Elmvale WWTP, ON

1 In-Tank Fine Screen, 1 Wash Press, Electrical Controls & Auxiliary Equipment

Technical Submittal (R0)

Township of Springwater, ON
Consulting Engineer: Arcadis
Project & Contract No.: 2024-05-PW
Contractor PO No.: TBD upon Novation
Claro Ref.: 22167-P-00

Electronic Copy
(Bookmarked PDF)

Arcadis Inc

The review of this Shop Drawing is for the sole purpose of ascertaining conformance with the general design concept and general arrangement only. This review does not constitute approval or verification of the design inherent in the Shop Drawings, and any omissions or errors therein remain the responsibility of the Contractor. The Contractor remains entirely responsible for complying with the Contract Documents, confirming all field dimensions and site conditions, for information that pertains to fabrication, techniques of construction and installation, and co-ordination of the Work.

Reviewed	Reviewed As Noted	Revise & Resubmit	Not Reviewed
	X		
Reviewed By:	S.G.	Date:	

Comments

Process (SG):

1. Service water will be final effluent (not potable). Please provide Y-strainer and appurtenances

2. Revise screen inlet and outlet connections to 300mm as per the Process drawings.

3. Provide check-marked specification (11330) noting compliance or deviation for each paragraph section including rationales for each deviation

3. Shop drawings shall be certified by a professional engineer licensed to practice in the Province of Ontario

4. Refer to the latest P&ID for equipment tagging

Elmvale WWTP, ON

1 In-Tank Fine Step Screen, 1 Wash Press, Electronic Controls & Auxiliary Equipment

Technical Submittal (R0)

Contents

- G.Wiring (General Note)
- H. Ultrasonic Level Sensor Probe – Endress + Hauser Wiring Recommendation
- I. Work Outline (Install & Supply) to Be Completed by Installing Contractor
- J. Equipment Storage (Prior to Installation)
- K. Offloading Instruction – Mechanical Equipment (Preliminary)

5. Preliminary/Sample O&M Manuals – Fine Step Screen & Wash Press
    - A. Fine Step Screen Manual (Preliminary)
    - B. Wash Press Manual (Preliminary)
    - C. Hygienic Bagger Instructions
6. Control Narrative Sequence & SCADA Exchange Table
    - A. Control Sequence Operation Description for Fine Screening Systems
    - B. SCADA Data Exchange Table – Elmvale WWTP
7. Electronic Controls Submittal Drawings & Component Catalog Cuts
    - A. Control Panel Submittal Drawings
    - B. Field Wiring & Wire Weights Diagram (Phase 1)
    - C. Components Catalog Cuts (Annotated) & Index
8. Appendices (for additional information or reference documentation)
    - A. Warranty Certificate – Five (5) Years
    - B. Training Agenda – Elmvale WWTP (Duration: approx. 2.5 hours)

1. Submittal Cover Letter

1 In-Tank Fine Screen, 1 Wash Press, Electrical Controls & Auxiliary Equipment

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Township of Springwater, ON
Consulting Engineer: Arcadis
Project & Contract No.: 2024-05-PW
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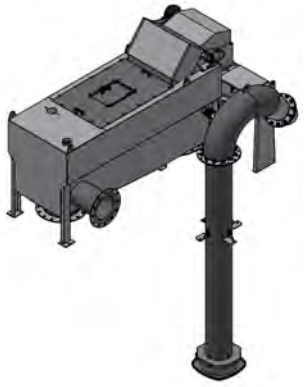
Claro Ref.: 22167-P-00

Claro™

claroglobal.com

Project:	Elmvale WWTP Upgrades	**2 July 2024 (R0)**
Municipal Authority:	Township of Springwater, ON	**Ref#: Elmvale, ON; 22167-P-00**
Installing Contractor:	TBD	
Consultant Contact:	Kaiping Zhang, P.Eng., Arcadis, 8133 Warden Ave, Unit 300, Markham, ON L6G 1B3; T.: 905.763.2322 (x 63551), kaiping.zhang@ibigroup.com	
Claro Representative:	Scott Lenhardt, P.Eng., Pro Aqua, Inc., 264 Bronte Street South, Unit #7, Milton, ON L9T 5A3; T.: 905.864.9311 (228); C.: 905.330.9244; scott@proaquasales.com	
Subject:	Technical Submittal (R0): Elmvale WWTP, ON; Project No. 2024-05-PW (Arcadis); Specification Section: 113300 – Mechanical Screen System Equipment: One (1) model 1100-600-6mm fine step screen-in-tank, one (1) model TP200-600 wash press & auxiliary equipment. Including PLC-based main control panel and local stations. Peak Flow: 141.4 L/s (12,216 m^3/d) & typical daily pattern flows of 80 L/sec & 40 L/sec.	



Thank you for the project kick-off meeting on Friday, 21 June – it was a pleasure to meet Township personnel. We look forward to working with everyone on project design/implementation and supporting Township personnel with operation into the future.

Claro is pleased to provide its technical submittal (R0) for the specified modular in-tank fine step screening system including PLC-based controls and auxiliary equipment for the Elmvale WWTP Upgrades project (mechanical portion only – controls to follow in subsequent R1 submittal). The proposed mechanical system & control panel is designed to enable seamless integration of a second future fine screening system. Controls enable the activation of screen No. 2's logic. The flow equalization pipe flange (supplied with a blind flange in the current phase) enables the upstream hydraulic connection of the present and future screens for even lower runtimes, higher separation & 100% redundancy. Note: This submittal document is bookmarked for ease of navigation.

Claro is submitting a short list of 'Open Items' for review and comment by the Engineer in the R0 submittal. These open items are listed in Section 2, item B of this document and are intended as a project checklist.

Thank you for reviewing our submittal (R0) materials. We would be keen to provide a complete installation requirements and tips review via Teams in advance of installation in addition to installation advice support through-out the installation process. If Arcadis or the installing contractor have comments or questions, please feel free to contact us at any time.

Thank you & regards,

Peter Lipert Jr.

Peter Lipert Jr.
General Manager
Administrative Office

screening grit removal Claro

Claro™

125 Elmire, Suite 311
Montréal, Québec H2T 1J9 Cell: 514.562.4575 pjr@claroglobal.com

- Claro Design Offices – Montréal, QC
- Claro Parts & Equipment Warehouse – St.-Roch-De-L'Achigan, QC

Analogous Application – Wellesley WWTP (Region of Waterloo, ON; 2021)

2. Scope of Supply & 'Open Items'

1 In-Tank Fine Screen, 1 Wash Press, Electrical Controls & Auxiliary Equipment

Technical Submittal (R0)

Township of Springwater, ON
Consulting Engineer: Arcadis
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A. Scope of Supply

Elmvale WWTP, ON
Fine Step Screen-in-Tank, Wash Press c/w
Discharge Tube/Drop Chute including Hygienic Bagger & Controls

Fine Screening System

Item 1: One (1) Claro Fine Step Screen – Model 1100-600-6mm (In-Tank)

- Tag No./Label: Mechanical Screen 1
- Quantity: One (1)
- Discharge height: 1100 mm
- Effective width: 600 mm
- Screen frame width (without channel seals): 720 mm
- Screen frame width (with channel seals): 750 mm; Neoprene side seals will seal against stainless steel tank walls (15 mm to each side)
- Tank channel dims. (Width x Depth): 750 mm x 1000 mm
- Aperture between bars: 6 mm + screenings filter mat
- Lamella bar thickness: 3 mm
- Frame components: 5 mm
- Installation angle: 50 degrees
- Frame: AISI 304L stainless steel
- Covers material: AISI 316L stainless steel on screen motor compartment at/above top of tank covers; Inspection covers on tank in AISI 316L to protect against H_2S discolouration/corrosion.
- Bars material: AISI 304L stainless steel
- Linkage drive system: AISI 304L stainless steel
- Linkage drive system sleeve bushings: High load PTFE fibre-weave
- Drive shaft material Epoxy-painted shafting steel (shafting steel is more resilient than stainless steel)
- Drive unit: SEW c/w NEMA adapter; directly-driven; Drive unit is painted according to SEW standard OS2, in RAL 6005. Service Factor: 1.4 (AGMA II).
- Electric motor: Baldor – 0.55 kW (0.75 HP), CSA 575 V, 3 Phase, 60 Hz; Class 1, Div. I, Group D; Premium Efficiency; motor Service Factor: 1.15; Equipped with integral externally wired electrical brake also Class I, Div. 1.
- Stainless steel motor mounting hardware: four (4) 3/8”x16 bolts & four (4) 3/8” lock washers.

- Home position (proximity sensor) switch by Turck (Schneider): Class I, Div. 1 compliant c/w intrinsic barrier pre-installed in proposed 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 304L 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 304L 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 tank with linkage system; no disassembly of screen, inlet chute or movement of downstream wash press equipment required. Screen pivots out of tank to suitable inspection 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 tank; also, additional lifting lugs inside motor compartment for four-point lifting of screen if required.
- Odour control connection in AISI 316L stainless steel (100 mm dia.) on screen tank for direct negative venting of tank channel & screening equipment in the present phase or in the future. Stainless steel or rubber cap provided for vent if not utilized in the present phase.
- Screen total weight: 6 mm including tank approx.: 500 kg empty; 2180 kg full of liquid; including Class I, Div. 1 motor.
- Fasteners: AISI 304.
- Fine step screen built under ISO 9001:2015 & ISO 14001:2015 certification.
- Capacities: Model 1100-600-6mm
  - ➢ Peak Flow: 12,216 m3/day (141.39 L/sec); total of three (3) MSPS pumps installed delivering flow to fine screen via a 300 mm diameter single force main. Two (2) constant-speed submersible pumps, each rated at 65 L/s and a third pump equipped with VFD rated at 76.4 L/s. Peak flow is equal to one (1) 65 L/sec pump + 76.4 L/s pump running at 60Hz.
  - ➢ Hydraulic Levels:

    Peak Flow (141.39 L/sec): 596 mm/419 mm (upstream/downstream); head loss @ 35% fine screen blockage: 177 mm; channel velocity: 0.45 m/sec; downstream level produced by internal-to-tank Sutro weir rolled into an internal pipe with open top in-flow exit for higher flows.

    Average Flow Conditions/Pattern (80 L/sec & 40 L/sec): Based on a review of the RFP documents and daily facility flow data that shows the pump flow pattern into the Elmvale facility, there are three (3) flow scenarios that provide an accurate review of the proposed fine screen capacity and hydraulics. The facility flow data shows that in normal flow conditions the pumped flow tends to oscillate between 2 approximate values: 80 L/sec, which is reported to be intended for flushing of influent piping, and between 30 - 40 L/sec, which is likely the turndown flow rate of

the VFD operated 65 L/sec pump. Here are the levels for these 2 conditions:

- 80 L/sec: 470 mm/287 mm (upstream/downstream); head loss @ 35% blockage: 183 mm; channel velocity: 0.37 m/sec.
- 40 L/sec: 369 mm/184 mm (upstream/downstream); head loss @ 35% blockage: 185 mm; channel velocity: 0.30 m/sec.

Item 2: One (1) Claro Wash Press – Model TP200-600

- Tag No./Label: Wash Press 1
- Quantity: One (1)
- Press diameter: Ø 200 mm
- Inlet: L x W x H: 600 mm x 290 mm x approx. 330 mm Inlet chute; 90° inlet walls & matches fine screen discharge dimensions.
- Discharge tube connection flange: DN200, PN10.
- Material of construction: AISI 304L, 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 significantly 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 AMS c/w 1.5 kW Baldor motor – Service Factor 1.49 (AGMA II).
- Electric motor, Baldor – 1.5 kW (2 HP), CSA 575 V, 3 Phase, 60 Hz; Class 1, Div. I, Group D; Service Factor: 1.15. Premium Efficiency. Helical bevel arrangement for reduced footprint.
- Stainless steel motor mounting hardware: four (4) 3/8”x16 bolts & four (4) 3/8” lock washers.
- 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 including protective diaphragm & 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)).
- Service water requirements: approx. 0.67 L/s @ 40 – 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 m^3/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.; flexible piping and stainless steel gear clamps by Claro connect wash press drain to tank stub inlet downstream of screen.
- Wash press total weight: empty: 300 kg. with Class I. Div. 1 motor; 385 kg when full of screenings + discharge tube: 120 kg when empty & 210 kg when partially full with screenings.
- Fasteners: AISI 304L.
- Wash press built under ISO 9001:2015 & ISO 14001:2015 certification.

Item 3: One (1) Claro Outloading Discharge/Compaction Tube System for Wash Press Including Drop Chute

- Quantity: One (1).
- Material AISI 304L Incl. bolts, gaskets & supports as required. Flanges in AISI 304L stainless steel.
- Ø200mm to 250mm to 300mm flared discharge tubes including vertical drop chute section with supports that attach to the screening system platform for compaction, dewatering, & delivery of screenings to the receiving bin @ grade level.
- Including hygienic bagging system; material of construction: AISI 304L & ABS plastic bag holder assembly, stainless steel retaining ring and aluminum crip nut.
- Bagging system provided with a hygienic bags starter kit: Two (2) x 90 m-long, 3-ply hygienic bags for wastewater applications.

Item 4: Fine Screening System Control Panel for Two (2) Fine Screens & Two (2) Wash Presses

- General Overview: Proposed control panel system provides for the automatic and manual control of two (2) fine step screening in-tank stations as specified. Each fine screening station is constituted of one (1) fine step screen & one (1) wash press (one for implementation in the present Phase I upgrade and a second fine screening system to be integrated as part of a future upgrade). All electromechanical components & programming for the future system are included and can be easily activated by pressing a password-protected button on the HMI.

  The control system will incorporate an intuitively designed 7-inch colour graphic touch screen interface for ease of system optimization & use. The HMI graphic interface design is based on the final (future) project drawings layout in order to reflect the specific Elmvale influent works layout and equipment. The 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 and other data.

  The panel enclosure also includes all elements for a fully functional plug-&-play system including all starters, torque & amperage protection, loss-of-phase

protection, surge protection, Ethernet connectivity, & dry contact relay alarms as preferred & other elements.

For a complete portrait of the control system, please see control panel submittal drawings, field wiring & wire weights diagram, & annotated component catalog cuts in section 7 & the control narrative description & SCADA exchange table in section 6.

- The submitted control panel includes the following general features & components:
- NEMA 12 painted steel enclosure for installation outside of explosion proof area. Dimensions: TBD.
- Allen Bradley MicroLogix 1400 PLC including all required I/O modules.
- Surge protector module to protect PLC.
- 7” colour intuitively-designed graphic touch screen interface HMI; touch screen designs based on project drawing layouts; Siemens TP700 Comfort.
- Includes Endress + Hauser Prosonic S ultrasonic level detection upstream of each fine screening system; two (2) x level detector probes (E+H model FDU91) c/w 25 m of sealed Class I, Div. 1 cable + din-rail-mounted transmitter (E+H model FMU90) pre-installed inside control panel; the sensors are included with a mounting tube that is installed on the top of each screen tank. All setpoints adjustment via the control panel HMI for ease of use.


Sensor Mounting Tubes

- Starters for fine screens (2, reversible) & wash press (2, reversible).
- Emotron M20 torque sensor for motor torque reading for each fine screen (x2) and current transformer (CT) for amperage reading of each wash press motor (x2).
- Loss-of-phase detector to further protect all motors.
- Ethernet / Scada connectivity & PLC + HMI programming included. Exchange table & HMI screen shots or constituent graphics provided to Scada designer. Hard wire relay alarms also provided at no extra cost as preferred.
- Two (2) HOA combination local Man/Off/Auto + Forward/Reverse + E-Stop stations in Class I, Div. 1 cast aluminum enclosures; CSA.
- Two (2) local motor power lock-out switches in Class I, Div. 1 cast aluminum enclosures including auxiliary status feedback. Additional power lock-out switches on front door of panel for operator safety. Main disconnect is also lockable.

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

• Note 1: The Endress+Hauser ultrasonic level probe transmitter (FDU90) is provided with two sensor inputs. No change to this component is required to implement a second screening system. Second level sensor and mounting tube for future screen are provided by Claro for client storage in order to ensure future compatibility.

• Note 2: Local stations and local motor power disconnects not included for the future screen (these items would be provided if a second screening system is implemented since there is no future compatibility risk).

- Note 3: The programming for control of the second future screening system is included with the panel upon shipping to site. When the second screening system is implemented, the programming would be activated by pressing a password protected button on the HMI.

Item 5: Spare Parts

1. One (1) set of high load fibre-weave sleeve bushings (16 bushings plus required stainless steel circa clips).
2. Four (4) screen linkage system stub shafts, four (4) rockers, & four (4) connecting rods.
3. One (1) set of wash compactor wear bars & stainless steel mounting hardware.
4. Ten (10) deflector plate spring kits + 150 UHMW spacers (addition to spec; nominal cost).
5. Spare parts to be furnished in a suitable & heavy-duty tool box or plastic container with all parts labelled include associated drawings.

B. '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 installing contractor and/or Engineer on the items below.

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. Service Water Source: We would appreciate if you could confirm if the service water that will be supplied to the wash press is potable water, Final Effluent (FE) or other. If not potable, we will provide a Y-strainer including associated ball valves for pre-filtration of the service water.

Service water will be final effluent (not potable). Please provide Y-strainer and appurtenances

3. Mechanical & Auxiliary Equipment Catalog Cuts

1 In-Tank Fine Screen, 1 Wash Press, Electrical Controls & Auxiliary Equipment

Technical Submittal (R0)

Township of Springwater, ON
Consulting Engineer: Arcadis
Project & Contract No.: 2024-05-PW
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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 wihout 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

Claro

B. Screenings Wash Press – Brochure

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.

Wash Press Screw Compactor

Wash Press Screw Compactor
(Assomption WWTP, QC)

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

Claro

C. Hygienic Bagger – Brochure

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 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

Claro

D. Motors & Gear Drives Data

i. Fine Screen

- SEW – KA57 AMS56
- Baldor – 0.75 HP; 1800 RPM; 575V/3Ph/60Hz, Class I, Div. 1 & Stearns Electrical Brake

1 PC
Helical-bevel gear unit with adapter
KA57 AMS56

Technical data

Speed [r/min]	: 1750 / 12		
Total ratio [i]	: 145,14 / finite	Adapter	: AMS56
No. of teeth nom./denominator	: 29029/200	Output oil seal material	: Oil seal made of FKM with optimized spring force
Ma max [Nm]	: 600		
Mou. pos. / Pivoting angle [°]	: M1-M4A / 45	Input flange	: Centering diameter 114.3mm, hole circle 149.2mm, bore 10.5 (NEMA)
Lubricant / -volume [l]	: CLP HC 220 Synth.Oil / 2,35		
Corrosion protection	: Yes	Bore on input side	: 0.625 inch (15.875mm)
Surface protection	: OS2 to technical data sheet 01802__94	Max. insertion depth (mot. SE)	: 52.3mm
Paint coat	: Top coat RAL5020 ocean blue	Spare parts list	: You can find the SWPL (spare and wearing parts list) under the serial number in the Online Support.
Gear unit	: KA57		
Ma max G [Nm]	: 600		
Hollow shaft	: 40mm	Nameplate	: English
Design	: Hollow shaft	Nameplate position	: Attached to the gear unit
Safety cover	: None	Text of gear unit nameplate	: 10023848, XS
Output oil seal material	: FKM	Opera.instr. A lang./quantity	: English / 0
Documentation no. A	: 26865351	Parts list/language/quantity	: English / 0
	26883406	Commodity code	: 84834023
Parts list	: 382511499		

BALDOR • RELIANCE

Customer information packet

35Y968M218G1

.75HP, 1750RPM, 3PH, 60HZ, 56C, 3516M, XPFC, F1
CLARO ENVIRONMENTAL TECH.

11/26/2020 8:09:59 AM

Specifications

Enclosure	XPFC
Frame	56C
Frame Material	Steel
Frequency	60.00 Hz
Output @ Frequency	.750 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
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	.900 A @ 575.0 V
Design Code	B
Drip Cover	No Drip Cover
Duty Rating	CONT
Efficiency @ 100% Load	84.0 %
Electrically Isolated Bearing	Not Electrically Isolated
Feedback Device	NO FEEDBACK
Front Face Code	Fan Housing Cover For Brake
Front Shaft Indicator	None
Heater Indicator	No Heater
High Voltage Full Load Amps	0.9 a
Insulation Class	F
Inverter Code	Inverter Ready
KVA Code	M
Lifting Lugs	No Lifting Lugs
Locked Bearing Indicator	Locked Bearing

Part detail

Revision	C
Type	AC
Mech. spec.	35Y968
Base	
Status	PRD/A
Elec. spec.	35WGM218
Layout	35LYY968
Eff. date	05-05-2020
CD Diagram	CD0006
Poles	04
Leads	3#18
Proprietary	True
Created date	05-26-2017

Motor Lead Exit	Ko Box
Motor Lead Quantity/Wire Size	3 @ 18 AWG
Motor Lead Termination	Flying Leads
Motor Standards	NEMA
Motor Type	3516M
Mounting Arrangement	F1
Number of Poles	4
Overall Length	23.37 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	1.25
Shaft Diameter	0.625 IN
Shaft Extension Location	Pulley End
Shaft Ground Indicator	No Shaft Grounding
Shaft Rotation	Reversible
Shaft Slinger Indicator	Shaft Slinger
Speed	1750 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

NP0977XPSL											
NO.						**CC**					
SER.						**TEMP CODE**	T3C				
SPEC.	35Y968M218G1										
CAT.NO.	VBM7010-I-5										
HP	.75										
VOLTS	575										
AMPS	.9										
RPM	1750				**MOTOR WEIGHT**	83					
HERTZ	60	**PH**	3	**CL**	F	**DE BRG**	6205				
SER.F.	1.25	**DES**	B	**CODE**	M	**ODE BRG**	6203				
FRAME	56C	**GREASE**	POLYREX EM								
RATING	40C AMB-CONT										
USABLE AT 208V		**NEMA-NOM-EFF**	84	**PF**	73						
	SFA 1.1										

AC Induction Motor Performance Data
Record # 28554
Typical performance - not guaranteed values

Winding: 35WGM218-R001	**Type:** 3516M	**Enclosure:** TEFC

Nameplate Data				**575 V, 60 Hz: Single Voltage Motor**	
Rated Output (HP)			.75	**Full Load Torque**	2.22 LB-FT
Volts			575	**Start Configuration**	direct on line
Full Load Amps			.9	**Breakdown Torque**	10.6 LB-FT
R.P.M.			1750	**Pull-up Torque**	6.34 LB-FT
Hz	60	**Phase**	3	**Locked-rotor Torque**	7.57 LB-FT
NEMA Design Code	B	**KVA Code**	M	**Starting Current**	7.89 A
Service Factor (S.F.)			1.25	**No-load Current**	0.621 A
NEMA Nom. Eff.	84	**Power Factor**	73	**Line-line Res. @ 25ºC**	34.7 Ω
Rating - Duty			40C AMB-CONT	**Temp. Rise @ Rated Load**	30°C
S.F. Amps			1.1	**Temp. Rise @ S.F. Load**	38°C
				Locked-rotor Power Factor	65.1
				Rotor inertia	0.0946 LB-FT2

Load Characteristics 575 V, 60 Hz, 0.75 HP

% of Rated Load	**25**	**50**	**75**	**100**	**125**	**150**	**S.F.**
Power Factor	31	48	62	71	78	83	80
Efficiency	68.5	80	83.5	84.4	84.3	82.2	84.2
Speed	1790	1778	1766	1753	1739	1722	1738
Line amperes	0.647	0.711	0.808	0.924	1.07	1.24	1.05

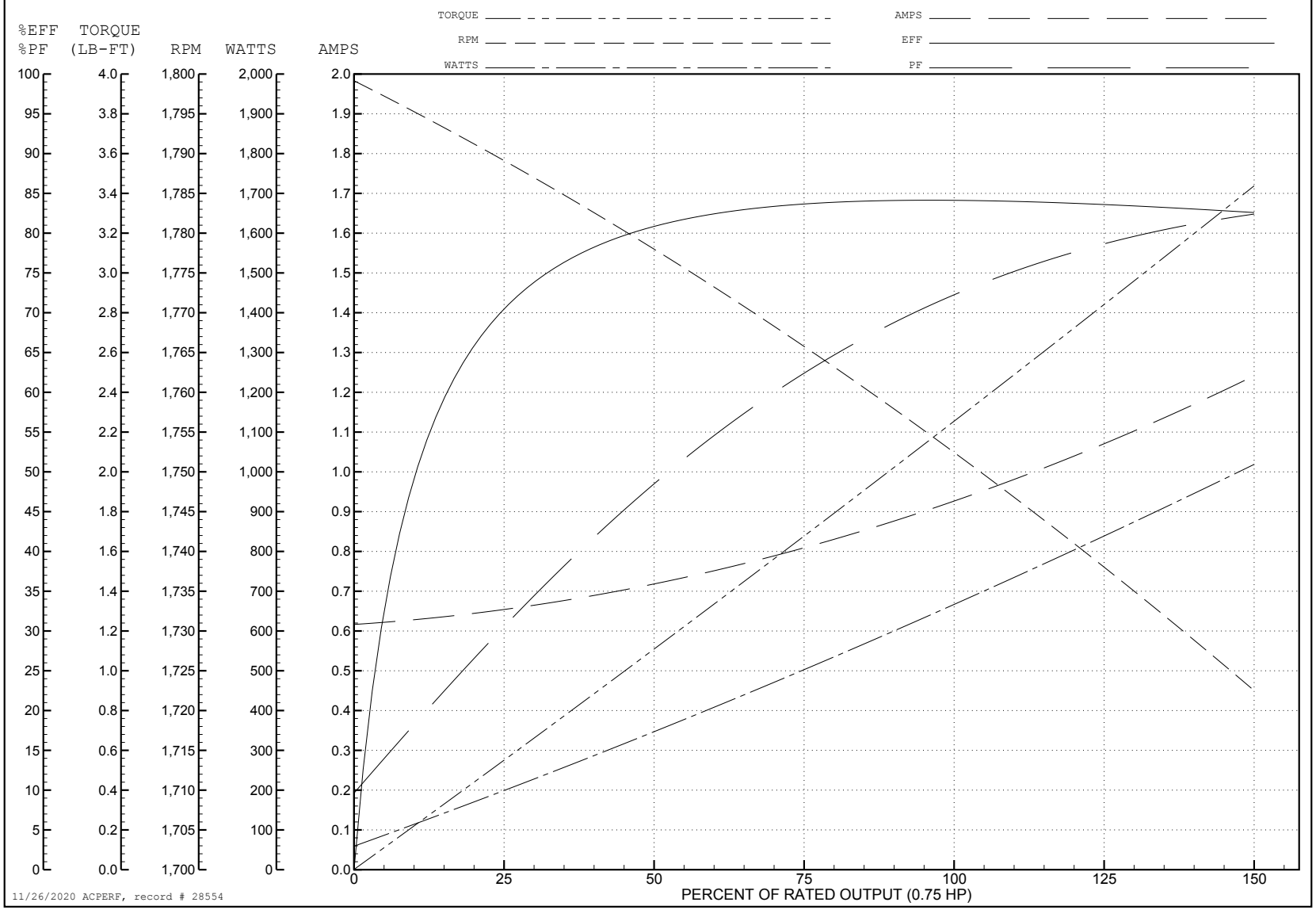
ABB Motors and Mechanical Inc.

WINDING # 35WGM218

0.75 HP 3 PH 60 HZ 1750 RPM 575 V 3516M

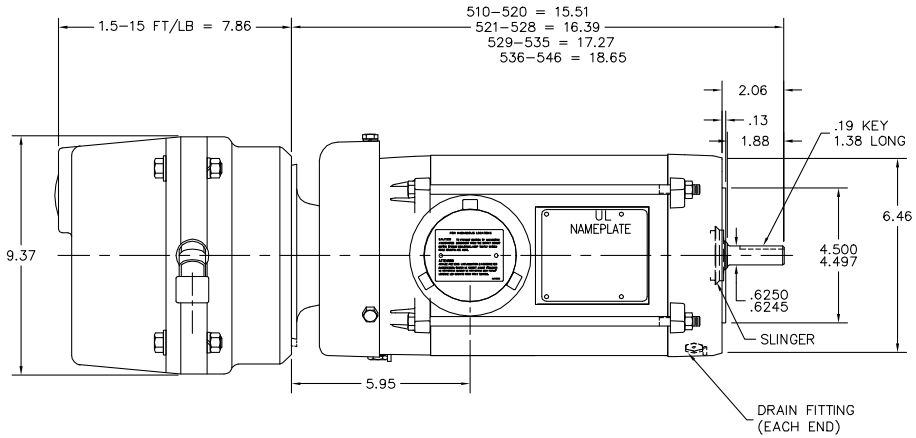
Typical performance - not guaranteed values.

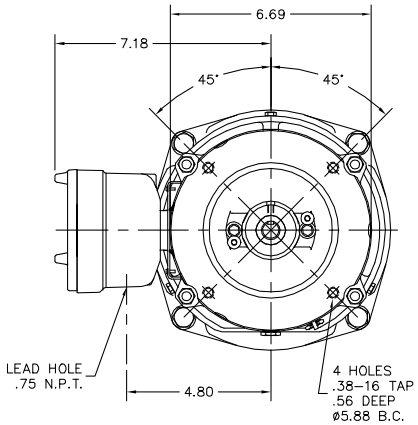
TORQUES(LB-FT): PO=10.6 PU=6.34 LR=7.57 LRA=7.89

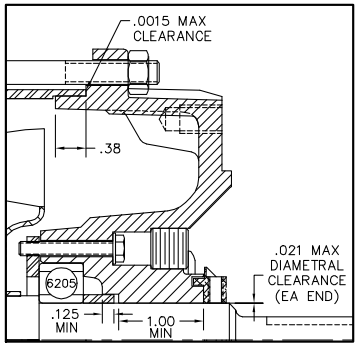


11/26/2020 ACPERF, record # 28554

35LY968







CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT BALDOR'S PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION.

REV. DESC: CORRECT AND/OR ADD DIM FOR FLAME PATH IN PU DETAIL		
REV. LTR: A	VERSION: 01	TDR: 000000785522
FILE: \AAA\00173\493	REVISED: 01:52:18 02/15/2013	BY: ENTROE0
MTL: –		

BALDOR

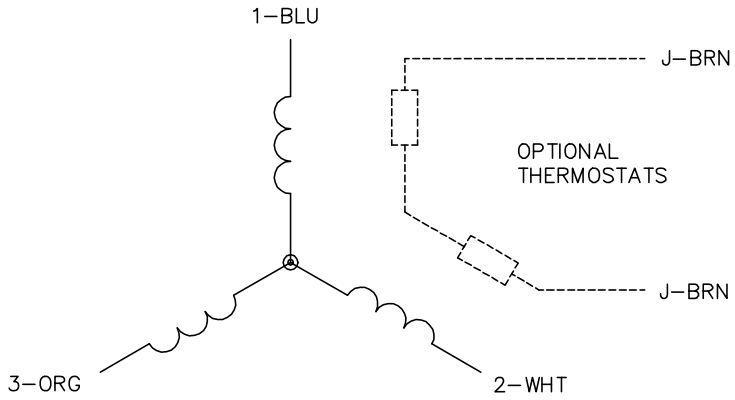
VER 56C XPFC M CLI GP C&D, BRAKE ON FH, DRILL RIG

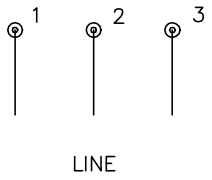
SH 1 of 1

35LY968

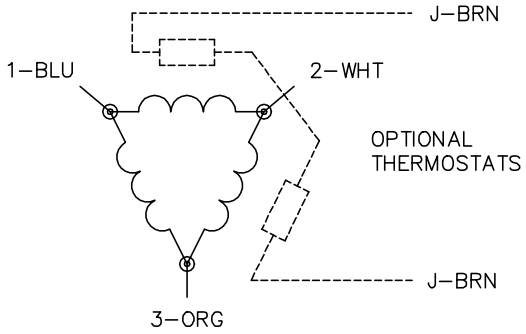
CD0006

TYPICAL WYE–CONNECTED MOTOR





TYPICAL DELTA–CONNECTED MOTOR



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: ENBRIR0
MTL: –		

BALDOR - RELIANCE®

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

SH 1 of 1

ii. Wash Press

- SEW – KAF77 AMS145
- Baldor – 2 HP; 1800 RPM; 575V/3Ph/60Hz, Class I, Div. 1

KAF77 AMS145
Bevel-helical gear units K

Reference data

Your reference number	: 306029
Your material number	: 10015061
Transaction	: 81662525
Item	: 100
Serial number	: 60.8166252501

Product data

Year of manufacture	: 2022
Speed [r/min]	: 1755 / 13
Total ratio [i]	: 135,28 / infinite
Ma max [Nm]	: 1.550
Mounting position	: M4A
Lubricant / -volume [l]	: CLP 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
Opera.instr. A lang./quantity	: Swedish / 0
Parts list/language/quantity	: Swedish / 0

SEW EURODRIVE

Claro

BALDOR • RELIANCE

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

7/2/2024 1:42:27 PM

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.	35WGZ823
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		
Rated Output (HP)		2
Volts		575
Full Load Amps		2.15
R.P.M.		1765
Hz	60 **Phase**	3
NEMA Design Code	B **KVA Code**	K
Service Factor (S.F.)		1.15
NEMA Nom. Eff.	86.5 **Power Factor**	81
Rating - Duty		40C AMB-CONT
S.F. Amps		2.45

575 V, 60 Hz: Single Voltage Motor	
Full Load Torque	5.95 LB-FT
Start Configuration	direct on line
Breakdown Torque	22.1 LB-FT
Pull-up Torque	13.1 LB-FT
Locked-rotor Torque	15.85 LB-FT
Starting Current	18.31 A
No-load Current	1.15 A
Line-line Res. @ 25ºC	15.5 Ω
Temp. Rise @ Rated Load	81°C
Temp. Rise @ S.F. Load	98°C
Locked-rotor Power Factor	57
Rotor inertia	0.202 lb-ft²

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

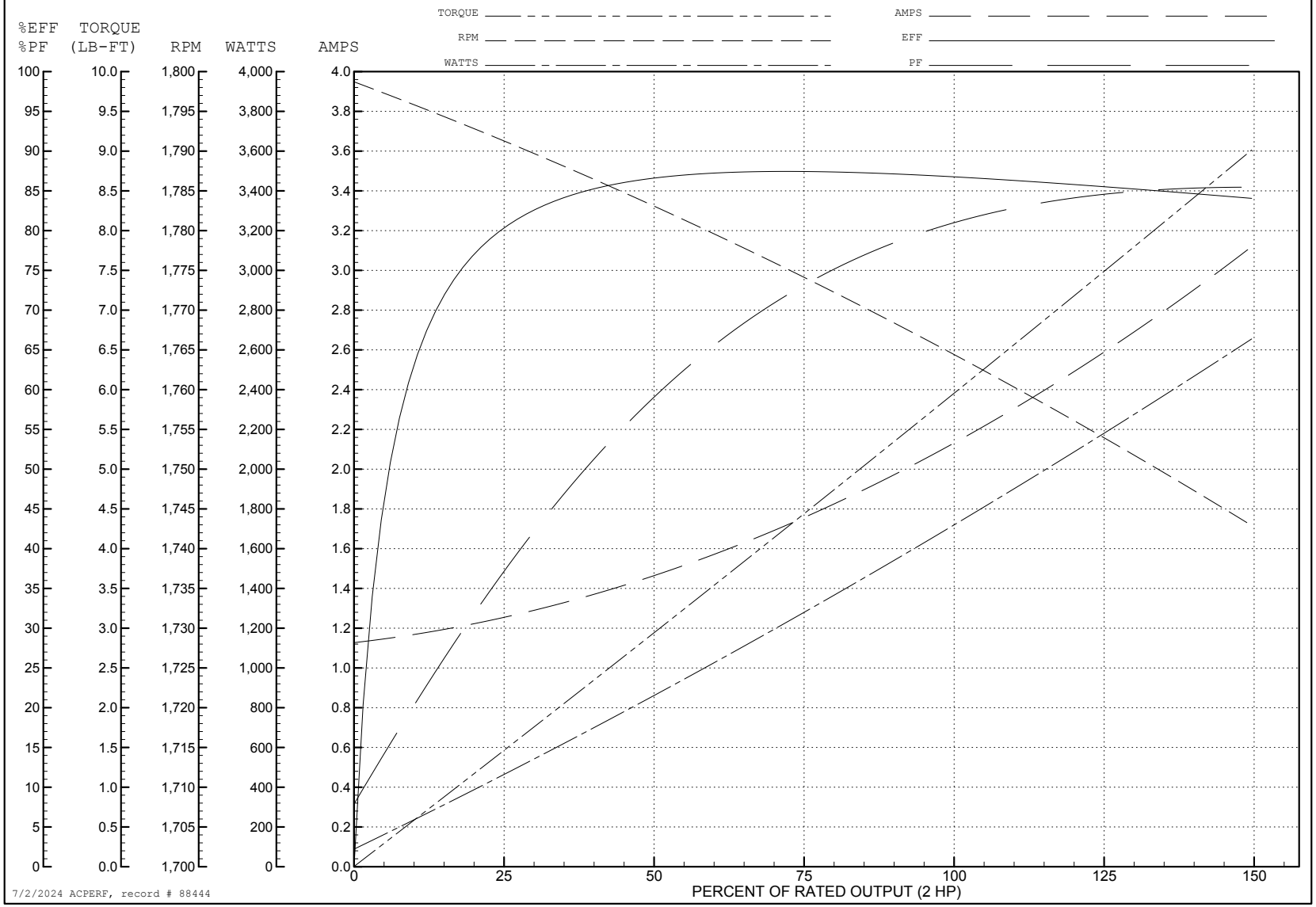
ABB Motors and Mechanical Inc.

WINDING # 35WGZ823

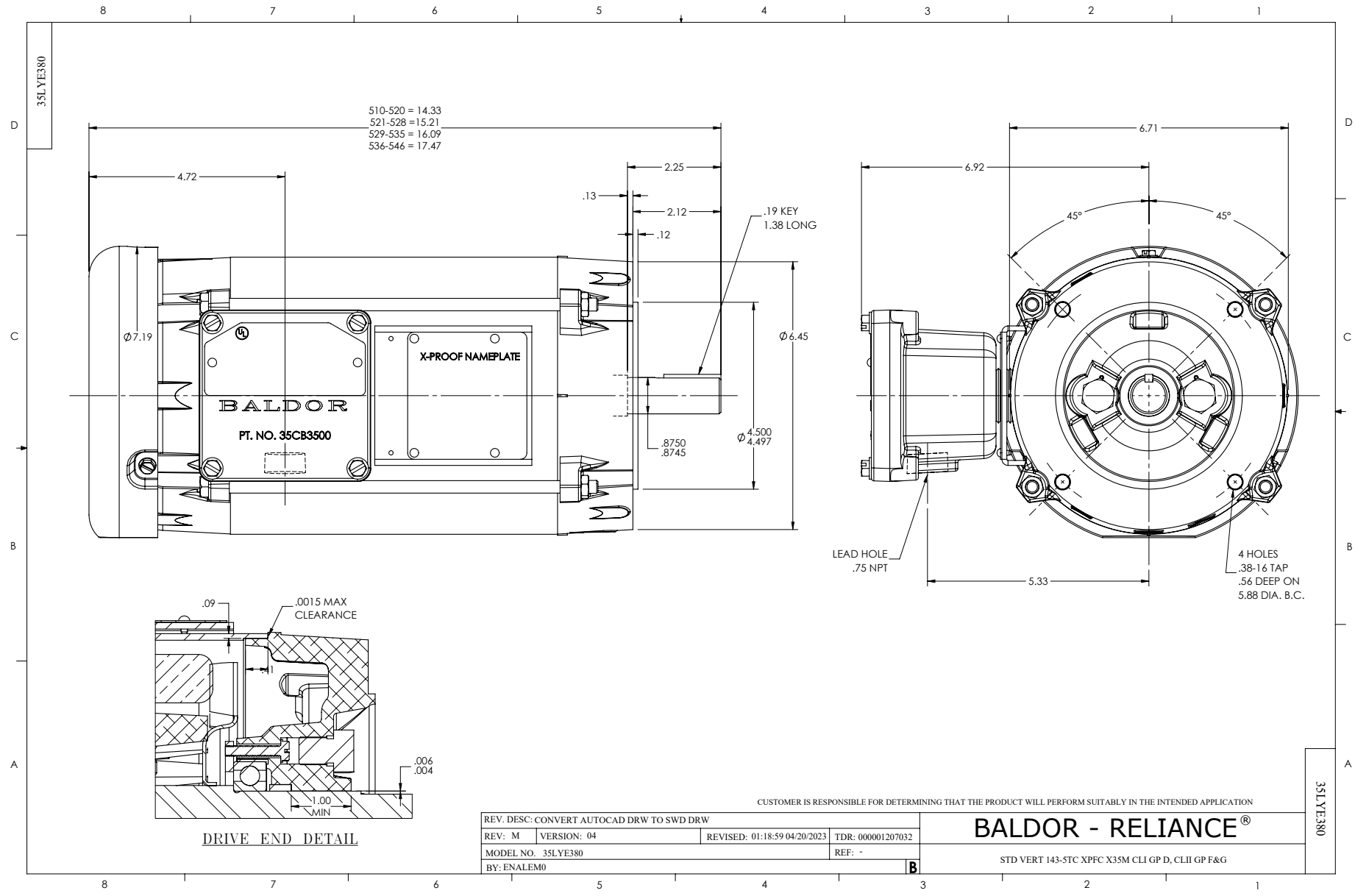
Typical performance - not guaranteed values.

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

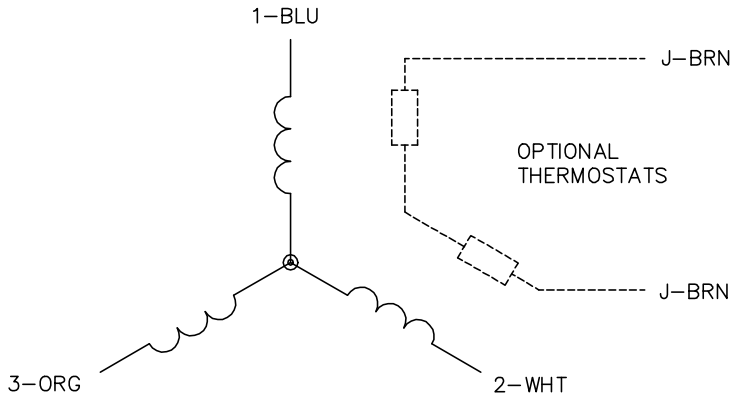


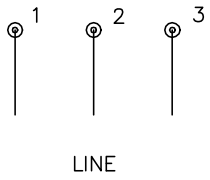
7/2/2024 ACPERF, record # 88444


35LYE380
510-520 = 14.33
521-528 =15.21
529-535 = 16.09
536-546 = 17.47
4.72
2.25
.13
2.12
.12
.19 KEY
1.38 LONG
Ø7.19
X-PROOF NAMEPLATE
BALDOR
PT. NO. 35CB3500
Ø6.45
Ø4.500
4.497
.8750
.8745
6.71
6.92
45°
45°
LEAD HOLE
.75 NPT
5.33
4 HOLES
.38-16 TAP
.56 DEEP ON
5.88 DIA. B.C.
.09
.0015 MAX
CLEARANCE
.006
.004
1.00
MIN
DRIVE END DETAIL
CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT THE PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION
REV. DESC: CONVERT AUTOCAD DRW TO SWD DRW
REV: M
VERSION: 04
REVISED: 01:18:59 04/20/2023
TDR: 000001207032
MODEL NO. 35LYE380
REF: -
BY: ENALEM0
B
BALDOR - RELIANCE®
STD VERT 143-5TC XPFC X35M CLI GP D, CLII GP F&G
35LYE380

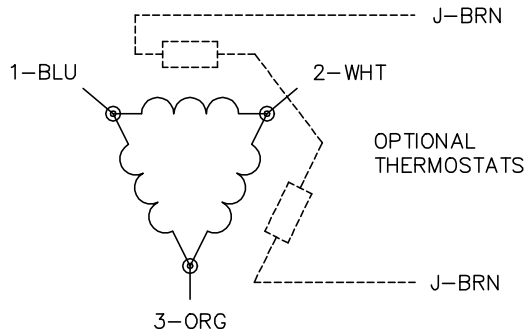
CD0006

TYPICAL WYE–CONNECTED MOTOR





TYPICAL DELTA–CONNECTED MOTOR



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: ENBRIR0
MTL: –		

BALDOR - RELIANCE®

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

SH 1 of 1

E. Screen Home Position (Proximity) Switch (Class I, Div. 1) + Intrinsic Barrier in Panel

TURCK

NI10-G18-Y1X
Inductive sensor

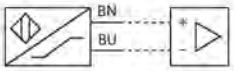
Features

- 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	≤ (0.81 × Sn) mm
Correction factors	St37 = 1; Al = 0.3; stainless steel = 0.7; Ms = 0.4
Repeat accuracy	≤ 2 % of full scale
Temperature drift	≤ ± 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 µH
Device marking	Ⓔx II 1 G Ex ia IIC T6 Ga/II 1 D Ex ia IIIC T115 °C Da
	(max. U_i = 20 V, I_i = 20 mA, P_i = 200 mW)
Design	Threaded barrel, M18 × 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.

Claro

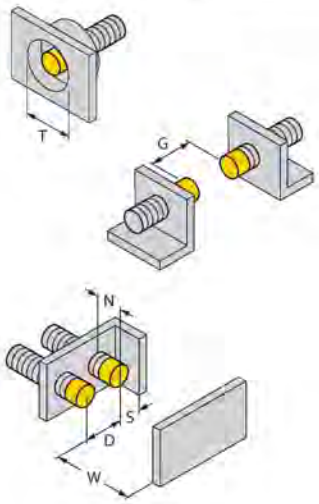
TURCK

Technical data

Cable quality	Ø 5.2 mm, Blue, LifYY, PVC, 2 m
Core cross-section	2 x 0.34 mm²
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

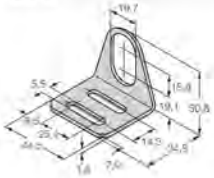
Mounting instructions/Description



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

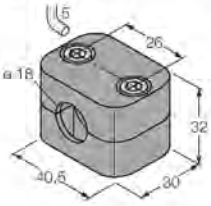
Accessories

MW18 **6945004**



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

BSS-18 **6901320**

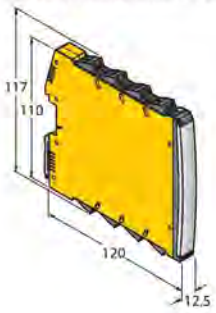


Mounting clamp for smooth and threaded barrel sensors; material: Polypropylene

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

TURCK

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

Claro

TURCK

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)	Ⓔx II 1 G and Ex ia IIC T6 Ga acc. to EN60079-0 and -26 and Ⓔx 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.

Claro

F. Ultrasonic Level Transmitter & Level Probe Model Numbers & Specification Data

- **i. Endress+Hauser Level Sensor Model: FDU91-SN(25m)AA**

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:	**25**	**Meters (Special Order)**
Heater:	A	W/o
Additional Option:	A	Basic version

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ii. Endress+Hauser Transmitter Model: FMU90-N12CB232AA1A

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

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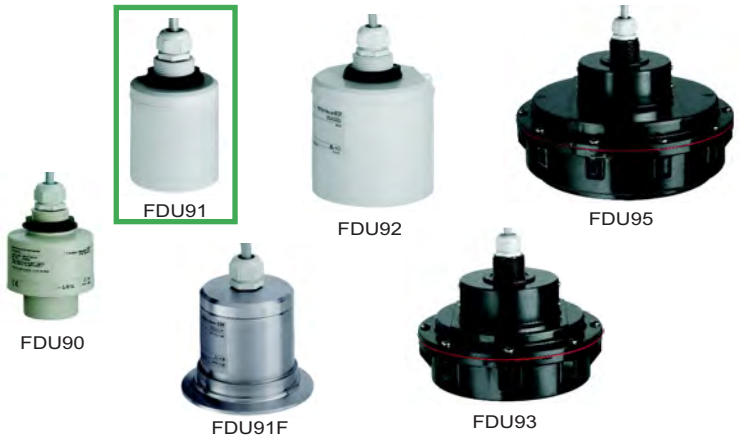
People for Process Automation

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

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Table of Contents

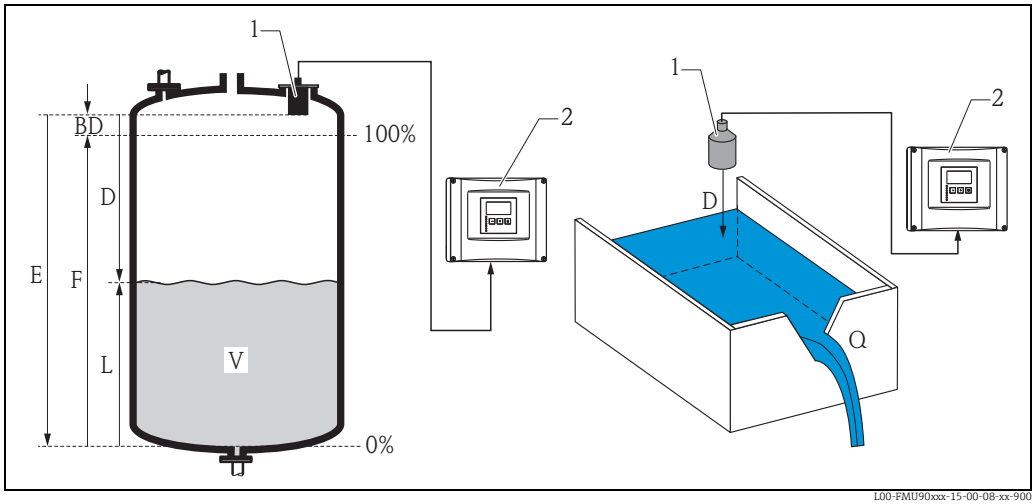
Safety symbols

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

Explosion protection	Meaning
⟨Ex⟩	**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
EX	**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.
EX	**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*

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:

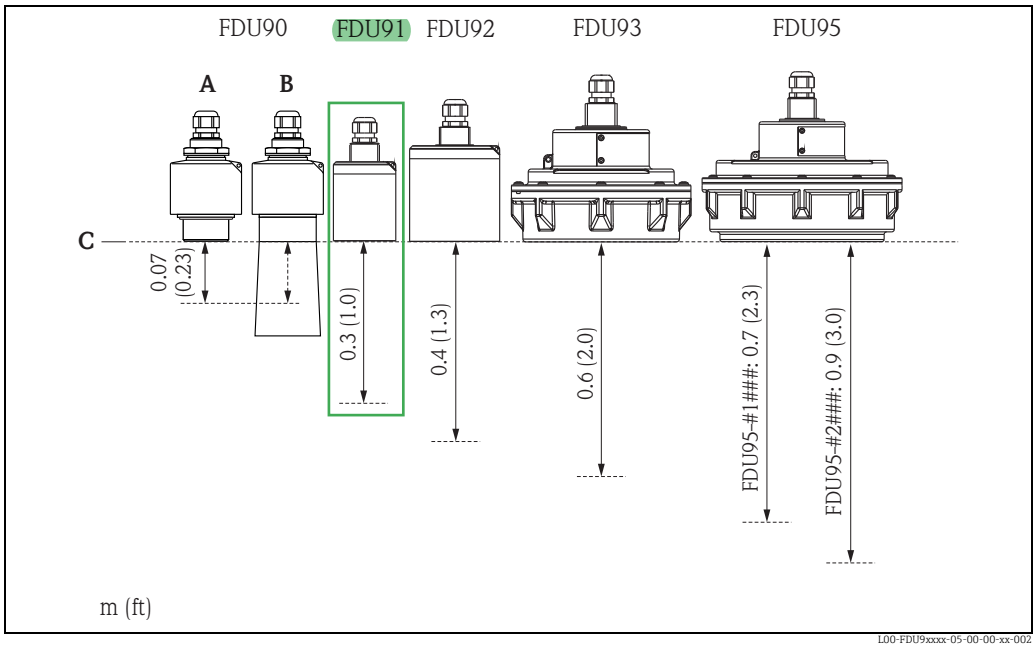
$D = c \cdot t/2$
From D results the desired measuring value:
- Level L
- Volume V
- Flow Q across measuring weirs or open channels

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.

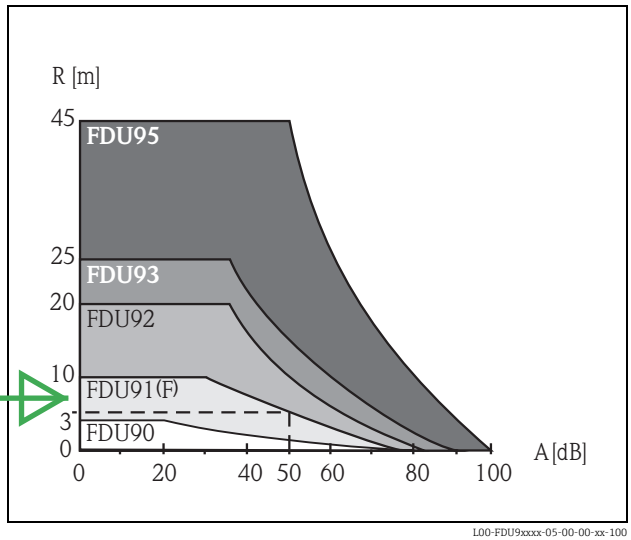
Fluid surface	Attenuation
calm	0 dB
waves	5 to 10 dB
strong turbulence (e.g. stirrers)	10 to 20 dB
foaming	Please contact your Endress+Hauser sales representative.

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



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

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)

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.

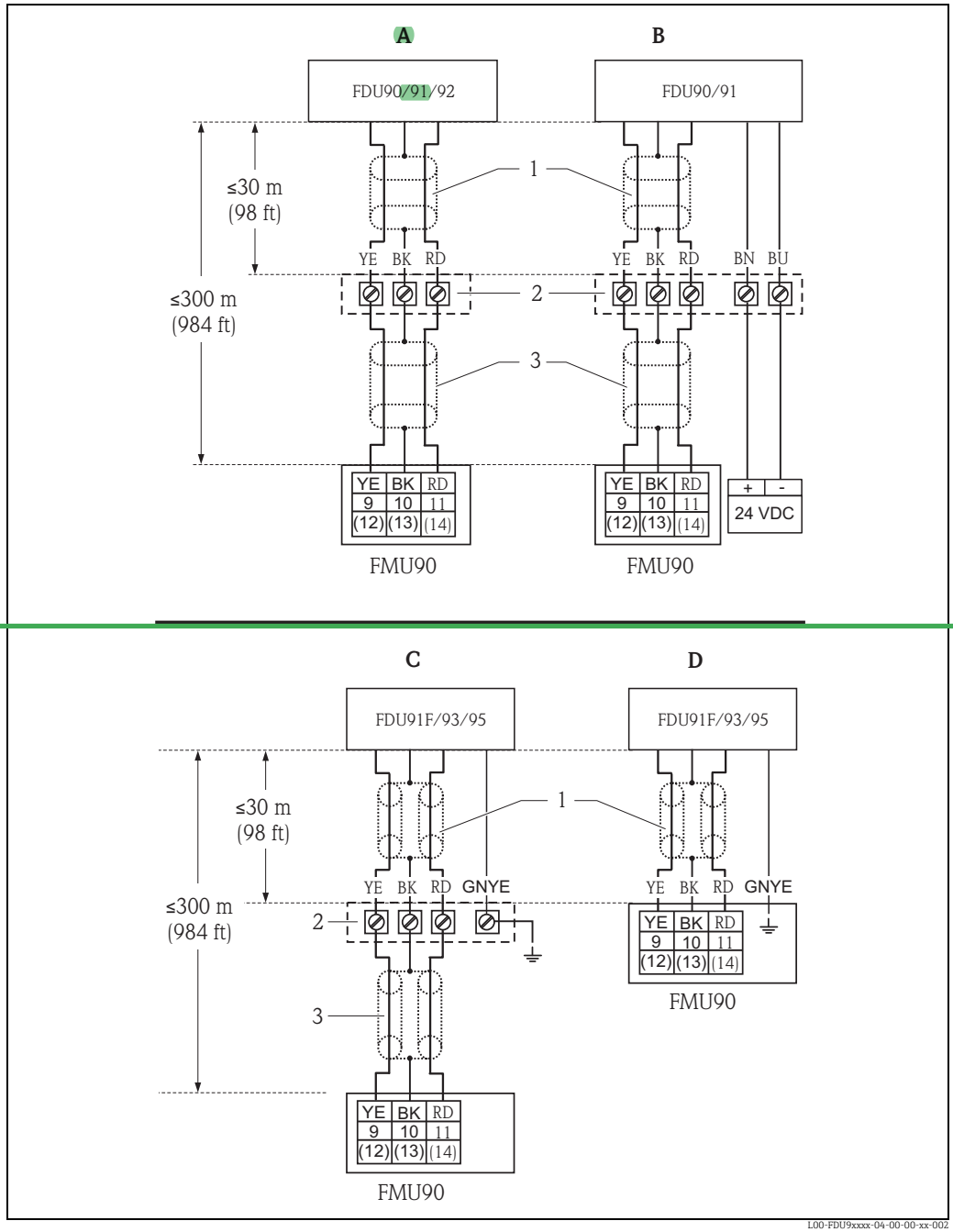
Technical data

- 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



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:

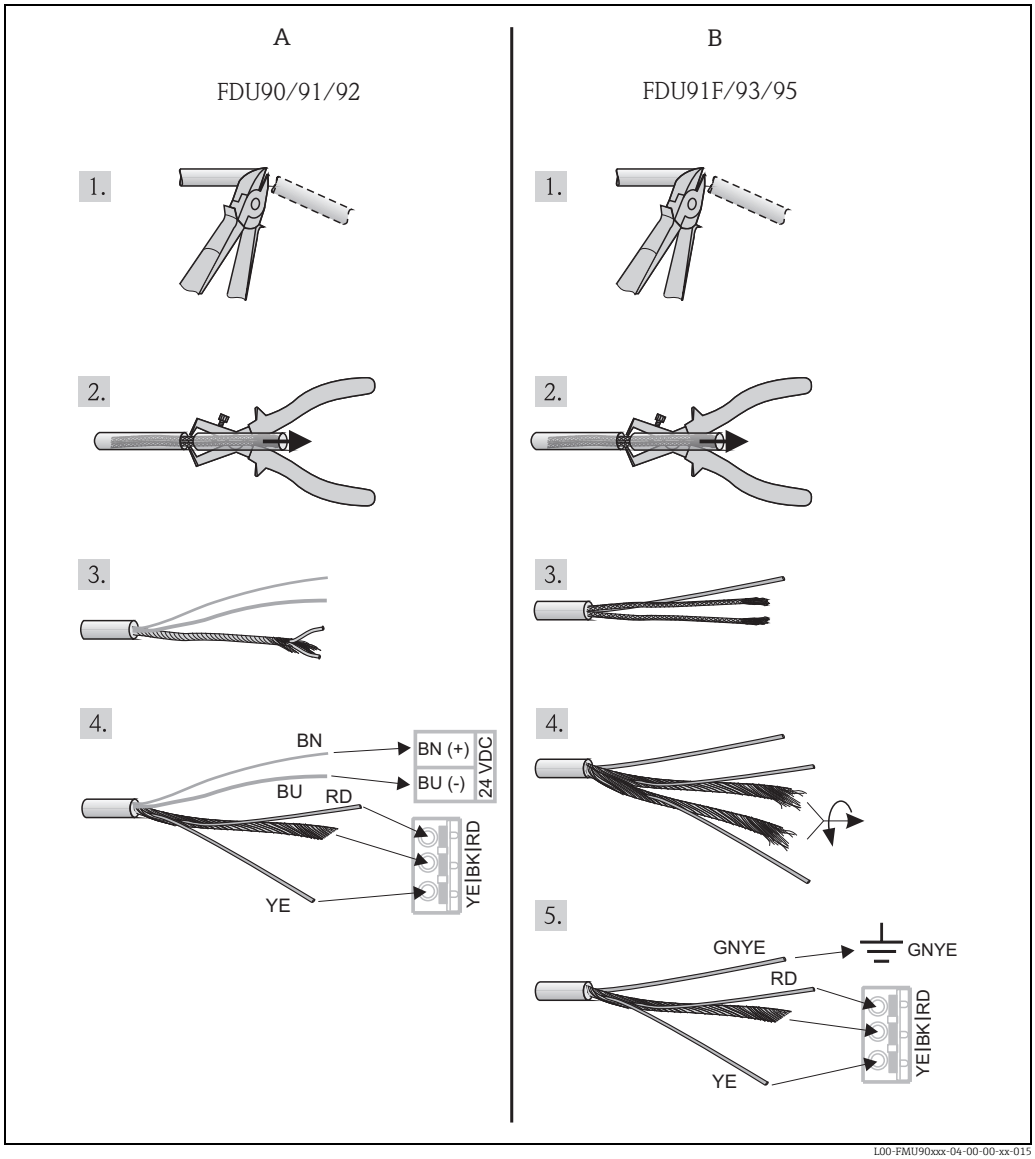
- Number of cores according to the connection diagram (→ 7 "Connection diagram")
- Braided wire shield for the yellow (YE) and red (RD) core (no foil shield)
- Length: up to 300 m (984 ft), sensor cable + extension cable
- Cross section: 0.75 mm^2 to 2.5 mm^2 (18 to 14 AWG)
- Up to 8 Ω per core
- Max. 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.

The protective 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

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.

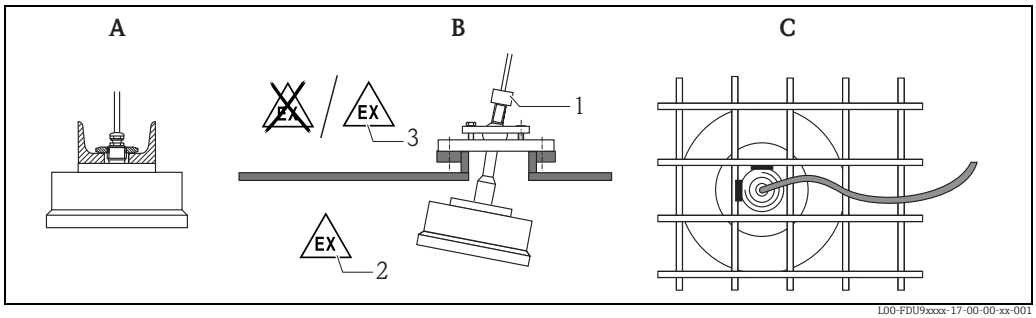
- Only install sensors in areas that are stable and sufficiently able to take the load.
- Fasten sensors only with fastening material that is proper and suited for the environment.

NOTICE

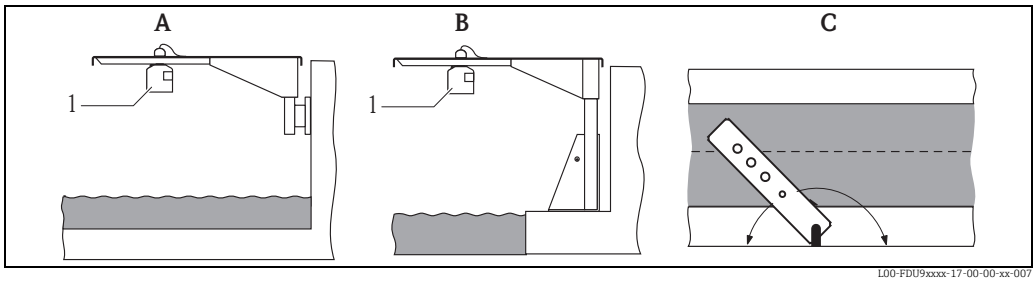
Risk of sensor damage.

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

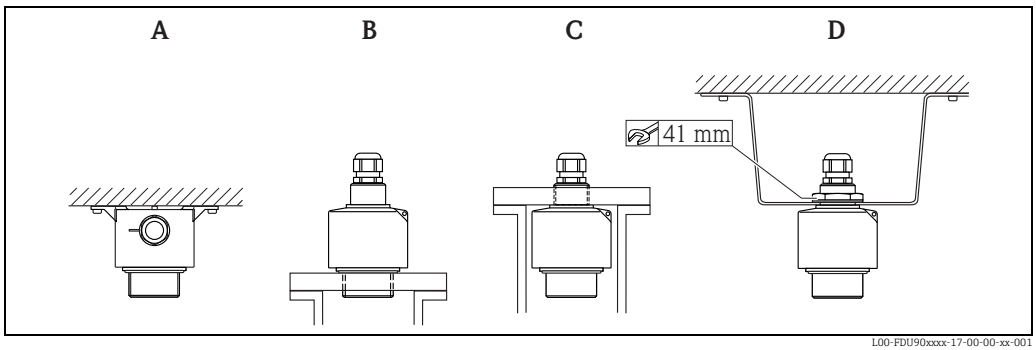
Installation options (Examples)



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*



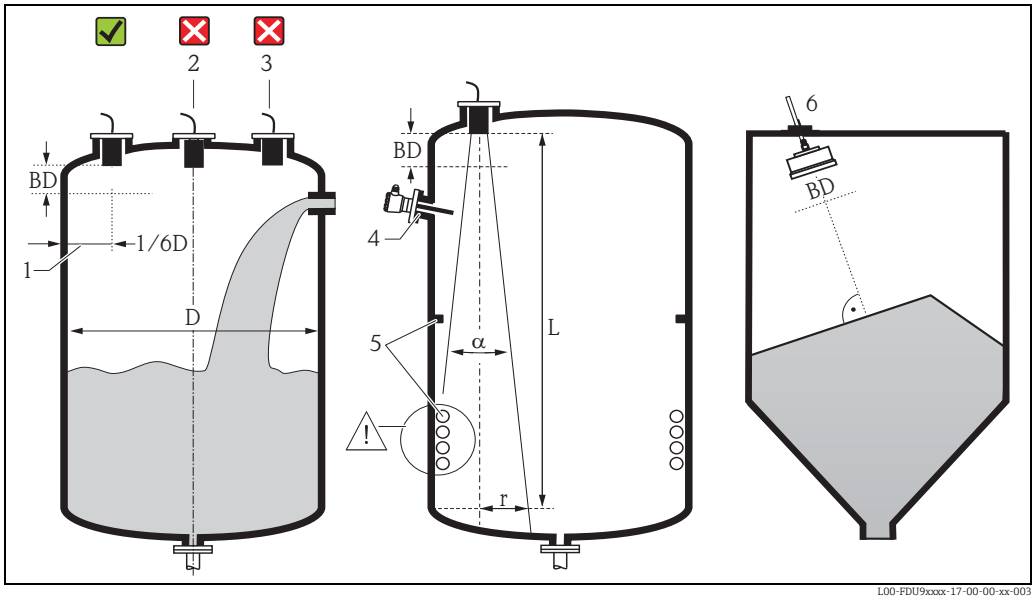
1 FDU9x
***A:** Installation with cantilever and wall bracket, **B:** Installation with cantilever and mounting frame, **C:** The cantilever can be turned in order to position the sensor over the centre of the flume.*
Cantilever, wall bracket and mounting frame are available as accessories (→ 🖹23).



***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!

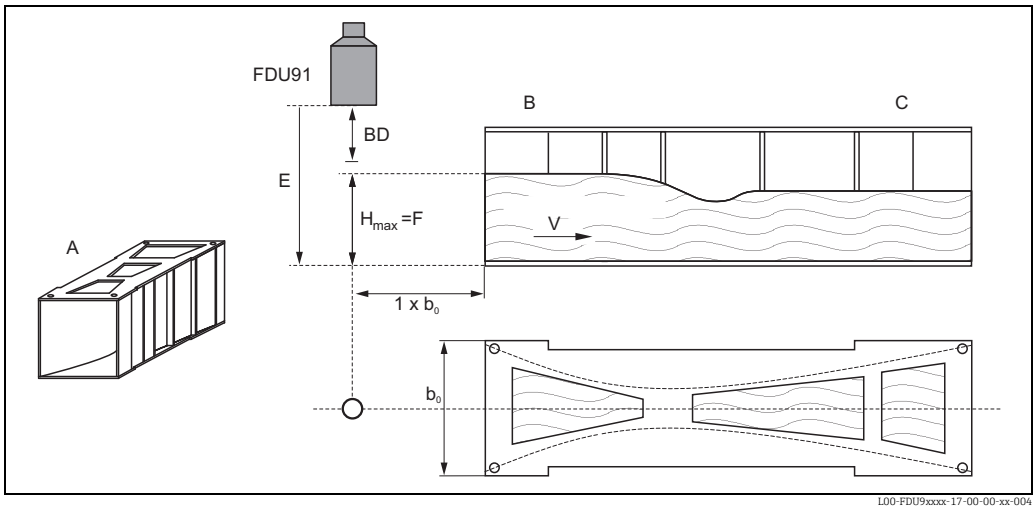
In explosion hazardous areas, sparks can cause explosions. This may lead to serious or fatal injury. Additionally, the device and installation may be seriously damaged.

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

Installation conditions for flow measurements

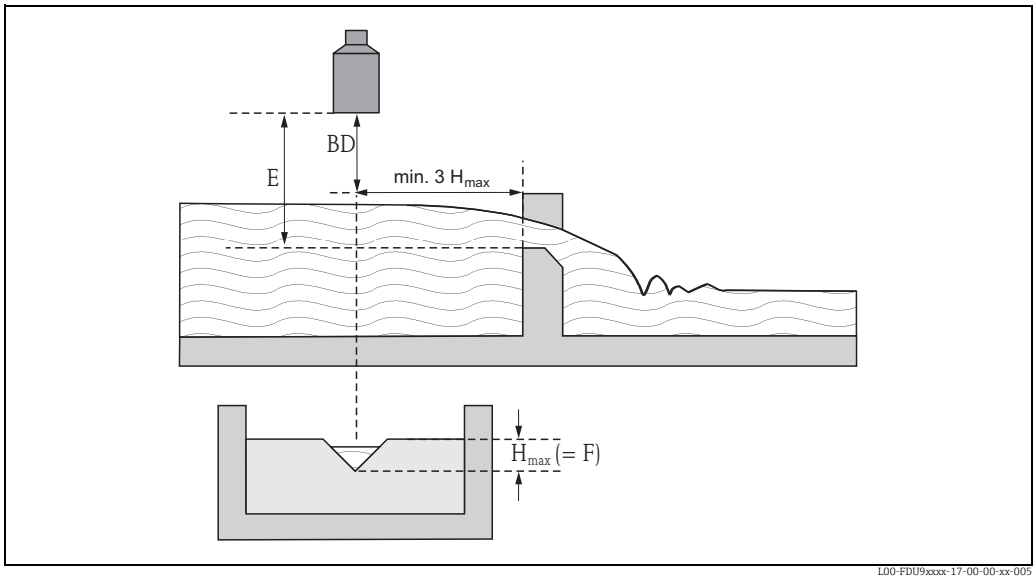
- Install the sensor at the inflow side (B), above the maximum water level H_{max} (=F) plus the blocking distance BD.
- Position the sensor in the middle of the channel or weir.
- Align the sensor vertically to the water surface.
- Comply to the installation distance of the channel or weir.[2)]
- Use 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

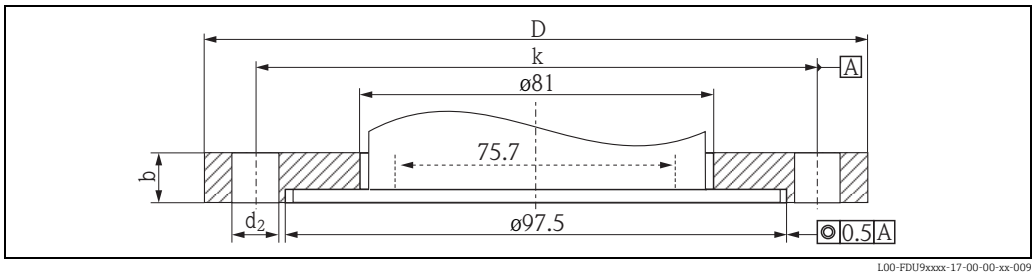


***BD:** blocking distance, **E:** empty calibration, **F:** full calibration*

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

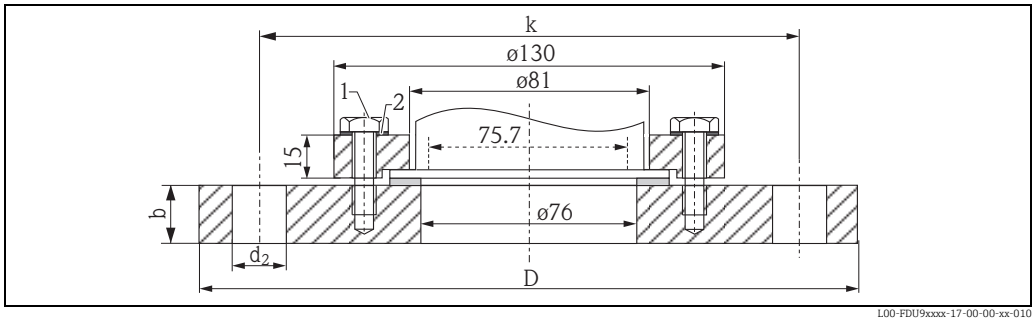
Flush mounting with slip-on flange FAU80

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.

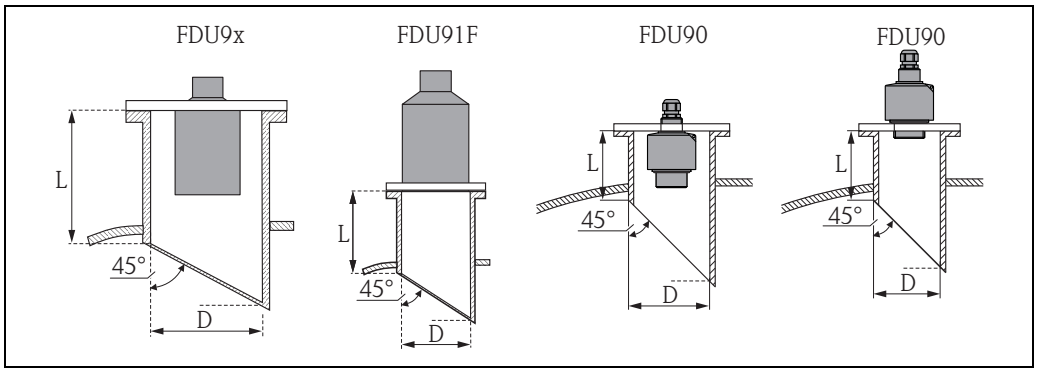
Position	Part	Material
1	Screws	V2A
2	Washer	PP-FR or 316/316L (1.4435)

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)						

- 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.
- 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°).



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	Maximum nozzle length [mm (in)]						
Nozzle diameter	**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)

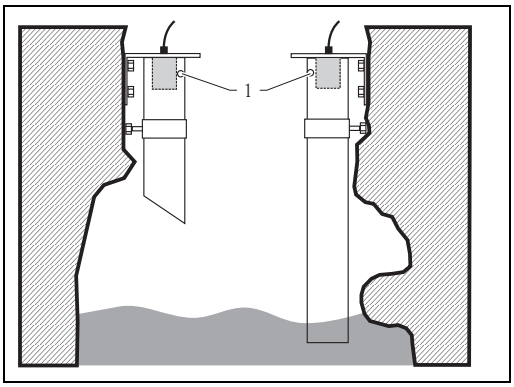
1) mounted at the rear side thread

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



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.

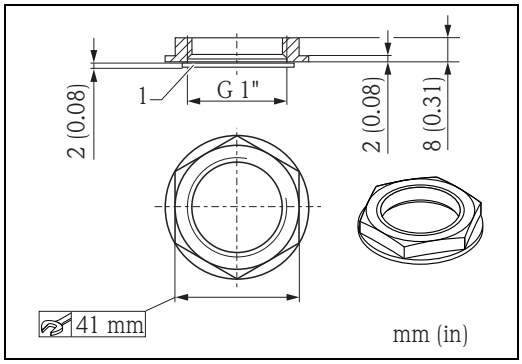
2) Only valid for Tri-clamp and flush mounting

Mechanical construction

Counter nut G 1"

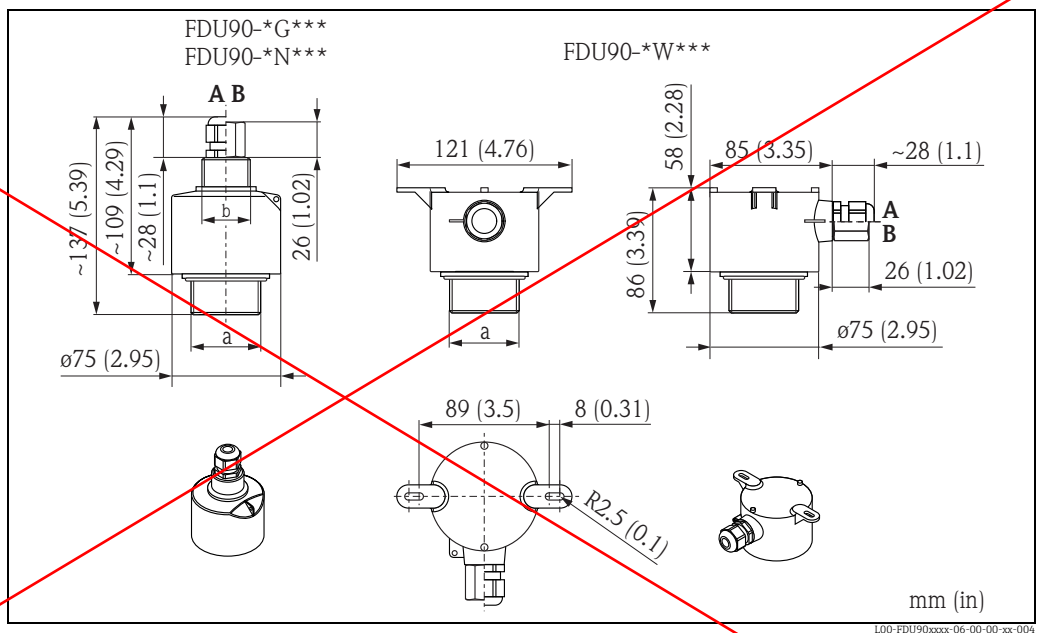
- Is supplied for the sensor FDU90, FDU91 and FDU92 with a metric G 1" thread.
- Material: PA6.6
- Gasket (EPDM) is supplied

Note!
The counter nut is not for NPT thread.



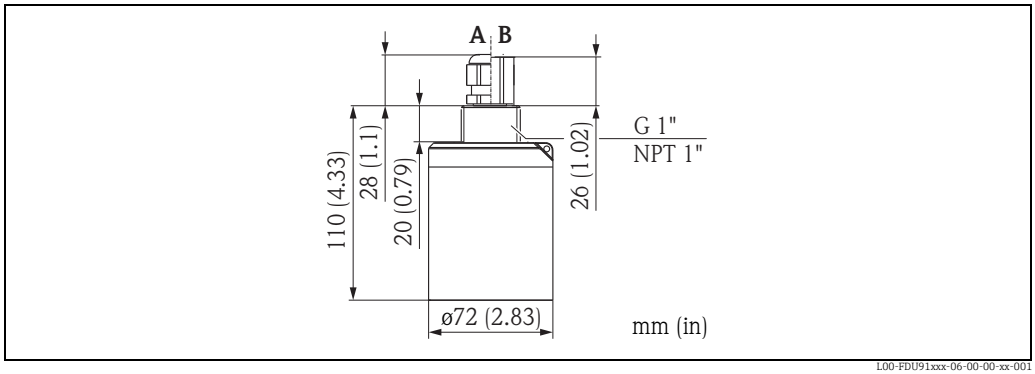
1 Gasket

Dimensions FDU90



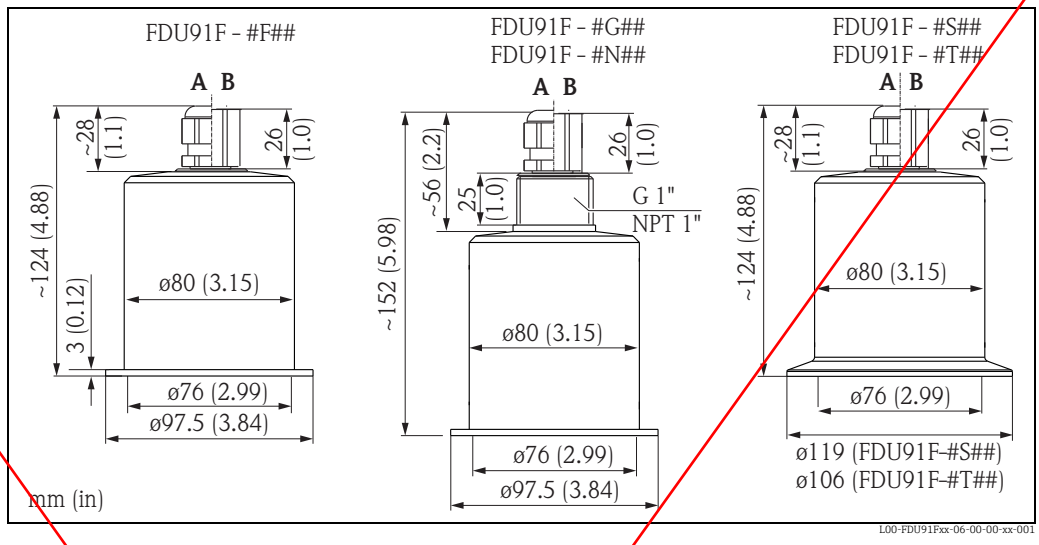
A: *Cable gland for approval versions FDU90-C/D/E/G/H/J/R/U/V/1*
B: *Conduit connection NPT ½" for approval versions FDU90-Q/S*
The conduit connection is partly potted (half-filled)
a: *G 1-1½" or NPT 1-1½" (see product structure: 020 "Process connection" → 🖹21)*
b: *G 1" or NPT 1" (see product structure: 020 "Process connection" → 🖹21)*

Dimensions FDU91



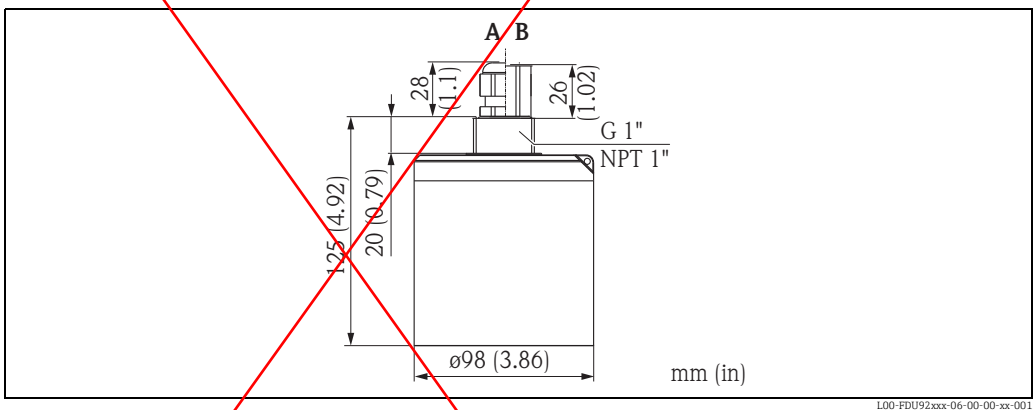
A: *Cable gland for approval versions FDU91-C/D/E/G/H/J/R/U/V/1*
B: *Conduit connection NPT 1/2" for approval versions FDU91-Q/S*
The conduit connection is partly potted (half-filled).

Dimensions FDU91F



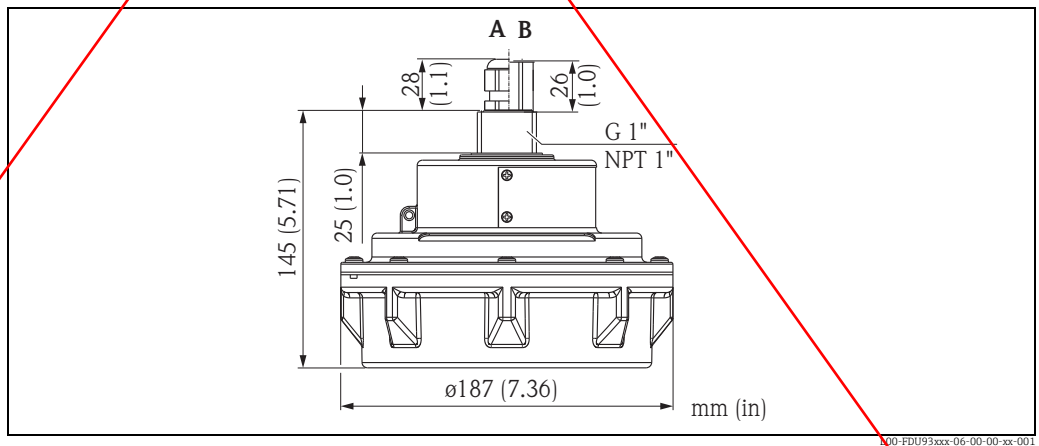
A: Cable gland for approval versions FDU91F-C/D/E/G/H/J/R/U/V
B: Conduit connection NPT 1/2" for approval versions FDU91F-Q/S
The conduit connection is partly potted (half-filled).

Dimensions FDU92



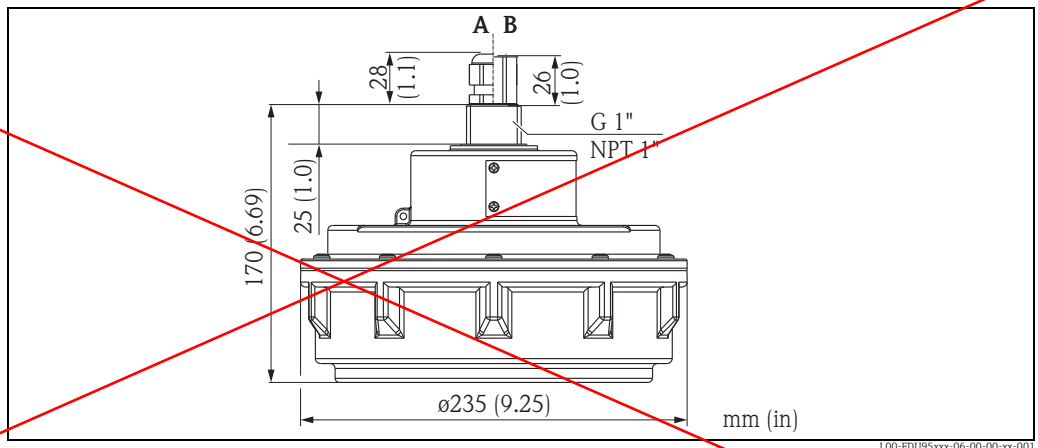
A: Cable gland for approval versions FDU92-C/D/E/G/H/J/R/U/V/1
B: Conduit connection NPT 1/2" for approval versions FDU92-Q/S
The conduit connection is partly potted (half-filled).

Dimensions FDU93



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).

Weight

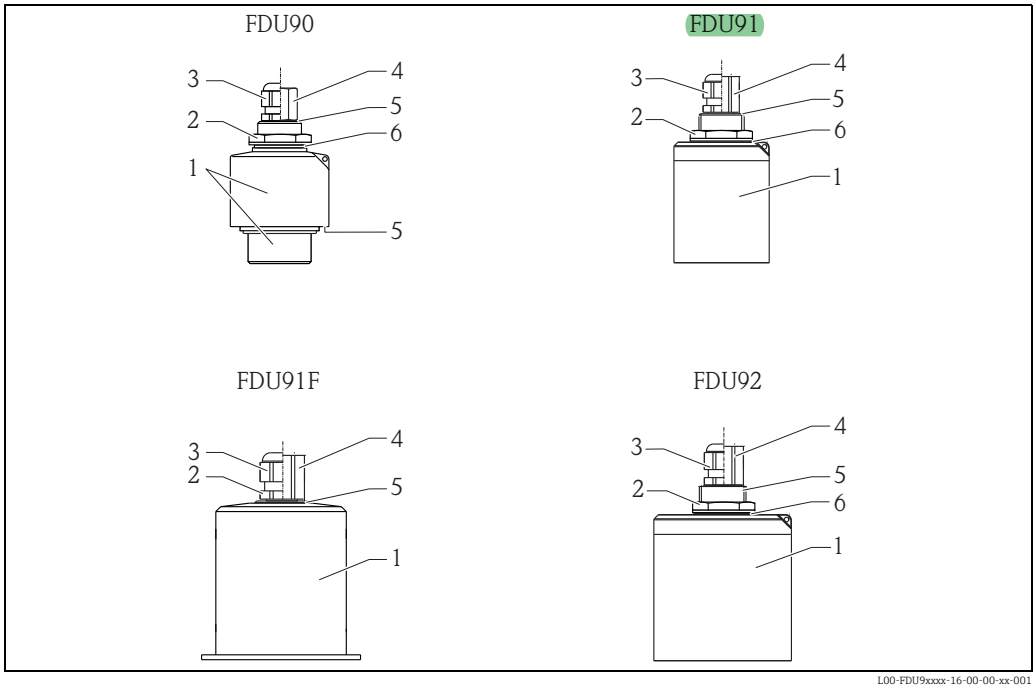
Sensor	Weight (including 5 m (16 ft) cable)
FDU90	▪ approx. 0.9 kg (1.98 lbs) without flooding protection tube ▪ approx. 1.0 kg (2.21 lbs) with flooding protection tube
FDU91	approx. 1.1 kg (2.43 lbs)
FDU91F	approx. 1.6 kg (3.53 lbs)
FDU92	approx. 2 kg (4.41 lbs)
FDU93	approx. 2.9 kg (6.39 lbs)
FDU95	approx. 4.5 kg (9.92 lbs)

Materials

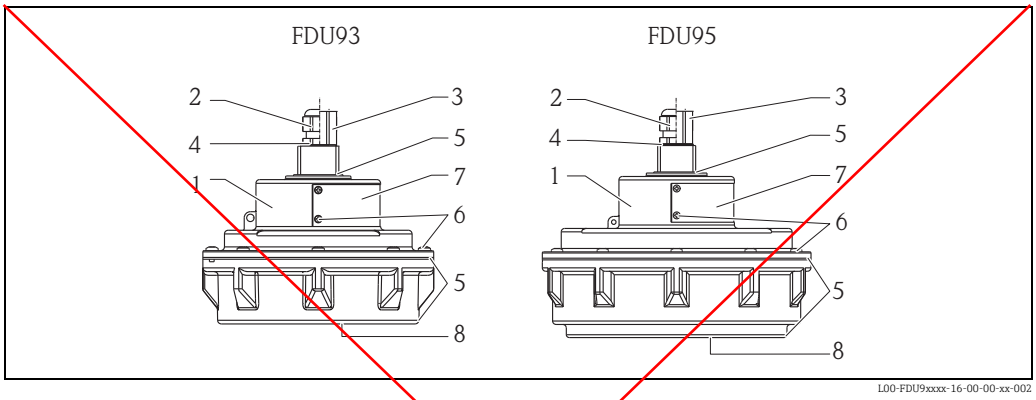
NOTICE

Risk of sensor damage caused by chemical substances.

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



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				



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

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.

External standards and directives

EN 60529

Protection class of housing (IP code)

EN 61326 series

EMC product family standard for electrical equipment for measurement, control and laboratory use

NAMUR

User association for automation technology in process industries

Ordering information

Ordering information

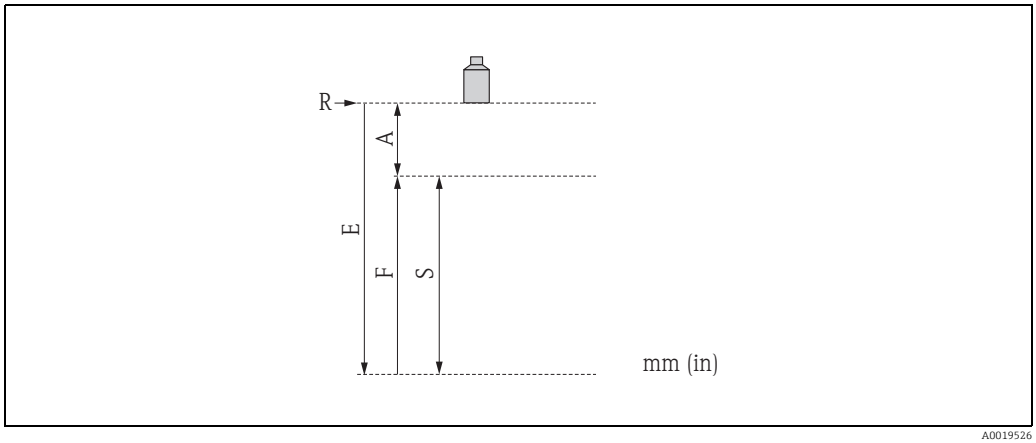
Detailed ordering information is available from the following sources:
- In the Product Configurator on the Endress+Hauser web site: www.endress.com → Choose your country → Products → Select measuring technology, software or components → Select product (picklists: measurement method, product family etc.) → Device support (right-hand column): Configure the selected product → The Product Configurator for the selected product is opened.
- From your Endress+Hauser Sales Center: www.addresses.endress.com

Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

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

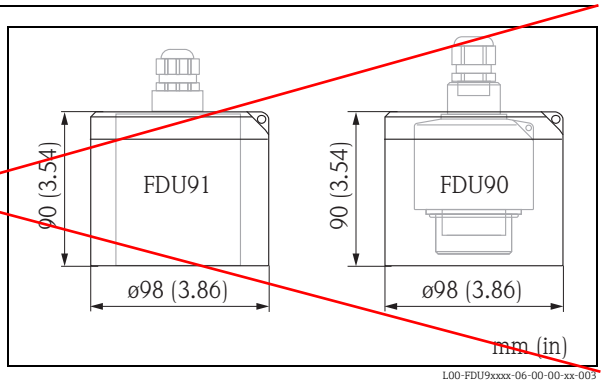
for Sensor	Material	Cable type	Order code
▪ FDU90 ▪ FDU91 ▪ FDU92	PVC	LiYCY 2x(0.75)	71027742
▪ FDU91F ▪ FDU93 ▪ FDU95	PVC (–40 to +105 °C) (–40 to +221 °F)	LiYY 2x(0.75)D+1x0.75	71027743
▪ FDU95	Silicone (–40 to +150 °C) (–40 to +302 °F)	Li2G2G 2x(0.75)D+1x0.75	71027745
▪ FDU90/FDU91 with heater	PVC	LiYY 2x(0.75)D+2x0.75	71027746

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

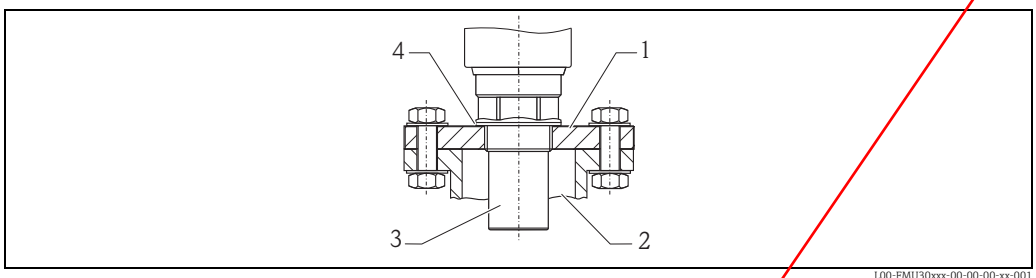
* The sensor cable and the extension cable are of the same type.

Protective cover for FDU90 and FDU91

- Material: PVDF
- Order code: 52025686



Screw in flange FAX50



L00-FMU30xxx-00-00-00-xx-001

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

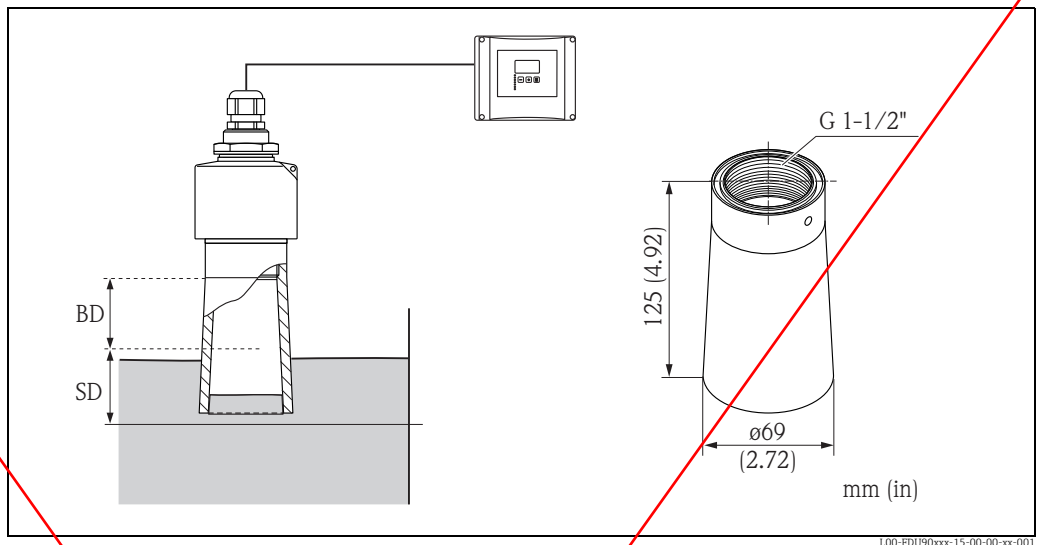
Product structure FAX50

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.

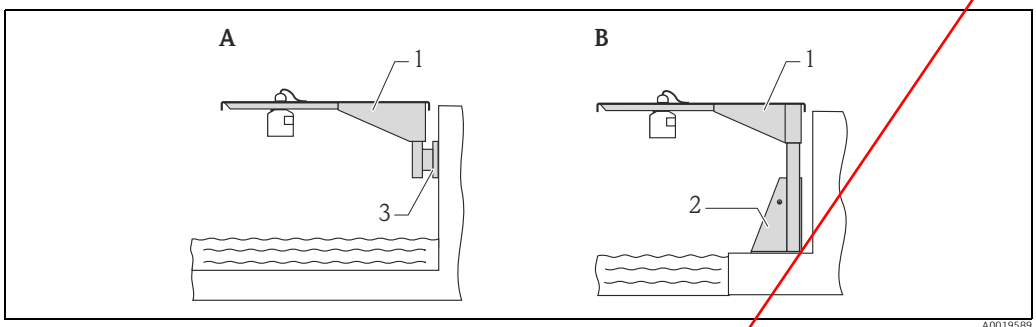
Mounting hints

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 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		

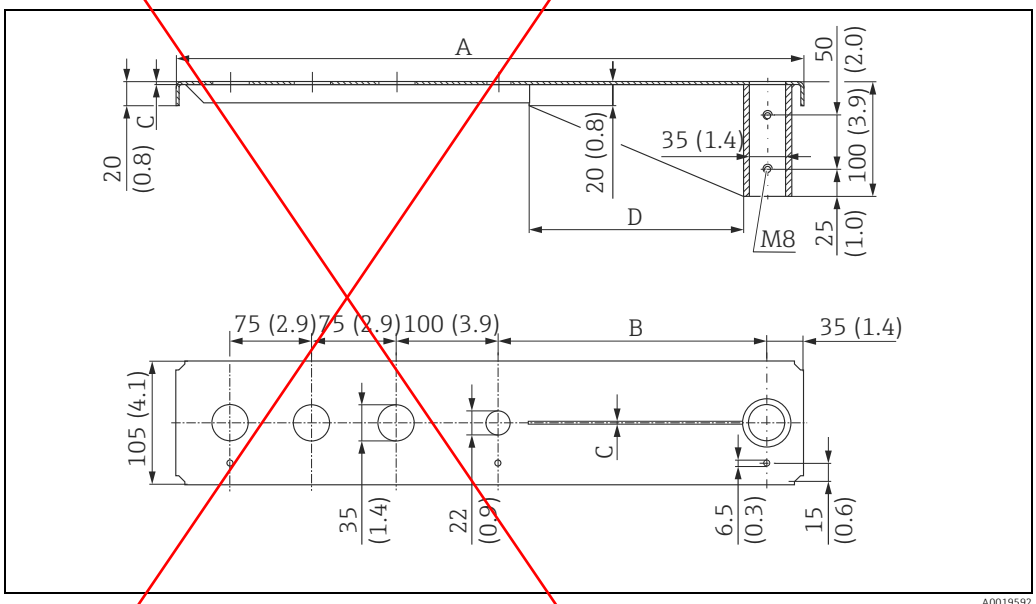
Cantilever with mounting frame or wall bracket



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.



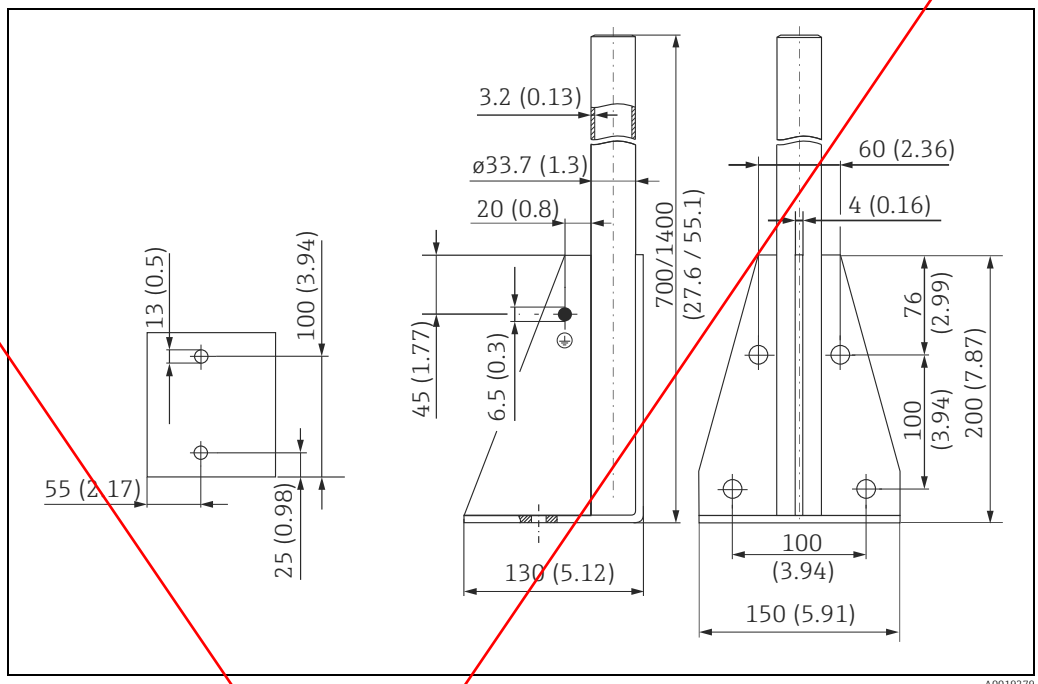
A	B	C	D	Material	Weight	Order code
585 (23)	250 (9.84)	2 (0.08)	200 (7.87)	galvanised steel	2.1 kg (4.63 lbs)	919790-0000
				316Ti (1.4571)	2.0 kg (4.41 lbs)	919790-0001
1085 (42.7)	750 (29.5)	3 (0.12)	300 (11.8)	galvanised steel	4.5 kg (9.92 lbs)	919790-0002
				316Ti (1.4571)	4.3 kg (9.48 lbs)	919790-0003

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.

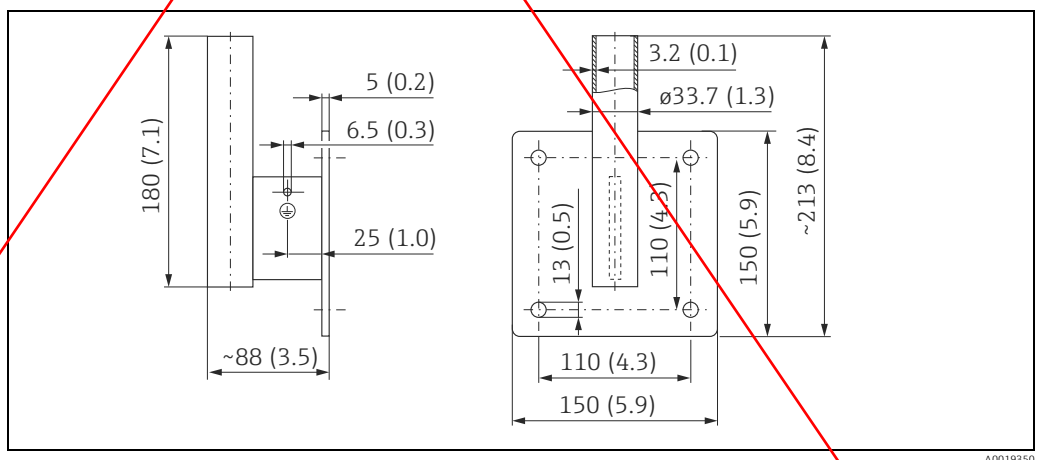
Mounting Frame



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

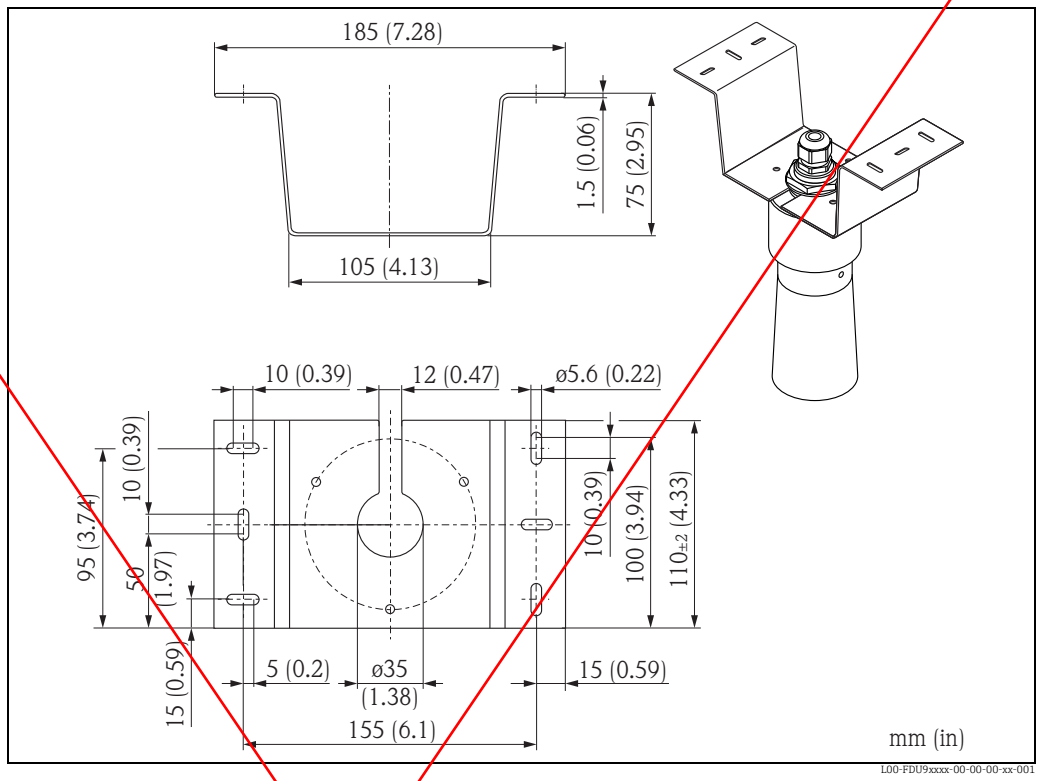
mm (in)

Wall Bracket



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

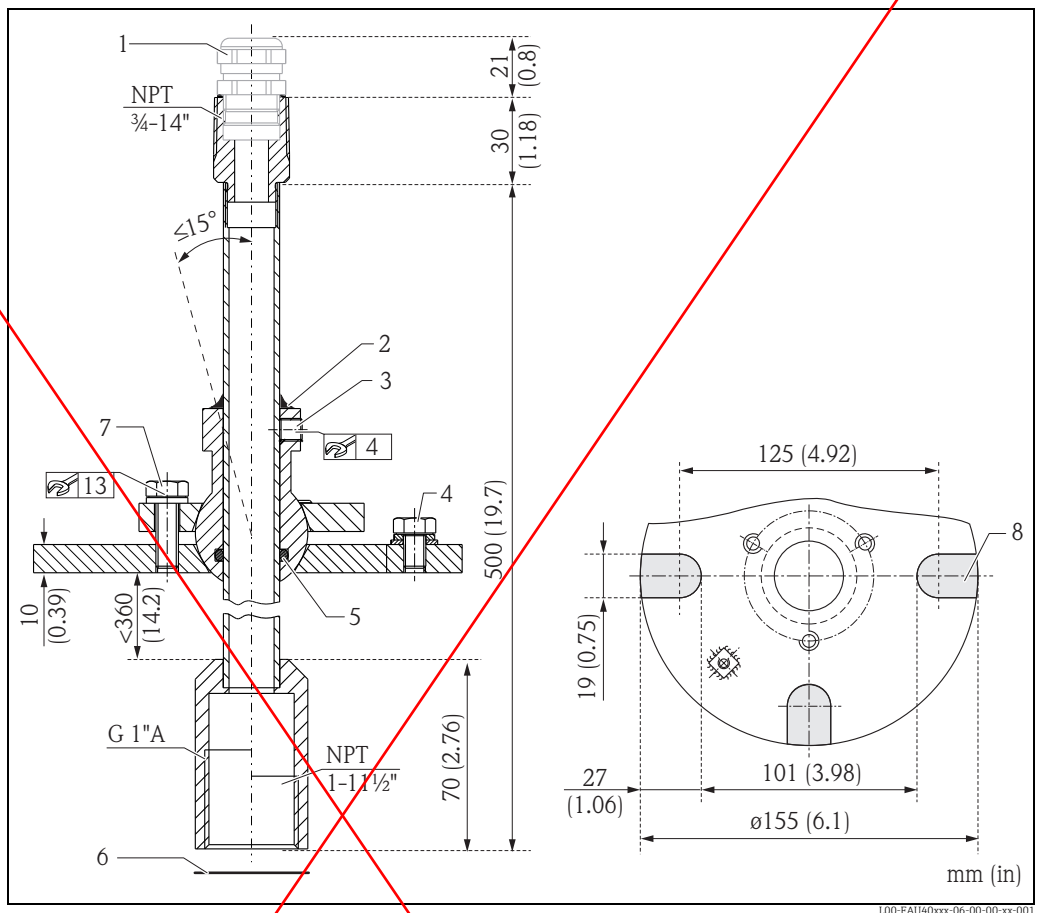
Mounting bracket for ceiling mounting



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 TI00179F.

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 entry3/4, 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	HART	▪ level measurement ▪ alternating pump control ▪ screen and rake control	FMU90 - *******1**** FMU90 - *******2****
BA00289F		▪ flow measurement ▪ backwater and dirt detection ▪ totalizers and counters	FMU90 - *2*****1**** FMU90 - *4*****1**** FMU90 - *2*****2**** FMU90 - *4*****2****
BA00292F	PROFIBUS DP	▪ level measurement ▪ alternating pump control ▪ screen and rake control	FMU90 - *******3****
BA00293F		▪ 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		
▪ FDU90 - J... ▪ FDU91 - J... ▪ FDU91F - J... ▪ FDU92 - J...	▪ II 2 G Ex ma IIC T5 Gb (FDU90) ▪ II 2 G Ex ma IIC T6 Gb (FDU91/91F/92)	XA00321F
▪ FDU90 - E... ▪ FDU91 - E... ▪ FDU91F - E... ▪ FDU92 - E... ▪ FDU93 - J... ▪ FDU95 - J...	▪ 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
▪ FDU93 - E... ▪ FDU95 - E...	▪ 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		
▪ FDU90 - C... ▪ FDU91 - C... ▪ FDU91F - C... ▪ FDU92 - C... ▪ FDU93 - D... ▪ FDU95 - D...	▪ 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
▪ FDU90 - D... ▪ FDU91 - D... ▪ FDU91F - D... ▪ FDU92 - D...	▪ IEC Ex ma IIC T5 Gb (FDU90) ▪ IEC Ex ma IIC T6 Gb (FDU91, FDU91F, FDU92)	XA00482F
▪ FDU93 - C... ▪ FDU95 - C...	▪ IEC Ex ta/tb IIIC Txx°C Da/Db IP68 ▪ IEC Ex tbIIIC Txx°C Db IP68	XA00483F

www.addresses.endress.com

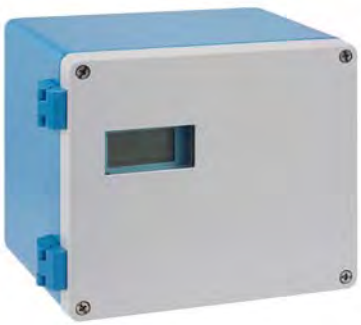
Endress+Hauser

People for Process Automation

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

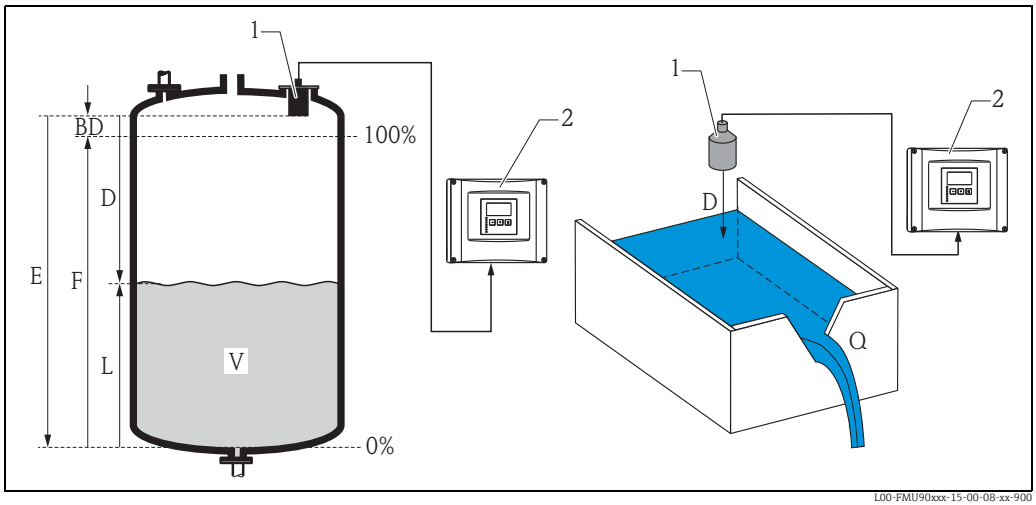
Safety symbols

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*

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/92/93/95[1)]

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/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.

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 weirs[2)]

- Khafagi-Venturi flume
- ISO-Venturi flume
- BST[3)]-Venturi flume
- Parshall flume
- Palmer-Bowlus flume
- Rectangular weir
- Rectangular constricted weir
- NFX[4)] rectangular weir
- NFX[4] rectangular constricted weir
- Trapezoidal weir
- V-notch weir
- BST[3] V-notch weir
- NFX[4] V-notch weir

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

Linearization formula for flow measurements[2]

$Q = C (h^{\alpha} + \gamma h^{\beta})$
"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 functions[5)]:
  - 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) totalisers[2]
- triggering of a sampler by time or quantity pulses[2]
- low flow cut off[2]
- backwater detection in flumes[2]
- sludge detection in flumes[2]
- trend detection

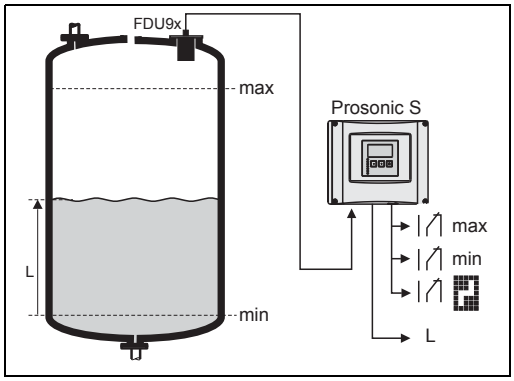
Datalog functions

- 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

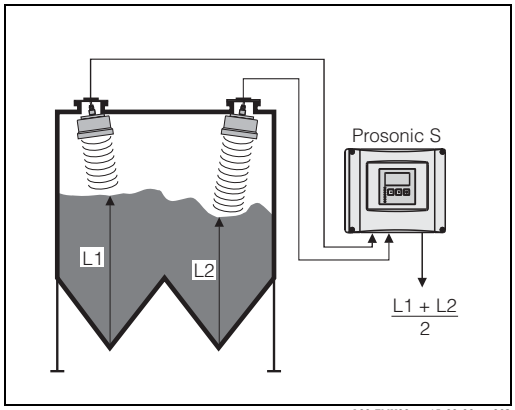
Level measurement with limit detection and alarm output



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

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

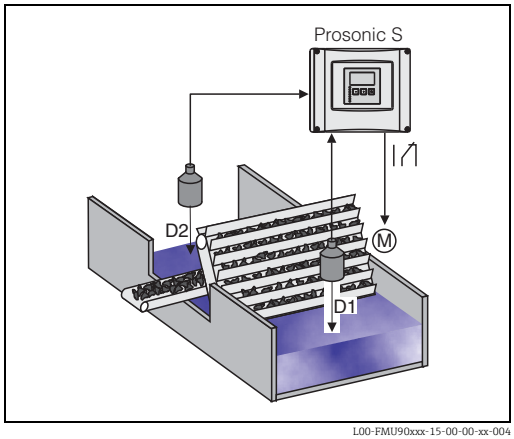
Average level measurement



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

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

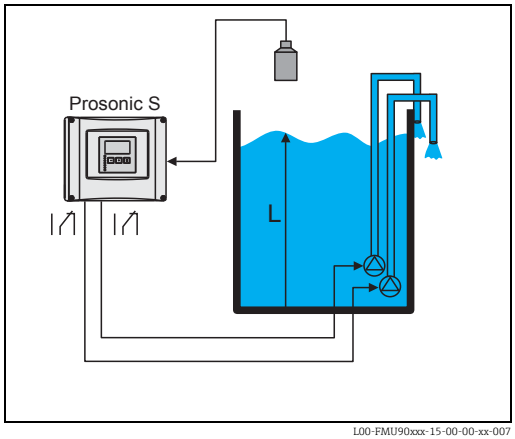
Rake control (differential measurement)



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

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

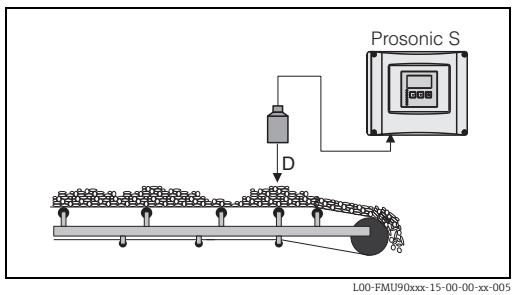
Alternating pump control (up to 6 pumps)



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

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

Conveyor belt

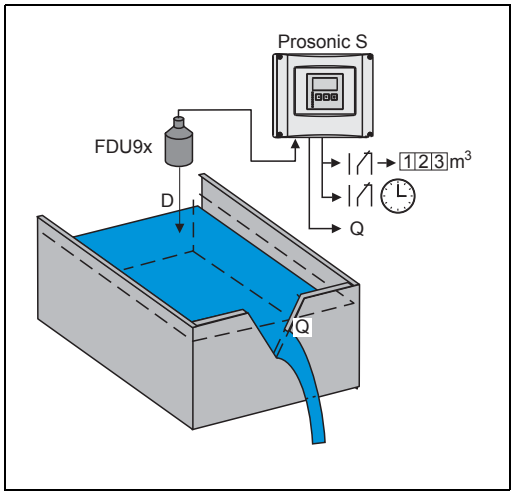


L00-FMU90xxx-15-00-00-xx-005

*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)

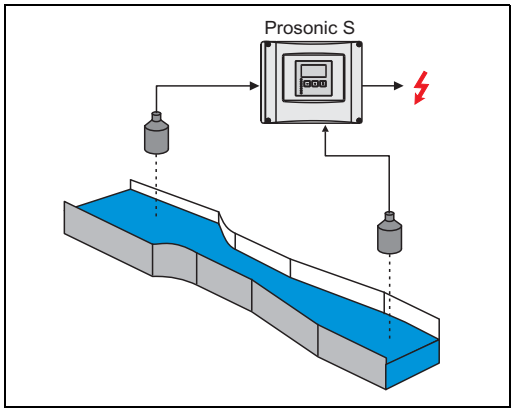


L00-FMU90xxx-15-00-00-xx-011

*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.

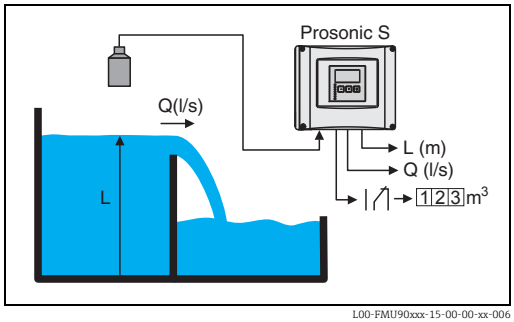


L00-FMU90xxx-15-00-00-xx-008

*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.



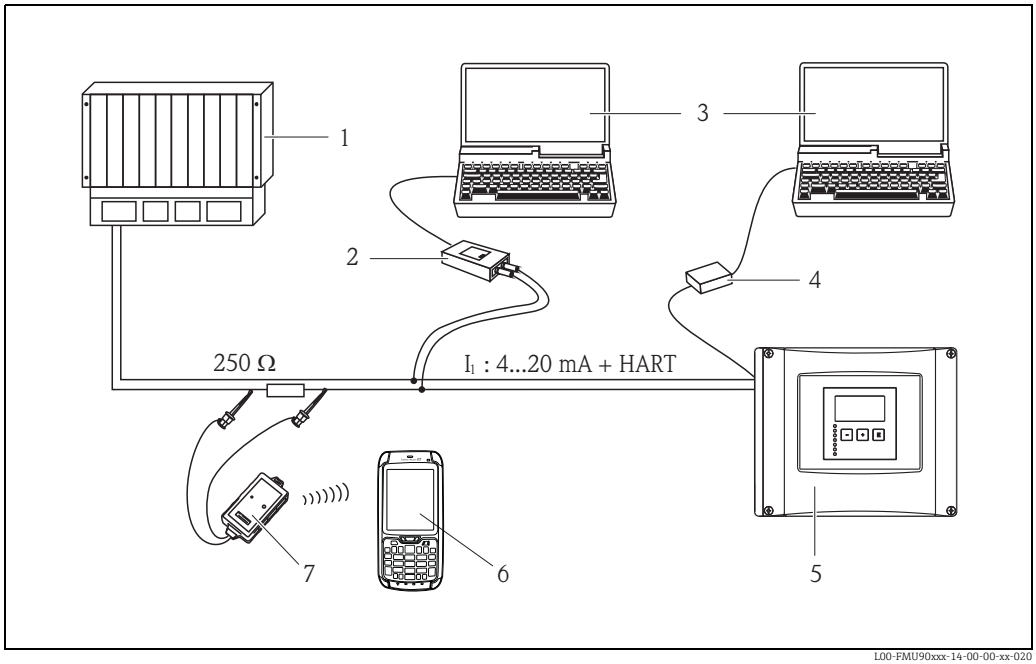
L00-FMU90xxx-15-00-00-xx-006

*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.



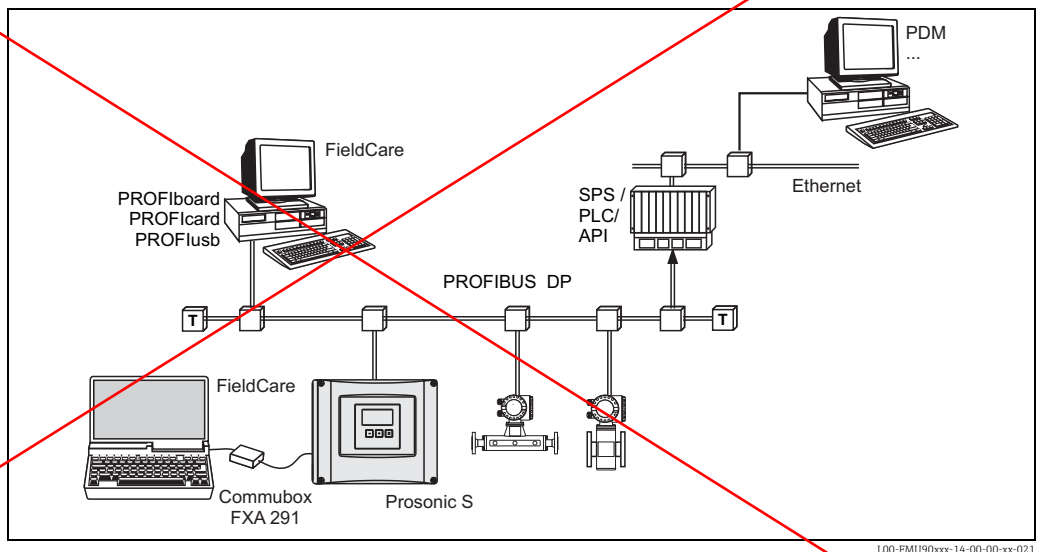
L00-FMU90xxx-14-00-00-xx-020

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-FMU90xxx-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: ▪ 4 to 20 mA with HART[1)] ▪ 0 to 20 mA without HART
Signal on alarm	▪ For setting 4 to 20 mA, selectable: – MIN: -10 % (3,6 mA) – MAX: 110 % (22 mA) – HOLD (last current value is held) – User specific ▪ For setting 0 to 20 mA: – 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 mV at 47 to 125 Hz (measured at 500 Ω)
Max. noise	U_{eff} = 2,2 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	▪ Limit (inband, out-of-band, trend, level limit) ▪ Counting pulse[1] for flow counting (max. frequency 2 Hz; pulse width adjustable) ▪ Time pulse[1] (max. frequency 2 Hz; pulse width adjustable) ▪ Alarm/diagnosis (e.g. indication of backwater[1)], sludge[1], 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 direclty from the PROFIBUS DP-bus)
Switching power	▪ DC voltage: 35 V_{DC}, 100 W ▪ AC voltage: 4 A, 250 V, 1000 VA at cosφ = 0,7
State on error	Selectable: ▪ 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	▪ Main value (level or flow, depending on the instrument version) ▪ Distances ▪ Counters ▪ Temperatures ▪ Average/difference/sum ▪ Relay states ▪ Rake control ▪ Pump control
Function blocks	▪ 10 Analog Input Blocks (AI) ▪ 10 Digital Input Blocks (DI) ▪ 10 Digital Output Blocks (DO)
Supported baud rates	▪ 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

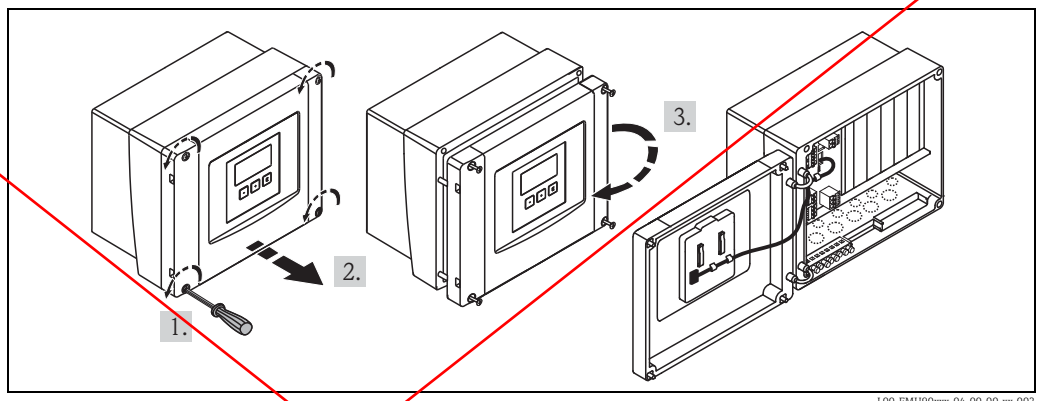
- 2 A T /DC
- 400 mA T /AC

Accessible in the terminal compartment

Electrical connection

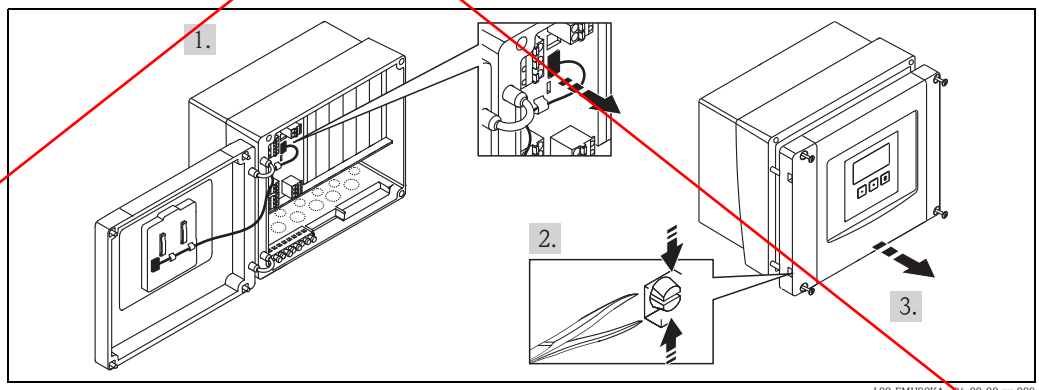
Terminal compartment of the field housing polycarbonate

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-FMU90KAx-04-00-00-xx-009

Cable entries of the field housing polycarbonate

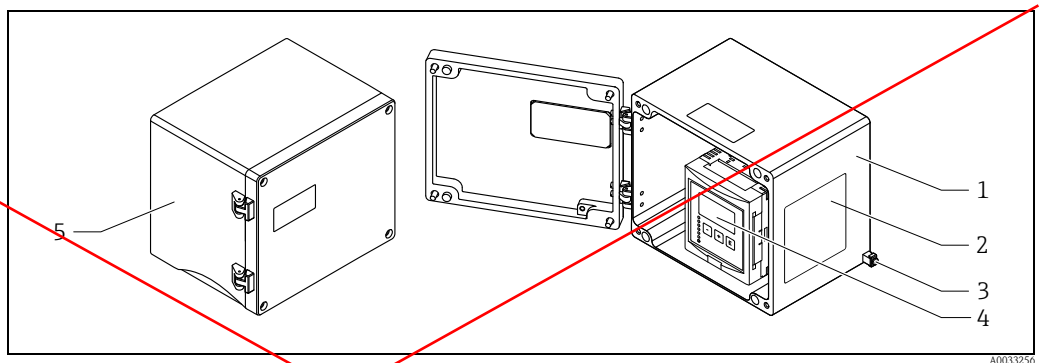
On the bottom of the housing the following openings for cable entries are prestamped:
- M20x1.5 (10 openings)
- M16x1.5 (5 openings)
- M25x1.5 (1 opening)

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

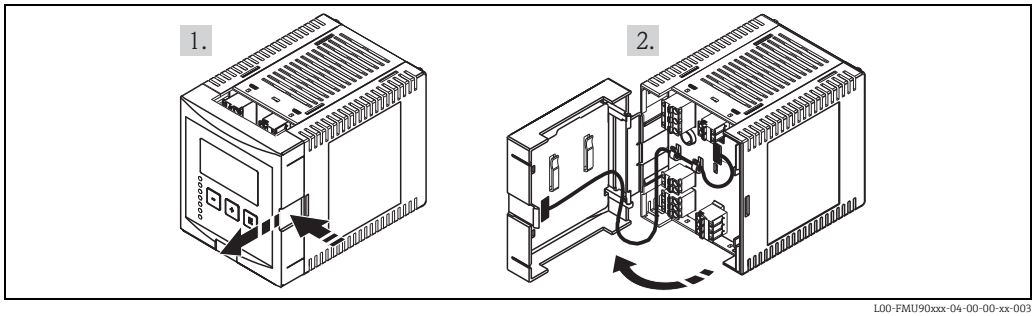
At the bottom of the housing are 12 cable entries M20x1,5 located :

HINWEIS

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

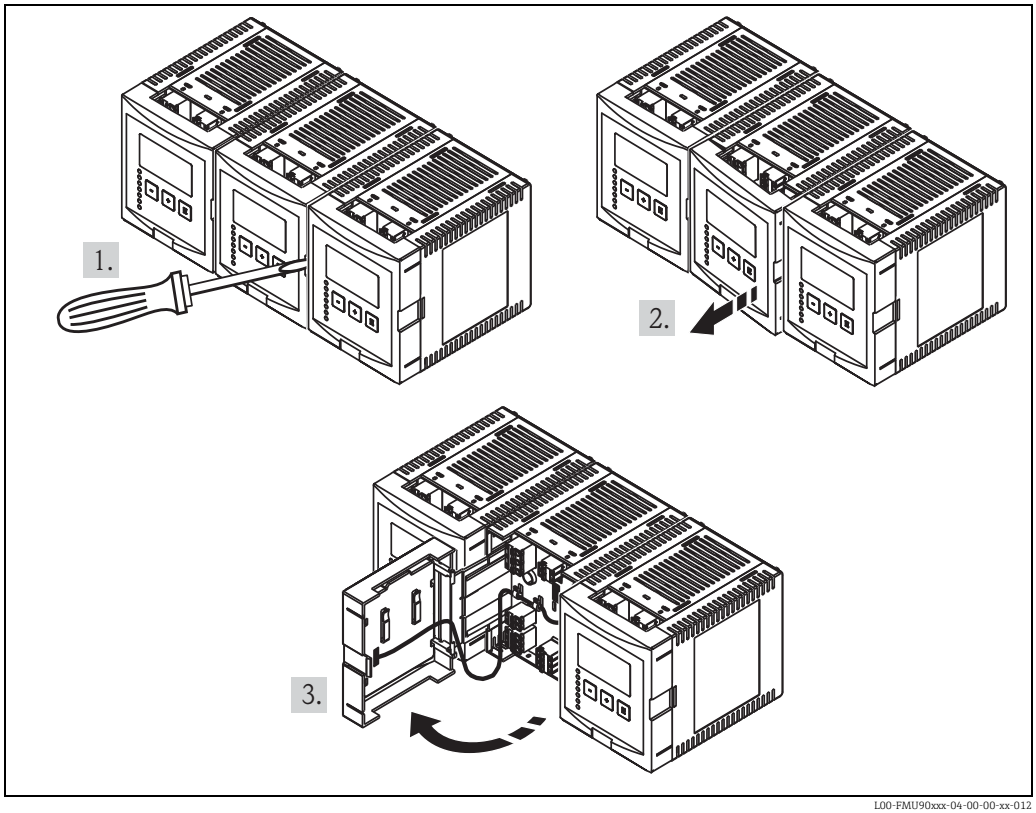
Terminal compartment of the DIN-rail housing

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").

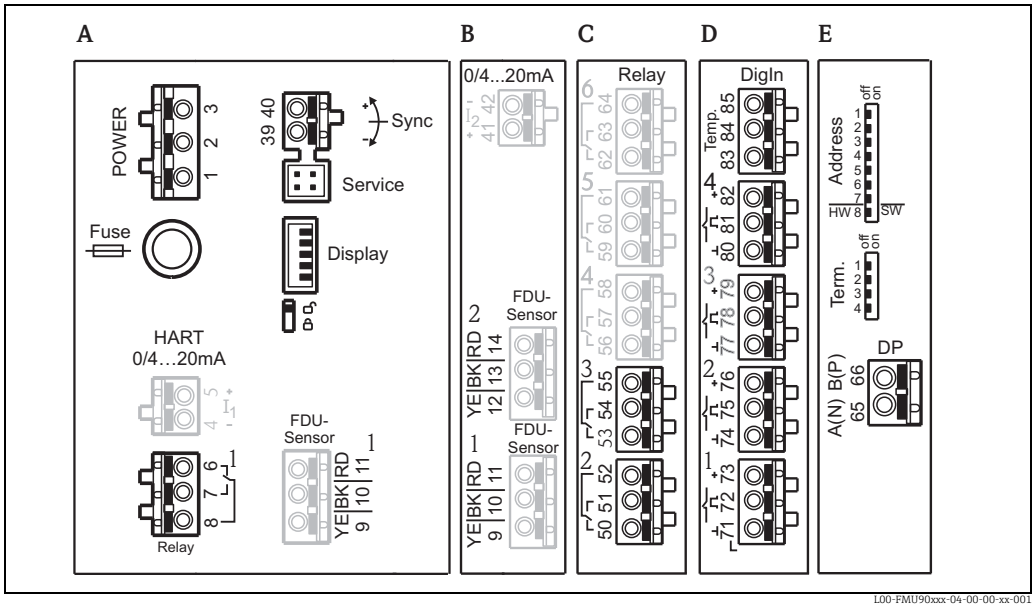
Terminal assignment

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****)



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	▪ L (für AC version) ▪ L+ (for DC version)	A	Depending on instrument version: ▪ 90 to 253 V_{AC} ▪ 10,5 to 32 V_{DC}
2	▪ N (for AC version) ▪ L- (for DC version)	A	
3	Potential equalization	A	
Fuse		A	Depending on instrument version: ▪ 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	▪ A: for versions with 1 sensor input ▪ B: for versions with 2 sensor inputs[1)]	
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: ▪ 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.

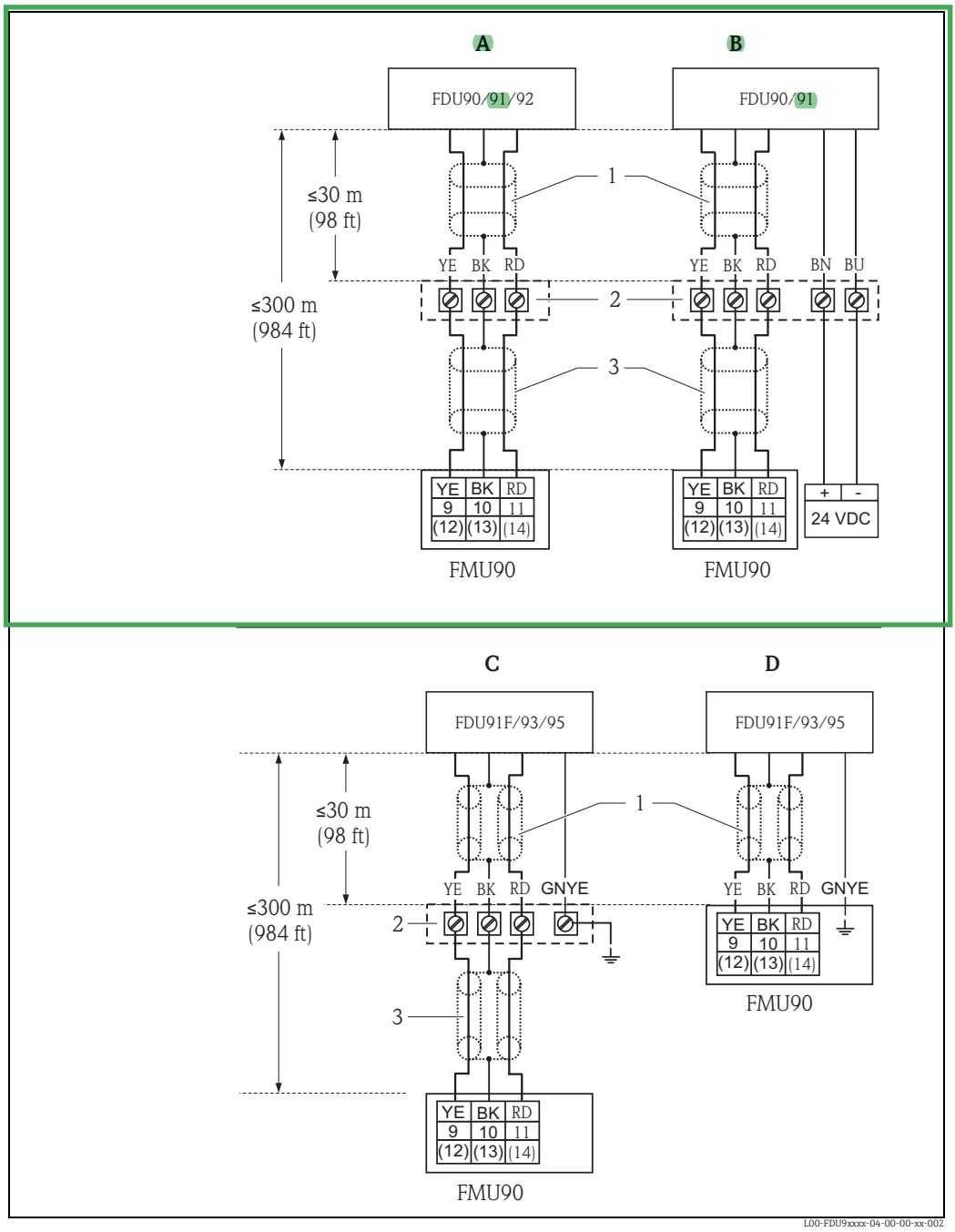
- When using the public supply mains, an easily accessible power switch must be installed in the proximity of the device. The power switch must be marked as a disconnector for the device (IEC/EN 61010).

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*

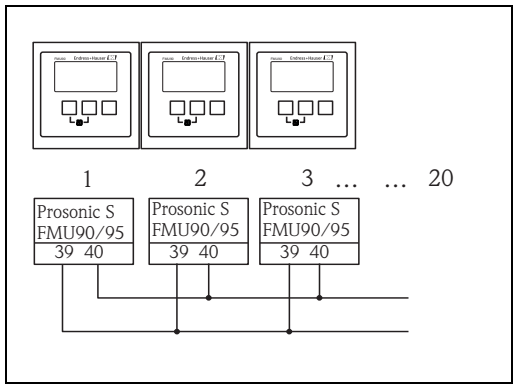
Colours of the strands: YE = yellow; BK = black; RD = red; BU = blue; BN = brown; GNYE = green-yellow

For details refer to Technical Information TI00396F[7)].

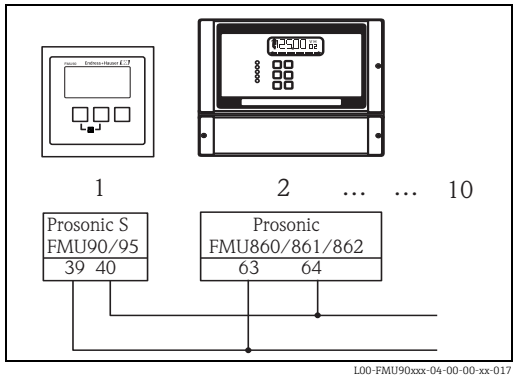
7) The sensors FDU80/80F/81/81F/82/83/84/85/86/96 are not available anymore.
Use the serial number of your device to access the documentation for your device via www.endress.com.

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 seperated 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 mm^2 (18 to 14 AWG))
  - for lengths up to 1 m (3.3 ft), an unscreened cable can be used; for lenghts 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.

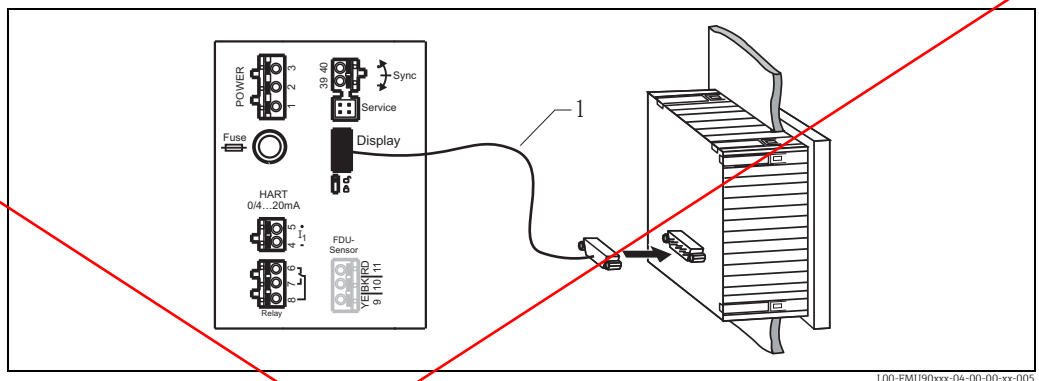


L00-FMU90xxx-04-00-00-xx-004



L00-FMU90xxx-04-00-00-xx-017

Connection of the separate display and operating module



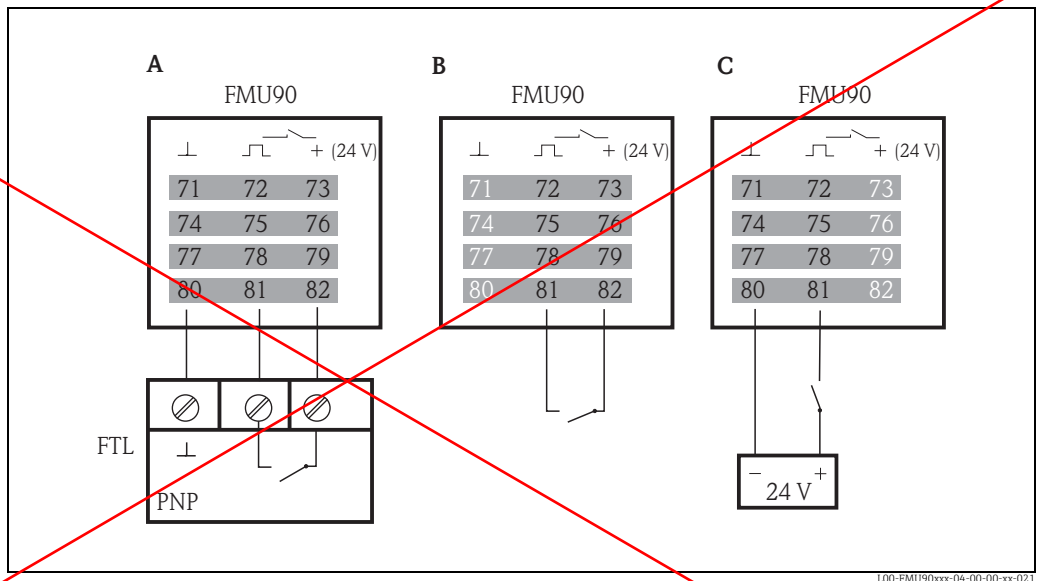
L00-FMU90xxx-04-00-00-xx-005

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.

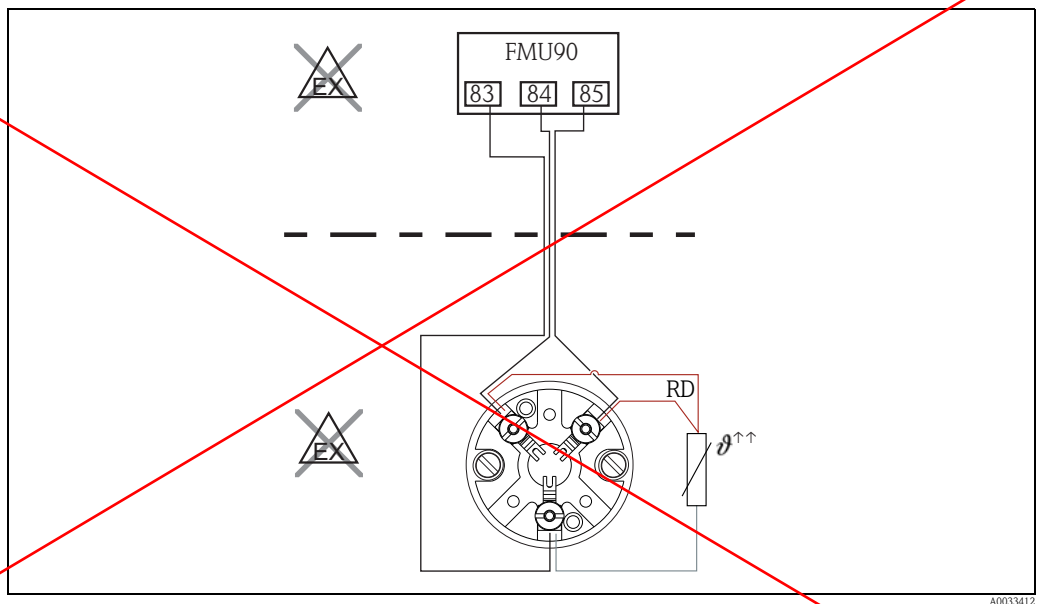
Omnigrad S TR61 (Endress+Hauser) (connectable to FMU90-******B***)**

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**********

95



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-******B***)**

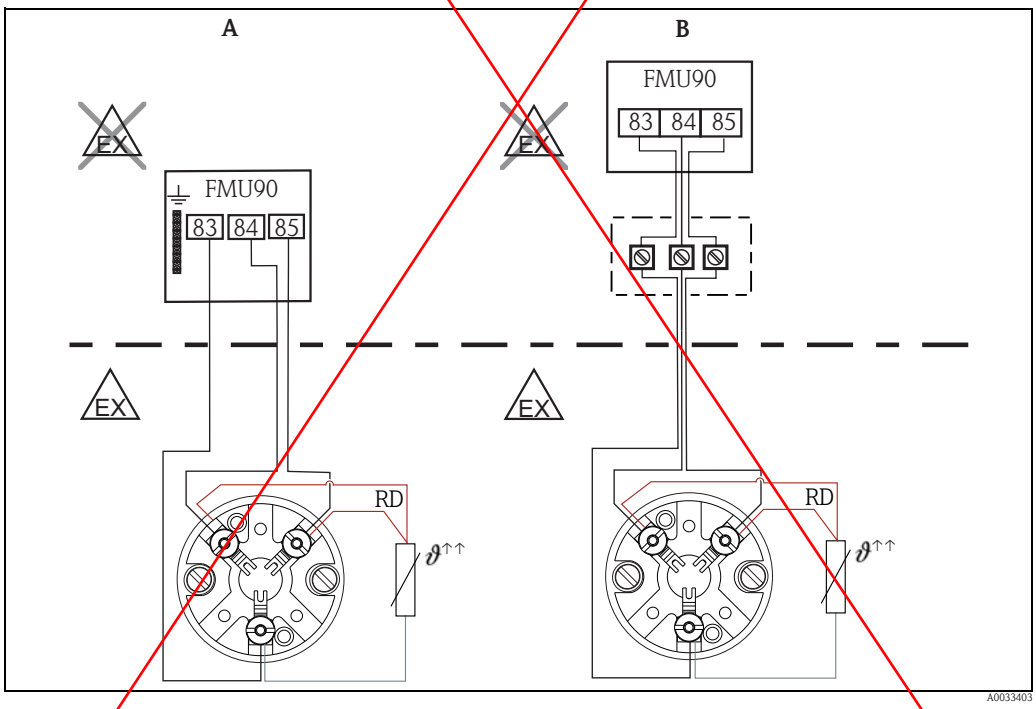
For explosion-hazardous areas, an Omnigrad S TR61 with ceramic terminal block (no head transmitter) can be used, which has appropriate approval for the corresponding area.

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.

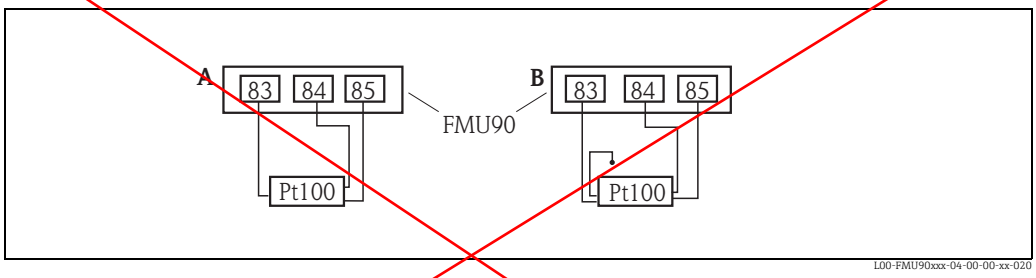


A Ex area
B Ex area, with connection via terminal box
RD Cable color = Red

More information can be found in the following documents:

- TI01029T

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



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

- 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 m^2 (10.76 ft^2))
- No interference echoes within the signal beam
- Settings of the application parameters:
  - 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 error[9)]

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

- **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

- Housing for DIN rail: DIN EN 60068-2-64 / IEC 68-2-64; 20 to 2000 Hz; 0,5 $(m/s^2)^2/Hz$
- Field housing polycarbonate: DIN EN 60068-2-64 / IEC 68-2-64; 20 to 2000 Hz; 1,0 $(m/s^2)^2/Hz$
- Field housing aluminium: DIN EN 60068-2-64 / IEC 68-2-64; 20 to 2000 Hz; 1,0 $(m/s^2)^2/Hz$

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)

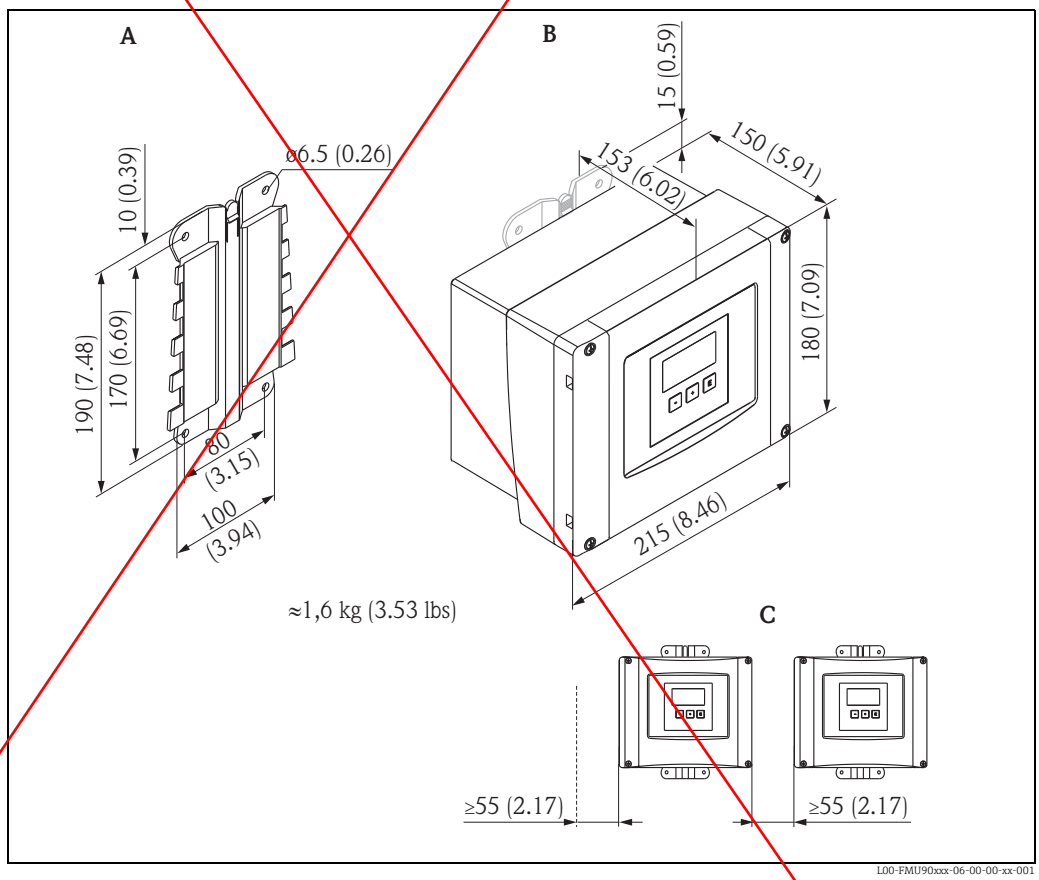
Electromagnetic compatibility according to all relevant requirements of the EN 61326- series and NAMUR recommendation EMC (NE21). For details see declaration of conformity.
With respect to interference emission the devices meet the requirements of class A and are only provided for use in an "industrial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



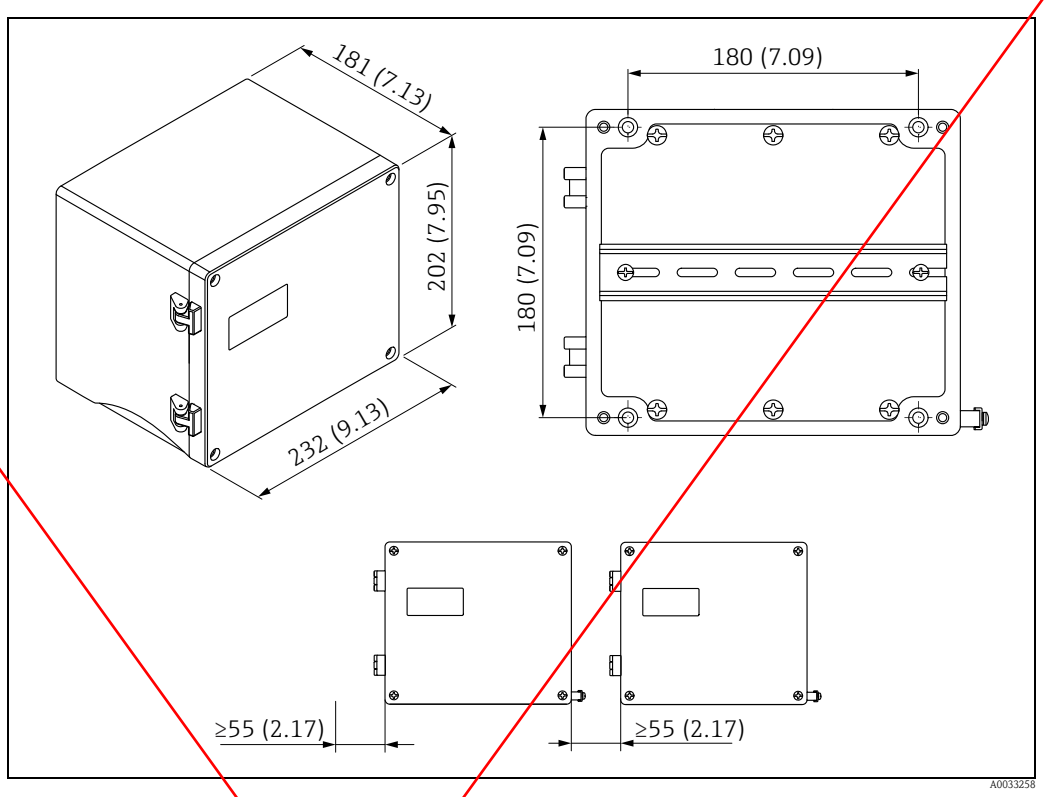
Dimensions in mm (in)

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.

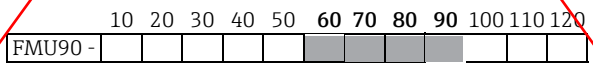
Dimensions of the DIN-rail housing

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.



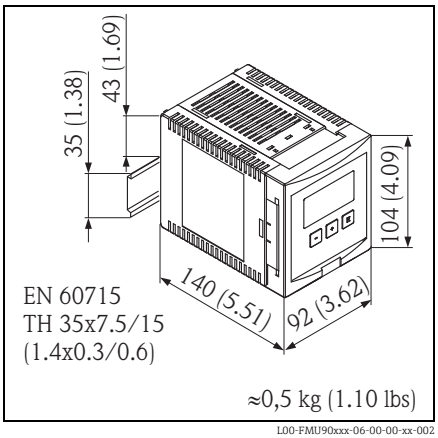
2. Using the following table, determine how many optional terminal areas this instrument version contains.

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 o 6 relays	

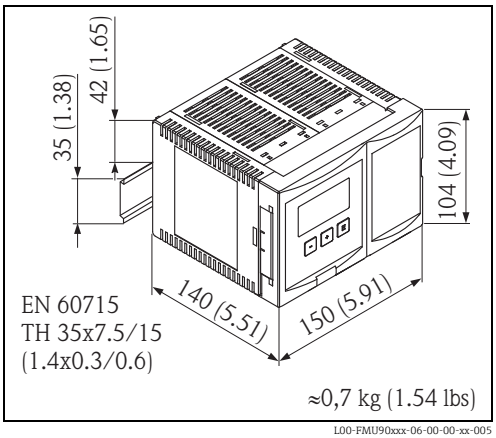
Feature 80, option 3	PROFIBUS DP interface	
Feature 90, option B	Inputs for external switches and external temperature sensor	
	Sum =	

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

Sum = 0
(only basic terminal area)

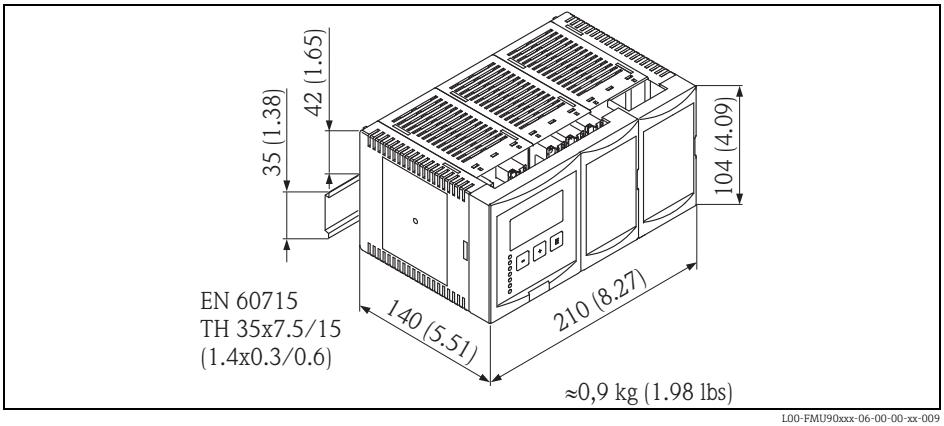


Sum = 1, 2 or 3
(1-3 optional terminal areas)



Dimensions in mm (in)

Sum = 4
(4 optional terminal areas)



Dimensions in mm (in)

Example

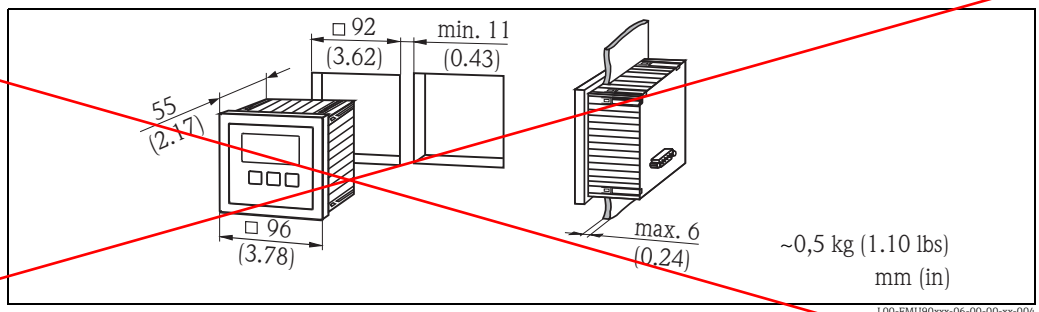
	10	20	30	40	50	**60**	**70**	**80**	**90**	100	110	120
FMU90 -	R	1	2	A	A	2	3	2	A	A	1	A

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 sensorr	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

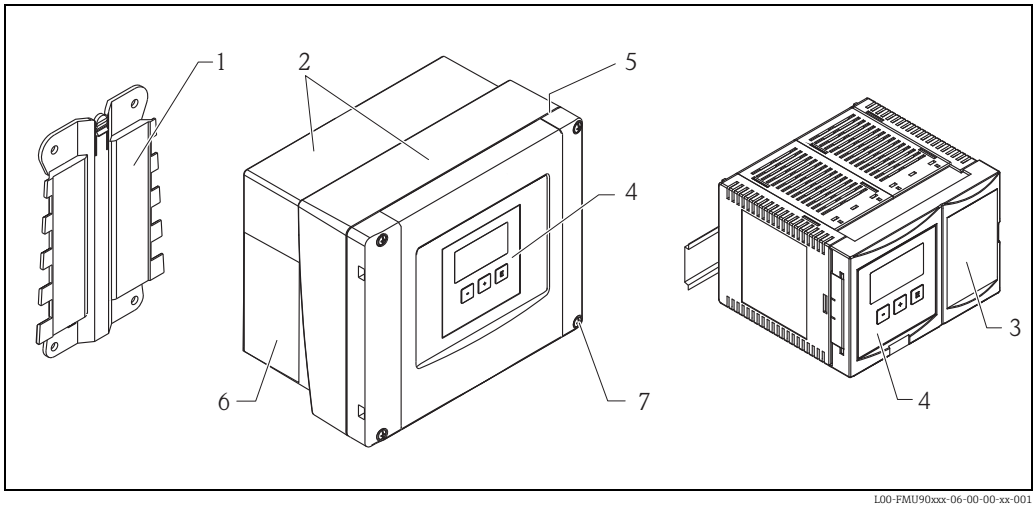


Weight

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

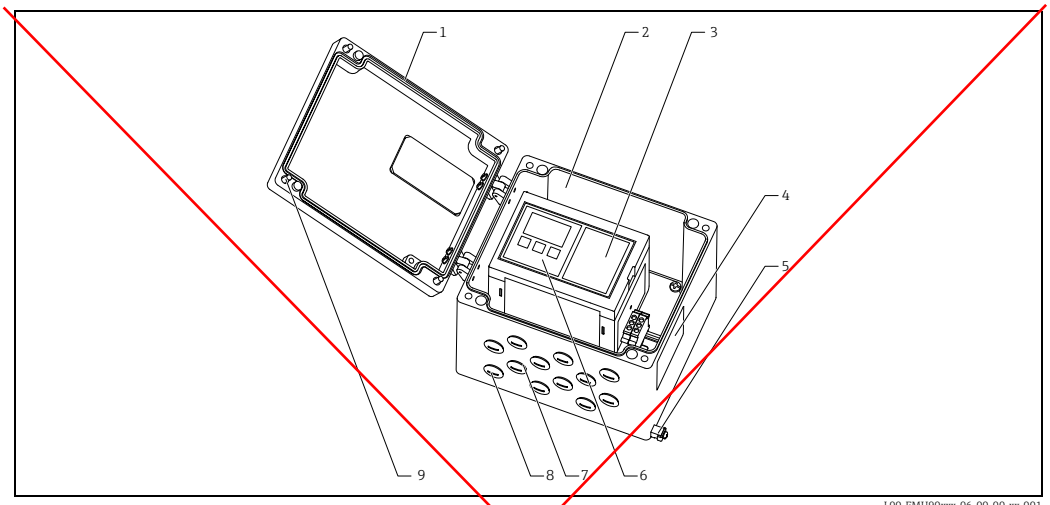
Field housing polycarbonate with DIN rail



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)

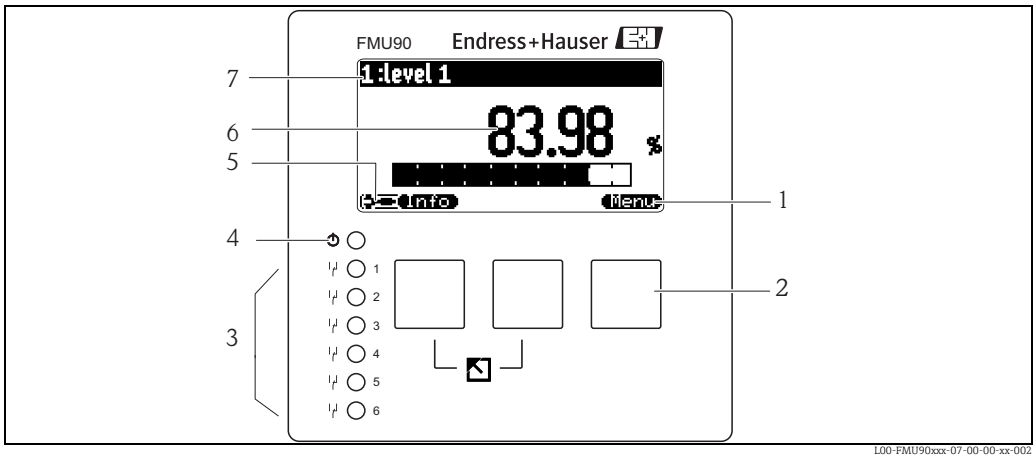
Field housing aluminium with DIN rail



Pos.	Bauteil	Werkstoff
1	Sealing	Silicone
2	Field housing aluminium	EN AC-AlSi12 (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

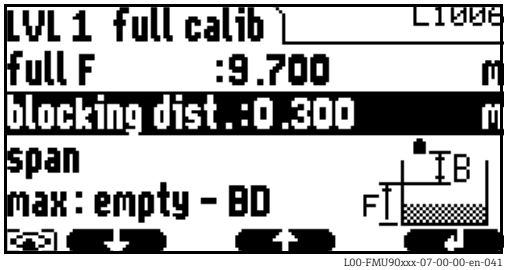
Display and operating module



L00-FMU90xxx-07-00-00-xx-002

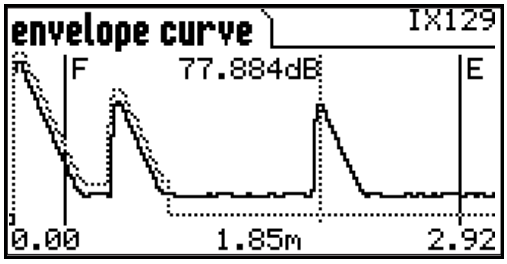
1 *Softkey symbol*
2 *Key*
3 *LEDs indicating the switching states of the relays*
4 *LED indicating the operating state*
5 *Display symbols*
6 *Value of the parameter, including unit*
7 *Name of the parameter*

Display (Examples)



L00-FMU90xxx-07-00-00-en-041

Display of a function including help text and descriptive graphic



L00-FMU90xxx-19-00-00-en-089

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: ▪ 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

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.

Endress+Hauser confirms successful testing of the device by affixing to it the EAC mark.

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

EN 60529

Protection class of housing (IP code)

EN 61326 series

EMC product family standard for electrical equipment for measurement, control and laboratory use

NAMUR

User association for automation technology in process industries

US Standard UL 61010-1

CSA General Purpose Units FMU9x-N********** are tested according to US standard UL 61010-1, 2nd edition

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 plombing the device

Accessories

Commubox FXA195 HART

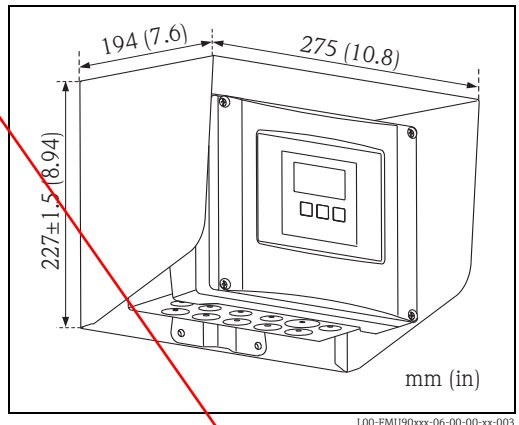
For intrinsically safe communication with FieldCare via the USB interface. For details refer to TI00404F/00/EN.

Commubox FXA291

The Commubox FXA291connects 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

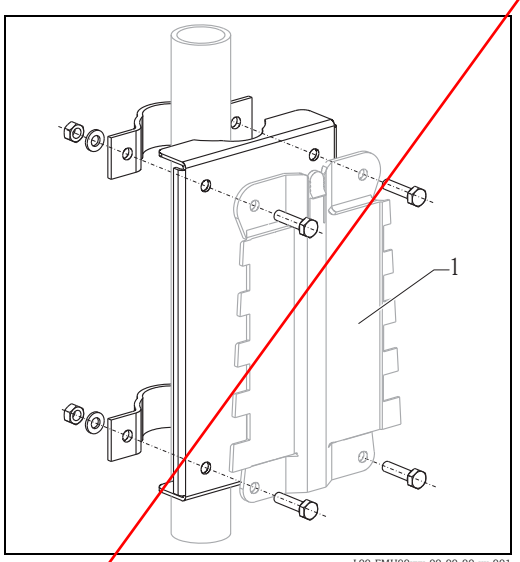
- Material: 316Ti (1.4571)
- is mounted by the mounting help of the Prosonic S
- Order-Code: 52024477



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

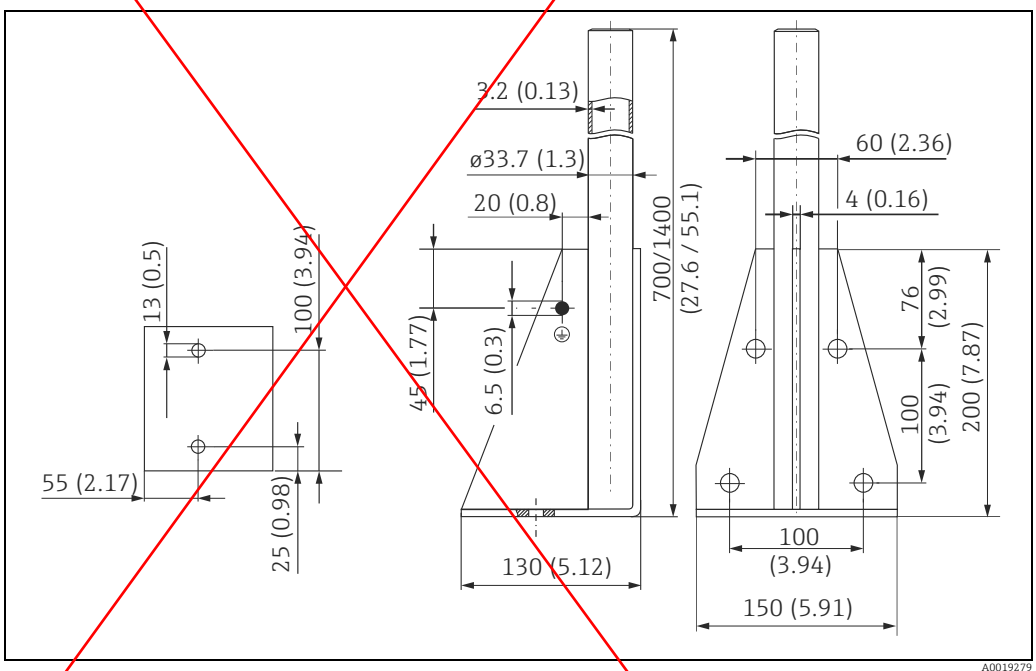
Mounting plate for the field housing polycarbonate

- 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



1 Mounting help of the field housing

Mounting bracket



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

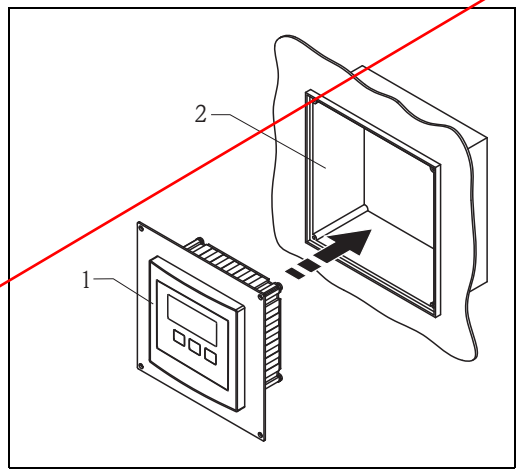
mm (in)

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).



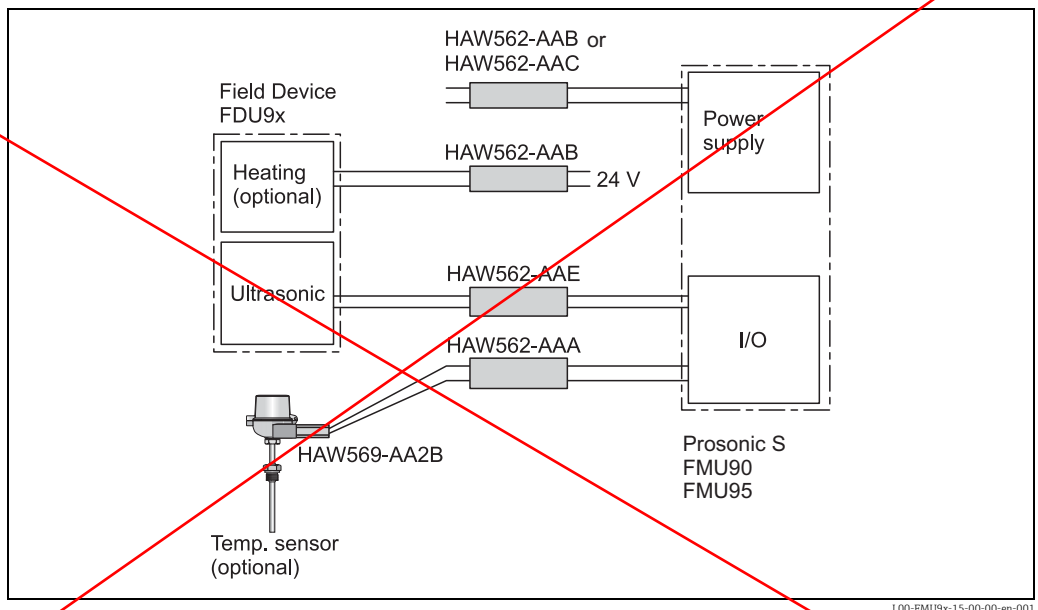
L00-FMU90xxx-00-00-00-xx-001

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

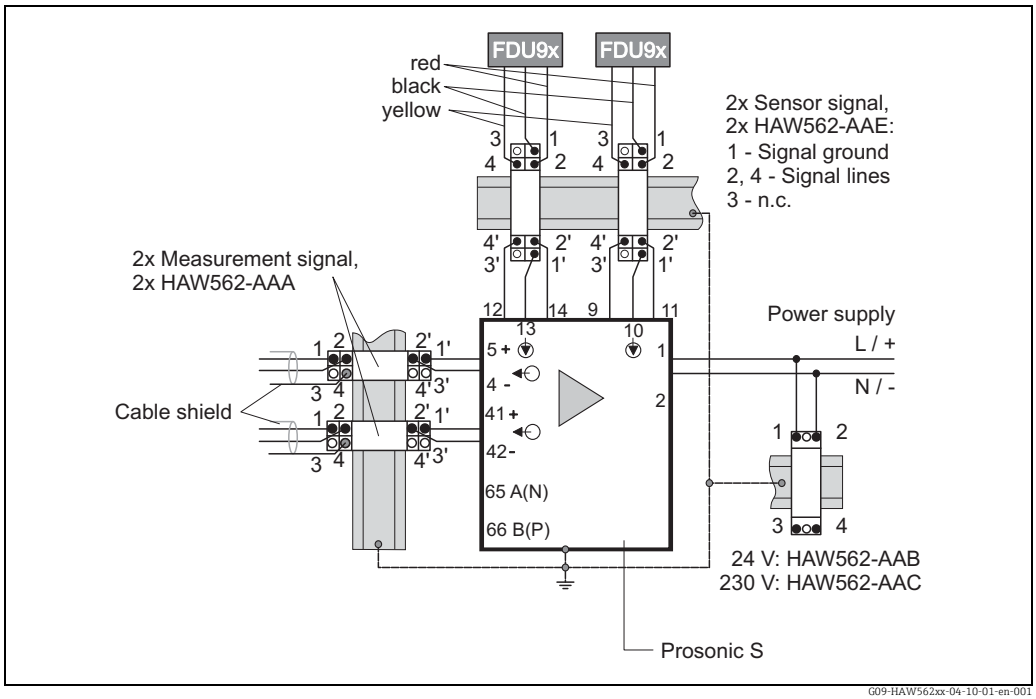
Overvoltage protection HAW562

System principle

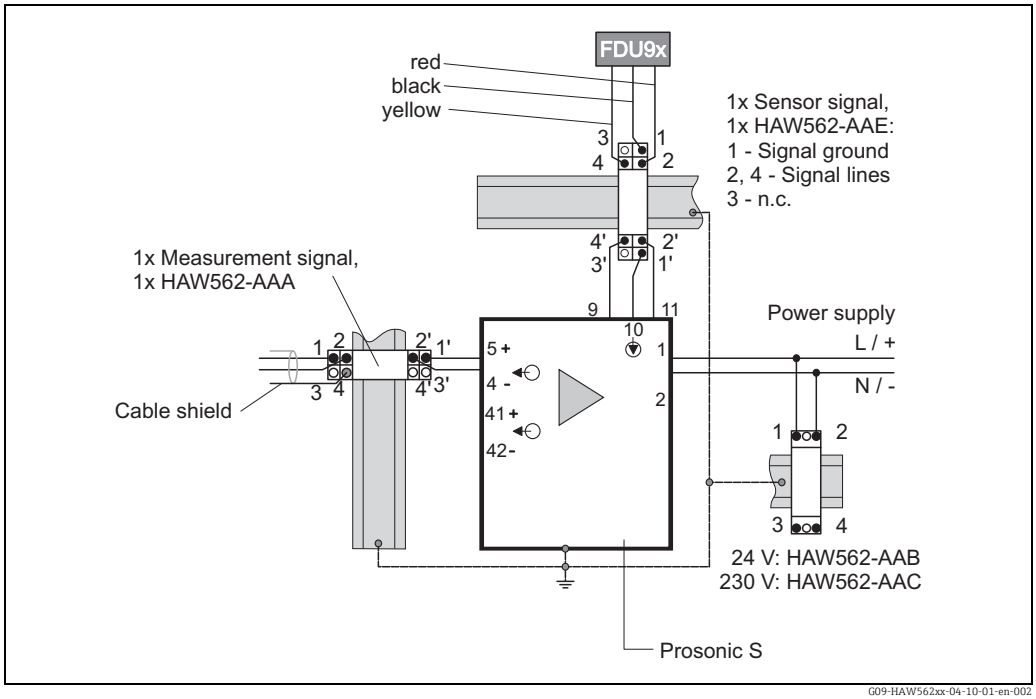


L00-FMU9x-15-00-00-en-001

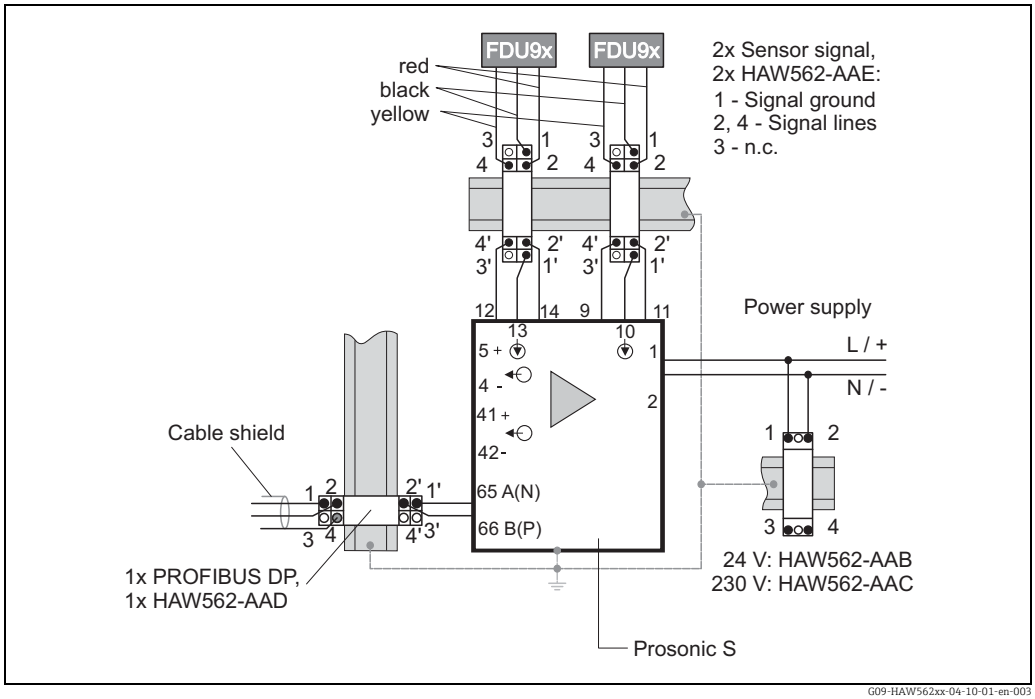
Application examples



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



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

Ordering information

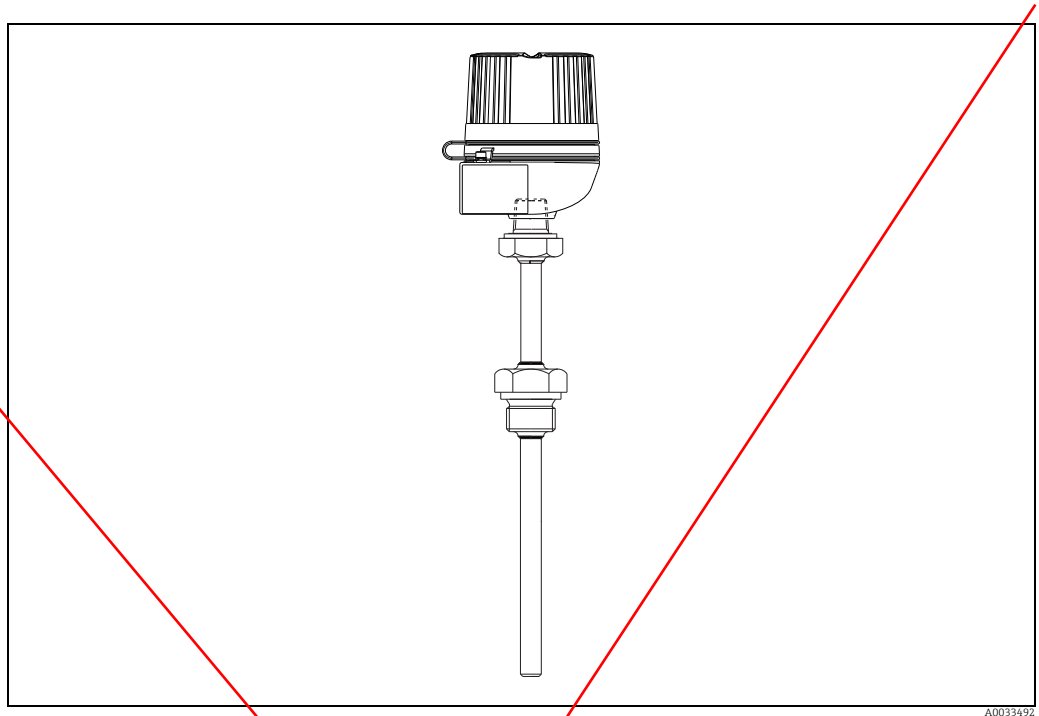
Surge Arrester HAW562, compact device for DINrail installation in signal and power supply lines and communication lines protecting field devices and systems against overvoltage and magnetic induction.

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



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/FDU95[10)]

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	▪ level measurement ▪ alternating pump control ▪ screen and rake control	FMU90 - *******1**** FMU90 - *******2****
BA00289F		▪ flow measurement ▪ backwater and dirt detection ▪ totalizers and counters	FMU90 - *2*****1**** FMU90 - *4*****1**** FMU90 - *2*****2**** FMU90 - *4*****2****
BA00292F	PROFIBUS DP	▪ level measurement ▪ alternating pump control ▪ screen and rake control	FMU90 - *******3****
BA00293F		▪ 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

Endress+Hauser

People for Process Automation

G. Solenoid Valves

- 2 x ½" AISI 304, full port solenoid valves for Wash Press Washing & Flushing (EF8210G087)

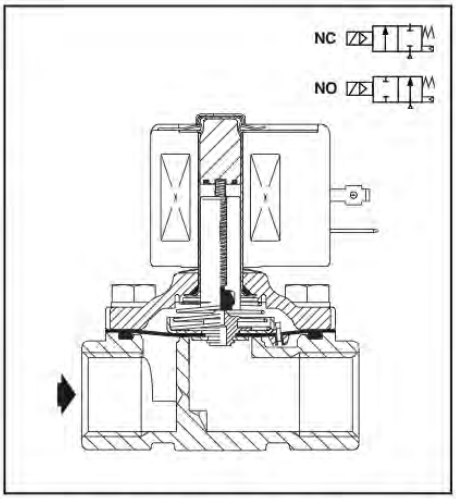
ASCO® RedHat®

Pilot Operated
General Service Solenoid Valves
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			
		AC			General Purpose		Explosionproof	
	DC Watts	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	15.8	-	-	-	-	501695	-	501696
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.*

11

Claro

2-WAY

2/2 SERIES 8210

ASCO®

Specifications (English units)

Pipe Size (in)	Orifice Size (in)	Cv Flow Factor	Operating Pressure Differential (psi)							Max. Fluid Temp. °F		Brass Body			Stainless Steel Body			Watt Rating/ Class of Coil Insulation ⑦	
			Min.	Max. AC			Max. DC												
				Air-Inert Gas	Water	Light Oil @ 300 SSU	Air-Inert Gas	Water	Light Oil @ 300 SSU	AC	DC	Catalog Number	Const. Ref. ④	UL ⑤ Listing	Catalog Number	Const. Ref. ④	UL ⑤ Listing	AC	DC
NORMALLY CLOSED (Closed when de-energized), NBR or PTFE ② Seating																			
3/8	3/8	1.5	①	150	125	-	40	40	-	180	150	8210G073 ③	1P	●	8210G036 ③	1P	●	6.1/F	11.6/F
3/8	5/8	3	0	150	150	-	40	40	-	180	150	8210G093	5D	○	-	-	-	10.1/F	11.6/F
3/8	5/8	3	5	200	150	135	125	100	100	180	150	8210G001 ▼	6D	○	-	-	-	6.1/F	11.6/F
3/8	5/8	3	5	300	300	300	-	-	-	175	-	8210G006 ✓	5D	○	-	-	-	17.1/F	-
1/2	7/16	2.2	①	150	125	-	40	40	-	180	150	8210G015 ③	2P	●	8210G037 ③	2P	●	6.1/F	11.6/F
1/2	5/8	4	0	150	150	-	40	40	-	180	150	8210G094 ✓♦	5D	○	-	-	-	10.1/F	11.6/F
1/2	5/8	4	0	150	150	125	40	40	-	175	150	-	-	-	8210G087 ✓	7D	●	17.1/F	11.6/F
1/2	5/8	4	5	200	150	135	125	100	100	180	150	8210G002 ▼♦	6D	○	-	-	-	6.1/F	11.6/F
1/2	5/8	4	5	300	300	300	-	-	-	175	-	8210G007	5D	○	-	-	-	17.1/F	-
1/2	3/4	4	5	-	300	-	-	300	-	130	90	8210G227	5D	○ †	-	-	-	17.1/F	40.6/H
3/4	5/8	4.5	0	150	150	125	40	40	-	175	150	-	-	-	8210G088 ✓	7D	●	17.1/F	11.6/F
3/4	3/4	5	5	125	125	125	100	90	75	180	150	8210G009 ▼♦	9D	○	-	-	-	6.1/F	11.6/F
3/4	3/4	5	0	150	150	-	40	40	-	180	150	8210G095 ✓♦	8D	○	-	-	-	10.1/F	11.6/F
3/4	3/4	6.5	5	250	150	100	125	125	125	180	150	8210G003 ▼	11D	○	-	-	-	6.1/F	11.6/F
3/4	3/4	6	0	350	300	200	200	200	200	200	180	8210G026 ② ‡ ◆	40P/10D	●	-	-	-	16.1F	30.8/F
1	1	13	0	150	125	125	135	120	120	180	180	8210G054 ‡ ◆	41D/31D	●	8210G089 ‡ ◆	45D/15D	●	16.1/F	30.8/F
1	1	13	5	150	150	100	125	125	125	180	150	8210G004 ▼♦	12D	○	-	-	-	6.1/F	11.6/F
1	1	13.5	0	300	225	115	-	-	-	200	-	8210G027	42P	●	-	-	-	20.1/F	-
1	1	13.5	10	300	300	300	-	-	-	175	-	8210G078 ⑦	13P	-	-	-	-	17.1/F	-
1 1/4	1 1/8	15	0	150	125	125	135	120	120	180	180	8210G055 ‡ ◆	43D/32D	●	-	-	-	16.1/F	30.8/F
1 1/4	1 1/8	15	5	150	150	100	125	125	125	180	150	8210G008 ▼	16D	○	-	-	-	6.1/F	11.6/F
1 1/2	1 1/4	22.5	0	150	125	125	135	120	120	180	180	8210G056 ‡ ◆	44D/33D	●	-	-	-	16.1/F	30.8/F
1 1/2	1 1/4	22.5	5	150	150	100	125	125	125	180	150	8210G022 ▼	18D	○	8210G127	52D	●	6.1/F	11.6/H
2	1 3/4	43	5	150	125	90	50	50	50	180	150	8210G100	20P	●	8210G129	53P	●	6.1/F	11.6/H
2 1/2	1 3/4	45	5	150	125	90	50	50	50	180	150	8210G101	21P	●	-	-	-	6.1/F	11.6/F
NORMALLY OPEN (Open when de-energized), NBR Seating (PA Disc-Holder, except as noted)																			
3/8	5/8	3	0	150	150	125	125	125	80	180	150	8210G033	23D	●	-	-	-	10.1/F	11.6/F
3/8	5/8	3	5	250	200	200	250	200	200	180	180	8210G011 ⑥ ⑨	39D	●	-	-	-	10.1/F	11.6/F
1/2	5/8	4	0	150	150	125	125	125	80	180	150	8210G034 ✓	23D	●	-	-	-	10.1/F	11.6/F
1/2	5/8	3	0	150	150	100	125	125	80	180	150	-	-	-	8210G030 ✓	37D	●	10.1/F	11.6/F
1/2	5/8	4	5	250	200	200	250	200	200	180	180	8210G012 ⑥ ⑨	39D	●	-	-	-	10.1/F	11.6/F
3/4	3/4	5.5	0	150	150	125	125	125	80	180	150	8210G035 ✓	25D	●	-	-	-	10.1/F	11.6/F
3/4	5/8	3	0	150	150	100	125	125	80	180	150	-	-	-	8210G038 ✓	38D	●	10.1/F	11.6/F
3/4	3/4	6.5	5	250	200	200	250	200	200	180	180	8210G013	46D/52D	●	-	-	-	16.1/F	15.8/F
1	1	13	0	125	125	125	-	-	-	180	-	8210B057 ⑥ ⑩	34D	●	-	-	-	20/F	-
1	1	13	5	150	150	125	150	150	125	180	180	8210G014	47D/53D	●	-	-	-	16.1/F	15.8/F
1 1/4	1 1/8	15	0	125	125	125	-	-	-	180	-	8210B058 ⑥ ⑩	35D	●	-	-	-	20/F	-
1 1/4	1 1/8	15	5	150	150	125	150	150	125	180	-	8210G018	48D/54D	●	-	-	-	16.1/F	15.8/F
1 1/2	1 1/4	22.5	0	125	125	125	-	-	-	180	-	8210B059 ⑥ ⑩	36D	●	-	-	-	20/F	-
1 1/2	1 1/4	22.5	5	150	150	125	150	150	125	180	180	8210G032	49D/55D	●	8210G132	29D	●	16.1/F	15.8/F
2	1 3/4	43	5	150	125	125	150	150	125	180	180	8210G103	50P/56P	●	8210G133	30P	●	16.1/F	15.8/F
2 1/2	1 3/4	45	5	150	125	125	150	150	125	180	180	8210G104	51P/57P	●	-	-	-	16.1/F	15.8/F

① 5 psi on Air; 1 psi on Water.
② Valve provided with PTFE main disc.
③ Valve includes Ultem (G.E. trademark) piston.
④ Letter "D" = diaphragm construction; "P"= piston construction.
⑤ ○ Safety Shutoff Valve; ● General Purpose Valve.
Refer to Engineering Section (Approvals) for details.
⑥ Valves not available with Explosionproof enclosures.
⑦ On 50 hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts.
⑨ AC construction also has PA seating.
⑩ No disc-holder.
⑪ Stainless steel disc-holder.
† UL listed for fire protection systems per UL429A 120/60, 110/5024VDC, no prefix and voltage options offered.
‡ DC constructions must have solenoid mounted vertical and upright.
✓ ATEX/IECEx certified with prefix "EV".
▼ ATEX/IECEx certified for DC only with prefix "EV".
◆ Not available in 6 Volt DC. EF and HB prefix only.
♦ Valve available with lead-free brass body and bonnet using suffix "LF". The term "Lead-Free" for brass materials is defined by SDWA 1417 as having a maximum weighted average lead content of 0.25% on the wetted surface area.

Claro

Installation & Maintenance Instructions

ASCO Red-Hat II®

OPEN–FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS

SERIES
8003G/H
8202G/H
I&M No.V6584R11
(Section 1 of 2)

— 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–resetable 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.

Temperature Limitations For Series 8003G or 8202G Solenoids for use on Valves Rated at 10.1, 11.6, 17.1, or 22.6 Watts

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).

Temperature Limitations for series 8202H/8003H solenoids (Catalog Numbers 8262H & 8263H valves)

Prefix①	Coil Class	Wattage Ratings AC 60 Hz	AC 50 Hz	DC	Max. Ambient Temperature Normally Closed 8003 solenoid (°C)	Normally Closed 8003 solenoid (°F)	Normally Open 8202 solenoid (°C)	Normally Open 8202 solenoid (°F)
EF, EV	FT	10.1	10.1	–	52	125	52	125
EF, EV	FB	17.1	17.1	–			–	–
	FT	10.1	10.1	–	55	131	55	131
	FB	17.1	17.1	–			–	–
	HT	–	–	11.6	40 ②	104 ②	55	131
	HB	–	–	22.6				
EF, EV	HT	–	–	11.6				
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
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″ h ex 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.

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Installation & Maintenance Instructions

ASCO Red-Hat II ®

OPEN–FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS

SERIES
8003G/H
8202G/H

I&M No.V6584R11
(Section 2 of 2)

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

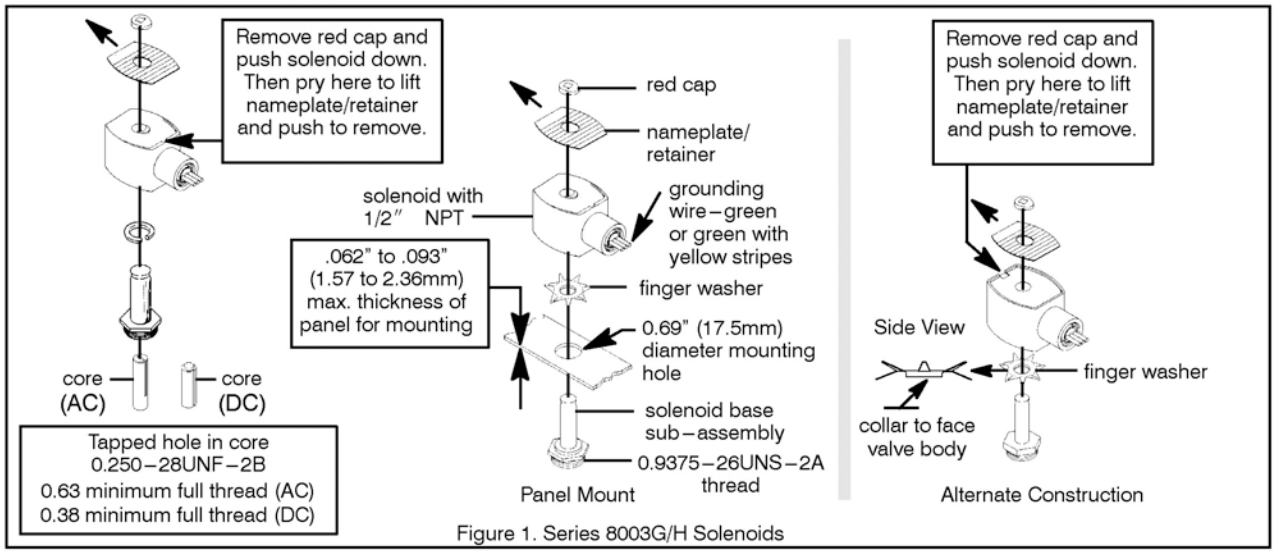

Figure 1. Series 8003G/H Solenoids

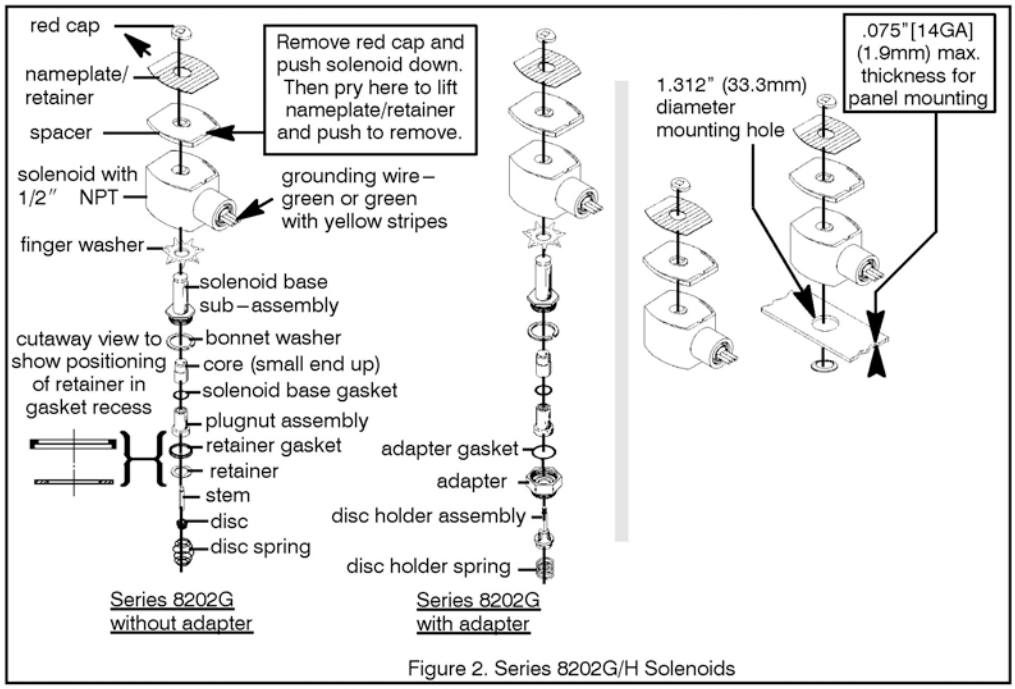

Figure 2. Series 8202G/H Solenoids

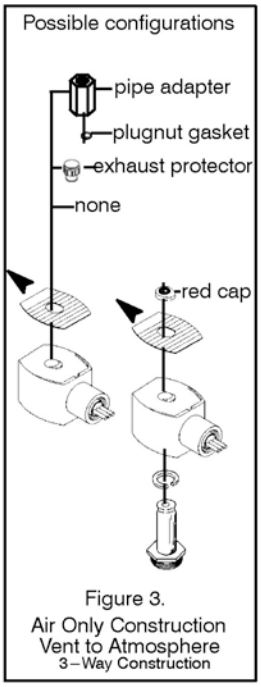

Figure 3.
Air Only Construction
Vent to Atmosphere
3–Way Construction

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

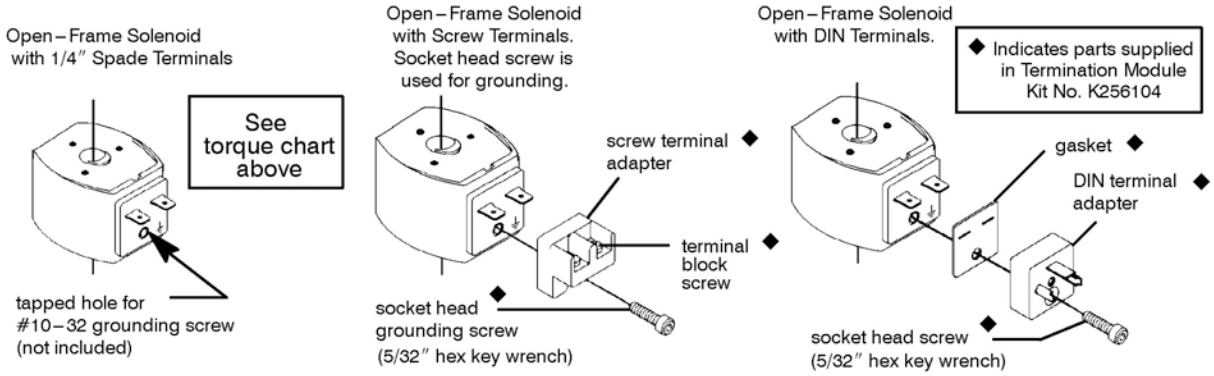

Figure 4. Open–frame solenoids

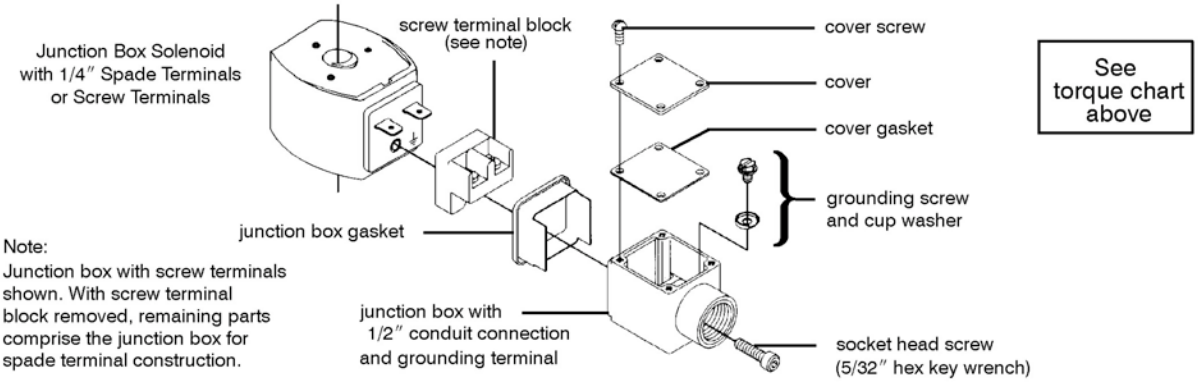

Figure 5. Junction box (optional feature)

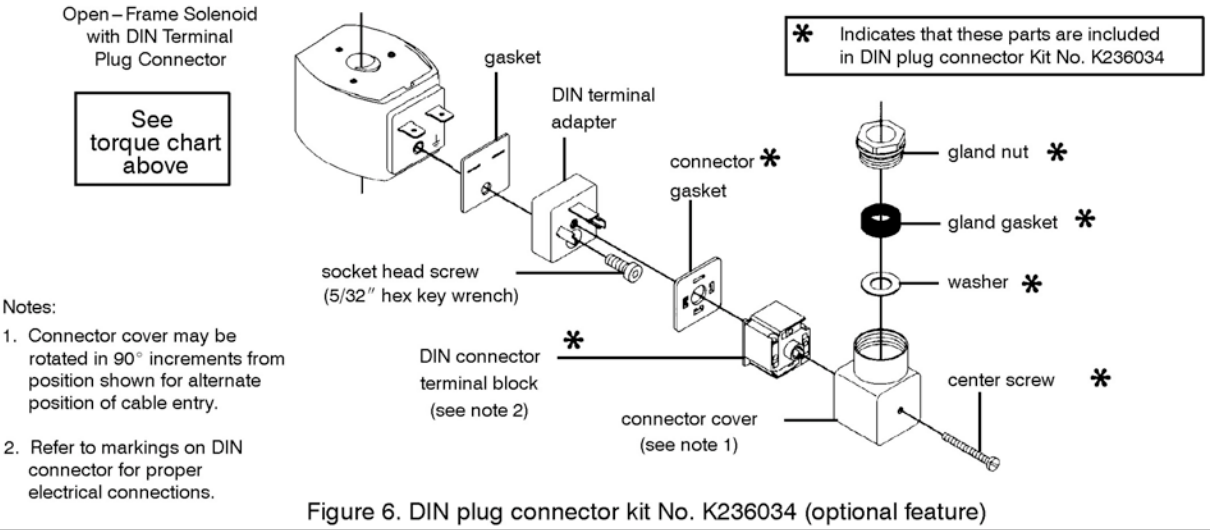

Figure 6. DIN plug connector kit No. K236034 (optional feature)

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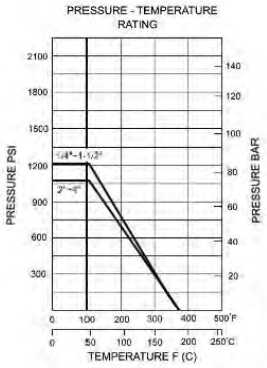
H. Ball Valves (Full Port; AISI 316)

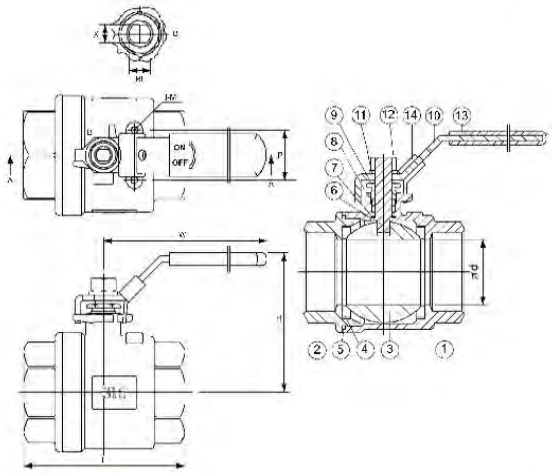
- 1 x ¼" WOG for Pressure Gauge Isolation
- 2 x ½" WOG for Wash Press Isolation
- 1 x ½" WOG for Y-Strainer (if Applicable)

NVC

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	in	mm	mm	in			lb	kg
¼"	8	0.48	11.8	1.75	44.5	2.01	51	.98	25	3.74	95	5	5/16"	2-M6xP1.0	6.8	.46	.21
⅜"	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
½"	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
¾"	20	0.79	20	2.56	65	2.34	59.5	.94	24	4.33	110	6.5	⅜"	2-M6xP1.0	21	.93	.442
1"	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	.706
1¼"	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
1½"	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
2"	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
2½"	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
3"	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

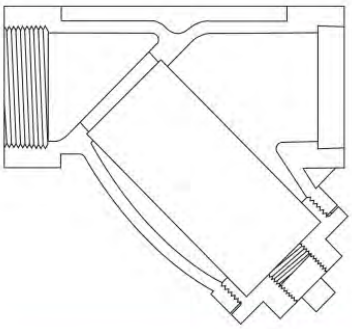
Claro

I. Wye-Strainer (If Service Water Is Not Potable)

• 1 x ½" for Wash Press

ISLIP FLOW CONTROLS Inc.

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.

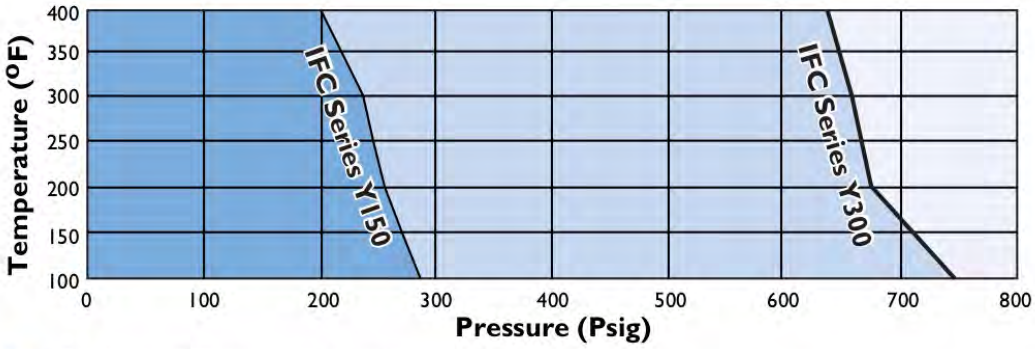
Upper Pressure Limits (Non-Shock)

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)

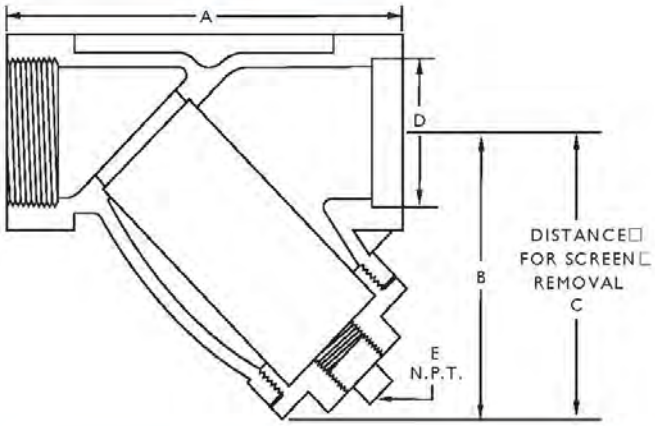


Note: Teflon limited to 400°F maximum sustained operating temperature.
When operating IFC series Y150 and Y300 cast steel strainers at higher temperatures please consult factory.

Tel. 905-335-8777 Fax. 905-335-0977 Toll Free Tel. 1-866-872-0072 Toll Free Fax. 1-866-872-0073

ISLIP FLOW CONTROLS Inc.

IFC Series 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"	-	2.31	-	1.56	-	2.38	-	0.855	-	3/8	-	0.50
15	-	59	-	40	-	60	-	21.72	-	10	-	0.22
3/4"	-	3.13	-	2.13	-	3.19	-	1.065	-	3/8	-	0.82
20	-	80	-	54	-	81	-	27.05	-	10	-	0.37
1"	-	3.31	-	2.63	-	4.00	-	1.330	-	1/2	-	1.50
25	-	84	-	67	-	102	-	33.78	-	15	-	0.68
1 1/4"	-	4.13	-	3.00	-	4.50	-	1.675	-	1/2	-	2.0
32	-	105	-	76	-	114	-	42.55	-	15	-	0.90
1 1/2"	-	4.69	-	3.19	-	4.75	-	1.915	-	1/2	-	2.75
40	-	119	-	81	-	121	-	48.64	-	15	-	1.25
2"	-	5.44	-	3.81	-	5.75	-	2.406	-	1/2	-	4.25
50	-	1.38	-	97	-	146	-	61.11	-	15	-	1.90
2 1/2"	7.19	7.19	4.88	4.88	7.25	7.25	2.906	2.906	1/2	1/2	10	10
65	183	183	124	124	184	184	73.81	73.81	15	15	4.54	4.54
3"	8.00	8.00	5.25	5.25	7.50	7.50	3.535	3.535	1/2	1/2	14	14
80	203	203	133	133	190	190	89.79	89.79	15	15	6.35	6.35

General:

1. For further optional features see page 19.
2. Other perforations and screen materials available. Please see page 20.
3. For pressure loss information see page 21 and 23.
4. For ordering information please see page 30.
5. Dimensions shown are subject to change. Contact factory for certified prints when required.

Claro

J. Pressure Gauge – WIKA (Glycerine-Filled) + Diaphragm/Snubber (Final 1/4" Female Connection Provided)

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)

Bourdon Tube Pressure Gauge Model 232.53 - 2½"

Specifications

Design
ASME B40.100 & EN 837-1

Sizes
2", 2½" & 4" (50, 63 and 100 mm)

Accuracy class
2" & 2½": ± 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" & 2½":	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

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 2½" with stop pin

Pointer
Black aluminum

Case
304 stainless steel with vent plug and SS crimp ring
Welded case / socket connection

Window
Polycarbonate

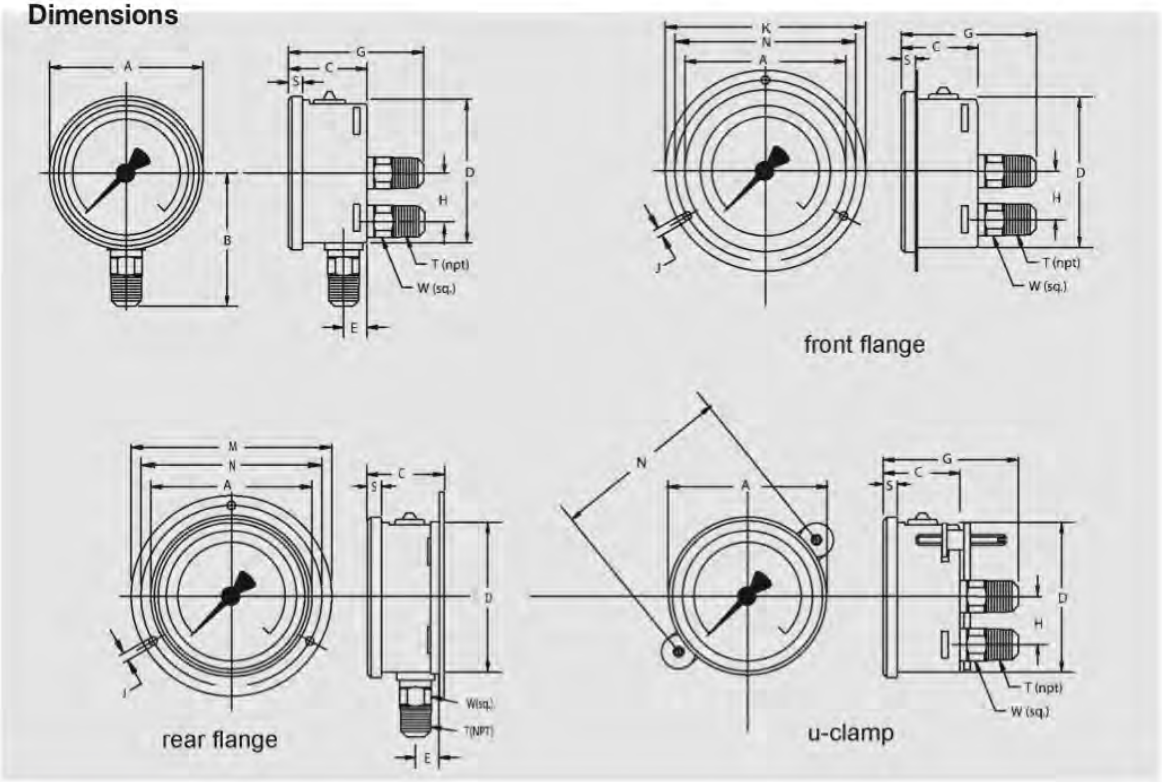
Liquid filling
Glycerine 99.7% - Type 233.53

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.

WIKA 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

4. Project Mechanical Drawings

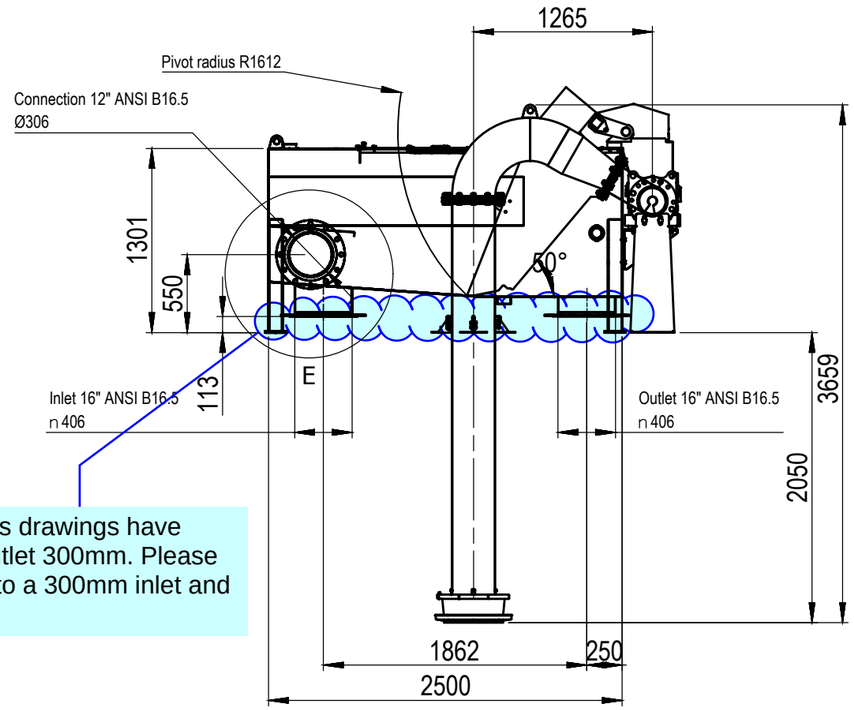
1 In-Tank Fine Screen, 1 Wash Press, Electrical Controls & Auxiliary Equipment

Technical Submittal (R0)

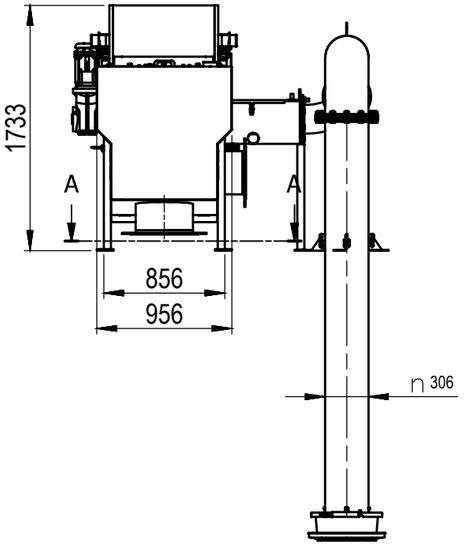
Township of Springwater, ON
Consulting Engineer: Arcadis
Project & Contract No.: 2024-05-PW
Contractor PO No.: TBD upon Novation
Claro Ref.: 22167-P-00

A. Project Submittal Drawing – Screening Equipment Arrangement

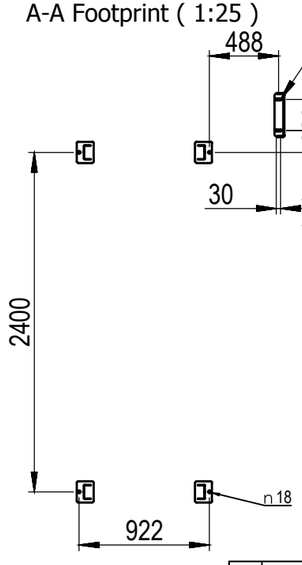
- Please see following pages

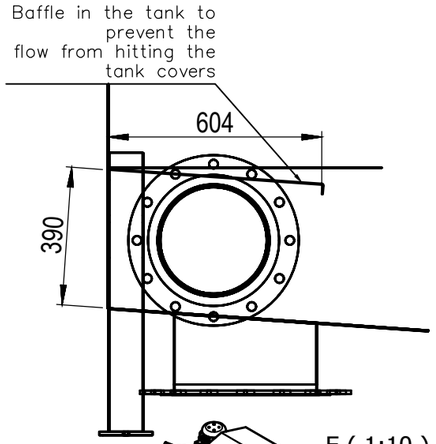


Process drawings have inlet/outlet 300mm. Please revise to a 300mm inlet and outlet.

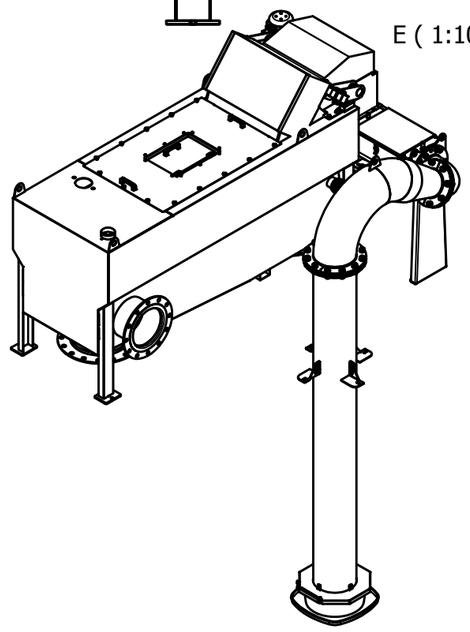


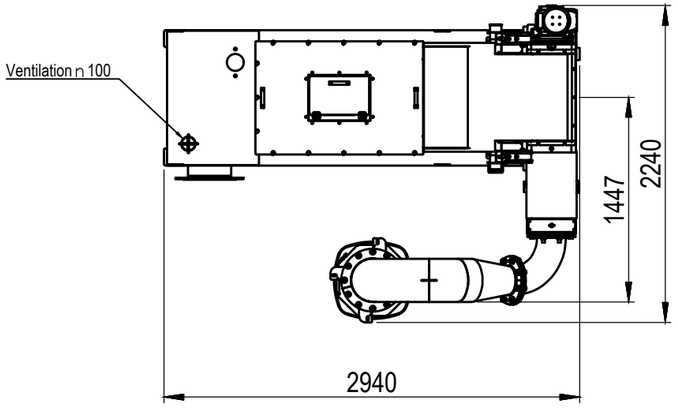
A-A Footprint (1:25)





E (1:10)





Note: Flow balancing pipe flange on side of tank provided with a bolt-on stainless steel cover with gasket.

Rev	Date	Description
0	030724	For Approval

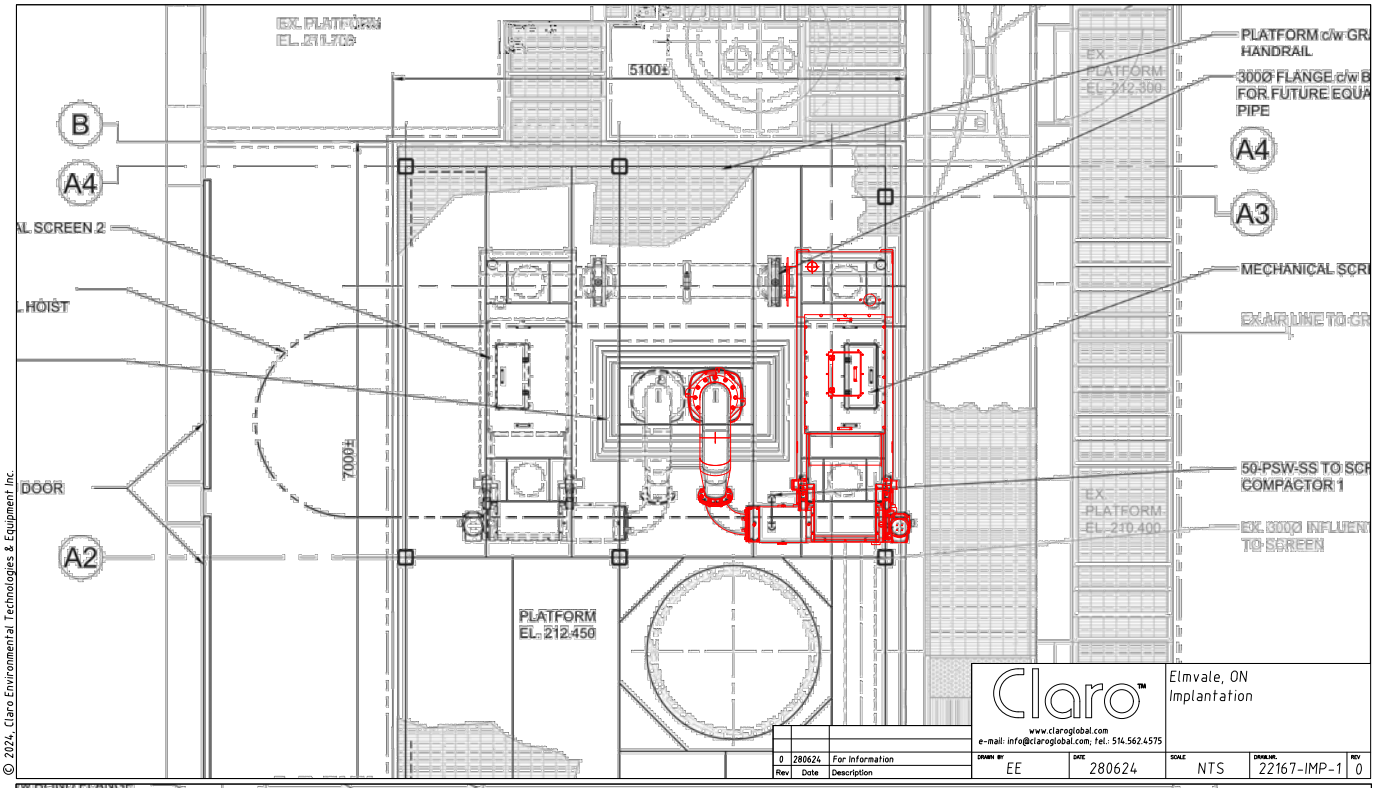
Claro™
www.claroglobal.com
e-mail: info@claroglobal.com; tel.: 514.562.4575

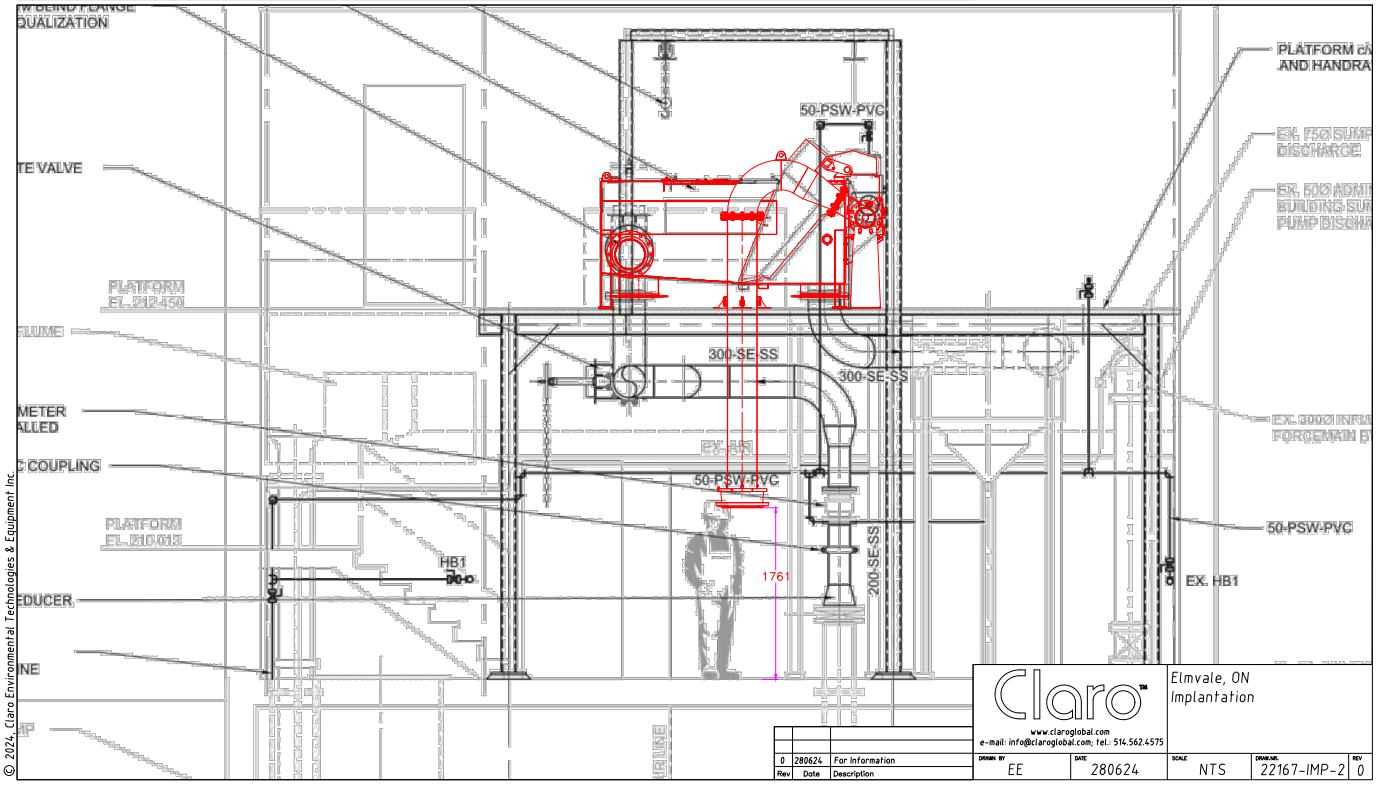
Elmvale, ON
Step Screen: 1100-600-6
Wash Press: 200-600

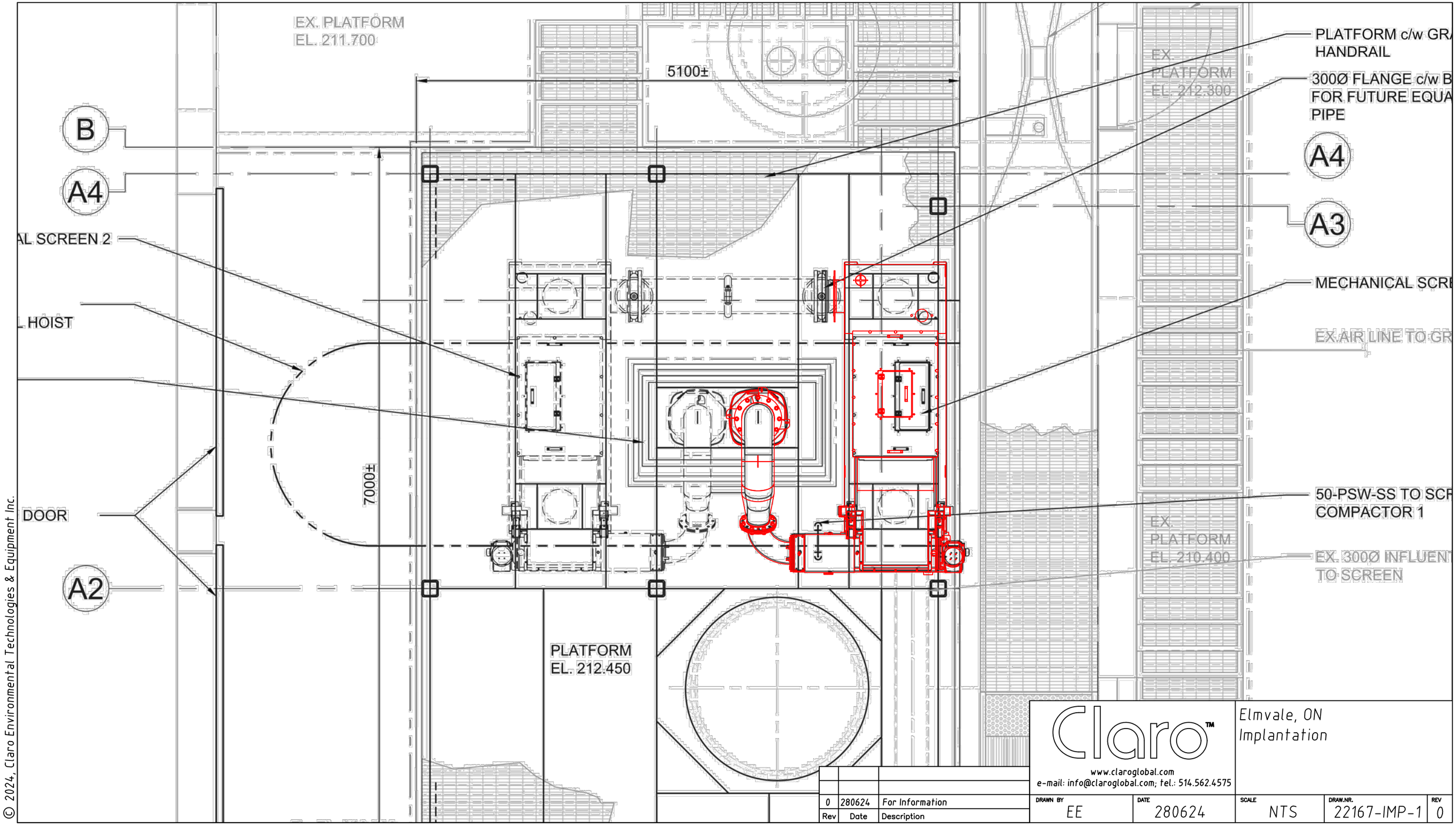
DRAWN BY	DATE	SCALE	DRAW.NR.	REV
EE	030724	NTS	22167-01	0

B. Project Submittal Drawing – Equipment Implantations

- Please see following pages for large format drawings.







Rev	Date	Description
0	280624	For Information

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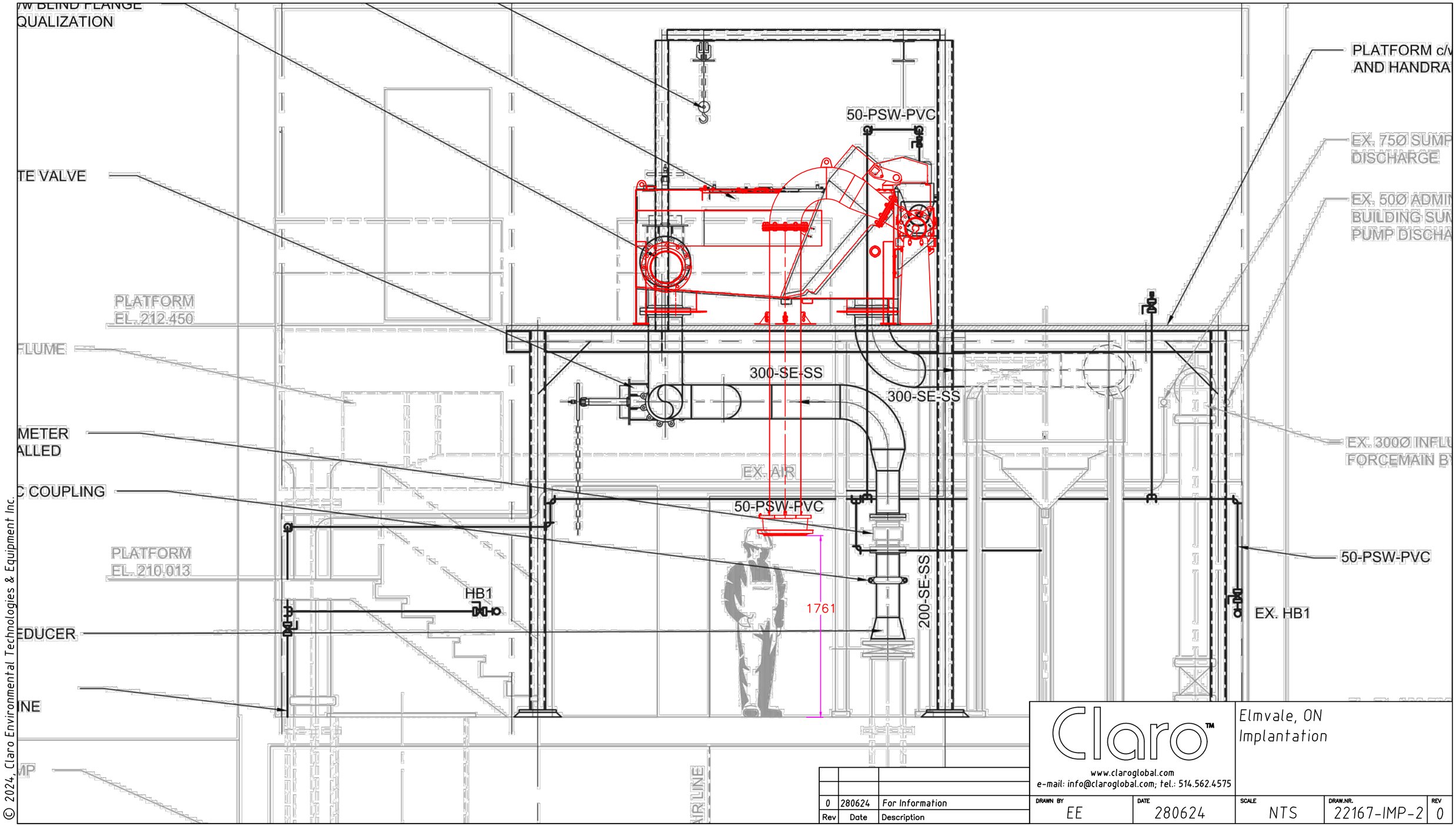
e-mail: info@claroglobal.com; tel.: 514.562.4575

Elmvale, ON
Implantation

DRAWN BY	DATE	SCALE	DRAW.NR.	REV
EE	280624	NTS	22167-IMP-1	0



Rev	Date	Description
0	280624	For Information

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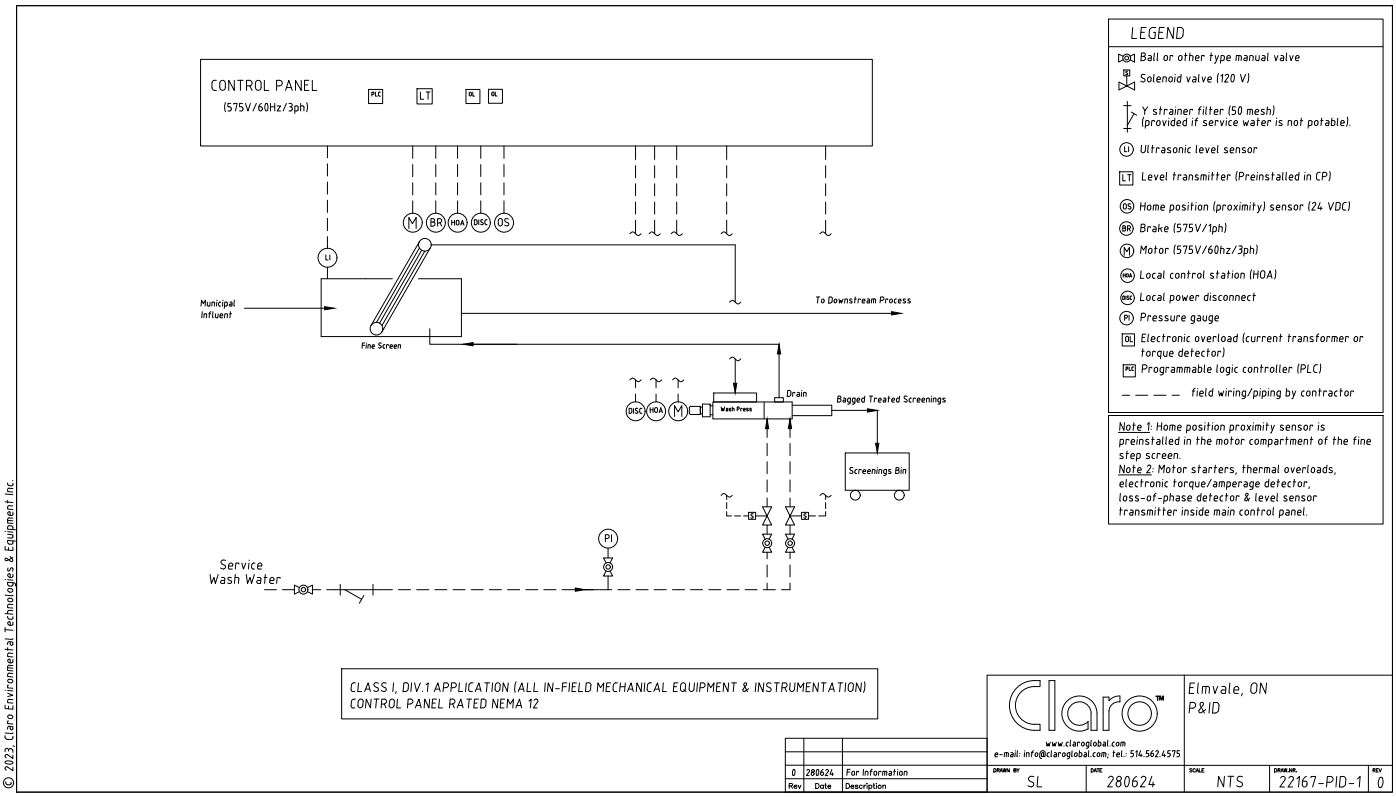
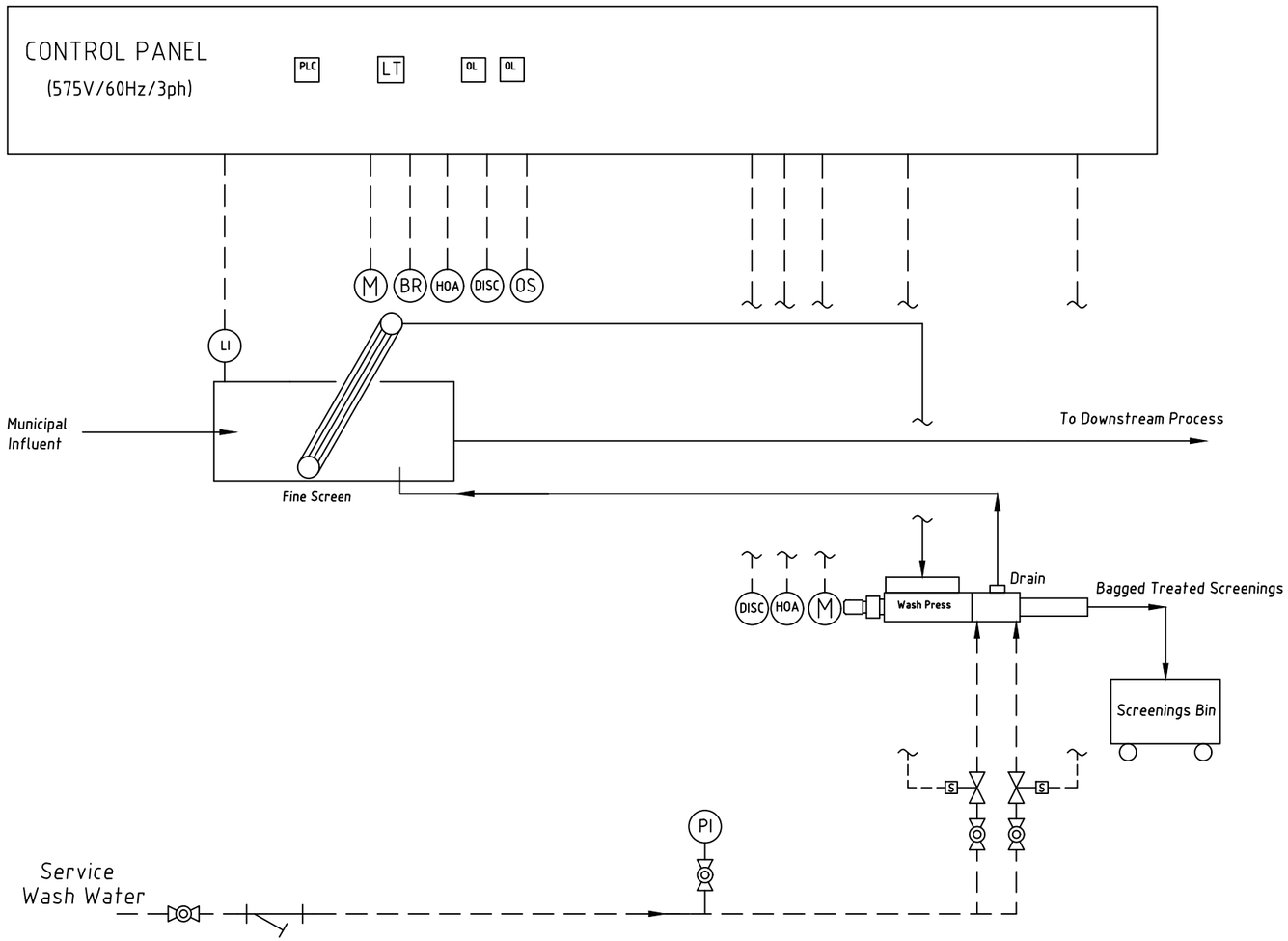
Elmvale, ON
Implantation

DRAWN BY	DATE	SCALE	DRAW.NR.	REV
EE	280624	NTS	22167-IMP-2	0

C. Project Submittal Drawing – P&ID (Phase 1)



- Please see following page for large format drawing



LEGEND

- Ball or other type manual valve
- S — Solenoid valve (120 V)
- Y strainer filter (50 mesh) (provided if service water is not potable).
- LI — Ultrasonic level sensor
- LT — Level transmitter (Preinstalled in CP)
- OS — Home position (proximity) sensor (24 VDC)
- BR — Brake (575V/1ph)
- M — Motor (575V/60hz/3ph)
- HOA — Local control station (HOA)
- DISC — Local power disconnect
- PI — Pressure gauge
- OL — Electronic overload (current transformer or torque detector)
- PLC — Programmable logic controller (PLC)
- — — — — field wiring/piping by contractor

Note 1: Home position proximity sensor is preinstalled in the motor compartment of the fine step screen.
Note 2: Motor starters, thermal overloads, electronic torque/amperage detector, loss-of-phase detector & level sensor transmitter inside main control panel.

CLASS I, DIV.1 APPLICATION (ALL IN-FIELD MECHANICAL EQUIPMENT & INSTRUMENTATION)
CONTROL PANEL RATED NEMA 12

Rev	Date	Description
0	280624	For Information

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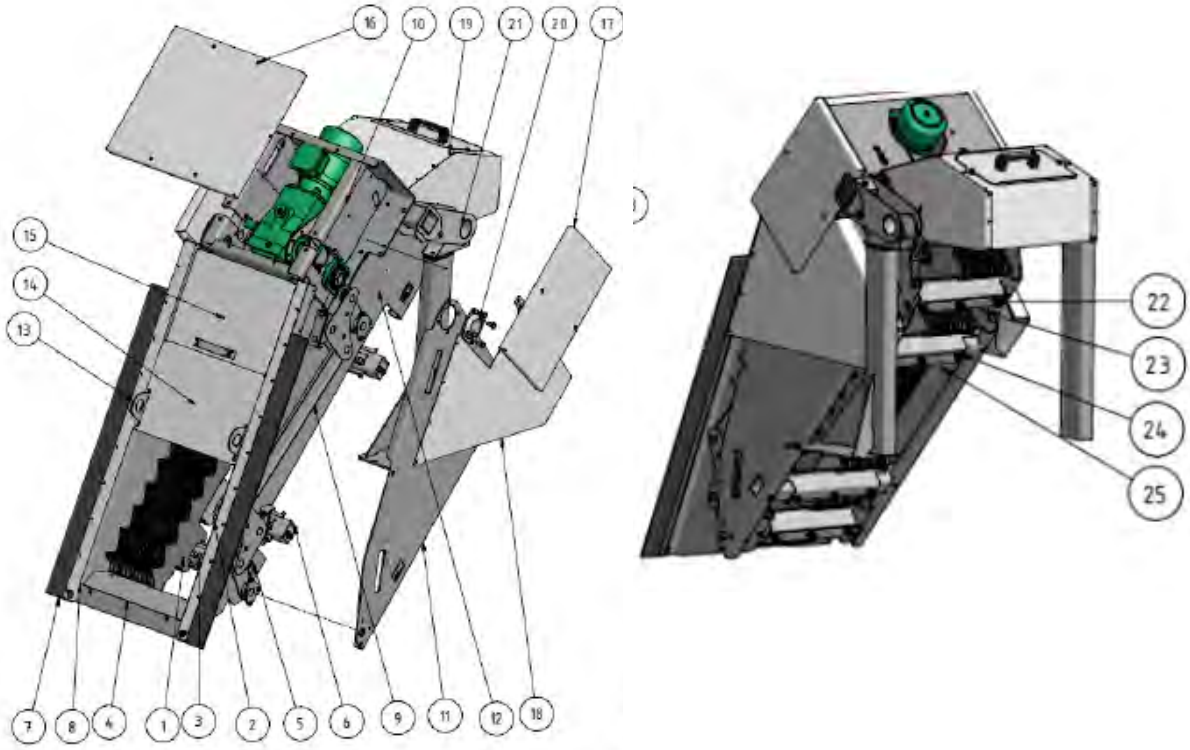
www.claroglobal.com
e-mail: info@claroglobal.com; tel.: 514.562.4575

Elmvale, ON
P&ID

DRAWN BY	DATE	SCALE	DRAW.NR.	REV
SL	280624	NTS	22167-PID-1	0

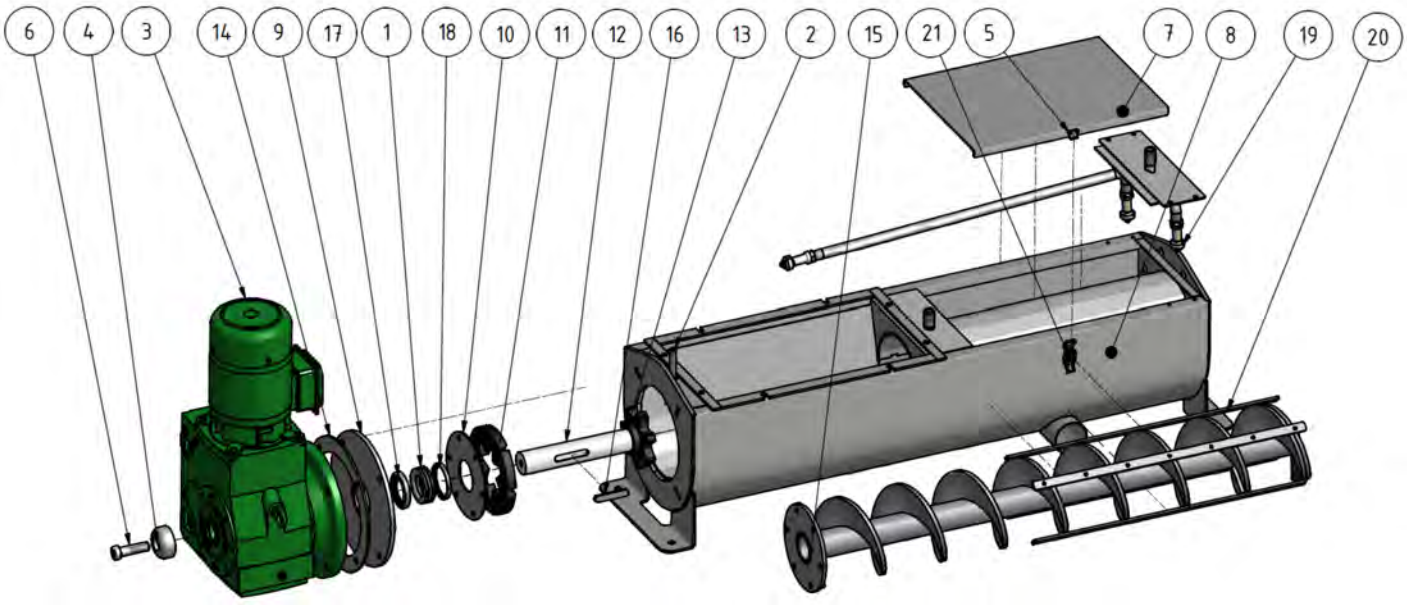
D. Step Screen – Typical Components Drawing (Exploded 3D View)



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 cross member
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 200 Exploded View 3-D Components Drawing & Listing

Claro Wash Press – Model TP 200
Components Drawing & Spare Parts List



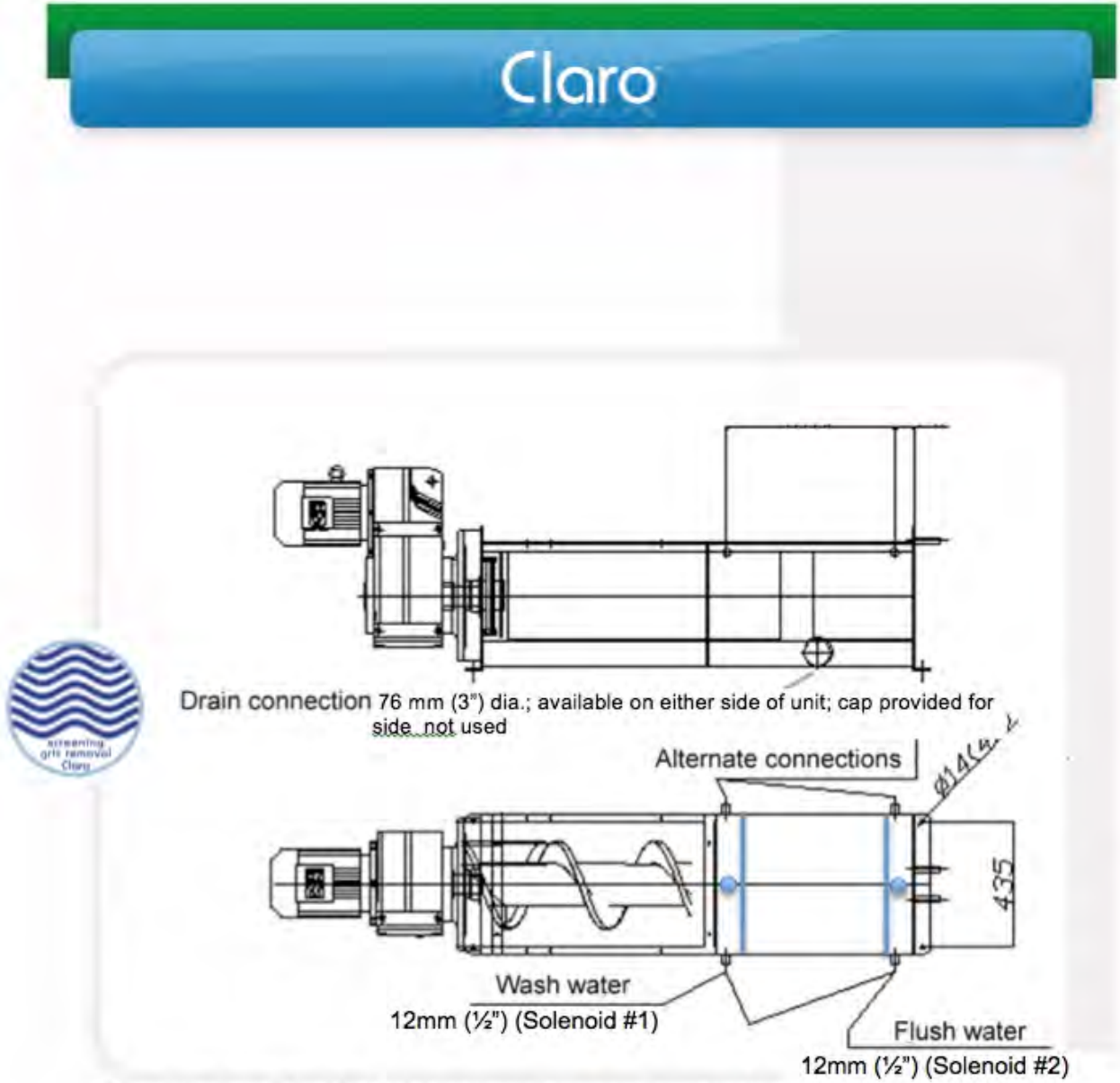
21	1	Lock
20	1	Wear liner
19	1	Spray nozzle
18	1	Sealing
17	1	Sealing
16	1	Key
15	1	Spiral
14	1	Distance
13	1	Sleeve
12	1	Shaft assembly
11	1	Carrier
10	1	Bracket
9	1	Drive unit flange
8	1	Press house
7	1	Cover
6	1	Screw
5	2	Lockplate
4	1	Sleeve
3	1	Drive unit
2	1	Pipe
1	1	Bearing

screening
grit removal
Claro

Claro

F. Wash Press – Water Supply Piping Arrangement (Suggested)

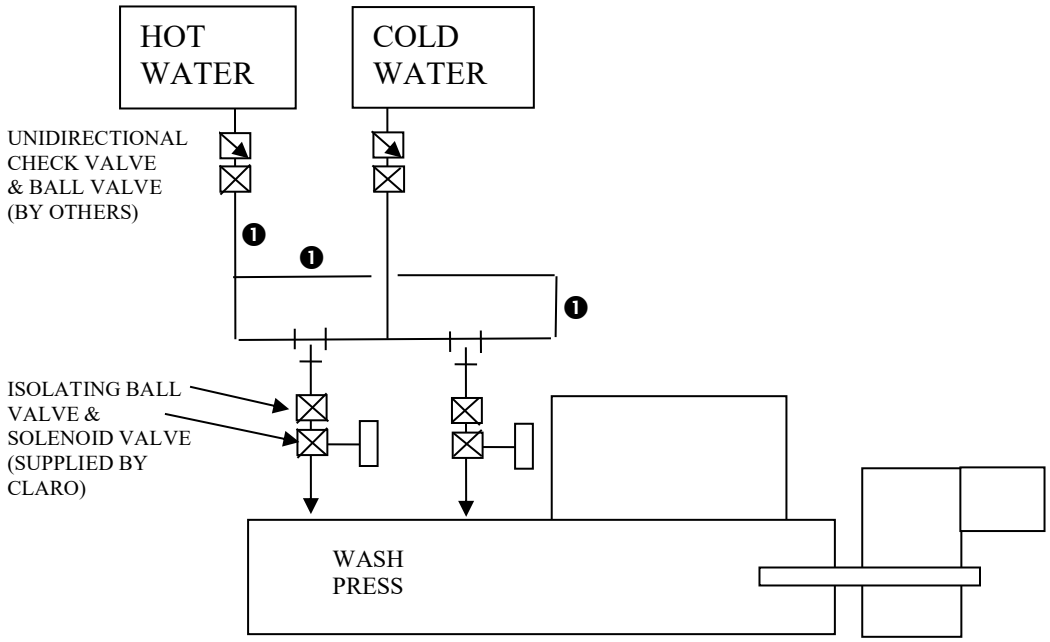
- The wash press has 2 water connections for washing of screenings debris inside the perforated tube and for washing the removed organics from the outside of the perforated tube. These are referred to as solenoid #1 (Washing) and solenoid #2 (Flushing) respectively. For the Elmvale application, the 2 connections are 12 mm (½") & 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. N.B. Elmvale WWTP is a cold water and optional hot water application (both cold & hot water supply are provided/available). 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

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 valve. Note: If re-use service water is soiled to a degree that will cause a nuisance-level cleaning interval of the Y-strainer, a self-cleaning in-line or bag filter should be considered.

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 (¼") dia. ball valve. Pressure gauge c/w protective diaphragm/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. The same principles are applicable to in-tank applications.
  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. Best-practice routing depends on the source location of utilities. Claro can help with routing for this project.

•Note: Please note that the ball valves provided for the present project shall be stainless steel. PVC valves are pictured above.

G. Wiring (General Note)

- The step screen pivots out of tank (please see example photographs at right of screen pivoting out of channel) – 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:

H. 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 shielded 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

BELDEN

8208 Paired - Audio, Control and Instrumentation Cable

For more information please call
1-800-Belden1

See Put-ups and Colors

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:

Claro

Detailed Specifications & Technical Data

BELDEN

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

Claro

Detailed Specifications & Technical Data

BELDEN

8208 Paired - Audio, Control and Instrumentation Cable

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Belden declares this product to be in compliance with EU LVD (Low Voltage Directive 73/23/EEC), as amended by directive 93/68/EEC.

I. Work Outline (Install & Supply) to Be Completed by Installing Contractor

- Note: The following provides an overview outline of requirements & installation procedures (not an exhaustive listing).

Contractor Installation Requirements Outline

Introduction: The following is an outline of the installation requirements for the Claro fine screening system equipment for the Elmvale WWTP application. 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: <u>Installation of Mechanical Equipment – Outline</u>:

A. <u>Screen Tank</u>

- The fine screen arrives on site preinstalled in its stainless steel tank. The tank has four (4) lifting lugs for a controlled 4-point lift during installation.
- The tank is provided with flanged inlet and outlet pipes (ANSI B16.5; floating 'Van Stone' type flanges for ease of installation) that are bolted to the respecting force main & drainage pipes including gasket (gasket & stainless steel hardware by installer).
- A third floating flanged connection is provided on the side of the tank as shown in the submittal and project drawings. This flange is for connection to a future flow equalization piping assembly. This connection is provided with a blind flange upon delivery.
- The screen tank has four (4) support legs. Each support leg is anchored to the screening room floor/slab and levelled with one (1) bolt and/or shims. Claro on-site installation inspection/assistance will ensure proper alignment, plumbness etc.

B. <u>Fine Screen</u>

- The fine screen arrives with the gear drive preinstalled and filled with oil as required. As Elmvale 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.
- 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.

C. <u>Wash Press</u>

- As the Elmvale WWTP is a Class I, Div. 1 installation, the 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 mounted to the supports on the tank. 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 & drop chute supports are also provided and bolted to the floor/platform.

- **N.B.:** Each segment of wash press discharge tube must be perfectly centered relative to its opposite flange in order to create a smooth internal transition between the wash press discharge and the first elbow and between the exit flange of the elbow and all subsequent discharge tube/drop chute segments. 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 protruding 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). 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.

- 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 ¼" 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.

- The 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). A flexible pipe to the downstream area of the screen tank including the required stainless steel gear clamp fasteners will be provided by Claro. A bead of silicone made be needed to ensure a water-tight seal at the inlet/outlet ends of the flexible pipe.

Part 2: <u>Power Supply & Control Wiring Summary</u>:

- <u>The screen (x1) has the following electrical elements</u>:

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 screening system control panel. Please see Stearns brake wiring diagram included below (only the two [2] black coil wires are brought back to the 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 screening system control panel).

The electrician is asked to provide a Teck cable sheath/covering on the 24VDC cable for protection against physical damage. If Class I, Div. 1 junction box is required, it is provided by the electrician.

c) One (1) ultrasonic level detector probe that senses liquid level in the tank upstream of the screen. The ultrasonic level detector probe is wired back to the transmitter installed in the screening system control panel via the designated terminal blocks shown in the As-Built control panel drawings.
d) One (1) combination Man/Off/Auto + Forward/Off/Reverse + latchable E-Stop button local station. Rated Class I, Div. 1 (wired back to screening system control panel).
e) One (1) motor power lock-out station. Rated Class I, Div. 1 (wired back to screen control panel).

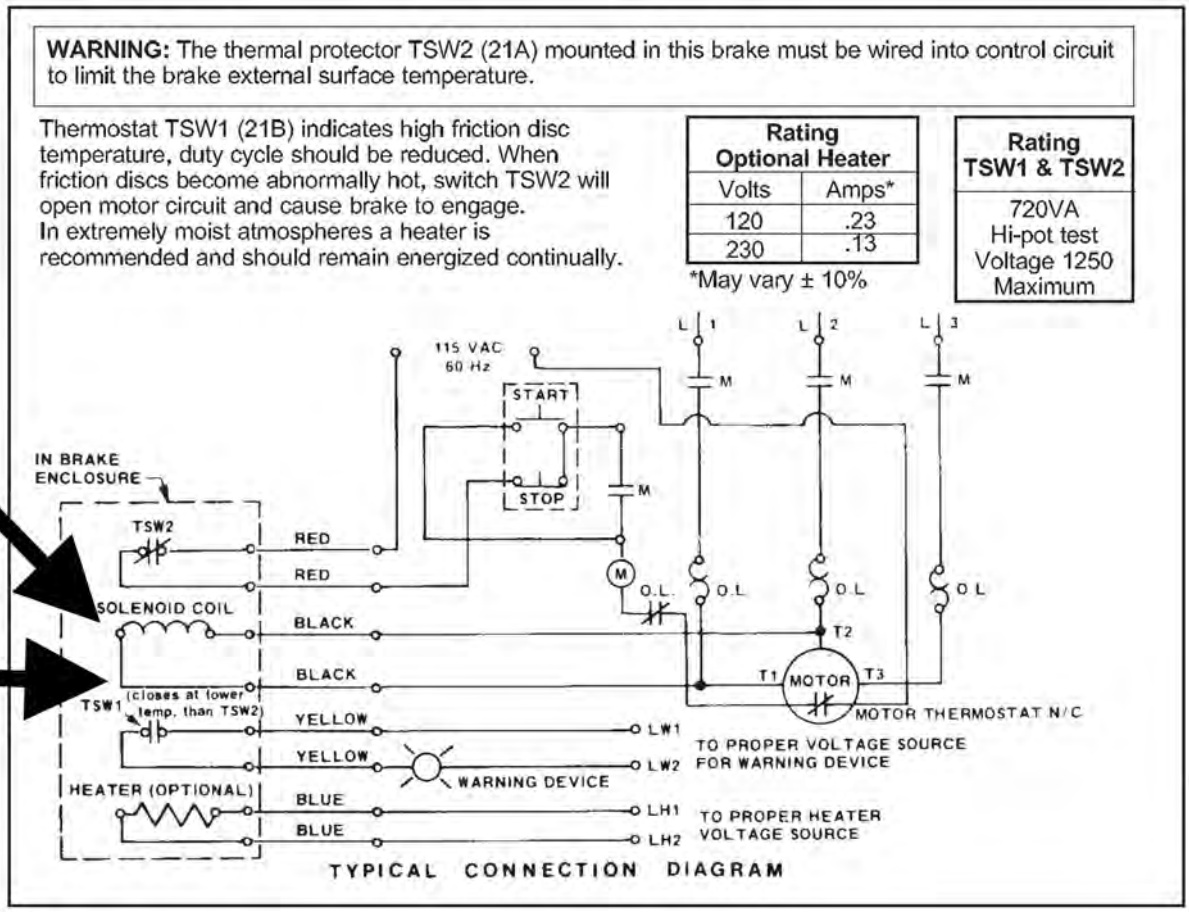
- <u>The wash press (x1) has the following electrical elements</u>:

f) One (1) reversible motor (575V/3Ph/60Hz) (wired back to the screening system control panel).
g) Two (2) solenoid valves 2 x ½", Class I, Div. 1 (120V/1Ph) (wired back to the screening system control panel).
h) One (1) combination Man/Off/Auto + Forward/Off/Reverse + latchable E-Stop button local station. Rated Class I, Div. 1 (wired back to the screening system control panel).
i) One (1) motor power lock-out station. Rated Class I, Div. 1 (wired back to screening system control panel).

• Continued 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 and not used. Here is a wiring diagram representing the brake coil wires.



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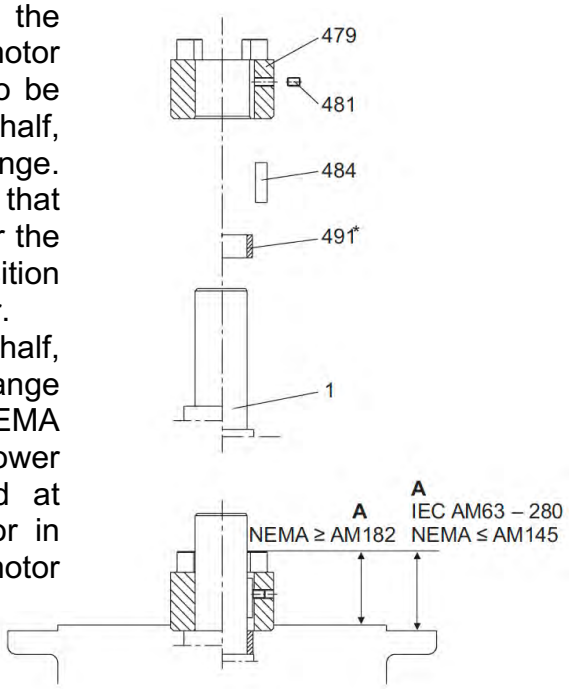
Part 3: Class I, Div. 1 Motor Installation & Connection Instructions

- 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.

  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

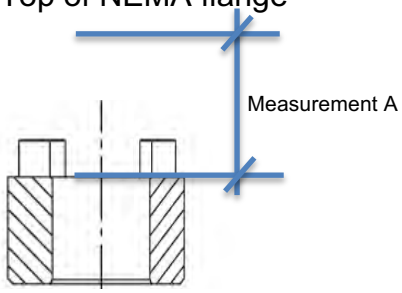


[1]	Motor shaft	[484]	Key
[479]	Coupling half	[491]	Spacer tube
[481]	Set screw		

Fig. B

NEMA Flange Half Coupling Measurement:

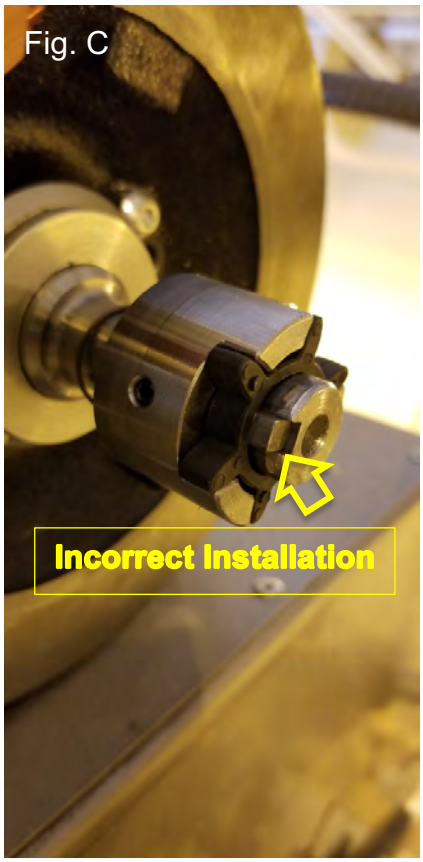
Top of NEMA flange



NEMA Flange Half Coupling

• Continued 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 photograph at right shows a key that has not be 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 to be tightened & shock absorber installed into coupling after key properly installed & coupling position on shaft is installed as per Part 1 instructions outlined above.

Part 4: <u>Service Water Supply Requirements Summary</u>:

<u>Wash Press</u>: 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); note: up to 95 PSI is also acceptable;

J. Equipment Storage (Prior to Installation)

- Mechanical equipment 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.

K. Offloading Instructions – Mechanical Equipment (Preliminary)

1. The equipment 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. Septage stations or screen-in-tank units typically have wooden ‘skis’ bolted to their supports. 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. Unlike in-channel screening equipment, in-tank screening units have a footprint that lands close to the top roof of the marine container. Open-top containers are currently unavailable due to the worldwide container shortage. Thus, a boom or telehandler fork typically will not have sufficient clearance above the unit while it is located within the marine container. Typically, unloading involves sliding the septage station/screen-in-tank toward the door of the container after removal of floor screws & Nylon restraining straps, attaching the lifting equipment to the first set of tank lifting lugs, pulling the tank partially out of the container to a point where the second set of lifting lugs are within range and are attached to a second telehandler or other lifting equipment. Once fully-supported & secured, the septage/screen-in-tank unit is moved out of the container and brought to the ground where all 4 lugs are connected to a single telehandler or other lifting machine. We have also seen the transport truck pull away from the suspended & secured unit in order to facilitate removal from the marine container. The heavier end of the septage/screen-in-tank unit is the side that incorporates the screen discharge. Usually, the unit is loaded with the heavy end oriented toward the container door.

- **N.B.** It is forbidden to offload a septage station or screen-in-tank by placing forks under the tank, which would transfer the weight of the unit to the tank welds and structural members upon lifting. Critical damage can ensue.

4. The lifting equipment must be rated for the full weight of the heaviest piece of equipment. Weights and a container layout drawing + loading photographs will be provided at time of shipping.
5. 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.
6. The delivery is made by appointment with the site foreman. The transport company will call the foreman to schedule delivery on site (we will also track the shipment, however, on-site personnel may hear the last-stage delivery news before we do as offloading personnel contact information will be in the possession of the transport company). We will also update as the equipment nears Port. The last step will be the delivery appointment.
7. 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). Please see storage instructions listed above (item K).

5. Preliminary/Sample O&M Manuals

1 In-Tank Fine Screen, 1 Wash Press, Electrical Controls & Auxiliary Equipment

Technical Submittal (R0)

Township of Springwater, ON
Consulting Engineer: Arcadis
Project & Contract No.: 2024-05-PW
Contractor PO No.: TBD upon Novation
Claro Ref.: 22167-P-00

SAMPLE MANUAL

Claro™
ENVIRONMENTAL TECHNOLOGIES & EQUIPMENT
claroglobal.com

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 (Assomption WWTP, QC)

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

Fine Step Screen and Shaftless Screenings Transfer Conveyor

Contents

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).

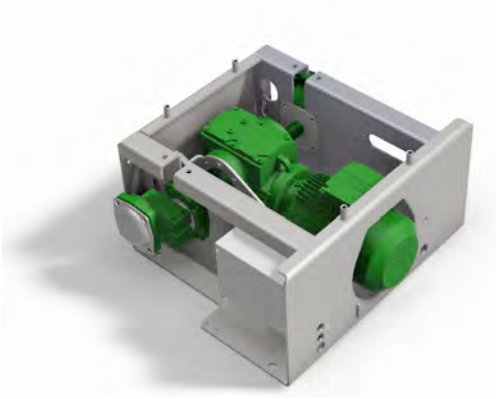


Figure 1, Drive unit

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).

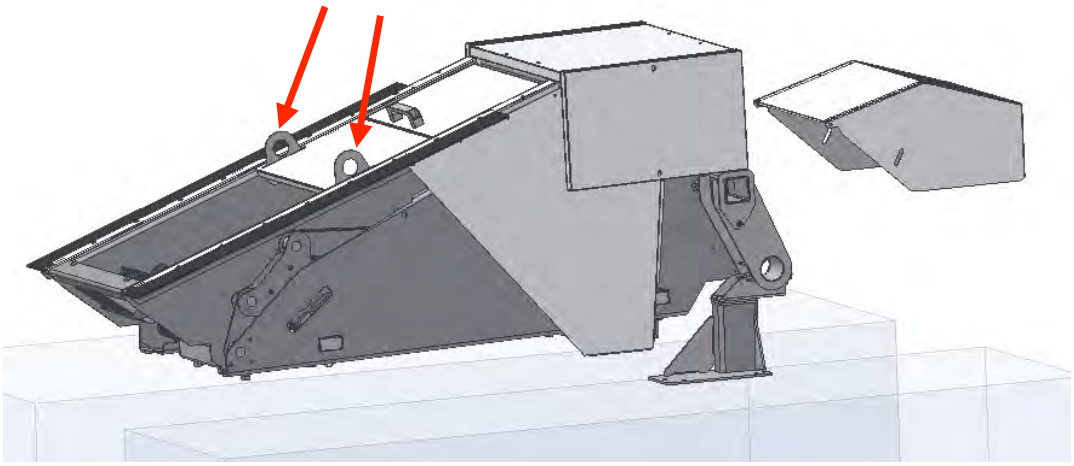


Figure 4. Lifting the screen, arrows showing lifting lugs.

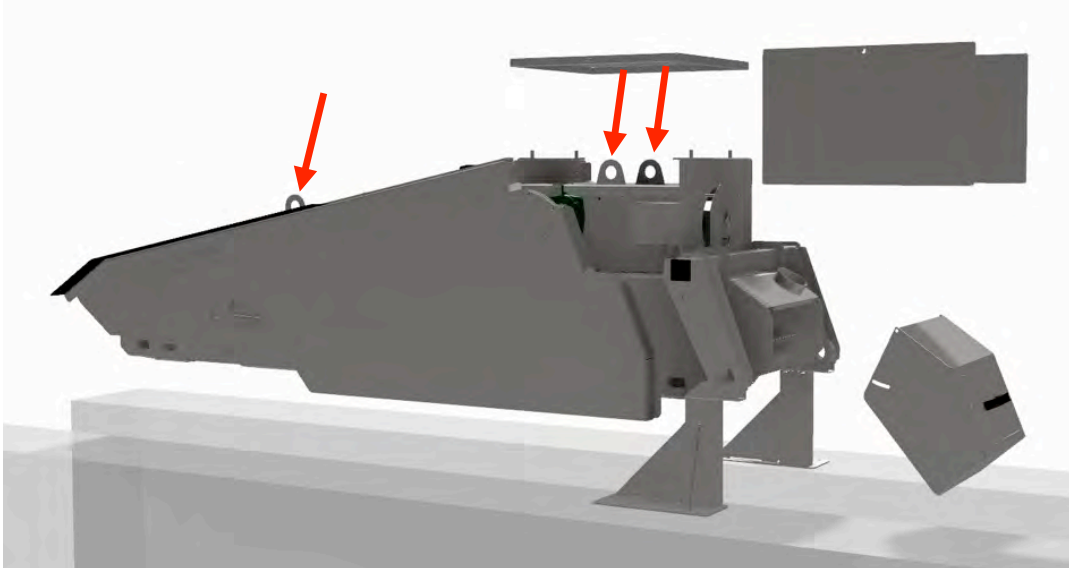


Figure 5. Lifting lugs for fine screens with a model number from 1700 to 4500; use all 4 lifting lugs for a 4-point controlled lift if lifting the entire screen out of channel or during installation.

• 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.

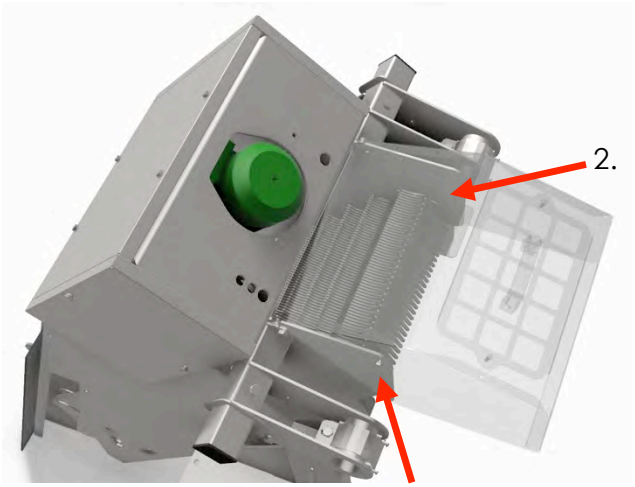
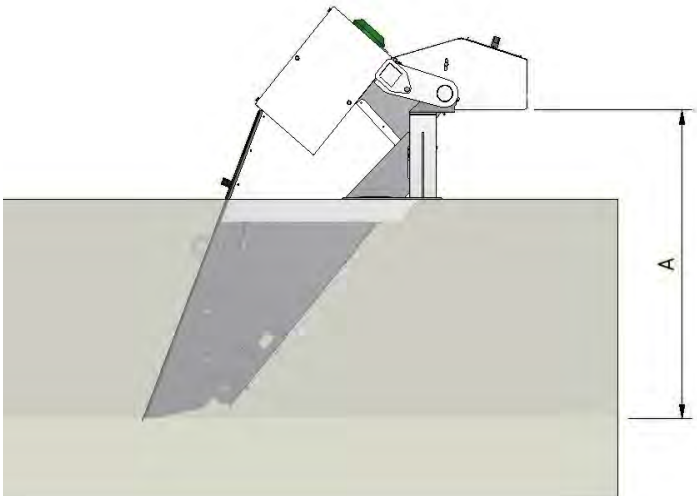


Figure 6.



Place the screen in the correct position, measure the correct discharge height A. Please see figure 7.

Figure 7. Discharge height measurement

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.

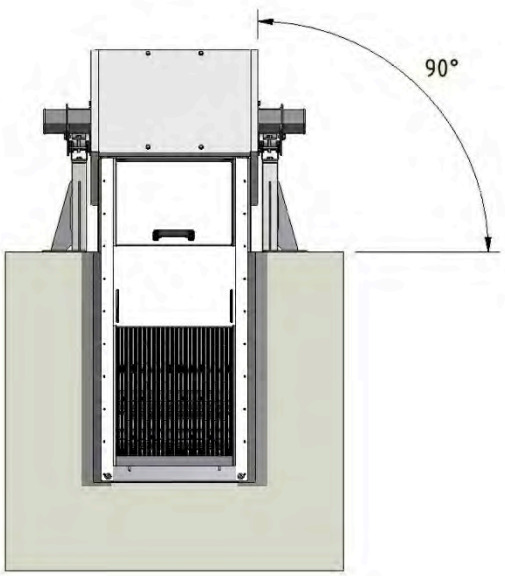
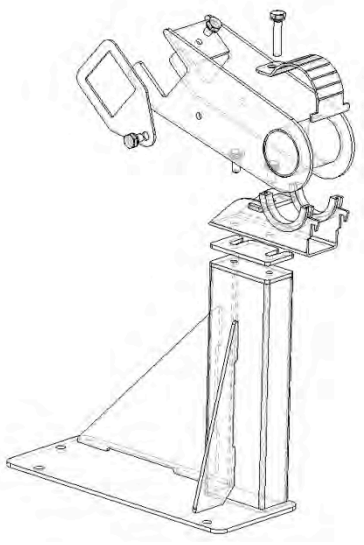


Figure 8.

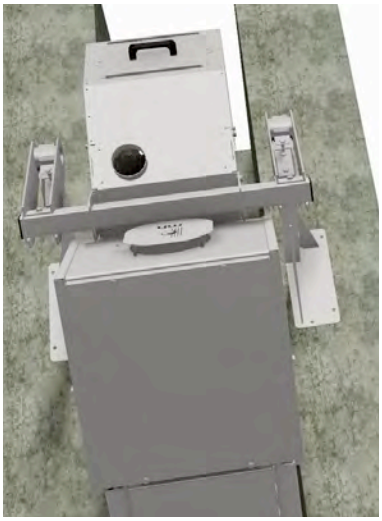
Install the support legs on the fine screen and fasten them to the floor slab.

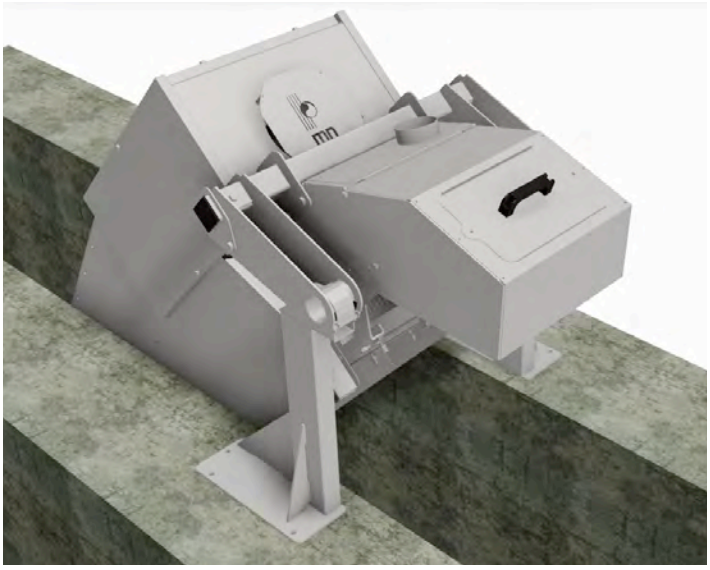
There are various types of pivoting screen support mechanisms depending on the unit size/model. Support legs and pivoting mechanisms shall be mounted as shown below. Typically, installation guide stickers are placed on the supports in order to aid in assembly.

5.2.1 Support Leg Installation – Fine Screen Models 1100 - 1400

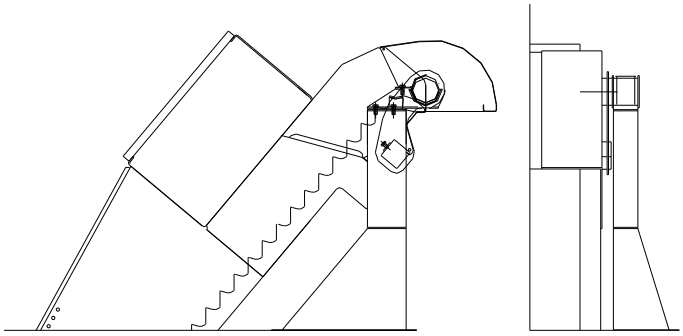


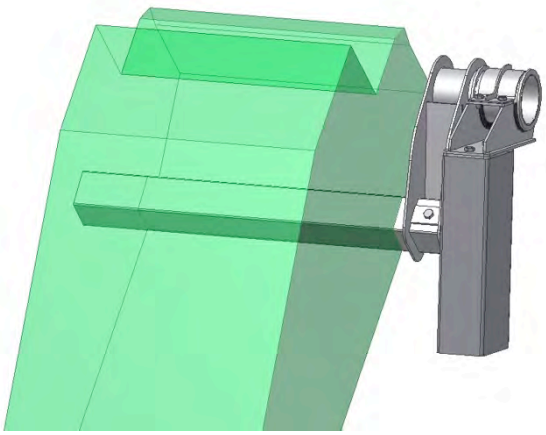
5.2.2 Support Leg Installation – Fine Screen Models 1700 - 2100

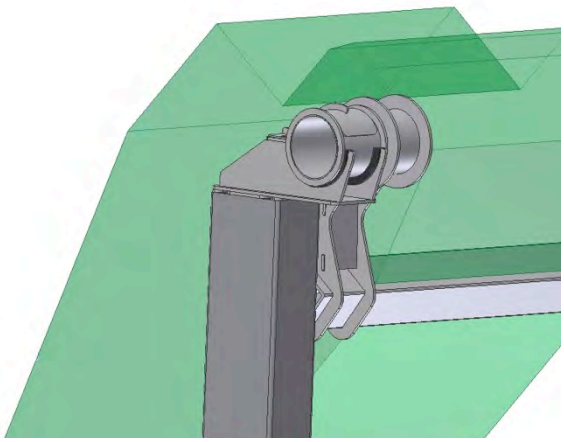




5.2.3 Support Leg Installation – Fine Screen Models 2200 - 4500







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 treament 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.

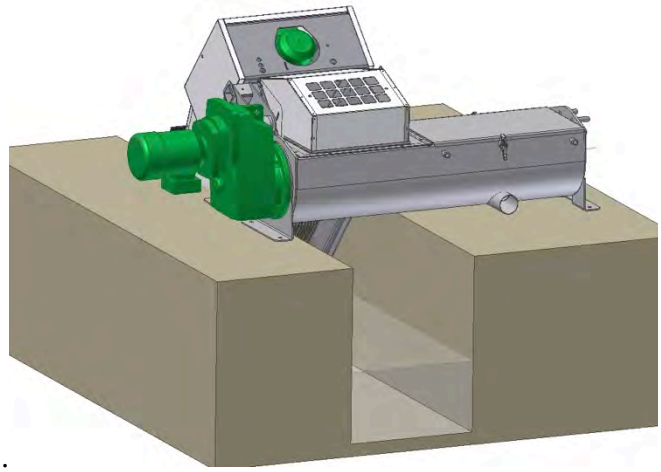


Figure 9. Wash press installed after screen

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.

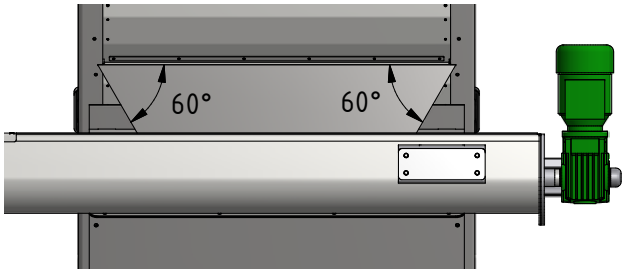


Figure 10. Tapered chute installed at discharge of screen. Typically, chute walls are 90 degrees.

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 of 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.

SAMPLE MANUAL

Claro™
ENVIRONMENTAL TECHNOLOGIES & EQUIPMENT
claroglobal.com

Claro Wash Press

O&M Manual

Installation – Operation – Care

Electronic Copy
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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.

Wash Press Screw Compactor

Wash Press Screw Compactor (Assomption WWTP, QC)

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

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

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)

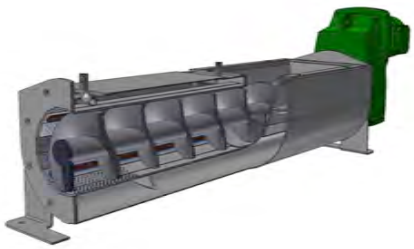
1.1 Structure & Function

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.

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 1, drive unit



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.

Figure 2, Wash press body incl. wear bars and transport screw

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/manuipulating 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 it 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 →

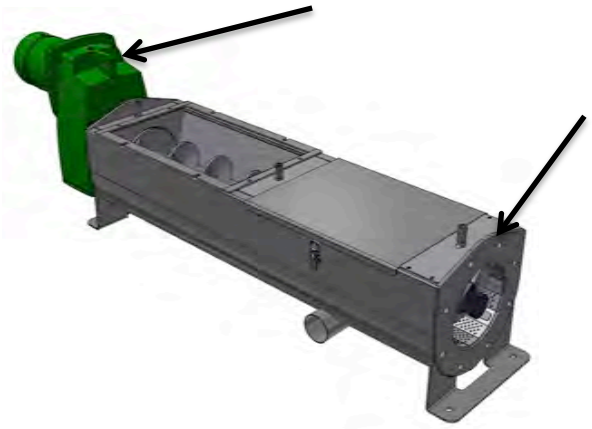


Figure 3 Lifting the machine, arrows showing lifting lug and placement of lifting belt

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.

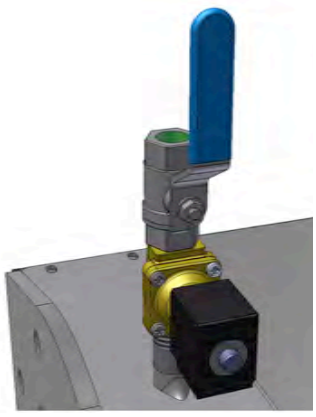
5.2 Electrical Installation

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 dissembled 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 is 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.

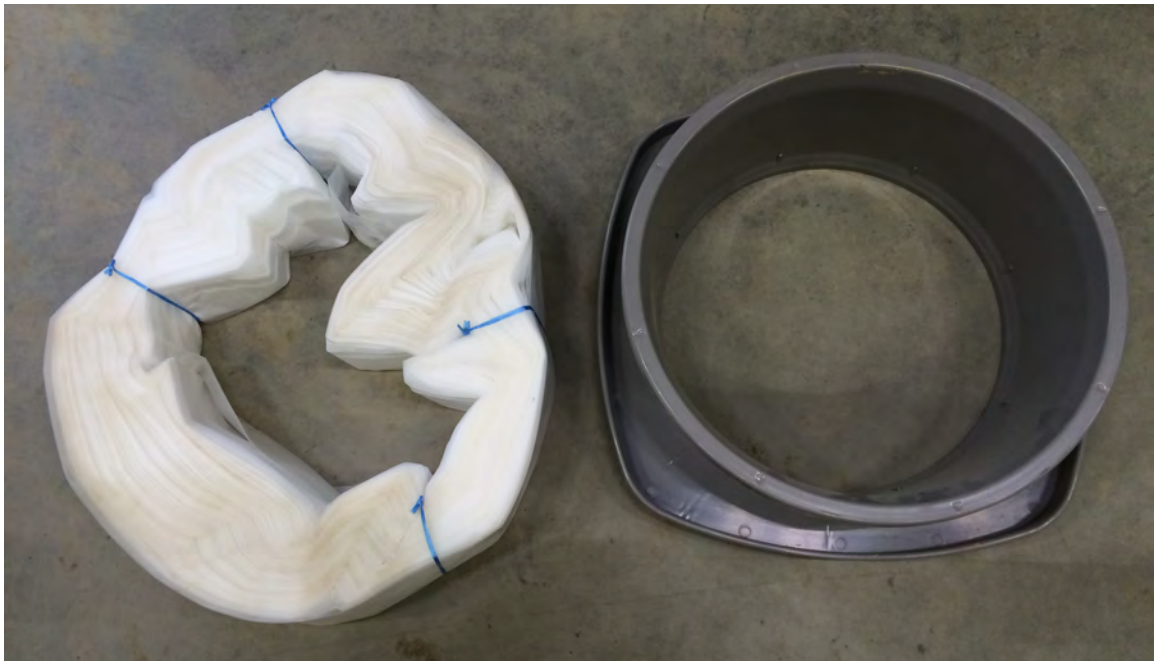
9.3 Disposal

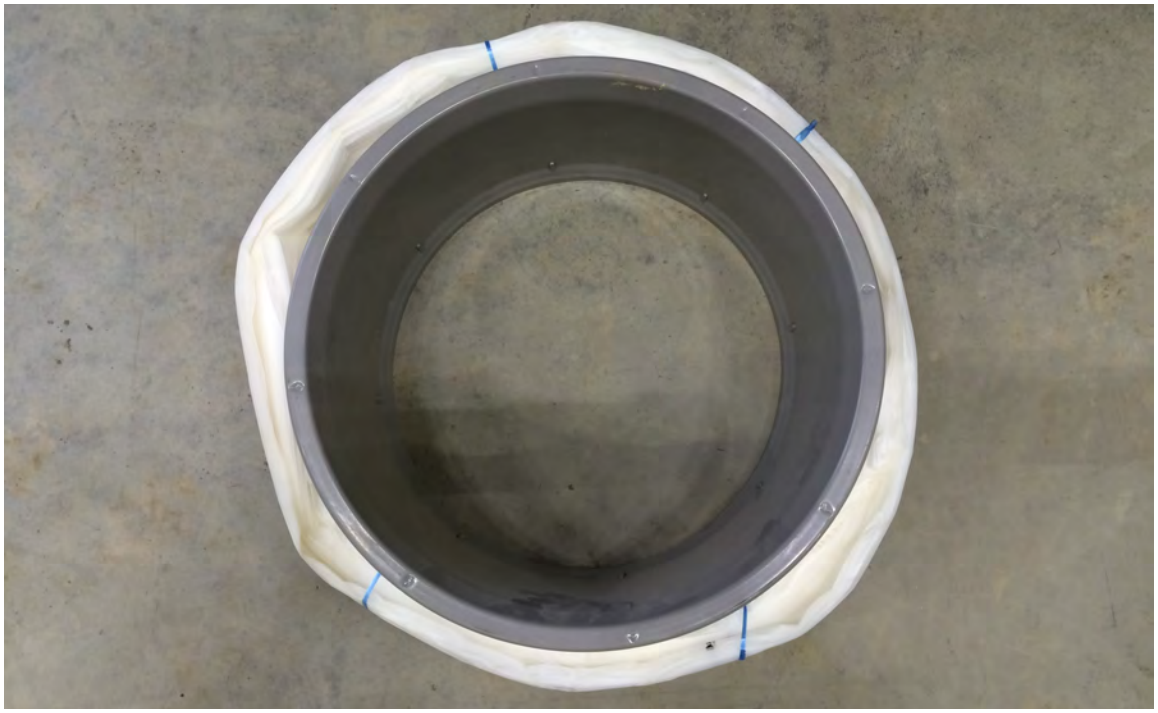
All parts should be recycled/disposed of in accordance to the applicable regulations. Stainless steel parts can be recycled according to the governing regulations. Disposal of consumables, such as oil, shall be in accordance with applicable local regulations

10. Components / Spare Parts Drawings

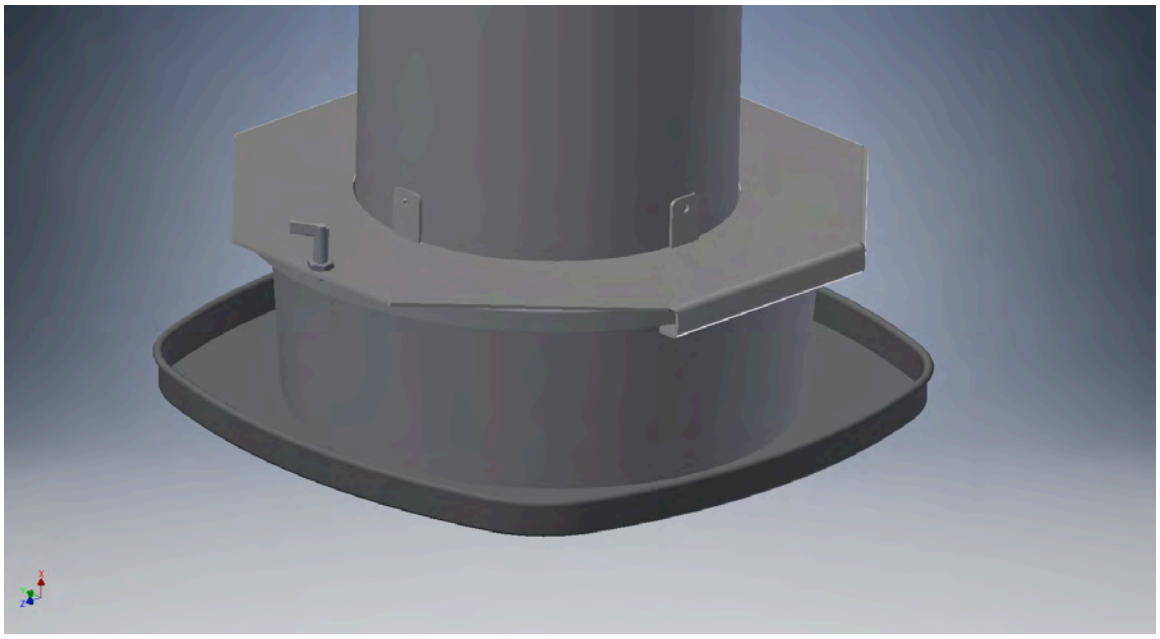
Please see appendices section for equipment drawings, spare parts drawings & project layout drawings.

Hygienic Bagger Cartridge Installation Instructions (Visual)





- Slide the bag & its plastic holder into the stainless steel adapter and secure with spring-loaded retaining pin. Cut off blue retaining strings (all 4) after mounting the bag holder with cartridge.



- Pull outer bag layer over the plastic brim of the holder.

- Tie-wrap or knot bag end.

Claro

- 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

6. Control Narrative Sequence & SCADA Exchange Table

1 In-Tank Fine Screen, 1 Wash Press, Electrical Controls & Auxiliary Equipment

Technical Submittal (R0)

Township of Springwater, ON
Consulting Engineer: Arcadis
Project & Contract No.: 2024-05-PW
Contractor PO No.: TBD upon Novation
Claro Ref.: 22167-P-00

A. Control Sequence Operation Description for Two (2) Fine Step Screens (in-Tank) & Two (2) Wash Press Compactors Including Discharge Tubes c/w Bagging Systems (Phase 1 & Future Phase)

Project Outline:

The project has 2 phases – a phase 1 fine screening system in-tank c/w wash press and a future phase screening system of identical but mirrored components. The two (2) screens are designed to be hydraulically connected with a flow equalization pipe that equalizes flow and establishes a common level upstream of both fine screens.

Each (1) x 6 mm aperture fine step screen-in-tank captures and discharges screenings debris into a screenings wash press unit that washes, dewaters & compacts the removed material. Treated screenings plugs are transited through each wash press's flared discharge tube and drop chute to its hygienic bagging system that automatically unfolds its 90m long bag magazine cartridge under the weight of the discharged material. A receiving bin is located beneath each compaction tube discharge & bagger. The operator ties off the hygienic bag once the respective receiving bin is full. The control narrative is characterized by a principle of restrained, intermittent operation at each fine screen & wash press in order to yield lower runtimes, augmented separation efficiency & exceptionally long service life of wear parts.

Motors List: each fine screen (1; reversible) & each wash press (1; reversible).

Instrumentation includes: An ultrasonic level sensor upstream of each fine screen, and a proximity home position sensor pre-installed in each fine screen motor compartment. Torque detection for each fine screen is effected by Emotron M20 torque detectors preinstalled within the screening system control panel. Wash press amperage protection is provided by current transformers (CT) also located within the screening system control panel. Additional thermal overload protection is also provided for each fine screen & wash press equipment in addition to electronic protection.

HMI Interface Design: The programming & HMI design aim to provide an easy-to-use intuitive graphic interface that provides a real-time overview of the system's operation. HMI interface screens are modelled on the project submittal drawings layout & equipment models.

A. Automatic Operation:

• Fine Screen: The following fine step screen control sequence applies to a single fine screen, which operates independently in response to its respective upstream & downstream ultrasonic level detector-indicated levels. Once the second, future fine screen is implemented, Item E: Alternating Start Subroutine will be applicable.

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 Level②**) measured by an ultrasonic level detector upstream of the fine screen unit;
      (or)
   b. 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 & max. pause time. Approach 'a' 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 screen & wash press. Typically, the max. preset time interval approach "b" is turned 'OFF' and only the level detector prompts the movement of the screen. The timer function is provided as a precaution in case the level sensor is out of service or in 'Fault'.

   Precautionary timer back-up routine: A relay on the level transmitter (e.g. Endress & Hauser Prosonic S FMU90) will also automatically switch to timer mode if the transmitter happens to fall into 'Fault' or the 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.

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 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. Filter screen cleaning does not employ the actuation of brushes, wash water solenoids or scrapers. Please see Claro films website developed for the Elmvale application for illustration.
https://vimeopro.com/user10768107/elmvale-wwtp-arcadis Password is: **ClaroFilms**

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 Level②** 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 maintained below the preset start level: the **'Upstream Mode' Continuous Run Shut-Off Level①**, which is typically 50 mm below the normal start level preset. Once this liquid level criterion is met, the screening system will 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 <<b>> to be turned ON or OFF. Typically, subroutine <<b>> is turned OFF

• Wash Press

5. Each Elmvale fine screen incorporates one (1) screenings wash. The wash press will begin its treatment sequence once a preset number of screen moveable bar rack rotations / discharges has been achieved or if its associated screen switches into continuous run mode. Screen rotation count is correlated with a consistent screenings volume. The wash press runs only when sufficient debris loading within its inlet justifies a treatment / transport cycle. Once the start 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 that 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.

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B. Manual Operation:

1. Fine Screen 1 (or 2) – 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 associated 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 are exceedingly rare and should be approached as a cue to inspection since the screen will have already have effected an automatic reverse run sequence. Please feel free to call Claro at any time @ its 24-hour hotline.
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 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: Each wash press's solenoids can be operated manually via the control panel HMI control screens. When the Solenoid #1 or Solenoid #2 manual operation buttons for the associated 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 associated wash press MAN/OFF/AUTO selector is in the <<Manual>> position. These instructions are represented on the screening system control panel HMI 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.
6. Fine Screen – Trigger Sequence: The operator can trigger a fine screen 1 or 2 sequence by pressing on the appropriate 'Trigger' button on the control panel HMI screen (located on each fine screen's visualization/status HMI screen).
7. Wash Press – Trigger Sequence: The operator can trigger a complete wash press treatment cycle for either wash press unit by pressing on the appropriate 'Trigger' button on the control panel HMI screen (located on each wash press's visualization/status screen).

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C. Alarms:

1. Fine Screen – High Torque/Amperage: During overload or jamming of a screen, the Emotron M20 torque/amperage sensor 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 appropriate 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 tank 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 moveable bar rotation at this adjustable 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 a wash press is left in OFF or MAN at the local HOA while its associated fine screen is also in Auto, an alarm will sound after an adjustable time delay.

• •

• Continued following page →

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 & wash press. Note: The graphics representing the screens & wash presses are adapted from the project drawings in order to faithfully reflect the Elmvale screening systems layout. Claro would be pleased to provide graphics to the facility network programmer if this is preferred.

- A trends page records:
  a) the upstream liquid levels & differential levels
  b) fine screen 1 & 2 + wash press 1 & 2 torque/amperage levels

- A runtimes page records:
  a) the number of motor starts for each screen & wash press
  b) the total amount of time each motor has run
  c) the total number of treatment cycles completed by each wash press
  d) 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/tanks are joined and thus where the upstream level in the channels/tanks 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 (or more) screens actuate at nearly the same time & in response to the same shared upstream water level or differential value. The subroutine will ensure the least wear-&-tear and the best separation efficiency in this type of configuration.
   N.B. This standard subroutine can be turned ON or OFF at the network PLC visualization screen(s).

2. With this subroutine ON, the controls program will keep one screen (e.g. screen #2) inhibited from responding to a start signal until the other screen (e.g. screen #1) has been triggered first and has run 1 complete moveable 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 throughout the day.

3. The inhibition/alternation subroutine will be turned OFF if the level in at least one of the channels/tanks 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 or debris influx while also preserving the formation of a screenings 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/tank is closed by a

[1] The adjustable delay provides time for the level to fall after a screen's moveable bar rotation

gate/valve. 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/alternation subroutine can be turned ON or OFF at the screening system HMI screen.
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 setpoint. And so on back and forth so that each screen responds once in every two movements;
   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 to each channel/tank due to hydraulic imbalance & perhaps a slight difference in the level measurement in each channel/tank). By having only one screen respond, the controls ensure that the 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.

• For comments or questions, please feel free to contact Claro at any time (514.562.4575).

• Continued following page →

'Screenings Mat' Operation:

exceptional screening & low-impact mechanical operation

Examples of the 'screenings mat' filter. As screenings accumulate into a filter mat, the water level rises in front of the bar screen. Once the water level reaches a predetermined level, the step screen advances one step. This single rotation of the moving bars shifts the entire screenings mat up the bar screen and frees the bottom step from screenings. The water level falls until the mat is reconstituted and the cycle begins again.

'Screenings Mat' Operation:

exceptional screening & low-impact mechanical operation

Example of the step-by-step discharge of screenings into a Claro washpress. The interval between step movements is coordinated by a water-level detector. The screen moves only when the volume of screened material necessitates a self-cleaning rotation of the mobile bars. This intermittent cycle of intelligent, step-by-step movements significantly reduces mechanical wear & tear.

B. SCADA Data Exchange Table

To follow in R1 submittal

7. Electronic Controls Submittal Drawings & Component Catalog Cuts

1 In-Tank Fine Screen, 1 Wash Press, Electrical Controls & Auxiliary Equipment

Technical Submittal (R0)

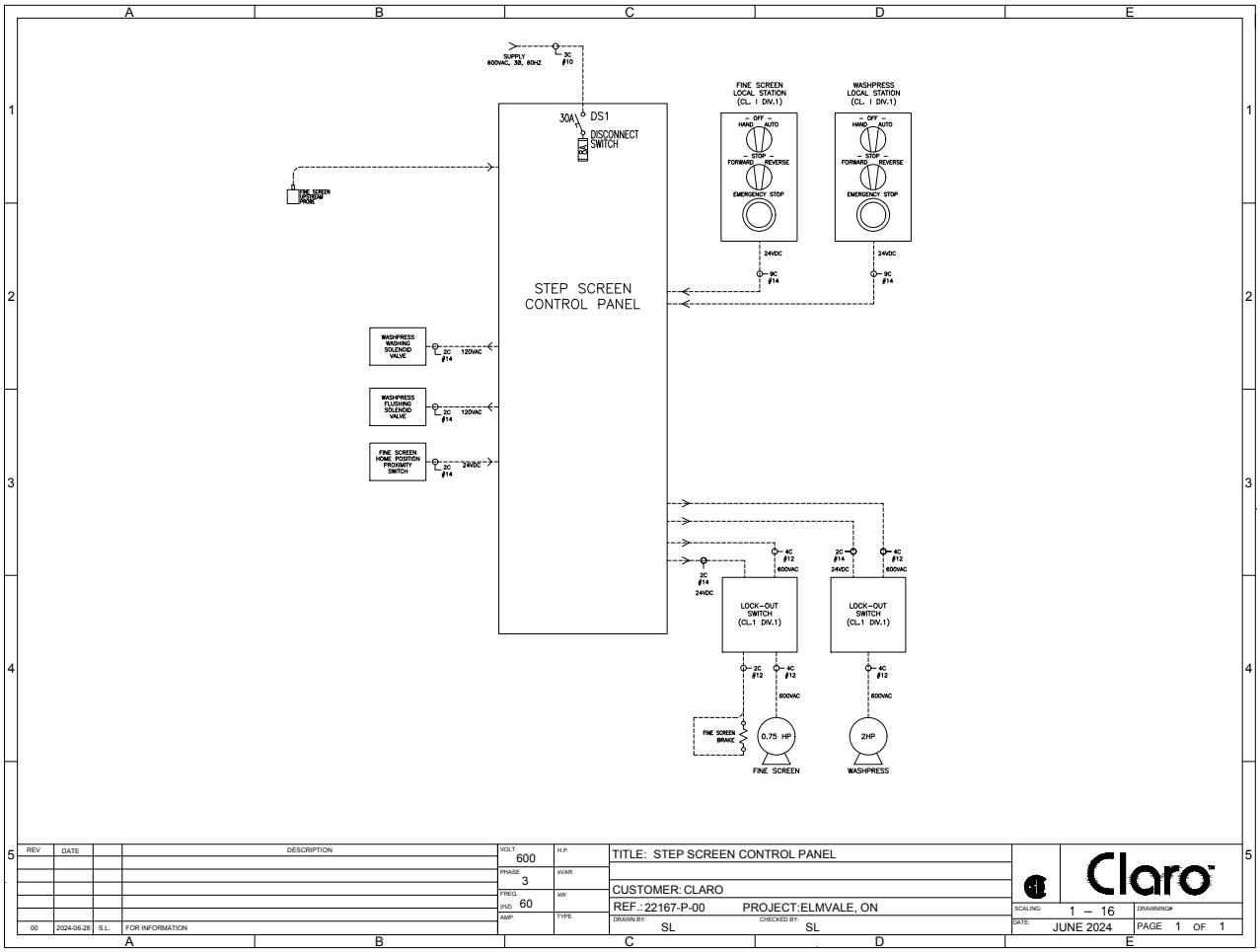
Township of Springwater, ON
Consulting Engineer: Arcadis
Project & Contract No.: 2024-05-PW
Contractor PO No.: TBD upon Novation
Claro Ref.: 22167-P-00

A. Control Panel Submittal Drawings – Elmvale WWTP, ON

To follow in R1 submittal

B. Elmvale WWTP Field Wiring & Wire Weights Diagram (Phase 1)

- Please see following page for large scale drawing



SUPPLY
600VAC, 3Ø, 60HZ

3C
#10

30A

DS1

DISCONNECT
SWITCH

8A

FINE SCREEN
UPSTREAM
PROBE

STEP SCREEN
CONTROL PANEL

FINE SCREEN
LOCAL STATION
(CL. I DIV.1)

WASHPRESS
LOCAL STATION
(CL. I DIV.1)

– OFF –
HAND AUTO
– STOP –
FORWARD REVERSE
EMERGENCY STOP

24VDC

9C
#14

WASHPRESS
WASHING
SOLENOID
VALVE

2C
#14

120VAC

WASHPRESS
FLUSHING
SOLENOID
VALVE

FINE SCREEN
HOME POSITION
PROXIMITY
SWITCH

24VDC

4C
#12

600VAC

LOCK–OUT
SWITCH
(CL.1 DIV.1)

FINE SCREEN
BRAKE

0.75 HP

FINE SCREEN

2HP

WASHPRESS

REV	DATE		DESCRIPTION
00	2024-06-28	S.L.	FOR INFORMATION

VOLT. 600	H.P.
PHASE 3	kVAR
FREQ. (HZ) 60	kW
AMP.	TYPE

TITLE: STEP SCREEN CONTROL PANEL

CUSTOMER: CLARO

REF.: 22167-P-00 PROJECT: ELMVALE, ON

DRAWN BY: SL CHECKED BY: SL

Claro™

SCALING: 1 – 16

DRAWNING#

DATE: JUNE 2024

PAGE 1 OF 1

C. Component Catalog Cuts (Annotated) & Index – Elmvale WWTP

To follow in R1 submittal

8. Appendices

1 In-Tank Fine Screen, 1 Wash Press, Electrical Controls & Auxiliary Equipment

Technical Submittal (R0)

Township of Springwater, ON
Consulting Engineer: Arcadis
Project & Contract No.: 2024-05-PW
Contractor PO No.: TBD upon Novation
Claro Ref.: 22167-P-00

Appendix A. Elmvale WWTP – Five (5) Year Warranty Statement

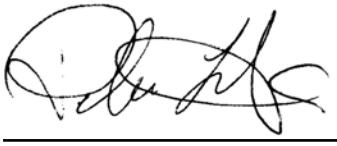
Claro Warranty – Township of Springwater, ON (Elmvale WWTP)

The Claro fine step screen, modular tank, wash press, main PLC control panel, local HOA stations, local motor lock-out stations and instrumentation 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,



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. Elmvale WWTP – Training Agenda
(Duration: approx. 2.5 hours)

Part 1: Mechanical Overview – Fine Screen & Wash Press

• Classroom

a. Review of Claro fine step screen & wash press features and operational philosophy film (12 minutes);
b. Review mechanical components of fine screen & wash press – 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 & Demo 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 liquid level detection & Sutro weir downstream level control;
e. Demonstrate movement of lamellae in Manual Forward & Reverse modes;
f. Remove cover over motor and identify home position switch, motor and gear drive arrangement;
g. Review screen discharge arrangement;
h. Demonstrate how to pivot the screen out of tank 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 controls narrative/stages of operation of the wash press 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 discharge tube i.e. backpressure and motor amperage readings on the HMI;
q. Demonstrate how to install a hygienic bag magazine on the bagger unit 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;

• Continued following page →

Part 2: Control Panel Overview – Fine Screen & Wash Press

a. Review the major components and features of the main 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;
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 and their significance;
f. Review of panel internals including torque sensors, current transformers, thermal overloads, starters, 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)

Elmvale WWTP, ON

1 In-Tank Fine Screen, 1 Wash Press, Electrical Controls & Auxiliary Equipment

Technical Submittal (R0)

Township of Springwater, ON
Consulting Engineer: Arcadis
Project & Contract No.: 2024-05-PW
Contractor PO No.: TBD upon Novation
Claro Ref.: 22167-P-00

Electronic Copy
(Bookmarked PDF)

Arcadis Inc

The review of this Shop Drawing is for the sole purpose of ascertaining conformance with the general design concept and general arrangement only. This review does not constitute approval or verification of the design inherent in the Shop Drawings, and any omissions or errors therein remain the responsibility of the Contractor. The Contractor remains entirely responsible for complying with the Contract Documents, confirming all field dimensions and site conditions, for information that pertains to fabrication, techniques of construction and installation, and co-ordination of the Work.

Reviewed	Reviewed As Noted	Revise & Resubmit	Not Reviewed
	X		
Reviewed By:	JGC	Date:	July 22, 2024

Please see detailed comments in the file

Elmvale WWTP, ON

1 In-Tank Fine Step Screen, 1 Wash Press, Electronic Controls & Auxiliary Equipment

Technical Submittal (R0)

Contents

- G.Wiring (General Note)
- H. Ultrasonic Level Sensor Probe – Endress + Hauser Wiring Recommendation
- I. Work Outline (Install & Supply) to Be Completed by Installing Contractor
- J. Equipment Storage (Prior to Installation)
- K. Offloading Instruction – Mechanical Equipment (Preliminary)

5. Preliminary/Sample O&M Manuals – Fine Step Screen & Wash Press
    - A. Fine Step Screen Manual (Preliminary)
    - B. Wash Press Manual (Preliminary)
    - C. Hygienic Bagger Instructions
6. Control Narrative Sequence & SCADA Exchange Table
    - A. Control Sequence Operation Description for Fine Screening Systems
    - B. SCADA Data Exchange Table – Elmvale WWTP
7. Electronic Controls Submittal Drawings & Component Catalog Cuts
    - A. Control Panel Submittal Drawings
    - B. Field Wiring & Wire Weights Diagram (Phase 1)
    - C. Components Catalog Cuts (Annotated) & Index
8. Appendices (for additional information or reference documentation)
    - A. Warranty Certificate – Five (5) Years
    - B. Training Agenda – Elmvale WWTP (Duration: approx. 2.5 hours)
    - C. Specification Compliance

1. Submittal Cover Letter

1 In-Tank Fine Screen, 1 Wash Press, Electrical Controls & Auxiliary Equipment

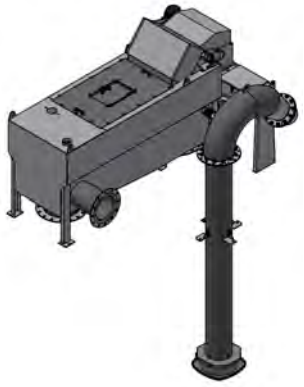
Technical Submittal (R0)

Township of Springwater, ON
Consulting Engineer: Arcadis
Project & Contract No.: 2024-05-PW
Contractor PO No.: TBD upon Novation
Claro Ref.: 22167-P-00

Claro™

claroglobal.com

Project:	Elmvale WWTP Upgrades	**16 July 2024 (R0)**
Municipal Authority:	Township of Springwater, ON	**Ref#: Elmvale, ON; 22167-P-00**
Installing Contractor:	TBD	
Consultant Contact:	Kaiping Zhang, P.Eng., Arcadis, 8133 Warden Ave, Unit 300, Markham, ON L6G 1B3; T.: 905.763.2322 (x 63551), kaiping.zhang@ibigroup.com	
Claro Representative:	Scott Lenhardt, P.Eng., Pro Aqua, Inc., 264 Bronte Street South, Unit #7, Milton, ON L9T 5A3; T.: 905.864.9311 (228); C.: 905.330.9244; scott@proaquasales.com	
Subject:	Technical Submittal (R0): Elmvale WWTP, ON; Project No. 2024-05-PW (Arcadis); Specification Section: 113300 – Mechanical Screen System Equipment: One (1) model 1100-600-6mm fine step screen-in-tank, one (1) model TP200-600 wash press & auxiliary equipment. Including PLC-based main control panel and local stations. Peak Flow: 141.4 L/s (12,216 m^3/d) & typical daily pattern flows of 80 L/sec & 40 L/sec.	



Thank you for the project kick-off meeting on Friday, 21 June – it was a pleasure to meet Township personnel. We look forward to working with everyone on project design/implementation and supporting Township personnel with operation into the future.

Claro is pleased to provide the balance of its technical submittal (R0) for the specified modular in-tank fine step screening system including PLC-based controls and auxiliary equipment for the Elmvale WWTP Upgrades project (controls portion - mechanical portion previously submitted). The proposed mechanical system & control panel is designed to enable seamless integration of a second future fine screening system. Controls enable the activation of screen No. 2's logic. The flow equalization pipe flange (supplied with a blind flange in the current phase) enables the upstream hydraulic connection of the present and future screens for even lower runtimes, higher separation & 100% redundancy. Note: This submittal document is bookmarked for ease of navigation.

Claro is submitting a short list of 'Open Items' for review and comment by the Engineer in the R0 submittal. These open items are listed in Section 2, item B of this document and are intended as a project checklist.

Thank you for reviewing our submittal (R0) materials. We would be keen to provide a complete installation requirements and tips review via Teams in advance of installation in addition to installation advice support through-out the installation process. If Arcadis or the installing contractor have comments or questions, please feel free to contact us at any time.

Thank you & regards,

Peter Lipert Jr.

Peter Lipert Jr.
General Manager
Administrative Office

screening grit removal Claro

Claro

125 Elmire, Suite 311
Montréal, Québec H2T 1J9 Cell: 514.562.4575 pjr@claroglobal.com

- Claro Design Offices – Montréal, QC
- Claro Parts & Equipment Warehouse – St.-Roch-De-L'Achigan, QC

Analogous Application – Wellesley WWTP (Region of Waterloo, ON; 2021)

6. Control Narrative Sequence & SCADA Exchange Table

1 In-Tank Fine Screen, 1 Wash Press, Electrical Controls & Auxiliary Equipment

Technical Submittal (R0)

Township of Springwater, ON
Consulting Engineer: Arcadis
Project & Contract No.: 2024-05-PW
Contractor PO No.: TBD upon Novation
Claro Ref.: 22167-P-00

A. Control Sequence Operation Description for Two (2) Fine Step Screens (in-Tank) & Two (2) Wash Press Compactors Including Discharge Tubes c/w Bagging Systems (Phase 1 & Future Phase)

Project Outline:

The project has 2 phases – a phase 1 fine screening system in-tank c/w wash press and a future phase screening system of identical but mirrored components. The two (2) screens are designed to be hydraulically connected with a flow equalization pipe that equalizes flow and establishes a common level upstream of both fine screens.

Each (1) x 6 mm aperture fine step screen-in-tank captures and discharges screenings debris into a screenings wash press unit that washes, dewaters & compacts the removed material. Treated screenings plugs are transited through each wash press's flared discharge tube and drop chute to its hygienic bagging system that automatically unfolds its 90m long bag magazine cartridge under the weight of the discharged material. A receiving bin is located beneath each compaction tube discharge & bagger. The operator ties off the hygienic bag once the respective receiving bin is full. The control narrative is characterized by a principle of restrained, intermittent operation at each fine screen & wash press in order to yield lower runtimes, augmented separation efficiency & exceptionally long service life of wear parts.

Motors List: each fine screen (1; reversible) & each wash press (1; reversible).

Instrumentation includes: An ultrasonic level sensor upstream of each fine screen, and a proximity home position sensor pre-installed in each fine screen motor compartment. Torque detection for each fine screen is effected by Emotron M20 torque detectors preinstalled within the screening system control panel. Wash press amperage protection is provided by current transformers (CT) also located within the screening system control panel. Additional thermal overload protection is also provided for each fine screen & wash press equipment in addition to electronic protection.

HMI Interface Design: The programming & HMI design aim to provide an easy-to-use intuitive graphic interface that provides a real-time overview of the system's operation. HMI interface screens are modelled on the project submittal drawings layout & equipment models.

A. Automatic Operation:

• Fine Screen: The following fine step screen control sequence applies to a single fine screen, which operates independently in response to its respective upstream & downstream ultrasonic level detector-indicated levels. Once the second, future fine screen is implemented, Item E: Alternating Start Subroutine will be applicable.

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 Level②**) measured by an ultrasonic level detector upstream of the fine screen unit;
      (or)
   b. 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 & max. pause time. Approach 'a' 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 screen & wash press. Typically, the max. preset time interval approach "b" is turned 'OFF' and only the level detector prompts the movement of the screen. The timer function is provided as a precaution in case the level sensor is out of service or in 'Fault'.

   Precautionary timer back-up routine: A relay on the level transmitter (e.g. Endress & Hauser Prosonic S FMU90) will also automatically switch to timer mode if the transmitter happens to fall into 'Fault' or the 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.

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 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. Filter screen cleaning does not employ the actuation of brushes, wash water solenoids or scrapers. Please see Claro films website developed for the Elmvale application for illustration.
https://vimeopro.com/user10768107/elmvale-wwtp-arcadis Password is: **ClaroFilms**

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 Level②** 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 maintained below the preset start level: the **'Upstream Mode' Continuous Run Shut-Off Level①**, which is typically 50 mm below the normal start level preset. Once this liquid level criterion is met, the screening system will 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 <<b>> to be turned ON or OFF. Typically, subroutine <<b>> is turned OFF

• Wash Press

5. Each Elmvale fine screen incorporates one (1) screenings wash. The wash press will begin its treatment sequence once a preset number of screen moveable bar rack rotations / discharges has been achieved or if its associated screen switches into continuous run mode. Screen rotation count is correlated with a consistent screenings volume. The wash press runs only when sufficient debris loading within its inlet justifies a treatment / transport cycle. Once the start 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 that 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.

• Continued following page →

B. Manual Operation:

1. Fine Screen 1 (or 2) – 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 associated 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 are exceedingly rare and should be approached as a cue to inspection since the screen will have already have effected an automatic reverse run sequence. Please feel free to call Claro at any time @ its 24-hour hotline.
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 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: Each wash press's solenoids can be operated manually via the control panel HMI control screens. When the Solenoid #1 or Solenoid #2 manual operation buttons for the associated 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 associated wash press MAN/OFF/AUTO selector is in the <<Manual>> position. These instructions are represented on the screening system control panel HMI 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.
6. Fine Screen – Trigger Sequence: The operator can trigger a fine screen 1 or 2 sequence by pressing on the appropriate 'Trigger' button on the control panel HMI screen (located on each fine screen's visualization/status HMI screen).
7. Wash Press – Trigger Sequence: The operator can trigger a complete wash press treatment cycle for either wash press unit by pressing on the appropriate 'Trigger' button on the control panel HMI screen (located on each wash press's visualization/status screen).

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• Continued following page →

C. Alarms:

1. Fine Screen – High Torque/Amperage: During overload or jamming of a screen, the Emotron M20 torque/amperage sensor 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 appropriate 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 tank 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 moveable bar rotation at this adjustable 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 a wash press is left in OFF or MAN at the local HOA while its associated fine screen is also in Auto, an alarm will sound after an adjustable time delay.

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• Continued following page →

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 & wash press. Note: The graphics representing the screens & wash presses are adapted from the project drawings in order to faithfully reflect the Elmvale screening systems layout. Claro would be pleased to provide graphics to the facility network programmer if this is preferred.

- A trends page records:
  a) the upstream liquid levels & differential levels
  b) fine screen 1 & 2 + wash press 1 & 2 torque/amperage levels

- A runtimes page records:
  a) the number of motor starts for each screen & wash press
  b) the total amount of time each motor has run
  c) the total number of treatment cycles completed by each wash press
  d) 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/tanks are joined and thus where the upstream level in the channels/tanks 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 (or more) screens actuate at nearly the same time & in response to the same shared upstream water level or differential value. The subroutine will ensure the least wear-&-tear and the best separation efficiency in this type of configuration.
   N.B. This standard subroutine can be turned ON or OFF at the network PLC visualization screen(s).

2. With this subroutine ON, the controls program will keep one screen (e.g. screen #2) inhibited from responding to a start signal until the other screen (e.g. screen #1) has been triggered first and has run 1 complete moveable 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 throughout the day.

3. The inhibition/alternation subroutine will be turned OFF if the level in at least one of the channels/tanks 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 or debris influx while also preserving the formation of a screenings 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/tank is closed by a

[1] The adjustable delay provides time for the level to fall after a screen's moveable bar rotation

gate/valve. 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/alternation subroutine can be turned ON or OFF at the screening system HMI screen.
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 setpoint. And so on back and forth so that each screen responds once in every two movements;
   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 to each channel/tank due to hydraulic imbalance & perhaps a slight difference in the level measurement in each channel/tank). By having only one screen respond, the controls ensure that the 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.

• For comments or questions, please feel free to contact Claro at any time (514.562.4575).

• Continued following page →

'Screenings Mat' Operation:

exceptional screening & low-impact mechanical operation

Examples of the 'screenings mat' filter. As screenings accumulate into a filter mat, the water level rises in front of the bar screen. Once the water level reaches a predetermined level, the step screen advances one step. This single rotation of the moving bars shifts the entire screenings mat up the bar screen and frees the bottom step from screenings. The water level falls until the mat is reconstituted and the cycle begins again.

'Screenings Mat' Operation:

exceptional screening & low-impact mechanical operation

Example of the step-by-step discharge of screenings into a Claro washpress. The interval between step movements is coordinated by a water-level detector. The screen moves only when the volume of screened material necessitates a self-cleaning rotation of the mobile bars. This intermittent cycle of intelligent, step-by-step movements significantly reduces mechanical wear & tear.

B. SCADA Data Exchange Table

Elmvale, ON
Screening System SCADA Data Exchange Table
Screening System Control Panel

PLC - Network Configuration

Ethernet Address (MAC):
IP Address: 1.0.0.1
Mask: 255.255.255.0
Gateway: 0.0.0.0

* Network addresses are preliminary. Final preferred

HMI - Network Configuration

Ethernet Address (MAC):
IP Address: 1.0.0.2
Mask: 255.255.255.0
Gateway: 0.0.0.0

* Network addresses are preliminary. Final preferred addresses to be provided.

Rev. : 0 (2024-07-15)

PLC

Micrologix 1400

Reading Data Only	Data Type	PLC Address	Dec Point	PLC Map Address		Modbus TCP Address	
				Word	Bit	Word	Bit
User = claro							
pass = 330614							
Fine Screen 1							
Fine Screen 1 - Selector Switch in Manual Position	BOOL			N74:0	0		
Fine Screen 1 - Selector Switch in Auto Position	BOOL			N74:0	1		
Fine Screen 1 - Selector Switch in OFF Position	BOOL			N74:0	2		
Fine Screen 1 - Running Status	BOOL			N74:0	3		
Fine Screen 1 - Local E-Stop Activated	BOOL			N74:0	4		
Fine Screen 1 - Ready	BOOL			N74:0	5		
Fine Screen 1 - Collective Fault	BOOL			N74:0	6		
Fine Screen 1 - Motor Overload	BOOL			N74:0	7		
Fine Screen 1 - Mechanical Blocking Alarm	BOOL			N74:0	8		
Fine Screen 1 - Fail to Start Alarm	BOOL			N74:0	9		
Fine Screen 1 - High Level Warning (Upstream)	BOOL			N74:0	10		
Fine Screen 1 - Upstream Level Probe Echo Loss	BOOL			N74:0	11		
Fine Screen 1 - Start Mode (0 = Level / 1 = Timer & Level)	BOOL			N74:0	12		
Fine Screen 1 - Home Position Switch Alarm	BOOL			N74:0	13		
Fine Screen 1 - Downstream Level Probe Echo Loss	BOOL			N74:0	14		
	BOOL			N74:0	15		
Washpress 1							
Washpress 1 - Selector Switch in Manual Position	BOOL			N74:1	0		
Washpress 1 - Selector Switch in Auto Position	BOOL			N74:1	1		
Washpress 1 - Selector Switch in OFF Position	BOOL			N74:1	2		
Washpress 1 - Running Status	BOOL			N74:1	3		
Washpress 1 - Local E-Stop Activated	BOOL			N74:1	4		
Washpress 1 - Ready	BOOL			N74:1	5		
Washpress 1 - Collective Fault	BOOL			N74:1	6		
Washpress 1 - Low Amperage Alarm (Low Torque)	BOOL			N74:1	7		
Washpress 1 - High Amperage Alarm (High Torque)	BOOL			N74:1	8		
Washpress 1 - Motor Overload	BOOL			N74:1	9		
Washpress 1 - Fail to Start Alarm	BOOL			N74:1	10		
Washpress 1 - High Amperage Warning (High Torque)	BOOL			N74:1	11		
Washpress 1 - Washing Solenoid ON/OFF	BOOL			N74:1	12		
Washpress 1 - Flushing Solenoid ON/OFF	BOOL			N74:1	13		
Washpress 1 - Wash Back-in-Service Alarm	BOOL			N74:1	14		
	BOOL			N74:1	15		

	Fine Screen 2								
	Fine Screen 2 - Selector Switch in Manual Position	BOOL			N74:2	0			
	Fine Screen 2 - Selector Switch in Auto Position	BOOL			N74:2	1			
	Fine Screen 2 - Selector Switch in OFF Position	BOOL			N74:2	2			
	Fine Screen 2 - Running Status	BOOL			N74:2	3			
	Fine Screen 2 - Local E-Stop Activated	BOOL			N74:2	4			
	Fine Screen 2 - Ready	BOOL			N74:2	5			
	Fine Screen 2 - Collective Fault	BOOL			N74:2	6			
	Fine Screen 2 - Motor Overload	BOOL			N74:2	7			
	Fine Screen 2 - Mechanical Blocking Alarm	BOOL			N74:2	8			
	Fine Screen 2 - Fail to Start Alarm	BOOL			N74:2	9			
	Fine Screen 2 - High Level Warning (Upstream)	BOOL			N74:2	10			
	Fine Screen 2 - Upstream Level Probe Echo Loss	BOOL			N74:2	11			
	Fine Screen 2 - Start Mode (0 = Level / 1 = Timer & Level)	BOOL			N74:2	12			
	Fine Screen 2 - Home Position Switch Alarm	BOOL			N74:2	13			
	Fine Screen 2 - Downstream Level Probe Echo Loss	BOOL			N74:2	14			
		BOOL			N74:2	15			
	Washpress 2								
	Washpress 2 - Selector Switch in Manual Position	BOOL			N74:3	0			
	Washpress 2 - Selector Switch in Auto Position	BOOL			N74:3	1			
	Washpress 2 - Selector Switch in OFF Position	BOOL			N74:3	2			
	Washpress 2 - Running Status	BOOL			N74:3	3			
	Washpress 2 - Local E-Stop Activated	BOOL			N74:3	4			
	Washpress 2 - Ready	BOOL			N74:3	5			
	Washpress 2 - Collective Fault	BOOL			N74:3	6			
	Washpress 2 - Low Amperage Alarm (Low Torque)	BOOL			N74:3	7			
	Washpress 2 - High Amperage Alarm (High Torque)	BOOL			N74:3	8			
	Washpress 2 - Motor Overload	BOOL			N74:3	9			
	Washpress 2 - Fail to Start Alarm	BOOL			N74:3	10			
	Washpress 2 - High Amperage Warning (High Torque)	BOOL			N74:3	11			
	Washpress 2 - Washing Solenoid ON/OFF	BOOL			N74:3	12			
	Washpress 2 - Flushing Solenoid ON/OFF	BOOL			N74:3	13			
	Washpress 2 - Wash Back-in-Service Alarm	BOOL			N74:3	14			
		BOOL			N74:3	15			
	Others								
	Main Panel E-Stop Activated	BOOL			N74:4	0			
	PLC Low Battery								
	Phase Loss Alarm or Power Outage								
	Collective Fault								
	Washpress 1 - Washing Mode = Alt 1 - With Pauses								
	Washpress 1 - Washing Mode = Alt 2 - Without Pauses	BOOL			N74:4	5			
	Washpress 1 - Washing Mode = Alt 3 - For. / Reverse	BOOL			N74:4	6			
	Washpress 2 - Washing Mode = Alt 1 - With Pauses	BOOL			N74:4	7			
	Washpress 2 - Washing Mode = Alt 2 - Without Pauses	BOOL			N74:4	8			
	Washpress 2 - Washing Mode = Alt 3 - For. / Reverse	BOOL			N74:4	9			
		BOOL			N74:4	10			
		BOOL			N74:4	11			
		BOOL			N74:4	12			
		BOOL			N74:4	13			
		BOOL			N74:4	14			
		BOOL			N74:4	15			

Confirmation that the collective fault includes any fault from the 2 screens and the 2 washpresses.

	PLC seconds (0-59)	INTEGER			N74:5			
	Instrumentation							
	Fine Screen 1 - Upstream Level (mm)	FLOAT			F17:50			
	Fine Screen 1 - Downstream Level (mm)	FLOAT			F17:51			
	Fine Screen 1 - Differential Level Value (mm)	FLOAT			F17:52			
	Fine Screen 1 - Motor Torque (%)	FLOAT			F17:53			
	Fine Screen 2 - Upstream Level (mm)	FLOAT			F17:54			
	Fine Screen 2 - Downstream Level (mm)	FLOAT			F17:55			
	Fine Screen 2 - Differential Level Value (mm)	FLOAT			F17:56			
	Fine Screen 2 - Motor Torque (%)	FLOAT			F17:57			
	Washpress 1 - Motor Amperage (Amps)	FLOAT			F17:58			
	Washpress 2 - Motor Amperage (Amps)	FLOAT			F17:59			
		FLOAT			F17:60			
		FLOAT			F17:61			
		FLOAT			F17:62			
		FLOAT			F17:63			
	Statistics							
	Washpress 1 - Total Run Time (1/100 hr)	FLOAT			F17:0			
	Washpress 1 - Total Starts Number	FLOAT			F17:1			
	Washpress 1 - Total Treatment Cycles	FLOAT			F17:2			
		FLOAT			F17:3			
		FLOAT			F17:4			
	Fine Screen 1 - Total Run Time (1/100 hr)	FLOAT			F17:5			
	Fine Screen 1 - Total Starts Number	FLOAT			F17:6			
	Fine Screen 1 - Total Cycles Number	FLOAT			F17:7			
		FLOAT			F17:8			
		FLOAT			F17:9			
		FLOAT			F17:10			
	Fine Screen 2 - Total Run Time (1/100 hr)	FLOAT			F17:11			
	Fine Screen 2 - Total Starts Number	FLOAT			F17:12			
	Fine Screen 2 - Total Cycles Number	FLOAT			F17:13			
		FLOAT			F17:14			
	Washpress 2 - Total Run time (1/100 hr)	FLOAT			F17:15			
	Washpress 2 - Total Starts Number	FLOAT			F17:16			
	Washpress 2 - Total Treatment Cycles	FLOAT			F17:17			

7. Electronic Controls Submittal Drawings & Component Catalog Cuts

1 In-Tank Fine Screen, 1 Wash Press, Electrical Controls & Auxiliary Equipment

Technical Submittal (R0)

Township of Springwater, ON
Consulting Engineer: Arcadis
Project & Contract No.: 2024-05-PW
Contractor PO No.: TBD upon Novation
Claro Ref.: 22167-P-00

A. Control Panel Submittal Drawings – Elmvale WWTP, ON

• Please see following pages.

SHTS	TITLE
1	TABLE OF CONTENT
2	BILL OF MATERIAL
3	BILL OF MATERIAL (NEXT)
4	BILL OF MATERIAL (NEXT)
5	PANEL LAYOUT
6	PANEL LAYOUT
7	LOCAL STATION AND LOCKOUT SWITCH
8	LOCAL STATION AND LOCKOUT SWITCH
9	PLC CONFIGURATION
10	POWER DIAGRAM
11	POWER DIAGRAM (NEXT)
12	120VAC DISTRIBUTION
13	24VDC DISTRIBUTION
14	BLANK PAGE
15	120VAC CONTROL DIAGRAM
16	120VAC CONTROL DIAGRAM (NEXT)
17	24VDC CONTROL DIAGRAM
18	24VDC CONTROL DIAGRAM (NEXT)
19	24VDC CONTROL DIAGRAM (NEXT)
20	24VDC INDICATOR LIGHTS
21	INTRINSIC RELAY
22	BLANK PAGE
23	PLC - DIGITAL INPUTS
24	PLC - DIGITAL INPUTS (NEXT)
25	PLC - ANALOG INPUTS

SHTS	TITLE
26	PLC - DIGITAL OUTPUTS
27	PLC - DIGITAL OUTPUTS (NEXT)
28	PLC - ANALOG OUTPUTS
29	MOD1 - DIGITAL INPUTS
30	MOD1 - DIGITAL INPUTS (NEXT)
31	MOD2 - ANALOG INPUTS
32	MOD2 - ANALOG INPUTS (NEXT)
33	MOD3 - DIGITAL OUTPUTS
34	EXTERNAL CONTACTS
35	TERMINALS
36	TERMINALS (NEXT)
37	WIRING DIAGRAM
38	WIRING DIAGRAM (NEXT)
39	WIRING DIAGRAM (NEXT)
40	WIRING DIAGRAM (NEXT)
41	WIRING DIAGRAM (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 2.5mm² (1SNK 705 010 R0000)
⊘	GND (1SNK 705/708 150 R0000)
◪	ISOL. GND (1SNK 705 061 R0000)
□	50A 6mm² (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 / XX → SHEET NUMBER / LINE NUMBER

CONTACT REFERENCE

XXXX → SHEET NUMBER / LINE NUMBER

NO XXXX

NC

REMOVE THE JUMPER IF AN INSTRUMENTATION GROUND IS SUPPLIED

QTY: 1X

REV	DATE		DESCRIPTION
00	2024-07-09	X.M.	FOR APPROVAL

VOLT.	600	H.P.	5.5
PHASE	3	kVAR	N/A
FREQ. (HZ)	60	kW	N/A
AMP.	10	TYPE	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

TABLE OF CONTENT

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE DRAWING# 12033416

DATE: JULY 2024 PAGE 1 OF 39

H:_Projets_12033\XXX\12033416 Claro Elmvale, ON\Dessins\12033416_R0\12033416_R0_P1.dwg

TAGS	DESCRIPTION	CATALOG	MFG	QTY
	SINGLE DOOR ENCLOSURE, WALL-MOUNT, 72x36x12 IN, GRAY PAINT ASA-61	R723612	BEL Products	1
DS1001	FUSE DISCONNECT SWITCH, 30A, 20HP, 600V, 3P , CLASS J	OS30FAJ12	ABB	1
	HPC FUSE CLASS J, 15A, 600VAC, TIME DELAY	AJT-15N	FERRAZ SHAWMUT	3
	PISTOL HANDLE FOR DISCONNECT SWITCH, LENGTH 65mm, FOR 6mm DIA. SHAFT., NEMA 12 & 3R	OHB65J6	ABB	1
	SHAFT FOR PISTOL HANDLE, LENGTH: 265mm	OXP6X265	ABB	1
CB1003 CB1103	THERMAL MAGNETIC CIRCUIT BREAKER FOR MOTOR PROTECTION, CLASS 10, 30, BREAKING CAP. 30kA @ 600V, RATED CURRENT 0.9 - 1.25AMPS, S00	3RV20 11-0KA10	SIEMENS	2
	AUXILIARY CONTACT, FRONT MOUNT, SIZE 00, S0 TO S3 MOTOR STARTER PROTECTORS, 1NO & 1NC	3RV29 01-1E	SIEMENS	2
CB1003A CB1103A	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
	AUXILIARY CONTACT, FRONT MOUNT, SIZE 00, S0 TO S3 MOTOR STARTER PROTECTORS, 1NO & 1NC	3RV29 01-1E	SIEMENS	2
	SHAFT AND HANDLE FOR STARTER 3RV S00 & S0, IP65, NEMA 1&12&3R	3RV2926-2B	SIEMENS	4
M1503 M1508 M1603 M1608	CONTACTOR FOR SWITCHING MOTOR SIZE S00 3P, 10HP @ 600V, 11A IND.(22A RES.), 1NO, COIL 50/60HZ 120VAC	3RT20 17-1AK61	SIEMENS	4
	AUX. SWITCH BLOCK SNAP. ONTO FRONT, 2NC+2NO, S00, S0 TO S3	3RH29 11-1FA22	SIEMENS	4
	MECHANICAL INTERLOCKS FOR 3P CONTACTOR ASSEMBLIES, SIZE S00 - COMPATIBLE WITH "3RT20 1"	3RA29 13-2AA1	SIEMENS	2
M1506 M1511 M1606 M1611	CONTACTOR FOR SWITCHING MOTOR SIZE S00 3P, 10HP @ 600V, 11A IND.(22A RES.), 1NO, COIL 50/60HZ 120VAC	3RT20 17-1AK61	SIEMENS	4
	AUX. SWITCH BLOCK SNAP. ONTO FRONT, 2NC+2NO, S00, S0 TO S3	3RH29 11-1FA22	SIEMENS	4
CT1004 CT1104	SHAFT POWER MONITOR, 3x525-690VAC	M20 (3x525-690VAC)	EMOTRON	2
XF1006 XF1106	CURRENT TRANSFORMER TYPE, 10A	CTM010	EMOTRON	2
XF1006A XF1106A	CURRENT TRANSFORMER 0-10/20/40A TO 4-20mA OUTPUT	H721LC	HAWKEYE	2
FU1003	FUSE HOLDER, 30A, 600V, 3P, CC ULTRA-SAFE	USCC3	FERRAZ SHAWMUT	1
	HPC FUSE CLASS CC, 7.5A, 600VAC, TIME DELAY	ATDR-7 1/2	FERRAZ SHAWMUT	3
DPP1006	LINE MONITORING- PHASE TROUBLE - ANALOG -DIGITAL ADJUSTABLE - 160-690VAC	3UG55 14-1BR20	SIEMENS	1
XF1007	1PH CONTROL TRANSFORMER, 480/600V X 120/240V, 1500VA	SP1500ACP	HAMMOND	1
	SNAP-ON TERMINAL TOUCH-SAFE COVER KIT FOR HAMMOND TRANSFORMER	SPFG1	HAMMOND	2
CB1204	MINI CIRCUIT BREAKER - 1 POLE - 10A - 60VDC/240VAC - WITH PROTECTORS SCREWS	5SJ4110-7HG41	SIEMENS	1
CB1202	MINI CIRCUIT BREAKER - 1 POLE - 2 A - 60VDC/240VAC - WITH PROTECTORS SCREWS	5SJ4102-7HG41	SIEMENS	1
FU1305 FU1311 FU1312 FU1313	SCREW CLAMP FUSE HOLDER, 1 POLE, 10A, 300V, 24-10AWG, ZS4-SF1, FOR 5X20 & 5X25 FUSES	1SNK 508 410 R0000	ABB	4
	ELECTRONIC / GLASS FUSE (20x5mm), 1A, 250VAC, TIME DELAY	GDG1	FERRAZ SHAWMUT	4
FU1302 FU1303	SCREW CLAMP FUSE HOLDER, 1 POLE, 10A, 300V, 24-10AWG, ZS4-SF1, FOR 5X20 & 5X25 FUSES	1SNK 508 410 R0000	ABB	2
	ELECTRONIC / GLASS FUSE (20x5mm), 10A, 250VAC, TIME DELAY	GDG10	FERRAZ SHAWMUT	2

TAGS	DESCRIPTION	CATALOG	MFG	QTY
FU1216 FU1307 FU1309 FU1317	SCREW CLAMP FUSE HOLDER, 1 POLE, 10A, 300V, 24-10AWG, ZS4-SF1, FOR 5X20 & 5X25 FUSES	1SNK 508 410 R0000	ABB	4
	ELECTRONIC / GLASS FUSE (20x5mm), 2A, 250VAC, TIME DELAY	GDG2	FERRAZ SHAWMUT	4
FU1211	SCREW CLAMP FUSE HOLDER, 1 POLE, 10A, 300V, 24-10AWG, ZS4-SF1, FOR 5X20 & 5X25 FUSES	1SNK 508 410 R0000	ABB	1
	ELECTRONIC / GLASS FUSE (20x5mm), 5A, 250VAC, TIME DELAY	GDG5	FERRAZ SHAWMUT	1
PR1202	SINGLE OUTLET WITH CIRCUIT BREAKER, 5A, 120VAC	9915480001	WEIDMULLER	1
TVSS1213	FILTER TVSS, 120VCA, 10A	10VR1	CORCOM	1
FU1206 FU1207 FU1208 FU1209 FU1310 FU1315	SCREW CLAMP FUSE HOLDER, 1 POLE, 10A, 300V, 24-10AWG, ZS4-SF1, FOR 5X20 & 5X25 FUSES	1SNK 508 410 R0000	ABB	6
	ELECTRONIC / GLASS FUSE (20x5mm), 0.5A, 250VAC, TIME DELAY	GDG.5	FERRAZ SHAWMUT	6
LT3302 LT3304 LT3306 LT3308	INDICATOR LIGHT, 22mm, RED	3SU1051-6AA20-0AA0	SIEMENS	4
	HOLDER FOR THREE MODULES, 22mm	3SU1550-0AA10-0AA0	SIEMENS	4
	MODULE WITH INTEGRATED LED 24Vac/dc, RED	3SU1401-1BB20-1AA0	SIEMENS	4
LT2004 LT2006 LT2008 LT2010	INDICATOR LIGHT, 22mm, GREEN	3SU1051-6AA40-0AA0	SIEMENS	4
	HOLDER FOR THREE MODULES, 22mm	3SU1550-0AA10-0AA0	SIEMENS	4
	MODULE WITH INTEGRATED LED 24Vac/dc, GREEN	3SU1401-1BB40-1AA0	SIEMENS	4
LT2002	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
PB2412	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
PB1703	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, 1NO	3SU1400-1AA10-1BA0	SIEMENS	1
PS1302	SITOP PSU100L 24V/10A STABILIZED POWER SUPPLY, INPUT: 120/230 V AC OUTPUT: 24 V DC/10 A	6EP1 334-1LB00	SIEMENS	1
PLC2302	A-B PLC, MICROLOGIX 1400, 120/240VAC, 20DI 24VDC, 12 RELAY OUT, 4AI, 2AO	1766-L32BWAA	AB	1
MOD1	1762 MICRO LOGIX 1200, 16 DISCRETE INPUT 24VDC	1762-IQ16	AB	1
MOD2	MICRO LOGIX 1200 ANALOG INPUT 4 CHANNEL INPUT +/-10VDC, 4-20mA	1762-IF4	AB	1
MOD3	1762 MICRO LOGIX 1200, 8 DISCRETE OUTPUT	1762-OB8	AB	1
ES1305	5 PORTS ETHERNET SWITCH 10/100 MBITS, 24VDC POWER SUPPLY	6GK5005-0BA00-1AB2	SIEMENS	1
	PATCH CABLE CAT-5E, LENGTH 3'	MP-54RJ45DNNE-003	AMPHENOL	1
	PATCH CABLE CAT-5E, LENGTH 15'	MP-54RJ45DNNE-015	AMPHENOL	1
HMI1307	SIMATIC HMI TP700 COMFORT, TOUCH OPERATION, 7" WIDESCREEN-TFT-DISPLAY, PROFINET INTERFACE, MPI/PROFIBUS DP INTERFACE, SUPPLY 24VDC	6AV2 124-0GC01-0AX0	SIEMENS	1

23

REV	DATE		DESCRIPTION
00	2024-07-09	X.M.	FOR APPROVAL

VOLT.	H.P.
600	5.5
PHASE	kVAR
3	N/A
FREQ. (HZ)	kW
60	N/A
AMP.	TYPE
10	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

BILL OF MATERIAL

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE DRAWING# 12033416

DATE: JULY 2024 PAGE 2 OF 39

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TAGS	DESCRIPTION	CATALOG	MFG	QTY
CR1703 CR1705 CR1707 CR1709 CR1803 CR1804 CR1805 CR1806 CR1811 CR1812 CR1813 CR1814 CR1903 CR1904 CR1905 CR1906 CR1911 CR1912 CR1913 CR1914	MINI INDUSTRIAL RELAY WITH TEST BRACKET AND MECHANICAL SWITCH POSITION INDICATOR - 4P/DT 24VDC 6A(RES)/1A(IND)@230V, CR-M	1SVR405613R1000	ABB	20
	PLUG-IN BASE FOR 2/4 CO CR-M RELAYS, MOUNTING ONTO STANDARD MOUNTING RAIL, SCREW TERMINALS	1SVR405651R3000	ABB	20
	FIXING/EJECTION BRACKET, CR-M TYPE	1SVR405659R1000	ABB	20
D1703 D1705 D1707 D1709 D1803 D1804 D1805 D1806 D1811 D1812 D1813 D1814 D1903 D1904 D1905 D1906 D1911 D1912 D1913 D1914	FREEWHEEL DIODE WITH CONNECTION TO A1 - 6-230VDC	1SVR405651R0000	ABB	20
CR3303 CR3305 CR3307 CR3309 CR3311	OUTPUT COUPLING DEVICE, RELAY 1CO DRY CONTACT, 3A, COIL 24VDC, SCREW TERMINAL	3RQ3118-1AM00	SIEMENS	5
	CONNECTING COMB FOR 3RQ COUPLING DEVICE, 16-POLE	3RQ3901-0D	SIEMENS	1
RI2102	INTRINSIC RELAY, 2 CHANNELS, UNIVERSAL VOLTAGE SUPPLY	IM1-22EX-R	TURCK	1
	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
TRANS3102	ULTRASONIC LEVEL TRANSDUCER, 2 SENSOR, 3 ALARM RELAY, 2x 4-20mA HART, SUPPLY 10.5-32VDC	FMU90-N12CB232AA1A	ENDRESS_HAUSER	1
LS3106 LS3109	ULTRASONIC LEVEL PROBE CLASS 1 DIV 1, 15M CABLE	FDU91-SN3AA	ENDRESS_HAUSER	2

TAGS	DESCRIPTION	CATALOG	MFG	QTY
	SCREWLESS END STOP, DARK GREY, DIN 3, BAZ1	1SNK 900 002 R0000	ABB	43
	END SECTION, DARK GREY, ES4-SF FOR ZS4-SF1 FUSE HOLDER	1SNK 508 960 R0000	ABB	3
	END SECTION, DARK GREY, EK2.5 FOR ZK2.5, ZK4 AND ZK6 TERMINAL	1SNK 705 910 R0000	ABB	11
	JUMPER BAR, 50 POLES, ORANGE, 32A, JB5-50 FOR ZK2.5 TERMINAL	1SNK 905 350 R0000	ABB	2
	JUMPER BAR, 10 POLES, GRAY, 35A, PC81-10 FOR ZS4-SF1 FUSE HOLDER	017352311	ABB	2
	PI-SPRING TERMINAL BLOCK, FEED-THROUGH WITH 2 CONNECTIONS , GREY BODY, 20A, 600V, 26-12AWG, ZK2.5	1SNK 705 010 R0000	ABB	181
	PI-SPRING TERMINAL BLOCK, FEED-THROUGH WITH 2 CONNECTIONS , BLUE BODY, 20A, 600V, 26-12AWG, ZK2.5-BL	1SNK 705 020 R0000	ABB	4
	PI-SPRING TERMINAL BLOCK, FEED-THROUGH WITH 2 CONNECTIONS , GREEN BODY, 20A, 600V, 26-12AWG, ZK2.5-GN	1SNK 705 061 R0000	ABB	14
	PI-SPRING TERMINAL BLOCK, FEED-THROUGH WITH 2 CONNECTIONS , RED BODY, 20A, 600V, 26-12AWG, ZK2.5-RD	1SNK 705 062 R0000	ABB	18
	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	10
	PI-SPRING TERMINAL BLOCK, FEED-THROUGH WITH 2 CONNECTIONS , GREY BODY, 50A, 600V, 24-8AWG, ZK6	1SNK 708 010 R0000	ABB	12
	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	5
	SYMETRICAL DIN RAIL, TS35/F6	0173 220.05	ENTRELEC	15
LT2002 LT2004 LT2006 LT2008 LT2010 LT3302 LT3304 LT3306 LT3308 PB1703 PB2412	LABEL HOLDER, 22mm, BLACK	3SU1900-0AG10-0AA0	SIEMENS	11

REV	DATE		DESCRIPTION
00	2024-07-09	X.M.	FOR APPROVAL

VOLT.	600
H.P.	5.5
PHASE	3
kVAR	N/A
FREQ. (HZ)	60
kW	N/A
AMP.	10
TYPE	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

BILL OF MATERIAL (NEXT)

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE

DRAWING# 12033416

DATE: JULY 2024

PAGE 3 OF 39

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⚠ LOCK–OUT SWITCHES

TAGS	DESCRIPTION	CATALOG	MFG	QTY
DS1010	LOCKABLE MANUAL SWITCH ENCLOSURE CLASS1 DIV1, NEMA 4	SA5762	ADALET	1
	THERMAL MAGNETIC CIRCUIT BREAKER, CLASS 10, 3Ø, BREAKING CAP. 4kA @ 690V, RATED CURRENT 10AMPS, S00	3RV23 21-1JC10	SIEMENS	1
DS1010A	LOCKABLE MANUAL SWITCH ENCLOSURE CLASS1 DIV1, NEMA 4	SA5762	ADALET	1
	THERMAL MAGNETIC CIRCUIT BREAKER, CLASS 10, 3Ø, BREAKING CAP. 4kA @ 690V, RATED CURRENT 10AMPS, S00	3RV23 21-1JC10	SIEMENS	1
	CLOSURE PLUG	PLG-1-RD	T&B	1
	AUXILIARY CONTACT, FRONT MOUNT, SIZE 00, 0 & 2 MOTOR STARTER PROTECTORS, 1NO & 1NC	3RV29 01-1E	SIEMENS	1

⚠ LOCAL CONTROL STATIONS

TAGS	DESCRIPTION	CATALOG	MFG	QTY
	EXPLOSIONPROOF CONTROL STATION, CLASS I DIV 1, CAST ALUMINUM, NEMA 4, 7, 9, 3 UNITS, WALL-MOUNT	X3-N4-10-111-462	ADALET	2
	3 POSITION SELECTOR, MAINTAINED OPERATORS, 2NO	1SS	ADALET	2
	3 POSITION SELECTOR, SPRING RETURN OPERATORS, 2NO	1SSS	ADALET	2
	2 POSITION PUSH PULL MAINTAINED, RED, 1NO&1NC	1PB	ADALET	2
	NAMEPLATE	XNPWB	ADALET	6

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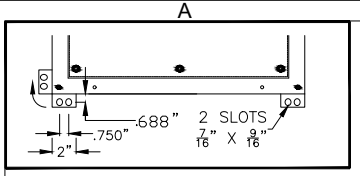
REV	DATE		DESCRIPTION
00	2024-07-09	X.M.	FOR APPROVAL

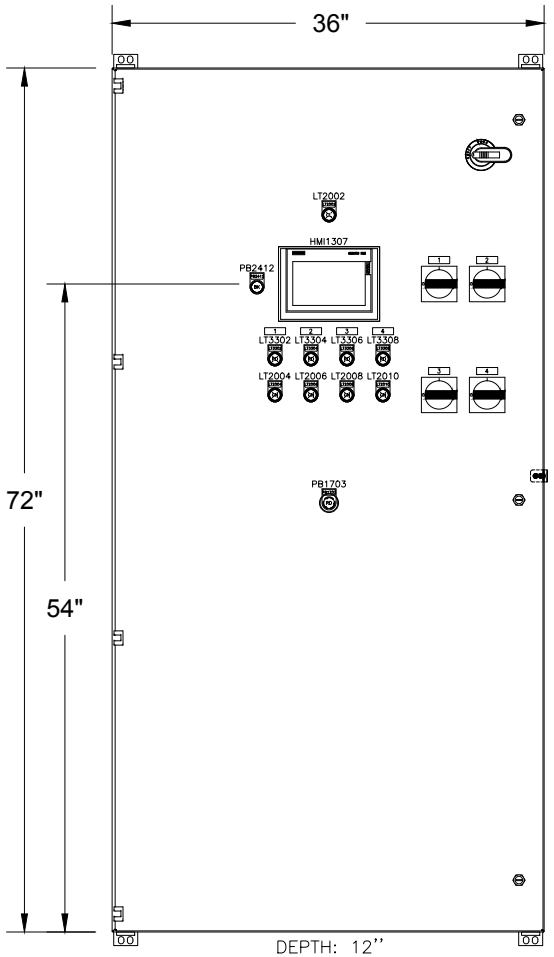
VOLT. 600	H.P. 5.5	TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL	
PHASE 3	kVAR N/A	BILL OF MATERIAL (NEXT)	
FREQ. (HZ) 60	kW N/A	CUSTOMER: CLARO	
AMP. 10	TYPE 12	REF.: 22167-P-00 PROJET: ELMVALE, ON	
		DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON	

Claro™

SCALE: NONE	DRAWING# 12033416
DATE: JULY 2024	PAGE 4 OF 39



NAMEPLATES				
ITEM	DIMENSIONS	LINE1	LINE2	LINE3
1	0.6" X 1.75"		FINE SCREEN 1	
2	0.6" X 1.75"		WASHPRESS 1	
3	0.6" X 1.75"		FINE SCREEN 2	
4	0.6" X 1.75"		WASHPRESS 2	
LT2002	22mm		POWER ON	
LT2004	22mm		RUNNING	
LT2006	22mm		RUNNING	
LT2008	22mm		RUNNING	
LT2010	22mm		RUNNING	
LT3302	22mm		FAULT	
LT3304	22mm		FAULT	
LT3306	22mm		FAULT	
LT3308	22mm		FAULT	
PB1703	22mm	EMERGENCY	STOP	
PB2412	22mm	ALARM	RESET/SILENCE	



AVERTISSEMENT/WARNING

UTILISEZ DES CONNECTEURS AVEC LE MÊME DEGRÉ DE PROTECTION ENVIRONNEMENTAL QUE LE BOITIER

USE HUBS OR FITTINGS WITH THE SAME ENVIRONMENTAL RATING AS THE ENCLOSURE

REV	DATE		DESCRIPTION
00	2024-07-09	X.M.	FOR APPROVAL

VOLT. 600	H.P. 5.5
PHASE 3	kVAR N/A
FREQ. (HZ) 60	kW N/A
AMP. 10	TYPE 12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
PANEL LAYOUT
CUSTOMER: CLARO
REF.: 22167-P-00 PROJET: ELMVALE, ON
DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: 1 - 16 DRAWING# 12033416
DATE: JULY 2024 PAGE 5 OF 39

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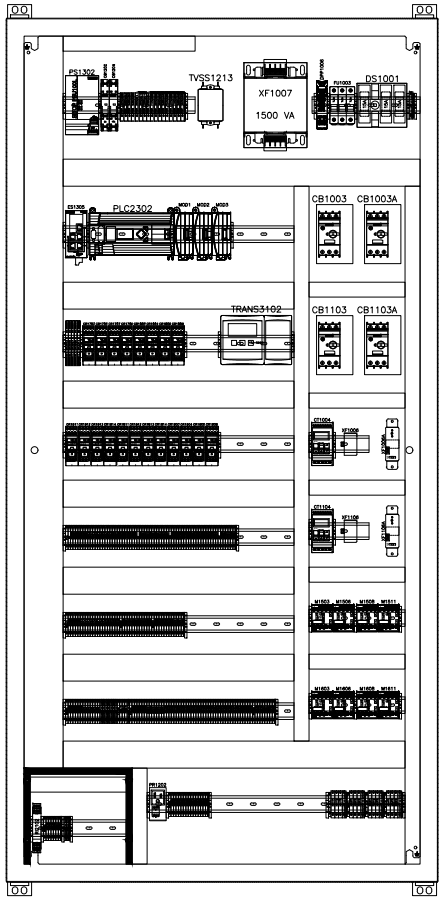

REV	DATE		DESCRIPTION
00	2024-07-09	X.M.	FOR APPROVAL

VOLT. 600	H.P. 5.5
PHASE 3	kVAR N/A
FREQ. (HZ) 60	kW N/A
AMP. 10	TYPE 12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
PANEL LAYOUT
CUSTOMER: CLARO
REF.: 22167-P-00 PROJET: ELMVALE, ON
DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: 1 - 16 DRAWING# 12033416
DATE: JULY 2024 PAGE 6 OF 39

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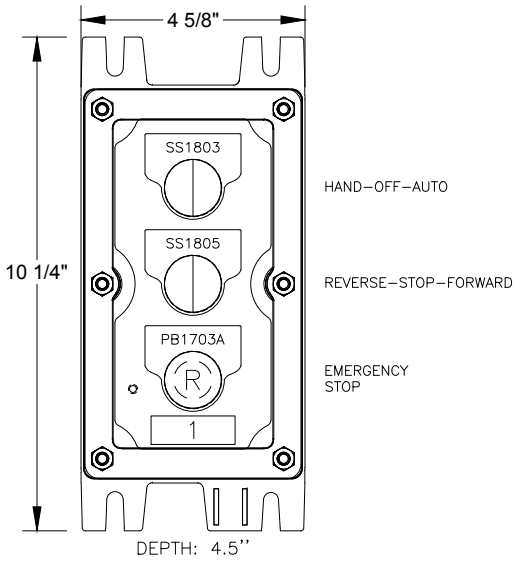
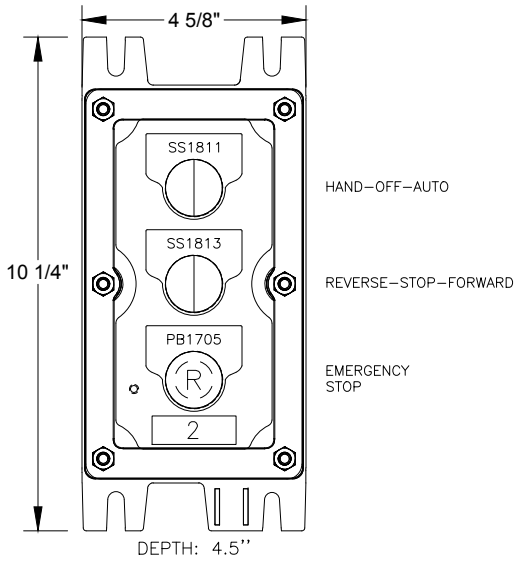
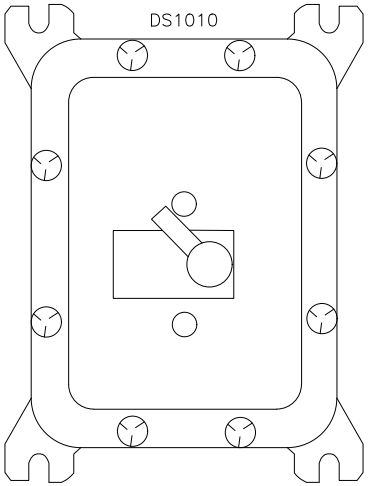
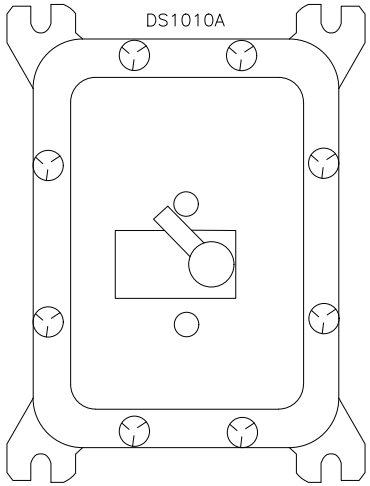
PLAQUES D'IDENTIFICATION ECRITURE NOIRE SUR FOND BLANC				
ITEM	DIMENSIONS	LIGNE1	LIGNE2	LIGNE3
1	0.6" X 1.75"		FINE SCREEN 1	
2	0.6" X 1.75"		WASHPRESS 1	
PB1703A	30mm	EMERGENCY	STOP	
PB1705	30mm	EMERGENCY	STOP	
SS1803	30mm	-OFF-	HAND AUTO	
SS1805	30mm	-STOP-	REVERSE FORWARD	
SS1811	30mm	-OFF-	HAND AUTO	
SS1813	30mm	-STOP-	REVERSE FORWARD	







FINE SCREEN 1



WASHPRESS 1

CLASS I DIVISION 1

–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
00	2024-07-09	X.M.	FOR APPROVAL

VOLT. 600	H.P. 5.5	TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL	
PHASE 3	kVAR N/A	LOCAL STATION AND LOCKOUT SWITCH	
FREQ. (HZ) 60	kW N/A	CUSTOMER: CLARO	
AMP. 10	TYPE 12	REF.: 22167-P-00 PROJET: ELMVALE, ON	
		DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON	

Claro™

SCALE: 1 - 4 DRAWING# 12033416

DATE: JULY 2024 PAGE 7 OF 39

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REV	DATE		DESCRIPTION
00	2024-07-09	X.M.	FOR APPROVAL

VOLT. 600	H.P. 5.5
PHASE 3	kVAR N/A
FREQ. (HZ) 60	kW N/A
AMP. 10	TYPE 12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
LOCAL STATION AND LOCKOUT SWITCH
CUSTOMER: CLARO
REF.: 22167-P-00 PROJET: ELMVALE, ON
DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: 1 - 4
DRAWING# 12033416
DATE: JULY 2024
PAGE 8 OF 39

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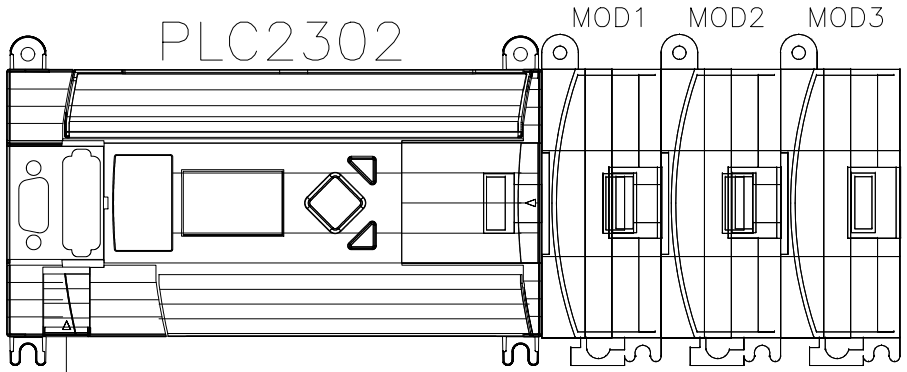
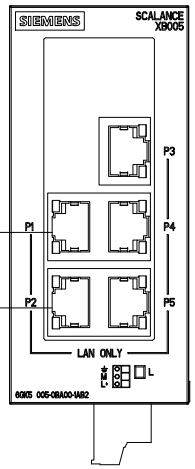


P1
MP-54RJ45DNNE-003

ES1305



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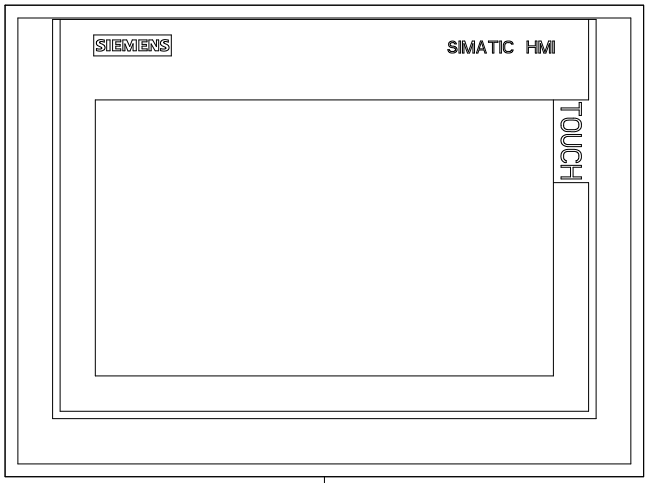

REV	DATE		DESCRIPTION
00	2024-07-09	X.M.	FOR APPROVAL

VOLT. 600	H.P. 5.5
PHASE 3	kVAR N/A
FREQ. (HZ) 60	kW N/A
AMP. 10	TYPE 12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
PLC CONFIGURATION
CUSTOMER: CLARO
REF.: 22167-P-00 PROJET: ELMVALE, ON
DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE
DRAWING# 12033416
DATE: JULY 2024
PAGE 9 OF 39

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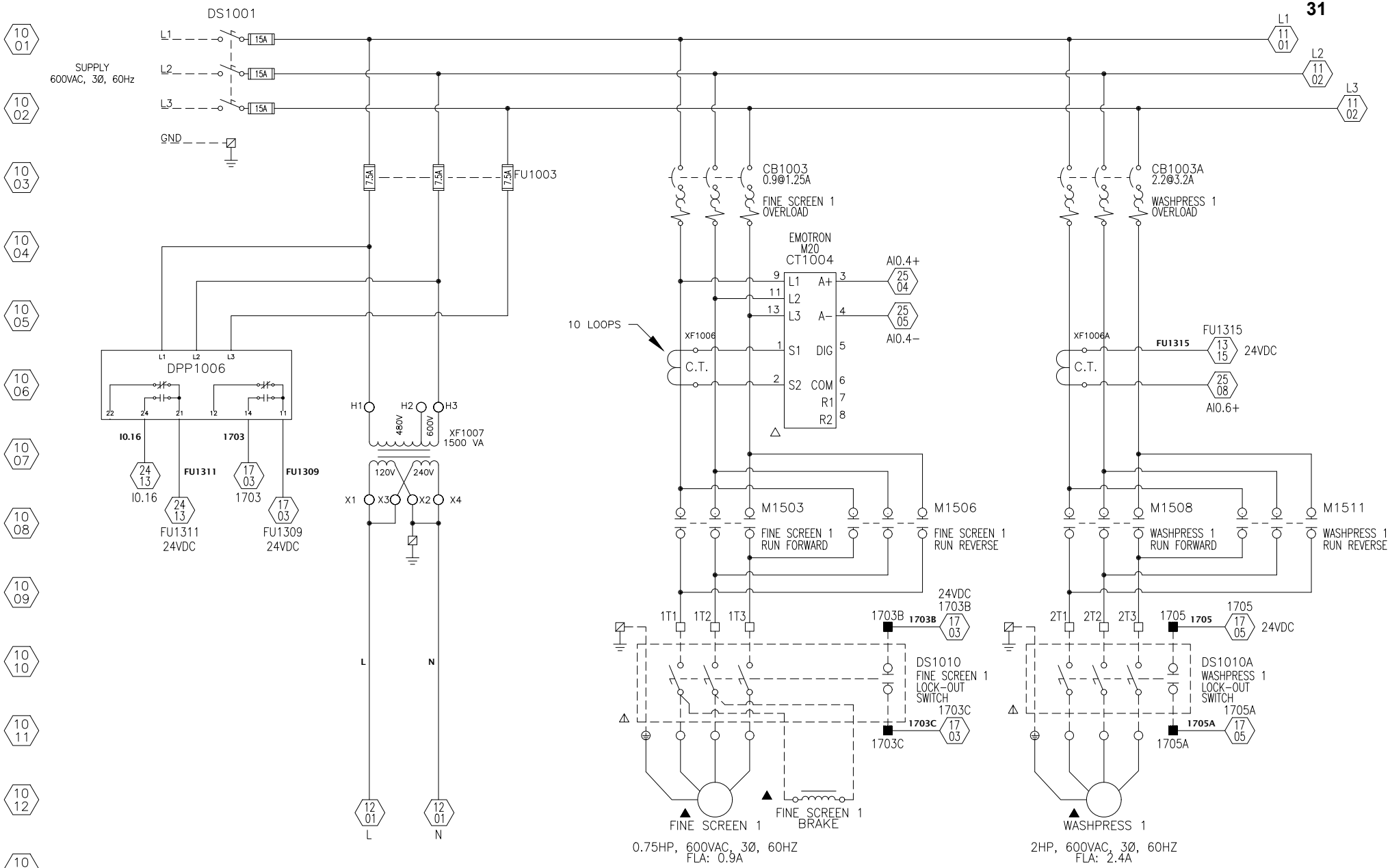

REV	DATE		DESCRIPTION
00	2024-07-09	X.M.	FOR APPROVAL

VOLT. 600	H.P. 5.5
PHASE 3	kVAR N/A
FREQ. (HZ) 60	kW N/A
AMP. 10	TYPE 12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
POWER DIAGRAM
CUSTOMER: CLARO
REF.: 22167-P-00 PROJET: ELMVALE, ON
DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE
DRAWING# 12033416
DATE: JULY 2024
PAGE 10 OF 39

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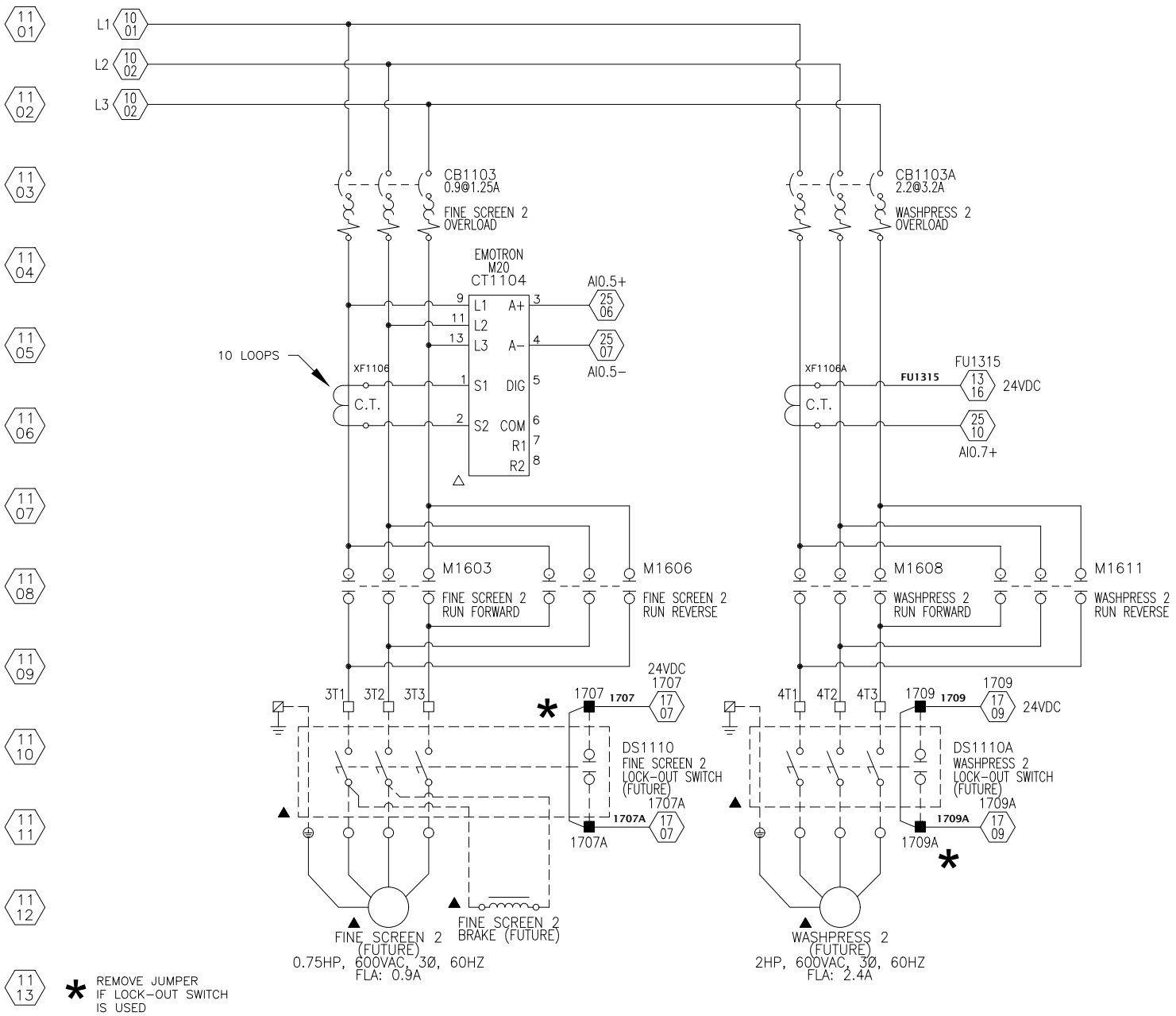

REV	DATE		DESCRIPTION
00	2024-07-09	X.M.	FOR APPROVAL

VOLT.	600	H.P.	5.5
PHASE	3	kVAR	N/A
FREQ. (HZ)	60	kW	N/A
AMP.	10	TYPE	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
POWER DIAGRAM (NEXT)

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE DRAWING# 12033416

DATE: JULY 2024 PAGE 11 OF 39

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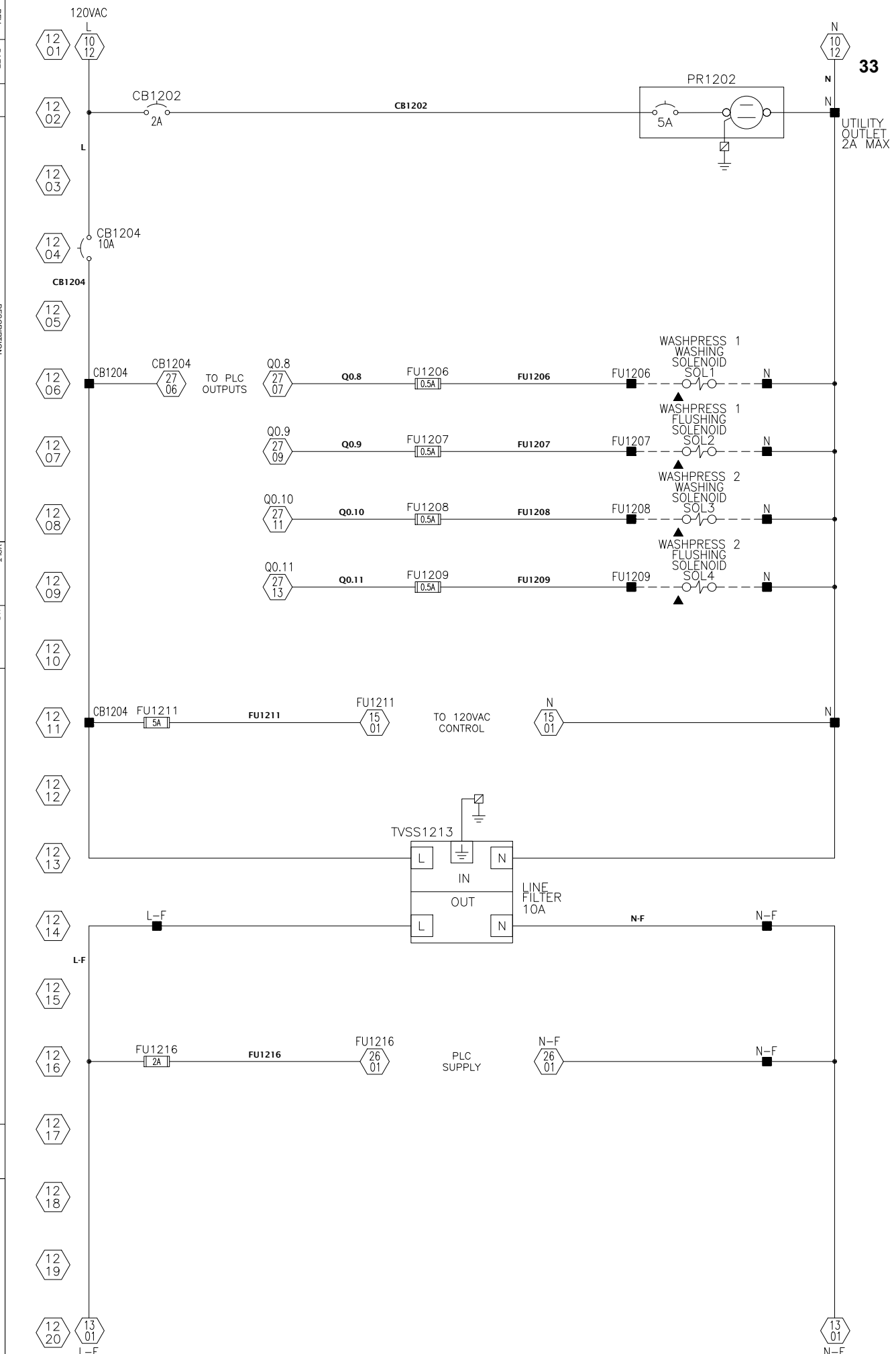

REV	DATE	DESCRIPTION
00	2024-07-09	X.M. FOR APPROVAL

VOLT.	PHASE	FREQ. (HZ)	AMP.
600	3	60	10

H.P	KVAR	KW	TYPE
5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

120VAC DISTRIBUTION

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE

DATE: JULY 2024

DRAWING# 12033416

PAGE 12 OF 39

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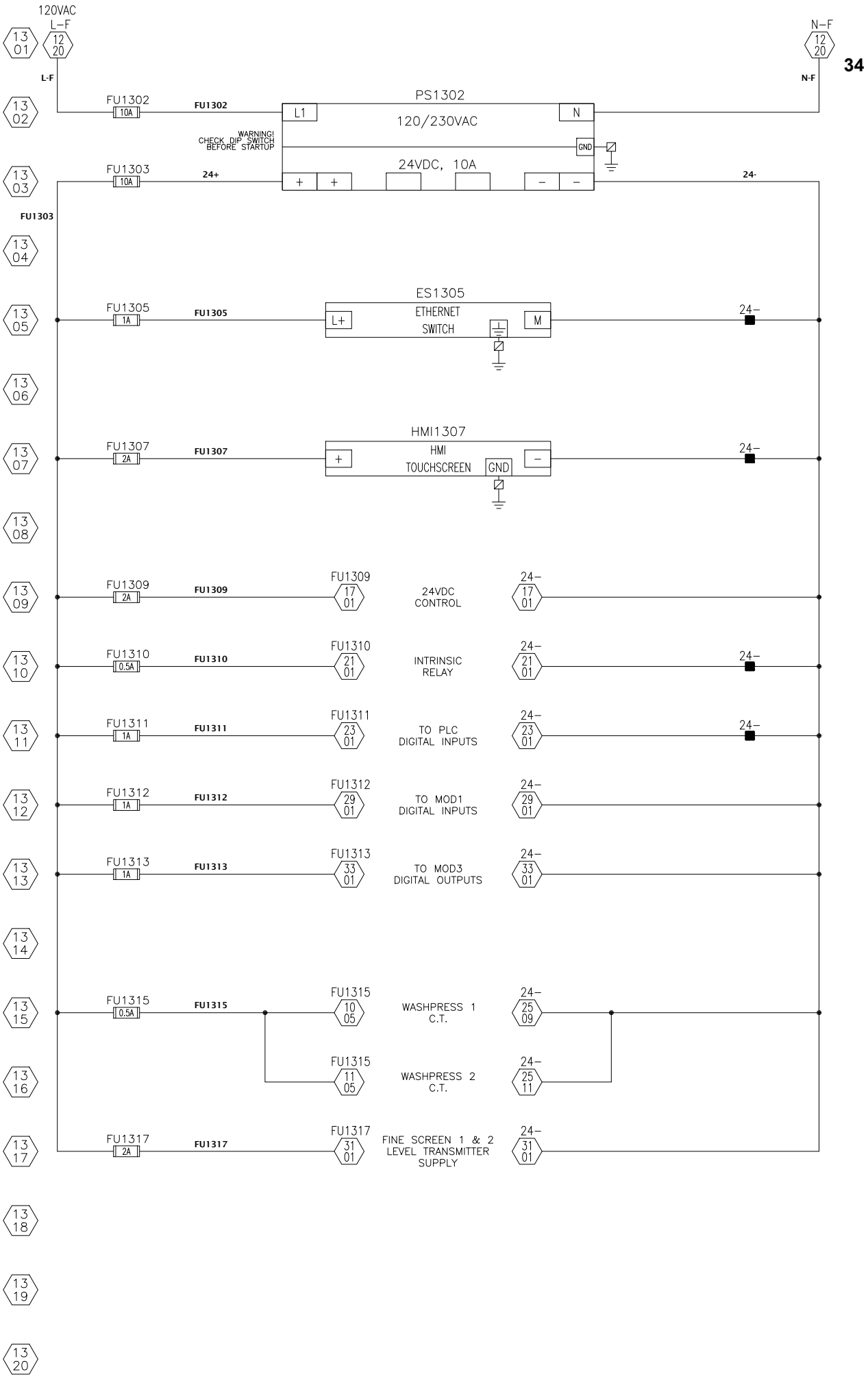

REV	DATE	DESCRIPTION
00	2024-07-09	X.M. FOR APPROVAL

VOLT.	PHASE	FREQ. (HZ)	AMP.
600	3	60	10

H.P	KVAR	KW	TYPE
5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

24VDC DISTRIBUTION

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

SCALE: NONE

DATE: JULY 2024

DRAWING# 12033416

PAGE 13 OF 39

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14 01 | 14 02 | 14 03 | 14 04 | 14 05 | 14 06 | 14 07 | 14 08 | 14 09 | 14 10 | 14 11 | 14 12 | 14 13 | 14 14 | 14 15 | 14 16 | 14 17 | 14 18 | 14 19 | 14 20

REV	DATE		DESCRIPTION
00	2024-07-09	X.M.	FOR APPROVAL

VOLT.	600	H.P.	5.5
PHASE	3	kVAR	N/A
FREQ. (HZ)	60	kW	N/A
AMP.	10	TYPE	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
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CUSTOMER: CLARO
REF.: 22167-P-00 PROJET: ELMVALE, ON
DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE
DRAWING# 12033416
DATE: JULY 2024
PAGE 14 OF 39

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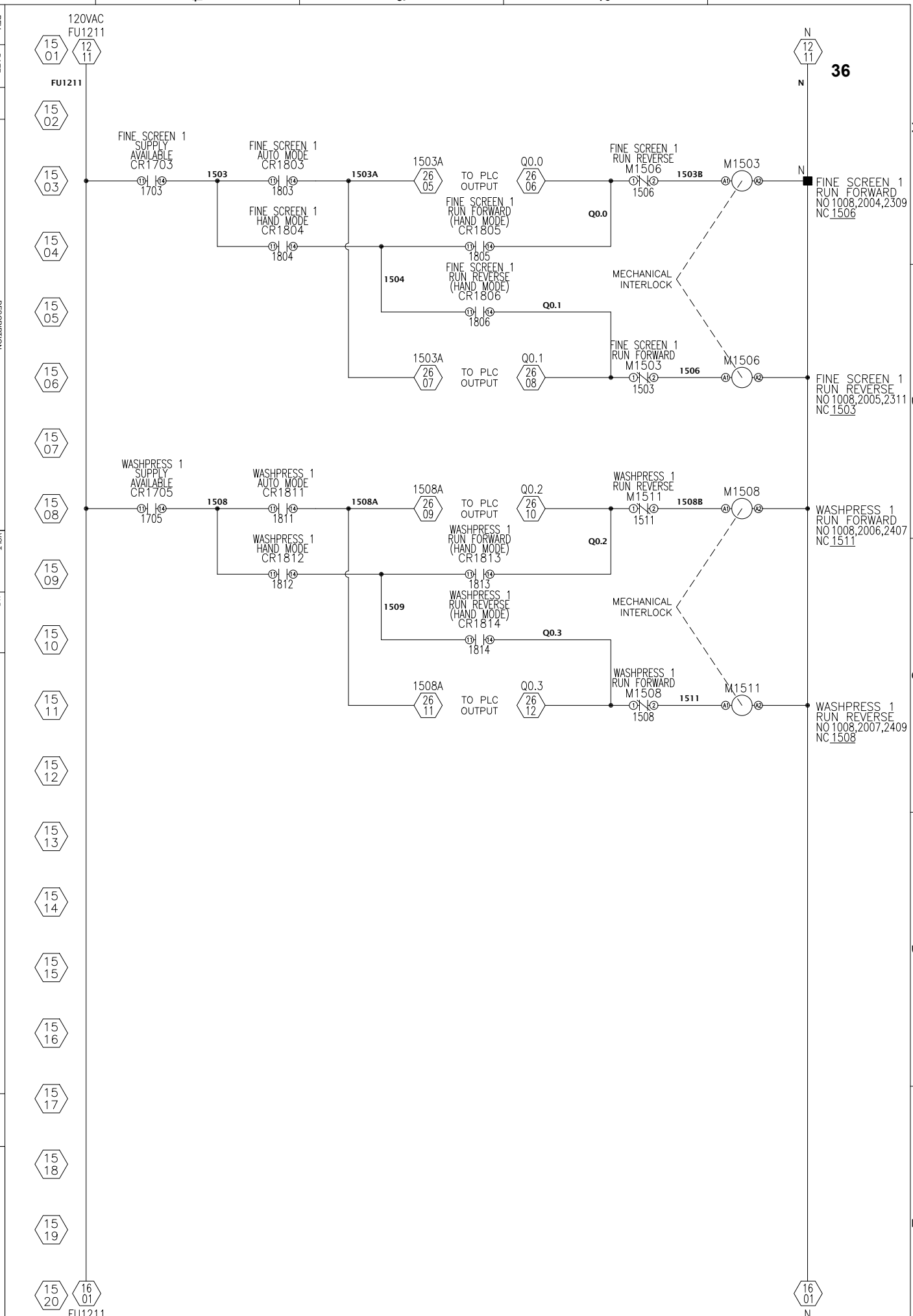

REV	DATE	DESCRIPTION
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VOLT.	PHASE	FREQ. (HZ)	AMP.
600	3	60	10

H.P	KVAR	KW	TYPE
5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

120VAC CONTROL DIAGRAM

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

SCALE: NONE

DATE: JULY 2024

DRAWING# 12033416

PAGE 15 OF 39

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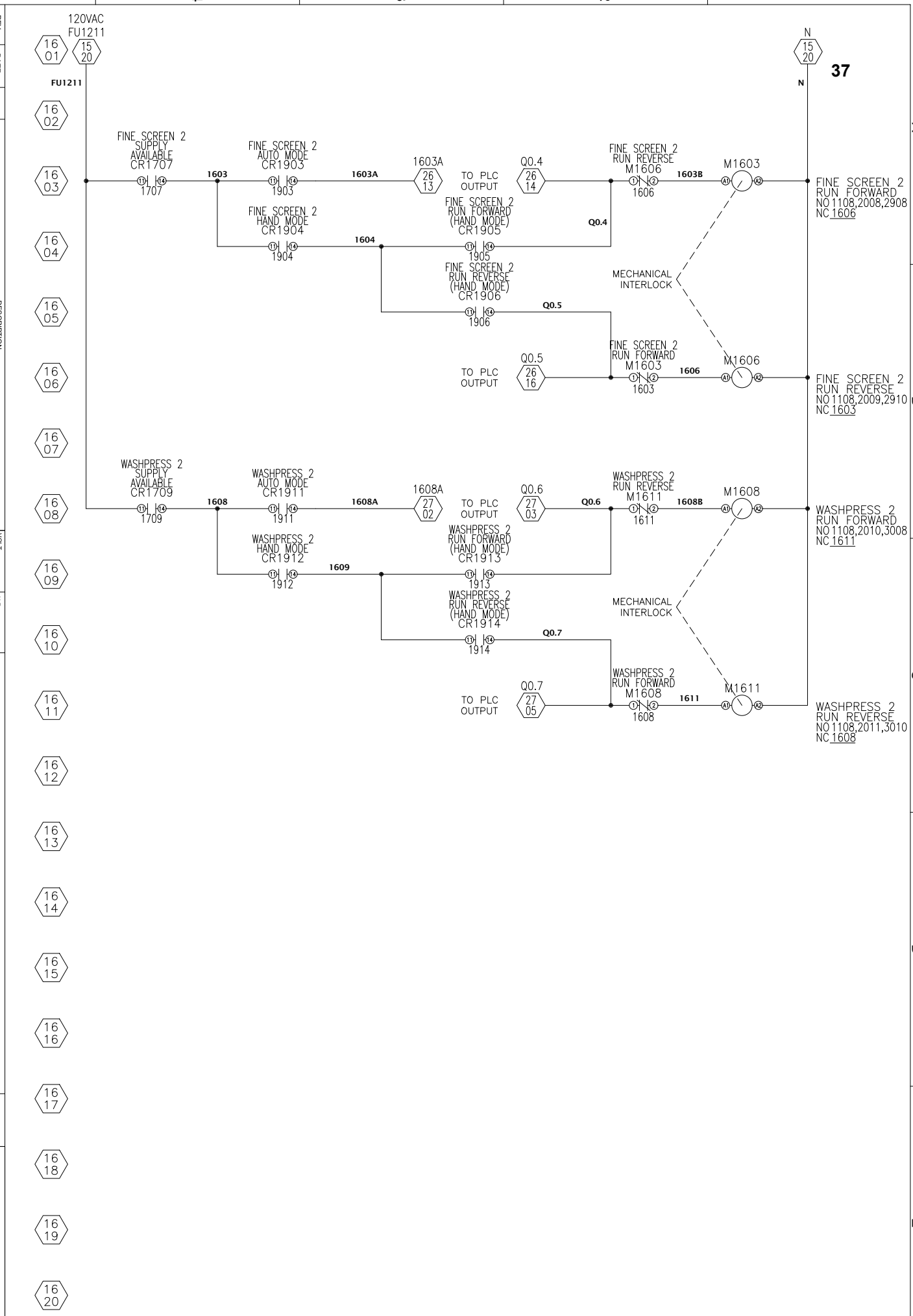

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VOLT.	PHASE	FREQ. (HZ)	AMP.
600	3	60	10

H.P	KVAR	KW	TYPE
5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
120VAC CONTROL DIAGRAM (NEXT)
CUSTOMER: CLARO
REF.: 22167-P-00 PROJET: ELMVALE, ON
DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE
DATE: JULY 2024
DRAWING# 12033416
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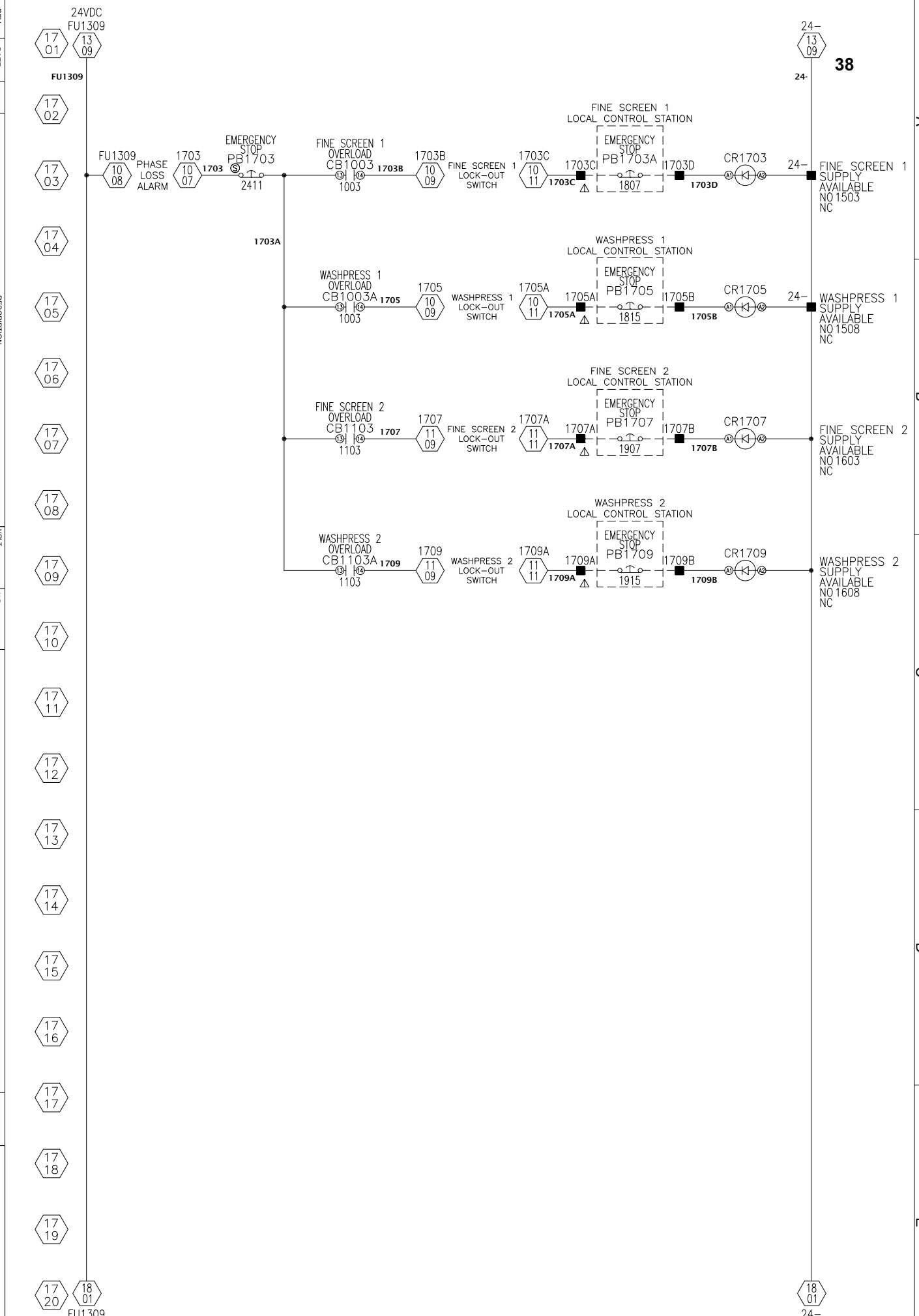

REV	DATE	DESCRIPTION
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VOLT.	H.P	PHASE	KVAR	FREQ. (HZ)	KW	AMP.	TYPE
600	5.5	3	N/A	60	N/A	10	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

24VDC CONTROL DIAGRAM

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

SCALE: NONE

DATE: JULY 2024

DRAWING# 12033416

PAGE 17 OF 39

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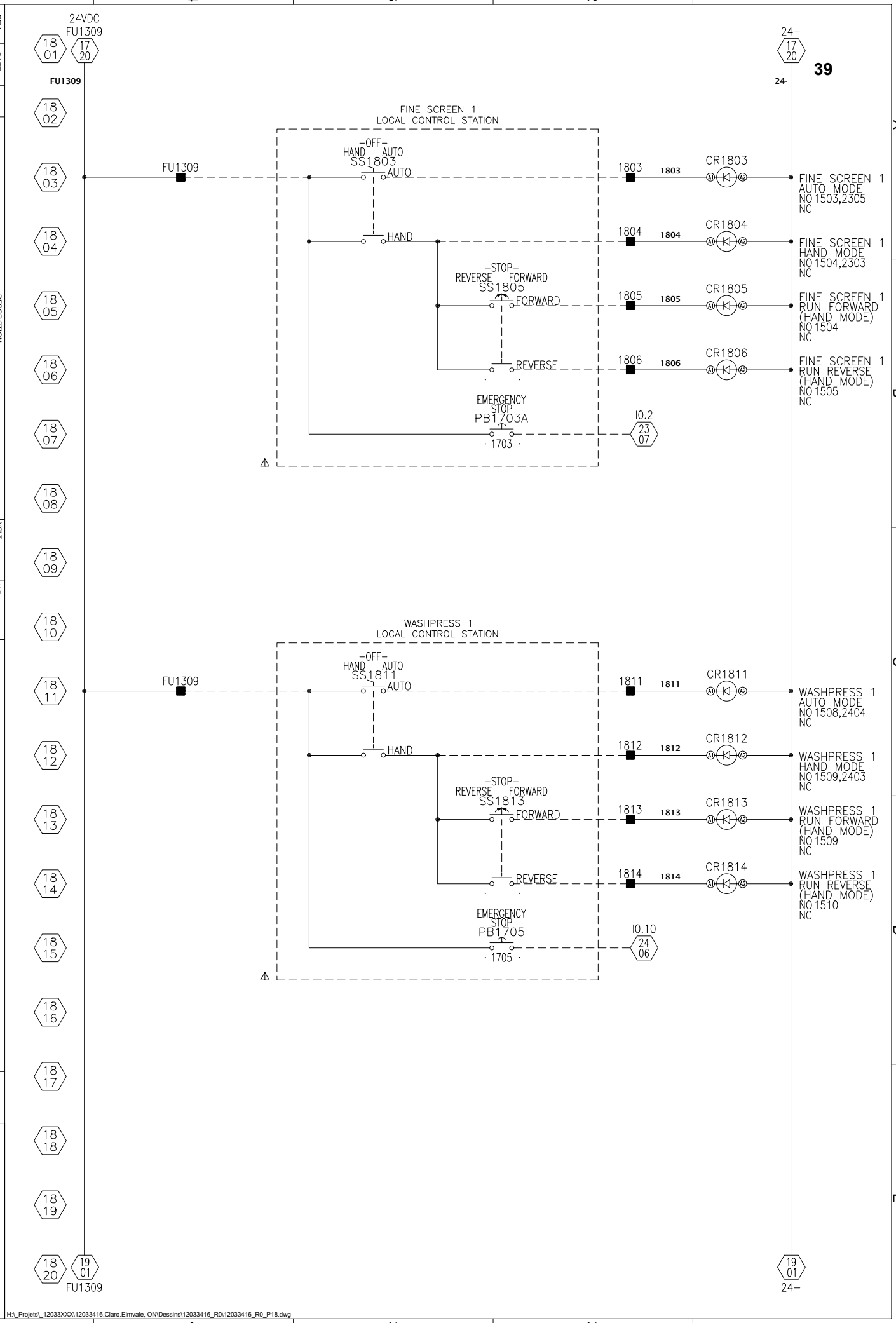

REV	DATE	DESCRIPTION
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VOLT.	PHASE	FREQ. (HZ)	AMP.
600	3	60	10

H.P	KVAR	KW	TYPE
5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
24VDC CONTROL DIAGRAM (NEXT)
CUSTOMER: CLARO
REF.: 22167-P-00 PROJET: ELMVALE, ON
DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE
DATE: JULY 2024
DRAWING# 12033416
PAGE 18 OF 39

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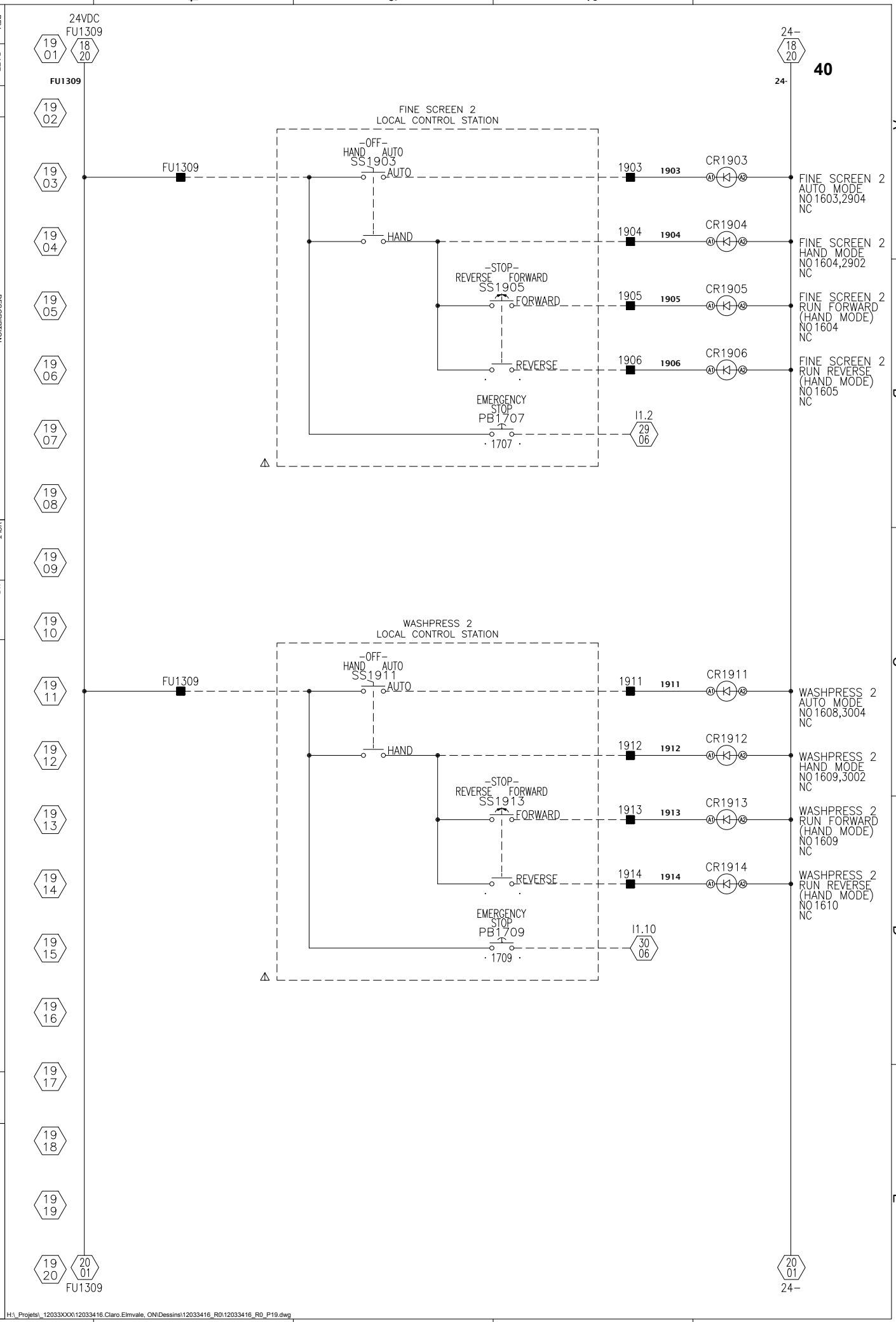

REV	DATE	DESCRIPTION
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VOLT.	PHASE	FREQ. (HZ)	AMP.
600	3	60	10

H.P	KVAR	KW	TYPE
5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
24VDC CONTROL DIAGRAM (NEXT)
CUSTOMER: CLARO
REF.: 22167-P-00 PROJET: ELMVALE, ON
DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE
DATE: JULY 2024
DRAWING# 12033416
PAGE 19 OF 39

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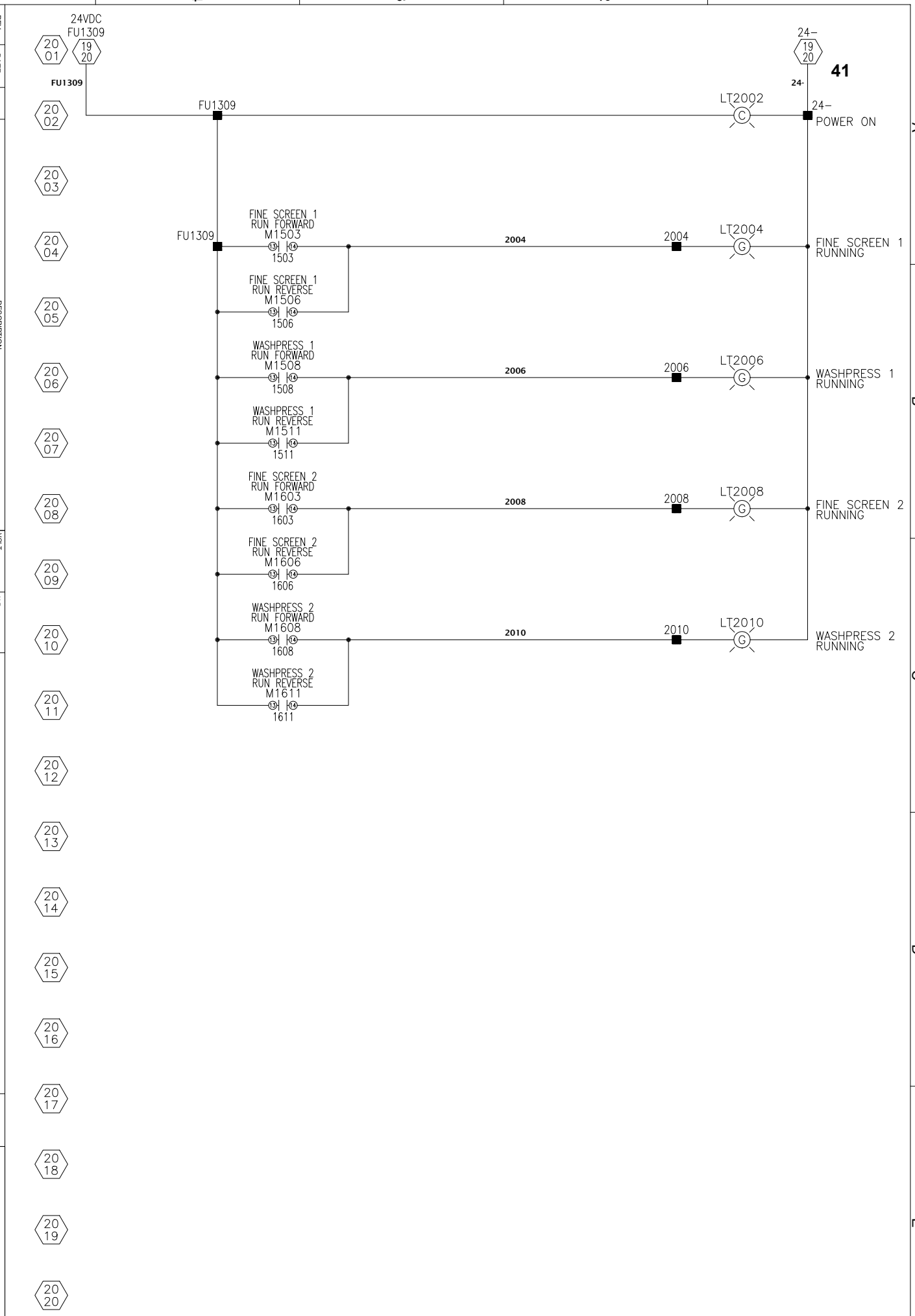

REV	DATE	DESCRIPTION
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VOLT.	PHASE	FREQ. (HZ)	AMP.
600	3	60	10

H.P	KVAR	KW	TYPE
5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

24VDC INDICATOR LIGHTS

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

SCALE: NONE

DATE: JULY 2024

DRAWING# 12033416

PAGE 20 OF 39

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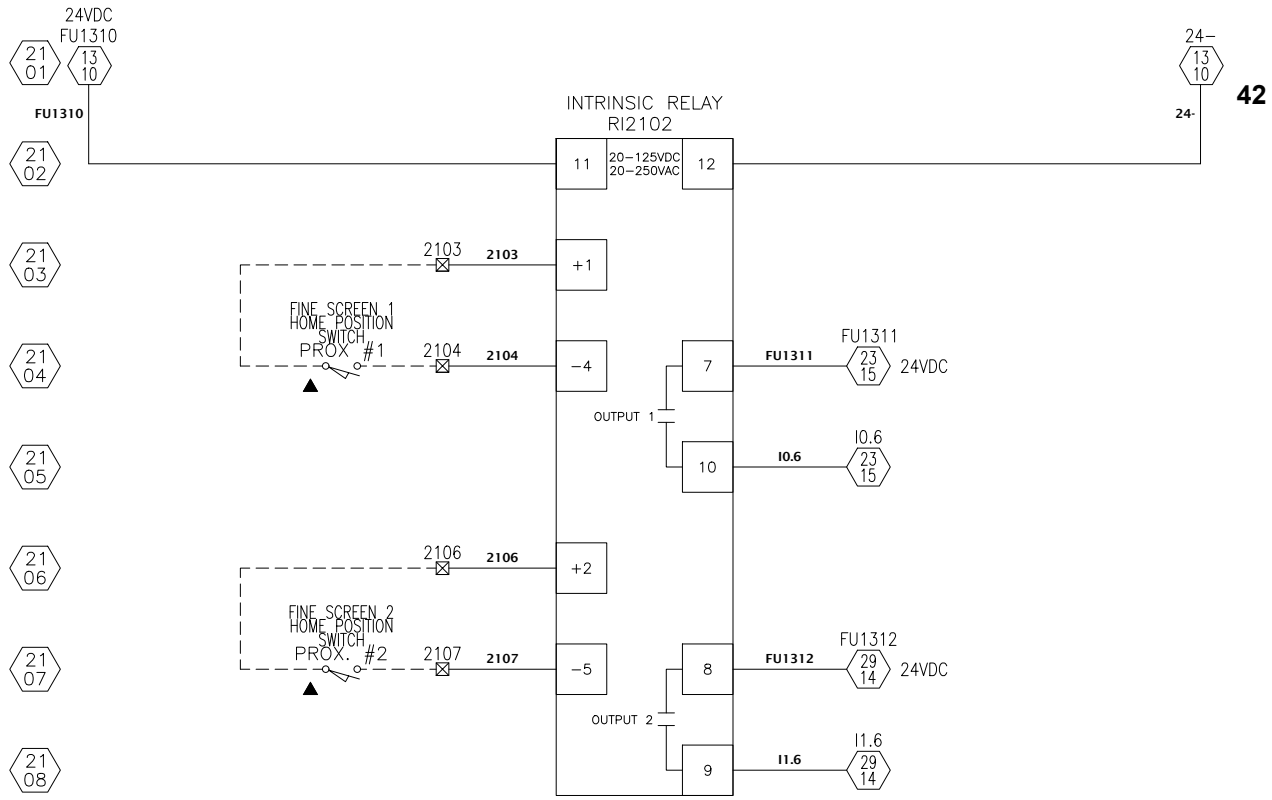

REV	DATE	DESCRIPTION
00	2024-07-09	FOR APPROVAL
	X.M.	

VOLT.	PHASE	FREQ. (HZ)	AMP.
600	3	60	10

H.P	KVAR	KW	TYPE
5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

INTRINSIC RELAY

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

SCALE: NONE

DATE: JULY 2024

DRAWING# 12033416

PAGE 21 OF 39

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REV	DATE		DESCRIPTION
00	2024-07-09	X.M.	FOR APPROVAL

VOLT. 600	H.P. 5.5
PHASE 3	kVAR N/A
FREQ. (HZ) 60	kW N/A
AMP. 10	TYPE 12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
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CUSTOMER: CLARO
REF.: 22167-P-00 PROJET: ELMVALE, ON
DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE
DRAWING# 12033416
DATE: JULY 2024
PAGE 22 OF 39

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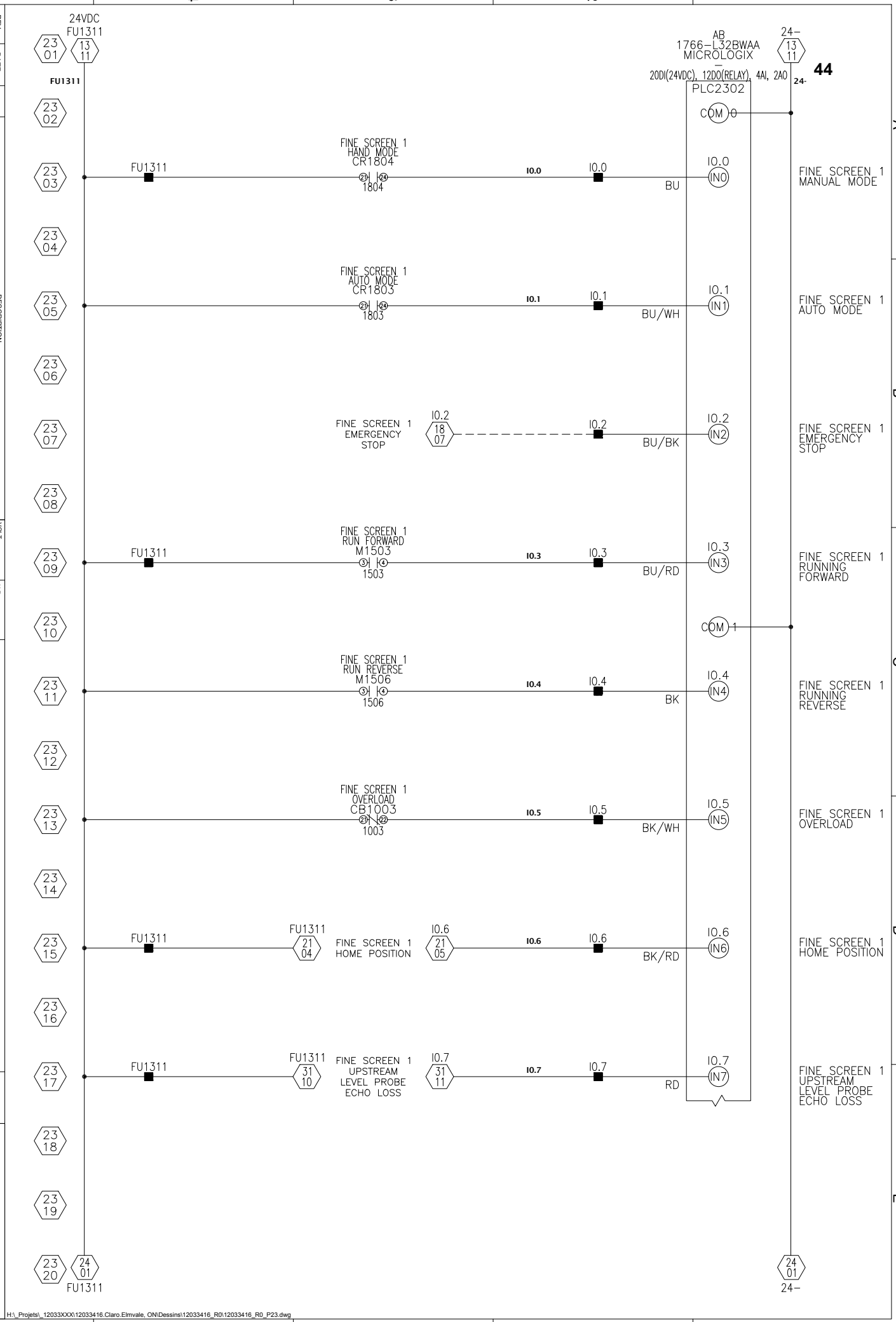

REV	DATE	DESCRIPTION
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VOLT.	PHASE	FREQ. (HZ)	AMP.
600	3	60	10

H.P	KVAR	KW	TYPE
5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

PLC - DIGITAL INPUTS

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

DATE: JULY 2024 SCALE: NONE

DRAWING# 12033416

PAGE 23 OF 39

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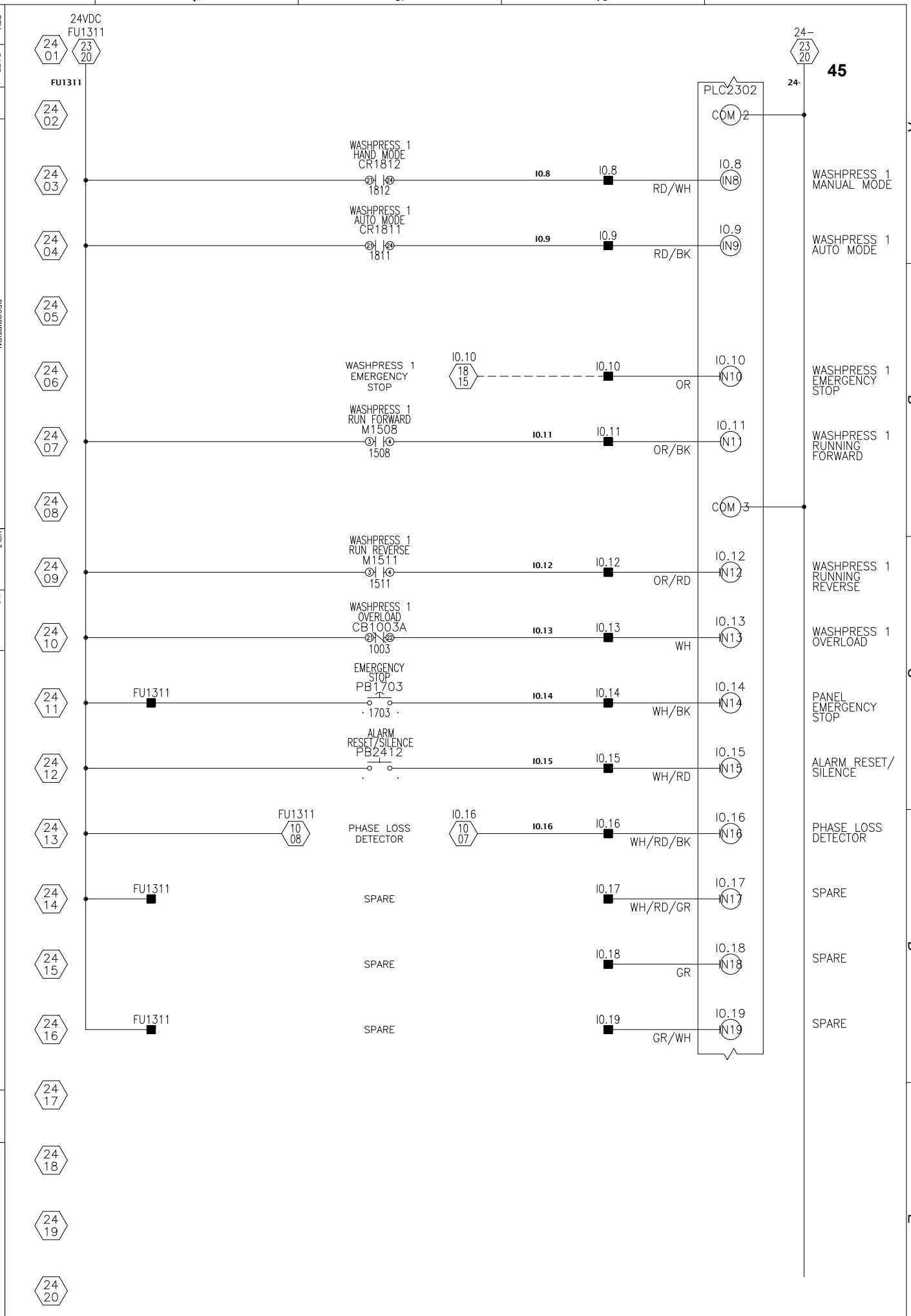

REV	DATE	DESCRIPTION
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VOLT.	PHASE	FREQ. (HZ)	AMP.	H.P	KVAR	KW	TYPE
600	3	60	10	5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

PLC - DIGITAL INPUTS (NEXT)

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

SCALE: NONE

DATE: JULY 2024

DRAWING# 12033416

PAGE 24 OF 39

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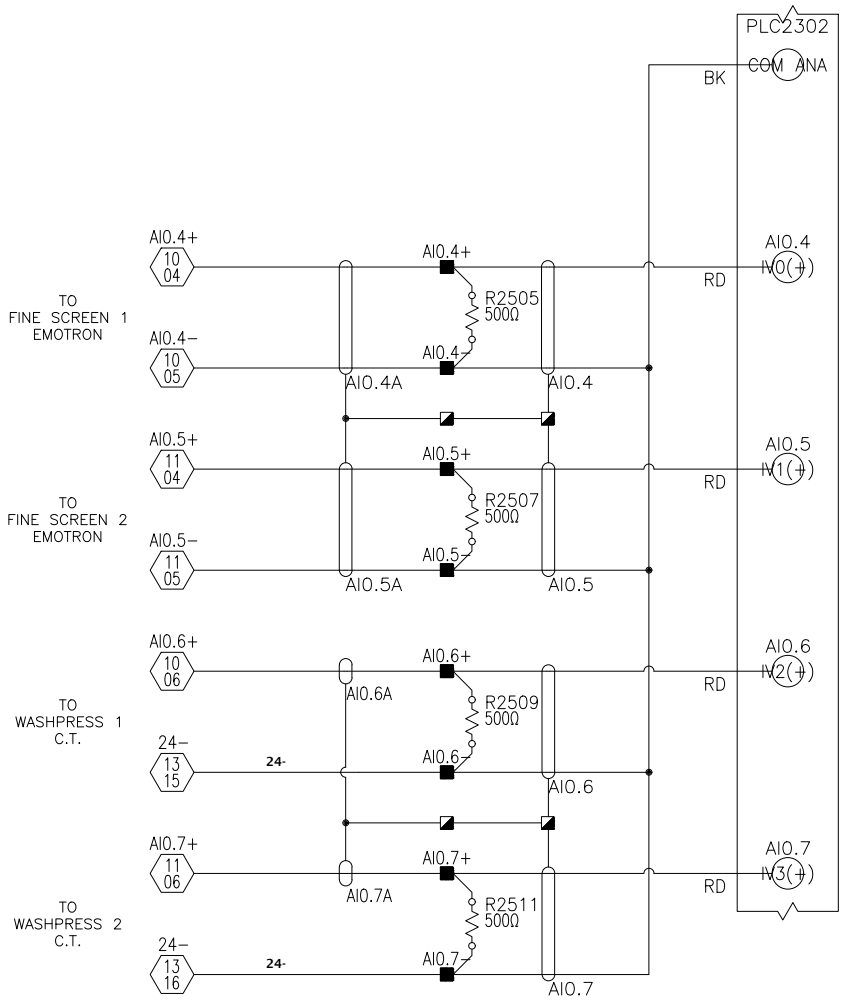

REV	DATE	DESCRIPTION
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VOLT.	PHASE	FREQ. (HZ)	AMP.	H.P	KVAR	KW	TYPE
600	3	60	10	5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

PLC - ANALOG INPUTS

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE

DATE: JULY 2024

DRAWING# 12033416

PAGE 25 OF 39

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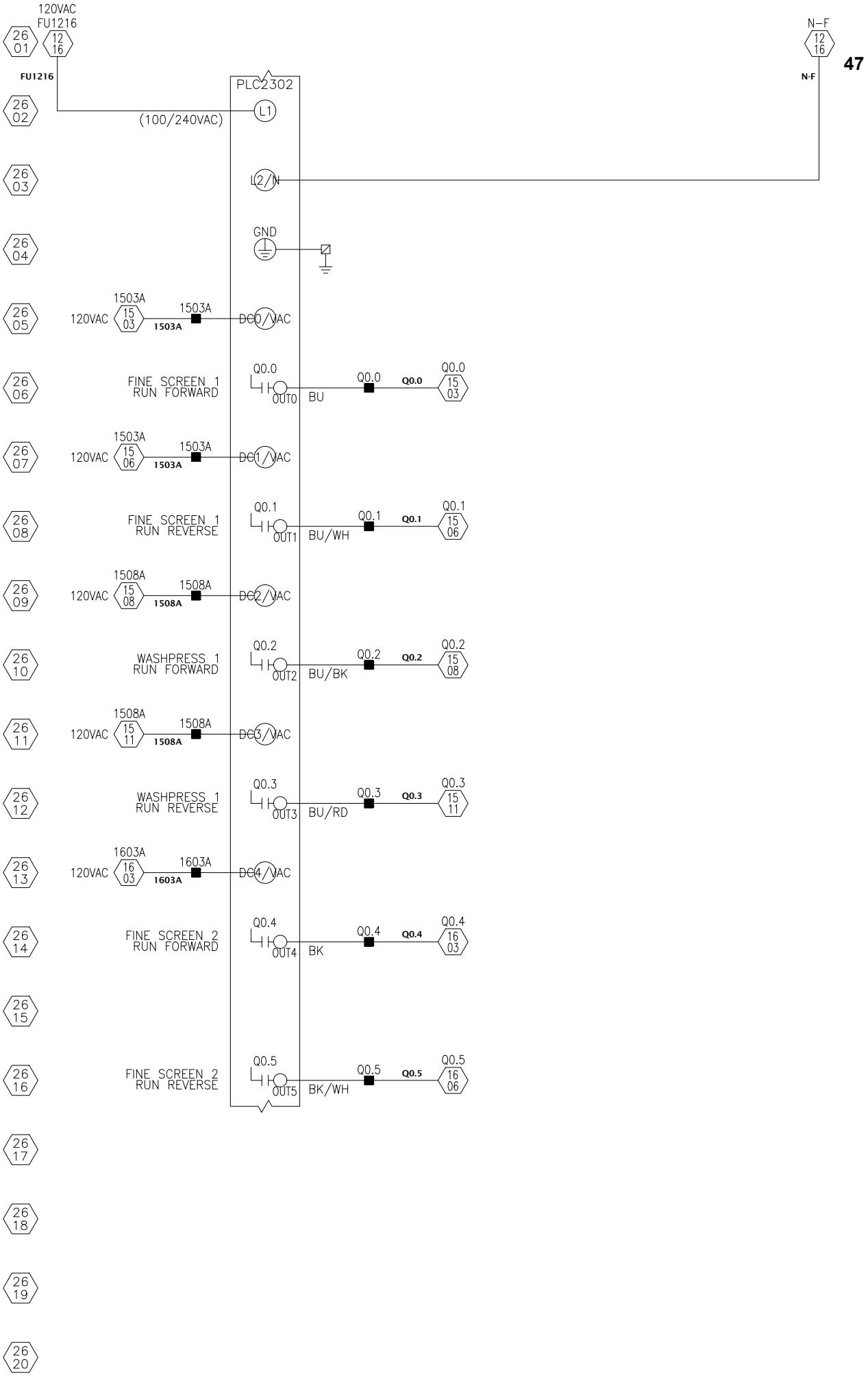

REV	DATE	DESCRIPTION
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VOLT.	PHASE	FREQ. (HZ)	AMP.	H.P	KVAR	KW	TYPE
600	3	60	10	5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

PLC - DIGITAL OUTPUTS

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

SCALE: NONE

DATE: JULY 2024

DRAWING# 12033416

PAGE 26 OF 39

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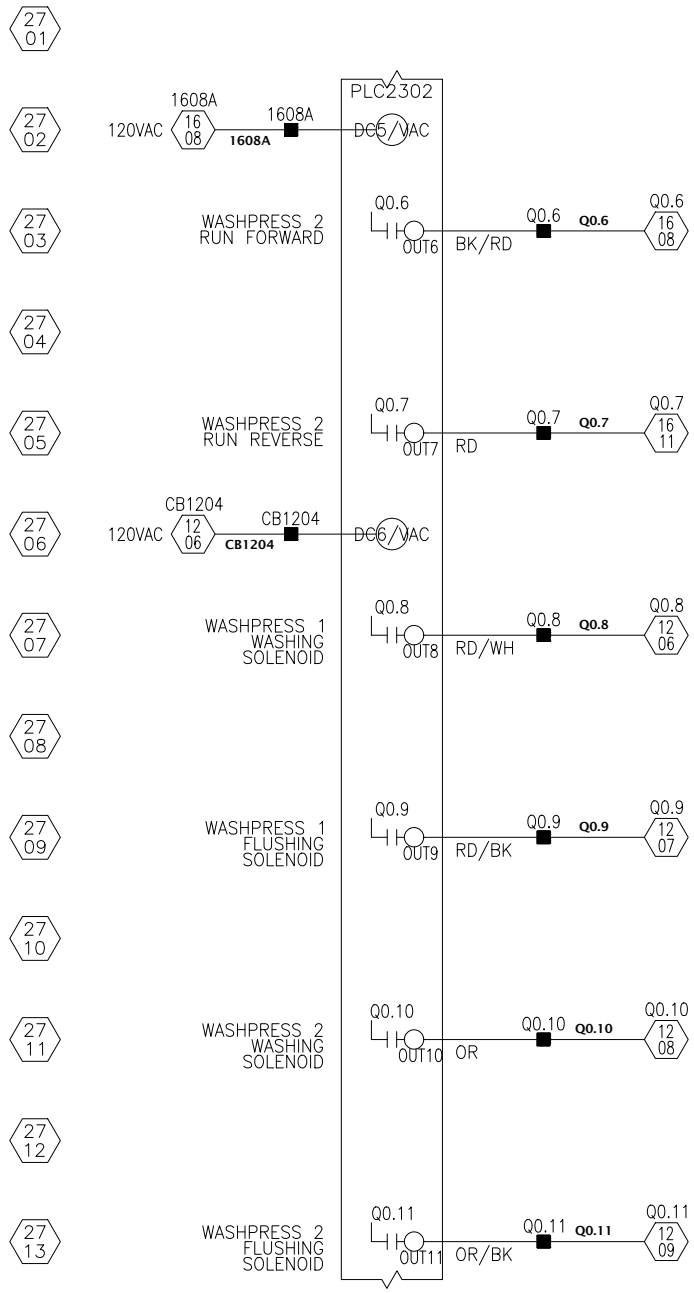

REV	DATE	DESCRIPTION
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VOLT.	PHASE	FREQ. (HZ)	AMP.
600	3	60	10

H.P	KVAR	KW	TYPE
5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

PLC - DIGITAL OUTPUTS (NEXT)

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

SCALE: NONE

DATE: JULY 2024

DRAWING# 12033416

PAGE 27 OF 39

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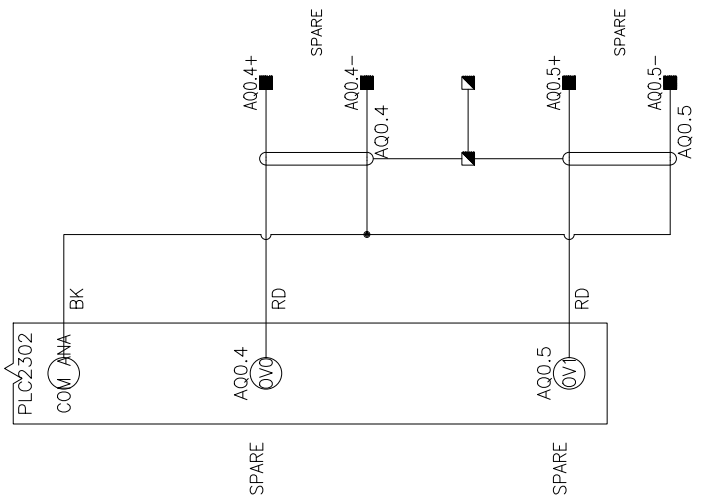

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REV	DATE		DESCRIPTION
00	2024-07-09	X.M.	FOR APPROVAL

VOLT.	600
H.P.	5.5
PHASE	3
kVAR	N/A
FREQ. (HZ)	60
kW	N/A
AMP.	10
TYPE	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
PLC - ANALOG OUTPUTS

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

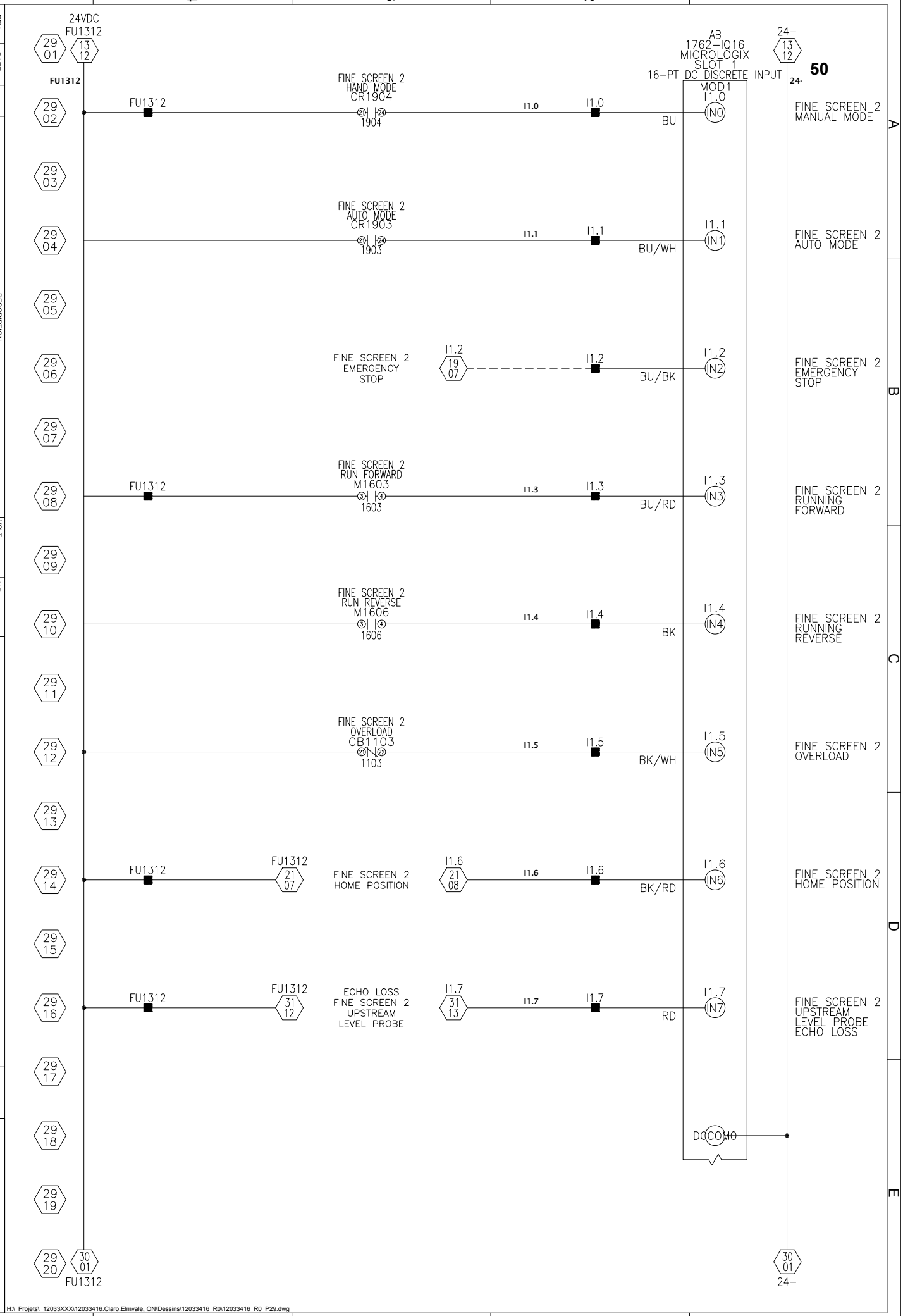
Claro™

SCALE: NONE

DRAWING# 12033416

DATE: JULY 2024

PAGE 28 OF 39



REV	DATE	DESCRIPTION
00	2024-07-09	X.M. FOR APPROVAL

VOLT.	PHASE	FREQ. (HZ)	AMP.
600	3	60	10

H.P	KVAR	KW	TYPE
5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

MOD1 - DIGITAL INPUTS

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

SCALE: NONE

DATE: JULY 2024

DRAWING# 12033416

PAGE 29 OF 39

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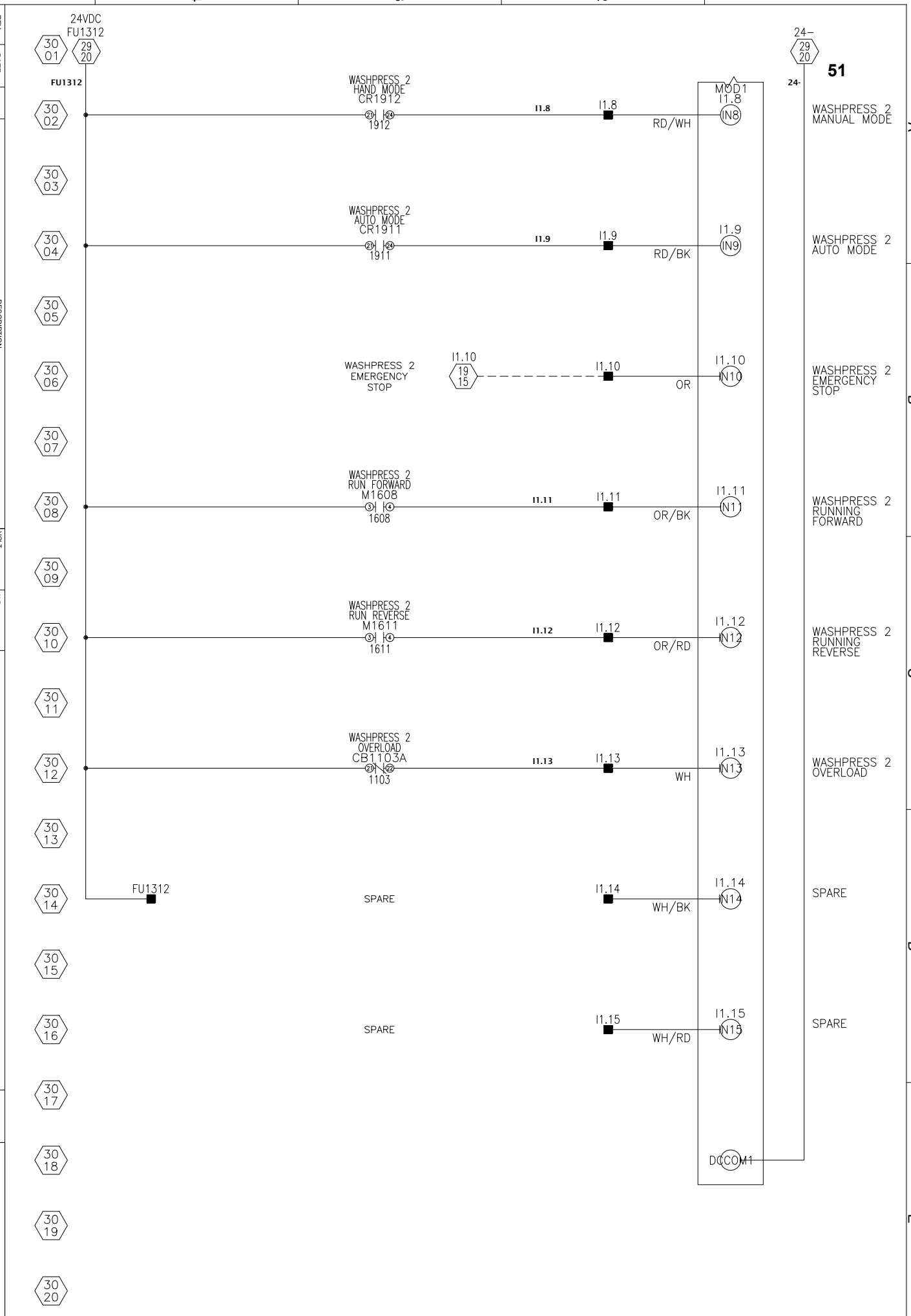

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VOLT.	PHASE	FREQ. (HZ)	AMP.	H.P	KVAR	KW	TYPE
600	3	60	10	5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

MOD1 - DIGITAL INPUTS (NEXT)

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

DATE: JULY 2024 SCALE: NONE DRAWING# 12033416

PAGE 30 OF 39

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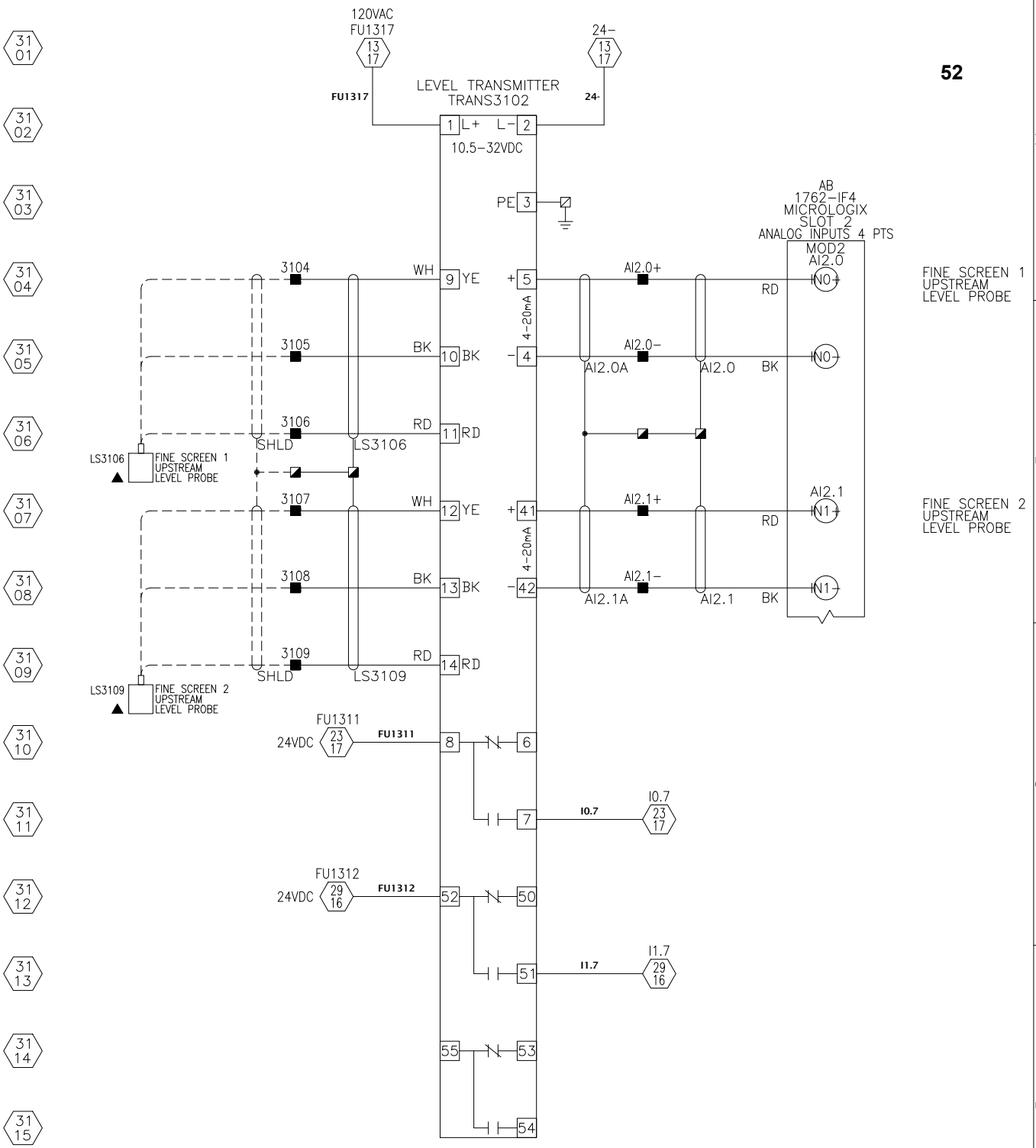

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VOLT.	PHASE	FREQ. (HZ)	AMP.
600	3	60	10

H.P	KVAR	KW	TYPE
5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

MOD2 - ANALOG INPUTS

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

DATE: JULY 2024 SCALE: NONE

DRAWING# 12033416

PAGE 31 OF 39

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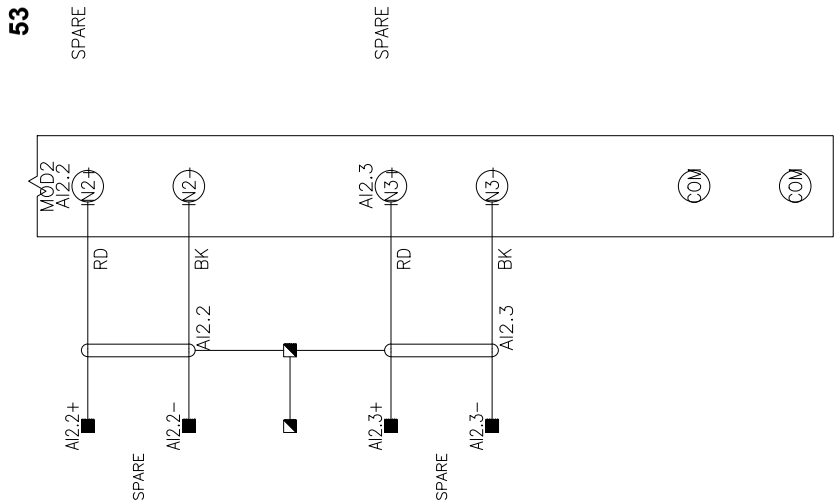

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REV	DATE		DESCRIPTION
00	2024-07-09	X.M.	FOR APPROVAL

VOLT.	600
H.P.	5.5
PHASE	3
kVAR	N/A
FREQ. (HZ)	60
kW	N/A
AMP.	10
TYPE	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
MOD2 - ANALOG INPUTS (NEXT)
CUSTOMER: CLARO
REF.: 22167-P-00 PROJET: ELMVALE, ON
DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE
DRAWING# 12033416
DATE: JULY 2024
PAGE 32 OF 39

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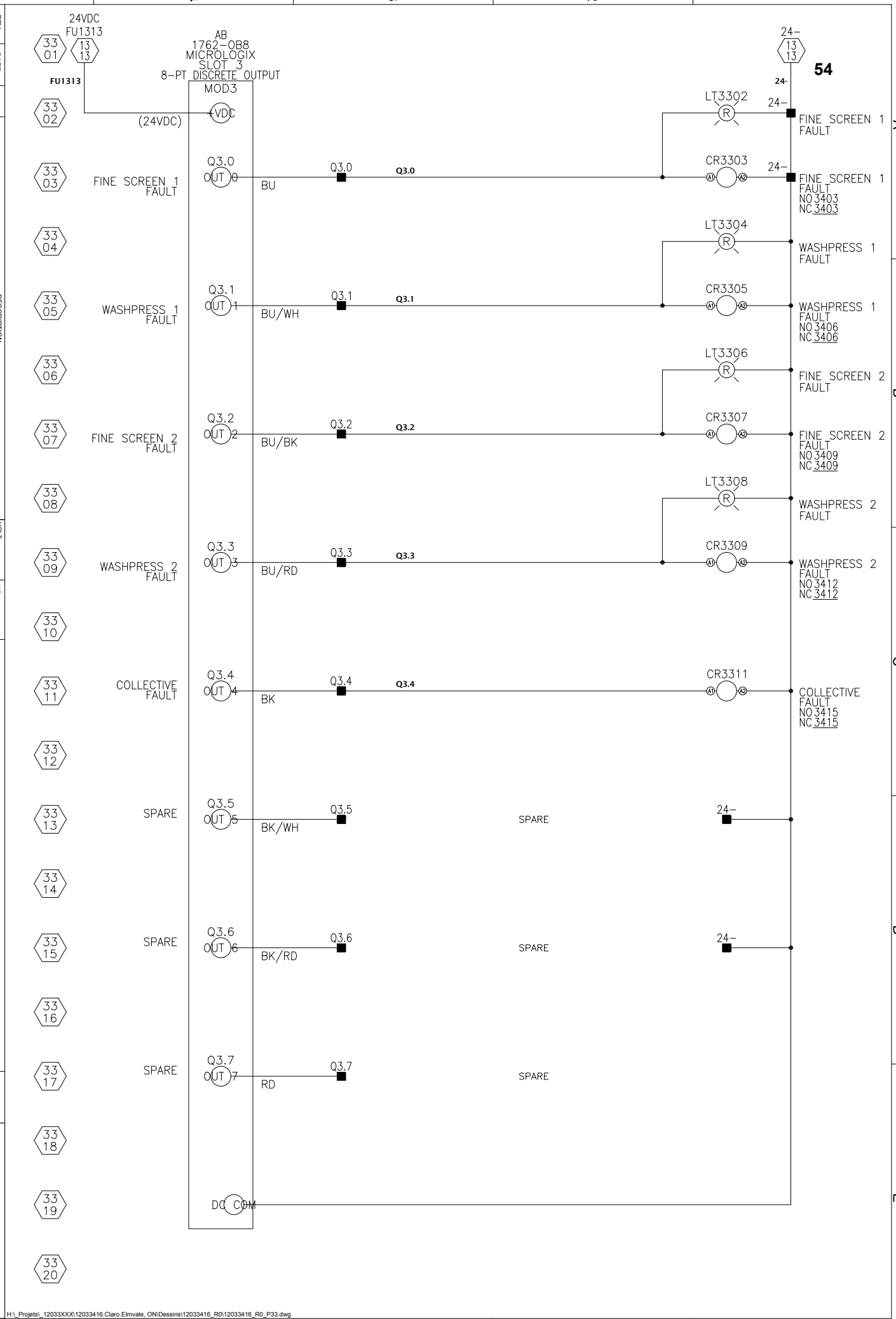

REV	DATE	DESCRIPTION
00	2024-07-09	X.M. FOR APPROVAL

VOLT.	PHASE	FREQ. (HZ)	AMP.
600	3	60	10

H.P	KVAR	KW	TYPE
5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

MOD3 - DIGITAL OUTPUTS

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

DATE: JULY 2024 SCALE: NONE

DRAWING# 12033416 PAGE 33 OF 39

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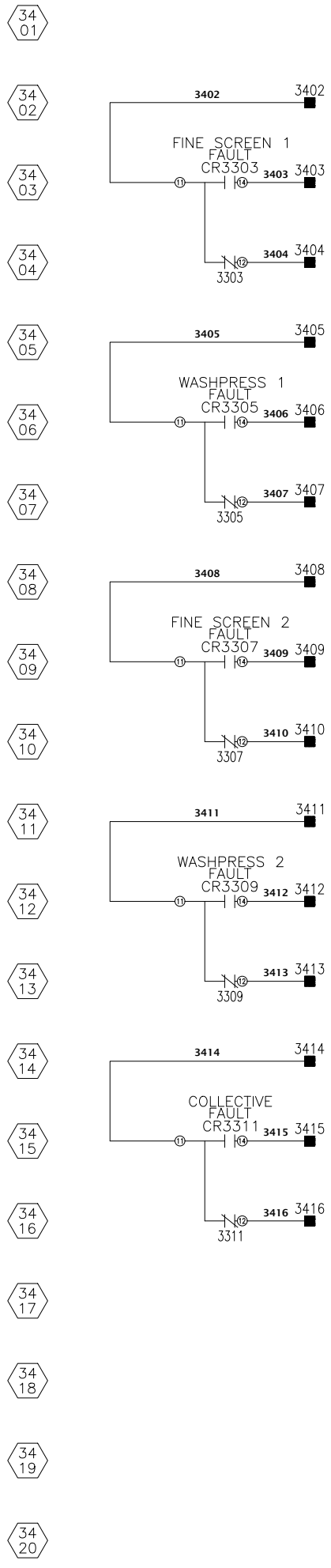

Similar to the comment in the SCADA data exchange table. Confirm that the collective fault covers any fault for the 2 screens and the 2 wash presses.

REV	DATE	DESCRIPTION
00	2024-07-09	FOR APPROVAL

VOLT.	PHASE	FREQ. (HZ)	AMP.
600	3	60	10

H.P	KVAR	KW	TYPE
5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
EXTERNAL CONTACTS
CUSTOMER: CLARO
REF.: 22167-P-00
PROJET: ELMVALE, ON
DRAWN BY: X.MONTAMBAULT
CHECKED BY: C.SAMSON
DATE: JULY 2024
SCALE: NONE
DRAWING# 12033416
PAGE 34 OF 39

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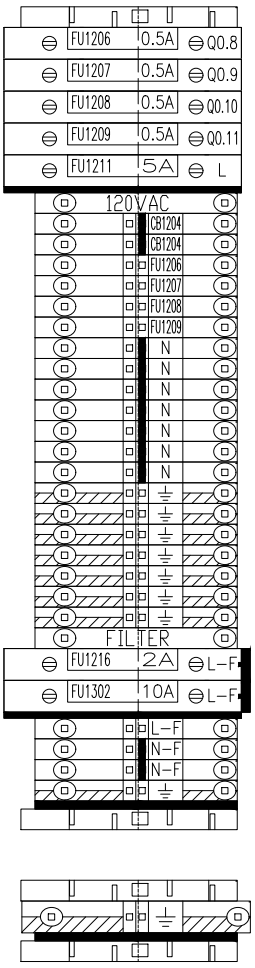

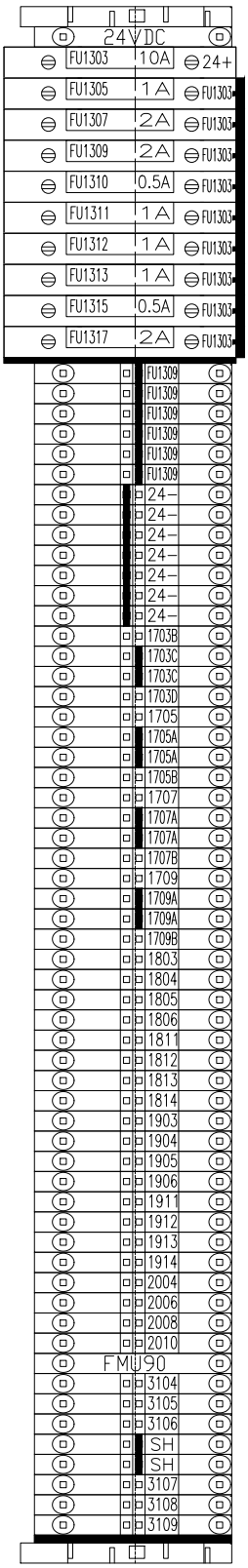

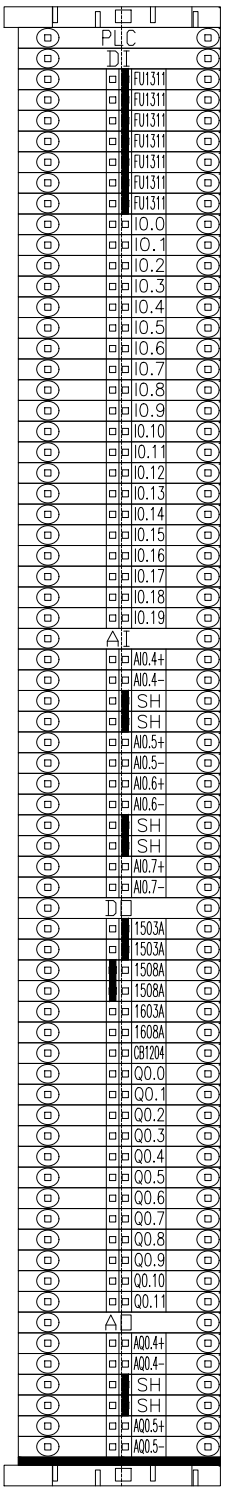

REV	DATE	DESCRIPTION
00	2024-07-09	X.M. FOR APPROVAL

VOLT.	PHASE	FREQ. (HZ)	AMP.	H.P	KVAR	KW	TYPE
600	3	60	10	5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
TERMINALS
CUSTOMER: CLARO
REF.: 22167-P-00
PROJET: ELMVALE, ON
DRAWN BY: X.MONTAMBAULT
CHECKED BY: C.SAMSON

Claro™

SCALE: NONE
DATE: JULY 2024
DRAWING# 12033416
PAGE 35 OF 39

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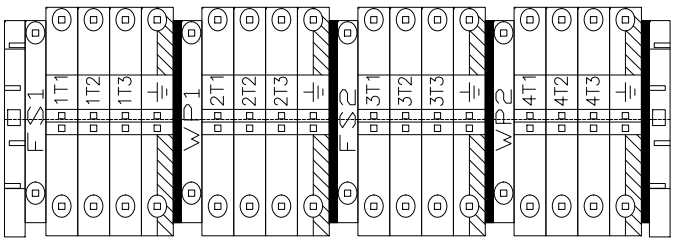
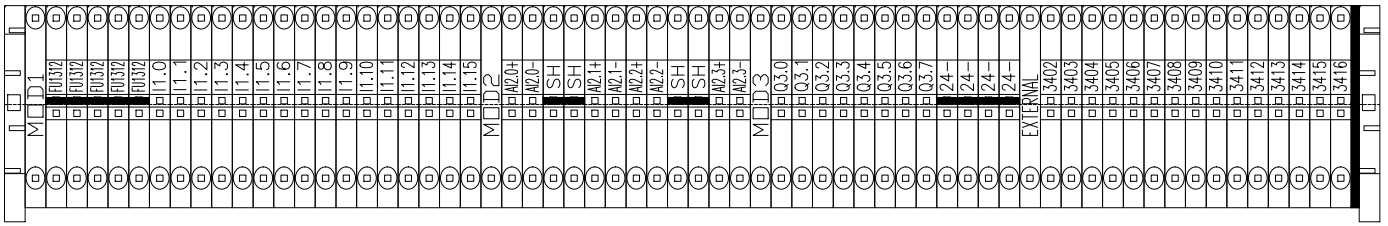
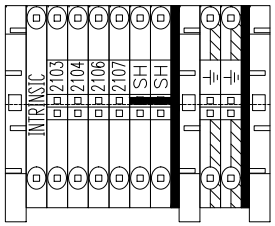
57







3601 3602 3603 3604 3605 3606 3607 3608 3609 3610 3611 3612 3613 3614 3615 3616 3617 3618 3619 3620

REV	DATE		DESCRIPTION
00	2024-07-09	X.M.	FOR APPROVAL

VOLT. 600	H.P. 5.5
PHASE 3	kVAR N/A
FREQ. (HZ) 60	kW N/A
AMP. 10	TYPE 12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
TERMINALS (NEXT)

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE DRAWING# 12033416

DATE: JULY 2024 PAGE 36 OF 39

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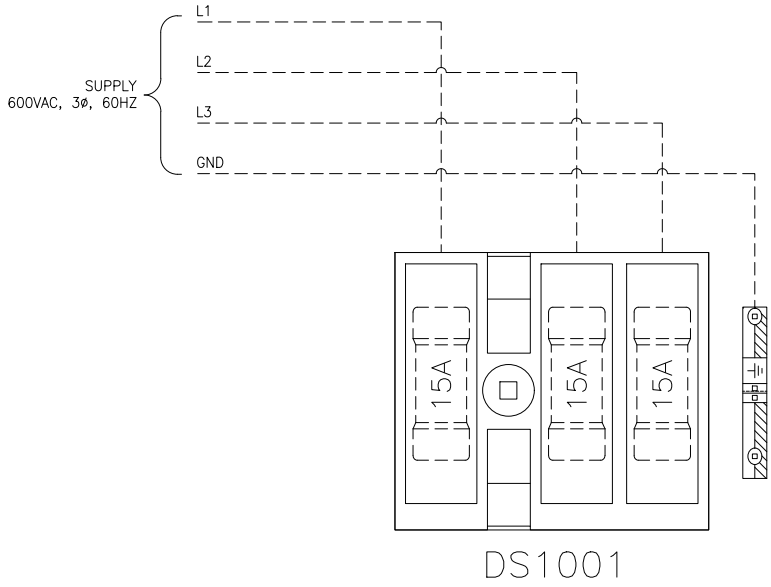
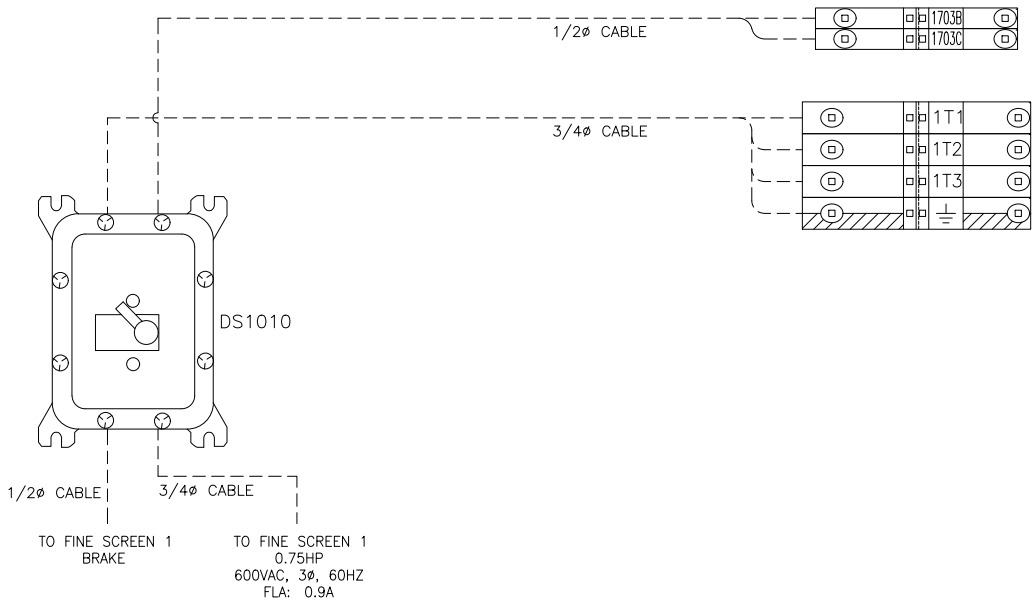
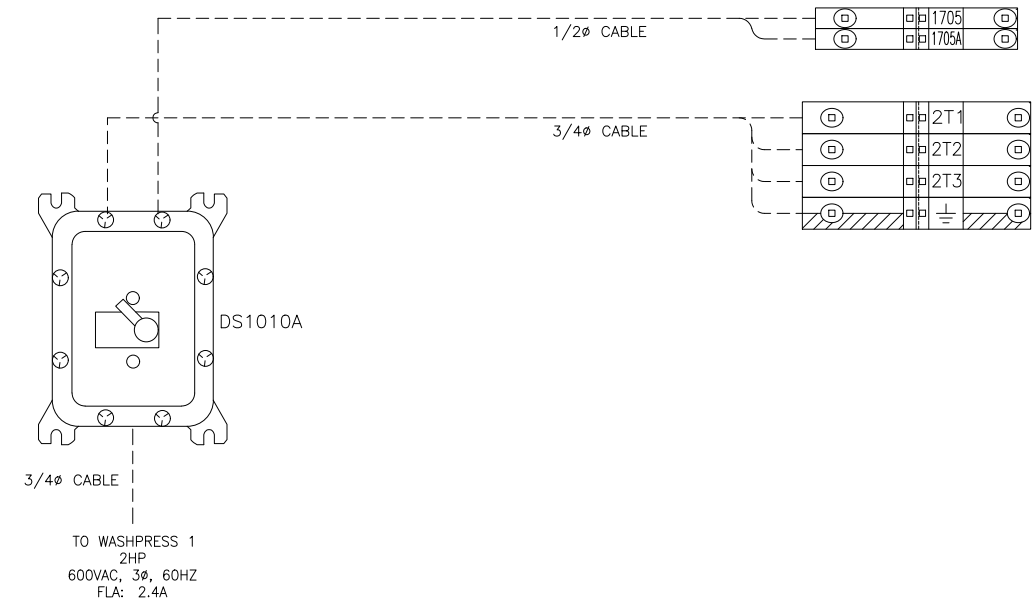






REV	DATE	DESCRIPTION
00	2024-07-09	X.M. FOR APPROVAL

VOLT.	PHASE	FREQ. (HZ)	AMP.
600	3	60	10

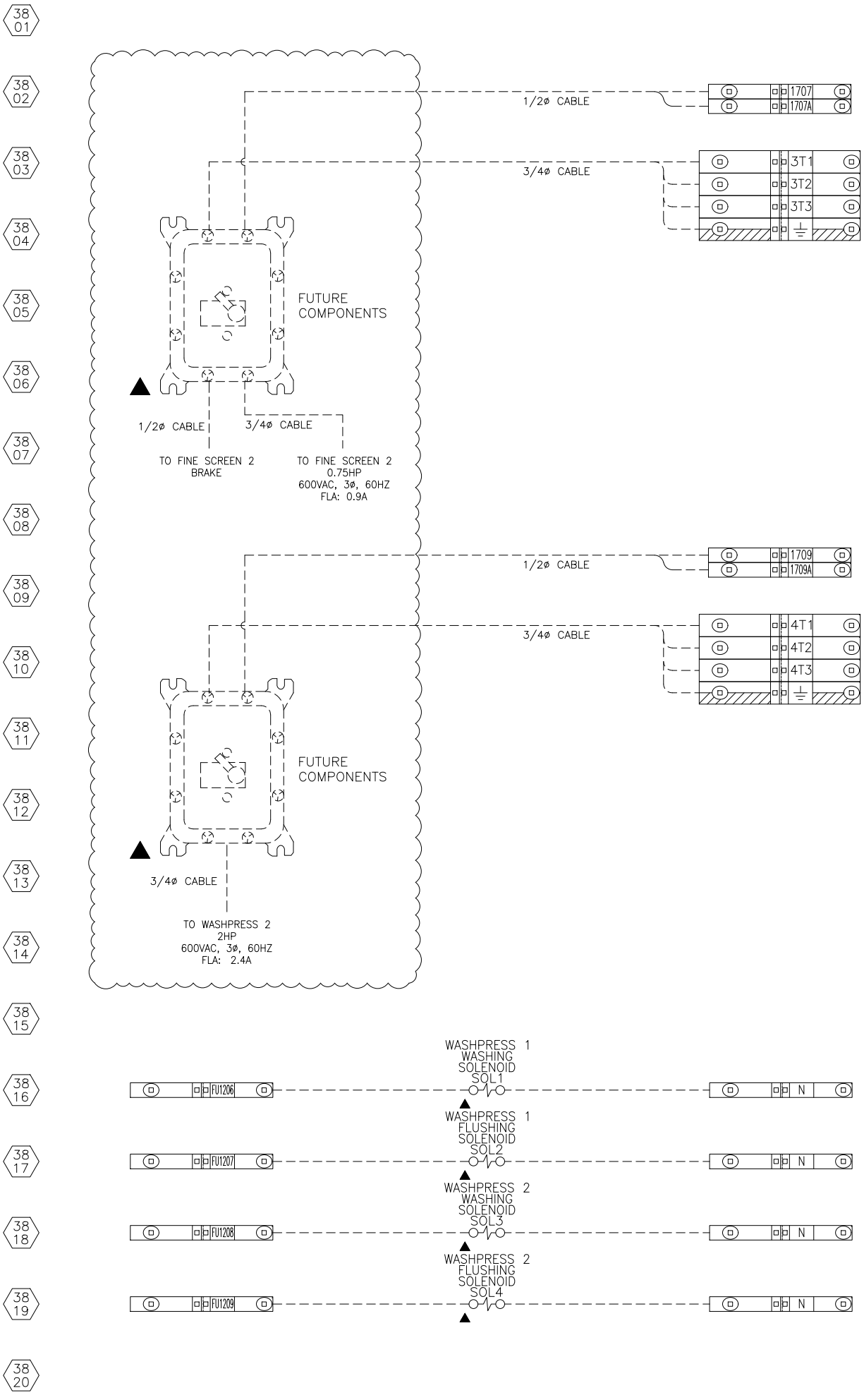
H.P	KVAR	KW	TYPE
5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
WIRING DIAGRAM
CUSTOMER: CLARO
REF.: 22167-P-00 PROJET: ELMVALE, ON
DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE
DATE: JULY 2024
DRAWING# 12033416
PAGE 37 OF 39

H:_Projets_12033XXX\12033416.Claro.Elmvale, ON\Dessins\12033416_R0\12033416_R0_P37.dwg



REV	DATE	DESCRIPTION
00	2024-07-09	X.M. FOR APPROVAL

VOLT.	PHASE	FREQ. (HZ)	AMP.
600	3	60	10

H.P	KVAR	KW	TYPE
5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
WIRING DIAGRAM (NEXT)
CUSTOMER: CLARO
REF.: 22167-P-00 PROJET: ELMVALE, ON
DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE
DATE: JULY 2024
DRAWING# 12033416
PAGE 38 OF 39

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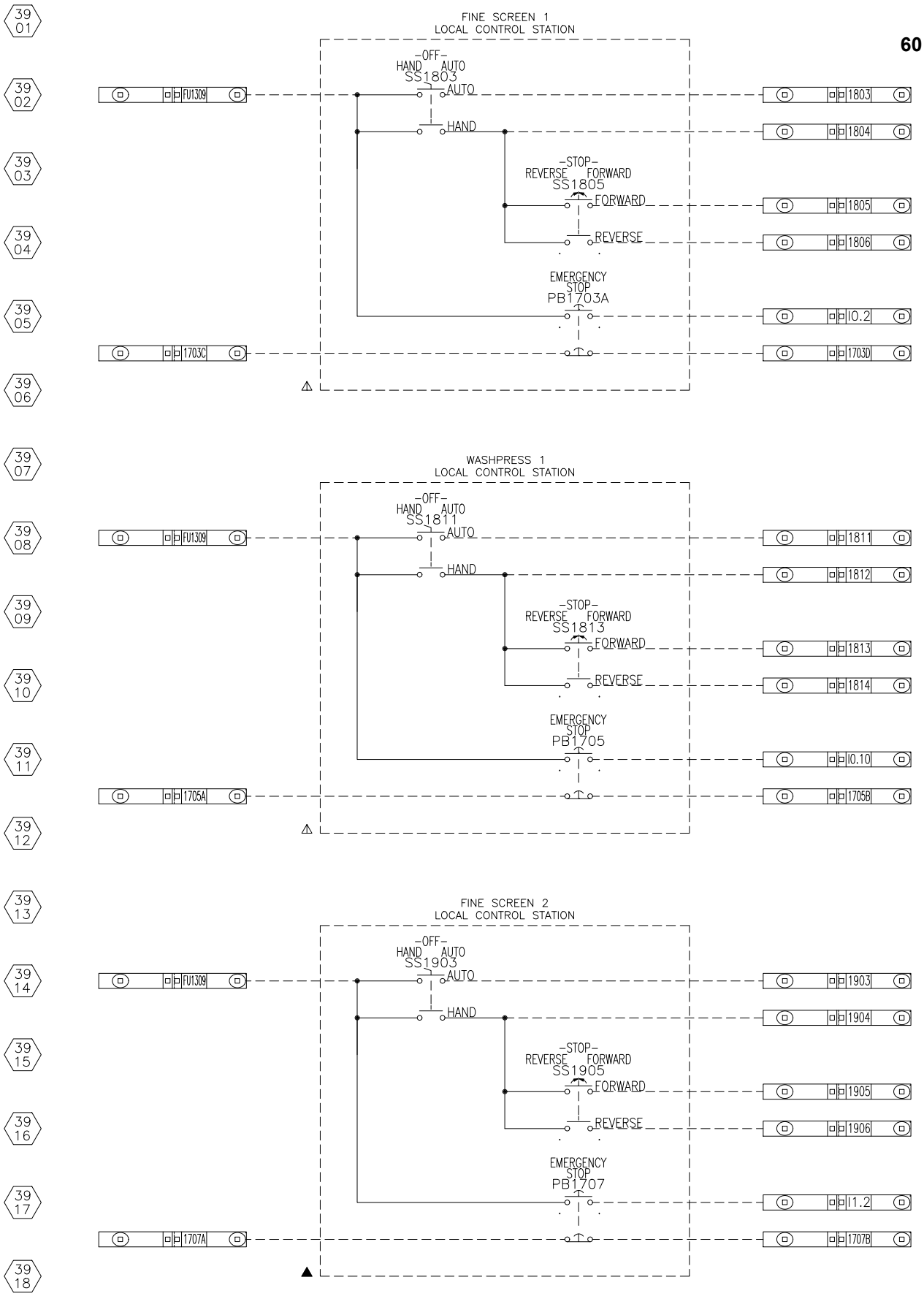

REV	DATE	DESCRIPTION
00	2024-07-09	FOR APPROVAL

VOLT.	PHASE	FREQ. (HZ)	AMP.	H.P	KVAR	KW	TYPE
600	3	60	10	5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL

WIRING DIAGRAM (NEXT)

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

SCALE: NONE

DATE: JULY 2024

DRAWING# 12033416

PAGE 39 OF 39

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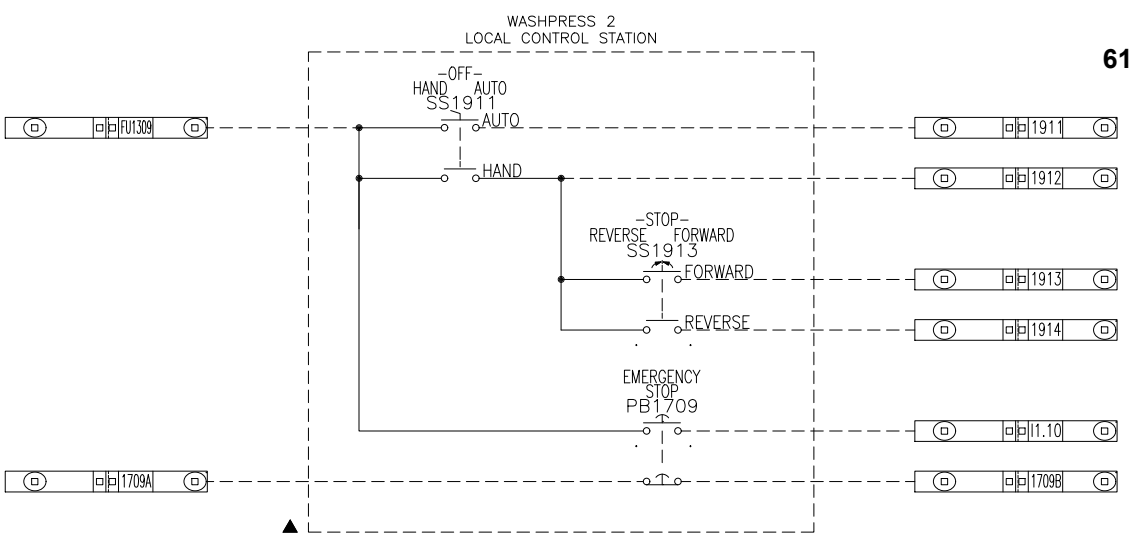

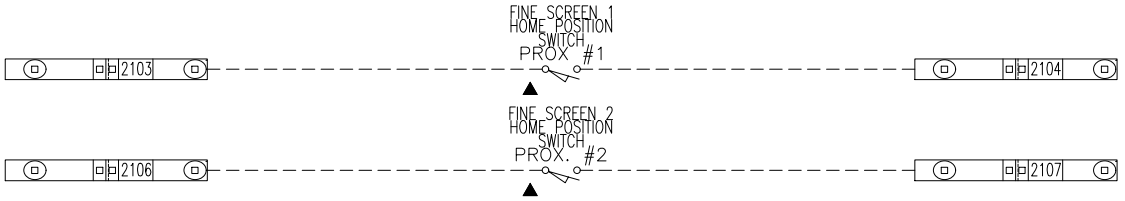

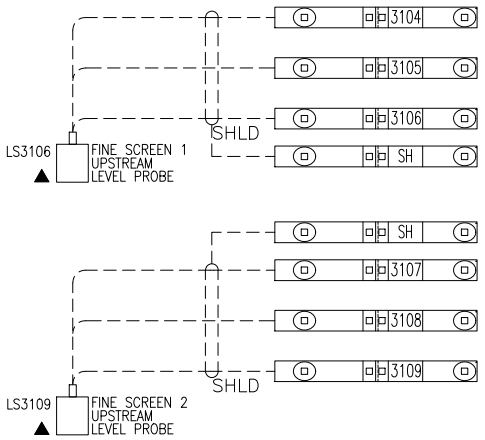

REV	DATE	DESCRIPTION
00	2024-07-09	X.M. FOR APPROVAL

VOLT.	PHASE	FREQ. (HZ)	AMP.	H.P	KVAR	KW	TYPE
600	3	60	10	5.5	N/A	N/A	12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
WIRING DIAGRAM (NEXT)
CUSTOMER: CLARO
REF.: 22167-P-00 PROJET: ELMVALE, ON
DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE
DATE: JULY 2024
DRAWING# 12033416
PAGE 40 OF 40

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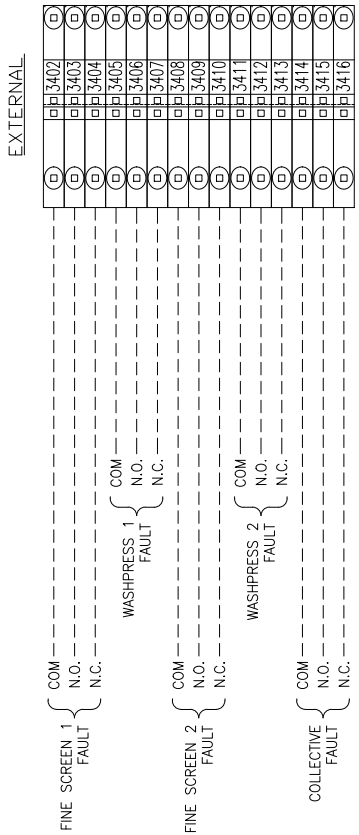
62



41 01 41 02 41 03 41 04 41 05 41 06 41 07 41 08 41 09 41 10 41 11 41 12 41 13 41 14 41 15 41 16 41 17 41 18 41 19 41 20

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REV	DATE		DESCRIPTION
00	2024-07-09	X.M.	FOR APPROVAL

VOLT. 600	H.P. 5.5
PHASE 3	kVAR N/A
FREQ. (HZ) 60	kW N/A
AMP. 10	TYPE 12

TITLE: TWO FINE SCREEN, TWO WASHPRESS CONTROL PANEL
WIRING DIAGRAM (NEXT)

CUSTOMER: CLARO

REF.: 22167-P-00 PROJET: ELMVALE, ON

DRAWN BY: X.MONTAMBAULT CHECKED BY: C.SAMSON

Claro™

SCALE: NONE DRAWING# 12033416

DATE: JULY 2024 PAGE 41 OF 41

151015
ELECTRO MECANIK PLAYFORD
DIVISION DE FRANKLIN EMPIRE INC.
215, FORTIN
QUÉBEC (QUÉBEC)
CANADA G1M 3M2
TÉL.: 418-683-1725

PANNEAU INDUSTRIEL DE COMMANDE / INDUSTRIAL CONTROL PANEL

No.Dessin / Drawing No.	DATE (Y/A - M - D/J)
12033416	2024-MM-DD

#1

TENSION/VOLTAGE (V)	HERTZ (Hz)	PHASES (ϕ)	TYPE DE BOITIER / ENCLOSURE TYPE
600	60	3	12

AMPERAGE (A)	WIRES/FILS
10	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)
5.5	N/A	N/A

MINIMUM	MAXIMUM	
0°C	40°C	TEMPÉRATURE AMBIANTE RECOMMANDÉE / RECOMMANDED AMBIENT TEMPERATURE

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

---

c UL us LISTED 38H1
ELECTRO MECANIK PLAYFORD
DIVISION DE FRANKLIN EMPIRE INC.
215, FORTIN
QUÉBEC (QUÉBEC)
CANADA G1M-3M2
TÉL.: 418-683-1725

PANNEAU DE CONTRÔLE POUR EMPLACEMENT DANGEREUX
CONTROL PANEL FOR HAZARDOUS LOCATIONS
FACTORY/MANUFACTURE ID : Q

No.Dessin / Drawing No.	TYPE DE BOITIER / ENCLOSURE TYPE
12033416	
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

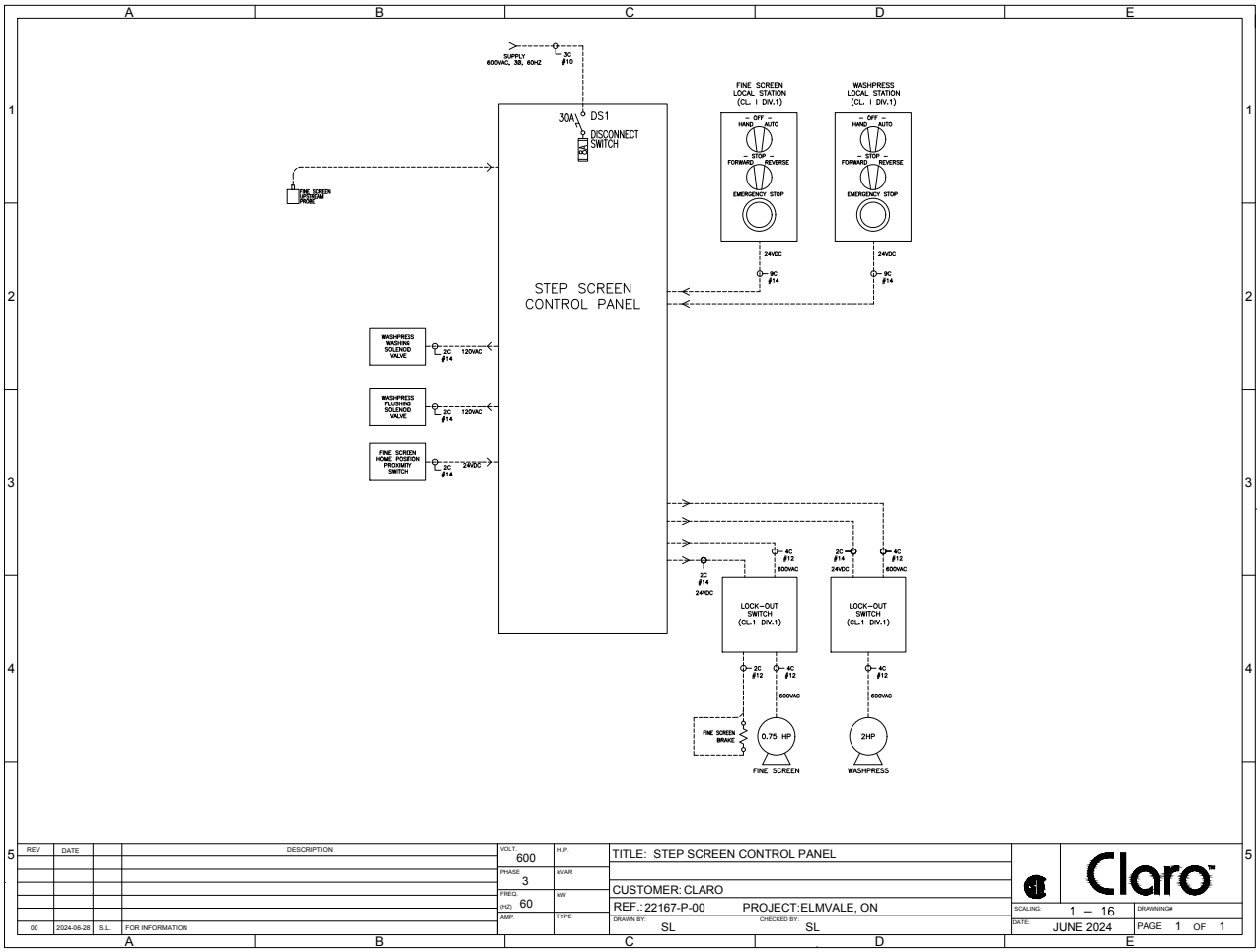
-CONVIENT À UN CIRCUIT POUVANT DÉBITER UN COURANT DE DÉFAUT
SUITABLE FOR USE ON A CIRCUIT CAPABLE OF DELIVERING

	#1	#2	
MAXIMUM DE / MAXIMUM OF	10k	N/A	EFFICACES SYMÉTRIQUE / RMS SYM.
TENSION DE / TENSION OF	600	N/A	VOLT MAX.

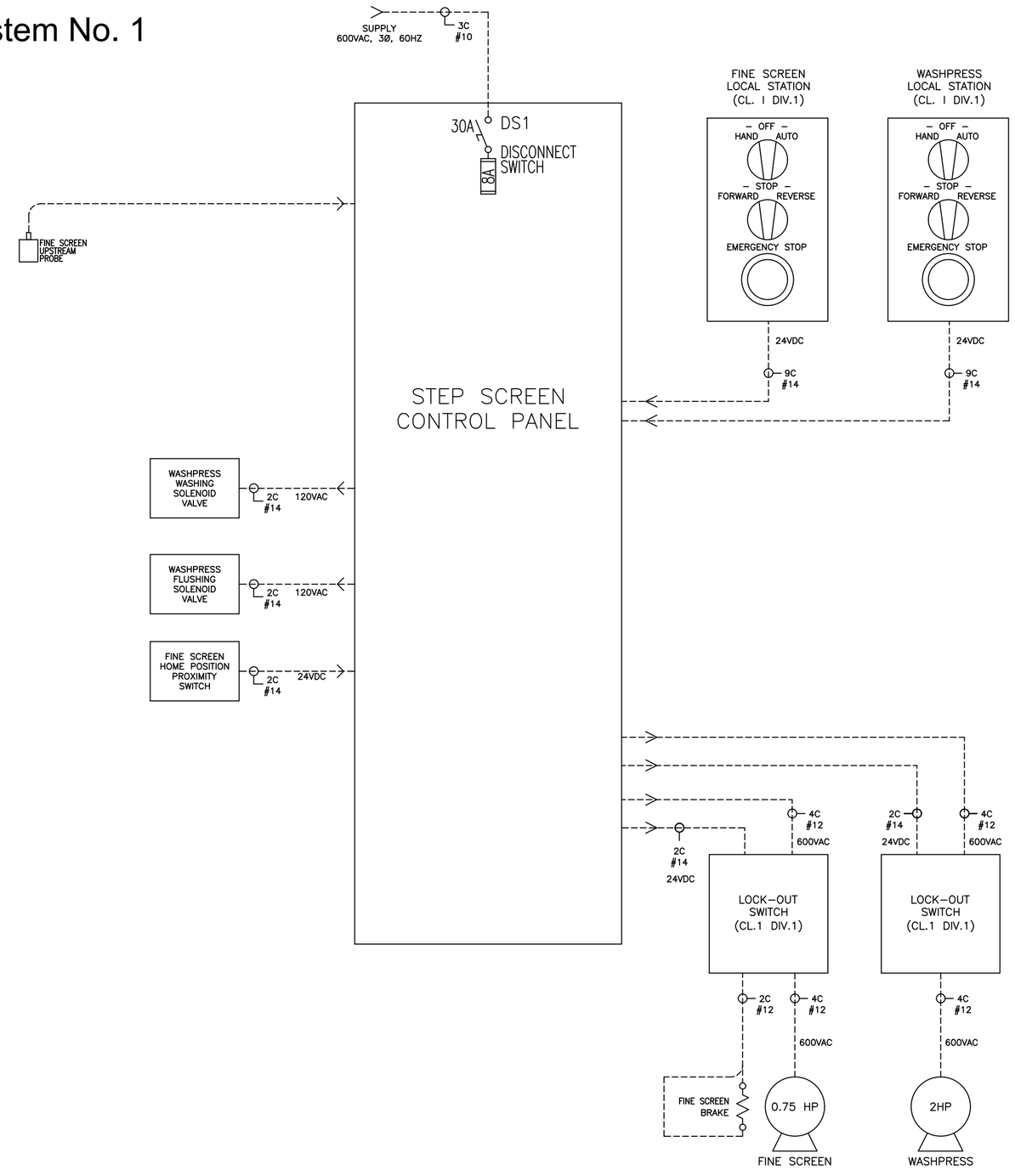
Fabriqué au Canada Made in Canada

B. Elmvale WWTP Field Wiring & Wire Weights Diagram (Phase 1)

- Please see following page for large scale drawing



Phase 1: Screening System No. 1
Field Wiring



REV	DATE		DESCRIPTION
00	2024-06-28	S.L.	FOR INFORMATION

VOLT. 600	H.P.
PHASE 3	kVAR
FREQ. (HZ) 60	kW
AMP.	TYPE

TITLE: STEP SCREEN CONTROL PANEL

CUSTOMER: CLARO

REF.: 22167-P-00 PROJECT: ELMVALE, ON

DRAWN BY: SL CHECKED BY: SL

Claro™

SCALING: 1 – 16 DRAWNING#

DATE: JUNE 2024 PAGE 1 OF 1

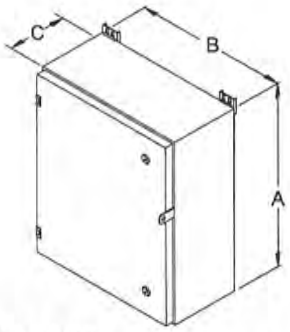
C. Component Catalog Cuts (Annotated) & Index – Elmvale WWTP

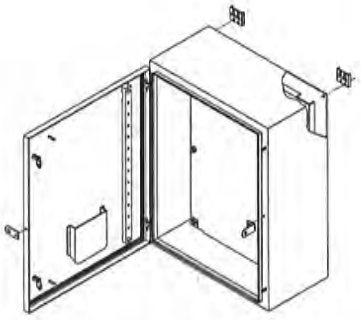
Index

030B_Adalet_SA5762_Motor_Station
030C_Adalet_Control_Stations
030D_Pushin_Lug_3RV2928-0B
030E_3RV29011E_datasheet_en

BEL **R Series**

EEMAC / NEMA 4-4x-12 / IP-65
Single Door Enclosures





TECHNICAL READOUT

Catalog No.	Dimensions A	B	C	Panel E	x	F	Weight lbs
R122406	12	24	6	9	x	21	36
R161206	16	12	6	13	x	9	26
R161606	16	16	6	13	x	13	32
R162006	16	20	6	13	x	17	38
R201206	20	12	6	17	x	9	31
R201606	20	16	6	17	x	13	38
R202006	20	20	6	17	x	17	43
R202406	20	24	6	17	x	21	55
R241206	24	12	6	21	x	9	36
R241606	24	16	6	21	x	13	46
R242006	24	20	6	21	x	17	55
R242406	24	24	6	21	x	21	60
R301606	30	16	6	27	x	13	53
R302006	30	20	6	27	x	17	65
R302406	30	24	6	27	x	21	75
R362406	36	24	6	33	x	21	88
R363006	36	30	6	33	x	27	114
R122408	12	24	8	9	x	21	40
R161208	16	12	8	13	x	9	30
R161608	16	16	8	13	x	13	34
R162008	16	20	8	13	x	17	43
R201208	20	12	8	17	x	9	33
R201608	20	16	8	17	x	13	43
R202008	20	20	8	17	x	17	47
R202408	20	24	8	17	x	21	59
R241208	24	12	8	21	x	9	40
R241608	24	16	8	21	x	13	49
R242008	24	20	8	21	x	17	59
R242408	24	24	8	21	x	21	68
R243008	24	30	8	21	x	27	85
R301208	30	12	8	27	x	9	42
R301608	30	16	8	27	x	13	54
R302008	30	20	8	27	x	17	70
R302408	30	24	8	27	x	21	82
R303008	30	30	8	27	x	27	102
R303608	30	36	8	27	x	33	121
R362408	36	24	8	33	x	21	94
R363008	36	30	8	33	x	27	121
R363608	36	36	8	33	x	33	139
R422408	42	24	8	39	x	21	107
R423008	42	30	8	39	x	27	132
R423608	42	36	8	39	x	33	162
R482408	48	24	8	45	x	21	117
R483008	48	30	8	45	x	27	153
R483608	48	36	8	45	x	33	182
R603608	60	36	8	57	x	33	208

Catalog No.	Dimensions A	B	C	Panel E	x	F	Weight lbs
R161210	16	12	10	13	x	9	34
R201610	20	16	10	17	x	13	48
R202010	20	20	10	17	x	17	52
R241210	24	12	10	21	x	9	43
R242010	24	20	10	21	x	17	63
R242410	24	24	10	21	x	21	73
R302010	30	20	10	27	x	17	76
R302410	30	24	10	27	x	21	87
R362410	36	24	10	33	x	21	102
R363010	36	30	10	33	x	27	127
R423010	42	30	10	39	x	27	137
R423610	42	36	10	39	x	33	184
R483010	48	30	10	45	x	27	159
R483610	48	36	10	45	x	33	190
R603610	60	36	10	57	x	33	230
R201612	20	16	12	17	x	13	54
R242012	24	20	12	21	x	17	67
R242412	24	24	12	21	x	21	78
R302412	30	24	12	27	x	21	90
R303012	30	30	12	27	x	27	113
R362412	36	24	12	33	x	21	106
R363012	36	30	12	33	x	27	130
R363612	36	36	12	33	x	33	137
R423012	42	30	12	39	x	27	150
R423612	42	36	12	39	x	33	175
R483612	42	36	12	45	x	33	197
R603612	60	36	12	57	x	33	239
R723012	72	30	12	69	x	27	260
R723612	72	36	12	69	x	33	320
R242016	24	20	16	21	x	17	81
R242416	24	24	16	21	x	21	86
R302416	30	24	16	27	x	21	100
R363016	36	30	16	33	x	27	137
R423616	42	36	16	39	x	33	147
R483616	48	36	16	45	x	33	213
R603616	60	36	16	57	x	33	256
R723016	72	30	16	69	x	27	260
R723616	72	36	16	69	x	33	272
R302420	30	24	20	27	x	21	111
R363020	36	30	20	33	x	27	155
R483620	48	36	20	45	x	33	227
R603620	60	36	20	57	x	33	272
R723020	72	30	20	69	x	27	287
R302424	30	24	24	27	x	21	129
R723024	72	30	24	69	x	27	300

Application:
Type 4-4x-12 / IP-65 enclosure designed for INDOOR/OUTDOOR housing of electrical, pneumatic or hydraulic instruments.

Construction:
- 16 or 14 gauge steel
- Removable cover
- Continuously welded and ground smooth seams
- Padlock hasp supplied
- Interchangeable left/right side cover opening
- Cover stabilizing bumpers
- 1/4 turn latches
- Grounding studs welded on inner cover surface
- Galvanized mounting rail
- Galvanized steel mounting panel (unpainted)
- Four (4) wall mounting brackets offering multiple installation positionning
- Self-adhesive polymer BEL data pocket
- ANSI/ASA61 grey polyester textured powder coating inside out

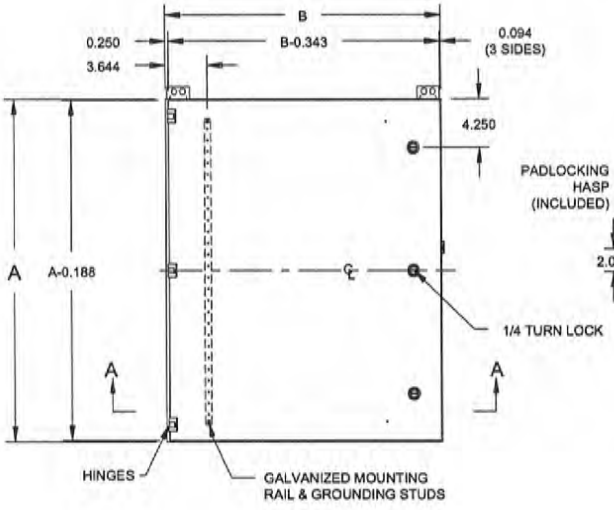
Also Available:
- Galvanized steel
- Cutouts, hubs, windows
- Special finishes & sizes
- Flush handle

Standards:
- CSA certified 150359
- UL listed E109310
- CE

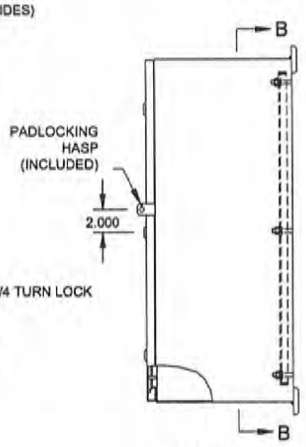
C SA US UL CE

BEL R Series

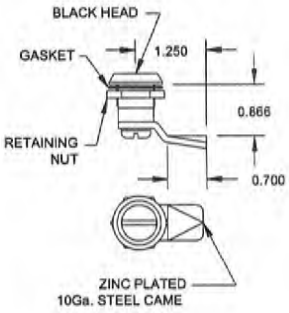
EEMAC / NEMA 4-4x-12 / IP-65
Single Door Enclosures



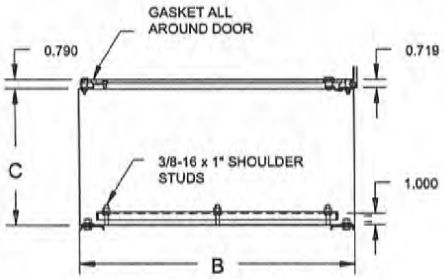
Front View



Side View

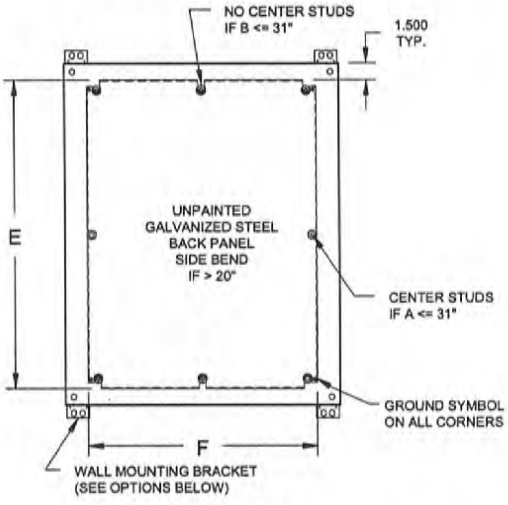


Standard
1/4 Turn Latch
A14KR

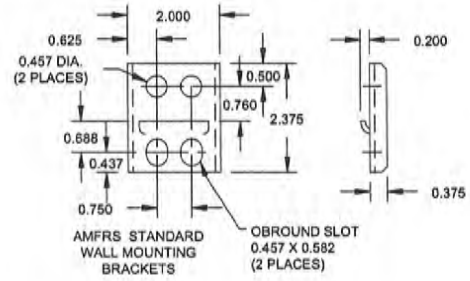


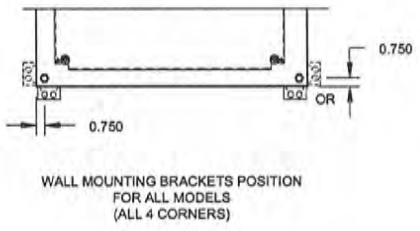
Section A-A

A	HINGES	LOCKS
0	2	1
24	2	2
36	3	2
42	3	3
60	4	3



Section B-B





BEL **Accessories**

Spare Inner Panels For S and R Enclosures

TECHNICAL READOUT

Catalog No.	Box Size Height	Width	Panel Size Height	Width	Weight lbs.
ASP0604	6	4	4.875	2.875	0.5
ASP0606	6	6	4.875	4.875	0.75
ASP0806	8	6	6.875	4.875	1
ASP0808	8	8	6.875	6.875	1.25
ASP1008	10	8	8.875	6.875	1.5
ASP1010	10	10	8.875	8.875	2
ASP1210	12	10	10.875	8.875	2.25
ASP1212	12	12	10.875	10.875	2.75
ASP1412	14	12	12.875	10.875	3.25
ASP1614	16	14	14.875	12.875	4.25
ASP2012	20	12	18.875	10.875	4
ASP2016	20	16	18.875	14.875	5
ASP2412	24	12	22.875	10.875	5
ASP2416	24	16	22.875	14.875	6
ASP2420	24	20	22.875	18.875	8

ASP SERIES

Spare inner panels for all S enclosures

- Made from 14 gauge galvanized steel. Natural finish (unpainted)
- All panels have four mounting holes
- Ground symbols and holes

TECHNICAL READOUT

Catalog No.	Box Size Height	Width	Panel Size Height	Width	Weight lbs.
ARP1612	16	12	13	9	3.75
ARP1616	16	16	13	13	5.25
ARP2012	20	12	17	9	4.75
ARP2016	20	16	17	13	6.75
ARP2020	20	20	17	17	10
ARP2412	24	12	21	9	6.5
ARP2416	24	16	21	13	9
ARP2420	24	20	21	17	12
ARP2424	24	24	21	21	15
ARP3012	30	12	27	9	9
ARP3016	30	16	27	13	12
ARP3020	30	20	27	17	16
ARP3024	30	24	27	21	18
ARP3030	30	30	27	27	24
ARP3624	36	24	33	21	23
ARP3630	36	30	33	27	28
ARP3636	36	36	33	33	34
ARP4224	42	24	39	21	27
ARP4230	42	30	39	27	35
ARP4236	42	36	39	33	42
ARP4824	48	24	45	21	31
ARP4830	48	30	45	27	41
ARP4836	48	36	45	33	49
ARP6036	60	36	57	33	60
ARP7230	72	30	69	27	61
ARP7236	72	36	69	33	74

ARP SERIES

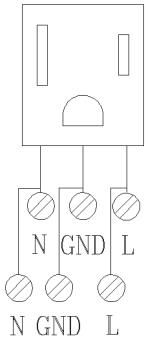
Spare inner panels for all R enclosures

- Made from 14 and 12 gauge galvanized steel. Natural finish (unpainted)
- All panels have 4 or 6 or 8 mounting holes all depend of the size
- Ground symbols and holes

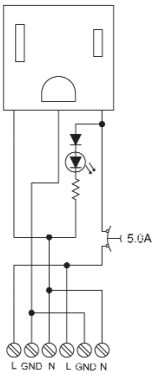
These modules are intended for use within cabinets and enclosures as 120 VAC outlets for power tools, lights, computers or test equipment for troubleshooting.

- 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



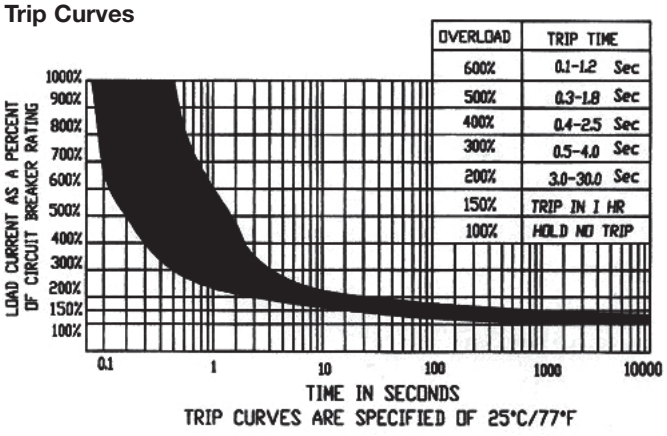
Schematic diagram



Rated data

Input voltage		
Rated current	120Vac	120Vac
	5A max via outlet	5A max via outlet
	10A via redundant terminals	10A via redundant terminals
Wire range	26 - 12 AWG (0.14 0 4.0mm²)	26 - 12 AWG (0.14 0 4.0mm²)
Ordering data	**Type** / **Part No.**	**Type** / **Part No.**
TS32 / TS35 mounting (⊏⎽⎽ / ⎽⎽⌐)	Single outlet without circuit breaker **9915480000**	Single outlet with circuit breaker **9915480001**
		(supplemental protector with manual reset via push button)
Dimensions		
Width	35mm	35mm
Length	70mm	70mm
Height	55mm	55mm
Approvals		
	LR-229352, E252394	LR-229352, E252394

Trip Curves



Fusible disconnect switches
30 – 1200 A, 600 VAC

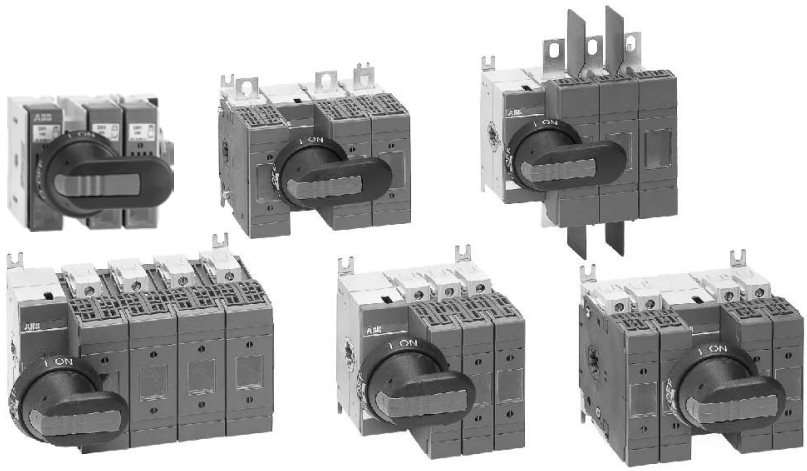


ABB disconnect switch family includes seven different amperage sizes from 30A to 1200A. All ABB fusible switches are designed to meet customer requirements in terms of high interrupting capacity and long electrical life while occupying only little more panel space than the appropriate fuses. The basic construction provides flexibility and high performance in an extremely compact size. ABB's disconnects are a perfect choice to withstand the heat and humidity of the tropics, the extreme cold of the arctic and any rugged industrial environment you may have.

International acceptance

ABB fusible switches are available with a wide range of fuse clip options:

UL	USA	CSA	Canada
DIN	Europe	BS	United Kingdom
NFC	France	Ultra-rapid	

As well as the corresponding approvals: UL listed, CSA approved, IEC rated, CE marked, and most other international standards.

UL98 (CSA 22.2 No.4) — UL File # E101914, CSA File #58077
For OS30 – 1200 switches, OH__ pistol grip handles

Suitable for use as motor disconnects or industrial control panel disconnects on service entrance equipment, panelboards, switchboards, industrial control equipment, motor control centers, etc. Horsepower and ampere rated.

IEC

Tested in accordance to IEC 60947-1 and 3

CE

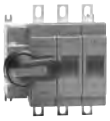
Compliance with the European Machine Directive IEC/EN 60204

For a complete offer including other standards such as IEC, BS etc, visit:
http://new.abb.com/low-voltage/products/switches

Selection guide
OS30 – 1200

OS30FA_12 OS60GJ03

OS100GJ03



OS200J03

OS400J03

OS600J03

OS800L3

OS1200L03

Catalog number 3 pole		OS30FACC12	OS30FAJ12	OS60GJ12	OS100GJ03	OS200J03	OS400J03	OS600J03	OS800L3	OS1200L03
General purpose amp rating	A	30	30	60	100	200	400	600	800	1200
Approvals ①										
	2 pole	N/A	N/A	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC
	3 pole	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC
	4 pole	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC
Technical ratings (UL,CSA)										
Max operating voltage	V	600	600	600	600	600	600	600	600	600
Max horsepower rating Three phase										
240V	HP	7.5	7.5	15	30	60	125	200	250	—
480V	HP	15	15	30	60	125	250	400	500	—
600V	HP	20	20	50	75	150	350	500	500	—
Single phase										
120V	HP	2	2	—	—	—	—	—	—	—
240V	HP	3	3	—	—	—	—	—	—	—
UL fuse class		CC	J	J	J	J	J	J	L	L
Technical ratings (IEC)										
Rated insulation and operational voltage. AC20 and DC20	V	1000	1000	1000	1000	1000	1000	1000	1000	1000
Rated thermal current, I_{th}										
AC 20/DC 20 open	A	32	32	63	160	200	400	630	800	1250
AC 20/DC 20 enclosed	A	32	32	63	160	200	400	570	720	1000
AC 21A ≤500V	A	32	32	63	160	200	400	630	800	1250
≤690V	A	32	32	63	160	200	400	630	800	1250
Rated operational power AC23										
400/415V	kW	15	15	30	75	110	230	355	450	560
690V	kW	22	22	55	132	200	400	630	710	1000
Physical characteristics										
Weight 3 pole switch	lb	1.54	1.54	2.86	3.30	5.9	12.56	28.66	37.44	63.93
4 pole	lb	1.98	1.98	3.52	3.96	7.5	15.21	37.48	46.26	—
Dimension 3 pole H	in	3.66	3.60	3.94	5.67	6.5	9.29	12.03	12.03	16.7
W	in	4.15	4.15	5.63	7.07	7.1	10.04	13.86	13.86	16.42
D	in	4.10	4.10	5.04	5.10	5.2	6.93	9.18	9.18	11.62
Accessories										
Double break contacts		S	S	S	S	S	S	S	S	S
Fuse cover		S	S	S	S	S	S	S	S	S
Terminal lug kit		Integral	Integral	Integral	OZXA-24	OZXA-200	OZXA-400	OZXA-800	OZXA-800	OZXA-1200
Terminal shroud		Not required	Not required	Not required	•	•	•	•	•	•
Auxiliary contact		•	•	•	•	•	•	•	•	•
Shaft/handle diameter		6mm .24 x .24"	6mm .24 x .24"	6mm .24 x .24"	6mm .24 x .24"	6mm .24 x .24"	12mm .47 x .47"	12mm .47 x .47"	12mm .47 x .47"	12mm .47 x .47"
Handle UL/NEMA type										
Type 1, 3R, 12		•	•	•	•	•	•	•	•	•
Type 1, 3R, 4, 4X, 12		•	•	•	•	•	•	•	•	•
Recommended pistol handle length		45 - 65mm	45 - 65mm	45 - 65mm	45 - 65mm	65 - 80mm	125 - 175mm	125 - 175mm	125 - 175mm	125 - 175mm
Maximum recommended shaft length		290mm	290mm	290mm	290mm	290mm	535mm	535mm	535mm	535mm
Electrical interlock		—	—	—	—	—	•	•	•	•

S = Standard
• = Available
— = Not available

① UL listed switches are also listed for CSA Standards.

Standard part number designation ①

Fusible OS Switches (30A)

OS 30 F A J 22 F

Amperage
30 = 30 amps

Fuse Type/Class
J = Class J fuse compatible CC= Class CC fuse compatible

Number of poles and placement of the mechanism
12 = 1 Pole to the left of mechanism, 2 poles to the right of mechanism
22 = 2 Poles to the left of mechanism, 2 poles to the right of mechanism

Fusible OS Switches (60 to 100A)

OS 100G J 03

Amperage
60 = 60 amps 100 = 100 amps

Fuse Type/Class
J = Class J fuse compatible

Number of poles and placement of the mechanism
03 = 3 Poles to the right of mechanism 04 = 4 poles to the right of mechanism

Fusible OS Switches (200A and above)

OS 200 J 04 F

Amperage
200 = 200 amps 400 = 400 amps 600 = 600 amps 800 = 800 amps 1200 = 1200 amps

Fuse Type/Class
J = Class J fuse compatible
L = Class L fuse compatible

Number of poles and placement of the mechanism
03 = 3 Poles to the right of mechanism
12 = 1 Pole to left of mechanism, 2 poles to right
30 = 3 Poles to the left of mechanism
04 = 4 poles to the right of mechanism
22 = 2 Poles to left of mechanism, 2 poles to right

Pistol Handles

O H B 65 J 6 E011

Handle Color
B = Black Y = Red/Yellow M = Stainless Steel

Handle Length
65 = 65mm 80 = 80mm 125 = 125mm 145 = 145m 175 = 175mm 274 = 274mm 330 = 330mm

Environmental Rating
J = Nema 1, 3R, 12 L = Nema 1, 3R, 12, 4, 4X

Shaft Diameter
6 = 6mm 12 = 12mm

Special Configuration
Blank = for disconnect switches, fusible and non-fusible
E011 = 3 position double throw handle
EH = Stainless Steel Hasp

① Part designation keys are provided for reference only. Not all variations or configurations a e available.

Base & DIN rail mounted ①
30 – 1200 A, UL fuse class CC, J and L

For a complete assembly, please select one of each:

1 switch (page 19.22)
1 handle (page 19.30)
1 shaft (page 19.32)
1 terminal lug kit (page 19.34)

NOTE: For additional accessories, see pages 19.29 - 19.40.


Switch
OS_

+


Handle
OH_J_

+


Shaft
OXP_X_

+


Lug Kit ①
OZXA_


OS30FA_12


OS60GJ03


OS100GJ12


OS200...1200_03

	UL general purpose amp rating	UL Fuse Type 600V	2 Pole	3 Pole	4 Pole
			Catalog number	Catalog number	Catalog number
UL 98	30	J CC ②	— —	OS30FAJ12 OS30FACC12	OS30FAJ22F OS30FACC22F
	60	J	OS60GJ02	OS60GJ12 OS60GJ03	OS60GJ04F
	100	J	OS100GJ02	OS100GJ12 OS100GJ03	OS100GJ04F
	200	J	OS200J02	OS200J03 OS200J30 OS200J12	OS200J04F
	400	J	OS400J02	OS400J03 OS400J30 OS400J12	OS400J04F
	600	J	OS600J02	OS600J03	OS600J04F
	800	L	OS800L02	OS800L03	OS800L04F
	1200	L	OS1200L02	OS1200L03	OS1200L04F

① For OS60 and OS100, please add the accessory OSGZD1 in order to mount on a DIN rail. OS200 and above are screw mounted only. Lugs only required for OS100 and above.
② Rejection style fuses only

Special configurations ①
Side operated
30 – 100 A, UL fuse class CC and J

For a complete assembly, please select one of each:
1 switch
1 handle
1 shaft
1 terminal lug ①

Switch
OS_

+

Handle
OH_J_

+

Shaft
OXP_X_

OS60GJS30

OS100GJS30

OXP6X_

OZXA-24

Side operated fusible disconnects — 3 poles

UL general purpose amp rating	UL fuse type 600V	Maximum horsepower rating					Weight (Lbs.)	Catalog number
		Three phase						
		200V	208V	240V	480V	600V		
30	J	5	7.5	7.5	15	20	1.54	OS30FAJS30
30	CC ②	5	7.5	7.5	15	20	1.54	OS30FACCS30
60	J	15	15	15	30	50	3.52	OS60GJS30
100	J1	25	25	30	60	75	3.97	OS100GJS30

Handles

UL/NEMA type	IEC type	Color	Length (Inches/mm)	Marking	Defeatable	Padlockable	Weight	Catalog number
For use with OS30FA_S_, OS60GJS_ & OS100GJS_								
1, 3R, 12	IP65	Black Red/Yel	2.6/65	OFF/ON	Yes	Yes	0.29	OHB65J6E00S OHY65J6E00S
For use with OS60GJS_ & OS100GJS_								
1, 3R, 12	IP65	Black Red/Yel	3.1/80	OFF/ON	Yes	Yes	0.30	OHB80J6E00S

Shaft

For use with:	Length (Inches/mm)	Description	Weight (Lbs.)	Catalog number
OS30FA_S_, OS60GJS_ & OS100GJS_	6.7/170 8.3/210	.24 x .24" (6 x 6mm) .24 x .24" (6 x 6mm)	0.08 0.10	OXP6X170 OXP6X210

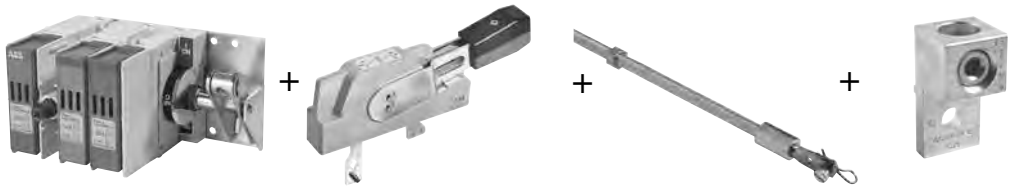
Terminal lug kits

For use with:	Wire size	Weight	Wire type	Lugs per kit	Catalog number
OS30FA_S_	#18 – 8	—	Cu	—	Integral
OS60GJS_	#14 – 4	—	Cu	—	Integral
OS100GJS_	#14 – 2/0	0.43	Cu/Al	6	OZXA-24

① For OS60 and OS100, please add the accessory OSGZD1 in order to mount on a DIN rail.
Lugs only required for OS100.
② Rejection style fuses only

Special configurations
Shaft operated flange
30 - 100 A

For a complete assembly, please select one of each.



Switch + Handle + Shaft + Lug kit ①

OS30FAJ_

Flange operated fusible disconnects (shaft) — 3 poles

UL general purpose amp rating A	UL fuse type 600V	Maximum horsepower rating Three phase 240V	480V	600V	Catalog number
30	J	7.5	15	20	OS30FAJF30
30	CC	7.5	15	20	OS30FACCF30
60	J	15	30	50	OS60GJF30
100	J	30	60	75	OS100GJF30

DSFHN-HS_

Flange handles

UL/ NEMA type	Marking	Defeatable	Padlockable	Catalog number
1, 3R, 12	OFF/ON	No	Yes	DSFHN-HS12
4, 4X	OFF/ON	No	Yes	DSFHN-HS4

DSFHS-_

Shafts

For use with:	Maximum enclosure depth (inches)	Catalog number
OS30_ - OS100_	16	DSFHS-12
	21	DSFHS-17
	26.5	DSFHS-22

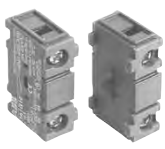
OSZ4

OZXA-24

Terminal lug kits and accessories

For use on:	Description	Wire size	Wire type / additional info	Qty.	Catalog number
OS30_	Lug	#18 - #8	Cu	--	Integral
OS60_	Lug	#14 - #4	Cu	--	Integral
OS100_	Lug	#14 - 2/0	Cu/Al	6	OZXA-24
OS30FA_ & OS60-100G_	Aux. Contact	1 NO	Up to 4 aux. contacts	1	OA1G10 ②
		1 NC		1	OA3G01 ②
OS30FA_	Aux. Contact	1 NC+1 NO	2 max, mounted to the switch mechanism	1	OA4B1C
OS30FA_	Adapter	Needed for mounting OA_G_ aux. cont. on OS30FA_		1	OSZ4
OS100GJ_	Shroud	Single Pole Long type shroud, 3 pcs ③		1	OSS160GG1L/3
		Single Pole Short type shroud, 3 pcs ③			OSS160GG1S/3

① For 100 A and above. OS30...60 come with internal lugs.
② OSZ4 adaptor is needed to mount on OS30FA_
③ For full protection, please order 2 kits.



OA1G_

Flange operated fusible and non-fusible disconnect switches

ABB's solutions comply with NFPA79 requirements for Flange Operated Fusible and Non-fusible Disconnect Switches.

NFPA 79 requires main disconnecting means to be operable without the use of accessory tools or devices, independent of door position. This code also includes an interlocking provision to prevent the closing of disconnects while the enclosure door is open, unless an interlock is operated by a deliberate action.

The flange operated disconnect switches are available as ridged shaft or flexible cable operated versions. The cable operated version allows you to install the disconnect switch virtually anywhere in the enclosure depending on the length of the cable. Cables are available in lengths up to 84 inches.

The designs are cost-effective NFPA 79 solutions offering quick and easy installation.

Special configurations
Cable operated flange
30 - 800 A

For a complete assembly, please select one each of the following:


Switch

+


Handle

+


Cable

+


Lug kit ①

+


Operating mechanism


OS200J30

Fusible

UL general purpose amp rating	UL fuse type 600V	Catalog number
30	J	OS30FAJ12
30	CC	OS30FACC12
60	J	OS60GJ30
60	J	OS60GJ03 ②
100	J	OS100GJ30
100	J	OS100GJ03 ②
200	J	OS200J30
200	J	OS200GJ03 ②
400	J	OS400J30-FC ③
600	J	OES600J3-FC ③
800	L	OES800L3-FC ③


OHF1C_

Flange handles — UL98; File #E101914

For use with:	Environmental rating	Catalog number
OS30FA_12, OS60GJ12/30, OS100GJ30, OS200J30	NEMA 1, 3R, 12	OHF1C12
	NEMA 4, 4X	OHF1C4
OS400J30-FC, OES600J3-FC, OES800J3-FC	NEMA 4, 4X	K7FCH4


OXC1L_

Flexible cables

For use with:	Cable length (inches)	Catalog number
OS30FA_12, OS60GJ30/03, OS100GJ30/03, OS200J30/03	36	OXC1L36
	48	OXC1L48
	60	OXC1L60
	72	OXC1L72
	84	OXC1L84
OS400J30-FC, OES600J3-FC, OES800J3-FC	48	K7C048
	60	K7C060
	72	K7C072
	84	K7C084


MKCS_

Operating mechanisms

For use with:	Catalog number
OS30FAJ12, OS30FACC12	MKCS2
OS60GJ12	MKCS3
OS60GJ30/03, OS100GJ30/03 , OS200J30/03 ②	MKCS4
OS400J30-FC - OES800J3-FC	Included

① For 100 A and above. OS30FA_. ..60GJ_ come with internal lugs
② Rotate the OS_03 disconnect 180 degrees to mount on the operating mechanism
③ Operating mechanism is included

Special configurations
Cable operated flange
30 - 800 A

OZXA-200

Terminal lug kits

For use with	Wire size	Wire type	Description	Lugs per kit	Catalog number
OS100GJ_	#4 – 300 kcmil	Cu/Al	-	6	OZXA-24
OS200J_	#4 – 300 kcmil	Cu/Al	-	6	OZXA-200
OS400	#2 - 600 kcmil	Cu/Al	-	6	OZXA-400
OES600 - OES800	(2) #2 - 600 kcmil	Cu/Al	-	6	OZXA-27

OSS_L_

OSS_S_

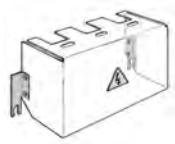
Terminal shrouds

For use on	Description	For full protection order	Weight (lbs.)	Catalog number
OS100GJ_	Single Pole long type shroud, 3 pcs	2 kits	0.17	OSS160GG1L/3
OS100GJ_	Single Pole short type shroud, 3 pcs	2 kits	0.11	OSS160GG1S/3
OS200J_	Single Pole long type shroud, 3 pcs	2 kits	0.20	OSS200G1L/3
OS200J_	Single Pole short type shroud, 3 pcs	2 kits	0.13	OSS200G1S/3
OS400J_	3 pole shroud, 1 pc	2 kits	0.13	OSS403
OES600J_	3 Pole (includes one shroud for line and load side)	1 kit	0.13	OESA-ZX125
OES800J_	3 Pole (includes one shroud for line and load side)	1 kit	0.13	OESA-ZX125

Door hardware NEMA 12

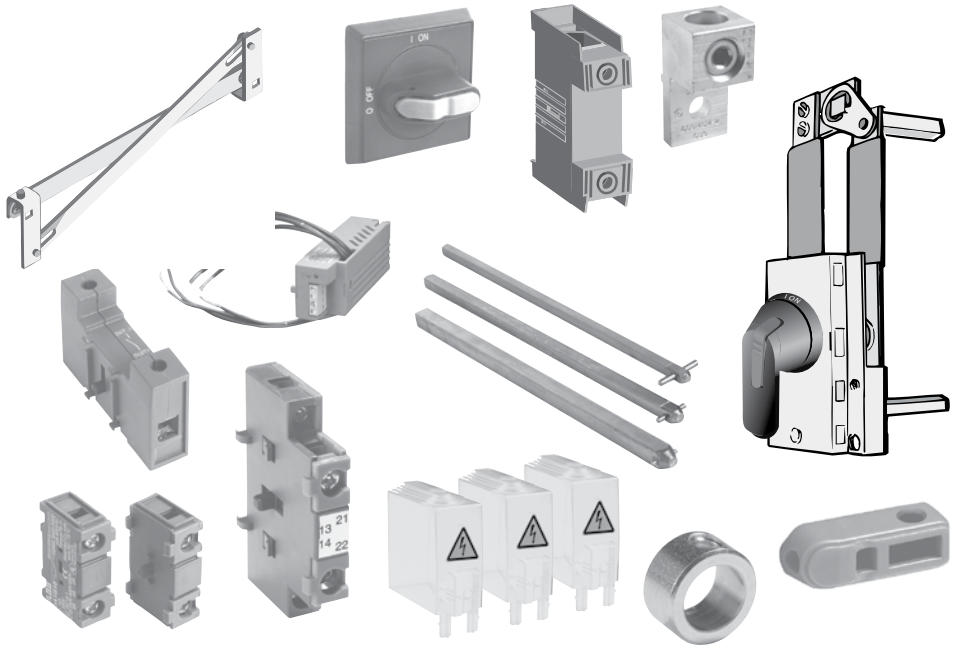
OSS_03

Item	Catalog number
Safety door latch, 2 point, door less than 40” high	KDH2R
Safety door latch, 3 point, door greater than 40” high	KDH3R



OESA-ZX_

Disconnect switch accessories
Non-fusible & fusible



Standard handles & shafts ①②

Selector Handle
OHBS_

Pistol Handle
OHB_J_

Pistol Handle
YASDA-8

Stainless Steel Pistol Handle
OHM_L_

OHBS5

OHBS12

Recommended handles & shafts

Amperes	Shaft diameter	Recommended standard pistol handle length	Maximum recommended shaft length
16 - 100	6x6 mm - .24 x .24"	45 - 65 mm	430 mm
200	6x6 mm - .24 x .24"	65 - 80 mm	290 mm
400 - 1200	12x12 mm - .47 x .47"	125 - 274 mm	535 mm
1600 - 2000	12x12 mm - .47 x .47"	175 - 330 mm	535 mm

Selector handles — for use with .24 x .24" (6mm) OXS6X_shafts

UL/NEMA Type	IEC type	Color	Marking	Defeatable	Padlockable	Weight (lbs)	Catalog number
1	IP54	Black	O/I & Off/On	No	No	0.09	OHBS1AH1 ③
				No	Yes	0.12	OHBS3AH1 ③
1, 3R, 12	IP65	Black	O/I & Off/On	No	Yes	0.16	OHBS2AJ1 ③
				Yes	Yes	0.16	OHBS2AJ ③

Pistol handles — for use with .24 x .24" (6mm) OXP6X_ shafts

UL/NEMA Type	IEC type	Color	Marking	Length in/mm	Defeatable	Padlockable	Weight (lbs)	Catalog number
1, 3R, 12	IP65	Black	O/I & Off/On	2.6/65	Yes	Yes	0.29	OHB65J6
			Off/On/Test	2.6/65	Yes	Yes	0.29	OHB65J6T ④
			O/I & Off/On	3.1/80	Yes	Yes	0.30	OHB80J6
1, 3R, 12, 4, 4X	IP66	Black	O/I & Off/On	2.6/65	Yes	Yes	0.29	OHB65L6
				3.1/80	Yes	Yes	0.30	OHB80L6
1, 3R, 12, 4, 4X	IP66	316L Stainless steel	O/I & Off/On	2.6/65	Yes	Yes	1.60	OHM65L6
1, 3R, 12	IP65	Black w/ 316 stainless hasp	O/I & Off/On	2.6/65	Yes	Yes	0.31	OHB65J6EH
1, 3R, 12, 4, 4X	IP66	Black w/ 316 stainless hasp	O/I & Off/On	2.6/65	Yes	Yes	0.31	OHB65L6EH

Pistol handles — for use with .47 x .47" (12mm) OXP12X_ shafts ⑤

UL/NEMA Type	IEC type	Color	Marking	Length in/mm	Defeatable	Padlockable	Weight (lbs)	Catalog number
1, 3R, 12	IP65	Black	O/I & Off/On	4.9/125	Yes	Yes	0.39	OHB125J12
		Black		5.7/145	Yes	Yes	0.39	OHB145J12
		Black		6.9/175	Yes	Yes	0.41	OHB175J12
		Black T-Handle		7.9/200	Yes	Yes	0.88	OHB200J12P
		Black Steel Reinforced		10.8/274	Yes	Yes	1.19	OHB274J12
		Black Steel Reinforced		13/330	Yes	Yes	1.28	OHB330J12
1, 3R, 12, 4, 4X	IP66	Black	O/I & Off/On	5.7/145	Yes	Yes	0.39	OHB145L12
		Black		6.9/175	Yes	Yes	0.41	OHB175L12
		Black T-Handle		7.9/200	Yes	Yes	0.88	OHB200L12P
		Black Steel Reinforced		10.8/274	Yes	Yes	1.19	OHB274L12
		Black Steel Reinforced		13/330	Yes	Yes	1.28	OHB330L12
1, 3R, 12, 4, 4X	IP65	Metal	Off/On	8.7/220	No	Yes	1.50	YASDA-8
1, 3R, 12, 4, 4X	IP66	316L Stainless Steel	O/I & Off/On	4.9/125	Yes	Yes	1.7	OHM125L12
				6.9/175	Yes	Yes	1.8	OHM175L12
				10.8/275	Yes	Yes	2.1	OHM275L12
		T-Handle		7.9/200	Yes	Yes	0.88	OHM200L12P
1, 3R, 12	IP65	Black w/ 316 stainless hasp	O/I & Off/On	4.9/125	Yes	Yes	0.44	OHB125J12EH
				6.9/175	Yes	Yes	0.76	OHB175J12EH
1, 3R, 12, 4, 4X	IP66	Black w/ 316 stainless hasp	O/I & Off/On	4.9/125	Yes	Yes	0.44	OHB125L12EH
				6.9/175	Yes	Yes	0.76	OHB175L12EH

① Red/Yellow handles are available by substituting the OHB prefix with OHY.
② All handles are plastic unless otherwise noted as metal or stainless steel.
③ Recommended for use only on OT16F_, 25F_, 40F_, 63F_ and 80F_.
④ TEST position is accessed by rotating the mechanism 45 degrees counterclockwise from OFF position. In TEST position, optional auxiliary contacts are actuated but the main/power contacts are not.
⑤ Test handles are also available for other disconnect sizes. Please consult ABB for options available.

Standard handles & shafts ①

Direct mount handle for non-fusible disconnects

Description	For use on	Color	Padlockable	Shaft through handle	Weight	catalog number
Mounts directly on switch. No shaft necessary	OT16-40F_	Black	Yes No	Yes	0.05	OHBS12 ② CXBY68989
	OT63-80F_ OT30/60/100F_	Black	Yes No Yes	No Yes Yes	0.05	OHBS2 ② CXBY68998 CXBY68419/6/2M
Up to 3 padlocks in OFF-position, includes shaft and mechanism	OT200	Black	Yes	Yes	0.22	OTV250EK
	OT400	Black	Yes	Yes	0.44	OTV400EK
	OT600	Black	Yes	Yes	0.66	OTV800EK
	OT800	Black	Yes	Yes	0.30	OTV1000EK
	OT1200	Black	Yes	Yes	0.30	OTV1000EK
Mounts on 12 mm shaft	OETL-NF1600-2000_SW	Metal	No	Yes	0.80	YASDA-34

Direct mount handle for fusible disconnects

For use on	Description	Marking	Color	Padlockable	Weight (lbs)	Catalog number
OS30	No shaft required	O/I/Test	Black	Yes	0.10	OHBS5
OS60 - OS200	No shaft required	O/I/Test	Black	Yes	0.30	OSV200BK
OS400	No shaft required	O/I/Test	Black	Yes	0.75	OSV400BK
OS600-OS800	No shaft required	O/I/Test	Black	Yes	2.43	OSV800DK
OS1200	No shaft required	O/I/Test	Black	Yes	3.30	OSV1250DK

Selector handles for door mounted switches

UL/NEMA Type	IEC Type	Color	Defeatable	Padlockable	Weight (lbs)	Catalog number
Snap-on mounting - for use on OT16FT3 - OT40FT3						
1	IP54	Black	No	No	0.10	OHBS1PH
1	IP54	Black	No	Yes	0.13	OHBS3PH
1, 3R, 12	IP65	Black	No	Yes	0.17	OHBS2PJ
Screw mounting - for use on OT16-100FT3. For OT30FT3, OT60FT3 and OT100FT3 use OH_2_ only						
1	IP54	Black	No	No	0.11	OHBS1RH
1	IP54	Black	No	Yes	0.14	OHBS3RH
1, 3R, 12	IP65	Black	No	Yes	0.18	OHBS2RJ

3 Position selector handles for double throw switches - for use with .24 x .24" (6mm) OXS6X_shafts

UL/NEMA Type	IEC Type	Markings	Color	Defeatable	Padlockable	Weight (Lbs.)	Catalog number
1, 3R, 12	IP65	I/0/II, ON/OFF/ON	Black	Yes	Yes	0.16	OHBS2AJE011

3 Position pistol handles for double throw switches

UL/NEMA Type	IEC Type	Markings	Color	Defeatable	Padlockable	Weight (Lbs.)	Catalog number 6 mm	Catalog number 12 mm
1, 3R, 12	IP65	I/0/II, ON/OFF/ON	Black	Yes	Yes	0.29/0.33	OHB65J6E011	OHB145J12E011
1, 3R, 12, 4, 4X	IP66		Black	Yes	Yes	0.29/ 0.33	OHB65L6E011	OHB145L12E011
1, 3R, 12	IP65		Black	Yes	Yes	0.30/0.37	OHB80J6E011	OHB175J12E011
1, 3R, 12, 4, 4X	IP66		Black	Yes	Yes	0.30/0.37	OHB80L6E011	OHB175L12E011
1, 3R, 12	IP65		Black	Yes	Yes	0.88		OHB200J12PE011
1, 3R, 12	IP65		Black	Yes	Yes	1.19		OHB274J12E011
1, 3R, 12, 4, 4X	IP66		Black	Yes	Yes	1.19		OHB274L12E011

Direct mount handle for double throw switches

For use on	Description	Marking	Color	Padlockable	Weight (lbs)	Catalog number
OT16...80F_C	No shaft required	— ③	Black	No	0.03	OHBS3
OT30, 60, 100F_C	No shaft required		Black	No	0.02	OHBS9
OT16...80F_C	No shaft required		Black	Yes	0.05	OHBS2
OT30, 60, 100F_C	No shaft required		Black	Yes	0.04	OHBS11
OT200U_C	No shaft required	O/I/Test	Black	Yes	0.10	OTV250ECK
OT400U_C	No shaft required	O/I/Test	Black	Yes	0.30	OTV400ECK
OT600U_C	No shaft required	O/I/Test	Black	Yes	0.75	OTV800ECK
OT800U_C	No shaft required	O/I/Test	Black	Yes	2.43	OTV1000ECK

① Red/Yellow handles are available by substituting the OHB prefix with OHY. All handles are plastic unless otherwise noted as metal or stainless steel.
② Suitable for 3 & 4 pole versions only. Not for use with 6 or 8 pole.
③ Markings are on the disconnect, not on the handles.

Standard handles & shafts

OXS6X__
for selector type handles

OXP6X
OXP12X_
for pistol type handles

Shafts for use with selector handles – .24 x .24" (6x6 mm)

Shaft length (in/mm)	Maximum Mounting Depth (inches) ①				Weight (lbs)	Catalog number
	OT16F3, OT25F3, OT40F3		OT63F3, OT80F3			
	OH_1_ & OH_3_	OH_2_	OH_1_ & OH_3_	OH_2_		
3.3/85	5.0	4.3	5.6	5.0	0.07	OXS6X85
4.1/105	5.8	5.1	6.4	5.8	0.07	OXS6X105
4.7/120	6.4	5.8	7.0	6.4	0.08	OXS6X120
5.1/130	6.7	6.1	7.4	6.8	0.08	OXS6X130
7.1/180	8.7	8.1	9.4	8.7	0.11	OXS6X180
9.8/250	11.5	10.8	12.1	11.5	0.13	OXS6X250
13/330	14.6	14.0	15.3	14.7	0.17	OXS6X330

Shafts for use with pistol handles – .24 x .24" (6x6 mm)

Shaft length (in/mm)	Maximum Mounting Depth (inches) ①								Weight (lbs)	Catalog number
	OT16F3 - OT40F3	OT63F3 - OT80F3	OT30F3/60F3/100F3	OT200	OS30	OS60G	OS100G	OS200		
5.2/130	5.9	6.4	6.7	6.5	–	–	–	–	0.08	OXP6X130
5.9/150	6.7	7.4	7.0	7.2	8.2	7.6	7.6	7.6	0.09	OXP6X150
8.3/210	9.1	9.7	9.8	9.6	10.6	10.0	10.0	10.0	0.13	OXP6X210
11.4/290	12.2	12.8	12.9	12.7	13.7	13.1	13.1	13.1	0.18	OXP6X290
14.2/360	14.9	13.8	15.6	-	16.5	15.9	15.9	–	0.23	OXP6X360
15.7/400	16.5	15.4	17.2	-	18.1	17.5	15.5	–	0.27	OXP6X400
16.9/430	17.6	18.3	18.3	-	19.3	18.6	18.6	–	0.27	OXP6X430

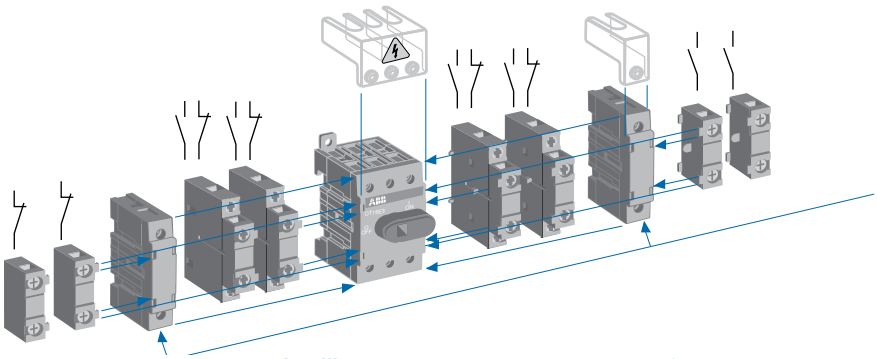
Shafts for use with pistol handles – .47 x .47" (12x12 mm)

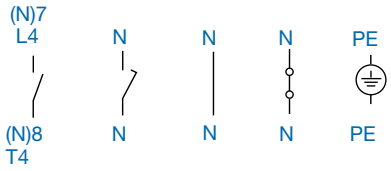
Shaft length (in/mm)	Maximum Mounting Depth (inches)						Weight (lbs)	Catalog number
	OT400	OT600	OT800 - OT1200	OETL-NF1600 - 2000_SW	OS400	OS600 - OS1200		
11.0/280	13.3	14.6	14.5	—	13.8	14.9	0.77	OXP12X280
12.8/325	15.0	16.4	16.3	20.9	15.6	16.7	0.90	OXP12X325
15.6/395	20.5	19.1	19.1	23.6	18.3	19.4	1.10	OXP12X395
18.3/465	21.9	21.8	21.9	26.3	21.0	22.1	1.32	OXP12X465
21.1/535	22.8	24.6	24.6	29.1	23.8	24.8	1.54	OXP12X535

19

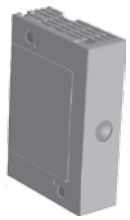
① Mounting depth is distance from the outside of the door to the disconnect switch mounting plate. Shaft can be adjusted or cut to desired length.

Auxiliary contacts



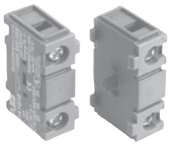


Auxiliary contacts — snap-on mounting ①


OEA28

Description	For Use On	Weight (lbs)	AC Thermal amp rating	AC rated voltage	Catalog number
Form C, 1 N.O. & 1 N.C.	OS30	0.04	6	400	OA4B1C
1 N.O.	OT16-100F_ (right side), OT200-1200 OS30-OS1200	0.07	10	600	OA1G10
1 N.C.	OT16-100F_ (left side)	0.07	10	600	OA1G01
	OT200-1200 OS30-OS1200	0.07	10	600	OA3G01
1 N.O. & 1 N.C.	OT16-100F3 (both sides)	0.07	10	600	OA2G11 ②
Module for auxiliary contacts	OS30	0.09	–	–	OSZ4
	OT200-1200 OS60G-OS1200	0.1	–	–	OEA28

Auxiliary contacts — front mounting


OA1G_

Description	For Use On	Weight (lbs)	AC Thermal amp rating	AC rated voltage	Catalog number
1 N.O. + 1 N.C.	OETL-NF1600SW	0.2	10	600	OZXK-1
2 N.O. + 2 N.C.		0.26	10	600	OZXK-2
4 N.O. + 4 N.C.		0.4	10	600	OZXK-3
2 N.O.	OETL-NF2000SW	0.18	10	600	OZXK-4
4 N.O.		0.25	10	600	OZXK-5
8 N.O.		0.4	10	600	OZXK-6

Auxiliary contacts — snap-on mounting for double throw

OA2G11

Description	For Use On	Weight (lbs)	AC Thermal amp rating	AC rated voltage	Catalog number
1 N.C.	OT16-100F_C (left side)	0.7	10	600	OA1G01
1 N.O.	OT16-100F_C (left side)	0.7	10	600	OA7G10
1 N.O. & 1 N.C.	OT16-100F3C (both sides)	0.7	10	600	OA2G11 ②
1 N.C.	OT16-100F_C (right side)	0.7	10	600	OA8G01
1 N.O.	OT16-100_C (right side), OT200-800_C	0.7	10	600	OA1G10
1 N.C.	OT200-800_C	0.7	10	600	OA3G01

Mounting & installation considerations


OZXK-_

Non-Fusible	
OT16-100F_	OA1G10 (1 N.O.) mounts on right side of switch only, 2 pcs max. OA1G01 (1 N.C.) mounts on left side of the disconnect only, 2 pcs max. OA2G11 (1 N.O. & 1 N.C.) mounts on left or right side of the disconnect, 2 pcs max. Not mountable on the side of 4th poles.
OT200-1200	Mounting to the left side of the disconnect with OEA28 module: max. 8 aux. contacts At least 4 auxiliary contact blocks mounting under the mechanisms.
Fusible	
OS30	Form C contacts mount directly to switch, 2 pcs max. OA1G10 (1 N.O.) + OA3G01 (1 N.C.) require module OSZ4 (mounts on the left side) Max. 6 OA1G10 + OA3G01 contacts with module OSZ4 (mounts on the left side)
OS60G-1200	Mounting to the left side of the disconnect with OEA28 module: max. 8 aux. contacts At least 4 auxiliary contact blocks mounting under the mechanisms.

① UL file #E8351
② Not mountable on the side of 4th poles.

Terminal lugs

Terminal lugs ①


OZXA-24


OZXA-200

For Use On	Wire Size	Wire Type	Lugs/Kit	Weight (lbs)	Catalog number
OS100G	#14-2/0	Cu/Al	6	0.50	OZXA-24
OT200, OS200	#4 - 300 kcmil #4 - 300 kcmil (6) 14-6 AWG	Cu/Al	6 3 3	0.50 0.25 0.25	OZXA-200 OZXA-200/3 OZXA-206T ②
OT400, OS400	#2 - 600 kcmil #2 - 600 kcmil (2) #4 - 300 kcmil (6) #14 - 6 AWG	Cu/Al	6 3 6 3	0.50 0.25 0.50 0.50	OZXA-400 OZXA-400/3 OZXA-402 OZXA-406
OT600, OS600, OS800	(2) #2 - 600 kcmil	Cu/Al	6 3	0.50 0.50	OZXA-800 OZXA-800/3
OT800, OT1200, OS1200	(4) #2 - 600 kcmil	Cu/Al	6 3	6.90 3.45	OZXA-1200 OZXA-1200/3
OETL-NF1600_SW	(4) #2 - 600 kcmil (4) #2 - 600 kcmil (8) 2/0 + (2) #2 - 600 kcmil ③	Cu/Al	6 3 3	10.44 5.22 10.44	OZXA-28 OZXA-28/3 OZXA-32
OETL-NF2000_SW	(8) #2 - 600 kcmil	Cu/Al	12	20.88	OZXA-28/2

Terminal lug kits for double throw switches


OZXA-400


OZXA-32

For Use On	Wire Size	Wire Type	Lugs/Kit	Weight (lbs)	Catalog number
OT200_C	#4 - 300kcmil	Cu/Al	9 12	0.5 0.25	OZXA-200/9 OZXA-200/12
OT400_C	#2 - 600kcmil	Cu/Al	9 12	0.5 0.25	OZXA-400/9 OZXA-400/12
OT600_C	(2) #2 - 600kcmil	Cu/Al	9 12	0.5 0.5	OZXA-800/9 OZXA-800/12
OT800_C	(4) #2 - 600 kcmil	Cu/Al	9 12	0.5 0.5	OZXA-1200/9 OZXA-1200/12

Additional Terminal lug kits for flange operated switches

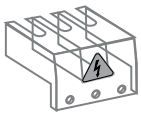

OZXA-27


OZXA-30

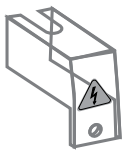
For Use On	Wire Size	Wire Type	Lugs/Kit	Weight (lbs)	Catalog number
OETL-NF400-FC , OES400	#2 - 600 kcmil	Cu/Al	6	3.10	OZXA-26
OETL-NF600-FC , OES600 - OES800	(2) #2 - 600 kcmil	Cu/Al	6	4.39	OZXA-27
OETL-NF800-FC	(2) #2 - 600 kcmil	Cu/Al	6	8.71	OZXA-30
OETL-NF1200-FC	(4) #2-600 kcmil	Cu/Al	6	10.44	OZXA-28

① Lugs are integral to the disconnects OT16-100F_, OS30FA_ and OS60G_. No separate lug kit accessory is required.
② OZXA-206T is a kit that contains: lug OZXA-175 and terminal shroud OTS250G1L/3, both for 3 poles. For top and bottom, order two OZXA-206T kits
③ A load side distribution lug eliminates the need to purchase, install and wire a separate distribution block.

Terminal shrouds

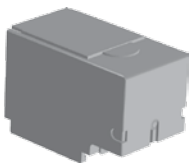


OTS40T3
OTS80T3
OTS125T3



OTS40T1
OTS80T1
OTS125T1

OTS_G1L/_
OSS_G1L/_



OTS_G1S/_
OSS_G1S/_

OTS_03
OSS_03

Terminal shrouds for non-fusible

Description	For Use On	Disconnect	Double-throw	Weight	Catalog number
		For full protection, order			
3 pole shroud, 1 pc	OT16-OT40 ① OT63-OT80 ① OT30-OT100 ①	2 kits	4 kits	0.02 0.02 0.02	OTS40T3 OTS63T3 OTS125T3
For 4th poles, Single pole shroud, 1pc	OTP_40F_ ① OTP_80F_ ① OTP_125F_ ①	2 kits	4 kits	0.03 0.03 0.03	OTS40T1 OTS63T1 OTS125T1
Single pole long shroud, 3 pcs	OT200, 3 poles	2 kits	2 kits	0.12	OTS250G1L/3
Single pole short shroud, 3 pcs				0.13	OTS250G1S/3
Single pole long shroud, 4 pcs	OT200, 4 poles			0.26	OTS250G1L/4
Single pole short shroud, 4 pcs				3.18	OTS250G1S/4
3 pole shroud, 1 pc ②	OT400 OT600	2 kits	-	0.33 0.33	OTS403 OTS603
3 pole shroud, 1 pc ②	OT800 OT1200	2 kits 2 kits	-	0.88 1.2	OTS803 OTS1203

Terminal shrouds for fusible

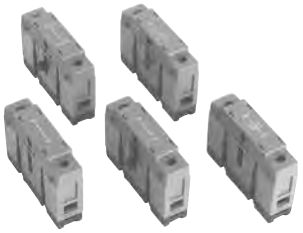
Description	For Use On	For full protection order	Weight (lbs)	Catalog number
Single pole long shroud, 3 pcs Single pole short shroud, 3 pcs	OS100G, 3 poles	2 kits	0.04 0.04	OSS160GG1L/3 OSS160GG1S/3
Single pole long shroud, 3 pcs Single pole short shroud, 3 pcs	OS200, 3 poles	2 kits	0.20 0.13	OSS200G1L/3 OSS200G1S/3
Single pole long shroud, 4 pcs Single pole short shroud, 4 pcs	OS200, 4 poles		0.26 0.18	OSS200G1L/4 OSS200G1S/4
3 pole shroud,1 pc ②	OS400, 3 poles	2 kits	0.13	OSS403
	OS600, 3 poles		0.11	OSS603
3 pole shroud,1 pc ②	OS800, 3 poles	2 kits	0.11	OSS803
Single pole long shroud, 3 pcs Single pole short shroud, 3 pcs	OS1200, 3 poles	2 kits	2.12 0.88	OSS1250G1L/3 OSS1250G1S/3
Single pole long shroud, 4 pcs Single pole short shroud, 4 pcs	OS1200, 4 poles		2.20 1.15	OSS1250G1L/4 OSS1250G1S/4

① OT16 - OT100 disconnects are IP20 touchsafe as standard. Terminal shrouds provide an extra degree of protection.
② For 4 pole shrouds, please consult ABB.

Additional poles

Additional poles for non-fusible ①

Power poles - Only one power pole per switch: mounts on left or right side of switch.



OTP_40FP

Description	For use on	Weight	AC Thermal amp rating	AC rated voltage	Catalog number ②
(N)7 L4 / (N)8 T4 Fourth Pole	OT16-40F3, left side	0.07	40	600	OTPS40FPN1
	OT16-40F3, right size	0.07	40		OTPS40FPN2
	OT63-80F3	0.13	80		OTPS80FP
	OT30-60F3 (UL98)	0.31	60		OTPS60FP
	OT100F3 (UL98)	0.31	100		OTPS125FP
N / N Late-break/ early-make	OT16-40F3	0.07	40	600	OTPL40FP
	OT63-80F3	0.13	80		OTPL80FP
	OT30-60F3 (UL98)	0.31	60		OTPL60FP
	OT100F3 (UL98)	0.31	100		OTPL125FP

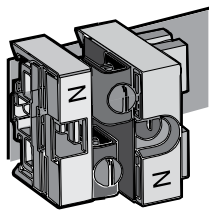
Terminal poles - Switch accepts one terminal pole per side: mounts on left or right side of switch

OTP_80FP

OTP_125FP

Description	For use on	Weight	AC Thermal amp rating	AC rated voltage	Catalog number ②
N / N Solid neutral	OT16-40F3	0.07	40	600	OTPN40FP
	OT63-80F3	0.13	80		OTPN80FP
	OT30-60F3 (UL98)	0.31	60		OTPN60FP
	OT100F3 (UL98)	0.31	100		OTPN125FP
N / N Detachable Neutral	OT16-OT40F3	0.07	40	600	OTPD40FP
	OT63-OT80F3	0.13	80		OTPD80FP
	OT30-60F3 (UL98)	0.31	60		OTPD60FP
	OT100F3 (UL98)	0.31	60		OTPD125FP
PE / PE Ground Terminal	OT16-OT40F3	0.07	40	600	OTPE40FP
	OT63-OT80F3	0.13	80		OTPE80FP
	OT30-60F3 (UL98)	0.31	60		OTPE60FP
	OT100F3 (UL98)	0.31	100		OTPE125FP

Additional poles for fusible switches



OESA-ZX171

OSZ_

Description	For use on	Weight (lbs)	AC Thermal amp rating	AC rated voltage	Catalog number
Detachable neutral	OS30 ③	0.45	30	600	OESA-ZX171
	OS60G ④	0.13	63	600	OSZ1
	OS100G ④	0.31	125	600	OSZ2

① Disconnect accept only one power pole or one terminal pole per side
For double throw disconnect OT_F3C: always order two poles, one for each side of the disconnect
Power pole for OT16-OT40F3C, order 1 piece of OTPS40FPN1 and 1 piece of OTPS40FPN2

② For door mounted non-fusible disconnects OT_FT3, replace _FP_ by _FD_ in the catalogue number

③ Mounted on the side of the disconnect, on the base plate or on a DIN rail

④ Mounted on the base plate or DIN rail

Fuse monitors, carriers and mounting adapters

Fuse monitors

OFM_

For Use With	Rated Voltage	Weight (lbs)	Catalog number
OS30-1200	100-240 380-600	0.31 0.31	OFM240 OFM600

Suitable for 1 or 3 phase circuits. Includes 1 N.O. and 1 N.C. auxiliary contacts and red & green LED lights for indication.

Crimp terminals for fuse monitor wires

For Use With	Crimp Terminal size (mm)	Includes	Catalog number
OS30-200	2.8-0.8	6 terminals	OFMZX2
OS400-1200	6.3-0.8		OFMZX4

Fuse carriers

Fuse carriers
OESAZD_

Description	For Use on	Catalog number
CC fuse carrier (Qty. 1) J fuse carrier (Qty. 1) Solid link carrier (Qty. 1)	OS30FACC_ OS30FAJ_ OS30_	OESAZD48 OESAZD28 OESAZD55

Shorting bars for fusible switches

Description	For Use On	AC thermal amp rating	AC rated voltage	Catalog number
Dummy Fuse	OS60	60	600	OESAZD54
Solid links: metal strap	OS100 OS200	100 400	600 600	OESA-ZS36 OESA-ZK98

DIN rail mounting kit

For Use With	Weight (lbs)	Catalog number
OS60-100G_	0.44	OSGZD1

Miscellaneous accessories
Replacement parts

Miscellaneous accessories

Shaft accessories

OETL-ZK19

Accessory Type	Description	For Use On	Weight	Catalog number
Shaft Adapter	Adapts one end of a 6mm shaft to 12mm (use with shaft extension coupler)	6mm shafts	0.20	OETL-ZK19
Shaft Extension Coupler	Joins two shafts together for applications where extended length is required	6mm shafts 12mm shafts	0.26 0.26	OESA-ZX167 OETL-ZX95
Shaft Guide	Fits all pistol grip handles, mounts on the inside of the enclosure door with provided hardware	pistol handles	-	OHZX10

Busbar connections


OESAZX-167
OETL-ZX95

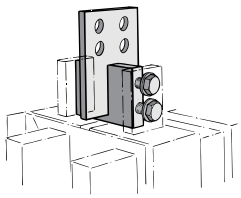
Accessory Type	Description	For Use On	Weight	Catalog number
Busbar Connections	Vertical, back or edgewise mounting ①	OETL-NF1600 -2000_SW	46.2 31.0	OETL-ZX115 OETL-ZX114

Locking accessories

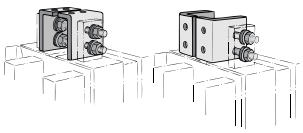

OHZX10

Accessory Type	Description	For Use On	Weight	Catalog number
Electrical Interlock	Closed circuit principle for interlocking the switch movement. When the coil circuit is dead, A-types cannot be operated to O-position and L-types cannot be operated to ON- or OFF-position. Coil voltages 110VAC, 220 VAC, 24VDC, 48VDC, 60VDC, 110VDC, 220VDC, P - 15W U = 0.7 - 1.1 Un (U = coil voltage, Un = nominal voltage)	OETL-NF1600 -2000_SW	2.42	OETL-ZT80AΔ OETL-ZT80LΔ

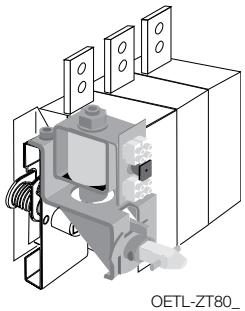
Δ = Coil Voltage


OETL-ZX115

Replacement parts


OETLZX114

Accessory Type	Description	For Use On	Catalog number
Metal collar	Replaces original black knob for locking shaft in place	OT16F-200, OS30-200	OTZS2
Set screw	Set screw for use with knob or collar	OT16F-200 OS30-200	FLSWM5X8AX
Shaft set screw	Shaft set screw, bag of 10	OT400-1200, OS400-1200	OZX1
Terminal cover	Covers terminal below fuse carrier	OS30	CXBY67121
Phase barrier	–	OS200	CXBY68794
Fuse covers	–	OS60GJ_ OS100GJ_	CXBY69058 CXBY69072

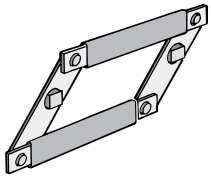

OETL-ZT80_


OTZS2


FLSWM5X8AX

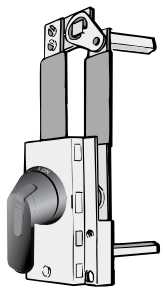
① Vertical busbar is provided as standard on OETL-NF1600 and OETL-NF2000 disconnects.

Conversion, transfer & bypass mechanisms
Mechanical interlocks

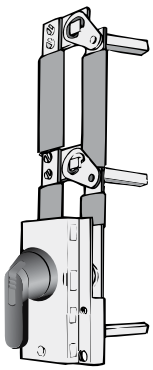


OTZW8

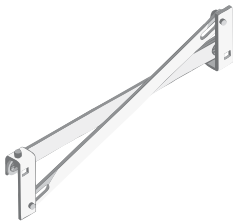
OESAZ-ZW2
OETL-ZW9



OTZW25



OTZW17



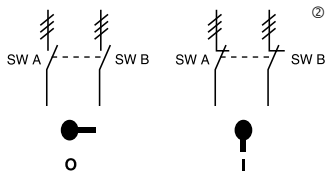
OETL-ZW24

Conversion mechanisms

Mechanism Type	For use on	Weight	UL/Nema Type	Catalog number
6 or 8 pole mechanisms	OS30, 6 poles	1.52	-	OWP6DS1
	OS30, 8 poles	1.52	-	OWP6DS2
	OT16-100F_	0.33	-	OTZW8
	OT200, OS30-200	1.52	1, 3R, 12	OESA-ZW2
	OT400-600, OS400	2.42	-	OETL-ZW9
Double throw mechanisms	OT16-100F_	2.20	1, 3R, 12 1, 3R, 12, 4, 4X	OESA-ZW1 OESA-ZW1X
	OT200, OS30-200	2.20	1, 3R, 12 1, 3R, 12, 4, 4X	OTZW25 OTZW25X
	OT400-600, OS400	10.10	1, 3R, 12, 4, 4X	OETL-ZW12
Bypass mechanisms	OT16-100F_	1.54	1, 3R, 12 1, 3R, 12, 4, 4X	OTZW17 OTZW17X
	OT200, OS30-200	7.28	1, 3R, 12	OTZW26
	OT400-600, OS400	8.81	1, 3R, 12, 4, 4X	OETL-ZW33
Mechanical interlock mechanisms	OT16-100F_	0.33	-	OTZW24
	OS30-200	0.55	-	OTZW10
	OT400-600, OS400-800	1.26	-	OETL-ZW3
	OETL-NF1600-2000_SW	2.64	-	OETL-ZW15

6 or 8 pole

6 (8) pole mechanism allows two switches controlled by one handle to open or close simultaneously.
Equipment required for a complete installation:
- One conversion mechanism
- Two disconnect switches (see page 19.11)
- One handle① (see page 19.30)
- Two shafts (see page 19.32)

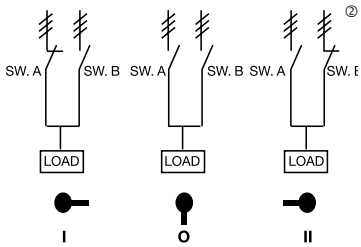


	POS. O	POS. I
SW. A	O	X
SW. B	O	X

X = Closed
O = Open

Transfer

Transfer mechanism manually transfers between two power sources using two switches and a center OFF position.
A 3-position handle is included.
Shafts included. Equipment required for a complete installation:
- One conversion mechanism
- Two disconnect switches (see page 19.11.)

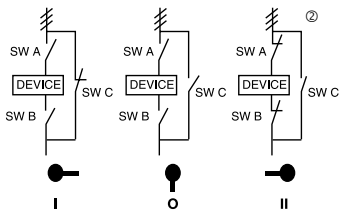


	POS. I	POS. O	POS. II
SW. A	X	O	O
SW. B	O	O	X

X = Closed
O = Open

Bypass

Bypass mechanism operates three switches: Two switches in series and one changeover switch to allow power bypass.
A 3-position handle is included.
Shafts included.Equipment required for a complete installation:
- One conversion mechanism
- Three disconnect switches (see page 19.11.)

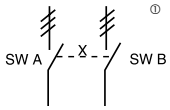


	POS. I	POS. O	POS. II
SW. A	O	O	X
SW. B	O	O	X
SW. C	X	O	O

X = Closed
O = Open

Mechanical interlock

Mechanical interlock mechanism prevents both switches from being in the ON position at the same time.
Equipment required for a complete installation:
- One conversion mechanism
- Two disconnect switches (see page 19.11)
- Two handles (see page 19.30)
- Two shafts (see page 19.32)



	SW. A POS. I	SW. B POS. I
SW. A	X	O
SW. B	O	X

X = Closed
O = Open

① OT16E3 – OT32E3 can use a selector or pistol handle. All other sizes must use a pistol handle.
② = Three poles

Notes

Enclosed Disconnect switches

eOT, NF, FC, FJ and FL products meet customer requirements in terms of safety, ease of installation, space savings and operational convenience. They are available in a wide range of amperage ratings:
- eOT from 16 to 100 A, UL98
- NF, FC, FJ and FL from 16 to 2000 A built to UL98 requirements
- NF 3150 A IEC rated

Non-fusible

Snap on accessories include additional poles, auxiliary contacts, etc.

Enclosures available in plastic, metal, or stainless steel in NEMA 1, 3R, 12, 4X, 7 & 9 environmental categories

Modern appearance

Quick make, quick brake mechanism

Heavy duty disconnect, 600VAC

Extremely compact size

Finger-proof construction. No hazardous exposed parts

3/4/6/8 pole constructions; transfer switches and by-by-pass switches available

Fusible

Snap on accessories include fuse monitors, auxiliary contacts, etc.

Enclosures available in plastic, metal, or stainless steel in NEMA 1, 3R, 12, 4X, 7 & 9 environmental categories

Modern appearance

Quick make, quick brake mechanism

Heavy duty disconnect, 600VAC, 200kA, I_{SC}

Extreme compact size as fuse carriers are decked above contacts

Double contacts enabling feed from any direction and preventing back feed

Finger-proof construction. No hazardous exposed parts

3/4/6/8 pole constructions; transfer switches and by-pass switches available

Lockable

Clear position indications:
- I-ON
- O-OFF

Door interlocked when handle padlocked to OFF position

Handle padlockable with up to three padlocks

Door interlocked when handle is in ON position. Door interlock can be defeated by authorized personnel.

Pilot devices can be added

General information
Non-fusible, 16 - 3150 A
Fusible, 30 - 800 A

NF range ratings, 16 – 3150 A, 600 V

UL General purpose amp rating	Maximum horsepower rating							Wire size for terminal lugs	For wire type	Built according to (*)
	Single phase			Three phase						
	120V	200V	240V	200V – 208V	240V	480V	600V			
16	1	2	2	3	5	10	10	#18 – 8	Cu	UL508
25	1.5	3	3	7.5	7.5	15	20	#18 – 8	Cu	UL508
40	2	5	5	10	10	20	25	#18 – 8	Cu	UL508
60	2	5	5	15	15	30	30	#14 – 1	Cu	UL508
80	2	5	5	20	20	40	40	#14 – 1	Cu	UL508
30	2	5	5	10	10	20	30	#14 – 4	Cu	UL98
60	3	7.5	7.5	20	20	40	40	#14 – 4	Cu	UL98
100	5	15	15	25	30	50	50	#8 – 1/0	Cu	UL98
200	—	—	—	60	75	150	200	#6 – 300 kcmil	Cu	UL98
400	—	—	—	100	125	250	350	#2 – 600 kcmil	Cu	UL98
600	—	—	—	150	200	400	500	(2) #2 – 600 kcmil	Cu	UL98
800	—	—	—	200	250	500	600	(2) #2 – 600 kcmil	Cu/Al	UL98
1200	—	—	—	—	—	—	—	(4) #2 – 600 kcmil	Cu/Al	UL98
1600	—	—	—	—	—	—	—	(4) #2 – 600 kcmil	Cu/Al	UL98
2000	—	—	—	—	—	—	—	(8) #2 – 600 kcmil	Cu/Al	UL98
3150	—	—	—	—	—	—	—	(8) #2 – 600 kcmil	Cu/Al	IEC

(*) Assemblies are not UL listed, but built to meet UL requirements

Handle ratings

Catalog number suffix	Style type	NEMA	Color	Marking	Defeatable	Padlockable	Catalog number
S	Selector	1,3R,12	Black	O/I & OFF/ON	Yes	Yes	OHBS2AJ ①
S1	Selector	1,3R,12	Red/Yel	O/I & OFF/ON	Yes	Yes	OHYS2AJ ①
P	Pistol	1,3R,12	Black	O/I & OFF/ON	Yes	Yes	OHB65J6 ①
P	Pistol	1,3R,4,4X,12	Black	O/I & OFF/ON	Yes	Yes	OHB65L6 ①
P1	Pistol	1,3R,12	Red/Yel	O/I & OFF/ON	Yes	Yes	OHY65J6 ①
P1	Pistol	1,3R,4,4X,12	Red/Yel	O/I & OFF/ON	Yes	Yes	OHY65L6 ①
BJ	Selector	1,3R,12	Black	O/I & OFF/ON	Yes	Yes	OHBS2AJ
YJ	Selector	1,3R,12	Red/Yel	O/I & OFF/ON	Yes	Yes	OHYS2AJ
B4	Pistol	1,3R,12	Black	O/I & OFF/ON	Yes	Yes	OHB145J12
B4	Pistol	1,3R,12	Black	I/O/II	Yes	Yes	OHB145J12E011 ②
B4	Pistol	1,3R,4,4X,12	Black	I/O/II	Yes	Yes	OHB145L12E011 ②
Y4	Pistol	1,3R,12	Red/Yel	O/I & OFF/ON	Yes	Yes	OHY145J12
B6	Pistol	1,3R,4,4X,12	Black	O/I & OFF/ON	Yes	Yes	OHB65L6
Y6	Pistol	1,3R,4,4X,12	Red/Yel	O/I & OFF/ON	Yes	Yes	OHY65L6
B7	Pistol	1,3R,4,4X,12	Black	O/I & OFF/ON	Yes	Yes	OHB175J12
B7	Pistol	1,3R,12	Black	I/O/II	Yes	Yes	OHB175J12E011 ②
B7	Pistol	1,3R,4,4X,12	Black	I/O/II	Yes	Yes	OHB175L12E011 ②
Y7	Pistol	1,3R,4,4X,12	Red/Yel	O/I & OFF/ON	Yes	Yes	OHY175L12
B8	Pistol	1,3R,4,4X,12	Black	O/I & OFF/ON	Yes	Yes	OHB80L6
B8	Pistol	1,3R,12	Black	I/O/II	Yes	Yes	OHB80J6E011 ②
B8	Pistol	1,3R,4,4X,12	Black	I/O/II	Yes	Yes	OHB80L6E011 ②
Y8	Pistol	1,3R,4,4X,12	Red/Yel	O/I & OFF/ON	Yes	Yes	OHY80L6
6	Pistol	1,3R,4,4X,12	Black	I/O/II	No	Yes	OHB174L12E011 ②
8	Pistol	1,3R,4,4X,12	Metal	O/I & OFF/ON	No	Yes	YASDA-8
21	Pistol	1,3R,4,4X,12	Metal	I/O/II	No	Yes	YASDA-21
21	Pistol	1,3R,4,4X,12	Black	I/O/II	No	Yes	OHB274L12E011 ②

① Handles are for the eOT range

② Handles are for double throw switches

FC, FJ an FL range ratings

UL general purpose amp rating	Maximum horsepower rating								Wire size for terminal lugs	For wire type	Built according to (*)
	Single phase			Three phase							
	120V	200V	240V	200V	208V	240V	480V	600V			
30	2	3	5	5	7.5	7.5	15	20	#18 – 8	Cu	CSA, UL
60	3	7.5	10	15	15	15	30	50	#14 – 4	Cu	CSA, UL
100	5	10	15	25	25	30	60	75	#14 – 2/0	Cu/Al	CSA, UL
200	—	—	—	50	50	60	125	150	#6 – 300 kcmil	Cu/Al	CSA, UL
400	—	—	—	100	125	125	250	350	#2 – 600 kcmil	Cu/Al	CSA, UL
600	—	—	—	150	150	200	400	500	(2) #2 – 600 kcmil	Cu/Al	CSA, UL
800	—	—	—	200	200	250	500	600	(2) #2 – 600 kcmil	Cu/Al	CSA, UL

(*) Assemblies are not UL listed, but built to meet UL requirements

Enclosed non-fusible, 3 poles, 16 to 100 A ①

EOT 16 U 3 M 1 - 1 P

Size and Amps
16 = 16 A
30 = 30 A
32 = 40 A
45 = 60 A
60 = 60 A
63 = 80 A
100 = 100 A

Poles
3

Enclosure
P = Plastic
S = Stainless steel
M = Sheet steel

Enclosure type
1 = Type 1
3 = Type 3R/12
4 = Type 4/4X

Auxiliary contact
[Blank] = None
0 = 1 N.C.
1 = 1 N.O.

Handle
P = Pistol Black
P1 = Pistol Red/Yellow
S = Selector Black
S1 = Selector Red/Yellow
M = Stainless Steel Handle

Enclosed non-fusible 200 to 3150 A, fusible from 30 to 800 A and specialty configuration ①

NF 200 1 - 6 P B6 C

Style
NF - Non-fused (200-3150 A)
FJ - Fused "J" type fuses (30-800 A)
FC -Fused "CC" type fuses (30 A)

Amps
200
400
600
800
1200
1600
2000
3150

Type
1 = Type 1
3 = Type 3R/12
4 = Type 4
7 = Type 7 and/or 9
X = Type 4X Stainless Steel
P = Type 4X Plastic

Poles
3
6

Configuration
P = Standard
T = Double Throw

Handle
Refer to previous page, Handle ratings table

Revision

19

Custom versions or other versions of enclosed products are available upon request. Please, consult ABB.

① Part designation keys are provided for reference only. Not all variations or configurations are available.

3 pole
Non-fusible, 16 – 3150 A

NF32X-3PB6C

EOT16U3P3-S

EOT63U3M1-P

16-80 A, 600 VAC, 3 poles, UL508
Selector handle

UL general purpose amp rating	Standard	UL/NEMA Enclosure Type			
		1	3R/12	4/4X	3R/12 Plastic
		Catalog number	Catalog number	Catalog number	Catalog number
16	UL508	EOT16U3M1-S	EOT16U3M3-S	Not available with selector handles	EOT16U3P3-S
40	UL508	EOT32U3M1-S	EOT32U3M3-S		EOT32U3P3-S
60	UL508	EOT45U3M1-S	EOT45U3M3-S		EOT45U3P3-S
80	UL508	EOT63U3M1-S	EOT63U3M3-S		EOT63U3P3-P

16-100 A, 600 VAC, 3 poles, UL508 and UL98
Pistol handle

UL general purpose amp rating	Standard	UL/NEMA Enclosure Type					
		1	3R/12	4	4X Stainless	4X Plastic ①	7 & 9 ①
		Catalog number	Catalog number	Catalog number	Catalog number	Catalog number	Catalog number
16	UL508	EOT16U3M1-P	EOT16U3M3-P	-	EOT16U3S4-P	EOT16U3P4-P	NF167-3P
40	UL508	EOT32U3M1-P	EOT32U3M3-P	-	EOT32U3S4-P	EOT32U3P4-P	NF327-3P
60	UL508	EOT45U3M1-P	EOT45U3M3-P	-	EOT45U3S4-P	EOT45U3P4-P	NF457-3P
80	UL98	EOT63U3M1-P	EOT63U3M3-P	-	EOT63U3S4-P	EOT63U3P4-P	NF637-3P
30	UL98	EOT30U3M1-P	EOT30U3M3-P	-	EOT30U3S4-P	NF30P-3PB~~6C~~	NF307-3P
60	UL98	EOT60U3M1-P	EOT60U3M3-P	-	EOT60U3S4-P	NF60P-3PB6C	NF607-3P
100	UL98	EOT100U3M1-P	EOT100U3M3-P	-	EOT100U3S4-P	NF100P-3PB6B	NF1007-3P

200–3150A, 600 VAC, 3 poles, built according to UL standards ①
Pistol handle

UL general purpose amp rating	UL/NEMA Enclosure Type					
	1	3R/12	4	4X Stainless	4X Plastic	7 & 9
	Catalog number	Catalog number	Catalog number	Catalog number	Catalog number	Catalog number
200	NF2001-3PB8B	NF2003-3PB8B	NF2004-3PB8B	NF200X-3PB8B	NF200P-3PB8B	—
400	NF4001-3PB4B	NF4003-3PB4B	NF4004-3PB4B	NF400X-3PB4B	NF400P-3PB4B	—
600	NF6001-3PB7B	NF6003-3PB7B	NF6004-3PB7B	NF600X-3PB7B	NF600P-3PB7B	—
800	NF8001-3PB4A	NF8003-3PB4A	NF8004-3PB4A	NF800X-3PB4A	NF800P-3PB4A	—
1200	NF12001-3PB4A	NF12003-3PB4A	NF12004-3PB4A	NF1200X-3PB4A	NF1200P-3PB4A	—
1600	NF16001-3P8A	NF16003-3P8A	NF16004-3P8A	NF1600X-3P8A	—	—
2000	NF20001-3P8A	NF20003-3P8A	NF20004-3P8A	NF2000X-3P8A	—	—
3150 ②	NF31501-3P8A	NF31503-3P8A	NF31504-3P8A	NF3150X-3P8A	—	—

NOTE: All enclosed switches are provided with a black handle; however, most handles can be substituted with a red and yellow handle if desired.

EXAMPLE: A red/yellow selector handle for an EOT16U3M1-S can be substituted for the black selector handle by using the "S1" suffix instead of the "S" sufix, new catalog #EOT16U3M1-S1.

① NF_ disconnects are not UL listed, but built to meet UL requirements

② IEC rated only

6 pole
Non-fusible, 16 – 1200 A

16-1200 A, 600 VAC, 6 poles ①
Pistol handle

UL general purpose amp rating	UL/NEMA Enclosure Type					
	1	3R/12	4	4X Stainless	4X Plastic	7
	Catalog number	Catalog number	Catalog number	Catalog number	Catalog number	Catalog number
16	NF161-6PB6C	NF163-6PB6C	NF164-6PB6A	NF16X-6PB6C	NF16P-6PB6A	NF167-6P
25	NF251-6PB6C	NF253-6PB6C	NF254-6PB6A	NF25X-6PB6C	NF25P-6PB6A	NF257-6P
40	NF321-6PB6C	NF323-6PB6C	NF324-6PB6A	NF32X-6PB6C	NF32P-6PB6A	NF327-6P
60	NF451-6PB6B	NF453-6PB6B	NF454-6PB6B	NF45X-6PB6B	NF45P-6PB6B	NF457-6P
80	NF631-6PB6A	NF633-6PB6A	NF634-6PB6A	NF63X-6PB6A	NF63P-6PB6A	NF637-6P
30	NF301-6PB6B	NF303-6PB6B	NF304-6PB6B	NF30X-6PB6B	NF30P-6PB6B	–
60	NF601-6PB6C	NF603-6PB6B	NF604-6PB6B	NF60X-6PB6B	NF60P-6PB6B	–
100	NF1001-6PB6B	NF1003-6PB6B	NF1004-6PB6B	NF100X-6PB6B	NF100P-6PB6B	–
200	NF2001-6PB4B	NF2003-6PB4B	NF2004-6PB4B	NF200X-6PB4B	NF200P-6PB4B	–
400	NF4001-6PB8B	NF4003-6PB8B	NF4004-6PB8B	NF400X-6P8B	NF400P-6P8B	–
600	NF6001-6PB8B	NF6003-6PB8B	NF6004-6PB8B	NF600X-6P8B	NF600P-6P8B	–
800	NF8001-6PB8A	NF8003-6PB4A	NF8004-6PB4A	NF800X-6P8A	NF800P-6P8A	–
1200	NF12001-6P8A	NF12003-6PB4A	NF12004-6P8A	NF1200X-6P8A	NF1200P-6P8A	–

16-1200 A, 600 VAC, 3 poles, double throw ①
Pistol handle

UL general purpose amp rating	UL/NEMA Enclosure Type				
	1	3R/12	4	4X Stainless	4X Plastic
	Catalog number	Catalog number	Catalog number	Catalog number	Catalog number
16	NF161-3TB8C	NF163-3TB8C	NF164-3TB8C	NF16X-3TB8C	NF16P-3TB8A
25	NF251-3TB8C	NF253-3TB8C	NF254-3TB8C	NF25X-3TB8C	NF25P-3TB8A
40	NF321-3TB8C	NF323-3TB8C	NF324-3TB8C	NF32X-3TB8C	NF32P-3TB8A
60	NF451-3TB8B	NF453-3TB8B	NF454-3TB8B	NF45X-3TB8B	NF45P-3TB8B
80	NF631-3TB8A	NF633-3TB8A	NF634-3TB8A	NF63X-3TB8A	NF63P-3TB8A
30	NF301-3TB8B	NF303-3TB8B	NF304-3TB8B	NF30X-3TB8B	NF30P-3TB8B
60	NF601-3TB8B	NF603-3TB8B	NF604-3TB8B	NF60X-3TB8B	NF60P-3TB8B
100	NF1001-3TB8B	NF1003-3TB8B	NF1004-3TB8B	NF100X-3TB8B	NF100P-3TB8B
200	NF2001-3TB4B	NF2003-3TB4B	NF2004-3TB4B	NF200X-3TB4B	NF200P-3TB4B
400	NF4001-3TB4B	NF4003-3TB4B	NF4004-3TB4B	NF400X-3TB4B	NF400P-3TB4B
600	NF6001-3TB4A	NF6003-3TB4B	NF6004-3TB4A	NF600X-3TB4A	NF600P-3TB4A
800	NF8001-3TB4A	NF8003-3TB4A	NF8004-3TB4A	NF800X-3TB4A	NF800P-3TB4A
1200	NF12001-3TB4A	NF12003-3TB4A	NF12004-3TB4A	NF1200X-3TB4A	NF1200P-3TB4A

① NF_ disconnects are not UL listed, but built to meet UL requirements

3 Pole
Fusible, 30 – 800 A

FJ30X-3PB6B

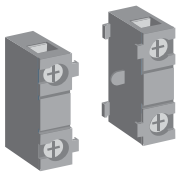
3 pole, 600V, 30-800A ①

Pistol handle

UL general purpose amp rating	Fuse Type	UL/NEMA Enclosure Type				
		1	3R/12	4	4X Stainless	4X Plastic
		Catalog number	Catalog number	Catalog number	Catalog number	Catalog number
30	J	FJ301-3PB6B	FJ303-3PB6B	FJ304-3PB6B	FJ30X-3PB6B	FJ30P-3PB6B
30	CC	FC301-3PB6B	FC303-3PB6B	FC304-3PB6B	FC30X-3PB6B	FC30P-3PB6B
60	J	FJ601-3PB6B	FJ603-3PB6B	FJ604-3PB8B	FJ60X-3PB8B	FJ60P-3PB8B
100	J	FJ1001-3PB8B	FJ1003-3PB8B	FJ1004-3PB8B	FJ100X-3PB8B	FJ100P-3PB8B
200	J	FJ2001-3PB8C	FJ2003-3PB8C	FJ2004-3PB8C	FJ200X-3PB8C	FJ200P-3PB8C
400	J	FJ4001-3PB4C	FJ4003-3PB4C	FJ4004-3PB4C	FJ400X-3PB4C	FJ400P-3PB4C
600	J	FJ6001-3PB7C	FJ6003-3PB7C	FJ6004-3PB7C	FJ600X-3PB7C	FJ600P-3PB7C
800	L	FL8001-3PB4B	FL8003-3PB4B	FL8004-3PB4B	FL800X-3PB4B	FL800P-3PB4

① Assemblies are not UL listed, but built to meet UL requirements

Accessories
Non -fusible



OA1G10

Auxiliary contacts

For use on:	Contact configuratio	Catalog number
16 – 100 A	1 N.O.	OA1G10
	1 N.C.	OA1G01
	1 N.O. & 1 N.C.	OA2G11
200 - 1200 A	1 N.O.	OA1G10
	1 N.C.	OA3G01
1600 – 3150 A	1 N.O. & 1 N.C.	OZXK-1
	2 N.O. & 2 N.C.	OZXK-2

OZXK-_

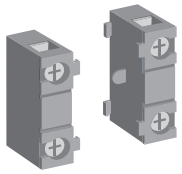
Accessories

For use on:	Description	Installation suffix code
EOT16, 32	Neutral or isolated ground block	N or G
EOT45, 63	Neutral or isolated ground block	N or G
EOT30, 60, 100	Neutral or isolated ground block	N or G
NF200 – 1200A	Neutral block	N
NF1600 – 3150A	Neutral block	N
NF200 – 1200A	Service entrance, 3 wire	U
NF200 – 1200A	Service entrance, 4 wire	V

Accessories
Fusible

Auxiliary contacts

For use on:	Contact configuration	Catalog number
30A	1 N.O. + 1 N. C.	OA4B1C
60-1200	1 N.O.	OA1G10
	1 N.C.	OA3G01



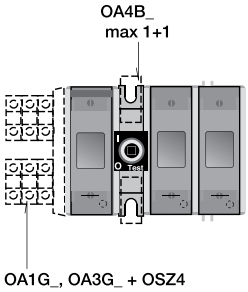
OA1G10

Accessories

For use on:	Description	Installation suffix code
30A	Neutral block	N
60A – 100A	Neutral block	N
200A – 400A	Neutral block	N
600A – 800A	Neutral block	N
30A – 200A	Service entrance, 3 wire	U
	Service entrance, 4 wire	V
400A – 800A	Service entrance, 3 wire	U
	Service entrance, 4 wire	V

OA4B1C

19



Selecting disconnects for motor applications per NEC

Article 430 of the US National Electric Code includes two methods for properly sizing motor disconnects:

1. Single motor application

A properly sized disconnect switch for a single motor will:

a) have an ampere rating greater than or equal to 115 percent of the rated motor full load current; or,

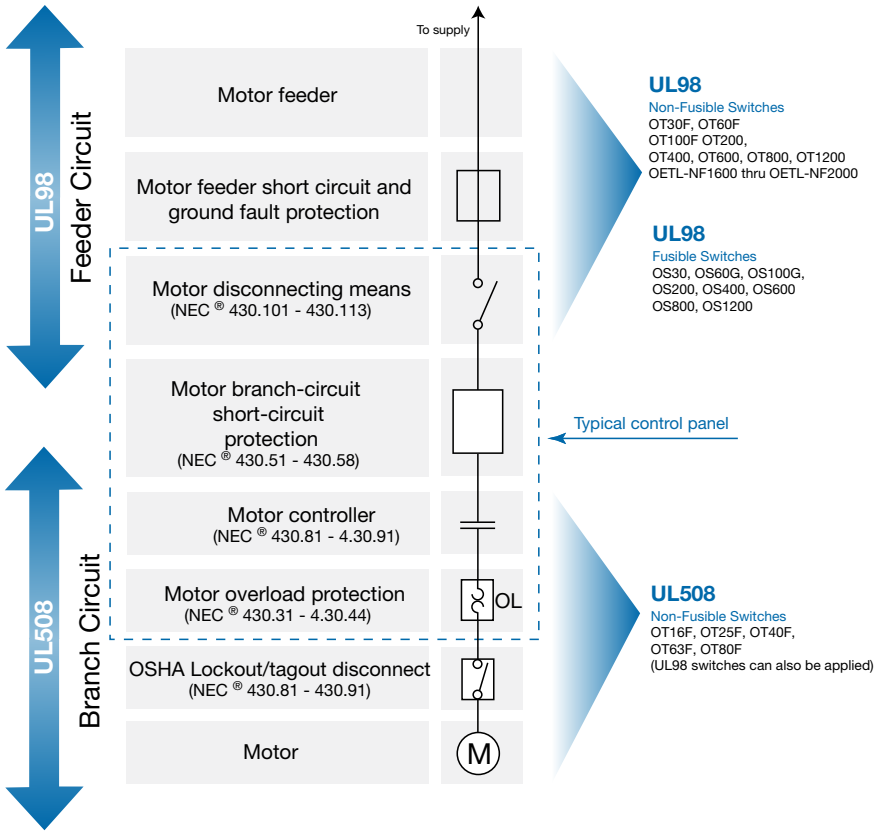
b) have a HP rating greater than or equal to the rated motor HP (at applied voltage) if the disconnect switch under consideration is HP rated.

2. Combination load application

A properly sized disconnect switch for a combination load will be selected by adding all the simultaneous individual loads in the circuit under consideration.

Using motor nameplate information, load information, and tables from section 430 of the NEC, determine one equivalent full load current, one equivalent locked rotor current and equivalent HP rating. Select a disconnect switch using equivalent current and/or housepower ratings of the combined load.

Use of UL98 & UL508 Disconnects
According to *NEC ®* Article 430



Technical data
OT16 – 100F_
UL & CSA

UL & CSA

Catalog number	3 pole	OT16F3	OT25F3	OT40F3	OT63F3	OT80F3	OT30F3	OT60F3	OT100F3
Approvals①	3 pole	UL508 & IEC	UL508 & IEC	UL508 & IEC	UL508 & IEC	UL508 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC
	4 pole	UL508 & IEC	UL508 & IEC	UL508 & IEC	UL508 & IEC	UL508 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC
General purpose amp rating	-40° to 40°C								
pf = 0.7 – 0.8	**A**	**20**	**30**	**40**	**60**	**80**	**30**	**60**	**100**
Max. operating voltage	V	600	600	600	600	600	600	600	600
Max. horsepower rating/motor FLA current									
pf = 0.4 – 0.5									
Three phase									
240V	HP/A	5/15.2	7.5/22	10/28	15/42	20/54	10/28	20/54	30/80
480V	HP/A	10/14	15/21	20/27	30/40	40/52	20/27	40/52	50/65
600V	HP/A	10/11	20/22	25/27	30/32	40/41	30/32	40/41	50/41
Single phase 120V	HP/A	1/16	1.5/20	2/24	2/24	2/24	—	—	5/56
240V	HP/A	2/12	3/17	5/28	7.5/40	10/50	—	—	15/68
480V	HP/A	5/14	7.5/21	10/26	15/34	20/44	—	—	25/55
600V	HP/A	7.5/16	10/20	15/27	15/27	20/385	—	—	20/35
Short circuit rating with fuse - 480/600 V		②	②	②	②	②	②	②	②
Fuse type CC	kA	10 , 200 / 100	10, 200 / 100	10, 200 / 100	— / —	— / —	— / —	— / —	— / —
Fuse type J	kA	10, 200 / 10, 100	10, 200 / 10, 100	10, 200 / 10, 100	100 / —	100 / —	200 / —	50 / 200	50 / 200
Fuse type T	kA	10, 200 / 10, 100	10, 200 / 10, 100	10, 200 / 10, 100	100 / —	100 / —	200 / —	50 / 200	50 / 200
Fuse type RK1	kA	10 / —	10 / —	10 / —	— / —	— / —	— / —	— / —	— / —
Fuse type RK5	kA	5 / 5	5 / 5	5 / 5	10 / 5	10 / 5	— / —	— / —	— / —
Fuse type L	kA	— / —	— / —	— / —	— / —	— / —	— / —	— / —	— / —
Fuse type H	kA	— / —	— / —	— / —	— / 5	— / 5	— / —	— / —	— / —
Maximum fuse size	A	30 / 60 ③	30 / 60 ③	30 / 60 ③	100 / 150	100 / 150	60 / —	150 / 60	150 / 100
3 cycle short circuit current withstand rating ④	kA	—	—	—	—	—	—	—	—
Endurances									
Min. Electrical endurance, pf = 0.75 – 0.80	operation cycles	6000	6000	6000	6000	6000	6000	6000	6000
Physical characteristics									
Weight, switches 3 pole	lb	0.24	0.24	0.24	0.59	0.59	0.79	0.79	0.79
4 pole	lb	0.33	0.33	0.33	0.77	0.77	1.10	1.10	1.10
Dimension, switches 3 pole H	in	2.68	2.68	2.68	3.60	3.60	3.94	3.94	3.94
W	in	1.38	1.38	1.38	2.07	2.07	2.76	2.76	2.76
D	in	2.20	2.20	2.20	2.85	2.85	2.95	2.95	2.95
Shaft set screw tightening torque	lb. in.	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9
Shaft size — square □	in	.24 x .24	.24 x .24	.24 x .24	.24 x .24	.24 x .24	.24 x .24	.24 x .24	.24 x .24
	mm	6 x 6	6 x 6	6 x 6	6 x 6	6 x 6	6 x 6	6 x 6	6 x 6
Switch operating torque for rotary 3 pole switches	lb. in.	8.8	8.8	8.8	10.5	10.5	17.5	17.5	17.5
Terminal lug kits		Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required
Wire range	AWG	#18 – 8	#18 – 8	#18 – 8	#14 – 4	#14 – 4	#14 – 4	#14 – 4	#8 – 1/0
Torque:									
Wire tightening	lb. in.	7	7	7	18	18	55	55	55
Lug mounting	lb. in.	Integral	Integral	Integral	Integral	Integral	Integral	Integral	Integral
Auxiliary contacts		OA_G_	OA_G_	OA_G_	OA_G_	OA_G_	OA_G_	OA_G_	OA_G_
NEMA ratings, AC		A600	A600	A600	A600	A600	A600	A600	A600
AC rated voltage	VAC	600	600	600	600	600	600	600	600
AC thermal rated current	A	10	10	10	10	10	10	10	10
AC maximum volt-ampere making	VA	7200	7200	7200	7200	7200	7200	7200	7200
AC maximum volt-ampere breaking	VA	720	720	720	720	720	720	720	720
NEMA ratings, DC		R300	R300	R300	R300	R300	R300	R300	R300
DC rated voltage	VDC	300	300	300	300	300	300	300	300
DC thermal rated current	A	1	1	1	1	1	1	1	1
DC maximum make-break	VA	28	28	28	28	28	28	28	28
Torque: Wire tightening	lb. in	7	7	7	7	7	7	7	7
Wire range	AWG	#18 – 14	#18 – 14	#18 – 14	#18 – 14	#18 – 14	#18 – 14	#18 – 14	#18 – 14

① UL Listed switches are also CSA Approved.
② For 100 and 200 kA ratings, mounting hardware must be used.
③ Fuse size 70A for RK5
④ When protected by any Listed fuse or Listed circuit breaker whose current rating does not exceed the maximum thermal current rating of the switch.

Technical data
OT200 – OT1200U_
OETL-NF1600 – 2000
UL & CSA

UL & CSA

Catalog number	3 pole	OT200U03	OT400U03	OT600U03	OT800U03	OT1200U03	OETL-NF1600	OETL-NF2000
Approvals ①	2 pole 3 pole 4 pole	UL98 & IEC UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC UL98 & IEC	UL98 & IEC UL98 & IEC UL98 & IEC
General purpose amp rating -40° to 40°C pf = 0.7 – 0.8	**A**	**200**	**400**	**600**	**800**	**1200**	**1600**	**2000**
Max. operating voltage	V	600	600	600	600	600	600	480
Max. horsepower rating/Max. motor FLA current,								
pf = 0.4 – 0.5 240V	HP/A	75/192.0	125/312.0	200/480.0	200/480	—	—	—
Three phase 480V	HP/A	150/180.0	250/302.0	450/515	500/590	—	—	—
600V	HP/A	200/192.0	350/336.0	500/472.0	500/472	—	—	—
Single phase 120V	HP/A	10/-	—	—	—	—	—	—
240V	HP/A	10/-	10/-	50/-	—	—	—	—
480V	HP/A	10/-	—	—	—	—	—	—
600V	HP/A	10/-	—	—	—	—	—	—
Maximum General Use, DC ratings								
250VDC / 2 poles	HP/A	40/200	50/400	50/600	—	—	—	—
125VDC / 2 poles	HP/A	20/-	40/-	—	—	—	—	—
600VDC / 4 poles	HP/A	50/100	50/200	-/200	—	—	—	—
Short circuit rating with fuse - 480/600 V		②	②	②	②	②	②	②
Fuse type CC	kA	—	—	—	—	—	—	—
Fuse type J	kA	200/100	100	—/100	—	—	—	—
Fuse type T	kA	—/100	—	— /100	—	—	—	—
Fuse type RK1	kA	—	—	—	—	—	—	—
Fuse type RK5	kA	—	—	100 /—	—	—	—	—
Fuse type L	kA	—	—	—/100	100	100	100	100
Fuse type H	kA	—	—	—	—	—	—	—
Maximum fuse size	A	200/350	600	600/800	1200	1200	2000	2000
3 cycle short circuit current withstand rating ③	kA	14	30	35	42	42	65	65
Endurances								
Min. Electrical endurance, pf = 0.75 – 0.80	operation cycles	6000	1000	1000	500	500	500	500
Physical characteristics								
Weight, switches 3 pole	lb	2.9	5.7	11.4	33.5	33.5	127.7	127.7
4 pole	lb	3.5	6.8	14.3	42.9	42.9	149.7	149.7
Dimension, switches 3 pole H	in	6.69	8.66	9.84	14.65	14.65	21.5	21.5
W	in	6.67	8.70	10.48	13.78	13.78	18.11	18.11
D	in	3.27	4.15	5.47	5.20	5.20	10.67	10.67
Shaft set screw tightening torque	lb. in.	14 - 17.7	—	—	—	—	—	—
Shaft size — square □in	.24 x .24	.47 x .47	.47 x .47	.47 x .47	.47 x .47	.47 x .47	.47 x .47	.47 x .47
	mm	6 x 6	12 x 12	12 x 12	12 x 12	12 x 12	12 x 12	12 x 12
Switch operating torque for rotary 3 pole switches	lb. in.	62	142	184	575	575	438	438
Terminal lug kits		OZXA-200	OZXA-400	OZXA-800	OZXA-1200	OZXA-1200	OZXA-28	OZXA-28/2
Wire range	AWG	#4-300kcmil③	#2-600kcmil③	(2)#2-600kcmil	(4)#2-600kcmil	(4)#2-600kcmil	(4)#2-600kcmil	(8)#2-600kcmil
Torque:								
Wire tightening	lb. in.	200	375	500	500	500	375	375
Lug mounting	lb. in.	72	240	480	450-670	450-670	230	230
Auxiliary contacts		OA_G_	OA_G_	OA_G_	OA_G_	OA_G_	OZXK-_ _	OZXK-_ _
NEMA ratings, AC		A600	A600	A600	A600	A600	A600	A600
AC rated voltage	VAC	600	600	600	600	600	600	600
AC thermal rated current	A	10	10	10	10	10	10	10
AC maximum volt-ampere making	VA	7200	7200	7200	7200	7200	7200	7200
AC maximum volt-ampere breaking	VA	720	720	720	720	720	720	720
NEMA ratings, DC		P600	P600	P600	P600	P600	P600	P600
DC rated voltage	VDC	600	600	600	600	600	600	600
DC thermal rated current	A	5	5	5	5	5	5	5
DC maximum make-break	VA	138	138	138	138	138	138	138
Torque: Wire tightening	lb. in	7	7	7	7	7	7	7
Wire range	AWG	#22 – #14	#22 – #14	#22 – #14	#22 – #14	#22 – #14	#22 – #14	#22 – #14

① UL Listed switches are also CSA Approved.
② When protected by any Listed fuse or Listed circuit breaker whose current rating does not exceed the maximum thermal current rating of the switch
③ Multi-tap lug available, please see page 19.34.

Technical data
OTDC Disconnect switches
100 - 600 A, 1000 - 1500 VDC

Technical data in accordance to UL508I for photovoltaic disconnect switches OTDC16...32U

Suitable For Use in Photovoltaic Systems in Accordance With Article 690 of the NEC.

Switch size			OTDC16U	OTDC25U	OTDC32U
UL Listed		Standard	UL 508i & IEC	UL 508i & IEC	UL 508i & IEC
Rated ambient temperature		°C	…+60	…+60	…+60
Rated current /poles in series	600 V	One circuit	16/2	25/2	
		Two circuits	16/2x2	25/2x2	32/2x2
		Three circuits	16/2x3		
Short circuit rating		kA, 600 V	5	5	5
		Protection type	RK5 Fuse	RK5 Fuse	RK5 Fuse
Wire range		MCM	12-6 AWG	12-6 AWG	12-6 AWG

Technical data in accordance to UL98B for photovoltaic disconnect switches OTDC100...600U

Suitable For Use in Photovoltaic Systems in Accordance With Article 690 of the NEC.

Catalogue number			OTDC100U	OTDC180U	OTDC200U	OTDC250U	OTDC320U	OTDC400U	OTDC600U
Approvals		Standard	UL 98B & IEC	UL 98B & IEC	UL 98B & IEC	UL 98B & IEC	UL 98B & IEC	UL 98B & IEC	UL 98B & IEC
Rated ambient temperature		°C	-20...+50	-20...+50	-20...+50	-20...+50	-20...+50	-20...+50	-20...+50
Rated current /poles in series	1000 V	One circuit	100/2		200/2	250/2	320/2	400/2	600/2
		Two circuits	100/2	180/2		250/2	320/2	400/2	
	1500 V	One circuit				250/3	320/3	400/3	
Short circuit rating		kA, 1000 V	5	5	5	10	10	10	10
		Protection type	Circuit breaker	Circuit breaker	Circuit breaker	Circuit breaker	Circuit breaker	Circuit breaker	Circuit breaker
Wire range		MCM	#4-300	#4-300	#4-300	#2 – 600	#2 – 600	#2 – 600	#2 – 600
IEC equivalent			OTDC160E	OTDC250E	OTDC250E	OTDC315E	OTDC400E	OTDC500E	OTDC630E

Technical data
OS30 – OS1200
UL & CSA

UL & CSA

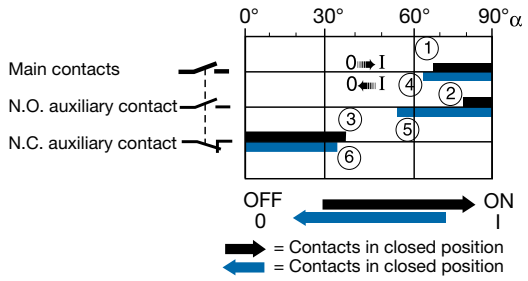
Catalog number	3 pole	OS30FA_12	OS60GJ12	OS100GJ03	OS200J03	OS400J03	OS600J03	OS800L03	OS1200L03
Approvals ①	2 pole	N/A	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC
	3 pole	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC
	4 pole	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC	UL98 & IEC
Technical ratings	-40° to 40°C								
General purpose amp rating pf = 0.7 – 0.8	A	30	60	100	200	400	600	800	1200
Max operating voltage	V	600	600	600	600	600	600	600	600
Max horsepower rating/ Max motor FLA current pf = 0.4 – 0.5 Three phase									
240V	HP/A	7.5/22.0	15/42.0	30/80.0	60/154.0	125/312.0	200/480.0	250/602.0	–
480V	HP/A	15/21.0	30/40.0	60/77.0	125/156.0	250/302.0	400/477.0	500/590.0	–
600V	HP/A	20/22.0	50/52.0	75/77.0	150/144.0	350/336.0	500/472.0	500/472.0	–
Single phase									
120V	HP/A	2/24.0	–	–	–	–	–	–	–
240V	HP/A	3/17.0	–	–	–	–	–	–	–
Short circuit rating with fuse	kA	200	200	200	200	200	200	200	200
UL Fuse size	A	30	60	100	200	400	600	800	1200
UL Fuse type		J/CC	J	J	J	J	J	L	L
Endurances									
Min. Electrical endurance, pf = 0.75 – 0.80	operation cycles	6000	6000	6000	6000	1000	1000	500	500
Physical characteristics									
Weight	3 pole lb	1.54	2.86	3.30	5.9	12.56	28.66	28.66	63.93
	4 pole lb	1.98	3.52	3.96	7.5	15.21	37.48	37.48	–
Dimension	3 pole H in	3.66	3.94	5.67	6.5	9.29	12.04	12.04	16.7
	W in	4.15	5.63	7.07	7.1	10.04	13.50	13.50	16.42
	D in	4.10	5.04	5.10	5.2	6.93	9.17	9.17	11.62
Shaft size square □	in	.24 x .24	.24 x .24	.24 x .24	.24 x .24	.47 x .47	.47 x .47	.47 x .47	.47 x .47
	mm	6 x 6	6 x 6	6 x 6	6 x 6	12 x 12	12 x 12	12 x 12	12 x 12
Switch operating torque for rotary 3 pole switches	lb. in.	26.6	35.5	70.9	195	195	336	336	575
Terminal lug kits		Integral	Integral	OZXA-24	OZXA-200	OZXA-400	OZXA-800	OZXA-800	OZXA-1200
Wire range	AWG	#18 – 8	#14 – 4	#14 – 2/0	#4 – 300kcmil	#2 – 600kcmil	(2) #2 – 600 kcmil	(2) #2 – 600 kcmil	(4)#2-600kcmil
Torque:									
Wire tightening	lb. in.	17	30	120	200	500	500	500	500
Lug mounting	lb. in.	N/A	N/A	50	72	480	480	480	480

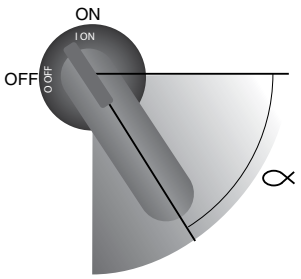
Auxiliary contacts		OA4B_	OA1/3G_	OA_G_	OA_G_	OA_G_	OA_G_	OA_G_	OA_G_	OA_G_
NEMA ratings, AC		–	A600	A600	A600	A600	A600	A600	A600	A600
AC rated voltage	VAC	250	600	600	600	600	600	600	600	600
AC thermal rated current	A	6	10	10	10	10	10	10	10	10
AC maximum volt ampere making	VA	–	7200	7200	7200	7200	7200	7200	7200	7200
AC maximum volt ampere breaking	VA	–	720	720	720	720	720	720	720	720
NEMA ratings, DC		–	P300	R300	R300	R300	P600	P600	P600	P600
DC rated voltage	VDC	–	300	300	300	300	600	600	600	600
DC thermal rated current	A	–	1	1	1	1	1	1	1	1
DC maximum make break current	A	–	28	28	28	28	28	28	28	28
Torque:										
Wire tightening	lb. in.	7		7	7	7	7	7	7	7
Wire range	AWG	#22 – 14/#18 – 14		#18 – 14	#18 – 14	#18 – 14	#18 – 14	#18 – 14	#20 – 12	#20 – 12

① The following UL Listed switches are also CSA approved.

Auxiliary contact timing diagrams
OT16 – OT100

Legend





Contacts closing

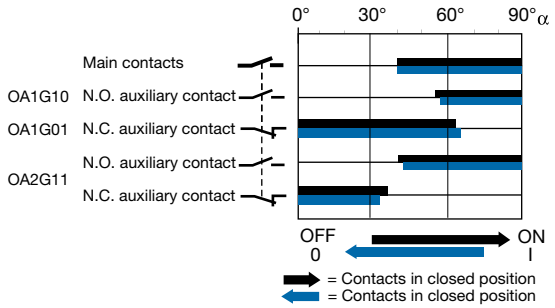
① Main contacts close
② N.O. auxiliary contacts close
③ N.C. auxiliary contacts open

Contacts opening

④ Main contacts open
⑤ N.O. auxiliary contacts open
⑥ N.C. auxiliary contacts close

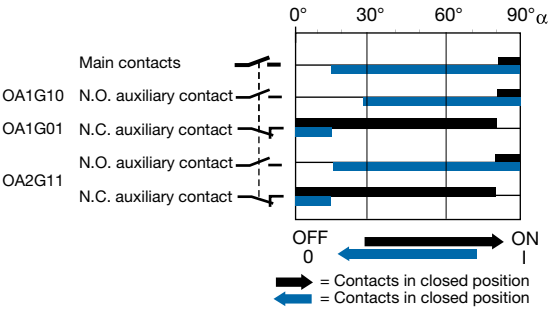
OT16, OT25, OT40

Catalog number	Auxiliary contact	Contact configuratio
OT16, OT25, OT40	OA1G10 OA1G01 OA2G11	1 N.O. 1 N.C. 1 N.O. & 1 N.C.



OT63, OT80

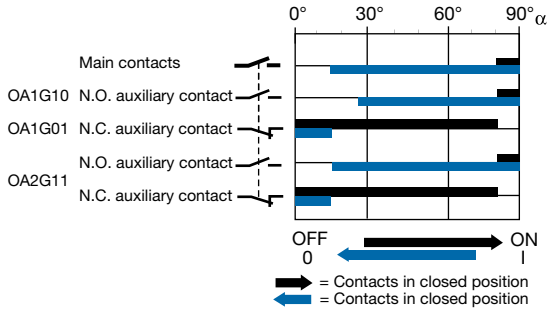
Catalog number	Auxiliary contact	Contact configuratio
OT63, OT80	OA1G10 OA1G01 OA2G11	1 N.O. 1 N.C. 1 N.O. & 1 N.C.



19

OT30, OT60, OT100

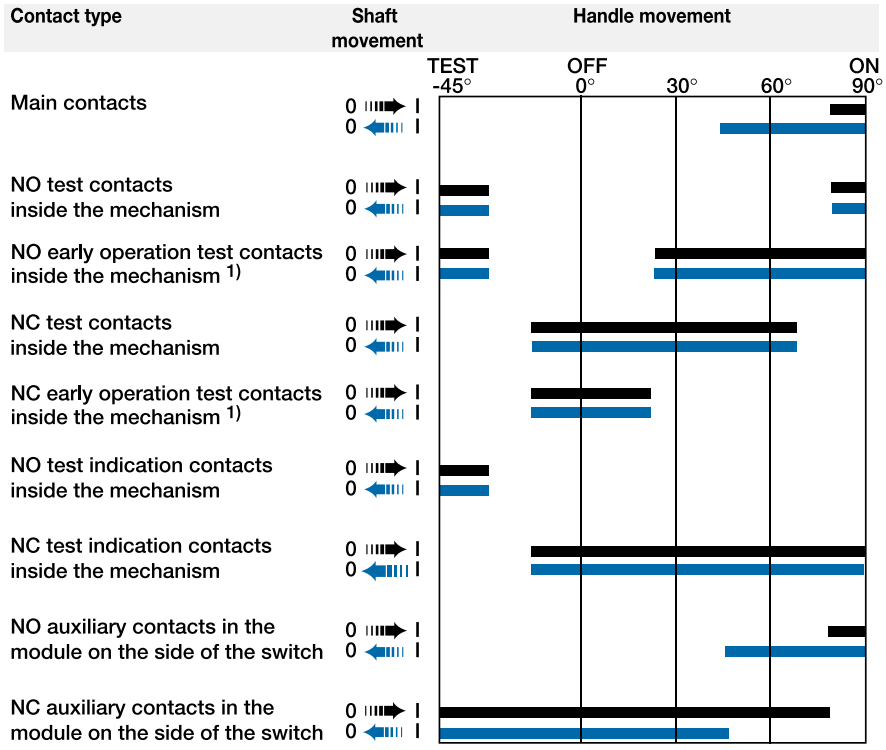
Catalog number	Auxiliary contact	Contact configuratio
OT30, OT60, OT100	OA1G10 OA1G01 OA2G11	1 N.O. 1 N.C. 1 N.O. & 1 N.C.



Auxiliary contact timing diagrams
OT200U - OT1200U
OETL-NF1600 - OETL-NF2000

OT200U – OT1200U

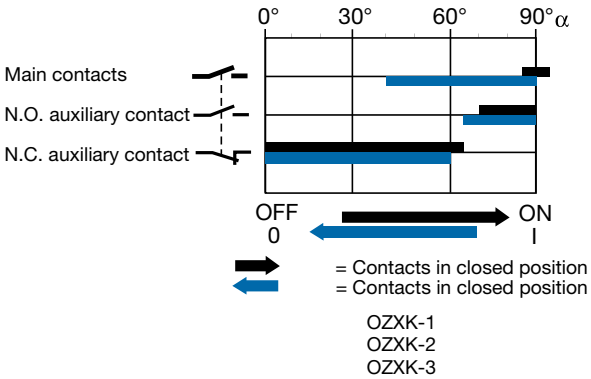
Catalog number	Auxiliary contact	Contact configuratio
OT200U - OT1200U	OA1G10 OA3G01	1 N.O. 1 N.C.



1) OT800 - 1200 only

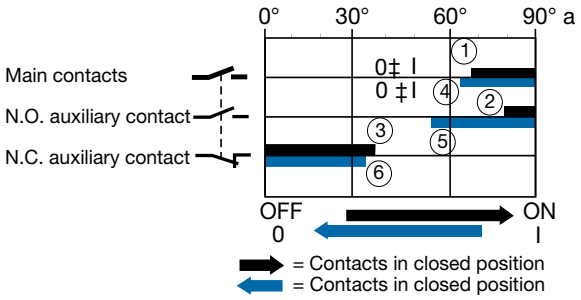
OETL-NF1600 – OETL-NF2000

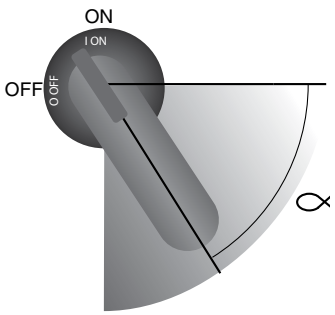
Catalog number	Auxiliary contact	Contact configuratio
OETL-NF1600 - OETL-NF2000	OZXK-1 OZXK-2 OZXK-3	1 N.O. & 1 N.C. 2 N.O. & 2 N.C. 4 N.O. & 4 N.C.



Auxiliary contact timing diagrams
OS30

Legend



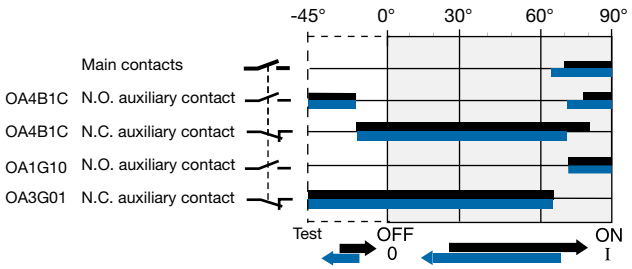


Contacts closing
① Main contacts close
② N.O. auxiliary contacts close
③ N.C. auxiliary contacts open

Contacts opening
④ Main contacts open
⑤ N.O. auxiliary contacts open
⑥ N.C. auxiliary contacts close

OS30

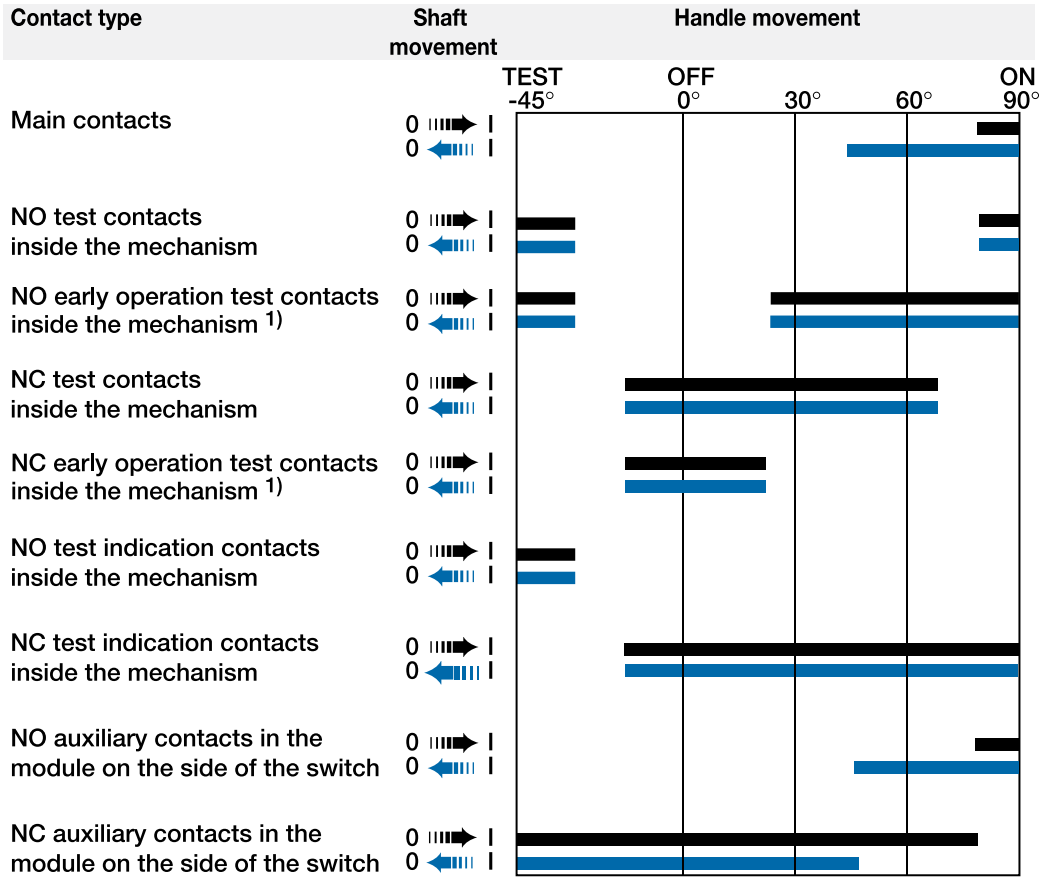
Catalog number	Auxiliary contact	Contact configuration
OS30_	OA4B1C	1 N.O. & 1 N.C.
	OA1G10	1 N.O.
	OA3G01	1 N.C.



19

Auxiliary contact timing diagrams
OS60 - OS1200

OS60 - OS1200



1) OS1200 only

NEMA Environmental ratings

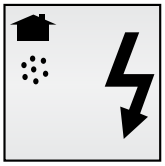
Introduction

An enclosure is a surrounding case constructed to provide a degree of protection to personnel against accidental contact with the enclosed equipment and to provide a degree of protection to the enclosed equipment against specified environmental conditions.

A brief description of the more common types of enclosures used by the electrical industry relating to their environmental capabilities follows. Refer to NEMA Standards Publication for more information regarding applications, features and design tests.

Individual NEMA product Standards Publications or third party certification standards may contain additional requirements for product testing and performance.

Definitions pertaining to nonhazardous locations



Type 1

Enclosures are intended for indoor use primarily to provide a degree of protection against limited amounts of falling dirt. (NEMA Standard 7-15-1991.)

Type 3R

Enclosures are intended for outdoor use primarily to provide a degree of protection against rain, sleet and damage from external ice formation. (NEMA Standard 7-15-1991.)

Type 4

Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, hose-directed water and damage from external ice formation. (NEMA Standard 1-10-1979.)

Type 4X

Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, hose-directed water and damage from external ice formation. (NEMA Standard 1-10-1979)

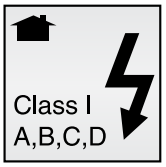
Type 12

Enclosures are intended for indoor use primarily to provide a degree of protection against circulating dust, falling dirt, and dripping noncorrosive liquids. (NEMA Standard 7-15-1991.)

Type 13

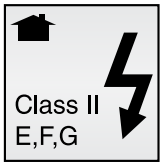
Enclosures are intended for indoor use primarily to provide a degree of protection against dust, spraying of water, oil and noncorrosive coolant. (NEMA Standard 1-10-1979.)

Definitions pertaining to hazardous locations



Type 7

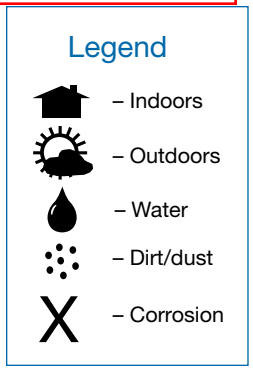
Enclosures are intended for indoor use in locations classified as Class I, G oups, A, B, C, or D, as defined in the National Electrical Code. (NFPA 70)



Type 9

Enclosures are intended for indoor use in locations classified as Class II, G oups E, F, or G, as defined in the National Electrical Code. (~~NEMA Standard 7-15-1991.~~)

NFPA 70.



IEC Environmental ratings

IP ratings

indicate the degree of protection against dust, liquids and impacts. The IP degrees of protection are defined by IEC 60529. To rate a device's degrees of protection, the letters IP are followed by up to three numbers. These numbers are defined as follows

first number protection against solid objects	second number protection against liquids	third number protection against mechanical impacts
IP 0 — no protection	IP 0 — no protection	IP 0 — no protection
1 — protected against solid objects over 50mm (e.g. accidental touch by hands.)	1 — protected against vertically falling rain or condensation	1 — impact 0,225 joule 150g falling from 15 cm
2 — protected against solid objects over 12 mm (e.g. fingers	2 — protected against direct sprays of water up to 15° from vertical	2 — impact 0,375 joule 250g falling from15 cm
3 — protected against solid objects over 2.5 mm (tools & wires)	3 — protected against sprays to 60° from vertical	3 — impact 0,50 joule 250g falling from 20cm
4 — protected against solid objects over 1mm (small tools & small wires)	4 — protected against water sprayed from all directions	5 — impact 2,00 joule 500g falling from 40 cm
5 — protected against dust (no harmful deposit)	5 — protected against low pressure jets of water from all directions	7 — impact 6,00 joule 1.5kg falling from 40 cm
6 — totally protected against dust	6 — protected from strong jets of water (e.g. for use on ship decks)	9 — impact 20,00 joule 5 kg falling from 40 cm
	7 — protected against the effects of immersion between 15cm and 1m	

AC – Alternating current — Current that reverses its direction of flow twice per cycle

Ambient temperature — Temperature of the air surrounding the unit.

Amp rating — The basic unit of measurement for electric current (columbs / seconds).

Conventional thermal current I_{th} — Value of the current the disconnect switch can withstand with poles in closed position, in free air for an eight hour duty, without the temperature rise of its various parts exceeding the limits specified by the standa ds.

Cycle duration — Total time of the on-load + off-load period.

DC – Direct current — Current that flows in only one di ection.

Electrical endurance — Number of on-load operating cycles.

IEC environmental protection type — see page 19.48.

Full load amp current FLA — The current required by a motor to produce full-load torque at the motor's rated speed.

Inductive load — An electrical load characterized by having significant inrush (5 to 6 times FLA for typical design-B AC induction motors).

kW — Kilowatts (1000 watts)

Lockout/Tagout — Means of removing power from electrical equipment during inspection, service or repair.

Make / Break — ON / OFF

Mechanical endurance — Number of off-load operating cycles.

Poles in series — Means of connection poles using wires or bus bars to increase breaking capacity of load.

Power factor — The relationship between working power and total power consumed. Power factor measures how effectively electrical power is being used.

Rated insulation U_i — Voltage value which designates the unit and to which dielectric tests, clearance and creepage distances are referred.

Rated operating current I_e —Current value stated by the manufacturer and taking into account the rated operating voltage U_e, the rated frequency, the rated duty, the utilization category, the electrical contact life and the type of protective enclosure.

Rated operating voltage U_e — Voltage value to which utilization characteristics of the disconnect switch are referred, i.e. phase-to-phase voltage in 3 phase circuits.

Rated short circuit making capacity I_{cm}— The rated short-circuit making capacity of a disconnect switch, a disconnector or a switch-disconnector is the value assigned to equipment at the rated operational voltage, frequency (if any) and specified powe - factor for AC or time constant for DC. It is expressed as the maximum prospective peak current under prescribed conditions.

Rated short time withstand current I_{cw} — The rated short-time withstand current of a disconnect switch, a disconnector or a switch-disconnector is the value that the equipment can carry without damage, under the test conditions specified in the relevant product standard. The value of the rated short-time withstand current shall be not less than twelve times the maximum rated operational current unless otherwise stated by manufacturer and the duration of the current shall be 1 s.

Resistive load — An electrical load characterized by not having any significant inrush cur ent.

Short circuit protection coordination — Co-ordination types "1" and "2" are defined in IEC 947-4-1
Type 1 coordination — There has to be no discharge of parts beyond the enclosure. Damage to the contactor and the overload is acceptable.
Type 2 coordination — No damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated.

Time constant — Ratio of inductance to the resistance: L/R = mH/Ohm = ms.

Torque — The force that produces rotation. It is commonly measured in pound-feet (lb-ft). Torque applies to such things as motor operations, handle rotations, wire tightening.

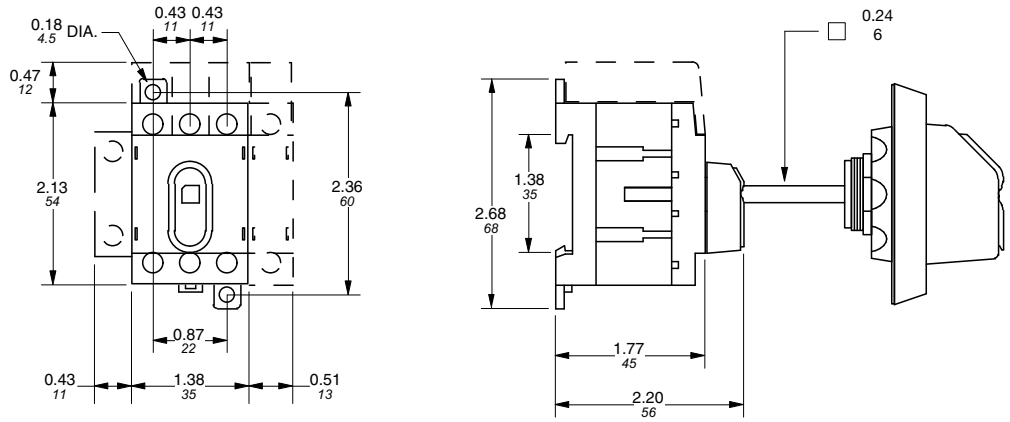
NEMA environmental protection type — see page 19.47.

Volt — The unit of electrical potential difference and electromotive force.

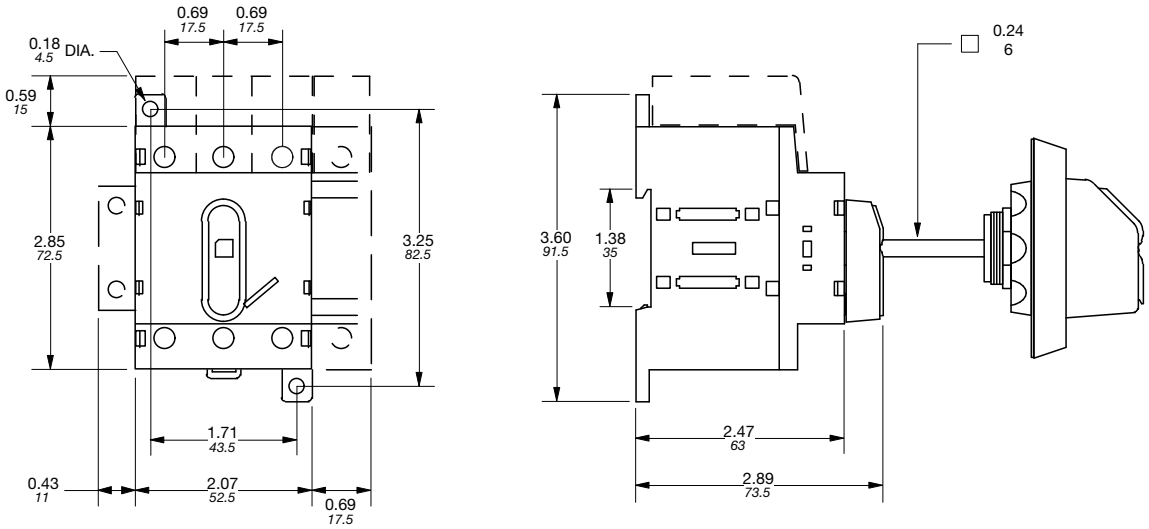
Approximate dimensions
OT16 – OT100

00.00 [Inches]
00.00 [Millimeters]

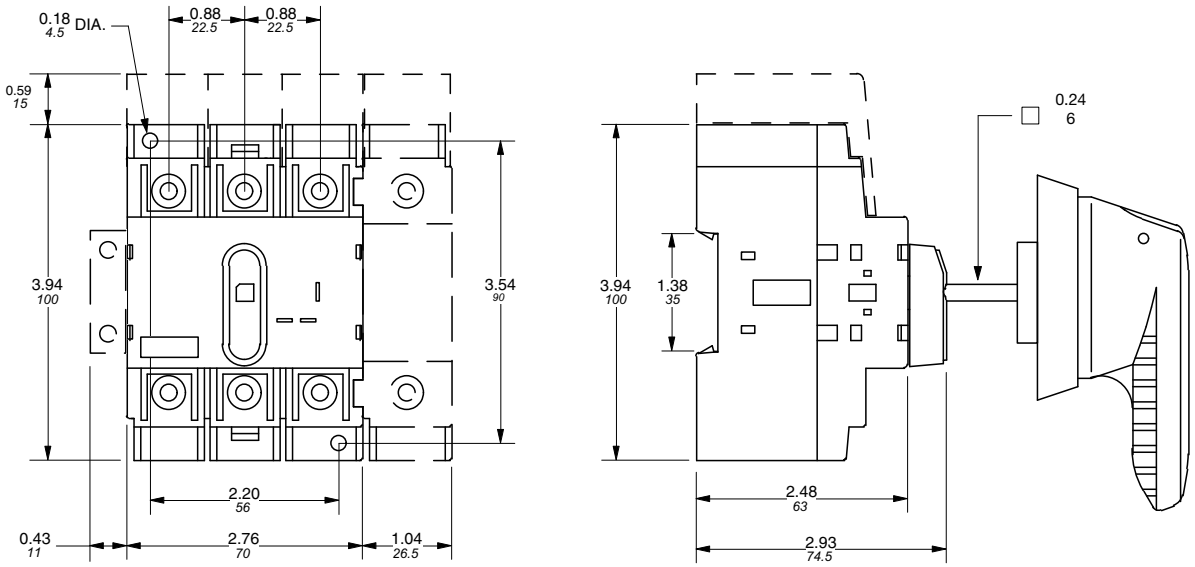
OT16F3, OT25F3, OT40F3 — base & DIN rail mounted switch



OT63F3, OT80F3 — base & DIN rail mounted switch



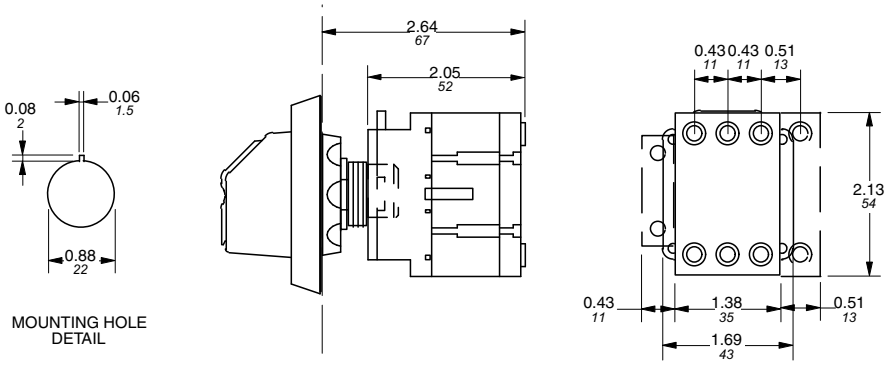
OT30F3, OT60F3, OT100F3 — base & DIN rail mounted switch



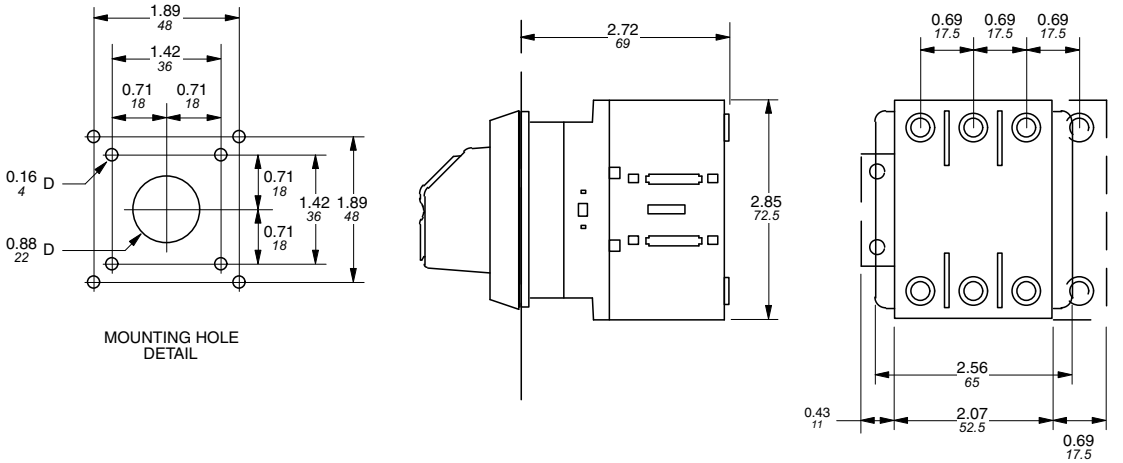
19

Approximate dimensions
OT16 – OT100

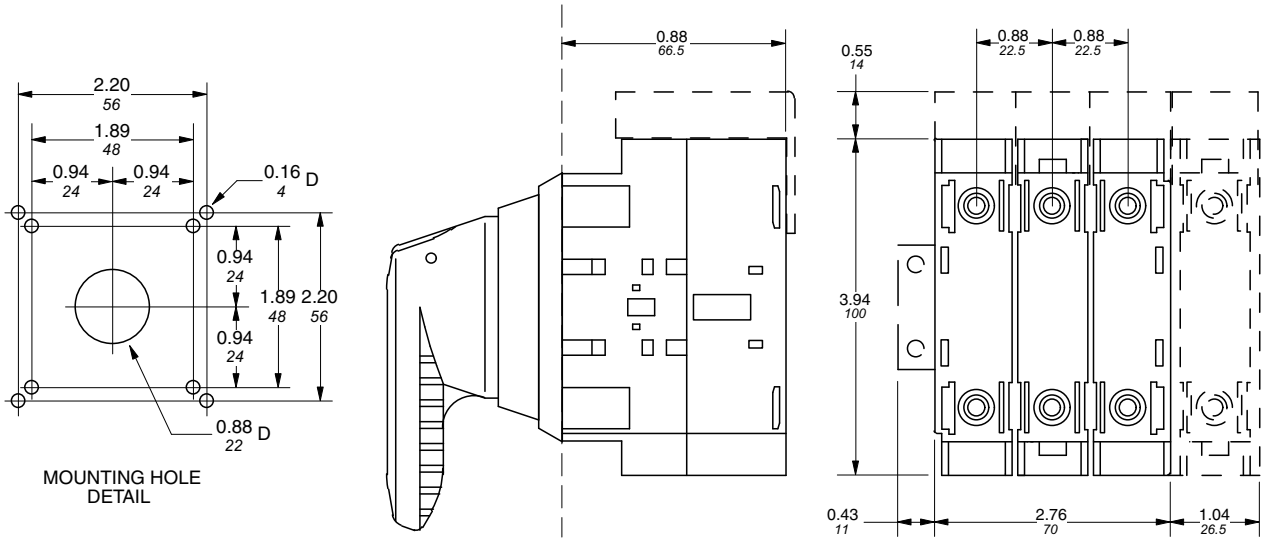
OT16FT3, OT25FT3, OT40FT3 — door mounted switch



OT63FT3, OT80FT3 — door mounted switch



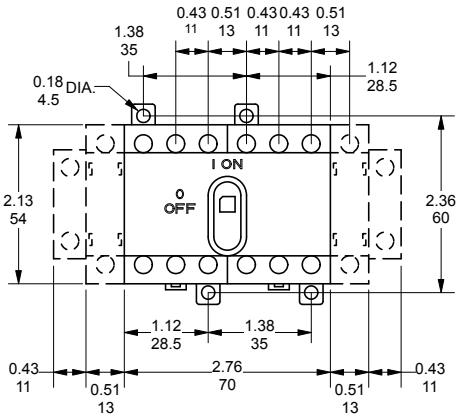
OT30FT3, OT60FT3, OT100FT3 — door mounted switch

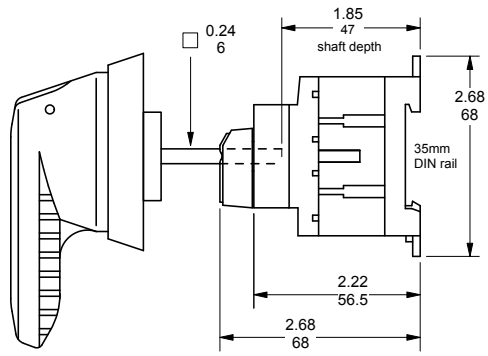


Approximate dimensions
OT16F6 – OT100F6
6-pole switches

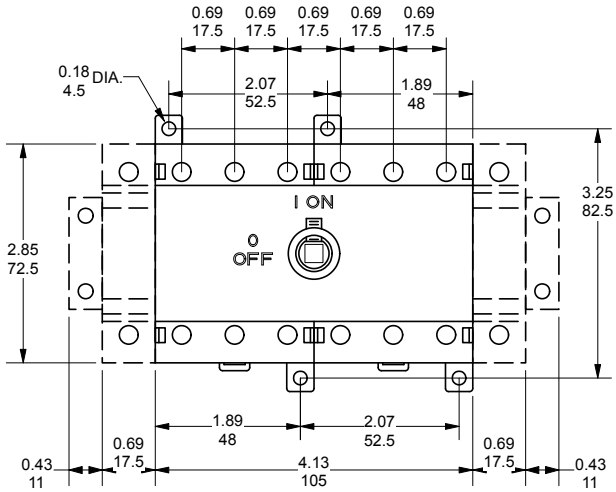
00.00 [Inches]
00.00

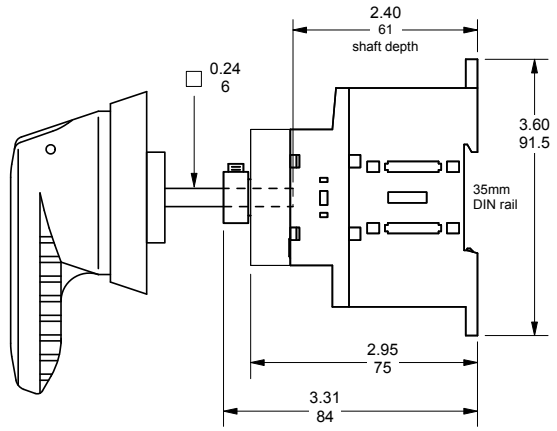
OT16, 25, 40F6 — 6 Pole switches



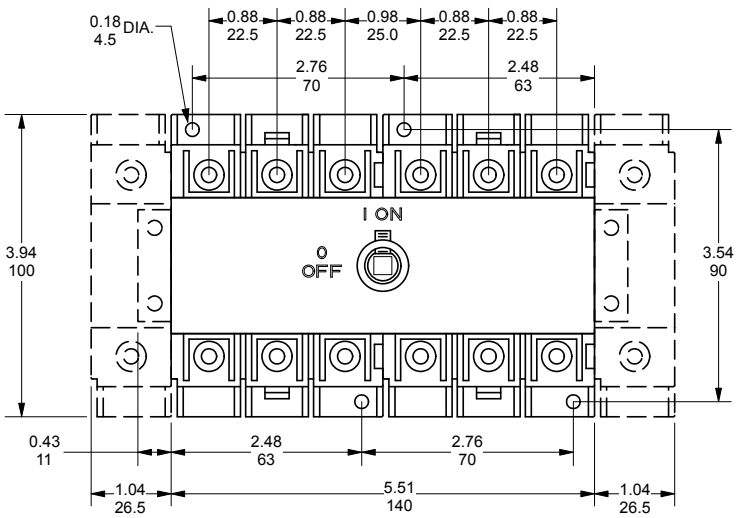


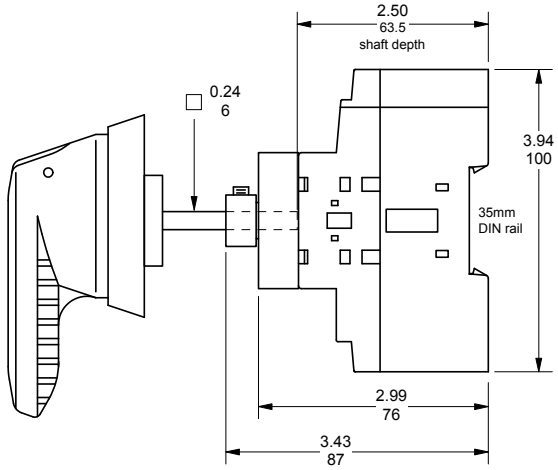
OT63, OT80F6 — 6 Pole switches





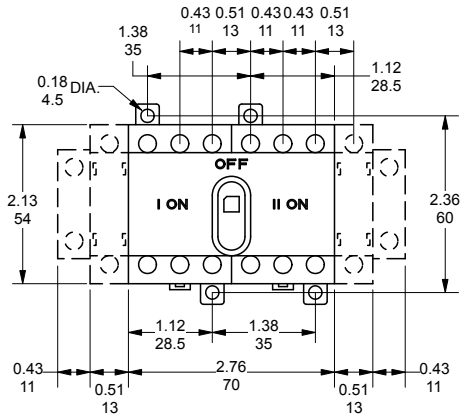
OT30, OT60, OT100F6 — 6 Pole switches

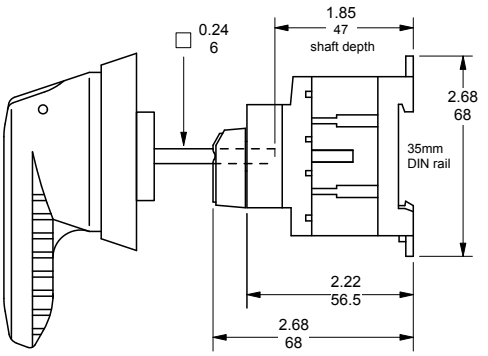




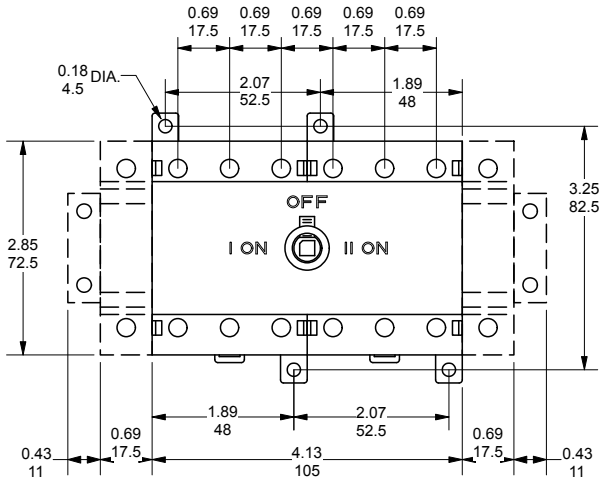
Approximate dimensions
OT16 – OT100F3C
Double throw switches

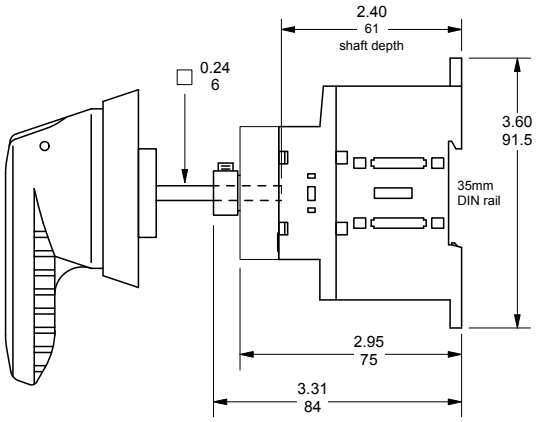
OT16, OT25, OT40F3C – Double throw switches



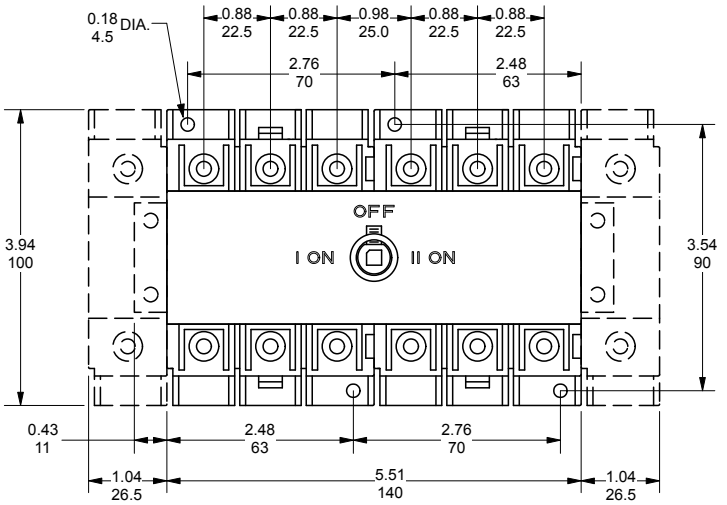


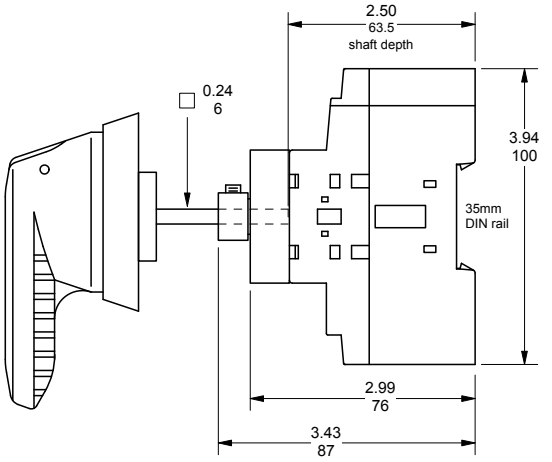
OT45, OT63, OT80F3C – Double throw switches





OT30, OT60, OT100F3C – Double throw switches

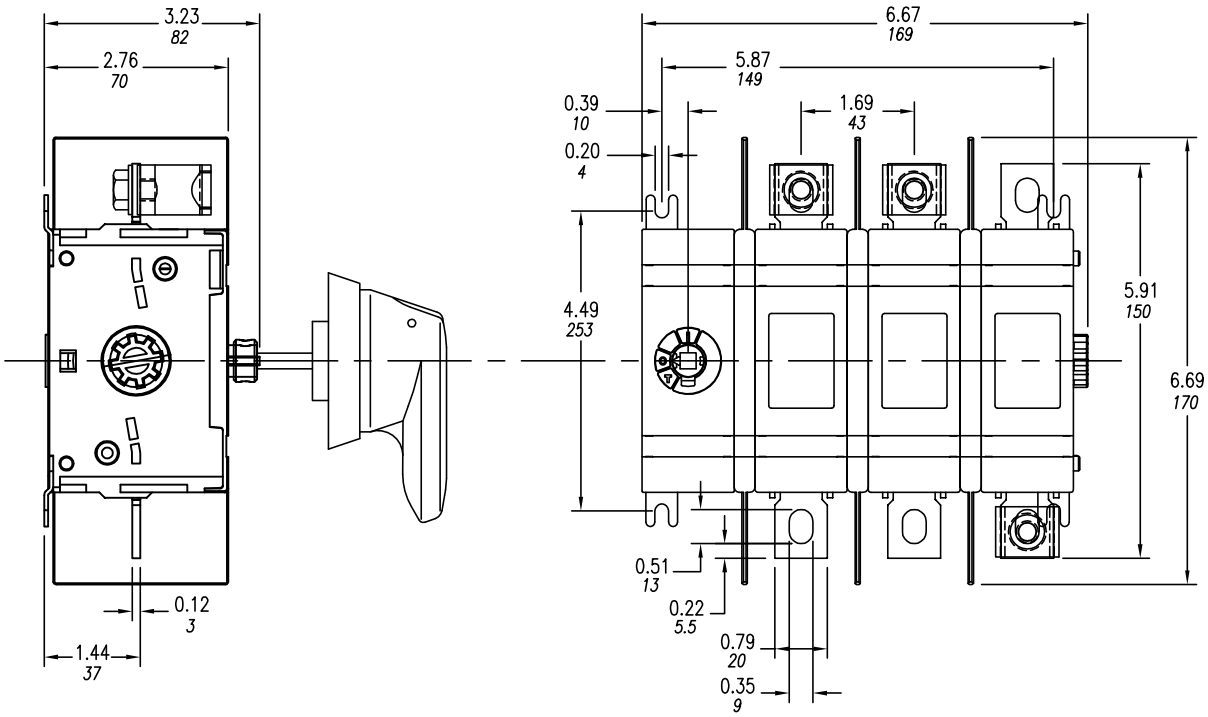




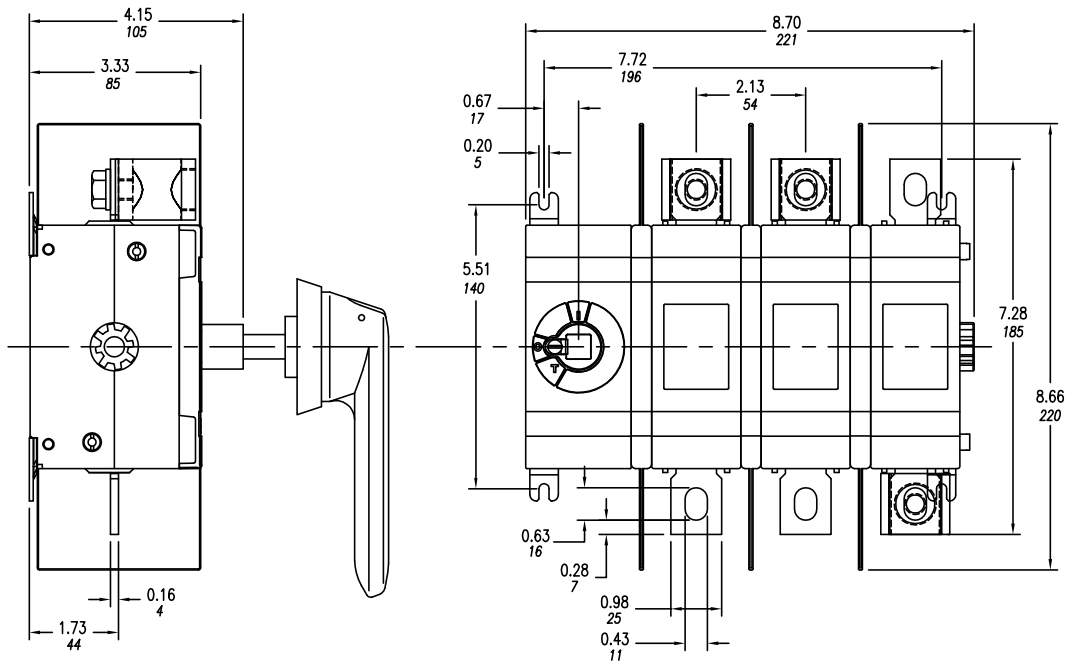
Approximate dimensions
OT200_ — OT400_

00.00 [Inches]
00.00

OT200U03

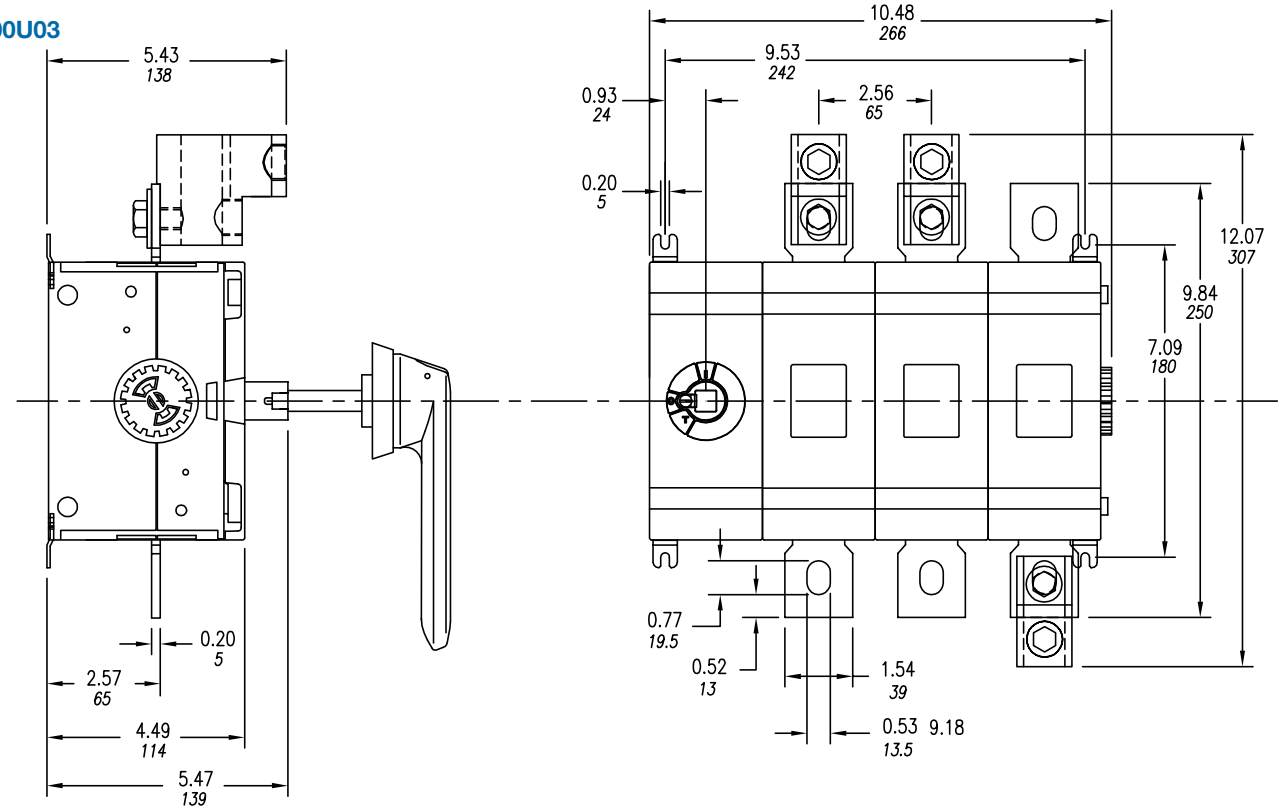


OT400U03

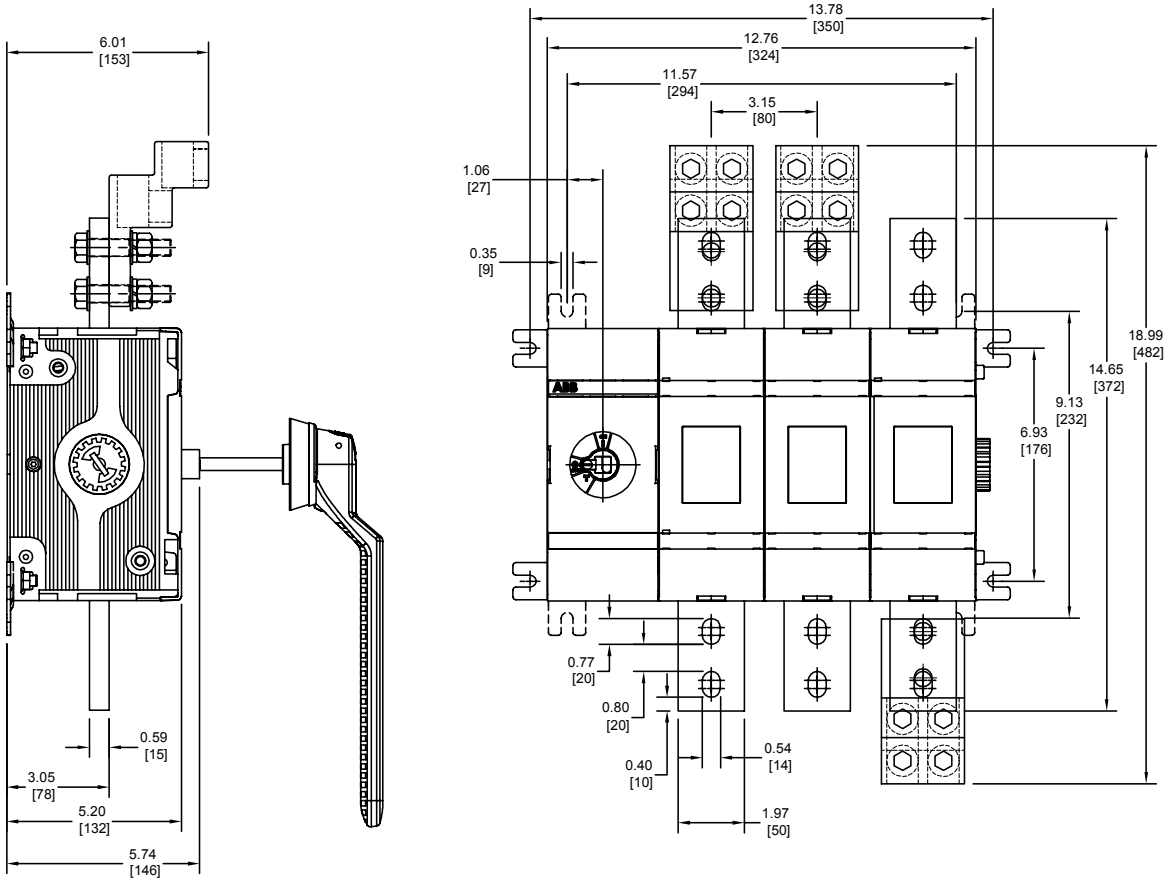


Approximate dimensions
OT600U03 – OT800U03

OT600U03



OT800U03

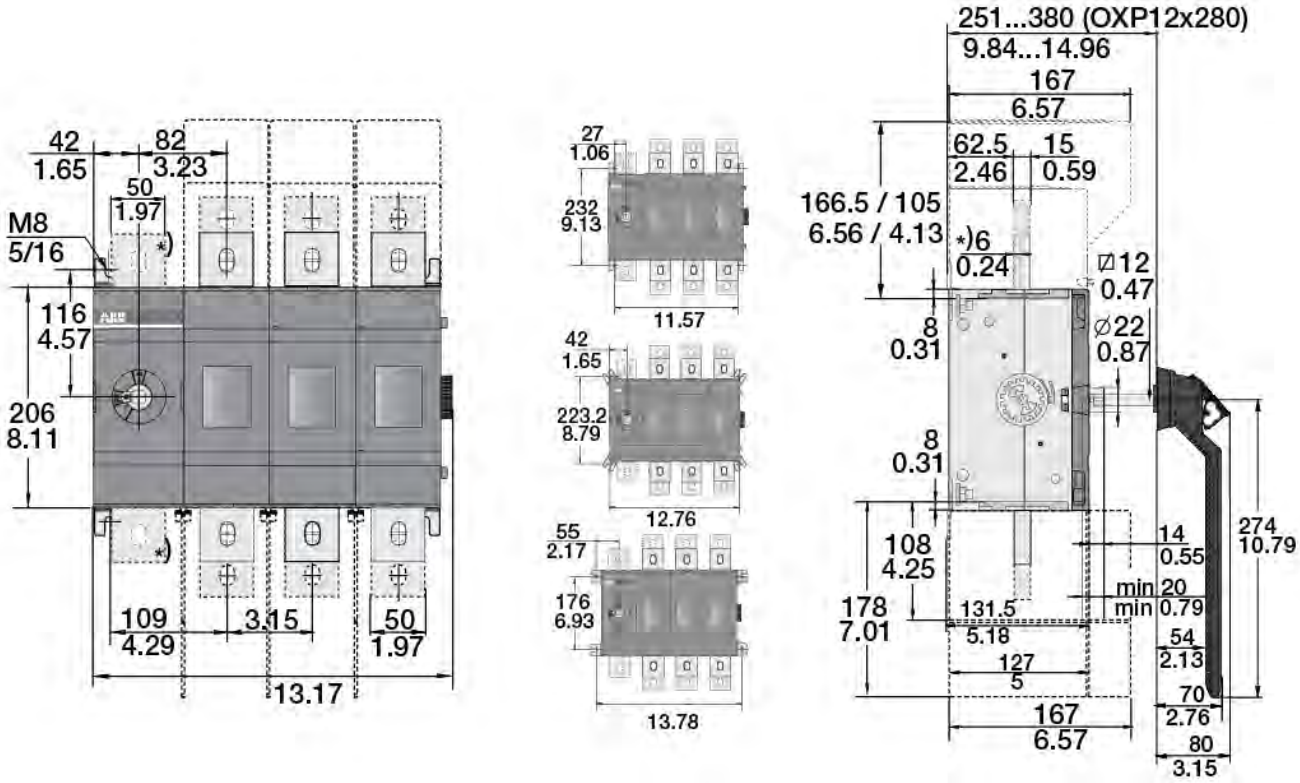


19

Approximate dimensions
OT1200U03 – OETL-NF1600

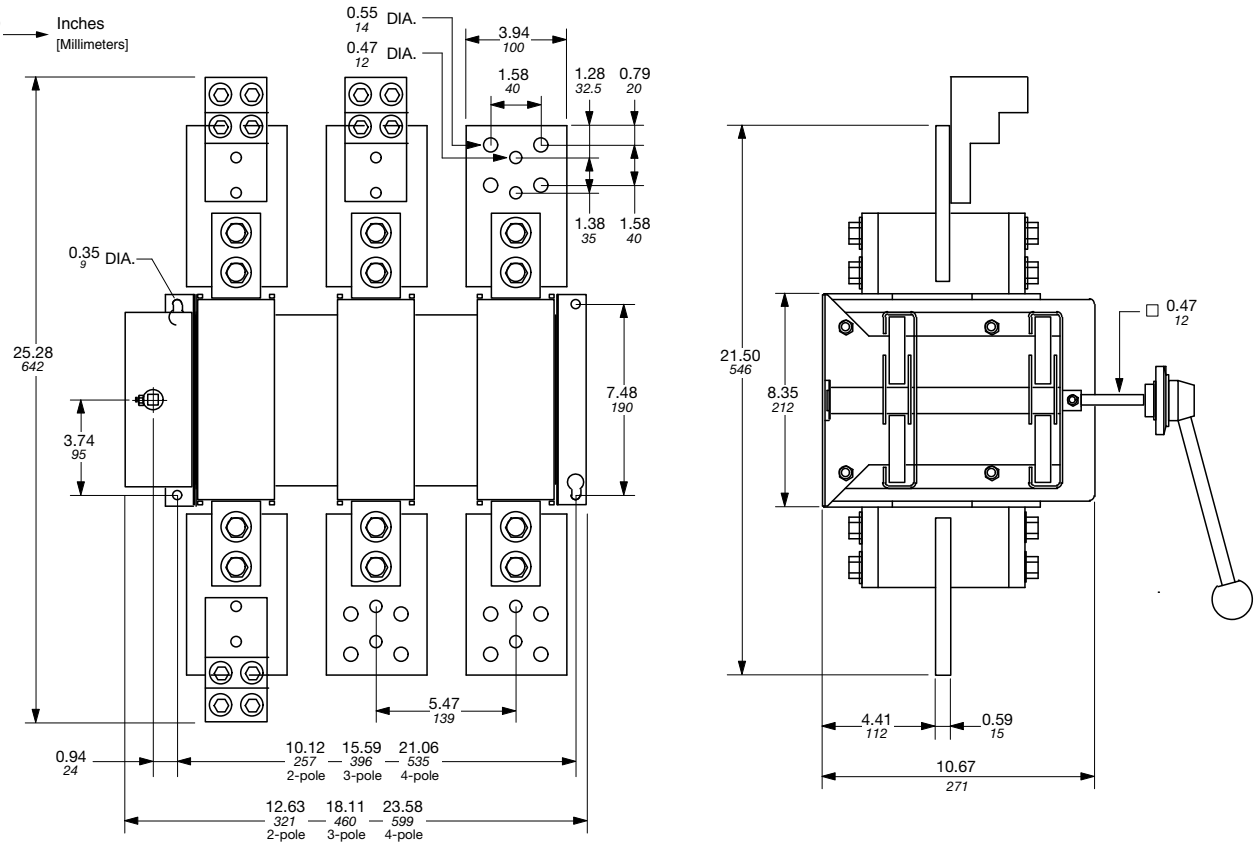
00.00 [Inches]
00.00 Inches

OT1200U03



OETL-NF1600

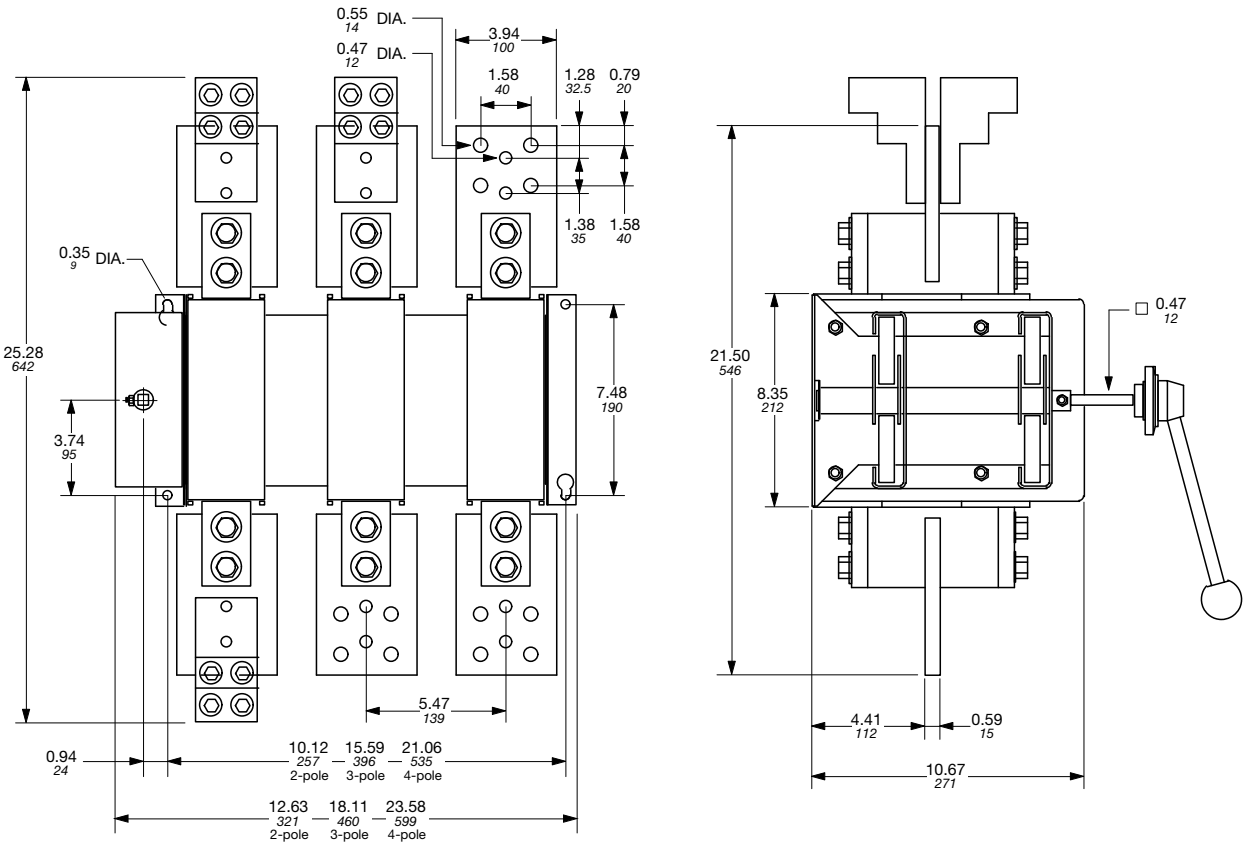
00.00 Inches
00.00 [Millimeters]



19

Approximate dimensions
OETL-NF2000

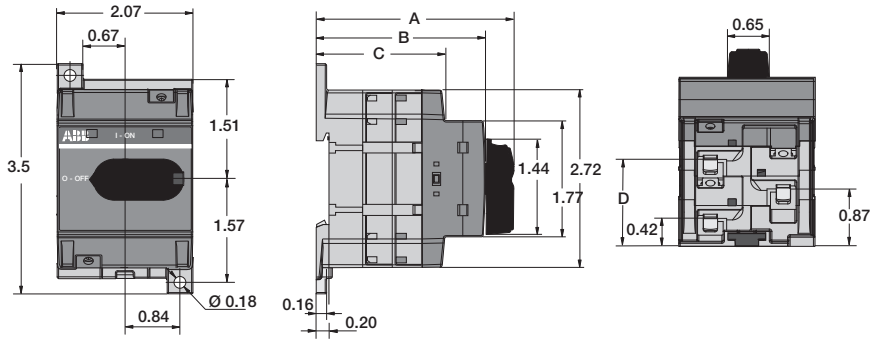
OETL-NF2000



19

Approximate dimensions
OTDC

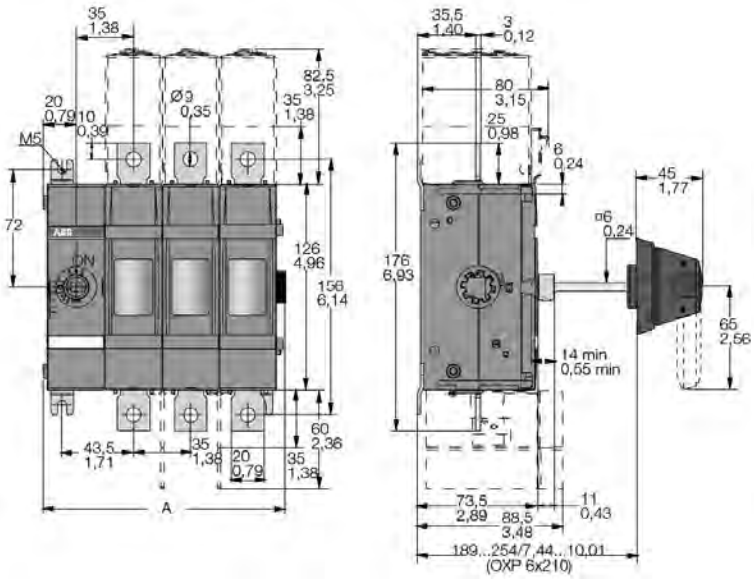
OTDC16...32US_, base or DIN rail mounted



Dimension [in]				
Number of poles	A	B	C	D
2	2.60	2.13	1.51	0.87
3	3.06	2.58	1.96	1.32
4	3.50	3.03	2.41	1.76

OTDC100...200US02

Picture may not match the exact catalogue number. Dimensions are correct.

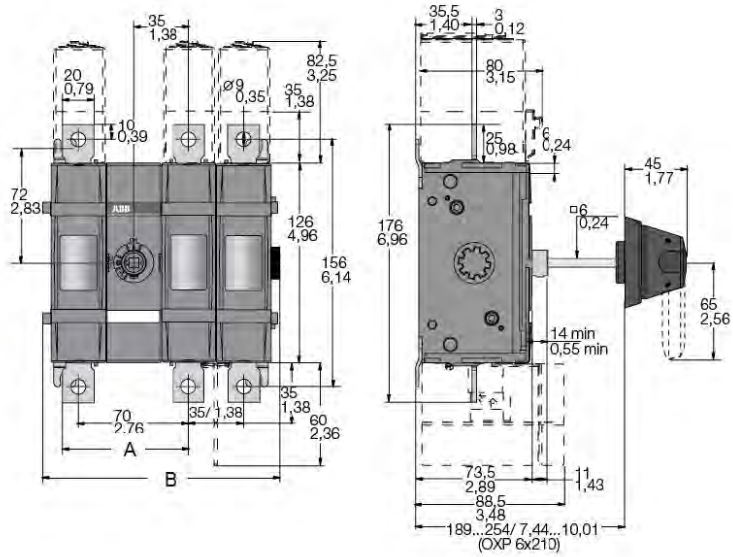


OTDC100, 200U02

[mm/in]	02
A	80/3,15
B	115,5/4,55

OTDC100...200US11/22

Picture may not match the exact catalogue number. Dimensions are correct.



OTDC100, 200U11...22

[mm/in]	11	22
A	80/3,15	115/4,53
B	115,5/4,55	185,5/7,31

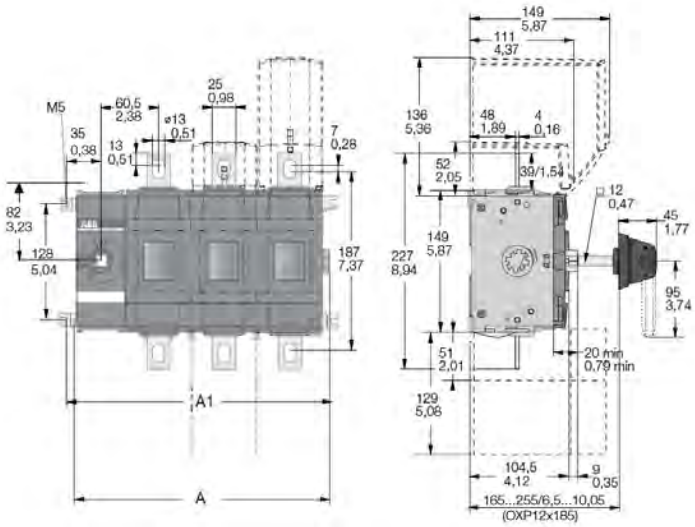
19

Approximate dimensions OTDC

00.00 [Millimeters]
00.00 Inches

OTDC250/320/400US_

Picture may not match the exact catalogue number. Dimensios are correct.

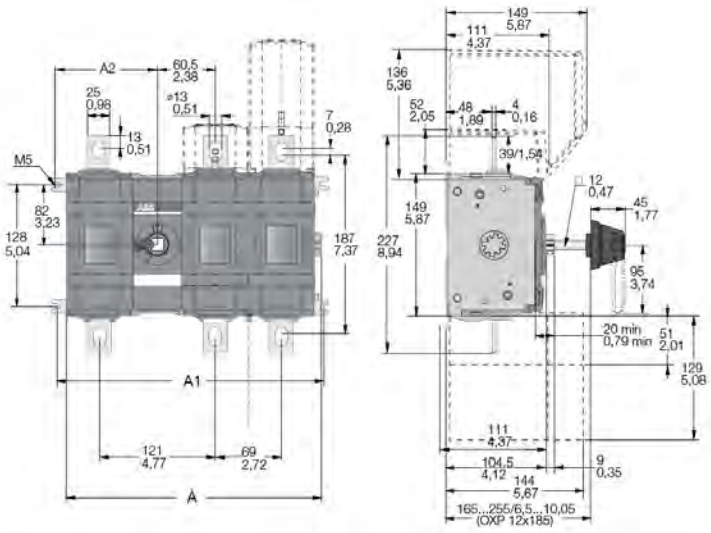


OTDC250, 320, 400U_

[mm/in]	02
A	199/7,84
A1	208/8,19

OTDC250/320/400/600US_

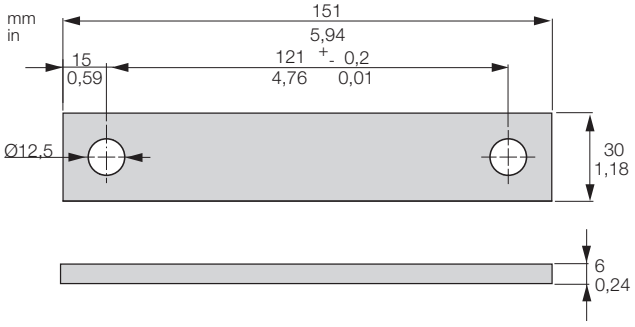
Picture may not match the exact catalogue number. Dimensios are correct.



OTDC250, 320, 400, 600U_

[mm/in]	11	12	22
A	197/7,76	266/10,48	335/13,2
A1	208/8,19	277/10,91	346/63

OTDCKIT400B101

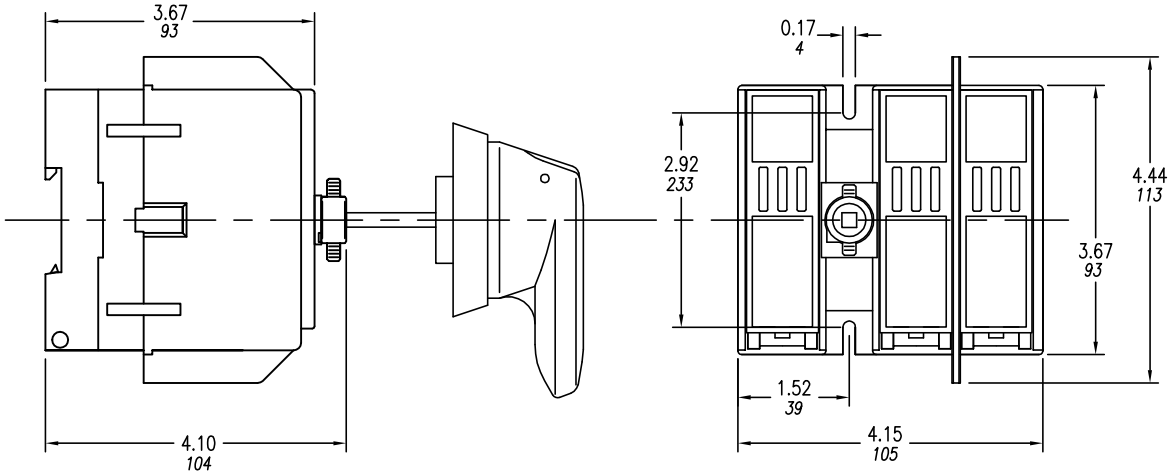


19

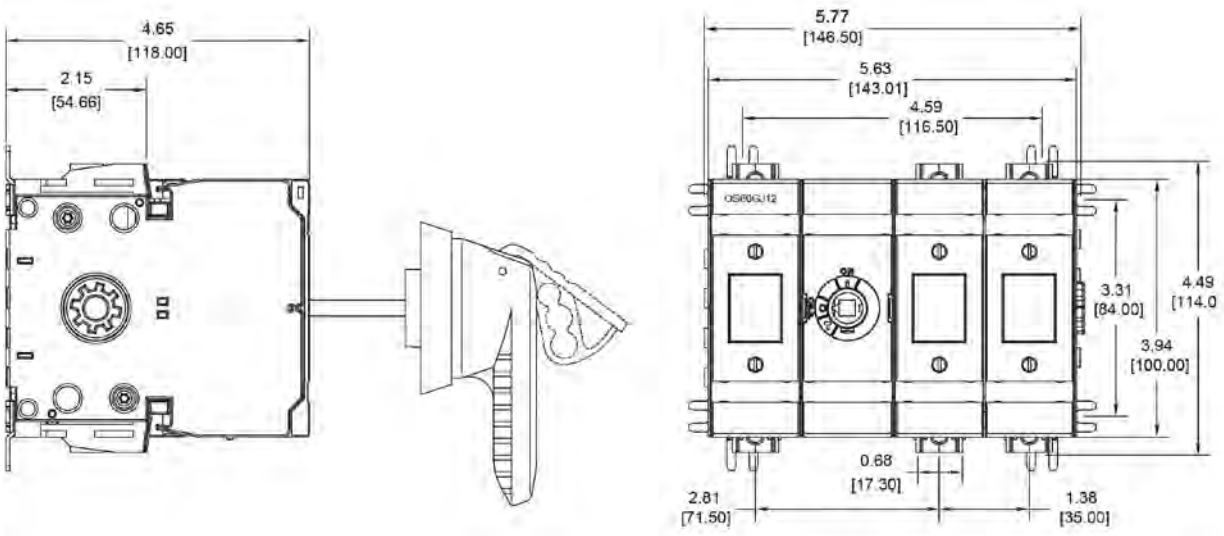
Approximate dimensions
OS30FA_12 — OS60GJ12

00.00 [Inches]
00.00 Inches

OS30FA_12

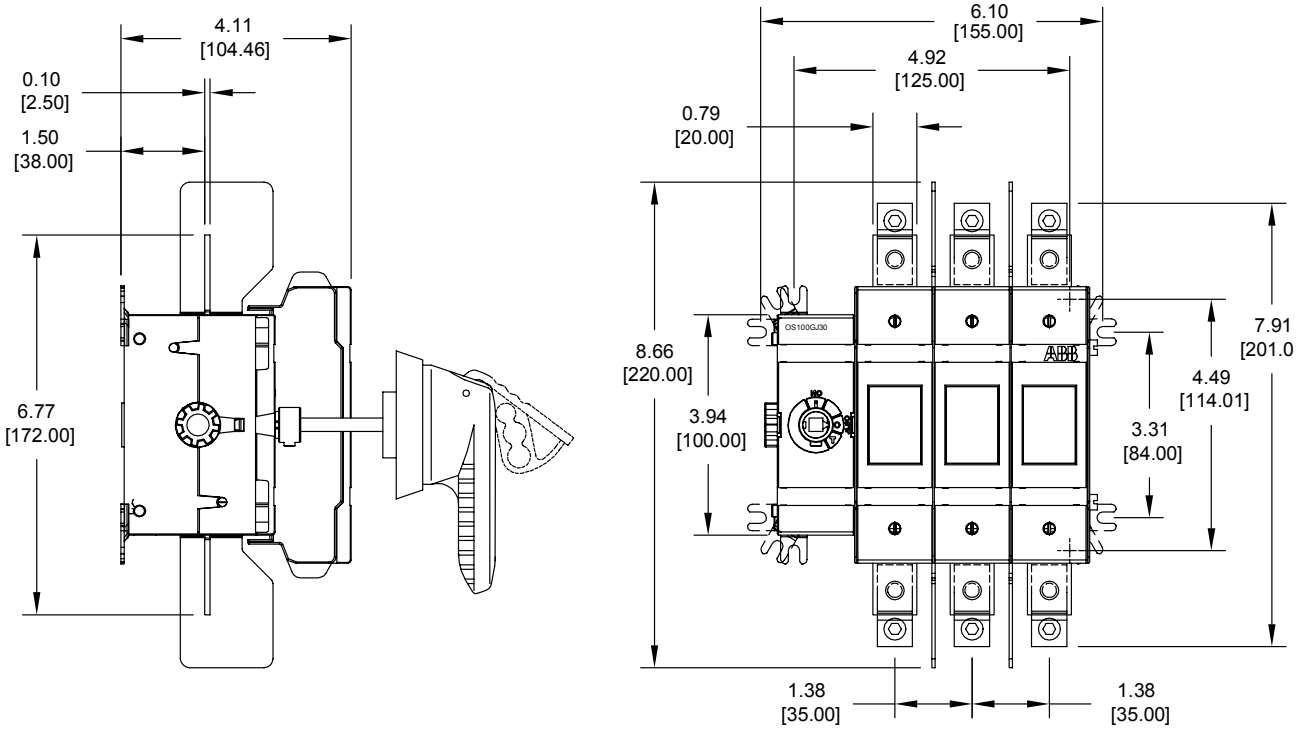


OS60GJ12

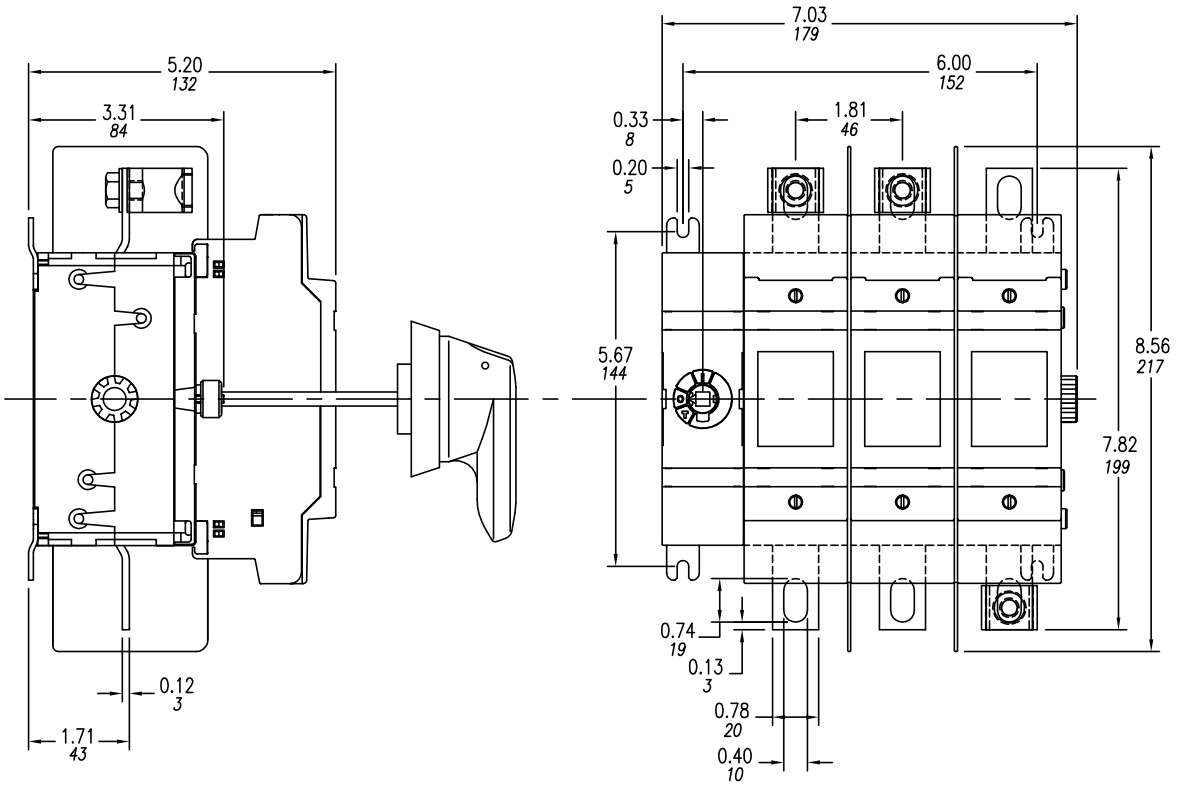


Approximate dimensions
OS100GJ03 — OS200J03

OS100GJ03



OS200J03

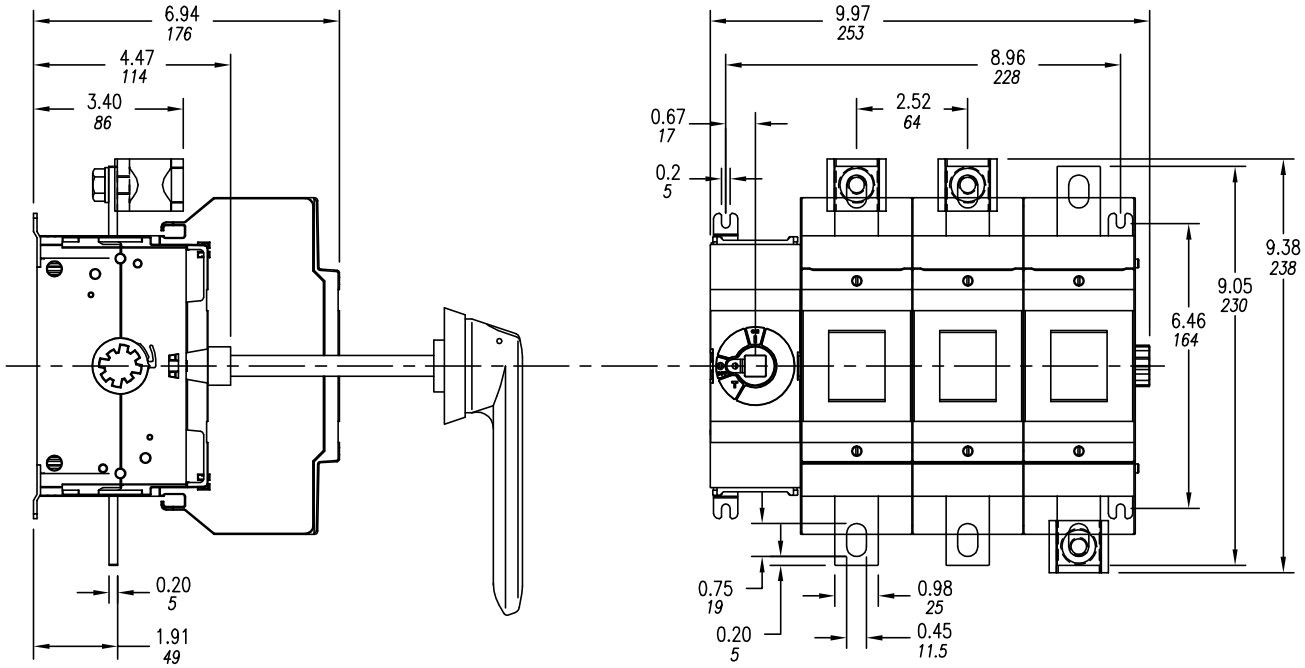


19

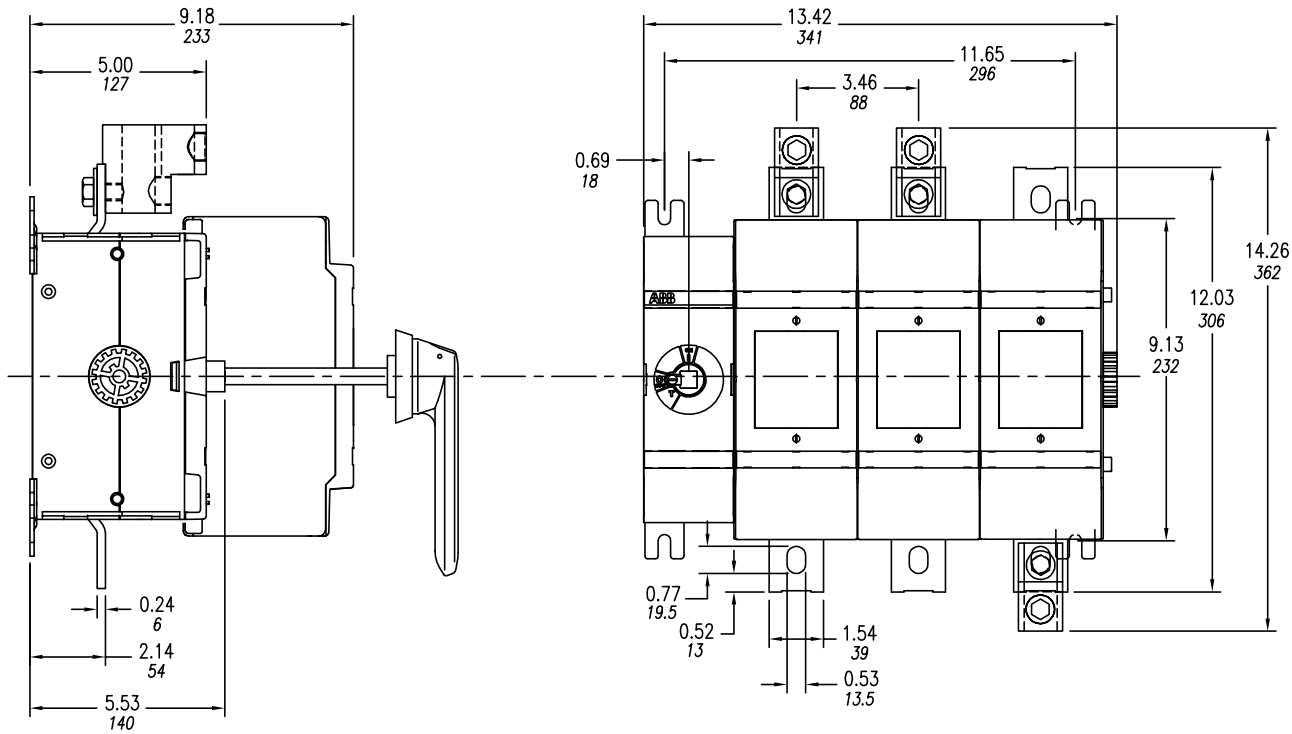
Approximate dimensions
OS400J03 — OS600J03

00.00 [Inches]
00.00

OS400J03

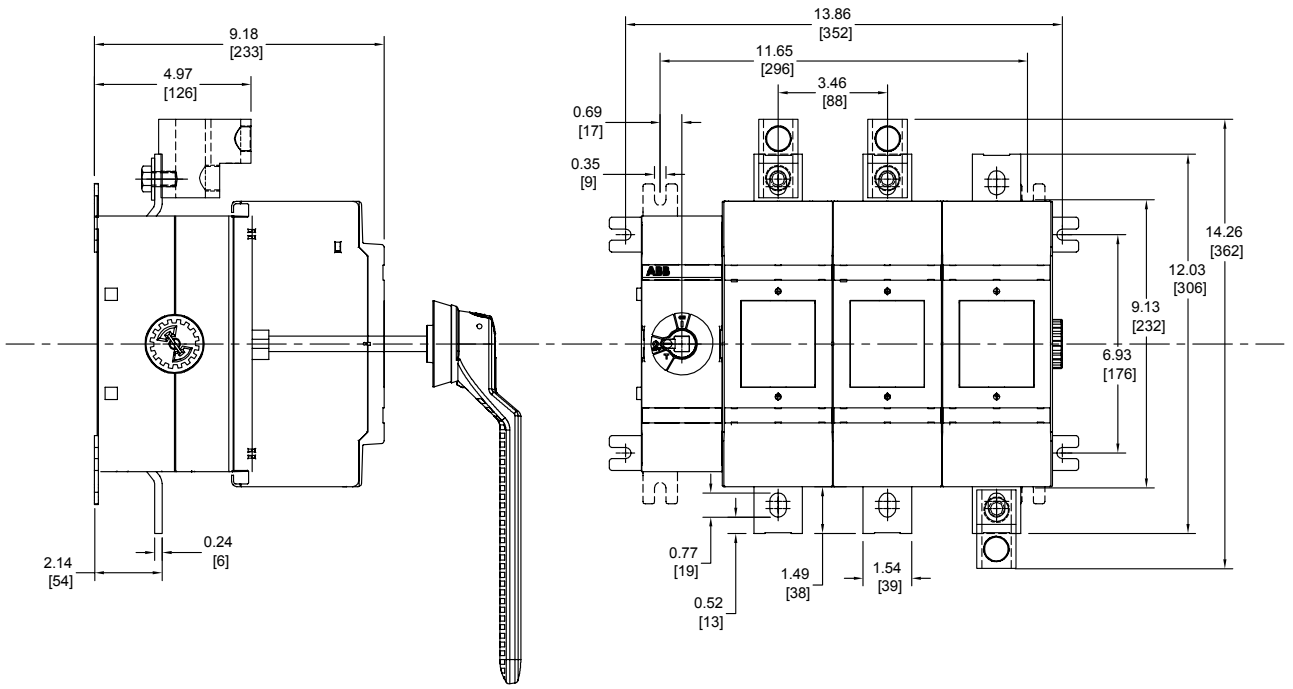


OS600J03

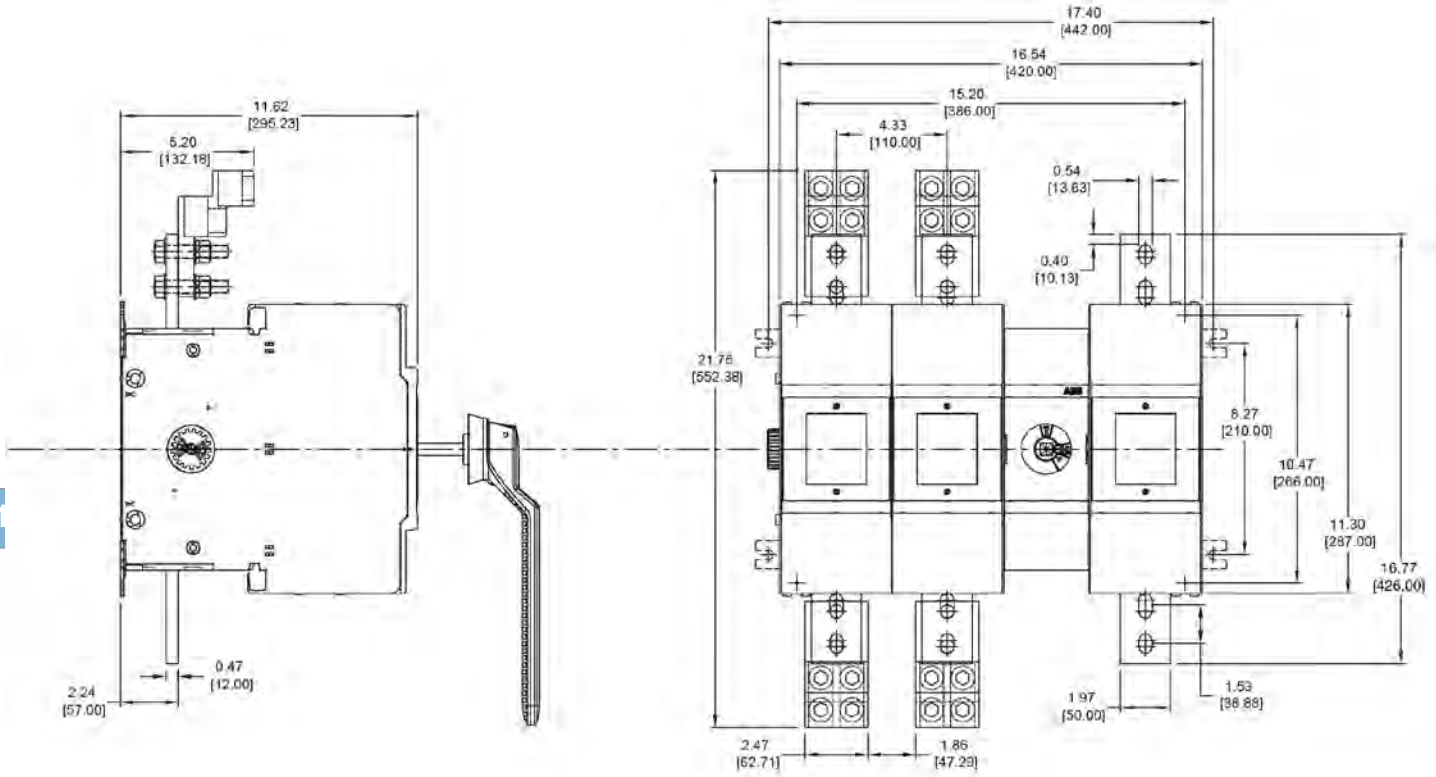


Approximate dimensions
OS800L03 — OS1200L03

OS800L03



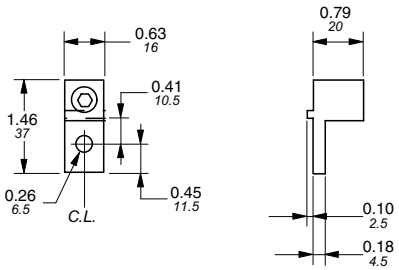
OS1200L03



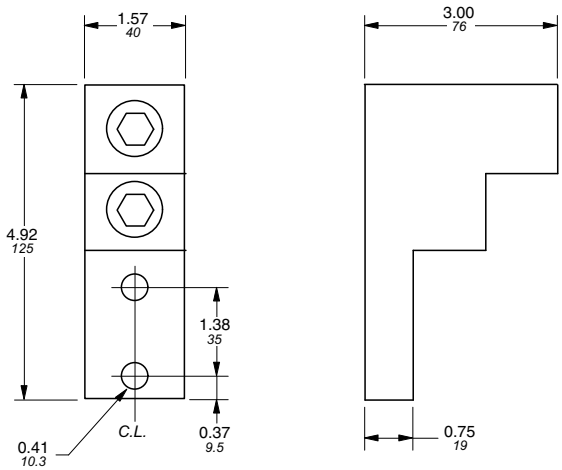
Approximate dimensions
for Terminal lugs

00.00 [Inches]
00.00

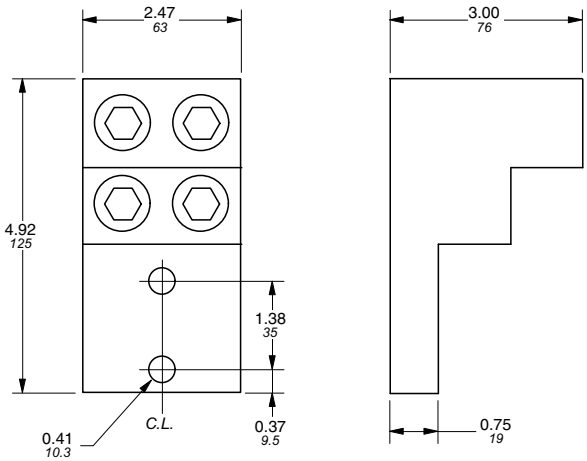
OZXA-24



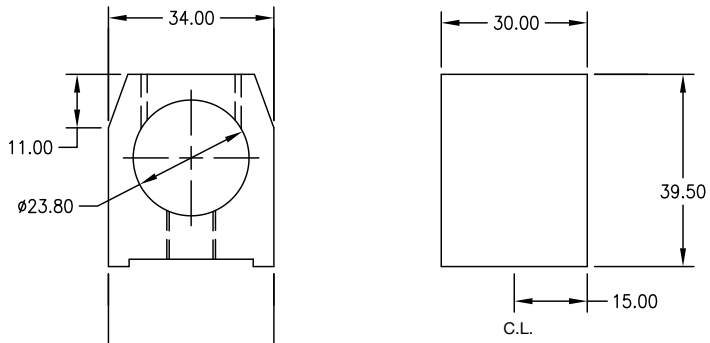
OZXA-30



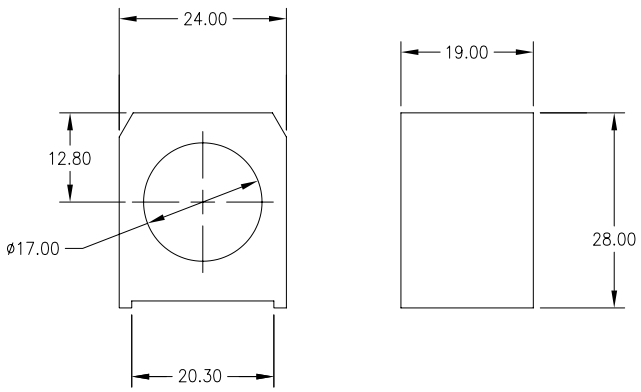
OZXA-28



OZXA-400



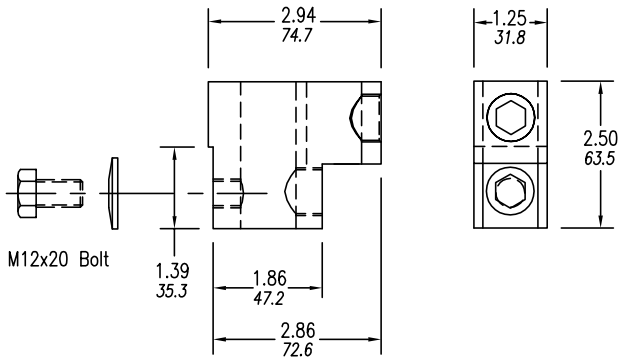
OZXA-200



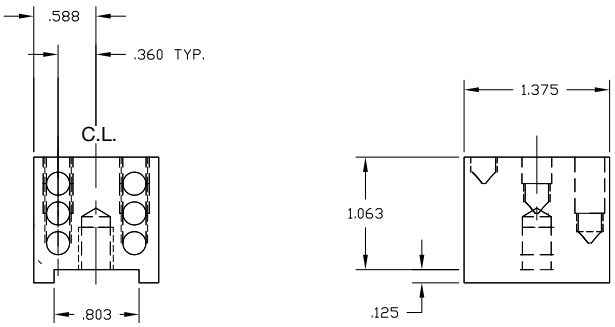
19

Approximate dimensions
for Terminal lugs

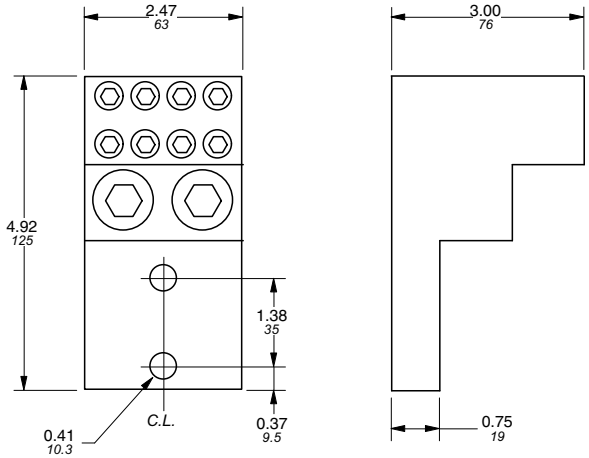
OZXA-800



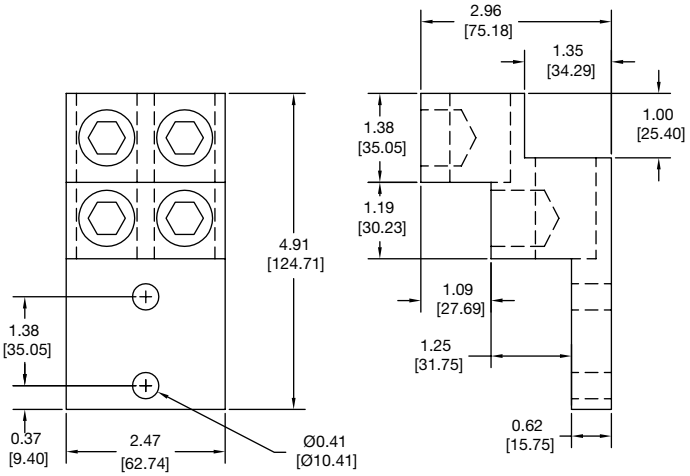
OZXA-406



OZXA-32



OZXA-1200

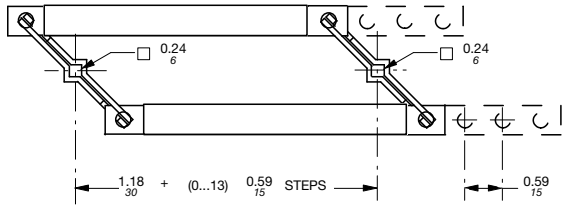


19

Approximate dimensions
for 16A – 100A conversion mechanisms

00.00 [Inches]
00.00

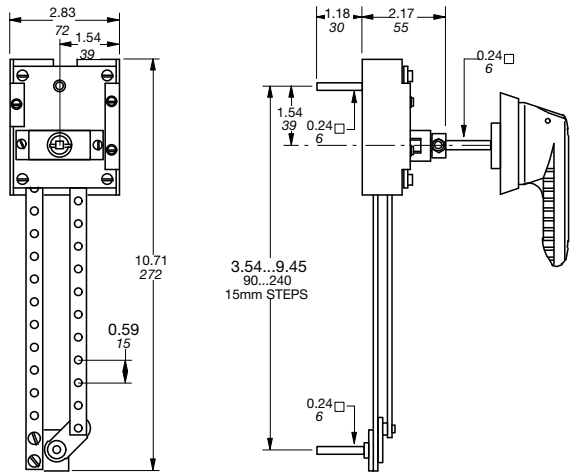
6 or 8 pole — OTZW8



For installation of 6 or 8 pole, transfer and bypass mechanisms, the following minimum and maximum mounting dimensions are given below.

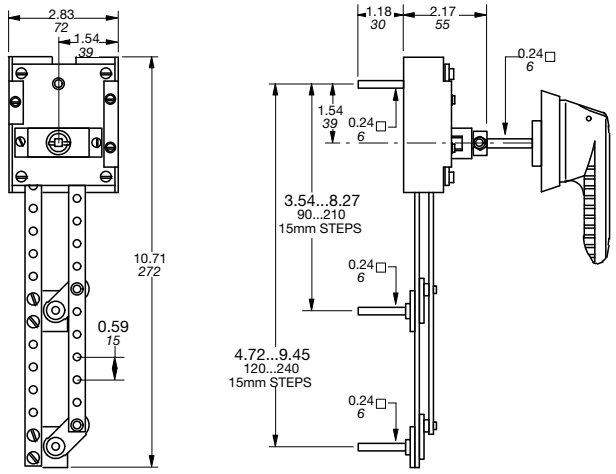
OTZW8 in combination with:	Minimum inches/mm	Maximum inches/mm
OT16F3, OT25F3, OT40F3	3.07/78	N/A
OT63F3, OT80F3	3.74/95	N/A
OT30F3, OT60F3, OT100F3	3.82/97	N/A

Double throw switch — OTZW6, OTZW6X



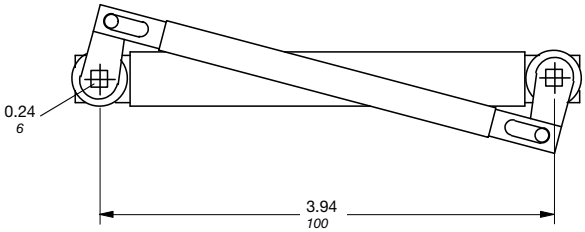
OESA-ZW1, OESA-ZW1X in combination with:	Minimum inches/mm	Maximum① inches/mm
OT16F3, OT25F3, OT40F3	4.61/117	6.57/167
OT63F3, OT80F3	5.31/135	7.28/185
OT30F3, OT60F3, OT100F3	4.84/123	6.81/173

Bypass switch — OTZW17, OTZW17X



OTZW17, OTZW17X in combination with:	Minimum inches/mm	Maximum① inches/mm
OT16F3, OT25F3, OT40F3	4.61/117	6.57/167
OT63F3, OT80F3	5.31/135	7.28/185
OT30F3, OT60F3, OT100F3	4.84/123	6.81/173

Mechanical interlock — OETL-ZW24

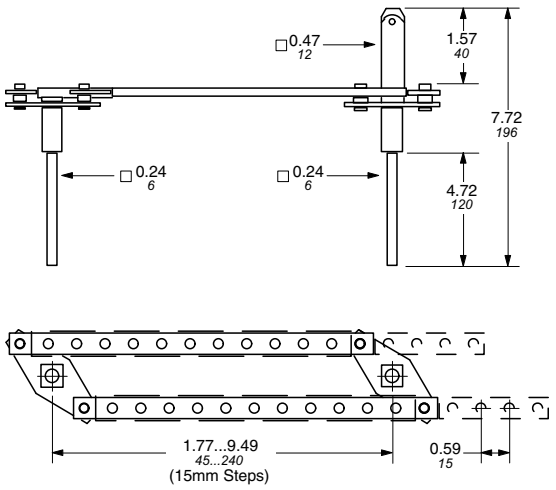


OETL-ZW24 in combination with:	Minimum inches/mm	Maximum① inches/mm
OT16F3, OT25F3, OT40F3	3.39 / 86	—
OT63F3, OT80F3	4.09 / 104	—
OT30F3, OT60F3, OT100F3	4.13 / 105	—

① Deeper enclosures will require a longer shaft. Please select a 6mm shaft from page 19.5.

Approximate dimensions
for 125 – 200A conversion mechanisms

6 or 8 pole — OESA-ZW2

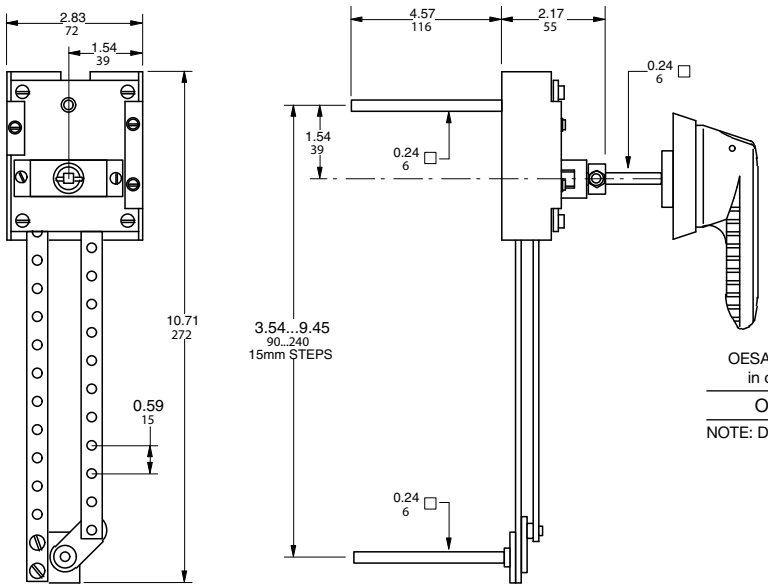


For installation of 6 or 8 pole, transfer and bypass mechanisms, the following minimum and maximum mounting dimensions are given below.

OESA-ZW2 in combination with:	Minimum inches/mm	Maximum inches/mm
OT160 - OT200	5.35/136	9.49/241

NOTE: Deeper enclosures will require a longer shaft. Please select a 12mm shaft from page 19.7 and an OETL-ZX95 shaft extension coupler from page 19.10.

Double throw switch — OESA-ZW1, OESA-ZW1X

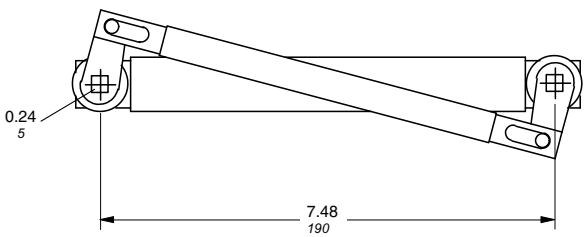


OESA-ZW1, OESA-ZW1X in combination with:	Minimum inches/mm	Maximum inches/mm
OT160 - OT200	4.61/117	6.57/167

NOTE: Deeper enclosures will require a longer shaft. Please select a 6mm shaft from page 19.7

19

Mechanical interlock — OTZW10



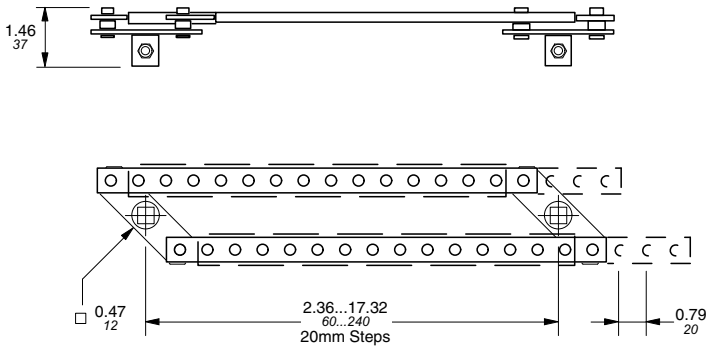
OTZW10 in combination with:	Minimum inches/mm	Maximum inches/mm
OT160 - OT200	4.13 / 105	—

NOTE: Deeper enclosures will require a longer shaft. Please select a 6mm shaft from page 19.7

Approximate dimensions
for 400A – 1200A conversion mechanisms

00.00 [Inches]
00.00

6 or 8 pole — OETL-ZW9

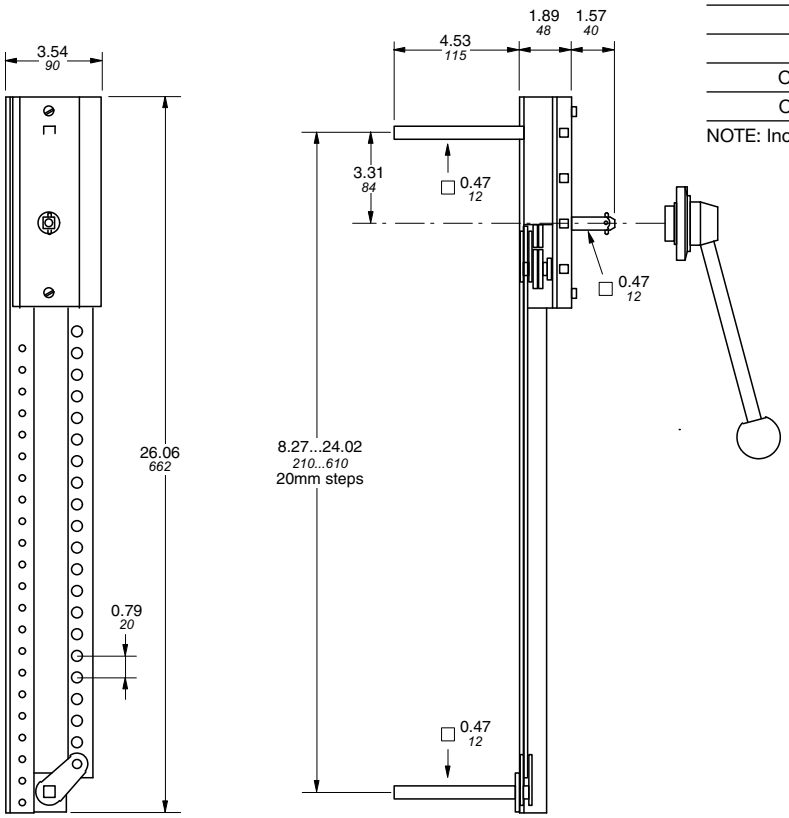


For installation of 6 or 8 pole, transfer and bypass mechanisms, the following minimum and maximum mounting dimensions are given below.

OETL-ZW9 in combination with:	Minimum inches/mm	Maximum inches/mm
OT400	7.52/191	N/A
OT600	7.52/191	N/A
OETL-NF800A	7.52/191	N/A
OETL-NF1200	7.52/191	N/A

NOTE: Handle not included

Double throw — OETL-ZW12



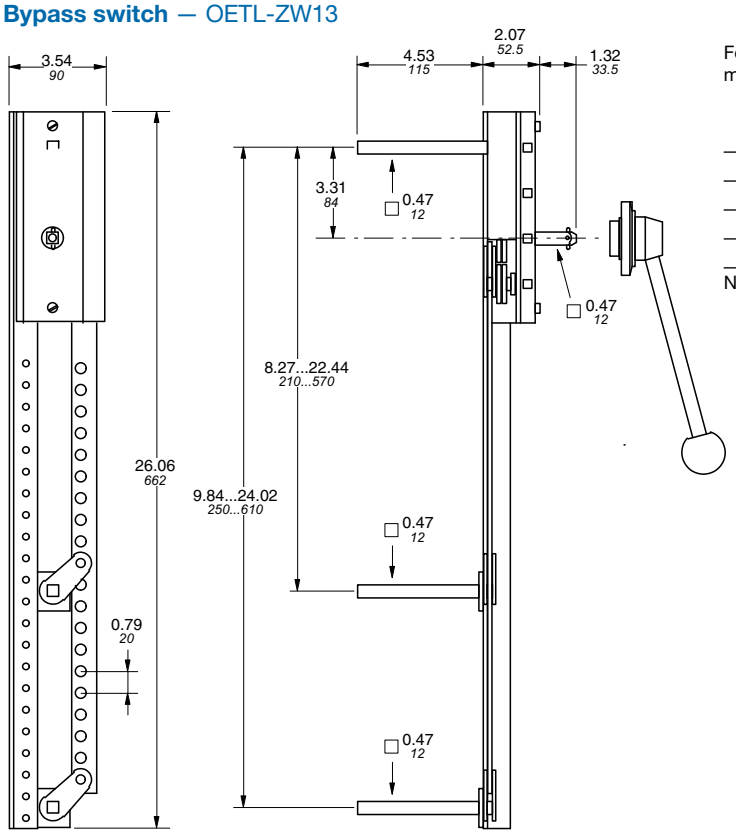
OETL-ZW12 in combination with:	Minimum inches/mm	Maximum① inches/mm
OT400	8.19/208	11.73/298
OT600	8.19/208	11.73/298
OETL-NF800A	8.19/208	11.73/298
OETL-NF1200	8.19/208	11.73/298

NOTE: Includes YASDA-21 handle

① Deeper enclosures will require a longer shaft. Please select a 12mm shaft from page 19.7 and an OETL-ZX95 shaft extension coupler from pg. 18.10.

Approximate dimensions
for 400A – 3150A conversion mechanisms

Bypass switch — OETL-ZW13

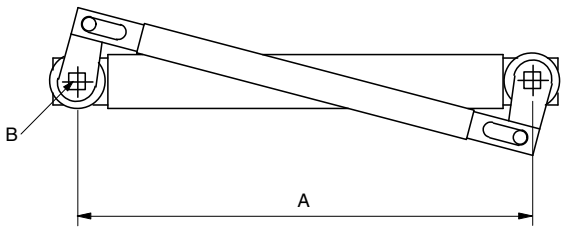


For installation of 6 or 8 pole, transfer and bypass mechanisms, the following minimum and maximum mounting dimensions are given below.

OETL-ZW12 in combination with:	Minimum inches/mm	Maximum① inches/mm
OT400	8.19/208	11.73/298
OT600	8.19/208	11.73/298
OETL-NF800A	8.19/208	11.73/298
OETL-NF1200	8.19/208	11.73/298

NOTE: Includes YASDA-21 handle

Mechanical interlock — OETL-ZW3, OETL-ZW14, OETL-ZW15



Dimensions in Inches & *mm*

	A	B
OETL-ZW3	11.81 *300.0*	0.47 *12.0*
OETL-ZW14	9.84 *250.0*	0.47 *12.0*
OETL-ZW15	19.69 *500.0*	0.47 *12.0*

OETL-ZW3, 14 & 15 in combination with:	Minimum inches/mm	Maximum① inches/mm
OT400 & OT600	6.50/165	—
OETL-NF800 – OETL-NF1200	6.30/160	—
OETL-NF1600 – OETL-NF3150	12.00/305	—

NOTE: Handle(s) not included.

NOTE: OETL-ZW15 is the only mechnical interlock OETL-NF1200 – OETL-NF3150 can use.

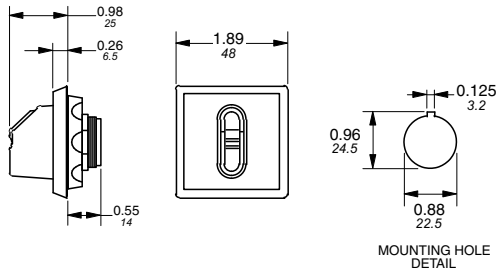
① Deeper enclosures will require a longer shaft. Please select a 12mm shaft from page 19.7 and an OETL-ZX95 shaft extension coupler from page 19.10.

Approximate dimensions
for Handles

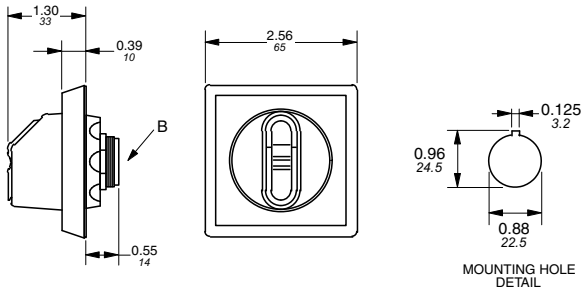
00.00 [Inches]
00.00

Selector handles for base and DIN rail mounted switches

OH_S1AH1 & OH_S3AH1

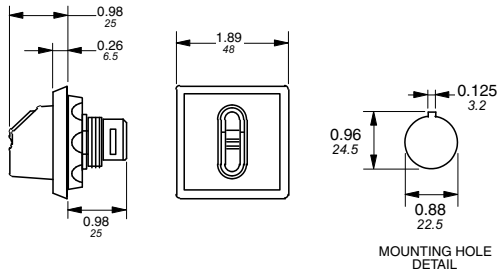


OH_S2A_

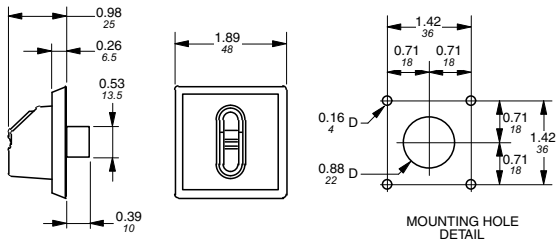


Selector handles for door mounted switches

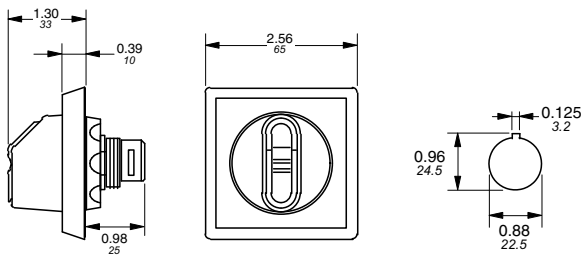
OH_S1P_ & OH_S3P_



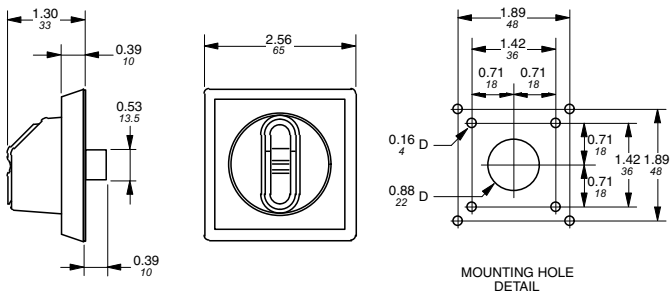
OH_S1R_ & OH_S3R_



OH_S2P_



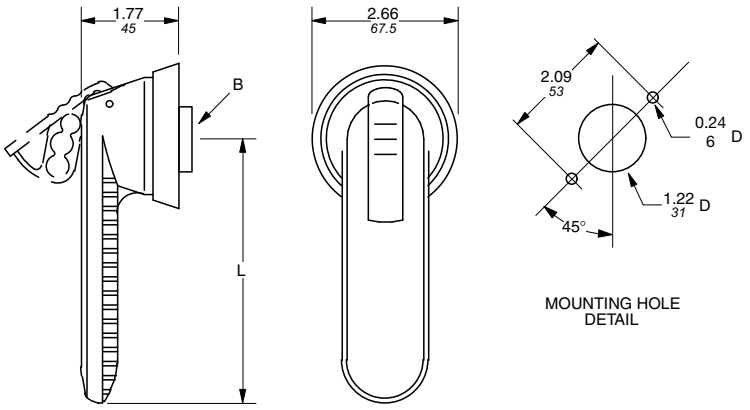
OH_S2R_



19

Approximate dimensions
for Handles

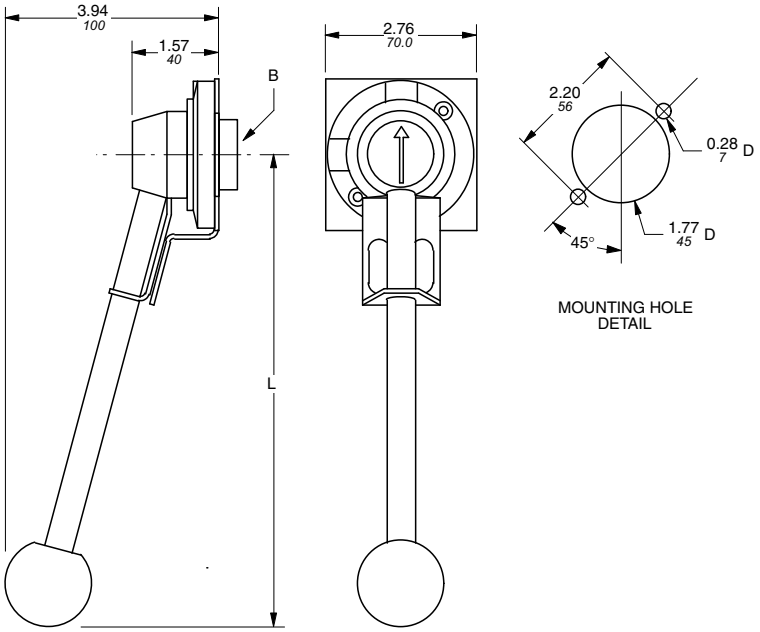
Pistol handles



MOUNTING HOLE DETAIL

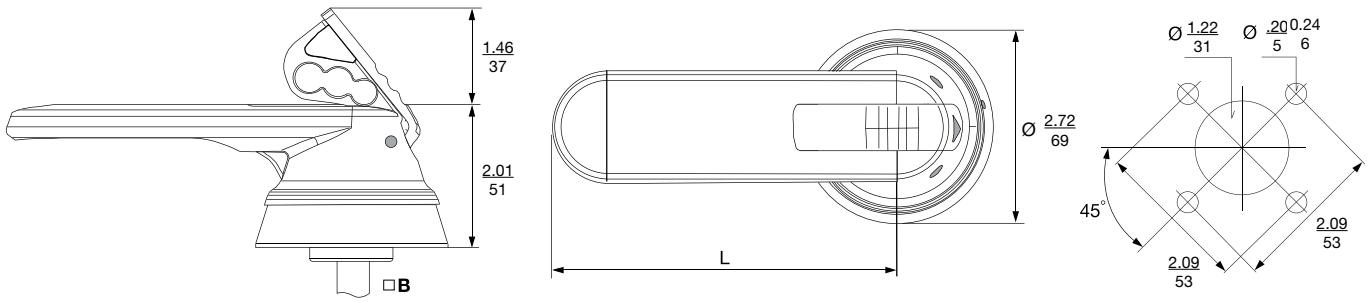
A Catalog number	L Inches/ mm	□B Shaft size Inches/ mm	NEMA / UL Type
OH_45J6	1.8/45	0.24/6	1, 3R, 12
OH_65J6	2.6/65	0.24/6	1, 3R, 12
OH_80J6	3.1/80	0.24/6	1, 3R, 12
OH_125J12	4.9/125	0.47/12	1, 3R, 12
OH_145J12	5.7/145	0.47/12	1, 3R, 12
OH_175J12	6.9/175	0.47/12	1, 3R, 12
OH_80L6	3.1/80	0.24/6	1, 3R, 4, 4X, 12
OH_145L12	5.7/145	0.47/12	1, 3R, 4, 4X, 12
OH_175L12	6.9/175	0.47/12	1, 3R, 4, 4X, 12

__ = Handle color, B (Black) or Y (Red/Yellow)



MOUNTING HOLE DETAIL

A catalog number	L inches/mm	□B Shaft size inches/mm	NEMA Type
YASDA-7	8.66/220	0.47/12	1, 3R, 4, 4X, 12
YASDA-8	8.66/220	0.47/12	1, 3R, 4, 4X, 12
YASDA-21	8.66/220	0.47/12	1, 3R, 4, 4X, 12
YASDA-6	12.60/320	0.47/12	1, 3R, 4, 4X, 12

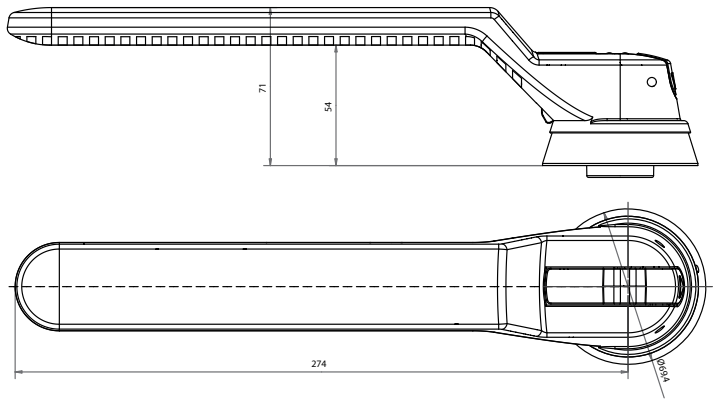


Handle type	OHM65L6	OHM125L12	OHM175L12	OHM275L12
L	2.6/65	4.9/125	6.9/175	10.8/225
□B	.24/6	.47/12	.47/12	.47/12

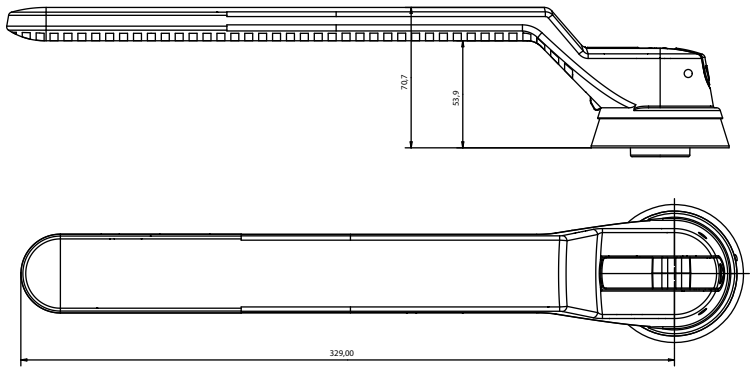
Approximate dimensions
for Handles

00.00 [Inches]
00.00

OH_274_12



OH_330_12



A Catalog number	L inches/mm	B shaft size inches/mm	NEMA Type
OHB274-330	10.75/274	0.47/12	1, 3R, 4, 4X, 12

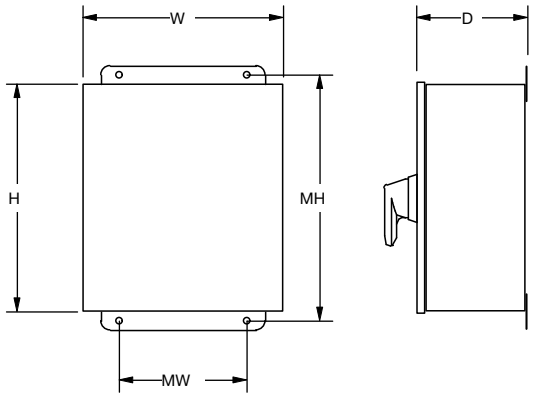
Approximate dimensions
2, 3 & 4 Pole ②
30A – 1200A Fusible

Fusible

Frame size	Enclosure type	H height	W width	D depth	MH mtg. height	MW mtg. width	Weight
OS30_	1	10.0	8.0	6.0	7.0	7.0	12
	3R	10.0	8.0	6.0	10.75	6.0	12
	4	10.0	8.0	6.0	10.75	6.0	12
	4X SS	10.0	8.0	6.0	10.75	6.0	12
	4X Plastic	10.0	8.0	8.0	10.75	6.0	8.0
	12	10.0	8.0	6.0	10.75	6.0	12
OS60_	1	14.0	12.0	8.0	7.0	7.0	13
	3R	14.0	12.0	8.0	10.75	6.0	13
	4	14.0	12.0	8.0	10.75	6.0	13
	4X SS	14.0	12.0	8.0	10.75	6.0	13
	4X Plastic	10.0	8.0	8.0	10.75	6.0	9.0
	12	14.0	12.0	8.0	10.75	6.0	13
OS100_	1	14.0	12.0	8.0	11.0	9.0	22
	3R	14.0	12.0	8.0	14.75	10.0	22
	4	14.0	12.0	8.0	14.75	10.0	22
	4X SS	14.0	12.0	8.0	14.75	10.0	22
	4X Plastic	14.0	12.0	8.0	14.75	10.0	16
	12	14.0	12.0	8.0	14.75	10.0	22
OS200_	1	24.0	16.0	8.0	25.5	14.5	75
	3R	24.0	16.0	8.0	25.5	14.5	75
	4	24.0	16.0	8.0	25.5	14.5	75
	4X SS	24.0	16.0	8.0	25.5	14.5	75
	4X Plastic	①	①	①	①	①	①
	12	24.0	16.0	8.0	25.5	14.5	75

Frame size	Enclosure type	H height	W width	D depth	mtg. height	MW mtg. width	Weight
OS400_	1	44.0	22.0	11.0	37.5	22.5	150
	3R	44.0	22.0	11.0	37.5	22.5	150
	4	44.0	22.0	11.0	37.5	22.5	150
	4X SS	44.0	22.0	11.0	37.5	22.5	150
	4X Plastic	①	①	①	①	①	①
	12	44.0	22.0	11.0	37.5	22.5	150
OS600_	1	42.0	36.0	12.0	43.5	34.5	150
	3R	42.0	36.0	12.0	43.5	34.5	150
	4	42.0	36.0	12.0	43.5	34.5	150
	4X SS	42.0	36.0	12.0	43.5	34.5	150
	4X Plastic	①	①	①	①	①	①
	12	42.0	36.0	12.0	43.5	34.5	150
OS800_	1	48.0	24.0	12.0	49.5	22.5	170
	3R	48.0	24.0	12.0	49.5	22.5	170
	4	48.0	24.0	12.0	49.5	22.5	170
	4X SS	48.0	24.0	12.0	49.5	22.5	170
	4X Plastic	①	①	①	①	①	①
	12	48.0	24.0	12.0	49.5	22.5	170
OS1200_	1	60.0	36.0	12.8	62	38	200
	3R	60.0	36.0	12.8	62	38	200
	4	60.0	36.0	12.8	62	38	200
	4X SS	60.0	36.0	12.8	62	38	200
	4X Plastic	①	①	①	①	①	①
	12	60.0	36.0	12.8	62	38	200

① Please consult factory, enclosures are sized to suit specific customer needs.
② Some 4-pole switches require larger enclosures. Please consult factory.



00.00 [Inches]
00.00

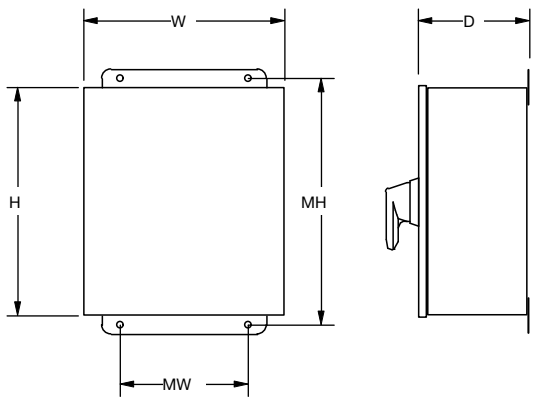
Approximate dimensions
2, 3 & 4 Pole ③
16A – 3150A, Non-fusible

Non-Fusible

Frame size	Enclosure type	H height	W width	D depth	MH mtg. height	MW mtg. width	Weight
OT16_ OT25_ OT40_	1	6.0	6.0	4.0	4.0	4.0	4.0
	3R	6.0	6.0	4.0	7.75	3.0	4.0
	4	6.0	6.0	4.0	6.75	4.0	4.0
	4X SS	6.0	6.0	4.0	7.75	3.0	4.0
	4X Plastic	6.0	6.0	5.9	6.75	4.0	4.0
	12	6.0	6.0	4.0	7.75	3.0	4.0
OT63_ OT80_	1	8.0	6.0	4.0	7.0	5.0	6.0
	3R	8.0	6.0	4.0	8.75	4.0	6.0
	4	8.0	6.0	4.0	8.75	4.0	6.0
	4X SS	8.0	6.0	4.0	8.75	4.0	6.0
	4X Plastic	8.0	6.0	5.9	8.75	4.0	6.0
	12	8.0	6.0	4.0	8.75	4.0	6.0
OT30 OT60 OT100	1	10.0	8.0	5.0	7.0	7.0	9.0
	3R	10.0	8.0	5.0	10.75	6.0	9.0
	4	10.0	8.0	5.0	10.75	6.0	9.0
	4X SS	10.0	8.0	5.0	10.75	6.0	9.0
	4X Plastic	10.0	8.0	5.9	10.75	6.0	9.0
	12	10.0	8.0	5.0	10.75	6.0	9.0

Frame size	Enclosure type	H height	W width	D depth	MH mtg. height	MW mtg. width	Weight
OT200	1	24.0	16.0	8.0	25.5	14.5	50
	3R	24.0	16.0	8.0	25.5	14.5	50
	4	24.0	16.0	8.0	25.5	14.5	50
	4X SS	24.0	16.0	8.0	25.5	14.5	50
	4X Plastic	25.0	17.0	10.0	25.5	14.5	40
	12	24.0	16.0	8.0	25.5	14.5	50
OT400	1	44.0	22.0	11.0	37.5	22.5	120
	3R	44.0	22.0	11.0	37.5	22.5	120
	4	①	①	①	①	①	①
	4X SS	36.0	24.0	12.0	37.5	22.5	130
	4X Plastic	①	①	①	①	①	①
	12	36.0	24.0	8.0	37.5	22.5	120
OT600	1	44.0	22.0	11.0	37.5	22.5	120
	3R	36.0	24.0	12.0	37.5	22.5	120
	4	36.0	24.0	12.0	37.5	22.5	120
	4X SS	36.0	24.0	12.0	37.5	22.5	120
	4X Plastic	40.0	32.0	13.0	41.2	30.2	120
	12	36.0	24.0	12.0	37.5	22.5	120
OT800 - OT1200	1	60.0	36.0	12.0	61.5	34.5	200
	3R	60.0	36.0	12.0	61.5	34.5	200
	4	60.0	36.0	12.0	61.5	34.5	200
	4X SS	60.0	36.0	12.0	61.5	34.5	200
	4X Plastic	①	①	①	①	①	①
	12	60.0	36.0	12.0	61.5	34.5	200
OETL-NF1600 OETL-NF2000 OETL-NF3150	1	90.0	36.0	24.0	②	②	600
	3R	90.0	36.0	24.0	②	②	600
	4	①	①	①	①	①	①
	4X SS	①	①	①	①	①	①
	4X Plastic	①	①	①	①	①	①
	12	90.0	36.0	24.0	②	②	600

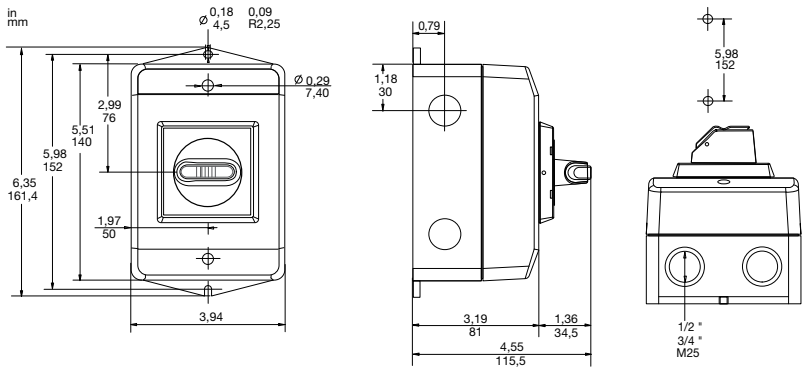
① Please consult factory, enclosures are sized to suit specific customer needs.
② Enclosure is free standing.
③ Some 4-pole switches require larger enclosures. Please consult factory.



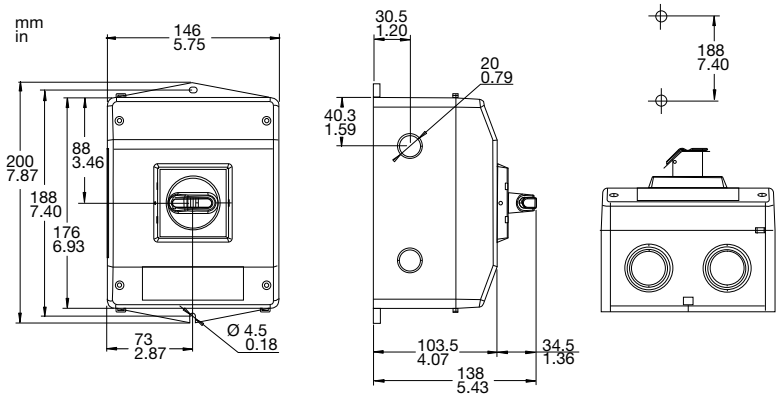
600V, 16A - 3150A
2, 3 and 4-pole switches
Enclosure dimensions

eOT Enclosed switches
Approximate dimensions
eOT16_ - eOT45U

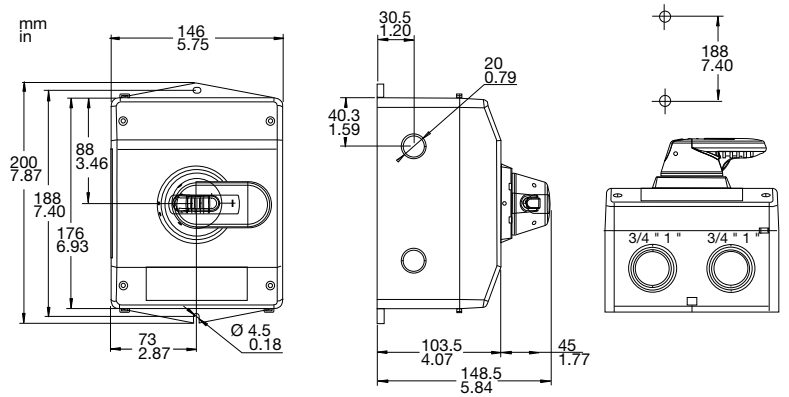
eOT16_, eOT32_ (enclosure size 1)



eOT45U_ (enclosure size 2 with selector handle)



eOT45U_ (enclosure size 2 with pistol grip handle)

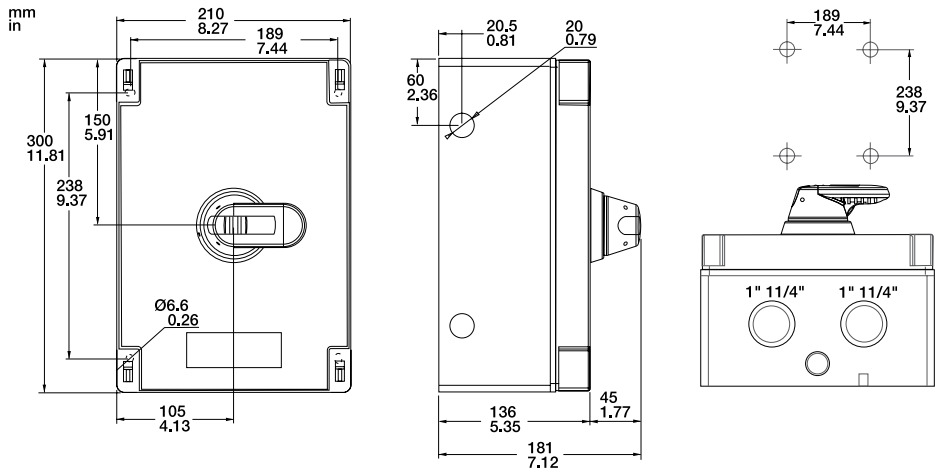


19

eOT Enclosed manual motor controllers
Approximate dimensions
eOT63_

00.00 [Inches]
00.00

eOT63_ (enclosure size 3 with pistol grip handle)



Notes

AJT

TIME DELAY / CLASS J

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.

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

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

A

Standard Fuse Ampere Ratings, Catalog Numbers

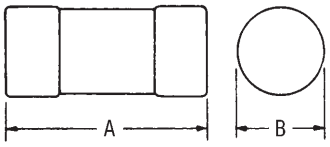
AMPERE RATING	CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER
1	AJT1	4-1/2	AJT4-1/2	25	AJT25	125	AJT125
1-1/4	AJT1-1/4	5	AJT5	30	AJT30	150	AJT150
1-1/2	AJT1-1/2	5-6/10	AJT5-6/10	35	AJT35	175	AJT175
1-6/10	AJT1-6/10	6	AJT6	40	AJT40	200	AJT200
1-8/10	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				

Note: Indicator Not availible (1-7a)

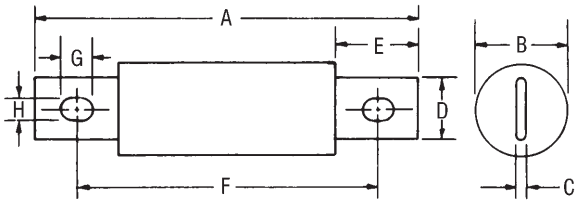
Recommended Fuse Blocks With Box Connectors for Amp-trap® Class J Fuses

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.



1-60A

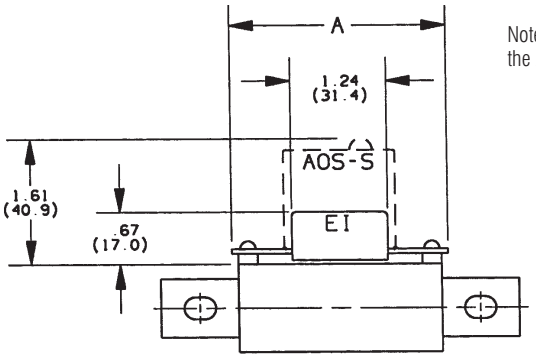


70-600A

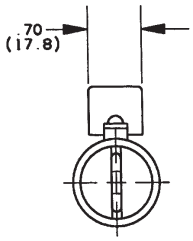
Dimensions

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:



Note: Fuses with the EI option will receive the AOS-S or AOS-Q Add-On-Switch

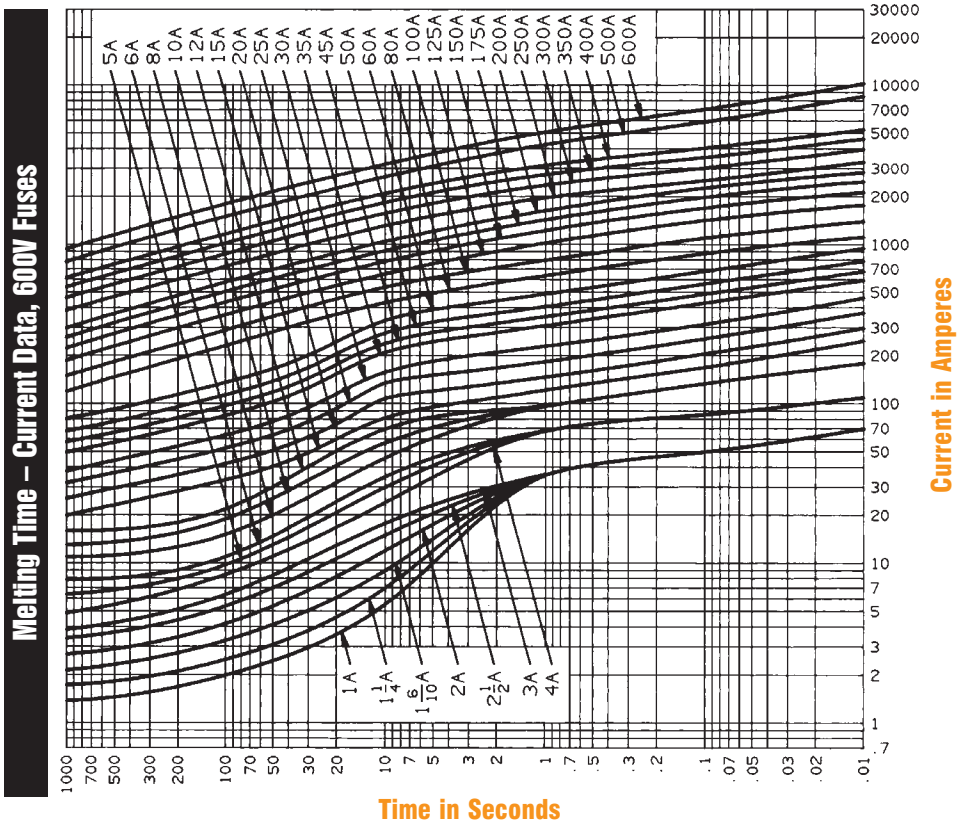


CATALOG NUMBER	A
AJT(70-100)-EI	2.80 (71.0)
AJT(110-200)-EI	3.22 (81.8)
AJT(225-400)-EI	3.24 (82.2)
AJT(450-600)-EI	3.61 (91.8)

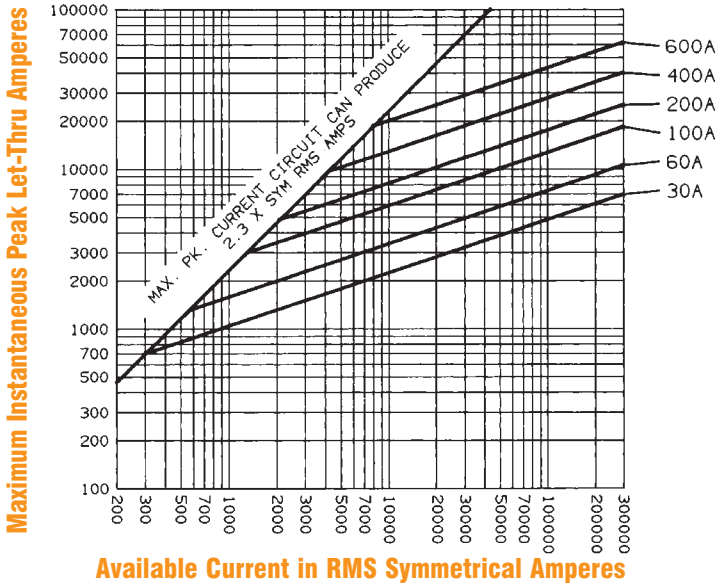
TIME DELAY / CLASS J FUSES

AJT

AJT1 to 600



Peak Let-Thru Current Data – AJT30 to 600, 600 Volts AC



Note: See Application Tables page L9 for Three Phase Class J AJT Fuses.

Group A

Primary Voltage: **600/480** | 575/460 | 550/440
Secondary Voltage: **120 x 240** | 115 x 230 | 110 x 220

60 Hertz

VA Rating	CE VA Rating	Catalog Number	Mtg. Fig.	Output Amps	Overall Dimensions			Mounting Centers		Mounting Slot	Height with Finger Guard	Height with Fuse Block Adapter	Approx. Ship Weight Lbs.
					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
1000	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
1500	1000	**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
2000	1300	**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
3000	2000	**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
5000	3000	**SP5000ACP**	C	41.7/20.8	8.98	9.88	7.76	7.40	7.13	0.44 x 1.00	N/A	N/A	93

Primary and Secondary voltage links/jumpers supplied standard with all transformers.
Special voltages and VA sizes available upon request.
All dimensions in inches
[1] Note: For 750 through 2000 VA units actual overall depth is 0.24" plus the value in column B.
*** See page 10 for dimensional drawings.**

Group B

Primary Voltage: **600** | 575 | 550
Secondary Voltage: **12 x 24** | 11.5 x 23 | 11 x 22

60 Hertz

VA Rating	CE VA Rating	Catalog Number	Mtg. Fig.	Output Amps	Overall Dimensions			Mounting Centers		Mounting Slot	Height with Finger Guard	Height with Fuse Block Adapter	Approx. Ship Weight Lbs.
					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

Primary and Secondary voltage links/jumpers supplied standard with all transformers.
Special voltages and VA sizes available upon request.
All dimensions in inches
*** See page 10 for dimensional drawings.**

Features and Benefits

- Molded terminal blocks for primary and secondary connections up to 3000 VA or 30 amps. Coil face termination over 3000 VA or 30 amps.
- All terminal blocks utilize a combination slot/Phillips #6 screw with a SEMS washer (Suitable for 18 AWG to 14 AWG for solid wire and 18 AWG to 12 AWG for stranded wire). Coil face terminations utilize a ¼-20 UNC X 0.50" combination slot/Phillips screw and a spring lock washer.
- 50/60 Hz (60 Hz on SP***ACP and SP***AR).
- Copper wound coils with high dielectric strength insulation.
- CSA Certifie (fil LR 3902), UL Listed (fil E50394), CE Marked and RoHS Compliant.
- Meets NEMA standards.
- Superior insulating materials. The HPS Spartan offers the following insulation systems:
  Up to 1500 VA: 80°C rise,
  130°C temperature class (B)
  2000 VA to 5000 VA: 115°C rise,
  180°C temperature class (F)
- Most HPS Spartan units incorporate "Premium Packaging" which feature:
  - Premium flute cartons
  - Custom molded foam inserts
  - Easy removal and repacking
  - Industry's best box label
- All HPS Spartan units are supplied with trilingual installation and wiring instruction sheets.
- All units supplied with primary and secondary voltage links/jumpers.
- All HPS Spartan® transformers are Vacuum Impregnated with Polyester Resin and oven cured.
- Bolted core construction.
- Bolt-on mounting brackets.
- 15 year warranty.

Dimensional Drawings

Some actual transformer units may differ from dimensional drawings shown below.

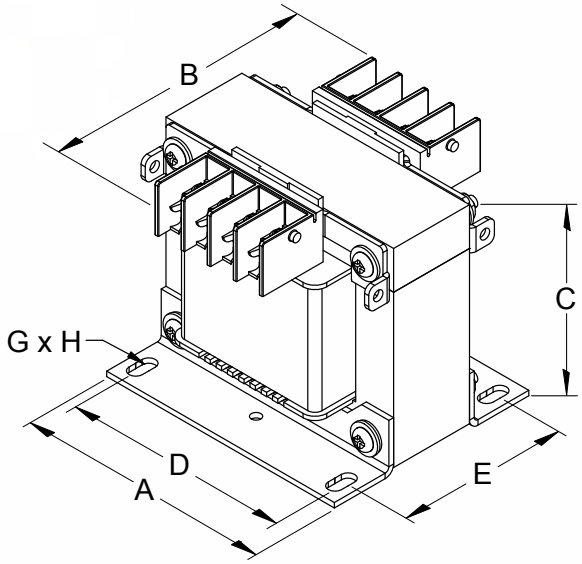


FIGURE A

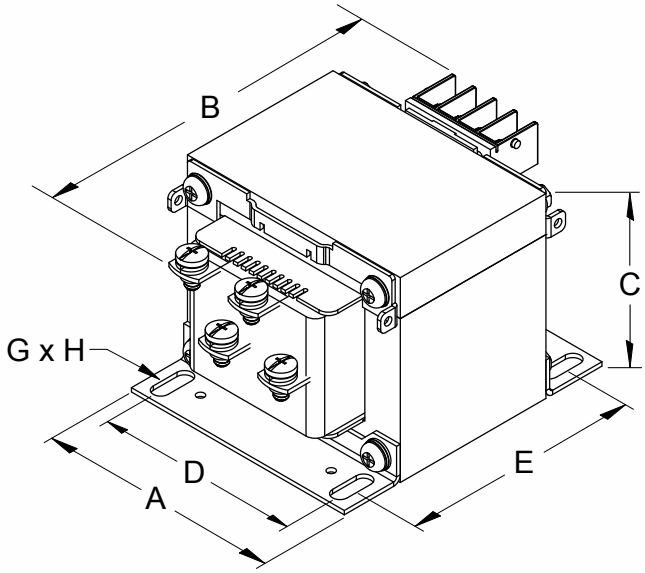


FIGURE B

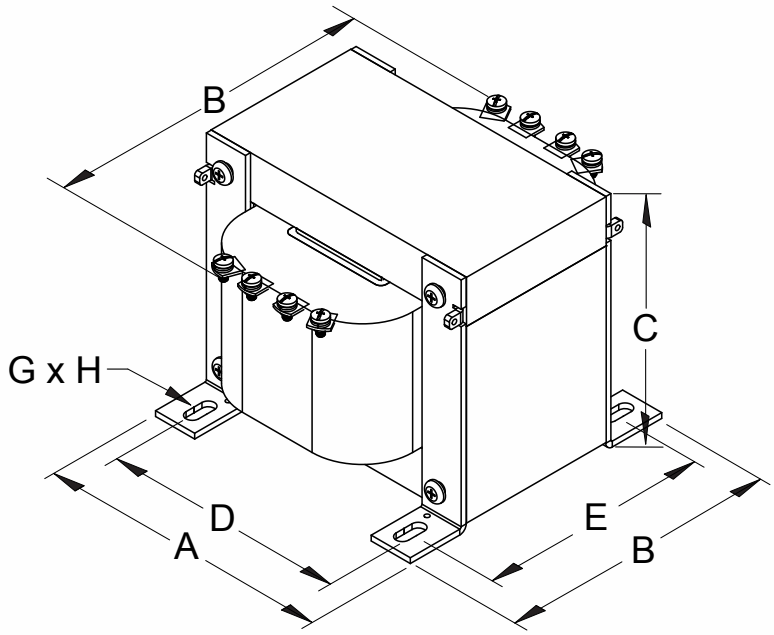


FIGURE C

H721LC

c UL us LISTED CE

Hawkeye® 721LC

Solid-Core Current Transducer, 4-20mA Output

Installer's Specifications

Amperage Range	0-10/20/40 Amps (slide switch selectable)
Sensor Power	30mA (max)@12-30VDC
Insulation Class	600VAC RMS (UL), 300VAC RMS (CE)
Frequency	50/60Hz
Temperature Range	-15° to 60°C (5° to 140°F)
Humidity Range	10-90% RH, non-condensing
Accuracy	±2%FS from 10% - 100% of selected range, but not less than ±0.4A
Response Time	2 sec.
Terminal Block Maximum Wire Size	14 AWG
Terminal Block Torque (nominal)	4 in-lbs (0.45 N-m)
Agency Approvals	UL 508 open device listing
	CE: EN61010-1:2001-2, CAT III, deg. 2, basic insulation

⚠ DANGER ⚠

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Follow safe electrical work practices. See NFPA 70E in the USA, or applicable local codes.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Read, understand and follow the instructions before installing this product.
- Turn off all power supplying equipment before working on or inside the equipment.
- Use a properly rated voltage sensing device to confirm power is off.
  DO NOT DEPEND ON THIS PRODUCT FOR VOLTAGE INDICATION
- Only install this product on insulated conductors.

Failure to follow these instructions will result in death or serious injury.

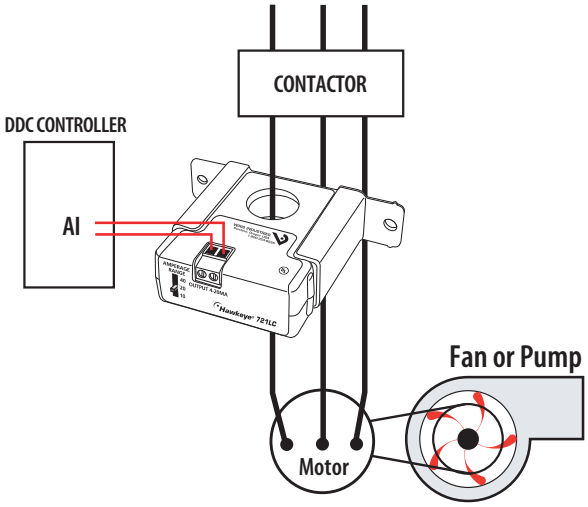
NOTICE

- This product is not intended for life or safety applications.
- Do not install this product in hazardous or classified locations.
- The installer is responsible for conformance to all applicable codes.
- Mount this product inside a suitable fire and electrical enclosure.

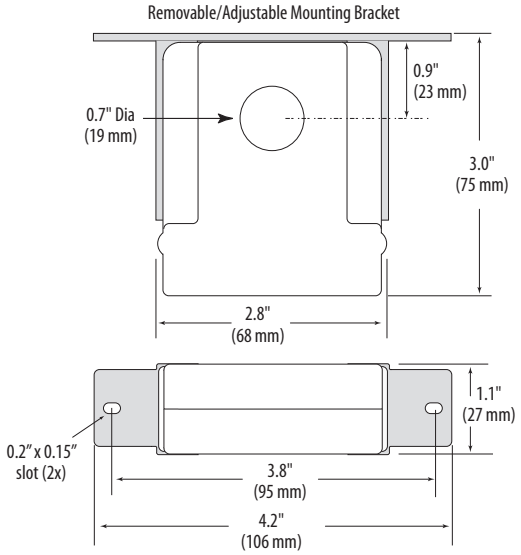
QUICK INSTALL

1. Disconnect and lock out power.
2. Install the mounting bracket to the back of the electrical enclosure, no closer than ½" (12mm) to an uninsulated conductor.
3. Slide the conductor to be monitored through the sensing hole of the current switch. Terminate the conductor. See Notes (page 2) for currents under 1 Amp or above 40 Amp.
4. Set the desired amperage range on the H721LC (10, 20, or 40 Amps).
5. Wire the output connections between the H721LC and the controller (4-20mA).
6. Reconnect power.
7. Scale the controller software to match the H721LC's output.

WIRING EXAMPLE



DIMENSIONS

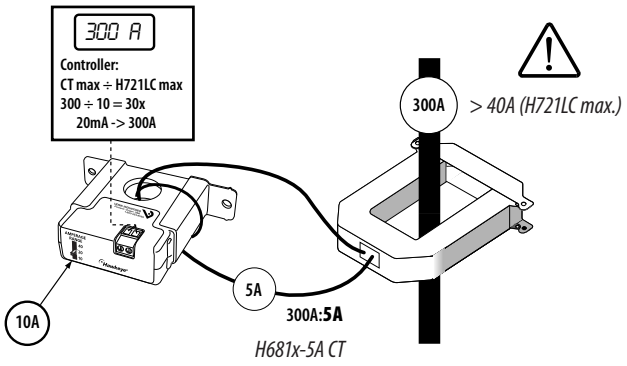


OPERATION

The H721LC is a current transducer that senses current (amperage) in any of three field-selectable ranges: 0-10, 0-20, or 0-40 amperes. These ranges represent the maximum current that can be applied to the monitored conductor. The H721LC transforms the monitored current into a 4-20mA output suitable for connection to building controllers or other appropriate data acquisition equipment. The H721LC requires 12-30VDC external power to generate its output.

NOTES

For load currents greater than sensor maximum rating:
Use a 5 Amp (H681x series) Current Transformer (CT) as shown.



DANGER: 5A CTs can present hazardous voltages.
Install CTs in accordance with manufacturer's instructions.
Terminate the CT secondary before applying current.

CAUTION

RISK OF EQUIPMENT DAMAGE

- **Derate the product's maximum current for the number of turns through the sensing window using the following formula.**

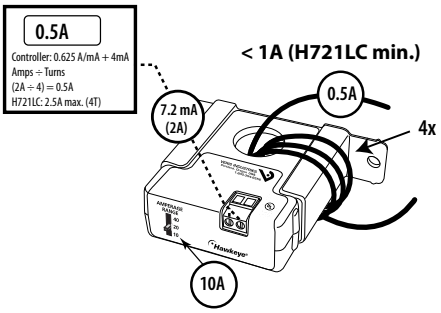
Rated Max. Amps ÷ Number of Turns = Max. monitored Amps

e.g. : 30A ÷ 4 Turns = 7.5 Amps max. in monitored conductor

Failure to follow these instructions can result in overheating and permanent equipment damage.

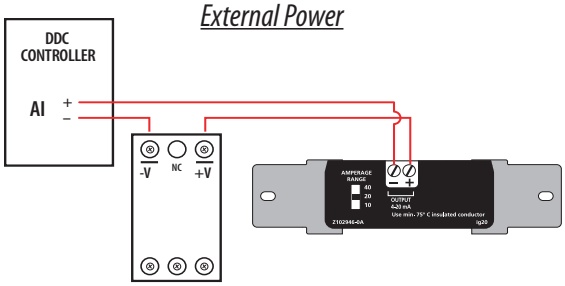
For load currents less than sensor minimum rating:
Wrap the monitored conductor through the center hole and around the sensor body to produce multiple turns through the "window." This increases the current measured by the transducer.

• Controller must be programmed to account for the extra turns. e.g., if four turns pass through the sensor (as shown) the normal controller reading must be divided by 4.

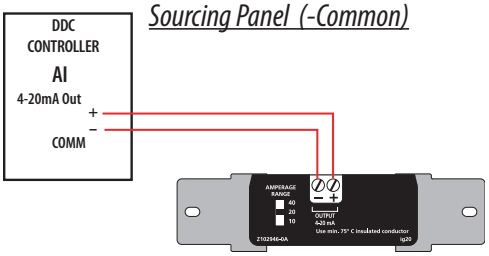


WIRING EXAMPLES

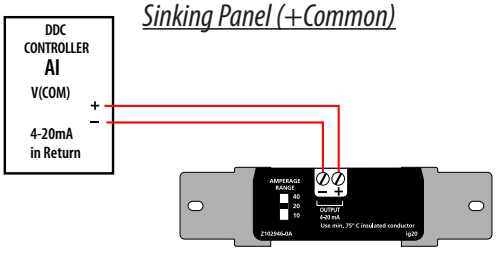
External Power



Sourcing Panel (-Common)



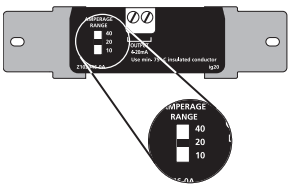
Sinking Panel (+Common)



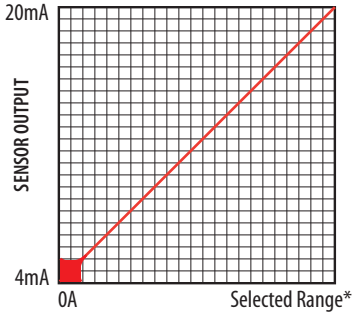
**A resistor can be added in parallel to convert the 4-20mA signal to a VDC signal (250 ohm= 1-5VDC); (500 ohm = 2-10VDC)*

CALIBRATION/SCALING

Set the amperage range selector switch to a level appropriate for your load. The H721LC is available with three choices, 0-10, 0-20, or 0-40 Amps.



Amperage Range
Selector Switch



SENSED AMPS
**Factory calibrated ranges selected with the amperage range switch*

TROUBLESHOOTING

Problem	Solution
No Reading at Controller	•Confirm that you have 12-30VDC in series with the sensor output terminals and the control panel analog input. • Confirm measured current is within the selected range on the product. • Check polarity of sensor output connections.

3UG4513-1BR20

PHASE FAILURE AND SEQUENCE

Overview

^ Technical data

^ CAx data

Technical data

Artikelnummer		3UG4513-1BR20
		ANALOG MONITORING RELAY PHASE FAILURE AND - SEQUENCE ADJUSTABLE UNDERVOLTAGE UNBALANCE 20% FIXED 3X 160 TO 690V AC 50 TO 60 HZ HYSTERESIS 5% FIXED DELAY TIME 0-20S 2 CHANGEOVER CONTACTS SCREW TERMINAL REPLACEMENT PRODUCT FOR 3UG3013-1B...
Product function		Phase monitoring relay
Measuring circuit:		
Type of voltage for monitoring		AC
Number of poles for main current circuit		3
Measurable voltage with AC	V	160 ... 690
Adjustable voltage range	V	200 ... 690
Relative metering precision	%	5
Relative repeat accuracy	%	1
General technical data:		
Display version LED		Yes
Product function		
● undervoltage detection		Yes
● Overvoltage detection		No
● phase sequence recognition		Yes
● Phase failure detection		Yes
● Asymmetry recognition		Yes
● Overvoltage detection 3 phase		No
● undervoltage detection 3 phases		Yes
● Voltage window recognition 3 phase		No
● Auto-reset		Yes
● Adjustable open/closed-circuit current principle		No
Startup time after the control supply voltage has been applied	ms	1 000
Response time maximum	ms	450
Type of voltage of the control supply voltage		AC
Control supply voltage		
● with AC		
— at 50 Hz Rated value	V	160 ... 690
— at 60 Hz Rated value	V	160 ... 690
Operating range factor control supply voltage rated value		
● with AC		
— at 50 Hz		1 ... 1
— at 60 Hz		1 ... 1
Surge voltage resistance Rated value	kV	6
Active power consumption	W	2
Protection class IP		IP20
Electromagnetic compatibility		IEC 60947-1 / IEC 61000-6-2 / IEC 61000-6-4
Vibration resistance acc. to IEC 60068-2-6		1 ... 6 Hz: 15 mm, 6 ... 500 Hz: 2g
Shock resistance acc. to IEC 60068-2-27		sinusoidal half-wave 15g / 11 ms
Installation altitude at height above sea level maximum	m	2 000
Conducted interference due to burst acc. to IEC 61000-4-4		2 kV
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		6 kV contact discharge / 8 kV air discharge
Field-bound parasitic coupling acc. to IEC 61000-4-3		10 V/m
Insulation voltage for overvoltage category III according to IEC 60664 with degree of pollution 3 Rated value	V	690
Degree of pollution		3
Ambient temperature		
● during operation	°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 data:		
Width	mm	22.5
Height	mm	92
Depth	mm	91
mounting position		any
Required spacing for grounded parts		
● forwards	mm	0

● Backwards	mm	0
● at the side	mm	0
● upwards	mm	0
● downwards	mm	0
Required spacing with side-by-side mounting		
● forwards	mm	0
● Backwards	mm	0
● at the side	mm	0
● upwards	mm	0
● downwards	mm	0
Required spacing for live parts		
● forwards	mm	0
● Backwards	mm	0
● at the side	mm	0
● upwards	mm	0
● downwards	mm	0
Mounting type		snap-on mounting
Product function removable terminal for auxiliary and control circuit		Yes
Type of electrical connection		screw-type terminals
Type of connectable conductor cross-section		
● solid		1x (0.5 ... 4 mm2), 2x (0.5 ... 2.5 mm2)
● finely stranded		
— with core end processing		1x (0.5 ... 2.5 mm2), 2x (0.5 ... 1.5 mm2)
● for AWG conductors		
— solid		2x (20 ... 14)
— stranded		2x (20 ... 14)
Tightening torque with screw-type terminals	N·m	0.8 ... 1.2
Outputs:		
Number of NO contacts delayed switching		0
Number of NC contacts delayed switching		0
Number of CO contacts delayed switching		2
Ampacity of the 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
Thermal current of the switching element with contacts maximum	A	5
Operating current at 17 V minimum	mA	5
Continuous current of the DIAZED fuse link of the output relay	A	4
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

Certificates/ approvals:

General Product Approval | EMC | Test Certificates

Type Test Certificates/Test Report | Special Test Certificate

Shipping Approval | other

Declaration of Conformity | other

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=3UG45131BR20

Service&Support (Manuals, Certificates, Characteristics, FAQs,...)
https://support.industry.siemens.com/cs/ww/en/ps/3UG45131BR20

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)
http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3UG45131BR20&lang=en

last modified: 24.04.2015

Date
26.04.2015

Last changes: 04/26/2015

CAx data

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10VR1

SAFETY ORGANIZATION(S):

THIS FILTER HAS BEEN FORMALLY RECOGNIZED, CERTIFIED OR APPROVED BY THE LISTED AGENCY. THEREFORE, ALL TEST/REQUIREMENTS SPECIFIED IN THE LATEST REVISION OF THE FOLLOWING AGENCY STANDARDS HAVE BEEN MET:

UL RECOGNIZED	UL 1283
CSA CERTIFIED	CSA 22.2, NO.0,0.4,8
VDE APPROVED	VDE 565-3

OPERATING SPECIFICATIONS:

LINE VOLTAGE/CURRENT: 10 AMP, 120/250 VAC
8 AMP./40°C, 250 VAC

LINE FREQUENCY: 50-60Hz

MAX. LEAKAGE CURRENT, EACH: .5 mA AT 120V 60Hz
LINE TO GROUND: .83 mA at 250V 50Hz

OPERATING AMBIENT TEMP. RANGE: -10°C TO +40°C @ RATED CURRENT, I_r

IN AN AMBIENT, T_a, HIGHER THAN 40°C, THE MAXIMUM OPERATING CURRENT, I_o, IS AS FOLLOWS:

$$I_o = I_r\sqrt{\frac{85-T_a}{45}}$$

RELIABILITY SPECIFICATIONS:

STORAGE TEMPERATURE: -40°C TO +85°C
HUMIDITY: 21 DAYS @ 40°C 95% RH
CURRENT OVERLOAD TEST: 6 TIMES RATED CURRENT FOR 8 SECONDS

TEST SPECIFICATIONS:

INDUCTANCE: .99 mH NOMINAL
CAPACITANCE: (MEASURED @ 1 KHz, 0.25VAC MAX., 25°C±1°C)
LINE TO GROUND: .011µF ±20%
LINE TO LINE: .303µF ±20%
DISCHARGE RESISTOR: 680 KΩ

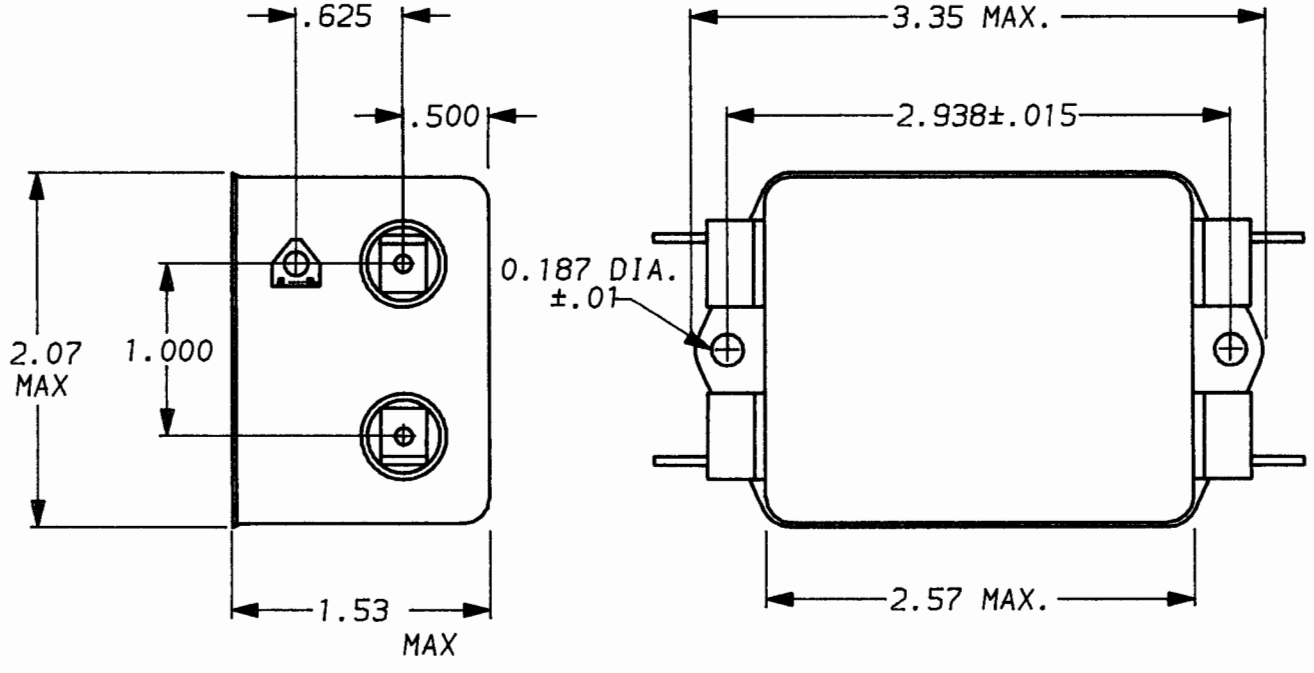
LINE/GROUND AND LINE/LINE: 6000MΩ (MIN) AT 100VDC
INSULATION RESISTANCE: 20°C AND 50% RH

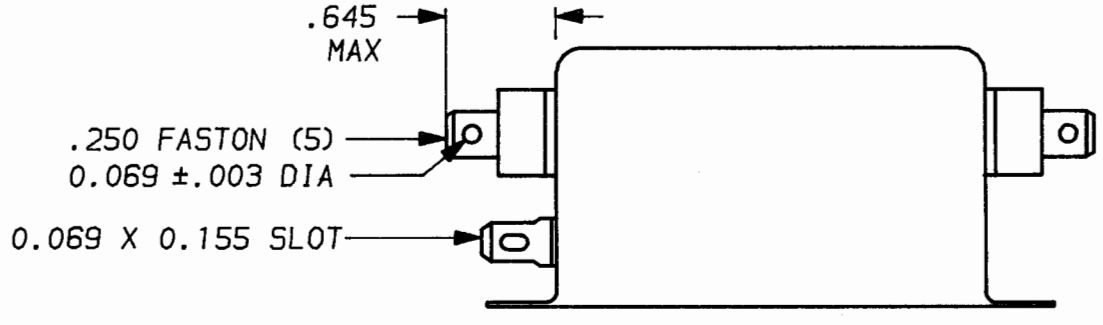
RECOMMENDED RECEIVING INSPECTION HIPOT:

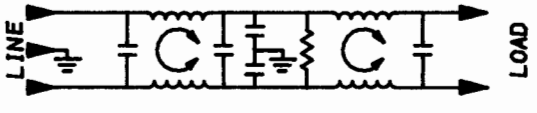
LINES TO GROUND: 2250 VDC FOR 1 MINUTE
LINE TO LINE: 1450 VDC FOR 1 MINUTE

FILTER APPROVAL:

THE BEST WAY TO SELECT AND QUALIFY A FILTER IS FOR YOUR ENGINEERING TO TEST THE UNIT IN YOUR EQUIPMENT.







50Ω - 50Ω (MINIMUM) INSERTION LOSS												
FREQUENCY MHz	.15	.4	.5	.6	1	2	5	10	20	30	/	/
COMMON dB	11	42	50	53	62	65	65	65	65	65	/	/
DIFF. dB	7	3	7	10	40	65	65	65	57	57	/	/

UNLESS OTHERWISE SPECIFIED, TOLERANCE TO BE ±.025
MATERIAL & FINISH: AS SUPPLIED

corcom
LIBERTYVILLE, IL 60048

POWER LINE FILTER

DATE: 9-10-93
APPRVD.
CATALOG NO. 10VR1
CAD NO. 10VR1.07

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

TE Connectivity:

10VR1

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Show actual product details

Data sheet 6EP1334-1LB00

SITOP PSU100L 24 V/10 A
SITOP PSU100L 24 V/10 A STABILIZED POWER SUPPLY INPUT: 120/230 V AC OUTPUT: 24 V/10 A DC

Input	
Input	1-phase AC
Supply voltage	
• 1 at AC Rated value	120 V
• 2 at AC Rated value	230 V
• Note	Set by means of selector switch on the device
Input voltage	
• 1 at AC	93 ... 132 V
• 2 at AC	187 ... 264 V
Wide-range input	No
Overvoltage resistance	2.3 × Vin rated, 1.3 ms
Mains buffering at Iout rated, min.	20 ms; at Vin = 93/187 V
Rated line frequency 1	50 Hz
Rated line frequency 2	60 Hz
Rated line range	47 ... 63 Hz
Input current	
• at rated input voltage 120 V	4.1 A
• at rated input voltage 230 V	2 A
Switch-on current limiting (+25 °C), max.	65 A

Duration of inrush current limiting at 25 °C	
• typical	3 ms
I²t, max.	3.3 A²·s
Built-in incoming fuse	T 6.3 A/250 V (not accessible)
Protection in the mains power input (IEC 898)	Recommended miniature circuit breaker: from 10 A characteristic C

Output	
Output	Controlled, isolated DC voltage
Rated voltage Vout DC	24 V
Total tolerance, static ±	3 %
Static mains compensation, approx.	0.1 %
Static load balancing, approx.	0.5 %
Residual ripple peak-peak, max.	150 mV
Residual ripple peak-peak, typ.	50 mV
Spikes peak-peak, max. (bandwidth: 20 MHz)	240 mV
Spikes peak-peak, typ. (bandwidth: 20 MHz)	150 mV
Adjustment range	22.8 ... 26.4 V
Product function Output voltage adjustable	Yes
Output voltage setting	via potentiometer
Status display	Green LED for 24 V OK
On/off behavior	Overshoot of Vout approx. 4 %
Startup delay, max.	1.5 s
Voltage rise, typ.	170 ms
Rated current value Iout rated	10 A
Current range	0 ... 10 A
• Note	+45 ... +60 °C: Derating 2%/K
Supplied active power typical	240 W
Parallel switching for enhanced performance	Yes
Numbers of parallel switchable units for enhanced performance	2

Efficiency	
Efficiency at Vout rated, Iout rated, approx.	89 %
Power loss at Vout rated, Iout rated, approx.	34 W

Closed-loop control	
Dynamic mains compensation (Vin rated ±15 %), max.	0.3 %
Dynamic load smoothing (Iout: 10/90/10 %), Uout ± typ.	2 %
Load step setting time 10 to 90%, typ.	0.5 ms
Load step setting time 90 to 10%, typ.	0.7 ms

Protection and monitoring	
Output overvoltage protection	< 33 V

Current limitation, typ.	10.5 A
Property of the output Short-circuit proof	Yes
Short-circuit protection	Constant current characteristic
Enduring short circuit current RMS value	
• typical	16 A
Overload/short-circuit indicator	-

Safety	
Primary/secondary isolation	Yes
Galvanic isolation	Safety extra-low output voltage Uout acc. to EN 60950-1 and EN 50178
Protection class	Class I
Leakage current	
• maximum	3.5 mA
• typical	0.8 mA
CE mark	Yes
UL/cUL (CSA) approval	cULus-Listed (UL 508, CSA C22.2 No. 107.1), File E197259
Explosion protection	-
FM approval	-
CB approval	Yes
Marine approval	-
Degree of protection (EN 60529)	IP20

EMC	
Emitted interference	EN 55022 Class A
Supply harmonics limitation	-
Noise immunity	EN 61000-6-2

Operating data	
Ambient temperature	
• during operation	0 ... 60 °C
— Note	with natural convection
• during transport	-40 ... +85 °C
• during storage	-40 ... +85 °C
Humidity class according to EN 60721	Climate class 3K3, no condensation

Mechanics	
Connection technology	screw-type terminals
Connections	
• Supply input	L, N, PE: 1 screw terminal each for 0.5 ... 2.5 mm² single-core/finely stranded
• Output	+, -: 2 screw terminals each for 0.5 ... 2.5 mm²
• Auxiliary	-
Width of the enclosure	70 mm
Height of the enclosure	125 mm
Depth of the enclosure	120 mm

Required spacing	
• top	50 mm
• bottom	50 mm
• left	0 mm
• right	0 mm
Weight, approx.	0.75 kg
Product feature of the enclosure housing for side-by-side mounting	Yes
Installation	Snaps onto DIN rail EN 60715 35x7.5/15
MTBF at 40 °C	2 333 396 h
Other information	Specifications at rated input voltage and ambient temperature +25 °C (unless otherwise specified)

SIEMENS

Product data sheet 3RT2017-1AK61

CONTACTOR, AC-3, 5.5KW/400V, 1NO,
AC110V 50HZ, 120V 60HZ 3-POLE,
SZ S00 SCREW TERMINAL

General technical data:		
product brand name		SIRIUS
Size of the contactor		S00
Product extension / auxiliary switch		Yes
Protection class IP / on the front		IP20
Protection against electrical shock		finger-safe
Degree of pollution		3
Installation altitude / at a height over sea level / maximum	m	2,000
Ambient temperature		
• during storage	°C	-55 … +80
• during operating	°C	-25 … +60
Shock resistance		
• at rectangular impulse		
• at AC		7,3g / 5 ms, 4,7g / 10 ms
• at sine pulse		
• at AC		11,4g / 5 ms, 7,3g / 10 ms
Impulse voltage resistance / rated value	kV	6
Insulation voltage / rated value	V	690
Mechanical operating cycles as operating time		
• of the contactor / typical		30,000,000

• of the contactor with added auxiliary switch block / typical		10,000,000
• of the contactor with added electronics-compatible auxiliary switch block / typical		5,000,000

Main circuit:		
Number of NC contacts / for main contacts		0
Number of NO contacts / for main contacts		3
Operating current		
• at AC-1 / at 400 V		
• at 40 °C ambient temperature / rated value	A	22
• at 60 °C ambient temperature / rated value	A	20
• at AC-2 / at 400 V / rated value	A	12
• at AC-3 / at 400 V / rated value	A	12
• at AC-4 / at 400 V / rated value	A	8.5
Operating current		
• with 1 current path / at DC-1		
• at 24 V / rated value	A	20
• at 110 V / rated value	A	2.1
• with 2 current paths in series / at DC-1		
• at 24 V / rated value	A	20
• at 110 V / rated value	A	12
• with 3 current paths in series / at DC-1		
• at 24 V / rated value	A	20
• at 110 V / rated value	A	20
• with 1 current path / at DC-3 / at DC-5		
• at 24 V / rated value	A	20
• at 110 V / rated value	A	0.1
• with 2 current paths in series / at DC-3 / at DC-5		
• at 24 V / rated value	A	20
• at 110 V / rated value	A	0.35
• with 3 current paths in series / at DC-3 / at DC-5		
• at 24 V / rated value	A	20
• at 110 V / rated value	A	20
Service power		
• at AC-2 / at 400 V / rated value	kW	5.5
• at AC-3 / at 400 V / rated value	kW	5.5
• at AC-4 / at 400 V / rated value	kW	4
Active power loss / per conductor / typical	W	1.2
Off-load operating frequency		
• at AC	1/h	10,000

• at DC	1/h	10,000
Frequency of operation / at AC-1 / according to IEC 60947-6-2	1/h	1,000
Frequency of operation / at AC-2 / according to IEC 60947-6-2	1/h	750
Frequency of operation / at AC-3 / according to IEC 60947-6-2	1/h	750
Frequency of operation / at AC-4 / according to IEC 60947-6-2	1/h	250

Control circuit:		
Type of voltage / of the controlled supply voltage		AC
Control supply voltage / 1		
• at 50 Hz / for AC / rated value	V	110
• at 60 Hz / for AC / rated value	V	120
Operating range factor control supply voltage rated value / of the magnet coil		
• at 50 Hz / for AC		0.8 … 1.1
• at 60 Hz / for AC		0.85 … 1.1
Apparent pull-in power / of the solenoid / for AC	V·A	43
Apparent holding power / of the solenoid / for AC	V·A	6.5
Inductive power factor		
• with the pull-in power of the coil		0.8
• with the pull-in power of the coil		0.25
Closing delay		
• at AC	ms	8 … 33
Opening delay		
• at AC	ms	4 … 15
Arcing time	ms	10 … 15

Auxiliary circuit:		
Contact reliability / of the auxiliary contacts		1 faulty switching per 100 million (17 V, 1 mA)
Number of NC contacts / for auxiliary contacts / instantaneous switching		0
Number of NO contacts / for auxiliary contacts / instantaneous switching		1
Operating current / of the auxiliary contacts		
• at AC-12 / maximum	A	10
• at AC-15		
• at 230 V	A	10
• at 400 V	A	3
• at DC-12		
• at 48 V	A	6
• at 60 V	A	6
• at 110 V	A	3

• at 220 V	A	1
• at DC-13		
• at 24 V	A	10
• at 48 V	A	2
• at 60 V	A	2
• at 110 V	A	1
• at 220 V	A	0.3

Short-circuit:

Design of the fuse link		
• for short-circuit protection of the auxiliary switch / required		fuse gL/gG: 10 A
• for short-circuit protection of the main circuit		
• with type of assignment 1 / required		gL/gG LV HRC 3NA, DIAZED 5SB, NEOZED 5SE: 35 A
• at type of coordination 2 / required		gL/gG LV HRC 3NA, DIAZED 5SB, NEOZED 5SE: 20A

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
Type of mounting		screw and snap-on mounting onto 35 mm standard mounting rail according to DIN EN 50022
Type of fixing/fixation / series installation		Yes
Width	mm	45
Height	mm	57.5
Depth	mm	73
Distance, to be maintained, to the ranks assembly / sidewards	mm	0
Distance, to be maintained, to earthed part / sidewards	mm	6

Connections:

Design of the electrical connection		
• for main current circuit		screw-type terminals
• for auxiliary and control current circuit		screw-type terminals
Type of the connectable conductor cross-section		
• for main contacts		
• solid		2x (0.5 ... 1.5 mm²), 2x (0.75 ... 2.5 mm²), 2x 4 mm²
• finely stranded		
• with conductor end processing		2x (0.5 ... 1.5 mm²), 2x (0.75 ... 2.5 mm²)
• for AWG conductors / for main contacts		2x (20 ... 16), 2x (18 ... 14), 2x 12
• for auxiliary contacts		
• solid		2x (0.5 ... 1.5 mm²), 2x (0.75 ... 2.5 mm²), 2x 4 mm²
• finely stranded		

• with conductor end processing		2x (0.5 ... 1.5 mm²), 2x (0.75 ... 2.5 mm²)
• for AWG conductors / for auxiliary contacts		2x (20 ... 16), 2x (18 ... 14), 2x 12

Certificates/approvals:

General Product Approval				Declaration of Conformity	Test Certificates
CCC	CSA	GOST	UL	EG-Konf.	Special Test Certificate

Shipping Approval					
ABS	DNV	GL	LRS	PRS	RINA

Shipping Approval	other	
RMRS	Confirmation	VDE

UL/CSA ratings:

yielded mechanical performance (hp)		
• for single-phase squirrel cage motors		
• at 110/120 V / rated value	hp	0.5
• at 230 V / rated value	hp	2
• for three-phase squirrel cage motors		
• at 200/208 V / rated value	hp	3
• at 220/230 V / rated value	hp	3
• at 460/480 V / rated value	hp	7.5
• at 575/600 V / rated value	hp	10
Operating current (FLA) / for three-phase squirrel cage motors		
• at 480 V / rated value	A	11
• at 600 V / rated value	A	11
Contact rating designation / for auxiliary contacts / according to UL		A600 / Q600

Sicherheitsrelevante Kenngrößen:

B10 value / with high demand rate		
• according to SN 31920		1,000,000
T1 value / for proof test interval or service life		
• according to IEC 61508	a	20
Proportion of dangerous failures		
• with low demand rate / according to SN 31920	%	40
• with high demand rate / according to SN 31920	%	73

Failure rate (FIT value) / with low demand rate		
• according to SN 31920	FIT	100
Product function		
• mirror contact to IEC 60947-4-1		Yes
• comment		with 3RH29
• positively driven operation to IEC 60947-5-1		No

Further information:

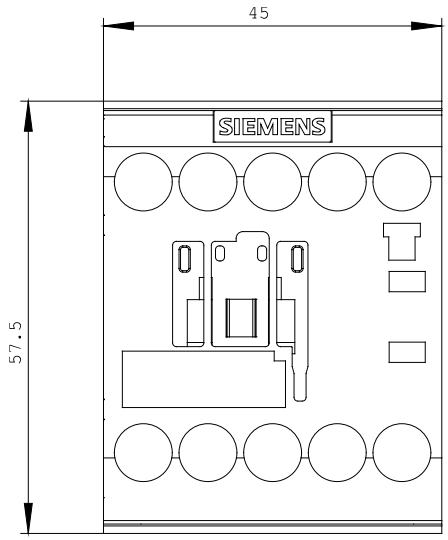
Information- and Downloadcenter (Catalogs, Brochures,…)
http://www.siemens.com/industrial-controls/catalogs

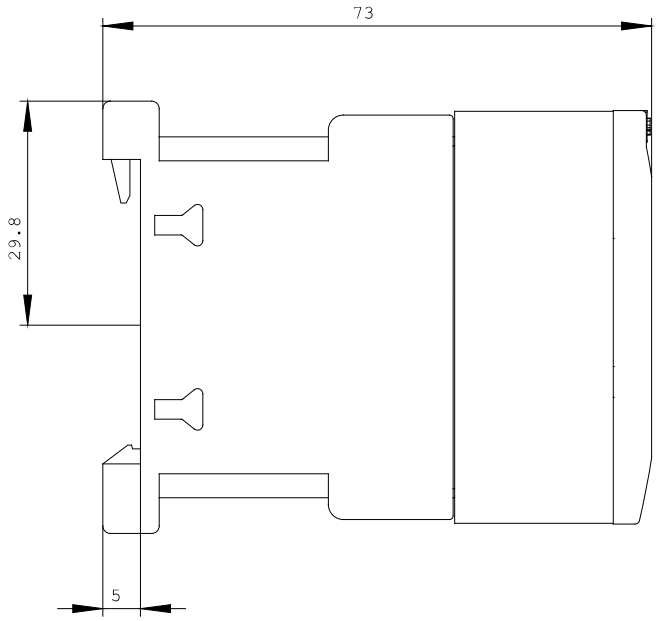
Industry Mall (Online ordering system)
http://www.siemens.com/industrial-controls/mall

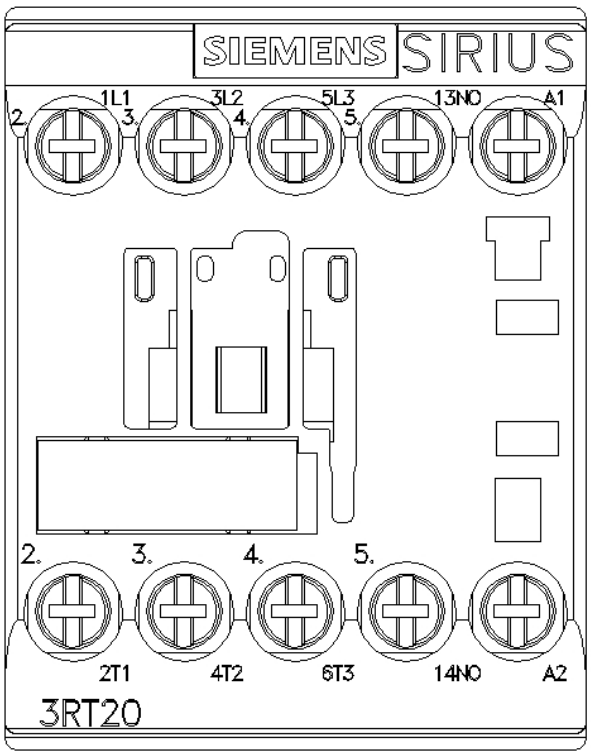
Cax online generator:
http://www.siemens.com/cax

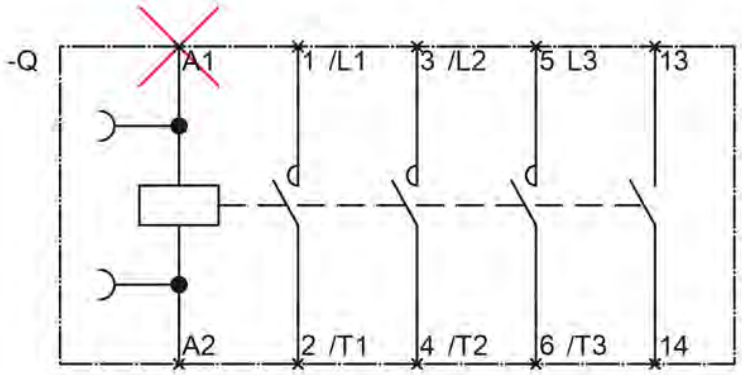
Service&Support (Manuals, Certificates, Characteristics, FAQs,...)
http://support.automation.siemens.com/WW/view/en/3RT2017-1AK61/all

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, ...)
http://www.automation.siemens.com/bilddb/cax_en.aspx?mlfb=3RT2017-1AK61









last change: Jul 26, 2012

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Data sheet 3RH2911-1FA22

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	Contactor relay and power contactor
Protection class IP on the front	IP20
Ambient temperature	
• during storage	-55 ... +80 °C
• during operation	-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	
• 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 mm²), 2x (0.75 ... 2.5 mm²)
• 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	EAC	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	Confirmation	VDE	Vibration and Shock

Further information

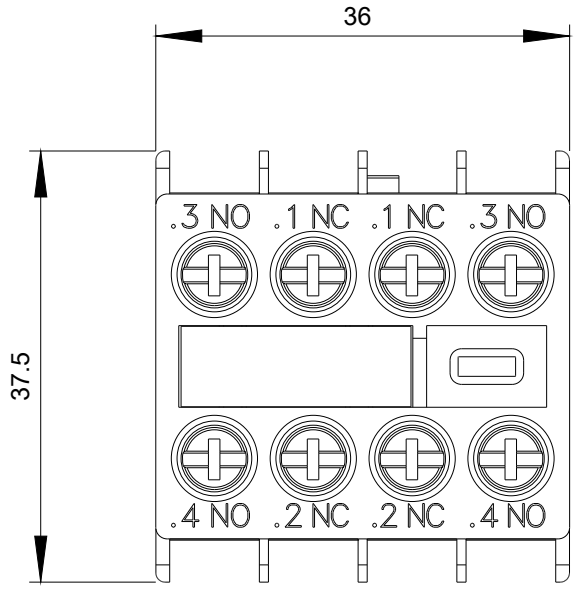
Information- and Downloadcenter (Catalogs, Brochures,…)
http://www.siemens.com/industrial-controls/catalogs

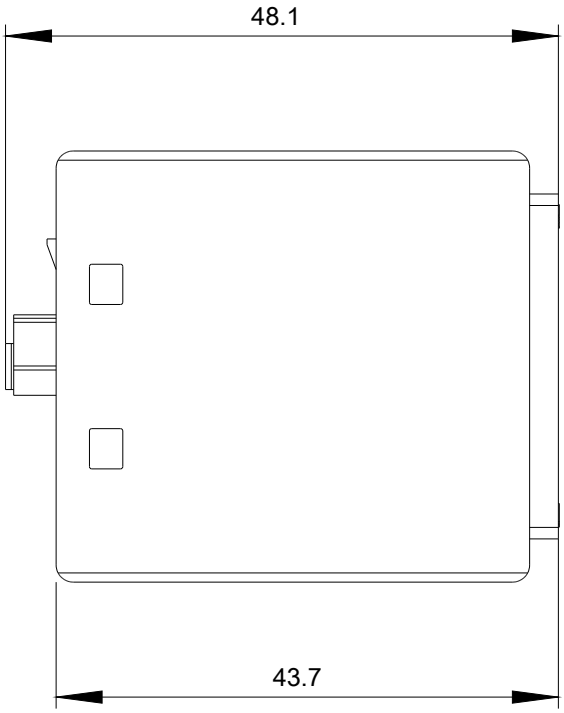
Industry Mall (Online ordering system)
https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3RH2911-1FA22

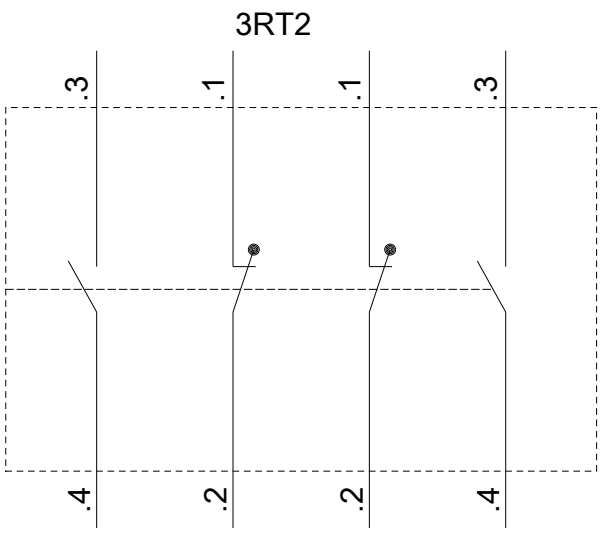
Cax online generator
http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3RH2911-1FA22

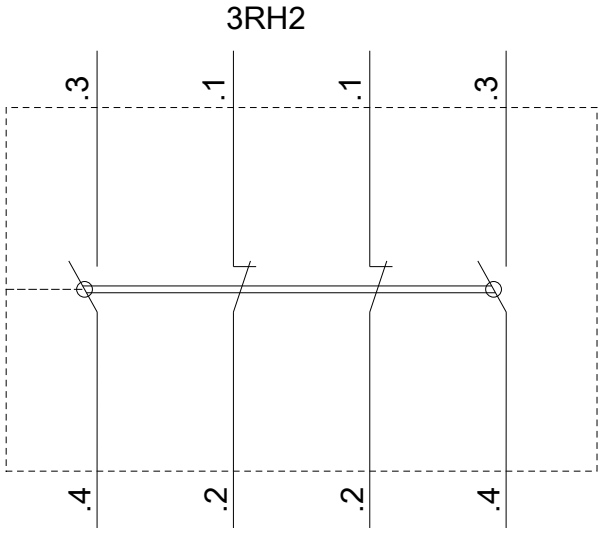
Service&Support (Manuals, Certificates, Characteristics, FAQs,...)
https://support.industry.siemens.com/cs/ww/en/ps/3RH2911-1FA22

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





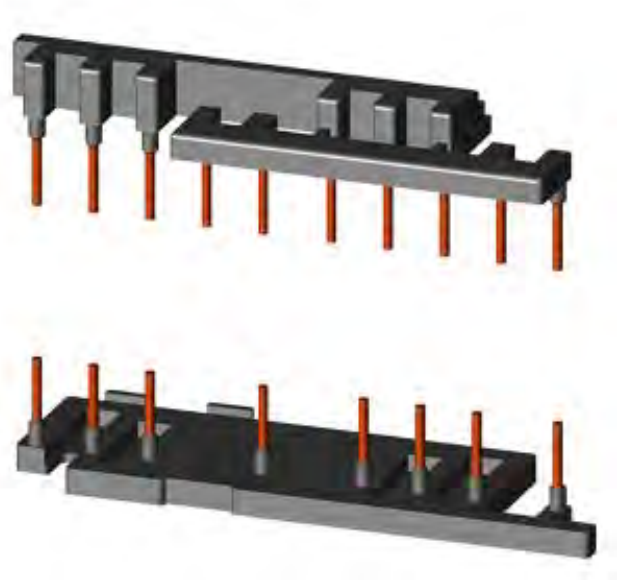




last modified: 03/27/2018

SIEMENS

Product data sheet 3RA2913-2AA1



WIRING KIT,
SCREW ELECTRICAL AND MECHANICAL,
INCL. MECH. INTERLOCK,
FOR REVERS. STARTERS, SIZE S00

General technical data:		
product brand name		SIRIUS
Product designation		Mounting kit
Size of the contactor		S00
Design of the product		Reversing contactor assembly S00, screw terminal

Installation/mounting/dimensions:		
Mounting type		screw fixing

Certificates/approvals:

General Product Approval				Declaration of Conformity	Test Certificates
CSA		UL	UR	EG-Konf.	Special Test Certificate

Shipping Approval					
ABS	BUREAU VERITAS	DNV	GL	LRS	PRS

Shipping Approval		other			
RINA	RMRS	Declaration of Conformity	other	Environmental Confirmations	

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Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, ...)
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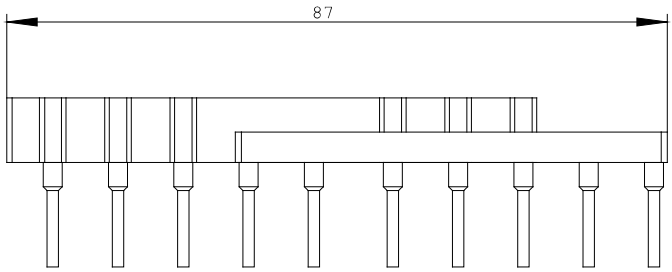
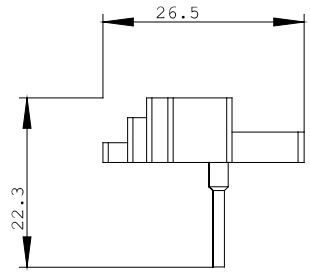
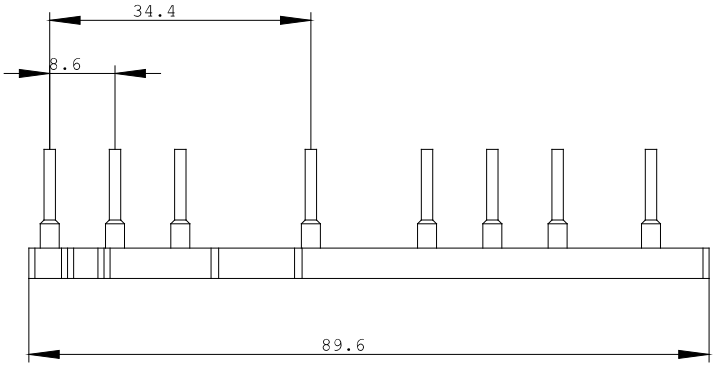
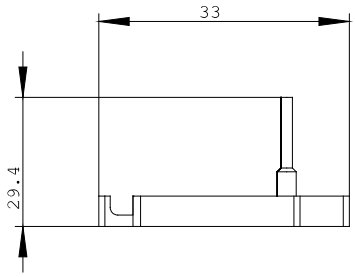








last change: Jun 14, 2014

3RV20 Class 10 up to 40A

Description

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:

– 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.

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.

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

Ordering Information

- 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 115V	Single-Phase HP Ratings 230V	Three-Phase HP Ratings[1] 200V	Three-Phase HP Ratings[1] 230V	Three-Phase HP Ratings[1] 460V	Three-Phase HP Ratings[1] 575V	Instant-aneous short circuit release [A]	UL short-circuit breaking capacity @ 480V [kA]	Size S00 [2) 4)] Order Number	Size S0 [2) 4)] 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	—	—	—	—	—	½	13	65	**3RV2011-0JA●●**	**3RV2021-0JA●●**
	0.9-1.25	—	—	—	—	½	½	16	65	**3RV2011-0KA●●**	**3RV2021-0KA●●**
	1.1-1.6	—	1/10	—	—	¾	¾	21	65	**3RV2011-1AA●●**	**3RV2021-1AA●●**
	1.4-2	—	⅛	—	—	¾	1	26	65	**3RV2011-1BA●●**	**3RV2021-1BA●●**
	1.8-2.5	—	⅙	½	½	1	1 ½	33	65	**3RV2011-1CA●●**	**3RV2021-1CA●●**
	2.2-3.2	1/10	¼	½	¾	1 ½	2	42	65	**3RV2011-1DA●●**	**3RV2021-1DA●●**
	2.8-4	⅛	⅓	¾	¾	2	3	52	65	**3RV2011-1EA●●**	**3RV2021-1EA●●**
	3.5-5	⅙	½	1	1	3	3	65	65	**3RV2011-1FA●●**	**3RV2021-1FA●●**
	4.5-6.3	¼	½	1	1 ½	3	5	82	65	**3RV2011-1GA●●**	**3RV2021-1GA●●**
	5.5-8	⅓	1	2	2	5	5	104	65	**3RV2011-1HA●●**	**3RV2021-1HA●●**
	7-10	½	1 ½	2	3	5	7 ½	130	65	**3RV2011-1JA●●**	**3RV2021-1JA●●**
	9-12.5	½	2	3	3	7 ½	10	163	65	**3RV2011-1KA●●**	**3RV2021-1KA●●**
	11-16	1	2	3	5	10	—	208	65	**3RV2011-4AA●●**	**3RV2021-4AA●●**
	14-20	1 ½	3	5	5	10	—	260	65	—	**3RV2021-4BA●●**
	17-22	1 ½	3	5	7 ½	15	—	286	65	—	**3RV2021-4CA●●**
	20-25	2	3	5	7 ½	15	—	325	65	—	**3RV2021-4DA●●**
	23-28	2	5	7 ½	10	20	—	364	50	—	**3RV2021-4NA●●**
	27-32	2	5	7 ½	10	20	—	400	50	—	**3RV2021-4EA●●**
	30-36 [3)]	3	5	10	10	25	—	432	12	—	**3RV2021-4PA●●**
	34-40 [3)]	3	7 ½	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.

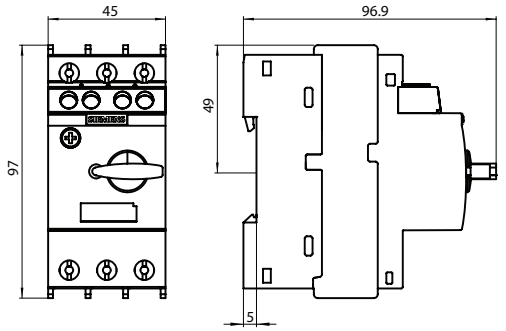
3) These products are NOT certified as Type E combination motor controllers. They can only be used as manual motor controllers.

4) 3RV2 MSP's can only be used with Innovations contactors and accessories

Dimension drawings

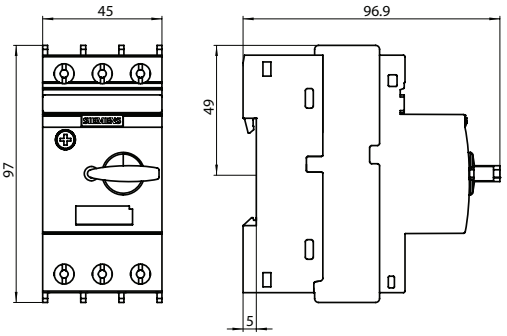
3RV2 MSP, size S00

3RV20 11



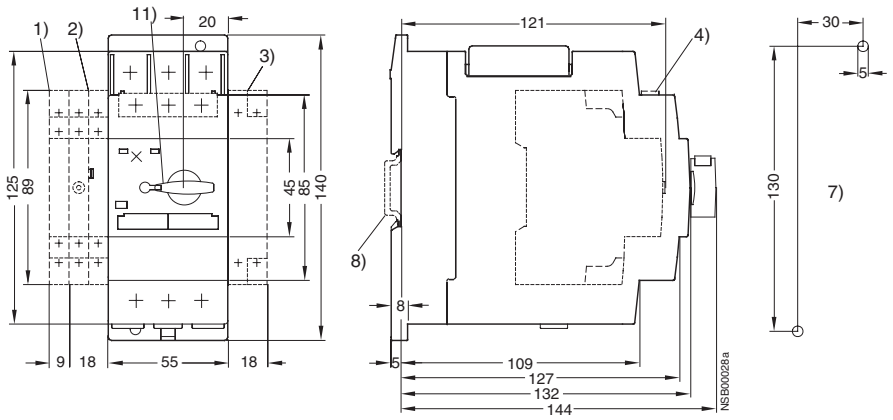
3RV2 MSP, size S0

3RV20 21



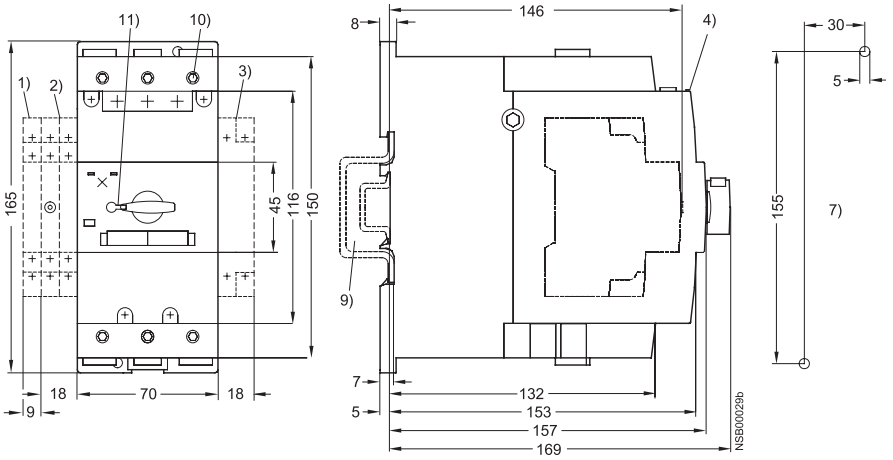
3RV1 MSP, size S2

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

SIEMENS

Product data sheet 3RV2901-1E

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	A	10
• at AC-15		
• at 24 V	A	2
• at 230 V	A	0.5
• at DC-13		
• at 24 V	A	1
• at 48 V	A	0.3
• at 60 V	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		
• for auxiliary and control current circuit		screw-type terminals
Type of the connectable conductor cross-section		
• for auxiliary contacts		
• solid		2x (0.5 ... 1.5 mm²), 2x (0.75 ... 2.5 mm²)
• finely stranded		
• with conductor end processing		2x (0.5 ... 1.5 mm²), 2x (0.75 ... 2.5 mm²)
• for AWG conductors / for auxiliary contacts		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

ABS BUREAU VERITAS DNV GL LRS PRS

Shipping Approval | **other**

RINA RMRS VDE

other | Environmental Confirmations

Further information:

Information- and Downloadcenter (Catalogs, Brochures,…)
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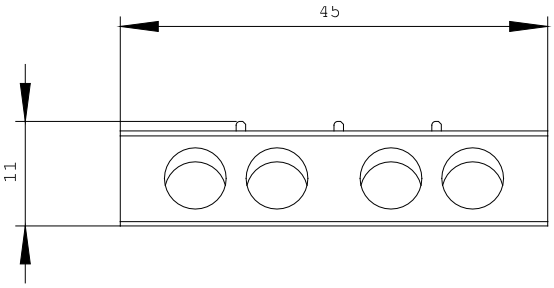

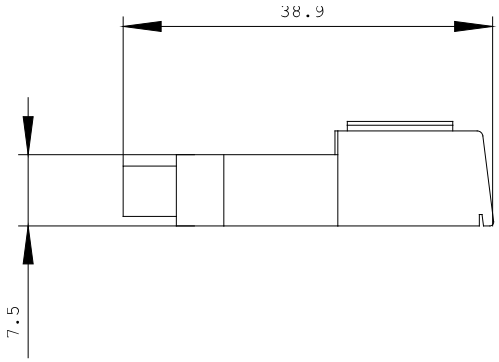

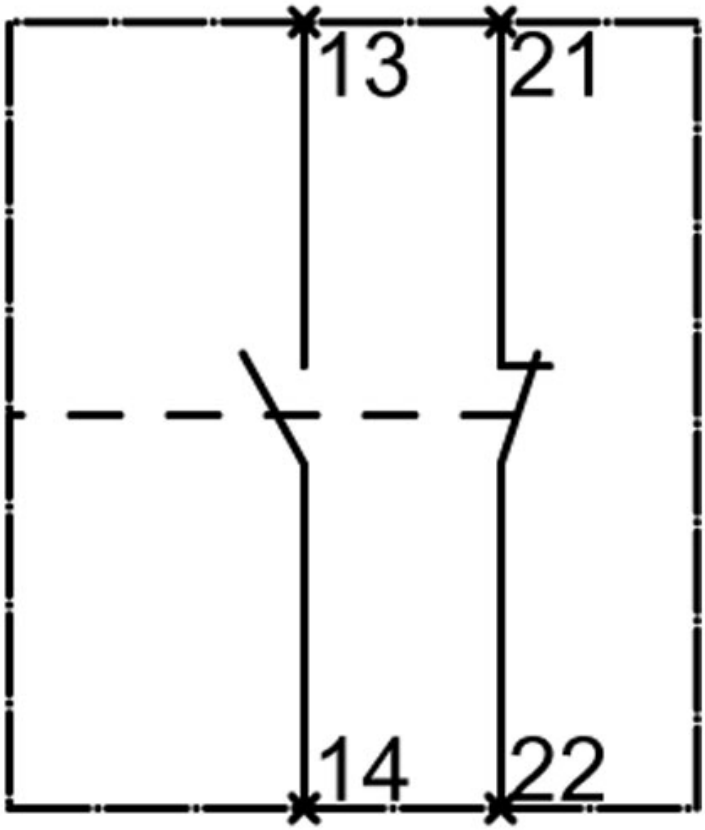

last change: Mar 17, 2014

SIEMENS

Product data sheet 3RV2926-2B

DOOR-COUPLING ROTARY OPERATING MECHANISM
FOR CIRCUIT-BREAKERS SIZE S00/S0,
HANDLE GRAY NEW DESIGN

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
Acceptability for application		circuit-breakers S0
Protection class IP / on the front		IP65
Ambient temperature		
• during storage	°C	-50 … +80
• during operating	°C	-20 … +70
Operating cycles / maximum	1/h	15
Color / of the activation element		gray

Installation/mounting/dimensions:		
mounting position		any
Type of mounting		screw fixing
Width	mm	75
Height	mm	75
Depth	mm	78

Length	mm	300
Diameter	mm	40
Distance, to be maintained, to earthed part		
• forwards	mm	0
• backwards	mm	0
• upwards	mm	0
• sidewards	mm	0
• downwards	mm	0

Certificates/approvals:

Verification of suitability		CE / UL / CSA

General Product Approval		**Shipping Approval**	
CSA	UL	BUREAU VERITAS	
other			
Confirmation	VDE	other	Environmental Confirmations

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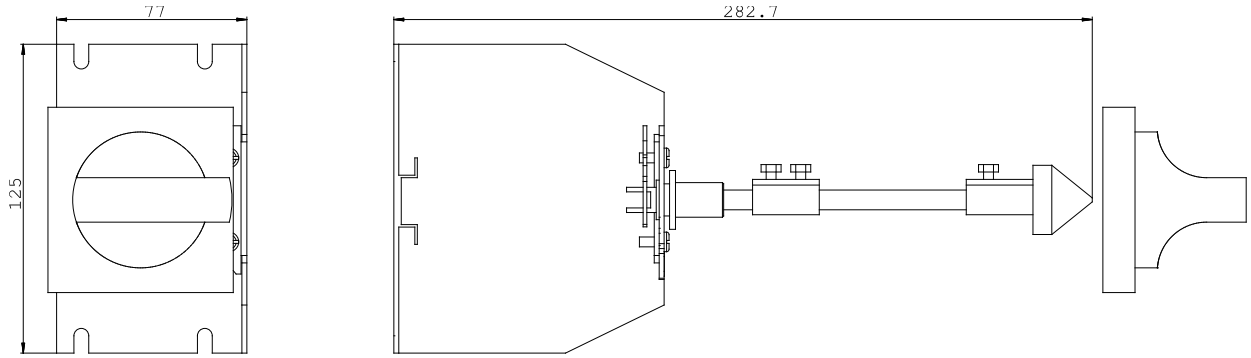
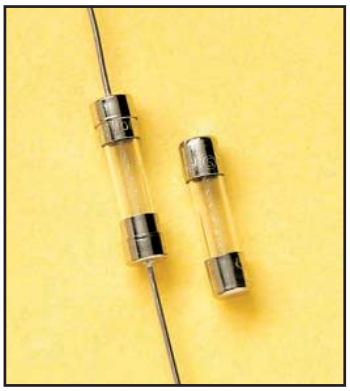


last change: Dec 17, 2012

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*

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	GSB0-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.

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

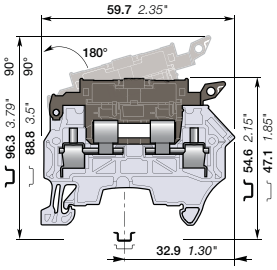
CATALOG NUMBER	AXIAL LEAD CAT. NO	AMPERE RATING	VOLTS	I.R.
GDG1/16	GDG-V1/16	1/16A	250V	1
GDG8/100	GDG-V8/100	8/100A	250V	1
GDG1/10	GDG-V1/10	1/10A	250V	1
GDG1/8	GDG-V1/8	1/8A	250V	1
GDG16/100	GDG-V16/100	16/100A	250V	1
GDG2/10	GDG-V2/10	2/10A	250V	1
GDG1/4	GDG-V1/4	1/4A	250V	1
GDG315/1000	GDG-V315/1000	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.

ZS4-SF1 screw clamp terminal blocks
For 5x20 and 5x25 fuses - 8 mm *0.315 in* spacing

ZS4-SF1



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*
1 conductor per clamp	Rigid - Solid / Stranded	0.2 ... 4 mm²	*24 ... 10 AWG*
	Flexible	0.22 ... 4 mm²	
	with non insulated ferrule	0.22 ... 4 mm²	*24 ... 12 AWG*
	with insulated ferrule	0.22 ... 4 mm²	*24 ... 12 AWG*
	Gauge	A3-B3	
2 conductors per clamp	Rigid - Solid / Stranded	0.2 ... 1.5 mm²	*24 ... 16 AWG*
	Flexible	0.2 ... 1.5 mm²	
	with twin ferrule	0.22 ... 1.5 mm²	*24 ... 16 AWG*
Rated current / Rated cross section		6.3 A / 4 mm²	*10 A / 10 AWG*
Rated voltage		630 V	*300 V*
Impulse withstand voltage		8000 V	
Protection		IP20	*NEMA 1*

Mounting instructions

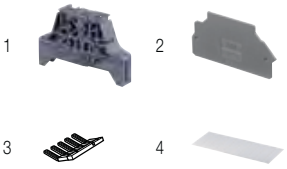
Rail		TH 35-7.5, TH 35-15
Wire stripping length		11 mm *0.433 in*
Tool		Flat screwdriver Ø 3.5 mm *Ø 0.138 in*
Torque		0.6 N.m ± 0.1 *5.31 lb.in ± 0.885*

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

CE CB RoHS USR CNR CSA Gost R BV DNV Rina

Accessories



	Description			Color	Type	Order code	Pkg pce	Weight (1 pce) g
1	**End stops**	10 mm	*0.394 in*	Dark grey	BAM3	1SNK900001R0000	50	13.80
2	**End sections**	1.5 mm	*0.059 in*	Dark grey	ES4-SF	1SNK508960R0000	20	1.82
3	**Lateral jumper bars**	10 poles	35 A	Black	PC81-10	1SNA173523R1100	10	5.00
4	**Terminal block markers**	Blank card		White	MC812	1SNK160000R0000	22	10.00
					MC812PA	1SNK169999R0000	20	14.00
		Universal wire markers holder		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.

1SNK161011S0201 - Rev. C

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.

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

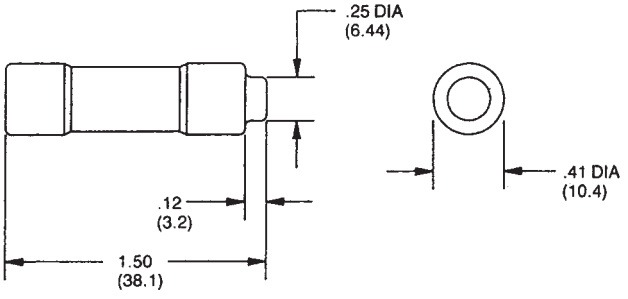
TIME DELAY/CLASS CC FUSES

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

* The National Electrical Code allows time-delay Class CC fuses to be sized at up to 400% (maximum) of motor FLA, if needed.

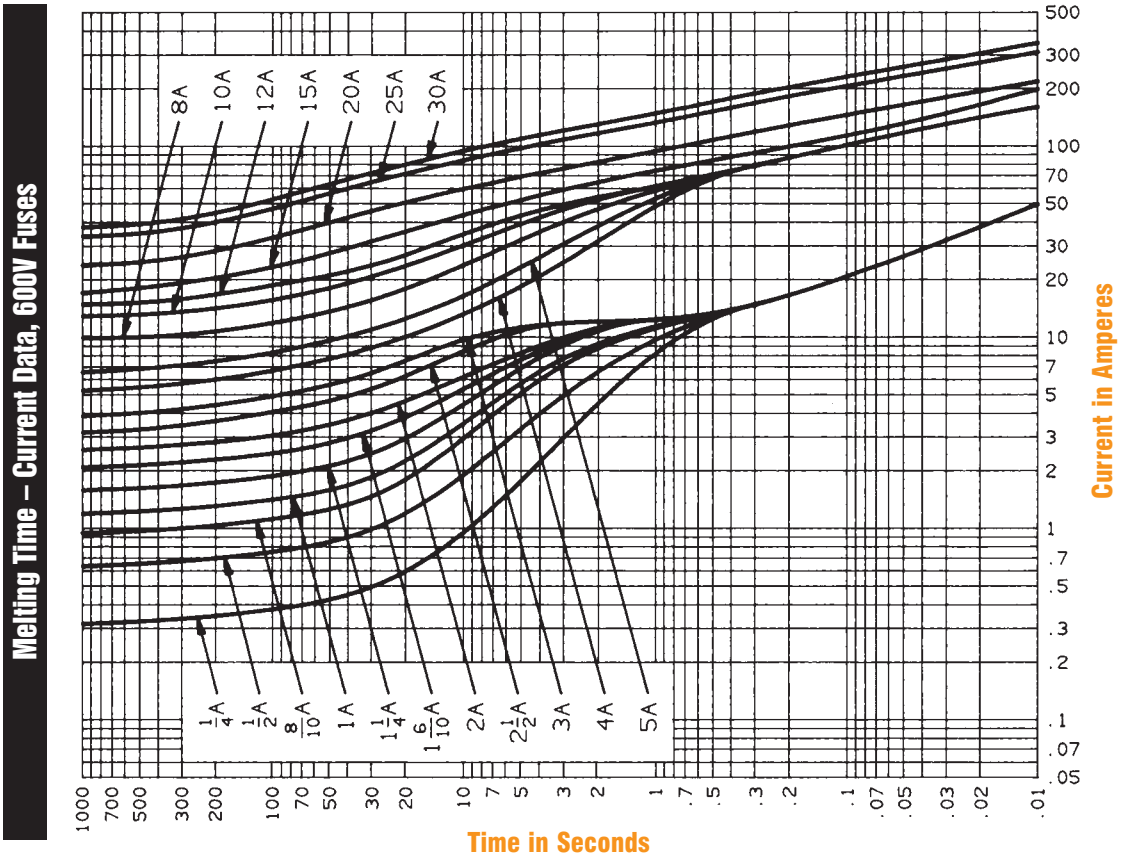
Recommended Fuse Blocks for Class CC Fuses

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		30310R	30320R	30350R
1	USCC1I	30311R	30321R	30351R
2	USCC2I	30312R	30322R	30352R
3	USCC3I	30313R	30323R	30353R

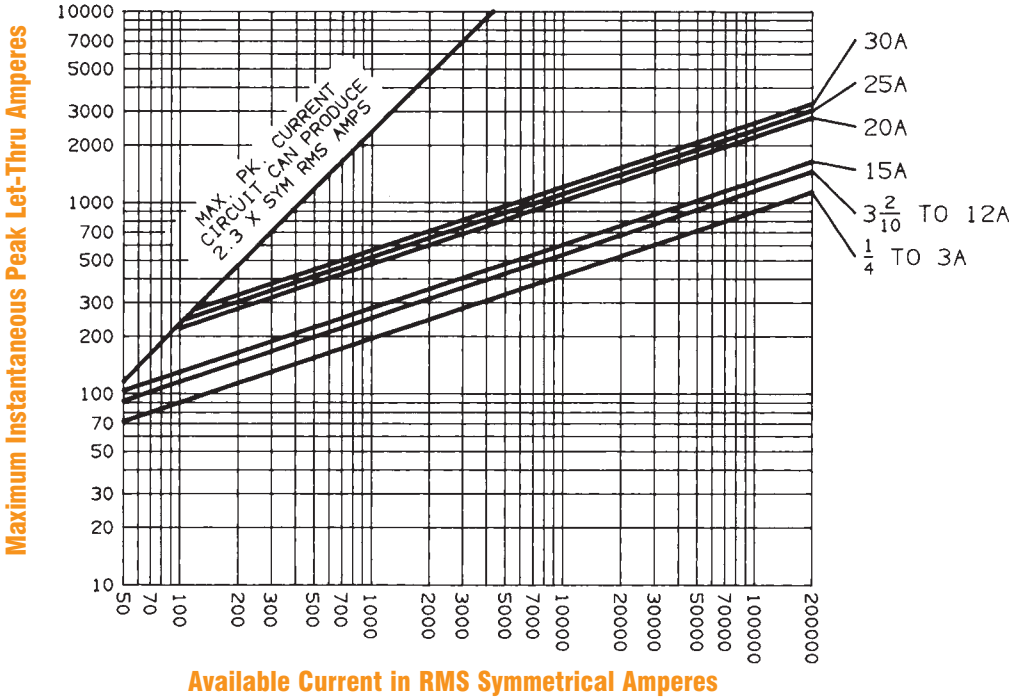
TIME DELAY/CLASS CC FUSES

A

ATDR1/4 to 30



Peak Let-Thru Current Data – ATDR1/4 to 30, 600 Volts AC



USCC & USM

ULTRASAFE™ FUSEHOLDERS

ULTRASAFE MODULAR FUSE HOLDERS

Ferraz Shawmut UltraSafe™ Modular Fuse Holders 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

Ratings

- **USM** (10x38mm, Midget Fuses)
  800VAC / 1000VDC, 30A (non-indicating versions)
  600VAC / 600VDC, 30A (indicating versions)
  Short Circuit Current Rating: 100kA
  Special indicators available for 24VDC, 120VAC and 1000VDC
- **USCC** (Class CC Fuses)
  600VAC / 600VDC, 30A
  Short Circuit Current Rating: 200kA
  Special indicators available for 24VDC, 120VAC and 300VAC

Recommended Fuse Usage

- **USM** use with:
  ATQ, ATM*, A6Y-2B, A25Z-2, TRM, OTM, A13X-2, A60Q-2, DCT*
- **USCC** use with:
  ATDR, ATMR*, ATQR

*** Recommended for DC Applications**

Approvals

All UltraSafe fuse holders meet the requirements of UL4248 (formally UL512)
CSA Certified C22.2, Class 6225, File 32169
IEC Compliant 60269-1

- **USM** (Midget, 10x38mm, 1-1/2" x 13/ 32")
  UL Recognized Component, Guide IZLT2, File E52283
  CSA Certified 750VAC, 30A
  IEC Compliant 690VAC, 32A
- **USCC** (UL Class CC)
  UL Listed, Guide IZLT, File E52283
  CSA Certified, 600V, 30A

RoHS 2002/95/EC

USCC & USM

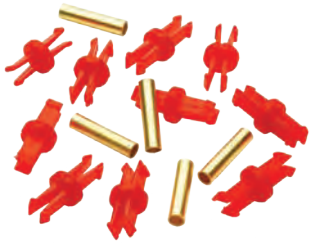
ULTRASAFE™ FUSEHOLDERS

Catalog Number W/O Indicator	Catalog Number W/ Indicator	Description	Fuse Type	Voltage Rating		Ampere Rating	No. of Poles	Certifications
				AC	DC			
USCC1	USCC1I	1-Pole Class CC UltraSafe Fuse Holder	Class CC	600V	600V	30A	1	UL Listed CSA
USCC2	USCC2I	2-Pole Class CC UltraSafe Fuse Holder					2	
USCC3	USCC3I	3-Pole Class CC UltraSafe Fuse Holder					3	
USCC4	USCC4I	4-Pole Class CC UltraSafe Fuse Holder					4	
USCC3N	USCC3IN	3-Pole + N Class CC UltraSafe Fuse Holder					4	
Special Indicator Versions	USCC1I-AC120	USCC1I with 120VAC indicator		120	-		1	
	USCC1I-AC300	USCC1I with 300VAC indicator		300	-		1	
	USCC1I-DC24	USCC1I with 24VDC indicator		-	24		1	
USM1	USM1I	1-Pole Midget UltraSafe Fuse Holder	Midget (10 x 38mm) (1-1/2" x 13/32")	800V*	1000V*	30A	1	UL Recognized CSA IEC Certified
USM2	USM2I	2-Pole Midget UltraSafe Fuse Holder					2	
USM3	USM3I	3-Pole Midget UltraSafe Fuse Holder					3	
USM4	USM4I	4-Pole Midget UltraSafe Fuse Holder					4	
USM3N	USM3IN	3-Pole + N Midget UltraSafe Fuse Holder					4	
Special Indicator Versions	USM1I-AC120	USM1I with 120VAC indicator		120	-		1	
	USM1I-DC24	USM1I with 24VDC indicator		-	24		1	
	USM1I-DC1000	USM1I with 1000VDC indicator		-	1000		1	

* Catalog Numbers with Indicators are rated 600VAC / 600VDC unless otherwise noted.

Accessories Catalog Number	Description
USN	1-Pole with Integral Neutral Link
USPTH	Pin-Tie Accessory for 12-Poles

USPTH Pin-Tie Accessory



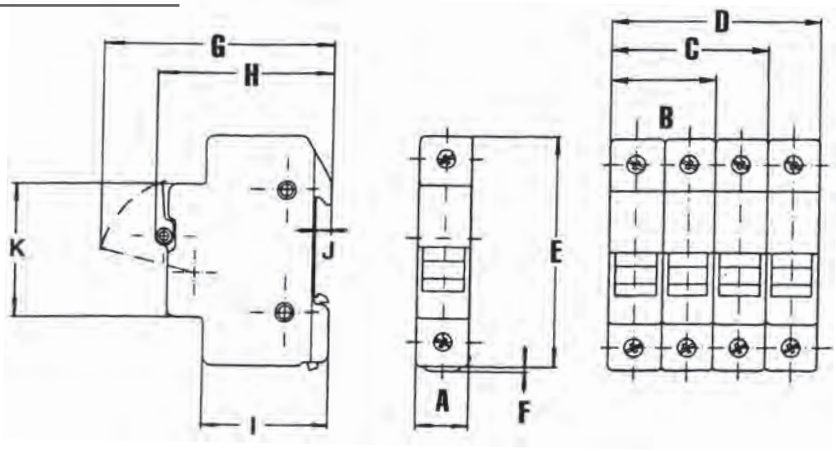
USM1 with USPTH Pin-Ties

Additional Specifications

Terminal screws: Phillips/slot head
Suggested screw torque: 14.75 in-lbs.
Connector type: Pressure plate
Wire range: #6 to #14 (solid/stranded Cu)
Load-break disconnect: No

Dimensions

DIMENSION	mm	In
A	17.5	0.69
B	35.0	1.38
C	52.5	2.07
D	70.0	2.76
E	78.0	3.07
F	2.5	0.10
G	78.0	3.07
H	59.0	2.32
I	42.5	1.67
J	5.0	0.20
K	45.0	1.77



Features

5SJ4...-.HG41 miniature circuit breakers are designed to comply with UL 489 and CSA 22.2 No. 5-02 standards. They are used in single and multi-pole, branch circuit protection applications up to 240 VAC maximum and 60/125 VDC maximum. Refer to Technical Data (page 16/8) for additional information.

Selection and ordering data

		I_n	Characteristic C			Characteristic D			Weight
			Order No.	Interruption Type [1]	List Price $	Order No.	Interruption Type [1]	List Price $	1 item
		A			1 item			1 item	kg
	**1-pole** 	0.3	**5SJ4114-7HG41**	**HSJ**		**5SJ4114-8HG41**	**HSJ**		0.155
		0.5	**5SJ4105-7HG41**	**HSJ**		**5SJ4105-8HG41**	**HSJ**		
		1	**5SJ4101-7HG41**	**HSJ**		**5SJ4101-8HG41**	**HSJ**		
		1.6	**5SJ4115-7HG41**	**HSJ**		**5SJ4115-8HG41**	**HSJ**		
		2	**5SJ4102-7HG41**	**HSJ**		**5SJ4102-8HG41**	**HSJ**		
		3	**5SJ4103-7HG41**	**HSJ**		**5SJ4103-8HG41**	**HSJ**		
		4	**5SJ4104-7HG41**	**HSJ**		**5SJ4104-8HG41**	**HSJ**		
		5	**5SJ4111-7HG41**	**HSJ**		**5SJ4111-8HG41**	**HSJ**		
		6	**5SJ4106-7HG41**	**HSJ**		**5SJ4106-8HG41**	**HSJ**		
		8	**5SJ4108-7HG41**	**HSJ**		**5SJ4108-8HG41**	**HSJ**		
		10	**5SJ4110-7HG41**	**HSJ**		**5SJ4110-8HG41**	**HSJ**		
		13	**5SJ4113-7HG41**	**HSJ**		**5SJ4113-8HG41**	**HSJ**		
		15	**5SJ4118-7HG41**	**HSJ**		**5SJ4118-8HG41**	**HSJ**		
		16	**5SJ4116-7HG41**	**HSJ**		**5SJ4116-8HG41**	**HSJ**		
		20	**5SJ4120-7HG41**	**HSJ**		**5SJ4120-8HG41**	**HSJ**		
		25	**5SJ4125-7HG41**	**HSJ**		**5SJ4125-8HG41**	**NSJ**		
		30	**5SJ4130-7HG41**	**HSJ**		**5SJ4130-8HG41**	**NSJ**		
		32	**5SJ4132-7HG41**	**HSJ**		**5SJ4132-8HG41**	**NSJ**		
		35	**5SJ4135-7HG41**	**HSJ**		**5SJ4135-8HG41**	**NSJ**		
		40	**5SJ4140-7HG41**	**HSJ**		**5SJ4140-8HG41**	**NSJ**		
		45	**5SJ4145-7HG41**	**NSJ**		**5SJ4145-8HG41**	**NSJ**		
		50	**5SJ4150-7HG41**	**NSJ**		**5SJ4150-8HG41**	**NSJ**		
		60	**5SJ4160-7HG41**	**NSJ**		**5SJ4160-8HG41**	**NSJ**		
		63	**5SJ4163-7HG41**	**NSJ**		**5SJ4163-8HG41**	**NSJ**		
	**2-pole** 	0.3	**5SJ4214-7HG41**	**HSJ**		**5SJ4214-8HG41**	**HSJ**		0.310
		0.5	**5SJ4205-7HG41**	**HSJ**		**5SJ4205-8HG41**	**HSJ**		
		1	**5SJ4201-7HG41**	**HSJ**		**5SJ4201-8HG41**	**HSJ**		
		1.6	**5SJ4215-7HG41**	**HSJ**		**5SJ4215-8HG41**	**HSJ**		
		2	**5SJ4202-7HG41**	**HSJ**		**5SJ4202-8HG41**	**HSJ**		
		3	**5SJ4203-7HG41**	**HSJ**		**5SJ4203-8HG41**	**HSJ**		
		4	**5SJ4204-7HG41**	**HSJ**		**5SJ4204-8HG41**	**HSJ**		
		5	**5SJ4211-7HG41**	**HSJ**		**5SJ4211-8HG41**	**HSJ**		
		6	**5SJ4206-7HG41**	**HSJ**		**5SJ4206-8HG41**	**HSJ**		
		8	**5SJ4208-7HG41**	**HSJ**		**5SJ4208-8HG41**	**HSJ**		
		10	**5SJ4210-7HG41**	**HSJ**		**5SJ4210-8HG41**	**HSJ**		
		13	**5SJ4213-7HG41**	**HSJ**		**5SJ4213-8HG41**	**HSJ**		
		15	**5SJ4218-7HG41**	**HSJ**		**5SJ4218-8HG41**	**HSJ**		
		16	**5SJ4216-7HG41**	**HSJ**		**5SJ4216-8HG41**	**HSJ**		
		20	**5SJ4220-7HG41**	**HSJ**		**5SJ4220-8HG41**	**HSJ**		
		25	**5SJ4225-7HG41**	**HSJ**		**5SJ4225-8HG41**	**NSJ**		
		30	**5SJ4230-7HG41**	**HSJ**		**5SJ4230-8HG41**	**NSJ**		
		32	**5SJ4232-7HG41**	**HSJ**		**5SJ4232-8HG41**	**NSJ**		
		35	**5SJ4235-7HG41**	**HSJ**		**5SJ4235-8HG41**	**NSJ**		
		40	**5SJ4240-7HG41**	**HSJ**		**5SJ4240-8HG41**	**NSJ**		
		45	**5SJ4245-7HG41**	**NSJ**		**5SJ4245-8HG41**	**NSJ**		
		50	**5SJ4250-7HG41**	**NSJ**		**5SJ4250-8HG41**	**NSJ**		
		60	**5SJ4260-7HG41**	**NSJ**		**5SJ4260-8HG41**	**NSJ**		
		63	**5SJ4263-7HG41**	**NSJ**		**5SJ4263-8HG41**	**NSJ**		
	**3-pole** 	0.3	**5SJ4314-7HG41**	**HSJ**		**5SJ4314-8HG41**	**HSJ**		0.465
		0.5	**5SJ4305-7HG41**	**HSJ**		**5SJ4305-8HG41**	**HSJ**		
		1	**5SJ4301-7HG41**	**HSJ**		**5SJ4301-8HG41**	**HSJ**		
		1.6	**5SJ4315-7HG41**	**HSJ**		**5SJ4315-8HG41**	**HSJ**		
		2	**5SJ4302-7HG41**	**HSJ**		**5SJ4302-8HG41**	**HSJ**		
		3	**5SJ4303-7HG41**	**HSJ**		**5SJ4303-8HG41**	**HSJ**		
		4	**5SJ4304-7HG41**	**HSJ**		**5SJ4304-8HG41**	**HSJ**		
		5	**5SJ4311-7HG41**	**HSJ**		**5SJ4311-8HG41**	**HSJ**		
		6	**5SJ4306-7HG41**	**HSJ**		**5SJ4306-8HG41**	**HSJ**		
		8	**5SJ4308-7HG41**	**HSJ**		**5SJ4308-8HG41**	**HSJ**		
		10	**5SJ4310-7HG41**	**HSJ**		**5SJ4310-8HG41**	**HSJ**		
		13	**5SJ4313-7HG41**	**HSJ**		**5SJ4313-8HG41**	**HSJ**		
		15	**5SJ4318-7HG41**	**HSJ**		**5SJ4318-8HG41**	**HSJ**		
		16	**5SJ4316-7HG41**	**HSJ**		**5SJ4316-8HG41**	**HSJ**		
		20	**5SJ4320-7HG41**	**HSJ**		**5SJ4320-8HG41**	**HSJ**		
		25	**5SJ4325-7HG41**	**HSJ**		**5SJ4325-8HG41**	**NSJ**		
		30	**5SJ4330-7HG41**	**HSJ**		**5SJ4330-8HG41**	**NSJ**		
		32	**5SJ4332-7HG41**	**HSJ**		**5SJ4332-8HG41**	**NSJ**		
		35	**5SJ4335-7HG41**	**HSJ**		**5SJ4335-8HG41**	**NSJ**		
		40	**5SJ4340-7HG41**	**HSJ**		**5SJ4340-8HG41**	**NSJ**		
		45	**5SJ4345-7HG41**	**NSJ**		**5SJ4345-8HG41**	**NSJ**		
		50	**5SJ4350-7HG41**	**NSJ**		**5SJ4350-8HG41**	**NSJ**		
		60	**5SJ4360-7HG41**	**NSJ**		**5SJ4360-8HG41**	**NSJ**		
		63	**5SJ4363-7HG41**	**NSJ**		**5SJ4363-8HG41**	**NSJ**		

1) Interrupting Rating to UL489, AC Max. RMS Symmetrical: Type NSJ = 10kA, Type HSJ = 14 kA.

Pluggable interface relays 187

CR-P, CR-M and CR-U range

Content

6

Pluggable interface relays CR-P, CR-M and CR-U range
Benefits and advantages

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

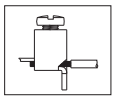
Kinds of sockets

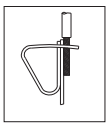
Standard sockets - Position of connecting terminals:
Coil connection (A1-A2) on lower socket side,
contact connections (n/o and n/c contacts)
on the lower and upper socket side.

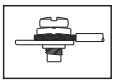
Logical sockets - Position of connecting terminals:
Coil connection (A1-A2) on lower socket side,
all contact connections (common contacts,
n/o and n/c contacts) on upper socket side.

Details see connection diagrams

Kind of connecting terminals


Screw type


Spring type


Fork type

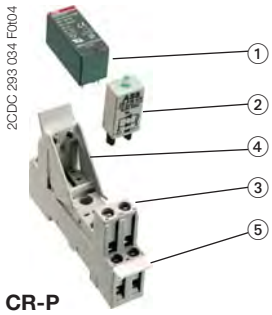
Approvals and marks

■ **existing**
□ **pending**

		Relays				Sockets							Modules	
Approvals		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
	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	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



CR-P

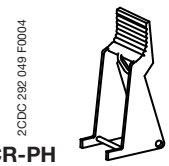
① interface relay
② Pluggable function module
③ Socket
④ Holder
⑤ Marker

CR-P

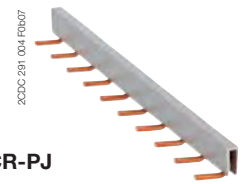
CR-PLS

CR-PSS

CR-PLC



CR-PH



CR-PJ

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	

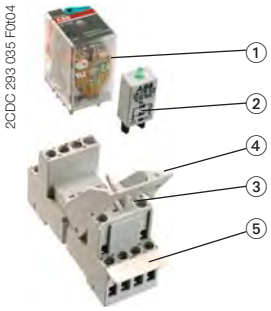
Accessories - Sockets

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 modules .....258 • Technical data .....261 • Dimensional drawings 265

Pluggable interface relays CR-M
Miniature relays
Ordering details



CR-M

① Interface relay
② Pluggable function module
③ Socket
④ Holder
⑤ Marker

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 modules .....258 • Technical data .....261 • Dimensional drawings 265

Pluggable interface relays CR-M
Miniature relays
Ordering details (continued)

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 modules .....258 • Technical data .....261 • Dimensional drawings 265

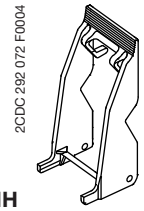
Pluggable interface relays CR-M
Miniature relays
Ordering details (continued)

CR-M

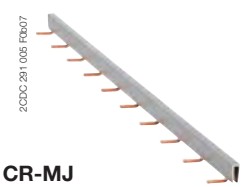
CR-M4SS

CR-M4LS

CR-M4LC



CR-MH



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...
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• Pluggable function modules .....258 • Technical data .....261 • Dimensional drawings 265

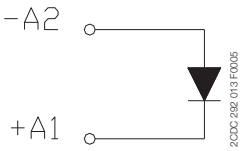
Pluggable interface relays CR-P, CR-M - Accessories
Pluggable function modules
Ordering details, Connection diagrams

CR-P/M ..

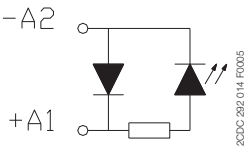
CR-P/M T..

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	

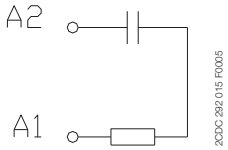
Connection diagrams



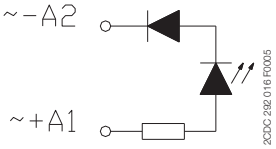
CR-P/M 22



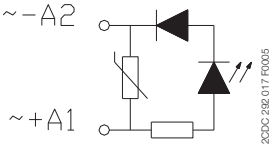
CR-P/M 42, CR-P/M 42B, CR-P/M 42C, CR-P/M 42V, CR-P/M 42BV, CR-P/M 42CV



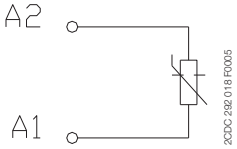
CR-P/M 52B, CR-P/M 52C, CR-P/M 52D,



CR-P/M 62, CR-P/M 62E, CR-P/M 92, CR-P/M 62V, 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

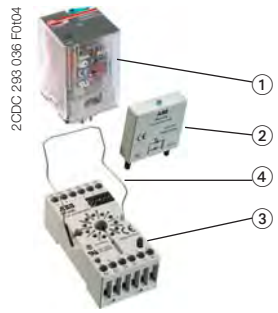


CR-P/M 72, CR-P/M 72A, CR-P/M 82

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



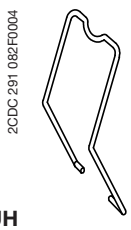
CR-U

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 modules .....260 • Technical data .....261 • Dimensional drawings 265

6

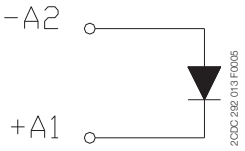
Pluggable interface relays CR-U - Accessories
Pluggable function modules
Ordering details, Connection diagrams

CR-U ..

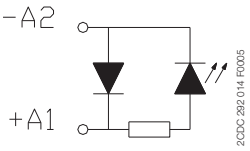
CR-U T

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**	
Diode and LED - Reverse polarity protection/free wheeling diode					
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**	

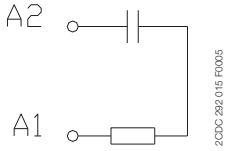
Connection diagrams



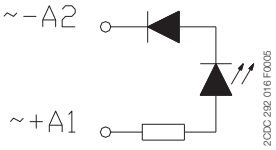
CR-U 21



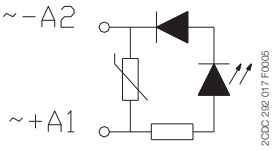
CR-U 41, CR-U 41B, CR-U 41C, CR-U 41V, CR-U 41BV, CR-U 41CV



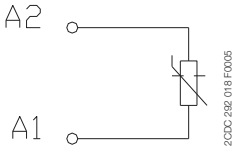
CR-U 51B, CR-U 51C CR-U 51D,



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	≥ 0.1 U_s	0.4-0.48 W	360 Ω	± 10%
	24 V DC	-	16.8 V DC	61.2 V DC	≥ 0.1 U_s	0.4-0.48 W	1440 Ω	± 10%
	48 V DC	-	33.6 V DC	122.4 V DC	≥ 0.1 U_s	0.4-0.48 W	5700 Ω	± 10%
	110 V DC	-	77 V DC	280 V DC	≥ 0.1 U_s	0.4-0.48 W	25200 Ω	± 10%
AC coils	24 V AC	50 / 60 Hz	19.2 V AC	28.8 V AC	≥ 0.15 U_s	0.75 VA	400 Ω	± 10%
	48 V AC	50 / 60 Hz	38.4 V AC	57.6 V AC	≥ 0.15 U_s	0.75 VA	1550 Ω	± 10%
	110 V AC	50 / 60 Hz	88 V AC	132 V AC	≥ 0.15 U_s	0.75 VA	8900 Ω	± 10%
	120 V AC	50 / 60 Hz	96 V AC	144 V AC	≥ 0.15 U_s	0.75 VA	10200 Ω	± 10%
	230 V AC	50 / 60 Hz	184 V AC	276 V AC	≥ 0.15 U_s	0.75 VA	38500 Ω	± 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	≥ 0.1 U_s	0.9 W	160 Ω	± 10%
	24 V DC	-	19.2 DC	26.4 V DC	≥ 0.1 U_s	0.9 W	640 Ω	± 10%
	48 V DC	-	38.4 V DC	52.8 V DC	≥ 0.1 U_s	0.9 W	2600 Ω	± 10%
	60 V DC	-	48.0 V DC	66.0 V DC	≥ 0.1 U_s	0.9 W	4000 Ω	± 10%
	110 V DC	-	88 V DC	121 V DC	≥ 0.1 U_s	0.9 W	13600 Ω	± 10%
	125 V DC	-	100 V DC	137,5 V DC	≥ 0.1 U_s	0.9 W	16000 Ω	± 10%
	220 V DC	-	176 V DC	242 V DC	≥ 0.1 U_s	0.9 W	54000 Ω	± 10%
AC coils	24 V AC	50 / 60 Hz	19.2 V AC	26.4 V AC	≥ 0.2 U_s	1.6 VA	158 Ω	± 10%
	48 V AC	50 / 60 Hz	38.4 V AC	52.8 V AC	≥ 0.2 U_s	1.6 VA	640 Ω	± 10%
	110 V AC	50 / 60 Hz	88 V AC	121 V AC	≥ 0.2 U_s	1.6 VA	3450 Ω	± 10%
	120 V AC	50 / 60 Hz	96 V AC	132 V AC	≥ 0.2 U_s	1.6 VA	3770 Ω	± 10%
	230 V AC	50 / 60 Hz	184 V AC	253 V AC	≥ 0.2 U_s	1.6 VA	16100 Ω	± 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	≥ 0.1 U_s	1.5 W	110 Ω	± 10%
	24 V DC	-	19.2 DC	26.4 V DC	≥ 0.1 U_s	1.5 W	430 Ω	± 10%
	48 V DC	-	38.4 V DC	52.8 V DC	≥ 0.1 U_s	1.5 W	1750 Ω	± 10%
	110 V DC	-	88 V DC	121 V DC	≥ 0.1 U_s	1.5 W	9200 Ω	± 10%
	220 V DC	-	176 V DC	242 V DC	≥ 0.1 U_s	1.5 W	37000 Ω	± 10%
AC coils	24 V AC	50 / 60 Hz	19.2 V AC	26.4 V AC	≥ 0.15 U_s	2.8 VA (50 Hz) 2.5 VA (60 Hz)	75 Ω	± 10%
	48 V AC	50 / 60 Hz	38.4 V AC	52.8 V AC	≥ 0.15 U_s	2.8 VA (50 Hz) 2.5 VA (60 Hz)	305 Ω	± 10%
	110 V AC	50 / 60 Hz	88 V AC	121 V AC	≥ 0.15 U_s	2.8 VA (50 Hz) 2.5 VA (60 Hz)	1700 Ω	± 10%
	120 V AC	50 / 60 Hz	96 V AC	132 V AC	≥ 0.15 U_s	2.8 VA (50 Hz) 2.5 VA (60 Hz)	1910 Ω	± 10%
	230 V AC	50 / 60 Hz	184 V AC	253 V AC	≥ 0.15 U_s	2.8 VA (50 Hz) 2.5 VA (60 Hz)	7080 Ω	± 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_e (VDE 0110, IEC 60947-1)		250 V						
Minimum switching voltage		5 V						
Maximum switching voltage	DC	300 V DC		250 V DC				
	AC	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	-
Minmum 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		> 10^5 switching cycles			> 10^5 switching cycles	
		(16 A, 250 V)	(8 A, 250 V)	(12 A, 250 V)	(10 A, 250 V)	(6 A, 250 V)	(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	

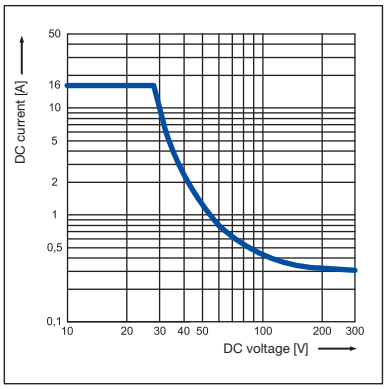
6

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						

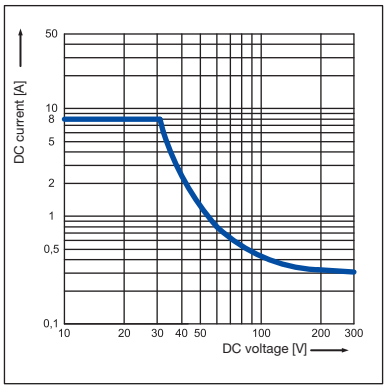
Load limit curves - Maximum switching power at resistive DC load

CR-P with 1 c/o contact



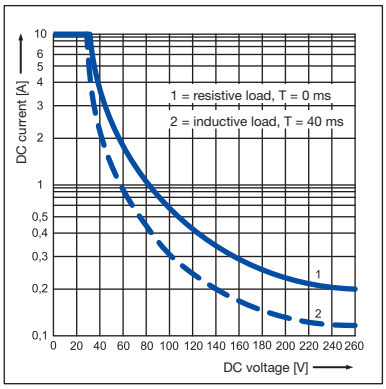
2CDC 292 005 F0204

CR-P with 2 c/o contacts



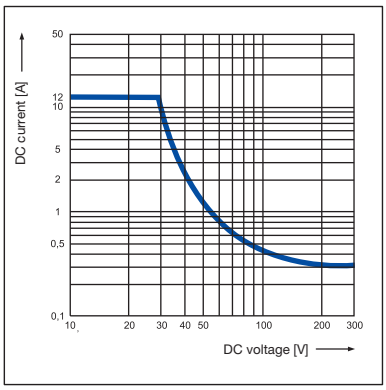
2CDC 292 010 F0204

CR-U with 2 and 3 c/o contacts



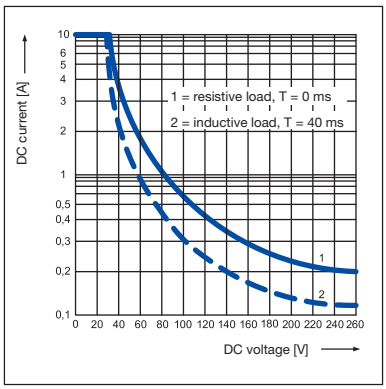
2CDC 292 028 F0204

CR-M with 2 c/o contacts



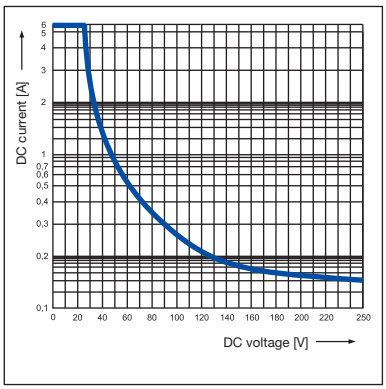
2CDC 292 015 F0204

CR-M with 3 c/o contacts



2CDC 292 019 F0204

CR-M with 4 c/o contacts



2CDC 292 023 F0204

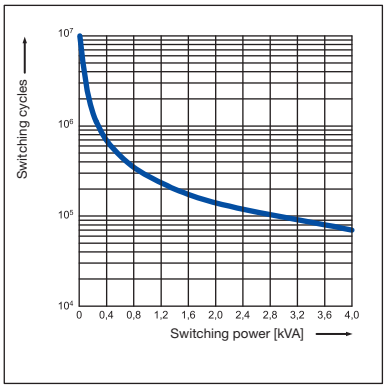
6

• **Approvals** 253

Pluggable interface relays CR-P, CR-M and CR-U
Pcb-, miniature- and universal relays
Technical diagrams

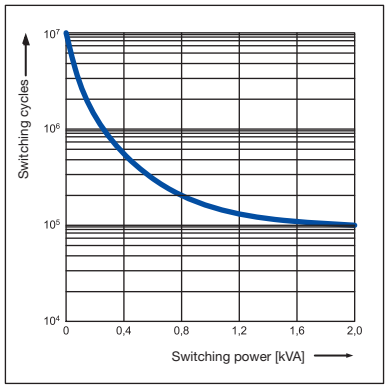
Load limit curves - Electrical lifetime at resistive AC load

CR-P with 1 c/o contact



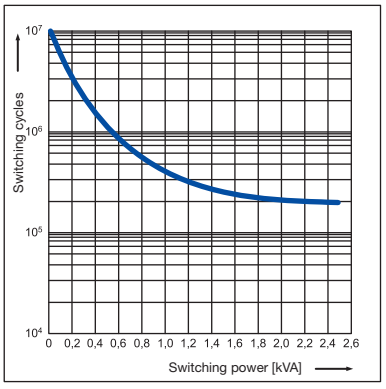
2CDC 292 003 F0204

CR-P with 2 c/o contacts



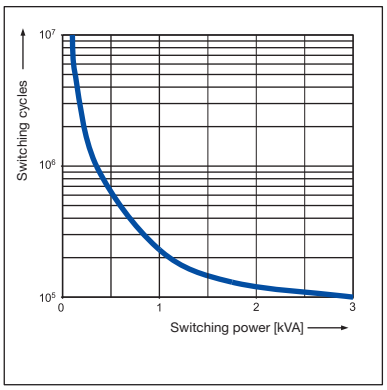
2CDC 292 009 F0204

CR-U with 2 and 3 c/o contacts



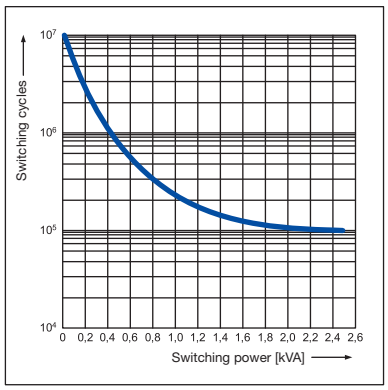
2CDC 292 027 F0204

CR-M with 2 c/o contacts



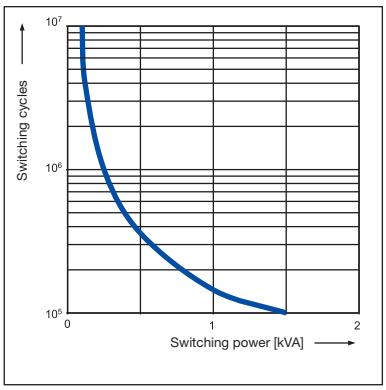
2CDC 292 013 F0204

CR-M with 3 c/o contacts



2CDC 292 018 F0204

CR-M with 4 c/o contacts

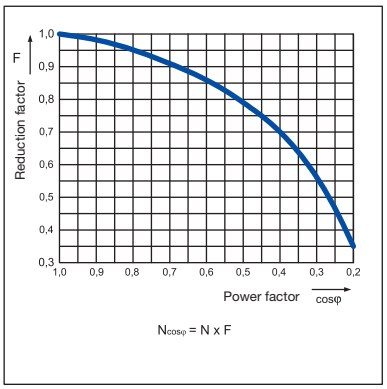


2CDC 292 022 F0204

6

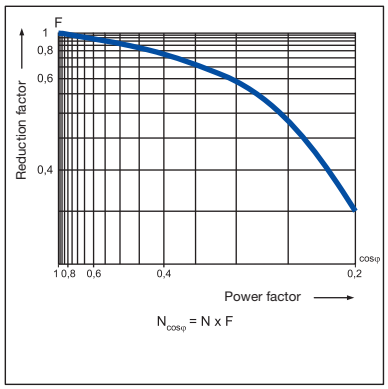
Reduction factor F at inductive AC load

CR-P



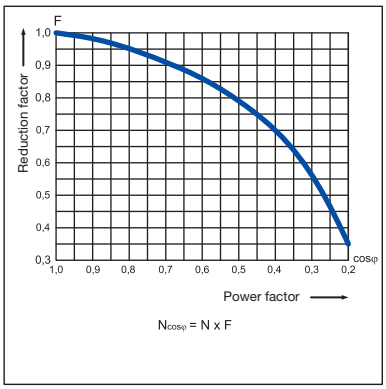
2CDC 292 004 F0204

CR-M



2CDC 292 014 F0204

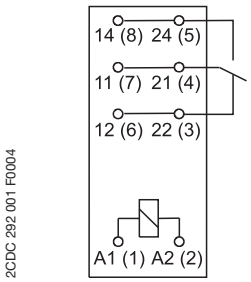
CR-U



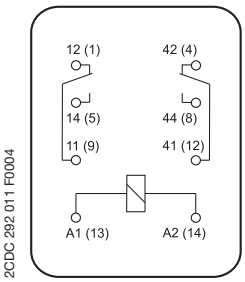
2CDC 292 029 F0204

Pluggable interface relays CR-P, CR-M and CR-U
Pcb-, miniature- and universal relays
Connection diagrams, dimensional drawings

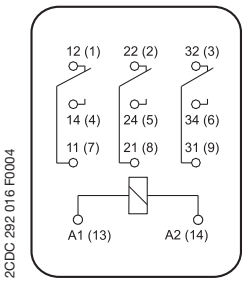
Connection diagrams



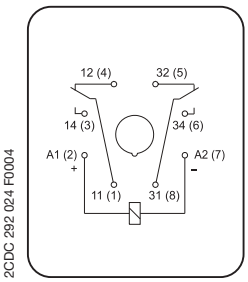
CR-P with 1 c/o contact



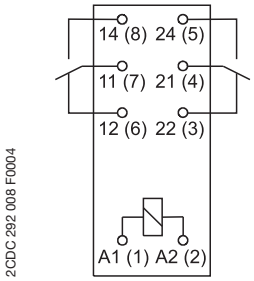
CR-M with 2 c/o contacts



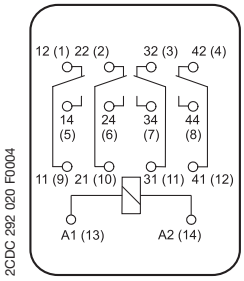
CR-M with 3 c/o contacts



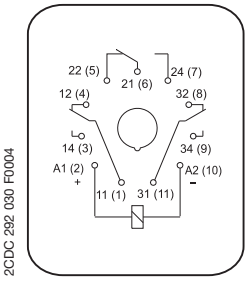
CR-U with 2 c/o contacts



CR-P with 2 c/o contacts



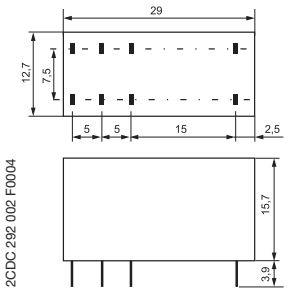
CR-M with 4 c/o contacts



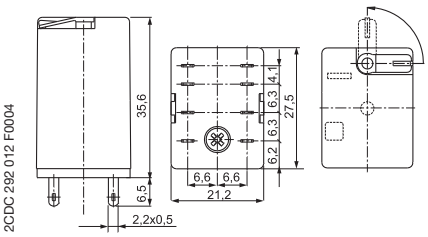
CR-U with 3 c/o contacts

Dimensional drawings

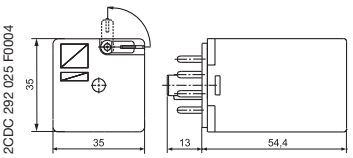
Dimensions in mm



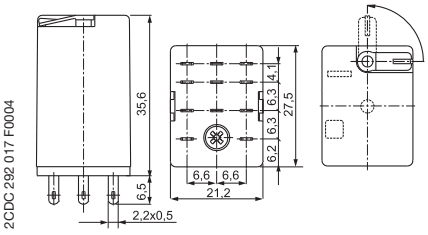
CR-P



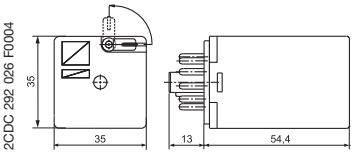
CR-M with 2 c/o contacts



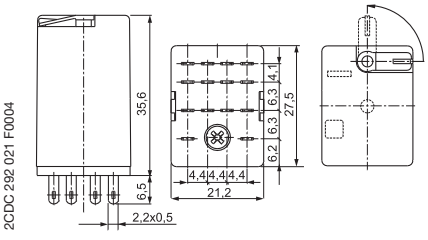
CR-U with 2 c/o contacts



CR-M with 3 c/o contacts



CR-U with 3 c/o contacts



CR-M with 4 c/o contacts

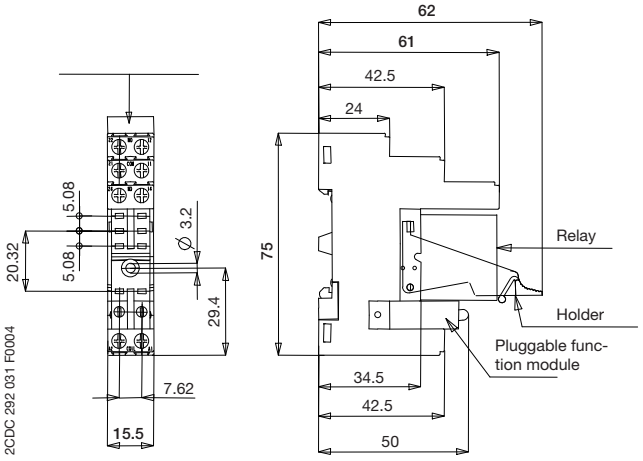
6

Pluggable interface relays CR-P, CR-M and CR-U
Pcb-, miniature- and universal relays
Dimensional drawings

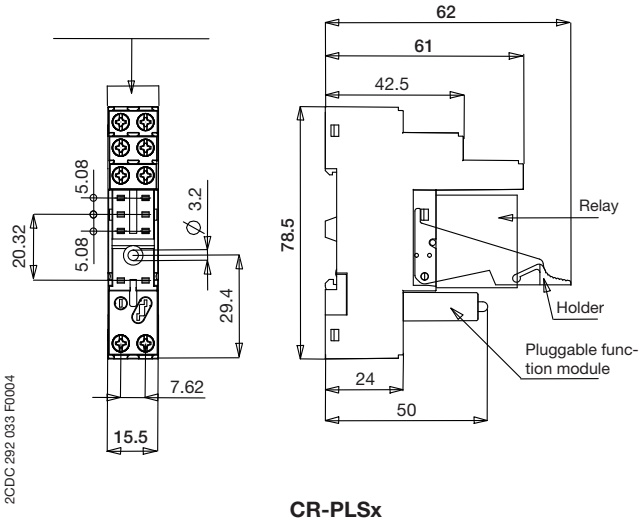
Dimensional drawings

Dimensions in mm

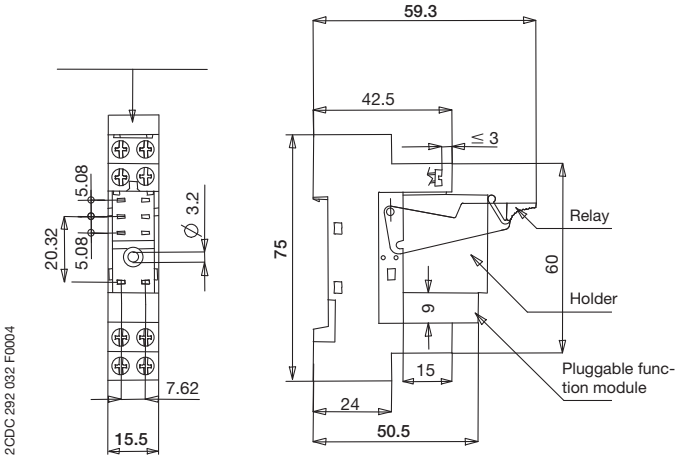
Sockets for screw connection



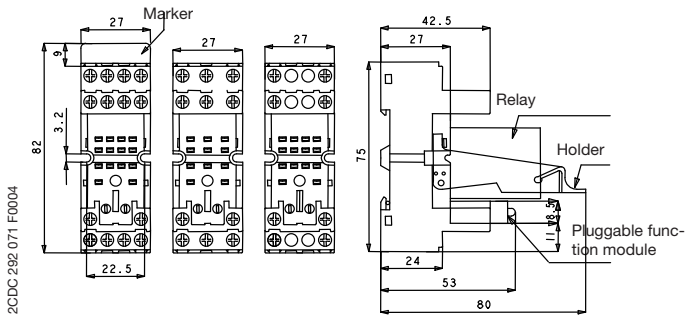
CR-PLS



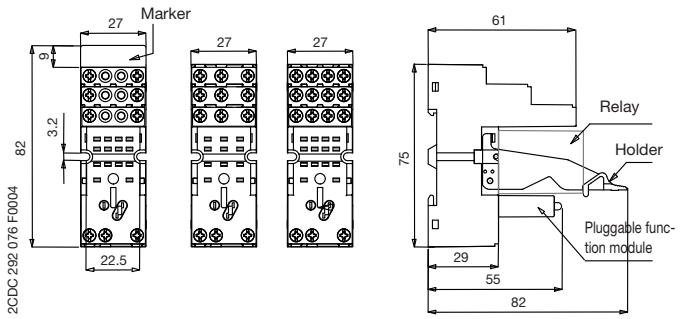
CR-PLSx



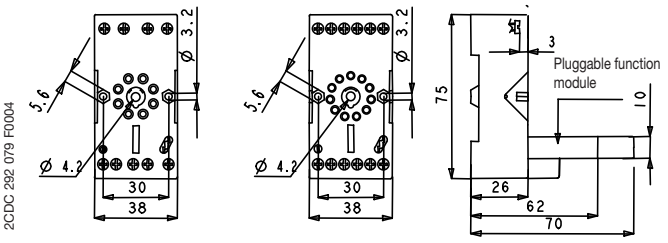
CR-PSS



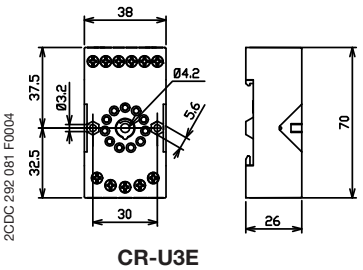
CR-M2SS - CR-M3SS - CR-M4SS



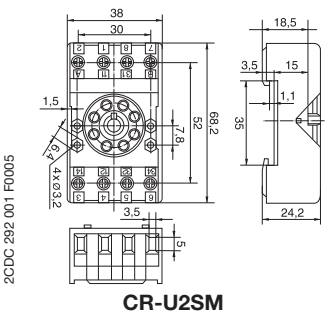
CR-M2LS - CR-M3LS - CR-M4LS



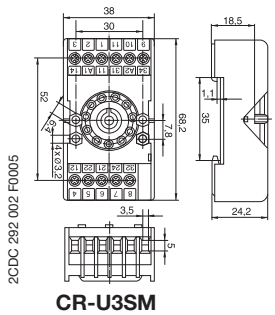
CR-U2S - CR-U3S



CR-U3E



CR-U2SM



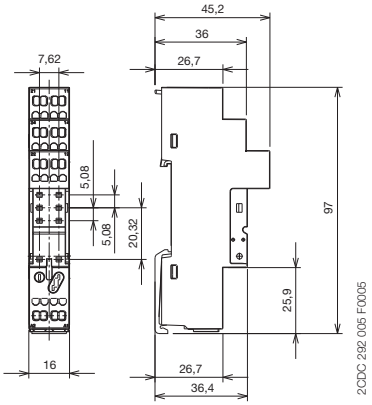
CR-U3SM

Pluggable interface relays CR-P, CR-M and CR-U
Pcb-, miniature- and universal relays
Dimensional drawings

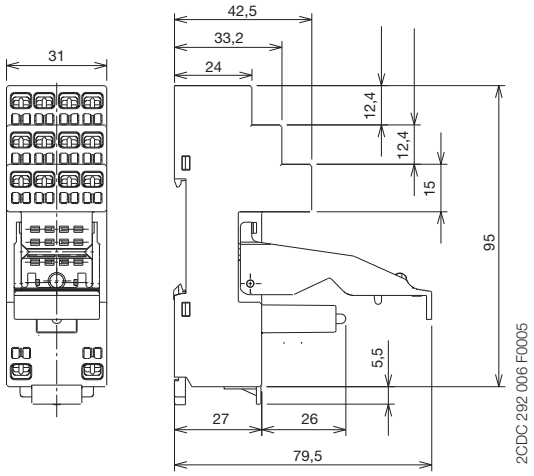
Dimensional drawings

Dimensions in mm

Sockets for spring connection

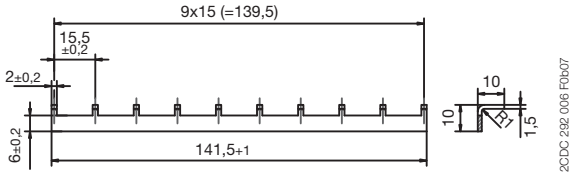


CR-PLC

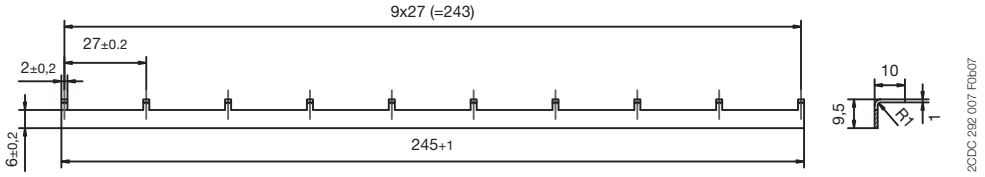


CR-M2LC , CR-M4LC

Jumper



CR-PJ



CR-MJ

6

Notes

SIEMENS

Data sheet 3RQ3118-1AM00

Output coupler with plug-in Relay, 1 change-over contact screw terminal 24 V DC Enclosure width 6.2 mm Thermal current 6A

Figure similar

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 link
Product type designation	3RQ3

General technical data	
Display version LED	Yes
Product component	
• Relay output	Yes
• semi-conductor output	No
Insulation voltage	
• for overvoltage category III according to IEC 60664	
— with degree of pollution 3 rated value	300 V
Surge voltage resistance rated value	4 kV
maximum permissible voltage for safe isolation	
• between control and auxiliary circuit	300 V

Percental drop-out voltage related to the input voltage	10 %
Protection class IP	IP20
Shock resistance	
• acc. to IEC 60068-2-27	sinusoidal half-wave 15g / 11 ms
Vibration resistance	
• acc. to IEC 60068-2-6	6 ... 150 Hz: 2 g
Operating frequency maximum	72 000 1/h
Switching behavior	monostable
Mechanical service life (switching cycles)	
• typical	10 000 000
Electrical endurance (switching cycles)	
• at AC-15 at 230 V typical	100 000
Thermal current	6 A
Reference code acc. to DIN EN 81346-2	K
Reference code acc. to DIN EN 61346-2	K

Control circuit/ Control

Control supply voltage at DC	
• rated value	24 V
Operating range factor control supply voltage rated value at DC	
• initial value	0.8
• Full-scale value	1.25
Switch-on delay time	
• at DC maximum	12 ms
Off-delay time	13 ms
Closing delay	
• at DC	6 ms
Opening delay	
• at DC	13 ms
Design of the relay operating mechanism	poled
Product component Plug-in socket	Yes

Short-circuit protection

Design of the fuse link	
• 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	
• **for auxiliary contacts**	1
Operating current of auxiliary contacts at AC-15	

• at 24 V	3 A
• at 250 V	3 A
Operating current of auxiliary contacts at DC-13	
• at 24 V	1 A
• at 125 V	0.2 A
• at 250 V	0.1 A
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	3 A
Ampacity of the output relay at DC-13	
• at 24 V	1 A
• at 125 V	0.2 A
• at 250 V	0.1 A

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	1 000 m
Type of connectable conductor cross-sections	
• solid	1x (0.25 ... 2.5 mm²)
• finely stranded with core end processing	1x (0.25 ... 1.5 mm²)
• at AWG conductors solid	1 x (20 ... 14)
Connectable conductor cross-section	
• solid	0.25 ... 2.5 mm²
• finely stranded with core end processing	0.25 ... 1.5 mm²
AWG number as coded connectable conductor cross section	
• solid	20 ... 14
Tightening torque	
• with screw-type terminals	0.5 ... 0.6 N·m

Installation/ mounting/ dimensions

Mounting position	any
Mounting type	snap-on mounting
Height	93 mm
Width	6.2 mm
Depth	76 mm
Required spacing	
• with side-by-side mounting	
— forwards	0 mm
— Backwards	0 mm
— upwards	0 mm
— downwards	0 mm
— at the side	0 mm
• for grounded parts	
— forwards	0 mm
— Backwards	0 mm
— upwards	0 mm
— at the side	0 mm
— downwards	0 mm
• for live parts	
— forwards	0 mm
— Backwards	0 mm
— upwards	0 mm
— downwards	0 mm
— at the side	0 mm

Ambient conditions

Installation altitude at height above sea level	

• maximum	2 000 m
Ambient temperature	
• during operation	-25 ... +60 °C
• during storage	-40 ... +85 °C
• during transport	-40 ... +85 °C
Relative humidity	
• during operation	10 ... 95 %

Certificates/approvals

General Product Approval				Declaration of Conformity	Marine / Shipping
CCC	CSA	UL	EAC	EG-Konf.	DNV·GL

other

Confirmation

Further information

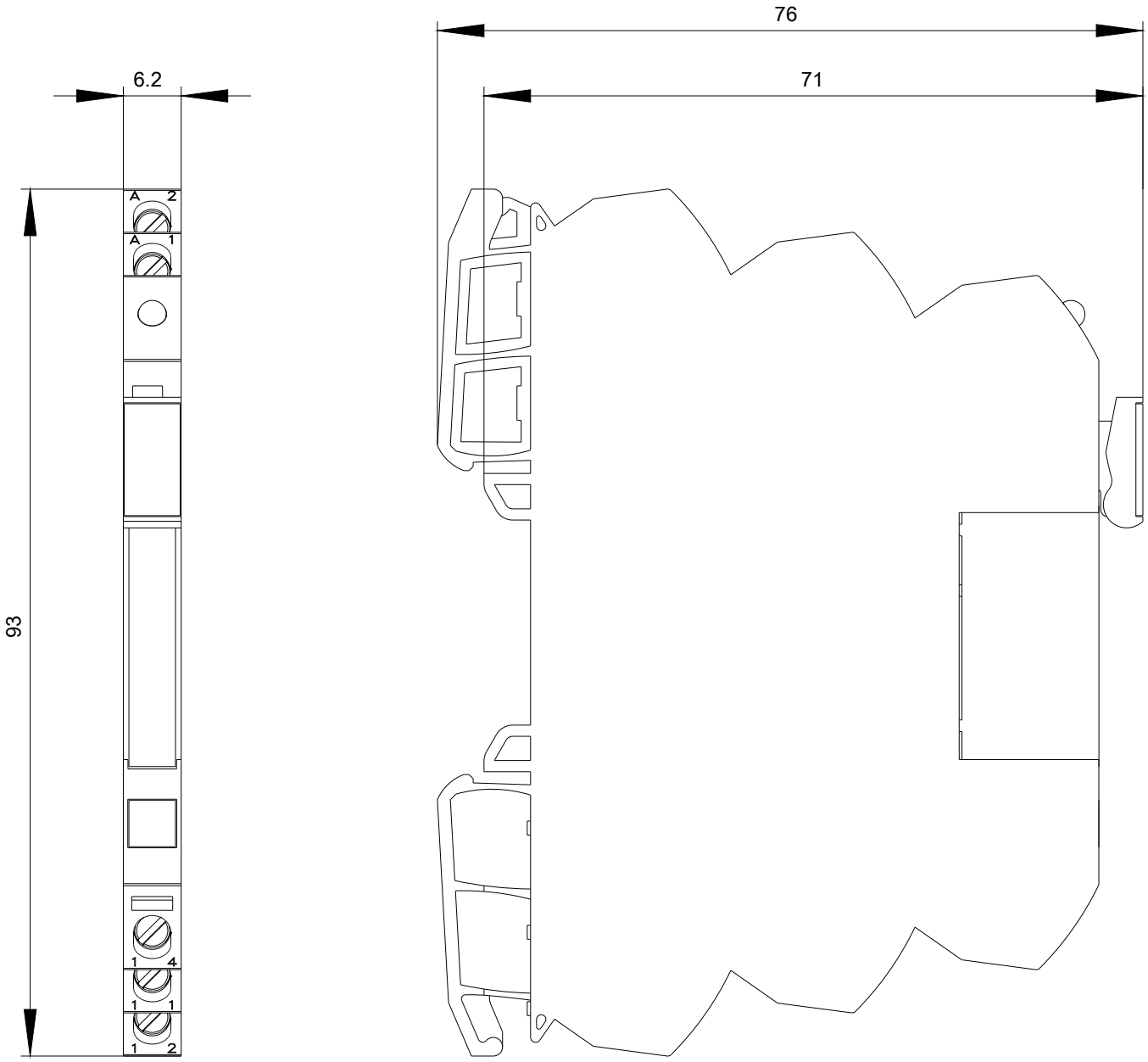
Information- and Downloadcenter (Catalogs, Brochures,…)
http://www.siemens.com/industrial-controls/catalogs

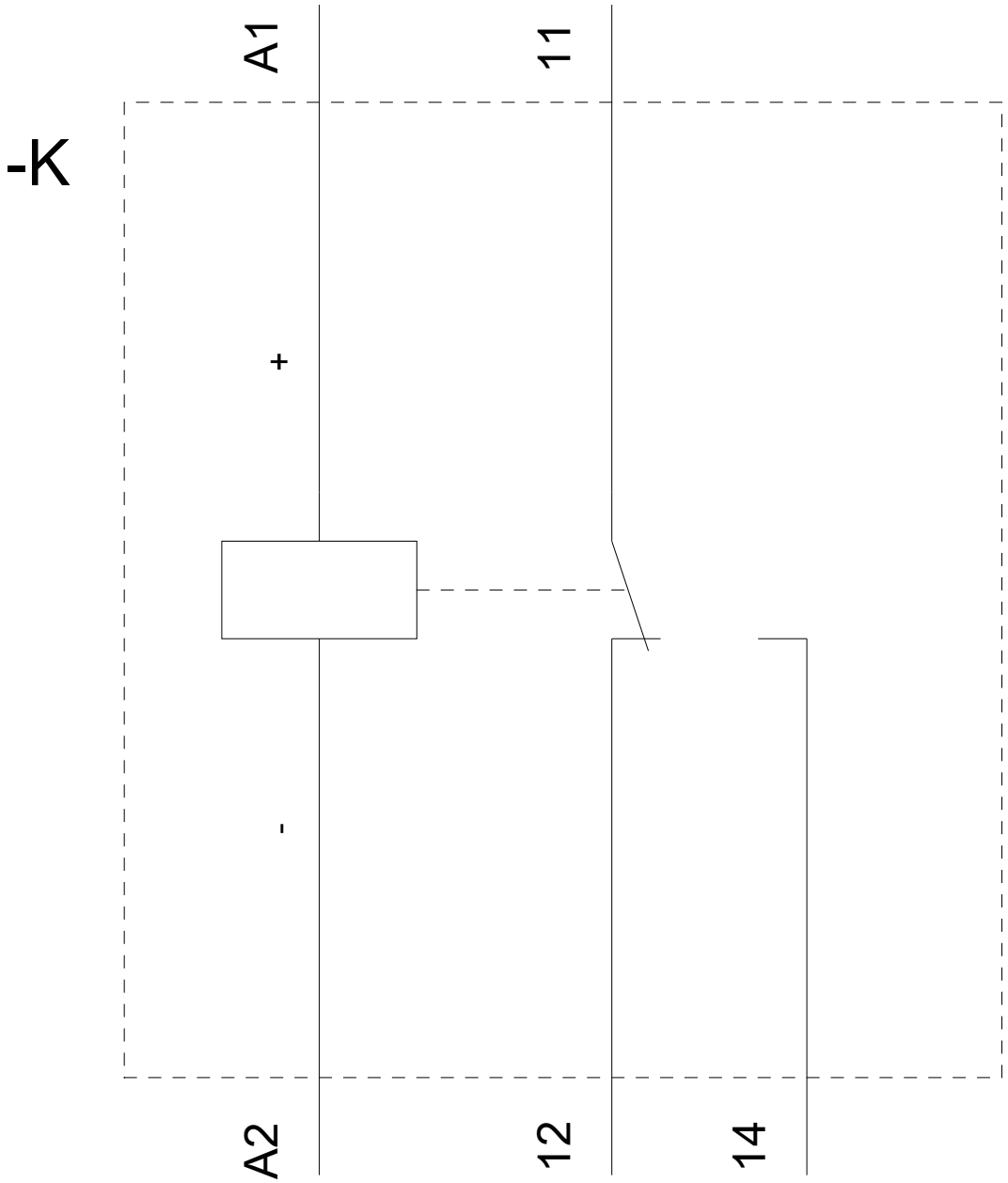
Industry Mall (Online ordering system)
https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3RQ3118-1AM00

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: 07/20/2018

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Data sheet 3RQ3901-0D

CONNECTING COMB 16-POLE

Figure similar

product brandname		SIRIUS
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		
Product component Plug-in socket		No
Product component semi-conductor output		No
Design of the switching function positively driven		No
Equipment marking		
• acc. to DIN EN 81346-2		X
• acc. to DIN EN 61346-2		X
Display version LED		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

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
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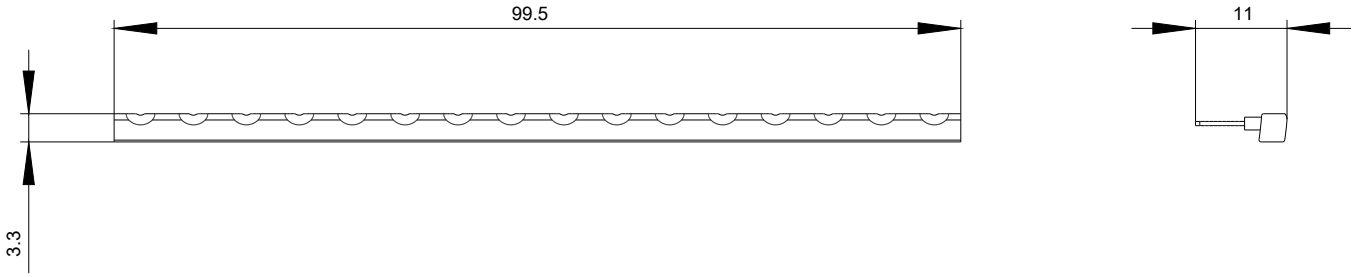
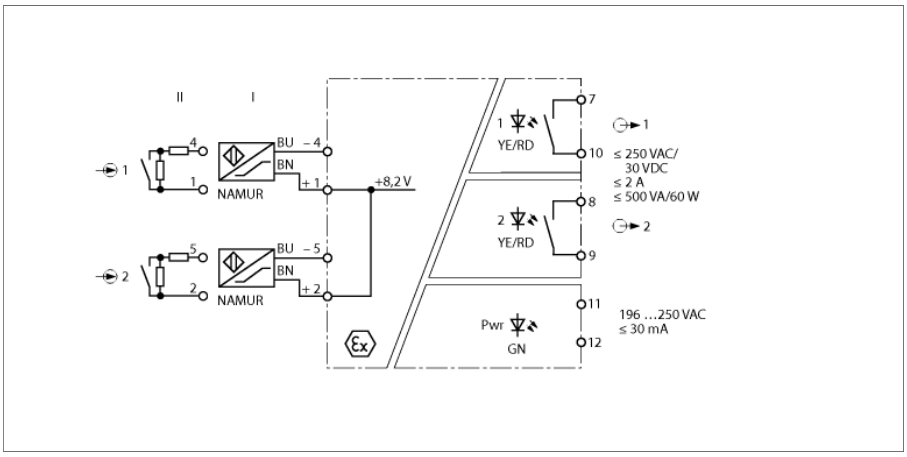
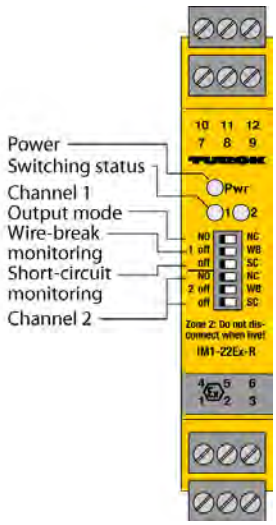


last modified: 04/30/2017

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, $_{c}$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**

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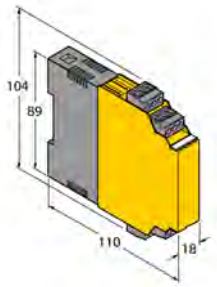
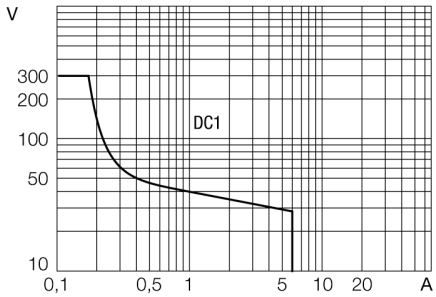
Isolating switching amplifier
2-channel
IM1-22EX-R

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 × yellow/red
Error indication	red

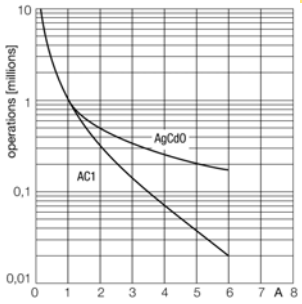
Dimensions



Output relay – Load curve



Output relay – Electrical lifetime



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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

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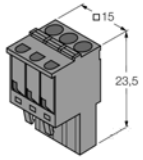
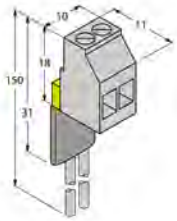
Isolating switching amplifier
2-channel
IM1-22EX-R

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.	

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Show actual product details

Data sheet 3SU1050-0AB10-0AA0

PUSHBUTTON, 22MM, ROUND, METAL, SHINY, BLACK, FLAT BUTTON MOMENTARY CONTACT TYPE

Figure similar

product brand name	SIRIUS ACT
Product designation	Commanding and signaling devices
Design of the product	Pushbutton
Enclosure:	
Number of command points	1
Actuator:	
Design of the operating mechanism	pushbutton with flat button
Manner of function of the actuating element	Momentary contact type
Product extension optional Light source	No
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
Type of unlocking device	without
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	NEMA 1, 2, 3, 3R, 4, 4X, 12
Shock resistance	
• acc. to IEC 60068-2-27	Sinusoidal half-wave 50 g / 11 ms
Vibration resistance	
• acc. to IEC 60068-2-6	10 ... 500 Hz: 5g
Operating frequency maximum	3 600 1/h
Mechanical service life (switching cycles)	
• typical	10 000 000
Equipment marking	
• acc. to DIN EN 61346-2	S
• acc. to DIN EN 81346-2	S

Ambient conditions:	
Ambient temperature	
• during operation	-25 ... +70 °C
• during storage	-40 ... +80 °C
Environmental category during operation acc. to IEC 60721	3M6, 3S2, 3B2, 3C3, 3K6 (with relative air humidity of 10 ... 95 %)

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

Certificates/approvals

General Product Approval			Declaration of Conformity	Test Certificates	
CSA	UL	EAC	EG-Konf.	Werksbescheinigungen	spezielle Prüfbescheinigungen

other
Bestätigungen

Further information

Information- and Downloadcenter (Catalogs, Brochures,…)
http://www.siemens.com/industrial-controls/catalogs

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Cax online generator
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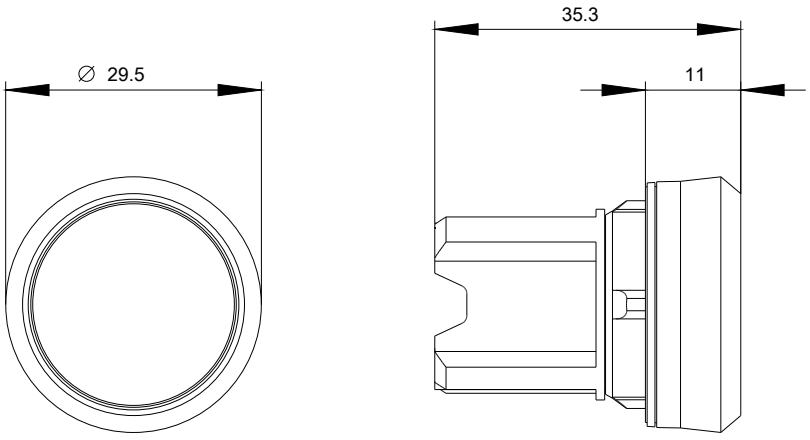
Service&Support (Manuals, Certificates, Characteristics, FAQs,...)
https://support.industry.siemens.com/cs/ww/en/ps/3SU1050-0AB10-0AA0

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: 07/27/2016

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Show actual product details

Data sheet 3SU1050-1HB20-0AA0

EM. STOP MUSHROOM PUSHBUTTON, 22MM, ROUND, METAL, SHINY, RED, 40MM, POSITIVE LATCHING, ROTATE TO UNLATCH

Figure similar

product brand name	SIRIUS ACT
Product designation	Commanding and signaling devices
Design of the product	EMERGENCY STOP mushroom pushbutton
Enclosure:	
Number of command points	1
Actuator:	
Design of the operating mechanism	EMERGENCY STOP mushroom pushbutton; tamper-proof
Manner of function of the actuating element	Latching
Product extension optional Light source	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	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	NEMA 1, 2, 3, 3R, 4, 4X, 12
Shock resistance	
• acc. to IEC 60068-2-27	Sinusoidal half-wave 50 g / 11 ms
Vibration resistance	
• acc. to IEC 60068-2-6	10 ... 500 Hz: 5g
Operating frequency maximum	600 1/h
Mechanical service life (switching cycles)	
• typical	300 000
Equipment marking	
• acc. to DIN EN 61346-2	S
• acc. to DIN EN 81346-2	S

Safety related data:	
B10 value	
• with high demand rate acc. to SN 31920	100 000

Ambient conditions:	
Ambient temperature	
• during operation	-25 ... +70 °C
• during storage	-40 ... +80 °C
Environmental category during operation acc. to IEC 60721	3M6, 3S2, 3B2, 3C3, 3K6 (with relative air humidity of 10 ... 95 %)

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

Certificates/approvals

General Product Approval				Declaration of Conformity	Test Certificates
CSA	UL	VDE	EAC	EG-Konf.	Werksbescheinigungen

Test Certificates	other
spezielle Prüfbescheinigungen	Bestätigungen

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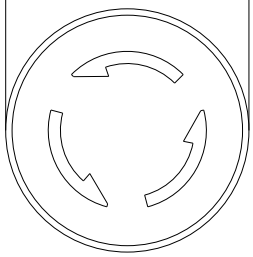

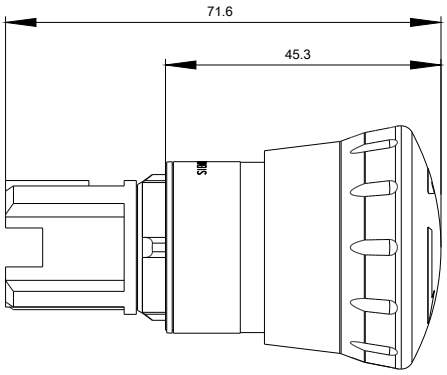

last modified: 07/27/2016

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Data sheet 3SU1400-1AA10-1HA0

Contact module with 1 contact element, 1 NC, Contact for installation monitoring, screw terminal, for front plate mounting

Figure similar

Product brand name	SIRIUS ACT
Product designation	Contact module
Product type designation	3SU1

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
Shock resistance	

• acc. to IEC 60068-2-27	Sinusoidal half-wave 50 g / 11 ms
• for railway applications acc. to DIN EN 61373	Category 1, Class B
Vibration resistance	
• acc. to IEC 60068-2-6	10 ... 500 Hz: 5g
• for railway applications acc. to DIN EN 61373	Category 1, Class B
Operating frequency maximum	3 600 1/h
Mechanical service life (switching cycles)	
• typical	10 000 000
Electrical endurance (switching cycles)	
• typical	10 000 000
Thermal current	10 A
Continuous current of the C characteristic MCB	10 A
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**	0
— leading contact	0
Number of CO contacts	
• **for auxiliary contacts**	0
Operating 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
Operating 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
Operating 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
Operating 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-type terminals
Type of connectable conductor cross-sections	
• solid with core end processing	2x (0.5 ... 0.75 mm²)
• solid without core end processing	2x (1.0 ... 1.5 mm²)
• finely stranded with core end processing	2x (0.5 ... 1.5 mm²)
• finely stranded without core end processing	2x (1,0 ... 1,5 mm²)
• at AWG conductors	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 acc. to IEC 60721	3M6, 3S2, 3B2, 3C3 (without salt spray), 3K6 (with relative humidity of 10 ... 95%, no condensation in operation permitted)

Installation/ mounting/ dimensions

Mounting type	
• of modules and accessories	Front plate mounting
Height	34 mm
Width	9.8 mm
Depth	49.7 mm

Certificates/approvals

General Product Approval				Declaration of Conformity	Test Certificates
CCC	CSA	UL	EAC	EG-Konf.	Declaration of the Compliance with the order

Test Certificates	other
Special Test Certificate	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=3SU1400-1AA10-1HA0

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https://support.industry.siemens.com/cs/ww/en/ps/3SU1400-1AA10-1HA0

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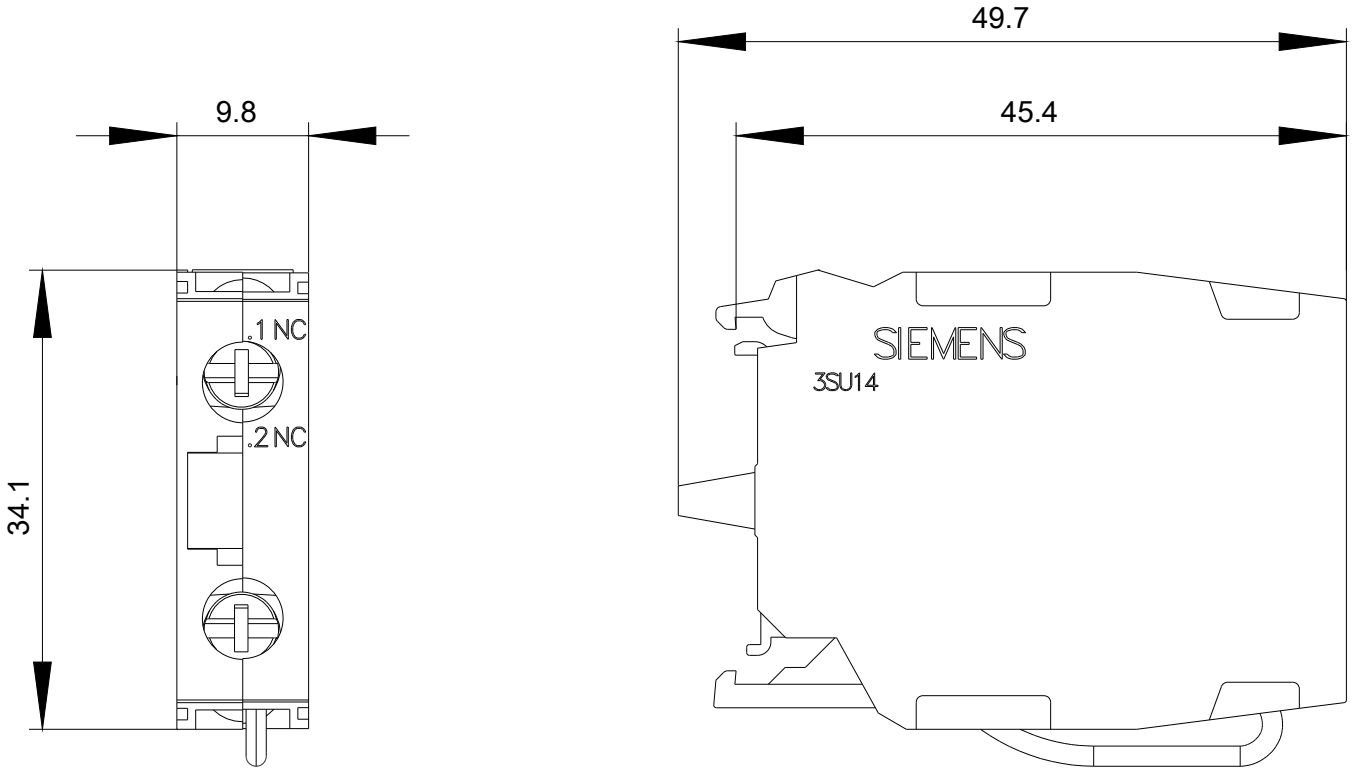
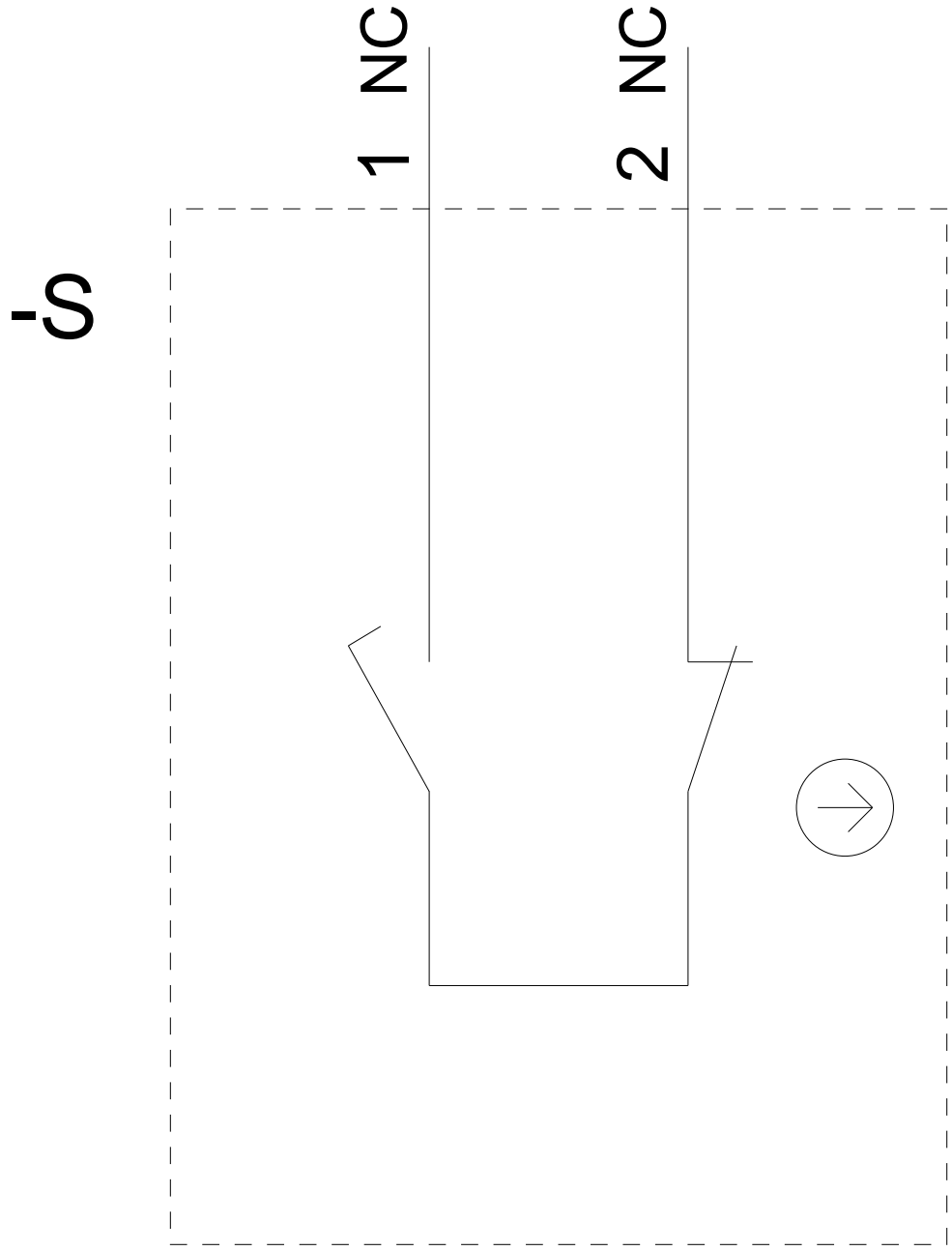
http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3SU1400-1AA10-1HA0&lang=en





last modified: 04/19/2018

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Data sheet 3SU1400-1AA10-1BA0

CONTACT MODULE WITH 1 CONTACT ELEMENT, 1NO, SCREW TERMINAL, FOR FRONT PLATE MOUNTING

Figure similar

product brand name	SIRIUS ACT
Product designation	Commanding and signaling devices
Design of the product	Contact module

Contact block/ lampholder:

Suitability for integration	
• pressure selection button	Yes
• front element	Yes
• Pendant pushbutton	Yes
• Pendant switch	Yes

General technical data:

Product function	
• positive opening	No
Insulation voltage	
• rated value	500 V
Degree of pollution	3
Surge voltage resistance rated value	6 kV
Protection class IP	

• of the enclosure	IP40
• of the terminal	IP20
Shock resistance	
• acc. to IEC 60068-2-27	Sinusoidal half-wave 50 g / 11 ms
• for railway applications acc. to DIN EN 61373	Category 1, Class B
Vibration resistance	
• acc. to IEC 60068-2-6	10 ... 500 Hz: 5g
• for railway applications acc. to DIN EN 61373	Category 1, Class B
Operating frequency maximum	3 600 1/h
Mechanical service life (switching cycles)	
• typical	10 000 000
Electrical endurance (switching cycles)	
• typical	10 000 000
Thermal current	10 A
Equipment marking	
• acc. to DIN EN 61346-2	S
• acc. to DIN EN 81346-2	S
Continuous current of the C characteristic MCB	10 A

Main circuit:

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
Number of CO contacts	
• for auxiliary contacts	0
Operating 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
Operating current at AC-15	
• at 230 V rated value	6 A
• at 400 V rated value	3 A
Operating current at DC-12	
• at 110 V rated value	2.5 A
Operating current at DC-13	
• at 24 V rated value	3 A
• at 110 V rated value	0.7 A
• at 400 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 mm²)
• solid without core end processing	2x (1.0 ... 1.5 mm²)
• finely stranded with core end processing	2x (0.5 ... 1.5 mm²)
• finely stranded without core end processing	2x (1,0 ... 1,5 mm²)
• at AWG conductors	2x (18 ... 14)
Connectable conductor cross-section	
• finely stranded with core end processing	0.5 ... 1.5 mm²
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 acc. to IEC 60721	3M6, 3S2, 3B2, 3C3, 3K6 (with relative air humidity of 10 ... 95 %, no condensation in operation permitted)

Installation/ mounting/ dimensions:

Mounting type	
• of modules and accessories	Front plate mounting
Height	33.2 mm
Width	9.8 mm
Depth	27.7 mm

Certificates/approvals

General Product Approval					Declaration of Conformity
CCC	CSA	UL	VDE	EAC	EG-Konf.

Test Certificates		other
Werksbescheinigungen	spezielle Prüfbescheinigungen	Bestätigungen

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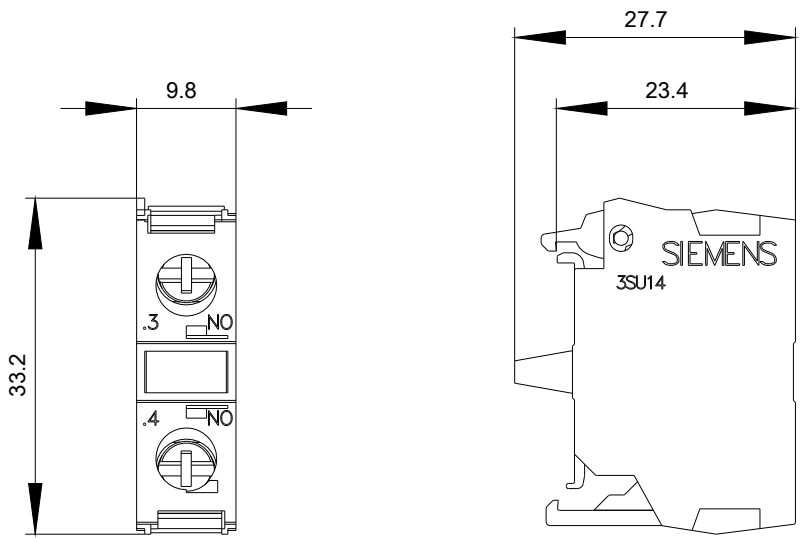

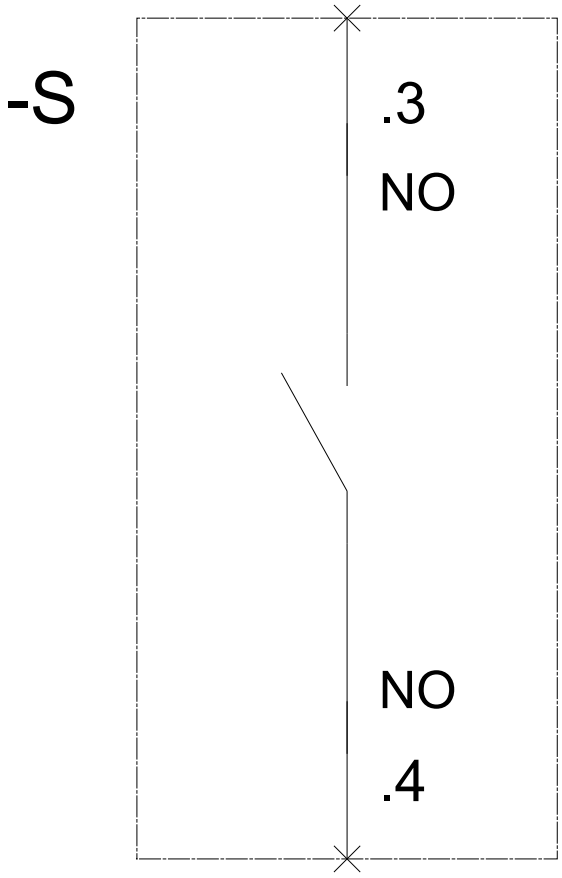

last modified: 07/27/2016

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Data sheet 3SU1051-6AA20-0AA0

INDICATOR LIGHT, 22MM, ROUND, METAL, SHINY, RED, SMOOTH LENS

Figure similar

product brand name	SIRIUS ACT
Product designation	Commanding and signaling devices
Design of the product	Pilot Light

Actuator:	
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	NEMA 1, 2, 3, 3R, 4, 4X, 12
Shock resistance	
• acc. to IEC 60068-2-27	Sinusoidal half-wave 50 g / 11 ms
Vibration resistance	

• acc. to IEC 60068-2-6	10 ... 500 Hz: 5g
Equipment marking	
• acc. to DIN EN 61346-2	P
• acc. to DIN EN 81346-2	P

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 acc. to IEC 60721	3M6, 3S2, 3B2, 3C3, 3K6 (with relative air humidity of 10 ... 95 %)

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

Certificates/approvals

General Product Approval			Declaration of Conformity	Test Certificates	
CSA	UL	EAC	EG-Konf.	Werksbescheinigungen	spezielle Prüfbescheinigungen

other

Bestätigungen

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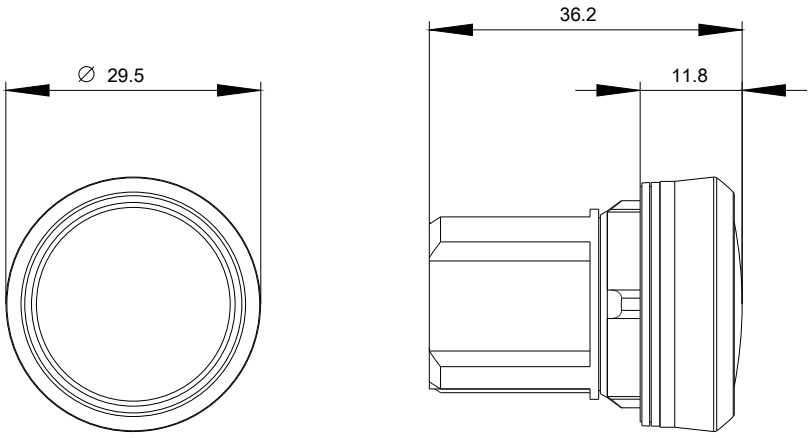

last modified: 07/27/2016

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Show actual product details

Data sheet 3SU1051-6AA40-0AA0

INDICATOR LIGHT, 22MM, ROUND, METAL, SHINY, GREEN, SMOOTH LENS

Figure similar

product brand name	SIRIUS ACT
Product designation	Commanding and signaling devices
Design of the product	Pilot Light

Actuator:	
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	NEMA 1, 2, 3, 3R, 4, 4X, 12
Shock resistance	
• acc. to IEC 60068-2-27	Sinusoidal half-wave 50 g / 11 ms
Vibration resistance	

• acc. to IEC 60068-2-6	10 ... 500 Hz: 5g
Equipment marking	
• acc. to DIN EN 61346-2	P
• acc. to DIN EN 81346-2	P

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 acc. to IEC 60721	3M6, 3S2, 3B2, 3C3, 3K6 (with relative air humidity of 10 ... 95 %)

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

Certificates/approvals

General Product Approval			Declaration of Conformity	Test Certificates	
CSA	UL	EAC	EG-Konf.	Werksbescheinigungen	spezielle Prüfbescheinigungen

other

Bestätigungen

Further information

Information- and Downloadcenter (Catalogs, Brochures,…)
http://www.siemens.com/industrial-controls/catalogs

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https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3SU1051-6AA40-0AA0

Cax online generator
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Service&Support (Manuals, Certificates, Characteristics, FAQs,...)
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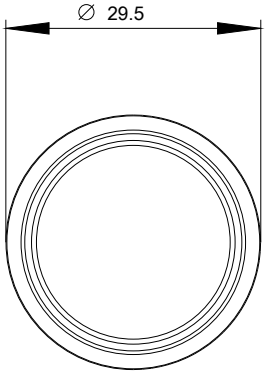
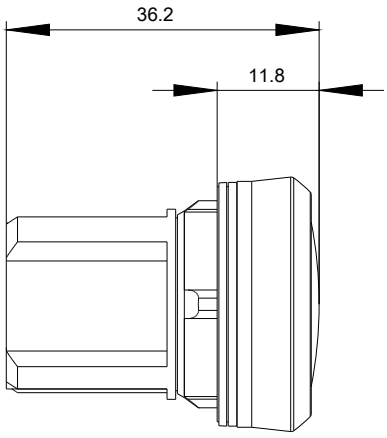
Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)
http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3SU1051-6AA40-0AA0&lang=en





last modified: 07/27/2016

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Data sheet 3SU1051-6AA70-0AA0

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
• Product extension optional 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	
• acc. to IEC 60068-2-27	Sinusoidal half-wave 50g / 11 ms
vibration resistance	
• acc. to IEC 60068-2-6	10 ... 500 Hz: 5g
reference code acc. to IEC 81346-2	P

Connections/ Terminals

tightening torque of the screws in the bracket	1 ... 1.2 N·m

Ambient conditions

environmental category during operation acc. to IEC 60721	3M6, 3S2, 3B2, 3C3, 3K6 (with relative air humidity of 10 ... 95 %)

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

Certificates/ approvals

General Product Approval			Declaration of Conformity		Test Certificates
CSA	UL	EAC	EG-Konf.	Miscellaneous	Type Test Certificates/Test Report

Marine / Shipping					other
ABS	LRS	PRS	RINA	RMRS	Confirmation

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=3SU1051-6AA70-0AA0

Cax online generator
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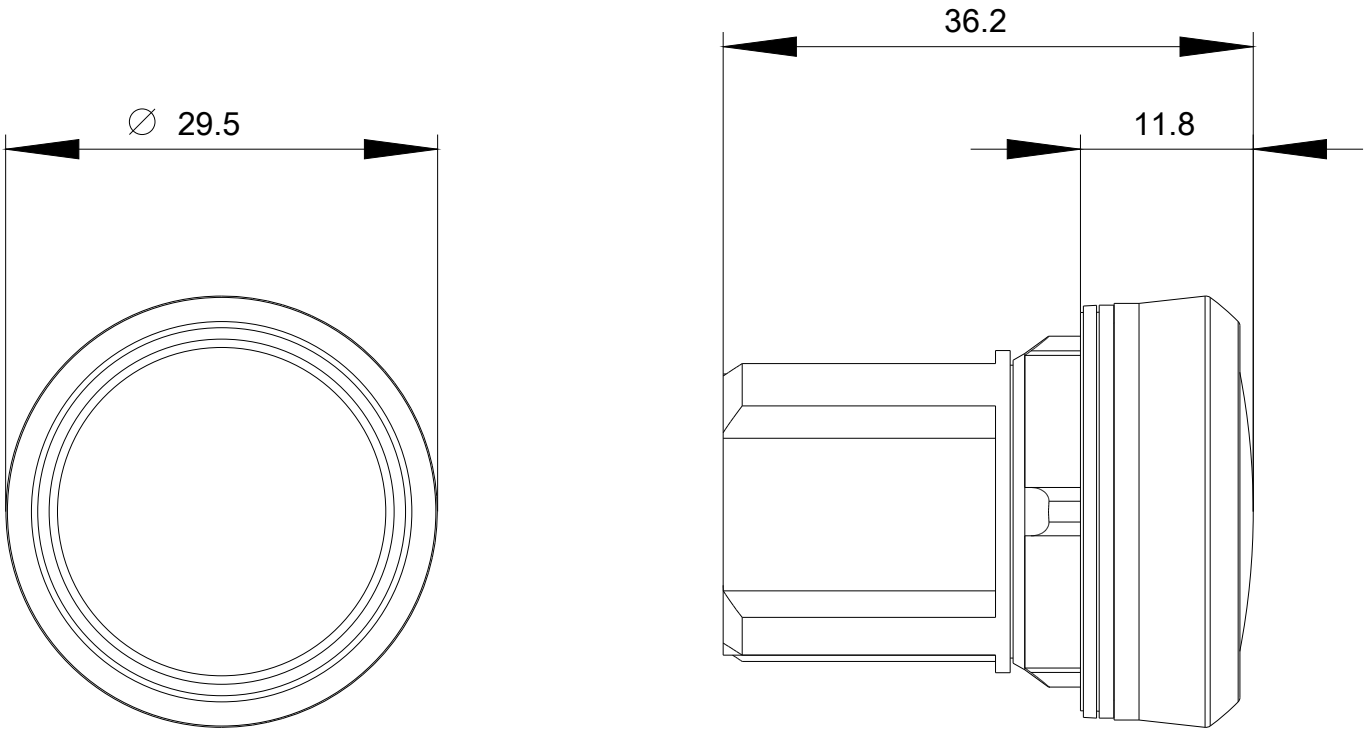

last modified: 11/04/2020

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Data sheet 3SU1401-1BB20-1AA0

LED MODULE WITH INTEGRATED LED 24V AC/DC, RED, SCREW TERMINAL, FOR FRONT PLATE MOUNTING

Figure similar

product brand name	SIRIUS ACT
Product designation	Commanding and signaling devices
Design of the product	LED module

Display:	
Light intensity	800 mcd
Light intensity	450 ... 1 120 mcd

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
Surge voltage resistance rated value	4 kV
Consumed current	

• maximum	20 mA
Protection class IP	
• of the enclosure	IP40
• of the terminal	IP20
Shock resistance	
• acc. to IEC 60068-2-27	Sinusoidal half-wave 50 g / 11 ms
• for railway applications acc. to DIN EN 61373	Category 1, Class B
Vibration resistance	
• acc. to IEC 60068-2-6	10 ... 500 Hz: 5g
• for railway applications acc. to DIN EN 61373	Category 1, Class B
Operating period typical	100 000 h
Equipment marking	
• acc. to DIN EN 61346-2	P
• acc. to DIN EN 81346-2	P

Main circuit:

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 %

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 mm²)
• solid without core end processing	2x (1.0 ... 1.5 mm²)
• finely stranded with core end processing	2x (0.5 ... 1.5 mm²)
• finely stranded without core end processing	2x (1,0 ... 1,5 mm²)
• at AWG conductors	2x (18 ... 14)
Connectable conductor cross-section	
• finely stranded with core end processing	0.5 ... 1.5 mm²
Tightening torque	
• with screw-type terminals	0.8 ... 0.9 N·m

Lamp:

Type of light source	LED
Color of the light source	red

Ambient conditions:

Ambient temperature	
• during operation	-25 ... +70 °C

• during storage	-40 ... +80 °C
Environmental category during operation acc. to IEC 60721	3M6, 3S2, 3B2, 3K6 (with relative air humidity of 10 ... 95 %, no condensation in operation permitted)

Installation/ mounting/ dimensions:

Mounting type	
• of modules and accessories	Front plate mounting
Height	33.2 mm
Width	9.8 mm
Depth	29.4 mm

Certificates/approvals

General Product Approval				Declaration of Conformity	Test Certificates
CCC	CSA	UL	EAC	EG-Konf.	Werksbescheinigungen

Test Certificates	other
spezielle Prüfbescheinigungen	Bestätigungen

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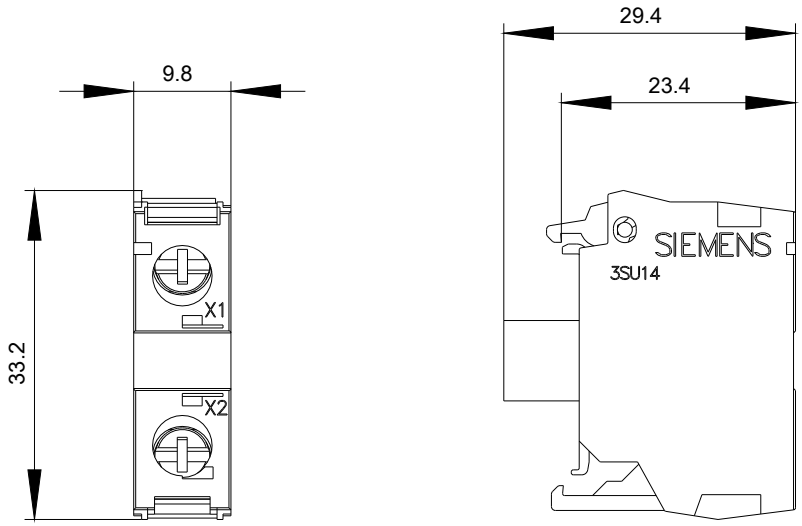

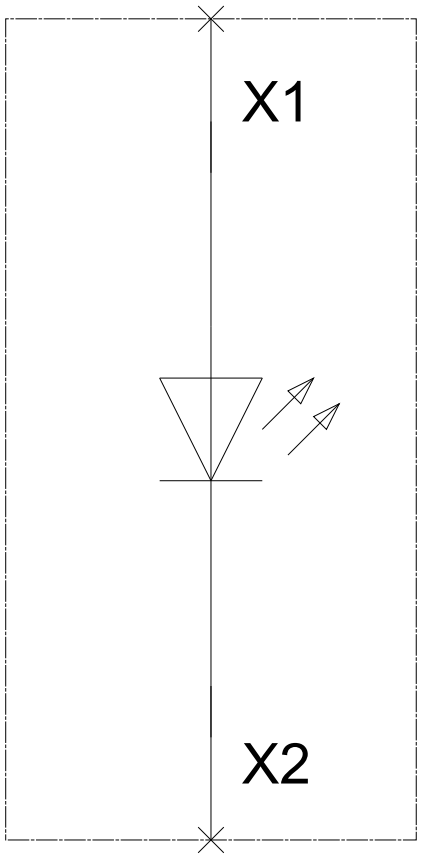

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24 V AC/DC

last modified: 07/27/2016

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Data sheet 3SU1401-1BB40-1AA0

LED MODULE WITH INTEGRATED LED 24V AC/DC, GREEN, SCREW TERMINAL, FOR FRONT PLATE MOUNTING

Figure similar

product brand name	SIRIUS ACT
Product designation	Commanding and signaling devices
Design of the product	LED module

Display:	
Light intensity	1 400 mcd
Light intensity	900 ... 1 400 mcd

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
Surge voltage resistance rated value	4 kV
Consumed current	

• maximum	20 mA
Protection class IP	
• of the enclosure	IP40
• of the terminal	IP20
Shock resistance	
• acc. to IEC 60068-2-27	Sinusoidal half-wave 50 g / 11 ms
• for railway applications acc. to DIN EN 61373	Category 1, Class B
Vibration resistance	
• acc. to IEC 60068-2-6	10 ... 500 Hz: 5g
• for railway applications acc. to DIN EN 61373	Category 1, Class B
Operating period typical	100 000 h
Equipment marking	
• acc. to DIN EN 61346-2	P
• acc. to DIN EN 81346-2	P

Main circuit:

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 %

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 mm²)
• solid without core end processing	2x (1.0 ... 1.5 mm²)
• finely stranded with core end processing	2x (0.5 ... 1.5 mm²)
• finely stranded without core end processing	2x (1,0 ... 1,5 mm²)
• at AWG conductors	2x (18 ... 14)
Connectable conductor cross-section	
• finely stranded with core end processing	0.5 ... 1.5 mm²
Tightening torque	
• with screw-type terminals	0.8 ... 0.9 N·m

Lamp:

Type of light source	LED
Color of the light source	green

Ambient conditions:

Ambient temperature	
• during operation	-25 ... +70 °C

• during storage	-40 ... +80 °C
Environmental category during operation acc. to IEC 60721	3M6, 3S2, 3B2, 3K6 (with relative air humidity of 10 ... 95 %, no condensation in operation permitted)

Installation/ mounting/ dimensions:

Mounting type	
• of modules and accessories	Front plate mounting
Height	33.2 mm
Width	9.8 mm
Depth	29.4 mm

Certificates/approvals

General Product Approval				Declaration of Conformity	Test Certificates
CCC	CSA	UL	EAC	EG-Konf.	Werksbescheinigungen

Test Certificates	other
spezielle Prüfbescheinigungen	Bestätigungen

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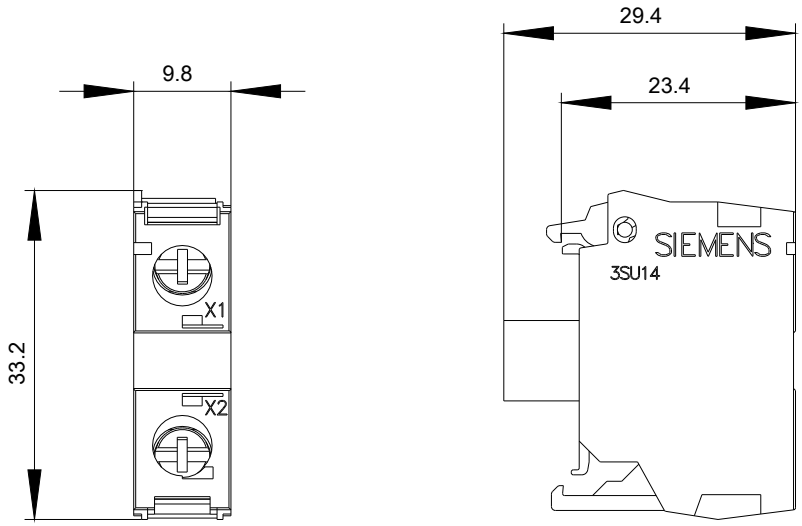
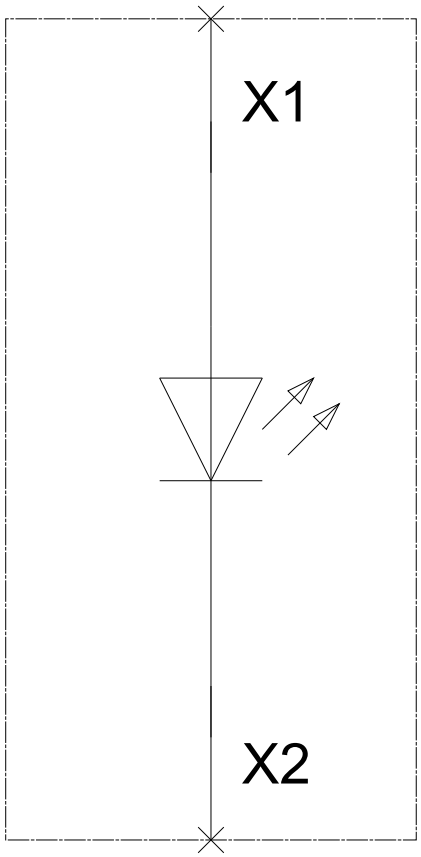


-P

24 V AC/DC



last modified: 07/27/2016

SIEMENS

Show actual product details

Data sheet 3SU1401-1BB60-1AA0

LED MODULE WITH INTEGRATED LED 24V AC/DC, WHITE, SCREW TERMINAL, FOR FRONT PLATE MOUNTING

Figure similar

product brand name	SIRIUS ACT
Product designation	Commanding and signaling devices
Design of the product	LED module

Display:	
Light intensity	1 200 mcd
Light intensity	900 ... 1 400 mcd

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
Surge voltage resistance rated value	4 kV
Consumed current	

• maximum	20 mA
Protection class IP	
• of the enclosure	IP40
• of the terminal	IP20
Shock resistance	
• acc. to IEC 60068-2-27	Sinusoidal half-wave 50 g / 11 ms
• for railway applications acc. to DIN EN 61373	Category 1, Class B
Vibration resistance	
• acc. to IEC 60068-2-6	10 ... 500 Hz: 5g
• for railway applications acc. to DIN EN 61373	Category 1, Class B
Operating period typical	100 000 h
Equipment marking	
• acc. to DIN EN 61346-2	P
• acc. to DIN EN 81346-2	P

Main circuit:

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 %

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 mm²)
• solid without core end processing	2x (1.0 ... 1.5 mm²)
• finely stranded with core end processing	2x (0.5 ... 1.5 mm²)
• finely stranded without core end processing	2x (1,0 ... 1,5 mm²)
• at AWG conductors	2x (18 ... 14)
Connectable conductor cross-section	
• finely stranded with core end processing	0.5 ... 1.5 mm²
Tightening torque	
• with screw-type terminals	0.8 ... 0.9 N·m

Lamp:

Type of light source	LED
Color of the light source	white

Ambient conditions:

Ambient temperature	
• during operation	-25 ... +70 °C

• during storage	-40 ... +80 °C
Environmental category during operation acc. to IEC 60721	3M6, 3S2, 3B2, 3K6 (with relative air humidity of 10 ... 95 %, no condensation in operation permitted)

Installation/ mounting/ dimensions:

Mounting type	
• of modules and accessories	Front plate mounting
Height	33.2 mm
Width	9.8 mm
Depth	29.4 mm

Certificates/approvals

General Product Approval				Declaration of Conformity	Test Certificates
CCC	CSA	UL	EAC	EG-Konf.	Werksbescheinigungen

Test Certificates	other
spezielle Prüfbescheinigungen	Bestätigungen

Further information

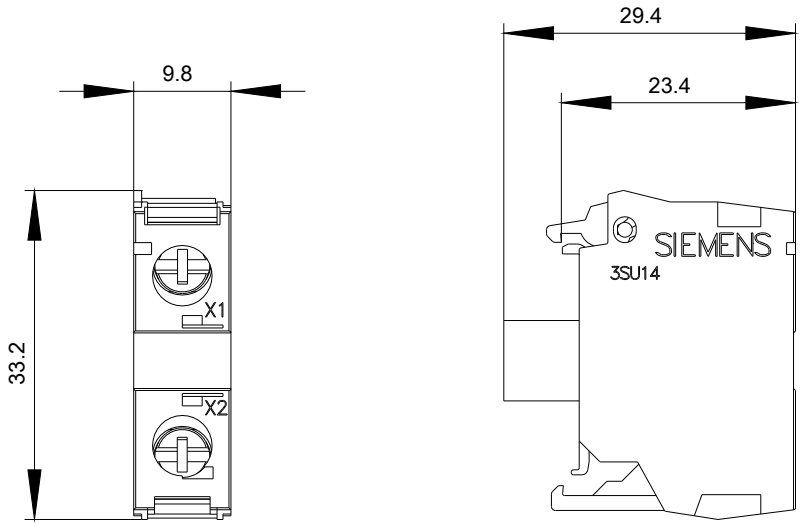
Information- and Downloadcenter (Catalogs, Brochures,…)
http://www.siemens.com/industrial-controls/catalogs

Industry Mall (Online ordering system)
https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=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



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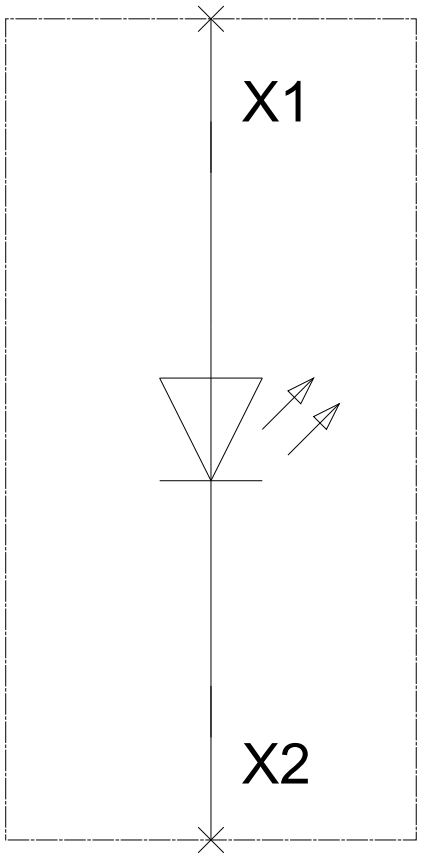
24 V AC/DC



last modified: 07/27/2016

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Show actual product details

Data sheet 3SU1550-0AA10-0AA0

HOLDER FOR 3 MODULES, METAL

Figure similar

product brand name	SIRIUS ACT
Product designation	Commanding and signaling devices
Design of the product	Holder
Manufacturer's article number	
• of the supplied holder	3SU1550-0AA10-0AA0

Actuator:	
Design of the operating mechanism	3-way without module
Number of contact modules	0

Holder:	
Material of the holder	Metal

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	
• acc. to IEC 60068-2-27	Sinusoidal half-wave 50 g / 11 ms
• for railway applications acc. to DIN EN 61373	Category 1, Class B
Vibration resistance	
• acc. to IEC 60068-2-6	10 ... 500 Hz: 5g
• for railway applications acc. to DIN EN 61373	Category 1, Class B
Mechanical service life (switching cycles)	
• typical	10
Equipment marking	
• acc. to DIN EN 61346-2	U
• acc. to DIN EN 81346-2	U

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

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 acc. to IEC 60721	3M6, 3S2, 3B2, 3C3, 3K6 (with relative air humidity of 10 ... 95 %, no condensation in operation permitted)

Installation/ mounting/ dimensions:

Mounting type	without
• 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

Certificates/approvals

General Product Approval	Declaration of Conformity	Test Certificates		other
EAC	CE EG-Konf.	Werksbescheinigungen	spezielle Prüfbescheinigungen	Bestätigungen

Further information

Information- and Downloadcenter (Catalogs, Brochures,…)
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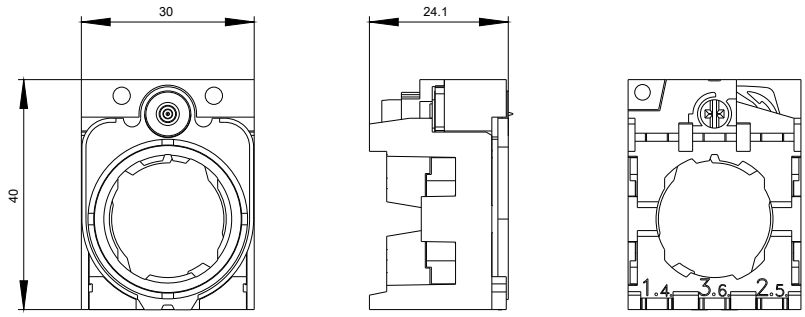

last modified: 07/27/2016

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Data sheet 3SU1900-0AG10-0AA0

Label holder, 22mm, flat, Frame rounded off at the bottom black, for labeling plate 12.5 mm x 27 mm, for gluing

Product brand name	SIRIUS ACT
Product designation	Label holder
Design of the product	for labeling plate 12.5 x 27 mm
Product type designation	3SU1

General technical data

Protection class IP	IP66, IP67, IP69(IP69K)
Degree of protection NEMA rating	NEMA 1, 2, 3, 3R, 4, 4X, 12
Shock resistance	
• for railway applications acc. to DIN EN 61373	Category 1, Class B

Installation/ mounting/ dimensions

(height)	44.8 mm
Width	29.8 mm

Accessories

Material of accessory	Plastic
Shape of label holder	rounded below
Color of label holder	Black
Mounting type of label	stick

Certificates/approvals

General Product Approval				Declaration of Conformity	Test Certificates
CSA	UL	EAC	EG-Konf.	Miscellaneous	Type Test Certificates/Test Report

Marine / Shipping

ABS LRS PRS RINA RMRS

other

Confirmation

Further information

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Cax online generator
http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3SU1900-0AG10-0AA0

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https://support.industry.siemens.com/cs/ww/en/ps/3SU1900-0AG10-0AA0

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)
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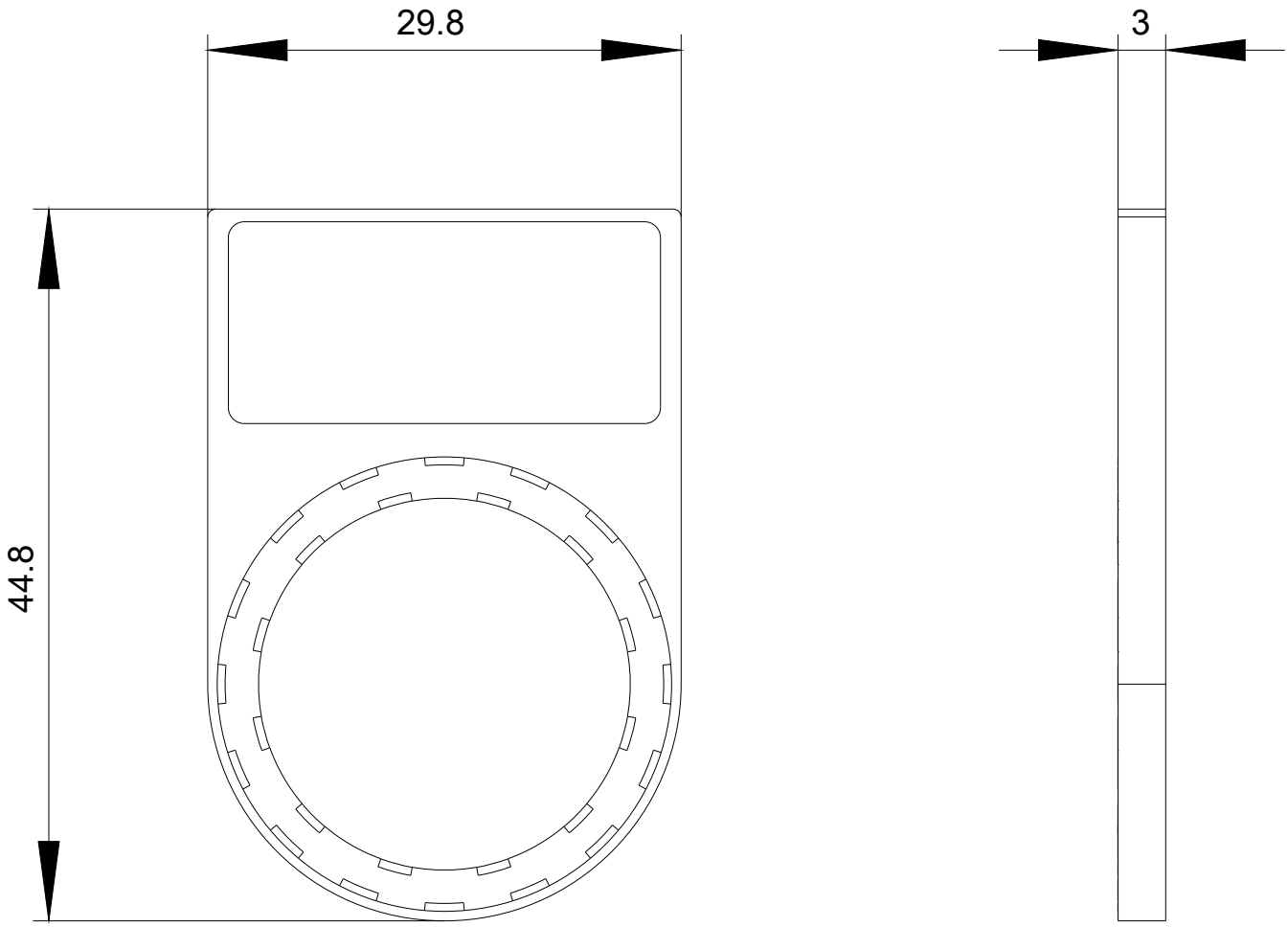


last modified: 04/29/2019

MicroLogix 1400 Programmable Controllers

Catalog Number(s) 1766-L32AWA, 1766-L32AWAA, 1766-L32BWA, 1766-L32BWAA, 1766-L32BXB, 1766-L32BXBA

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.

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.

Preventing 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 modules are North American Hazardous Location approved: 1766-L32AWA, 1766-L32AWAA, 1766-L32BWA, 1766-L32BWAA, 1766-L32BXB, 1766-L32BXBA

The following information applies when operating this equipment in hazardous locations:	**Informations sur l'utilisation de cet équipement en environnements dangereux:**
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.	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.

WARNING 	**EXPLOSION HAZARD** • Do not disconnect while the circuit is live or unless the area is known to be free of ignitible concentrations. • 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. • Do not remove or replace lamps, fuses or plug-in modules (as applicable) unless power has been disconnected or the area is known to be free of ignitible concentrations of flammable gases or vapors.	**AVERTISSEMENT** 	**RISQUE D'EXPLOSION** • 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.

Additional Resources

Resource	Description
MicroLogix 1400 Programmable Controllers User Manual 1766-UM001	A more detailed description of how to install and use your MicroLogix 1400 programmable controller and expansion I/O system.
MicroLogix 1400 Instruction Set Reference Manual 1766-RM001	A reference manual that contains data and function files, instruction set, and troubleshooting information for MicroLogix 1400.
Installation Instructions 1762-INxxx	Information on installing and using 1762 expansion I/O modules.
Industrial Automation Wiring and Grounding Guidelines 1770-4.1	More information on proper wiring and grounding techniques.

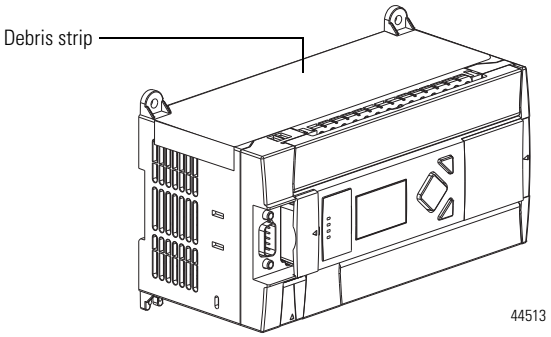
If you would like a manual, you can:

- download a free electronic version from the internet: http://literature.rockwellautomation.com
- purchase a printed manual by contacting your local Allen-Bradley distributor or Rockwell Automation representative

Overview

MicroLogix 1400 controllers are 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 with circuits not exceeding Over Voltage Category II[2] (IEC 60664-1)[3]. AC powered products must be connected to the secondary of an isolating transformer.

Install your controller using these installation instructions.



ATTENTION

Do not remove the protective debris strip until after the controller and all other equipment in the panel near the controller are mounted and wiring is complete. Once wiring is complete, remove protective debris strip. Failure to remove strip before operating can cause overheating.

ATTENTION

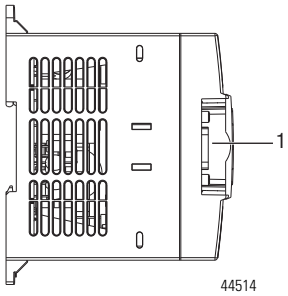
Electrostatic discharge can damage semiconductor devices inside the controller. Do not touch the connector pins or other sensitive areas.

(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.

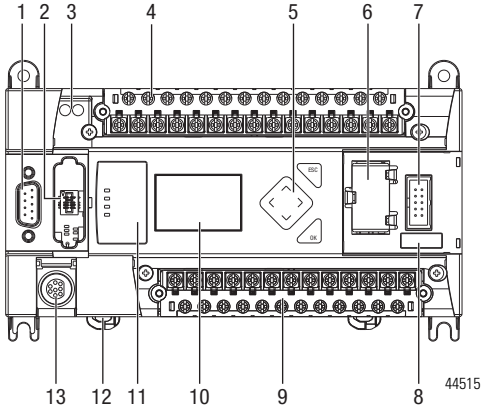
(2) Over Voltage Category II is the load level section of the electrical distribution system. At this level transient voltages are controlled and do not exceed the impulse voltage capability of the product's insulation.

(3) Pollution Degree 2 and Over Voltage Category II are International Electrotechnical commissions (IEC) designations.

Controller Description



Left side view



Top view

	Description
1	Comm port 2 - 9-pin D-Shell RS-232C connector
2	Memory module (refer to MicroLogix 1400 Memory Module Installation Instructions, publication 1766-IN010 for instructions on installing the memory module).
3	User 24V (for 1766-L32BWA and 1766-L32BWAA only)
4	Input terminal block
5	LCD Display Keypad (ESC, OK, Up, Down, Left, Right)
6	Battery compartment
7	1762 expansion bus connector
8	Battery connector
9	Output terminal block
10	LCD Display
11	Indicator LED panel
12	Comm port 1 - RJ45 connector
13	Comm port 0 - 8-pin mini DIN RS-232C/RS-485 connector

Controller Input and Output Description

Catalog Number	Description				
	Input Power	User Power	Embedded Discrete I/O	Embedded Analog I/O	Comm. Ports
1766-L32BWA	100/240V AC	24V DC	12 Fast 24V DC Inputs 8 Normal 24V DC Inputs 12 Relay Outputs	None	1 RS232/RS485[1] 1 Ethernet/IP 1 RS232[2]
1766-L32AWA		None	20 120V AC Inputs 12 Relay Outputs		
1766-L32BXB	24 V DC		12 Fast 24V DC Inputs 8 Normal 24V DC Inputs 6 Relay Outputs 3 Fast DC Outputs 3 Normal DC Outputs		
1766-L32BWAA	100/240V AC	24V DC	12 Fast 24V DC Inputs 8 Normal 24V DC Inputs 12 Relay Outputs	4 Voltage Inputs 2 Voltage Outputs	
1766-L32AWAA		None	20 120V AC Inputs 12 Relay Outputs		
1766-L32BXBA	24V DC		12 Fast 24V DC Inputs 8 Normal 24V DC Inputs 6 Relay Outputs 3 Fast DC Outputs 3 Normal DC Outputs		

(1) Isolated RS-232/RS-485 combo port. Same as ML1100 Comm 0

(2) Non-isolated RS-232. Standard D-sub connector

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 WARNING 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 has been switched off.
- Do not connect or disconnect components unless power has been switched off.
- This product must be installed in an enclosure. All cables connected to the product must remain in the enclosure or be protected by conduit or other means.
- All wiring must comply with N.E.C. article 501-10(b) and/or in accordance with Section 18-1J2 of the Canadian Electrical Code, and in accordance with the authority having jurisdiction.

Use only the following communication cables in Class I, Division 2 hazardous locations.

Environment Classification	Communication Cables
Class I, Division 2 Hazardous Environment	1761-CBL-AC00 Series C or later
	1761-CBL-AM00 Series C or later
	1761-CBL-AP00 Series C or later
	1761-CBL-PM02 Series C or later
	1761-CBL-HM02 Series C or later
	2707-NC9 Series C or later
	1763-NC01 Series A or later
	1747-CP3 Series

Environnements dangereux

Cet équipement est conçu pour une utilisation en environnements dangereux de Classe I, Division 2, Groupes A, B, C, D ou non dangereux. La mise en garde suivante s'applique à utilisation en environnements dangereux.

WARNING

DANGER D'EXPLOSION

- La substitution de composants peut rendre cet équipement impropre à une utilisation en environnement de Classe I, 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. Tous les câbles connectés à l'appareil doivent rester dans l'armoire ou être protégés par une goulotte ou tout autre moyen.
- L'ensemble du câblage doit être conforme à la réglementation en vigueur dans les pays où l'appareil est installé.

Utilisez uniquement les câbles de communication suivants dans les environnements dangereux de Classe I, Division 2.

Classification des environnements	Câbles de communication
Environnement dangereux de Classe I, Division 2	1761-CBL-AC00 série C ou ultérieure
	1761-CBL-AM00 série C ou ultérieure
	1761-CBL-AP00 série C ou ultérieure
	1761-CBL-PM02 série C ou ultérieure
	1761-CBL-HM02 série C ou ultérieure
	2707-NC9 série C ou ultérieure
	1763-NC01 série A ou ultérieure
	série 1747-CP3

ATTENTION

UNSUPPORTED CONNECTION

Do not connect the Comm0 port on the MicroLogix 1400 controller to another MicroLogix family controller such as MicroLogix 1000, MicroLogix 1200, or MicroLogix 1500 using a 1761-CBL-AM00 (8-pin mini-DIN to 8-pin mini-DIN) cable or equivalent.
This type of connection will cause damage to the RS-232/485 communication port (Channel 0) of the MicroLogix 1400 and/or the controller itself. Communication pins used for RS-485 communications are alternately used for 24V power on the other MicroLogix controllers.

Mount the Controller

General Considerations

Most applications require installation in an industrial enclosure to reduce the effects of electrical interference and environmental exposure. Locate your controller as far as possible from power lines, load lines, and other sources of electrical noise such as hard-contact switches, relays, and ac motor drives. For more information on proper grounding guidelines, see the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

ATTENTION

Mount the controller horizontally only. Vertical mounting is not supported due to thermal considerations.

ATTENTION

Be careful of metal chips when drilling mounting holes for your controller or other equipment within the enclosure or panel. Drilled fragments that fall into the controller could cause damage. Do not drill holes above a mounted controller if the protective debris strips have been removed.

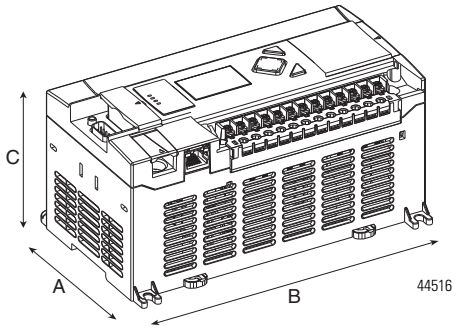
WARNING

Do not place the MicroLogix 1400 Programmable Controller in direct sunlight. Prolonged exposure to direct sunlight could degrade the LCD display.

WARNING

The local programming terminal port is intended for temporary use only and must not be connected or disconnected unless the area is assured to be nonhazardous.

Mounting Dimensions

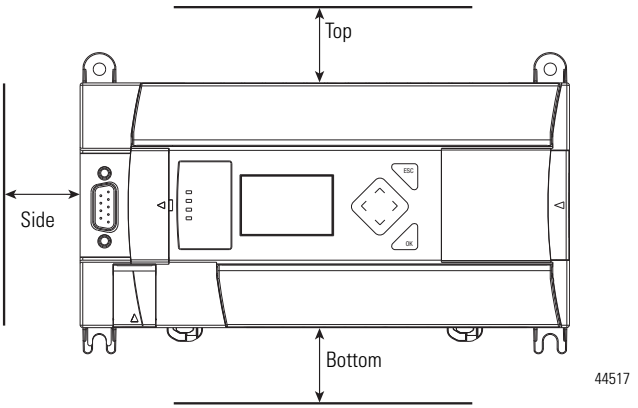


1766-L32BWA, 1766-L32AWA, 1766-L32BXB,
1766-L32BWAA, 1766-L32AWAA, 1766-L32BXBA

Dimension	Height
A	90 mm (3.5 in.)
B	180 mm (7.087 in.)
C	87 mm (3.43 in.)

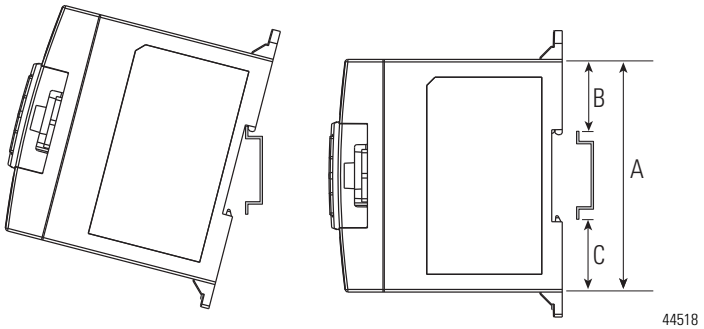
Controller Spacing

The controller mounts horizontally, with the expansion I/O extending to the right of the controller. Allow 50 mm (2 in.) of space on all but the right side for adequate ventilation, as shown below.



DIN Rail Mounting

The maximum extension of the latch is 14 mm (0.55 in.) in the open position. A flat-blade screwdriver is required for removal of the controller. The controller can be mounted to EN50022-35x7.5 or EN50022-35x15 DIN rails. DIN rail mounting dimensions are shown below.



Dimension	Height
A	90 mm (3.5 in.)
B	27.5 mm (1.08 in.)
C	27.5 mm (1.08 in.)

Follow these steps to install your controller on the DIN rail.

1. Mount your DIN rail. Make sure that the placement of the controller on the DIN rail meets the recommended spacing requirements (see Controller Spacing on page 14 for more information). Refer to the mounting template inside the back cover of this document.
2. If it is open, close the DIN latch.
3. Hook the top slot over the DIN rail.
4. While pressing the controller down against the top of the rail, snap the bottom of the controller into position.
5. Leave the protective debris strip attached until you are finished wiring the controller and any other devices.

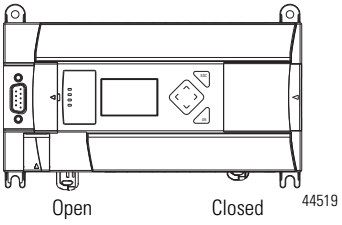
Follow these steps to remove your controller from the DIN rail.

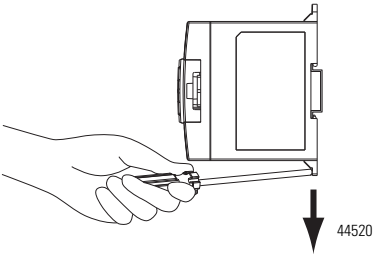
1. Place a flat-blade screwdriver in the DIN rail latch at the bottom of the controller.

2. Holding the controller, pry downward on the latch until the latch locks in the open position.

3. Repeat steps 1 and 2 for the second DIN rail latch.

4. Unhook the top of the DIN rail slot from the rail.





Panel Mounting

Mount to panel using #8 or M4 screws. Follow these steps to install your controller using mounting screws.

1. Remove the mounting template from inside the back cover of this document.

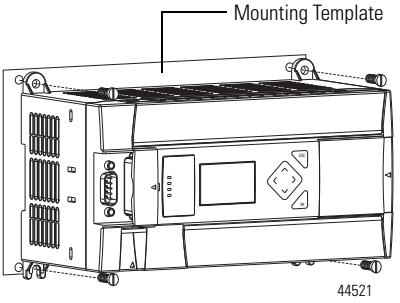
2. Secure the template to the mounting surface. Make sure your controller is spaced properly (see Controller Spacing on page 14 for more information).

3. Drill holes through the template.

4. Remove the mounting template.

5. Mount the controller.

6. Leave the protective debris strip in place until you are finished wiring the controller and any other devices



Using the Battery

The MicroLogix 1400 controller is equipped with a replaceable battery (catalog number 1747-BA). The Battery Low indicator on the LCD display of the controller shows the status of the replaceable battery. When the battery is low, the indicator is set (displayed as a solid rectangle). This means that either the battery wire connector is disconnected, or the battery may fail within 2 days if it is connected.

IMPORTANT

The MicroLogix 1400 controller ships with the battery wire connector connected. Ensure that the battery wire connector is inserted into the connector port if your application needs battery power. For example, when using a real-time clock (RTC).

Replacing the battery when the controller is powered down will lose all user application memory. Replace the battery when the controller is powered on. Refer to the SLC 500 Lithium Battery Installation Instructions, publication 1747-IN515, for more information on installation, handling, usage, storage, and disposal of the battery.

WARNING

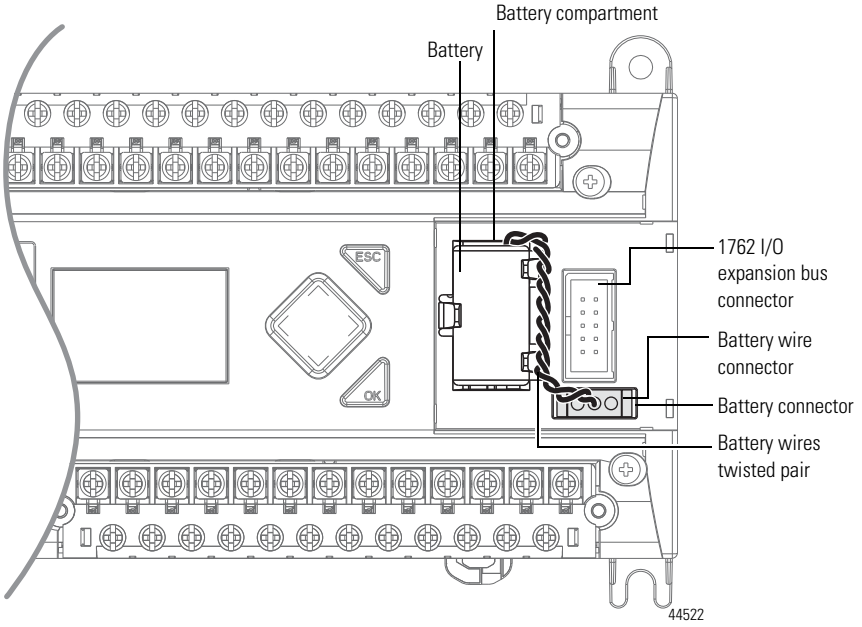
When you connect or disconnect the battery an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that the area is nonhazardous before proceeding.

For Safety information on the handling of lithium batteries, including handling and disposal of leaking batteries, see Guidelines for Handling Lithium Batteries, publication AG 5-4.

Follow these steps to connect the replaceable battery.

1. Insert the replaceable battery wire connector into the controller's battery connector.

2. Secure the battery connector wires so that it does not block the 1762 expansion bus connector as shown below.



Connect 1762 I/O Expansion Modules

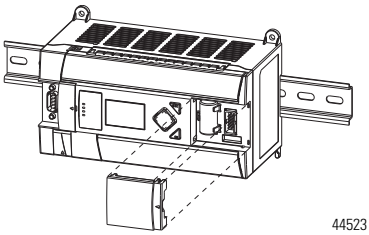
ATTENTION

Remove power from the system before installing or removing expansion I/O or damage to the controller may result.

Connect 1762 I/O after mounting the controller.

1. Remove the expansion port cover to install expansion I/O modules.
2. Plug the ribbon cable connector into the bus connector.

3. Replace the cover as shown below.



The MicroLogix 1400 controller is designed to support up to any seven 1762 expansion I/O modules.

For detailed information on using expansion I/O, refer to the installation instructions for your expansion module.

Wire the Controller

The shading in the following terminal block illustrations indicates which terminal groups are tied to which commons.

Terminal Block Layouts

WARNING

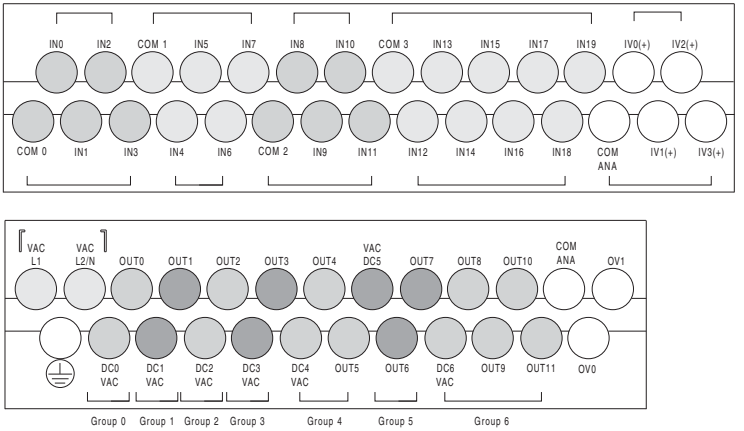
When you connect or disconnect the Removable Terminal Block (RTB) with field side power applied, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

WARNING

When used in a Class I, Division 2, hazardous location, this equipment must be mounted in a suitable enclosure. All wiring must be in accordance 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.

1766-L32BWA/L32BWAA

Input Terminal Block

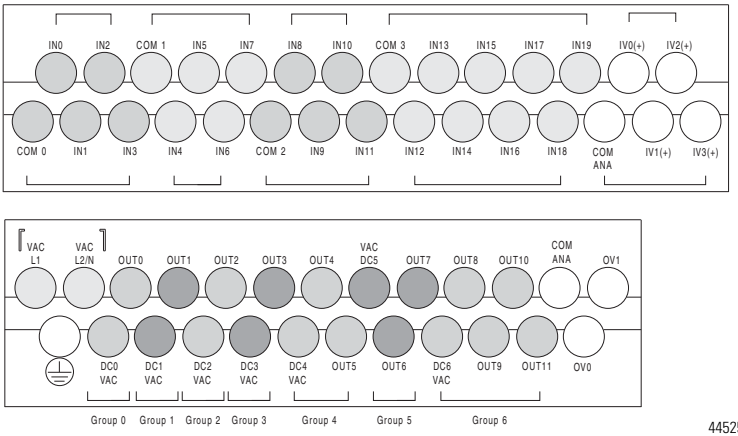


44524

Output Terminal Block

1766-L32AWA/L32AWAA

Input Terminal Block

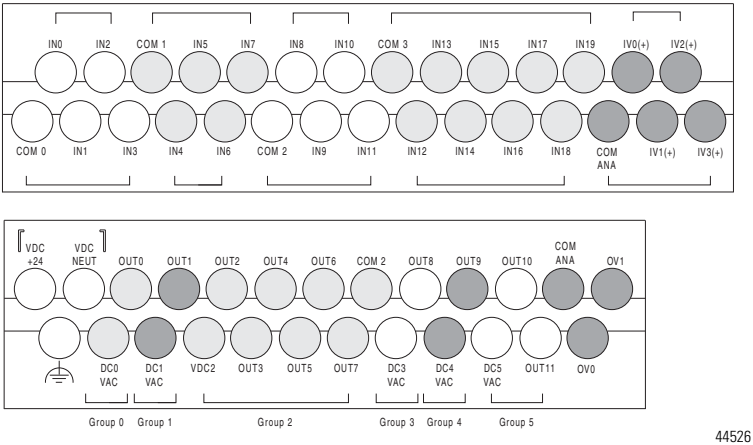


44525

Output Terminal Block

1766-L32BXB/L32BXBA

Input Terminal Block



44526

Wire Type		Wire Size
Solid wire	Cu-90°C (194°F)	14…22 AWG
Stranded wire	Cu-90°C (194°F)	16…22 AWG

Wiring torque = 0.791Nm (7 in-lb) rated.

Output Terminal Grouping

Controller	Output Group	Description	Outputs Voltage Terminal	Output Terminal
1766-L32BWA 1766--L32BWAA	Group 0	Isolated relay output	VAC/DC0	OUT 0
	Group 1	Isolated relay output	VAC/DC1	OUT 1
	Group 2	Isolated relay output	VAC/DC2	OUT 2
	Group 3	Isolated relay output	VAC/DC3	OUT 3
	Group 4	Isolated relay output	VAC/DC4	OUT 4, OUT 5
	Group 5	Isolated relay output	VAC/DC5	OUT 6, OUT 7
	Group 6	Isolated relay output	VAC/DC6	OUT 8…11

Output Terminal Grouping

Controller	Output Group	Description	Outputs Voltage Terminal	Output Terminal
1766-L32AWA 1766-L32AWAA	Group 0	Isolated relay output	VAC/DC0	OUT 0
	Group 1	Isolated relay output	VAC/DC1	OUT 1
	Group 2	Isolated relay output	VAC/DC2	OUT 2
	Group 3	Isolated relay output	VAC/DC3	OUT 3
	Group 4	Isolated relay output	VAC/DC4	OUT 4, OUT 5
	Group 5	Isolated relay output	VAC/DC5	OUT 6, OUT 7
	Group 6	Isolated relay output	VAC/DC6	OUT 8…11
1766-L32BXB 1766-L32BXBA	Group 0	Isolated relay output	VAC/DC0	OUT 0
	Group 1	Isolated relay output	VAC/DC1	OUT 1
	Group 2	FET output	VDC2/COM 2	OUT 2…7
	Group 3	Isolated relay output	VAC/DC3	OUT 8
	Group 4	Isolated relay output	VAC/DC4	OUT 9
	Group 5	Isolated relay output	VAC/DC5	OUT 10, OUT 11

WARNING

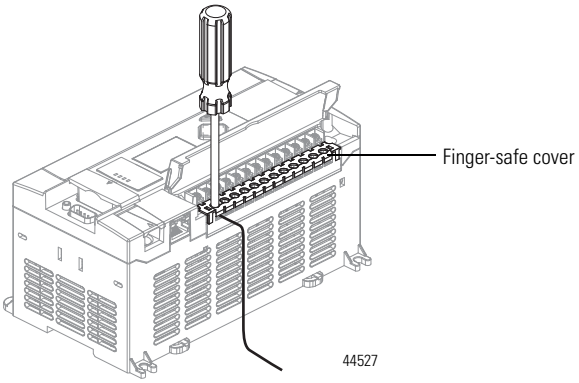
If you connect or disconnect wiring while the field-side power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding

WARNING

The local programming terminal port is intended for temporary use only and must not be connected or disconnected unless the area is free of ignitable concentrations of flammable gases or vapors.

Wiring Recommendation

When wiring without spade lugs, keep the finger-safe covers in place. Loosen the terminal screw and route the wires through the opening in the finger-safe cover. Tighten the terminal screw, making sure the pressure plate secures the wire.



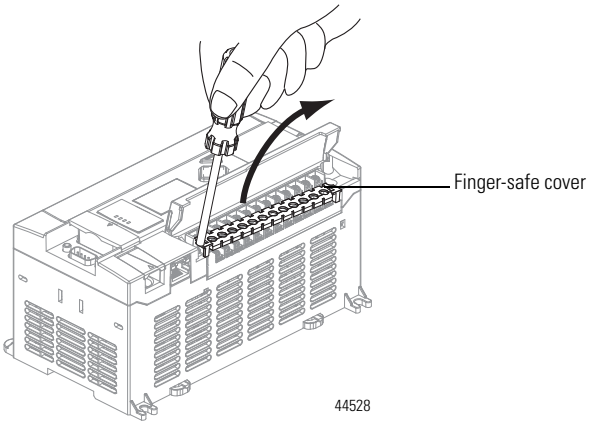
ATTENTION

Be careful when stripping wires. Wire fragments that fall into the controller could cause damage. Once wiring is complete, be sure the controller is free of all metal fragments before removing the protective debris strip. Failure to remove the strip before operating can cause overheating.

Spade Lug Recommendation

The diameter of the terminal screw head is 5.5 mm (0.220 in.). The input and output terminals of the MicroLogix 1400 controller are designed for the following spade lugs. The terminals will accept a 6.35mm (0.25 in.) wide spade (standard for #6 screw for up to 14 AWG) or a 4 mm (metric #4) fork terminal.

When using spade lugs, use a small, flat-blade screwdriver to pry the finger-safe cover from the terminal blocks, then loosen the terminal screw.



TIP If you wire the terminal block with the finger-safe cover removed, you may not be able to put it back on the terminal block if the wires are in the way.

Surge Suppression

ATTENTION

Inductive load devices such as motor starters and solenoids require the use of some type of surge suppression to protect the controller output. Switching inductive loads without surge suppression can significantly reduce the life of relay contacts or damage transistor outputs. By using suppression, you also reduce the effects of voltage transients caused by interrupting the current to that inductive device, and prevent electrical noise from radiating into system wiring. Refer to the MicroLogix 1400 Programmable Controller User Manual, publication 1766-UM001, for more information on surge suppression.

Grounding the Controller

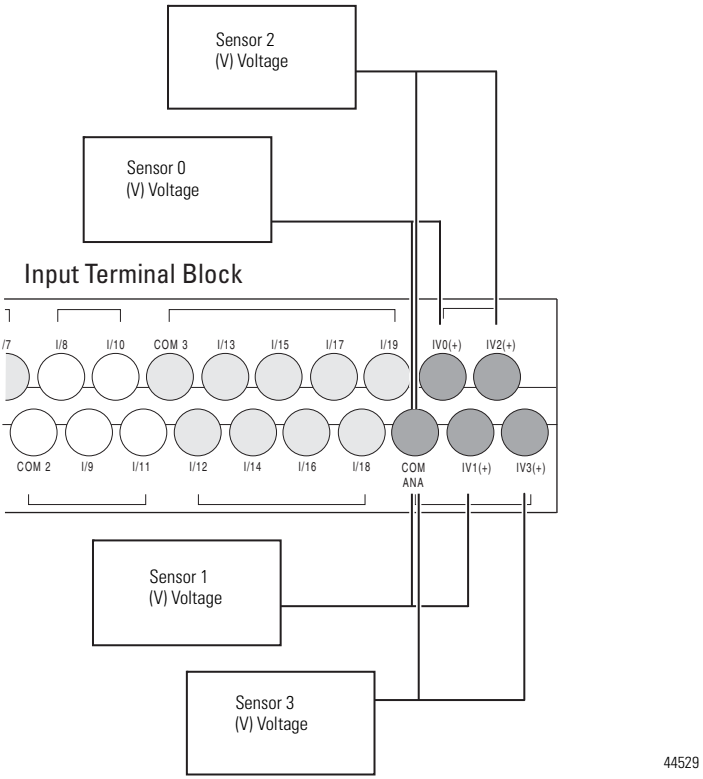
In solid-state control systems, grounding and wire routing helps limit the effects of noise due to electromagnetic interference (EMI). Run the ground connection from the ground screw of the controller to the ground bus prior to connecting any devices. Use AWG #14 wire. For AC-powered controllers, this connection must be made for safety purposes.

You must also provide an acceptable grounding path for each device in your application. For more information on proper grounding guidelines, refer to the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Wiring Your Analog Channels

Analog input circuits can monitor voltage signals and convert them to serial digital data as shown in the following illustration.

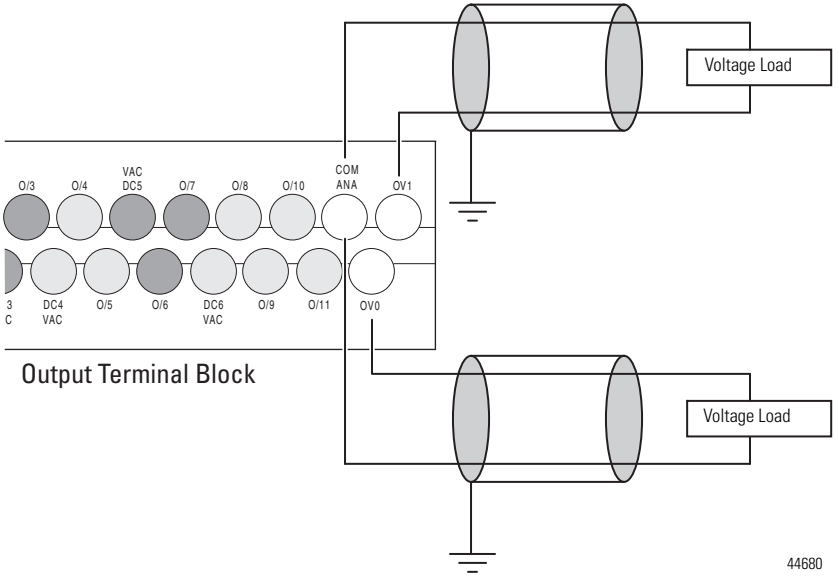
Analog Input



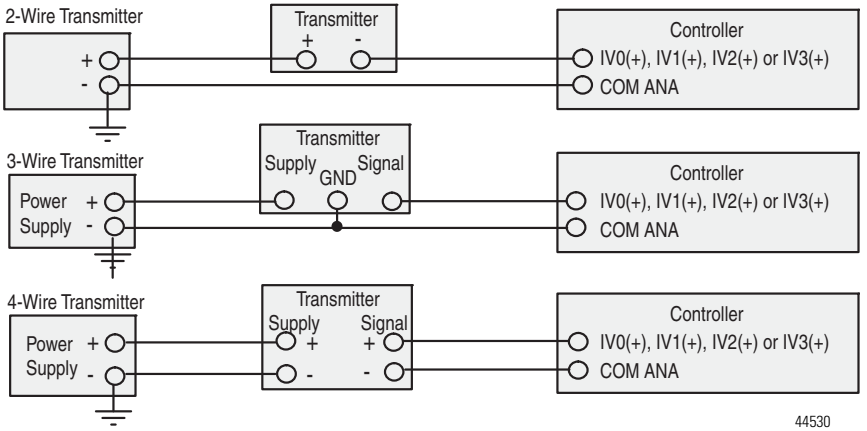
The controller does not provide loop power for analog inputs. Use a power supply that matches the transmitter specifications as shown.

The analog output can support a voltage function as shown in the following illustration.

Analog Output



Analog Input Transmitter Specifications



Minimizing Electrical Noise on Analog Channels

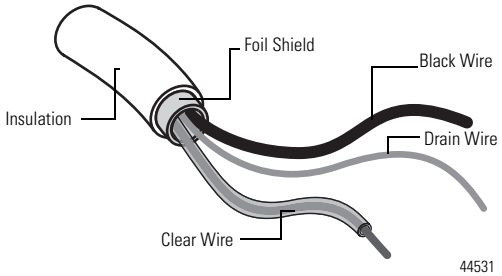
Inputs on analog channels employ digital high-frequency filters that significantly reduce the effects of electrical noise on input signals. However, because of the variety of applications and environments where analog controllers are installed and operated, it is impossible to ensure that all environmental noise will be removed by the input filters.

Several specific steps can be taken to help reduce the effects of environmental noise on analog signals:

- Install the MicroLogix 1400 system in a properly rated (NEMA) enclosure. Make sure that the MicroLogix 1400 system is properly grounded.
- Use Belden cable #8761 for wiring the analog channels, making sure that the drain wire and foil shield are properly earth grounded, (see Grounding Your Analog Cable on page 27 for more information).
- Route the Belden cable separately from any AC wiring. Additional noise immunity can be obtained by routing the cables in grounded conduit.

Grounding Your Analog Cable

Use shielded communication cable (Belden #8761). The Belden cable has two signal wires (black and clear), one drain wire, and a foil shield. The drain wire and foil shield must be grounded at one end of the cable.



IMPORTANT Do not ground the drain wire and foil shield at both ends of the cable.

Specifications

General Specifications

Description	1766-L32AWA 1766-L32AWAA	1766-L32BWA 1766-L32BWAA	1766-L32BXB 1766-L32BXBA
Dimensions HxWxD	90 x 180 x 87 mm 3.5 x 7.087 x 3.43 in.		
Shipping weight	0.9 kg (2.0 lbs)		
Number of I/O	24 inputs (20 digital and 4 analog) and 14 outputs (12 digital and 2 analog)		
Power supply voltage	100…240V AC @ 47…63 Hz		24V DC Class 2 SELV
Heat dissipation	Refer to the MicroLogix 1400 Programmable Controllers User Manual, Publication 1766-UM001.		
Power supply inrush current	120V AC: 25 A for 8 ms 240V AC: 40A for 4 ms		24V DC: 15 A for 20 ms
Power consumption	100 VA	120 VA	50W 7.5W (with no 1762 expansion I/O)
24V DC sensor power	none	24V DC @ 250 mA 400 µF max.	none
Input circuit type	Digital: 120V AC Analog: 0…10V DC	Digital: 24V DC sink/source (standard and high-speed) Analog: 0…10V DC	Digital: 24V DC sink/source (standard and high-speed) Analog: 0…10V DC
Output circuit type	Relay		Relay/FET
Relay life - Electrical	2 x 10^5 operations min (2.5 A, 250V AC / 30V DC)		
Enclosure type rating	None (open-style)		
Wire size	0.25… 2.5 mm^2 (22…14 AWG) solid or stranded copper wire rated @ 90 °C (194 °F) or greater.		
Wiring category(1)	2 - on signal ports 2 - on power ports 3 - on communications ports		
Terminal screw torque	0.79 Nm (7.0 in-lb) rated		

General Specifications

Description	1766-L32AWA 1766-L32AWAA	1766-L32BWA 1766-L32BWAA	1766-L32BXB 1766-L32BXBA
Pilot duty rating	R300, C300		
Expansion bus	Supports up to seven 1762 modules, up to a maximum of 5V, 1500 mA (1300 mA for Series C only) and 24 V, 1500 mA (1300 mA for Seriec C only).		
North American temp code	T3C		

(1) Use this Conductor Category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Specifications for Inputs

Digital Inputs

Description	1766-L32AWA 1766-L32AWAA	1766-L32BWA, 1766-L32BWAA, 1766-L32BXB, 1766-L32BXBA	
		Inputs 0 through 11 (12 high-speed DC inputs)	Inputs 12 and higher (8 standard DC inputs)
On-state voltage range	79…132 V AC	4.5…24V DC, Class 2 (4.5…26.4V DC @ 60°C/140°F) (4.5…30V DC @ 30°C/86°F)	10…24V DC, Class 2 (10…26.4V DC @ 60°C/140°F) (10…30V DC @ 30°C/86°F)
Off-state voltage range	0…20 V AC	0…1.5V DC	0…5V DC
Operating frequency	47…63 Hz	0 Hz…100 kHz	0 Hz…1 kHz (scan time dependent)
On-state current min nom max	 5.0 mA @ 79 V AC 12 mA @ 120 V AC 16.0 mA @ 132 V AC	 7.1 mA @ 4.5V DC 9.9 mA @ 24V DC 10.5 mA @ 30V DC	 3.2 mA @ 10V DC 5.3 mA @ 24V DC 5.5 mA @ 30V DC
Off-state leakage current	2.5 mA max.	0.2 mA max.	1.5 mA max.
Nominal impedance	12 kΩ @ 50 Hz 10 kΩ @ 60 Hz	2.4 kΩ	4.5 kΩ
Inrush current (max.) @ 120V AC	250 mA		

Analog Inputs

Description	1766-L32AWAA, -L32BWAA, -L32BXBA
Voltage input range	0…10.0V DC - 1 LSB
Type of data	12-bit unsigned integer
Input coding (0…10.0V DC - 1 LSB)	0…4,095
Voltage input impedance	>199 kΩ
Input resolution	12 bit
Non-linearity	±1.0% of full scale
Overall accuracy -20…60 °C (-4…140 °F)	±1.0% of full scale
Voltage input overvoltage protection	10.5 V DC
Field wiring to logic isolation	Non-isolated with internal logic

Analog Outputs

Description	1766-L32AWAA, -L32BWAA, -L32BXBA
Number of inputs	2 single-ended
Voltage output range	0…10 V DC - 1 LSB
Type of data	12 bit unsigned integer
Step response	2.5 ms @ 95%
Load range Voltage output	 1 KΩ
Output resolution	12 bit
Analog output setting time	3 ms (max.)
Overall Accuracy -20…60 °C (-4…140 °F)	 ±1.0% of full scale
Electrical isolation	Non-isolated with internal logic
Cable length	30 m (98 ft) shielded cable

Relay and FET Outputs

Description		1766-L32AWA, 1766-L32AWAA, 1766-L32BWA, 1766-L32BWAA	1766-L32BXB, 1766-L32BXBA
Maximum controlled load		1440 VA	1080 VA
Maximum Continuous Current:			
Current per channel and group common		2.5 A per channel 8A max channel 8…11 common	2.5 A per channel
Current per controller	at 150V max	28 A or total of per-point loads, whichever is less	
	at 240V max	20 A or total of per-point loads, whichever is less	

Relay Outputs

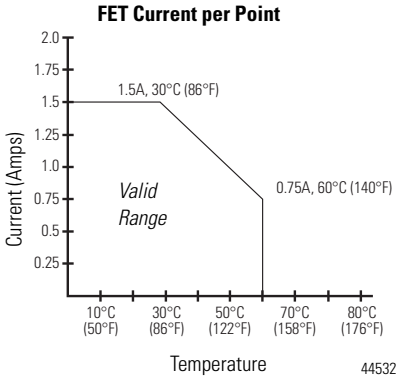
Description	1766-L32AWA, 1766-L32AWAA, 1766-L32BWA, 1766-L32BWAA, 1766-L32BXB, 1766-L32BXBA
Turn On Time/Turn Off Time	10 ms (maximum)(1)
Load current	10 mA (minimum)

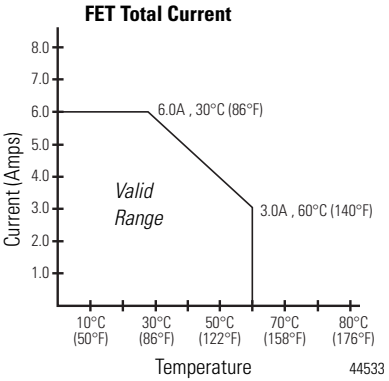
(1) Scan time dependent

Maximum Volts	Amperes		Amperes Continuous	Volt-Amperes	
	Make	Break		Make	Break
240V AC	7.5 A	0.75 A	2.5 A	1800 VA	180 VA
120V AC	15.0 A	1.5 A	2.5 A	1800 VA	180 VA
250V DC	0.11 A		1.0 A	28 VA	
125V DC	0.22 A		1.0 A	28 VA	

1766-L32BXB, 1766-L32BXBA FET Output

Maximum output current (temperature dependent):





Description	General Operation	High Speed Operation[1] (Output 2, 3 and 4 Only)
Power supply voltage	24V DC (-15%, 10%) Class 2	
On-state voltage drop: at max load current at max surge current	 1V DC 2.5V DC	 Not Applicable Not Applicable
Current rating per point max load min load max leakage	 See graphic above 1.0 mA 1.0 mA	 100 mA 20 mA 1.0 mA
Surge current per point: peak current max surge duration max rate of repetition @ 30 °C (86 °F) max rate of repetition @ 60 °C (140 °F)	 4.0 A 10 ms once every second once every 2 seconds	 Not Applicable Not Applicable Not Applicable Not Applicable

Description	General Operation	High Speed Operation[1] (Output 2, 3 and 4 Only)
Turn-On Time (maximum)	11 μs	28 ns (250 ns for Series C only)
Turn-Off Time (maximum)	89 μs	2.3 μs (3.5 μs for Series C only)

(1) Output 2, 3 and 4 are designed to provide increased functionality over the other FET outputs. Output 2, 3 and 4 may be used like the other FET transistor outputs, but in addition, within a limited current range, they may be operated at a higher speed. Output 2, 3 and 4 also provide a pulse train output (PTO) or pulse width modulation output (PWM) function.

Working Voltage

Working Voltage for 1766-L32AWA, 1766-L32AWAA

Description	Recommendation
Power supply input to backplane isolation	Verified by one of the following dielectric tests: 1836V AC for 1 second or 2596V DC for 1 second
	265V AC Working Voltage (IEC Class 2 reinforced insulation)
Input group to backplane isolation	Verified by one of the following dielectric tests:1517V AC for 1 second or 2145V DC for 1 second
	132V AC Working Voltage (IEC Class 2 reinforced insulation)
Input group to input group isolation	Verified by one of the following dielectric tests:1517V AC for 1 second or 2145V DC for 1 second
	132V AC Working Voltage (basic insulation)
Output group to backplane isolation	Verified by one of the following dielectric tests: 1836V AC for 1 second or 2596V DC for 1 second
	265V AC Working Voltage (IEC Class 2 reinforced insulation)
Output group to output group isolation	Verified by one of the following dielectric tests: 1836V AC for 1 second or 2596V DC for 1second
	265V AC Working Voltage (basic insulation), 150V AC Working Voltage (IEC Class 2 reinforced insulation)

Working Voltage for 1766-L32BWA, 1766-L32BWAA

Description	Recommendation
Power supply input to backplane isolation	Verified by one of the following dielectric tests:1836V AC for 1 second or 2596V DC for 1 second
	265V AC Working Voltage (IEC Class 2 reinforced insulation)
Input group to backplane isolation and input group to input group isolation	Verified by one of the following dielectric tests: 1100V AC for 1 second or 1697V DC for 1 second
	75V DC Working Voltage (IEC Class 2 reinforced insulation)
Output group to backplane Isolation	Verified by one of the following dielectric tests: 1836V AC for 1 second or 2596V DC for 1 second
	265V AC Working Voltage (IEC Class 2 reinforced insulation).
Output group to output group isolation	Verified by one of the following dielectric tests: 1836V AC for 1 second or 2596V DC for 1 second
	265V AC Working Voltage (basic insulation) 150V Working Voltage (IEC Class 2 reinforced insulation)

Working Voltage for 1766-L16BXB, 1766-L16BXBA

Description	Recommendation
Input group to backplane isolation and input group to input group isolation	Verified by one of the following dielectric tests: 1100V AC for 1 second or 1697V DC for 1 second
	75V DC Working Voltage (IEC Class 2 reinforced insulation)
FET output group to backplane isolation	Verified by one of the following dielectric tests: 1100V AC for 1 second or 1697V DC for 1 second
	75V DC Working Voltage (IEC Class 2 reinforced insulation)
Relay output group to backplane isolation	Verified by one of the following dielectric tests: 1836V AC for 1 second or 2596V DC for 1 second
	265V AC Working Voltage (IEC Class 2 reinforced insulation)
Relay output group to relay output group and FET output group isolation	Verified by one of the following dielectric tests: 1836V AC for 1 second or 2596V DC for 1 second
	265V AC Working Voltage (basic insulation), 150V Working Voltage (IEC Class 2 reinforced insulation)

Environmental Specifications

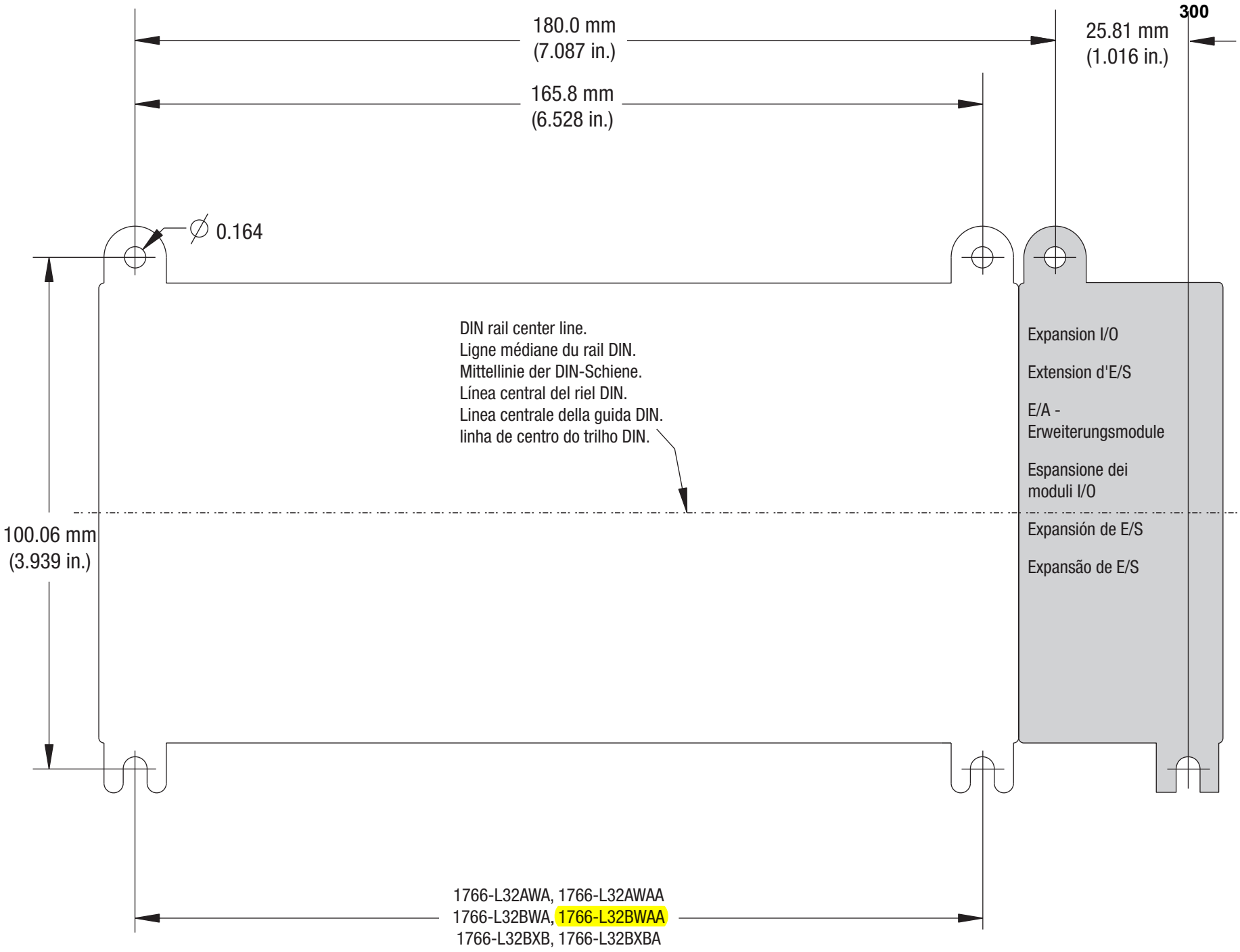
Description	1766-L32AWA 1766-L32AWAA	1766-L32BWA 1766-L32BWAA	1766-L32BXB 1766-L32BXBA
Temperature, operating	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20… 60 °C (-4…140 °F)		
Temperature, storage	IEC 60068-2-1 (Test Ab, Unpackaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Non-operating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Non-operating Thermal Shock): -40…85 °C (-40…185 °F)		
Relative humidity	IEC 60068-2-30 (Test Db, Unpackaged Damp Heat): 5…95% non-condensing		
Vibration	IEC 60068-2-6 (Test Fc, Operating): 3 g @ 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): Panel mount - 50 g DIN mount - 40 g		
Emissions	CISPR 11 Group 1, Class A		
ESD immunity	IEC 61000-4-2: 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 80…1000 MHz 3 V/m with 1 kHz sine-wave 80% AM from 1.4…2.0 GHz 1 V/m with 1 kHz sine-wave 80% AM from 2.0…2.7 GHz		
EFT/B immunity	IEC 61000-4-4: ±2 kV @ 5 kHz on power ports ±2 kV @ 5 kHz on signal ports ±1 kV @ 5 kHz on communications ports		

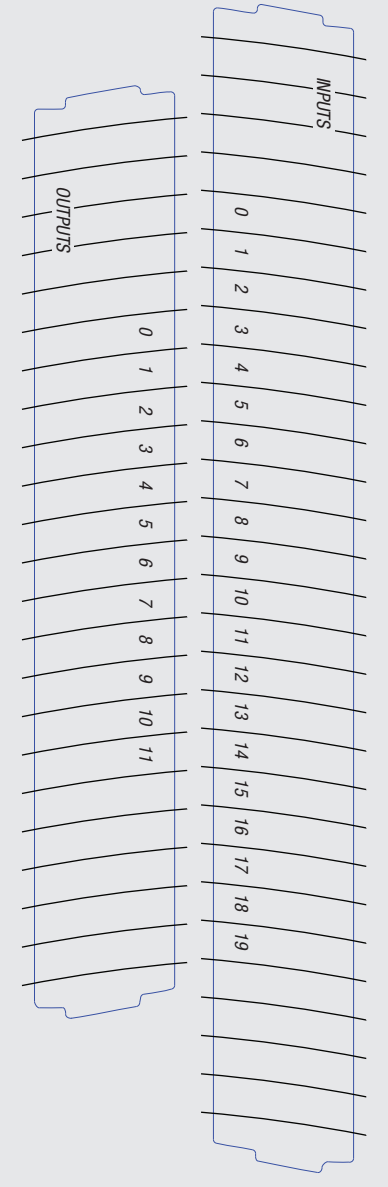
Description	1766-L32AWA 1766-L32AWAA	1766-L32BWA 1766-L32BWAA	1766-L32BXB 1766-L32BXBA
Surge transient immunity	IEC 61000-4-5: ±1 kV line-line(DM) and ±2 kV line-earth(CM) on AC power ports ±1 kV line-line(DM) and ±2 kV line-earth(CM) on signal ports ±1 kV line-earth(CM) on communications ports		
Conducted RF immunity	IEC 61000-4-6: 10V rms with 1 kHz sine-wave 80% AM from 150 kHz…80 MHz		
Voltage variation	IEC 6100-4-11: 60% dip for 10 periods on AC supply ports 30% dips for 25 periods @ 0° and 180° on AC supply ports 100% dip for 250 periods @ 0° and 180° on AC supply ports 100% dip for 0.5 periods, arbitrary angle, on AC supply ports		

Certifications for 1766-L32AWA, 1766-L32AWAA, 1766-L32BWA, 1766-L32BWAA, 1766-L32BXB, 1766-L32BXBA

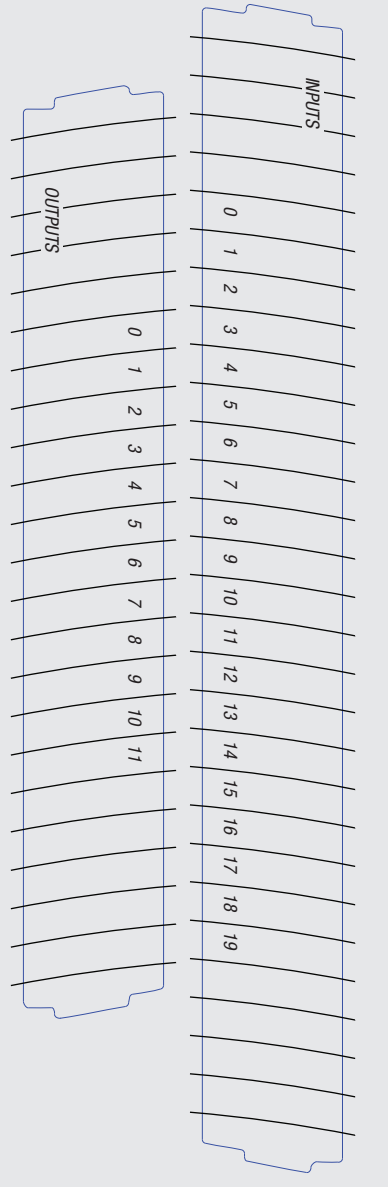
Certification (when product is marked)[1]	Value
UL	UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations. See UL File E10314.
c-UL	UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for Canada. See UL File E10314.
CE	European Union 2014/30/EU EMC Directive, compliant with: EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2014/35/EU LVD, compliant with: EN 61131-2; Programmable Controllers (Clause 11)
RCM	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
EAC	Russian Customs Union TR CU 020/2011 EMC Technical Regulation
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3

(1) See the Product Certification link at http://www.ab.com for Declaration of Conformity, Certificates, and other certification details.


180.0 mm
(7.087 in.)
165.8 mm
(6.528 in.)
25.81 mm
(1.016 in.)
∅ 0.164
100.06 mm
(3.939 in.)
DIN rail center line.
Ligne médiane du rail DIN.
Mittellinie der DIN-Schiene.
Línea central del riel DIN.
Linea centrale della guida DIN.
linha de centro do trilho DIN.
Expansion I/O
Extension d'E/S
E/A - Erweiterungsmodule
Espansione dei moduli I/O
Expansión de E/S
Expansão de E/S
1766-L32AWA, 1766-L32AWAA
1766-L32BWA, 1766-L32BWAA
1766-L32BXB, 1766-L32BXBA



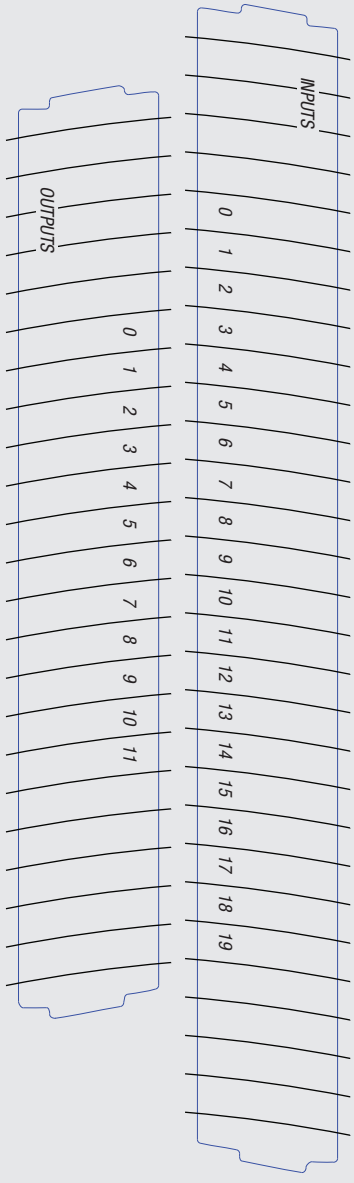
L32AWA



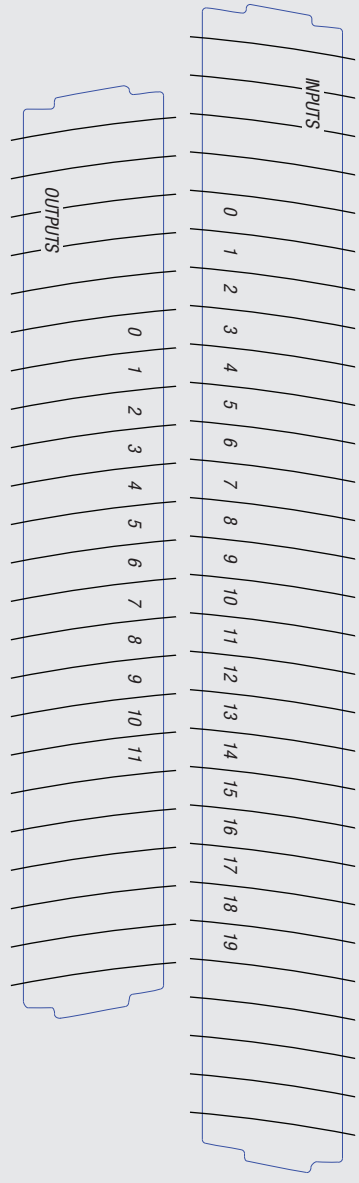
L32AWAA

1766-L32AWA
VAC L1
VAC L2/N
OUT 0
OUT 1
OUT 2
OUT 3
OUT 4
VAC DC5
OUT 7
OUT 8
OUT 10
NC
NC
VAC DC0
VAC DC1
VAC DC2
VAC DC3
VAC DC4
OUT 5
OUT 6
VAC DC6
OUT 9
OUT 11
NC
1766-L32AWA
COM 0
IN0
IN2
COM 1
IN5
IN7
IN8
IN10
COM 3
IN13
IN15
IN17
IN19
NC
NC
IN1
IN3
IN4
IN6
COM 2
IN9
IN11
IN12
IN14
IN16
IN18
NC
NC
NC
L32AWA
1766-L32AWAA
VAC L1
VAC L2/N
OUT 0
OUT 1
OUT 2
OUT 3
OUT 4
VAC DC5
OUT 7
OUT 8
OUT 10
COM ANA
OV1
VAC DC0
VAC DC1
VAC DC2
VAC DC3
VAC DC4
OUT 5
OUT 6
VAC DC6
OUT 9
OUT 11
OV0
1766-L32AWAA
COM 0
IN0
IN2
COM 1
IN5
IN7
IN8
IN10
COM 3
IN13
IN15
IN17
IN19
IV0
IV2
IN1
IN3
IN4
IN6
COM 2
IN9
IN11
IN12
IN14
IN16
IN18
COM ANA
IV1
IV3
L32AWAA

953203-16

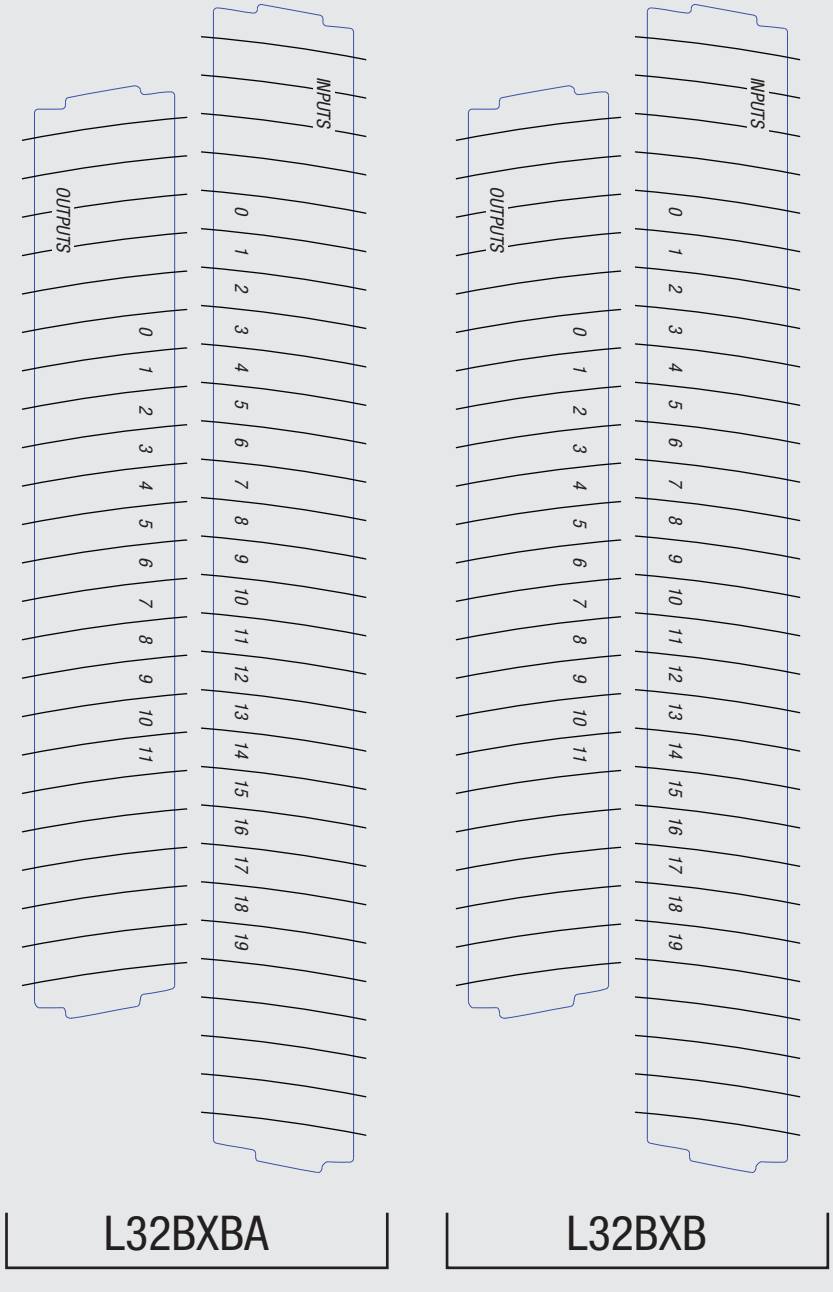


L32BWA



L32BWAA

1766-L32BWA
VAC L1
VAC L2/N
VAC DC0
VAC DC1
VAC DC2
VAC DC3
VAC DC4
OUT 0
OUT 1
OUT 2
OUT 3
OUT 4
OUT 5
VAC DC5
VAC DC6
OUT 6
OUT 7
OUT 8
OUT 9
OUT 10
OUT 11
NC
NC
COM 0
IN0
IN1
IN2
IN3
COM 1
IN4
IN5
IN6
IN7
COM 2
IN8
IN9
IN10
IN11
COM 3
IN12
IN13
IN14
IN15
IN16
IN17
IN18
IN19
NC
NC
NC
NC
1766-L32BWAA
VAC L1
VAC L2/N
VAC DC0
VAC DC1
VAC DC2
VAC DC3
VAC DC4
OUT 0
OUT 1
OUT 2
OUT 3
OUT 4
OUT 5
VAC DC5
VAC DC6
OUT 6
OUT 7
OUT 8
OUT 9
OUT 10
OUT 11
COM ANA
OV0
OV1
1766-L32BWAA
COM 0
IN0
IN1
IN2
IN3
COM 1
IN4
IN5
IN6
IN7
COM 2
IN8
IN9
IN10
IN11
COM 3
IN12
IN13
IN14
IN15
IN16
IN17
IN18
IN19
COM ANA
IV0
IV1
IV2
IV3
L32BWA
L32BWAA



L32BXBA

L32BXB

1766-L32BXBA
+24 VDC
VDC NEUT
VAC DC0
VAC DC1
VDC 2
OUT 3
OUT 5
OUT 7
COM 2
OUT 6
OUT 4
OUT 2
OUT 1
OUT 0
COM 8
OUT 9
OUT 10
OUT 11
COM ANA
OV0
OV1
1766-L32BXBA
COM 0
IN0
IN1
IN2
IN3
COM 1
IN4
IN5
IN6
IN7
COM 2
IN8
IN9
IN10
IN11
COM 3
IN12
IN13
IN14
IN15
IN16
IN17
IN18
IN19
COM ANA
IV0
IV1
IV2
IV3
1766-L32BXB
+24 VDC
VDC NEUT
VAC DC0
VAC DC1
VDC 2
OUT 3
OUT 5
OUT 7
COM 2
OUT 6
OUT 4
OUT 2
OUT 1
OUT 0
COM 8
OUT 9
OUT 10
OUT 11
NC
NC
1766-L32BXB
COM 0
IN0
IN1
IN2
IN3
COM 1
IN4
IN5
IN6
IN7
COM 2
IN8
IN9
IN10
IN11
COM 3
IN12
IN13
IN14
IN15
IN16
IN17
IN18
IN19
NC
NC
NC
NC
L32BXBA
L32BXB

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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 the return procedure.

Rockwell Automation maintains current product environmental information on its website at http://www.rockwellautomation.com/rockwellautomation/about-us/sustainability-ethics/product-environmental-compliance.page.

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Supersedes Publication 1766-IN001D-EN-P - June 2015

Allen-Bradley

Installation Instructions

MicroLogix 1762-IQ16 DC Input Module

Catalog Number 1762-IQ16

Table of Contents

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 60664-1), at altitudes up to 2000 m (6562 ft) without derating.This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR 11. Without appropriate precautions, there may be difficulties with electromagnetic compatibility in residential and other environments due to conducted and radiated disturbances.

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 250 and IEC 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure.

Preventing 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 modules are North American Hazardous Location approved: 1762-IQ16

The following information applies when operating this equipment in hazardous locations:	**Informations sur l'utilisation de cet équipement en environnements dangereux:**
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.	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.
WARNING  **EXPLOSION HAZARD** • 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. • All wiring must comply with N.E.C. article 501-4(b). • The interior of the enclosure must be accessible only by the use of a tool. • For applicable equipment (relay modules, etc.), exposure to some chemicals may degrade the sealing properties of materials used in the following devices: Relays, Epoxy. It is recommended that the User periodically inspect these devices for any degradation of properties and replace the module if degradation is found.	**AVERTISSEMENT**  **RISQUE D'EXPLOSION** • 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.

Additional Resources

Resource	Description
MicroLogix 1100 Programmable Controllers User Manual, publication 1763-UM001.	A more detailed description of how to install and use your MicroLogix 1100 programmable controller and expansion I/O system.
MicroLogix 1200 Programmable Controllers User Manual, publication 1762-UM001.	A more detailed description of how to install and use your MicroLogix 1200 programmable controller and expansion I/O system.
MicroLogix 1400 Programmable Controllers User Manual, publication 1766-UM001.	A more detailed description of how to install and use your MicroLogix 1400 programmable controller and expansion I/O system.
MicroLogix 1100 Programmable Controllers Installation Instructions, publication 1763-IN001.	Information on installing and using the MicroLogix 1100 programmable controller.
MicroLogix 1200 Programmable Controllers Installation Instructions, publication 1762-IN006.	Information on installing and using the MicroLogix 1200 programmable controller.
MicroLogix 1400 Programmable Controllers Installation Instructions, publication 1766-IN001.	Information on installing and using the MicroLogix 1400 programmable controller.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.	More information on proper wiring and grounding techniques.

If you would like a manual, you can:

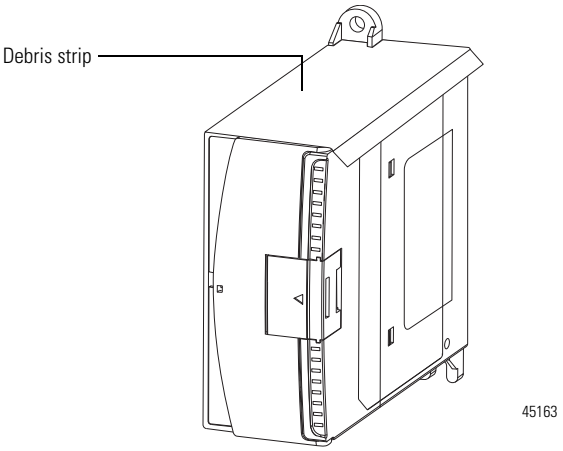
- download a free electronic version from the Internet: http://literature.rockwellautomation.com
- purchase a printed manual by contacting your local Allen-Bradley distributor or Rockwell Automation representative

Overview

The 1762 input module 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 to circuits not exceeding Over Voltage Category II[2] (IEC 60664-1)[3].

Install your module using these installation instructions.

1762 Input Module



ATTENTION

Do not remove the protective debris strip until after the module and all other equipment in the panel near the module are mounted and wiring is complete. Once wiring is complete, remove protective debris strip. Failure to remove strip before operating can cause overheating.

ATTENTION

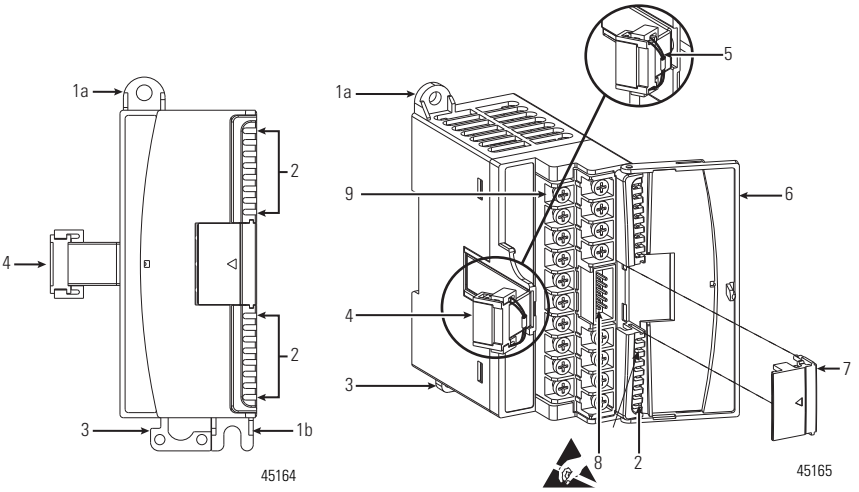
Electrostatic discharge can damage semiconductor devices inside the module. Do not touch the connector pins or other sensitive areas.

(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.

Module Description



This equipment is sensitive to electrostatic discharge (ESD).
Follow ESD prevention guidelines when handling this equipment.

Front view **Left side view**

	Description		Description
1a	Upper panel mounting tab	5	pull loop
1b	Lower panel mounting tab	6	module door with terminal identification label
2	I/O diagnostic LEDs	7	bus connector cover
3	DIN rail latch	8	bus connector with male pins
4	flat ribbon cable with bus connector (female pins)	9	terminal block

ATTENTION

To comply with UL restrictions, this equipment must be powered from a source compliant with Class 2 or Limited Voltage/Current.

Mount the Module

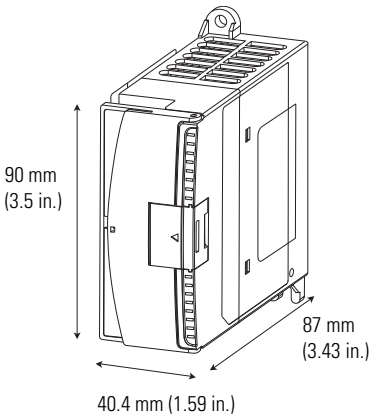
General Considerations

Most applications require installation in an industrial enclosure to reduce the effects of electrical interference and environmental exposure. Locate your controller as far as possible from power lines, load lines, and other sources of electrical noise such as hard-contact switches, relays, and AC motor drives. For more information on proper grounding guidelines, see the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

ATTENTION

This product is intended to be mounted to a well-grounded mounting surface such as a metal panel. Additional grounding connections from the power supply'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.

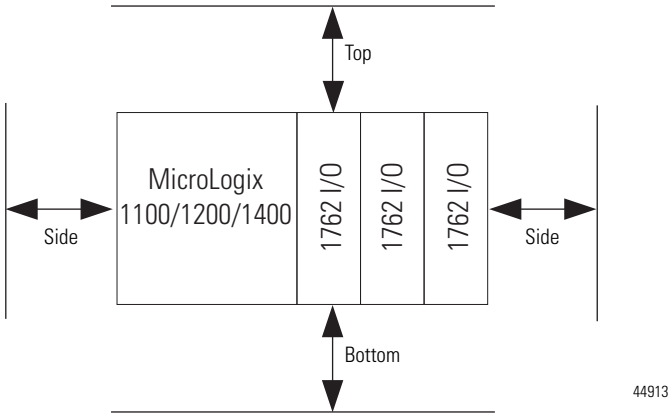
Mounting Dimensions



Measurements do not include mounting feet or DIN rail latches.

Module Spacing

Maintain spacing from objects such as enclosure walls, wireways and adjacent equipment. Allow 50.8 mm (2 in.) of space on all sides for adequate ventilation, as shown:

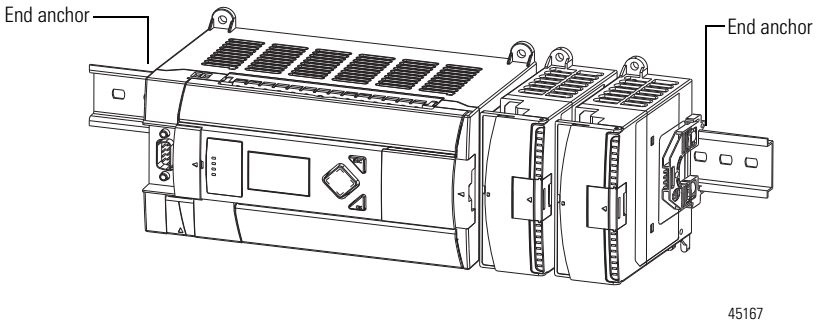


DIN Rail Mounting

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 latch. Press the DIN rail mounting area of the module against the DIN rail. The latch will momentarily open and lock into place.

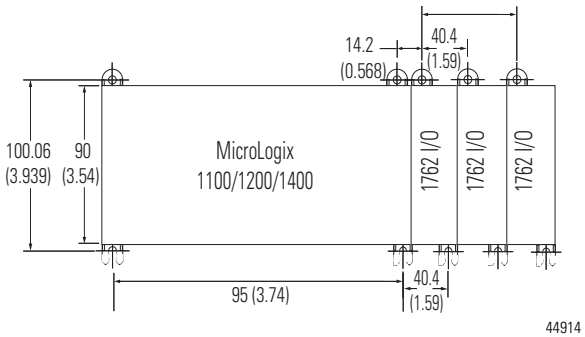
Use DIN rail end anchors (Allen-Bradley part number 1492-EA35 or 1492-EAH35) for vibration or shock environments.



TIP For environments with greater vibration and shock concerns, use the panel mounting method described below, instead of DIN rail mounting.

Panel Mounting

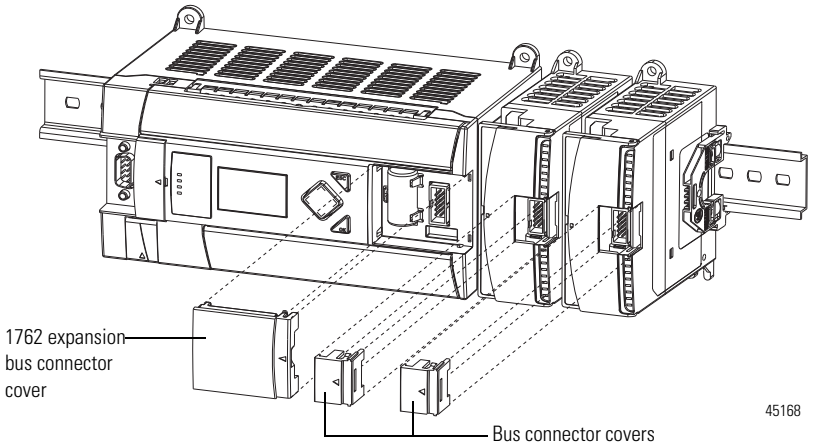
Use the dimensional template shown below to mount the module. The preferred mounting method is to use two M4 (#8) panhead screws per module. M3.5 (#6) panhead screws may also be used, but a washer may be needed to ensure a good mechanical contact. Mounting screws are required on every module.



NOTE: All dimensions are in mm (in.). Hole spacing tolerance: ±0.4 mm (0.016 in.).

System Assembly

The expansion I/O module is attached to the controller or another I/O module by means of a flat ribbon cable *after* mounting as shown below.



TIP Use the pull loop on the connector to disconnect modules. Do not pull on the ribbon cable.

Field Wiring Connections

Grounding the Module

In solid-state control systems, grounding and wire routing helps limit the effects of noise due to electromagnetic interference (EMI). Run the ground connection from the ground screw of the controller to the ground bus prior to connecting any devices. Use AWG #14 wire. For AC-powered controllers, this connection must be made for safety purposes.

You must also provide an acceptable grounding path for each device in your application. For more information on proper grounding guidelines, refer to the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

WARNING

EXPLOSION HAZARD

- In Class I, Division 2 applications, the bus connector must be fully seated and the bus connector cover must be snapped in place.
- In Class I, Division 2 applications, all modules must be mounted in direct contact with each other as shown on page 10. If DIN rail mounting is used, an end anchor must be installed ahead of the controller and after the last 1762 I/O module.

ATTENTION

To comply with the CE Low Voltage Directive (LVD), all connected I/O must be powered from a source compliant with the Safety Extra Low Voltage (SELV) or Protected Extra Low Voltage (PELV).

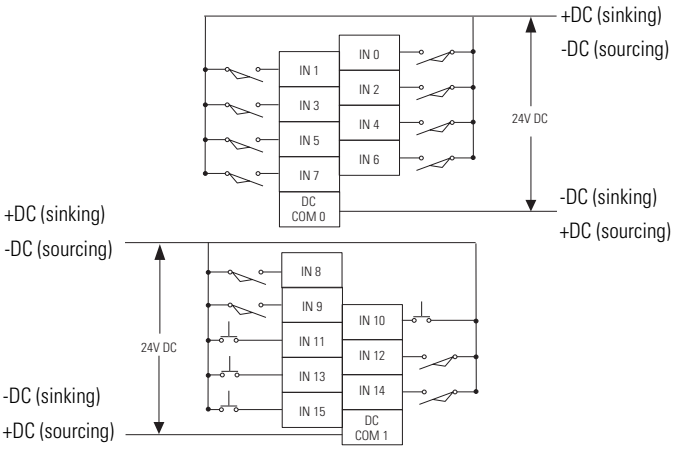
WARNING

If you connect or disconnect wiring while the field-side power is on, an electrical 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.

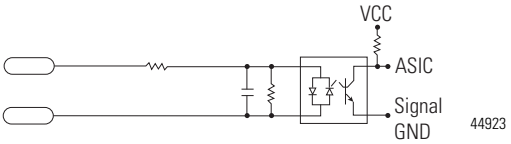
Input Wiring

Basic wiring of input devices to the 1762-IQ16 is shown below.

Basic Input Wiring to the 1762-IQ16 Module



Simplified Input Circuit Diagram

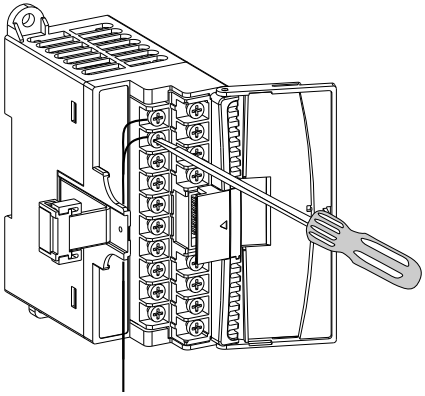


A write-on label is provided with the module. Mark the identification of each terminal with permanent ink, and slide the label back into the door.

ATTENTION

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.

Wiring the Finger-Safe Terminal Block



TIP Finger-safe cover not shown for clarity.

When wiring the terminal block, keep the finger-safe cover in place.

1. Route the wire under the terminal pressure plate. You can use the stripped end of the wire or a spade lug. The terminals will accept a 6.35 mm (0.25 in.) spade lug.

2. Tighten the terminal screw making sure the pressure plate secures the wire. Recommended torque when tightening terminal screws is 0.90 Nm (8 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 up to two wires with the following restrictions:

Wire Type		Wire Size	Terminal Screw Torque
Solid	Cu-90 °C (194 °F)	#14…22 AWG	0.90 Nm (8 lb-in.)
Stranded	Cu-90 °C (194 °F)	#16…22 AWG	0.90 Nm (8 lb-in.)

I/O Memory Mapping

Input Data File

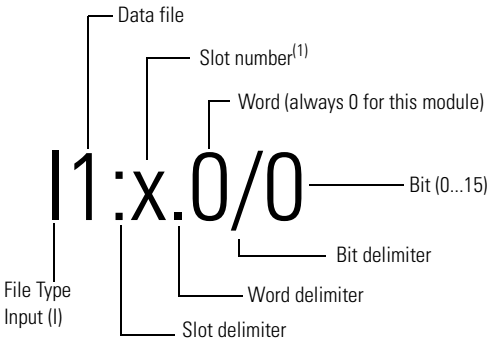
For each input module, the input data file contains the current state of the field input points. Bit positions 0...15 correspond to input terminals 0...15.

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 only

1762 Expansion I/O Addressing

The addressing scheme for 1762 Expansion I/O is shown below.



(1) I/O located on the controller (embedded I/O) is slot 0. I/O added to the controller (expansion I/O) begins with slot 1.

Specifications

General

Attribute	Value
Dimensions, HxWxD	90 x 40.4 x 87 mm (3.54 x 1.59 x 3.43 in.)
Shipping weight, approx.	230g (8.11oz)
Wire size	See Wire Size and Terminal Screw Torque on page 13
Wiring category(1)	2 - on signal ports
Pilot duty rating	Not rated
Enclosure type rating	IP20
North American temp code	T3C

(1) Use this Conductor Category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Input

Attribute	Value
Voltage category	24V DC (sink/source)(1)
Operating voltage range	10…30V DC 10…26.4V DC. See Derating Charts on page 17.
Number of inputs	16
Bus current draw, max	70 mA @ 5V DC (0.35 W)
Heat dissipation, max.	5.4 Total Watts @ 30V DC 4.3 Total Watts @ 26.4V DC
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	2.0 mA min @ 10V DC 8.0 mA nom @ 24V DC 12.0 mA max @ 30V DC
Nominal impedance	3K ohm
IEC input compatibility	Type 1
Isolated groups	Group 1: inputs 0…7; Group 2: inputs 8…15
Input group to backplane Isolation	Verified by one of the following dielectric tests: 1200V AC for 1s or 1697V DC for 1s 75V DC working voltage (IEC Class 2 reinforced insulation)

Input

Attribute	Value
Vendor I.D. Code	1
Product type code	7
Product code	97

(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.

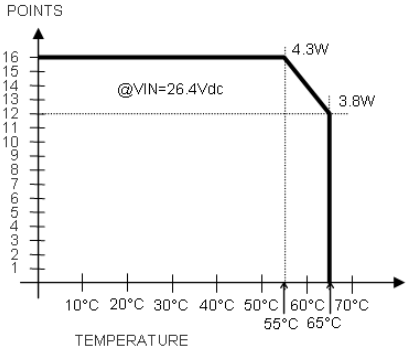
Environmental

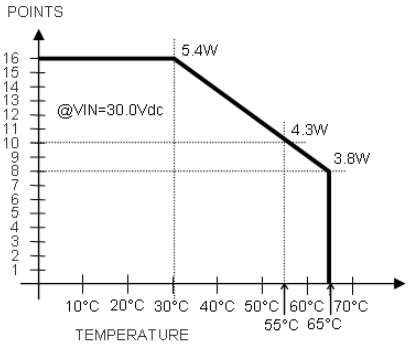
Attribute	Value
Temperature, operating	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20... 65 °C (-4...149 °F) See Derating Charts on page 17.
Temperature, storage	IEC 60068-2-1 (Test Ab, Unpackaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Non-operating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Non-operating Thermal Shock): -40…85 °C (-40…185 °F)
Relative humidity	IEC 60068-2-30 (Test Db, Unpackaged Damp Heat): 5...95% non-condensing
Vibration	IEC 60068-2-6 (Test Fc, Operating): 5 g @ 10... 500 Hz
Altitude, operating, max	2000 m (6562 ft)
Shock, operating	IEC 60068-2-27 (Test Ea, Unpackaged Shock): 30 g
Shock, nonoperating	IEC 60068-2-27 (Test Ea, Unpackaged Shock): Panel mount - 50 g DIN mount - 40 g
Emissions	CISPR 11 Group 1, Class A
ESD immunity	IEC 61000-4-2: 4 kV contact discharges 8 kV air discharges 4 kV indirect
Radiated RF immunity	IEC 61000-4-3: 10V/m with 1 kHz sine-wave 80% AM from 80…2700 MHz

Environmental

Attribute	Value
EFT/B immunity	IEC 61000-4-4: ±2 kV at 5 kHz on signal ports
Surge transient immunity	IEC 61000-4-5: ±1 kV line-line(DM) and ±2 kV line-earth(CM) on signal ports
Conducted RF immunity	IEC 61000-4-6: 10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Derating Charts for each input for 1762-IQ16 Input Module





Certifications

Certification (when product is marked)[1]	Value
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E322657. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E334470.
CE	European Union 2004/108/EC EMC Directive, compliant with: 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)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3

(1) See the Product Certification link at http://www.rockwellautomation.com/products/certification for Declaration 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://www.rockwellautomation.com/support/, 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://www.rockwellautomation.com/support/.

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 or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/support/americas/phone_en.html, or contact your local Rockwell Automation representative.

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 to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication RA-DU002, available at http://www.rockwellautomation.com/literature/.

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Supersedes Publication 1762-IN010B-EN-P - November 2010

Allen-Bradley

Installation Instructions

MicroLogix 1762-IF4 Analog Input Module

Catalog Number 1762-IF4

Table of Contents

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 60664-1), at altitudes up to 2000 m (6562 ft) without derating.This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR 11. Without appropriate precautions, there may be difficulties with electromagnetic compatibility in residential and other environments due to conducted and radiated disturbances.

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 250 and IEC 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure.

Preventing 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 modules are North American Hazardous Location approved: 1762-IF4

The following information applies when operating this equipment in hazardous locations:	**Informations sur l'utilisation de cet équipement en environnements dangereux:**
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.	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.

WARNING

EXPLOSION HAZARD

- 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.
- All wiring must comply with N.E.C. article 501-4(b).
- The interior of the enclosure must be accessible only by the use of a tool.
- For applicable equipment (relay modules, etc.), exposure to some chemicals may degrade the sealing properties of materials used in the following devices: Relays, Epoxy. It is recommended that the User periodically inspect these devices for any degradation of properties and replace the module if degradation is found.

AVERTISSEMENT

RISQUE D'EXPLOSION

- 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.

Additional Resources

Resource	Description
MicroLogix 1100 Programmable Controllers User Manual, publication 1763-UM001.	A more detailed description of how to install and use your MicroLogix 1100 programmable controller and expansion I/O system.
MicroLogix 1200 Programmable Controllers User Manual, publication 1762-UM001.	A more detailed description of how to install and use your MicroLogix 1200 programmable controller and expansion I/O system.
MicroLogix 1400 Programmable Controllers User Manual, publication 1766-UM001.	A more detailed description of how to install and use your MicroLogix 1400 programmable controller and expansion I/O system.
MicroLogix 1100 Programmable Controllers Installation Instructions, publication 1763-IN001.	Information on installing and using the MicroLogix 1100 programmable controller.
MicroLogix 1200 Programmable Controllers Installation Instructions, publication 1762-IN006.	Information on installing and using the MicroLogix 1200 programmable controller.
MicroLogix 1400 Programmable Controllers Installation Instructions, publication 1766-IN001.	Information on installing and using the MicroLogix 1400 programmable controller.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.	More information on proper wiring and grounding techniques.

If you would like a manual, you can:

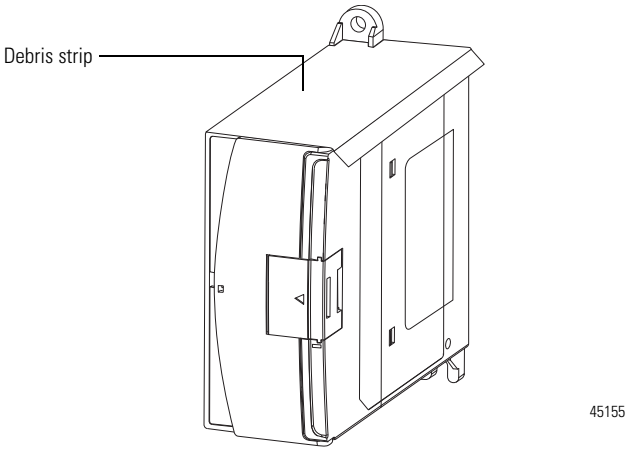
- download a free electronic version from the Internet: http://literature.rockwellautomation.com
- purchase a printed manual by contacting your local Allen-Bradley distributor or Rockwell Automation representative

Overview

The 1762 input module 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 to circuits not exceeding Over Voltage Category II[2] (IEC 60664-1)[3].

Install your module using these installation instructions.

1762 Input Module



ATTENTION

Do not remove the protective debris strip until after the module and all other equipment in the panel near the module are mounted and wiring is complete. Once wiring is complete, remove protective debris strip. Failure to remove strip before operating can cause overheating.

ATTENTION

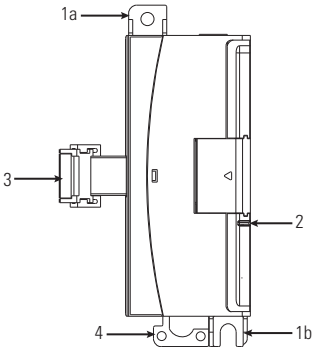
Electrostatic discharge can damage semiconductor devices inside the module. Do not touch the connector pins or other sensitive areas.

(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.

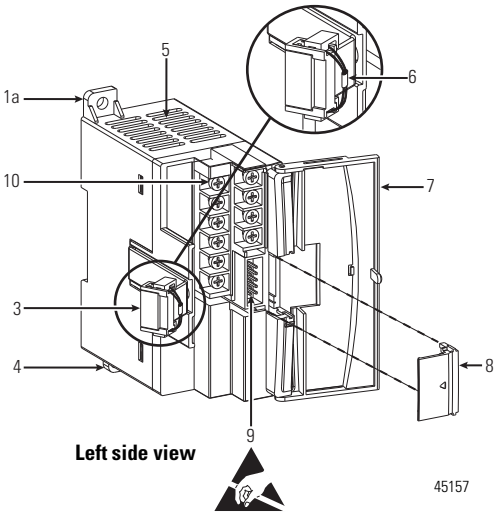
(2) Over Voltage Category II is the load level section of the electrical distribution system. At this level transient voltages are controlled and do not exceed the impulse voltage capability of the product's insulation.

(3) Pollution Degree 2 and Over Voltage Category II are International Electrotechnical Commission (IEC) designations.

Module Description



Front view 45156



Left side view 45157

This equipment is sensitive to electrostatic discharge (ESD). Follow ESD prevention guidelines when handling this equipment.

	Description		Description
1a	upper panel mounting tab	6	pull loop
1b	lower panel mounting tab	7	module door with terminal identification label
2	power diagnostic LED	8	bus connector cover
3	flat ribbon cable with bus connector (female)	9	bus connector with male pins
4	DIN rail latch	10	terminal block
5	input type selector switch		

ATTENTION

To comply with UL restrictions, this equipment must be powered from a source compliant with Class 2 or Limited Voltage/Current.

Mount the Module

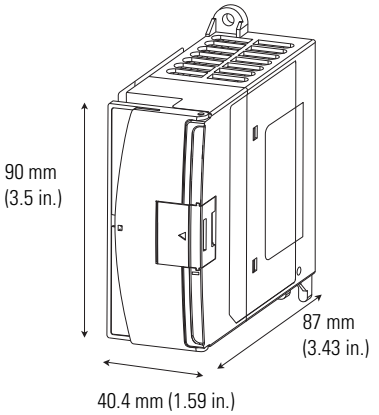
General Considerations

Most applications require installation in an industrial enclosure to reduce the effects of electrical interference and environmental exposure. Locate your controller as far as possible from power lines, load lines, and other sources of electrical noise such as hard-contact switches, relays, and AC motor drives. For more information on proper grounding guidelines, see the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

ATTENTION

This product is intended to be mounted to a well-grounded mounting surface such as a metal panel. Additional grounding connections from the power supply'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.

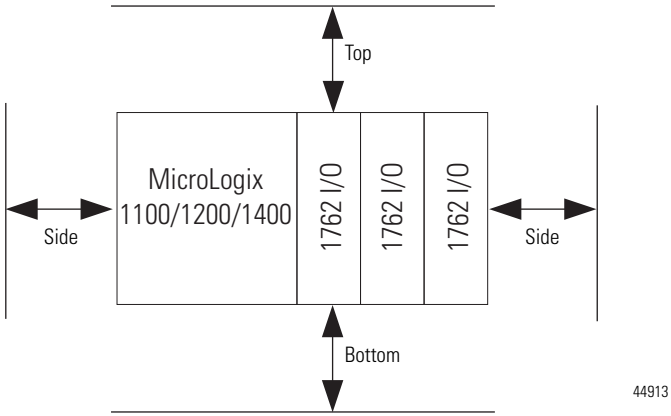
Mounting Dimensions



Measurements do not include mounting feet or DIN rail latches.

Module Spacing

Maintain spacing from objects such as enclosure walls, wireways and adjacent equipment. Allow 50.8 mm (2 in.) of space on all sides for adequate ventilation, as shown:

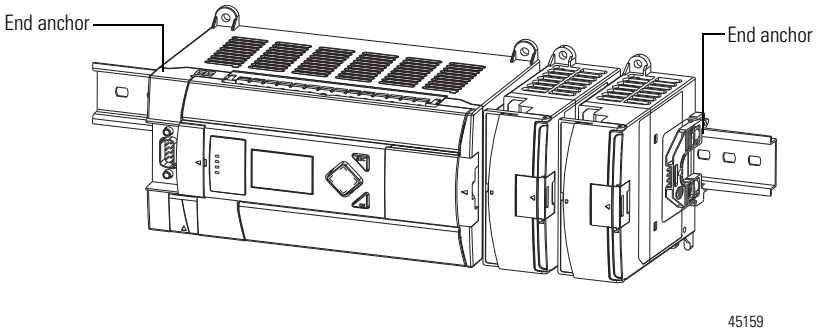


DIN Rail Mounting

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 latch. Press the DIN rail mounting area of the module against the DIN rail. The latch will momentarily open and lock into place.

Use DIN rail end anchors (Allen-Bradley part number 1492-EA35 or 1492-EAH35) for vibration or shock environments.

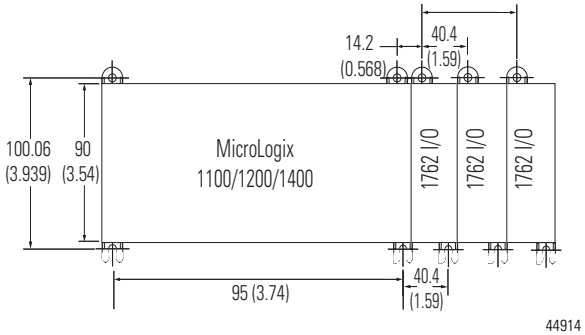


TIP For environments with greater vibration and shock concerns, use the panel mounting method described below, instead of DIN rail mounting.

Panel Mounting

Use the dimensional template shown below to mount the module. The preferred mounting method is to use two M4 (#8) panhead screws per module. M3.5 (#6) panhead screws may also be used, but a washer may be needed to ensure a good mechanical contact. Mounting screws are required on every module.

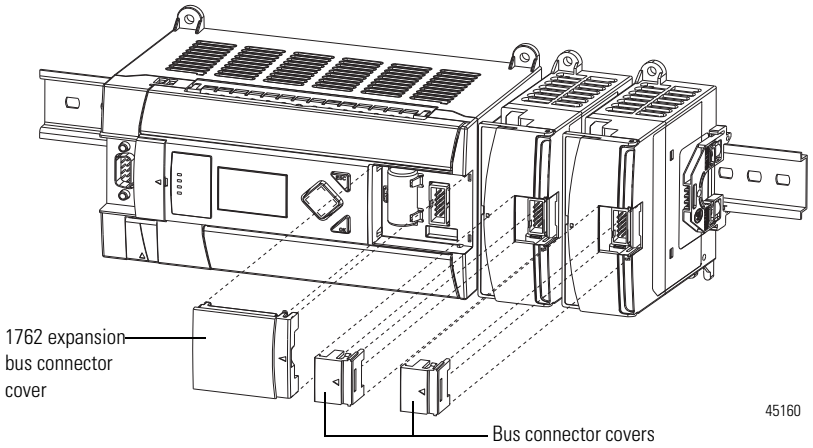
For more than two I/O modules: measure (number of modules - 1) x 40 mm (1.59 in.)



NOTE: All dimensions are in mm (in.). Hole spacing tolerance: ±0.4 mm (0.016 in.).

System Assembly

The expansion I/O module is attached to the controller or another I/O module by means of a flat ribbon cable after mounting as shown below.



TIP Use the pull loop on the connector to disconnect modules. Do not pull on the ribbon cable.

Field Wiring Connections

Grounding the Module

In solid-state control systems, grounding and wire routing helps limit the effects of noise due to electromagnetic interference (EMI). Run the ground connection from the ground screw of the controller to the ground bus prior to connecting any devices. Use AWG #14 wire. For AC-powered controllers, this connection must be made for safety purposes.

You must also provide an acceptable grounding path for each device in your application. For more information on proper grounding guidelines, refer to the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

WARNING

EXPLOSION HAZARD

- In Class I, Division 2 applications, the bus connector must be fully seated and the bus connector cover must be snapped in place.
- In Class I, Division 2 applications, all modules must be mounted in direct contact with each other as shown on page 10. If DIN rail mounting is used, an end anchor must be installed ahead of the controller and after the last 1762 I/O module.

ATTENTION

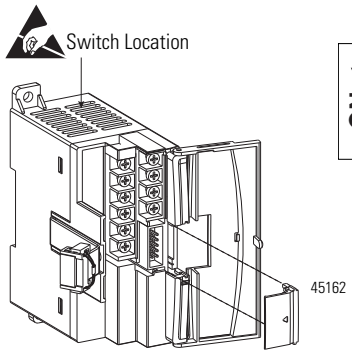
To comply with the CE Low Voltage Directive (LVD), all connected I/O must be powered from a source compliant with the Safety Extra Low Voltage (SELV) or Protected Extra Low Voltage (PELV).

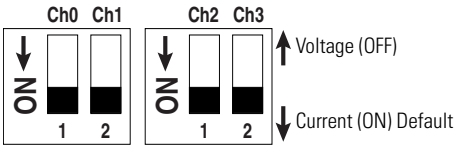
WARNING

If you connect or disconnect wiring while the field-side power is on, an electrical 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.

Input Type Selection

Select the input type, current or voltage, using the switch located on the module's circuit board and the input type/range selection bits in the Configuration Data File (see page 17). You can access the switch through the ventilation slots on the top of the module. The factory default setting for all switches is Current. Switch positions are shown below.

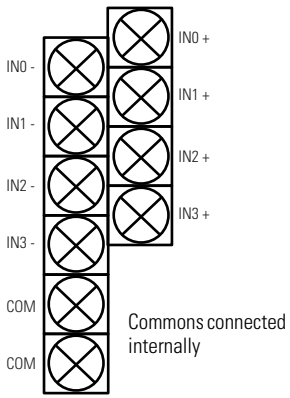




Input Wiring

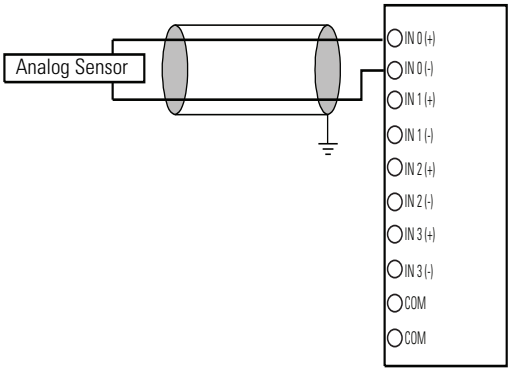
Basic wiring of input devices to the 1762-IF4 is shown below.

Terminal Block Layout



Basic Input Wiring to the 1762-IF4 Module

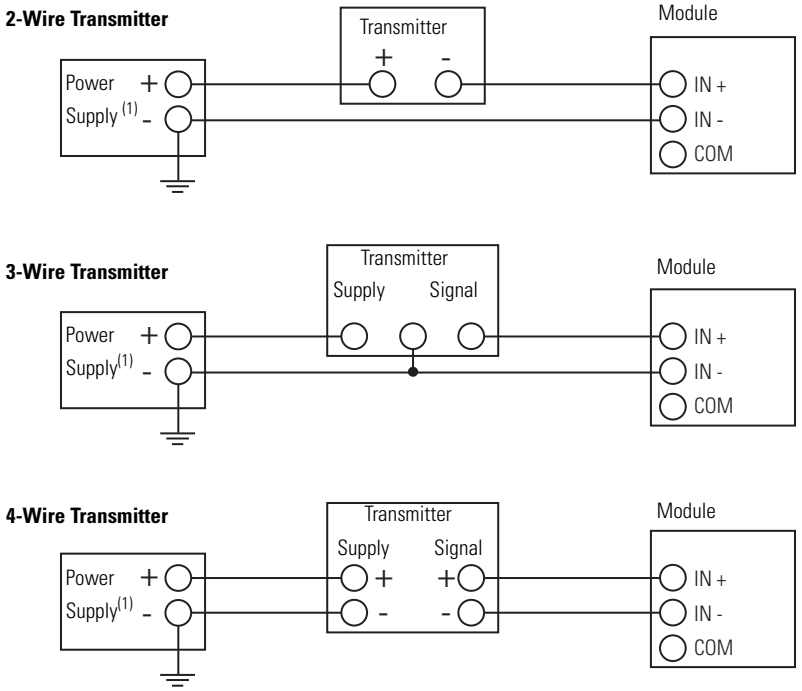
Differential Sensor Transmitter Types



TIP

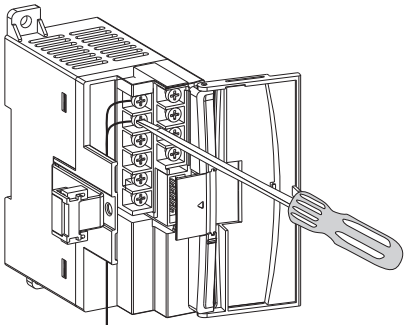
Grounding the cable shield at the module end only usually provides sufficient noise immunity. However, for best cable shield performance, earth ground the shield at both ends, using a 0.01µF capacitor at one end to block AC power ground currents, if necessary.

Sensor/Transmitter Types



(1) All power supplies rated N.E.C. Class 2.

Wiring the Finger-Safe Terminal Block



ATTENTION

Be careful when stripping wires. Wire fragments that fall into a module could cause damage when power is applied. Once wiring is complete, ensure the module is free of all metal fragments.

When wiring the terminal block, keep the finger-safe cover in place.

1. Route the wire under the terminal pressure plate. You can use the stripped end of the wire or a spade lug. The terminals will accept a 6.35 mm (0.25 in.) spade lug.
2. Tighten the terminal screw making sure the pressure plate secures the wire. Recommended torque when tightening terminal screws is 0.904 Nm (8 lb-in.).
3. After wiring is complete, remove the debris shield.

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 up to two wires with the following restrictions:

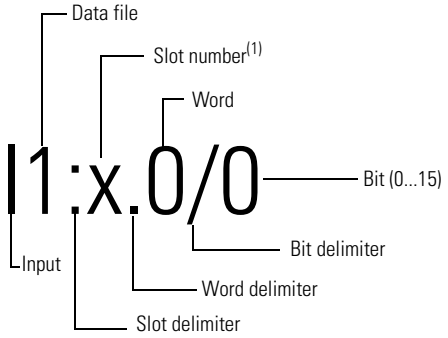
Wire Type		Wire Size	Terminal Screw Torque
Solid	Cu-90 °C (194 °F)	#14…22 AWG	0.904 Nm (8 lb-in.)
Stranded	Cu-90 °C (194 °F)	#16…22 AWG	0.904 Nm (8 lb-in.)

Labeling the Terminals

A write-on label is provided with the module. Mark the identification of each terminal with permanent ink, and slide the label back into the door.

1762 Expansion I/O Addressing

The addressing scheme for 1762 Expansion I/O is represented in the following figure.



(1) I/O located on the controller (embedded I/O) is slot 0. I/O added to the controller (expansion I/O) begins with slot 1.

Input Data File

For each module, slot x, words 0...3 contain the analog values of the inputs. The module can be configured to use either raw/proportional data or scaled-for-PID data. The input data file for either configuration is shown below.

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	SGN0	Channel 0 Data														
1	SGN1	Channel 1 Data														
2	SGN2	Channel 2 Data														
3	SGN3	Channel 3 Data														
4	reserved												S3	S2	S1	S0
5	U0	O0	U1	O1	U2	O2	U3	O3	reserved							
6	reserved															

The bits are defined as follows:

- Sx = General status bits for channels 0...3. This bit is set when an error (over- or under-range) exists for that channel, or there is a general module hardware error.
- Ox = Over-range flag bits for channels 0...3. These bits are set when the input signal is above the user-specified range. The module continues to convert data to the maximum full range value during an over-range condition. The bits reset when the over-range condition clears.
- Ux = Under-range flag bits for input channels 0...3. These bits are set when the input signal is below the user-specified range. The module continues to convert data to the maximum full range value during an under-range condition. The bits reset when the under-range condition clears.
- SGNx = The sign bit for channels 0...3.

Configuration Data File

The configuration of the format for analog inputs is made at going to run (GTR). Changes made to the configuration file while in run mode have no effect.

The configuration table is shown below.

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	reserved	Data Format Channel 0			Type/Range Select Channel 0				reserved				Filter Select Channel 0			
1		Data Format Channel 1			Type/Range Select Channel 1				reserved				Filter Select Channel 1			
2		Data Format Channel 2			Type/Range Select Channel 2				reserved				Filter Select Channel 2			
3		Data Format Channel 3			Type/Range Select Channel 3				reserved				Filter Select Channel 3			
4	reserved															
5	reserved															
6	reserved															
7	reserved															

Bit 15 and Bits 7...4 - Reserved

These bits are reserved and are not checked by the module.

Data Format (Bits 14 ...12)

These bits indicate the format of the data as shown in the following table. Other combinations of these bits are not supported and result in an error.

Bit Settings			Data Format
14	13	12	
0	0	0	Raw/Proportional
0	1	0	Scaled for PID
other			Not Supported

Type/Range Select (Bits 11...8)

These bits indicate the type and range as in the following table. Other combinations of these bits are not supported and result in an error.

Bit Settings				Data Format
11	10	9	8	
0	0	0	0	Voltage Mode -10…10V DC
0	0	1	1	Current Mode 4…20 mA
other				Not Supported

Filter Select (Bits 3...0)

These bits indicate the filter (for desired normal mode rejection) as shown in the table below. Other combinations of these bits are not supported and result in an error.

Bit Settings				Filter Frequency	4-Channel Conversion Time	Attenuation at Filter Frequency
3	2	1	0			
0	0	0	0	60 Hz	450 ms	>55dB
0	0	0	1	50 Hz	530 ms	>55dB
0	0	1	0	60 Hz	250 ms	>20dB
0	0	1	1	50 Hz	290 ms	>20dB
0	1	0	0	No filter	130 ms	—

Error Codes

The 1762-IF4 module notifies the controller of critical and non-critical errors. The module condition array word 0 contains the error codes that are generated by the module, as shown below.

"Don't Care" Bits				Module Error			Extended Error Information								
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hex Digit 4				Hex Digit 3				Hex Digit 2				Hex Digit 1			

The table below describes the module error codes.

Error Type	Hex Equivalent[1]	Module Error Code	Extended Error Information Code	Error Description
		Binary	Binary	
No Error	X000	000	0 0000 0000	No error
General Common Hardware Error	X200	001	0 0000 0000	General hardware error; no additional information
	X201	001	0 0000 0001	Power-up reset state
Hardware-Specific Error	X300	001	1 0000 0000	Reserved
Configuration Error	X400	010	0 0000 0000	General configuration error; no additional information
	X401	010	0 0000 0001	Invalid range select (Channel 0)
	X402	010	0 0000 0010	Invalid range select (Channel 1)
	X403	010	0 0000 0011	Invalid range select (Channel 2)
	X404	010	0 0000 0100	Invalid range select (Channel 3)
	X405	010	0 0000 0101	Invalid filter select (Channel 0)
	X406	010	0 0000 0110	Invalid filter select (Channel 1)
	X407	010	0 0000 0111	Invalid filter select (Channel 2)
	X408	010	0 0000 1000	Invalid filter select (Channel 3)
	X409	010	0 0000 1001	Invalid format select (Channel 0)
	X40A	010	0 0000 1010	Invalid format select (Channel 1)
	X40B	010	0 0000 1011	Invalid format select (Channel 2)
	X40C	010	0 0000 1100	Invalid format select (Channel 3)

(1) X represents "Don't Care".

Specifications

Input

Attribute	Value
Number of inputs	4 differential (bipolar)
A/D converter type	Sigma-Delta
Common mode voltage range(1)	±27V
Common mode rejection(2)	> 55 dB @ 50 and 60 Hz
Non-linearity (in percent full scale)	±0.12%
Typical overall accuracy(3)	±0.32% full scale @ -20…65 °C (-4 °F…149 °F) ±0.24% full scale @ 25 °C (77 °F)
Input impedance	Voltage terminal: 200KΩ Current terminal: 275Ω
Current input protection	±32 mA
Voltage input protection	±30V
Channel diagnostics	Over or under range or open circuit condition by bit reporting for analog inputs.

(1) For proper operation, both the plus and minus input terminals must be within ±27V of analog common.

(2) V_{cm} = 1 V_{pk-pk} AC

(3) V_{cm} = 0 (includes offset, gain, non-linearity and repeatability error terms)

General

Attribute	Value
Dimensions, HxWxD	90 x 40.4 x 87 mm (3.54 x 1.59 x 3.43 in.)
Approximate shipping weight (with carton)	235 g (8.28 oz)
Bus current draw, max	40 mA @ 5V DC 50 mA @ 24V DC
Analog normal operating range	Voltage: -10…10V DC Current: 4…20 mA
Full scale[1] analog ranges	Voltage: -10.5…10.5V DC Current: -21…21 mA
Resolution	15 bits (bipolar)
Repeatability[2]	±0.12%
Input group to system isolation	30V AC/30V DC rated working voltage[4] (IEC Class 2 reinforced insulation) type test: 500V AC or 707V DC for 1 min
Module power LED	On: indicates power is applied.
Recommended cable	Belden 8761 (shielded)
Vendor ID code	1
Product type code	10
Product code	67
Wire size	See Wire Size and Terminal Screw Torque on page 15
Wiring category[3]	2 - on signal ports
Pilot duty rating	Not rated
Enclosure type rating	IP20
North American temp code	T3C

(1) The over- or under-range flag comes on when the normal operating range (over/under) is exceeded. The module continues to convert the analog input up to the maximum full scale range.

(2) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.

(3) Use this Conductor Category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

(4) Rated working voltage is the maximum continuous voltage that can be applied at the terminals with respect to earth ground.

Environmental

Attribute	Value
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): -20... 65 °C (-4...149 °F)
Temperature, storage	IEC 60068-2-1 (Test Ab, Unpackaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Non-operating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Non-operating Thermal Shock): -40…85 °C (-40…185 °F)
Relative humidity	IEC 60068-2-30 (Test Db, Unpackaged Damp Heat): 5...95% non-condensing
Vibration	IEC 60068-2-6 (Test Fc, Operating): 5 g @ 10... 500 Hz
Altitude, operating, max	2000 m (6562 ft)
Shock, operating	IEC 60068-2-27 (Test Ea, Unpackaged Shock): 30 g
Shock, nonoperating	IEC 60068-2-27 (Test Ea, Unpackaged Shock): Panel mount - 50 g DIN mount - 40 g
Emissions	CISPR 11 Group 1, Class A
ESD immunity	IEC 61000-4-2: 4 kV contact discharges 8 kV air discharges 4 kV indirect
Radiated RF immunity	IEC 61000-4-3: 10V/m with 1 kHz sine-wave 80% AM from 80…2700 MHz
EFT/B immunity	IEC 61000-4-4: ±2 kV at 5 kHz on signal ports
Surge transient immunity	IEC 61000-4-5: ±1 kV shielded line-earth (CM) on signal ports
Conducted RF immunity	IEC 61000-4-6: 10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications

Certification (when product is marked)[1]	Value
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E322657. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E334470.
CE	European Union 2004/108/EC EMC Directive, compliant with: 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)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3

(1) See the Product Certification link at http://www.rockwellautomation.com/products/certification for Declaration of Conformity, Certificates, and other certification details.

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://www.rockwellautomation.com/support/, 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://www.rockwellautomation.com/support/.

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 or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/support/americas/phone_en.html, or contact your local Rockwell Automation representative.

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 to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication RA-DU002, available at http://www.rockwellautomation.com/literature/.

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Supersedes Publication 1762-IN012B-EN-P - April 2011

MicroLogix 1762-OB8 Solid-State 24V DC Source Output Module

Catalog Number 1762-OB8

Table of Contents

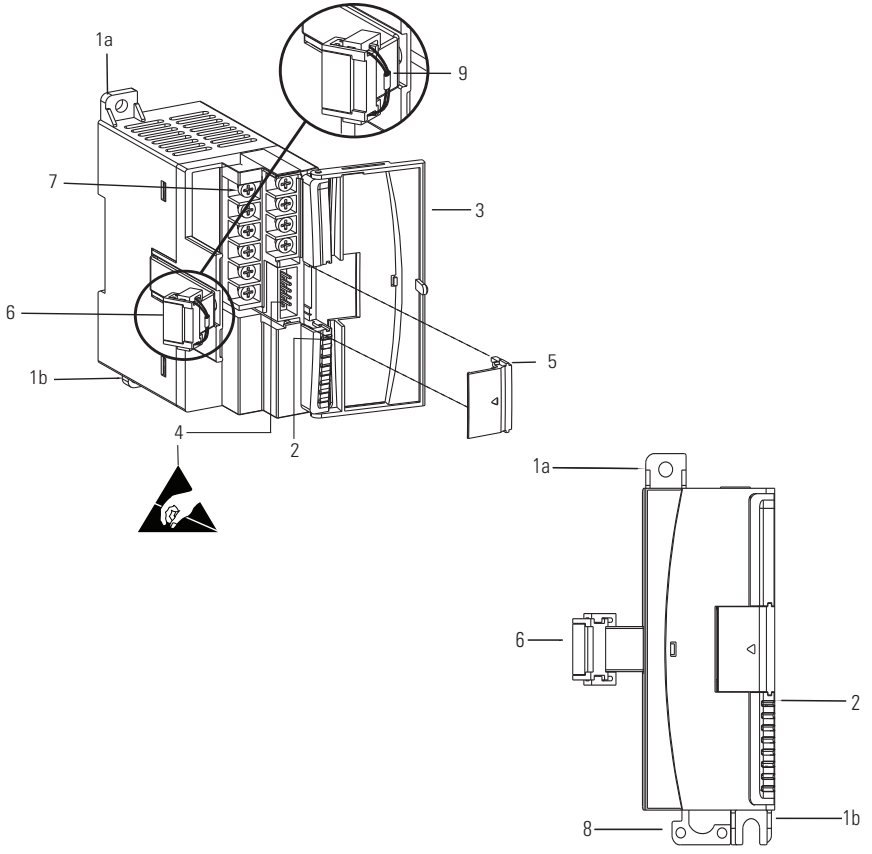
For More Information

Resource	Description
MicroLogix 1200 Programmable Controllers User Manual, publication 1762-UM001.	Information on installing, wiring, and operating a MicroLogix 1200 Programmable Controller
MicroLogix 1200 Programmable Controllers Installation Instructions, publication 1762-IN006.	Installation guide for the MicroLogix 1200 Programmable Controller.
MicroLogix 1200 Memory Module and/or Real Time Clock Installation Instructions, publication 1762-IN001.	Installation guide for the MicroLogix 1200 Memory Module and Real Time Clock.
1762- IA8 120V AC Input Module Installation Instructions, publication 1762-IN002.	Installation guide for the 1762-IA8 Discrete Input Module
1762-OW8 Relay Output Module, publication 1762-IN003.	Installation guide for the 1762-OW8 Relay Output Module
1762-IQ8 DC Input Module Installation Instructions, publication 1762-IN004.	Installation guide for the 1762-IQ8 Discrete Input Module
1762-IF2OF2 Analog Input/Output Module Installation Instructions, publication 1762-IN005.	Installation guide for the 1762-IF2OF2 Analog I/O Module
1762-OA8 Solid-State Output Module, publication 1762-IN007.	Installation guide for the 1762-OA8 Solid-State Output Module
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.	More information on proper wiring and grounding techniques.

If you would like a manual, you can:

- download a free electronic version from the Internet: http://literature.rockwellautomation.com
- purchase a printed manual by contacting your local Allen-Bradley distributor or Rockwell Automation representative

Description



Item	Description	Item	Description
1a	upper panel mounting tab	5	bus connector cover
1b	lower panel mounting tab	6	flat ribbon cable with bus connector (female pins)
2	I/O diagnostic LEDs	7	terminal block
3	module door with terminal identification label	8	DIN rail latch
4	bus connector with male pins	9	pull loop

Installation

1762 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 to circuits not exceeding Over Voltage Category II[(2)] (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 installing this module. When you remove or install 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
- causing permanent damage to the module's circuitry

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.

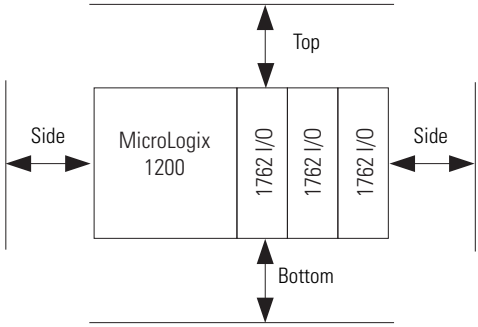
Mounting

ATTENTION

Do not remove protective debris strip until after the module and all other equipment near the module is mounted and wiring is complete. Once wiring is complete and the module is free of debris, carefully remove protective debris strip. Failure to remove strip before operating can cause overheating.

Minimum Spacing

Maintain spacing from enclosure walls, wireways, adjacent equipment, etc. Allow 50.8 mm (2 in.) of space on all sides for adequate ventilation, as shown:



TIP

1762 expansion I/O may be mounted horizontally only.

ATTENTION

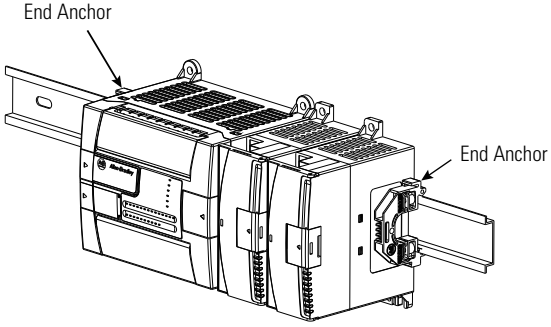
During panel or DIN rail mounting of all devices, be sure that all debris (metal chips, wire strands, etc.) is kept from falling into the module. Debris that falls into the module could cause damage when power is applied to the module.

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 latch. Press the DIN rail mounting area of the module against the DIN rail. The latch will momentarily open and lock into place.

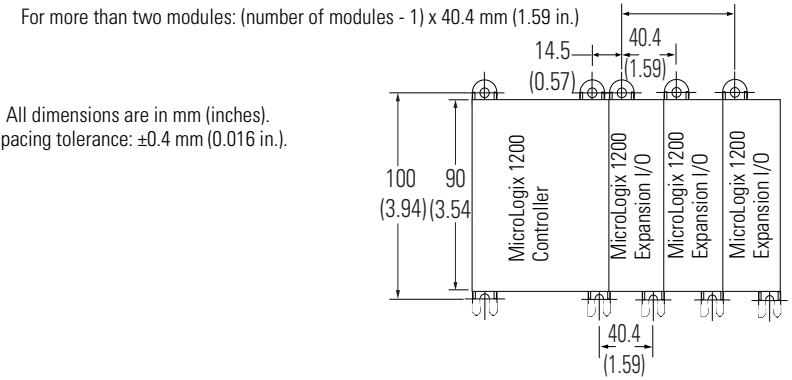
Use DIN rail end anchors (Allen-Bradley part number 1492-EA35 or 1492-EAH35) for vibration or shock environments.



TIP For environments with greater vibration and shock concerns, use the panel mounting method described below, instead of DIN rail mounting.

Panel Mounting

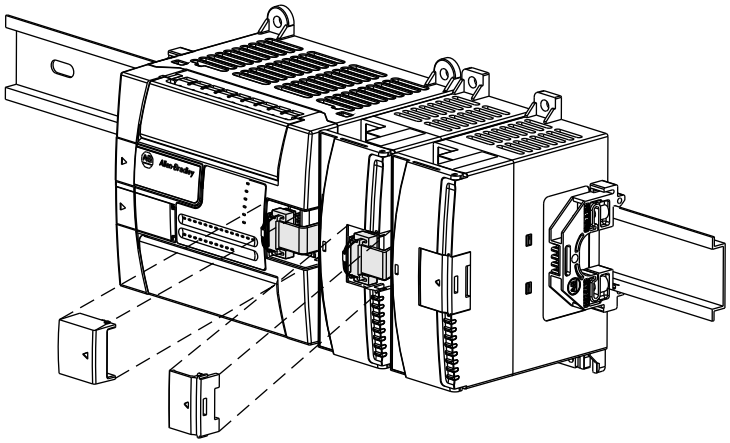
Use the dimensional template shown below to mount the module. The preferred mounting method is to use two M4 or #8 panhead screws per module. M3.5 or #6 panhead screws may also be used, but a washer may be needed to ensure a good mechanical contact. Mounting screws are required on every module.



NOTE: All dimensions are in mm (inches).
Hole spacing tolerance: ±0.4 mm (0.016 in.).

System Assembly

The expansion I/O module is attached to the controller or another I/O module by means of a flat ribbon cable after mounting as shown below.



TIP Use the pull loop on the connector to disconnect modules. Do not pull on the ribbon cable.

ATTENTION

EXPLOSION HAZARD

- In Class I, Division 2 applications, the bus connector must be fully seated and the bus connector cover must be snapped in place.
- In Class I, Division 2 applications, all modules must be mounted in direct contact with each other as shown on Page 6. If DIN rail mounting is used, an end stop must be installed ahead of the controller and after the last 1762 I/O module.

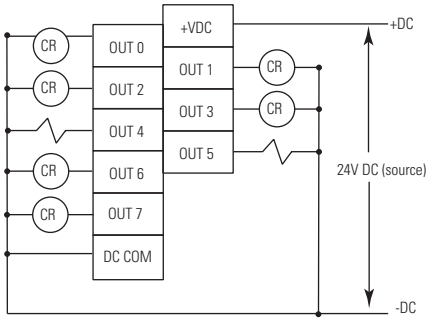
Field Wiring Connections

Grounding the Module

This product is intended to be mounted to a well-grounded mounting surface such as a metal panel. Refer to Industrial Automation Wiring and Grounding Guidelines, Allen-Bradley publication 1770-4.1, for additional information.

Output Wiring

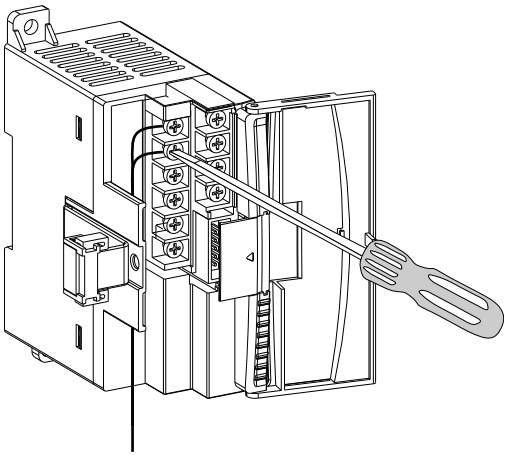
Basic wiring of the 1762-OB8 is shown below.



A write-on label is provided with the module. Mark the identification of each terminal with permanent ink, and slide the label back into the door.

ATTENTION

Be careful when stripping wires. Wire fragments that fall into a module could cause damage when power is applied. Once wiring is complete, ensure the module is free of all metal fragments.



TIP Finger-safe cover not shown for clarity.

Wiring the Finger-Safe Terminal Block

When wiring the terminal block, keep the finger-safe cover in place.

1. Route the wire under the terminal pressure plate. You can use the stripped end of the wire or a spade lug. The terminals will accept a 6.35 mm (0.25 in.) spade lug.
2. Tighten the terminal screw making sure the pressure plate secures the wire. Recommended torque when tightening terminal screws is 0.90 Nm (8 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 up to two wires with the following restrictions:

Wire Type		Wire Size	Terminal Screw Torque
Solid	Cu-90 °C (194 °F)	#14 …22 AWG	0.904 Nm (8 lb-in.)
Stranded	Cu-90 °C (194 °F)	#16…22 AWG	0.904 Nm (8 lb-in.)

I/O Memory Mapping

Output Data File

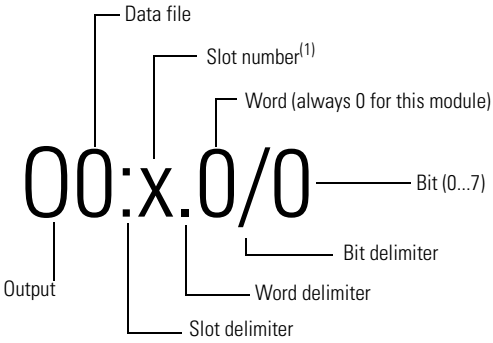
For each output module, the output data file contains the controller-directed state of the discrete output points. Bit positions 0…7 correspond to output terminals 0…7.

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	0	w	w	w	w	w	w	w	w

w = write only, 0 = always at a 0 or OFF state

Addressing

The addressing scheme for 1762 Expansion I/O is shown below.



(1) I/O located on the controller (embedded I/O) is slot 0. I/O added to the controller (expansion I/O) begins with slot 1.

Specifications

General Specifications

Specification	Value
Dimensions, HxWxD	90 x 40.4 x 87 mm (height including mounting tabs is 110 mm) 3.54 x 1.59 x 3.43 in. (height including mounting tabs is 4.33 in.)
Approximate Shipping Weight (with carton)	210 g (0.46 lbs.)
Storage Temperature	-40…85 °C (-40…185 °F)
Operating Temperature	0…55 °C (32…131 °F)
Operating Humidity	5…95% non-condensing
Operating Altitude	2000 m (6561 ft)
Vibration	Refer to the MicroLogix 1200 Controllers Installation Instructions, publication 1762-IN006.
Shock	
Hazardous Environment Class	Class I, Division 2, Hazardous Location, Groups A, B, C, D ISA/ANSI12.12.01 (C-UL under CSA C22.2 No. 213)
Noise Immunity	NEMA standard ICS 2-230
Radiated and Conducted Emissions	EN50081-2 Class A
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, +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…80 MHz(1)

(1) Conducted Immunity frequency range may be 150 kHz… 30 MHz if the Radiated Immunity frequency range is 30…1000 MHz.

Output Specifications

Specification	1762-OB8
Voltage Category	24V DC
Operating Voltage Range	20.4…26.4V DC
Number of Outputs	8
Bus Current Draw (max.)	115 mA @ 5V DC (0.575W)
Heat Dissipation (max.)	1.61 Total Watts
Signal Delay (max.) – resistive load	On Delay: 0.1 ms Off Delay: 1.0ms
Off-State Leakage (max.)	1.0 mA
On-State Current (min.)	1.0 mA
On-State Volage Drop (max.)	1.0V DC
Continuous Current per Point (max.)	0.5A @ 55°C; 1.0A @ 30°C
Continuous Current per Module (max.)	4.0 A @ 55°C; 8.0 A @ 30°C
Surge Current (maximum)	2.0 A (Repeatability is once every 2 seconds for a duration of 10 msec.
Power Supply Distance Rating	6 (The module may not be more than 6 modules away from the power supply.)
Isolated Groups	Group 1: Outputs 0…7
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 ID Code	1
Product Type Code	7
Product Code	101

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 Ω, 1/4W 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 information, refer to Industrial Automation Wiring and Grounding Guidelines, Allen-Bradley publication 1770-4.1.

Certifications

Certification (when product is marked)(1)	Value
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E334470.
CE	European Union 2004/108/EC EMC Directive, compliant with: 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)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3

(1) See the Product Certification link at http://www.rockwellautomation.com/products/certification for Declaration of Conformity, Certificates, and other certification details.

North American Hazardous Location Approval

The following modules are North American Hazardous Location approved: 1762-OB8

The following information applies when operating this equipment in hazardous locations:	**Informations sur l'utilisation de cet équipement en environnements dangereux:**
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.	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.
WARNING  **EXPLOSION HAZARD** • 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 any component 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. • All wiring must comply with N.E.C. article 501-4(b). • The interior of the enclosure must be accessible only by the use of a tool. • For applicable equipment (relay modules, etc.), exposure to some chemicals may degrade the sealing properties of materials used in the following devices: Relays, Epoxy. It is recommended that the User periodically inspect these devices for any degradation of properties and replace the module if degradation is found.	**AVERTISSEMENT**  **RISQUE D'EXPLOSION** • 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 tout composant 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.

Notes:

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://www.rockwellautomation.com/support/, 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://www.rockwellautomation.com/support/.

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 or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/support/americas/phone_en.html, or contact your local Rockwell Automation representative.

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 to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication RA-DU002, available at http://www.rockwellautomation.com/literature/.

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www.rockwellautomation.com

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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 1762-IN008B-EN-P - July 2013
Supersedes Publication 1762-IN008A-EN-P - July 2000

SIEMENS

Data sheet 6GK5005-0BA00-1AB2

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	
• external	24 V
• external / minimum	19.2 V
• external / maximum	28.8 V
• 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]	
• at DC / at 24 V	1.68 W

Permitted ambient conditions

Ambient temperature	
• during operation	-10 ... +60 °C
• during storage	-40 ... +80 °C
• during transport	-40 ... +80 °C
Relative humidity	
• 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	
• 35 mm DIN rail mounting	Yes
• wall mounting	Yes
• S7-1500 rail mounting	No

Product functions / management, configuration

Product function	
• multiport mirroring	No
• CoS	Yes
• switch-managed	No

Product functions / Redundancy

Product function	
• Parallel Redundancy Protocol (PRP)/operation in the PRP-network	Yes
• Parallel Redundancy Protocol (PRP)/Redundant Network Access (RNA)	No

Standards, specifications, approvals

Standard	
• for FM	FM3611: Class 1, Divison 2, Group A, B, C, D / T4, CL.1, Zone 2, GP. IIC, T4
• for hazardous zone	EN 60079-0:2009, EN60079-15:2010, II 3 G Ex nA IIC T4 Gc, KEMA 07ATEX0145 X
• for safety / from CSA and UL	UL 60950-1, CSA C22.2 No. 60950-1
• for emitted interference	EN 61000-6-4 (Class A)
• 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
• C-Tick	Yes
• KC approval	Yes

Standards, specifications, approvals / product conformity

MTBF / at 40 °C	241 y

Accessories

Further Information / Internet Links

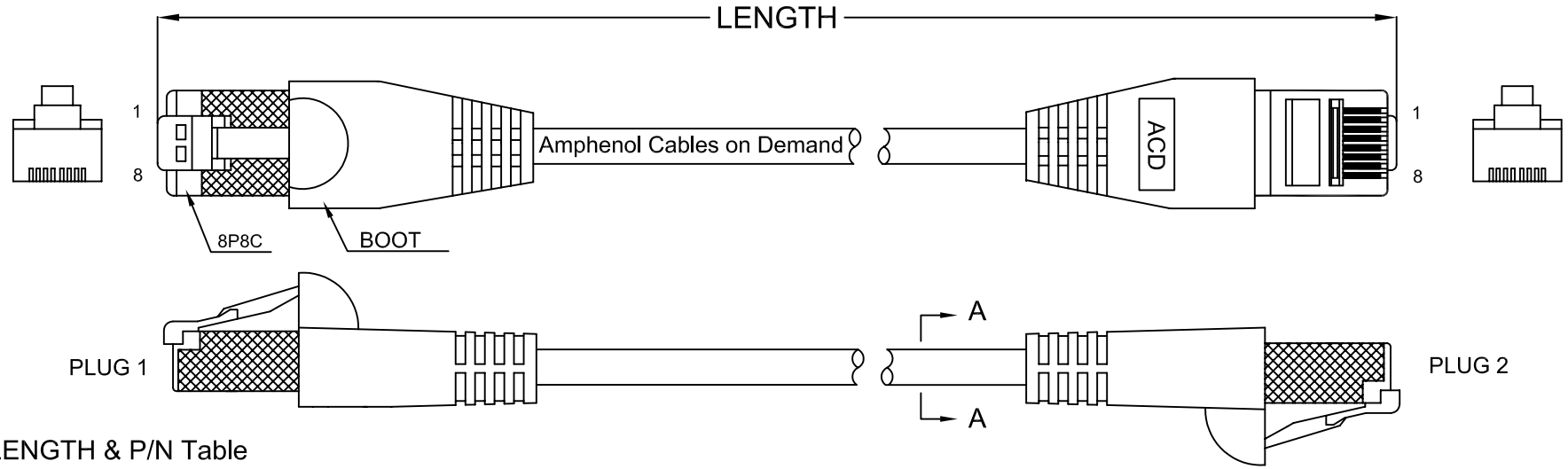
Internet-Link	
• to website: Selector SIMATIC NET SELECTION TOOL	http://www.siemens.com/snst
• to website: Industrial communication	http://www.siemens.com/simatic-net
• to website: Industry Mall	https://mall.industry.siemens.com
• to website: Information and Download Center	http://www.siemens.com/industry/infocenter
• to website: Image database	http://automation.siemens.com/bilddb
• to website: CAx Download Manager	http://www.siemens.com/cax
• 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

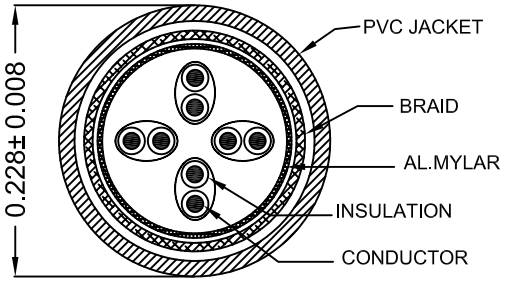
REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	NEW RELEASE	07/31/06	
A1	Change Part Number	20/11/06	

372



LENGTH & P/N Table

LENGTH	P/N	Cable Color
1FT ±1 inch	MP-54RJ45DNNE-001	Beige
2FT ±1 inch	MP-54RJ45DNNE-002	Beige
3FT ±1 inch	MP-54RJ45DNNE-003	Beige
5FT ±2 inch	MP-54RJ45DNNE-005	Beige
7FT ±2 inch	MP-54RJ45DNNE-007	Beige
10FT ±3 inch	MP-54RJ45DNNE-010	Beige
15FT ±3 inch	MP-54RJ45DNNE-015	Beige
25FT ±4 inch	MP-54RJ45DNNE-025	Beige
50FT ±8 inch	MP-54RJ45DNNE-050	Beige
75FT ±8 inch	MP-54RJ45DNNE-075	Beige
100FT ±8 inch	MP-54RJ45DNNE-100	Beige
150FT ±10 inch	MP-54RJ45DNNE-150	Beige
200FT ±10 inch	MP-54RJ45DNNE-200	Beige
250FT ±12 inch	MP-54RJ45DNNE-250	Beige
300FT ±12 inch	MP-54RJ45DNNE-300	Beige



A-A

PIN OUT: T568B

PLUG 1	PLUG 2	COLOR
PIN 1	PIN 1	WHITE/ORANGE
PIN 2	PIN 2	ORANGE
PIN 3	PIN 3	WHITE/GREEN
PIN 4	PIN 4	BLUE
PIN 5	PIN 5	WHITE/BLUE
PIN 6	PIN 6	GREEN
PIN 7	PIN 7	WHITE/BROWN
PIN 8	PIN 8	BROWN
Shielded		Shielded

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:

DECIMALS .X ±.X .XX ±.XX .XXX ±.XXX ANGLES ±X°

THIRD ANGLE PROJECTION

EAR NO.

APPROVALS	DATE
DRAWN LF	20/11/06
CHECKED BA	20/11/06
RESP ENG	
MFG ENG	

CAD FILE:

Amphenol Cables on Demand
20 VALLEY ST. ENDICOTT, NY 13760

ASM CBL DOUBLE SHIELDED
RJ45/RJ45 CAT.5E 4PR SOLID

SIZE	DWG. NO.	REV.
A	MP-54RJ45DNNE-XXX	A1

SCALE SHEET OF

1-phase, 24 V DC

Overview

The single-phase SITOP lite power supplies are designed for basic requirements in industrial environments and offer all the key functions at an attractive price. Thanks to the slim design, the power supplies require little space on the standard mounting rail, and their excellent efficiency ensures low thermal losses in the control cabinet.

To further increase 24 V availability, the SITOP lite power supplies can be combined with **DC UPS**, **redundancy** and **selectivity modules**.

Main product highlights

- 24 V DC/ 2.5 A, 5 A, 10 A and 20 A
- 1-phase wide-range input with manual switchover
- Slim design - no lateral installation clearances required
- High degree of efficiency
- Green LED for "24 V OK"
- Adjustable output voltage for compensating voltage drops
- Parallel connection possible
- Ambient temperature range of 0 °C to 60 °C (above 45 °C with derating)
- Short-circuit and overload protection
- Certified according to CE, cULus and CB

Technical specifications

Article number	**6EP1332-1LB00**	**6EP1333-1LB00**	**6EP1334-1LB00**	**6EP1336-1LB00**
Product	**SITOP PSU100L**	**SITOP PSU100L**	**SITOP PSU100L**	**SITOP PSU100L**
Power supply, type	**24 V/2.5 A**	**24 V/5 A**	**24 V/10 A**	**24 V/20 A**
Input				
Input	1-phase AC	1-phase AC	1-phase AC	1-phase AC
Supply voltage				
• 1 at AC Rated value	120 V	120 V	120 V	100 V
• 2 at AC Rated value	230 V	230 V	230 V	240 V
• Note	Set by means of selector switch on the device	Set by means of selector switch on the device	Set by means of selector switch on the device	
Input voltage				
• 1 at AC	93 ... 132 V	93 ... 132 V	93 ... 132 V	93 ... 264 V
• 2 at AC	187 ... 264 V	187 ... 264 V	187 ... 264 V	
• at DC				85 ... 370 V
Wide-range input	No	No	No	Yes
Overvoltage resistance	2.3 × $V_{in\ rated}$, 1.3 ms	2.3 × $V_{in\ rated}$, 1.3 ms	2.3 × $V_{in\ rated}$, 1.3 ms	
Mains buffering at $I_{out\ rated}$, min.	20 ms; at V_{in} = 93/187 V	20 ms; at V_{in} = 93/187 V	20 ms; at V_{in} = 93/187 V	20 ms; at V_{in} = 93/187 V
Rated line frequency	50 ... 60 Hz	50 ... 60 Hz	50 ... 60 Hz	50 ... 60 Hz
Rated line range	47 ... 63 Hz	47 ... 63 Hz	47 ... 63 Hz	47 ... 63 Hz
Input current				
• at rated input voltage 120 V	1.1 A	2.1 A	4.1 A	5.55 A
• at rated input voltage 230 V	0.65 A	1.15 A	2 A	2.35 A

Technical specifications (continued)

Article number	6EP1332-1LB00	6EP1333-1LB00	6EP1334-1LB00	6EP1336-1LB00
Product	**SITOP PSU100L**	**SITOP PSU100L**	**SITOP PSU100L**	**SITOP PSU100L**
Power supply, type	**24 V/2.5 A**	**24 V/5 A**	**24 V/10 A**	**24 V/20 A**
Input (continued)				
Switch-on current limiting (+25 °C), max.	27 A	32 A	65 A	45 A
Duration of inrush current limiting at 25 °C				
• typical	3 ms	3 ms	3 ms	15 ms
I^2t, max.	0.3 $A^2 \cdot s$	0.8 $A^2 \cdot s$	3.3 $A^2 \cdot s$	3.3 $A^2 \cdot s$
Built-in incoming fuse	T 2 A/250 V (not accessible)	T 3,15 A/250 V (not accessible)	T 6.3 A/250 V (not accessible)	T 10 A/250 V (not accessible)
Protection in the mains power input (IEC 898)	Recommended miniature circuit breaker: from 3 A characteristic C	Recommended miniature circuit breaker: from 6 A characteristic C	Recommended miniature circuit breaker: from 10 A characteristic C	Recommended miniature circuit breaker: from 10 A characteristic C
Output				
Output	Controlled, isolated DC voltage	Controlled, isolated DC voltage	Controlled, isolated DC voltage	Controlled, isolated DC voltage
Rated voltage V_{out} DC	24 V	24 V	24 V	24 V
Total tolerance, static ±	3 %	3 %	3 %	3 %
Static mains compensation, approx.	0.1 %	0.1 %	0.1 %	0.1 %
Static load balancing, approx.	0.5 %	0.5 %	0.5 %	1 %
Residual ripple peak-peak, max.	150 mV	150 mV	150 mV	150 mV
Residual ripple peak-peak, typ.	10 mV	50 mV	50 mV	50 mV
Spikes peak-peak, max. (bandwidth: 20 MHz)	240 mV	240 mV	240 mV	240 mV
Spikes peak-peak, typ. (bandwidth: 20 MHz)	50 mV	150 mV	150 mV	100 mV
Adjustment range	22.8 ... 26.4 V	22.8 ... 26.4 V	22.8 ... 26.4 V	22.8 ... 28 V
Product function Output voltage adjustable	Yes	Yes	Yes	Yes
Output voltage setting	via potentiometer	via potentiometer	via potentiometer	via potentiometer
Status display	Green LED for 24 V OK	Green LED for 24 V OK	Green LED for 24 V OK	Green LED for 24 V OK
On/off behavior	Overshoot of V_{out} approx. 4 %	Overshoot of V_{out} approx. 4 %	Overshoot of V_{out} approx. 4 %	No overshoot of V_{out} (soft start)
Startup delay, max.	1.5 s	1.5 s	1.5 s	1.5 s
Voltage rise, typ.	150 ms	130 ms	170 ms	20 ms
Rated current value $I_{out\ rated}$	2.5 A	5 A	10 A	20 A
Current range	0 ... 2.5 A	0 ... 5 A	0 ... 10 A	0 ... 20 A
• Note	+45 ... +60 °C: Derating 2%/K	+45 ... +60 °C: Derating 2%/K	+45 ... +60 °C: Derating 2%/K	+45 ... +70 °C: Derating 2.5%/K
Supplied active power typical	60 W	120 W	240 W	480 W
Parallel switching for enhanced performance	Yes	Yes	Yes	Yes
Numbers of parallel switchable units for enhanced performance	2	2	2	2
Efficiency				
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$, approx.	85 %	86 %	89 %	92 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$, approx.	9 W	17 W	34 W	45 W

Technical specifications (continued)

Article number	6EP1332-1LB00	6EP1333-1LB00	6EP1334-1LB00	6EP1336-1LB00
Product	SITOP PSU100L	SITOP PSU100L	SITOP PSU100L	SITOP PSU100L
Power supply, type	24 V/2.5 A	24 V/5 A	24 V/10 A	24 V/20 A
Closed-loop control				
Dynamic mains compensation ($V_{in\ rated}$ ±15 %), max.	0.3 %	0.3 %	0.3 %	0.5 %
Dynamic load smoothing (I_{out}: 10/90/10 %), U_{out} ± typ.	2 %	2 %	2 %	3 %
Load step setting time 10 to 90%, typ.	0.5 ms	0.4 ms	0.5 ms	0.7 ms
Load step setting time 90 to 10%, typ.	0.7 ms	0.4 ms	0.7 ms	6 ms
Protection and monitoring				
Output overvoltage protection	< 33 V	< 33 V	< 33 V	< 33 V
Current limitation, typ.	2.6 A	5.25 A	16 A	24 A
Property of the output Short-circuit proof	Yes	Yes	Yes	Yes
Short-circuit protection	Constant current characteristic	Constant current characteristic	Constant current characteristic	Constant current characteristic
Enduring short circuit current RMS value				
• typical	4 A	8 A	12.6 A	24 A
Overload/short-circuit indicator	-	-	-	-
Safety				
Primary/secondary isolation	Yes	Yes	Yes	Yes
Galvanic isolation	Safety extra-low output voltage U_{out} acc. to EN 60950-1 and EN 50178	Safety extra-low output voltage U_{out} acc. to EN 60950-1 and EN 50178	Safety extra-low output voltage U_{out} acc. to EN 60950-1 and EN 50178	Safety extra-low output voltage U_{out} acc. to EN 60950-1 and EN 50178
Protection class	Class I	Class I	Class I	Class I
Leakage current				
• maximum	3.5 mA	3.5 mA	3.5 mA	3.5 mA
• typical	0.4 mA	0.4 mA	0.8 mA	0.8 mA
CE mark	Yes	Yes	Yes	Yes
UL/cUL (CSA) approval	cULus-Listed (UL 508, CSA C22.2 No. 107.1), File E197259	cULus-Listed (UL 508, CSA C22.2 No. 107.1), File E197259	cULus-Listed (UL 508, CSA C22.2 No. 107.1), File E197259	cULus-Listed (UL 508, CSA C22.2 No. 107.1), File E197259
Explosion protection	-	-	-	-
FM approval	-	-	-	-
CB approval	Yes	Yes	Yes	Yes
Marine approval	-	-	-	-
Degree of protection (EN 60529)	IP20	IP20	IP20	IP20

Technical specifications (continued)

Article number	6EP1332-1LB00	6EP1333-1LB00	6EP1334-1LB00	6EP1336-1LB00
Product	**SITOP PSU100L**	**SITOP PSU100L**	**SITOP PSU100L**	**SITOP PSU100L**
Power supply, type	**24 V/2.5 A**	**24 V/5 A**	**24 V/10 A**	**24 V/20 A**
EMC				
Emitted interference	EN 55022 Class A	EN 55022 Class A	EN 55022 Class A	EN 55022 Class B
Supply harmonics limitation	not applicable	-	-	-
Noise immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
Operating data				
Ambient temperature				
• during operation	0 ... 60 °C	0 ... 60 °C	0 ... 60 °C	-25 ... +70 °C
- Note	with natural convection	with natural convection	with natural convection	with natural convection
• during transport	-40 ... +85 °C	-40 ... +85 °C	-40 ... +85 °C	-40 ... +85 °C
• during storage	-40 ... +85 °C	-40 ... +85 °C	-40 ... +85 °C	-40 ... +85 °C
Humidity class according to EN 60721	Climate class 3K3, no condensation	Climate class 3K3, no condensation	Climate class 3K3, no condensation	Climate class 3K3, no condensation
Mechanics				
Connection technology	screw-type terminals	screw-type terminals	screw-type terminals	screw-type terminals
Connections				
• Supply input	L, N, PE: 1 screw terminal each for 0.5 ... 2.5 mm^2 single-core/finely stranded	L, N, PE: 1 screw terminal each for 0.5 ... 2.5 mm^2 single-core/finely stranded	L, N, PE: 1 screw terminal each for 0.5 ... 2.5 mm^2 single-core/finely stranded	L, N, PE: 1 screw terminal each for 0.5 ... 2.5 mm^2 single-core/finely stranded
• Output	+, -: 2 screw terminals each for 0.5 ... 2.5 mm^2	+, -: 2 screw terminals each for 0.5 ... 2.5 mm^2	+, -: 2 screw terminals each for 0.5 ... 2.5 mm^2	+, -: 2 screw terminals each for 0.5 ... 2.5 mm^2
• Auxiliary	-	-	-	-
Width of the enclosure	32.5 mm	50 mm	70 mm	110 mm
Height of the enclosure	125 mm	125 mm	125 mm	125 mm
Depth of the enclosure	120 mm	120 mm	120 mm	125 mm
Required spacing				
• top	50 mm	50 mm	50 mm	50 mm
• bottom	50 mm	50 mm	50 mm	50 mm
• left	0 mm	0 mm	0 mm	0 mm
• right	0 mm	0 mm	0 mm	0 mm
Weight, approx.	0,3 kg	0.5 kg	0.75 kg	1.8 kg
Product feature of the enclosure housing for side-by-side mounting	Yes	Yes	Yes	Yes
Installation	Snaps onto DIN rail EN 60715 35x7.5/15	Snaps onto DIN rail EN 60715 35x7.5/15	Snaps onto DIN rail EN 60715 35x7.5/15	Snaps onto DIN rail EN 60715 35x7.5/15
MTBF at 40 °C	3 153 082 h	3 076 166 h	2 333 396 h	
Other information	Specifications at rated input voltage and ambient temperature +25 °C (unless otherwise specified)	Specifications at rated input voltage and ambient temperature +25 °C (unless otherwise specified)	Specifications at rated input voltage and ambient temperature +25 °C (unless otherwise specified)	Specifications at rated input voltage and ambient temperature +25 °C (unless otherwise specified)

SIEMENS

Data sheet 6AV2124-0GC01-0AX0

SIMATIC HMI TP700 COMFORT, COMFORT PANEL, TOUCH OPERATION, 7" WIDESCREEN-TFT-DISPLAY, 16 MIL. COLORS, PROFINET INTERFACE, MPI/PROFIBUS DP INTERFACE, 12 MB USER MEMORY, WINDOWS CE 6.0, CONFIGURABLE FROM WINCC COMFORT V11

General information	
Product type designation	SIMATIC HMI TP700 Comfort
Display	
Design of display	TFT
Screen diagonal	7 in
Display width	152.4 mm
Display height	91.4 mm
Number of colors	16 777 216
Resolution (pixels)	
• Horizontal image resolution	800 Pixel
• Vertical image resolution	480 Pixel
Backlighting	
• MTBF backlighting (at 25 °C)	80 000 h
• Backlight dimmable	Yes; 0-100 %
Control elements	
Keyboard fonts	
• Function keys	
— Number of function keys	0

• Keys with LED	No
• System keys	No
• Numeric keyboard	Yes; Onscreen keyboard
• alphanumeric keyboard	Yes; Onscreen keyboard
Touch operation	
• Design as touch screen	Yes
Expansions for operator control of the process	
• DP direct LEDs (LEDs as S7 output I/O)	
— F1...Fx	0
• Direct keys (keys as S7 input I/O)	
— F1...Fx	0
• Direct keys (touch buttons as S7 input I/O)	32

Installation type/mounting	
Mounting position	vertical
Mounting in portrait format possible	Yes
Mounting in landscape format possible	Yes
maximum permissible angle of inclination without external ventilation	35°

Supply voltage	
Type of supply voltage	DC
Rated value (DC)	24 V
permissible range, lower limit (DC)	19.2 V
permissible range, upper limit (DC)	28.8 V

Input current	
Current consumption (rated value)	0.5 A
Starting current inrush I²t	0.5 A²·s

Power	
Active power input, typ.	12 W

Processor	
Processor type	X86

Memory	
Flash	Yes
RAM	Yes
Memory available for user data	12 Mbyte

Type of output	
Info LED	No
Power LED	No
Error LED	No
Acoustics	
• Buzzer	No

• Speaker	Yes

Time of day	
Clock	
• Hardware clock (real-time)	Yes
• Software clock	Yes
• retentive	Yes; Back-up duration typically 6 weeks
• synchronizable	Yes

Interfaces	
Number of industrial Ethernet interfaces	1; 2 ports (switch)
Number of RS 485 interfaces	1; RS 422/485 combined
Number of RS 422 interfaces	0; together with RS485
Number of RS 232 interfaces	0
Number of USB interfaces	2; USB 2.0
• USB Mini B	1; 5-pole
Number of 20 mA interfaces (TTY)	0
Number of parallel interfaces	0
Number of other interfaces	0
Number of SD card slots	2
With software interfaces	No
Industrial Ethernet	
• Industrial Ethernet status LED	2
• Number of ports of the integrated switch	2

Protocols	
PROFINET	Yes
Supports protocol for PROFINET IO	Yes
IRT	Yes; As of WinCC V12
MRP	Yes; As of WinCC V12
PROFIBUS	Yes
MPI	Yes
Protocols (Ethernet)	
• TCP/IP	Yes
• DHCP	Yes
• SNMP	Yes
• DCP	Yes
• LLDP	Yes
WEB characteristics	
• HTTP	Yes
• HTTPS	Yes
• HTML	Yes
• XML	Yes
• CSS	Yes

• Active X	Yes
• JavaScript	Yes
• Java VM	No
Further protocols	
• CAN	No
• EtherNet/IP	Yes
• MODBUS	Yes

EMC	
Emission of radio interference acc. to EN 55 011	
• Limit class A, for use in industrial areas	Yes
• Limit class B, for use in residential areas	No

Degree and class of protection	
IP (at the front)	IP65
Enclosure Type 4 at the front	Yes
Enclosure Type 4x at the front	Yes
IP (rear)	IP20

Standards, approvals, certificates	
CE mark	Yes
cULus	Yes
RCM (formerly C-TICK)	Yes
KC approval	Yes
Marine approval	
• Germanischer Lloyd (GL)	Yes
• American Bureau of Shipping (ABS)	Yes
• Bureau Veritas (BV)	Yes
• Det Norske Veritas (DNV)	Yes
• Lloyds Register of Shipping (LRS)	Yes
• Nippon Kaiji Kyokai (Class NK)	Yes
• Polski Rejestr Statkow (PRS)	No
Use in hazardous areas	
• ATEX Zone 2	Yes
• ATEX Zone 22	Yes
• IECEx Zone 2	Yes
• IECEx Zone 22	Yes
• cULus Class I Zone 1	No
• cULus Class I Zone 2, Division 2	Yes
• FM Class I Division 2	Yes

Ambient conditions	
Ambient temperature during operation	
• Operation (vertical installation)	

— For vertical installation, min.	0 °C
— For vertical installation, max.	50 °C; (55 °C, see entry ID: 64847814)
• Operation (max. tilt angle)	
— At maximum tilt angle, min.	0 °C
— At maximum tilt angle, min.	40 °C
• Operation (vertical installation, portrait format)	
— For vertical installation, min.	0 °C
— For vertical installation, max.	40 °C
• Operation (max. tilt angle, portrait format)	
— At maximum tilt angle, min.	0 °C
— At maximum tilt angle, min.	35 °C
Ambient temperature during storage/transportation	
• min.	-20 °C
• max.	60 °C
Relative humidity	
• Operation, max.	90 %; no condensation

Operating systems	
proprietary	No
pre-installed operating system	
• Windows CE	Yes

Configuration	
Message indicator	Yes
Alarm system (incl. buffer and acknowledgment)	Yes
Process value display (output)	Yes
Process value default (input) possible	Yes
Recipe management	Yes
Configuration software	
• STEP 7 Basic (TIA Portal)	No
• STEP 7 Professional (TIA Portal)	No
• WinCC flexible Compact	No
• WinCC flexible Standard	No
• WinCC flexible Advanced	No
• WinCC Basic (TIA Portal)	No
• WinCC Comfort (TIA Portal)	Yes; from V11
• WinCC Advanced (TIA Portal)	Yes; from V11
• WinCC Professional (TIA Portal)	Yes; from V11

Languages	
Online languages	
• Number of online/runtime languages	32
Project languages	
• Languages per project	32

Functionality under WinCC (TIA Portal)	
Libraries	Yes
Applications/options	
• Web browser	Yes
• Pocket Word	Yes
• Pocket Excel	Yes
• PDF Viewer	Yes
• Media Player	Yes
• SIMATIC WinCC Sm@rtServer	Yes
• SIMATIC WinCC Audit	Yes
Number of Visual Basic Scripts	Yes
Task planner	
• time-controlled	Yes
• task-controlled	Yes
Help system	
• Number of characters per info text	70
Message system	
• Number of alarm classes	32
• Bit messages	
— Number of bit messages	4 000
• Analog messages	
— Number of analog messages	200
• S7 alarm number procedure	Yes
• System messages HMI	Yes
• System messages, other (SIMATIC S7, Sinumerik, Simotion, etc.)	Yes
• Number of characters per message	80
• Number of process values per message	8
• Acknowledgment groups	Yes
• Message indicator	Yes
• Message buffer	
— Number of entries	1 024
— Circulating buffer	Yes
— retentive	Yes
— maintenance-free	Yes
Recipe management	
• Number of recipes	300
• Data records per recipe	500
• Entries per data record	1 000
• Size of internal recipe memory	2 Mbyte
• Recipe memory expandable	Yes

Variables	
• Number of variables per device	2 048
• Number of variables per screen	400
• Limit values	Yes
• Multiplexing	Yes
• Structures	Yes
• Arrays	Yes
Images	
• Number of configurable images	500
• Permanent window/default	Yes
• Global image	Yes
• Pop-up images	Yes
• Slide-in images	Yes
• Image selection by PLC	Yes
• Image number in the PLC	Yes
Image objects	
• Number of objects per image	400
• Text fields	Yes
• I/O fields	Yes
• Graphic I/O fields (graphics list)	Yes
• Symbolic I/O fields (text list)	Yes
• Date/time fields	Yes
• Switches	Yes
• Buttons	Yes
• Graphic display	Yes
• Icons	Yes
• Geometric objects	Yes
Complex image objects	
• Number of complex objects per screen	20
• Alarm view	Yes
• Trend view	Yes
• User view	Yes
• Status/control	Yes
• Sm@rtClient view	Yes
• Recipe view	Yes
• f(x) trend view	Yes
• System diagnostics view	Yes
• Media Player	Yes
• HTML browser	Yes
• PDF display	Yes
• IP camera display	Yes

• Bar graphs	Yes
• Sliders	Yes
• Pointer instruments	Yes
• Analog/digital clock	Yes
Lists	
• Number of text lists per project	500
• Number of entries per text list	500
• Number of graphics lists per project	500
• Number of entries per graphics list	500
Archiving	
• Number of archives per device	50
• Number of entries per archive	20 000
• Message archive	Yes
• Process value archive	Yes
• Archiving methods	
— Sequential archive	Yes
— Short-term archive	Yes
• Memory location	
— Memory card	Yes
— USB memory	Yes
— Ethernet	Yes
• Data storage format	
— CSV	Yes
— TXT	Yes
— RDB	Yes
Security	
• Number of user groups	50
• Number of user rights	32
• Number of users	50
• Password export/import	Yes
• SIMATIC Logon	Yes
Logging through printer	
• Alarms	Yes
• Report (shift log)	Yes
• Hardcopy	Yes
• Electronic print to file	Yes; pdf, html
Character sets	
• Keyboard fonts	
— US English	Yes
Transfer (upload/download)	
• MPI/PROFIBUS DP	Yes

• USB	Yes
• Ethernet	Yes
• using external storage medium	Yes
Process coupling	
• S7-1200	Yes
• S7-1500	Yes
• S7-200	Yes
• S7-300/400	Yes
• LOGO!	Yes
• WinAC	Yes
• SINUMERIK	Yes; with SINUMERIK option package
• SIMOTION	Yes
• Allen Bradley (EtherNet/IP)	Yes
• Allen Bradley (DF1)	Yes
• Mitsubishi (MC TCP/IP)	Yes
• Mitsubishi (FX)	Yes
• OMRON (FINS TCP)	No
• OMRON (LINK/Multilink)	Yes
• Modicon (Modbus TCP/IP)	Yes
• Modicon (Modbus)	Yes
• OPC UA Client	Yes
• OPC UA Server	Yes
Service tools/configuration aids	
• Backup/Restore manually	Yes
• Backup/Restore automatically	Yes
• Simulation	Yes
• Device switchover	Yes

Peripherals/Options

Peripherals	
• Printer	Yes
• SIMATIC HMI MM memory card: Multi Media Card	Yes; Up to 128 MB
• SIMATIC HMI SD memory card: Secure Digital memory card	Yes; Up to 2 GB
• SIMATIC HMI CF memory card Compact Flash Card	No
• USB memory	Yes
• SIMATIC IPC USB Flashdrive (USB stick)	Yes; Up to 16 GB
• SIMATIC HMI USB stick	Yes; Up to 8 GB
• Network camera	Yes

Mechanics/material

Enclosure material (front)	
• Plastic	No
• Aluminum	Yes
• Stainless steel	No

Dimensions	
Width of the housing front	214 mm
Height of housing front	158 mm
Mounting cutout, width	197 mm
Mounting cutout, height	141 mm
Overall depth	63 mm

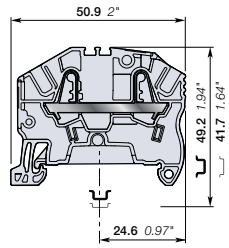
Weights	
Weight without packaging	1.4 kg
Weight incl. packaging	1.6 kg

last modified: 08/12/2017

ZK2.5 PI-Spring terminal blocks
Feed-through - 5.2 mm *0.205 in* spacing

2.5 mm²
12 AWG

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*
1 conductor per clamp	Rigid - Solid / Stranded	0.2 ... 4 mm²	*26 ... 12 AWG*
	Flexible	0.22 ... 2.5 mm²	
	with non insulated ferrule	0.22 ... 2.5 mm²	*26 ... 14 AWG*
	with insulated ferrule	0.22 ... 2.5 mm²	*26 ... 14 AWG*
2 conductors per clamp	Flexible with twin ferrule	0.22 ... 0.5 mm²	*26 ... 20 AWG*
Rated current / Rated cross section		24 A / 2.5 mm²	*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/IIC/IIIC	

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

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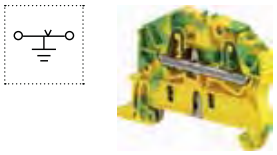
Accessories

	Description			Color	Type	Order code		Pkg pce	Weight (1 pce) g
1	**End stops**	5.2 mm	*0.205 in*	Dark grey	BAZ1	1SNK900002R0000		20	5.30
2	**End sections**	2 mm	*0.079 in*	Dark grey	EK2.5	1SNK705910R0000		20	1.76
3	**Jumper bars**	2 poles	32 A	Orange	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**	3 mm	*0.118 in*	Dark grey	CS-R2	1SNK900106R0000		20	3.84
6	**Test adapters**	For test plugs DIA 2 mm *0.079 in*		Dark grey	TP2	1SNK900203R0000		20	1.73
		For test plugs DIA 4 mm *0.157 in*			TP4	1SNK900205R0000		20	2.41
7	**Test connectors**	5.2 mm *0.205 in* spacing		Dark grey	TC5	1SNK900200R0000		10	5.23
		End module, 5.2 mm *0.205 in*			TC5-R1	1SNK900201R0000		10	5.23
8	**Shield connectors**				SHBP	1SNK900601R0000		20	4.12
9	**Terminal block markers**	Blank card		White	MC512	1SNK140000R0000		22	9.00
					MC512PA	1SNK149999R0000		20	10.00
		Universal wire markers holder		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.



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

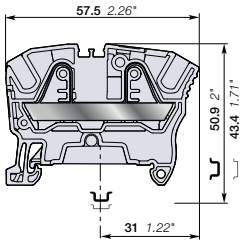
All the technical data for UL/CSA standard and dimensions in inches are in italic.

1SNK162023S0201

ZK6 PI-Spring terminal blocks
Feed-through - 8 mm *0.315 in* spacing

6 mm²
8 AWG

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	ZK6	1SNK708010R0000		50	11.80
		Blue	ZK6-BL	1SNK708020R0000		50	11.80
		Orange	ZK6-OR	1SNK708030R0000		50	11.80

Main technical data

Connecting capacity		IEC	*UL - CSA*
1 conductor per clamp	Rigid - Solid / Stranded	0.5 ... 10 mm²	*24 ... 8 AWG*
	Flexible	0.5 ... 6 mm²	
	with non insulated ferrule	0.5 ... 6 mm²	*24 ... 10 AWG*
	with insulated ferrule	0.5 ... 6 mm²	*24 ... 10 AWG*
2 conductors per clamp	Flexible with twin ferrule	0.5 ... 1.5 mm²	*24 ... 16 AWG*
Rated current / Rated cross section		41 A / 6 mm²	*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/IIC/IIIC	

Mounting instructions

Rail		TH 35-7.5, TH 35-15
Wire stripping length		12.5 mm *0.492 in*
Tool (for flexible conductor without ferrule)		Flat screwdriver Ø 4 mm *Ø 0.157 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

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Accessories

	Description			Color	Type	Order code		Pkg pce	Weight (1 pce) g
1	**End stops**	5.2 mm	*0.205 in*	Dark grey	BAZ1	1SNK900002R0000		20	5.30
2	**End sections**	2 mm	*0.079 in*	Dark grey	EK2.5	1SNK705910R0000		20	1.76
3	**Jumper bars**	2 poles	57 A	Orange	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	JB85-3	1SNK900603R0000		10	2.80
5	**Circuit separators**	3 mm	*0.118 in*	Dark grey	CS-R2	1SNK900106R0000		20	3.84
6	**Test adapters**	For test plugs DIA 2 mm *0.079 in*		Dark grey	TP2	1SNK900203R0000		20	1.73
		For test plugs DIA 4 mm *0.157 in*			TP4	1SNK900205R0000		20	2.41
7	**Test connectors**	End module, 5.2 mm *0.205 in*		Dark grey	TC5-R1	1SNK900201R0000		10	5.23
8	**Spacers**	2.8 mm	*0.110 in*	Dark grey	ES-TC8	1SNK900104R0000		10	1.35
9	**Terminal block markers**	Blank card		White	MC812	1SNK160000R0000		22	10.00
					MC812PA	1SNK169999R0000		20	14.00
		Universal wire markers holder		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.

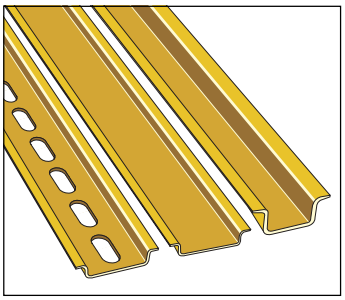
Ground PI-Spring terminal blocks

Description		Color	Type	Order code		Pkg pce	Weight (1 pce) g
Ground	Profile aligned with ZK6	Green-yellow	ZK6-PE	1SNK708150R0000		20	20.30

All the technical data for UL/CSA standard and dimensions in inches are in italic.

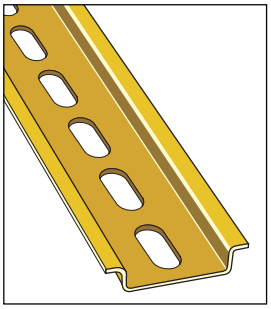
1SNK162229S0201

Mounting rails
Symmetrical - DIN 3

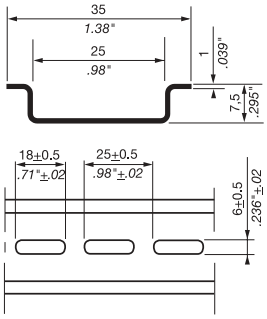


RAIL CURRENT CARRYING CAPACITY

Rail	Material	Current (A)	Wire size AWG	Wire size mm²
PR30	Steel	65	8	10
PR3.Z2 - PR3.G2	Steel	87	6	16
PR5	Steel	125	4	25
PR4	Steel	143	2	35

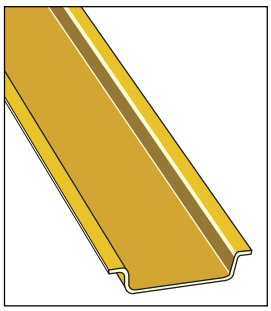


In compliance with EN 50022 standard (DIN 46277-3 - NFC 63015) DIN 3

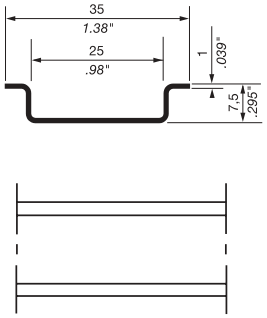


Type	P/N
PR30	0173 220.05

Zinc bichromate plated steel, prepunched, length 2 m 6'6" (78") approx. The length and prepunched cut out dimensions are approximate.

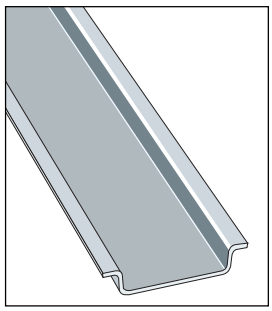


In compliance with EN 50022 standard (DIN 46277-3 - NFC 63015) DIN 3

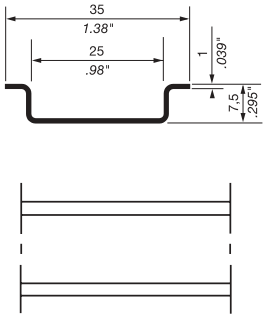


Type	P/N
PR3.Z2	0174 300.17

Zinc bichromate plated steel, length 2 m 6'6" (78") approx.

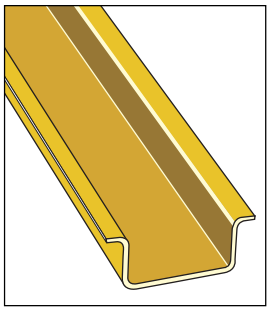


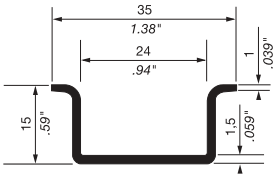
In compliance with EN 50022 standard (DIN 46277-3 - NFC 63015) DIN 3



Type	P/N
PR3.G2	0164 800.03

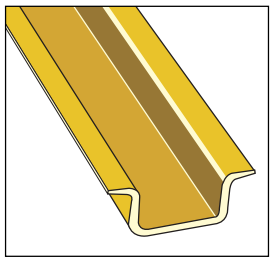
White, passivated galvanized steel, length 2 m 6'6" (78") approx.



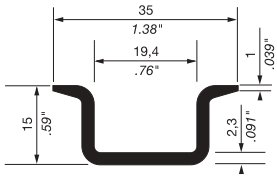


Type	P/N
PR5	0168 700.22

Zinc bichromate plated steel, length 2 m 6'6" (78") approx.



In compliance with EN 50022 standard (NFC 63015) DIN 3



Type	P/N
PR4	0168 500.12

Zinc bichromate plated steel, length 2 m 6'6" (78") approx.

Data sheet 3RV2321-1JC10

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

● for grounded parts at 500 V	
— downwards	30 mm
— upwards	30 mm
— at the side	9 mm
● for live parts at 500 V	
— downwards	30 mm
— upwards	30 mm
— at the side	9 mm
● for grounded parts at 690 V	
— downwards	50 mm
— upwards	50 mm
— backwards	0 mm
— at the side	30 mm
— forwards	0 mm
● for live parts at 690 V	
— downwards	50 mm
— upwards	50 mm
— backwards	0 mm
— at the side	30 mm
— forwards	0 mm
Connections/ Terminals	
product component removable terminal for auxiliary and control circuit	No
type of electrical connection	
● for main current circuit	screw-type terminals
arrangement of electrical connectors for main current circuit	Top and bottom
type of connectable conductor cross-sections	
● for main contacts	
— solid or stranded	2x (1 ... 2,5 mm²), 2x (2,5 ... 10 mm²)
— finely stranded with core end processing	2x (1 ... 2.5 mm²), 2x (2.5 ... 6 mm²), 1x 10 mm²
● at AWG cables for main contacts	2x (16 ... 12), 2x (14 ... 8)
tightening torque	
● 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	
● for main contacts	M4
Safety related data	
B10 value	
● with high demand rate acc. to SN 31920	5 000
proportion of dangerous failures	
● with low demand rate acc. to SN 31920	50 %
● with high demand rate acc. to SN 31920	50 %
failure rate [FIT]	
● 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

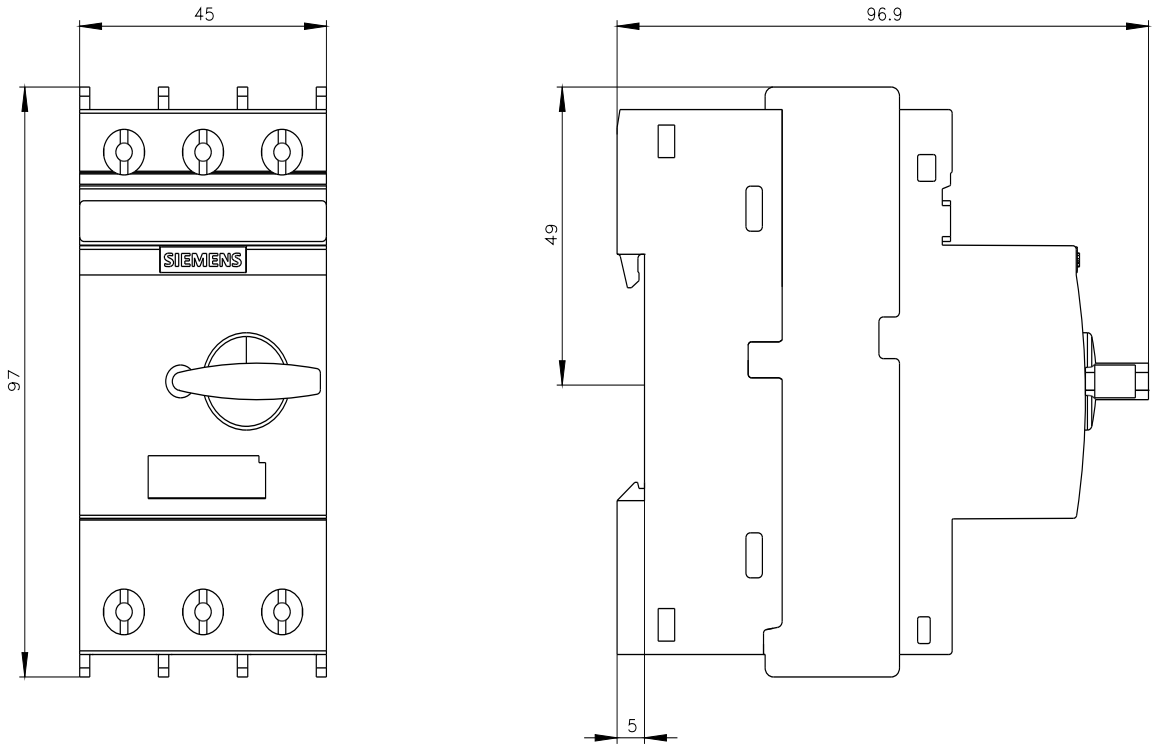
Declaration of Conformity	Test Certificates		Marine / Shipping	
EG-Konf.	UK Declaration of Conformity	Special Test Certific-ate	Type Test Certific-ates/Test Report	ABS

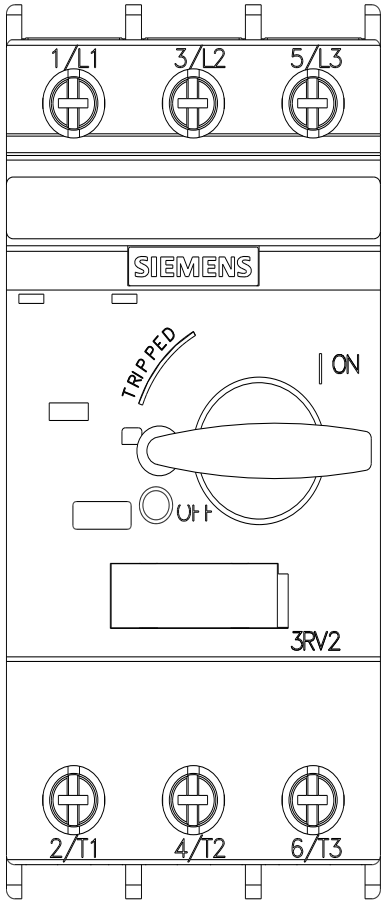
Marine / Shipping					other
DNV	LRS	PRS	RINA	RMRS	Confirmation

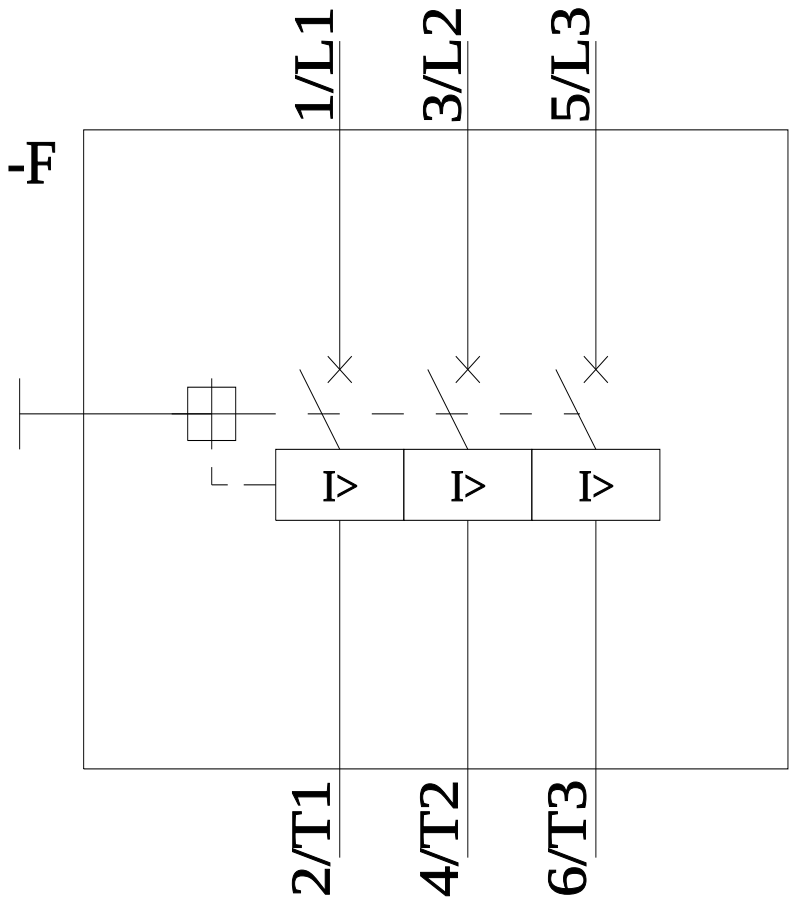
other	Railway	
VDE	Confirmation	Vibration and Shock

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



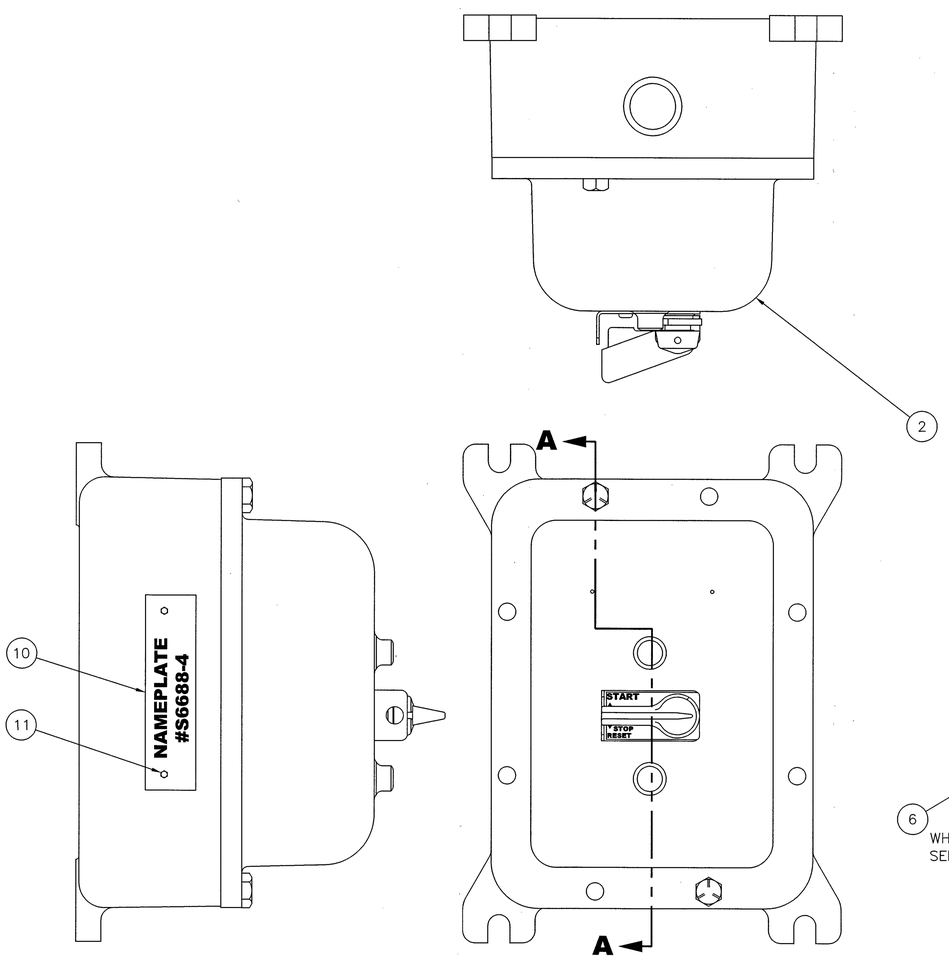


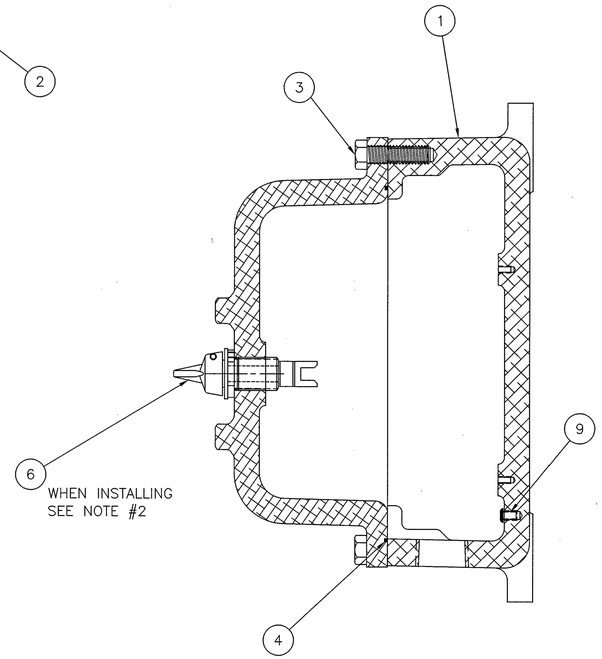


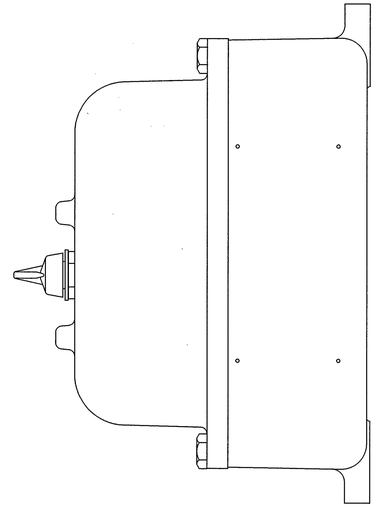
last modified: 10/7/2021

SA5762

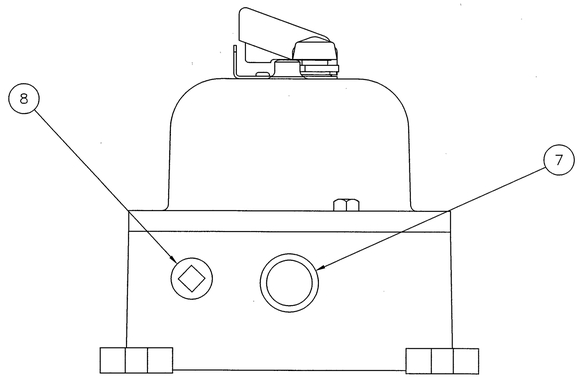
REV	REVISION	BY	ECN	DATE
A	INITIAL RELEASE	DDH	13791	06/26/14
B	CHANGE TO M/C	DDH	14363	4/15/15







SECTION A-A



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 SG5 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 ASEMBLY
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)

NOTES:

1. ASSEMBLE BOX AND COVER WITH PADS AND HANDLE AS SHOWN.
2. WHEN INSTALLING HANDLE WAVE WASHER 1 BELOW AND 1 ABOVE SPACER.

DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
CAST TOLERANCES ON DIMENSIONS NOT OTHERWISE SPECIFIED:
✓ = 1/8" STOCK
FILLET OR CORNER RADII 1/8"
DRAFT 1 1/2°
FRAC ±1/16
ANGLES ± 1°
MACHINE TOLERANCES ON DIMENSIONS NOT OTHERWISE SPECIFIED:
.125" .XX ± .010"
✓ = .031" .XXX ± .005"
FILLET RADII .03"
EDGE BREAK .005"-.015" R. or 45°
ANGLES ± 0°-30'
GAGING FOR THREADED HOLES NOT OTHERWISE SPECIFIED:
NPT E-21-2.6
NPSM E-24-1.0

THIRD ANGLE PROJECTION

ADALET
a Scott Fetzer company
Cleveland, OH 44135

MATERIAL
FINISH
CAT NO

TITLE: XMMS 050704 N4 ASSEMBLY FOR SIEMENS CLASS 11 3RT MANUAL MOTOR STARTER FOR M/C

DRAWN BY	DDH	DATE	06/26/14
ENG APPROVAL	4/15/15	PLOT SCALE	1=1.5
MFG APPROVAL	N/A	DWG SIZE	D
DWG NO	SA5762	SHT	10F1
		REV	B

PRISTAR: Configurable Explosionproof Control Stations

FEATURES

- Configure with up to 7 devices
- One-piece, NEMA 4 water-tight gasket (UL/CSA stations only)
- Premium, high-strength steel cover bolts
- Internal grounding provisions
- Cast-on mounting feet
- Tumblast surface preparation for uniform, natural aluminum finish
- Wide variety of operating devices

CONFIGURATION INSTRUCTIONS

STEP 1: Select your enclosure size from Table A

STEP 2: Select your devices from Tables B1-B4 in order from TOP TO BOTTOM as you would like them installed in your control station

STEP 3: Add legend engraving in order from TOP TO BOTTOM as you would like them installed in your control station (please limit characters to 20 per legend)

EXAMPLE:

4-Device Control Station w/
Green Momentary Pushbutton w 1NO contact "START"
Red Momentary Pushbutton w/ 1NC contact "STOP"
Green 120V LED Pilot Light "ON"
Maintained E-Stop w/ 1NO/1NC contact "EMERGENCY STOP"

ORDER AS: **X4-N4-445-451-403-462-START-STOP-ON-EMERGENCY STOP**

X1-N4-10
X3-N4-10-111-462

Certifications

Class I, Divisions 1 and 2, Groups C and D	UL1203/CSA C22.2 No. 25 & 30
Class II, Divisions 1 and 2, Groups E, F, and G	UL1203/CSA C22.2 No. 25 & 30
Class III	UL1203/CSA C22.2 No. 25 & 30
NEMA Type 4, 7, and 9	UL50

Configuration Tables

TABLE A - Select Enclosure Base Upon # of Devices

# of Operators	UL/CSA Item#	ATEX/IECEx Item#	Std. Conduit Size (feed through)	XIFC Enclosure Size
1	X1 N4	X1X*	¾"	XIFC 030303 N4
2	X2 N4	X2X*	¾"	XIFC 030603 N4
3	X3 N4	X3X*	¾"	XIFC 030703 N4
4	X4 N4	X4X*	1"	XIFC 030903 N4
5	X5 N4	X5X*	1¼	XIFC 031103 N4
6	X6 N4	X6X*	1¼"	XIFC 031303 N4
7	X7 N4	X7X*	1¼	XIFC 031503 N4

*NEMA 4 water-tight gasket not avaiable on ATEX/IECEx Version - IP40 only.

TABLE B1 - Pilot Lights (Guarded w/Terminal)*

Color	120V LED	24V LED	120V Incandescent	120V Incandescent
Amber	400	406	337	412
Blue	401	407	338	413
Clear	402	408	339	414
Green	403	409	340	415
Red	404	410	341	416
White	405	411	342	417

*LED version must be selected for ATEX/IECEx applications.

TABLE B2 - Pilot Lights (Guarded)

Color	120V LED	24V LED	120V Incandescent	120V Incandescent
Amber	418	424	430	436
Blue	419	425	431	437
Clear	420	426	432	438
Green	421	427	433	439
Red	422	428	434	440
White	423	429	435	441

Configuration Tables

TABLE B3 - SELECTOR SWITCHES

	Contact Block	CAM#	CAM/ Contact Sequence	STANDARD SELECTOR SWITCHES: Standard Selector Switch	Selector Switch w/Padlock	Spring Ret. Center from R & L	Spring Ret. Center from R	Spring Ret. Center from L	KEYED SELECTOR SWITCHES: Standard Key Switch	Spring Ret. Center from R & L	Spring Ret. Center from R	Spring Ret. Center from L
Two-Position Switches	BT-1A(1NO/1NC)	1	XO OX	6	283	N/A	N/A	N/A	82	N/A	N/A	N/A
	BT-1B(1NC/1NO)	1	OX XO	7	284	N/A	N/A	N/A	83	N/A	N/A	N/A
	BT-2(2NO)	1	OX OX	8	285	N/A	N/A	N/A	84	N/A	N/A	N/A
	BT-3(2NC)	1	XO XO	9	286	N/A	N/A	N/A	85	N/A	N/A	N/A
Three-Position Switches	BT-2(2NO)	3	XOO OOX	10	293	111	135	159	86	229	249	269
	BT-1B(1NC/1NO)	2	XOX XXO	11	288	112	136	160	87	224	244	264
	BT-2(2NO)	2	XOX OOX	12	289	113	137	161	88	225	245	265
	BT-3(2NC)	2	OXO XXO	13	290	114	138	162	89	226	246	266
	BT-3(2NC)	3	OXX XXO	14	294	115	139	163	90	230	250	270
	BT-1A(1NO/1NC)	2	OXO OOX	15	287	116	140	164	91	223	243	263
	BT-1A(1NO/1NC)	3	OXX OOX	16	291	117	141	165	92	227	247	267
	BT-1B(1NC/1NO)	3	XOO XXO	17	292	118	142	166	93	228	248	268

TABLE B4 - PUSHBUTTONS

Momentary Pushbutton Contact Block	Momentary Pushbutton (Black)	Momentary Pushbutton (Green)	Momentary Pushbutton (Red)	Momentary Momentary w/Padlock (Blk)	Momentary Pushbutton w/Padlock (Grn)	Momentary Pushbutton w/Padlock (Red)	Momentary Mushroom Head Pushbutton (Red)	Maintained (Push-Pull) Mushroom Head Pushbutton (Red)	Maintained (Push-Pull) Mushroom Head Pushbutton (Red) w/Guard	Momentary Dual Pushbutton (Green "START" & Red "STOP")
BT-1A (1NO/1NC)	1	442	447	307	452	457	106	462	465	72
BT-2 (2NO)	2	443	448	308	453	458	107	463	466	73
BT-3 (2NC)	3	444	449	309	454	459	108	464	467	74
BT-4 (1NO)	4	445	450	310	455	460	109	N/A	468	N/A
BT-5 (1NC)	5	446	451	311	456	461	110	N/A	469	N/A

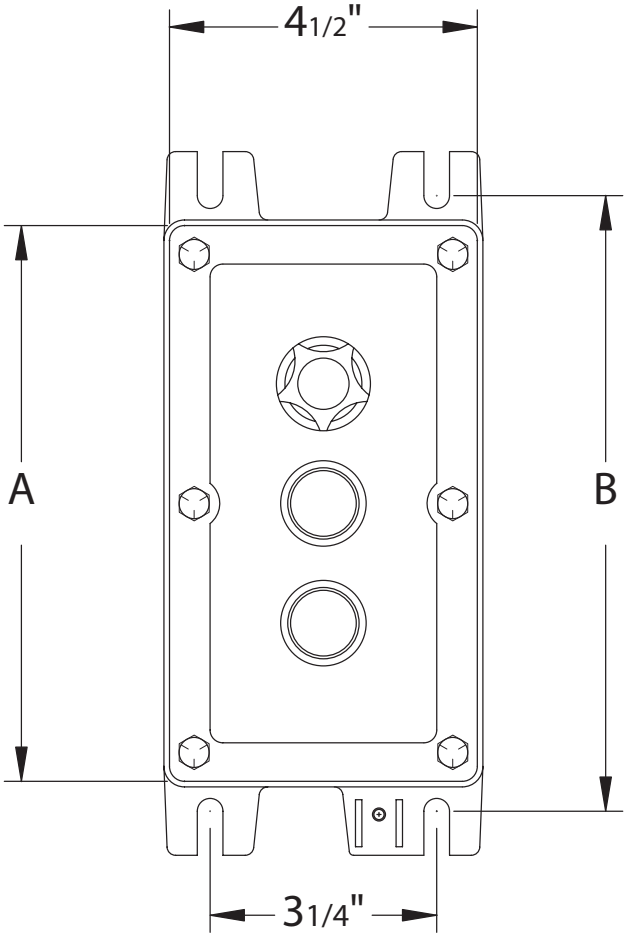
Other pilot devices available – Consult Factory.

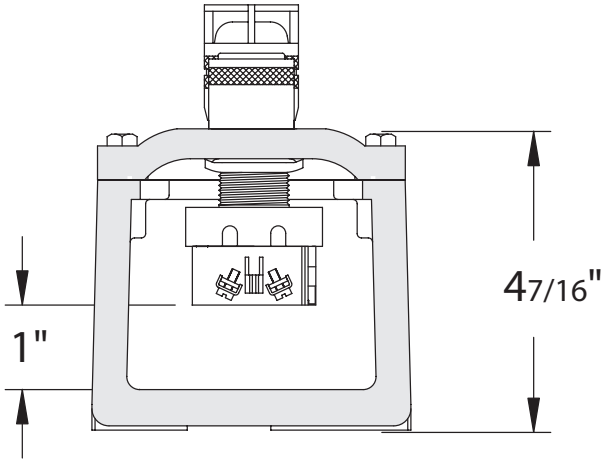
Control Station

DIMENSIONS

Enclosure	Nom. Inside Dimensions	Dimensions (in.) A	Dimensions (in.) B	Est. Weight (lbs.)	Std. Conduit* Size (in.)
X1	030303	4 ½	5 ½	5	¾
X2	030603	7 1⁄16	8	7	¾
X3	030703	8 1⁄8	9	8	¾
X4	030903	10 1⁄16	11	10	1
X5	031103	12 1⁄16	13	11	1¼
X6	031303	14 1⁄16	15	12	1¼
X7	031503	16	17	13	1¼

Control Stations have conduit openings centered on top and bottom.
*Consult factory for other conduit sizes.





Legend Plates Standard Marking

TABLE F2 - STANDARD MARKING

PUSHBUTTON / PILOT LIGHTS			SELECTOR SWITCHES	
Blank	Slow	Reset	Run-Jog	Open-Off-Close
Start	Open	In	Hand-Auto	Fast-Off-Slow
Inch	Close	Out	Forward-Reverse	Run-Auto-Jog
Stop	Up	Left	Fast-Slow	Hand-Off-Auto
Run	Jog	Right	Open-Close	Forward-Off-Reverse
Forward	On	Low	Up-Down	1-Off-2
Reverse	Off	High	Off-On	Up-Off-Down
Fast	Back	Down		
		E-Stop		

Legend plates are anodized aluminum with engraved letters on black background.
Stop has red and start has green background.
Special engraved legend plates can be supplied.

Contact Ratings

MAX RATING: TYPE BT CONTACT BLOCKS

		AC				DC			
Volts		110	220	440	550	24/28	120	240	600
Make & Emergency Interrupting Capacity	A	60.	30.	15.	12.	5.7	1.1	0.5	0.2
Normal Load Break	A	6.	3.	1.5	1.2	5.7	1.1	0.5	0.2
Continuous Current	A	10.	10.	10.	10.	5.	10.	10.	10.5

Data sheet 3RV2928-0B

Push-in lug size S00/S0

General technical data		
product brand name		SIRIUS
product designation		Push-in lugs for screw mounting
design of the product		Can be used for 3UF71.0, 3UF71.1 and 3UF71.2
ambient temperature		
• during operation	°C	-20 ... +70
• during storage	°C	-50 ... +80
Installation/ mounting/ dimensions		
fastening method		clip-on
width	mm	10
height	mm	27
depth	mm	4.7
Certificates/ approvals		
certificate of suitability		CE / UL / CSA / CCC

General Product Approval	Declaration of Conformity	Test Certificates	
Confirmation	UK Declaration of Conformity	Type Test Certific-ates/Test Report	Special Test Certific-ate

Marine / Shipping

ABS BUREAU VERITAS DNV LRS PRS RINA

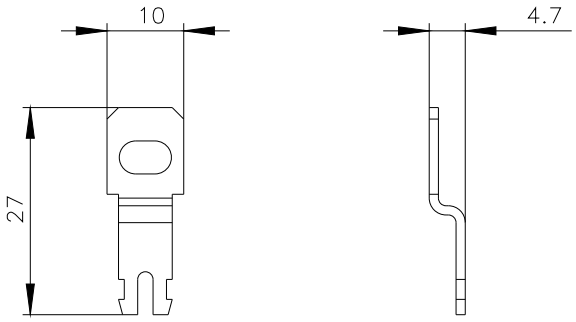
Marine / Shipping	other	Railway
RMRS	Confirmation	Vibration and Shock

VDE

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=3RV2928-0B
Cax online generator
http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3RV2928-0B
Service&Support (Manuals, Certificates, Characteristics, FAQs,...)
https://support.industry.siemens.com/cs/ww/en/ps/3RV2928-0B
Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)
http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3RV2928-0B&lang=en



last modified: 1/6/2021

Data sheet 3RV2901-1E

Auxiliary switch transverse 1 NO+1 NC screw terminal for circuit breaker 3RV2

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, S2, S3
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
ambient temperature		
● during storage	°C	-50 ... +80
● during operation	°C	-20 ... +60
Auxiliary circuit		
number of NC contacts for auxiliary contacts instantaneous contact		1
number of NO contacts for auxiliary contacts instantaneous contact		1
number of CO contacts of auxiliary contacts instantaneous contact		0
operational current		
● of auxiliary contacts		
— at AC-12		
— at 24 V	A	2.5
— at 230 V	A	2.5
— maximum	A	2.5
— at AC-15		
— at 24 V	A	2
— at 230 V	A	0.5
— at DC-13		
— at 24 V	A	1
— at 48 V	A	0.3
— at 60 V	A	0.15
Installation/ mounting/ dimensions		
fastening method		plug-in fixing
width	mm	45
height	mm	12
depth	mm	17
Connections/ Terminals		
type of electrical connection for auxiliary and control circuit		screw-type terminals
type of connectable conductor cross-sections		
● for auxiliary contacts		
— solid		2x (0.5 ... 1.5 mm²), 2x (0.75 ... 2.5 mm²)
— finely stranded		

— with core end processing		2x (0.5 ... 1.5 mm²), 2x (0.75 ... 2.5 mm²)
● at AWG cables for auxiliary contacts		2x (20 ... 14)

Certificates/ approvals

certificate of suitability — CE / UL / CSA / CCC

General Product Approval

Confirmation


KC


Declaration of Conformity

Test Certificates

Type Test Certific-ates/Test Report

Special Test Certific-ate

Marine / Shipping

Marine / Shipping

other

Environmental Con-firmations

other

Confirmation

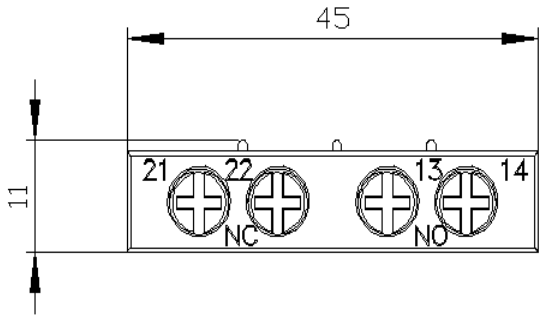
Railway

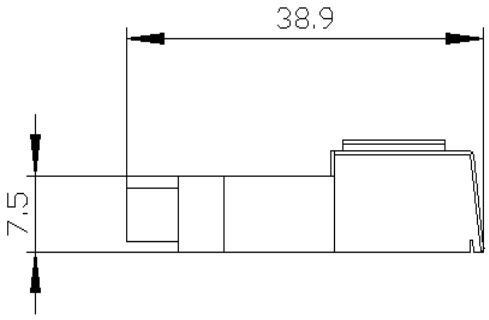
Confirmation

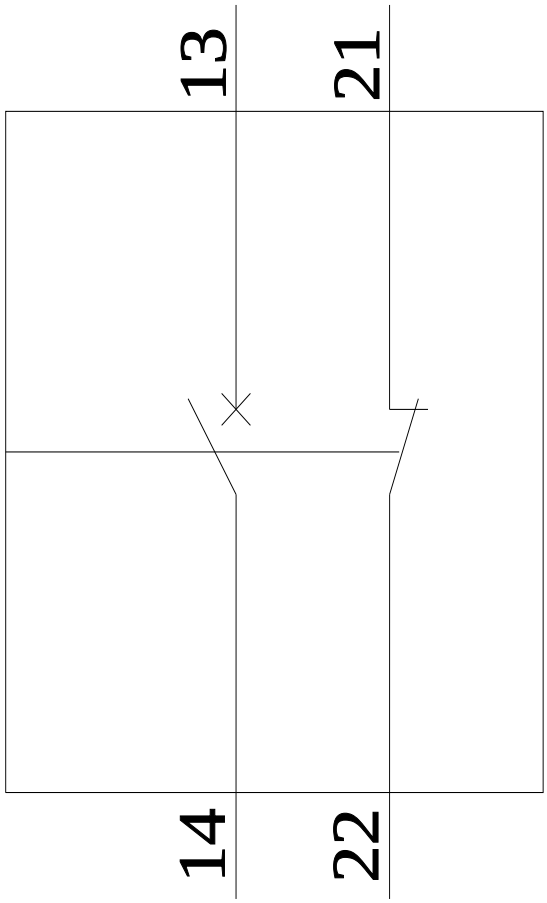
Vibration and Shock

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=3RV2901-1E
Cax online generator
http://support.automation.siemens.com/WW/CAXorder/default.aspx?lang=en&mlfb=3RV2901-1E
Service&Support (Manuals, Certificates, Characteristics, FAQs,...)
https://support.industry.siemens.com/cs/ww/en/ps/3RV2901-1E
Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, EPLAN macros, ...)
http://www.automation.siemens.com/bilddb/cax_de.aspx?mlfb=3RV2901-1E&lang=en







last modified: 7/1/2021

8. Appendices

1 In-Tank Fine Screen, 1 Wash Press, Electrical Controls & Auxiliary Equipment

Technical Submittal (R0)

Township of Springwater, ON
Consulting Engineer: Arcadis
Project & Contract No.: 2024-05-PW
Contractor PO No.: TBD upon Novation
Claro Ref.: 22167-P-00

Appendix C. Elmvale WWTP – Specification Compliance

- Please see following pages.

PART 1. GENERAL

1.1 SCOPE OF WORK

.1 The work of this Section includes design, fabrication, programming, supply, delivery, factory test, supervision of installation and commissioning, training of one (1) complete mechanical screen system with all accessories and appurtenances as shown on the Contract Drawings. Screening and washing system shall be provided with all supports, controls, and all necessary appurtenances to provide complete operating system.

.2 The scope of mechanical screen system is to include the following items, but not to be limited to:

.1 One (1) custom-built stainless steel tank that houses the mechanical screen, including a flange equipped with a bolted blind cover & gasket on the side of the tank for a future flow equalization connection, flanged inlet and outlet connections, and all other accessories as described herein.

.2 One (1) mechanical screen pre-installed in the aforementioned stainless-steel tank.

.3 One (1) wash compactor mounted to the stainless-steel tank including mounting brackets/supports as required and shown on the Contract Drawings.

.4 One (1) wash compactor discharge tube assembly including supports, lifting lugs, hardware, gaskets and a hygienic bagging system including one (1) hygienic bag cartridge.

.5 One (1) associated main control panel, two (2) local HOA control stations and two (2) local motor disconnect stations.

.6 Provide monitoring and control of the mechanical screen system system that enables full functionality in automatic and manual modes.

.7 Provide all equipment, instrumentation, and controls, whether or not specifically listed herein to provide a complete and functional mechanical screen system.

.8 Provide a centralized screening system controller panel complete with PLC based monitoring and control, HMI colour touch screen interface, CAT6 networking including Ethernet switch, wire/terminal blocks, motor starters/drives, as well as equipment, materials, and incidentals as necessary for a complete and operational fine screening system. The centralized screening system controller panel and local control and motor disconnect stations shall be provided in conformance with the Contract Documents.

.9 Provide PLC programming, pre-start up verification and commissioning of the mechanical screen system. All HMI and PLC programs supplied will be the property of the Township of Springwater (Township). The HMI and PLC software application programs in native file format are to be submitted for final as-built documentation and archive. Licenses for the development of the HMI

and PLC software application programs are the responsibility of the mechanical screen system manufacture and will not be provided by the Consultant or Township.

.10 Provide a Process Control Narrative (PCN) that fully describes the operation of the mechanical screen system . The facility will not have a plant SCADA system for integration with the present phase of the project. The vendor-supplied centralized controller panel, however, shall be properly designed to enable seamless integration into the wider facility PLC architecture when it is available in a future phase of the upgrade. The PCN shall include a complete data exchange table for integration of the mechanical screen system with the future plant-wide SCADA system. The data exchange table shall include all real-time process/field values, equipment statuses and fault conditions among other pertinent data available at the fine screening system PLC. Data exchange will include all differentiated 'Read' data and selected 'Write' data including the ability to trigger equipment remotely. The data exchange table shall include tag name, English description of the data point, data type, read/write access and indication if the data point is an alarm. Ensure all required system monitoring and control is implemented and enables the operation of the equipment in a manner acceptable to the Consultant.

.11 The Township is planning to install one (1) additional mechanical screen system in a dedicated stainless steel tank and an associated wash compactor in a future facility upgrade. The vendor-supplied centralized mechanical screen system controller panel and programming, specified in Section 1.1.8 shall incorporate all physical control / electromechanical components and programming to enable the seamless integration of the future mechanical screening system. The second screen's logic shall be activated via a button located on a password-protected HMI screen. No other modifications or additional equipment other than the provision of the necessary local HOA and motor lock-out stations will be required for implementation of the future mechanical screen system.

1.2 WORK NOT INCLUDED

.1 The following items shall be the responsibility of the Contractor.

.1 Offloading, handling, temporary storage, and security of the mechanical screen system.

.2 Modifications to the existing inlet building as shown on the Contract Drawings.

.3 Installation of the mechanical screen system

.4 Interconnecting power source, status/control signal cables and conduits between the mechanical screen system manufacture's equipment and the plant power source and Panalarm panel located in the existing main facility control panel.

.5 Testing and commissioning of the mechanical screen system (in collaboration with the mechanical screen system manufacture).

1.3 RELATED SECTIONS

.1 Section 01300 – Submittals

.2 Section 01430 – Operation and Maintenance Data

.3 Section 01600 – Material and Equipment

.4 Section 01640 - Manufacturers' Services

.5 Section 01810 – Equipment Testing and Facility Commissioning

.6 Section 01820 – Demonstration and Training

.7 Section 11010 – Equipment General Requirements

.8 Section 15200 – Process Piping and Fittings

1.4 REFERENCES

.1 Comply with the latest edition of the following codes and standards, and all amendments thereto:

.1 American National Standards Institute (ANSI/ASME):

.1 ASME B16.5, Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24 Metric/inch Standard.

.2 Ministry of the Environment and Climate Change,

.1 Design Guidelines for Sewage Works (2008).

.3 Canadian Standards Association (CSA):

.1 CSA B137 Series -17 – Thermoplastic Pressure Piping Compendium (CSA B137.3, Rigid polyvinylchloride (PVC) pipe and fittings for pressure applications).

.2 CSA Z-432 for guarding

.4 American Society for Testing and Materials (ASTM):

.1 ASTM A182 / A182M – 16a, Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service

.2 ASTM A240 / A240M – 16a Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

.3 ASTM A380/A380M-13 Standard practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment and Systems

.5 The equipment included in this specification shall comply with the latest edition of the applicable codes and regulations including the following:

.1 American Society of Mechanical Engineers: (ASME).

.2 Canadian Standards Association: (CSA).

.3 American Gear Manufacturers Association: (AGMA).

.4 Canadian Electrical Manufacturers Association: (CEMA).

.5 National Electrical Manufacturers Association: (NEMA).

.6 American Society for Testing and Materials: (ASTM).

.7 American National Standard Institute: (ANSI).

.6 Any requirements of local electrical authorities.

1.5 PRE-CONSTRUCTION SUBMITTALS

.1 Shop Drawings:

✔ .1 Shop drawings shall be certified by a professional engineer licensed to practice in the Province of Ontario.

✔ .2 Make, model, and weight of each equipment assembly. All information shall be provided in an electronic format.

✔ .3 Calculations certified by a professional engineer licensed to practice in Ontario are to demonstrate that the design complies with the requirements of this section.

.4 Product Data:

✔ .1 Detailed mechanical drawings showing equipment fabrications and interface with other items. Include dimensions, size, and locations of connections to other work, and weights of associated equipment.

✔ .2 Relevant information to confirm the specifications have been met. Identify any and all deviations. Provide check-marked specification noting compliance or deviation for each paragraph section including rationales for each deviation.

✔ .3 Identify construction materials for tank, step screen, wash compactor and related instrumentation components.

.4 Relevant data illustrating full range of operation including speed curves, if applicable.

.5 Electrical motor information and specification.

.6 Loadings imparted to each piece of equipment.

.7 Permissible range of vibration.

.8 Factory finishing details.

.9 Anchoring requirements.

.10 Shop and Field Painting Systems proposed; include the manufacturer's descriptive technical catalogue literature and specifications.

.11 A motor performance chart exhibiting curves for motor torque, current, power factor, input/output Kw and efficiency. Chart to also include date on motor starter and no-load characteristics.

.12 Noise characteristics of equipment.

.13 Provide Instrumentation and Control Systems submittals including, but not limited to the following:

- .1 Piping and Instrumentation Diagrams (P&IDs).
- .2 Process Control Narrative.
- .3 Centralized Control Panel and Local Control Panel layouts complete with component bill of materials.
- .4 Panel product shop drawings for utilized PLC controllers, power supplies, controller cards, touch screen interface, intrinsically safe relays, terminal block, surge protective devices, starters, and drives.
- .5 Field instrumentation product shop drawings and data sheets.
- .6 Control Panel schematics and wiring diagrams, including field loop diagrams and network schematics.
- .7 HMI screens in PDF and native software files in a separate submission once the custom HMI screens reflecting project drawings have been developed. Typical HMI screens are to be provided at time of submittal.
- .8 PLC and HMI programs in native software file formats in a separate submission once the custom programs have been developed.

.9 Field instrument classification ratings as well as specific installation details.

.2 Information Submittals:

.1 Site Acceptance Test Report.

.2 Manufacturer's Certificate of Conformance: Manufactured/commercial products.

.3 Special shipping, storage, protection, and handling instructions.

.4 Manufacturer's Certificate of Proper Installation.

.5 Operation and Maintenance Manual: Include the manufacturer's written/printed installation instructions with erection drawings indicating, by piece marking, how the entire assembly is to be shipped and field assembled. Installation and instructional records during construction, including commissioning, shall be provided in an electronic format.

.6 Manufacturer's special guarantee/warranty as defined by the Contract Documents.

.7 Service records for maintenance performed during construction and up to the commissioning shall be provided in an electronic format.

1.6 PERFORMANCE AND DESIGN REQUIREMENTS

.1 General

.1 Design the mechanical screen to capture and lift out municipal screenings typically found in domestic wastewater influent.

.2 The mechanical screen shall receive Main Sewage Pumping Station (MSPS) via a 300 mm diameter single forcemain. There are in total three (3) pumps installed in the wet well of the MSPS: two constant speed submersible pumps, each rated at 65 L/s; the third pump, equipped with VFD is rated at 76.4 L/s.

.3 Compacted screenings to be transit through a compaction tube and deposited into a drop chute leading to a waste container provided by the Town and to be suitable for landfill disposal without any additional treatment or processing. Treated screenings are to be washed, dry and not promote standing water in the hygienic bag or receiving bin.

.4 Clean and hygienic operation is required. Screenings are to be removed from raw sewage flow in a closed tank equipped with inspection covers and ports, transited to the wash compactor without falling outside the system enclosure and subsequently washed, compacted and dewatered in a manner that enables the clean and reliable deposit of the treated debris into the closed hygienic bagging system positioned above the disposal bin. Hygienic bagger to progressively

unfold its 90 m bag magazine cartridge under the weight of the discharged final product material.

.5 Include design features that effectively prevent retention of screenings on the screen, discharge assembly, chute, cleaning mechanism or drive train.

.6 Include measures to remove organics from screenings prior to depositing screenings in compaction tube and drop chute.

.7 The specified mechanical screen system shall incorporate standard spare parts including screen linkage system sleeve bushings, wash press slide wear bars and wash press spiral.

.8 Correct all deficiencies if present after start-up at no cost to the Township.

.9 Pre-install the mechanical screen in a custom-designed stainless steel tank including an internal by-pass weir arrangement as specified herein and in the Contract Documents.

.10 Provide a 300 mm diameter ANSI floating flange on the upstream side of the tank that will enable the installation of an influent level and flow equalization pipe that will run in-between the specified step screen tank and the future step screen tank. A bolted, blind cover and gasket shall be supplied on the flange with the specified step screen tank for use during the present phase of the upgrade.

.11 Design the mechanical screen to elevate captured screenings material to a wash compactor complete with compaction tube, integrated vertical drop chute and hygienic bagger assembly. Discharge of screenings is to be in the area one floor below the screening unit platform area as shown on the Contract Drawings.

.12 Design the washer compactor to be supported from the stainless steel screen tank and provide all necessary supports in AISI 304L stainless steel.

.13 The discharge tubes, including flanged vertical drop chute sections, are to be equipped with a support system that will enable the support of its full weight from the top of the screening system platform floor.

.14 The control panel will be located in the electrical room of the existing inlet building which is an unclassified area. All other components of the system will be located in the inlet building operating area and must be suitable for a Division 1, Class I, Group D area.

.2 Design Requirements

MECHANICAL SCREEN	
ITEM	**DESCRIPTION**
Mechanical Screen Type	Step Screen
Number of Units	1
Peak Flow to Unit	12,216 m^3/d (with 35% screen blockage)

Operation	Intermittent
Media	Raw Wastewater
Bar Spacing (mm)	6
Opening Type	Slot Opening
Screen Inclination (degrees)	50 (pivots out of stainless-steel tank channel)
Discharge Height (mm)	1100
Effective width (mm)	600
Screen frame width without Neoprene side channel seals, (mm)	720
Aperture between bars (mm)	6 + filter mat
Lamella bar thickness (mm)	3
Frame components (mm)	5
Frame & covers materials	AISI 304L frame/AISI 316L screen covers including discharge cover & top-of-screen tank covers
Bar material	AISI 304L
Screen motor (hp)	0.75
Drive Unit	SEW including NEMA Flange
Power Requirement (V/Ph/Hz)	575/3/60
Components Materials	
Frame Assembly	5 mm, AISI 304L stainless steel
Bars (lamella) fixed and movable	3 mm, AISI 304L stainless steel
Support legs	3 mm, AISI 304L stainless steel
Bottom defector	3 mm, AISI 304L stainless steel
Inspection lids	1.5 mm, AISI 304L stainless steel & AISI 316L fine screen covers including discharge cover & top-of-screen tank covers
Compaction tube and discharge drop chute	Minimum 1.5 mm, AISI 304L stainless steel
Side seals	Neoprene rubber
Lamellae inter spacers	UHMW plastic
SCREENING WASHER/COMPACTOR	
ITEM	**DESCRIPTION**
Designation	Washer/Compactor
Number of Units	1
Capacity	1 m^3/h wet screenings at inlet
Press diameter (mm)	200
Inlet Dimensions, L x W (mm)	500 x 285
Connection Flange in-between equipment components	DN200, PN10
Press Material	ANSI 304L body and spiral in special high-tensile abrasion-resistant Swedish micro alloy steel with Hardox plate on last flight, last 2 flights double thickness & wear bars in Hardox (BN 400)
Motor (hp)	2

PART 2. PRODUCTS

2.1 GENERAL

.1 The mechanical screen system, including mechanical fine step screen, washer compactor, controls, instrumentation, and appurtenances shall be supplied by a single manufacturer.

2.2 MECHANICAL SCREEN

.1 General

.1 Provide the mechanical screen to include lamellae bar rack, linkage drive system, structural frame, covers, and a self-contained tank. The unit is to be factory assembled and FAT tested. Equipment shall be ready for installation and shall not require field assembly except where partial disassembly is required for transportation or protection of components.

.2 Design to ensure that day-to-day maintenance may be accomplished at the equipment platform level. The mechanical screen shall be able to pivot out of tank with the aid of a lifting system without disassembly or movement of the downstream washer compactor other than the removal of one bolted discharge cover.

.3 Design the mechanical screen to operate without drive chains, sprockets or tensioners.

.4 Furnish the mechanical screen with a precautionary Emotron M20 torque overload guard pre-installed in the control panel to protect against jamming and to protect mobile components. Torque reading to be reported to control panel HMI.

.5 Equip the mechanical screen with Neoprene rubber skirts in order to provide an adequate liquid and debris seal between the inside channel walls of the screen tank and the screen's frame thereby ensuring that:

.1 All raw wastewater passes through the screen passage openings.

.2 The linkage mechanism is protected from unscreened wastewater.

.6 Design the mechanical screen to be normally positioned at a 50° inclination and to be supported and bolted to the stainless steel tank in a manner that enables pivoting of the screen out of the tank.

.1 The mechanical screen is to be delivered pre-installed in the stainless steel tank.

.2 Mechanical screen with a lower installation angle than 50° are not acceptable.

.7 Design the mechanical screen to be able to pivot completely out of its respective stainless steel tank channel to allow for complete access to all components from the operating floor. This lift-out capability is to allow for easy maintenance access.

.1 Locate lifting lugs for pivoting the screen on the lower sides of the step screen unit frame.

.8 The gear drive and motor of the screen are to be isolated from screenings debris and the channel by being located in their own enclosure with a bolted or hinged cover.

.9 Design the mechanical screen system to be able to be operated intermittently in order to capture much finer debris when a 'screenings filter mat' layer accumulates across the surface of the screen's lamellae bars. This operating technique will increase the performance efficiency of the screen to be comparable to a significantly finer aperture screen.

.10 Supports are to be of a bolt-together design with no on-site welding required.

.2 Screenings Removal Mechanism:

.1 Design the mechanical screen lamellae (bars) to incorporate a curved step to improve lifting of screenings material.

.1 This curved step is to have a 1:1 ratio of height to depth, alternating between fixed and mobile lamellae, in order to ensure effective screenings transport toward discharge without material roll-back.

.2 Tall, shallow steps that do not reflect the height-to-depth ratio and steps that have a hook-like design with a flat horizontal step are unacceptable.

.3 Provide the step's curve on the horizontal part of the step.

.2 The mechanical screen screening surface will consist of alternating fixed and mobile lamellae steps. All required lamellae will be attached to either the fixed or mobile lamella support members. Normally, it will be necessary to replace lamellae in exceptional circumstances only. The lamellae will have a 6 mm opening slot width (aperture). Moveable lamellae will be provided with UHMW spacers on each side to maintain the proper spacing between the lamellae. The lower portion of the mobile lamellas will be provided with saw teeth to penetrate through fine grit and sand during operation.

.3 Design mechanical screen's lamella steps to be the same size/height across their full length. Lamella steps are to move in the same circular pattern across the full length of bar screen.

.4 Lamellae are to be 304L stainless steel with a minimum thickness of 3 mm each, and to be of bolt-on construction such that individual lamellae can be easily

removed and replaced if required. Thinner lamellae or screening units that incorporate plastic lamellae are not acceptable.

.5 Design the fine step screen lamellas of a bolt-on type rather than welded, in order to allow for quick and easy replacement of one or more bars, if necessary.

.6 Screening Removal Mechanism and Bottom Step Design:

.1 Design the bottom step of the screen to allow for sewage inflow. Bottom step will not be equipped with plug/spacers, end shoes, brushes, or rubber barriers.

.2 Design the bottom step to restrict screenings passage to 6 mm maximum throughout its entire operating cycle (moveable bar rotation) in all operating conditions.

.3 Screens with flexible bottom lamellae, which allow larger debris to pass through the bar screen than the specified aperture, are not acceptable.

.7 Provide the screenings removal mechanism to include: a moveable and stationary step-shaped lamellae bar rack filter area; a bottom step deflector plate that moves up and down with every screen lamellae bar rotation; a drive mechanism constituted of a motor, gear drive, drive shaft and all stainless steel linkage drive system; and, an all-stainless steel discharge assembly.

.8 Mechanical screen to be supported and bolted to the tank with its lamellae bar filter media area at a 50 degree angle to the tank invert in order to provide the effective removal and transit of screenings debris.

.9 The mechanical screen will be equipped with an AISI 304L automated deflector plate located at the base of the machine to maintain constant aperture between the fixed screen steps throughout its entire operating cycle (moveable bar rotation) and in all operating conditions.

.1 This hinge-pinned screen flap will be positioned perpendicular to the flow and level with the lowest step of the lamellas eliminating end bar spacers on the lower stationary lamellas in order to:

.1 Greatly diminish the risk of the screen's jamming with sand or other debris, and

.2 Guarantee a constant aperture as specified.

.2 The mechanical screen automated screen deflector plate will move up and down with the movement of the lowest step and will ensure that, during the operation of the screen, the aperture between the bars will never become larger than specified.

.3 Bottom plates that do not cover the bottom step are not acceptable. Plates that do not move in tandem with the rotation of the moveable lamellae bar rack are not acceptable.

.4 The mechanical screen will not use end-shoes or end-bar spacers at the base of its bar screen in lieu of a deflector plate. Fixed plates, brushes, rubber strips or other types of approaches are not acceptable.

.5 Special flushing equipment at the screen's lowest step or frame and/or a recessed channel invert as a means of coping with grit build-up in lieu of the deflector plate are unacceptable.

.10 All steps on the lamellas will be of the same height and depth which will assure proper upward transport of the screenings from the very bottom to the top of the screen.

.11 The mechanical screen will have an all stainless steel discharge that does not use plastic endshoe spacers.

.3 Frame:

.1 The frame assembly will be of unified construction, forming a rigid structural assembly in order to provide a secure and structurally sound unit consisting of:

.1 Two (2) side frames.

.2 Two (2) linkage system drive plates & linkage system components.

.3 Fixed and mobile lamellae support members.

.4 Lamellae structural cross members.

.5 A modular, bolt-on motor compartment.

.6 A base plate structural member integrated with the bottom deflector plate.

.2 The drive plates will be mounted within the side frame and will be connected to the mobile lamella structural support members.

.3 The frame assembly will be designed to fit into the stainless steel tank channel without the need for recessed channel walls or invert.

.4 The neoprene side skirts will be attached to the front side frames of the fine screen frame with stainless steel retainers and hardware to provide sealing between the screen and the stainless steel tank channel walls.

.5 The screen frame will extend fully from the stainless steel channel invert to the top of the unit and will be arranged to pivot out of the stainless steel tank channel

for maintenance when required. The motor and gear drive will be located above the top of the stainless steel tank walls and above maximum influent liquid level.

.6 Lifting Lugs:

.1 Lifting lugs for pivoting the screen will be installed on the screen frame.

.2 Include additional lifting lugs to permit loading and unloading, and transportation of the fine screen itself and of the screen stainless steel tank.

.7 The stainless steel frame shall be designed to be rigid and prevent deflection due to the operation or installation of the screen. Design frame to permit access to all components requiring inspection and/or eventual PM maintenance when the unit is pivoted above the stainless steel tank.

.4 Housing:

.1 The upper section of the step screen located above the top of the stainless steel tank channel will be equipped with removable cover panels manufactured from AISI 316L stainless steel.

.2 Although the screening system is provided in AISI 304L, its tank inspection cover assembly will be provided in AISI 316L to protect against corrosion and discolouration from the possibility of H_2S.

.3 Provide vent connection from the tank reserved for future connection with HVAC system.

.5 Tank:

.1 Tank to be equipped with integral precautionary overflow weirs upstream of the screen that discharge downstream of the screen. Provide high level sensing instrumentation for reporting of an overflow condition near the weir. The high level sensor shall be a Class I. Div. 1, Group D-rated Endress + Hauser Liquiphant FTL51B vibronic sensor unit.

.2 Provide a neoprene rubber skirt inside the tank between the tank walls and the screen frame to ensure that all wastewater is directed through the screen.

.3 Wash compactor is to drain back into the downstream side of the tank.

.4 Firmly anchor tank to the equipment platform. The screen frame and tank shall be designed to support the tank dead load, live loads and lateral loads due to Earthquake according to the OBC and applicable tank design standards. Earthquake loading to assume Site Class ‘D’, Post Disaster (IE = 1.5) and Specified Accelerations as per OBC Seismic Data.

.6 Chute:

.1 Furnish an easily removable bolt-on discharge cover and chute at the point of screen discharge in order to safely and hygienically direct the captured screenings into the receiving equipment (wash press).

.2 The discharge chute will be manufactured from AISI 304L stainless steel and will have 90 degree walls in order to eliminate the risk of screenings bridging.

.7 Drive Assembly:

.1 The fine step screen is to be complete with an integrated drive assembly consisting of an electric gear motor, drive shaft, automatically/lifetime greased shaft bearings, eccentric bearings, and home-position braking mechanism.

.1 The drive system components will not require greasing or automatic greasers.

.2 The drive assembly must be capable of elevating the weight of the mobile lamellas and the maximum debris load.

.3 No electrical drive components will be located below the maximum water level of the stainless steel tank channel.

.4 The fine step screen will be driven by an eccentric drive shaft without the use of chains, sprockets, tensioners, or belts.

.5 An appropriate safety guard (Emotron M20) will be pre-installed in the screening system control panel to stop the motor and perform a self-clearing sequence in the event that the lamellae bars experience a high torque or jamming condition (note: jamming incidence is zero with the specified deflector plate).

2.3 WASH COMPACTOR AND DISCHARGE TUBE

.1 General

.1 The wash compactor will receive municipal screenings captured by the fine step screen, wash-off organics, and transfer screenings via a compaction tube and drop chute to a hygienic bagger and existing bin. The wash compactor will be supported from the screen tank and provided with all required supports.

.2 All wash compactor and discharge tube components are to be accessible for servicing.

.1 Design the discharge tube so that discharge tube's first 90-degree bend will be equipped with an extra flange enabling it to be removed for wash compactor inspection purposes.

.2 Equip the discharge tube with lifting lugs in order to facilitate manipulation of the tube segments.

.3 Equip the wash compactor discharge tube with an integrated drop chute section and hygienic bagger as shown in the Contract Drawings.

.2 Wash Compactor

.1 Provide the wash compactor with a helical bevel gear drive with thrust bearings and a special flexible flange coupling connecting the gear drive shaft with the press shaft for optimal process performance and protection of the spiral and shaft. Systems with fixed shafts are not acceptable due to the risk of shaft inflection.

.2 Construct the wash compactor spiral of special high-tensile, abrasion-resistant micro alloy (220 - 250 Brinell Hardness) welded to a shaft. Shaftless spirals are not acceptable.

.1 Equip the last flight with a Hardox steel plate (400 Brinell Hardness) for additional abrasion resistance.

.2 Reinforce the last two flights of the spiral to double the flight thickness for additional structural strength.

.3 Wash press slide wear bars are to be constructed using Hardox steel (400 Brinell Hardness).

.3 Design the wash compactor with a stainless steel 304L wash zone tube with perforations for the drainage of wash water and the exit of removed organics. Units with wedge wire are not acceptable due to grease plugging and susceptibility to damage issues.

.4 Construct the wash compactor of a double trough construction. Wash press units requiring a drain pan are not permitted due to leakage issues.

.5 Provide a reject water outlet, 76.2 mm diameter, piped back to the stainless-steel tank with flexible hose and stainless steel gear clamps.

.6 Connect the wash compactor drain to the screen tank. Drainage piping by screening system manufacturer.

.3 Wash Water Requirements

.1 Provide two (2) x 13 mm dia. water connections equipped with AISI 316 isolating full port manual ball valves and Class I, Div. 1, AISI 304 automated ASCO RedHat II solenoid valves (120V/1Ph) at the wash compactor:

.1 One (1) connection to wash the screenings internal to the washing tube.

.2 One (1) connection to flush the removed organic debris outside the wash-compression zone of the unit to the drain connection.

.2 Furnish a 65 mm diameter dia. AISI 304 pressure gauge and a 6 mm AISI 316 isolating ball valve in order to measure service water pressure to the wash compactor.

.3 Filtered effluent water isprovided at the facility with a dynamic pressure from 275 kPa (40 psig) to 482 kPa (70 psig).

.1 Contractor to supply 13 mm diameter service water piping.

.2 All interconnecting fittings for service water piping are to be provided by the Contractor.

.4 An AISI 316 Y-strainer shall be provided by the screen manufacturer with manual ball valve for voiding of the strainer filter basket.

.1 The voiding line shall be piped back to the drain piping downstream of the screen by the Contractor.

.5 Contractor shall supply and connect to the press two (2) water supply lines as specified above (i.e. one common line that splits into 2 lines near the wash compactor).

.4 Discharge/Compaction Pipe System

.1 Quantity: One (1)

.2 Material AISI 304L, floating stainless steel flanges. Including stainless steel bolts and required flange gaskets.

.3 200 mm to 250 mm diameter flared discharge tube for compaction, dewatering, and delivery of screenings to integrated drop chute and hygienic bagger / receiving bin as shown on the Contract Drawings. Receiving bin to be provided by the Township.

.4 Discharge tube to include 2 lifting lugs and additional flanges after the first bend as specified herein. All sections of the discharge and drop chute assembly shall integrate lifting lugs for ease of manipulation and installation.

.5 All required supports are to be provided by the manufacturer in AISI 304L. Drop chute with floor support assembly are to be as specified herein. The additional support frame from the screening room platform is to be provided by the installing contractor.

2.4 ELECTRICAL CONTROLS

.1 General:

.1 Mechanical screen system manufacturer is to provide one (1) remote main control panel to integrate the fully automatic operation of one (1) new fine step screen, one (1) wash compactor and one (1) future screen & one (1) wash

compactor of the same design, motor and instrumentation requirements. Provide controls as specified below.

.1 Enable the operation of the screen in fully automatic and manual modes. Fully automatic operation is effected by the main control panel in conjunction with the specified instrumentation. The system shall be stand-alone; no signals or logic are required from a facility network. The main control panel reports operational data and presents the opportunity for remote trigger of the equipment to the facility Scada system. Manual operation of the screen and wash compactor shall be effected at local HOA control stations as specified herein.

.2 One ultrasonic sensor probe for upstream start level control is to be supplied for the step screen with the new control panel in order to effect a one-step-at-a-time operational cycle that promotes a screenings-filter mat-assisted form of screenings separation. The ultrasonic level sensing equipment shall be a Class I, Div. 1 Endress+Hauser ProSonic S FDU91 probe and a corresponding FDU90 transmitter. Sensor probe to be supplied with 25 m. of factory-sealed cable. The transmitter shall be installed within the main screening system control panel. All level set points are adjustable via the main control panel HMI interface.

.1 Level transmitter is to be installed inside the main control panel. Level transmitter shall be configured to accept the future second screening system level sensor probe.

.2 The sensor is to be installed on the stainless steel tank in a PVC and ABS mounting tube supplied by the screen manufacturer. A second FDU91 level sensor probe shall be furnished for future installation on the second screening system tank in order to ensure future availability and compatibility of the sensor equipment and to avoid future control panel modifications.

.2 The control panel must incorporate PLC programming and HMI screens that enable the visualization of the specified screen and the future screening system including real-time status and instrumentation data. The HMI screens shall be modelled on the specific project drawings layout.

.3 The programming will enable the operation of the 2 screens in tandem including the alternation of screen starts based on shared influent flow enabled by the influent level and flow equalization piping.

.2 Control Panel:

.1 Provide control panel for the control of two (2) mechanical screen systems (present phase and future phase upgrade equipment) with the following dimensions: 914 mm (w) x 1524 mm (height) x 305 mm (depth).

.2 Control panel shall be a NEMA 12 epoxy painted steel enclosure equipped with all components that enable a fully functional system including:

.1 Full voltage reversing 575V/3/60 motor starters for two (2) fine step screens and two (2) wash presses including thermal overloads installed are to be inside the control panel.

.2 Emotron M20 torque detectors for the two (2) fine step screens and two (2) current transformer (CT) amperage detectors for the two (2) wash presses. Devices to be pre-installed within main control panel enclosure.

.3 Surge protector module for the PLC and a loss-of-phase detector to further safeguard system motors.

.4 PLC including all I/O modules and power supply.

.5 178 mm colour touch screen HMI; Siemens TP700 Comfort.

.6 Ethernet switch and other components.

.7 One (1) Endress & Hauser Prosonic ultrasonic level sensor (Class I, Div. 1) installed upstream of the fine step screen (total of 1 sensor + 1 for future screening system) including the corresponding FDU90 transmitter installed inside the main control panel (total of 1 transmitter). Sensor to be provided with 25 m of sealed, Class I, Div. 1 cable.

.8 All controls equipment shall be bear a CSA certification label and be manufactured under ISO 9001:2015 certification.

.3 PLC: Provide one (1) Allen-Bradley MicroLogix 1400 PLC with Ethernet connectivity and ready for connection to the plant future local area network; complete data exchange table and HMI screen Jpegs to be provided to client by manufacturer. Provide the following minimum hardwire relay alarms including:

.1 Screening system general fault alarm including one (1) hardwired fault relay to be connected to the Panalarm panel located in the existing main facility control panel within administration building. Field wiring of the alarm to the existing equipment is by the Contractor.

.4 HMI: Provide One (1) 178 mm colour Siemens model TP700 Comfort HMI touch screen with an elegant & intuitive graphic interface custom-designed to represent the specific project equipment components and arrangement including current stage in the operational sequence, set points, motor amperage, and real-time timer, liquid levels, and other pertinent control values. A standard control panel that does not graphically represent the specific Elmvale, ON screening layout drawings in plan and elevational views, equipment models, and system is not acceptable.

.5 The control panel will be a one-step-at-a-time operational cycle that effects a screenings-filter-mat-assisted form of screenings separation. This intermittent operation will augment the separation efficiency of the 6 mm aperture screen with the following minimum characteristics, components, and functionality to provide for a fully functioning fine screening system:

.1 The PLC programming and HMI design will enable the operator to review the real-time status and operational data of the specified step screening system. Present and future phase screening equipment data shall be represented on the control panel HMI screens and be available via Ethernet data exchange to the future SCADA facility network.

.2 Enable the adjustment of every aspect of the control narrative values for each piece of equipment for optimization that will significantly diminish electrical and wash water usage and runtimes/mechanical wear-and-tear.

.3 Regular and high-capacity wash compactor modes.

.4 The Elmvale WWTP currently does not have plant-wide SCADA system. Manufacture to ensure provided network switch has a minimum of one (1) Ethernet port available for connection to the future plant LAN plus a minimum of one (1) spare port. Quantity of Ethernet switch ports to be sized appropriately to meet the requirement above and all Ethernet connections required within the vendor supplied control panel. Acceptable manufacturers: Allen Bradley Stratix series, MOXA, Siemens X series.

.5 Enable a precautionary screen reverse self-clearing sequence based on the fine screens' Emotron M20 signal.

.6 The HMI will have password protection to ensure a tamper-proof interface. Password to be provided to Consultant and Township.

.3 Local HOA Control Stations:

.1 Furnish local HOA control stations for the fully automatic and manual operation of one (1) fine step screen, and one (1) wash compactor. Future local HOA stations to be provided with the future phase equipment.

.2 One (1) Class I, Div. 1 combination Man/Off/Auto, Forward/Reverse, and push-pull E-Stop push button in cast aluminum Class I, Div. 1, Group D enclosure for the screen and for the wash compactor (total of two [2] control stations) to be installed adjacent to the screen-in-tank and wash compactor as shown on the contract drawings. Local stations to bear a CSA certification label and be manufactured under ISO 9001:2015 certification. Operators to be 30mm NEMA 4X and by Siemens or Adalet.

.4 Disconnect Switches

.1 Furnish motor power lock-out disconnect switches for each motor installed on the face of the disconnect switch enclosure cast aluminum enclosures for mounting in the field close to the respective pieces of equipment. Enclosures to be cast aluminum, bear a CSA certification label and be manufactured under ISO 9001:2015 certification.

.2 Disconnect switches are to be suitable for Division 1, Class I, Group D area.

2.5 FACTORY FINISHING

.1 All welded stainless steel components are to be acid washed after welding by either full dipping, applying spray-on acid solution, or by using acid passivation paste, following which all components are thoroughly rinsed with clean water and allowed to air dry. Passivation is to be in accordance with ISO 14001.

.2 Supply materials that are non-stainless and non-galvanized fabricated steel components cleaned and prepared to SSPC-SP6 and shop painted with a self priming, chemical resistant epoxy paint.

2.6 FIELD FINISHING

.1 Finish painting system shall be the standards of the equipment manufacturer and suitable for the environment where ethe equipment will be installed.

.2 Supply drive systems components with manufacturer's standards washdown finish.

2.7 SOURCE QUALITY CONTROL

.1 Factory Tests:

.1 Factory test the centralized control panel in conjunction with supplied local control panels and related instrumentation and test motors in order to verify a complete and operational system, as well as related interlocks and operational sequencing prior to shipping. Network connectivity as well as PLC-based monitoring and alarming shall be fully verified. Factory testing to be carried out in the presence of the Consultant upon request. FAT test reports, including finished equipment photographs, to be submitted to the Consultant for review.

.2 Controls to be factory tested and reports are to be provided to the Consultant and the Township prior to shipment of the equipment.

.3 Mechanical equipment shall be submitted to factory testing. FAT test reports, including finished equipment photographs, to be submitted to the Consultant for review.

2.8 SPARE PARTS

.1 The screening manufacturer will provide the following spare parts:

.1 One (1) set of high load fibre-weave sleeve bushings (16 bushings plus required circa clips).

.2 Four (4) screen linkage system stub shafts, rockers, & connecting rods.

.3 One (1) set of wash compactor wear bars.

.4 Spare parts to be furnished in a suitable and heavy-duty tool box or plastic container with all parts labelled include associated drawings.

PART 3. EXECUTION

3.1 INSTALLATION

.1 In accordance with the manufacturer's written instructions.

Anchors by Contractor

.2 Provide anchor bolts, fasteners, washers, and templates required for installation. Accurately place anchor bolts using templates furnished by the manufacturer.

.3 mechanical screen system manufacture shall assist with installation instructions, inspection, and testing services related to the work of the Installation Contractor that includes but is not limited to installation of the following mechanical screen system components:

.1 All interconnecting control/power wiring.

.2 Verify all field wiring and PLC I/O connections made by Contractor to their respective termination points.

.3 Inspect, test, and verify communications links from respective control panels, drives and equipment to plant SCADA.

3.2 FIELD QUALITY CONTROL

.1 General:

.1 The mechanical screen system manufacture shall complete a Manufacturer's Certificate of Proper Installation upon satisfactory installation of the fine screening, washer/compactor and controls equipment.

.2 Mechanical screen system manufacture shall calibrate supplied instruments, sensors and meters for testing and regular operation service.

.3 Instrumentation and Controls Testing: After installation of the mechanical screen system and prior to commissioning, the mechanical screen system manufacture, in coordination with the Contractor, shall test all Fine Screening and Washer/Compactor instrumentation and controls functions and verify conformance with approved sequence of operation and system documentation. The Contractor shall also coordinate with the mechanical screen system manufacture and the contractor-hired electrician to ensure the connection of the screening system general Fault signal to the existing alarming equipment as specified herein. mechanical screen system manufacture and Contractor shall test the alarming system.

.2 Functional Tests:

.1 Functional testing shall be conducted after the installation of the mechanical screen system and all appurtenances is complete and plant utility water is available, to verify proper operation of all mechanical screen system and controls under wet-run conditions using plant water for Mechanical screen system feed.

Each complete unit shall be subject to field functional tests under wet-run conditions to determine that operation is satisfactory.

.2 The mechanical screen system manufacture, in coordination with the Contractor, will provide all temporary measures required for the functional tests. Written test procedures shall be submitted to the Consultant for approval a minimum of 60 days prior to testing.

.3 The functional tests shall determine the characteristics of each unit and demonstrate that the units:

.1 Have not been damaged by transportation or installation.

.2 Have been properly installed.

.3 Have no mechanical defects.

.4 Are in proper alignment.

.5 Have been properly connected.

.6 Are free of overheating of any parts.

.7 Are free of objectionable vibration and noise as specified.

.8 Are free of overloading of any parts.

.9 Are properly lubricated.

.10 Respond properly to all start-up and shutdown sequences.

.3 Vibration Test: Vibration testing shall be conducted during field functional testing. The mechanical screen system manufacture shall verify operations are within tolerances and the vibration signature recorded over the frequency domain.

Vibration testing not required due to low RPM operation of the equipment. FAT checks for smooth running of equipment.

.1 Provide vibration signature test data for each piece of equipment and drive assembly to meet performance requirements specified.

.2 Test Duration: Refer to Section 15010.

.4 Noise Test: Perform noise testing in the field with equipment installed and operating at peak capacity to verify noise produced by the equipment. Noise from equipment to be less than or equal to those listed by the manufacturer.

3.3 COMMISSIONING

.1 Following installation and initial checkout by the Contractor, the manufacturer is to provide a factory trained technician to:

.1 Inspect the installation, verify alignments, make adjustments, complete a functional verification of over-torque and other protective devices, measure motor amperages, and adjust the screen cleaning device.

.2 Provide a complete and detailed start-up report including all measurements made such as alignment, clearances, and initial start-up setpoints.

.3 Provide a start-up verification of field terminations to the centralized screening system controller, local control panels, local motor disconnects and supplied instrumentation.

.4 Assist the electrician and Contractor in the testing of the facility's existing alarm call-out system.

.2 Provide a checklist of items to be completed by Contractor prior to commissioning beginning.

3.4 MANUFACTURER'S SERVICES

.1 Manufacturer's Representative: The Contractor shall ensure that the manufacturer's representative will be present at Site or the classroom designated by the Township for the minimum number of person-days listed below, travel time excluded:

.1 2 Person-days, 2 separate Site visits for installation assistance and inspection.

.2 0.5 Person-day, 1 designated classroom or Site visit for pre-start-up classroom or Site training.

.3 3 Person-days, 1 Site visit for facility start-up.

.2 Training:

.1 Training shall not commence until an accepted detailed lesson plan for each training activity has been reviewed by the Consultant and approved by the Township.

.2 Only following commissioning and acceptance of screen installation by Consultant, the factory technician is to provide two 3-hour training sessions in the operation and maintenance of the equipment using slides, films and/or the maintenance manual provided.

.3 Training is to be separate from the start-up of the equipment and include classroom and on-site equipment walk-through & demonstration sessions.

.4 Document training and have participants sign record that training is satisfactorily completed.

.5 General:

.1 Training shall not commence until accepted detailed lesson plan for each training activity has been reviewed by the Township.

.2 Provide for training of designated Township personnel in operation and maintenance of Mechanical screen system equipment.

.3 Training shall consist of both classroom and hands-on sessions conducted at time and location acceptable to the Township.

.4 Designate a person responsible for scheduling and coordinating training.

.5 Training sessions may be recorded if the Township so chooses. If sessions are to be recorded, provide necessary recording equipment or approach. Recording equipment to be provided by Contractor (or) recording can be effected via a MS Teams meeting connection that records audio and visual presentation materials..

.6 Manufacturer's personnel shall provide detailed system training including, as a minimum, the following:

.1 System operations philosophy.

.2 System Control:

.1 Loop Functions: Understanding loop functions, including interlocks.

.2 Loop Operation: For example, adjusting process variable setpoints, and control.

.3 Interfaces with other loops and subsystems.

.3 Operator interface/system setpoints.

.4 Component performance requirements.

.5 Component functions.

.6 Component maintenance.

.7 Component troubleshooting.

.8 Instrument operation, maintenance, troubleshooting, replacement, and calibration procedures.

.7 Coordinate training periods with Township's operating personnel and manufacturer's representatives, and with submittal of O&M Manuals.

.1 Initial training shall be completed prior to start-up, but not more than 30 days prior to start-up.

.2 Operation and Maintenance Manuals shall be reviewed, accepted, and resubmitted in accordance with this section before start of training. Modifications resulting from start-up of facility shall be incorporated into final manuals.

.8 Perform Demonstration Training in accordance with Section 01820 – Demonstration and Training.

.3 Refer to Section 01640 - Manufacturers' Services, Section 01810 - Equipment Testing and Facility Commissioning, and Section 01820 - Demonstration and Training.

END OF SECTION