CRX02D1BE	17.83	21	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
2.4	CRX02D4AE	4.67	29	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
	CRX02D4BE	4.08	9	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
	CRX02D4CE	7.06	22	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
	CRX02D4DE	7.06	22	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
2.6	CRX02D6AE	10.61	35	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
	CRX02D6BE	17.83	21	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
2.7	CRX02D7AE	10.61	19	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
	CRX02D7BE	17.83	21	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
3	CRX0003AE	7.06	22	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
	CRX0003BE	10.61	35	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
3.4	CRX03D4AE	7.06	22	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
	CRX03D4BE	10.61	35	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
3.5	CRX03D5AE	2.80	15	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
	CRX03D5BE	3.55	18	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
	CRX03D5CE	5.09	40	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	16.00
	CRX03D5DE	4.67	29	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
3.9	CRX03D9AE	7.06	22	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
	CRX03D9BE	10.61	35	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
4	CRX0004CE	9.10	26	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
4.6	CRX04D6AE	2.13	15	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
	CRX04D6BE	2.13	15	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
	CRX04D6CE	3.55	18	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
	CRX04D6DE	4.67	29	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
4.8	CRX04D8AE	4.70	22	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
	CRX04D8BE	7.78	35	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	9.50
6.1	CRX06D1AE	4.67	29	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
	CRX06D1BE	7.78	35	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	9.50
6.6	CRX06D6AE	1.48	18	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
	CRX06D6BE	1.48	18	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
	CRX06D6CE	2.33	24	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
	CRX06D6DE	3.06	31	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	9.50
7.5	CRX07D5AE	1.31	18	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	7.50
	CRX07D5BE	1.53	25	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	9.50
	CRX07D5CE	2.33	24	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
	CRX07D5DE	2.33	24	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	8.00
7.6	CRX07D6AE	3.06	31	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	9.50
	CRX07D6BE	5.09	40	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	16.00
8	CRX0008CE	7.50	39	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	17.00
9	CRX0009AE	3.06	31	10.00	8.00	8.13	7.00	6.50	0.188	N1	1	9.50
	CRX0009BE	5.09	40	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	16.00
10.7	CRX10D7AE	0.95	30	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	9.50
	CRX10D7BE	0.95	30	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	9.50
	CRX10D7CE	1.64	37	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	9.50
	CRX10D7DE	1.53	25	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	9.50

HPS Centurion® R

Line Reactor

Enclosed Specification Charts Continued

60 Hz

RMS Amp	Enclosed	Inductance (mH)	Watts Loss	Width	Depth	Height	Mtg. Width	Mtg. Depth	Mtg. Slot w x d	Enclosure Style	Termination Style Ref.	Weight (lb)
11	CRX0011AE	2.57	36	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	10.00
	CRX0011BE	2.10	31	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	9.50
	CRX0011CE	3.40	39	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	16.00
	CRX0011DE	4.28	45	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	16.00
12	CRX0012CE	4.20	52	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	17.00
14	CRX0014AE	1.64	37	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	9.50
	CRX0014BE	2.73	57	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	16.50
16.7	CRX16D7AE	0.59	30	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	9.50
	CRX16D7BE	0.59	30	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	9.50
	CRX16D7CE	1.06	57	10.00	8.00	8.13	7.00	6.50	0.188	N1	3	16.50
	CRX16D7DE	0.95	30	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	9.50
17	CRX0017AE	1.66	51	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	15.50
	CRX0017BE	2.73	57	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	16.50
21	CRX0021AE	1.06	57	10.00	8.00	8.13	7.00	6.50	0.188	N1	3	16.50
	CRX0021BE	1.80	57	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	16.50
22	CRX0022AE	1.28	51	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	16.00
	CRX0022BE	2.14	77	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	17.00
24	CRX0024AE	0.41	35	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	9.50
	CRX0024BE	0.55	68	10.00	8.00	8.13	7.00	6.50	0.188	N1	3	17.00
	CRX0024CE	0.68	47	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	16.00
	CRX0024DE	0.86	60	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	15.50
27	CRX0027AE	1.06	57	10.00	8.00	8.13	7.00	6.50	0.188	N1	3	16.50
	CRX0027BE	0.86	60	10.00	8.00	8.13	7.00	6.50	0.188	N1	2	15.50
	CRX0027CE	1.40	57	10.00	8.00	8.13	7.00	6.50	0.188	N1	3	17.50
	CRX0027DE	1.77	93	14.00	14.00	12.13	10.00	10.50	0.188	N2	3	21.50
31	CRX0031AE	0.32	31	10.00	8.00	8.13	7.00	6.50	0.188	N1	3	15.50
	CRX0031BE	0.32	31	10.00	8.00	8.13	7.00	6.50	0.188	N1	3	15.50
	CRX0031CE	0.55	68	10.00	8.00	8.13	7.00	6.50	0.188	N1	3	17.00
	CRX0031DE	0.68	80	10.00	8.00	8.13	7.00	6.50	0.188	N1	3	17.50
32	CRX0032AE	0.88	68	10.00	8.00	8.13	7.00	6.50	0.188	N1	3	17.00
	CRX0032BE	1.43	80	14.00	14.00	12.13	10.00	10.50	0.188	N2	3	22.50
34	CRX0034AE	0.68	80	10.00	8.00	8.13	7.00	6.50	0.188	N1	3	17.50
	CRX0034BE	1.13	115	14.00	14.00	12.13	10.00	10.50	0.188	N2	3	22.00
35	CRX0035CE	1.70	93	14.00	14.00	12.13	10.00	10.50	0.188	N2	3	34.00
40	CRX0040AE	0.55	68	10.00	8.00	8.13	7.00	6.50	0.188	N1	3	17.00
	CRX0040BE	0.94	105	14.00	14.00	12.13	10.00	10.50	0.188	N2	3	22.50
41	CRX0041AE	0.68	80	10.00	8.00	8.13	7.00	6.50	0.188	N1	3	17.50
	CRX0041BE	1.13	115	14.00	14.00	12.13	10.00	10.50	0.188	N2	3	22.00
45	CRX0045CE	1.20	140	14.00	14.00	12.13	10.00	10.50	0.188	N2	3	34.00
46	CRX0046AE	0.21	40	10.00	8.00	8.13	7.00	6.50	0.188	N1	3	16.00
	CRX0046BE	0.21	40	10.00	8.00	8.13	7.00	6.50	0.188	N1	3	16.00
	CRX0046CE	0.36	60	10.00	8.00	8.13	7.00	6.50	0.188	N1	3	16.50
	CRX0046DE	0.45	130	14.00	14.00	12.13	10.00	10.50	0.188	N2	3	29.00
52	CRX0052AE	0.50	70	14.00	14.00	12.13	10.00	10.50	0.188	N2	3	25.00
	CRX0052BE	0.43	85	14.00	14.00	12.13	10.00	10.50	0.188	N2	3	27.00
	CRX0052CE	0.91	130	14.00	14.00	12.13	10.00	10.50	0.188	N2	3	35.00
	CRX0052DE	0.74	170	14.00	14.00	12.13	10.00	10.50	0.188	N2	3	35.00
59	CRX0059AE	0.17	55	10.00	8.00	8.13	7.00	6.50	0.188	N1	3	16.50
	CRX0059BE	0.22	85	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	28.00
	CRX0059CE	0.30	75	14.00	14.00	12.13	10.00	10.50	0.188	N2	3	26.00
	CRX0059DE	0.36	110	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	35.00
62	CRX0062AE	0.45	130	14.00	14.00	12.13	10.00	10.50	0.188	N2	3	29.00
	CRX0062BE	0.74	170	14.00	14.00	12.13	10.00	10.50	0.188	N2	3	35.00
65	CRX0065AE	0.34	110	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	35.00
	CRX0065BE	0.57	120	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	35.00

60 Hz

RMS Amp	Enclosed	Inductance (mH)	Watts Loss	Width	Depth	Height	Mtg. Width	Mtg. Depth	Mtg. Slot w x d	Enclosure Style	Termination Style Ref.	Weight (lb)
75	CRX0075AE	0.12	70	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	27.00
	CRX0075BE	0.19	95	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	28.00
	CRX0075CE	0.22	85	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	28.00
	CRX0075DE	0.29	105	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	31.00
77	CRX0077AE	0.29	105	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	31.00
	CRX0077BE	0.36	110	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	35.00
	CRX0077CE	0.60	216	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	40.00
	CRX0077DE	0.49	160	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	34.00
88	CRX0088AE	0.12	70	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	27.00
	CRX0088BE	0.12	70	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	27.00
	CRX0088CE	0.19	95	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	28.00
	CRX0088DE	0.24	120	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	34.00
96	CRX0096AE	0.24	120	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	34.00
	CRX0096BE	0.39	170	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	59.00
99	CRX0099AE	0.28	125	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	36.00
	CRX0099BE	0.48	210	14.00	14.00	12.13	10.00	10.50	0.188	N2	4	58.00
114	CRX0114AE	0.09	70	14.00	14.00	12.13	10.00	10.50	0.188	N2	5	28.00
	CRX0114BE	0.11	140	14.00	14.00	12.13	10.00	10.50	0.188	N2	5	38.00
	CRX0114CE	0.14	110	14.00	14.00	12.13	10.00	10.50	0.188	N2	5	43.00
	CRX0114DE	0.19	190	23.50	16.50	17.90	22.40	6.50	0.56	CH2	5	83.00
124	CRX0124AE	0.19	190	23.50	16.50	17.90	22.40	6.50	0.56	CH2	5	83.00
	CRX0124BE	0.30	185	14.00	14.00	12.13	10.00	10.50	0.188	N2	5	58.00
125	CRX0125AE	0.23	160	14.00	14.00	12.13	10.00	10.50	0.188	N2	5	51.00
	CRX0125BE	0.38	250	23.50	16.50	17.90	22.40	6.50	0.56	CH2	5	98.00
143	CRX0143AE	0.07	88	14.00	14.00	12.13	10.00	10.50	0.188	N2	5	30.00
	CRX0143BE	0.10	130	14.00	14.00	12.13	10.00	10.50	0.188	N2	5	44.00
	CRX0143CE	0.11	140	14.00	14.00	12.13	10.00	10.50	0.188	N2	5	38.00
	CRX0143DE	0.11	140	14.00	14.00	12.13	10.00	10.50	0.188	N2	5	38.00
144	CRX0144AE	0.19	190	23.50	16.50	17.90	22.40	6.50	0.56	CH2	5	83.00
	CRX0144BE	0.35	240	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	114.00
156	CRX0156AE	0.15	210	14.00	14.00	12.13	10.00	10.50	0.188	N2	5	42.00
	CRX0156BE	0.24	260	23.50	16.50	17.90	22.40	6.50	0.56	CH2	5	63.00
170	CRX0170AE	0.06	100	14.00	14.00	12.13	10.00	10.50	0.188	N2	5	33.00
	CRX0170BE	0.06	100	14.00	14.00	12.13	10.00	10.50	0.188	N2	5	33.00
	CRX0170CE	0.10	130	14.00	14.00	12.13	10.00	10.50	0.188	N2	5	44.00
	CRX0170DE	0.10	130	14.00	14.00	12.13	10.00	10.50	0.188	N2	5	44.00
180	CRX0180AE	0.13	180	23.50	16.50	17.90	22.40	6.50	0.56	CH2	5	85.00
	CRX0180BE	0.21	250	23.50	16.50	17.90	22.40	6.50	0.56	CH2	5	94.00
192	CRX0192AE	0.15	200	23.50	16.50	17.90	22.40	6.50	0.56	CH2	5	84.00
	CRX0192BE	0.25	325	23.50	16.50	17.90	22.40	6.50	0.56	CH2	5	121.00
200	CRX0200CE	0.11	195	23.50	16.50	17.90	22.40	6.50	0.56	CH2	5	75.00
211	CRX0211AE	0.05	125	14.00	14.00	12.13	10.00	10.50	0.188	N2	5	34.00
	CRX0211BE	0.05	125	14.00	14.00	12.13	10.00	10.50	0.188	N2	5	34.00
	CRX0211CE	0.08	180	23.50	16.50	17.90	22.40	6.50	0.56	CH2	5	70.00
	CRX0211DE	0.10	225	23.50	16.50	17.90	22.40	6.50	0.56	CH2	5	89.00
240	CRX0240AE	0.10	225	23.50	16.50	17.90	22.40	6.50	0.56	CH2	5	89.00
	CRX0240BE	0.16	435	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	195.00
242	CRX0242AE	0.12	275	23.50	16.50	17.90	22.40	6.50	0.56	CH2	5	90.00
	CRX0242BE	0.20	360	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	127.00
273	CRX0273AE	0.04	130	23.50	16.50	17.90	22.40	6.50	0.56	CH2	5	74.00
	CRX0273BE	0.04	130	23.50	16.50	17.90	22.40	6.50	0.56	CH2	5	74.00
	CRX0273CE	0.06	200	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	107.00
	CRX0273DE	0.08	310	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	124.00

HPS Centurion® R

Line Reactor

Enclosed Specification Charts Continued

60 Hz

RMS Amp	Enclosed	Inductance (mH)	Watts Loss	Width	Depth	Height	Mtg. Width	Mtg. Depth	Mtg. Slot w x d	Enclosure Style	Termination Style Ref.	Weight (lb)
289	CRX0289AE	0.10	290	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	115.00
	CRX0289BE	0.16	435	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	195.00
302	CRX0302AE	0.08	310	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	124.00
	CRX0302BE	0.13	475	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	211.00
336	CRX0336AE	0.08	360	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	150.00
	CRX0336BE	0.13	475	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	211.00
343	CRX0343AE	0.03	200	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	97.00
	CRX0343BE	0.03	200	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	97.00
	CRX0343CE	0.05	230	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	106.00
	CRX0343DE	0.06	325	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	135.00
361	CRX0361AE	0.06	325	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	135.00
	CRX0361BE	0.10	445	28.10	21.30	28.90	27.00	6.50	0.56	CH5	5	203.00
382	CRX0382AE	0.07	435	28.10	21.30	28.90	27.00	6.50	0.56	CH5	5	172.00
	CRX0382BE	0.12	580	28.10	21.30	28.90	27.00	6.50	0.56	CH5	5	236.00
396	CRX0396AE	0.03	200	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	97.00
	CRX0396BE	0.03	200	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	97.00
	CRX0396CE	0.04	300	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	132.00
	CRX0396DE	0.04	300	26.10	20.50	25.90	25.00	6.50	0.56	CH4	5	132.00
412	CRX0412AE	0.07	435	28.10	21.30	28.90	27.00	6.50	0.56	CH5	5	172.00
	CRX0412BE	0.11	550	28.10	21.30	28.90	27.00	6.50	0.56	CH5	5	202.00
414	CRX0414AE	0.06	400	28.10	21.30	28.90	27.00	6.50	0.56	CH5	5	181.00
	CRX0414BE	0.08	505	28.10	21.30	28.90	27.00	6.50	0.56	CH5	5	199.00
472	CRX0472AE	0.06	400	28.10	21.30	28.90	27.00	6.50	0.56	CH5	5	181.00
	CRX0472BE	0.10	560	28.10	21.30	28.90	27.00	6.50	0.56	CH5	5	227.00
477	CRX0477AE	0.05	420	33.50	23.00	31.20	32.50	9.00	0.56	CH6	6	231.00
	CRX0477BE	0.08	600	33.50	23.00	31.20	32.50	9.00	0.56	CH6	6	306.00
515	CRX0515AE	0.05	420	33.50	23.00	31.20	32.50	9.00	0.56	CH6	6	231.00
	CRX0515BE	0.08	600	33.50	23.00	31.20	32.50	9.00	0.56	CH6	6	306.00
528	CRX0528AE	0.02	220	28.10	21.30	28.90	27.00	6.50	0.56	CH5	6	130.00
	CRX0528BE	0.02	220	28.10	21.30	28.90	27.00	6.50	0.56	CH5	6	130.00
	CRX0528CE	0.03	355	28.10	21.30	28.90	27.00	6.50	0.56	CH5	6	158.00
	CRX0528DE	0.04	495	28.10	21.30	28.90	27.00	6.50	0.56	CH5	6	189.00
590	CRX0590AE	0.04	495	28.10	21.30	28.90	27.00	6.50	0.56	CH5	6	189.00
	CRX0590BE	0.06	680	33.50	23.00	31.20	32.50	9.00	0.56	CH6	6	306.00
600	CRX0600CE	0.046	525	33.5	23	31.2	32.5	9	0.56	CH6	6	296.00
	CRX0600EE	0.077	675	33.5	23	31.2	32.5	9	0.56	CH6	6	316.00
700	CRX0700CE	0.039	615	33.5	23	31.2	32.5	9	0.56	CH6	6	257.00
	CRX0700EE	0.066	860	33.5	23	31.2	32.5	9	0.56	CH6	6	332.00
720	CRX0720AE	0.031	480	33.5	23	31.2	32.5	9	0.56	CH6	6	231.00
750	CRX0750CE	0.037	600	33.5	23	31.2	32.5	9	0.56	CH6	6	229.00
	CRX0750DE	0.049	770	33.50	23.00	31.20	32.50	9	0.56	CH6	6	303.00
	CRX0750EE	0.061	940	33.50	23.00	31.20	32.50	9	0.56	CH6	6	341.00
840	CRX0840AE	0.027	570	33.5	23	31.2	32.5	9	0.56	CH6	6	236.00
900	CRX0900CE	0.031	750	33.5	23	31.2	32.5	9	0.56	CH6	7	286.00
	CRX0900DE	0.041	950	33.5	23	31.2	32.5	9	0.56	CH6	7	331.00
	CRX0900EE	0.051	1075	33.5	23	31.2	32.5	9	0.56	CH6	7	376.00
960	CRX0960AE	0.022	675	33.5	23	31.2	32.5	9	0.56	CH6	7	356.00
1000	CRX1000CE	0.028	785	33.5	23	31.2	32.5	9	0.56	CH6	7	386.00
	CRX1000DE	0.037	820	33.5	23	31.2	32.5	9	0.56	CH6	7	450.00
	CRX1000EE	0.046	970	33.5	23	31.2	32.5	9	0.56	CH6	7	491.00
1080	CRX1080AE	0.022	675	33.5	23	31.2	32.5	9	0.56	CH6	7	356.00
1200	CRX1200AE	0.018	710	33.5	23	31.2	32.5	9	0.56	CH6	7	336.00
	CRX1200CE	0.023	880	33.5	23	31.2	32.5	9	0.56	CH6	7	350.00
	CRX1200DE	0.031	1100	33.5	23	31.2	32.5	9	0.56	CH6	7	423.00
	CRX1200EE	0.038	1100	33.5	23	31.2	32.5	9	0.56	CH6	7	508.00

50 Hz

RMS Amp	Enclosed	Inductance (mH)	Watts Loss	Width	Depth	Height	Mtg. Width	Mtg. Depth	Mtg. Slot w x d	Enclosure Style	Termination Style Ref.	Weight (lb)
1.2	CRX01D2NE	33.94	15	10	8	8.13	7	6.5	0.188	N1	1	7.5
1.6	CRX01D6NE	23.55	12	10	8	8.13	7	6.5	0.188	N1	1	7.5
1.6	CRX0002NE	17.83	21	10	8	8.13	7	6.5	0.188	N1	1	8
2.1	CRX02D1NE	10.61	19	10	8	8.13	7	6.5	0.188	N1	1	7.5
	CRX02D1PE	17.83	21	10	8	8.13	7	6.5	0.188	N1	1	8
3	CRX0003NE	7.06	22	10	8	8.13	7	6.5	0.188	N1	1	8
	CRX0003PE	10.61	35	10	8	8.13	7	6.5	0.188	N1	1	8
3.4	CRX03D4NE	10.61	35	10	8	8.13	7	6.5	0.188	N1	1	8
3.7	Consult Factory											
4.5	Consult Factory											
4.8	CRX04D8NE	4.70	22	10	8	8.13	7	6.5	0.188	N1	1	8
	CRX04D8PE	7.78	35	10	8	8.13	7	6.5	0.188	N1	1	9.5
7.5	CRX07D5NE	5.09	40	10	8	8.13	7	6.5	0.188	N1	2	16
8	CRX0008NE	2.57	36	10	8	8.13	7	6.5	0.188	N1	2	10
	CRX0008PE	4.67	29	10	8	8.13	7	6.5	0.188	N1	1	8
11	CRX0011NE	3.40	39	10	8	8.13	7	6.5	0.188	N1	2	16
11.8	CRX11D8NE	1.66	51	10	8	8.13	7	6.5	0.188	N1	2	15.5
	CRX11D8PE	2.73	57	10	8	8.13	7	6.5	0.188	N1	2	16.5
14	CRX0014NE	2.73	57	10	8	8.13	7	6.5	0.188	N1	2	16.5
15.6	CRX15D6NE	1.28	51	10	8	8.13	7	6.5	0.188	N1	2	16
	CRX15D6PE	2.14	77	10	8	8.13	7	6.5	0.188	N1	2	17
18	CRX0018NE	2.14	77	10	8	8.13	7	6.5	0.188	N1	2	17
21	CRX0021NE	2.14	77	10	8	8.13	7	6.5	0.188	N1	2	17
23	CRX0023NE	1.06	57	10	8	8.13	7	6.5	0.188	N1	3	16.5
	CRX0023PE	1.43	80	14	14	12.13	10	10.5	0.188	N2	3	22.5
25	CRX0025NE	1.77	93	14	14	12.13	10	10.5	0.188	N2	3	21.5
30.5	CRX30D5NE	0.68	80	10	8	8.13	7	6.5	0.188	N1	3	17.5
	CRX30D5PE	1.13	115	14	14	12.13	10	10.5	0.188	N2	3	22
33	CRX0033NE	1.13	115	14	14	12.13	10	10.5	0.188	N2	3	22
37.8	CRX37D8NE	0.55	68	10	8	8.13	7	6.5	0.188	N1	3	17
	CRX37D8PE	0.94	105	14	14	12.13	10	10.5	0.188	N2	3	22.5
45.2	CRX45D2NE	0.45	130	14	14	12.13	10	10.5	0.188	N2	3	29
	CRX45D2PE	0.74	170	14	14	12.13	10	10.5	0.188	N2	3	35
45	CRX0045NE	0.91	130	14	14	12.13	10	10.5	0.188	N2	3	35
55	CRX0055NE	0.74	170	14	14	12.13	10	10.5	0.188	N2	3	35
59.8	CRX59D8NE	0.36	110	14	14	12.13	10	10.5	0.188	N2	4	35
	CRX59D8PE	0.60	216	14	14	12.13	10	10.5	0.188	N2	4	40
65	CRX0065NE	0.60	216	14	14	12.13	10	10.5	0.188	N2	4	40
74.4	CRX74D4NE	0.29	105	14	14	12.13	10	10.5	0.188	N2	4	31
	CRX74D4PE	0.49	160	14	14	12.13	10	10.5	0.188	N2	4	34
80	CRX0080NE	0.48	210	14	14	12.13	10	10.5	0.188	N2	4	58
89	CRX0089NE	0.24	120	14	14	12.13	10	10.5	0.188	N2	4	34
	CRX0089PE	0.39	170	14	14	12.13	10	10.5	0.188	N2	4	59
96	CRX0096NE	0.39	170	14	14	12.13	10	10.5	0.188	N2	4	59
111	Consult Factory											
111	CRX0111PE	0.30	185	14	14	12.13	10	10.5	0.188	N2	5	58
130	CRX0130NE	0.35	240	26.1	20.5	25.9	25	6.5	0.56	CH4	5	114
147	CRX0147NE	0.15	210	14	14	12.13	10	10.5	0.188	N2	5	42
	CRX0147PE	0.24	260	23.5	16.5	17.9	22.4	6.5	0.56	CH2	5	63
160	CRX0160NE	0.24	260	23.5	16.5	17.9	22.4	6.5	0.56	CH2	5	63
183	CRX0183NE	0.13	180	23.5	16.5	17.9	22.4	6.5	0.56	CH2	5	85
	CRX0183PE	0.20	360	26.1	20.5	25.9	25	6.5	0.56	CH4	5	127
219	CRX0219NE	0.10	225	23.5	16.5	17.9	22.4	6.5	0.56	CH2	5	89
	CRX0219PE	0.16	435	26.1	20.5	25.9	25	6.5	0.56	CH4	5	195
291	CRX0291NE	0.08	310	26.1	20.5	25.9	25	6.5	0.56	CH4	5	124
	CRX0291PE	0.12	580	28.1	21.3	28.9	27	6.5	0.56	CH5	5	236

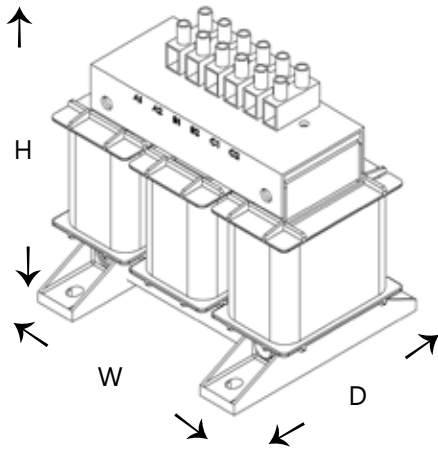
All dimensions in inches
Refer to page 19 for drawings

HPS Centurion® R

Line Reactor

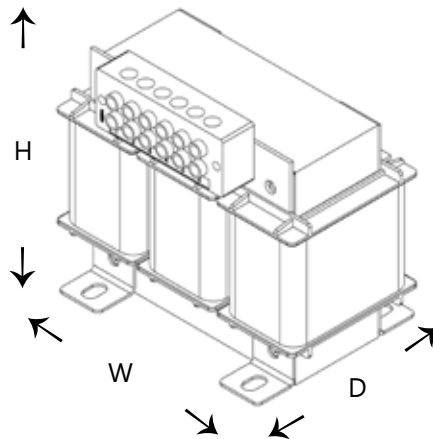
Diagrams

Figure #1



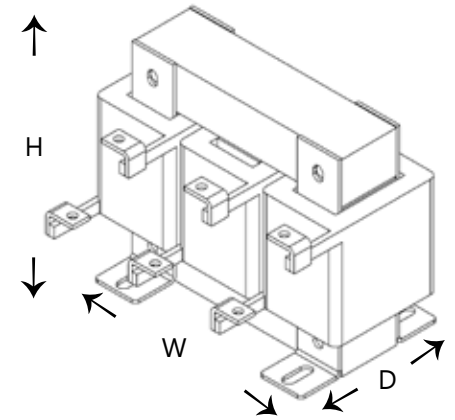
Mounting hardware
(not included)
4 pcs - 1/4 in. bolts
4 pcs - 1/4 in. nuts
8 pcs - 1/4 in. flat washers
4 pcs - 1/4 in. lock washers
Max. tightening torque: 5.5 ft-lb

Figure #2



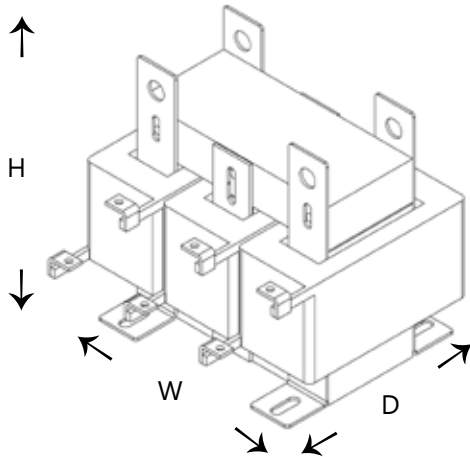
Mounting hardware
(not included)
4 pcs - 5/16 in. bolts
4 pcs - 5/16 in. nuts
8 pcs - 5/16 in. flat washers
4 pcs - 5/16 in. lock washers
Max. tightening torque: 18 ft-lb

Figure #3



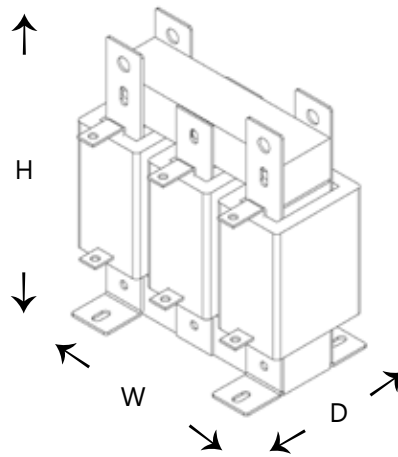
Mounting hardware (not included)	.38x.5 slot	.44x1.0 slot
4 pcs bolts	5/16 in.	3/8 in.
4 pcs nuts	5/16 in.	3/8 in.
8 pcs flat washers	5/16 in.	3/8 in.
4 pcs lock washers	5/16 in.	3/8 in.
Max. tightening torque	18 ft-lb	28 ft-lb

Figure #4



Mounting hardware
(not included)
4 pcs - 3/8 in. bolts
4 pcs - 3/8 in. nuts
8 pcs - 3/8 in. flat washers
4 pcs - 3/8 in. lock washers
Max. tightening torque: 28 ft-lb

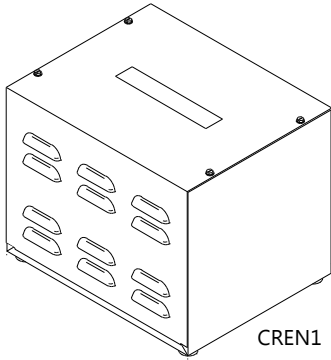
Figure #5



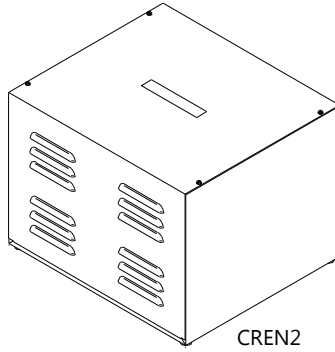
Mounting hardware
(not included)
4 pcs - 3/8 in. bolts
4 pcs - 3/8 in. nuts
8 pcs - 3/8 in. flat washers
4 pcs - 3/8 in. lock washers
Max. tightening torque: 28 ft-lb

Enclosure Styles

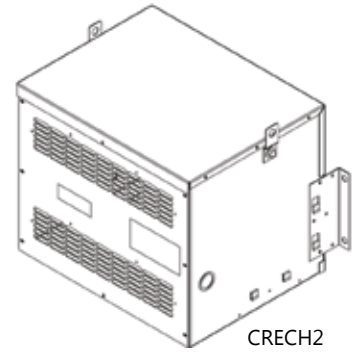
N1



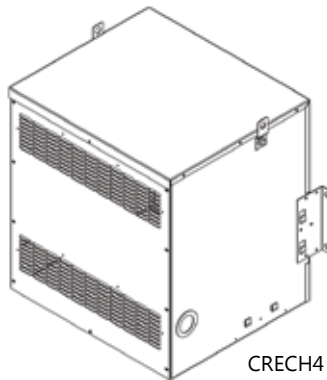
N2



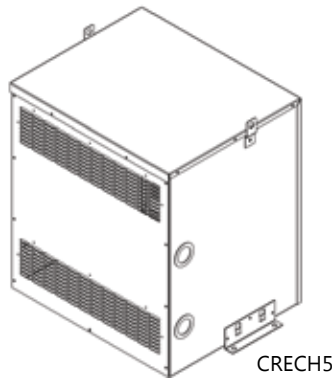
CH2



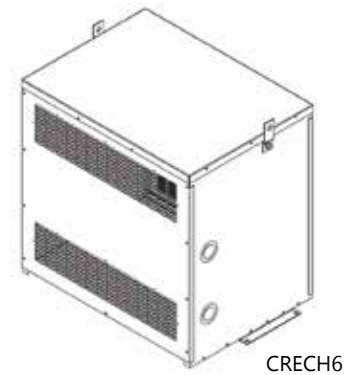
CH4



CH5



CH6

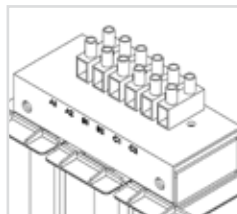


Termination Style Reference

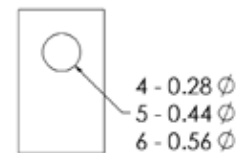
Style Number	Size	Max. Amps	Max. Torque
1	18-14 AWG	9	5 in-lbs
2	13-10 AWG	27	11 in-lbs
3	4-14 AWG	65	20 in-lbs
4	0.28"	110	10 ft-lbs
5	0.44"	472	28 ft-lbs
6	0.56"	840	70 ft-lbs
7	4 x 0.53"	1200	70 ft-lbs

Style #1, 2

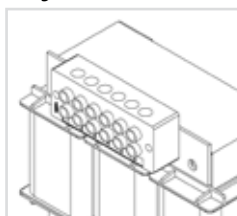
Use applicable terminal block



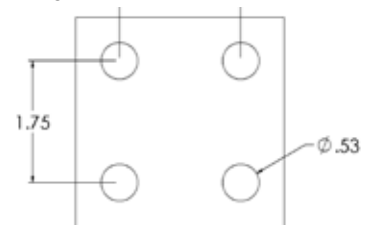
Style #4, 5, 6



Style #3



Style #7





CANADA

Hammond Power Solutions
595 Southgate Drive
Guelph, Ontario N1G 3W6
Tel: (519) 822-2441
Fax: (519) 822-9701
Toll Free: 1-888-798-8882
sales@hammondpowersolutions.com

ASIA

Hammond Power Solutions Pvt. Ltd.
D. No. 5-2/222/IP/B, II-Floor, Icon Plaza
Allwyn X-Roads, Miyapur, Hyderabad 500 049
Tel: +91-994-995-0009
marketing-india@hammondpowersolutions.com

UNITED STATES

Hammond Power Solutions
1100 Lake Street
Baraboo, Wisconsin 53913-2866
Tel: (608) 356-3921
Fax: (608) 355-7623
Toll Free: 1-866-705-4684
sales@hammondpowersolutions.com

EMEA (Sales Office)

Hammond Power Solutions SpA
Tel: +49 (152) 08800468
sales-emea@hammondpowersolutions.com



Distributed by:

H721XC SERIES & H921

Load Trending with 4 to 20 mA Output



Hawkeye Relay Combination Series high voltage output current switches are the ideal solution for the automation installer. These units combine a current switch and relay into a single package, reducing the space required for total control of fans and pumps. The integrated current switch and relay operate independently of one another. All relay connections are externally available for maximum flexibility.

These products perform the functions of start/stop and status monitoring with one device instead of two.

SPECIFICATIONS

Sensor Power	30 mA (max) @ 12 to 30 Vdc
Insulation Class	600 Vac RMS (UL), 300 Vac RMS (CE)
Frequency Range	50/60 Hz
Temperature Range	-15 to 60 °C (5 to 140 °F)
Humidity Range	10 to 90% RH non-condensing
Accuracy	±2% F.S. from 10% to 100% of selected range, but not less than ±0.4 A
Response Time	2 sec.
Terminal Block Wire Size	24 to 14 AWG (0.2 to 2.1 mm ²)
Terminal Block Torque	3.5 to 4.4 in-lbs (0.4 to 0.5 N-m)

WARRANTY

Limited Warranty	5 years
------------------	---------

AGENCY APPROVALS

Agency Approvals	UL 508 open device listing; CE: EN61010-1, CAT III, Pollution Degree 2, basic insulation
------------------	--

Lower costs

Power the sensor, and receive the signal with only two wires...lower cabling and commissioning costs than with traditional 3-wire sensors

Retrofit

Self-gripping, split-core design for fast retrofit installation...no need to remove conductor (H921)

New construction

Economical solid-core features adjustable bracket for easy alignment (H721 Series)

Factory calibrated

Factory calibrated switch-selectable ranges for high resolution and installation ease

3 field-selectable

Three field-selectable ranges per unit...fewer versions to choose from, stock, and install

Installation flexibility

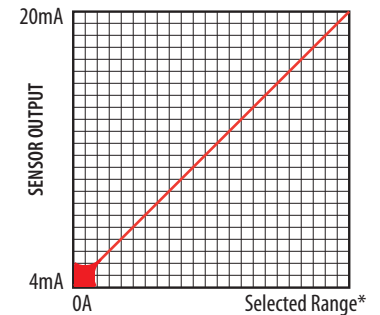
Removable mounting bracket for installation flexibility

APPLICATIONS

- Load trending
- Motor control
- Fan/pump status

EXAMPLE LINEAR OUTPUT

Scale software as shown

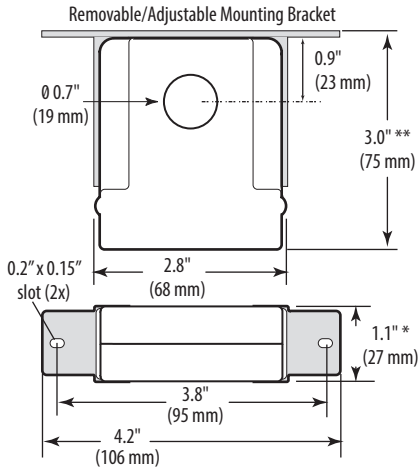


SENSED AMPS

*Factory calibrated ranges selected with the amperage range switch

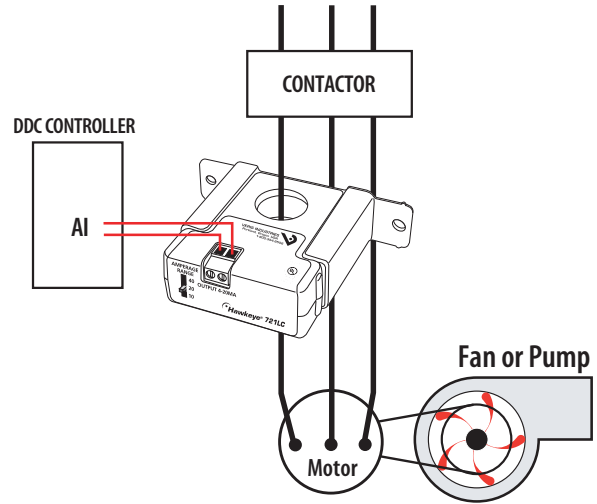


H721LC/H721HC
Dimensional Drawing



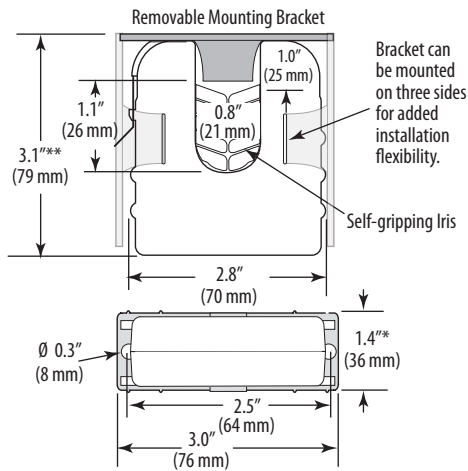
* Terminal block may extend up to 1/8" over the height dimensions shown.
** Slide switch may extend up to 1/4" over the height dimensions shown.

MONITORING FAN /PUMP MOTORS FOR POSITIVE PROOF OF FLOW
Wiring Diagram



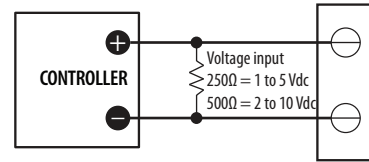
Note: This example diagram refers to the H721xC. Please see the H721xC and H921 installation guides for specific wiring information.

H921
Dimensional Drawing



* Terminal block may extend up to 1/8" over the height dimensions shown.
** Slide switch may extend up to 1/4" over the height dimensions shown.

Voltage Output



ORDERING INFORMATION

MODEL	AMPERAGE RANGE	SENSOR OUTPUT	HOUSING	UL	CE
H721LC	0 to 10/20/40 A	4 to 20 mA DC	Solid-Core	•	•
H721HC	0 to 50/100/200 A		Solid-Core	•	•
H921	0 to 30/60/120 A		Split-Core	• ¹	•

1. Listed for use on 75 °C insulated conductors.
Note: For 10 to 80 Hz applications, see the H720 VFD sensor.



3RV Motor Starter Protectors

For Motor Protection


SIRIUS



3RV20 Class 10
up to 40A

Description	Ordering Information
<p>The 3RV20x MSP's are UL approved as Self Protected Combination Motor Controllers which are also called Type E. In this application, all the required functions for a motor branch are provided in one device: disconnect, short circuit protection, motor control and overload protection. A type E terminal adaptor is required. The 3RV20x MSP's are also approved for use as follows:</p> <ul style="list-style-type: none"> – Manual Motor Controller: Motor starter, motor disconnect, control and overload—protection. – Group Installation: Motor starter only, motor disconnect, control and overload protection. – Tap conductor Protection in Group Installation acc. NEC: Motor starter only; motor disconnect, control and overload protection. <p>When the 3RV20x is used with one of the 3 above mentioned approvals, the 3RV20x can be installed downstream of one circuit breaker or fuse set.</p> <p>For more detailed application information and rules how to apply, size and rate the 3RV20x in control panels in general, in group installations or in accordance to international IEC standards visit our website: www.usa.siemens.com/controlpaneldesign</p>	<ul style="list-style-type: none"> ▶ ON/OFF rotary handle with lockout and visible trip indication. ▶ Adjustment dial for setting to motor FLA. ▶ Class 10 overload trip characteristics. ▶ Short circuit trip at 13 times the maximum setting of the FLA adjustment dial. ▶ Short circuit current rating: ▶ Ambient compensated up to 140° F (applies to side by side mounting). ▶ Phase loss sensitivity. ▶ Test trip function. ▶ Terminal versions: screw, spring, ring lug. ▶ Auxiliaries and Accessories see pages 1/7–1/17. ▶ General Information see pages 1/29–1/32. ▶ Technical Data see pages 1/18–1/28. ▶ Dimensions see page 1/33.

Note: Select MSP by motor Full Load Amperes. Horsepower ratings are for reference only.

Illustration	FLA Adjustment Range [A]	Single-Phase HP Ratings		Three-Phase HP Ratings ¹⁾				Instantaneous short circuit release [A]	UL short-circuit breaking capacity @ 480V [kA]	Size S00 ^{2) 4)}	
		115V	230V	200V	230V	460V	575V			Order Number	Order Number
	0.11-0.16	—	—	—	—	—	—	2.1	65	3RV2011-0AA●●	—
	0.14-0.2	—	—	—	—	—	—	2.6	65	3RV2011-0BA●●	—
	0.18-0.25	—	—	—	—	—	—	3.3	65	3RV2011-0CA●●	—
	0.22-0.32	—	—	—	—	—	—	4.2	65	3RV2011-0DA●●	—
	0.28-0.4	—	—	—	—	—	—	5.2	65	3RV2011-0EA●●	—
	0.35-0.5	—	—	—	—	—	—	6.5	65	3RV2011-0FA●●	—
	0.45-0.63	—	—	—	—	—	—	8.2	65	3RV2011-0GA●●	3RV2021-0GA●●
	0.55-0.8	—	—	—	—	—	—	10	65	3RV2011-0HA●●	3RV2021-0HA●●
	0.7-1	—	—	—	—	—	1/2	13	65	3RV2011-0JA●●	3RV2021-0JA●●
	0.9-1.25	—	—	—	—	—	1/2	16	65	3RV2011-0KA●●	3RV2021-0KA●●
	1.1-1.6	—	1/10	—	—	3/4	3/4	21	65	3RV2011-1AA●●	3RV2021-1AA●●
	1.4-2	—	1/8	—	—	3/4	1	26	65	3RV2011-1BA●●	3RV2021-1BA●●
	1.8-2.5	—	1/8	1/2	1/2	1	1 1/2	33	65	3RV2011-1CA●●	3RV2021-1CA●●
	2.2-3.2	1/10	1/4	1/2	3/4	1 1/2	2	42	65	3RV2011-1DA●●	3RV2021-1DA●●
	2.8-4	1/8	1/8	3/4	3/4	2	3	52	65	3RV2011-1EA●●	3RV2021-1EA●●
	3.5-5	1/8	1/2	1	1	3	3	65	65	3RV2011-1FA●●	3RV2021-1FA●●
	4.5-6.3	1/4	1/2	1	1 1/2	3	5	82	65	3RV2011-1GA●●	3RV2021-1GA●●
	5.5-8	1/3	1	2	2	5	5	104	65	3RV2011-1HA●●	3RV2021-1HA●●
	7-10	1/2	1 1/2	2	3	5	7 1/2	130	65	3RV2011-1JA●●	3RV2021-1JA●●
	9-12.5	1/2	2	3	3	7 1/2	10	163	65	3RV2011-1KA●●	3RV2021-1KA●●
11-16	1	2	3	5	10	—	208	65	3RV2011-4AA●●	3RV2021-4AA●●	
14-20	1 1/2	3	5	5	10	—	260	65	—	3RV2021-4BA●●	
17-22	1 1/2	3	5	7 1/2	15	—	286	65	—	3RV2021-4CA●●	
20-25	2	3	5	7 1/2	15	—	325	65	—	3RV2021-4DA●●	
23-28	2	5	7 1/2	10	20	—	364	50	—	3RV2021-4NA●●	
27-32	2	5	7 1/2	10	20	—	400	50	—	3RV2021-4EA●●	
30-36 ³⁾	3	5	10	10	25	—	432	12	—	3RV2021-4PA●●	
34-40 ³⁾	3	7 1/2	10	10	30	—	480	12	—	3RV2021-4FA●●	

Screw terminals, no auxiliary: ●● = 10
 Screw Terminals, with 1NO/1NC Aux: ●● = 15
 Spring terminals, no auxiliary: ●● = 20
 Spring Terminals, with 1NO/1NC Aux: ●● = 25
 Ring Lug Terminals, no Auxiliary: ●● = 40

1) Select motor starter protector by motor full load amps. Horse power ratings for reference only.

2) The motor starter protectors rated up to 32 A can be used as manual motor controllers or as Type E combination motor controllers. For use as a Type E combination motor controller, a Type E terminal is required. See accessories page 1/10.

3) These products are NOT certified as Type E combination motor controllers. They can only be used as manual motor controllers.

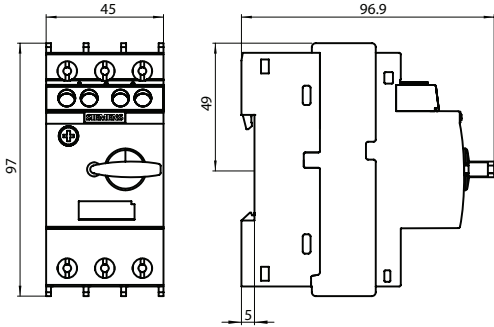
4) 3RV2 MSP's can only be used with Innovations contactors and accessories



Dimension drawings

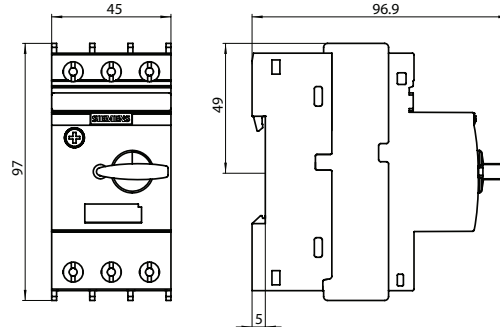
3RV2 MSP, size S00

3RV20 11



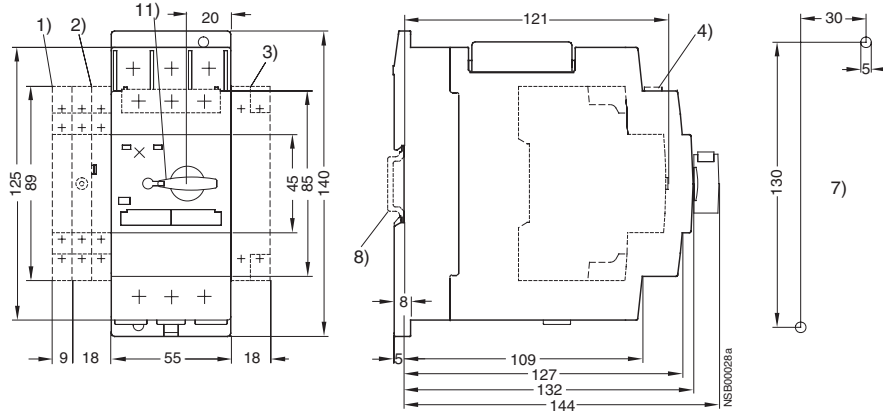
3RV2 MSP, size S0

3RV20 21



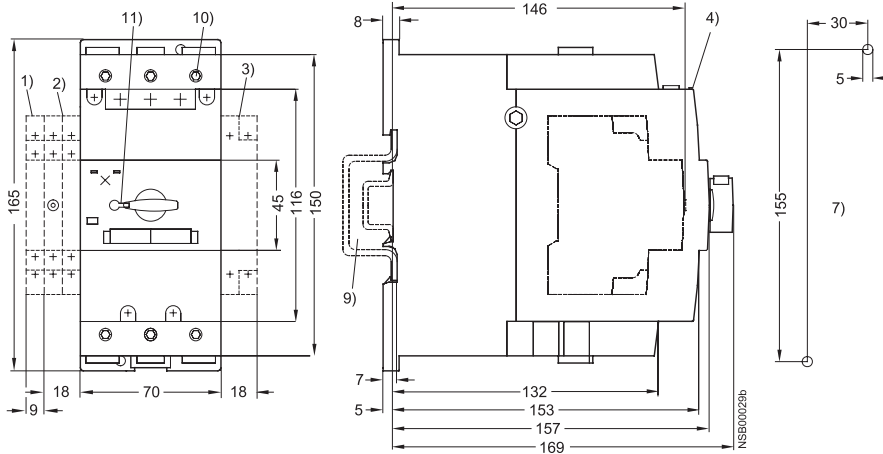
3RV1 MSP, size S2

3RV10 31



3RV1 MSP, size S3

3RV10 4



- 1) 2-pole lateral auxiliary switch
- 2) Signalling switch (S0-S3) or lateral auxiliary switch, 4-pole (S00-S3)
- 3) Auxiliary releases
- 4) Transverse auxiliary switch
- 5) Push-in lugs for screw mounting
- 6) Only for undervoltage release with leading auxiliary switch
- 7) Drilling template
- 8) 35 mm standard mounting rail acc. to EN 50 022
- 9) Mounting on 35 mm standard mounting rail, 15 mm high, acc. to EN 50 022 or on 75 mm standard mounting rail acc. to EN 50 023
- 10) 4 mm hexagon socket screw
- 11) Lockable in 0 position with shackle diameter 3.5 to 4.5 mm

TRANSVERSE AUX. SWITCH, 1NO+1NC,
SCREW CONNECTION, FOR CIRCUIT-BREAKERS,
SZ S00/S0



General technical data:

product brand name		SIRIUS
Product designation		auxiliary switch, transverse on the front
Design of the product		transverse auxiliary switches
Size of the circuit-breaker		S00, S0
Protection class IP / on the front		IP20
Ambient temperature		
• during storage	°C	-50 ... +80
• during operating	°C	-20 ... +60

Auxiliary circuit:

Number of NC contacts / for auxiliary contacts		
• instantaneous switching		1
Number of NO contacts / for auxiliary contacts		
• instantaneous switching		1
Number of changeover contacts / of the auxiliary contacts		
• instantaneous switching		0
Operating current / of the auxiliary contacts		
• at AC-12		
• at 24 V	A	2.5
• at 230 V	A	2.5

- maximum
- at AC-15
 - at 24 V
 - at 230 V
- at DC-13
 - at 24 V
 - at 48 V
 - at 60 V

A	10
A	2
A	0.5
A	1
A	0.3
A	0.15





Installation/mounting/dimensions:

Mounting type		plug-in fixing
Width	mm	45
Height	mm	12
Depth	mm	17

Connections:

Design of the electrical connection		screw-type terminals
<ul style="list-style-type: none"> • for auxiliary and control current circuit 		
Type of the connectable conductor cross-section		
<ul style="list-style-type: none"> • for auxiliary contacts <ul style="list-style-type: none"> • solid • finely stranded <ul style="list-style-type: none"> • with conductor end processing • for AWG conductors / for auxiliary contacts 		2x (0.5 ... 1.5 mm ²), 2x (0.75 ... 2.5 mm ²) 2x (0.5 ... 1.5 mm ²), 2x (0.75 ... 2.5 mm ²) 2x (20 ... 14)

Certificates/approvals:

Verification of suitability	CE / UL / CSA / CCC	
General Product Approval	Declaration of Conformity	Test Certificates
 CCC  CSA  UL	 EG-Konf.	Special Test Certificate Type Test Certificates/Test Report

Shipping Approval



Shipping Approval



Further information:

Information- and Downloadcenter (Catalogs, Brochures,...)

<http://www.siemens.com/industrial-controls/catalogs>

Industry Mall (Online ordering system)

<http://www.siemens.com/industrial-controls/mall>

CAX-Online-Generator

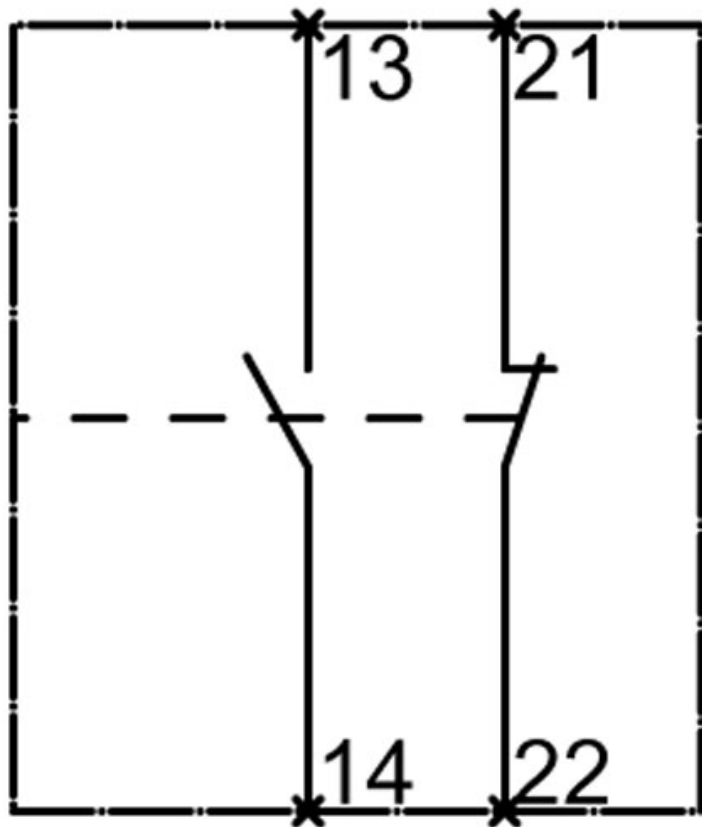
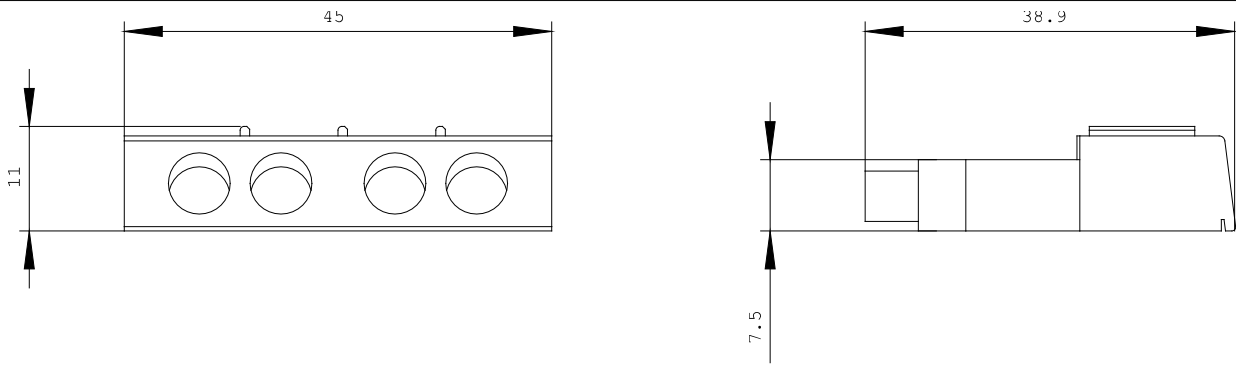
<http://www.siemens.com/cax>

Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

<http://support.automation.siemens.com/WW/view/en/3RV2901-1E/all>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, ...)

http://www.automation.siemens.com/bilddb/cax_en.aspx?mlfb=3RV2901-1E



last change:

Mar 17, 2014

DOOR-COUPLING ROTARY OPERATING MECHANISM FOR CIRCUIT-BREAKERS SIZE S00/S0, HANDLE GRAY NEW DESIGN



Figure similar

General technical data:

product brand name		SIRIUS
Product designation		door-coupling rotary operating mechanism for heavy-duty operating conditions
Size of the circuit-breaker		S0
Design of the product		standard
Suitability for use		circuit-breakers S0
Protection class IP on the front		IP65
Ambient temperature		
• during storage	°C	-50 ... +80
• during operation	°C	-20 ... +70
Operating frequency maximum	1/h	15
Color of the actuating element		gray

Installation/ mounting/ dimensions:

Mounting position		any
Mounting type		screw fixing
Width	mm	75
Height	mm	75
Depth	mm	78

Length	mm	300
Diameter	mm	40
Required spacing for grounded parts		
• forwards	mm	0
• Backwards	mm	0
• upwards	mm	0
• at the side	mm	0
• downwards	mm	0

Certificates/ approvals:

Certificate of suitability CE / UL / CSA

General Product Approval	Shipping Approval	other
---------------------------------	--------------------------	--------------



[Umweltbestätigung](#)

[Bestätigungen](#)



Further information

Information- and Downloadcenter (Catalogs, Brochures,...)

<http://www.siemens.com/industrial-controls/catalogs>

Industry Mall (Online ordering system)

<http://www.siemens.com/industrymall>

Cax online generator

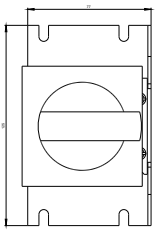
<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3RV29262B>

Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

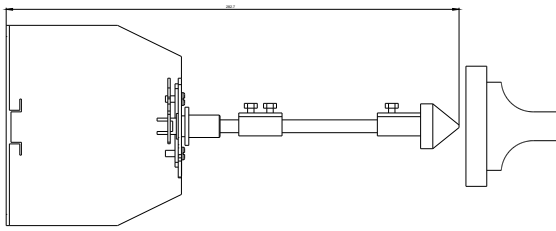
<https://support.industry.siemens.com/cs/ww/en/ps/3RV29262B>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3RV29262B&lang=en



last modified:



07.12.2015



power contactor, AC-3e/AC-3, 9 A, 4 kW / 400 V, 3-pole, 110 V AC, 50 Hz / 120 V, 60 Hz, auxiliary contacts: 1 NO, screw terminal, size: S00

product brand name	SIRIUS
product designation	Power contactor
product type designation	3RT2
General technical data	
size of contactor	S00
product extension	
• function module for communication	No
• auxiliary switch	Yes
power loss [W] for rated value of the current	
• at AC in hot operating state	0.9 W
• at AC in hot operating state per pole	0.3 W
• without load current share typical	1.2 W
type of calculation of power loss depending on pole	quadratic
insulation voltage	
• of main circuit with degree of pollution 3 rated value	690 V
• of auxiliary circuit with degree of pollution 3 rated value	690 V
surge voltage resistance	
• of main circuit rated value	6 kV
• of auxiliary circuit rated value	6 kV
maximum permissible voltage for protective separation between coil and main contacts according to EN 60947-1	400 V
shock resistance at rectangular impulse	
• at AC	6,7g / 5 ms, 4,2g / 10 ms
shock resistance with sine pulse	
• at AC	10,5g / 5 ms, 6,6g / 10 ms
mechanical service life (operating cycles)	
• of contactor typical	30 000 000
• of the contactor with added electronically optimized auxiliary switch block typical	5 000 000
• of the contactor with added auxiliary switch block typical	10 000 000
reference code according to IEC 81346-2	Q
Substance Prohibition (Date)	10/01/2009
Ambient conditions	
installation altitude at height above sea level maximum	2 000 m
ambient temperature	
• during operation	-25 ... +60 °C
• during storage	-55 ... +80 °C
relative humidity minimum	10 %
relative humidity at 55 °C according to IEC 60068-2-30 maximum	95 %
Environmental footprint	

Environmental Product Declaration(EPD)	Yes
Global Warming Potential [CO2 eq] total	39.6 kg
Global Warming Potential [CO2 eq] during manufacturing	1.18 kg
Global Warming Potential [CO2 eq] during operation	38.5 kg
Global Warming Potential [CO2 eq] after end of life	-0.155 kg
Main circuit	
number of poles for main current circuit	3
number of NO contacts for main contacts	3
operating voltage	
• at AC-3 rated value maximum	690 V
• at AC-3e rated value maximum	690 V
operational current	
• at AC-1 at 400 V at ambient temperature 40 °C rated value	22 A
• at AC-1	
— up to 690 V at ambient temperature 40 °C rated value	22 A
— up to 690 V at ambient temperature 60 °C rated value	20 A
• at AC-3	
— at 400 V rated value	9 A
— at 500 V rated value	7.7 A
— at 690 V rated value	6.7 A
• at AC-3e	
— at 400 V rated value	9 A
— at 500 V rated value	7.7 A
— at 690 V rated value	6.7 A
• at AC-4 at 400 V rated value	8.5 A
• at AC-5a up to 690 V rated value	19.4 A
• at AC-5b up to 400 V rated value	7.4 A
• at AC-6a	
— up to 230 V for current peak value n=20 rated value	5.3 A
— up to 400 V for current peak value n=20 rated value	5.3 A
— up to 500 V for current peak value n=20 rated value	5.3 A
— up to 690 V for current peak value n=20 rated value	5 A
• at AC-6a	
— up to 230 V for current peak value n=30 rated value	3.5 A
— up to 400 V for current peak value n=30 rated value	3.5 A
— up to 500 V for current peak value n=30 rated value	3.6 A
— up to 690 V for current peak value n=30 rated value	3.3 A
minimum cross-section in main circuit at maximum AC-1 rated value	4 mm ²
operational current for approx. 200000 operating cycles at AC-4	
• at 400 V rated value	4.1 A
• at 690 V rated value	3.3 A
operational current	
• at 1 current path at DC-1	
— at 24 V rated value	20 A
— at 60 V rated value	20 A
— at 110 V rated value	2.1 A
— at 220 V rated value	0.8 A
— at 440 V rated value	0.6 A
— at 600 V rated value	0.6 A
• with 2 current paths in series at DC-1	
— at 24 V rated value	20 A
— at 60 V rated value	20 A
— at 110 V rated value	12 A
— at 220 V rated value	1.6 A
— at 440 V rated value	0.8 A
— at 600 V rated value	0.7 A
• with 3 current paths in series at DC-1	

<ul style="list-style-type: none"> — at 24 V rated value — at 60 V rated value — at 110 V rated value — at 220 V rated value — at 440 V rated value — at 600 V rated value 	20 A 20 A 20 A 20 A 1.3 A 1 A
<ul style="list-style-type: none"> ● at 1 current path at DC-3 at DC-5 <ul style="list-style-type: none"> — at 24 V rated value — at 60 V rated value — at 110 V rated value ● with 2 current paths in series at DC-3 at DC-5 <ul style="list-style-type: none"> — at 24 V rated value — at 60 V rated value — at 110 V rated value ● with 3 current paths in series at DC-3 at DC-5 <ul style="list-style-type: none"> — at 24 V rated value — at 60 V rated value — at 110 V rated value — at 220 V rated value — at 440 V rated value — at 600 V rated value 	20 A 0.5 A 0.15 A 20 A 5 A 0.35 A 20 A 20 A 20 A 1.5 A 0.2 A 0.2 A
operating power <ul style="list-style-type: none"> ● at AC-3 <ul style="list-style-type: none"> — at 230 V rated value — at 400 V rated value — at 500 V rated value — at 690 V rated value ● at AC-3e <ul style="list-style-type: none"> — at 230 V rated value — at 400 V rated value — at 500 V rated value — at 690 V rated value 	2.2 kW 4 kW 4 kW 5.5 kW 2.2 kW 4 kW 4 kW 5.5 kW
operating power for approx. 200000 operating cycles at AC-4 <ul style="list-style-type: none"> ● at 400 V rated value ● at 690 V rated value 	2 kW 2.5 kW
operating apparent power at AC-6a <ul style="list-style-type: none"> ● up to 230 V for current peak value n=20 rated value ● up to 400 V for current peak value n=20 rated value ● up to 500 V for current peak value n=20 rated value ● up to 690 V for current peak value n=20 rated value 	2 kVA 3.6 kVA 4.6 kVA 5.9 kVA
operating apparent power at AC-6a <ul style="list-style-type: none"> ● up to 230 V for current peak value n=30 rated value ● up to 400 V for current peak value n=30 rated value ● up to 500 V for current peak value n=30 rated value ● up to 690 V for current peak value n=30 rated value 	1.3 kVA 2.4 kVA 3.1 kVA 4 kVA
short-time withstand current in cold operating state up to 40 °C <ul style="list-style-type: none"> ● limited to 1 s switching at zero current maximum ● limited to 5 s switching at zero current maximum ● limited to 10 s switching at zero current maximum ● limited to 30 s switching at zero current maximum ● limited to 60 s switching at zero current maximum 	155 A; Use minimum cross-section acc. to AC-1 rated value 111 A; Use minimum cross-section acc. to AC-1 rated value 86 A; Use minimum cross-section acc. to AC-1 rated value 66 A; Use minimum cross-section acc. to AC-1 rated value 55 A; Use minimum cross-section acc. to AC-1 rated value
no-load switching frequency <ul style="list-style-type: none"> ● at AC 	10 000 1/h
operating frequency <ul style="list-style-type: none"> ● at AC-1 maximum ● at AC-2 maximum ● at AC-3 maximum ● at AC-3e maximum ● at AC-4 maximum 	1 000 1/h 750 1/h 750 1/h 750 1/h 250 1/h

Control circuit/ Control	
type of voltage of the control supply voltage	AC
control supply voltage at AC	
• at 50 Hz rated value	110 V
• at 60 Hz rated value	120 V
operating range factor control supply voltage rated value of magnet coil at AC	
• at 50 Hz	0.8 ... 1.1
• at 60 Hz	0.8 ... 1.1
apparent pick-up power of magnet coil at AC	
• at 50 Hz	26.4 VA
• at 60 Hz	26.4 VA
inductive power factor with closing power of the coil	
• at 50 Hz	0.81
• at 60 Hz	0.81
apparent holding power of magnet coil at AC	
• at 50 Hz	4.4 VA
• at 60 Hz	4.4 VA
inductive power factor with the holding power of the coil	
• at 50 Hz	0.24
• at 60 Hz	0.24
closing delay	
• at AC	9 ... 35 ms
opening delay	
• at AC	4 ... 15 ms
arcing time	10 ... 15 ms
control version of the switch operating mechanism	Standard A1 - A2
Auxiliary circuit	
number of NO contacts for auxiliary contacts instantaneous contact	1
operational current at AC-12 maximum	10 A
operational current at AC-15	
• at 230 V rated value	10 A
• at 400 V rated value	3 A
• at 500 V rated value	2 A
• at 690 V rated value	1 A
operational current at DC-12	
• at 24 V rated value	10 A
• at 48 V rated value	6 A
• at 60 V rated value	6 A
• at 110 V rated value	3 A
• at 125 V rated value	2 A
• at 220 V rated value	1 A
• at 600 V rated value	0.15 A
operational current at DC-13	
• at 24 V rated value	10 A
• at 48 V rated value	2 A
• at 60 V rated value	2 A
• at 110 V rated value	1 A
• at 125 V rated value	0.9 A
• at 220 V rated value	0.3 A
• at 600 V rated value	0.1 A
contact reliability of auxiliary contacts	1 faulty switching per 100 million (17 V, 1 mA)
UL/CSA ratings	
full-load current (FLA) for 3-phase AC motor	
• at 480 V rated value	7.6 A
• at 600 V rated value	9 A
yielded mechanical performance [hp]	
• for single-phase AC motor	
— at 110/120 V rated value	0.33 hp
— at 230 V rated value	1 hp

<ul style="list-style-type: none"> ● for 3-phase AC motor <ul style="list-style-type: none"> — at 200/208 V rated value — at 220/230 V rated value — at 460/480 V rated value — at 575/600 V rated value 	<p>2 hp</p> <p>3 hp</p> <p>5 hp</p> <p>7.5 hp</p>
contact rating of auxiliary contacts according to UL	A600 / Q600
Short-circuit protection	
design of the fuse link	
<ul style="list-style-type: none"> ● for short-circuit protection of the main circuit <ul style="list-style-type: none"> — with type of coordination 1 required — with type of assignment 2 required ● for short-circuit protection of the auxiliary switch required 	<p>gG: 35A (690V, 100kA), aM: 20A (690V, 100kA), BS88: 35A (415V, 80kA)</p> <p>gG: 20A (690V, 100kA), aM: 16A (690V, 100kA), BS88: 20A (415V, 80kA)</p> <p>gG: 10 A (500 V, 1 kA)</p>
Installation/ mounting/ dimensions	
mounting position	+/-180° rotation possible on vertical mounting surface; can be tilted forward and backward by +/- 22.5° on vertical mounting surface
fastening method	screw and snap-on mounting onto 35 mm DIN rail according to DIN EN 60715
height	58 mm
width	45 mm
depth	73 mm
required spacing	
<ul style="list-style-type: none"> ● with side-by-side mounting <ul style="list-style-type: none"> — forwards — upwards — downwards — at the side ● for grounded parts <ul style="list-style-type: none"> — forwards — upwards — at the side — downwards ● for live parts <ul style="list-style-type: none"> — forwards — upwards — downwards — at the side 	<p>10 mm</p> <p>10 mm</p> <p>10 mm</p> <p>0 mm</p> <p>10 mm</p> <p>10 mm</p> <p>6 mm</p> <p>10 mm</p> <p>10 mm</p> <p>10 mm</p> <p>6 mm</p>
Connections/ Terminals	
type of electrical connection	
<ul style="list-style-type: none"> ● for main current circuit ● for auxiliary and control circuit ● at contactor for auxiliary contacts ● of magnet coil 	<p>screw-type terminals</p> <p>screw-type terminals</p> <p>Screw-type terminals</p> <p>Screw-type terminals</p>
type of connectable conductor cross-sections	
<ul style="list-style-type: none"> ● for main contacts <ul style="list-style-type: none"> — solid — solid or stranded — finely stranded with core end processing ● for AWG cables for main contacts 	<p>2x (0.5 ... 1.5 mm²), 2x (0.75 ... 2.5 mm²), 2x 4 mm²</p> <p>2x (0,5 ... 1,5 mm²), 2x (0,75 ... 2,5 mm²), 2x 4 mm²</p> <p>2x (0.5 ... 1.5 mm²), 2x (0.75 ... 2.5 mm²)</p> <p>2x (20 ... 16), 2x (18 ... 14), 2x 12</p>
connectable conductor cross-section for main contacts	
<ul style="list-style-type: none"> ● solid ● stranded ● finely stranded with core end processing 	<p>0.5 ... 4 mm²</p> <p>0.5 ... 4 mm²</p> <p>0.5 ... 2.5 mm²</p>
connectable conductor cross-section for auxiliary contacts	
<ul style="list-style-type: none"> ● solid or stranded ● finely stranded with core end processing 	<p>0.5 ... 4 mm²</p> <p>0.5 ... 2.5 mm²</p>
type of connectable conductor cross-sections	
<ul style="list-style-type: none"> ● for auxiliary contacts <ul style="list-style-type: none"> — solid or stranded — finely stranded with core end processing ● for AWG cables for auxiliary contacts 	<p>2x (0.5 ... 1.5 mm²), 2x (0.75 ... 2.5 mm²), 2x 4 mm²</p> <p>2x (0.5 ... 1.5 mm²), 2x (0.75 ... 2.5 mm²)</p> <p>2x (20 ... 16), 2x (18 ... 14), 2x 12</p>
AWG number as coded connectable conductor cross section	

- for main contacts 20 ... 12
- for auxiliary contacts 20 ... 12

Safety related data

product function	
<ul style="list-style-type: none"> • mirror contact according to IEC 60947-4-1 	Yes; with 3RH29
suitability for use safety-related switching OFF	Yes; applies only to contactor operating mechanism
proportion of dangerous failures	
<ul style="list-style-type: none"> • with low demand rate according to SN 31920 	40 %
<ul style="list-style-type: none"> • with high demand rate according to SN 31920 	73 %
B10 value with high demand rate according to SN 31920	1 000 000
failure rate [FIT] with low demand rate according to SN 31920	100 FIT

IEC 61508	
T1 value	
<ul style="list-style-type: none"> • for proof test interval or service life according to IEC 61508 	20 a

Electrical Safety	
protection class IP on the front according to IEC 60529	IP20
touch protection on the front according to IEC 60529	finger-safe, for vertical contact from the front



Approvals Certificates

General Product Approval




[Confirmation](#)





General Product Approval	EMV	Functional Safety	Test Certificates		
KC			Type Examination Certificate	Type Test Certificates/Test Report	Special Test Certificate

Marine / Shipping








Marine / Shipping	other	Railway	Environment
	Miscellaneous	Confirmation	Confirmation Special Test Certificate 

Environment

[Environmental Confirmations](#)

Further information

Information on the packaging
<https://support.industry.siemens.com/cs/ww/en/view/109813875>

Information- and Downloadcenter (Catalogs, Brochures,...)
<https://www.siemens.com/ic10>

Industry Mall (Online ordering system)
<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3RT2016-1AK61>

Cax online generator

<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3RT2016-1AK61>

Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

<https://support.industry.siemens.com/cs/ww/en/ps/3RT2016-1AK61>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

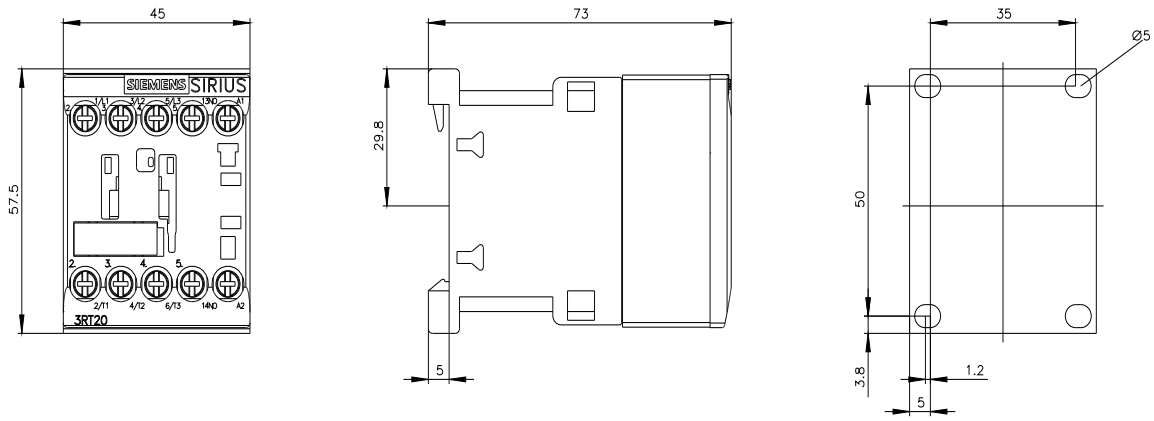
http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3RT2016-1AK61&lang=en

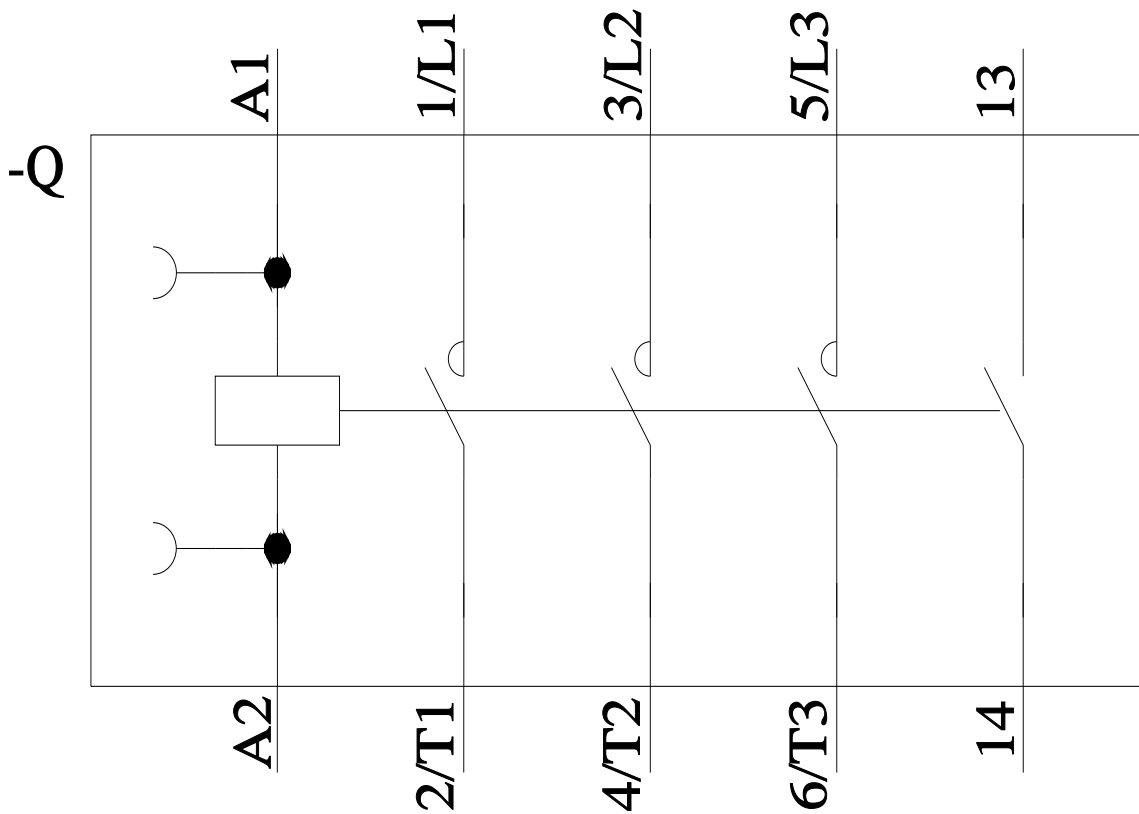
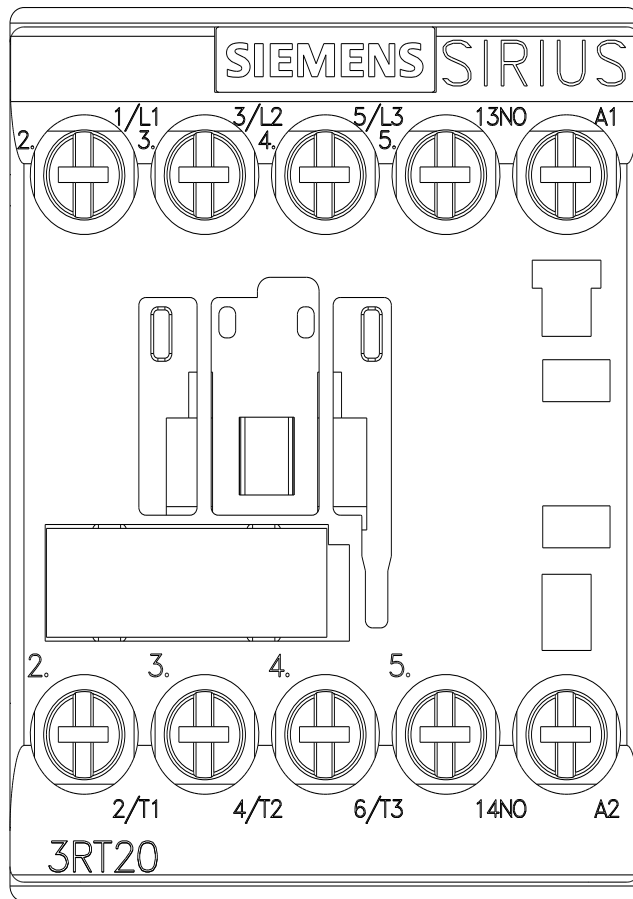
Characteristic: Tripping characteristics, I²t, Let-through current

<https://support.industry.siemens.com/cs/ww/en/ps/3RT2016-1AK61/char>

Further characteristics (e.g. electrical endurance, switching frequency)

<http://www.automation.siemens.com/bilddb/index.aspx?view=Search&mlfb=3RT2016-1AK61&objecttype=14&gridview=view1>





last modified:

3/15/2024 

Auxiliary switch on the front, 2 NO + 2 NC Current path 1 NO, 1 NC, 1 NC, 1 NO for 3RH and 3RT screw terminal .3/.4, .1/.2, .1/.2, .3/.4



General technical data	
Product brand name	SIRIUS
Suitability for use	Contact relay and power contactor
Protection class IP on the front	IP20
Ambient temperature	
<ul style="list-style-type: none"> during storage during operation 	-55 ... +80 °C -25 ... +60 °C
Mechanical service life (switching cycles) typical	10 000 000
Electrical endurance (switching cycles) at AC-15 at 230 V typical	200 000
Contact reliability	one incorrect switching operation of 100 million switching operations (17 V, 1 mA)
Contact reliability of auxiliary contacts	1 faulty switching per 100 million (17 V, 1 mA)
Insulation voltage with degree of pollution 3 rated value	690 V
Surge voltage resistance rated value	6 kV
Auxiliary circuit	
Number of NC contacts for auxiliary contacts	
<ul style="list-style-type: none"> instantaneous contact 	2

• lagging switching	0
Number of NO contacts for auxiliary contacts	
• instantaneous contact	2
• leading contact	0
Operating current of auxiliary contacts at AC-12	
• at 24 V	10 A
• at 230 V	10 A
• maximum	10 A
Operating current	
• of auxiliary contacts	
— at AC-14	
— at 125 V	6 A
— at 250 V	6 A
— at AC-15	
— at 24 V	6 A
— at 230 V	6 A
— at 400 V	3 A
• at AC-15 at 690 V rated value	1 A
Operating current	
• of auxiliary contacts at DC-12	
— at 24 V	10 A
— at 110 V	3 A
— at 220 V	1 A
• with 2 current paths in series at DC-12	
— at 24 V rated value	10 A
— at 60 V rated value	10 A
— at 110 V rated value	4 A
— at 220 V rated value	2 A
— at 440 V rated value	1.3 A
— at 600 V rated value	0.65 A
• with 3 current paths in series at DC-12	
— at 24 V rated value	10 A
— at 60 V rated value	10 A
— at 110 V rated value	10 A
— at 220 V rated value	3.6 A
— at 440 V rated value	2.5 A
— at 600 V rated value	1.8 A
Operating current	
• of auxiliary contacts at DC-13	
— at 24 V	6 A
— at 60 V	2 A

— at 110 V	1 A
— at 220 V	0.3 A
• with 2 current paths in series at DC-13	
— at 24 V rated value	10 A
— at 60 V rated value	3.5 A
— at 110 V rated value	1.3 A
— at 220 V rated value	0.9 A
— at 440 V rated value	0.2 A
— at 600 V rated value	0.1 A
• with 3 current paths in series at DC-13	
— at 24 V rated value	10 A
— at 60 V rated value	4.7 A
— at 110 V rated value	3 A
— at 220 V rated value	1.2 A
— at 440 V rated value	0.5 A
— at 600 V rated value	0.26 A

Installation/ mounting/ dimensions

Mounting type	snap-on mounting
Width	36 mm
Height	37.5 mm
Depth	43.7 mm

Connections/Terminals






Type of electrical connection for auxiliary and control current circuit	screw-type terminals
Type of connectable conductor cross-sections	
• for auxiliary contacts	
— finely stranded	
— with core end processing	2x (0.5 ... 1.5 mm ²), 2x (0.75 ... 2.5 mm ²)
• at AWG conductors for auxiliary contacts	2x (20 ... 16), 2x (18 ... 14)




Safety related data

Product function Mirror contact acc. to IEC 60947-4-1	Yes
• Note	with 3RT2
Product function positively driven operation acc. to IEC 60947-5-1	Yes
• Note	with 3RH2

Certificates/approvals

General Product Approval				Declaration of Conformity	Test Certificates
 CCC	 CSA	 UL		 EG-Konf.	Type Test Certificates/Test Report

Test Certificates	Shipping Approval				
Special Test Certificate	 ABS	 BUREAU VERITAS	 GL	 LRS	 PRS

Shipping Approval	other	Railway
 RINA	 RMRS	 VDE
	Confirmation	Vibration and Shock

Further information

Information- and Downloadcenter (Catalogs, Brochures,...)

<http://www.siemens.com/industrial-controls/catalogs>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3RH2911-1FA22>

Cax online generator

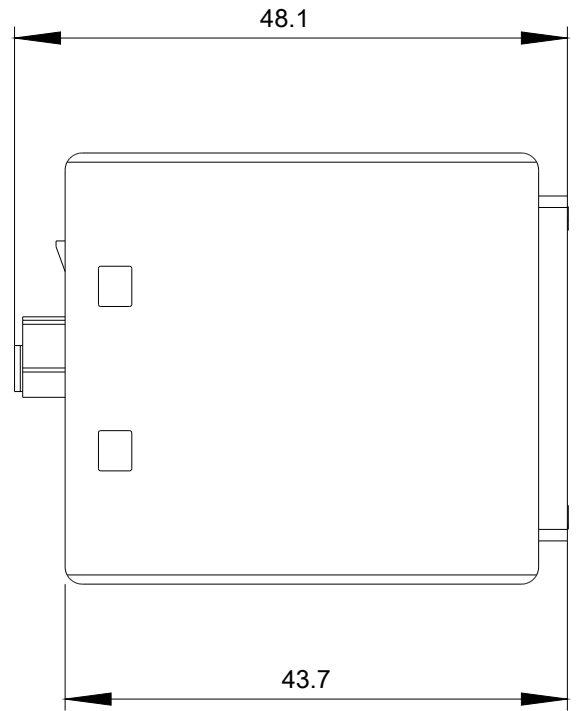
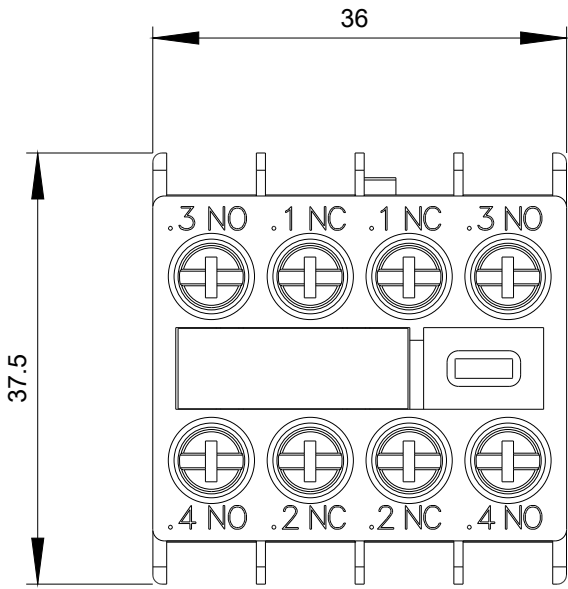
<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3RH2911-1FA22>

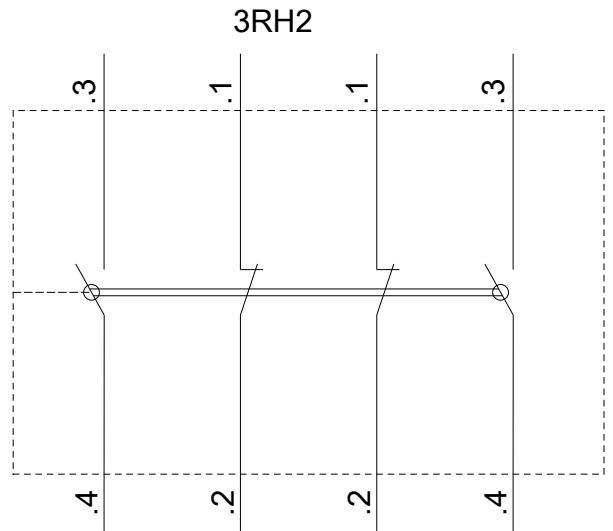
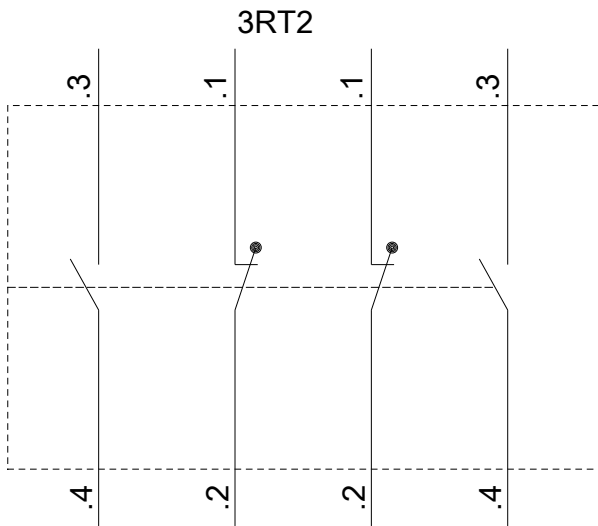
Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

<https://support.industry.siemens.com/cs/ww/en/ps/3RH2911-1FA22>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

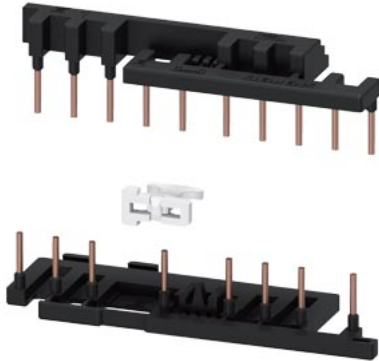
http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3RH2911-1FA22&lang=en





last modified:

03/27/2018



Wiring kit for screw terminal Electrical and mechanical Including mechanical interlocking for reversing starter Size S00

product brand name	SIRIUS
product category	Wiring modules, connectors and kits
product designation	Wiring kit
design of the product	Reversing contactor assembly S00, screw terminal

General technical data

size of contactor	S00
Substance Prohibittance (Date)	10/01/2009
number of poles	3

Installation/ mounting/ dimensions

fastening method	screw fixing
------------------	--------------

Approvals Certificates

General Product Approval



[Confirmation](#)



EG-Konf.



UR



UL

General Product Approval Marine / Shipping



ABS



BUREAU VERITAS



DNV



LRS



PRS

Marine / Shipping **other** **Environment**



RINA



RMRS

[Confirmation](#)

[Environmental Confirmations](#)

Further information

Information on the packaging

<https://support.industry.siemens.com/cs/ww/en/view/109813875>

Information- and Downloadcenter (Catalogs, Brochures,...)

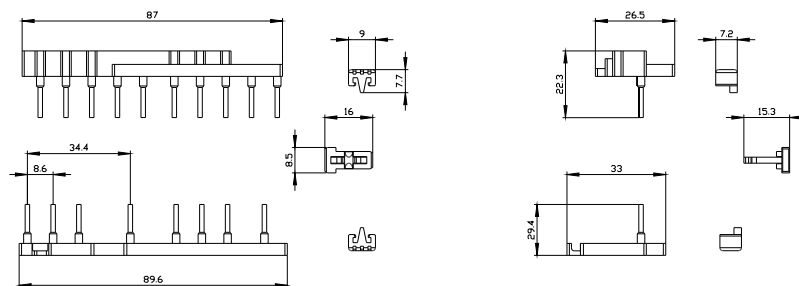
<https://www.siemens.com/ic10>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3RA2913-2AA1>

Cax online generator

<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3RA2913-2AA1>



last modified:

1/10/2024 



SITOP PSU100S/1AC/24VDC/20A

SITOP PSU100S 20 A stabilized power supply input: 120/230 V AC output: 24 V DC/20 A

input	
type of the power supply network	1-phase AC
supply voltage at AC	Automatic range selection
supply voltage	120 V/230 V
input voltage 1 at AC	85 ... 132 V
input voltage 2 at AC	176 ... 264 V
wide range input	No
overvoltage overload capability	2.3 × Vin rated, 1.3 ms
buffering time for rated value of the output current in the event of power failure minimum	20 ms
operating condition of the mains buffering	at Vin = 120/230 V
line frequency	50/60 Hz
line frequency	47 ... 63 Hz
input current	
• at rated input voltage 120 V	7.5 A
• at rated input voltage 230 V	3.5 A
current limitation of inrush current at 25 °C maximum	11 A
I ² t value maximum	10 A ² ·s
fuse protection type	T 10 A (not accessible)
fuse protection type in the feeder	Recommended miniature circuit breaker: from 10 A characteristic C or circuit-breaker 3RV2411-1JA10 (120 V) or 3RV2411-1FA10 (230 V)
output	
voltage curve at output	Controlled, isolated DC voltage
output voltage at DC rated value	24 V
output voltage	
• at output 1 at DC rated value	24 V
output voltage adjustable	Yes; via potentiometer
adjustable output voltage	24 ... 28 V; max. 480 W
relative overall tolerance of the voltage	3 %
relative control precision of the output voltage	
• on slow fluctuation of input voltage	0.5 %
• on slow fluctuation of ohm loading	1 %
residual ripple	
• maximum	150 mV
voltage peak	
• maximum	240 mV
display version for normal operation	Green LED for 24 V OK
type of signal at output	Relay contact (NO contact, rating 50 V DC/ 0.3 A) for "24 V OK"
behavior of the output voltage when switching on	No overshoot of Vout (soft start)
response delay maximum	1.5 s

voltage increase time of the output voltage	
• typical	50 ms
• maximum	500 ms
output current	
• rated value	20 A
• rated range	0 ... 20 A; 24 A up to +45°C; +60 ... +70 °C: Derating 5%/K
supplied active power typical	480 W
short-term overload current	
• on short-circuiting during the start-up typical	35 A
• at short-circuit during operation typical	35 A
duration of overloading capability for excess current	
• on short-circuiting during the start-up	100 ms
• at short-circuit during operation	100 ms
bridging of equipment	Yes
number of parallel-switched equipment resources for increasing the power	2
efficiency	
efficiency in percent	90 %
power loss [W]	
• at rated output voltage for rated value of the output current typical	53 W
closed-loop control	
relative control precision of the output voltage with rapid fluctuation of the input voltage by +/- 15% typical	1 %
relative control precision of the output voltage load step of resistive load 50/100/50 % typical	3 %
setting time	
• maximum	10 ms
protection and monitoring	
design of the overvoltage protection	Yes, according to EN 60950-1
property of the output short-circuit proof	Yes
design of short-circuit protection	Electronic shutdown, automatic restart
• typical	21 A
overcurrent overload capability	
• in normal operation	overload capability 150 % Iout rated up to 5 s/min
enduring short circuit current RMS value	
• maximum	7 A
safety	
galvanic isolation between input and output	Yes
galvanic isolation	Safety extra-low output voltage Uout acc. to EN 60950-1 and EN 50178
operating resource protection class	Class I
leakage current	
• maximum	3.5 mA
• typical	1 mA
protection class IP	IP20
standard	
• for emitted interference	EN 55022 Class B
• for mains harmonics limitation	EN 61000-3-2
• for interference immunity	EN 61000-6-2
standards, specifications, approvals	
certificate of suitability	
• CE marking	Yes
• UL approval	Yes; cULus-Listed (UL 508, CSA C22.2 No. 107.1), File E197259; cCSAus (CSA C22.2 No. 60950-1, UL 60950-1)
• CSA approval	Yes; cULus-Listed (UL 508, CSA C22.2 No. 107.1), File E197259; cCSAus (CSA C22.2 No. 60950-1, UL 60950-1)
• EAC approval	Yes
• NEC Class 2	No
type of certification	
• BIS	Yes; R-41183539
• CB-certificate	Yes
MTBF at 40 °C	1 778 916 h

standards, specifications, approvals hazardous environments

certificate of suitability	
• IECEX	No
• ATEX	No
• ULhazloc approval	No
• cCSAus, Class 1, Division 2	No
• FM registration	No

standards, specifications, approvals marine classification

shipbuilding approval	Yes
Marine classification association	
• American Bureau of Shipping Europe Ltd. (ABS)	No
• French marine classification society (BV)	No
• Det Norske Veritas (DNV)	Yes
• Lloyds Register of Shipping (LRS)	No

standards, specifications, approvals Environmental Product Declaration

Environmental Product Declaration	Yes
Global Warming Potential [CO2 eq]	
• total	1 707.2 kg
• during manufacturing	47.4 kg
• during operation	1 658.2 kg
• after end of life	0.72 kg

ambient conditions

ambient temperature	
• during operation	0 ... 70 °C; with natural convection
• during transport	-40 ... +85 °C
• during storage	-40 ... +85 °C
environmental category according to IEC 60721	Climate class 3K3, 5 ... 95% no condensation

connection method

type of electrical connection	screw terminal
• at input	L1, N, PE: 1 screw terminal each for 0.2 ... 4 mm ² single-core/finely stranded
• at output	+, -: 2 screw terminals each for 0.2 ... 4 mm ²
• for auxiliary contacts	13, 14 (alarm signal): 1 screw terminal each for 0.14 ... 1.5 mm ²

mechanical data

width × height × depth of the enclosure	115 × 145 × 150 mm
installation width × mounting height	120 mm × 245 mm
required spacing	
• top	50 mm
• bottom	50 mm
• left	0 mm
• right	0 mm
fastening method	Snaps onto DIN rail EN 60715 35x7.5/15
• standard rail mounting	Yes
• S7 rail mounting	No
• wall mounting	No
housing can be lined up	Yes
net weight	2.4 kg

accessories

electrical accessories	Buffer module
mechanical accessories	Device identification label 20 mm × 7 mm, pale turquoise 3RT1900-1SB20

further information internet links

internet link	
• to website: Industry Mall	https://mall.industry.siemens.com
• to website: Industrial communication	https://siemens.com/industrial-communication
• to website: CAx-Download-Manager	https://siemens.com/cax
• to website: Industry Online Support	https://support.industry.siemens.com

additional information

other information	Specifications at rated input voltage and ambient temperature +25 °C (unless otherwise specified)
-------------------	---

security information

security information	Siemens provides products and solutions with industrial cybersecurity functions that support the secure operation of plants, systems, machines and networks.
----------------------	--

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial cybersecurity concept. Siemens' products and solutions constitute one element of such a concept. Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place. For additional information on industrial cybersecurity measures that may be implemented, please visit www.siemens.com/cybersecurity-industry. Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats. To stay informed about product updates, subscribe to the Siemens Industrial Cybersecurity RSS Feed under <https://www.siemens.com/cert>. (V4.7)

Classifications

	Version	Classification
eClass	14	27-04-07-01
eClass	12	27-04-07-01
eClass	9.1	27-04-07-01
eClass	9	27-04-07-01
eClass	8	27-04-90-02
eClass	7.1	27-04-90-02
eClass	6	27-04-90-02
ETIM	9	EC002540
ETIM	8	EC002540
ETIM	7	EC002540
IDEA	4	4130
UNSPSC	15	39-12-10-04

Approvals Certificates

General Product Approval



[Manufacturer Declaration](#)

[Declaration of Conformity](#)



General Product Approval	Marine / Shipping	Environment
--------------------------	-------------------	-------------

[BIS CRS](#)



last modified:

6/26/2024

USCC & USM UltraSafe™ Fuseholders

UltraSafe modular fuseholders for midget and class CC fuses

Mersen UltraSafe Modular Fuseholders introduce a new level of safety for Class CC (USCC) and Midget 1-1/2" x 13/32" (USM) AC and DC-rated fuses up to 30 amperes. UltraSafe holders qualify as "Finger-safe" under IEC and DIN standards to an IP20 grade of protection, including fuse changing (with the flick of a finger). UltraSafe holders are available in 1, 2, 3 or 4 poles, with or without visual blown-fuse indicators in each pole. Multi-pole units can also be field assembled by ordering pin-tie handles.

UltraSafe holders save up to 15% mounting space and any combination can be snapped onto 35mm DIN-rail for extra savings in panel building time. UltraSafe holders with Class CC fuses chosen for Type "2" No Damage protection give one of the safest protection packages in the industry. UltraSafe body material is tough and durable polyamide, with exceptional insulating properties.

Highlights:

- IP20 Finger-Safe (touch safe)
- Optional visual blown fuse Indicator lights
- DIN-rail mounting
- Compact footprint
- Quick, tool-free, easy fuse change outs

Applications:

- All circuits up to 600 volts for motors, control circuits, transformers, etc...
- DC circuits up to 1000VDC including photovoltaic applications
- Non-load disconnect

Recommended Fuse Usage:

- **USM use with:**
ATQ, ATM*, A6Y-2B, A25Z-2, TRM, OTM, A13X-2, A60Q-2, DCT*, HP6M, HP10M
- **USCC use with:**
ATDR, ATMR*, ATQR

* Recommended for DC applications

Additional Specifications:

Terminal screws: Phillips/slot head

Suggested screw torque: 14.75 in-lbs.

Wire range: #14 to 6 AWG (2.5 to 16mm²) single conductor
: #14 to 10 AWG (2.5 to 5.0 mm²) dual conductor

Wire type: 60/75/90°C solid/stranded copper

Connector type: Pressure plate

Load-break disconnect: No

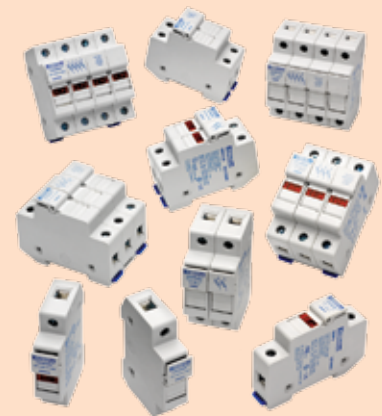
Environmental: RoHS compliant, lead free

Operating temperature: -40° to 85°C

Watts loss: 3W or less

Flammability rating: UL 94-V0

Optional Blown Fuse Indicator Lens Color: Red



Ratings:

USM (Midget 10x38mm Fuses)

- Volts** : 800VAC Maximum
: 1000VDC Maximum
- Amps** : 30A Maximum
- SCCR** : 200kA AC
: 100kA DC

USCC (Class CC Fuses)

- Volts** : 600VAC / DC Maximum
- Amps** : 30A Maximum
- SCCR** : 200kA

Min. voltage to operate indicator light: 90VAC, 115VDC [Less than 0.7 mA leakage current at 600V]

USM1IHEL minimum indicator operating voltage: 350VDC

Approvals:

- UL Listed to Standard 4248-4 (class CC) and 4248-1 (midget), File E52283
- UL Listed to standard 4248-18 (photovoltaic), File E347822
- CSA Certified C22.2
- IEC 60269-2-1 and 60947-3 Compliant (USM only)



MERSEN

USCC & USM UltraSafe™ Fuseholders

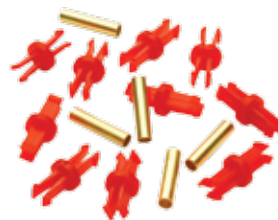
Catalog Numbers:

Fuse Type	Ampere Rating	Voltage Rating		Visual Indication	No. of Poles	Catalog Number
		AC	DC			
Class CC	30	600	600	No	1	USCC1
	30	600	600	No	2	USCC2
	30	600	600	No	3	USCC3
	30	600	600	No	4	USCC4
	30	600	600	No	3+N	USCC3N
	30	600	600	Yes	1	USCC1I
	30	600	600	Yes	2	USCC2I
	30	600	600	Yes	3	USCC3I
	30	600	600	Yes	4	USCC4I
	30	600	600	Yes	3+N	USCC3IN
	30	120	-	Yes	1	USCC1-AC120
	30	300	-	Yes	1	USCC1-AC300
	30	-	24	Yes	1	USCC1-DC24
Midget (10 x 38mm) (1-1/2" x 13/32")	30	800	1000	No	1	USM1
	30	800	1000	No	2	USM2
	30	800	1000	No	3	USM3
	30	800	1000	No	4	USM4
	30	800	1000	No	3+N	USM3N
	30	600	600	Yes	1	USM1I
	30	600	600	Yes	2	USM2I
	30	600	600	Yes	3	USM3I
	30	600	600	Yes	4	USM4I
	30	600	600	Yes	3+N	USM3IN
	30	120	-	Yes	1	USM1I-AC120
	30	-	24	Yes	1	USM1I-DC24
	Photovoltaic	32	-	1000	No	1
Midget	32	-	1000	Yes	1	USM1IHEL

IEC Ratings for USM: 690VAC / 1000VDC, 32A, 50kA SCCR
 CSA Ratings for USM: 750VAC / 1000VDC, 30A

Catalog Numbers—Accessories:

Accessories Catalog No.	Description
USN	1-Pole with Integral Neutral Link
USPTH	Pin-tie Accessory for 12-Poles



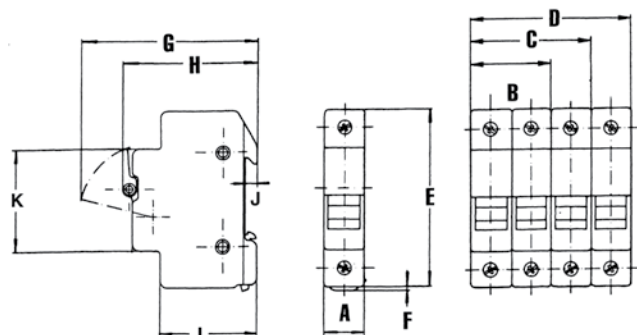
USPTH Pin-Tie Accessory



USM1 with USPTH Pin-Ties

Dimensions

Dimension	mm	In	Dimension	mm	In
A	17.5	0.69	G	78.0	3.07
B	35.0	1.38	H	59.0	2.32
C	52.5	2.07	I	42.5	1.67
D	70.0	2.76	J	5.0	0.20
E	78.0	3.07	K	45.0	1.77
F	2.5	0.10			



For the most current product performance data visit ep.mersen.com and use catalog search.

ATDR

TIME DELAY/CLASS CC



THE BEST PROTECTION FOR TODAY'S SMALL MOTORS.

Amp-trap 2000® ATDR small-dimension fuses can provide IEC Type 2 “no damage” protection to your facility’s increasingly sensitive branch circuit components and small motors – minimizing the risk of fault-related damage. ATDR Class CC fuses deliver the best time delay characteristics in their class with excellent cycling ability for small motor loads.

A

Features/Benefits

- **Time delay** for motor starting inrush currents without nuisance opening
- **Highly current limiting** for low peak let-thru current
- **Improved cycling ability** for frequent motor starts/stops without nuisance fuse opening
- **Rejection-style design** prevents replacement errors (when used with recommended fuse blocks)
- **High-visibility orange label** ensures instant recognition, simplifies replacement
- **Metal-embossed date and catalog number** for traceability and lasting identification
- **Fiberglass body** provides dimensional stability in harsh industrial settings
- **High-grade silica filler** ensures fast arc quenching and optimum current limitation

HIGHLIGHTS:

- Time Delay
- Best Choice for Small Motor Protection
- Highly Current-Limiting
- AC & DC Rated

APPLICATIONS:

- Small Motors
- Contactors
- Lighting, Heating & General Loads
- Branch Circuit Protector

Ratings

- **AC:** 1/4 to 30A
600VAC, 200kA I.R.
- **DC:** 1/4 to 30A
300VDC, 100kA I.R.

Approvals

- UL Listed to Standard 248-4 File 2137
- CSA Certified to Standard C22.2 No. 248.4
- DC Listed to UL Standard 248



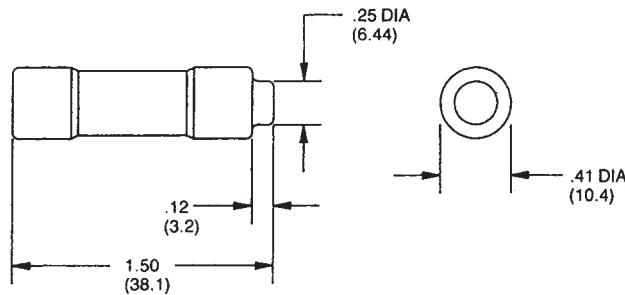
TIME DELAY/CLASS CC FUSES

ATDR

Standard Fuse Ampere Ratings, Catalog Numbers

AMPERE RATING	CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER
1/4	ATDR1/4	1-1/2	ATDR1-1/2	3	ATDR3	6	ATDR6	12	ATDR12
1/2	ATDR1/2	1-6/10	ATDR1-6/10	3-2/10	ATDR3-2/10	6-1/4	ATDR6-1/4	15	ATDR15
8/10	ATDR8/10	1-8/10	ATDR1-8/10	3-1/2	ATDR3-1/2	7	ATDR7	17-1/2	ATDR17-1/2
1	ATDR1	2	ATDR2	4	ATDR4	7-1/2	ATDR7-1/2	20	ATDR20
1-1/8	ATDR1-1/8	2-1/4	ATDR2-1/4	4-1/2	ATDR4-1/2	8	ATDR8	25	ATDR25
1-1/4	ATDR1-1/4	2-1/2	ATDR2-1/2	5	ATDR5	9	ATDR9	30	ATDR30
1-4/10	ATDR1-4/10	2-8/10	ATDR2-8/10	5-6/10	ATDR5-6/10	10	ATDR10		

Dimensions



Small Motor Fuse Protection, 600 Volts AC or Less

MOTOR FULL LOAD AMPERES	ATDR RATING*	
	MINIMUM DUTY	NORMAL DUTY
.71 - .89	1-1/4	1-6/10
.90 - 1.19	1-6/10	2
1.20 - 1.34	2	2-1/2
1.35 - 1.79	2-1/2	3
1.80 - 2.25	3	4
2.26 - 2.69	4	5
2.70 - 2.90	4	6
2.91 - 3.20	5	6
3.21 - 3.75	5	7
3.76 - 4.50	6	8
4.51 - 5.34	8	10
5.35 - 5.69	10	12
5.70 - 6.70	12	12
6.71 - 7.79	12	15
7.80 - 8.88	15	17-1/2
8.89 - 11.1	17-1/2	20
11.2 - 13.3	20	25
13.4 - 15.2	25	30

Recommended Fuse Blocks for Class CC Fuses

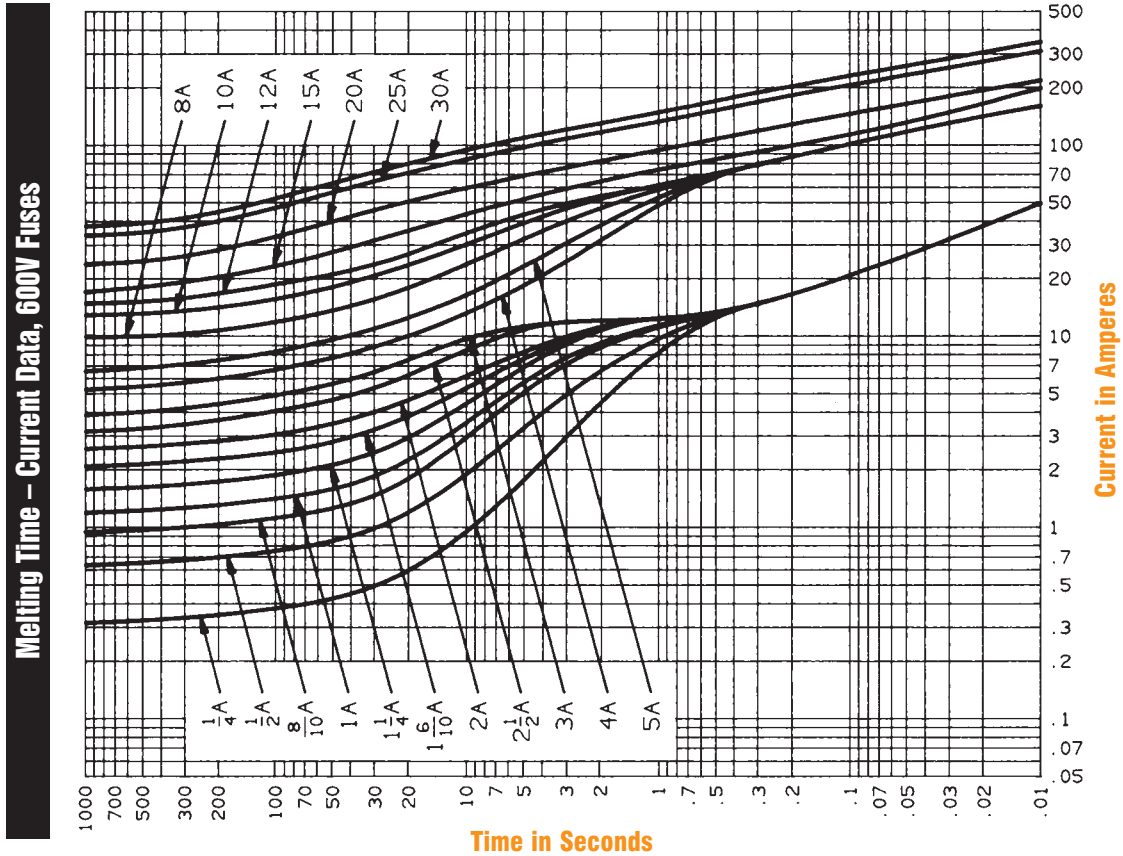
Number of Poles	CATALOG NUMBER			
	ULTRASAFE™ Indicating Fuse Holder	Screw Connector w/ Double Quick Connects	Pressure Plate Connector w/ Double Quick Connects	Copper Box Connector
ADDER				
1	USCC1I	30310R	30320R	30350R
2	USCC2I	30311R	30321R	30351R
3	USCC3I	30312R	30322R	30352R
		30313R	30323R	30353R

* The National Electrical Code allows time-delay Class CC fuses to be sized at up to 400% (maximum) of motor FLA, if needed.

TIME DELAY/CLASS CC FUSES

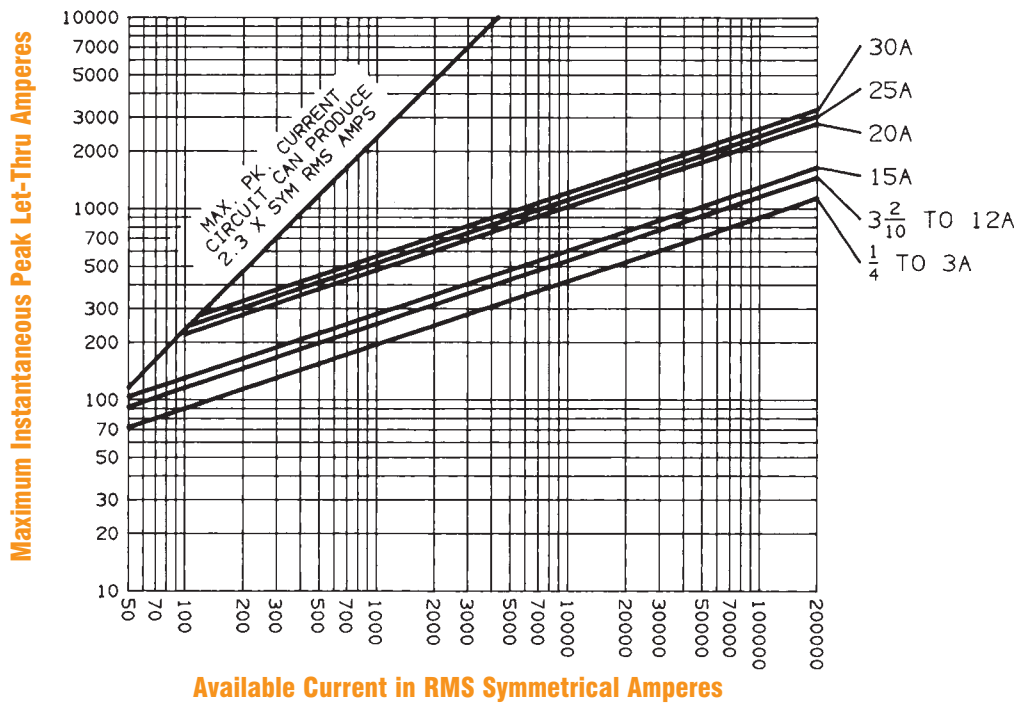
ATDR

ATDR1/4 to 30

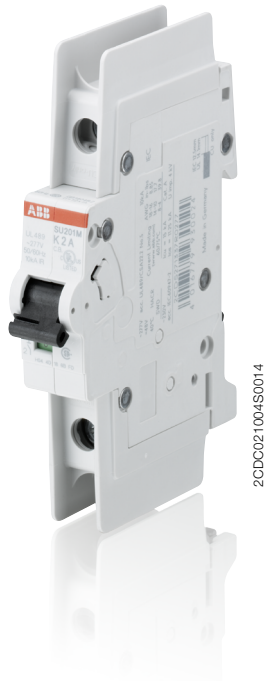


A

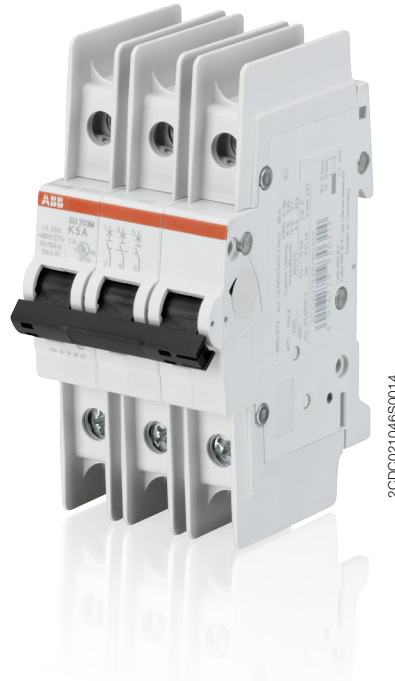
Peak Let-Through Current Data – ATDR1/4 to 30, 600 Volts AC



System pro M compact® Miniature Circuit Breaker SU200M for branch circuit protection acc. to UL 489



2CDC021004S0014



2CDC021046S0014

The miniature circuit breaker SU 200 M is ABB's solution for UL 489 branch circuit protection up to 480 Y/277 V AC and 96 V DC. This circuit breaker is an all-round device for AC and DC applications for universal use in North American and global markets due to its approvals acc. to the international standards UL, CSA and IEC. Moreover, SU 200 M is fully compatible with System pro M compact® UL 489 accessories.

Features

- High performance MCB with 10 kA interrupting capacity acc. to UL 489 / CSA 22.2 No. 5 and 15 kA breaking capacity acc. to IEC/EN 60947-2
- Certified up to $I_n = 40$ A at 480 Y/277 V AC acc. to UL 489 / CSA 22.2 No. 5
- Certified for AC and DC use acc. to UL and CSA
- 40 °C reference temperature acc. to UL and CSA
- Current limiting acc. to UL 489
- Clear contact position indication in red/green ("real CPI")

Standards and approvals

Standards

UL 489
 CSA 22.2 No. 5
 IEC/EN 60947-2

Approvals

UL 489	US
CSA 22.2 No. 5	CA
VDE	DE
CCC	CN

Miniature Circuit Breaker SU200M

Technical data

General Data

Standards	UL 489, CSA 22.2 No. 5, IEC/EN 60947-2
Poles	1P, 2P, 3P, 4P
Tripping characteristics	C, K, Z
Rated current I_n	0.2 - 63 A
Rated frequency f	50 / 60 Hz, DC (0 Hz)
Rated insulation voltage U acc. to IEC/EN 60664-1	250 V AC (phase to ground), 440 V AC (phase to phase)
Overvoltage category	III
Pollution degree	3

IEC/EN 60947-2

Rated operational voltage U	1P: 230 V AC; 2P, 3P, 4P: 400 V AC
Max. power frequency recovery voltage U_{max} AC	1P: 253 V AC; 2P, 3P, 4P: 440 V AC
Min. operating voltage	12 V AC, 12 V DC
Rated ultimate short-circuit breaking capacity I_{cu}	15 kA
Rated service short-circuit breaking capacity I_{cs}	≤ 40 A: 11.25 kA > 40 A: 7.5 kA
Rated impulse withstand voltage U_{imp} (1.2/50μs)	4 kV (test voltage 6.2 kV at sea level, 5 kV at 2,000 m)
Dielectric test voltage	2 kV (50 / 60Hz, 1 min.)
Reference temperature for tripping characteristics	30 °C
Electrical endurance	$I_n < 30$ A: 20,000 ops (AC), $I_n ≥ 30$ A: 10,000 ops. (AC); 1 cycle (2 s - ON, 13 s - OFF, $I_n ≤ 32$ A), 1 cycle (2 s - ON, 28 s - OFF, $I_n > 32$ A)

UL / CSA

Rated voltage	AC	1P: 277 V AC up to 40 A for C, Z char., 277 V AC up to 35 A for K char., 240 V AC
	AC	2P, 3P, 4P: 480 Y / 277 V AC up to 40 A for C, Z char., 480 Y / 277 V AC up to 35 A for K char., 240 V AC
	DC	1P: 48 V DC; 2P: 96 V DC (2p in series)
Rated interrupting capacity acc. to UL 1077	-	-
Short-circuit current rating acc. to UL 489	-	10 kA
Application	-	-
Reference temperature for tripping characteristics	-	40 °C
Electrical endurance	-	6,000 ops (AC), 6,000 ops. (DC); 1 cycle (1 s - ON, 9 s - OFF)

Mechanical data

Housing	Insulation group II, RAL 7035
Toggle	Insulation group II, black, sealable
Contact position indication	Real CPI (green OFF / red ON)
Protection degree acc. to DIN EN 60529	IP20*, IP40 in enclosure with cover
Mechanical endurance	20,000 ops.
Shock resistance acc. to IEC/EN 60068-2-27	25 g - 2 shocks - 13 ms
Vibration resistance acc. to IEC/EN 60068-2-6	5g - 20 cycles at 5...150...5 Hz with load 0.8 I_n
Environmental conditions (damp heat cyclic) acc. to IEC/EN 60068-2-30	28 cycles with 55°C/90-96% and 25°C/95-100%
Ambient temperature	-25 ... +55°C
Storage temperature	-40 ... +70 °C

Installation

Terminal	Failsafe bi-directional cylinder-lift terminal
Cross-section of conductors (top/bottom)	solid, stranded: 35 mm ² / 35 mm ² flexible: 25 mm ² / 25 mm ² 18 - 4 AWG
Cross-section of busbars (top/bottom)	10 mm ² / 10 mm ² 18 - 8 AWG
Torque	2.8 Nm AWG 18-16: 13.3 in-lbs. AWG 14-10: 17.7 in-lbs. AWG 8-4: 39.8 in-lbs.
Screwdriver	No. 2 Pozidrive
Mounting	On DIN rail 35 mm acc. to EN 60715 by fast clip
Mounting position	any
Supply	optional

Dimensions and weight

Mounting dimensions acc. to DIN 43880	Mounting dimension 3
Pole dimensions (H x D x W)	111 x 69 x 17.5 mm
Pole weight	approx. 125 g

Combination with auxiliary elements

Auxiliary contact	Yes
Signal contact	Yes
Shunt trip	Yes

Miniature Circuit Breaker SU200M

Tripping characteristics

Tripping characteristics

Acc. to	Tripping characteristics	Rated current I_n	Thermal release ¹⁾			Electromagnetic release ²⁾		
			Currents: conventional non-tripping current I_1	conventional tripping current I_2	Tripping time	Range of instantaneous tripping	Tripping time	
IEC/EN 60947-2	C	0.5 to 63 A	$1.05 \cdot I_n$	$1.3 \cdot I_n$	> 1 h < 1 h ³⁾	$5 \cdot I_n$ $10 \cdot I_n$	> 0.2 s < 0.2 s	
	K	0.2 to 63 A	$1.05 \cdot I_n$	$1.3 \cdot I_n$	> 1 h < 1 h ³⁾	$10 \cdot I_n$ $14 \cdot I_n$	> 0.2 s < 0.2 s	
	Z	0.5 to 63 A	$1.05 \cdot I_n$	$1.3 \cdot I_n$	> 1 h < 1 h ³⁾	$2 \cdot I_n$ $3 \cdot I_n$	> 0.2 s < 0.2 s	

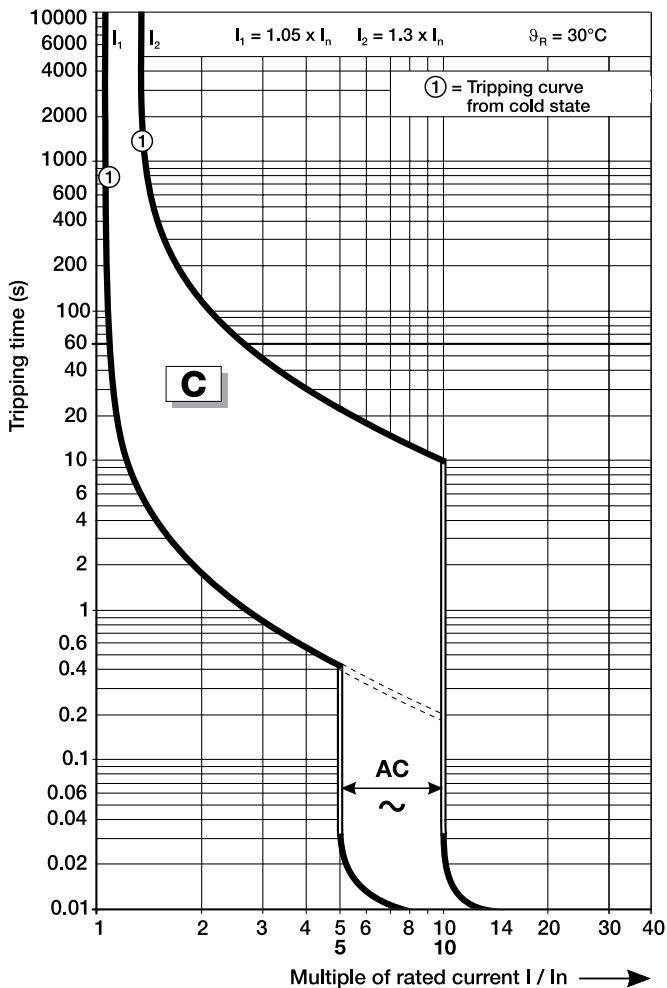
¹⁾ The thermal releases are calibrated to a nominal reference ambient temperature of 30 °C.

In the case of higher ambient temperatures, the current values fall by approx. 6 % for each 10 K temperature rise.

²⁾ The indicated tripping values of electromagnetic tripping devices apply to a frequency of 50/60 Hz. The thermal release operates independent of frequency.

³⁾ As from operating temperature (after $I_1 > 1h$)

C characteristic

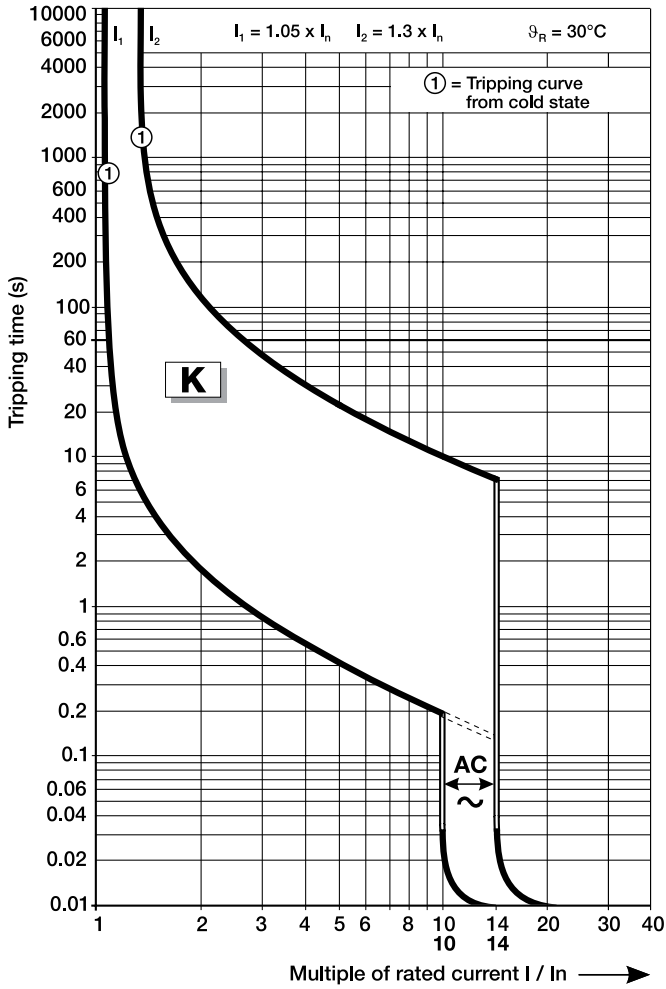


2CDC022002F0214

Miniature Circuit Breaker SU200M

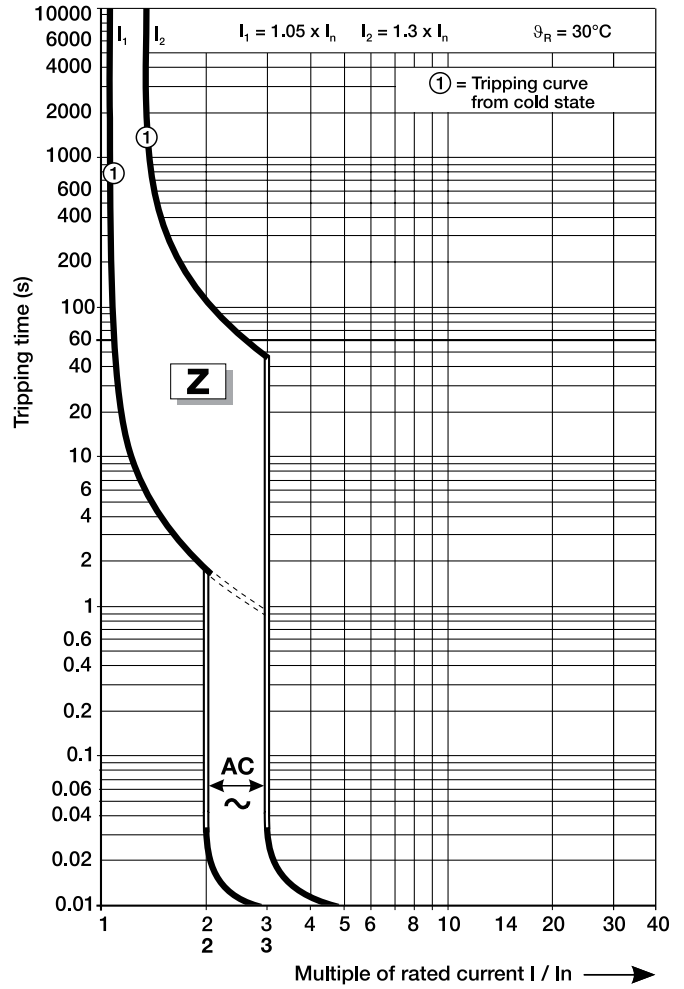
Tripping characteristics

K characteristic



2CDC022D04F0214

Z characteristic



2CDC022D05F0214

Miniature Circuit Breaker SU200M

Deviating ambient temperature

The rated value of the current of a miniature circuit breaker of SU 200 M series refers to a reference ambient temperature of 30 °C acc. to IEC/EN 60947-2 and 40° acc. to UL/CSA.

The following table shows derating factors for ambient temperature from -40 °C to 70 °C for the characteristics C, K, Z.

Standard	Rated current I_n A	Maximum operating current at ambient temperature T											
		A											
		- 40 °C	- 30 °C	- 20 °C	- 10 °C	0 °C	10 °C	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
IEC/EN 60947-2	0.2 *	0.26	0.25	0.24	0.23	0.22	0.22	0.21	0.20	0.19	0.19	0.18	0.17
	0.3 *	0.39	0.37	0.36	0.35	0.33	0.32	0.31	0.30	0.29	0.28	0.27	0.26
	0.5	0.64	0.62	0.60	0.58	0.56	0.54	0.52	0.5	0.48	0.46	0.45	0.43
	0.75 *	0.97	0.93	0.90	0.87	0.84	0.81	0.78	0.75	0.72	0.70	0.67	0.65
	1	1.29	1.24	1.20	1.16	1.12	1.08	1.04	1	0.96	0.93	0.89	0.86
	1.6	1.68	1.62	1.56	1.50	1.45	1.40	1.35	1.3	1.25	1.21	1.16	1.12
	2	2.58	2.49	2.40	2.31	2.23	2.15	2.07	2	1.93	1.85	1.79	1.72
	3	3.87	3.73	3.60	3.47	3.35	3.23	3.11	3	2.89	2.78	2.68	2.58
	4	5.16	4.97	4.80	4.63	4.46	4.30	4.15	4	3.85	3.71	3.57	3.44
	5	6.45	6.22	6.00	5.78	5.58	5.38	5.19	5	4.82	4.64	4.47	4.30
	6	7.74	7.46	7.20	6.94	6.69	6.45	6.22	6	5.78	5.56	5.36	5.16
	8	10.32	9.95	9.59	9.25	8.92	8.60	8.30	8	7.70	7.42	7.14	6.88
	10	12.90	12.44	11.99	11.56	11.15	10.75	10.37	10	9.63	9.27	8.93	8.60
	13	16.76	16.17	15.59	15.03	14.50	13.98	13.48	13	12.52	12.06	11.61	11.18
	15	19.34	18.65	17.99	17.35	16.73	16.13	15.56	15	14.45	13.91	13.40	12.90
	16	20.63	19.90	19.19	18.50	17.84	17.21	16.59	16	15.41	14.84	14.29	13.76
	20	25.79	24.87	23.98	23.13	22.30	21.51	20.74	20	19.26	18.55	17.86	17.20
	25	32.24	31.09	29.98	28.91	27.88	26.88	25.93	25	24.08	23.18	22.33	21.50
	30	38.69	37.31	35.98	34.69	33.45	32.26	31.11	30	28.89	27.82	26.79	25.80
	32	41.27	39.79	38.37	37.01	35.69	34.41	33.18	32	30.82	29.68	28.58	27.52
35	45.14	43.53	41.97	40.47	39.03	37.64	36.30	35	33.71	32.46	31.26	30.10	
40	51.58	49.74	47.97	46.26	44.61	43.01	41.48	40	38.52	37.09	35.72	34.40	
50	64.48	62.18	59.96	57.82	55.76	53.77	51.85	50	48.15	46.37	44.65	43.00	
60	77.38	74.61	71.95	69.39	66.91	64.52	62.22	60	57.78	55.64	53.58	51.60	
63	81.24	78.35	75.55	72.85	70.25	67.75	65.33	63	61	58	56	54	

Miniature Circuit Breaker SU200M

Deviating ambient temperature

Standard	Rated current I_n A	Maximum operating current at ambient temperature T											
		A											
		- 40 °C	- 30 °C	- 20 °C	- 10 °C	0 °C	10 °C	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
UL 489	0.2 *	0.27	0.26	0.25	0.24	0.23	0.22	0.22	0.21	0.20	0.19	0.19	0.18
	0.3 *	0.40	0.39	0.37	0.36	0.35	0.33	0.32	0.31	0.30	0.29	0.28	0.27
	0.5	0.67	0.64	0.62	0.60	0.58	0.56	0.54	0.52	0.5	0.48	0.46	0.45
	0.75 *	1.00	0.97	0.93	0.90	0.87	0.84	0.81	0.78	0.75	0.72	0.70	0.67
	1	1.34	1.29	1.24	1.20	1.16	1.12	1.08	1.04	1	0.96	0.93	0.89
	1.6	1.74	1.68	1.62	1.56	1.50	1.45	1.40	1.35	1.3	1.25	1.21	1.16
	2	2.67	2.58	2.49	2.40	2.31	2.23	2.15	2.07	2	1.93	1.85	1.79
	3	4.01	3.87	3.73	3.60	3.47	3.35	3.23	3.11	3	2.89	2.78	2.68
	4	5.35	5.16	4.97	4.80	4.63	4.46	4.30	4.15	4	3.85	3.71	3.57
	5	6.69	6.45	6.22	6.00	5.78	5.58	5.38	5.19	5	4.82	4.64	4.47
	6	8.02	7.74	7.46	7.20	6.94	6.69	6.45	6.22	6	5.78	5.56	5.36
	8	10.70	10.32	9.95	9.59	9.25	8.92	8.60	8.30	8	7.70	7.42	7.14
	10	13.37	12.90	12.44	11.99	11.56	11.15	10.75	10.37	10	9.63	9.27	8.93
	13	17.38	16.76	16.17	15.59	15.03	14.50	13.98	13.48	13	12.52	12.06	11.61
	15	20.06	19.34	18.65	17.99	17.35	16.73	16.13	15.56	15	14.45	13.91	13.40
	16	21.40	20.63	19.90	19.19	18.50	17.84	17.21	16.59	16	15.41	14.84	14.29
	20	26.75	25.79	24.87	23.98	23.13	22.30	21.51	20.74	20	19.26	18.55	17.86
	25	33.43	32.24	31.09	29.98	28.91	27.88	26.88	25.93	25	24.08	23.18	22.33
	30	40.12	38.69	37.31	35.98	34.69	33.45	32.26	31.11	30	28.89	27.82	26.79
	32	42.79	41.27	39.79	38.37	37.01	35.69	34.41	33.18	32	30.82	29.68	28.58
35	46.81	45.14	43.53	41.97	40.47	39.03	37.64	36.30	35	33.71	32.46	31.26	
40	53.49	51.58	49.74	47.97	46.26	44.61	43.01	41.48	40	38.52	37.09	35.72	
50	66.87	64.48	62.18	59.96	57.82	55.76	53.77	51.85	50	48.15	46.37	44.65	
60	80.24	77.38	74.61	71.95	69.39	66.91	64.52	62.22	60	57.78	55.64	53.58	
63	84.25	81.24	78.35	75.55	72.85	70.25	67.75	65.33	63	60.67	58.42	56.26	

Miniature Circuit Breaker SU200M

Internal resistance and power loss

Influence of adjacent devices

If several miniature circuit breakers are installed directly side by side with high load on all poles, a correction factor has to be applied to the rated current (see table). If distance pieces are used, the factor is not to be considered.

No. of adjacent devices	Factor F
1	1
2, 3	0.9
4, 5	0.8
≥ 6	0.75

Internal resistance and power loss per pole

Rated current I_n A	C, K characteristics		Z characteristics	
	Internal resistance per pole R_i mΩ	Power loss P_v W	Internal resistance per pole R_i mΩ	Power loss P_v W
0.2	42500	1.7	-	-
0.3	18889	1.7	-	-
0.5	5600	1.4	9000	2.3
0.75	2489	1.4	-	-
1	1400	1.4	2200	2.2
1.6	703	1.8	1000	2.6
2	450	1.8	650	2.6
3	178	1.6	250	2.3
4	113	1.8	140	2.2
5	50	1.3	100	2.5
6	56	2.0	70	2.5
8	23	1.5	28	1.8
10	21	2.1	21	2.1
13	14	2.3	17	2.9
15	11	2.4	13	2.9
16	9.8	2.5	10	2.6
20	6.3	2.5	6.5	2.6
25	5.1	3.2	5.1	3.2
30	3.9	3.5	3.9	3.5
32	3.6	3.7	3.6	3.7
35	3.3	4.1	3.3	4.1
40	2.8	4.5	2.8	4.5
50	1.8	4.5	1.8	4.5
60	1.4	4.9	1.4	4.9
63	1.4	5.4	1.4	5.4

Internal resistances are subject to application-specific and environment-specific conditions and are therefore to be considered as typical values.

Miniature Circuit Breaker SU200M

Current limiting – I_{peak} and I^2t values acc. to UL 489

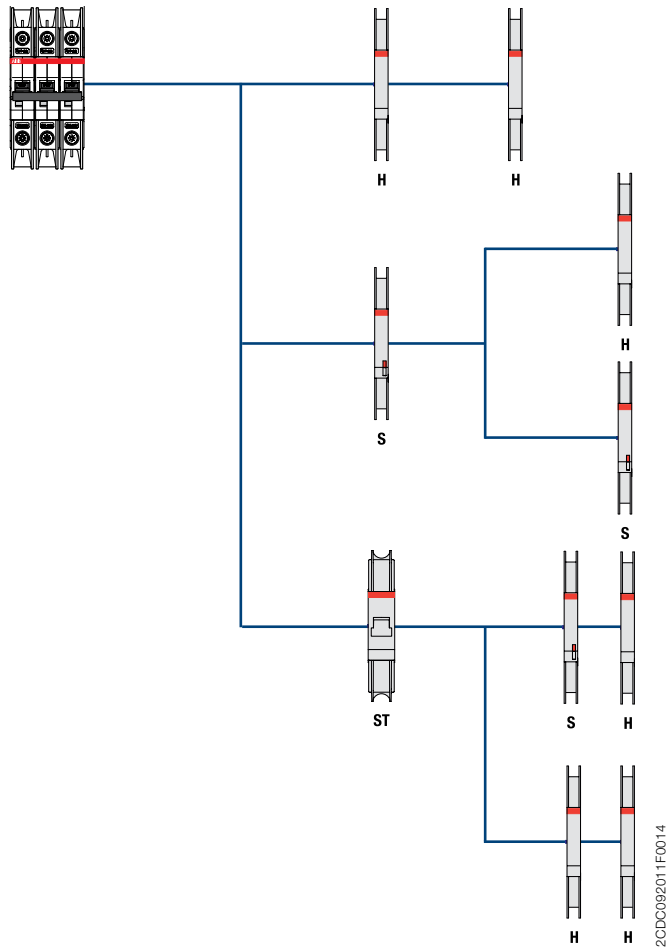
Type	Voltage	Current A	Power Factor	Phase	I_{peak} kA	I^2t kA ² S
SU203M-K0.2	480Y/277	10000	0.45-0.5	3	0.026	0.008
SU203M-K7	480Y/277	4095	0.45-0.5	3	2.3	11.9
SU203M-K7	480Y/277	7500	0.45-0.5	3	3.4	16.7
SU203M-K7	480Y/277	10000	0.45-0.5	3	4.6	19.0
SU203M-K20	480Y/277	4095	0.45-0.5	3	2.9	18.1
SU203M-K20	480Y/277	7500	0.45-0.5	3	4.3	28.1
SU203M-K20	480Y/277	10000	0.45-0.5	3	6.4	34.6
SU203M-K35	480Y/277	4095	0.45-0.5	3	3.4	27.9
SU203M-K35	480Y/277	7500	0.45-0.5	3	4.7	33.1
SU203M-K35	480Y/277	10000	0.45-0.5	3	9.0	72.0
SU203M-C40	480Y/277	4095	0.45-0.5	3	3.4	22.8
SU203M-C40	480Y/277	7500	0.45-0.5	3	5.1	42.5
SU203M-C40	480Y/277	10000	0.45-0.5	3	9.3	74.6
SU201M-K0.2	277	10000	0.45-0.5	1	0.7	0.092
SU201M-K7	277	4095	0.45-0.5	1	2.5	10.5
SU201M-K7	277	7500	0.45-0.5	1	3.4	16.9
SU201M-K7	277	10000	0.45-0.5	1	3.4	14.5
SU201M-K20	277	4095	0.45-0.5	1	2.8	14.7
SU201M-K20	277	7500	0.45-0.5	1	4.1	23.5
SU201M-K20	277	10000	0.45-0.5	1	4.7	32.5
SU201M-K35	277	4095	0.45-0.5	1	3.0	19.8
SU201M-K35	277	7500	0.45-0.5	1	4.7	36.5
SU201M-K35	277	10000	0.45-0.5	1	4.4	22.1
SU201M-C40	277	4095	0.45-0.5	1	3.6	22.9
SU201M-C40	277	7500	0.45-0.5	1	5.3	52.6
SU201M-C40	277	10000	0.45-0.5	1	5.9	44.9
SU203M-K63	240	4095	0.45-0.5	3	3.6	19.9
SU203M-K63	240	7500	0.45-0.5	3	5.1	33.0
SU203M-K63	240	10000	0.45-0.5	3	6.3	43.3
SU201M-K63	240	4095	0.45-0.5	1	3.9	33.8
SU201M-K63	240	7500	0.45-0.5	1	5.2	43.8
SU201M-K63	240	10000	0.45-0.5	1	6.5	61.8

Miniature Circuit Breaker SU200M

Accessories and dimensional drawing

Accessory overview

SU 200 M

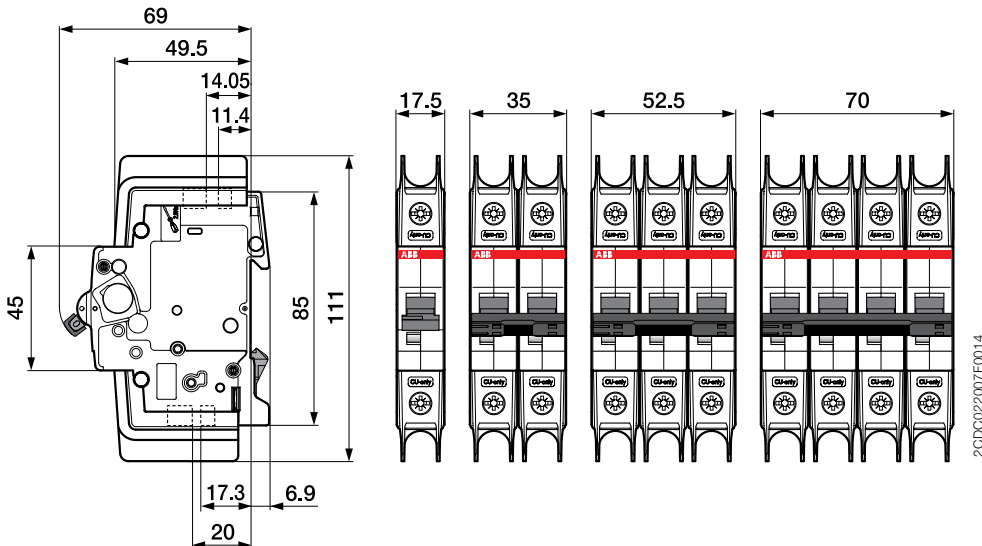


H	Auxiliary contact (change-over contact)	S2C-H6RU
S/H	Signal contact	S2C-S6RU
ST	Shunt trip	S2C-A...U

The certification of the Accessories has been done with one accessory only.

The number of electrical operations is limited to 4,000 operations for the maximum combinations and the combinations including shunt trips.

Dimensional drawing



Miniature Circuit Breaker SU200M

Ordering data characteristic C



2CDC021004S0014



2CDC021045S0014

Number of poles	Rated current I_n A	Type	Order code	Weight per PCE kg	Packing unit PCE
1	0.5	SU201M-C0,5	2CDS271337R0984	0.125	10
	1	SU201M-C1	2CDS271337R0014	0.125	10
	1.6	SU201M-C1,6	2CDS271337R0974	0.125	10
	2	SU201M-C2	2CDS271337R0024	0.125	10
	3	SU201M-C3	2CDS271337R0034	0.125	10
	4	SU201M-C4	2CDS271337R0044	0.125	10
	5	SU201M-C5	2CDS271337R0054	0.125	10
	6	SU201M-C6	2CDS271337R0064	0.125	10
	8	SU201M-C8	2CDS271337R0084	0.125	10
	10	SU201M-C10	2CDS271337R0104	0.125	10
	13	SU201M-C13	2CDS271337R0134	0.125	10
	15	SU201M-C15	2CDS271337R0154	0.125	10
	16	SU201M-C16	2CDS271337R0164	0.125	10
	20	SU201M-C20	2CDS271337R0204	0.125	10
	25	SU201M-C25	2CDS271337R0254	0.125	10
	30	SU201M-C30	2CDS271337R0304	0.125	10
	32	SU201M-C32	2CDS271337R0324	0.125	10
	35	SU201M-C35	2CDS271337R0354	0.125	10
	40	SU201M-C40	2CDS271337R0404	0.125	10
	50	SU201M-C50	2CDS271337R0504	0.125	10
60	SU201M-C60	2CDS271337R0604	0.125	10	
63	SU201M-C63	2CDS271337R0634	0.125	10	
2	0.5	SU202M-C0,5	2CDS272337R0984	0.250	5
	1	SU202M-C1	2CDS272337R0014	0.250	5
	1.6	SU202M-C1,6	2CDS272337R0974	0.250	5
	2	SU202M-C2	2CDS272337R0024	0.250	5
	3	SU202M-C3	2CDS272337R0034	0.250	5
	4	SU202M-C4	2CDS272337R0044	0.250	5
	5	SU202M-C5	2CDS272337R0054	0.250	5
	6	SU202M-C6	2CDS272337R0064	0.250	5
	8	SU202M-C8	2CDS272337R0084	0.250	5
	10	SU202M-C10	2CDS272337R0104	0.250	5
	13	SU202M-C13	2CDS272337R0134	0.250	5
	15	SU202M-C15	2CDS272337R0154	0.250	5
	16	SU202M-C16	2CDS272337R0164	0.250	5
	20	SU202M-C20	2CDS272337R0204	0.250	5
	25	SU202M-C25	2CDS272337R0254	0.250	5
	30	SU202M-C30	2CDS272337R0304	0.250	5
	32	SU202M-C32	2CDS272337R0324	0.250	5
	35	SU202M-C35	2CDS272337R0354	0.250	5
	40	SU202M-C40	2CDS272337R0404	0.250	5
	50	SU202M-C50	2CDS272337R0504	0.250	5
60	SU202M-C60	2CDS272337R0604	0.250	5	
63	SU202M-C63	2CDS272337R0634	0.250	5	

Miniature Circuit Breaker SU200M

Ordering data characteristic C



2CDC021046S0014



2CDC021047S0014

Number of poles	Rated current I_n A	Type	Order code	Weight per PCE kg	Packing unit PCE
3	0.5	SU203M-C0,5	2CDS273337R0984	0.375	3
	1	SU203M-C1	2CDS273337R0014	0.375	3
	1.6	SU203M-C1,6	2CDS273337R0974	0.375	3
	2	SU203M-C2	2CDS273337R0024	0.375	3
	3	SU203M-C3	2CDS273337R0034	0.375	3
	4	SU203M-C4	2CDS273337R0044	0.375	3
	5	SU203M-C5	2CDS273337R0054	0.375	3
	6	SU203M-C6	2CDS273337R0064	0.375	3
	8	SU203M-C8	2CDS273337R0084	0.375	3
	10	SU203M-C10	2CDS273337R0104	0.375	3
	13	SU203M-C13	2CDS273337R0134	0.375	3
	15	SU203M-C15	2CDS273337R0154	0.375	3
	16	SU203M-C16	2CDS273337R0164	0.375	3
	20	SU203M-C20	2CDS273337R0204	0.375	3
	25	SU203M-C25	2CDS273337R0254	0.375	3
	30	SU203M-C30	2CDS273337R0304	0.375	3
	32	SU203M-C32	2CDS273337R0324	0.375	3
	35	SU203M-C35	2CDS273337R0354	0.375	3
	40	SU203M-C40	2CDS273337R0404	0.375	3
	50	SU203M-C50	2CDS273337R0504	0.375	3
60	SU203M-C60	2CDS273337R0604	0.375	3	
63	SU203M-C63	2CDS273337R0634	0.375	3	
4	0.5	SU204M-C0,5	2CDS274337R0984	0.500	2
	1	SU204M-C1	2CDS274337R0014	0.500	2
	1.6	SU204M-C1,6	2CDS274337R0974	0.500	2
	2	SU204M-C2	2CDS274337R0024	0.500	2
	3	SU204M-C3	2CDS274337R0034	0.500	2
	4	SU204M-C4	2CDS274337R0044	0.500	2
	5	SU204M-C5	2CDS274337R0054	0.500	2
	6	SU204M-C6	2CDS274337R0064	0.500	2
	8	SU204M-C8	2CDS274337R0084	0.500	2
	10	SU204M-C10	2CDS274337R0104	0.500	2
	13	SU204M-C13	2CDS274337R0134	0.500	2
	15	SU204M-C15	2CDS274337R0154	0.500	2
	16	SU204M-C16	2CDS274337R0164	0.500	2
	20	SU204M-C20	2CDS274337R0204	0.500	2
	25	SU204M-C25	2CDS274337R0254	0.500	2
	30	SU204M-C30	2CDS274337R0304	0.500	2
	32	SU204M-C32	2CDS274337R0324	0.500	2
	35	SU204M-C35	2CDS274337R0354	0.500	2
	40	SU204M-C40	2CDS274337R0404	0.500	2
	50	SU204M-C50	2CDS274337R0504	0.500	2
60	SU204M-C60	2CDS274337R0604	0.500	2	
63	SU204M-C63	2CDS274337R0634	0.500	2	

Miniature Circuit Breaker SU200M

Ordering data characteristic K



2CDC021004S0014



2CDC021045S0014

Number of poles	Rated current I_n A	Type	Order code	Weight per PCE kg	Packing unit PCE
1	0.2	SU201M-K0,2	2CDS271337R0087	0.125	10
	0.3	SU201M-K0,3	2CDS271337R0117	0.125	10
	0.5	SU201M-K0,5	2CDS271337R0157	0.125	10
	0.75	SU201M-K0,75	2CDS271337R0187	0.125	10
	1	SU201M-K1	2CDS271337R0217	0.125	10
	1.6	SU201M-K1,6	2CDS271337R0257	0.125	10
	2	SU201M-K2	2CDS271337R0277	0.125	10
	3	SU201M-K3	2CDS271337R0317	0.125	10
	4	SU201M-K4	2CDS271337R0337	0.125	10
	5	SU201M-K5	2CDS271337R0357	0.125	10
	6	SU201M-K6	2CDS271337R0377	0.125	10
	8	SU201M-K8	2CDS271337R0407	0.125	10
	10	SU201M-K10	2CDS271337R0427	0.125	10
	13	SU201M-K13	2CDS271337R0447	0.125	10
	15	SU201M-K15	2CDS271337R0457	0.125	10
	16	SU201M-K16	2CDS271337R0467	0.125	10
	20	SU201M-K20	2CDS271337R0487	0.125	10
	25	SU201M-K25	2CDS271337R0517	0.125	10
	30	SU201M-K30	2CDS271337R0527	0.125	10
	32	SU201M-K32	2CDS271337R0537	0.125	10
35	SU201M-K35	2CDS271337R0547	0.125	10	
40	SU201M-K40	2CDS271337R0557	0.125	10	
50	SU201M-K50	2CDS271337R0577	0.125	10	
60	SU201M-K60	2CDS271337R0587	0.125	10	
63	SU201M-K63	2CDS271337R0607	0.125	10	
2	0.2	SU202M-K0,2	2CDS272337R0087	0.250	5
	0.3	SU202M-K0,3	2CDS272337R0117	0.250	5
	0.5	SU202M-K0,5	2CDS272337R0157	0.250	5
	0.75	SU202M-K0,75	2CDS272337R0187	0.250	5
	1	SU202M-K1	2CDS272337R0217	0.250	5
	1.6	SU202M-K1,6	2CDS272337R0257	0.250	5
	2	SU202M-K2	2CDS272337R0277	0.250	5
	3	SU202M-K3	2CDS272337R0317	0.250	5
	4	SU202M-K4	2CDS272337R0337	0.250	5
	5	SU202M-K5	2CDS272337R0357	0.250	5
	6	SU202M-K6	2CDS272337R0377	0.250	5
	8	SU202M-K8	2CDS272337R0407	0.250	5
	10	SU202M-K10	2CDS272337R0427	0.250	5
	13	SU202M-K13	2CDS272337R0447	0.250	5
	15	SU202M-K15	2CDS272337R0457	0.250	5
	16	SU202M-K16	2CDS272337R0467	0.250	5
	20	SU202M-K20	2CDS272337R0487	0.250	5
	25	SU202M-K25	2CDS272337R0517	0.250	5
	30	SU202M-K30	2CDS272337R0527	0.250	5
	32	SU202M-K32	2CDS272337R0537	0.250	5
35	SU202M-K35	2CDS272337R0547	0.250	5	
40	SU202M-K40	2CDS272337R0557	0.250	5	
50	SU202M-K50	2CDS272337R0577	0.250	5	
60	SU202M-K60	2CDS272337R0587	0.250	5	
63	SU202M-K63	2CDS272337R0607	0.250	5	

Miniature Circuit Breaker SU200M

Ordering data characteristic K



2CDC021046S0014



2CDC021047S0014

Number of poles	Rated current I_n A	Type	Order code	Weight per PCE kg	Packing unit PCE
3	0.2	SU203M-K0,2	2CDS273337R0087	0.375	3
	0.3	SU203M-K0,3	2CDS273337R0117	0.375	3
	0.5	SU203M-K0,5	2CDS273337R0157	0.375	3
	0.75	SU203M-K0,75	2CDS273337R0187	0.375	3
	1	SU203M-K1	2CDS273337R0217	0.375	3
	1.6	SU203M-K1,6	2CDS273337R0257	0.375	3
	2	SU203M-K2	2CDS273337R0277	0.375	3
	3	SU203M-K3	2CDS273337R0317	0.375	3
	4	SU203M-K4	2CDS273337R0337	0.375	3
	5	SU203M-K5	2CDS273337R0357	0.375	3
	6	SU203M-K6	2CDS273337R0377	0.375	3
	8	SU203M-K8	2CDS273337R0407	0.375	3
	10	SU203M-K10	2CDS273337R0427	0.375	3
	13	SU203M-K13	2CDS273337R0447	0.375	3
	15	SU203M-K15	2CDS273337R0457	0.375	3
	16	SU203M-K16	2CDS273337R0467	0.375	3
	20	SU203M-K20	2CDS273337R0487	0.375	3
	25	SU203M-K25	2CDS273337R0517	0.375	3
	30	SU203M-K30	2CDS273337R0527	0.375	3
	32	SU203M-K32	2CDS273337R0537	0.375	3
35	SU203M-K35	2CDS273337R0547	0.375	3	
40	SU203M-K40	2CDS273337R0557	0.375	3	
50	SU203M-K50	2CDS273337R0577	0.375	3	
60	SU203M-K60	2CDS273337R0587	0.375	3	
63	SU203M-K63	2CDS273337R0607	0.375	3	
4	0.2	SU204M-K0,2	2CDS274337R0087	0.500	2
	0.3	SU204M-K0,3	2CDS274337R0117	0.500	2
	0.5	SU204M-K0,5	2CDS274337R0157	0.500	2
	0.75	SU204M-K0,75	2CDS274337R0187	0.500	2
	1	SU204M-K1	2CDS274337R0217	0.500	2
	1.6	SU204M-K1,6	2CDS274337R0257	0.500	2
	2	SU204M-K2	2CDS274337R0277	0.500	2
	3	SU204M-K3	2CDS274337R0317	0.500	2
	4	SU204M-K4	2CDS274337R0337	0.500	2
	5	SU204M-K5	2CDS274337R0357	0.500	2
	6	SU204M-K6	2CDS274337R0377	0.500	2
	8	SU204M-K8	2CDS274337R0407	0.500	2
	10	SU204M-K10	2CDS274337R0427	0.500	2
	13	SU204M-K13	2CDS274337R0447	0.500	2
	15	SU204M-K15	2CDS274337R0457	0.500	2
	16	SU204M-K16	2CDS274337R0467	0.500	2
	20	SU204M-K20	2CDS274337R0487	0.500	2
	25	SU204M-K25	2CDS274337R0517	0.500	2
	30	SU204M-K30	2CDS274337R0527	0.500	2
	32	SU204M-K32	2CDS274337R0537	0.500	2
35	SU204M-K35	2CDS274337R0547	0.500	2	
40	SU204M-K40	2CDS274337R0557	0.500	2	
50	SU204M-K50	2CDS274337R0577	0.500	2	
60	SU204M-K60	2CDS274337R0587	0.500	2	
63	SU204M-K63	2CDS274337R0607	0.500	2	

Miniature Circuit Breaker SU200M

Ordering data characteristic Z



2CDC021045S0014



2CDC021045S0014

Number of poles	Rated current I_n A	Type	Order code	Weight per PCE kg	Packing unit PCE
1	0.5	SU201M-Z0,5	2CDS271337R0158	0.125	10
	1	SU201M-Z1	2CDS271337R0218	0.125	10
	1.6	SU201M-Z1,6	2CDS271337R0258	0.125	10
	2	SU201M-Z2	2CDS271337R0278	0.125	10
	3	SU201M-Z3	2CDS271337R0318	0.125	10
	4	SU201M-Z4	2CDS271337R0338	0.125	10
	5	SU201M-Z5	2CDS271337R0358	0.125	10
	6	SU201M-Z6	2CDS271337R0378	0.125	10
	8	SU201M-Z8	2CDS271337R0408	0.125	10
	10	SU201M-Z10	2CDS271337R0428	0.125	10
	13	SU201M-Z13	2CDS271337R0448	0.125	10
	15	SU201M-Z15	2CDS271337R0458	0.125	10
	16	SU201M-Z16	2CDS271337R0468	0.125	10
	20	SU201M-Z20	2CDS271337R0488	0.125	10
	25	SU201M-Z25	2CDS271337R0518	0.125	10
	30	SU201M-Z30	2CDS271337R0528	0.125	10
	32	SU201M-Z32	2CDS271337R0538	0.125	10
	35	SU201M-Z35	2CDS271337R0548	0.125	10
	40	SU201M-Z40	2CDS271337R0558	0.125	10
	50	SU201M-Z50	2CDS271337R0578	0.125	10
60	SU201M-Z60	2CDS271337R0588	0.125	10	
63	SU201M-Z63	2CDS271337R0608	0.125	10	
2	0.5	SU202M-Z0,5	2CDS272337R0158	0.250	5
	1	SU202M-Z1	2CDS272337R0218	0.250	5
	1.6	SU202M-Z1,6	2CDS272337R0258	0.250	5
	2	SU202M-Z2	2CDS272337R0278	0.250	5
	3	SU202M-Z3	2CDS272337R0318	0.250	5
	4	SU202M-Z4	2CDS272337R0338	0.250	5
	5	SU202M-Z5	2CDS272337R0358	0.250	5
	6	SU202M-Z6	2CDS272337R0378	0.250	5
	8	SU202M-Z8	2CDS272337R0408	0.250	5
	10	SU202M-Z10	2CDS272337R0428	0.250	5
	13	SU202M-Z13	2CDS272337R0448	0.250	5
	15	SU202M-Z15	2CDS272337R0458	0.250	5
	16	SU202M-Z16	2CDS272337R0468	0.250	5
	20	SU202M-Z20	2CDS272337R0488	0.250	5
	25	SU202M-Z25	2CDS272337R0518	0.250	5
	30	SU202M-Z30	2CDS272337R0528	0.250	5
	32	SU202M-Z32	2CDS272337R0538	0.250	5
	35	SU202M-Z35	2CDS272337R0548	0.250	5
	40	SU202M-Z40	2CDS272337R0558	0.250	5
	50	SU202M-Z50	2CDS272337R0578	0.250	5
60	SU202M-Z60	2CDS272337R0588	0.250	5	
63	SU202M-Z63	2CDS272337R0608	0.250	5	

Miniature Circuit Breaker SU200M

Ordering data characteristic Z



2CDC021046S0014



2CDC021047S0014

Number of poles	Rated current I_n A	Type	Order code	Weight per PCE kg	Packing unit PCE
3	0.5	SU203M-Z0,5	2CDS273337R0158	0.375	3
	1	SU203M-Z1	2CDS273337R0218	0.375	3
	1.6	SU203M-Z1,6	2CDS273337R0258	0.375	3
	2	SU203M-Z2	2CDS273337R0278	0.375	3
	3	SU203M-Z3	2CDS273337R0318	0.375	3
	4	SU203M-Z4	2CDS273337R0338	0.375	3
	5	SU203M-Z5	2CDS273337R0358	0.375	3
	6	SU203M-Z6	2CDS273337R0378	0.375	3
	8	SU203M-Z8	2CDS273337R0408	0.375	3
	10	SU203M-Z10	2CDS273337R0428	0.375	3
	13	SU203M-Z13	2CDS273337R0448	0.375	3
	15	SU203M-Z15	2CDS273337R0458	0.375	3
	16	SU203M-Z16	2CDS273337R0468	0.375	3
	20	SU203M-Z20	2CDS273337R0488	0.375	3
	25	SU203M-Z25	2CDS273337R0518	0.375	3
	30	SU203M-Z30	2CDS273337R0528	0.375	3
	32	SU203M-Z32	2CDS273337R0538	0.375	3
	35	SU203M-Z35	2CDS273337R0548	0.375	3
	40	SU203M-Z40	2CDS273337R0558	0.375	3
	50	SU203M-Z50	2CDS273337R0578	0.375	3
60	SU203M-Z60	2CDS273337R0588	0.375	3	
63	SU203M-Z63	2CDS273337R0608	0.375	3	
4	0.5	SU204M-Z0,5	2CDS274337R0158	0.500	2
	1	SU204M-Z1	2CDS274337R0218	0.500	2
	1.6	SU204M-Z1,6	2CDS274337R0258	0.500	2
	2	SU204M-Z2	2CDS274337R0278	0.500	2
	3	SU204M-Z3	2CDS274337R0318	0.500	2
	4	SU204M-Z4	2CDS274337R0338	0.500	2
	5	SU204M-Z5	2CDS274337R0358	0.500	2
	6	SU204M-Z6	2CDS274337R0378	0.500	2
	8	SU204M-Z8	2CDS274337R0408	0.500	2
	10	SU204M-Z10	2CDS274337R0428	0.500	2
	13	SU204M-Z13	2CDS274337R0448	0.500	2
	15	SU204M-Z15	2CDS274337R0458	0.500	2
	16	SU204M-Z16	2CDS274337R0468	0.500	2
	20	SU204M-Z20	2CDS274337R0488	0.500	2
	25	SU204M-Z25	2CDS274337R0518	0.500	2
	30	SU204M-Z30	2CDS274337R0528	0.500	2
	32	SU204M-Z32	2CDS274337R0538	0.500	2
	35	SU204M-Z35	2CDS274337R0548	0.500	2
	40	SU204M-Z40	2CDS274337R0558	0.500	2
	50	SU204M-Z50	2CDS274337R0578	0.500	2
60	SU204M-Z60	2CDS274337R0588	0.500	2	
63	SU204M-Z63	2CDS274337R0608	0.500	2	

Contact us

ABB Inc.

Low Voltage Products

2117 – 32nd Avenue
Lachine, QC, CANADA H8T 3J1
Phone: 514-420-3100
Fax: 514-420-3137
Toll Free: 1-800-567-0283

You can find the address of your
local sales organization on the
ABB home page
<http://www.abb.com/contacts>
-> Low Voltage Products and Systems

Note:

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB AG does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of ABB AG.

Copyright© 2015 ABB
All rights reserved

ZS4-SF1 screw clamp terminal blocks

For 5x20 and 5x25 fuses - 8 mm 0.315 in spacing



Description

Protect your circuit with 5x25 and 5x20 fuse terminal blocks, compliant with IEC 60947-7-3 standard (fuse not supplied with the terminal blocks).

Ordering details

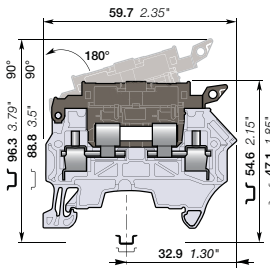
Description	Color	Type	Order code	Pkg pce	Weight (1 pce) g
Fuses	Grey-dark grey	ZS4-SF1	1SNK508410R0000	50	13.30

Main technical data

		IEC	UL - CSA	Mounting instructions	
1 conductor per clamp	Rigid - Solid / Stranded	0.2 ... 4 mm ²	24 ... 10 AWG	Rail	TH 35-7.5, TH 35-15
	Flexible	0.22 ... 4 mm ²		Wire stripping length	11 mm 0.433 in
	with non insulated ferrule	0.22 ... 4 mm ²	24 ... 12 AWG		
	with insulated ferrule	0.22 ... 4 mm ²	24 ... 12 AWG		
2 conductors per clamp	Rigid - Solid / Stranded	0.2 ... 1.5 mm ²	24 ... 16 AWG	Tool	Flat screwdriver Ø 3.5 mm Ø 0.138 in
	Flexible with twin ferrule	0.22 ... 1.5 mm ²	24 ... 16 AWG		
Rated current / Rated cross section		6.3 A / 4 mm ²	10 A / 10 AWG	Torque	0.6 N.m ± 0.1 5.31 lb.in ± 0.885
Rated voltage		630 V	300 V		
Impulse withstand voltage		8000 V			
Protection		IP20	NEMA 1		



ZS4-SF1



8 mm 0.315 in spacing

Separate arrangement		Assembly composed of 1 fuse terminal block in between non fuse terminal blocks	Overload and short-circuit protection	2.5 W
			Exclusive short-circuit protection	4 W
Compound arrangement		Assembly composed of 5 fuse terminal blocks	Overload and short-circuit protection	1.6 W
			Exclusive short-circuit protection	4 W

The connecting capacity data for one Rigid - Solid / Stranded - Flexible conductor (when applicable) is a mandatory information required by IEC, UL and CSA standards.

All other data are provided as supplementary information only. For more details, please consult our CB, UL or CSA certificates and technical datasheet available on <http://www.ABB.com>

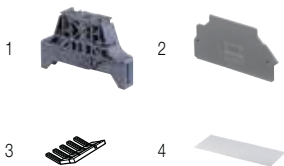


Accessories

Description	Color	Type	Order code	Pkg pce	Weight (1 pce) g
1 End stops	Dark grey	BAM3	1SNK900001R0000	50	13.80
2 End sections	Dark grey	ES4-SF	1SNK508960R0000	20	1.82
3 Lateral jumper bars	Black	PC81-10	1SNA173523R1100	10	5.00
4 Terminal block markers	White	MC812	1SNK160000R0000	22	10.00
		MC812PA	1SNK169999R0000	20	14.00
	Grey	UMH	1SNK900611R0000	10	0.20

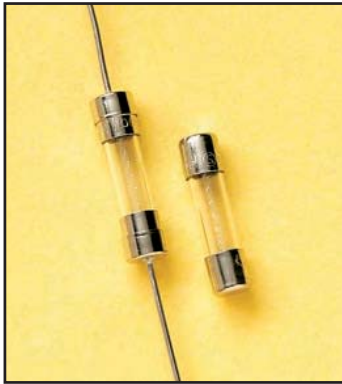
Complete list of accessories is indicated in the terminal block datasheet.

Some accessories such as jumper bars may modify the terminal block's ratings: complete information in the accessories catalogue pages.



All the technical data for UL/CSA standard and dimensions in inches are in italic.
Technical data valid for copper conductors only.

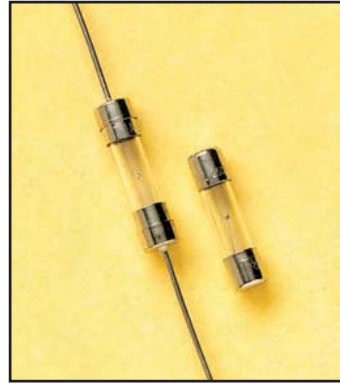
ELECTRONIC/GLASS FUSES



GSB / GSB-V

Glass Body
Fast Acting
5mm x 20mm
1-1/2" Axial Leads Optional

1/6A through 10A, 250VAC, UL and CSA Recognized
1/16A through 6-3/10A, 250VAC, SEMKO Approved
1/16A through 6-3/10A, 250VAC, VDE Approved
IEC-127-2 Standard Sheet 2*



GDG / GDG-V

Glass Body
Time Delay
5mm x 20 mm
1-1/2" Axial Leads Optional

1/16A through 10A, 250VAC, UL and CSA Recognized
1/16A through 6-3/10A, 250VAC, SEMKO Approved
1/16A through 6-3/10A, 250VAC, VDE Approved
IEC-127-2 Standard Sheet 3*

Standard Fuse Ampere Ratings

CATALOG NUMBER	AXIAL LEAD CAT. NO	AMPERE RATING	VOLTS	I.R.
GSB1/16	GSB-V1/16	1/16A	250V	1
GSB8/100	GSB-V8/100	8/100A	250V	1
GSB1/10	GSB-V1/10	1/10A	250V	1
GSB1/8	GSB-V1/8	1/8A	250V	1
GSB16/100	GSB-V16/100	16/100A	250V	1
GSB2/10	GSB-V2/10	2/10A	250V	1
GSB1/4	GSB-V1/4	1/4A	250V	1
GSB315/1000	GSB-V315/1000	315/1000A	250V	1
GSB4/10	GSB-V4/10	4/10A	250V	1
GSB1/2	GSB-V1/2	1/2A	250V	1
GSB630/1000	GSB-V630/1000	630/1000A	250V	1
GSB8/10	GSB-V8/10	8/10A	250V	1
GSB1	GSB-V1	1A	250V	1
GSB1-1/4	GSB-V1-1/4	1-1/4A	250V	1
GSB1-6/10	GSB-V1-6/10	1-6/10A	250V	1
GSB2	GSB-V2	2A	250V	1
GSB2-1/2	GSB-V2-1/2	2-1/2A	250V	1
GSB3-15/100	GSB-V3-15/100	3-15/100A	250V	1
GSB4	GSB-V4	4A	250V	2
GSB5	GSB-V5	5A	250V	3
GSB6-3/10	GSB-V6-3/10	6-3/10A	250V	4
GSB8	GSB-V8	8A	250V	5
GSB10	GSB-V10	10A	250V	6

1. 250VAC @ 35A I.R.
2. 250VAC @ 40A I.R.
3. 250VAC @ 50A I.R.
4. 250VAC @ 63A I.R.
5. 250VAC @ 80A I.R.
6. 250VAC @ 100A I.R.

* IEC Standards for 5x20mm fuses do not include ratings above 6.3 amperes.

Standard Fuse Ampere Ratings

CATALOG NUMBER	AXIAL LEAD CAT. NO	AMPERE RATING	VOLTS	I.R.
GDG1/16	GDG-V1/16	1/16A	250V	1
GDG8/100	GDG-V8/100	8/100A	250V	1
GDG1/10	GDG-V1/10	1/10A	250V	1
GDG1/8	GDG-V1/8	1/8A	250V	1
GDG16/100	GDG-V16/100	16/100A	250V	1
GDG2/10	GDG-V2/10	2/10A	250V	1
GDG1/4	GDG-V1/4	1/4A	250V	1
GDG315/1000	GDG-V315/1000	315/1000A	250V	1
GDG4/10	GDG-V4/10	4/10A	250V	1
GDG1/2	GDG-V1/2	1/2A	250V	1
GDG630/1000	GDG-V630/1000	630/1000A	250V	1
GDG8/10	GDG-V8/10	8/10A	250V	1
GDG1	GDG-V1	1A	250V	1
GDG1-1/4	GDG-V1-1/4	1-1/4A	250V	1
GDG1-6/10	GDG-V1-6/10	1-6/10A	250V	1
GDG2	GDG-V2	2A	250V	1
GDG2-1/2	GDG-V2-1/2	2-1/2A	250V	1
GDG3-15/100	GDG-V3-15/100	3-15/100A	250V	1
GDG4	GDG-V4	4A	250V	2
GDG5	GDG-V5	5A	250V	3
GDG6-3/10	GDG-V6-3/10	6-3/10A	250V	4
GDG8	GDG-V8	8A	250V	5
GDG10	GDG-V10	10A	250V	6

1. 250VAC @ 35A I.R.
2. 250VAC @ 40A I.R.
3. 250VAC @ 50A I.R.
4. 250VAC @ 63A I.R.
5. 250VAC @ 80A I.R.
6. 250VAC @ 100A I.R.

* IEC Standards for 5x20mm fuses do not include ratings above 6.3 amperes.

Output coupler with plug-in relay, 1 CO Screw terminal
24 V DC Enclosure width 6.2 mm Thermal current 6 A



Figure similar

Article number		
Product brand name		SIRIUS
Product category		SIRIUS 3RQ3 coupling relays in slim design
Product designation		Coupling relays with plug-in relay
Design of the product		Output coupling links
Product type designation		3RQ3

General technical data		
Display version LED		Yes
Product component		
• Relay output		Yes
• semi-conductor output		No
Consumed active power	W	0.3
Insulation voltage		
• for overvoltage category III according to IEC 60664		
— with degree of pollution 3 rated value	V	300
Surge voltage resistance rated value	kV	4
maximum permissible voltage for safe isolation		

<ul style="list-style-type: none"> • between control and auxiliary circuit 	V	300
Percental drop-out voltage related to the input voltage	%	10
Protection class IP		IP20
Shock resistance <ul style="list-style-type: none"> • acc. to IEC 60068-2-27 		sinusoidal half-wave 15g / 11 ms
Vibration resistance <ul style="list-style-type: none"> • acc. to IEC 60068-2-6 		6 ... 150 Hz: 2 g
Operating frequency maximum	1/h	72 000
Switching behavior		monostable
Mechanical service life (switching cycles) <ul style="list-style-type: none"> • typical 		10 000 000
Electrical endurance (switching cycles) <ul style="list-style-type: none"> • at AC-15 at 230 V typical 		100 000
Thermal current	A	6
Equipment marking <ul style="list-style-type: none"> • acc. to DIN EN 61346-2 • acc. to DIN EN 81346-2 		K K

Control circuit/ Control

Control supply voltage at DC <ul style="list-style-type: none"> • rated value 	V	24
Operating range factor control supply voltage rated value at DC <ul style="list-style-type: none"> • initial value • Full-scale value 		0.8 1.25
Off-delay time	ms	13
Closing delay <ul style="list-style-type: none"> • at DC 	ms	6
Opening delay <ul style="list-style-type: none"> • at DC 	ms	13
Design of the relay operating mechanism		poled
Product component Plug-in socket		Yes

Short-circuit protection

Design of the fuse link <ul style="list-style-type: none"> • for short-circuit protection of the auxiliary switch required 		fuse gG: 4 A
--	--	--------------

Auxiliary circuit

Type of switching contact		Changeover contact
Material of switching contacts		AgSnO2
Number of CO contacts <ul style="list-style-type: none"> • for auxiliary contacts 		1
Operating current of auxiliary contacts at AC-15		

• at 24 V	A	3
• at 250 V	A	3
Operating current of auxiliary contacts at DC-13		
• at 24 V	A	1
• at 125 V	A	0.2
• at 250 V	A	0.1
Contact reliability of auxiliary contacts		one incorrect switching operation of 100 million switching operations (17 V, 5 mA)

Main circuit		
Type of voltage		DC

Inputs/ Outputs		
Property of the output Short-circuit proof		No

Outputs		
Ampacity of the output relay at AC-15		
• at 250 V at 50/60 Hz	A	3
Ampacity of the output relay at DC-13		
• at 24 V	A	1
• at 125 V	A	0.2
• at 250 V	A	0.1

Electromagnetic compatibility		
EMC emitted interference		
• acc. to IEC 60947-1		ambience A (industrial sector)
EMI immunity		
• acc. to IEC 60947-1		corresponds to degree of severity 3
Conducted interference		
• due to burst acc. to IEC 61000-4-4		2 kV
• due to conductor-earth surge acc. to IEC 61000-4-5		2 kV
• due to conductor-conductor surge acc. to IEC 61000-4-5		1 kV
Field-bound parasitic coupling acc. to IEC 61000-4-3		10 V/m
Electrostatic discharge acc. to IEC 61000-4-2		6 kV contact discharge / 8 kV air discharge

Display		
Display version		
• as status display by LED		LED green

Connections/Terminals		
Product function		
• removable terminal		No
Type of electrical connection		
• for auxiliary and control current circuit		screw-type terminals

Wire length		
• at DC maximum	m	1 000
Type of connectable conductor cross-sections		
• solid		1x (0.25 ... 2.5 mm ²)
• finely stranded with core end processing		1x (0.25 ... 1.5 mm ²)
• at AWG conductors solid		1 x (20 ... 14)
Connectable conductor cross-section		
• solid	mm ²	0.25 ... 2.5
• finely stranded with core end processing	mm ²	0.25 ... 1.5
AWG number as coded connectable conductor cross section		
• solid		20 ... 14
Tightening torque		
• with screw-type terminals	N·m	0.5 ... 0.6

Installation/ mounting/ dimensions

Mounting position		any
Mounting type		snap-on mounting
Height	mm	93
Width	mm	6.2
Depth	mm	76
Required spacing		
• with side-by-side mounting		
— forwards	mm	0
— Backwards	mm	0
— upwards	mm	0
— downwards	mm	0
— at the side	mm	0
• for grounded parts		
— forwards	mm	0
— Backwards	mm	0
— upwards	mm	0
— at the side	mm	0
— downwards	mm	0
• for live parts		
— forwards	mm	0
— Backwards	mm	0
— upwards	mm	0
— downwards	mm	0
— at the side	mm	0

Ambient conditions

Installation altitude at height above sea level		
--	--	--

<ul style="list-style-type: none"> • maximum 	m	2 000
Ambient temperature		
<ul style="list-style-type: none"> • during operation 	°C	-25 ... +60
<ul style="list-style-type: none"> • during storage 	°C	-40 ... +85
<ul style="list-style-type: none"> • during transport 	°C	-40 ... +85
Relative humidity		
<ul style="list-style-type: none"> • during operation 	%	10 ... 95

Certificates/approvals

General Product Approval	Declaration of Conformity	Marine / Shipping
 CCC	 EAC	 DNV-GL TYPE APPROVED PRODUCT DNVGL.COM/AF
 CSA	 UL	 EG-Konf.

other

[Confirmation](#)

Further information

Information- and Downloadcenter (Catalogs, Brochures,...)

<http://www.siemens.com/industrial-controls/catalogs>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3RQ3118-1AM00>

Cax online generator

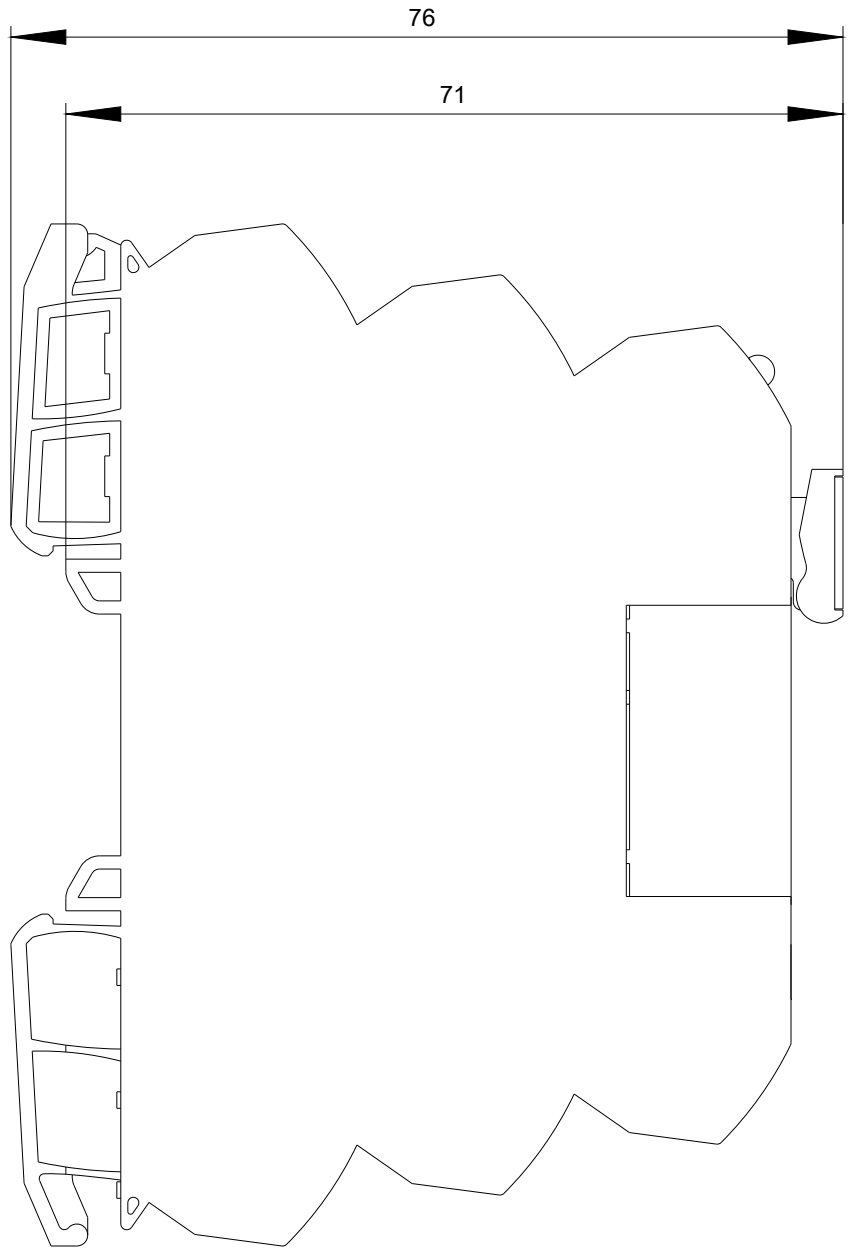
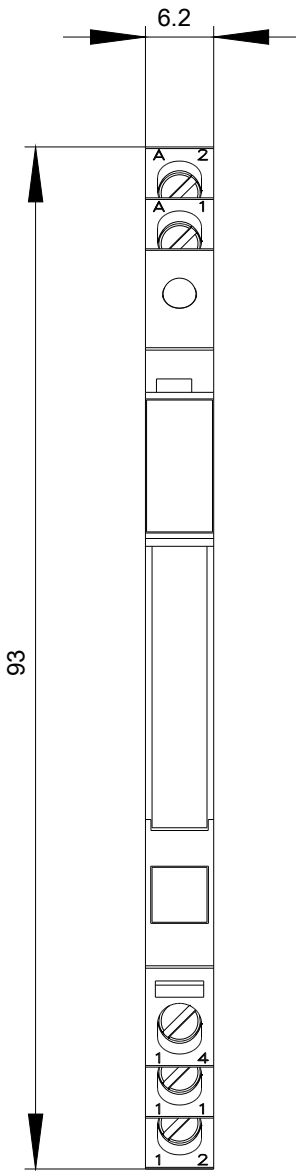
<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3RQ3118-1AM00>

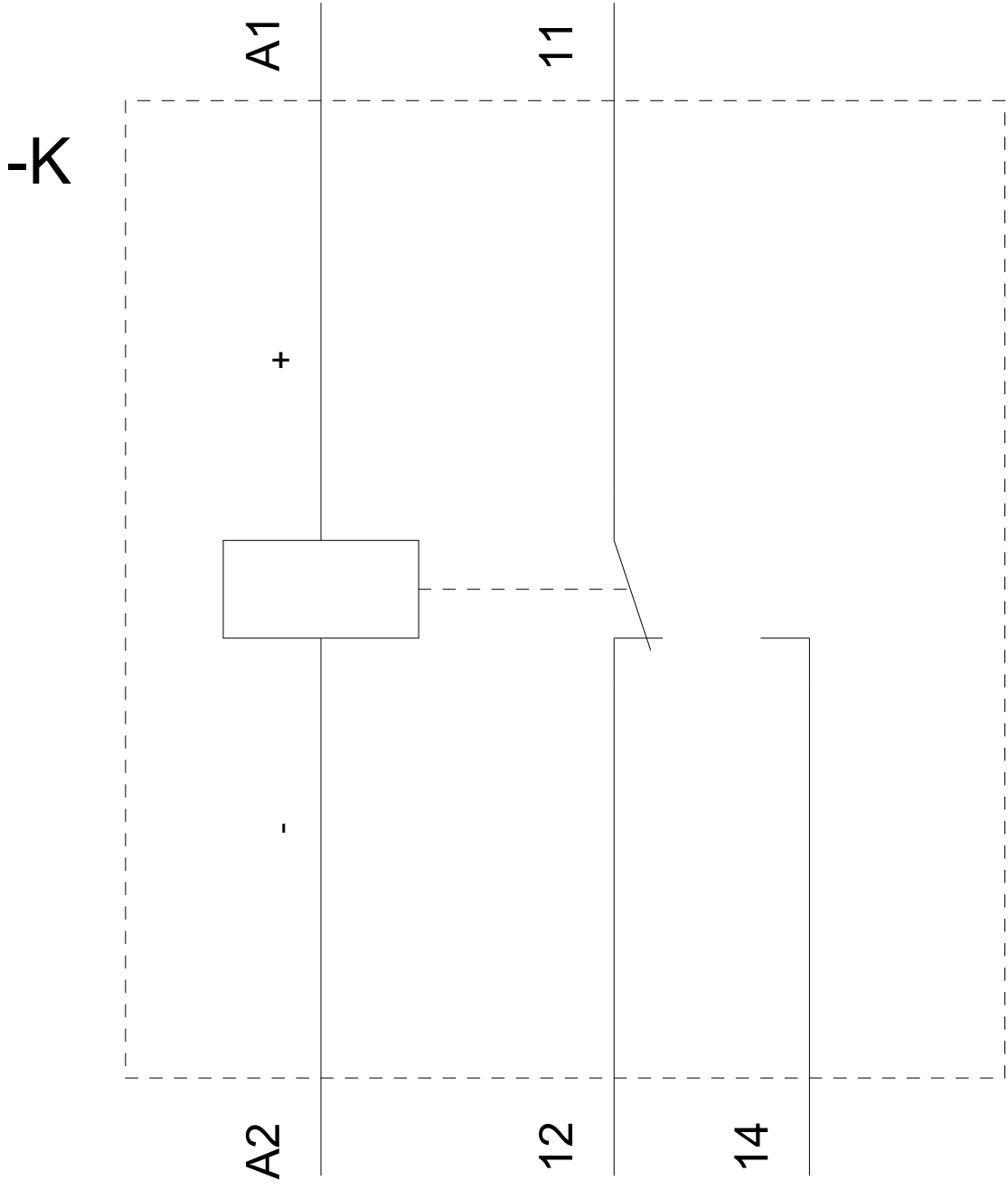
Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

<https://support.industry.siemens.com/cs/ww/en/ps/3RQ3118-1AM00>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3RQ3118-1AM00&lang=en





last modified:

09/25/2017



Figure similar

Article number		
Product brand name		SIRIUS
Product category		Connecting combs
Product designation		Connecting comb
Design of the product		For linking the same potentials, current carrying capacity for infeed max. 6 A/16-pole

General technical data

Display version LED		No
Product component		No
<ul style="list-style-type: none"> • semi-conductor output 		No
Equipment marking		
<ul style="list-style-type: none"> • acc. to DIN EN 61346-2 		X
<ul style="list-style-type: none"> • acc. to DIN EN 81346-2 		X
Product component Plug-in socket		No

Connections/Terminals

Product function		
<ul style="list-style-type: none"> • removable terminal 		No

Installation/ mounting/ dimensions

Height	mm	3.3
Width	mm	99
Depth	mm	11

Ambient conditions

Ambient temperature		
• during operation	°C	-25 ... +60
• during storage	°C	-40 ... +85
• during transport	°C	-40 ... +85

Certificates/approvals

General Product Approval	Declaration of Conformity	Marine / Shipping	other
--------------------------	---------------------------	-------------------	-------



CSA



EG-Konf.



DNVGL.COM/AF

[Confirmation](#)

Further information

Information- and Downloadcenter (Catalogs, Brochures,...)

<http://www.siemens.com/industrial-controls/catalogs>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3RQ3901-0D>

Cax online generator

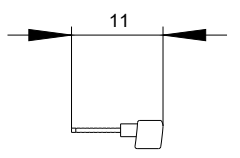
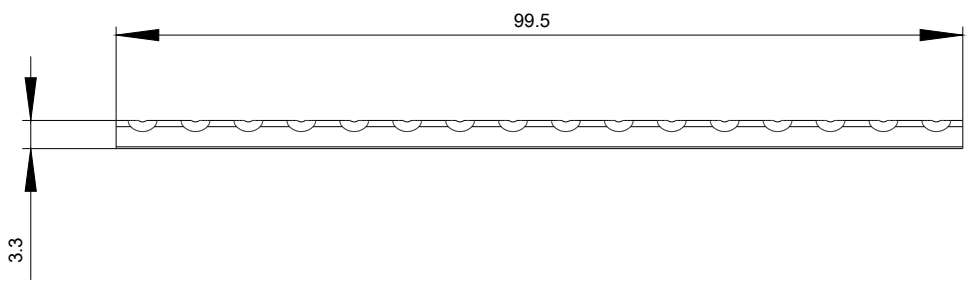
<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3RQ3901-0D>

Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

<https://support.industry.siemens.com/cs/ww/en/ps/3RQ3901-0D>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3RQ3901-0D&lang=en



last modified:

09/25/2017



Pluggable interface relays

CR-P, CR-M and CR-U range

Content

Benefits and advantages	252
Approvals and marks	253
Ordering details	
CR-P relays	254
Sockets for CR-P relays	254
Pluggable function modules for CR-P relays	258
CR-M relays	255
Sockets for CR-M relays	257
Pluggable function modules for CR-M relays	258
CR-U relays	259
Sockets for CR-U relays	259
Pluggable function modules for CR-U relays	260
Technical data	261
Technical diagrams.....	263
Connection diagrams.....	265
Dimensional drawings	265

Pluggable interface relays CR-P, CR-M and CR-U range

Benefits and advantages



2CDC 295 007 F0605

Pluggable pcb relays CR-P

- 9 different coil voltages
 - DC versions: 12 V, 24 V, 48 V, 110 V
 - AC versions: 24 V, 48 V, 110 V, 120 V, 230 V
- Output contacts:
 - 1 c/o contact (16 A) or
 - 2 c/o contacts (8 A) optionally equipped with gold contacts
- Logical or standard sockets
- Cadmium-free contact material
- Width on socket: 15,5 mm
- Pluggable function modules
 - Reverse polarity protection/ Free wheeling diode
 - LED indication
 - RC elements
 - Overvoltage protection
 - Time modules

Pluggable miniature relays CR-M

- 12 different coil voltages
 - DC versions: 12 V, 24 V, 48 V, 60 V, 110 V, 125 V, 220 V
 - AC versions: 24 V, 48 V, 110 V, 120 V, 230 V
- Output contacts
 - 2 c/o contacts (12 A) or
 - 3 c/o contacts (10 A) or
 - 4 c/o contacts (6 A) optionally equipped with gold contacts, LED and free wheeling diode
- Integrated test button for manual actuation and locking of the output contacts (blue = DC, orange = AC) that can be removed if necessary
- With or without integrated LED
- Logical or standard sockets
- Cadmium-free contact material
- Width on socket: 27 mm
- Pluggable function modules
 - Reverse polarity protection/ Free wheeling diode
 - LED indication
 - RC elements
 - Overvoltage protection
 - Time modules

Pluggable universal relays CR-U

- 10 different coil voltages
 - DC versions: 12 V, 24 V, 48 V, 110 V, 220 V
 - AC versions: 24 V, 48 V, 110 V, 120 V, 230 V
- Output contacts
 - 2 c/o contacts (10 A) or
 - 3 c/o contacts (10 A)
- Integrated test button for manual actuation and locking of the output contacts (blue = DC, orange = AC) that can be removed if necessary
- With or without integrated LED
- Cadmium-free contact material
- Width on socket: 38 mm
- Pluggable function modules
 - Reverse polarity protection/ Free wheeling diode
 - LED indication
 - RC elements
 - Overvoltage protection
 - Multifunction time module

Pluggable interface relays CR-P, CR-M and CR-U range Approvals and marks

Kinds of sockets

Standard sockets - Position of connecting terminals:

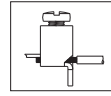
Coil connection (A1-A2) on lower socket side,
contact connections (n/o and n/c contacts)
on the lower and upper socket side.

Logical sockets - Position of connecting terminals:

Coil connection (A1-A2) on lower socket side,
all contact connections (common contacts,
n/o and n/c contacts) on upper socket side.

Details see connection diagrams

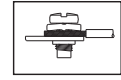
Kind of connecting terminals



Screw type



Spring type



Fork type

Approvals and marks

- existing
- pending

		Relays			Sockets							Modules	
		CR-P	CR-M	CR-U	CR-PLS CR-PSS	CR-PLC	CR-M..L. CR-M..SS	CR-M..SF	CR-U..S CR-U..E	CR-U..SM		CR-P/M	CR-U
Approvals													
	UL 508	■	■ ¹⁾	■	■	■	■	■	■	■			
	CAN/CSA C22.2 No. 14	■	■ ²⁾	■								■ ⁶⁾	■ ⁷⁾
	CAN/CSA C22.2 No. 14	■	■ ³⁾	■	■		■	■	■				
	VDE	■	■ ⁴⁾	■									
	GOST	■	■	■	■	■	■	■	■	■		■	■
	Lloyds Register		■ ⁵⁾	■									
	CCC	■	■	■									
	RMRS	■	■	■	■	■	■	■	■	■			
Marks													
	CE	■	■	■	■		■	■	■	■		■	■

¹⁾ except 60 V DC and 125 V DC devices with gold contacts

²⁾ except devices with gold contacts

³⁾ except 60 V DC and 125 V DC devices

⁴⁾ except 125 V DC devices

⁵⁾ only devices with 4 c/o contacts

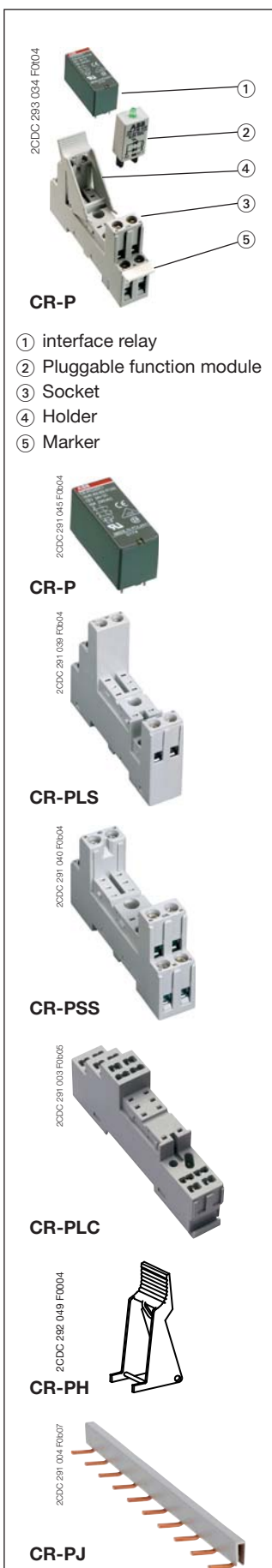
⁶⁾ except CR-P/M 42B, CR-P/M 42BV, CR-P/M 42C, CR-P/M 42CV, CR-P/M 52D, CR-P/M 62E, CR-P/M 62EV, CR-P/M 62D, CR-P/M 62DV, CR-P/M T...

⁷⁾ except CR-U 41B, CR-U 41BV, CR-U 41C, CR-U 41CV, CR-U 51D, CR-U 61CV, CR-U 61E, CR-U 61EV, CR-U 61D, CR-U 61DV, CR-U 91C, CR-U T

Pluggable interface relays CR-P

Pcb relays

Ordering details



Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece
------	------------------------------	------------	-------------------	---------------

Interface relays

1 c/o contact: 250 V, 16 A

CR-P012DC1	12 V DC	1SVR 405 600 R4000	10	
CR-P024DC1	24 V DC	1SVR 405 600 R1000	10	
CR-P048DC1	48 V DC	1SVR 405 600 R6000	10	
CR-P110DC1	110 V DC	1SVR 405 600 R8000	10	
CR-P024AC1	24 V AC	1SVR 405 600 R0000	10	
CR-P048AC1	48 V AC	1SVR 405 600 R5000	10	
CR-P110AC1	110 V AC	1SVR 405 600 R7000	10	
CR-P120AC1	120 V AC	1SVR 405 600 R2000	10	
CR-P230AC1	230 V AC	1SVR 405 600 R3000	10	

2 c/o contacts: 250 V, 8 A

CR-P012DC2	12 V DC	1SVR 405 601 R4000	10	
CR-P024DC2	24 V DC	1SVR 405 601 R1000	10	
CR-P048DC2	48 V DC	1SVR 405 601 R6000	10	
CR-P110DC2	110 V DC	1SVR 405 601 R8000	10	
CR-P024AC2	24 V AC	1SVR 405 601 R0000	10	
CR-P048AC2	48 V AC	1SVR 405 601 R5000	10	
CR-P110AC2	110 V AC	1SVR 405 601 R7000	10	
CR-P120AC2	120 V AC	1SVR 405 601 R2000	10	
CR-P230AC2	230 V AC	1SVR 405 601 R3000	10	

Interface relays with gold contacts

2 c/o gold contacts: 250 V, 8 A

CR-P024DC2G	24 V DC	1SVR 405 606 R1000	10	
CR-P024AC2G	24 V AC	1SVR 405 606 R0000	10	
CR-P110AC2G	110 V AC	1SVR 405 606 R7000	10	
CR-P230AC2G	230 V AC	1SVR 405 606 R3000	10	

Accessories - Sockets

Type	Version	Connection terminals	Order code	Pack. unit pieces	Price 1 piece
------	---------	----------------------	------------	-------------------	---------------

Sockets

CR-PLS	Logical socket with safety isolation	screw	1SVR 405 650 R0000	10	
CR-PLSx	Logical socket ¹⁾	screw	1SVR 405 650 R0100	10	
CR-PLC	Logical socket ¹⁾	spring connection	1SVR 405 650 R0200	10	
CR-PSS	Standard socket	screw	1SVR 405 650 R1000	10	

Socket accessories

CR-PH	Plastic Holder		1SVR 405 659 R0000	10	
CR-PJ	Jumper bar for sockets with screw connection		1SVR 405 658 R5000	10	

¹⁾ can be used with time modules CR-P/M T...
Bold printed products = stocked products

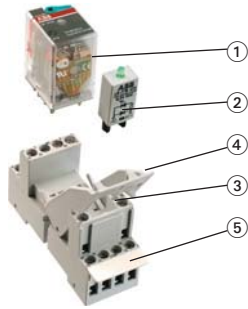
• Pluggable function modules258 • Technical data261 • Dimensional drawings265

Pluggable interface relays CR-M

Miniature relays

Ordering details

2CDC 293 035 F0004



CR-M

- ① Interface relay
- ② Pluggable function module
- ③ Socket
- ④ Holder
- ⑤ Marker

2CDC 291 046 F0004



CR-M

Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece
------	------------------------------	------------	-------------------	---------------

Interface relays without LED

2 c/o contacts: 250 V, 12 A

CR-M012DC2	12 V DC	1SVR 405 611 R4000	10	
CR-M024DC2	24 V DC	1SVR 405 611 R1000	10	
CR-M048DC2	48 V DC	1SVR 405 611 R6000	10	
CR-M060DC2	60 V DC	1SVR 405 611 R4200	10	
CR-M110DC2	110 V DC	1SVR 405 611 R8000	10	
CR-M125DC2	125 V DC	1SVR 405 611 R8200	10	
CR-M220DC2	220 V DC	1SVR 405 611 R9000	10	
CR-M024AC2	24 V AC	1SVR 405 611 R0000	10	
CR-M048AC2	48 V AC	1SVR 405 611 R5000	10	
CR-M110AC2	110 V AC	1SVR 405 611 R7000	10	
CR-M120AC2	120 V AC	1SVR 405 611 R2000	10	
CR-M230AC2	230 V AC	1SVR 405 611 R3000	10	

3 c/o contacts: 250 V, 10 A

CR-M012DC3	12 V DC	1SVR 405 612 R4000	10	
CR-M024DC3	24 V DC	1SVR 405 612 R1000	10	
CR-M048DC3	48 V DC	1SVR 405 612 R6000	10	
CR-M060DC3	60 V DC	1SVR 405 612 R4200	10	
CR-M110DC3	110 V DC	1SVR 405 612 R8000	10	
CR-M125DC3	125 V DC	1SVR 405 612 R8200	10	
CR-M220DC3	220 V DC	1SVR 405 612 R9000	10	
CR-M024AC3	24 V AC	1SVR 405 612 R0000	10	
CR-M048AC3	48 V AC	1SVR 405 612 R5000	10	
CR-M110AC3	110 V AC	1SVR 405 612 R7000	10	
CR-M120AC3	120 V AC	1SVR 405 612 R2000	10	
CR-M230AC3	230 V AC	1SVR 405 612 R3000	10	

4 c/o contacts: 250 V, 6 A

CR-M012DC4	12 V DC	1SVR 405 613 R4000	10	
CR-M024DC4	24 V DC	1SVR 405 613 R1000	10	
CR-M048DC4	48 V DC	1SVR 405 613 R6000	10	
CR-M060DC4	60 V DC	1SVR 405 613 R4200	10	
CR-M110DC4	110 V DC	1SVR 405 613 R8000	10	
CR-M125DC4	125 V DC	1SVR 405 613 R8200	10	
CR-M220DC4	220 V DC	1SVR 405 613 R9000	10	
CR-M024AC4	24 V AC	1SVR 405 613 R0000	10	
CR-M048AC4	48 V AC	1SVR 405 613 R5000	10	
CR-M110AC4	110 V AC	1SVR 405 613 R7000	10	
CR-M120AC4	120 V AC	1SVR 405 613 R2000	10	
CR-M230AC4	230 V AC	1SVR 405 613 R3000	10	

Bold printed products = stocked products

• Pluggable function modules258 • Technical data261 • Dimensional drawings265

Pluggable interface relays CR-M

Miniature relays

Ordering details (continued)

2CDC 291 046 F0004

CR-M



Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece
------	------------------------------	------------	-------------------	---------------

Interface relays with LED

2 c/o contacts: 250 V, 12 A

CR-M012DC2L	12 V DC	1SVR 405 611 R4100	10	
CR-M024DC2L	24 V DC	1SVR 405 611 R1100	10	
CR-M048DC2L	48 V DC	1SVR 405 611 R6100	10	
CR-M060DC2L	60 V DC	1SVR 405 611 R4300	10	
CR-M110DC2L	110 V DC	1SVR 405 611 R8100	10	
CR-M125DC2L	125 V DC	1SVR 405 611 R8300	10	
CR-M220DC2L	220 V DC	1SVR 405 611 R9100	10	
CR-M024AC2L	24 V AC	1SVR 405 611 R0100	10	
CR-M048AC2L	48 V AC	1SVR 405 611 R5100	10	
CR-M110AC2L	110 V AC	1SVR 405 611 R7100	10	
CR-M120AC2L	120 V AC	1SVR 405 611 R2100	10	
CR-M230AC2L	230 V AC	1SVR 405 611 R3100	10	

3 c/o contacts: 250 V, 10 A

CR-M012DC3L	12 V DC	1SVR 405 612 R4100	10	
CR-M024DC3L	24 V DC	1SVR 405 612 R1100	10	
CR-M048DC3L	48 V DC	1SVR 405 612 R6100	10	
CR-M060DC3L	60 V DC	1SVR 405 612 R4300	10	
CR-M110DC3L	110 V DC	1SVR 405 612 R8100	10	
CR-M125DC3L	125 V DC	1SVR 405 612 R8300	10	
CR-M220DC3L	220 V DC	1SVR 405 612 R9100	10	
CR-M024AC3L	24 V AC	1SVR 405 612 R0100	10	
CR-M048AC3L	48 V AC	1SVR 405 612 R5100	10	
CR-M110AC3L	110 V AC	1SVR 405 612 R7100	10	
CR-M120AC3L	120 V AC	1SVR 405 612 R2100	10	
CR-M230AC3L	230 V AC	1SVR 405 612 R3100	10	

4 c/o contacts: 250 V, 6 A

CR-M012DC4L	12 V DC	1SVR 405 613 R4100	10	
CR-M024DC4L	24 V DC	1SVR 405 613 R1100	10	
CR-M048DC4L	48 V DC	1SVR 405 613 R6100	10	
CR-M060DC4L	60 V DC	1SVR 405 613 R4300	10	
CR-M110DC4L	110 V DC	1SVR 405 613 R8100	10	
CR-M125DC4L	125 V DC	1SVR 405 613 R8300	10	
CR-M220DC4L	220 V DC	1SVR 405 613 R9100	10	
CR-M024AC4L	24 V AC	1SVR 405 613 R0100	10	
CR-M048AC4L	48 V AC	1SVR 405 613 R5100	10	
CR-M110AC4L	110 V AC	1SVR 405 613 R7100	10	
CR-M120AC4L	120 V AC	1SVR 405 613 R2100	10	
CR-M230AC4L	230 V AC	1SVR 405 613 R3100	10	

Interface relays with LED and free-wheeling diode

4 c/o contacts: 250 V, 6 A

CR-M024DC4LD	24 V DC	1SVR 405 614 R1100	10	
--------------	---------	--------------------	----	--

Bold printed products = stocked products

• Pluggable function modules258 • Technical data261 • Dimensional drawings265

Pluggable interface relays CR-M

Miniature relays

Ordering details (continued)

2CDC 291 046 F0004



CR-M

2CDC 291 041 F0004



CR-M4SS

2CDC 291 042 F0004



CR-M4LS

2CDC 291 004 F0005



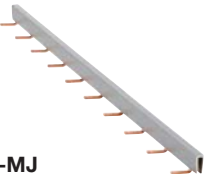
CR-M4LC

2CDC 292 072 F0004



CR-MH

2CDC 291 005 F0007



CR-MJ

Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece
------	------------------------------	------------	-------------------	---------------

Interface relays with gold contacts

4 c/o contacts: 250 V, 6 A

CR-M024DC4G	24 V DC	1SVR 405 618 R1000	10	
CR-M024AC4G	24 V AC	1SVR 405 618 R0000	10	
CR-M110AC4G	110 V AC	1SVR 405 618 R7000	10	
CR-M230AC4G	230 V AC	1SVR 405 618 R3000	10	

Interface relays with gold contacts and LED

4 c/o contacts: 250 V, 6 A

CR-M012DC4LG	12 V DC	1SVR 405 618 R4100	10	
CR-M024DC4LG	24 V DC	1SVR 405 618 R1100	10	
CR-M048DC4LG	48 V DC	1SVR 405 618 R6100	10	
CR-M060DC4LG	60 V DC	1SVR 405 618 R4300	10	
CR-M110DC4LG	110 V DC	1SVR 405 618 R8100	10	
CR-M125DC4LG	125 V DC	1SVR 405 618 R8300	10	
CR-M220DC4LG	220 V DC	1SVR 405 618 R9100	10	
CR-M024AC4LG	24 V AC	1SVR 405 618 R0100	10	
CR-M048AC4LG	48 V AC	1SVR 405 618 R5100	10	
CR-M110AC4LG	110 V AC	1SVR 405 618 R7100	10	
CR-M120AC4LG	120 V AC	1SVR 405 618 R2100	10	
CR-M230AC4LG	230 V AC	1SVR 405 618 R3100	10	

Interface relays with gold contacts, LED and free-wheeling diode

4 c/o contacts: 250 V, 6 A

CR-M012DC4LDG	12 V DC	1SVR 405 618 R4400	10	
CR-M024DC4LDG	24 V DC	1SVR 405 618 R1400	10	

Accessories - Sockets

Type	Version	Connection terminals	Order code	Pack. unit pieces	Price 1 piece
------	---------	----------------------	------------	-------------------	---------------

Sockets

CR-M2LS	Logical socket ¹⁾ for 2 c/o	screw	1SVR 405 651 R1100	10	
CR-M3LS	Logical socket ¹⁾ for 3 c/o		1SVR 405 651 R2100	10	
CR-M4LS	Logical socket ¹⁾ for 2/4 c/o		1SVR 405 651 R3100	10	
CR-M2LC	Logical socket ¹⁾ for 2 c/o	spring connection	1SVR 405 651 R1200	10	
CR-M4LC	Logical socket ¹⁾ for 4 c/o		1SVR 405 651 R3200	10	
CR-M2SS	Standard socket for 2 c/o	screw	1SVR 405 651 R1000	10	
CR-M3SS	Standard socket for 3 c/o		1SVR 405 651 R2000	10	
CR-M4SS	Standard socket for 2/4 c/o		1SVR 405 651 R3000	10	
CR-M2SF	Standard socket for 2 c/o	fork type	1SVR 405 651 R1300	10	
CR-M4SF	Standard socket for 2/4 c/o		1SVR 405 651 R3300	10	

Socket accessories

CR-MH	Plastic holder	1SVR 405 659 R1000	10	
CR-MH1	Metal holder	1SVR 405 659 R1100	10	
CR-MJ	Jumper bar for sockets with screw connection	1SVR 405 658 R6000	10	

¹⁾ can be used with time modules CR-P/M T...

Bold printed products = stocked products

Pluggable interface relays CR-P, CR-M - Accessories

Pluggable function modules

Ordering details, Connection diagrams

2CDC 291 037 F0b04



CR-P/M ..

Type	Rated control supply voltage	Version	Order code	Pack. unit pieces	Price 1 piece
------	------------------------------	---------	------------	-------------------	---------------

Diode - Reverse polarity protection/free wheeling diode

CR-P/M 22	6-230 V DC	A1+, A2-	1SVR 405 651 R0000	10	
-----------	------------	----------	--------------------	----	--

Diode and LED - Reverse polarity protection/free wheeling diode

CR-P/M 42	6-24 V DC	red, A1+, A2-	1SVR 405 652 R0000	10	
CR-P/M 42V	6-24 V DC	green, A1+, A2-	1SVR 405 652 R1000	10	
CR-P/M 42B	24-60 V DC	red, A1+, A2-	1SVR 405 652 R4000	10	
CR-P/M 42BV	24-60 V DC	green, A1+, A2-	1SVR 405 652 R4100	10	
CR-P/M 42C	110-230 V DC	red, A1+, A2-	1SVR 405 652 R9000	10	
CR-P/M 42CV	110-230 V DC	green, A1+, A2-	1SVR 405 652 R9100	10	

RC element - Spark quenching

CR-P/M 52B	6-24 V AC		1SVR 405 653 R0000	10	
CR-P/M 52D	24-60 V AC		1SVR 405 653 R4000	10	
CR-P/M 52C	110-230 V AC		1SVR 405 653 R1000	10	

Diode and LED

CR-P/M 62	6-24 V AC/DC	red, for DC A1+, A2-	1SVR 405 654 R0000	10	
CR-P/M 62V	6-24 V AC/DC	green, for DC A1+, A2-	1SVR 405 654 R1000	10	
CR-P/M 62E	24-60 V AC/DC	red, for DC A1+, A2-	1SVR 405 654 R4000	10	
CR-P/M 62EV	24-60 V AC/DC	green, for DC A1+, A2-	1SVR 405 654 R4100	10	
CR-P/M 92	110-230 V AC/DC	red, for DC A1+, A2-	1SVR 405 654 R0100	10	
CR-P/M 92V	110-230 V AC/DC	green, for DC A1+, A2-	1SVR 405 654 R1100	10	

Varistor and LED - Overvoltage protection

CR-P/M 62C	6-24 V AC/DC	red, for DC A1+, A2-	1SVR 405 655 R0000	10	
CR-P/M 62CV	6-24 V AC/DC	green, for DC A1+, A2-	1SVR 405 655 R1000	10	
CR-P/M 62D	24-60 V AC/DC	red, for DC A1+, A2-	1SVR 405 655 R4000	10	
CR-P/M 62DV	24-60 V AC/DC	green, for DC A1+, A2-	1SVR 405 655 R4100	10	
CR-P/M 92C	110-230 V AC/DC	red, for DC A1+, A2-	1SVR 405 655 R0100	10	
CR-P/M 92CV	110-230 V AC/DC	green, for DC A1+, A2-	1SVR 405 655 R1100	10	

Varistor - Overvoltage protection

CR-P/M 72	24 V AC		1SVR 405 656 R0000	10	
CR-P/M 72A	115 V AC		1SVR 405 656 R1000	10	
CR-P/M 82	230 V AC		1SVR 405 656 R2000	10	

Time modules

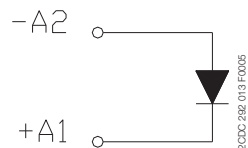
CR-P/M T1	12-24 V AC/DC	ON-delay	1SVR 405 657 R0000	10	
CR-P/M T2	12-24 V AC/DC	Impulse-ON	1SVR 405 657 R0100	10	

2CDC 291 002 F0b07

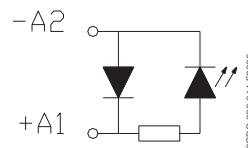


CR-P/M T..

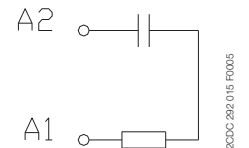
Connection diagrams



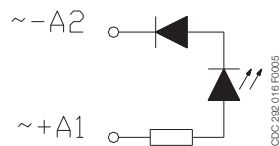
CR-P/M 22



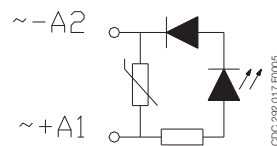
CR-P/M 42, CR-P/M 42B, CR-P/M 42C, CR-P/M 42BV, CR-P/M 42CV



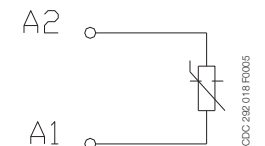
CR-P/M 52B, CR-P/M 52C, CR-P/M 52D



CR-P/M 62, CR-P/M 62E, CR-P/M 92, CR-P/M 92V, CR-P/M 62EV, CR-P/M 92V



CR-P/M 62C, CR-P/M 62D, CR-P/M 92C, CR-P/M 62CV, CR-P/M 62DV, CR-P/M 92CV



CR-P/M 72, CR-P/M 72A, CR-P/M 82

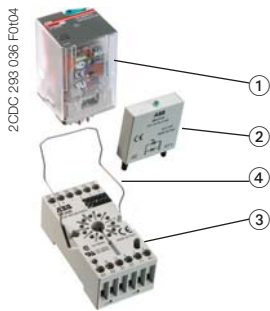
All CR-P/M modules - except time modules CR-P/M T... - can be plugged onto all CR-P or CR-M sockets. The time modules CR-P/M T... can be plugged onto the following sockets only: CR-PLSx, CR-PLC and CR-M2LS, CR-M3LS, CR-M4LS, CR-M2LC, CR-M4LC.

Bold printed products = stocked products

Pluggable interface relays CR-U

Universal relays

Ordering details



CR-U

- ① Interface relay
- ② Pluggable function module
- ③ Socket
- ④ Holder



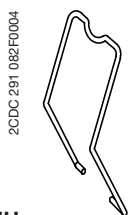
CR-U



CR-U3S



CR-U3E



CR-UH

Type	Rated control supply voltage	Order code	Pack. unit pieces	Price 1 piece
------	------------------------------	------------	-------------------	---------------

Interface relays without LED: 2 c/o contacts: 250 V, 10 A

CR-U012DC2	12 V DC	1SVR 405 621 R4000	10	
CR-U024DC2	24 V DC	1SVR 405 621 R1000	10	
CR-U048DC2	48 V DC	1SVR 405 621 R6000	10	
CR-U110DC2	110 V DC	1SVR 405 621 R8000	10	
CR-U220DC2	220 V DC	1SVR 405 621 R9000	10	
CR-U024AC2	24 V AC	1SVR 405 621 R0000	10	
CR-U048AC2	48 V AC	1SVR 405 621 R5000	10	
CR-U110AC2	110 V AC	1SVR 405 621 R7000	10	
CR-U120AC2	120 V AC	1SVR 405 621 R2000	10	
CR-U230AC2	230 V AC	1SVR 405 621 R3000	10	

Interface relays without LED: 3 c/o contacts: 250 V, 10 A

CR-U012DC3	12 V DC	1SVR 405 622 R4000	10	
CR-U024DC3	24 V DC	1SVR 405 622 R1000	10	
CR-U048DC3	48 V DC	1SVR 405 622 R6000	10	
CR-U110DC3	110 V DC	1SVR 405 622 R8000	10	
CR-U220DC3	220 V DC	1SVR 405 622 R9000	10	
CR-U024AC3	24 V AC	1SVR 405 622 R0000	10	
CR-U048AC3	48 V AC	1SVR 405 622 R5000	10	
CR-U110AC3	110 V AC	1SVR 405 622 R7000	10	
CR-U120AC3	120 V AC	1SVR 405 622 R2000	10	
CR-U230AC3	230 V AC	1SVR 405 622 R3000	10	

Interface relays with LED: 2 c/o contacts: 250 V, 10 A

CR-U012DC2L	12 V DC	1SVR 405 621 R4100	10	
CR-U024DC2L	24 V DC	1SVR 405 621 R1100	10	
CR-U048DC2L	48 V DC	1SVR 405 621 R6100	10	
CR-U110DC2L	110 V DC	1SVR 405 621 R8100	10	
CR-U220DC2L	220 V DC	1SVR 405 621 R9100	10	
CR-U024AC2L	24 V AC	1SVR 405 621 R0100	10	
CR-U048AC2L	48 V AC	1SVR 405 621 R5100	10	
CR-U110AC2L	110 V AC	1SVR 405 621 R7100	10	
CR-U120AC2L	120 V AC	1SVR 405 621 R2100	10	
CR-U230AC2L	230 V AC	1SVR 405 621 R3100	10	

Interface relays with LED: 3 c/o contacts: 250 V, 10 A

CR-U012DC3L	12 V DC	1SVR 405 622 R4100	10	
CR-U024DC3L	24 V DC	1SVR 405 622 R1100	10	
CR-U048DC3L	48 V DC	1SVR 405 622 R6100	10	
CR-U110DC3L	110 V DC	1SVR 405 622 R8100	10	
CR-U220DC3L	220 V DC	1SVR 405 622 R9100	10	
CR-U024AC3L	24 V AC	1SVR 405 622 R0100	10	
CR-U048AC3L	48 V AC	1SVR 405 622 R5100	10	
CR-U110AC3L	110 V AC	1SVR 405 622 R7100	10	
CR-U120AC3L	120 V AC	1SVR 405 622 R2100	10	
CR-U230AC3L	230 V AC	1SVR 405 622 R3100	10	

Accessories - Sockets

Type	Version	Order code	Pack. unit pieces	Price 1 piece
------	---------	------------	-------------------	---------------

Sockets

CR-U2S	Socket for 2 c/o and module	1SVR 405 670 R0000	10	
CR-U3S	Socket for 3 c/o and module	1SVR 405 660 R0000	10	
CR-U3E	Socket for 2 c/o	1SVR 405 660 R0100	10	
CR-U2SM	Socket small for 2 c/o	1SVR 405 670 R1100	10	
CR-U3SM	Socket small for 3 c/o	1SVR 405 660 R1100	10	

Sockelzubehör

CR-UH	Holder for CR-U socket	1SVR 405 669 R0000	10	
--------------	------------------------	---------------------------	-----------	--

Bold printed products = stocked products

• Pluggable function modules260 • Technical data261 • Dimensional drawings265

Pluggable interface relays CR-U - Accessories

Pluggable function modules

Ordering details, Connection diagrams

2CDC 291 038 F004



CR-U ..

Type	Rated control supply voltage	Version	Order code	Pack. unit pieces	Price 1 piece
------	------------------------------	---------	------------	-------------------	---------------

Diode - Reverse polarity protection/free wheeling diode

CR-U 21	6-230 V DC	A1+, A2-	1SVR 405 661 R0000	10	
CR-U 41	6-24 V DC	red, A1+, A2-	1SVR 405 662 R0000	10	
CR-U 41V	6-24 V DC	green, A1+, A2-	1SVR 405 662 R1000	10	
CR-U 41B	24-60 V DC	red, A1+, A2-	1SVR 405 662 R4000	10	
CR-U 41BV	24-60 V DC	green, A1+, A2-	1SVR 405 662 R4100	10	
CR-U 41C	110-230 V DC	red, A1+, A2-	1SVR 405 662 R9000	10	
CR-U 41CV	110-230 V DC	green, A1+, A2-	1SVR 405 662 R9100	10	

RC element - Spark quenching

CR-U 51B	6-24 V AC		1SVR 405 663 R0000	10	
CR-U 51D	24-60 V AC		1SVR 405 663 R4000	10	
CR-U 51C	110-230 V AC		1SVR 405 663 R1000	10	

Diode and LED

CR-U 61	6-24 V AC/DC	red, for DC: A1+, A2-	1SVR 405 664 R0000	10	
CR-U 61V	6-24 V AC/DC	green, for DC: A1+, A2-	1SVR 405 664 R1000	10	
CR-U 61E	24-60 V AC/DC	red, for DC: A1+, A2-	1SVR 405 664 R4000	10	
CR-U 61EV	24-60 V AC/DC	green, for DC: A1+, A2-	1SVR 405 664 R4100	10	
CR-U 91	110-230 V AC/DC	red, for DC: A1+, A2-	1SVR 405 664 R0100	10	
CR-U 91V	110-230 V AC/DC	green, for DC: A1+, A2-	1SVR 405 664 R1100	10	

Varistor and LED - Overvoltage protection

CR-U 61C	6-24 V AC/DC	red, for DC: A1+, A2-	1SVR 405 665 R0000	10	
CR-U 61CV	6-24 V AC/DC	green, for DC: A1+, A2-	1SVR 405 665 R1000	10	
CR-U 61D	24-60 V AC/DC	red, for DC: A1+, A2-	1SVR 405 665 R4000	10	
CR-U 61DV	24-60 V AC/DC	green, for DC: A1+, A2-	1SVR 405 665 R4100	10	
CR-U 91C	110-230 V AC/DC	red, for DC: A1+, A2-	1SVR 405 665 R0100	10	
CR-U 91CV	110-230 V AC/DC	green, for DC: A1+, A2-	1SVR 405 665 R1100	10	

Varistor - Overvoltage protection

CR-U 71	24 V AC		1SVR 405 666 R0000	10	
CR-U 71A	115 V AC		1SVR 405 666 R1000	10	
CR-U 81	230 V AC		1SVR 405 666 R2000	10	

Multifunction time module

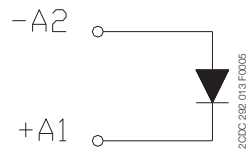
CR-U T	24-240 V AC/DC	pluggable onto CR-U2S and CR-U3S	1SVR 405 667 R0000	10	
---------------	-----------------------	---	---------------------------	-----------	--

2CDC 291 032 F005

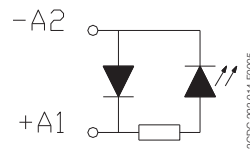


CR-U T

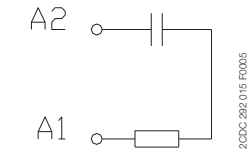
Connection diagrams



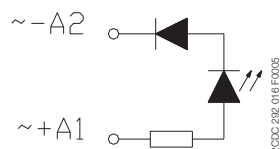
CR-U 21



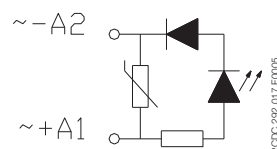
CR-U 41, CR-U 41B, CR-U 41C, CR-U 41V, CR-U 41BV, CR-U 41CV



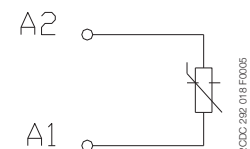
CR-U 51B, CR-U 51C CR-U 51D,



CR-U 61, CR-U 61E, CR-U 91, CR-U 61V, CR-U 61EV, CR-U 91V



CR-U 61C, CR-U 61D, CR-U 91C, CR-U 61CV, CR-U 61DV CR-U 91CV



CR-U 71, CR-U 81 CR-U 71A,

All CR-U modules can be plugged onto sockets CR-U2S and CR-U3S.
Bold printed products = stocked products

Pluggable interface relays CR-P, CR-M and CR-U

Pcb-, miniature- and universal relays

Technical data

Input circuit - coil data

CR-P range



	Rated control supply voltage U_s	Rated frequency	Make voltage (at 20 °C)	Maximum voltage (at 55 °C)	Break voltage	Rated power	Coil resistance (at 20 °C)	Tolerance of coil resistance
DC coils	12 V DC	-	8.4 V DC	30.6 V DC	$\geq 0.1 U_s$	0.4-0.48 W	360 Ω	$\pm 10\%$
	24 V DC	-	16.8 V DC	61.2 V DC	$\geq 0.1 U_s$	0.4-0.48 W	1440 Ω	$\pm 10\%$
	48 V DC	-	33.6 V DC	122.4 V DC	$\geq 0.1 U_s$	0.4-0.48 W	5700 Ω	$\pm 10\%$
	110 V DC	-	77 V DC	280 V DC	$\geq 0.1 U_s$	0.4-0.48 W	25200 Ω	$\pm 10\%$
AC coils	24 V AC	50 / 60 Hz	19.2 V AC	28.8 V AC	$\geq 0.15 U_s$	0.75 VA	400 Ω	$\pm 10\%$
	48 V AC	50 / 60 Hz	38.4 V AC	57.6 V AC	$\geq 0.15 U_s$	0.75 VA	1550 Ω	$\pm 10\%$
	110 V AC	50 / 60 Hz	88 V AC	132 V AC	$\geq 0.15 U_s$	0.75 VA	8900 Ω	$\pm 10\%$
	120 V AC	50 / 60 Hz	96 V AC	144 V AC	$\geq 0.15 U_s$	0.75 VA	10200 Ω	$\pm 10\%$
	230 V AC	50 / 60 Hz	184 V AC	276 V AC	$\geq 0.15 U_s$	0.75 VA	38500 Ω	$\pm 10\%$

CR-M range



	Rated control supply voltage U_s	Rated frequency	Make voltage (at 20 °C)	Maximum voltage (at 55 °C)	Break voltage	Rated power	Coil resistance (at 20 °C)	Tolerance of coil resistance
DC coils	12 V DC	-	9.6 V DC	13.2 V DC	$\geq 0.1 U_s$	0.9 W	160 Ω	$\pm 10\%$
	24 V DC	-	19.2 DC	26.4 V DC	$\geq 0.1 U_s$	0.9 W	640 Ω	$\pm 10\%$
	48 V DC	-	38.4 V DC	52.8 V DC	$\geq 0.1 U_s$	0.9 W	2600 Ω	$\pm 10\%$
	60 V DC	-	48.0 V DC	66.0 V DC	$\geq 0.1 U_s$	0.9 W	4000 Ω	$\pm 10\%$
	110 V DC	-	88 V DC	121 V DC	$\geq 0.1 U_s$	0.9 W	13600 Ω	$\pm 10\%$
	125 V DC	-	100 V DC	137,5 V DC	$\geq 0.1 U_s$	0.9 W	16000 Ω	$\pm 10\%$
	220 V DC	-	176 V DC	242 V DC	$\geq 0.1 U_s$	0.9 W	54000 Ω	$\pm 10\%$
AC coils	24 V AC	50 / 60 Hz	19.2 V AC	26.4 V AC	$\geq 0.2 U_s$	1.6 VA	158 Ω	$\pm 10\%$
	48 V AC	50 / 60 Hz	38.4 V AC	52.8 V AC	$\geq 0.2 U_s$	1.6 VA	640 Ω	$\pm 10\%$
	110 V AC	50 / 60 Hz	88 V AC	121 V AC	$\geq 0.2 U_s$	1.6 VA	3450 Ω	$\pm 10\%$
	120 V AC	50 / 60 Hz	96 V AC	132 V AC	$\geq 0.2 U_s$	1.6 VA	3770 Ω	$\pm 10\%$
	230 V AC	50 / 60 Hz	184 V AC	253 V AC	$\geq 0.2 U_s$	1.6 VA	16100 Ω	$\pm 10\%$

CR-U range



	Rated control supply voltage U_s	Rated frequency	Make voltage (at 20 °C)	Maximum voltage (at 55 °C)	Break voltage	Rated power	Coil resistance (at 20 °C)	Tolerance of coil resistance
DC coils	12 V DC	-	9.6 V DC	13.2 V DC	$\geq 0.1 U_s$	1.5 W	110 Ω	$\pm 10\%$
	24 V DC	-	19.2 DC	26.4 V DC	$\geq 0.1 U_s$	1.5 W	430 Ω	$\pm 10\%$
	48 V DC	-	38.4 V DC	52.8 V DC	$\geq 0.1 U_s$	1.5 W	1750 Ω	$\pm 10\%$
	110 V DC	-	88 V DC	121 V DC	$\geq 0.1 U_s$	1.5 W	9200 Ω	$\pm 10\%$
	220 V DC	-	176 V DC	242 V DC	$\geq 0.1 U_s$	1.5 W	37000 Ω	$\pm 10\%$
AC coils	24 V AC	50 / 60 Hz	19.2 V AC	26.4 V AC	$\geq 0.15 U_s$	2.8 VA (50 Hz) 2.5 VA (60 Hz)	75 Ω	$\pm 10\%$
	48 V AC	50 / 60 Hz	38.4 V AC	52.8 V AC	$\geq 0.15 U_s$	2.8 VA (50 Hz) 2.5 VA (60 Hz)	305 Ω	$\pm 10\%$
	110 V AC	50 / 60 Hz	88 V AC	121 V AC	$\geq 0.15 U_s$	2.8 VA (50 Hz) 2.5 VA (60 Hz)	1700 Ω	$\pm 10\%$
	120 V AC	50 / 60 Hz	96 V AC	132 V AC	$\geq 0.15 U_s$	2.8 VA (50 Hz) 2.5 VA (60 Hz)	1910 Ω	$\pm 10\%$
	230 V AC	50 / 60 Hz	184 V AC	253 V AC	$\geq 0.15 U_s$	2.8 VA (50 Hz) 2.5 VA (60 Hz)	7080 Ω	$\pm 10\%$

Pluggable interface relays CR-P, CR-M and CR-U

Pcb-, miniature- and universal relays

Technical data (continued)

Type	CR-P...1	CR-P...2	CR-M...2	CR-M...3	CR-M...4	CR-U...2	CR-U...3	
Output circuit(s)	11-12/14	11-12/14 21-22/24	11-12/14 21-22/24	11-12/14 21-22/24 31-32/34	11-12/14 21-22/24 31-32/34 41-42/44	11-12/14 31-32/34	11-12/14 21-22/24 31-32/34	
Kind of output	Relay, 1 c/o	Relay, 2 c/o	Relay, 2 c/o	Relay, 3 c/o	Relay, 4 c/o	Relay, 2 c/o	Relay, 3 c/o	
Contact material	AgNi	AgNi AgNi/Au 5 µm	AgNi	AgNi	AgNi AgNi/Au 5 µm	AgNi		
Rated operational voltage U_g (VDE 0110, IEC 60947-1)	250 V							
Minimum switching voltage	5 V							
Maximum switching voltage	300 V DC		250 V DC					
	400 V AC		250 V AC					
Minimum switching current	5 mA (AgNi), 2 mA (AgNi/Au)							
Rated free air thermal current I_{th}	16 A	8 A	12 A	10 A	6 A	10 A		
Rated operational current (IEC 60947-5-1)	AC12 (resistive) 230 V	16 A	8 A	12 A	10 A	6 A	10 A	
	AC15 (inductive) 230 V	1.5 A	1 A	1.5 A	1.5 A	1 A	1.5 A	
	DC12 (resistive) 24 V	16 A	8 A	12 A	10 A	6 A	10 A	
	DC13 (inductive) 24 V	2 A	2 A	8 A	8 A	6 A	2 A	
AC rating (UL 508)	Utilization category (Control Circuit Rating Code)	-		-			-	B 300
	max. rated operational voltage	-		-			-	300 V AC
	max. continuous thermal current at B 300	-		-			-	5 A
	max. making / breaking apparent power at B 300	-		-			-	3600/360 VA
	Utilization category General Purpose (single phase)	-		-			10 A, 250 V AC	10 A, 250 V AC
	Utilization category (Resistive)	16 A, 250 V AC	8 A, 250 V AC	10 A, 250 V AC 12 A, 150 V AC	6 A, 250 V AC 10 A, 150 V AC	6 A, 250 V AC 10 A, 150 V AC	10 A, 250 V AC	-
Minimum switching power	0.3 W (AgNi), 0.1 W (AgNi/Au)						0.3 W	
Maximum switching power	AC-1	4000 VA	2000 VA	3000 VA	2500 VA	1500 VA	2500 VA	
Contact resistance	≤ 100 mΩ			≤ 100 mΩ				
Maximum switching capacity	rated load AC-1	600 switching cycles/h		1200 switching cycles/h				
	without load	72000 switching cycles/h		18000 switching cycles/h		12000 switching cycles/h		
Mechanical lifetime	> 3 x 10 ⁷ switching cycles		> 2 x 10 ⁷ switching cycles					
Electrical lifetime	AC1 (resistive)	> 10 ⁵ switching cycles (16 A, 250 V) (8 A, 250 V)		> 10 ⁵ switching cycles (12 A, 250 V) (10 A, 250 V) (6 A, 250 V)			> 10 ⁵ switching cycles (10 A, 250 V)	
		cos φ see reduction factor F						
Response time	typ. 7 ms		typ. 13 ms (DC), 10 ms (AC)			typ. 18 ms (DC), 12 ms (AC)		
Release time	typ. 3 ms		typ. 3 ms (DC), 8 ms (AC)			typ. 7 ms (DC), 10 ms (AC)		
Isolation data								
Rated insulation voltage	400 V AC		250 V AC					
Insulation class	C250 / B400		C250 / B250			C250		
Rated impulse withstand voltage U_{imp}	between coil and contacts	5 kV AC		2.5 kV AC				
	between open contacts	1 kV AC		1.5 kV AC				
	between c/o contacts	2.5 kV AC		2.5 kV AC		2 kV AC	2 kV AC	
Clearance distance	between coil and contacts	≥ 10 mm		≥ 2.5 mm	≥ 1.6 mm	≥ 3 mm		
Creepage distance	between coil and contacts	≥ 10 mm		≥ 4 mm	≥ 3.2 mm	≥ 4.2 mm		
Overvoltage category	III		III		II	III		
Pollution degree	3		3		2	3		

Pluggable interface relays CR-P, CR-M and CR-U

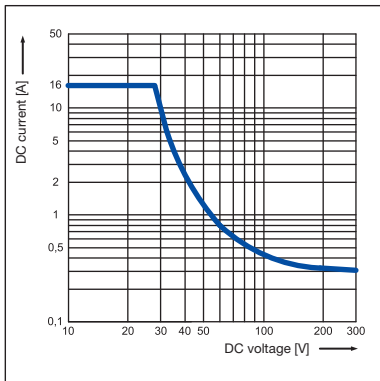
Pcb-, miniature- and universal relays

Technical data (continued), Technical diagrams

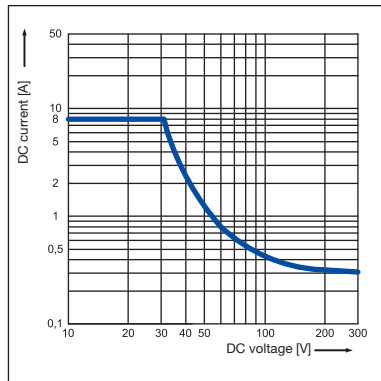
Type	CR-P...1	CR-P...2	CR-M...2	CR-M...3	CR-M...4	CR-U...2	CR-U...3
General data							
Dimensions (W x H x D) when mounted	12.7 x 29 x 15.7 mm		21.2 x 27.5 x 35.6 mm			35 x 35 x 54.4 mm	
Weight	14 g (0.031 lb)		35 g (0.077 lb)			83 g (0.18 lb)	
Mounting	on socket (see accessories)						
Mounting position	any						
Degree of protection	IP 67			IP 40			
Electrical connection							
Connection	by socket						
Environmental data							
Ambient temperature range	operation DC	-40 ... +85 °C			-40 ... +70 °C		
	operation AC	-40 ... +70 °C			-40 ... +55 °C		
	storage	-40 ... +85 °C					
Vibration resistance 10-150 Hz	n/o contact	10 g		5 g		5 g	
	n/c contact	10 g	5 g	5 g		5 g	
Shock resistance	n/o contact	30 g	20 g	10 g		10 g	
	n/c contact	30 g	20 g	5 g		10 g	
Standards							
Product standard	EN 61810-1, EN 60255-23 IEC 60664-1			EN 60810-1, EN 60255-23 IEC 61810-7		EN 60255-1-00	
Low Voltage Directive				73/23/EEC			

Load limit curves - Maximum switching power at resistive DC load

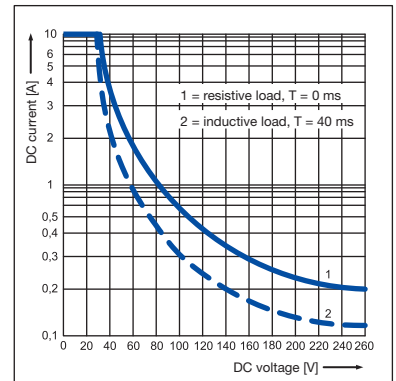
CR-P with 1 c/o contact



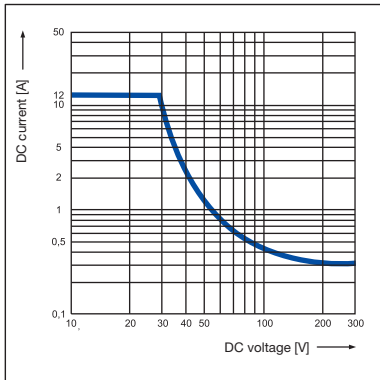
CR-P with 2 c/o contacts



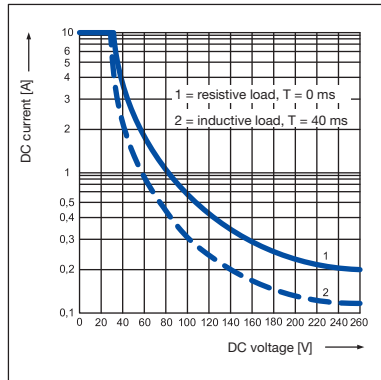
CR-U with 2 and 3 c/o contacts



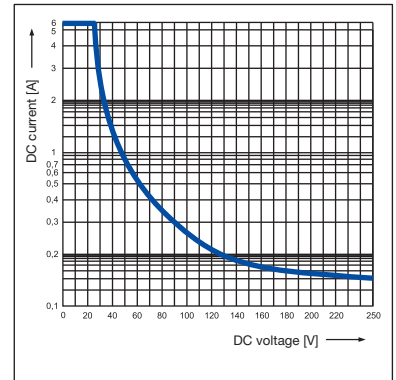
CR-M with 2 c/o contacts



CR-M with 3 c/o contacts



CR-M with 4 c/o contacts



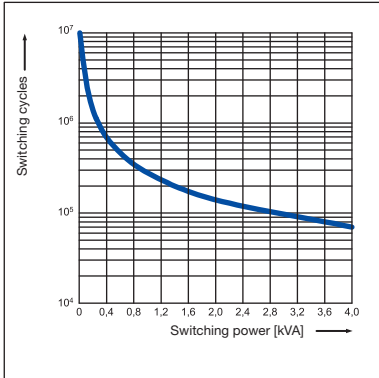
Pluggable interface relays CR-P, CR-M and CR-U

Pcb-, miniature- and universal relays

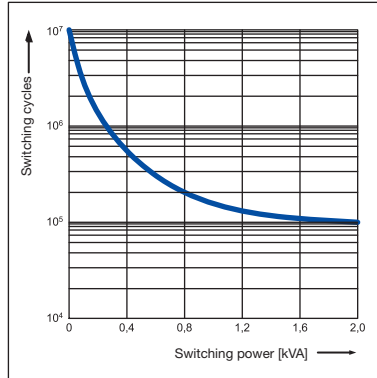
Technical diagrams

Load limit curves - Electrical lifetime at resistive AC load

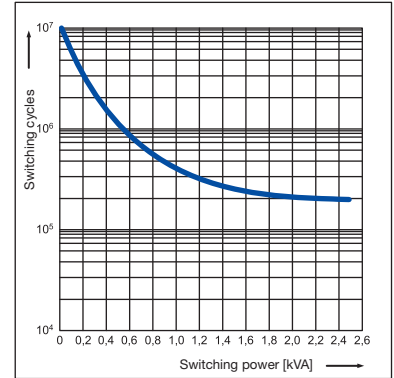
CR-P with 1 c/o contact



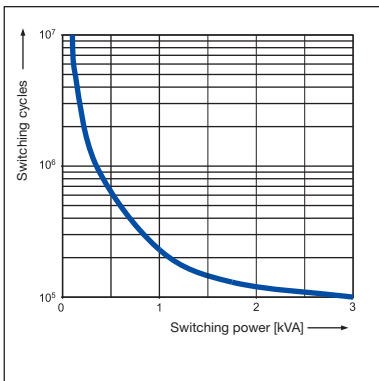
CR-P with 2 c/o contacts



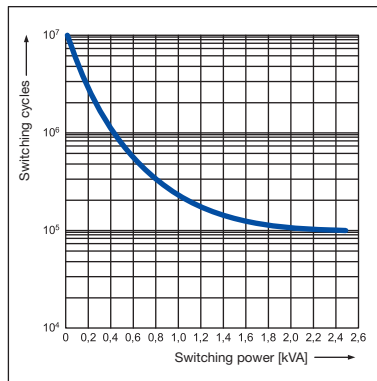
CR-U with 2 and 3 c/o contacts



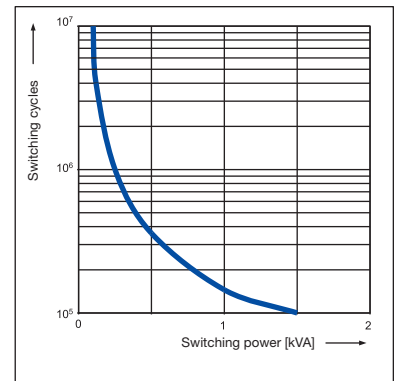
CR-M with 2 c/o contacts



CR-M with 3 c/o contacts



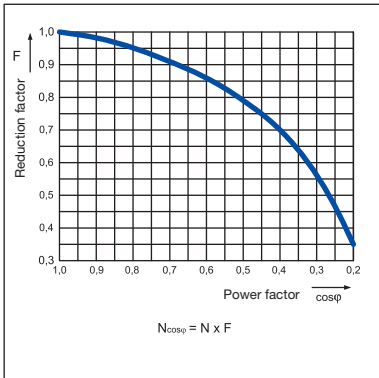
CR-M with 4 c/o contacts



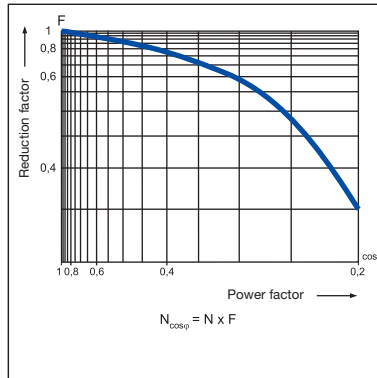
6

Reduction factor F at inductive AC load

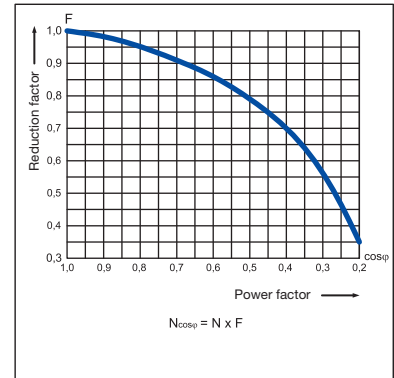
CR-P



CR-M



CR-U

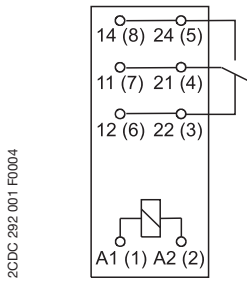


Pluggable interface relays CR-P, CR-M and CR-U

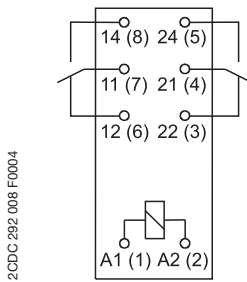
Pcb-, miniature- and universal relays

Connection diagrams, dimensional drawings

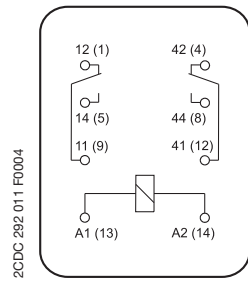
Connection diagrams



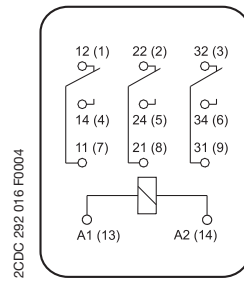
CR-P with 1 c/o contact



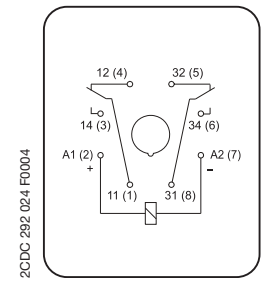
CR-P with 2 c/o contacts



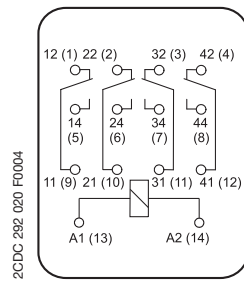
CR-M with 2 c/o contacts



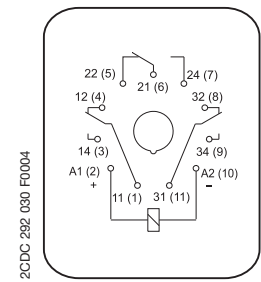
CR-M with 3 c/o contacts



CR-U with 2 c/o contacts

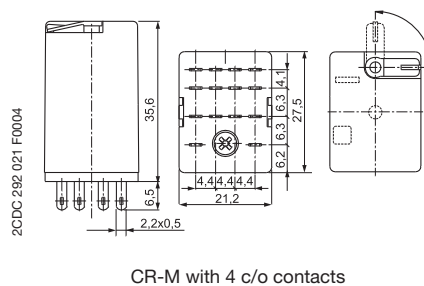
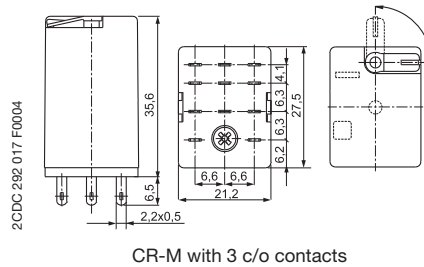
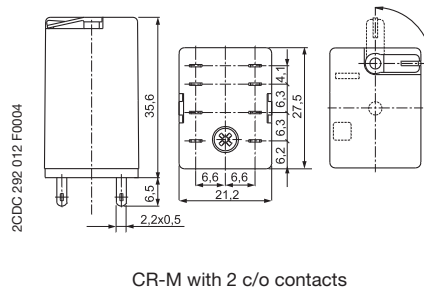
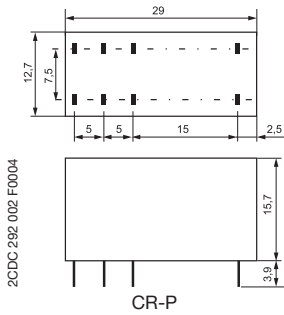


CR-M with 4 c/o contacts

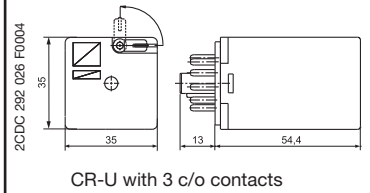
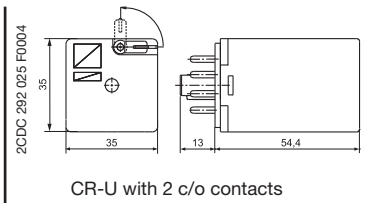


CR-U with 3 c/o contacts

Dimensional drawings



Dimensions in mm



Pluggable interface relays CR-P, CR-M and CR-U

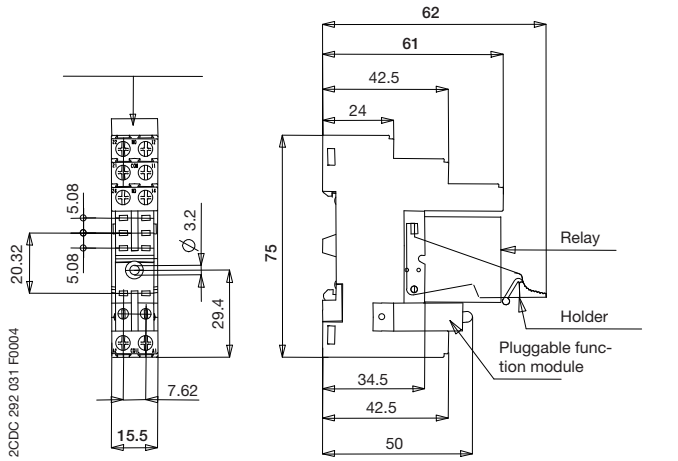
Pcb-, miniature- and universal relays

Dimensional drawings

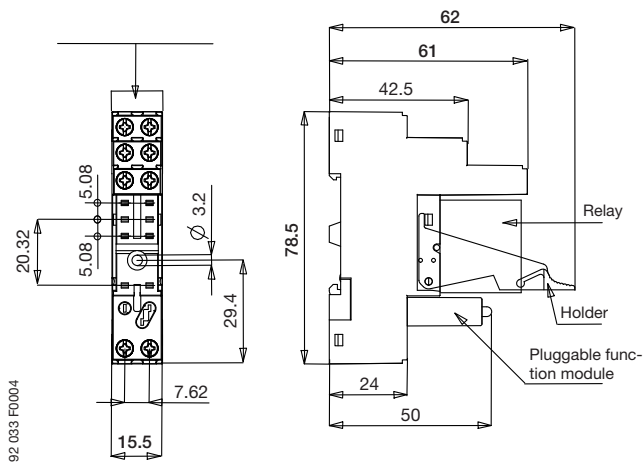
Dimensional drawings

Dimensions in mm

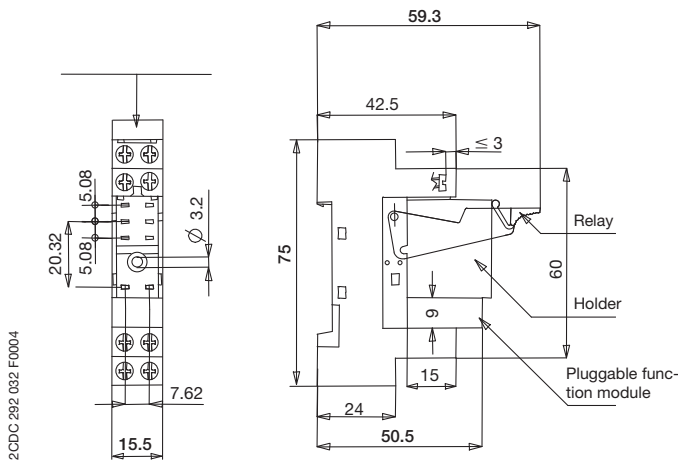
Sockets for screw connection



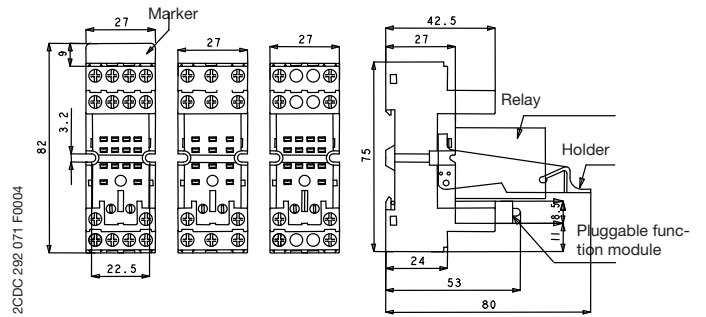
CR-PLS



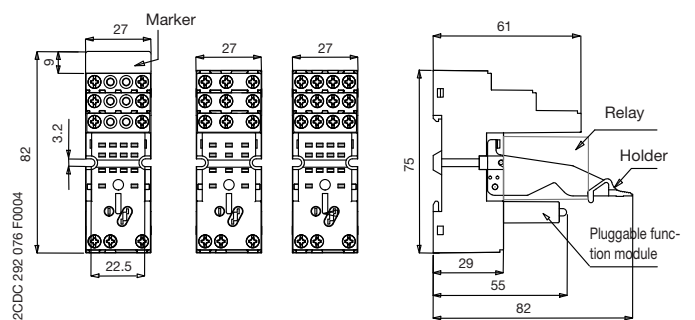
CR-PLSx



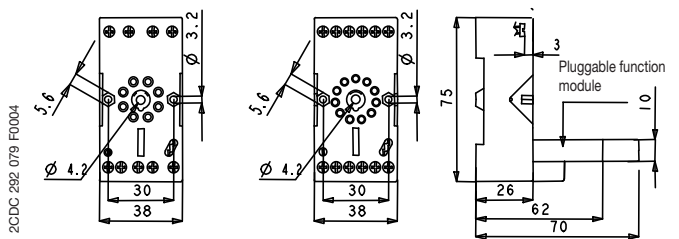
CR-PSS



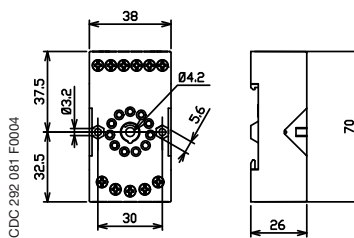
CR-M2SS - CR-M3SS - CR-M4SS



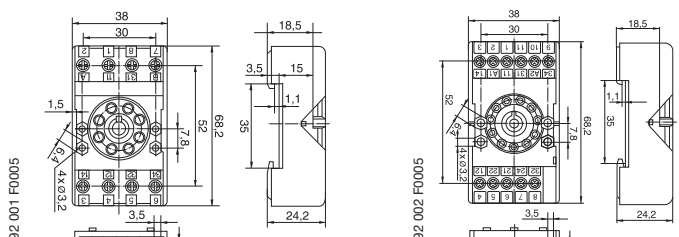
CR-M2LS - CR-M3LS - CR-M4LS



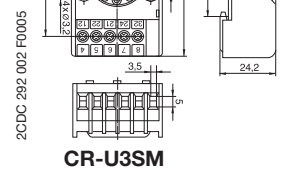
CR-U2S - CR-U3S



CR-U3E



CR-U2SM



CR-U3SM

Pluggable interface relays CR-P, CR-M and CR-U

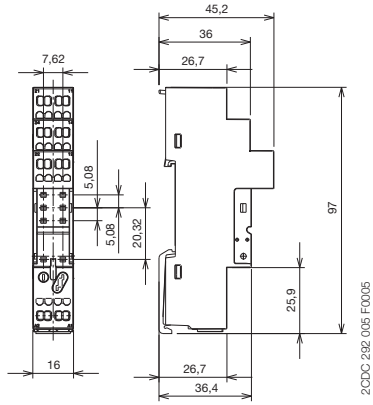
Pcb-, miniature- and universal relays

Dimensional drawings

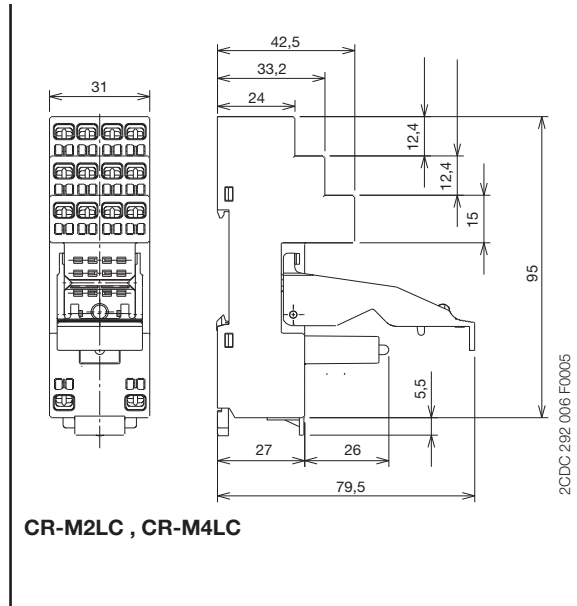
Dimensional drawings

Dimensions in mm

Sockets for spring connection

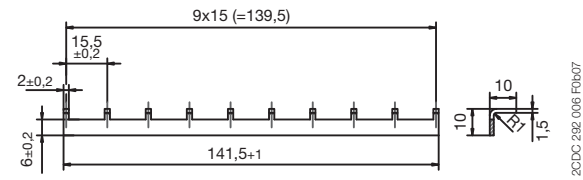


CR-PLC

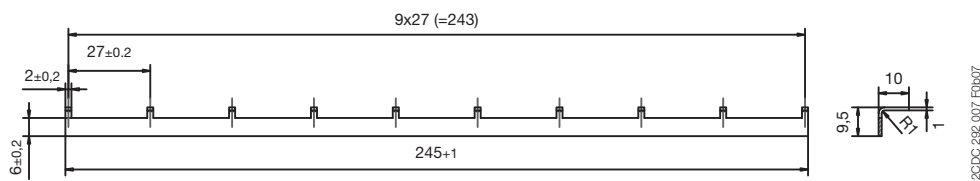


CR-M2LC , CR-M4LC

Jumper



CR-PJ



CR-MJ

TIME RELAY, ELECTRONIC, DELAYED, 1 CO CONT.,
15 TIME SET. RANGES, 0.05S...100HR, 12...240V
AC/DC AT AC 50/60HZ, LED, SCREW TERMINAL



Figure similar

General technical data:		
product brandname		SIRIUS
Product designation		timing relay
Design of the product		slow-operating
Mounting position		any
Product function at the relay outputs Switchover delayed/without delay		No
Product function non-volatile		No
Product component		
• Relay output		Yes
• semi-conductor output		No
Installation altitude at height above sea level maximum	m	2 000
Ambient temperature		
• during operation	°C	-25 ... +60
• during storage	°C	-40 ... +85
• during transport	°C	-40 ... +85
Relative humidity during operation	%	10 ... 95

EMC emitted interference acc. to IEC 61812-1		EN 61000-6-4(3)
EMI immunity acc. to IEC 61812-1		EN 61000-6-2
Conducted interference due to burst acc. to IEC 61000-4-4		2 kV network connection / 1 kV control connection
Conducted interference due to conductor-earth surge acc. to IEC 61000-4-5		2 kV
Conducted interference due to conductor-conductor surge acc. to IEC 61000-4-5		1 kV
Electrostatic discharge acc. to IEC 61000-4-2		4 kV contact discharge / 8 kV air discharge
Field-bound parasitic coupling acc. to IEC 61000-4-3		10 V/m
Surge voltage resistance rated value	V	4 000
Power loss [W] total typical	W	2
Equipment marking		
<ul style="list-style-type: none"> • acc. to DIN 40719 extended according to IEC 204-2 acc. to IEC 750 		K
<ul style="list-style-type: none"> • acc. to DIN EN 61346-2 		K
<ul style="list-style-type: none"> • acc. to DIN EN 81346-2 		K
Category acc. to EN 954-1		none
Protection against electrical shock		finger-safe
Protection class IP		IP20
Type of insulation		Basic insulation
Mechanical service life (switching cycles) typical		10 000 000
Electrical endurance (switching cycles) at AC-15 at 230 V typical		100 000
Operating frequency with 3RT2 contactor maximum	1/h	5 000
Vibration resistance acc. to IEC 60068-2-6		10 ... 55 Hz / 0.35 mm
Shock resistance acc. to IEC 60068-2-27		11g / 15 ms
Relative repeat accuracy	%	1
Recovery time	ms	250
Degree of pollution		3
Insulation voltage for overvoltage category III according to IEC 60664 with degree of pollution 3 rated value	V	300
Relative setting accuracy relating to full-scale value	%	5
Product extension required remote control		No
Product extension optional remote control		No

Switching Function:

Switching function

<ul style="list-style-type: none"> • ON-delay 	Yes
<ul style="list-style-type: none"> • ON-delay/instantaneous contact 	No
<ul style="list-style-type: none"> • passing make contact 	No
<ul style="list-style-type: none"> • passing make contact/instantaneous contact 	No
<ul style="list-style-type: none"> • OFF delay 	No
<ul style="list-style-type: none"> • flashing asymmetrically starting with interval 	No

<ul style="list-style-type: none"> flashing asymmetrically starting with pulse 	No
<ul style="list-style-type: none"> flashing symmetrically starting with pulse 	No
<ul style="list-style-type: none"> flashing symmetrically starting with pulse/instantaneous 	No
<ul style="list-style-type: none"> flashing symmetrically starting with interval 	No
<ul style="list-style-type: none"> flashing symmetrically starting with interval/instantaneous 	No
<ul style="list-style-type: none"> star-delta circuit 	No
<ul style="list-style-type: none"> star-delta circuit with delay time 	No
Switching function with control signal	
<ul style="list-style-type: none"> additive ON delay 	No
<ul style="list-style-type: none"> passing break contact 	No
<ul style="list-style-type: none"> OFF delay 	No
<ul style="list-style-type: none"> pulse-shaping 	No
<ul style="list-style-type: none"> OFF delay/instantaneous 	No
<ul style="list-style-type: none"> ON-delay/OFF-delay/instantaneous 	No
<ul style="list-style-type: none"> passing break contact/instantaneous 	No
<ul style="list-style-type: none"> additive ON delay/instantaneous 	No
<ul style="list-style-type: none"> ON-delay/OFF-delay 	No
<ul style="list-style-type: none"> passing make contact 	No
<ul style="list-style-type: none"> passing make contact/instantaneous contact 	No
<ul style="list-style-type: none"> pulse delayed 	No
<ul style="list-style-type: none"> pulse delayed/instantaneous 	No
<ul style="list-style-type: none"> pulse-shaping/instantaneous 	No
Switching function of interval relay with control signal	
<ul style="list-style-type: none"> retrotriggerable with deactivated control signal/instantaneous contact 	No
<ul style="list-style-type: none"> retrotriggerable with activated control signal 	No
<ul style="list-style-type: none"> retrotriggerable with activated control signal/instantaneous contact 	No
<ul style="list-style-type: none"> retriggerable with deactivated control signal 	No

Control circuit/ Control:		
Adjustable time	s	0.05 ... 360 000
Type of voltage of the control supply voltage		AC/DC
Control supply voltage frequency 1	Hz	50 ... 60
Control supply voltage 1		
<ul style="list-style-type: none"> at AC at 50 Hz 	V	12 ... 240
<ul style="list-style-type: none"> at AC at 60 Hz 	V	12 ... 240
<ul style="list-style-type: none"> at DC 	V	12 ... 240
Operating range factor control supply voltage rated value		
<ul style="list-style-type: none"> at AC 		

— at 50 Hz		0.85 ... 1.1
— at 60 Hz		0.85 ... 1.1
• at DC		0.85 ... 1.1
Inrush current peak		
• at 24 V	A	0.4
• at 240 V	A	5
Duration of inrush current peak		
• at 24 V	ms	0.3
• at 240 V	ms	0.5
Power loss [W] at AC maximum	W	1.09
Power loss [V·A] at AC maximum	V·A	2.95

Auxiliary circuit:

Contact reliability of auxiliary contacts		one incorrect switching operation of 100 million switching operations (17 V, 5 mA)
Material of switching contacts		AgSnO2
Operating current of auxiliary contacts		
• at AC-15		
— at 24 V	A	3
— at 250 V	A	3
• at DC-13		
— at 24 V	A	1
— at 125 V	A	0.2
— at 250 V	A	0.1
Influence of the surrounding temperature		1% in the whole temperature range to the set runtime
Power supply influence		1% in the whole voltage range to the set runtime
Test voltage for isolation test	kV	2.5
Design of the fuse link for short-circuit protection of the auxiliary switch required		fuse gL/gG: 4 A
Thermal current	A	5
Switching capacity current with inductive load	A	0.01 ... 3
Number of NC contacts		
• delayed switching		0
• instantaneous contact		0
Number of NO contacts		
• delayed switching		0
• instantaneous contact		0
Number of CO contacts		
• delayed switching		1
• instantaneous contact		0
Contact rating of auxiliary contacts according to UL		R300 / B300

Installation/ mounting/ dimensions:





Mounting type		screw and snap-on mounting onto 35 mm standard mounting rail
Width	mm	17.5
Height	mm	100
Depth	mm	90
Required spacing with side-by-side mounting		
• upwards	mm	0
• forwards	mm	0
• at the side	mm	0
• Backwards	mm	0
• downwards	mm	0
Required spacing for grounded parts		
• Backwards	mm	0
• at the side	mm	0
• upwards	mm	0
• forwards	mm	0
• downwards	mm	0
Required spacing for live parts		
• downwards	mm	0
• Backwards	mm	0
• at the side	mm	0
• forwards	mm	0
• upwards	mm	0

Connections/ Terminals:

Type of electrical connection for auxiliary and control current circuit		screw-type terminals
Product function removable terminal for auxiliary and control circuit		Yes
Type of connectable conductor cross-sections		
• solid		1x (0.5 ... 4.0 mm ²), 2x (0.5 ... 2.5 mm ²)
• finely stranded — with core end processing		1x (0.5 ... 4 mm ²), 2x (0.5 ... 1.5 mm ²)
• at AWG conductors — stranded		1x (20 ... 12), 2x (20 ... 14)
— solid		1x (20 ... 12), 2x (20 ... 14)
Tightening torque	N·m	0.6 ... 0.8
Design of the thread of the connection screw		M3
Ampacity of the bridge terminals maximum	A	10

Certificates/approvals

General Product Approval				Declaration of Conformity	Test Certificates
 CCC	 CSA	 UL		 EG-Konf.	Typprüfbescheinigung/Werkszeugnis

Shipping Approval				other	
 LRS	 PRS	 RINA	 RMRS	Umweltbestätigung	Bestätigungen

Further information

Information- and Downloadcenter (Catalogs, Brochures,...)

<http://www.siemens.com/industrial-controls/catalogs>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3RP2525-1AW30>

Cax online generator

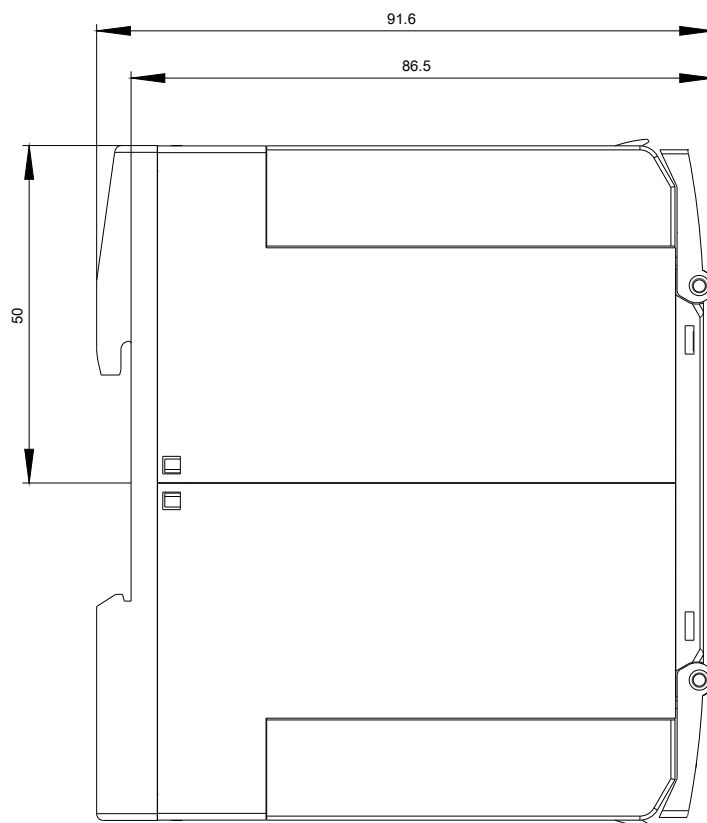
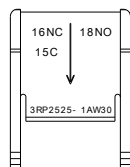
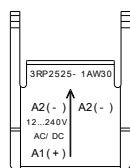
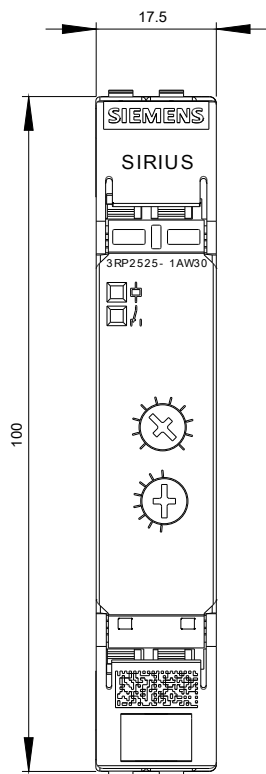
<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3RP2525-1AW30>

Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

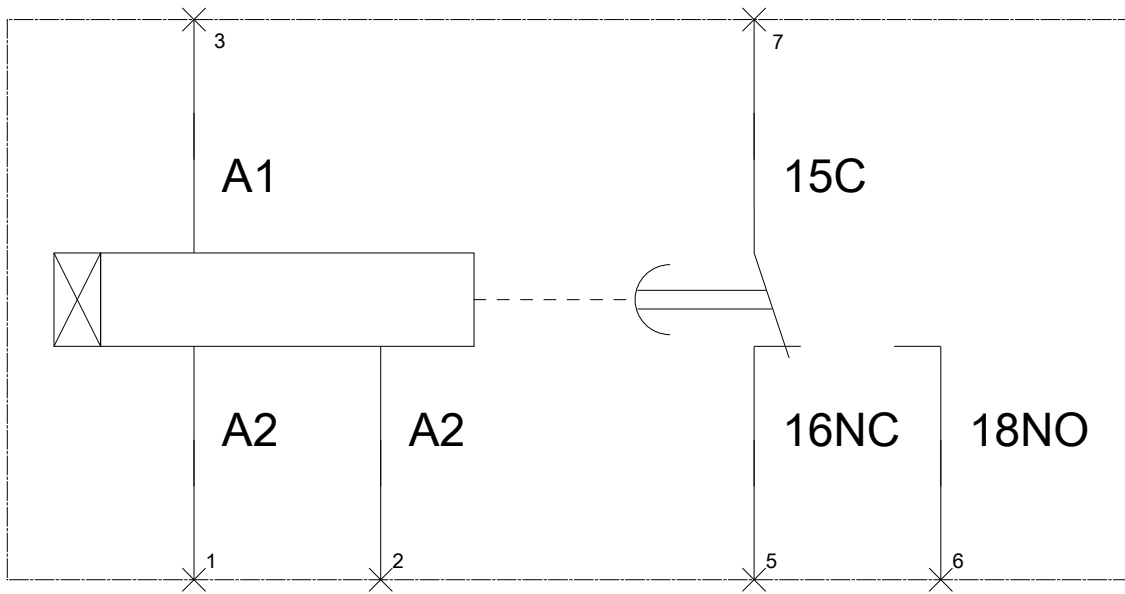
<https://support.industry.siemens.com/cs/ww/en/ps/3RP2525-1AW30>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3RP2525-1AW30&lang=en



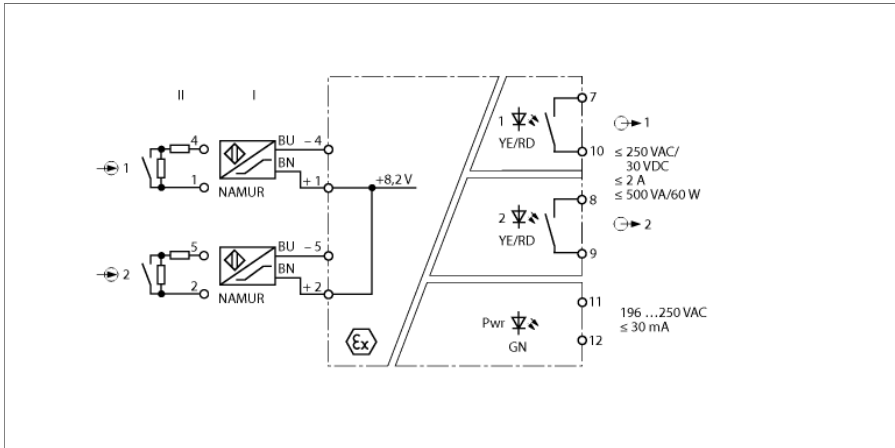
-K



last modified:

02/27/2017

**Isolating switching amplifier
2-channel
IM1-22EX-R**



The 2-channel IM1-22EX-R isolating switching amplifier is equipped with intrinsically safe input circuits.

Sensors according to EN 60947-5-6 (NAMUR) or potential-free contact transmitters can be connected to the device.

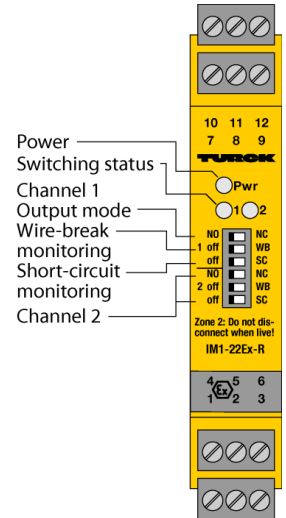
The output circuits feature 2 relays, each with 1 NO contact.

Via six switches on the front, you can set the operating behaviour for each channel separately (work or quiescent current behavior, i.e. NO/NC) as well as switch wire-break (WB) and short-circuit monitoring (SC) on and off.

When using mechanical contacts, wire-break and short-circuit monitoring must be switched off or the contacts must be wired to resistors (II) (see circuit diagram).

The Pwr LED lights green to indicate operational readiness. The 2-color LEDs 1 and 2 light yellow to indicate the switching status of the associated output. In the event of an input circuit error, the 2-color LED of the assigned faulty input turns red, with the input circuit monitoring switched on. Thereupon the output relay drops out.

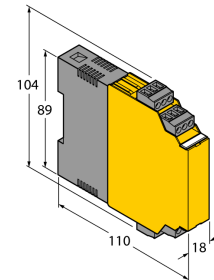
- ATEX, IECEx, UL, FM_{us}, CSA, TR CU, NEPSI, KOSHA, TIIS, CCOE, INMETRO
- Installation in zone 2
- 2 relay outputs (NO)
- Output mode adjustable (NO/NC mode)
- Input circuits monitored for wire-break/short-circuit (ON/OFF switchable)
- SIL 2
- Complete galvanic isolation



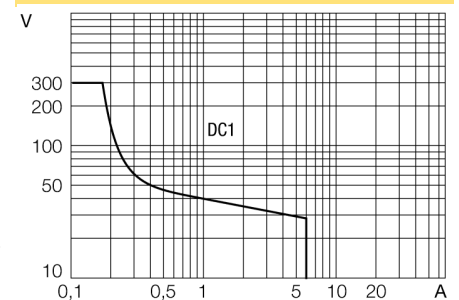
**Isolating switching amplifier
2-channel
IM1-22EX-R**

Type designation	IM1-22EX-R
Ident no.	7541231
Nominal voltage	Universal voltage supply unit
Operating voltage	20...250 VAC
Frequency	40...70 Hz
Operating voltage range	20...125 VDC
Power consumption	≤ 3 W
Power dissipation, typ.	≤ 0.98 W
NAMUR input	
NAMUR	EN 60947-5-6
Input circuit monitoring	on/off switchable
No-load voltage	8.2 VDC
Short-circuit current	8.2 mA
Input resistance	1 kΩ
Cable resistance	≤ 50 Ω
Switch-on threshold	1.75 mA
Switch-off threshold	1.55 mA
Wire breakage threshold	≤ 0.06 mA
Short-circuit threshold	≥ 6.4 mA
Output circuits (digital)	2 x relays (NO)
Output switching voltage relay	≤ 30 VDC / ≤ 250 VAC
Switching current per output	≤ 2 A
Switching capacity per output	≤ 500 VA/60 W
Switching frequency	≤ 10 Hz
Contact quality	AgNi, 3μ Au
Galvanic isolation	
Test voltage	2.5 kV
Important note	For Ex-applications the values specified in the corresponding Ex certificates (ATEX, IECEx, UL, etc.) apply.
Ex approval acc. to conformity certificate	TÜV 04 ATEX 2553
Application area	II (1) G, II (1) D
Ignition protection category	[Ex ia Ga] IIC; [Ex ia Da] IIIC
Ex approval acc. to conformity certificate	TÜV 06 ATEX 552968 X
Application area	II 3 G
Ignition protection type	Ex nA nC [ic Gc] IIC/IIB T4 Gc
Characteristic	linear
Important note	If the device is used in applications to achieve functional safety according to IEC 61508, the safety manual must be used. Information in the data sheet are not valid for functional safety.
Approval	SIL 2 acc. to EXIDA FMEDA
Use in SIL safety circuits	SIL 2 acc. to IEC 61508
Indication	
Operational readiness	green
Switching state	Yellow
State/ Fault	2 x yellow/red
Error indication	red

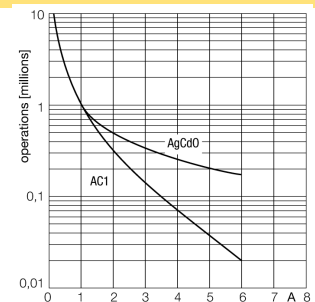
Dimensions



Output relay – Load curve



Output relay – Electrical lifetime

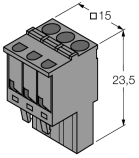
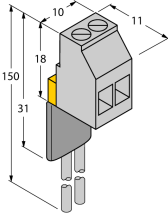


**Isolating switching amplifier
2-channel
IM1-22EX-R**

Mechanical Data

Protection class	IP20
Flammability class acc. to UL 94	V-0
Ambient temperature	-25...+70 °C -25 ... +60 °C für UL, FM, TIIS
Storage temperature	-40...+80 °C
Relative humidity	≤ 95 %
Dimensions	104 x 18 x 110 mm
Weight	167 g
Mounting instructions	DIN rail (NS35) or panel
Housing material	Polycarbonate/ABS
Electrical connection	4 × 3-pin removable terminal blocks, reverse polarity protected, screw terminal
Terminal cross-section	1 x 2.5 mm ² / 2 x 1.5 mm ²
Tightening torque	0.5 Nm

Accessories

Type code	Ident no.	Description	
IM-CC-3X2BU/2BK	6900475	Cage clamp terminals for IM modules (Ex-devices with 18 mm overall width); includes: 2 pcs. 3-pin blue terminals and 2 pcs. 3-pin black terminals.	
WM1	0912101	The resistor module WM1 meets the requirements for line monitoring between a mechanical contact and a TURCK signal processor. The input circuit of the signal processor is designed for sensors acc. to EN60947-5-6 (NAMUR) and equipped with a wire-break and short-circuit monitoring function.	

SCALANCE XB005 UNMANAGED INDUSTRIAL ETHERNET SWITCH FOR 10/100MBIT/S; WITH 5 X 10/100MBIT/S TWISTED PAIR- PORTS WITH RJ45-SOCKETS; FOR CONFIGURING SMALL STAR- AND LINE TOPOGRAPHIES; LED-DIAGNOSIS, IP20, 24 V DC POWER SUPPLY, MANUAL AVAILABLE AS DOWNLOAD



Transmission rate	
Transfer rate	10 Mbit/s, 100 Mbit/s
Interfaces / for communication / integrated	
Number of electrical connections	
• for network components or terminal equipment	5; RJ45
Number of 100 Mbit/s SC ports	
• for multimode	0
Number of 1000 Mbit/s LC ports	
• for multimode	0
• for single mode (LD)	0
Interfaces / others	
Number of electrical connections	
• for power supply	1
Type of electrical connection	
• for power supply	3-pole terminal block
Supply voltage, current consumption, power loss	
Type of voltage / of the supply voltage	AC/DC

Supply voltage	
<ul style="list-style-type: none"> • external 	24 V
<ul style="list-style-type: none"> • external / minimum 	19.2 V
<ul style="list-style-type: none"> • external / maximum 	28.8 V
<ul style="list-style-type: none"> • at AC 	24 V
Product component / fusing at power supply input	Yes
Fuse protection type / at input for supply voltage	0.6 A / 60 V
Consumed current / maximum	0.07 A
Power loss [W]	
<ul style="list-style-type: none"> • at DC / at 24 V 	1.68 W

Permitted ambient conditions

Ambient temperature	
<ul style="list-style-type: none"> • during operation 	-10 ... +60 °C
<ul style="list-style-type: none"> • during storage 	-40 ... +80 °C
<ul style="list-style-type: none"> • during transport 	-40 ... +80 °C
Relative humidity	
<ul style="list-style-type: none"> • at 25 °C / without condensation / during operation / maximum 	95 %
Protection class IP	IP20

Design, dimensions and weight

Design	Box
Width	45 mm
Height	100 mm
Depth	87 mm
Net weight	0.165 kg
Mounting type	
<ul style="list-style-type: none"> • 35 mm DIN rail mounting 	Yes
<ul style="list-style-type: none"> • wall mounting 	Yes
<ul style="list-style-type: none"> • S7-1500 rail mounting 	No

Product functions / management, configuration

Product function	
<ul style="list-style-type: none"> • multiport mirroring 	No
<ul style="list-style-type: none"> • CoS 	Yes
<ul style="list-style-type: none"> • switch-managed 	No

Product functions / Redundancy

Product function	
<ul style="list-style-type: none"> • Parallel Redundancy Protocol (PRP)/operation in the PRP-network 	Yes
<ul style="list-style-type: none"> • Parallel Redundancy Protocol (PRP)/Redundant Network Access (RNA) 	No

Standards, specifications, approvals

Standard	
<ul style="list-style-type: none"> • for FM 	FM3611: Class 1, Divison 2, Group A, B, C, D / T4, CL.1, Zone 2, GP. IIC, T4
<ul style="list-style-type: none"> • for hazardous zone 	EN 60079-0:2009, EN60079-15:2010, II 3 G Ex nA IIC T4 Gc, KEMA 07ATEX0145 X
<ul style="list-style-type: none"> • for safety / from CSA and UL 	UL 60950-1, CSA C22.2 No. 60950-1
<ul style="list-style-type: none"> • for emitted interference 	EN 61000-6-4 (Class A)
<ul style="list-style-type: none"> • for interference immunity 	EN 61000-6-2

Standards, specifications, approvals / CE	
Certificate of suitability / CE marking	Yes

Standards, specifications, approvals / miscellaneous	
Certificate of suitability	EN 61000-6-2, EN 61000-6-4
<ul style="list-style-type: none"> • C-Tick 	Yes
<ul style="list-style-type: none"> • KC approval 	Yes

Standards, specifications, approvals / product conformity	
MTBF / at 40 °C	241 y

Accessories

Further Information / Internet Links

Internet-Link	
<ul style="list-style-type: none"> • to website: Selector SIMATIC NET SELECTION TOOL 	http://www.siemens.com/snst
<ul style="list-style-type: none"> • to website: Industrial communication 	http://www.siemens.com/simatic-net
<ul style="list-style-type: none"> • to website: Industry Mall 	https://mall.industry.siemens.com
<ul style="list-style-type: none"> • to website: Information and Download Center 	http://www.siemens.com/industry/infocenter
<ul style="list-style-type: none"> • to website: Image database 	http://automation.siemens.com/bilddb
<ul style="list-style-type: none"> • to website: CAx Download Manager 	http://www.siemens.com/cax
<ul style="list-style-type: none"> • to website: Industry Online Support 	https://support.industry.siemens.com

Security information

Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates. For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. For more information about industrial security, visit <http://www.siemens.com/industrialsecurity>. To stay informed about product updates as they occur, sign up for a product-specific newsletter. For more information, visit <http://support.automation.siemens.com>. (V3.4)

last modified:

08/08/2017

PanelView Plus 7 Standard Terminals

Catalog Numbers 2711P-T4W21D8S, 2711P-T4W22D8S, 2711P-T4W21D8S-B, 2711P-T4W22D8S-B, 2711P-T6C21D8S, 2711P-T6C22D8S, 2711P-T6C21D8S-B, 2711P-T6C22D8S-B, 2711P-T7C21D8S, 2711P-T7C22D8S, 2711P-T7C21D8S-B, 2711P-T7C22D8S-B, 2711P-T9W21D8S, 2711P-T9W22D8S, 2711P-T9W21D8S-B, 2711P-T9W22D8S-B, 2711P-T10C21D8S, 2711P-T10C22D8S, 2711P-T10C21D8S-B, 2711P-T10C22D8S-B, **2711P-T12W21D8S**, 2711P-T12W22D8S, 2711P-T12W21D8S-B, 2711P-T12W22D8S-B, 2711P-T15C21D8S, 2711P-T15C22D8S, 2711P-T15C21D8S-B, 2711P-T15C22D8S-B

Topic	Page
Summary of Changes	1
Environmental Specifications	2
Certifications	3
Technical Specifications	4
Product Dimensions	7
HMI Software	8
Additional Resources	8

Summary of Changes

Topic	Pages
Updated the screen and alarm counts for the PanelView Plus 7 Standard terminals.	1
In the Certifications table, updated the ATEX, IECEx, and INMETRO information, and also added the CCC Ex information.	3
Added catalog numbers for the new SDHC cards.	4...6

The PanelView™ Plus 7 Standard terminals are operator interface devices. They monitor and control devices that are attached to ControlLogix® 5570 and CompactLogix™ 5370 controllers on an EtherNet/IP network. Animated graphic and text displays provide operators a view into the operating state of a machine or process. Operators interact with the control system by using touch screen input.

The PanelView Plus 7 Standard terminals include these features:

- Terminal functionality permits connection to 1 controller, up to 100 screens, and up to 500 alarms.
- FactoryTalk® View Machine Edition software provides a familiar environment for creating HMI applications.
- Windows CE operating system with desktop access for configuration and third-party applications.



- Ethernet communication that supports linear and star network topology.
- PDF viewer to access PDF files that are stored on the terminal.
- More screen options including 4-in., 6-in., 7-in., 9-in., 10-in., 12-in., and 15-in. terminals.
- Widescreen on three sizes, 4-in., 9-in., and 12-in. terminals.
- Greater screen resolution.
- Terminals are available with an Allen-Bradley brand marking, or with no marking for customers who want to put their own brand label on the terminal.
- Certifications including Class I, Div. 2; Class II, Div. 2; Class III; and ATEX, IECEx, and INMETRO Zones 2 and 22.

Environmental Specifications

Table 1 - Environmental Specifications - 2711P-T4W21D8S, 2711P-T4W22D8S, 2711P-T4W21D8S-B, 2711P-T4W22D8S-B, 2711P-T6C21D8S, 2711P-T6C22D8S, 2711P-T6C21D8S-B, 2711P-T6C22D8S-B, 2711P-T7C21D8S, 2711P-T7C22D8S, 2711P-T7C21D8S-B, 2711P-T7C22D8S-B, 2711P-T9W21D8S, 2711P-T9W22D8S, 2711P-T9W21D8S-B, 2711P-T9W22D8S-B, 2711P-T10C21D8S, 2711P-T10C22D8S, 2711P-T10C21D8S-B, 2711P-T10C22D8S-B, 2711P-T12W21D8S, 2711P-T12W22D8S, 2711P-T12W21D8S-B, 2711P-T12W22D8S-B, 2711P-T15C21D8S, 2711P-T15C22D8S, 2711P-T15C21D8S-B, 2711P-T15C22D8S-B⁽¹⁾

Attribute	Value
Temperature, operating	0...55 °C (32...131 °F)
Temperature, nonoperating	-25...+70 °C (-13...+158 °F)
Relative humidity	5...95% without condensation
Heat dissipation	4 in., 15 W = 51 BTU 6 in., 15 W = 51 BTU 7 in., 15 W = 51 BTU 9 in., 20 W = 68 BTU 10 in., 20 W = 68 BTU 12 in., 30 W = 102 BTU 15 in., 30 W = 102 BTU
Altitude, operating	2000 M
Vibration 4.3-in., 5.7-in., 6.5-in., 9.0-in., 10.4-in., 12.1-in., and 15-in.	0.012 pk-pk, 10...57 Hz 2g peak at 57...500 Hz
Shock, operating	15 g at 11 ms
Shock, nonoperating	30 g at 11 ms
Enclosure ratings	NEMA and UL Type 12, 13, 4X (indoor use only), also rated IP54 or IP66 as Classified by UL

(1) Catalog numbers with a -B extension denote terminals that do not include the Allen-Bradley brand marking. Customers can put their own brand labels on these terminals.

Certifications

Table 2 Certifications - 2711P-T4W21D8S, 2711P-T4W22D8S, 2711P-T4W21D8S-B, 2711P-T4W22D8S-B, 2711P-T6C21D8S, 2711P-T6C22D8S, 2711P-T6C21D8S-B, 2711P-T6C22D8S-B, 2711P-T7C21D8S, 2711P-T7C22D8S, 2711P-T7C21D8S-B, 2711P-T7C22D8S-B, 2711P-T9W21D8S, 2711P-T9W22D8S, 2711P-T9W21D8S-B, 2711P-T9W22D8S-B, 2711P-T10C21D8S, 2711P-T10C22D8S, 2711P-T10C21D8S-B, 2711P-T10C22D8S-B, 2711P-T12W21D8S, 2711P-T12W22D8S, 2711P-T12W21D8S-B, 2711P-T12W22D8S-B, 2711P-T15C21D8S, 2711P-T15C22D8S, 2711P-T15C21D8S-B, 2711P-T15C22D8S-B⁽¹⁾

Certification ⁽²⁾	Value
IECEX	IEC 60079-0; IEC 60079-7; IEC 60079-11; and IEC 60079-31 II 3 GD Ex ec ic IIC T4 Gc Ex tc IIIC T135 °C (275 °F) Dc IP66 Tamb = 0 °C... +55 °C (32 °F... 131 °F) IECEX UL 20.0046X
CCC Ex	GB 3836.1-2010; GB 3836.3-2010; GB 3836.4-2010; GB 12476.1-2013; GB 12476.5-2013 Ex ec ic IIC T4 Gc Ex tc IIIC T135 °C (275 °F) Dc IP66 Tamb = 0 °C... +55 °C (32 °F... 131 °F)
cULus	cULus Listed Industrial Control Equipment for use in Hazardous Locations (E10314) per standards ANSI / ISA 12.12.01 and CSA C22.2 No. 213. rated: <ul style="list-style-type: none"> • Class I, Division 2, Groups A, B, C and D • Class II, Division 2, Groups F and G • Class III Enclosure type ratings per UL50 and CSA C22.2 No. 94.2-07. Enclosure ingress protection classified by UL per IEC 60529
ATEX	European Union 94/9/EC ATEX Directive, compliant with: <ul style="list-style-type: none"> • EN 60079-0; EN 60079-7; EN 60079-11; and EN 60079-31 • II 3 GD • Ex ec ic IIC T4 Gc • Ex tc IIIC T135 °C (275 °F) Dc IP66 • Tamb = 0 °C... +55 °C (32 °F... +131 °F) • DEMKO 14 ATEX 1302X
INMETRO	ABNT NBR IEC 60079-0 ABNT NBR IEC 60079-8 ABNT NBR IEC 60079-11 ABNT NBR IEC 60079-31 Ex ec ic IIC T4 Gc Ex tc IIIC T135 °C (275 °F) Dc IP66 Tamb = 0 °C... +55 °C (32 °F... +131 °F) UL-BR 14.0716X
CE (EMC)	European Union 2004/108/EC EMC Directive, compliant with: <ul style="list-style-type: none"> • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers
CE (LVD)	European Union 2006/95/EC Low Voltage Directive, compliant with: <ul style="list-style-type: none"> • EN 61131-2; Programmable Controllers
RCM	Australian Radio Communications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
EAC	Certificate of compliance
RoHS	China RoHS, Turkey RoHS, European RoHS
KCC	Certificate of compliance

(1) Catalog numbers with a -B extension denote terminals that do not include the Allen-Bradley brand marking. Customers can put their own brand labels on these terminals.

(2) When marked. See the Product Certification link on <http://www.ab.com> for declarations of conformity, certificates, and other certification details.

Technical Specifications

Table 3 - PanelView Plus 7 Standard 4-in and 6-in Terminals

Attribute	4-in. Touch 2711P-T4W21D8S, 2711P-T4W21D8S-B, 2711P-T4W22D8S, 2711P-T4W22D8S-B		6-in. Touch 2711P-T6C21D8S, 2711P-T6C21D8S-B, 2711P-T6C22D8S, 2711P-T6C22D8S-B	
	Operator input	Touch		Touch
Display type	Color TFT LCD		Color TFT LCD	
Display size, diagonal	4.3 in. widescreen		5.7 in.	
Viewing area	95 x 54 mm		115 x 86 mm	
Display resolution	480 x 272 WQVGA, 18-bit color graphics		640 x 480 VGA, 18-bit color graphics	
Aspect ratio	16:9		4:3	
Brightness, typical	300 nits			
Backlight life	50,000 h life, min. at 40° C to half-brightness. Backlight is not replaceable			
Touch screen	Analog resistive Actuation rating: 1 million presses Operating force: 100 grams			
Battery (real-time clock backup)	Accuracy: +/-2 minutes per month. Battery life: 4 years min at 25 °C (77 °F) Replacement: CR2032 lithium coin cell (Allen-Bradley part number 2711P-RY2032)			
Memory	System	512 MB RAM and 512 MB storage		
	User	80 MB nonvolatile storage for applications		
Secure Digital (SD) card slot	One SD card slot for storing application files Replacement: Allen-Bradley part number 1784-SD1 (1 GB), 1784-SD2 (2 GB), 1784-SDHC8 (8 GB), and 1784-SDHC32 (32 GB)			
USB ports	Host	One USB 2.0 high-speed host port (type A) support removal flash drives for storage		
	Device	One high-speed 1.0 device port (type B) supports connection to host computer		
Ethernet port	Cat. Nos. with 21	One 10/100Base-T, Auto MDI/MDI-X Ethernet port with IEEE1588 support		
	Cat. Nos. with 22	Two 10/100Base-T, Auto MDI/MDI-X Ethernet ports supporting star, linear, or DLR network topology		
Operating system	Windows CE includes FTP, VNC client server, ActiveX controls, PDF reader, third-party device support			
Software	FactoryTalk View Studio for Machine Edition, version 8.0 or later, FactoryTalk ViewPoint, version 2.6 or later			
Electrical				
Input voltage, DC	24V DC nom (18...30V DC), nonisolated DC power supply			
Power consumption, DC	35 W max (1.46A at 24V DC)			
Power supply	DIN-rail power supply, AC-to-DC, 85...265V AC, 47...63 Hz Recommended Replacement: Allen-Bradley part number 2711P-RSACDIN			
Mechanical				
Weight, approx	0.44 kg (0.97 lb)		0.70 kg (1.53 lb)	
Dimensions, HxWxD, approx.	110 x 135 x 56.5 mm (4.33 x 5.31 x 2.22 in.)		152 x 176 x 56.5 mm (5.98 x 6.93 x 2.22 in.)	
Cutout dimensions, HxW, approx.	92 x 117 mm (3.62 in. x 4.61 in.)		123 x 156 mm (4.84 x 6.14 in.)	

Table 4 - PanelView Plus 7 Standard 7-in., 9-in., and 10-in. Terminals

Attribute	7-in. Touch 2711P-T7C21D8S, 2711P-T7C21D8S-B, 2711P-T7C22D8S, 2711P-T7C22D8S-B	9-in. Touch 2711P-T9W21D8S, 2711P-T9W21D8S-B, 2711P-T9W22D8S, 2711P-T9W22D8S-B	10-in. Touch 2711P-T10C21D8S, 2711P-T10C21D8S-B, 2711P-T10C22D8S, 2711P-T10C22D8S-B
Operator input	Touch	Touch	Touch
Display type	Color TFT LCD	Color TFT LCD	Color TFT LCD
Display size, diagonal	6.5 in.	9 in. widescreen	10.4 in.
Viewing area	132 x 99 mm	196 x 118 mm	211 x 158 mm
Display resolution	640 x 480 VGA, 18-bit color graphics	800 x 480 WVGA, 18-bit color graphics	800 x 600 SVGA, 18-bit color graphics
Aspect ratio	4:3	5:3	4:3
Brightness, typical	300 nits		
Backlight life	50,000 hr life, min at 40° C (104 °F) to half-brightness. Backlight is not replaceable.		
Touch screen	Analog resistive Actuation rating: 1 million presses Operating force: 100 grams		
Battery (real-time clock backup)	Accuracy: ±2 minutes per month. Battery life: 4 years min at 25 °C (77 °F) Replacement: CR2032 lithium coin cell (Allen-Bradley part number 2711P-RY2032)		
Memory	System User	512 MB RAM and 512 MB storage 80 MB nonvolatile storage for applications	
Secure Digital (SD) card slot	One SD card slot for storing application files Replacement: Allen-Bradley part number 1784-SD1 (1 GB), 1784-SD2 (2 GB), 1784-SDHC8 (8 GB), and 1784-SDHC32 (32 GB)		
USB ports	Host Device	One USB 2.0 high-speed host port (type A) support removal flash drives for storage One high-speed 1.0 device port (type B) supports connection to host computer	
Ethernet port	Cat. Nos. with 21 Cat. Nos. with 22	One 10/100Base-T, Auto MDI/MDI-X Ethernet port with IEEE1588 support Two 10/100Base-T, Auto MDI/MDI-X Ethernet ports supporting star, linear, or DLR network topology	
Operating system	Windows CE includes FTP, VNC client server, ActiveX controls, PDF reader, third-party device support		
Software	FactoryTalk View Studio for Machine Edition, version 8.0 or later, FactoryTalk ViewPoint, version 2.6 or later		
Electrical			
Input voltage, DC	24V DC nom (18...30V DC), nonisolated DC power supply		
Power consumption, DC	50 W max (2.1A at 24V DC)		
Power supply	DIN-rail power supply, AC-to-DC, 85...265V AC, 47...63 Hz Recommended Replacement: Allen-Bradley part number 2711P-RSACDIN		
Mechanical			
Weight, approx	0.85 kg (1.86 lb)	1.29 kg (2.84 lb)	1.82 kg (4.0 lb)
Dimensions, HxWxD, approx	170 x 212 x 56.5 mm (6.69 x 8.35 x 2.22 in.)	190 x 280 x 56.5 mm (7.48 x 11.02 x 2.22 in.)	252 x 297 x 56.5 mm (9.92 x 11.69 x 2.22 in.)
Cutout dimensions, HxW, approx.	142 x 184 mm (5.59 x 7.24 in.)	162 x 252 mm (6.38 x 9.92 in.)	224 x 269 mm (8.82 x 10.59 in.)

Table 5 - PanelView Plus 7 Standard 12-in. and 15-in. Terminals

Attribute	12-in. Touch 2711P-T12W21D8S, 2711P-T12W21D8S-B, 2711P-T12W22D8S, 2711P-T12W22D8S-B	15-in. Touch 2711P-T15C21D8S, 2711P-T15C21D8S-B, 2711P-T15C22D8S, 2711P-T15C22D8S-B
Operator Input	Touch	Touch
Display type	Color TFT LCD	Color TFT LCD
Display size, diagonal	12.1 in. widescreen	15-in.
Viewing area	261 x 163 mm	304 x 228 mm
Display resolution	1280 x 800 WXGA, 18-bit color graphics	1024 x 768 XGA, 18-bit color graphics
Aspect ratio	5:3	4:3
Brightness, typical	300 nits	
Backlight life	50,000 h life, min. at 40° C to half-brightness. Backlight is not replaceable	
Touch screen	Analog resistive Actuation rating: 1 million presses Operating force: 100 grams	
Battery (real-time clock backup)	Accuracy: +/-2 minutes per month Battery life: 4 years min at 25 °C (77 °F) Replacement: CR2032 lithium coin cell	
Memory	System User	512 MB RAM and 512 MB storage 80 MB nonvolatile storage for applications
Secure Digital (SD) card slot	One SD card slot for storing application files Replacement: Allen-Bradley part number 1784-SD1 (1 GB), 1784-SD2 (2 GB), 1784-SDHC8 (8 GB), and 1784-SDHC32 (32 GB)	
USB ports	Host Device	One USB 2.0 high-speed host port (type A) support removal flash drives for storage One high-speed 1.0 device port (type B) supports connection to host computer
Ethernet port	Cat. Nos. with 21 Cat. Nos. with 22	One 10/100Base-T, Auto MDI/MDI-X Ethernet port with IEEE1588 support Two 10/100Base-T, Auto MDI/MDI-X Ethernet ports supporting star, linear, or DLR network topology
Operating system	Windows CE includes FTP, VNC client server, ActiveX controls, PDF reader, third-party device support	
Software	FactoryTalk View Studio for Machine Edition, version 8.0 or later, FactoryTalk ViewPoint, version 2.6 or later	
Electrical		
Input voltage, DC	24V DC nom (18...30V DC), nonisolated DC power supply	
Power consumption, DC	50 W max (2.1A at 24V DC)	
Power supply	DIN-rail power supply, AC-to-DC, 85...265V AC, 47...63 Hz Recommended Replacement: Allen-Bradley part number 2711P-RSACDIN	
Mechanical		
Weight, approx.	1.95 kg (4.29 lb)	3.07 kg (6.75 lb)
Dimensions, HxWxD, approx.	240 x 340 x 56.5 mm (9.65 x 13.39 x 2.22 in.)	318 x 381 x 56.5mm (12.52 x 15.00 x 2.22 in.)
Cutout dimensions, HxW, approx.	218 x 312 mm (8.58 x 12.28 in.)	290 x 353 mm (11.42 x 13.90 in.)

Product Dimensions

The table provides product dimensions. The 5.7-in. and 10.4-in. touch-screen terminals are shown for illustrative purposes. All other terminal sizes look similar. For information on proper mounting clamp installation, refer to the PanelView Plus 7 Standard Terminals User Manual, publication [2711P-UM007](#).

Figure 1 - PanelView Plus 7 Standard Terminals, Front View

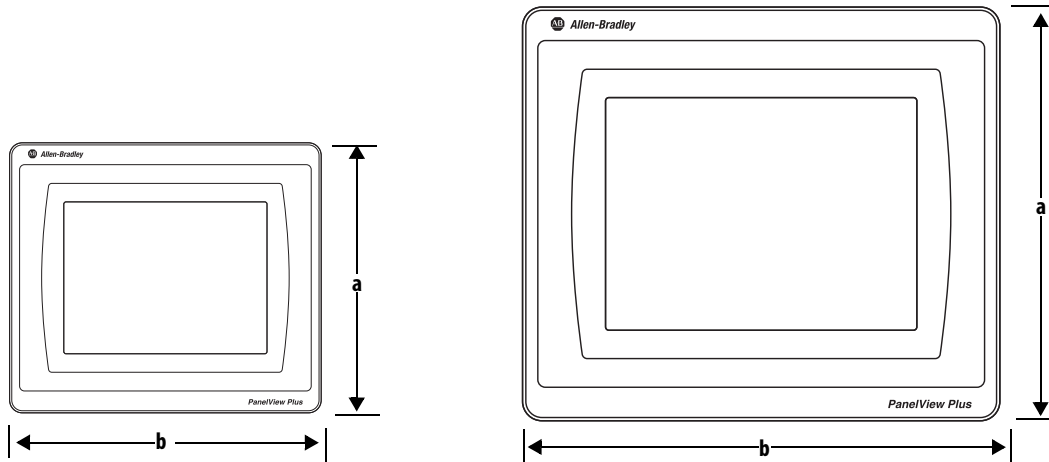


Figure 2 - PanelView Plus 7 Standard Terminals with Single Ethernet Port, Bottom View

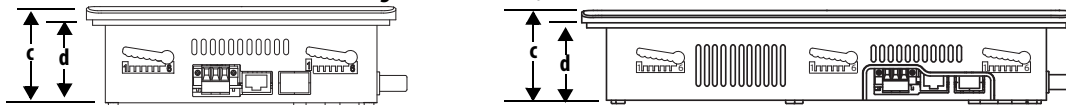


Figure 3 - PanelView Plus 7 Standard Terminals with Dual Ethernet Ports, Bottom View

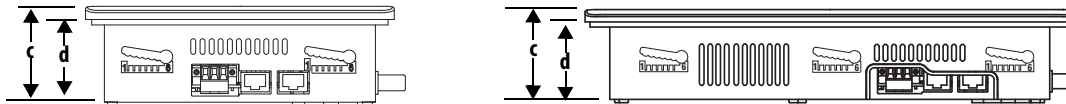


Table 6 - PanelView Plus 7 Standard Terminals Dimensions

Terminal Size	Input Type	Height (a) mm (in.)	Width (b) mm (in.)	Overall Depth (c) mm (in.)	Mounted Depth (d) mm (in.)
4.3 in.	Touch	110 (4.33)	135 (5.31)	56.5 (2.22)	50.14 (1.97)
5.7 in.	Touch	152 (5.98)	176 (6.93)	56.5 (2.22)	50.14 (1.97)
6.5 in.	Touch	170 (6.69)	212 (8.35)	56.5 (2.22)	50.14 (1.97)
9 in.	Touch	190 (7.48)	280 (11.02)	56.5 (2.22)	50.14 (1.97)
10.4 in.	Touch	252 (9.92)	297 (11.69)	56.5 (2.22)	50.14 (1.97)
12.1 in.	Touch	240 (9.65)	340 (13.39)	56.5 (2.22)	50.14 (1.97)
15 in.	Touch	318 (12.52)	381 (15.00)	56.5 (2.22)	50.14 (1.97)

TIP When mounted in a panel, the front of the bezel extends less than 6.36 mm (0.25 in.) from the front of the panel.

HMI Software



All PanelView Plus 7 terminals are configured with FactoryTalk View Studio software and have an integrated runtime system called FactoryTalk View Machine Edition Station.

Machine Edition Station runs projects developed with FactoryTalk View Studio software and is included on all PanelView Plus 7 terminals.

Two versions of FactoryTalk View Studio software support application development for PanelView Plus 7 terminals.

Cat. No. ⁽¹⁾	Description
9701-VWSTMENE	FactoryTalk View Studio for Machine Edition software - Configuration software for developing and testing machine level human machine interface (HMI) applications. Includes RSLinx® Enterprise and KEPServer Enterprise software.
9701-VWSTENE	FactoryTalk View Studio software - Configuration software for developing and testing machine level and supervisory level human machine interface (HMI) applications.

(1) Order localized versions of the software by replacing EN in the catalog number with DE for German, FR for French, JP for Japanese, or ZH for Chinese.

You can import PanelView Standard/PanelBuilder™32 and PanelView *e* applications into FactoryTalk View Studio software as Machine Edition applications by using the Machine Edition Import Wizard. The Import Wizard steps you through a few options such as scaling to a new screen resolution size, and then converts objects, text, tags, and communication configurations to ones that are available in Machine Edition.

FactoryTalk ViewPoint software, an add-on to FactoryTalk View Studio software, allows plant managers, production supervisors, system integrators, and other key stakeholders to view and control real-time plant floor operations remotely from a web browser. FactoryTalk ViewPoint enabled displays are fully scalable and animated in the browser. The remote user can also view displays that are not the active display of the terminal.

Each PanelView Plus 7 terminal contains one license supporting a single client connection to the terminal. No additional software is required.



For a complete list of available HMI software, visit <http://www.rockwellautomation.com/rockwellsoftware>.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
PanelView Plus 7 Standard Terminals User Manual, publication 2711P-UM007	Provides details on how to install, configure, and operate the PanelView Plus 7 Standard terminals.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.ab.com	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at <http://www.rockwellautomation.com/literature/>. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Notes:

Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	www.rockwellautomation.com/knowledgebase
Local Technical Support Phone Numbers	Locate the phone number for your country.	www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	www.rockwellautomation.com/literature
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	www.rockwellautomation.com/global/support/pcdc.page

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete the How Are We Doing? form at http://literature.rockwellautomation.com/idc/groups/literature/documents/du/ra-du002_-en-e.pdf.

Rockwell Automation maintains current product environmental information on its website at rok.auto/pec

Allen-Bradley, CompactLogix, ControlLogix, FactoryTalk, LISTEN. THINK. SOLVE., PanelBuilder, PanelView, Rockwell Automation, Rockwell Software, and RSLinx are trademarks of Rockwell Automation, Inc.

EtherNet/IP is a trademark of ODVA, Inc.

SD and SDHC are trademarks of SD-3C LLC.

Trademarks not belonging to Rockwell Automation are property of their respective companies.

Rockwell Otomasyon Ticaret A.Ş., Kar Plaza İş Merkezi E Blok Kat:6 34752 İçerenköy, İstanbul, Tel: +90 (216) 5698400

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444

Europe/Middle East/Africa: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640

Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

CompactLogix™ 5370 L3 Programmable Automation Controllers



1769-L30ER, -L30ERM, -L30ER-NSE, -L33ER, -L33ERM, -L36ERM

Features and Benefits

The CompactLogix 5370 L3 controllers deliver scalable, affordable control ideal for applications from small stand-alone equipment to high performance indexing tables, process skids, case packers and erectors, and packaging.

Machine builders and end users can take advantage of the cost-saving features of these controllers:

- Support for Integrated Motion on EtherNet/IP
- Support for Device Level Ring (DLR) network topologies
- Built-in energy storage eliminates the need for lithium batteries
- Support reuse of existing 1769 I/O
- Removable 1GB secure digital (SD) card improves data integrity
- Flexible memory options up to 3MB
- Added features for hazardous environments (NSE version)
- Support for Kinematics eliminates the need for additional robot controllers and software
- Open socket capability allows support for Modbus TCP as well as devices such as printers, barcode readers and servers

Reduce cost and time to market with CompactLogix 5370 L3 Programmable Automation Controllers.



Expanding on the scalability of the Logix family of controllers, the CompactLogix 5370 L3 programmable automation controllers (PAC) are designed to meet the growing need for a higher performance controller in a compact and affordable package.

As part of the Integrated Architecture system, the CompactLogix 5370 L3 controllers use the same programming software, network protocol, and information capabilities as all Logix controllers, providing a common development environment for all control disciplines.

Integrated Motion on EtherNet/IP

The CompactLogix 5370 L3 controller provides a strong motion solution for customers looking for performance and cost competitiveness.

- Supports up to 16 axes of integrated motion
- Together with the Kinetix 350, offers cost-effective, scalable motion solution

Network Capabilities

With dual Ethernet ports and an integrated Ethernet switch, these controllers now support Device Level Ring (DLR) network topologies, simplifying integration of components in your control system and reducing system cost:

- Provides resiliency from loss of one network connection
- Allows replacement of devices one at a time without stopping production
- Reduces the number of Ethernet switches in the control system

Features for Hazardous Environments

The No Stored Energy (NSE) version of the CompactLogix 5370 L3 offers additional features for hazardous environments found in industries such as mining and oil and gas.

- Allows safe transport of controller in and out of mining areas
- Powered down controller has less than 200uJ of residual energy stored in each component
- No consequences of arc or spark to cause an explosion in gaseous environment

LISTEN.
THINK.
SOLVE.

CompactLogix 5370 L3 Controller Product Specifications



	1769-L30ER	1769-L30ERM	1769-L30ER-NSE	1769-L33ER	1769-L33ERM	1769-L36ERM
User memory	1 MB	1 MB	1 MB	2 MB	2 MB	3 MB
Controller tasks	32	32	32	32	32	32
Programs per task	100	100	100	100	100	100
Integrated Motion	--	4 axis CIP motion position loop axis	--	--	8 axis CIP motion position loop axis	16 axis CIP motion position loop axis
Package Size	55mm wide x 118mm high x 105mm deep					
Certifications	cULH (Class I Division 2), KCC / UL (UL 508), ULH (Class I & II, Division 2 and Class III, Divisions 1 & 2) / ATEX, CE, C-Tick / Marine and GOST certifications in 2012					
Local Expansion Modules	8	8	8	16	16	30
Local Expansion I/O Points (Max)	256	256	256	512	512	960
Communication Module Additions	DeviceNet with 1769-SDN or 3rd party					
Flash Memory Card	Industrially rated and certified Secure Digital (SD) memory card (1 and 2 GB options); all controllers shipped with 1 GB card					
Servo Drives (Position Loop CIP)	--	4	--	--	8	16
Ethernet I/O IP nodes	16	16	16	32	32	48
Virtual axes	100	100	100	100	100	100
Feedback only, torque, velocity, Vhz (max CIP motion drives)	--	16	--	--	32	48
Axes/ms	--	2	--	--	2	2
Kinematics support	--	yes	--	--	yes	yes
Software / Firmware	RSLogix 5000 V20 and RSLinx Classic V2.59 Firmware v20.1x or later					

CompactLogix, Integrated Architecture, Kinetix, RSLogix, Integrated Motion on EtherNet/IP are trademarks of Rockwell Automation, inc. Trademarks not belonging to Rockwell Automation are property of their respective companies.

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444

Europe/Middle East/Africa: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640

Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

1769-IQ32

Compact 24V DC sink/source input module

1769-IQ32

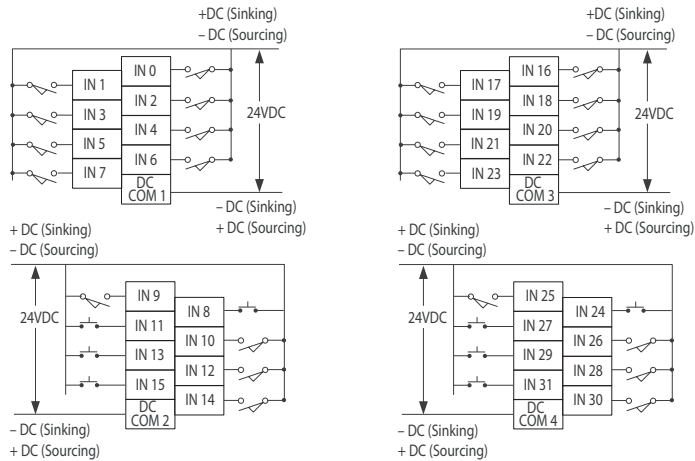


Table 35 - Technical Specifications - 1769-IQ32

Attribute	1769-IQ32
Inputs	32 (8 points/group)
Voltage category	24V DC sink/source
Operating voltage range	10...30V DC @ 30 °C (86 °F) 10...26.4V DC @ 60 °C (140 °F)
Input delay, on	8 ms
Input delay, off	8 ms
Current draw @ 5.1V	170 mA
Heat dissipation, max	4.6 W
Off-state voltage, max	5V DC
Off-state current, max	1.5 mA
On-state voltage, min	10V DC
On-state current, min	2 mA
Inrush current, max	250 mA
Input impedance, nominal	5.2 k Ω @ 24V DC 6.1 k Ω @ 30V DC
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 1 s or 1697V DC for 1 s, input point to bus and group to group 75V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	440 g (0.97 lb)
Dimensions (HxWxD), approx	118 x 52.5 x 87 mm (4.65 x 2.07 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1.5
Module location	DIN rail or panel mount

Table 35 - Technical Specifications - 1769-IQ32

Attribute	1769-IQ32
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22...14 AWG) solid (22...16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
IEC input compatibility	Type 1+
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	68
Enclosure type rating	None (open-style)

Table 36 - Certifications - 1769-IQ32

Certification ⁽¹⁾	1769-IQ32
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	Australian Radiocommunications Act, compliant with: <ul style="list-style-type: none"> AS/NZS cispr 11; Industrial Enclosure

(1) When marked. See the Product Certification link at <http://www.ab.com> for Declarations of Conformity, Certificates, and other certification details.



CompactLogix Power Supplies Specifications

1768 CompactLogix Catalog Numbers 1768-PA3, 1768-PB3

1769 Compact I/O Catalog Numbers 1769-PA2, 1769-PA2K, 1769-PA4, 1769-PA4K, 1769-PB2, 1769-PB2K, 1769-PB4, 1769-PB4K

Topic	Page
1768 CompactLogix Power Supplies	2
1769 Compact I/O Power Supplies	6
Additional Resources	11

Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

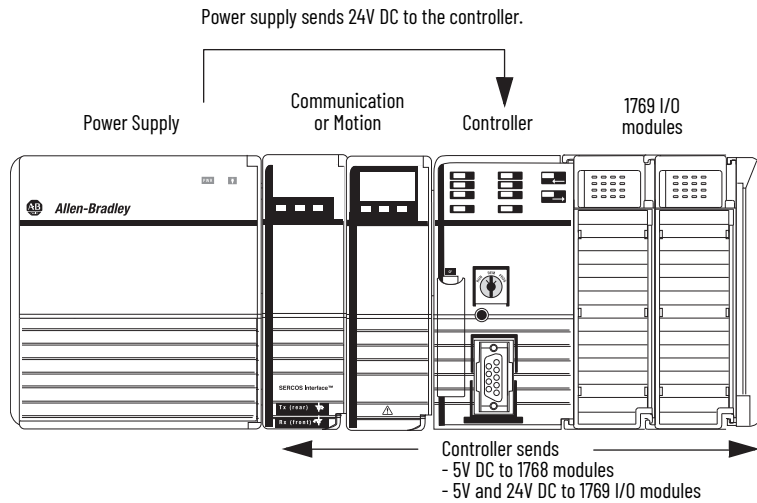
Topic	Page
Removed the EAC certification	8

1768 CompactLogix Power Supplies

Each 1768 backplane requires one 1768 CompactLogix power supply. The power supply is a dual-input supply that operates in multiple ranges, offers a 24V DC external power source, and sends 24V DC to the 1768 CompactLogix controller in slot 0.

The controller converts the 24V DC to 5V DC and 24V DC and distributes it as follows:

- 5V and 24V power to 1769 I/O modules on the right side of the controller
- 24V power to 1768 modules on the left side of the controller



1768 modules do not have a distance rating from the 1768 power supply.

The distance rating for 1769 I/O modules in a 1768 system is from the controller and not the 1768 power supply.

Technical Specifications - 1768 CompactLogix Power Supplies

Attribute	1768-PA3	1768-PB3
Input voltage range	85...265V AC 108...132V DC	16.8...31.2V DC
Input voltage, nom	120V/220V AC	24V DC
Input frequency range	47...63 Hz	DC
Input power, max	120VA/120 W	112 W
Output power, max	90 W 24V DC to backplane: 3.5 24V DC to user-accessible terminal block: 0.25 A	
Output power, min	6 W 24V DC to backplane: 0.25 A 24V DC to user-accessible terminal block: 0.0 A	
Power dissipation	30 W	22 W
Inrush current, max	50 A @ 85...132V AC 80 A @ 195...265V AC	50 A @ 16.8...31.2V DC ⁽¹⁾
Isolation voltage	250V, reinforced insulation type, input to system and 24V DC AUX Tested at 4250V DC for 60 s 150V, basic insulation type, 24V DC AUX to system Tested at 2200V DC for 60 s	
Internal overcurrent protection	Non-replaceable fuse is soldered in place	
Recommended external overcurrent protection	4...6 A @ 28.5...36.7 A ² S	8...12 A @ 166...250 A ² S
Overcurrent protection	15 A, user supplied	
Weight, approx.	0.98 kg (2.15 lb)	1.01 kg (2.22 lb)
Dimensions (HxWxD), approx.	131.25 x 132.75 x 105.50 mm (5.17 x 5.23 x 4.15 in.)	
Module location	DIN rail or panel mount	
Mounting screw torque	1.16 N•m (10 lb•in) - use M4 or #8 screws	
Wire category	1 - on power ports ⁽²⁾	
Wire size, input power terminal	14 AWG (2.5 mm ²) solid or stranded copper wire rated at 75 °C (167 °F) or greater, 1.2 mm (3/64 in.) insulation maximum	
Wire size, output power terminal	14 AWG (2.5 mm ²)...22 AWG (0.25 mm ²) solid or stranded copper wire rated at 75 °C (167 °C) or greater, 1.2 mm (3/64 in.) insulation max	
Conductor screw torque	0.6 N•m (5 lb•in)	
North American temperature code	T4	
Output #1: 24V DC to backplane		
Ride-through interval time, min	25 ms @ 90 W	5 ms @ 90 W
Full power hold-up interval	5 ms @ 90 W	
Extended hold-up interval	8...12 s @ 1.25 W	
Output #2: 24V DC to front panel terminal block		
Voltage	18...27.60V @ front panel	
Output disable	Disable output during hold-up periods	
Enclosure type rating	None (open-style)	

(1) Excludes X-capacitor charging current.

(2) Use this conductor category information to plan conductor routing as described in the system level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).

Environmental Specifications - 1768 CompactLogix Power Supplies

Attribute	1768-PA3	1768-PB3
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold) IEC 60068-2-2 (Test Bd, Operating Dry Heat) IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0 °C < Ta < 60 °C (32 °F < Ta < 140 °F)	
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold) IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat) IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40...+85 °C (-40...+185 °F)	
Relative humidity IEC 60068-2-30 (Test dB, Unpackaged Damp Heat)	5...95% noncondensing	
Vibration IEC 60068-2-6 (Test Fc, Operating)	5 g at 10...500 Hz	
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g	
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g	
Emissions IEC 61000-4-2	CISPR 11: Group 1, Class A	
ESD immunity	6 kV contact discharges 8 kV air discharges	
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine wave 80% AM from 30...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM at 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM at 1890 MHz 1V/m with 1 kHz sine wave 80% AM from 2000...2700 MHz	
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on power ports	
Surge transient immunity IEC 61000-4-5	±2 kV line-line (DM) and ±4 kV line-earth (CM) on AC power ports ±1 kV line-line (DM) and ±2 kV line-earth (CM) on DC power ports	±1 kV line-line (DM) and ±2 kV line-earth (CM) on DC power ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine wave 80% AM from 150 kHz...80 MHz	
Voltage variation	IEC 61000-4-11: 30% dips for 1 period at 0° and 180° on AC supply ports 60% dips for 5 and 50 periods on AC supply ports ±10% fluctuations for 15 min on AC supply ports > 95% interruptions for 250 periods on AC supply ports	IEC 61000-4-29: 60% dip for 100 ms on DC supply ports 30% dip for 10 ms on DC supply ports 100% dip for 10 ms on DC supply ports ±20% fluctuations for 15 min on DC supply ports 5 s interruptions on DC supply ports

Certifications - 1768 CompactLogix Power Supplies

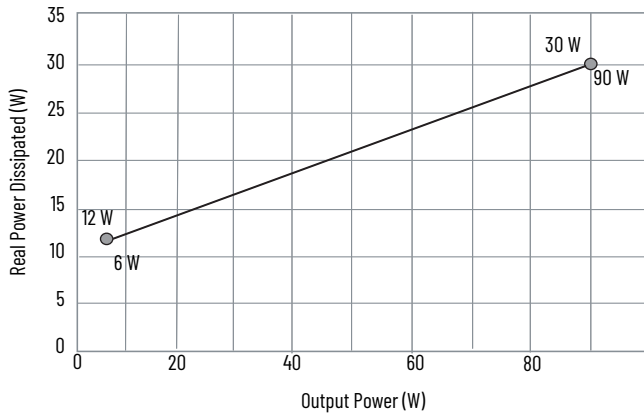
Certification ⁽¹⁾	1768-PA3, 1768-PB3
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 89/336 EEC EMC Directive, compliant with: EN 50082-2; Industrial Immunity EN 61326-1; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 73/23/EEC LVD Directive, compliant with: EN 1010-1; Meas./Control/Lab
RCM	Australian Radiocommunications Act, compliant with: EN 61000-6-4; Industrial Emissions

(1) When marked. See the Product Certification link at rok.auto/certifications for Declarations of Conformity, Certificates, and other certification details.

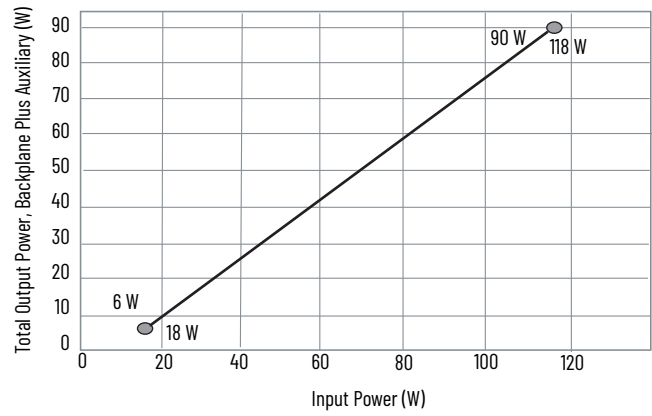
Power Dissipation and Requirements - 1768 CompactLogix Power Supplies

The following graphs show power dissipation and input power requirements for the 1768 power supplies.

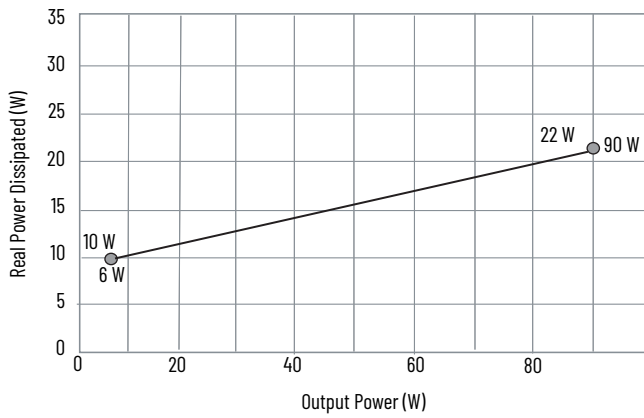
1768-PA3 Power Dissipation



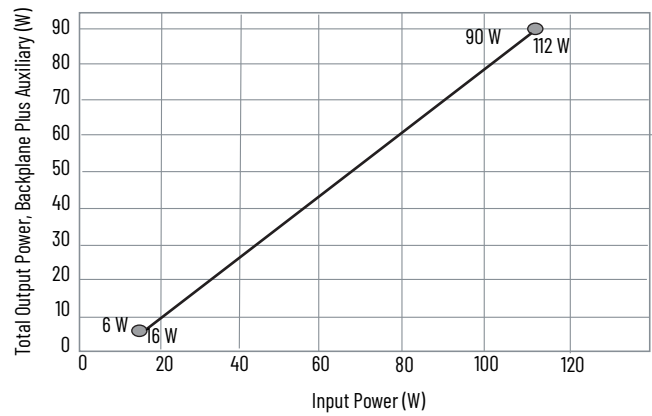
1768-PA3 Input Power Requirements



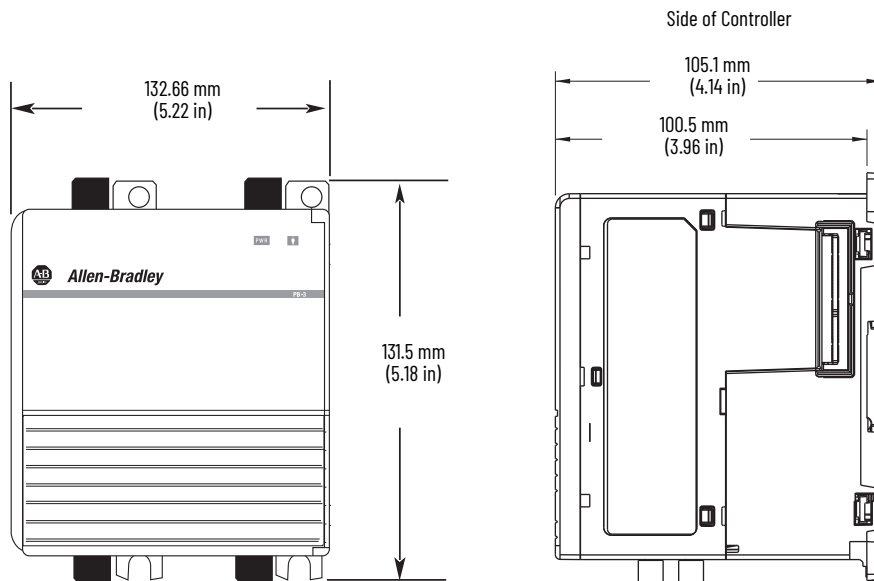
1768-PB3 Power Dissipation



1768-PB3 Input Power Requirements



Mounting Dimensions - 1768 CompactLogix Power Supplies



1769 Compact I/O Power Supplies

Each 1769-L3x controller and additional bank of I/O modules requires a 1769 power supply. Place 1769 I/O modules to the left or right of the 1769 power supply. As many as eight I/O modules can be placed on each side of the power supply.

Each 1769 module also has a power supply distance rating (the number of modules from the power supply). Each module must be located within its distance rating. See the specifications for the module to determine its distance rating.

Technical Specifications - 1769 Compact I/O Power Supplies

Attribute	1769-PA2, 1769-PA2K	1769-PA4, 1769-PA4K	1769-PB2, 1769-PB2K	1769-PB4, 1769-PB4K
Input voltage range	85...265V AC	85...265V AC or 170...265V AC, switch selectable	19.2...31.2V DC	
Input voltage, nom	120V/220V AC	120V/220V AC	24V DC	
Power consumption	100VA @ 120V AC 130VA @ 240V AC	200VA @ 120V AC 240VA @ 240V AC	50VA @ 24V DC	100VA @ 24V DC
Power dissipation	8 W @ 60° C (140° F)	18 W @ 60° C (140° F)	7.5 W @ 60° C (140° F)	14.5 W @ 60° C (140° F)
Current capacity @ 5V	2.0 A	4.0 A	2.0 A	4.0 A
Current capacity @ 24V	0.8 A	2.0 A	0.7 A	1.7 A
Inrush current, max	25 A @ 132V AC		30 A @ 31.2V DC	
Isolation voltage	265V (continuous), reinforced insulation type (IEC Class 1 grounding required) Routine tested @ 2596V DC for 1 s, AC power input to system and AC power input to 24V DC user power	265V (continuous), reinforced insulation type (IEC Class 1 grounding required) Routine tested at 2596V DC for 1 s, AC power input to system	75V (continuous), reinforced insulation type (IEC Class 1 grounding required) Routine tested at 1697V DC for 1 s, DC power input to system	
Fuse type	Wickmann 19195-3.15A Littelfuse 02183.15MXP		Wickmann 19193-6.3A Littelfuse 021706.3MXP	
Weight, approx.	525 g (1.16 lb)	630 g (1.39 lb)	525 g (1.16 lb)	630 g (1.39 lb)
Dimensions (HxWxD), approx.	118 x 70 x 87 mm (4.65 x 2.76 x 3.43 in.)			
Module location	DIN rail or panel mount			
Mounting screw torque	1.16 N•m (10 lb•in) - use M4 or #8 screws			
Power supply distance rating	8 8 I/O modules can be connected on either side of the power supply for a maximum of 16 modules			
Wire category ⁽¹⁾	1 - on power ports		2 - on power ports	
Wire size	14 AWG (2.5 mm ²) solid copper wire rated at 90 °C (194 °F) or greater, 1.2 mm (3/64 in.) insulation max			
North American temperature code	T3C			
IEC temperature code	-		T4	
Enclosure type rating	None (open-style)			

(1) Use this conductor category information to plan conductor routing as described in the system level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).

Environmental Specifications - 1769 Compact I/O Power Supplies

Attribute	1769-PA2, 1769-PA2K ⁽¹⁾	1769-PA4, 1769-PA4K ⁽¹⁾	1769-PB2, 1769-PB2K ⁽¹⁾	1769-PB4, 1769-PB4K ⁽¹⁾
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold) IEC 60068-2-2 (Test Bd, Operating Dry Heat) IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0 °C < Ta < 60 °C (32 °F < Ta < 140 °F)			
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold) IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat) IEC 60068-2-14 (Test Na, Unpackaged Thermal Shock)	-40 < Ta < +85 °C (-40 < Ta < +185 °F)			
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5...95% noncondensing			
Vibration IEC 60068-2-6 (Test Fc, Operating)	5 g @ 10...500 Hz			
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	DIN rail mount: 20 g Panel mount: 30 g			
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	DIN rail mount: 30 g Panel mount: 40 g			
Emissions CISPR 11	Group 1, Class A			
ESD immunity IEC61000-4-2	6 kV contact 8 kV air discharges			
Radiated RF immunity IEC61000-4-3	10V/m with 1 kHz sine wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM at 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM at 1890 MHz 10V/m with 1 kHz sine wave 80% AM from 2000...2700 MHz			
EFT/B immunity IEC 61000-4-4	±2 kV at 5 kHz on AC power ports ±2 kV at 5 kHz on 24V DC PWR OUT ports	±2 kV at 5 kHz on AC power ports	±2 kV at 5 kHz on DC power ports	
Surge transient immunity IEC61000-4-5	±2 kV line-line (DM) and ±4 kV line-earth (CM) on AC power ports ±500V line-line (DM) and ±500V line-earth (CM) on 24V DC PWR OUT ports	±2 kV line-line (DM) and ±4 kV line-earth (CM) on AC power ports	±500V line-line (DM) and ±1 kV line-earth (CM) on DC power ports	
Conducted RF Immunity IEC61000-4-6	10V rms with 1 kHz sine wave 80% AM from 150 kHz...80 MHz			
Voltage variation	IEC 61000-4-11: 30% dips for 1 period at 0° and 180° on AC supply ports 60% dips for 5 and 50 periods on AC supply ports ±10% fluctuations for 15 min on AC supply ports >95% interruptions for 250 periods on AC supply ports		IEC 61000-4-29: 10 ms interruption on DC supply ports	

(1) Catalog numbers followed by a "K" indicate a conformal coating option.

Certifications - 1769 Compact I/O Power Supplies

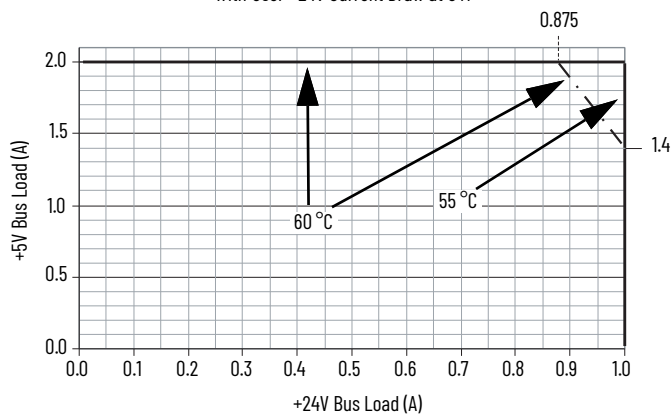
Certification ⁽¹⁾	1769-PA2, 1769-PA2K, 1769-PA4, 1769-PA4K	1769-PB2, 1769-PB2K, 1769-PB4, 1769-PB4K
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E337454 UL Listed for Class 1, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E334470	
UKCA and CE	UK Statutory Instrument 2008 No. 1101 and European Union 2014/35/EU LVD Directive, compliant with: EN 61131-2; Programmable Controllers (pertinent LVD sections only) UK Statutory Instrument 2016 No. 1091 and European Union 2014/30/EU EMC Directive, compliant with: EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions UK Statutory Instrument 2012 No. 3032 and European Union 2011/65/EU RoHS, compliant with: EN IEC 63000; Technical documentation	UK Statutory Instrument 2016 No. 1091 and European Union 2014/30/EU EMC Directive, compliant with: EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions UK Statutory Instrument 2012 No. 3032 and European Union 2011/65/EU RoHS, compliant with: EN IEC 63000; Technical documentation
RCM	Australian Radiocommunications Act, compliant with: EN 61000-6-4; Industrial Emissions	
Ex	—	UK Statutory Instrument 2016 No. 1107 and European Union 2014/34/EU ATEX Directive, compliant with: EN 60079-7; Explosive atmospheres. Equipment protection by increased safety "e" (Zone 2) EN 60079-0; General Requirements (Zone 2) DEMKO 12 ATEX 1116807X (from Rev. 5) UL 22 UKEX 2516X (from Rev. 0)
IECEX	—	IECEX System, compliant with: IEC 60079-7; Explosive atmospheres. Equipment protection by increased safety "e" (Zone 2) IEC 60079-0; General Requirements (Zone 2) II 3 G Ex ec IIC T4 Gc IECEX UL 21.0112X
CCC	—	CNCA-C23-01 强制性产品认证实施规则 防爆电气 CNCA-C23-01 CCC Implementation Rule Explosion-Proof Electrical Products
Morocco	Arrêté ministériel n° 6404-15 du 1 er muharram 1437 Arrêté ministériel n° 6404-15 du 29 ramadan 1436	
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3	

(1) When marked. See the Product Certification link at rok.auto/certifications for Declarations of Conformity, Certificates, and other certification details.

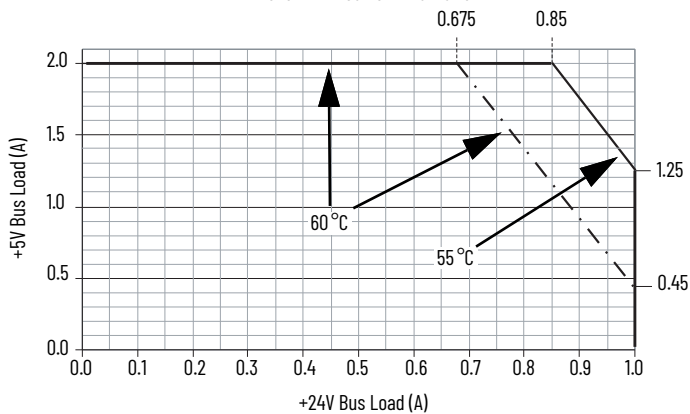
Temperature Derating - 1769 Compact I/O Power Supplies

The following graphs indicate how much current can be drawn from the power supply at the indicated case temperature without damaging it.

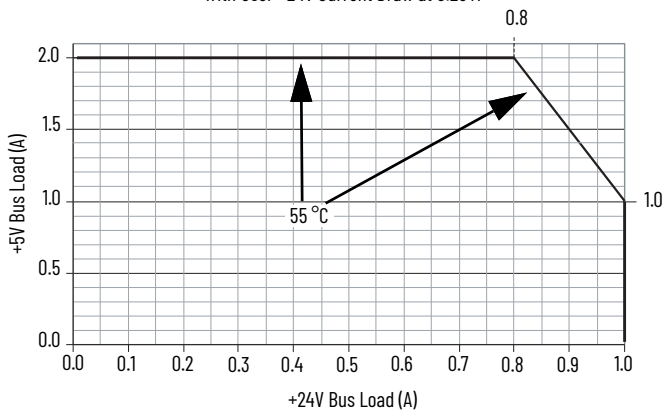
1769-PA2, 1769-PA2K Output Derating
With User +24V Current Draw at 0 A



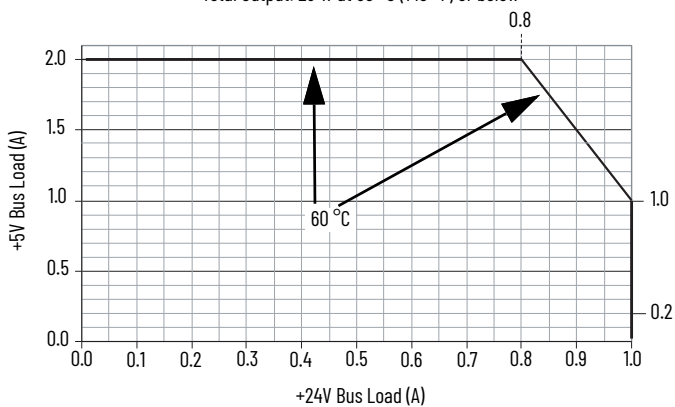
1769-PA2, 1769-PA2K Output Derating
With User +24V Current Draw at 0.2 A



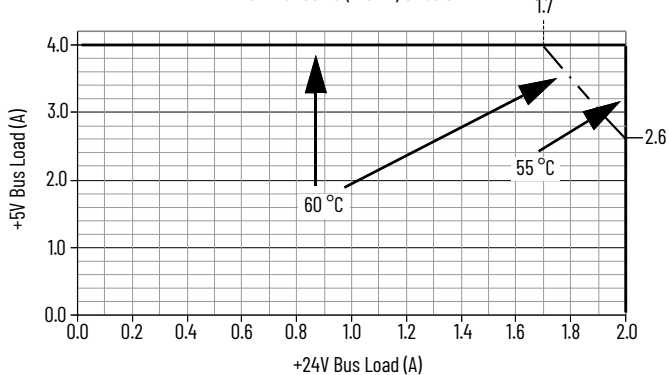
1769-PA2, 1769-PA2K Output Derating
With User +24V Current Draw at 0.25 A



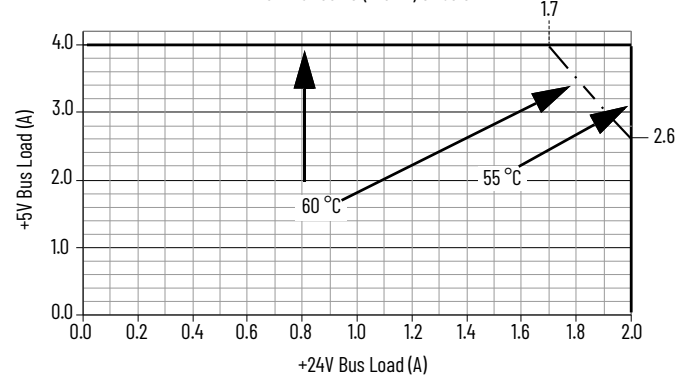
1769-PB2, 1769-PB2K Output Derating
Total Output: 29 W at 60 °C (140 °F) or below



1769-PA4, 1769-PA4K Output Derating
Total Output: 68 W at 55 °C (131 °F) or below
61 W at 60 °C (140 °F) or below



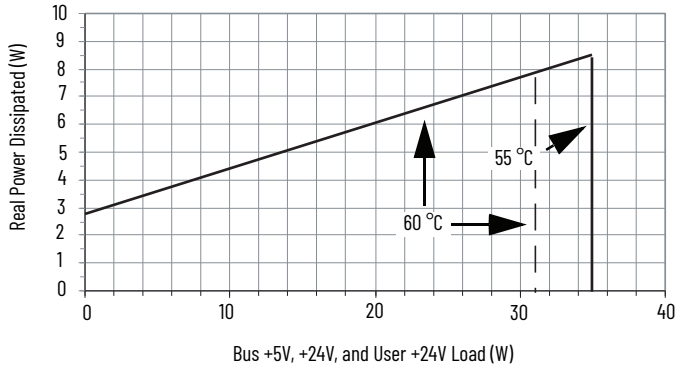
1769-PB4, 1769-PB4K Output Derating
Total Output: 68 W at 55 °C (131 °F) or below
61 W at 60 °C (140 °F) or below



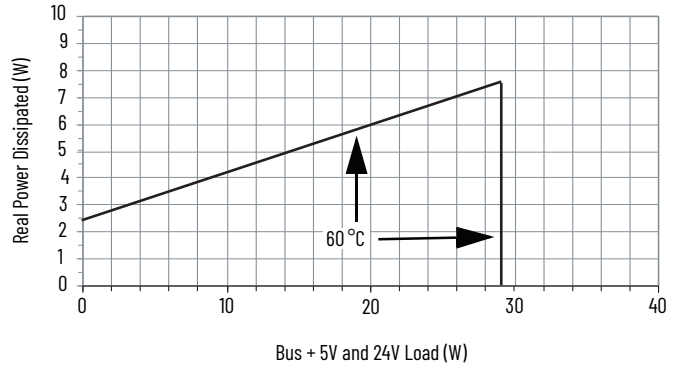
Power Dissipation - 1769 Compact I/O Power Supplies

The following graphs indicate the real electrical power dissipation of the 1769 power supplies in function of the electrical load.

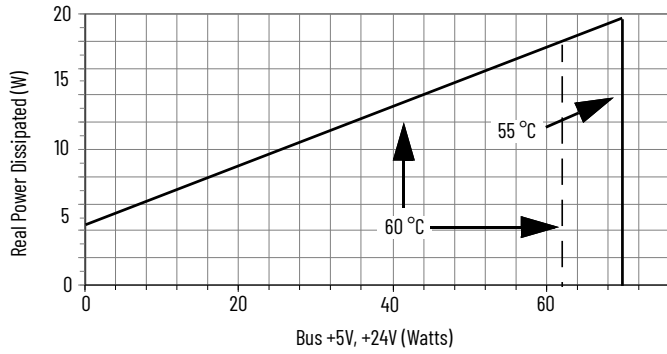
1769-PA2, 1769-PA2K Power Dissipation



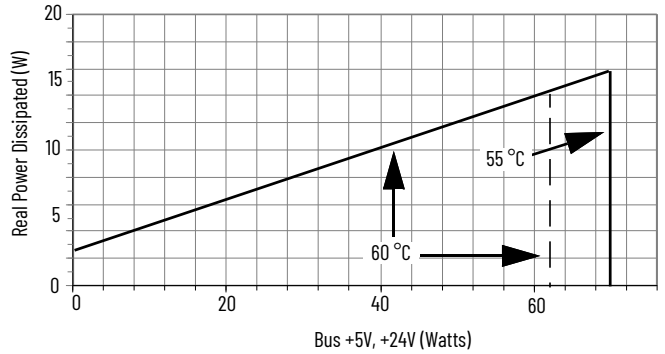
1769-PB2, 1769-PB2K Power Dissipation



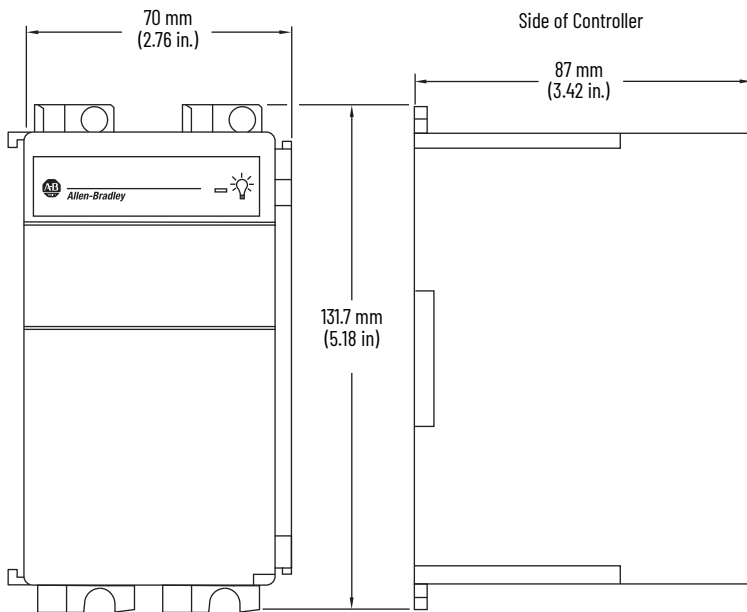
1769-PA4, 1769-PA4K Power Dissipation



1769-PB4, 1769-PB4K Power Dissipation



Mounting Dimensions - 1769 Compact I/O Power Supplies



Additional Resources

These documents contain additional information concerning related products from Rockwell Automation. You can view or download publications at rok.auto/literature.

Resource	Description
1768 CompactLogix Power Supplies Installation Instructions, publication 1768-INQ01	Describes how to install a 1768 CompactLogix power supply.
Compact I/O Expansion Power Supplies Installation Instructions, publication 1769-INQ28	Describes how to install a 1769 CompactLogix power supply.
1768 CompactLogix Controllers User Manual, publication 1768-UM001	Describes how to configure, program, and operate a 1768 CompactLogix system.
CompactLogix System User Manual, publication 1769-UM011	Describes how to configure, program, and operate a 1769 CompactLogix system.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, rok.auto/certifications .	Provides declarations of conformity, certificates, and other certification details.

Rockwell Automation Support

Use these resources to access support information.

Technical Support Center	Find help with how-to videos, FAQs, chat, user forums, Knowledgebase, and product notification updates.	rok.auto/support
Local Technical Support Phone Numbers	Locate the telephone number for your country.	rok.auto/phonesupport
Technical Documentation Center	Quickly access and download technical specifications, installation instructions, and user manuals.	rok.auto/techdocs
Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	rok.auto/pcdc





Documentation Feedback

Your comments help us serve your documentation needs better. If you have any suggestions on how to improve our content, complete the form at rok.auto/docfeedback.

Allen-Bradley, Compact I/O, CompactLogix, expanding human possibility, and Rockwell Automation are trademarks of Rockwell Automation, Inc. Trademarks not belonging to Rockwell Automation are property of their respective companies.

Rockwell Automation maintains current product environmental compliance information on its website at rok.auto/pec.

Rockwell Otomasyon Ticaret A.Ş. Kar Plaza İş Merkezi E Blok Kat:6 34752, İçerenköy, İstanbul, Tel: +90 (216) 5698400 EEE Yönetmeliğine Uygundur

Connect with us.    

rockwellautomation.com ————— expanding **human possibility**[®]

AMERICAS: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444

EUROPE/MIDDLE EAST/AFRICA: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2663 0600, Fax: (32) 2 663 0640

ASIA PACIFIC: Rockwell Automation SEA Pte Ltd, 2 Corporation Road, #04-05, Main Lobby, Corporation Place, Singapore 618494, Tel: (65) 6510 6608, FAX: (65) 6510 6699

UNITED KINGDOM: Rockwell Automation Ltd., Pitfield, Kiln Farm, Milton Keynes, MK11 3DR, United Kingdom, Tel: (44)(1908) 838-800, Fax: (44)(1908) 261-917

Publication 1769-TD008C-EN-P - November 2023

Supersedes Publication 1769-TD008B-EN-P - September 2022

Copyright © 2023 Rockwell Automation, Inc. All rights reserved. Printed in the U.S.A.



Compact™ 24V dc Sink/Source Input Module

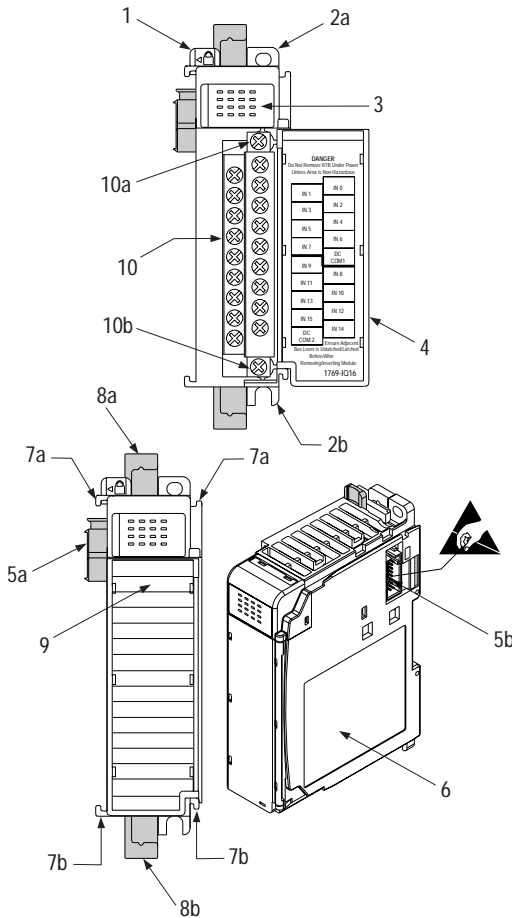
(Catalog Number 1769-IQ16)

Installation Instructions

Inside

Module Description	2
Module Installation	3
System Assembly	4
Mounting Expansion I/O	5
Replacing a Single Module within a System	7
Field Wiring Connections	8
I/O Memory Mapping	10
Spare/Replacement Parts	10
Specifications	11
Hazardous Location Considerations	13
Environnements dangereux	13
For More Information	14

Module Description



Item	Description
1	bus lever (with locking function)
2a	upper panel mounting tab
2b	lower panel mounting tab
3	I/O diagnostic LEDs
4	module door with terminal identification label
5a	movable bus connector with female pins
5b	stationary bus connector with male pins
6	nameplate label
7a	upper tongue-and-groove slots
7b	lower tongue-and-groove slots
8a	upper DIN rail latch
8b	lower DIN rail latch
9	write-on label (user ID tag)
10	removable terminal block (RTB) with finger-safe cover
10a	RTB upper retaining screw
10b	RTB lower retaining screw

Module Installation

Compact I/O is suitable for use in an industrial environment when installed in accordance with these instructions. Specifically, this equipment is intended for use in clean, dry environments (Pollution degree 2¹) and to circuits not exceeding Over Voltage Category II² (IEC 60664-1).³

Prevent Electrostatic Discharge



ATTENTION: Electrostatic discharge can damage integrated circuits or semiconductors if you touch bus connector pins. Follow these guidelines when you handle the module:

- Touch a grounded object to discharge static potential.
- Wear an approved wrist-strap grounding device.
- Do not touch the bus connector or connector pins.
- Do not touch circuit components inside the module.
- If available, use a static-safe work station.
- When not in use, keep the module in its static-shield box.

Remove Power



ATTENTION: Remove power before removing or inserting this module. When you remove or insert a module with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field devices, causing unintended machine motion
- causing an explosion in a hazardous environment

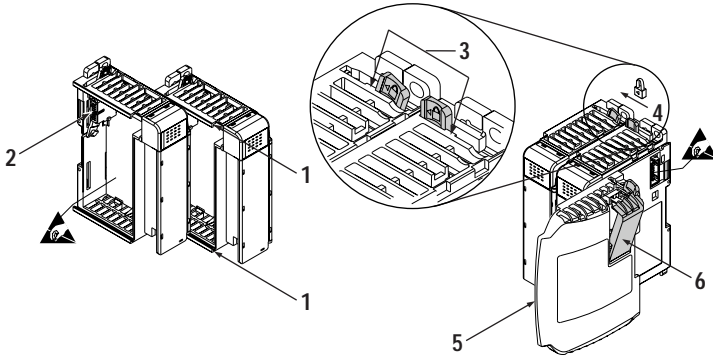
Electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance.

-
1. Pollution Degree 2 is an environment where, normally, only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation shall be expected.
 2. Over Voltage Category II is the load level section of the electrical distribution system. At this level transient voltages are controlled and do not exceed the impulse voltage capability of the product's insulation.
 3. Pollution Degree 2 and Over Voltage Category II are International Electrotechnical Commission (IEC) designations.

System Assembly

The module can be attached to the controller or an adjacent I/O module *before* or *after* mounting. For mounting instructions, see “Panel Mounting” on page 5, or “DIN Rail Mounting” on page 6. To work with a system that is already mounted, see “Replacing a Single Module within a System” on page 7.

The following procedure shows you how to assemble the Compact I/O system.



1. Disconnect power.
2. Check that the bus lever of the module to be installed is in the unlocked (fully right) position.
3. Use the upper and lower tongue-and-groove slots (1) to secure the modules together (or to a controller).
4. Move the module back along the tongue-and-groove slots until the bus connectors (2) line up with each other.
5. Push the bus lever back slightly to clear the positioning tab (3). Use your fingers or a small screw driver.
6. To allow communication between the controller and module, move the bus lever fully to the left (4) until it clicks. Ensure it is locked firmly in place.



ATTENTION: When attaching I/O modules, it is very important that the bus connectors are securely locked together to ensure proper electrical connection.

7. Attach an end cap terminator (5) to the last module in the system by using the tongue-and-groove slots as before.
8. Lock the end cap bus terminator (6).

IMPORTANT: A 1769-ECR or 1769-ECL right or left end cap must be used to terminate the end of the serial communication bus.

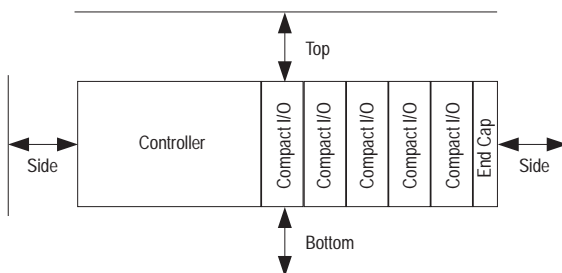
Mounting Expansion I/O



ATTENTION: During panel or DIN rail mounting of all devices, be sure that all debris (metal chips, wire strands, etc.) is kept from falling into the module. Debris that falls into the module could cause damage on power up.

Minimum Spacing

Maintain spacing from enclosure walls, wireways, adjacent equipment, etc. Allow 50 mm (2 in.) of space on all sides for adequate ventilation, as shown:



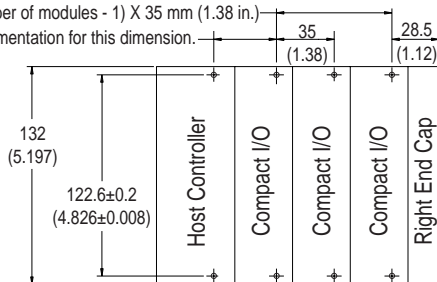
Panel Mounting

Mount the module to a panel using two screws per module. Use M4 or #8 panhead screws. Mounting screws are required on every module.

Panel Mounting Using the Dimensional Template

For more than 2 modules: (number of modules - 1) X 35 mm (1.38 in.)

Refer to host controller documentation for this dimension.



NOTE: All dimensions are in mm (inches). Hole spacing tolerance: ± 0.4 mm (0.016 in.)

Panel Mounting Procedure Using Modules as a Template

The following procedure allows you to use the assembled modules as a template for drilling holes in the panel. If you have sophisticated panel mounting equipment, you can use the dimensional template provided on page 5. Due to module mounting hole tolerance, it is important to follow these procedures:

1. On a clean work surface, assemble no more than three modules.
2. Using the assembled modules as a template, carefully mark the center of all module-mounting holes on the panel.
3. Return the assembled modules to the clean work surface, including any previously mounted modules.
4. Drill and tap the mounting holes for the recommended M4 or #8 screw.
5. Place the modules back on the panel, and check for proper hole alignment.
6. Attach the modules to the panel using the mounting screws.
Note: If mounting more modules, mount only the last one of this group and put the others aside. This reduces remounting time during drilling and tapping of the next group.
7. Repeat steps 1 to 6 for any remaining modules.

DIN Rail Mounting

The module can be mounted using the following DIN rails: 35 x 7.5 mm (EN 50 022 - 35 x 7.5) or 35 x 15 mm (EN 50 022 - 35 x 15).

Before mounting the module on a DIN rail, close the DIN rail latches. Press the DIN rail mounting area of the module against the DIN rail. The latches will momentarily open and lock into place.

Replacing a Single Module within a System

The module can be replaced while the system is mounted to a panel (or DIN rail).

1. Remove power. See important note on page 3.
2. On the module to be removed, remove the upper and lower mounting screws from the module (or open the DIN latches using a flat-blade or phillips style screw driver).
3. Move the bus lever to the right to disconnect (unlock) the bus.
4. On the right-side adjacent module, move its bus lever to the right (unlock) to disconnect it from the module to be removed.
5. Gently slide the disconnected module forward. If you feel excessive resistance, check that the module has been disconnected from the bus, and that both mounting screws have been removed (or DIN latches opened).

Note: It may be necessary to rock the module slightly from front to back to remove it, or, in a panel-mounted system, to loosen the screws of adjacent modules.

6. Before installing the replacement module, be sure that the bus lever on the module to be installed, and on the right-side adjacent module are in the unlocked (fully right) position.
7. Slide the replacement module into the open slot.
8. Connect the modules together by locking (fully left) the bus levers on the replacement module and the right-side adjacent module.
9. Replace the mounting screws (or snap the module onto the DIN rail).

Field Wiring Connections

Grounding the Module

This product is intended to be mounted to a well-grounded mounting surface such as a metal panel. Additional grounding connections from the module's mounting tabs or DIN rail (if used), are not required unless the mounting surface cannot be grounded. Refer to *Industrial Automation Wiring and Grounding Guidelines*, Allen-Bradley publication 1770-4.1, for additional information.

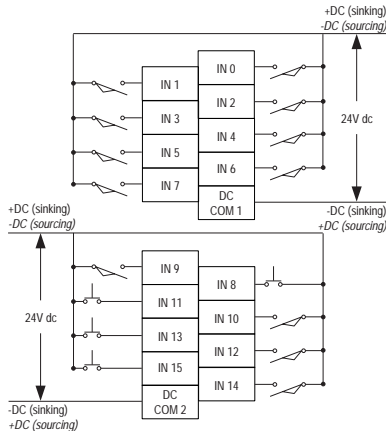
Input Wiring

Basic wiring of input devices¹ to the 1769-IQ16 is shown below.



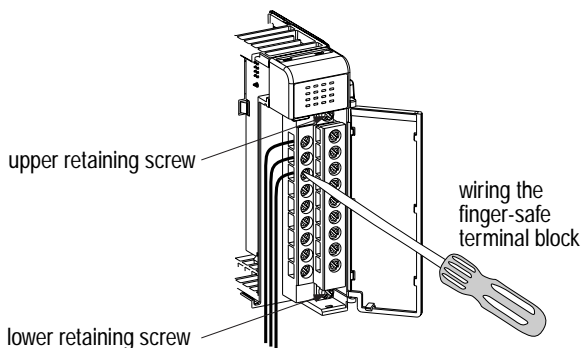
ATTENTION:

- Miswiring of the module to an AC power source will damage the module.
- Be careful when stripping wires. Wire fragments that fall into a module could cause damage at power up. Once wiring is complete, ensure the module is free of all metal fragments.



1. **Sinking/Sourcing Inputs** - Sourcing/sinking describes the current flow between the I/O module and the field device. Sourcing I/O circuits supply (source) current to sinking field devices. Sinking I/O circuits are driven by a current sourcing field device. Field devices connected to the negative side (DC Common) of the field power supply are sinking field devices. Field devices connected to the positive side (+V) of the field supply are sourcing field devices. *Europe*: DC sinking input and sourcing output module circuits are the commonly used options.

A removable, write-on label is provided with the module. Remove the label from the door, mark the identification of each terminal with permanent ink, and slide the label back into the door. Your markings (ID tag) will be visible when the module door is closed.



Removing the Finger-Safe Terminal Block

To remove the terminal block, loosen the upper and lower retaining screws. The terminal block will back away from the module as you remove the screws. When replacing the terminal block, torque the retaining screws to 0.46 Nm (4.1 in-lbs).

Wiring the Finger-Safe Terminal Block

When wiring the terminal block, keep the finger-safe cover in place.

1. Loosen the terminal screws to be wired.
2. Route the wire under the terminal pressure plate. You can use the bare wire or a spade lug. The terminals will accept a 6.35 mm (0.25 in.) spade lug.

Note: The terminal screws are non-captive. Therefore, it is possible to use a ring lug [max. 1/4" o.d. with a 0.139" minimum i.d. (M3.5)] with the module.

3. Tighten the terminal screw making sure the pressure plate secures the wire. Recommended torque when tightening terminal screws is 0.68 Nm (6 in-lbs).

Note: If you need to remove the finger-safe cover, insert a screw driver into one of the square, wiring holes and gently pry the cover off. If you wire the terminal block with the finger-safe cover removed, you will not be able to put it back on the terminal block because the wires will be in the way.

Wire Size and Terminal Screw Torque

Each terminal accepts up to two wires with the following restrictions:

Wire Type		Wire Size	Terminal Screw Torque	Retaining Screw Torque
Solid	Cu-90°C (194°F)	#14 to #22 AWG	0.68 Nm (6 in-lbs)	0.46 Nm (4.1 in-lbs)
Stranded	Cu-90°C (194°F)	#16 to #22 AWG	0.68 Nm (6 in-lbs)	0.46 Nm (4.1 in-lbs)

I/O Memory Mapping

Input Data File

For each input module, slot x, word 0 in the input data file contains the current state of the field input points.

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r

r= read

Spare/Replacement Module Parts

- Terminal Block: 1769-RTBN18 (1 per kit)
- Door Label: 1769-RL1 (2 per kit)
- Door: 1769-RD (2 per kit)

Specifications

General Specifications

Specification	Value
Dimensions	118 mm (height) x 87 mm (depth) x 35 mm (width) height including mounting tabs is 138 mm 4.65 in. (height) x 3.43 in. (depth) x 1.38 in. (width) height including mounting tabs is 5.43 in.
Approximate Shipping Weight (with carton)	270g (0.6 lbs.)
Storage Temperature	-40°C to +85°C (-40°F to +185°F)
Operating Temperature	0°C to +60°C (32°F to +140°F)
Operating Humidity	5% to 95% non-condensing
Operating Altitude	2000 meters (6561 feet)
Vibration	Operating: 10 to 500 Hz, 5G, 0.030 inches maximum peak-to-peak Relay Operation: 2G
Shock	Operating: 30G panel mounted (20G DIN rail mounted) Relay Operation: 7.5G panel mounted (5G DIN rail mounted) Non-Operating: 40G panel mounted (30G DIN rail mounted)
Agency Certification	<ul style="list-style-type: none"> • C-UL certified (under CSA C22.2 No. 142) • UL 508 listed • CE compliant for all applicable directives
Hazardous Environment Class	Class I, Division 2, Hazardous Location, Groups A, B, C, D (UL 1604, C-UL under CSA C22.2 No. 213)
Radiated and Conducted Emissions	EN50081-2 Class A
<i>Electrical /EMC:</i>	<i>The module has passed testing at the following levels:</i>
• ESD Immunity (IEC1000-4-2)	• 4kV contact, 8 kV air, 4 kV indirect
• Radiated Immunity (IEC1000-4-3)	• 10 V/m, 80 to 1000 MHz, 80% amplitude modulation, +900 MHz keyed carrier
• Fast Transient Burst (IEC1000-4-4)	• 2 kV, 5 kHz
• Surge Immunity (IEC1000-4-5)	• 2 kV common mode, 1 kV differential mode
• Conducted Immunity (IEC1000-4-6)	• 10V, 0.15 to 80 MHz ¹

1. Conducted Immunity frequency range may be 150 kHz to 30 MHz if the Radiated Immunity frequency range is 30 MHz to 1000 MHz.

Input Specifications

Specification	1769-IQ16
Voltage Category	24V dc (sink/source ¹)
Operating Voltage Range	10 to 30V dc at 30°C (86°F) 10 to 26.4V dc at 60°C (140°F)
Number of Inputs	16
Bus Current Draw (max.)	115 mA at 5V dc (0.575W)
Heat Dissipation	3.55 Total Watts (<i>The Watts per point, plus the minimum Watts, with all points energized.</i>)
Signal Delay (max.)	On Delay: 8.0 ms Off Delay: 8.0 ms
Off-State Voltage (max.)	5V dc
Off-State Current (max.)	1.5 mA
On-State Voltage (min.)	10V dc
On-State Current (min.)	2.0 mA
Inrush Current (max.)	250 mA
Nominal Impedance	3K Ω
IEC Input Compatibility	Type 1+
Power Supply Distance Rating	8 (The module may not be more than 8 modules away from the power supply or controller.)
Input Point to Bus (Compact Bus) Isolation	Verified by one of the following dielectric tests: 1200V ac for 1 sec. or 1697V dc for 1 sec. 75V dc working voltage (IEC Class 2 reinforced insulation)
Isolated Groups	Group 1: inputs 0 to 7 Group 2: inputs 8 to 15 Isolated groups operate in either sink or source configurations.
Input Group to Input Group Isolation	Verified by one of the following dielectric tests: 1200V ac for 1 sec. or 1697V dc for 1 sec. 75V dc working voltage (IEC Class 2 reinforced insulation)
Vendor I.D. Code	1
Product Type Code	7
Product Code	67

1. **Sinking/Sourcing Inputs** - Sourcing/sinking describes the current flow between the I/O module and the field device. Sourcing I/O circuits supply (source) current to sinking field devices. Sinking I/O circuits are driven by a current sourcing field device. Field devices connected to the negative side (DC Common) of the field power supply are sinking field devices. Field devices connected to the positive side (+V) of the field supply are sourcing field devices. *Europe:* DC sinking input and sourcing output module circuits are the commonly used options.

Hazardous Location Considerations

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only. The following ATTENTION statement applies to use in hazardous locations.



ATTENTION: EXPLOSION HAZARD

- Substitution of components may impair suitability for Class I, Division 2.
 - Do not replace components or disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
 - Do not connect or disconnect components unless power has been switched off or the area is known to be non-hazardous.
 - This product must be installed in an enclosure.
 - All wiring must comply with N.E.C. article 501-4(b).
-

Environnements dangereux

Cet équipement est conçu pour être utilisé dans des environnements de Classe 1, Division 2, Groupes A, B, C, D ou non dangereux. La mise en garde suivante s'applique à une utilisation dans des environnements dangereux.



ATTENTION: DANGER D'EXPLOSION

- La substitution de composants peut rendre cet équipement impropre à une utilisation en environnement de Classe 1, Division 2.
 - Ne pas remplacer de composants ou déconnecter l'équipement sans s'être assuré que l'alimentation est coupée et que l'environnement est classé non dangereux.
 - Ne pas connecter ou déconnecter des composants sans s'être assuré que l'alimentation est coupée ou que l'environnement est classé non dangereux.
 - Ce produit doit être installé dans une armoire.
-

For More Information

For	Refer to this Document	Pub. No.
A more detailed description of how to install and use your Compact I/O with MicroLogix 1200 & 1500 programmable controller.	<i>MicroLogix 1200 and MicroLogix 1500 Programmable Controllers User Manual</i>	1764-RM001B-US-P
A more detailed description of how to install and use your Compact I/O with the 1769-ADN DeviceNet Adapter.	<i>1769-ADN DeviceNet Adapter User Manual</i>	1769-UM001A-US-P
More information on proper wiring and grounding techniques.	<i>Industrial Automation Wiring and Grounding Guidelines</i>	1770-4.1

If you would like a manual, you can:

- download a free electronic version from the internet:
www.ab.com/micrologix or www.theautomationbookstore.com
- purchase a printed manual by:
 - contacting your local distributor or Rockwell Automation representative
 - visiting www.theautomationbookstore.com and placing your order
 - calling **1.800.9NEWLIT (800.963.9548)** (USA/Canada)
or **001.330.725.1574** (Outside USA/Canada)

Compact and MicroLogix are trademarks of Rockwell Automation.

Reach us now at www.rockwellautomation.com

Wherever you need us, Rockwell Automation brings together leading brands in industrial automation including Allen-Bradley controls, Reliance Electric power transmission products, Dodge mechanical power transmission components, and Rockwell Software. Rockwell Automation's unique, flexible approach to helping customers achieve a competitive advantage is supported by thousands of authorized partners, distributors and system integrators around the world.

Americas Headquarters, 1201 South Second Street, Milwaukee, WI 53204, USA, Tel: (1) 414 382-2000, Fax: (1) 414 382-4444
European Headquarters SA/NV, avenue Herrmann Debroux, 46, 1160 Brussels, Belgium, Tel: (32) 2 663 06 00, Fax: (32) 2 663 06 40
Asia Pacific Headquarters, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846



**Rockwell
Automation**

Publication 1769-IN007B-EN-P - June 2000

Supersedes 1769-IN007A-EN-P - April 2000
& 1769-5.3 - January 1999

PN 40071-097-01(B)

© 2000 Rockwell International Corporation. All rights reserved. Printed in the U.S.A.



Compact 5000 I/O Analog 8-channel Current/Voltage Input Module

Catalog Number 5069-IF8

Topic	Page
Module Overview	5
Install a System	5
Install the Removable Terminal Block	7
Install the Module	7
Install the End Cap	8
Wire the Removable Terminal Block	9
Disconnect Wires from the Removable Terminal Block	9
Wiring Diagram	10
Use a Cable Tie	12
Power the System	12
Remove the Module	12
Specifications	13
Additional Resources	14

The 5069-IF8 analog 8-channel current/voltage input module offers differential, non-isolated input channels that can connect to current or voltage input devices. The module supports multiple ranges for each input type. Differential inputs have greater resistance to the effects of electromagnetic noise in a control system.

Compact 5000 I/O™ modules use the Producer/Consumer communication model. The Producer/Consumer communication model is an intelligent data exchange between module and other system devices in which each module produces data without first being polled.

For more information on how to use Compact 5000 I/O modules, see the publications that are listed in [Additional Resources on page 14](#).

Summary of Changes

The following changes were made to this revision of this publication.

Topic	Page(s)
Updated graphics that shows the lower hook that can be used with a cable tie	5, 5, and 10
New module height dimension	5
Additional information about how to install an end cap	8
Additional information in the wiring diagram	10
Description of how to use the cable tie on the module	12
Updates to module specifications	13



ATTENTION: Read this document and the documents listed in the Additional Resources section about installation, configuration and operation of this equipment before you install, configure, operate or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

注意：在安装、配置、操作和维护本产品前，请阅读本文档以及“其他资源”部分列出的有关设备安装、配置和操作的相应文档。除了所有适用规范、法律和标准的相关要求之外，用户还必须熟悉安装和接线说明。

安装、调整、投运、使用、组装、拆卸和维护等各项操作必须由经过适当训练的专业人员按照适用的操作规范实施。

如果未按照制造商指定的方式使用该设备，则可能会损害设备提供的保护。

ATENCIÓN: Antes de instalar, configurar, poner en funcionamiento o realizar el mantenimiento de este producto, lea este documento y los documentos listados en la sección Recursos adicionales acerca de la instalación, configuración y operación de este equipo. Los usuarios deben familiarizarse con las instrucciones de instalación y cableado y con los requisitos de todos los códigos, leyes y estándares vigentes.

El personal debidamente capacitado debe realizar las actividades relacionadas a la instalación, ajustes, puesta en servicio, uso, ensamblaje, desensamblaje y mantenimiento de conformidad con el código de práctica aplicable.

Si este equipo se usa de una manera no especificada por el fabricante, la protección provista por el equipo puede resultar afectada.

ATENÇÃO: Leia este e os demais documentos sobre instalação, configuração e operação do equipamento que estão na seção Recursos adicionais antes de instalar, configurar, operar ou manter este produto. Os usuários devem se familiarizar com as instruções de instalação e fiação além das especificações para todos os códigos, leis e normas aplicáveis.

É necessário que as atividades, incluindo instalação, ajustes, colocação em serviço, utilização, montagem, desmontagem e manutenção sejam realizadas por pessoal qualificado e especializado, de acordo com o código de prática aplicável.

Caso este equipamento seja utilizado de maneira não estabelecida pelo fabricante, a proteção fornecida pelo equipamento pode ficar prejudicada.

ВНИМАНИЕ: Перед тем как устанавливать, настраивать, эксплуатировать или обслуживать данное оборудование, прочитайте этот документ и документы, перечисленные в разделе «Дополнительные ресурсы». В этих документах изложены сведения об установке, настройке и эксплуатации данного оборудования. Пользователи обязаны ознакомиться с инструкциями по установке и прокладке соединений, а также с требованиями всех применимых норм, законов и стандартов.

Все действия, включая установку, наладку, ввод в эксплуатацию, использование, сборку, разборку и техническое обслуживание, должны выполняться обученным персоналом в соответствии с применимыми нормами и правилами.

Если оборудование используется не предусмотренным производителем образом, защита оборудования может быть нарушена.

注意：本製品を設置、構成、稼働または保守する前に、本書および本機器の設置、設定、操作についての参考資料の該当箇所に記載されている文書に目を通してください。ユーザは、すべての該当する条例、法律、規格の要件に加えて、設置および配線の手順に習熟している必要があります。

設置調整、運転の開始、使用、組立て、解体、保守を含む諸作業は、該当する実施規則に従って訓練を受けた適切な作業員が実行する必要があります。

本機器が製造メーカーにより指定されていない方法で使用されている場合、機器により提供されている保護が損なわれる恐れがあります。

ACHTUNG: Lesen Sie dieses Dokument und die im Abschnitt „Weitere Informationen“ aufgeführten Dokumente, die Informationen zu Installation, Konfiguration und Bedienung dieses Produkts enthalten, bevor Sie dieses Produkt installieren, konfigurieren, bedienen oder warten. Anwender müssen sich neben den Bestimmungen aller anwendbaren Vorschriften, Gesetze und Normen zusätzlich mit den Installations- und Verdrahtungsanweisungen vertraut machen.

Arbeiten im Rahmen der Installation, Anpassung, Inbetriebnahme, Verwendung, Montage, Demontage oder Instandhaltung dürfen nur durch ausreichend geschulte Mitarbeiter und in Übereinstimmung mit den anwendbaren Ausführungsvorschriften vorgenommen werden.

Wenn das Gerät in einer Weise verwendet wird, die vom Hersteller nicht vorgesehen ist, kann die Schutzfunktion beeinträchtigt sein.

ATTENTION : Lisez ce document et les documents listés dans la section Ressources complémentaires relatifs à l'installation, la configuration et le fonctionnement de cet équipement avant d'installer, configurer, utiliser ou entretenir ce produit. Les utilisateurs doivent se familiariser avec les instructions d'installation et de câblage en plus des exigences relatives aux codes, lois et normes en vigueur.

Les activités relatives à l'installation, le réglage, la mise en service, l'utilisation, l'assemblage, le démontage et l'entretien doivent être réalisées par des personnes formées selon le code de pratique en vigueur.

Si cet équipement est utilisé d'une façon qui n'a pas été définie par le fabricant, la protection fournie par l'équipement peut être compromise.

주의：본 제품 설치, 설정, 작동 또는 유지 보수하기 전에 본 문서를 포함하여 설치, 설정 및 작동에 관한 참고 자료 섹션의 문서들을 반드시 읽고 숙지하십시오. 사용자는 모든 관련 규정, 법규 및 표준에서 요구하는 사항에 대해 반드시 설치 및 배선 지침을 숙지해야 합니다.

설치, 조정, 가동, 사용, 조립, 분해, 유지보수 등 모든 작업은 관련 규정에 따라 적절한 교육을 받은 사용자를 통해서만 수행해야 합니다.

본 장비를 제조사가 명시하지 않은 방법으로 사용하면 장비의 보호 기능이 손상될 수 있습니다.

ATTENZIONE Prima di installare, configurare ed utilizzare il prodotto, o effettuare interventi di manutenzione su di esso, leggere il presente documento ed i documenti elencati nella sezione "Altre risorse", riguardanti l'installazione, la configurazione ed il funzionamento dell'apparecchiatura. Gli utenti devono leggere e comprendere le istruzioni di installazione e cablaggio, oltre ai requisiti previsti dalle leggi, codici e standard applicabili.

Le attività come installazione, regolazioni, utilizzo, assemblaggio, disassemblaggio e manutenzione devono essere svolte da personale adeguatamente addestrato, nel rispetto delle procedure previste.

Qualora l'apparecchio venga utilizzato con modalità diverse da quanto previsto dal produttore, la sua funzione di protezione potrebbe venire compromessa.

DIKKAT: Bu ürünün kurulumu, yapılandırılması, işletilmesi veya bakımı öncesinde bu dokümanı ve bu ekipmanın kurulumu, yapılandırılması ve işletimi ile ilgili İlavə Kaynaklar bölümünde yer listelenmiş dokümanları okuyun. Kullanıcılar yürürlükteki tüm yönetmelikler, yasalar ve standartların gereksinimlerine ek olarak kurulum ve kablolarla talimatlarını da öğrenmek zorundadır.

Kurulum, ayarlama, hizmet alma, kulllanma, parçaları birleştirme, parçaları sökme ve bakım gibi aktiviteler sadece uygun eğitimleri almış kişiler tarafından yürürlükteki uygulama yönetmeliklerine uygun şekilde yapılabilir.

Bu ekipman üretici tarafından belirlenmiş amaç dışında kullanılırsa, ekipman tarafından sağlanan koruma bozulabilir.

注意事項：在安装、設定、操作或維護本產品前，請先閱讀此文件以及列於「其他資源」章節中有關安裝、設定與操作此設備的文件。使用者必須熟悉安裝和配線指示，並符合所有法規、法律和標準要求。

包括安裝、調整、交付使用、使用、組裝、拆卸和維護等動作都必須交由已經過適當訓練的人員進行，以符合適用的實作法規。

如果將設備用於非製造商指定的用途時，可能會造成設備所提供的保護功能受損。

POZOR: Než začnete instalovat, konfigurovat či provozovat tento výrobek nebo provádět jeho údržbu, přečtěte si tento dokument a dokumenty uvedené v části Dodatečné zdroje ohledně instalace, konfigurace a provozu tohoto zařízení. Uživatelé se musejí vedle požadavků všech relevantních vyhlášek, zákonů a norem nutně seznámit také s pokyny pro instalaci a elektrické zapojení.

Činnosti zahrnující instalaci, nastavení, uvedení do provozu, užívání, montáž, demontáž a údržbu musí vykonávat vhodně proškolený personál v souladu s příslušnými prováděcími předpisy.

Pokud se toto zařízení používá způsobem neodpovídajícím specifikaci výrobce, může být narušena ochrana, kterou toto zařízení poskytuje.

UWAGA: Przed instalacją, konfiguracją, użytkowaniem lub konserwacją tego produktu należy przeczytać niniejszy dokument oraz wszystkie dokumenty wymienione w sekcji Dodatkowe źródła omawiające instalację, konfigurację i procedury użytkowania tego urządzenia. Użytkownicy mają obowiązek zapoznać się z instrukcjami dotyczącymi instalacji oraz oprezwodowania, jak również z obowiązującymi kodeksami, prawami i normami.

Działania obejmujące instalację, regulację, przekazanie do użytkowania, użytkowanie, montaż, demontaż oraz konserwację muszą być wykonywane przez odpowiednio przeszkolony personel zgodnie z obowiązującym kodeksem postępowania.

Jeśli urządzenie jest użytkowane w sposób inny niż określony przez producenta, zabezpieczenie zapewniane przez urządzenie może zostać ograniczone.

OBST Läs detta dokument samt dokumentet, som står listat i avsnittet Övriga resurser, om installation, konfigurering och drift av denna utrustning innan du installerar, konfigurerar eller börjar använda eller utföra underhållsarbete på produkten. Användare måste bekanta sig med instruktioner för installation och kabeldragning, förutom krav enligt gällande koder, lagar och standarder.

Åtgärder som installation, justering, service, användning, montering, demontering och underhållsarbete måste utföras av personal med lämplig utbildning enligt lämpligt bruk.

Om denna utrustning används på ett sätt som inte anges av tillverkaren kan det hända att utrustningens skyddsanordningar försätts ur funktion.

LET OP: Lees dit document en de documenten die genoemd worden in de paragraaf Aanvullende informatie over de installatie, configuratie en bediening van deze apparatuur voordat u dit product installeert, configureert, bediend of onderhoudt. Gebruikers moeten zich vertrouwd maken met de installatie en de bedradinginstructies, naast de vereisten van alle toepasselijke regels, wetten en normen.

Activiteiten zoals het installeren, afstellen, in gebruik stellen, gebruiken, monteren, demonteren en het uitvoeren van onderhoud mogen uitsluitend worden uitgevoerd door hiervoor opgeleid personeel en in overeenstemming met de geldende praktijkregels.

Indien de apparatuur wordt gebruikt op een wijze die niet is gespecificeerd door de fabrikant, dan bestaat het gevaar dat de beveiliging van de apparatuur niet goed werkt.

Waste Electrical and Electronic Equipment (WEEE)



At the end of its life, this equipment should be collected separately from any unsorted municipal waste.

Environment and Enclosure



ATTENTION: This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC 60664-1), at altitudes up to 2000 m (6562 ft) without derating.

This equipment is not intended for use in residential environments and may not provide adequate protection to radio communication services in such environments.

This equipment is supplied as open-type equipment for indoor use. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The enclosure must have suitable flame-retardant properties to prevent or minimize the spread of flame, complying with a flame spread rating of 5VA or be approved for the application if nonmetallic. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain more information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

In addition to this publication, see the following:

- Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#), for more installation requirements.
- NEMA Standard 250 and EN/IEC 60529, as applicable, for explanations of the degrees of protection provided by enclosures.

North American Hazardous Location Approval

The following information applies when operating this equipment in hazardous locations.	Informations sur l'utilisation de cet équipement en environnements dangereux.
<p>Products marked "CL I, DIV 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, D, Hazardous Locations and nonhazardous locations only. Each product is supplied with markings on the rating nameplate indicating the hazardous location temperature code. When combining products within a system, the most adverse temperature code (lowest "T" number) may be used to help determine the overall temperature code of the system. Combinations of equipment in your system are subject to investigation by the local Authority Having Jurisdiction at the time of installation.</p>	<p>Les produits marqués "CL I, DIV 2, GP A, B, C, D" ne conviennent qu'à une utilisation en environnements de Classe I Division 2 Groupes A, B, C, D dangereux et non dangereux. Chaque produit est livré avec des marquages sur sa plaque d'identification qui indiquent le code de température pour les environnements dangereux. Lorsque plusieurs produits sont combinés dans un système, le code de température le plus défavorable (code de température le plus faible) peut être utilisé pour déterminer le code de température global du système. Les combinaisons d'équipements dans le système sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation.</p>
<div style="display: flex; align-items: center;"> <div> <p>WARNING: Explosion Hazard –</p> <ul style="list-style-type: none"> • Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous. • Do not disconnect connections to this equipment unless power has been removed or the area is known to be nonhazardous. Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product. • Substitution of components may impair suitability for Class I, Division 2. • If this product contains batteries, they must only be changed in an area known to be nonhazardous. </div> </div>	<div style="display: flex; align-items: center;"> <div> <p>AVERTISSEMENT: Risque d'Explosion –</p> <ul style="list-style-type: none"> • Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement. • Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs. Fixer tous les connecteurs externes reliés à cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens fournis avec ce produit. • La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2. • S'assurer que l'environnement est classé non dangereux avant de changer les piles. </div> </div>

European Hazardous Location Approval

The following applies to products marked **II 3 G**. Such modules:

- Are Equipment Group II, Equipment Category 3, and comply with the Essential Health and Safety Requirements relating to the design and construction of such equipment given in Annex II to Directive 94/9/EC. See the EC Declaration of Conformity at <http://www.rockwellautomation.com/products/certification> for details.
- The type of protection is "Ex nA IIC T4 Gc" according to EN 60079-15.
- The 5069-IF8 module complies to standards: EN 60079-0:2012+A11:2013, EN 60079-15:2010, reference certificate number DEMKO 15 ATEX 1484X.
- Are intended for use in areas in which explosive atmospheres caused by gases, vapors, mists, or air are unlikely to occur, or are likely to occur only infrequently and for short periods. Such locations correspond to Zone 2 classification according to ATEX directive 1999/92/EC.

IEC Hazardous Location Approval

The following applies to products with IECEx certification: Such modules:

- Are intended for use in areas in which explosive atmospheres caused by gases, vapors, mists, or air are unlikely to occur, or are likely to occur only infrequently and for short periods. Such locations correspond to Zone 2 classification to IEC 60079-0.
 - The type of protection is "Ex nA IIC T4 Gc" according to IEC 60079-15.
 - The 5069-IF8 module complies to standards IEC 60079-0:6th Edition, IEC-60079-15:4th Edition, reference IECEx certificate number IECEx UL 15.0055X.
-

Special Conditions for Safe Use



WARNING:

- This equipment is not resistant to sunlight or other sources of UV radiation.
 - This equipment shall be mounted in an ATEX/IECEx Zone 2 certified enclosure with a minimum ingress protection rating of at least IP54 (as defined in EN/IEC 60529) and used in an environment of not more than Pollution Degree 2 (as defined in EN/IEC 60664-1) when applied in Zone 2 environments. The enclosure must be accessible only by the use of a tool.
 - This equipment shall be used within its specified ratings defined by Rockwell Automation.
 - Provision shall be made to prevent the rated voltage from being exceeded by transient disturbances of more than 140% of the rated voltage when applied in Zone 2 environments.
 - The instructions in the user manual shall be observed.
 - This equipment must be used only with ATEX/IECEx certified Rockwell Automation backplanes.
 - Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product.
 - Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.
 - Earthing is accomplished through mounting of modules on rail.
 - Devices shall be used in an environment of not more than Pollution Degree 2.
-

Prevent Electrostatic Discharge



ATTENTION: This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
 - Wear an approved grounding wriststrap.
 - Do not touch connectors or pins on component boards.
 - Do not touch circuit components inside the equipment.
 - Use a static-safe workstation, if available.
 - Store the equipment in appropriate static-safe packaging when not in use.
-

Electrical Safety Considerations

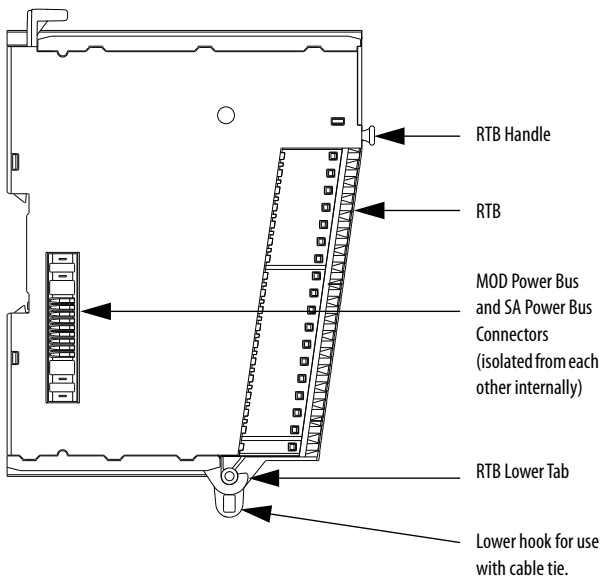
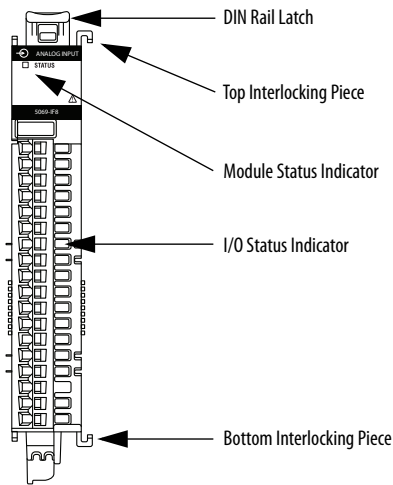


ATTENTION:

- Do not wire more than 1 conductor on any single RTB terminal.
 - In case of malfunction or damage, no attempts at repair should be made. The module should be returned to the manufacturer for repair. Do not dismantle the module.
 - This equipment is certified for use only within the surrounding air temperature range of 0...60 °C (32...140 °F) The equipment must not be used outside of this range.
 - Use only a soft dry anti-static cloth to wipe down equipment. Do not use any cleaning agents.
-

IMPORTANT Any illustrations, charts, sample programs, and layout examples shown in this publication are intended solely for the purposes of example. Since there are many variables and requirements associated with any particular installation, Rockwell Automation does not assume responsibility or liability for actual use based upon the examples shown in this publication.

Module Overview



Install a System

Based on your application design, you must install a CompactLogix 5380 controller or Compact 5000 I/O EtherNet/IP adapter before you can install the module.

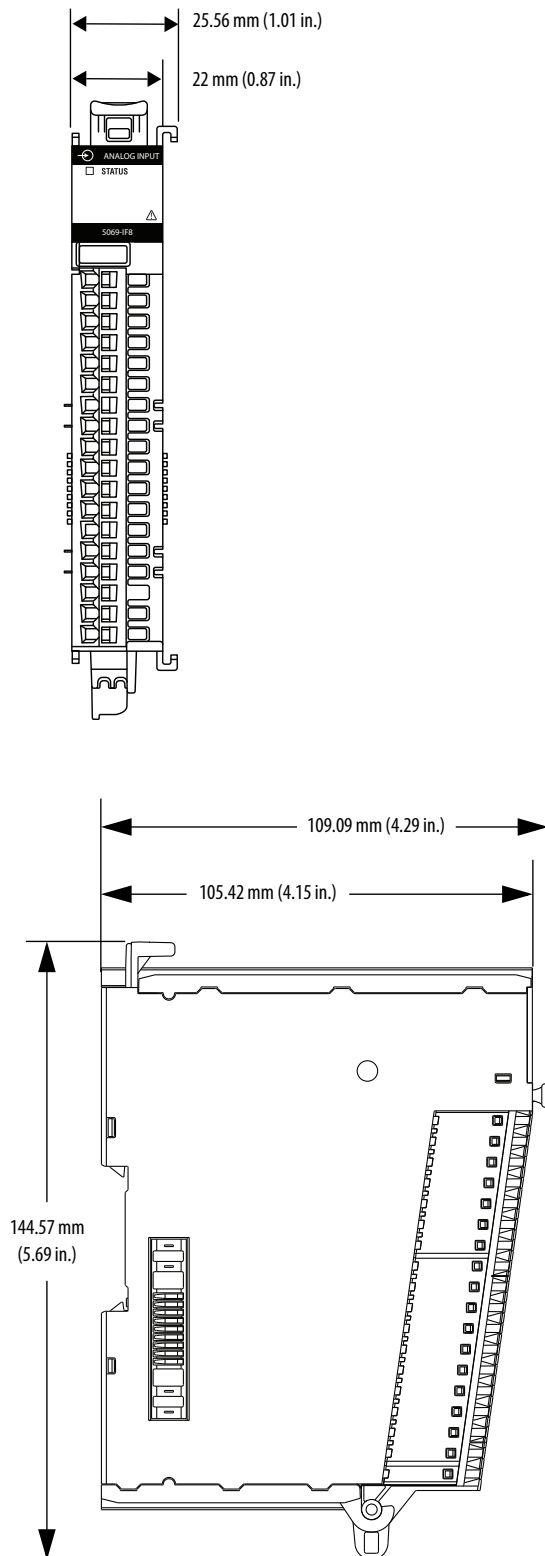
For more information on how to install these components, see [Additional Resources on page 14](#).

Required Components

To install the module, you need these components.

Component	Description
Removable terminal blocks	One of the following RTB types. <ul style="list-style-type: none"> • 5069-RTB18-SPRING RTB • 5069-RTB18-SCREW RTB IMPORTANT: You must order RTBs separately. RTBs do not ship with Compact 5000 I/O modules. We recommend that you order only the RTB type that your system requires.
End cap	An end cap ships with the CompactLogix 5380 controllers and the Compact 5000 I/O EtherNet/IP adapters.
Tools	The following tools are needed: <ul style="list-style-type: none"> • Screwdriver • Wire stripper • Wires For more information on available wire sizes and wire insulation stripping length, see Specifications on page 13 .

Dimensions



Ground Considerations

You must ground DIN rails according to the Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).



ATTENTION: This product is grounded through the DIN rail to chassis ground. Use zinc-plated chromate-passivated steel DIN rail to assure proper grounding. The use of other DIN rail materials (for example, aluminum or plastic) that can corrode, oxidize, or are poor conductors, can result in improper or intermittent grounding. Secure DIN rail to mounting surface approximately every 200 mm (7.8 in.) and use end-anchors appropriately. Be sure to ground the DIN rail properly. Refer to Industrial Automation Wiring and Grounding Guidelines, Rockwell Automation® publication [1770-4.1](#) for more information.

You can use the EN50022 - 35 x 7.5 mm (1.38 x 0.30 in.) DIN rail with Compact 5000 I/O modules.

System Power Considerations

A CompactLogix 5380 controller or Compact 5000 I/O EtherNet/IP adapter provides power to the module.

The following power types are available:

- **Module (MOD) power** - System-side power that is required to operate the Compact 5000 I/O modules. MOD power is provided through the MOD power RTB and passed across the MOD power bus.
- **Sensor/Actuator (SA) power** - Field-side power that is used to power field-side devices. SA power is provided through the SA power RTB and passed across the SA power bus.

The first component in the system, that is, the controller or the adapter, establishes an SA power bus.

A system can have more than one SA power bus. You use 5069-FPD field potential distributors to establish a new SA power bus. SA power buses are isolated from each other.

If a system includes Compact 5000 I/O modules that use AC SA power and modules that use DC SA power, you must install them on separate SA power buses.

To keep the modules on separate SA power buses, complete the following steps.

- a. Install the modules that use one type of SA power, for example AC, to the right of the adapter or controller, that is, the first SA power bus.
- b. Install the 5069-FPD field potential distributor to establish a second SA power bus.
- c. Install the modules that use the other type of SA power, for example DC, on the second SA power bus.



ATTENTION: To reduce susceptibility to noise, power analog modules and digital modules from separate power supplies.

IMPORTANT

We recommend that you use separate external power supplies for MOD power and SA power respectively. This practice helps to prevent unintended consequences that can result if you use one supply.

If you use separate external power supplies, the loss of power from one external power supply does not affect the availability of power from the other supply. For example, if separate external power supplies are used and SA power is lost, MOD power remains available for the Compact 5000 I/O modules.

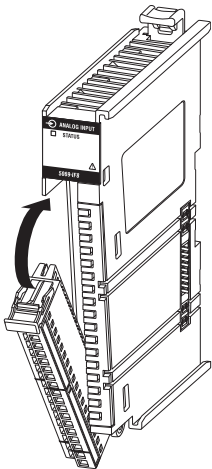
Install the Removable Terminal Block



WARNING: If you connect or disconnect the removable terminal block (RTB) with power applied, an electric arc can occur. This could cause an explosion in hazardous location installations.

The removable terminal block (RTB) does not support "Removal and Insertion Under Power" (RIUP) capability. Do not connect or disconnect the removable terminal block (RTB) while power is applied. Be sure that power is removed before proceeding.

1. Hook the bottom of the RTB on the module.
2. Push the RTB against the module until the RTB clicks into place.



3. Push the RTB handle against the RTB until you hear another click.

Install the Module



WARNING: If you insert or remove the module while backplane power is on, an electric arc can occur. This could cause an explosion in hazardous location installations.

The module does not support "Removal and Insertion Under Power" (RIUP) capability. Do not connect or disconnect the module while power is applied. Be sure that power is removed before proceeding.

Install the I/O module next to the right-most device in the system. To install the module, complete these steps.

1. Confirm that MOD power and all sources of SA power are off.

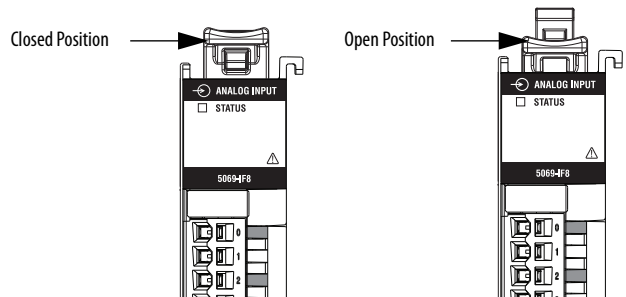
If you remove the module with power applied, the system MOD power bus and SA power bus are affected. For example, you can interrupt MOD power to the other modules in the system. Unintended consequences can occur as a result.

2. If an end cap is installed on the right-most module that is installed in the system, remove it and keep for later use.



ATTENTION: Do not discard the end cap. Use this end cap to cover the exposed interconnections on the last module on the DIN rail. Failure to do so could result in equipment damage or injury from electric shock.

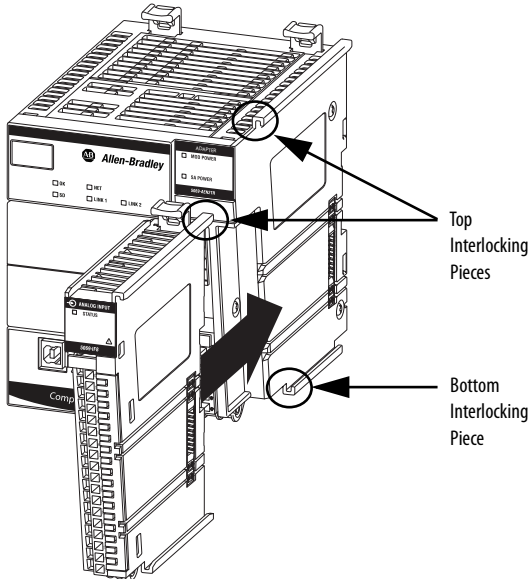
3. Confirm that the DIN rail latch is closed.
4. If the DIN rail latches are open, gently push the rear latch back until the front latch pops up and clicks.



- Align the interlocking pieces of the module with the device on the left.

The top interlocking pieces engage first.

- Push the module toward the DIN rail until a click indicates that the module is locked in place.



- Verify that the module is installed in one of the following ways:
 - If the module is installed next to a controller or adapter, the front of the module is set back slightly from the front of the controller or adapter.
 - If the module is installed next to another I/O module, the fronts of both modules are flush with each other.

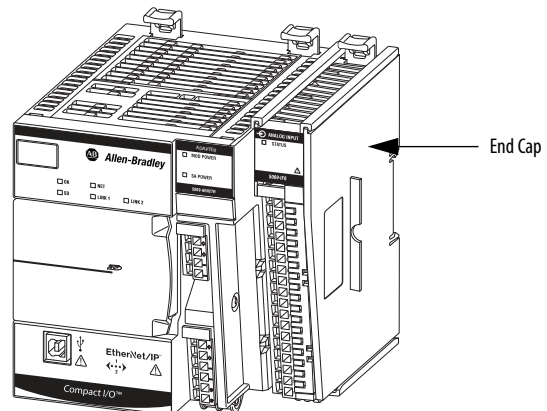
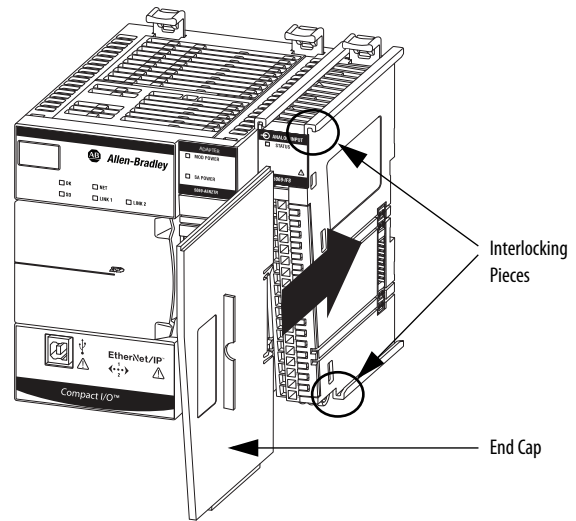
Install the End Cap

You must install an end cap on the last module in your system.

IMPORTANT You install the end cap after the last module is installed on the DIN rail. This design helps to prevent the end cap from going beyond the locked position.

If you push the end cap beyond the locked position or insert it from the backwards direction, you can damage the MOD power bus and SA power bus connector.

- Align the end cap with the interlocking pieces on the module.
- Push the end cap toward the DIN rail until it locks in place.



Wire the Removable Terminal Block



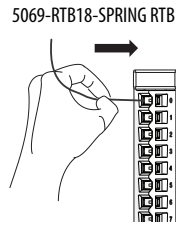
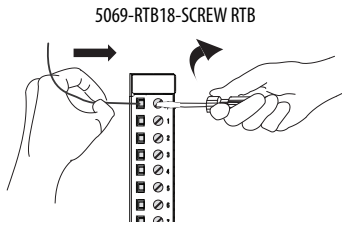
WARNING: If you connect or disconnect wiring while power is applied, an electric arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

1. Confirm that MOD power and all sources of SA power are turned off.
2. Strip insulation from the wires that you connect to the RTB.

RTB Type	Action
Screw	Strip 12 mm (0.47 in.) of insulation from the wires.
Spring	Strip 10 mm (0.39 in.) of insulation from the wires.

3. Connect the wire to the terminal.

RTB Type	Action
Screw	<ol style="list-style-type: none"> 1. Insert the wire into the terminal. 2. Turn the screwdriver to close the terminal on the wire. Torque the screw to 0.4 N·m (3.5 lb·in).
Spring	Push the wire into the terminal. If the wire is too thin, crimp a wire ferrule on the wire and insert it.



Disconnect Wires from the Removable Terminal Block

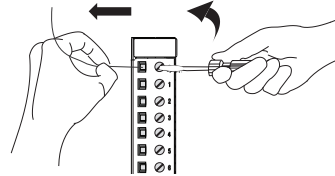


WARNING: If you connect or disconnect wiring while power is applied, an electric arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

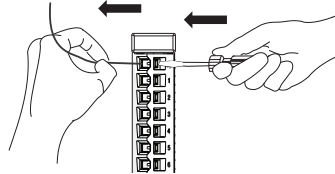
Disconnect wires from the RTB.

RTB Type	Action
Screw	<ol style="list-style-type: none"> 1. Turn the screwdriver counter-clockwise to open the terminal. 2. Remove the wire.
Spring	<ol style="list-style-type: none"> 1. Insert and hold a screwdriver in the right-side terminal. 2. Remove the wire. 3. Pull out the screwdriver.

5069-RTB18-SCREW RTB



5069-RTB18-SPRING RTB



Wiring Diagram

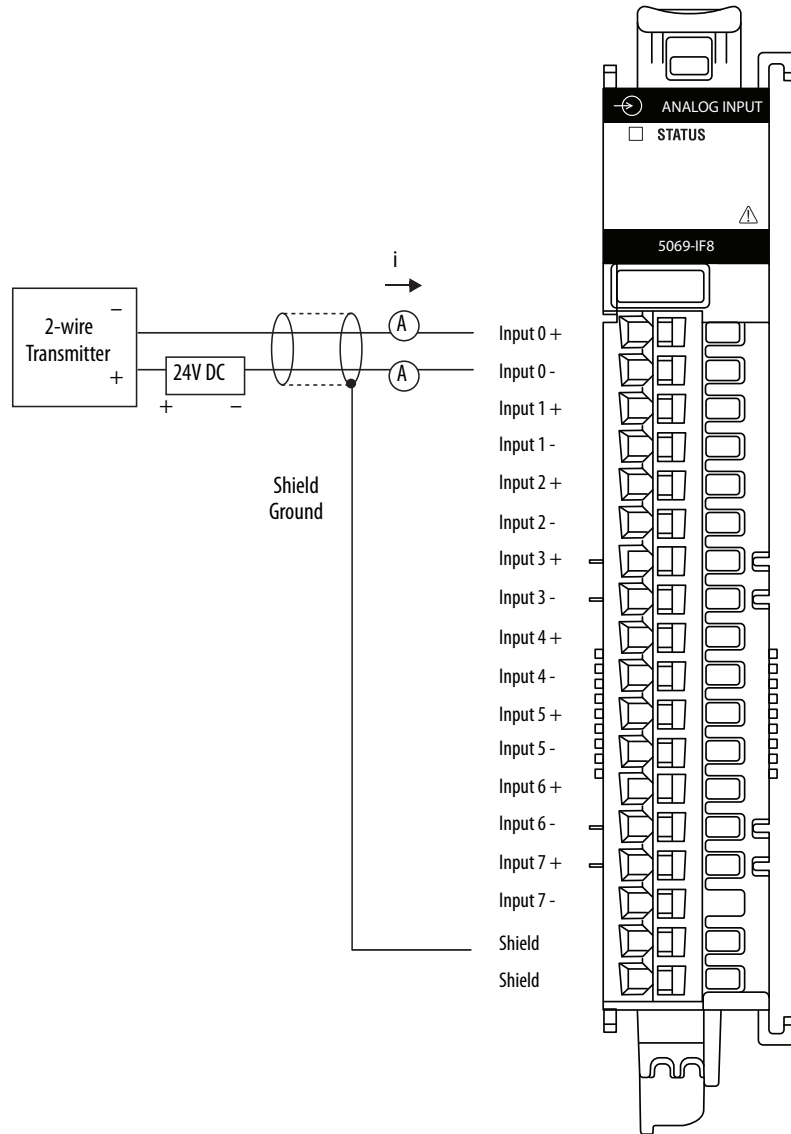
The following is an example wiring diagram for the 5069-IF8 analog input module in current mode.

Channel Connections

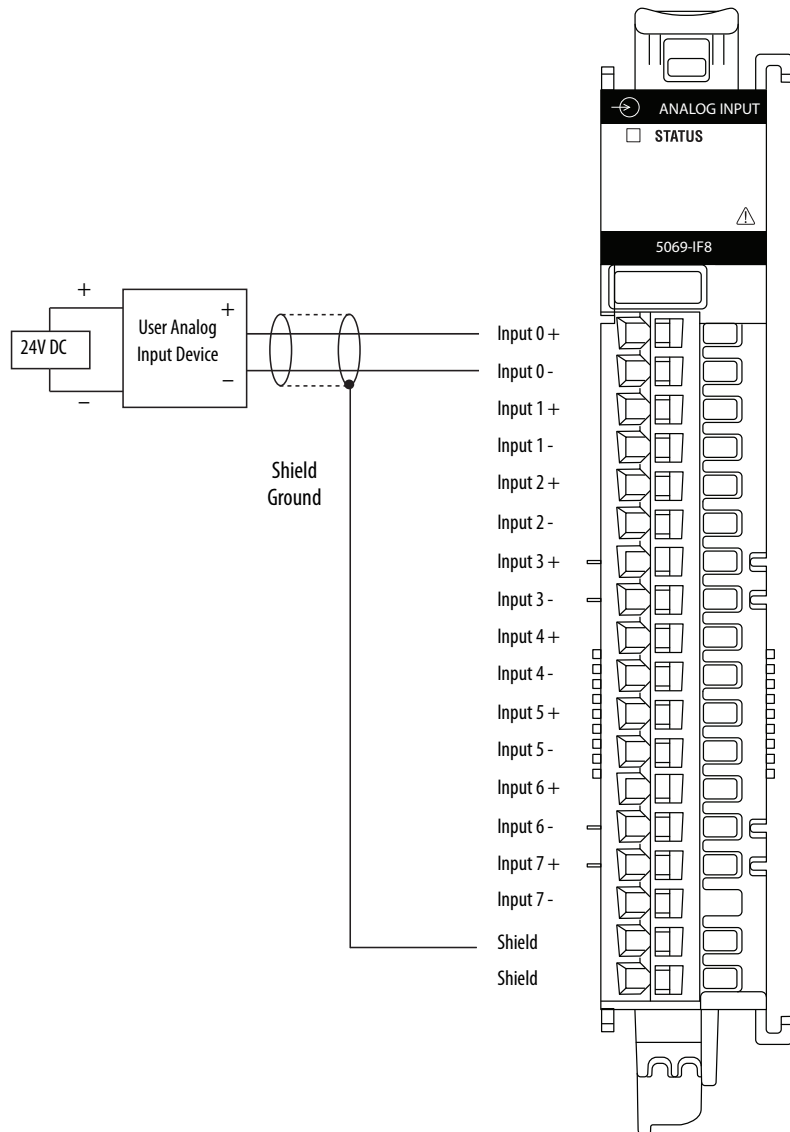
The diagram shows a device that is connected to channel 0. You are not restricted to using only this channel.

You can connect devices to any channel or combination of channels as needed.

IMPORTANT: Place additional loop devices, for example, strip chart recorders, at either **A** location in the current loop.



The following is an example wiring diagram for the 5069-IF8 analog input module in voltage mode.



Channel Connections

The diagram shows a device that is connected to channel 0. You are not restricted to using only this channel.

You can connect devices to any channel or combination of channels as needed.

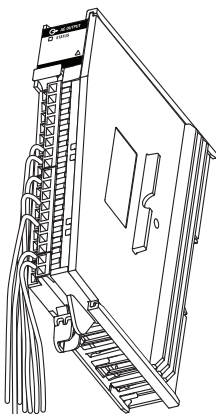
Use a Cable Tie

After you connect the required wires to the RTB, you can use a cable tie to bundle the wires. There is a lower hook at the bottom of the module that you use to secure the tied bundle to the module.

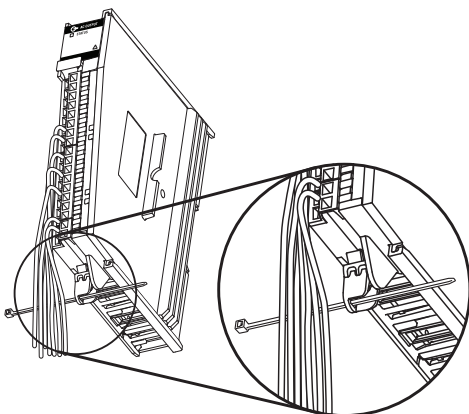
1. Make sure that you have a cable tie long enough to contain the wires that are connected to the module.

The maximum width of the cable tie is 4.5 mm (0.18 in).

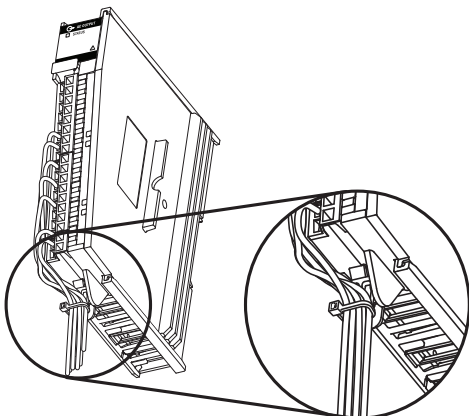
2. Gather the wires at the bottom of the module.



3. Thread the cable tie through the lower hook at the bottom of the RTB..



4. Wrap the cable tie around the wires and secure it.



Power the System

After you install all Compact 5000 I/O modules, you can turn on MOD power and, if used, SA power to the system.

For more information on MOD power and SA power, see [System Power Considerations on page 6](#).

Remove the Module



ATTENTION: Do not remove or replace the module while power is applied. Interruption of the backplane can result in unintentional operation or machine motion.

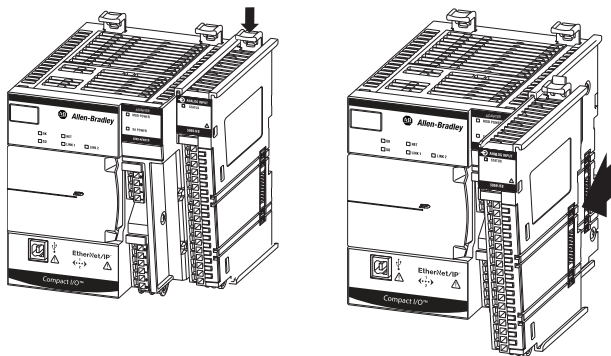
1. Confirm that MOD power and all sources of SA power are turned off.

IMPORTANT Before you remove power from the MOD power RTB and, if used, SA power RTB, consider the effect on your system.

When you remove MOD power and SA power from a controller or adapter, you shut down power to all Compact 5000 I/O modules in the system. That is, all system-side and field-side power is removed.

We strongly recommend that you take the appropriate actions to help prevent unintended consequences that can result from a system power shutdown before you remove MOD power and SA power.

2. If necessary, remove the end cap from the right side of the module.
3. If desired, disconnect wires from the RTB as described on [page 9](#).
4. Press the DIN rail latch down until it clicks and let go of the latch.
5. Pull the module off the DIN rail.



6. To replace the module, follow the steps that are described beginning at [Install the Module on page 7](#).

Specifications

This table lists a subset of the module specifications. For a list of all specifications, see the Compact 5000 I/O Modules and EtherNet/IP Adapters Technical Data, publication [5069-TD001](#).

5069-IF8 Analog 8-channel Current/Voltage Input Module Specifications

Attribute	Value
Temperature, operating <ul style="list-style-type: none"> IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock) 	0...60 °C (32...140 °F)
Temperature, surrounding air, max	60 °C (140 °F)
Enclosure type rating	None (open-style)
Voltage and current ratings	
Analog input ratings	0...20 mA, +/-10V DC (per channel)
MOD Power	75 mA @ 18...32V DC
MOD Power (Passthrough) ⁽¹⁾	9.55 A @ 18...32V DC
SA Power	100 mA @ 18...32V DC
SA Power (Passthrough) ⁽²⁾	9.95 A @ 18...32V DC
Do not exceed 10 A MOD or SA Power (Passthrough) current draw	
Isolation voltage	300V (continuous), Basic Insulation Type 50V Functional Isolation between SA power and input ports No isolation between individual input ports
Wire size	
5069-RTB18-SCREW and 5069-RTB14CJC-SCREW connections	0.5...1.5 mm ² (22...16 AWG) solid or stranded shielded copper wire rated at 105 °C (221 °F), or greater, 3.5 mm (0.14 in.) max diameter including insulation, single wire connection only.
5069-RTB18-SPRING and 5069-RTB14CJC-SPRING connections	0.5...1.5 mm ² (22...16 AWG) solid or stranded shielded copper wire rated at 105 °C (221 °F), or greater, 2.9 mm (0.11 in.) max diameter including insulation, single wire connection only.
Insulation stripping length	
5069-RTB18-SCREW and 5069-RTB14CJC-SCREW connections	12 mm (0.47 in.)
5069-RTB18-SPRING and 5069-RTB14CJC-SPRING connections	10 mm (0.39 in.)
RTB torque specifications (5069-RTB18-SCREW RTB and 5069-RTB14CJC-SCREW RTB only)	0.4 N·m (3.5 lb-in)
North American Temp Code	T4
ATEX Temp Code	T4
IECEx Temp Code	T4

(1) Maximum level of MOD Power current that the module can pass through to the next module in the system. The specific level of current passed through varies based on system configuration.

(2) Maximum level of SA Power current that the module can pass through to the next module in the system. The specific level of current passed through varies based on system configuration.

Additional Resources

Resource	Description
Compact 5000 I/O Modules and EtherNet/IP Adapters Technical Data, publication 5069-TD001	Provides specifications for Compact 5000 I/O modules and EtherNet/IP adapters.
Compact 5000 I/O Analog Modules User Manual, publication 5000-UM005	Describes how to use the Compact 5000 I/O analog modules.
EtherNet/IP Communication Modules in Logix 5000 Control Systems User Manual, publication ENET-UM004	Describes how to use Compact 5000 I/O EtherNet/IP adapters.
CompactLogix 5380 Controllers User Manual, publication 5069-UM001	Describes how to use CompactLogix 5380 controllers.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.rockwellautomation.com/global/certification/overview.page	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at <http://www.rockwellautomation.com/global/literature-library/overview.page>. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Notes:

Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	https://rockwellautomation.custhelp.com/
Local Technical Support Phone Numbers	Locate the phone number for your country.	http://www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	http://www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	http://www.rockwellautomation.com/global/literature-library/overview.page
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	http://www.rockwellautomation.com/global/support/pcdc.page

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete the How Are We Doing? form at http://literature.rockwellautomation.com/idc/groups/literature/documents/du/ra-du002_-en-e.pdf.

Rockwell Automation maintains current product environmental information on its website at <http://www.rockwellautomation.com/rockwellautomation/about-us/sustainability-ethics/product-environmental-compliance.page>.

Allen-Bradley, Compact 5000, CompactLogix, Rockwell Automation, Rockwell Software, and Studio 5000 Logix Designer are trademarks of Rockwell Automation, Inc. Trademarks not belonging to Rockwell Automation are property of their respective companies.

Rockwell Otomasyon Ticaret A.Ş., Kar Plaza İş Merkezi E Blok Kat:6 34752 İçerenköy, İstanbul, Tel: +90 (216) 5698400

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe/Middle East/Africa: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Publication 5069-IN010B-EN-P - November 2017

Supersedes Publication 5069-IN010A-EN-P - October 2015

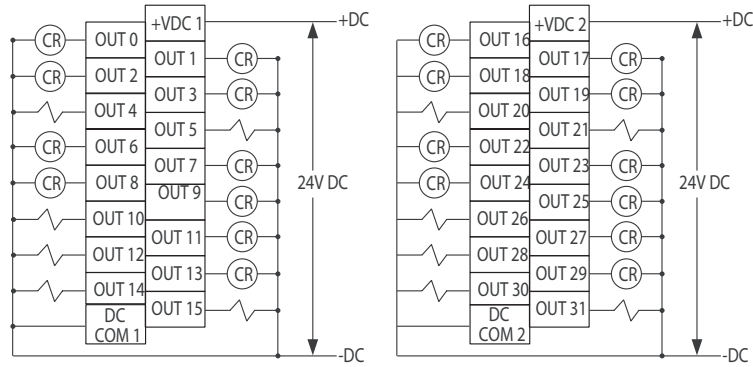
PN-469204

Copyright © 2017 Rockwell Automation, Inc. All rights reserved. Printed in the U.S.A.

1769-OB32

Compact solid state 24V DC source output module

1769-OB32



Simplified Output Circuit Diagram

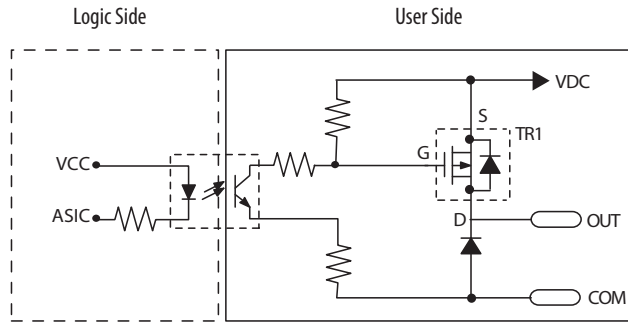


Table 61 - Technical Specifications - 1769-OB32

Attribute	1769-OB32
Outputs	32 (16 points/group)
Voltage category	24V DC source
Operating voltage range	20.4...26.4V DC
Output delay, on	0.1 ms
Output delay, off	1.0 ms
Current draw @ 5.1V	300 mA
Heat dissipation, max	4.5 W
Off-state leakage current, max ⁽¹⁾	1.0 mA @ 26.4V DC
On-state current, min	1.0 mA
On-state voltage drop, max	1.0V DC @ 1 A
Current per point, max	0.5 A @ 60 °C (140 °F) 1.0 A @ 30 °C (86 °F)
Current per module, max	4.0 A @ 60 °C (140 °F) 8.0 A @ 30 °C (86 °F)
Surge current ⁽²⁾	2.0 A for 10 ms, repeatable every 2 s

Table 61 - Technical Specifications - 1769-OB32

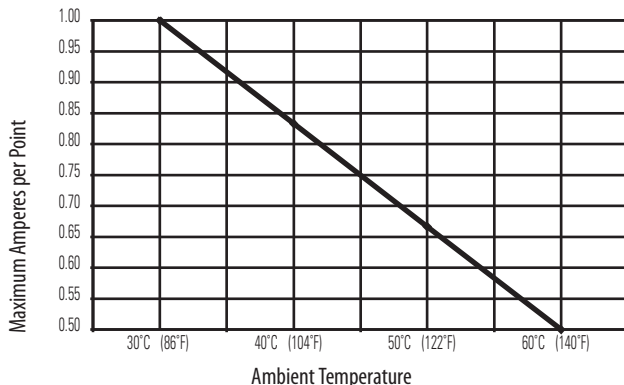
Attribute	1769-OB32
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 1 s or 1697V DC for 1 s, output point to bus 75V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	450 g (0.992 lb)
Dimensions (HxWxD), approx	118 x 52.5 x 87 mm (4.65 x 2.07 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1.5
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	6 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22...14 AWG) solid (22...16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	73
Enclosure type rating	None (open style)

(1) To limit the effects of leakage current through solid state outputs, a loading resistor can be connected in parallel with your load. Use a 5.6 k Ω , 1/2 W resistor for transistor outputs, 24V DC operation.

(2) Use a 1N4004 diode reverse-wired across the load for transistor outputs switching 24V DC inductive loads.

Temperature Derating - 1769-OB32

1769-OB32 Maximum Amperes per Point versus Temperature



1769-OB32 Maximum Amperes per Module versus Temperature

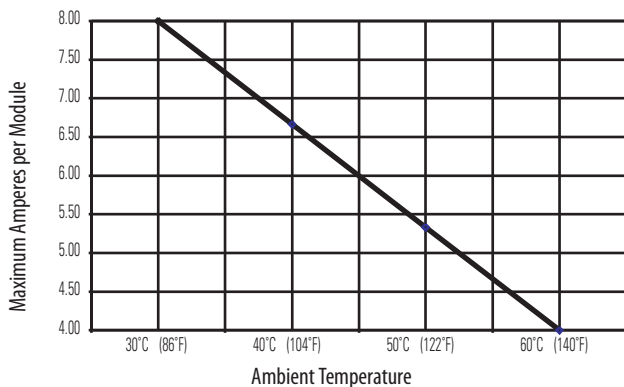


Table 62 - Certifications - 1769-OB32

Certification ⁽¹⁾	1769-OB32
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: <ul style="list-style-type: none"> AS/NZS cispr 11; Industrial Enclosure

(1) When marked. See the Product Certification link at <http://www.ab.com> for Declarations of Conformity, Certificates, and other certification details.



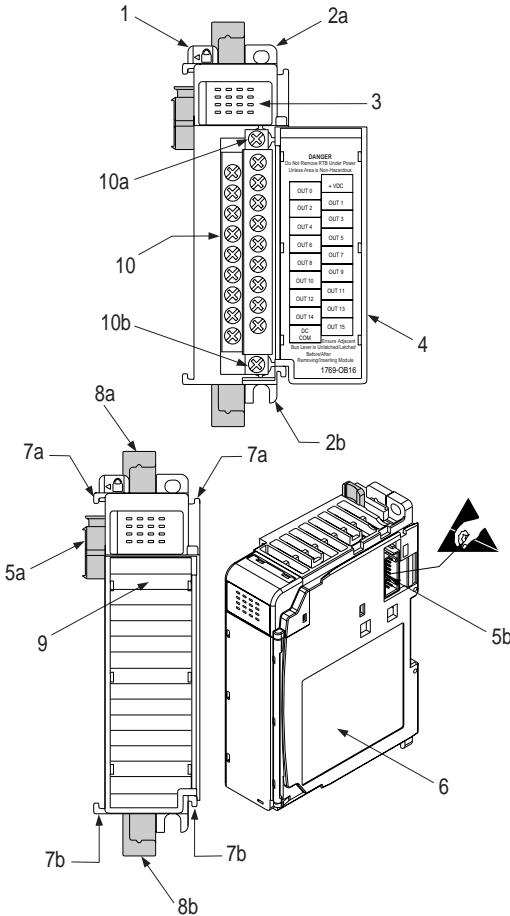
Compact™ 1769-OB16 Solid State 24V dc Source Output Module

Installation Instructions

Inside

Module Description	2
Module Installation	3
System Assembly	4
Mounting Expansion I/O.....	5
Replacing a Single Module within a System	7
Field Wiring Connections	7
I/O Memory Mapping	10
Specifications.....	11
Hazardous Location Considerations	15
Environnements dangereux	15
For More Information	16

Module Description



Item	Description
1	bus lever (with locking function)
2a	upper panel mounting tab
2b	lower panel mounting tab
3	I/O diagnostic LEDs
4	module door with terminal identification label
5a	movable bus connector with female pins
5b	stationary bus connector with male pins
6	nameplate label
7a	upper tongue-and-groove slots
7b	lower tongue-and-groove slots
8a	upper DIN rail latch
8b	lower DIN rail latch
9	write-on label (user ID tag)
10	removable terminal block (RTB) with finger-safe cover
10a	RTB upper retaining screw
10b	RTB lower retaining screw

Module Installation

Compact I/O is suitable for use in an industrial environment when installed in accordance with these instructions. Specifically, this equipment is intended for use in clean, dry environments (Pollution degree 2¹) and to circuits not exceeding Over Voltage Category II² (IEC 60664-1).³

Prevent Electrostatic Discharge



ATTENTION: Electrostatic discharge can damage integrated circuits or semiconductors if you touch bus connector pins. Follow these guidelines when you handle the module:

- Touch a grounded object to discharge static potential.
- Wear an approved wrist-strap grounding device.
- Do not touch the bus connector or connector pins.
- Do not touch circuit components inside the module.
- If available, use a static-safe work station.
- When not in use, keep the module in its static-shield box.

Remove Power



ATTENTION: Remove power before removing or inserting this module. When you remove or insert a module with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field devices, causing unintended machine motion
- causing an explosion in a hazardous environment

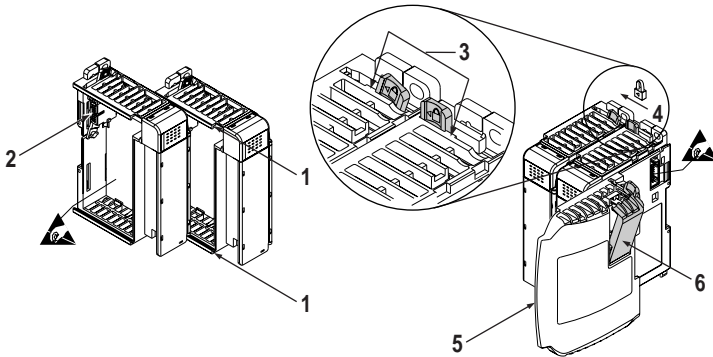
Electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance.

1. Pollution Degree 2 is an environment where, normally, only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation shall be expected.
2. Over Voltage Category II is the load level section of the electrical distribution system. At this level transient voltages are controlled and do not exceed the impulse voltage capability of the product's insulation.
3. Pollution Degree 2 and Over Voltage Category II are International Electrotechnical Commission (IEC) designations.

System Assembly

The module can be attached to the controller or an adjacent I/O module *before* or *after* mounting. For mounting instructions, see “Panel Mounting” on page 5, or “DIN Rail Mounting” on page 6. To work with a system that is already mounted, see “Replacing a Single Module within a System” on page 7.

The following procedure shows you how to assemble the Compact I/O system.



1. Disconnect power.
2. Check that the bus lever of the module to be installed is in the unlocked (fully right) position.
3. Use the upper and lower tongue-and-groove slots (1) to secure the modules together (or to a controller).
4. Move the module back along the tongue-and-groove slots until the bus connectors (2) line up with each other.
5. Push the bus lever back slightly to clear the positioning tab (3). Use your fingers or a small screw driver.
6. To allow communication between the controller and module, move the bus lever fully to the left (4) until it clicks. Ensure it is locked firmly in place.



ATTENTION: When attaching I/O modules, it is very important that the bus connectors are securely locked together to ensure proper electrical connection.

7. Attach an end cap terminator (5) to the last module in the system by using the tongue-and-groove slots as before.
8. Lock the end cap bus terminator (6).

IMPORTANT: A 1769-ECR or 1769-ECL right or left end cap must be used to terminate the end of the serial communication bus.

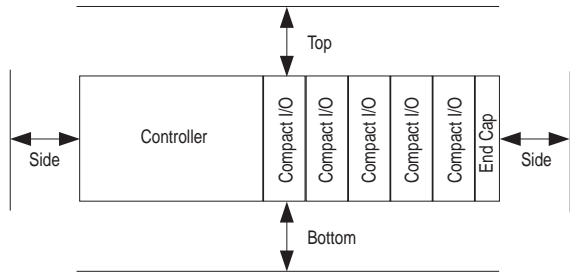
Mounting Expansion I/O



ATTENTION: During panel or DIN rail mounting of all devices, be sure that all debris (metal chips, wire strands, etc.) is kept from falling into the module. Debris that falls into the module could cause damage on power up.

Minimum Spacing

Maintain spacing from enclosure walls, wireways, adjacent equipment, etc. Allow 50 mm (2 in.) of space on all sides for adequate ventilation, as shown:

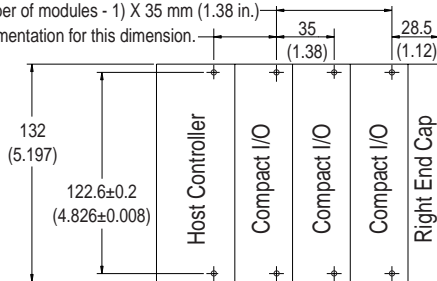


Panel Mounting

Mount the module to a panel using two screws per module. Use M4 or #8 panhead screws. Mounting screws are required on every module.

Panel Mounting Using the Dimensional Template

For more than 2 modules: (number of modules - 1) X 35 mm (1.38 in.)
Refer to host controller documentation for this dimension.



NOTE: All dimensions are in mm (inches). Hole spacing tolerance: ± 0.4 mm (0.016 in.)

Panel Mounting Procedure Using Modules as a Template

The following procedure allows you to use the assembled modules as a template for drilling holes in the panel. If you have sophisticated panel mounting equipment, you can use the dimensional template provided on page 5. Due to module mounting hole tolerance, it is important to follow these procedures:

1. On a clean work surface, assemble no more than three modules.
2. Using the assembled modules as a template, carefully mark the center of all module-mounting holes on the panel.
3. Return the assembled modules to the clean work surface, including any previously mounted modules.
4. Drill and tap the mounting holes for the recommended M4 or #8 screw.
5. Place the modules back on the panel, and check for proper hole alignment.
6. Attach the modules to the panel using the mounting screws.

Note: If mounting more modules, mount only the last one of this group and put the others aside. This reduces remounting time during drilling and tapping of the next group.

7. Repeat steps 1 to 6 for any remaining modules.

DIN Rail Mounting

The module can be mounted using the following DIN rails: 35 x 7.5 mm (EN 50 022 - 35 x 7.5) or 35 x 15 mm (EN 50 022 - 35 x 15).

Before mounting the module on a DIN rail, close the DIN rail latches. Press the DIN rail mounting area of the module against the DIN rail. The latches will momentarily open and lock into place.

Replacing a Single Module within a System

The module can be replaced while the system is mounted to a panel (or DIN rail).

1. Remove power. See important note on page 3.
2. On the module to be removed, remove the upper and lower mounting screws from the module (or open the DIN latches using a flat-blade or phillips style screw driver).
3. Move the bus lever to the right to disconnect (unlock) the bus.
4. On the right-side adjacent module, move its bus lever to the right (unlock) to disconnect it from the module to be removed.
5. Gently slide the disconnected module forward. If you feel excessive resistance, check that the module has been disconnected from the bus, and that both mounting screws have been removed (or DIN latches opened).

Note: It may be necessary to rock the module slightly from front to back to remove it, or, in a panel-mounted system, to loosen the screws of adjacent modules.

6. Before installing the replacement module, be sure that the bus lever on the module to be installed, and on the right-side adjacent module are in the unlocked (fully right) position.
7. Slide the replacement module into the open slot.
8. Connect the modules together by locking (fully left) the bus levers on the replacement module and the right-side adjacent module.
9. Replace the mounting screws (or snap the module onto the DIN rail).

Field Wiring Connections

Grounding the Module

This product is intended to be mounted to a well-grounded mounting surface such as a metal panel. Additional grounding connections from the module's mounting tabs or DIN rail (if used), are not required unless the mounting surface cannot be grounded. Refer to *Industrial Automation Wiring and Grounding Guidelines*, Allen-Bradley publication 1770-4.1, for additional information.

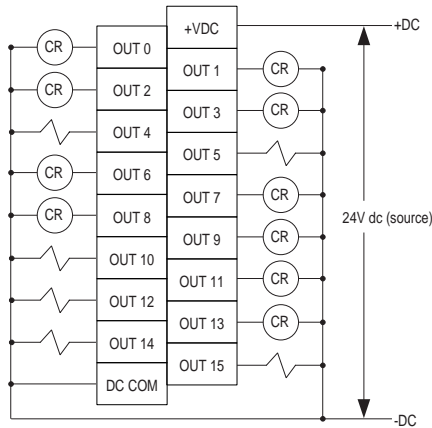
Output Wiring

Basic wiring¹ of output devices² to the 1769-OB16 is shown below.



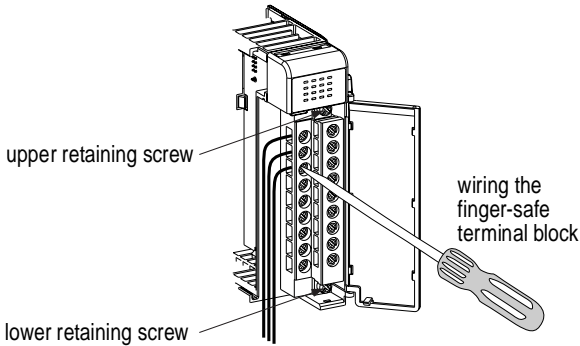
ATTENTION:

- Miswiring of the module to an AC power source or applying reverse polarity will damage the module.
- Be careful when stripping wires. Wire fragments that fall into a module could cause damage at power up. Once wiring is complete, ensure the module is free of all metal fragments.



A removable, write-on label is provided with the module. Remove the label from the door, mark the identification of each terminal with permanent ink, and slide the label back into the door. Your markings (ID tag) will be visible when the module door is closed.

1. **Recommended Surge Suppression** - Use a 1N4004 diode reverse-wired across the load for transistor outputs switching 24V dc inductive loads. For additional details, refer to Industrial Automation Wiring and Grounding Guidelines, Allen-Bradley publication 1770-4.1.
2. **Sourcing Output** - Source describes the current flow between the I/O module and the field device. Sourcing output circuits supply (source) current to sinking field devices. Field devices connected to the negative side (DC Common) of the field power supply are sinking field devices. Field devices connected to the positive side (+V) of the field supply are sourcing field devices. *Europe:* DC sinking input and sourcing output module circuits are the commonly used options.



Removing the Finger-Safe Terminal Block

To remove the terminal block, loosen the upper and lower retaining screws. The terminal block will back away from the module as you remove the screws. When replacing the terminal block, torque the retaining screws to 0.46 Nm (4.1 in-lbs).

Wiring the Finger-Safe Terminal Block

When wiring the terminal block, keep the finger-safe cover in place.

1. Loosen the terminal screws to be wired.
2. Route the wire under the terminal pressure plate. You can use the bare wire or a spade lug. The terminals will accept a 6.35 mm (0.25 in.) spade lug.
3. Tighten the terminal screw making sure the pressure plate secures the wire. Recommended torque when tightening terminal screws is 0.68 Nm (6 in-lbs).

Note: If you need to remove the finger-safe cover, insert a screw driver into one of the square, wiring holes and gently pry the cover off. If you wire the terminal block with the finger-safe cover removed, you will not be able to put it back on the terminal block because the wires will be in the way.

Wire Size and Terminal Screw Torque

Each terminal accepts up to two wires with the following restrictions:

Wire Type		Wire Size	Terminal Screw Torque	Retaining Screw Torque
Solid	Cu-90°C (194°F)	#14 to #22 AWG	0.68 Nm (6 in-lbs)	0.46 Nm (4.1 in-lbs)
Stranded	Cu-90°C (194°F)	#16 to #22 AWG	0.68 Nm (6 in-lbs)	0.46 Nm (4.1 in-lbs)

I/O Memory Mapping

Output Data File

For each module, slot x, word 0 in the output data file contains the control program's directed state of the discrete output points.

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	w	w	w	w	w	w	w	w	w	w	w	w	w	w	w	w

w = write

Output Module's Input Data File

For each module, slot x, input data file word 0 contains the state of the module's output data (output data echo) file word 0. During normal operation, these input bits represent the logic state that the outputs are directed to by the control program. They are also dependent upon the:

- Program Mode configuration (if supported by the controller)
- The Fault Mode configuration (if supported by the controller)

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r

r = read

IMPORTANT: The output module's input data file reflects the output data echo of the module, not necessarily the electrical state of the output terminals. It does not reflect shorted or open outputs.

Note: It is only important to use this input word if the controller supports the Program Mode or Fault Mode function, and if it is configured to use them.

Specifications

General Specifications

Specification	Value
Dimensions	118 mm (height) x 87 mm (depth) x 35 mm (width) height including mounting tabs is 138 mm 4.65 in. (height) x 3.43 in (depth) x 1.38 in (width) height including mounting tabs is 5.43 in.
Approximate Shipping Weight (with carton)	280g (0.61 lbs.)
Storage Temperature	-40°C to +85°C (-40°F to +185°F)
Operating Temperature	0°C to +60°C (32°F to +140°F)
Operating Humidity	5% to 95% non-condensing
Operating Altitude	2000 meters (6561 feet)
Vibration	Operating: 10 to 500 Hz, 5g, 0.015 in. peak-to-peak Relay Operation: 2g
Shock	Operating: 30g panel mounted (20g DIN rail mounted) Relay Operation: 7.5g panel mounted (5g DIN rail mounted) Non-Operating: 40g panel mounted (30g DIN rail mounted)
Agency Certification	<ul style="list-style-type: none"> • C-UL certified (under CSA C22.2 No. 142) • UL 508 listed • CE compliant for all applicable directives
Hazardous Environment Class	Class I, Division 2, Hazardous Location, Groups A, B, C, D (UL 1604, C-UL under CSA C22.2 No. 213)
Radiated and Conducted Emissions	EN50081-2 Class A
<i>Electrical /EMC:</i>	<i>The module has passed testing at the following levels:</i>
• ESD Immunity (IEC1000-4-2)	• 4kV contact, 8 kV air, 4 kV indirect
• Radiated Immunity (IEC1000-4-3)	• 10 V/m, 80 to 1000 MHz, 80% amplitude modulation, +900 MHz keyed carrier
• Fast Transient Burst (IEC1000-4-4)	• 2 kV, 5 kHz
• Surge Immunity (IEC1000-4-5)	• 2 kV common mode, 1 kV differential mode
• Conducted Immunity (IEC1000-4-6)	• 10V, 0.15 to 80 MHz ¹

1. Conducted Immunity frequency range may be 150 kHz to 30 MHz if the Radiated Immunity frequency range is 30 MHz to 1000 MHz.

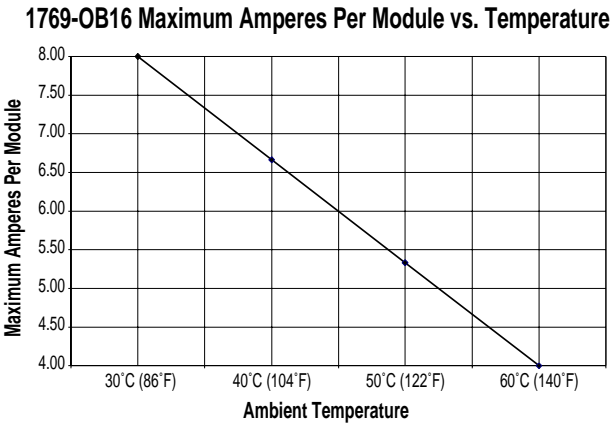
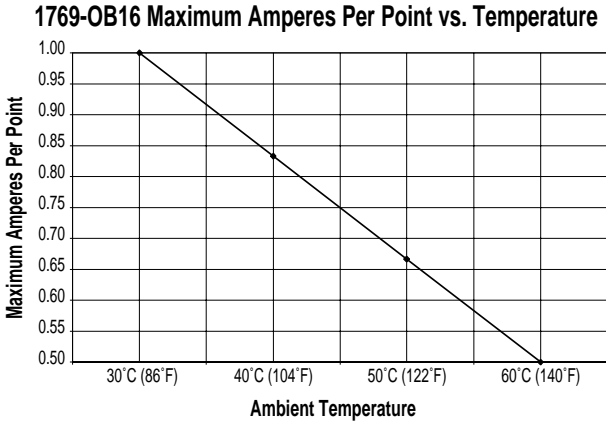
Output Specifications

Specification	1769-OB16
Voltage Category	24V dc
Operating Voltage Range	20.4V dc to 26.4V dc (source ¹)
Number of Outputs	16
Bus Current Draw (max.)	200 mA at 5V dc (1.0W)
Heat Dissipation	2.11 Total Watts (<i>The Watts per point, plus the minimum Watts, with all points energized.</i>)
Signal Delay (max.) – resistive load	turn-on = 0.1 ms turn-off = 1.0 ms
Off-State Leakage (max.) ²	1.0 mA at 26.4V dc
On-State Current (min.)	1.0 mA
On-State Voltage Drop (max.)	1.0V dc
Continuous Current Per Point (max.)	0.5A at 60°C (140°F) <i>See the derating graphs on page 13.</i> 1.0A at 30°C (86°F)
Continuous Current Per Module (max.)	4.0A at 60°C (140°F) <i>See the derating graphs on page 13.</i> 8.0A at 30°C (86°F)
Surge Current (max.) ³	2.0A (Repeatability is once every 2 seconds for a duration of 10 msec.)
Power Supply Distance Rating	8 (The module may not be more than 8 modules away from the power supply.)
Isolated Groups	Group 1: outputs 0 to 15
Output Group to Backplane Isolation	Verified by one of the following dielectric tests: 1200V ac for 1 sec. or 1697V dc for 1 sec. 75V dc working voltage (IEC Class 2 reinforced insulation)
Vendor I.D. Code	1
Product Type Code	7
Product Code	71

- Sourcing Output** - Source describes the current flow between the I/O module and the field device. Sourcing output circuits supply (source) current to sinking field devices. Field devices connected to the negative side (DC Common) of the field power supply are sinking field devices. Field devices connected to the positive side (+V) of the field supply are sourcing field devices. *Europe:* DC sinking input and sourcing output module circuits are the commonly used options.
- Typical Loading Resistor** - To limit the effects of leakage current through solid state outputs, a loading resistor can be connected in parallel with your load. Use a 5.6K ohm, ½ watt resistor for transistor outputs, 24V dc operation.
- Recommended Surge Suppression** - Use a 1N4004 diode reverse-wired across the load for transistor outputs switching 24V dc inductive loads. For additional details, refer to Industrial Automation Wiring and Grounding Guidelines, Allen-Bradley publication 1770-4.1.

Temperature Derating

The area within the curve represents the safe operating range for the module under various conditions of user supplied voltages and ambient temperatures.



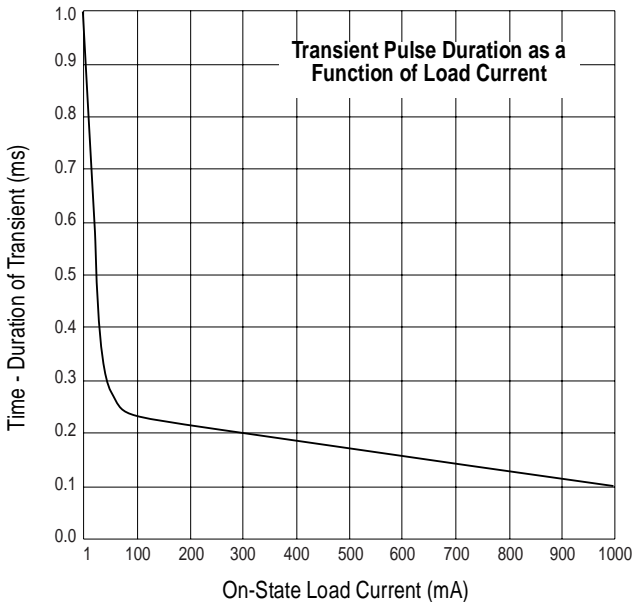
Transistor Output Transient Pulses

The maximum duration of the transient pulse occurs when minimum load is connected to the output. However, for most applications, the energy of the transient pulse is not sufficient to energize the load.



ATTENTION: A transient pulse occurs in transistor outputs when the external DC supply voltage is applied to the output common terminals (e.g. via the master control relay). The sudden application of voltage creates this transient pulse. This condition is inherent in transistor outputs and is common to solid state devices. A transient pulse can occur regardless of the controller having power or not. Refer to your controller's user manual to reduce inadvertent operation.

The graph below illustrates that the duration of the transient is proportional to the load current. Therefore, as the on-state load current increases, the transient pulse decreases. Power-up transients do not exceed the time duration shown below, for the amount of loading indicated, at 60°C (140°F).



Hazardous Location Considerations

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only. The following ATTENTION statement applies to use in hazardous locations.



ATTENTION: EXPLOSION HAZARD

- Substitution of components may impair suitability for Class I, Division 2.
 - Do not replace components or disconnect equipment unless power has been switched off.
 - Do not connect or disconnect components unless power has been switched off.
 - This product must be installed in an enclosure.
-

Environnements dangereux

Cet équipement est conçu pour être utilisé dans des environnements de Classe 1, Division 2, Groupes A, B, C, D ou non dangereux. La mise en garde suivante s'applique à une utilisation dans des environnements dangereux.



ATTENTION: DANGER D'EXPLOSION

- La substitution de composants peut rendre cet équipement impropre à une utilisation en environnement de Classe 1, Division 2.
 - Ne pas remplacer de composants ou déconnecter l'équipement sans s'être assuré que l'alimentation est coupée.
 - Ne pas connecter ou déconnecter des composants sans s'être assuré que l'alimentation est coupée.
 - Ce produit doit être installé dans une armoire.
-

For More Information

For	Refer to this Document	Pub. No.
A more detailed description of how to install and use your Compact I/O with MicroLogix 1500 programmable controller.	<i>MicroLogix 1500 Programmable Controllers User Manual</i>	1764-6.1
More information on proper wiring and grounding techniques.	<i>Industrial Automation Wiring and Grounding Guidelines</i>	1770-4.1

If you would like a manual, you can:

- download a free electronic version from the internet:
www.ab.com/micrologix or www.theautomationbookstore.com
- purchase a printed manual by:
 - contacting your local distributor or Rockwell Automation representative
 - visiting www.theautomationbookstore.com and placing your order
 - calling **1.800.9NEWLIT (800.963.9548)** (USA/Canada)
or **001.330.725.1574** (Outside USA/Canada)

Compact and MicroLogix are trademarks of Rockwell Automation.

Reach us now at www.rockwellautomation.com

Wherever you need us, Rockwell Automation brings together leading brands in industrial automation including Allen-Bradley controls, Reliance Electric power transmission products, Dodge mechanical power transmission components, and Rockwell Software. Rockwell Automation's unique, flexible approach to helping customers achieve a competitive advantage is supported by thousands of authorized partners, distributors and system integrators around the world.

Americas Headquarters, 1201 South Second Street, Milwaukee, WI 53204, USA, Tel: (1) 414 382-2000, Fax: (1) 414 382-4444
European Headquarters SA/NV, avenue Hermann Debroux, 46, 1180 Brussels, Belgium, Tel: (32) 2 663 06 00, Fax: (32) 2 663 06 40
Asia Pacific Headquarters, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846



Publication 1769-5.4 - January 1999

40071-049-01(A)

© 1999 Rockwell International. All Rights Reserved. Printed in USA



Compact I/O Analog Output Module

Catalog Number 1769-OF4

Topic	Page
Important User Information	2
Electrostatic Discharge	3
Remove Power	3
Hazardous Location	4
Environnements dangereux	4
About the 1769-OF4 Module	5
Install the 1769-OF4 Module	6
Replacement Parts	10
Field Wiring Connections	10
Specifications	19
Additional Resources	22

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (Publication [SGI-1.1](#) available from your local Rockwell Automation sales office or online at <http://literature.rockwellautomation.com>) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.





In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

Reproduction of the contents of this manual, in whole or in part, without written permission of Rockwell Automation, Inc., is prohibited.

Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

<p>WARNING</p> 	<p>Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.</p>
<p>IMPORTANT</p>	<p>Identifies information that is critical for successful application and understanding of the product.</p>
<p>ATTENTION</p> 	<p>Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard and recognize the consequences.</p>
<p>SHOCK HAZARD</p> 	<p>Labels may be on or inside the equipment (for example, drive or motor) to alert people that dangerous voltage may be present.</p>
<p>BURN HAZARD</p> 	<p>Labels may be on or inside the equipment (for example, drive or motor) to alert people that surfaces may reach dangerous temperatures.</p>

Electrostatic Discharge

ATTENTION

Electrostatic discharge can damage integrated circuits or semiconductors if you touch bus connector pins. Follow these guidelines when you handle the module:

- Touch a grounded object to discharge static potential.
 - Wear an approved wrist-strap grounding device.
 - Do not touch the bus connector or connector pins.
 - Do not touch circuit components inside the module.
 - Use a static-safe work station, if available.
 - Keep the module in its static-shield box when not in use.
-

Remove Power

ATTENTION

Remove power before removing or inserting this module. When you remove or insert a module with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field devices, causing unintended machine motion.
- causing an explosion in a hazardous environment.

Electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance.

Hazardous Location

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only. The following statement applies to use in hazardous locations.

WARNING



EXPLOSION HAZARD

Substitution of components may impair suitability for Class I, Division 2.

Do not replace components or disconnect equipment unless power is switched off or the area is known to be non-hazardous.

Do not connect or disconnect components unless power is switched off or the area is known to be non-hazardous.

This product must be installed in an enclosure.

All wiring must comply with Class I, Division 2 wiring methods of Article 501 of the National Electrical Code and/or in accordance with Section 18-1J2 of the Canadian Electrical Code, and in accordance with the authority having jurisdiction.

Environnements dangereux

Cet équipement est conçu pour être utilisé dans des environnements de Classe 1, Division 2, Groupes A, B, C, D ou non dangereux. La mise en garde suivante s'applique à une utilisation dans des environnements dangereux.

AVERTISSEMENT



DANGER D'EXPLOSION

La substitution de composants peut rendre cet équipement impropre à une utilisation en environnement de Classe 1, Division 2.

Ne pas remplacer de composants ou déconnecter l'équipement sans s'être assuré que l'alimentation est coupée et que l'environnement est classé non dangereux.

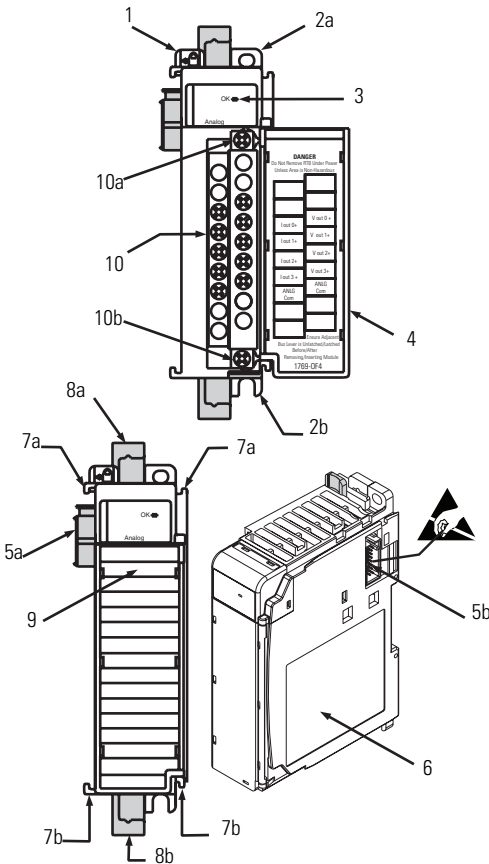
Ne pas connecter ou déconnecter des composants sans s'être assuré que l'alimentation est coupée ou que l'environnement est classé non dangereux.

Ce produit doit être installé dans une armoire.

About the 1769-OF4 Module

Compact I/O is suitable for use in an industrial environment when installed in accordance with these instructions. Specifically, this equipment is intended for use in clean, dry environments (Pollution degree 2⁽¹⁾) and for circuits not exceeding Over Voltage Category II⁽²⁾ (IEC 60664-1)⁽³⁾.

Module Description



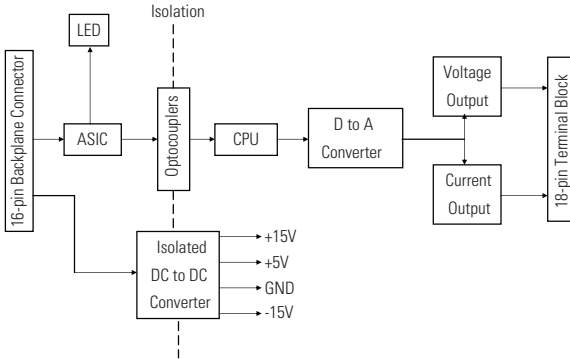
Item	Description
1	Bus lever (with locking function)
2a	Upper panel mounting tab
2b	Lower panel mounting tab
3	Module status indicator
4	Module door with terminal identification label
5a	Movable bus connector with female pins
5b	Stationary bus connector with male pins
6	Nameplate label
7a	Upper tongue-and-groove slots
7b	Lower tongue-and-groove slots
8a	Upper DIN rail latch
8b	Lower DIN rail latch
9	Write-on label (user ID tag)
10	Removable terminal block (RTB) with finger-safe cover
10a	RTB upper retaining screw
10b	RTB lower retaining screw

(1) Pollution Degree 2 is an environment where, normally, only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is expected.

(2) Over Voltage Category II is the load level section of the electrical distribution system. At this level, transient voltages are controlled and do not exceed the impulse voltage capability of the product's insulation.

(3) Pollution Degree 2 and Over Voltage Category II are International Electrotechnical Commission (IEC) designations.

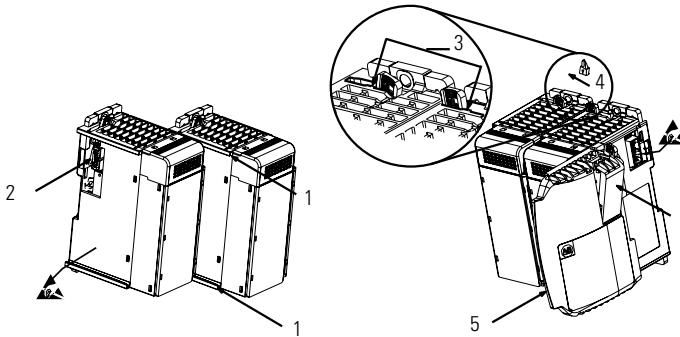
Simplified Block Diagram



Install the 1769-OF4 Module

Attach the module to the controller or an adjacent I/O module before or after mounting. For mounting instructions, see *Mount Module to Panel by Using the Dimensional Template*, or *Mount Module to a DIN Rail*. To work with a system that is already mounted, see [Replace a Single Module within a System on page 7](#).

The following procedure shows you how to assemble the Compact I/O system.



1. Disconnect power.
2. Check that the bus lever of the module to be installed is in the unlocked (fully right) position.
3. Use the upper and lower tongue-and-groove slots (1) to secure the modules together or to a controller.

4. Move the module back along the tongue-and-groove slots until the bus connectors (2) line up with each other.
5. Push the bus lever back slightly to clear the positioning tab (3).

Use your fingers or a small screwdriver.

6. To allow communication between the controller and module, move the bus lever fully to the left (4) until it clicks, making sure it is locked firmly in place.

ATTENTION

When attaching I/O modules, it is very important that the bus connectors are securely locked together to be sure of proper electrical connection. Securely locking together the bus connectors is required for use in hazardous locations.

For more information on hazardous locations, see [page 4](#).

7. Attach an end-cap terminator (5) to the last module in the system by using the tongue-and-groove slots as before.
8. Lock the end-cap bus terminator (6).

IMPORTANT

You must use a 1769-ECR (right) or 1769-ECL (left) end cap to terminate the end of the serial communication bus. An I/O configuration fault will occur if an end cap is not used.

Replace a Single Module within a System

The module can be replaced while the system is mounted to a panel or DIN rail.

1. Remove power.

See [Remove Power on page 3](#).

2. Remove the upper and lower mounting screws from the module or open the DIN latches by using a flat-blade or Phillips screwdriver.
3. Move the bus lever to the right to disconnect or unlock the bus.
4. On the right-side adjacent module, move its bus lever to the right (unlock) to disconnect it from the module to be removed.

5. Gently slide the disconnected module forward.

If you feel excessive resistance, check that the module is disconnected from the bus and that both mounting screws are removed or DIN latches opened.

TIP

It may be necessary to rock the module slightly from front to back to remove it, or, in a panel-mounted system, to loosen the screws of adjacent modules.

6. Be sure that the bus lever on the module and on the right-side adjacent module are in the unlocked (fully right) position before installing the replacement module.
7. Slide the replacement module into the open slot.
8. Connect the modules by locking (fully left) the bus levers on the replacement module and the right-side adjacent module.
9. Replace the mounting screws or snap the module onto the DIN rail.

Mount Expansion I/O

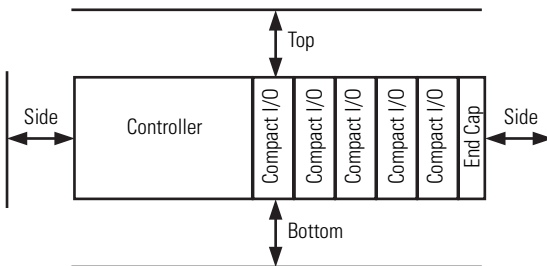
ATTENTION



During panel or DIN rail mounting of all devices, be sure that all debris, that is, metal chips or wire strands, is kept from falling into the module. Debris that falls into the module could cause damage when cycling power.

Minimum Spacing

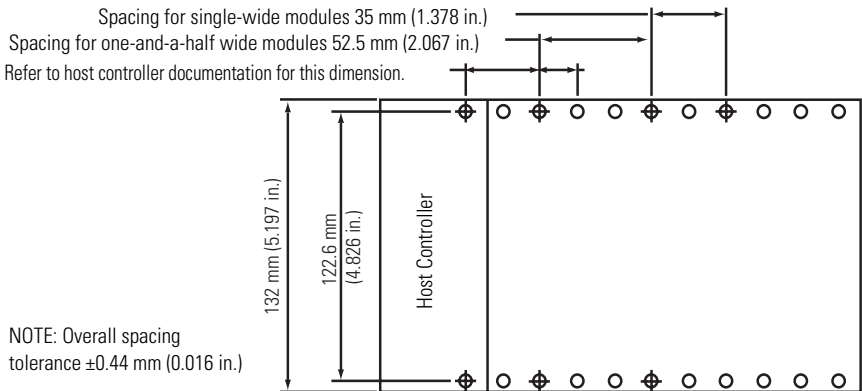
Maintain spacing from enclosure walls, wireways, or adjacent equipment. Allow 50 mm (2 in.) of space on all sides for adequate ventilation, as shown.



Mount Module to Panel

Mount the module to a panel by using two screws per module. Use M4 or #8 panhead screws. Mounting screws are required on every module.

Mount Module to Panel by Using the Dimensional Template



Locate holes every 17.5 mm (0.689 in.) to allow for a mix of single-wide and one-and-a-half-wide modules (for example, the 1769-OA16 module).

Mount Module to Panel by Using Modules as a Template

This procedure lets you use the assembled modules as a template for drilling holes in the panel. See [Mount Module to Panel by Using the Dimensional Template on page 9](#) if you have sophisticated panel mounting equipment.

On a clean work surface, assemble no more than three modules.

Due to module-mounting hole tolerance, it is important to follow this procedure.

1. Using the assembled modules as a template, carefully mark the center of all module-mounting holes on the panel.
2. Return the assembled modules to the clean work surface, including any previously mounted modules.
3. Drill and tap the mounting holes for the recommended M4 or #8 screws.
4. Place the modules back on the panel, and check for proper hole alignment.

5. Attach the modules to the panel by using the mounting screws.

TIP

If mounting more modules, mount only the last one of this group and put the others aside. This reduces the remounting time during drilling and tapping of the next group.

6. Repeat steps 1 to 6 for any remaining modules.

Mount Module to a DIN Rail

The module can be mounted by using these DIN rails:

- 35 x 7.5 mm (EN 50 022 - 35 x 7.5)
- 35 x 15 mm (EN 50 022 - 35 x 15)

To mount the module on a DIN rail, follow these steps.

1. Close the DIN rail latches.
2. Press the DIN-rail mounting area of the module against the DIN rail.

The latches will momentarily open and lock into place.

Replacement Parts

The 1769-OF4 module has the following replacement parts:

- Terminal block, catalog no. 1769-RTBN10 (1 per kit)
- Door, catalog no. 1769-RD (2 per kit)

Field Wiring Connections

This section includes information on the following topics:

- Module grounding
- System wiring guidelines
- Module wiring
- Analog outputs wiring
- Terminal labeling
- Finger-safe terminal block wiring and removal
- Wire size and terminal screw torque
- Module configuration

Ground the Module

This product is intended to be mounted to a well-grounded mounting surface such as a metal panel. Additional grounding connections from the module's mounting tabs or DIN rail, if used, are not required unless the mounting surface cannot be grounded. Refer to Industrial Automation Wiring and Grounding Guidelines, Allen-Bradley publication [1770-4.1](#), for additional information.

System Wiring Guidelines

Consider the following when wiring your system:

- All module commons (ANLG COM) are connected in the analog module.
- The analog common (ANLG COM) is not connected to earth ground inside the module.
- Channels are not isolated from each other.
- Use Belden 8761, or equivalent, shielded wire.
- Under normal conditions, the drain wire and shield junction must be connected to earth ground via a panel or DIN rail mounting screw at the analog I/O module end. Keep the shield connection to ground as short as possible.⁽¹⁾
- For optimum accuracy, limit overall cable impedance by keeping your cable as short as possible. Locate the I/O system as close to your sensors or actuators as your application will permit.⁽²⁾
- Voltage outputs (Vout 0+...Vout 3+) of the 1769-OF4 module are referenced to ANLG COM. Load resistance for a voltage output channel must be equal to or greater than 1K Ω .
- Current outputs (Iout 0+...Iout 3+) of the 1769-OF4 module source current that returns to ANLG COM. Load resistance for a current output channel must remain between 0 and 600 Ω .

ATTENTION

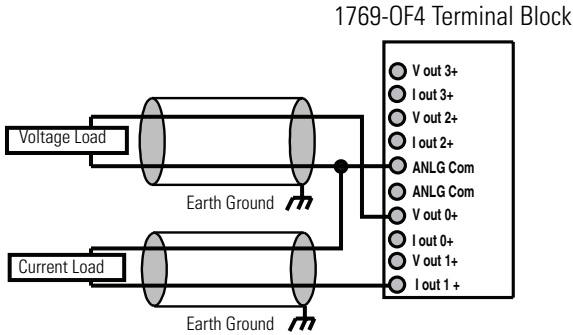


Be careful when stripping wires. Wire fragments that fall into a module can cause damage at power up. Once wiring is complete, make sure the module is free of all metal fragments.

(1) In environments where high-frequency noise may be present, it may be necessary to directly ground cable shields to earth at the module end and via a 0.01 μ F, 2000V capacitor at the sensor end.

(2) Cable length over 50 meters may impact accuracy. For details, refer to the Compact I/O Analog Output Module User Manual, publication [1769-UM020](#).

Wire Analog Outputs



ATTENTION



Analog outputs may fluctuate for less than a second when power is applied or removed. This characteristic is common to most analog outputs. While the majority of loads will not recognize this short signal, take preventive measures to make sure that connected equipment is not affected. Failure to take these preventative measures may result in unexpected load reactions.

Label the Terminals

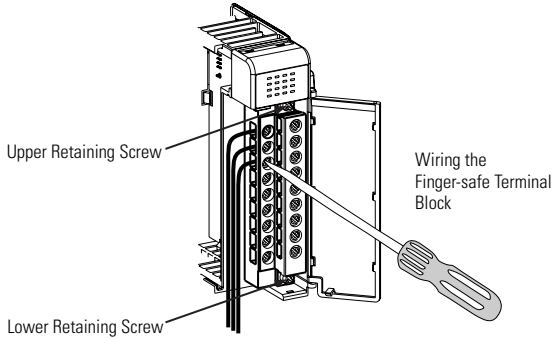
A removable, write-on label is provided with the module. Remove the label from the door, mark the identification of each terminal with permanent ink, and slide the label back into the door. Your markings (ID tag) will be visible when the module door is closed.

Remove the Finger-safe Terminal Block

When wiring field devices to the module, it is not necessary to remove the terminal block. If you remove the terminal block, use the write-on label on the side of the terminal block to identify the module slot location and type.



To remove the terminal block, loosen the upper and lower retaining screws. The terminal block will back away from the module as you remove the screws. When replacing the terminal block, torque the retaining screws to 0.46 N•m (4.1 lb•in).



Wire the Finger-safe Terminal Block

When wiring the terminal block, keep the finger-safe cover in place.

1. Loosen the terminal screws to be wired.
2. Route the wire under the terminal pressure plate.

You can use the bare wire or a spade lug. The terminals will accept a 6.35 mm (0.25 in.) spade lug.

TIP

The terminal screws are non-captive. Therefore, it is possible to use a ring lug [maximum 1/4 inch o.d. with a 0.139 inch minimum i.d. (M3.5)] with the module.

3. Tighten the terminal screw making sure the pressure plate secures the wire. Recommended torque when tightening terminal screws is 0.68 N•m (6 lb•in).

TIP

If you need to remove the finger-safe cover, insert a screw driver into one of the square wiring holes and gently pry the cover off. If you wire the terminal block with the finger-safe cover removed, you will not be able to put it back on the terminal block because the wires will be in the way.

Wire Size and Terminal Screw Torque

Each terminal accepts two wires with the following restrictions.

Wire Type		Wire Size	Terminal Screw Torque	Retaining Screw Torque
Solid	Cu-90 °C (194 °F)	14...22 AWG (2.08...0.33 mm ²)	0.68 N•m (6 lb•in)	0.46 N•m (4.1 lb•in)
Stranded	Cu-90 °C (194 °F)	16...22 AWG (1.31...0.33 mm ²)	0.68 N•m (6 lb•in)	0.46 N•m (4.1 lb•in)

Configure the 1769-OF4 Module

The following I/O memory mapping lets you configure the 1769-OF4 module.

Output Data File

For each module, slot x, words 0...3 in the output data file contain the control program's directed state of the module's analog output channels. Word 4 contains the cancel output-channel-clamp alarm control bits.

Word/Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Word 0	SGN	Analog Output Data Channel 0														
Word 1	SGN	Analog Output Data Channel 1														
Word 2	SGN	Analog Output Data Channel 2														
Word 3	SGN	Analog Output Data Channel 3														
Word 4	NU	NU	NU	NU	NU	NU	NU	NU	CL O3	CH O3	CL O2	CH O2	CL O1	CH O1	CL O0	CH O0

The bits are defined as follows:

- SGN = Sign bit in 2's complement format.
- NU = Not used. Bit must be set to 0.
- CHOx = Cancel High Clamp Alarm Latch for Output x: Allows each output high-clamp-alarm latch to be individually cancelled. NOTE: Cancel = 1.
- CLOx = Cancel Low Clamp Alarm Latch for Output x: Allows each output low-clamp-alarm-latch to be individually cancelled. NOTE: Cancel = 1.

Input Data File

For each module, slot x, word 0 in the input data file contains the status bits for the module's analog output channels. Words 1...4 contain the directed values of the analog output channels (output data echo).

Word/Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Word 0	U3	O3	U2	O2	U1	O1	U0	O0	NU	NU	NU	NU	S3	S2	S1	S0
Word 1	SGN	Output Data Loopback/Echo Channel 0														
Word 2	SGN	Output Data Loopback/Echo Channel 1														
Word 3	SGN	Output Data Loopback/Echo Channel 2														
Word 4	SGN	Output Data Loopback/Echo Channel 3														

The bits are defined as follows:

- SGN = Sign bit in 2's complement format.
- NU = Not Used. Bit must be set to 0.
- Sx = General Status bit for output channels 0...3.
- Ox = Over range flag bits for output channels 0...3.
- Ux = Under range flag bits for output channels 0...3.

Configuration Data File

The manipulation of bits from this file is normally done with programming software (for example, RSLogix 500 software or RSNetWorx for DeviceNet software) during initial configuration of the system. In that case, graphical screens provided by the programming software simplify configuration.

Some systems, like the 1769-ADN DeviceNet adapter system, also allow the bits to be altered as part of the control program using communication rungs. In that case, it is necessary to understand the bit arrangement, shown on the following page.

Configuration Data File

Word/Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00	
Word 0	EC	NU						EHI	ELI	LC	ER	FM	PM	NU	PFE		
Word 1	NU					Format Ch0			NU			Type/Range Sel Ch0					
Word 2	SGN	Fault Value Channel 0															
Word 3	SGN	Program (Idle) Value Channel 0															
Word 4	SGN	Clamp High Data Value Channel 0															
Word 5	SGN	Clamp Low Data Value Channel 0															
Word 6	SGN	Ramp Rate Channel 0															
Word 7	NU																
Word 8	EC	NU						EHI	ELI	LC	ER	FM	PM	NU	PFE		
Word 9	NU					Format Ch1			NU			Type/Range Sel Ch1					
Word 10	SGN	Fault Value Channel 1															
Word 11	SGN	Program (Idle) Value Channel 1															
Word 12	SGN	Clamp High Data Value Channel 1															
Word 13	SGN	Clamp Low Data Value Channel 1															
Word 14	SGN	Ramp Rate Channel 1															
Word 15	NU																
Word 16	EC	NU						EHI	ELI	LC	ER	FM	PM	NU	PFE		
Word 17	NU					Format Ch2			NU			Type/Range Sel Ch2					
Word 18	SGN	Fault Value Channel 2															
Word 19	SGN	Program (Idle) Value Channel 2															
Word 20	SGN	Clamp High Data Value Channel 2															
Word 21	SGN	Clamp Low Data Value Channel 2															
Word 22	SGN	Ramp Rate Channel 2															
Word 23	NU																
Word 24	EC	NU						EHI	ELI	LC	ER	FM	PM	NU	PFE		
Word 25	NU					Format Ch3			NU			Type/Range Sel Ch3					
Word 26	SGN	Fault Value Channel 3															
Word 27	SGN	Program (Idle) Value Channel 3															
Word 28	SGN	Clamp High Data Value Channel 3															
Word 29	SGN	Clamp Low Data Value Channel 3															
Word 30	SGN	Ramp Rate Channel 3															
Word 31	NU																

The bits are defined as follows:

- SGN = Sign bit in 2's complement format.
- EC = Enable Channel.
- NU = Not used. Bit must be set to 0.
- EHI = Enable Output Channel Interrupt on High Clamp Alarm.⁽¹⁾
- ELI = Enable Output Channel Interrupt on Low Clamp Alarm.⁽¹⁾
- LC = Latch Low/High Clamp and Under/Over Range Alarm.
- ER = Enable Ramping.⁽¹⁾
- FM = Enable Fault Alternate Output State mode.⁽¹⁾
- PM = Enable Program/Idle Alternate Output State mode.⁽¹⁾
- PFE = Enable Program/Idle to Fault Alternate Output State mode.⁽¹⁾
- Format Chx = Output Data Format Select.
- Type/Range Sel Chx = Output Type/Range Select.
- Fault Value Channel x = Provides the ability to configure the Fault mode alternate output value.⁽¹⁾
- Program (Idle) Value Channel x = Provides the ability to configure the Program (Idle) alternate output value.⁽¹⁾
- Clamp High Data Value Channel x = Provides the ability to configure the output high clamp value.
- Clamp Low Data Value Channel x = Provides the ability to configure the output low clamp value.
- Ramp Rate Channel x = Provides the ability to configure the Ramp Rate.⁽¹⁾

(1) Interrupts, ramping, and alternate output states are not supported by all controllers. Refer to your controller's user manual to determine if these functions are available.

Range and Data Format Selections

Define	To Select	Make these bit settings															
		15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Type / Range Select	-10...+10V DC													0	0	0	0
	0...5V DC													0	0	0	1
	0...10V DC													0	0	1	0
	4...20 mA													0	0	1	1
	1...5V DC													0	1	0	0
	0...20 mA													0	1	0	1
Data Format Select	Raw/ Proportional Counts						0	0	0								
	Engineering Units						0	0	1								
	Scaled for PID						0	1	0								
	Percent Range						0	1	1								

Specifications

Compact I/O Analog Output Module - 1769-OF4

Attribute	Value
Dimensions (HxWxD), approx.	118 x 35 x 87 mm Height including mounting tabs is 138 mm (5.43 in.) 4.65 x 1.38 x 3.43 in. Height including mounting tabs is 138 mm (5.43 in.)
Approximate shipping weight (with carton)	280 g (0.61 lb)
Storage temperature	-40...+85 °C (-40...+185 °F)
Operating temperature	0...+60 °C (32...+140 °F)
Operating humidity	5...95% noncondensing
Operating altitude	2000 m (6561 ft)
Vibration, operating	10...500 Hz, 5 G, 0.030 in. peak-to-peak
Shock, operating	30 G, 11 ms panel mounted (20G, 11 ms DIN rail mounted)
Shock, nonoperating	40G panel mounted (30G DIN rail mounted)
Bus current draw, max	120 mA at 5V DC; 170 mA at 24V DC
Heat dissipation	2.86 Total Watts (<i>The Watts per point plus the minimum Watts with all points energized.</i>)
Module OK indicator	On: module has power, has passed internal diagnostics, and is communicating over the bus. Off: Any of the above is not true.
System Power Supply Distance Rating	The module may not be more than 8 modules away from the system power supply.
Recommended Cable	Belden 8761 (shielded)
ESD Immunity (IEC1000-4-2)	4 kV contact, 8 kV air, 4 kV indirect
Radiated Immunity (IEC1000-4-3)	10 V/m, 80...1000 MHz, 80% amplitude modulation
Fast Transient Burst (IEC1000-4-4)	2 kV, 5 kHz
Surge Immunity (IEC1000-4-5)	1 kV galvanic gun
Conducted Immunity (IEC1000-4-6)	10V, 0.15...80 MHz
Vendor I.D. Code	1
Product Type Code	10
Product Code	48
Input Words	5
Output Words	5
Configuration Words	32

Certifications

Certification	Value
Agency Certification	<ul style="list-style-type: none"> • C-UL certified (under CSA C22.2 No. 142) • UL 508 listed • CE compliant for all applicable directives
Hazardous Environment Class	Class I, Division 2, Hazardous Location, Groups A, B, C, D (UL 1604, C-UL under CSA C22.2 No. 213)
Radiated and Conducted Emissions	EN50011 Class A

Output Specifications

Attribute	Value
Analog Normal Operating Ranges ⁽¹⁾	0...20 mA, 4...20 mA, +/-10V DC, 0...10V DC, 0...5 V DC, 1...5V DC
Full Scale Analog Ranges ⁽¹⁾	0...21 mA, 3.2...21 mA, +/-10.5V DC, -0.5...10.5V DC, -0.5... 5.25V DC, 0.5... 5.25V DC
Number of Outputs	Four single-ended, voltage or current
Digital Resolution Across Full Range	15 bits plus sign unipolar and bipolar
Conversion Rate (all channels) max.	Interrupts not enabled: 2.5 ms Interrupts enabled: 3.8 ms
Step Response to 63% ⁽²⁾	2.9 ms
Resistive Load	Current: 0...600 Ω (includes wire resistance) Voltage: 1 K Ω or greater
Max. Inductive Load	0.1 mH (current loads), 1.0 uF (voltage loads)
Field Calibration	None required
Overall Accuracy ⁽³⁾	0.5% full scale at 25 °C (77 °F)

(1) The over- or under-range flag will come on when either the High Clamp or the Low Clamp values are exceeded. When either range flag is set, the module clamps the corresponding channel's output to the High Clamp or the Low Clamp value. Unless latched, the flag automatically resets when directed to a value between the High Clamp and the Low Clamp values. The output channel value always returns to normal operation when directed to a value allowed by the High Clamp and Low Clamp values (even if latching of the Clamp status bits is enabled).

(2) Step response is the period of time between when the D/A converter was instructed to go from minimum to full range until the device is at 63% of full range.

(3) Includes offset, gain, drift, non-linearity, and repeatability error terms.

Attribute	Value
Accuracy Drift with Temperature	$\pm 0.0086\%$ of full scale per °C
Output Ripple ⁽¹⁾ range 0...50 kHz (referred to output range)	$\pm 0.05\%$
Non-linearity (in percent full scale)	$\pm 0.05\%$
Repeatability ⁽²⁾ (in percent full scale)	$\pm 0.05\%$
Output Error Over Full Temperature Range (0...60 °C [+32...140 °F])	$\pm 0.8\%$ of full scale
Open and Short-circuit protection	Yes
Maximum Short-circuit current	40 mA
Output overvoltage protection	Yes
Rated working voltage	30V AC/30V DC
Output group to bus isolation	510V AC or 720V DC for 1 minute (qualification test) 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation)
Channel diagnostics	High or Low Clamps Limit Exceeded, by status bit reporting
Output response at system power up and power down	2.5...-1.0V DC spike for less than 15 ms
Output Impedance	Voltage output: $< 1 \Omega$ Current output: $> 1 M\Omega$

(1) Output ripple is the amount a fixed output varies with time, assuming a constant load and temperature.

(2) Repeatability is the ability of the output module to reproduce output readings when the same controller value is applied to it consecutively, under the same conditions and in the same direction.

Additional Resources

For more information refer to the following publications.

Resource	Description
Compact I/O Analog Output Module User Manual, publication 1769-UM020 .	Provides details on installing, configuring, operating, and troubleshooting your 1769-OF4 module
1768 CompactLogix Controllers User Manual, publication number 1768-UM001	Detailed description of how to install and use your 1768 CompactLogix controller
MicroLogix 1200 and MicroLogix 1500 Programmable Controllers User Manual, publication number 1762-RM001	Detailed description of how to install and use your Compact I/O with MicroLogix 1200/1500 programmable controllers
1769-ADN DeviceNet Adapter User Manual, publication number 1769-UM001	Detailed description of how to install and use your Compact I/O system with the 1769-ADN DeviceNet adapter
CompactLogix System User Manual, publication number 1769-UM007	Detailed description of how to install and use your Compact I/O system with the CompactLogix system
Industrial Automation Wiring and Grounding Guidelines, publication number, publication number 1770-4.1	More information on proper wiring and grounding techniques

You can view or download publications at <http://literature.rockwellautomation.com>. To order paper copies of technical documentation, contact your local Rockwell Automation distributor or sales representative.

Notes:

Rockwell Automation Support

Rockwell Automation provides technical information on the web to assist you in using its products. At <http://support.rockwellautomation.com>, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://support.rockwellautomation.com>.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running:

United States	1.440.646.3223 Monday – Friday, 8 a.m. – 5 p.m. EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these instructions.

United States	Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.

Compact I/O, TechConnect, CompactLogix, MicroLogix, RSLogix 500, and RSNetWorx for DeviceNet are trademarks of Rockwell Automation, Inc.

Trademarks not belonging to Rockwell Automation are property of their respective companies.

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444

Europe/Middle East/Africa: Rockwell Automation, Vorstlaan/Boulevard du Souverain 36, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640

Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Publication 1769-IN087A-EN-P - August 2009

PN-47822

Copyright © 2009 Rockwell Automation, Inc. All rights reserved. Printed in Japan.



Compact I/O End Caps/Terminators

Catalog Numbers 1769-ECL, 1769-ECR

Topic	Page
Important User Information	2
Environment and Enclosure	3
North American Hazardous Location Approval	4
European Hazardous Location Approval - 1769-ECR Only	5
1769-ECL Left End Cap	6
1769-ECL Dimensions	6
1769-ECR Right End Cap	7
1769-ECR Dimensions	8
Specifications	9

About the End Caps/Terminators

The 1769 controllers, such as the 1769-L32E, require end caps. A 1769-ECR right end cap or 1769-ECL left end cap terminates the end of the communication bus. Use this guide to install either end cap.

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at <http://literature.rockwellautomation.com>) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.





In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

Reproduction of the contents of this manual, in whole or in part, without written permission of Rockwell Automation, Inc., is prohibited.

Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

WARNING 	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION 	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard and recognize the consequences.
SHOCK HAZARD 	Labels may be on or inside the equipment (for example, drive or motor) to alert people that dangerous voltage may be present.
BURN HAZARD 	Labels may be on or inside the equipment (for example, drive or motor) to alert people that surfaces may reach dangerous temperatures.

Environment and Enclosure

ATTENTION

This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters (6562 ft) without derating.

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

This equipment is supplied as open-type equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The enclosure must have suitable flame-retardant properties to prevent or minimize the spread of flame, complying with a flame spread rating of 5VA, V2, V1, V0 (or equivalent) if non-metallic. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

In addition to this publication, see:

- Industrial Automation Wiring and Grounding Guidelines, for additional installation requirements, Allen-Bradley publication [1770-4.1](#).
- NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure.

Prevent Electrostatic Discharge



ATTENTION



This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wriststrap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- Use a static-safe workstation, if available.
- Store the equipment in appropriate static-safe packaging when not in use.

North American Hazardous Location Approval

The following information applies when operating this equipment in hazardous locations.	Informations sur l'utilisation de cet équipement en environnements dangereux.
<p>Products marked "CL I, DIV 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, D, Hazardous Locations and nonhazardous locations only. Each product is supplied with markings on the rating nameplate indicating the hazardous location temperature code. When combining products within a system, the most adverse temperature code (lowest "T" number) may be used to help determine the overall temperature code of the system. Combinations of equipment in your system are subject to investigation by the local Authority Having Jurisdiction at the time of installation.</p>	<p>Les produits marqués "CL I, DIV 2, GP A, B, C, D" ne conviennent qu'à une utilisation en environnements de Classe I Division 2 Groupes A, B, C, D dangereux et non dangereux. Chaque produit est livré avec des marquages sur sa plaque d'identification qui indiquent le code de température pour les environnements dangereux. Lorsque plusieurs produits sont combinés dans un système, le code de température le plus défavorable (code de température le plus faible) peut être utilisé pour déterminer le code de température global du système. Les combinaisons d'équipements dans le système sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation.</p>
<p>WARNING</p> 	<p>EXPLOSION HAZARD -</p> <ul style="list-style-type: none"> • Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous. Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous. • Do not disconnect connections to this equipment unless power has been removed or the area is known to be nonhazardous. Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product. • Substitution of components may impair suitability for Class I, Division 2. • If this product contains batteries, they must only be changed in an area known to be nonhazardous.
<p>AVERTISSEMENT</p> 	<p>RISQUE D'EXPLOSION –</p> <ul style="list-style-type: none"> • Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement. • Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs. Fixer tous les connecteurs externes reliés à cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens fournis avec ce produit. • La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2. • S'assurer que l'environnement est classé non dangereux avant de changer les piles.

European Hazardous Location Approval - 1769-ECR Only

European Zone 2 Certification (The following applies when the product bears the Ex or EEx Marking)

This equipment is intended for use in potentially explosive atmospheres as defined by European Union Directive 94/9/EC and has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of Category 3 equipment intended for use in potentially explosive atmospheres, given in Annex II to this Directive.

Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 60079-15 and EN 60079-0.

WARNING



- This equipment must be installed in an enclosure providing at least IP54 protection when applied in Zone 2 environments.
 - This equipment shall be used within its specified ratings defined by Allen-Bradley.
 - Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.
-

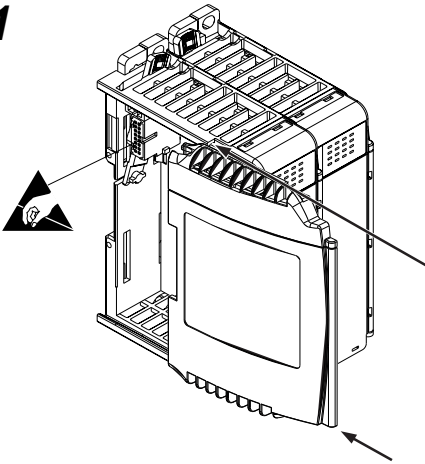
ATTENTION



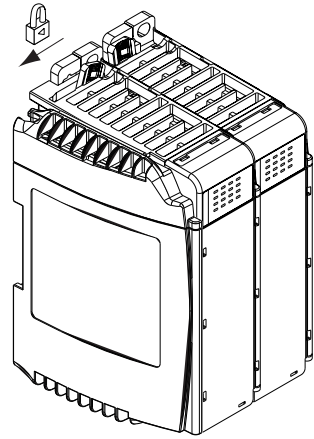
This equipment is not resistant to sunlight or other sources of UV radiation.

1769-ECL Left End Cap

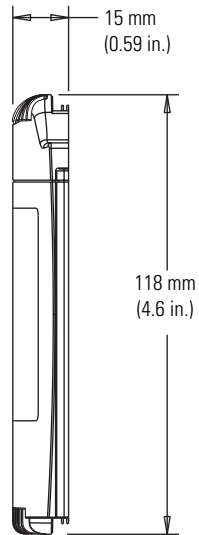
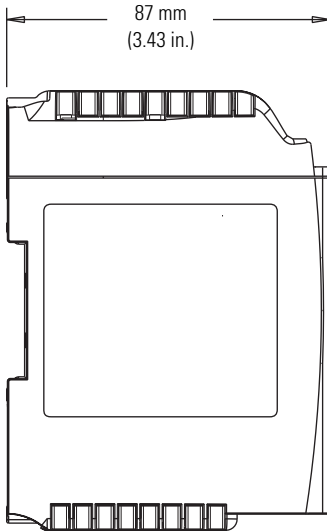
1



2

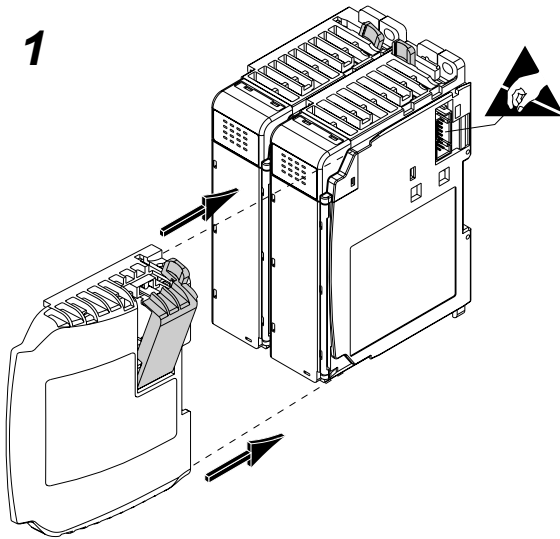


1769-ECL Dimensions

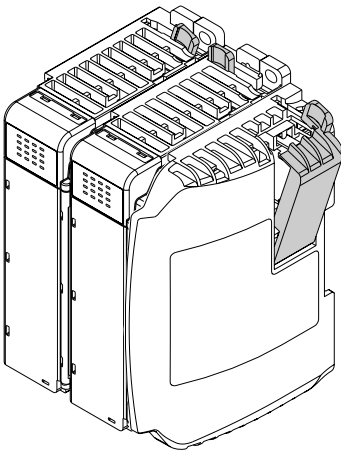


1769-ECR Right End Cap

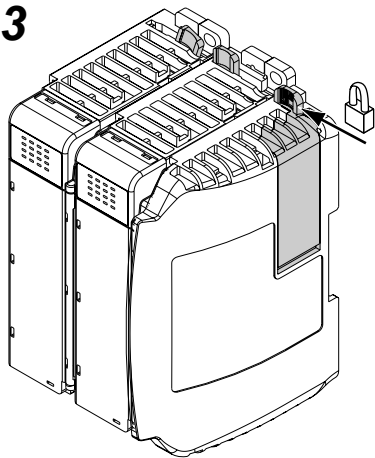
1



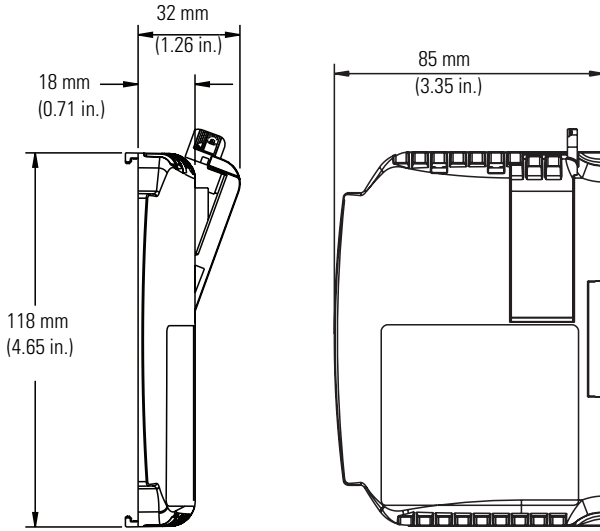
2



3



1769-ECR Dimensions



Specifications

1769-ECL, 1769-ECR - Technical Specifications

Attribute	1769-ECL	1769-ECR
Bus current draw, max	5 mA at 5V DC	
Operating altitude	2000 m (6562 ft)	
North American temp code	T3C	
IEC temp code	N/A	T4
Shipping weight, approx	130 g (0.286 lb)	
Enclosure type rating	None (open style)	

1769-ECL, 1769-ECR - Environmental Specifications

Attribute	1769-ECL	1769-ECR
Operating temperature IEC 60068-2-1 (Test Ad, Operating Cold) IEC 60068-2-2 (Test Bd, Operating Dry Heat) IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0...60 °C (32...140 °F)	
Nonoperating temperature IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold) IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat) IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40...85 °C (-40...185 °F)	
Relative humidity	5...95% noncondensing	
Vibration IEC 60068-2-6 (Test Fc, Operating)	5 g @ 10...500 Hz	
Operating shock IEC 60068-2-27 (Test Ea, Unpackaged Shock)	DIN rail mount: 20 g; Panel mount: 30 g	
Nonoperating shock IEC 60068-2-27 (Test Ea, Unpackaged Shock)	DIN rail mount: 30 g; Panel mount: 40 g	

1769-ECL, 1769-ECR - Environmental Specifications

Attribute	1769-ECL	1769-ECR
Emissions CISPR 11	Group 1, Class A	
ESD immunity IEC 61000-4-2	8 kV air discharges	
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80 .. 2000 MHz 10V/m with 200 Hz 50%Pulse 100% AM at 900 MHz	

1769-ECL, 1769-ECR - Certifications⁽¹⁾

Certifications ⁽²⁾	1769-ECL	1769-ECR
c-UL-us	UL Listed for Class I, Division 2 Group A, B, C, D Hazardous Locations, certified for U.S. and Canada. See UL File E10314	
CE	European Union 2004/108/EC EMC Directive, compliant with: <ul style="list-style-type: none"> • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions 	
C-Tick	Australian Radio Communications Act, compliant with: <ul style="list-style-type: none"> • AS/NZS CISPR 11; Industrial Emissions 	
Ex	N/A	European Union 94/9/EC ATEX Directive, compliant with: <ul style="list-style-type: none"> • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" (II 3 G Ex nA IIC T4 X) • EN 60079-0; General Requirements (Zone 2)

⁽¹⁾ When product is marked.

⁽²⁾ See the Product Certification link at <http://www.ab.com> for Declarations of Conformity, Certificates, and other certification details.

Notes:

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At <http://support.rockwellautomation.com>, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://support.rockwellautomation.com>.

Installation Assistance

If you experience a problem within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your product up and running.

United States	1.440.646.3434 Monday – Friday, 8 a.m. – 5 p.m. EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.

Allen-Bradley, Rockwell Automation, Compact I/O, and TechConnect are trademarks of Rockwell Automation, Inc.

Trademarks not belonging to Rockwell Automation are property of their respective companies.

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444

Europe/Middle East/Africa: Rockwell Automation, Vorstlaan/Boulevard du Souverain 36, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640

Publication 1769-IN015C-EN-P - October 2008

Supersedes Publication 1769-IN015B-MU-P - July 2002

PN 33149

Copyright © 2008 Rockwell Automation, Inc. All rights reserved. Printed in the U.S.A.



Siemens
EcoTech



Indicator lights, 22 mm, round, metal, shiny, clear, lens, smooth



product brand name	SIRIUS ACT
product designation	Indicator lights
design of the product	Actuating/signaling element
product type designation	3SU1
product line	Metal, shiny, 22 mm
Actuator	
product extension optional	
• light source	Yes
• contact module	No
color	
• of the actuating element	clear
material of the actuating element	plastic
shape of the actuating element	round
outer diameter of the actuating element	29.45 mm
Front ring	
product component front ring	No
General technical data	
protection class IP	IP66, IP67, IP69(IP69K)
degree of protection NEMA rating	1, 2, 3, 3R, 4, 4X, 12, 13
shock resistance	
• according to IEC 60068-2-27	sinusoidal half-wave 15g / 11 ms
vibration resistance	
• according to IEC 60068-2-6	10 ... 500 Hz: 5g
reference code according to IEC 81346-2	P
Substance Prohibitance (Date)	10/01/2014
Connections/ Terminals	
tightening torque of the screws in the bracket	1 ... 1.2 N·m
Ambient conditions	
ambient temperature	
• during operation	-25 ... +70 °C
• during storage	-40 ... +80 °C
environmental category during operation according to IEC 60721	3M6, 3S2, 3B2, 3C3, 3K6 (with relative air humidity of 10 ... 95%)
Environmental footprint	
Environmental Product Declaration (EPD)	Yes
Global Warming Potential [CO ₂ eq] total	0.593 kg
Global Warming Potential [CO ₂ eq] during manufacturing	0.625 kg

Global Warming Potential [CO2 eq] during operation	0.235 kg
Global Warming Potential [CO2 eq] after end of life	-0.267 kg
Siemens Eco Profile (SEP)	Siemens EcoTech

Installation/ mounting/ dimensions

height	29.5 mm
width	29.5 mm
shape of the installation opening	round
mounting diameter	22.3 mm
positive tolerance of installation diameter	0.4 mm
mounting height	11.8 mm
installation width	29.5 mm
installation depth	24.4 mm

Approvals Certificates

General Product Approval



[Confirmation](#)



Test Certificates

Marine / Shipping

other

[Type Test Certificates/Test Report](#)



[Confirmation](#)

Environment



[Environmental Confirmations](#)

Further information

Information on the packaging

<https://support.industry.siemens.com/cs/ww/en/view/109813875>

Information- and Downloadcenter (Catalogs, Brochures,...)

<https://www.siemens.com/ic10>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3SU1051-6AA70-0AA0>

Cax online generator

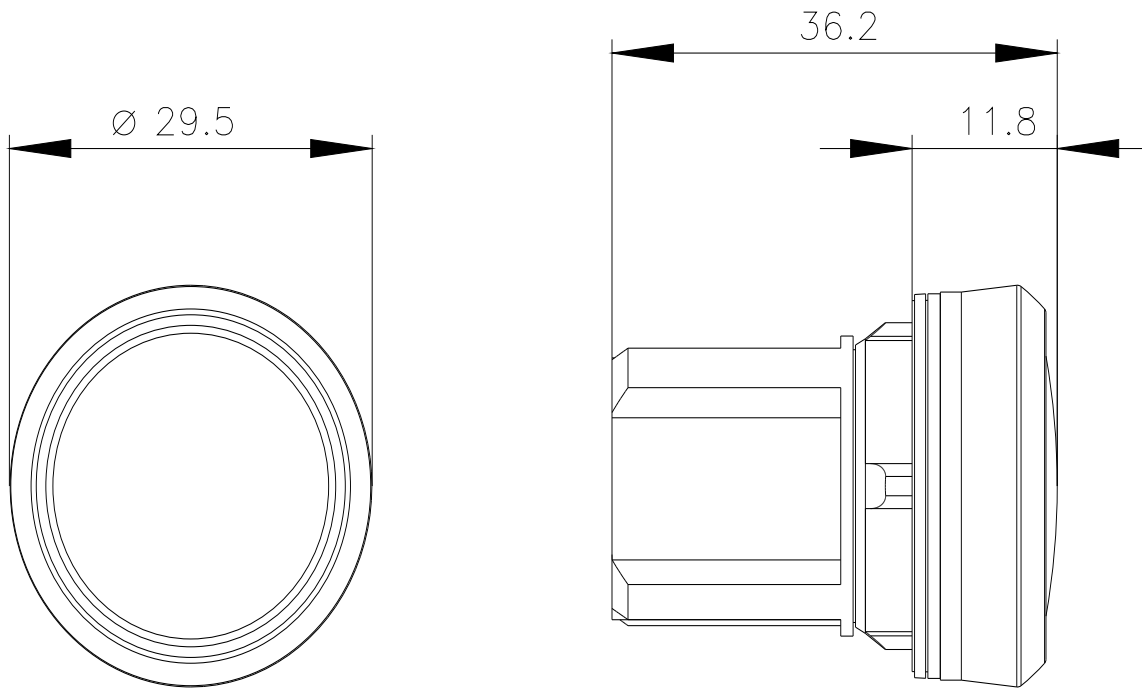
<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3SU1051-6AA70-0AA0>

Service&Support (Manuals, Certificates, Characteristics, FAQs,...)


<https://support.industry.siemens.com/cs/ww/en/ps/3SU1051-6AA70-0AA0>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3SU1051-6AA70-0AA0&lang=en



last modified:

2/7/2024 

Siemens
EcoTech



LED module with integrated LED 24 V AC/DC, white, screw terminal, for front plate mounting, Minimum order quantity 5 or a multiple thereof



product brand name	SIRIUS ACT
product designation	LED module
product type designation	3SU1
General technical data	
product component	
• diode	Yes
• lamp transformer	No
• light source	Yes
• series resistor	No
insulation voltage rated value	320 V
degree of pollution	3
type of voltage of the operating voltage	AC/DC
• for actuation	AC/DC
surge voltage resistance rated value	4 kV
consumed current maximum	25 mA
protection class IP	
• of the enclosure	IP40
• of the terminal	IP20
shock resistance	
• according to IEC 60068-2-27	sinusoidal half-wave 15g / 11 ms
• for railway applications according to EN 61373	Category 1, Class B
vibration resistance	
• according to IEC 60068-2-6	10 ... 500 Hz: 5g
• for railway applications according to EN 61373	Category 1, Class B
operating period typical	100 000 h
reference code according to IEC 81346-2	P
Substance Prohibitance (Date)	10/01/2014
SVHC substance name	Lead monoxide (lead oxide) - 1317-36-8 2-methyl-1-(4-methylthiophenyl)-2-morpholinopropan-1-one - 71868-10-5
operating voltage 1	
• at AC	
— at 50 Hz rated value	24 V
— at 60 Hz rated value	24 V
• at DC rated value	24 V
relative positive tolerance of the operating voltage	20 %
relative negative tolerance of the operating voltage	20 %
Control circuit/ Control	

inrush current maximum	2 A
Connections/ Terminals	
type of electrical connection	screw terminal
type of connectable conductor cross-sections	
<ul style="list-style-type: none"> • solid with core end processing • solid without core end processing • finely stranded with core end processing • finely stranded without core end processing • for AWG cables 	2x (0.5 ... 0.75 mm ²) 2x (1.0 ... 1.5 mm ²) 2x (0.5 ... 1.5 mm ²) 2x (1,0 ... 1,5 mm ²) 2x (18 ... 14)
connectable conductor cross-section finely stranded with core end processing	0.5 ... 1.5 mm ²
tightening torque with screw-type terminals	0.8 ... 0.9 N·m

Lamp	
type of light source	LED
color of the light source	white
light intensity	900 ... 1 400 mcd
certificate of suitability	
<ul style="list-style-type: none"> • ATEX • IECEx 	No No

Ambient conditions	
ambient temperature	
<ul style="list-style-type: none"> • during operation • during storage 	-25 ... +70 °C -40 ... +80 °C
environmental category during operation according to IEC 60721	3M6, 3S2, 3B2, 3C3, 3K6 (with relative air humidity of 10 ... 95%, no condensation in operation permitted)

Environmental footprint	
Environmental Product Declaration (EPD)	Yes
Global Warming Potential [CO2 eq] total	0.787 kg
Global Warming Potential [CO2 eq] during manufacturing	0.566 kg
Global Warming Potential [CO2 eq] during operation	0.235 kg
Global Warming Potential [CO2 eq] after end of life	-0.015 kg
Siemens Eco Profile (SEP)	Siemens EcoTech

Installation/ mounting/ dimensions	
fastening method	
<ul style="list-style-type: none"> • of modules and accessories 	Front plate mounting
height	33.2 mm
width	9.8 mm
depth	29.4 mm

Approvals Certificates	
General Product Approval	



[Confirmation](#)



EMV	Test Certificates	Marine / Shipping
------------	--------------------------	--------------------------



[Special Test Certificate](#)

[Type Test Certificates/Test Report](#)



Marine / Shipping	other	Environment
--------------------------	--------------	--------------------



[Confirmation](#)



Siemens EcoTech



[Environmental Confirmations](#)

Further information

Information on the packaging

<https://support.industry.siemens.com/cs/ww/en/view/109813875>

Information- and Downloadcenter (Catalogs, Brochures,...)

<https://www.siemens.com/ic10>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3SU1401-1BB60-1AA0>

Cax online generator

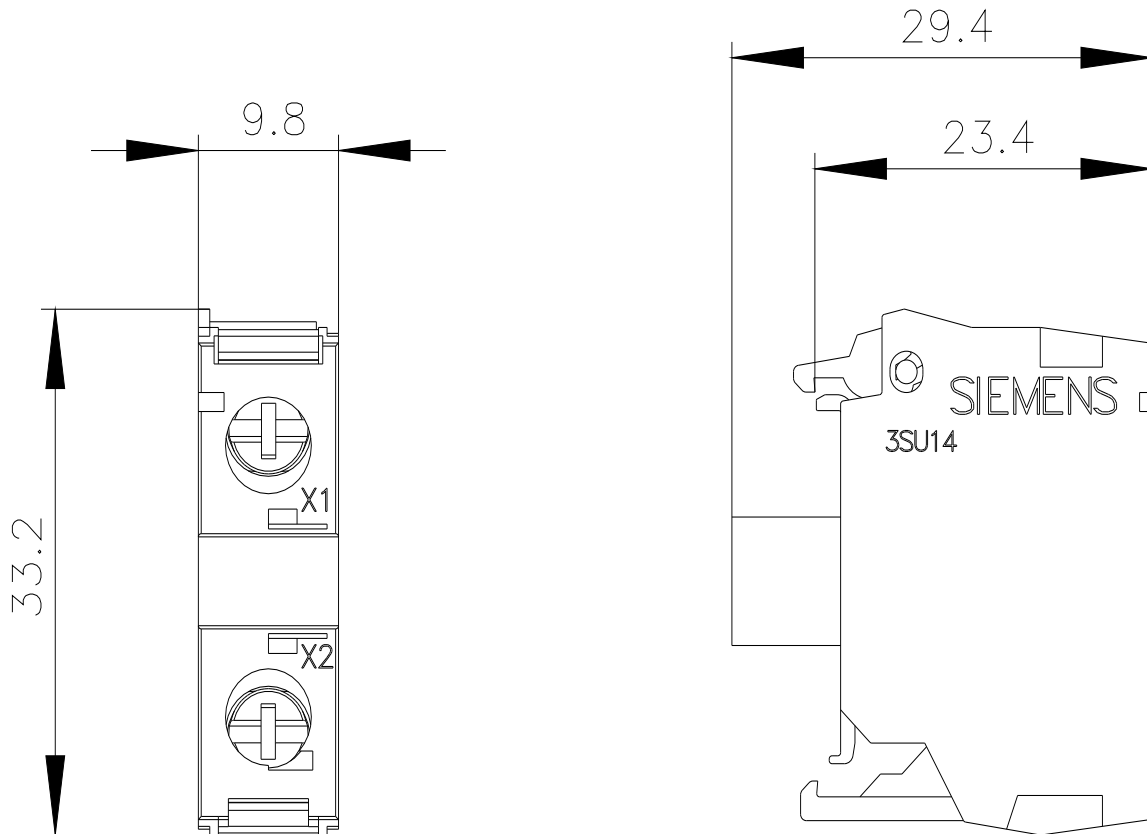
<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3SU1401-1BB60-1AA0>

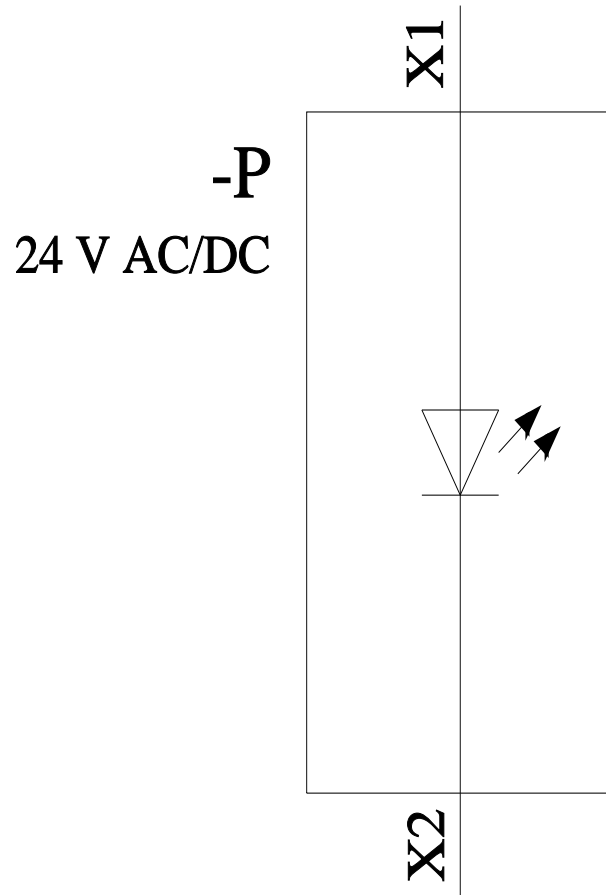
Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

<https://support.industry.siemens.com/cs/ww/en/ps/3SU1401-1BB60-1AA0>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3SU1401-1BB60-1AA0&lang=en





last modified:

4/8/2024 

Siemens
EcoTech



Indicator lights, 22 mm, round, metal, shiny, red, lens, smooth



product brand name	SIRIUS ACT
product designation	Indicator lights
design of the product	Actuating/signaling element
product type designation	3SU1
product line	Metal, shiny, 22 mm
Actuator	
product extension optional	
• light source	Yes
• contact module	No
color	
• of the actuating element	red
material of the actuating element	plastic
shape of the actuating element	round
outer diameter of the actuating element	29.45 mm
Front ring	
product component front ring	No
General technical data	
protection class IP	IP66, IP67, IP69(IP69K)
degree of protection NEMA rating	1, 2, 3, 3R, 4, 4X, 12, 13
shock resistance	
• according to IEC 60068-2-27	sinusoidal half-wave 15g / 11 ms
vibration resistance	
• according to IEC 60068-2-6	10 ... 500 Hz: 5g
reference code according to IEC 81346-2	P
Substance Prohibitance (Date)	10/01/2014
Connections/ Terminals	
tightening torque of the screws in the bracket	1 ... 1.2 N·m
Ambient conditions	
ambient temperature	
• during operation	-25 ... +70 °C
• during storage	-40 ... +80 °C
environmental category during operation according to IEC 60721	3M6, 3S2, 3B2, 3C3, 3K6 (with relative air humidity of 10 ... 95%)
Environmental footprint	
Environmental Product Declaration (EPD)	Yes
Global Warming Potential [CO ₂ eq] total	0.593 kg
Global Warming Potential [CO ₂ eq] during manufacturing	0.625 kg

Global Warming Potential [CO2 eq] during operation	0.235 kg
Global Warming Potential [CO2 eq] after end of life	-0.267 kg
Siemens Eco Profile (SEP)	Siemens EcoTech

Installation/ mounting/ dimensions

height	29.5 mm
width	29.5 mm
shape of the installation opening	round
mounting diameter	22.3 mm
positive tolerance of installation diameter	0.4 mm
mounting height	11.8 mm
installation width	29.5 mm
installation depth	24.4 mm

Approvals Certificates

General Product Approval	Marine / Shipping
--------------------------	-------------------



Marine / Shipping	other	Environment
-------------------	-------	-------------



[Confirmation](#)



Siemens
EcoTech



Further information

Information on the packaging

<https://support.industry.siemens.com/cs/ww/en/view/109813875>

Information- and Downloadcenter (Catalogs, Brochures,...)

<https://www.siemens.com/ic10>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3SU1051-6AA20-0AA0>

Cax online generator

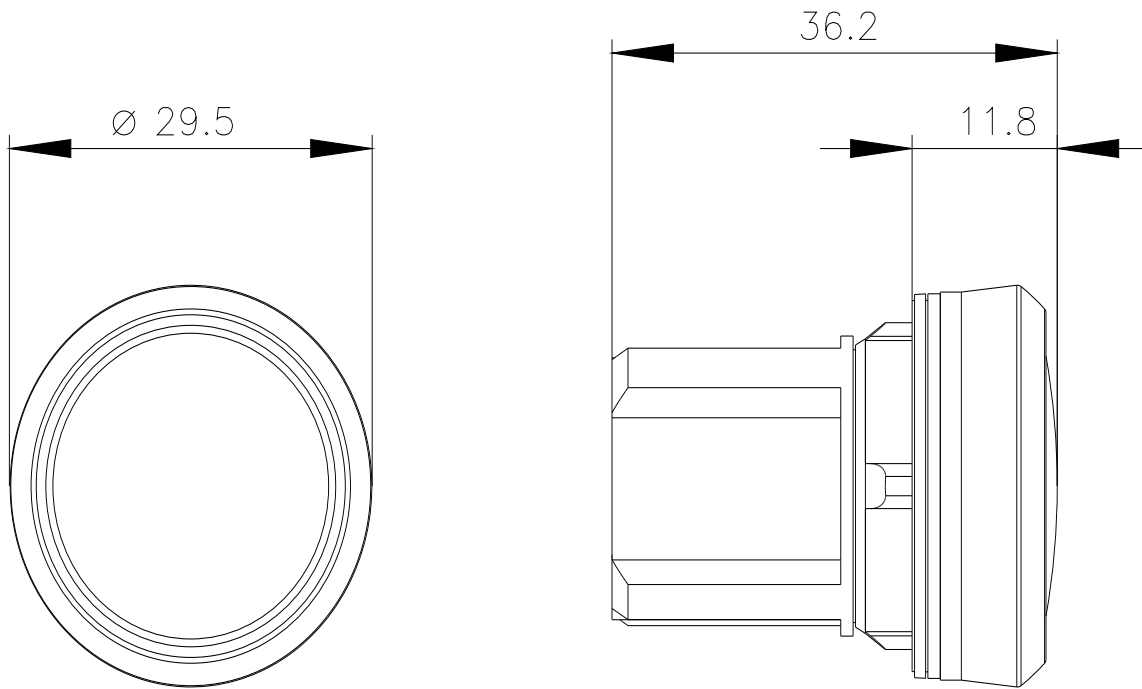
<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3SU1051-6AA20-0AA0>

Service&Support (Manuals, Certificates, Characteristics, FAQs,...)


<https://support.industry.siemens.com/cs/ww/en/ps/3SU1051-6AA20-0AA0>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3SU1051-6AA20-0AA0&lang=en



last modified:

2/7/2024 

Siemens
EcoTech



LED module with integrated LED 24 V AC/DC, red, screw terminal, for front plate mounting, Minimum order quantity 5 or a multiple thereof



product brand name	SIRIUS ACT
product designation	LED module
product type designation	3SU1
General technical data	
product component	
• diode	Yes
• lamp transformer	No
• light source	Yes
• series resistor	No
insulation voltage rated value	320 V
degree of pollution	3
type of voltage of the operating voltage	AC/DC
• for actuation	AC/DC
surge voltage resistance rated value	4 kV
consumed current maximum	25 mA
protection class IP	
• of the enclosure	IP40
• of the terminal	IP20
shock resistance	
• according to IEC 60068-2-27	sinusoidal half-wave 15g / 11 ms
• for railway applications according to EN 61373	Category 1, Class B
vibration resistance	
• according to IEC 60068-2-6	10 ... 500 Hz: 5g
• for railway applications according to EN 61373	Category 1, Class B
operating period typical	100 000 h
reference code according to IEC 81346-2	P
Substance Prohibitance (Date)	10/01/2014
SVHC substance name	Lead monoxide (lead oxide) - 1317-36-8 2-methyl-1-(4-methylthiophenyl)-2-morpholinopropan-1-one - 71868-10-5
operating voltage 1	
• at AC	
— at 50 Hz rated value	24 V
— at 60 Hz rated value	24 V
• at DC rated value	24 V
relative positive tolerance of the operating voltage	20 %
relative negative tolerance of the operating voltage	20 %
Control circuit/ Control	

inrush current maximum	2 A
Connections/ Terminals	
type of electrical connection	screw terminal
type of connectable conductor cross-sections	
<ul style="list-style-type: none"> • solid with core end processing • solid without core end processing • finely stranded with core end processing • finely stranded without core end processing • for AWG cables 	2x (0.5 ... 0.75 mm ²) 2x (1.0 ... 1.5 mm ²) 2x (0.5 ... 1.5 mm ²) 2x (1,0 ... 1,5 mm ²) 2x (18 ... 14)
connectable conductor cross-section finely stranded with core end processing	0.5 ... 1.5 mm ²
tightening torque with screw-type terminals	0.8 ... 0.9 N·m

Lamp	
type of light source	LED
color of the light source	red
light intensity	450 ... 1 120 mcd
certificate of suitability	
<ul style="list-style-type: none"> • ATEX • IECEx 	No No

Ambient conditions	
ambient temperature	
<ul style="list-style-type: none"> • during operation • during storage 	-25 ... +70 °C -40 ... +80 °C
environmental category during operation according to IEC 60721	3M6, 3S2, 3B2, 3C3, 3K6 (with relative air humidity of 10 ... 95%, no condensation in operation permitted)

Environmental footprint	
Environmental Product Declaration (EPD)	Yes
Global Warming Potential [CO2 eq] total	0.787 kg
Global Warming Potential [CO2 eq] during manufacturing	0.566 kg
Global Warming Potential [CO2 eq] during operation	0.235 kg
Global Warming Potential [CO2 eq] after end of life	-0.015 kg
Siemens Eco Profile (SEP)	Siemens EcoTech

Installation/ mounting/ dimensions	
fastening method	
<ul style="list-style-type: none"> • of modules and accessories 	Front plate mounting
height	33.2 mm
width	9.8 mm
depth	29.4 mm

Approvals Certificates		
General Product Approval	EMV	Test Certificates



[Confirmation](#)



[Special Test Certificate](#)

Test Certificates	Marine / Shipping	other
--------------------------	--------------------------	--------------

[Type Test Certificates/Test Report](#)



[Confirmation](#)

Environment



Siemens EcoTech



Further information

Information on the packaging

<https://support.industry.siemens.com/cs/ww/en/view/109813875>

Information- and Downloadcenter (Catalogs, Brochures,...)

<https://www.siemens.com/ic10>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3SU1401-1BB20-1AA0>

Cax online generator

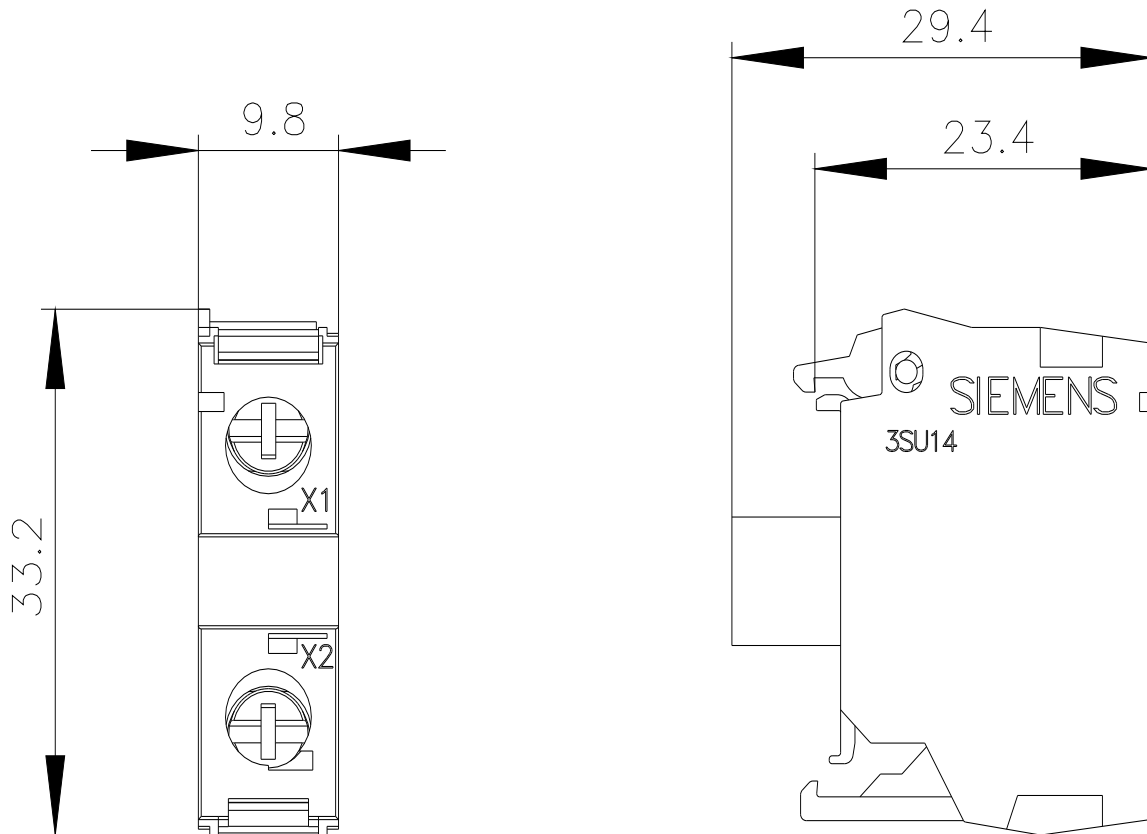
<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3SU1401-1BB20-1AA0>

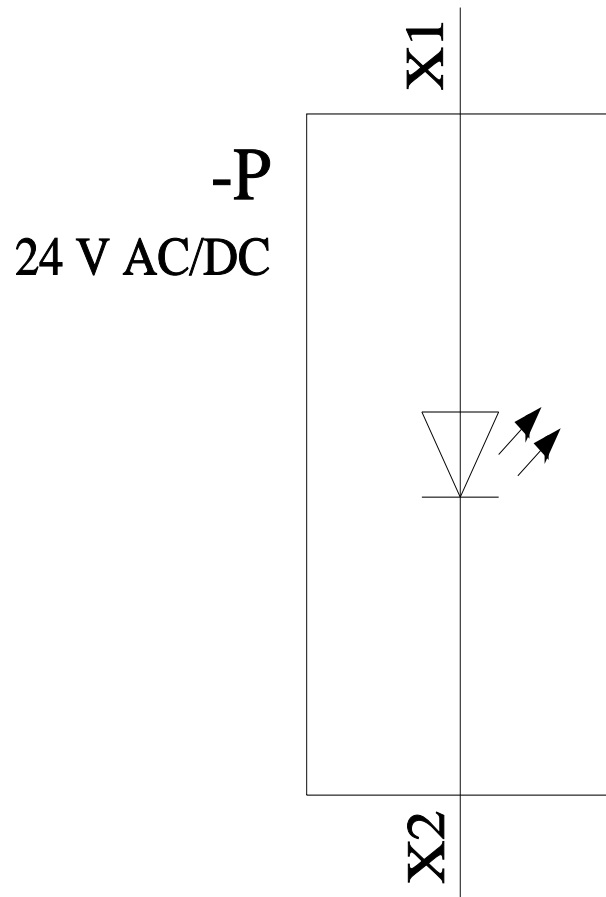
Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

<https://support.industry.siemens.com/cs/ww/en/ps/3SU1401-1BB20-1AA0>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3SU1401-1BB20-1AA0&lang=en





last modified:

4/8/2024 

Siemens
EcoTech



Indicator lights, 22 mm, round, metal, shiny, green, lens, smooth



product brand name	SIRIUS ACT
product designation	Indicator lights
design of the product	Actuating/signaling element
product type designation	3SU1
product line	Metal, shiny, 22 mm
Actuator	
product extension optional	
• light source	Yes
• contact module	No
color	
• of the actuating element	green
material of the actuating element	plastic
shape of the actuating element	round
outer diameter of the actuating element	29.45 mm
Front ring	
product component front ring	No
General technical data	
protection class IP	IP66, IP67, IP69(IP69K)
degree of protection NEMA rating	1, 2, 3, 3R, 4, 4X, 12, 13
shock resistance	
• according to IEC 60068-2-27	sinusoidal half-wave 15g / 11 ms
vibration resistance	
• according to IEC 60068-2-6	10 ... 500 Hz: 5g
reference code according to IEC 81346-2	P
Substance Prohibitance (Date)	10/01/2014
Connections/ Terminals	
tightening torque of the screws in the bracket	1 ... 1.2 N·m
Ambient conditions	
ambient temperature	
• during operation	-25 ... +70 °C
• during storage	-40 ... +80 °C
environmental category during operation according to IEC 60721	3M6, 3S2, 3B2, 3C3, 3K6 (with relative air humidity of 10 ... 95%)
Environmental footprint	
Environmental Product Declaration (EPD)	Yes
Global Warming Potential [CO ₂ eq] total	0.593 kg
Global Warming Potential [CO ₂ eq] during manufacturing	0.625 kg

Global Warming Potential [CO2 eq] during operation	0.235 kg
Global Warming Potential [CO2 eq] after end of life	-0.267 kg
Siemens Eco Profile (SEP)	Siemens EcoTech

Installation/ mounting/ dimensions

height	29.5 mm
width	29.5 mm
shape of the installation opening	round
mounting diameter	22.3 mm
positive tolerance of installation diameter	0.4 mm
mounting height	11.8 mm
installation width	29.5 mm
installation depth	24.4 mm

Approvals Certificates

General Product Approval



[Confirmation](#)



Test Certificates

Marine / Shipping

other

[Type Test Certificates/Test Report](#)



[Confirmation](#)

Environment



[Environmental Confirmations](#)

Further information

Information on the packaging

<https://support.industry.siemens.com/cs/ww/en/view/109813875>

Information- and Downloadcenter (Catalogs, Brochures,...)

<https://www.siemens.com/ic10>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3SU1051-6AA40-0AA0>

Cax online generator

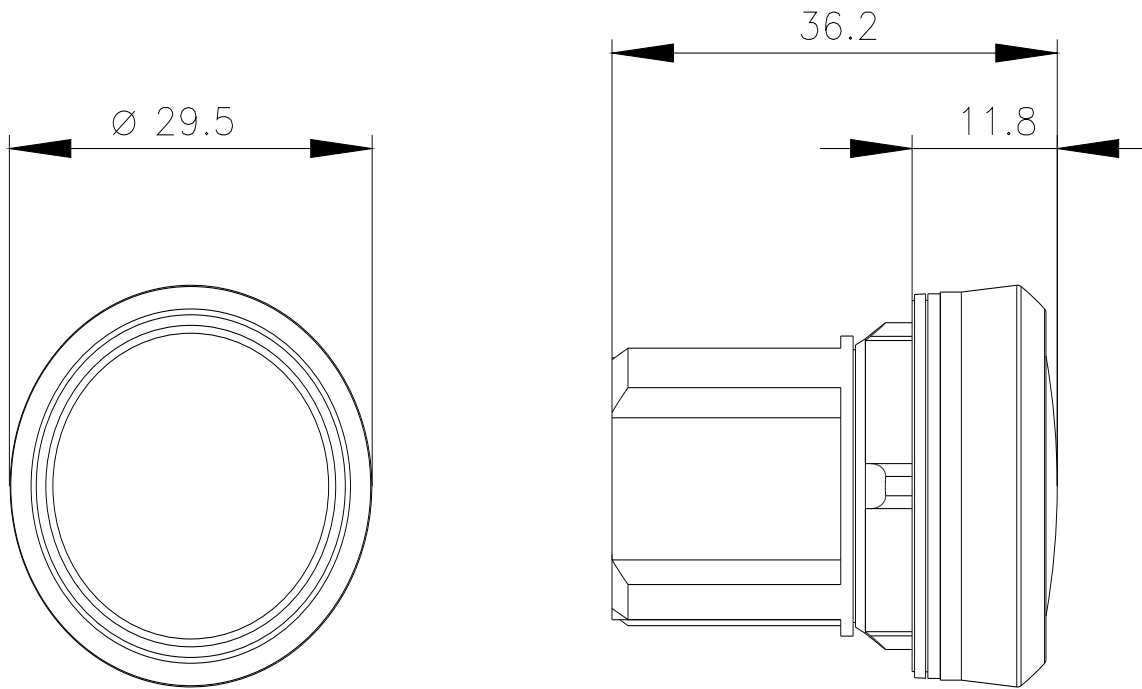
<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3SU1051-6AA40-0AA0>

Service&Support (Manuals, Certificates, Characteristics, FAQs,...)


<https://support.industry.siemens.com/cs/ww/en/ps/3SU1051-6AA40-0AA0>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3SU1051-6AA40-0AA0&lang=en



last modified:

2/7/2024 

Siemens
EcoTech



LED module with integrated LED 24 V AC/DC, green, screw terminal, for front plate mounting, Minimum order quantity 5 or a multiple thereof



product brand name	SIRIUS ACT
product designation	LED module
product type designation	3SU1
General technical data	
product component	
• diode	Yes
• lamp transformer	No
• light source	Yes
• series resistor	No
insulation voltage rated value	320 V
degree of pollution	3
type of voltage of the operating voltage	AC/DC
• for actuation	AC/DC
surge voltage resistance rated value	4 kV
consumed current maximum	25 mA
protection class IP	
• of the enclosure	IP40
• of the terminal	IP20
shock resistance	
• according to IEC 60068-2-27	sinusoidal half-wave 15g / 11 ms
• for railway applications according to EN 61373	Category 1, Class B
vibration resistance	
• according to IEC 60068-2-6	10 ... 500 Hz: 5g
• for railway applications according to EN 61373	Category 1, Class B
operating period typical	100 000 h
reference code according to IEC 81346-2	P
Substance Prohibitance (Date)	10/01/2014
SVHC substance name	Lead monoxide (lead oxide) - 1317-36-8 2-methyl-1-(4-methylthiophenyl)-2-morpholinopropan-1-one - 71868-10-5
operating voltage 1	
• at AC	
— at 50 Hz rated value	24 V
— at 60 Hz rated value	24 V
• at DC rated value	24 V
relative positive tolerance of the operating voltage	20 %
relative negative tolerance of the operating voltage	20 %
Control circuit/ Control	

inrush current maximum	2 A
Connections/ Terminals	
type of electrical connection	screw terminal
type of connectable conductor cross-sections	
<ul style="list-style-type: none"> • solid with core end processing • solid without core end processing • finely stranded with core end processing • finely stranded without core end processing • for AWG cables 	2x (0.5 ... 0.75 mm ²) 2x (1.0 ... 1.5 mm ²) 2x (0.5 ... 1.5 mm ²) 2x (1,0 ... 1,5 mm ²) 2x (18 ... 14)
connectable conductor cross-section finely stranded with core end processing	0.5 ... 1.5 mm ²
tightening torque with screw-type terminals	0.8 ... 0.9 N·m

Lamp	
type of light source	LED
color of the light source	green
light intensity	900 ... 1 400 mcd
certificate of suitability	
<ul style="list-style-type: none"> • ATEX • IECEx 	No No

Ambient conditions	
ambient temperature	
<ul style="list-style-type: none"> • during operation • during storage 	-25 ... +70 °C -40 ... +80 °C
environmental category during operation according to IEC 60721	3M6, 3S2, 3B2, 3C3, 3K6 (with relative air humidity of 10 ... 95%, no condensation in operation permitted)

Environmental footprint	
Environmental Product Declaration (EPD)	Yes
Global Warming Potential [CO2 eq] total	0.787 kg
Global Warming Potential [CO2 eq] during manufacturing	0.566 kg
Global Warming Potential [CO2 eq] during operation	0.235 kg
Global Warming Potential [CO2 eq] after end of life	-0.015 kg
Siemens Eco Profile (SEP)	Siemens EcoTech

Installation/ mounting/ dimensions	
fastening method	
<ul style="list-style-type: none"> • of modules and accessories 	Front plate mounting
height	33.2 mm
width	9.8 mm
depth	29.4 mm

Approvals Certificates	
General Product Approval	



[Confirmation](#)



EMV	Test Certificates	Marine / Shipping
------------	--------------------------	--------------------------



[Special Test Certificate](#)

[Type Test Certificates/Test Report](#)



Marine / Shipping	other	Environment
--------------------------	--------------	--------------------



[Confirmation](#)



Siemens EcoTech



[Environmental Confirmations](#)

Further information

Information on the packaging

<https://support.industry.siemens.com/cs/ww/en/view/109813875>

Information- and Downloadcenter (Catalogs, Brochures,...)

<https://www.siemens.com/ic10>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3SU1401-1BB40-1AA0>

Cax online generator

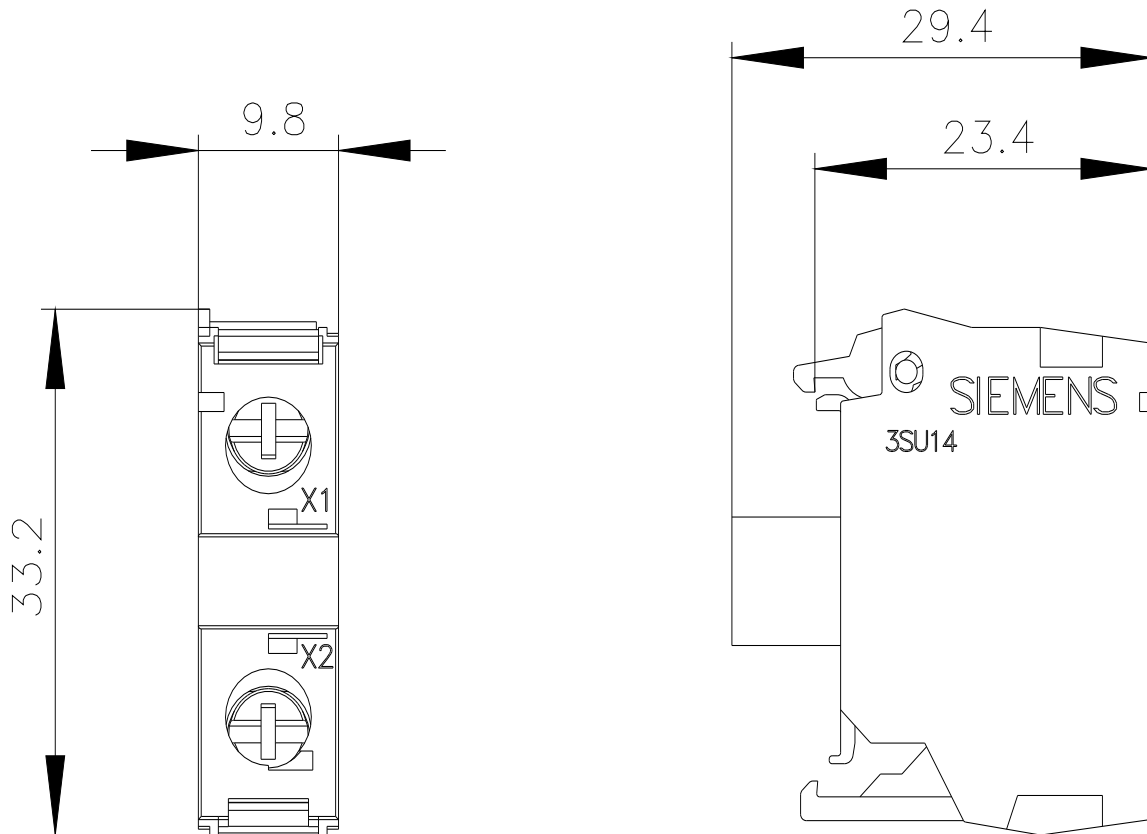
<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3SU1401-1BB40-1AA0>

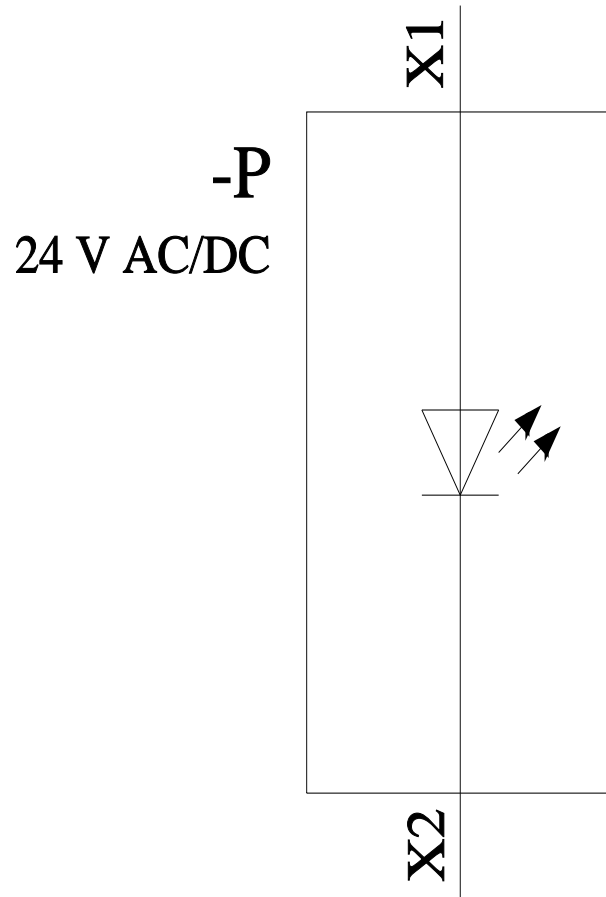
Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

<https://support.industry.siemens.com/cs/ww/en/ps/3SU1401-1BB40-1AA0>


Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3SU1401-1BB40-1AA0&lang=en





last modified:

4/8/2024 

Siemens
EcoTech



EMERGENCY STOP mushroom pushbutton, 22 mm, round, metal, shiny, red, 40 mm, positive latching, acc. to EN ISO 13850, rotate-to-unlatch



product brand name	SIRIUS ACT
product designation	EMERGENCY STOP mushroom pushbuttons
design of the product	Actuating/signaling element
product type designation	3SU1
product line	Metal, shiny, 22 mm
Enclosure	
number of command points	1
Actuator	
design of the actuating element	positive latching
principle of operation of the actuating element	latching
product extension optional	
• light source	No
• contact module	Yes
color	
• of the actuating element	red
material of the actuating element	plastic
shape of the actuating element	round
outer diameter of the actuating element	40 mm
type of unlocking device	rotate-to-unlatch mechanism
number of switching positions	2
Front ring	
product component front ring	No
General technical data	
product function	
• positive opening	Yes
• EMERGENCY OFF function	Yes
• EMERGENCY STOP function	Yes
protection class IP	IP66, IP67, IP69(IP69K)
degree of protection NEMA rating	1, 2, 3, 3R, 4, 4X, 12, 13
shock resistance	
• according to IEC 60068-2-27	sinusoidal half-wave 15g / 11 ms
vibration resistance	
• according to IEC 60068-2-6	10 ... 500 Hz: 5g
operating frequency maximum	600 1/h
mechanical service life (operating cycles) typical	300 000
reference code according to IEC 81346-2	S
Substance Prohibitance (Date)	10/01/2014

Safety related data

proportion of dangerous failures	
<ul style="list-style-type: none"> with low demand rate according to SN 31920 with high demand rate according to SN 31920 	20 %
B10 value with high demand rate according to SN 31920	100 000
failure rate [FIT] with low demand rate according to SN 31920	100 FIT

Ambient conditions

ambient temperature	
<ul style="list-style-type: none"> during operation during storage 	-25 ... +70 °C -40 ... +80 °C
environmental category during operation according to IEC 60721	3M6, 3S2, 3B2, 3C3, 3K6 (with relative air humidity of 10 ... 95%)

Environmental footprint

Environmental Product Declaration(EPD)	Yes
Global Warming Potential [CO2 eq] total	0.593 kg
Global Warming Potential [CO2 eq] during manufacturing	0.625 kg
Global Warming Potential [CO2 eq] during operation	0.235 kg
Global Warming Potential [CO2 eq] after end of life	-0.267 kg
Siemens Eco Profile (SEP)	Siemens EcoTech

Installation/ mounting/ dimensions

shape of the installation opening	round
mounting diameter	22.3 mm
positive tolerance of installation diameter	0.4 mm
mounting height	45.3 mm
installation width	40 mm
installation depth	26.3 mm

Approvals Certificates

General Product Approval



[Confirmation](#)



General Product Approval	Test Certificates	Marine / Shipping
---------------------------------	--------------------------	--------------------------



[Type Test Certificates/Test Report](#)

[Special Test Certificate](#)



Marine / Shipping	other	Environment
--------------------------	--------------	--------------------



[Confirmation](#)



Siemens EcoTech



[Environmental Confirmations](#)

Further information

Information on the packaging

<https://support.industry.siemens.com/cs/ww/en/view/109813875>

Information- and Downloadcenter (Catalogs, Brochures,...)

<https://www.siemens.com/ic10>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3SU1050-1HB20-0AA0>

Cax online generator

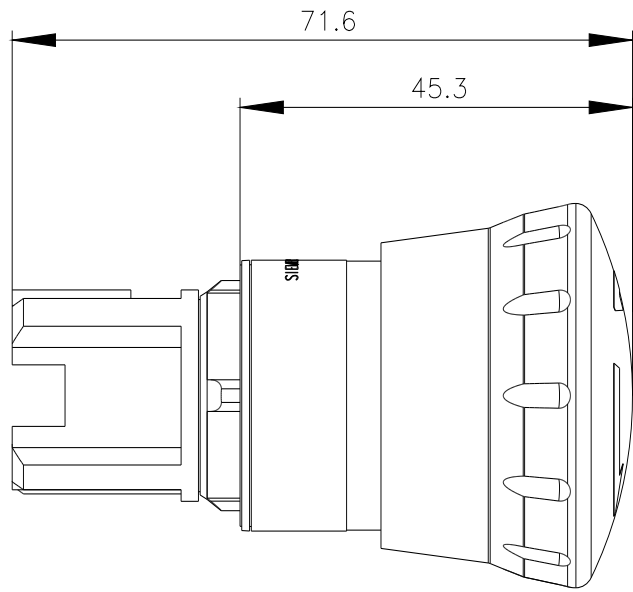
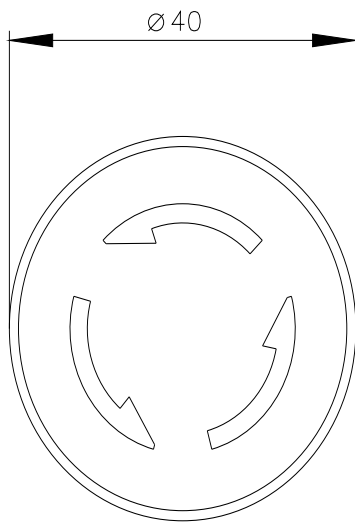
<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3SU1050-1HB20-0AA0>

Service&Support (Manuals, Certificates, Characteristics, FAQs,...)


<https://support.industry.siemens.com/cs/ww/en/ps/3SU1050-1HB20-0AA0>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3SU1050-1HB20-0AA0&lang=en



last modified:

2/7/2024 

Siemens
EcoTech



Pushbutton, 22 mm, round, metal, shiny, black, pushbutton, flat momentary contact type



product brand name	SIRIUS ACT
product designation	Pushbuttons
design of the product	Actuating/signaling element
product type designation	3SU1
product line	Metal, shiny, 22 mm
Enclosure	
number of command points	1
Actuator	
design of the actuating element	Flat button
principle of operation of the actuating element	momentary contact type
product extension optional	
• light source	No
• contact module	Yes
color of the actuating element	black
material of the actuating element	plastic
shape of the actuating element	round
outer diameter of the actuating element	29.5 mm
Front ring	
product component front ring	Yes
design of the front ring	Standard
material of the front ring	Metal, high gloss
color of the front ring	silver
General technical data	
protection class IP	IP66, IP67, IP69(IP69K)
degree of protection NEMA rating	1, 2, 3, 3R, 4, 4X, 12, 13
shock resistance	
• according to IEC 60068-2-27	sinusoidal half-wave 15g / 11 ms
vibration resistance	
• according to IEC 60068-2-6	10 ... 500 Hz: 5g
operating frequency maximum	3 600 1/h
mechanical service life (operating cycles) typical	10 000 000
reference code according to IEC 81346-2	S
Substance Prohibitance (Date)	10/01/2014
Ambient conditions	
ambient temperature	
• during operation	-25 ... +70 °C
• during storage	-40 ... +80 °C

environmental category during operation according to IEC 60721	3M6, 3S2, 3B2, 3C3, 3K6 (with relative air humidity of 10 ... 95%)
--	--

Environmental footprint

Environmental Product Declaration(EPD)	Yes
Global Warming Potential [CO2 eq] total	0.593 kg
Global Warming Potential [CO2 eq] during manufacturing	0.625 kg
Global Warming Potential [CO2 eq] during operation	0.235 kg
Global Warming Potential [CO2 eq] after end of life	-0.267 kg
Siemens Eco Profile (SEP)	Siemens EcoTech

Installation/ mounting/ dimensions

height	29.5 mm
width	29.5 mm
shape of the installation opening	round
mounting diameter	22.3 mm
positive tolerance of installation diameter	0.4 mm
mounting height	11 mm
installation width	29.5 mm
installation depth	24.3 mm

Approvals Certificates

General Product Approval



[Confirmation](#)



Test Certificates

Marine / Shipping

[Special Test Certificate](#)

[Type Test Certificates/Test Report](#)



other

Environment

[Confirmation](#)



Siemens EcoTech



[Environmental Confirmations](#)

Further information

Information on the packaging

<https://support.industry.siemens.com/cs/ww/en/view/109813875>

Information- and Downloadcenter (Catalogs, Brochures,...)

<https://www.siemens.com/ic10>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3SU1050-0AB10-0AA0>

Cax online generator

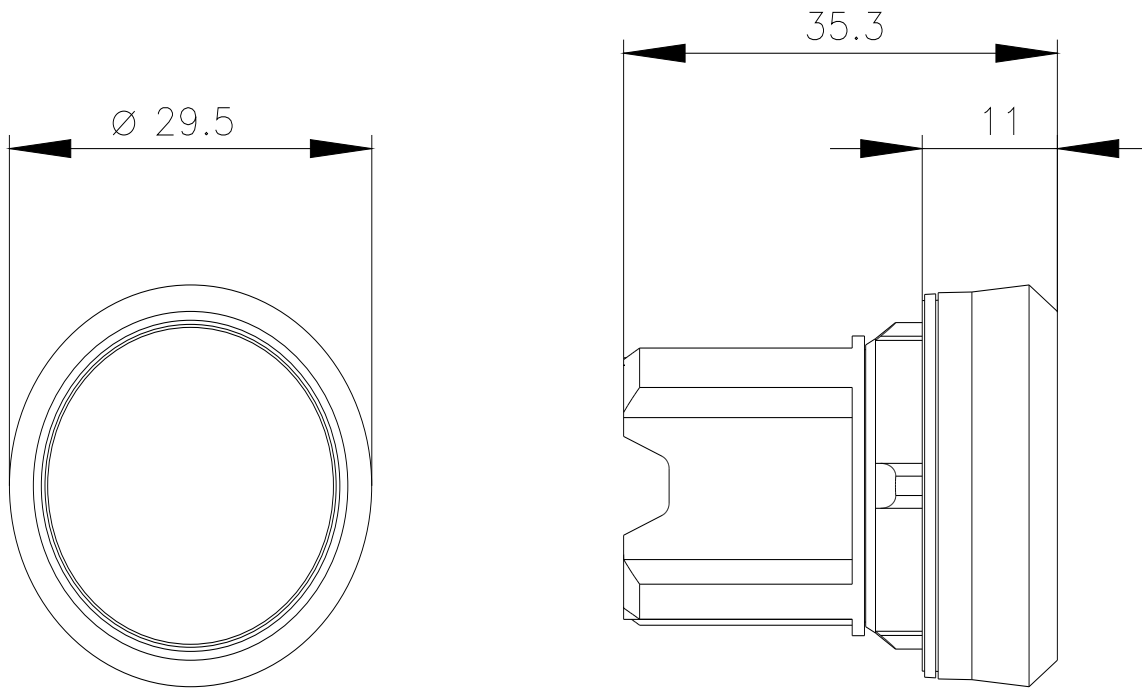
<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3SU1050-0AB10-0AA0>

Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

<https://support.industry.siemens.com/cs/ww/en/ps/3SU1050-0AB10-0AA0>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3SU1050-0AB10-0AA0&lang=en



last modified:

2/6/2024 



Contact module with 1 contact element, 1 NO, screw terminal, for front plate mounting, Minimum order quantity 5 or a multiple of this

product brand name	SIRIUS ACT
product designation	Contact module
product type designation	3SU1
Contact block/ lampholder	
socket design	other
General technical data	
product function positive opening	No
insulation voltage rated value	500 V
degree of pollution	3
type of voltage	
• of the operating voltage	AC/DC
• of the input voltage	AC/DC
surge voltage resistance rated value	6 kV
protection class IP	
• of the enclosure	IP40
• of the terminal	IP20
shock resistance	
• according to IEC 60068-2-27	sinusoidal half-wave 15g / 11 ms
• for railway applications according to EN 61373	Category 1, Class B
vibration resistance	
• according to IEC 60068-2-6	10 ... 500 Hz: 5g
• for railway applications according to EN 61373	Category 1, Class B
operating frequency maximum	3 600 1/h
mechanical service life (operating cycles) typical	10 000 000
electrical endurance (operating cycles) typical	10 000 000
thermal current	10 A
reference code according to IEC 81346-2	S
continuous current of the C characteristic MCB	10 A
Substance Prohibitance (Date)	10/01/2014
operating voltage	
• at AC	
— at 50 Hz rated value	5 ... 500 V
— at 60 Hz rated value	5 ... 500 V
• at DC rated value	5 ... 500 V
Power Electronics	
contact reliability	One maloperation per 100 million (17 V, 5 mA), one maloperation per 10 million (5 V, 1 mA)

Auxiliary circuit	
design of the contact of auxiliary contacts	Silver alloy
number of NC contacts for auxiliary contacts	0
• lagging switching	0
number of NO contacts for auxiliary contacts	1
• leading contact	0
operational current at AC-12	
• at 24 V rated value	10 A
• at 48 V rated value	10 A
• at 110 V rated value	10 A
• at 230 V rated value	8 A
• at 400 V rated value	8 A
operational current at AC-15	
• at 24 V rated value	6 A
• at 48 V rated value	6 A
• at 110 V rated value	6 A
• at 230 V rated value	6 A
• at 400 V rated value	3 A
• at 500 V rated value	1.4 A
operational current at DC-12	
• at 24 V rated value	10 A
• at 48 V rated value	5 A
• at 110 V rated value	2.5 A
• at 230 V rated value	1 A
• at 400 V rated value	0.3 A
• at 500 V rated value	0.3 A
operational current at DC-13	
• at 24 V rated value	3 A
• at 48 V rated value	1.5 A
• at 110 V rated value	0.7 A
• at 230 V rated value	0.3 A
• at 400 V rated value	0.1 A
• at 500 V rated value	0.1 A
Connections/ Terminals	
type of electrical connection	screw-type terminals
type of connectable conductor cross-sections	
• solid with core end processing	2x (0.5 ... 0.75 mm ²)
• solid without core end processing	2x (1.0 ... 1.5 mm ²)
• finely stranded with core end processing	2x (0.5 ... 1.5 mm ²)
• finely stranded without core end processing	2x (1.0 ... 1.5 mm ²)
• for AWG cables	2x (18 ... 14)
tightening torque with screw-type terminals	0.8 ... 0.9 N·m
Ambient conditions	
ambient temperature	
• during operation	-25 ... +70 °C
• during storage	-40 ... +80 °C
environmental category during operation according to IEC 60721	3M6, 3S2, 3B2, 3C3 (without salt spray), 3K6 (with relative humidity of 10 ... 95%, no condensation in operation permitted)
Environmental footprint	
Environmental Product Declaration (EPD)	Yes
Global Warming Potential [CO ₂ eq] total	0.787 kg
Global Warming Potential [CO ₂ eq] during manufacturing	0.566 kg
Global Warming Potential [CO ₂ eq] during operation	0.235 kg
Global Warming Potential [CO ₂ eq] after end of life	-0.015 kg
Siemens Eco Profile (SEP)	Siemens EcoTech
Installation/ mounting/ dimensions	
fastening method	front plate mounting
• of modules and accessories	Front plate mounting
height	33.2 mm
width	9.8 mm
depth	27.7 mm

suitability for integration	
<ul style="list-style-type: none"> • plastic enclosure • metal enclosure 	<p>Yes</p> <p>Yes</p>

Approvals Certificates

General Product Approval



[Confirmation](#)



General Product Approval	Test Certificates	Marine / Shipping
--------------------------	-------------------	-------------------



[KC](#)



[Type Test Certificates/Test Report](#)

[Special Test Certificate](#)



Marine / Shipping	other	Environment
-------------------	-------	-------------



[Confirmation](#)



Environment

[Environmental Confirmations](#)

Further information

Information on the packaging

<https://support.industry.siemens.com/cs/ww/en/view/109813875>

Information- and Downloadcenter (Catalogs, Brochures,...)

<https://www.siemens.com/ic10>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3SU1400-1AA10-1BA0>

Cax online generator

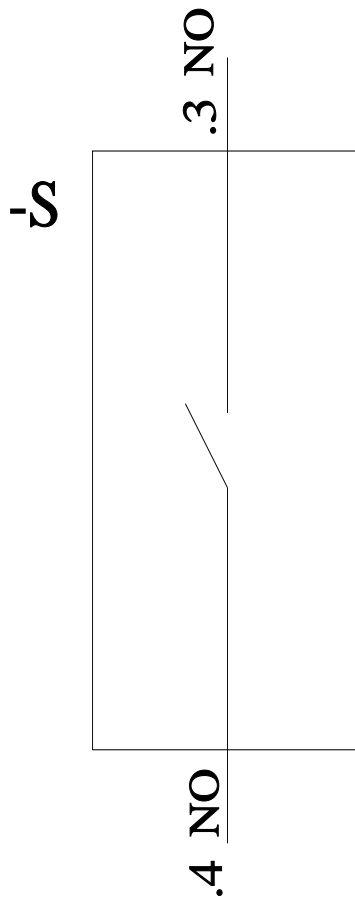
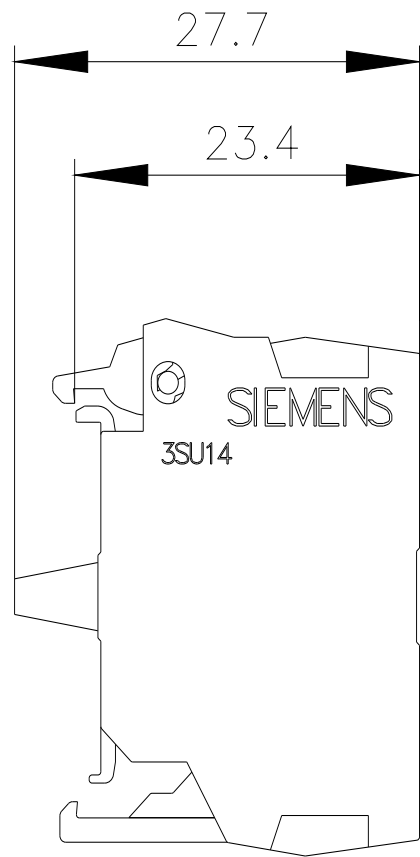
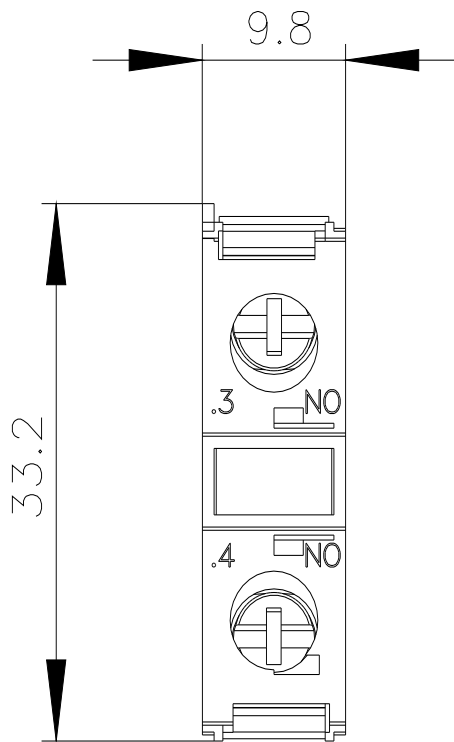
<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3SU1400-1AA10-1BA0>

Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

<https://support.industry.siemens.com/cs/ww/en/ps/3SU1400-1AA10-1BA0>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3SU1400-1AA10-1BA0&lang=en





Contact module with 1 contact element, 1 NC, Contact for installation monitoring, screw terminal, for front plate mounting

product brand name	SIRIUS ACT
product designation	Contact module
product type designation	3SU1
Contact block/ lampholder	
socket design	other
General technical data	
product function positive opening	Yes
insulation voltage rated value	500 V
degree of pollution	3
type of voltage	
• of the operating voltage	AC/DC
• of the input voltage	AC/DC
surge voltage resistance rated value	6 kV
protection class IP	
• of the enclosure	IP40
• of the terminal	IP20, clamping screw tightened
shock resistance	
• according to IEC 60068-2-27	sinusoidal half-wave 15g / 11 ms
• for railway applications according to EN 61373	Category 1, Class B
vibration resistance	
• according to IEC 60068-2-6	10 ... 500 Hz: 5g
• for railway applications according to EN 61373	Category 1, Class B
operating frequency maximum	3 600 1/h
mechanical service life (operating cycles) typical	10 000 000
electrical endurance (operating cycles) typical	10 000 000
thermal current	10 A
reference code according to IEC 81346-2	S
continuous current of the C characteristic MCB	10 A
Substance Prohibitance (Date)	10/01/2014
operating voltage	
• at AC	
— at 50 Hz rated value	5 ... 500 V
— at 60 Hz rated value	5 ... 500 V
• at DC rated value	5 ... 500 V
Power Electronics	
contact reliability	One maloperation per 100 million (17 V, 5 mA), one maloperation per 10 million (5 V, 1 mA)

Auxiliary circuit	
design of the contact of auxiliary contacts	Silver alloy
number of NC contacts for auxiliary contacts	1
• lagging switching	0
number of NO contacts for auxiliary contacts	1
• leading contact	0
operational current at AC-12	
• at 24 V rated value	10 A
• at 48 V rated value	10 A
• at 110 V rated value	10 A
• at 230 V rated value	8 A
• at 400 V rated value	6 A
operational current at AC-15	
• at 24 V rated value	6 A
• at 48 V rated value	6 A
• at 110 V rated value	6 A
• at 230 V rated value	4 A
• at 400 V rated value	3 A
• at 500 V rated value	1.4 A
operational current at DC-12	
• at 24 V rated value	10 A
• at 48 V rated value	5 A
• at 110 V rated value	2.5 A
• at 230 V rated value	0.3 A
• at 400 V rated value	0.3 A
• at 500 V rated value	0.2 A
operational current at DC-13	
• at 24 V rated value	3 A
• at 48 V rated value	1.5 A
• at 110 V rated value	0.6 A
• at 230 V rated value	0.3 A
• at 400 V rated value	0.1 A
• at 500 V rated value	0.1 A
Connections/ Terminals	
type of electrical connection	screw terminal
type of connectable conductor cross-sections	
• solid with core end processing	2x (0.5 ... 0.75 mm ²)
• solid without core end processing	2x (1.0 ... 1.5 mm ²)
• finely stranded with core end processing	2x (0.5 ... 1.5 mm ²)
• finely stranded without core end processing	2x (1,0 ... 1,5 mm ²)
• for AWG cables	2x (18 ... 14)
tightening torque with screw-type terminals	0.8 ... 0.9 N·m
Ambient conditions	
ambient temperature	
• during operation	-25 ... +70 °C
• during storage	-40 ... +80 °C
environmental category during operation according to IEC 60721	3M6, 3S2, 3B2, 3C3 (without salt spray), 3K6 (with relative humidity of 10 ... 95%, no condensation in operation permitted)
Environmental footprint	
Environmental Product Declaration (EPD)	Yes
Global Warming Potential [CO ₂ eq] total	0.787 kg
Global Warming Potential [CO ₂ eq] during manufacturing	0.566 kg
Global Warming Potential [CO ₂ eq] during operation	0.235 kg
Global Warming Potential [CO ₂ eq] after end of life	-0.015 kg
Siemens Eco Profile (SEP)	Siemens EcoTech
Installation/ mounting/ dimensions	
fastening method	front plate mounting
• of modules and accessories	Front plate mounting
height	34 mm
width	9.8 mm
depth	49.7 mm

suitability for integration	
<ul style="list-style-type: none"> • plastic enclosure • metal enclosure 	<p>Yes</p> <p>Yes</p>

Approvals Certificates

General Product Approval



[Confirmation](#)



General Product Approval Test Certificates Marine / Shipping

[KC](#)



[Type Test Certificates/Test Report](#)

[Special Test Certificate](#)



Marine / Shipping other Environment



[Confirmation](#)



Siemens EcoTech



[Environmental Confirmations](#)

Further information

Information on the packaging

<https://support.industry.siemens.com/cs/ww/en/view/109813875>

Information- and Downloadcenter (Catalogs, Brochures,...)

<https://www.siemens.com/ic10>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3SU1400-1AA10-1HA0>

Cax online generator

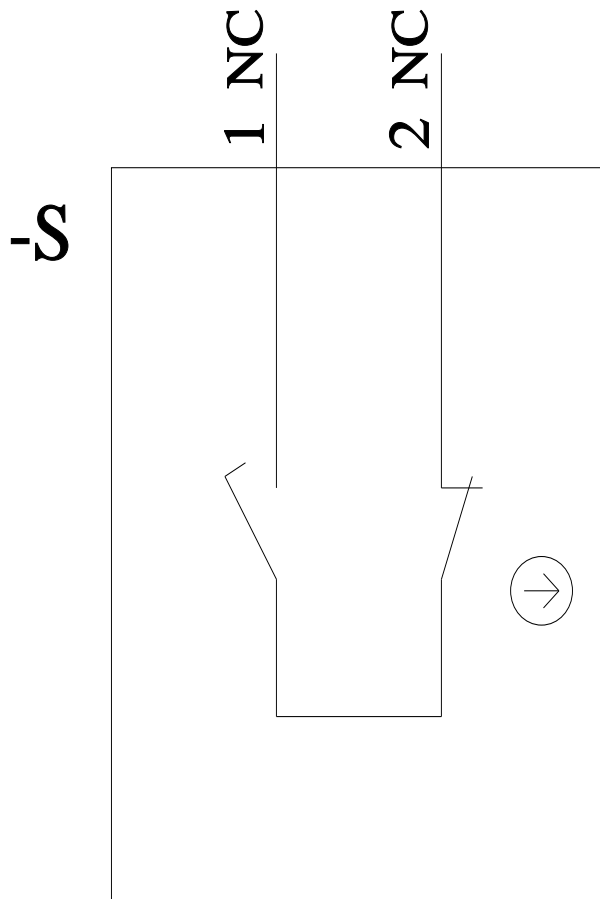
<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3SU1400-1AA10-1HA0>

Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

<https://support.industry.siemens.com/cs/ww/en/ps/3SU1400-1AA10-1HA0>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3SU1400-1AA10-1HA0&lang=en



last modified:

4/8/2024 

Siemens
EcoTech



holder, universal, 3-way, plastic/metal, minimum order quantity 5 or a multiple thereof



product brand name	SIRIUS ACT
product designation	Holders
design of the product	holder, universal for plastic/metal
product type designation	3SU1
manufacturer's article number	
• of the supplied holder	3SU1550-0AA10-0AA0
Actuator	
design of the actuating element	3-way without module
number of contact modules	0
Holder	
material of the holder	Plastic
Display	
number of LED modules	0
General technical data	
product function positive opening	No
product component	
• diode	No
• lamp transformer	No
• light source	No
• series resistor	No
insulation voltage rated value	500 V
degree of pollution	3
surge voltage resistance rated value	6 kV
shock resistance	
• according to IEC 60068-2-27	sinusoidal half-wave 15g / 11 ms
• for railway applications according to EN 61373	Category 1, Class B
vibration resistance	
• according to IEC 60068-2-6	10 ... 500 Hz: 5g
• for railway applications according to EN 61373	Category 1, Class B
reference code according to IEC 81346-2	U
Substance Prohibitance (Date)	10/01/2014
Auxiliary circuit	
number of NC contacts for auxiliary contacts	0
number of NO contacts for auxiliary contacts	0
Connections/ Terminals	
tightening torque of the screws in the bracket	1 ... 1.2 N·m
tightening torque	

• for grounding	0.8 ... 1 N·m
Ambient conditions	
ambient temperature	
• during operation	-25 ... +70 °C
• during storage	-40 ... +80 °C
environmental category during operation according to IEC 60721	3M6, 3S2, 3B2, 3C3, 3K6 (with relative air humidity of 10 ... 95%, no condensation in operation permitted)
Environmental footprint	
Environmental Product Declaration(EPD)	Yes
Global Warming Potential [CO2 eq] total	0.593 kg
Global Warming Potential [CO2 eq] during manufacturing	0.625 kg
Global Warming Potential [CO2 eq] during operation	0.235 kg
Global Warming Potential [CO2 eq] after end of life	-0.267 kg
Siemens Eco Profile (SEP)	Siemens EcoTech
Installation/ mounting/ dimensions	
• fastening method	without
• fastening method of modules and accessories	Front plate mounting
height	40 mm
width	30 mm
shape of the installation opening	round
installation width	30 mm
installation depth	30.1 mm
thickness of the front plate usable	1 ... 6 mm

Approvals Certificates

General Product Approval



[Confirmation](#)



Test Certificates **Marine / Shipping** **other**

[Type Test Certificates/Test Report](#)



[Confirmation](#)

Environment



[Environmental Confirmations](#)

Further information

Information on the packaging

<https://support.industry.siemens.com/cs/ww/en/view/109813875>

Information- and Downloadcenter (Catalogs, Brochures,...)

<https://www.siemens.com/ic10>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3SU1550-0AA10-0AA0>

Cax online generator

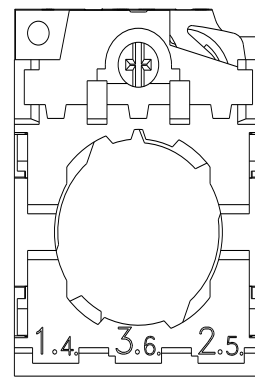
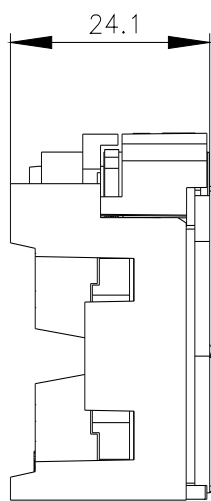
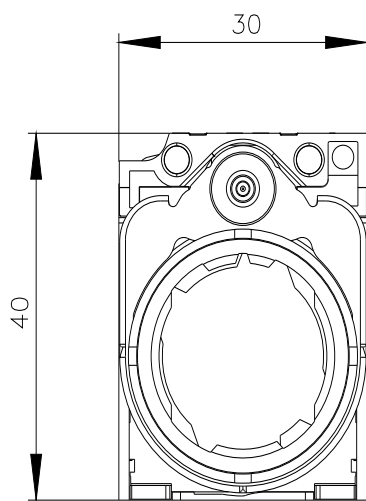
<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3SU1550-0AA10-0AA0>

Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

<https://support.industry.siemens.com/cs/ww/en/ps/3SU1550-0AA10-0AA0>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3SU1550-0AA10-0AA0&lang=en



last modified:

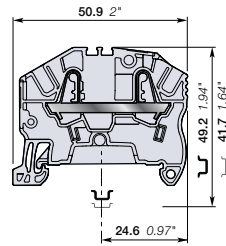
2/7/2024 

ZK2.5 PI-Spring terminal blocks

Feed-through - 5.2 mm 0.205 in spacing



ZK2.5



5.2 mm 0.205 in spacing

Description

Combine high performance with compact dimensions:

- 1000 V IEC 600 V UL,
- Opt for the best marking visibility thanks to the up-front, flat marker zone, which lets you mark up to eight digits or increase the font size.

Ordering details

Description	Color	Type	Order code	Pkg pce	Weight (1 pce) g
Feed-through 2 connections	Grey	ZK2.5	1SNK705010R0000	50	5.50
	Blue	ZK2.5-BL	1SNK705020R0000	50	5.50
	Orange	ZK2.5-OR	1SNK705030R0000	50	5.50
	Yellow	ZK2.5-YL	1SNK705060R0000	50	5.50
	Green	ZK2.5-GN	1SNK705061R0000	50	5.50
	Red	ZK2.5-RD	1SNK705062R0000	50	5.50
	White	ZK2.5-WH	1SNK705065R0000	50	5.50
	Black	ZK2.5-BK	1SNK705066R0000	50	5.50

Main technical data

Connecting capacity	IEC	UL - CSA	Mounting instructions
1 conductor per clamp	Rigid - Solid / Stranded	0.2 ... 4 mm ²	26 ... 12 AWG
	Flexible	0.22 ... 2.5 mm ²	26 ... 14 AWG
	with non insulated ferrule	0.22 ... 2.5 mm ²	26 ... 14 AWG
	with insulated ferrule	0.22 ... 2.5 mm ²	26 ... 14 AWG
2 conductors per clamp	Flexible with twin ferrule	0.22 ... 0.5 mm ²	26 ... 20 AWG
Rated current / Rated cross section		24 A / 2.5 mm ²	20 A / 12 AWG
Rated short-time withstand current (1s)		300 A	
Short Circuit Current Rating (with specific conditions)			100 KA
Rated voltage		1000 V	600 V
Impulse withstand voltage		8000 V	
Protection		IP20	NEMA 1
Increased safety Ex e		693 V 21 A IEC/EN 60079-7 - IM2 II 2 GD Ex eb I/II/III	

Mounting instructions

Rail		TH 35-7.5, TH 35-15
Wire stripping length		11 mm 0.433 in
Tool (for flexible conductor without ferrule)		Flat screwdriver Ø 3.5 mm Ø 0.138 in

The connecting capacity data for one Rigid - Solid / Stranded - Flexible conductor (when applicable) is a mandatory information required by IEC, UL and CSA standards. All other data are provided as supplementary information only. For more details, please consult our CB, UL or CSA certificates and technical datasheet available on <http://www.ABB.com>



Accessories



Description	Color	Type	Order code	Pkg pce	Weight (1 pce) g	
1 End stops	Dark grey	BAZ1	1SNK900002R0000	20	5.30	
2 End sections	Dark grey	EK2.5	1SNK705910R0000	20	1.76	
3 Jumper bars	Orange	2 poles	JB5-2	1SNK905302R0000	50	1.30
		3 poles	JB5-3	1SNK905303R0000	50	2.00
		4 poles	JB5-4	1SNK905304R0000	50	2.70
		5 poles	JB5-5	1SNK905305R0000	50	3.50
		10 poles	JB5-10	1SNK905310R0000	30	7.10
		50 poles	JB5-50	1SNK905350R0000	10	36.10
4 Cross spacing jumpers	Orange	JB85-3	1SNK900603R0000	10	2.80	
5 Circuit separators	Dark grey	CS-R2	1SNK900106R0000	20	3.84	
6 Test adapters	Dark grey	For test plugs DIA 2 mm 0.079 in	TP2	1SNK900203R0000	20	1.73
		For test plugs DIA 4 mm 0.157 in	TP4	1SNK900205R0000	20	2.41
		For test plugs DIA 4 mm 0.157 in	TP4	1SNK900205R0000	20	2.41
7 Test connectors	Dark grey	5.2 mm 0.205 in spacing	TC5	1SNK900200R0000	10	5.23
		End module, 5.2 mm 0.205 in	TC5-R1	1SNK900201R0000	10	5.23
			SHBP	1SNK900601R0000	20	4.12
8 Shield connectors	White	Blank card	MC512	1SNK140000R0000	22	9.00
			MC512PA	1SNK149999R0000	20	10.00
		Universal wire markers holder	Grey	UMH	1SNK900611R0000	10

Complete list of accessories is indicated in the terminal block datasheet. Some accessories such as jumper bars may modify the terminal block's ratings: complete information in the accessories catalogue pages.

Ground PI-Spring terminal blocks

Description	Color	Type	Order code	Pkg pce	Weight (1 pce) g
Ground Profile aligned with ZK2.5	Green-yellow	ZK2.5-PE	1SNK705150R0000	20	10.00

All the technical data for UL/CSA standard and dimensions in inches are in italic.

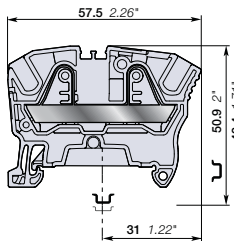
ZK6 PI-Spring terminal blocks

Feed-through - 8 mm 0.315 in spacing



1SNK1620450014

ZK6



8 mm 0.315 in spacing

Description

Combine high performance with compact dimensions:

- 1000 V IEC 600 V UL,
- Opt for the best marking visibility thanks to the up-front, flat marker zone, which lets you mark up to eight digits or increase the font size.

Ordering details

Description	Color	Type	Order code	Pkg pce	Weight (1 pce) g
Feed-through 2 connections	Grey <input type="checkbox"/>	ZK6	1SNK708010R0000	50	11.80
	Blue <input type="checkbox"/>	ZK6-BL	1SNK708020R0000	50	11.80
	Orange <input type="checkbox"/>	ZK6-OR	1SNK708030R0000	50	11.80

Main technical data

Connecting capacity	IEC	UL - CSA	Mounting instructions	
1 conductor per clamp	Rigid - Solid / Stranded	0.5 ... 10 mm ²	24 ... 8 AWG	Rail TH 35-7.5, TH 35-15
	Flexible	0.5 ... 6 mm ²	24 ... 8 AWG	Wire stripping length 12.5 mm 0.492 in
	with non insulated ferrule	0.5 ... 6 mm ²	24 ... 10 AWG	
2 conductors per clamp	with insulated ferrule	0.5 ... 6 mm ²	24 ... 10 AWG	Tool (for flexible conductor without ferrule) Flat screwdriver Ø 4 mm Ø 0.157 in
	Flexible with twin ferrule	0.5 ... 1.5 mm ²	24 ... 16 AWG	
Rated current / Rated cross section		41 A / 6 mm ²	50 A / 8 AWG	
Rated short-time withstand current (1s)		720 A		
Short Circuit Current Rating (with specific conditions)			100 kA	
Rated voltage		1000 V	600 V	
Impulse withstand voltage		8000 V		
Protection		IP20	NEMA 1	
Increased safety Ex e		693 V 37 A IEC/EN 60079-7 - IM2 II 2 GD Ex eb I/II/C/IIIC		

The connecting capacity data for one Rigid - Solid / Stranded - Flexible conductor (when applicable) is a mandatory information required by IEC, UL and CSA standards. All other data are provided as supplementary information only. For more details, please consult our CB, UL or CSA certificates and technical datasheet available on <http://www.ABB.com>



Accessories



Description	Color	Type	Order code	Pkg pce	Weight (1 pce) g	
1 End stops	Dark grey <input type="checkbox"/>	BAZ1	1SNK900002R0000	20	5.30	
2 End sections	Dark grey <input type="checkbox"/>	EK2.5	1SNK705910R0000	20	1.76	
3 Jumper bars	Orange <input type="checkbox"/>	2 poles 57 A	JB8-2	1SNK908302R0000	50	2.70
		3 poles	JB8-3	1SNK908303R0000	50	4.10
		4 poles	JB8-4	1SNK908304R0000	50	5.60
		5 poles	JB8-5	1SNK908305R0000	40	7.00
		10 poles	JB8-10	1SNK908310R0000	20	14.20
4 Cross spacing jumpers	Orange <input type="checkbox"/>	JB85-3	1SNK900603R0000	10	2.80	
5 Circuit separators	Dark grey <input type="checkbox"/>	CS-R2	1SNK900106R0000	20	3.84	
6 Test adapters	Dark grey <input type="checkbox"/>	For test plugs DIA 2 mm 0.079 in	TP2	1SNK900203R0000	20	1.73
		For test plugs DIA 4 mm 0.157 in	TP4	1SNK900205R0000	20	2.41
7 Test connectors	Dark grey <input type="checkbox"/>	TC5-R1	1SNK900201R0000	10	5.23	
8 Spacers	Dark grey <input type="checkbox"/>	2.8 mm 0.110 in	ES-TC8	1SNK900104R0000	10	1.35
		Blank card	White <input type="checkbox"/>	MC812	1SNK160000R0000	22
9 Terminal block markers	Grey <input type="checkbox"/>	MC812PA	1SNK169999R0000	20	14.00	
		Universal wire markers holder	UMH	1SNK900611R0000	10	0.20

Complete list of accessories is indicated in the terminal block datasheet. Some accessories such as jumper bars may modify the terminal block's ratings: complete information in the accessories catalogue pages.



Ground PI-Spring terminal blocks

Description	Color	Type	Order code	Pkg pce	Weight (1 pce) g
Ground Profile aligned with ZK6	Green-yellow <input type="checkbox"/>	ZK6-PE	1SNK708150R0000	20	20.30

All the technical data for UL/CSA standard and dimensions in inches are in italic.

1SNK16202950201



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Technical Information

Prosonic S FMU90

Transmitter in housing for field or top-hat rail mounting
for the ultrasonic sensors FDU90/91/91F/92/93/95/96



Application for level measurement

- Continuous, non-contact level measurement of fluids, pastes, sludge and powdery to coarse bulk materials with 1 or 2 ultrasonic sensors
- Measuring range up to 70 m (depending on sensor and material measured)
- Level limit detection (up to 6 relays)
- Pump control (alternating); rake control
- Option: additional pump control functions (pump function test, ...)
- Calculations: average, difference, sum

Application for flow measurement

- Flow measurement in open channels and measuring weirs with 1 or 2 ultrasonic sensors
- Simultaneous measurement of level and flow in a stormwater overflow basin with only 1 sensor
- Flow measurement with back water detection (2 sensors) or sludge detection
- Up to 3 totalizers and 3 (resettable) counters; optionally resettable via digital inputs
- Counting or time pulse output for control of external units

Your benefits

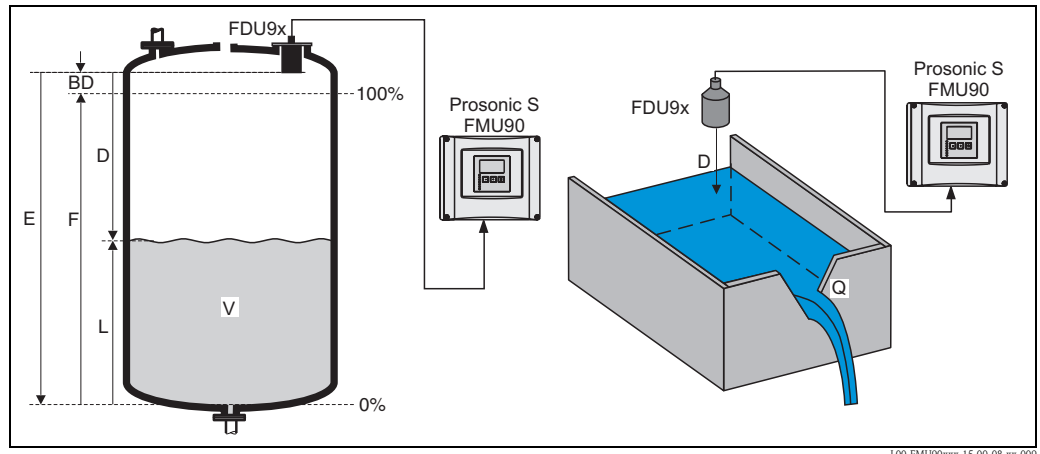
- Simple, menu-guided operation with 6-line plain text display; 15 languages selectable
- Envelope curves on the display for quick and simple diagnosis
- Easy operation, diagnosis and measuring point documentation with the supplied "ToF-Tool - FieldTool Package" operating program.
- Option: four digital inputs (e.g. for pump feedback) and one external temperature input
- Time-of-flight correction via integrated or external temperature sensors
- Linearisation (up to 32 points, freely configurable)
- Linearisation tables for the most common flumes and weirs pre-programmed and selectable
- Online calculation of the flume-/weir-flows via integrated flow curves
- Pre-programmed pump control routines
- System integration via HART or PROFIBUS DP
- Automatic detection of the sensors FDU9x
- The sensors of the former series FDU8x can be connected (for certificates see note on page 8)

Table of Contents

Function and system design	3	Climate class	21
Measuring principle	3	Vibration resistance	21
Blocking distance	3	Ingress protection	21
Time-of-flight correction	3	Electromagnetic compatibility (EMC)	22
Interference echo suppression	3		
Pump control	3	Mechanical construction	23
Linearisation	4	Housing versions	23
Special functions	4	Dimensions of the field housing	23
Datalog functions	4	Dimensions of the DIN-rail housing	24
Application examples for level measurements	5	Dimensions of the separate display and operating module	26
Application examples for flow measurements	6	Weight	26
System integration HART	7	Materials	26
System integration			
PROFIBUS DP	7	Human interface	27
		Display and operating module	27
Input	8	Operating menu	27
Sensor inputs	8	Basic setup	27
External limit switches		Locking of the instrument	27
(option)	8		
External temperature sensor	8	Certificates and Approvals	28
		CE mark	28
Output	9	Ex approval	28
Analogue outputs	9	External standards and guidelines	28
Relay outputs	9		
PROFIBUS DP interface	10	Ordering information	29
		Product structure	29
Auxiliary energy	10	Scope of delivery	29
Supply voltage/			
Power consumption/		Accessories	30
Current consumption	10	Commubox FXA191 HART	30
Galvanic isolation	10	Commubox FXA195 HART	30
Fuse	10	Commubox FXA291	30
		Protection cover for the field housing	30
Electrical connection	11	Mounting plate for the field housing	30
Terminal compartment of the field housing	11	Mounting bracket	31
Cable entries of the field housing	11	Adaption plate for remote display	31
Terminal compartment of the DIN-rail housing	12	Overvoltage protection HAW56x	32
Terminal assignment	13	Temperature sensor FMT131	36
Terminals	15		
Connection of the sensors FDU9x	16	Supplementary documentation	37
Synchronization line	17	Innovation booklet	37
Connection of the separate display and operating module	17	Technical Information	37
Connection of external switches		Operating instructions	
(for FMU90-*****B***)	18	(for transmitter FMU90)	37
Connection of a temperature sensor	19	Description of Instrument Functions	37
		Safety Instructions	37
Performance characteristics	21	38
Reference operating conditions	21	39
Measuring uncertainty	21		
Typical accuracy	21		
Measured value resolution	21		
Measuring frequency	21		
Influence of the vapor pressure	21		
Ambient conditions	21		
Ambient temperature	21		
Storage temperature	21		

Function and system design

Measuring principle



BD: blocking distance; **D:** distance from sensor membrane to fluid surface; **E:** empty distance **F:** span (full distance); **L:** level; **V:** volume (or mass); **Q:** flow

The sensor transmits ultrasonic pulses in the direction of the product surface. There, they are reflected back and received by the sensor. The transmitter Prosonic S measures the time t between pulse transmission and reception. From t (and the velocity of sound c) it calculates the distance D from the sensor membrane to the product surface:

$$D = c \cdot t/2$$

From D results the desired measuring value:

- level L
- volume V
- flow Q across measuring weirs or open channels

Blocking distance

The span F may not extend into the blocking distance BD . Level echos from the blocking distance can not be evaluated due to the transient characteristics of the sensor. The blocking distances of the individual sensors are given in the following documents:

- TI 396F for the sensors FDU 90/91/91F/92/93/95/96
- TI 189F for the sensors FDU 80/80F/81/81F/82/83/84/85/86

Time-of-flight correction

In order to compensate for temperature dependent time-of-flight changes, a temperature sensor is integrated in the ultrasonic sensors.

Optionally, the Prosonic S FMU90 has an input for an external temperature sensor (FMU90-*****B***). The following sensor can be connected:

- Pt100
- FMT131 from Endress+Hauser

The external sensor must be used for the heated version of the ultrasonic sensors FDU90 and FDU91.

Interference echo suppression

The interference echo suppression feature of the Prosonic S ensures that interference echos (e.g. from edges, welded joints and installations) are not interpreted as a level echo.

Pump control

individually configurable for each pump:

- pump switching delay, e.g. to prevent overload of the power supply system
- backlash time and backlash interval, e.g. for complete draining of shafts or channels
- crust reduction at pump shaft walls by fine adjustment of the switch point

Linearisation**Pre-programmed linearisation curves***Types of vessels*

- horizontal, cylindrical tank
- spherical tank
- tank with pyramidal bottom
- tank with conical bottom
- tank with flat, inclined bottom

Flow curves for flumes and weirs¹⁾

- Khafagi-Venturi flume
- ISO-Venturi flume
- BST²⁾-Venturi flume
- Parshall flume
- Palmer-Bowlus flume
- Rectangular weir
- Rectangular constricted weir
- NFX³⁾ rectangular weir
- NFX³ rectangular constricted weir
- Trapezoidal weir
- V-notch weir
- BST² V-notch wier
- NFX³ V-notch weir

The pre-programmed linearisation curves are calculated on-line.

Linearisation formula for flow measurements¹

$$Q = C (h^\alpha + \gamma h^\beta)$$

"h" is the upstream level. The parameters α , β , γ and C can be freely programmed by the user.

Linearisation table

consisting of up to 32 linearisation points; to be entered manually or half-automatically.

Special functions

- limit detection
- rake control
- alternating pump control or control according to pump rate (standard)
- option: additional pump control functions⁴⁾:
 - Alternation accordint to runtime or starts
 - pump feedback via the optional digital inputs; stand-by pump configurable
 - pump function test after resting time
 - storm function to prevent unnecessary pump running times
 - flush control for regular pump shaft cleaning
 - pump control according to tariff times via digital input
 - output of operating hours alarm or pump alarm
 - recording of pump data (operating hours, number of starts, last running time)
- totalising of the flow volume with (resettable) counters and (non-resettable) totalisers¹
- triggering of a sampler by time or quantity pulses¹
- low flow cut off¹
- backwater detection in flumes¹
- sludge detection in flumes¹
- trend detection

Datalog functions

- Peak hold indicator of the min./max. levels or flows and the min./max. temperatures at the sensors
- Recording of the last 10 alarms
- Indication of the operating status
- Trend indication of the outputs on the on-site display
- Indication of the operating hours

1) for instrument versions with flow software (FMU90 - *2*****)

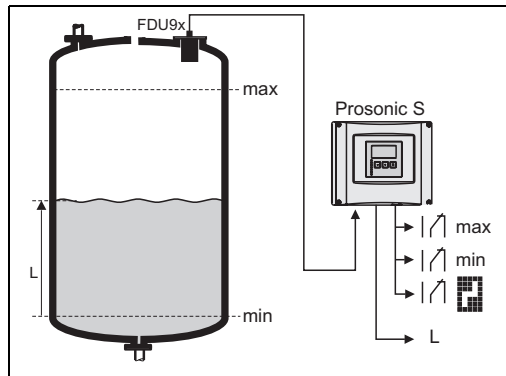
2) BST: British Standard

3) French standard NFX 10-311

4) for instruments with software for additional pump control (FMU90-*3***** or FMU90-*4*****)

Application examples for level measurements

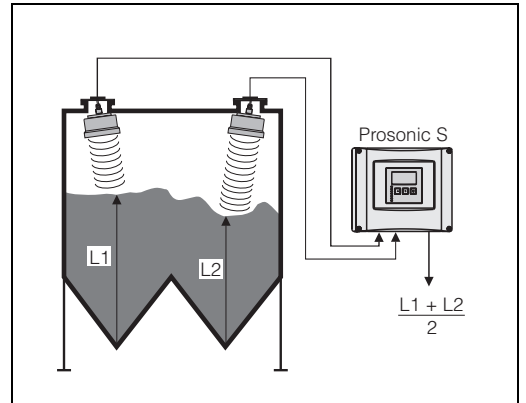
Level measurement with limit detection and alarm output



L00-FMU90xxx-15-00-00-xx-010

Order code e.g.: FMU90 - *1***131****
(1 input, 3 relays, 1 outputs)

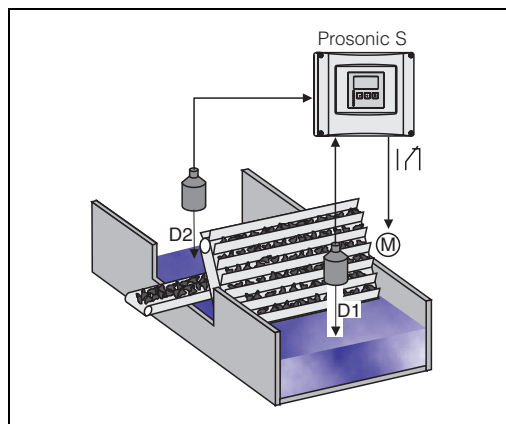
Average level measurement



L00-FMU90xxx-15-00-00-xx-003

Order code e.g.: FMU90 - *1***212****
(2 inputs, 2 outputs)

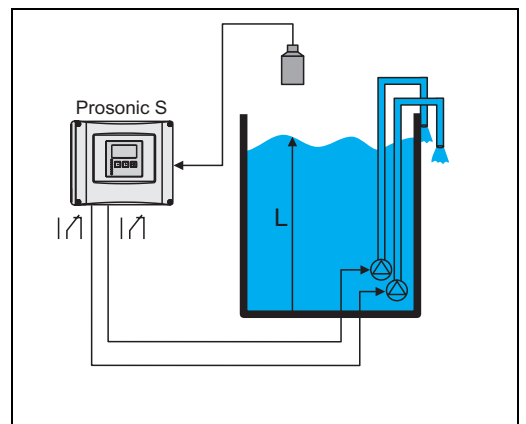
Rake control (differential measurement)



L00-FMU90xxx-15-00-00-xx-004

Order code e.g.: FMU90 - *1***212****
(2 inputs, 1 relay, 2 outputs)

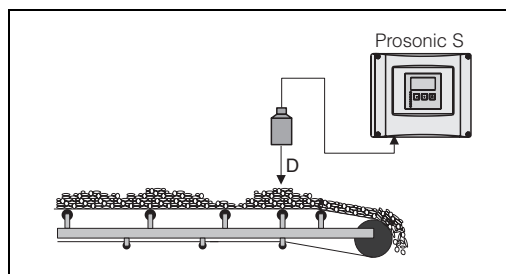
Alternating pump control (up to 6 pumps)



L00-FMU90xxx-15-00-00-xx-007

Order code e.g.: FMU90 - *1***131****
(1 input, 3 relays)

Conveyor belt

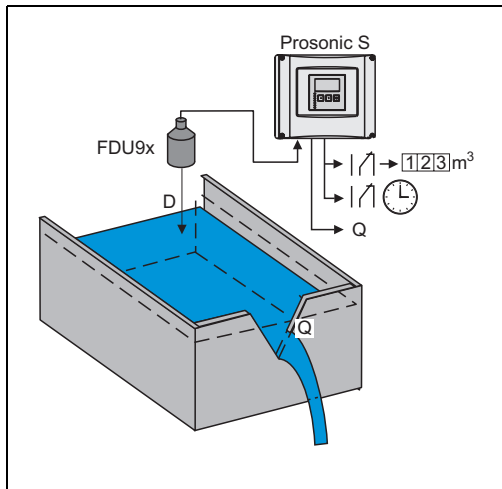


L00-FMU90xxx-15-00-00-xx-005

Order code e.g.: FMU90 - *1***111****
(1 input, 1 output)

Application examples for flow measurements

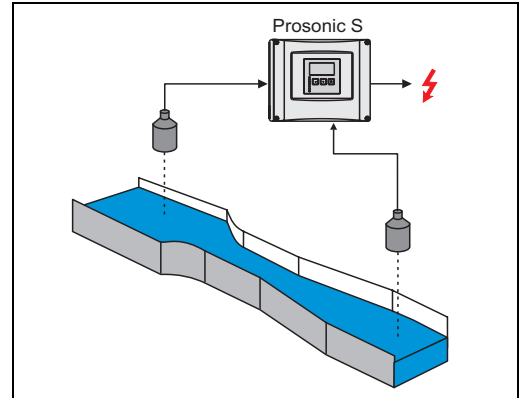
Pulses for volume counter + time pulses (e.g. for sampler)



Order code e.g.: FMU90 - *2***131****
(1 input, 3 relays, 1 output)

Flow measurement with backwater alarm or sludge detection

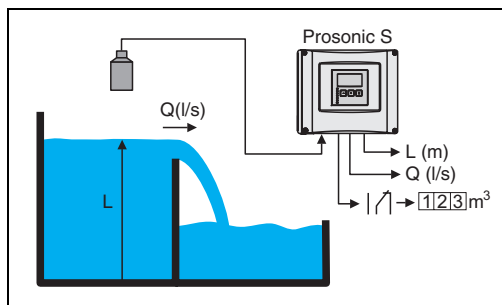
If the ratio "downstream level:upstream level" rises above or falls below a critical value, an alarm will be generated.



Order code e.g.: FMU90 - *2***212****
(2 inputs, 1 relay, 2 outputs)

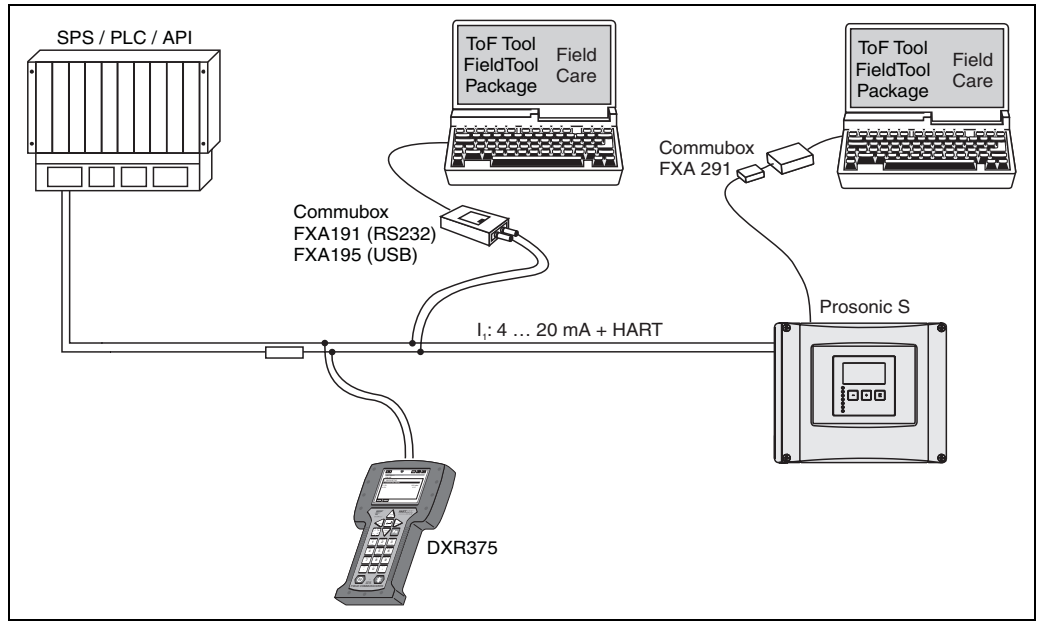
Stormwater overflow bassin

Simultaneous measurement of level L and flow Q with 1 sensor.



Order code e.g.: FMU90 - *2***112****
(1 input, 2 outputs)

System integration HART



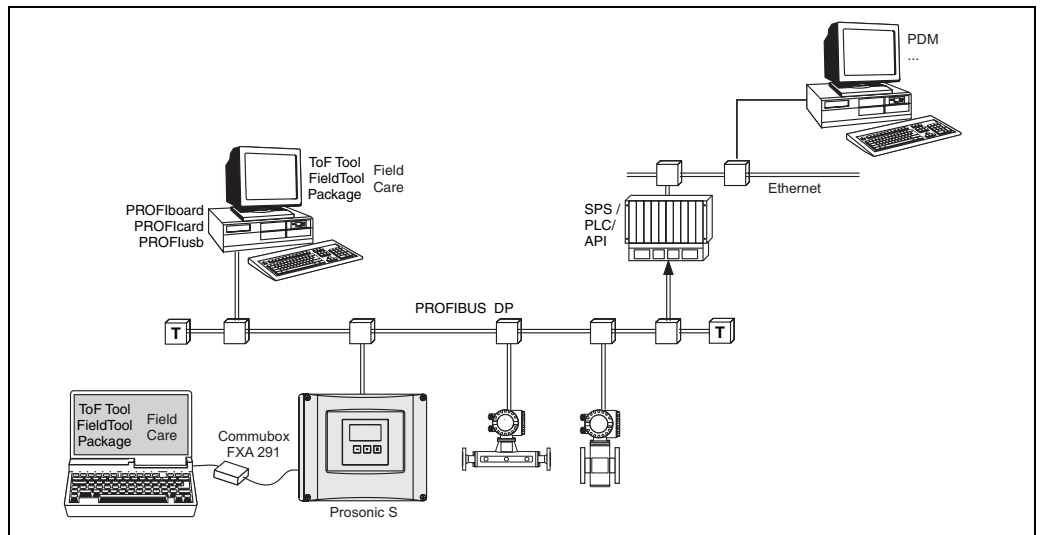
L00-FMU90xxx-14-00-00-xx-009

In the standard version a HART signal is superimposed onto the first output current. In order to use the HART communication, the circuit must contain a communication resistor of 250Ω.

Operating options

- via the operating and display module at the Prosonic S (if present)
- via the service interface of the Prosonic S with the Commubox FXA291 and the operating program "ToF Tool - FieldTool Package" or "FieldCare"
- via the HART protocol, e.g. with the Commubox FXA191 or FXA195 and the operating program "ToF Tool - FieldTool Package" or "FieldCare"
- via the HART handheld terminal DXR375

System integration PROFIBUS DP



L00-FMU90xxx-14-00-00-xx-010

Operating options

- via the display and operating module at the Prosonic S
- via the service interface with the Commubox FXA291 and the operating program "ToF Tool - FieldTool Package" or "FieldCare"
- via PROFIBUS DP with Profibus or Proficard and the operating program "ToF Tool - FieldTool Package" or "FieldCare"

Input

Sensor inputs

Depending on the instrument version, 1 or 2 of the sensors FDU90, FDU91, FDU91F, FDU92, FDU93, FDU95 and FDU96 can be connected. The Prosonic S identifies these sensors automatically.

Sensor	FDU90	FDU91 FDU91F	FDU92	FDU93	FDU95	FDU96
max. range ¹⁾ in liquids	3 m	10 m	20 m	25 m	-	-
max. range ¹⁾ in solids	1.2 m	5 m	10 m	15 m	45 m	70 m

- 1) This table gives the maximum range. The range depends on the measuring conditions. For an estimation see Technical Information TI 396F, chapter "Input".

In order to support existing installations, the sensors of the former series FDU8x can be connected as well. The type of sensor must be entered manually.

Sensor	FDU80 FDU80F	FDU81 FDU81F	FDU82	FDU83	FDU84	FDU85	FDU86
max. range ¹⁾ in liquids	5 m	9 m	20 m	25 m	-	-	-
max. range ¹⁾ in solids	2 m	5 m	10 m	15 m	25 m	45 m	70 m

- 1) This table gives the maximum range. The range depends on the measuring conditions. For an estimation see Technical Information TI 189F, chapter "Planning Recommendations".



Warning!

The sensors FDU83, FDU84, FDU85 and FDU86 with an ATEX, FM or CSA certificate are not certified for connection to the transmitter FMU90.

External limit switches (option)

Optionally, the Prosonic S FMU90 has four inputs for external limit switches (FMU90-*****B***).

Switching options

- external passive limit switch (NC/NO switch)
- 0: < 8 V; 1: > 16 V

Usage (examples)

- pump feedback (for FMU90-*3*****B*** and FMU90-*4*****B***)
- pump tariff control (for FMU90-*3*****B*** and FMU90-*4*****B***)
- start/stop/reset of daily counters (for flow measurements)
(for FMU90-*2*****B*** and FMU90-*4*****B***)
- min/max level detection, e.g. by Liquiphant

External temperature sensor

Optionally, the Prosonic S FMU90 has an input for an external temperature sensor (FMU90-*****B***).

Connectable sensors

- Pt100 (3-wire or 4-wire connection)
A Pt100 with 2-wire connection may not be used due to its insufficient accuracy.
- FMT131 (from Endress+Hauser, see chapter "Accessories")

Usage (example)

- Time-of-flight correction for a heated sensor (FDU91-***B*).

Output

Analogue outputs

Number	1 or 2, depending on instrument version
Output signal	configurable at the instrument: <ul style="list-style-type: none"> ■ 4 ... 20 mA with HART¹⁾ ■ 0 ... 20 mA without HART
Signal on alarm	<ul style="list-style-type: none"> ■ for setting 4 ... 20 mA, selectable: <ul style="list-style-type: none"> - -10% (3,6 mA) - 110% (22 mA) - HOLD (last current value is held) - user specific ■ for setting 0 ... 20 mA: <ul style="list-style-type: none"> - 110% (21,6 mA) - HOLD (last current value is held) - user specific
Output damping	freely selectable, 0 ... 1000 s
Load	max. 600 Ω, influence negligible
max. ripple	$U_{SS} = 200 \text{ mV}$ at 47 ... 125 Hz (measured at 500Ω)
max. noise	$U_{eff} = 2,2 \text{ mV}$ at 500 Hz... 10 kHz (measured at 500Ω)

1) The HART signal is assigned to the first analogue output. The second analogue output does not carry a HART signal.

Relay outputs

Number	1, 3 or 6; depending on the instrument version
Type	potential-free relay, SPDT, can be inverted
Assignable functions	<ul style="list-style-type: none"> ■ limit (inband, out-of-band, trend, level limit) ■ counting pulse¹ for flow counting (max. frequency 2 Hz; pulse width adjustable) ■ time pulse¹ (max. frequency 2 Hz; pulse width adjustable) ■ alarm/diagnosis (e.g. indication of backwater¹⁾, sludge¹, echo loss etc.) ■ pump control (alternating/fixed limit/pump rate) ■ for FMU90-*3***** and FMU90-*4*****): additional pump control (standby pump, storm function to avoid unnecessary run times of the pumps, pump function test, flush control to clean pump shafts, operating hours alarm, pump alarm) ■ rake control (difference or relative measurement) ■ fieldbus relay (to be switched directly from the Profibus DP-bus)
Switching power	<ul style="list-style-type: none"> ■ DC voltage: 35 V_{DC}, 100 W ■ AC voltage: 4 A, 250 V, 100 VA at $\cos\varphi = 0,7$
State on error	selectable: <ul style="list-style-type: none"> ■ HOLD (last value is held) ■ energized ■ de-energized ■ present value is used
Behaviour after power failure	switch-on delay selectable
LEDs ²⁾	A yellow LED on the front panel is allocated to each relay, which lights if the relay is energized. The LED of an alarm relay lights during normal operation. The LED for a pulse relay briefly flashes at every pulse.

1) for instrument versions with flow software (FMU90 - *2*****)

2) for instrument versions with display and operating module

PROFIBUS DP interface

Profile	3.0
Transmittable values	<ul style="list-style-type: none"> ■ main value (level or flow, depending on the instrument version) ■ distances ■ counters ■ temperatures ■ average/difference/sum ■ relay states ■ rake control ■ pump control
Function blocks	<ul style="list-style-type: none"> ■ 10 Analog Input Blocks (AI) ■ 10 Digital Input Blocks (DI) ■ 10 Digital Output Blocks (DO)
Supported baud rates	<ul style="list-style-type: none"> ■ 9.6 kbaud ■ 19.2 kbaud ■ 45,45 kbaud ■ 93.75 kbaud ■ 187.5 kbaud ■ 500 kbaud ■ 1.5 Mbaud ■ 3 Mbaud ■ 6 Mbaud ■ 12 Mbaud
Service Access Points (SAPs)	1
ID number 1540 (hex)	1540 (hex) = 5440 (dec)
GSD file	EH3x1540.gsd
Addressing	via dip switches at the instrument or via software (e.g. FieldCare) Default address: 126 per software
Termination	can be activated/deactivated in the instrument
Locking	The device can be locked by hardware or software.

Auxiliary energy

**Supply voltage/
Power consumption/
Current consumption**

Instrument version	Supply voltage	Power consumption	Current consumption
AC voltage (FMU90 - ****A****)	90 ... 253 V _{AC} (50/60 Hz)	max. 23 VA	max. 100 mA at 230 V _{AC}
DC voltage (FMU90 - ****B****)	10,5 ... 32 V _{DC}	max. 14 W (typically 8 W)	max. 580 mA at 24 V _{DC}

Galvanic isolation

The following terminals are galvanically isolated from each other:

- auxiliary energy
- sensor inputs
- analogue output 1
- analogue output 2
- relay outputs
- bus connection (PROFIBUS DP)

Fuse

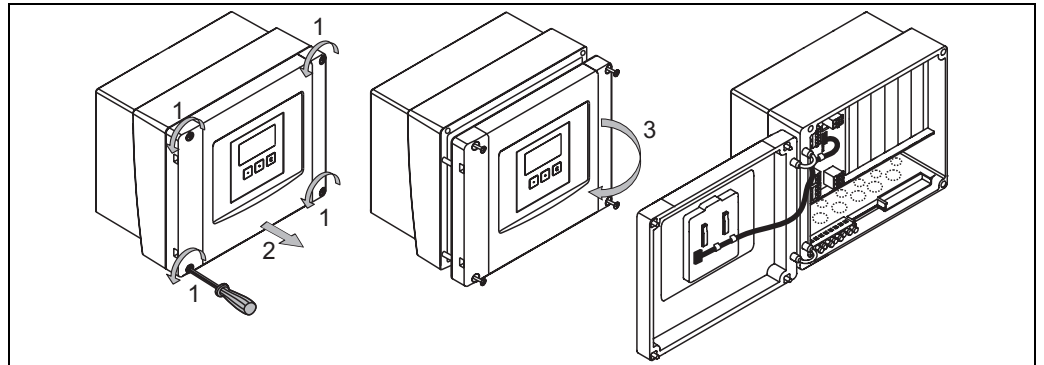
- 2 A T /DC
- 400 mA T /AC

accessible in the terminal compartment

Electrical connection

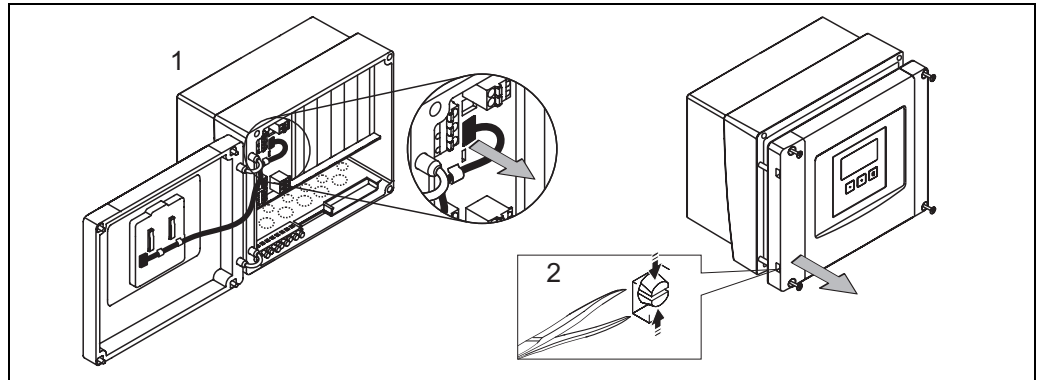
Terminal compartment of the field housing

The field housing has a separate terminal compartment. It can be opened after loosening the four screws of the lid.



L00-FMU90xxx-04-00-00-xx-002

For easier wiring, the lid can be completely removed by unplugging the display plug (1) and loosening the hinges (2):



L00-FMU90xxx-04-00-00-xx-009

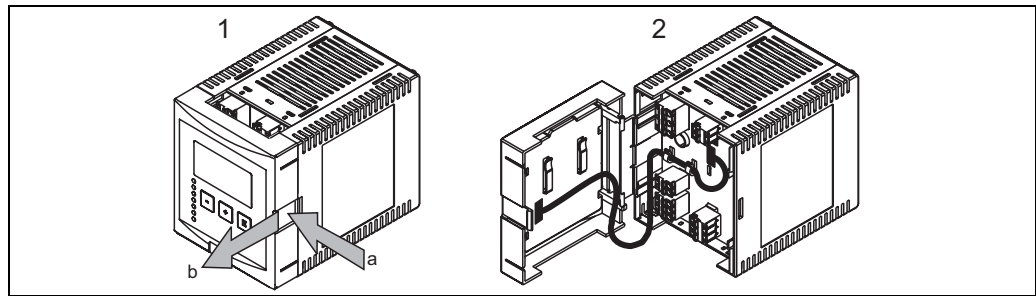
Cable entries of the field housing

On the bottom of the housing the following openings for cable entries are prestamped:

- M20x1,5 (10 openings)
- M16x1,5 (5 openings)
- M25x1,5 (1 opening)

A suitable cutting device must be used for cutting out the openings.

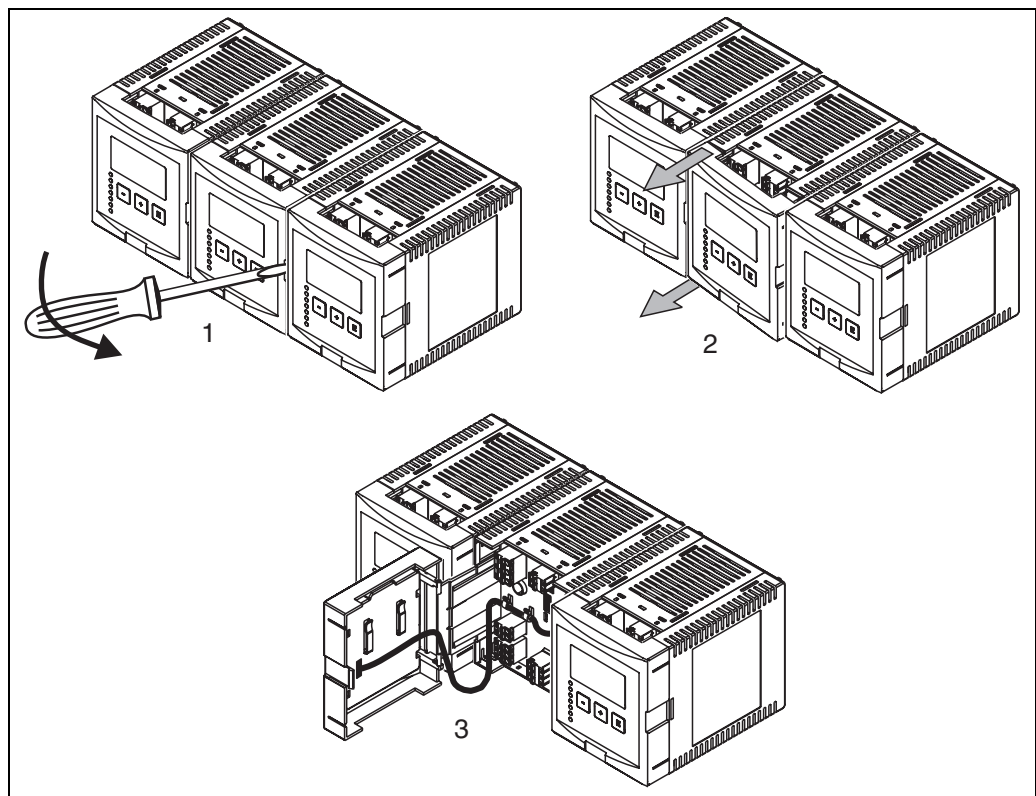
Terminal compartment of the Single instrument DIN-rail housing



I00-fmu90xxx-04-00-00-xx-003

The catch can be unlocked by slightly pressing onto the clip. Then, the cover of the terminal compartment can be opened.

Several instruments mounted side by side



I00-FMU90xxx-04-00-00-xx-012

1. Open the catch of the cover (e.g. by a screwdriver).
2. Pull the cover out by approx. 2 cm.
3. The cover can now be opened.



Note!

- The cables can be inserted into the housing from above or from below.
- The pictures show the smallest housing version but are valid for the larger versions as well.
- If the instruments are mounted next to each other and if the sensor cables run in parallel, the synchronization terminals (39 and 40) must be interconnected (see sections "Terminal assignment" and Synchronization line").

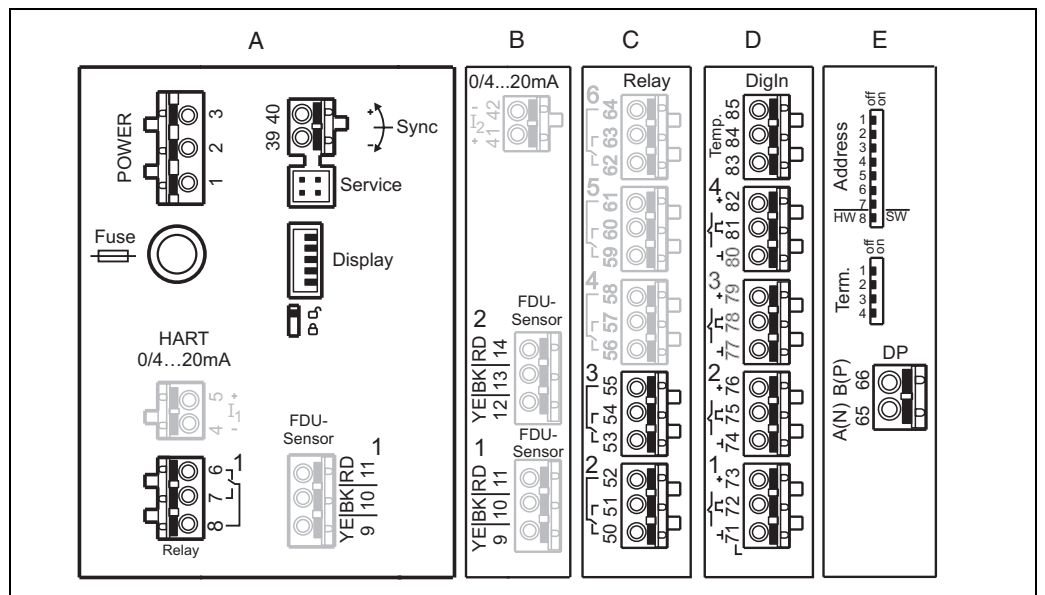
Terminal assignment

Pluggable spring-force terminals for connection of the cables are supplied in the terminal compartment. Rigid conductors or flexible conductors with cable sleeve can directly be inserted and are contacted automatically.

Conductor cross section	0,2 mm ² - 2,5 mm ²
Cable and sleeve cross section	0,25 mm ² - 2,5 mm ²
min. stripping length	10 mm

The terminal configuration depends on the instrument version ordered. There is a basic terminal area, which is present in every instrument version. Additional optional terminal areas are only present if the respective option has been selected in the product structure.

Terminal area	present for the following instrument versions	
Basic area	A	for all versions
Optional areas	B	for instrument versions with 2 sensor inputs and/or 2 analogue outputs (FMU90 - *****2***** and/or FMU90 - *****2*****)
	C	for instrument versions with 3 or 6 relays (FMU90 - *****3***** oder FMU90 - *****6*****)
	D	for instruments with external switch inputs and external temperature input (FMU90 - *****B*****)
	E	for instrument versions with PROFIBUS DP interface (FMU90 - *****3*****)



Terminals of the Prosonic S; the terminals depicted in grey are not present in every instrument version. **A:** Basic terminal area; **B-E:** Optional terminal areas (present if the respective option has been selected in the product structure)



Note!
The depicted switching states of the relays refer to the de-energized state.

Terminals	Meaning	Terminal area	Remarks
Auxiliary energy			
1, 2	<ul style="list-style-type: none"> ■ L (für AC version) ■ L+ (for DC version) 	A	depending on instrument version: <ul style="list-style-type: none"> ■ 90 ... 253 V_{AC} ■ 10,5 ... 32 V_{DC}
2	<ul style="list-style-type: none"> ■ N (for AC version) ■ L- (for DC version) 	A	
3	Potential equalization	A	
Fuse		A	depending on instrument version: <ul style="list-style-type: none"> ■ 400 mA T (for AC) ■ 2 A T (for DC)
Analog outputs (not available for Profibus DP instruments)			
4, 5	Analog output 1; 4 ... 20 mA with HART/ 0 ... 20 mA w/o HART	A	not present for the PROFIBUS DP version
41, 42	Analog output 2 (optional); 4 ... 20 mA/ 0 ... 20 mA	B	only for the version with two analog outputs; no HART signal at this output
Relay outputs			
6, 7, 8	Relay 1	A	
50, 51, 52	Relay 2 (optional)	C	only for the versions with 3 or 6 relays
53, 54, 55	Relay 3 (optional)	C	only for the versions with 3 or 6 relays
56, 57, 58	Relay 4 (optional)	C	only for the version with 6 relays
59, 60, 61	Relay 5 (optional)	C	only for the version with 6 relays
62, 63, 64	Relay 6 (optional)	C	only for the version with 6 relays
Bus communication (only available for Profibus DP instruments)			
65	PROFIBUS A (RxT/TxD - N)	D	only for the PROFIBUS DP version
66	PROFIBUS B (RxT/TxD - P)	D	
Synchronization			
39, 40	Synchronization	A	see section 4.6, "Synchronization line"
Level inputs			
9 (YE), 10 (BK), 11 (RD)	Sensor 1 (FDU8x/9x) YE: yellow strand BK: black strand RD: red strand		<ul style="list-style-type: none"> ■ A: for versions with 1 sensor input ■ B: for versions with 2 sensor inputs¹⁾
12 (YE), 13 (BK), 14 (RD)	Sensor 2 (FDU8x/9x) (optional) YE: yellow strand BK: black strand RD: red strand	B	only for the version with 2 sensor inputs
external switch inputs			
71, 72, 73	external switch input 1	D	0: < 8 V or 72 and 73 interconnected 1: > 16 V or 72 and 73 not interconnected
74, 75, 76	external switch input 2	D	0: < 8 V or 75 and 76 interconnected 1: > 16 V or 75 and 76 not interconnected
77, 78, 79	external switch input 3	D	0: < 8 V or 78 and 79 interconnected 1: > 16 V or 78 and 79 not interconnected
80, 81, 82	external switch input 4	D	0: < 8 V or 81 and 82 interconnected 1: > 16 V or 81 and 82 not interconnected
temperature input			
83, 84, 85	temperature input: <ul style="list-style-type: none"> ■ PT100 ■ FMT131 (Endress+Hauser) 	D	see section "Connection of a temperature sensor"

1) In this case, terminals 9/10/11 are not present on terminal area A.



Warning!


When using the public supply mains, an easily accessible power switch must be installed in the proximity of the device. The power switch must be marked as a disconnecter for the device (IEC/EN 61010)



Note!

- In order to avoid interference signals, the sensor cables should not be laid parallel to high voltage or electric power lines.
- The cables may not be laid in the proximity to frequency converters.

Additional elements on the terminal areas

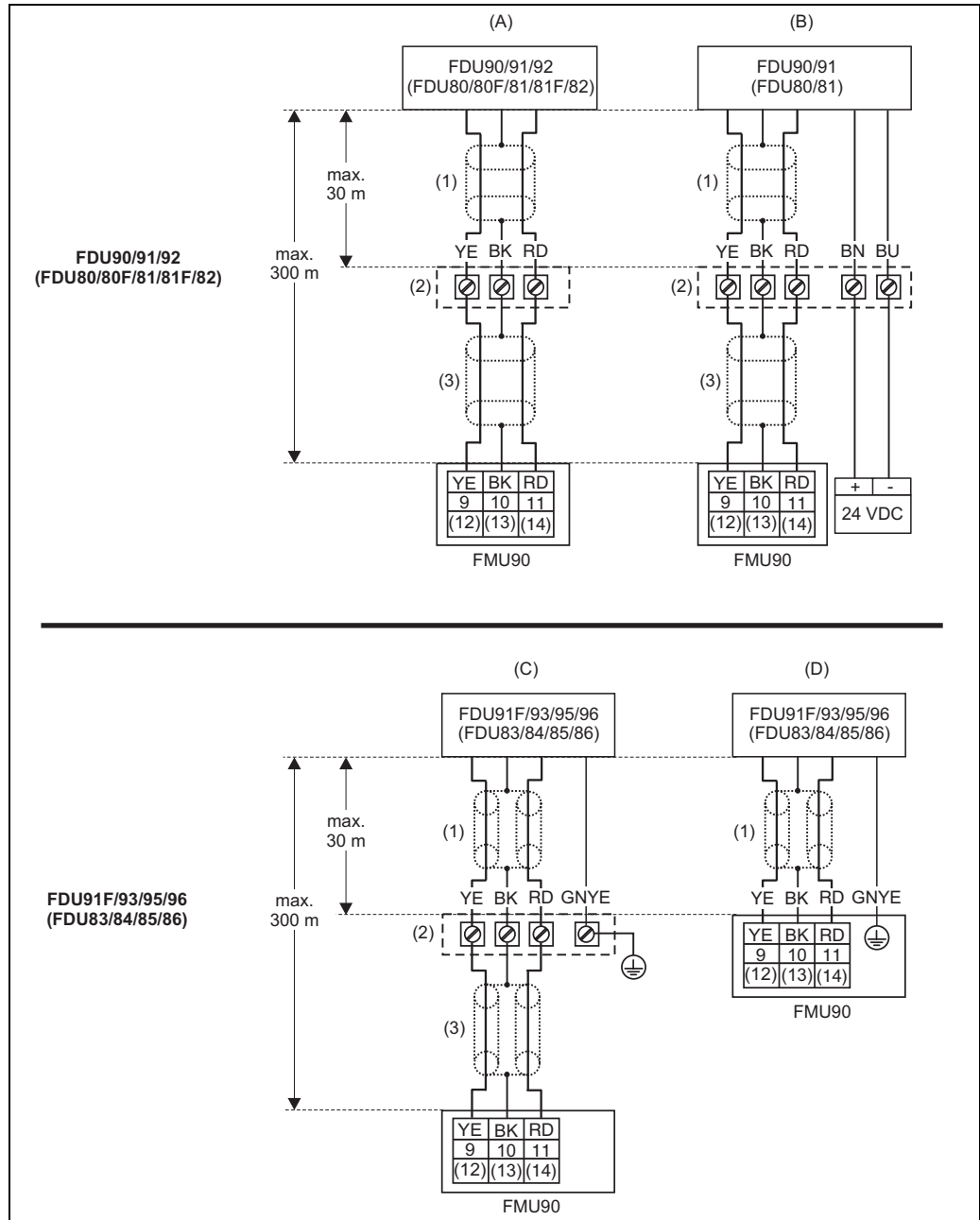
Designation	Meaning/Remarks
Fuse	Fuse: 2 A T /DC or 400 mA T/AC
Display	Connection of the display or the remote display and operating module
Service	Service interface for connection of a PC/Notebook via Commubox FXA291
	Locking switch
Term.	Bus termination (only applicable for instruments with PROFIBUS interface)
Address	Bus address (only applicable for instruments with PROFIBUS interface)

Terminals

Pluggable spring-force terminals for connection of the cables are supplied in the terminal compartment. Rigid conductors or flexible conductors with cable and sleeve can directly be inserted and are contacted automatically.

Conductor cross section	0,2 mm ² - 2,5 mm ²
Cable and sleeve cross section	0,25 mm ² - 2,5 mm ²
min. stripping length	10 mm

**Connection of the sensors
FDU9x**



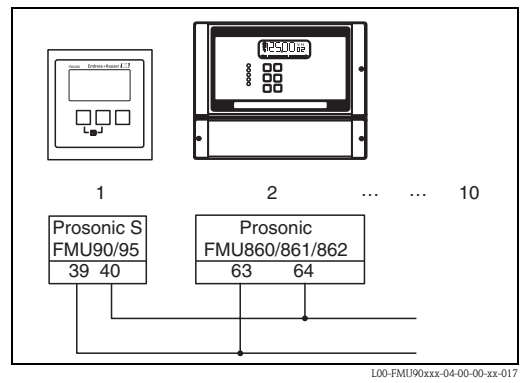
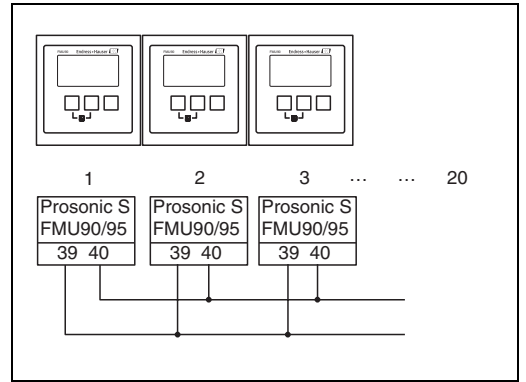
L00-FDU9xxxx-04-00-00-xx-002

- (A): without sensor heater;
 - (B): with sensor heater;
 - (C): grounding at the terminal box;
 - (D): grounding at the transmitter FMU90;
 - (1): Screen of the sensor cable;
 - (2): Terminal box;
 - (3): Screen of the extension cable;
- Colours of the strands: YE = yellow; BK = black; RD = red; BU = blue; BN = brown; GNYE = green-yellow

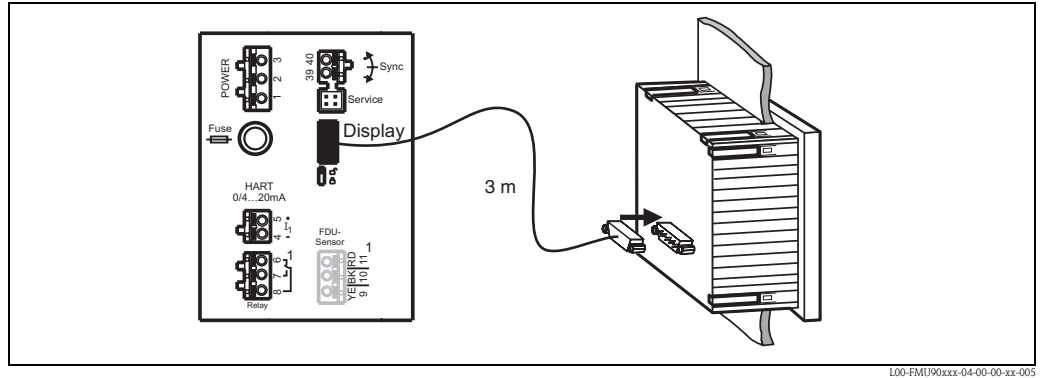
For details refer to Technical Information TI 396F (FDU9x) or TI189F (FDU8x).

Synchronization line

- If wiring several Prosonic S (FMU90/FMU95) which are mounted in a common cabinet and if the sensor cables run in parallel, the synchronization terminals (39 and 40) must be interconnected.
- Up to 20 instruments can be synchronized in this way.
- If there are more than 20 instruments, groups must be formed, each containing a maximum of 20 instruments. For the instruments within each group, the sensor cables may run in parallel. The sensor cables of different groups must be separated from each other.
- Usual commercial screened cable can be used for synchronization
 - max. length: 10 m between the individual instruments
 - cross section: 2 x (0.75 - 2.5 mm²)
 - for lengths up to 1 m, an unscreened cable can be used; for lengths exceeding 1 m, screening is required. The screen must be connected to ground
- Instruments of the Prosonic FMU86x family can be connected to the synchronization line as well. In this case a maximum of 10 instruments can be connected to each synchronisation line.



Connection of the separate display and operating module

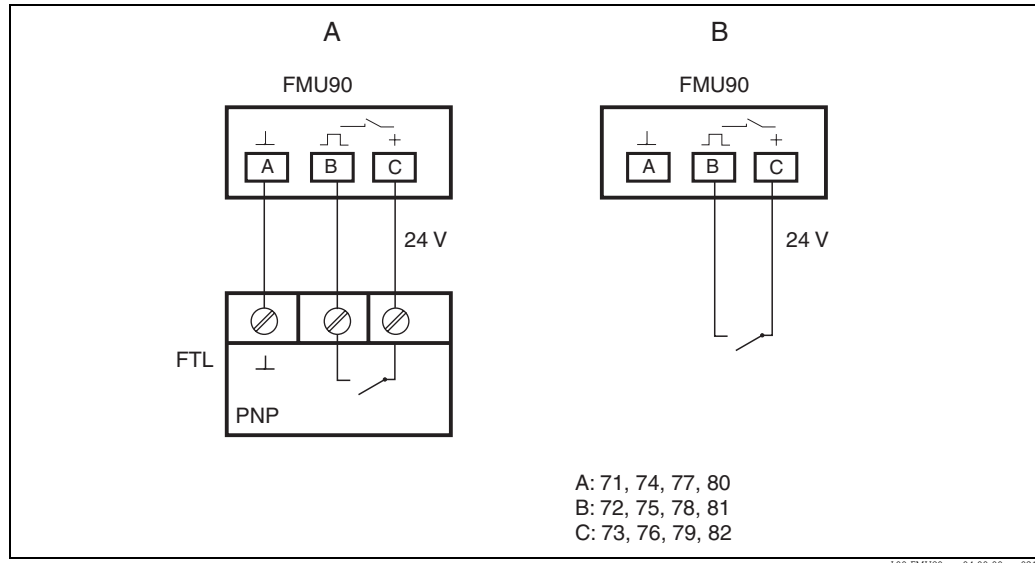


For the version of the Prosonic S with a separate display for panel mounting, a pre-assembled connecting cable (3 m) is supplied. The cable must be connected to the display plug of the Prosonic S.



Note!
Minimum diameter for cable bushing: 2 cm

Connection of external switches
(for FMU90-*****B***)



The maximum short-circuit current at 24 V is 20 mA.

Connection of a temperature sensor

The Prosonic S FMU90 transmitter has an optional input for an external temperature probe (in the product structure: feature 90 "Additional input", option B). The following probes can be connected:

- a FMT131 temperature probe from Endress+Hauser
- a Pt100 temperature probe



Note!

After connecting an external temperature sensor, the following is required:

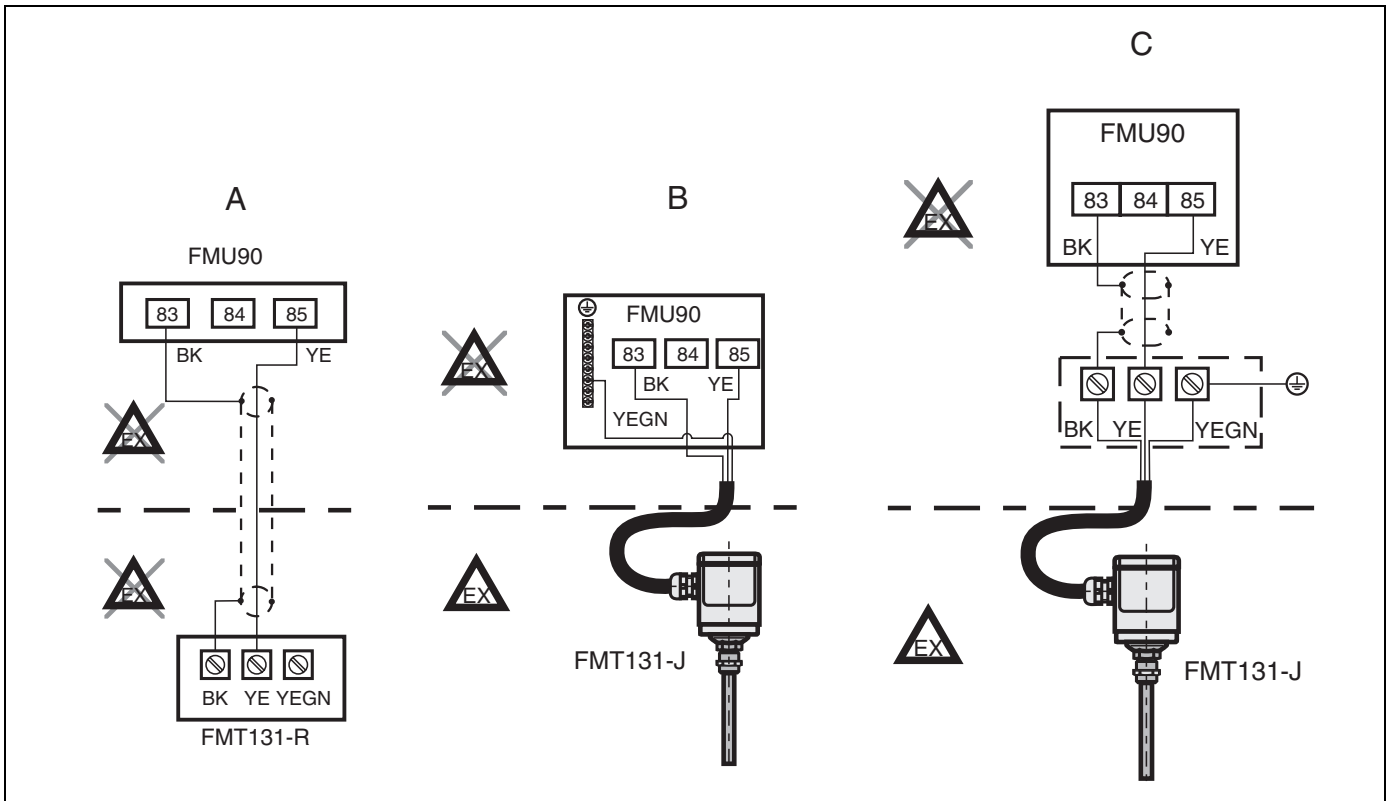
1. The type of the connected sensor (Pt100 or FMT131) must be selected in "sensor management/ext. temp. sensor" in the "sensor type" parameter.
2. The external temperature sensor must be assigned to an ultrasonic sensor in "sensor management/FDU sensor/US sensor N" in the "temp. measurement" parameter.



Note!

If the option "alarm" has been selected for the case of an error in external temperature sensor, this alarm is indicated by the alarm relay.

FMT131 (Endress+Hauser)
(connectable to FMU90-***B****)**



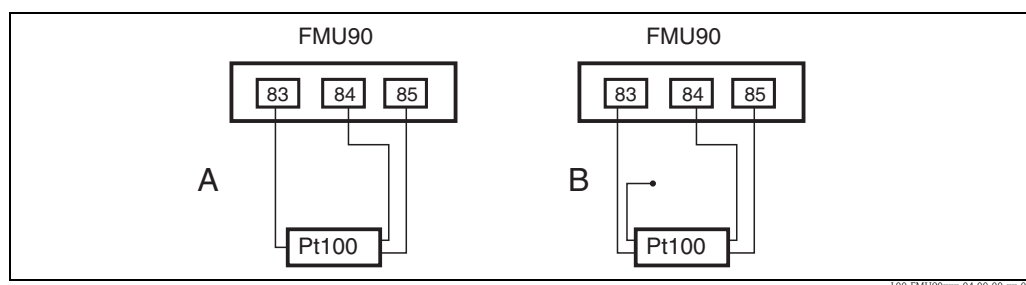
A: Non-Ex area (FMT131-R); **B:** Ex area (FMT131-J) with grounding in the FMU90;
C: Ex area (FMT131-J) with grounding at a terminal box
BK: black; **YE:** yellow; **YEGN:** yellow-green



Note!

For details refer to the Operating Instructions KA019F.

Pt100
(connectable to FMU90-*****B***)



A: Pt100 with 3-wire connection; B: Pt100 with 4-wire connection (one connector remains unused)



Note!

A Pt100 with 2-wire connection may not be used due to its insufficient measuring accuracy.



Warning!

A Pt100 may not be connected in explosion hazardous areas. A FMT131 must be used instead.

Performance characteristics

Reference operating conditions

- Temperature = 24 ± 5 °C
- Pressure = 960 ± 100 mbar
- Relative humidity = 60 ± 15 %
- Ideally reflecting surface, sensor vertically aligned (e.g. calm, plane liquid surface of 1 m^2)
- No interference echoes within the signal beam
- Settings of the application parameters:
 - tank shape = flat ceiling
 - medium property = liquid
 - process condition = calm surface

Measuring uncertainty⁵⁾ $\pm 0,2$ % of the maximum span of the sensor

Typical accuracy⁶⁾ ± 2 mm + 0,17 % of the measured distance

Measured value resolution 1 mm with FDU91

Measuring frequency

max. 3 Hz

The exact value depends on the settings of the application parameters and the instrument version.



Note!

The maximum measuring frequency is obtained for "empty E" ≤ 2 m and "process condition" = "test: no filter".

Influence of the vapor pressure

The vapor pressure at 20 °C (68 °F) gives a hint on the accuracy of the ultrasonic level measurement. If the vapor pressure at 20 °C (68 °F) is below 50 mbar, ultrasonic level measurement is possible with a very high accuracy. This is valid for water, aqueous solutions, water-solid-solutions, dilute acids (hydrochloric acid, sulfuric acid, ...), dilute bases (caustic soda, ...), oils, greases, slurries, pastes, ... High vapor pressures or outgassing media (ethanol, acetone, ammonia, ...) can influence the accuracy. If conditions like these are present, please contact the Endress+Hauser support.

5) according to NAMUR EN 61298-2

6) after calibration

Ambient conditions

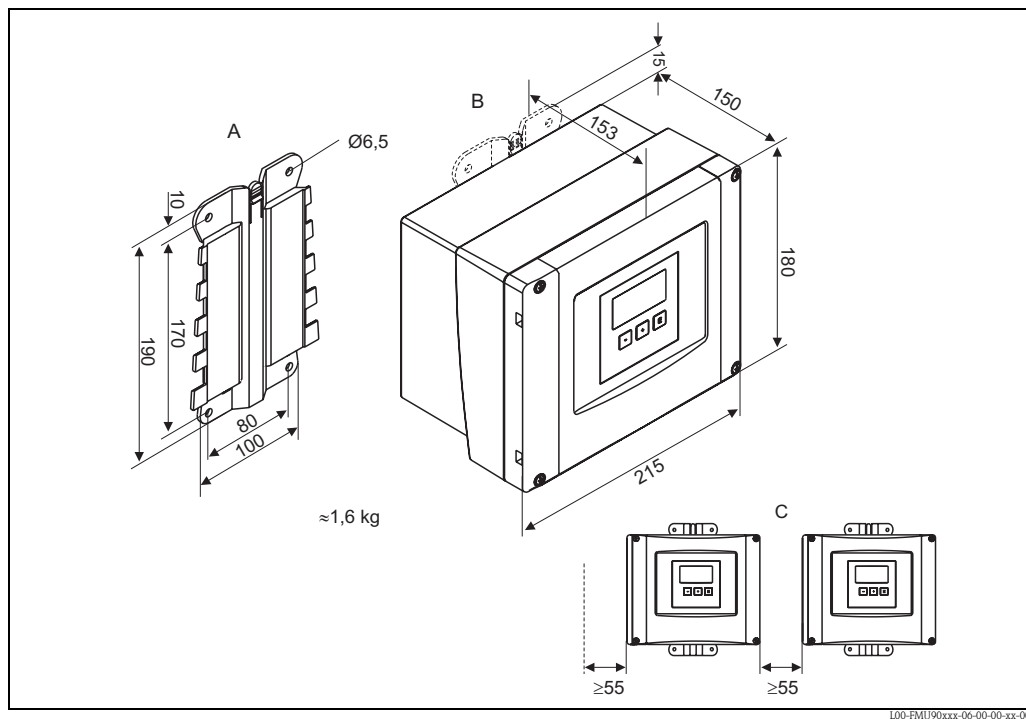
Ambient temperature	-40 ... 60 °C The functionality of the LC display becomes restricted at $T_U < -20$ °C. If the device is operated outdoors in strong sunlight, a protective cover should be used (s. chapter "Accessories").
Storage temperature	-40 ... 60 °C
Climate class	<ul style="list-style-type: none">■ Field housing: according to DIN EN 60721-3 4K2/4K5/4K6/4Z2/4Z5/4C3/4S4/4M2 (DIN 60721-3 4K2 corresponds to DIN 60654-1 D1)■ Housing for DIN rail mounting: according to DIN EN 60721-3 3K3/3Z2/3Z5/3B1/3C2/3S3/3M1 (DIN 60721-3 3K3 corresponds to DIN 60654-1 B2)
Vibration resistance	<ul style="list-style-type: none">■ Housing for DIN rail: DIN EN 600068-2-64 / IEC 68-2-64; 20 ... 2000 Hz; 0,5 (m/s²)²/Hz■ Field housing: DIN EN 600068-2-64 / IEC 68-2-64; 20 ... 2000 Hz; 1,0 (m/s²)²/Hz
Ingress protection	<ul style="list-style-type: none">■ Field housing: IP66 / NEMA 4x■ Housing for DIN rail: IP20■ separate display:<ul style="list-style-type: none">– IP65 / NEMA 4 (front panel , if mounted in cabinet door)– IP20 (rear panel, if mounted in cabinet door)
Electromagnetic compatibility (EMC)	<ul style="list-style-type: none">■ Interference emission to EN 61326; Equipment class A■ Interference immunity to EN 61326; Annex A (Industrial) and NAMUR recommendation EMC (NE21)

Mechanical construction

Housing versions

- Field housing; optionally with integrated display and operating module
- Housing for top-hat rail mounting; optionally with integrated display and operating module
- Housing for top-hat rail mounting with separated display and operating module for cabinet door mounting

Dimensions of the field housing



Dimensions in mm

A: Mounting help (supplied); can also be used as drilling template ; **B:** Field housing; **C:** minimum mounting distance

The dimensions of the field housing are the same for all instrument versions.

To open the housing, a minimum mounting distance of 55 mm is required on the left.



Note!

The mounting help must be mounted on a plane surface and must not become bent. Otherwise the mounting of the field housing may be difficult or impossible.

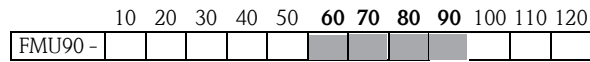
Dimensions of the DIN-rail housing

The dimensions of the DIN-rail housing depend on the instrument version. The version determines, which terminal areas the Prosonic S contains. The dimensions are influenced by the following features of the product structure (see chapter 2.3):

- 60: Level Input
- 70: Switch Output
- 80: Output

In order to determine the dimensions of a specific version, perform the following steps (see the example on page 24):

1. Using the product structure, determine the options of the features 60, 70 and 80 of the instrument version in question.

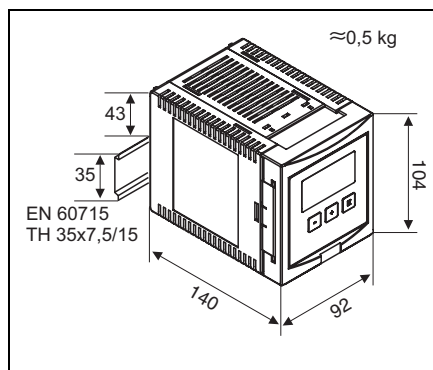


2. Using the following table, determine how many optional terminal areas this instrument version contains.

Feature and option of the product structure	corresponds to the following terminal area	present? yes = 1 no = 0
feature 60; option 2 and/or feature 80, option 2	2 sensor inputs and/or 2 analogue outputs	
feature 70, option 3 or 6	3 o 6 relays	
feature 80, option 3	PROFIBUS DP interface	
feature 90, option B	inputs for external switches and external temperature sensor	
Sum =		

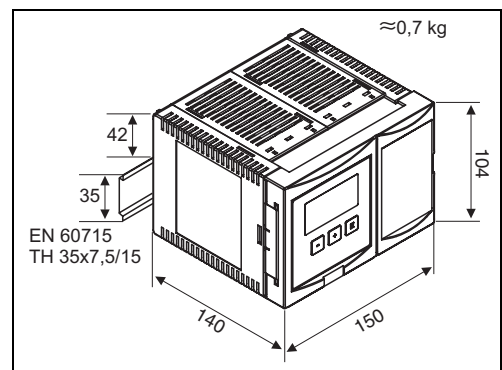
3. The appropriate dimensions are given in the following diagram:

Sum = 0
(only basic terminal area)



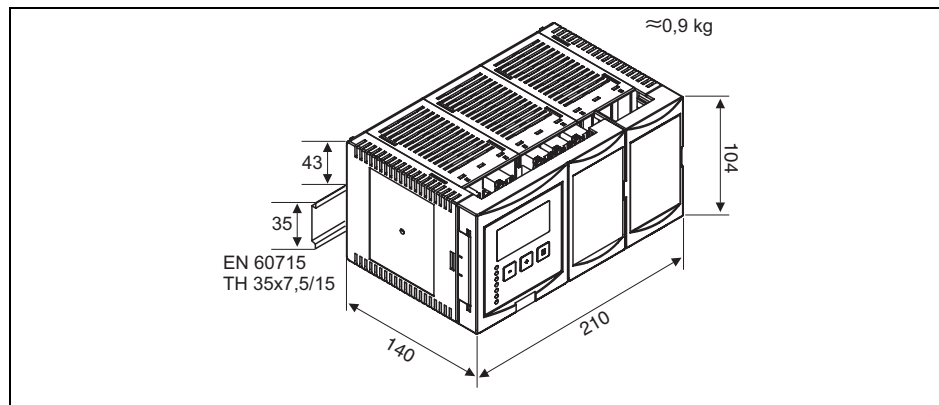
Dimensions in mm

Sum = 1, 2 or 3
(1-3 optional terminal areas)



Dimensions in mm

Sum = 4
(4 optional terminal areas)



L00-FMU90xxx-06-00-00-xx-009

Dimensions in mm

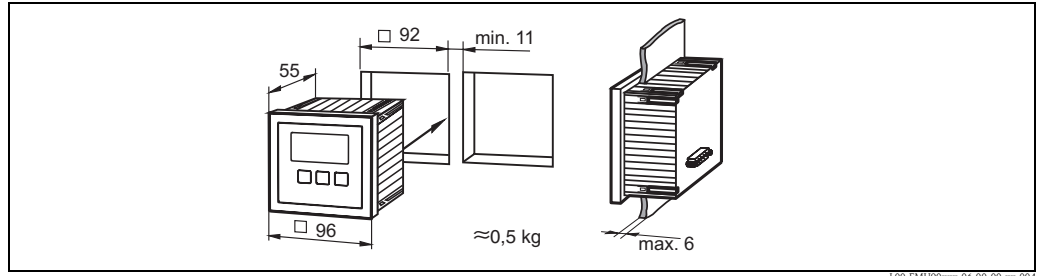
Example

		10	20	30	40	50	60	70	80	90	100	110	120
FMU90 -	R	1	2	A	A	2	3	2	A	A	1	A	

feature and option of the product structure	corresponds to the following terminal area	present?
feature 60; option 2 and/or feature 80, option 2	2 sensor inputs and/or 2 analogue outputs	1 (yes)
feature 70, option 3 or 6	3 or 6 relays	1 (yes)
feature 80, option 3	PROFIBUS DP interface	0 (no)
feature 90, option B	inputs for external switches and external temperature sensor	0 (no)
	Sum =	2

Sum = 2
=> 104 mm x 150 mm x 140 mm

Dimensions of the separate display and operating module



Dimensions in mm

Weight

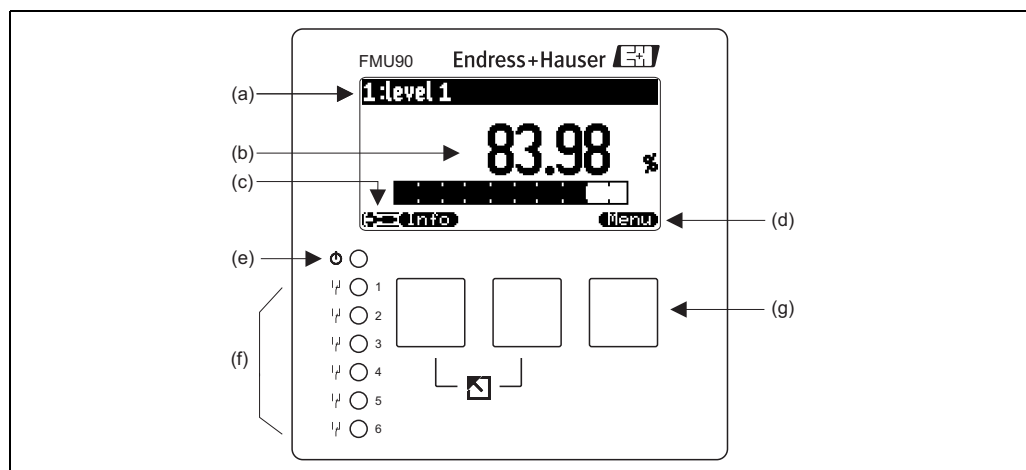
Housing version	Weight
Field housing	approx.. 1,6 ... 1,8 kg; depending on instrument version
Housing for DIN rail	approx. 0,5 ... 0,7 kg; depending on instrument version (s. section: "Dimensions of the DIN-rail housing")
separate display and operating module	approx. 0,5 kg

Materials

- Field housing: PC
- Housing for DIN rail: PBT

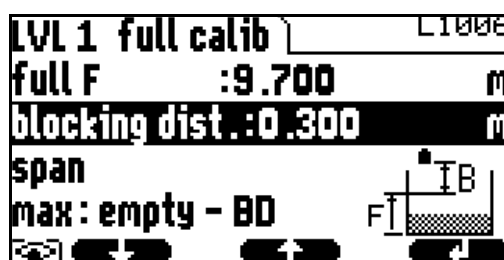
Human interface

Display and operating module

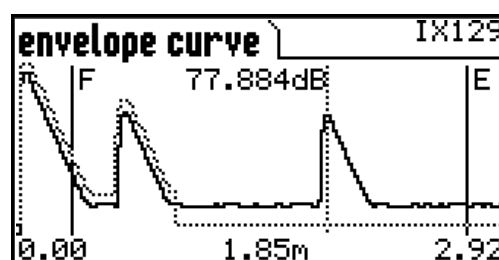


(a): name of the parameter; (b): value of the parameter, including unit; (c): display symbols; (d): softkey symbol; (e): LED indicating the operating state; (f): LEDs indicating the switching states of the relays; (g): keys

Display (Examples)



Display of a function including help text and descriptive graphic



Display of the envelope curve including the mapping. The level echo and the empty distance are marked.

Keys (softkey operation)

The function of the keys depends on the current position within the operating menu (softkey functionality). The key functions are indicated by softkey symbols in the bottom line of the display.

LEDs

- 1 LED (a) indicates the operating state ("normal operation", "alarm" or "warning")
- 6 LEDs (b) indicate the switching state of the relays (LED glows if the respective relay is energised)

Illuminated display

An illuminated display is available as an option (s. feature 40 of the product structure)

Operating menu

The Prosonic S has got a dynamical operating menu. Only those functions are visible which are relevant for the instrument version and installation environment at hand.

Basic setup





The operating menu contains basic setups for easy commissioning of level and flow measurements. The basic setups guide the user through the complete commissioning procedure.

Locking of the instrument

The instrument can be locked against parameter changes in the following ways:

- Locking switch in the terminal compartment
- Key combination at the operating module
- Input of a locking code via software (e.g. "ToF Tool" or "FieldCare")

Certificates and Approvals

CE mark	The measuring system meets the legal requirements of the EC-guidelines. Endress+Hauser confirms the instrument passing the required tests by attaching the CE-mark.
Ex approval	<p>The available certificates are listed in the ordering information. Note the associated safety instructions (XA) and control or installation drawings (ZD).</p> <p>Measuring systems for use in hazardous environments are accompanied by separate "Ex documentation", which is an integral part of this Operating Manual. Strict compliance with the installation instructions and ratings as stated in this supplementary documentation is mandatory.</p> <ul style="list-style-type: none"> ■ Ensure that all personnel are suitably qualified. ■ Observe the specifications in the certificate as well as national and local standards and regulations. <p>The transmitter may only be installed in suitable areas. Sensors with a certificate for hazardous areas may be connected to a transmitter without a certificate.</p> <p> Warning! For FM approvals: Unauthorized substitution of components may impair the suitability for Division 1 or Division 2.</p> <p> Warning! Do not disconnect equipment unless the area is known to be non-hazardous.</p> <p> Note! The sensor must be installed and used in a way that eliminates any danger. Possible installation positions: in tanks, vessels, silos, over stockpiles, open channels, weirs or other bins.</p> <p> Note! Sensors FDU9x with Ex-approval can be connected to the transmitter FMU90 without Ex-approval.</p>
External standards and guidelines	<p>EN 60529 Protection class of housing (IP code)</p> <p>EN 61326 Electromagnetic compatibility (EMC requirements)</p> <p>NAMUR Standards committee for measurement and control in the chemical industry</p> <p>US Standard UL 61010-1 CSA General Purpose Units FMU9x-N***** are tested according to US standard UL 61010-1, 2nd edition</p>

Ordering information

Product structure

10	Approval	
	R	Non-hazardous area
	J	ATEX II 3D
	N	CSA General Purpose
20	Application	
	1	Level + pump control, alternating
	2	Flow + totalizer + level + sample control + preprogrammed OCM flow curves
	3	Level + additional pump control
	4	Universal instrument (Level + Flow + Additional pump control)
30	Housing, material	
	1	Field mounting PC, IP66 NEMA 4x
	2	DIN rail mounting PBT, IP20
40	Operation	
	C	Illuminated display + keypad
	E	Illuminated display + keypad, 96x96, panel mounting, front IP65
	K	w/o display, via communication
50	Power supply	
	A	90-253 VAC
	B	10,5-32 VDC
60	Level input	
	1	1x sensor FDU9x/8x
	2	2x sensor FDU9x/8x
70	Switch output	
	1	1x relay, SPDT
	3	3x relay, SPDT
	6	6x relay, SPDT
80	Output	
	1	1x 0/4-20mA HART
	2	2x 0/4-20mA HART
	3	PROFIBUS DP
90	Additional input	
	A	w/o additional input
	B	4x limit switch + 1x temperature PT100/FMT131
100	Datalog function	
	A	Basic version
110	Languages	
	1	de, en, nl, fr, es, it, pt
	2	en, ru, pl, cs
	3	en, zh, ja, ko, th, id
120	Additional option	
	A	Basic version
FMU90 -		complete product designation

(*): meaning of the language code:

cs: Czech; de: German; en: English; es: Spanish; fr: French; id: Bahasa (Indonesia, Malaysia); it: Italian; ja: Japanese; ko: korean; nl: Dutch; pl: Polish; pt: Portuguese; ru: Russian; th: Thai; zh: Chinese

Scope of delivery

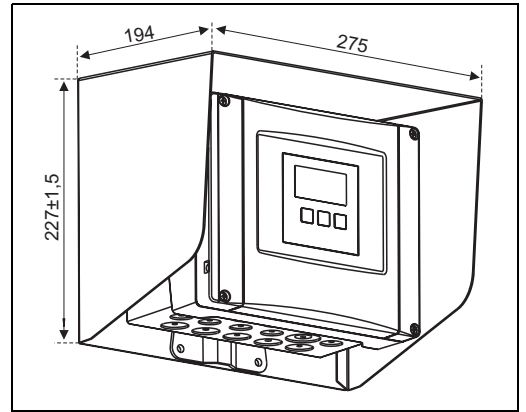
- Instrument according to the version ordered
- Operating program: ToF Tool - FieldTool Package
- Operating Instructions (depending on communication version, see chapter "Supplementary documentation")
- for certified instrument versions: Safety Instructions (XAs) or Control Drawings (ZDs) (s. chapter "Supplementary documentation")
- field housing units for flow measurement FMU90-*21***** are delivered with 2 screws for plumbing the device

Accessories

Commubox FXA191 HART	For intrinsically safe communication with ToF Tool/FieldCare via the RS232C interface. For details refer to TI237F/00/en.
Commubox FXA195 HART	For intrinsically safe communication with ToF Tool/FieldCare via the USB interface. For details refer to TI404F/00/en.
Commubox FXA291	For intrinsically safe communication with ToF Tool/FieldCare via the service interface (IPC) of the instrument and the USB interface of a PC/Notebook. Ordering Code: 51516983

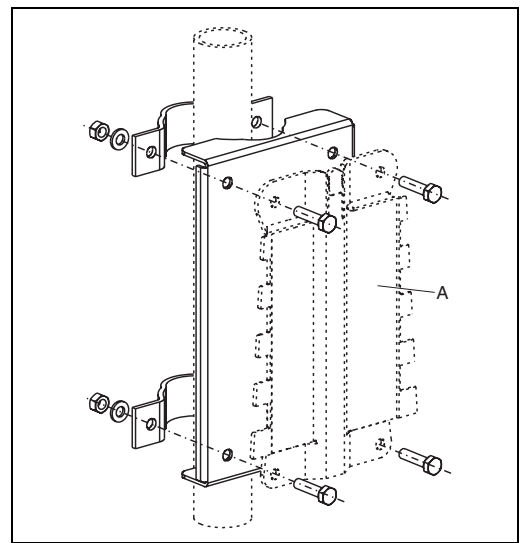
Protection cover for the field housing

- Material: 316Ti/1.4571
- is mounted by the mounting help of the Prosonic S
- Order-Code: 52024477



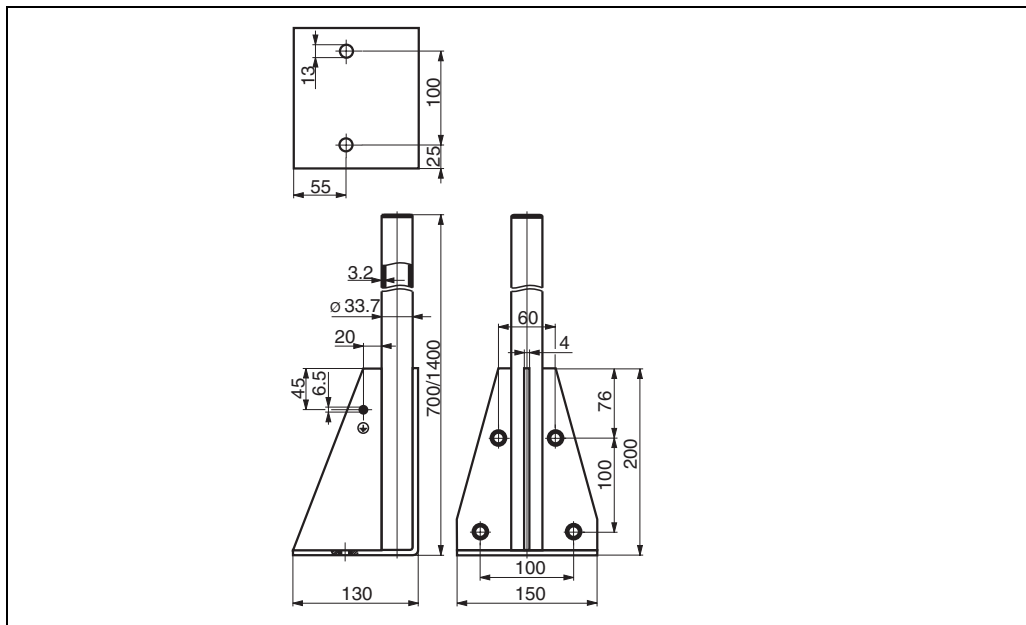
Mounting plate for the field housing

- suited for the mounting help of the Prosonic S
- for 1" - 2" tubes
- Dimensions: 210 mm x 110 mm
- Material: 316Ti/1.4571
- fixing clips, screws and nuts are supplied
- Order code: 52024478



A: mounting help of the field housing

Mounting bracket



L00-FMU14x-00-00-00-yy-005

Height	Material	Order Code
700 mm	galv. steel	919791-0000
700 mm	316 Ti	919791-0001
1400 mm	galv. steel	919791-0002
1400 mm	316 Ti	919791-0003

Adaption plate for remote display

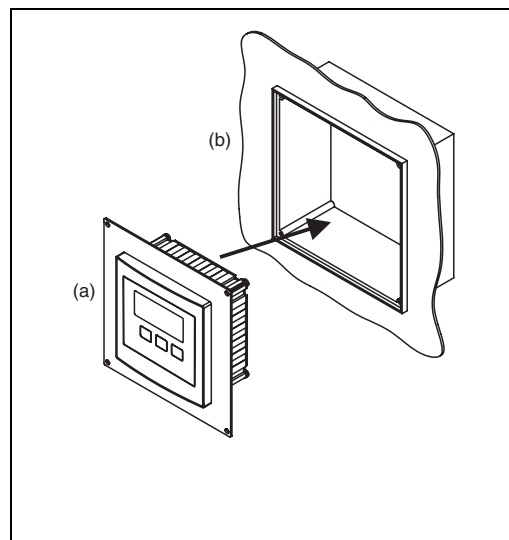
Used to mount the remote display into the opening (138 mm x 138 mm) of the remote display module of the Prosonic FMU860/861/862 (Display size: 144 x 144 mm).

Order-Code: 52027441



Note!

The adapter plate will be mounted directly in the old remote display of the FMU86x series. The housing of the remote display of FMU860/861/862 is the holder for the adapter plate and the new remote display of the FMU90/95 in the format 96x96 mm.



L00-FMU90xxx-00-00-00-xx-001

(a): remote display of the Prosonic S with adaption plate;
 (b): opening of the remote display FMU860/861/862

Option:

Adaption plate 160x160 mm, thickness 3mm, aluminum, opening 92x92 mm for remote display of the FMU90 (size of the display: 96 x 96 mm).

Can be used to replace the FMU86x remote display or DMU2160/2260.

Order Code: TSPFU 0390

Please contact your Endress+Hauser representative.

**Overvoltage protection
HAW56x**

Application examples

Measurement signal	Measurement point requirements	Connection diagram
<ul style="list-style-type: none"> ■ Current output 1 0/4 to 20 mA ■ Current output 2 0/4 bis 20 mA <p>Transducer Prosonic S FMU90 with 2 Prosonic FDU9x sensors</p>	<ul style="list-style-type: none"> ■ 2 x HAW560 + 562 for 0/4 to 20 mA output signal ■ 2 x HAW561 for power supply to the transducer ■ 2 x HAW560 + 566 for the sensor signal <p>Use gas discharge tube for indirect shield earthing.</p>	<p style="text-align: right; font-size: small;">G09-HAW56xxx-04-10-xx-en-009</p>
<ul style="list-style-type: none"> ■ Current output 0/4 to 20 mA <p>Prosonic S FMU90 transducer with Prosonic FDU9x level measurement sensors</p>	<ul style="list-style-type: none"> ■ 1 x HAW560 + 562 for 0/4 to 20 mA output signals ■ 2 x HAW561 for power supply to the transducers ■ 1 x HAW560 + 566 for the sensor signal <p>Use gas discharge tube for indirect shield earthing.</p>	<p style="text-align: right; font-size: small;">G09-HAW56xxx-04-10-xx-en-010</p>

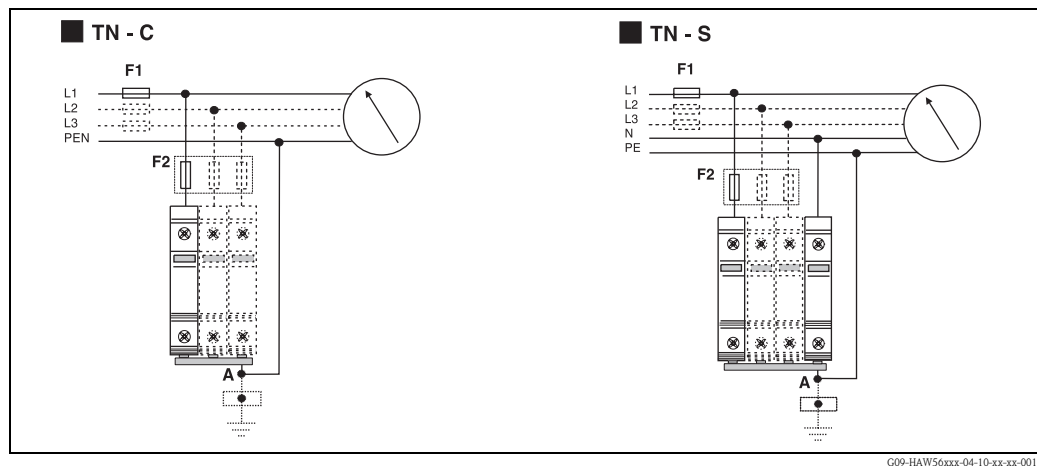
Measurement signal	Measurement point requirements	Connection diagram
<ul style="list-style-type: none"> no current output (only relay outputs) Prosonic S FMU90 transducer with Prosonic FDU9x level measurement sensor	<ul style="list-style-type: none"> 1 x HAW560 + 1 x HAW566 for sensor signal. Use gas discharge tube for indirect shield earthing. 2 x HAW561 for power supply 	



Note!
 HAW560 with the HAW562 module can also be used to protect the signal line of the external temperature probe FMT131 (Ex or Non-Ex version).

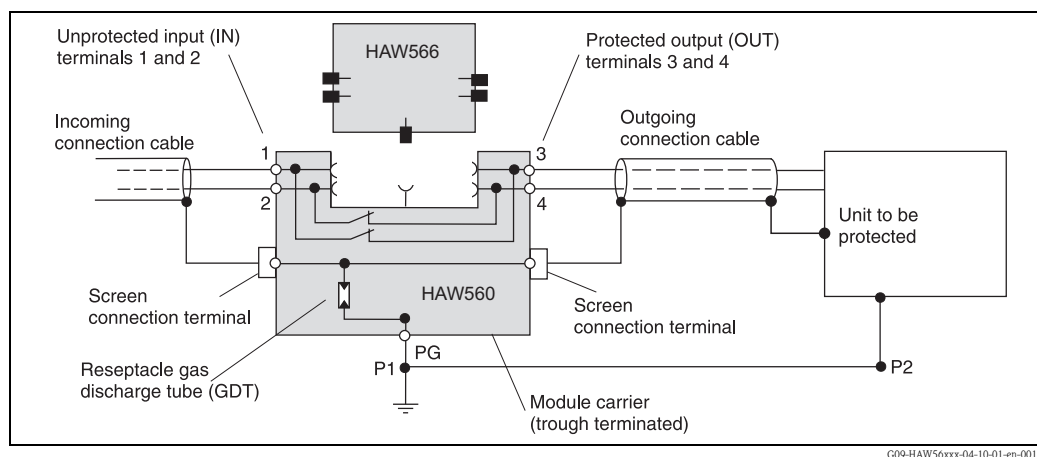
Electrical connection

Power supply: HAW561 and 561K

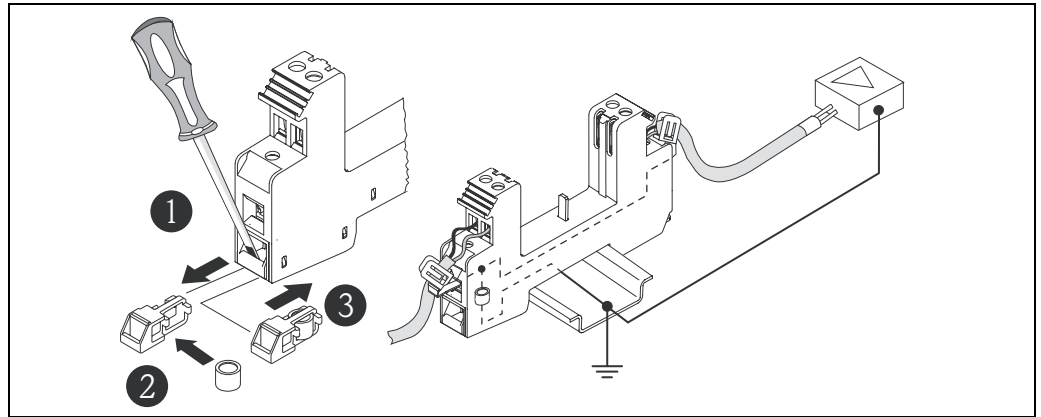


A fixed allocation of the phase and ground terminal is not allocated (pole security). The unit is fitted on both ends with a multi function connection terminal. This gives the opportunity to simultaneously connect a cable as well as a fork ferrule from standard busbars. Connection of the unit is as in the diagram above. Dependent on the cabling, up to four units will be required.

Sensor signal: HAW560 with HAW566

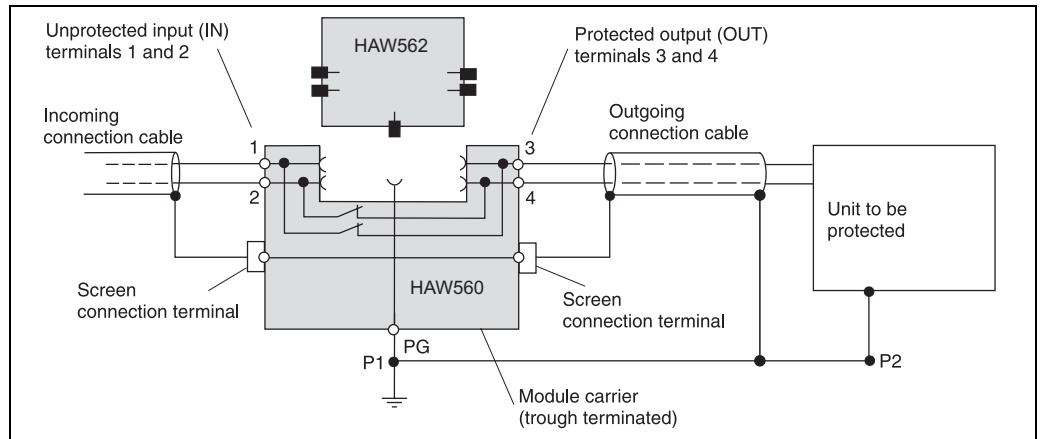


Connection of the unit as in the diagram. The ground connection is made using the DIN rail.
 For indirect screening (as required if connecting the Prosonic S signal line to an HAW566) a gas-discharge arrester is supplied. It must be inserted into the provided plug-in bay on the HAW560:



G09-HAW560xx-11-10-xx-xx-000

Output signal



G09-HAW560xx-04-10-01-en-002

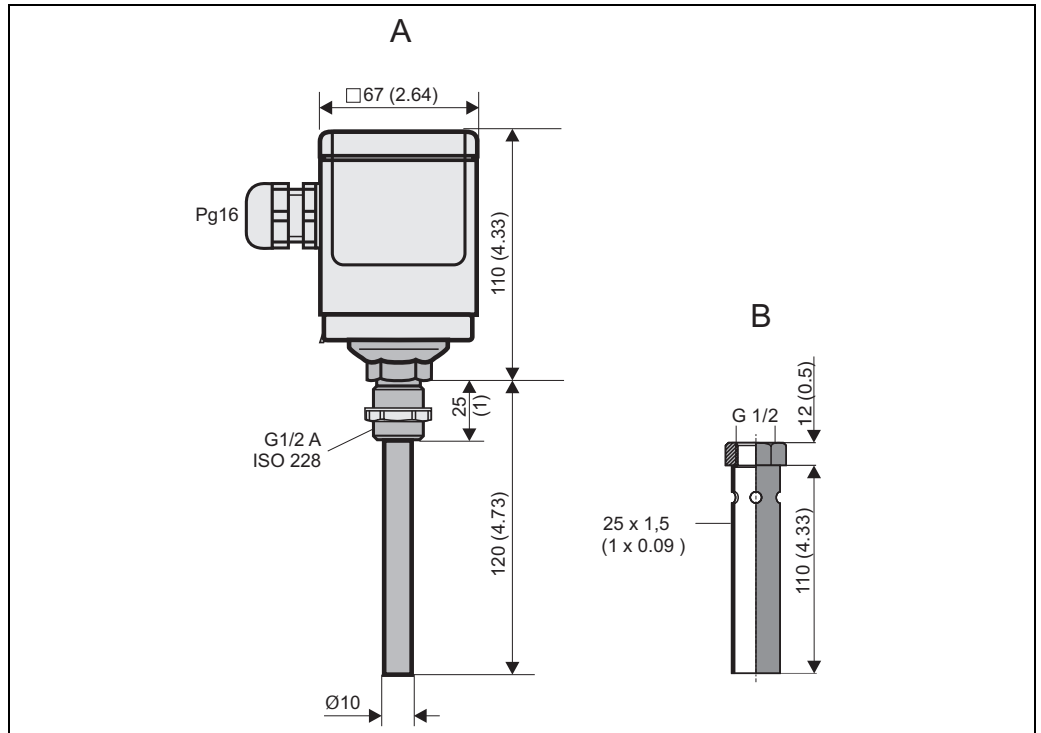
Connection of the unit as in the diagram. The ground connection is made using the DIN rail.

Product overview

Oreder code	Unit
51003569	Surge arrester HAW561K For low voltage users 24/48V, single pole, requirement class C, basic component with plugged in protection unit, defect display, 18 mm housing width
51003570	Surge arrester HAW561 For standard voltage users 115/230 V, single pole, requirement class C, basic component with plugged in protection unit, defect display, 18 mm housing width
51003571	Surge arrester module carrier HAW560 Two pole through terminated for fitting surge arrester modules for units in information technology, 12 mm housing width, colour grey
51003572	Surge arrester module HAW562 For protection of 2 single lines, e.g. 2 asymmetrical single lines, e.g.: 0/4 to 20 mA, Profibus PA, 12 mm housing width, colour grey
51003573	Surge arrester module HAW565 For protection of 2 single lines, e.g. 2 asymmetrical single lines with high frequency signal transmission, e.g.: Profibus DP, RS 485, 12 mm housing width, colour grey
51003574	Surge arrester module carrier HAW560Z Two pole through terminated for fitting surge arrester modules for units in information technology in Ex areas, 12 mm housing width, colour blue
51003575	Surge arrester module HAW562 For protection of 2 single lines, e.g. 2 asymmetrical single lines in Ex areas, e.g.: 0/4 to 20 mA, Profibus PA, 12 mm housing width, colour blue
71028875	Surge arrester module HAW566 Protection for 2 signal inputs, e.g. 2 asymmetrical inputs, e.g. Prosonic S signal 12 mm housing with, colour grey

For details see Technical Information TI093R.

Temperature sensor FMT131



L00-FMU90xxx-00-00-00-xx-002

A: Temperature sensor FMT131; B: weather protector

Product structure

010	Approval
	R Non-hazardous area J ATEX II 2G EEx m II T6/T5 Q FM Cl.I Div. 1 Gr. A-D U CSA General Purpose S CSA Class I Div. 1
020	Cable length
	1 5 m/16 ft 2 10 m/ 32 ft 3 15 m/49 ft 4 20 m/65 ft 5 25 m/82 ft 6 30 m/98 ft 7 w/o cable, gland Pg16, IP66 8 ... m A ... ft
FMT131 -	complete product designation

Weather protection cover for FMT131

Order code: 942046-0000

Supplementary documentation

Innovation booklet
IN 003

Ultrasonic measurement – the solution for your application

Technical Information
TI 396F

Technical Information for the ultrasonic sensors FDU90/FDU91/FDU91F/FDU92/FDU93/FDU95/FDU96

**Operating instructions
(for transmitter FMU90)**

Depending on the instrument version, the following operating instructions are supplied with the Prosonic S FMU90:

Operating instructions	Output	Application	Instrument version
BA 288F	HART	<ul style="list-style-type: none"> ■ level measurement ■ alternating pump control ■ screen and rake control 	FMU90 - *****1**** FMU90 - *****2****
BA 289F		<ul style="list-style-type: none"> ■ flow measurement ■ backwater and dirt detection ■ totalizers and counters 	FMU90 - *2*****1**** FMU90 - *4*****1**** FMU90 - *2*****2**** FMU90 - *4*****2****
BA 292F	PROFIBUS DP	<ul style="list-style-type: none"> ■ level measurement ■ alternating pump control ■ screen and rake control 	FMU90 - *****3****
BA 293F		<ul style="list-style-type: none"> ■ flow measurement ■ backwater and dirt detection ■ totalizers and counters 	FMU90 - *2*****3**** FMU90 - *4*****3****

These operating instructions describe installation and commissioning of the respective version of the Prosonic S. It contains those functions from the operating menu, which are required for a standard measuring task. Additional functions are contained in the "Description of Instrument Functions" (BA 290F, see below).

**Description of Instrument
Functions**
BA290F

 contains a detailed description of **all** functions of the Prosonic S and is valid for all instrument versions. A PDF file of this document can be found

- on the CD-ROM of the "ToF-Tool - FieldTool Package", which is supplied together with the instrument
- in the internet at "www.endress.com"

Safety Instructions
XA326F

Safety Instructions for ATEX II 3D

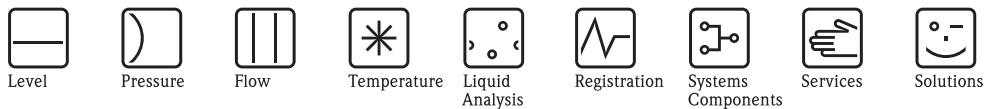
Instruments International

Endress+Hauser
Instruments International AG
Kaegenstrasse 2
4153 Reinach
Switzerland

Tel. +41 61 715 81 00
Fax +41 61 715 25 00
www.endress.com
info@ii.endress.com

Endress+Hauser 
People for Process Automation



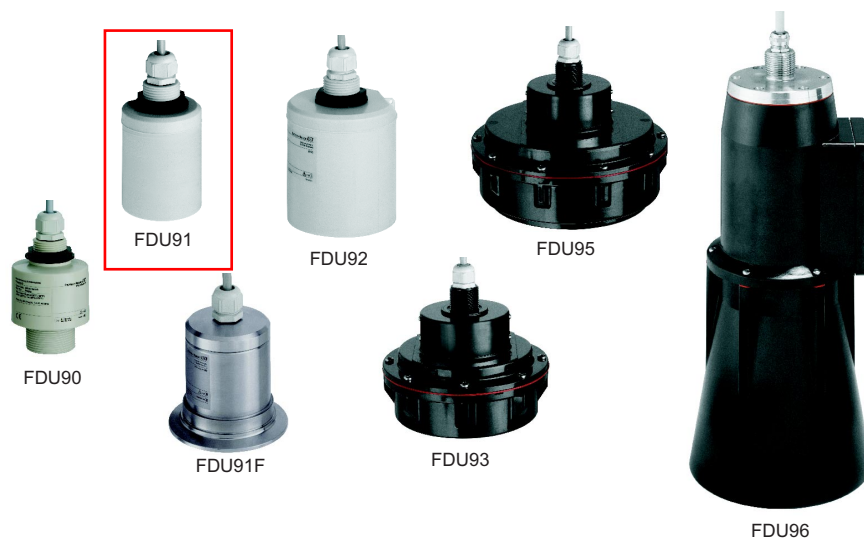


Technical Information

Prosonic S

FDU90/91/91F/92/93/95/96

Ultrasonic sensors for non-contact continuous level and flow measurement, for connection to the transmitters FMU90 and FMU95



Application

- Continuous, non-contact level measurement of fluids, pastes, sludges and powdery to coarse bulk materials
- Flow measurement in open channels and measuring weirs
- Maximum measuring range
 - FDU90: 3 m (9.8 ft) in fluids
1.2 m (3.9 ft) in bulk materials
 - FDU91/FDU91F: 10 m (33 ft) in fluids
5 m (16 ft) in bulk materials
 - FDU92: 20 m (66 ft) in fluids
10 m (33 ft) in bulk materials
 - FDU93: 25 m (82 ft) in fluids
15 m (49 ft) in bulk materials
 - FDU95: 45 m (148 ft) in bulk materials
 - FDU96: 70 m (230 ft) in bulk materials
- Suited for explosion hazardous areas

Your benefits

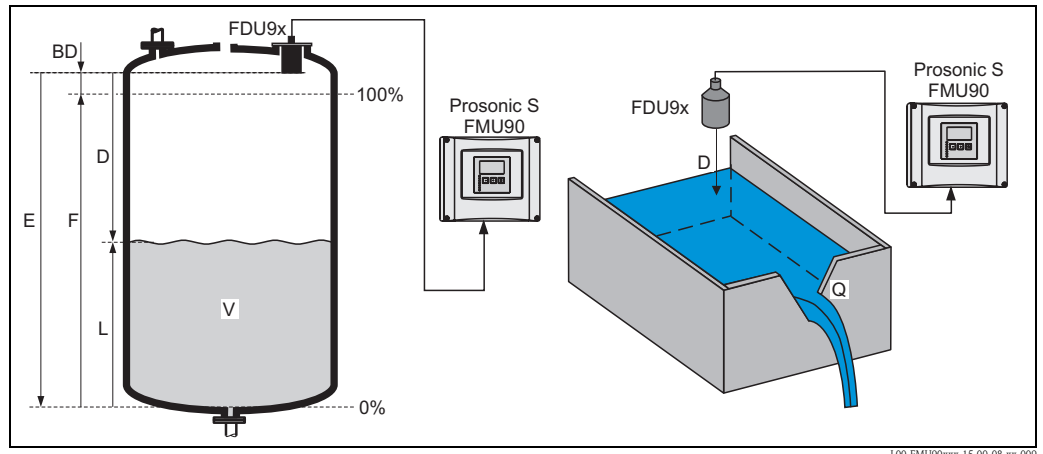
- Non-contact measurement method; minimizes service requirements
- Integrated temperature sensor for time-of-flight correction. Accurate measurements are possible, even if temperature changes are present
- Hermetically welded PVDF sensors FDU91/92 for fluid measurement, for highest chemical resistance
- Integrated automatical sensor detection for transmitters FMU90, simple commissioning
- Can be installed up to 300 m (984 ft) from the transmitter
- Suited for rough ambient conditions thanks to separate installation from the transmitter
- Reduced build-up formation because of the self-cleaning effect
- Integrated heating against a build-up of ice at the sensor (optional), ensures reliable measurement
- Weather resistant and flood-proof (IP68)
- Dust-Ex and Gas-Ex certificates available (ATEX, FM, CSA)

Table of Contents

Function and system design	3	Certificates and Approvals	22
Measuring principle	3	CE mark	22
Time-of-flight correction	3	Ex approval	22
Blocking distance	4	External standards and guidelines	22
Transmitter	4		
Input	5	Ordering information	23
Measuring range	5	Product structure FDU90	23
Operating frequency	6	Product structure FDU91	24
		Product structure FDU91F	25
		Product structure FDU92	26
		Product structure FDU93	27
		Product structure FDU95	28
		Product structure FDU96	29
		Scope of delivery	29
Output	6		
Signal transmission	6	Accessories	30
		Extension cable for sensors	30
Auxiliary energy	6	Protective cover for FDU91	30
Power supply	6	Screw in flange	31
Sensor heater (for FDU91)	6	Flooding protection tube for FDU90	32
		Cantilever	33
		Mounting Frame	34
		Wall Bracket	34
		Mounting bracket for ceiling mounting	35
		Alignment unit FAU40	36
		Power supply RNB130 for the FDU90/FDU91 sensor heater ...	37
		IP66 protective housing for the power supply RNB130	37
Electrical connection	7		
Connection diagram	7	Additional documentation	38
Connection hints	8	Innovation booklet	38
Connection of the sensor heater (for FDU90/FDU91)	8	Technical Information	38
Extension cables for the sensors	8	Operating instructions (for transmitter FMU90)	38
Shortening the sensor cable	9	Description of Instrument Functions (for transmitter FMU90) ...	38
		Safety Instructions	39
Installation conditions	10		
Installation options (Examples)	10		
Installation conditions for level measurements	11		
Installation conditions for flow measurements	12		
Flush mounting with slip-on flange FAU80	13		
Nozzle installation	14		
Ultrasound guide pipe	15		
Operating conditions: Environment	16		
Ingress protection	16		
Vibration resistance	16		
Storage temperature	16		
Thermal shock resistance	16		
Electromagnetic compatibility	16		
Operating conditions: Process	16		
Process temperature, Process pressure	16		
Mechanical construction	17		
Counter nut G1	17		
Dimensions FDU90	17		
Dimensions FDU91	17		
Dimensions FDU91F	18		
Dimensions FDU92	18		
Dimensions FDU93	18		
Dimensions FDU95	19		
Dimensions FDU96	19		
Weight	19		
Materials	20		
Connecting cable	21		

Function and system design

Measuring principle



BD: blocking distance, **D:** distance from sensor membrane to fluid surface, **E:** empty distance **F:** span (full distance), **L:** level, **V:** volume (or mass), **Q:** flow

The sensor transmits ultrasonic pulses in the direction of the product surface. There, they are reflected back and received by the sensor. The transmitter Prosonic S measures the time t between pulse transmission and reception. From t (and the velocity of sound c) it calculates the distance D from the reference point (see the figure → 4) to the product surface:

$$D = c \cdot t / 2$$

From D results the desired measuring value:

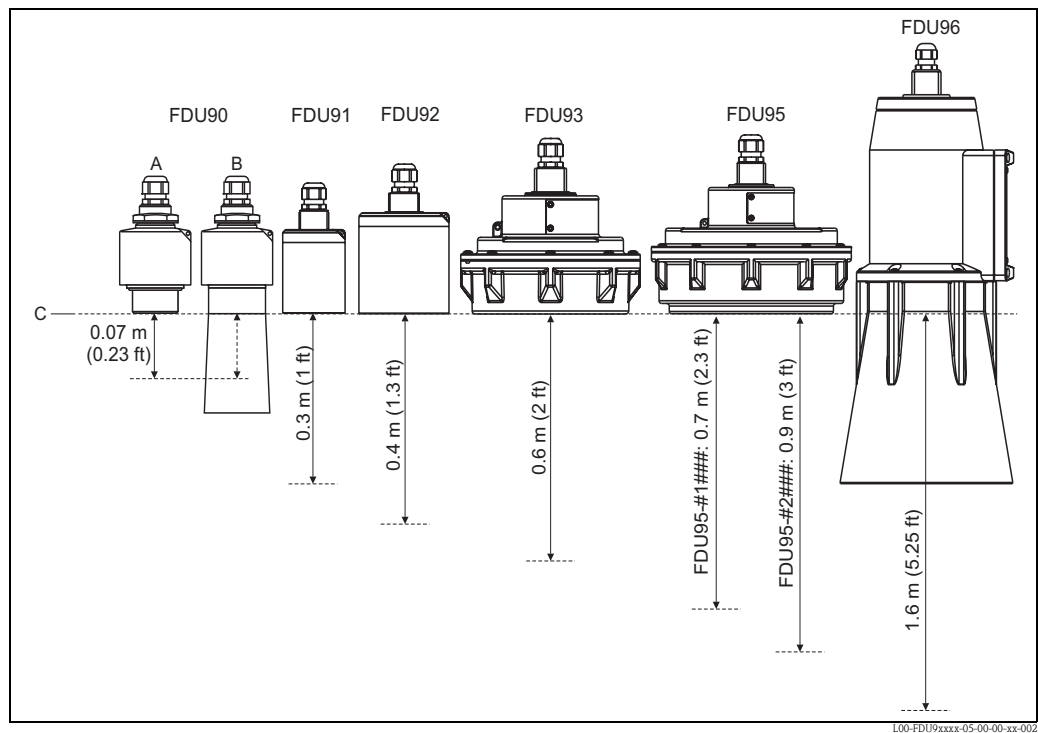
- level L
- volume V
- flow Q across measuring weirs or open channels

Time-of-flight correction

In order to compensate for temperature dependent time-of-flight changes, a temperature sensor is integrated in the ultrasonic sensors.

Blocking distance

The level L may not extend into the blocking distance BD. Level echoes within the blocking distance can not be evaluated due to the transient characteristics of the sensor and thus a reliable measurement is not possible. The blocking distance BD is dependent on the type of sensor:



A: without flooding protection tube, **B:** with flooding protection tube, **C:** reference point

Transmitter

The sensors can be connected to the transmitter FMU90 and FMU95. The transmitter recognizes the type of sensor automatically.

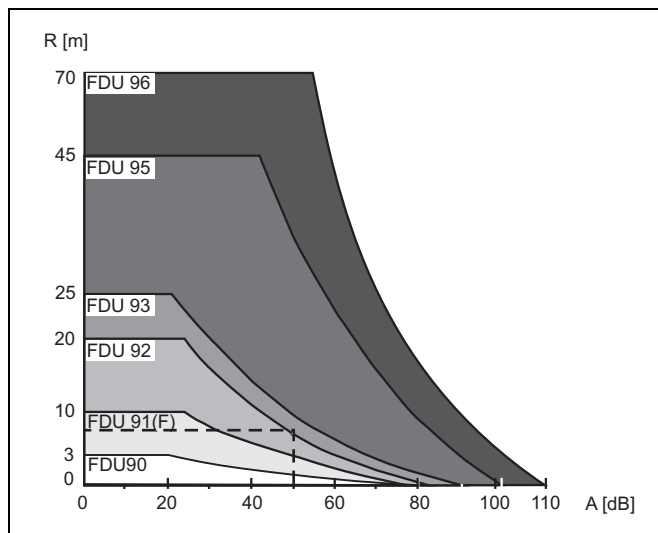
Input

Measuring range

The effective range of the sensors is dependent on the operating conditions. To estimate the range, proceed as follows (see also the example):

1. Determine which of the influences shown in the following table are appropriate for your process.
2. Add the corresponding attenuation values.
3. From the total attenuation, use the diagram to calculate the range.

Fluid surface	Attenuation
calm	0 dB
waves	5 to 10 dB
strong turbulence (e.g. stirrers)	10 to 20 dB
foaming	Please contact your Endress+Hauser sales representative.
Bulk material surface	Attenuation
hard, rough (e.g. rubble)	40 dB
soft (e.g. peat, dust-covered clinker)	40 to 60 dB
Dust	Attenuation
no dust formation	0 dB
little dust formation	5 dB
heavy dust formation	5 to 20 dB
Filling curtain in detection range	Attenuation
none	0 dB
small quantities	5 dB
large quantities	5 to 20 dB
Temperature difference between sensor and product surface	Attenuation
to 20 °C (68 °F)	0 dB
to 40 °C (104 °F)	5 to 10 dB
to 80 °C (176 °F)	10 to 20 dB



A: Attenuation (dB), R: Range (m)

Example for FDU92

- Silo with rubble: ~ 40dB
- small quantities of filling curtain: ~ 5dB
- little dust: ~ 5dB

total: ~ 50dB

=> Range approx. 8 m (26 ft)

Operating frequency

Sensor	Operating frequency
FDU90	90 kHz
FDU91	43 kHz
FDU91F	42 kHz
FDU92	30 kHz
FDU93	27 kHz
FDU95 - *1*** (low temperature version)	17 kHz
FDU95 - *2*** (high temperature version)	18 kHz
FDU96	11 kHz

Output

Signal transmission

analogue voltages

Auxiliary energy

Power supply

supplied by the transmitter FMU90


Sensor heater (for FDU91)

The FDU90 and FDU91 sensors are available in a version with heater. The power for this heater must be provided by an external power supply unit. The supply voltage is connected to the brown (BN) and blue (BU) strands of the sensor cable.

Technical data

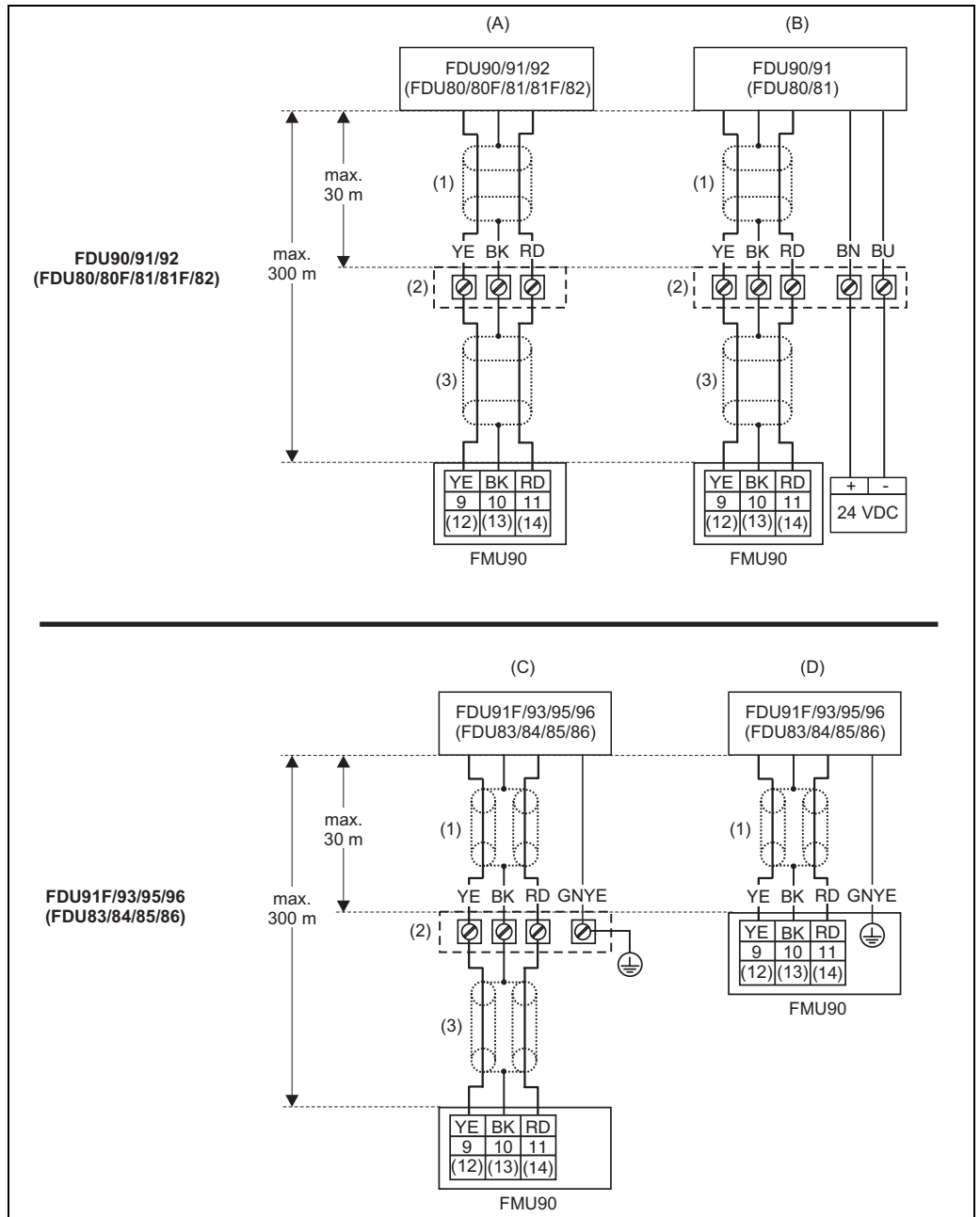
- 24 VDC \pm 10 %; residual ripple < 100 mV
- 250 mA per sensor

Note!

- If the sensor heater is applied, the integrated temperature sensor can not be used. Instead, an external temperature sensor (Pt100 or FMT131 from Endress+Hauser) must be used. The transmitter FMU90 is available in a version with an input for the external temperature sensor. For details refer to Technical Information TI00397F.
- The power for the sensor heater can be supplied by the power supply RNB130 from Endress+Hauser (→  30 "Accessories").

Electrical connection

Connection diagram



L00-FDU9xxxx-04-00-00-xxx-002

Connection hints**Caution!**

- In order to avoid interference signals, the sensor cables should not be laid parallel to high voltage electric power lines. The cables may not be laid in the proximity to frequency converters.
- The cable screen serves as a return cable and must be connected to the transmitter without any electrical break. With the pre-assembled cables, the screen ends in a black strand (BK). With the extension cable, the screen must be twisted together and connected to the "BK" terminal.

Warning!

- The sensors FDU83, FDU84, FDU85 and FDU86 with an ATEX, FM or CSA certificate are not certified for connection to the FMU90 transmitter.
- for the sensors FDU91F/93/95/96 and FDU83/84/85/86:
The ground lead (GNYE) must be connected to the local potential equalization **after a maximum distance of 30 m (98 ft)**. This can be done either
 - at the terminal box or
 - at the transmitter FMU90 or in the cabinet (if the distance to the sensor does not exceed 30 m (98 ft)).

Note!

For easier mounting it is advisable to use the sensors FDU90/91/92 and FDU80/80F/81/81F/82 with a maximum cable length of 30 m (98 ft) as well. For longer distances an extension cable with a terminal box should be used.

Connection of the sensor heater (for FDU90/FDU91)

The FDU90 and FDU91 sensors are available in a version with heater. The power for this heater must be provided by an external power supply unit. The supply voltage is connected to the brown (BN) and blue (BU) strands of the sensor cable.

Technical Data

- 24 VDC \pm 10 %; residual ripple < 100 mV
- 250 mA per sensor


Note!


When using the sensor heater, the temperature compensation of the ultrasonic measurement must be performed with an external temperature probe, which is connecte to the additional temperature input of the FMU90 transmitter (see Technical Information TI00397F).

Extension cables for the sensors

For distances up to 30 m (98 ft) the sensor can be directly connected by the sensor cable. For longer distances, it is recommended to use an extension cable. The extension cable is connected via a terminal box. The total length (sensor cable + extension cable) may be up to 300 m (984 ft).

Caution!

If the terminal box is installed in explosion hazardous areas, all applicable national guidelines must be observed. Suitable extension cables can be obtained from Endress+Hauser (→  30 "Accessories")
Alternatively, cables with the following properties can be used:

- Number of cores according to the connection diagram (→  7 "Connection diagram")
- braided wire screen for the yellow (YE) and red (RD) core (no foil screen)
- Length: up to 300 m (984 ft), sensor cable + extension cable
- Cross section: 0.75 mm² to 2.5 mm² (18 to 14 AWG)
- up to 6 Ω per core
- max. 60 nF
- for FDU91F/93/95/96 and FDU 83/84/85/86: The earth lead must not be within the screening.

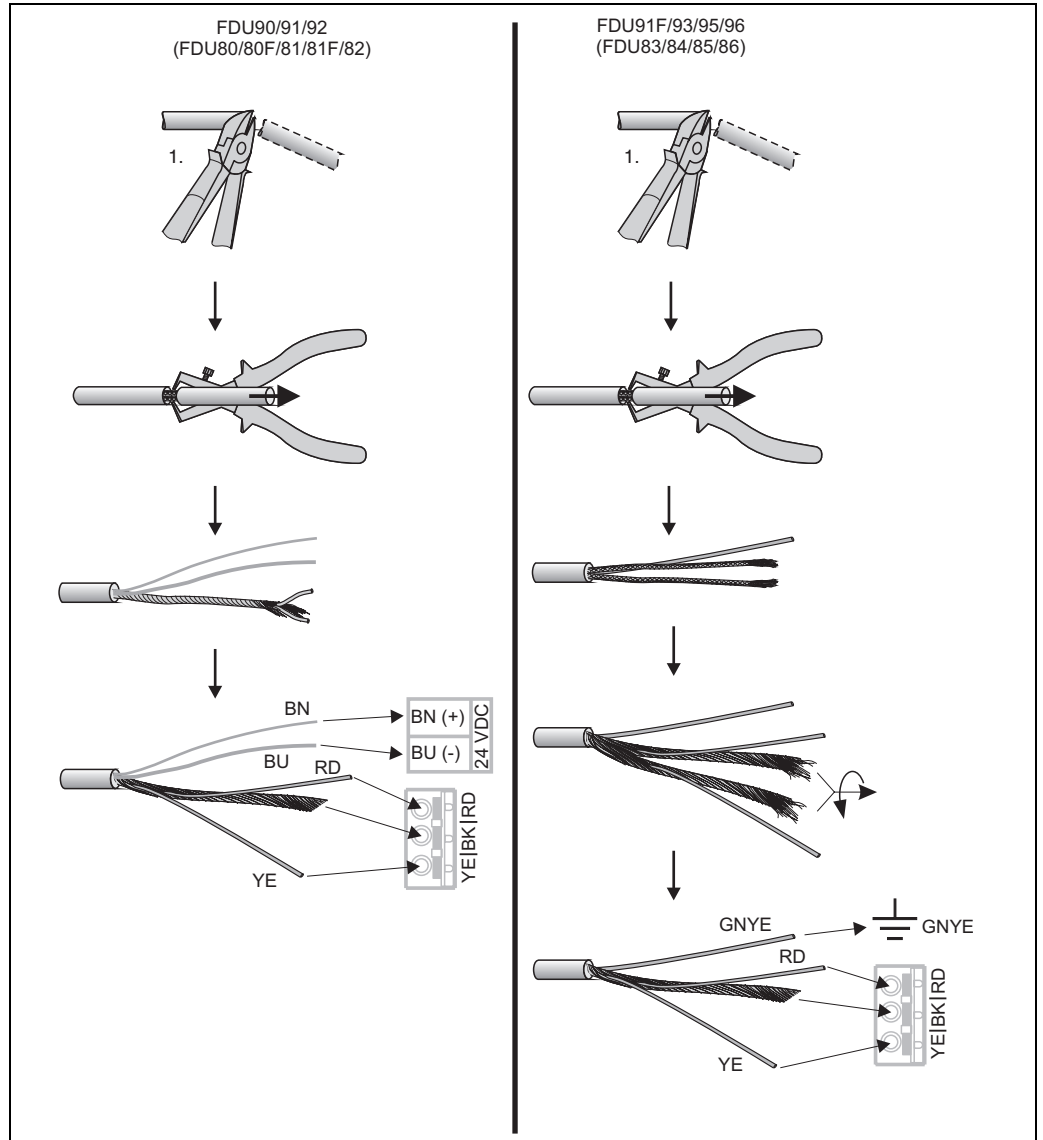
Shortening the sensor cable

If required, the sensor cable can be shortened. Please note:

- Do not damage the cores when removing the insulation.
- The cable is shielded by a metallic braiding. This shielding serves as a return cable and corresponds to the black (BK) strand of the unshortened cable. After shortening the cable, loosen the metallic braiding, twist it together securely and connect it to the "BK" terminal.

Caution!

The protective earth conductor (GNYE), which is present in some of the sensor cables, may not be electrically connected to the cable shield.



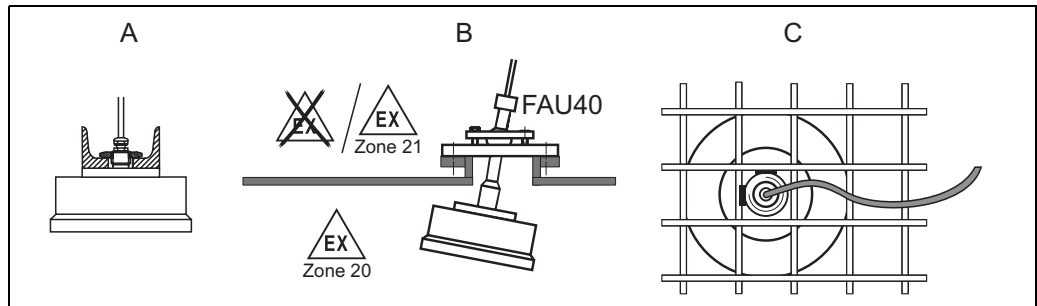
Colours of the strands: YE = yellow; BK = black; RD = red; BU = blue; BN = brown; GNYE = green-yellow

Note!

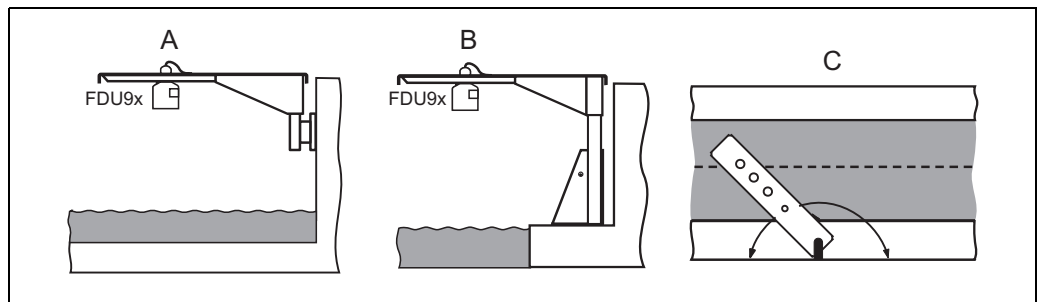
The blue (BU) and brown (BN) strands is only present for sensors with heater.

Installation conditions

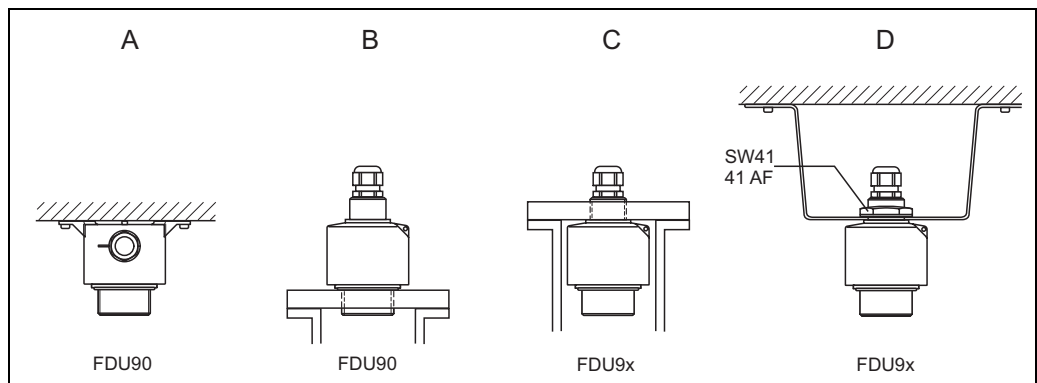
Installation options (Examples)



A: at girder or angle bracket, **B:** with alignment unit FAU40, in ATEX Zone 20 the alignment unit can be used for zone separation, **C:** with a 1" sleeve welded to a grating



A: Installation with cantilever and wall bracket, **B:** Installation with cantilever and mounting frame, **C:** The cantilever can be turned in order to position the sensor over the centre of the flume.
Cantilever, wall bracket and mounting frame are available as accessories (→ 30).



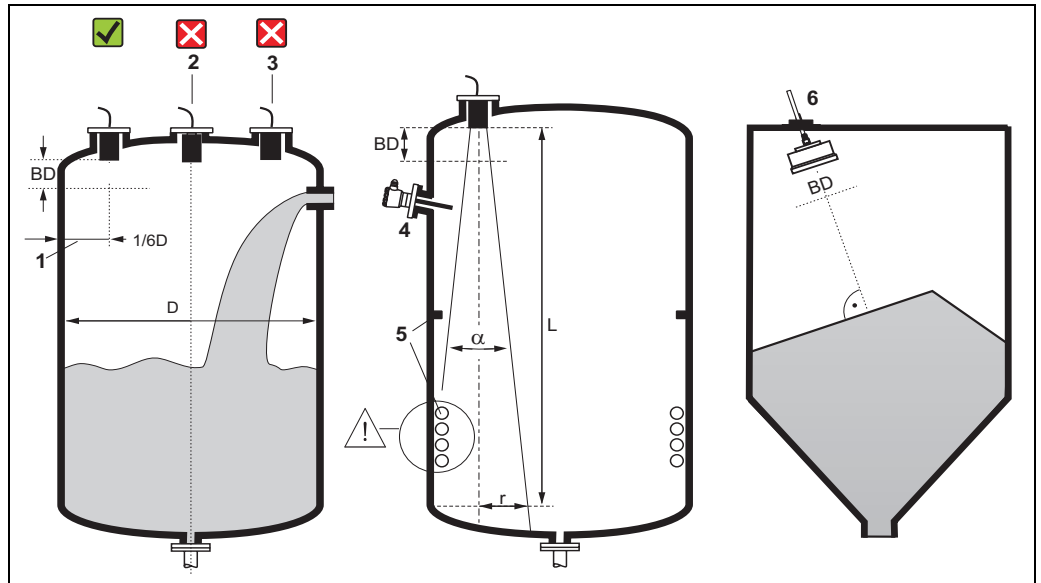
A: FDU90: Ceiling mounting
B: FDU90: Mounted at front thread (G1-1/2 or NPT1-1/2)
C: FDU9x: Mounted at rear thread (G1 or NPT1)
D: FDU90, FDU91, FDU92: Mounting with G1 counter nut¹⁾; 42AF

Caution!

- The cable of the sensors is not designed as a supporting cable. Do not use it as a suspension wire.
- The sensor membrane is part of the measuring system and must not be damaged during installation.

1) The counter nut with gasket is supplied for the sensors FDU90, FDU91 and FDU92 with a metric thread G1 at the process connection.

Installation conditions for level measurements



L00-FDU9xxxx-17-00-00-xx-003

- If possible, install the sensor so that its lower edge projects into the vessel.
- Make sure, that the maximum level does not reach into the blocking distance (BD, see table).
- Do not install the sensor in the middle of the tank (2). We recommend leaving a distance (1) between the sensor and the tank wall measuring 1/6 of the tank diameter.
- Avoid measurements through the filling curtain (3).
- Make sure that equipment (4) such as limit switches, temperature sensors, baffles etc. are not located within the emitting angle α . Emitting angles of the individual sensors are given in the table below. In particular, symmetrical equipment (5) such as heating coils etc. can influence the measurement.
- Align the sensor vertically to the product surface (6). An alignment unit (FAU40) is available as an accessory (→ 30).
- If the two-channel version of the transmitter FMU90 or the multi-channel version of the transmitter FMU90 is used, both sensors can be mounted in one vessel.
- To estimate the detection range, use the 3 dB emitting angle α :

Sensor	α (typically)	L (max)	r (max)
FDU90	12°	3 (9.8)	0.31 (1.0)
FDU91	9°	10 (33)	0.79 (2.6)
FDU91F	12°	10 (33)	1.05 (3.4)
FDU92	11°	20 (66)	1.92 (6.3)
FDU93	4°	25 (82)	0.87 (2.9)
FDU95	5°	45 (148)	1.96 (6.4)
FDU96	6°	70 (230)	3.6 (12)

m (ft)

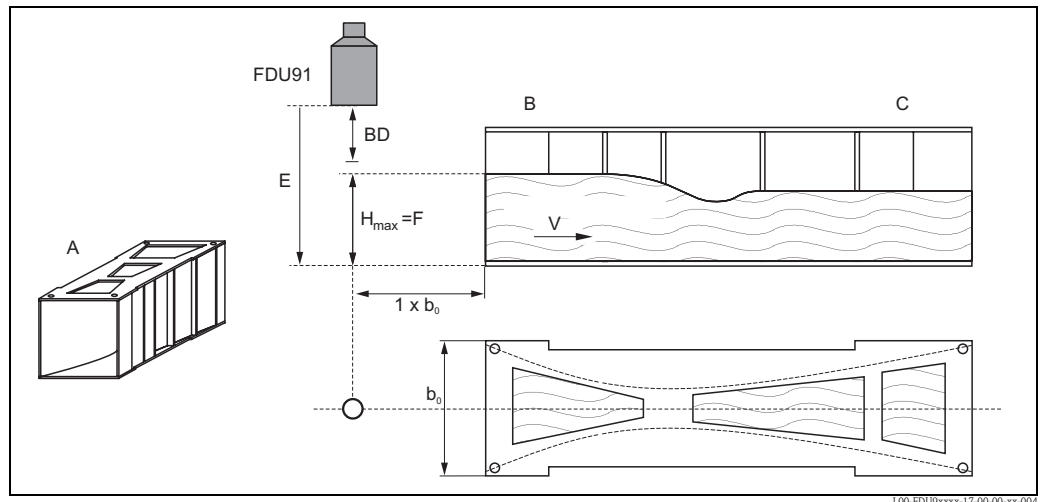
Warning!

All national guidelines applicable must be observed in explosion hazardous areas.

Installation conditions for flow measurements

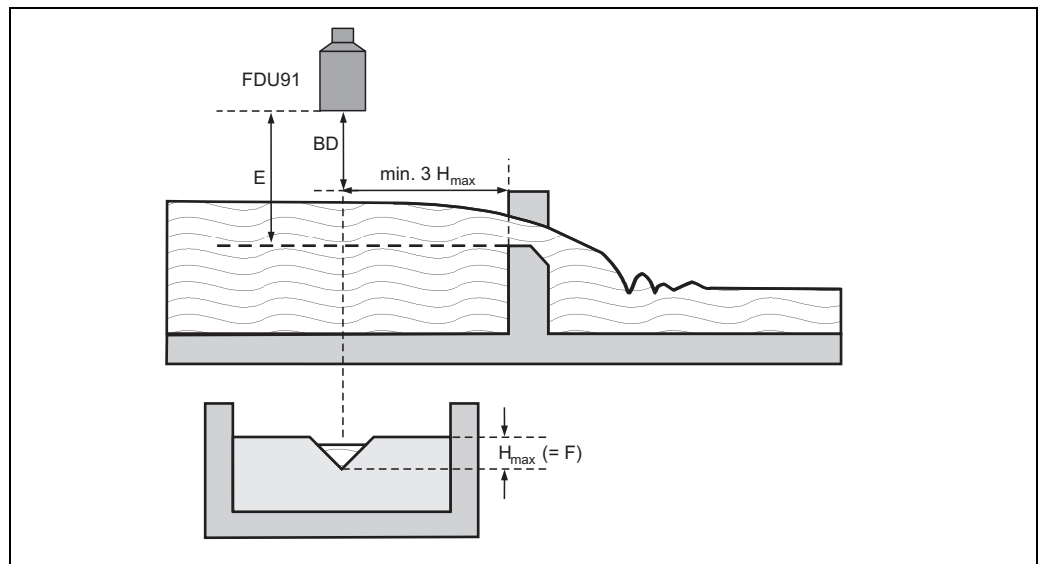
- Install the sensor at the inflow side (B), above the maximum water level H_{\max} (=F) plus the blocking distance BD.
- Position the sensor in the middle of the channel or weir.
- Align the sensor vertically to the water surface.
- Comply to the installation distance of the channel or weir.²⁾
- Use a protective cover, in order to protect the sensor from direct sun or rain. A protective cover is available for the sensors FDU90 and FDU91 (→ 30).

Example: Khafagi-Venturi flume



A: Khafagi-Venturi flume, **B:** inflow, **C:** outflow, **BD:** blocking distance, **E:** empty calibration, **F:** full calibration, **V:** direction of flow

Example: V-notch weir

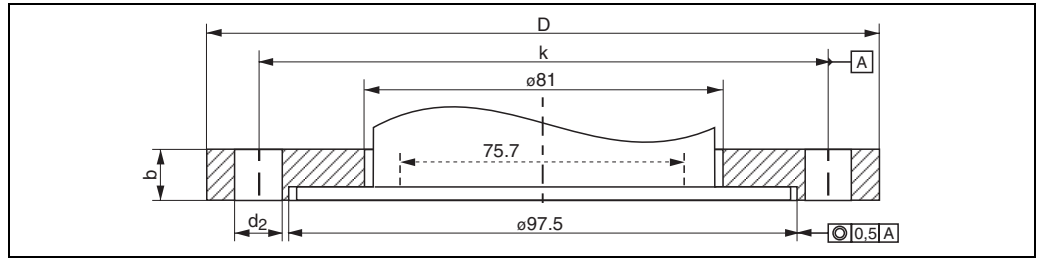


BD: blocking distance, **E:** empty calibration, **F:** full calibration

2) The installation distances of important flumes and weirs are specified in the Operating Instructions BA00289F (FMU90 with HART) and BA00293F (FMU90 with PROFIBUS).

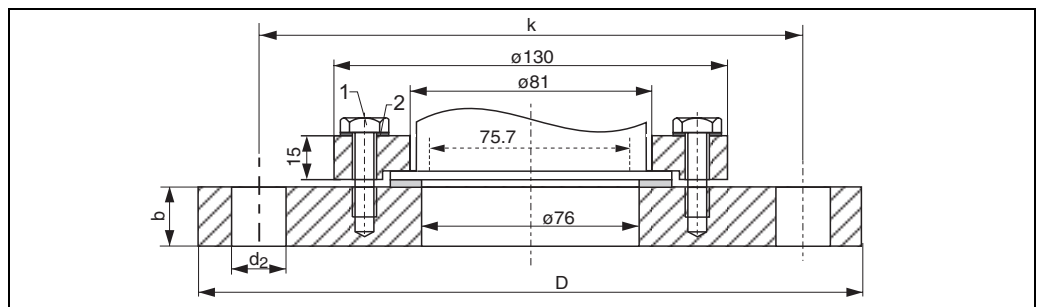
Flush mounting with slip-on flange FAU80

The FDU91F sensor can be flush mounted using a FAU80 slip-on flange. Flanges in polypropylene (PP-FR) should only be used with pressures up to 1.5 bar_{abs} (22 psi abs), flanges in 316L also above.



L00-FDU9xxxx-17-00-00-xx-009

Order code	Material	b [mm (in)]	øD [mm (in)]	ød2 [mm (in)]	k [mm (in)]	No. d2	Standard
FAU80 - CAP	PP-FR	20 (0.79)	200 (7.87)	18 (0.71)	160 (6.3)	8	DN80 PN16 A (DIN EN 1092-1 (DIN2527 B))
FAU80 - CAJ	316L (1.4435)						
FAU80 - AAP	PP-FR	23.9 (0.94)	190.5 (7.5)	19.1 (0.75)	152.4 (6.0)	4	ANSI 3" 150 lbs FF (ANSI B 16.5)
FAU80 - AAJ	316L (1.4435)						
FAU80 - KAP	PP-FR	18 (0.71)	185 (7.28)	19 (0.75)	150 (5.9)	8	JIS 10K 80A FF (JIS B 2220)
FAU80 - KAJ	316L (1.4435)						



L00-FDU9xxxx-17-00-00-xx-010

The adapter flange is included in the delivery

Position	Part	Material
1	Screws	V2A
2	Washer	PP-FR or 316/316L (1.4435)

Order code	Material	b [mm]	øD [mm]	ød2 [mm]	k [mm]	No. d2	Standard
FAU80 - CHP	PP-FR	20 (0.79)	220 (8.66)	18 (0.71)	180 (7.09)	8	DN100 PN16 A (DIN EN 1092-1 (DIN2527 B))
FAU80 - CHJ	316L (1.4435)						
FAU80 - AHP	PP-FR	23.9 (0.94)	228.6 (9.0)	19.1 (0.75)	190.5 (7.5)	4	ANSI 4" 150 lbs FF (ANSI B 16.5)
FAU80 - AHJ	316L (1.4435)						
FAU80 - KHP	PP-FR	18 (0.71)	210 (8.27)	19 (0.75)	175 (6.89)	8	JIS 10K 100A FF (JIS B 2220)
FAU80 - KHJ	316L (1.4435)						

Note!

- The process seal is not included in the delivery.

- Endress+Hauser supplies DIN/EN flanges made of stainless steel AISI 316L with the material number 1.4404 or 1.4435. With regard to their temperature stability properties, the materials 1.4404 and 1.4435 are grouped under 13E0 in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.

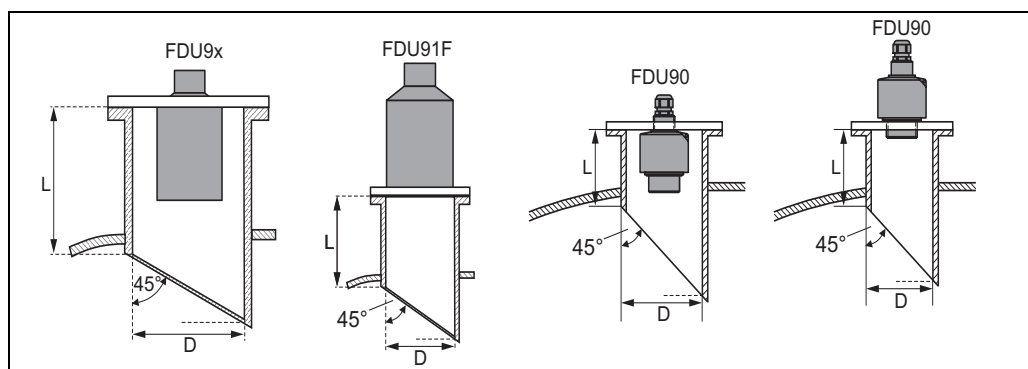
Caution!

For 3A applications:

The internal diameter of the nozzle should be selected according to the valid allowable limits for 3A applications. Usually, the internal diameter of the nozzle should be larger than or equal to the internal diameter of the sensor.

Nozzle installation

Install the sensor at a height so that the blocking distance BD is not undershot, even at maximum fill level. Use a pipe nozzle if you cannot maintain the blocking distance in any other way. The interior of the nozzle must be smooth and may not contain any edges or welded joints. In particular, there should be no burr on the inside of the tank side nozzle end. Note the specified limits for nozzle diameter and length. To minimise disturbing factors, we recommend an angled socket edge (ideally 45°).



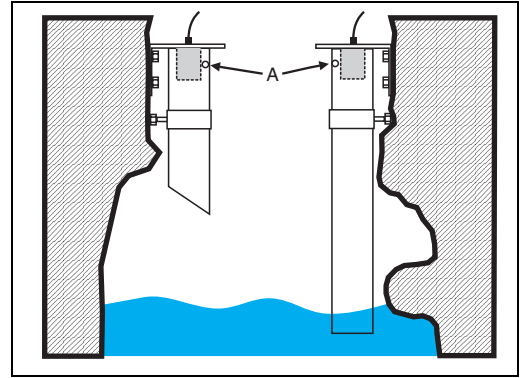
L00-FDU9xxxx-17-00-00-xx-006

Nozzle diameter	Maximum nozzle length [mm (in)]							
	FDU90 ¹⁾	FDU90 ²⁾	FDU91	FDU91F	FDU92	FDU93	FDU95	FDU96
DN50/2"		50 (1.97)						
DN80/3"	340 (13.4)	250 (9.84)	340 (13.4)	250 (9.84) ³⁾				
DN100/4"	390 (15.4)	300 (11.8)	390 (15.4)	300 (11.8) ³⁾				
DN150/6"	400 (15.7)	300 (11.8)	400 (15.7)	300(11.8) ³⁾	400 (15.7)			
DN200/8"	400 (15.7)	300 (11.8)	400 (15.7)	300(11.8) ³⁾	400 (15.7)	520 (20.5)		
DN250/10"	400 (15.7)	300 (11.8)	400 (15.7)	300(11.8) ³⁾	400 (15.7)	520 (20.5)	630 (24.8)	
DN300/12"	400 (15.7)	300 (11.8)	400 (15.7)	300(11.8) ³⁾	400 (15.7)	520 (20.5)	630 (24.8)	800 (31.5)
Sensor characteristics								
Emission angle α	12°	12°	9°	12°	11°	4°	5°	6°
Blocking distance [m (ft)]	0.07 (0.2)	0.07 (0.2)	0.3 (1)	0.3 (1)	0.4 (1.3)	0.6 (2)	0.7 (2.3)	1.6 (5.2)
Max. measuring range [m (ft)] in liquids	3 (9.8)	3 (9.8)	10 (33)	10 (33)	20 (66)	25 (82)		
Max. measuring range [m] in solids	1.2 (3.9)	1.2 (3.9)	5 (16)	5 (16)	10 (33)	15 (49)	45 (148)	70 (230)

- mounted at the rear side thread
- mounted at the front side thread (flush mounting)
- Valid for flush mounting; for mounting with G/NPT1" and DN100 or higher see FDU91F.

Ultrasound guide pipe

In narrow shafts with strong interference echoes, we recommend using an ultrasound guide pipe (e.g. PE or PVC wastewater pipe) with a minimum diameter of 100 mm (3.94 in), for FDU91. Make sure that the pipe is not soiled by accumulated dirt. If necessary, clean the pipe at regular intervals.



A: venting hole

Operating conditions: Environment

Ingress protection	tested according to IP68/NEMA6P (24 h at 6 ft under water surface)
Vibration resistance	DIN EN 600068-2-64; 20 to 2000 Hz; 1 (m/s ²) ² /Hz; 3x100 min.
Storage temperature	identical to process temperature, see below
Thermal shock resistance	according to DIN EN 60068-2-14; examination to min/max process temperature; 0.5 K/min; 1000 h
Electromagnetic compatibility	Electromagnetic compatibility according to all relevant requirements of the EN 61326-series and NAMUR recommendation EMC (NE21). For details see declaration of conformity. With respect to interference emission the devices meet the requirements of class A and are only provided for use in an "industrial environment"!

Operating conditions: Process

Process temperature
Process pressure

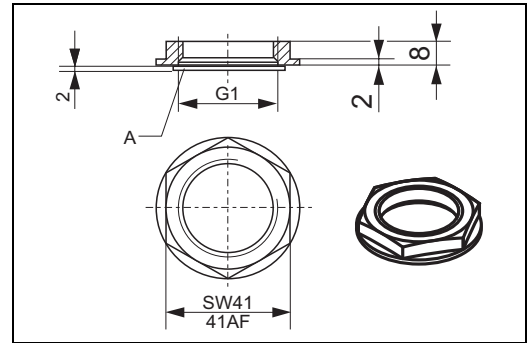
Sensor	Process temperature	Process pressure (abs.)
FDU90	-40 to +80 °C (-40 to +176 °F) ¹	0.7 to 4 bar (10.15 to 58 psi)
FDU91	-40 to +80 °C (-40 to +176 °F) ¹⁾	0.7 to 4 bar (10.15 to 58 psi)
FDU91F	-40 to +105 °C (-40 to +221 °F) (30 min/135 °C (275 °F)) ²⁾ for Ex instruments: -40 to +80 °C (-40 to +176 °F)	0.7 to 4 bar (10.15 to 58 psi)
FDU92	-40 to +95 °C (-40 to +203 °F) for Ex instruments: -40 to +80 °C (-40 to +176 °F)	0.7 to 4 bar (10.15 to 58 psi)
FDU93	-40 to +95 °C (-40 to +203 °F) for Ex instruments: -40 to +80 °C (-40 to +176 °F)	0.7 to 3 bar (10.15 to 43.5 psi)
FDU95 - *1*** (low temperature version)	-40 to +80 °C (-40 to +176 °F)	0.7 to 1.5 bar (10.15 to 22 psi)
FDU95 - *2*** (high temperature version)	-40 to +150 °C (-40 to +302 °F) for Dust-Ex versions: -40 to +130 °C	0.7 to 1.5 bar (10.15 to 22 psi)
FDU96	-40 to +150 °C (-40 to +302 °F) for Dust-Ex or Gas-Ex versions: -40 to 140 °C (-40 to +284 °F)	0.7 to 3 bar (10.15 to 43.5 psi)

- 1) In order to avoid ice build-up, the sensors FDU90 and FDU91 are available in a version with integrated sensor heater (see page 6). If this heater is used, an external temperature sensor has to be applied for time-of-flight correction. The transmitter FMU90 is available in a version with an input for the external temperature sensor. For details refer to Technical Information TI00397F.
- 2) only valid for Tri-clamp and flush mounting

Mechanical construction

Counter nut G1

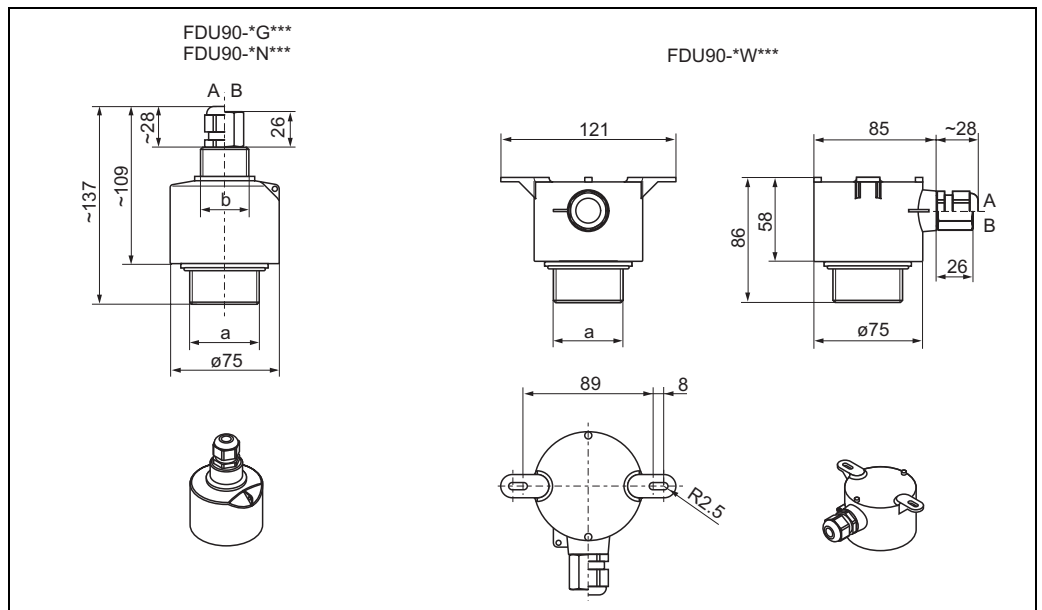
- Is supplied for the sensor FDU90, FDU91 and FDU92 with a metric G1 thread.
- Material: PA6.6
- Gasket (EPDM) is supplied



L0-FDU9xxxx-06-00-00-xx-004

A: Gasket

Dimensions FDU90



L00-FDU90xxxx-06-00-00-xx-004

Dimensions in mm

A: Cable gland for approval versions FDU90-C/D/E/G/H/J/R/U/V/1

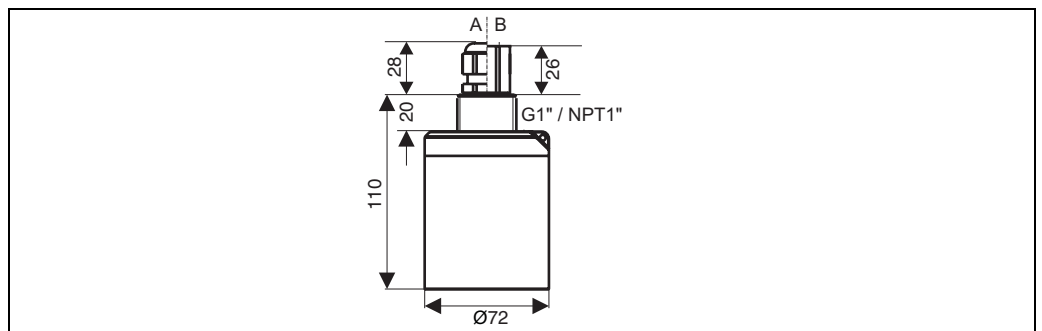
B: Conduit connection NPT 1/2" for approval versions FDU90-Q/S

The conduit connection is partly potted (half-filled)

a: G1-1/2 or NPT1-1/2 (see product structure: 020 "Process connection" → 23)

b: G1 or NPT1 (see product structure: 020 "Process connection" → 23)

Dimensions FDU91



L00-FDU91xxx-06-00-00-xx-001

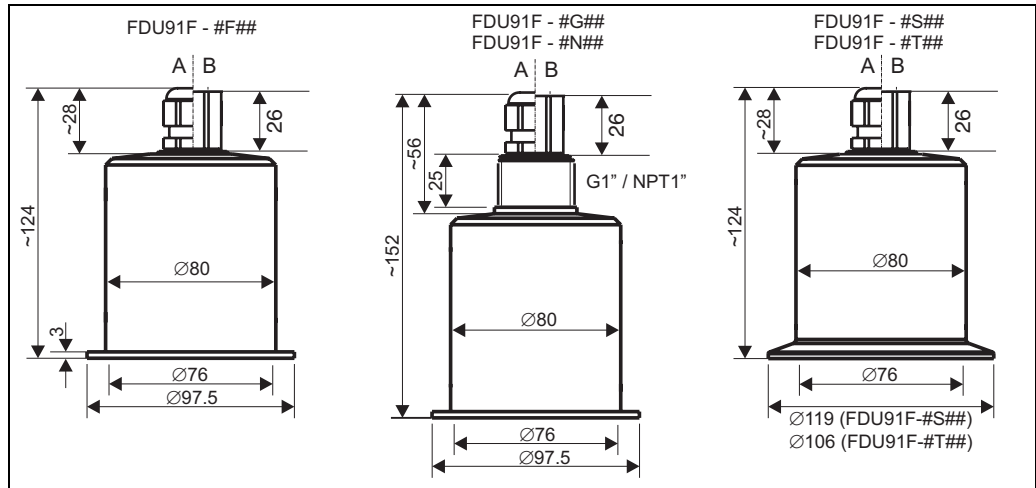
Dimensions in mm

A: Cable gland for approval versions FDU91-C/D/E/G/H/J/R/U/V/1

B: Conduit connection NPT 1/2" for approval versions FDU91-Q/S

The conduit connection is partly potted (half-filled).

Dimensions FDU91F



L00-FDU91Fxx-06-00-00-xx-001

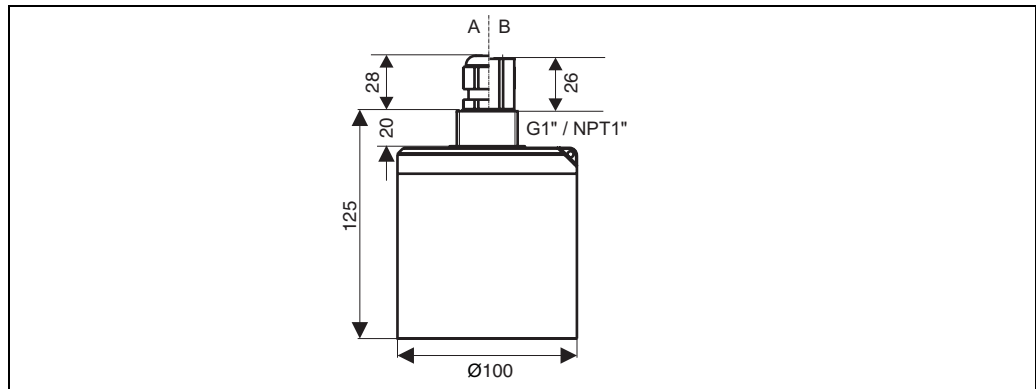
Dimensions in mm

A: Cable gland for approval versions FDU91F-C/D/E/G/H/J/R/U/V

B: Conduit connection NPT 1/2" for approval versions FDU91F-Q/S

The conduit connection is partly potted (half-filled).

Dimensions FDU92



L00-FDU92xxx-06-00-00-xx-001

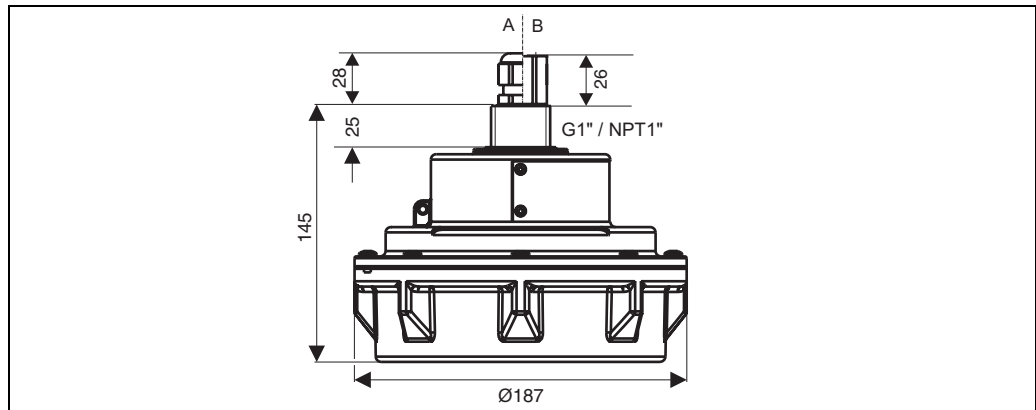
Dimensions in mm

A: Cable gland for approval versions FDU92-C/D/E/G/H/J/R/U/V/1

B: Conduit connection NPT 1/2" for approval versions FDU92-Q/S

The conduit connection is partly potted (half-filled).

Dimensions FDU93



L00-FDU93xxx-06-00-00-xx-001

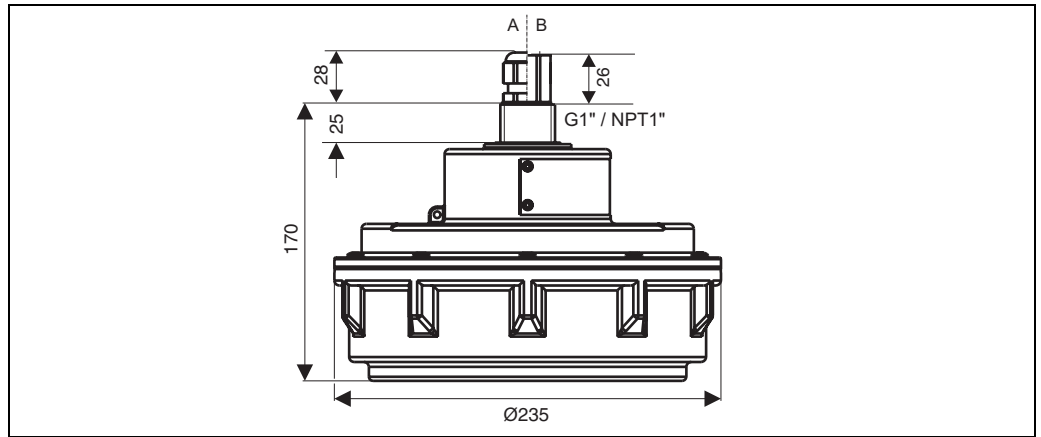
Dimensions in mm

A: Cable gland for approval version FDU93-C/D/E/G/H/J/R/U/W/1

B: Conduit connection NPT 1/2" for approval versions FDU93-P/T

The conduit connection is partly potted (half-filled).

Dimensions FDU95



L00-FDU195xxx-06-00-00-xx-001

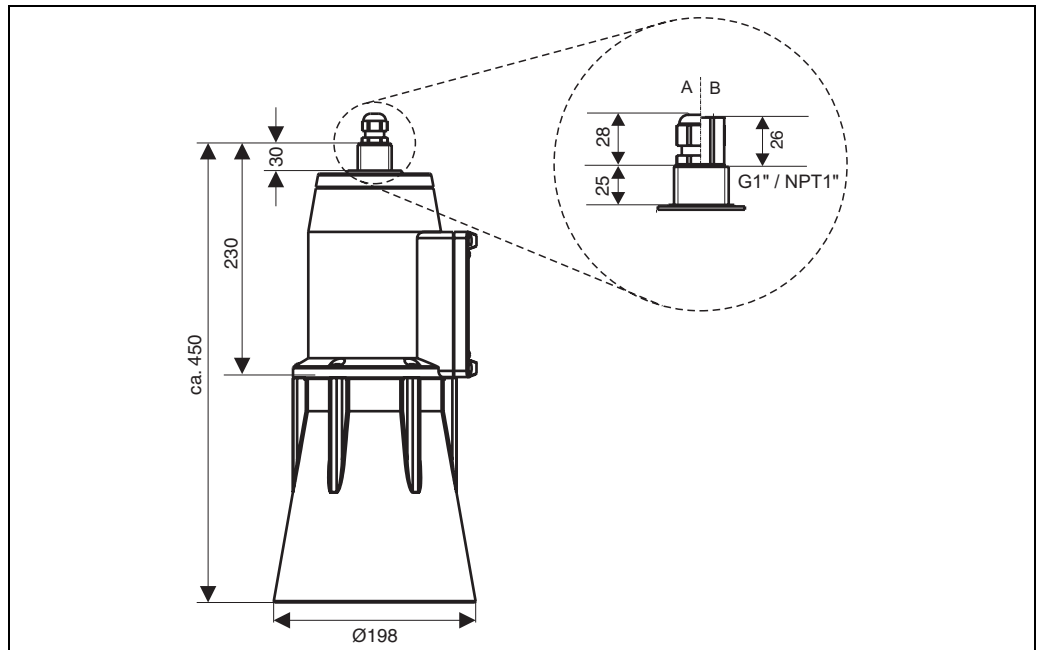
Dimensions in mm

A: Cable gland for approval versions FDU95-C/D/E/H/J/R/U/W/1

B: Conduit connection NPT 1/2" for approval versions FDU95-P/T

The conduit connection is partly potted (half-filled).

Dimensions FDU96



L00-FDU96xxx-06-00-00-xx-001

Dimensions in mm

A: Cable gland for approval versions FDU96-C/D/E/F/H/J/R/W/1

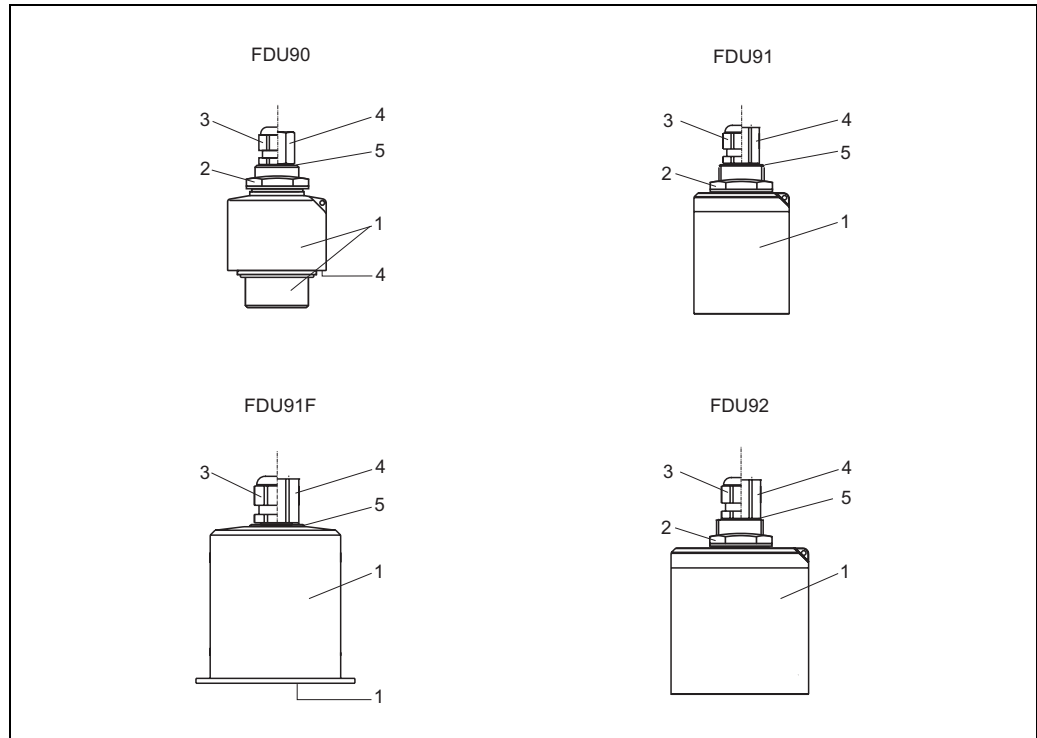
B: Conduit connection NPT 1/2" for approval versions FDU96-K/L/P/T

The conduit connection is partly potted (half-filled).

Weight

Sensor	Weight (including 5 m (16 ft) cable)
FDU90	<ul style="list-style-type: none"> ■ approx. 0.9 kg (1.98 lbs) without flooding protection tube ■ approx. 1.0 kg (2.21 lbs) with flooding protection tube
FDU91	approx. 1.1 kg (2.43 lbs)
FDU91F	approx. 1.6 kg (3.53 lbs)
FDU92	approx. 2 kg (4.41 lbs)
FDU93	approx. 2.9 kg (6.39 lbs)
FDU95	approx. 4.5 kg (9.92 lbs)
FDU96	approx. 5 kg (11.03 lbs)

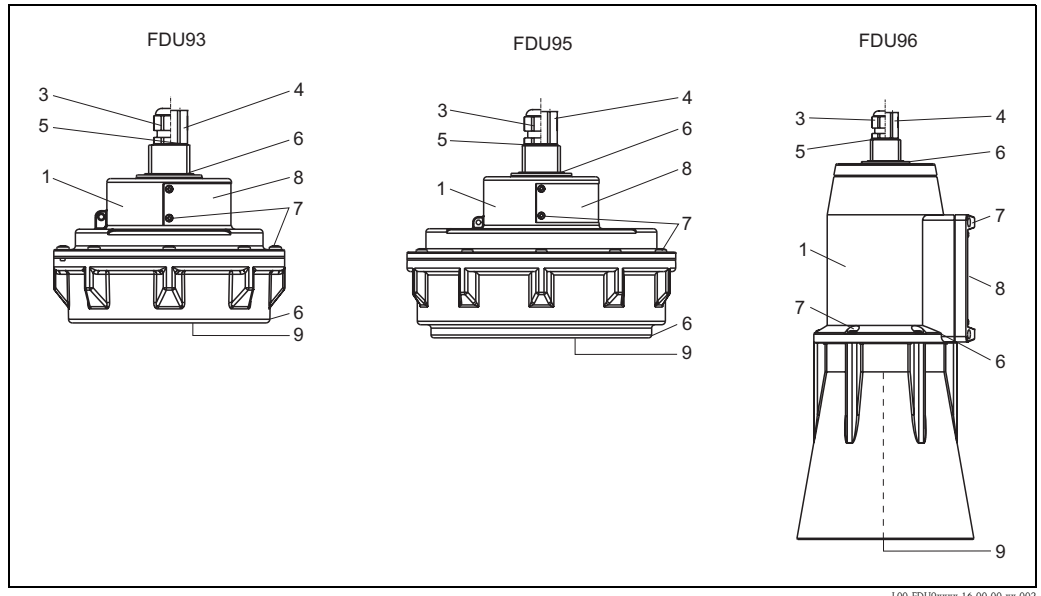
Materials



Pos.	Part	FDU90	FDU91	FDU91F	FDU92
1	Sensor	PVDF		316 L (1.4404/1.4435)	PVDF
2	Counter nut	PA6.6		–	PA6.6
3	Cable gland	PA			
4	Adpater	CuZn nickel-plated			
5	O-ring	EPDM			
6	Sealing				

Note!

The chemical compatibility of the sensors must be checked before installation with compatibility charts.



Pos.	Part	FDU93	FDU95	FDU96
1	Sensor	UP		
2	Counter nut	PA6.6		
3	Cable gland	PA or CuZn nickel-plated		
4	Adpater	CuZn nickel-plated		
5	O-ring	EPDM		
6	Sealing	VMQ		
7	Screws	V2A		
8	Nameplate	304 (1.4301)		
9	Membrane	ALU or PFA coated	FDU95 - *1*** (low temperature version): 316 L (1.4404) FDU95 - *2*** (high temperature version): 316 L (1.4404) and PE	ALU or PFA coated

Note!
 The chemical compatibility of the sensors must be checked before installation with compatibility charts.

Connecting cable

5 to 300 m (16 to 984 ft)
 for cable length > 30 m (> 98 ft), an extension cable is recommended.
 In this case, the total length (sensor cable + extension cable) must not exceed 300 m (984 ft).

Cable	Material
for FDU90/91/91F/92/93	PVC
for FDU95/96	VMQ

Certificates and Approvals

CE mark	The measuring system meets the legal requirements of the EC-guidelines. Endress+Hauser confirms the instrument passing the required tests by attaching the CE-mark.
Ex approval	<p>The available certificates are listed in the ordering information. Note the associated safety instructions (XA) and control or installation drawings (ZD).</p> <p>Warning!</p> <ul style="list-style-type: none"> ■ Measuring systems for use in hazardous environments are accompanied by separate "Ex documentation", which is an integral part of this Operating Manual. Strict compliance with the installation instructions and ratings as stated in this supplementary documentation is mandatory. <ul style="list-style-type: none"> – Ensure that all personnel are suitably qualified. – Observe the specifications in the certificate as well as national and local standards and regulations. ■ The transmitter may only be installed in suitable areas. ■ Sensors with a certificate for hazardous areas may be connected to a transmitter without a certificate. ■ For FM approvals: <ul style="list-style-type: none"> Unauthorized substitution of components may impair the suitability for Division 1 or Division 2. ■ Do not disconnect equipment unless the area is known to be non-hazardous. <p>Note!</p> <p>The sensor must be installed and used in a way that eliminates any danger. Possible installation positions: in tanks, vessels, silos, over stockpiles, open channels, weirs or other bins.</p>
External standards and guidelines	<p>EN 60529 Protection class of housing (IP code)</p> <p>EN 61326 series EMC product family standard for electrical equipment for measurement, control and laboratory use</p> <p>NAMUR User association for automation technology in process industries</p>

Ordering information

Product structure FDU90

010	Approval		
	C	IEC Ex ta/tb IIIC Da/Db, IEC Ex ma IIC T5 Gb	
	D	IEC Ex ma IIC T5 Gb	
	E	ATEX II 1/2D Ex ta/tb IIIC, ATEX II 2G Ex ma IIC T5	
	G	ATEX II 3G Ex nA II T6 (in preparation)	
	H	ATEX II 3D (in preparation)	
	J	ATEX II 2G Ex ma IIC T5	
	Q	FM Cl.I,II,III Div.1+2 Gr.A-G, zone 1,2,21,22 (in preparation)	
	R	Non-hazardous area	
	S	CSA C/US Cl.I,II,III Div.1+2 Gr.A-G, zone 1,2 (in preparation)	
	U	CSA General Purpose (in preparation)	
	V	TIS Ex is IIC T6 (in preparation)	
	1	NEPSI DIP (in preparation)	
020	Process connection (threaded boss)		
	G	Thread ISO228, PVDF; rear side G1, front side G1-1/2	
	N	Thread ANSI, PVDF; rear side NPT1, front side NPT1-1/2	
	W	Ceiling mounting; front side G1-1/2	
030	Cable length		
	1	5 m/16 ft	
	2	10 m/32 ft	
	3	15 m/49 ft	
	4	20 m/65 ft	
	5	25 m/82 ft	
	6	30 m/98 ft	
	8	... m (variable length, up to 300 m)	
	A	... ft (variable length, up to 985 ft)	
035	Heater		
	A	W/o	
	B	Connection to 24 VDC Note Technical Information FMU90! (Temperature compensation)	
040	Additional option		
	A	Basic version	
	B	Flooding protection tube	
	L	5-point linearity protocol (only to order with FMU9x transmitter + 5-point linearity protocol (in preparation))	
895	Marking		
	Z1	Tagging (TAG)	
FDU90 -			product designation

Product structure FDU91

010	Approval		
	C	IEC Ex ta/tb IIIC Da/Db, IEC Ex ma IIC T6 Gb	
	D	IEC Ex ma IIC T6 Gb	
	E	ATEX II 1/2 D Ex ta/tb IIIC, ATEX II 2 G Ex ma IIC T6	
	G	ATEX II 3G EEx nA II T6 (in preparation)	
	H	ATEX II 3D (in preparation)	
	J	ATEX II 2 G Ex ma IIC T6	
	Q	FM Cl.I,II,III Div. 1+2 Gr.A-G, zone 1,2,21,22	
	R	Non-hazardous area	
	S	CSA Cl.I,II,III Div.1+2 Gr.A-G, zone 1,2	
	U	CSA General Purpose	
	V	TIIIS Ex is IIC T6	
	1	NEPSI DIP (in preparation)	
020	Process connection (threaded boss)		
	G	Thread ISO228 G1, PVDF	
	N	Thread ANSI NPT1, PVDF	
030	Cable length		
	1	5 m/16 ft	
	2	10 m/32 ft	
	3	15 m/49 ft	
	4	20 m/65 ft	
	5	25 m/82 ft	
	6	30 m/98 ft	
	8	... m (variable length, up to 300 m)	
	A	... ft (variable length, up to 985 ft)	
035	Heater		
	A	w/o	
	B	Connection to 24 VDC Note Technical Information FMU90! (Temperature compensation)	
040	Additional option		
	A	Basic version	
	L	5-point linearity protocol only to order with FMU9x transmitter + 5-point linearity protocol (in preparation)	
995	Marking		
	1	Tagging (TAG)	
FDU91 -			product designation

Product structure FDU91F

010	Approval				
	C	IEC Ex ta/tb IIIC Da/Db, IEC Ex ma IIC T6 Gb			
	D	IEC Ex ma IIC T6 Gb			
	E	ATEX II 1/2 D Ex ta/tb IIIC, ATEX II 2 G Ex ma IIC T6			
	G	ATEX II 3G EEx nA II T6 (in preparation)			
	H	ATEX II 3D (in preparation)			
	J	ATEX II 2G Ex ma II T6			
	Q	FM Cl.I,II,III Div. 1+2 Gr.A-G, zone 1,2,21,22			
	R	Non-hazardous area			
	S	CSA Cl.I,II,III Div.1+2 Gr.A-G, zone 1,2			
	U	CSA General Purpose			
	V	TIIS Ex is IIC T6 (in preparation)			
020	Process connection				
	F	for slip-on flange, 316L, accessory FAU80A			
	G	Thread ISO228 G1, 316L			
	N	Thread ANSI NPT1, 316L			
	S	Tri-Clamp ISO2852 DN101,6 (4"), 316L, 3A			
	T	Tri-Clamp ISO2852 DN88,6 (3½"), 316L, 3A			
030	Cable length				
	1	5 m/16 ft			
	2	10 m/32 ft			
	3	15 m/49 ft			
	4	20 m/65 ft			
	5	25 m/82 ft			
	6	30 m/98 ft			
	8	... m (variable length, up to 300 m)			
	A	... ft (variable length, up to 985 ft)			
040	Additional option				
	A	Basic version			
	B	EN10204-3.1 material, wetted parts, (316L wetted parts); inspection certificate			
	L	5-point linearity protocol (only to order with FMU9x transmitter + 5-point linearity protocol, (in preparation))			
995	Marking				
	1	Tagging (TAG)			
FDU91F -					product designation

Product structure FDU92

010	Approval		
	C	IIEC Ex ta/tb IIIC Da/Db, IEC Ex ma IIC T6 Gb	
	D	IEC Ex ma IIC T6 Gb	
	E	ATEX II 1/2 D Ex ta/tb IIIC, ATEX II 2 G Ex ma IIC T6	
	G	ATEX II 3G EEx nA II T6 (in preparation)	
	H	ATEX II 3D (in preparation)	
	J	ATEX II 2G Ex m II T6	
	Q	FM Cl.I,II,III Div. 1+2 Gr.A-G, zone 1,2,21,22	
	R	Non-hazardous area	
	S	CSA Cl.I,II,III Div.1+2 Gr.A-G, zone 1,2	
	U	CSA General Purpose	
	V	TIIIS Ex is IIC T6	
	1	NEPSI DIP (in preparation)	
020	Process connection (threaded boss)		
	G	Thread ISO228 G1, PVDF	
	N	Thread ANSI NPT1, PVDF	
030	Cable length		
	1	5 m/16 ft	
	2	10 m/32 ft	
	3	15 m/49 ft	
	4	20 m/65 ft	
	5	25 m/82 ft	
	6	30 m/98 ft	
	8	... m (variable length, up to 300 m)	
	A	... ft (variable length, up to 985 ft)	
040	Additional option		
	A	Basic version	
	L	5-point linearity protocol	
		(only to order with FMU9x transmitter + 5-point linearity protocol, (in preparation))	
995	Marking		
	1	Tagging (TAG)	
FDU92 -			product designation

Product structure FDU93

010	Approval				
	C	IEC Ex ta/tb IIIC Da/Db			
	D	IEC Ex ma IIC T6 Gb, IEC Ex ta/tb IIIC Da/Db			
	E	ATEX II 1/2 D Ex ta/tb IIIC			
	G	ATEX II 3G EEx nA II T6 (in preparation)			
	H	ATEX II 3D (in preparation)			
	J	ATEX II 1/2 D Ex ta/tb IIIC, ATEX II 2 G Ex ma IIC T6			
	P	FM Cl.I,II,III Div. 1+2 Gr.A-G, zone 2,21,22			
	R	Non-hazardous area			
	T	CSA Cl.II,III Div.1 Gr.E-G, zone 2			
	U	CSA General Purpose			
	W	TIIS dust-Ex DP12 (in preparation)			
	1	NEPSI DIP (in preparation)			
020	Process connection (threaded boss)				
	G	Thread ISO228 G1, UP			
	N	Thread ANSI NPT1, UP			
030	Cable length				
	1	5 m/16 ft			
	2	10 m/32 ft			
	3	15 m/49 ft			
	4	20 m/65 ft			
	5	25 m/82 ft			
	6	30 m/98 ft			
	8	... m (variable length, up to 300 m)			
	A	... ft (variable length, up to 985 ft)			
040	Additional option				
	A	Basic version			
	L	5-point linearity protocol (only to order with FMU9x transmitter + 5-point linearity protocol, (in preparation))			
995	Marking				
	1	Tagging (TAG)			
FDU93 -					product designation

Product structure FDU95

010	Approval								
	C	IEC Ex ta/tb IIIC Da/Db							
	D	IEC Ex ma IIC T6 Gb, IEC Ex ta/tb IIIC Da/Db							
	E	ATEX II 1/2 D Ex ta/tb IIIC							
	H	ATEX II 3D (in preparation)							
	J	ATEX II 1/2 D Ex ta/tb IIIC, ATEX II 2G Ex ma IIC T6							
	P	FM Cl.II Div.1 Gr.E-G, zone 2,21,22							
	R	Non-hazardous area							
	T	CSA Cl.II Div.1 Gr.E-G, zone 2							
	U	CSA General Purpose							
	W	TIIS dust-Ex DP12 (in preparation)							
	I	NEPSI DIP (in preparation)							
015	Temperature; blocking distance; material								
	1	-40 ... +80°C/176°F; 70 cm/2.3ft; membrane: 316L; PEcoated							
	2	-40 ... 150°C/302°F; 90 cm/2,9ft; membrane: 316L							
020	Process connection (threaded boss)								
	G	Thread ISO228 G1, UP							
	N	Thread ANSI NPT1, UP							
030	Cable length								
	1	5 m/16 ft							
	2	10 m/32 ft							
	3	15 m/49 ft							
	4	20 m/65 ft							
	5	25 m/82 ft							
	6	30 m/98 ft							
	8	... m (variable length, up to 300 m)							
	A	... ft (variable length, up to 985 ft)							
040	Additional option								
	A	Basic version							
	L	5-point linearity protocol (only to order with FMU9x transmitter + 5-point linearity protocol, (in preparation))							
995	Marking								
	1	Tagging (TAG)							
FDU95 -									product designation

Product structure FDU96

010	Approval	C IEC Ex ta/tb IIIC Da/Db D IEC Ex ma IIC T6 Gb, IEC Ex ta/tb IIIC Da/D E ATEX II 1/2 D Ex ta/tb IIIC, -40 ... +140 °C F ATEX II 1/2 D Ex ta/tb IIIC, -40 ... +80 °C H ATEX II 3D (in preparation) J ATEX II 1/2 D Ex ta/tb IIIC, ATEX II 2 G Ex ma IIC T6 K FM Cl.I,II,III Div.1+2 Gr.A-G, LT; Ambient temperature: -40 ... +80 °C (176 °F), zone 2,21,22 L CSA Cl.II,III Div.1 Gr.E-G, LT; Ambient temperature: -40 ... +80 °C (176 °F), zone 2 P FM Cl.I,II,III Div.1+2 Gr.A-G, HT; Ambient temperature: -40 ... +140 °C (284 °F), zone 2,21,22 R Non-hazardous area T CSA Cl.II,III Div.1 Gr.E-G, HT; Ambient temperature: -40 ... +140 °C (284 °F), zone 2 U CSA General Purpose W TIS dust-Ex DP12 (in preparation) I NEPSI DIP (in preparation)
020	Process connection (threaded boss)	G Thread ISO228 G1, UP S Thread ISO228 G1, 304 N Thread ANSI NPT1, UP V Thread ANSI NPT1, 304
030	Cable length	1 5 m/16 ft 2 10 m/32 ft 3 15 m/49 ft 4 20 m/65 ft 5 25 m/82 ft 6 30 m/98 ft 8 ... m (variable length, up to 300 m) A ... ft (variable length, up to 985 ft)
040	Additional options	A Basic version L 5-point linearity protocol (only to order with FMU9x transmitter + 5-point linearity protocol, (in preparation))
995	Marking	1 Tagging (TAG)
FDU96 -		product designation

Scope of delivery

- Instrument according to the version ordered
- This Technical Information TI00396F (serves as installation and operating instruction)
- For certified instrument versions: Safety Instructions (XA) or Control Drawings (ZD)
- For FDU90/91 with sensor heater: terminal module, to be mounted in the field housing of the transmitter FMU90
- For FDU90/91/92 with G1" process connection: counter nut (PA6.6) + seal (EPDM)
- For FDU 93/95/96 with Ex-certificate: process seal (VMQ)

Accessories

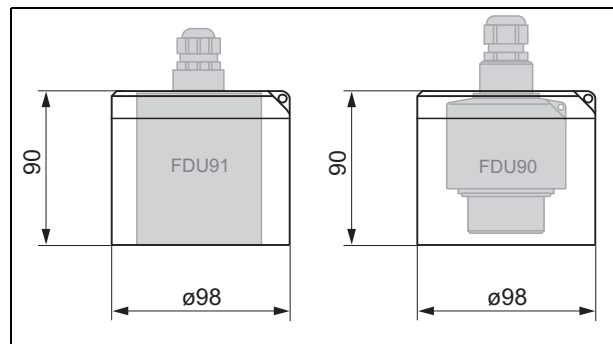
Extension cable for sensors

for Sensor	Material	Cable type	Order code
<ul style="list-style-type: none"> ■ FDU90 ■ FDU91 ■ FDU92 	PVC	LiYCY 2x(0.75)	71027742
<ul style="list-style-type: none"> ■ FDU91F ■ FDU93 ■ FDU95 	PVC (-40 to +105 °C) (-40 to +221 °F)	LiYY 2x(0.75)D+1x0.75	71027743
<ul style="list-style-type: none"> ■ FDU95 ■ FDU96 	Silicone (-40 to +150 °C) (-40 to +302 °F)	Li2G2G 2x(0.75)D+1x0.75	71027745
<ul style="list-style-type: none"> ■ FDU90/FDU91 with heater 	PVC	LiYY 2x(0.75)D+2x0.75	71027746

Total length (sensor cable + extension cable): up to 300 m (984 ft)

Protective cover for FDU91

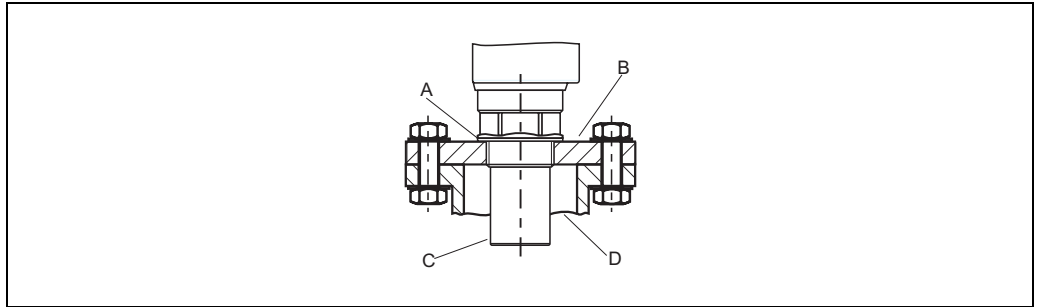
- Material: PVDF
- Order code: 52025686



L00-FDU9xxxx-06-00-00-xx-003

Dimensions in mm

Screw in flange



L00-FMU1X3XXX-00-00-00-DE-001

A: sealing ring EPDM (supplied), **B:** screw in flange, **C:** sensor, **D:** nozzle

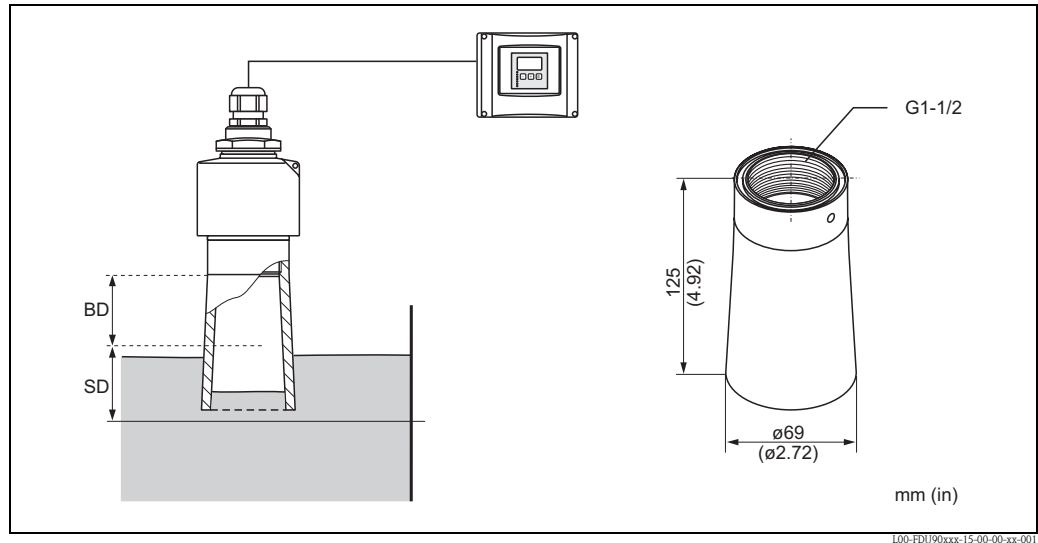
Screw in flange FAX50

015 Material:	
BR1	DN50 PN10/16 A, steel flange EN1092-1
BS1	DN80 PN10/16 A, steel flange EN1092-1
BT1	DN100 PN10/16 A, steel flange EN1092-1
JF1	2" 150lbs FF, steel flange ANSI B16.5
JG1	3" 150lbs FF, steel flange ANSI B16.5
JH1	4" 150lbs FF, steel flange ANSI B16.5
JK2	8" 150lbs FF, PP max 3bar abs/44psia flange ANSI B16.5
XIF	UNI flange 2"/DN50/50, PVDF max 4bar abs/58psia, suitable for 2" 150lbs/DN50 PN16/10K 50
XIG	UNI flange 2"/DN50/50, PP max 4bar abs/58psia, suitable for 2" 150lbs/DN50 PN16/10K 50
XIJ	UNI flange 2"/DN50/50, 316L max 4bar abs/58psia suitable for 2" 150lbs/DN50 PN16/10K 50
XJF	UNI flange 3"/DN80/80, max 4bar abs/58psia, suitable for 3" 150lbs/DN80 PN16/10K 80
XJG	UNI flange 3"/DN80/80, PP max 4bar abs/58psia, suitable for 3" 150lbs/DN80 PN16/10K 80
XJJ	UNI flange 3"/DN80/80, 316L max 4bar abs/58psia, suitable for 3" 150lbs/DN80 PN16/10K 80
XKF	UNI flange 4"/DN100/100, PVDF max 4bar abs/58psia, suitable for 4" 150lbs/DN100 PN16/10K 100
XKG	UNI flange 4"/DN100/100, PP max 4bar abs/58psia, suitable for 4" 150lbs/DN100 PN16/10K 100
XKJ	UNI flange 4"/DN100/100, 316L max 4bar abs/58psia, suitable for 4" 150lbs/DN100 PN16/10K 100
XLF	UNI flange 6"/DN150/150, PVDF max 4bar abs/58psia, suitable for 6" 150lbs/DN150 PN16/10K 150
XLG	UNI flange 6"/DN150/150, PP max 4bar abs/58psia, suitable for 6" 150lbs/DN150 PN16/10K 150
XLJ	UNI flange 6"/DN150/150, 316L max 4bar abs/58psia, suitable for 6" 150lbs/DN150 PN16/10K 150
XMG	UNI flange DN200/200, PP max 4bar abs/58psia, suitable for DN200 PN16/10K 200
XNG	UNI flange DN250/250, PP max 4bar abs/58psia, suitable for DN250 PN16/10K 250
YYY	Special version

020 Sensor Connection:	
A	Thread ISO228 G3/4
B	Thread ISO228 G1
C	Thread ISO228 G1-1/2
D	Thread ISO228 G2
E	Thread ANSI NPT3/4
F	Thread ANSI NPT1
G	Thread ANSI NPT1-1/2
H	Thread ANSI NPT2
Y	Special version

	015	020
FAX50 -		

Flooding protection tube for FDU90



BD: Blocking distance, **SD:** Safety distance

Usage

The flooding protection tube prevents the level to rise into the blocking distance of the FDU90 sensor even if the sensor is flooded.

The user can set a safety distance SD in the transmitter FMU90/FMU95 and define that a warning signal is generated as soon as the level rises into the safety distance.

Mounting hints

In order to ensure tightness, the supplied gasket has to be applied and the flooding protection tube must be screwed hand tight up to limit stop. When re-equipping the flooding protection tube, repeat the basic setup including the mapping

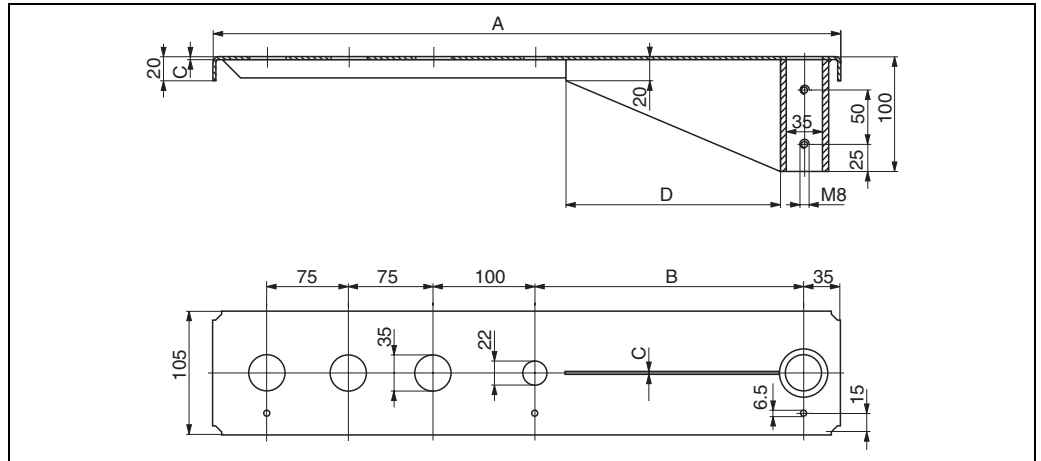
Note!

- The flooding protection tube has a G1-1/2" thread.
- If it is ordered together with the FDU90 sensor in the product structure, the sensor always has a G1-1/2" thread at its front side, irrespective of the selection in feature 020, "Process connection".
- If the flooding protection tube is ordered as an accessory, it can only be used for sensors with a G1-1/2" thread at the front side.

Material	Weight	Order code
PP	0.12 kg (0.26 lbs)	71091216
Gasket EPDM		

Cantilever

The cantilever is used to mount the sensors FDU90, FDU91 and FDU92 above open channels for example.



100-FMU4xxxx-06-00-00-yy-005

A	B	C	D	Material	Order code
585 (23)	250 (9.84)	2 (0.08)	200 (7.87)	galvanised steel	919790-0000
				316Ti (1.4571)	919790-0001
1085 (42.7)	750 (29.5)	3 (0.12)	300 (11.8)	galvanised steel	919790-0002
				316Ti (1.4571)	919790-0003

mm (in)

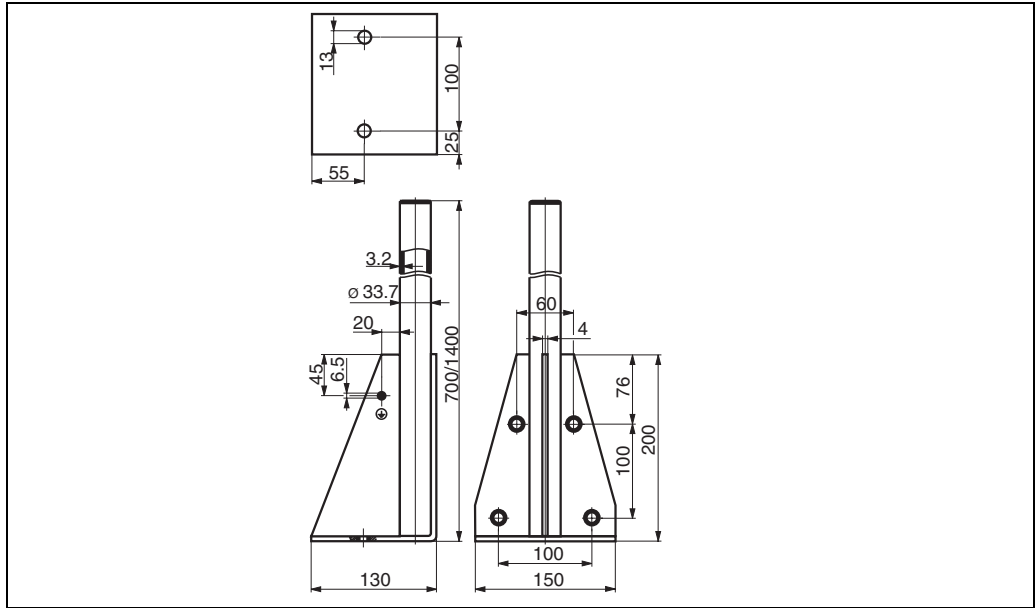
- The 35 mm (1.38 in) orifices are for the sensors FDU9x.
- The 22 mm (0.87 in) orifice may be used for an external temperature sensor (e.g. FMT131).

The cantilever can be mounted in the following ways:

- by a mounting frame (see below)
- by a wall bracket (see below)

Fixing screws are supplied.

Mounting Frame

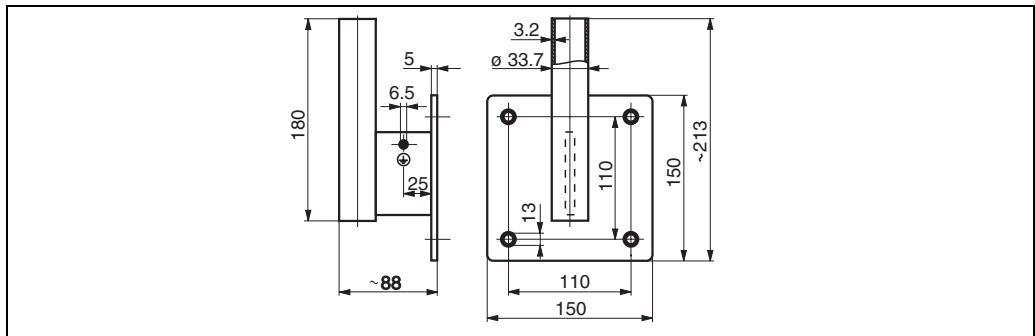


L00-FMU14x-00-00-yy-005

Height	Material	Order Code
700 (27.6)	galv. steel	919791-0000
700 (27.6)	316Ti (1.4571)	919791-0001
1400 (55.1)	galv. steel	919791-0002
1400 (55.1)	316Ti (1.4571)	919791-0003

mm (in)

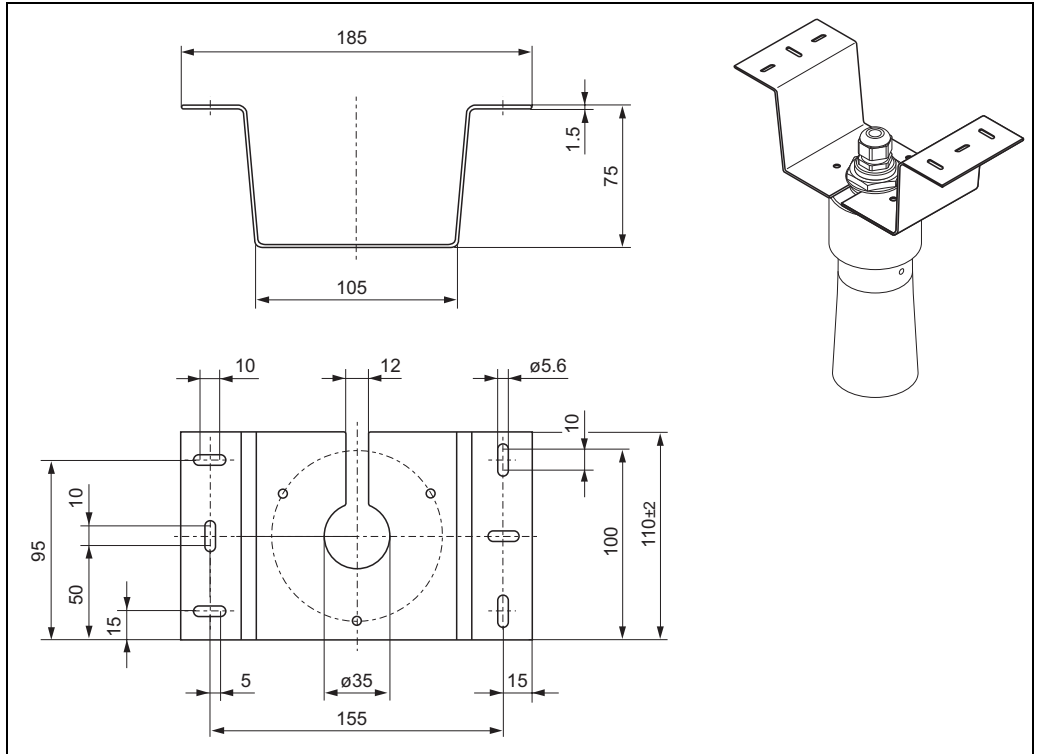
Wall Bracket



L00-FMU14x-00-00-yy-006

Material	Order Code
galv. steel	919792-0000
316Ti (1.4571)	919792-0001

**Mounting bracket for ceiling
mounting**



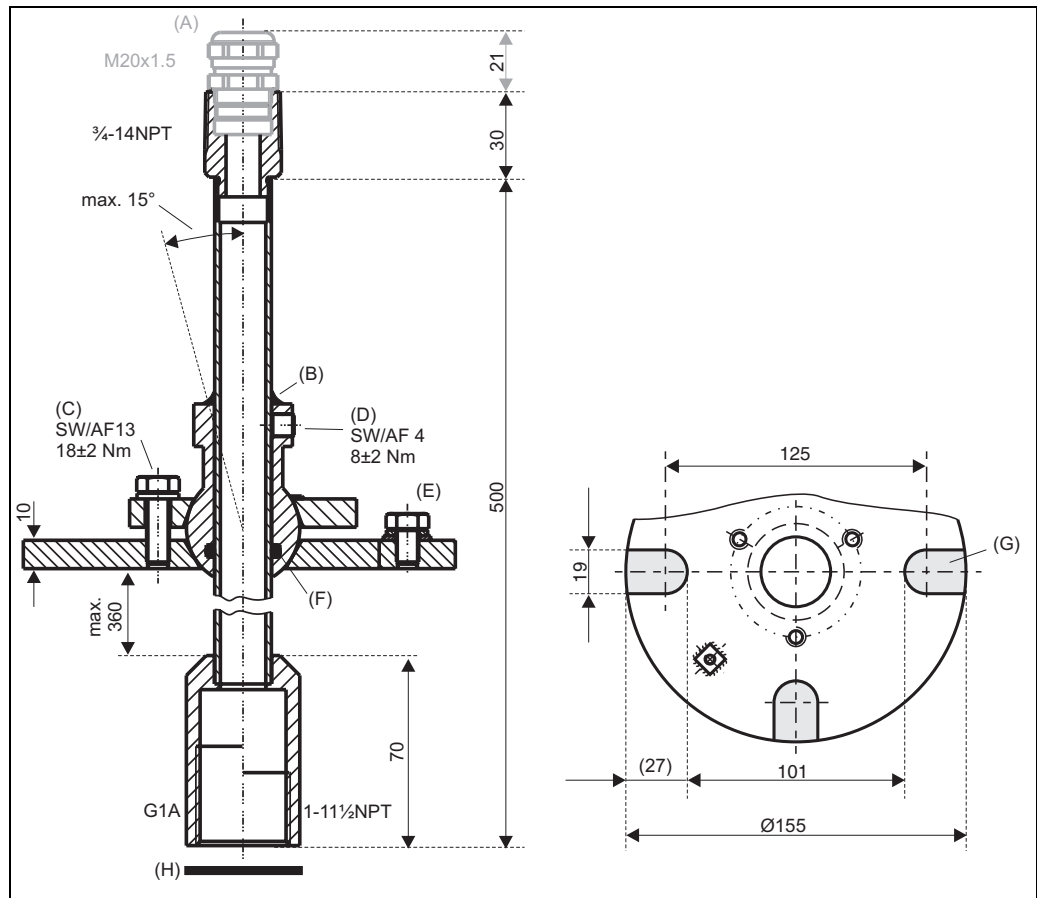
100-FDU9xxxx-00-00-00-xx-001

Dimensions in mm

	Material	Order No.
Suited for: FDU90, FDU91, FDU91F, FDU92	316 L (1.4404)	71093130

Alignment unit FAU40

For measurements in solids, usage of the alignment unit FAU40 is recommended. It is designed for simple mounting and alignment of a FDU sensor on the product surface and can be used for zone separation in explosion hazardous areas.



L00-FAU40xxx-06-00-00-xx-001

(A): Cable gland M20x1.5 (present if selected in the product structure), **(B):** sealant here, **(C):** screw for lateral movement, **(D):** two Allen screws for height adjustment, **(E):** ground pin, **(F):** O-ring, **(G):** mounting grooves (present in the UNI flange), **(H):** seal supplied with the sensor, must be used for applications in ATEX zone 20

The alignment unit can be rotated up to 15°.
For further information see Technical Information T00179F.

Product structure

010	Process connection (Flange)
1	Welding flange, 304/1.4301
2	UNI flange 2"/DN50/50, 304, max. 1.5 bar abs./22psia suitable for 2" 150lbs / DN50 PN16 / 10K 50
020	Sensor connection
S	Thread G1, cable gland M20, 304/1.4301
G	Thread G1, cable gland M20, galvanised steel
N	Thread NPT1, cable entry 3/4, galvanised steel
FAU40 -	product designation

Power supply RNB130 for the FDU90/FDU91 sensor heater

Technical data

- Primary switched-mode power supply
- Input: 100 - 240 V AC
- Output: 24 V DC connection, max. 30 V in the event of a fault
- Connection to monophased a.c. networks or to two phase conductors of three-phase supply networks (TN, TT or IT networks as per VDE 0100 T 300/IEC 364-3) with 100 - 240 V AC nominal voltage

For further information see Technical Information TI00120R.

Product structure

010	Approvals		
	A	Non-hazardous area	
020	Connection		
	1	Screw strip	
	3	Screw connection, power terminal block	
030	Version		
	A	Standard	
RNB130 -			complete product designation

IP66 protective housing for the power supply RNB130

Order code: 51002468

For additional information refer to Technical Information TI00080R.

Additional documentation

Innovation booklet **IN00003F**
Ultrasonic measurement – the solution for your application

Technical Information **TI00397F**
Technical Information for the transmitter Prosonic S FMU90

TI00179F
Technical Information for the alignment unit FAU40

Operating instructions (for transmitter FMU90) Depending on the instrument version, the following operating instructions are supplied with the Prosonic S FMU90:

Operating instructions	Output	Application	Instrument version
BA00288F	HART	<ul style="list-style-type: none"> ■ level measurement ■ alternating pump control ■ screen and rake control 	FMU90 - *****1**** FMU90 - *****2****
BA00289F		<ul style="list-style-type: none"> ■ flow measurement ■ backwater and dirt detection ■ totalizers and counters 	FMU90 - *2*****1**** FMU90 - *4*****1**** FMU90 - *2*****2**** FMU90 - *4*****2****
BA00292F	PROFIBUS DP	<ul style="list-style-type: none"> ■ level measurement ■ alternating pump control ■ screen and rake control 	FMU90 - *****3****
BA00293F		<ul style="list-style-type: none"> ■ flow measurement ■ backwater and dirt detection ■ totalizers and counters 	FMU90 - *2*****3**** FMU90 - *4*****3****

These operating instructions describe installation and commissioning of the respective version of the Prosonic S. It contains those functions from the operating menu, which are required for a standard measuring task. Additional functions are contained in the "Description of Instrument Functions" (BA00290F, see below).

Description of Instrument Functions (for transmitter FMU90) **BA00290F**
contains a detailed description of **all** functions of the Prosonic S and is valid for all instrument versions. A PDF file of this document can be found

- on the CD-ROM, which is supplied together with the instrument
- in the internet at → see: www.en.endress.com → Download

Safety Instructions

The following Safety Instructions are supplied with certified versions of the sensors. If the sensors are used in hazardous areas, comply with all the specifications in these Safety Instructions.

Sensor version	Certificate	Safety Instructions
ATEX		
<ul style="list-style-type: none"> ■ FDU90 - J... ■ FDU91 - J... ■ FDU91F - J... ■ FDU92 - J... 	<ul style="list-style-type: none"> ■ II 2 G Ex ma IIC T5 Gb (FDU90) ■ II 2 G Ex ma IIC T6 Gb (FDU91/91F/92) 	XA00321F
<ul style="list-style-type: none"> ■ FDU90 - E... ■ FDU91 - E... ■ FDU91F - E... ■ FDU92 - E... ■ FDU93 - J... ■ FDU95 - J... ■ FDU96 - J... 	<ul style="list-style-type: none"> ■ II 2 G Ex ma IIC T5 Gb (FDU90) ■ II 2 G Ex ma IIC T6 Gb (FDU91/91F/92/93/95/96) ■ II 1/2 D Ex ta/tb IIIC Txx°C Da/Db IP68 ■ II 2 D Ex tb IIIC Txx°C Db IP68 	XA00322F
<ul style="list-style-type: none"> ■ FDU93 - E... ■ FDU95 - E... ■ FDU96 - E... 	<ul style="list-style-type: none"> ■ II 1/2 D Ex ta/tb IIIC Txx°C Da/Db IP68 ■ II 2 D Ex tb IIIC Txx°C Db IP68 	XA00323F
IEC Ex		
<ul style="list-style-type: none"> ■ FDU90 - C... ■ FDU91 - C... ■ FDU91F - C... ■ FDU92 - C... ■ FDU93 - D... ■ FDU95 - D... ■ FDU96 - D... 	<ul style="list-style-type: none"> ■ IEC Ex ma IIC T5 Gb (FDU90) ■ IEC Ex ma IIC T6 Gb (FDU91/91F/92/93/95/96) ■ IEC Ex ta/tb IIIC Txx°C Da/Db IP68 ■ IEC Ex tbIIIC Txx°C DbIP68 	XA00481F
<ul style="list-style-type: none"> ■ FDU90 - D... ■ FDU91 - D... ■ FDU91F - D... ■ FDU92 - D... 	<ul style="list-style-type: none"> ■ IEC Ex ma IIC T5 Gb (FDU90) ■ IEC Ex ma IIC T6 Gb (FDU91, FDU91F, FDU92) 	XA00482F
<ul style="list-style-type: none"> ■ FDU93 - C... ■ FDU95 - C... ■ FDU96 - C... 	<ul style="list-style-type: none"> ■ IEC Ex ta/tb IIIC Txx°C Da/Db IP68 ■ IEC Ex tbIIIC Txx°C Db IP68 	XA00483F

Instruments International

Endress+Hauser
Instruments International AG
Kaegenstrasse 2
4153 Reinach
Switzerland

Tel. +41 61 715 81 00
Fax +41 61 715 25 00
www.endress.com
info@ii.endress.com

Endress+Hauser 
People for Process Automation



Process Protection

Motion sensors

SITRANS WM300 Motion failure alarm controller

Overview



SITRANS WM300 MFA motion failure alarm controller is a highly sensitive dual setpoint motion sensor system, used with Milltronics MSP probes.

Benefits

- Up to 100 mm (4 inch) gap between target and probe.
- Over and under speed setpoint detection.
- Setpoint adjustment range 2 to 5 000 Hz (120 to 300 000 ppm).
- Adjustable start-up time delay.
- Visual indication of probe operation and relay status.
- General purpose, suitable for majority of industrial applications; rugged probe designs provide unmatched reliability.

Application

The SITRANS WM300 MFA detects changes in the motion and speed of rotating, reciprocating or conveying equipment. It warns of equipment malfunction and signals through contacts to shut down machinery in case of a slowdown or failure. Its reliability makes it a cost-effective way to protect valuable process equipment.

The dual setpoint system suits most industrial applications. This versatile unit can be used on tail pulley shafts, driven pulleys, motor shaft sensing, belt or drag conveyors, screw conveyor flights, bucket elevators, fans and pumps.

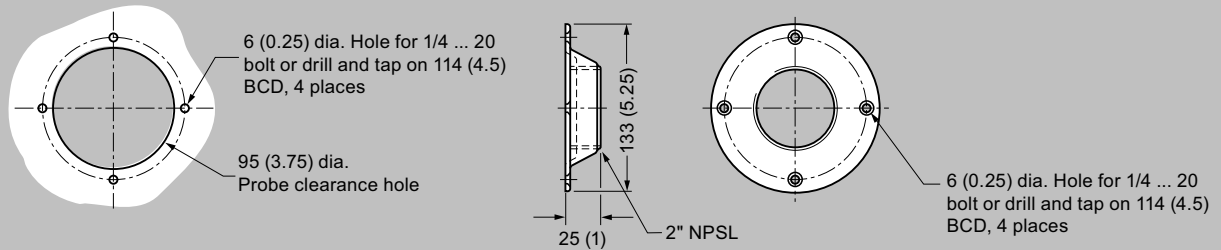
Multiple machines can be monitored with twin, independent probe inputs as well as an additional 2 inputs for differential speed detection (DSD) within a machine monitoring solution such as a belt conveyor comparing the head to tail pulley speeds. An optional analog output module can convert the WM300 into a non-contacting tachometer (NCT) with 2 mA outputs.

A special feature is the adjustable 0 to 60 second time delay, allowing the monitored device to accelerate to normal running speed before monitoring begins. A wide range of probes are available to suit specific needs, including high temperatures and corrosive installations. SITRANS WM300 MFA consistently meets the needs of mining aggregate, cement and other primary and secondary industries.

- Key Applications: tail pulleys, motor shaft sensing, screw conveyor flights, bucket elevators

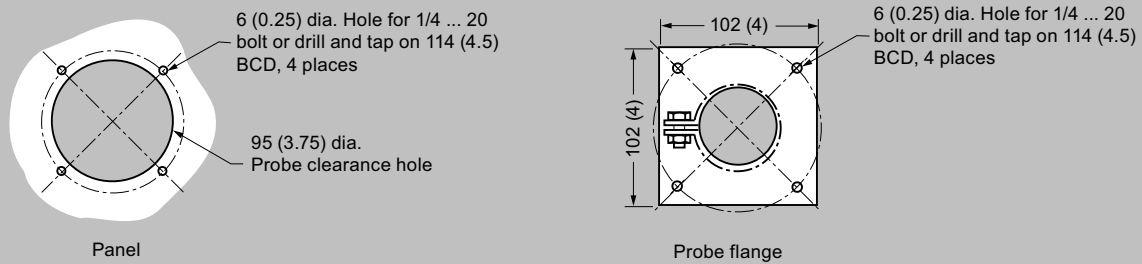
Design

Mounting for Milltronics MSP-3, MSP-7, MSP-12, XPP-5



Note: Mounting flange supplied with probe.

Mounting for Milltronics MSP-9



Milltronics MSP-12, MSP-3, MSP-7, MSP-9, XPP-5 mounting, dimensions in mm (inch)

**Standard Milltronics MSP-12**

- Heavy-duty general purpose motion probe
- Long lasting aluminum body with internal amplifier
- Convenient mounting flange and locknut for fast installation and setup
- Temperature rating: $-40 \dots +60 \text{ }^{\circ}\text{C}$ ($-40 \dots +140 \text{ }^{\circ}\text{F}$)
- Enclosure rating: Type/NEMA 4X, 6, IP67

**High temperature Milltronics MSP-3**

- Heavy-duty, high temperature aluminum probe designed to withstand operating temperatures from $-50 \dots 260 \text{ }^{\circ}\text{C}$ ($500 \text{ }^{\circ}\text{F}$)
- Cast aluminum probe with convenient mounting flange and locknut
- 1.5 m (5 ft) of high temperature PTFE cable provided. Up to 30 m (100 ft) may be used.
- Enclosure rating: Type/NEMA 4X, 6, IP67

**Standard Milltronics MSP-7**

- Heavy-duty general purpose motion probe for direct connection to WM300 MFA
- Long lasting aluminum body
- Convenient mounting flange and locknut for fast installation and setup
- Temperature rating: $-40 \dots +60 \text{ }^{\circ}\text{C}$ ($-40 \dots +140 \text{ }^{\circ}\text{F}$)
- Enclosure rating: Type/NEMA 4X, 6, IP67
- NPN, open collector output
- 24 V DC power supply

**Stainless high temperature Milltronics MSP-9**

- Heavy-duty, high temperature 304 stainless steel probe
- Special construction allows operation of probe in environment from $-50 \dots 260 \text{ }^{\circ}\text{C}$ ($500 \text{ }^{\circ}\text{F}$)
- 1.5 m (5 ft) special high temperature PTFE cable provided. Up to 30 m (100 ft) may be used.
- Enclosure rating: Type/NEMA 4X, 6, IP67

**Milltronics XPP-5**

- CSA hazardous approval (Class I, Div. 1, Groups A, B, C, D; Class II Div. 1, Groups E, F, G; Class III)
- Aluminum body that is fully potted
- Convenient mounting flange and locknut
- 3/4" NPT male hub connection
- Operating temperature from $-40 \dots 60 \text{ }^{\circ}\text{C}$ ($-40 \dots 140 \text{ }^{\circ}\text{F}$)
- Enclosure rating: Type/NEMA 4X, 6, IP67

**Milltronics RMA (Remote Mounted Amplifier)**

- Available for internal mounted IMA in probe, or without and converting older existing applications into 3-wire NPN signals for use with WM300 MFA
- DIN rail mount
- Operating temp. from $-40 \dots +60 \text{ }^{\circ}\text{C}$ ($-40 \dots +140 \text{ }^{\circ}\text{F}$)

Milltronics motion probes

Process Protection

Motion sensors

SITRANS WM300 Motion failure alarm controller

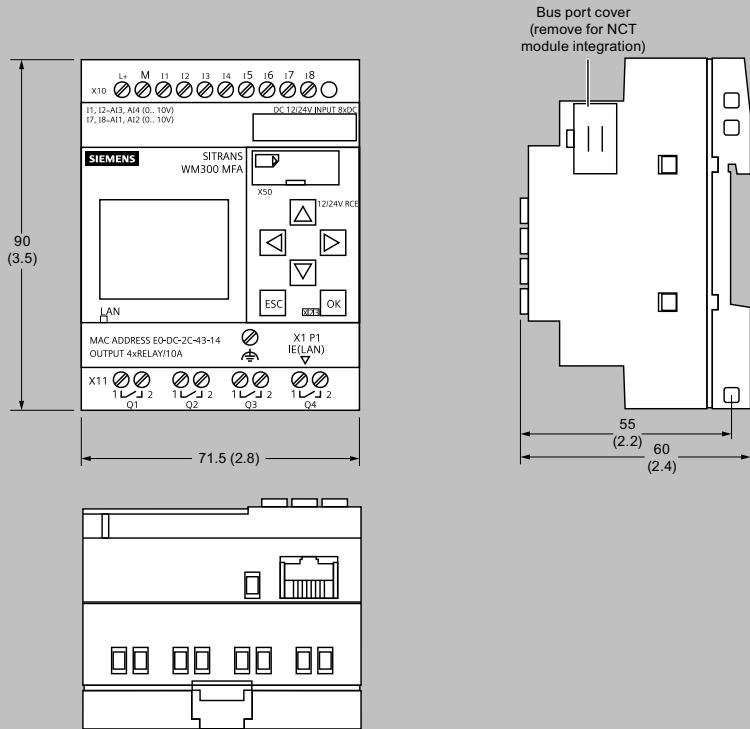
Selection and ordering data

Selection and ordering data	Article No.
Motion Failure Alarm MFA, DSD, NCT A highly sensitive dual setpoint motion sensor system, used with up to 2 MSP or XPP probes. Capable of hi/lo setpoint as well as differential monitoring with 2 additional probes.	7MH7701-0AA00-0A
Remote Mounted Amplifier RMA A remote mounted amplifier for 2 Milltronics MSP-1, MSP-3, MSP-9, MSP-12 and XPP-5 motion sensing probes.	7MH7702-0B
Analog output module NCT Additional module required for NCT applications featuring 2, 4 ... 20 mA outputs, used with WM300.	6ED10551MM000BA2
Power conversion module Convert 100 ... 240 V AC ... 24 V DC power, for use with WM300	6EP33316SB000AY0
Remote display and configuration panel Larger text display panel mount HMI for use with enclosure mounted WM300 for easy user access and monitoring.	6ED10554MH080BA0
Operating Instructions All literature is available to download for free, in a range of languages, at http://www.siemens.com/processinstrumentation/documentation .	

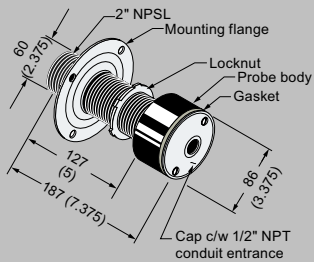
Technical specifications

Mode of operation	
Measuring principle	Motion monitor and alarm
Typical application	Monitoring loss of motion in tail pulley, screw flights, bucket elevators
Features	<ul style="list-style-type: none"> • Switch user configurable overspeed and underspeed detection • Setpoint adjustment range: <ul style="list-style-type: none"> - Standard model: 2 ... 5 000 Hz (120 ... 300 000 ppm) - Slow speed version: 2 ... 400 seconds (30 ... 0.15 ppm) • Adjustable start-up time delay: 0 ... 60 seconds • Visual indication of probe operation and relay status
Output	4 relays
Resistive rating	<ul style="list-style-type: none"> • 10 A at 24 V DC • 10 A at 240 V AC
Performance	
Repeatability	± 1 %
Dead band	± 0.25 %
MSP and XPP dynamic range	0 ... 7 200 PPM
Ambient temperature range	-20 ... +50 °C (-5 ... +122 °F)
Storage temperature	-20 ... +50 °C (-5 ... +122 °F)
Design	
Enclosure dimensions	71.5 x 90 x 60 mm (2.8 x 3.5 x 2.4 inch)
Enclosure material	Polycarbonate
Power	<ul style="list-style-type: none"> • 10.8 ... 28.8 V DC, 25 ... 165 mA • Power supply: 100 ... 240 V AC, 50/60 Hz, 0.7 ... 0.35 A per LOGO! power module
Certificates and approvals	CE, UKCA, cCSA/ULUs, FM, EAC, RCM, KC

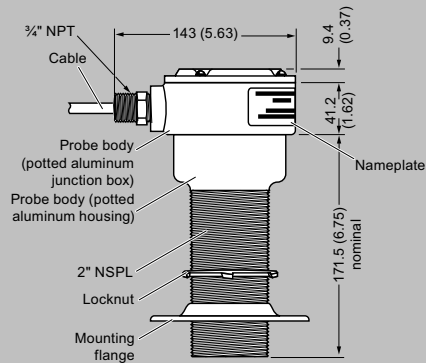
Dimensional drawings



Standard Probe MSP-7, MSP-12



Hazardous Locations XPP-5



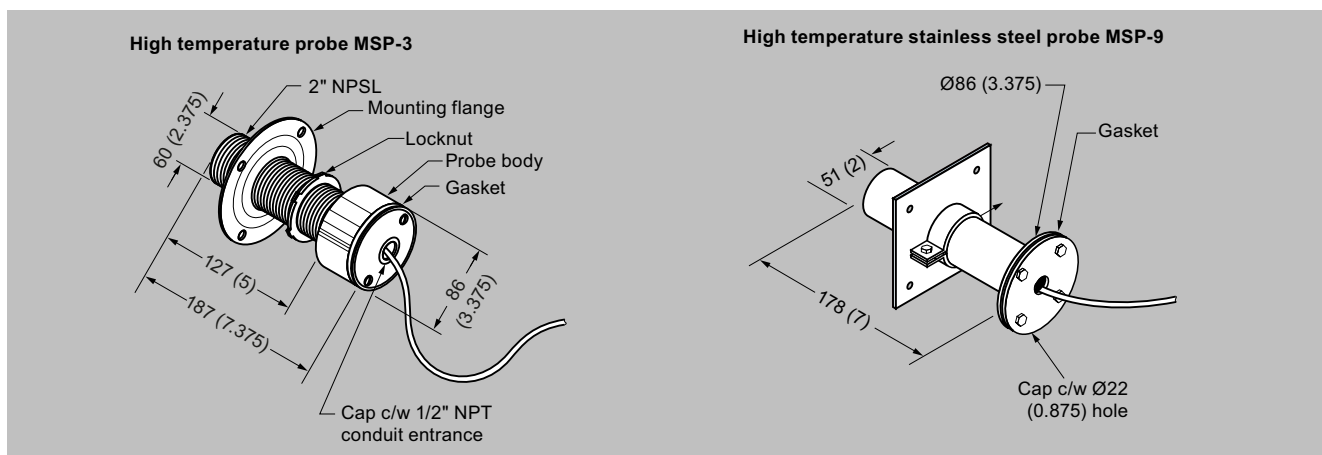
SITRANS WM300 MFA and probe, dimensions in mm (inch)

Process Protection

Motion sensors

SITRANS WM300 Motion failure alarm controller

Dimensional drawings (continued)



Milltronics probes, dimensions in mm (inch)



Circuit breaker size S0 for starter combination Rated current 10 A N release 130 A screw terminal Standard switching capacity

product brand name	SIRIUS
product designation	Circuit breaker
design of the product	For starter combinations
product type designation	3RV2
General technical data	
size of the circuit-breaker	S0
size of contactor can be combined company-specific	S00, S0
product extension auxiliary switch	Yes
power loss [W] for rated value of the current	
• at AC in hot operating state	9.25 W
• at AC in hot operating state per pole	3.1 W
insulation voltage with degree of pollution 3 at AC rated value	690 V
surge voltage resistance rated value	6 kV
maximum permissible voltage for safe isolation in networks with grounded star point	
• between main and auxiliary circuit	400 V
• between main and auxiliary circuit	400 V
shock resistance acc. to IEC 60068-2-27	25g / 11 ms
mechanical service life (switching cycles)	
• of the main contacts typical	100 000
• of auxiliary contacts typical	100 000
electrical endurance (switching cycles) typical	100 000
reference code acc. to IEC 81346-2	Q
Substance Prohibitance (Date)	01.10.2009
Ambient conditions	
installation altitude at height above sea level maximum	2 000 m
ambient temperature	
• during operation	-20 ... +60 °C
• during storage	-50 ... +80 °C
• during transport	-50 ... +80 °C
relative humidity during operation	10 ... 95 %
Main circuit	
number of poles for main current circuit	3
operating voltage	
• rated value	690 V
• rated value	20 ... 690 V
• at AC-3 rated value maximum	690 V
operating frequency rated value	50 ... 60 Hz
operational current rated value	10 A

operational current at AC-3 at 400 V rated value	10 A
operating power at AC-3	
• at 230 V rated value	2.2 kW
• at 400 V rated value	4 kW
• at 500 V rated value	5.5 kW
• at 690 V rated value	7.5 kW
operating frequency at AC-3 maximum	15 1/h
Auxiliary circuit	
number of NC contacts for auxiliary contacts	0
number of NO contacts for auxiliary contacts	0
number of CO contacts for auxiliary contacts	0
Protective and monitoring functions	
product function	
• ground fault detection	No
• phase failure detection	No
breaking capacity operating short-circuit current (Ics) at AC	
• at 240 V rated value	100 kA
• at 400 V rated value	42 kA
• at 500 V rated value	42 kA
• at 690 V rated value	4 kA
breaking capacity maximum short-circuit current (Icu)	
• at AC at 240 V rated value	100 kA
• at AC at 400 V rated value	100 kA
• at AC at 500 V rated value	42 kA
• at AC at 690 V rated value	6 kA
response value current of instantaneous short-circuit trip unit	130 A
UL/CSA ratings	
full-load current (FLA) for 3-phase AC motor	
• at 480 V rated value	10 A
• at 600 V rated value	10 A
yielded mechanical performance [hp]	
• for single-phase AC motor	
— at 110/120 V rated value	0.5 hp
— at 230 V rated value	1.5 hp
• for 3-phase AC motor	
— at 200/208 V rated value	2 hp
— at 220/230 V rated value	3 hp
— at 460/480 V rated value	5 hp
— at 575/600 V rated value	10 hp
Short-circuit protection	
product function short circuit protection	Yes
design of the short-circuit trip	magnetic
Installation/ mounting/ dimensions	
mounting position	any
fastening method	screw and snap-on mounting onto 35 mm standard mounting rail according to DIN EN 60715
height	97 mm
width	45 mm
depth	97 mm
required spacing	
• for grounded parts at 400 V	
— downwards	30 mm
— upwards	30 mm
— at the side	9 mm
• for live parts at 400 V	
— downwards	30 mm
— upwards	30 mm
— at the side	9 mm

<ul style="list-style-type: none"> • for grounded parts at 500 V <ul style="list-style-type: none"> — downwards — upwards — at the side • for live parts at 500 V <ul style="list-style-type: none"> — downwards — upwards — at the side • for grounded parts at 690 V <ul style="list-style-type: none"> — downwards — upwards — backwards — at the side — forwards • for live parts at 690 V <ul style="list-style-type: none"> — downwards — upwards — backwards — at the side — forwards 	30 mm 30 mm 9 mm 30 mm 30 mm 9 mm 50 mm 50 mm 0 mm 30 mm 0 mm 50 mm 50 mm 0 mm 30 mm 0 mm
--	--

Connections/ Terminals

product component removable terminal for auxiliary and control circuit	No
type of electrical connection	
<ul style="list-style-type: none"> • for main current circuit 	screw-type terminals
arrangement of electrical connectors for main current circuit	Top and bottom
type of connectable conductor cross-sections	
<ul style="list-style-type: none"> • for main contacts <ul style="list-style-type: none"> — solid or stranded — finely stranded with core end processing • at AWG cables for main contacts 	2x (1 ... 2,5 mm ²), 2x (2,5 ... 10 mm ²) 2x (1 ... 2.5 mm ²), 2x (2.5 ... 6 mm ²), 1x 10 mm ² 2x (16 ... 12), 2x (14 ... 8)
tightening torque	
<ul style="list-style-type: none"> • for main contacts with screw-type terminals 	2 ... 2.5 N·m
design of screwdriver shaft	Diameter 5 to 6 mm
size of the screwdriver tip	Pozidriv 2
design of the thread of the connection screw	
<ul style="list-style-type: none"> • for main contacts 	M4

Safety related data

B10 value	
<ul style="list-style-type: none"> • with high demand rate acc. to SN 31920 	5 000
proportion of dangerous failures	
<ul style="list-style-type: none"> • with low demand rate acc. to SN 31920 • with high demand rate acc. to SN 31920 	50 % 50 %
failure rate [FIT]	
<ul style="list-style-type: none"> • with low demand rate acc. to SN 31920 	50 FIT
T1 value for proof test interval or service life acc. to IEC 61508	10 y
protection class IP on the front acc. to IEC 60529	IP20
touch protection on the front acc. to IEC 60529	finger-safe, for vertical contact from the front
display version for switching status	Handle

Certificates/ approvals

General Product Approval



[Confirmation](#)



[KC](#)



Declaration of Conformity	Test Certificates	Marine / Shipping
---------------------------	-------------------	-------------------



[UK Declaration of Conformity](#)

[Special Test Certificate](#)

[Type Test Certificates/Test Report](#)



Marine / Shipping	other
-------------------	-------



[Confirmation](#)

other	Railway
-------	---------



[Confirmation](#)

[Vibration and Shock](#)

Further information

Information- and Downloadcenter (Catalogs, Brochures,...)

<https://www.siemens.com/ic10>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3RV2321-1JC10>

Cax online generator

<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3RV2321-1JC10>

Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

<https://support.industry.siemens.com/cs/ww/en/ps/3RV2321-1JC10>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

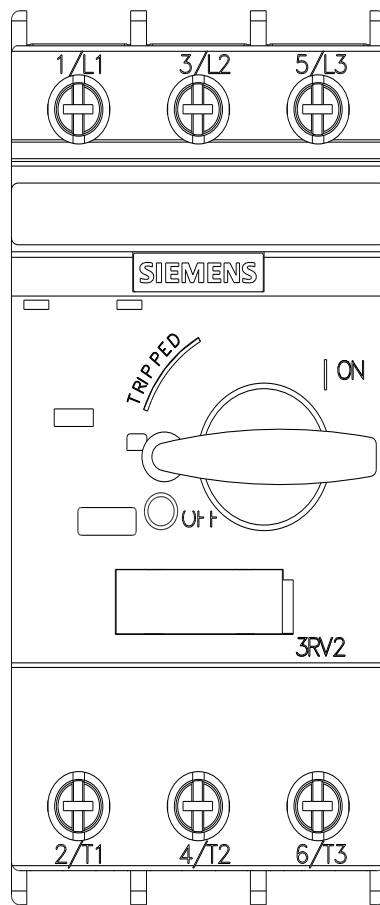
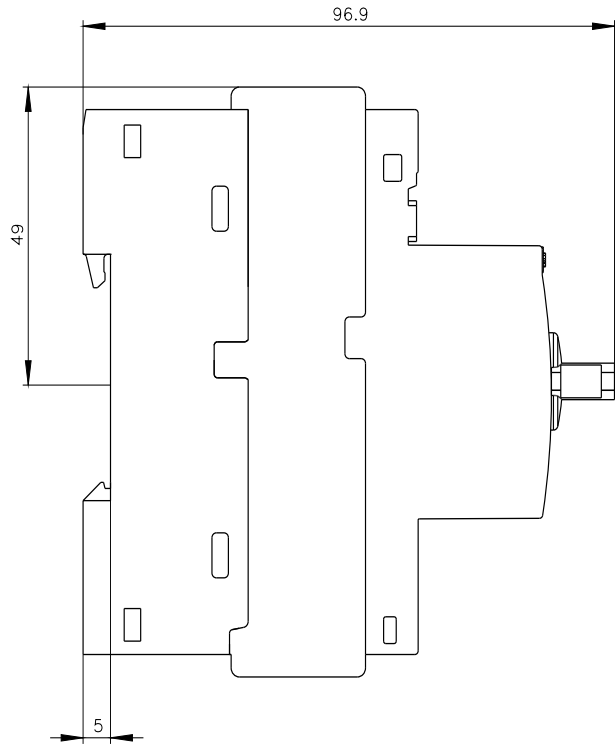
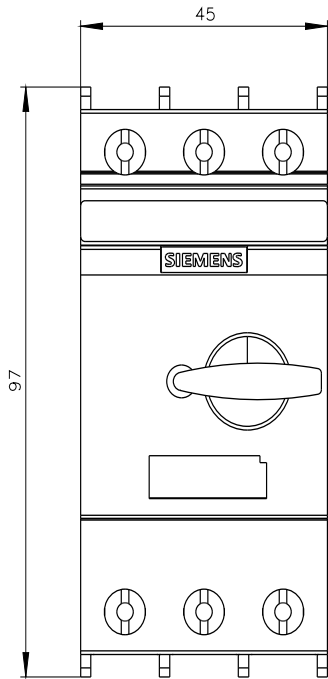
http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3RV2321-1JC10&lang=en

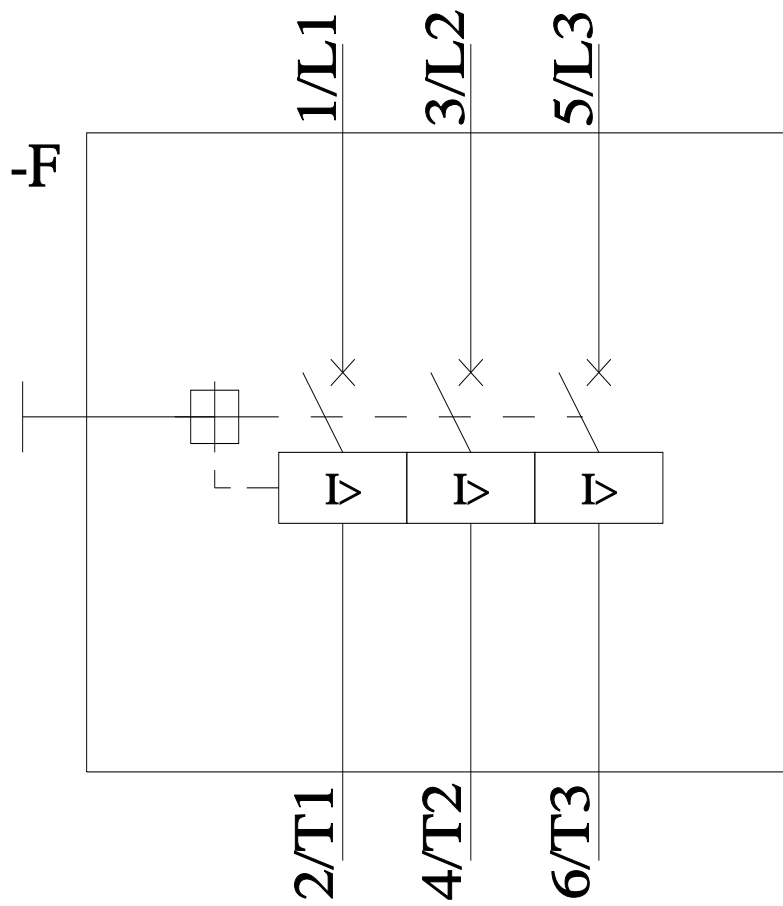
Characteristic: Tripping characteristics, I²t, Let-through current

<https://support.industry.siemens.com/cs/ww/en/ps/3RV2321-1JC10/char>

Further characteristics (e.g. electrical endurance, switching frequency)

<http://www.automation.siemens.com/bilddb/index.aspx?view=Search&mlfb=3RV2321-1JC10&objecttype=14&gridview=view1>





last modified:

10/7/2021 



Auxiliary switch can be mounted on the side 2 NO, screw terminal for circuit breaker 3RV2

General technical data		
product brand name		SIRIUS
product designation		auxiliary switch, lateral
design of the product		lateral auxiliary switches
size of the circuit-breaker		S00, S0, S2, S3
protection class IP on the front acc. to IEC 60529		IP20
touch protection on the front acc. to IEC 60529		finger-safe, for vertical contact from the front
ambient temperature		
• during storage	°C	-50 ... +80
• during operation	°C	-20 ... +60
Auxiliary circuit		
number of NC contacts for auxiliary contacts instantaneous contact		0
number of NO contacts for auxiliary contacts instantaneous contact		2
number of CO contacts of auxiliary contacts instantaneous contact		0
operational current		
• of auxiliary contacts		
— at AC-12		
— at 24 V	A	10
— at 230 V	A	10
— at 400 V	A	10
— at 690 V	A	10
— maximum	A	10
— at AC-15		
— at 24 V	A	6
— at 230 V	A	4
— at 400 V	A	3
— at DC-13		
— at 24 V	A	2
— at 110 V	A	0.5
— at 220 V	A	0.25
— at 250 V	A	0.25
• at AC-15 at 690 V rated value	A	1
Installation/ mounting/ dimensions		
fastening method		plug-in fixing
width	mm	9.5
height	mm	90
depth	mm	70

Connections/ Terminals		
type of electrical connection for auxiliary and control circuit		screw-type terminals
type of connectable conductor cross-sections <ul style="list-style-type: none"> • for auxiliary contacts <ul style="list-style-type: none"> — solid — finely stranded <ul style="list-style-type: none"> — with core end processing • at AWG cables for auxiliary contacts 		2x (0.5 ... 1.5 mm ²), 2x (0.75 ... 2.5 mm ²) 2x (0.5 ... 1.5 mm ²), 2x (0.75 ... 2.5 mm ²) 2x (20 ... 14)

Certificates/ approvals		
certificate of suitability		CE / UL / CSA / CCC
General Product Approval		Declaration of Conformity



[Confirmation](#)



[KC](#)



Declaration of Conformity	Test Certificates	Marine / Shipping
---------------------------	-------------------	-------------------

[UK Declaration of Conformity](#)

[Type Test Certificates/Test Report](#)

[Special Test Certificate](#)



Marine / Shipping	other
-------------------	-------



[Confirmation](#)



Railway

[Confirmation](#)

[Vibration and Shock](#)

Further information

Information- and Downloadcenter (Catalogs, Brochures,...)

<https://www.siemens.com/ic10>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3RV2901-1B>

Cax online generator

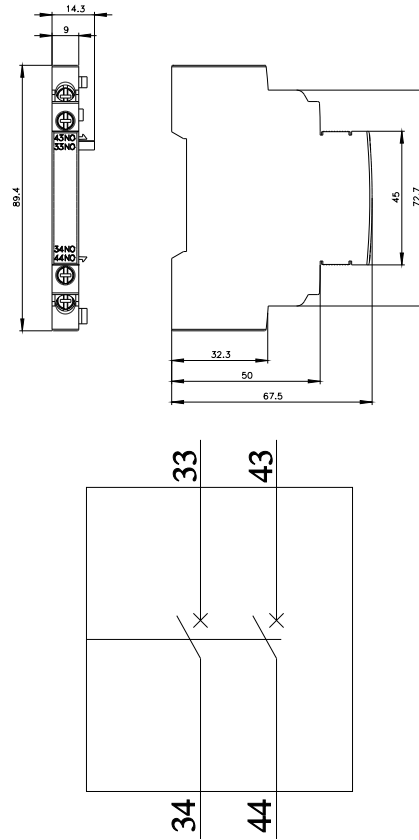
<http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3RV2901-1B>

Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

<https://support.industry.siemens.com/cs/ww/en/ps/3RV2901-1B>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)

http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3RV2901-1B&lang=en

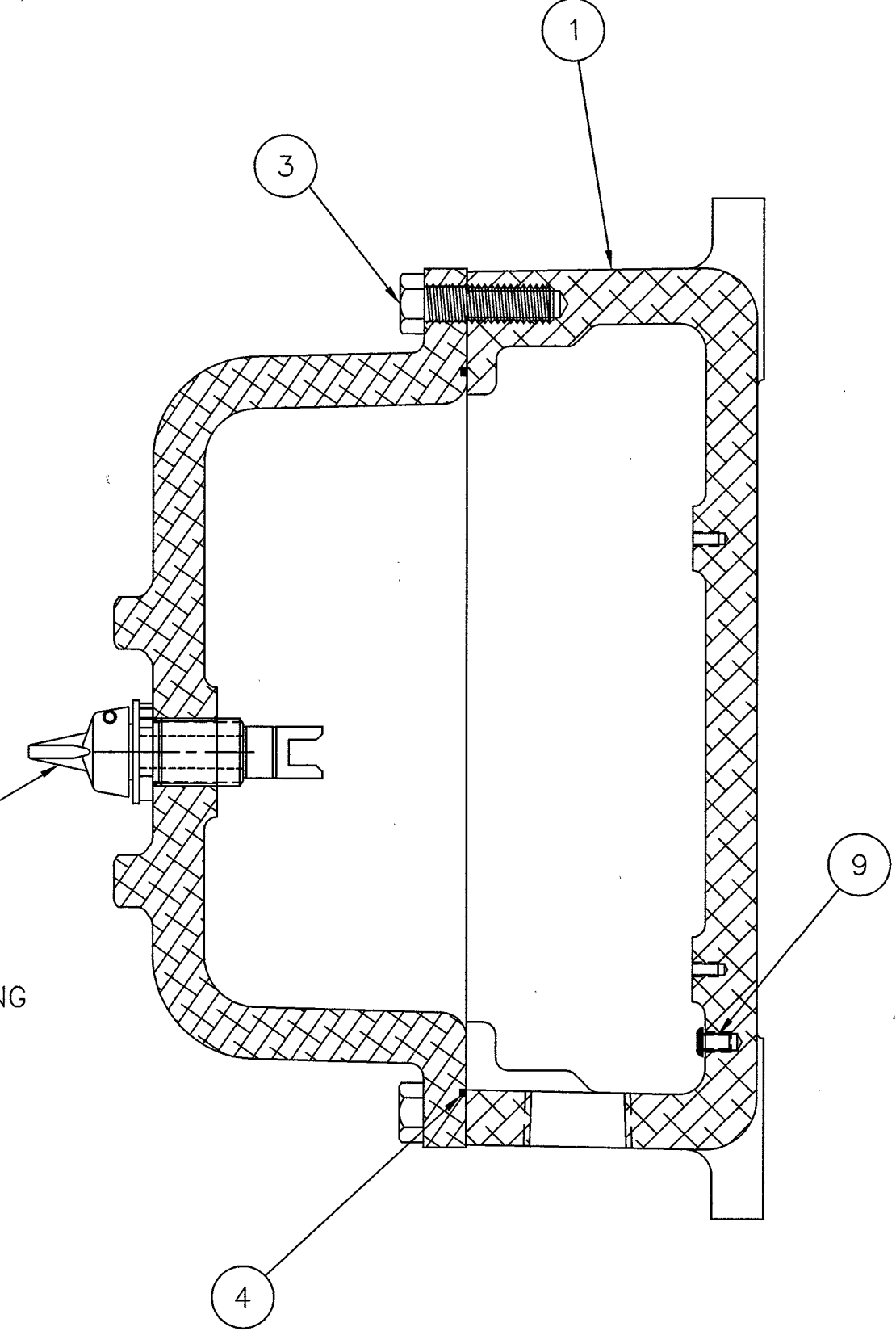
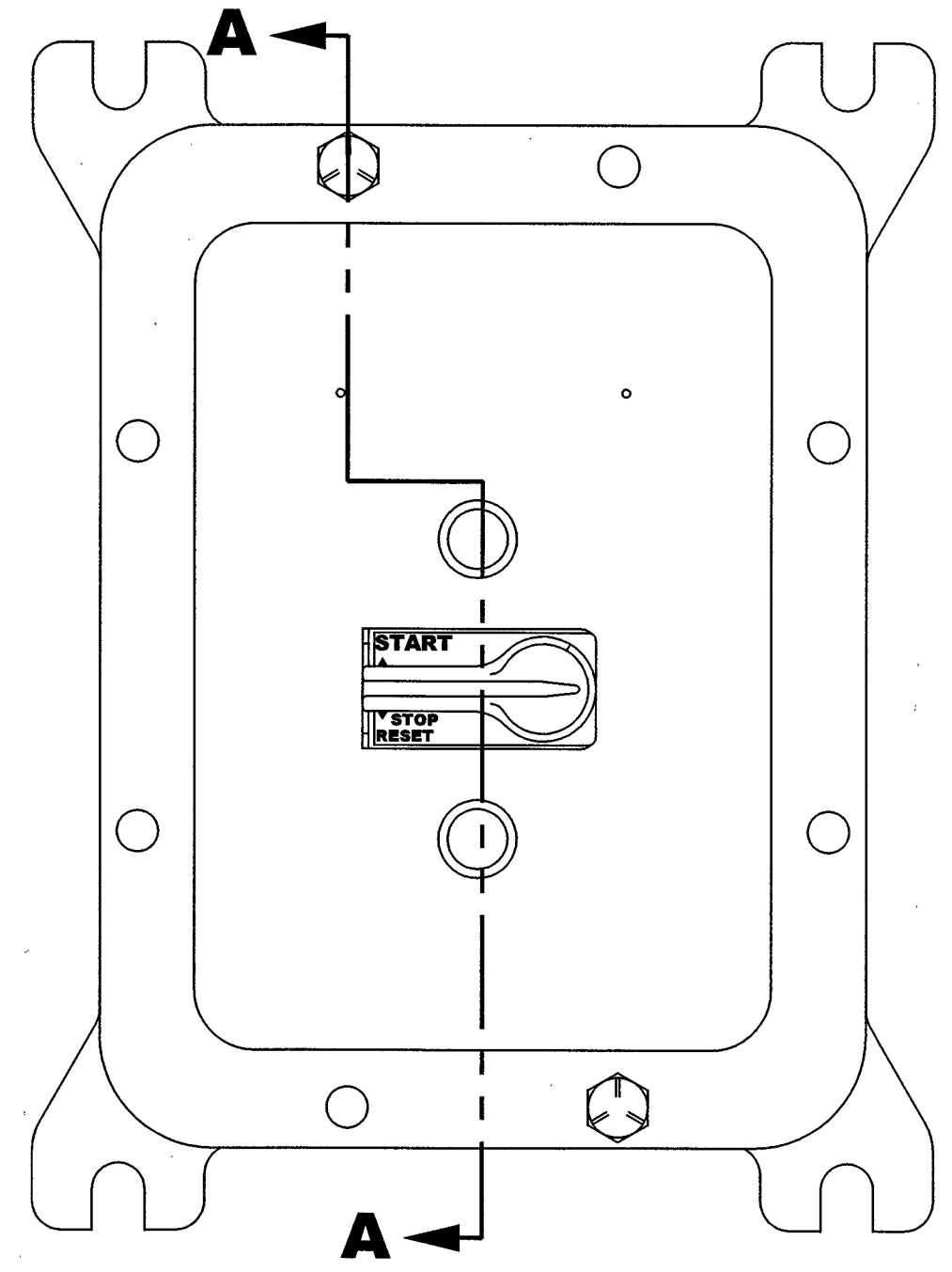
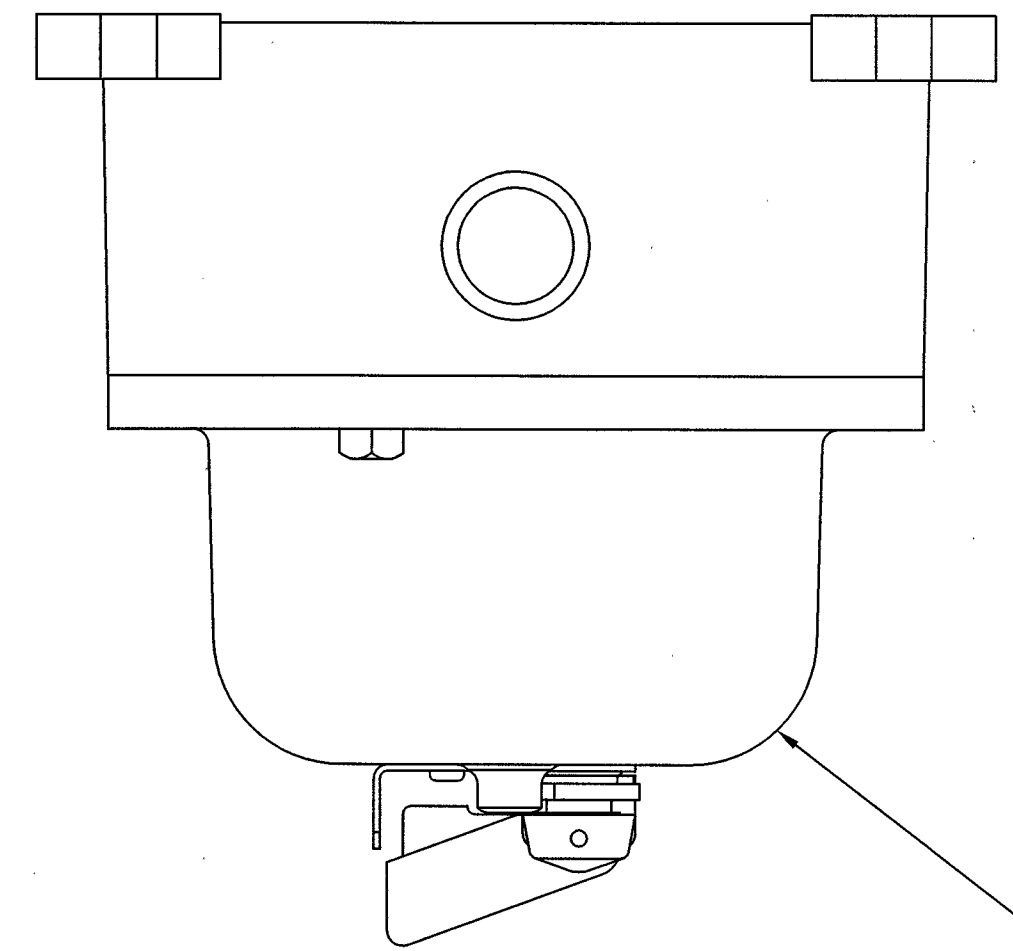


last modified:

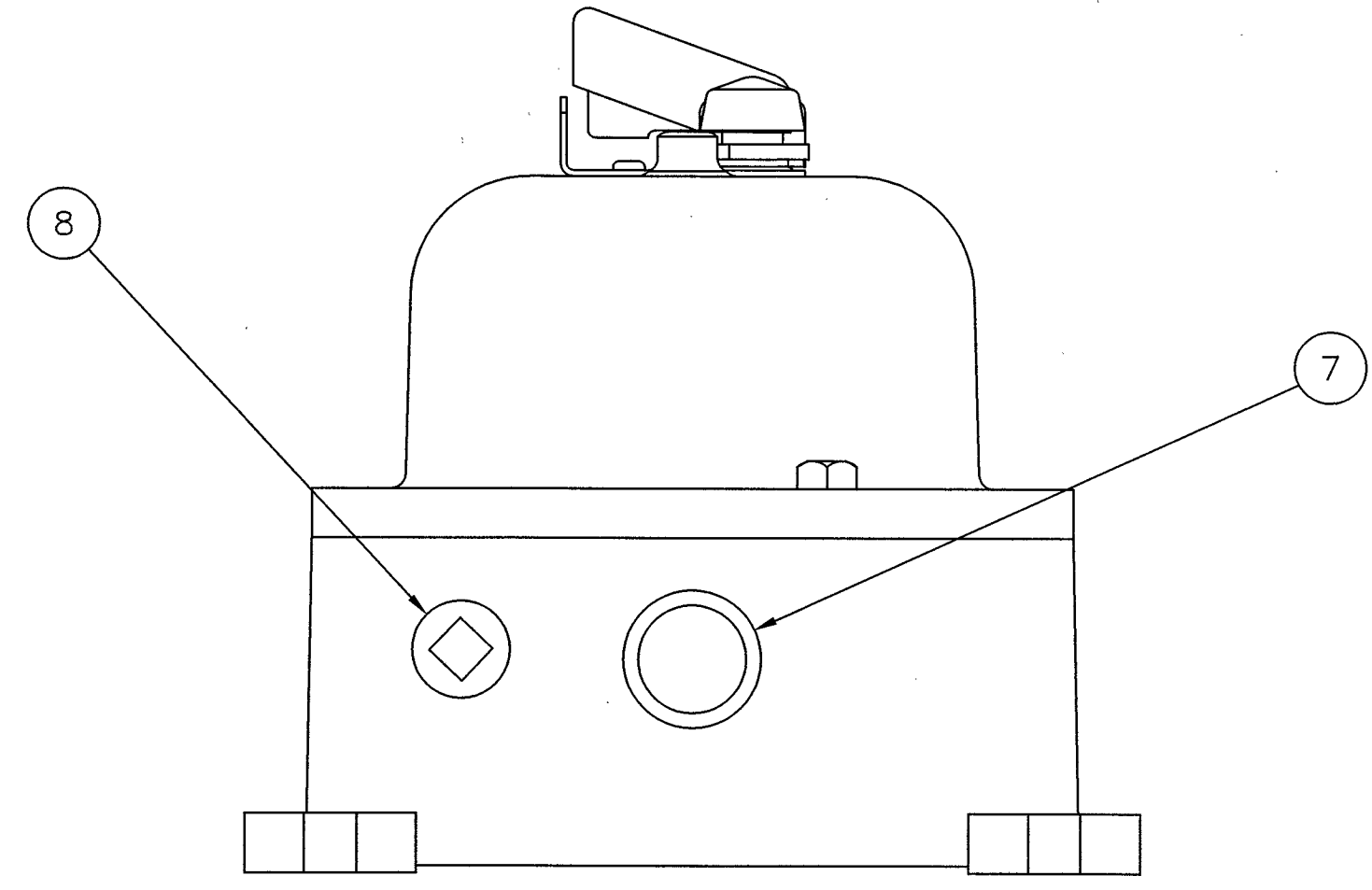
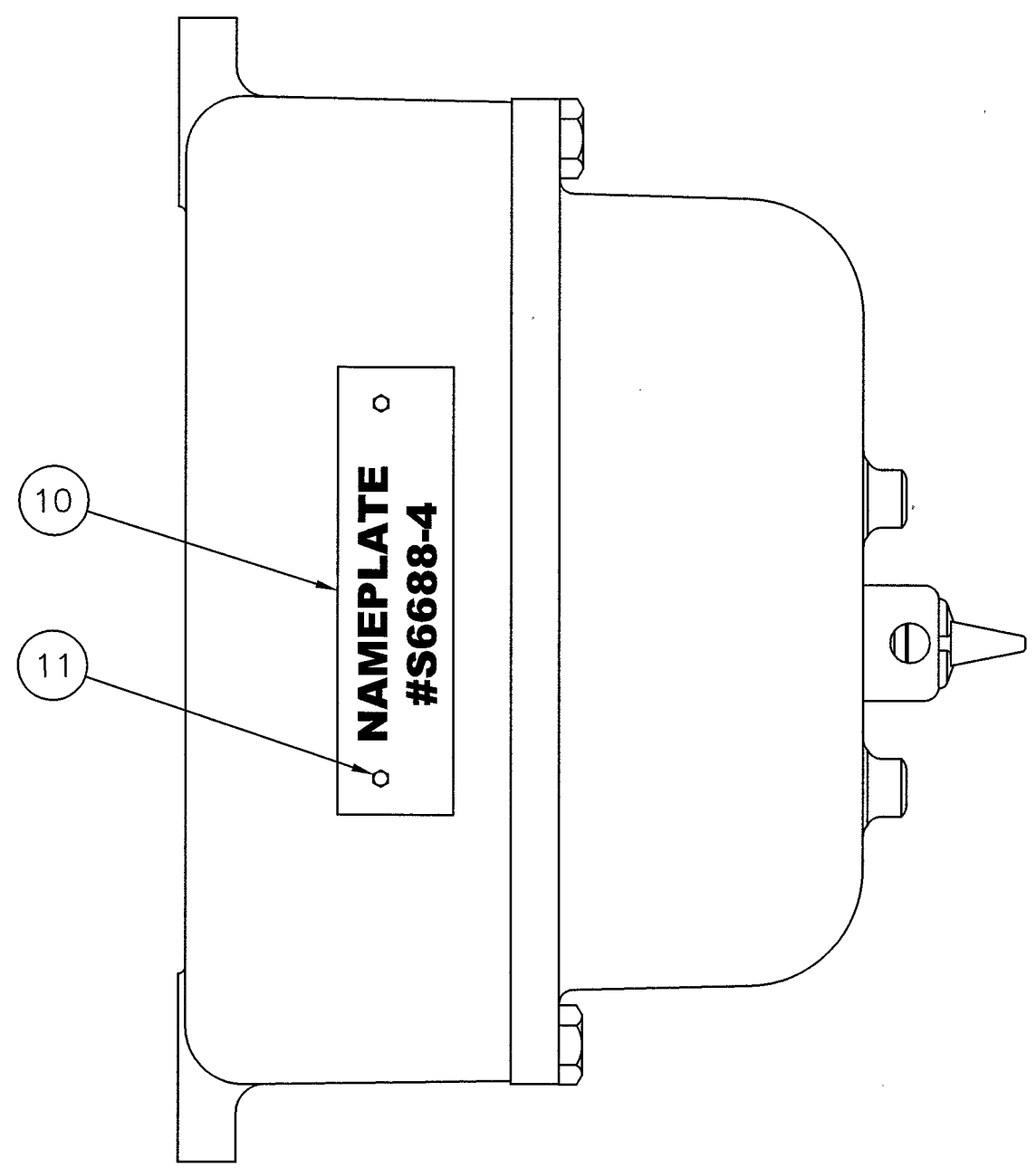
6/26/2021 

REV	REVISION	BY	ECN	DATE
A	INITIAL RELEASE	DDH	13791	06/26/14
B	CHANGE TO M/C	DDH	14363	4/15/15

SA5762



SECTION A-A



6
WHEN INSTALLING
SEE NOTE #2

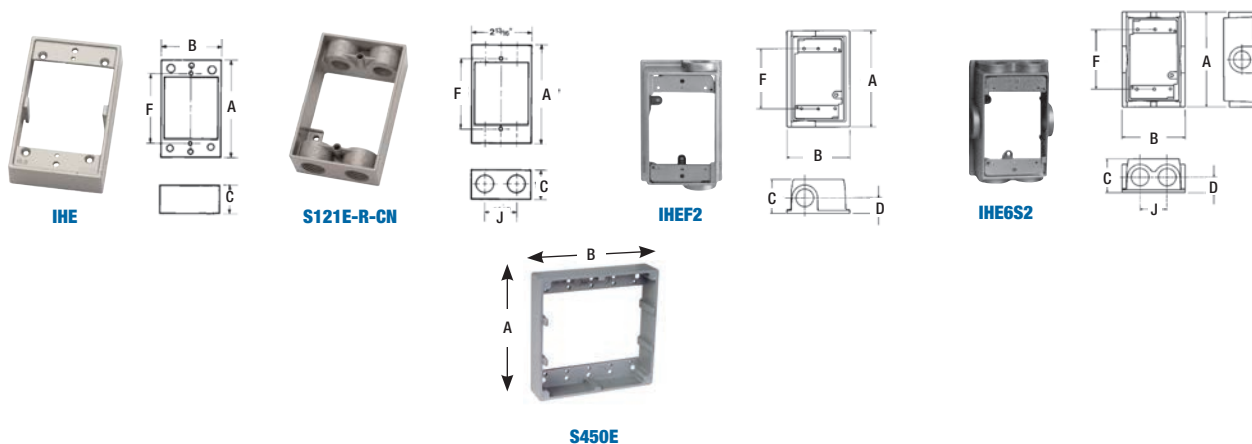
NOTES:

1. ASSEMBLE BOX AND COVER WITH PADS AND HANDLE AS SHOWN.
2. WHEN INSTALLING HANDLE WAVE WASHER 1 BELOW AND 1 ABOVE SPACER.

BILL OF MATERIAL				
ITEM #	QTY.	PART #	DESCRIPTION	
1	1	SA2737-1	XMMS 050704 SPECIAL BOX	
2	1	SA2737-2	XMMS 0507 N4 SPECIAL COVER	
3	8	1-202	BOLT HH 5/16-18x1-1/4 S G5 ZYD *INSTALL 2, PACK 6 INSIDE*	
4	29 IN.	7172	BUNA NITRILE RUBBER GASKET 70 DUROMETER	
5	.1 OZ.	5451	ADHESIVE RUBBER GASKET BULK (NOT SHOWN)	
6	1	SA5762-3	SPECIAL N4 HANDLE ASSEMBLY	
7	2	SEE B/M	PLASTIC PLUG, 3/4 NPT	
8	1	3-26S	PPLG SQSKT 1/2-14 NPT	S ZCD
9	1	5850-6	SCRW SLBHUC 10-24 x 1/4	S ZGR
10	1	S6688-4	NAMEPLATE XMMS 050704	
11	2	6199	1/8 HEX HD. STICK SCREW #1 x 11/64 LG.	
12	1	4878	LABEL - FLANGE CLEANING INSTRUCTIONS (NOT SHOWN)	
13	1	6549	LABEL - CAUTION STICKER/CLASSIFIED ENCLOSURES (NOT SHOWN)	
14	4	2-518	SCRW SLPH 6-32x1/4 SS (NOT SHOWN) *PACK INSIDE PLASTIC BAG*	
15	1	5200-3	PLASTIC BAG (NOT SHOWN)	

<small>DO NOT SCALE DRAWING UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. CAST TOLERANCES ON DIMENSIONS NOT OTHERWISE SPECIFIED: 1/8" STOCK FILLET OR CORNER RADIUS 1/8" DRAFT 1/16" FRACTION 1/16" ANGLES 1/2" MACHINE TOLERANCES ON DIMEN- SIONS NOT OTHERWISE SPECIFIED: XX ± .025 XXX ± .010" FILLET RADIUS .03" EDGE BREAK .005"-.015" R. or 45° ANGLES 1/2" GAGING FOR THREADED HOLES NOT OTHERWISE SPECIFIED: NPT E-21-2.8 NPSM E-24-1.0</small>	<p align="center">ADALET a Scott Fetzer company Cleveland, OH 44135</p>	<small>TITLE</small> XMMS 050704 N4 ASSEMBLY FOR SIEMENS CLASS 11 3RT MANUAL MOTOR STARTER FOR M/C	
		<small>NOTICE TO PERSONS RECEIVING THIS DRAWING:</small> ADALET-PLM CLAIMS PROPRIETARY RIGHTS IN THE MATERIAL DISCLOSED HEREON. THIS DRAWING IS ISSUED IN CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND MAY NOT BE REPRODUCED OR USED TO MANUFACTURE, ANYTHING, SHOWN HEREON, WITHOUT WRITTEN PERMISSION FROM ADALET-PLM TO THE USER.	<small>DRAWN BY</small> DDH
<small>FINISH</small> CAT NO	<small>ENG APPROVAL</small> <i>[Signature]</i>	<small>PLOT SCALE</small> 1=1.5	<small>DWG SIZES</small> D
<small>THIRD ANGLE PROJECTION</small>	<small>MFG APPROVAL</small> <i>[Signature]</i>	<small>DWG NO</small> SA5762	<small>REV</small> 10F1 B

Universal Device Box Extensions



Cat. No.	Description	No. of Hubs	Hub Size (in.)	A (in.)	B (in.)	C (in.)	D (in.)	F (in.)	J (in.)	Cu. (in.)
Single Gang Extensions Ring (Cast Aluminum)										
IHE	Single gang universal box extension adapter, 1 in. deep, with gasket and screws	None	–	4-9/16	2-13/16	1	–	3-9/32	–	10.0
IHEF2-1	Two gang flanged extension adapter, 1-7/8 in. deep, with gasket and screws	2 (1 plug)	1/2	4-1/2	3-1/2	1-7/8	7/8	3-9/32	–	21.3
S121E-R-CN	Single gang universal box extension adapter, 1-3/8 in. deep, with gasket, screws and ground screws	4	1/2	4-9/16	2-13/16	1-3/8	–	3-9/32	–	11.3
S450E	Two gang universal square box extension ring, Silver, Aluminum, with gasket and screws	–	–	4-3/4	4-3/4	–	–	–	–	–
IHEF2-2	Two gang flanged extension adapter, 1-7/8 in. deep, with gasket and screws	2 (1 plug)	3/4	4-1/2	3-1/2	1-7/8	7/8	3-9/32	–	21.3
IHEF6S2-1	Single gang flanged extension adapter, 1-7/8 in. deep, with gasket and screws	6 (4 plugs)	1/2	4-1/2	3-1/2	1-7/8	7/8	3-9/32	1-1/2	21.3
IHEF6S2-2	Single gang flanged extension adapter, 1-7/8 in. deep, with gasket and screws	6 (4 plugs)	3/4	4-1/2	3-1/2	1-7/8	7/8	3-9/32	1-1/2	21.3



PLG-1-RD / PLG-2-RD / PLG-3-RD



S603E-R / S603BRE-R / S603WHE-R



LM



Cat. No.	Colour	Size (in.)	Description
Plugs and Lug Mounts			
PLG-1-RD	Silver	1/2	Close-up plugs
PLG-2-RD	Silver	3/4	Close-up plugs
PLG-3-RD	Silver	1	Close-up plugs
S603E-R	Silver	1/2	Close-up plugs Bag/4
S603BRE-R	Bronze	1/2	Close-up plugs Bag/4
S603WHE-R	White	1/2	Close-up plugs Bag/4
LM	–	–	2 mounting lugs with screws, for LM boxes only

Universal Device Box Extensions

Two and three Gang



S400CN / S405E



2IH4



S401CN / S402CN / 2IH5-1



2IH5S2



2IH7



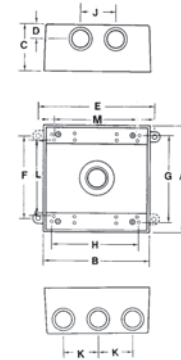
2IH7S2



2IHD5



3IHD7



Cat. No.	Description	No. of Hubs	Hub Size (in.)	A (in.)	B (in.)	C (in.)	D (in.)	E (in.)	F (in.)	G (in.)	H (in.)	J (in.)	K (in.)	L (in.)	M (in.)	Cu. (in.)
Two Gang Outlet Boxes – 2 in. Deep (Cast Aluminum)																
S400CN	Two gang universal weatherproof box, silver, aluminum, with ground screw	3	1/2	4-9/16	4-5/8	2-1/16	5/8	5	3-1/2	3-11/16	3-3/4	-	-	3-1/4	3-9/16	31.8
S405E	Two gang universal weatherproof box, silver, aluminum, with ground screw	3	3/4	4-9/16	4-5/8	2-1/16	5/8	5	3-1/2	3-11/16	3-3/4	-	-	3-1/4	3-9/16	31.8
2IH3-2	Two gang universal weatherproof box, silver, aluminum, with ground screw	3	3/4	4-9/16	4-5/8	2-1/16	-	-	-	-	-	-	-	3-1/4	3-9/16	31.8
2IH4-1	Two gang universal weatherproof box, silver, aluminum, with ground screw	4	1/2	4-9/16	4-5/8	2-1/16	5/8	5	3-1/2	3-11/16	3-3/4	1-1/2	-	3-1/4	3-9/16	31.8
2IH4-2	Two gang universal weatherproof box, silver, aluminum, with ground screw	4	3/4	4-9/16	4-5/8	2-1/16	5/8	5	3-1/2	3-11/16	3-3/4	1-1/2	-	3-1/4	3-9/16	31.8
S401CN	Two gang universal weatherproof box, silver, aluminum, with ground screw	5	1/2	4-9/16	4-5/8	2-1/16	5/8	5	3-1/2	3-11/16	3-3/4	1-1/2	-	3-1/4	3-9/16	31.8
S402CN	Two gang universal weatherproof box, silver, aluminum, with ground screw	5	3/4	4-9/16	4-5/8	2-1/16	5/8	5	3-1/2	3-11/16	3-3/4	1-1/2	-	3-1/4	3-9/16	31.8
2IH5-1	Two gang universal weatherproof box, silver, aluminum, with ground screw	5	1/2	4-9/16	4-5/8	2-1/16	5/8	5	3-1/2	3-11/16	3-3/4	1-1/2	-	3-1/4	3-9/16	31.8
2IH5S2-1	Two gang universal weatherproof box, silver, aluminum, with ground screw	5	1/2	4-9/16	4-5/8	2-1/16	5/8	5	3-1/2	3-11/16	3-3/4	-	-	3-1/4	3-9/16	31.8
2IH5S2-2	Two gang universal weatherproof box, silver, aluminum, with ground screw	5	3/4	4-9/16	4-5/8	2-1/16	5/8	5	3-1/2	3-11/16	3-3/4	-	-	3-1/4	3-9/16	31.8
2IH7-1	Two gang universal weatherproof box, silver, aluminum, with ground screw	7	1/2	4-9/16	4-5/8	2-1/16	5/8	5	3-1/2	3-11/16	3-3/4	-	1-1/2	3-1/4	3-9/16	30.3
2IH7-2	Two gang universal weatherproof box, silver, aluminum, with ground screw	7	3/4	4-9/16	4-5/8	2-1/16	5/8	5	3-1/2	3-11/16	3-3/4	-	1-1/2	3-1/4	3-9/16	30.3
2IH7S2-1	Two gang universal weatherproof box, silver, aluminum, with ground screw	7	1/2	4-9/16	4-5/8	2-1/16	5/8	5	3-1/2	3-11/16	3-3/4	1-1/2	-	3-1/4	3-9/16	32.0
2IH7S2-2	Two gang universal weatherproof box, silver, aluminum, with ground screw	7	3/4	4-9/16	4-5/8	2-1/16	5/8	5	3-1/2	3-11/16	3-3/4	1-1/2	-	3-1/4	3-9/16	32.0
Two Gang Universal Box Extension																
2IHE	Two gang universal box extension ring, silver, aluminum, gaskets and screws included															



Cat. No.	No. of Hubs	Hub Size (in.)	A (in.)	B (in.)	C (in.)	D (in.)	E (in.)	F (in.)	G (in.)	H (in.)	J (in.)	L (in.)	M (in.)	Cu. (in.)
Two Gang Outlet Boxes – 2-5/8 in. Deep (Cast Aluminum)														
2IHD5-1	5	1/2	4-9/16	4-5/8	2-11/16	5/8	5	3-1/2	3-11/16	3-3/4	1-1/2	3-1/4	3-9/16	40.3
2IHD5-2	5	3/4	4-9/16	4-5/8	2-11/16	5/8	5	3-1/2	3-11/16	3-3/4	1-1/2	3-1/4	3-9/16	40.3
2IHD5-3	5	1	4-9/16	4-5/8	2-11/16	5/8	5	3-1/2	3-11/16	3-3/4	1-1/2	3-1/4	3-9/16	40.3



Cat. No.	No. of Hubs	Hub Size (in.)	A (in.)	B (in.)	C (in.)	D (in.)	E (in.)	F (in.)	G (in.)	H (in.)	K (in.)	L (in.)	M (in.)	Cu. (in.)
Three Gang Outlet Boxes - 2-5/8 in. Deep (Cast Aluminum)														
B37D20G*	7	3/4	4-9/16	6-7/16	2-11/16	1-3/16	6-13/16	3-1/2	3-1/4	5-5/8	1-1/2	3-1/4	3-9/16	54.8
B37D30G*	7	1	4-9/16	6-7/16	2-11/16	1-3/16	6-13/16	3-1/2	3-1/4	5-5/8	1-1/2	3-1/4	3-9/16	54.8

* Not CSA approved

Raintight when used with appropriate Red Dot® covers

8. Appendices

Napanee WPCP Upgrades, ON Screening & Grit Removal System

Municipal Authority: Town of Greater Napanee, ON

RFP Number: RFP-IS-2023-01

Sections: 46 43 00 & 46 53 00

Consulting Engineer: EVB Engineering

Installation Contractor: TBD

Contractor PO Number: TBD

Claro Ref.: 20048-P-00



Appendix A. Napanee WPCP – 5-Year Warranty Certificate



Claro Warranty – Napanee, ON

The Claro fine step screens, wash presses, grit vortex, grit pumps & grit classifier c/w hydrocyclones, control panel, local HOA stations and local disconnect stations equipment are covered by Claro's standard warranty for a period of five (5) years. The warranty begins following successful commissioning & substantial completion. All the above equipment is guaranteed to be free from defective material and workmanship, under normal use and service, for a period of five (5) years.

This guarantee does not cover wear of normal wearing parts unless wear of such part has resulted from defective material and workmanship. In the event of any defects developing within the stated period, under normal and proper use, Claro is to be notified promptly in writing, and upon receipt of our written consent, the parts are to be returned promptly to Claro at Claro's shipping expense or Claro will promptly travel to site in order to review the issue. Shipping and travel expenses are to be at Claro expense in both directions.

If Claro's inspection indicates defective material or workmanship, the parts will, at Claro's option, either be repaired or replaced without charge and shipped back to site at Claro's expense. Note: Corrective or other work, or expenditures of any kind must be authorized by Claro in writing prior to the commencement of such work or prior to committing to such expenditures, without exception.

Sincerely,

A handwritten signature in black ink, appearing to read "Peter Lipert Jr.", written over a horizontal line.

Peter Lipert Jr.
General Manager/President
Claro Environmental Technologies & Equipment Inc.
Administrative Office
125 rue Elmire
Suite 311
Montréal, QC H2T 1J9
514.562.4575
pjr@claroglobal.com



- Claro Design Offices – Downtown Montréal, QC
- Claro Parts & Equipment Warehouse – St.-Roch-de-l'Achigan, QC

Appendix B. Napanee WPCP – Training Agenda

i. Fine Screening System

Part 1: Mechanical Overview – Fine Screens & Wash Presses

- Classroom

- a. Review of Claro fine step screen & wash press features and operational philosophy film (12 minutes);
 - b. Review mechanical components of fine screens & wash presses – power point slides;
 - c. Questions / comments are welcomed throughout the classroom presentation and at its conclusion;
- Duration of classroom portion is approx. 90 minutes.

- Screening Room – Walk Through & Demonstration of Installed Equipment

- d. Re-cap of screen operational philosophy with the installed equipment used for illustration i.e. filter mat/intermittent actuation and rationale behind upstream & differential liquid level detection;
- e. Demonstrate movement of lamellae in Manual Forward & Reverse modes;
- f. Remove cover over fine screen motor and identify home position switch, motor and gear drive arrangement;
- g. Review screen discharge arrangement;
- h. Demonstrate how to pivot a screen out of channel with a manual chain block after removing the protective cover over the screen discharge;
- i. Review the bottom deflector plate – its function, operation, and the recommended schedule of checking for grit deposition in front of / under the screen;
- j. Review other regular maintenance inspection requirements as defined in the O&M manual with the installed equipment used for illustration;
- k. Review safety requirements related to the screen i.e. power lock-outs & local E-Stop;
- l. Review of how the wash press is coordinated with the fine screen;
- m. Re-cap the wash press's major components (motor & gear drive, inlet, washing zone, solenoids and water jets, spiral, drain, discharge tube & hygienic bagger) and the location and method of changing an automatic greaser cartridge;
- n. Re-cap the control narrative/stages of operation of the wash presses i.e. feed, three (3) washing alternatives, dewatering/compaction, and cylinder flushing;
- o. Review maintenance inspection procedures with the installed equipment used for illustration;
- p. Review the function of the wash press discharge tube i.e. backpressure and motor amperage readings on the HMI;
- q. Demonstrate how to install a hygienic bag magazine on the bagger units and how to tie off the bag in a manner that isolates the operator from the screenings material;
- r. Review safety requirements related to the wash press i.e. power lock-outs & local E-Stop;

Part 2: Control Panel Overview – Fine Screens & Wash Presses

- a. Review the major components and features of the main PLC and local control panels including the operation of the HMI screens, which can be used to control all control narrative settings, alarm settings, & transmitter settings. Review the relationship of the control panel to the MCC (by others);
 - b. Review of system visualization screens;
 - c. Review of settings input screens;
 - d. Review of alarm and transmitters settings input screens;
 - e. Review of possible alarms & their significance;
 - f. Review of control panel internals including starters/VFDs, torque sensors, current transformers, thermal overloads, etc.
- Hand-outs: All visual materials will be presented in film & PowerPoint slide format with a reinforcement/re-cap of training items via a review of the installed equipment. Training will require a classroom with large format television & one extension cord with two (2) x 120V outlets. Connection is HDMI. Alternately, the classroom portion of the training will take place on Microsoft Teams (Claro to provide invitation) followed by an in-field review.



ii. Grit Removal System

Part 3: Mechanical Overview – Vortex Unit, Grit Pumps & Grit Classifier

- Classroom

- Review mechanical components of vortex unit, grit pumps & grit classifier and the principles of operation of each of these major system components including the principle of centrifugal force, paddles system updraft, the introduction of shear upon the grit particles, & other aspects that help yield high levels of grit extraction & a clean, dry grit product without standing water within the hygienic bag or receiving bin – power point slides & films. Also: review of controls approaches and control panel visualization & setpoint input HMI screens.
 - Questions / comments are welcomed throughout the classroom presentation and at its conclusion;
- Duration of classroom portion is approx. 60 minutes.

- Grit Room – Walk Through & Demonstration of Installed Equipment

- Re-cap of vortex unit operational philosophy & components with the installed equipment used for illustration.
- Demonstrate movement of grit unit paddles.
- Review regular maintenance inspection requirements as defined in the O&M manual with the installed equipment used for illustration.
- Review safety requirements related to the vortex unit, grit pump(s) and grit classifier i.e. power lock-outs & E-Stops;
- Review of how the grit classifier & grit pumps are coordinated with the vortex unit including grit extraction piping connections & service water fluidization connection;
- Re-cap the classifier's operational philosophy & major components (motor & gear drive, spiral, drain, discharge & hygienic bagger) with the installed equipment used for illustration;
- Re-cap the control narrative/stages of operation of the grit system including the philosophy that informs grit extraction sequence timing, grit pump operation time & the intermittent operation of the grit classifier.
- Review maintenance inspection procedures with the installed equipment used for illustration;
- Demonstrate how to install a hygienic bag magazine on the grit classifier bagger unit and how to tie off the bag in a manner that isolates the operator from the captured grit material.

Part 4: Control Panel Overview – Vortex Grit Removal System

- Review the major components and features of the PLC control panel including the operation of the HMI, which can be used to control all control narrative settings, alarm settings, & grit extraction schedule settings. Review the relationship of the control panel to the MCC (by others);
- Review of system visualization screens;
- Review of settings input screens including the grit extraction schedule HMI screen;

- d. Review of alarm settings input screens;
 - e. Review of possible alarms and their significance;
 - f. Review of PLC panel internals including starters, current transformers, thermal overloads, etc.
-
- Hand-outs: All visual materials will be presented in film & PowerPoint slide format with a reinforcement/re-cap of training items via a review of the installed equipment. Training will require a classroom with large format television & one extension cord with two (2) x 120V outlets. Connection is HDMI. Alternately, the classroom portion of the training will take place on Microsoft Teams (Claro to provide invitation) followed by an in-field review.





End of Submittal Document (R0)