

Stantec Consulting Ltd.
400 - 655 Tye Road,
Victoria, BC
V9A 6X5

Addendum – No. 3

Project No.:	111720015	Owner:	District of Sooke
Addendum No.:	3	Contract No.:	WWTP-2020
Date:	August 5, 2020		

Addendum issued to active tenderers with documents on record (**566 pages**). *This addendum is to be read with and constitutes part of the tender document.*

The following changes to the Tender documents for District of Sooke Tender WWTP-2020 are issued by this Addendum No. 3.

QUESTIONS AND ANSWERS

Q3.1. Would it be possible to arrange another walkthrough of the site for our electrical contractors?

An "optional" site walk through will be provided to interested bidders:

Location: Sooke Wastewater Plant
Left at 7113 West Coast Road
700m gravel road to a gate.
If the gates not open call the number on the gate and we will open it.

Date: Friday August 7th, 2020

Time 9:00 am

Q3.2. Could this tender be extended to August 13, 2020?

Tender Closing Date extended until August 13th, 2020 by Addendum No. 2.

Q3.3. Please provide the shop drawings of the pre-purchased equipment if available. Some required information is as follows:

- Weight of centrifuge and conveyors
- Confirm the conveyor/centrifuge supports c/w anchor bolts and seismic engineering is by the conveyor/centrifuge supplier
- Does the long conveyor come in 2 parts requiring the shaft to be welded in the field?
- Confirm complete training and testing and commissioning is included by equipment suppliers

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- Confirm conveyor, sludge pump and centrifuge motor HP and FLAs

Shop Drawings for Centrifuge and Screw Conveyors attached.

- **Weights:**

Centrifuge (Decanter)	Weight (Empty) = 3,500 kg
Supply Conveyor 1	Weight Full (100%) = 1,055 kg
Supply Conveyor 2	Weight Full (100%) = 515kg
Supply Conveyor 3	Weight Full (100%) = 515kg

- **Seismic engineering**

Conveyor/centrifuge supports c/w anchor bolts and seismic engineering by Stantec as per structural drawings

All main and internal parts of the decanter are able to withstand inertial forces, which may occur during an earthquake, below 2 times the gravitational acceleration

The decanter is attached to the foundation through vibration isolators which are designed and selected to withstand forces in any direction of up to 2 times the weight of the decanter without permanent damage, and up to 5 times the weight of the decanter without rupture.

- **Field Welding**

Long conveyor comes in Two parts. Requires a field weld joint for the spiral (prepared in factory).

Field welding of support legs may also be required. No details provided with conveyor shop drawings.

- **Training, testing, and commissioning**

The suppliers for all equipment are required to provide a minimum of 5 days of startup and commissioning assistance and operator training.

- **Motor HP and FLA**

	HP	FLA
Centrifuge Main Drive	50HP Motor 575/3/60	45.6
Centrifuge Back Drive	10HP Motor 575/3/61	12
Supply Conveyor 1	3HP Motor 575/3/60	3.6
Supply Conveyor 2	2HP Motor 575/3/60	2.54
Supply Conveyor 3	2HP Motor 575/3/61	2.54

Q3.4. Is the contractor responsible for damage to the pre-purchased equipment once the contractor takes possession? If yes, what is the value of the pre-purchase equipment for insurance purposes?

Yes. See price summary below

Centrifuge + PLC	\$241,065
Progressive Cavity pumps	\$38,585
Polymer system	\$59,353
Supply Conveyor 1	\$43,650
Supply Conveyor 2	\$21,825
Supply Conveyor 3	\$21,825
Conveyor E&IC equip.	\$6,500

Q3.5. The existing centrifuge system will need to be shutdown for an extended duration during installation. Is Sooke Operations or the Contractor responsible for dewatering and disposing of the sludge during the construction period? If the contractor is responsible, we will need more time to price a temporary rental system and will also need to know the WAS storage available and the daily WAS volume

The District does not anticipate that the existing centrifuge will need to be offline for an extended period of time and does not want temporary dewatering and disposal of biosolids.

There are 2 periods when the existing centrifuge would be offline

- 1 When the sludge pumps and piping on the west wall are replaced. If the new PVC piping is precut and dry fitted, it should be possible to remove existing piping and replace within a 7 day period. Double shifts or 7/24 work would be allowed. Mobile dewatering is not allowed
- 2 During installation of screw conveyors 1 & 2 are installed. If the new structure is constructed outside and the wall penetration is prepared, it should be possible to install the two new conveyors within 7 days.

The installation of the new centrifuge and polymer system can be accomplished without disrupting the operation of the existing centrifuge.

Q3.6. Currently spec 40 05 15 call for FRP pipe supports. Would 316SS be acceptable instead?
Yes

Q3.7. There are no items in the Schedule of Quantities for Division 2 (Demolition) and Division 31 (Civil). Should the demolition and civil work be included in the pricing. If yes, which item?

Form of Tender

Delete: Appendix 1 - Schedule of Quantities and Prices page 8 of 21

Insert: Appendix 1, Rev 1 - Schedule of Quantities and Prices (attached)

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Specification Section 01 15 00 MEASUREMENT AND PAYMENT

Insert:

3.11 DIVISION 2– DEMOLITION**.1 Item 2 – Demolition**

.1 This item shall include all costs associated with removal and disposal of all equipment and piping required to facilitate the installation of the new systems.

.2 Payment will be made on the percentage complete applied to the lump sum price tendered

Pricing for Civil Works may be added to Division 03 - Concrete and Division 05 - Metals

Q3.8. Does the tender submission need to include appendix 4-6; typically, these types of forms are during contract signing

Appendix 4-6 should be initialed only. Signatures will be added during contract execution.

Q3.9. Is the Conveyor Control panel PNL-4 supplied with the Conveyor Package?

The intent was the control detailed by PNL-04 is part of the dewatering equipment package. This vendor-supplied panel was to be supplied with Ethernet/IP for monitoring by ACP-500/SCADA and control by PNL-03. Coordination previously occurred to merge functionality of PNL-01 (existing), PNL-02 and PNL-04 within PNL-03 (see dewatering equipment scope of supply, item 1.2.1.4); at present, understanding is that PNL-01 will remain separate, and it is likely the polymer system will have it's own skid controller per the manufacturers

1.2 SCOPE OF SUPPLY AND DESCRIPTION OF GOODS

.1 The supply, delivery, start-up and commissioning of dewatering equipment for incorporation into the District of Sooke WWTP Upgrades 2019 in Sooke, BC. This consists of the following.

- .1 Supply of a 30 m³/hour decanting centrifuge for dewatering aerobically digested SBR waste activated sludge at the Sooke Wastewater Treatment Plant in Sooke, British Columbia.
- .2 Supply of a polymer solution preparation and blending system compatible with the proposed decanting centrifuge.
- .3 Supply of two (2) progressive cavity sludge feed pumps compatible with the proposed decanting centrifuge.
- .4 Supply of an integrated Programmable Logic Control (PLC) system for the control and operation of the new decanting centrifuge, the existing centrifuge, polymer preparation and blending system, sludge feed pumps and dewatered cake screw conveyors (3 total).
- .5 Installation support services.
- .6 Testing, start-up and commissioning support services

.2 This tender consists of the supply, delivery, start-up and commissioning of a dewatering centrifuge and related equipment, as detailed on the drawings and in the specifications (the “Goods”).

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requirements. In preparation for Panel PNL-04 not being vendor-supplied, an upcoming addenda will include a remote I/O panel with control station, to be supplied, programmed and installed by the Contractor. The I/O contained within the cabinet will be Allen Bradley-based, and the operating logic contained in ACP-500, based on calls to operate from PNL-

Q3.10. Are the three conveyor starters supplied by the contractor?

Supply by the Contractor is the expectation (reversing starters, wall mounted within the electrical room, hard wired to PNL-04 referenced above). Challenge will be the incorporation of a 'shock' sensor that is detailed for installation within each starter 'MCC bucket', which means the equipment needs to be accommodated within the provided starter equipment.

I assume the two Sludge Pump VFDs are supplied by the contractor. Note that the spec is asking for Line and Load filters. If we use AB drives it will need to go to AB Engineering to quote. AB may need more time.

Noted. See 262911.2.1.1.1 for approved manufactures, and note this equipment is not designated for installation in an MCC enclosure so 2.1.1 does not apply to be aligned only with the MCC supplier.

Q3.11. Drawings E-601 shows Panel PB-600V with 6CCT. With 6 x 3 Pole breakers we need at least 36 CCT

- How many CCT do you want for PB-600V?

Intent is to allow for 6-3pole breakers for the 600V panel. One of those would be a spare 30A 3P.

The spec says 35KA unless noted. What KA rating do you want for PB-600V?

The MCC board indicates a 42kA bracing; considering the sub-feed, 35kA is likely acceptable. To be safe, recommend executing requirement of Coordination/Arc Flash study per 260501.2.17/2.18 to ensure no issue with this equipment at this bracing of 35kA.

Q3.12. The three new control panel are wired to the existing PLC ACP-500

- Do we need to add I/O card, relays, Network switches or other electrical components to PLC ACP-500?

Intent is for control of Conveyor and Centrifuge panels over ethernet/ip, managed by the new centrifuge PLC (logic and coordination the responsibility of the Contractor). Allowance for minimal hard wiring, to be verified with vendor shop drawings (only use if required).

Intent is for Polymer to be wired to available I/O in exiting PLC cabinet (ACP-500).

Q3.13. Intent is for VFD-01/02 to be wired to available I/O in exiting PLC cabinet (ACP-500). Option, control of VFD strictly with Ethernet/IP (262911.2.11.1) and replace armored control cables with armored CAT6.

Available I/O: 7DO, 10DI, 3AI, 5AO (strict requirement is anticipated only for Polymer, but should allow for VFD-01/02 as well)

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Available Ethernet: mount power and wire 509FX switch and tie to existing 708FX2, allowing 8 available ethernet connections.

Q3.14. Drawing E-101 has minimal information on it

- Can you show the new Cable Tray layout?

Tray is required for supporting cabinet to field equipment. Anticipation is Contractor to expand on tray system around the centrifuge room to suit.

- Can you show the lights and receptacles in the new construction area?

The facility is existing, with a canvas overhang; there is no intention to provide drawings of existing equipment. There may be the opportunity to replace existing fixtures or revise location of existing fixtures to suit orientation of conveyor equipment.

Q3.15. Drawing E1-650 Centrifuge #2 Vender Panel does not quantify the number of conductor or pairs going back to PLC ACP-500

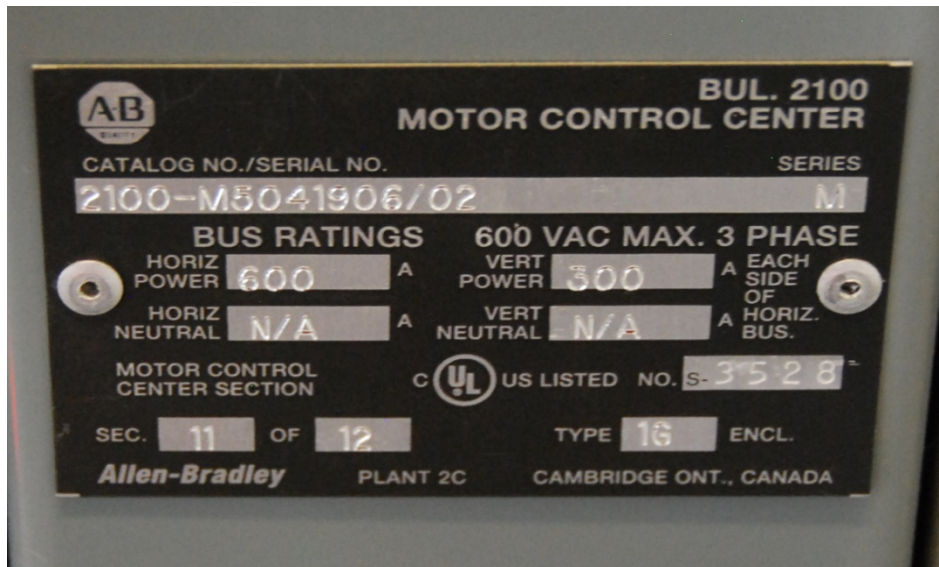
- Can you provide the number of conductor and pairs?

These conductors may not be required, based on the feedback from the Centrifuge supplier; anticipation is that Ethernet/IP will be used exclusively. This will be confirmed and updated in a separate addenda.

Q3.16. The spec does not provide the serial number of the existing AB MCC

- Can you also provide a picture of the name tag?

2100-M5041906/02, to be verified it relates to the structures being modified. See below:



<p style="text-align: center;">Stantec Consulting Ltd.</p> <p style="text-align: center;"></p> <p style="text-align: center;">Prepared by: Stan Spencer, P. Eng. Process Mechanical Lead Phone: (250) 389-2376 Stan.spencer@stantec.com</p>	<p style="text-align: center;">Stantec Consulting Ltd.</p> <p style="text-align: center;">Prepared by: Sean Lockhart, P. Eng. EIC Lead Phone: (250) 389-2511 Sean.lockhart@stantec.com</p>
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APPENDIX 1, REV.1

SCHEDULE OF QUANTITIES AND PRICES – GST EXCLUDED (See paragraphs 3.3.4 and 10.1 of the Instructions to Tenderers)

Description	Quantity	Unit	Total Price (\$)
DIVISION 00 – CONTRACT REQUIREMENTS			
Item 1.1 – Bonding and Insurance	1	LS	
DIVISION 01 – GENERAL REQUIREMENTS			
Item 2.1 – Mobilization and Demobilization	1	LS	
Item 2.2 – Startup, Commissioning and Training	1	LS	
Item 2.3 – O and M Manuals and Record Drawings	1	LS	
DIVISION 02 – DEMOLITION	1	LS	
DIVISION 03 - CONCRETE	1	LS	
DIVISION 05 - METALS	1	LS	
DIVISION 22 - PLUMBING	1	LS	
DIVISION 25 – INTEGRATED AUTOMATION			
Item 6.1 – SCADA PLC Programming/Integration	1	LS	
DIVISION 26 – ELECTRICAL			
Item 7.1 – Electrical Equipment and Wiring	1	LS	
Item 7.2 – Commissioning Support	1	LS	
Item 7.3 – Other Electrical	1	LS	
DIVISION 40 – PROCESS EQUIPMENT			
Item 8.1 – Process Piping and Valves	1	LS	
Item 8.2 – Other Process Appurtenances	1	LS	
DIVISION 43 – PROCESS PUMPS			
Item 9.1 – Dewatering Centrifuge Feed Pumps	1	LS	
DIVISION 46 – DEWATERING EQUIPMENT			
Item 10.1 – Dewatering Centrifuge	1	LS	
Item 10.2 – Polymer System	1	LS	

Description	Quantity	Unit	Total Price (\$)
Item 10.3 – Conveyor System	1	LS	
Sub-Total:			\$
GST (5%):			\$
Total:			\$

STANTEC
PROJECT #: 111720015

SUBMITTAL # 5185 rev1

This review by Stantec is for general conformance with the design concept of Stantec's design of the:

- Architectural
- Structural
- Electrical
- Other
- Mechanical



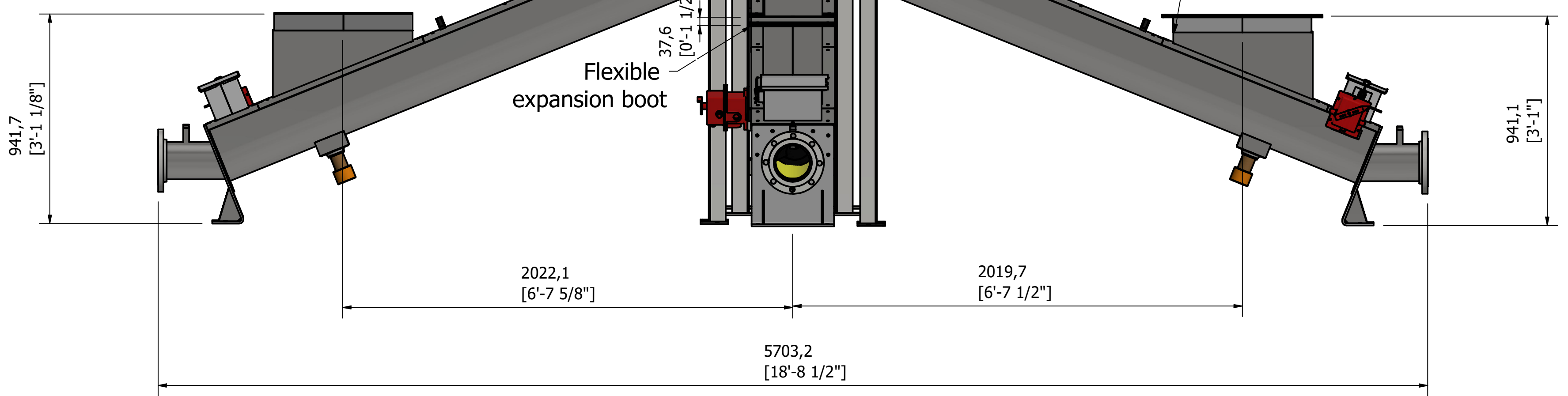
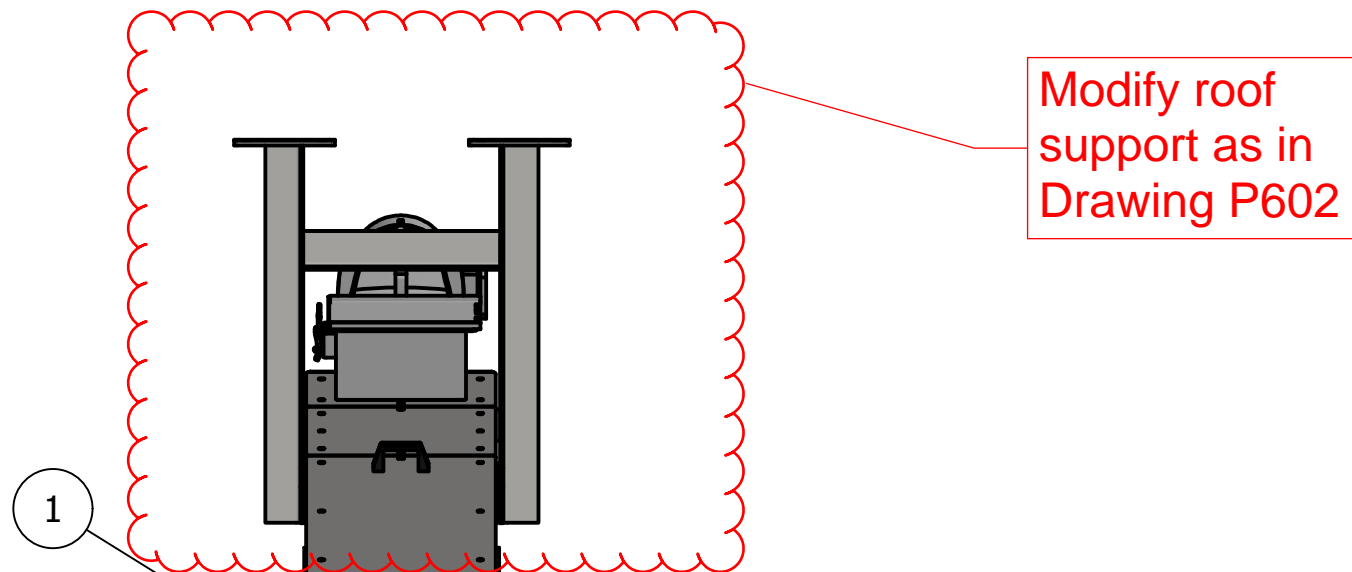
- REVIEWED
- REVIEWED, AS NOTED
- REVISE AND RESUBMIT
- NOT REVIEWED

DATE 2020-06-09

BY SSpencer

component(s) only and does not mean that Stantec has verified or approves the shop drawing(s). The Contractor remains solely responsible for the shop drawing(s) and this review by Stantec does not relieve the Contractor of the Contractor's responsibility for errors or omissions in the shop drawing(s) or for meeting all requirements of the contract documents. This review does not mean that Stantec approves the detailed design inherent in the shop drawing, responsibility for which shall remain with the Contractor submitting same, nor does this review mean that Stantec accepts any deviation of the shop drawing(s) from the contract documents. The Contractor is responsible for confirming all dimensions and correlating them at the job site, for all construction means, methods and techniques, and for coordination of construction work of all trades, including coordination of all shop drawings.

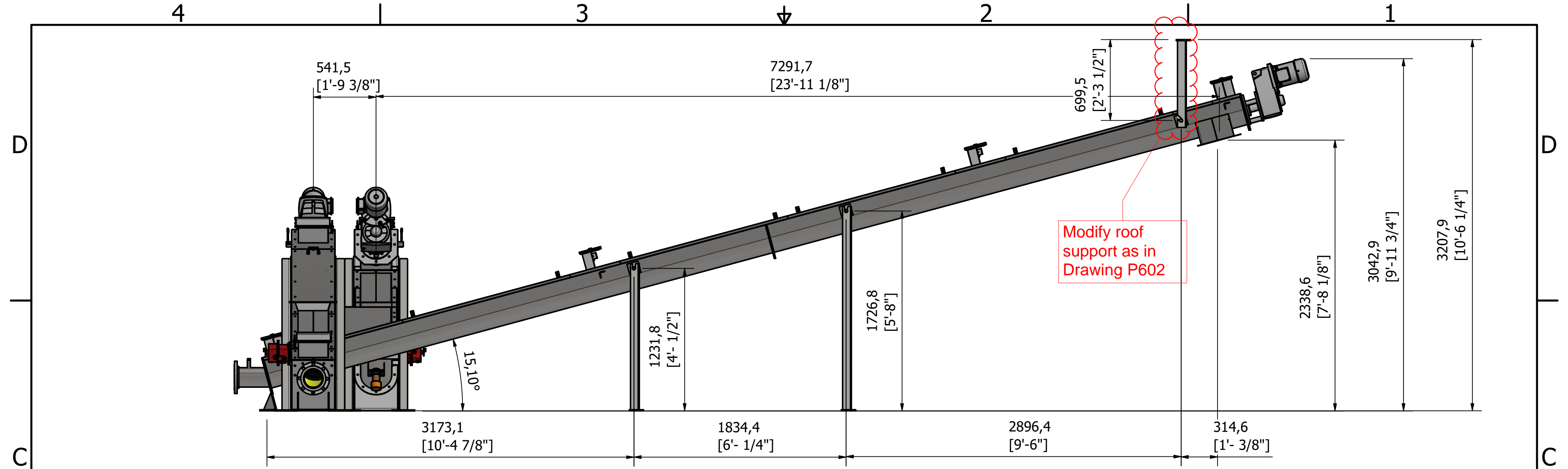
LISTE DE PIÉCES			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	5185-Conveyor 1 Total assembly	
2	1	5085-Conveyor 2 total assembly	
3	1	5085-Conveyor 3 total assembly	
4	2	5185-Transition chutes	



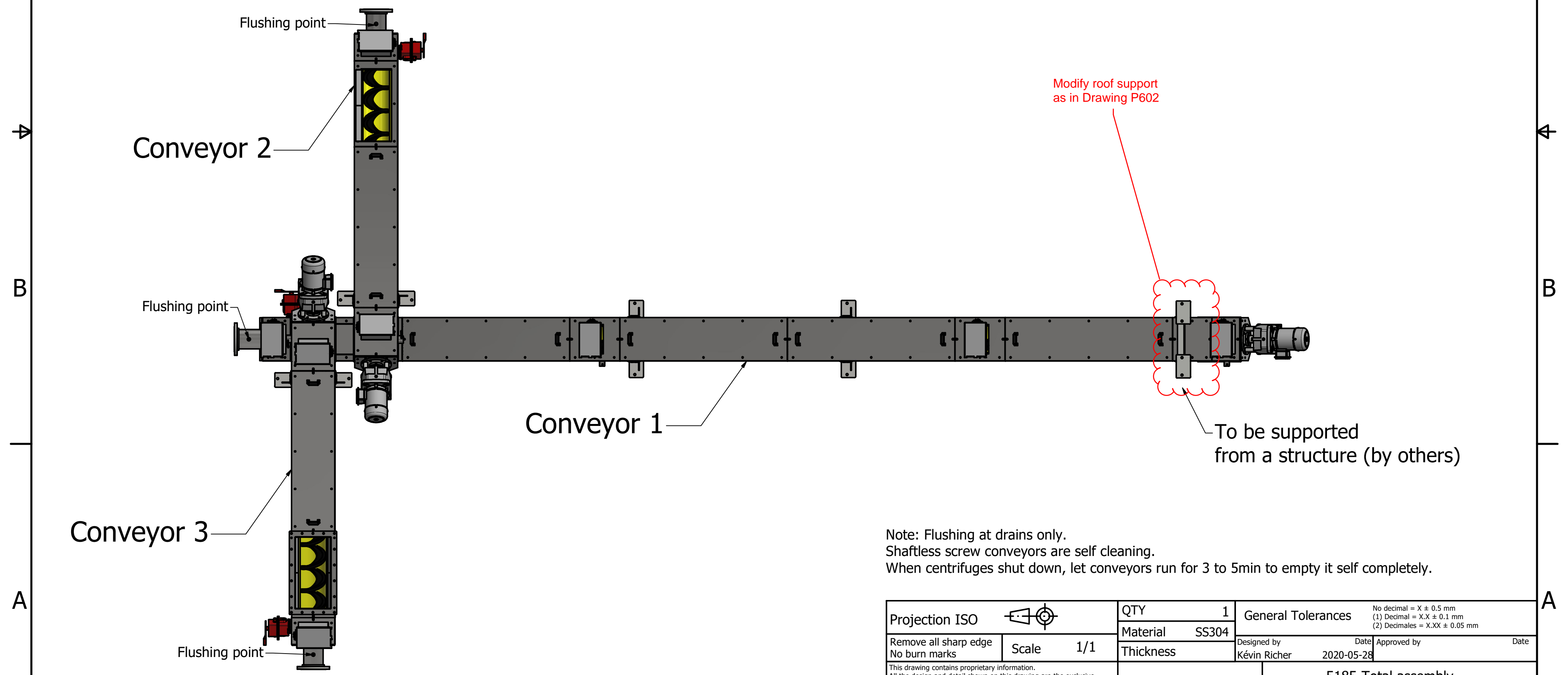
Projection ISO		QTY	1	General Tolerances	No decimal = X ± 0.5 mm (1) Decimal = X.X ± 0.1 mm (2) Decimals = X.XX ± 0.05 mm
Remove all sharp edge No burn marks	Scale 1/1	Material	SS304	Designed by	Kévin Richer
		Thickness		Date	2020-05-28
				Approved by	
				5185-Total assembly	
				5185 - Sooke	Edition 1
				Sheet 1 / 2	

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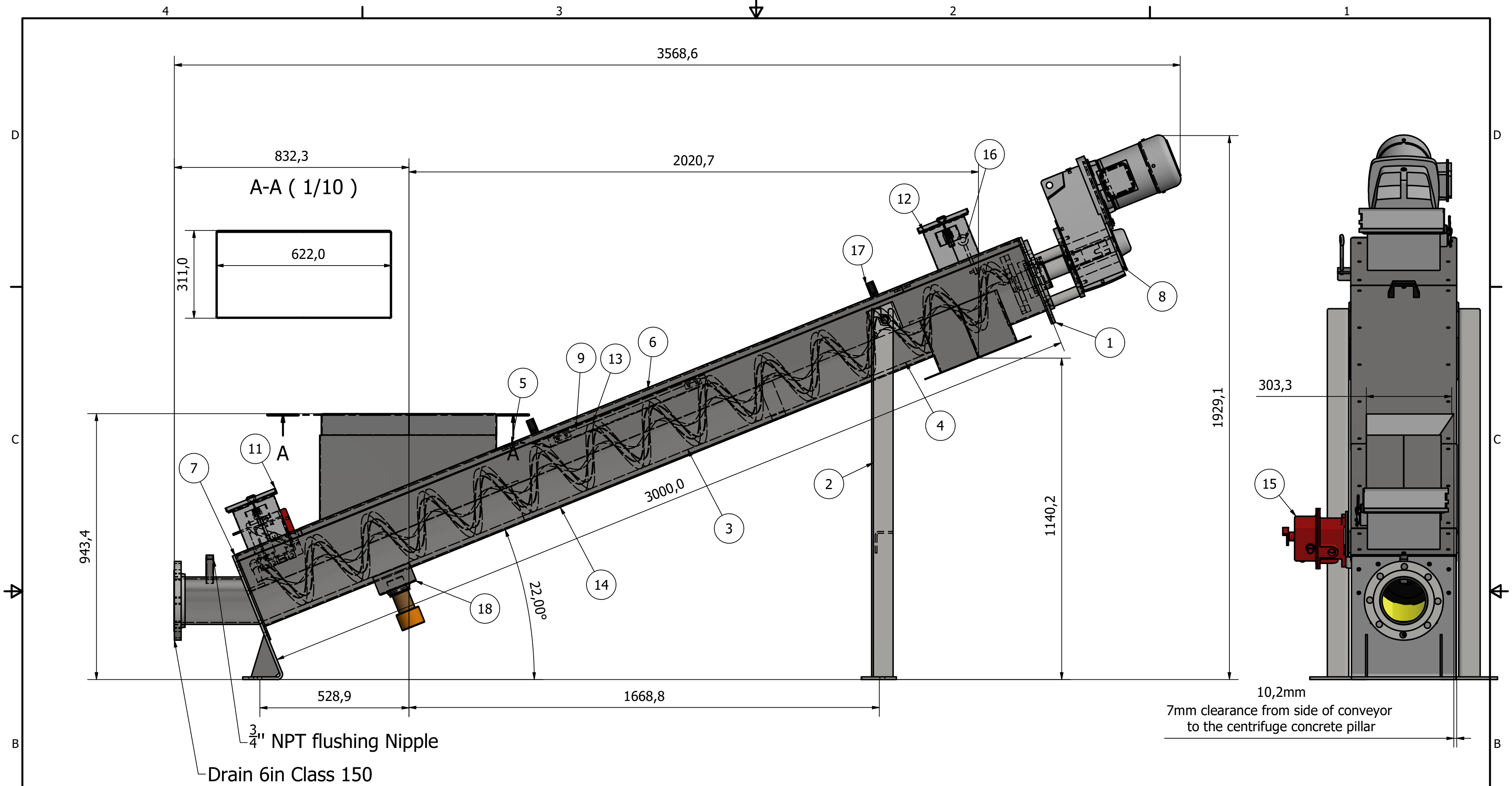


Modify roof support as in Drawing P602



Note: Flushing at drains only.
 Shaftless screw conveyors are self cleaning.
 When centrifuges shut down, let conveyors run for 3 to 5min to empty it self completely.

Projection ISO		QTY	1	General Tolerances		No decimal = X ± 0.5 mm (1) Decimal = X.X ± 0.1 mm (2) Decimals = X.XX ± 0.05 mm
Remove all sharp edge No burn marks	Scale 1/1	Material	SS304	Designed by	Date	Approved by
		Thickness		Kévin Richer	2020-05-28	
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				5185 - Sooke	Edition 1	Sheet 2 / 2



3/4" NPT flushing Nipple
 Drain 6in Class 150

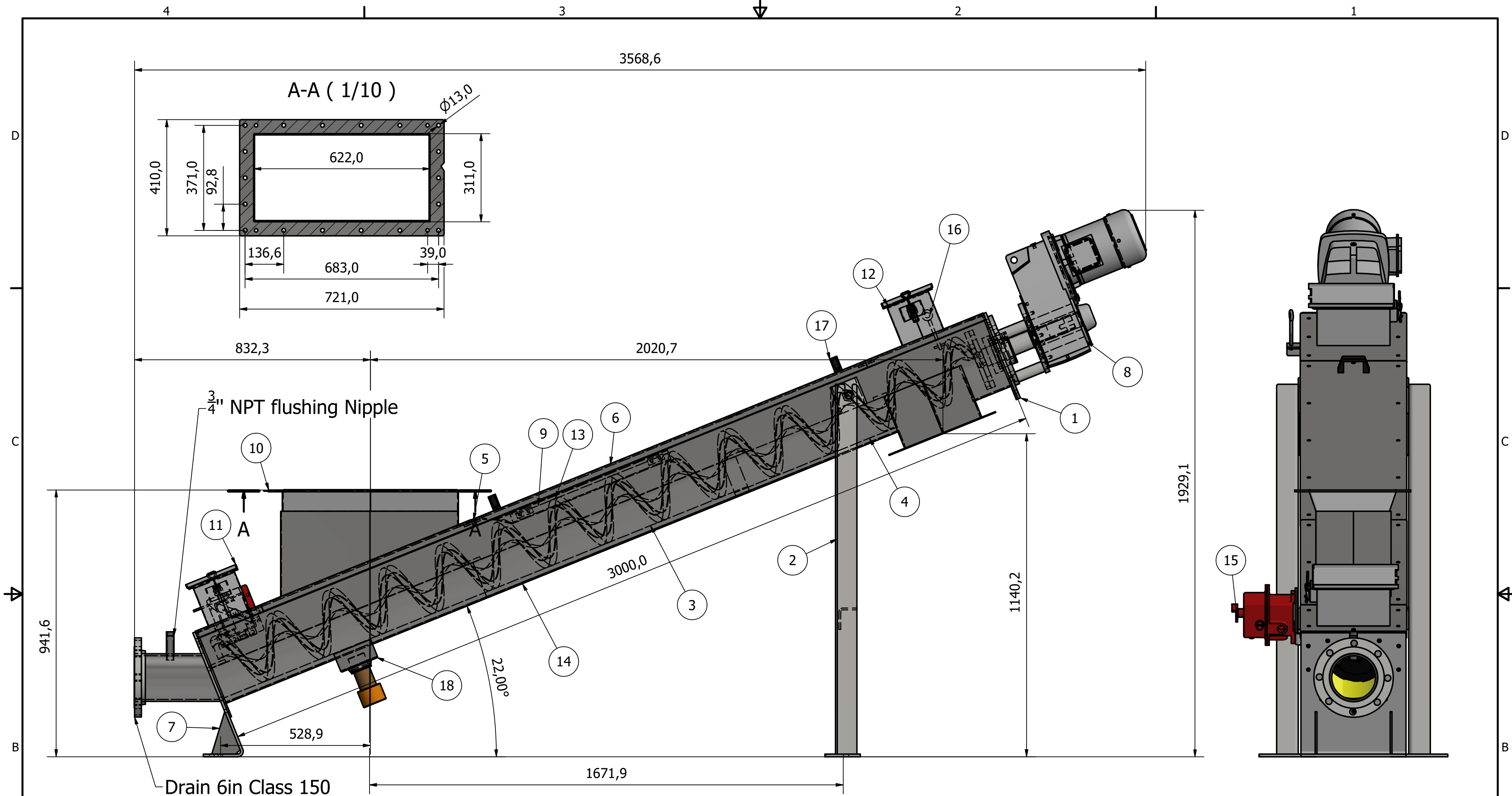
10,2mm
 7mm clearance from side of conveyor
 to the centrifuge concrete pillar

LISTE DE PIECES

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	5185-09-02	GEAR DRIVE END PLATE SK4X
2	1	5185-23-Top Support	TOP SUPPORT
3	2	5185-27-01	LINER 1000mm
4	1	5185-27-02	LINER 615mm
5	2	5185-28-01	BRACE
6	1	5185-29-01	LID 1m
7	1	5185-Bottom support plate assembly	BOTTOM SUPPORT PLATE ASSEMBLY
8	1	5185-GD Assembly	GEAR DRIVE ASSEMBLY
9	1	5185-Hold down	HOLD DOWN DEVICE
10	1	5185-Inlet chute	INLET CHUTE
11	1	5185-Inspection port	150mm above cover, C/w mesh + hinges and latch
12	1	5185-Inspection port 2	150mm above cover, C/w mesh + hinges and latch
13	1	5185-Spiral assembly CNV 2	RH Spiral 215x215 C/w Coupling disc
14	1	5185-Trough assembly CNV2	THROUGH SS304 3/16"
15	1	CCC-SPS	SPS DEVICE
16	1	HEXCO-EYEBOLT	EYEBOLT
17	2	Plastic Handle	HANDLE
18	1	SISTRANS WM100-PROBE	PROBE

Conveyor U260
 2HP Motor 575/3/60
 Spiral 215mmOD at 23RPM
 Capacity 4m3/h at 50% fill rate
 Weight empty = 420 kg
 Weight Full (100%) = 515kg

Projection ISO		QTY	1	General Tolerances	No decimal = X ± 0.5 mm (1) Decimal = X.X ± 0.1 mm (2) Decimals = X.XX ± 0.05 mm
Remove all sharp edge No burn marks	Scale 1/1	Material	SS304	Designed by	L.Pierre
		Thickness		Date	2020-05-28
<small>This drawing contains proprietary information. All the design and detail shown on this drawing are the exclusive property of Atara Equipment Ltd and are confidential. This drawing may not be copied or disclosed to others without the written permission of Atara Equipment Ltd. All patent and design are reserved.</small>				5085-Conveyor 2 total assembly	
		5185 - Sooke		Edition	1
				Sheet	1 / 1



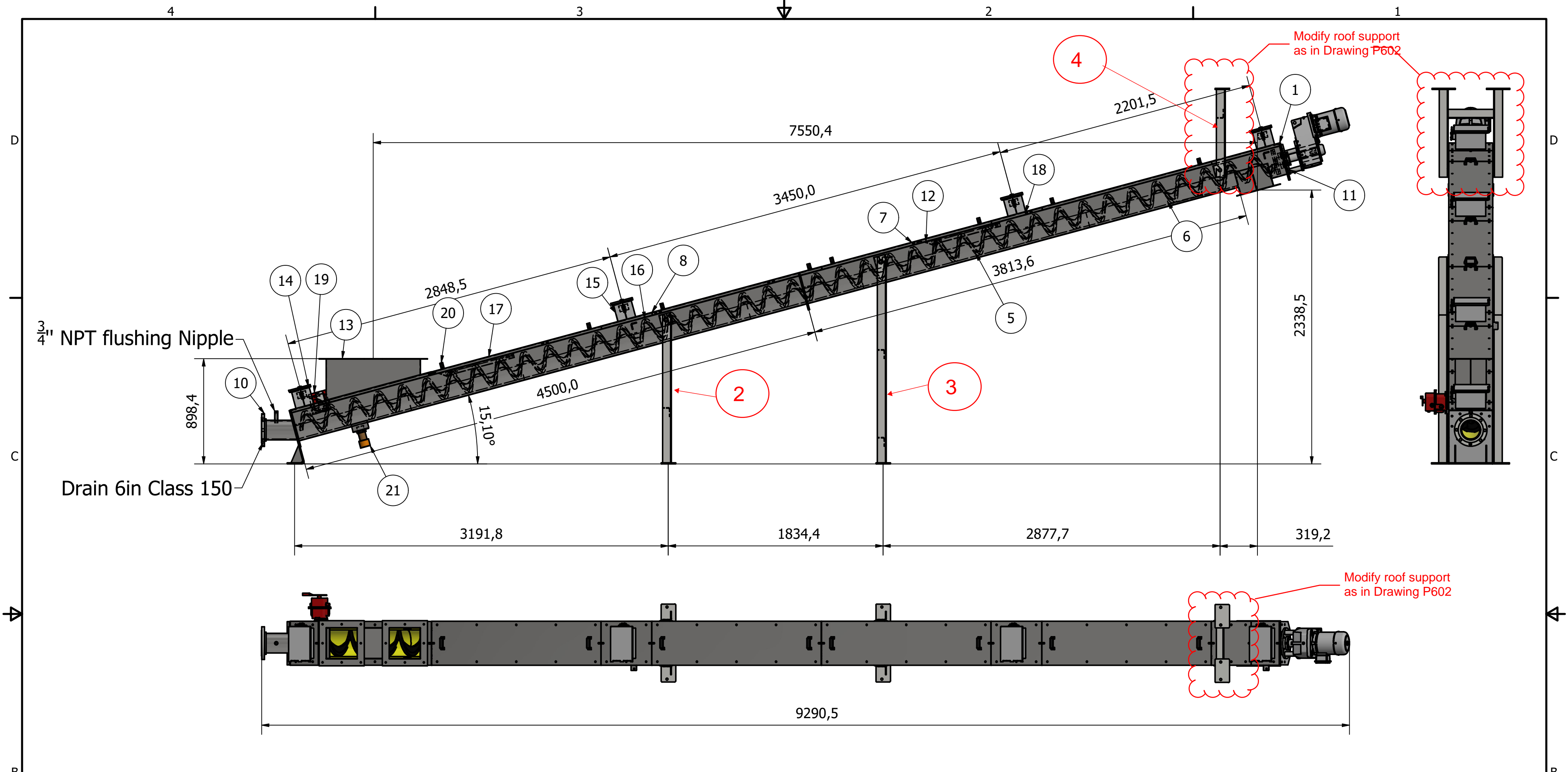
Drain 6in Class 150

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3	2	5185-27-01	LINER 1000mm
4	1	5185-27-02	LINER 615mm
5	2	5185-28-01	BRACE
6	1	5185-29-01	LID 1m
7	1	5185-Bottom support plate assembly	BOTTOM SUPPORT PLATE ASSEMBLY
8	1	5185-GD Assembly	GEAR DRIVE ASSEMBLY
9	1	5185-Hold down	HOLD DOWN DEVICE
10	1	5185-Inlet chute	INLET CHUTE
11	1	5185-Inspection port	150mm above cover, C/w mesh + hinges and latch
12	1	5185-Inspection port 2	150mm above cover, C/w mesh + hinges and latch
13	1	5185-Spiral assembly CNV 3	RH SPIRAL 215 x 215 C/w coupling disc
14	1	5185-Trough assembly	THROUGH
15	1	CCC-SPS	SPS DEVICE
16	1	HEXCO-EYEBOLT	EYEBOLT
17	2	Plastic Handle	HANDLE
18	1	SISTRANS WM100-PROBE	PROBE

Conveyor U260
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Scale	1/1	Thickness		Designed by	Date
				L.Pierre	2020-05-28
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			5085-Conveyor 3 total assembly		
			5185 - Sooke	Edition	Sheet
				1	1 / 1



LISTE DE PIECES

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	5185-09-02	GEAR DRIVE END PLATE SK4X
2	1	5185-24-Support CNV1-1	TOP SUPPORT
3	1	5185-25-Support CNV1-2	TOP SUPPORT
4	1	5185-26-Roof support	ROOF SUPPORT
5	8	5185-27-01	LINER 1000mm
6	1	5185-27-02	LINER 615mm
7	1	5185-28-01	BRACE
8	4	5185-29-01	LID 1m
9	1	5185-29-04	LID 1m
10	1	5185-Bottom support plate assembly CNV1	BOTTOM SUPPORT PLATE ASSEMBLY
11	1	5185-GD Assembly	GEAR DRIVE ASSEMBLY
12	2	5185-Hold down	HOLD DOWN DEVICE
13	1	5185-Inlet chute	INLET CHUTE
14	2	5185-Inspection port	150mm above cover, C/w mesh + hinges and latch
15	2	5185-Inspection port 2	150mm above cover, C/w mesh + hinges and latch
16	1	5185-Spiral assembly CNV 1	RH Spiral 215x215 Cw Couplind disc
17	1	5185-Trough assembly CNV1 Part 1	THROUGH SS304 3/16"
18	1	5185-Trough assembly CNV1 part 2	THROUGH SS304 3/16"
19	1	CCC-SPS	SPS DEVICE
20	8	Plastic Handle	HANDLE
21	1	SISTRANS WM100-PROBE	PROBE

Conveyor U260
 3HP Motor 575/3/60
 Spiral 215mmOD at 23RPM
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				5185 - Sooke	Edition 1 Sheet 1 / 1



STANTEC PROJECT # 111720015

SUBMITTAL # 5185 rev1/ Conveyor

This review by Stantec is for general conformance with the design concept of Stantec's design of the:

- Architectural
 Structural
 Mechanical
 Electrical
 Other

component(s) only and does not mean that Stantec has verified or approves the shop drawing(s). The Contractor remains solely responsible for the shop drawing(s) and this review by Stantec does not relieve the Contractor of the Contractor's responsibility for errors or omissions in the shop drawing(s) or for meeting all requirements of the contract documents. This review does not mean that Stantec approves the detailed design inherent in the shop drawing, responsibility for which shall remain with the Contractor submitting same, nor does this review mean that Stantec accepts any deviation of the shop drawing(s) from the contract documents. The Contractor is responsible for confirming all dimensions and correlating them at the job site, for all construction means, methods and techniques, and for coordination of construction work of all trades, including coordination of all shop drawings.



- REVIEWED
 REVIEWED, AS NOTED
 REVISE AND RESUBMIT
 NOT REVIEWED

DATE 2020-06-03

BY SSpencer

Submittal Revision 1

ATARA Shaftless Screw dewatered sludge Conveyor

SUPPLY AND DELIVERY OF DEWATERING EQUIPMENT DISTRICT OF SOOKE WWTP UPGRADES 2019

Letter " Preferred Proponent by Stantec Consulting Ltd."



ATARA Project # 5185

Client: **District of Sooke**
Supplier / Manufacturer: **ATARA EQUIPMENT LTD**

Project Manager: **Laurent Pierre**
date: **28 May 2020**



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INTRODUCTION

1.1. Warning

In order to avoid damage to the equipment and personal injury, this manual should be read through and understood, prior to the conveyor reception, installation and/or service.

All personnel should be informed of all Regional and Local Plant safety regulations plus the safety instructions found in this manual.

All **ATARA** conveyors are built to convey different types of materials that may be wet, semi- fluid, sludgy, uneven or hygienically demanding etc. However, every **ATARA** conveyor is custom manufactured, to give maximum working efficiency, for the specific material being conveyed.

Your conveyor is designed for your specific type of material, conveying any other material than specified will change the design parameters and warranties.

This manual is relevant for all **ATARA** conveyors and installations. But because **ATARA** conveyors are produced in various sizes and with varying capacities, the diagrams in the manual can differ some what from your conveyor. Take care to ensure that this manual is relevant for your specific conveyor. The conveyor I.D & Tag numbers are located on the conveyor's data plate and should correspond to the number on the drawings provided with this manual.

In order to maintain a problem free operation, the conveyor should be serviced in accordance with the instructions in this manual.

Any modification, change or rebuilding of an **ATARA** conveyor, must be approved in writing by **Atara Equipment Ltd** so that conveyor damage and or personal injury are avoided and that documentation stay relevant.

Atara Equipment Ltd assumes no responsibility for injuries that result from unprofessional conduct.

All installation and service should be conducted by skilled service personnel i.e. all welding should be done by qualified and experienced welders and all electrical installation by qualified and experienced electricians etc.

If you have any concerns with our product please contact your supplier:

ATARA EQUIPMENT LTD

3737 Boul Lite
Laval, QC, H7E 4X8

TEL: 1 (514) 931-5445 or 1 (866) 931-5445

FAX: 1 (514) 931-0629

e-mail: info@ataraequipment.com

1.2. Warranty of Equipment

Your conveyor is supplied by **Atara Equipment Ltd** under the scope of the actual contract is guaranteed against any fabrication default for a period of Twelve (12) months from the date of substantial completion.

Atara Equipment Ltd warrants its equipment against defects in material and workmanship under normal use and service, which shall not have been subjected to misuse, negligence or accident, for a period of 1 year from beneficial use, the period of beneficial must start within 90 days from delivery, or whichever comes first.

Atara Equipment Ltd will replace or repair free of charge, FOB **Atara Equipment Ltd** warehouse, such part or parts thereof as in its sole judgment shall be deemed defective.

This warranty shall not apply to any piece of equipment manufactured and / or supplied by **Atara Equipment Ltd**, which shall have been loaded or operated beyond its rated capacity as specified. Damages resulting from improper installations or alterations outside the plant will be considered, as misuse and not as a defect. Certain parts of the supplied equipment, provided by **Atara Equipment Ltd** come in contact with other material which is subject to normal wear. This normal wear is not covered under this warranty. **Atara Equipment Ltd** shall not be liable for consequential damages or injuries of any kind, or for expenses, losses or delays incidental to any failure.

Atara Equipment Ltd reserves the right to make changes and improvements in its products without incurring any obligations to install any such changes or improvements in its products previously manufactured.

1.3. Atara Equipment Ltd Quality assurance

Atara Equipment Ltd installations comply with all the existing norms and legislation within this specification. Our quality control includes (when applicable):

- The strength and resistance of all materials,
- Manufactured using all new materials
- Welding procedures (pre & post)
- Preparation of all surfaces
- Protective coatings
- Respect for all approved dimensions,
- Recommendations for electrical components,
- Security norms and environment protection.

All the main components supplied by **Atara Equipment Ltd** are standardised to ensure their availability.

For parts that are not made by **Atara Equipment Ltd**, long-term agreements have been established with our sub-suppliers.

Assembly of components, set-up, study and execution of automation, programming of computers is done by **Atara Equipment Ltd** or under its quality control when sub-contracting.

Prior to shipping, installations are tested at the shop by the technicians in charge of the start-up on site. The O & M Manual is submitted prior to start up.

An active maintenance program, prompt spare parts delivery and our clients environmental concerns guaranty the quality of **Atara Equipment Ltd** systems.

GENERAL DESCRIPTION

2.1. Description of equipments

Shaftless screw dewatered sludge conveyor

Atara Equipment Ltd will supply Three (3) *ATARA* shaftless screw sludge conveyor (**CON-U260**) complete with gear drives, motion failure alarms, safety pull cable switches and overload protections for motors (shock relays).

Two inclined conveyors (**CON-U260: Screw conveyor No.2 & No.3**) receive sludge by gravity from the centrifuges (One existing and One new supplied by others) through an inlet chute and discharge the sludge through their outlet chute into another inclined conveyor (**CON-U260: Screw conveyor No.1**).

This conveyor No.1 discharges the sludge through the outlet chute by gravity into the disposal bin

The motors are reversible and drain pipes and flushing connections are provided to connect when the rinse water mode is on.

Before changing from pulling to pushing mode (or vice-versa), the conveyor has to run long enough to be able to remove any residual sludge left in the trough (in order to avoid any damage on the equipment).

Safety equipment

Motion failure alarm (one per conveyor) is supplied by *Atara Equipment Ltd*. This motion sensor (probe and controller) is located at the free end of the spiral, on the bottom of the trough. This system is used to confirm the operation of the conveyor (spiral is rotating) or to send a signal to operations that there is 0 rotation and to shut down the system (this could mean that the spiral in the conveyor has become loose or broken).

Shock relay (one for each motor) is supplied by *Atara Equipment Ltd*. for the electrical protection of motor. They are located in the MCC control panel (supplied and installed by others). The set points need to be adjusted on site at the initial start-up of the conveyors.

Safety cable pull switch (one per conveyor) is supplied by *Atara Equipment Ltd*. This switch and cord are located along the conveyor trough, accessible to the plant operators in case of emergency. When the cord is pulled, it cuts the conveyor power and stops the whole system.

Meaning the MCC starters are supplied and installed by others, but the shock relay is supplied by Atara, loose, and installed by the site electrical team.

2.2. Atara Shaftless screw dewatered sludge conveyor

Safe operational requirements

When operating the conveying system, safe operational practices must be follows:

1. The conveyor must be started-up in sequential order: conveyor No.1, then conveyor No.2 and / or conveyor No.3
2. A running signal from the sludge transport conveyor must be confirmed before the introduction of sludge into the conveying system.
3. If any one of these components stop (for any reason), the following sequences apply. The centrifuge is switched to idle mode, sludge conveyor stops,
4. In normal operating conditions, when the external equipment is in shut down mode, all of the conveying system should be kept running long enough to empty (sequential shut-down sequence: centrifuge, sludge conveyor.
5. During a general power failure external equipment and conveyors stop suddenly all at the same time. When power has resumed, each part of the system should be emptied of their individual contents before going back to normal sequence of operating.

When setting the shock relays or motor protections, safe operational practices must be follows:

Start Time is the delay required during start-up when the amperage draw may exceed the Trip Current.

Shock Time is the delay period that a Trip Current will be sustained before causing a shut-down.

The start time is a delay factor to avoid tripping on the inrush current, Minimal setting is required.

The shock time has to be set: below 1 second.

It is important to realize that the theoretical values can and will change depending on the variants within the operations.

When Atara Equipment provides the shock relays: our site technician will:

- Take the running amps for each motor
- Set the shock relay amps to the running amps, adjust the delay and shocktime values.
- Adjust the values to simulate a failure, then reset the values to the correct settings.

Atara Equipment strongly suggests that this procedure be implemented.

Spiral design

The material is to be conveyed using a shaftless spiral. The spiral's diameter and pitch are relevant to the type material being transported. The spiral is a helix without the need of a centre shaft. This increases the conveyor capacity and reduces the required power Hp.

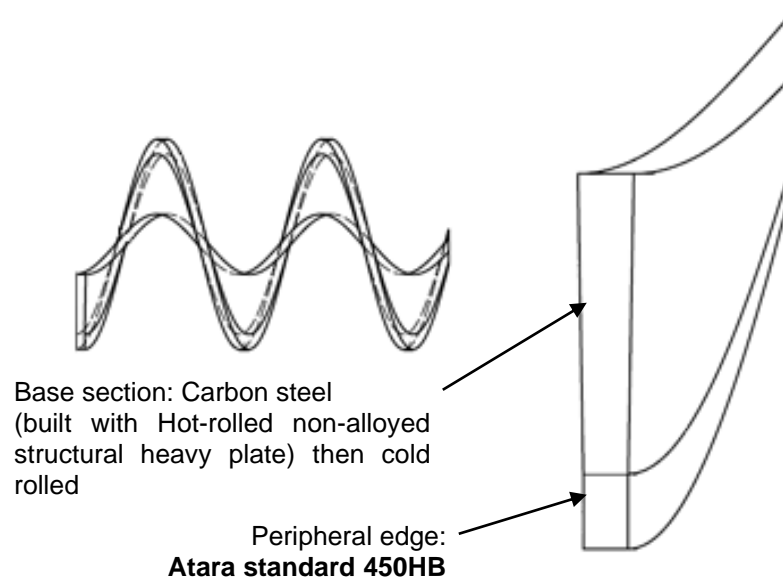
The spiral is always in contact with liners, (the liners are therefore a consumable item). Atara standard replaceable bi-colour UHMW liners are 16 mm thick.

It is possible to reduce wear and tear on both the liner and the spiral, by optimising the running times.

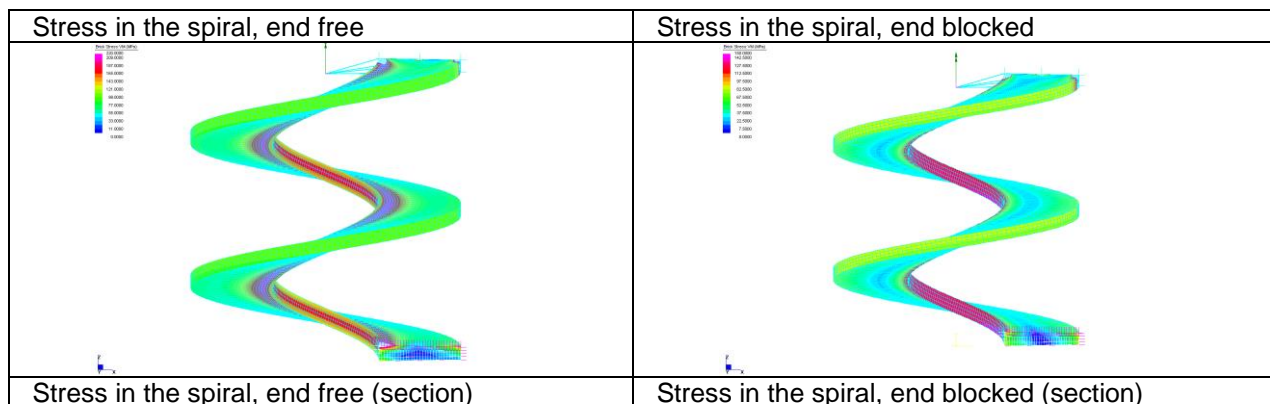
All spirals base material is carbon steel (built with hot-rolled non-alloyed structural heavy plate) cold formed. Based upon our experience (of over 350 installations) in these types of applications, *Atara Equipment Ltd* proposes the following spiral material and design:

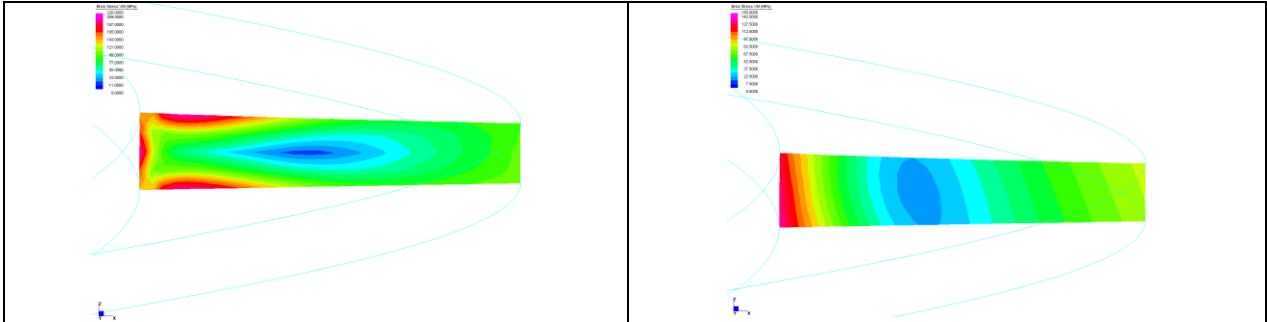
- 2" x 3/4" Cross section manufactured in 50W carbon steel base material
- 1" x 1" Peripheral edge manufactured in HX450 steel

The 450 Brinell peripheral edge is welded on the top of the base section, to provide longevity to the spiral in abrasive materials. It represents at least 30% of wear material.



Finite Element Analysis shows that the inner spiral is the area which takes the most of the stress (Axial Loading):





The red zones show the higher loading areas of the spiral.

This is why *Atara Equipment Ltd* designs its spirals with the largest cross section of the spiral to the inside and the smallest cross section to the outside.

The base section of our spiral is designed to meet the torsion and stress requirements. Even with the outside peripheral edge worn, the integrity of the spiral is not compromised. With a strong base section and a hard peripheral edge, the spiral lasts longer and keeps all of its mechanical property's.

In comparison, with a large section on the outside and a smaller inner spiral insert, as soon as the spiral is placed in operation, immediately the wear starts to reduce the integrity of the spiral cross section, and mechanical property are now compromised. The more the wear there is the weaker the spiral becomes.

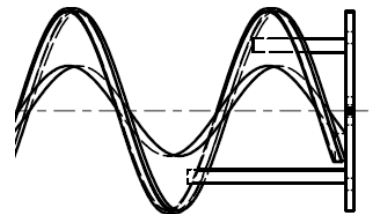
Initially, inner spiral inserts were originally added to spiral only to increase the spiral transport surface by reducing the centre hole of the spiral. Main reason was that it was too difficult to cold-roll large and thick cross section of flat bars, which is no longer true with our manufacturing tools.

By continuously welding the 400 Brinell peripheral edge to the spiral outside edge, under normal wear, the peripheral edge can wear all the way through to the base material without the spiral coming apart.

With a multiple spiral, where the metals have dissimilar profiles and are over lapped to increase the strength in the actual loading mode, once the peripheral edge wears down to the weld which holds the two profiles together, the two profiles have a tendency to separate and the premature replacement of the spiral is necessary.

To assure a perfect alignment and good welding practices, follow the *Atara Equipment Ltd* spiral assembly instructions.

The spiral connection to the coupling disc is welded as shown on the picture below. This smooth and continuous assembly allows the transmission of the torque from the gear drive through the spiral without any stress or torsion build up inside the spiral.



Spiral specifications

Based upon *Atara Equipment Ltd's* experience and calculations, our design and manufacturing gives the spiral the necessary strengths, stability and reliability to prevent distortion or jumping within the trough.

The mechanical properties of the carbon steel used for the spiral,
The calculated specifications do not exceed the following characteristics:

- Torsion stress in the spiral index \ll 250 MPa
- Compression stress in the spiral index \ll 250 MPa
- Drive shaft stiffness index $<$ 200 MPa
- Torsional rating of the spiral fighting $>$ 250% of the drive unit torque
- Maximum elongation $<$ 0,25% per meter (0,03" per foot)

Conveyors capacity

The sludge transport capacity (in m³/h) for the *Atara Equipment Ltd* conveyors is calculated by using the following formula (for a material with density 1):

$$C = (\pi \times R^2) \times P \times (V \times 60) \times \frac{F\%}{100}$$

With: R = spiral radius (m)
 P = spiral pitch (m)
 V = motor speed (RPM)
 F% = filling rate of the conveyor (%)

The capacity and weight for each spiral are given in the tables below, based on an inlet flow at 20% dry solid rate.

The sludge conveyor are U260. The dimensions are below. We calculate an amount of 3.35 kg / pitch when the conveyor is 50% full. With the length of the conveyor and the speed of the gear drive, we find the following capacities for our conveyor:

Sludge conveyor U260		
Screw Dimensions		
Diameter	215	mm
Pitch	215	mm
Base section Height	50,8	mm
Base section Width	19,05	mm
Tip section Height	27,5	mm
Tip section Width	25,4	mm
Product density	1000	Kg / m ³
Length (cumulated)	12	m
Weight of material inside the spiral for 1 pitch at 50 %	3,35	Kg / pitch
Run time (to empty the system)	3	min

	Capacity (m ³ /h)
15 % full	1,2
30 % full	2.4
50% full	4
75 % full	6
100 % full	8

Gear drive speed	motor speed	Frequency
23 rpm	1629 rpm	60 Hz

TECHNICAL SPECIFICATIONS

3.1. Scope of supply

Type of product Spiral Client Ref. Quantity	Conveyor Shaftless Conveyor No 1 1	Conveyor Shaftless Conveyor No 2 1	Conveyor Shaftless Conveyor No 3 1
Material	Primary sludge	Primary sludge	Primary sludge
Concentration (%DS)	16%	16%	16%
Density (kg/m ³)	1000	1000	1000
Capacity (m ³ /h)	2.55	0.51	2.04
Operation (h/day)	6 hours/day	Standby	6 hours / day
Conveyor Specifications			
Orientation (degree)	16°	22°	22°
Filling rate (%)	50%	50%	50%
Direction (Pushing / Pulling)	Pulling	Pulling	Pulling
Spiral	450 BHN	450 BHN	450 BHN
Diameter	215 mm	215 mm	215 mm
Pitch	215 mm	215 mm	215 mm
Profile I Flight	50,8 x 20 + 30 x 25	50,8 x 20 + 30 x 25	50,8 x 20 + 30 x 25
Coupling disc	Yes	Yes	Yes
Trough	U260	U260	U260
Length	9,129 mm	3,362 mm	3,198 mm
Steel	SS 304	SS 304	SS 304
Thickness	4.5 mm	4.5 mm	4.5 mm
End plate	10 mm	10 mm	10 mm
Mounting hardware	A2	A2	A2
UHMW bicolored Wear liner	16 mm	16 mm	16 mm
Hold-down bars	2	1	1
Drain	Yes	Yes	Yes
Flushing connection	Yes	Yes	Yes
Lids			
Steel	SS 304	SS 304	SS 304
Section length	1,000 mm	1000 mm	1000 mm
Thickness	2 mm	2 mm	2 mm
Inspection hatches	4	2	2
Gasket material	Closed Cell Neoprene	Closed Cell Neoprene	Closed Cell Neoprene
Handles	Yes	Yes	Yes
Inlet Chute			
Quantity	2	1	1
Dimensions	260 x 260 mm	As per Centrifuge	As per Centrifuge
Steel	SS 304	SS 304	SS 304
Thickness	3 mm	3 mm	3 mm
Flange	6mm (¼")	6mm (¼")	6mm (¼")
Flexible connection	Optional	Yes	Yes

Type of product Spiral Client Ref. Quantity	Conveyor Shaftless Conveyor No 1 1	Conveyor Shaftless Conveyor No 2 1	Conveyor Shaftless Conveyor No 3 1
Outlet Chute Quantity Dimensions Steel Thickness Flange Flexible Chute	Gravity 1 260 x 390 mm SS 304 3 mm 6 mm Yes	Gravity 1 260x260 SS 304 3 mm 6 mm Yes	Gravity 1 260x260 SS 304 3 mm 6 mm Yes
Supports Number Type Steel High Anchor bolts	4 Structural SS 304 TBD By Others	2 Structural SS 304 TBD By Others	2 Structural SS 304 TBD By Others
Drive system Gear Drive adaptor Packing gland Packing Drive Shaft	Yes (Standard Atara) Labyrinth Type 1/4" Teflon C1045	Yes (Standard Atara) Labyrinth Type 1/4" Teflon C1045	Yes (Standard Atara) Labyrinth Type 1/4" Teflon C1045
Gear Drive Quantity Speed Mounting position Service factor	1 23 RPM M1 1.5	1 23 RPM M1 1.5	1 23 RPM M1 1.5
Motor Power Reversible Voltage Explosion proof Safety factor	3 HP Yes 575 3 60 N/a 1.15	2 HP Yes 575 3 60 N/a 1.15	2 HP Yes 575 3 60 N/a 1.15
Security and control parts Motion sensor Safety pull switch Shock relay Control panel	WM-100 RS-2 Yes Local NEMA4X	WM-100 RS-2 Yes Local NEMA4X	WM-100 RS-2 Yes Local NEMA4X

Category 2 space
Electrical components come with CSA certification

3.2. Materials

a) Stainless steel (304 SS)

U-Trough assembly and covers, inlet and discharge chutes, assembly hardware, supports are all manufactured with stainless steel. Stainless steel's main properties are : resistance to corrosion, to staining and low maintenance. That's why the material used is stainless steel, designed by "304 SS", see the chemical composition and mechanical properties below.

Chemical Composition

Designation	C %	Cr %	Ni %	Mn %	Si %	P %	S %	N %
304 SS	0,08	18 - 20	8 - 10.5	2	0.75	0.045	0.03	0,1

b) Carbon steel (44/50W)

The shaftless spiral screw base is cold formed. The material used is a carbon steel. See the chemical composition and mechanical properties below.

Chemical Composition

Dimension (mm)	C %	Mn %	Si %	P %	S %	Al %	V %
44/50W	0,22	0.5/1.5	0.4	0,04	0,05	0,004	0, 1

Mechanical Properties

Mechanical Properties	Yield strength (Re)	Tensile strength (Rm)	Elongation (As)	Hardness
44/50W	300-350 MPa	450 - 650 MPa	20 %	180-220 HB

c) HARDOX 450

HARDOX 450 is an abrasion resistant plate with a hardness of 450 HB, intended for abrasive applications. HARDOX 450 offers very good weldability. Because of the abrasion between the screw and the liners, this material is welded to the base material. See the chemical composition and mechanical properties below.

Chemical Composition

Plate thickness (mm)	C %	Si %	Mn %	P %	S %	Cr %	Ni %	Mo %	B %
Hardox 450	0,18	0,70	1,60	0,025	0,01	1,00	0,25	0,25	0,004

Mechanical Properties

Mechanical Properties	Yield strength (Re)	Tensile strength (Rm)	Elongation (As)	Hardness
Hardox 450	1000 MPa	1250 MPa	10 %	430 - 470 HB

d) C1045 steel

Drive shaft assembly is made with a standard C 1045 bar stock : C1045 steel. Good formability and weldability characteristics. See the chemical composition and mechanical properties below.

Chemical Composition

Designation	C %	Mn %	P %	S %
C1045	0,42 - 0.50	0,6 - 0.9	0.04	0.05

Mechanical Properties

Mechanical Properties	Yield strength	Tensile strength (Rm)	Elongation (As)
C1045	65.3 KSI	84.8 KSI	12 %

3.3. Surface preparation

All sheet metal pieces (trough, lids, chutes,...) will be manufactured in SS 304.

The supports will be manufactured in SS 304.

The gear drive adaptor and packing gland will be manufactured in C 1045 cold rolled shaft grinding.

3.4. Drive assembly

See catalogue cuts section for details.

Drive Specifications		Conveyor No.1
	Gear box	SK4282 AZBH
	Speed	23 rpm
	Safety factor	1.7
	Motor	100LP/4 TEFC
	Power	3 hp
	Voltage	575V / 3Ph / 60Hz
	Heater	No
	Reversible	Yes
	Service factor	1.15 - classe F insulation
	Coupling	M1
	Drive Shaft Material	End plate gear drive adaptor
	Seal	C1045 Packing gland ¼" x ¼"

Drive Specifications		Conveyor No.2 & 3
	Gear box	SK4282 AZBH
	Speed	23 rpm
	Safety factor	2,5
	Motor	90 LP/4 TEFC
	Power	3 hp
	Voltage	575V / 3Ph / 60Hz
	Heater	No
	Reversible	Yes
	Service factor	1.15 - classe F insulation
	Coupling	M1
	Drive Shaft Material	End plate gear drive adaptor
	Seal	C1045 Packing gland ¼" x ¼"

3.5. Accessories

Conveyor Ref.	
Shock Relay	3
Type	Tsubaki TSB-SB-05 CUL
Motion Sensor	3
Type	Siemens Sistrans WM-100
Safety Pull Switch	3
Type	Conveyor Components Co. RS-2

See catalogue cuts section for details.

SHAFTLESS SCREW CONVEYOR MANUAL

5.1. Safety Instructions

General

The suggested following instructions should be observed when performing maintenance work on the conveyor:

- **Always Follow Plant Safety Procedures.**
Lock out tag out procedures must be observed, to ensure that the conveyor cannot be started, while service work is being performed.
- Compressed or extended spirals can rapidly return to normal length during cleaning and maintenance work.
- Take care to avoid spiral decompression injuries when removing or replacing the spiral. Note that the spiral can slide out of the trough, when the conveyor is in an inclined position.
- Never place arms, legs or any loose objects into the conveyor, when the main train power source has not been disconnected.
- The protective cover should not be removed while the conveyor is in operation.
- Make sure that no work is being performed on the conveyor, before start up.
- Personnel who frequent areas where conveyors have manual start / stop or automatic start/stop, must be informed of any maintenance work being done.
- Personnel working with the conveyor should use protective clothing if hazardous materials are being conveyed.

Noise level

Equivalent continual A-wave noise during normal operation should be less than 70 dB.

In cases where the equivalent continual A-wave noise exceeds 70 dB, ear protectors must be worn.

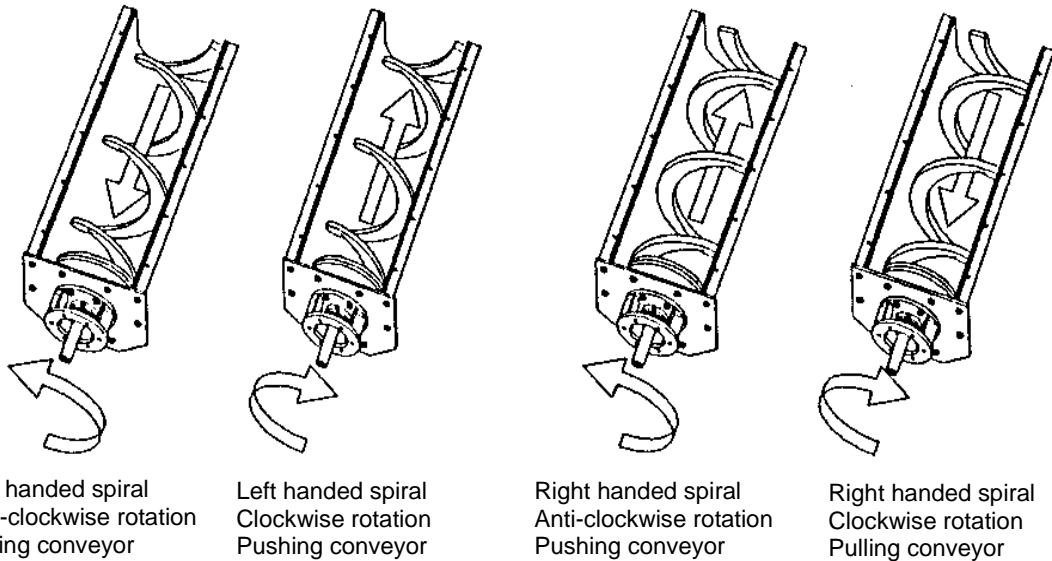
Commisioning

Before the *Atara* conveyor is placed into operation, it should be tested to make sure that everything functions correctly (spiral rotation) and that there's no leakage.

- Conduct the necessary connections according to the drawings.

NB: All electrical connections should be made by an electrician.

- Ensure that emergency stop buttons is mounted in a suitable location, according to local regulations.
- Bump the motor and check that the spirals rotate in the correct direction. This will depend on whether they are right or left handed, pushing or pulling:



NB: The material should always be conveyed toward the outlet.

- Run the conveyor with material and check that there's no leak nearby the packing gland. If necessary, torque up to the packing pressure ring screws (3).

Before the conveyor is started, the following recommendations should also be observed when installing. Where relevant these recommendations should be followed.

- Where there is a risk of the conveyor components freezing, the conveyor components in question should be insulated and fitted with heat tracing cables or pads.
- To help reduce the risk of injury (this is especially relevant around in moving parts), erect protective guards around the conveyor (e.g. guard-rails) and post safety signs & instructions according to local regulations.

5.2. Installation

These instructions must be carried out in the order stated, to prevent equipment damage and or personal injury.

Checks and preparation

The following checks must be conducted prior to assembly:

- Check that the conveyor has not been damaged during in transit.
- Take care not to damage the conveyor during unloading.
- If forklift trucks are used during unloading, the conveyor must be protected with padding materials.
- Before the conveyor is installed, a dimensional check against the installation drawing is required. Check off all pertinent dimensions.
- Place the equipment in its intended position.
- Check that if there are drains, the drain location on the drawings.
- Review recommended Torque setting chart below for the mounting hardware.

Recommended torque settings

Torque settings for coupling disc:

M6S 8.8 16x60 fzb	220 Nm (oiled thread)
M6S 8.8 20x65 fzb	430 Nm (oiled thread)
SR-M6S 16x60 A4	175 Nm (waxed thread)
SR-M6S 20x60 A4	175 Nm (waxed thread)

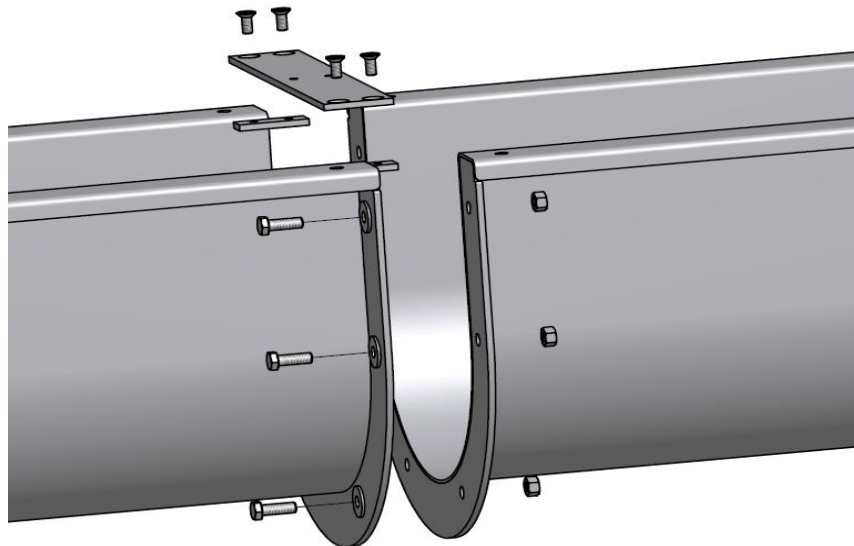
Torque settings for drive shaft end:

MC6S 12.9 12x55	140 Nm (oiled thread)
MC6S 12.9 16x70	340 Nm (oiled thread)
MC6S 12.9 20x90	670 Nm (oiled thread)
MC6S 12.9 20x100	670 Nm (oiled thread)

Trough assembly

If the conveyor is so long that the trough has been delivered in several sections, these sections should be assembled first where possible. If the trough is already assembled, then continue to the next heading.

- To assemble multiple sections lay out the troughs in a straight line on a flat surface.
- Check that the individual troughs are positioned in the correct order. The trough ends are match marked with letters to show the order in which they are to be assembled. See drawings for more information.
- Make sure that a gasket is placed between the trough flanges.
- Fasten the trough sections together with the hard ware provided.



Spirals assembly

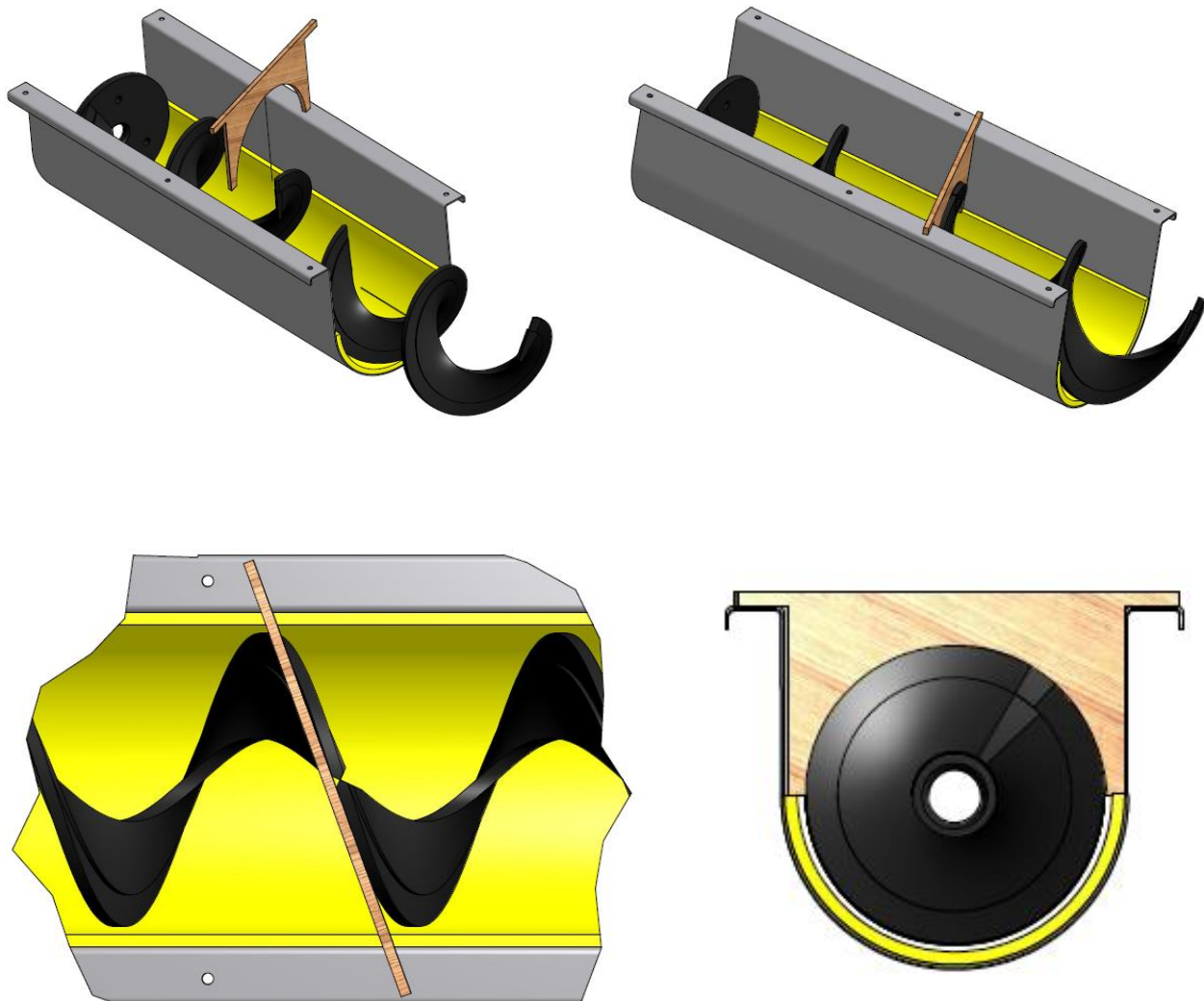
Sometimes, the spirals are delivered longer than required and must therefore be cut to length (review drawings). The spiral should be cut at right angles to its axis. After this, all sharp edges should be polished away, to protect the liner from premature wear.

When the spiral is delivered in several sections, it must be assembled together.

Welded connection:

See Section "Welding instructions" before commencing to weld.

- Unbolt the protective cover from the trough, remove the trough cross bracing when necessary.
- Lay the spiral sections in line with each other in the trough. The ends of the spiral sections are mach marked with numbers, to show the order in which they should be assembled.
- Use a template (not supplied by Atara Equipment) to align the spiral sections together. The sections have to be perfectly aligned before you start to weld.



- Remove the paint from the surfaces that are to be welded.
- Make sure that the part of the spiral to be welded is facing upward (12 O'clock). (If welding is performed against the bottom of the trough, the liner may become damaged).
- A full penetration weld is required to ensure the strength of the connection.
- When welding is deemed necessary, follow standard welding practices for full penetration welds.
- Polish the weld carefully to remove all sharp edges and unevenness on the transport surface and peripheral edge.
- Remove all the debris, out of the trough.
- Prime according to Section "Surface coating and protection" or passivate if the spiral is stainless steel.
- Replace and secure the trough's protective covers. Re-install the trough stays.

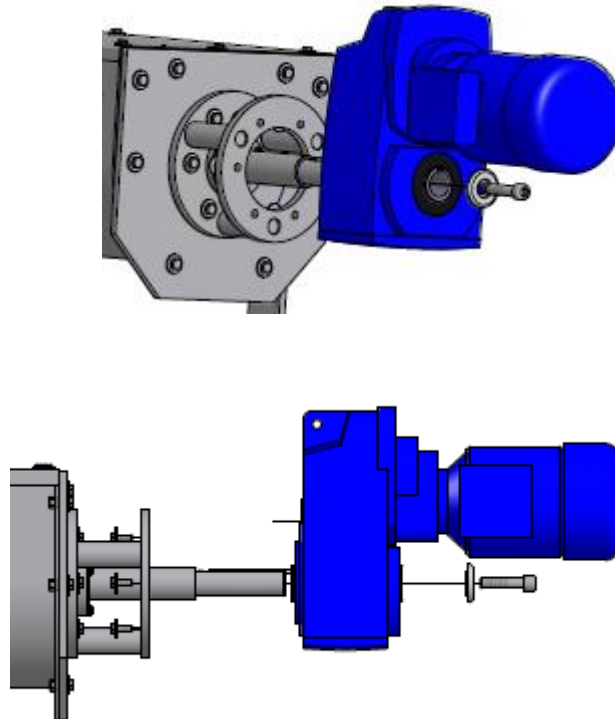
Bolted connection:

- All spirals have been factory aligned.
- An alignment tang has been welded to one section of the spiral.
- Using mounting hardware provided, align the two spirals together, place bolts through the alignment tang holes and tighten (in most cases it is not necessary to weld the sections of spiral together).

Gear drive assembly

The gear drive assembly is usually comes installed on the conveyor gear drive end plate. If the gear drive has been shipped separately, read the following instructions.

- Review the conveyor drawings, locate the designated gear drive, note the mounting position of the of the gear drive.
- Clean and remove the protective coating on the drive shaft sticking through the gear drive end plate and drive adaptor packing gland. Using your hand, feel the drive shaft for blemishes, remove the blemishes with a fine file or Emery cloth. Make sure the key is removed from the Keyway and that the drive shaft and keyway are lubricated.
- Check that there is no debris in the hollow shaft of the gear drive and that the fixing element and the fixing element bolt plus the mounting hardware have been included in this shipment.
- Lift the gear drive assembly and slide the gear drive hollow shaft onto the drive shaft, slide it all the way up-to the gear drive adaptor and secure with the mounting hardware provided.

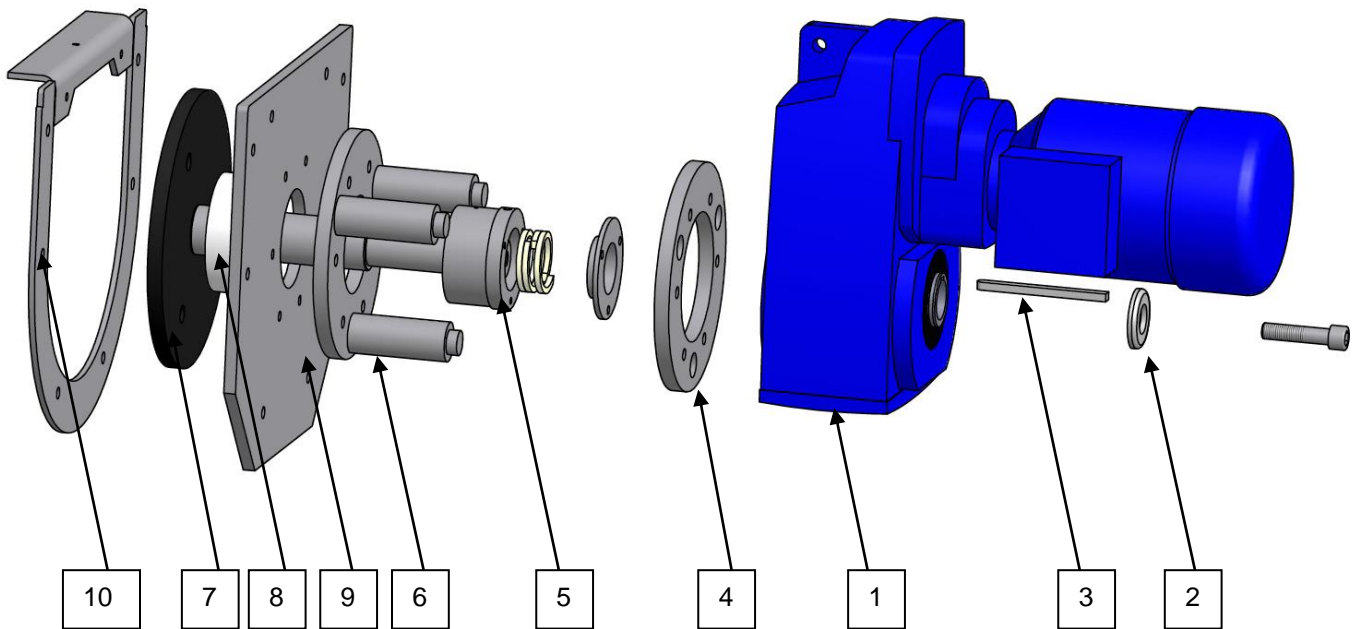


- Once the gear drive assembly is secured, remove the protective fan cover on the motor. Rotate the hollow shaft using the motor fan until the key ways of the hollow shaft and drive shaft align. Once in alignment, slide in the key. Install the fixing element and secure with the fixing element bolt (hex-cap bolt).
- You should be able to turn the spiral by rotating the fan on the motor of the gear-drive.
- Check gear drive oil level.

The packing gland is a three part system. The first part is the packing gland, where the packing is installed. The second part is a pressure ring; this ring has 3 bolts for tightening purposes. The third part is the grease nipple and galleries.

- Once the packing (3 pcs) is installed into the packing gland, tighten the three pressure bolts until the gap between the packing gland and the pressure ring is even all around (tighten the three bolts alternatively).
- Fill the packing gland with grease according to Section "Lubricating the packing gland"
- Replace the cooling fan cover of the motor.
- Remove the plastic tube from the breather.

NB: If the drive assembly is mounted in another position than shown above, the oil level and breather plug must be adjusted accordingly, see motor instructions.



1.	Motor and gear drive	2.	Bolt and fixing element
3.	Key	4.	Gear Drive adaptor
5.	Packing gland (Body, packing and cover)	6.	End plate adaptor (Cw spacers)
7.	Drive shaft and coupling disc	8.	Plastic Labyrinth seal
9.	End plate	10.	Flange

Supports assembly

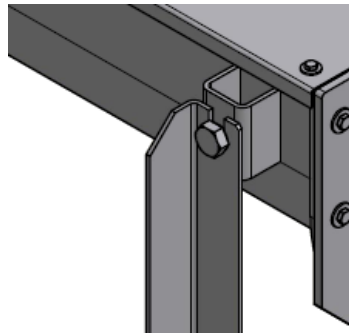
Due to the varying angles in which the conveyor can be installed, the drawing below can differ from the actual angle. The example shown below is just one way in which the support can be assembled.

The procedure may involve welding, review Section "Welding instructions" before commencing work.

NB: If the conveyor is fitted with slide gates, they should be attached before the conveyor is raised into position.

Make sure that all safety practices are being implemented before raising the conveyor.

- Using straps to lift, locate the conveyor temporarily into its operating position.
- Secure the supports into position (see the figure below).



- Using the base plate as a template, set the anchors.
- Adjust support base plate via anchor bolts to correct height and secure.

Conveyor interconnections

There are two types of interconnections:

- Gravity feed
- Axial feed

Gravity feed type connections require drop chutes and inlet chutes. These chutes are either bolted directly together (with a gasket between the two flanges), or have a flexible connection, between the two chutes.

Axial connections are bolted directly into the conveyor (rigid connection). These connections are flanged and require a gasket between the flanges.

5.3. Operation and Maintenance

Routine maintenance

The following section only gives the checks and balances that should be carried out for routine maintenance. If any item does not fulfil the requirements, Section "Service" describes how replacements and services should be carried out.

Weekly checks

- Check that the safety equipment, both electrically mechanically are functioning correctly.
- Make sure equipment is free from debris (clean house keeping).

Monthly checks

- Clean the conveyor inside and outside (if necessary).
- Check the packing box for excessive leaks.
- Check the spiral for damage (visual inspection / noisy operations).
- Check the spiral for wear. A maximum of 20% of the spiral's original dimension can be worn away before it needs to be replaced. If the spiral is extremely long (>15 m or 49') it should be replaced before this level of wear is reached.

Half yearly checks

- Check all mounting hardware.
- Check the liner for wear (visual inspection).
- Check the oil level and colour. If discoloured or smells burned: drain oil, flush gear box and add recommended oil (review motor servicing requirements).
- Check the electrical control system, i.e. emergency stop, sequential control, sensors and pneumatics etc (where applicable).
- Faults or abnormal wear must be corrected immediately, this includes corrosion.

Surface coating and protection

This section describes how the conveyor's surfaces should be treated, if made of stainless steel or not. The materials used in your conveyor are specified on drawings.

Operating in sewage treatment plants or in a damp environment, exposes the conveyor to air that may contain chemically or biologically corrosive components. In this type of environment, both painted and stainless steel surfaces can be damaged. It is therefore important that personnel follow the operating and maintenance instructions and remedy any corrosion or damage to coatings as soon as they occur.

Specifications for surface repairs are included in this section. All deviation from these specifications could be given in the appendix, it is important to pay attention to these exceptions.

For stainless steel and acid resistant steel, the material used is AISI 304 stainless steel. This material does not need special treatment but the following may be observed:

- Cross contamination may occur, when grinding other material close to the conveyor. It is important to protect the conveyor when implementing such work.
- All stainless steel surfaces must be handled so that its corrosive resistance is not impaired. As a minimum the following must be observed: stainless steel should not come into contact with mild steel during transportation or assembly. Wood, cloth or plastic should be used to protect the stainless steel when lifting or transporting the conveyor.

Welding instructions

When welding, it should be noted that steel is affected by heat. Overheating should therefore be avoided.

When welding stainless steel, the consumable materials must ensure that the weld is as resistant to corrosion as the parent metal. The consumable should therefore contain as a minimum, as much alloy as the parent metal.

Welding together two dissimilar materials should be avoided due to the risks for hairline cracks, these cracks reduce the weld strength and a greater propensity to corrode due to electrolytic action.

The weld surfaces should be degreased with acetone (or an equivalent solvent) immediately prior to welding. The material should be degreased at least 60 mm (2") from the weld surface.

The following electrodes should be used for arc welding:

- Hobart 7018 for spirals of special steel (the electrode dimension should be at least 2.0 mm to avoid overheating)
- OK 6130 for stainless steel

Suitable electrode sizes are 2.0-3.25 mm (1/16" to 1/8") depending on where the weld is located.

5.4. Service

All instructions must be carried out in the order stated to prevent personal injury or machine damage.

! Warning! No service work should start, before the conveyor's main isolator is locked & tagged out.

Liner replacement

There are different types of liners for different types of applications (review drawings for types of liners used in this application):

- plastic UMHW
- hardox bars
- stainless steel bars

Technical data concerning these liners' steel and plastic qualities is specified on the drawings. Liners can't often be replaced without removing the spiral.

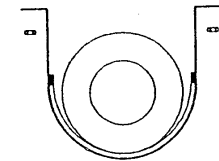
Replacing the Plastic Liner

The replacement UMHW liners are delivered preformed and racked. The U-shaped liners should not be removed from their racking until immediately before they are to be installed.

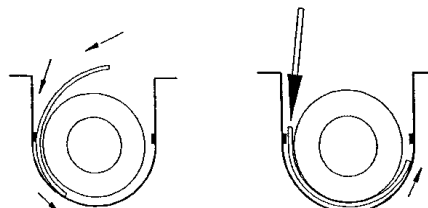
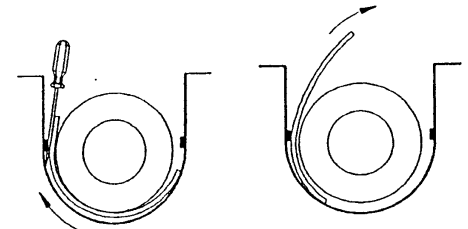
- Remove the protective cover (lid) from trough.



- First locate the cleats that hold the liner in place. Then using a wedge or a large screw driver, pry the liner free from the cleat on one side at (both ends). Place a short piece of 2 x 4 between the cleats on top of the liner edge, opposite the free end of the liner, using a hammer on the 2 x 4 push the liner under the spiral so that the free end rotates out on top the spiral.



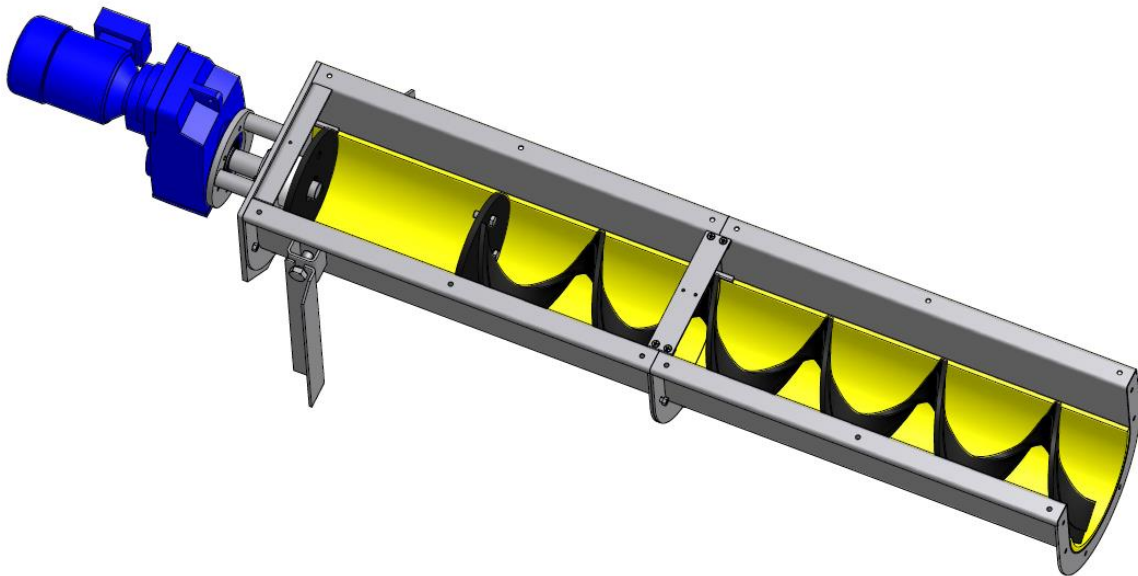
- Take hold and remove the liner.
- Once the liner has been removed, remove any debris from trough.
- Remove the liner from its racking, place the liner over the spiral, rotate the liner under the spiral, until it hits the cleats on the opposite side of the trough. The liner should be on the out side of the cleat, on your side of the trough. Using a piece of 2x4, place the 2x4 on the edge of the liner in front of the cleat. Hit the 2x4 with a hammer, this will force the liner under the cleat and secure the liner in position.



Spiral replacement

The spiral should have no joints within 4 flights of the coupling disc.

- Undo the bolts holding the protective covers and remove them from the trough.
- Check spiral dimensions against the drawings (for wear and tear purposes).
- Unbolt the spiral from the coupling disc.
- Remove the spiral from the trough. The spiral can be removed in several ways. The spiral can be lifted, pushed through an opening or cut into pieces.
- Place the new spiral in the trough (make sure the coupling disc is at the same end as the drive shaft)
- Bolt the coupling discs together (using new ny-lock nuts each time).
- Replace the protective cover to the trough.

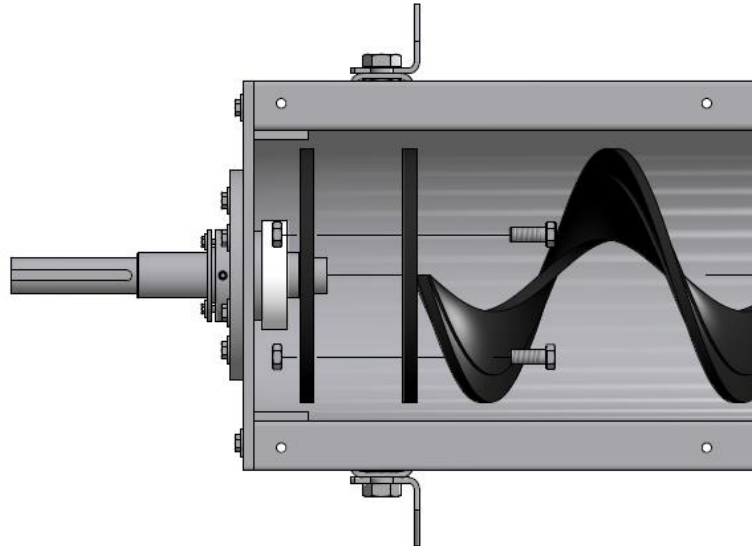


Drive shaft replacement

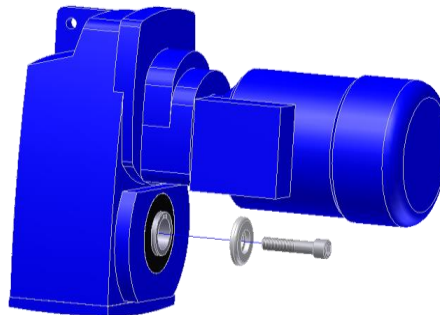
All plant safety procedures (lock out tag out) must be in place before starting this procedure.

Remove the old drive shaft

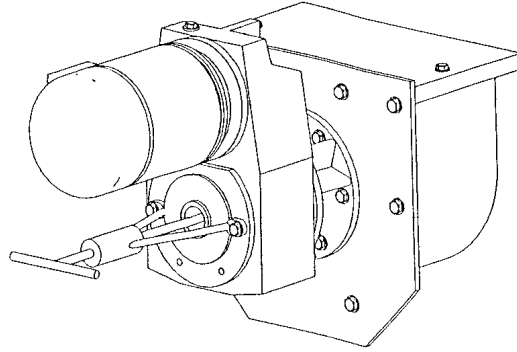
- Remove protective covers (lids) at gear drive end and secure the spiral into position (stop spiral moving when bolts are removed from drive shaft).
- Remove coupling disc bolts and move the spiral away from the drive shaft as far as needed to remove the drive shaft inside the conveyor.



- Unbolt the end screw.



- Loosen the pressure screws from the packing gland ring.
- Use an extractor tool to push the drive shaft into the trough. Remove the key from keyway before the drive shaft goes through the packing box.



NB: when using the extractor tool, the end of the drive shaft must be protected so that the threads are not damaged. A bolt can be inserted into the end of the shaft before pressure is applied.

- Remove the old drive shaft from the trough and lift in the new one.

It's also possible to remove the drive shaft by pulling back the gear drive / drive adaptor / end plate assembly:

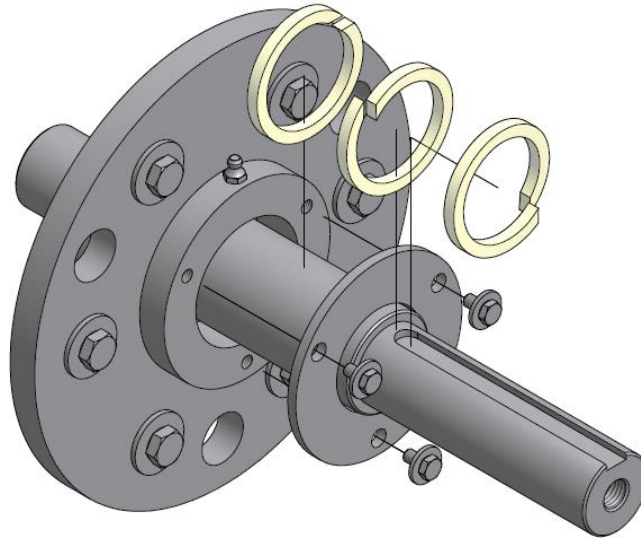
- Remove the cover nearest the gear drive.
- Clean out the trough so you can see the drive shaft coupling discs, remove the nuts & bolts.
- Support the gear drive via hoist or chain block. Remove the bolts that secure the gear drive end plate to the trough flange.
- Check to see if the electrical cable to the gear drive is long enough to allow the gear drive to be lowered to the floor. If not disconnect the electrical cable at the motor.
- Lower the assembly to the floor and remove the drive shaft in the same sequence as above.

Install the new drive shaft

- Make sure that the hollow shaft in the gear-box is clean and free from corrosion.
- Lubricate the new drive shaft and slide into the hollow shaft of the gear box.
- Align the two keyways and slide the key in the keyway.
- Place the fixing element into the opposite end of the hollow shaft and secure with the fixing element bolt.
- Lift the whole assembly back into position in alignment with the trough. Bolt the gear drive assembly end plate to the trough flange (don't forget the gasket).
- Bolt the drive shaft and spiral coupling discs together. Remove all tools and objects from inside the trough. Rotate the spiral and check for misalignment. Reinstall the cover and place back into operation.
- Retighten the packing gland ring between the packing gland. Tighten the screws alternately and check that the gap remains even after each turn.
- Lubricate according to Section "Lubricating the packing gland".
- Test run the conveyor with material to make sure that the packing gland does not leak excessively.

Packing gland replacement

- Unscrew the pressure screws and slide the gland back along the drive shaft.



- Remove the old packing and clean out the packing gland seat.
- Cut the new packing with an angle (45°). Put tape around the packing before you cut it to prevent the ends from fraying.
- Split the packing, place it over the shaft, push the packing into the packing gland with the first cut at 12 O'clock.
- Repeat this process with three or more pieces of packing. Each cut must be placed at 45° to each other so that the joints are not in alignment.
- Replace the packing gland ring and tighten the pressure screws so that the packing is compressed properly in the packing gland seat.
- Tighten the pressure screws so that only a 7 mm (¼") gap remains between the packing ring and gland. Tighten the screws alternatively and check that the gap remains even after each turn.
- Lubricate according to Section "Lubricating the packing box".
- Test run the conveyor with material to make sure that the packing gland does not leak excessively. If there is a heavy leakage, tighten the screws.

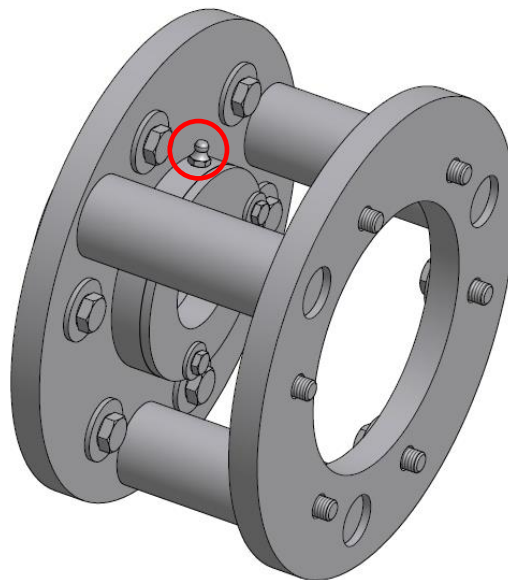
Lubricating the packing box

The most suitable greases for the packing gland are universal grease or bearing grease. Use grease with a NALI number of 2 or 3.

The amount of grease required depends on the drive shaft diameter.

Shaft Diameter	Amount of Grease
50 and 60 mm	c.20 cm ³ (1.22 in ³)
70 and 80 mm	c.30 cm ³ (1.83 in ³)
90 mm	c.40 cm ³ (2.44 in ³)

Fill with grease through the grease nipple on the packing gland seat.



TRAINING AND START-UP

6.1. Technical Shop Training Program

- 1) **Gear Drive Motor:** Data HP, Voltage, Hz, Speed
Installation
Removal
Trouble Shooting

- 2) **Gear Drive:** Mounting Position
Breather
Oil Level
Oil Drain Plug
Type Of Oil
Installation Procedure
Removal Procedure
Seals
Trouble Shooting

- 3) **Packing Gland:** Packing Replacement
Trouble Shooting

- 4) **Drive Shaft:** Design
Removal
Installation
Trouble Shooting

- 5) **Spiral:** Design
Removal
Installation
Trouble Shooting

- 6) **Safety Devices:** Design
Removal
Installation
Trouble Shooting

- 7) **Maintenance**

- 8) **Optimization of equipment**

See previous sections for equipment design and specifications.

Required detailed manuals will be supply on site prior to the technical shop training lesson.

6.2. Quality Control Inspection

- 1) **Motor data:** Kw / Hp
Voltage
Hz
Safety Factor
Full Load Amps
Insulation

All of the above is as per manufacture drawing for the selected position.
- 2) **Gear drive positioning:** Matches the position on the approved drawing
Breather plug
Oil level plug
Drain plug
Oil level
Fixing element & fixing element bolt

All of the above is as per manufacture drawing for the selected position.
- 3) **Packing Gland:** Grease nipple location
Packing in packing gland
Compression ring has equal distance around packing gland
- 4) **Drive Shaft:** Coupling disc connection to spiral
Bolts grade 8a
Nuts, nylock
- 5) **Spiral:** Diameter
Pitch
Profile
- 6) **Liners:** Correct thickness
Secured under cleats
Even joints
- 7) **Trough:** Flange Joints Gasket & mounting hardware
Lids, gasket & mounting hardware
Inlet chute dimensions
Outlet chute dimensions
Supports
Drain, size, location
- 8) **Motion sensor:** Location
Set for under speed
Set rpm value
Set delay time
- 9) **Shock relay:** Set full load motor amps
Set delay time
- 10) **Safety pull switch:** Location
Eye bolts
Safety cable
Safety cable ends
- 11) **Mounting hardware:** Tighten all mounting hardware

6.3. Dry Start up

- 1) Follow all plant safety regulation.
- 2) Clear area and equipment from all debris left over from construction.
- 3) Start the conveyors in manual.
- 4) Checks for:
 - Spiral rotation
 - Amperage reading per motor
 - Noisy operation (bangs)
 - Select overload settings for running amps
 - Select shock relay settings for running amps
 - Safety cable pull switch is functioning
 - Motion sensor signal feed

6.4. Product Start up

- 1) Follow all plant safety regulation.
- 2) Clear area and equipment from all debris left over from construction.
- 3) Put the conveyor in automatic mode.

When the centrifuges are ready to produce sludge cake, a signal will be given to the conveyors to start running.

The conveyors start-up is done sequentially, starting by the last one, the out-loading conveyor, and finally the centrifuge conveyor. Automation of the process is realised from a control panel (supplied by others).

When the conveyor starts, the motion sensor will try to detect the spiral movement, there is a built in delay timer that latches in a relay for a period of time, if the motions sensor detect the spiral the latch stays in and gives the signal that the conveyor is running, if the motion sensor does not detect the spiral it will shut down the conveyor and send an alarm signal.

Each conveyor will start only once it receives the signal that the previous conveyor is running correctly.

Once all of the conveyors are in operation, it's time to check that the safety devices work. By pulling any of the safety cable pull switches. This will cause the shut down all of the conveyors and place the centrifuge into Idle.

We will also fake over amperage by moving the settings of the shock relay. This intern will stop all of the conveyors and place the centrifuge into Idle.

The same procedure will be applied for the motion sensor.

The spiral rotational speed versus the pitch can determine the required run times. Optimizing these run times increase the efficiency of the equipment and reduce wear & tear on the equipment. It will also increase the life expectancy for all of the consumable parts, liners & spirals.

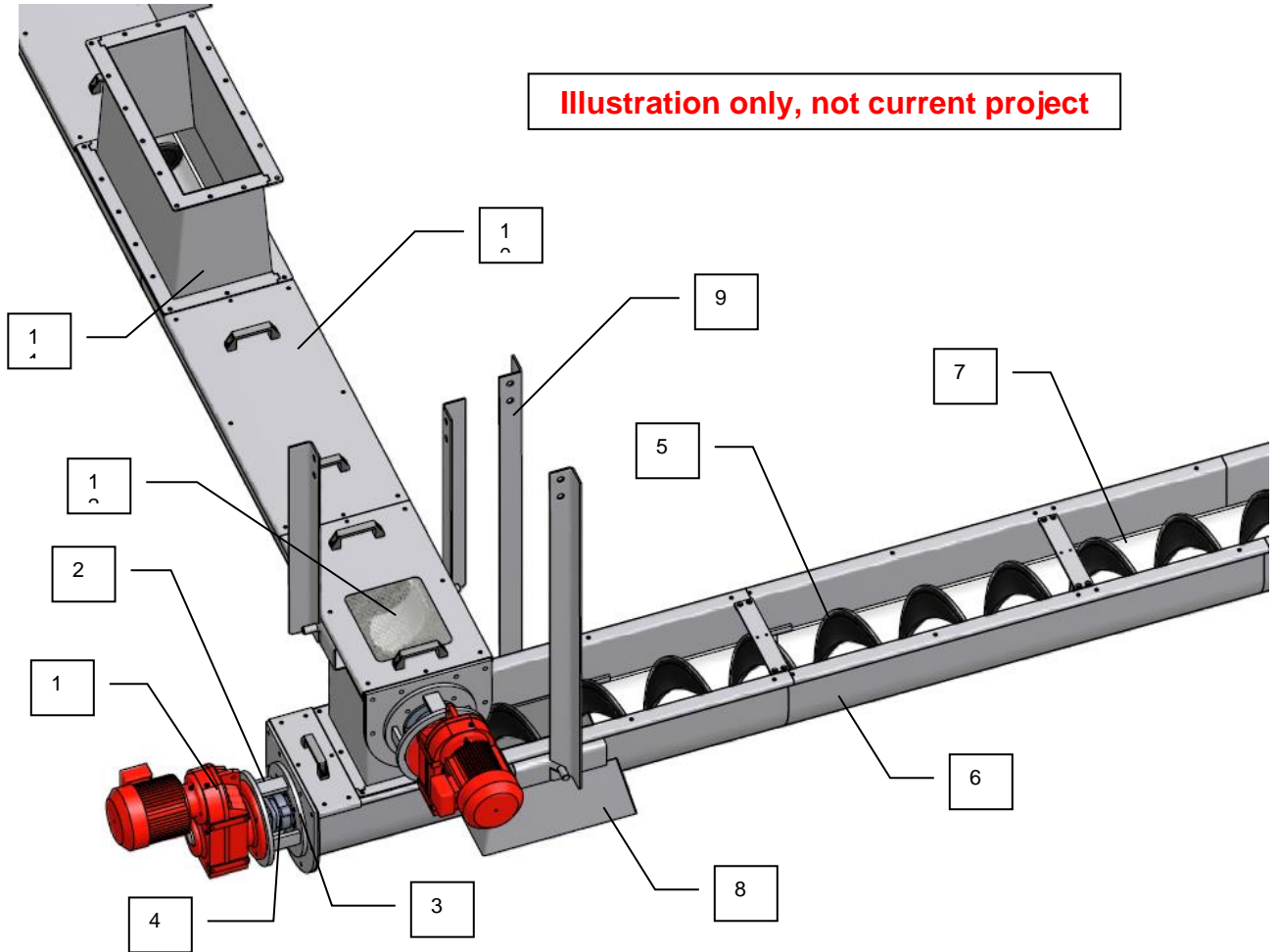
It is therefore important to collect as much running data as possible.

SPARE PARTS

7.1. Names of components for sludge conveyor

The list below gives the correct names of the typical conveyors components to identify the potential spare parts. Please refer to it when ordering spare parts.

The dimensions and technical data for your *Atara* installations are specified on the drawings in previous section. Make sure you have the drawing available when ordering parts.



1.	Motor and gear drive	7.	Wear liner
2.	Drive adaptor	8.	Outlet chutes
3.	Drive shaft and coupling disc	9.	Supports
4.	Packing gland	10.	Lids
5.	Spiral	11.	Inlet chute
6.	Trough	12.	Inspection door

See *Catalogue Cuts* section for gear drives, motors and accessories references.



7.2. Spare parts list for sludge conveyor

The spare parts normally required in the first five years of operation are:

- One (1) spare shaftless spiral c/w coupling disc
- One (1) set of UHMW 12 mm wear liner

The delivery time will be from 2 to 3 weeks for standard equipment such as liner or packing gland and will be 8 to 12 weeks for specific equipments such as spiral and trough. The exact delivery schedule for spare parts will be confirmed by *Atara Equipment Ltd.*

Supplier: **ATARA EQUIPMENT LTD**
3737 Boul Lite
Laval, QC, H7E 4X8
Tel : 1 866 931 5445 / Fax : (514) 931-0629
Courriel : info@ataraequipment.com

Spare parts supplied under this contract :

Spare parts Safety cable pull switch Liners Special tool	1x RS-2 2x standard lengths per cnv size 1x liner installer
--	--

CATALOGUE CUTS

8.1. Gear drives and motors

Drive Specifications		Conveyor No.1
	Gear box	SK4282 AZBH
		Speed 23 rpm
		Safety factor 1.7
	Motor	100LP/4 TEFC
		Power 3 hp
		Voltage 575V / 3Ph / 60Hz
		Heater No
		Reversible Yes
		Service factor 1.15 - classe F insulation
Coupling	M1	
	End plate gear drive adaptor C1045	
	Seal Packing gland ¼" x ¼"	

Drive Specifications		Conveyor No.2 & 3
	Gear box	SK4282 AZBH
		Speed 23 rpm
		Safety factor 2,5
	Motor	90 LP/4 TEFC
		Power 3 hp
		Voltage 575V / 3Ph / 60Hz
		Heater No
		Reversible Yes
		Service factor 1.15 - classe F insulation
Coupling	M1	
	End plate gear drive adaptor C1045	
	Seal Packing gland ¼" x ¼"	

All motors come with Thermostat (Space heater)

CONSTANT SPEED DRIVES



SIMPLE RELIABLE EFFICIENT

UNICASE™

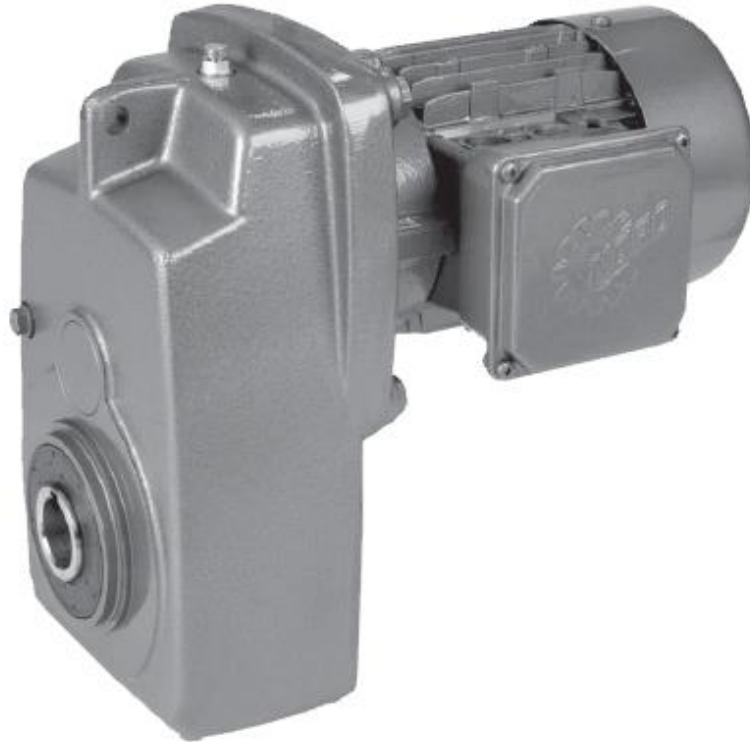


**NORD GEAR
DRIVESYSTEMS**

Clincher™ Shaft Mount Gearmotors

Selection

- Order Form
- Unit Examples
- 0.16 hp
- 0.25 hp
- 0.33 hp
- 0.50 hp
- 0.75 hp
- 1.0 hp
- 1.5 hp
- 2.0 hp
- 3.0 hp
- 5.0 hp
- 7.5 hp
- 10 hp
- 15 hp
- 20 hp
- 25 hp
- 30 hp
- 40 hp
- 50 hp
- 60 hp
- 75 hp
- 100 hp
- 125 hp
- 150 hp
- 175 hp
- 200 hp



www.nord.com

UNICASE™

Clincher™ Ordering Guide

SK	Series	Mounting	Material
SK 1282A	90 L/4	Half Shaft	Cast Iron
SK 1282B	90 L/4	Half Shaft	Cast Iron
SK 1282C	90 L/4	Half Shaft	Cast Iron
SK 1282D	90 L/4	Half Shaft	Cast Iron
SK 1282E	90 L/4	Half Shaft	Cast Iron
SK 1282F	90 L/4	Half Shaft	Cast Iron
SK 1282G	90 L/4	Half Shaft	Cast Iron
SK 1282H	90 L/4	Half Shaft	Cast Iron
SK 1282I	90 L/4	Half Shaft	Cast Iron
SK 1282J	90 L/4	Half Shaft	Cast Iron
SK 1282K	90 L/4	Half Shaft	Cast Iron
SK 1282L	90 L/4	Half Shaft	Cast Iron
SK 1282M	90 L/4	Half Shaft	Cast Iron
SK 1282N	90 L/4	Half Shaft	Cast Iron
SK 1282O	90 L/4	Half Shaft	Cast Iron
SK 1282P	90 L/4	Half Shaft	Cast Iron
SK 1282Q	90 L/4	Half Shaft	Cast Iron
SK 1282R	90 L/4	Half Shaft	Cast Iron
SK 1282S	90 L/4	Half Shaft	Cast Iron
SK 1282T	90 L/4	Half Shaft	Cast Iron
SK 1282U	90 L/4	Half Shaft	Cast Iron
SK 1282V	90 L/4	Half Shaft	Cast Iron
SK 1282W	90 L/4	Half Shaft	Cast Iron
SK 1282X	90 L/4	Half Shaft	Cast Iron
SK 1282Y	90 L/4	Half Shaft	Cast Iron
SK 1282Z	90 L/4	Half Shaft	Cast Iron

SK 1282A - 90 L/4
Clincher Shaft Mount™
Half Shaft
Two Stage

SK 1282B - 90 L/4
Clincher Shaft Mount™
Half Shaft
Rubber Soften
Two Stage

SK 1282C - 90 L/4
Clincher Shaft Mount™
Half Shaft
Rising Bevel 63
Two Stage

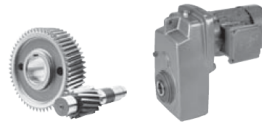
SK 1282D - 90 L/4
Clincher Shaft Mount™

Power	Speed	Output	Output	Service	Factor	ASMA	Frame	Flange	Mounting	Material
[kW]	[rpm]	[Nm]	[HP]	[min]	[min]	[min]	[mm]	[mm]	[mm]	[mm]
0.16	1500	1.2	1.6	10	10	10	100	100	100	Cast Iron
0.25	1500	1.8	2.4	10	10	10	100	100	100	Cast Iron
0.33	1500	2.4	3.2	10	10	10	100	100	100	Cast Iron
0.50	1500	3.6	4.8	10	10	10	100	100	100	Cast Iron
0.75	1500	5.4	7.2	10	10	10	100	100	100	Cast Iron
1.0	1500	7.2	9.6	10	10	10	100	100	100	Cast Iron
1.5	1500	10.8	14.4	10	10	10	100	100	100	Cast Iron
2.0	1500	14.4	19.2	10	10	10	100	100	100	Cast Iron
3.0	1500	21.6	28.8	10	10	10	100	100	100	Cast Iron
5.0	1500	36.0	48.0	10	10	10	100	100	100	Cast Iron
7.5	1500	54.0	72.0	10	10	10	100	100	100	Cast Iron
10	1500	72.0	96.0	10	10	10	100	100	100	Cast Iron
15	1500	108.0	144.0	10	10	10	100	100	100	Cast Iron
20	1500	144.0	192.0	10	10	10	100	100	100	Cast Iron
25	1500	180.0	240.0	10	10	10	100	100	100	Cast Iron
30	1500	216.0	288.0	10	10	10	100	100	100	Cast Iron
40	1500	288.0	384.0	10	10	10	100	100	100	Cast Iron
50	1500	360.0	480.0	10	10	10	100	100	100	Cast Iron
60	1500	432.0	576.0	10	10	10	100	100	100	Cast Iron
75	1500	540.0	720.0	10	10	10	100	100	100	Cast Iron
100	1500	720.0	960.0	10	10	10	100	100	100	Cast Iron
125	1500	900.0	1200.0	10	10	10	100	100	100	Cast Iron
150	1500	1080.0	1440.0	10	10	10	100	100	100	Cast Iron
175	1500	1260.0	1680.0	10	10	10	100	100	100	Cast Iron
200	1500	1440.0	1920.0	10	10	10	100	100	100	Cast Iron



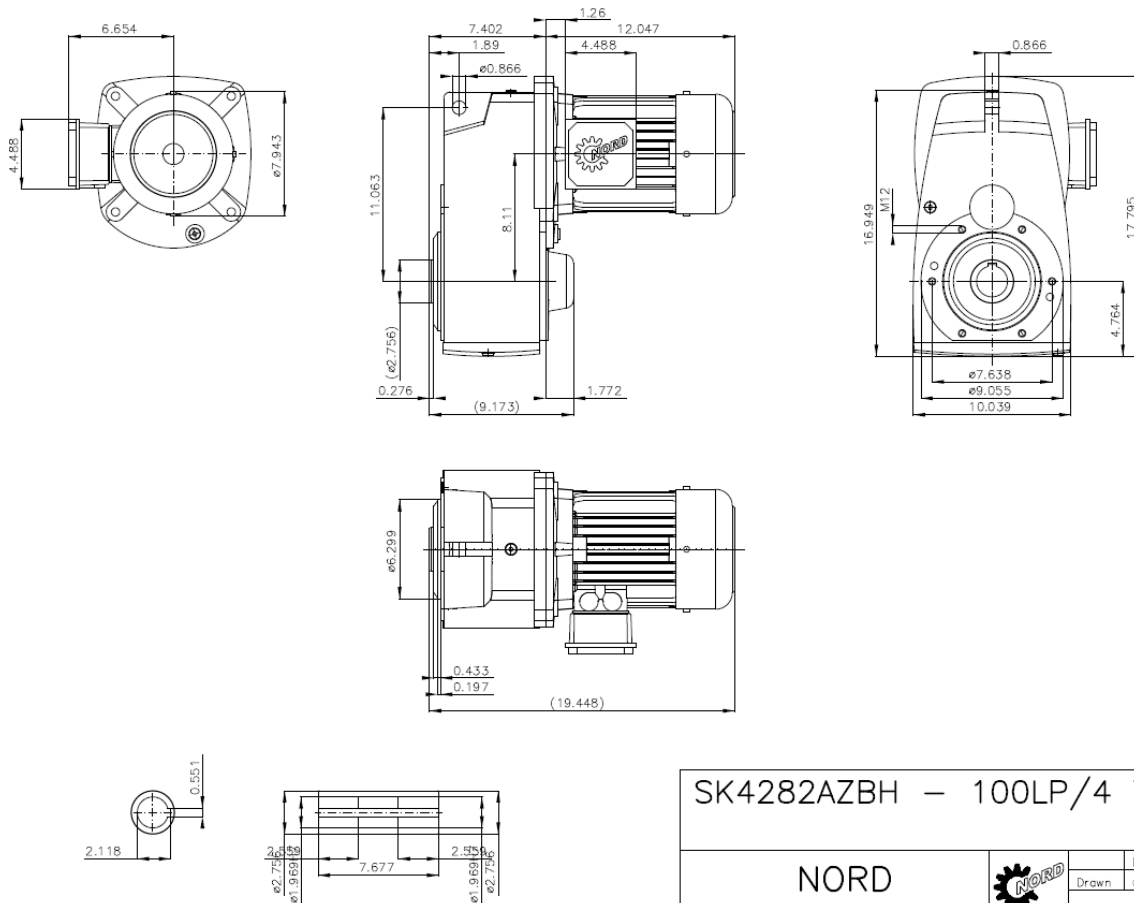
Pos.	Description	Material	Quantity
1	Shaft Mount Gearmotor SK 4282AZBH - 100LP/4 CUS TW		1
	<i>No.1</i>		
	Product Name	Parallel Shaft Gears BLOCK	
	Input Speed	1770 rpm	
	Motor Inverter Speed Range	Standard Line Powered - Inverter Capable	
	Ratio	75.39	
	Output Speed	23 rpm	
	Service Factor	1.7	
	Output Torque	8055 lb-in	
	Overhung load	3400 lb	
	Axial Load	4950 lb	
	Power	3 hp	
	Voltage	332/575 V	
	Frequency	60 Hz	
	Efficiency Class	IE3 Premium Efficient Motor	
	Current 1	5.32 A	
	Current 2	3.07 A	
	Cosinus	0.79	
	Motor Duty	S1 - Continuous	
	Enclosure	IP55	
	Insulation	F	
	Mounting Pos	M1	
	Number of stages	2 :1	
	Type of housing	Face Flange	
	Output Shaft Dia	50H7 mm	
	Output Shaft Material	Standard	
	Gearbox Breather Options	Autovent	
	Gearbox Options	Cover Hollow Shaft Shaft Fixing Kit	
	Bearing Design	Standard Bearings	
	Motor Cooling	TEFC - Totally Enclosed Fan Cooled	
	Terminal Box Pos	1	
	Conduit Entry Loc	I	
	Cable Glands	None	
	Motor Option	Thermostat	
	Lubricant	VG220-MIN-EP	
	Lubricant Qty	4.44 qt	
	Sealed Surface Conversion	No Surface Sealing Conversion	
	Paint Coating	Standard Paint	
	Paint Color	Stainless Steel Gray	
	Base Weight	183 lb	
	Requested Delivery Date	on request	

3.0 hp Gearmotors



GEARMOTORS

Motor Power P_n [hp]	Output Speed n_2 [rpm]	Output Torque T_a [lb-in]	Service Factor f_s	AGMA Class	Gear Ratio i_{tot}	Standard Bearings		Heavy Duty Bearings (VL)		Model Type	Weight [lb]	Dim. Page
						F_{ON} OHL [lb]	F_{AN} Thrust [lb]	F_{QVL} OHL [lb]	F_{AVL} Thrust [lb]			
3.0	53	3591	3.4	III	32.34	2921	4950	5778	6750	SK 4282 - 100L/4 SK 4282 - 100LH/4	161	346
	47	4042	3.0	III	36.40	2975	4950	5931	6750			
	46	4087	2.9	III	36.81	3013	4950	5978	6750			
	42	4524	3.0	III	40.74	3098	4950	6156	6750			
	39	4847	2.9	III	43.65	3125	4950	6228	6750			
	38	5002	2.8	III	45.05	3175	4950	6305	6750			
	33	5796	2.8	III	52.20	3263	4950	6523	6750			
	29	6840	2.3	III	61.60	3398	4950	6843	6750			
	23	8371	1.7	II	75.39	3553	4950	6757	6750			
	22	8617	1.7	II	76.70	3535	4950	6752	6750			
	19	10051	1.4	II	90.52	3656	4950	6683	6750			
	15	12301	1.2	I	110.78	3796	4950	6559	6750			

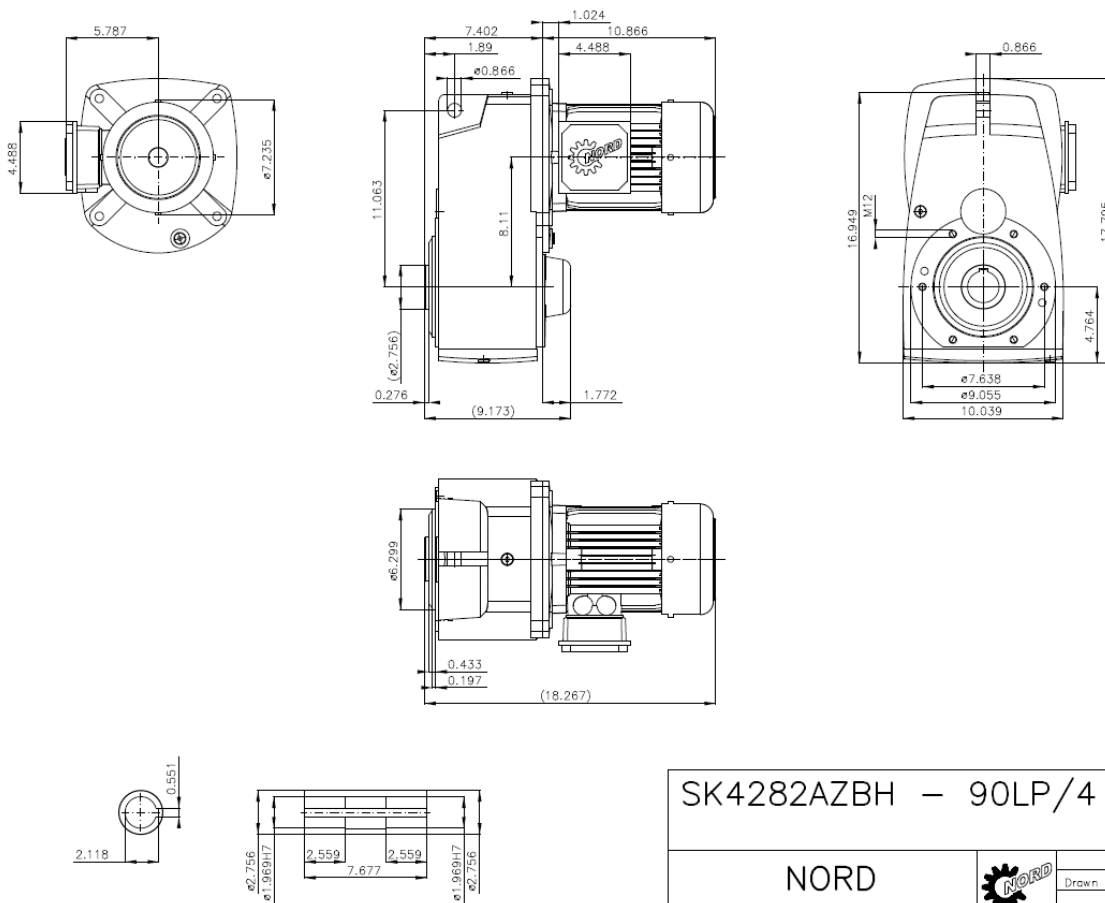


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This drawing is created with NORDCAD 9.2.1 DriveExpert

NORD		 DRIVE SYSTEMS	Date	Name
Nord Internet: http://www.nord.com			Drawn	05.04.2020



Pos.	Description	Material	Quantity
2	Shaft Mount Gearmotor SK 4282AZBH - 90LP/4 CUS TW		1
	No2		
	Product Name	Parallel Shaft Gears BLOCK	
	Input Speed	1730 rpm	
	Motor Inverter Speed Range	Standard Line Powered - Inverter Capable	
	Ratio	76.7	
	Output Speed	23 rpm	
	Service Factor	2.5	
	Output Torque	5588 lb-in	
	Overhung load	3690 lb	
	Axial Load	4950 lb	
	Power	2 hp	
	Voltage	332/575 V	
	Frequency	60 Hz	
	Efficiency Class	IE3 Premium Efficient Motor	
	Current 1	3.88 A	
	Current 2	2.24 A	
	Cosinus	0.78	
	Motor Duty	S1 - Continuous	
	Enclosure	IP55	
	Insulation	F	
	Mounting Pos	M1	
	Number of stages	2 :1	
	Type of housing	Face Flange	
	Output Shaft Dia	50H7 mm	
	Output Shaft Material	Standard	
	Gearbox Breather Options	Autovent	
	Gearbox Options	Shaft Fixing Kit Cover Hollow Shaft	
	Bearing Design	Standard Bearings	
	Motor Cooling	TEFC - Totally Enclosed Fan Cooled	
	Terminal Box Pos	1	
	Conduit Entry Loc	I	
	Cable Glands	None	
	Motor Option	Thermostat	
	Lubricant	VG220-MIN-EP	
	Lubricant Qty	4.44 qt	
	Sealed Surface Conversion	No Surface Sealing Conversion	
	Paint Coating	Standard Paint	
	Paint Color	Stainless Steel Gray	
	Base Weight	159 lb	
	Requested Delivery Date	on request	



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SK4282AZBH – 90LP/4 TW

NORD

Nord Internet: <http://www.nord.com>



Drawn	Date	Name
	28.03.2020	SYSTEM



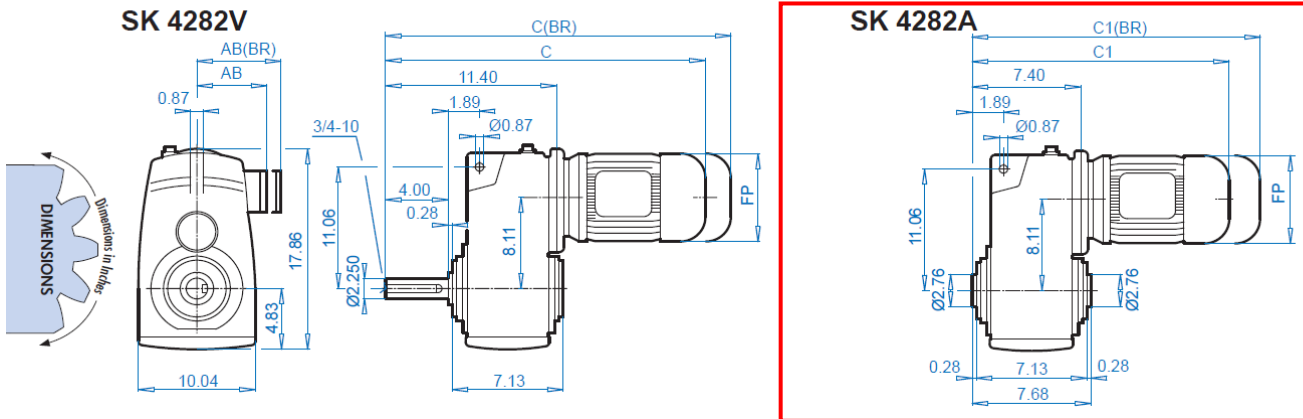
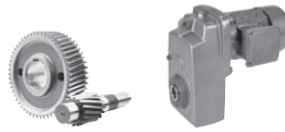
2.0 hp Gearmotors

Motor Power	Output Speed	Output Torque	Service Factor	AGMA Class	Gear Ratio	Standard Bearings		Heavy Duty Bearings (VL)		Model Type	Weight	Dim. Page
P_n	n_2	T_a	f_b		i_{tot}	F_{QN} OHL	F_{AN} Thrust	F_{QVL} OHL	F_{AVL} Thrust			
[hp]	[rpm]	[lb-in]				[lb]	[lb]	[lb]	[lb]		[lb]	
2.0	96	1306	1.5	II	17.21	716	1517	2131	1609	SK 1282 - 90L/4 SK 1282 - 90LH/4	62	330
	81	1560	1.3	I	20.57	736	1600	2113	1609			
	66	1913	1.0	I	25.22	754	1609	2081	1609			
	59	2149	0.9	*	28.33	763	1609	2054	1609			
	52	2434	0.8	*	32.08	763	1609	2021	1609			
	102	1235	1.7	II	16.28	898	1492	1800	2363	SK 1382NB - 90L/4 SK 1382NB - 90LH/4	75	324
	89	1422	1.5	II	18.75	923	1559	1800	2363			
	68	1840	1.3	I	24.26	963	1609	1800	2363			
	64	1973	1.2	I	26.01	970	1609	1800	2363			
	56	2260	1.1	I	29.79	981	1609	1800	2363			
	46	2712	1.0	I	35.75	992	1609	1800	2363			
	43	2941	1.0	I	38.77	995	1609	1800	2363			
	37	3368	0.9	*	44.40	992	1609	1800	2363			
	31	4042	0.8	*	53.28	947	1609	1800	2363			
	141	896	2.9	III	11.81	1375	2700	2691	3375	SK 2282 - 90L/4 SK 2282 - 90LH/4	86	332
	125	1004	2.8	III	13.23	1413	2700	2777	3375			
	100	1254	2.9	III	16.53	1510	2700	2959	3375			
	90	1404	2.8	III	18.51	1555	2700	3049	3375			
	76	1661	2.6	III	21.90	1625	2700	3128	3375			
	69	1818	2.1	III	23.96	1667	2700	3121	3375			
66	1894	2.3	III	24.97	1681	2700	3116	3375				
62	2035	1.9	II	26.83	1715	2700	3110	3375				
56	2249	2.0	III	29.65	1751	2700	3098	3375				
53	2369	1.7	II	31.23	1755	2700	3089	3375				
45	2772	1.6	II	36.54	1827	2700	3062	3375				
45	2821	1.4	II	37.18	1843	2700	3058	3375				
38	3316	1.5	II	43.71	1904	2700	3017	3375				
37	3422	1.2	I	45.11	1899	2700	3006	3375				
32	3923	1.2	I	51.71	1960	2700	2954	3375				
31	4094	1.1	I	53.96	1942	2700	2936	3375				
26	4842	1.0	I	63.83	1791	2700	2837	3375				
70	1799	2.9	III	23.71	1865	3263	3755	4500	SK 3282 - 90L/4 SK 3282 - 90LH/4	119	336	
64	1963	3.0	III	25.88	1917	3263	3850	4500				
58	2177	2.9	III	28.7	1969	3263	3960	4500				
52	2422	2.9	III	31.93	2025	3263	4070	4500				
44	2865	2.6	III	37.77	2104	3263	4255	4500				
43	2930	1.9	II	38.62	2093	3263	4262	4500				
40	3188	2.6	III	42.02	2162	3263	4379	4500				
37	3402	1.9	II	44.85	2174	3263	4428	4500				
35	3644	1.3	I	48.04	2194	3263	4500	4500				
31	4018	1.9	II	52.97	2259	3263	4626	4500				
30	4232	1.3	I	55.79	2275	3263	4671	4500				
26	4864	1.8	II	64.12	2356	3263	4849	4500				
25	4999	1.3	I	65.89	2356	3263	4874	4500				
21	6051	1.2	I	79.76	2444	3263	4966	4500				
19	6732	1.2	I	88.74	2493	3263	4921	4500				
37	3418	3.1	III	45.05	3344	4950	6489	6750	SK 4282 - 90L/4 SK 4282 - 90LH/4	152	346	
22	5819	2.4	III	76.70	3818	4950	6845	6750				
18	6867	2.1	III	90.52	3989	4950	6813	6750				
15	8404	1.7	II	110.78	4183	4950	6757	6750				
11	11789	1.0	I	155.40	4473	4950	6590	6750				



(AGMA Class I = f_b 1.0 - 1.39 II = f_b 1.4 - 1.99 III = $f_b \geq 2.0$ * = $f_b < 1.0$) (Model Type in blue is an Energy Efficient motor)

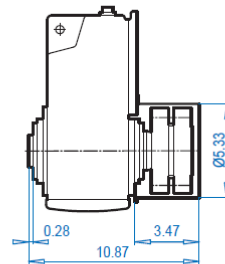
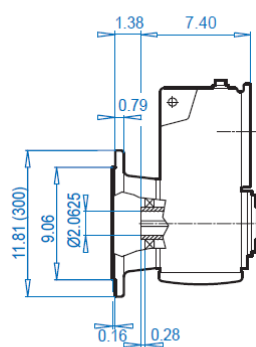
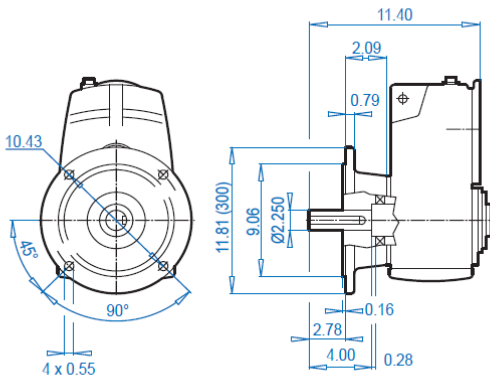
SK 4282 + Motor



SK 4282VF

SK 4282AF

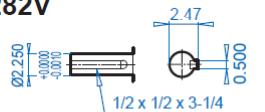
SK 4282ASH



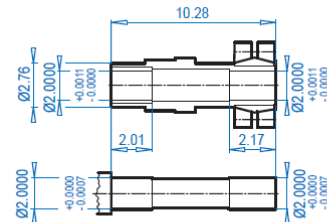
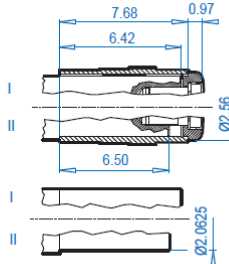
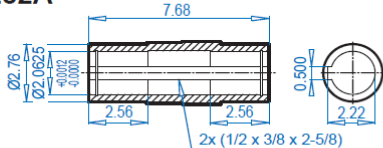
SK 4282V

SK 4282AB ⇨ 394

SK 4282AS ⇨ 72



SK 4282A



Motor dimensions

Standard efficiency	90S/L	100L		132S/M	160M/L		For Other Connection Possibilities please see ⇨ 376 & 378
Energy efficiency	90SH/LH	100LH	112MH	132SH/MH	160MH	160LH	
AB	5.79	6.65	7.05	8.03	8.90	8.90	
AB (BR)	5.83	6.26	6.69	7.72	8.90	8.90	
C1	18.31	19.49	20.40	23.78	26.26	27.84	
C1 (BR)	21.26	23.08	24.06	28.00	32.84	34.57	
C	22.31	23.49	24.40	27.78	30.26	31.84	
C (BR)	25.26	27.08	28.06	32.00	36.84	38.57	
FP	6.92	7.63	8.58	10.16	12.60	12.60	

(BR) denotes Brakemotor

Performance Data



Standard Efficiency

575V – 60Hz

Inverter duty • TEFC
 Synchronous speed 1800rpm @ 60Hz • 4-pole • Three-phase
 Voltages: 332/575V – 60Hz • 1.15 Service Factor
 Continuous Duty • 40°C Ambient • up to 3300ft Elevation
 Class B temperature rise • Class F insulation



Motor Type	Power Pn		Nn Full-load [rpm]	In Full-Load Current 575V [A]	Ia/In [%]	Code Letter	Torque Tn [lb-in]	Ta/Tn	Tk/Tn	pf	Eff. [%]	Jm Inertia [lb-ft²]
	[hp]	[kW]										
63S/4	0.16	0.12	1700	0.37	245	F	5.92	2.1	2.2	0.66	52	0.005
63L/4	0.25	0.18	1680	0.46	275	E	8.99	2.1	2.2	0.71	57	0.0067
71S/4	0.33	0.25	1710	0.66	310	G	12.3	2.5	2.4	0.64	63	0.017
71L/4	0.5	0.37	1720	0.8	355	F	18.0	2.45	2.6	0.69	71	0.0204
80S/4	0.75	0.55	1710	1.12	355	F	27.0	2.2	2.2	0.71	72	0.0259
80L/4	1	0.75	1650	1.46	390	G	38.1	2.2	2.3	0.74	70	0.0345
90S/4	1.5	1.1	1660	1.94	445	G	55.6	2.7	2.6	0.78	73	0.055
90L/4	2	1.5	1660	2.54	465	G	75.8	2.55	2.5	0.80	74	0.074
100L/4	3	2.2	1705	3.6	490	G	108	2.3	2.6	0.81	82	0.107
100LA/4	5	3.7	1725	6.1	510	G	180	2.7	3.1	0.75	81	0.141
132S/4	7.5	5.5	1735	7.92	545	G	267	2.45	2.75	0.82	86	0.55
132M/4	10	7.5	1735	10.3	645	H	363	2.9	3.2	0.84	87	0.752
160M/4	15	11	1770	14.7	665	H	522	2.45	3.0	0.82	88	0.95
160L/4	20	15	1765	19.5	725	H	713	2.9	3.3	0.86	89.4	1.23
180MX/4	25	18.5	1750	24.0	860	K	887	2.95	3.4	0.87	89	1.35
180LX/4	30	22	1755	28.4	980	L	1052	3.4	3.7	0.87	89.4	1.35
200L/4	40	30	1780	36.0	770	J	1414	2.9	3.6	0.85	92	5.70
225S/4	50	37	1765	50.0	760	H	1759	3.1	3.5	0.86	93.1	7.60
225M/4	60	45	1770		840	J	2133	3.1	3.6	0.86	93.8	8.54
250M/4	75	55	1782		700	H	2636	2.8	3.2	0.84	93.7	16.4
280S/4	100	75	1788		830	J	3497	2.9	3.5	0.84	94.4	30.6
280M/4	125	90	1786		810	J	4385	2.8	3.3	0.86	95.1	34.9
315S/4	150	110	1788		720	H	5255	2.8	3.1	0.84	94.7	47.5
315M/4	175	132	1790		800	J	6125	3.0	3.4	0.85	95.4	58.4
315Ma/4	200	150	1790		810	J	7003	3.2	3.6	0.86	95.7	71.4
315L/4	250	187	1790		850	J	8734	3.2	3.3	0.87	96.3	92.8



Pn - Full load power
 Nn - Full load speed
 In - Full load current
 Ia - Locked-rotor current
 Ia/In - Locked-rotor current ratio (%)
 Tn - Full-load torque
 Ta - Locked-rotor torque

Ta/Tn - Locked-rotor torque ratio
 Tk - Break-down torque
 Tk/Tn - Break-down torque ratio
 pf - Power factor
 Eff - Normal efficiency
 Jm - Motor inertia

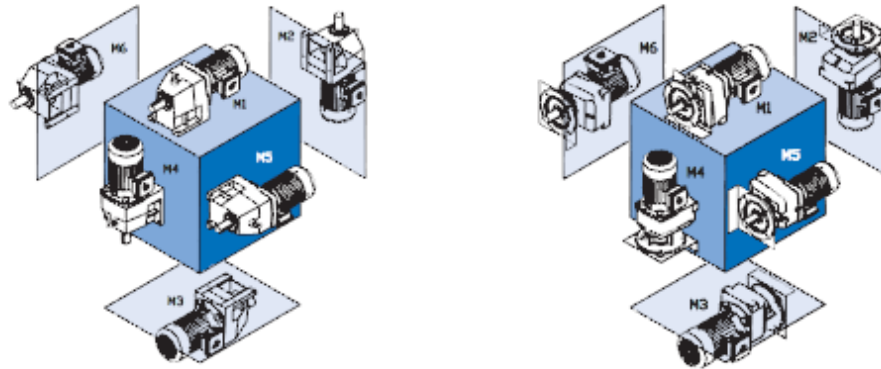
Mounting Positions



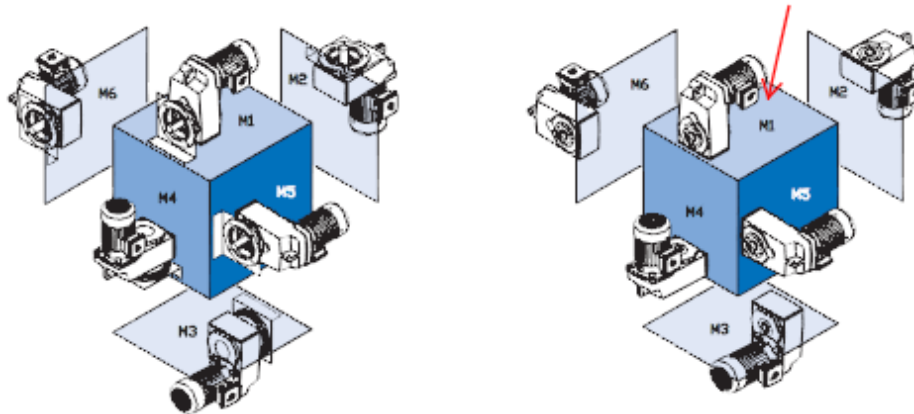
Mounting Positions

The reducer mounting position determines the approximate oil fill level and the appropriate vent location. In some cases mounting position may dictate possible variation in final reducer assembly. If considering any mounting positions that are not shown as catalog-standard options, it is critical that the customer consult with NORD prior to ordering.

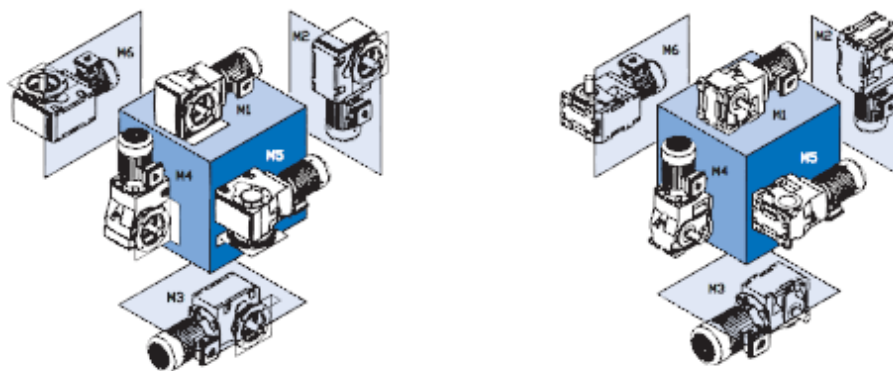
In-line



Clincher™



Right-Angle



Lubrication



The Importance of Proper Lubrication

Proper gearbox lubrication is essential in order to reduce friction and component wear, and protect against corrosion and rust. Gear lubricants reduce heat and wear by inserting a load-sharing “protective fluid film” between mating parts and preventing direct metal to metal contact. Properly selected lubricants will operate under various film conditions, improve heat transfer, optimize reducer efficiency, absorb shock loads, reduce noise, inhibit foaming, and separate water readily.

Design Considerations

Along with many other factors, the gear designer must consider the type of gearing (helical, bevel, worm, etc.), the gear load and speed conditions, and the expected operating oil temperatures. These factors help determine a generally suitable oil category, a desired additive package, preferred base-oil type, and oil viscosity.

It is important that the consumer be aware of these many design factors before making any changes in the critical areas (oil category, base-oil type, viscosity, etc.) One should consult their preferred lubrication supplier or NORD Gear when questions arise.

Gear Oil Types, Categorized by Base Oil

Mineral Oil with an EP Additive (DIN 51517, Type CLP)

High performance mineral gear oils are carefully engineered and manufactured to improve aging characteristics, minimize friction, offer good wear protection, provide corrosion and oxidation resistance, minimize foam, and separate water. Mineral gear oils are classified as API Group I or II oils, depending upon viscosity.

The standard NORD mineral gear oil has an extreme pressure (EP) additive ISO Viscosity Grade EP220 (AGMA 5 EP) and is generally acceptable for helical and helical-bevel gear units. Good quality mineral oil should have the ability to operate at moderate sump temperatures (up to 80-85 °C) without losing viscosity or thickness. A minimum viscosity index (VI) of 93 or higher is suggested. The oil must also have good film strength to handle shock loads, high torque, and start-up conditions. A minimum FZG Scuffing Load Stage 12 is desirable.

Advantages:

- Most economical of all the gear oil types.
- Generally offers good compatibility with shaft seals, gaskets, paint finishes, etc.
- Offers good corrosion and oxidation protection.
- Effectively reduces internal friction and wear.

When Synthetic Oils Are Used

Synthetic gear oils are suggested when mineral gear oils have reached their performance limit or when they no longer meet certain application requirements. NORD may recommend synthetic oil for any one of the following conditions:

- Severe duty applications or when gears are exposed to frequent starts and stops, high-load or shock.
- For applications in low or high temperature service.
- To extend oil service interval requirements.
- To eliminate the necessity for seasonal oil changes.
- To extend service life of factory-sealed or maintenance-free gear units.
- To take advantage of performance benefits: shear resistance, low traction coefficient, reduced internal friction, improved lubricity, reduced operating temperatures, improved gear efficiency, etc.

Performance Advantages of Synthetic Oil

Compared to mineral oils, synthetic oils provide a number of performance advantages including:

- Ability to operate at higher temperatures without losing viscosity or thickness, due to a much improved viscosity index.
- Improved low-temperature stability due to a lower pour point
- Increased oil change intervals due to superior oxidative and wear resistance
- Lower tendency to form residues and increased resistance to foaming.
- Other benefits may include: very good shear resistance, low traction coefficient, reduced internal friction, improved lubricity, reduced operating temperatures, improved gear efficiency, and extended component life and wear protection.

When application conditions warrant the use of synthetic oil, NORD may suggest a particular type of synthetic oil, depending upon the gear unit type and the application.



Lubrication

Synthetic Hydrocarbon/Polyalphaolefin (SHC/PAO) Oil (DIN 51517, Type CLP-HC)

Synthetic Hydrocarbons (SHC) or Polyalphaolefin (PAO) synthetic base oils offer good miscibility with mineral base oils and are very readily available. SHC/PAO oils are classified as API Group IV oils. They can be formulated with or without anti-wear (AW) or extreme pressure (EP) additives. They can also be formulated for acceptance in food-grade applications.

Advantages:

- Higher viscosity index and therefore greater high-temperature stability than mineral oil.
- Better low-temperature stability and lower pour point than mineral type gear oils
- High surface tension and lower tendency to foam compared to mineral oil, and water-soluble polyglycol gear oils.
- Compatible (miscible) with mineral oil.
- Better water separability demulsibility than PG oils.

Polyalkylene Glycol or Polyglycol Synthetic Oil (DIN 51517, Type CLP-PG)

Polyalkylene glycol or polyglycol (PAG or PG) synthetic gear oils are made readily available through many lubrication suppliers. PG oils are classified as API Group V gear oils. They can also be formulated for acceptance in food-grade applications.

PG gear oils possess extremely low traction coefficients and a viscosity index higher than any of the other synthetics (often greater than 220 VI), resulting in excellent heat resistant, shear stability, and natural anti-wear properties.

Typical PG gear oils are formulated with a 1:1 or higher ratio of ethylene oxide to propylene oxide (50:50 or 60:40 is common); this makes PG gear oils water soluble, providing them with very good corrosion resistance even when water is present in concentrations that are higher than what is normally allowed.

Advantages:

- PG oils offer the highest viscosity index of any other synthetic resulting in excellent heat resistant, shear stability, and superior natural anti-wear properties without requiring EP-additives.
- PG gears oils minimize internal friction and often result in improved gear efficiency.
- PG oils have significantly higher film strength than mineral and SHC/PAO oils and out perform these oils at higher operating oil temperatures (approaching 80°C or higher).



CAUTIONS



Polyglycol (PG) oils are not miscible with other oil types and should never be mixed with mineral oil, hydrosynthesized synthetic or PAO synthetic oils.

Food-Grade Lubricants

Food-grade lubricants should be manufactured in compliance with FDA 212 CFR 178.3570 and should either satisfy the former 1998 USDA Guidelines as an H1 lubricant or currently qualify as a NSF-H1 lubricant. Please consult with lubrication manufacture for more information or visit www.nsf.org

H1 food grade oil can only contain additives which appear on the FDA "approved list" for food safe compounds. H1 oils are generally absent of common zinc-based AW additives, and sulfur-phosphorus based, EP chemistries, commonly found in many industrial gear oils.

Food manufactures control risk and liability by following detailed guidelines outlined by the HACCP (Hazard Analysis and Critical Control Point) program, which includes food-grade H1 lubricants.

Food grade H1 lubricants may be formulated as highly refined mineral oils (white oils), SHC/PAO synthetic oils or PG synthetic oils.

The highly refined nature of good-quality food-grade white-oils provides good long-term oxidative stability and in most cases adequate lubrication under high-load (boundary) conditions. So long as food-grade white oils meet the minimum anti-wear requirements of the normally specified non-food grade oil, they are often acceptable.

Both food-grade white oils and PAO's have an inherent "purity" and absence of polar compounds, making them better than the average mineral oil or even PG oil in terms of demulsibility (water separability).

Compared to food-grade white-oils, food-grade synthetic PAO or PG oils typically provide:

- Better wear and oxidation resistance.
- Improved high-temperature characteristics.
- Better cold-temperature behavior.

Lubrication



The Importance of Oil Viscosity

Viscosity or the oil's resistance to shear under load, is often considered the single most important property of any gear oil.

NORD Gear Designers have selected the most appropriate ISO viscosity grade of oil, for each type or class of gear reducer. Gear oil viscosity is selected by assuming typical ambient conditions, at rated speed and load conditions.

Important Considerations:

- The correct viscosity selection helps provide proper lubrication and assures that a minimum film thickness is maintained between interacting surfaces.
- The degree to which viscosity changes with temperature or the viscosity index, varies from oil to oil, and depends upon the type of lubricant and additive agents used.
- Selecting too low of a viscosity can result in mixed-boundary (partial metal-to-metal contact) or boundary lubrication (full metal-to-metal contact) conditions, increasing internal friction heat build-up and wear.
- Selecting too high of a viscosity results in increased churning and squeezing losses in the load zone and excessive heat (especially when peripheral gear speeds are high); Ultimately, this causes the oil temperature to rise and the viscosity to go down, decreasing the effectiveness of the lubricant.

Considering an Oil Viscosity Change

There are three primary reasons to consider a lubrication viscosity change as follows:

1. Low temperature gear oils should be selected so that the pour point is at least 9°F (5°C) lower than the expected minimum ambient temperature. In extreme cases, consider a lower ISO Viscosity rating and test the critical performance of the gear box under cold start-up.
2. High temperature applications may require an increase in the lubricants viscosity to assure proper lubrication conditions in the critical load zones of the gear unit. NORD also recommends switching to synthetic oil if oil sump temperatures exceed 176-185 °F (80-85 °C).
3. In cases of extreme load conditions, gear pairs and antifriction bearings may be more susceptible to scuffing wear. In these operating conditions, it may be beneficial to consider an increased lubrication viscosity and/or lubrication with improved antiwear additive packages.

NORD recommends that the user consult with their primary lubrication supplier when considering changes in oil viscosity.

Maximum Oil Sump Temperature Limit

To prevent reducer overheating, the reducer's maximum oil sump temperature limit must not be exceeded for prolonged periods of operation (up to 3 hours continuous operation, depending upon reducer size).

Oil Type	Maximum Oil Temperature Limit	
	NORD	AGMA 9005-D94
Mineral	80-85 °C (176-185 °F)	95 °C (203 °F)
Synthetic	105 °C (220 °F)	107 °C (225 °F)

Lubrication



Lubrication Types

Proper gearbox lubrication is essential in order to reduce friction, heat, and component wear. Lubricants reduce heat and wear by inserting a protective “fluid boundary” between mating parts and preventing direct metal to metal contact. Lubricants also help prevent corrosion and oxidation, minimize foam, improve heat transfer, optimize reducer efficiency, absorb shock loads and reduce noise.

Mounting position not only determines the proper fill-level but may also have some effect on final reducer assembly. If considering any mounting positions that are not shown as catalog-standard options, it is critical that the customer consult with NORD prior to ordering. Unless otherwise specified, NORD supplies most all gear units (*) factory-filled with the standard lubrication type and the appropriate amount of lubricating oil.

* Gear units SK10282, SK10382, SK11282, SK11382, SK12382, and SK9096.1 are supplied without oil.

Standard Oil Lubricants

Gear Unit Type	Ambient Temperature	Oil Type	ISO Viscosity	Manufacturer Brand / Type
Helical-Inline, Parallel-Shaft, & Helical-Bevel	-4 to 104 °F (-20 to 40 °C)	MIN-EP	VG 220	Shell / Omala 220 ♣
	-40 to 140 °F (-40 to 60 °C)	PAO	VG 220	Mobil SHC 630 ♣
	23 to 104 °F (-5 to 40 °C)	FG	VG 220	Shell / FM 220 ♣
Helical-Worm	-22 to 122 °F (-30 to 50 °C)	PAO	VG 680	Mobil SHC 636 ♣

Optional Oil Lubricants

Gear Unit Type	Ambient Temperature	Oil Type	ISO Viscosity	Manufacturer Brand / Type
Helical-Inline, Parallel-Shaft, & Helical-Bevel	-31 to 176 °F (-35 to 80 °C)	PAO	VG 460	Mobil SHC 634
	-22 to 77 °F (-30 to 25 °C)	PAO	VG 150	Mobil SHC 629
	-40 to 140 °F (-40 to 60 °C)	FG-PAO	VG 220	Shell / Cassida GL 220
Helical-Worm	-40 to 122 °F (-40 to 50 °C)	FG-PAO	VG 460	Shell / Cassida GL 460

Standard Bearing Grease Lubricants

Grease Type / Thickener	Ambient Temperature	NLGI Grade	Manufacturer Brand / Type
Standard (Li-Complex)	-22 to 140 °F (-30 to 60 °C)	NLGI 2	Shell Albida EP LC2 ♣
High Temp (Polyurea)	-13 to 176 °F (-25 to 80 °C)	NLGI 2	Mobil Polyrex EP 2 ♣
Food-Grade (Al-Complex)	-13 to 104 °F (-25 to 40 °C)	NLGI 2	Mobil Grease FM 222 ♣

♣ Stocked lubricant

Oil Formulation Codes

MIN-EP	Mineral Oil with EP Additive
PAO	Synthetic Polyalphaolefin Oil
PG	Synthetic Polyglycol Oil
FG	Food-Grade Oil
FG-PAO	Food-Grade, Synthetic Polyalphaolefin Oil

Important Notes

- In worm gears avoid using (EP) gear oils that contain sulfur-phosphorous chemistries, as these additives can react adversely with bronze worm gears and accelerate wear.
- Food grade lubricants must be in compliance with FDA 21 CFR 178.3570 and qualify as a NSF-H1 lubricant. Please consult with lubrication manufacture for more information.
- When making a lubrication change, check with the lubrication supplier to assure compatibility and to obtain recommended cleaning or flushing procedures.
- Do not mix different oils with different additive packages or different base oil formulation types. Polyglycol (PG) oils are not miscible with other oil types and should never be mixed with mineral oil, or Polyalphaolefin (PAO) oil.
- Please Consult NORD if considering cold-temperature oils below an ISO Viscosity VG100 or lower.



Lubrication



Ventilation

Most gear reducers (except for SK0182NB, SK0282NB and SK1382NB) are equipped with a vent which helps compensate for air pressure differences between the inner space of the gear unit and the atmosphere.

The spring-pressure vent (Autovent™) is commonly supplied and factory-installed. Normally open vents may also be supplied as an option; normally-open vents are closed upon delivery in order to prevent oil leakage during transport. When normally open vents are supplied, the sealing plugs must be removed prior to commissioning the reducer.

Prior to reducer start-up, it is important to check the maintenance manual to verify that the vent is properly located with respect to mounting position.

Mounting Position

The reducer mounting position determines the approximate oil fill-level and the appropriate vent location. In some cases mounting position may dictate possible variation in final reducer assembly.

If considering any mounting positions that are not shown as catalog-standard options, it is critical that the customer consult with NORD prior to ordering.

Oil Fill Quantities

Oil fill quantities shown in the catalog or maintenance instructions are approximate amounts. The actual oil volume varies depending upon the gear ratio. Prior to commissioning the reducer, the oil-fill level should be checked using the reducer's oil-level plug. It may be necessary to drain excess oil or add additional oil.

Unless otherwise specified, NORD supplies most all gear units factory-filled with the standard lubrication type per the specified mounting position. Gear units SK10282, SK10382, SK11282, SK11382, SK12382, and SK9096.1 are supplied without oil.

Lubrication Replacement

If the gear unit is filled with mineral oil, the lubricant should be replaced at least after every 10,000 operating hours or after every two years. If the gear unit is filled with synthetic oil, the lubricant should be replaced at least after every 20,000 operating hours or after every four years.

Often gear reducers are exposed to extreme ambient conditions, hostile environments, wet conditions, or dirty and dusty operating areas. Especially in these situations, it is important to change the reducer lubricant more often than what is suggested as a typical guideline.

The Importance of Routine Oil Analysis

Routine oil analysis, sound lubrication practices, and good tracking of oil performance trends as related to specific equipment, will help establish proper lubrication maintenance and change-out intervals.

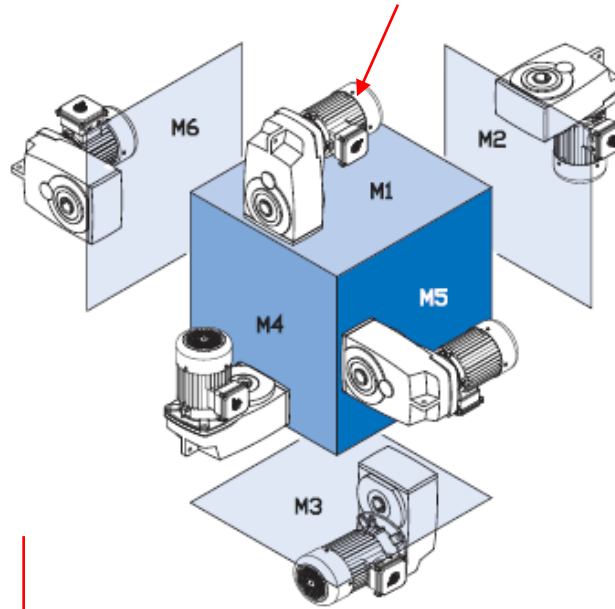
To maximize equipment reliability, NORD Gear generally recommends a condition-based lubrication maintenance program. One may take exceptions to this general recommendation on sealed-for-life or maintenance-free gear units or smaller and less costly gear units. In these instances, the replacement cost of the gear unit is often small compared to the costs associated with this type of oil analysis program.

NORD suggests replacing the gear oil if oil analysis indicates any of the following:

- Viscosity has changed by approximately 10% or more.
- Debris particles (silicon, dust, dirt or sand) exceed 25 ppm.
- Iron content exceeds 150-200 ppm.
- Water content is greater than 0.05% (500 ppm).
- Acid number tests indicate a significant level of oxidative break-down of the oil and a critical reduction in performance.



Clincher™ Shaft Mount Positions & Oil Fill Quantities



Mounting Position	M1		M2		M3		M4		M5		M6	
	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters
SK0182NB	0.42	0.40	0.58	0.55	0.63	0.60	0.58	0.55	0.37	0.35	0.37	0.35
SK0282NB	0.74	0.70	1.06	1.00	0.85	0.80	1.16	1.10	0.95	0.90	0.95	0.90
SK1282	1.37	1.30	2.43	2.30	1.48	1.40	2.22	2.10	2.11	2.00	2.01	1.90
SK1382NB	0.95	0.90	1.37	1.30	0.95	0.90	1.27	1.20	1.00	0.95	1.00	0.95
SK2282	1.74	1.65	2.54	2.40	2.01	1.90	2.11	2.00	1.90	1.80	1.90	1.80
SK2382	1.80	1.70	2.75	2.60	2.01	1.90	3.28	3.10	1.59	1.50	1.59	1.50
SK3282	3.33	3.15	4.33	4.10	3.44	3.25	4.33	4.10	3.33	3.15	3.33	3.15
SK3382	4.33	4.10	4.33	4.10	3.49	3.30	5.92	5.60	3.49	3.30	3.49	3.30
SK4282	4.97	4.70	6.45	6.10	5.02	4.75	5.71	5.40	4.97	4.70	4.97	4.70
SK4382	6.24	5.90	7.19	6.80	5.18	4.90	8.77	8.30	5.18	4.90	5.18	4.90
SK5282	7.93	7.50	9.30	8.80	7.93	7.50	9.30	8.80	7.61	7.20	7.61	7.20
SK5382	13.2	12.5	12.7	12.0	7.08	6.70	14.80	14.00	8.77	8.30	8.77	8.30
SK6282	18.0	17.0	14.8	14.0	12.7	12.0	18.5	17.5	10.6	10.0	14.8	14.0
SK6382	17.4	16.5	13.7	13.0	10.1	9.6	19.0	18.0	14.8	14.0	13.2	12.5
SK7282	26.4	25.0	22.2	21.0	21.1	20.0	28.5	27.0	16.9	16.0	22.2	21.0
SK7382	23.3	22.0	21.1	20.0	16.9	16.0	26.4	25.0	24.3	23.0	20.1	19.0
SK8282	39.1	37.0	34.9	33.0	31.7	30.0	43.3	41.0	32.8	31.0	32.8	31.0
SK8382	35.9	34.0	33.8	32.0	26.4	25.0	40.2	38.0	37.0	35.0	31.7	30.0
SK9282	78.2	74.0	74.0	70.0	58.1	55.0	76.1	72.0	72.9	69.0	62.4	59.0
SK9382	77.2	73.0	74.0	70.0	47.6	45.0	78.2	74.0	68.7	65.0	63.4	60.0
SK10282	95.1	90.0	95.1	90.0	42.3	40.0	95.1	90.0	63.4	60.0	86.7	82.0
SK10382	89.8	85.0	106	100	77.2	73.0	106	100	84.6	80.0	84.6	80.0
SK11282	174	165	169	160	153	145	206	195	106	100	148	140
SK11382	169	160	164	155	148	140	222	210	164	155	143	135
SK12382	169	160	164	155	148	140	222	210	164	155	143	135



Clincher™ Shaft Mount Weights - Gearmotor



Approximate Weights [lb]

Type	43S	43L	71S	71L	80S	80L	90S	90L	100L	100LA	132S	132M	160M	160L	180MX	180LX	200L	225S	225M	250M	280S	280M	315S	315M	315MA
SK 0182 NB	17	18	21	23	26	29	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 0282 NB	26	27	30	32	35	37	44	49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 1282	39	40	43	45	49	51	57	62	71	77	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 1382 NB	52	53	56	58	62	64	71	75	84	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 1282/02	56	58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 2282	-	-	67	69	73	75	82	86	95	101	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 2382	78	80	82	84	88	90	97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 2282/02	81	82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 3282	-	-	-	102	106	108	115	119	128	135	185	209	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 3382	114	115	118	120	123	126	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 3282/12	118	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 4282	-	-	-	-	-	-	148	152	161	168	218	243	282	320	-	-	-	-	-	-	-	-	-	-	-
SK 4382	-	-	166	168	172	174	181	185	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 4282/12	151	153	155	157	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 5282	-	-	-	-	-	-	227	232	240	247	298	322	362	399	-	452	-	-	-	-	-	-	-	-	-
SK 5382	-	-	-	-	260	262	269	273	282	289	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 5282/12	-	-	235	237	240	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 6282	-	-	-	-	-	-	-	-	432	483	507	547	584	637	637	-	867	939	-	-	-	-	-	-	-
SK 6382	-	-	-	-	-	-	406	410	419	426	476	501	540	578	631	631	-	-	-	-	-	-	-	-	-
SK 6382/22	-	-	-	-	439	441	448	452	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 7282	-	-	-	-	-	-	-	-	-	622	646	686	723	776	776	933	1005	1078	-	-	-	-	-	-	-
SK 7382	-	-	-	-	-	-	-	-	580	587	637	662	701	739	792	792	948	1021	1094	-	-	-	-	-	-
SK 7382/22	-	-	-	-	600	602	609	613	622	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 8282	-	-	-	-	-	-	-	-	-	904	968	1005	-	1058	1215	1288	1360	1766	2152	-	-	-	-	-	-
SK 8382	-	-	-	-	-	-	-	-	856	862	913	937	977	1014	1067	1067	1224	1297	1369	-	-	-	-	-	-
SK 8382/32	-	-	-	-	900	902	908	913	922	928	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 8382/42	-	-	-	-	-	-	-	946	955	961	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 9282	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1951	2024	2430	2816	2926	3301	3477	3808	
SK 9382	-	-	-	-	-	-	-	-	-	1579	1603	1643	1680	1733	1733	1890	1962	2035	2441	2827	-	-	-	-	-
SK 9382/42	-	-	-	-	-	-	1607	1612	1621	1627	1678	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SK 9382/52	-	-	-	-	-	-	-	-	-	1691	-	-	1806	-	1896	-	-	-	-	-	-	-	-	-	-
SK 10282	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4126	4500	4677	5008	
SK 10382	-	-	-	-	-	-	-	-	-	-	2847	2886	2924	2977	2977	3133	3206	3279	3685	4070	4181	4556	4732	5063	
SK 10382/52	-	-	-	-	-	-	-	-	2928	2935	2986	3010	3050	3087	3140	3140	-	-	-	-	-	-	-	-	
SK 11282	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5859	6234	6410	6741	
SK 11382	-	-	-	-	-	-	-	-	-	-	-	-	4772	4825	4825	4981	5054	5127	5532	5918	6028	6403	6580	6910	
SK 11382/52	-	-	-	-	-	-	-	-	4783	4833	4858	4897	4935	4988	4988	-	-	-	-	-	-	-	-	-	
SK12382	-	-	-	-	-	-	-	-	-	-	-	-	4734	4772	4825	4825	4981	5054	5127	5532	5918	6028	6403	6580	6910

Above weights are approximate. Depending upon ratio, oil quantity and optional equipment, reducer weights may be different than shown. Exact weights can be obtained after the unit is fully assembled.

Motors

Motors

- Order Form
- NEMA C-Face Motors
- Engineering Information
- Options
- Environmental Options
- Inverter Options
- SK 300E Trio Inverter
- Additional Options
- Ratings Tables
- Dimensions
- Connection Diagrams

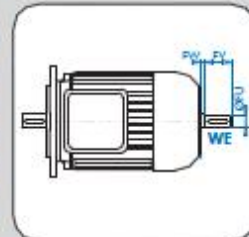


www.nord.com

**INVERTER
DUTY MOTOR**



Motor Type	Power Pn		rpm	Full-load	Full-load
	[kW]	[HP]	[rpm]	[A]	[A]
435/A	0.18	0.17	1700	0.84	0.44
435/A	0.25	0.19	1680	1.12	0.55
775/A	0.33	0.25	1710	1.34	0.70
775/A	0.5	0.37	1710	1.90	0.95
995/A	0.75	0.55	1710	2.70	1.25
1300/A	1.1	0.75	1680	3.50	1.60
1615/A	1.5	1.1	1680	4.34	2.1
1615/A	2	1.5	1680	5.34	2.7
1995/A	3	2.3	1705	6.2	3.50
1995/A	5	3.7	1705	10.2	5.0
1225/A	7.5	5.3	1725	19.8	9.9
1225/A	10	7.5	1725	25.8	12.9
1600/A	15	11	1770	38.4	19





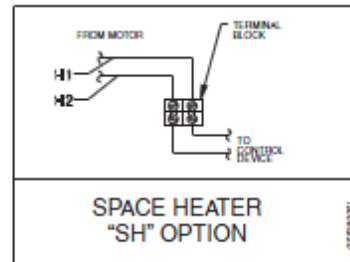
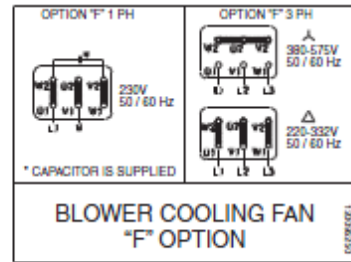
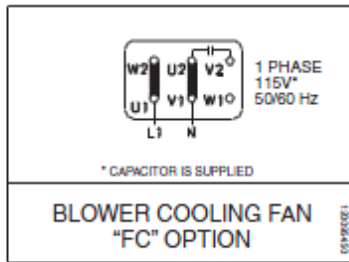
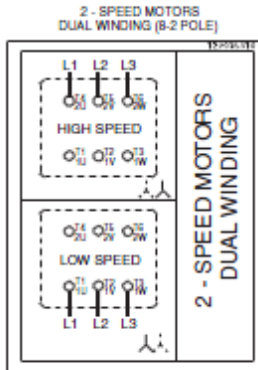
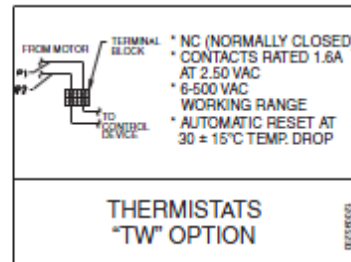
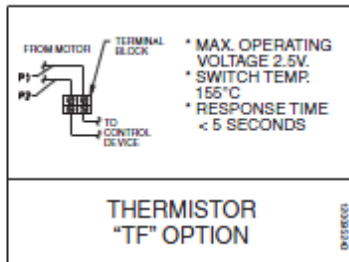
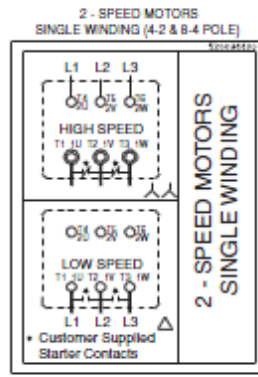
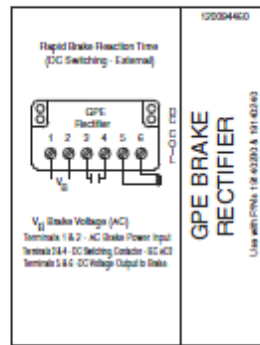
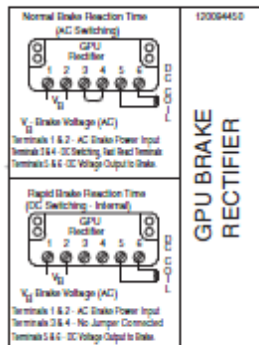
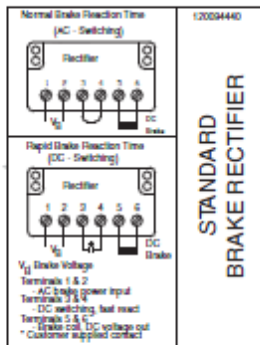
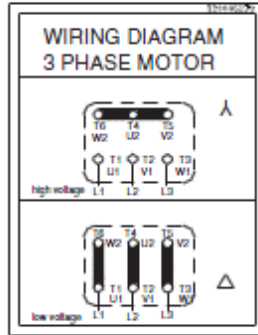
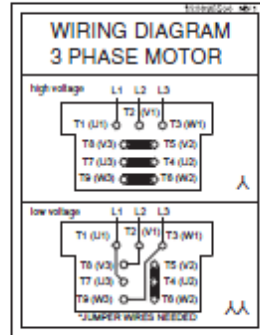
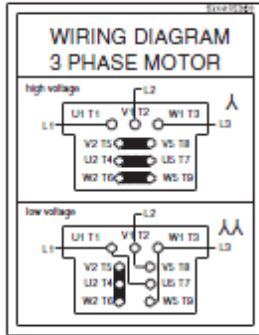
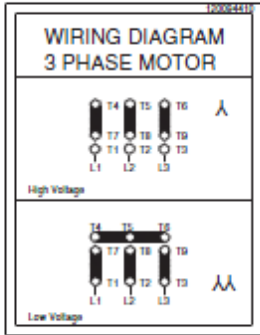
Connection Diagrams

Frames 63-132 | 230 / 460V, 60Hz, 3Ø | 200 / 400V, 50Hz, 3Ø | 190 / 380V, 60Hz, 3Ø

Frames 160 + | 230 / 460V, 60Hz, 3Ø | 200 / 400V, 50Hz, 3Ø | 190 / 380V, 60Hz, 3Ø

Frames 160 + | 230 / 460V, 60Hz, 3Ø | 200 / 400V, 50Hz, 3Ø | 190 / 380V, 60Hz, 3Ø

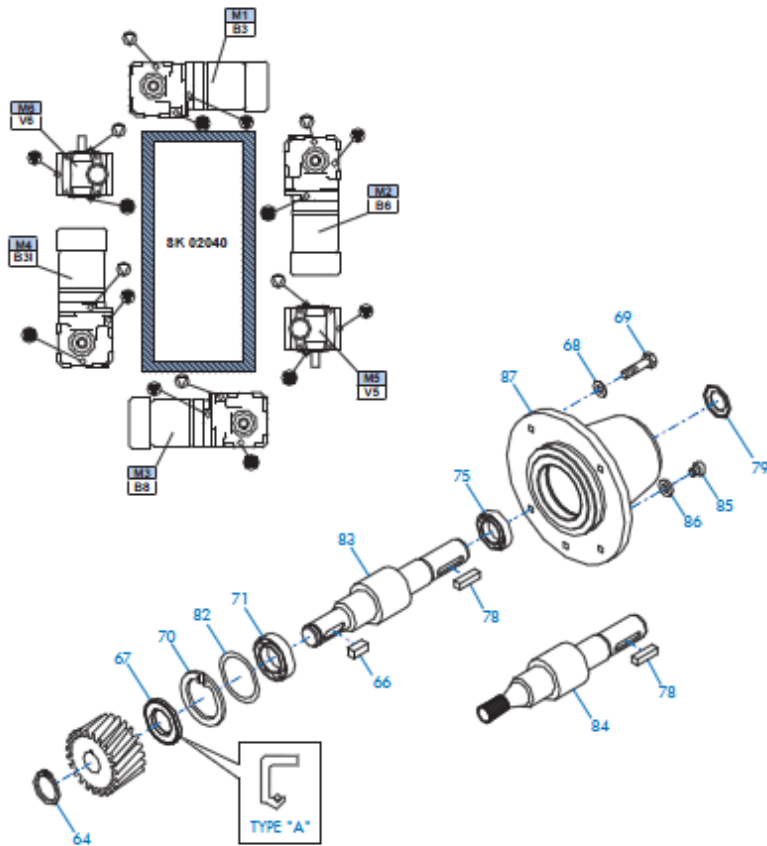
460 / 800V, 60Hz, 3Ø | 230 / 400V, 50Hz, 3Ø | 208 / 360V, 60Hz, 3Ø | 400 / 690V, 50Hz, 3Ø | 332 / 575V, 60Hz, 3Ø



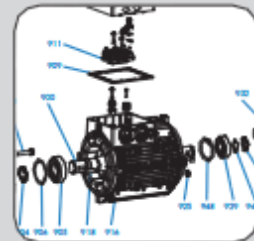
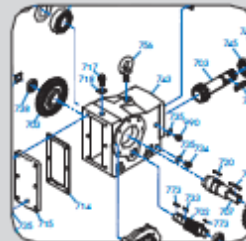
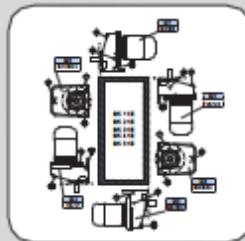
Comes with the space heater option.

Service

- Oil Plugs
 - In-line
 - Clincher™
 - Helical-bevel
 - Helical-worm
- Parts Lists
 - In-line
 - Clincher
 - Helical-bevel
 - Helical-worm
 - Helical Input Stage
 - Motor
 - NEMA C-face
 - Solid Input Shaft - W

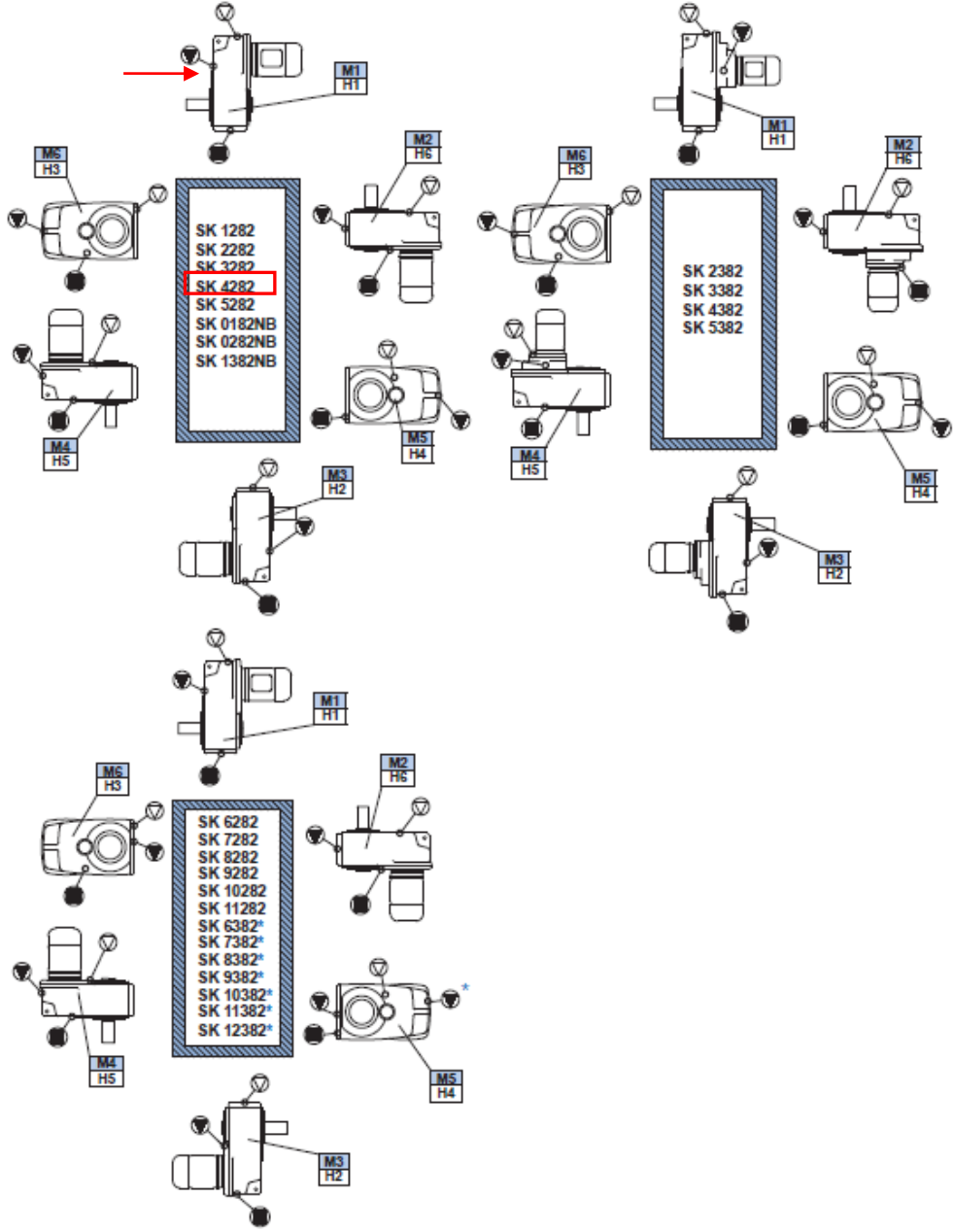


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Oil Plugs



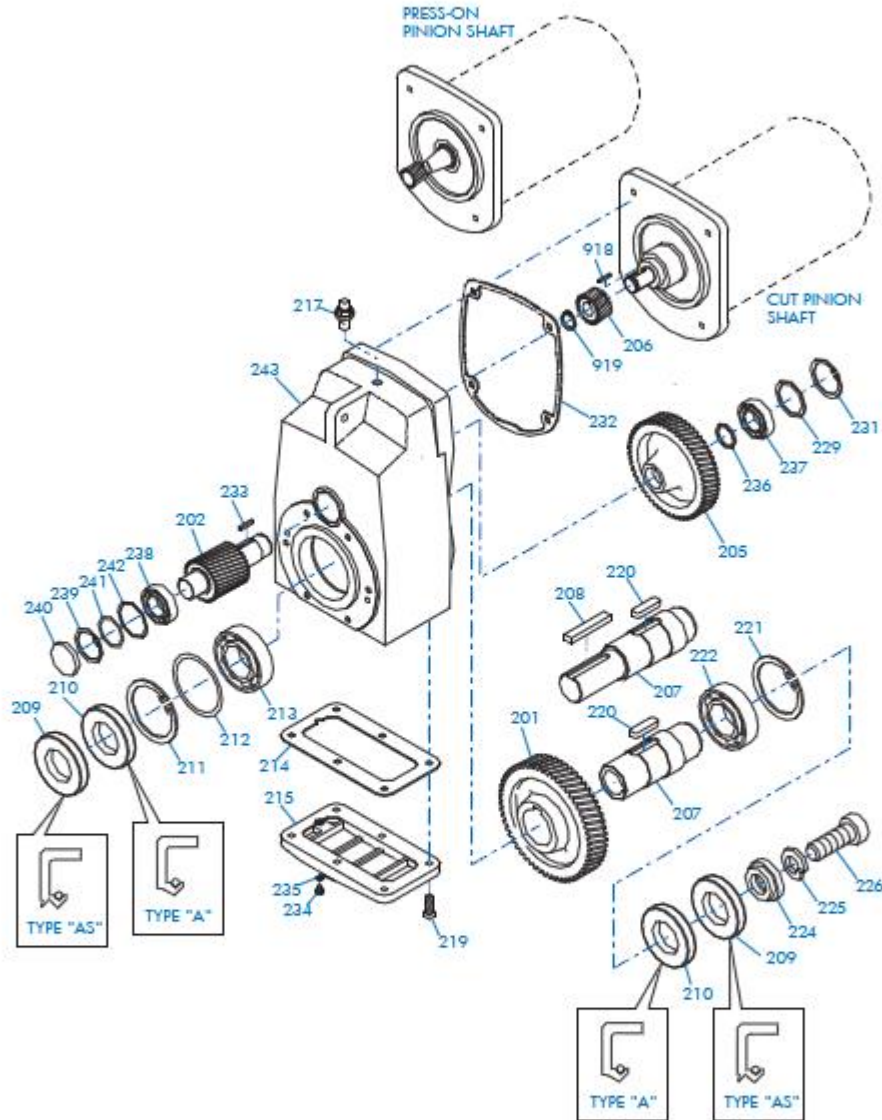
▽ = Vent ▼ = Oil Level ■ = Oil Drain



Parts Lists



Clincher™ SK0182NB + SK1282 - SK5282 AZB + VZ



201 Gear	213 Anti-Friction Bearing	226 Bolt	239 Snap Ring
202 Pinion Shaft	214 Gasket	229 Thrust Washer	240 Bore Plug
205 Gear	215 Inspection Cover	231 Snap Ring	241 Shim
206 Pinion	217 Vent Plug	232 Gasket	242 Thrust Washer
207 Output Shaft	219 Bolt	233 Key	243 Gearcase
208 Key	220 Key	234 Drain Plug	918 Key
209 Oil Seal	221 Snap Ring	235 Gasket	919 Snap Ring
210 Oil Seal	222 Anti-Friction Bearing	236 Thrust Washer	
211 Snap Ring	224 Retaining Washer	237 Anti-Friction Bearing	
212 Shim	225 Lock Washer	238 Anti-Friction Bearing	

H760

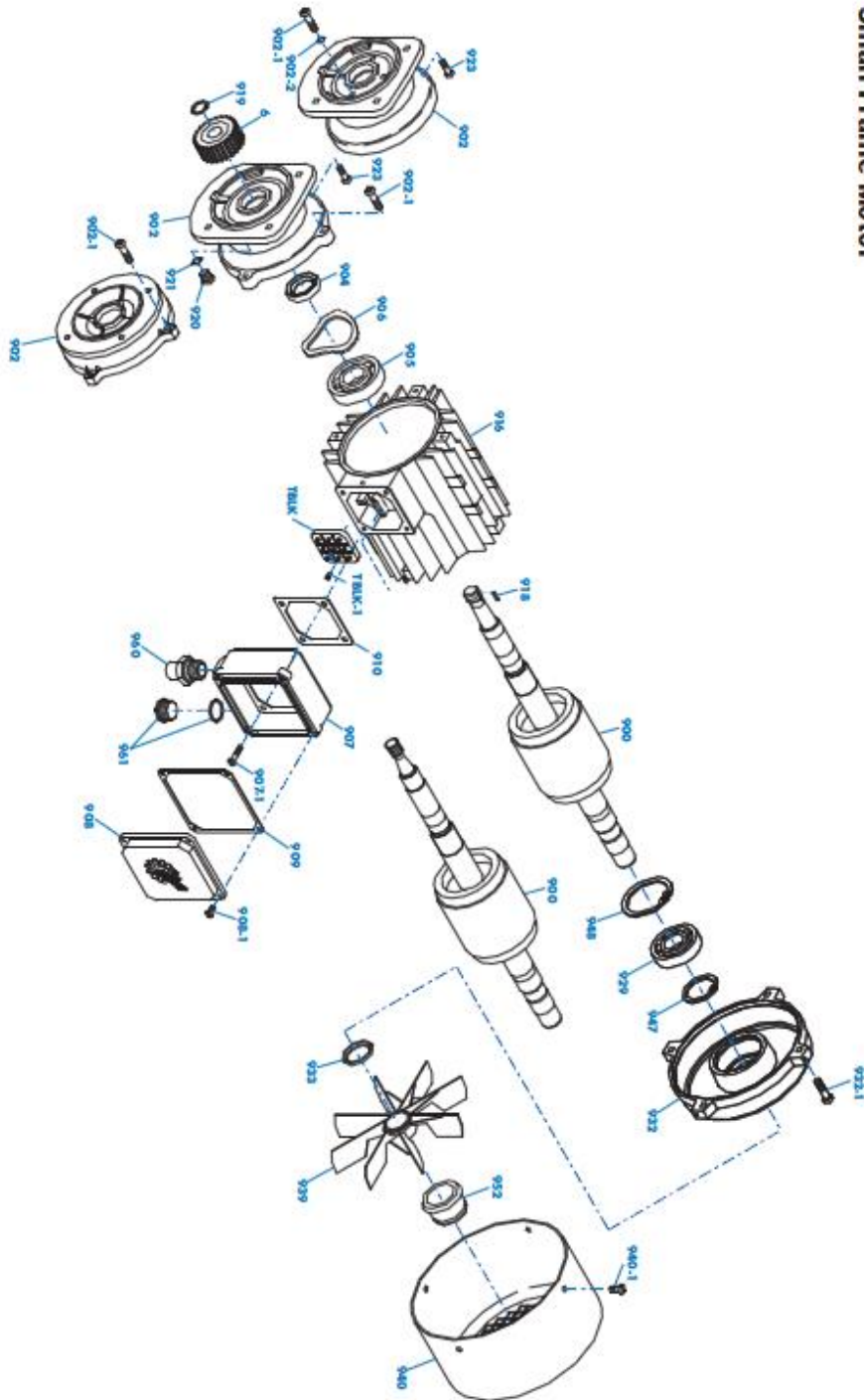
G1000 - Subject to Change Without Notice

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Parts Lists



Small Frame Motor



6	Pinion	907	Terminal Box Frame	919	Snap Ring	939	Fan
900	Rotor With Shaft	907:1	Bolt	920	Oil Plug	940	Fan Cover
902	End Shield A	908	Terminal Box Cover	921	Gasket	940:1	Screw
902:1	Bolt	908-1	Bolt	923	Bolt	947	Snap Ring
902:2	Gasket	909	Terminal Box Cover Gasket	929	Bearing B	948	Snap Ring
904	Oil Seal	910	Terminal Box Frame Gasket	932	End Shield B	952	Fan Clip
905	Bearing A	916	Slider	932:1	Bolt	960	NPT Adapter
906	Shim	918	Key	933	Oil Seal	961	Plug & Gasket



H778

G1000 - Subject to Change Without Notice

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8.2. Tsubaki - Shock Relay

One shock relay is provided for each motor and wired in the control panel of the area concerned. The shock relay is shipped loose to be installed in the control panel by the MCC manufacturer.

Conveyor Ref.	CONVEYOR – U260
Shock Relay	1 per conveyor (3 total)
Type	Tsubaki TSB-SB-05 CUL

The procedure to set a shock relay is quite simple, just follow these steps:

1. Find the shock relay and determine which is the dial for the current load, with the equipment running, Back off the dial TURNING IT COUNTER CLOCKWISE until the equipment stops.
2. Add 5% to the load current reading at the point the equipment stopped.(If the equipment stops,(after it has been running for awhile), Increase the load current at 1% increments this should keep the equipment running under normal conditions.
3. DO NOT EXCEED THE FULL LOAD AMPS OF THE MOTOR.
4. On the shock relay set the START TIME to 3 seconds.
5. Set the load current as explained above.
6. Set the shock time to 0,5 seconds.

install in MCC bucket.

TSUBAKI SHOCK RELAY SB Series

Electrical Overload Protectors



What is the SHOCK RELAY?

▶ Quick overcurrent detection ◀

The SHOCK RELAY outputs a signal if the current from a motor exceeds the set value for longer than the set amount of time.
For example, when foreign material causes a conveyor to jam, the signal from the SHOCK RELAY can help minimize damage to the equipment.

▶ Easy to install on existing equipment ◀

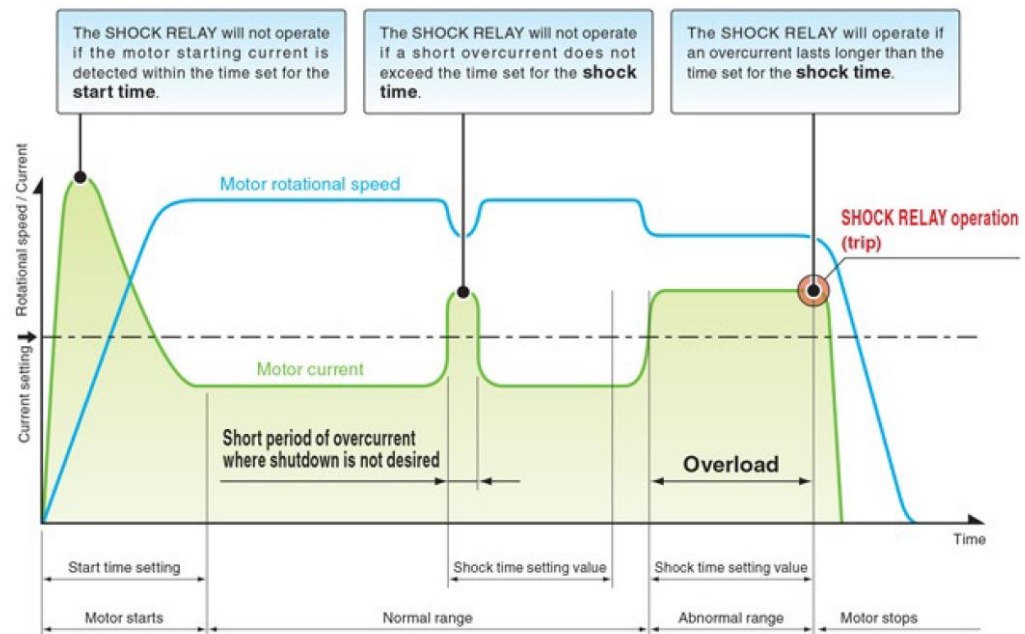
Because the SHOCK RELAY is an electric protection device, it can be mounted on existing equipment without making intensive mechanical modifications similar to mechanical protection devices.

▶ Operates only when an overcurrent occurs ◀

The shock time setting makes it possible to prevent a motor from shutting down due to device-specific pulsations or short overcurrent occurrences.

Operation modes

▶ Overload operation mode ◀



Model No.

T S B S B 0 5

SHOCK RELAY SB Series Frame No.

Various part names and functions



* Picture shows the SHOCK RELAY with the DIP switch cover removed.

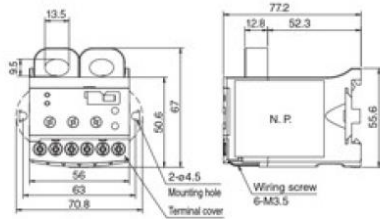
Standard specifications

Item		Model No.	TSBSB05	TSBSB10	TSBSB30	TSBSB60	TSBSB100	TSBSB200	TSBSB300
Current setting range			0.5 to 6 A	1 to 12 A	3 to 30 A	5 to 60 A	10 to 100 A	20 to 200 A	30 to 300 A
Time setting range	Start time		0.2 to 10s						
	Shock time		0.2 to 5s						
Current accuracy setting			±10% (Full scale)						
Operation power			24 to 240 V AC/DC ±10%, 50/60 Hz						
Maximum motor circuit voltage			600 V AC, 50/60 Hz						
Current detection			Two-phase CT system						
Display			Normal monitoring state: MON lamp is on Overcurrent monitoring state: OC lamp is on						
Output relay	Contact arrangement		1a1b						
	Contact rating		3 A, 250 V AC, $\cos\phi = 1$						
	Recommended current step-down operation		0.2 A or less, 250 V AC, $\cos\phi = 0.4$						
	Minimum applicable load		10 V DC, 10 mA						
	Operation selection		DIP switch selection set to SS: Excitation when normal, self-hold after trip; Selection set to SA: Excitation upon error, automatic reset after trip						
Operating environment	Life		80,000 times at contact rating load						
	Operating temperature		-20 to 60°C						
	Storage temperature		-30 to 70°C						
	Humidity		45 to 85% RH with no condensation						
	Altitude		2,000 m or less						
	Atmosphere		No dust or corrosive gas Pollution degree 3 or below when installed in control box						
Insulation resistance	Vibration		5.9 m/s ² or less						
	Between circuit and housing		10 MΩ or more (500 V DC Megger)						
Dielectric voltage	Between circuit and housing		2000 V AC, 60 Hz, for 1 minute						
	Between contacts		1000 V AC, 60 Hz, for 1 minute						
	Between circuits		2000 V AC, 60 Hz, for 1 minute						
Protection construction			IP20						
Material	Housing		Upper housing: PA6; Lower housing: PA66						
	Terminal cover		PA6						
Power consumption			2 W or less						
Mounting			35-mm DIN rail or mounting plate						
Estimated mass	Main unit (External CT only)		0.2 kg (0.5 kg)						

External dimensions

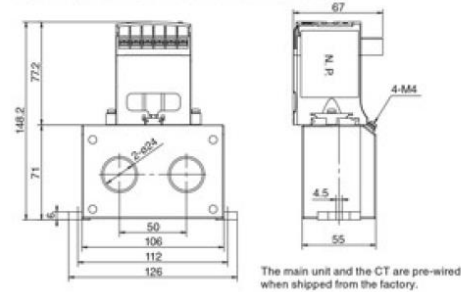
▶ Integrated CT type ◀

TSBSB05 / TSBSB10 / TSBSB30 / TSBSB60



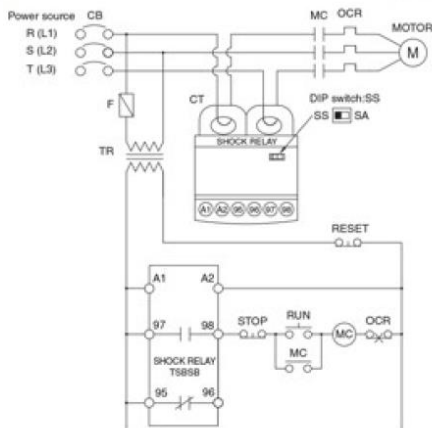
▶ Externally mounted CT type ◀

TSBSB100 / TSBSB200 / TSBSB300

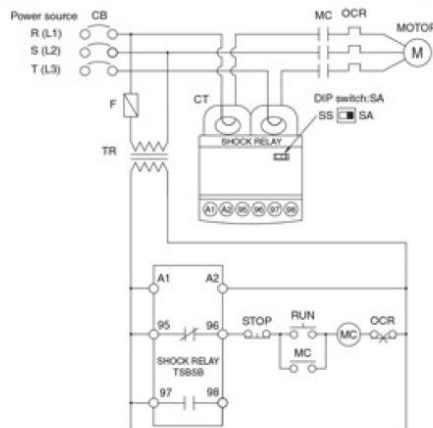


Basic connection diagram

▶ DIP switch selection set to SS ◀



▶ DIP switch selection set to SA ◀



- Notes: 1. Transformers (Tr) should be attached as necessary according to the operating power of the SHOCK RELAY.
 In addition, the use of inverters or other harmonic noise generators may cause a malfunction. In such cases, make sure to install an isolation transformer.
 2. Make sure that two of the three-phase wires routed to the motor pass through the two SHOCK RELAY CTs in the same orientation.
 3. The coil capacity of the electromagnetic contactor (MC) to be connected to the output relay of the SHOCK RELAY should be less than 200 VA when ON and less than 20 VA during retention.
 4. Be cautious of the DIP switch selection of the SHOCK RELAY when connecting.

CT wiring

Depending on the motor capacity, refer to the table on the right to decide the applicable SHOCK RELAY model No. and the number of wires passing through the CT.
 To improve CURRENT volume setting accuracy, at least two wires are used in combination with smaller motor currents. In such instances as when the load factor of the motor is low, increase the number of wires as necessary.
 It should be noted that, with two wires passing through, it's necessary to convert the current scale of the CURRENT volume.

(Example) With two wires passing through the CT, the CURRENT scale values should be halved before configuring the settings.

200 V AC motor			400 V AC motor		
Capacity (kW)	Applicable SHOCK RELAY model No.	Number of wires passing through CT	Capacity (kW)	Applicable SHOCK RELAY model No.	Number of wires passing through CT
0.1	TSBSB05	4	-	-	-
0.2	TSBSB05	3	0.2	TSBSB05	4
0.4	TSBSB05	2	0.4	TSBSB05	3
0.75	TSBSB05	1	0.75	TSBSB05	2
1.5	TSBSB10	1	1.5	TSBSB05	1
2.2	TSBSB10	1	2.2	TSBSB05	1
3.7	TSBSB30	1	3.7	TSBSB10	1
5.5	TSBSB30	1	5.5	TSBSB30	1
7.5	TSBSB60	1	7.5	TSBSB30	1
11	TSBSB60	1	11	TSBSB30	1
-	-	-	15	TSBSB60	1
-	-	-	18.5	TSBSB60	1
-	-	-	22	TSBSB60	1

8.3. Motion sensor

Conveyor Ref.	CONVEYOR – U260
Motion Sensor	1 per conveyor (3 total)
Type	Siemens Sistrans WM100

One motion sensor probe (zero speed switches) including his controller is provided for each conveyor and wired to the control panel of the area concerned.

WM-100 comes with no transmitter
To be wired directly to the control panel (by others)
CSA certification

Motion sensors

SITRANS WM100

Selection and Ordering data	Order No.
SITRANS WM100	7MH7158 -
A heavy-duty zero-speed alarm switch that does not require a controller.	0 A 0 0
Model	
115 VAC	A
230 VAC	B

Selection and Ordering data	Order code
<i>Further designs</i>	
Please add "-Z" to Order No. and specify Order code(s).	
Manufacturer's test certificate M to DIN 55 350, Part 18 and to ISO 9000	C11
Acrylic coated, stainless steel tag [13 x 45 mm (0.5 x 1.75")]: Measuring-point number/identification (max. 16 characters), specify in plain text	Y17
<i>Operating Instructions</i>	Order No.
SITRANS WM100, English	C) 7ML1998-5MW01
SITRANS WM100, German	C) 7ML1998-5MW31
Note: The operating instructions should be ordered as a separate item on the order. This device is shipped with the Siemens Milltronics manual CD containing the complete operating instructions library.	
Locknut, for WM100 and Millpulse 600	C) 7MH7723-1CR
Mounting flange, for WM100 and Millpulse 600	7MH7723-1CS
Motion cable gland adaptor kit	7MH7723-1JN
C) Subject to export regulations AL: N, ECCN: EAR99.	

Process Protection

Motion sensors

SITRANS WM100

Overview



SITRANS WM100 is a heavy-duty zero-speed alarm switch. This non-contacting unit provides cost-effective equipment protection even in the harshest conditions.

Benefits

- Up to 100 mm (4 inch) gap between SITRANS WM100 and targets
- Rugged, low maintenance suitable for tough environments
- 1 SPDT Form C relay contact
- Provides cost-effective protection
- Visual indication of target triggered pulse

Application

This rugged unit is impervious to dust, dirt, build-up and moisture and is ideal for such primary industries as mining, aggregate, and cement. Operating where other systems are prone to failure, the non-contacting design eliminates the need for lubricating, cleaning and part replacement. Downtime and clean-up expenses associated with conveying equipment failure are reduced by the SITRANS WM100. It alarms to minimize spillage, prevent extensive damage or even fire caused by belt slippage at the head pulley and warn against conveyor malfunction.

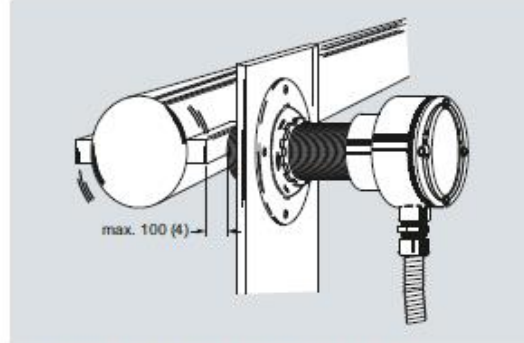
The SITRANS WM100 has built-in selectable start delays and 1 Form C relay contact. With an aluminum body, it operates from -40 to +60 °C (-40 to +140 °F).

- Key Applications: tail pulleys, driven pulleys, motor shaft sensing, screw conveyor flights, bucket elevators

Design

Mounting

The WM100 probe should be mounted, using the supplied mounting flange, onto a vibration-free structure. The gap between the probe and the target should be sufficient such that there is no danger of the target damaging the probe. The maximum allowable gap is 100 mm (4") from the face of the target to the face of the probe for 4.5 x 4.5 mm (3/16 x 3/16") keyway. The WM100 is sensitive to lateral disturbances to its magnetic field. If the WM100 is responding to motion from an interfering target, move the WM100 or install a ferrous plate (steel) as a shield between the WM100 and the interfering target. Where possible, the probe should be mounted such that the cable inlet is pointing downward to avoid accumulation of condensation in the casing. Connection of the probe should be made via flexible conduit for easier removal or adjustment of the probe.



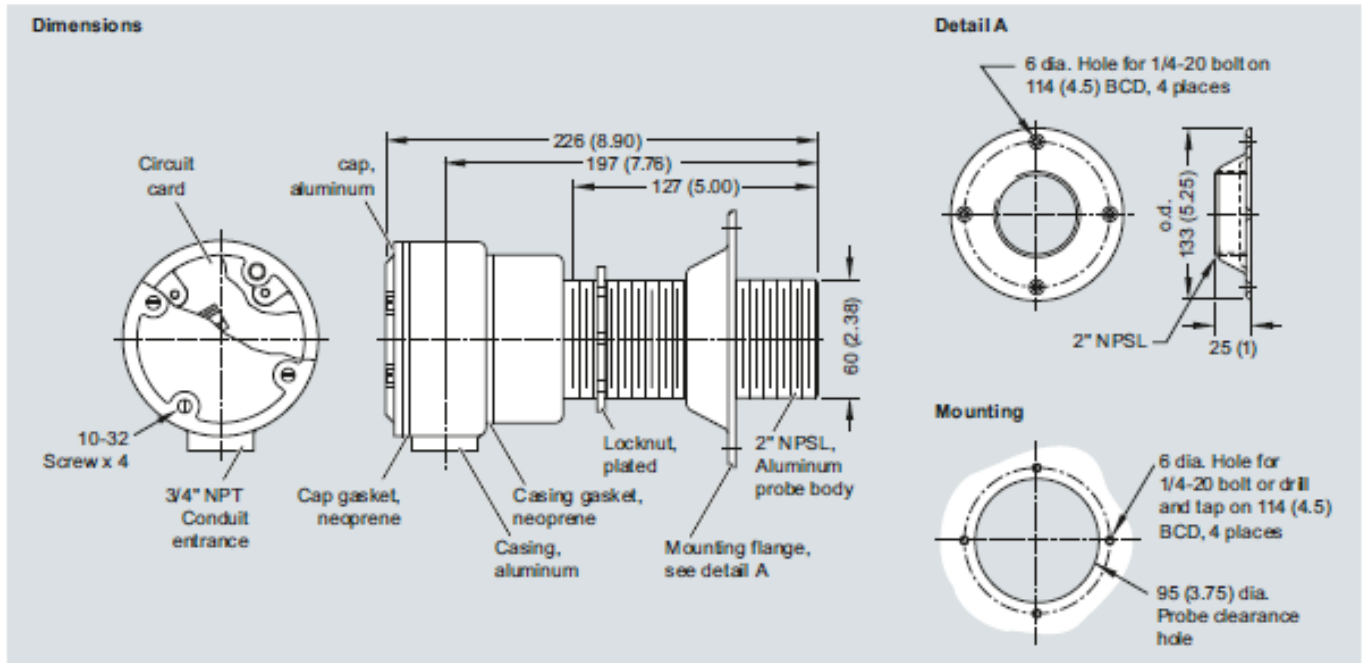
SITRANS WM100 mounting, dimensions in mm (inch)

Technical specifications

Mode of operation	
Measuring principle	Disruption of magnetic field by ferrous target
Typical application	Monitors absence or presence of motion in harsh conditions
Output	
Contact	1 SPDT Form C dry relay contact, rated 5 A at 250 V AC, fail-safe operation
Time delay	Start up: 10 ... 14 seconds (5 ... 7 seconds with 12 ppm jumper installed)
Zero Speed (selected via a common jumper)	<ul style="list-style-type: none"> • 5 seconds ± 1 (minimum speed 10 ... 15 ppm) or • 10 seconds ± 2 (minimum speed 5 ... 7.5 ppm)
Rated operating conditions	
Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Design	
Probe body	Aluminum
Process mounting	2" NPSL
Connection box	Aluminum, 3/4" NPT conduit entrance, 5 screw terminals plus grounding terminal for electrical connection, max. 12 AWG (3.30 mm ²) wire size
Gasketing	Neoprene
Display	Red LED for verification of pulses
Enclosure rating	Type NEMA 4x, 6, IP67
Dynamic range	Minimum 6 or 12 pulses per minute Maximum 3000 pulses per minute
Shipping weight	2 kg (4.4 lbs)
Power supply	<ul style="list-style-type: none"> • 115 V AC/50 ... 60 Hz, 7 VA • 230 V AC/50 ... 60 Hz, 7 VA • ± 10 % of rated voltage
Certificates and approvals	CSA-USC, CE, C-TICK

7

Dimensional drawings



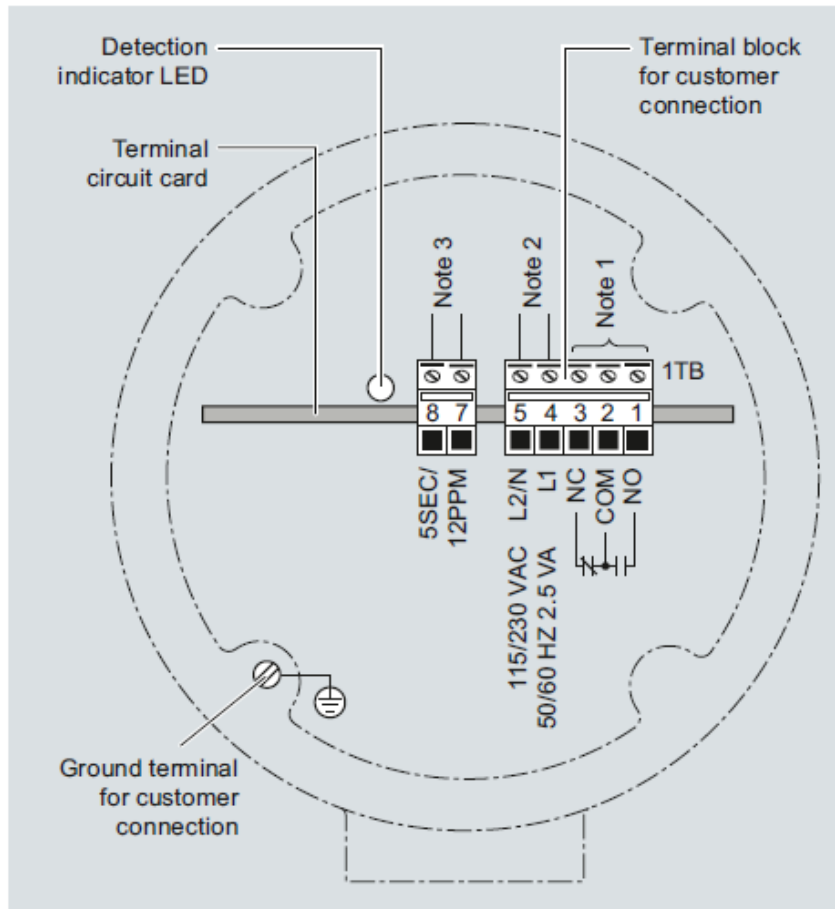
SITRANS WM100 dimensions in mm (inch) and mounting

Process Protection

Motion sensors

SITRANS WM100

Schematics



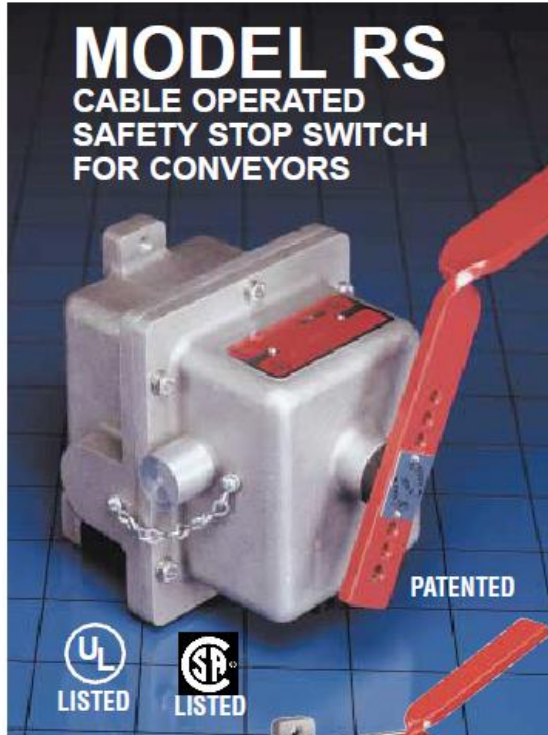
SITRANS WM100 wiring

Notes:

1. Dry contacts shown in de-energized (alarm or shelf) state.
2. SITRANS WM100 is manufactured for either 115 or 230 V AC operation. Check WM100 nameplate for applicable voltage. Correct voltage must be supplied. Voltages lower than specified will result in an inoperative condition. Voltages higher than specified will severely damage unit.
3. For 5 second time delay and a minimum 12 ppm range, connect jumper across terminals 7 and 8. Without a jumper, the default is a 10 second time delay and a minimum 6 ppm range

8.4. Safety pull switch cable

Conveyor Ref.	CON-U260	
Safety Pull Switch	Type	1 per conveyor (3 total) Conveyor Components Co. RS-2



The model RS Safety Stop Switch in operation for immediate shutdown of conveyor system at a sand and gravel company.

EXCLUSIVE FEATURES

1. The Model RS is equipped with a positive safety lock. Having once been actuated, it cannot be accidentally reset causing dangerous equipment to restart. In order to reset the switch, the actuation arm must be pushed in and turned. It takes no longer and it makes this a true "safety" switch.
2. The Model RS is installed with cable extending in both directions from the actuating handle. There is one electrical connection inside. This simple arrangement eliminates the double electrical connections required in two ended units employing a separate micro switch for cable in each direction.
3. The actuation force required is simply adjusted in the field by a change in the position of the cable in holes provided in the actuation arm. One of our units will handle as much cable length as a double ended competitive unit and there is no longer a need to specify actuating force or right or left handed units.
4. The standard construction of the unit is a corrosion resistant aluminum housing complete with stainless steel hardware and red powder coated actuation handle. The actuation shaft is of stainless steel. Powder coated cast iron construction is available if necessary. Epoxy coating of either casting is also available if required.
5. The Model RS controls are listed by Underwriters Laboratories, Inc. and Canadian Standards Association. The general purpose models are listed for non hazardous atmospheres. Explosion proof models are listed for use in hazardous atmospheres as defined by the National Electric Code handbook and the National Electrical Manufacturers Association Standards for NEMA 7 and 9 hazardous locations. Specifically, they are listed for Class I, Groups C and D; and Class II, Groups E, F, and G.
6. Model RS offers the lowest cost per foot of protection because it incorporates fewer switches and less wiring is required. Cable may be extended in either or both directions with no changes required in the internal mechanism of the unit and the wiring is still of a simple uncomplicated nature.
7. The switch is available with a warning light that may be wired to indicate actuation. This permits easy identification of actuated switches in areas where visual identification is difficult.

SHOWN TO THE RIGHT IS THE MODEL RS WITH THE BROKEN CABLE OPTION. THIS FEATURE ENSURES ACTUATION EVEN IF THE CABLE IS BROKEN OR CUT.



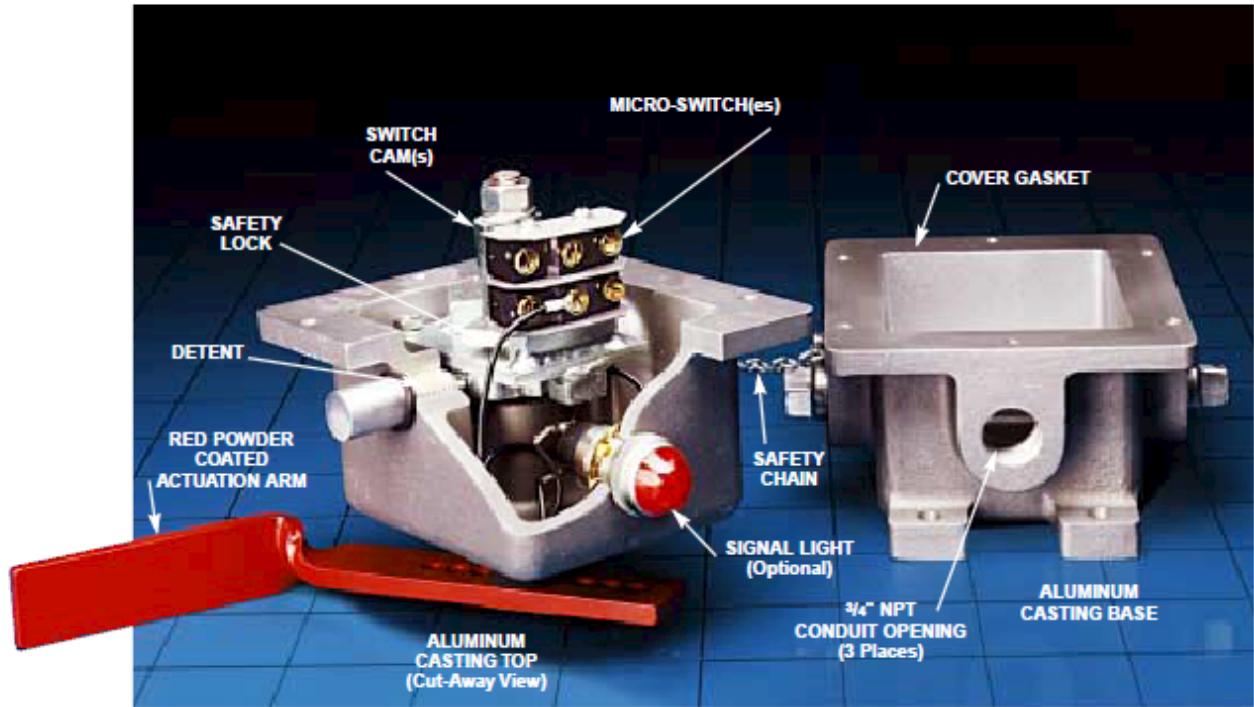
WHAT IT IS AND DOES:

The Model RS is a rugged safety switch that provides a quick positive shut off of dangerous equipment in emergencies or normal operation. It is actuated by a cable pulled by endangered personnel. The output contacts of the Model RS can control up to two separate circuits, one for machinery shutdown and one for alarm.

WHY IS IT NECESSARY?

Safety minded operators of conveyors, production lines, elevator equipment, assembly lines, material handling systems, cranes, etc. consider it a must for employee protection. Most states have safety statutes that require these switches on conveyor and related equipment. American National Standard Institute recommends their use in ANSI standard No. ASME B20.1 - 1993-5.11. This ANSI standard will probably soon become part of the Williams-Steiger Act of 1970-the OSHA Act.

UL Listed for General Purpose and EXPLOSION PROOF Environments . . . the only switch of its kind to meet these requirements



OPERATION OF THE UNIT:

The unit is usually installed with cable running in both directions from the crank type actuating arm. Each of the two sections of cable runs to a fixed point through eye-bolts spaced at regular intervals.

A pull on the cable at any point along its run will rotate the red actuation arm 60°. The actuation arm will end in a position that is easily seen from a distance, thus identifying the actuated unit. Two spring loaded detents riding on a hardened steel cam provide resistance to arm rotation. When the actuation force overcomes this resistance the assembly rotated the 60° and is locked in place by the detents. Affixed to the rotating shaft is a cam mechanism which actuates up to two micro switches during rotation. The micro switches are held in the actuated position by the detents.

To reset the unit and deactivate the micro switches, the actuation arm is pushed in a rotated backwards.

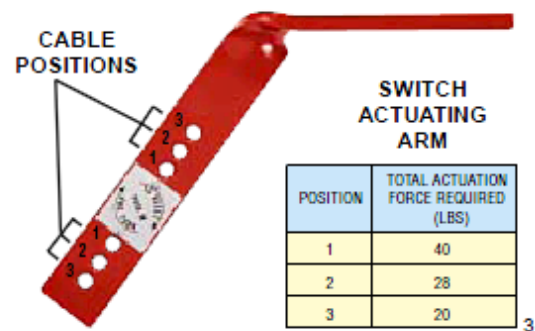
DETERMINATION OF NUMBER OF UNITS REQUIRED:

The Model RS control is designed so that a maximum of 100' of cable can be used on each side of the unit. A single switch can therefore cover a maximum of 200' of conveyor belt or other machinery. Of course, if necessary, cable can be extended in only one direction from either side of the unit. The electrical characteristics of the application will determine the numbers of micro switches to be specified in the unit: either one, or two. The environmental considerations will determine whether or not the unit is to be explosion proof or to have special paint or coatings. The possibility of a light to aid in identification of actuated units should be considered.

We recommend that high quality cable be used with the switch to assure proper actuation with no stretching. We recommend our own galvanized aircraft cable which is available with either vinyl or nylon coating. It is orange in color and weighs .0273 lbs. per foot and has an outside diameter of 3/16".

As shown in the chart and picture of the actuating arm, the actuation force can be varied by attaching the cable at any one of the three positions.

The cable should be supported by eyebolts every 8-10'. These supports ensure that the weight of the cable alone will not actuate the switch.





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 Email: info@conveyorcomponents.com • <http://www.conveyorcomponents.com>

MODEL RS: ROPE SAFETY CONTROL INSTALLATION INSTRUCTIONS

WARNING:
DEATH or SERIOUS INJURY may occur.
Before installing or adjusting, shut down and physically lock-out the conveyor system.

TECHNICAL INFORMATION

Raintight units (standard):

Enclosure type 1, 3, 3R, 4 and 4X dust-tight and raintight construction with corrosion resistance.
 Gasket sealed for indoor/outdoor applications.
 Aluminum housing with 3 conduit openings in base casting.

Dual Rated Units:

Enclosure type 1, 3, 3R, 4 and 4X dust-tight and raintight construction, also for use in Class II, Groups E, F & G and Class III Hazardous Locations.
 Aluminum housing with 1 conduit opening in base casting.

Explosion Proof units:

Enclosure for use in Class I, Groups C & D; and Class II, Groups E, F & G, and Class III Hazardous Locations.
 Aluminum housing with 1 conduit opening in base casting.

Electrical Ratings:

SPDT switches:	DPDT switches:
20 Amps, 125/250/480 VAC	15 Amps, 125/250 VAC
10 Amps, 125 VAC Inductive	N/A
1 hp, 125 VAC	3/4 hp, 125 VAC
2 hp, 250 VAC	1 1/2 hp, 250 VAC
1/2 Amp, 24 VDC	N/A
1/2 Amp, 125 VDC	N/A
1/4 Amp, 250 VDC	N/A

Micro-switch(es) may be wired for single throw operation, either normally open or normally closed as required. See figure 1.

Figure 2: Electrical Terminals

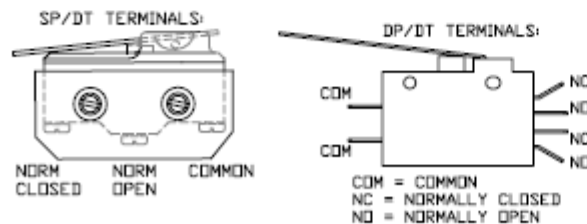
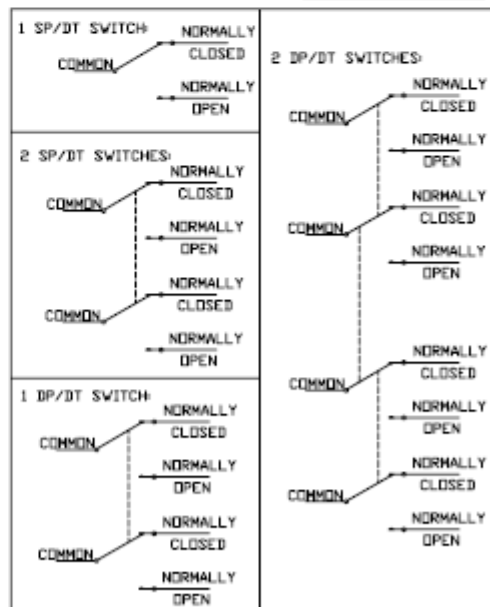


Figure 1: Contacts



INSTALLATION INSTRUCTIONS

1. The base should be mounted on a flat surface using the three (3) mounting holes in the base casting (see figure 3). The holes in the base are manufactured for 3/8" bolts.
2. Each unit can cover a maximum of 200 feet of conveyor – 100 feet in each direction. Safety considerations dictate that not more than 100 feet of cable should be attached to each side.
3. The eyebolts supporting the cable should be placed at intervals from 8' – 10'. Care must be taken that the cable does not become too slack. However, if the cable is too tight, false actuation of the unit may occur.
4. This unit is designed for pilot duty. The control circuit should be wired through the motor starter circuit of the conveyor or other equipment to be controlled. Do not wire the unit directly into a heavy duty motor circuit. See "Switch" information on front page. Note: TWIST WIRES TOGETHER BEFORE INSERTING IN TERMINAL (ENROULEZ LES FILS ENSEMBLE AVANT LES INTRODUITE DANS LA BORNE.).
5. The control should be tested after installation by actuation of the cable. The protected equipment should stop and alarms should sound as required with a minimum effort on the cable. Cable tension can be adjusted as necessary by changing the location of the cable on the handle (see figure 4).

Figure 4: Cable Positions

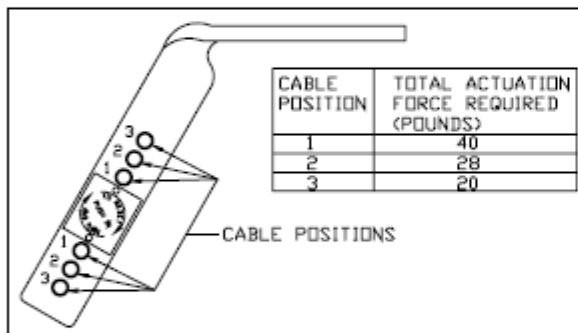
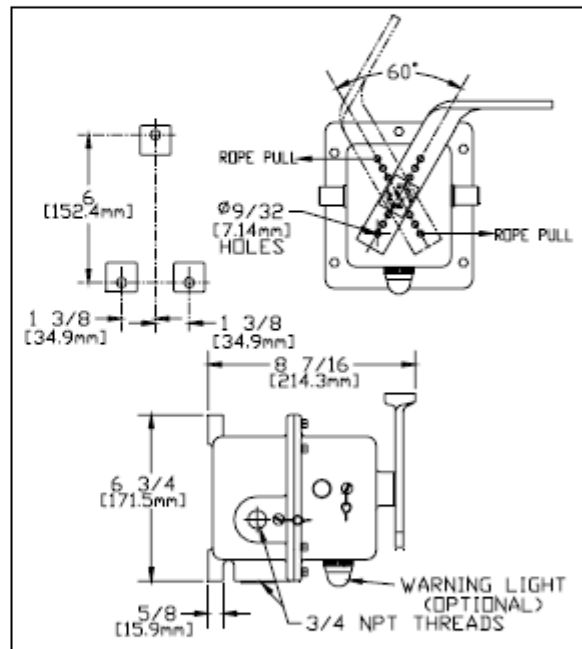


Figure 3: Control Dimensions



Document Transmittal / Submittal Compliance Certificate



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		Title	District of Sooke – Dewatering Centrifuge Address: 2205 Otter Point Road Sooke, BC V9Z 1J2
Description	ALDEC G3-75	Customer Ref./PO	N/A
Transmittal No.	CA-PWW15-0047-03	Alfa Laval Ref.	CA-PWW15-0047
Issued By	Jason Wang	Date	February 21 st , 2020

Document Transmittal				
Document Number	Issue No.	Description / Title	Copies	
			P	E
CA-PWW15-0047-03-01	1	Dimensioned Drawing	0	1
CA-PWW15-0047-03-02	1	Installation Drawing	0	1
CA-PWW15-0047-03-03	1	Materials of Construction	0	1
CA-PWW15-0047-03-04	1	Centrate Funnel Flexible Connection Drawing	0	1
CA-PWW15-0047-03-05	1	Centrate Side Flexible Connection Drawing	0	1
CA-PWW15-0047-03-06	1	Feed Flexible Connection Drawing	0	1
CA-PWW15-0047-03-07	1	Solid Flexible Connection Drawing	0	1
CA-PWW15-0047-03-08	1	Polymer Flexible Connection Drawing	0	1
CA-PWW15-0047-03-09	1	Back Drive Motor	0	1
CA-PWW15-0047-03-10	1	Main Drive Motor	0	1
CA-PWW15-0047-03-11	1	Electrical Drawing Package	0	1
CA-PWW15-0047-03-12	1	Spare Parts and Tools	0	1
CA-PWW15-0047-03-13	1	Decanter Installation Data	0	1
CA-PWW15-0047-03-14	1	Storage Procedure	0	1
CA-PWW15-0047-03-15	1	Decanter Automation AB Parameters and Alarms Manual	0	1
CA-PWW15-0047-03-16	1	Decanter Automation AB Operator Manual	0	1
CA-PWW15-0047-03-17	1	Vibration Damper Drawing	0	1
CA-PWW15-0047-03-18	1	Decanter Specification Type	0	1
CA-PWW15-0047-03-19	1	Decanter Vent Sizing	0	1
CA-PWW15-0047-03-20	1	Vibration Isolation Datasheet	0	1
CA-PWW15-0047-03-21	1	Resistance of AL decanters to loads from	0	1

Legend : P=Prints, E=Electronic

Document Transmittal / Submittal Compliance Certificate



Alfa Laval Inc.
101 Milner Ave.
Scarborough, ON, Canada, M1S 4S6
Tel.: +416-299-6101
Fax: +416-299-6476
www.alfalaval.com

Customer	Attn.: Norm McInnis District of Sooke 2205 Otter Point Road Sooke, BC V9Z 1J2 Office: 250-642-1634 Email: nmcinnis@sooke.ca	Project	CA-PWW15-0047
		Title	District of Sooke – Dewatering Centrifuge
		Address:	2205 Otter Point Road Sooke, BC V9Z 1J2
Description	ALDEC G3-75	Customer Ref./PO	N/A
Transmittal No.	CA-PWW15-0047-03	Alfa Laval Ref.	CA-PWW15-0047
Issued By	Jason Wang	Date	February 21 st , 2020

		earthquakes		
CA-PWW15-0047-03-22	1	Alfa Laval Shop Drawing Response	0	1

Submittal Certificate of Compliance

We hereby certify that – to the best of our knowledge – the data submissions referenced in this Document Transmittal are in compliance with the applicable Contract Documents, except for the deviations identified in the following Submittal Deviation List.

Submittal Deviation List

None

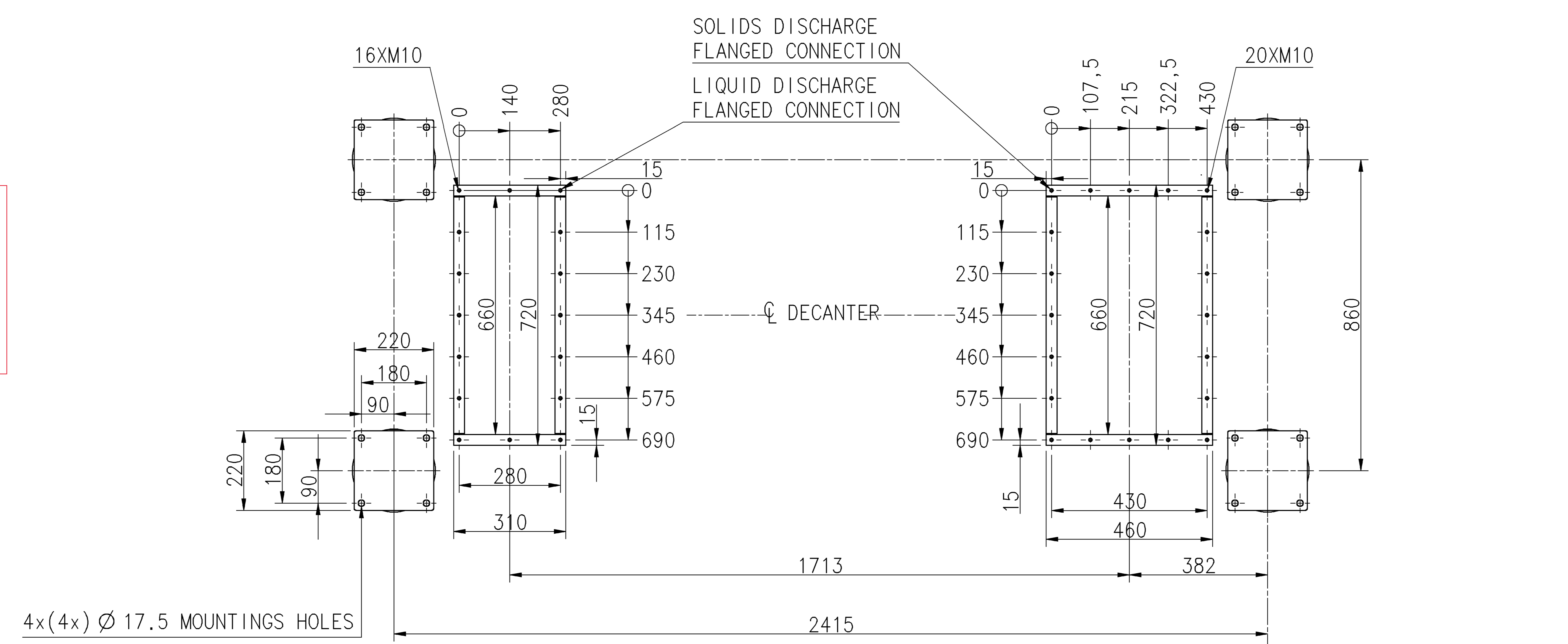
Submittal Review Timeframe

In order to keep the agreed schedule, it is required to return the reviewed documentation within one month from receipt

Submittal Receipt Record

Received By		
Print Name :	Signed :	Date :

Document No.: 01
 Title: Dimensioned Drawing



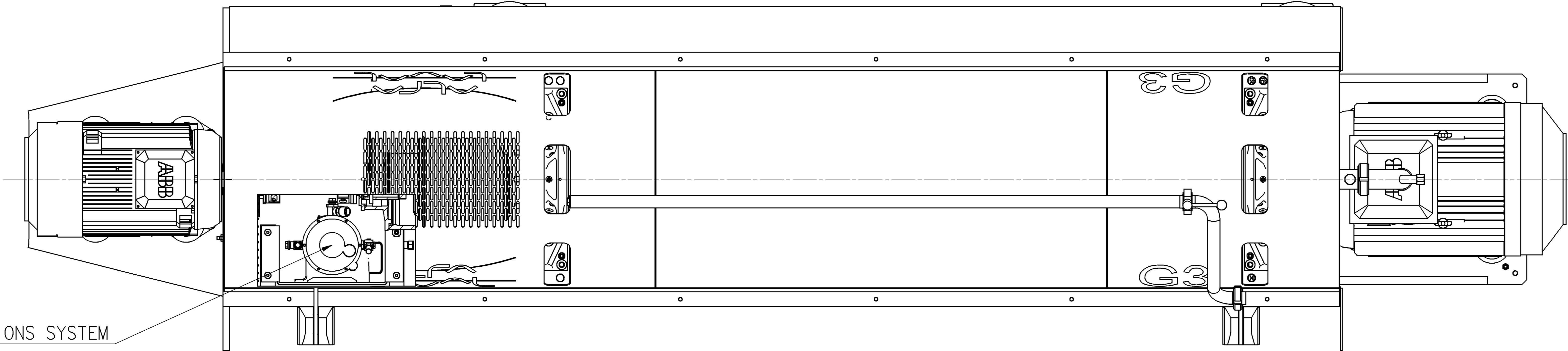
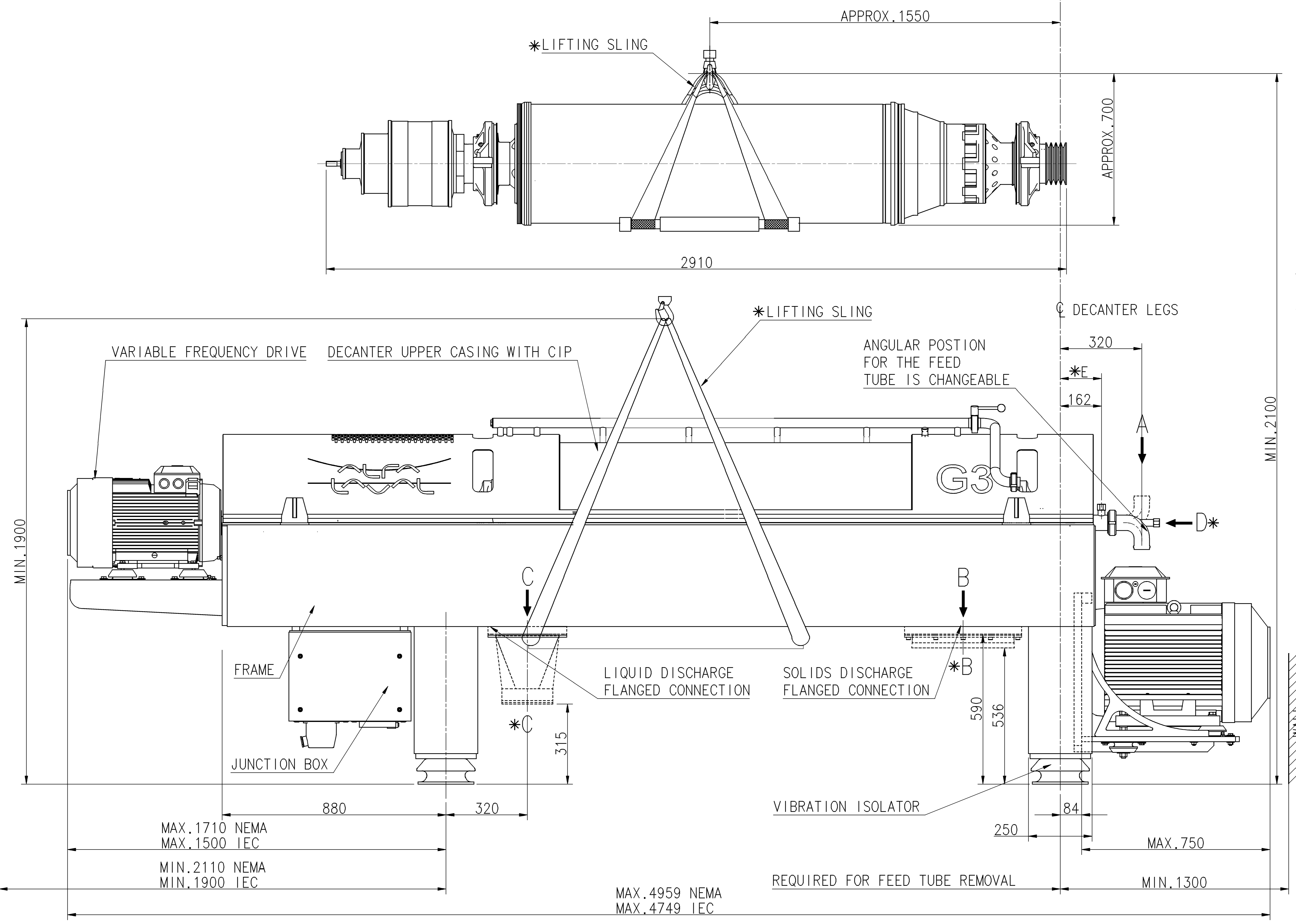
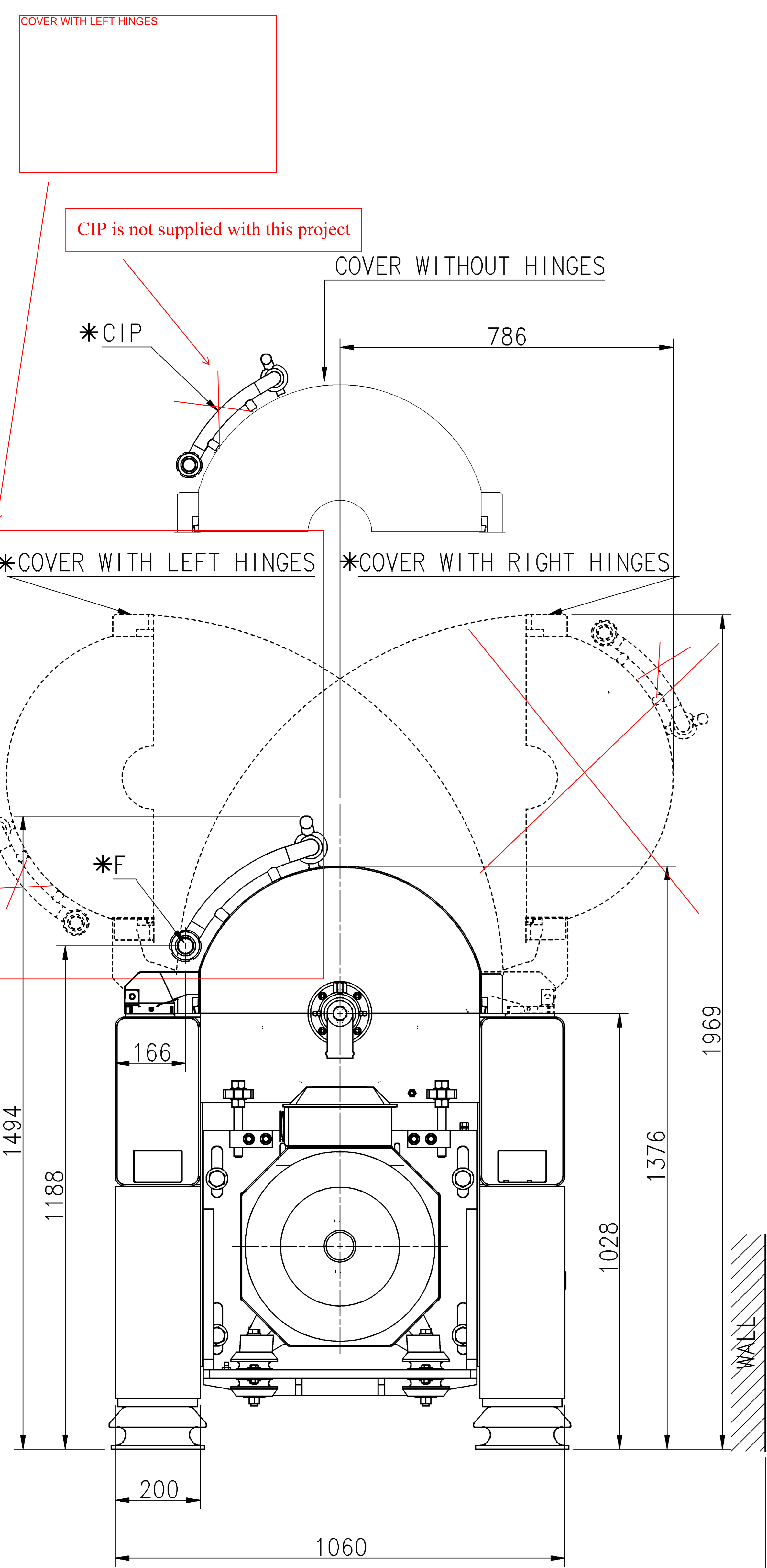
APPROXIMATE WEIGHTS:
 TOTAL WEIGHT OF EMPTY DECANTER.....3.200kg/7050 lbs
 ROTATING ASSEMBLY INCL. PILLOW BLOCKS.....1.000kg/2200 lbs
 CPL. FRAME ASSEMBLY EXCL. MAIN MOTOR AND ROT. ASSEMBLY...1.100kg/2420 lbs
 MAIN MOTOR.....600kg/1320 lbs
 UPPER CASING.....140kg/ 308 lbs
 GEAR BOX.....150kg/ 330 lbs
 MIN. CRANE CAPACITY FOR LIFTING OF ROTATING ASSEMBLY...1.500kg/3500 lbs

LOADING DATA:
 DECANTER
 1. MAX. STATIC LOAD
 A-VERTICAL.....35.000 N
 B-HORIZONTAL.....0 N
 2. MAX. DYNAMIC LOAD AT RUN DOWN
 (ADD TO STATIC LOAD)
 A-VERTICAL.....± 20.000 N
 B-HORIZONTAL.....± 10.000 N
 3. MAX. DYNAMIC LOAD AT OPERATING SPEED
 A-VERTICAL.....1.000 N
 B-HORIZONTAL.....1.000 N
 ALL LOADS ARE EVENLY DISTRIBUTED ON THE VIBRATION ISOLATORS

CONNECTIONS: DIMENSION/TYPE:
 A FEED.....Ø63.5(2 1/2") HOSE CONNECTION OD 43-46
 B SOLIDS OUTLET.....RECTANGULAR FLANGE
 *B SOLIDS OUTLET FUNNEL.....660X400
 C LIQUID OUTLET.....RECTANGULAR FLANGE
 *C LIQUID PHASE OUTLET FUNNEL.....Ø200 HOSE CONNECTION
 *D POLYMER ADDITION.....ISO 228-G 3/4" B CONNECTION
 *E POLYMER ADDITION.....ISO 228-G 1/4" B CONNECTION
 *F CIP/DILUTING WATER.....1 1/2" WELDING FERRULE

NOTES:
 1. ALL CONNECTIONS MUST BE FLEXIBLE
 2. FOR PROPER VENTING OF DISCHARGE HOPPERS REFER TO THE INSTALLATION DATA MANUAL IMPROPER VENTING CAN LEAD TO LEAKAGE PROBLEMS
 3. CUSTOMER IS RESPONSIBLE FOR ANCHORING
 4. FOR FURTHER INFORMATION, SEE INSTALLATION DATA MANUAL AND INSTALLATION DRAWING

*OPTIONAL EQUIPMENT
 COMPLEMENTARY DRAWING 61244228



MAIN VIEW:
 1710 NEMA REPLACES 1715 NEMA
 1500 IEC REPLACES 1585 IEC
 2110 NEMA REPLACES 2115 NEMA
 1900 IEC REPLACES 1985 IEC
 4959 NEMA REPLACES 5020 NEMA
 4749 IEC REPLACES 4890 IEC
 MAX. 750 REPLACES MAX. 890

Rev. No.	Date	Modified By	Appr.
4	151228	NKE	OAN

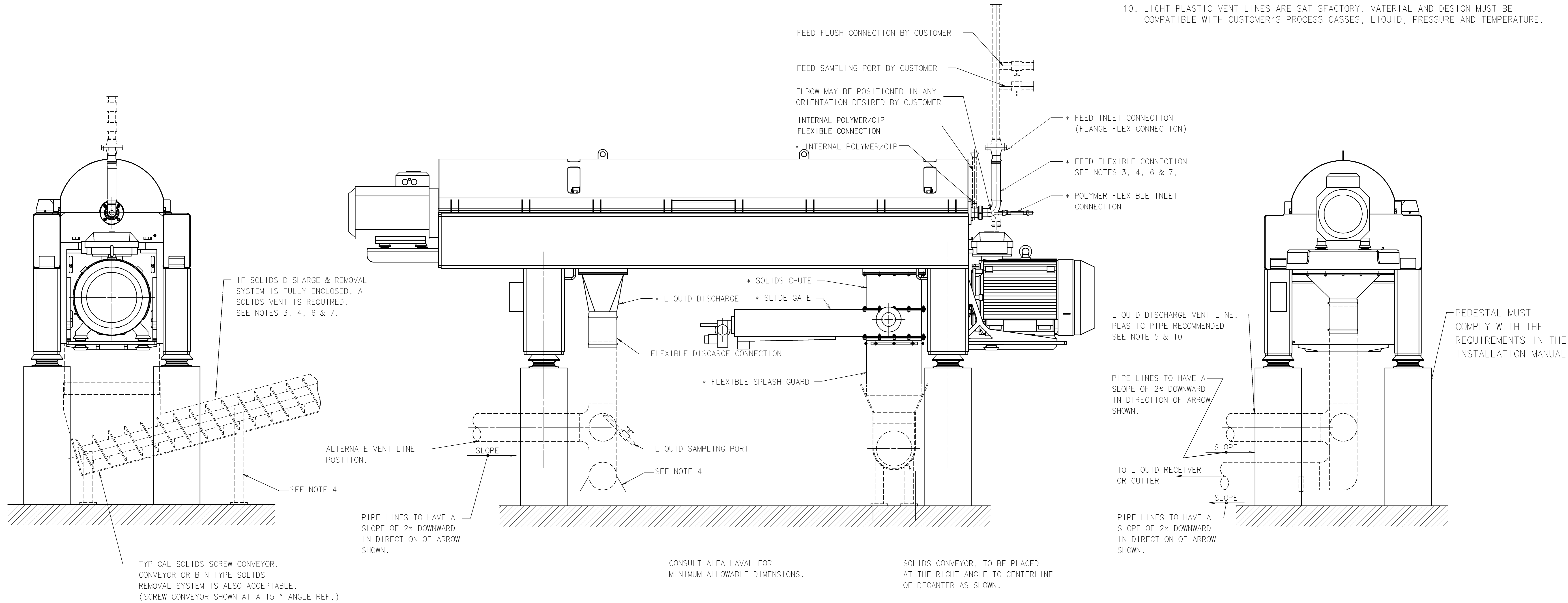
Item	Article No.	Name/Designation	WEIGHT	Material
80 kNm DD GEARBOX				
Title: DIMENSIONED DRAWING				
ALDEC G3-75				
First angle projection	Surface roughness	Scale: 1:8	Date: 101103	Design Code
Format: AQ	Drawn: AHR	Appr.: JOD	Model: Y	Document No.: 61244227

Alfa Laval Copenhagen A/S
 SØBORG DENMARK

Document No.: 02
 Title: Decanter Centrifuge Installation Drawing

NOTES:

- SEE DIMENSION DRAWING FOR MOUNTING DIMENSIONS AND CONNECTING PIPE AND FLANGE SIZES.
- PIPE SIZES SHOWN ARE FOR REFERENCE ONLY, CONSULT ALFA LAVAL FOR SPECIFIC APPLICATION.
- ONLY SAMPLE TAPS PROVIDED BY ALFA LAVAL MAY BE DIRECTLY BOLTED TO THE CASING FLANGES. SEE NOTE 4 FOR CUSTOMER SUPPLIED HOPPERS.
- CUSTOMER SUPPLIED DISCHARGE HOPPERS AND PIPES MUST NOT BE ATTACHED DIRECTLY TO CASING FLANGES, HOPPERS OR PIPES SHOULD BE SUPPORTED BY BUILDING STRUCTURE AND CONNECTED TO CASING FLANGES BY FLEXIBLE BOOTS AS SHOWN. FLEXIBLE BOOTS MUST NOT IMPOSE LOAD ON CASING FLANGES AND MUST ACCOMMODATE HORIZONTAL AND VERTICAL MOVEMENT.
- VENTING REQUIREMENTS VARY WITH ACTUAL BOWL SPEED. IF VENT LINES ARE CONNECTED TO A COMMON MANIFOLD, THE MANIFOLD DIAMETER SHOULD BE $D_m = D_v \sqrt{N}$, WHERE D_m = MANIFOLD DIAMETER, D_v = INDIVIDUAL VENT DIAMETER, AND N = NUMBER OF CENTRIFUGES CONNECTED TO A MANIFOLD. VENTS SHOULD PITCH BACK TO CHUTE.
- IF POSITIVE VENT CONTROL (ODOUR CONTROL ETC.) IS REQUIRED, PROVIDE A SUCTION FAN. DAMPERS SHOULD BE PLACED IN EACH VENT LINE TO CONTROL FLOW.
- WHERE THE LIQUID AND SOLIDS CASING OUTLETS ARE REQUIRED BY THE CUSTOMER TO BE BOLTED TO HIS RECEIVING SYSTEM, FLEXIBLE CONNECTORS MUST BE INSTALLED.
- IT IS RECOMMENDED THAT SAMPLING POINTS BE PROVIDED BY THE USER IN THE FEED AND DISCHARGE CONNECTIONS NEAR THE DECANTER, THESE POINTS SHOULD BE LOCATED SO THAT THEY ARE ACCESSABLE AND SAFE FOR THE OPERATOR TO USE. THE SAMPLES COLLECTED SHOULD BE REPRESENTATIVE OF THE FLOW.
- EXTREME TEMPERATURE CONDITIONS MAY AFFECT FLEXIBLE CONNECTORS AND ELECTRICAL CONTROLS, CONSULT ALFA LAVAL.
- LIGHT PLASTIC VENT LINES ARE SATISFACTORY. MATERIAL AND DESIGN MUST BE COMPATIBLE WITH CUSTOMER'S PROCESS GASSES, LIQUID, PRESSURE AND TEMPERATURE.



THIS PRINT IS INTENDED AS A GUIDE ONLY. IT MUST NOT BE USED FOR CONSTRUCTION PURPOSES. IT WILL NEVER BE CERTIFIED. SEE CERTIFIED DRAWINGS FOR DETAIL DIMENSIONS. ALFA LAVAL ASSUMES NO RESPONSIBILITY FOR THE DETAILS OR PROCESS OPERATION COVERED BY THIS DRAWING. ANY SUGGESTIONS REGARDING THE INSTALLATION OF THE EQUIPMENT HAVE BEEN MADE TO SERVE AS A GUIDE ONLY.

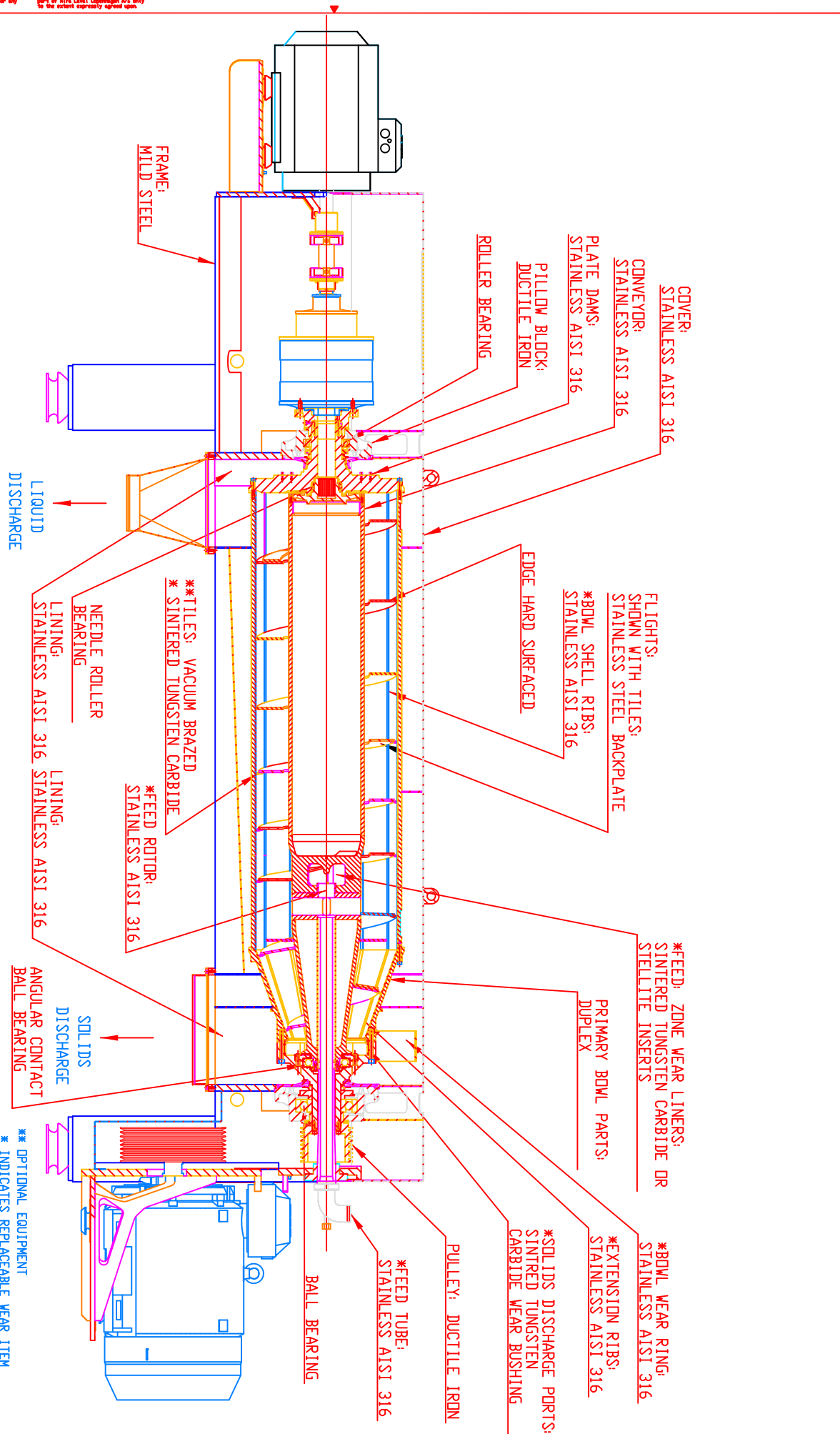
----- : CUSTOMER SUPPLIED
 * OPTIONAL EQUIPMENT

Rev. No.	Date	Modified By	Appr.

Item	Article No.	Name/Designation	Material
INSTALLATION DRAWING			
Alfa Laval			
Alfa Laval Copenhagen A/S			
SØBORG			
DENMARK			
First angle projection	Surface roughness	Scale	Sheet
	RA 4µm	1:10	02U
		Format	Date
		A0	150107
		DWE	Appr.
		JOD	Model
		N	Document No.
			61244123

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Document No.: 03
 Title: Material of Construction Drawing

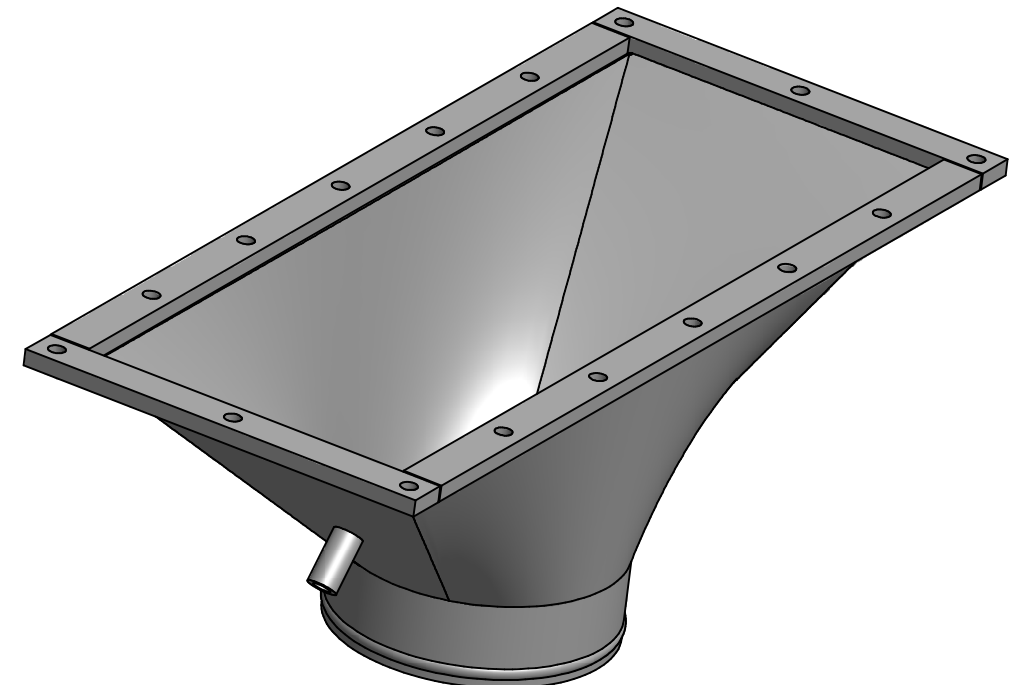
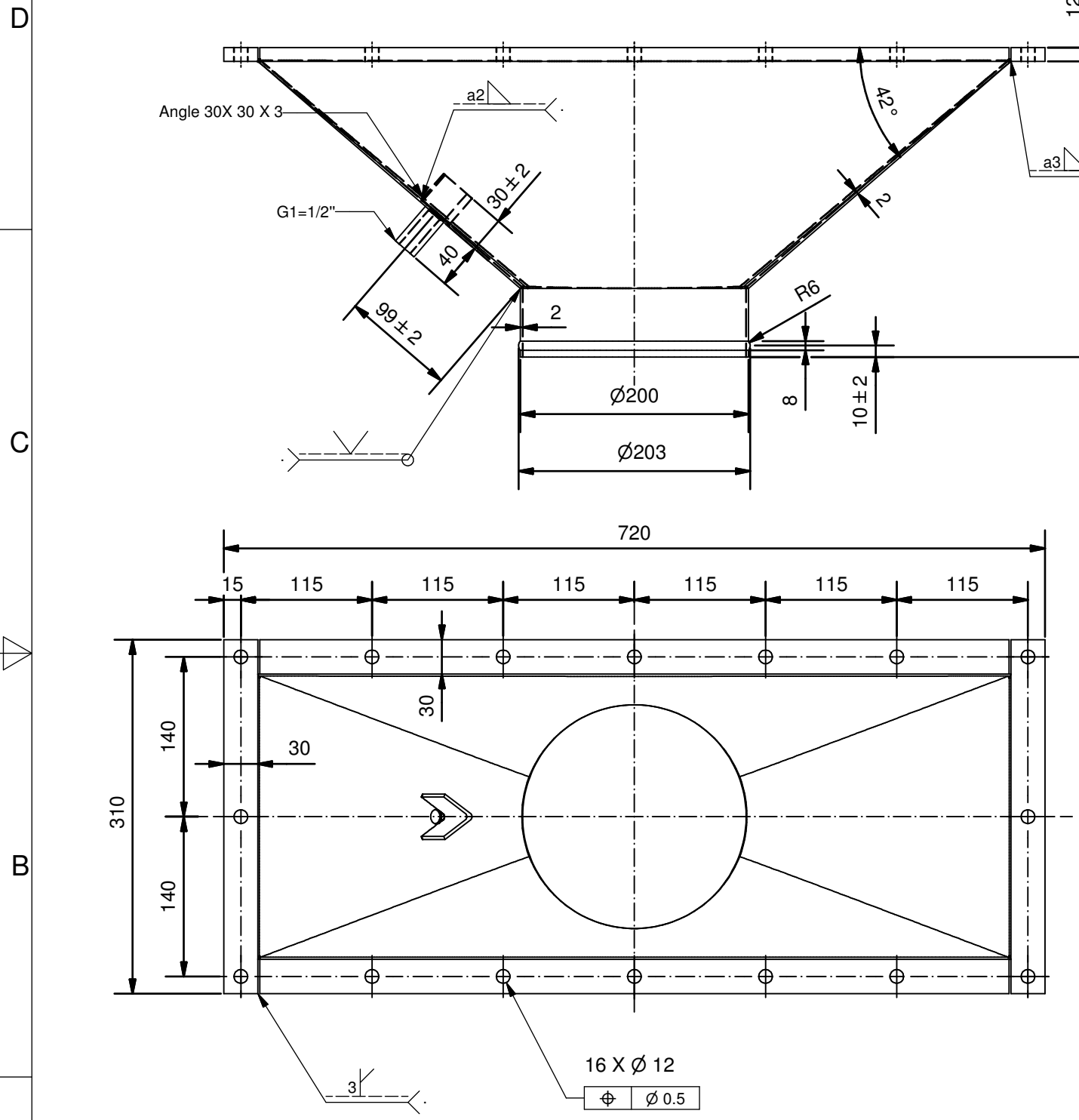
DISTRICT OF SDOKE WWT

Item	Article No.	Rev/Description	Material
TITLE: MATERIALS OF CONSTRUCTION			
ALDEC G3-75			
First angle projection	Scale	1:10	Scale
Surface roughness	Symbol	Ra 1.0	Symbol
Projection	Symbol	Al	Symbol
Material	Symbol	Al	Symbol
Part No.	Rev	070514	Rev
Project	Code	00	Code
Plant	Code	N	Code
Document No.	61241904		
Alfa Laval Alfa Laval Copenhagen A/S SØBORG DENMARK			

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6 5 4 3 2 1



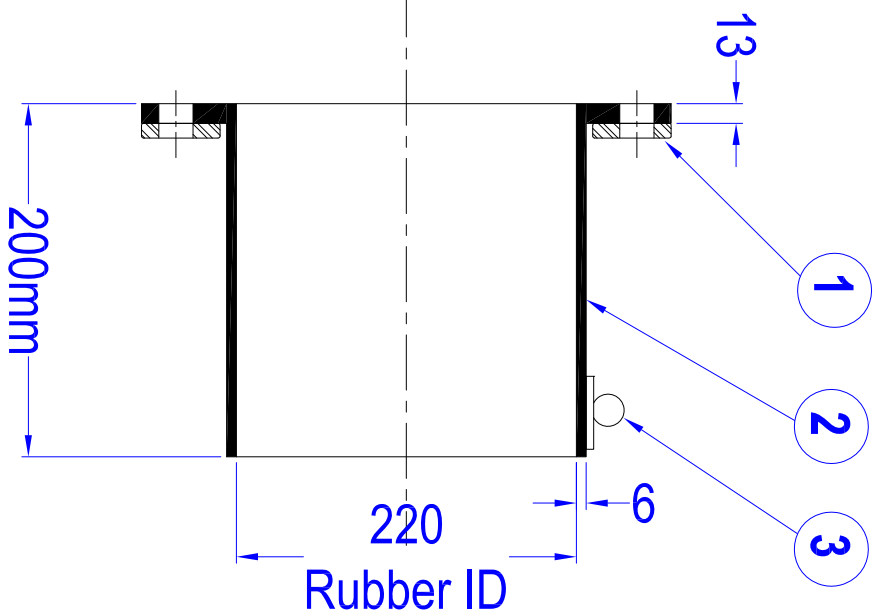
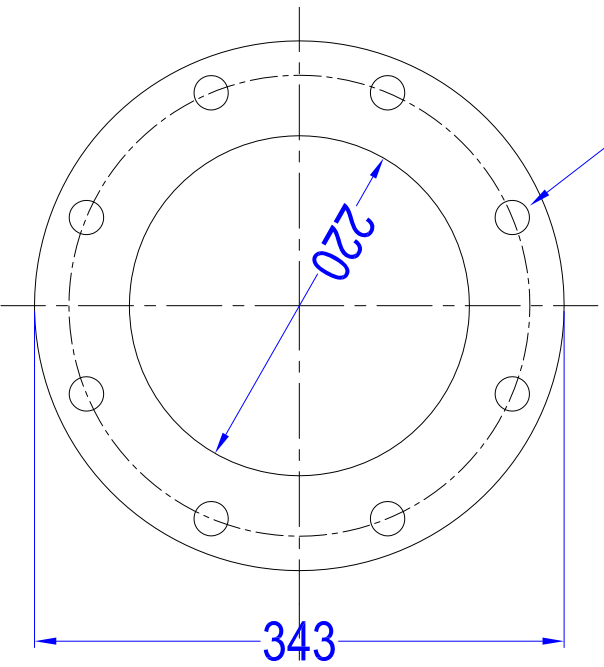
Document No.: 04
Title: Centrate Funnel Flexible Connection Drawing

- NOTE:
1. MATERIAL. AISI 316
 2. ALL WELDING SHALL BE CARRIED OUT ACCORDANCE TO DS/ISO 5817 CHARACTER C.
 3. BURRS AND SHARP EDGES TO BE REMOVED.
 4. BLAST WITH GLASS-SHOT: AL 2062 610-0

61299817-02	61299817-01	NPT BSP G1	01	FLANGE THICKNESS MODIFIED	16-12-2013	INPAJPE	INPASJIA	DKSODPZ
			00	RELEASED FIRST TIME	03-02-2011	INPAVBR	INPASPR	DKSOJLNA
			Rev No	Revision text	Date	Drawn	Checked	Approved
1	1	Sheets				Title		
						LIQUID OUTLET ADAPTER , Ø 440 mm DECANTER		
			Location		Proj. No		Proj. Type	
			Alfa Laval Copenhagen A/S		Ass. PRODUCTS		Proj. Name	
			Date		ISO Method E		Dimensions without tolerances:	
			03-02-2011		Method E		ISO 2768-M or ISO 13920-B	
			Drawn		Scale		Drawing No	
			INPAVBR		1:5		Rev	
					Sheet		61299817	
					1		01	

6 5 4 3 2 1

(8) - Ø 0.875" holes
on a 11.75" B.C.D.



Document Number: 05
Title: Centrate Side Flexible
Connection Drawing

ITEM	EXP.	JNT. No.	QTY	COMP.	EXT.	LATERAL	DESIGN TEMP.	DESIGN PRESS. PSIG.	BREACH OPENING	BY	E	F	J	K	L	M	EPDM	Vert. Down
1			1				95°C	± 3	200mm									
2			1															
3			1															
4			1															
5			1															
6			1															
7			1															
8			1															
9			1															
10			1															

DESCRIPTION	MATERIAL	REV	DATE	DESCRIPTION	BY
Clamp	304 SS				
Flexible Element	EPDM				
Retaining bars 51 x 9	304 SS				

DECIMAL	FRACTIONAL	ANGULAR

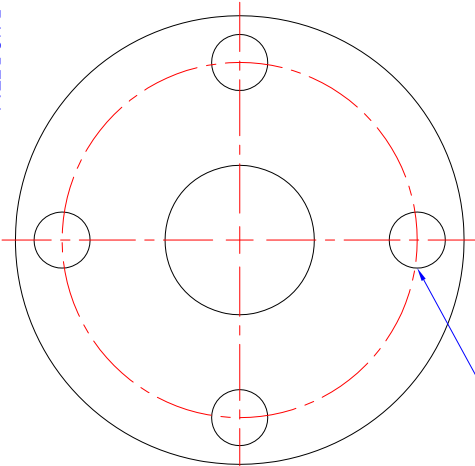
DATE	APPROVED	DATE	PROJ. FILE	DWG. NO.	REV.
10/02/19	J.R.		20-12817	312285	.

VIBRANT POWER INC.

TITLE: Round Flexible Connector

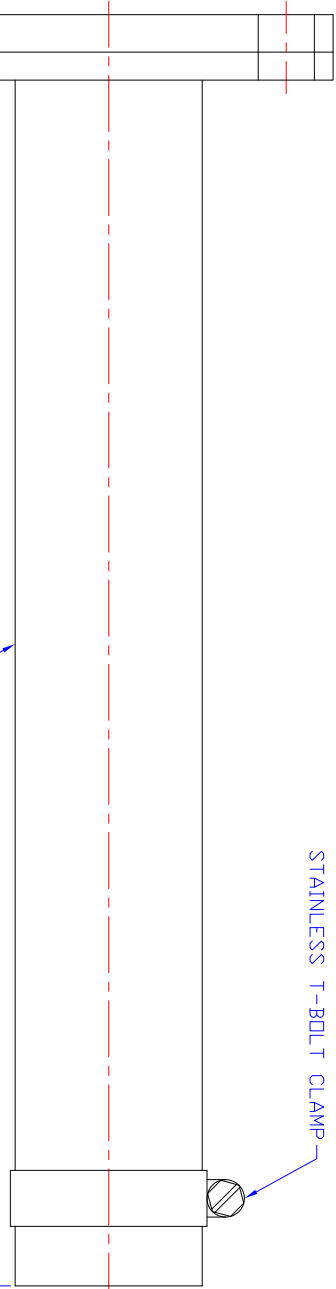
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2.5" 150# FLANGE PATTERN
(4) Ø0.75" holes on a 5.5" BCD



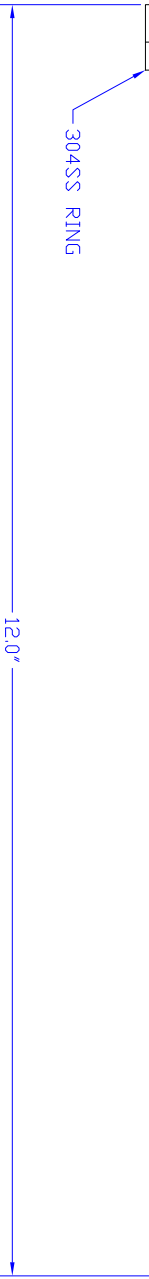
RING DETAIL
2.5" 150# DRILLING
Ø7.0" O.D.
3/8" THICK 304 SS

STAINLESS T-BOLT CLAMP



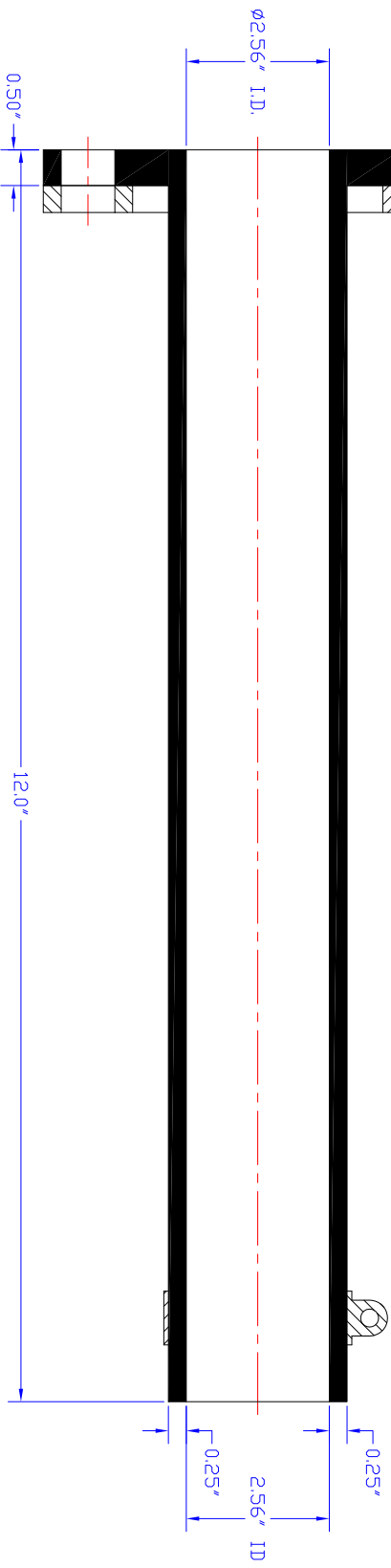
FLEXIBLE EPDM HOSE

304SS RING

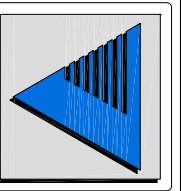


Ø2.56" I.D.

2.56" ID



Document No.: 06
Title: Feed Side Flexible Connection Drawing



VIBRANT

TOLERANCES (EXCEPT AS NOTED)

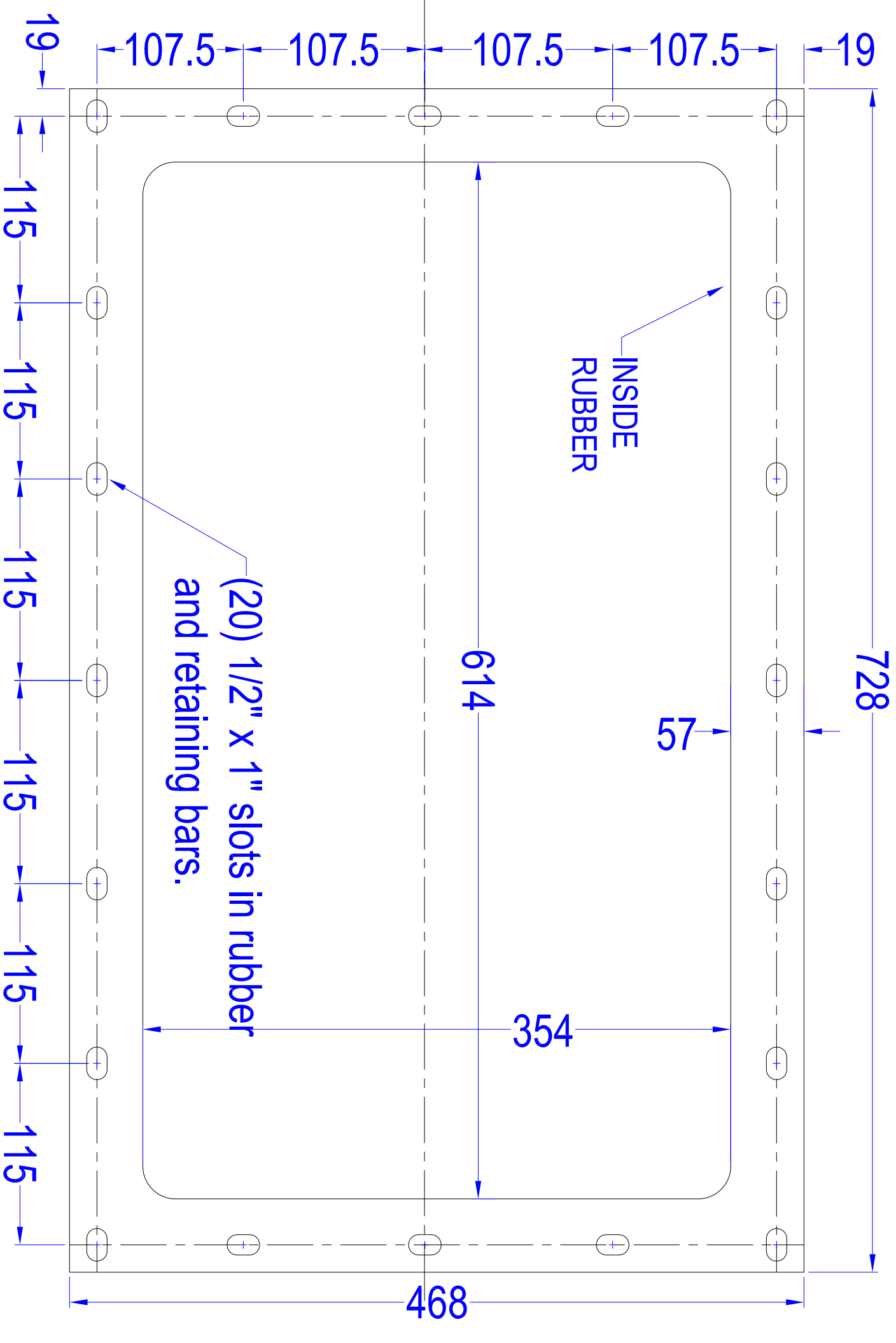
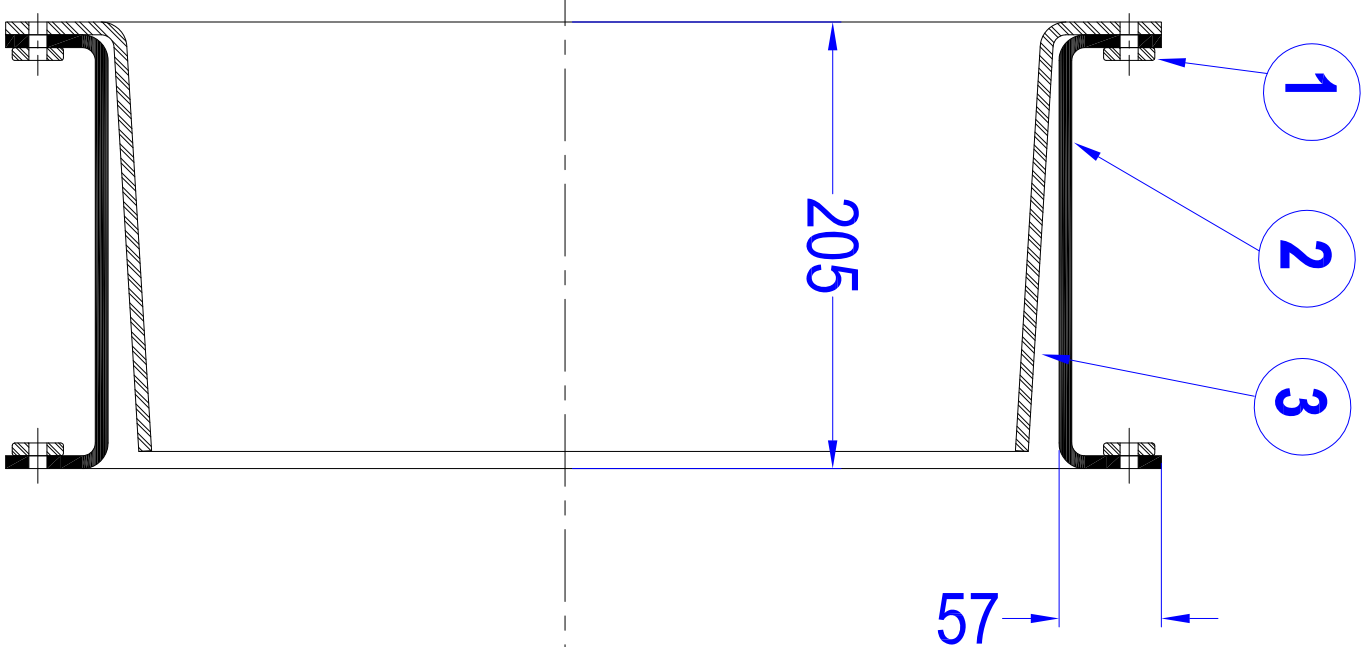
DECIMAL	± 0.010"
FRACTIONAL	± 1/16"
ANGULAR	± 2.5°

VIBRANT POWER INC.

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TITLE: 2.5" 150# COUPLING
EPDM

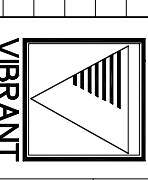
DRAWN BY:	DATE	CUSTOMER:
J.R.	10/02/19	
APPROVED:	DATE	PROJECT FILE
		20-12817
		DRAWING NO.
		31228
		REV.



(20) 1/2" x 1" slots in rubber and retaining bars.

Document Number: 07
 Title: Solid Side Flexible Connection Drawing

10	EXP. JNT. No.	1	QTY	COMP.	EXT. MOVEMENTS	DESIGN TEMP.	DESIGN PRES.	BREECH OPENING	E	F	J	K	L	M	1/4" EPDM	Vert. Down	
9						95°C	± 3	205mm									
8																	
7																	
6																	
5																	
4																	
3																	
2																	
1																	
	ITEM QTY.	DESCRIPTION		MATERIAL	REV	DATE	DESCRIPTION	BY	J.R.	10/02/19					20-12817	312286	



VIBRANT POWER INC.
 TITLE: Rectangular Duct Connector
 CUST: .
 PROJ. FILE: 20-12817
 DWG. NO.: 312286
 REV.:

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Tolerances (Except as Noted)
 Decimal
 Fractional
 Angular
 Drawn By: J.R.
 DATE: 10/02/19
 PROJ. FILE: 20-12817
 DWG. NO.: 312286
 REV.:

BALDOR® • RELIANCE 

Product Information Packet

ABB A/S

A28-0299-0892

10HP,880RPM,3PH,30HZ,284T,A28054M,TEFC,F

Document No.: 09

Title: Decanter Centrifuge Back Drive Motor

Part Detail							
Revision:	F	Status:	INA/A	Change #:		Proprietary:	Yes
Type:	AC	Elec. Spec:	A28WG0892	CD Diagram:	416820-036	Mfg Plant:	
Mech. Spec:		Layout:	611740-501-SH1	Poles:	04	Created Date:	12-21-2011
Base:		Eff. Date:	12-23-2015	Leads:	3#12		

Specs			
Enclosure:	TEFC	Insulation Class:	F
Frame:	284T	Inverter Code:	Inverter Ready
Frame Material:	Iron	KVA Code:	J
Output @ Frequency:	10.000 HP @ 30 HZ	Lifting Lugs:	Standard Lifting Lugs
Synchronous Speed @ Frequency:	900 RPM @ 30 HZ	Motor Lead Quantity/Wire Size:	3 @ 12 AWG
Voltage @ Frequency:	575.0 V @ 30 HZ	Motor Type:	A28054M
XP Division:	Not Applicable	Mounting Arrangement:	F1
Agency Approvals:	CCSA US	Power Factor:	79
Auxillary Box:	No Auxillary Box	Product Family:	General Industrial
Base Indicator:	RG	Pulley End Bearing Type:	Ball
Bearing Grease Type:	Polyrex EM (-20F +300F)	Pulley Face Code:	Standard
Constant Torque Speed Range:	1000:1	Shaft Ground Indicator:	No Shaft Grounding
Current @ Voltage:	10.400 A @ 575.0 V	Shaft Rotation:	Reversible
Design Code:	Y	Shaft Slinger Indicator:	Shaft Slinger
Drip Cover:	No Drip Cover	Speed Code:	Single Speed
Duty Rating:	CONT	Motor Standards:	NEMA
Feedback Device:	NO FEEDBACK	Starting Method:	Direct on line
Heater Indicator:	No Heater	Thermal Device - Bearing:	None

Thermal Device - Winding:	Normally Closed Thermostat
----------------------------------	----------------------------

Nameplate NP2496L

MOBIL POLYREX EM

Nameplate 000901002AAA	
61195632-52	
XT MOTOR	

Nameplate 000613007HV									
CAT NO				SPEC NO.	A28-0299-0892				
SER.NO.				FRAME	284T				
	HP	TYPE	P				SF	1.15	
BASE	10	880	575	10.4	30				
MAX	10	1350	575	9.57	46		INSUL.CLASS	F	
DRIVE END BEARING	50BC03J30X			CONSTANT TORQUE	DUTY	CONT	AMB	40	
OPP D.E. BEARING	50BC03J30X			1000:1	ENCL	TEFC	PHASE	3	
DESIGN NO.	A28WG0892-R001			FLUX AMPS	4.5				
MAX SPEED/RPM	5400			OVERTEMP PROT	2	WK2	3.46	POLES	4
								WEIGHT	527

Parts List		
Part Number	Description	Quantity
SA236129	SA A28-0299-0892	1.000 EA
RA223077	RA A28-0299-0892	1.000 EA
NP2496L	MOTOR LUBE NAMEPLATE	1.000 EA
000613006PU	N/P (RELEASE QTY 10,000) UL CSA LABEL	1.000 EA
000901002AAA	N/P BLANK (RELEASE QTY 1,500)	1.000 EA
000692000VD	LABEL WARNING	1.000 EA
000613007HV	N/P BALDOR VSMMASTER	1.000 EA
089481001B	BRKT 280 085900055WCE	1.000 EA
415072001B	CLAMP	1.000 EA
078568026A	+FANCV - 280	1.000 EA
034180008DA	KEY 1/4X1/4X1 L (shipping)	1.000 EA
418151057A	PLASTIC DRAIN,ODE BRKT	1.000 EA
078549001H	FAN 280	1.000 EA
004824015A	GREASE POLYREX EM	0.270 LB
032018010CK	HHCS 3/8-16X1-1/4 PLTD.	4.000 EA
032018006AK	HHCS 1/4-20X3/4L PLATED	4.000 EA
032018020CK	HHCS 3/8-16X2-1/2 PLTD.	3.000 EA
415096002A	CPLG 1/8 HEX TYPE	1.000 EA
415045002G	SLGR	1.000 EA
410700004D	WSHR	1.000 EA
034530036AB	P/NIP 1/8 X4-1/2 Yellow Zinc46114-BM	1.000 EA
034690002AB	PPLG 1/4" PLTD.	1.000 EA
034690002AB	PPLG 1/4" PLTD.	1.000 EA
089481001A	BRKT 280 085900055WCE	1.000 EA

Parts List (continued)		
Part Number	Description	Quantity
032018010CK	HHCS 3/8-16X1-1/4 PLTD.	4.000 EA
032018020CK	HHCS 3/8-16X2-1/2 PLTD.	3.000 EA
415045002G	SLGR	1.000 EA
418151057A	PLASTIC DRAIN,ODE BRKT	1.000 EA
034530014AB	P/NIP 1/8X1-3/4 PLATED	1.000 EA
415096002A	CPLG 1/8 HEX TYPE	1.000 EA
075460062B	+C/B - 280	1.000 EA
415039007A	TERBD 250-280	1.000 EA
075461011A	+CBOX CVR BLKT - 280	1.000 EA
065591000C	GASK 250-280	1.000 EA
418150003A	GREASE FITTING CAP	1.000 EA
032018006AK	HHCS 1/4-20X3/4L PLATED	2.000 EA
035000001A	ALFTG 1/8" 1610-BL	1.000 EA
035000001A	ALFTG 1/8" 1610-BL	1.000 EA
418150003A	GREASE FITTING CAP	1.000 EA
032018006AK	HHCS 1/4-20X3/4L PLATED	4.000 EA
415000103A	T/LUG #14AWG-#4AWG W/HOLE FOR .250 BOLT	1.000 EA
418149001B	PLUG	1.000 EA
034000012AB	WSHR 1/4 STD. PLATED	4.000 EA
MG1025G05	WILKOFAS, 789.227, MED. GRAY CHAR. MET.	1.000 GA
033775004EA	DRSCR #6-1/4 304 S.S.	2.000 EA
034180026GA	KEY 1/2X1/2X3-1/4 L	1.000 EA
PK5803A22	CRATE 310 ENCSDFLT 32X29-3/4X22-1/2 SP11	1.000 EA
HW1000A32	5/16 FL WASHER WIDE,ID=.344,OD=1.125	3.000 EA

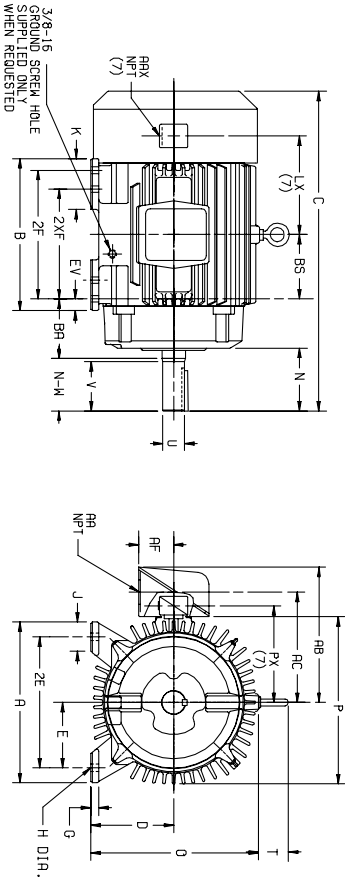
032509020C	CARRIAGE BOLT - 360	3.000 EA
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611740-501-SH1

DUTY MASTER ALTERNATING CURRENT MOTORS

SCIPREL-CAGE INDUCTION
 CAST IRON CONSTRUCTION
 ENCLOSURE: TOTALLY ENCLOSED
 MOUNTING: FOOT
 COOLING: FAN COOLED

FRAMES 250T THRU 440T



DIMENSIONS ARE IN INCHES. SEE SHEET 2 FOR DIMENSIONS IN MILLIMETERS

FRAME	A	D(2)	E	G	H	J	K	O	P	T	CAST IRON TERMINAL BOX	AA	AB	AC	AE	AF	AX LX (7)	PX (7)	BA	EV
254T-256T	12.50	6.25	5.00	.75	.56	2.50	--	13.25	13.25	2.44	1-1/4	10.81	8.81	2.50	3/4	6.31	9.31	4.25	1.00	
284T-286T5	13.75	7.00	5.50	.75	.56	2.50	--	14.75	14.88	2.44	1-1/2	12.62	10.19	3.00	3/4	6.88	10.50	4.75	1.00	
324T-326T5	15.50	8.00	6.25	.88	.69	2.75	4.50	16.69	17.00	2.44	2	15.44	11.69	3.62	3/4	8.00	10.50	5.25	1.38	
364T-365T5	17.00	9.00	7.00	.88	.69	2.75	3.88	18.50	19.50	2.94	3	18.00	13.81	4.12	3/4	8.38	11.62	5.88	1.38	
404T-405T5	19.00	10.00	8.00	1.12	.81	3.25	4.62	21.31	22.50	2.94	3	19.25	15.06	4.12	3/4	9.62	14.44	6.62	1.13	
444T-445T5	21.00	11.00	9.00	1.12	.81	3.25	5.25	23.38	25.25	3.25	3	22.19	17.44	6.00	3/4	11.12	15.25	7.50	1.25	

FRAME	SIZE	C	BS	B	2R	(4)	N	N	SHAFT AND KEY	SO.	LGTH.	WEIGHT
254T	24.56	5.00	12.00	10.00	8.25	4.12	4.00	4.00	1.625	3.75	2.88	335
284T	27.44	5.50	13.00	11.00	9.50	5.00	4.62	4.62	1.875	4.38	3.25	345
324T	27.44	5.50	13.00	11.00	9.50	5.00	3.62	3.25	1.625	3.00	3.75	475
364T	28.06	5.50	13.00	11.00	10.50	5.62	4.62	4.38	1.875	3.50	3.25	490
404T	28.94	6.00	14.75	12.00	10.50	5.62	5.25	2.125	5.00	5.00	3.88	590
444T	30.44	6.00	14.75	12.00	10.50	5.62	5.25	2.125	5.00	5.00	3.88	630
324T5	28.94	6.00	14.75	12.00	11.25	4.12	3.75	1.875	3.50	5.00	2.00	650
364T5	31.31	6.12	15.00	12.25	11.25	4.12	3.75	1.875	3.50	5.00	2.00	859
365T5	33.44	6.12	15.00	12.25	11.25	4.12	3.75	1.875	3.50	5.00	2.00	865
404T5	35.31	6.12	15.00	12.25	12.25	4.12	3.75	1.875	3.50	5.00	2.00	890
404T5	35.31	6.88	16.00	13.75	12.25	4.50	4.25	2.125	4.00	5.00	2.75	1211
405T5	35.31	6.88	16.00	13.75	12.25	4.50	4.25	2.125	4.00	5.00	2.75	1211
444T5	44.62	8.25	19.00	16.50	14.50	8.94	8.50	3.375	7.00	7.50	5.62	1260
444T5	44.62	8.25	19.00	16.50	14.50	8.94	8.50	3.375	7.00	7.50	5.62	1260
445T	44.62	8.25	19.00	16.50	14.50	8.94	8.50	3.375	7.00	7.50	5.62	1654
445T5	40.88	8.25	19.00	16.50	14.50	8.94	8.50	3.375	7.00	7.50	5.62	1860
(1)							5.19	4.75	2.375	4.50	6.25	1844

- (1) SPECIAL DIMENSIONS APPLYING TO THIS ORDER ON THIS LINE.
- (2) "C" VARIES $\begin{cases} 250T - 320T +.00, -.03, \\ 360T - 440T +.00, -.06, \\ HP TO 1.625 \text{ DIA.} +.0000, -.0005 \end{cases}$
- (3) "N" VARIES $\begin{cases} 1.625 \text{ AND LARGER} +.000, -.001, \\ HP TO 1.625 \text{ DIA.} +.0000, -.0005 \end{cases}$
- (4) ALL FRAMES HAVE EIGHT MOUNTING HOLES FOR DUAL MOUNTING.
- (5) MOTOR WEIGHTS MAY VARY BY 15% DEPENDING UPON RATING.
- (6) "N-W" VARIES $+ .00, -.25$.
- (7) AUXILIARY CONDUIT BOX SUPPLIED WHEN SPECIFIED CONDUIT BOXES LOCATED ON OPPOSITE SIDE WHEN F-2W-1, W-4-W-5-W-7, OR C-1 MOUNTING IS SPECIFIED. IF MOUNTING CLEARANCE DETAILS ARE REQUIRED, CONSULT FACTORY.

FRAME _____ TYPE _____ CERTIFIED FOR _____
 ORDER # _____ ITEM # _____ HP _____ RPM _____ PH _____ HZ _____ VOLTS _____
 SALES ORDER # _____ APPROVED BY _____ DATE _____

IHS-105-074119

CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT MOTOR PERFORMANCE IS SUITABLE IN THE APPLICATION.

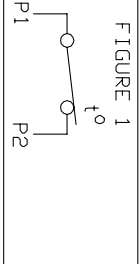
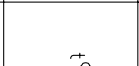
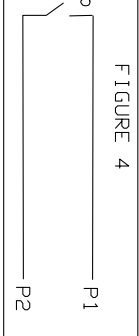
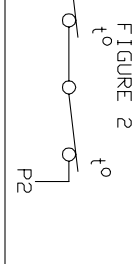
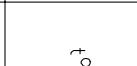
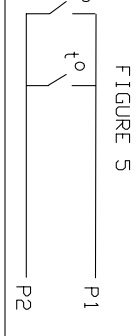
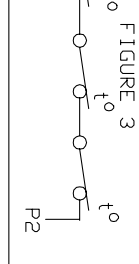
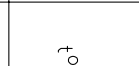
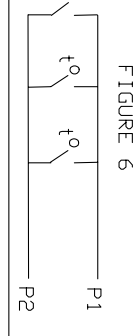
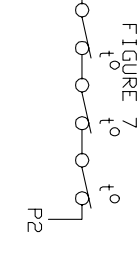
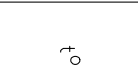
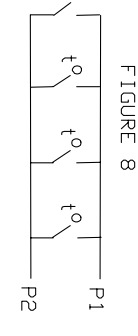
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FILE: \RAG\00004\525		
MTL: -		

BALDOR • DODGE • RELIANCE

DIM SHT 250T-440T TEFC FT MTG STD T & TS SGL EXT XT

CONNECTION DIAGRAM ACCESSORIES

MOTOR WINDING THERMOSTATS	
CONTACTS _____ @ _____ °C	
FIGURE NUMBER _____	
CONTACT RATING	
VOLTS	CONTINUOUS AMPERES
110-120	3.0
220-240	1.5
440-480	0.75
550-600	0.60
	INRUSH AMPERES
	30
	15
	7.5
	6.0

NORMALLY CLOSED	THERMOSTATS	NORMALLY OPEN
 <p>FIGURE 1</p>	 <p>FIGURE 4</p>	 <p>FIGURE 5</p>
 <p>FIGURE 2</p>	 <p>FIGURE 5</p>	 <p>FIGURE 6</p>
 <p>FIGURE 3</p>	 <p>FIGURE 6</p>	 <p>FIGURE 7</p>
 <p>FIGURE 7</p>	 <p>FIGURE 8</p>	 <p>FIGURE 8</p>

CUSTOMER _____ CUSTOMER ORDER NO. _____ S.D. NO. _____

418174-006

418174-006

REV. DESC: LOADED TO BUS		TDR: 000000570390
REV. LTR: A	VERSION: 01	BY: RAGDRF
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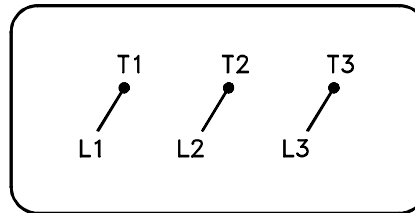
BALDOR

A-C MOTOR CONNECTION ACCESSORIES

SH 1 of 1

416820-036

A-C MOTOR
 CONNECTION DIAGRAM
 STANDARD 3 LEAD CONNECTED



(N.P. 1575-BA)

416820-036

REV. DESC: LOADED TO BUS, C/R 335225		
REV. LTR: -	VERSION: 00	TDR: 000000538207
FILE: \MGA\00000\682	REVISED: 11:54:06 04/30/2010	
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BALDOR

CONN DIAG - STANDARD 3 LEAD

SH 1 of 1

Marketing maintained PDF of MN408:

<http://www.baldor.com/support/Literature/Load.ashx/MN408?ManNumber=MN408>

Marketing maintained PDF of MN416:

<http://www.baldor.com/support/Literature/Load.ashx/MN416?ManNumber=MN416>

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Product Information Packet

ABB A/S

12H015Y607G1

50HP,1775RPM,3PH,60HZ,326T,1272M,TEFC,F1

Document No.: 10

Title: Decanter Centrifuge Main Drive Motor

Part Detail							
Revision:	B	Status:	PRD/A	Change #:		Proprietary:	Yes
Type:	AC	Elec. Spec:	12WGY607	CD Diagram:	CD0382	Mfg Plant:	
Mech. Spec:	12H15	Layout:	12LYH015	Poles:	04	Created Date:	11-28-2016
Base:	RG	Eff. Date:	06-25-2018	Leads:	6#8		

Specs			
Enclosure:	TEFC	KVA Code:	H
Frame:	326T	Lifting Lugs:	Standard Lifting Lugs
Frame Material:	Iron	Locked Bearing Indicator:	Locked Bearing
Output @ Frequency:	50.000 HP @ 60 HZ	Motor Lead Quantity/Wire Size:	6 @ 8 AWG
Synchronous Speed @ Frequency:	1800 RPM @ 60 HZ	Motor Lead Exit:	Ko Box
Voltage @ Frequency:	575.0 V @ 60 HZ	Motor Lead Termination:	Flying Leads
XP Class and Group:	None	Motor Type:	1272M
XP Division:	Not Applicable	Mounting Arrangement:	F1
Agency Approvals:	UR	Power Factor:	85
	CSA	Product Family:	Chemical Processing (Not DC)
Auxillary Box:	No Auxillary Box	Pulley End Bearing Type:	Ball
Auxillary Box Lead Termination:	None	Pulley Face Code:	Standard
Base Indicator:	Rigid	Pulley Shaft Indicator:	Standard
Bearing Grease Type:	Polyrex EM (-20F +300F)	Rodent Screen:	None
Blower:	None	Shaft Extension Location:	Pulley End
Current @ Voltage:	46.000 A @ 575.0 V	Shaft Ground Indicator:	No Shaft Grounding
Design Code:	A	Shaft Rotation:	Reversible
Drip Cover:	No Drip Cover	Shaft Slinger Indicator:	Shaft Slinger

Duty Rating:	CONT	Speed Code:	Single Speed
Electrically Isolated Bearing:	Not Electrically Isolated	Motor Standards:	NEMA
Feedback Device:	NO FEEDBACK	Starting Method:	Wye Start - Delta Run
Front Face Code:	Standard	Thermal Device - Bearing:	None
Front Shaft Indicator:	None	Thermal Device - Winding:	Thermal & Thermostat Or RTD
Heater Indicator:	No Heater	Vibration Sensor Indicator:	No Vibration Sensor
Insulation Class:	H	Winding Thermal 1:	None
Inverter Code:	Inverter Duty	Winding Thermal 2:	None

Nameplate NP2741E	
CAT NO	61195636-62
SPEC.	12H015Y607G1
FRAME	326T HP 50 TE
VOLTS	575
MAG CUR	16.7
RPM	1775
HZ	60
SER.F.	1.15
NEMA-NOM-EFF	94.5
BLWR V	
RATING	40C AMB-CONT
DE BRG	6312
CC	010A
	10:1 CT
	FLA 46
	RPM MAX 2400
	PH 3
	DES A
	WK2 9.59
	PH HZ A
	CLASS H
	SL HZ 0.8
	ODE BRG 6311
	SN

Nameplate NP0090E	
FRONT	6311
PULLEY	6312
LUBRICATE WITH	
GREASE	POLYREX EM

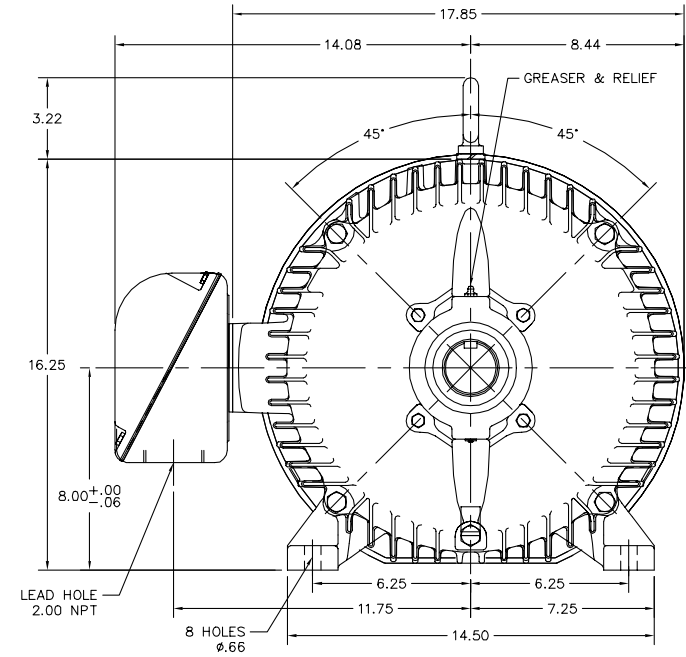
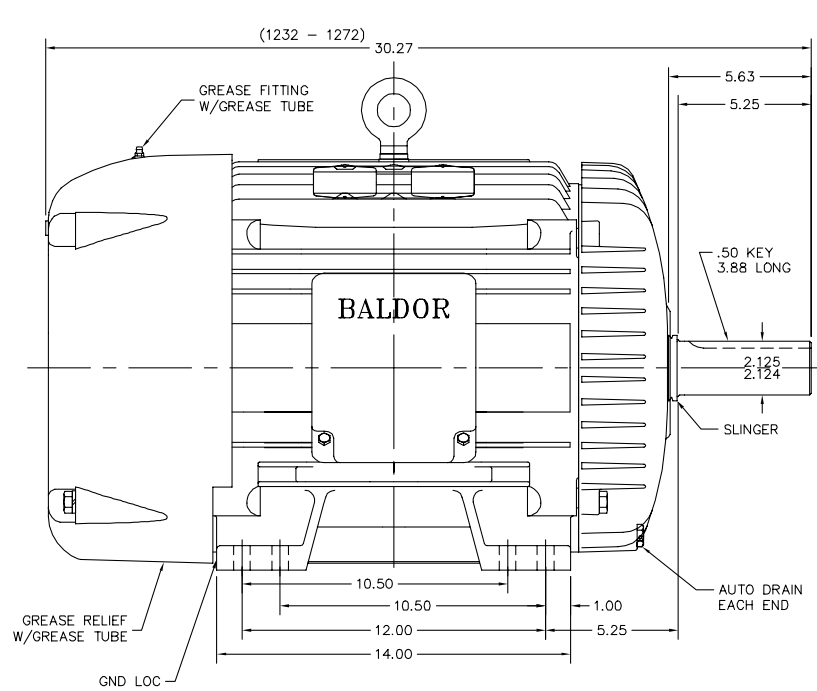
Parts List		
Part Number	Description	Quantity
SA330622	SA 12H015Y607G1	1.000 EA
RA318607	RA 12H015Y607G1	1.000 EA
09FN3001B03SP	EXTERNAL FAN, PLASTIC	1.000 EA
10CB1000A04P	KO BOX, MACH W/2.00 NPT W/EPOXY PRIMER	1.000 EA
09GS1010	GASKET, DWG, LEADWIRE SEPERATOR	1.000 EA
10XN3118K16	5/16-18 X 1' GRADE #5, STL, ZINC PLATE	4.000 EA
HW1001A31	LOCKWASHER 5/16, ZINC PLT.591 OD, .319 I	4.000 EA
WD1000B16	T&B CX70TN TERMINAL	1.000 EA
10XN2520K06	1/4-20 X 3/8" HX HD SCREWGRADE 5, ZINC P	1.000 EA
HW1001A25	LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I	1.000 EA
HA4017A03	.125 X 1.75 GREASE EXT (F/S)	1.000 EA
HW4019A01	PIPE COUPLING 1/8 NPT,STEEL,ZINC COATING	1.000 EA
HA4017A01	1/8 X 4 GREASE EXT (F/S)	1.000 EA
HA3400A13	STUD, 1/2-13 X 7" WELKER	4.000 EA
HW1001A50	LOCKWASHER 1/2, ZINC PLT.,879 OD, .509 I	4.000 EA
HW4600B40	V-RING SLINGER 2.000 X 2.680 X .28 VITON	1.000 EA
HW5100A13	W4627-047 WVY WSHER	1.000 EA
10XN3118K36	5/16-18 X 2.25" HEX HD, GRADE 5	2.000 EA
10XN3118K40	5/16-18 X 2.50" HEX HD, GRADE 5	4.000 EA
12EP1106A02P	PU ENDPLATE, MACH W/EPOXY PRIMER	1.000 EA
10XN5013K28	1/2-13 X 1.75 HEX HEAD MACH SCREW,GRAD	4.000 EA
HW1001A50	LOCKWASHER 1/2, ZINC PLT.,879 OD, .509 I	4.000 EA
HW4600B41	V-RING SLINGER 2.125 X 2.880 X 0.280	1.000 EA
12FH1002P	FAN COVER, CAST W/EPOXY PRIMER	1.000 EA

Parts List (continued)		
Part Number	Description	Quantity
XY5013A12	NUT,1/2-13,HEX,STEEL,ZINCPLATED	4.000 EA
HW1001A50	LOCKWASHER 1/2, ZINC PLT.,.879 OD, .509 I	4.000 EA
10CB1503A01P	CONDUIT BOX LIPPED LID, MACH W/EPXY PRMR	1.000 EA
14GS1003	GASKET CONDUIT BOX LID, NEOP	1.000 EA
10XN2520K16	1/4-20 X 1" HX HD SCRW GRADE 5, ZINC P	4.000 EA
HW1001A25	LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I	4.000 EA
HW2501H33	KEY, 1/2 SQ X 3.875	1.000 EA
MJ5001A27	32220KN GRAY SEALER *MIN BUY 4 QTS=1GAL	0.031 QT
MJ5001A14	DYNAPRO SEALANT, CP MTR VC#2508050 (603	0.030 EA
LB1115N	LABEL,LIFTING DEVICE (ON ROLLS)	1.000 EA
LB1002N	LABEL,MARINE DUTY (ON ROLLS)	1.000 EA
12EP1107A05GP6	FR ENDPLATE, MACH W/EPOXY PRIMER & GREE	1.000 EA
HW4500A17	317400 ALEMITE GREASE RELIEF	1.000 EA
HW4500A21	1618BALEMITE FITTING 825 UNIVERSAL	1.000 EA
HA4001A01SP	DRAIN PLUG, PLASTIC (MICRO PLAS)	1.000 EA
HA4051A00	PLASTIC CAP FOR GREASE FITTING	1.000 EA
MJ1000A02	GREASE, MOBIL POLYREX EM - 124047	0.200 LB
HW4500A17	317400 ALEMITE GREASE RELIEF	1.000 EA
HW4500A03	GREASE FITTING, .125 NPT 1610(ALEMITE) 8	1.000 EA
HA4001A01SP	DRAIN PLUG, PLASTIC (MICRO PLAS)	1.000 EA
HA4051A00	PLASTIC CAP FOR GREASE FITTING	1.000 EA
HW2500A25	WOODRUFF KEY USA #1008 #BLOW CARBON STEE	1.000 EA
51XB1214A20	12-14X1.25 HXWSSLD SERTYB	1.000 EA
MG1025N19	WILKOFASST, 778.50, RELIANCE BLUE-GREEN	0.080 GA

Product Information Packet: 12H015Y607G1 - 50HP,1775RPM,3PH,60HZ,326T,1272M,TEFC,F1

85XU0407S04	4X1/4 U DRIVE PIN STAINLESS	4.000 EA
LB1119N	WARNING LABEL	1.000 EA
LB1417	LABEL CARTON 6X4 PERFORATED BLANK ROLLS	1.000 EA
LC0382	CONNECTION LABEL	1.000 EA
NP2741E	SS CP INV UL CSA CC	1.000 EA
NP0090E	SS NO LOGO'S BEARING & GREASE DATA	1.000 EA
12PA1000	PACKAGING GROUP PRINT PK1024A06	1.000 EA
MN416A01	TAG-INSTAL-MAINT no wire (1200/bx) 3/19	1.000 EA

12LYH015



12LYH015

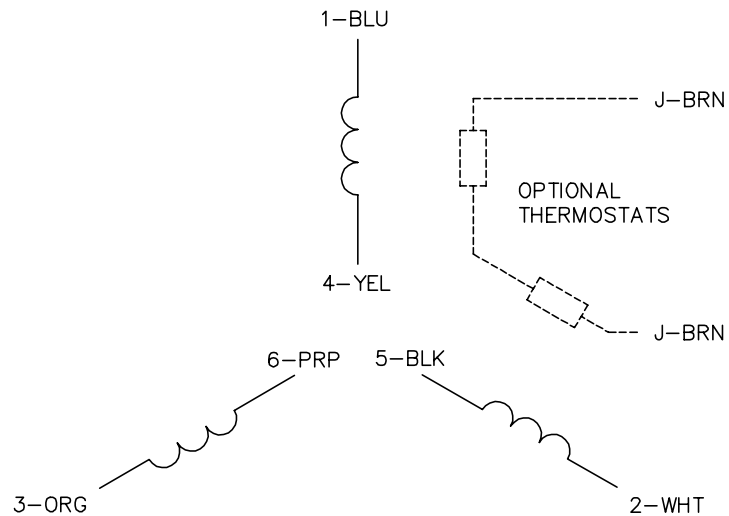
CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT BALDOR'S PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION.

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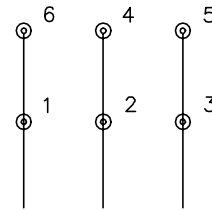
BALDOR

HOR TEFC 324-6T; CP
SH 1 of 1

CD0382

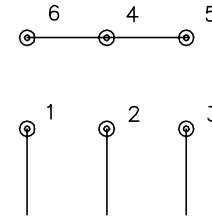


RUN CONNECTION
(1D)



LINE

START CONNECTION
(1Y)



LINE

NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.
5. FOR ACROSS-THE-LINE STARTING, USE 'RUN' CONNECTION.

CD0382

REV. DESC: ADD CLASS CONN00000007		
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FILE: \AAA\00005\243	REVISED: 09:05:32 02/19/2019	BY: ENBRIRO
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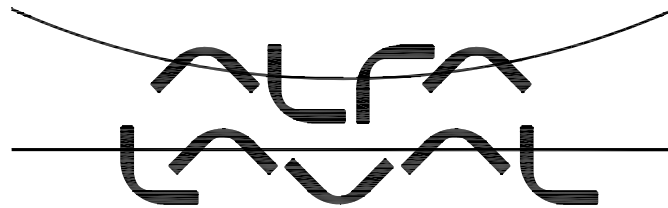
BALDOR - RELIANCE®

3PH, SV, 6 LEADS, Y START/D RUN

SH 1 of 1

Marketing maintained PDF of MN416:

<http://www.baldor.com/support/Literature/Load.ashx/MN416?ManNumber=MN416>



District of Sooke WWTP
ALDEC G3-750 (575/3/60, 50HP-10HP)
DECANTER CONNECT CONTROLS
ELECTRICAL DRAWINGS PACKAGE

REVISION 1

PROJECT CA-PWW15-0047
November 2019

Document No.: 11
Title: Electrical Drawing Package

					District of Sooke WWTP Sooke, BC, CANADA	Date	01.10.19	 Scarborough, ONTARIO, CANADA			
					DECANTER CONNECT CONTROLS ELECTRICAL DRAWINGS PACKAGE TITLE PAGE	Division	PTD	Project	CA-PWW15-0047	Total Pages 26	
1	Changes per review comments Jan 2020	20.01.20	AKE			AutoCAD, File	191001CR1			Cont. on 001	
Rev.	Description	Date	Rev. By	Checked By	Designer	Drawn	Verified	CAD Rev.	Rev.	Drawing No.	Page 000
						AKE		18	1	191001	

SYMBOLS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	N.O. CONTACT		SINGLE POLE CIRCUIT BREAKER
	N.C. CONTACT		THREE POLE CIRCUIT BREAKER WITH MAX CURRENT AND O/L PROTECTIONS AND AUXILIARY CONTACT
	CONTROL RELAY, CONTACTOR COIL		SOLENOID COIL
	MOTOR		THERMAL OVERLOAD
	PUSH BUTTON N.O. - MOMENTARY		THREE POLE CONTACTOR WITH OVERLOAD RELAY
	PUSH BUTTON N.C. - MOMENTARY		CONTROL TRANSFORMER
	MUSHROOM HEAD PUSH BUTTON N.C. - MAINTAINED		COIL
	2 POSITION SELECTOR SWITCH MAINTAINED		CAPACITOR
	N.O. LIMIT SWITCH		RESISTOR
	N.C. LIMIT SWITCH		RTD, THERMISTOR
	N.O. TEMPERATURE SWITCH		2 WIRE PROXIMITY SWITCH
	N.C. TEMPERATURE SWITCH		3 WIRE PROXIMITY SWITCH
	N.O. FLOW SWITCH		ANALOG SIGNAL
	N.C. FLOW SWITCH		SHIELDED TWISTED PAIR
	TIMED CONTACT N.O. TIMED CLOSED		HORN, BUZZER
	TIMED CONTACT N.C. TIMED OPEN		
	TIMED CONTACT N.O. TIMED OPEN		
	TIMED CONTACT N.C. TIMED CLOSED		
	JUMPER		
	FUSE		
	LIGHT		
	GROUND CONNECTION		

DEVICE TYPE LEGEND

ABBR.	DESCRIPTION	ABBR.	DESCRIPTION
AC	ALTERNATING CURRENT	HSC	HIGH SPEED COUNTER
AC	AIR CONDITIONER	IO	INPUTS & OUTPUTS
AI	ANALOG INPUT	I/P	CURRENT TO PRESSURE
ALH	ALARM HORN	JB	JUNCTION BOX
ALL	ALARM LIGHT	KLS	KEY LOCK SWITCH
AO	ANALOG OUTPUT	L	LINE
AM	AMMETER	LS	LEVEL SWITCH
BAT	BATTERY	LS	LOW SPEED
BD	BACK DRIVE	LT	LEVEL TRANSMITTER
BDB	BACK DRIVE BLOWER	M	MOTOR
BRNG	BEARING	MD	MAIN DRIVE
C, K	CONTACTOR	MCC	MOTOR CONTROL CENTER
CAP	CAPACITOR	MCR	MASTER CONTROL RELAY
CC	CORE CONTROLLER	MV	MOTORIZED VALVE
CB	CIRCUIT BREAKER	N	NEUTRAL
CR, K	CONTROL RELAY	OIT	OPERATOR INTERFACE TERMINAL
CPU	CENTRAL PROCESSING UNIT	OL, O/L	OVERLOAD
CT	CURRENT TRANSFORMER	PB	PUSH BUTTON
CTR	COUNTER	PDB	POWER DISTRIBUTION BLOCK
DC	DIRECT CURRENT	PE	PLANT EARTH
DI	DIGITAL INPUT	PLC	PROGRAMMABLE LOGIC CONTROLLER
DISC	DISCONNECT	PS	PRESSURE SWITCH
DS	DOOR SWITCH	PSU	POWER SUPPLY UNIT
DO	DIGITAL OUTPUT	PWL	POWER LIGHT
DU/DT	DU/DT FILTER	RIO	REMOTE IO
ELT	ENCLOSURE LIGHT	RTD	RESISTIVE TEMPERATURE DEVICE
ENA	ETHERNET ADAPTER	SIL	SILENCE
ENF	ENCLOSURE FAN	SIL	SAFETY INTEGRITY LEVEL
ENT	ENCLOSURE FANTHERMOSTAT	SMR	SAFETY MONITORING RELAY
EPR	EXTERNAL POWER RECEPTACLE	SR	SAFETY RELAY
ES	EMERGENCY STOP	SS	SELECTOR SWITCH
ESL	EMERGENCY STOP LIGHT	STO	SAFE TORQUE OFF
ESR	EMERGENCY STOP RELAY	SV	SOLENOID VALVE
ESR	EMERGENCY STOP RESET	SW	SWITCH
ETH	ETHERNET	T	TRANSFORMER
FL	FLUSH	TE	TEMPERATURE ELEMENT
FS	FLOW SWITCH	TI	TEMPERATURE INDICATOR
FU	FUSE	TMR	TIMER
GFCI	GROUND FAULT CIRCUIT INTERRUPTOR	TS	TEMPERATURE SWITCH
GB	GEARBOX	TT	TEMPERATURE TRANSMITTER
GP	GREASE PUMP	UFC	UNIVERSAL FREQUENCY CONVERTER
GRND	GROUND	UPS	UNINTERRUPTABLE POWER SUPPLY
HF	HARMONIC FILTER	VFD	VARIABLE FREQUENCY DRIVE
HMI	HUMAN MACHINE INTERFACE		

District of Sooke WWTP

Sooke, BC, CANADA

DECANTER CONNECT CONTROLS
ELECTRICAL DRAWINGS PACKAGE
SYMBOLS AND DEVICE LEGEND

Date 01.10.19

Division
PTD



Scarborough, ONTARIO, CANADA

AutoCAD, File
191001CR1

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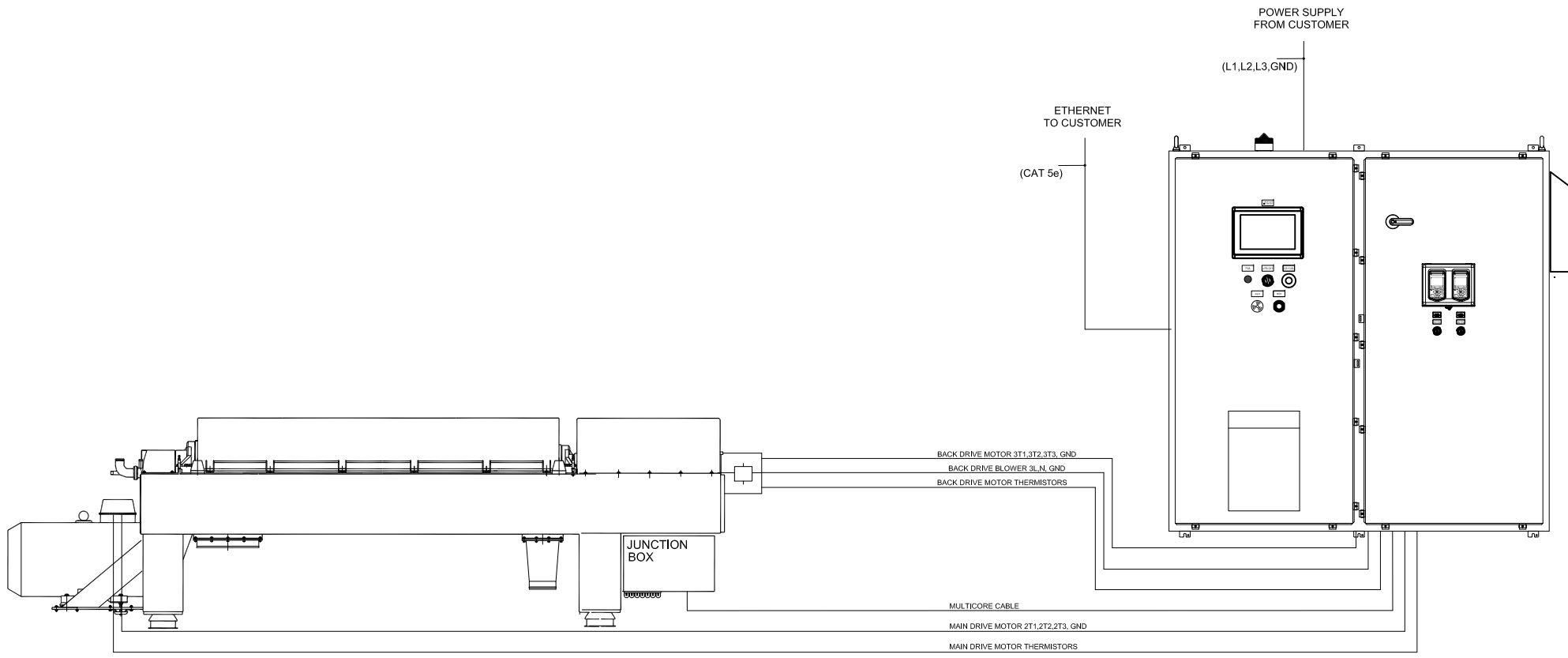
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Drawing No. 191001

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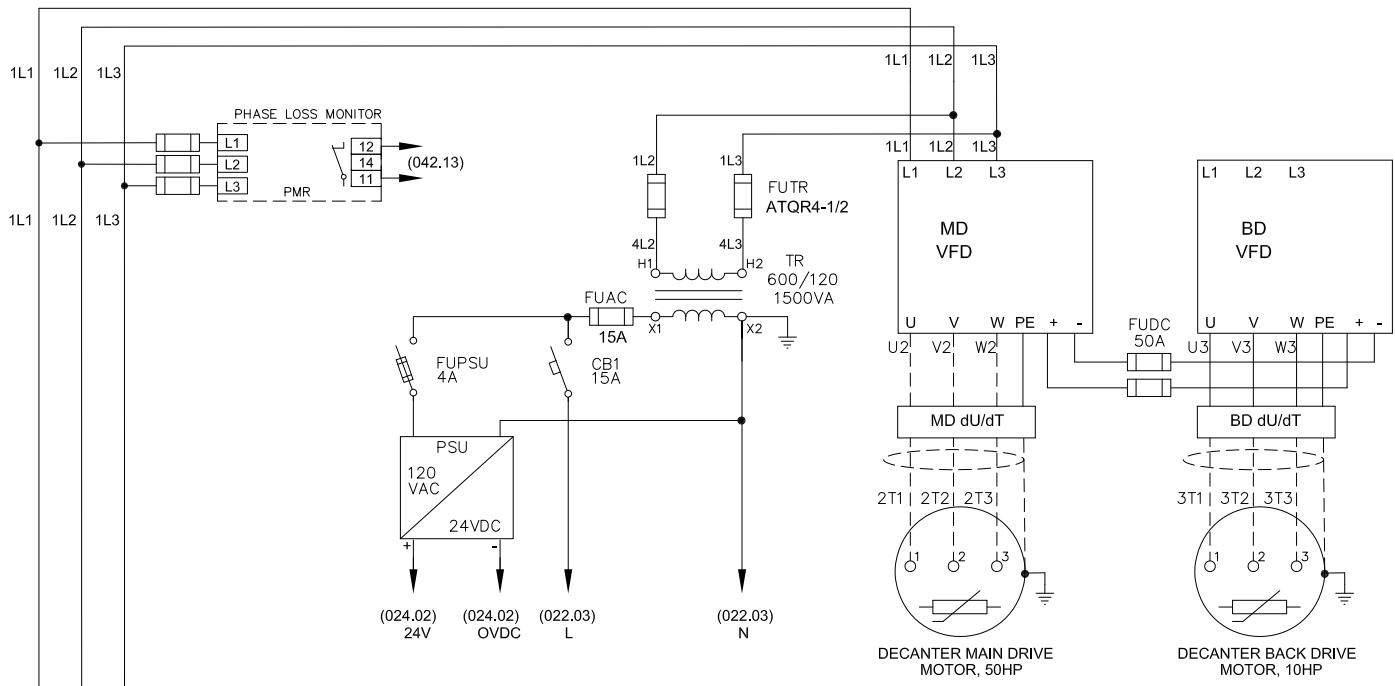
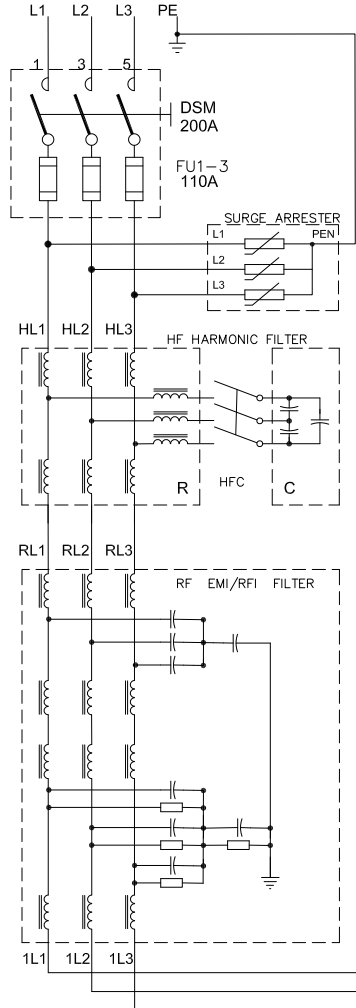
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					DECANTER CONNECT CONTROLS ELECTRICAL DRAWINGS PACKAGE INTERCONNECTION DIAGRAM			AutoCAD, File	191001CR1			Project	CA-PWW15-0047	Page
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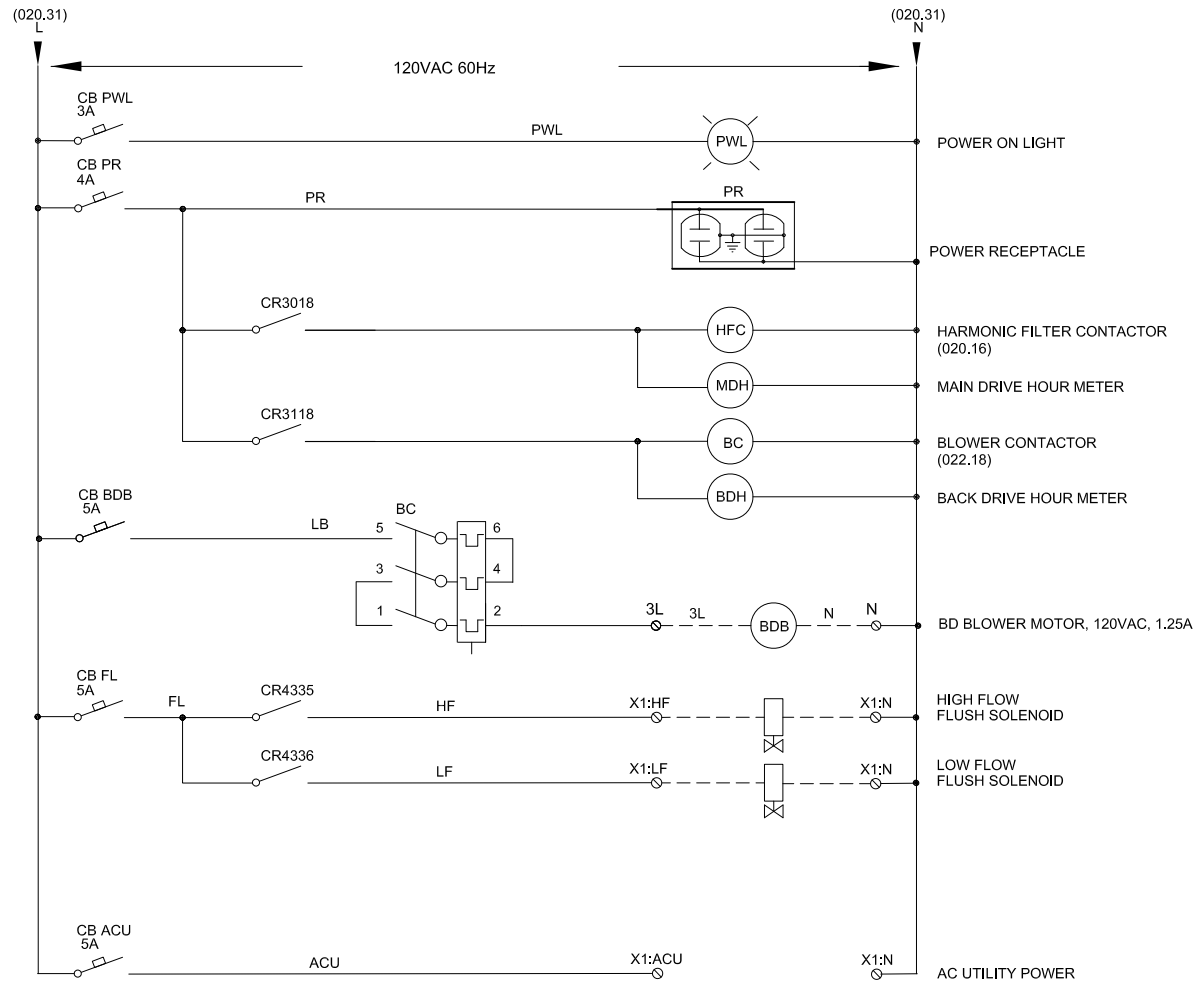
CUSTOMER SUPPLY
600/3/60, 70A, SCCR 65kA




- NOTES:
1. WARNING LABEL TO BE PROVIDED NEAR VFD DC LINK FUSES TO WARN ABOUT VOLTAGE LEVEL HIGHER THEN SUPPLY
 2. DC LINK FUSES ARE TO BE COVERED WITH LEXAN TRANSPARENT BARRIER

					District of Sooke WWTP Sooke, BC, CANADA			Date	01.10.19	 Scarborough, ONTARIO, CANADA	Total Pages	24				
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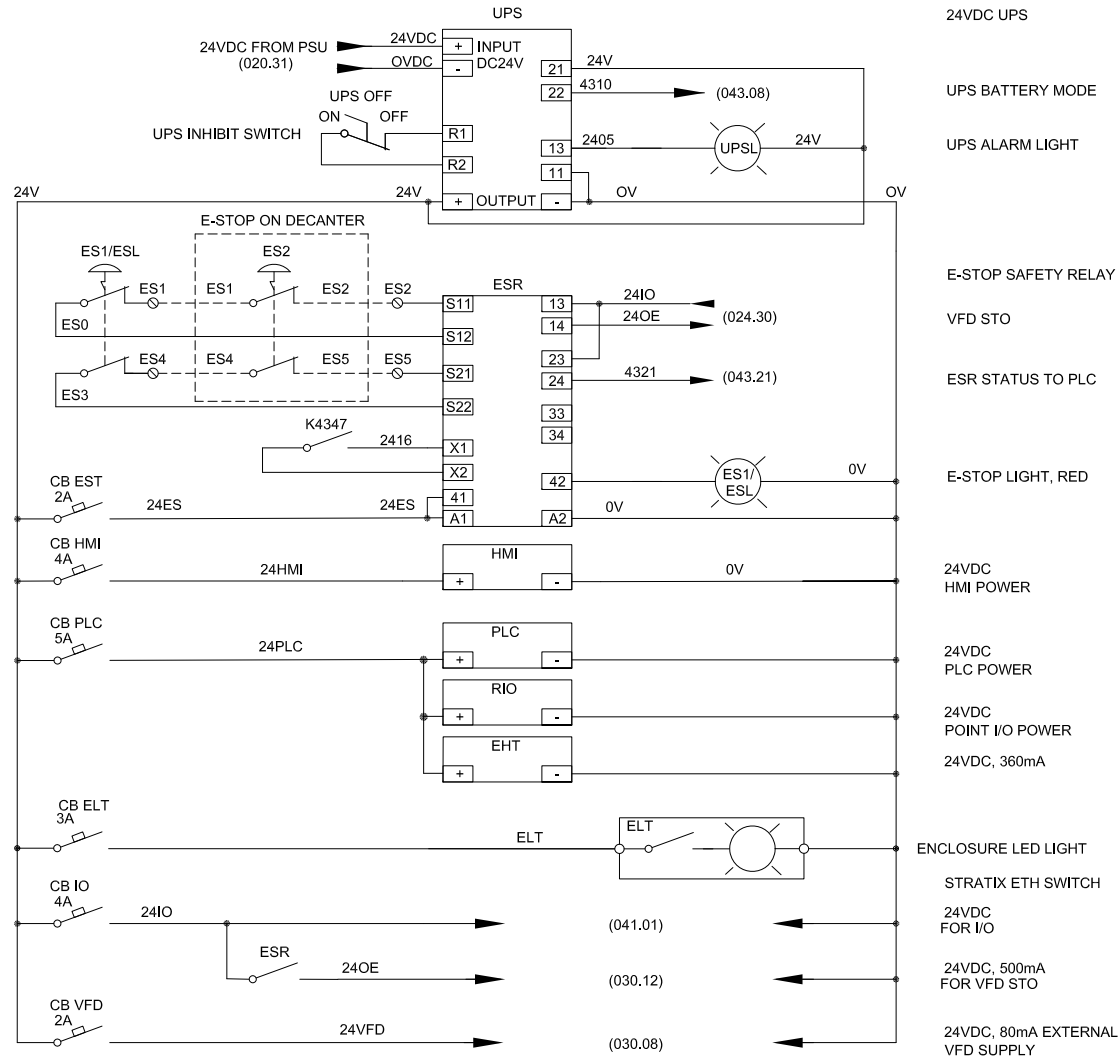
District of Sooke WWTP
Sooke, BC, CANADA
DECANTER CONNECT CONTROLS
ELECTRICAL DRAWINGS PACKAGE
120VAC PRINCIPAL DIAGRAM

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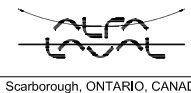
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24VDC UPS
UPS BATTERY MODE
UPS ALARM LIGHT
E-STOP SAFETY RELAY
VFD STO
ESR STATUS TO PLC
E-STOP LIGHT, RED
24VDC HMI POWER
24VDC PLC POWER
24VDC POINT I/O POWER
24VDC, 360mA
ENCLOSURE LED LIGHT
STRATIX ETH SWITCH
24VDC FOR I/O
24VDC, 500mA FOR VFD STO
24VDC, 80mA EXTERNAL VFD SUPPLY

District of Sooke WWTP
Sooke, BC, CANADA

Date 01.10.19
Division PTD



**DECANTER CONNECT CONTROLS
ELECTRICAL DRAWINGS PACKAGE
24VDC PRINCIPAL DIAGRAM**

AutoCAD, File 191001CR1
Project CA-PWW15-0047

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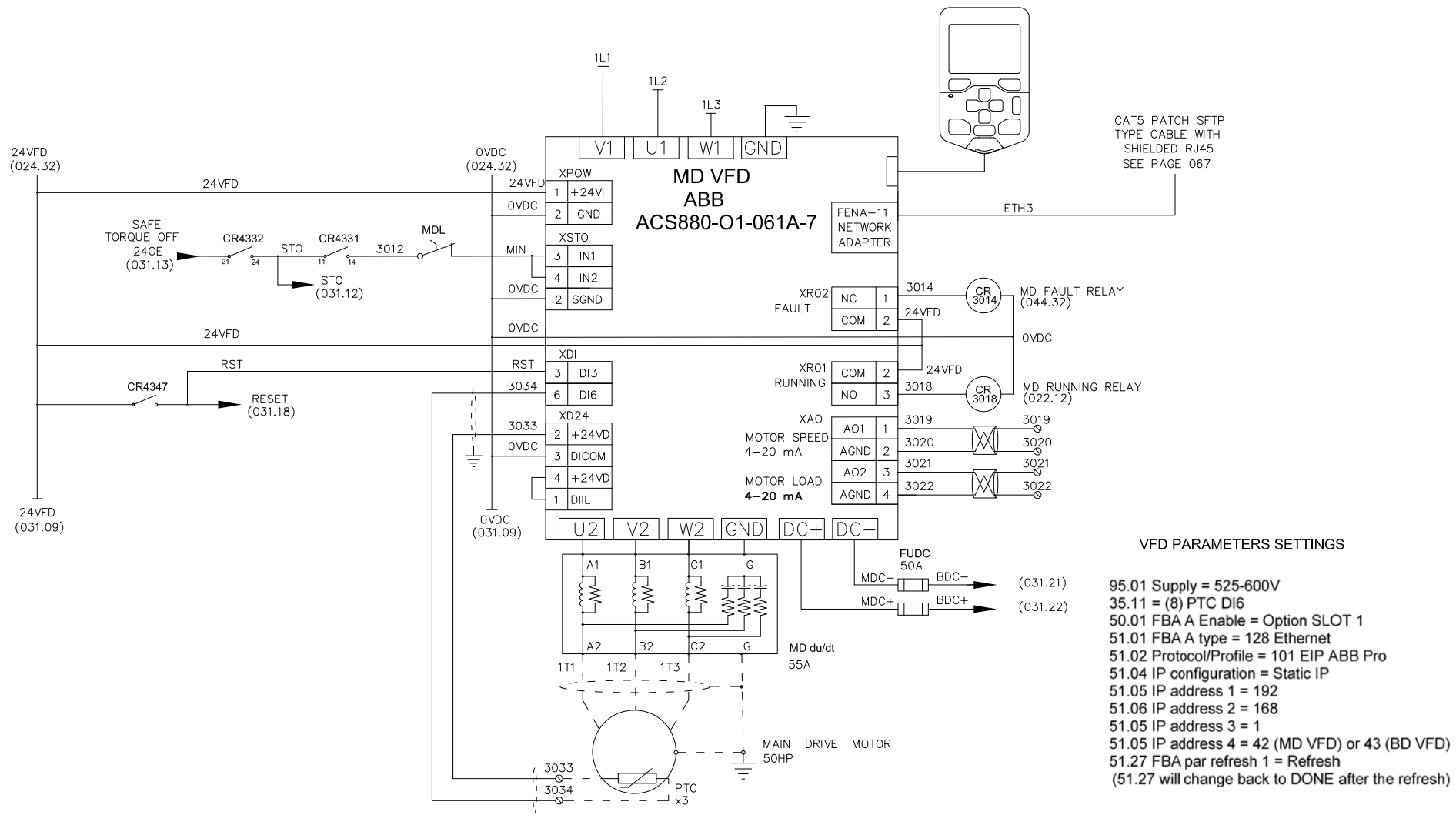
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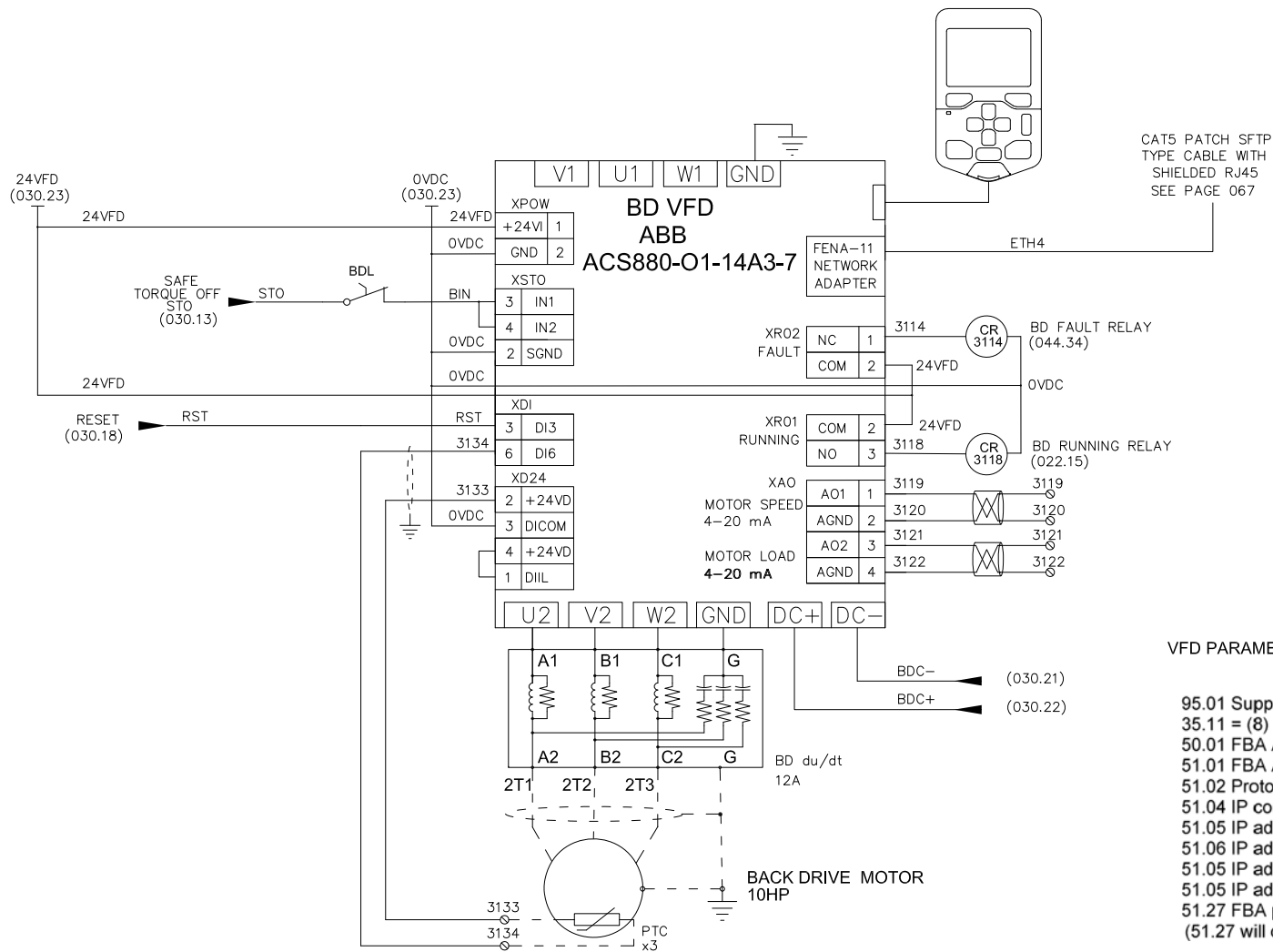


VFD PARAMETERS SETTINGS

- 95.01 Supply = 525-600V
- 35.11 = (8) PTC DI6
- 50.01 FBA A Enable = Option SLOT 1
- 51.01 FBA A type = 128 Ethernet
- 51.02 Protocol/Profile = 101 EIP ABB Pro
- 51.04 IP configuration = Static IP
- 51.05 IP address 1 = 192
- 51.06 IP address 2 = 168
- 51.05 IP address 3 = 1
- 51.05 IP address 4 = 42 (MD VFD) or 43 (BD VFD)
- 51.27 FBA par refresh 1 = Refresh
- (51.27 will change back to DONE after the refresh)

					District of Sooke WWTP			Date	01.10.19			Scarborough, ONTARIO, CANADA			
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CAT5 PATCH SFTP
TYPE CABLE WITH
SHIELDED RJ45
SEE PAGE 067

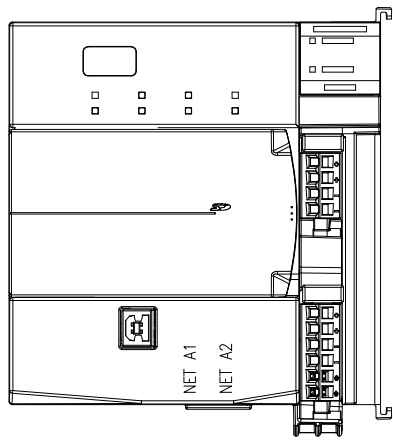
VFD PARAMETERS SETTINGS

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- 50.01 FBA A Enable = Option SLOT 1
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- 51.06 IP address 2 = 168
- 51.05 IP address 3 = 1
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- 51.27 FBA par refresh 1 = Refresh
- (51.27 will change back to DONE after the refresh)

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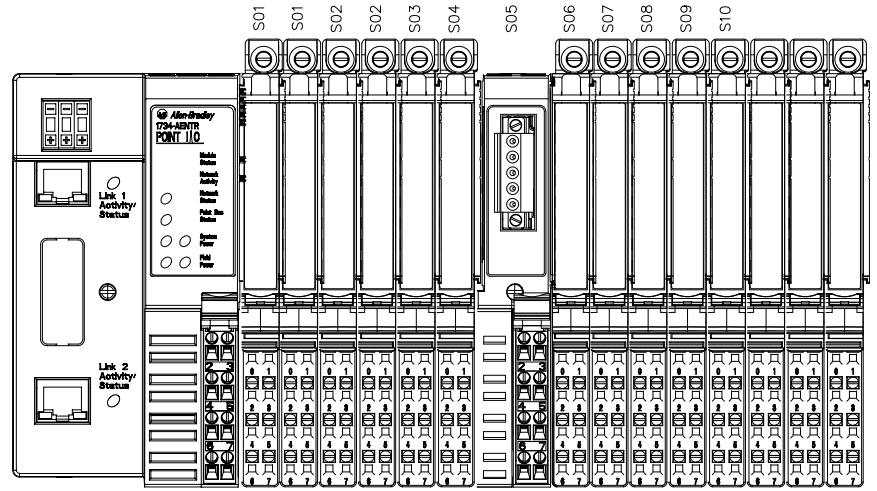
PLC



COMPACTLOGIX CONTROLLER AB,5069-L320ER

COMPACT I/O POWER TERMINAL KIT SCREW TYPE
AB,5069-RTB64-SCREW

RIO



POINT IO ADAPTER, ETHERNET I/P AB,1734-AENTR

POINT IO MODULE HIGH SPEED COUNTER AB,1734-VHSC24

POINT IO MODULE HIGH SPEED COUNTER AB,1734-VHSC24

POINT IO MODULE 2 CH RTD INPUT AB,1734-IR2

POINT IO MODULE 4 CH ANALOG INPUT AB,1734-IE4C

POINT IO 24VDC POWER/BUS EXPANSION AB,1734-EP24DC

POINT IO MODULE 8 CH 24VDC INPUT AB,1734-IB8

POINT IO MODULE 8 CH 24VDC INPUT AB,1734-IB8

POINT IO MODULE 8 CH 24VDC OUTPUT AB,1734-OB8

POINT IO MODULE 8 CH 24VDC OUTPUT AB,1734-OB8

POINT IO 8 CH DEVICELOGIX CONFIGURABLE AB,1734-8CFGDLX

POINT IO ADDRESS RESERVE MODULE AB,1734-ARM

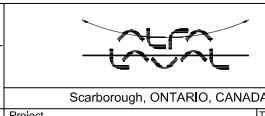
POINT IO ADDRESS RESERVE MODULE AB,1734-ARM

POINT IO ADDRESS RESERVE MODULE AB,1734-ARM

District of Sooke WWTP
Sooke, BC, CANADA

DECANTER CONNECT CONTROLS
ELECTRICAL DRAWINGS PACKAGE
PLC LAYOUT

Date 01.10.19
Division PTD
AutoCAD, File 191001CR1
CAD Rev. 18 Rev. 1

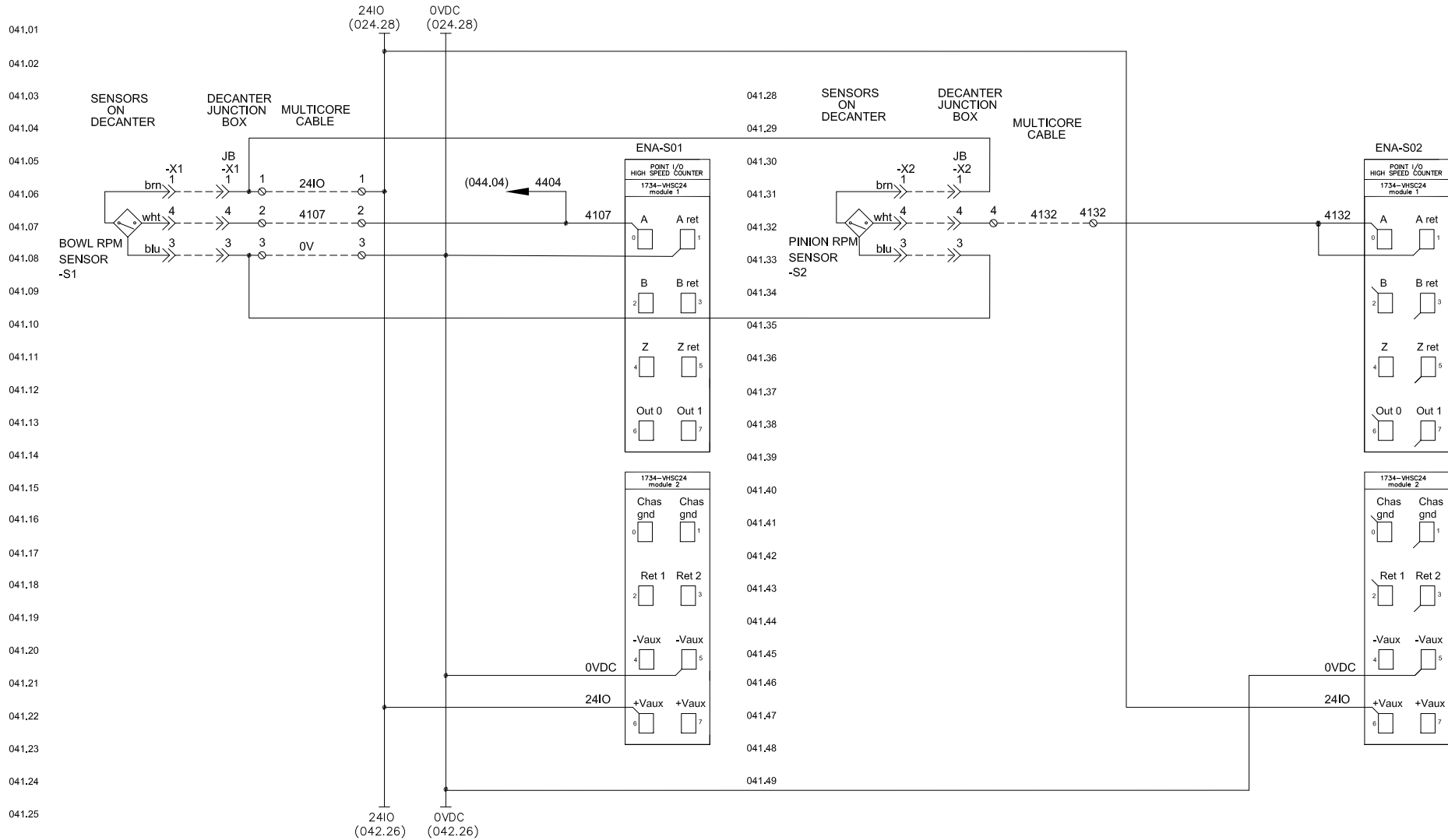


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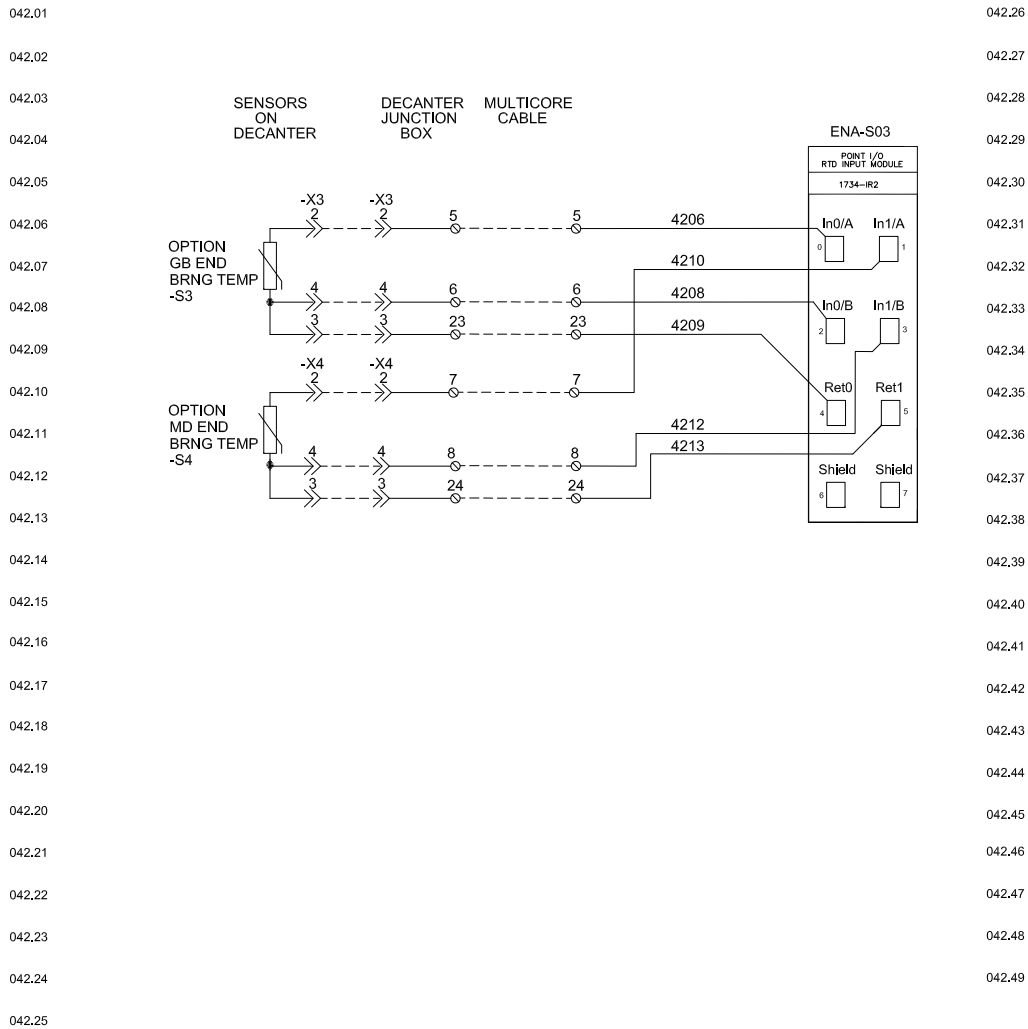
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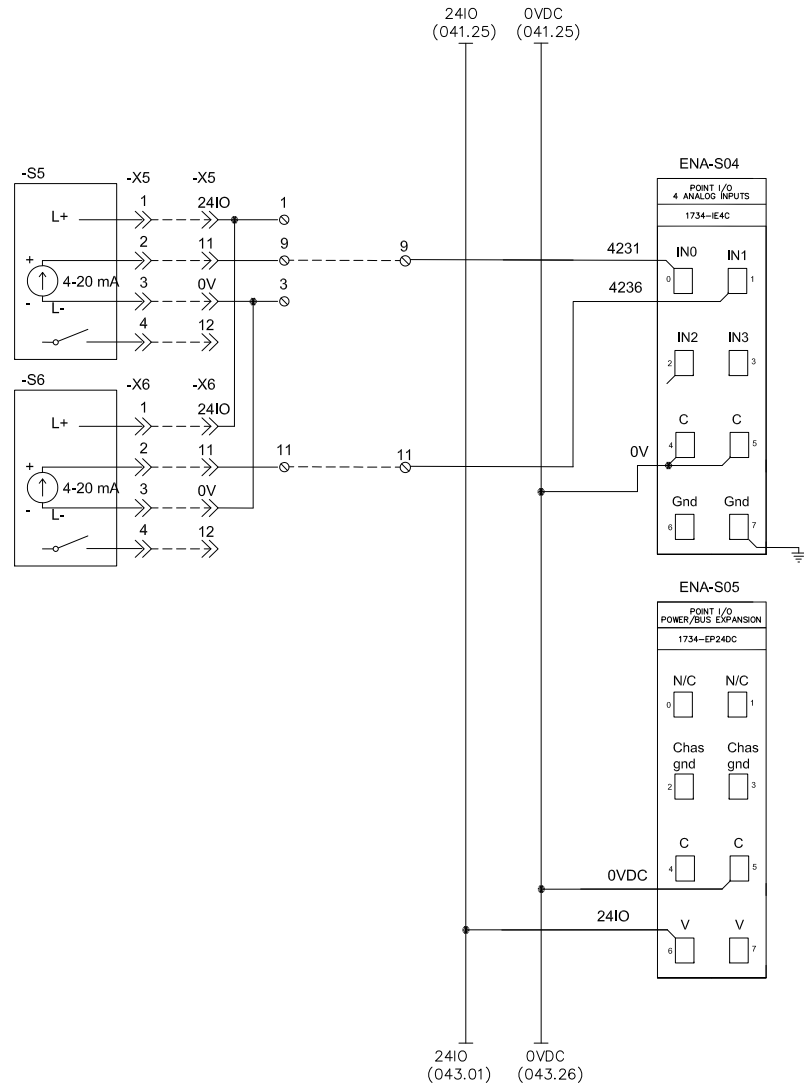
District of Sooke WWTP
 Sooke, BC, CANADA
 DECANTER CONNECT CONTROLS
 ELECTRICAL DRAWINGS PACKAGE
 HIGH SPEED COUNTER MODULES

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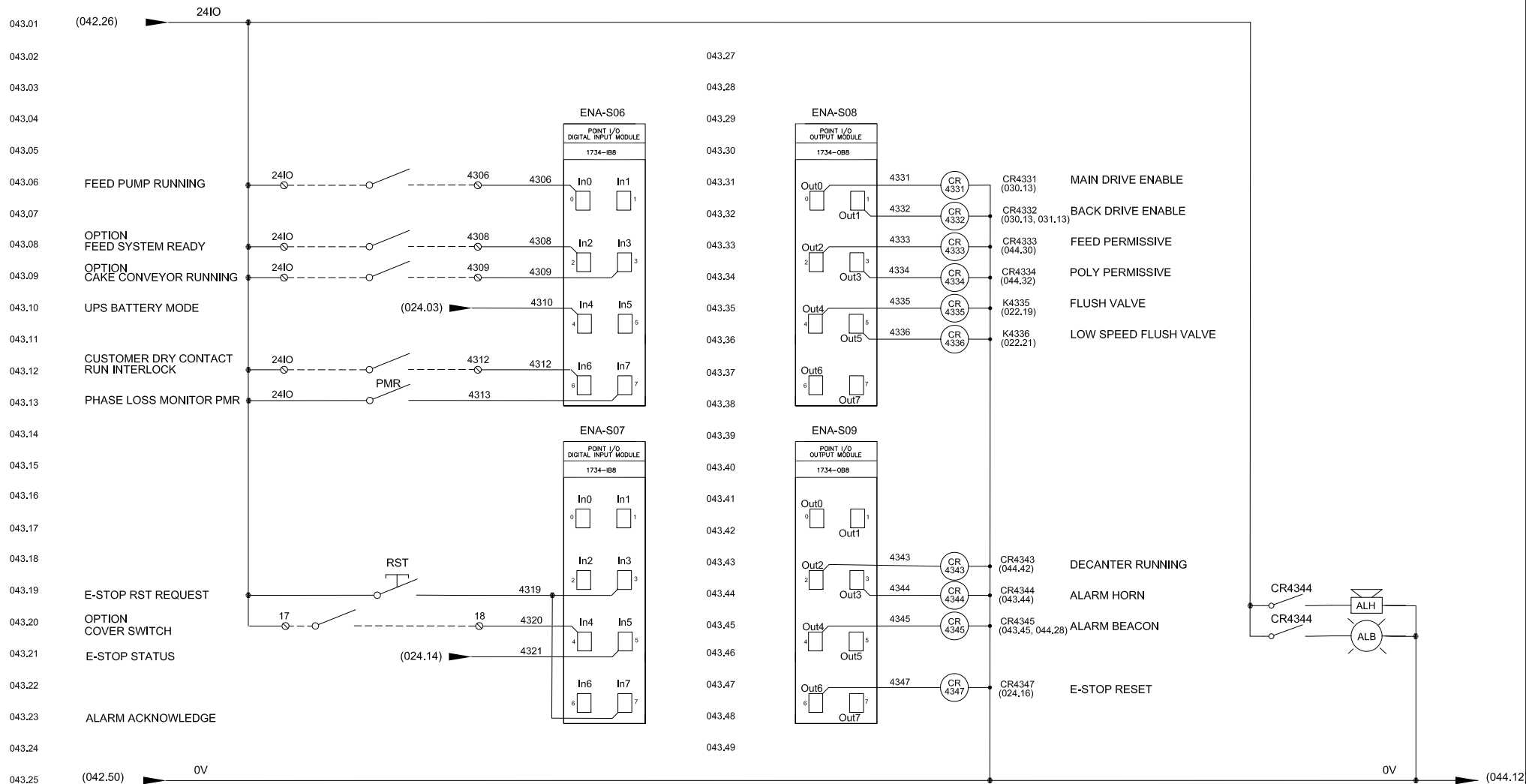


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Rev.	Description	Date	Rev. By	Checked By

District of Sooke WWTP Sooke, BC, CANADA				Date	01.10.19	 Scarborough, ONTARIO, CANADA					
				Division	PTD						
DECANter CONNECT CONTROLS ELECTRICAL DRAWINGS PACKAGE RTD & VIBRATION ANALOG INPUT MODULES				AutoCAD, File	191001CR1		Project	CA-PWW15-0047	Total Pages	24	
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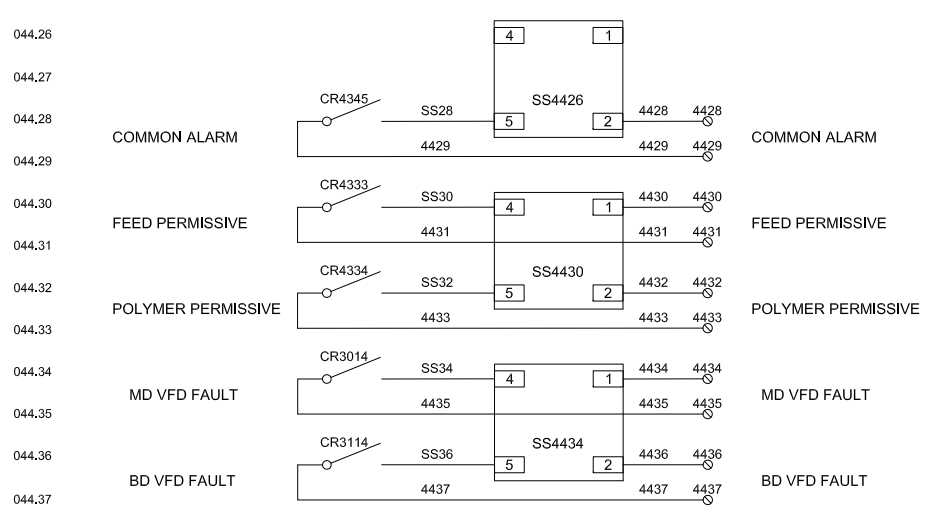
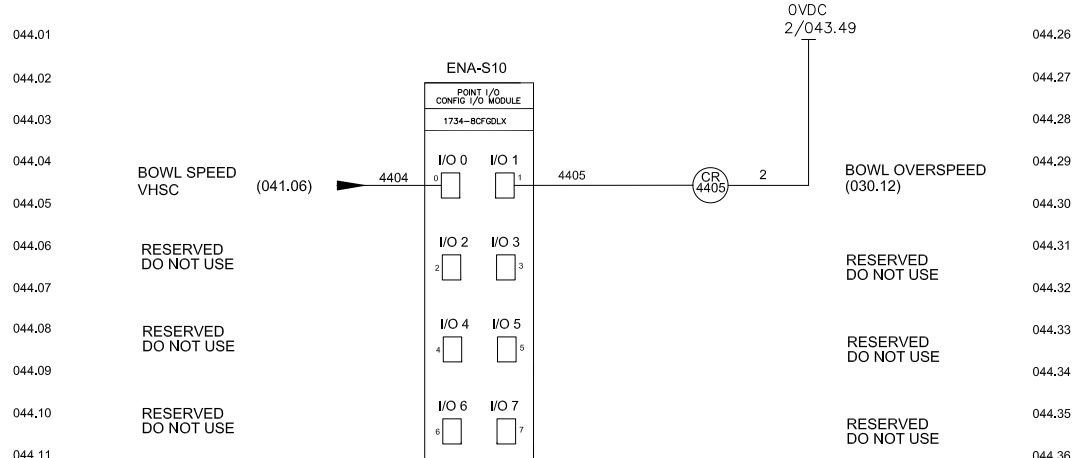


District of Sooke WWTP
 Sooke, BC, CANADA

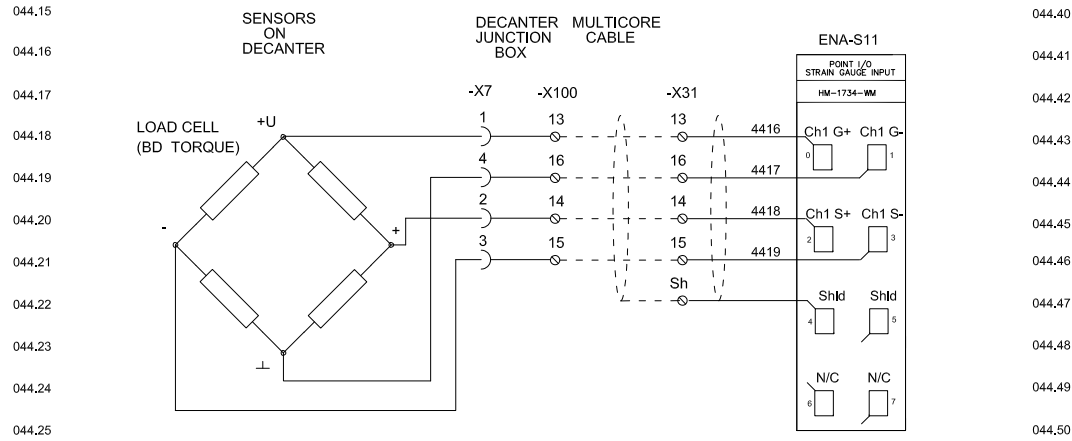
**DECANTER CONNECT CONTROLS
 ELECTRICAL DRAWINGS PACKAGE
 DIGITAL INPUT AND OUTPUT MODULES**

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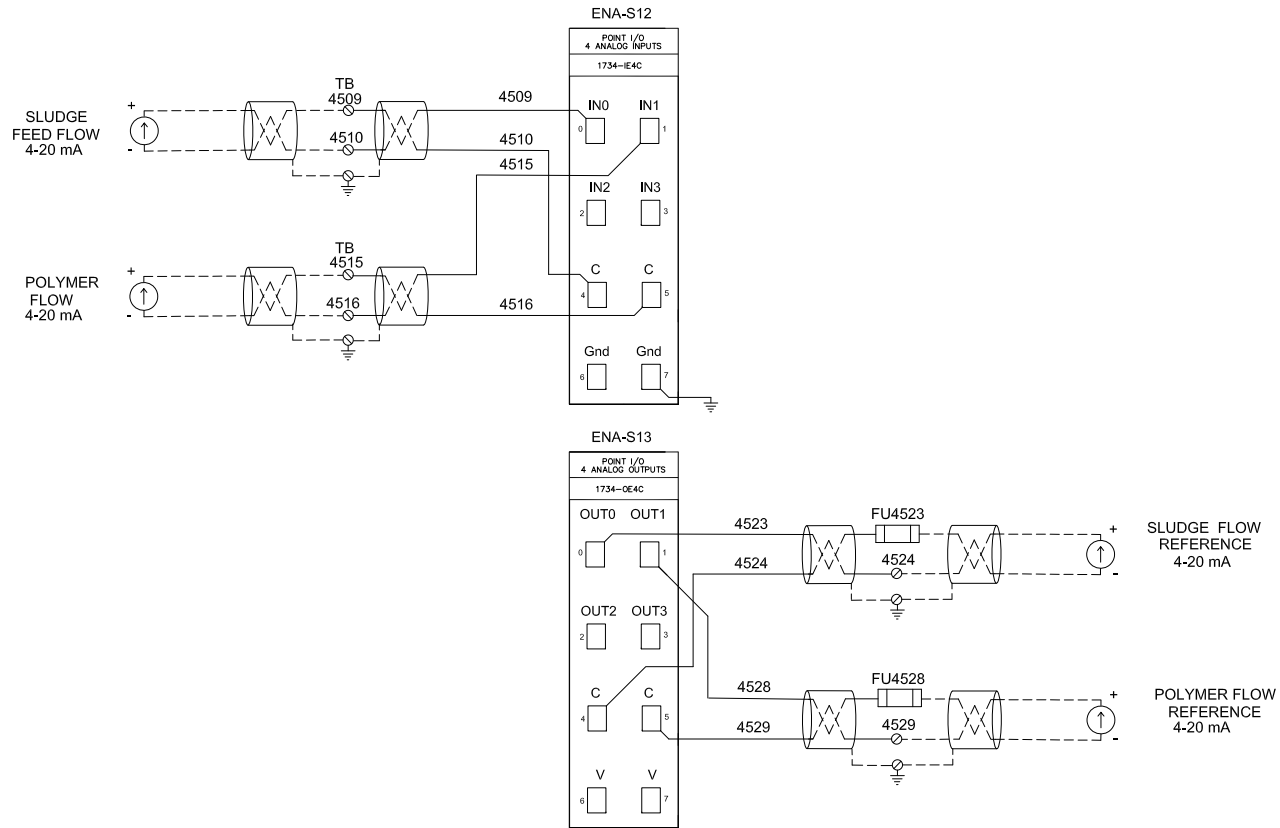



OPTION LOAD CELL INTERFACE FOR DD TYPE GEARBOX ONLY



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								AutoCAD, File 191001CR1				Division	PTD	
					DECANter CONNECT CONTROLS ELECTRICAL DRAWINGS PACKAGE CONFIGURABLE MODULE, OUTPUT TERMINALS			Project	CA-PWW15-0047			Total Pages	24	
1	Changes per review comments Jan 2020			20.01.20	AKE				CAD Rev.	Rev.	Drawing No.	Cont. on	067	
Rev.	Description			Date	Rev. By	Checked By	Designer	Drawn	Verified	18	1	191001	Page	044

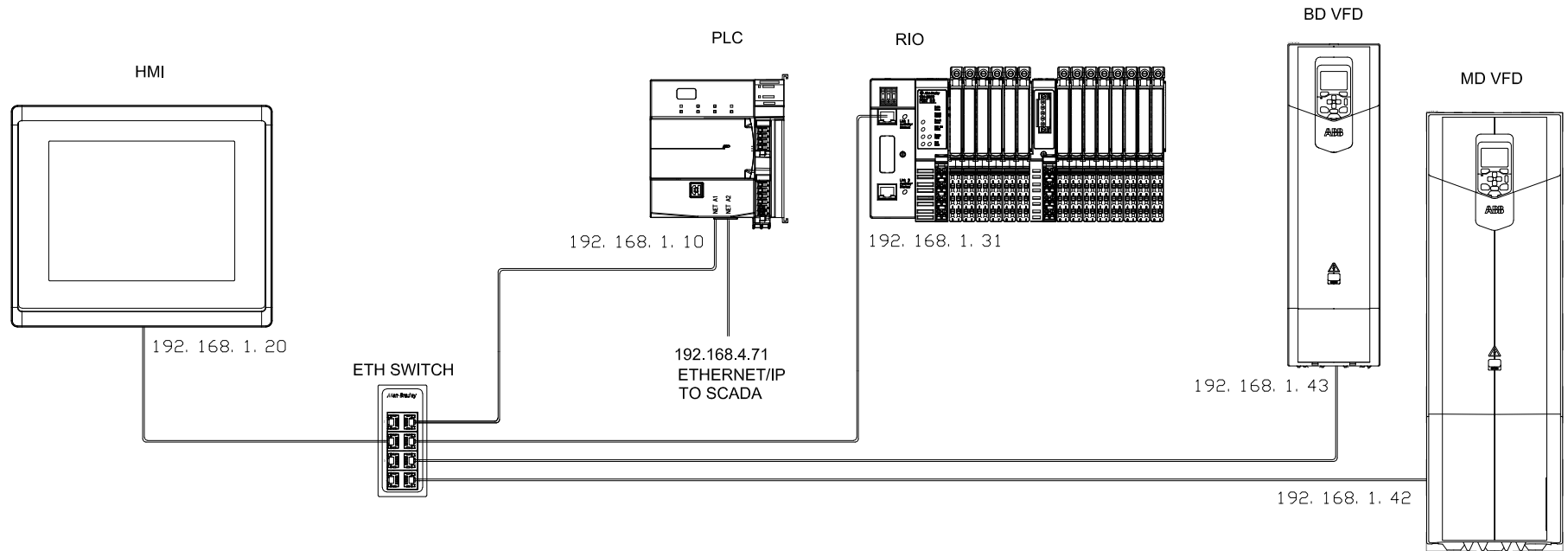
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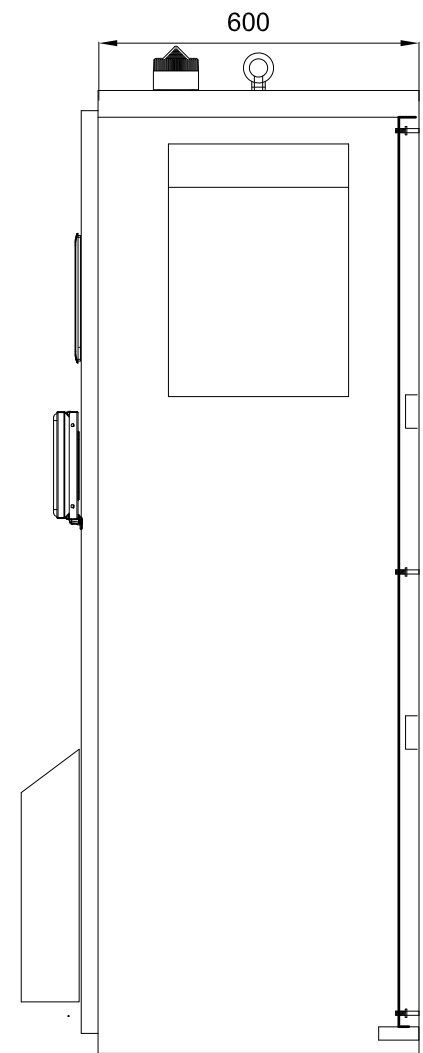
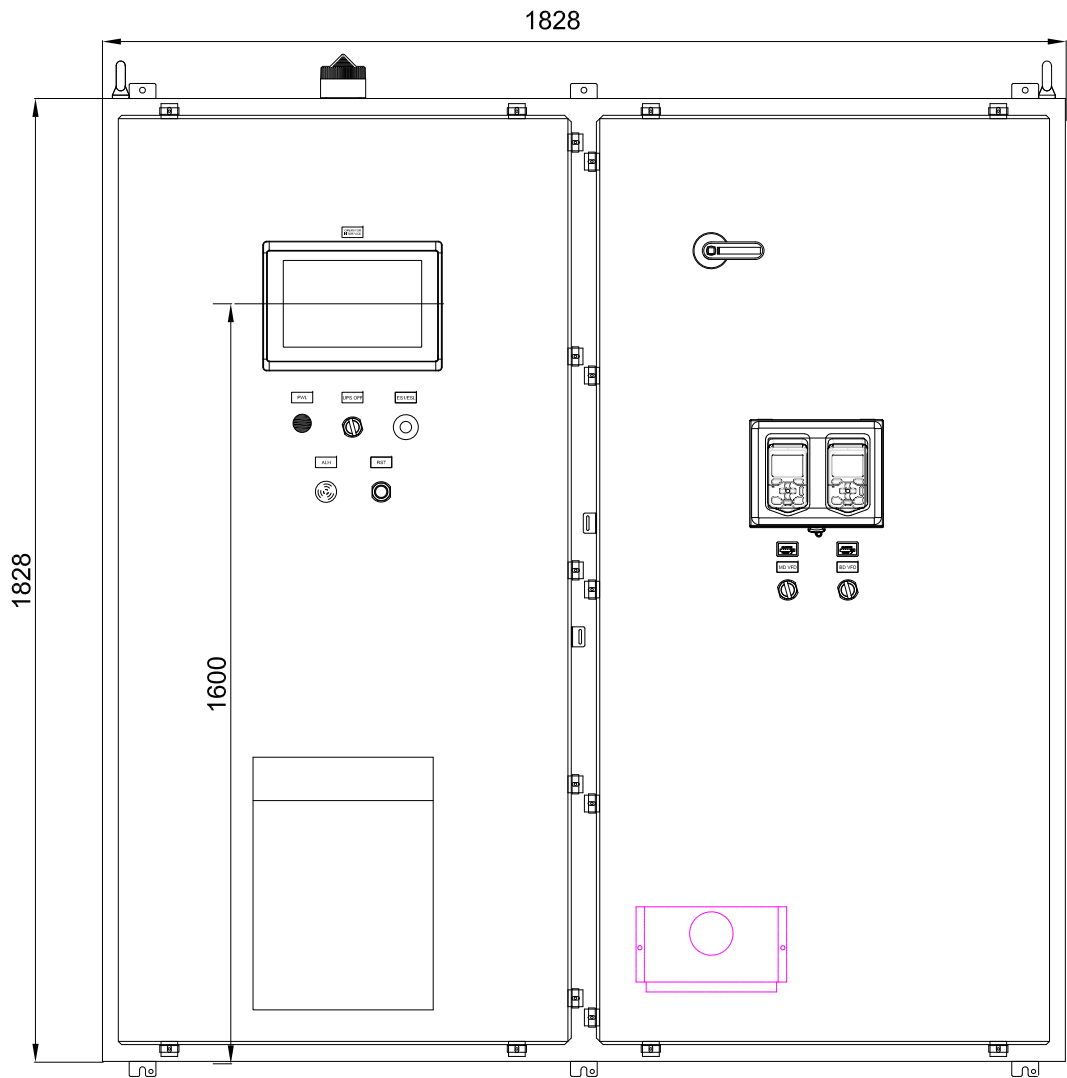
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NOTES:

1. USE CAT5 SFTP TYPE PATCH CABLES WITH SHIELDED RJ45 JACKS
2. MAX CABLE LENGTH FOR PATCH CABLES IS 100 M or 300 FT
3. CENTRIFUGE HAS RESERVED ADDRESSES ON PLC/SCADA NETWORK
CENT 1: 192.168.4.7# SHOWN BELOW, CENT 2: 192.168.4.8#



					District of Sooke WWTP Sooke, BC, CANADA			Date	01.10.19		 Scarborough, ONTARIO, CANADA	Total Pages	24	
								DECANter CONNECT CONTROLS ELECTRICAL DRAWINGS PACKAGE ETHERNET NETWORKS				Division	PTD	
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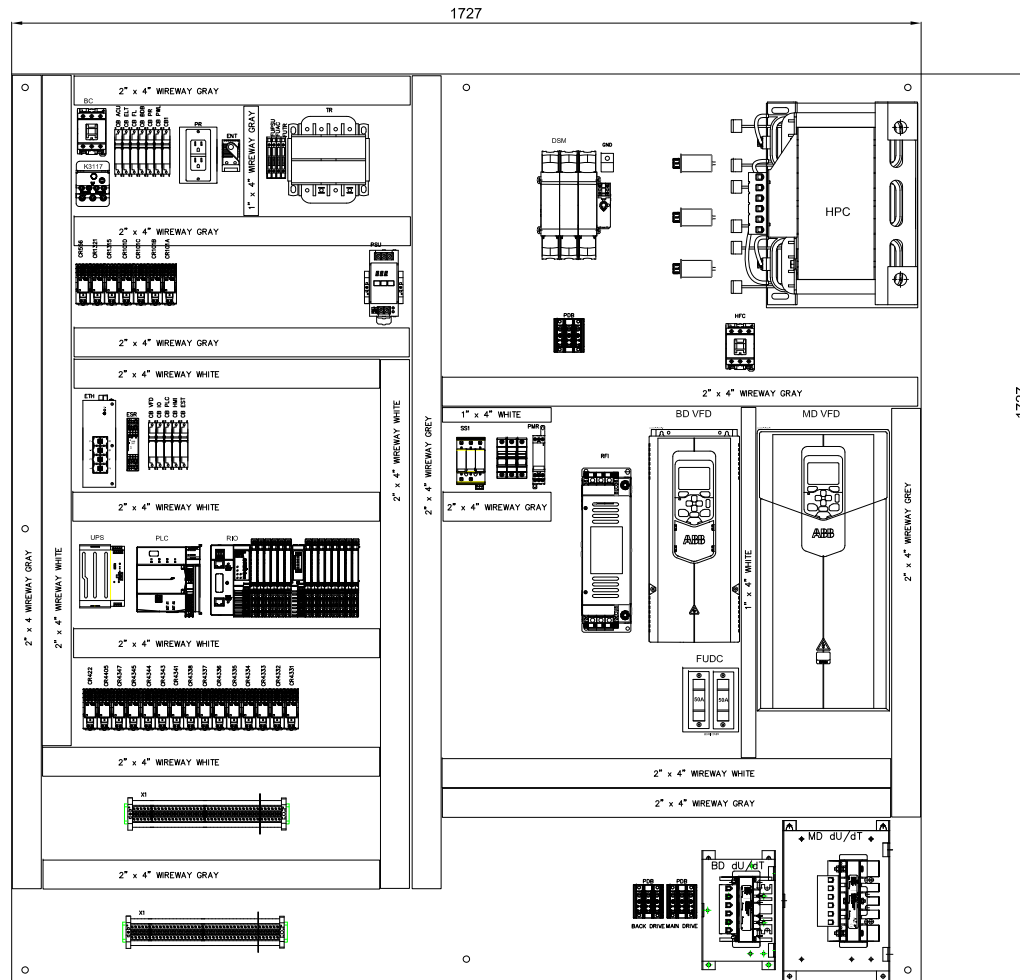
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District of Sooke WWTP
 Sooke, BC, CANADA

DECANTER CONNECT CONTROLS
 ELECTRICAL DRAWINGS PACKAGE
 VFD PANEL EXTERNAL LAYOUT

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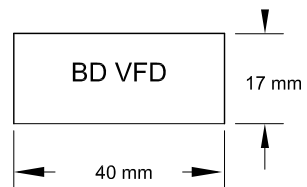
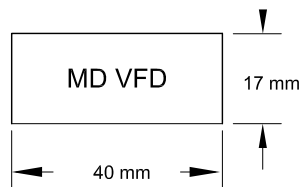
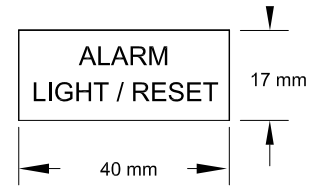
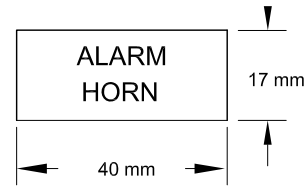
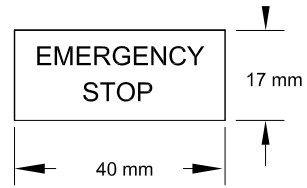
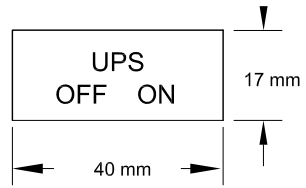
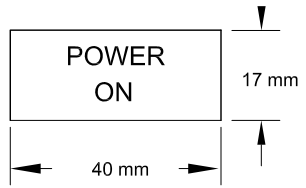
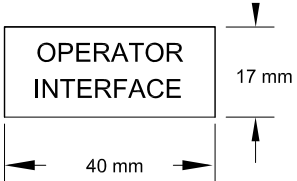
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 DECANTER CONNECT CONTROLS
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 PANEL INTERNAL LAYOUT

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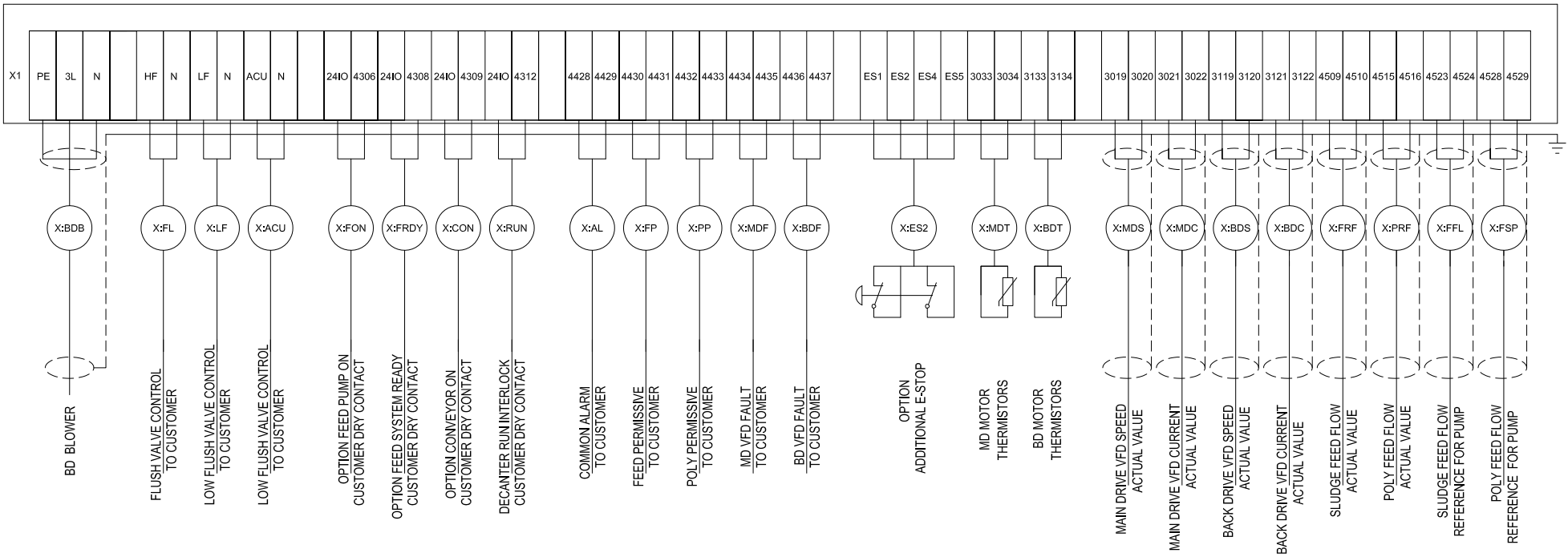

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TERMINAL STRIP X1




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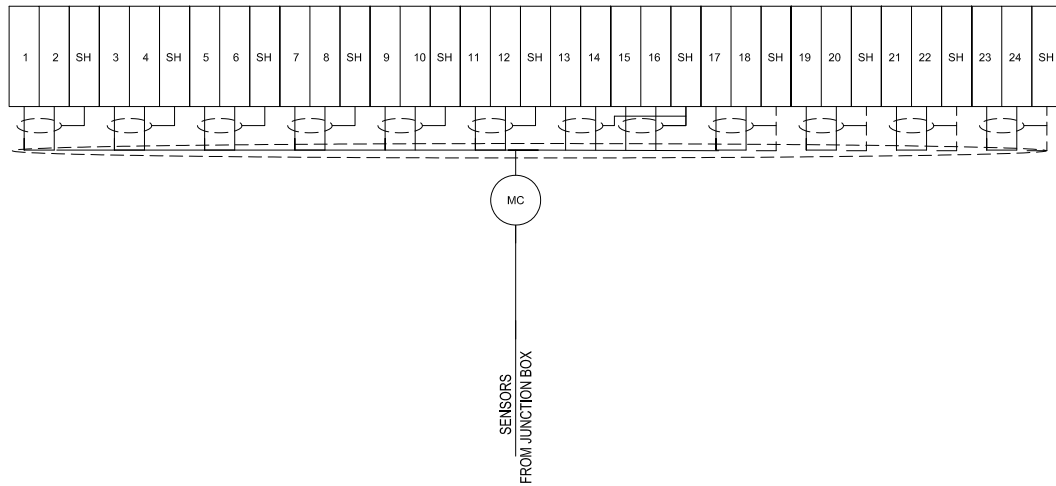
District of Sooke WWTP
 Sooke, BC, CANADA


DECANTER CONNECT CONTROLS
 ELECTRICAL DRAWINGS PACKAGE
 PANEL TERMINAL STRIPS WIRING 1

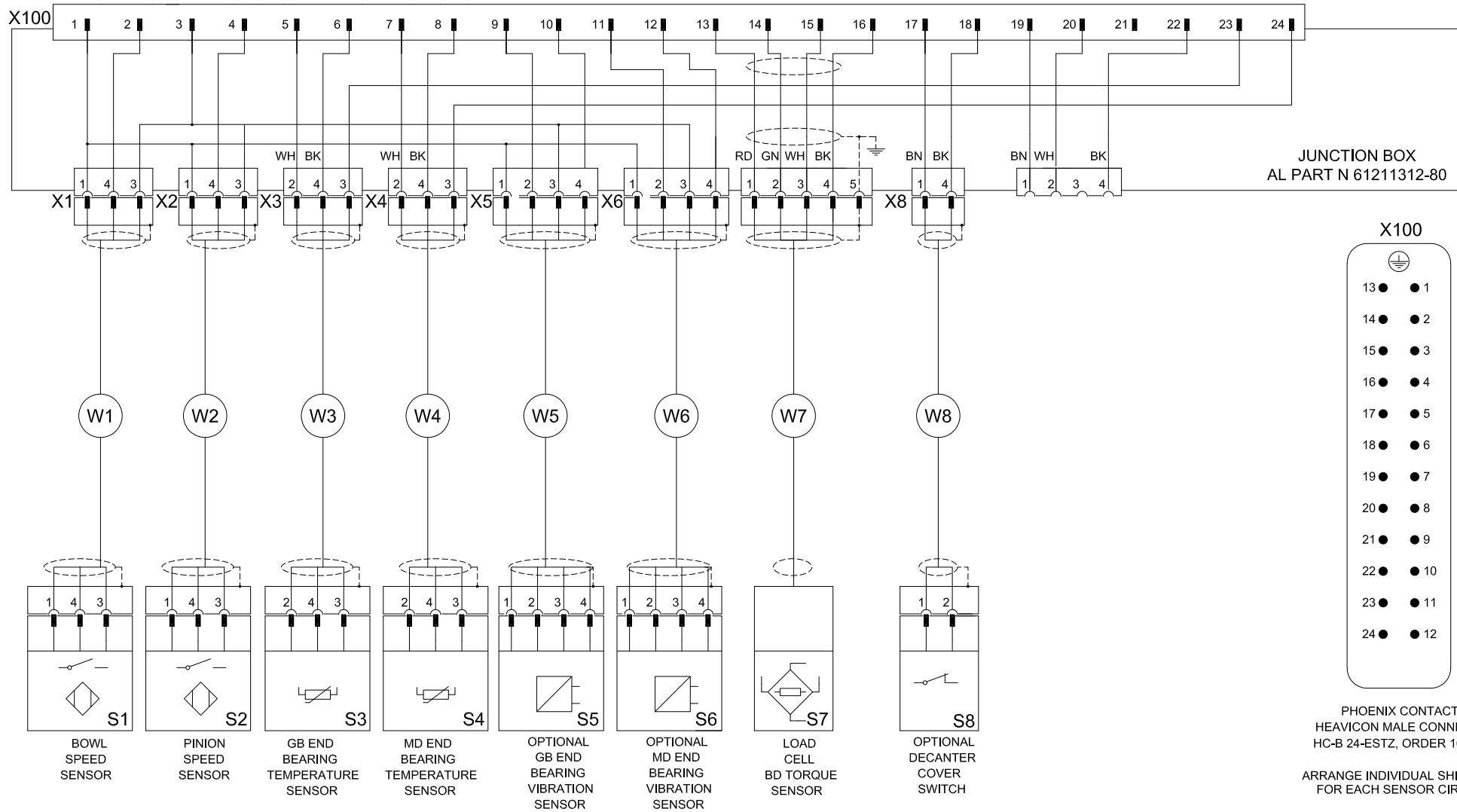
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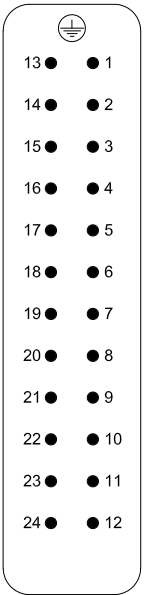


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JUNCTION BOX
AL PART N 61211312-80

X100



PHOENIX CONTACT
HEAVICON MALE CONNECTOR
HC-B 24-ESTZ, ORDER 1687914
ARRANGE INDIVIDUAL SHIELDING
FOR EACH SENSOR CIRCUIT

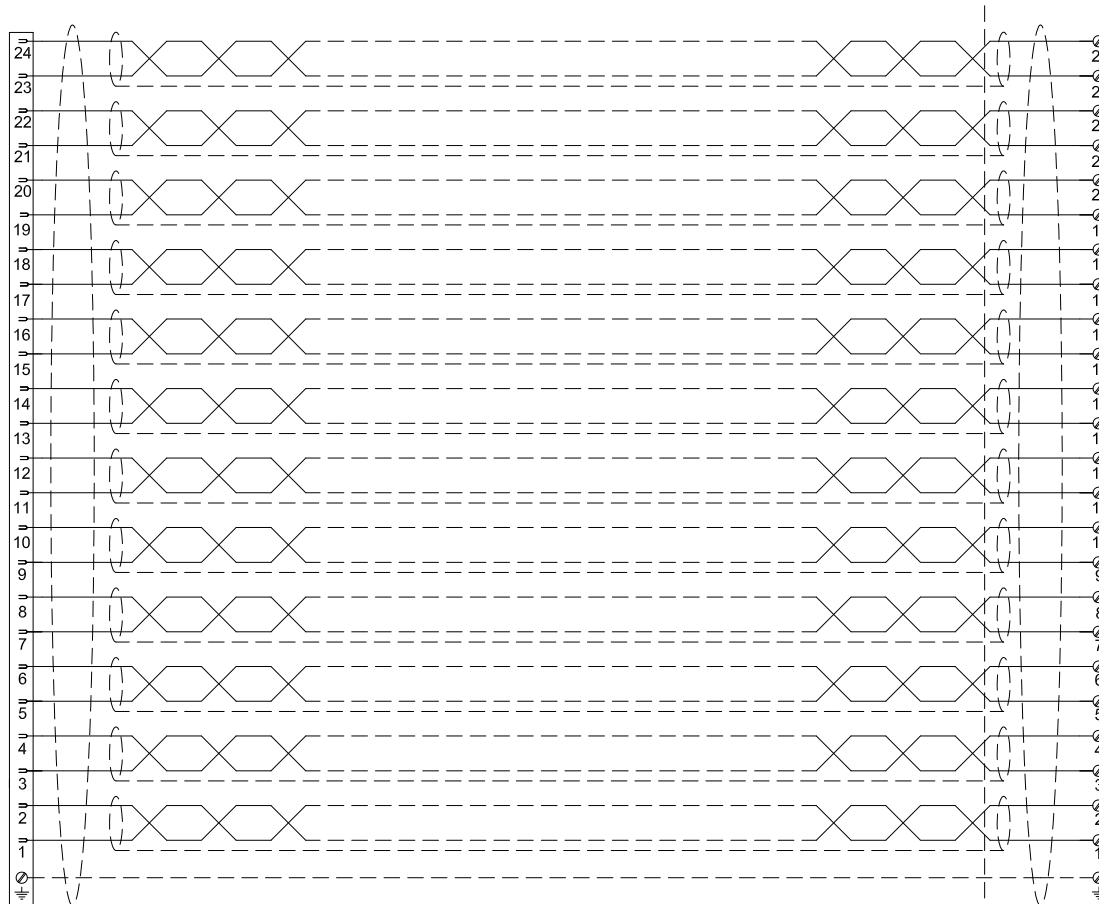
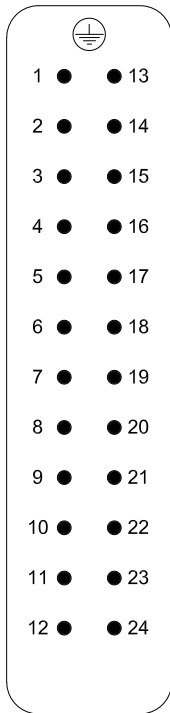
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2TOUCH JUNCTION BOX
END

MC MULTICORE CABLE

CONTROL PANEL

X100



PHOENIX CONTACT HEAVICON CONNECTOR
SLEEVE HOUSING HC-B 24-TFQ-76/M1PG29S
FEMALE INSERT HC-B 24-EBUZ

District of Sooke WWTP

Sooke, BC, CANADA

DECANTER CONNECT CONTROLS
ELECTRICAL DRAWINGS PACKAGE
MULTICORE CABLE

Date 01.10.19

Division
PTD



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No	MAKE	DESCRIPTION	PART #	QTY	TAG	REMARKS
1	RALSTON	TWO DOOR FREE STANDING NEMA4X SS ENCLOSURE 72"H X 72"W X 24"D	N4X-DD-SS-727224	1	ENCL	
2						
3	SOCOMEK	FUSED DISCONNECT SWITCH, 200 AMP, 3P + SHAFT + HANDLE + SHROUDS	3841 3019 + 1400 1032 + 1423 2111 + 3998 3016	1	DSM	
4	FERRAZ	HIGH SPEED CLASS J SEMICONDUCTOR FUSE, 110A	HSJ110	3	FU1-3	
5	FERRAZ	HIGH SPEED CLASS J SEMICONDUCTOR FUSE, 50A	HSJ50	2	FUDC	
6	FERRAZ	1 POLE FUSE HOLDER 31-60A	US6J11	2	FUDC	
7	FERRAZ	CC TYPE FUSES, 4.5 AMP	ATQR4-1/2	7	FUTR, FUPMR	
8	FERRAZ	CC TYPE FUSE HOLDER 0-30A 2 POLES	USCC2	1	FUTR	
9	FERRAZ	CC TYPE FUSE HOLDER 0-30A 3 POLES	USCC3	1	FUPMR	
9	FERRAZ	MIDGET FUSES, 15A	TRM15	1	FUAC	
10	FERRAZ	MIDGET FUSES, 15A	TRM15	1	FUAC	
11	FERRAZ	MIDGET TYPE FUSE HOLDER	USM1	1	FUAC	
12	LITTELFUSE	CATRIDGE FUSES 250V, 4A, 5X20	021504	1	FU PSU	
13	LITTELFUSE	CATRIDGE FUSES 250V, 1A, 5X20	0251001	2	FU4523, FU4528	
14	WEIDMULLER	FUSE HOLDER	474560000	3	FU PSU,FU4523,FU4528	
15						
16	MARCUS	CONTROL POWER TRANSFORMER 1500VA, 600V/120V/230V	MO1K5P	1	TR	
17	PHOENIX	24VDC POWER SUPPLY	QUINT-PS-100-240AC/24DC/10, ORDER # 2938604	1	PSU	
18	PHOENIX	24VDC UPS, 10 AMP, WITH INTEGRATED 1.3AH BATTERY	QUINT-DC-UPS/24DC/10, ORDER # 2866226	1	UPS	
19	ABB	15A CIRCUIT BREAKER	S201U-K15	1	CB1	
20	ABB	5 AMP CIRCUIT PROTECTOR	SU201M-C5	4	CBBDB,CBPLC,CBFL,CBACU	
21	ABB	4 AMP CIRCUIT PROTECTOR	SU201M-C4	3	CBPR, CBHMI, CBIO	
22	ABB	3 AMP CIRCUIT PROTECTOR	SU201M-C3	2	CBPWL,CBELT	
23	ABB	2 AMP CIRCUIT PROTECTOR	SU201M-C2	2	CBEST, CBVFD	
24	SCHMERSAL	E-STOP SAFETY RELAY	SRB301MC	1	ESR	
25	PHOENIX	SURGE SUPPRESSOR	VAL-MS 750/30/3+0	1	SS	
26	SIEMENS	POWER MONITORING PHASE LOSS PROTECTION RELAY	3UG4513-1BR20	1	PMR	
27	FUJI	CONTACTOR 600V, 25A, 120VAC COIL	SC-E2S-110VAC	1	HFC	
28	MTE	HARMONIC FILTER, OPEN, 600V, 66A	MAPP 0066 E 002	1	HF	
29	MTE	HARMONIC FILTER CAPACITORS	CAP-370TP	3	HF	
30	MTE	EMV/RFI FILTER, 70A, size B	RF3-0070-6	1	RF	
31	TCI	DV/DT FILTER 55A	V1K55A00	1	MD dv/dt	
32	TCI	DV/DT FILTER 12A	V1K12A00	1	BD dv/dt	
33						
34	ALLEN BRADLEY	PILOT LIGHT, LED, WHITE, 120VAC	800H-QRH2W	1	PWL	
35	ALLEN BRADLEY	PUSHBUTTON, MOMENTARY, NON ILLUMINATED, 1NO 1NC	800H-AR2A	1	ALL/RST	
36	ALLEN BRADLEY	E-STOP PUSHBUTTON, MUSHROOM, RED, LED ILLUMINATED	800HC-TFRXTQH2RA1S	1	EST1/ESL	
37	ALLEN BRADLEY	2 POS 1NO MAINTAINED SELECTOR SWITCH + N.C. CONTACT BLOCK	800H-HR2A	1	UPS OFF	
38	ALLEN BRADLEY	ALARM BUZZER	855P-B30ME22	1	ALH	
39	ALLEN BRADLEY	INDUSTRIAL MINI SQUARE BEACON, 24VDC, STROBE, RED	855B-GMS24R4	1	ALB	
40	RITTAL	ENCLOSURE LED LIGHT 24VDC 21" LONG WITH SWITCH + 3M CABLE	4140.840 + 4315.800	1	ELT	

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No	MAKE	DESCRIPTION	PART #	QTY	TAG	REMARKS
41						
42	WEIDMULLER	RELAY MODULE 2CO 8A 24VDC COIL	TRS 24VDC 2CO 1123490000	18	CR3014-CR4405	INCL 2 SPARE RELAYS
43	mitsubishi	CONTACTOR, 120VAC COIL	S-T12AC100V1A1B	1	BC	
44	mitsubishi	THERMAL OVERLOAD	TH-T18KP1.3	1	BC	
45						
46	WEIDMULLER	DUPLEX POWER RECEPTACLE	6720005430	1	PR	
47	EXM	WINDOW KIT 10" x 8" SS	880-HWKSS1008	1		
48						
49	ABB	MAIN DRIVE VFD	ACS880-01-061A-7	1	MD VFD	FREE ISSUE TO THE PANEL BUILDER
50	ABB	BACK DRIVE VFD	ACS880-01-14A3-7	1	BD VFD	FREE ISSUE TO THE PANEL BUILDER
51	ABB	ETHERNET ADAPTER EtherNet/IP, Modbus TCP, PROFINET IO	FENA-11 (k473)	2	MD VFD, BD VFD	FREE ISSUE TO THE PANEL BUILDER
52	ABB	CONTROL PANEL DOOR MOLNT KIT IP65	DPMP-02	2	MD VFD, BD VFD	FREE ISSUE TO THE PANEL BUILDER
53	REDINGTON	NON RESETTABLE 6 DIGIT ELAPSED TIME METER + GASKET	722-0002 + 5003-009	2	MDH, BDH	
54						
55	AB	12" PanelView Plus 7 Performance Terminal, Touch, Eth, 24V DC, Win CE	2711P-T12W22D9P	1	HMI	FREE ISSUE TO THE PANEL BUILDER
56	AB	2-Port EtherNet I/O Adapter Module	1734-AENTR	1	RIO	FREE ISSUE TO THE PANEL BUILDER
57	AB	24VDC Very High Speed Counter With Source Outputs	1734-VHSC24	2	RIO	FREE ISSUE TO THE PANEL BUILDER
58	AB	24VDC 2 Channel RTD Input Module	1734-IR2	1	RIO	FREE ISSUE TO THE PANEL BUILDER
59	AB	24VDC 4 Channel High Density Analog Current Input Module	1734-IE4C	2	RIO	FREE ISSUE TO THE PANEL BUILDER
60	AB	24VDC Power/Bus Extension Module	1734-EP24DC	1	RIO	FREE ISSUE TO THE PANEL BUILDER
61	AB	24VDC 8 Channel Sink Input Module	1734-IB8	2	RIO	FREE ISSUE TO THE PANEL BUILDER
62	AB	24VDC 8 Channel Source Output Module	1734-OB8	2	RIO	FREE ISSUE TO THE PANEL BUILDER
63	AB	POINT I/O Module with 8 Configurable 24VDC Points with DeviceLogix	1734-8CFGDLX	1	RIO	FREE ISSUE TO THE PANEL BUILDER
64	AB	POINT I/O One-piece Terminal Base with Screw Clamp, 8 Terminations	1734-TOP	13	RIO	FREE ISSUE TO THE PANEL BUILDER
65	AB	24VDC 4 Channel High Density Analog Current Output Module	1734-OE4C	1	RIO	FREE ISSUE TO THE PANEL BUILDER
66	AB	POINT I/O Strain Gauge Input module by HELM (USD425 from Helm)	HM-1734-WM	1	RIO	FREE ISSUE TO THE PANEL BUILDER
67	AB	Stratix 2000 Switch, Unmanagec, 8 Copper Ports	1783-US8T	1	ETH	FREE ISSUE TO THE PANEL BUILDER
68	AB	CompactLogix Controller	5069-L320ER	1	PLC	FREE ISSUE TO THE PANEL BUILDER
69	AB	Compact I/O power terminal kit screw type	5069-RTB64-SCREW	1	PLC	FREE ISSUE TO THE PANEL BUILDER
70						
71						
72						
73						
74						
75						
76						
77	RITTAL	ENCLOSURE FAN 115VAC 1.25A 424CFM 13"x13"	3244.110	2	ENF	
78	RITTAL	FILTER 13"x13"	3243.200	2	ENF	
79	RITTAL	HOSE PROOF HOOD NEMA4X 304SS	3243.080	2	ENF	
80	RITTAL	THERMOSTAT	3110.000	1	ENT	

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No	MAKE	DESCRIPTION	PART #	QTY	TAG	REMARKS
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90	WEIDMULLER	SURGE PROTECTOR 120VAC/DC, VSSC6 MOV 120VAC/DC	1064610000	3	SS4426, SS4430, SS4434	
91	WEIDMULLER	FEED THROUGH TERMINALS	SAK 2.5/35 # 0279660000			
92	WEIDMULLER	END PLATE FOR FEED THROUGH TERMINALS	279520000			
93	WEIDMULLER	TERMINALS PARTITION	232820000			
94	WEIDMULLER	TERMINALS CROSS CONNECTION 10 POLE	368700000			
95	WEIDMULLER	DISCONNECT TEST TERMINALS	SAKR/35 # 0172160000			
96	WEIDMULLER	END PLATE FOR DISCONNECT TERMINALS	211360000			
97	WEIDMULLER	FUSE TERMINALS	ASK 1/35 # 0474560000			
98	WEIDMULLER	END PLATE FOR FUSE TERMINALS	380360000			
99	WEIDMULLER	GROUND TERMINAL	661060000			
100	WEIDMULLER	END STOP	383560000			
101	WEIDMULLER	GROUNDING BUSBAR + SCREW + PRESSURE CLAMP	NSCH 1M# 0280200000 + 0296700000 + 0280100000			
102	WEIDMULLER	GROUNDING BUSBAR HOLDERS	299860000			
103						
104						
105						
106	PHOENIX CONTACT	HEAVICON FEMALE INSERT	HC-B24-EBUZ, ORDER 1687927	1	-X100	FREE ISSUE TO THE PANEL BUILDER
107	PHOENIX CONTACT	SLEEVE HOUSING B24	HC-B24-TFQ-76/M1PG29S, ORDER 1771778	1	-X100	FREE ISSUE TO THE PANEL BUILDER
108	TEXCAN	30M CONNECTING CABLE 12 TWISTED PAIRS AWG18	C3-1324-1812-19	1	MC	
109	PHOENIX	RJ45 SHIELDED CONNECTOR	1656725		LOT	
110	HYPERLINE	SHIELDED CABLE	SFTP4-C5E-PATCH-GY		LOT	
111	MAPLE ENG'G	LAMACOIDS	CUSTOM		LOT	
112						
113	NORTHERN TECH	ZERUST VAPOR CORROSICN INHIBITOR CAPSULES	VC 6-1	1		PROVIDE ONE SPARE CAPSULE
114						
115						
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RECOMMENDED SPARE PARTS FOR DECANTER CENTRIFUGE

Spares

Item	Description	Part Number	Notes
1	Belt Tension Tester	61210791-01	
1	Service Kit, 8 kNm DD Gearbox	61239681-11	
1	Lubricants 4450	61244240-11	
1	Tools operation	61244098-40	
1	Major Kit, Conveyor Bearings (NBR)	61249974-30	
1	Major Kit, Main Bearings (NBR)	61243806-30	

Tools:

Item	Description	Part Number	Notes
1	Tools, Speical	61244096-80	
1	Lifting Sling for bowl	61241417-84	
1	Lifting tool for conveyor	61244094-80	
1	Lifting strap for cover	61237159-77	
1	Lifting strap for decanter assembly	61237159-74	

Document No.: 12
Title: Decanter Spare Parts and Tools List

Alfa Laval

Decanter Centrifuge

TYPICAL

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**INSTALLATION
DATA**

Document No.: 13
Title: Decanter Installation Manual

TYPICAL

Chapter Contents

0 **About This Manual**

1 **Safety Instructions**

2 **General Information**

3 **Space Requirements**

4 **Foundation**

5 **Connections and Venting**

6 **Electrical Installation**

7 **Supplementary Documentation**

The material inserted in section “Supplementary Documentation” consists mainly of technical documentation specific to the actual delivery of the decanter, i.e. installation dimensions, electrical wiring diagrams, extra control equipment, etc.

TYPICAL

INSTALLATION DATA

ABOUT THIS MANUAL

This Installation Guide (volume ID) forms part of a set of manuals including Operators Manual (volume OM) and Spare Parts Catalogue (volume SP). The three volumes contain the necessary information for installing, running and servicing the Alfa Laval decanter centrifuges.

This manual contains information and sketches necessary for planning the installation of site and for the actual installation procedure.

WARNING *Never allow persons who have not read and understood the safety instructions in this manual to operate or service the decanter.*



The material inserted in section 'Supplementary Documentation' consists mainly of technical documentation specific to the actual delivery of the decanter, i.e. installation dimensions, electrical wiring diagrams, extra control equipment, etc.

TYPICAL

1 Safety Instructions

FAILURE TO FOLLOW THESE RULES MAY RESULT IN SEVERE PERSONAL INJURY OR PROPERTY DAMAGE.

The Decanter

1. The decanter delivered must not be used to separate flammable, toxic, corrosive, or radioactive process media without prior written approval from Alfa Laval.
2. Read this manual and the Operator's Manual before attempting to install or operate the decanter equipment, and follow all recommendations.
3. Do not operate the decanter with damaged or missing warning labels.
4. Do not operate the decanter if the vibration level exceeds 24 mm/sec (RMS) (US: 1 inch/sec).
5. Do not operate the decanter with feed temperatures exceeding the limits stated on the DATA SHEET included in all three volumes of the Instruction Manual.
6. Never attempt to start the decanter with frozen water or frozen or hardened process material in the bowl.
7. Do not exceed the maximum bowl speed or solids density specified on the decanter name-plate and DATA SHEET.
8. Do not operate the decanter without belt guards and other guards provided.
9. Periodically check all the automatic shut-off devices and monitoring systems for correct operation.

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10. Do not attempt dismantling until the decanter has come to a complete stop, the main power is shut off, and the disconnected main switch is locked with a safety lock.
11. Do not operate the decanter if the bowl, motor, or supporting structure show cracks, pitting, holes, or grooves.
12. Do not use tools other than those recommended by Alfa Laval to dismantle and assemble the decanter.
13. Do not attempt to use the decanter for any application or process material other than that stated on the original purchase documentation without first consulting Alfa Laval.
14. Follow all lubricating procedures and schedules.
15. Check periodically - at least once a year - for loose bolts on foundation and supporting structures, covers, hatches and pipe connections of decanter and motor.
16. Do not get rags or loose clothing near rotating parts.
17. At all times follow the recommended sequence and procedures for dismantling, assembly, operation, and maintenance. Do not introduce new procedures without first consulting Alfa Laval.
18. Only allow trained personnel to operate, clean, dismantle or assemble the decanter.
19. Do not operate the decanter before the installation is complete.
20. Do not operate the decanter with any electrical motor running in the opposite direction to that indicated by the arrows on the frame or otherwise specified.

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21. If the decanter is fitted with a frequency inverter, make sure that the maximum possible frequency will not cause overspeeding of the decanter. At least two separate protections against overspeed must be provided. See section 6.9.
22. Do not turn on feed or water before the decanter has attained its full speed.
23. If the decanter is operated with hot, corrosive, or aggressive liquids, care should be taken that any incidental spillage from the decanter cannot hit persons below the centre line of the decanter.
24. Never turn on feed or large amounts of hot, corrosive, or aggressive liquids when the decanter is at a standstill, as these liquids might hit persons below the centre line of the decanter.
25. Never start the feed pump or flush the decanter before opening the discharge valves or starting the discharge pumps, including any conveying means for the liquid and solids phases.
26. When personnel are working on a decanter with a hinged cover, care should be taken that the cover is not closed unintentionally by other persons or by moving machinery, which might cause injury.
27. Do not touch the solids phase discharging from the decanter as hard lumps being ejected with high speed might cause injury.
28. When using straps to lift the complete decanter or any of its parts such as the rotating assembly, make sure to prevent the part hanging by the straps from sliding.
29. When lifting the decanter, use the slings specified on the dimensioned drawing.
30. The lifting eyes in the bearing housings, if fitted, must not be used for lifting the bowl assembly.

contd...

Electrical Installation

1. Install and earth all equipment in accordance with requirements of the Local Electricity Authority.
2. Use an “on-load” isolator or circuit breaker (a main switch for switching off during run-up) on the main power supply.
3. Check that the voltage and the frequency are in agreement with labels on motors and other electrical equipment.
4. De-energize all equipment before connecting and disconnecting test equipment.

Repairs

1. Major repairs to decanter must not be made without first consulting with Alfa Laval.
In no circumstances should weld repairs, heating with a naked flame, or other alterations be made to bowl shells, bowl hubs, gearbox adapter, shafts, or other rotating parts without prior written approval and instructions from Alfa Laval. Failure to obtain this approval may result in failure of parts involved with possible serious damage to equipment, property, or personnel.
2. Do not operate the decanter on completion of the repairs until the belt and/or other guards are re-fitted.

contd...

3. Do not exceed the maximum load carrying capacity of the lifting tools. Only use the lifting tools for the intended purpose.
4. Replace worn or damaged parts with only original Alfa Laval parts.

Alfa Laval cannot be held responsible for any damage to property or for injury to persons if genuine parts are not used.
5. Do not interchange bowl parts, since specific parts are balanced as a unit.

The Motor

1. Do not operate a decanter equipped with flame proof motor(s) and control unit(s) until all enclosures have been assembled in accordance with the appropriate standards.
2. If a motor should become inoperative, immediately shut off the power.
3. Always follow motor manufacturer's specifications on bearing lubrication.
4. Do not attempt to operate a motor that is overheated due to frequent starts and stops. Allow motors to cool to ambient temperature (as designated on the motor nameplate) before each restart.

Do not attempt to start motor unless the rotating elements turn freely.

contd...

Corrosion, Erosion and Pitting of Decanter Equipment

It should be recognized that equipment subjected to severe erosive or corrosive environments may deteriorate over a period of time, depending upon the severity of exposure and/or possible misuse. Users of high speed centrifugal equipment should be aware of this fact and also that extremely high forces are brought into play when their equipment is in operation. Any weakening of highly stressed members by misuse, erosion, corrosion, chemical pitting, or stress cracking must be guarded against.

The following points should be noted and the recommended action taken:

1. Inspect the outside of the bowl for erosion and corrosion, at least every two months.
2. Do not operate equipment when:
 - 2.1 Holes are worn through rotating parts.
 - 2.2 Grooves greater than 2 mm (0.08 inch) deep are worn in rotating parts.
 - 2.3 Evidence of cracks is present in rotating parts.
 - 2.4 Chemical pitting of 2 mm (0.08 inch) depth or greater is present on rotating parts.
3. Chemical Pitting Observed:

All cases of chemical pitting, even under 2 mm depth, should be monitored carefully. This action is almost always due to the breakdown of the passive film on stainless bowl shell walls, in the presence of chlorides. This often occurs under deposits that have not been cleaned from the outside of the bowl wall. High temperature and high acidity accelerate the action.
4. Pay special attention to the bolts assembling the bowl sections. If the process liquid or cleaning agents contain chlorides, check these bolts at least once a year and exchange them at least every three years. Contact Alfa Laval, if in doubt.

Contact Alfa Laval regarding the repair or replacement of pitted bowl shells or other parts.

2 - General Information

- 2.1 See the last pages "Supplementary Documentation" for precise data of the actual delivery of decanter.
- 2.2 Follow the recommendations below in order to facilitate daily operations and to create an effective and secure environment for service and repair personnel.
- 2.3 The decanter and its electric equipment must be protected against rain and snow, and temperatures below 0°C (32°F). If it is not possible to avoid exposing the equipment to temperatures below 0°C, make sure that the heat exchanger (if fitted) in the hydraulic back drive system is drained of water whenever not in use. Standard ABB motor complies with DIN/ISO IP 55 (ECB Brake IP 54). All other electrical equipment complies with an equal or higher protection class.
- 2.4 Place warning lamps and acoustic alarms in such a way that they can be seen or heard everywhere in the process area.
- 2.5 Place control panels and valves in a way that makes it easy for the operator to reach them.
- 2.6 Place control panels in a way that they are not damaged mechanically or sprayed by water or product during transportation, repair, maintenance, or operation.

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3 - Space Requirements

- 3.1 The passageways must be of adequate width to allow the passage of necessary transport equipment (fork lifts etc.).
- 3.2 Lifting gear to remove the bowl from the frame must have adequate lifting height and capacity (see Dimensional Drawing).
- 3.3 Adequate space must be allowed to accommodate complete removal of the feed tube (see Dimensional Drawing).
- 3.4 Allow adequate floor space around the decanter for work benches, tools, dismantled and new parts, and transport trolleys.

TYPICAL

TYPICAL

4 - Foundation

- 4.1 The decanter must be fastened securely to the floor or any base frame or steel structure.

The maximum static and dynamic foundation loads from the decanter are stated on the dimensioned drawing.

The maximum dynamic foundation loads are specified due to the liquid-induced vibrations which may occur at speeds, depending on decanter size, between 200 and 1500 rpm during run-down and start-up with a liquid-filled bowl.

All static and dynamic loads are distributed equally on each leg unless otherwise specified on the dimensioned drawing.

- 4.2 If the decanter is mounted on a steel frame it must be sufficiently stiff to be free from any resonance within the range from standstill to full speed of the decanter.

The maximum permissible vertical and horizontal deflection of the frame caused by a load in each direction of the same magnitude as the maximum static load is

0.5 mm for decanters with bowl size below 430 mm

1 mm for decanters with bowl size above 430 mm

- 4.3 Maximum permissible vertical misalignment of the vibration dampers:

2 mm for decanters with bowl diameter less than 430 mm.

4 mm for decanters with bowl diameter greater than 430 mm.

- 4.4 If a decanter and other machinery are placed in the same area, do not place the machinery in such a way that vibrations or dynamic forces can be transmitted to the decanter.

TYPICAL

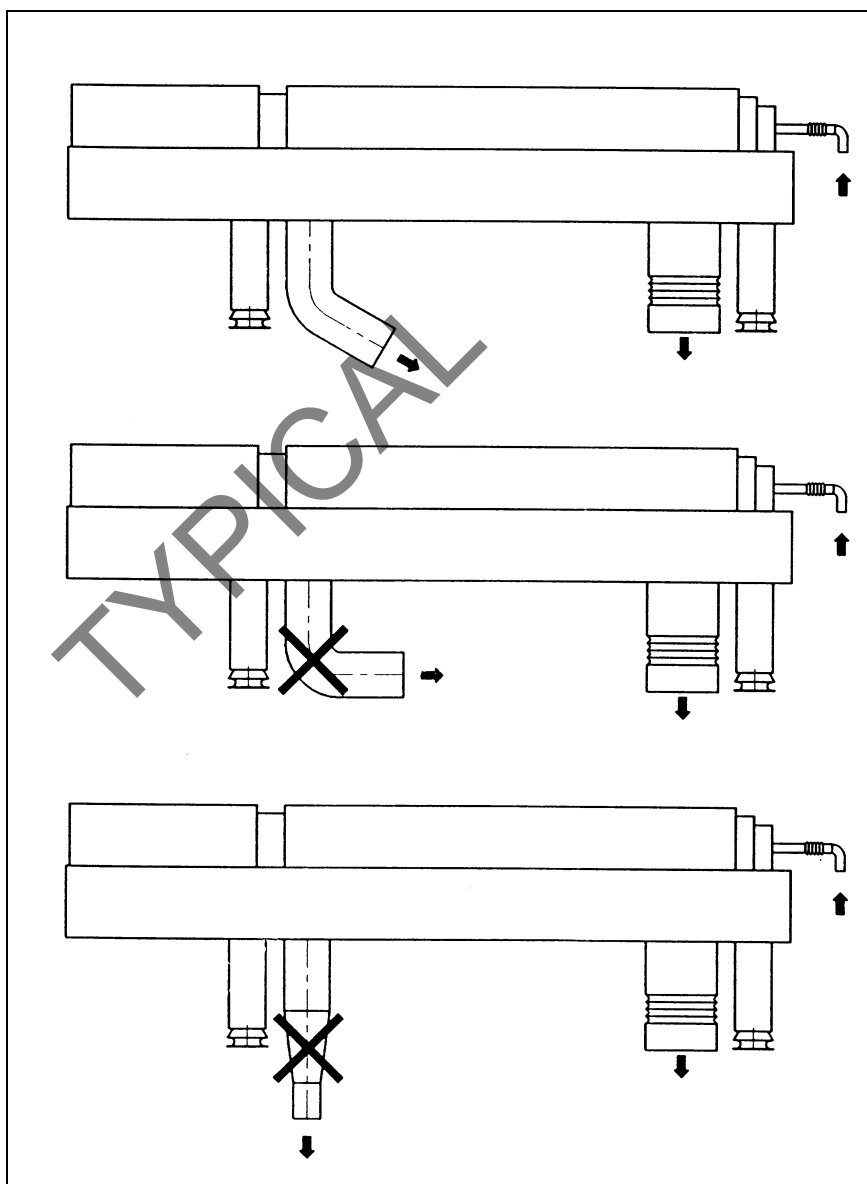
5 - Connections and Venting

- 5.0 The feed pipe must always be pushed home in the decanter.
- 5.1 For plants comprising more than one decanter, each decanter must have its own feed line with its own feed pump(s).
- 5.2 As the outlets for solids and liquid are placed under the decanter, enough space must be provided for collection of solids and liquid, and for transport equipment for their removal.
- 5.3 The installation must be made in such a way that the rotating bowl or any scraping device cannot be reached from underneath the decanter.

TYPICAL

5.4 The free flow from the liquid discharge must not be obstructed. For this reason:

- always dimension the liquid discharge duct according to the flow rate. The liquid discharge duct must not be the limiting factor for the hydraulic capacity.
- avoid too sharp or too many bends.
- always arrange for a slope in the liquid discharge duct.



- 5.5 The liquid and solids discharge ducts or connections should be arranged in short easily assembled and disassembled sections to facilitate maintenance and replacements.
- 5.6 Material for connections and fittings should be chosen with respect to the process.
Special attention must be paid to corrosion, temperature, and safety.
- 5.7 The connection between the external piping and the feed tube must be flexible. If the decanter blocks, the pressure in the system will increase to full pump pressure, therefore high quality industrial hose compensator and fittings suited for the actual pressures must be used.
Take care not to bend or stress plastic connections.
- 5.8 All connections for feed tube, solids, and liquid discharges must be flexible. They must be able to compensate for vibration amplitudes of +/- 5 mm in any direction.

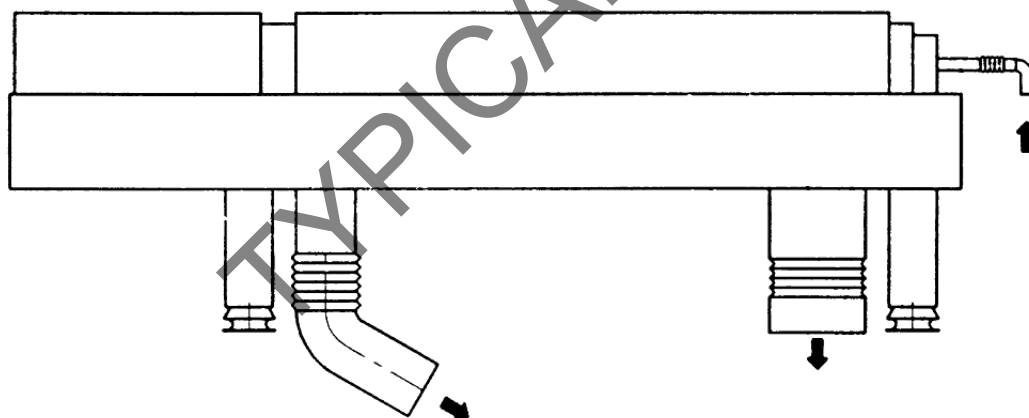
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TYPICAL

- 5.9 The Dimensioned Drawing (see supplementary section of this book) gives the dimensions for pipe and flange connections. The flexible connections should be fitted as close as possible to the flanges shown in the dimensioned drawing.

For the solids and liquid outlets under the decanter, distance from the decanter flange to the flexible connection shall be less than the width of the flange. The maximum permissible weight of any adaptor for the solids and liquid outlets is 2.5% of the weight of the empty decanter, which is stated on the Dimensioned Drawing.

The maximum permissible distance between the feed tube connection and the flexible connection is 3 times the width of the feed tube connection flange. The flexible connection shall be of the same internal diameter size as the feed tube. Any diameter increase in the connecting piping must take place on the other side of the flexible connection and not directly on the connection to the decanter inlet pipe.

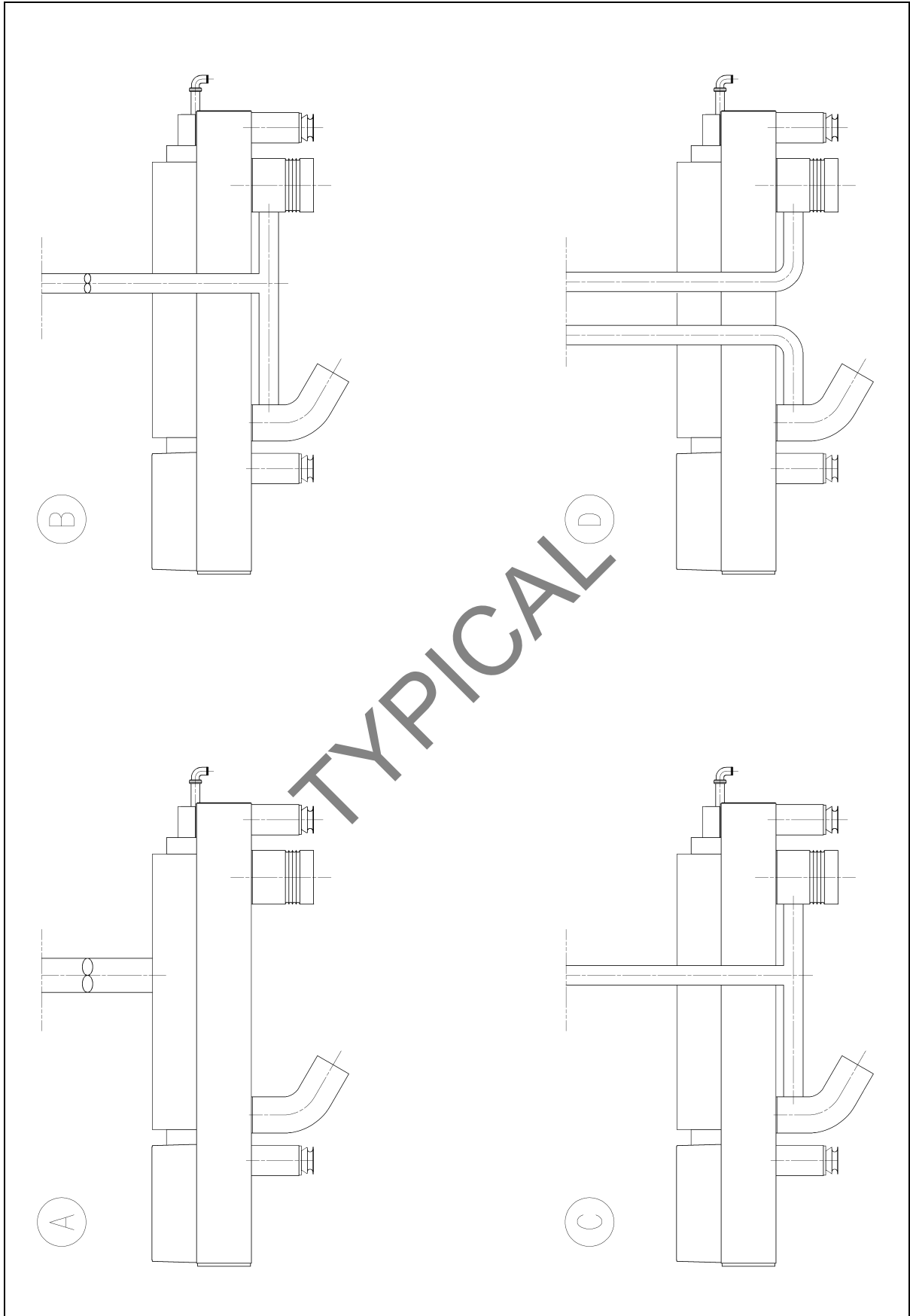


- 5.10 Over-pressure in the casing may cause main bearing failures because liquid, steam, solids, dirt, etc. will pass the sealing between casing and bearings.

If both solids and liquid discharge are closed, a suction fan must create the under-pressure in the casing. The suction fan should preferably be placed in the neutral compartment of the casing closest to the liquid end (see page 5.0-5, figure A).

Optionally, chimneys in the ducting system from both liquid discharge and solids discharge can be fitted (see page 5.0-5, figure D).

Alternatively, one shared chimney for both liquid and solids can be used (see page 5.0-5, figure C). Finally, the suction fan can be placed in the chimney(s) (see page 5.0-5, figure B).



5.11 Ensure that large amounts of water vapour from tanks positioned below the decanter will not pass through the liquid and solids discharge lines during long periods of standstill as the bearings might be damaged.

5.12 For Decanters with Paring Disc

A blockage of the liquid discharge opening may result in a very high pressure.

For that reason, the downstream pipings and valves on the centrate side should always be open for flow. If it seems probable that this is not the case (logical, electrical or operator's fault) a safety valve which must be set at max 5 bar should be connected to the liquid discharge opening.

5.13 Paring disc decanters have a ventilation opening placed beside the liquid outlet. This opening must not be blocked or restricted.

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6 - Electrical Installation

- 6.1 Alfa Laval cannot be held responsible for any damage or injury caused by faults in installation, design or manufacturing of electrical equipment not supplied by Alfa Laval.
- 6.2 The electrical connections and the cable size must be in conformity with Local Electricity Authority regulations.
- 6.3 For decanters supplied with an electrical panel from Alfa Laval the diagram is shipped within the panel.
Always study the diagram carefully before starting installation work. Ask your Alfa Laval representative if in doubt.
- 6.4 The cables on the decanter are normally wired to a junction box. A drawing of the connections to this box is enclosed in the rear of this manual.
- 6.5 The safety functions must be checked before the first start.
- 6.6 **Contactors and Cables for Star-Delta Connected Motors:**
When a star-delta starter is used to start the decanter, contactors and cables must be dimensioned to withstand the load during the starting period.

ATTENTION



The starting time in star connection is 2.5 to 4 minutes depending upon motor size and the decanter speed. During this period of time *the amperage is approx. 2.3 times* the full load amperage of the motor.

Example: The full load amperage of a 3 X 380V, 37 kW motor is 75. During start-up the amperage increases to 170.
Consequently contactors and cables must be dimensioned to carry *170 Amp*.

contd...

6.7 **Contactors and Cables for Motors with Hydraulic or Frictional Start Coupling:**

When a start coupling is used to start the decanter, contactors and cables must be dimensioned to withstand the load during the starting period.

ATTENTION



In most installations the motor is accelerated in the star mode for maximum 5 seconds to attain its full speed. During this period *the maximum amperage will be 2.3 times full load amperage.*

The delta mode is used to accelerate the decanter to its full speed. The starting time in delta connection is 1 to 1.5 minutes depending on motor size and full speed. During this period *the maximum amperage will be 3 times the full load amperage.*

- 6.8 Cables and electrical wires must not be attached to the decanter by means of stiff connections. Arrange for the cabling and wiring to absorb decanter vibration amplitudes of +/-5 mm in any direction.

contd...

- 6.9 Control panels must not be placed in rooms where the atmosphere is corrosive as this might cause serious damage to the built-in electronic equipment, such as back-drive controllers, frequency converters, PLCs, amplifiers, etc.

This applies especially to control equipment with built-in ventilation. In such cases external supply of clean cooling air must be provided. As an alternative the control equipment could be installed in a separate room.

A control panel must fulfil the following minimum safety requirements:

Obligatory Alarms:

The following alarms are obligatory:

- disengaged cover switch
- conveyor load high (see also 'Other Control Panel Requirements' below)
- tripped thermal protection for main motor

Extra Alarms:

The most common extra alarms are:

- speed too high (main drive controlled by frequency converter)
- vibration level high
- high oil temperature in the hydraulic system
- low oil level
- low / high brake speed
- high bearing temperature

contd...

Functions which must be switched off by an activated alarm, emergency stop, or main switch:

Each of the mentioned alarms, the activation of the emergency stop, or stop by means of the main switch must engage the following actions (if decanter is equipped with the appropriate items):

- stop main motor
- stop feed pump (incl CIP liquid, water, polymer, etc.)
- stop sun wheel motor or electric motor for hydraulic back drive (timer)
- stop solids scraper
- stop vibrator for solids
- stop solids conveyor

Restarting:

On a tripped alarm, an activated emergency stop, or a broken mains supply circuit automatic restarting of the decanter must not be possible before having eliminated the conditions which caused the alarm to trip and reset the tripped alarm and the emergency stop, and after this remedy a signal has been given to start the decanter again.

Other Control Panel Requirements:

It must not be possible to start the feed pump before the decanter has attained its full speed. This can be achieved by using a timer relay or an interlocking to the main motor star-delta starter.

For decanters fitted with an automatic back drive, two alarm levels are defined: one which should only stop the feed pump, and one which stops all as above.

Driving a decanter by means of a frequency converter involves the immediate risk of overspeeding the decanter. Consequently, electric control panels for decanters must contain at least two mutually independent circuits for the shut down of the decanter in case of overspeeding. These circuits can be:

- frequency converter frequency
- speed signal from main speed sensor.

7 - Supplementary Documentation

TYPICAL

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Alfa Laval STORAGE PROCEDURE

Bulletin 442
Revision 5

Document No.: 14
Title: Alfa Laval Decanter Centrifuge
Storage Procedure Manual

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Section 1: Introduction

Before shipment, Alfa Laval centrifuges are prepared with rust preventives and are then packaged to offer protection from rust and corrosion for up to one year with indoor storage. Beyond this period, the rust preventives must be reapplied and packaging maintained as required.

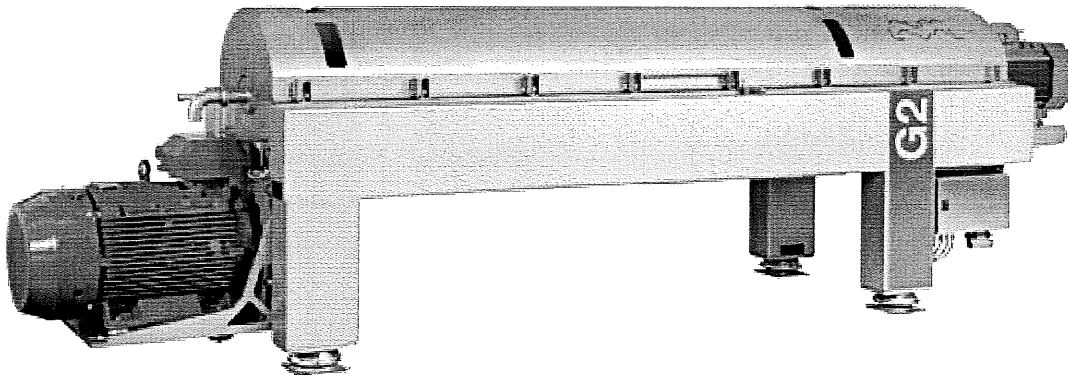
Where maintenance of bearings, etc., may not be required, the equipment may be left in the original factory packaging. However, if this packaging must be removed while still in storage, certain guidelines must be followed.

NOTE

The owner assumes full responsibility for the protection and maintenance of the equipment after shipment from Alfa Laval.

A. Typical Centrifuge Types

Two of the centrifuge types covered by this bulletin are illustrated below.



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Section 2: Factory Preparation - General

A. The Skid Base

1. The skid base is made of wood and suitable for fork lift transit.
2. All skid-mounted assemblies are covered with heavy-gauge transparent plastic. An excess of the covering material is provided at the ends and is to be used as access for maintenance of bearings, etc., during storage.

B. Ferrous Surfaces

All unpainted and unplated ferrous surfaces are covered with tape, masonite, overwrap, oil, etc., as practical.

C. Centrifuge Assembly

1. The centrifuge is mounted on a skid base.
2. All accessible openings are closed with tape, masonite, overwrap, etc., as practical.

D. Starter Panel or Control Console (As Supplied)

1. The panel is mounted on a skid base.
2. Corrosion inhibitor and desiccant are included inside the cabinet.
3. Exterior openings are closed with tape, masonite, overwrap, etc. as practical.

E. Drive Motor

The motor shaft ends are coated with a metal protector and overwrapped.

F. Tools and Small Spare Parts

All unpainted and unplated ferrous surfaces are coated with a metal protector and, where practical, the items are overwrapped and then packed in a box which is mounted on a skid.

G. Spare Bearings

Spare bearings should not be removed from their original manufacturer packaging.

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Section 3: Factory Preparation - Specific

In addition to the general factory preparations outlined in Section 2, please note the following preparations specific to the Super-D-Canter® Centrifuge.

1. On grease-lubricated horizontal Super-D-Canters, the pillow block bearings are filled with the specified grease.
2. On oil-lubricated Super-D-Canters, the lube system has been flushed with a mixture of nine parts specified oil and one part Rust Veto concentrate. The oil reservoir is drained prior to shipment.
3. The heat exchanger (if supplied) has been drained of water and blown dry.
4. Only horizontal Super-D-Canters, the gear box is overfilled with the recommended gear oil.

CAUTION

Before placing in operation, drain excess oil to obtain correct operating oil level in gear box. Failure to do this will result in damage to gear box and will void warranty.

5. Spare Rotating Assembly:
 - a. All unpainted and unplated ferrous surfaces are coated with a metal protector and where practical, overwrapped.
 - b. All non-process openings to the interior are closed with overwrap.

Section 4: Storage Area Requirements and Stored Equipment Maintenance

A. General

Storage Environment - Applicable to all equipment

1. Storage of centrifuge, motor, control console, and backdrive (if supplied) to be indoors, in a temperature controlled environment, protected from the elements.
2. "Temperature controlled environment" is an area that is thermostatically controlled with adequate air ventilation to prevent stratification and has a temperature range maintained between 50° and 90°F.
3. If a temperature controlled environment is not available, power must be provided to motor heaters and control panel space heaters, as a minimum

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protection against accumulation of condensate. If heaters are not provided, then commercial space heaters should be acquired for use during storage.

CONCERNING OUTDOOR STORAGE

Although Alfa Laval centrifuges are capable of outdoor operation, Alfa Laval does not recommend storing centrifuges outdoors. The difference is that the bearing lubricants of operating centrifuges continuously cover and protect the bearings due to circulation and distribution.

If storing outdoors cannot be avoided, then the centrifuge only may be stored outdoors for up to one month. It must be suitably protected from the direct impingement of the elements. All control and drive components must be stored indoors. Outdoor storage of centrifuges in corrosive environments, typical of coastal regions, must be avoided entirely.

4. To prevent bearing fret, the storage area, whether indoors or outdoors, should not be subjected to constant vibration.
5. Openings: Keep all openings leading to the interior of the equipment sealed.
6. Painted Parts:
 - a. Clean the parts. Refer to the cleaning section of this bulletin.
 - b. Touch up or repaint as necessary.

NOTE

Do not paint rotating shafts or threaded parts.

7. Lubrication: At the beginning of the storage period, lubricate all grease lubricated centrifuge bearings and drive motor and backdrive motor (if supplied) bearings in accordance with lubrication instructions. Thereafter grease every six months while in storage. On motors, all drains must be fully operable while in storage and/or the drain plugs removed. All breathers and automatic "Tee" drains on motors must be operable to allow breathing at points other than through the bearing fits.
8. Maintenance Log: Maintain a log to record each task performed during storage of equipment.

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B. Motors

1. Every six months and just prior to placing in operation, measure the resistance of motor windings with a megger. Minimum reading is 1 megaohm. If below this reading, drying is necessary. Contact motor manufacturer.
2. Monthly, rotate the shafts of motors at least 10 revolutions to keep the bearings lubricated and prevent their rusting and brinelling.

C. Control Consoles

Change corrosion inhibitors once a year. Refer to Section 5.

D. Programmable Controllers (If Supplied)

Observe humidity recommendations and replace batteries as directed in programmable controller manufacturer's instructions.

E. Super-D-Canter[®] Centrifuge

1. Initially, when placed in storage, and monthly thereafter, rotate the bowl by hand at least 20 revolutions. Hold the pinion shaft (shaft protruding from the gear box) stationary while rotating the bowl.

CAUTION

DO NOT PLACE HANDS NEAR PULLEYS, BELTS, AND OTHER PINCH POINTS WHILE ROTATING BOWL!

NOTE

Ideally, if possible, the centrifuge should be installed and run a minimum of one hour at least once a week. If this is possible, then lubrication interval should be the same as an operating centrifuge.

2. If equipped with a backdrive motor or eddy-current brake, monthly rotate the shafts at least 10 revolutions.
3. On Super-D-Canters equipped with a fluid coupling, rotate coupling, jack shaft and drive motor. Overfill jack shaft bearing reservoirs with nine parts recommended oil mixed with one part Rust Veto Concentrate while in storage. Drain to proper level before startup.

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Section 5: General Pre-Startup Procedures

This section is applicable to all equipment.

A. If Equipment Has Been Stored More Than One Year

1. Before startup, inspect all seals, gaskets, O-rings, belts and other elastomeric parts to determine their condition, since these parts can become brittle in time.
2. If the equipment has been exposed to low temperature for an extended period of time, unpacking it before it has reached room temperature can cause water condensation on the cold surfaces. This must be avoided, especially with motors, since the presence of moisture can cause electrical failures.

B. If Equipment Has Been Stored More Than Two Years

Replace all bearings, seals, gaskets, O-rings, belts, and other elastomeric parts.

C. Motor

1. Be sure all lubrication passages are clear of hardened lubricant.
2. Purge bearings of grease to their proper operating quantity.
3. If motor has been stored for more than six months, measure the resistance of motor windings with a megger. If reading is less than 1 megohm, contact motor manufacturer for drying procedure.
4. If stored more than three years, the motor should be completely dismantled and inspected by an authorized service facility of the motor manufacturer.

D. Electrical Controls

1. If dirty, vacuum clean. Do not use metal tipped hoses.
2. Check and tighten all terminal connections.
3. Check for moisture and corrosion. Do not operate until all corroded parts have been replaced or repaired.
4. Remove desiccant and corrosion inhibitor.

E. Coated Parts

If parts have been coated with rust preventive materials, refer to that section of this bulletin to determine if these have to be removed before startup.

F. Lubrication

Lubricate equipment before placing in service.

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Section 6: Specific Pre-Startup Procedures

A. Super-D-Canter[®] Centrifuge

1. Gear Box: If the gear box has been stored for more than one year, completely drain and fill with recommended quantity of fresh specified oil.
2. Reservoir Lube System: Before use, flush and fill with recommended quantity of fresh specified oil.
3. Backdrive Motor (If Supplied): Purge bearings of grease to proper operating quantity.
4. Main Drive Jack Shaft Bearing Reservoirs (If Supplied): Drain excess oil to proper level.

Section 7: Cleaning

CAUTION

Observe ALL safety precautions when handling chemicals.

A. Vacuum Cleaning

Vacuumping is efficient in removing dust from most equipment, but is especially necessary with electrical controls, and is the only method recommended.

B. Solvent Cleaning

1. Specific types and concentrations of cleaners, and appropriate methods can be recommended by the Alfa Laval Metallurgical Department. Generally, parts (other than electrical) are completely immersed using baskets or hooks. They may then be spray rinsed or dipped in clean water.
2. Steel parts must be thoroughly dried to prevent rust.

C. Abrasive Cleaning

Adhering dirt may require scrubbing with a stiff bristle brush or abrasive paper.

D. Rust Removal

Rust may be removed by the careful use of fine abrasive paper, or swabbing the area down with a metal-prep acid cleaner (e.g., phosphoric acid).

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CAUTIONS

Handle machined surfaces carefully.

Surfaces cleaned with an acid or other strong solvent must be thoroughly rinsed and dried before application of a rust preventive.

Remove burrs or rough spots with an abrasive, but corrective measures should not be so extensive as to alter the dimensions of the parts involved.

WARNING

Do NOT use compressed air for cleaning!

Section 8: Typical Protective Materials used by Alfa Laval

A. Wraps

1. Overwrap: An overwrap is any self-adherent, grease, oil and water-proof material which can be molded around parts:
 - "MarvelPak 22" by Ludlow Corp.
 - "Scotch-Wrap" by Minnesota Mining & Mfg. Co.

NOTE

Tears in the covering must be kept repaired.

2. Unit Covering: A heavy gauge plastic completely covers the equipment. To protect equipment against cold and humidity, desiccant, space heaters or electric dehumidifiers can be used.

NOTE

Tears in the covering must be kept repaired.

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B. Coatings and Oils

At regular intervals during storage, all exposed machined surfaces, unpainted steel parts, shafts, cast iron parts, piping, couplings, etc., should be examined for signs of rust and moisture.

Affected parts must be thoroughly cleaned and coated with the appropriate material listed below:

1. Molykote Metal Protector (Dow Corning): A wax type rust preventive which is sprayed, brushed, or dipped onto bare steel parts. It dries to a hard, dry film and is practically invisible. An overwrap is used.
2. Rust Veto 342 (Houghton Co.): A soft, amber-colored material leaving a transparent, dry plastic film on coated parts. Applied by brushing, dipping, or spraying, it is used for maximum heavy duty protection on interior or exterior surfaces with or without a covering.

Before using parts, remove Rust Veto with solvent.

3. Rust Veto 377 (Houghton Co.): A light, polar type water-displacing oil. It is used on metal parts stored indoors. It can be sprayed on intricate parts and bearings. An overwrap is used.

Since it is lightweight, removal is not necessary before use.

An equivalent is "AntiRust #77" WD Oil by International Chemical.

4. Rust Veto Concentrate (Houghton Co.): A rust preventive base that is mixed in one part with nine parts lubricating oil, or hydraulic oil, etc. It is circulated through hydraulic systems and then drained before shipment.

It is compatible with most hydraulic oils and removal is not necessary before use.

5. Ferrocote 346 (Quaker Chemical Co.): A heavy oil which leaves a soft, paste-like film on a surface. For outdoor storage, it must be used with an overwrap.

Before parts are used, Ferrocote must be removed with a solvent.

NOTE

Contact each manufacturer as required to determine if the rust preventives are compatible with the type of oils you are using.

C. Vaporizers and Desiccants (For Electrical Enclosures)

1. Foam Corrosion Inhibitor (Hoffman Engineering Co.) These are foam shapes of various sizes impregnated with special patented chemical inhibitors, buffers, and anti-oxidants.

Alfa Laval STORAGE PROCEDURE

The chemicals vaporize and then condense on all surfaces of the enclosed area. Vapors will redeposit as needed in the event of condensation of moisture on surfaces. These vapors reach every part of an enclosure, protecting all interior components (ferrous and non-ferrous metal parts) from corrosion.

These inhibitors eliminate the need for spraying, wiping, greasing, precoating, special wrapping or drying agents.

The vapors have no deleterious effect on the commonly used plastics, rubbers, paints, and adhesives.

The inhibitors have an expected lifetime of one year unless they are subjected to:

- Extended air exchange
- Temperatures above 120°F (49°C)
- Direct contact with water
- pH below 4.5 or above 10.5

The foam shapes are supplied in three sizes. The area of protection listed below refers to non-ventilated (sealed) enclosures:

<u>Alfa Laval Spec. No.</u>	<u>Capacity</u>
#14EF14	40 cubic feet (approx. 1.13 cubic meters)
#14EF15	5 cubic feet (approx. 0.7 cubic meters)
#14EF16	1 cubic feet (approx. 0.03 cubic meters)

NOTE

Reduce the volume if:

- Cabinet doors are opened frequently (more than once daily).
 - Cabinet located in extremely corrosive area.
2. Desiccants, such as:
- "Humisorb", Multiform Desiccant Products, Inc.
 - Reusable - Reactivate by heating at 245° - 260°F (118° - 127°C) for 16 hours.
 - Complies with MIL-D-3464 Type 1, and MIL-P-116 Method II.
 - Dry, dustless, inert, odorless, tasteless, nontoxic, non-corrosive, non-deliquescent.



Decanter Automation Allen Bradley

Parameters and Alarms Manual

Document No.: 15

Title: Decanter Automation Allen Bradley Manual

The original instructions are in English

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Alfa Laval Corporate AB will enforce its rights related to this document to the fullest extent of the law, including the seeking of criminal prosecution. The instructions given in this manual are intended as a general instruction to Alfa Laval Decanter Automation Siemens. Alfa Laval reserves the right to make changes at any time without prior notice.

If further clarification regarding this manual is required, please contact your local Alfa Laval representative.

Revision History

Date	Revision no.	Description (including software version)	Comments
	1.0	First release	
24-01-2019	2.0	Added information of parameters P118, P138, P143, P144, P307, P308, P309, P310 and P312 , which are present in current release.	
09-07-2019	3.0	Alarms A252, A253, A901, A902 added.	
12-09-2019	3.1	Alarm A132 added.	

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1. Parameters List

1.1. Common Parameters

Group	Parameter Number	Parameter Name
COMMON PARAMETERS	P101	Decanter Name
	P103	Decanter Serial Number
	P114	Option UPS
	P118	Option Remote Control
	P120	Option Cover Switch
	P130	RFZ Enable
	P134	Bowl Diameter
	P138	Overwrite Local Setpoints with Remote
	P143	Remote Command Mode
	P144	Master of Local/Remote Mode

1.2. Main Drive

Group	Parameter Number	Parameter Name
MAIN DRIVE	P104	Min Bowl Speed Delay
	P107	Min Bowl Speed
	P108	Bowl Stop Speed
	P109	Min Rundown Time
	P201	Pulse Per Revolution Bowl
	P203	Main Motor Pulley
	P204	Bowl Pulley
	P205	Max Bowl Speed
	P206	Max Rev Bowl Speed
	P207	Bowl RPM Ref
	P208	Bowl RPM Tolerance
	P213	MD Type
	P215	MD Thermistor Type
	P217	Bowl Speed Ref Remote Control Active
	P225	MD Acceleration Time
	P226	MD Deceleration Time
	P227	MD Max Current
	P228	MD Motor Current
	P229	MD Motor Freq
	P230	MD Motor Power
	P231	MD Motor Speed
	P232	MD Motor Voltage
	P233	MD Power Gen Limit
	P234	MD Power Mot Limit
P235	MD Torque Max Limit	
P236	MD Min Speed	
P237	MD Max Speed	

1.3. Back Drive

Group	Parameter Number	Parameter Name
BACK DRIVE	P302	Pinion Deadband
	P303	Gear Box Size
	P304	Gear Box Ratio
	P305	Max Diff Speed
	P306	Pulses Per Revolution Pinion
	P307	Torque Arm Length
	P308	Torque Arm Tare
	P309	Torque Filter Time
	P310	Load Cell Capacity
	P312	Load Cell Gain
	P319	BD Type
	P320	Gearbox Type
	P321	Torque Type
	P325	BD Acceleration Time
	P326	BD Deceleration Time
	P327	BD Max Current
	P328	BD Motor Current
	P329	BD Motor Freq
	P330	BD Motor Power
	P331	BD Motor Speed
	P332	BD Motor Voltage
	P333	BD Power Gen Limit
	P334	BD Power Motor Limit
	P335	BD Min Speed
	P336	BD Max Speed
	P337	BD Thermistor Type
	P351	P Gain Torque
	P352	I Gain Torque
	P353	P Gain Diff Speed
	P354	I Gain Diff Speed
	P356	D Gain Diff Speed
	P357	LP Filter Torque Control
	P358	Diff / Torque Hysteresis
P377	Output at Standstill	
P378	Max Diff Diff Speed	

1.4. Set-points

Group	Parameter Number	Parameter Name
SET-POINTS	S301	Diff Speed
	S302	Torque
	S304	Flushing Diff
	S801	Feed Flow

1.5. Bearings

Group	Parameter Number	Parameter Name
BEARINGS	P401	Temp Monitoring
	P402	Vibration Monitoring
	P490	Vibration Type

1.6. Flush

Group	Parameter Number	Parameter Name
FLUSH	P501	Low Flush Bowl Speed
	P502	Full Speed Flush Time
	P503	Rundown Flush Time
	P504	Stop Flush Speed
	P505	Low Flush Time Rev
	P506	Low Flush Time Fwd
	P507	Low Flush Cycles
	P508	Low Flush Auto Start
	P513	Low Flush Enable
	P514	Low Flush Valve
	P517	Disable Flush Water on First Low Speed Flush Cycle
	P518	Begin Low Speed Flushing in Reverse Direction

1.7. Lubrication

Group	Parameter Number	Parameter Name
LUBRICATION	P604	Grease On Timer
	P605	Grease Off Timer
	P607	Enable automatic grease system

1.8. Diverter

Group	Parameter Number	Parameter Name
DIVERTER	P701	Stop Divert Torque
	P702	Start Divert Torque
	P703	Stop Diverting Flush Delay Time
	P705	Start Diverting Flush Time
	P708	Start Diverting Flush at Feed Running
	P709	Diverter Feedback Monitoring
	P714	Diverter Type
	P715	Diverter Flush Valve

1.9. Feed

Group	Parameter Number	Parameter Name
FEED	P801	Feed P Gain
	P802	Feed I Gain
	P805	Feed AI Min
	P806	Feed AI Max
	P812	Auto Feed Request
	P813	Feed Equipment Config
	P814	Feed Flow Signal Type
	P816	Feed Rmt Control Active
	P820	Output Min Limit
	P821	Output Max Limit
	P824	Feed Pressure Transmitter

2. Alarms List

2.1. Common Alarms

Group	Alarm Number	Alarm Name
COMMON ALARMS	A103	Emergency Stop
	A104	Decanter Cover Open
	A105	UPS on Battery
	A113	IO Module Alarm
	A114	Analog Input Alarm
	A132	Bus Remote Communication Error
	A901	Additive without Permission
	A902	Additive Pump Stopped

2.2. Main Drive

Group	Alarm Number	Alarm Name
MAIN DRIVE	A101	Stop Speed Not Reached
	A102	Min Speed Not Reached
	A201	Min Operating Bowl Speed
	A202	Max Operating Bowl Speed
	A203	Max Bowl Speed Deviation
	A208	MD Still Running
	A209	MD Not Running
	A210	MD High Temp
	A213	MD VFD Alarm
	A214	MD VFD Tripped
	A216	MD VFD Comm Error
	A217	MD VFD in Local Mode
	A252	Safety Max Operating Bowl Speed
	A253	Safety Max Bowl Speed Deviation

2.3. Back Drive

Group	Alarm Number	Alarm Name
BACK DRIVE	A302	Max Pinion Speed
	A303	Max Diff Speed
	A304	Min Diff Speed
	A305	Torque Limit Stop Feed
	A306	Torque Limit Shutdown
	A307	Torque BD Shutdown
	A309	BD Still Running
	A310	BD Not Running
	A311	BD High Temperature
	A314	BD VFD Alarm
	A315	BD VFD Tripped
	A317	BD VFD Comm Error
	A318	BD VFD in Local Mode

2.4. Bearings

Group	Alarm Number	Alarm Name
BEARINGS	A401	Temp MD End Warning
	A402	Temp GB End Warning
	A403	Temp MD End Shutdown
	A404	Temp GB End Shutdown
	A405	Vibration MD End Warning
	A406	Vibration GB End Warning
	A407	Vibration MD End Shutdown
	A408	Vibration GB End Shutdown
	A409	Vibration during start-up MD End Shutdown
	A410	Vibration during start-up GB End Shutdown
	A117	Speed and Vibration Comm

2.5. Lubrication

Group	Alarm Number	Alarm Name
LUBRICATION	A605	Too Low Grease Level
	A606	Lube Motor Overload
	A607	Lube Motor Not Running
	A612	Low Grease Level Too Young
	A690	Lube Motor Still Running

2.6. Diverter

Group	Alarm Number	Alarm Name
DIVERTER	A701	Diverting Max Time
	A702	Gate Not Opened
	A703	Gate Not Closed
	A707	Diverter Failure
	A711	Diverting During Production

2.7. Feed

Group	Alarm Number	Alarm Name
FEED	A801	Feed Without Permission
	A802	Feed Pump Stopped
	A804	Feed System Not Ready
	A805	Max Flow Deviation
	A806	Feed VFD Comm Alarm
	A807	Feed VFD Tripped
	A808	Max Feed Pressure

3. Parameters Description

3.1. Common Parameters

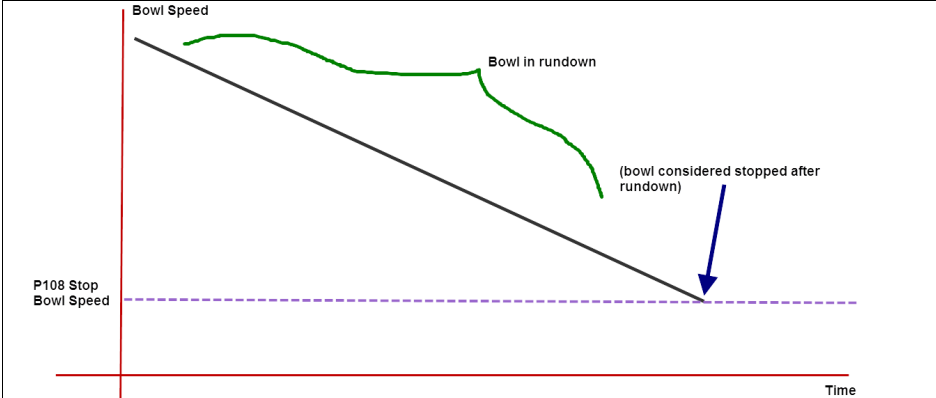
Number	Parameter Name	Description	Values			
P101	Decanter Name	Machine name as assigned by the customer.	Default	Blank	Access	advoper
P103	Decanter Serial Number	Machine serial number as shown on the nameplate.	Default	Blank	Access	alse
P114	Option UPS	Enable ONLY if UPS is installed. Enables the UPS feedback signals on the Digital Input Module.	Default	Enabled	Access	advoper
P118	Option Remote Control	Enables control of the Decanter from other sources than the HMI: <ul style="list-style-type: none"> No Remote System Select if there is no connection to the customer system at all. Bus Remote System Select if Bus communication is connected via A2 port on the CPU. 	Default	Disabled	Access	

Number	Parameter Name	Description	Values																					
P120	Option Cover Switch	Enables the cover switch feedback signal on the Digital Input Module.	Default	Disabled	Access	alse																		
P130	RFZ Enable																							
NOTE: Not applicable for current release.																								
P134	Bowl Diameter	<p>Sets the decanter bowl internal diameter as shown on the machine's nameplate.</p> <p>Options:</p> <table border="1"> <tr> <td>200mm</td> <td>510mm</td> </tr> <tr> <td>280mm</td> <td>550mm</td> </tr> <tr> <td>353mm</td> <td>570mm</td> </tr> <tr> <td>360mm</td> <td>575mm</td> </tr> <tr> <td>400mm</td> <td>650mm</td> </tr> <tr> <td>440mm</td> <td>720mm</td> </tr> <tr> <td>450mm</td> <td>740mm</td> </tr> <tr> <td>480mm</td> <td>1000mm</td> </tr> <tr> <td>490mm</td> <td></td> </tr> </table>	200mm	510mm	280mm	550mm	353mm	570mm	360mm	575mm	400mm	650mm	440mm	720mm	450mm	740mm	480mm	1000mm	490mm		Default	360mm	Access	alse
200mm	510mm																							
280mm	550mm																							
353mm	570mm																							
360mm	575mm																							
400mm	650mm																							
440mm	720mm																							
450mm	740mm																							
480mm	1000mm																							
490mm																								

Number	Parameter Name	Description	Values			
P138	Overwrite Local set-points with Remote set-points	If enabled, set-points stored in Decanter when in local mode (control from the HMI) will be overwritten when switched to Remote Mode (control from customer SCADA system). Only applicable when P118 Option Remote Control is set to Bus Remote System.	Default	Enabled	Access	
P143	Remote Command Mode	<p>Selects the source of the commands (<i>CMD</i>) and set-points (<i>SP</i>) in remote mode.</p> <p>Options:</p> <ul style="list-style-type: none"> CMD and SP Customer system can control both commands (<i>start, stop, flush, etc.</i>) and set-points (<i>diff speed, torque, etc.</i>) CMD Only Customer system can control commands (<i>start, stop, flush, etc.</i>) only. Set-points are controlled locally on the HMI. SP Only Customer system can control set-points (<i>diff speed, torque, etc.</i>). Commands are controlled locally on the HMI. <p>For <i>CMD and SP</i>, both commands and set-points on the bus are read in remote mode.</p> <p>Only applicable when P118 Option Remote Control is set to Bus Remote System.</p>	Default	CMD and SP	Access	

Number	Parameter Name	Description	Values			
P144	Master of Local/Remote Mode	<p>This parameter selects who oversees selecting Remote or Local mode.</p> <p>Options:</p> <ul style="list-style-type: none"> Local The selection of local/remote is done on the HMI only. Remote The selection of local/remote is done on the customer SCADA system only. Customer SCADA uses bits 12 and 13 of signal 045 Control CMD. Both Both the HMI and Customer SCADA system can control the selection of local/remote. Customer SCADA uses bits 12 and 13 of signal 045 Control CMD. <p>Only applicable when P118 Option Remote Control is set to Bus Remote System.</p>	Default	Local	Access	

3.2. Main Drive

Number	Parameter Name	Description	Values			
P104	Min Bowl Speed Delay	Operating Bowl Speed has been reached, to ensure stable operating bowl speed has been achieved.	Units	s	Access	advoper
			Min	0		
			Default	30		
			Max	99999		
P107	Min Bowl Speed	When the bowl speed reaches this value, the timer P104 Min Bowl Speed Delay starts. The Min Bowl Speed is a percentage of P207 Bowl RPM Ref.	Units	%	Access	advoper
			Min	50		
			Default	95		
			Max	100		
P108	Bowl Stop Speed	<p>The value of the bowl speed at which the Decanter is considered stopped by the software, if P109 Min Rundown Time has expired.</p> 	Units	RPM	Access	advoper
			Min	1		
			Default	50		
			Max	100		

Number	Parameter Name	Description	Values			
P109	Min Rundown Time	During this time, the back drive maintains the differential speed. This ensures a minimum time for emptying the Decanter during rundown.	Units	s	Access	advoper
			Min	10		
			Default	30		
			Max	600		
P201	Pulse Per Revolution Bowl	Sets amount of pulses the bowl speed pick-up counts at each full turn.	Units		Access	alse
			Min	1		
			Default	2		
			Max	4		
P203	Main Motor Pulley	Measured diameter of the main motor pulley. Used to calculate MD Pulleys Ratio.	Units	mm	Access	alse
			Min	1		
			Default	1		
			Max	1000		
P204	Bowl Pulley	Measured diameter of the bowl pulley. Used to calculate MD Pulleys Ratio.	Units	mm	Access	alse
			Min	1		
			Default	1		
			Max	1000		
P205	Max Bowl Speed	Select the max bowl speed as shown on Decanter nameplate from: 2200 3200 4400 2500 3400 5300 2800 3600 2900 3650 3075 3800 3100 4000 3150 4200	Units	RPM	Access	alse
			Min	0		
			Default	2200		
			Max	5300		

Number	Parameter Name	Description	Values			
			Units		Access	
P206	Max Rev Bowl Speed	Max reverse bowl speed in Low Speed Flush in LS CIP mode.	Units	RPM	Access	else
			Min	0		
			Default	-100		
			Max	-5300		
P207	Bowl RPM Ref	Bowl speed set-point value for VFD. Maximum limit is set equal to P205 Max Bowl Speed.	Units	RPM	Access	advoper
			Min	0		
			Default	2100		
			Max	P205 Max Bowl Speed		
P208	Bowl RPM Tolerance	The bowl speed value must be reached during ramp up in CIP and Low Speed Flush sequence.	Units	%	Access	advoper
			Min	0		
			Default	90		
			Max	100		
P213	MD Type	Sets the type of the MD starter. ABB VFD EPL ACS880 Select between Allen Bradley Power Flex 755 or ABB ACS 880 drives.	Default	AB PF755	Access	advoper
P215	MD Thermistor Type	Allows selection of the MD thermistor protection type. Options: • No Thermistor Thermistor not installed on Main Drive motor. • Through VFD input Thermistor input for Main Motor connected through VFD.	Default	Thermistor through VFD	Access	advoper

Number	Parameter Name	Description	Values			
P217	Bowl Speed Ref Remote Control Active	<p>Selects the source of the bowl speed reference.</p> <p>Options:</p> <ul style="list-style-type: none"> Local Mode Bowl speed controlled ONLY through the HMI. Remote Mode Bowl speed controlled ONLY via customer SCADA system Follow Back Drive Settings Source of controlling Bowl Speed is set via local/remote selection (on HMI control bar or via Remote Communication depending on setting of P144 Master of Local or Remote, and only applicable when P118 is selected as Bus Remote. 	Default	Local Mode	Access:	advoper
P225	MD Acceleration Time	Defines the time required for the speed to change from zero to the maximum speed.	Units	S	Access:	advoper
			Min	10		
			Default	300		
			Max	600		
P226	MD Deceleration Time	Defines the time required for the speed to change from the maximum speed to zero.	Units	S	Access:	advoper
			Min	0		
			Default	1200		
			Max	1800		

Number	Parameter Name	Description	Values			
P227	MD Max Current	Defines the allowed maximum motor current. Enter value 5% higher than the rated motor current.	Units	A	Access:	advoper
			Min	0		
			Default	0		
			Max	1000		
P228	MD Motor Current	Must be equal to the motor current on the Main Motor nameplate.	Units	A	Access:	advoper
			Min	0		
			Default	0		
			Max	1000		
P229	MD Motor Freq	Must be equal to the motor frequency on the Main Motor nameplate.	Units	Hz	Access:	advoper
			Min	50		
			Default	50		
			Max	120		
P230	MD Motor Power	Must be equal to the motor power on the Main Motor nameplate	Units	Kw	Access:	advoper
			Min	0		
			Default	0		
			Max	500		
P231	MD Motor Speed	Must be equal to the motor speed on the Main Motor nameplate.	Units	RPM	Access:	advoper
			Min	0		
			Default	0		
			Max	3600		
P232	MD Motor Voltage	Must be equal to the motor voltage on the Main Motor nameplate.	Units	V	Access:	advoper
			Min	110		
			Default	400		
			Max	690		

Number	Parameter Name	Description	Values			
P233	MD Power Gen Limit	Defines the allowed maximum power fed by the motor to the VFD.	Units	%	Access:	advoper
			Min	-350		
			Default	-300		
			Max	0		
P234	MD Power Mot Limit	Defines the allowed maximum power fed by the inverter to the VFD.	Units	%	Access:	advoper
			Min	0		
			Default	105		
			Max	300		
P235	MD Torque Max Limit	Value of VFD torque limit in percent of motor nominal torque.	Units	%	Access:	advoper
			Min	0		
			Default	105		
			Max	300		
P236	MD Min speed	Defines the allowed minimum speed of the Main Drive.	Units	RPM	Access	N/A
			Min	Calculated		
			Default			
			Max			
P237	MD Max Speed	Defines the allowed maximum speed of the Main Drive.	Units	RPM	Access	N/A
			Min	Calculated		
			Default			
			Max			

3.3. Back Drive

Number	Parameter Name	Description	Values			
			Units	Min	Default	Max
P302	Pinion Dead band	This is the prohibited pinion speed interval. Used with hydraulic and 4Q VFD type back drives.	Units	RPM	Access	advoper
			Min	0		
			Default	0		
			Max	1000		
P303	Gearbox Size	Gearbox kNm rating	Units	kNm	Access	alse
			Min	0		
			Default	3.5		
			Max	1000		
P304	Gearbox Ratio	Gearbox speed reduction ratio	Units		Access	alse
			Min	1		
			Default	1		
			Max	1000		
P305	Max Diff Speed	This value is used by the torque control.	Units	RPM	Access	advoper
			Min	1		
			Default	1		
			Max	80		
P306	PPR Pinion	Sets amount of pulses per revolution for pinion speed pick up.	Units		Access	alse
			Min	1		
			Default	2		
			Max	20		

Number	Parameter Name	Description	Values			
P307	Torque Arm Length	Used to calculate DD gearbox torque.	Units	mm	Access	else
			Min	0		
			Default	315		
			Max	1000		
P308	Torque Arm Tare	Press <i>Calibrate</i> to zero load cell (if connected).	Units		Access	else
			Default			
P309	Torque Filter Time	Used to filter the torque signal when using a strain gauge. When set to 0, the filter is disabled.	Units	s	Access	else
			Min	0		
			Default	1		
			Max	1000		
P310	Load Cell Capacity	Parameter sets the load cell capacity that is used to scale the load cell raw value.	Units	kg	Access	else
			Min	0		
			Default	250		
			Max	500		
P312	Load Cell Gain	This parameter contains the calibration factor for the specified load cell.	Units	mV/V	Access	else
			Min	0		
			Default	3.03		
			Max	10		
P319	BD Type	Sets the Back Drive type. Select between Allen Bradley Power Flex 755 or ABB ACS 880 drives.	Default	AB PF755	Access	else
P320	Gearbox Type	Two Gearbox types are supported: <ul style="list-style-type: none"> Planetary Direct Drive 	Default	Direct Drive Gearbox	Access	else

Number	Parameter Name	Description	Values			
P321	Torque Type	Torque measurement type: <ul style="list-style-type: none"> Load Cell Load cell connected via HM 1734WM card <ul style="list-style-type: none"> VFD Bus Torque measurement calculated through VFD	Default	VFD Bus	Access	advoper
P325	BD Acceleration Time	Defines the time required for the speed to change from zero to the maximum speed.	Units	S	Access:	advoper
			Min	0		
			Default	10		
			Max	1000		
P326	BD Deceleration Time	Defines the time required for the speed to change from the maximum speed to zero.	Units	S	Access:	advoper
			Min	0		
			Default	10		
			Max	1000		
P327	BD Max Current	Defines the allowed maximum motor current. Enter value 5% higher than rated motor current.	Units	A	Access:	advoper
			Min	0		
			Default	0		
			Max	1000		
P328	BD Motor Current	Must be equal to the value on the Back Drive Motor nameplate.	Units	A	Access:	advoper
			Min	0		
			Default	0		
			Max	1000		

Number	Parameter Name	Description	Values			
P329	BD Motor Freq	Must be equal to the motor frequency value on the Back Drive Motor nameplate	Units	Hz	Access:	advoper
			Min	50		
			Default	50		
			Max	120		
P330	BD Motor Power	Must be equal to the motor power value on the Back Drive Motor nameplate.	Units	kW	Access	advoper
			Min	0		
			Default	0		
			Max	1000		
P331	BD Motor Speed	Must be equal to the motor speed value on the Back Drive Motor nameplate.	Units	RPM	Access	advoper
			Min	0		
			Default	0		
			Max	10000		
P332	BD Motor Voltage	Must be equal to the motor voltage value on the Back Drive Motor nameplate.	Units	V	Access:	advoper
			Min	110		
			Default	400		
			Max	690		
P333	BD Power Gen Limit	Defines the allowed maximum power fed by the motor to the inverter.	Units	%	Access:	advoper
			Min	-300		
			Default	-105		
			Max	0		
P334	BD Power Motor Limit	Defines the allowed maximum power fed by the inverter to the motor.	Units	%	Access:	advoper
			Min	0		
			Default	105		
			Max	300		

Number	Parameter Name	Description	Values			
P335	BD Min Speed	Defines the allowed minimum speed of the Back Drive.	Units	RPM	Access	alse
			Min	-10000		
			Default	50		
			Max	100		
P336	BD Max Speed	Defines the allowed maximum speed of the Back Drive.	Units	RPM	Access	alse
			Min	0		
			Default	3000		
			Max	10000		
P337	BD Thermistor Type	<p>Allows selection of the BD thermistor protection type.</p> <p>Options:</p> <ul style="list-style-type: none"> • No Thermistor Thermistor not installed on the Back Drive motor. • Through VFD input Thermistor input for Main Motor connected through VFD 	Default	VFD input	Access:	advoper
P351	P Gain Torque	This is the proportional gain for T regulation. The larger the value, the faster the response. Setting this value too high will result in 'hunting'.	Units		Access	advoper
			Min	0		
			Default	2.5		
			Max	1000		
P352	I Gain Torque	This is the integral gain for T regulation. The larger the value, the faster the response. Setting this value too high will result in 'hunting'.	Units		Access	advoper
			Min	0		
			Default	5		
			Max	1000		

Number	Parameter Name	Description	Values			
P353	P Gain Diff Speed	This is the proportional gain for Dn regulation.	Units		Access	advoper
			Min	0		
			Default	0		
			Max	1000		
P354	I Gain Diff Speed	This is the integral gain for Dn regulation.	Units		Access	advoper
			Min	0		
			Default	16		
			Max	1000		
P356	D Gain Diff Spd	This is the derivative gain for Dn regulation.	Units		Access	advoper
			Min	0		
			Default	0		
			Max	1000		
P357	LP Filter Torque Control	Low pass filter for torque control	Units		Access	advoper
			Min	0		
			Default	0.0625		
			Max	1		

Number	Parameter Name	Description	Values			
P358	Diff/Torque Hysteresis	Hysteresis when switching from Diff Speed to Torque control	Units	RPM	Access	advoper
			Min	0		
			Default	0		
			Max	100		
P377	Output at Standstill	BD control output speed reference pre-set when Decanter starts.	Units	%	Access	advoper
			Min	0		
			Default	0		
			Max	100		
P378	Max Diff Diff Speed	Parameter used by the torque control algorithm. P377 and P378 are always applied to all torque controls.	Units	RPM	Access	advoper
			Min	0		
			Default	4		
			Max	100		

3.4. Set-points

Number	Set-point name	Description	Values			
S301	Diff Speed	Differential speed set-point used during production in T/Dn control.	Units	RPM	Access	operator
			Min	0.2		
			Default	5		
			Max	100		
S302	Torque	Torque set-point used during production in T/Dn torque control.	Units	kNm	Access	operator
			Min	0		
			Default	2		
			Max	1000		
S304	Flushing Diff	This set-point is only used when the Decanter is being flushed.	Units	RPM	Access	operator
			Min	0.2		
			Default	10		
			Max	100		
S801	Feed Flow	Set-point value for Feed Pump from HMI (if Decanter is in <i>Local</i> mode).	Units	m ³ /h	Access:	operator
			Min	0		
			Default	10		
			Max	10000		

3.5. Bearings

Number	Parameter name	Description	Values			
P401	Temp Monitoring	Determines whether PT100 temperature sensors are mounted on Decanter. Set ON if applicable.	Default	Disabled	Access	advoper
P402	Vibration Monitoring	Determines whether vibration sensors / monitors are mounted on Decanter. Set ON if applicable.	Default	Disabled	Access	advoper
P490	Vibration Type	Determines whether the sensors are mounted on the frame or on the bearings.	Default	Bearing mounted	Access	advoper

3.6. Flush

Number	Parameter name	Description	Values			
			Units	Min	Default	Max
P501	Low Flush Bowl Speed	Bowl speed set-point during low speed flush. Speed is set automatically depending on bowl size. The speed is set to maintain a g-force of 1.4 during low-speed flushing.	Units	RPM	Access	advoper
			Min	0		
			Default	100		
			Max	10000		
P502	Full Speed Flush Time	This is the flushing time at operating bowl speed. The flushing valve will open for the specified period while the Decanter is still running at operating speed.	Units	s	Access	advoper
			Min	1		
			Default	120		
			Max	10000		
P503	Rundown Flush Time	If Rundown Flush Time is set to a value lower than P109 Min Rundown time, the flushing valve will close when the specified period has elapsed. Otherwise, the flushing will continue until the bowl speed has dropped below the Stop Flush Speed.	Units	s	Access	advoper
			Min	1		
			Default	1800		
			Max	10000		
P504	Stop Flush Speed	The flush valve will close when the bowl speed has dropped below the specified flush speed.	Units	RPM	Access	advoper
			Min	50		
			Default	100		
			Max	10000		

Number	Parameter Name	Description	Values			
P505	Low Flush Time Rev	This is the period for running low speed flush in the direction opposite to the normal bowl rotation.	Units	s	Access	advoper
			Min	0		
			Default	60		
			Max	10000		
P506	Low Flush Time Fwd	This is the time period for running low speed flush in the same direction as the bowl.	Units	s	Access	advoper
			Min	0		
			Default	60		
			Max	10000		
P507	Low Flush Cycles	This specifies the total number of Low Speed Flush cycles.	Units		Access	advoper
			Min	0		
			Default	10		
			Max	10000		
P508	Low Flush Auto Start	Determine if the Low Speed Flush shall start automatically after the Decanter has stopped or it requires a manual start.	Default	Disabled	Access	advoper
P513	Low Flush Enable	Enables or disables the low speed flush valve operation, both in HMI and PLC.	Default	Disabled	Access	advoper
P514	Low Flush Valve	Set to enable when separate valve is used for the Low Speed Flush; otherwise, the same valve is used for both Flush and Low Speed Flush functions.	Default	Disabled	Access	advoper

Number	Parameter Name	Description	Values			
P517	Disable Flush Water on First Low Speed Flush Cycle	When enabled, flush water valve stays closed during the first cycle of low speed flushing.	Default	Disabled	Access	advoper
P518	Begin Low Speed Flushing in Reverse Direction	When enabled, the first cycle of low speed flushing will begin in the reverse bowl direction.	Default	Disabled	Access	advoper

3.7. Lubrication

Number	Parameter name	Description	Values			
P604	Grease On Timer	Running period for the grease pump motor. A complete grease cycle = P604 grease on timer + P605 grease off timer.	Units	s	Access	else
			Min	0		
			Default	300		
			Max	10000		
P605	Grease Off Timer	Off period for the grease pump motor. A complete grease cycle = P604 grease on timer + P605 grease off timer.	Units	Min	Access	else
			Min	0		
			Default	360		
			Max	10000		
P607	Enable automatic grease system	Determines if automatic lubrication system is installed. If disabled, lubrication should be handled manually.	Default	Disabled	Access	else

3.8. Diverter

Number	Parameter name	Description	Values			
			Unit	Min	Default	Max
P701	Stop Divert Torque	This is the torque limit value for stop diverting.	Unit	kNm	Access	advoper
			Min	0		
			Default	1		
			Max	100		
P702	Start Divert Torque	This is the torque limit value for start diverting. It should be set lower than P701 .	Unit	kNm	Access	advoper
			Min	0		
			Default	0.5		
			Max	100		
P703	Stop Diverting Flush Delay Time	When the torque increases above the Stop Divert Torque level (P701), the Decanter keeps diverting and the diverter flush valve stays open, until P703 expires.	Units	s	Access	advoper
			Min	0		
			Default	0		
			Max	1000		
P705	Start Diverting Flush Delay Time	When the torque drops below Start Divert Torque Level (P702), the diverter starts diverting and the diverter flush valve stays open, until P705 expires.	Units	s	Access	advoper
			Min	0		
			Default	10		
			Max	1000		
P708	Start Diverter Flush at Feed Running	If enabled, the diverter flush valve opens when the feed pump feedback signal is received.	Default	Disabled	Access	advoper

Number	Parameter Name	Description	Values			
P709	Diverter Feedback Monitoring	Determines if the Gate/Conveyor has limit switch feedback.	Default	Disabled	Access	advoper
P714	Diverter Type	Configures the diverter system: <ul style="list-style-type: none"> • No diverter system No diverter/conveyor present • Slide gate single action Slide gate installed with one end powered and one end spring-loaded • Slide gate dual action Slide gate installed with both ends powered • Inclined conveyor single dir • Inclined conveyor dual dir 	Default	No diverter system	Access	advoper
P715	Diverter Flush Valve	Configures diverter system flush valve: <ul style="list-style-type: none"> • No Flush Valve • Flush Valve Enable if a diverter flush valve is installed.	Default	Disabled	Access	advoper

3.9. Feed

Number	Parameter name	Description	Values			
P801	Feed P Gain	Proportional gain for closed loop PI-control of the feed pump. As high as possible, because this makes the closed-loop control circuit faster and more precise. However, a value that is too high may lead to overshoots or even undamped oscillation (instability). The value can be doubled in intervals until the risk of oscillation becomes apparent.	Units		Access	advoper
			Min	0		
			Default	0		
			Max	1000		
P802	Feed I Time	Integral Time for closed loop PI-control of the feed pump. Smaller integral action times result in a stronger (more aggressive) integral element. The value can be halved in intervals until negative effects (risk of oscillation) influence the step-response. The integrator is disabled when the value is zero.	Units		Access	advoper
			Min	0		
			Default	0		
			Max	1000		
P805	Feed AI Min	Together the two parameters P805 Feed AI Min and P806 Feed AI Max set the flow range, which is assigned to the analog input. The signal span of the analog input is selected with P814 Feed Flow Signal Type.	Units	%	Access	advoper
			Min	0		
			Default	0		
			Max	100		

Number	Parameter Name	Description	Values			
P806	Feed AI Max	Together the two parameters P805 Feed AI Min and P806 Feed AI Max set the flow range, which is assigned to the analog input. The signal span of the analog input is selected with P814 Feed Flow Signal Type.	Units	%	Access	advoper
			Min	0		
			Default	0		
			Max	100		
P812	Auto Feed Request	If enabled the control will request feed automatically. Otherwise it will require an additional start command to request feed after the Decanter is at speed.	Default	Disable	Access	advoper
P813	Feed Equipment Config	Selects the configuration of the feed flow control. Options: <ul style="list-style-type: none"> No Control VFD PI Control VFD Open Loop Control 4-20mA Valve PI Control 4-20mA VFD Open Loop Control For PI Control the P801 Feed P Gain and P802 Feed I Time are used.	Default	No Control	Access	advoper
P814	Feed Flow Signal Type	Signal type of the flow process variable. Options: <ul style="list-style-type: none"> No Flow Transmitter Flow Transmitter 4-20mA Control Signal via Bus For hardware input, the flow range is set with P805 Feed AI Min and P806 Feed AI Max.	Default	No Flow Transmitter	Access	advoper

Number	Parameter Name	Description	Values			
P816	Feed Rmt Control Active	<p>Selects the source of the feed setpoint. Options:</p> <ul style="list-style-type: none"> Local Mode Remote Mode Follow Back Drive Settings <p>For Local Mode, the feed setpoint source is permanently local. For Remote Mode, the feed setpoint source is permanently remote. In the Follow Back Drive Settings, the feed setpoint source is the same as for the Back Drive setpoints and controlled by the Local/Remote buttons in the control bar at the bottom of the HMI screen.</p>	Default	Local Mode	Access	advoper
		<p>Together the two parameters P820 Output Min Limit and P821 Output Max Limit set the range of the control output from the PI-controller. For analog output, these parameters must be kept within the range set by P803 Feed AO Min and P804 Feed AO Max.</p>	Units	m ³ /h	Access	advoper
Min	0					
Default	0					
Max	1000					

Number	Parameter Name	Description	Values			
P821	Output Max Limit	Together the two parameters P820 Output Min Limit and P821 Output Max Limit set the range of the control output from the PI-controller. For analog output, these parameters must be kept within the range set by P803 Feed AO Min and P804 Feed AO Max.	Units	m ³ /h	Access	Advoper
			Min	0		
			Default	1000		
			Max	1000		
P824	Feed Pressure Transmitter	Selects the Feed Pressure Transmitter. Currently, the Pressure Transmitter will only read 0-100 psi range. 0 = None 1 = 4-20mA S12 input 3 2 = Bus	Default	0 = None	Access	advoper

4. Alarm Types

Alarm Type	Actions	Digital Output Signals Set
Emergency Stop	<p>Safety outputs are turned OFF. Alarm icon on HMI screen flashes. Alarm message is displayed on active alarms screen. Both MD and BD motors are stopped without flushing. After the E-stop button is returned to its no-alarm state, the Safety Relay must be reset from either the <i>Reset</i> button on the HMI screen or from the one on the Control Panel.</p>	<p>Alarm Light Alarm Horn</p>
Stop Decanter	<p>Alarm icon on HMI flashes. Alarm message is displayed on active alarms screen. Decanter's sequence changes to Run Down Flush. So, Main Drive is ramping down, the BD motor and oil lubrication pump are kept running until P108 Bowl Stop Speed is reached and P109 Min Rundown Timer has expired.</p>	<p>Alarm Light Alarm Horn</p>
Stop Feed	<p>Alarm icon on HMI screen flashes. Alarm message is displayed on active alarms screen. If alarm persists for too long, a <i>Stop Decanter</i> alarm is issued. <i>Stop Feed Alarm</i> icon on HMI screen flashes.</p>	<p>Alarm Light Alarm Horn Alarm Stop Feed</p>
Warning	<p>Alarm icon on HMI screen flashes. Alarm message is displayed on active alarms screen.</p>	<p>Alarm Light Alarm Horn</p>

5. Alarms Description

5.1. Common Alarms

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A103	Emergency Stop	Emergency Stop	N/A	Emergency stop button has been activated.	- Emergency stop button depressed.	- Check all Emergency Stop buttons. - Remove Emergency Stop conditions.
A104	Decanter Cover Open	Emergency Stop	Delay 1s Access advoper	Decanter cover switch indicates that the cover is open.	- Decanter Cover open - Faulty cover switch	- Check if optional Decanter Cover Switch is present and wiring corresponds to the P120 settings.
A105	UPS on Battery	Warning	Delay 1s Access advoper	UPS has switched to battery power due to loss in main supply. Alarm is disabled if P114 Option UPS is disabled.	- Power to Decanter control cabinet lost	- Determine reasons for power loss. - Refer to UPS Manual for information on any alarms present. - Check status of UPS fuse and battery.

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A113	I/O Module Alarm	Stop Decanter	Delay 1s	Error on an I/O Module	<ul style="list-style-type: none"> - Faulty I/O card - Wrong node address on I/O module - Communication lost to I/O module 	<ul style="list-style-type: none"> - Check wiring to module. - Check power supplied to module. - Check parameter settings for additional modules (modules not used in system must be disabled).
			Access advoper			
A114	Analogue Input Alarm	Stop Decanter	Delay 0s	Out of range error on an analogue input on an I/O module	<ul style="list-style-type: none"> - Faulty analogue input - Faulty I/O card - Faulty I/O module 	<ul style="list-style-type: none"> - Check the analogue input electrical signal. - Ensure the parameter settings for analogue input correspond to the physical connection (0-20mA, 4-20mA, ±10V).
			Access advoper			
A132	CC Bus Remote Communication Error	Message		Communication error between Core Controller and remote system.	Communication problem between Core Controller and the Bus Remote Interface Module.	<ul style="list-style-type: none"> -Check the status of the Remote system. -Check node settings on Remote communication module. -Ensure parameter settings for remote communication are correct.

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A901	Additive without permission	Stop Feed	Access advoper	Additive Running signal is active when feed pump is not expected to run.	Additive pump running before Additive Permissive signal is active.	-Ensure additive pump wiring is correct. -Ensure additive signals are connected correctly. -Check operation of additive pump.
A902	Additive pump stopped	Stop Feed	Access advoper	Additive Running signal is not active when pump is expected to run.	Feed pump not running after Additive Permissive signal is active.	-Ensure additive pump wiring is correct. -Ensure additive signals are connected correctly. -Check operation of additive pump.

5.2. Main Drive

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A101	Stop Speed Not Reached	Stop Decanter	Delay 60s	P108 Bowl Stop Speed has not been reached after machine is started.	<ul style="list-style-type: none"> - Faulty Bowl Speed sensor - Main Drive Motor VFD parameter settings are incorrect. 	<ul style="list-style-type: none"> - Check that bowl speed sensor is functioning properly. - Check Main Drive VFD settings. - Check that bowl speed sensor cable is screened and shielded (the problem could be caused by electromagnetic interference).
			Access advoper			
A102	Min Speed Not Reached	Stop Decanter	Delay 1800s	P107 Minimum Bowl Speed has not been reached after machine is started.	<ul style="list-style-type: none"> - Faulty Bowl Speed Sensor - Main Drive Motor VFD parameter settings are incorrect. 	<ul style="list-style-type: none"> - Check that bowl speed sensor is functioning properly. - Check Main Drive VFD settings. - Check that bowl speed sensor cable is screened and shielded (the problem could be caused by electromagnetic interference).
			Access advoper			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A201	Min Operating Bowl Speed	Stop Decanter	Unit %	Measured bowl speed has fallen below the minimum operating bowl speed during execute or held state of production mode. The default <i>Set</i> and <i>Reset</i> values are calculated from P207 Bowl RPM Ref.	<ul style="list-style-type: none"> - Faulty Bowl Speed sensor - Main Drive Motor VFD parameter settings are incorrect. - Electrical noise 	<ul style="list-style-type: none"> - Check that bowl speed sensor is functioning properly. - Check Main Drive VFD settings. - Check that bowl speed sensor cable is screened and shielded (the problem could be caused by electromagnetic interference).
			Min 80			
			Set 90			
			Reset 90			
			Max 100			
			Delay 10s			
			Access advoper			
A202	Max Operating Bowl Speed	Stop Decanter	Unit RPM	Bowl speed has risen above the set limit.	<ul style="list-style-type: none"> - Faulty Bowl Speed Sensor - Main Drive Motor VFD parameter settings incorrect - Electrical noise 	<ul style="list-style-type: none"> - Check that bowl speed sensor is functioning properly. - Check that bowl speed sensor cable is screened and shielded. - Ensure motor cable is properly shielded and grounded. - Ensure sensor distance, axial position and angle relative to cut-out are correct.
			Min 10			
			Set P205 + 100 RPM			
			Reset			
			Max Calculated			
			Delay 1s			
			Access ALSE			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A203	Max Bowl Speed Deviation	Stop Decanter	Unit RPM	Measured bowl speed from sensor and from VFD are not equal.	<ul style="list-style-type: none"> - Faulty Bowl Speed sensor - Main Drive Motor VFD parameter settings are incorrect. - Electrical noise 	<ul style="list-style-type: none"> -Check that bowl speed sensor is functioning properly. -Check that bowl speed sensor cable is screened and shielded. -Ensure motor cable is properly shielded and grounded. -Ensure sensor distance, axial position and angle relative to cut-out are correct.
			Min 0			
			Set 100			
			Reset 100			
			Max 1000			
			Delay 10s			
			Access advoper			
A208	MD Still Running	Stop Decanter	Delay 5s	The alarm is set if the MD running feedback signal is still present after the MD signal has been switched off and the delay time has elapsed.	<ul style="list-style-type: none"> - Incorrect MD VFD settings/wiring 	<ul style="list-style-type: none"> - Check MD VFD settings and wiring.
			Access advoper			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A209	MD Not Running	Stop Decanter	Delay 5s	The alarm is generated if the MD VFD running feedback is not present after the start command is given and the delay time has elapsed.	- Incorrect MD VFD settings/wiring	- Check MD VFD settings and wiring.
			Access advoper			
A210	MD High Temp	Stop Decanter	Delay 5s	MD Motor high temperature is registered by thermistor.	- MD VFD - MD Thermistor	- Check thermistor wiring. - Investigate causes for MD Motor overheating.
			Access advoper			
A213	MD VFD Alarm	Warning	Delay 0s	VFD Alarm reported via network.	- ABB ACS 880 MD VFD alarm	- Look up alarm code in ACS 880 Firmware manual.
			Access advoper			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A214	MD VFD Tripped	Stop Decanter	Delay 0s	VFD Trip reported via network.	- ABB ACS 880 MD VFD alarm	- Look up alarm code in ACS 880 Firmware manual.
			Access advoper			
A216	MD VFD Comm Error	Stop Decanter	Delay 0s	Communication link between Core Controller and MD VFD interrupted.	<ul style="list-style-type: none"> - Communication settings on MD VFD incorrect - Cable connection - Incorrect code address settings - Faulty Ethernet/IP adapter on MD VFD 	<ul style="list-style-type: none"> - Double-check communication parameters on MD VFD. - Double-check node address setting on MD VFD. - Check cable connection. - Check status lights on MD VFD adaptor.
			Access advoper			
A217	MD VFD in Local Mode	Stop Decanter	Delay 0s	Decanter controller cannot control the MD VFD.	- MD VFD is in Local Mode.	- Change MD VFD setting from <i>Local</i> to <i>Remote</i> mode on VFD control panel.
			Access advoper			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A252	Safety Max Operating Bowl Speed	Emergency Stop	Unit RPM	Bowl speed has risen above the set limit.	-Faulty Bowl Speed Sensor. -Main Drive Motor VFD parameter settings incorrect. - -Electrical noise	-Check that bowl speed sensor is functioning properly. -Check that bowl speed sensor cable is screened and shielded. -Ensure motor cable is properly shielded and grounded. -Ensure sensor distance, axial position and angle relative to cut-out are correct. -Ensure MD Motor parameters are entered correctly from Motor Nameplate).
			Min 10			
			Set Calculated			
			Reset 250			
			Max Calculated			
			Delay 1s			
			Access ALSE			
A253	Safety Max Bowl Speed Deviation	Stop Decanter	Unit RPM	Bowl speed measured by safety module deviates too much from either the value measured by normal speed module or the speed value calculated from MD VFD speed.	-Faulty Bowl Speed Sensor. -Main Drive Motor VFD parameter settings incorrect. - -Electrical noise	-Check that bowl speed sensor is functioning properly. -Check that bowl speed sensor cable is screened and shielded. -Ensure motor cable is properly shielded and grounded. -Ensure sensor distance, axial position and angle relative to cut-out are correct. -Ensure MD Motor parameters are entered correctly from Motor Nameplate.
			Min 0			
			Set 100			
			Reset 100			
			Max 1000			
			Delay 10s			
			Access advoper			

5.3. Back Drive

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A302	Max Pinion Speed	Stop Decanter	Unit RPM	Pinion speed has gone above the alarm set-point. Activation of this alarm disables BD enable signal.	-Faulty Pinion Speed Sensor -Back Drive Motor VFD Parameter settings incorrect - -Electrical noise	-Check that pinion speed sensor is functioning properly. -Check that pinion sensor cable is screened and shielded. -Ensure motor cable is properly grounded and shielded. -Ensure sensor distance, axial position and angle relative to cut-out are correct.
			Min 50			
			Set 3000			
			Reset 3000	Set and reset values are equal to BD Max Speed.		
			Max 5300			
			Delay 1s			
			Access alse			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A303	Max Diff Speed	Stop Decanter	Unit RPM	Actual differential speed has risen above alarm set-point.	<ul style="list-style-type: none"> - Faulty Pinion Speed Sensor - Back Drive Motor VFD Parameter settings incorrect - Electrical noise 	<ul style="list-style-type: none"> -Check that pinion speed sensor is functioning properly. -Check that pinion sensor cable is screened and shielded. -Ensure motor cable is properly grounded and shielded. -Ensure back drive motor is rotating in correct direction. -Ensure sensor distance, axial position and angle relative to cut-out are correct. -Ensure BD Motor parameters settings are correct.
			Min			
			Set			
			Reset	Set and reset values are equal to P305 Max Diff Speed.		
			Max			
			Delay 1s			
			Access alse			
A304	Min Diff Speed	Stop Decanter	Unit RPM	Actual differential speed has fallen below the alarm set-point.	<ul style="list-style-type: none"> - Incorrect BD VFD motor parameter settings 	<ul style="list-style-type: none"> -Check that pinion speed sensor is functioning properly. -Check that pinion sensor cable is screened and shielded. -Ensure motor cable is properly grounded and shielded. -Ensure back drive motor is rotating in correct direction. -Ensure sensor distance, axial position and angle relative to cut-out are correct. - Ensure BD Motor parameters settings are correct.
			Min 0			
			Set 0.1			
			Reset 0.2			
			Max 10			
			Delay 5s			
			Access advoper			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A305	Torque Limit Stop Feed	Stop Feed	Unit kNm	Measured torque value is higher than the alarm set-point. The parameter value is set when the gearbox size is selected and cannot be changed by the user.	-Incorrect load cell configuration parameters, gearbox and BD VFD settings. - High torque measured inside machine	-Ensure process set-points and related PID parameters are set per Decanter process. -Ensure load cell configuration parameter P312 , gearbox and BD VFD settings are correct. -Ensure Decanter is not blocked with product.
			Min 0			
			Set 12			
			Reset 10			
			Max 100			
			Delay 0s			
			Access advoper			
A306	Torque Limit Shutdown	Stop Decanter	Unit kNm	Torque value is higher than the alarm set-point. Alarm value is set when gearbox size is selected.	-High torque measured inside machine. - -Faulty torque measurement	-Ensure process set-points and related PID parameters are set per Decanter process. -Ensure load cell configuration parameter P312 , gearbox and BD VFD settings are correct. -Ensure Decanter is not blocked with product.
			Min 0			
			Set 16			
			Reset 15.5			
			Max 100			
			Delay 0s			
			Access advoper			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A307	Torque BD Shutdown	Stop Decanter	Unit kNm	Torque value is higher than the alarm set-point. Alarm value is set when gearbox size is selected.	<ul style="list-style-type: none"> - High torque measured inside machine. - Faulty torque measurement 	<ul style="list-style-type: none"> -Ensure process set-points and related PID parameters are set per Decanter process. -Ensure load cell configuration parameter P312, gearbox and BD VFD settings are correct. -Ensure Decanter is not blocked with product.
			Min 0			
			Set 18			
			Reset 17			
			Max 100			
			Delay 0s			
			Access advoper			
A309	BD Still Running	Stop Decanter	Delay 5s	If the BD VFD running signal is still present after the BD start signal has been switched off and the delay period specified by this parameter has elapsed, an alarm is generated.	<ul style="list-style-type: none"> - Option HW VFD BD Running Feedback signal not received. 	<ul style="list-style-type: none"> - Check BD VFD settings and wiring.
			Access advoper			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A310	BD Not Running	Stop Decanter	Delay 5s	If the BD VFD running signal is not present after the start command is given and the delay period specified by this parameter has elapsed, an alarm will be generated.	- BD VFD, BD VFD Running FB signal	- Check BD VFD settings and wiring.
			Access advoper			
A311	BD High Temperature	Stop Decanter	Delay 0s	BD Motor High Temperature is registered by thermistor.	- BD VFD, BD Thermistor	-Check thermistor wiring. -Investigate causes for BD Motor overheating.
			Access advoper			
A314	BD VFD Alarm	Stop Decanter	Delay 0s	VFD Alarm reported via network	- ABB ACS 880 BD VFD alarm	- Look up alarm code in ACS 880 Firmware manual.
			Access advoper			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A315	BD VFD Tripped	Stop Decanter	Delay 0s	VFD Trip reported via network.	- ABB ACS 880 BD VFD alarm	- Look up alarm code in ACS 880 Firmware manual.
			Access advoper			
A317	BD VFD Comm Error	Stop Decanter	Delay 1s	Communication link between Core Controller and BD VFD interrupted.	- Incorrect communication settings on BD VFD. - Cable connection - Incorrect Cable Node address settings - EPL adapter on BD VFD faulty	- Double-check communication parameters on BD VFD. - Double-check node address settings on MD VFD. - Check cable connection. - Check status lights on BD VFD adaptor.
			Access advoper			
A318	BD VFD in Local Mode	Stop Decanter	Delay 0s	Controller cannot control the BD VFD.	- BD VFD is in Local Mode.	- Change BD VFD setting from Local to Remote mode on Control Panel.
			Access advoper			

5.4. Bearings

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A401	Temp MD End Warning	Warning	Unit °C	MD temperature has increased above warning level.	<ul style="list-style-type: none"> -Bearing condition has deteriorated. -Ambient temperature is too high. -PT100 sensor is damaged. -PT100 temperature sensor cable is damaged/affected by electrical noise. 	<ul style="list-style-type: none"> -Ensure ambient temperature is not above warning level. -Check condition of temperature sensor. -Check condition of temperature sensor cable. -Ensure temperature cable is shielded. -Inspect bearing condition.
			Min 0			
			Set 110			
			Reset 80	MD End bearing temperature sensor reading.		
			Max 110			
			Delay 1800s			
			Access advoper			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A402	Temp GB End Warning	Warning	Unit °C	GB End temperature has increased above warning level.	-Bearing condition has deteriorated. -Ambient temperature is too high. -PT100 sensor is damaged. -PT100 temperature sensor cable is damaged/affected by electrical noise.	-Ensure ambient temperature is not above warning level. -Check condition of temperature sensor. -Check condition of temperature sensor cable. -Ensure temperature cable is shielded. -Inspect bearing condition.
			Min 0			
			Set 110			
			Reset 80	GB End bearing temperature sensor reading.		
			Max 110			
			Delay 1800s			
			Access advoper			
A403	Temp MD End Shutdown	Stop Decanter	Unit °C	Measured temperature has increased above shutdown level.	-Bearing condition has deteriorated. -Ambient temperature is too high. -PT100 sensor is damaged. - PT100 temperature sensor cable is damaged/affected by electrical noise.	-Ensure ambient temperature is not above warning level. -Check condition of temperature sensor. -Check condition of temperature sensor cable. -Ensure temperature cable is shielded. -Inspect bearing condition.
			Min 0			
			Set 120			
			Reset 80			
			Max 120			
			Delay 5s			
			Access advoper			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A404	Temp GB End Shutdown	Stop Decanter	Unit °C	Measured temperature has increased above shutdown level.	-Bearing condition has deteriorated. -Ambient temperature is too high. -PT100 sensor is damaged. - PT100 temperature sensor cable is damaged/affected by electrical noise.	-Ensure ambient temperature is not above warning level. -Check condition of temperature sensor. -Check condition of temperature sensor cable. -Ensure temperature cable is shielded. -Inspect bearing condition.
			Min 0			
			Set 120			
			Reset 80			
			Max 120			
			Delay 5s			
			Access advoper			
A405	Vibration MD End Warning	Warning	Unit mm/s	Measured vibration has increased above warning level.	-High vibrations measured in Decanter -Faulty vibration measurement	-Check actual bearing vibration level. -Check vibration sensor/monitor mounting and wiring.
			Min 0			
			Set 18			
			Reset 15			
			Max 24			
			Delay 1s			
			Access advoper			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A406	Vibration GB End Warning	Warning	Unit mm/s	Measured vibration has increased above warning level.	-High vibrations measured in Decanter -Faulty vibration measurement	-Check actual bearing vibration level. -Check vibration sensor/monitor mounting and wiring.
			Min 0			
			Set 18			
			Reset 15			
			Max 24			
			Delay 1s			
			Access advoper			
A407	Vibration MD End Shutdown	Stop Decanter	Unit mm/s	Measured bearing vibration has increased above shutdown level.	-High vibrations measured in Decanter. -Faulty vibration measurement	-Check actual bearing vibration level. -Check vibration sensor / monitor mounting and wiring.
			Min 0			
			Set 30			
			Reset 5			
			Max 30			
			Delay 1s			
			Access advoper			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A408	Vibration GB End Shutdown	Stop Decanter	Unit mm/s	Measured bearing vibration has increased above shutdown level.	-High vibrations measured in Decanter. -Faulty vibration measurement	-Check actual bearing vibration level. -Check vibration sensor / monitor mounting and wiring.
			Min 0			
			Set 30			
			Reset 5			
			Max 30			
			Delay 1s			
			Access advoper			
A409	Vibration During Start-up MD End Shutdown	Stop Decanter	Unit m/s ²	Measured bearing vibration has increased above shutdown level during start-up. Alarm level is set to: 0.7*1g=6.8m/s ²	-High vibrations measured in Decanter. -Faulty vibration measurement.	-Check actual bearing vibration level during start-up. -Check vibration sensor/monitor mounting and wiring.
			Min 0			
			Set 6.8			
			Reset 4			
			Max 6.8			
			Delay 1s			
			Access advoper			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A410	Vibration During Start-up GB End Shutdown	Stop Decanter	Unit m/s ²	Measured bearing vibration has increased above shutdown level during start-up.	-High vibrations measured in Decanter. -Faulty vibration measurement.	-Check actual bearing vibration level during start-up. -Check vibration sensor/monitor mounting and wiring.
			Min 0			
			Set 6.8			
			Reset 4	Alarm level is set to: 0.7*1g=6.8m/s ²		
			Max 6.8			
			Delay 1s			
			Access advoper			
A117	Vibration Comm	Stop Decanter	Delay 0s	This alarm is triggered when there is a communication problem with the 1444 DYN04 module.	Ethernet connection between Core Controller and P22-S Speed and Vibration unit.	-Check cables and connectors between Core Controller, Ethernet switch and 1444 DYN04 module.
			Access ALSE			

5.5. Lubrication

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A605	Too Low Grease Level	Warning	Delay 5s	Automatic Grease System grease level is too low.		Check oil level, flow switches, cable connections and wiring.
			Access advoper			
A606	Lube Motor Overload	Stop Decanter	Delay 0s	Lube Overload indicates Lubrication motor has tripped.		Check oil level, flow switches, cable connections and wiring.
			Access advoper			
A607	Lube Motor Not Running	Stop Decanter	Delay 5s	Lubrication motor running feedback signal is not present when pump is requested to run.		Check oil level, flow switches, cable connections and wiring.
			Access advoper			
A612	Low Grease Level Too Long	Warning	Delay 86400s	Alarm A605 Too Low Grease Level was active for too long.		Check the grease level, level switch wiring and grease pump running status.
			Access advoper			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A690	Lube Motor Still Running	Stop Decanter	Delay 5s	The alarm is set if the Lube running feedback signal is still present after the Lube start signal has been switched off and the delay time has elapsed.		Check oil level, flow switches, cable connections and wiring.
			Access advoper			

5.6. Diverter

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A701	Diverter Max time	Stop Feed	Delay 1200s	Torque has not reached P701 Stop Diverter Torque level within specified timer since feed pump has started.	- Difference between actual torque and P701 Stop Diverter Torque.	-Investigate why the Decanter is not sealing. -Ensure setting of P701 Stop Diverter Torque is correct per mechanical setting.
			Access advoper			
A702	Gate Not Opened	Stop Feed	Delay 50s	Confirmation of SG Open/Conveyor FW slide gate opened condition has not been received within specified time. Only relevant if P709 Diverter Feedback Monitoring parameter enabled.	- Slide gate not operating correctly. - Diverter parameters set incorrectly. - Faulty diverter gate position sensor	- Inspect the diverter / slide gate operation. - Confirm correct operation of position sensor.
			Access advoper			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A703	Gate Not Closed	Stop Feed	Delay 50s	Confirmation of SG Closed/Conveyor REV slide gate closed condition has not been received within specified time.	<ul style="list-style-type: none"> -Slide gate not operating correctly. -Diverter parameters set incorrectly. -Faulty diverter gate position sensor 	<ul style="list-style-type: none"> -Inspect the diverter / slide gate operation. -Confirm correct operation of position sensor.
			Access advoper	Only relevant if P709 Diverter Feedback Monitoring parameter enabled.		

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A707	Diverter Failure	Stop Feed	Delay 10s	Slide gate/diverter is selected: alarm is set on Air pressure fault, Motor overload protection or VFD fault.	-Diverter: Faulty VFD, motor overload or air pressure fault. -Inclined conveyor: Motor overload or faulty VFD.	-Confirm correct operation of diverter/inclined conveyor. -Ensure pneumatic system for diverter gate is operating correctly. -Ensure motor is not overloaded.
			Access advoper	Inclined conveyor: alarm is set on either motor overload protection or VFD Fault.		
A711	Diverter During Production	Stop Feed	Delay 5s	Torque has dropped below P702 Start Diverter Torque level during production.	Actual torque value differs from P702 .	-Investigate why the Decanter is not sealed. -Ensure setting of P702 is correct for the type of application the Decanter is used in.
			Access advoper			

5.7. Feed

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	What to do
A801	Feed Without Permission	Stop Feed	Delay 0s	Feed Pump Running signal is active when feed pump is not expected to run.	Feed pump running before Feed Permissive signal is active.	<ul style="list-style-type: none"> - Ensure feed pump wiring is correct. - Ensure feed signals are connected correctly. - Check operation of feed pump.
			Access advoper			
A802	Feed Pump Stopped	Stop Feed	Delay 0s	Feed Pump Running signal is not active when feed pump is not expected to run.	Feed pump running before Feed Permissive signal is not active.	<ul style="list-style-type: none"> - Ensure feed pump wiring is correct. - Ensure feed signals are connected correctly. Check operation of feed pump.
			Access advoper			
A804	Feed System Not Ready	Stop Feed	Delay 0s	External conditions prevent the Decanter from entering Production since Feed System Ready signal is not active.	Wiring to Feed System Ready Signal.	<ul style="list-style-type: none"> - Ensure Feed System Ready signal wiring is correct. - Ensure settings of P812 Feed System Ready is per Decanter installation.
			Access advoper			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause	-What to do
A805	Max Flow Deviation	Stop Feed	Units %	The alarm is set when the difference between Feed Setpoint and actual flow exceeds the alarm limit.	Calculated difference between measured actual Feed Flow and Feed Flow Setpoint.	-Avoid too large steps when changing the Feed Flow Setpoint.
			Min 0			
			Max 100			
			On 25			
			Off 10			
			Delay 10s			
			Access advoper			
A806	Feed VFD Comm Alarm	Stop Feed	Delay 1s	This alarm is set when the Feed VFD has lost communication with PLC.		<ul style="list-style-type: none"> - Double-check communication parameters on MD VFD. - Double-check node address setting on MD VFD. - Check cable connection. - Check status lights on MD VFD adaptor.
			Access advoper			

Alarm Number	Alarm Text	Type	Values	Description	Possible Cause
A807	Feed VFD Fault	Stop Feed	Delay 0s	This alarm is set when the Feed VFD has faulted due to an alarm condition on the VFD.	- Look up alarm code in ACS 880 Firmware manual.
			Access advoper		
A808	Max Feed Pressure	Stop Feed	Units PSI	The alarm is set when the pressure exceeds the alarm limit.	Check feed pressure.
			Min 0		
			Max 60		
			On 20		
			Off 6		
			Delay 3s		
			Access advoper		



Decanter Automation

Allen Bradley

Operator Manual

Document No.: 16
Title: Decanter Automation Manual

The original instructions are in English

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Alfa Laval Corporate AB will enforce its rights related to this document to the fullest extent of the law, including the seeking of criminal prosecution. The instructions given in this manual are intended as a general instruction to Alfa Laval Decanter Automation Allen Bradley. Alfa Laval reserves the right to make changes at any time without prior notice.

If further clarification regarding this manual is required, please contact your local Alfa Laval representative.

Revision History

Date	Revision no.	Description (including software version)	Comments
	1.0	First release	
28-01-2019	2.0	Updated Control Bar buttons with Remote/Local mode options. Updated screenshots.	
13-05-2019	3.0	Added description for screen 601 – units conversion (languages).	


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1. Safety Instructions and Warnings





The following symbols included in this manual refer to safety precautions, which need to be attended to ensure your safety.

	<p>WARNING</p> <p>This symbol is used to indicate the presence of a hazard, which can or will cause severe personal injury if the warning is ignored.</p>
---	--

	<p>CAUTION</p> <p>Certain passages of this manual will be marked with a caution mark. This mark indicates the presence of a hazard which can cause property damage if the instructions are not observed.</p>
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<p>NOTE</p>	<p>NOTE</p> <p>This type of instruction indicates a situation, which, if not avoided, could result in damage to the equipment.</p>
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The equipment is delivered with the following signs:

Requirement Signs		Warning Signs	
	<p>Always use protective foot surface</p>		<p>General Warning</p>
	<p>Always use protective hand-wear</p>		<p>Dangerous Electrical Voltage</p>

1.1 General Safety Guidelines

The following general safety guidelines must be considered on every occasion.

- This operator manual contains vital information that must be considered during all handling of the Decanter Automation Allen Bradley System. The operation manual should be kept available near the equipment.
- If the safety regulations are not followed there is a risk of injuries as well as damage to the machinery and surrounding environment. If these safety regulations are not considered, Alfa Laval will not be held responsible.

WARNING	
	<p>Noise Hazards</p> <ul style="list-style-type: none"> - Use ear protection in noisy environments.
	<p>Crush Hazards</p> <ul style="list-style-type: none"> - Do not work under hanging load. - Wear head protection during installation and maintenance of the equipment.
	<p>Cut Hazards</p> <ul style="list-style-type: none"> - Wear gloves when handling machine parts.

1.2 Safety Regulations during Installation, Operation and Maintenance

- Only authorized and qualified personnel should carry out the installation.
- All work on the machinery must be performed when it is not in operation and the main power switch is **OFF**.
- All local regulations regarding transport and lifting must be followed always.
- Never put hands, other parts of your body or foreign objects into the machinery without making sure the main power supply has been switched **OFF**.

1.3 Noise Emission

- Noise emission corresponds to the values for the rotating bowl.
- The mean sound pressure levels (Lp) measured at as Curve A (ISO 1680 standard)
- LPA < 80-85 dBA at 1 meter

1.4 Modifications and Reconstruction

- Machinery must not be altered or modified in any way if not directly approved by Alfa Laval. The sensors should not be modified or disconnected; altering or disconnecting any of them may jeopardize the warranty.
- Use of original spare parts and accessories guarantee a safe operation. Use of parts from other manufacturers can lead to premature failure of the machinery, cause damage to the machine and surrounding area and jeopardize the warranty.

1.5 Installation Guidelines

- For details on correct wiring, please refer to the corresponding [electrical diagram](#) supplied by Alfa Laval.
- The Decanter and Control Panel(s) are delivered separately and must be electrically integrated together when they arrive on site.
- Check and assemble any interconnecting wiring carefully, ensuring a reliable connection.
- All electrical installations must be done according to local regulations. A certified electrician should carry out this job.
- While working on the electrical installations, the main power supply must be shut **OFF** at all times.
- The HMI enclosure should ideally be mounted within 20 feet (6m) of the Decanter; the operator should have direct eyesight of the equipment from the HMI.
- As a part of the electrical system there must be an easily accessible emergency stop in a safe position close to the decanter. When the emergency stop is activated the feed of product to the decanter must be stopped or diverted. The emergency stop button must not be a part of or fitted on the decanter and it must be visible to personnel around the equipment.

1.6 Unpacking


NOTE	This section is only applicable when the Control Panel is provided by Alfa Laval.
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- Check the delivery and make sure the Control Panel(s) has not been damaged in transit and is complete according to the packing list and orders.
- Verify all electrical components are securely mounted to the back plate and are intact.
- If transport damages are found, please contact a local Alfa Laval agent.

1.7 Lifting

NOTE	This section is only applicable when the Control Panel is provided by Alfa Laval.
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When lifting the Control Panel unit:


	CAUTION <ul style="list-style-type: none">- Cross check that slings are secured. Keep the control panels upright and do not lay flat as damage may occur.- Always use approved equipment for lifting.- When lifting the Control Panel(s) use proper and approved rope slings and ensure the panel remains upright. Depending on the VFD sizes, the panel weight may not be equally distributed, and care must be taken when lifting the panel.- Ensure that the panels are not connected with any other system before lifting (free from interconnections).
---	---

	WARNING <ul style="list-style-type: none">- Always use lifting slings of appropriate strength and dimension to handle the weight of the Panels. Most MCC panels will weigh less than 2000lbs (900kg); however, verify the weight before lifting or transporting the panel(s).- Operators should avoid lifting heavy components.
---	---

1.8 Electrical Installation

NOTE	This section is only applicable when the Control Panel is provided by Alfa Laval.
-------------	---

- All electrical installations must be done according to local regulations. A professional electrician should carry out this job.
- Apart from the fact that the electrical installation must be carried out in a safe, proper and approved way, consider the different methods of how to regulate the equipment.
- While working on the electrical installations, the main power supply must always be shut **OFF**.
 - The power supply source is according to the technical data for the unit (see the type inside the panel or in the electrical drawing).
 - Do not apply power to the panel until an Alfa Laval Technician has verified the installation.

	<p>WARNING</p> <p>Failure to comply with electrical regulations can cause risk of death by touching electrified parts.</p>
---	---

1.9 Storage Guidelines

Unless otherwise agreed, Alfa Laval delivers the equipment ready to be put in service upon arrival and after installation.

If it is necessary to store the equipment for a longer period, certain procedures must be in place to protect and prevent unnecessary wear of the equipment.

Generally, the best solution is to leave the equipment in the packing until installation occurs. In this case, Alfa Laval should be informed, and proper type of packing should be ordered.

- Keep panel(s) in dry protected area from physical damage.

NOTE	<ul style="list-style-type: none"> - There should be absolutely NO ozone producing equipment in the storage room, like operating electric motors or arc welding. Ozone destroys many rubber materials. - Do not store organic solvents or acids in the storage room. - Do not install or store the Panel in a wet area unless environmentally certified for that installation. - Avoid direct heat and ultraviolet radiation to the HMI as it shortens its life expectancy.
-------------	---

2. System Introduction

2.1. Scope

These Operator Instructions are designed as a key to Alfa Laval Decanter Automation Allen Bradley System.

The [following documents](#) can be referenced for useful information:

- Schematics - Project Specific
- Sensor Connection Diagram – Project Specific
- Decanter Automation Allen Bradley – Parameters and Alarms Manual

2.2. System Description

The Decanter consists of a high-speed rotating assembly with internal conveyor that separates solids and liquids (2 Phase Decanter) or otherwise solids, liquids and oils (3 Phase Decanter). The Decanter consists of a Main Drive Motor connected to the Bowl. The bowl operates at speeds from 1850 to 5300 RPM depending on the model purchased. The Back Drive is connected through a Gearbox to a scroll conveyor. The gearbox can be either Direct Drive (DD) or a Standard Planetary (SP); each one has a unique operating algorithm and must be set up correctly to function properly. This controls the Differential between the bowl and the conveyor. A high differential typically results in a wetter product and low differential results in dryer discharge.

If the Decanter is equipped with a direct drive gearbox, it may also include a torque arm. The torque arm is connected to a strain gauge load cell and very accurately measures the torque being provided by the weighing scale to the gearbox to operate the scroll conveyor. The 4-wire sensor provides a differential very low voltage signal when force is applied. This torque may also be displayed through calculations via measurements of points within the VFD.

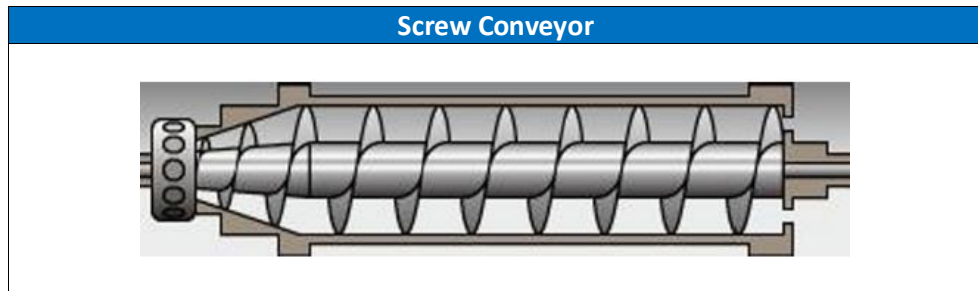
If a planetary gearbox is supplied, torque can only be calculated via measurements from the VFD. On Standard Planetary Gearbox Decanters, there will be no torque arm in the machine.

The Decanter may come equipped with an automatic grease/lubrication system. This system is connected to the control system through the X9 connector of the Junction Box. Grease is automatically pumped to the bowl bearings at timed intervals. A low grease level will signal the operator when the reservoir needs to be refilled. This system does not automatically grease the conveyor bearing and must still be performed manually after each LS CIP and each normal grease cycle.

2.3. Process Operation

2.3.1. Differential Speed Control

The essential job of the Decanter Automation System is to control the *differential speed* (Dn) of the screw conveyor inside the Decanter.

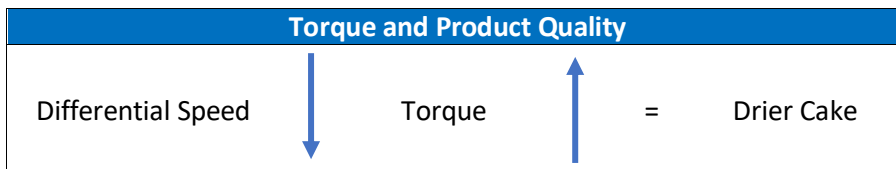


Adjusting the differential speed will influence the *torque* (T) on the screw conveyor.

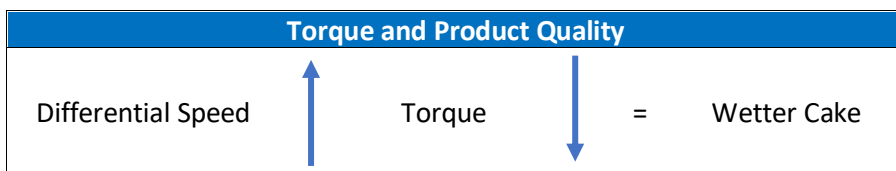
2.3.2. Torque and Product Quality

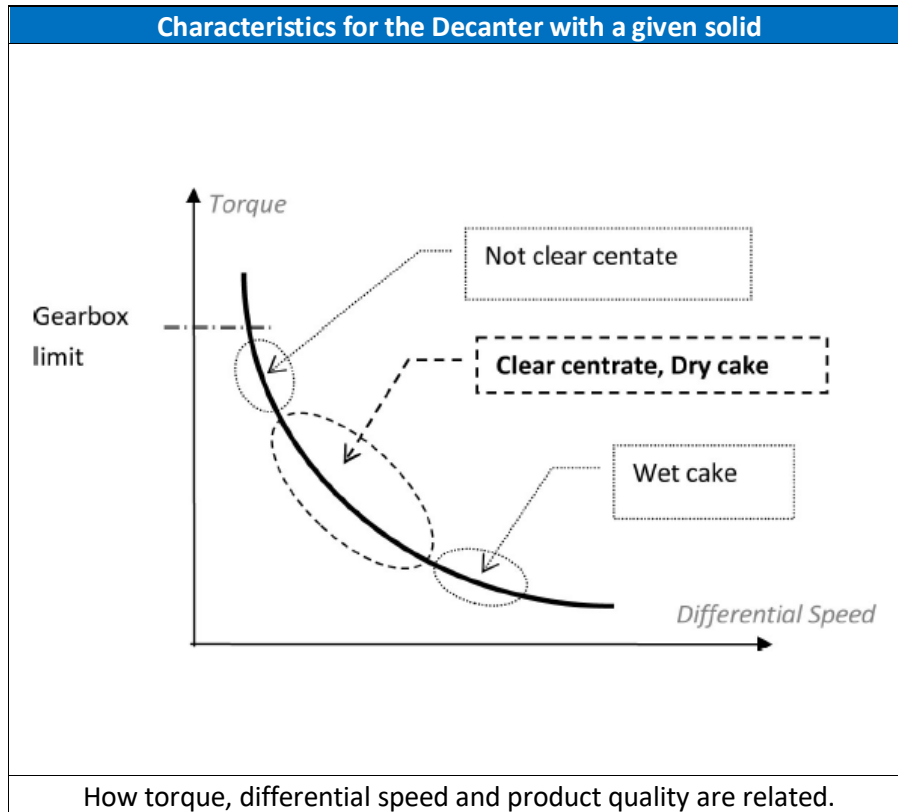
The *torque* (T) on the conveyor is an indicator of the amount of solids accumulated inside the Decanter.

In general, the conveyor torque will increase when the differential speed is lowered. And a high torque will typically result in a drier cake.



On the other hand, a higher differential speed will increase the transport of solids out of the decanter and this will lead to a decrease in conveyor torque.





If the differential speed is lowered too much, the torque becomes too high. This will eventually result in less clear centrate, i.e. more solids in the liquid outlet of the Decanter. The torque might also reach the maximum level allowed for the gearbox.

2.3.3. Optimal Settings

The optimal setting of differential speed and conveyor torque is the best combination of dryness of the cake and clearness of the centrate.

To obtain the best performance of the Decanter, other process factors must be considered.

These include:

- Bowl speed
- Liquid level in the bowl
- Feed rate into the Decanter

NOTE	If the liquid level is too high, it might not be possible to transport sludges out of the Decanter.
-------------	---

2.3.4. Torque Mode (T-mode)

The feed flow rate, as well as the solids concentrations in the feed, typically varies throughout the day. This will impact the load (torque) on the screw conveyor and may consequently affect the product quality.

Torque mode (T-mode) is used to constantly ensure high quality in the product. It maintains an optimal number of solids in the Decanter. This is achieved by varying the differential speed of the conveyor per the measured torque load. The torque set-point in T-mode is T_{max} .

In the HMI, *Torque Set-point* (T_{max}) is identified by the number **S302**.

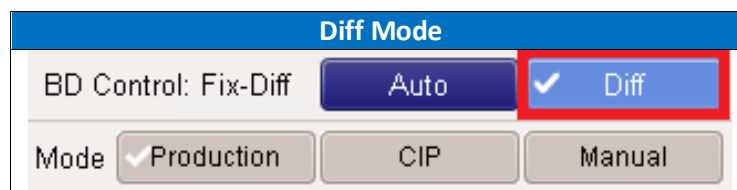
In T-mode, the Decanter Automation System keeps the Torque per the value entered in **S302**, which must be set in accordance with the installed gearbox.

2.3.5. Differential Speed Mode (Dn-mode)

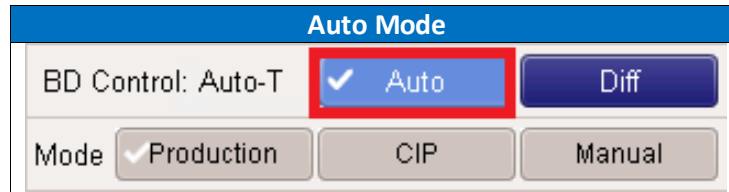
Differential speed control makes it possible to optimise and monitor the operation of the Decanter. During operation, it adjusts the differential speed between bowl and conveyor automatically and regulates the conveyor torque load.

The torque load on the conveyor is an indicator of the number of solids accumulated inside the Decanter. In general, both cake dryness and conveyor torque will increase when the differential speed is lowered. A higher differential speed, on the other hand, will increase the transport of solids out of the Decanter and this will lead to a decrease in conveyor torque.

If the differential speed is too low, i.e. the torque becomes too high, the centrate will at some point become less clear, and the torque might also reach the maximum level allowed for the gearbox. Selecting *Diff mode* on the touch screen display will cause the Decanter to run in fixed differential speed mode and to maintain the speed as set by the parameter *S301 Diff Speed Set-point*.

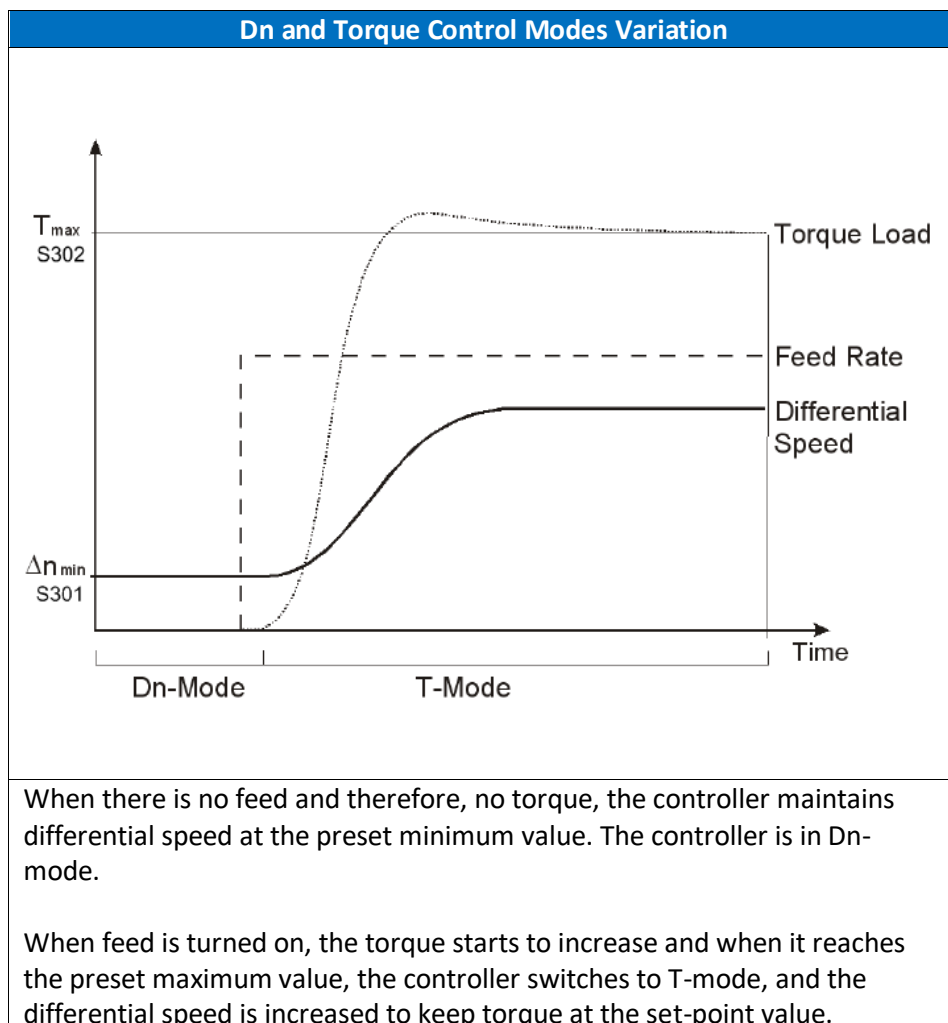


Selecting *Auto mode* sets an automatic mode where the operational behaviour of the controller is determined by the set-points for differential speed and torque. The controller automatically selects between Dn-mode (differential speed control) and T-mode (torque control), depending on the measured torque.





In the HMI, *Differential Speed Control* with set-point Dn_{min} is set by parameter $S301$ and *Torque Control Mode* with set-point T_{max} is set by parameter $S302$.



Set-point values are stored in the memory of the system, even when the controller is turned off. When turned on, the system will start up in automatic control mode with the stored set-points active.



Set-points for speed and torque can be modified by the user via the dashboard on the Decanter Overview Screen.

Dashboard on Decanter Overview Screen	
 Torque kNm ^L 5.0 4.8	Set-point and actual value
 Diff Speed RPM ^L 1.4 1.5	Set-point and actual value During automatic control and T-mode, the actual differential speed is higher than the set-point.

The operation status is displayed on the Decanter Overview Screen 101. This informs the user of the current control mode.

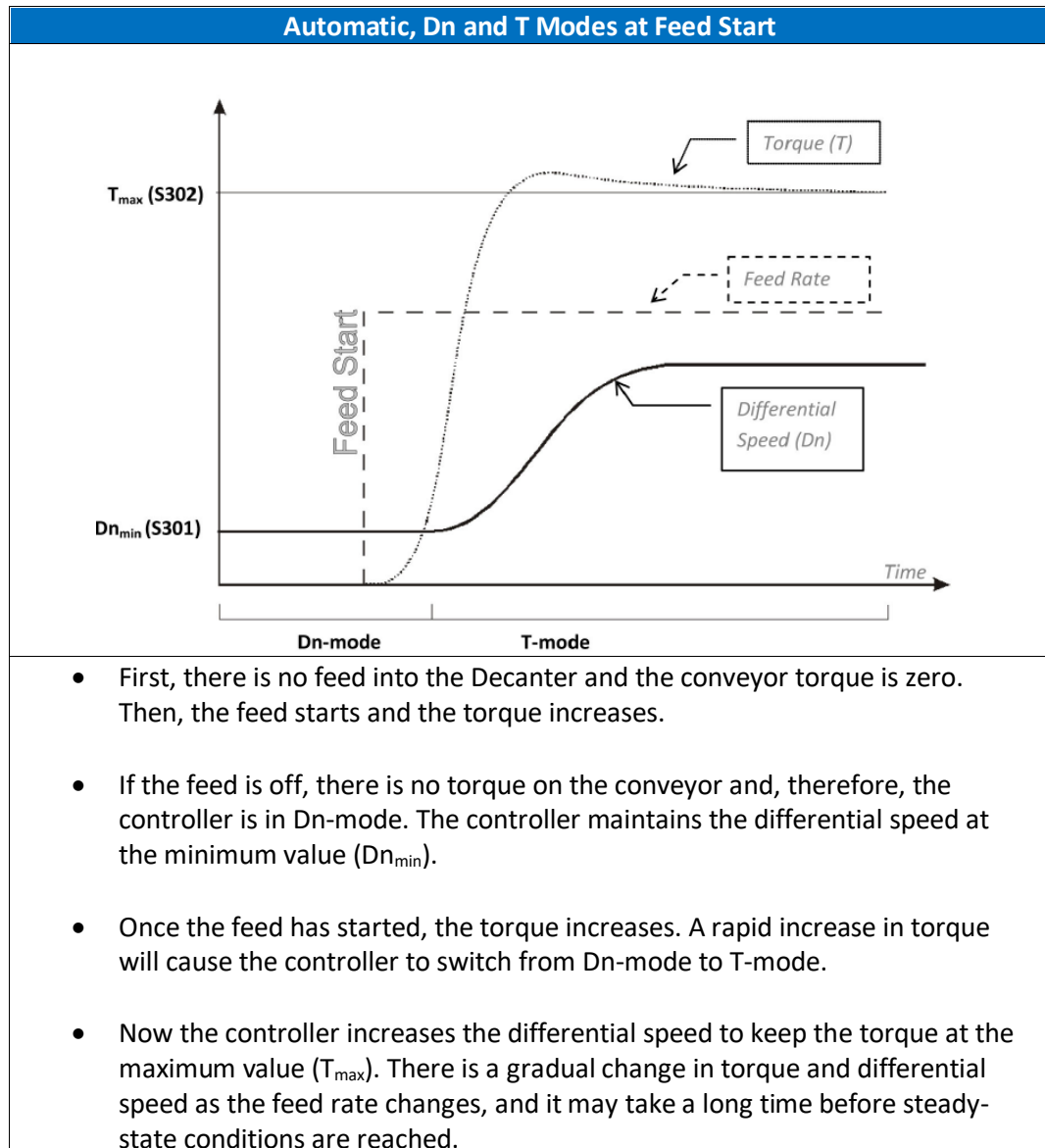
Dashboard on Decanter Overview Screen	
 Auto  Diff	The Auto and Diff buttons for changing between automatic control and fixed differential speed control.
BD Control: Auto-T	Automatic control: T-mode Torque control mode. The set-point T_{max} is set by S302 Torque .
BD Control: Auto-Dn	Automatic control: Dn-mode Differential speed control mode. The set-point is set by S301 Diff Speed .

2.3.6. Torque Overload Protection

To avoid problems of torque overload, torque set-point $S302$ must be set in accordance with the gearbox size.

To avoid difficulties when turning on the feed, differential speed set-point $S301$ should not be set too low, and the initial flow rate should not be too high.

An example is shown below:

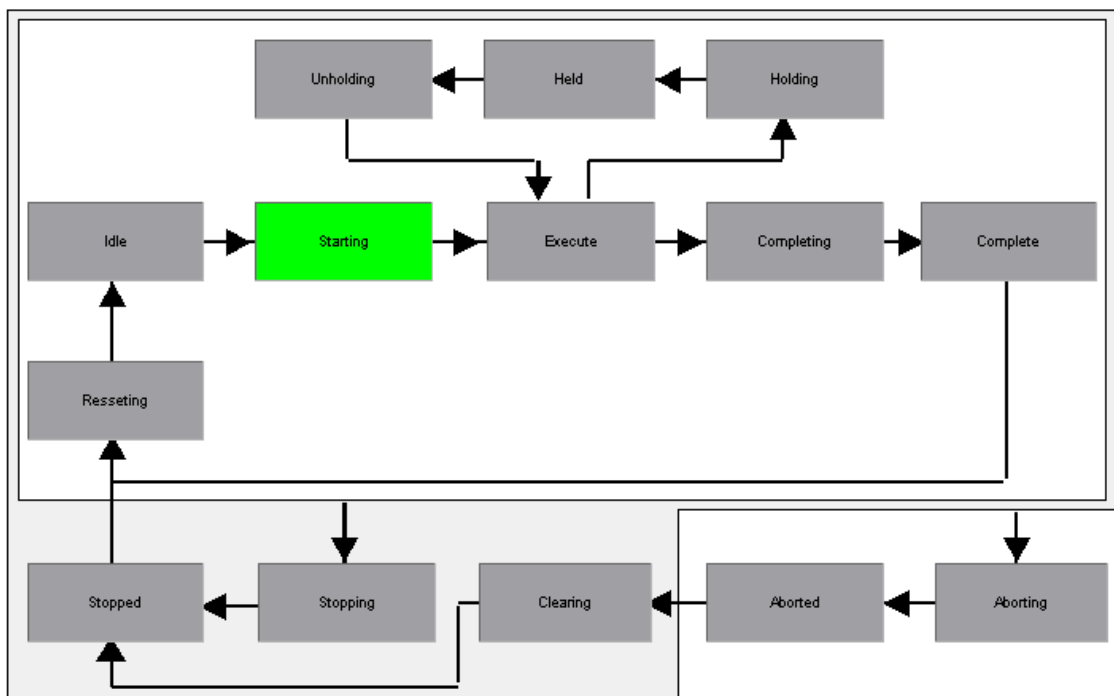


2.4. Decanter Operating Modes

PackML is an industry technical standard applied with a primary objective to bring a common “look and feel” and operational consistency for all Alfa Laval Products. In compliance with the PackML modes, the Decanter can operate in below three modes. The state model gets automatically adapted and shows the applicable states for the active mode. Change of mode is only permitted in **Stopped** state and hence disabled during all other states.

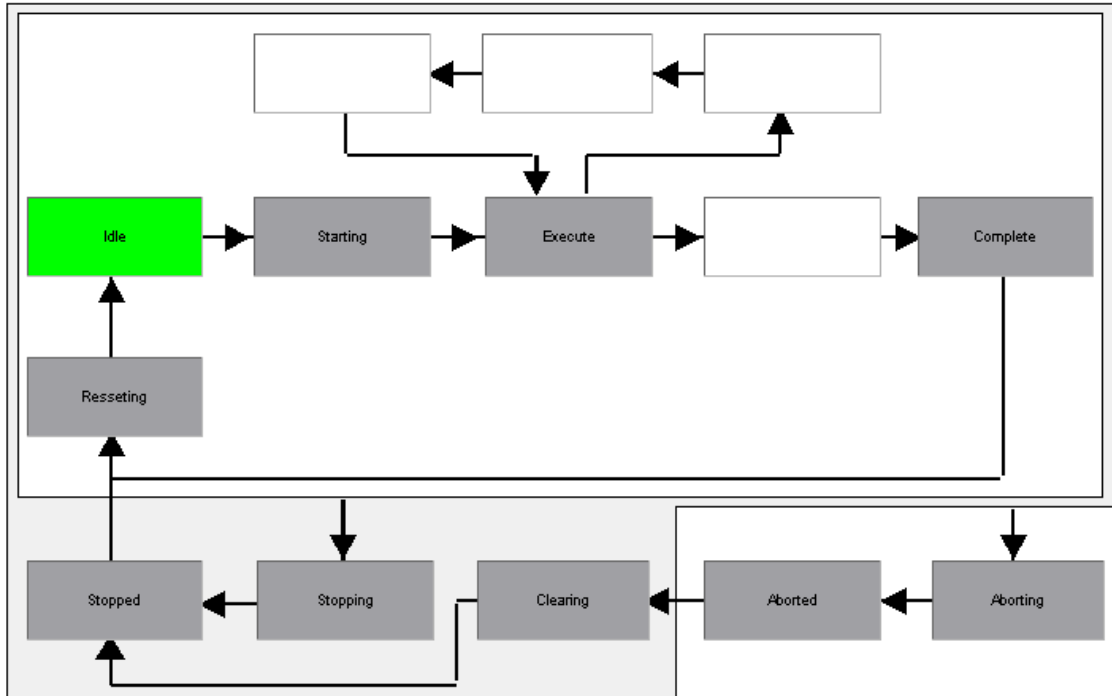
2.4.1. Production

This represents the mode which is utilised for routine production. The decanter works according to automatic sequences and differential control is active according to the selection as described in the section above. The LS CIP sequences can also be programmed to run at the end of production cycles based on parameter. This takes place in the completing state of production mode.



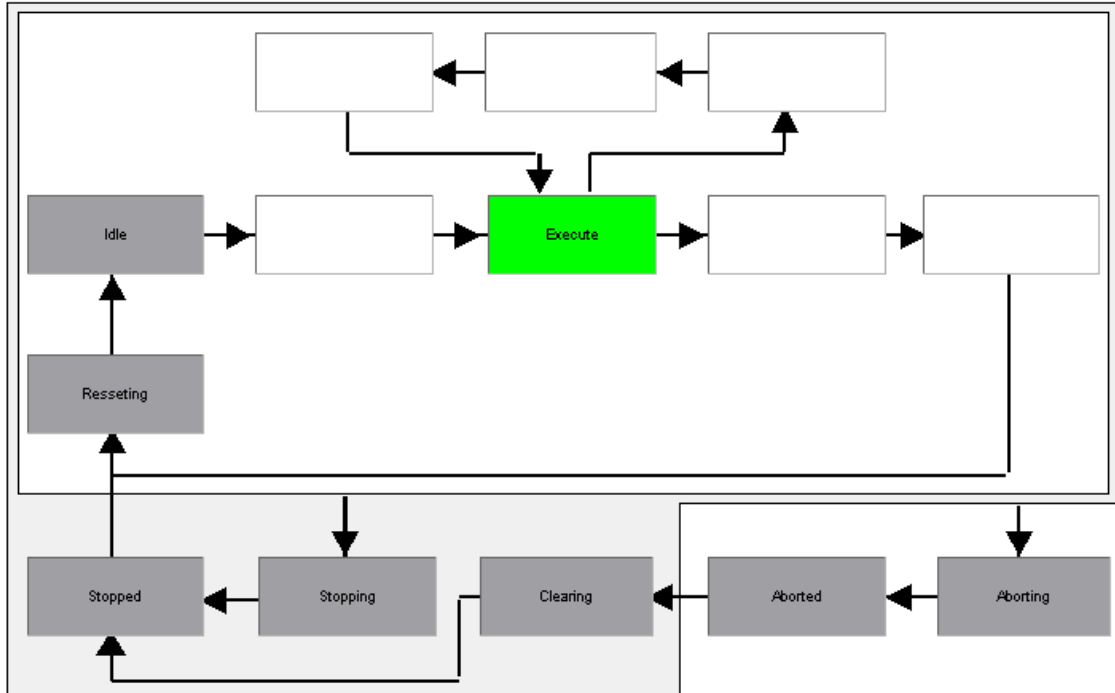
2.4.2. LS CIP

This mode is used for performing periodic low speed CIP sequences as per user requirement.



2.4.3. Manual

This provides direct control of individual devices (VFDs and Valves) for testing purpose. As the name implies, all operations are result of manual actions by the operator and no automatic sequences are executed. This mode is only intended to be used during start up to test the devices.



3. Decanter Sensors

3.1. Vibration Sensors

The simplest monitor is a frame mounted sensor that monitors the Decanter's vibration and outputs a 4-20mA signal to the control system measuring in 0-50 mm/sec of vibration. The frame mounted sensors are typically used on the smaller machines (200 and 280 mm bowl size) and not recommended for medium and large machines.


Model	IFM VKV022
Vibration Sensor on the Decanter	1



The image shows an IFM VKV022 vibration sensor. It is a cylindrical device with an orange top section and a silver bottom section. The orange section has a threaded top and a scale for 'RMS Set' with units in mm/s and inches. Below the scale is a 'Delay Set' dial with units in seconds. The silver section has two output terminals labeled 'V[mm/s] 10...1000Hz'.

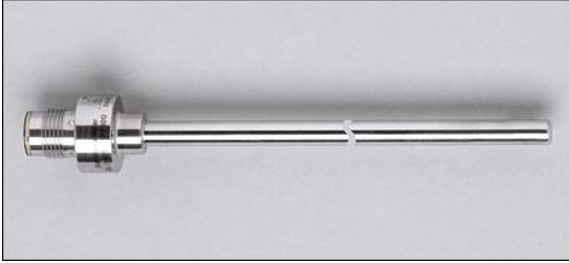
The second option for vibration monitoring consists of an accelerometer mounted near the temperature sensors on each of the Main Drive and Gearbox end bearings. The low voltage signals are routed back to the control system to a Vibration monitor amplifier and supply a 4-20mA signal to the control system, like the frame mounted sensor.

Model	IFM VSP001
Vibration Sensor on the Decanter	2



3.2. Temperature Sensors

Depending on the Decanter model, two bearing mounted RTD sensors may be included to monitor the temperature of the bearings on Main Drive and Gearbox end of the rotating assembly. These sensors protrude into the bearing to accurately measure the bearing temperature.

Model	IFM TT7281
Temperature Sensor on the Decanter	2
	

3.3. Speed Sensors

The machine contains two PNP speed sensors, one connected to monitor the bowl speed and the other connected to the Back-Drive Motor to monitor the Pinion Speed. These two sensors calculate the differential speed that measures the difference between the bowl and the scroll conveyor. On most of the machines, there will be two speed pickup points per revolution (two pulses per revolution); however, this should be verified before operating the machine.

Model	IGT219
Speed Sensor on the Decanter	2



3.4. Cover Switch

A cover switch may also be provided to signal the control system when the Decanter cover is open.

The cover switch senses an open condition and will prevent the system from starting. In addition, if the system is running and the cover is opened, the control system will stop the operation of the Decanter.

Model	Schmersal BPS 33
Cover Switch on the Decanter	1




WARNING

If the cover is opened during operation, power will be removed from the motors through the safe torque off circuit; however, the bowl will continue to rotate and slowly coast to 0 RPM. This deceleration and rotation of the bowl may last 30 minutes or more after power is removed from the motors. Contact with the rotating bowl is extremely dangerous and must always be avoided. Any contact with high-speed rotating equipment could be fatal to personnel if coming in contact with the rotating bowl. Additionally, product from inside the Decanter may continue to discharge and injury could result when coming in contact with the hot product.

3.5. Load Cell Sensor

This sensor provides accurate measurement of torque using weight as a measuring parameter.

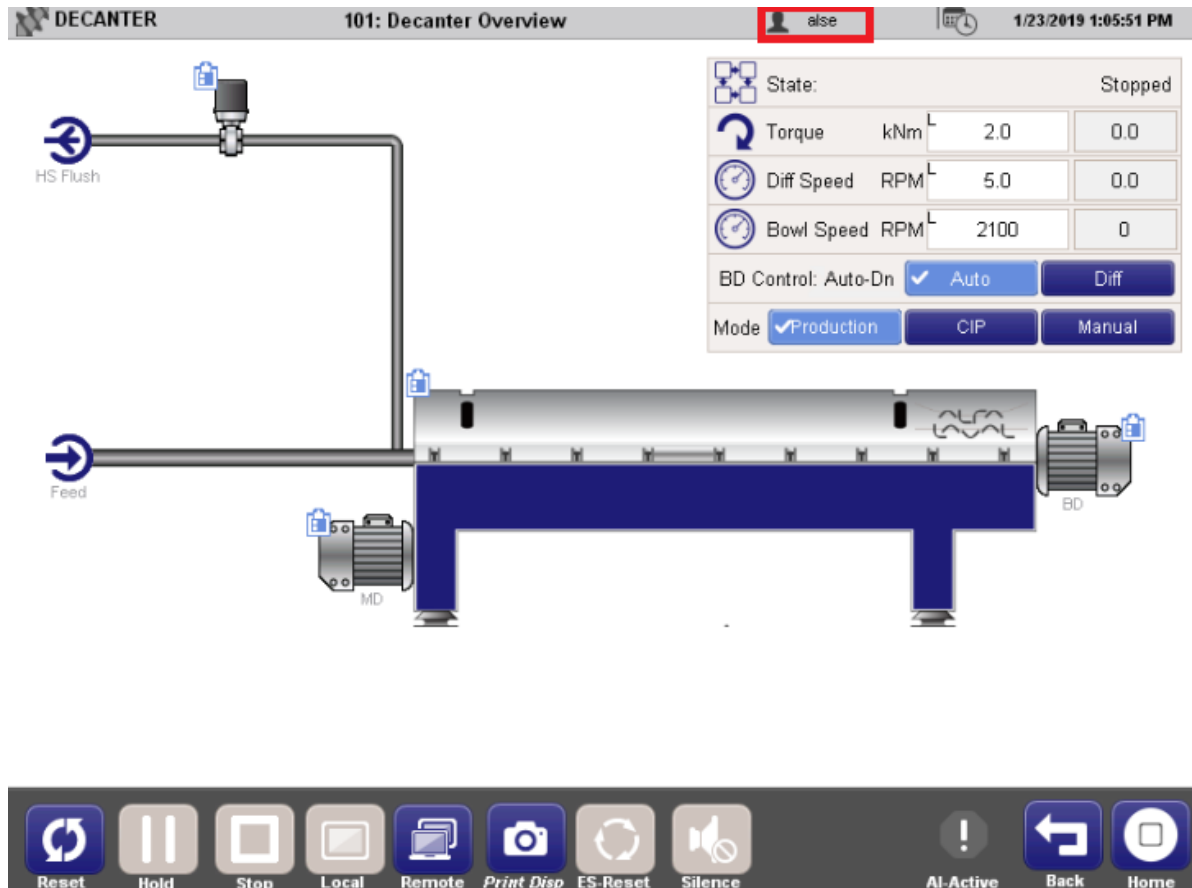
The load cell is a sensor used for DD Gearbox and there is only one in the machine.

Part Number	61211273-40
Load Sensor on the Decanter	1
	
Revere Transducers 9363-250KG-C3-20T1-R	

4. Security and Access Levels

Access levels are used to prevent unauthorised access to parameters and other features.

The user name indicating current access levels is displayed on the security bar located on the middle of the screen.



4.1. User Levels

The user levels are allocated as below:


Guest Lowest level of operation available on the system. Guest level is designed to view-operation only.	
User Name	Password
Guest	N/A
Can	Cannot
View all screens.	Control anything. View faceplates Modify parameters Modify alarms

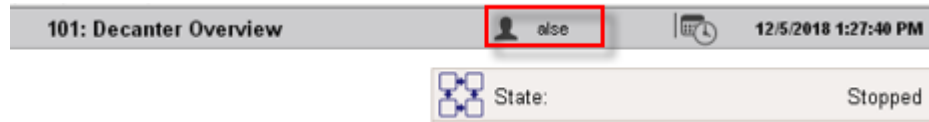
Operator Normal level of operation on the system.	
User Name	Password
operator	2821
Can	Cannot
Control all equipment that is enabled for Automatic Control.	View faceplates.
View all parameter screens.	Modify parameters
View all alarm screens.	Modify alarms
Acknowledge alarms.	

Advanced Operator Highest level of log-in provided to customer.	
User Name	Password
advoper	3584
Can	Cannot
Operator functions.	Edit important motor parameters.
View all parameter screens.	Edit max bowl speed parameter limits
View all alarm screens.	Disable / modify important operation alarms.
Restore parameters.	
Edit main drive bowl speed.	
Edit flushing parameters.	
Edit diverter configuration.	
Change operating mode	

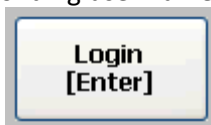
5. Navigation

5.1. Log in

1. Click on the  icon on the security bar located in the middle of the screen.



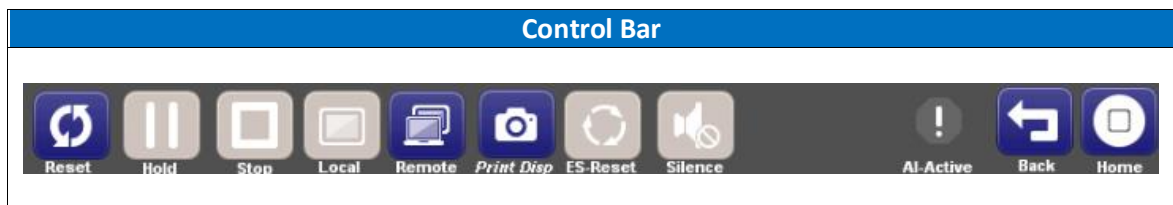
2. Enter the corresponding user name and password by using the pop-up keyboard






and press **ENTER**.









5.2. Control Bar

Virtual buttons are placed on the control bar located on the bottom of each screen.



The following buttons can be found:

	Name	Description
	Start	Press and hold for two seconds to start the Decanter. Press and hold again for two seconds to start Production mode.
	Reset	Press and hold for two seconds to start the Decanter. Press and hold again for two seconds to start Production mode.
	Hold	Press and hold for two seconds to exit Production mode and continue to run idle at full speed.

	<p>Stop</p>	<p>Press for normal shutdown sequence.</p> <p>Press a second time to cancel the Full Speed Flush mode.</p> <p>Press a third time to cancel the Rundown Flush mode.</p>
	<p>Horn Silence</p>	<p>If a new alarm is active, this icon will turn blue. Pressing this icon will silence the alarm horn.</p> <p>By default, this button is disabled.</p>
	<p>Safety Relay Reset</p>	<p>Duplicates the physical Safety Relay Reset button normally mounted on the VFD panel door.</p> <p>Either button should be operated after the E-stop button to activate or rearm the safety circuits.</p>
	<p>Alarms</p>	<p>This icon will blink when a new alarm is active. Pressing it will direct you to screen 201 Active Alarms.</p> <p>Allows to:</p> <ul style="list-style-type: none"> • Acknowledge alarms • View the latest alarms <p>After the alarm has been acknowledged, if an alarm still exists, the icon will be steady red.</p>
	<p>Previous</p>	<p>Returns to the previous screen (other than Navigation and Overview screens).</p>
	<p>Home</p>	<p>Displays the Home navigation screen where the operator can directly access the screens corresponding to his user level.</p>
	<p>Print screen</p>	<p>Makes the screenshot from the actual HMI screen and saves it to the USB memory stick inserted into USB slot on the HMI.</p>
	<p>Local / Remote</p>	<p>Used to select the source of machine control.</p>

5.3. Parameters and Alarms Set up

There are different ways to set up parameters and alarms in the HMI:

Parameters

- A. Some parameters allow the user to select the proper value by using up/down keys. In the example below, the active value for **P205 Max Bowl Speed** is currently 2100; however, it can be changed by selecting either the up or down keys, and then the right key to select the value (in this example, 2500 RPM is the value to be selected instead of 2100).

P204	Bowl Pulley	mm	1.00	≤	1.00	≤	1000.00
P205	Max Bowl Speed		▲ ▼ 2500 RPM ▶				2100
P206	Max Rev Bowl Speed	RPM	0	≤	-100	≤	-5300

- B. Some parameters will have a minimum and maximum value that defines the limit for that parameter. Use the pop-up numpad to enter the required value. In the example below for **P104 Min Bowl Speed Delay** value can be between 0 and 99999. When the user presses the set-point field, the numeric pad defines the limits of the value that can be entered by the operator.

DECANTER 702: Parameters Main Drive #1 | else | 1/23/2019 1:05:10 PM

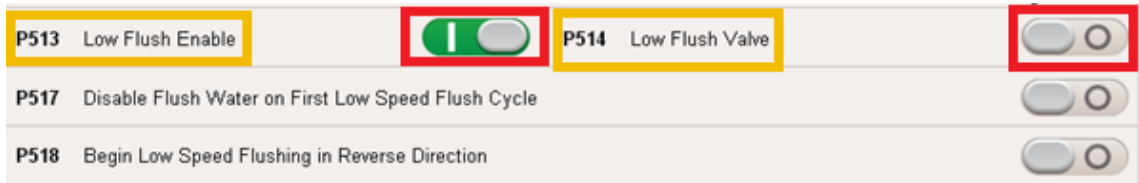
P104	Min Bowl Speed Delay		30	≤	99999
P107	Min Bowl Speed		95	≤	100
P108	Bowl Stop Speed		50	≤	100
P109	Min Rundown Time		30	≤	600
P201	Pulse Per Revolution Bowl		2	≤	4
P203	Main Motor Pulley		1.00	≤	1000.00
P204	Bowl Pulley		1.00	≤	1000.00
P205	Max Bowl Speed		▼ 2200 RPM ▶		2200
P206	Max Rev Bowl Speed		-100	≤	-5300
P207	Bowl RPM Ref		2100	≤	2200
P208	Bowl RPM Tolerance		90	≤	100

ParameterName\P104
30
0 ~ 99999

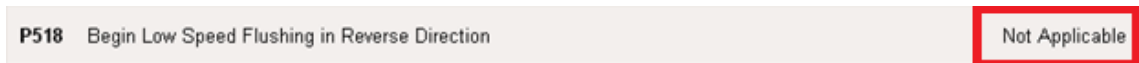
7 8 9
4 5 6
1 2 3
. 0 -
ESC ← ↵

Reset Hold Stop Local Remote Print Disp ES-Reset Silence AI-Active Back Home

- C. Some parameters are digital, which means they can be either ON or OFF. In the example below, **P120 Option Cover Switch** is enabled (ON) and **P114 Option UPS** is disabled (OFF).

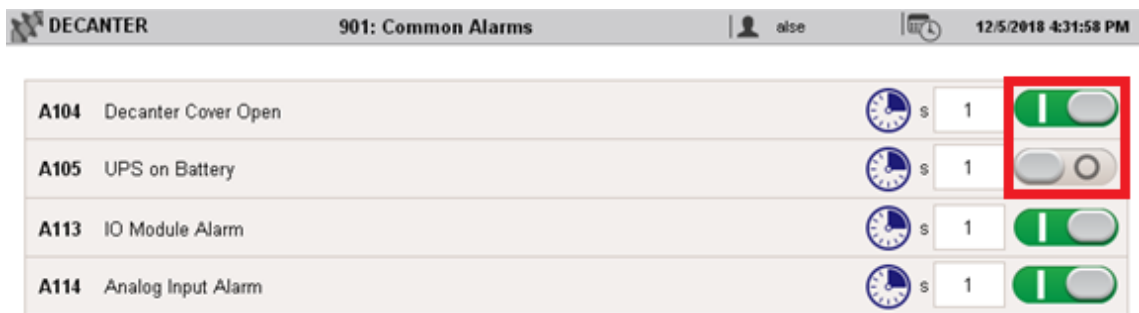


- D. Depending on the user's configuration and requirements, certain alarms and parameters will show a *Not Applicable* status.

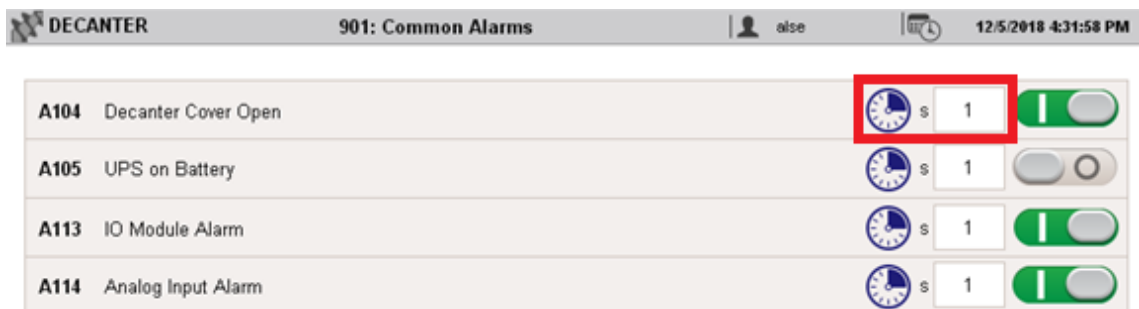


Alarms

- A. The basic alarm has a toggle switch to enable/disable the alarm.



The time delay sets the duration before the alarm is activated.



- B. Some alarms have additional settings depending on the access level of the user. The operator can change the values of the **Show Set P. (ON/OFF)** and **Show Limit (Min./Max.)** fields by taping on them and entering the new value in the pop-up numpad.

Alarm ID	Description	Unit	Value	Toggle
A101	Stop Speed Not Reached	s	60	ON
A102	Min Speed Not Reached	s	1800	ON
A201	Min Operating Bowl Speed	%	ON: 90, OFF: 50	ON
A202	Max Operating Bowl Speed	RPM	ON: 2300	ON
A203	Max Bowl Speed Deviation	RPM	ON: 100	ON
A208	MD Still Running	s	5	ON
A209	MD Not Running	s	5	ON
A210	MD High Temp			OFF
A213	MD VFD Alarm			OFF
A214	MD VFD Tripped			ON
A216	MD VFD Comm Error			OFF

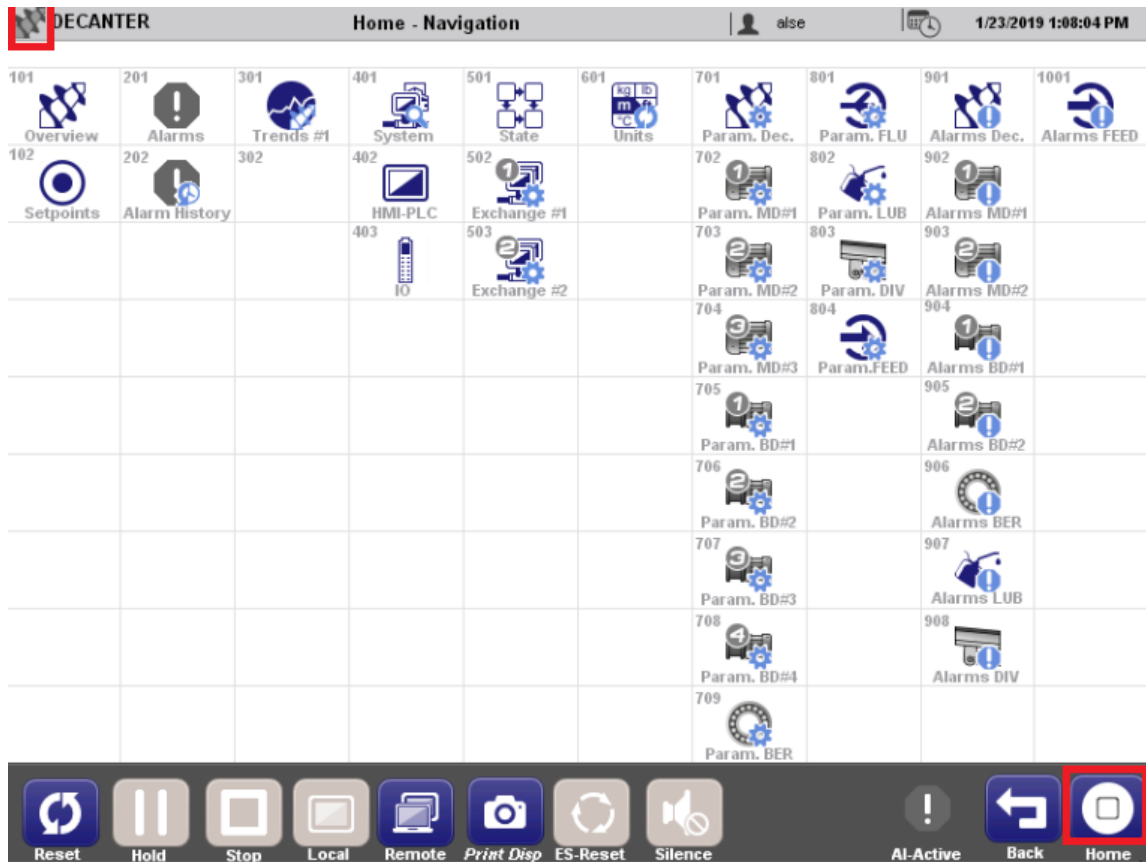
In the example below, alarm **A201 Min Operating Bowl Speed** is enabled.
Based on the limits entered, the alarm will be active when the minimum bowl speed rises above 100; likewise, when the speed falls below 80, the alarm will automatically reset.

The screenshot displays the '902: Main Drive Alarms #1' configuration screen. At the top, the header shows 'DECANTER', the user 'alse', and the date/time '1/23/2019 1:07:20 PM'. The main area lists several alarms with their respective settings and status:

Alarm ID	Description	Unit	Value	Enabled
A101	Stop Speed Not Reached	s	60	Yes
A102	Min Speed Not Reached	s	1800	Yes
A201	Min Operating Bowl Speed	%	MIN 80, MAX 100	Yes
A202	Max Operating Bowl Speed	RPM	ON 2300	Yes
A203	Max Bowl Speed Deviation	RPM	ON 100	Yes
A208	MD Still Running	s	5	Yes
A209	MD Not Running	s	5	Yes
A210	MD High Temp			No
A213	MD VFD Alarm			No
A214	MD VFD Tripped			Yes
A216	MD VFD Comm Error			No

The A201 row is highlighted with a red border. A 'Show Set P.' button is visible next to the MIN 80 and MAX 100 values. A control bar at the bottom contains icons for: Reset, Hold, Stop, Local, Remote, Print Disc, ES-Reset, Silence, AL-Active, Back, and Home.

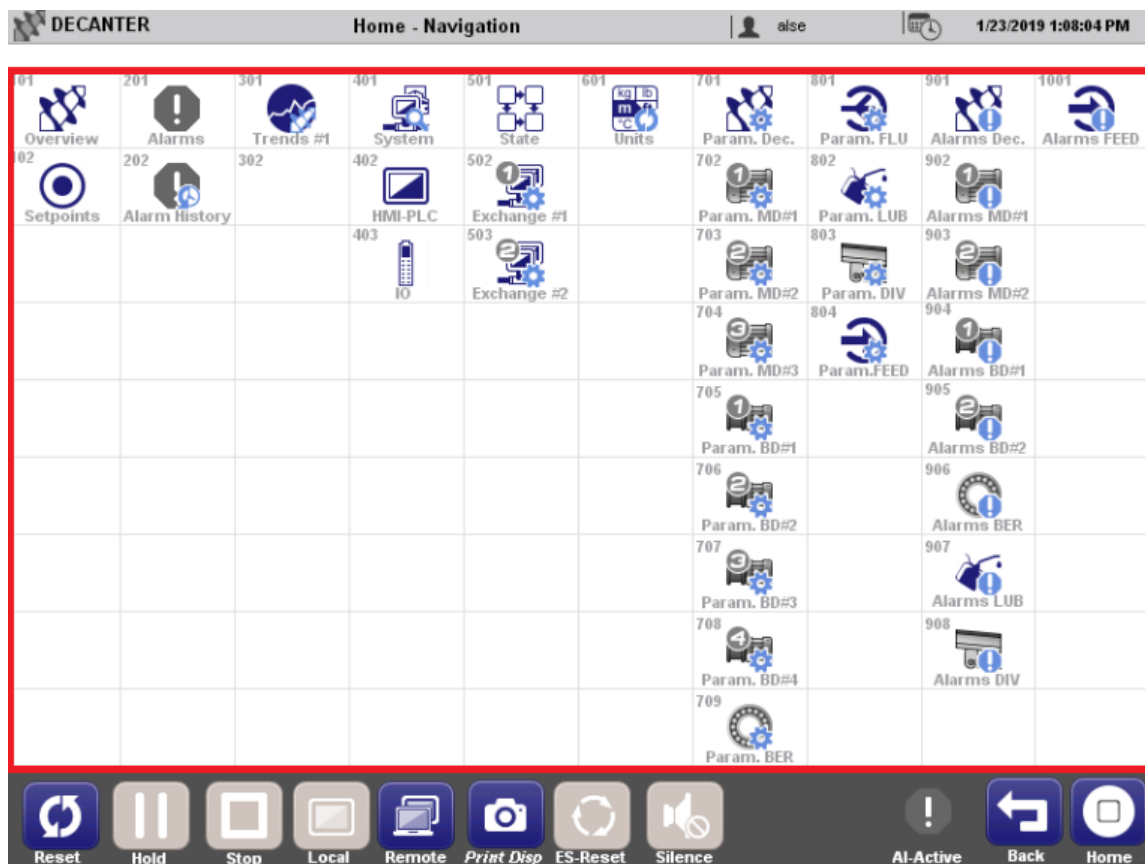
5.4. Home Screen



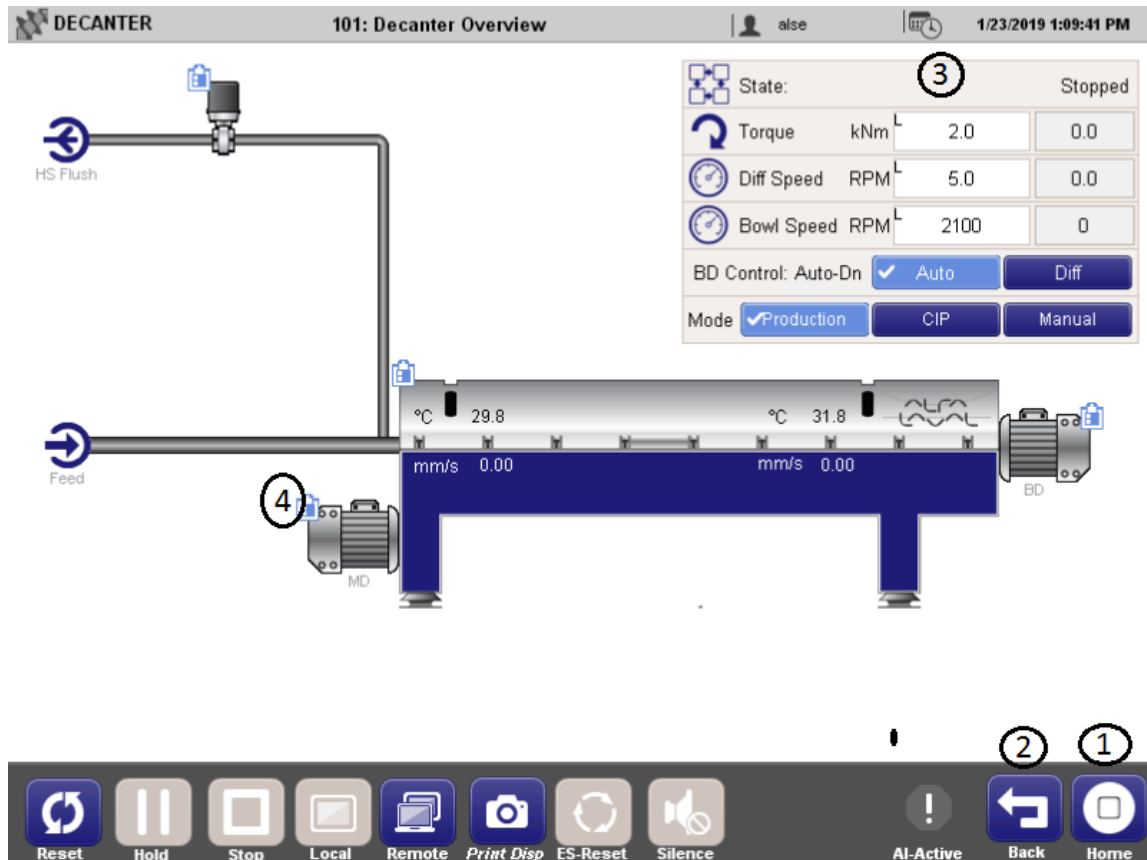
The *Home* icon gives an overview for screen navigation, which provides direct access to all the screens. This unique Alfa Laval display makes navigation quite simple; every screen can be accessed with one or two screen touches.

Likewise, pressing the top left corner (on the scroll conveyor image) will result in the same screen.

The screens are grouped into main columns. Each column has several subpages indicated in the rows of the *Home* screen.



5.5. Decanter Overview – Screen 101



Icon	Description
1	Home Tap to get an overview of screen navigation.
2	Previous Tap to navigate back to the visited screen.
3	Decanter Digital Dashboard Provides details on: <ul style="list-style-type: none"> • State: shows the current running mode. The available modes can be found in screen 501. • Torque: the number in white is the torque set-point entered by the operator (S302) and the one in grey is the torque value coming from the VFD. • Diff. Speed: the number in white is the differential speed entered by the operator (S301) and the one in grey is the real differential speed as calculated from the machine pulse counters. • Bowl speed: the number in white is the bowl speed entered by the operator and the one in grey is the real bowl speed as counted by the machine pulse counter. • BD Control: Decanter can be set for <i>Auto</i> or <i>Diff</i> back drive control. <ul style="list-style-type: none"> Auto – the Decanter Back Drive adjusts the differential to hold constant the torque value entered by the operator. Diff – the Decanter Back Drive maintains a fixed differential speed value and allows the torque to adjust accordingly.

		<ul style="list-style-type: none"> • Mode: three different operating modes can be chosen from the <i>Overview</i> screen (Production / LS CIP / Manual). Refer to Section 2.3 for more information regarding the operating modes.
4	Faceplate	Tap to access more information on the Decanter component. Opened faceplate can contain control functions for certain equipment.

If the Decanter is in *Auto* Back Drive Control, the Decanter Back Drive will adjust differential speed to meet the torque set-point.

If the Decanter is in *Diff* Back Drive Control, the Decanter Back Drive speed will be fixed at the input differential.

5.5.1. Faceplates

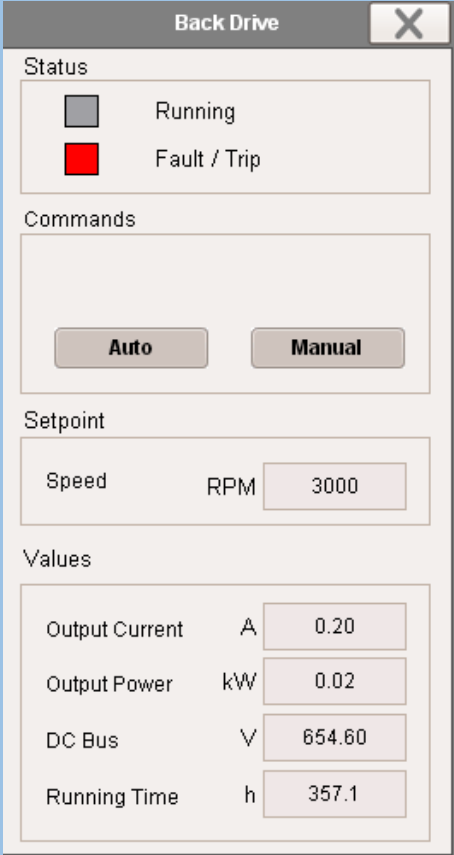
Some of the equipment images on **screen 101 Decanter Overview** include a small square symbol of the faceplate:

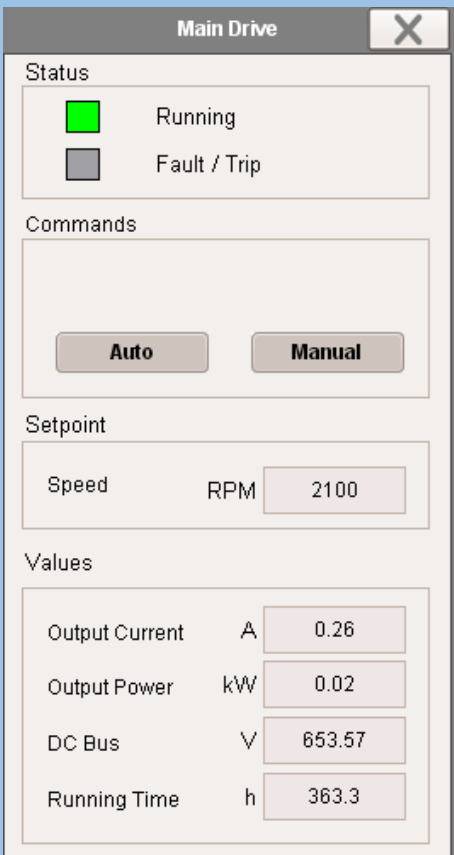


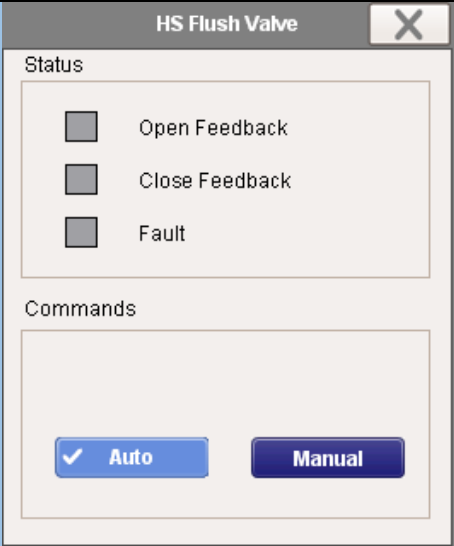
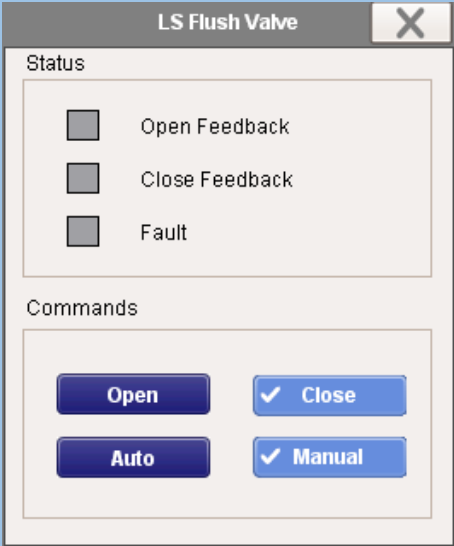
This symbol indicates that there is an additional screen available for this equipment, its monitoring and/or control. Tap the equipment icon and the faceplate window will pop up.

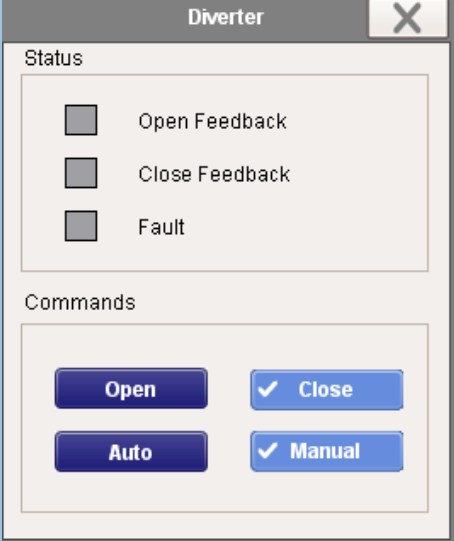
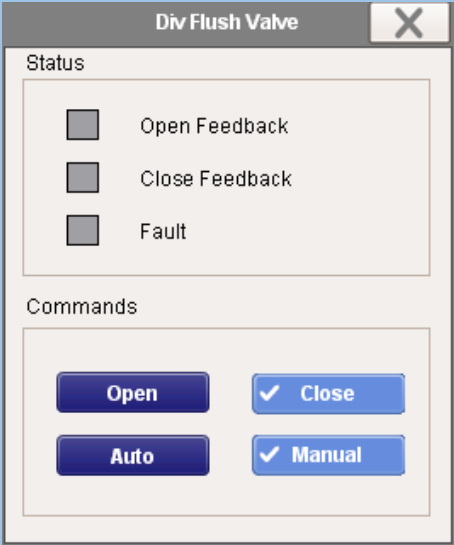
These are examples of faceplates:

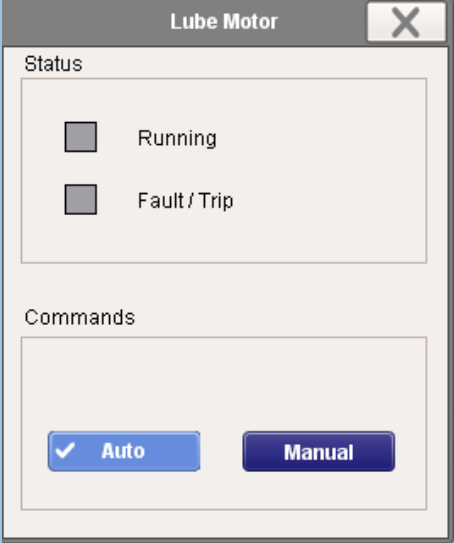
	Name	Description																		
<table border="1"> <thead> <tr> <th colspan="3">Decanter Faceplate</th> </tr> </thead> <tbody> <tr> <td>Bowl Speed</td> <td>RPM</td> <td>1950</td> </tr> <tr> <td>Pinion Speed</td> <td>RPM</td> <td>195</td> </tr> <tr> <td>Bearing Temperature MD End</td> <td>°C</td> <td>29.8</td> </tr> <tr> <td>Bearing Vibration MD End</td> <td>mm/s</td> <td>2.75828</td> </tr> <tr> <td>Bearing Temperature GB End</td> <td>°C</td> <td>31.8</td> </tr> </tbody> </table>	Decanter Faceplate			Bowl Speed	RPM	1950	Pinion Speed	RPM	195	Bearing Temperature MD End	°C	29.8	Bearing Vibration MD End	mm/s	2.75828	Bearing Temperature GB End	°C	31.8	Decanter Faceplate	<p>Actual values for:</p> <ul style="list-style-type: none"> • Bowl Speed • Pinion Speed • Bearing Temperature MD end • Bearing Vibration MD end • Bearing Temperature GB end • Bearing Vibration GB end
Decanter Faceplate																				
Bowl Speed	RPM	1950																		
Pinion Speed	RPM	195																		
Bearing Temperature MD End	°C	29.8																		
Bearing Vibration MD End	mm/s	2.75828																		
Bearing Temperature GB End	°C	31.8																		

	<p style="text-align: center;">Back Drive Faceplate</p> <p>Status</p> <ul style="list-style-type: none">• Running – green checkbox• Fault / Trip – red checkbox <p>Commands Different buttons to activate an action</p> <p>Start / Stop</p> <ul style="list-style-type: none">• Manual start of back drive motor• Manual stop of back drive motor <p>Auto / Manual</p> <ul style="list-style-type: none">• Automatic operation of back drive motor• Manual operation of back drive motor <p>Set-point</p> <ul style="list-style-type: none">• Speed – depending on the operating mode, the controller will send speed value to the Back Drive, which can be visualised here. <p>Values</p> <ul style="list-style-type: none">• Output Current• Output Power• DC Bus• Running time <p>These are actual values read from the VFD for diagnosis purposes.</p>
--	--

 <p>Main Drive Faceplate</p>	<p>Status</p> <ul style="list-style-type: none">• Running – green checkbox• Fault / Trip – red checkbox <p>Commands</p> <p>Different buttons to activate an action</p> <p>Start / Stop</p> <ul style="list-style-type: none">• Manual start of main drive motor• Manual stop of main drive motor <p>Auto / Manual</p> <ul style="list-style-type: none">• Automatic operation of main drive motor• Manual operation of main drive motor <p>Set-point</p> <ul style="list-style-type: none">• Speed – corresponds to the value of set-point S301 Diff Speed. <p>Values</p> <ul style="list-style-type: none">• Output Current• Output Power• DC Bus• Running time <p>These are actual values read from the VFD for diagnosis purposes.</p>
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 <p>The screenshot shows the 'HS Flush Valve' faceplate. It has a title bar with a close button (X). Below the title bar is a 'Status' section with three checkboxes: 'Open Feedback', 'Close Feedback', and 'Fault', all of which are currently unchecked. Below the status section is a 'Commands' section with two buttons: 'Auto' (with a green checkmark) and 'Manual'.</p>	<p>HS Flush Valve Faceplate</p>	<p>Status</p> <ul style="list-style-type: none"> • Open Feedback – green checkbox • Close Feedback - green checkbox • Fault / Trip – red checkbox <p>Commands</p> <p>Different buttons to activate an action</p> <p>Open / Close</p> <ul style="list-style-type: none"> • Manually opens HS Flush valve • Manually closes HS Flush valve <p>Auto / Manual</p> <ul style="list-style-type: none"> • Automatic operation of HS Flush valve • Manual operation of HS Flush valve <p>If the operation mode is in either Production or CIP, the command will always be Auto.</p>
 <p>The screenshot shows the 'LS Flush Valve' faceplate. It has a title bar with a close button (X). Below the title bar is a 'Status' section with three checkboxes: 'Open Feedback', 'Close Feedback', and 'Fault', all of which are currently unchecked. Below the status section is a 'Commands' section with four buttons: 'Open', 'Close' (with a green checkmark), 'Auto', and 'Manual' (with a green checkmark).</p>	<p>LS Flush Valve Faceplate (if applicable)</p>	<p>Status</p> <ul style="list-style-type: none"> • Open Feedback – green checkbox • Close Feedback - green checkbox • Fault / Trip – red checkbox <p>Commands</p> <p>Different buttons to initiate an action</p> <p>Open / Close</p> <ul style="list-style-type: none"> • Manually opens LS Flush valve • Manually closes LS Flush valve <p>Auto / Manual</p> <ul style="list-style-type: none"> • Automatic operation of LS Flush valve • Manual operation of LS Flush valve <p>If the operation mode is in either Production or CIP, the command will always be Auto.</p>

	<p>Diverter Gate Valve Faceplate (if applicable)</p>	<p>Status</p> <ul style="list-style-type: none"> • Open Feedback – green checkbox • Close Feedback – green checkbox • Fault / Trip – red checkbox <p>Commands Different buttons to initiate an action Open / Close</p> <ul style="list-style-type: none"> • Manually opens Diverter Gate valve • Manually closes Diverter Gate valve <p>Auto / Manual</p> <ul style="list-style-type: none"> • Automatic operation of Diverter Gate valve • Manual operation of Diverter Gate valve <p>If the operation mode is in either Production or CIP, the command will always be Auto.</p>
	<p>Diverter Flush Valve Faceplate (if applicable)</p>	<p>Status</p> <ul style="list-style-type: none"> • Open Feedback – green checkbox • Close Feedback - green checkbox • Fault / Trip – red checkbox <p>Commands Different buttons to initiate an action Open / Close</p> <ul style="list-style-type: none"> • Manually opens Diverter Flush valve • Manually closes Diverter Flush valve <p>Auto / Manual</p> <ul style="list-style-type: none"> • Automatic operation of Diverter Flush valve • Manual operation of Diverter Flush valve <p>If the operation mode is in either Production or CIP, the command will always be Auto.</p>

	<p>Lubrication Faceplate (if applicable)</p>	<p>Status</p> <ul style="list-style-type: none">• Running – green checkbox• Fault / Trip – red checkbox <p>Commands</p> <p>Different buttons to activate an action</p> <p>Start / Stop</p> <ul style="list-style-type: none">• Manual start of lubrication motor• Manual stop of lubrication motor <p>Auto / Manual</p> <ul style="list-style-type: none">• Automatic operation of lubrication motor• Manual operation of lubrication motor <p>If the operation mode is in either Production or CIP, the command will always be <i>Auto</i>.</p>
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5.6. Set-points – Screen 102

Backdrive Setpoints				
S301	Diff Speed RPM	0.20	5.00	100.00
S302	Torque kNm	0.0	2.0	1000.0
S304	Flushing Diff RPM	0.20	10.00	100.00


Feed Setpoints		
S801	Feed Flow Setpoint	Not Applicable

Set-point	Description
S301 – Diff Speed	Set-point for Decanter’s differential speed. It is also displayed on screen 101 Decanter Overview . If the machine is in <i>Diff</i> back drive control mode, the Decanter back drive speed will be fixed at the input differential.
S302 – Torque	Set-point for back drive torque. It is also displayed on screen 101 Decanter Overview . If the Decanter is in <i>Auto</i> back drive control mode, the Decanter back drive will adjust differential speed to meet the torque set-point.
S304 – Flushing Diff	Set-point for differential during CIP mode.

5.7. Alarms – Screen 201

Alarm Time	Acknowledge Time	Message
1/23/2019 1:13:34 PM		A104 Disabled: Decanter Cover Open
1/23/2019 1:13:25 PM		A132: Remote BUS Communication Error
1/23/2019 1:13:25 PM		A203: Max Bowl Speed Deviation
1/23/2019 1:13:25 PM		A113: IO Module Alarm
1/23/2019 1:13:25 PM		A104: Decanter Cover Open
1/23/2019 1:12:39 PM		A317: BD VFD Comm Error
1/23/2019 1:11:51 PM	1/23/2019 1:11:58 PM	A216: MD VFD Comm Error

This screen logs all current and active alarms with alarm number, date, time, status and a brief description.

The  icon allows acknowledging one or several alarms at the same time. If the alarm has not been acknowledged, the background colour will be red. Once the alarm has been acknowledged, the colour will change from red to yellow (if the alarm is still present) or to green. In case an active alarm condition has not been solved, the system will not allow that alarm to be acknowledged.

To view the entire list of alarms, touch the screen and scroll up and/or down accordingly.

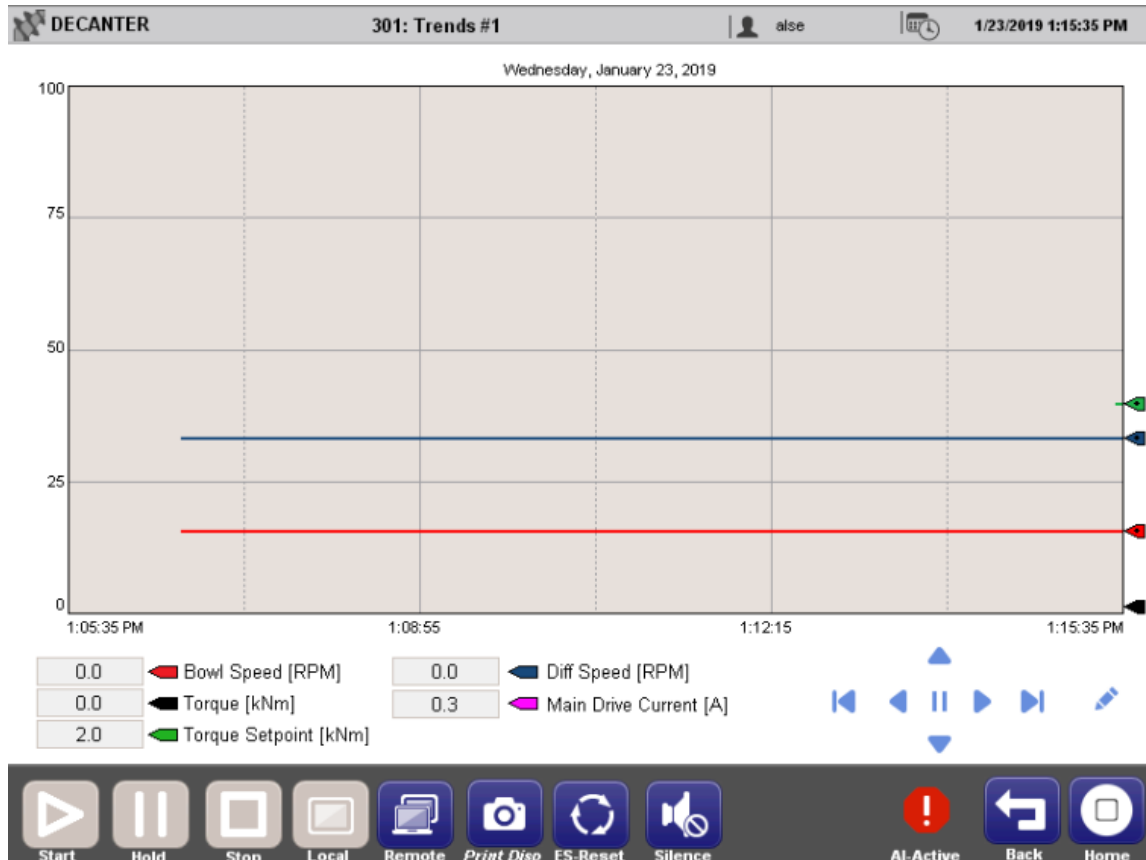
5.8. Alarms History – Screen 202

Alarm Time	Acknowledge Time	Message
1/23/2019 1:09:11 PM	1/23/2019 1:11:58 PM	A117: Vibration Module Communication
1/22/2019 1:23:52 PM	1/23/2019 1:11:58 PM	A408 Disabled: Vibration GB End Shutdown Alarm
1/22/2019 1:23:52 PM	1/23/2019 1:11:58 PM	A407 Disabled: Vibration MD End Shutdown Alarm
1/19/2019 6:12:20 PM	1/22/2019 11:47:08 AM	A117: Vibration Module Communication
1/19/2019 6:12:18 PM	1/22/2019 11:47:08 AM	A117: Vibration Module Communication
1/16/2019 4:32:03 PM	1/22/2019 11:47:08 AM	A317: BD VFD Comm Error
1/16/2019 4:32:03 PM	1/22/2019 11:47:08 AM	A216: MD VFD Comm Error
1/16/2019 4:32:03 PM	1/22/2019 11:47:08 AM	A213: MD VFD Alarm
1/16/2019 4:32:03 PM	1/22/2019 11:47:08 AM	A311: BD High Temperature
1/16/2019 4:32:03 PM	1/22/2019 11:47:08 AM	A210: MD High Temp

This screen displays all alarms with the corresponding number, time, date, status and description.

To view the entire list of alarms, touch the screen and scroll up and/or down accordingly.

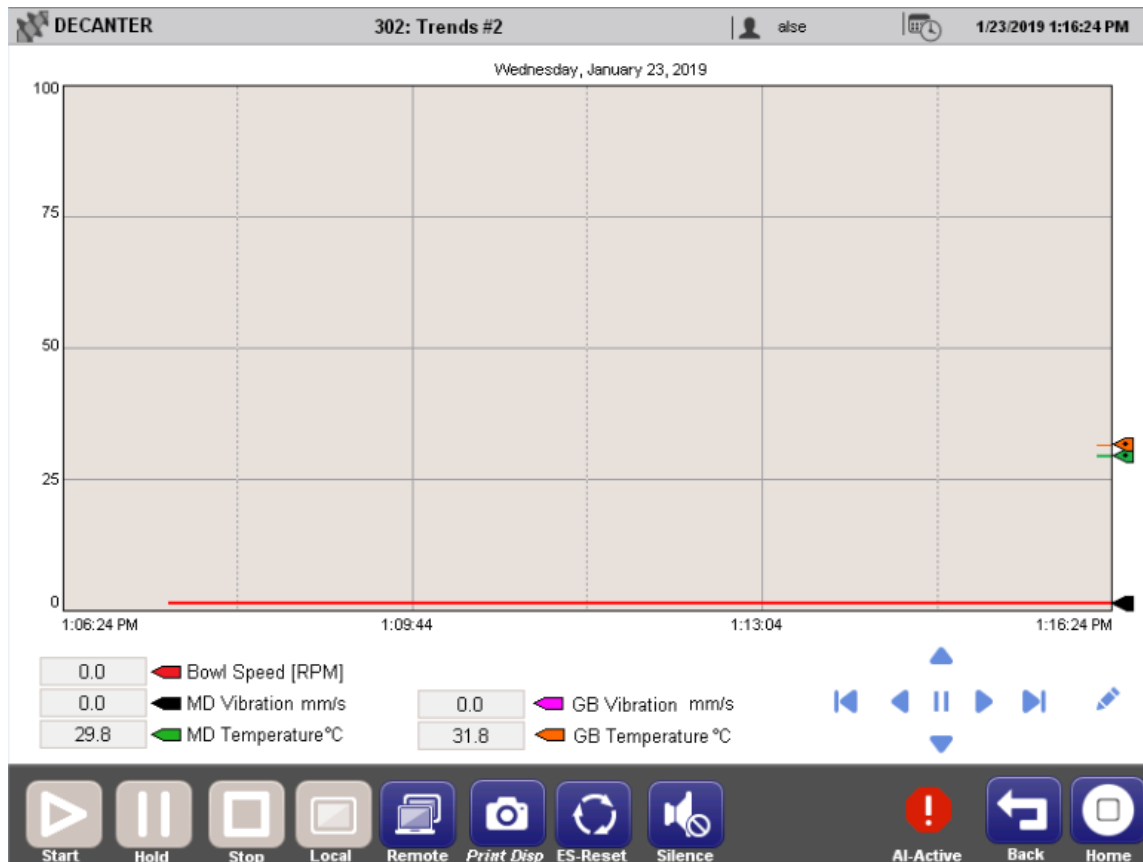
5.9. Trends #1 – Screen 301



This screen shows the line graph over the most recent 30-minute interval for:

- Bowl Speed (RPM)
- Torque (kNm)
- Torque Set-point (kNm)
- Diff Speed (RPM)
- Main Drive Current (A)

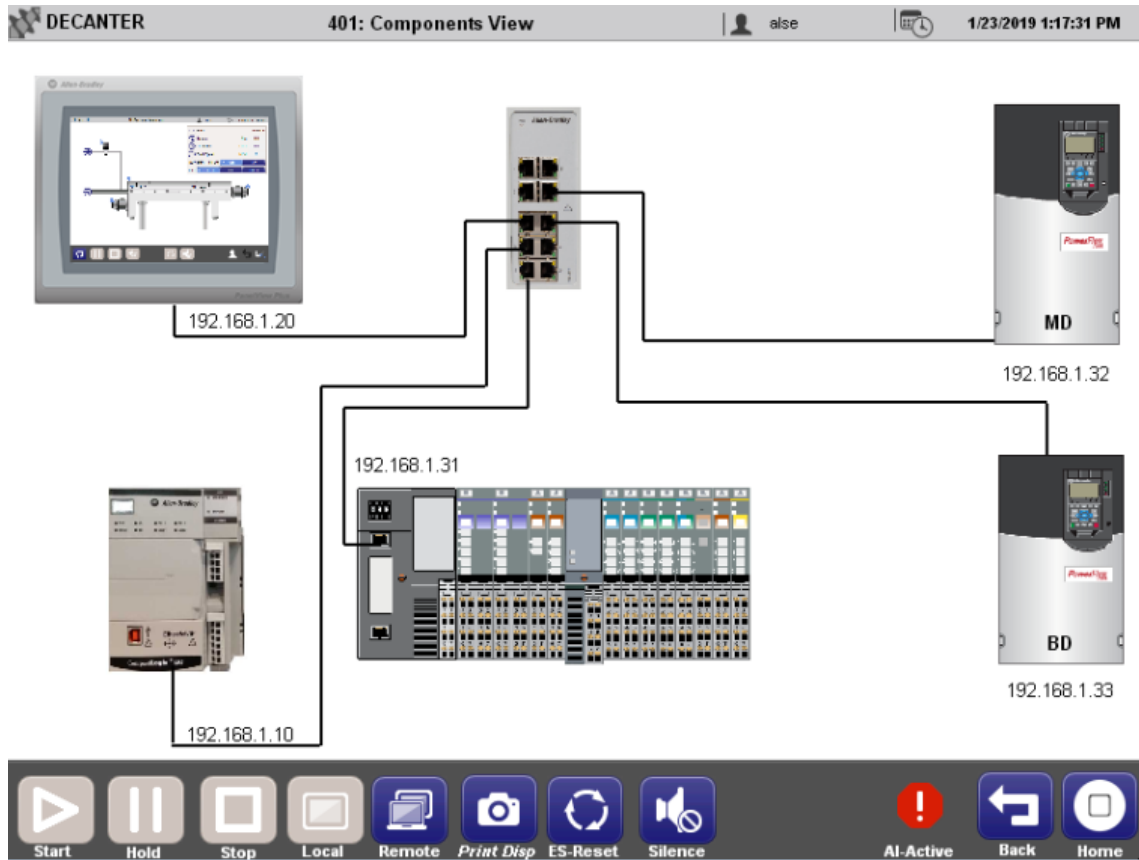
5.10. Trends #2 – Screen 302



This screen shows the line graph over the most recent 30-minute interval for:

- Bowl Speed (RPM)
- Main Drive Vibration (mm/s)
- Main Drive Temperature (°C)
- Gearbox Vibration (mm/s)
- Gearbox Temperature (°C)

5.11. Components View – Screen 401



This screen displays how connections are made among the different elements (HMI, VFD, PLC) of the system.

5.12. System Information – Screen 402

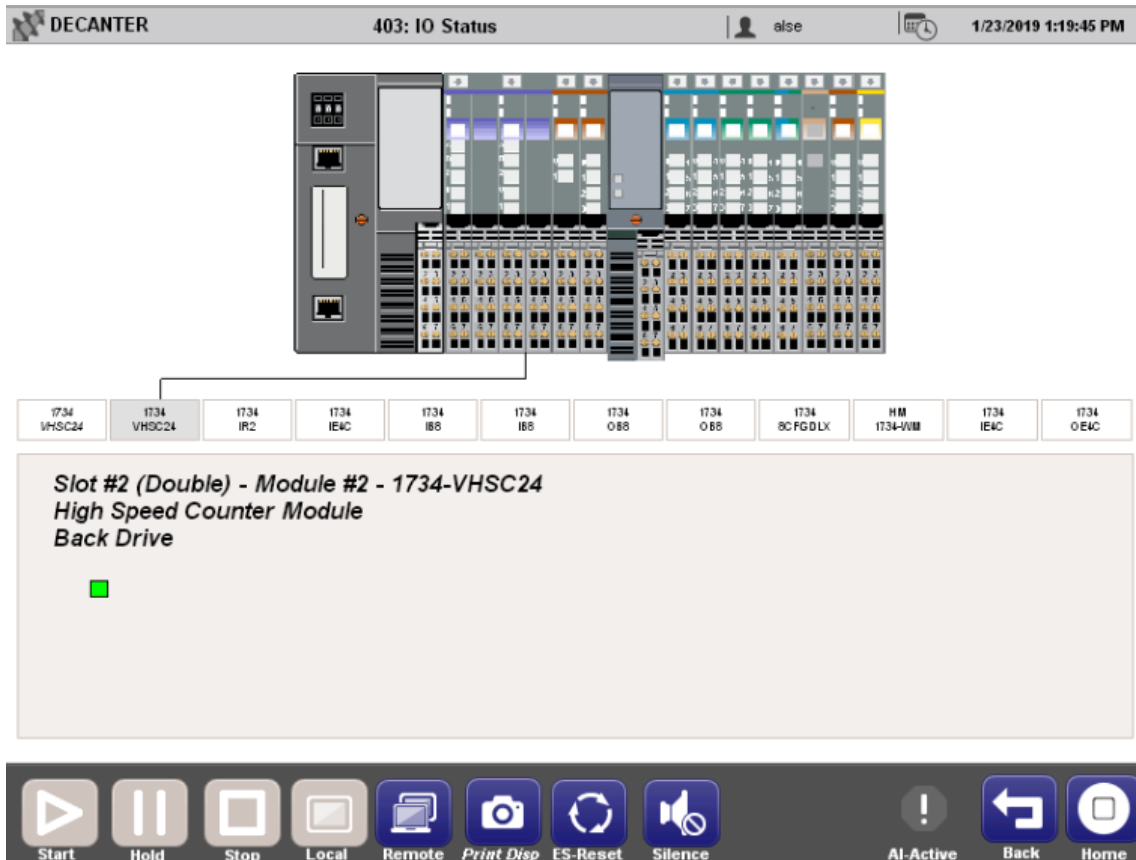
The screenshot displays the '402: System Information' screen. The top header includes the 'DECANTER' logo, the screen title '402: System Information', a user icon labeled 'alse', and a clock icon showing the date and time '1/23/2019 1:18:39 PM'. The main content area is organized into four panels:

- Software Versions:** HMI Version: V 1.00.00, PLC Version: V 1.00.00.
- Backup-Restore:** Folder: USB Storage, File: nx10, Parameter: Restore, Backup, Backup Status: (empty).
- Utilities:** Show Navigation Tool Tip (toggle switch is on).
- HMI Date/Time Settings:** Change HMI Date/Time: Config. Mode, HMI Time: 1/23/2019 1:18:39 PM.
- PLC Date/Time Settings:** A grid for selecting Year (1998, 2018), Month (3, 7), Day (19, 31), Hour (0, 13), Minute (51, 8), and Second (20, 0). An Update Time button is at the bottom.

The bottom navigation bar contains the following icons and labels: Start, Hold, Stop, Local, Remote, Print Disp, ES-Reset, Silence, AI-Active, Back, Home.

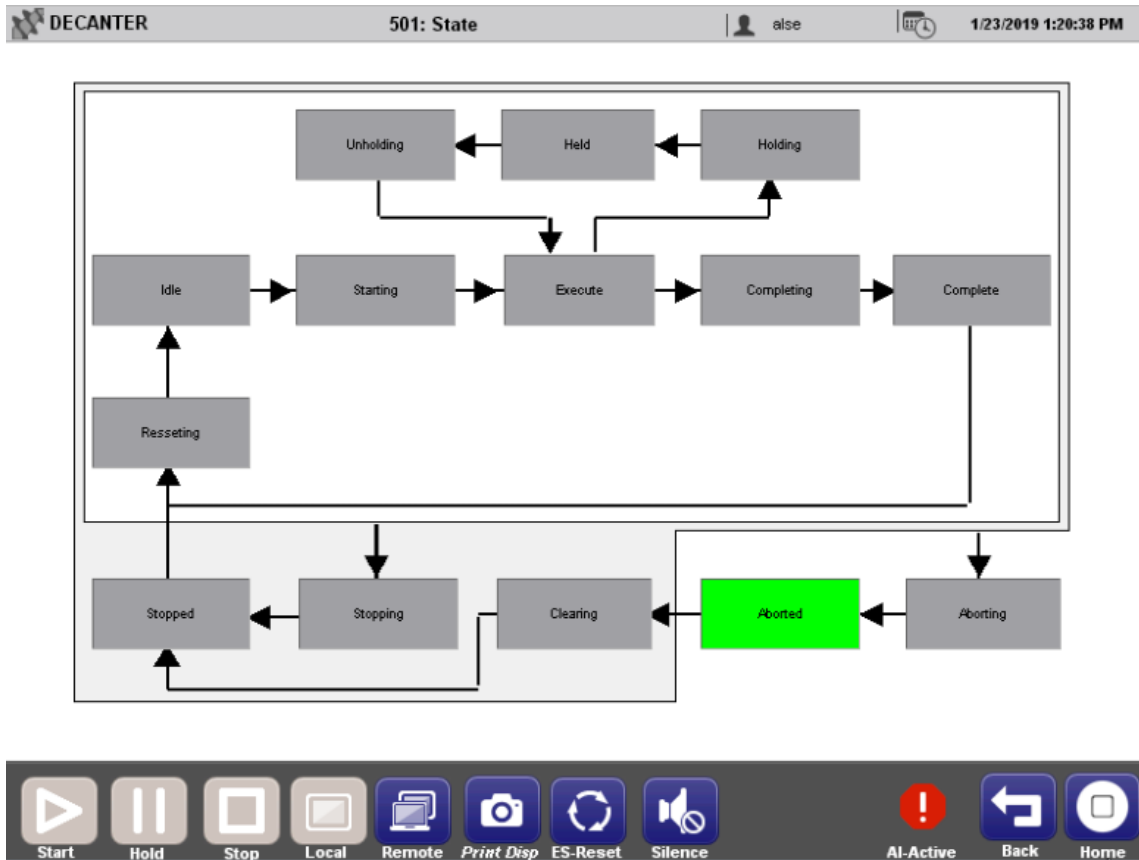
This screen contains information regarding the entire HMI and Core Controller system, possibility to back up and/or restore parameters, enable/disable the tool-tip option, and change HMI/PLC date-time settings.

5.13. IO Status – Screen 403



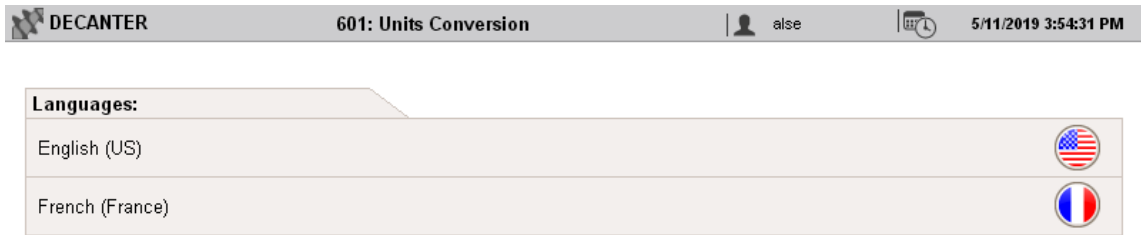
From this screen, the user can select which I/O card to monitor. Inputs and outputs that are active ($I/O = 1$) are green, and for analogue inputs and outputs a value will be displayed. A short description of the I/O card is included. Both digital and analogue points are for monitoring purposes, i.e. cannot be changed or modified.

5.14. State – Screen 501



The State Map shows the operational flow diagram as programmed for the Decanter operation.

5.15. Units Conversion - Screen 601



This screen displays the language options that can be selected for the solution. Currently, only English (default language) and French are available.

5.16. Parameters

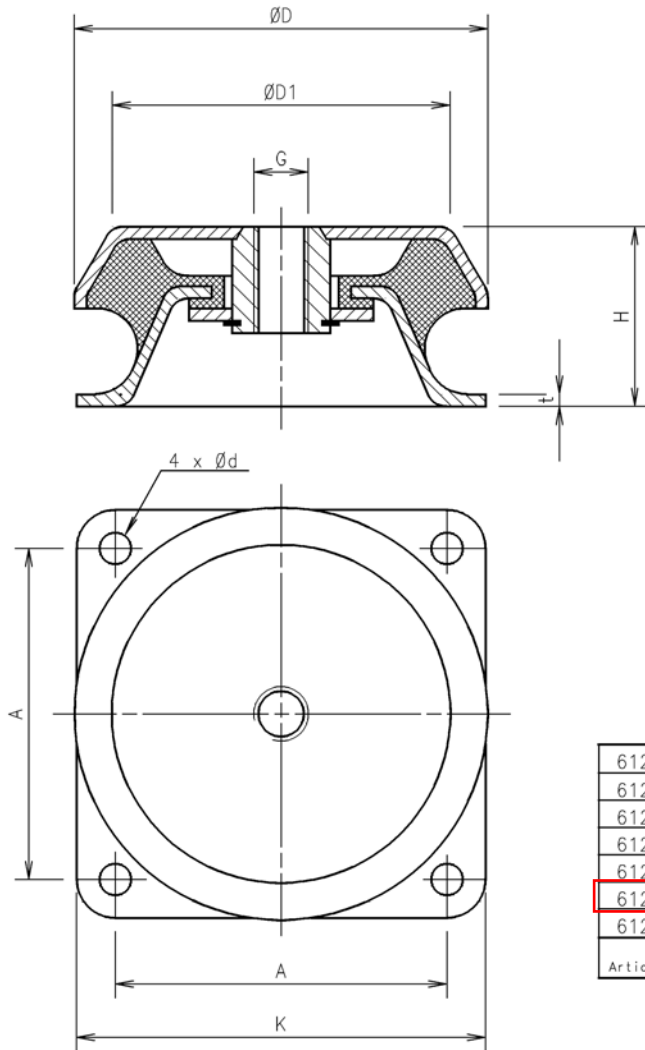
For more information regarding each parameter, refer to [Decanter Automation Allen Bradley Parameters and Alarms Manual](#).

5.17. Alarms

For more information regarding each parameter, refer to [Decanter Automation Allen Bradley Parameters and Alarms Manual](#).

This document may constitute a contractual obligation on the part of Alfa Laval Copenhagen A/S only to the extent expressly agreed upon.

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Document No.: 17
 Title: Decanter Centrifuge - Vibration Damper Drawing.

- Only -07:
 Painting :
 1. Cover: Rubber parts and Thread.
 2. Paint with: Arecal GALVA zink ULTRA.

6120.7468-07	224	156	180	220	105.5	17.5	4	M24	RA 2500 EM-B	TRELLEBORG NOVIBRA
6120.7468-06	224	156	180	220	105.5	17.5	4	M24	RA 2500 EM-E-70-BUTYL	TRELLEBORG NOVIBRA
6120.7468-05	182	130	146	180	85	14	4	M20	RA 1500 EM-B	TRELLEBORG NOVIBRA
6120.7468-04	182	130	146	180	85	14	4	M20	RA 1500 EM-A	TRELLEBORG NOVIBRA
6120.7468-03	224	156	180	220	105.5	17.5	4	M24	RA 2500 EM-E-60-BUTYL	TRELLEBORG NOVIBRA
6120.7468-02	224	156	180	220	105.5	17.5	4	M24	RA 2500 EM-A	TRELLEBORG NOVIBRA
6120.7468-01	224	156	180	220	105.5	17.5	4	M24	RA 2500 EM-B	TRELLEBORG NOVIBRA
Article No.	ØD	ØD1	A	K	H	Ød	t	G	TYPE	LEVERANDØR

Art.No. -07 added.			
Rev. No.	Date	Modified By	Appr.
8	130319	MGN	OAN

Item	Article No.	Name/Designation	Material
		VIBRATIONSDÆMPER	Alfa Laval Alfa Laval Copenhagen A/S SØBORG DENMARK
		VIBRATION DAMPER	
First angle projection	Surface roughness	Scale	Dept. Date
	R _A μm	-	GKU 970113
		Format	Drawn Appr. Model
		A3	HDJ N
			Design Code
			-
			Document No.
			61207468



Alfa Laval Decanter Centrifuge

Specification for Alfa Laval ALDEC G3-75 Decanter

Date of issue: 2019-10-04

Quotation Number: CA-PWW15-0047
Decanter type designation: ALDEC G3-75
Process Description: Dewatering of aerobically digested Sludge

Bowl Assembly

Operating Centrifugal Force: 3551G
Bowl diameter: 440 mm
Beach angle: 20°
Solids discharge type: 360°-type with 8 wear liners
Solids discharge radius: 120 mm
Material - hubs: Duplex Stainless steel
Material - bowl shell: Duplex Stainless steel
Material – gaskets and seals: Nitrile
Liquid outlet, number: 5

Conveyor Assembly

Material - flights: 316 Stainless steel
Material - hub: 316 Stainless steel

Wear protection

Bowl solids discharge: Wear bushing in tungsten carbide
Conveyor flights: Tungsten Carbide Tiles
Conveyor feed zone: Tungsten Carbide wear liners
Casing liner: Wear liner in upper casing

Frame and Casing

Material – casing / cover: 316 Stainless steel
Material frame: Mild steel
Paint colour: Aluminium grey

Drive Assembly

Gearbox, torque rating: DD 8.0 kNm
Gearbox, ratio: 1:100.8
Backdrive: Direct Drive 10 Hp VFD Reliance-Baldor (575V, 60 Hz)
Main drive motor: 50 Hp VFD Reliance-Baldor (575V, 60Hz), flange-mount
Main drive motor, protection: Thermistor

Control System

Decanter Core Control System, Back drive and Main drive motor, VFD Panel Alfa Laval AB Connect System

Installation Drawings

Dimension drawing: 61244227

Document No.: 18
Title: Decanter Specification Data Sheet

Venting of Decanter, R 0



Process Technology

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The ventilation of the decanter is very important and it is to allow the air and other gases escape from the decanter and piping system.

The vent will be located on the liquid discharge piping system after the flexible connection and it should pitch back to chutes (2% back slope).

If the vent control (odour control, etc.) is required, provide a suction fan. Dampers should be placed on each vent line to control flow.

Also, please consult the Alfa Laval Installation Drawing specifically provided for each type of decanter.

$Q=A*v$, wherefrom $A=Q/v$

$A=3.14*D^2/4$, wherefrom **$D= \text{SQR}(4*A/3.14)$**

Alfa Laval recommends calculating the size of the vent considering 10 m/s the vent velocity (v) and two times the feed rate for volume (Q).

If the vent lines are connected to a manifold, the manifold diameter should be:

$D_m = D_v*\text{sqrt}N$, where D_m is the manifold diameter, D_v is the individual vent diameter and N is to number of centrifuges connected to the manifold.

Prepared by: George Dumitra

November 29, 2011

Document No.: 19
Title: Decanter Vent Sizing Information



rpm, the RA and EF type provides a degree of isolation of 75-85%. For better isolation, the alternative RAEM or M can be chosen.

Its unique construction and the latest production methods make Novibra® type RA and EF a high performance mounting having a number of advantages:

Novibra® type RA and Metalastik® type Fail Safe EF

For effective isolation of vibration and noise on machines with rotating movements, e.g.

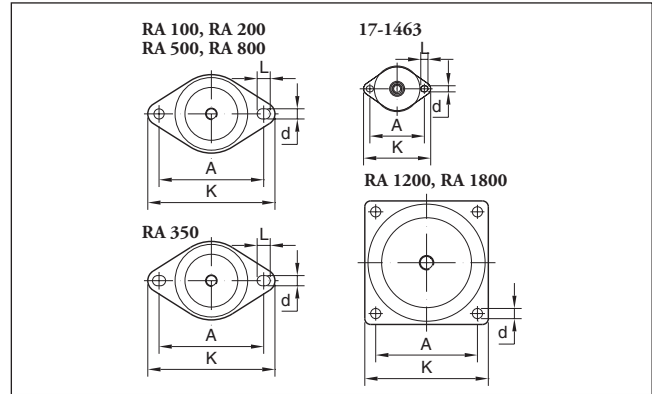
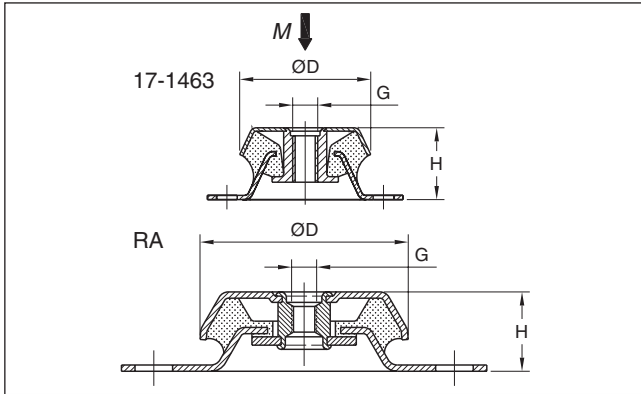
- Compressors
- Combustion engines
- Generators
- Converters
- Pumps
- Industrial and marine gen-sets
- Fans

Also suitable for use with presses, punches and other workshop machines.

Features

RA and EF uses the rubber profile in shear and compression, obtaining good vertical flexibility with the advantage of horizontal stability. For normal speeds of approx. 1500

- Rubber features are utilised effectively combining compression and shear.
- Wide load rating options, 40-2100 kg.
- Corrosion protected to cope with arduous environments on land or marine applications (Fe/Zn8C as per ISO 2081).
- Fitted as standard with an integral fail-safe design device with resilient stop, making RA and EF ideal for use in mobile or marine applications. The RA/EF-mounts can accommodate occasional shock loads to 5 g reference to the weight in hardness 60° IRH. The mount will withstand shock loads up to 2 g without plastic deformation.
- Clear and durable product marking so that mountings can be identified even after several years in operation.
- Domed shape cover to protect against oil contamination.



Type	Art.No. 40° IRH	Art.No. 60° IRH	Dimensions in mm						Weight (kg)	M-Max (kg)		
			D	A	H	K	d	L		G	40° IRH	60° IRH
RA 100/M10	1861700	1861710	79	110	30	130	9	12	M10	0.33	105	240
RA 100/M12	2256120	2256130	79	110	30	130	9	12	M12	0.33	105	240
RA 200/M10	1861740	1861750	94	124	35	150	10	15	M10	0.47	180	280
RA 200/M12	2255720	1860350	94	124	35	150	10	15	M12	0.47	180	280
RA 350/M12	2256370	2256380	101	140-148	38	175	14	18	M12	0.74	250	450
RA 350/M16	1861760	1861770	101	140-148	38	175	14	18	M16	0.74	250	450
RA 500	1861800	1861810	123	158	42	192	14	18	M16	1.02	450	700
RA 800	1861820	1861830	144	182	48	216	14	18	M16	1.59	750	1300
RA 1200	2255360	2255370	161	140	58	170	14		M20	2.19	900	1600
RA 1800	2255380	2255390	181	160	66.5	190	14		M20	2.33	1300	2100
Fail Safe EF	17-1463-35 (35° IRH)		65	76.2	35	94	8.5	10	M12	0.22	55	
	17-1463-45 (45° IRH)										80	
	17-1463-60 (60° IRH)										170	
	17-1463-70 (70° IRH)										240	



Date: 2015-03-19
Your Ref:
Our Ref: PCD/jct

Product Centre Decanters
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Denmark

Tel: +45 39 53 60 00
Fax: +45 39 53 65 60
www.alfalaval.com

To whom it may concern

Resistance of Alfa Laval decanters to loads from earthquakes

All main and internal parts of the decanter are able to withstand inertial forces, which may occur during an earthquake, below 2 times the gravitational acceleration

The decanter is attached to the foundation through vibration isolators which are designed and selected to withstand forces in any direction of up to 2 times the weight of the decanter without permanent damage, and up to 5 times the weight of the decanter without rupture.

If the decanter has been subjected to a heavy earthquake it must be thoroughly inspected and the main bearings must be replaced. The vibration isolators must be checked for deformation damage and if necessary replaced.

A handwritten signature in blue ink, appearing to read 'Jan Cederkvist'.

Jan Cederkvist
Product Validation Manager

Product Centre Decanters

Document No.: 21
Title: Resistance of AL decanters to loads from Earthquakes





Project: DISTRICT OF SOOKE WWTP - DEWATERING CENTRIFUGE

Project Number: CA-PWW15-0047

Document Title: Shop Drawing Review Comments

Document Number: CA-PWW15-0047_A01

Latest Revision: A01

(5 Pages)

Rev.	Date	Description	By	Reviewed	Approved
0	Jan 22, 2020	Review Comments	AJ		

Shop Drawing Review Comments



Project: District of SOOKE WWTP- Sludge Dewatering Centrifuge
 Document: CA-PWW15-0047, Rev.: A01

Page 2/6

Discipline: DECANTER CENTRIFUGE

Name: ANUP JAGADEESH

Ref.	Comment
1	Document Number not shown on drawings and document titles not shown on each document. Alfa Laval Response: Please see attached revised submittals package DT#2
2	Specify operating weight (Spec 46 76 00 clause 1.3.3.3) Alfa Laval Response: The operating weight for an ALDEC G3-75 will be roughly 3,750 kg.
3	Specification 46 76 00, clause 2.5.9.8. Mark code numbers and colours on shop drawings, on each isolator, and on each base to ensure proper placement. Alfa Laval Response: Please refer to the AutoCAD dimension drawing representing each main components of the decanter centrifuge showed with different colours representation.
4	Solid Sampling Point: Spec 46 76 00 clause 1.1.2.6 Provide a dewatering system with sludge cake and centrate sampling ports. Alfa Laval Response: Please refer to addendum 2.
5	Back Drive Motor 10 HP – Start Configuration refer to DOL Alfa Laval Response: The BD motor is VFD driven.
6	Main Drive Motor 50 HP – Insulation – 16012 Part 2 section 2.2.9.1 Use Class F insulation and Safety Factory – Confirm Class B@ 1.15 SF (16012 Part 2 Section 2.2.9.2) Alfa Laval Response: Please see attached revised R1 new motor data sheets for both Main drive and Back drive motor with S.F. of 1.15.
7	11367 Part 2 section 2.6.2.1 an elapsed time meter shall be supplied and will be of six (6) digit, non-reset, register type with the last digit reading in tenths of an hour for the main motor and scroll motor suitable for panel door mounting. Alfa Laval Response: Noted, please see revised electrical drawing Rev.1
8	Assume main disconnect for panel? Provide label per 16012 Part 1 Section 1.22.9 and Part 2 section 1.17.1 Confirm lockable. Alfa Laval Response: we can add labels. Yes, the handle is lockable.

Shop Drawing Review Comments



Project: District of SOOKE WWTP- Sludge Dewatering Centrifuge
 Document: CA-PWW15-0047, Rev.: A01

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Ref.	Comment
9	<p>Confirm short circuit KA rating of system</p> <p>Alfa Laval Response: Consider SCCR 65 kA.</p>
10	<p>Section 11367 Part 2 Section 2.6.2.2 Provide phase loss protection and lightning surge protection for each panel.</p> <p>Alfa Laval Response: Please see revised electrical drawing Rev.1</p>
11	<p>Section 11367 Part 2 Section 1.6.2.3 Control voltage shall be 120 Vac. Any conflict with plant control system resulting from 24VDC control power to be resolved by Contractor.</p> <p>Alfa Laval Response: Our standard Remote IO system uses 24VDC cards</p>
12	<p>Section 11367 Part 2 -Section 2.6.2.5 Provide local mushroom head maintained emergency stop for the centrifuge wired in series with the panel emergency stop and include E-stop and Panel E-stop.</p> <p>Alfa Laval Response: Yes, it is shown on page 024</p>
13	<p>Section 11367 Part 2 Section 2.6.2.3 Control voltage shall be 120Vac. Any conflict with Plant Control system resulting from 24VDC control power to be resolved by Contractor.</p> <p>Alfa Laval Response: Our standard Remote IO system uses 24VDC cards</p>
14	<p>Page 29 of 219 16012 Part 2 Section 2.4.15 Drive shall have....drive permissive signal (Lock out switch): Normally closed contact, open to emergency stop drive, operable in remote or local control mode.</p> <p>Alfa Laval Response: drive permissive is done via Safe Torque OFF.</p>
15	<p>Page 29 of 219 16012 Part 2 Section 2.4.18 The drive shall provide the following relay out-puts (form C, rated 2A at 120Vac) as minimum:</p> <p>.2 Fault signal – Normally closed contact, closed for normal and open for fault.</p> <p>Alfa Laval Response: Noted, please see revised electrical drawing Rev.1</p>
16	<p>Page 29 of 219 16012 Part 2 Section 2.4.19 The drive shall provide at least two isolated 4-20mA analog outputs that are programmable to frequency, speed, current, torque, or power factory configured for:</p> <p>.1 Remote Speed Indicator: Isolated analog 4 mA to 20 mA output for speed feedback to the packaged control system.</p> <p>.2 Remote Current Indicator: Isolated analog 4 mA to 20mA input for amperage feedback the packaged control system.</p> <p>Confirm that equipment can be fully controlled and monitored by the supplier's control system.</p>

Shop Drawing Review Comments



Project: District of SOOKE WWTP- Sludge Dewatering Centrifuge
 Document: CA-PWW15-0047, Rev.: A01

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Ref.	Comment
	<p>Alfa Laval Response: Noted, please see revised electrical drawing Rev.1</p>
17	<p>Page 34 of 219 Section 11367 Part 2 Section 2.6.3.1 The centrifuge will be enabled/disabled by the PCS via a dry contact closure signal (relay or through PLC).</p> <p>Alfa Laval Response: Noted, please see revised electrical drawing Rev.1</p>
18	<p>Page 34 of 219 Section 11367 Part 2 item 2.6.4.1 Alarm conditions shall be indicated with flashing red indicators on the OIT alarm screen and shall cause alarm horn to sound and beacon to flash. Cannot find Alarm Beacon.</p> <p>This can be installed outside of the vendor supply, but is still the responsibility of the installing contractor.</p> <p>Alfa Laval Response: Done, please see revised electrical drawing R1.</p>
19	<p>IP addresses to be confirmed with site personnel.</p> <p>Alfa Laval Response: OK</p>
20	<p>Page 38 of 219 Section 17012 Part 2 Section 2.15.1 Front of panel layout, panel interior layout, and electrical wiring and/or tubing schematic drawings shall be submitted to the Engineer for approval.</p> <p>.1 Panel interior view not submitted. .2 Could not evaluate compliance with isolation and spare spacing requirements.</p> <p>Alfa Laval Response: Please see revised electrical drawing R1.</p>
21	<p>Page 38 of 219 Section 17012 Part 2 Section 2.15.3 Print pocket required.</p> <p>Alfa Laval Response: Please see revised electrical drawing R1.</p>

Shop Drawing Review Comments



Project: District of SOOKE WWTP- Sludge Dewatering Centrifuge
 Document: CA-PWW15-0047, Rev.: A01

Page 5/6

Ref.	Comment
22	<p>Page 44 of 219 Section 16012 Part 2 Section 2.10.2 All equipment, not mounted in an electrical or mechanical room, shall be of weatherproof construction, unless specified otherwise, with a minimum NEMA 4X rating.</p> <p>Agreed. Confirm location of cabinet (understanding was to be installed in process area).</p> <ul style="list-style-type: none"> - Panel light shown on circuit drawings but not on BOM. Confirm light is LED per 16012 Part 2 Section 2.10.10. - No ground lug provided, per 11367 Part 2 Section 2.6.215 - No panduit provided, per 17012 Part 2 Section 2.15.10 - E-STOP SAFETY RELAY – TWO REQUIRED - POWER ON is White, per 17012 Section 2.17.5 <p>Alfa Laval Response: Please see revised electrical drawing R1.</p>
23	<p>Page 45 of 219 Per 17012, Part 4 (Preferred suppliers list), 12” or greater HMI is required.</p> <p>Alfa Laval Response: Yes, we can provide 12” HMI. Please see revised electrical drawing R1.</p>
24	<p>11367 Part 2 Section 2.8</p> <p>1.1 Spare Parts</p> <p>.1 Provide the following spare parts for each centrifuge:</p> <ul style="list-style-type: none"> .1 One set main bearings and seals .2 One set scroll bearings .3 One set O-rings .4 One thrust bearing .5 One thrust bearing seal and lockwasher .6 One spare set of belts of each size required .7 Lube oil/grease for one year <p>.2 Provide the following special tools:</p> <ul style="list-style-type: none"> .1 One set disassembly tools .2 One bearing puller .3 Bowl/conveyor lifter and all special maintenance tools <p>Alfa Laval Response: Please note that the One set of O-rings is included in our Intermediate kit for Conveyor and Main Bearings Kit. Also, the one sets of spare belts included and Grease for one year is included. The bearing puller is also included. Our machine doesn't require the Thrust bearings.</p>

Shop Drawing Review Comments



Project: District of SOOKE WWTP- Sludge Dewatering Centrifuge
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Ref.	Comment
25	Page 218 of 219 – Specification 46 76 00 Clause 2.5.9.3 Vibration Isolation to provide 95% isolation efficiency. Alfa Laval Response: Yes, Noted.

Signed:

Date:

Document Transmittal / Submittal Compliance Certificate



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Customer	Attn.: Norm McInnis District of Sooke 2205 Otter Point Road Sooke, BC V9Z 1J2 Office: 250-642-1634 Email: nmcinnis@sooke.ca	Project	CA-PWW15-0047
		Title	District of Sooke – Dewatering Centrifuge
Description	ALDEC G3-75	Customer Ref./PO	DISTRICTOFSSOOKE
Transmittal No.	CA-PWW15-0047-02	Alfa Laval Ref.	CASCAJHL-456
Issued By	Jason Wang	Date	November 27th, 2019

Document Transmittal				
Document Number	Issue No.	Description / Title	Copies	
			P	E
CA-PWW15-0047-02-01	1	Polymer System Submittal	0	1
CA-PWW15-0047-02-02	1	Progressive Cavity Pump Submittal	0	1

Submittal Certificate of Compliance

We hereby certify that – to the best of our knowledge – the data submissions referenced in this Document Transmittal are in compliance with the applicable Contract Documents, except for the deviations identified in the following Submittal Deviation List.

Submittal Deviation List

None

Submittal Review Timeframe

In order to keep the agreed schedule, it is required to return the reviewed documentation within one month from receipt

Submittal Receipt Record

Received By		
Print Name :	Signed :	Date :

CUSTOMER: ALFA LAVAL INC.

PO No.: 1877452

PROJECT: DISTRICT OF SOOKE WWTP

PFC SO No.: 3119800341

ProMinent®



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- 1.1 Start-up & Installation Guidelines

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- 2.4 Sigma Motors Calibration Column
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- 2.14 Seametrics Flow Sensor
- 2.15 Spears PVC Piping & Fittings

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- 3.2 3019800521-0-300-PROMIX C Components

Section 4 – Loose Ship Parts

- 4.1 Loose Ship Parts

SECTION 1

GENERAL INFORMATION

1.1

!!! IMPORTANT – PLEASE READ !!!

ProMinent® SYSTEMS

SITE DELIVERY AND STORAGE CHECKLIST

1. Check packing list for completeness and note any missing items immediately.
2. The skid may have been jarred during shipping. Inspect equipment and shipping container for damage before accepting delivery. Make note on the carrier's bill-of-lading the extent of the damage, if any, and notify the carrier. Save the shipping container until your system is started up.
3. Store equipment on firm level surface in original packing container. Do not store equipment where it may be exposed to extreme temperatures, precipitation, humidity, or dust. Avoid direct sunlight that could overheat and damage equipment.

WARNING – PUMPS MAY BE FILLED WITH OIL WHICH COULD LEAK IF TILTED

Ambient Conditions for storage and transport:

Temperature: 14°F to 120°F
Air humidity: max. 95% relative humidity, non-condensing

Please call if you have questions.

ProMinent Fluid Controls, Inc.
RIDC Park West
136 Industry Drive
Pittsburgh, PA 15275-1014
Phone: (412) 787-2484
Fax: (412) 787-0704

!!! IMPORTANT – PLEASE READ !!!

ProMinent® SYSTEMS

PRE-INSTALLATION CHECKLIST

- 1. Mount equipment on hard flat level surface. Stainless steel or FRP angle may be used to fasten skids down.**
- 2. Do not install equipment in areas of extreme heat, cold, dust or humidity. Avoid areas where objects or fluids can drop from overhead.**
- 3. Install piping so connections properly meet skid termination points. Do not “stretch” field installed piping to meet skid termination points. Stressed plastic piping will fail!**
- 4. Check the tightness on all unions. Hand tighten only - no tools. Unions incorporate an o-ring seal. Ensure that the o-ring is seated properly before tightening.**
- 5. Check the piping for breakage. The skid may have been jarred during shipping.**
- 6. Allow provisions for draining the system piping. Skid components will require maintenance. Ensure that chemicals can be evacuated from skid piping and components.**
- 7. Do not down-size piping to or from system. Piping should be at least equal in diameter to piping on skid and one or two sizes larger for long runs.**
- 8. Install suction line strainer if one was not included with your packaged system**
- 9. Avoid getting dirt in piping during installation. Plug ends of piping with rags if construction activities are underway. All debris must be flushed from piping before system start-up.**
- 10. Check electrical connections to be sure proper voltage is supplied to unit.**

Please call if you have questions.

**ProMinent Fluid Controls, Inc.
RIDC Park West
136 Industry Drive
Pittsburgh, PA 15275-1014
Phone: (412) 787-2484
Fax: (412) 787-0704**

!!! IMPORTANT – PLEASE READ !!!

ProMinent® SYSTEMS QUICK START GUIDE

1. Pressure Relief Valves and Back Pressure Valves (PRV's/BPV's) are NOT pre-adjusted. ProMinent adjusts valves for QC purposes, but valves must be opened before shipping to allow water to be drained out.
2. The PRV's should be set no higher than the lowest rated component – typically the pump. In any case, do not exceed 150 psi with plastic piping. Tighten the PRV only with the a proper sized screwdriver or the furnished adjusting wrench. An improper adjustment tool will damage the valve adjustment screw.

No extraordinary start-up procedures are required. However, the following steps are recommended. WEAR SAFETY GLASSES WHILE WORKING ON CHEMICAL FEED EQUIPMENT!

- a. Unions tagged with Red Tape are purposely loosened prior to shipping. Check ALL unions for tightness and insure O-ring is properly seated before tightening. **DO NOT OVERTIGHTEN!** Hand tighten initially, and if necessary, apply one-eighth to one-quarter turn with properly sized wrench. **DO NOT OVERTIGHTEN!**
- b. Start the pumps in manual control mode with water – **DO NOT APPLY SYSTEM PRESSURE. CHECK MOTOR ROTATION!** (clockwise, looking down towards pump). Open oil vent, if applicable. Check for leaks.
- c. Check pulsation dampener fastener bolts' torque and inflate dampeners before applying system pressure (~80% of System Pressure). Set BPV for at least 15 psi pressure. Set PRV for rated pressure of weakest link in system.
- d. Run the system in manual mode with water. Build pressure. Check for leaks! Correct all leaks before introducing chemical into the system.
- e. Familiarize yourself with controls, check functionality of instruments, and verify correct pump output.
- f. Run the system in automatic mode with water. Verify functionality of alarms and safety devices. Verify correct pump output and functionality of instruments.
- g. Run the system in automatic mode with chemicals. Allow system to build pressure and check for leaks.

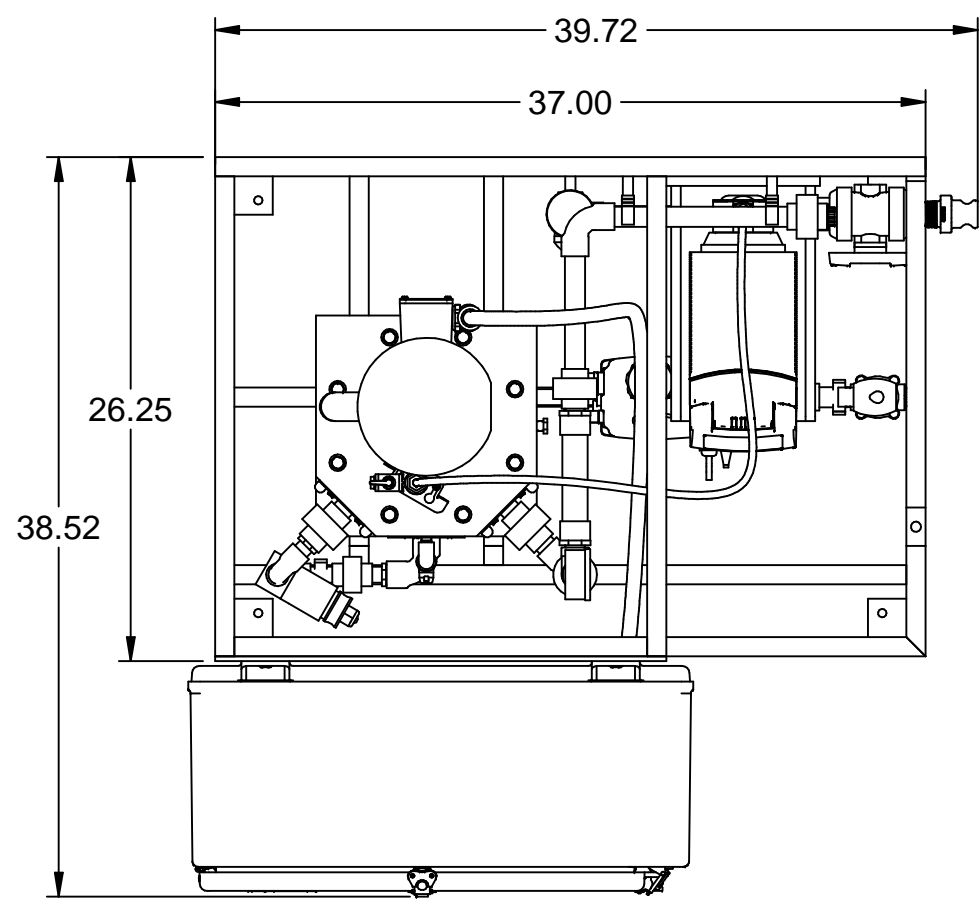
Please call if you have questions.

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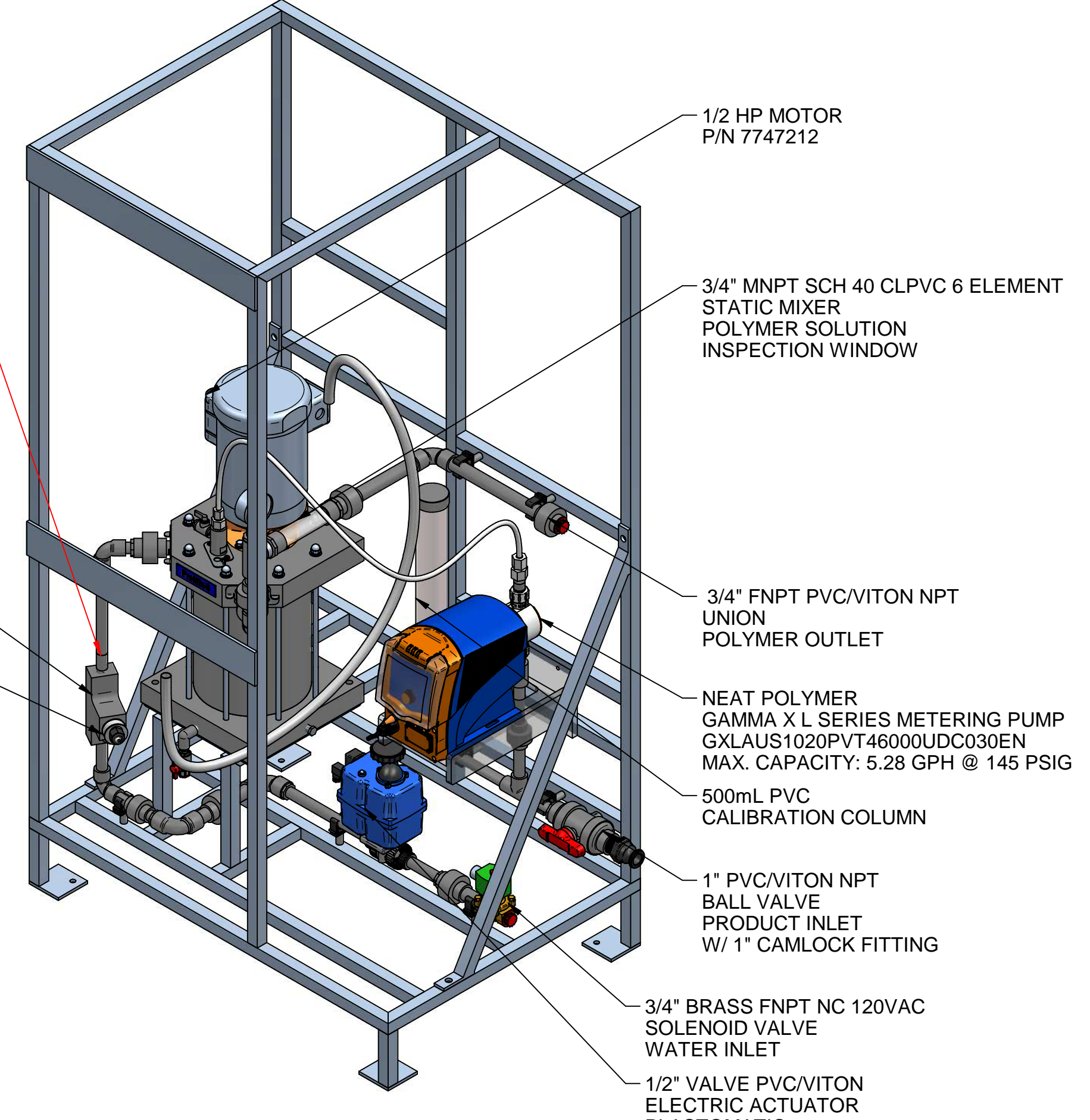
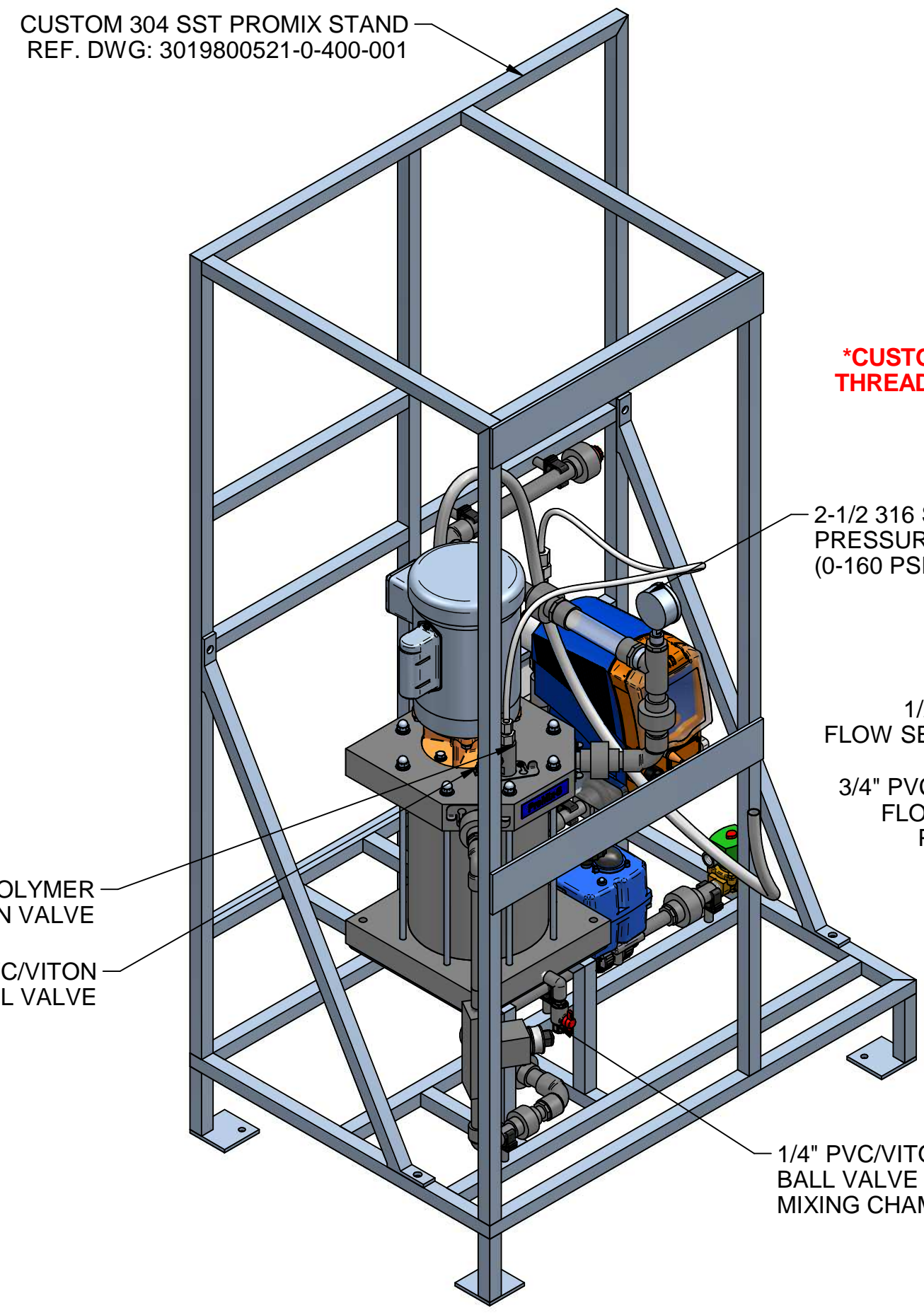
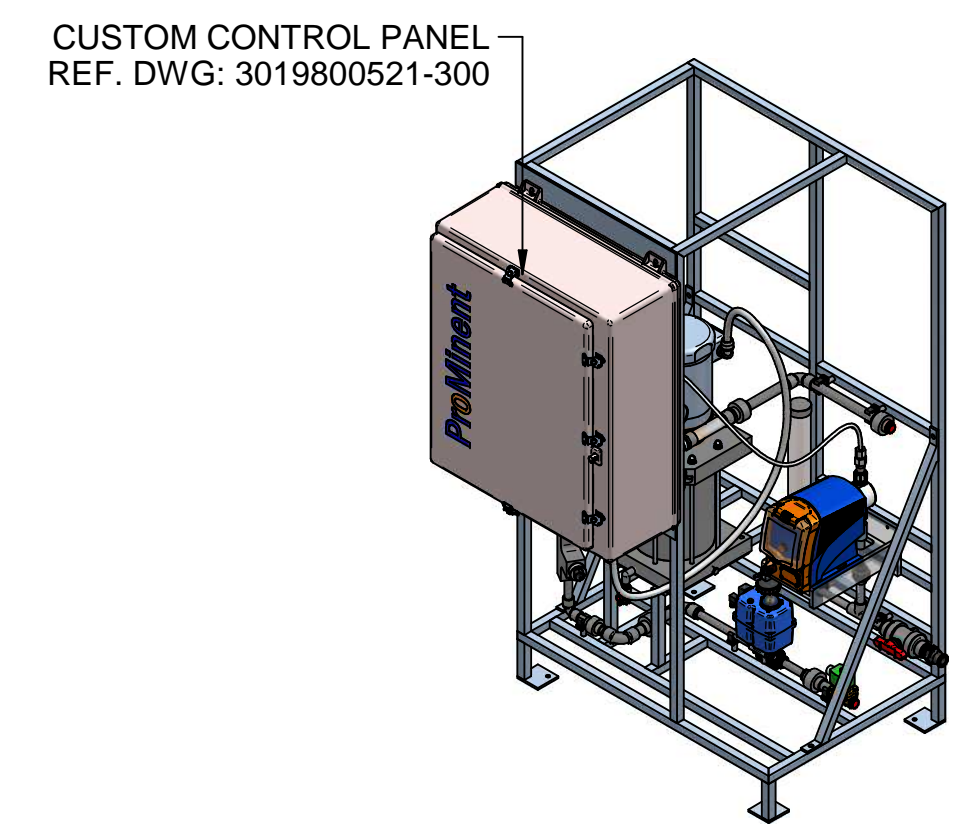
SECTION 2

PROMIX S

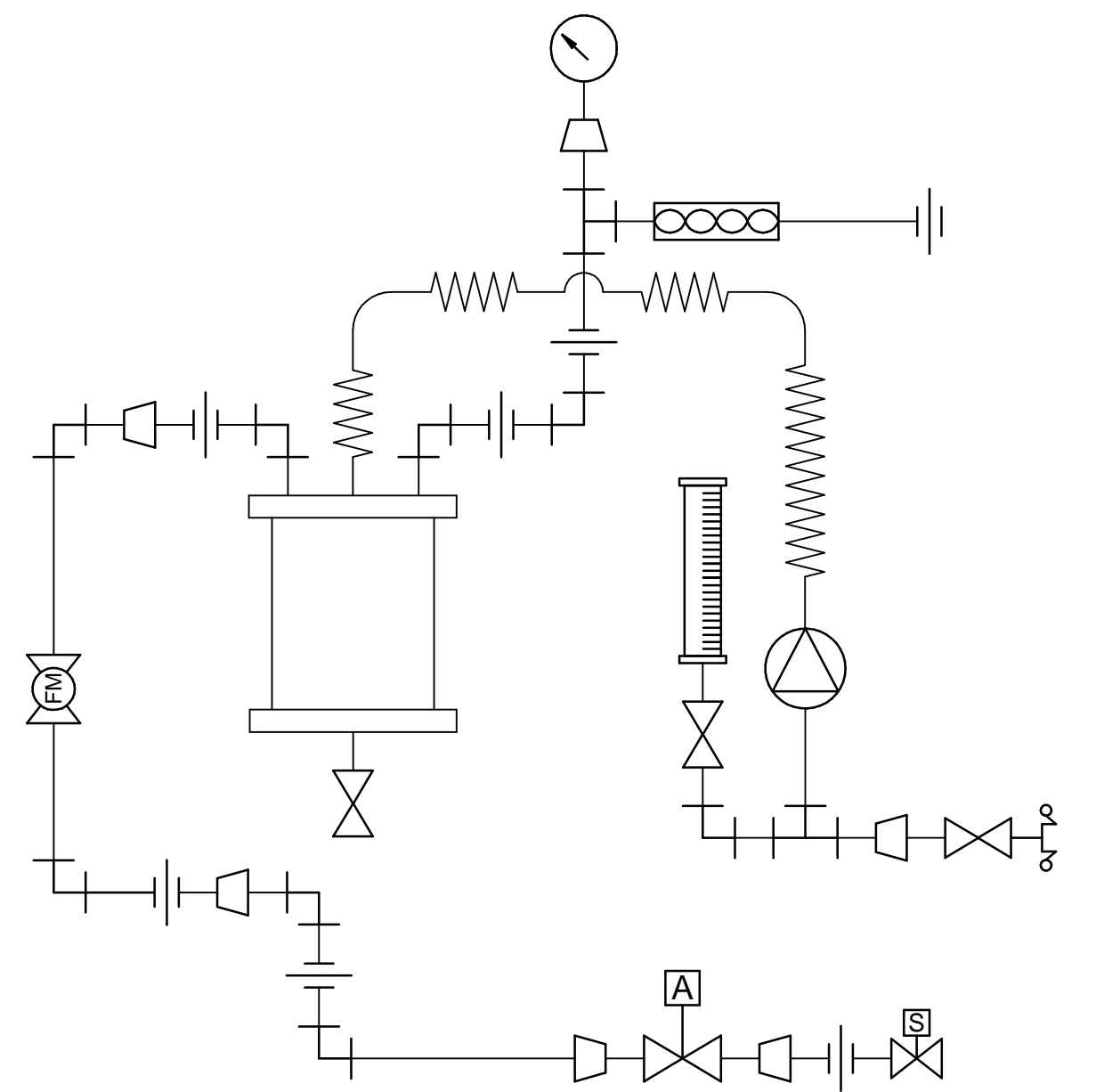
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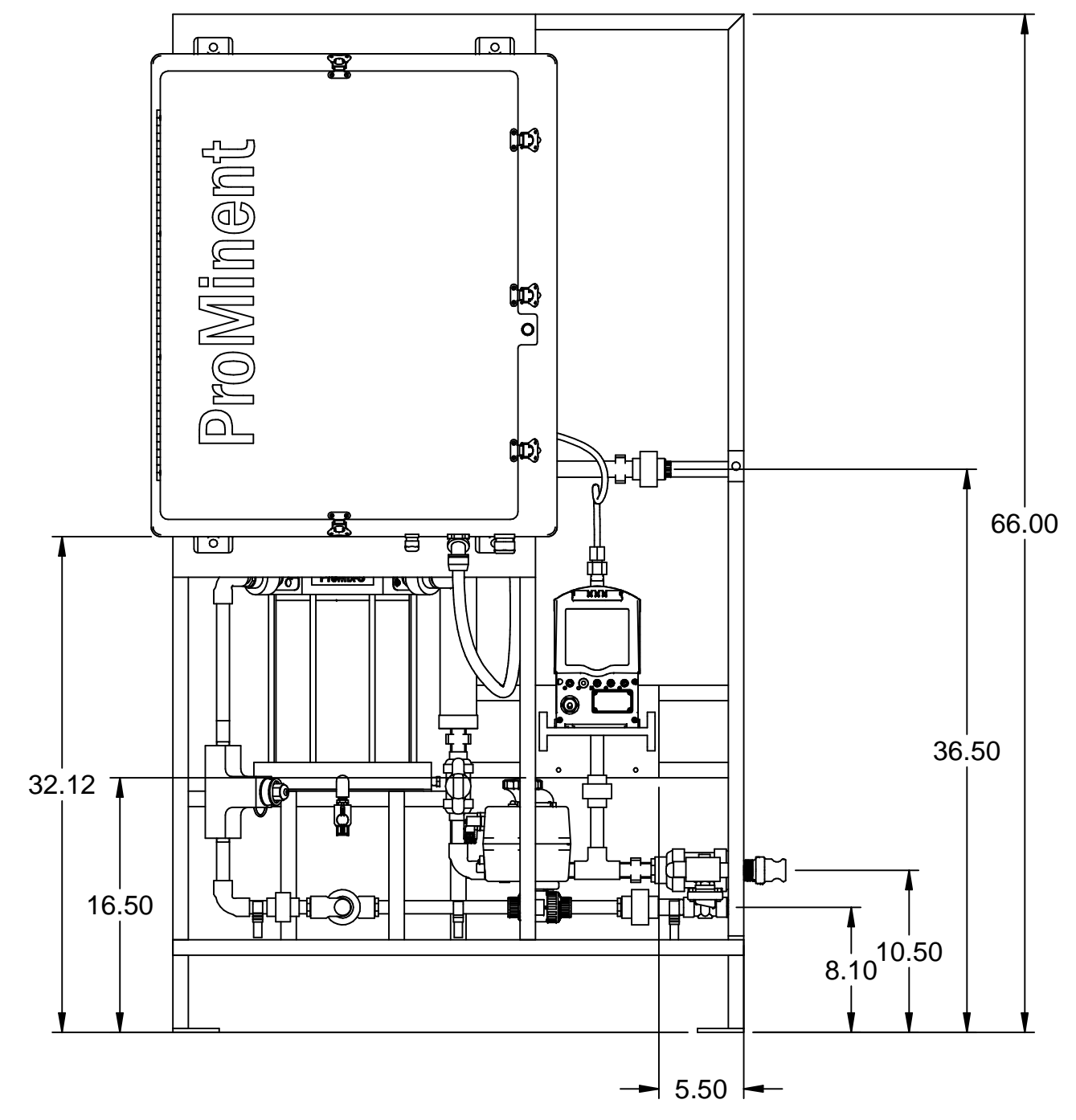
PLAN VIEW



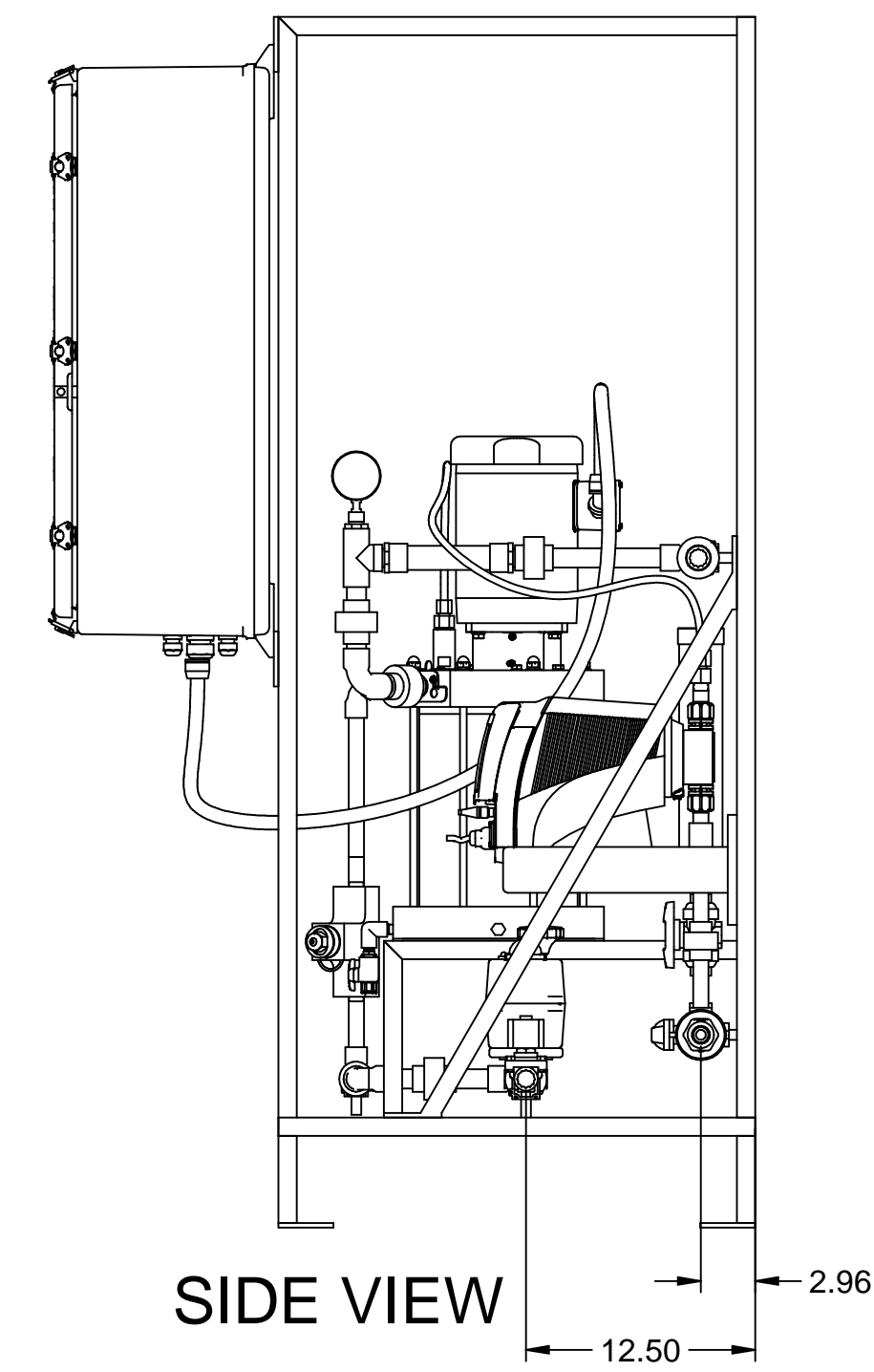
LEFT AND RIGHT ISOMETRIC VIEW



PIPING SCHEMATIC



FRONT VIEW



SIDE VIEW

NOTES:

- ALL PIPING AND FITTINGS SHALL BE 1/2" AND 3/4" SCH. 80 PVC SOCKET WELD WITH VITON SEALS UNLESS OTHERWISE REQUIRED BY COMPONENTS.
- PUMP MAXIMUM CAPACITY RATES BASED UPON PUMPING WATER.
- POLYMER BLENDING SYSTEM WITH THREE ZONE PVC MIXING CHAMBER.
- REQUIRED INCOMING POWER:
120 VAC, 1 PHASE, 60Hz, 15 AMP CURRENT RATING AT 120 VAC
- ALL DIMENSIONS ARE IN INCHES AND ARE SHOWN FOR REFERENCE ONLY.
- THE FOLLOWING ITEMS ARE SHIPPED LOOSE WITH THE PROMIX:

QUANTITY (1) PRESSURE REGULATING VALVE, WATTS 1/2", LF25AUB-HP-Z3
 QUANTITY (1) IBC TILTING CART (VESTIL IBC-TLT)
 QUANTITY (1) 1" HOSE ASSEMBLY PER DRAWING 3019800521-201

NETWORK NUMBERS (FOR INTERNAL USE ONLY)	
MECH:	1083484
ELEC:	XXXXXX
SPARE PARTS:	XXXXXX
NOTES:	
MAXIMUM TESTING PRESSURE =	150 PSI
MAXIMUM OPERATING PRESSURE =	145 PSI
MAX NEAT POLYMER PUMP=	145 PSI
CHEMICAL SERVICE = WATER SOLUBLE POLYMER	

0	11/18/19	FIRST ISSUE	TJB	
REV	DATE	DESCRIPTION	BY	APPD/REVD
REVISIONS				
CUSTOMER: PROMINENT FLUID CONTROLS, INC. (DISTRICT OF SOOKE)				
JOB No	3019800521	PURCHASE ORDER No	119078285	
TITLE: PROMIX S_300X1-2.30DA SYSTEM SKID GENERAL ARRANGEMENT				
THIS DRAWING IS THE PROPERTY OF PROMINENT FLUID CONTROLS INC. AND SHALL NOT BE COPIED OR TRANSFERRED WITHOUT THE WRITTEN CONSENT OF PROMINENT FLUID CONTROLS INC.				
ENGINEERS SEAL				
		PITTSBURGH, PA USA WWW.PROMINENT.US PROMINENT FLUID CONTROLS LTD. 490 SOUTHGATE DRIVE. GUELPH, ONTARIO, CANADA N1H 6J3 TEL. 519 836 5692 FAX. 519 836 5226 PROMINENT FLUID CONTROLS INC. RIDC PARK WEST 136 INDUSTRY DRIVE. PITTSBURGH P.A., USA. 15275 TEL. 412 787 2484 FAX. 412 787 0704		
DESIGNED	TJB	APPROVED	CM	
DRAWN	TJB	SCALE	N.T.S.	
CHECKED	SK	DATE	11/18/19	
DWG No	3019800521-200	REV	0	PAGE 1/1

2.2

gamma/ XL Series

Automatic Degassing for Critical Applications!



ProMinent®

The new **gamma/ XL** is a solenoid metering pump with predictive intelligence. Thanks to its controlled solenoid drive with sensor-free pressure measurement, it detects hydraulic faults even in the case of minimal deviations – immediately and optimally matching its output to the pressure conditions and properties of the medium while protecting the pump and piping systems from overload situations. The **gamma/ XL** covers a capacity range of **.006 GPD** at **363 PSIG** to **21.1 GPH** at **29 PSIG** (depending on pump version).

Features & Benefits

- Electronic stroke length adjustment via click wheel
- Volume adjustment in GPH or LPH
- Manual, Analog, Contact and Batch modes optional
- Integrated system pressure measurement
- BUS interfaces such as Profibus, CANbus, PROFINET and Modbus
- High visibility of LED-indicator lights
- Large illuminated display
- Analog output for stroke length and stroke rate transmission
- Auto compensates programmed feed rates during back pressure fluctuations
- As low as 1 mL/hr continuous feed rate with regulated solenoid drive
- Turn down ratio up to 40,000:1
- Integrated pressure measurement and display
- Available diaphragm rupture indicator
- Integrated 7 day timer
- Detects Overpressure/ No Pressure (broken discharge line) and gas in the liquid end
- Automatically sets optimal speed and stroke based on GPH settings (when set to automatic)
- New configurable input/output
- gamma/ XL and delta® footprints are identical

gamma/ XL Series

Technical data

Capacity Data											
Pump Version	Capacity at Maximum Backpressure					Max. Stroking Rate Strokes/min	Tubing Connectors O.D. x I.D. in	Suction Lift		Shipping Weight lbs	
	PSIG	(bar)	GPH*	(L/H)	ml/stroke			ft**	(m)**	NPE/NPB/PVT	SS
gamma/ XL with standard liquid ends											
2508	363	(25)	2.10	(8)	0.67	200	3/8" x 1/4" (1/2" MNPT dis. only)	16.4	(5)	22.0	24.25
1608	232	(16)	2.10	(8)	0.67	200	3/8" x 1/4"	16.4	(5)	22.0	24.25
1612	232	(16)	3.17	(12)	1	200	3/8" x 1/4"	19.6	(6)	22.0	24.25
1020	145	(10)	5.28	(20)	1.7	200	1/2" x 3/8"	16.4	(5)	22.0	24.25
0730	102	(7)	7.93	(30)	2.5	200	1/2" x 3/8"	16.4	(5)	22.0	24.25
0450	58	(4)	13.2	(50)	4.2	200	5/8" ID hose barb standard***	9.8	(3)	22.0	24.25
0280	29	(2)	21.1	(80)	6.7	200	5/8" ID hose barb standard***	6.5	(2)	22.0	24.25
gamma/ XL with auto-degassing dosing head, without bypass PVT7											
1608	232	(16)	1.00	(3.8)	0.32	200	1/2" x 3/8"	5.9	(1.8)	22.0	-
1612	232	(16)	1.70	(6.5)	0.54	200	1/2" x 3/8"	5.9	(1.8)	22.0	-
1020	145	(10)	3.70	(14)	1.17	200	1/2" x 3/8"	5.9	(1.8)	22.0	-
0730	101	(7)	7.40	(28)	2.33	200	1/2" x 3/8"	5.9	(1.8)	22.0	-

Positive suction is recommended on pumps with 1/2" MNPT connections.

gamma/ XL metering pumps with high viscosity liquid ends (PVT 4) have a 10 – 20 % lower capacity rating and are not self-priming.

Permissible ambient temperature: 14 °F to 113 °F | Average power consumption: 78 W | Degree of protection: IP 66

Repeatability ± 2% when utilized and installed per operating instructions

* Capacity data represents minimum values, tested using water at 68 °F (room temperature)

** Suction lift with pre-primed suction line and liquid end

*** (1/2" MNPT optional)

Liquid end materials in contact with media					
Version	Liquid End	Suction/ discharge valve	Ball seat	Seals	Balls
NPT	Acrylic	PVC	PVDF	PTFE	Ceramic
PVT	PVDF	PVDF	PVDF	PTFE	Ceramic
NPE	Acrylic	PVC	PVDF	EPDM	Ceramic
NPB	Acrylic	PVC	PVDF	FKM	Ceramic
SST	316 SST	316 SST	Ceramic	PTFE	Ceramic
SST (DN10)	316 SST	316 SST	PTFE with carbon	PTFE	Ceramic

Note: PVT7 versions have PVDF / PTFE wetted parts. Diaphragm with a PTFE face

FKM = fluorine rubber

1 Identity code

Product range gamma/ XL

GXLa	Type	
	1020	10bar, 20 l/h con.12x9/SS12x10
		Dosing head material
	NP	Clear acrylic
	PV	PVDF
	SS	Stainless steel
		Seal material
	T	PTFE
	F	PTFE, FDA-compliant
		Dosing head design
	0	without bleed valve, without valve spring
	1	without bleed valve, with valve spring
	2	with bleed valve, without valve spring
	3	with bleed valve, with valve spring
	4	without bleed valve, with valve spring for more high-viscosity media (HV)
	7	Self-bleeding with groove (SEK)
		Hydraulic connector
	6	standard-connection - USA
	5	Connector for 12/6 hose, suction side standard
	F	Connector on discharge side for 8/4 hose, standard on suction side
		Diaphragm rupture indicator
	0	without diaphragm rupture indicator
	1	With diaphragm rupture indicator, optical sensor, electrical signal
		Design
	0	Hous. RAL5003 / Hood RAL2003
		Logo
	0	with ProMinent logo
	2	without ProMinent logo
		Electrical connection
	U	100-230 V ± 10%, 50/60 Hz
		Cable and plug
	A	2 m European
	B	2 m Swiss
	C	2 m Australian
	D	2 m USA / 115 V
	1	2 m open end

		Relay, pre-set to ...
	0	no relay
		-

Product range gamma/ XL

1	1 x changeover contact 230 V AC – 2 A	Fault indicating relay (N/C)
4	2 x N/O 24 V DC – 100 mA	as 1 + pacing relay
C	1 x N/O 24 V DC – 100 mA, and 1 x 4-20 mA output	As 1 + 4-20 mA output
F	With automatic bleed valve	230 V AC
G	with automatic bleed valve and relay output	24 VDC
..	...	

Accessories

0	no accessories
1	with foot and injection valve, 2 m suction line, 5 m metering line
2	as 0 + measuring cup
3	as 1 + measuring cup

Control version

0	Manual + external contact with pulse control
3	Manual + external contact with pulse control + analogue 0/4-20mA
C	As 3 + CANopen
E	As 3 + PROFINET®
R	As 3 + PROFIBUS® interface, M12

Communication

0	without interface
B	with Bluetooth
W	with Wi-Fi

Language

DE	German
EN	English
ES	Spanish
FR	French
...	...

GXLA US 1020 PV T 4 6 0 0 0 U D C 0 3 0 EN

2.3



Type-21/21A Ball Valve

Standard Features (Sizes 1/2" – 6")

- Pressure rated up to 230psi (PVC, CPVC, PVDF)
- Double O-ring seals on stem for added protection
- Full bore, sizes 1/2" – 2"
- Full vacuum rated, all sizes
- Blocks in two directions, upstream and downstream, leaving full pressure on the opposite end of the valve
- Integrally molded ISO mounting pad for both manual and actuated operations
- Integrally molded base pad to mount valves securely on panel mounting
- PTFE seats with elastomeric backing cushions ensure bubble tight shut-off and a low fixed torque, while at the same time compensating for wear
- True union design for easier installation or repairs without expanding the pipe system
- Built-in spanner wrench on the handle for valve disassembly and assembly
- Two sets of end connectors (socket and threaded) included with all PVC and CPVC valves in sizes 1/2" – 2"
- CPVC threaded end connectors on sizes 1/2" – 1" come with stainless steel reinforcing rings
- New PTFE seat design – Facilitates easier field maintenance if required
- Tapered O-ring groove – Helps to keep the end connector O-rings on the valve body during installation
- Body flats – Flats have been added to either side of the valve body where a wrench can be applied to prevent the valve body from turning when the union nuts are tightened
- 1/2 - 2 " PVC and CPVC T-21A design

Options

- Pneumatic and electric actuators and accessories
- Stem extensions
- 2" square operating nut or "T" nut
- Locking handles
- Limit switches
- Vented ball

Specifications

Sizes: 1/2" – 6"
Models: PVC & CPVC: Socket Threaded and Flanged (ANSI)
 PP & PVDF: IPS and Metric (DIN) Socket, Threaded, Butt and Flanged (ANSI)
Bodies: PVC, CPVC, PP and PVDF
Seats: PTFE backed with EPDM or FKM
Seals: EPDM or FKM or AFLAS®†
Sizes 1/2" - 4" PVC/EPDM/FKM Models
NSF-61 Certified

† Trademark of Asahi Glass Co., Ltd.

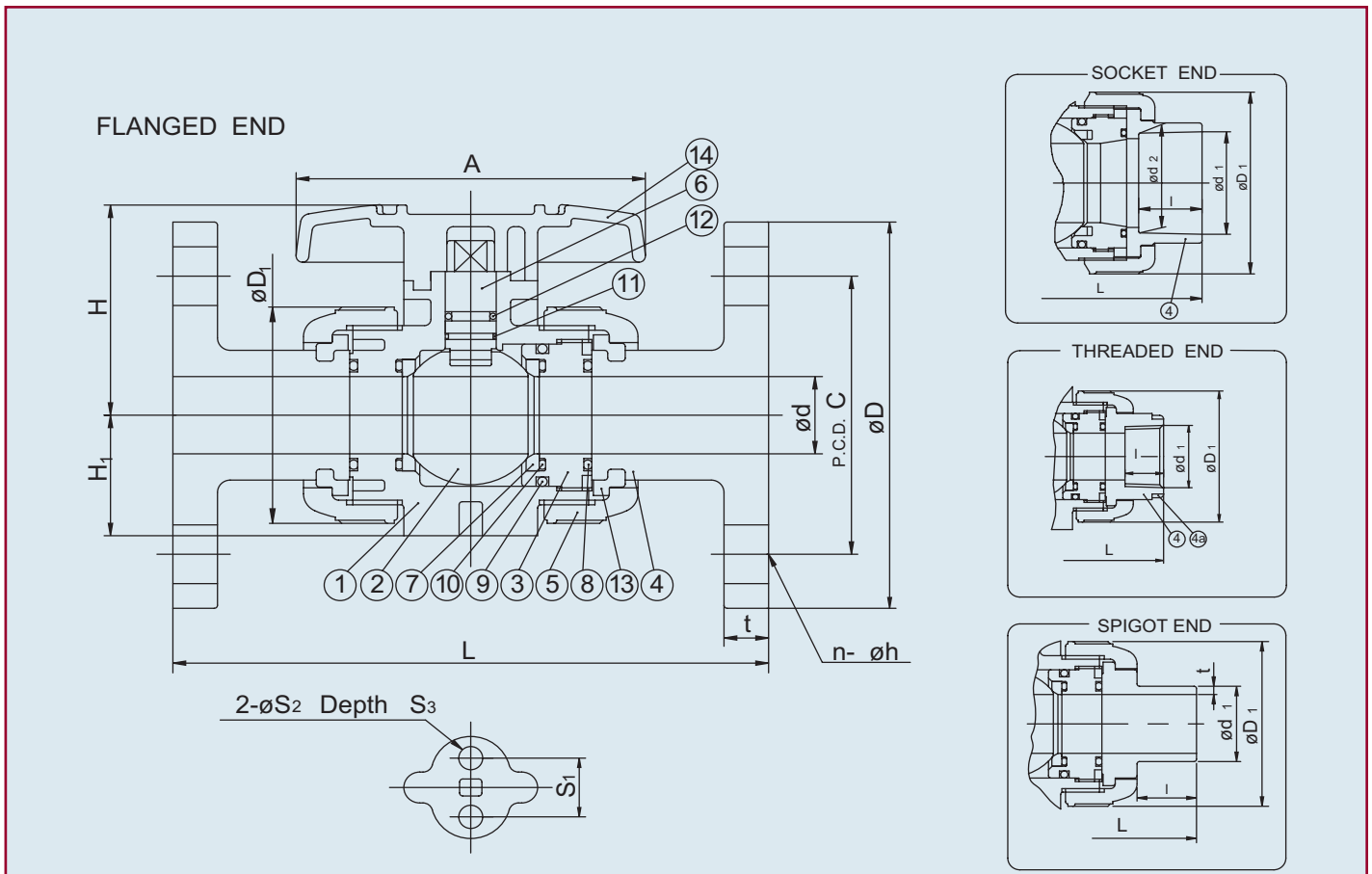
Parts List (Sizes 1/2" – 2")

PARTS			
NO.	DESCRIPTION	PCS.	MATERIAL
1	Body	1	PVC, CPVC, PP, PVDF
2	Ball	1	PVC, CPVC, PP, PVDF
3	Carrier	1	PVC, CPVC, PP, PVDF
4	End Connector	2	PVC, CPVC, PP, PVDF
5	Union Nut	2	PVC, CPVC, PP, PVDF
6	Stem	1	PVC, CPVC, PP, PVDF
7	Seat	2	PTFE
8	O-Ring (A)	2	EPDM, FKM, Others
9	O-Ring (B)	1	EPDM, FKM, Others
10	O-Ring (C)	2	EPDM, FKM, Others
11	O-Ring (D)	1	EPDM, FKM, Others
12	O-Ring (E)	1	EPDM, FKM, Others
13	Stop Ring*	2	PVDF
14	Handle	1	ABS
4a	Ring**	2	304 Stainless Steel

* Used for flanged end.

** Used for CPVC body, threaded end, 1/2"-1".





Dimensions (Sizes 1/2" - 2") (in.)

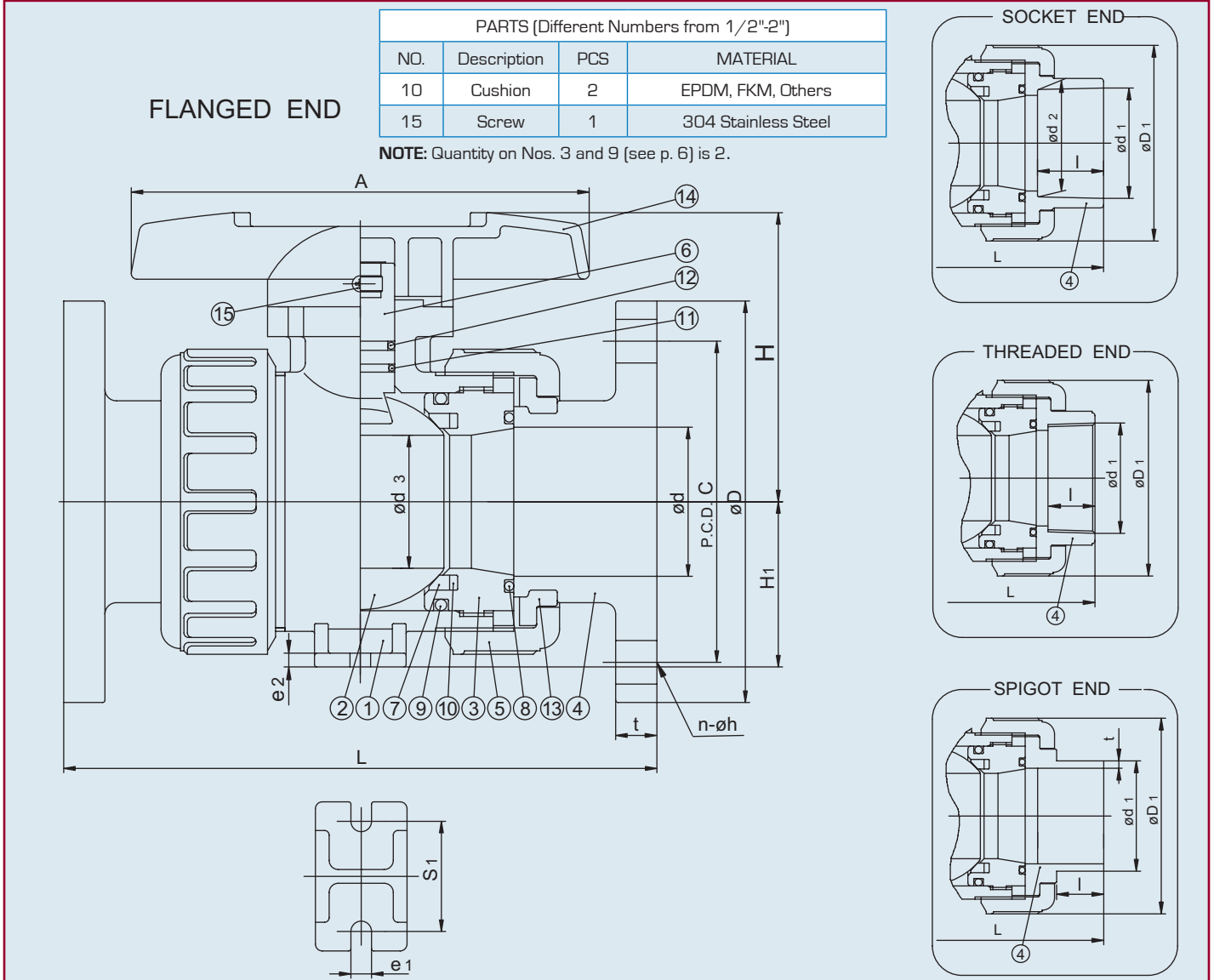
NOMINAL SIZE		FLANGED							SOCKET										
		ANSI CLASS 150							PVC, CPVC				PP, PVDF (DIN)				PP, PVDF (IPS)		
									ASTM SCH 80				DIN 16962						
INCHES	mm	d	D	C	n	h	L	t	d1	d2	/	L	d1	d2	/	L	d1	/	L
1/2	15	0.59	3.50	2.38	4	0.62	5.63	0.47	0.848	0.836	0.875	4.45	0.768	0.760	0.57	3.90	0.83	0.87	4.45
3/4	20	0.79	3.88	2.75	4	0.62	6.77	0.55	1.058	1.046	1.000	5.08	0.965	0.957	0.63	4.45	1.03	1.00	5.08
1	25	0.98	4.25	3.12	4	0.62	7.36	0.55	1.325	1.310	1.125	5.75	1.240	1.232	0.71	4.84	1.30	1.13	5.75
1-1/4	32	1.26	4.62	3.50	4	0.62	7.48	0.63	1.670	1.655	1.250	6.46	1.553	1.543	0.81	5.47	1.65	1.25	6.46
1-1/2	40	1.57	5.00	3.88	4	0.62	8.35	0.63	1.912	1.894	1.375	7.24	1.947	1.937	0.93	5.87	1.89	1.37	7.24
2	50	2.01	6.00	4.75	4	0.75	9.21	0.63	2.387	2.369	1.500	8.23	2.461	2.445	1.08	6.93	2.36	1.50	8.23

NOMINAL SIZE		THREADED			SPIGOT (BUTT END)												
					PP, PVDF												
					DIN 3442		PP	PVDF									
INCHES	mm	d1	/	L	d1	/	t	t	L	D1	H	H1	A	S1	S2	S3	
1/2	15	1/2 - 14 NPT		0.59	4.02	0.787	0.728	0.098	0.075	4.882	1.89	2.03	1.14	3.62	0.75	0.29	0.43
3/4	20	3/4 - 14 NPT		0.67	4.72	0.984	0.866	0.106	0.075	5.669	2.36	2.34	1.38	3.94	0.75	0.29	0.43
1	25	1 - 11-1/2 NPT		0.79	5.16	1.260	0.886	0.118	0.094	6.063	2.76	2.68	1.54	4.33	0.75	0.29	0.43
1-1/4	32	1-1/4 - 11-1/2 NPT		0.87	5.91	1.575	1.024	0.146	0.094	6.850	3.23	3.17	1.85	4.76	1.18	0.35	0.59
1-1/2	40	1-1/2 - 11-1/2 NPT		0.98	6.42	1.968	1.260	0.181	0.118	7.638	3.94	3.50	2.17	5.16	1.18	0.35	0.59
2	50	2 - 11-1/2 NPT		1.10	7.76	2.480	1.417	0.228	0.118	8.819	4.96	4.04	2.60	6.26	1.18	0.35	0.59

Note: The shape and appearance of assembly differ a little with nominal size compared to this drawing.

Type-21/21A

Ball Valves



Dimensions (Sizes 2-1/2" - 4") (in.) For 6" size consult factory.

NOMINAL SIZE		FLANGED										SOCKET											
		ANSI CLASS 150										PVC, CPVC				PP, PVDF (DIN)			PP, PVDF (IPS)				
		L					ASTM SCH 80					DIN 16962			PP	PVDF	PP		PVDF				
INCHES	mm	d	D	C	n	h	PVC CPVC	PP	PVDF	t	d1	d2	/	L	d1	d2	/	L	L	d1	/	L	L
2-1/2	65	2.56	7.0	5.5	4	0.75	10.20	10.12	10.08	0.71	2.889	2.868	1.750	9.45	2.923	2.911	1.22	8.07	8.03	2.88	1.752	9.37	9.33
3	80	3.07	7.5	6.0	4	0.75	12.05	12.07	11.89	0.71	3.516	3.492	1.875	11.14	3.512	3.498	1.40	9.92	9.80	3.48	1.874	11.10	10.28
4	100	3.94	9.0	7.5	8	0.75	14.72	14.72	14.53	0.71	4.518	4.491	2.000	13.89	4.293	4.278	1.63	12.28	12.09	4.48	2.252	14.37	14.13

NOMINAL SIZE		THREADED					SPIGOT (BUTT END)													
		L					PP, PVDF													
		PVC CPVC	PP	PVDF	DIN 3442		PP	PVDF	PP	PVDF										
INCHES	mm	d1	/	t	t	L	L	d3	D1	H	H1	A	e1	e2	S1					
2-1/2	65	2-1/2-8NPT	1.26	8.46	8.39	8.35	2.953	1.496	0.272	0.142	9.648	9.606	2.28	5.24	4.96	2.83	7.87	0.35	0.24	1.89
3	80	3-8NPT	1.38	10.43	10.39	10.28	3.543	1.496	0.323	0.169	11.654	11.535	2.70	5.98	5.51	3.35	9.45	0.43	0.28	2.17
4	100	4-8NPT	1.77	14.25	14.25	14.06	4.331	1.752	0.394	0.209	13.978	13.779	3.54	8.27	7.01	4.33	11.81	0.43	0.31	2.56

Note: The shape and appearance of assembly differ a little with nominal size compared to this drawing.

Pressure vs. Temperature (psi, water, non-shock)

NOMINAL SIZE		PVC				CPVC						PP				PVDF				
		30° F 70° F	71° F 105° F	106° F 120° F	121° F 140° F	30° F 70° F	71° F 105° F	106° F 120° F	121° F 140° F	141° F 175° F	176° F 195° F	- 5° F 85° F	86° F 120° F	121° F 140° F	141° F 175° F	- 5° F 70° F	71° F 105° F	106° F 140° F	141° F 175° F	176° F 210° F
INCHES	mm																			
1/2-2	15-50	230	170	150	30	230	170	150	120	75	55	150	110	90	55	230	185	150	115	85
2-1/2	65	230	170	150	NA	230	170	150	120	75	55	150	95	70	40	230	185	150	115	85
3	80	230	170	150	NA	230	170	150	85	55	40	150	95	70	40	230	185	150	100	70
4-6	100-150	150	150	150	NA	150	150	150	85	55	40	150	95	70	40	150	150	150	100	70

Sample Specification

All Type-21/21A ball valves, sizes 1/2" to 4", shall be of true union design with two-way blocking capability. All O-rings shall be EPDM or FKM with PTFE seats. PTFE seats shall have elastomeric backing cushion of the same material as the valve seals. Stem shall have double O-rings and be of blowout-proof design. The valve handle shall double as carrier removal and/or tightening tool. ISO mounting pad shall be integrally molded to valve body for actuation. PVC conforming to ASTM D1784 Cell Classification 12454A, CPVC conforming to ASTM D1784 Cell Classification 23567-A, PP conforming to ASTM D4101 Cell Classification PPO210B67272 and PVDF conforming to ASTM D3222 Cell Classification Type II. The ball valves, except PP, shall have a pressure rating of 230psi for sizes 1/2" to 3" and 150psi for 4" (150psi for PP, all sizes) at 70° F. Type-21/21A ball valves must carry a two year guarantee, as manufactured by Asahi/America, Inc.

Caution

- Do not use ball valves where media has suspended particles. Use the following valves:
 - Butterfly valves – PVDF disc is most abrasion resistant. Make sure of chemical compatibility.
 - Diaphragm valves – Elastomeric diaphragm is designed for handling suspended particles.
- Volatile fluids such as sodium hypochlorite (NaClO) and hydrogen peroxide (H₂O₂) could be trapped and gasified within the valve. We can provide you with a Type-21 ball valve with a vented ball to relieve pressure build-up inside the valve.

Troubleshooting

What if the fluid still flows when valve is closed?

- Carrier is not properly tightened. Tighten it.
- PTFE seat is damaged or worn. Replace seat.
- Foreign material is caught between ball and PTFE seat. Remove material and clean.
- Ball is damaged or worn. Change ball.

What if fluid leaks outside of valve?

- Union nut not properly tightened. Retighten.
- Carrier is not properly tightened. Thread it in firmly.
- Carrier or face O-ring is damaged, worn, or missing. Replace O-ring.

What if handle does not rotate smoothly?

- Foreign material has formed on the ball or seat. Clean both.
- Internal part(s) chemically attacked or swollen. Refer to Asahi/America Chemical Resistance Chart for compatibility. Replace part(s) as required.
- Carrier overtightened. Retighten properly.

What if handle rotates too freely?

- Stem is damaged. Replace stem.
- Handle is not engaged with stem. Disassemble and reengage. Inspect.
- Engaging part of stem and/or ball is damaged. Change stem and/or ball.

Cv Values

Weight (lbs.)

NOMINAL SIZE		Cv	NOMINAL SIZE		SOCKET	FLANGED
INCHES	mm		INCHES	mm	THREADED	
1/2	15	14	1/2	15	0.44	1.10
3/4	20	29	3/4	20	0.66	1.54
1	25	47	1	25	1.1	2.70
1-1/4	32	72	1-1/4	32	1.54	3.30
1-1/2	40	155	1-1/2	40	2.64	4.40
2	50	190	2	50	4.4	8.15
2-1/2	65	365	2-1/2	65	6.17	8.80
3	80	410	3	80	9.7	13.00
4	100	680	4	100	24.00	26.67

Caution

- Never remove valve from pipeline under pressure.
- Always wear protective gloves and goggles.
- Watch out for trapped fluid in valve. It is safe to close valve before removing it from the pipeline.

2.4

CALIBRATION CYLINDERS

Graduated Calibration Cylinders for Accurate Calibration of Chemical Metering Pumps

Verified Accuracy

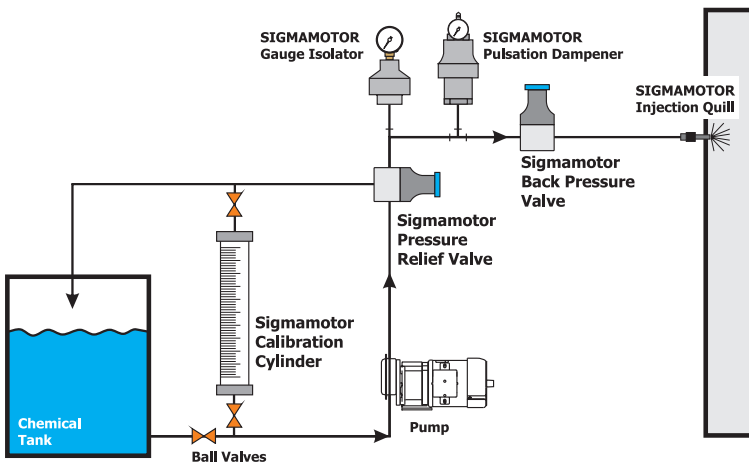
Sigmamotor Calibration Cylinders will enhance your feed systems by allowing verification of the flow rate of the feed pump.

- CNC machined ends
- Clear tube for easy GPH reading
- Sealed top
- Quick-off top for cleaning (optional)
- Loose top (optional)
- NSF-61 approved materials

Calibration Cylinders are installed on the suction side of the metering pump and are isolated with two valves installed with the cylinder. The top of the cylinder is vented back to the supply tank or drain. The calibration cylinder is filled to the top mark then the valve from the tank is closed. Turning on the metering pump will draw down the liquid providing a simple means to verify the accuracy of the pump flow rate. USGPH (gallons per hour) and ML (milliliters) are shown on the cylinder.

Sigmamotor Calibration Cylinders are critical to accurate determination of your system flow rate, either at start-up or following maintenance. Sigmamotor Calibration Cylinders are made from clear PVC with gray PVC ends. Max cylinder pressure is 15psi.

Typical System Block Diagram



Rugged PVC Sigmamotor Calibration Cylinders and are clearly marked in US GPH and milliliters for accurate drawdown calibrations.

Glass cylinders are also available.

SIGMAMOTOR CALIBRATION CYLINDERS

SEALED CAP (S)



Cap is permanently fixed to the top of the cylinder and includes a vent or NPT process connection. Used in applications requiring a positive suction head.

LOOSE CAP (L)

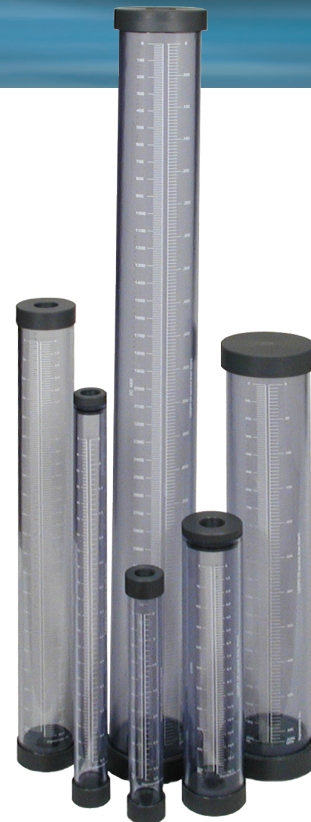


Cap is loose and easily removed for cleaning and manual filling. Used in applications where the cylinder must be filled from the top with no positive suction head.

QUICK OFF CAP (Q)



Cap is sealed with an O-ring and includes an NPT vent connection. Used in applications where frequent cleaning is required, such as polymer, alum, ferric chloride or chlorine.

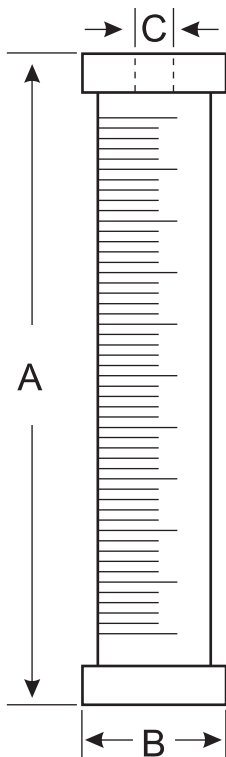


Sigmamotor Calibration Cylinders are available in eight sizes.

CALIBRATION CYLINDER SPECIFICATIONS

SIZE	NSF-61 approved materials							
	100ml	200ml	500ml	1000ml	2000ml	4000ml	10000ml	20000ml
PART NO. (cap style)	CA100 (S, L or Q)	CA200 (S, L or Q)	CA500 (S, L or Q)	CA1K (S, L or Q)	CA2K (S, L or Q)	CA4K (S, L or Q)	CA10K (S, L or Q)	CA20K (S, L or Q)
A - Height	11"	19"	13"	22"	20"	37"	26"	48"
B - Diameter	1.5"	1.5"	2.5"	2.5"	3.7"	3.7"	7.25"	7.25"
C - Connection	1/2" NPT	1/2" NPT	3/4" NPT	3/4" NPT	1" NPT	1" NPT	2" NPT	2" NPT
Capacity (GPH)	3.2	6.4	16	32	64	128	320	640
Scale (ml)	2	2	5	5	10	10	20	20

Custom sizes upon request.



Chemical Resistance Guide

RECOMMENDED				NOT RECOMMENDED	
Acetic Acid 10-20%	Barium Sulphate	Copper Sulphate	Linoleic Acid	Potassium Hydroxide	Acetic Acid
Acetylene	Barium Sulfide	Cupric Fluoride	Linseed Oil	Potassium Nitrate	Acetone
Adipic Acid	Beer	Detergents	Lithium Bromide	Potassium Permanganate	Ammonia (liquid)
Alum	Benzoic Acid	Dextrose	Malic Acid	Plating Solutions	Ammonium Fluoride
Aluminium Alum	Black Liquors	Distilled Water	Mercuric Chloride	Sea Water	Amyl Acetate
Aluminium Chloride	Bleach (12% Cl)	Ethylene Glycol	Mercuric Cyanide	Silicic Acid	Benzene
Aluminium Fluoride	Borax	Fatty Acids	Mercury	Silver Cyanide	Bromine, Liquid
Aluminium Hydroxide	Boric Acid	Ferric Chloride	Methyl Alcohol	Silver Nitrate	Bromine, water
Aluminium Oxychloride	Bromic Acid	Ferric Hydroxide	Methyl Sulfuric Acid	Sodium Acetate	Butyl Acetate
Aluminium Nitrate	Cadmium Cyanide	Ferric Nitrate	Milk	Sodium Alum	Carbon Bisulfide
Aluminium Sulfate	Calcium Bisulfide	Ferric Sulfate	Muratic Acid	Sodium Bicarbonate	Carbon Tetrachloride
Ammonia (dry-gas)	Calcium Bisulfite	Ferrous Chloride	Nitric Acid 10% - 60%	Sodium Bisulfate	Chlorine Gas
Ammonium Acetate	Calcium Carbonate	Ferrous Sulfate	Oleic Acid	Sodium Carbonate	Chlorine (wet)
Ammonium Alum	Calcium Chloride	Fluorosilicic Acid 25%	Ozone	Sodium Cyanide	Chromic Acid 10%
Ammonium Bifluoride	Calcium Hydroxide	Gallic Acid	Palmitric Acid 10%	Sodium Hydroxide	Chromic Acid 50%
Ammonium Carbonate	Calcium Hypochlorite	Gasoline	Perchloric Acid 10%	Sodium Hypochlorite	Ethers
Ammonium Chloride	Calcium Nitrate	Glycerine	Phosphoric Acid 10%	Stannic Chloride	Fluorine Gas
Ammonium Hydroxide	Carbon Dioxide	Glycol	Phosphoric Acid 25%	Sulfuric Acid 3%	Hydrofluoric Acid 50%
Ammon. Metaphosphate	Carbonic Acid	Glycolic Acid	Phosphoric Acid 75%	Sulfuric Acid 10%	Iodine
Ammonium Nitrate	Caustic Potash	Hydrobromic Acid 20%	Phosphoric Acid 85%	Sulfuric Acid 33%	Nitric Acid Anhydrous
Ammonium Persulfate	Caustic Soda	Hydrochloric Acid 35%	Potassium Alum	Sulfuric Acid 50%	Nitric Acid 68%
Ammonium Phosphate	Chlorine Water	Hydrocyanic Acid	Potassium Bicarbonate	Sulfuric Acid 70%	Perchloric Acid 15%
Ammonium Sulfate	Chrome Alum	Hydrogen Peroxide 90%	Potassium Borate	Trisodium Phosphate	Sulfide Sulfur Dioxide (wet)
Ammonium	Citric Acid	Hydrogen Sulfite	Potassium Bromate	Water, Deionized	Sulfuric Acid 80-94%
Ammonium Thiocyanate	Copper Carbonate	Kraft Liquors	Potassium Carbonate	Water, Distilled	Sulfuric Acid 80-94%
Arsenic Acid	Copper Chloride	Latic Acid 25%	Potassium Chlorate	Water, Salt	Titanium Tetrachloride
Barium Carbonate	Copper Cyanide	Lead Acetate	Potassium Chloride	Zinc Chloride	Tributyl Phosphate
Barium Chloride	Copper Fluoride	Lead Chloride	Potassium Cyanide	Zinc Sulfate	Turpentine
Barium Hydroxide	Copper Nitrate	Lead Sulfate	Potassium Fluoride		



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2.5



BOTTOM CONNECTED ALL STAINLESS GAUGES

MODEL BR301L

FEATURES:

The Model BR301L Series from Blue Ribbon Corporation is a high-quality line of liquid-filled bottom connected all stainless steel gauges. Their glycerine filling helps to dampen the effects of vibration, which will extend the life of the gauge.

This gauge is typically used on hydraulic & pneumatic systems, as well as any commercial or industrial application not corrosive to 316L stainless steel wetted parts, or where glycerine filling is suitable for use.



Model BR301L

SPECIFICATIONS:

- Stainless Steel Case and Bezel
- Stainless Steel Internals
- 316 Stainless Steel Bourdon Tube & Connection
- IP65 Enclosure
- Liquid Filled (Dry Available)
- Accuracy
 - 2½" Dial: 1.6%
 - 4" and 6" Dials: 1%
- Dual Scale: PSI & BAR (x100=kPa)
- Single Scale (PSI) Available
- Ambient Temperature
 - Filled: +30 °F to +160 °F
 - Dry: -30 °F to +180 °F

FIELD OPTIONS:

- Dial Sizes
 - 2½", 4", and 6"
- Connection Sizes
 - ¼"(M) NPT on 2½" and 4"
 - ½"(M) NPT on 4" and 6"
- Safety Glass Lens
- Welded Socket
- Overpressure Limit: 30% FSO
- Working Pressure: 75% FSO

RANGE	CODE	MAJOR INC.	MINOR INC.
30/0" VAC	A	5	0.5
30/0/15	CB	5	0.5
30/0/30	CC	10	1
30/0/60	CD	10	1
30/0/100	CE	20	2
30/0/150	CF	20	2
30/0/300	CH	50	10
0/15	B	2	0.2
0/30	C	5	0.5
0/60	D	10	1
0/100	E	20	2
0/160	F	20	2
0/200	G	40	4
0/300	H	50	5
0/400	I	50	5
0/500	J	100	10
0/600	K	100	10
0/800	L	100	10
0/1000	M	200	20
0/1500	N	200	20
0/2000	O	400	50
0/3000	P	500	50
0/4000	Q	500	50
0/5000	R	1000	100
0/6000	S	2000	200
0/10,000	U	2000	200
0/15,000	V	2000	200



2.6

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
- 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

Electrical

Standard Coil and Class of Insulation	Watt Rating and Power Consumption				Spare Coil Part Number			
	DC Watts	AC			General Purpose		Explosionproof	
		Watts	VA Holding	VA Inrush	AC	DC	AC	DC
F	-	6.1	16	40	238210	-	238214	-
F	11.6	10.1	25	70	238610	238710	238614	238714
F	16.8	16.1	35	180	272610	97617	272614	97617
F	-	17.1	40	93	238610	-	238614	-
F	-	20	43	240	99257	-	99257	-
F	-	20.1	48	240	272610	-	272614	-
H	30.6	-	-	-	-	74073	-	74073
H	40.6	-	-	-	-	238910	-	238914

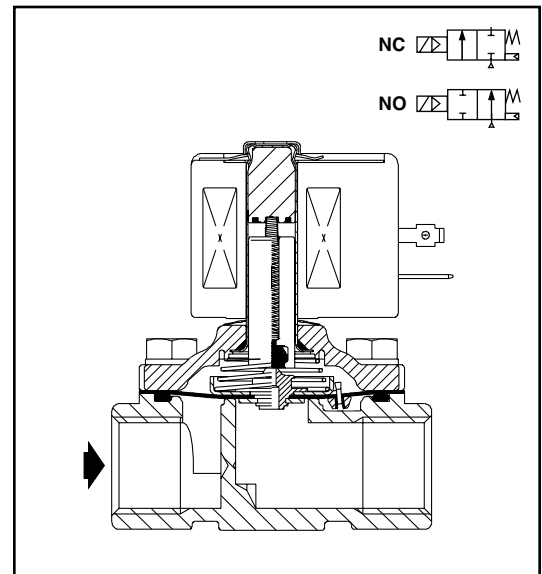
Standard Voltages: 24, 120, 240, 480 volts AC, 60 Hz (or 110, 220 volts AC, 50 Hz). 6, 12, 24, 120, 240 volts DC. Must be specified when ordering.
Other voltages available when required.

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.

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 Insulation ⑦	
			Min.	Max. AC			Max. DC			AC	DC	Catalog Number	Const. Ref. ④	UL ⑤ Listing	Catalog Number	Const. Ref. ④	UL ⑤ Listing	AC	DC
				Air-Inert Gas	Water ①	Light Oil @ 300 SSU	Air-Inert Gas	Water ①	Light Oil @ 300 SSU										
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	-	-	-	200	180	180	-	77	8210B026 ② ‡	10P	-	-	-	-	-	30.6/H
3/4	3/4	6	0	350	300	200	-	-	-	200	-	8210G026 ② ‡	40P	●	-	-	-	16.1F	-
1	1	13	0	-	-	-	100	100	80	-	77	8210B054 ‡	31D	-	8210D089	15D	-	-	30.6/H
1	1	13	0	150	125	125	-	-	-	180	-	8210G054	41D	●	8210G089	45D	●	16.1/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 ②	13P	-	-	-	-	17.1/F	-
1 1/4	1 1/8	15	0	-	-	-	100	100	80	-	77	8210B055 ‡	32D	-	-	-	-	-	30.6/H
1 1/4	1 1/8	15	0	150	125	125	-	-	-	180	-	8210G055	43D	●	-	-	-	16.1/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	-	-	-	100	100	80	-	77	8210B056 ‡	33D	-	-	-	-	-	30.6/H
1 1/2	1 1/4	22.5	0	150	125	125	-	-	-	180	-	8210G056	44D	●	-	-	-	16.1/F	-
1 1/2	1 1/4	22.5	5	150	150	100	125	125	125	180	150	8210G022	18D	●	-	-	-	6.1/F	11.6/F
2	1 3/4	43	5	150	125	90	50	50	50	180	150	8210G100	20P	●	-	-	-	6.1/F	11.6/F
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 ⑧ 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 ⑧ 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	-	180	8210C013	24D	●	-	-	-	-	16.8/F
3/4	3/4	6.5	5	250	200	200	-	-	-	180	-	8210G013	46D	●	-	-	-	16.1/F	-
1	1	13	0	125	125	125	-	-	-	180	-	8210B057 ⑩ ⑪	34D	●	-	-	-	20/F	-
1	1	13	5	-	-	-	125	125	125	-	180	8210D014	26D	●	-	-	-	-	16.8/F
1	1	13	5	150	150	125	-	-	-	180	-	8210G014	47D	●	-	-	-	16.1/F	-
1 1/4	1 1/8	15	0	125	125	125	-	-	-	180	-	8210B058 ⑩ ⑪	35D	●	-	-	-	20/F	-
1 1/4	1 1/8	15	5	-	-	-	125	125	125	-	180	8210D018	28D	●	-	-	-	-	16.8/F
1 1/4	1 1/8	15	5	150	150	125	-	-	-	180	-	8210G018	48D	●	-	-	-	16.1/F	-
1 1/2	1 1/4	22.5	0	125	125	125	-	-	-	180	-	8210B059 ⑩ ⑪	36D	●	-	-	-	20/F	-
1 1/2	1 1/4	22.5	5	-	-	-	125	125	125	-	180	8210D032	29D	●	-	-	-	-	16.8/F
1 1/2	1 1/4	22.5	5	150	150	125	-	-	-	180	-	8210G032	49D	●	-	-	-	16.1/F	-
2	1 3/4	43	5	-	-	-	125	125	125	-	150	8210 103	30P	●	-	-	-	-	16.8/F
2	1 3/4	43	5	125	125	125	-	-	-	180	-	8210G103	50P	●	-	-	-	16.1/F	-
2 1/2	1 3/4	45	5	-	-	-	125	125	125	-	150	8210 104	27P	●	-	-	-	-	16.8/F
2 1/2	1 3/4	45	5	125	125	125	-	-	-	180	-	8210G104	51P	●	-	-	-	16.1/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" denotes diaphragm construction; "P" denotes 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.
 ⑧ AC construction also has PA seating.
 ⑨ No disc-holder.
 ⑩ Stainless steel disc-holder.
 ⑪ Water rating, CSA certified up to 232 psi.

† UL listed for fire protection systems per UL429A.
 ‡ Must have solenoid mounted vertical and upright.

Specifications (Metric units)

Pipe Size (in)	Orifice Size (mm)	Kv Flow Factor (m ³ /hr)	Operating Pressure Differential (bar)									Max. Fluid Temp. °C		Brass Body			Stainless Steel Body			Watt Rating/ Class of Coil Insulation ⑦	
			Min.	Max. AC			Max. DC			AC	DC	Catalog Number	Const. Ref. ④	UL ⑤ Listing	Catalog Number	Const. Ref. ④	UL ⑤ Listing	AC	DC		
				Air-Inert Gas	Water ⑩	Light Oil @ 300 SSU	Air-Inert Gas	Water ⑩	Light Oil @ 300 SSU												
NORMALLY CLOSED (Closed when de-energized), NBR or PTFE ② Seating																					
3/8	10	1.3	①	10	9	-	3	3	-	82	65	8210G073 ③	1P	●	8210G036 ③	1P	●	6.1/F	11.6/F		
3/8	16	2.6	0	10	10	-	3	3	-	82	65	8210G093	5D	○	-	-	-	10.1/F	11.6/F		
3/8	16	2.6	0.3	14	10	9	9	7	7	82	65	8210G001	6D	○	-	-	-	6.1/F	11.6/F		
3/8	16	2.6	0.3	21	21	21	-	-	-	79	-	8210G006	5D	○	-	-	-	17.1/F	-		
1/2	11	1.9	①	10	9	-	3	3	-	82	65	8210G015 ③	2P	●	8210G037 ③	2P	●	6.1/F	11.6/F		
1/2	16	3.4	0	10	10	-	3	3	-	82	65	8210G094	5D	○	-	-	-	10.1/F	11.6/F		
1/2	16	3.4	0	10	10	9	3	3	-	79	65	-	-	-	8210G087	7D	●	17.1/F	11.6/F		
1/2	16	3.4	0.3	14	10	9	9	7	7	82	65	8210G002	6D	○	-	-	-	6.1/F	11.6/F		
1/2	16	3.4	0.3	21	21	21	-	-	-	79	-	8210G007	5D	○	-	-	-	17.1/F	-		
1/2	19	3.4	0.3	-	21	-	-	21	-	54	32	8210G227	5D	○ †	-	-	-	17.1/F	40.6H		
3/4	16	3.9	0	10	10	9	3	3	-	79	65	-	-	-	8210G088	7D	●	17.1/F	11.6/F		
3/4	19	4.3	0.3	9	9	9	7	6	5	82	65	8210G009	9D	○	-	-	-	6.1/F	11.6/F		
3/4	19	4.3	0	10	10	-	3	3	-	82	65	8210G095	8D	○	-	-	-	10.1/F	11.6/F		
3/4	19	5.6	0.3	17	10	7	9	9	9	82	65	8210G003	11D	○	-	-	-	6.1/F	11.6/F		
3/4	19	5.1	0	-	-	-	14	12	12	-	25	8210B026 ② ‡	10P	-	-	-	-	-	30.6/H		
3/4	19	5.1	0	24	21	14	-	-	-	93	-	8210G026 ② ‡	40P	●	-	-	-	16.1F	-		
1	25	11	0	-	-	-	7	7	6	-	25	8210B054 ‡	31D	-	8210D089	15D	-	-	30.6/H		
1	25	11	0	10	9	9	-	-	-	82	-	8210G054	41D	●	8210G089	45D	●	16.1/F	-		
1	25	11	0.3	10	10	7	9	9	9	82	65	8210G004	12D	○	-	-	-	6.1/F	11.6/F		
1	25	11.5	0	21	16	8	-	-	-	93	-	8210G027 ‡	42P	●	-	-	-	20.1/F	-		
1	25	11.5	0.7	21	21	21	-	-	-	79	-	8210G078 ②	13P	-	-	-	-	17.1/F	-		
1 1/4	29	13	0	-	-	-	7	7	6	-	25	8210B055 ‡	32D	-	-	-	-	-	30.6/H		
1 1/4	29	13	0	10	9	9	-	-	-	82	-	8210G055	43D	●	-	-	-	16.1/F	-		
1 1/4	29	13	0.3	10	10	7	9	9	9	82	65	8210G008	16D	○	-	-	-	6.1/F	11.6/F		
1 1/2	32	19.5	0	-	-	-	7	7	6	-	25	8210B056 ‡	33D	-	-	-	-	-	30.6/H		
1 1/2	32	19.5	0	10	9	9	-	-	-	82	-	8210G056	44D	●	-	-	-	16.1/F	-		
1 1/2	32	19.5	0.3	10	10	7	9	9	9	82	65	8210G022	18D	●	-	-	-	6.1/F	11.6/F		
2	44	37	0.3	10	9	6	3	3	3	82	65	8210G100	20P	●	-	-	-	6.1/F	11.6/F		
2 1/2	44	39	0.3	10	9	6	3	3	3	82	65	8210G101	21P	●	-	-	-	6.1/F	11.6/F		
NORMALLY OPEN (Open when de-energized), NBR Seating (PA Disc-Holder, except as noted)																					
3/8	16	2.6	0.0	10	10	9	9	9	6	82	65	8210G033	23D	●	-	-	-	10.1/F	11.6/F		
3/8	16	2.6	0.3	17	14	14	17	14	14	82	82	8210G011 ⑧ ⑨	39D	●	-	-	-	10.1/F	11.6/F		
1/2	16	3.4	0	10	10	9	9	9	6	82	65	8210G034	23D	●	-	-	-	10.1/F	11.6/F		
1/2	16	2.6	0	10	10	7	9	9	6	82	65	-	-	-	8210G030	37D	●	10.1/F	11.6/F		
1/2	16	3.4	0.3	17	14	14	17	14	14	82	82	8210G012 ⑧ ⑨	39D	●	-	-	-	10.1/F	11.6/F		
3/4	19	4.7	0	10	10	9	9	9	6	82	65	8210G035	25D	●	-	-	-	10.1/F	11.6/F		
3/4	16	2.6	0	10	10	7	9	9	6	82	65	-	-	-	8210G038	38D	●	10.1/F	11.6/F		
3/4	19	5.6	0.3	-	-	-	17	14	14	-	82	8210C013	24D	●	-	-	-	-	16.8/F		
3/4	19	5.6	0.3	17	14	14	-	-	-	82	-	8210G013	46D	●	-	-	-	16.1/F	-		
1	25	11	0	9	9	9	-	-	-	82	-	8210B057 ⑥ ⑩	34D	●	-	-	-	20/F	-		
1	25	11	0.3	-	-	-	9	9	9	-	82	8210D014	26D	●	-	-	-	-	16.8/F		
1	25	11	0.3	10	10	9	-	-	-	82	-	8210G014	47D	●	-	-	-	16.1/F	-		
1 1/4	29	13	0	9	9	9	-	-	-	82	-	8210B058 ⑥ ⑩	35D	●	-	-	-	20/F	-		
1 1/4	29	13	0.3	-	-	-	9	9	9	-	82	8210D018	28D	●	-	-	-	-	16.8/F		
1 1/4	29	13	0.3	10	10	9	-	-	-	82	-	8210G018	48D	●	-	-	-	16.1/F	-		
1 1/2	32	19.5	0	9	9	9	-	-	-	82	-	8210B059 ⑥ ⑩	36D	●	-	-	-	20/F	-		
1 1/2	32	19.5	0.3	-	-	-	9	9	9	-	82	8210D032	29D	●	-	-	-	-	16.8/F		
1 1/2	32	19.5	0.3	10	10	9	-	-	-	82	-	8210G032	49D	●	-	-	-	16.1/F	-		
2	44	37	0.3	-	-	-	9	9	9	-	65	8210 103	30P	●	-	-	-	-	16.8/F		
2	44	37	0.3	9	9	9	-	-	-	82	-	8210G103	50P	●	-	-	-	16.1/F	-		
2 1/2	44	39	0.3	-	-	-	9	9	9	-	65	8210 104	27P	●	-	-	-	-	16.8/F		
2 1/2	44	39	0.3	9	9	9	-	-	-	82	-	8210G104	51P	●	-	-	-	16.1/F	-		

① 0.3 bar on Air; 0.0 bar on Water.
 ② Valve provided with PTFE main disc.
 ③ Valve includes Ultem (G.E. trademark) piston.
 ④ Letter "D" denotes diaphragm construction; "P" denotes 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.
 ⑧ AC construction also has PA seating.
 ⑨ No disc-holder.
 ⑩ Stainless steel disc-holder.
 ⑪ Water rating, CSA certified up to 16 bar.

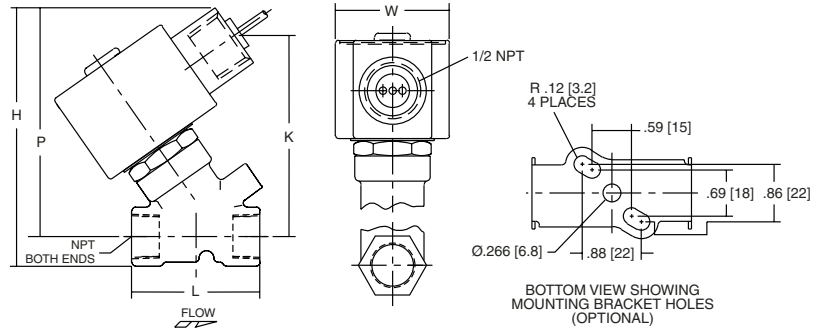
† UL listed for fire protection systems per UL429A.
 ‡ Must have solenoid mounted vertical and upright.

Dimensions: inches (mm)

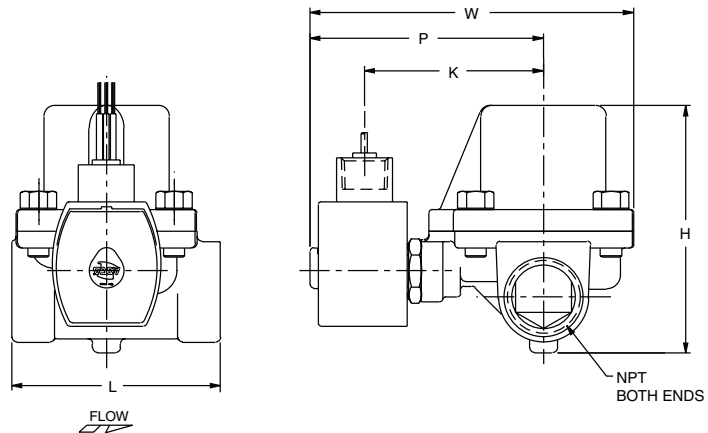
Const. Ref.		H	K	L	P	W
1*	in	3.85	3.00	1.91	3.41	1.69
	mm	98	76	49	87	43
2*	in	4.17	3.25	2.28	3.63	1.69
	mm	106	83	58	92	43
5	in	3.84	2.31	2.75	3.28	2.28
	mm	98	59	70	83	58
6*	in	3.38	1.94	2.75	2.80	2.28
	mm	86	49	70	71	58
7	in	4.19	2.50	2.81	3.47	2.39
	mm	106	64	71	88	61
8	in	4.13	2.47	2.81	3.44	2.29
	mm	105	63	71	87	58
9*	in	3.66	2.10	2.81	2.96	2.28
	mm	93	53	71	75	58
10*	in	5.25	X	2.81	4.59	2.31
	mm	133	X	71	117	59
11*	in	4.16	2.66	3.84	3.52	2.75
	mm	106	68	98	89	70
12	in	5.64	3.15	3.75	4.01	3.36
	mm	143	80	95	102	85
13	in	4.44	3.22	3.75	4.19	5.81
	mm	113	82	95	106	147
15*	in	5.34	X	3.75	4.47	3.84
	mm	136	X	95	114	98
16	in	5.64	3.15	3.66	4.01	3.56
	mm	143	80	93	102	90
18	in	6.11	3.30	4.38	4.16	3.92
	mm	155	84	111	106	100
20*	in	7.33	3.71	5.06	4.57	4.87
	mm	186	94	129	116	124
21*	in	7.33	3.71	5.50	4.57	4.87
	mm	186	94	140	116	124
23	in	4.35	2.65	2.75	3.79	2.28
	mm	110	67	70	96	58
24	in	5.06	X	3.78	4.44	2.75
	mm	129	X	96	113	70
25	in	4.64	2.81	2.81	3.94	2.28
	mm	118	71	71	100	58
26	in	6.53	X	3.75	4.91	3.19
	mm	166	X	95	125	81
27	in	8.22	X	5.50	5.47	4.87
	mm	209	X	140	139	124
28	in	6.53	X	3.66	4.91	3.19
	mm	166	X	93	125	81
29	in	7.03	X	4.38	5.06	4.40
	mm	179	X	111	129	112

* DC dimensions slightly larger.
IMPORTANT: Valves may be mounted in any position, except as noted in specifications table.

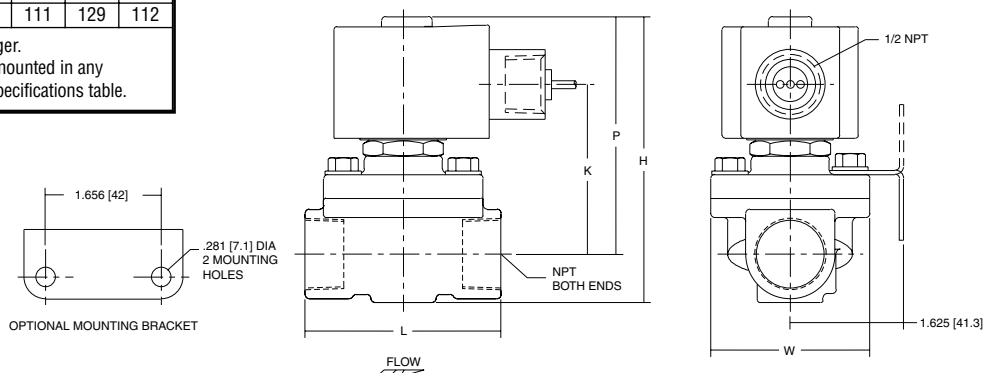
Const. Ref. 1, 2



Const. Ref. 13



Const. Ref. 5-9, 11, 23, 25, 37,38

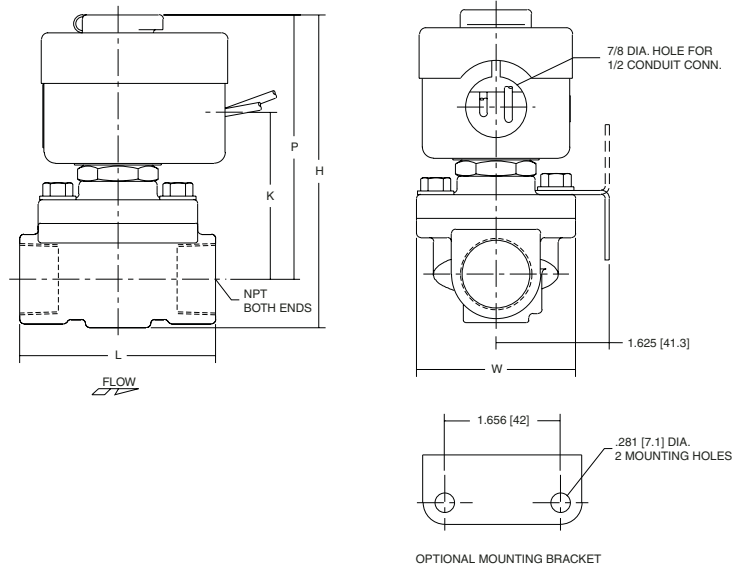


Dimensions: inches (mm)

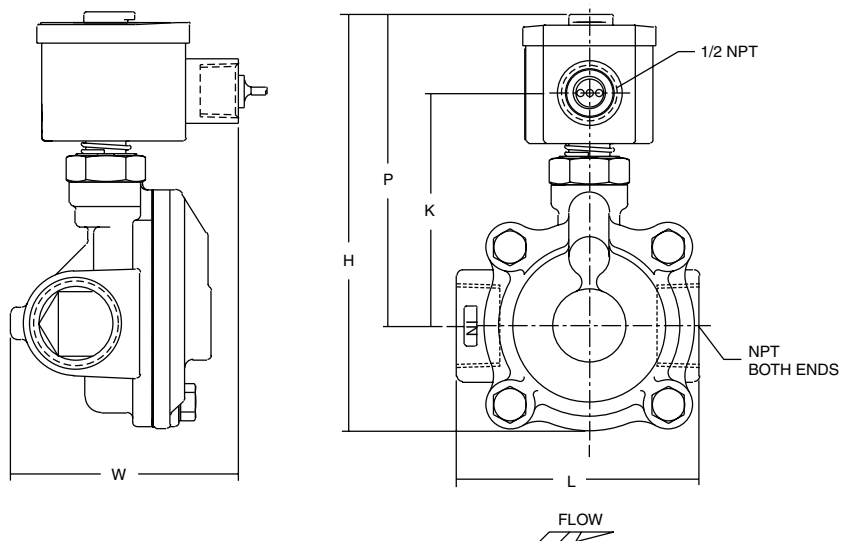
Const. Ref.		H	K	L	P	W
30	in	8.22	X	5.06	5.47	4.87
	mm	209	X	129	139	124
31	in	5.25	X	3.75	4.44	3.25
	mm	133	X	95	113	83
32	in	5.69	X	3.66	4.69	3.25
	mm	145	X	93	119	83
33	in	6.06	X	4.38	4.94	3.91
	mm	154	X	111	125	99
34	in	6.91	X	3.75	6.09	3.25
	mm	176	X	95	155	83
35	in	7.34	X	3.66	6.34	3.25
	mm	186	X	93	161	83
36	in	7.66	X	4.38	6.56	3.91
	mm	195	X	111	167	99
37	in	4.61	2.75	2.81	3.89	2.39
	mm	117	70	71	99	61
38	in	4.61	2.75	2.81	3.89	2.39
	mm	117	70	71	99	61
39	in	5.42	2.31	2.75	4.86	3.80
	mm	138	59	70	123	97
40	in	5.20	3.29	2.81	4.50	2.28
	mm	132	83	71	114	58
41	in	5.13	3.10	3.75	4.32	3.25
	mm	130	79	95	110	83
42	in	6.43	4.40	3.93	5.62	3.25
	mm	163	112	100	143	83
43	in	5.57	3.35	3.66	4.57	3.25
	mm	142	85	93	116	83
44	in	5.90	3.57	4.38	4.79	3.91
	mm	150	91	111	122	99
45	in	5.26	3.17	3.75	4.38	3.84
	mm	134	81	95	111	98
46	in	4.95	3.10	3.84	4.31	2.75
	mm	126	79	98	110	70
47	in	6.43	3.59	3.75	4.81	3.52
	mm	163	91	95	122	90
48	in	6.43	3.59	3.66	4.81	3.73
	mm	163	91	93	122	95
49	in	6.91	3.75	4.38	4.96	4.40
	mm	176	95	111	126	112
50	in	8.13	4.15	5.06	5.37	4.87
	mm	207	105	129	136	124
51	in	8.13	4.15	5.50	5.37	5.18
	mm	207	105	140	136	132

IMPORTANT: Valves may be mounted in any position, except as noted in specifications table.

Const. Ref. 10, 15, 24, 31-36

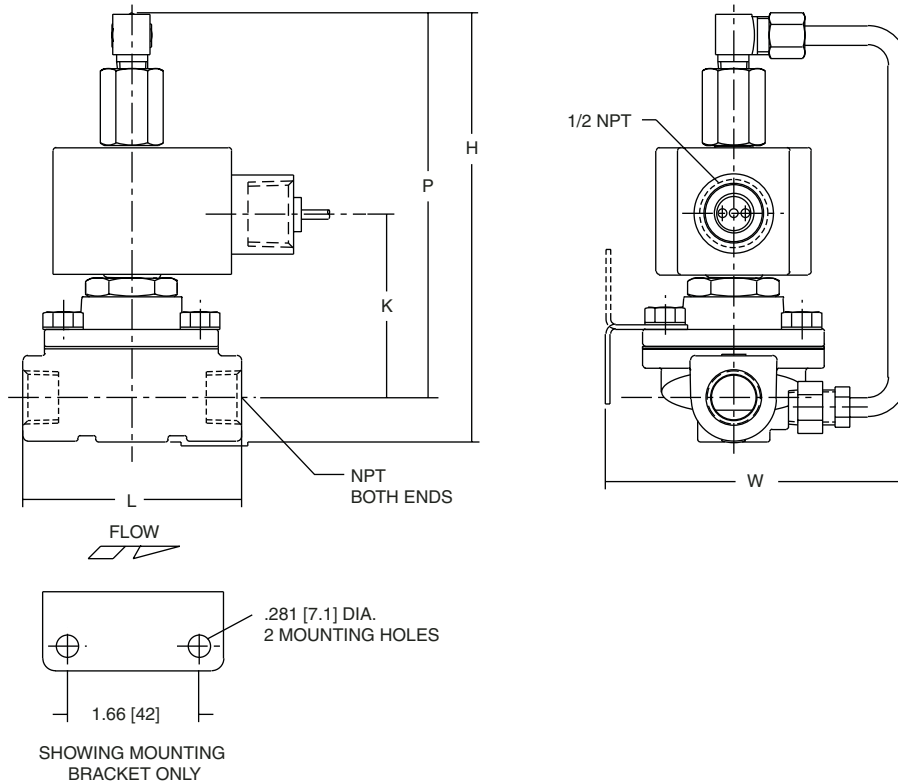


Const. Ref. 12, 16, 18, 20, 21, 26-30, 47-51

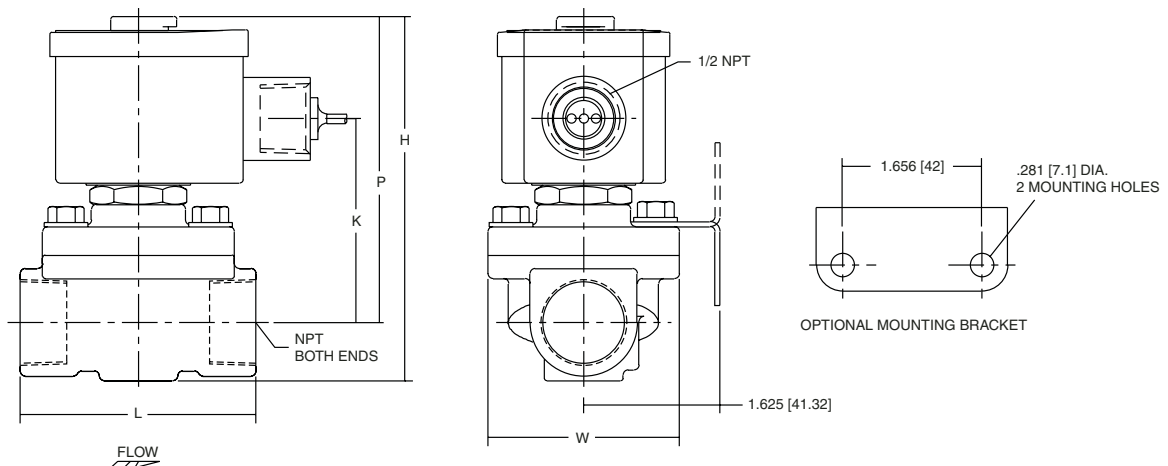


Dimensions: inches (mm)

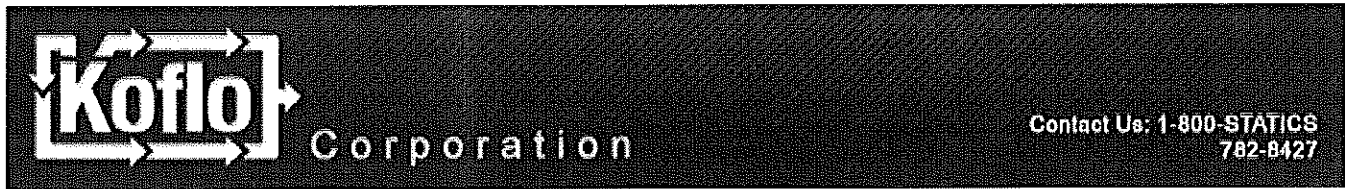
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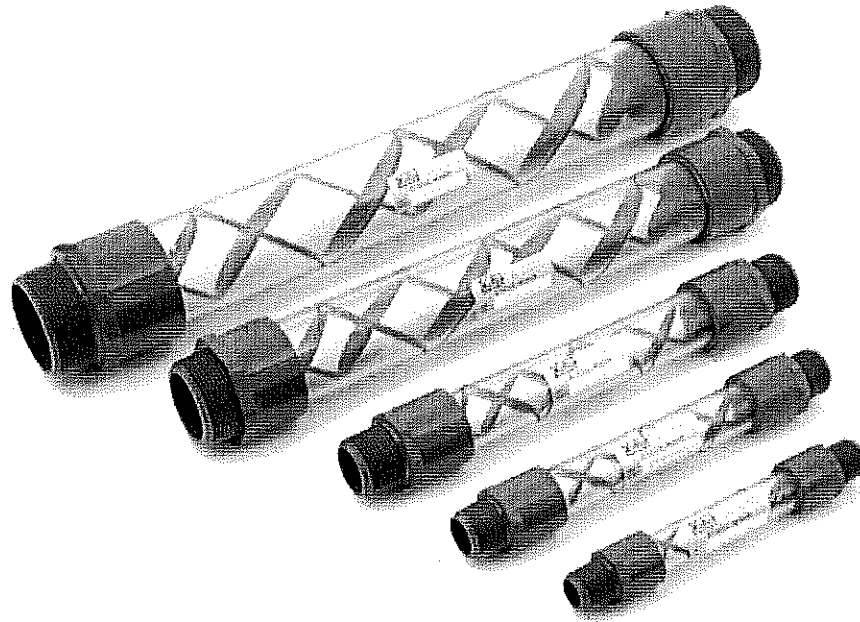
Const. Ref. 40-46



2.7



[View Drawing](#)



Clear PVC Static Mixers, Series 308

In response to a growing need for high quality PVC static mixers at a lower price, Koflo developed the Series 308 PVC Static Mixer. This unit is a clear PVC static mixer, which unlike other static mixers, allows for a visual inspection of the mixing process. All Series 308 static mixers are made in standard 6 element and 12 element configurations. Additionally, all PVC static mixers are edge sealed to the inside of the housing. The advantages of edge sealing are twofold. Not only does edge sealing increase mixing efficiency, but this bonding method also increases the structural integrity of the entire mixer. All mixers come standard with male NPT threads. Sizes 3/8" - 2" are in stock for immediate delivery.

Other static mixer applications include

- Admixing of water treatment chemicals
- pH control
- Chlorination and ozonation
- Process control sampling

One of the primary uses of the Series 308 static mixers is in the dilution of polymers and flocculants. With proper blending, it is quite common to recover the cost of a mixer in a relatively short period of time, due to the lower chemical costs associated with better mixing.

Technical Specifications

Model	Pipe Dia.	Number of	Max. Working Pressure	Typical Flow	Pressure Loss
-------	-----------	-----------	-----------------------	--------------	---------------

Number	MNPT Ends	Elements	Length	Weight	(PSI @ 75°F)	(GPM)	(PSI)
3/8-40C-4-6-2	3/8"	6	6-1/2"	1.3 oz	310	.4 - 3	.25 - 11.25
3/8-40C-4-12-2	3/8"	12	11"	2.1 oz	310	.4 - 3	.50 - 22.5
1/2-40C-4-6-2	1/2"	6	7"	2.1 oz	300	.65 - 5	.25 - 10
1/2-40C-4-12-2	1/2"	12	12"	3.3 oz	300	.65 - 5	.50 - 20
3/4-40C-4-6-2	3/4"	6	9"	3.7 oz	240	1.5 - 12	.25 - 11
3/4-40C-4-12-2	3/4"	12	15"	5.8 oz	240	1.5 - 12	.50 - 22
1-40C-4-6-2	1"	6	11"	6.5 oz	220	2.5 - 16	.30 - 11.75
1-40C-4-12-2	1"	12	18"	9.9 oz	220	2.5 - 16	.60 - 23.5
1.25-40C-4-6-2	1-1/4"	6	14"	12.2 oz	180	4 - 32	.25 - 13.5
1.25-40C-4-12-2	1-1/4"	12	25"	18.3 oz	180	4 - 32	.50 - 27
1.5-40C-4-6-2	1-1/2"	6	15"	14.8 oz	170	6 - 40	.25 - 12.25
1.5-40C-4-12-2	1-1/2"	12	28"	25.4 oz	170	6 - 40	.50 - 24.5
2-40C-4-6-2	2"	6	19"	25 oz	140	9 - 60	.25 - 9.25
2-40C-4-12-2	2"	12	35"	43 oz	140	9 - 60	.50 - 18.5

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2.8



Lab Specialty Products Lab Ball Valves & Needle Valves

Lab Ball Valves



Pressure Rating @ 73°F (23°C), Water
 1/4" - 3/8" 150 psi
 Maximum Service Temperature
 PVC = 140°F (60°C)
 CPVC = 200°F (93°C)
 Temperature/Pressure De-ratings Apply
 Rated for Vacuum Service

Valve & Adapters includes:

- 1 - Threaded 1/4" Valve
- 2 - O-ring Sealed 1/4" MPT x Mipt Adapters
- 2 - EPDM or FKM O-rings (AS568-013 size)
- 1 - End Connector Wrench
- 2 - O-ring Sealed 1/4" MPT x 3/8" I.D.
- Tubing Barb Adapters
- OR -
- 2 - O-ring Sealed 1/4" MPT x 1/4" I.D.
- Tubing Barb Adapters



Socket/Threaded Valve Only

All Valves Assembled with Silicone-Free, Water Soluble Lubricant

Valve & Adapters

PVC

Size	EPDM	FKM	Std Pk	Mstr Pk	Disc Code
Valve & Adapters Threaded Ends					
1/4X1/4T	1529-002A 25.75	1539-002A 26.92	1	25	218
1/4X3/8T	1529-002 25.75	1539-002 26.92	1	25	218
Valve only Threaded Ends					
1/4	1521-002 20.58	1531-002 22.91	50	200	218
3/8	1521-003 28.93	1531-003 32.07	50	200	218
Valve only Socket Ends					
1/4	1522-002 20.58	1532-002 23.28	50	200	218
3/8	1522-003 28.93	1532-003 32.07	50	200	218

CPVC

Size	EPDM	FKM	Std Pk	Mstr Pk	Disc Code
Valve & Adapters Threaded Ends					
1/4X1/4T	1529-002CA 30.91	1539-002CA 31.51	1	25	219
1/4X3/8T	1529-002C 30.91	1539-002C 31.51	1	25	219
Valve only Threaded Ends					
1/4	1521-002C 24.75	1531-002C 27.21	50	200	219
3/8	1521-003C 34.71	1531-003C 32.53	50	200	219
Valve only Socket Ends					
1/4	1522-002C 24.75	1532-002C 29.45	50	200	219
3/8	1522-003C 34.71	1532-003C 38.53	50	200	219

Needle Valves



Pressure Rating @ 73°F (23°C), Water
 PVC or CPVC 235 psi
 PP 150 psi
Maximum Service Temperature
 PVC = 140°F (60°C)
 CPVC = 200°F (93°C)
 PP = 180°F (82°C)
 Solid PTFE Stem Seals
 No Elastomer or Lubricants used
 Valves include Panel Mounting Nut

PVC Needle Valve

Size	Threaded	Socket	SR Threaded	Std Pk	Mstr Pk	Disc Code
Globe Pattern						
1/4	5591-002 71.27	5592-002 71.27		1	18	218
3/8	5591-003 71.27	5592-003 71.27	5591-003SR 65.01	1	18	218
1/2	5591-005 79.11	5592-005 79.11	5591-005SR 81.23	1	18	218
Angle Pattern						
1/4	5691-002 71.27	5692-002 71.27	---	1	18	218
3/8	5691-003 71.27	5692-003 71.27	---	1	18	218
1/2	5691-005 79.11	5692-005 79.11	5691-005SR 81.23	1	18	218

CPVC Needle Valve

Size	Threaded	Socket	SR Threaded	Std Pk	Mstr Pk	Disc Code
Globe Pattern						
1/4	5591-002C 83.94	5592-002C 83.94	---	1	18	219
3/8	5591-003C 83.94	5592-003C 83.94	5591-003CSR 83.75	1	18	219
1/2	5591-005C 88.77	5592-005C 88.77	5591-005CSR 91.04	1	18	219
Angle Pattern						
1/4	5691-002C 83.94	5692-002C 83.94	---	1	18	219
3/8	5691-003C 83.94	5692-003C 83.94	---	1	18	219
1/2	5691-005C 88.77	5692-005C 88.77	5691-005CSR 91.04	1	18	219

2.9



SERIES EBVF / TEBVF

MULTI-VOLTAGE ACTUATOR WITH FAIL-SAFE AND 4-20mA DIGITAL POSITIONER OPTIONS



STANDARD FEATURES

- Multi-voltage with auto-voltage sensing
 - 12V AC or DC
 - 24-240V AC or DC
- LED status light to indicate operational status of actuator
- Electronic over-torque protection against valve jam
- Thermostatic anti-condensation heater
- Easy-to-turn hand wheel for selectable manual override
- Large, dome style visual position indicator
- Remote position indicator
- Weatherproof anti-corrosive and UV protected glass filled polypro housing
- Easy mounting with double-D drive
- All external electrical connections via DIN plugs
- CE marked, IP67 ingress protection
- ISO 9000 manufacturer
- Fail-safe and 4-20mA or 0-10V DC digital positioner options
- Brushless, thermally protected motor

The EBVF/TEBVF features a rugged weatherproof and anti-corrosive polypro housing. A multi-color LED shows whether the actuator is operating correctly, or has tripped out either by its electronic torque limiter, or has been left in 'manual' mode. Site operators are no longer left with the 'valve or actuator' question when an actuator does not respond to a signal.

The EBVF/TEBVF is quick and easy to install, with a double-D drive, allowing fast mounting to True-Blue valves. There is no need to remove the cover to connect the EBVF/TEBVF electrically, saving installation time. Using the external DIN plugs and external wiring diagrams supplied with the actuator, installation can be pre-wired.

Protection against valve jams is provided by an electronic torque limiter, which auto-relaxes the gearbox when activated, allowing the manual override to be selected to assist in clearing the jam. The effect of condensation is eliminated by an internal thermostatic anti-condensation heater that does not require a separate independent power supply.

Standard function for the EBVF/TEBVF is power open (TEBVF left), power close (TEBVF right), stays put on power failure.

Units are available with factory installed Fail-safe (open or close) and modulating options. The modulating digital positioner offers auto-calibrating and self-resetting functions.

SPECIFICATIONS				
Sizes	3/8" - 2" Valves		3" and 4"	
Actuator	EBVF2 / TEBVF6	EBVF1 / TEBVF5	EBVF4/TEBVF8	EBVF3/TEBVF7
Voltage AC (1ph) or DC	12	24 - 240	12	24 - 240
Working Time - Sec. 0-90° (No Load) ±10%	5.5 / 11++	5.5 / 11++	16 / 16**	14 / 14**
Maximum Run Torque Nm / in./lbs.	20 / 177	20 / 177	55 / 487	55 / 487
Maximum Break Torque Nm / in./lbs.	25 / 221	25 / 221	60 / 531	60 / 531
On/Off Duty Rating %	75	75	75	75
*Modulating Duty Rating %	100	100	100	100
IP Rating - IEC 60529	IP67	IP67	IP67	IP67
Working Angle Standard	90/180	90/180	90	90
Temperature Range (F)	-4° to +158°	-4° to +158°	-4° to +158°	-4° to +158°
Motor Switch	2 x V3	2 x V3	2 x V3	2 x V3
Volt Free End of Travel Confirmation	2 x V3	2 x V3	2 x V3	2 x V3
Anti-Condensation Heater (W)	4	4	4	4
Current Full Load 12VDC	2.05A		3.23A	
24VDC		1.05A		1.44A
24V/1ph		0.85A		1.07A
110V/1ph		0.17A		0.23A
240V/1ph		0.09A		0.12A
Weight (kg) / lbs	1.8 / 4	1.8 / 4	2.0 / 4.4	2.0 / 4.4
Drive	Double-D	Double-D	Double-D	Double-D

* Option 3 and 4 only. ** Based on 3-hole ball. ++11 seconds @ 180°



EBVF OPTIONAL FEATURES

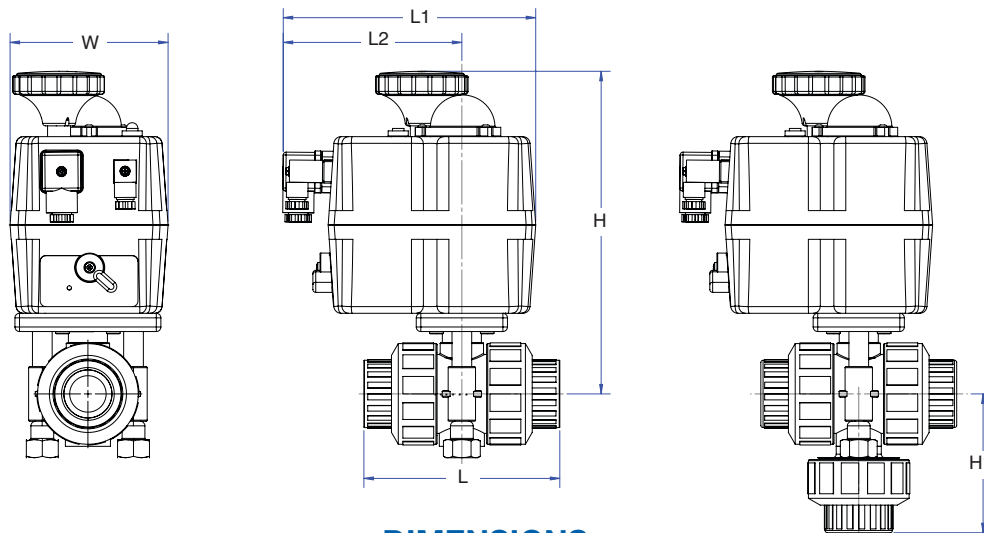
MODULATING ACTUATOR (Option 3, 4, 5 & 6)

Provided via factory installed, self-calibrating digital positioner with 4-20mA or 0-10V.

FAIL-SAFE ACTUATOR (Option 2, 4, or 6)

Fail-safe achieved with the use of an industrial re-chargeable battery which is supplied with the actuator. Specify fail closed or fail open.

APPROXIMATE FLOW RATES AT 1.0 PSI (0,07 Bar) PRESSURE DROP								
Valve Sizes	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	3"	4"
2-Way Cv Factor	10	20	40	80	100	120	490	770
3-Way Cv Factor	4	8	13	38	38	39	132	200



DIMENSIONS

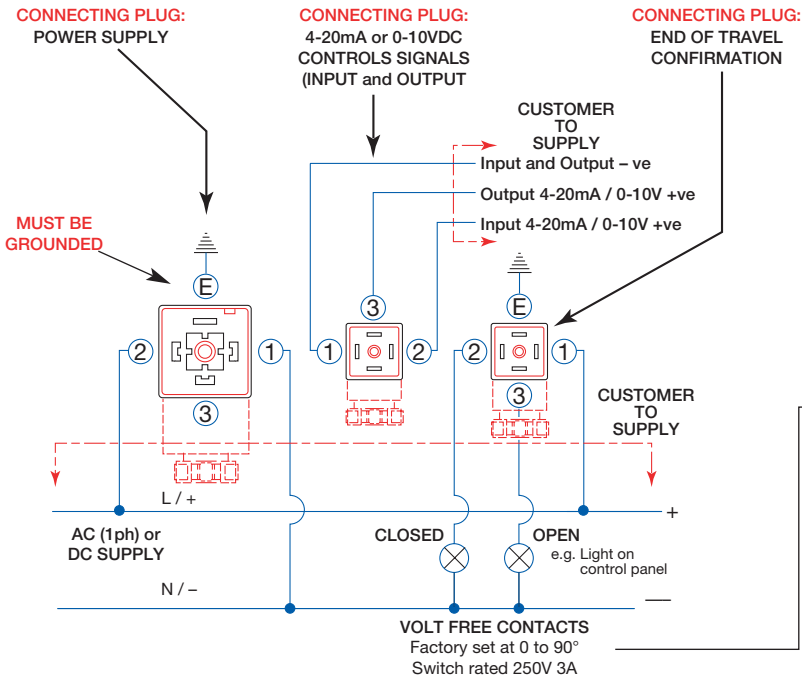
MODEL	SIZE		L		L1		L2		H		H1		W	
	IN.	DN	IN.	MM.	IN.	MM.	IN.	MM.	IN.	MM.	IN.	MM.	IN.	MM.
EBVF/TEBVF-037	3/8"	16	4.13	104.8	6.97	177.0	4.89	124.2	8.16	207.3	2.75	1.2	4.34	2.0
EBVF/TEBVF-050	1/2"	20	4.13	104.8	6.97	177.0	4.89	124.2	8.16	207.3	2.75	69.9	4.34	2.0
EBVF/TEBVF-075	3/4"	25	4.75	120.7	6.97	177.0	4.89	124.2	8.59	218.2	3.25	82.6	4.34	2.0
EBVF/TEBVF-100	1"	32	5.38	136.5	6.97	177.0	4.89	124.2	8.84	224.5	3.81	96.8	4.34	2.0
EBVF/TEBVF-125	1-1/4"	40	6.70	170.2	6.97	177.0	4.89	124.2	9.32	236.7	5.00	127.0	4.34	2.0
EBVF/TEBVF-150	1-1/2"	50	6.75	171.5	6.97	177.0	4.89	124.2	8.84	236.7	5.00	127.0	4.34	2.0
EBVF/TEBVF-200	2"	63	7.90	200.7	6.97	177.0	4.89	124.2	8.84	236.7	5.56	141.2	4.34	2.0
EBVF/TEBVF-300	3"	90	10.80	274.3	6.97	177.0	4.93	125.2	14.20	360.7	8.30	210.8	4.34	2.0
EBVF/TEBVF-400	4"	110	11.50	292.1	6.97	177.0	4.93	125.2	15.00	381.0	9.90	251.5	4.34	2.0

ORDERING INFORMATION

Order by part number and specify exact chemicals, temperatures and pressures. To arrive at the proper part number, please consult diagram below. The letters and numbers used in this part number are for example only!

EBVF/TEBVF BASIC MODEL VALVE EBVF 2-Way TEBVF 3-Way	1 VALVE TYPE SIZE/VOLTAGE 1 - 2-Way, 3/8"-2", 24-240 Volts, A/C or D/C 2 - 2-Way, 3/8"-2", 12 Volts, A/C or D/C 3 - 2-Way, 2 1/2"-4", 24-240 Volts, A/C or D/C 4 - 2-Way, 2 1/2"-4", 12 Volts, A/C or D/C 5 - 3-Way, 3/8"-2", 24-240 Volts, A/C or D/C 6 - 3-Way, 3/8"-2", 12 Volts, A/C or D/C 7 - 3-Way, 3" & 4", 24-240 Volts, A/C or D/C 8 - 3-Way, 3" & 4", 12 Volts, A/C or D/C	3 OPTIONS 1 - Standard Actuator 2 - Actuator, Fail-Safe 3 - Actuator, 4-20 mA 4 - Actuator, 4-20 mA Fail-Safe 5 - Actuator, 0-10 VDC 6 - Actuator, 0-10 VDC Fail-Safe	050 VALVE SIZE 037 - 3/8" 050 - 1/2" 075 - 3/4" 100 - 1" 125 - 1 1/4" 150 - 1 1/2" 200 - 2" 300 - 3" 400 - 4" 20 - 20mm 25 - 25mm 32 - 32mm 40 - 40mm 50 - 50mm 63 - 63mm 90 - 90mm 110 - 110mm	EP SEAL MATERIAL V FKM EP EPDM	S CONNECTIONS S Socket T NPT Threads FL Flanges SC Sanitary BSP BSP Threads	PV BODY MATERIAL -PV PVC -CP CPVC -PP Natural Polypro -PF PVDF	C BALL OPTIONS A - 3-Hole Ball (3-Way Only) C - Characterized Vent - Vented Ball
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AC (1ph) or DC SUPPLY – WIRING FOR MODULATING ACTUATORS



Function: MODULATING VERSION

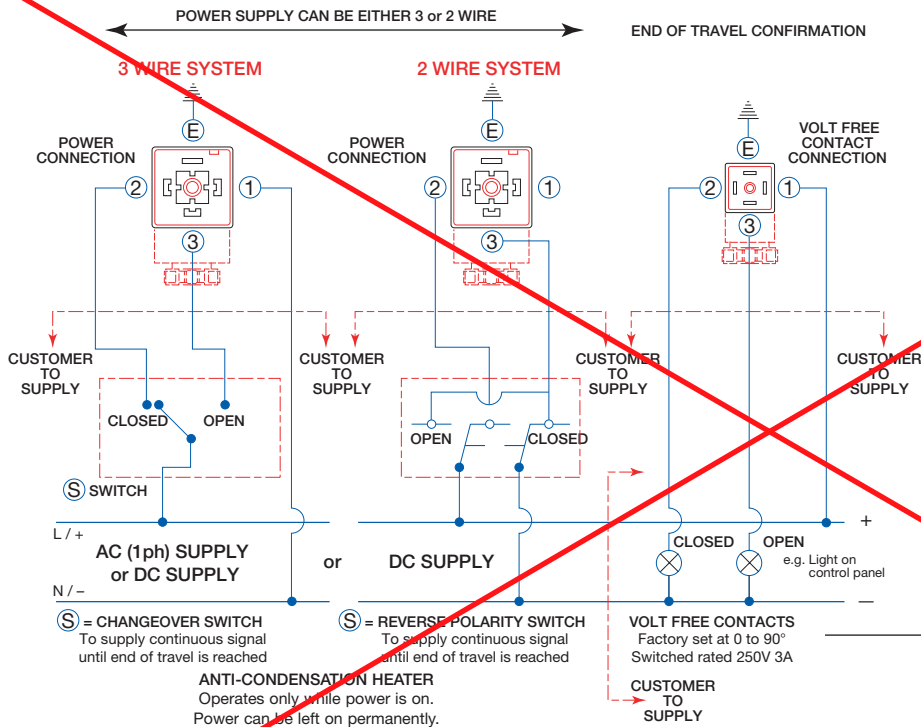
- Power open, power close – Actuator movement controlled by input signal (4-20mA or 0-10VDC)
- Standard Operation: 4mA or 0V = Actuator Closed, 20mA or 10V = Actuator Open (can be reversed)
- Standard Operation: Actuator close on loss of control signal, stays put if loss on main power.
- Output signal provided as standard (in same format as supply signal)

NOTE: Wiring showing same supply as motor is only a suggestion, Read *“Installation, Operation and Maintenance Instructions”* before connecting.

NOTE: Fail-safe option is also available for modulating version.

! Actuator power supply must be on a dedicated circuit and must be grounded.

AC (1ph) or DC SUPPLY – WIRING ON/OFF OR FAIL SAFE ACTUATORS



Function: ON/OFF VERSION

- Power open. power close
- Stays in place during power failure

Function: FAIL-SAFE VERSION

- Power open, power close – Trickle charges battery in either open or closed position
- Actuator sent by battery power to preset fail safe position on power failure
- Actuator returns to pre-failure position on power resumption
- Fail-safe can be either NC (normally-closed) or NO (normally-open)

NOTE: Wiring showing same supply as motor is only a suggestion, Read *“Installation, Operation and Maintenance Instructions”* before connecting.

! Volt free switches are set approximately 5° ahead of the final motor stop position. Do not use the signal from the volt free switches to cut the power to the motor, otherwise the actuator will not reach the full open or full closed position. The actuator is designed to have continuously energized power.

! Actuator power supply must be on a dedicated circuit and must be grounded.

Series EBVF Status Light Functions

ON/OFF ACTUATOR	ACTUATOR OPERATIONAL STATUS (200 msec/block)											
No power detected	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
In position open	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
In position close	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Opening	Yellow	Green	Yellow	Green	Yellow	Green	Yellow	Green	Yellow	Green	Yellow	Green
Closing	Yellow	Red	Yellow	Red	Yellow	Red	Yellow	Red	Yellow	Red	Yellow	Red
Torque limiter engaged, moving from close to open	Green	Green	Green	Grey	Grey	Grey	Green	Green	Green	Grey	Grey	Grey
Torque limiter engaged, moving from open to close	Red	Red	Red	Grey	Grey	Grey	Red	Red	Red	Grey	Grey	Grey
Actuator in MANUAL mode	Yellow	Yellow	Yellow	Grey	Grey	Grey	Yellow	Yellow	Yellow	Grey	Grey	Grey
Multiple concurrent signals	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple
FAIL SAFE ACTUATOR	ACTUATOR OPERATIONAL STATUS											
No power detected	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
In position open	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
In position close	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Opening	Yellow	Green	Yellow	Green	Yellow	Green	Yellow	Green	Yellow	Green	Yellow	Green
Closing	Yellow	Red	Yellow	Red	Yellow	Red	Yellow	Red	Yellow	Red	Yellow	Red
Torque limiter engaged, moving from close to open	Green	Green	Green	Grey	Grey	Grey	Green	Green	Green	Grey	Grey	Grey
Torque limiter engaged, moving from open to close	Red	Red	Red	Grey	Grey	Grey	Red	Red	Red	Grey	Grey	Grey
Actuator in MANUAL mode	Yellow	Yellow	Yellow	Grey	Grey	Grey	Yellow	Yellow	Yellow	Grey	Grey	Grey
Multiple concurrent signals	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple
Actuator without power, working with the NO system. Max.3 min., led off	Green	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Actuator without power, working with the NC system. Max.3 min., led off	Red	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Battery protection. Danger, the battery needs recharging. Fail Safe blocked	Yellow	Grey	Yellow	Grey	Yellow	Grey	Yellow	Grey	Yellow	Grey	Yellow	Grey
MODULATING ACTUATOR	ACTUATOR OPERATIONAL STATUS											
No power detected	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Actuation feedback complete	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
Opening	Green	Green	Green	Blue	Green	Blue	Green	Blue	Green	Blue	Green	Blue
Closing	Red	Red	Red	Blue	Red	Blue	Red	Blue	Red	Blue	Red	Blue
Auto adjusting configuration / reset	Red	Red	Blue	Green	Blue	Red	Red	Blue	Green	Blue	Red	Blue
Torque limiter engaged, moving from close to open	Green	Green	Green	Grey	Grey	Grey	Green	Green	Green	Grey	Grey	Grey
Torque limiter engaged, moving from open to close	Red	Red	Red	Grey	Grey	Grey	Red	Red	Red	Grey	Grey	Grey
Unrecognized modulation signal. Actuator stopped.	Blue	Blue	Blue	Cyan	Blue	Blue	Blue	Blue	Blue	Cyan	Blue	Blue
Actuator in MANUAL mode	Yellow	Yellow	Yellow	Grey	Grey	Grey	Yellow	Yellow	Yellow	Grey	Grey	Grey
Waiting for modulation signal	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue

2.10

ProMix PVC Injection Valve

SPECIFICATIONS:

- Material: PVC & 316SS
- Polymer Inlet Connection: ½" NPT
- Mixing Chamber Connection: ¾" NPT
- Location: Top Side of Mixing Chamber
- Spring Pressure: 27 PSIG
- Maximum Operating Pressure: 150 PSIG
- Normal Operating Pressure: 100 PSIG
- Weight: < 1 lbs

DESCRIPTION:

- Pass through design with large openings straight to the injection point.
- The injection tip can easily be unscrewed from the main body so that it can be cleaned periodically or during plant shut downs.



2.11

ProMix S Series PVC Mixing Chamber

SPECIFICATIONS:

- Material: PVC
- Volume: 2.0 Gallons
- Water Inlet Connection: ½" NPT
- Polymer Inlet Connection: ¾" NPT
- Polymer Solution Outlet Connection: ¾" NPT
- Maximum Chamber Pressure: 150 PSIG
- Normal Operating Pressure: 100 PSIG
- Recommended Running Temp: +50°F - 100°F
- Weight: 45 lbs.
- Motor Horsepower: .5HP
- Motor Frame: B5, TEFC
- Voltage: 120VAC, 60Hz, 1 Phase
- Direct Coupled Motor & Sealed Bearing

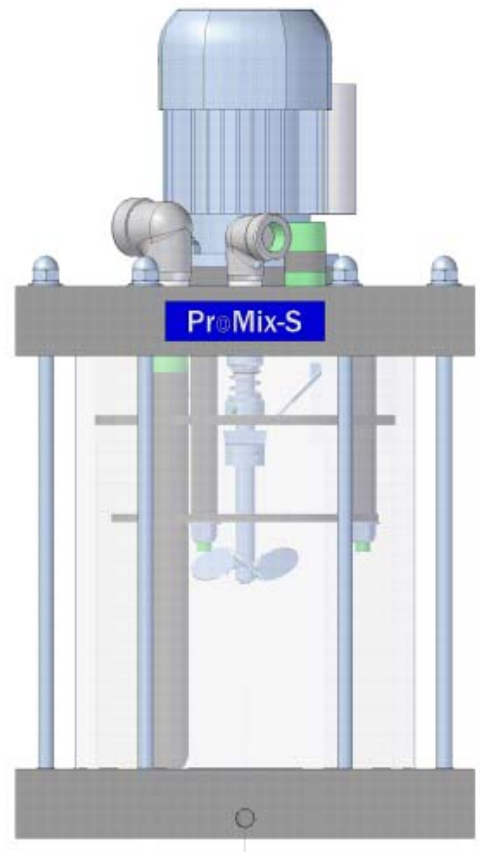
DESCRIPTION:

- Three Distinct Mixing Zones
- Three Different Mixing Blades for delivery of proper energy.

1st Zone = The first mixing blade delivers high shear at the precise point of polymer injection, creating immediate dispersion before agglomeration takes place.

2nd Zone = The second mixing blade induces a vortex and draws solution down through the center of the chamber from Zone 1 and forces the solution outward to the sides and then down into Zone 3.

3rd Zone = The third mixing blade gently agitates/blends the active polymer solution before it exits the chamber through the bottom of the discharge tube.



2.12

BALDOR® • RELIANCE

Product Information Packet

ELECTRIC MOTOR WHOLESAL.COM

VWDL3504

.5HP, 1725RPM, 1PH, 60HZ, 56C, 3520L, TEFC, F1

Part Detail							
Revision:	L	Status:	PRD/A	Change #:		Proprietary:	No
Type:	AC	Elec. Spec:	35WGN406	CD Diagram:	CD0001	Mfg Plant:	
Mech. Spec:	35S583	Layout:	35LYS583	Poles:	04	Created Date:	09-17-2012
Base:	N	Eff. Date:	08-31-2017	Leads:	6#18		

Specs			
Catalog Number:	VWDL3504	Insulation Class:	F
Enclosure:	TEFC	Inverter Code:	Not Inverter
Frame:	56C	KVA Code:	M
Frame Material:	Steel	Lifting Lugs:	No Lifting Lugs
Output @ Frequency:	.500 HP @ 60 HZ	Locked Bearing Indicator:	Locked Bearing
Synchronous Speed @ Frequency:	1800 RPM @ 60 HZ	Motor Lead Quantity/Wire Size:	6 @ 18 AWG
Voltage @ Frequency:	115.0 V @ 60 HZ	Motor Lead Exit:	Ko Box
	230.0 V @ 60 HZ	Motor Lead Termination:	Flying Leads
XP Class and Group:	None	Motor Type:	3520L
XP Division:	Not Applicable	Mounting Arrangement:	F1
Agency Approvals:	UR	Power Factor:	65
	CSA	Product Family:	Wash Down
Auxillary Box:	No Auxillary Box	Pulley End Bearing Type:	Sealed Bearing
Auxillary Box Lead Termination:	None	Pulley Face Code:	C-Face
Base Indicator:	No Mounting	Pulley Shaft Indicator:	Standard
Bearing Grease Type:	Polyrex EM (-20F +300F)	Rodent Screen:	None
Current @ Voltage:	3.700 A @ 230.0 V	Shaft Extension Location:	Pulley End
	4.100 A @ 208.0 V	Shaft Ground Indicator:	No Shaft Grounding

	7.400 A @ 115.0 V	Shaft Rotation:	Reversible
Design Code:	N	Shaft Slinger Indicator:	Shaft Slinger
Drip Cover:	No Drip Cover	Speed Code:	Single Speed
Duty Rating:	CONT	Motor Standards:	NEMA
Electrically Isolated Bearing:	Not Electrically Isolated	Starting Method:	Direct on line
Feedback Device:	NO FEEDBACK	Thermal Device - Bearing:	None
Front Face Code:	Standard	Thermal Device - Winding:	None
Front Shaft Indicator:	None	Vibration Sensor Indicator:	No Vibration Sensor
Heater Indicator:	No Heater	Winding Thermal 1:	None
		Winding Thermal 2:	None

Nameplate NP1496L										
CAT.NO.	VWDL3504									
SPEC.	35S583N406G1									
HP	.5									
VOLTS	115/230									
AMP	7.4/3.7									
RPM	1725									
FRAME	56C				HZ	60			PH	1
SER.F.	1.25		CODE	M	DES	N		CLASS	F	
NEMA-NOM-EFF	68		PF	65						
RATING	40C AMB-CONT									
CC								USABLE AT 208V	4.1	
DE	6205				ODE	6203				
ENCL	TEFC		SN							
	SFA 8.2/4.1									

Parts List		
Part Number	Description	Quantity
SA251234	SA 35S583N406G1	1.000 EA
RA238076	RA 35S583N406G1	1.000 EA
EC1400A03SP	ELEC CAP, 400-480 MFD, 125V, 1.81D X 3.	1.000 EA
NS2512A01	INSULATOR, CONDUIT BOX X	1.000 EA
35CB3008A01W	35 CB .50 NPT @ 6, MACH WHITE EPOXY	1.000 EA
35GS1039	05 MOLDED GASKET W/LIP, 1.12 LEAD HOLE,	1.000 EA
51XB1016A08	10-16X 1/2HXWSSLD SERTYB	2.000 EA
11XW1032G06	10-32 X .38, TAPTITE II, HEX WSHR SLTD U	1.000 EA
35EP3100M04MW	FREP TEFC,"O" DRILLS,NO GRSSR, MACH.WHITE	1.000 EA
HW4032A01	BLACK DRAIN PLUG FOR WASH DOWN MOTORS	3.000 EA
51XW0832A07	8-32 X .44, TAPTITE II, HEX WSHR SLTD SE	2.000 EA
35CB4802A02SP	CAPACITOR COVER, STAMPED X	1.000 EA
51XB1016A06	10-16X3/8 HXWSSLD SERTYB	4.000 EA
HW5100A03	WAVY WASHER (W1543-017)	1.000 EA
35PE3300A48MW	SPL FACE MTD EP - 205 BRG - W/SEAL FOR W	1.000 EA
HW4032A01	BLACK DRAIN PLUG FOR WASH DOWN MOTORS	3.000 EA
HW4600B49	SEAL 0.938 X 1.624 X 0.250 SINGLE LIP DB	1.000 EA
12XN1032S20	10-32 X 1-1/4 HEX M.S. , STAINLESS STEEL	2.000 EA
51XB1214A16	12-14X1.00 HXWSSLD SERTYB	1.000 EA
MG1025W01	WILKOFASST, 781.01, SIGNAL WHITE #9003	0.017 GA
MG1025Z02	ACTIVATOR WILKOFASST 060.02HF	0.010 GA
35FH4005A32SP	IEC FH NO GRSSR W/3 HOLES - PRIMED	1.000 EA
11XW1032S06	10-32 X .38, TAPTITE II, HEX WSHR SLTD U	3.000 EA
35CB4522	35 LIPPED CB LID PRIMED	1.000 EA

Parts List (continued)		
Part Number	Description	Quantity
35GS1030A02	35 GS FOR CB LID - WHITE NEOPRENE	1.000 EA
59XW0832S07	TAPTITE II,HEX WSHR UNSLTD SER,410 S.S.,	4.000 EA
HW4600B39SP	V-RING SLINGER 0.550 X 0.790 X .18 VITON	1.000 EA
HW4600B46	V-RING SLINGER 0.875 X 1.420 X .24 VITON	1.000 EA
HW2502D13	SS KEY, 3/16 SQ X 1.375	1.000 EA
HA7000A04	KEY RETAINER 0.625 DIA SHAFTS	1.000 EA
85XU0407S04	4X1/4 U DRIVE PIN STAINLESS	2.000 EA
LB1164	LABEL,WARNING AND DRAIN	1.000 EA
MJ5001A27	32220KN GRAY SEALER *MIN BUY 4 QTS=1GAL	0.001 QT
HA5027A01	HA4066A01 T-DRAIN X2 BAGGED	1.000 EA
WD1000A15	3-520132-2 AMP FLAG (4M/RL NON-CANC/NON-	2.000 EA
MJ1000A02	GREASE, POLYREX EM EXXON (USe 4824-15A)	0.050 LB
35FN3002A05SP	EXFN, PLASTIC, 6.376 OD, .638 ID	1.000 EA
51XB1214A16	12-14X1.00 HXWSSLD SERTYB	1.000 EA
35GS1016A03	GASKET, CAPAC BOX FOR 35CB4802 WD MOTORS	1.000 EA
HA3100S08	THRUBOLT 7.375LG SS	4.000 EA
SP5051A24	MODEL 35 TORQ STATIONARY SWITCH FOR "L"	1.000 EA
LC0001	CONN LABEL TYPE L, 6 LEAD, DUAL VOLTS, R	1.000 EA
NP1496L	SS WD UL CSA CC	1.000 EA
35PA1066	PKG GRP, PRINT PK1008A06	1.000 EA
PK3082	STYROFOAM CRADLE	1.000 EA
MN416A01	TAG-INSTAL-MAINT no wire (1100/bx) 11/14	1.000 EA

AC Induction Motor Performance Data

Record # 37353 - Typical performance - not guaranteed values

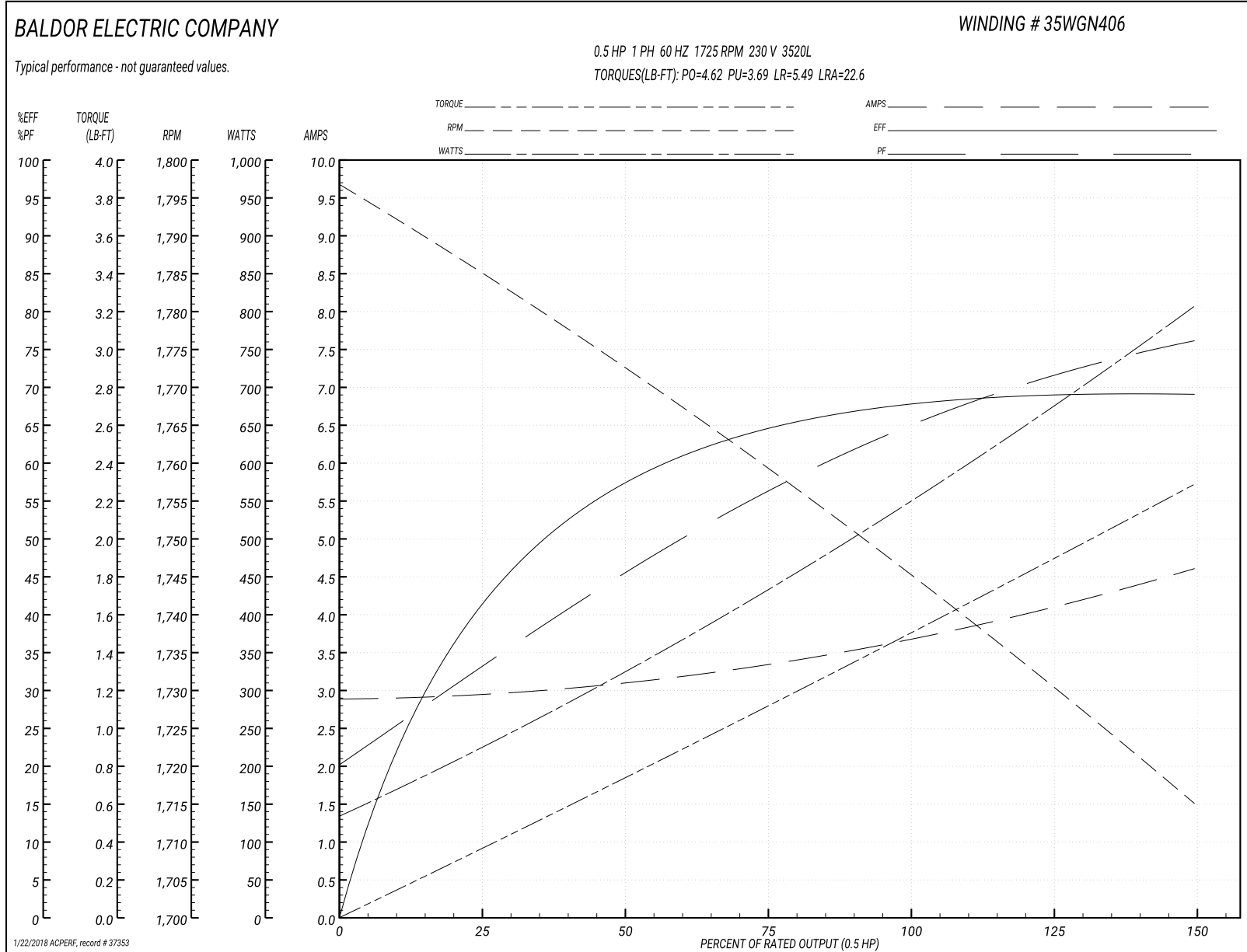
Winding: 35WGN406-R001	Type: 3520L	Enclosure: TEFC
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Nameplate Data				230 V, 60 Hz: High Voltage Connection	
Rated Output (HP)	.5			Full Load Torque	1.51 LB-FT
Volts	115/230			Start Configuration	direct on line
Full Load Amps	7.4/3.7			Breakdown Torque	4.62 LB-FT
R.P.M.	1725			Pull-up Torque	3.69 LB-FT
Hz	60	Phase	1	Locked-rotor Torque	5.49 LB-FT
NEMA Design Code	N	KVA Code	M	Starting Current	22.6 A
Service Factor (S.F.)	1.25			No-load Current	2.89 A
NEMA Nom. Eff.	68	Power Factor	65	Line-line Res. @ 25°C	4.0781 Ω A Ph 2.4038 Ω B Ph
Rating - Duty	40C AMB-CONT			Temp. Rise @ Rated Load	67°C
S.F. Amps	8.2/4.1			Temp. Rise @ S.F. Load	80°C

Load Characteristics 230 V, 60 Hz, 0.5 HP

% of Rated Load	25	50	75	100	125	150	S.F.
Power Factor	34	46	56	65	71	76	71
Efficiency	41.6	57.1	64.6	68	69	69	69
Speed	1783.2	1772	1759.8	1745.9	1730.5	1714.5	1730
Line amperes	2.95	3.09	3.35	3.69	4.1	4.61	4.1

Performance Graph at 230V, 60Hz, 0.5HP Typical performance - Not guaranteed values



AC Induction Motor Performance Data

Record # 62947 - Typical performance - not guaranteed values

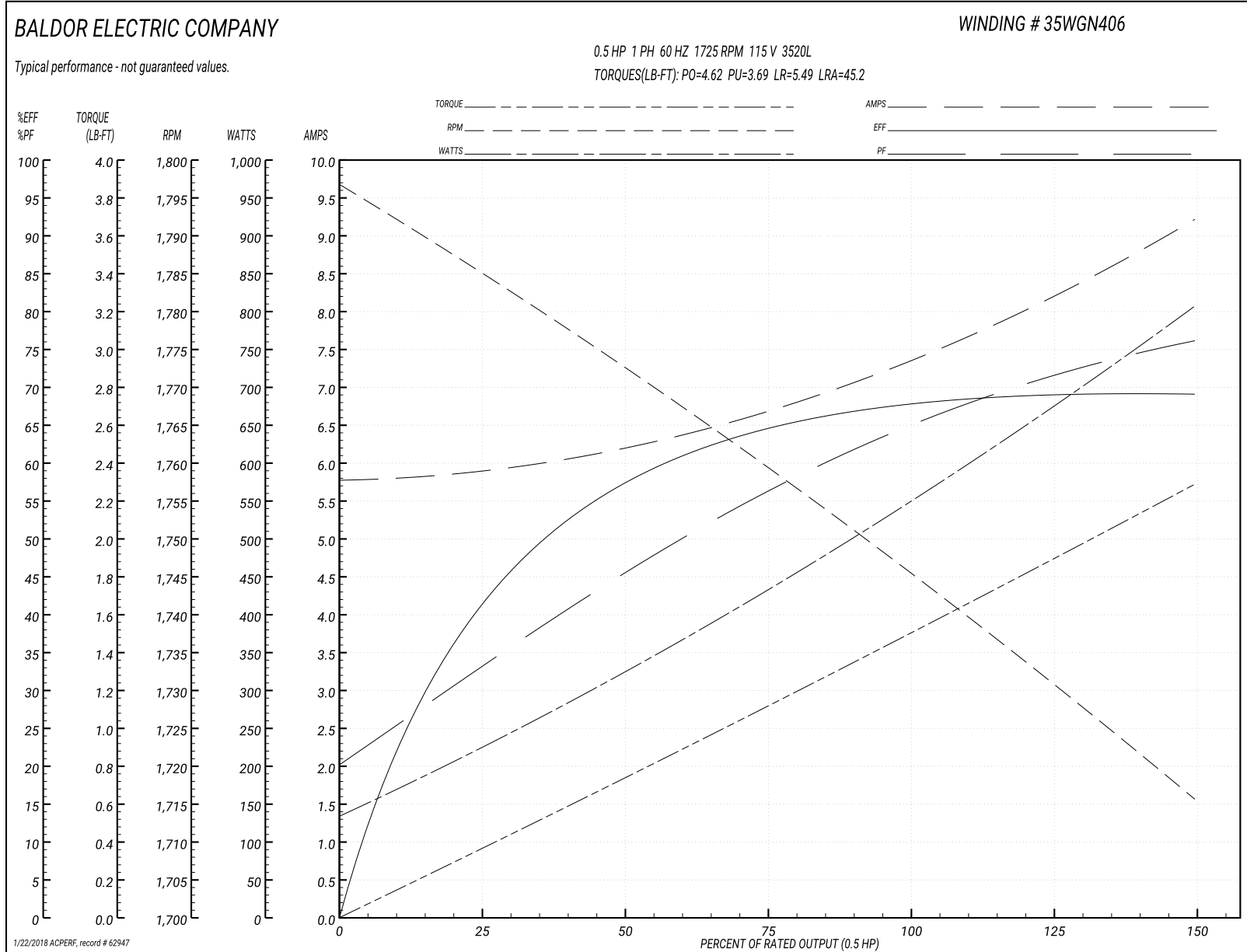
Winding: 35WGN406-R001	Type: 3520L	Enclosure: TEFC
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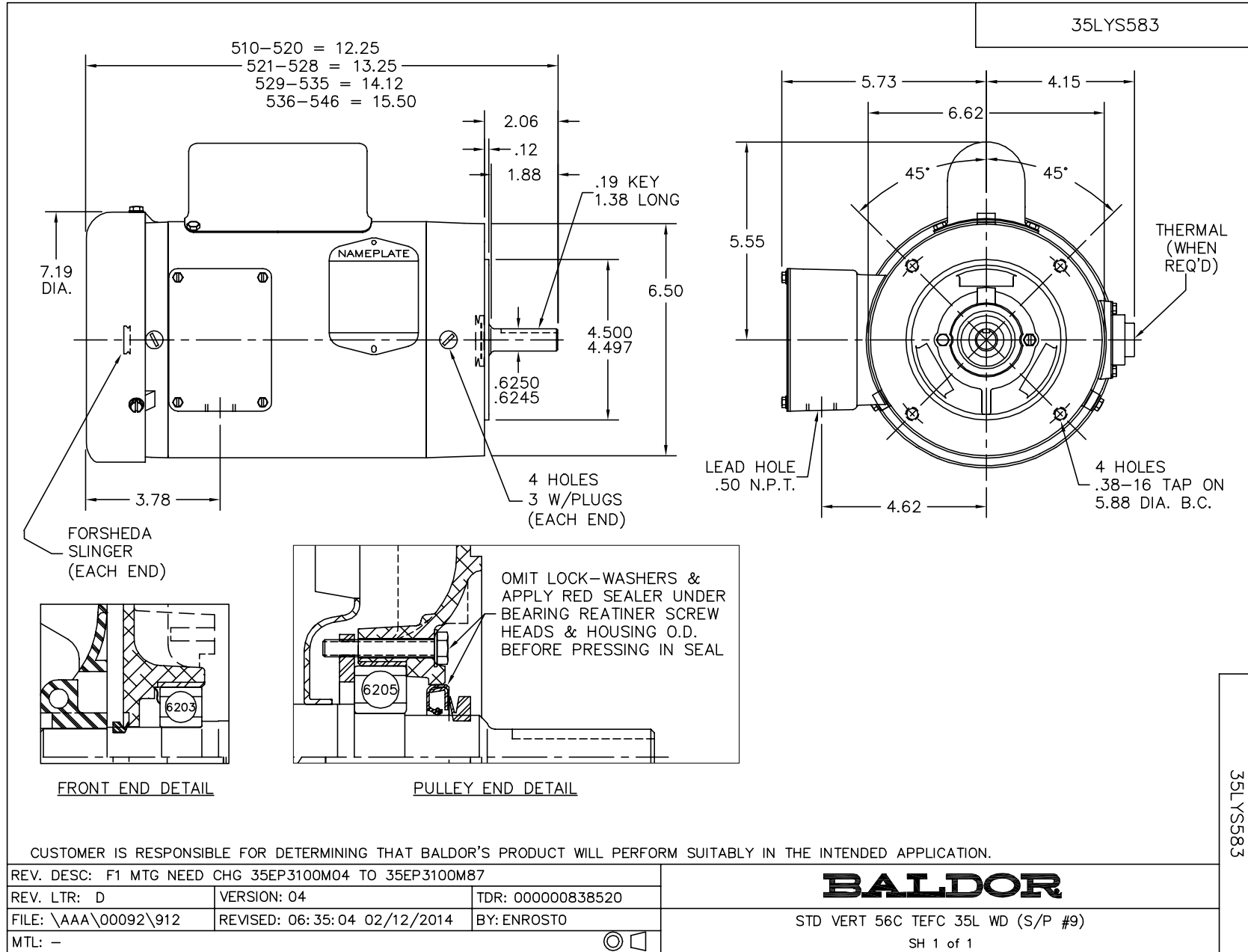
Nameplate Data				115 V, 60 Hz: Low Voltage Connection	
Rated Output (HP)	.5			Full Load Torque	1.51 LB-FT
Volts	115/230			Start Configuration	direct on line
Full Load Amps	7.4/3.7			Breakdown Torque	4.62 LB-FT
R.P.M.	1725			Pull-up Torque	3.69 LB-FT
Hz	60	Phase	1	Locked-rotor Torque	5.49 LB-FT
NEMA Design Code	N	KVA Code	M	Starting Current	45.2 A
Service Factor (S.F.)	1.25			No-load Current	5.78 A
NEMA Nom. Eff.	68	Power Factor	65	Line-line Res. @ 25°C	1.06 Ω A Ph 2.39 Ω B Ph
Rating - Duty	40C AMB-CONT			Temp. Rise @ Rated Load	67°C
S.F. Amps	8.2/4.1			Temp. Rise @ S.F. Load	79°C
				Locked-rotor Power Factor	96.2
				Rotor inertia	0.119 LB-FT ²

Load Characteristics 115 V, 60 Hz, 0.5 HP

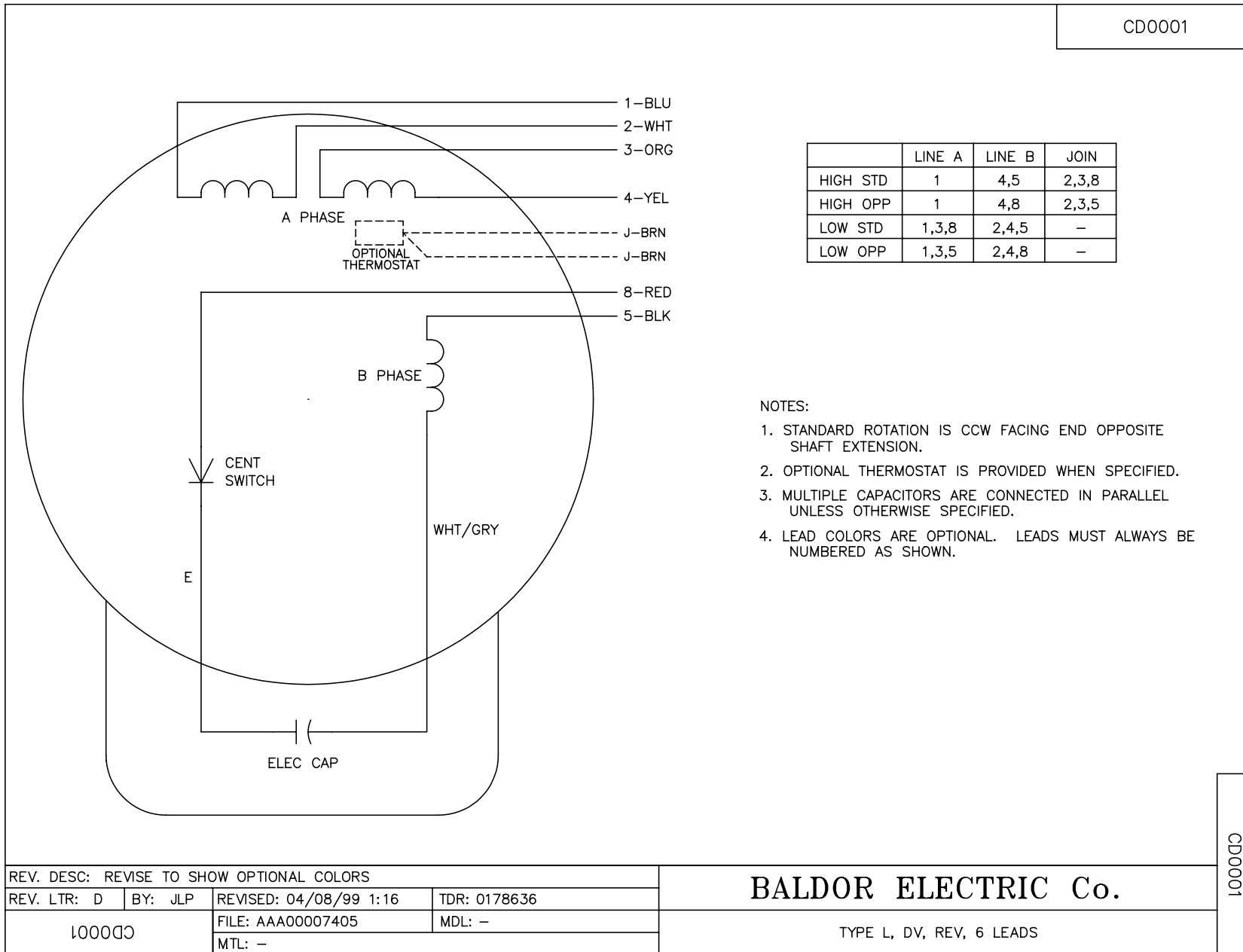
% of Rated Load	25	50	75	100	125	150	S.F.
Power Factor	34	46	56	65	72	76	72
Efficiency	41.5	57.1	64.8	68	69.2	69	69.2
Speed	1783	1772	1760	1746	1731	1715	1731
Line amperes	5.9	6.18	6.7	7.38	8.2	9.22	8.2

Performance Graph at 115V, 60Hz, 0.5HP Typical performance - Not guaranteed values





CD0001



NOTES:

1. STANDARD ROTATION IS CCW FACING END OPPOSITE SHAFT EXTENSION.
2. OPTIONAL THERMOSTAT IS PROVIDED WHEN SPECIFIED.
3. MULTIPLE CAPACITORS ARE CONNECTED IN PARALLEL UNLESS OTHERWISE SPECIFIED.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

CD0001

REV. DESC: REVISE TO SHOW OPTIONAL COLORS			
REV. LTR: D	BY: JLP	REVISED: 04/08/99 1:16	TDR: 0178636
100000		FILE: AAA00007405	MDL: -
		MTL: -	

BALDOR ELECTRIC Co.

TYPE L, DV, REV, 6 LEADS

2.13

Seametrics insertion meters must be seated in fittings that match the pipe size and material.

How to Order: Specify Part Number, Size Code, and Option Number (when appropriate).

Select pipe size codes as follows:



PIPE SIZE	1/2"	3/4"	1"	1-1/2"	2"	3"	4"	6"	8"	10"	12"
ORDER CODE	-050	-075	-100	-150	-200	-300	-400	-600	-800	-1000	-1200

TEE FITTINGS, 1/2" to 4" PIPE

		-050	-075	-100	-150	-200	-300	-400
EX800 Insertion Magmeters								
EF81T-P	PVC/Male Stub End	Not Available		•	•	•	¹ Note	¹ Note
EF81TC-B	Bronze/Female Sweat (for copper tubing)		•	•	•	•	•	
EF81T-B	Bronze/Female Thread		•	•	•	•	•	
EF81T-S	304 SS/Female Thread		•	•	•	Not Available		
EF81T-C	Carbon Steel/Female Thread		•	•	•			
Option 14	All 316 Stainless Steel			•	•	•	•	
Note: High Pressure Not Available								
TX800 Insertion Turbine Meters								
TF81T-P	PVC/Male Stub End	Not Available			•	•	¹ Note	¹ Note
TF81TC-B	Bronze/Female Sweat (for copper tubing)		•	•	•	•	•	
TF81T-B	Bronze/Female Thread		•	•	•	•	•	
TF81T-S	304 SS/Female Thread		•	•	•	Not Available		
TF81T-C	Carbon Steel/Female Thread		•	•	•			
Option 14	All 316 Stainless Steel					•	•	
Option HP	High Pressure (See ² Note)				•	•		
IP800 Insertion Paddlewheel Meters								
MF81T-P	PVC/Male Stub End	•	•	•	•	•	¹ Note	¹ Note
MF81TC-B	Bronze/Female Sweat (for copper tubing)	•	•	•	•	•	•	•
MF81T-B	Bronze/Female Thread	•	•	•	•	•	•	•
MF81T-S	304 SS/Female Thread	•	•	•	•	•	Not Available	
MF81T-C	Carbon Steel/Female Thread	•	•	•	•	•		
Option 14	All 316 Stainless Steel	•	•	•	•	•		
Option HP	High Pressure (See ² Note)	•	•	•	•	•		
¹ Note: Use MF82S-P or EF82S-P with Option 16		² Note: 400 PSI; Stainless & Carbon Fittings Only						

SADDLE FITTINGS, 3" to 12" PIPE

		-300	-400	-600	-800	-1000	-1200
EX800 Insertion Magmeters							
EF82S-P	PVC (See ³ Note)	•	•	•	•	Not Available	
EF82S-F	Ductile Iron	3.45-4.05	4.00-4.50	6.00-6.63	8.00-8.63	10.00-11010	12.00-13.20
EF82S-B	Bronze	•	•			Not Available	
Option 16	Installed on 16" Long Pipe Stub (PVC only)	•	•	•	•	Not Available	
TX800 Insertion Turbine Meters							
MF82S-P	PVC (See ³ Note)	•	•	•	•	Not Available	
MF82S-F	Ductile Iron	3.45-4.05	4.00-4.50	6.00-6.63	8.00-8.63	Not Available	
MF82S-B	Bronze	•	•			Not Available	
Option 16	Installed on 16" Long Pipe Stub (PVC only)	•	•	•	•	Not Available	
IP800 Insertion Paddlewheel Meters							
MF82S-P	PVC (See ³ Note)	•	•	•	•	Not Available	
MF82S-F	Ductile Iron	3.45-4.05	4.00-4.50	6.00-6.63	8.00-8.63	Not Available	
MF82S-B	Bronze	•	•			Not Available	
Option 16	Installed on 16" Long Pipe Stub (PVC only)	•	•	•	•	Not Available	
³ Note: PVC saddles supplied with Buna-N O-rings only. For chemical service, O-ring must be removed and saddle glued to pipe with PVC cement. See Instructions.							

WELD/BRAZE FITTINGS, 3" to 10" PIPE

		-300	-400	-600	-800	-1000
EX800 Insertion Magmeters						
EF82W-B	Bronze	•	•	•	•	•
EF82W-C	Carbon Steel	•	•	•	•	•
EF82W-S	316 Stainless Steel	•	•	•	•	•
TX800 Insertion Turbine Meters						
MF82W-B	Bronze	•	•	•	•	Not Available
MF82W-C	Carbon Steel	•	•	•	•	
MF82W-S	316 Stainless Steel	•	•	•	•	
Option HP	High Pressure (See ² Note)	•	•	•	•	
IP800 Insertion Paddlewheels						
MF82W-B	Bronze	•	•	•	•	Not Available
MF82W-C	Carbon Steel	•	•	•	•	
MF82W-S	316 Stainless Steel	•	•	•	•	
Option HP	High Pressure (See ² Note)	•	•	•	•	

²Note: 400 PSI; Stainless & Carbon Fittings Only



Seametrics Incorporated • 19026 72nd Avenue South • Kent, Washington 98032 • USA

(P) 253.872.0284 • (F) 253.872.0285 • 1.800.975.8153 • www.seametrics.com

LT-65650291-REV A
2/15

2.14



FEATURES

- Low-friction, long-life jewel bearings
- One moving part
- Fully field-repairable
- Choice of materials for compatibility with variety of chemicals
- Fits 1/2" to 8" pipe
- Fixed depth in fitting ensures proper placement in pipe

APPLICATIONS

- Industrial water/wastewater treatment
- Cooling water monitoring
- Industrial fluid control
- Chemical proportioning

GENERAL INFORMATION

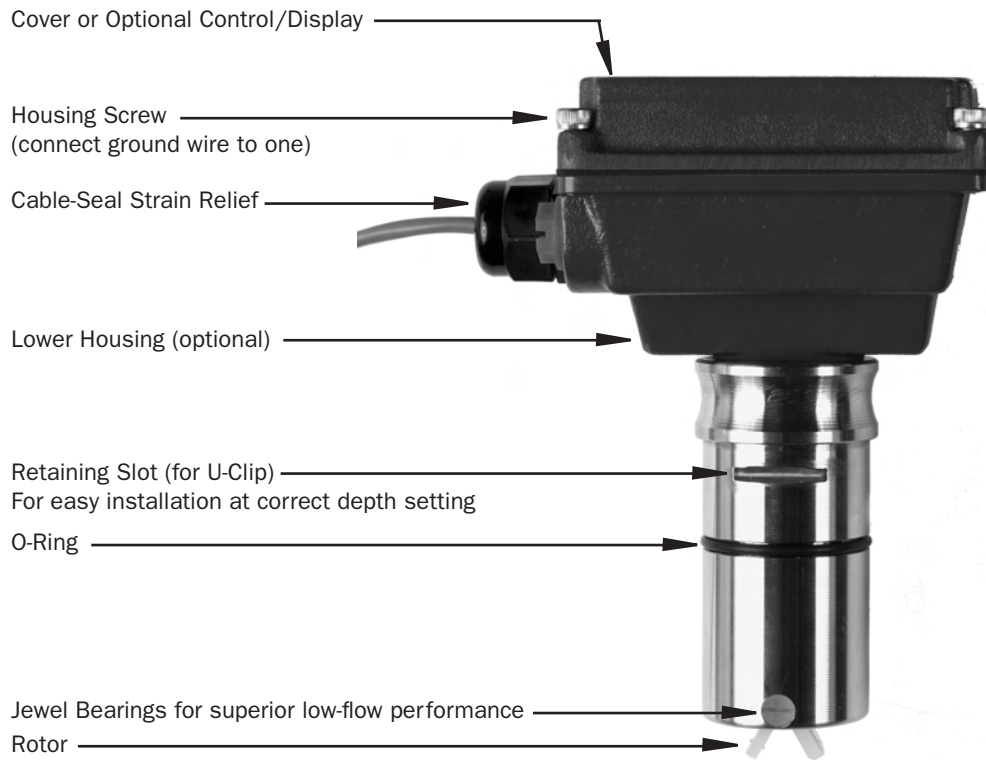
The **IP80-Series** are impeller (or "paddlewheel") insertion meters designed for use with a wide variety of liquids in pipe sizes 1/2" to 8". Sensors are available in brass, 316 stainless steel, PVC, and polypropylene. Bodies are machined from a solid rod for maximum precision. High-quality jewel bearings and nickel-bound tungsten carbide shafts are used for extreme low friction and long life. Low-flow performance is good, although other SeaMetrics flow meters are recommended where extremely low flows are being measured.

The rotation of the rotor is detected by a non-drag Hall-effect sensor. Output is a current-sinking pulse (square wave), which can be sent long distances (up to 2,000 feet) without a transmitter. This signal can be connected directly to PLC's, counters, and computer cards, as well as a variety of SeaMetrics controls and displays.

SeaMetrics IP meters are ideal for chemical proportioning applications. If no display is required, a simple divider such as the PD10 provides adjustable pump pacing. For rate and total display, the FT415 (battery powered) or FT420 (loop powered) flow indicator can be mounted directly on the IP80-Series meter, or remotely on a wall or panel. The AO55 blind analog transmitter can be used to convert to a 4-20 mA output. IP meters are also compatible with the DL75 data logger and FT520 batch processor.

The IP80-Series require special fittings that ensure correct depth placement in the pipe. Fittings come in a variety of materials for compatibility with specific applications. Tee fittings are individually wet-calibrated at the factory and marked with the K-factor (pulses per gallon). Saddle fittings must be field-installed on the pipe and do not come wet-calibrated. K-factors for saddles are based on factory-testing.

FEATURES



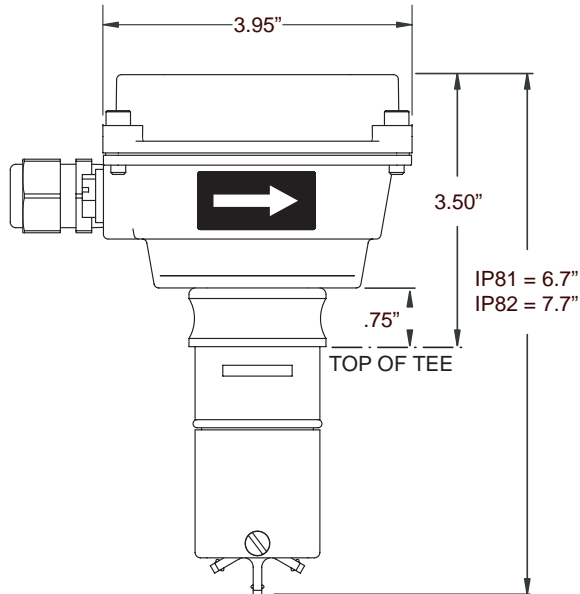
SPECIFICATIONS*

Materials	Sensor Body	Brass, 316 Stainless Steel, PVC, or Polypro		
	Rotor	PVDF		
	Shaft	Nickel-bonded tungsten carbide (Ceramic optional)		
	Bearings	Ruby jewel		
	O-Ring	EPDM (Viton optional)		
Rotor Pickup	GMR (Giant Magnetoresistive) Sensor			
Maximum Pressure	Brass	316 SS	PVC or Polypro (See Pressure vs. Temp. Chart)	
	200 PSI (14 bar)	250 PSI (17 bar)	175 PSI (12 bar) @ 75° F	
	Maximum Temperature	200° F (93° C)	200° F (93° C)	130° F (55° C)
Flow Range	0.3 - 30 ft./sec.			
Accuracy	+/- 1.5% of full scale			
Signal	Hall effect current sinking pulse			
Power	6-24 Vdc, 2 mA			
Maximum Current	20 mA			
Cable	#22 AWG, 3 Cond, 18 foot (maximum 2000' run)			

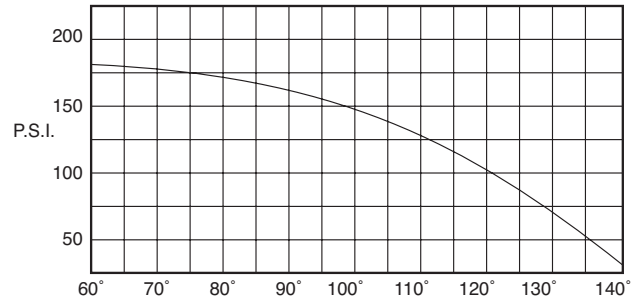
*Specifications subject to change • Please consult our website for current data (www.seametrics.com).

DIMENSIONS

NOTE: Housing Optional



PRESSURE VS. TEMPERATURE (PVC/Polypro)



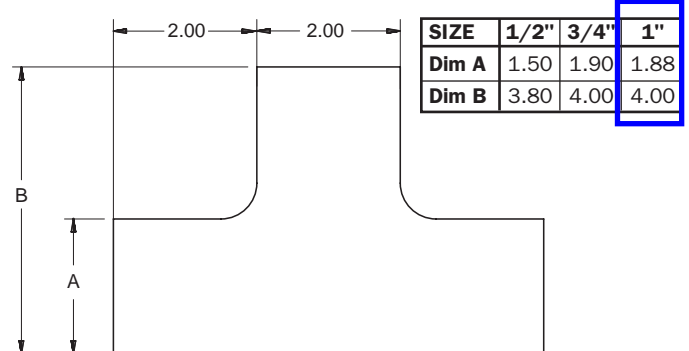
FLOW RANGE (In Gallons Per Minute)

	1/2"	3/4"	1"	1-1/2"	2"	3"	4"	6"	8"
Min	0.28	0.5	0.8	1.9	3.1	6.9	12	27	46.8
Max	28	50	80	190	314	691	1190	2700	4680

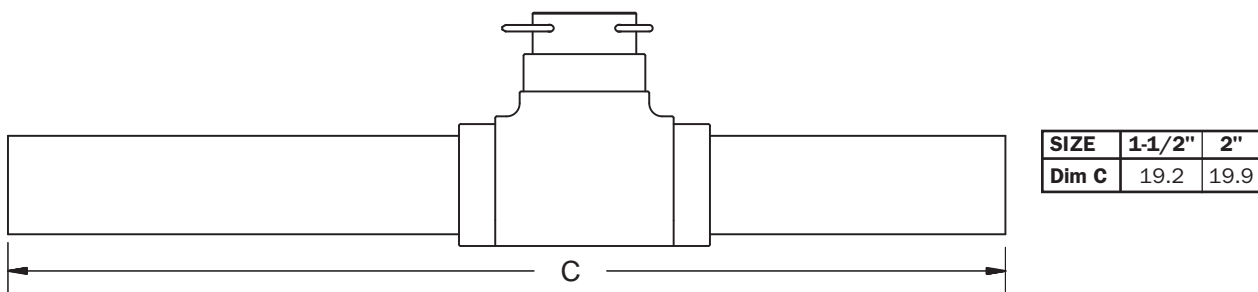
AVAILABLE FITTINGS

	Tee	Saddle	Weld	Braze	Sweat Tee
Bronze	1/2-4"	3-4"	x	3-8"	1/2-4"
PVC	1/2-2"	3-8"	x	x	x
Stainless Steel	1/2-2" 304SS	x	3-8" 316SS	x	x
Carbon Steel	1/2-2"	x	3-8"	x	x
Ductile Iron	x	3-8"	x	x	x

PVC BLOCK TEE FITTING



PVC TEE FITTINGS



HOW TO ORDER

MODEL	MATERIAL	OPTIONS	FITTINGS								
1/2" - 4" = IP81 6" - 8" = IP82 IP81	Brass = B 316 Stainless Steel = S PVC = P Polypro = Y P	Ceramic Shaft = -01 Micropower Pickup = -04 (Use with FT415 or DL75) LMI Pump Connector = -06 SeaMetrics Control Connector = -07 Viton® O-Ring = -60 07	Select from chart above (Fitting Type and Material) 								
<h3>ACCESSORIES</h3> <table> <tbody> <tr> <td>Rate and Total Indicator with pulse & 4-20 mA outputs = FT420</td> <td>Pulse divider = PD10</td> </tr> <tr> <td>Rate and Total Indicator, battery powered = FT415</td> <td>Data logger = DL75</td> </tr> <tr> <td>Analog transmitter, blind 4-20 mA converter = AO55</td> <td>Mounting kit, converts wall to meter mount = MK10</td> </tr> <tr> <td>Power converter, plug-in, 110-115 Vac, 24 Vdc = PC3</td> <td>Mounting kit, converts meter to wall mount = MK20</td> </tr> </tbody> </table>				Rate and Total Indicator with pulse & 4-20 mA outputs = FT420	Pulse divider = PD10	Rate and Total Indicator, battery powered = FT415	Data logger = DL75	Analog transmitter, blind 4-20 mA converter = AO55	Mounting kit, converts wall to meter mount = MK10	Power converter, plug-in, 110-115 Vac, 24 Vdc = PC3	Mounting kit, converts meter to wall mount = MK20
Rate and Total Indicator with pulse & 4-20 mA outputs = FT420	Pulse divider = PD10										
Rate and Total Indicator, battery powered = FT415	Data logger = DL75										
Analog transmitter, blind 4-20 mA converter = AO55	Mounting kit, converts wall to meter mount = MK10										
Power converter, plug-in, 110-115 Vac, 24 Vdc = PC3	Mounting kit, converts meter to wall mount = MK20										

CONTACT YOUR SUPPLIER

2.15



PVC SCHEDULE 80 FITTINGS

80-2-1000

Performance Engineered & Tested



SPEARS® Schedule 80 PVC fitting designs combine years of proven experience with computer generated stress analysis to yield the optimum physical structure and performance for each fitting. Material reinforcement is uniformly placed in stress concentration areas for substantially improved pressure handling capability. Resulting products are subjected to numerous verification tests to assure obtaining the very best PVC fittings available.

Full 1/4" Through 12" Availability

Spears® comprehensive line of injection molded PVC fittings offers a variety of configurations in molded Schedule 80 sizes 1/4" through 12" conforming to ASTM D 2467 and Spears® exclusive CL150 Flanges in sizes 1/2" through 16".

Exceptional Chemical & Corrosion Resistance

Unlike metal, PVC fittings never rust, scale, or pit, and will provide many years of maintenance-free service and extended system life.

High Temperature Ratings

PVC thermoplastic can handle fluids at service temperatures up to 140° F (60°C), allowing a wide range of process applications, including corrosive fluids.

Lower Installation Costs

Substantially lower material costs than steel alloys or lined steel, combined with lighter weight and ease of installation, can reduce installation costs by as much as 60% over conventional metal systems.

Higher Flow Capacity

Smooth interior walls result in lower pressure loss and higher volume than conventional metal fittings.

Additional Fabricated Configurations through 36"

Extra large, hard-to-find, and custom configurations are fabricated from NSF Certified pipe. Fittings are engineered and tested to provide full pressure handling capabilities according to Spears® specifications.

Advanced Design Specialty Fittings

Spears® wide range of innovative, improved products include numerous metal-to-plastic transition fittings and unions with Spears® patented special reinforced (SR) plastic threads.

PVC Valves

SPEARS® PVC Valve products are available for total system compatibility and uniformity; see SPEARS® THERMOPLASTIC VALVES PRODUCT GUIDE & ENGINEERING SPECIFICATIONS (V-4).



Sample Engineering Specifications

All PVC Schedule 80 fittings shall be produced by Spears® Manufacturing Company from PVC Type I, cell classification 12454, conforming to ASTM Standard D 1784. All injection molded PVC Schedule 80 fittings shall be Certified for potable water service by NSF International and manufactured in strict compliance to ASTM D 2467. All fabricated fittings shall be produced in accordance with Spears® General Specifications for Fabricated Fittings. All PVC flanges shall be designed and manufactured to meet CL150 bolt pattern per ANSI Standard B16.5 and rated for a maximum internal pressure of 150 psi, non-shock at 73°F.

PROGRESSIVE PRODUCTS FROM SPEARS® INNOVATION & TECHNOLOGY

Visit our web site: www.spearsmfg.com

PVC Thermoplastic Pipe Temperature Pressure De-Rating

To determine the maximum internal pressure rating at an elevated temperature, simply multiply the pipe pressure rating at 73°F by the percentage specified for the desired temperature.

System Operating Temperature °F (°C)	73 (23)	80 (27)	90 (32)	100 (38)	110 (43)	120 (49)	130 (54)	140 (60)
PVC	100%	90%	75%	62%	50%	40%	30%	22%

NOTE: Valves, Unions and Specialty Products have different elevated temperature ratings than pipe.

Typical Material Properties

Properties	ASTM Test Method	PVC
Mechanical Properties, 73°F		
Specific Gravity, g/cm ³	D 792	1.41
Tensile Strength, psi	D 638	7,000
Modulus of Elasticity, psi	D 638	440,000
Compressive Strength, psi	D 695	9,000
Flexural Strength, psi	D 790	13,200
Izod Impact, notched, ft-lb / in	D 256	.65
Thermal Properties		
Heat Deflection Temperature, °F at 66 psi	D 648	165
Thermal Conductivity, BTU / hr / sq ft / °F / in	C 177	1.2
Coefficient of Linear Expansion, in / in / °F	D 696	3.0 x 10 ⁻⁵
Flammability		
Limited Oxygen Index, %	D 2863	43
UL 94 Rating	94V-0	
Other Properties		
Water Absorption, % 24 hr.	D 570	.05
Industry Standard Color	White / Dark Gray	
ASTM Cell Classification	D 1784	12454
NSF Potable Water Approved	YES	

PVC Chemical Resistance

PVC is generally inert to most mineral acids, bases, salts and paraffinic hydrocarbon solutions. For more information on PVC chemical resistance refer to the Chemical Resistance of Rigid Vinyls Based on Immersion Test, published by the GEON® company.

NOT FOR USE WITH COMPRESSED AIR OR GASES

Spears® Manufacturing Company DOES NOT RECOMMEND the use of thermoplastic piping products for systems to transport or store compressed air or gases, or the testing of thermoplastic piping systems with compressed air or gases in above and below ground locations. The use of our product in compressed air or gas systems automatically voids any warranty for such products, and its use against our recommendation is entirely the responsibility and liability of the installer.

WARNING: DO NOT USE COMPRESSED AIR OR GAS TO TEST ANY PVC OR CPVC THERMOPLASTIC PIPING PRODUCT OR SYSTEM, AND DO NOT USE DEVICES PROPELLED BY COMPRESSED AIR OR GAS TO CLEAR SYSTEMS. THESE PRACTICES MAY RESULT IN EXPLOSIVE FRAGMENTATION OF SYSTEM PIPING COMPONENTS CAUSING SERIOUS OR FATAL BODILY INJURY.



SPEARS® MANUFACTURING COMPANY • CORPORATE OFFICE

15853 Olden St., Sylmar, CA 91342 • PO Box 9203, Sylmar, CA 91392
(818) 364-1611 • www.spearsmfg.com



PACIFIC SOUTHWEST

15860 Olden St.
Sylmar (Los Angeles), CA 91342
(818) 364-1611 • (800) 862-1499
Fax (818) 367-3014

ROCKY MOUNTAIN

4880 Florence St.
Denver, CO 80238
(303) 371-9430 • (800) 777-4154
Fax (303) 375-9546

UTAH

5395 West 1520 South
Salt Lake City, UT 84104
(303) 371-9430 • (800) 777-4154
Fax (303) 375-9546

SOUTHEAST

4205 Newpoint Pl. Suite 100
Lawrenceville (Atlanta), GA 30043
(678) 985-1263 • (800) 662-6326
Fax (678) 985-5642

MIDWEST

1 Gateway Ct. Suite A
Bolingbrook (Chicago), IL 60440
(630) 759-7529 • (800) 662-6330
Fax (630) 759-7515

NORTHWEST

4103 C St. NE Suite 200
Auburn (Seattle), WA 98002
(253) 939-4433 • (800) 347-7327
Fax (253) 939-7557

SOUTH CENTRAL

4250 Patriot Dr. Suite 300
Grapevine (Dallas), TX 76051-2317
(972) 691-4003 • (800) 441-1437
Fax (972) 691-4404

NORTHEAST

590 Industrial Dr. Suite 100
Lewisberry (Harrisburg), PA 17339-9532
(717) 938-8844 • (800) 233-0275
Fax (717) 938-6547

FLORIDA

9563 Parksouth Court
Orlando, FL 32837
(407) 843-1960 • (800) 327-6390
Fax (407) 425-3563

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E-mail: export@spearsmfg.com



IPS®

WELD-ON

PRODUCT BULLETIN • SPECIFICATIONS

724

CPVC Chemical Resistant Solvent Cement

GENERAL DESCRIPTION:

Weld-On 724 is a gray, reduced VOC emissions, heavy bodied, medium setting, high strength CPVC solvent cement for all classes and schedules of pipe and fittings with interference fit, including Schedule 80 through 12” diameter. Formulated for improved chemical resistance to caustics including hypochlorite solutions. Approved for Corzan™ Industrial Systems. **May be used on PVC industrial piping systems for chemical applications.**

APPLICATION:

Weld-On 724 is for use on CPVC and PVC industrial piping systems. It is especially for systems requiring chemical resistance to caustics, including hypochlorite solutions. It can also be used in systems for mineral acids, aggressive water and aqueous salt solutions.

Detailed directions on making solvent cemented joints are printed on the container label. An installation DVD/CD covering solvent cementing is available. It not only describes the basic principles of solvent cementing, but also covers the handling, storage and use of our products. It is highly recommended that the installer review the instructions supplied by the pipe and fitting manufacturer. **NOTE:** IPS Weld-On solvent cements must never be used in a CPVC or PVC system using or being tested by compressed air or gases.

AVAILABILITY:

This product is available in pint, quart and gallon metal cans. For detailed information on containers and applicators, see our current Price List.

STANDARDS AND APPROVALS:

Weld-On 724 meets ASTM F-493 and SCAQMD Rule 1168/316A. It is listed by NSF International for potable water, sewer, drain, waste and vent systems.

SPECIFICATIONS:

COLOR:	Gray
RESIN:	CPVC
SPECIFIC GRAVITY:	0.982 ± 0.040
BROOKFIELD VISCOSITY:	Minimum 1,800 cps @ 73 ± 2°F
MAX VOC EMISSIONS:	490 G/L, per SCAQMD Rule 1168, Method 316A

SHELF LIFE:

2 years expectancy in tightly sealed containers. The date of manufacture is stamped on the bottom of the container. Stability of the product is limited by the permanence of the container and the evaporation of the solvent when container is open. Evaporation of solvent will cause the cement to thicken and reduce its effectiveness. Adding of thinners to change viscosity is not recommended.

SHIPPING:

Shipping Information for Liter and Above: Proper Shipping Name: Adhesive. Hazard Class: 3. Identification Number: UN 1133. Packing Group: II. **Label Required:** Flammable Liquid.
Shipping Information for Less than One Liter: Proper Shipping Name: Consumer Commodity. Hazard Class: ORM-D.

Corzan™ is a registered trademark of Noveon, Inc.

**GENERAL DESCRIPTION:**

WELD-ON® P-70™ is an industrial grade, low VOC emission, non-bodied, fast acting, primer. The strong, aggressive action of P-70 primer rapidly softens and dissolves the joining surfaces of PVC and CPVC pipe and fittings. The benefit of this priming action is especially noticeable on parts being joined together in cold weather. Available in clear and purple; the latter allows easy identification when used on the joining surfaces.

APPLICATION:

WELD-ON P-70 primer, when used in conjunction with appropriate WELD-ON solvent cements, will make consistently strong, well-fused joints. It is essential that the joining surfaces of pipe and fittings be softened and remains softened prior to assembly. The main function of the primer is to expedite the penetration and softening of the surfaces. Its rate of penetration into the joining surfaces is more rapid than that of solvent cement alone. P-70 primer is suitable for use with all types, classes and schedules of PVC and CPVC pipe and fittings. It is specially recommended for use on Schedule 80 and large pipe size.

Detailed directions on making solvent cemented joints are printed on the container label. An installation DVD/CD covering solvent cementing is available. It not only describes the basic principles of solvent cementing, but also covers the handling, storage and use of our products. It is highly recommended that the installer review the instructions supplied by the pipe and fitting manufacturer.

NOTE: WELD-ON solvent cements must never be used in a CPVC system using or being tested by compressed air or gases; including air-over-water booster.

AVAILABILITY:

Both WELD-ON P-70 clear and purple primers are available in ¼ pint (118 ml), ½ pint (237 ml), pint (473 ml), quart (946 ml) and gallon (3.785 l) metal cans. For detailed information on containers and applicators, see our current Price List.

STANDARDS AND CERTIFICATION LISTINGS:

PW/DWV/SW Purple Only

- Meets ASTM F 656 Standard
- Meets SCAQMD Rule 1168/316A
- Compliant with LEED® (Leadership in Energy and Environmental Design). When using this WELD-ON low VOC product, credit can be claimed for LEED Green Building Rating System – Indoor Environmental Quality.
- Listed by NSF International for compliance with ASTM F 656, NSF/ANSI Standard 14, and NSF/ANSI Standard 61 for use on potable water, drain, waste, vent and sewer applications.
- **WELD-ON P-70 Purple Only** - Listed by IAPMO for compliance with ASTM F 656 and applicable sections of the latest edition of the Uniform Plumbing Code®.

SPECIFICATIONS:

COLOR: Clear or Purple
SPECIFIC GRAVITY: 0.858 ± 0.040
BROOKFIELD VISCOSITY: Water Thin

SHELF LIFE:

3 years in tightly sealed containers. The date code of manufacture is stamped on the bottom of the container. Stability of the product is limited by the evaporation of the solvent when the container is opened. Adding of solvents is not recommended and may significantly change the properties of the primer.

QUALITY ASSURANCE:

WELD-ON P-70 primer is carefully evaluated to assure that consistent high quality is maintained. Fourier transform infrared spectroscopy, gas chromatography, and additional in depth testing ensures each batch is manufactured to exacting standards. A batch identification code is stamped on each can and assures traceability of all materials and processes used in manufacturing this product.

SHIPPING:**For One Liter and Above**

Proper Shipping Name: Flammable Liquid
n.o.s. (Methyl Ethyl Ketone, Tetrahydrofuran)
Hazard Class: 3
Identification Number: UN 1993
Packing Group: II
Label Required: Flammable Liquid

For Less than One Liter

Proper Shipping Name: Consumer Commodity
Hazard Class: ORM-D

SAFETY AND ENVIRONMENTAL PRECAUTIONS:

This product is flammable and considered a hazardous material. In conformance with the Federal Hazardous Substances Labeling Act, the following hazards and precautions are given. Purchasers who repackage this product must also conform to all local, state and federal labeling, safety and other regulations. VOC emissions do not exceed 550 grams per liter.

**DANGER: EXTREMELY FLAMMABLE. VAPOR HARMFUL.
MAY BE HARMFUL IF SWALLOWED. MAY IRRITATE SKIN OR EYES.**

Keep out of reach of children. Do not take internally. Keep away from heat, spark, open flame and other sources of ignition. Vapors may ignite explosively. Solvent cement vapors are heavier than air and may travel to source(s) of ignition at or near ground or lower level(s) and flash back. Keep container closed when not in use. Store between 40°F (5°C) and 110°F (44°C). Avoid breathing of vapors. Use only in well-ventilated area. If confined or partially enclosed, use forced ventilation. When necessary, use local exhaust ventilation to remove harmful airborne contaminants from employee breathing zone and to keep contaminants below 25 ppm TWA. Atmospheric levels must be maintained below established exposure limits contained in Section II of the Material Safety Data Sheet (MSDS). If airborne concentrations exceed those limits, use of a NIOSH approved organic vapor cartridge respirator with full face-piece is recommended. The effectiveness of an air-purifying respirator is limited. Use it only for a single short-term exposure. For emergency and other conditions where short-term exposure guidelines may be exceeded, use an approved positive pressure self-contained breathing apparatus. Do not smoke, eat or drink while working with this product. Avoid contact with skin, eyes and clothing. May cause eye injury. Protective equipment such as gloves, goggles and impervious apron should be used. Carefully read Material Safety Data Sheet and follow all precautions. Do not use this product for other than intended use.

"SARA Title III Section 313 Supplier Notification": This product contains toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 and of 40CFR372. This information must be included in all MSDS that are copied and distributed for this material.

FIRST AID:

Inhalation: If overcome with vapors, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call physician.

Eye Contact: Flush with plenty of water for 15 minutes and call a physician.

Skin Contact: Wash skin with plenty of soap and water for at least 15 minutes. If irritation develops, get medical attention.

Ingestion: If swallowed, give 1 or 2 glasses of water or milk. Do not induce vomiting. Contact physician or poison control center immediately.

SPECIAL PRECAUTION:

Do not use a dry granular calcium hypochlorite as a disinfecting material for water purification in potable water piping systems. The introduction of granules or pellets of calcium hypochlorite with PVC and CPVC solvent cements and primers (including their vapors) may result in a violent chemical reaction if a water solution is not used. It is advisable to purify lines by pumping chlorinated water into the piping system – this solution will be nonvolatile. Furthermore, dry granular calcium hypochlorite should not be stored or used near solvent cements and primers.

IMPORTANT NOTE:

This product is intended for use by skilled individuals at their own risk. These suggestions and data are based on information we believe to be reliable. Installers should verify for themselves that they can make satisfactory joints under varying conditions. Toward this end, it is highly desirable that they receive personal instruction from trained instructors or competent, experienced installers. Contact IPS® Corporation or your supplier for additional information or instructions.

WARRANTY:

IPS® Corporation ("IPS Corp.") warrants that all new IPS Corp. products shall be of good quality and free from defects in material and workmanship for the shelf life as indicated on the product. If any IPS Corp. product becomes defective, or fails to conform to our written limited warranty under normal use and storage conditions, then IPS Corp. will, without charge, replace the nonconforming product. However, this limited warranty shall not extend to, nor shall IPS Corp. be responsible for, damages or loss resulting from accident, misuse, negligent use, improper application, or incorporation of IPS Corp. products into other products. In addition, any repackaging of IPS Corp. products also shall void the limited warranty. IPS Corp. shall not be responsible for, nor does this limited warranty extend to, consequential damage, or incidental damage or expense, including without limitation, injury to persons or property or loss of use. Please refer to our standard IPS Corp. Limited Warranty for additional provisions.



455 W. Victoria Street
Compton, CA 90220 U.S.A.
Tel: 310.898.3300
Fax: 310.898.3392

500 Distribution Parkway
Collierville, TN 38017 U.S.A.
Tel: 901.853.5001
Fax: 901.853.5008

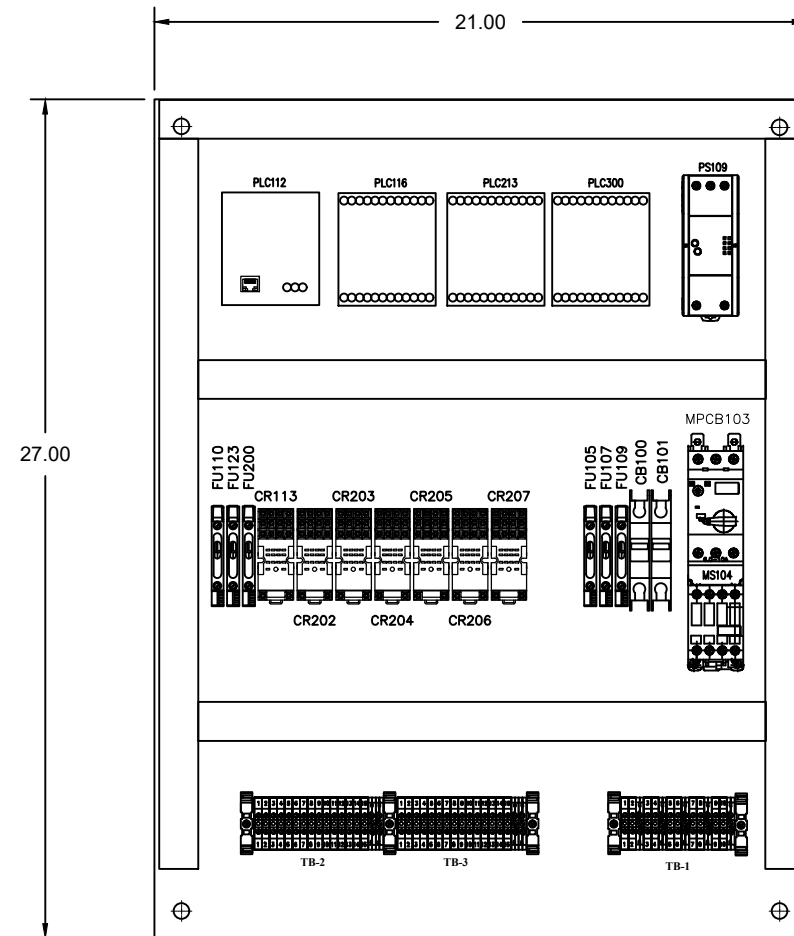
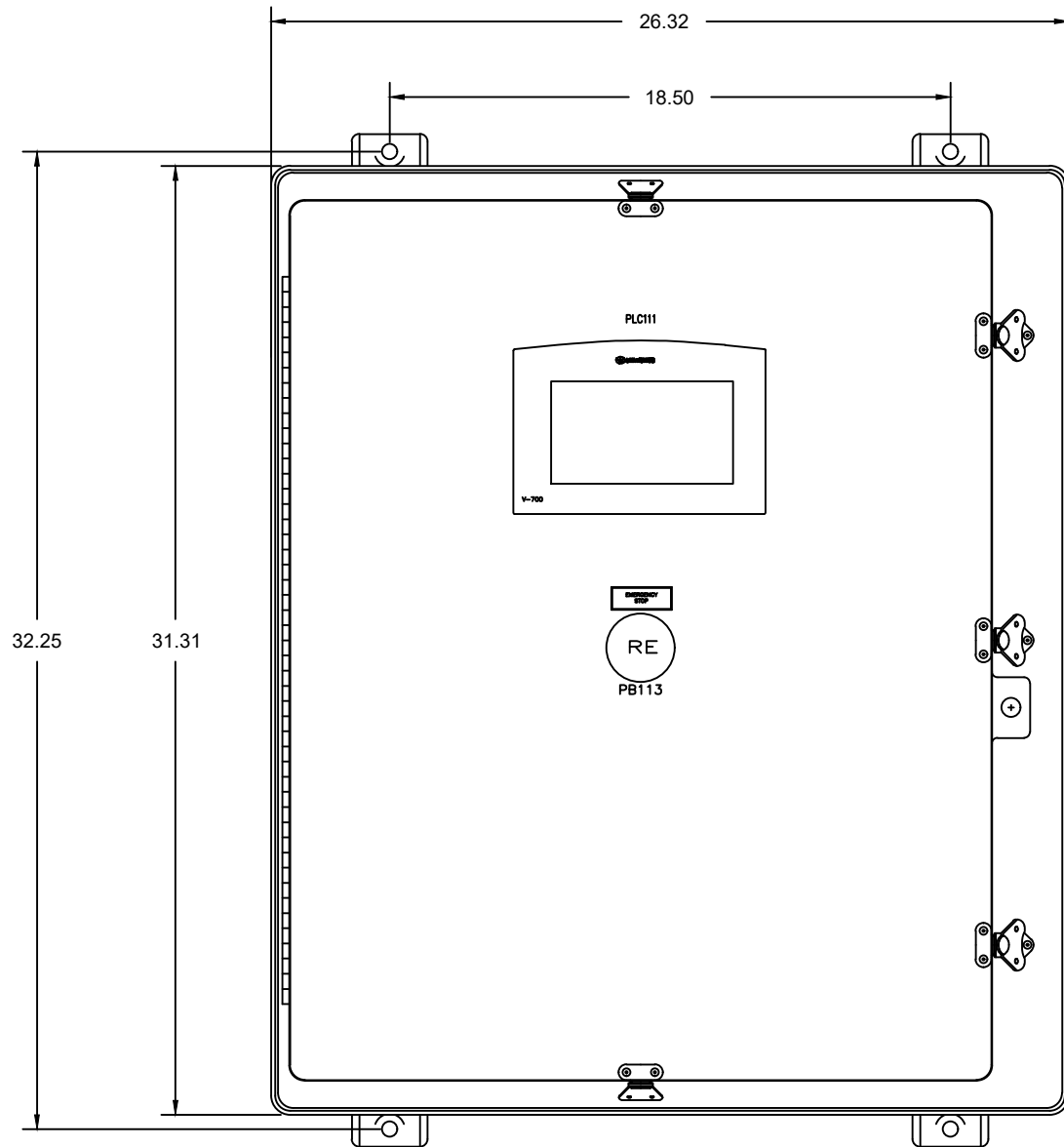
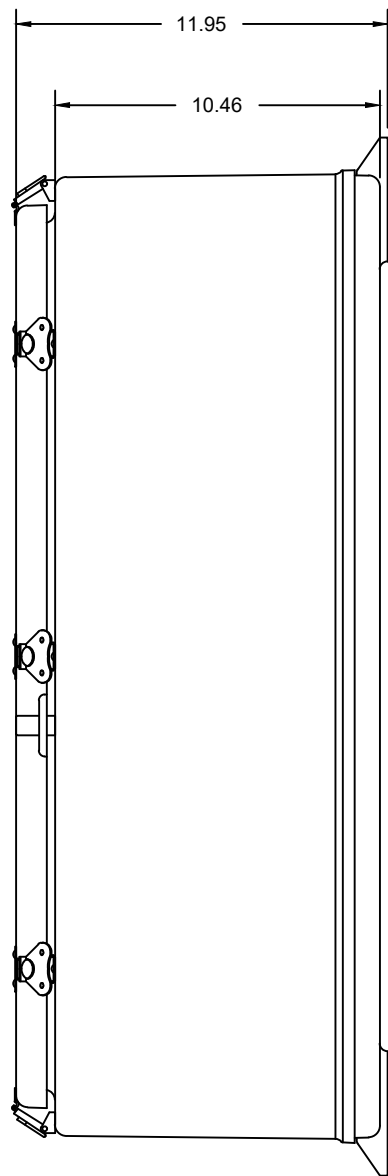
Customer Service: 800.888.8312
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SECTION 3

ELECTRICAL DRAWINGS & COMPONENTS

3.1



STAHLIN N302410HWT
NEMA 4X FRP ENCLOSURE

STAHLIN BP3024CS
SUB PANEL

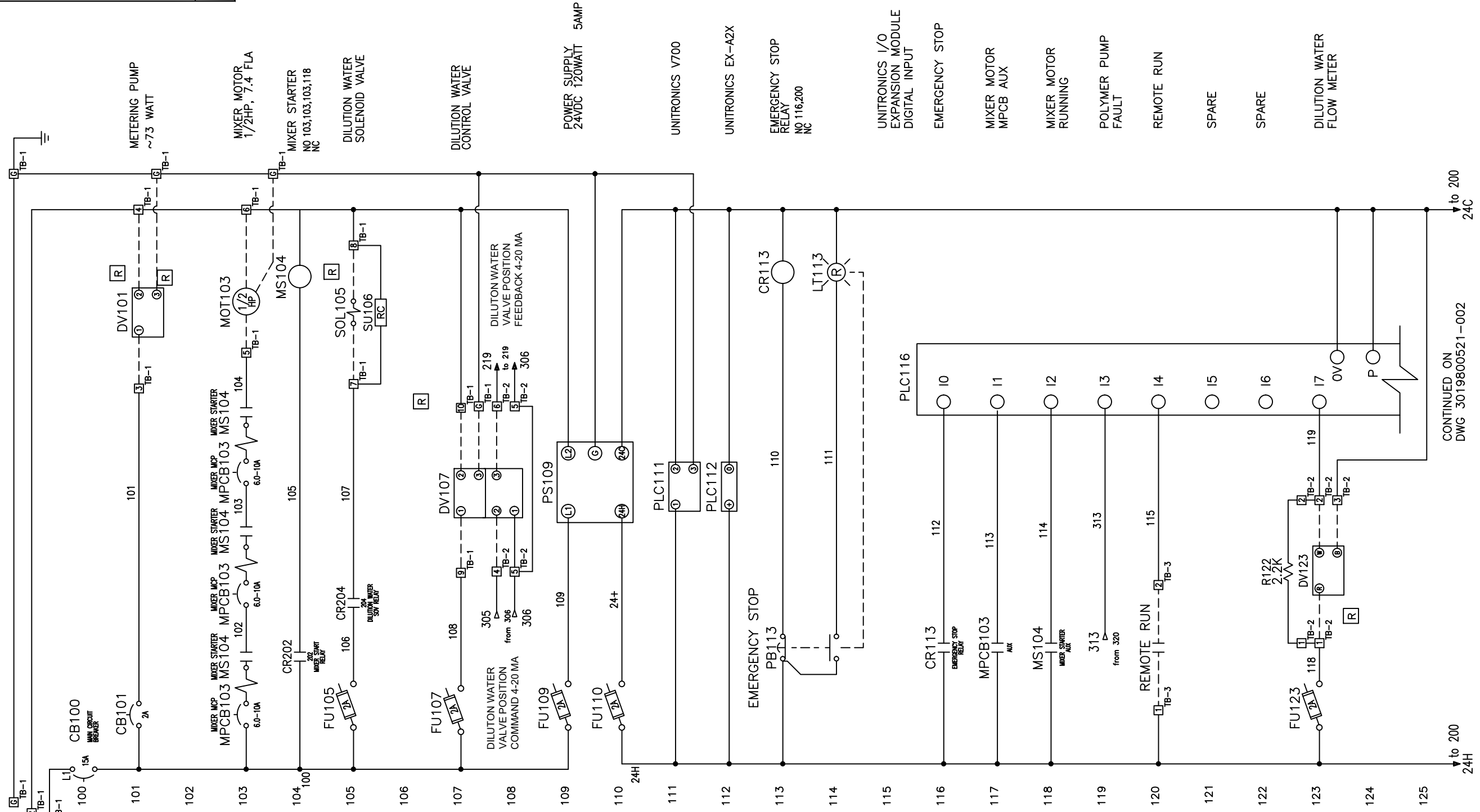
LABEL DETAILS



CUSTOMER: ALFA LAVAL INC.
PO No.: 1877452
PROJECT: DISTRICT OF SOOKE WWTP
PFC SO No.: 3119800341

0		11-22-19	SUBMITTAL REVIEW	RJT	ENGINEERS SEAL	 ProMinent® THE PROMINENT GROUP OF COMPANIES PITTSBURGH, PA USA WWW.PROMINENT.US <small>THIS DRAWING IS THE PROPERTY OF PROMINENT FLUID CONTROLS, INC. AND SHALL NOT BE COPIED OR TRANSFERRED WITHOUT THE WRITTEN CONSENT OF PROMINENT FLUID CONTROLS, INC.</small> PROMINENT FLUID CONTROLS, INC. 136 INDUSTRY DRIVE PITTSBURGH, PA 15275 USA TEL. 412 787 2484 FAX. 412 787 0704
REV	DATE	DESCRIPTION	BY			
CUSTOMER						
PROMINENT FLUID CONTROLS LTD-CA						
JOB No	3019800521	PURCHASE ORDER No XX				
TITLE					DWG No	
PROMIX S 300X1-2.3DC SYSTEM ENCLOSURE AND SUB PANEL LAYOUT					3019800521-300	
					REV	PAGE
					0	1/1

CUSTOMER POWER SUPPLY
120VAC, 1PH, 60HZ, 20 AMP
DISCONNECT SWITCH, BRANCH CIRCUIT
PROTECTION AND/OR OVERLOAD RELAY TO
BE PROVIDED BY INSTALLER



CONTINUED ON
DWG 3019800521-002

CUSTOMER: ALFA LAVAL INC.
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PROJECT: DISTRICT OF SOOKE WWTP
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REV	DATE	DESCRIPTION	BY	
REVISIONS				
CUSTOMER				ENGINEERS SEAL
PROMINENT FLUID CONTROLS LTD-CA				
JOB No	3019800521	PURCHASE ORDER No	XX	
TITLE				DWG No
PROMIX S 300X1-2.3DC SYSTEM ELECTRICAL SCHEMATIC				3019800521-301
				REV
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				PAGE
				1/3

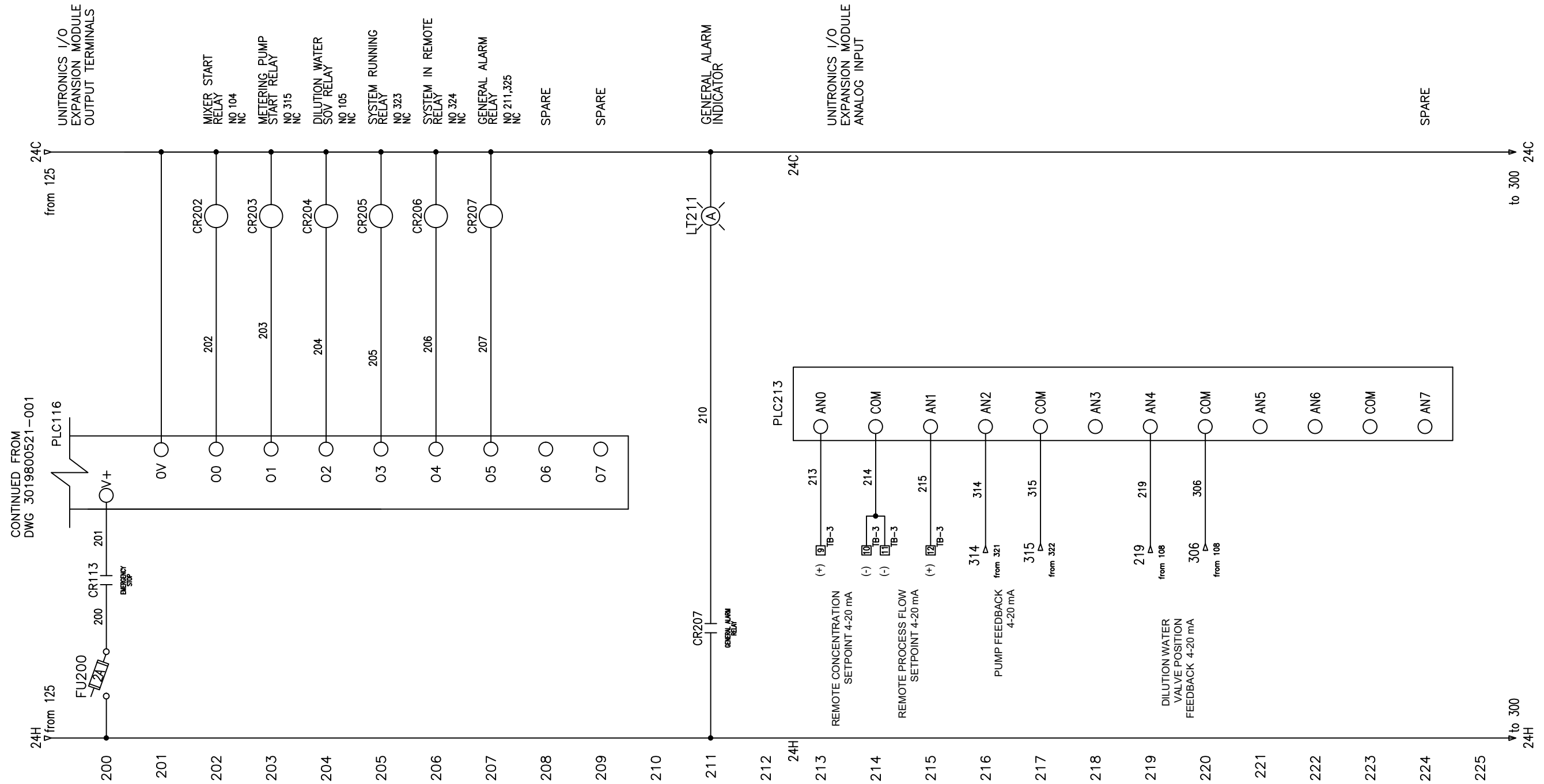
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136 PARK WEST
PITTSBURGH, PA 15275 USA
TEL. 412 787 2484 FAX. 412 787 0704

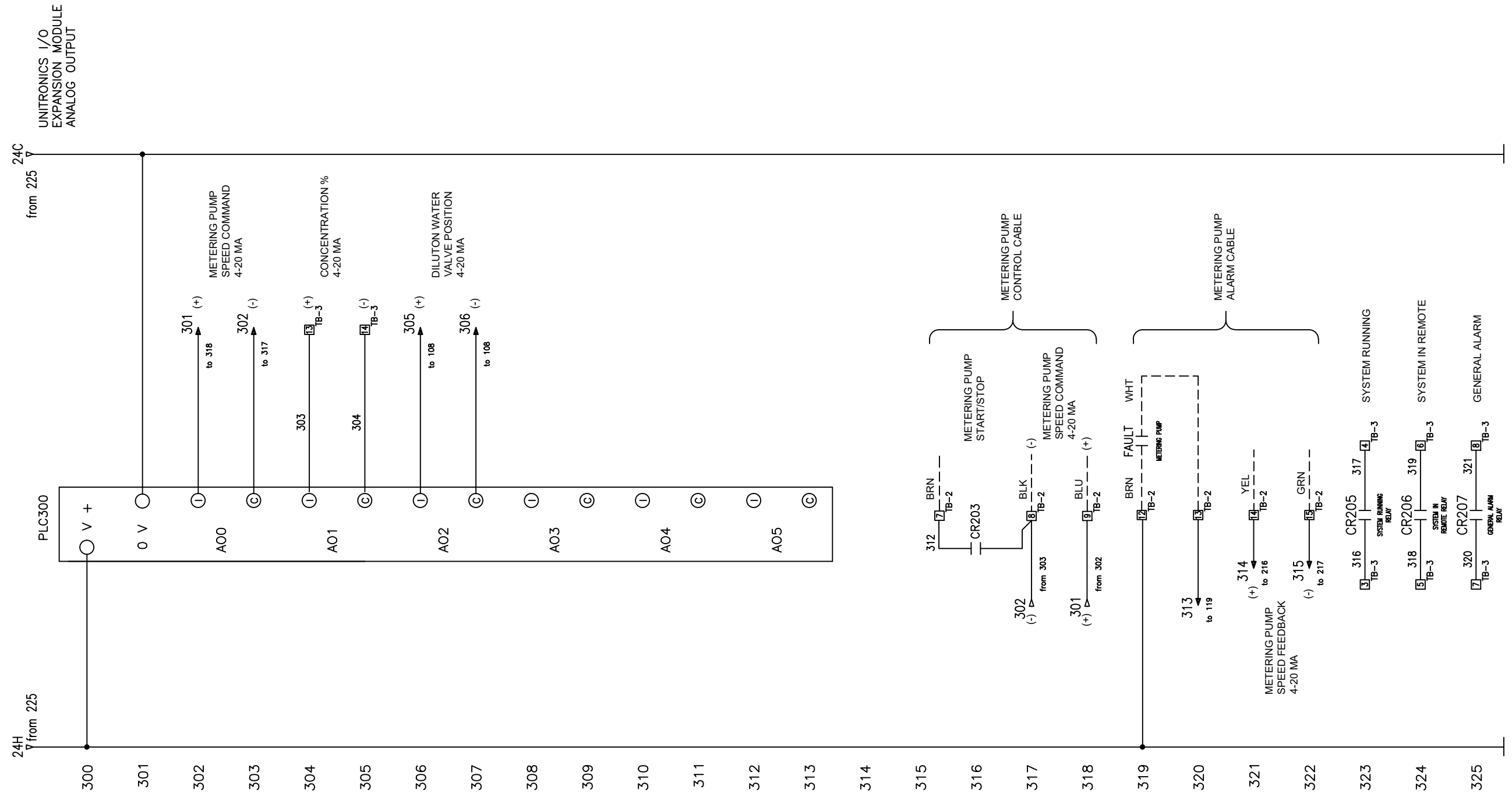
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DRAWN RJT SCALE NTS
CHECKED CM DATE 11-22-19



CONTINUED FROM
DWG 3019800521-001

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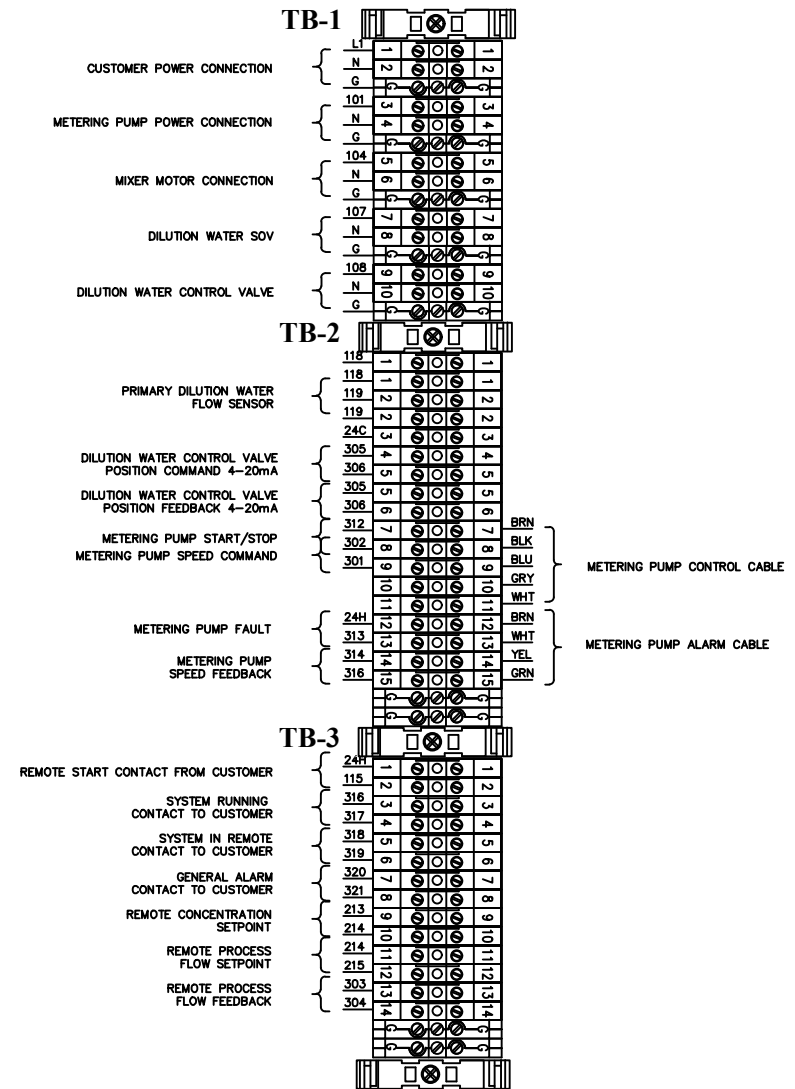
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REV	DATE	DESCRIPTION
		BY
SUBMITTAL REVIEW		RJT
REVISIONS		
CUSTOMER		PROMINENT FLUID CONTROLS LTD-CA
JOB No	3019800521	PURCHASE ORDER No XX
TITLE		PROMIX S 300X1-2.3DC SYSTEM ELECTRICAL SCHEMATIC
DWG No		3019800521-301
REV	0	PAGE 2/3
DATE	11-22-19	SCALE NTS
DESIGNED	RJT	APPROVED CM
DRAWN	RJT	SCALE NTS
CHECKED	CM	DATE 11-22-19



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PROJECT: DISTRICT OF SOOKE WWTP
PFC SO No.: 3119800341

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REV	DATE	DESCRIPTION		BY
CUSTOMER PROMINENT FLUID CONTROLS LTD-CA				
JOB No	3019800521	PURCHASE ORDER No XX		
TITLE	PROMIX S 300X1-2.3DC SYSTEM ELECTRICAL SCHEMATIC			DWG No
				ENGINEERS SEAL
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DESIGNED	RJT	APPROVED CM		
DRAWN	RJT	SCALE NTS		
CHECKED	CM	DATE 11-22-19		
DWG No 3019800521-301				REV 0 PAGE 3/3

TAGS	QTY	SUB	CATALOG	MFG	DESCRIPTION
	1		N302410HWT	STAHLIN	NEMA 4X, FRP WALL-MOUNT ENCLOSURE 30 X 24 X 10 IN
		*1	BP3022	STAHLIN	STEEL SUB-PANEL
CB100	1		1077609	ABB	CIRCUIT BREAKER - MINIATURE 1-POLE CIRCUIT BREAKER 10 AMPS,120 VAC, 10KAIR UL 489
CB101	1		1077611	ABB	CIRCUIT BREAKER - MINIATURE 1-POLE CIRCUIT BREAKER 2 AMPS,120 VAC, 10KAIR UL 489
CR113 CR202 CR203 CR204 CR205 CR206 CR207	7		7746414	SQD	ZELIO 4PDT RELAY 24VDC COIL
		*1	7746415	SQD	RELAY SOCKET
MCP103	1		1078793	SQD	MOTOR CIRCUIT PROTECTOR/CONTACTOR ASSEMBLY IEC ASSEMBLY W/ AUXILARY CONTACTS 6 - 10 AMP ADJUSTABLE
MS104	1		1078795	SQD	CONTACTOR LC1D12G7+GV2AF3+GV1F03+GV1F03
PB113	1		1060717	SDQ	ILLUMINATED E-STOP 30MM RED 24VDC
PS109	1		7746274	IDEC	POWER SUPPLY 24VDC 30 WATT 1.3 AMP OUT
SU106	1		1049043	PFC	RC NETWORK SNUBBER
PLC11	1		V700-T20BJ	UNITRONICS	VISION OPLC V700PLC WITH INTEGRATED 7" TFT LCD DISPLAY
PLC112			EX-A2X	UNITRONICS	I/O APADPTOR MODULE
PLC116	1		IO-DIB-R08	UNITRONICS	I/O EXPANSION MODULE, 8 DIGITAL INPUTS, 8 RELAY OUTPUTS
PLC213	1		IO-AI8	UNITRONICS	I/O EXPANSION MODULE, 8 ANALOG INPUTS
PLC300	1		IO-A06X	UNITRONICS	I/O EXPANSION MODULE, 6 ISOLATED ANALOG OUTPUTS
TB-1 TB-2 TB-3	9		7746750	PHOENIX	TERMINAL - USLKG5, GROUND TERMINAL GREEN/YELLOW 26-10AWG SCREW CLAMP
TB-1 TB-2 TB-3	41		7746748	PHOENIX	TERMINAL BLOCK - UK5N SINGLE LEVEL FEED -THROUGH, 41AMPS 800V, 24-10AWG SCREW CLAMP
		*3	7746749	PHOENIX	SINGLE LEVEL END PLATE
		*5	7746751	PHOENIX	END BRACKET - E/NS 35N THICKNESS 9.5MM
FU103	6		7745052	AUTO DIRECT	FUSE TERMINAL DN-F6 1"x1 1/4" FUSES
		*6	7746094	MERSEN	GLD2 TIME DELAY FUSE
	1		7500386	PFC	STOCK PRINTED LABELS



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PROJECT: DISTRICT OF SOOKE WWTP
PFC SO No.: 3119800341

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REV	DATE	DESCRIPTION	BY	PITTSBURGH, PA USA WWW.PROMINENT.US THIS DRAWING IS THE PROPERTY OF PROMINENT FLUID CONTROLS, INC. AND SHALL NOT BE COPIED OR TRANSFERRED WITHOUT THE WRITTEN CONSENT OF PROMINENT FLUID CONTROLS, INC. PROMINENT FLUID CONTROLS, INC. 136 INDUSTRY DRIVE PITTSBURGH, PA 15275 USA TEL. 412 787 2484 FAX. 412 787 0704	
CUSTOMER					
PROMINENT FLUID CONTROLS LTD-CA					
JOB No	3019800521	PURCHASE ORDER No	XX		
TITLE	PROMIX S 300X1-2.3DC SYSTEM TERMINAL STRIP DETAILS AND BILL OF MATERIAL		DWG No		
			3019800521-302		
			REV 0		
			PAGE 1/1		
		DESIGNED	RJT	APPROVED	CM
		DRAWN	RJT	SCALE	NTS
		CHECKED	CM	DATE	11-22-19

3.2

Technical Specifications - Control Enclosures Type 4X

N

“HWT” configuration - Stainless steel hinged, latched down cover



NOTES:

HWT Construction

Material	Hot compression molded fiberglass reinforced polyester, hand layup FRP
Gasket	Poured polyurethane seamless gasket provides watertight, dust-tight environmental seal
Stainless Steel Hardware	300 Series stainless used on all hardware
Mounting Bosses	Panel mounting capability for fixed rear panel
Metal inserts	All bosses utilize threaded brass inserts accepting 10-32 screws
Soft Edge Design	Rounded edges, minimal protrusions or exposed pocket areas for assembly of dust and debris

HWT Industry Standards

UL/cUL 50	File E64358 Type 1, 3, 3R, 4X, 12
NEMA 250	Type 1, 3, 3R, 4X, 12
CSA Std C22.2	File LR069014 Type 1, 3, 3R, 4X, 12
Temperature Range	(-76°F to +274°F) (-60°C to +134°C)
Flammability Rating	UL94-5V
Self Extinguishing	Non-halogenated, non-flame propagating
Chemical Resistance	Full chemical resistance charts listed in appendix
NFPA No. 101 Flame Spread	Class A (1)

HWT Accessories

Back Panels

Aluminum	BP_AL	pg. 149, 151
Fiberglass	BP_FG	pg. 149, 151
Stainless Steel	BP_SS	pg. 149, 151
Carbon Steel	BP_CS	pg. 149, 151

Accessories

Drain & Breather Vents	pg. 144, 146
Hole Plugs	pg. 145
Assorted Hubs and Cord Grips	pg. 145, 148
All Other Accessories	pg. 144 - 159

HWT Modifications

Custom Colors	pg. 12 - 13
Silk Screening	pg. 12 - 13
EMI/RFI Shielding	pg. 12 - 13
Custom Window	pg. 12 - 13
Custom Cutouts/Holes	pg. 12 - 13

General Information

Extended Product Type:	SU201M-K10
Product ID:	2CDS271337R0427
EAN:	4016779930093
Catalog Description:	Miniature Circuit Breaker - SU200M - 1P - K - 10 A
Long Description:	SU201M-K10 Miniature Circuit Breaker K-Char., 10kA, 10A, 1P UL489

Categories

Products » Low Voltage Products and Systems » Modular DIN Rail Products » Miniature Circuit Breakers MCBs

Ordering

Minimum Order Quantity:	1 piece
Customs Tariff Number:	85362010
EAN:	4016779930093

Dimensions

Product Net Depth:	69 mm
Product Net Height:	111 mm
Product Net Weight:	0.125 kg
Product Net Width:	17.5 mm

Container Information

Package Level 1 Width:	121 mm
Package Level 1 Length:	191 mm
Package Level 1 Height:	82 mm
Package Level 1 Gross Weight:	1.3 kg
Package Level 1 EAN:	4016779934350
Package Level 2 Units:	72 piece
Package Level 2 Width:	35 mm
Package Level 2 Length:	395 mm
Package Level 2 Height:	210 mm
Package Level 2 Gross Weight:	16 kg
Package Level 2 EAN:	4016779938150
Package Level 1 Units:	10 piece

Environmental

Ambient Air Temperature:	Operation -25 ... +55 °C Storage -40 ... +70 °C
Resistance to Shock acc. to IEC 60068-2-27:	25g / 2 shocks / 13 ms
Resistance to Vibrations acc. to IEC 60068-2-6:	5g, 20 cycles at 5 ... 150 ... 5 Hz with load 0.8 In
Environmental Conditions:	28 cycles with 55 °C / 90-96 % and 25 °C / 95-100 %
RoHS Status:	Following EU Directive 2002/95/EC August 18, 2005 and amendment

Technical

Number of Poles:	1
Tripping Characteristic:	K
Rated Current (I _n):	10 A
Rated Operational Voltage:	acc. to IEC 60947-2 230 V AC
Power Loss:	2,1 W at Rated Operating Conditions per Pole 2,1 W
Rated Insulation Voltage (U _i):	acc. to IEC/EN 60664-1 440 V
Rated Frequency (f):	50 Hz 60 Hz DC Hz
Rated Ultimate Short-Circuit Breaking Capacity (I _{cu}):	15 kA 15 kA (DC) kA
Rated Service Short-Circuit Breaking Capacity (I _{cs}):	11.2 kA
Overvoltage Category:	III

Pollution Degree:	3
Rated Impulse Withstand Voltage (U_{imp}):	4 kV (6.2 kV @ sea level) (5.0 kV @ 2000 m)
Dielectric Test Voltage:	50 / 60 Hz, 1 min: 2 kV
Housing Material:	Insulation Group I, RAL 7035
Contact Position Indication:	Red ON / Green OFF
Degree of Protection:	IP20
Remarks:	IP40 in enclosure with cover
Electrical Endurance:	20000 AC cycle
Mechanical Endurance:	20000 cycle
Terminal Type:	Screw Terminals
Screw Terminal Type:	Failsafe Bi-directional Cylinder-lift Terminal
Connecting Capacity:	Busbar 10 / 10 mm ² Flexible with Ferrule 0.75 ... 25 mm ² Flexible 0.75 ... 25 mm ² Rigid 0.75 ... 35 mm ² Stranded 0.75 ... 35 mm ²
Tightening Torque:	2.8 N·m
Recommended Screw Driver:	Pozidriv 2
Mounting on DIN Rail:	TH35-7.5 (35 x 7.5 mm Mounting Rail) acc. to IEC 60715 TH35-15 (35 x 15 mm Mounting Rail) acc. to IEC 60715
Mounting Position:	Any
Standards:	CSA 22.2 No. 5 IEC/EN 60947-2 UL 489

Technical UL/CSA

Connecting Capacity UL/CSA:	Busbar 18-8 AWG Conductor 18-4 AWG
Maximum Operating Voltage UL/CSA:	277 V AC

Certificates and Declarations (Document Number)

Instructions and Manuals:	2CDC002177D0202
Data Sheet, Technical Information:	2CDC002177D0202
Declaration of Conformity - CE:	2CDK400595D2702
RoHS Information:	2CDK400596D0201

Classifications

ETIM 5:	EC000042 - Miniature circuit breaker (MCB)
ETIM 6:	EC000042 - Miniature circuit breaker (MCB)
eClass:	7.0 27141901
UNSPSC:	39121614



General Information

Extended Product Type:	SU201M-K2
Product ID:	2CDS271337R0277
EAN:	4016779930024
Catalog Description:	Miniature Circuit Breaker - SU200M - 1P - K
Long Description:	SU201M-K2 Miniature Circuit Breaker K-Char., 10kA, 2A, 1P UL489

Ordering

Minimum Order Quantity:	1 piece
Customs Tariff Number:	85362010

Popular Downloads

Data Sheet, Technical Information:	2CDC002177D0202
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Dimensions

Product Net Width:	17.5 mm
Product Net Depth:	69 mm
Product Net Height:	111 mm
Product Net Weight:	0.125 kg

Technical

Standards:	CSA 22.2 No. 5 IEC/EN 60947-2 UL 489
Number of Poles:	1
Tripping Characteristic:	K
Rated Current (I_n):	2 A
Rated Operational Voltage:	acc. to IEC 60947-2 230 V AC
Power Loss:	1,8 W at Rated Operating Conditions per Pole 1,8 W
Rated Insulation Voltage (U_i):	acc. to IEC/EN 60664-1 440 V
Rated Frequency (f):	50 Hz 60 Hz DC Hz
Rated Ultimate Short-Circuit Breaking Capacity (I_{cu}):	(230 V AC) 15 kA
Rated Service Short-Circuit Breaking Capacity (I_{cs}):	(230 V AC) 11.2 kA
Overvoltage Category:	III
Pollution Degree:	3
Rated Impulse Withstand Voltage (U_{imp}):	4 kV (6.2 kV @ sea level) (5.0 kV @ 2000 m)
Dielectric Test Voltage:	50 / 60 Hz, 1 min: 2 kV
Housing Material:	Insulation Group I, RAL 7035
Contact Position Indication:	Red ON / Green OFF
Degree of Protection:	IP20
Remarks:	IP40 in enclosure with cover
Electrical Endurance:	20000 AC cycle

Mechanical Endurance (N_{endu}):	20000 cycle
Terminal Type:	Screw Terminals
Screw Terminal Type:	Failsafe Bi-directional Cylinder-lift Terminal
Connecting Capacity:	Busbar 10 / 10 mm ² Flexible with Ferrule 0.75 ... 25 mm ² Flexible 0.75 ... 25 mm ² Rigid 0.75 ... 35 mm ² Stranded 0.75 ... 35 mm ²
Tightening Torque:	2.8 N·m
Recommended Screw Driver:	Pozidriv 2
Mounting on DIN Rail:	TH35-7.5 (35 x 7.5 mm Mounting Rail) acc. to IEC 60715 TH35-15 (35 x 15 mm Mounting Rail) acc. to IEC 60715
Mounting Position:	Any

Environmental

Ambient Air Temperature:	Operation -25 ... +55 °C Storage -40 ... +70 °C
Resistance to Shock acc. to IEC 60068-2-27:	25g / 2 shocks / 13 ms
Resistance to Vibrations acc. to IEC 60068-2-6:	5g, 20 cycles at 5 ... 150 ... 5 Hz with load 0.8 In
Environmental Conditions:	28 cycles with 55 °C / 90-96 % and 25 °C / 95-100 %
RoHS Status:	Following EU Directive 2002/95/EC August 18, 2005 and amendment

Technical UL/CSA

Maximum Operating Voltage UL/CSA:	277 V AC 48 V DC
Connecting Capacity UL/CSA:	Busbar 18-8 AWG Conductor 18-4 AWG
Interrupting Rating acc. to UL1077:	(277 V AC) 10 kA

Certificates and Declarations (Document Number)

Declaration of Conformity - CE:	2CDK400595D2702
Instructions and Manuals:	2CDC002177D0202
RoHS Information:	2CDK400596D0203

Container Information

Package Level 1 Units:	10 piece
Package Level 1 Width:	121 mm
Package Level 1 Length:	191 mm
Package Level 1 Height:	82 mm
Package Level 1 Gross Weight:	1.3 kg
Package Level 1 EAN:	4016779934282
Package Level 2 Units:	72 piece
Package Level 2 Width:	35 mm
Package Level 2 Length:	395 mm
Package Level 2 Height:	210 mm
Package Level 2 Gross Weight:	16 kg
Package Level 2 EAN:	4016779938082

Classifications

ETIM 5:	EC000042 - Miniature circuit breaker (MCB)
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ETIM 6: EC000042 - Miniature circuit breaker (MCB)

eClass: 7.0 27141901

UNSPSC: 39121614





Price* : 6.80 USD



Main

Range of product	Zelio Relay
Series name	Miniature
Product or component type	Plug-in relay
Device short name	RXM
Contacts type and composition	4 C/O
[Uc] control circuit voltage	24 V DC
[Ithe] conventional enclosed thermal current	6 A at -40...131 °F (-40...55 °C)
Status LED	With
Control type	Lockable test button
Utilisation coefficient	20 %

Complementary

Shape of pin	Flat
[Ui] rated insulation voltage	250 V conforming to IEC 300 V conforming to UL 300 V conforming to CSA
[Uimp] rated impulse withstand voltage	2.5 kV for 1.2/50 µs
Contacts material	AgNi
[Ie] rated operational current	3 A at 28 V DC (NC) conforming to IEC 3 A at 250 V AC (NC) conforming to IEC 6 A at 28 V DC (NO) conforming to IEC 6 A at 250 V AC (NO) conforming to IEC 6 A at 277 V AC conforming to UL 8 A at 30 V DC conforming to UL
Maximum switching voltage	250 V conforming to IEC
Load current	6 A at 250 V AC 6 A at 28 V DC

Maximum switching capacity	1500 VA/168 W
Minimum switching capacity	170 mW at 10 mA, 17 V
Operating rate	<= 18000 cycles/hour no-load <= 1200 cycles/hour under load
Mechanical durability	10000000 cycles
Electrical durability	100000 cycles resistive load
Average coil consumption	0.9 W
Drop-out voltage threshold	>= 0.1 Uc
Operating time	20 ms
Reset time	20 ms
Average resistance	650 Ohm at 20 °C +/- 10 %
Rated operational voltage limits	19.2...26.4 V DC
Safety reliability data	B10d = 100000
Protection category	RT I
Operating position	Any position
Product weight	0.08 lb(US) (0.037 kg)
Device presentation	Complete product
Compatibility code	RXM

Environment

Dielectric strength	1300 V AC between contacts with micro disconnection insulation 2000 V AC between coil and contact with reinforced insulation 2000 V AC between poles with basic insulation
Product certifications	CE CSA GOST RoHS UL REACH Lloyd's
Standards	EN/IEC 61810-1 UL 508 CSA C22.2 No 14
Ambient air temperature for storage	-40...185 °F (-40...85 °C)
Ambient air temperature for operation	-40...131 °F (-40...55 °C)
Vibration resistance	3 gn (f = 10...150 Hz), amplitude +/- 1 mm (on 5 cycles in operation) 5 gn (f = 10...150 Hz), amplitude +/- 1 mm (on 5 cycles not operating)
IP degree of protection	IP40 conforming to EN/IEC 60529
Shock resistance	10 gn in operation 30 gn not operating
Pollution degree	2

Ordering and shipping details

Category	21127 - ZELIO ICE CUBE RELAYS
Discount Schedule	CP2
GTIN	00785901758112
Nbr. of units in pkg.	10
Package weight(Lbs)	8.0000000000000002E-2
Returnability	Y
Country of origin	ID

Offer Sustainability

Sustainable offer status	Green Premium product
RoHS (date code: YYWW)	Compliant - since 0801 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity
REACH	Reference not containing SVHC above the threshold

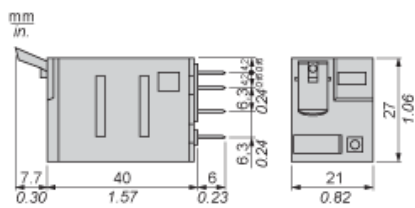
Product environmental profile	Available
Product end of life instructions	Need no specific recycling operations

Contractual warranty

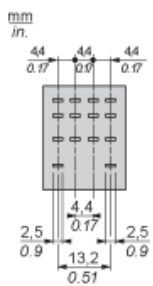
Warranty period	18 months
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Dimensions Drawings

Dimensions

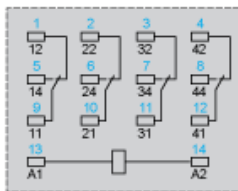
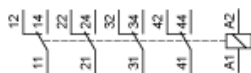


Pin Side View



Connections and Schema

Wiring Diagram

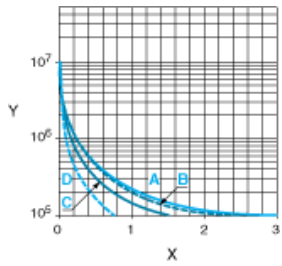


Symbols shown in blue correspond to Nema marking.

Electrical Durability of Contacts

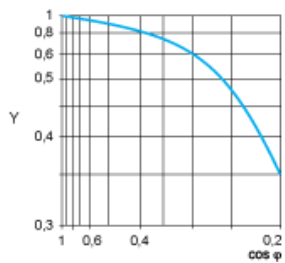
Durability (inductive load) = durability (resistive load) x reduction coefficient.

Resistive AC load



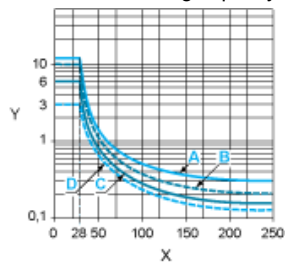
- X Switching capacity (kVA)
- Y Durability (Number of operating cycles)
- A RXM2AB...
- B RXM3AB...
- C RXM4AB...
- D RXM4GB...

Reduction coefficient for inductive AC load (depending on power factor $\cos \phi$)



- Y Reduction coefficient (A)

Maximum switching capacity on resistive DC load



- X Voltage DC
- Y Current DC
- A RXM2AB...
- B RXM3AB...
- C RXM4AB...
- D RXM4GB...

Note : These are typical curves, actual durability depends on load, environment, duty cycle, etc.

Product data sheet

Characteristics

RXZE2S114M

socket RXZ - separate contact - 10 A - < 250 V -
connector - for relay RXM4..

Product availability : Stock - Normally stocked in distribution facility



Main

Range of product	Zelio Relay
Product or component type	Socket
Contact terminal arrangement	Separate
Product compatibility	Plug-in relay RXM (4 C/O) Plug-in relay REXL (4 C/O)
Shape of pin	Flat
Device short name	RXZ
Sale per indivisible quantity	10

Complementary

[Ith] conventional free air thermal current	5 A , with bus jumper 10 A
System Voltage	< 250 V
Tightening torque	<= 8.85 lbf.in (1 N.m) (M3 screw(s))
Fixing mode	By screw panel Clip-on 35 mm symmetrical DIN rail
Marking	CE
Width	1.06 in (27 mm)
Product weight	0.15 lb(US) (0.07 kg)
Group of product	RXM_4_C/O_CON_SEP_FLAT
Compatibility code	RXZ

Environment

Connections - terminals	Connector, flexible cable with cable end 1 x 0.25...1 x 2.5 mm ² / AWG 22...AWG 14 Connector, flexible cable with cable end 2 x 0.25...2 x 1 mm ² / AWG 22...AWG 17 Connector, solid cable without cable end 1 x 0.5...1 x 2.5 mm ² / AWG 20...AWG 14 Connector, solid cable without cable end 2 x 0.5...2 x 1.5 mm ² / AWG 20...AWG 16
Standards	IEC 61984
Product certifications	CSA UL Lloyd's
Ambient air temperature for storage	-40...185 °F (-40...85 °C)

Ambient air temperature for operation	-40...131 °F (-40...55 °C)
IP degree of protection	IP20 conforming to EN/IEC 60529
Dielectric strength	2500 V

Ordering and shipping details

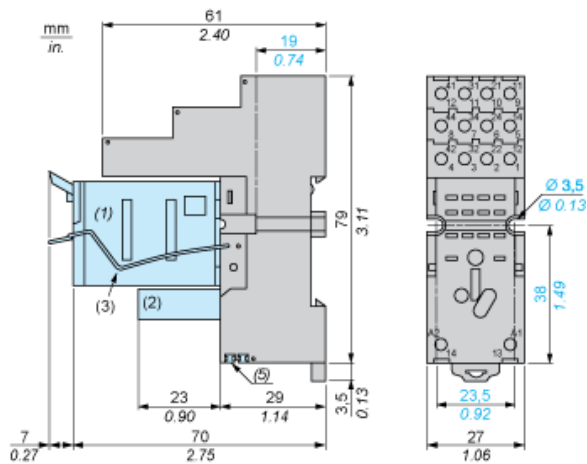
Category	21128 - ZELIO ICE CUBE RELAY ACCESSORIES
Discount Schedule	CP2
GTIN	00785901635758
Nbr. of units in pkg.	10
Package weight(Lbs)	0.14000000000000001
Returnability	Y
Country of origin	CN

Contractual warranty

Warranty period	18 months
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Dimensions Drawings

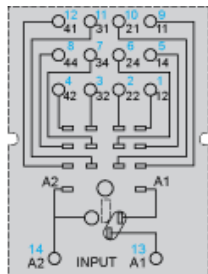
Dimensions



- (1) Relays
- (2) Protection module
- (3) Maintaining clamp
- (4) 2 elongated holes $\varnothing 3.5 \text{ mm} \times 6.5 \text{ mm} / \varnothing 0.13 \text{ in.} \times 0.25 \text{ in.}$
- (5) 2 bus jumpers

Connections and Schema

Wiring Diagram

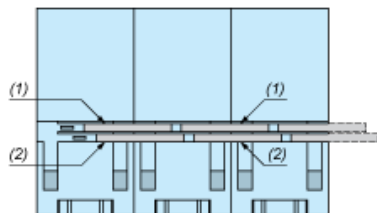


Symbols shown in blue correspond to Nema marking.

Connections and Schema

Bus Jumpers Mounting on Sockets with Separate Contacts

Example of RXZS2 bus jumper mounting on sockets (view from below)



- (1) 2 bus jumpers (polarity A2)
- (2) 2 bus jumpers (polarity A1)

GV2P14

TeSys GV2 Manual Starter and Protector, thermal magnetic circuit protector, rotary handle, 6...10 A, screw clamp terminals

Product availability : Stock - Normally stocked in distribution facility



Price* : 233.00 USD



Main

Range	TeSys
Product name	TeSys GV2
Device short name	GV2P
Product or component type	Circuit breaker
Device application	Motor
Trip unit technology	Thermal-magnetic

Complementary

Poles description	3P
Network type	AC
Utilisation category	AC-3 conforming to IEC 60947-4-1 Category A conforming to IEC 60947-2
Network frequency	50/60 Hz conforming to IEC 60947-4-1
Fixing mode	Clipped on 35 mm symmetrical DIN rail Screwed on panel (with 2 x M4 screws)
Operating position	Any position
Motor power kW	3 kW at 400/415 V AC 50/60 Hz 5 kW at 500 V AC 50/60 Hz 5.5 kW at 690 V AC 50/60 Hz
Breaking capacity	50 kA Icu at 500 V AC 50/60 Hz conforming to IEC 60947-2 100 kA Icu at 230/240 V AC 50/60 Hz conforming to IEC 60947-2 100 kA Icu at 400/415 V AC 50/60 Hz conforming to IEC 60947-2 100 kA Icu at 440 V AC 50/60 Hz conforming to IEC 60947-2 6 kA Icu at 690 V AC 50/60 Hz conforming to IEC 60947-2
[Ics] rated service short-circuit breaking capacity	100 % at 230/240 V AC 50/60 Hz conforming to IEC 60947-2 100 % at 440 V AC 50/60 Hz conforming to IEC 60947-2 100 % at 500 V AC 50/60 Hz conforming to IEC 60947-2 100 % at 690 V AC 50/60 Hz conforming to IEC 60947-2

100 % at 400/415 V AC 50/60 Hz conforming to IEC 60947-2

Control type	Rotary knob
[In] rated current	10 A
Thermal protection adjustment range	6...10 A
Magnetic tripping current	138 A
System Voltage	690 V AC 50/60 Hz conforming to IEC 60947-2
[Ui] rated insulation voltage	690 V AC 50/60 Hz conforming to IEC 60947-2
[Ith] conventional free air thermal current	10 A conforming to IEC 60947-4-1
[Uimp] rated impulse withstand voltage	6 kV conforming to IEC 60947-2
Power dissipation per pole	2.5 W
Mechanical durability	100000 cycles
Electrical durability	100000 cycles AC-3 at 440 V
Operating rate	25 cyc/h
Rated duty	Continuous conforming to IEC 60947-4-1
Connections - terminals	Screw clamp terminals 2 cable(s) 1...6 mm ² solid Screw clamp terminals 2 cable(s) 1.5...6 mm ² flexible without cable end Screw clamp terminals 2 cable(s) 1...4 mm ² flexible with cable end
Tightening torque	1.7 N.m on screw clamp terminals
Suitability for isolation	Yes conforming to IEC 60947-1
Phase failure sensitivity	Yes conforming to IEC 60947-4-1
Height	3.5 in (89 mm)
Width	1.77 in (45 mm)
Depth	3.82 in (97 mm)

Environment

Standards	EN 60204 IEC 60947-1 IEC 60947-2 IEC 60947-4-1 NF C 63-120 NF C 63-650 NF C 79-130 UL 508 VDE 0113 VDE 0660 CSA C22.2
Product certifications	ATEX BV CCC CSA DNV EZU GL LROS (Lloyds register of shipping) RINA TSE UL UL 508 type E EAC
Protective treatment	TH
IP degree of protection	IP20 conforming to IEC 60529
IK degree of protection	IK04
Ambient air temperature for operation	-4...140 °F (-20...60 °C)
Ambient air temperature for storage	-40...176 °F (-40...80 °C)
Fire resistance	1760 °F (960 °C) conforming to IEC 60695-2-1
Operating altitude	6561.68 ft (2000 m)

Ordering and shipping details

Category	22367 - MANUAL STR PROTECTOR - GV2
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Discount Schedule	I11
GTIN	00785901832577
Nbr. of units in pkg.	1
Package weight(Lbs)	0.7600000000000001
Returnability	Y
Country of origin	TH

Offer Sustainability

Sustainable offer status	Green Premium product
RoHS (date code: YYWW)	Compliant - since 0631 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity
REACH	Reference contains SVHC above the threshold - Go to CaP for more details Go to CaP for more details
Product environmental profile	Available
Product end of life instructions	Need no specific recycling operations
California proposition 65	WARNING: This product can expose you to chemicals including:
- - - - - Substance 1	Antimony oxide & Antimony trioxide, which is known to the State of California to cause cancer.
- - - - - More information	For more information go to www.p65warnings.ca.gov

Contractual warranty

Warranty period	18 months
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Product data sheet

Characteristics

LC1D12G7

TeSys D contactor - 3P(3 NO) - AC-3 - <= 440 V
12 A - 120 V AC coil

Product availability : Stock - Normally stocked in distribution facility



Offer Sustainability

Sustainable offer status	Green Premium product
RoHS (date code: YYWW)	Compliant - since 0627 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity
REACH	Reference not containing SVHC above the threshold Reference not containing SVHC above the threshold
Product environmental profile	Available
Product end of life instructions	Available

Ordering and shipping details

Category	22345 - CTR,D-LINE,OPEN,NONREV-NEW
Discount Schedule	I12
GTIN	00785901207047
Nbr. of units in pkg.	1
Package weight(Lbs)	0.800000000000000004
Returnability	Y
Country of origin	ID

Contractual warranty

Warranty period	18 months
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Main

Range	TeSys
Product name	TeSys D
Product or component type	Contactor
Device short name	LC1D

Contactor application	Motor control Resistive load
Utilisation category	AC-1 AC-3
Poles description	3P
Pole contact composition	3 NO
System Voltage	<= 690 V AC 25...400 Hz power circuit <= 300 V DC power circuit
[Ie] rated operational current	25 A (<= 140 °F (60 °C)) at <= 440 V AC AC-1 power circuit 12 A (<= 140 °F (60 °C)) at <= 440 V AC AC-3 power circuit
Motor power kW	3 kW at 220...230 V AC 50/60 Hz 5.5 kW at 380...400 V AC 50/60 Hz 5.5 kW at 415...440 V AC 50/60 Hz 7.5 kW at 500 V AC 50/60 Hz 7.5 kW at 660...690 V AC 50/60 Hz
Motor power hp	3 hp at 230/240 V AC 50/60 Hz 3 phases motors 7.5 hp at 460/480 V AC 50/60 Hz 3 phases motors 1 hp at 115 V AC 50/60 Hz 1 phase motors 3 hp at 200/208 V AC 50/60 Hz 3 phases motors 2 hp at 230/240 V AC 50/60 Hz 1 phase motors 10 hp at 575/600 V AC 50/60 Hz 3 phases motors
Control circuit type	AC 50/60 Hz
Control circuit voltage	120 V AC 50/60 Hz
Auxiliary contact composition	1 NO + 1 NC
[Uimp] rated impulse withstand voltage	6 kV conforming to IEC 60947
Overvoltage category	III
[Ith] conventional free air thermal current	25 A at <= 140 °F (60 °C) power circuit 10 A at <= 140 °F (60 °C) signalling circuit
Irms rated making capacity	140 A AC signalling circuit conforming to IEC 60947-5-1 250 A DC signalling circuit conforming to IEC 60947-5-1 250 A at 440 V power circuit conforming to IEC 60947
Rated breaking capacity	250 A at 440 V power circuit conforming to IEC 60947
[Icw] rated short-time withstand current	105 A <= 104 °F (40 °C) 10 s power circuit 210 A <= 104 °F (40 °C) 1 s power circuit 30 A <= 104 °F (40 °C) 10 min power circuit 61 A <= 104 °F (40 °C) 1 min power circuit 140 A 100 ms signalling circuit 100 A 1 s signalling circuit 120 A 500 ms signalling circuit
Associated fuse rating	40 A gG at <= 690 V coordination type 1 power circuit 10 A gG signalling circuit conforming to IEC 60947-5-1 25 A gG at <= 690 V coordination type 2 power circuit
Average impedance	2.5 mOhm at 50 Hz - Ith 25 A power circuit
[Ui] rated insulation voltage	690 V signalling circuit conforming to IEC 60947-1 690 V power circuit conforming to IEC 60947-4-1 600 V signalling circuit certifications CSA 600 V signalling circuit certifications UL 600 V power circuit certifications CSA 600 V power circuit certifications UL
Electrical durability	0.8 Mcycles 25 A AC-1 at Ue <= 440 V 2 Mcycles 12 A AC-3 at Ue <= 440 V
Power dissipation per pole	0.36 W AC-3 1.56 W AC-1
Protective cover	With
Mounting support	Plate Rail
Standards	CSA C22.2 No 14 EN 60947-5-1 IEC 60947-4-1 UL 508 EN 60947-4-1 IEC 60947-5-1
Product certifications	BV CCC CSA

DNV
GL
GOST
RINA
UL
LROS

Connections - terminals	Power circuit: screw clamp terminals 1 cable(s) 0...0.01 in ² (1...4 mm ²) - cable stiffness: flexible - without cable end Power circuit: screw clamp terminals 2 cable(s) 0...0 in ² (1...2.5 mm ²) - cable stiffness: flexible - with cable end Control circuit: screw clamp terminals 1 cable(s) 0...0.01 in ² (1...4 mm ²) - cable stiffness: flexible - without cable end Control circuit: screw clamp terminals 2 cable(s) 0...0.01 in ² (1...4 mm ²) - cable stiffness: flexible - without cable end Control circuit: screw clamp terminals 1 cable(s) 0...0.01 in ² (1...4 mm ²) - cable stiffness: flexible - with cable end Power circuit: screw clamp terminals 2 cable(s) 0...0.01 in ² (1...4 mm ²) - cable stiffness: solid - without cable end Control circuit: screw clamp terminals 2 cable(s) 0...0 in ² (1...2.5 mm ²) - cable stiffness: flexible - with cable end Control circuit: screw clamp terminals 1 cable(s) 0...0.01 in ² (1...4 mm ²) - cable stiffness: solid - without cable end Power circuit: screw clamp terminals 2 cable(s) 0...0.01 in ² (1...4 mm ²) - cable stiffness: flexible - without cable end Power circuit: screw clamp terminals 1 cable(s) 0...0.01 in ² (1...4 mm ²) - cable stiffness: flexible - with cable end Power circuit: screw clamp terminals 1 cable(s) 0...0.01 in ² (1...4 mm ²) - cable stiffness: solid - without cable end Control circuit: screw clamp terminals 2 cable(s) 0...0.01 in ² (1...4 mm ²) - cable stiffness: solid - without cable end
Tightening torque	Power circuit: 15.04 lbf.in (1.7 N.m) - on screw clamp terminals - with screwdriver Philips No 2 Control circuit: 15.04 lbf.in (1.7 N.m) - on screw clamp terminals - with screwdriver Philips No 2 Power circuit: 15.04 lbf.in (1.7 N.m) - on screw clamp terminals - with screwdriver flat Ø 6 mm Control circuit: 15.04 lbf.in (1.7 N.m) - on screw clamp terminals - with screwdriver flat Ø 6 mm
Operating time	4...19 ms opening 12...22 ms closing
Safety reliability level	B10d = 1369863 cycles contactor with nominal load conforming to EN/ISO 13849-1 B10d = 20000000 cycles contactor with mechanical load conforming to EN/ISO 13849-1
Mechanical durability	15 Mcycles
Operating rate	3600 cyc/h at ≤ 140 °F (60 °C)

Complementary

Coil technology	Without built-in suppressor module
Control circuit voltage limits	0.3...0.6 U _c drop-out at 140 °F (60 °C), AC 50/60 Hz 0.8...1.1 U _c operational at 140 °F (60 °C), AC 50 Hz 0.85...1.1 U _c operational at 140 °F (60 °C), AC 60 Hz
Inrush power in VA	70 VA at 68 °F (20 °C) (cos φ 0.75) 50 Hz 70 VA at 68 °F (20 °C) (cos φ 0.75) 60 Hz
Hold-in power consumption in VA	7.5 VA at 68 °F (20 °C) (cos φ 0.3) 60 Hz 7 VA at 68 °F (20 °C) (cos φ 0.3) 50 Hz
Heat dissipation	2...3 W at 50/60 Hz
Auxiliary contacts type	Type mirror contact (1 NC) conforming to IEC 60947-4-1 Type mechanically linked (1 NO + 1 NC) conforming to IEC 60947-5-1
Signalling circuit frequency	25...400 Hz
Minimum switching current	5 mA signalling circuit
Minimum switching voltage	17 V signalling circuit
Non-overlap time	1.5 ms on energisation (between NC and NO contact) 1.5 ms on de-energisation (between NC and NO contact)
Insulation resistance	> 10 MOhm signalling circuit

Environment

IP degree of protection	IP2x front face conforming to IEC 60529
Protective treatment	TH conforming to IEC 60068-2-30
Pollution degree	3

Ambient air temperature for operation	-4...140 °F (-20...60 °C)
Ambient air temperature for storage	-76...176 °F (-60...80 °C)
Permissible ambient air temperature around the device	-40...158 °F (-40...70 °C) at Uc
Operating altitude	9842.52 ft (3000 m) without derating in temperature
Fire resistance	1562 °F (850 °C) conforming to IEC 60695-2-1
Flame retardance	V1 conforming to UL 94
Mechanical robustness	Shocks contactor open 10 Gn for 11 ms Shocks contactor closed 15 Gn for 11 ms Vibrations contactor open 2 Gn, 5...300 Hz Vibrations contactor closed 4 Gn, 5...300 Hz
Height	3.03 in (77 mm)
Width	1.77 in (45 mm)
Depth	3.39 in (86 mm)
Product weight	0.72 lb(US) (0.325 kg)

GV2, GV3, and GV7 Manual Motor Starters, Controllers, and Protectors Selection

Table 56: GV2 Accessories



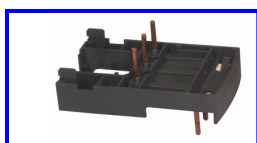
GV2GH7



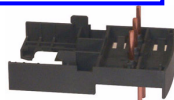
LAD31



LAD311



GV2AF3 / GV2AF4



Busbars						
Description	No. of GV Starters	No. of Side-Mounted Auxiliary Blocks on Each GV Starter	Busbar Pitch (mm)	Sold in Lots of	Catalog Number	Weight, lb (kg)
Sets of 3-pole, 63 A busbars	2	none	45	1	GV2G245	0.08 (0.036)
		1 GV2AN, AM, AD	54	1	GV2G254	0.084 (0.038)
		1 or 2 GV2AN, AM, AD; or 1 GV2AS, AU	72	1	GV2G272	0.09 (0.042)
	3	None	45	1	GV2G345	0.12 (0.058)
		1 GV2AN, AM, AD	54	1	GV2G354	0.13 (0.060)
	4	None	45	1	GV2G445	0.17 (0.077)
		1 GV2AN, AM, AD	54	1	GV2G454	0.19 (0.085)
		1 or 2 GV2AN, AM, AD; or 1 GV2AS, AU	72	1	GV2G472	0.21 (0.094)
	5	1 GV2AN, AM, AD	54	1	GV2G554	0.22 (0.100)

Additional GV2 Wiring Accessories				
Description	Application	Sold in Lots of	Catalog Number	Weight, lb (kg)
Protective end cover	For unused busbar outlets	5	GV1G10	0.01 (0.005)
Terminal blocks for supply to one or more GV2G+ busbar sets	Connects from the top	1	GV1G09	0.09 (0.040)
	Connects from the bottom. The connector can be fitted with a GV1L3 current limiter.	1	GV2G05	0.25 (0.115)
Cover for terminal block	For mounting in modular panels	10	LA9E07	0.01 (0.005)
Flexible 3-pole connector	For connecting a GV2 / LS1D30 to an LC1D09–D25 AC contactor	10	GV1G02	0.03 (0.013)
Clip-in marker holders (provided with each motor starter)	For GV2P, 0.31 x 0.87 in. (8 x 22 mm)	100	LA9D92	0.02 (0.001)
Incoming line insulator	For GV2P when used in UL 508 Type E applications	10	GV2GH7	0.09 (0.040)

GV2 Mounting Accessories				
Description	Application	Sold in Lots of	Catalog Number	Weight, lb (kg)
Motor starter adapter plate	With a 3-pole connector for mounting a GV2 controller to an LC1D09–D25 contactor	10	GK2AF01	0.26 (0.120)
Adapter plate	For screw mounting a GV2ME controller or an LS1D30 fuse holder	10	GV2AF02	0.05 (0.021)
	For mounting a GV2ME or GV2P controller to an LC1D09–LC1D32 contactor with front faces aligned	1	LAD31	0.09 (0.040)
Mounting bracket	For mounting a GV2ME or GV2P controller to an LC1D09–D38 contactor on a common base using 2 DIN rails	1	LAD311	0.09 (0.040)
7.5 mm height compensation plate	For mounting a GV2ME or GV2P controller on a common busbar	10	GV1F03	0.007 (0.003)
Combination block	Between a GV2ME controller or an LS1D30 fuse holder and a LC1K or LP1K contactor	10	GV2AF01	0.04 (0.021)
	Between a GV2 controller or an LS1D30 fuse holder and a LC1D09–D38 contactor	10	GV2AF3	0.03 (0.016)
	Between a GV2 controller or an LS1D30 fuse holder mounted on an LAD31 mounting plate and an LC1D09–D38 contactor	10	GV2AF4	0.03 (0.016)

GV2 Padlocking Options			
Description		Catalog Number	Weight, lb (kg)
Padlockable External Operator	Black handle, blue legend plate IP54	GV2AP01	0.44 (0.200)
	For GV2P controllers 6.0–11.4 in. (150–290 mm) Red handle, yellow legend plate IP54	GV2AP02	
Padlocking Device	Accommodates up to 6 padlocks (not supplied) For all GV2 controllers Maximum shank Ø 6 mm	GV2V03	0.20 (0.092)

GV2, GV3, and GV7 Manual Motor Starters, Controllers, and Protectors

Mounting Dimensions and Wiring Diagrams

Mounting of GV2P			
On 35 mm (1.4 in.) Rail	On Panel	On Pre-Slotted Mounting Plate, AM1PA	On Adapter Plate, GK2AF01
<p>C = 3.09 in. (78.5 mm) on AM1DP200 (35 x 7.5 mm) C = 3.39 in. (86 mm) on AM1DE200, ED200 (35 x 15 mm)</p>			

GV2AF01 GV2M + K contactor combination	GV2M and GV1L3 current limiter	GV1F03 7.5 mm height compensation plate
		<div style="border: 2px solid red; padding: 5px; display: inline-block; color: red; font-weight: bold;">2 REQUIRED</div> <p style="text-align: center;">Dimensions: $\frac{\text{in.}}{\text{mm}}$</p>
<p>X1 = 0.40 in. (10 mm) for Ue = 230 V or 1.2 in. (30 mm) for 230 V < Ue ≤ 690 V</p>		

GV2AF4 and LAD31					
Combination GV2ME and D range contactor			Combination GV2P and D range contactor		
<p style="text-align: center;">Dimensions: $\frac{\text{in.}}{\text{mm}}$</p>	<p style="text-align: center;">Dimensions: $\frac{\text{in.}}{\text{mm}}$</p>				
GV2ME +	LC2D09 to D18	LC2D25 and D32	GV2P +	LC2D09 to D18	LC2D25 and D32
b	7.4 (188.6)	7.8 (199)	b	6.61 (169.1)	7.9 (199.5)
c1	3.6 (92.7)	3.9 (99)	c1	4.6 (116.8)	4.6 (116.8)
c	3.9 (98.2)	4.11 (104.5)	c	4.8 (122.3)	4.8 (122.3)
d1	3.9 (98.3)	3.9 (98.3)			
d	4.1 (103.8)	1.4 (103.8)			

Product availability : Non-Stock - Not normally stocked in distribution facility



Price* : 316.00 USD



Main

Range of product	Harmony 9001SK
Product or component type	Push-button
Device short name	9001SK

Complementary

Bezel material	Plastic
Mounting diameter	1.18 in (30 mm)
Contact operation	Standard
Mechanical durability	5000000 cycles
Device presentation	Complete product

Environment

Standards	EN/IEC 60947-1 EN/IEC 60947-5-1 EN/IEC 60947-5-4 JIS C 4520 JIS C 852 UL 508 CSA C22.2 No 14
IP degree of protection	IP66
NEMA degree of protection	NEMA 1/2/3/3R/4/4X/6/12/13

Ordering and shipping details

Category	21429 - 9001 SK,SKY
Discount Schedule	CS1
GTIN	00785901043133
Nbr. of units in pkg.	1
Package weight(Lbs)	0.5

Returnability	N
Country of origin	MX

Offer Sustainability

RoHS (date code: YYWW)	Compliant - since 0921 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity
REACH	Reference not containing SVHC above the threshold Reference not containing SVHC above the threshold

Contractual warranty

Warranty period	18 months
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Switching Power Supplies

PS5R-V Series



STANDARDS COMPLIANCE

Applicable Standards	Mark	File No. or Organization
UL508 UL1310 ¹ ANSI/ISA 12.12.01 CSA C22.2 No.107.1 CSA C22.2 No.213 CSA C22.2 No.223 ¹		UL/c-UL Listed File No. E467154, E177168
EN60950-1 EN50178 EN61204-3 EN50581	 	TÜV SÜD ² EU Low Voltage Directive, EMC Directive RoHS Directive
SEMI F47	—	EPRI

Note 1: PS5R-VA/VB/VC/VD/VE only

Note 2: EN60950-1, EN50178 only

PART NUMBERS

Output Capacity	Part Number	Input Voltage	Output Voltage	Output Current
7.5W	PS5R-VA05	100 to 240V AC (Voltage range: 85 to 264V AC / 100 to 370V DC)	5V	1.5A
	PS5R-VA12		12V	0.6A
	PS5R-VA24		24V	0.3A
10W	PS5R-VB05		5V	2.0A
	PS5R-VB12		12V	1.3A
15W	PS5R-VB24		24V	0.65A
	PS5R-VC12		12V	2.5A
30W	PS5R-VC24		24V	1.3A
60W	PS5R-VD24		24V	2.5A
90W	PS5R-VE24		24V	3.75A
120W	PS5R-VF24	24V	5.0A	
240W	PS5R-VG24	24V	10.0A	

Part Number Structure

PS5R - V □ □

Output Capacity ——— Output Voltage

A: 7.5W
B: 10W/15W
C: 30W
D: 60W
E: 90W
F: 120W
G: 240W

05: 5V³
12: 12V⁴
24: 24V

Note 3: PS5R-VA/VB only

Note 4: PS5R-VA/VB/VC only

Use only for interpreting part numbers.

Do not use for developing part numbers.

PRODUCT DESCRIPTION

DIN-rail mount switching power supplies with global approvals for both industrial and hazardous locations

KEY FEATURES

- Compact size preserves panel space
- Slim size (width):
22.5mm (10W/15W/30W)
36mm (60W/90W)
46mm (120W)
60mm (240W)
- Universal Voltage Input:
85-264V AC/100-370V DC
- Wide operating temperature range
- Spring-up terminals accept ring & fork terminals
- Approved for use in Class I Division 2 hazardous locations
- Can be installed in 6 directions
- 10W ~ 90W meet NEC Class 2 output ratings
- Overcurrent protection with auto-reset
- Meets SEMI F47 Sag Immunity (208V AC input)
- RoHS compliant
- Five-year factory warranty



SPECIFICATIONS

Model	5V DC output	PS5R-VA05	PS5R-VB05	-	-	-	-	-	
	12V DC output	PS5R-VA12	PS5R-VB12	PS5R-VC12	-	-	-	-	
	24V DC output	PS5R-VA24	PS5R-VB24	PS5R-VC24	PS5R-VD24	PS5R-VE24	PS5R-VF24	PS5R-VG24	
Output Capacity		7.5W	15W (5V Model is 10W)	30W	60W	90W	120W	240W	
Input	Rated Input Voltage (Single-phase two-wire) ¹	100 to 240V AC (Voltage range: 85 to 264V AC/100 to 370V DC) (Load ≤ 80% at 100-105V DC)							
	Frequency	50/60 Hz							
	Input Current (Typ.)	100V AC	5V: 0.20A 12V, 24V: 0.18A	5V: 0.25A 12V, 24V: 0.35A	0.7A	1.3A	1.1A	1.4A	2.7A
		230V AC	5V: 0.12A 12V, 24V: 0.10A	5V: 0.14A 12V, 24V: 0.19A	0.3A	0.8A	0.6A	0.7A	1.2A
	Inrush Current (Typ.) (Ta=25°C, cold start)	100V AC	15A			18A			14A
		230V AC	36A			45A			30A
	Leakage Current	120V AC	0.5mA max.						
		230V AC	1.0mA max.						
	Efficiency (Typ.) (at rated output) ²	100V AC	5V: 74%, 12V: 79%, 24V: 80%	5V: 77%, 12V: 82%, 24V: 84%	12V: 83%, 24V: 85%	86%		88%	89%
		230V AC	5V: 73%, 12V: 77%, 24V: 76%	5V: 73%, 12V: 80%, 24V: 81%	12V: 85%, 24V: 87%	86%		89%	90%
Power Factor (Typ.)	100V AC	—							
	230V AC	—			—			0.99	0.96
Rated Voltage/Current		5V/1.5A, 12V/0.6A, 24V/0.3A	5V/2.0A ³ , 12V/1.3A, 24V/0.65A	12V/2.5A, 24V/1.3A	24V/2.5A	24V/3.75A	24V/5A	24V/10A	
Adjustable Voltage Range		±10%				±5%		±10%	
Output Holding Time (Typ.) (at rated output)	100V AC	45ms	5V: 53ms, 12V: 34ms, 24V: 36ms	12V: 13ms, 24V: 15ms	13ms	20ms	30ms		
	230V AC	285ms	5V: 330ms 12V: 215ms 24V: 230ms	12V: 110ms 24V: 110ms	105ms	30ms	33ms	40ms	
Start Time (at rated input and output)		500ms max.	500ms max.	600ms max.	800ms max.		700ms max.	800ms max.	
Rise Time (at rated input and output)		5V, 12V: 200ms max 24V: 250ms max	5V, 12V: 200ms max 24V: 250ms max.	200ms max.					
Output Regulation	Input Fluctuation	0.4% max.							
	Load Fluctuation	5V: 2.5% max. 12V, 24V: 1.0% max.			1.0% max.				
	Temperature Change	0.04%/°C max. (-10 to +65°C)	0.05%/°C max. (-10 to +65°C)	12V: 0.05%/°C max. (-10 to +50°C) 24V: 0.05%/°C max. (-10 to +55°C)	0.05%/°C max. (-10 to +55°C)	0.05%/°C max. (-10 to +50°C)	0.05%/°C max. (-25 to +55°C)	0.05%/°C max. (-25 to +50°C)	
	Ripple (including noise)	5V: 8% p-p max. (-25 to -10°C) 12V: 6% p-p max. (-25 to -10°C) 24V: 4% p-p max. (-25 to -10°C)	5V: 8% p-p max. (-25 to -10°C) 12V: 6% p-p max. (-25 to -10°C) 24V: 4% p-p max. (-25 to -10°C)	12V: 6% p-p max. (-25 to -10°C) 24V: 4% p-p max. (-25 to -10°C)	4% p-p max. (-25 to -10°C)				
		5V: 5% p-p max. (-10 to +0°C) 12V: 2.5% p-p max. (-10 to +0°C) 24V: 1.5% p-p max. (-10 to +0°C)	5V: 5% p-p max. (-10 to +0°C) 12V: 2.5% p-p max. (-10 to +0°C) 24V: 1.5% p-p max. (-10 to +0°C)	12V: 2.5% p-p max. (-10 to +0°C) 24V: 1.5% p-p max. (-10 to +0°C)	1.5% p-p max. (-10 to +0°C)				
		5V: 2.5% p-p max. (0 to +65°C) 12V: 1.5% p-p max. (0 to +65°C) 24V: 1% p-p max. (0 to +65°C)	5V: 2.5% p-p max. (0 to +65°C) 12V: 1.5% p-p max. (0 to +65°C) 24V: 1% p-p max. (0 to +65°C)	12V: 1.5% p-p max. (0 to +50°C) 24V: 1% p-p max. (0 to +55°C)	1% p-p max. (0 to +55°C)	1% p-p max. (0 to +50°C)	1% p-p max. (0 to +55°C)	1% p-p max. (0 to +50°C)	
Overcurrent Protection	105% min. (auto reset)				101% min. (auto reset)		105% min. (auto reset)		
Operation Indicator	LED (green)								
Dielectric Strength	Between input and output terminals	3,000V AC, 1 minute							
	Between input and ground terminals	2,000V AC, 1 minute							
	Between output and ground terminals	500V AC, 1 minute							
Insulation Resistance	Between input and output terminals: 100MΩ min. (500V DC megger)				Between input and ground terminals: 100MΩ min. (500V DC megger)				
Operating Temperature ⁴ (No freezing)	-25 to +75°C			-25 to +70°C		-25 to +65°C			
Operating Humidity (no condensation)	20 to 90% RH								
Storage Temperature (No freezing)	-25 to +75°C								
Storage Humidity (no condensation)	20 to 90% RH								
Vibration Resistance	10 to 55Hz, amplitude 0.375mm, 2 hours each in 3 axes (when used with BNL6 end clips)				10 to 55Hz, amplitude 0.33mm, 2 hours each in 3 axes (when used with BNL6 end clips)	10 to 55Hz, amplitude 0.375mm, 2 hours each in 3 axes (when used with BNL8 end clips)	10 to 55Hz, amplitude 0.21mm, 2 hours each in 3 axes (when used with BNL6 end clips)	10 to 55Hz, amplitude 0.375mm, 2 hours each in 3 axes (when used with part no. BNL6 mounting clips)	
Shock Resistance	300 m/s ² (30G), 3 times each in 6 directions								
Expected Life ⁵	8 years minimum (at the rated input, 50% load, operating temperature +40°C, standard mounting direction)								
EMC	EMI	EN61204-3 (Class B)							
	EMS	EN61204-3 (industrial)							
Safety Standards	UL508 (Listing), UL1310 Class 2, ANSI/ISA-12.12.01 CSA C22.2 No. 107.1, 213, 223 EN60950-1, EN50178						UL508 (Listing) ANSI/ISA-12.12.01 CSA C22.2 No. 107.1, 213 EN60950-1, EN50178		
Other Standard	SEMI F47 (at 208V AC input only)								
Degree of Protection	IP20 (EN60529)								
Dimensions (mm)	75H × 45W × 70D	90H × 22.5W × 95D			95H × 36W × 108D		115H × 46W × 121D	125H × 60W × 125D	
Weight (approx.)	130g	140g	150g	260g	310g	470g	960g		
Terminal Screw	M3.5								

*At normal temperature and humidity unless otherwise specified.

Note 1: DC input voltage is not subject to safety standards. When using on DC input, connect a fuse to the input terminal for DC input protection.

Note 2: Under stable state.

Note 3: PS5R-VB05 (5V DC/2.0A) is 10W (Up to 3.0A at Ta = 0 to 40°C. Not subject to safety standards above 2.0A.)

Note 4: See the output derating curves.

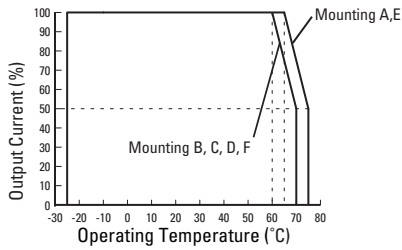
Note 5: Calculation of the expected life is based on the actual life of the aluminum electrolytic capacitor. The expected life depends on operating conditions.

CHARACTERISTICS

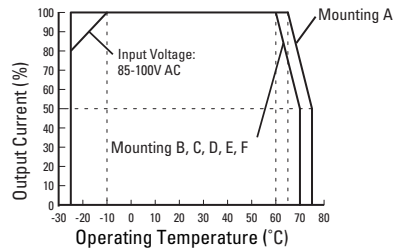
Operating Temperature vs. Output Current (Derating Curves)

Conditions: Natural air cooling (Operating temperature is the temperature around the switching power supply.)

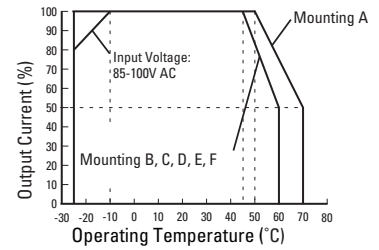
PS5R-VA05, -VA12, -VA24



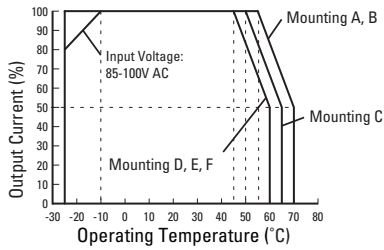
PS5R-VB05, -VB12, -VB24



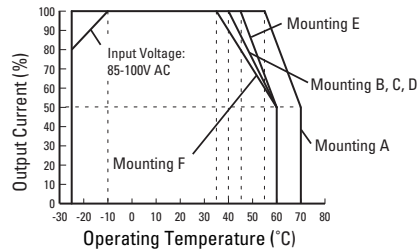
PS5R-VC12



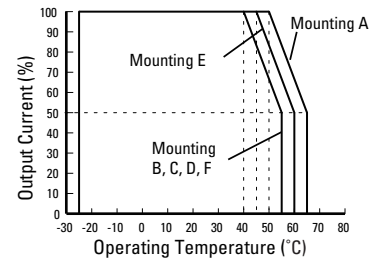
PS5R-VC24



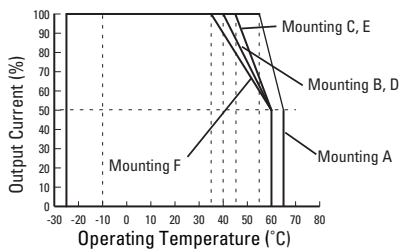
PS5R-VD24



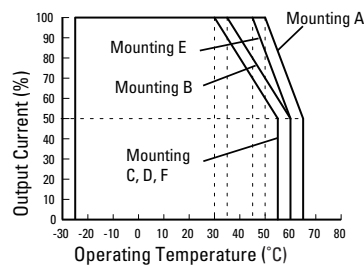
PS5R-VE24



PS5R-VF24

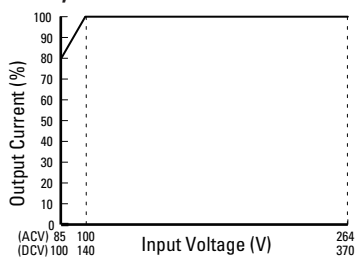


PS5R-VG24

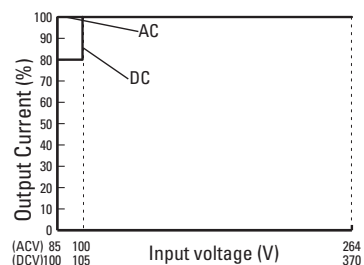


Input Voltage vs. Output Current (Derating Curves) Ta=25°C

PS5R-VB05, -VB12, -VB24, -VC12, -VC24, -VD24, -VE24, -VF24

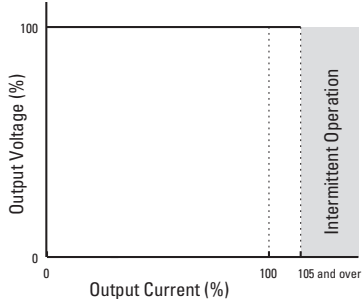


PS5R-VA05, -VA12, -VA24, -VG24

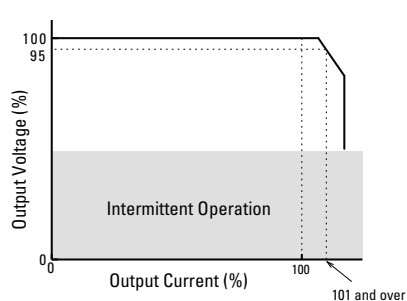


Overcurrent Protection Characteristics

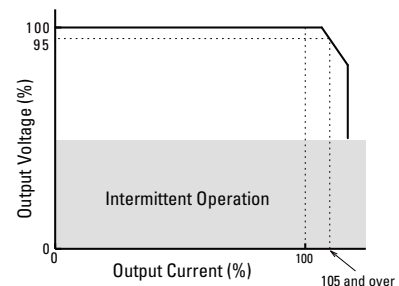
PS5R-VA/VB/VC/VD/VF



PS5R-VE24



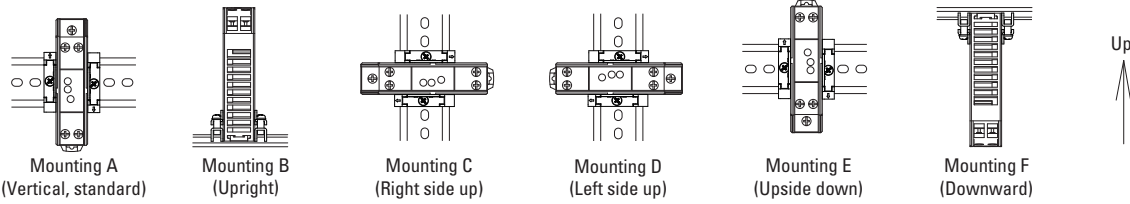
PS5R-VG24



Operating Temperature Approved by Safety Standards

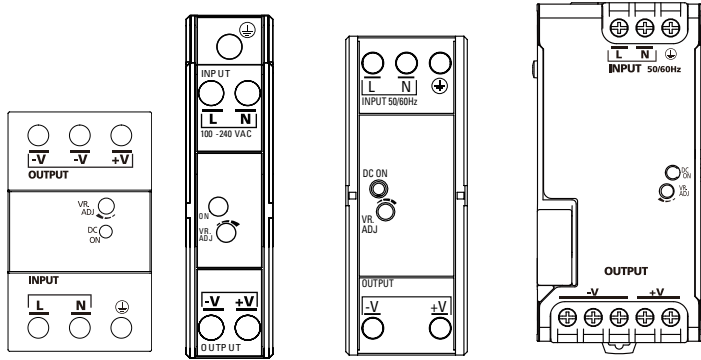
Part Number	UL508, CSA C22.2 No.107.1, ANSI/ISA12.12.01, EN60950-1, EN50178					
	Mounting A	Mounting B	Mounting C	Mounting D	Mounting E	Mounting F
PS5R-VA05, -VA12, -VA24	65	60	60	60	65	60
PS5R-VB05, -VB12, -VB24	65	60	60	60	60	60
PS5R-VC12	50	45	45	45	45	45
PS5R-VC24	55	55	50	45	45	45
PS5R-VD24	55	40	40	40	45	35
PS5R-VE24	50	40	40	40	45	40
PS5R-VF24	55	40	45	40	45	35
PS5R-VG24	50	35	30	30	45	30

MOUNTING STYLE



Front Panel

PS5R-VA PS5R-VB/VC PS5R-VD/VE/VF PS5R-VG



Marking	Name	Description
L, N	AC Input Terminal	Voltage range: 85 to 264V AC/100 to 370V DC
⊕	Ground Terminal	Be sure to connect this terminal to a proper ground.
+V, -V	DC Output Terminals	+V: Positive output terminal -V: Negative output terminal
VR.ADJ	Output Voltage Adjustment	Allows adjustment within $\pm 10\%$. (VE = $\pm 5\%$) Turning clockwise increases the output voltage. Turning counterclockwise decreases the output voltage.
DC ON	Operation Indicator (green)	Illuminates when the output voltage is on.

ACCESSORIES

Panel Mounting Bracket²

Applicable Switching Power Supply	Part Number	Remarks
PS5R-VB	PS9Z-5R1B	—
PS5R-VC	PS9Z-5R2B	For side mounting
PS5R-VD	PS9Z-5R1C	—
PS5R-VE	PS9Z-5R1E	—
PS5R-VF	PS9Z-5R1E	—
PS5R-VG	PS9Z-6R1F	—
	PS9Z-6R2F	For side mounting

Note 2: Used when installing on a panel directly, PS5R-VA model does not require panel mounting bracket.

DIN Rail (35mm-wide)

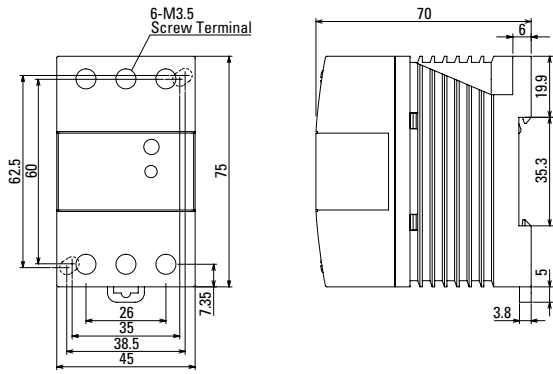
Length	Part Number	Material
1000mm	BNDN1000	Aluminum

End Clip

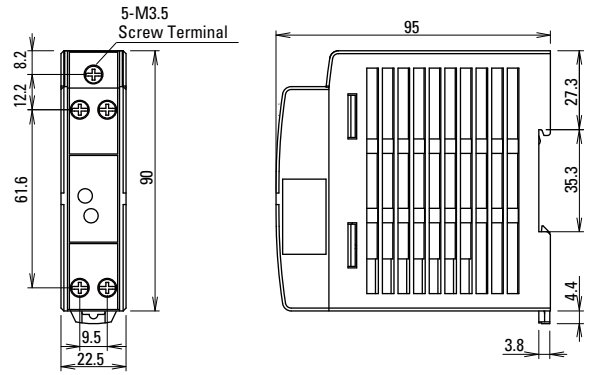
Part Number
BNL6
BNL8

DIMENSIONS (MM)

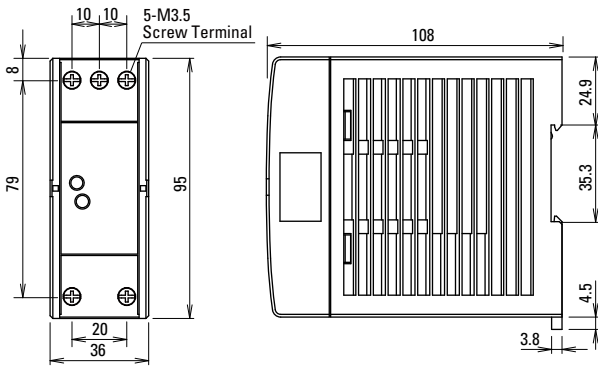
PS5R-VA



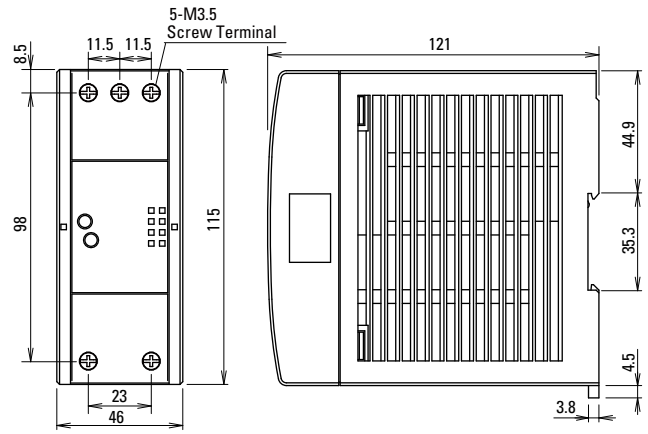
PS5R-VB/VC



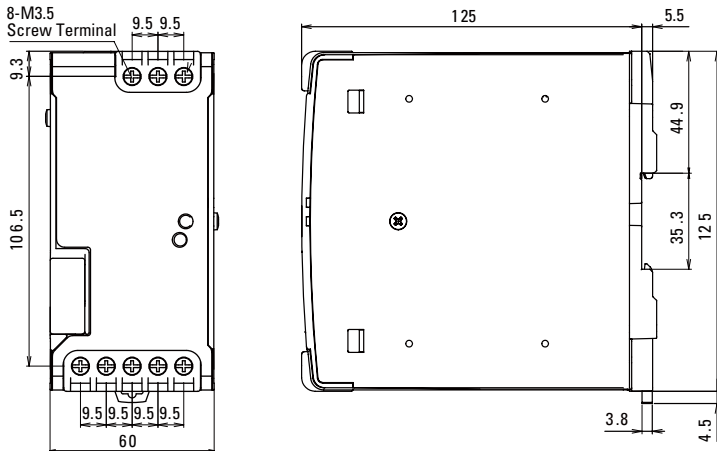
PS5R-VD/VE



PS5R-VF



PS5R-VG



MTBF*

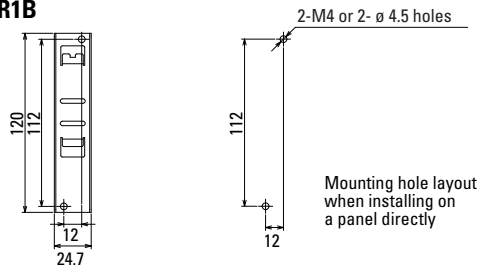
PS5R-VA:	1,150,000H minimum
PS5R-VB:	900,000H minimum
PS5R-VC:	650,000H minimum
PS5R-VD:	450,000H minimum
PS5R-VE:	380,000H minimum
PS5R-VF:	350,000H minimum
PS5R-VG:	290,000H minimum

MIL-HDBK-217FN2
(GB, 30°C)

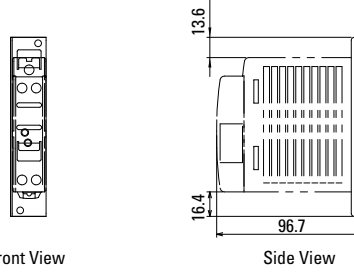
*MTBF stands for Mean Time Between Failure, which is calculated according to statistical device failures, and indicates reliability of a device. It is the statistical representation of the likelihood of the unit to fail and does not necessarily represent the expected life of a product.

Panel Mounting Bracket

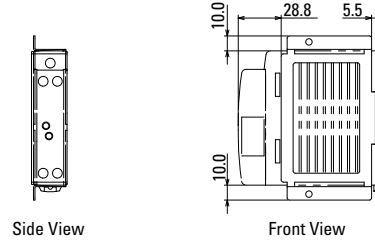
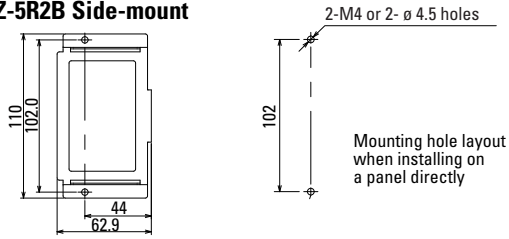
PS9Z-5R1B



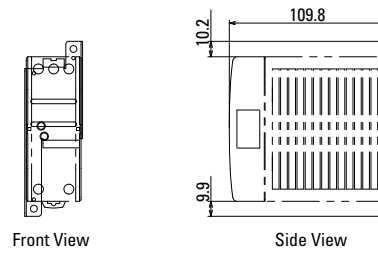
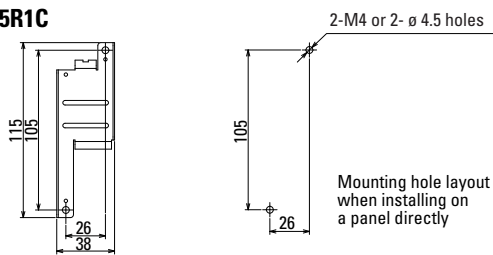
When installed on switching power supply



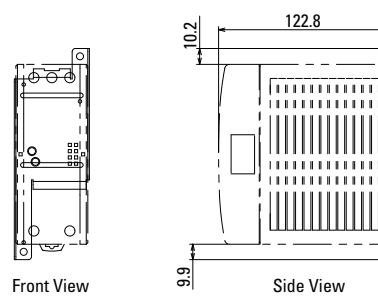
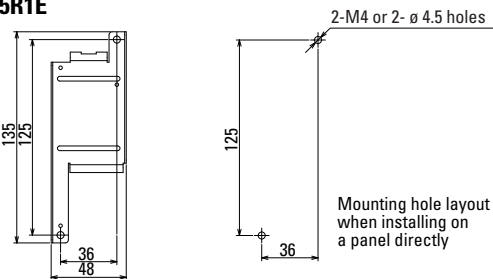
PS9Z-5R2B Side-mount



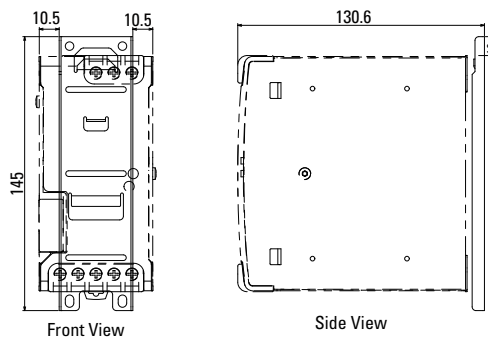
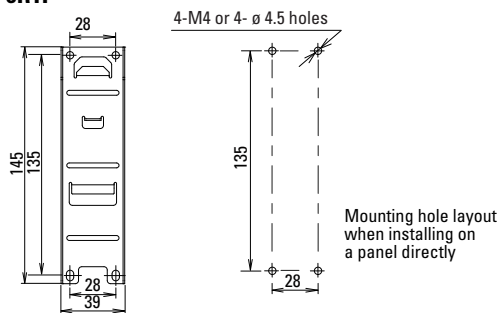
PS9Z-5R1C



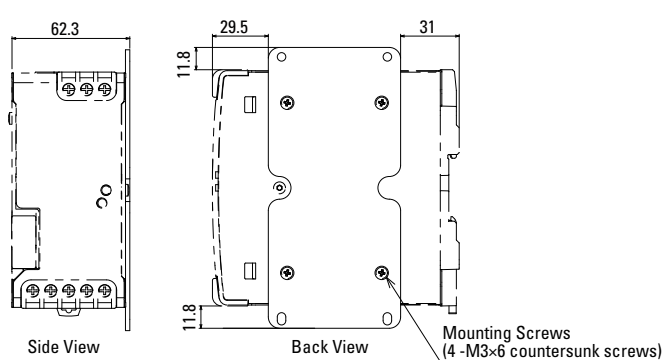
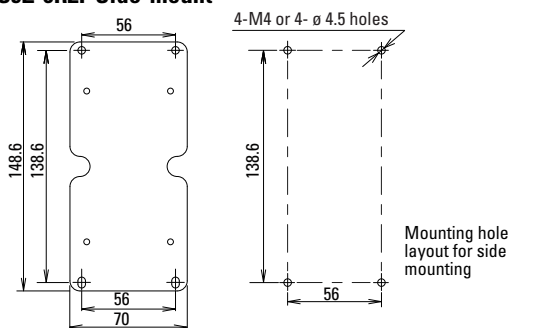
PS9Z-5R1E



PS9Z-6R1F



PS9Z-6R2F Side-mount



SAFETY PRECAUTIONS

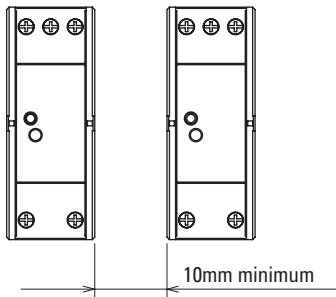
The PS5R-V should be placed in a proper enclosure. It is designed to be used with general electrical equipment and industrial electric devices

- Do not use switching power supplies with electric equipment whose malfunction or inadvertent operation may damage the human body or life directly.
- Make sure that the input voltage and output current do not exceed the ratings. If the input voltage and output current exceed the ratings, electric shock, fire, or malfunction may occur.
- Do not touch the terminals of the switching power supply while input voltage is applied, otherwise electric shock may occur.
- Provide the final product with protection against malfunction or damage that may be caused by malfunction of the switching power supply.
- Operating temperatures should not exceed the ratings. Be sure to note the derating characteristics. If the operating temperature exceeds the ratings, electric shock, fire, or malfunction may occur.
- Blown fuses indicate that the internal circuits are damaged. Contact IDEC for repair. Do not just replace the fuse and reoperate, otherwise electric shock, fire, or malfunction may occur.
- Do not use the switching power supplies to charge rechargeable batteries.
- Do not overload or short-circuit the switching power supply for a long period of time, otherwise the internal elements may be damaged.
- Do not disassemble, repair, or modify the power supplies, otherwise the high voltage internal part may cause electric shock, fire, or malfunction.
- The fuse inside the PS5R-V switching power supply is for AC input. Use an external fuse for DC input.

OPERATING INSTRUCTIONS

Notes for installation

- Do not close the top or bottom openings of the PS5R-V to allow for heat radiation by convection.
- When mounting multiple PS5R-V switching power supplies side by side, maintain a minimum of 10 mm clearance. Observe the derating curves in consideration of the ambient temperature.

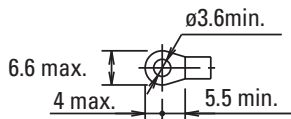


- When the derating voltage may exceed the recommended value, provide forced air-cooling.
- Make sure to wire the ground terminal correctly.
- For wiring, use wires of heat resistance of 60°C or higher (PS5R-VB: 80°C or higher). Use copper wire of the following sizes, according to the rated current.

Terminal	Wire Size (allowable current)	Wire Type
Input	AWG 18 to 14	Copper Solid/Stranded
Output	AWG18 to 14 (AWG18: 7A, AWG16: 10A, AWG14: 15A)	

Cross-Sectional area AWG18: 0.82mm², AWG16: 1.31mm², AWG14: 2.0mm²

Applicable crimp terminal (reference)



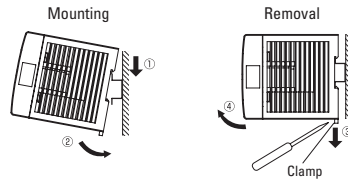
- Recommended tightening torque of the input and output terminals is 1.0 to 1.3Nm (0.8N·m for UL).

Mounting on DIN Rails

- Use a 35mm-wide DIN rail.
- Place the PS5R-V on the DIN rail as shown with input terminal side up (①), and press the PS5R-V towards the DIN rail (②). Make sure that the PS5R-V is installed firmly.
- Use BNL6 end clips to ensure power supplies do not slide off the end of the DIN rail. Use of BNL8 end clips is recommended when excessive vibration or shock is anticipated.

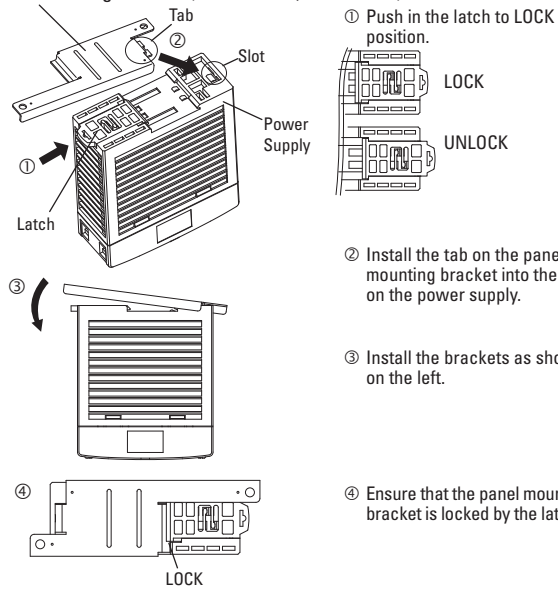
Removal

- Insert a flat screwdriver into the slot in the clamp, and pull out until it clicks (①). The lock mechanism is released and the PS5R-V can be removed (②). When mounting the PS5R-V again, push in the latch first.

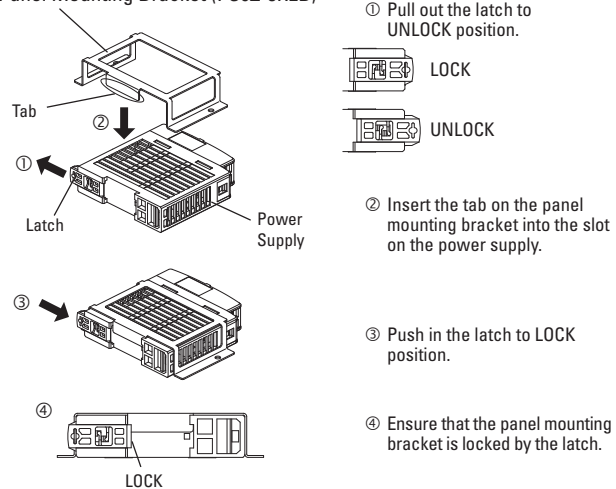


Installing a Panel Mounting Bracket

Panel Mounting Bracket (PS9Z-5R1□, PS9Z-6R1F)

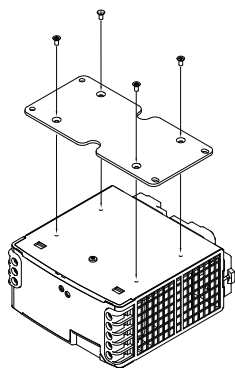


Panel Mounting Bracket (PS9Z-5R2B)



Installing PS9Z-6R2F Side-mount Panel Mounting Bracket

Install the bracket on the switching power supply using four M3 × 6 countersunk screws supplied with the bracket. Recommended tightening torque is 0.5 to 0.6N.m (should be in the center positions)



Adjustment of Output Voltage

The output voltage can be adjusted within ±10% (VE: ±5%) of the rated output voltage by using the VR.ADJ control on the front. Turning the VR.ADJ clockwise increases the output voltage. Turning the VR.ADJ counterclockwise decreases the output voltage.

Overcurrent Protection

The output voltage drops automatically when an overcurrent flows due to an overload or short circuit. Normal voltage is automatically restored when the load returns to normal conditions.

Insulation/Dielectric Test

When performing an insulation/dielectric test, short-circuit the input (between L and N) and output (between +V and -V). Do not apply or interrupt the voltage quickly, otherwise surge voltages may be generated and the PS5R-V may be damaged.

Notes for Operation

- Output interruption may indicate blown fuses. Contact IDEC.
- The PS5R-V switching power supply contains an internal fuse for AC input. When using DC input, install an external fuse. To avoid blown fuses, select a fuse in consideration of the rated current of the internal fuse.

Rated Current of Internal Fuses

Part Number	Internal Fuse Rated Current
PS5R-VB/VC	2A
PS5R-VD/VE/VF	4A
PS5R-VG	6.3A

- Avoid overload and short-circuit for a long period of time, otherwise the internal elements may be damaged.

WARRANTY

IDEC warrants the PS5R-V switching power supply for a period of five years from the date of shipment.

Scope

IDEC agrees to repair or replace the PS5R-V switching power supply if the product has been operated under the following conditions. The maximum value of output capacity is within the range shown in "Operating Temperature vs. Output Current" on page 3.

1. Average operating temperature (ambient temperature of switching power supply) is 40°C maximum.
2. The load is 80% maximum.
3. Input voltage is the rated input voltage.
4. Standard mounting style

- DC input operation is not subject to safety standards.

Rust and Scratches on Metal parts

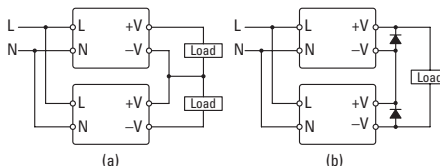
Bonded metal parts are used for the PS5R-V. Rust on the edge and scratches on the surfaces may be developed depending on the storage condition, but the performance of the PS5R-V is not affected.

Noise

Small acoustic noise inside the PS5R-V may be heard depending on the input voltage and load, but the performance of the PS5R-V is not affected.

Series Operation

Series operation is allowed. Connect Schottky barrier diodes D as shown below. Select a Schottky diode in consideration of the rated current. The diode's reverse voltage must be higher than the PS5R-V's output voltage.

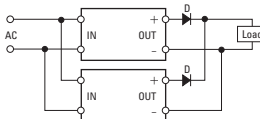


Parallel Operation

Parallel operation is not possible to increase the output capacity, because the internal elements and load may be damaged.

Backup Operation

Backup operation is a connection method of two switching power supplies in parallel for emergency. Normally one switching power supply has a sufficient output. If one switching power supply fails, another one operates to continue the output. Make sure that the sum of power consumption by load and diode is not greater than the rated wattage (rated voltage × rated current) of one switching power supply.



Select a diode in consideration of:

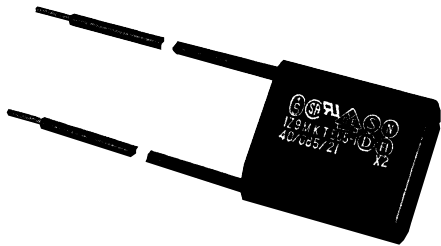
Diode's current must be more than double the PS5R-V's output current. Take heat dissipation into consideration.

IDEC shall not be liable for other damages including consequential, contingent or incidental damages. Warranty does not apply if the PS5R-V switching power supply was subject to:

1. Inappropriate handling, or operation beyond specifications.
2. Modification or repair by other than IDEC.
3. Failure caused by other than the PS5R-V switching power supply.
4. Failure caused by natural disasters.



R-C SNUBBER NOISE AND ARC SUPPRESSOR



SPECIFICATIONS

1. **R-C Value:** 0.1 μ f, 47 Ω 1/2 Watt (\pm 30%)
2. **Max. Line Voltage:** 250 V rms or 250 VDC
3. **Frequency:** DC to 62 Hz
4. **Peak Pulse Voltage:** 1200 V max.

UL recognized component
 (Okaya Electric America, Inc. PN# XEB0471, UL-1414, File # E47474)

ORDERING INFORMATION

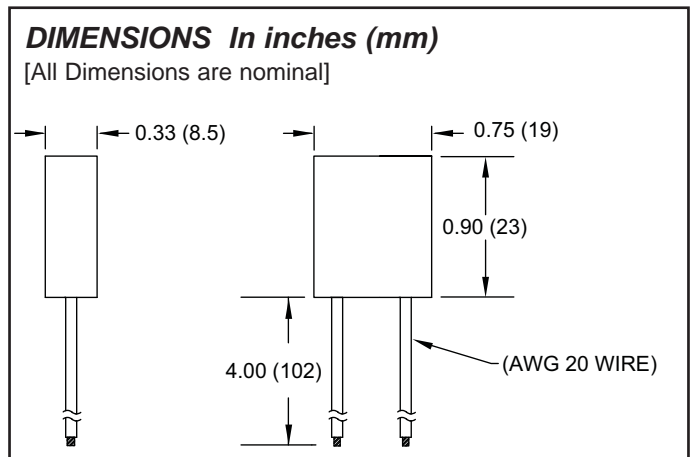
MODEL NO.	DESCRIPTION	PART NUMBER
SNUB	R-C Snubber Inductive Load Suppressor	SNUB0000



Do not dispose of unit in trash - Recycle

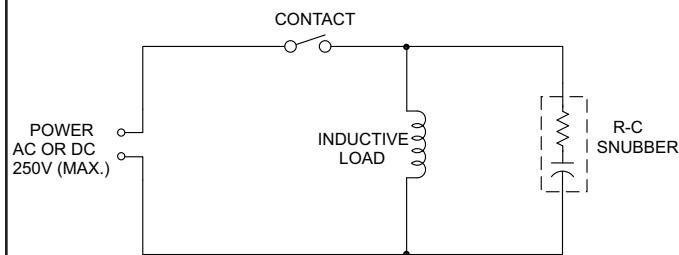
GENERAL DESCRIPTION

The R-C Snubber is intended to suppress the "inductive kick" from motors, solenoids or relay coils. High energy noise spikes are generated whenever current is interrupted through an inductive load. These noise spikes may interfere with associated equipment causing erratic operation and may also accelerate relay contact wear. Applied across an inductive load, the R-C snubber suppresses the noise spikes and extends contact life.



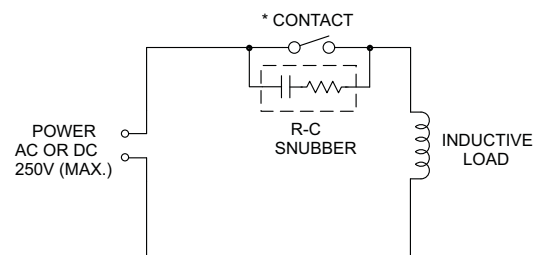
APPLICATION

The R-C snubber inductive load suppressor should be applied as shown below. Placing the suppressor across the contact in many cases can work as well, but for maximum effect, it is best to place the suppressor directly



Preferred Application

across the load. All inductive loads in a system should be suppressed in this manner to avoid mutual interference. The suppressors are effective in both AC and DC circuits.



Alternate Application

* Use a snubber across all contacts in the load circuit.

Ordering Information

V700-T20BJ PLC with Flat panel, Color touch display 7"

You can find additional information, such as wiring diagrams, in the product's installation guide located in the Technical Library at www.unitronics.com.

Power Supply

Input voltage	12 or 24VDC
Permissible range	10.2-28.8VDC
Max. current consumption	630mA@12V 320mA@24V

Graphic Display Screen

	See Note 1
LCD Type	TFT, LCD display
Illumination backlight	White LED
Display resolution	800x480 pixels
Viewing area	7"
Colors	65,536 (16-bit)
Touchscreen	Resistive, analog
'Touch' indication	Via buzzer
Screen brightness control	Via software (Store value to SI 9, values range: 0 to 100%)
Virtual Keypad	Displays virtual keyboard when the application requires data entry.

Notes:

- Note that the LCD screen may have a single pixel that is permanently either black or white.

Program

Memory size Application Logic – 2MB, Images – 60MB, Fonts – 1MB

Operand type	Quantity	Symbol	Value
Memory Bits	8192	MB	Bit (coil)
Memory Integers	4096	MI	16-bit
Long Integers	512	ML	32-bit
Double Word	256	DW	32-bit unsigned
Memory Floats	64	MF	32-bit
Fast Bits	1024	XB	Bits (coil) – fast, not retained
Fast Integers	512	XI	16 bit - fast, not retained
Fast Long Integers	256	XL	32 bit - fast, not retained
Fast Double Word	64	XDW	32 bit unsigned - fast, not retained
Timers	384	T	Res. 10 ms; max 99h, 59 min, 59.99s
Counters	32	C	16-bit

Data Tables 120K dynamic RAM data (recipe parameters, datalogs, etc.)
Up to 256K Flash data (read-only data, ingredient names, etc)
Expandable via micro-SD card. See Removable Memory below

HMI displays Up to 1024

Program scan time 9 µsec per 1K of typical application

Removable Memory

Micro-SD card Compatible with fast micro-SD cards; store datalogs, Alarms, Trends, Data Tables, backup Ladder, HMI, and OS. See Note 2

Notes:

2. User must format via Unitronics SD tools utility.

Communication

Port 1	1 channel, RS232/RS485 and USB device. See Note 3
Galvanic isolation	Yes
Baud rate range	300 to 115200 bps
RS232	
Voltage limits	±20VDC absolute maximum
Cable length	Up to 15m (50')
RS485	
Voltage limits	-7 to +12VDC differential maximum
Nodes	Up to 32
Cable type	Shielded twisted pair, in compliance with EIA RS485
Cable length	1200m maximum (4000')
USB	See Note 4
Port type	Mini-B
Galvanic isolation	No
Specification	USB 2.0 compliant; full speed
Cable	USB 2.0 compliant; up to 3m
Ethernet	
Port type	RJ45
Transmission speed	10/100Mbps
Network topology	Star, based on external hub/switch
Cable type	Category 5 STP (shielded twisted pair) is recommended; UTP (unshielded twisted pair) may also be used
Drop line length	Up to 100 meters, controller to hub/switch or controller to controller.
Port 2 (optional)	See Note 5
CANbus (optional)	See Note 5

Notes:

3. This model is supplied with a serial port: RS232/RS485 (Port 1). The standard is set to either RS232 or RS485 according to DIP switch settings. Refer to the product's Installation Guide.
4. Note that physically connecting a PC to the controller via USB suspends RS232/RS485 communications via Port 1. When the PC is disconnected, RS232/RS485 resumes.
5. The user may order and install one or both of the following modules:
 - A serial RS232/RS485 isolated/non-isolated interface module in port 2.
 - A CANbus module
 Modules documentation is available on the Unitronics website.

I/Os

	Additional I/Os may be added. Configurations vary according to module. Supports digital, high-speed, analog, weight and temperature measurement I/Os.
Snap-in I/O modules	Plugs into rear port to create self-contained PLC with up to 62 I/Os.
I/O Expansion	
Local	Via I/O Expansion Port. Integrate up to 8 I/O Expansion Modules comprising up to 128 additional I/Os. Adapter required (P.N. EX-A2X).
Remote	Via CANbus port. Connect up to 60 adapters to a distance of 1000 meters from controller; and up to 8 I/O expansion modules to each adapter (up to a total of 512 I/Os). Adapter required (P.N. EX-RC1).
Galvanic isolation	Yes

Miscellaneous

Clock (RTC)	Real-time clock functions (date and time)
Battery back-up	7 years typical at 25 °C, battery back-up for RTC and system data, including variable data
Battery replacement	Yes (without opening the controller). Coin-type 3V, lithium battery, CR2450

Dimensions

Size	210 x 146.4 x 42.3mm (8.26 x 5.76 x 1.66"). See Note 6
Weight	640g (22.57 oz)

Notes:

- For exact dimensions, refer to the product's Installation Guide.

Environment

Operational temperature	0 to 50°C (32 to 122°F)
Storage temperature	-20 to 60°C (-4 to 140°F)
Relative Humidity (RH)	10% to 95% (non-condensing)
Mounting method	Panel mounted (IP65/66/NEMA4X)
Operating Altitude	2000m (6562 ft)
Shock	IEC 60068-2-27, 15G, 11ms duration
Vibration	IEC 60068-2-6, 5Hz to 8.4Hz, 3.5mm constant amplitude, 8.4Hz to 150Hz, 1G acceleration.

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EX-A2X

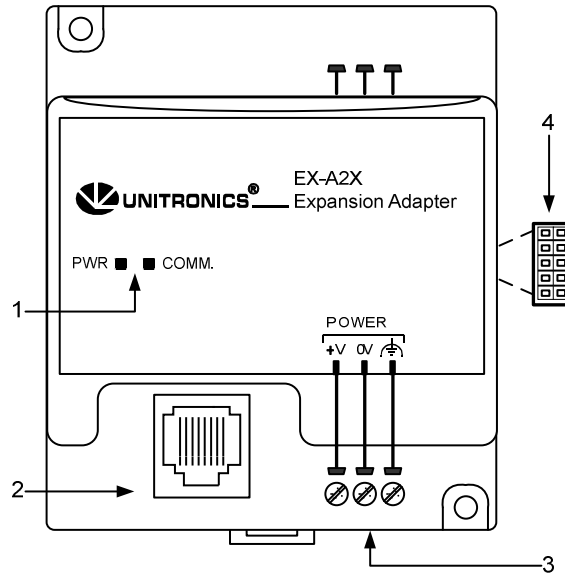
EX-A2X I/O Expansion Module Adapter, Isolated

The EX-A2X interfaces between a variety of I/O expansion modules and specific Unitronics' OPLCs.

A single adapter can be connected to up to 8 expansion modules.

The EX-A2X may either be snap-mounted on a DIN rail, or screw-mounted onto a mounting plate.

Component identification	
1	Status indicators
2	COM port, EX-A2X to OPLC
3	Power supply connection points
4	EX-A2X to expansion module connection port





- Before using this product, it is the responsibility of the user to read and understand this document and any accompanying documentation.
- All examples and diagrams shown herein are intended to aid understanding, and do not guarantee operation. Unitronics accepts no responsibility for actual use of this product based on these examples.
- Please dispose of this product in accordance with local and national standards and regulations.
- Only qualified service personnel should open this device or carry out repairs.

User safety and equipment protection guidelines

This document is intended to aid trained and competent personnel in the installation of this equipment as defined by the European directives for machinery, low voltage, and EMC. Only a technician or engineer trained in the local and national electrical standards should perform tasks associated with the device's electrical wiring.

Symbols are used to highlight information relating to the user's personal safety and equipment protection throughout this document. When these symbols appear, the associated information must be read carefully and understood fully.

Symbol	Meaning	Description
	Danger	The identified danger causes physical and property damage.
	Warning	The identified danger can cause physical and property damage.
<i>Caution</i>	Caution	Use caution.



- Failure to comply with appropriate safety guidelines can result in severe personal injury or property damage. Always exercise proper caution when working with electrical equipment.



- Check the user program before running it.
- Do not attempt to use this device with parameters that exceed permissible levels.
- Install an external circuit breaker and take appropriate safety measures against short-circuiting in external wiring.
- To avoid damaging the system, do not connect / disconnect the device when the power is on.

Environmental Considerations



- Do not install in areas with: excessive or conductive dust, corrosive or flammable gas, moisture or rain, excessive heat, regular impact shocks or excessive vibration.

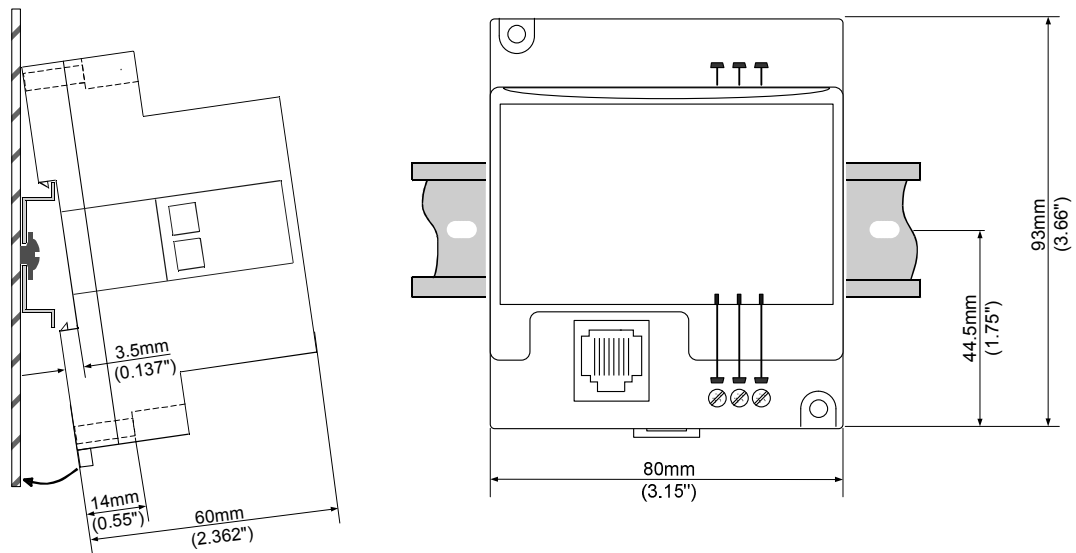


- Leave a minimum of 10mm space for ventilation between the top and bottom edges of the device and the enclosure walls.
- Do not place in water or let water leak onto the unit.
- Do not allow debris to fall inside the unit during installation.

Mounting the Module

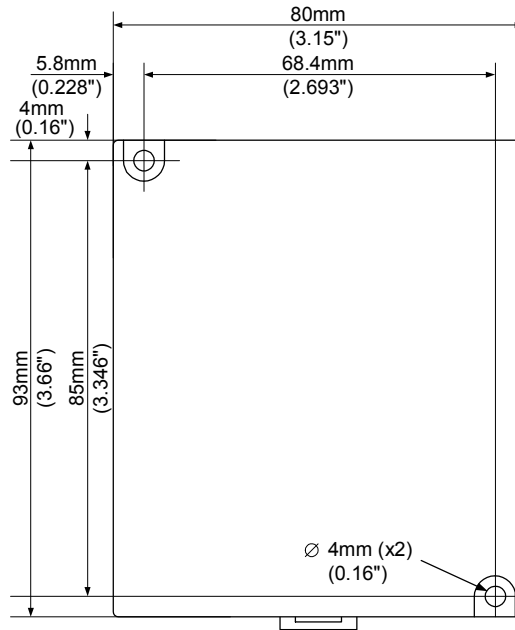
DIN-rail mounting

Snap the device onto the DIN rail as shown below; the module will be squarely situated on the DIN rail.



Screw-Mounting

The following figure is not drawn to scale. Mounting screw type: either M3 or NC6-32.

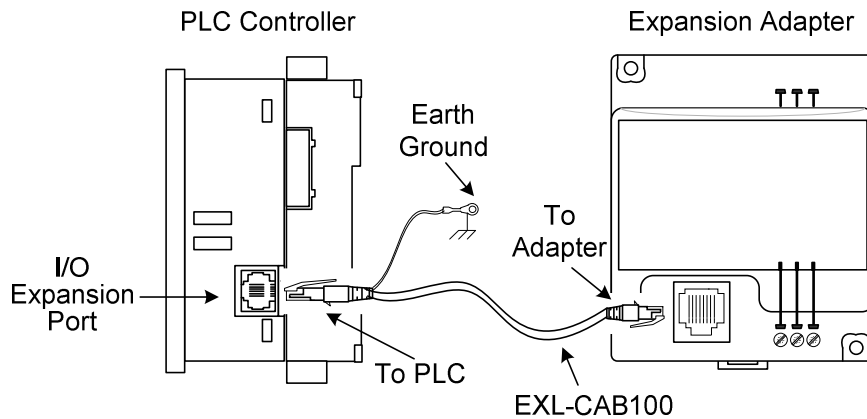
**Connecting the OPLC to the EX-A2X**

Use the communication cable to connect the module's PLC expansion port to the PLC.

Take care to connect the correct cable. The connectors of this cable are housed in yellow insulation. Note that one end is marked To PLC and the other To Adapter; insert accordingly.

The module is supplied with a 1-meter cable, part number EXL-CAB100. Other cable lengths are also available.

Use only an original Unitronics cable and do not make any changes to it.



Connecting Expansion Modules

An adapter provides the interface between the OPLC and an expansion module. To connect the I/O module to the adapter or to another module:

1. Push the module-to-module connector into the port located on the right side of the device.

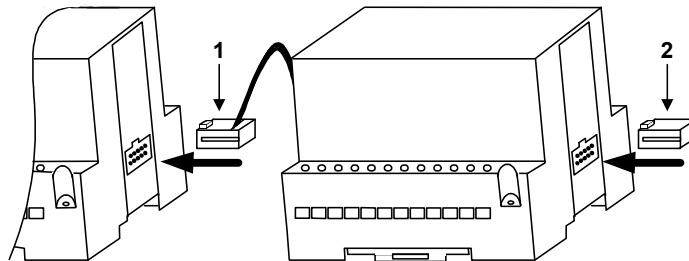
Note that there is a protective cap provided with the adapter. This cap covers the port of the final I/O module in the system.



- To avoid damaging the system, do not connect or disconnect the device when the power is on.

Component identification

1	Module-to-module connector
2	Protective cap



Wiring



- Do not touch live wires.



- Unused pins should not be connected. Ignoring this directive may damage the device.
- Double-check all wiring before turning on the power supply.
- Do not connect the 'Neutral or 'Line' signal of the 110/220VAC to the device's 0V pin.
- In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.
- Double-check all the wiring before turning on the power supply.

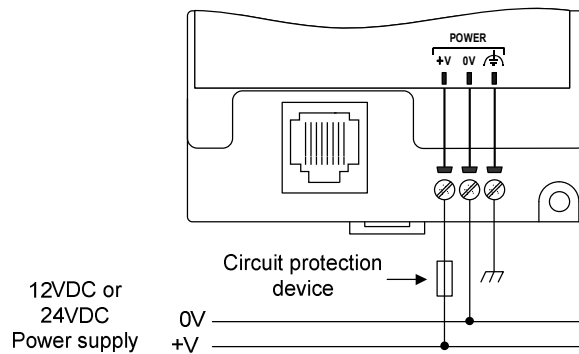
Wiring Procedures

Use crimp terminals for wiring; use 26-12AWG wire (0.13 mm^2 – 3.31 mm^2) for all wiring purposes.

1. Strip the wire to a length of $7 \pm 0.5 \text{ mm}$ (0.250–0.300 inches).
 2. Unscrew the terminal to its widest position before inserting a wire.
 3. Insert the wire completely into the terminal to ensure that a proper connection can be made.
 4. Tighten enough to keep the wire from pulling free.
- To avoid damaging the wire, do not exceed a maximum torque of 0.5 N·m (5 kgf·cm).
 - Do not use tin, solder, or any other substance on stripped wire that might cause the wire strand to break.
 - Install at maximum distance from high-voltage cables and power equipment.

Wiring Power Supply

1. Connect the "positive" cable to the "+V" terminal, and the "negative" to the "0V" terminal.
 - Always connect the functional earth pin to the earth ground. Use a dedicated wire for this purpose; it must not exceed 1 meter.
 - Do not connect the neutral or line signal of the 110/220VAC to the device's 0V pin.
 - In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.
 - A non-isolated power supply can be used provided that a 0V signal is connected to the chassis.
 - Note that both the OPLC and the EX-A2X must be connected to the same power supply. The EX-A2X and the OPLC must be turned on and off simultaneously.



EX-A2X Technical Specifications

I/O module capacity	Up to 8 I/O modules can be connected to a single adapter.
Power supply	12VDC or 24VDC
Permissible range	10.2 to 28.8VDC
Max. current consumption	650mA @ 12VDC; 350mA @ 24VDC
Typical power consumption	4W
Current supply for I/O modules	1A max. from 5V (see Note 1)
Galvanic isolation	
EX-A2X power supply to:	
OPLC port	Yes
Expansion module port	No
Status indicators	
(PWR)	Green LED—Lit when power is supplied.
(COMM.)	Green LED—Lit when communication is established.

Environmental	IP20/NEMA1
Operating temperature	0° to 50° C (32 to 122°F)
Storage temperature	-20° to 60° C (-4 to 140°F)
Relative Humidity (RH)	10% to 95% (non-condensing)
Dimensions (WxHxD)	80mm x 93mm x 60mm (3.15" x 3.66" x 2.362")
Weight	125g (4.3oz.)
Mounting	Either onto a 35mm DIN-rail or screw-mounted.

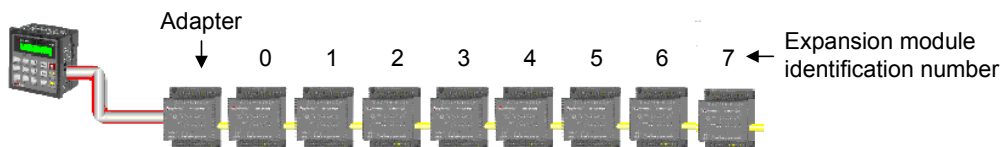
Notes:

1. Example: 2 I/O-DI8-TO8 units consume a maximum of 140mA of the 5VDC supplied by the EX-A2X.

Addressing I/Os on Expansion Modules

Inputs and outputs located on I/O expansion modules that are connected to an OPLC are assigned addresses that comprise a letter and a number. The letter indicates whether the I/O is an input (I) or an output (O). The number indicates the I/O's location in the system. This number relates to both the position of the expansion module in the system, and to the position of the I/O on that module.

Expansion modules are numbered from 0-7 as shown in the figure below.



The formula below is used to assign addresses for I/O modules used in conjunction with the OPLC.

X is the number representing a specific module's location (0-7). Y is the number of the input or output on that specific module (0-15).

The number that represents the I/O's location is equal to:

$$32 + x \cdot 16 + y$$

Examples

- Input #3, located on expansion module #2 in the system, will be addressed as I 67,
 $67 = 32 + 2 \cdot 16 + 3$
- Output #4, located on expansion module #3 in the system, will be addressed as O 84,
 $84 = 32 + 3 \cdot 16 + 4$.

EX90-DI8-RO8 is a stand-alone I/O module. Even if it is the only module in the configuration, the EX90-DI8-RO8 is always assigned the number 7.

Its I/Os are addressed accordingly.

Example

- Input #5, located on an EX90-DI8-RO8 connected to an OPLC will be addressed as I 149, $149 = 32 + 7 \cdot 16 + 5$

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DSP-EXP-EX-A2X 12/09

IO-D18-R08

IO-DI8-RO8, IO-DI8-RO8-L I/O Expansion Modules 8 Inputs, 8 Outputs

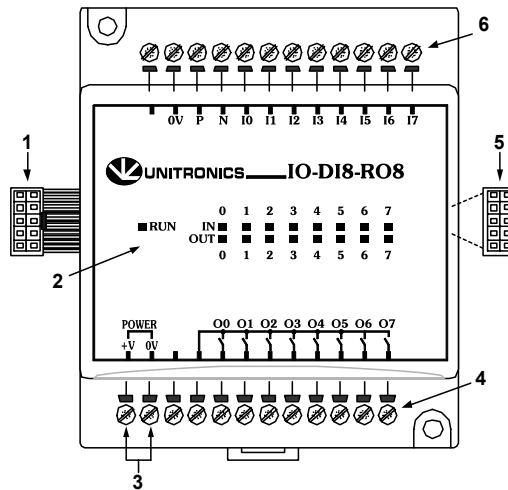
The IO-DI8-RO8 and IO-DI8-RO8-L are I/O expansion modules that can be used in conjunction with specific Unitronics OPLC controllers.

The modules are identical except for their voltage specifications: IO-DI8-RO8 runs at 24 VDC; IO-DI8-RO8-L at 12 VDC.

Both modules offer 8 digital inputs, type pnp/npn (source/sink), and 8 relay outputs.

The interface between a module and the OPLC is provided by an adapter.

These modules may either be snap-mounted on a DIN rail, or screw-mounted onto a mounting plate.



Component identification

1	Module-to-module connector
2	Status indicators
3	Connection points for power supply to outputs
4	Output connection points
5	Module-to-module connector port
6	Input connection points

- Before using this product, it is the responsibility of the user to read and understand this document and any accompanying documentation.
- All examples and diagrams shown herein are intended to aid understanding, and do not guarantee operation. Unitronics accepts no responsibility for actual use of this product based on these examples.
- Please dispose of this product in accordance with local and national standards and regulations.
- Only qualified service personnel should open this device or carry out repairs.

User safety and equipment protection guidelines

This document is intended to aid trained and competent personnel in the installation of this equipment as defined by the European directives for machinery, low voltage, and EMC. Only a technician or engineer trained in the local and national electrical standards should perform tasks associated with the device's electrical wiring.

Symbols are used to highlight information relating to the user's personal safety and equipment protection throughout this document. When these symbols appear, the associated information must be read carefully and understood fully.

Symbol	Meaning	Description
	Danger	The identified danger causes physical and property damage.
	Warning	The identified danger can cause physical and property damage.
Caution	Caution	Use caution.



- Failure to comply with appropriate safety guidelines can result in severe personal injury or property damage. Always exercise proper caution when working with electrical equipment.



- Check the user program before running it.
- Do not attempt to use this device with parameters that exceed permissible levels.
- Install an external circuit breaker and take appropriate safety measures against short-circuiting in external wiring.
- To avoid damaging the system, do not connect / disconnect the device when the power is on.

Environmental Considerations



- Do not install in areas with: excessive or conductive dust, corrosive or flammable gas, moisture or rain, excessive heat, regular impact shocks or excessive vibration.

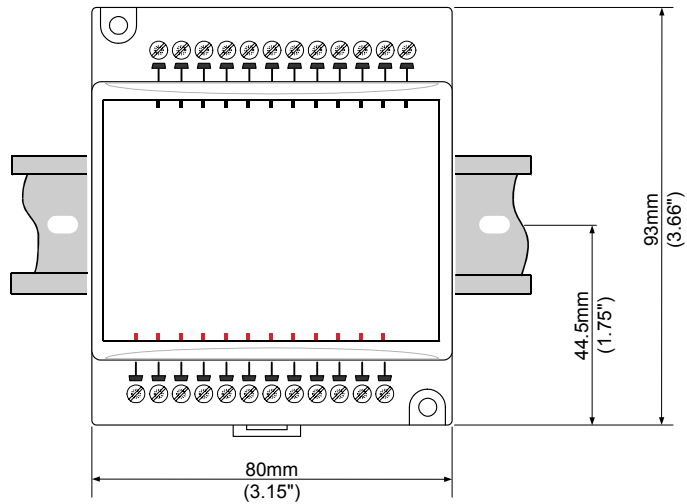
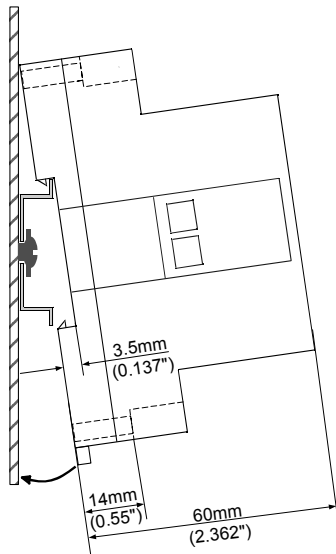


- Leave a minimum of 10mm space for ventilation between the top and bottom edges of the device and the enclosure walls.
- Do not place in water or let water leak onto the unit.
- Do not allow debris to fall inside the unit during installation.

Mounting the Module

DIN-rail mounting

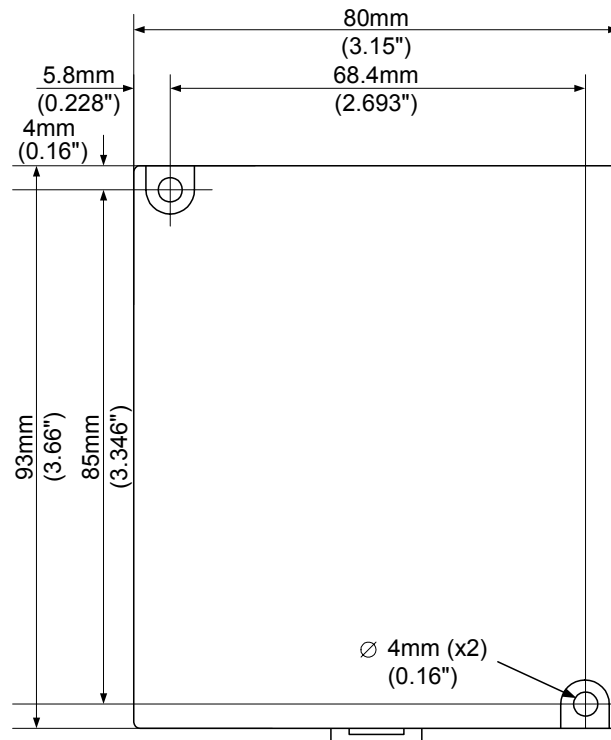
Snap the device onto the DIN rail as shown below; the module will be squarely situated on the DIN rail.



Screw-Mounting

The figure below is not drawn to scale. It may be used as a guide for screw-mounting the module.

Mounting screw type: either M3 or NC6-32.



Connecting Expansion Modules

An adapter provides the interface between the OPLC and an expansion module. To connect the I/O module to the adapter or to another module:

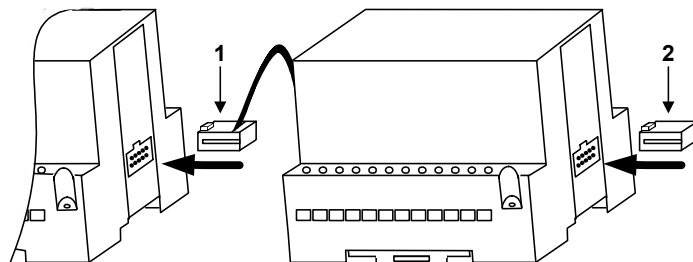
1. Push the module-to-module connector into the port located on the right side of the device.

Note that there is a protective cap provided with the adapter. This cap covers the port of the **final** I/O module in the system.



- To avoid damaging the system, do not connect or disconnect the device when the power is on.

Component identification	
1	Module-to-module connector
2	Protective cap



Wiring



- Do not touch live wires.



- Unused pins should not be connected. Ignoring this directive may damage the device.
- Do not connect the 'Neutral' or 'Line' signal of the 110/220VAC to the device's 0V pin.
- Double-check all wiring before turning on the power supply.

Wiring Procedures

Use crimp terminals for wiring; use 26-12 AWG wire (0.13 mm²–3.31 mm²) for all wiring purposes.

1. Strip the wire to a length of 7±0.5mm (0.250–0.300 inches).
2. Unscrew the terminal to its widest position before inserting a wire.
3. Insert the wire completely into the terminal to ensure that a proper connection can be made.
4. Tighten enough to keep the wire from pulling free.

- To avoid damaging the wire, do not exceed a maximum torque of 0.5 N·m (5 kgf·cm).
- Do not use tin, solder, or any other substance on stripped wire that might cause the wire strand to break.
- Install at maximum distance from high-voltage cables and power equipment.

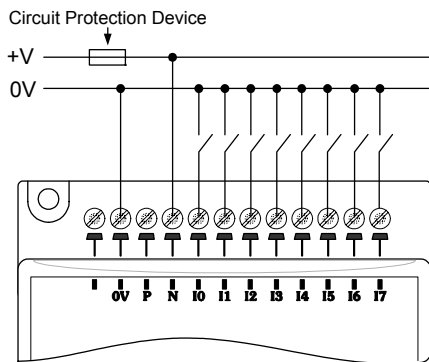
I/O Wiring—General

- Input or output cables should not be run through the same multi-core cable or share the same wire.
- Allow for voltage drop and noise interference with input/output lines used over an extended distance. Use wire that is properly sized for the load.
- The adapter and I/O signals must be connected to the same 0V signal.

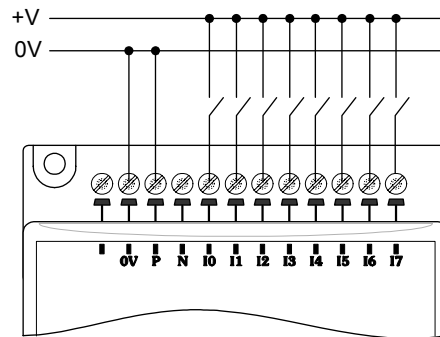
Digital I/Os

- Inputs may be wired as either pnp (source) or npn (sink) inputs.

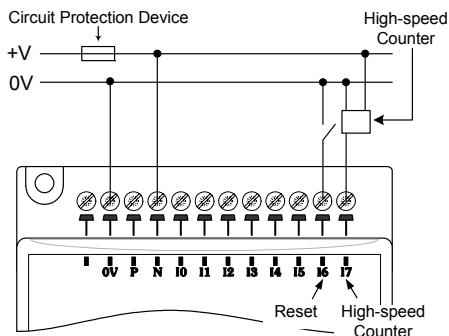
npn (sink) inputs



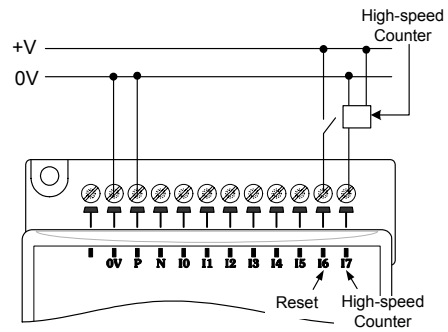
pnp (source) inputs



npn (sink) high-speed counter/frequency measurer



pnp (source) high-speed counter/frequency measurer

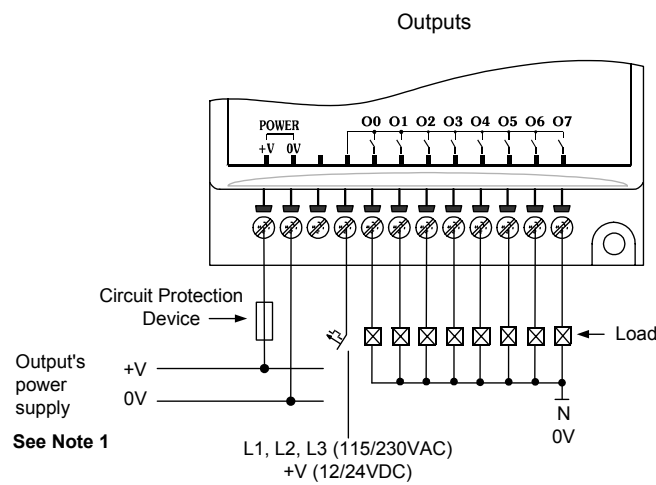


Wiring the Outputs' Power Supply

Wiring DC supply

- 1 Connect the "positive" cable to the "+V" terminal, and the "negative" to the "0V" terminal.
 - A non-isolated power supply can be used provided that a 0V signal is connected to the chassis.
 - Do not connect the 'Neutral' or 'Line' signal of the 110/220VAC to the device's 0V pin.
 - In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.

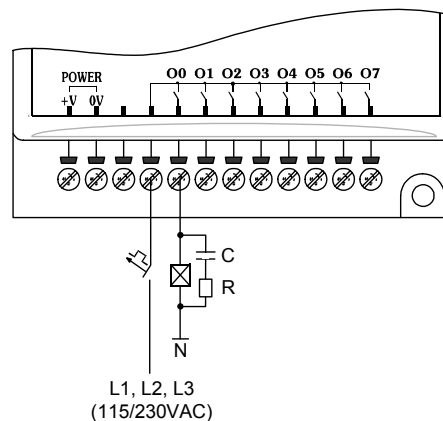
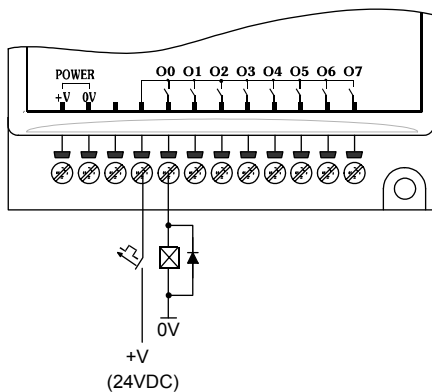
Notes: 1. The adapter and output's power supply must be connected to the same 0V signal.



Increasing Contact Life Span

Both modules have 8 relay outputs. To increase the life span of these contacts and protect the module from potential damage by reverse EMF, connect:

- a clamping diode in parallel with each inductive DC load,
- an RC snubber circuit in parallel with each inductive AC load.



IO-DI8-RO8, IO-DI8-RO8-L Technical Specifications

Max. current consumption	70mA maximum from the adapter's 5VDC
Typical power consumption	0.18W @ 5VDC
Status indicator (RUN)	Green LED: —Lit when a communication link is established between module and OPLC. —Blinks when the communication link fails.

Inputs

Number of inputs	8 (in one group)	
Input type	pnp (source) or npn (sink)	
Galvanic isolation	None	
Status indicators(IN)	Green LEDs—Lit when the corresponding input is active. See Note 1.	
Nominal input voltage	24VDC for IO-DI8-RO8, 12VDC for IO-DI8-RO8-L	
Input voltage	IO-DI8-RO8	IO-DI8-RO8-L
pnp (source)	0-5VDC for Logic '0' 17-28.8VDC for Logic '1'	0-3VDC for Logic '0' 8-15.6V for Logic '1'
nnp (sink), voltage/current	17-28.8VDC/<1.1 mA for Logic '0' 0-5VDC/>4.3mA for Logic '1'	8-15.6VDC/<1.1 mA for Logic '0' 0-3VDC/>4.3mA for Logic '1'
Input current	6mA@24VDC	6mA@12VDC
Response time	10mSec typical	
Input #7	The specifications below apply when this input is wired for use as a high-speed counter input/frequency measurer. See Notes 2 and 3.	
Resolution	16-bit	
Frequency	5kHz maximum	
Minimum pulse width	80µs	

Outputs

Number of outputs	8 relay
Output type	SPST-NO (Form A) All relays share a common signal
Isolation	By relay
Type of relay	
IO-DI8-RO8	Tyco PCN-124D3MHZ or compatible
IO-DI8-RO8-L	Tyco PCN-112D3MHZ or compatible
Output current	3A maximum per output (resistive load) 8A maximum total for common (resistive load).
Rated voltage	250VAC / 30VDC
Minimum load	1mA@5VDC
Life expectancy	100k operations at maximum load
Response time	10mS (typical)
Status Indicators (OUT)	Red LEDs—Lit when the corresponding output is active.
Contact protection	External precautions required (see above: Increasing Contact Life Span)

Outputs' power supply: IO-DI8-RO8

Nominal operating voltage	24VDC
Operating voltage	20.4 to 28.8VDC
Maximum current consumption	70mA@24VDC

Outputs' power supply: IO-DI8-RO8-L

Nominal operating voltage	12VDC
Operating voltage	10.2 to 15.6VDC
Maximum current consumption	90mA@12VDC

Environmental	IP20 / NEMA1
Operating temperature	0° to 50°C (32° to 122°F)
Storage temperature	-20° to 60° C (-4° to 140°F)
Relative Humidity (RH)	5% to 95% (non-condensing)
Dimensions (WxHxD)	80mm x 93mm x 60mm (3.15 " x 3.66 " x 2.362 ")
Weight	172g (6.07oz.)
Mounting	Either onto a 35mm DIN-rail or screw- mounted.

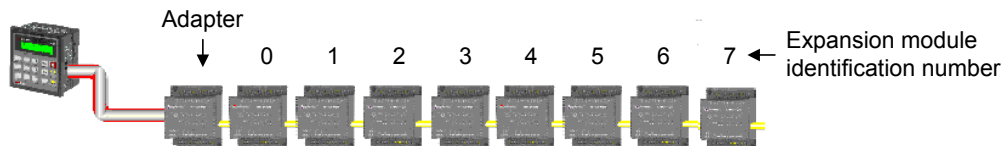
Notes:

1. The inputs' LEDs light up only when communication link is established between module and OPLC.
2. Input #7 can function either as a high-speed counter, a frequency measurer, or as a normal digital input. When Input #7 is used as a normal digital input, normal input specifications apply.
3. Input #6 can function either as the counter's reset, or as a normal digital input; in either case, its specifications are those of a normal digital input.

Addressing I/Os on Expansion Modules

Inputs and outputs located on I/O expansion modules that are connected to an OPLC are assigned addresses that comprise a letter and a number. The letter indicates whether the I/O is an input (I) or an output (O). The number indicates the I/O's location in the system. This number relates to both the position of the expansion module in the system, and to the position of the I/O on that module.

Expansion modules are numbered from 0-7 as shown in the figure below.



The formula below is used to assign addresses for I/O modules used in conjunction with the OPLC.

X is the number representing a specific module's location (0-7). Y is the number of the input or output on that specific module (0-15).

The number that represents the I/O's location is equal to:

$$32 + x \cdot 16 + y$$

Examples

- Input #3, located on expansion module #2 in the system, will be addressed as I 67, $67 = 32 + 2 \cdot 16 + 3$
- Output #4, located on expansion module #3 in the system, will be addressed as O 84, $84 = 32 + 3 \cdot 16 + 4$.

IO-A18

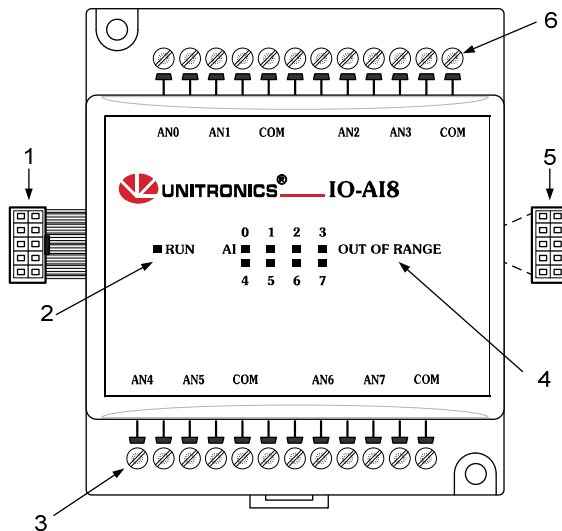
IO-A18 I/O Expansion Module 8 Analog Inputs

The IO-A18 is an I/O Expansion Module that can be used in conjunction with specific Unitronics OPLC controllers.

The module offers 8 analog inputs.

The interface between the module and the OPLC is provided by an adapter.

The module may either be snap-mounted on a DIN rail, or screw-mounted onto a mounting plate.



Component identification



1	Module-to-module connector
2	Communication status indicator
3	Input connection points, AN4 to AN7
4	Input status indicators
5	Module-to-module connector port
6	Input connection points, AN0 to AN3

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- All examples and diagrams shown herein are intended to aid understanding, and do not guarantee operation. Unitronics accepts no responsibility for actual use of this product based on these examples.
- Please dispose of this product in accordance with local and national standards and regulations.
- Only qualified service personnel should open this device or carry out repairs.

User safety and equipment protection guidelines

This document is intended to aid trained and competent personnel in the installation of this equipment as defined by the European directives for machinery, low voltage, and EMC. Only a technician or engineer trained in the local and national electrical standards should perform tasks associated with the device's electrical wiring.

Symbols are used to highlight information relating to the user's personal safety and equipment protection throughout this document. When these symbols appear, the associated information must be read carefully and understood fully.

Symbol	Meaning	Description
	Danger	The identified danger causes physical and property damage.
	Warning	The identified danger can cause physical and property damage.
Caution	Caution	Use caution.



- Failure to comply with appropriate safety guidelines can result in severe personal injury or property damage. Always exercise proper caution when working with electrical equipment.



- Check the user program before running it.
- Do not attempt to use this device with parameters that exceed permissible levels.
- To avoid damaging the system, do not connect / disconnect the device when the power is on.

Environmental Considerations



- Do not install in areas with: excessive or conductive dust, corrosive or flammable gas, moisture or rain, excessive heat, regular impact shocks or excessive vibration.

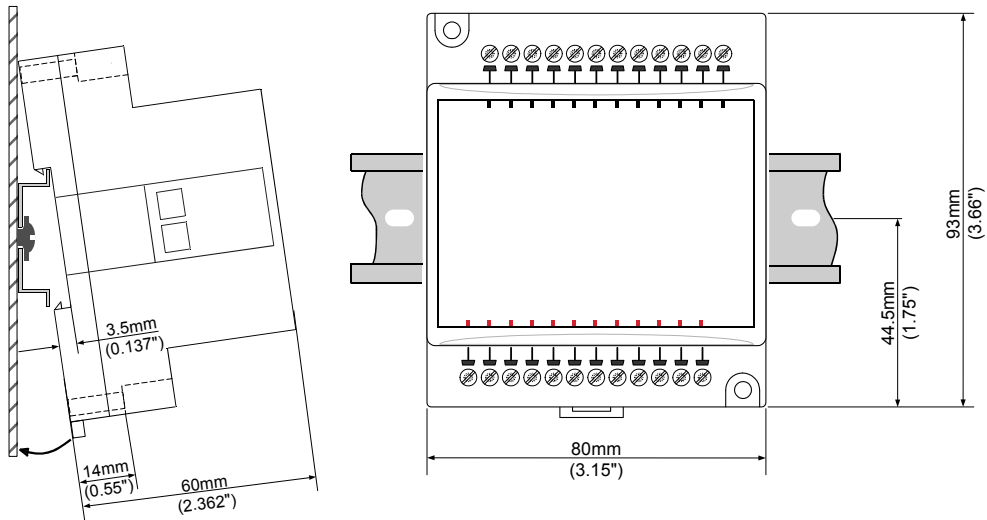


- Leave a minimum of 10mm space for ventilation between the top and bottom edges of the device and the enclosure walls.
- Do not place in water or let water leak onto the unit.
- Do not allow debris to fall inside the unit during installation.

Mounting the Module

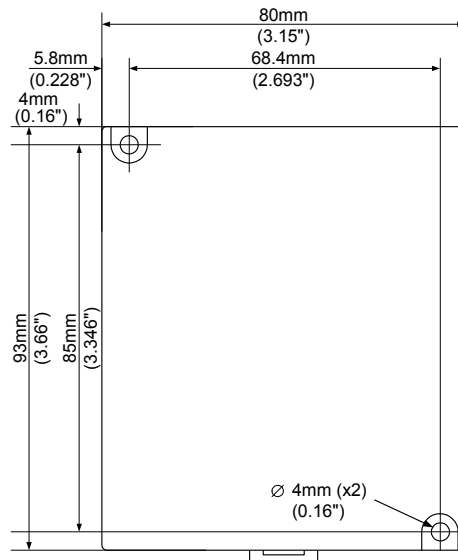
DIN-rail mounting

Snap the device onto the DIN rail as shown below; the module will be squarely situated on the DIN rail.



Screw-Mounting

The figure below is not drawn to scale. It may be used as a guide for screw-mounting the module.
Mounting screw type: either M3 or NC6-32.



Connecting Expansion Modules

An adapter provides the interface between the OPLC and an expansion module. To connect the I/O module to the adapter or to another module:

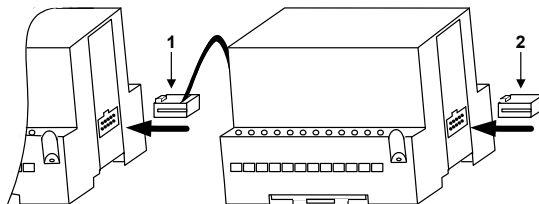
Push the module-to-module connector into the port located on the right side of the device.

Note that there is a protective cap provided with the adapter. This cap covers the port of the **final** I/O module in the system.



- To avoid damaging the system, do not connect or disconnect the device when the power is on.

Component identification	
1	Module-to-module connector
2	Protective cap



Wiring



- Do not touch live wires.



- Unused pins should not be connected. Ignoring this directive may damage the device.
- Do not connect the 'Neutral' or 'Line' signal of the 110/220VAC to the device's COM pins.
- Double-check all wiring before turning on the power supply.

Wiring Procedures

Use crimp terminals for wiring; use 26-12 AWG wire (0.13 mm^2 – 3.31 mm^2) for all wiring purposes.

- Strip the wire to a length of $7 \pm 0.5 \text{ mm}$ (0.250 – 0.300 ").
 - Unscrew the terminal to its widest position before inserting a wire.
 - Insert the wire completely into the terminal to ensure that a proper connection can be made.
 - Tighten enough to keep the wire from pulling free.
- To avoid damaging the wire, do not exceed a maximum torque of $0.5 \text{ N}\cdot\text{m}$ ($5 \text{ kgf}\cdot\text{m}$).
 - Do not use tin, solder, or any substance on stripped wire that might cause the wire strand to break.
 - Install at maximum distance from high-voltage cables and power equipment.

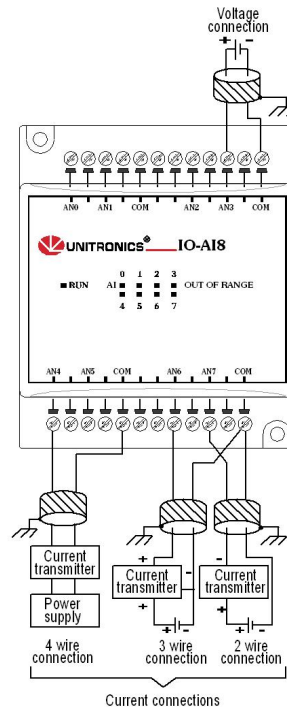
I/O Wiring—General

- Input or output cables should not be run through the same multi-core cable or share the same wire.
- Allow for voltage drop and noise interference with input lines used over an extended distance. Use wire that is properly sized for the load.

Analog Inputs

- Shields should be connected at the signal source.
- Inputs may be set as either current, or voltage. To set an input
- Use the appropriate wiring as shown near.
- Open the device and set the jumpers according to the instructions beginning on page 5.
- The adapter and the COM signals of the analog inputs must be connected to the same 0V signal.
- The COM signals of each channel are internally shorted.

When set to current/voltage, each 2 inputs share a common COM signal.



Opening the Device



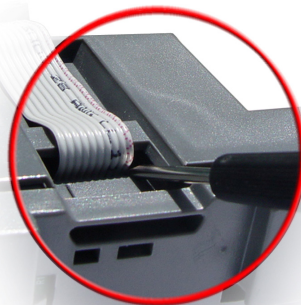
- Before opening the device, touch a grounded object to discharge any electrostatic charge.
- Avoid touching the PCB board directly.
- Turn power off and disconnect all leads before opening the device.

In order to change the jumper settings of a specific input, first open the device by prying off its back, using the blade of a flat-bladed screwdriver. The insertion points for the screwdriver are located on both sides of the module.

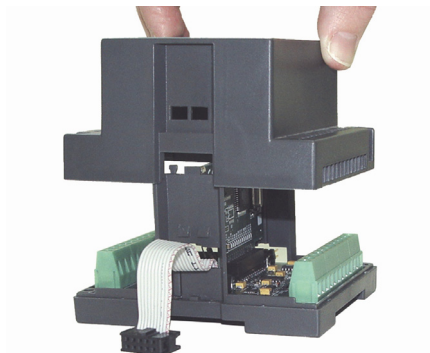
1. Open the first side of the device by inserting the blade between the 2 plastic moldings as shown below, then gently pushing up.



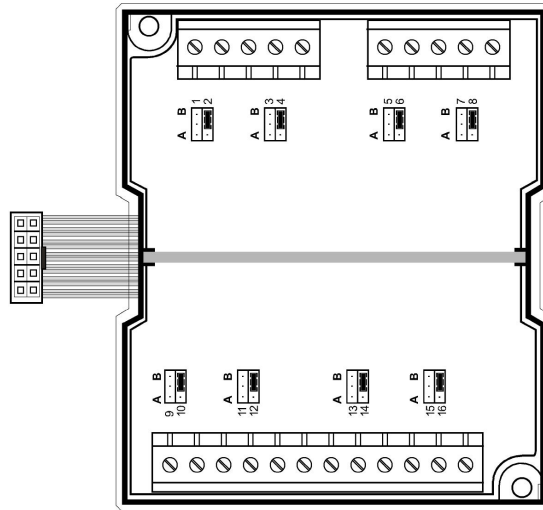
2. Taking care not to damage the cable, open the other side of the device by inserting the blade where shown below, then gently pushing up.



3. Gently remove the top of the device as shown.



4. The jumpers are shown at right. Change the jumper settings as required, in accordance with the tables shown on the next page.



Jumper Settings

The tables below show how to set a specific jumper to change the functionality of a specific input. To open the device and access the jumpers, refer to the instructions beginning on page 5.

Caution ■ Incompatible jumper settings and wiring may severely damage the device.

	Jumper #	Voltage*	Current
Input 0	2	A	B
Input 1	4	A	B
Input 2	6	A	B
Input 3	8	A	B
Input 4	10	A	B
Input 5	12	A	B
Input 6	14	A	B
Input 7	16	A	B

* Default factory setting.

IO-A18 Technical Specifications

Max. current consumption	40mA maximum from the adapter's 5VDC
Typical power consumption	0.2W@5VDC
Status indicator (RUN)	Green LED: —Lit when a communication link is established between module and OPLC. —Blinks when the communication link fails.

Analog Inputs

Number of inputs	8 (single-ended) See Note 1.
Input range	0-10V, 0-20mA, 4-20mA. See Note 1.
Input type	Either Normal or Fast mode, according to the filter type selected in software settings
Conversion method	Voltage to frequency
Normal mode	
Resolution at 0-10V, 0-20mA	14-bit (16384 units)
Resolution at 4-20mA	3277 to 16383 (13107 units)
Conversion time	100mSec minimum per input
Fast mode	
Resolution at 0-10V, 0-20mA	12-bit (4096 units)
Resolution at 4-20mA	819 to 4095 (3277 units)
Conversion time	25mSec minimum per input
Input impedance	>400K Ω —voltage 500 Ω —current
Isolation	None
Absolute maximum rating	\pm 15V—voltage \pm 30mA—current
Linearity error	0.04% max of full scale
Error limits	0.4% of input value
Status indicators (OUT OF RANGE)	Red LEDs—Lit when the corresponding input is receiving current or voltage in excess of the input range. See Note 5.

Environmental

Operating temperature	IP20/NEMA1 0° to 50°C (32 to 122° F)
Storage temperature	-20° to 60°C (-4 to 140° F)
Relative Humidity (RH)	5% to 95% (non-condensing)
Dimensions (WxHxD)	80mm x 93mm x 60mm (3.15 x 3.66 x 2.362")
Weight	150g (5.3 oz)
Mounting	Either onto a 35mm DIN-rail or screw-mounted.

Notes:

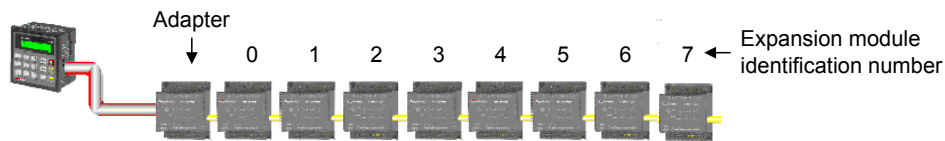
- Each input may be set as either voltage (0-10V), or current (0-20mA, 4-20mA) via wiring, jumper and software settings.
- The voltage or current value of analog inputs can also indicate faults, as shown in the table below.

Value: 12-bit (Fast mode)	Value: 14-bit (Normal mode)	Input Value Deviates:
-1	-1	Slightly below the input range.
4096	16384	Slightly above the input range.
32767	32767	Greatly above or below the input range.

Addressing I/Os on Expansion Modules

Inputs and outputs located on I/O expansion modules that are connected to an OPLC are assigned addresses that comprise a letter and a number. The letter indicates whether the I/O is an input (I) or an output (O). The number indicates the I/O's location in the system. This number relates to both the position of the expansion module in the system, and to the position of the I/O on that module.

Expansion modules are numbered from 0-7 as shown in the figure below.



The formula below is used to assign addresses for I/O modules used in conjunction with the OPLC.

X is the number representing a specific module's location (0-7). Y is the number of the input or output on that specific module (0-15).

The number that represents the I/O's location is equal to:

$$32 + x \cdot 16 + y$$

Examples

- Input #3, located on expansion module #2 in the system, will be addressed as I 67,
67 = 32 + 2 • 16 + 3
- Output #4, located on expansion module #3 in the system, will be addressed as O 84,
84 = 32 + 3 • 16 + 4.

EX90-DI8-RO8 is a stand-alone I/O module. Even if it is the only module in the configuration, the EX90-DI8-RO8 is always assigned the number 7.

Its I/Os are addressed accordingly.

Example

- Input #5, located on an EX90-DI8-RO8 connected to an OPLC will be addressed as I 149, 149 = 32 + 7 • 16 + 5

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DSP-EXP-AI8 01/11

IO-AO6X I/O Expansion Module 6 Isolated Analog Outputs

The IO-AO6X is an I/O Expansion Module that can be used in conjunction with specific Unitronics OPLC controllers.

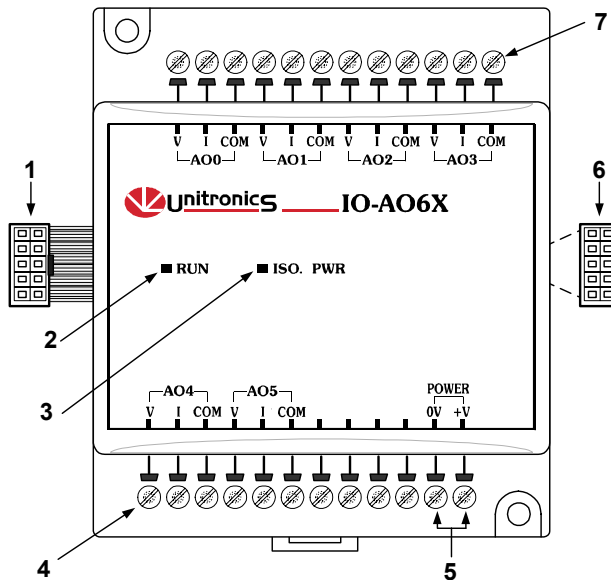
The module offers 6 12-bit isolated outputs; functioning at 0-10V, 0-20mA, and 4-20mA.

The interface between the module and the OPLC is provided by an adapter.

The module may either be snap-mounted on a DIN rail, or screw-mounted onto a mounting plate.

Component identification

1	Module-to-module connector
2	Communication status indicator
3	Isolated power supply indicator
4	Output connection points, AO4-AO5
5	Connection points for power supply to analog unit
6	Module-to-module connector port
7	Output connection points, AO0-AO3



- Before using this product, it is the responsibility of the user to read and understand this document and any accompanying documentation.
- All examples and diagrams shown herein are intended to aid understanding, and do not guarantee operation. Unitronics accepts no responsibility for actual use of this product based on these examples.
- Please dispose of this product in accordance with local and national standards and regulations.
- Only qualified service personnel should open this device or carry out repairs.

User safety and equipment protection guidelines

This document is intended to aid trained and competent personnel in the installation of this equipment as defined by the European directives for machinery, low voltage, and EMC. Only a technician or engineer trained in the local and national electrical standards should perform tasks associated with the device's electrical wiring.

Symbols are used to highlight information relating to the user's personal safety and equipment protection throughout this document. When these symbols appear, the associated information must be read carefully and understood fully.

Symbol	Meaning	Description
	Danger	The identified danger causes physical and property damage.
	Warning	The identified danger can cause physical and property damage.
Caution	Caution	Use caution.



- Failure to comply with appropriate safety guidelines can result in severe personal injury or property damage. Always exercise proper caution when working with electrical equipment.



- Check the user program before running it.
- Do not attempt to use this device with parameters that exceed permissible levels.
- Install an external circuit breaker and take appropriate safety measures against short-circuiting in external wiring.
- To avoid damaging the system, do not connect / disconnect the device when the power is on.

Environmental Considerations



- Do not install in areas with: excessive or conductive dust, corrosive or flammable gas, moisture or rain, excessive heat, regular impact shocks or excessive vibration.

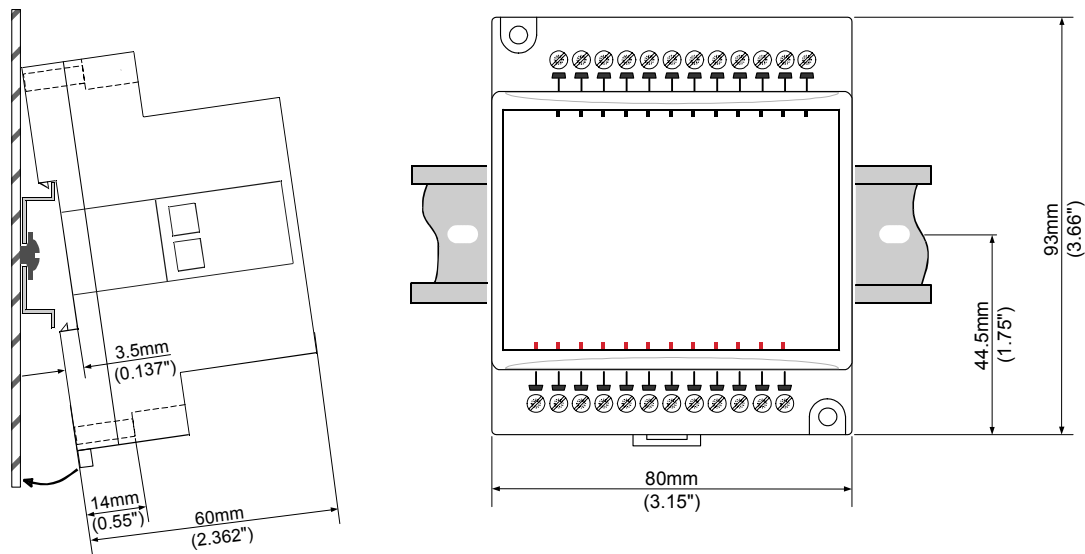


- Leave a minimum of 10mm space for ventilation between the top and bottom edges of the device and the enclosure walls.
- Do not place in water or let water leak onto the unit.
- Do not allow debris to fall inside the unit during installation.

Mounting the Module

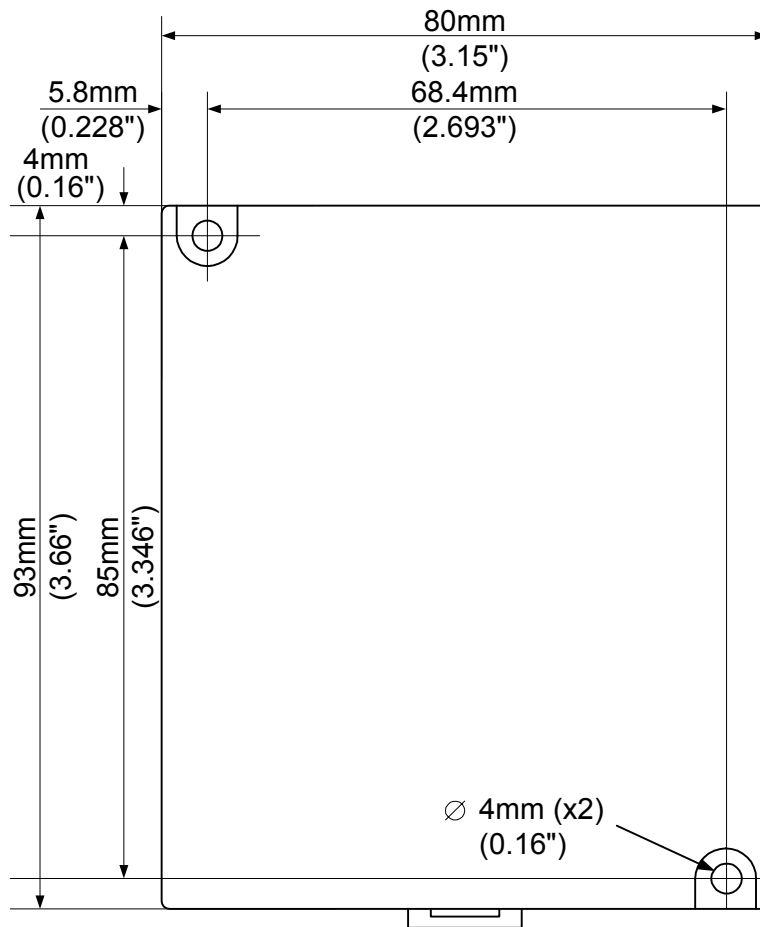
DIN-rail mounting

Snap the device onto the DIN rail as shown below; the module will be squarely situated on the DIN rail.



Screw-Mounting

The figure on the next page is drawn to scale. It may be used as a guide for screw-mounting the module.
Mounting screw type: either M3 or NC6-32.



Connecting Expansion Modules

An adapter provides the interface between the OPLC and an expansion module. To connect the I/O module to the adapter or to another module:

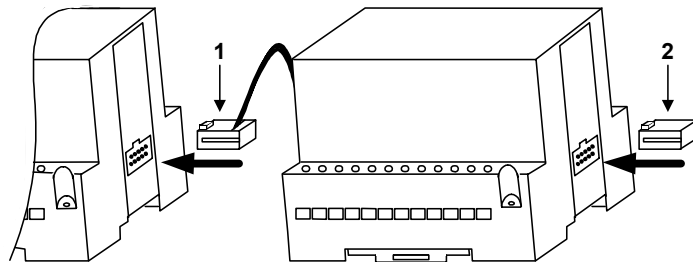
- 1 Push the module-to-module connector into the port located on the right side of the device.

Note that there is a protective cap provided with the adapter. This cap covers the port of the **final** I/O module in the system.



- To avoid damaging the system, do not connect or disconnect the device when the power is on.

Component identification	
1	Module-to-module connector
2	Protective cap



Wiring



- Do not touch live wires.



- Unused pins should not be connected. Ignoring this directive may damage the device.
- Do not connect the 'Neutral or 'Line' signal of the 110/220VAC to the device's 0V pin.
- Double-check all wiring before turning on the power supply.

Wiring Procedures

Use crimp terminals for wiring; use 26-12 AWG wire (0.13 mm²–3.31 mm²) for all wiring purposes.

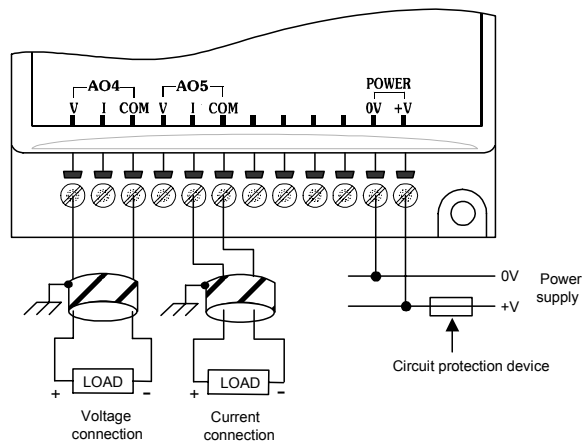
1. Strip the wire to a length of 7±0.5mm (0.250–0.300 inches).
 2. Unscrew the terminal to its widest position before inserting a wire.
 3. Insert the wire completely into the terminal to ensure that a proper connection can be made.
 4. Tighten enough to keep the wire from pulling free.
- To avoid damaging the wire, do not exceed a maximum torque of 0.5 N·m (5 kgf·m).
 - Do not use tin, solder, or any other substance on stripped wire that might cause the wire strand to break.
 - Install at maximum distance from high-voltage cables and power equipment.

I/O Wiring—General

- Input or output cables should not be run through the same multi-core cable or share the same wire.
- Allow for voltage drop and noise interference with input lines used over an extended distance. Use wire that is properly sized for the load.

Analog Outputs

- Shields should be earthed, connected to the earth of the cabinet.
- Do not connect unused outputs.
- An output can be wired to either current or voltage.
- Do not use current and voltage from the same source channel.
- The outputs' COM signals are internally shorted.

**Wiring the Analog Outputs' Power Supply**

1. Connect the "positive" cable to the "+V" terminal, and the "negative" to the "0V" terminal.
- A non-isolated power supply can be used provided that a 0V signal is connected to the chassis.
 - Do not connect the 'Neutral' or 'Line' signal of the 110/220VAC to the device's 0V pin.
 - In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.

IO-AO6X Technical Specifications

Max. current consumption	32mA maximum from the adapter's 5VDC
Typical power consumption	29mA @ 5VDC
Status indicator (RUN)	Green LED: —Lit when a communication link is established between module and OPLC. —Blinks when the communication link fails.
Isolated power indicator (ISO. PWR)	Green LED: —Lit when the isolated power supply is on.
Isolation	
Channel to bus	Yes
Channel to power supply	Yes
Channel to channel	No

Analog Outputs

Number of outputs	6 (single-ended)
Output range	0-10V, 0-20mA, 4-20mA. See Note 1.
Resolution (except at 4-20mA)	12-bit (4096 units)
Resolution at 4-20mA	819 to 4095 (3277 units)
Load impedance	1k Ω minimum—voltage 500 Ω maximum—current. See Note 2.
Conversion time	2 mSec, synchronized to expansion communication.
Linearity error	\pm 0.1%
Operational error limits	\pm 0.2%

Analog Power Supply

	24VDC
Permissible range	20.4 to 28.8VDC
Max. current consumption	170mA@24VDC

Environmental

	IP20 / NEMA1
Operating temperature	0° to 50°C (32 to 122° F)
Storage temperature	-20° to 60°C (-4 to 140° F)
Relative Humidity (RH)	5% to 95% (non-condensing)
Dimensions (WxHxD)	80mm x 93mm x 60mm (3.15 x 3.66 x 2.362")
Weight	159g (5.6oz.)
Mounting	Either onto a 35mm DIN-rail or screw- mounted.

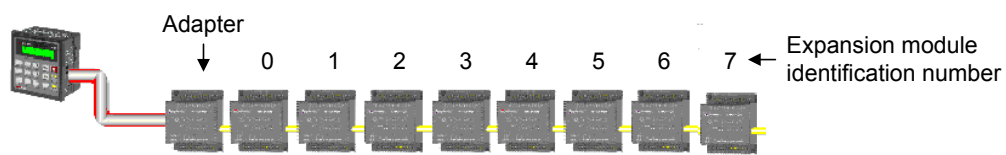
Notes:

- Note that the range of each I/O is defined both by wiring and within the controller's software.
- When an analog output is set to use current, the output must be connected **before** the power is turned on.

Addressing I/Os on Expansion Modules

Inputs and outputs located on I/O expansion modules that are connected to an OPLC are assigned addresses that comprise a letter and a number. The letter indicates whether the I/O is an input (I) or an output (O). The number indicates the I/O's location in the system. This number relates to both the position of the expansion module in the system, and to the position of the I/O on that module.

Expansion modules are numbered from 0-7 as shown in the figure below.



The formula below is used to assign addresses for I/O modules used in conjunction with the M90 OPLC. X is the number representing a specific module's location (0-7). Y is the number of the input or output on that specific module (0-15).

The number that represents the I/O's location is equal to:

$$32 + x \cdot 16 + y$$

Examples

- Input #3, located on expansion module #2 in the system, will be addressed as I 67,
67 = 32 + 2 • 16 + 3
- Output #4, located on expansion module #3 in the system, will be addressed as O 84,
84 = 32 + 3 • 16 + 4.

EX90-DI8-RO8 is a stand-alone I/O module. Even if it is the only module in the configuration, the EX90-DI8-RO8 is always assigned the number 7.

Its I/Os are addressed accordingly.

Example

- Input #5, located on an EX90-DI8-RO8 connected to an M90 OPLC will be addressed as I 149, 149 = 32 + 7 • 16 + 5

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Unitronics Industrial Automation Systems has been producing PLCs, automation software and accessory devices since 1989.

Unitronics' OPLC controllers combine full-function PLCs and HMI operating panels into single, compact units. These HMI + PLC devices are programmed in a single, user-friendly environment. Our clients save I/O points, wiring, space, and programming time; elements that translate directly into cost-efficiency.

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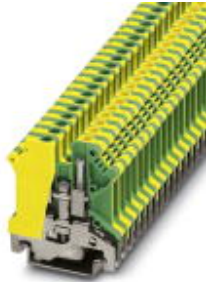
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Ground modular terminal block - USLKG 5 - 0441504


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Ground modular terminal block, connection method: Screw connection, number of connections: 2, number of positions: 1, cross section: 0.2 mm² - 6 mm², AWG: 24 - 10, width: 6.2 mm, color: green-yellow, mounting type: NS 35/7,5, NS 35/15, NS 32



Key Commercial Data

Packing unit	1 STK
GTIN	 4 017918 002190
GTIN	4017918002190
Weight per Piece (excluding packing)	20.800 g
Custom tariff number	85369010
Country of origin	Germany

Technical data

General

Note	When aligning with a feed-through terminal block with the same shape, an end cover must be interposed with insulation voltages of > 690 V
Number of positions	1
Number of levels	1
Number of connections	2
Nominal cross section	4 mm ²
Color	green-yellow
Insulating material	PA
Flammability rating according to UL 94	V0
Rated surge voltage	8 kV
Degree of pollution	3

Ground modular terminal block - USLKG 5 - 0441504

Technical data

General

Overvoltage category	III
Insulating material group	I
Maximum power dissipation for nominal condition	1.02 W
Open side panel	No
Terminal block mounting	0.6 Nm ... 0.8 Nm (PE foot with mounting screw, M3)
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Static insulating material application in cold	-60 °C
Behavior in fire for rail vehicles (DIN 5510-2)	Test passed
Flame test method (DIN EN 60695-11-10)	V0
Oxygen index (DIN EN ISO 4589-2)	>32 %
NF F16-101, NF F10-102 Class I	2
NF F16-101, NF F10-102 Class F	2
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Dimensions

Width	6.2 mm
Length	42.5 mm
Height NS 35/7,5	47 mm
Height NS 35/15	54.5 mm
Height NS 32	52 mm

Connection data

Note	Please observe the current carrying capacity of the DIN rails.
Connection method	Screw connection
Connection in acc. with standard	IEC 60947-7-2
Conductor cross section solid min.	0.2 mm ²
Conductor cross section solid max.	6 mm ²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	10
Conductor cross section flexible min.	0.2 mm ²

Ground modular terminal block - USLKG 5 - 0441504

Technical data

Connection data

Conductor cross section flexible max.	4 mm ²
Min. AWG conductor cross section, flexible	24
Max. AWG conductor cross section, flexible	12
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.25 mm ²
Conductor cross section flexible, with ferrule without plastic sleeve max.	4 mm ²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.25 mm ²
Conductor cross section flexible, with ferrule with plastic sleeve max.	2.5 mm ²
2 conductors with same cross section, solid min.	0.2 mm ²
2 conductors with same cross section, solid max.	1.5 mm ²
2 conductors with same cross section, stranded min.	0.2 mm ²
2 conductors with same cross section, stranded max.	1.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min.	0.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	2.5 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, min.	0.25 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, max.	1.5 mm ²
Connection in acc. with standard	IEC/EN 60079-7
Conductor cross section solid min.	0.2 mm ²
Conductor cross section solid max.	4 mm ²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	12
Conductor cross section flexible min.	0.2 mm ²
Conductor cross section flexible max.	4 mm ²
Stripping length	8 mm
Screw thread	M3
Tightening torque, min	0.6 Nm
Tightening torque max	0.8 Nm

Standards and Regulations

Connection in acc. with standard	CSA
	IEC 60947-7-2
Flammability rating according to UL 94	V0
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3

Ground modular terminal block - USLKG 5 - 0441504

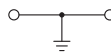
Technical data

Environmental Product Compliance

China RoHS	Environmentally Friendly Use Period = 50
	For details about hazardous substances go to tab "Downloads", Category "Manufacturer's declaration"

Drawings

Circuit diagram



Classifications

eCl@ss

eCl@ss 4.0	27141118
eCl@ss 4.1	27141118
eCl@ss 5.0	27141118
eCl@ss 5.1	27141118
eCl@ss 6.0	27141141
eCl@ss 7.0	27141141
eCl@ss 8.0	27141141
eCl@ss 9.0	27141141

ETIM

ETIM 2.0	EC000901
ETIM 3.0	EC000901
ETIM 4.0	EC000901
ETIM 5.0	EC000901
ETIM 6.0	EC000901

UNSPSC

UNSPSC 6.01	30211811
UNSPSC 7.0901	39121410
UNSPSC 11	39121410
UNSPSC 12.01	39121410
UNSPSC 13.2	39121410

Approvals

Approvals

Ground modular terminal block - USLKG 5 - 0441504

Approvals


Approvals


CSA / UL Recognized / KEMA-KEUR / cUL Recognized / BV / PRS / KR / EAC / EAC / IECEE CB Scheme / DNV GL / cULus Recognized


Ex Approvals


IECEX / ATEX / EAC Ex

Approval details

CSA		http://www.csagroup.org/services-industries/product-listing/	13631
mm ² /AWG/kcmil		26-10	

UL Recognized		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425
mm ² /AWG/kcmil		26-10	

KEMA-KEUR		http://www.dekra-certification.com	2191246.01
mm ² /AWG/kcmil		4	

cUL Recognized		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425
mm ² /AWG/kcmil		26-10	

BV		http://www.veristar.com/portal/veristarinfo/generalinfo/approved/approvedProducts/equipmentAndMaterials	07774/D0 BV
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Ground modular terminal block - USLKG 5 - 0441504

Approvals

PRS		http://www.prs.pl/	TE/1824/880590/09
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KR		http://www.krs.co.kr/eng/main/main.aspx	HMB17372-EL001
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EAC			EAC-Zulassung
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EAC			7500651.22.01.00246
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IECEE CB Scheme		http://www.iecee.org/	NL-39913
mm ² /AWG/kcmil	4		

DNV GL	http://exchange.dnv.com/tari/	TAE00001CT
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cULus Recognized		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm
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Accessories

Accessories

DIN rail

DIN rail perforated - NS 32 PERF 2000MM - 1201002



DIN rail perforated, G profile, width: 32 mm, height: 15 mm, in acc. with EN 60715: 2001, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

Feed-through terminal block - UK 5 N - 3004362

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Feed-through terminal block, nom. voltage: 800 V, nominal current: 32 A, connection method: Screw connection, number of connections: 2, cross section: 0.2 mm² - 6 mm², AWG: 24 - 10, width: 6.2 mm, color: gray, mounting type: NS 35/7,5, NS 35/15, NS 32

Why buy this product

- ✓ Universal foot which can be used on NS 35... and NS 32... DIN rails
- ✓ The UK universal screw terminal block series has the typical features which are decisive for practical applications
- ✓ Potential distribution via fixed bridges in the terminal center or insertion bridges in the clamping space



Key Commercial Data

Packing unit	1 STK
Minimum order quantity	50 STK
GTIN	 4 017918 090760
GTIN	4017918090760
Weight per Piece (excluding packing)	8.795 g
Custom tariff number	85369010
Country of origin	Germany

Technical data

General

Note	Other languages
Number of levels	1
Number of connections	2
Potentials	1
Nominal cross section	4 mm ²

Feed-through terminal block - UK 5 N - 3004362

Technical data

General

Color	gray
Insulating material	PA
Flammability rating according to UL 94	V0
Rated surge voltage	8 kV
Degree of pollution	3
Overvoltage category	III
Insulating material group	I
Maximum power dissipation for nominal condition	1.02 W
Maximum load current	41 A (with 6 mm ² conductor cross section)
Nominal current I _N	32 A
Nominal voltage U _N	800 V
Open side panel	Yes
Shock protection test specification	IEC 60529:1989-11 + AMD 1:1999-11 + AMD 2:2013-08
Back of the hand protection	guaranteed
Finger protection	guaranteed
Result of surge voltage test	Test passed
Surge voltage test setpoint	9.8 kV
Result of power-frequency withstand voltage test	Test passed
Power frequency withstand voltage setpoint	2 kV
Result of the test for mechanical stability of terminal points (5 x conductor connection)	Test passed
Result of bending test	Test passed
Bending test rotation speed	10 rpm
Bending test turns	135
Bending test conductor cross section/weight	0.2 mm ² / 0.2 kg
	4 mm ² / 0.9 kg
	6 mm ² / 1.4 kg
Tensile test result	Test passed
Conductor cross section tensile test	0.2 mm ²
Tractive force setpoint	10 N
Conductor cross section tensile test	4 mm ²
Tractive force setpoint	60 N
Conductor cross section tensile test	6 mm ²
Tractive force setpoint	80 N
Result of tight fit on support	Test passed
Tight fit on carrier	NS 32/NS 35
Setpoint	5 N

Feed-through terminal block - UK 5 N - 3004362

Technical data

General

Result of voltage-drop test	Test passed
Requirements, voltage drop	≤ 3.2 mV
Result of temperature-rise test	Test passed
Short circuit stability result	Test passed
Conductor cross section short circuit testing	4 mm ²
Short-time current	0.48 kA
Result of thermal test	Test passed
Proof of thermal characteristics (needle flame) effective duration	30 s
Oscillation, broadband noise test result	Test passed
Test specification, oscillation, broadband noise	DIN EN 50155 (VDE 0115-200):2008-03
Test spectrum	Service life test category 1, class B, body mounted
ASD level	1.857 (m/s ²) ² /Hz
Acceleration	0,8 g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Shock test result	Test passed
Test specification, shock test	DIN EN 50155 (VDE 0115-200):2008-03
Shock form	Half-sine
Acceleration	5g (10-150-10 Hz)
Shock duration	30 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	130 °C
Static insulating material application in cold	-60 °C
Behavior in fire for rail vehicles (DIN 5510-2)	Test passed
Flame test method (DIN EN 60695-11-10)	V0
Oxygen index (DIN EN ISO 4589-2)	>32 %
NF F16-101, NF F10-102 Class I	2
NF F16-101, NF F10-102 Class F	2
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3

Feed-through terminal block - UK 5 N - 3004362

Technical data

General

Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3
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Dimensions

Width	6.2 mm
End cover width	1.8 mm
Length	42.5 mm
Height NS 35/7,5	47 mm
Height NS 35/15	54.5 mm
Height NS 32	52 mm

Connection data

Connection method	Screw connection
Connection in acc. with standard	IEC 60947-7-1
Conductor cross section solid min.	0.2 mm ²
Conductor cross section solid max.	6 mm ²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	10
Conductor cross section flexible min.	0.2 mm ²
Conductor cross section flexible max.	4 mm ²
Min. AWG conductor cross section, flexible	24
Max. AWG conductor cross section, flexible	12
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.25 mm ²
Conductor cross section flexible, with ferrule without plastic sleeve max.	4 mm ²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.25 mm ²
Conductor cross section flexible, with ferrule with plastic sleeve max.	2.5 mm ²
Cross section with insertion bridge, solid max.	4 mm ²
Cross section with insertion bridge, stranded max.	4 mm ²
2 conductors with same cross section, solid min.	0.2 mm ²
2 conductors with same cross section, solid max.	1.5 mm ²
2 conductors with same cross section, stranded min.	0.2 mm ²
2 conductors with same cross section, stranded max.	1.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min.	0.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	2.5 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, min.	0.25 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, max.	1.5 mm ²
Cross section with insertion bridge, solid max.	4 mm ²

Feed-through terminal block - UK 5 N - 3004362

Technical data

Connection data

Cross section with insertion bridge, stranded max.	4 mm ²
Connection in acc. with standard	IEC/EN 60079-7
Conductor cross section solid min.	0.2 mm ²
Conductor cross section solid max.	6 mm ²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	10
Conductor cross section flexible min.	0.2 mm ²
Conductor cross section flexible max.	4 mm ²
Stripping length	8 mm
Internal cylindrical gage	A4
Screw thread	M3
Tightening torque, min	0.6 Nm
Tightening torque max	0.8 Nm

Standards and Regulations

Connection in acc. with standard	CSA
	IEC 60947-7-1
Flammability rating according to UL 94	V0
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3

Environmental Product Compliance

China RoHS	Environmentally Friendly Use Period = 25;
	For details about hazardous substances go to tab "Downloads", Category "Manufacturer's declaration"

Drawings

Circuit diagram



Classifications

eCl@ss

eCl@ss 4.0	27141120
eCl@ss 4.1	27141120

Feed-through terminal block - UK 5 N - 3004362

Classifications

eCl@ss

eCl@ss 5.0	27141120
eCl@ss 5.1	27141120
eCl@ss 6.0	27141120
eCl@ss 7.0	27141120
eCl@ss 8.0	27141120
eCl@ss 9.0	27141120

ETIM

ETIM 2.0	EC000897
ETIM 3.0	EC000897
ETIM 4.0	EC000897
ETIM 5.0	EC000897
ETIM 6.0	EC000897

UNSPSC

UNSPSC 6.01	30211811
UNSPSC 7.0901	39121410
UNSPSC 11	39121410
UNSPSC 12.01	39121410
UNSPSC 13.2	39121410

Approvals

Approvals

Approvals

CSA / UL Recognized / KEMA-KEUR / cUL Recognized / LR / PRS / KR / NK / IECCEB Scheme / LR / EAC / EAC / DNV GL / LR / cULus Recognized


Ex Approvals


IECEX / ATEX / EAC Ex / UL Recognized / cUL Recognized / cULus Recognized


Approval details


Feed-through terminal block - UK 5 N - 3004362


Approvals

CSA		http://www.csagroup.org/services-industries/product-listing/	13631
mm ² /AWG/kcmil	28-10		
Nominal current IN	30 A		
Nominal voltage UN	600 V		

UL Recognized		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425
mm ² /AWG/kcmil	30-10		
Nominal current IN	30 A		
Nominal voltage UN	600 V		

KEMA-KEUR		http://www.dekra-certification.com	2183462.01
mm ² /AWG/kcmil	4		
Nominal voltage UN	800 V		

cUL Recognized		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425
	B	C	
mm ² /AWG/kcmil	30-10	30-10	
Nominal current IN	30 A	30 A	
Nominal voltage UN	600 V	600 V	

LR		http://www.lr.org/en	96/20013
mm ² /AWG/kcmil	10		
Nominal current IN	57 A		
Nominal voltage UN	800 V		

Feed-through terminal block - UK 5 N - 3004362


Approvals

PRS		http://www.prs.pl/	TE/1824/880590/09
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KR		http://www.krs.co.kr/eng/main/main.aspx	HMB17372-EL001
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NK	ClassNK	http://www.classnk.or.jp/hp/en/	09 ME 141
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IECEE CB Scheme	CB scheme	http://www.iecee.org/	NL-26110
mm ² /AWG/kcmil	4		
Nominal voltage UN	800 V		

LR		http://www.lr.org/en	96/20013
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EAC	EAC		EAC-Zulassung
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EAC	EAC		7500651.22.01.00246
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DNV GL		http://exchange.dnv.com/tari/	TAE00001CT
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LR		http://www.lr.org/en	96/20013
mm ² /AWG/kcmil	2.5		

Feed-through terminal block - UK 5 N - 3004362

Approvals

Nominal current IN	24 A
Nominal voltage UN	800 V

cULus Recognized		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm
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Accessories

Accessories

Bridge

Fixed bridge - FB-150 METER - 0201595



Cross connection rail, for fixed bridging of identical inputs and outputs, made of Cu, nickel-plated, 1 m long

Cover profile

Cover - EA 5 - 1024014



Single covers, color: transparent

Cover - EA 5-WS - 1024085



Single covers, for covering one terminal block, with black symbol (lightning flash) snap fit, color: transparent/yellow

DIN rail

Partition plate - ATP-UK - 3003224


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Partition plate, length: 56 mm, width: 1.5 mm, height: 45.7 mm, color: gray



Key Commercial Data

Packing unit	1 STK
Minimum order quantity	50 STK
GTIN	 4 017918 090500
GTIN	4017918090500
Weight per Piece (excluding packing)	3.600 g
Custom tariff number	85472000
Country of origin	Germany

Technical data

General

Color	gray
Material	PA
Flammability rating according to UL 94	V2

Dimensions

Width	1.5 mm
Length	56 mm
Height	45.7 mm

General

Relative insulation material temperature index (Elec., UL 746 B)	130 °C
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Partition plate - ATP-UK - 3003224

Technical data

General

Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	130 °C
Static insulating material application in cold	-60 °C
Behavior in fire for rail vehicles (DIN 5510-2)	Test passed
Flame test method (DIN EN 60695-11-10)	V0
Oxygen index (DIN EN ISO 4589-2)	>32 %
NF F16-101, NF F10-102 Class I	2
NF F16-101, NF F10-102 Class F	2
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	28 MJ/kg
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Standards and Regulations

Flammability rating according to UL 94	V2
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3

Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

Classifications

eCl@ss

eCl@ss 4.0	27141199
eCl@ss 4.1	27141199
eCl@ss 5.0	27141145
eCl@ss 5.1	27141145
eCl@ss 6.0	27141133
eCl@ss 7.0	27141133
eCl@ss 8.0	27141133
eCl@ss 9.0	27141133

Partition plate - ATP-UK - 3003224

Classifications

ETIM

ETIM 2.0	EC000886
ETIM 3.0	EC000886
ETIM 4.0	EC000886
ETIM 5.0	EC000886
ETIM 6.0	EC000886

UNSPSC

UNSPSC 6.01	30211828
UNSPSC 7.0901	39121425
UNSPSC 11	39121425
UNSPSC 12.01	39121425
UNSPSC 13.2	39121425

End clamp - E/NS 35 N - 0800886

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End clamp, width: 9.5 mm, color: gray

Why buy this product

- Large-surface labeling

Key Commercial Data

Packing unit	1 STK
Minimum order quantity	50 STK
GTIN	 4 017918 129309
GTIN	4017918129309
Weight per Piece (excluding packing)	14.800 g
Custom tariff number	39269097
Country of origin	Germany

Technical data

Dimensions

Height	32.8 mm
Length	48.6 mm
Width	9.5 mm

General

Material	PA
Color	gray

Standards and Regulations

End clamp - E/NS 35 N - 0800886

Technical data

Standards and Regulations

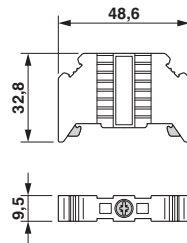
Flammability rating according to UL 94	V0
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Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

Drawings

Dimensional drawing



Classifications

eCl@ss

eCl@ss 4.0	27141199
eCl@ss 4.1	27141199
eCl@ss 5.0	27141135
eCl@ss 5.1	27141145
eCl@ss 6.0	27141135
eCl@ss 7.0	27141135
eCl@ss 8.0	27141135
eCl@ss 9.0	27141135

ETIM

ETIM 2.0	EC000761
ETIM 3.0	EC001041
ETIM 4.0	EC001041
ETIM 5.0	EC001041
ETIM 6.0	EC001041

UNSPSC

UNSPSC 6.01	30212109
UNSPSC 7.0901	39121708

Insertion bridge - EB 10- 6 - 0201139

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Insertion bridge, pitch: 6.2 mm, number of positions: 10, color: gray

RoHS

Key Commercial Data

Packing unit	1 STK
Minimum order quantity	10 STK
GTIN	 4 017918 098124
GTIN	4017918098124
Weight per Piece (excluding packing)	6.080 g
Custom tariff number	85389099
Country of origin	Poland

Technical data

Technical data

Color	gray
Material	CuZn (nickel-plated)
Number of positions	10
Pitch	6.2 mm
Flammability rating according to UL 94	V2

Standards and Regulations

Flammability rating according to UL 94	V2
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Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
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Insertion bridge - EB 10- 6 - 0201139

Technical data

Environmental Product Compliance

	No hazardous substances above threshold values
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Classifications

eCl@ss

eCl@ss 4.0	27141199
eCl@ss 4.1	27141199
eCl@ss 5.0	27141140
eCl@ss 5.1	27141140
eCl@ss 6.0	27141140
eCl@ss 7.0	27141140
eCl@ss 8.0	27141140
eCl@ss 9.0	27141140

ETIM

ETIM 2.0	EC000489
ETIM 3.0	EC000489
ETIM 4.0	EC000489
ETIM 5.0	EC000489
ETIM 6.0	EC000489

UNSPSC

UNSPSC 6.01	30211829
UNSPSC 7.0901	39121426
UNSPSC 11	39121426
UNSPSC 12.01	39121426
UNSPSC 13.2	39121426

Approvals

Approvals

Approvals

EAC

Ex Approvals

Insertion bridge - EB 10- 6 - 0201139

Approvals

Approval details

EAC		EAC-Zulassung
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ELECTRONIC/GLASS FUSES



GSA / GSA-V

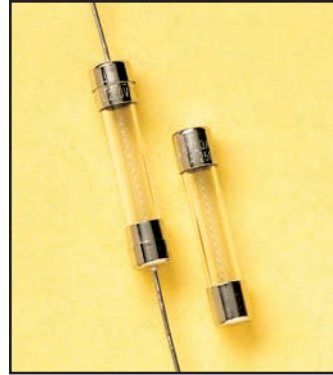
Ceramic Body
Time Delay
1/4" x 1-1/4"
1-1/2" Axial Leads Optional

1/16A through 8A, 250VAC, UL Listed - 10,12,15A, 250V UL Recognized
1/16A through 8A, 250VAC, CSA Certified - 10, 12, 15A, 250V CSA Recognized
20A, 250VAC, 25 & 30A, 125VAC

Standard Fuse Ampere Ratings

CATALOG NUMBER	AXIAL LEAD CAT. NO	AMPERE RATING	VOLTS	I.R.
GSA1/16	GSA-V1/16	1/16A	250V	1
GSA1/10	GSA-V1/10	1/10A	250V	1
GSA1/8	GSA-V1/8	1/8A	250V	1
GSA15/100	GSA-V15/100	15/100A	250V	1
GSA175/1000	GSA-V175/1000	175/1000A	250V	1
GSA3/16	GSA-V3/16	3/16A	250V	1
GSA2/10	GSA-V2/10	2/10A	250V	1
GSA1/4	GSA-V1/4	1/4A	250V	1
GSA3/10	GSA-V3/10	3/10A	250V	1
GSA3/8	GSA-V3/8	3/8A	250V	1
GSA4/10	GSA-V4/10	4/10A	250V	1
GSA1/2	GSA-V1/2	1/2A	250V	1
GSA6/10	GSA-V6/10	6/10A	250V	1
GSA7/10	GSA-V7/10	7/10A	250V	1
GSA3/4	GSA-V3/4	3/4A	250V	1
GSA8/10	GSA-V8/10	8/10A	250V	1
GSA1	GSA-V1	1A	250V	1
GSA1-1/4	GSA-V1-1/4	1-1/4A	250V	2
GSA1-1/2	GSA-V1-1/2	1-1/2A	250V	2
GSA1-6/10	GSA-V1-6/10	1-6/10A	250V	2
GSA2	GSA-V2	2A	250V	2
GSA2-1/4	GSA-V2-1/4	2-1/4A	250V	2
GSA2-1/2	GSA-V2-1/2	2-1/2A	250V	2
GSA2-8/10	GSA-V2-8/10	2-8/10A	250V	2
GSA3	GSA-V3	3A	250V	2
GSA3-2/10	GSA-V3-2/10	3-2/10A	250V	2
GSA3-1/2	GSA-V3-1/2	3-1/2A	250V	2
GSA4	GSA-V4	4A	250V	3
GSA5	GSA-V5	5A	250V	3
GSA6	GSA-V6	6A	250V	3
GSA6-1/4	GSA-V6-1/4	6-1/4A	250V	3
GSA7	GSA-V7	7A	250V	3
GSA8	GSA-V8	8A	250V	3
GSA10	GSA-V10	10A	250V	4
GSA12	GSA-V12	12A	250V	4
GSA15	GSA-V15	15A	250V	4
GSA20	GSA-V20	20A	250V	5
GSA25	GSA-V25	25A	125V	6
GSA30	GSA-V30	30A	125V	6

- 250VAC @ 35A I.R./125VAC @ 10kA I.R.
- 250VAC @ 100A I.R./125VAC @ 10kA I.R.
- 250VAC @ 200A I.R./125VAC @ 10kA I.R.
- 250VAC @ 750A I.R./125VAC @ 10kA I.R.
- 250VAC @ 400A I.R./125VAC @ 10kA I.R.
- 125VAC @ 400A I.R.



GDL / GDL-V

Glass Body
Time Delay
1/4" x 1-1/4"
1-1/2" Axial Leads Optional

1/16A through 8A, 250VAC, UL Listed and CSA Certified
10A through 15A, 125VAC, UL Listed and CSA Certified
20A through 30A, 32VAC, UL Listed to U.S. and Canadian safety standards

Standard Fuse Ampere Ratings

CATALOG NUMBER	AXIAL LEAD CAT. NO	AMPERE RATING	VOLTS	I.R.
GDL1/16	GDL-V1/16	1/16A	250V	1
GDL1/10	GDL-V1/10	1/10A	250V	1
GDL1/8	GDL-V1/8	1/8A	250V	1
GDL15/100	GDL-V15/100	15/100A	250V	1
GDL175/1000	GDL-V175/1000	175/1000A	250V	1
GDL3/16	GDL-V3/16	3/16A	250V	1
GDL2/10	GDL-V2/10	2/10A	250V	1
GDL1/4	GDL-V1/4	1/4A	250V	1
GDL3/10	GDL-V3/10	3/10A	250V	1
GDL3/8	GDL-V3/8	3/8A	250V	1
GDL4/10	GDL-V4/10	4/10A	250V	1
GDL1/2	GDL-V1/2	1/2A	250V	1
GDL6/10	GDL-V6/10	6/10A	250V	1
GDL7/10	GDL-V7/10	7/10A	250V	1
GDL3/4	GDL-V3/4	3/4A	250V	1
GDL8/10	GDL-V8/10	8/10A	250V	1
GDL1	GDL-V1	1A	250V	1
GDL1-1/4	GDL-V1-1/4	1-1/4A	250V	2
GDL1-1/2	GDL-V1-1/2	1-1/2A	250V	2
GDL1-6/10	GDL-V1-6/10	1-6/10A	250V	2
GDL1-8/10	GDL-V1-8/10	1-8/10A	250V	2
GDL2	GDL-V2	2A	250V	2
GDL2-1/4	GDL-V2-1/4	2-1/4A	250V	2
GDL2-1/2	GDL-V2-1/2	2-1/2A	250V	2
GDL2-8/10	GDL-V2-8/10	2-8/10A	250V	2
GDL3	GDL-V3	3A	250V	2
GDL3-2/10	GDL-V3-2/10	3-2/10A	250V	2
GDL4	GDL-V4	4A	250V	3
GDL5	GDL-V5	5A	250V	3
GDL6	GDL-V6	6A	250V	3
GDL6-1/4	GDL-V6-1/4	6-1/4A	250V	3
GDL7	GDL-V7	7A	250V	3
GDL8	GDL-V8	8A	250V	3
GDL10	GDL-V10	10A	125V	4
GDL12	GDL-V12	12A	125V	4
GDL15	GDL-V15	15A	125V	4
GDL20	GDL-V20	20A	32V	5
GDL25	GDL-V25	25A	32V	5
GDL30	GDL-V30	30A	32V	5

- 250VAC @ 35A I.R./125VAC @ 10kA I.R.
- 250VAC @ 100A I.R./125VAC @ 10kA I.R.
- 250VAC @ 200A I.R./125VAC @ 10kA I.R.
- 125VAC @ 10kA I.R.
- 32VAC @ 300A I.R.

C

Plastic label - UC-EMLP (60X15) - 0819330

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Plastic label, Sheet, white, unlabeled, can be labeled with: BLUEMARK CLED, BLUEMARK LED, CMS-P1-PLOTTER, PLOTMARK, mounting type: adhesive, lettering field size: 60 x 15 mm



Why buy this product

- The UC-EMLP ... UniCard labeling range includes self-adhesive device markers with good adhesive properties
- The markers, which are supplied in uniform sheets, can be labeled quickly and easily using the BLUEMARK LED
- The wide temperature range means that the labels can be used in control cabinets as well as the field
- The format automatically ensures printing with a high degree of positioning accuracy
- The sheets provide space for including function texts

RoHS

Key Commercial Data

Packing unit	1 STK
Minimum order quantity	10 STK
GTIN	 4 046356 152471
GTIN	4046356152471
Weight per Piece (excluding packing)	11.680 g
Custom tariff number	39269097
Country of origin	Poland

Technical data

Dimensions

Length (b)	15 mm
Width (a)	60 mm

Ambient conditions

Plastic label - UC-EMLP (60X15) - 0819330

Technical data

Ambient conditions

Ambient temperature (operation)	-40 °C ... 120 °C
Recommended storage conditions	23°C/50% relative humidity. Storage in a dry and dark place in the original packaging is recommended.

General

Color	white
Components	free from silicone and halogen
Flammability rating according to UL 94	V2
Material	PA
RoHS compliant	Yes
Wipe resistance	DIN EN 61010-1 (VDE 0411-1)
Number of individual labels	4
Number of individual labels per row	1
Adhesive	Acrylic
Printability	UV LED technology
Device	5147999 BLUEMARK CLED
Test for substances that would hinder coating with paint or varnish	VW PV 3.10.7:2005-02
Result	Test passed
Test specification weathering-resistance	Following ISO 4892-2:2013-03
Test duration	96 h
Wipe resistance test result	Test passed
Salt spray test specification	DIN EN 60068-2-11:2000-02
Test duration	96 h
Salt spray testing result	Test passed
Wipe resistance of test specification inscriptions	DIN EN 61010-1 (VDE 0411-1):2011-07
Result	Test passed
Adhesive strength	250 µm
Marking mounting type	adhesive
Result	Test passed
Oxygen index (DIN EN ISO 4589-2)	28,2%
Class I	3
Class F	2
R22	HL 1 - HL 2
R23	HL 1 - HL 2
R24	HL 1 - HL 2

Standards and Regulations

Wipe resistance	DIN EN 61010-1 (VDE 0411-1)
Flammability rating according to UL 94	V2

Plastic label - UC-EMLP (60X15) - 0819330

Technical data

Standards and Regulations

Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 2 HL 1 - HL 2 HL 1 - HL 2
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 2 HL 1 - HL 2 HL 1 - HL 2
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 2 HL 1 - HL 2 HL 1 - HL 2
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 2 HL 1 - HL 2 HL 1 - HL 2

Classifications

eCl@ss

eCl@ss 4.0	24190218
eCl@ss 4.1	24190218
eCl@ss 5.0	27141137
eCl@ss 5.1	27141137
eCl@ss 6.0	27141137
eCl@ss 7.0	27141137
eCl@ss 8.0	27149129
eCl@ss 9.0	27400629

ETIM

ETIM 2.0	EC000761
ETIM 3.0	EC000761
ETIM 4.0	EC000761
ETIM 5.0	EC001288
ETIM 6.0	EC001288

UNSPSC

UNSPSC 6.01	30211811
UNSPSC 7.0901	39121410
UNSPSC 11	39121410
UNSPSC 12.01	39121410
UNSPSC 13.2	39131504

Accessories

Accessories

Magazine

Plastic label - UC-EMLP (60X15) - 0819330

Accessories

Magazine - P1 UC-MAG 6 - 5146121



Magazine, for CMS-P1-PLOTTER and PLOTMARK, for accommodating UC-EMP..., UC-EMLP...

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SECTION 4

LOOSE SHIP PARTS

4.1

Parts Ship Loose with Skid

QTY	Description	Part #
1	Watts Pressure Regulating Valve	LF25AUB-HP-Z3
1	IBC TILTING CART	VESTIL IBC-TLT
1	1" HOSE ASSEMBLY PER DWG -201	3019800521-201

For Residential and Commercial Applications

Job Name _____

Contractor _____

Job Location _____

Approval _____

Engineer _____

Contractor's P.O. No. _____

Approval _____

Representative _____

LEAD FREE*

Series LF25AUB-Z3 Water Pressure Reducing Valves**

Sizes: 1/2" – 2" (15 – 50mm)

Series LF25AUB-Z3 Water Pressure Reducing Valves are designed to reduce incoming water pressure to a sensible level to protect plumbing system components and reduce water consumption. This series is suitable for water supply pressures up to 300psi (20.7 bar) and may be adjusted from 25 – 75psi (172 – 517 kPa). The LF25AUB-Z3 features Lead Free* construction to comply with Lead Free* installation requirements. The standard setting is 50psi (345 kPa). All parts are quickly and easily serviceable without removing the valve from the line. The standard bypass feature permits the flow of water back through the valve into the main when pressures, due to thermal expansion on the outlet side of the valve, exceed the pressure in the main supply.

Features

- Standard construction includes Z3 sealed spring cage and stainless steel corrosion resistant adjusting & cage screws for accessible outdoor or pit installations
- Union inlet connection
- Integral stainless steel strainer
- Replaceable seat module
- Lead Free* cast copper silicon alloy construction
- Serviceable in line
- Bypass feature controls thermal expansion pressure***
- High temperature resistant reinforced diaphragm for hot water

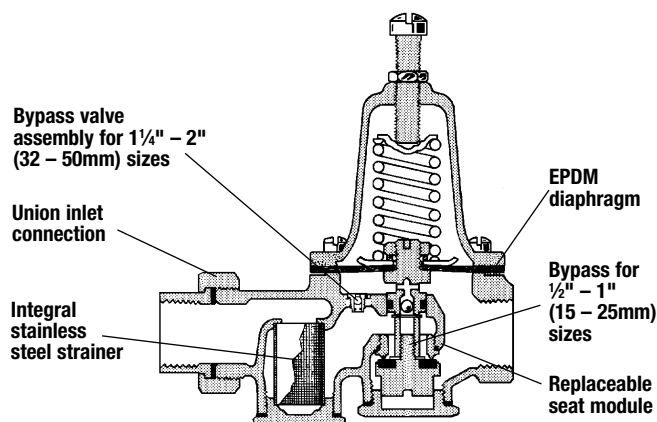
Models

LF25AUB-Z3-LP	NPT threaded female union inlet x NPT female outlet
LF25AUB-S-Z3	Solder union inlet x NPT female outlet
LF25AUB-DU-Z3	Double Union – NPT threaded union female inlet and outlet
LF25AUB-S-DU-Z3	Double Union – Solder union inlet and outlet
LF25AUB-DU-THDxPEX-Z3	Double Union – NPT threaded female inlet and PEX union outlet
LF25AUB-DU-LF-Z3	Double union body less fittings (3/4", 1", 1 1/4")
LF25AUB-QC-Z3	Single Union – Quick-Connect union inlet (1/2", 3/4", 1")
LF25AUB-DU-QC-Z3	Double Union – Quick-Connect inlet and outlet (1/2", 3/4", 1")

Specifications

A Water Pressure Reducing Valve with integral strainer shall be installed in the water service pipe near its entrance to the building where supply main pressure exceeds 60psi (413 kPa) to reduce it to 50psi (345 kPa) or lower. The water pressure reducing valve shall be constructed using Lead Free* materials. Lead Free* regulators shall comply with state codes and standards, where applicable, requiring reduced lead content. The valve shall feature a Lead Free* cast copper silicon alloy suitable for water supply pressures up to 300psi (20.7 bar). Provision shall be made to permit the bypass flow of water back through the valve into the main when pressures, due to thermal expansion on the outlet side of the valve, exceed the pressure in the main supply. Water Pressure Reducing Valve with built-in bypass check valves will be acceptable. Approved valve shall be listed to ASSE 1003 and IAPMO and certified to CSA B356. Valve shall be a Watts Series LF25AUB-Z3.

LF25AUB-Z3



*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

**A water saving test program concluded that reducing the supply pressure from 80-50psi (551-345 kPa) resulted in a water savings of 30%.

***The bypass feature will not prevent the pressure relief valve from opening on the hot water supply system with pressure above 150psi (10.3 bar).

Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold.

Materials

Body: Lead Free* copper silicon alloy
 Seat: 1/2"-1" (15-25mm) Replaceable engineered polymer (10% glass filled Noryl®)
 1 1/4"-2" (32-50mm) Replaceable stainless steel
 Integral Strainer: Stainless steel
 Diaphragm: Reinforced EPDM with PTFE wetted surface
 Valve Disc: EPDM

Pressure – Temperature

Temperature Range: 33°F – 160°F (0.5°C – 71°C)
 Maximum Working Pressure: 300psi (20.7 bar)
 Adjustable Reduced Pressure Range: 25-75psi (172 – 517 kPa)
 Standard Reduced Pressure Setting: 50psi (345 kPa)

Options

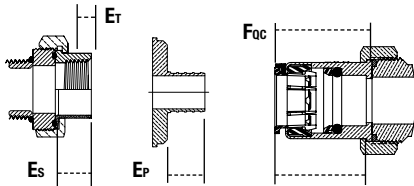
Add Suffix

G Gauge tapping, 1/8" (3mm)
 GG Gauge tapping and 160psi (11 bar) gauge
 HP High pressure range 75-125psi (5.2 – 8.6 bar) †
LP Low pressure range 10-35psi (69 – 241 kPa) †
 Z7 400psi (27.6 bar) initial pressure, 1/2" (20mm) models only

† Not available on G or GG models

Noryl® is a registered trademark of SABIC Innovative Plastics™

Dimensions – Weights



A - LF25AUB-Z3
 A1 - LF25AUB-S-Z3
 A2 - LF25AUB-DU-LF-Z3
 B - LF25AUB-DU-Z3
 B1 - LF25AUB-S-DU-Z3
 B2 - LF25AUB-DU-THDXPEX-Z3
 Et - NPT Engagement for tight joint
 Es - Female sweat socket depth
 Ep - PEX end connection
 Foc - Quick-Connect union

SIZE (DN)		DIMENSIONS													
		A		A1		A2		B		B1		B2		C	
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
1/2	15	5 3/8	137	5 1/16	135	5 3/16	132	6 7/16	164	6 3/8	162	-	-	7	178
3/4	20	5 1/16	135	5 1/2	140	5 1/4	133	6 1/2	165	6 3/8	175	6 3/4	171	7	178
1	25	6	152	6 1/4	159	5 7/8	149	7 3/8	187	7 13/16	198	7 11/16	195	8	203
1 1/4	32	8 3/4	222	8 15/16	227	8 1/4	210	10 3/4	273	11	279	-	-	9	229
1 1/2	40	8 3/4	222	9	229	8 1/4	210	10 3/4	273	11 3/16	284	-	-	9 1/2	241
2	50	9 1/4	235	10	254	8 3/4	222	11 5/16	287	12 11/16	322	-	-	11 1/4	286

SIZE (DN)		DIMENSIONS								WEIGHT							
		D		F ^Δ		G		Et		Es		Ep		Foc		lbs.	kgs.
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm		
1/2	15	1 1/2	38	9 1/16	240	3 1/8	79	1/2	13	1/2	13	-	-	1 1/2	38	3.5	1.6
3/4	20	1 1/2	38	9 1/16	240	3 1/8	79	1/2	13	3/4	19	5/8	16	1 11/16	42	3.5	1.6
1	25	1 3/4	44	10 7/16	266	3 5/8	92	5/8	16	15/16	23	13/16	21	1 3/4	45	6.5	3.0
1 1/4	32	2 1/8	54	11 7/16	291	3 5/8	92	5/8	16	1	25	-	-	-	-	10	4.5
1 1/2	40	2 3/8	60	11 15/16	304	4 1/8	103	5/8	16	1 1/16	28	-	-	-	-	10	4.5
2	50	3 1/4	83	13 11/16	348	4 3/4	121	5/8	16	1 5/16	34	-	-	-	-	15	6.8

Δ Dimension includes optional gauge



A Watts Water Technologies Company

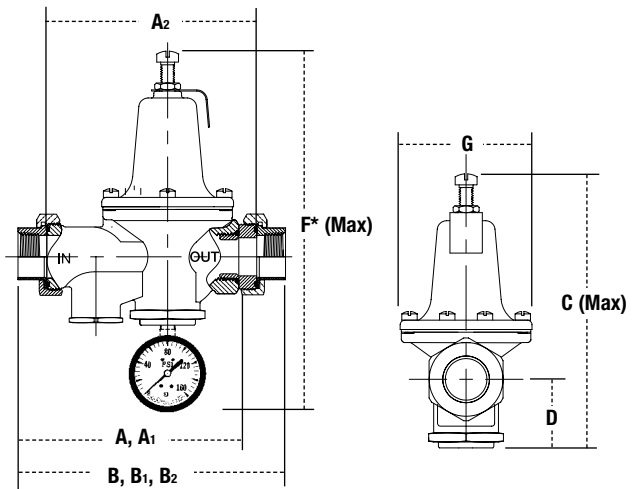
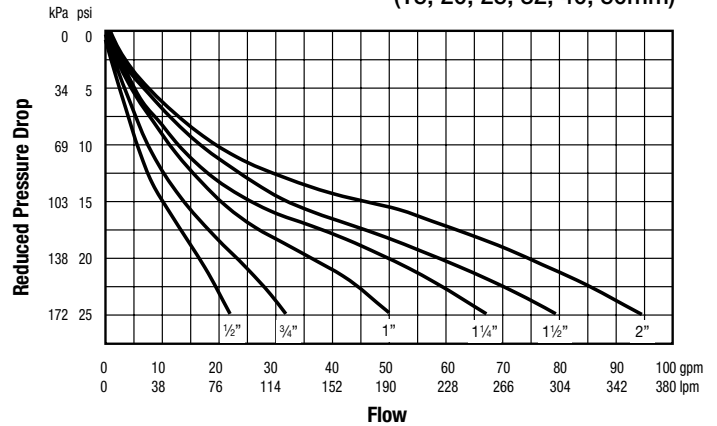
ES-LF25AUB 1415



Meets requirements of ASSE Standard 1003: ANSI A112.26.2: CSA Standard B356; Southern Standard Plumbing Code and listed by IAPMO. Military Standard MIL-V-18146B Type I.

Capacity

Sizes: 1/2", 3/4", 1", 1 1/4", 1 1/2", 2"
 (15, 20, 25, 32, 40, 50mm)



ISO 9001-2008
 CERTIFIED

USA: Tel: (978) 688-1811 • Fax: (978) 794-1848 • www.watts.com
 Canada: Tel: (905) 332-4090 • Fax: (905) 332-7068 • www.watts.ca

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Model: IBC-TLT



TILTING CART FOR INTERMEDIATE BULK CONTAINER

- Ergonomic handle for upright push position
- Rising design as weight diminishes
- Strong Construction for daily use
- Highly visible yellow finish

90 Days Warranty





41.1875 W
x 53.375 L x
35.8125 H

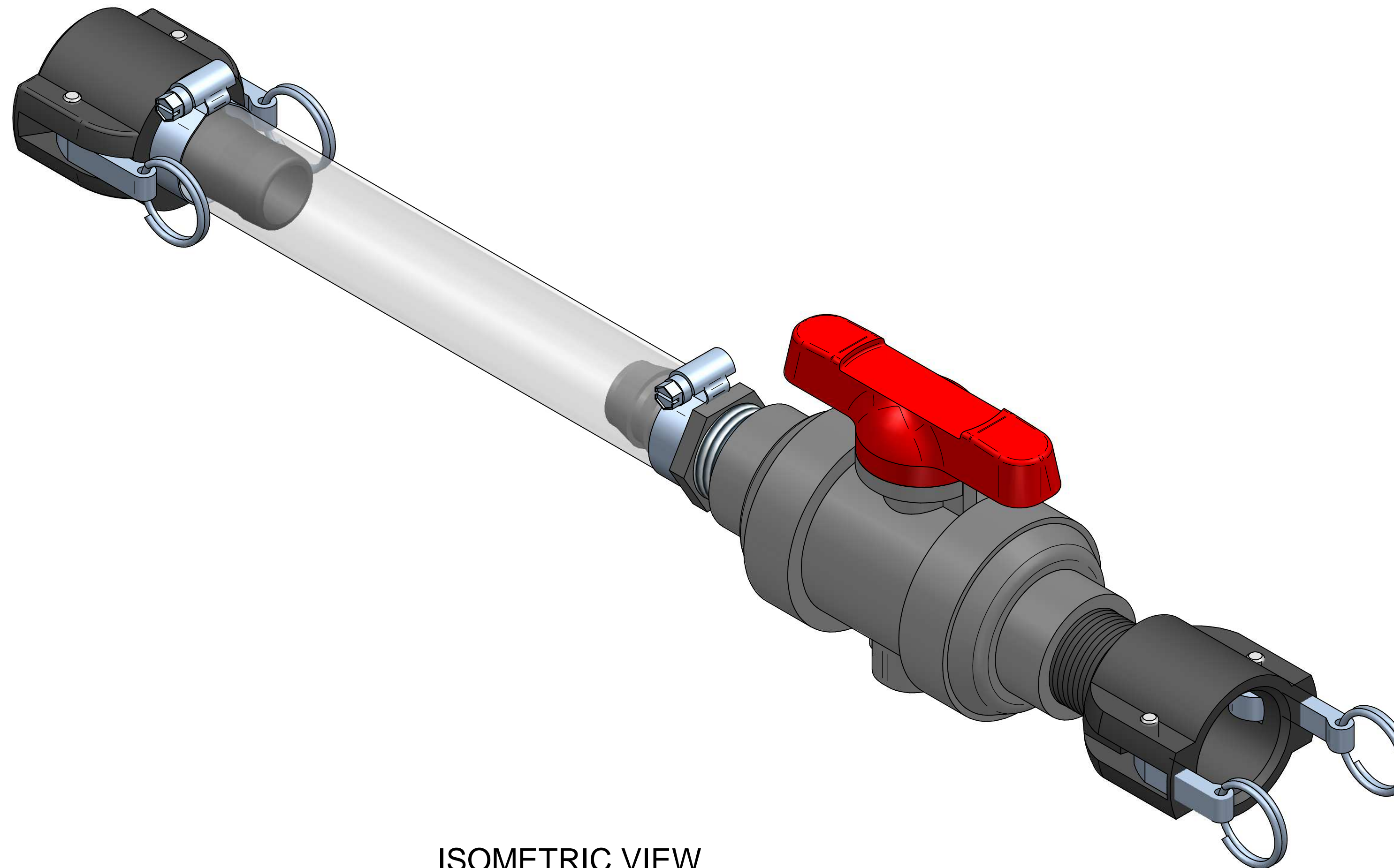
DIMENSIONS



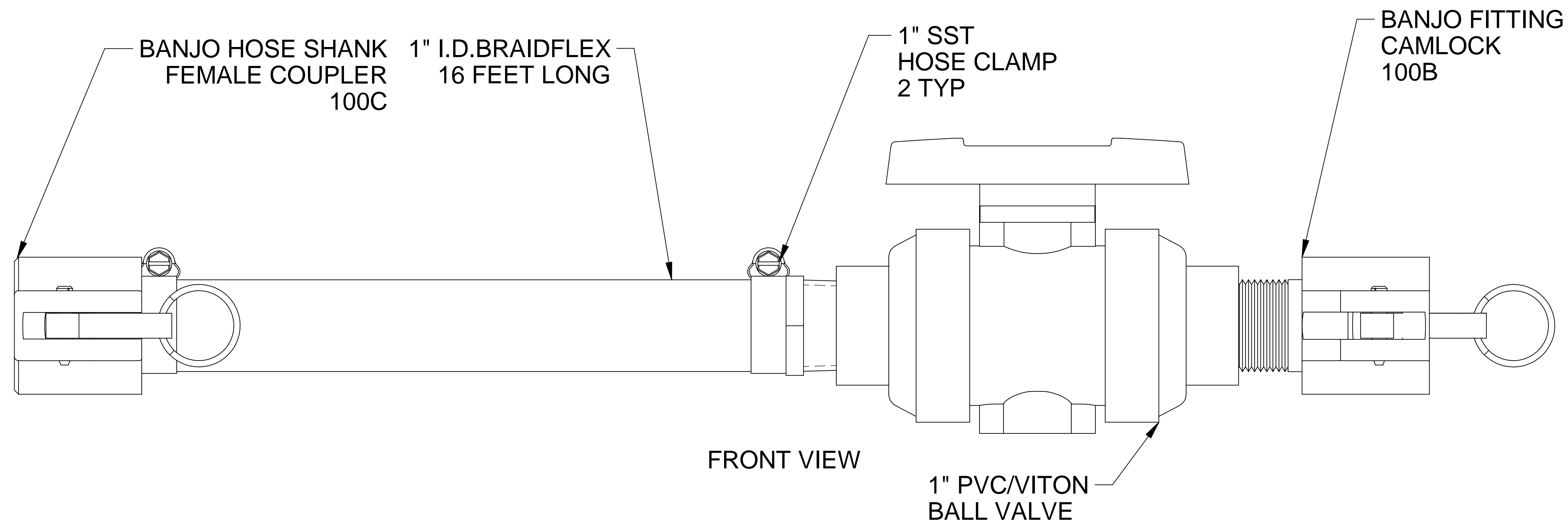
NaN
UNIT

Uniform Capacity (lb.)	4,400
Lowered Height (in.)	12-3/4
Raised Height (in.)	16-1/2
Usable Width (in.)	40-1/2
Usable Length (in.)	47-3/4


Tilt Up (degree)	5
	Download Approval Drawing
	Download Testing Certificate



ISOMETRIC VIEW



FRONT VIEW

0	11/18/19	FIRST ISSUE	TJB		
REV	DATE	DESCRIPTION	BY	APPD	REVD
REVISIONS					
CUSTOMER PROMINENT FLUID CONTROLS, INC. (DISTRICT OF SOOKE)					
JOB No 3019800521		PURCHASE ORDER No 119078285			
TITLE POLYMER SOLUTION HOSE ASSEMBLY GENERAL ARRANGEMENT					
THIS DRAWING IS THE PROPERTY OF PROMINENT FLUID CONTROLS INC. AND SHALL NOT BE COPIED OR TRANSFERRED WITHOUT THE WRITTEN CONSENT OF PROMINENT FLUID CONTROLS INC.					
ENGINEERS SEAL		 ProMinent [®] THE PROMINENT GROUP OF COMPANIES			
		PITTSBURGH, PA USA		WWW.PROMINENT.US	
PROMINENT FLUID CONTROLS LTD. 490 SOUTHGATE DRIVE. GUELPH, ONTARIO, CANADA N1H 6J3 TEL. 519 836 5692 FAX. 519 836 5226		PROMINENT FLUID CONTROLS INC. RIDC PARK WEST 136 INDUSTRY DRIVE. PITTSBURGH P.A., USA. 15275 TEL. 412 787 2484 FAX. 412 787 0704			
DESIGNED TJB		APPROVED CM			
DRAWN TJB		SCALE N.T.S.			
CHECKED SK		DATE 11/18/19			
DWG No 3019800521-201			REV 0	PAGE 1/1	



SEEPEX, Inc.
511 Speedway Drive
Enon, OH 45323
Phone (937) 864-7150
Fax (937) 864-7157
www.seepeex.com

LETTER OF TRANSMITTAL

November 25, 2019

Alfa Laval Inc
101 Milner Avenue
Scarborough, ON M1S 4S6

Subject: PC Pump submittal **SEEPEX Job #** P02007447
Project Name: Livingston # 286553 **SEEPEX Sales:** Willie Hoddess
Customer: Alfa Laval **SEEPEX Engineer:** David Brewer
Purchase Order: 1876993 **Items sent*:** S

*S – Submittals	*D – Drawings	*A – Seismic Anchorage Calculations
*O – O&M manuals	*T – Test Reports	*R – Request for Information

Remarks:

Please find the attached submittal for the above referenced project.



Progressive Cavity Pump Submittal

Supply of **SEEPEX Inc.** pumps & accessories consisting of engineering drawings, descriptive literature, operating data, and related information.

Submittal Prepared For:

Alfa Laval
101 Milner Avenue
Scarborough, ON M1S 4S6
Phone: 416-299-6101

Livingston #286553

PO # 1876993

SEEPEX Job # P02007447

Submittal for partial fulfillment of specification sections:

N/A

Equipment List

Application	Pump Type	Commission #	Equipment Tag #
Sludge Pumps	BN 35-6L	875325-875326	

Submittal Prepared By:

SEEPEX Inc.
511 Speedway Dr.
Enon, OH 45323
Phone: 937-864-7150

November 2019

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Section		Page
1	Sludge Feed Pumps - CN 875325-875326	
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	Dimensional Drawing	
	Pump Sectional Drawing	
	Parts List	
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	Over Pressure Protection	
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	Nameplate	

Section 1.1

Pump Technical Data

Order No. P02007447
 Data sheet 875325-875326
 Version 1 Item 10

SEEPEX.
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SEEPEX Inc.
 511 Speedway Drive
 Enon, OH 45323
 Phone (937) 864-7150
 sales.us@seepex.com
 www.seepex.com

SEEPEX

Order No.	P02007447
Date	10/22/2019
Commission no.	875325-875326
Offer No.	500160293/2 - 10
Customer	Alfa Laval Inc.
Purchase order no.	1876993
Project	CA-PWW15-0047 Epcor Sooke, BC

qty.: 2 **Progressive cavity pump**
BN 35-6L / A1-C1-L8-F0-GA

Application data

U 000 XXX001

Conveyed product	Sludge
Flowability	flowable
Viscosity	low viscosity (< 500 cP/mPas)
Solids content	1.5%
Size of solids	not specified
Density	1.0
Product temperature	32°F - 113°F
pH value	5-9
Kind of operation	continuous
Operating hours	8 h/day
Location	indoor, dry atmosphere
Altitude of installation	up to 1000 m assumed
Surrounding temperature	normal (32-113°F)

Performance data

	Capacity	Pressure	Speed	
	70 USGPM	60 psi	175 rpm	min
	135 USGPM	60 psi	320 rpm	max
Starting torque	250 lb.ft			
Req. operating power at pump shaft	8.4 HP			
Inlet pressure	flooded suction (up to 0,5bar)			
NPSHr	10.76 ft			

Tolerances according to SEEPEX standards.

Materials and executions

Installation	horizontal
Direction of rotation	counter clockwise (left)
Lantern - Design	with cover plates
Lantern - Material	EN-JL 1040 (gci-25)
Lantern - Flange diameter	250 mm
Suction casing - Design	standard
Suction casing - Material	EN-JL 1040 (gci-25)
Pressure branch - Design	standard
Pressure branch - Material	EN-JL 1040 (gci-25)
Position of branch	position 1
Suction connection	5" ANSI B16.5 Class 150 RF
Pressure connection	4" ANSI B16.5 Class 150 RF
Joint - Design	rotorsided UJ-sleeve prot. 1.4404, divided
Joint - Material	standard
Joint - Universal joint sleeve: material	NBR - Perbunan
Joint - Joint Grease	joint grease SEEPEX 30321

Order No. P02007447
Data sheet 875325-875326
Version 1 Item 10

Coupling rod - Design standard
Coupling rod - Material 1.4021 / AISI 420
Rotor - Design standard
Rotor - Material 1.0503 (C45) / AISI 1045
Rotor - Coating ductile chromium coating
Stator - Design standard, with TSE, sensor sleeve 1.4404
Stator - Material NBR - Perbunan
Shaft sealing mechanical seal
Code GA - single acting mechanical seal
Shaft diameter 70 mm
Make SEEPEX
Type GA Q1Q1 VGG
Casing - material 1.4408 / ASTM A351 grade CF8M
Casing - connection standard NPT
Plug-in Shaft - Design standard
Plug-in Shaft - Material 1.4021 / AISI 420
Plug-in Shaft - Drilling diameter 40
Plug-in Shaft - Drilling depth 75
Bolting - Design standard
Painting - Number of colors single-colored standard
Painting - Painted components complete combination
Painting - Color Standard Enamel (SEEPEX Blue)
Painting - Surface protection std. surface protection C2 (NDFT 95 µm)

Drive

Drive Type Gear motor at freq. inv.
Type Gearmotor
Make SEW
Model RF77AM132S/M/RS/DRN132M4/FF
Mounting position B5
Ratio (i) 5.31
Speed 334 rpm
Flange diameter 250 mm
Shaft diameter 40 mm
Shaft length 80 mm
Shaft drawing 716/0170-002B4

	Norm	Min	Max
Speed	330 rpm	175 rpm	320 rpm
Motor speed	1750 rpm	929 rpm	1696 rpm
Frequency	60 Hz	32 Hz	58 Hz

Rated output 10 HP
Rated speed 1740 rpm
Starting direct on frequency inverter
Efficiency class high efficiency
Voltage 3 x 230/460 V
Frequency 60Hz
Thermal class F

Remark for drive with backstop

Baseplate

Order No. P02007447
Data sheet 875325-875326
Version 1 **Item 10**

SEEPEX.
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Design extended - with motor support
Material steel, painted
GPU Type Code B-ST-LS-EM

TSE

Design standard design, complete
- sensor sleeve fitted to the stator of the pump with integrated temperature sensor
- connection head (IP55)
- separate TSE control device suitable for mounting inside a control panel
Voltage 110-115 V / 50-60 Hz
Temperature coefficient NTC
Material sensor sleeve 1.4404 / AISI 316L
Material connection head aluminium

Pressure sensor

Isolation ring make Ashcroft
Isolation ring type Type 80 Wafer
Design Isol. ring w/ gauge and switch
Body material 1.0037 (st. 37-2)
Plate material carbon steel
Elastomer NBR - Perbunan
Isolation ring size 4"
Flange rating not applicable
Gauge size 4.5" display
Gauge make Ashcroft
Gauge range 0-100 psi
Gauge type 1009
Fill fluid silicone oil
Switch make Ashcroft
Switch function High pressure (increasing)
Switch type B-series model B4 24 B
Switch range 0-100 psi
Switch set point 75 psi

Packing

Type of packing skid (US)

Quality Assurance

Design SEEPEX Standard 2 Point Performance Test
Document Standard SEEPEX form FO.QA.04e

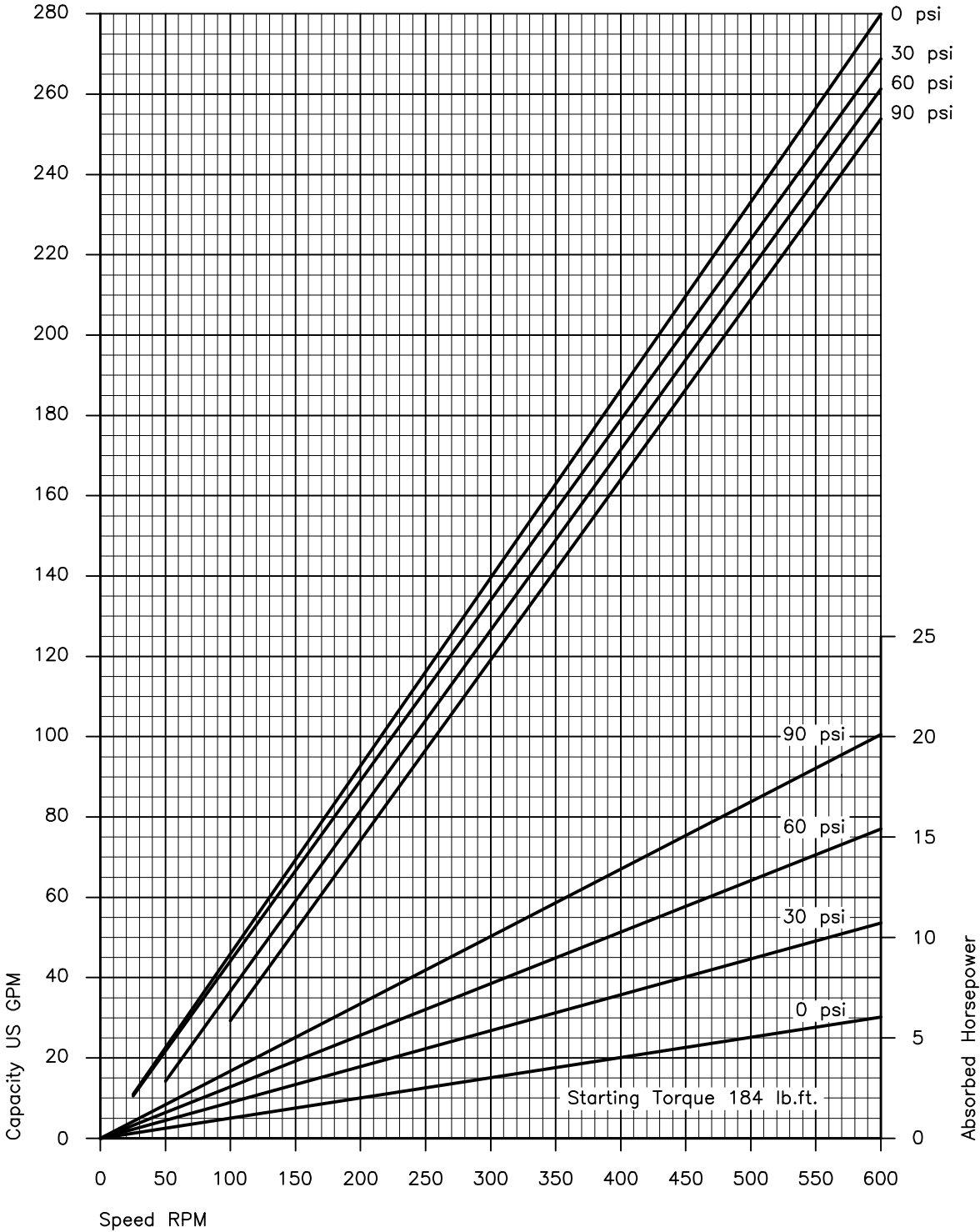
Quality Assurance

Design HI Hydrostatic Test
(150% working pressure for 5 minutes)
Document Standard SEEPEX form FO.QA.35e
QA Testing Mode SEEPEX standard

Documentation

Dimensional drawing 262-C14/0170-C-707A4
Sectional drawing 062-022C1
Mechanical seal drawing 262-0GA/0170-0-084A3
Operation Manual 2 x Print English (US)

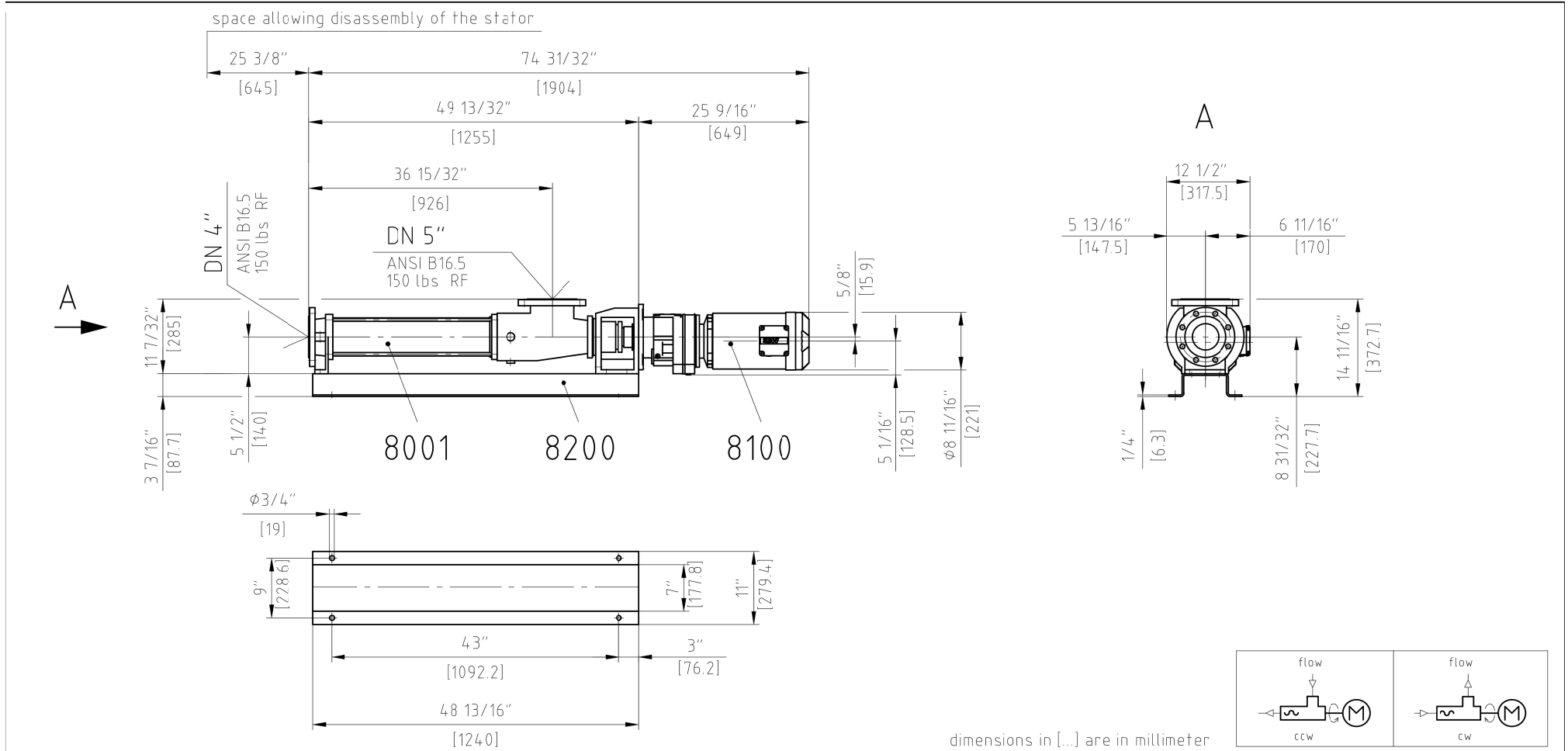
Characteristic Curves
 Size
35-6L



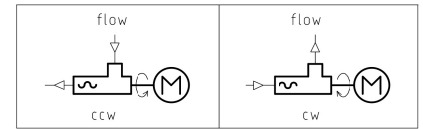
Values based upon water 68°F ; For notes on drive selection refer to PER

Section 1.2

Pump Equipment - Assembly



dimensions in [...] are in millimeter

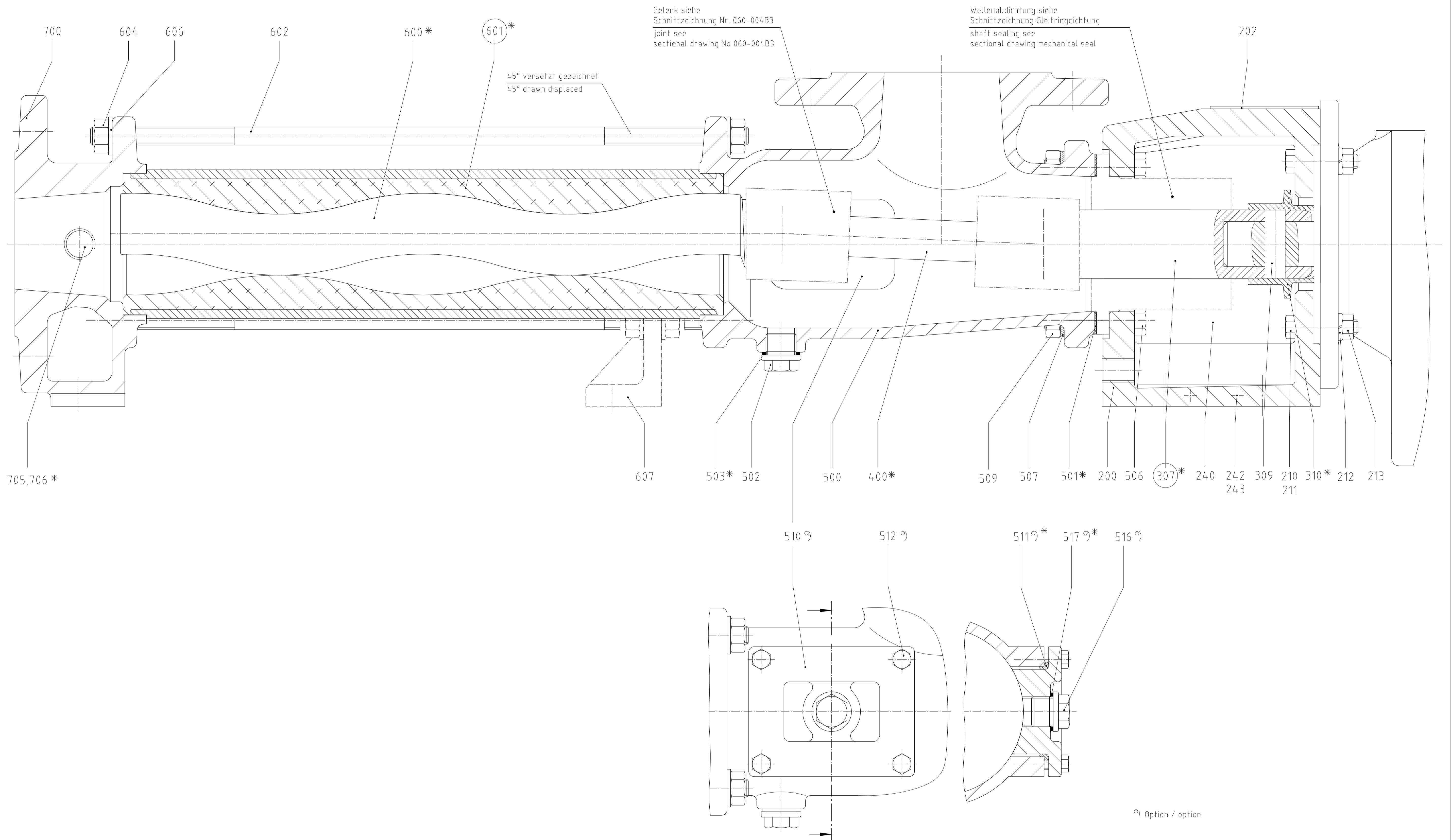


1	baseplate:	8200	Var.: 801-200/0170-C-100	28	
1	drive: SEW RF77DRE132MC	8100		97	
1	pump: BN 17-12 / 35-6L / 55-6LT / 30-12T	8001		110	
Quant.	Denomination	Item	Material	Note	Weight / kg

seepex.com

seepex, Inc.
511 Speedway Drive
Enon, OH 45323
www.seepex.com

2013	Name	Day	Scale	Note	Denomination
Drawn	com	21.08.	⊙ 1:20	Weight	dimensional drawing
Checked	her	22.08.	EDP-No.		Drawing-no.
			131907.dwg		262-C14/0170-C-707A4



°) Option / option

Stück Unit	Norm Standard	Benennung/Denomination Zeichnungs-Nummer/Drawing-Number	Werkstoff/Material	Bemerkung/Remark	Gewicht Weight kg
---------------	------------------	--	--------------------	------------------	-------------------------

SEEPEX. ALL THINGS FLOW		Allgemeintoleranzen für Maße ohne einzelne Toleranzangabe General tolerances for mass without individual tolerance entry DN ISO 2768-mittel		Änderung Modification Name Date 12.11.2002		Maßstab/Scale Bezeichnung/Denomination Schnittzeichnung Baureihe "BN" sectional drawing range "BN"		Werkstoff/Material Gewicht/Weight	
Reihe 2		C AD611 ebo		30.03.2019		Schnittzeichnung Baureihe "BN" sectional drawing range "BN"		Name Date 30.05.1997	
Reihe 2		C AD611 ebo		30.03.2019		Schnittzeichnung Baureihe "BN" sectional drawing range "BN"		Name Date 30.05.1997	
Reihe 2		C AD611 ebo		30.03.2019		Schnittzeichnung Baureihe "BN" sectional drawing range "BN"		Name Date 30.05.1997	

○ Werkzeuge
Betriebs- und Montageanleitung
entnehmen

Tools
see operating and
assembly instruction

* Verschleißteile und Dichtungen
Betriebs- und Montageanleitung
entnehmen

Wearing parts and sealings
see operating and
assembly instruction

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Stck.	Pos.	DE	EN	FR
		Baureihe BN	range BN	série BN
		Schnittzeichnung Nr. 062-002D1	sectional drawing no. 062-002D1	plan no. 062-002D1
		Benennung Stck. / Pos.	denomination Qty. / Item	désignation Qté. / Poste
1	200	Laterne	lantern	lanterne
1	202	Typenschild	type plate	plaque signalétique
4	210	6kt-Schraube	hexagon bolt	vis
	211	6kt-Schraube	hexagon bolt	vis
4	212	Federring	spring washer	rondelle frein
4	213	6kt-Mutter	hexagon nut	écrou
2	240	Abdeckblech	cover plate	tôle de protection
4	242	Zylinderschraube	socket screw	vis à tête cylindrique
4	243	Federring	spring washer	rondelle frein
1	300	Stopfbuchsgehäuse	gland housing	boitier de presse étoupe
6	301	Packungsring	packing ring	tresses
1	302	Stopfbuchsbrille	packing gland	fouloir
2	303	Hammerschraube	gland bolt	vis de fouloir
2	304	6kt-Mutter	hexagon nut	écrou
1	307	Steckwelle	plug-in shaft	arbre à broche
1	309	Steckwellenbolzen	plug-in shaft pin	cheville pour arbre à broche
1	310	Spritzring	splash ring	bague de projection
1	400	Kuppelstange	coupling rod	barre d'accouplement
2	401	Gelenkhülse	retaining sleeve	douille d' articulation
2	402	Kuppelstangenbolzen	coupling rod pin	axe d' articulation
4	403	Führungsbuchse	guide bushing	douille de guidage
2	404	Kuppelstangenbuchse	coupling rod bushing	chemise d' axe
2	405	Manschette	universal joint sleeve	manchette
2	406	Halteband	holding band	collier de serrage
2	407	Halteband	holding band	collier de serrage
1	500	Sauggehäuse	suction casing	carter d' aspiration
1	501	Sauggehäusedichtung	casing gasket	étanchéité du carter d' aspiration
3	502	Verschlusschraube	screwed plug	bouchon de vidange
3	503	Dichtring	sealing ring	joint d' étanchéité
4	506	6kt-Schraube	hexagon bolt	vis
4	507	Fächerscheibe	fan type lock washer	rondelle à dents chevauchantes extérieures
4	509	6kt-Mutter	hexagon nut	écrou
2	°) 510	Reinigungsdeckel	cleanout	couvercle de nettoyage
2	°) 511	Dichtung	gasket	étanchéité
8	°) 512	6kt-Schraube	hexagon bolt	vis
2	°) 516	Verschlusschraube	screwed plug	bouchon de vidange
2	°) 517	Dichtring	sealing ring	joint d' étanchéité
1	600	Rotor	rotor	rotor
1	601	Stator	stator	stator
4	602	Spannschraube	tie bolt	tirant
8	604	6kt-Mutter	hexagon nut	écrou
8	606	Scheibe	washer	rondelle
1	607	Stützbock	trestle	ped
1	700	Druckstutzen	pressure branch	bride de refoulement
1	705	Verschlusschraube	screwed plug	bouchon de vidange
1	706	Dichtring	sealing ring	joint d' étanchéité

Stck.	Pos.	DE	EN	FR
		Baureihe BN Schnittzeichnung Nr. 062-002D1 Benennung Stck. / Pos.	range BN sectional drawing no. 062-002D1 denomination Qty. / Item	série BN plan no. 062-002D1 désignation Qté. / Poste
	098	SEEPEX Gelenkfett Typ und Füllmenge: Betriebs- und Montageanleitung entnehmen	SEEPEX joint grease type and filling quantity: see operating and assembly instruction	SEEPEX graisse d' articulations sommaire pour type et quantité: voir instructions de montage et de fonctionnement
		Verschleißteile und Dichtungen: Betriebs- und Montageanleitung entnehmen	Wearing parts and sealings: see operating and assembly instruction	pièces d'usure et étanchéités: voir instructions de montage et de fonctionnement
		Werkzeuge: Betriebs- und Montageanleitung entnehmen	Tools: see operating and assembly instruction	Outils: voir instructions de montage et de fonctionnement
		versetzt gezeichnet	drawn displaced	plan séparé
	°)	Option	option	option

Section 1.3

Pump Equipment - OEM Products

SEEPEX MECHANICAL SEAL

Type GA-60

Features:

- For plain shafts
- Single and Dual Acting
- Rotating Elastomer Bellows
- Unbalanced
- Independent of direction of rotation
- No torsion on bellows

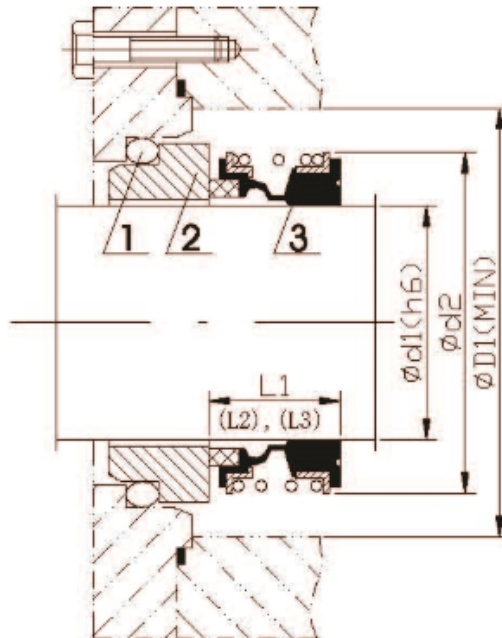
Advantages:

- Shaft protection over the entire seal length
- Protection of the seal face during installation due to special bellows design
- Insensitive to shaft deflections due to large axial movement ability
- Universal application opportunities



Major parts (in acc. to DIN24960) and description:

1. Seal ring for Static Ring
2. Static Ring
3. Rotating ring subassembly



Recommended Applications:

- Water and waste water technology
- Food and beverage industry
- Pulp and paper industry
- Chemical industry
- Water, waste water, slurries (up to 5 % by weight)
- Pulp (up to 4 % otro)
- Latex
- Dairies, beverages
- Sulfide slurries
- Chemicals
- Oils
- Chemical standard pumps
- Helical screw pumps
- Stock pumps
- Circulating pumps
- Submersible pumps
- Water and waste water pumps
- Oil applications

Operation range:

Shaft diameter: $d_1 = 10 \dots 100 \text{ mm}$ (0.39" ... 3.94")

Pressure: $p_1^* = 10 \text{ bar}$ (145 PSI),

vacuum ... 0.5 bar (7.25 PSI), up to 1 bar (14.5 PSI) with seat locking

Temperature: $t = -20 \text{ }^\circ\text{C} \dots +140 \text{ }^\circ\text{C}$ (-4 °F ... +284 °F)

Sliding velocity: $v_g = 10 \text{ m/s}$ (33 ft/s)

Admissible axial movement: $\pm 2.0 \text{ mm}$

Materials:

Rotary Face: Silicon Carbide (Q1), Carbon (A)

Static Face: Silicon Carbide (Q1)

Elastomer: EPDM (E), FKM (V)

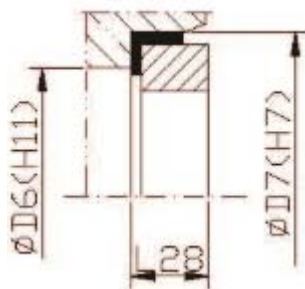
Metal Parts: CrNiMo steel (G)

Notes:

The GA-60 can also be used as a multiple seal in tandem or in a back-to-back arrangement. Installation proposals can be supplied on request. Dimension adaptations for specific conditions are available on request.

Available Seat Option:

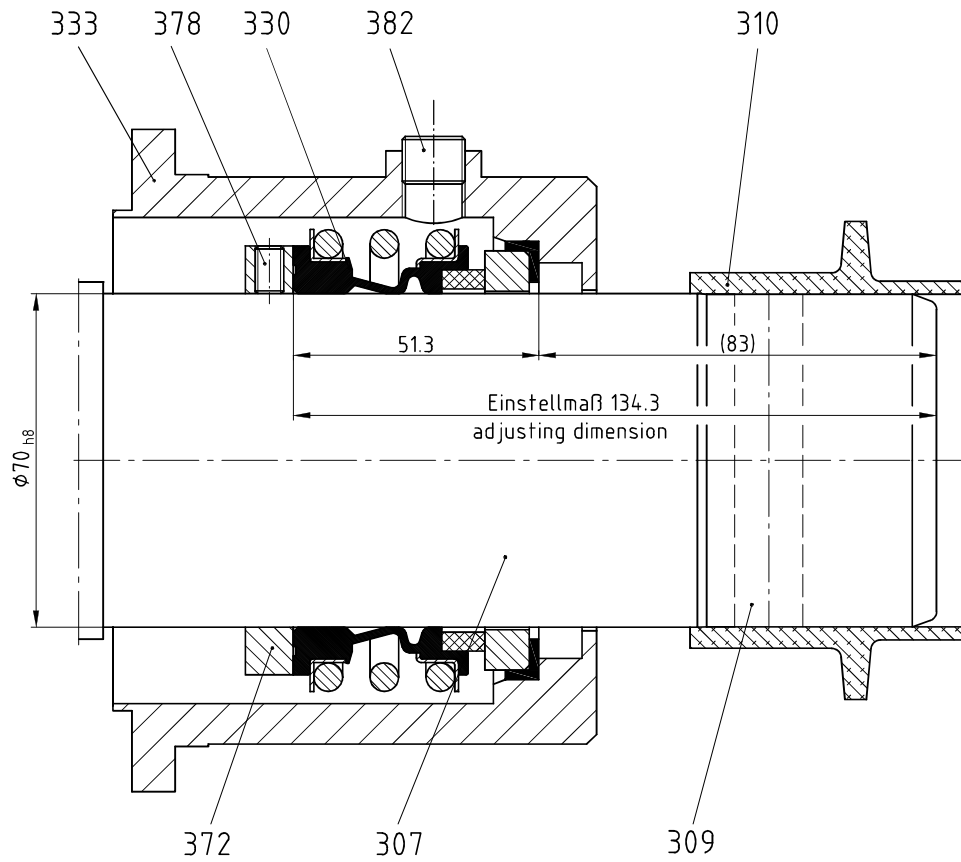
G60
EN 12756



Dimensions:

d1	d2	D1	L1	L2*	L3*	D11	D12	L14	L12	D6	D7	D5	L8	L9	L10	L28
18	32	33	19.5	30	37.5	24	30	8	8	27	33	3	19.5	11.5	8.5	7.5
20	37	38	21.5			29.5	35	7.5	8.5	29	35					
22	37	38				31	37									
24	42.5	44	2.5	32.5	40	32	38	33	39							
25	42.5	44	23			32	38	34	40							
28	49	50	26.5	35	42.5	36	42	9	10	37	43					
30	49	50				39.2	45	10.5	11.5	39	45					
32	53.5	55				27.5	42.2	48	11	12	42					
33	53.5	55	44.2	50	42		48									
35	57	59	28.5	30	36	46.2	52	10.3	11.3	44	50					
38	59	61	30.5			47.5	49.2			55	10.3	11.3	49	56		
40	62	64					52.2	58	10.8	11.8	51	58				
43	62.5	67					53.3	62	12	13.2	54	61				
45	68	70	38			47.5	55.3	64	11.6	12.6	56	63				
48	70.5	74					59.7	68.4			59	66				
50	74	77	60.8			69.2	62	70								
53	78.5	81	33			36.5	47.5	63.8	72.3	12.3	13.5	65	73			
55	81	83	35					66.5	75.4	67	75					
58	88.5	88	37			41.5	52.5	69.5	78.4	13.3	14.5	70	78			
60	88.5	91	38	71.5	80.4			72	80							
65	93.5	96	40	76.5	85.4			13	14.2	77	85					
68	96.5	100		41.2	82.7	91.5	13.7	14.9	81	90						
70	99.5	103		48.7	60	83	92	13	14.2	83	92					
75	107.5	110	90.2			99	14	15.2	88	97						
80	112	116	48	43	60	85.2	104	15	16.2	95	105					
85	120	124	41			100.2	109	14.8	16	100	110					
90	127	131	45			105.2	114			105	115					
95	132	136	46	51	65	111.6	120.3	15.8	17	110	120					
100	137	140	47			114.5	123.3			115	125					

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sales@seepex.com
www.seepex.com

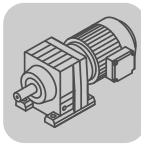


Stück Unit	Norm Standard	Pos./Item	Benennung/Denomination Zeichnungs-Nummer/Drawing-Number	Werkstoff/Material	Bemerkung/Remark	Gewicht Weight kg
1		382	Verschlußschraube / screwed plug		1/4"NPT	
3		378	Gewindestift / set screw		M6 x 10	
1		372	Stellring / set collar			
1		333	GLRD-Gehäuse / mechanical seal casing			
1		330	GLRD / mechanical seal		Fabrikat / make : SEEPEX	
1		310	Spritzring / splash ring			
1		309	Steckwellenbolzen / plug-in shaft pin			
1		307	Steckwelle / plug-in shaft			

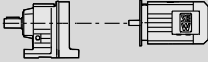
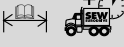
SEEPEX. ALL THINGS FLOW

Allgmeintoleranzen für Maße ohne einzelne Toleranzeintragung DIN ISO 2768-mittel General tolerances for mass without individual tolerance entry DIN ISO 2768-average Rauheit für Oberflächenzeichen DIN ISO 1302 Reihe 2 Roughness for surface finish indication DIN ISO 1302 Reihe 2	Aus- gabe Issue Änderung Modification Name Name Datum Date Bearbeitet/Drawn jap Geprüft/Checked kno Normiert/Standard Gedruckt/Printed	Name Name Datum Date 18.06.2014 18.06.2014 EDV-Nr./EDP-No. L:\ALFDZCHNG.1390\139019.dwg Ersatz für/Replacement for: Ersetzt durch/Replacement by:	Maßstab/Scale 1:1 Werkstoff/Material Bezeichnung/Denomination GLRD - Schnittzeichnung mechanical seal sectional drawing SEEPEX GA- 70 cup seat NPT Zeichnungs-Nummer/Drawing-Number 262-0GA/0170-0-084A3	Gewicht/Weight Gewicht/Weight kg
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R..DRE/DRS
R..DRE/DRS [HP]

P _m [HP]	n _a [rpm]	T _a [lb-in]	i	F _{Ra} ¹⁾ [lb]	SEW f _B			m [lbs]			
10	9.4	67200	188.45	12200	1.05						
	10	62200	174.40*	12400	1.15						
	11	55800	156.31	12700	1.25						
	13	50300	141.12*	12900	1.40						
	14	45700	128.18	13100	1.55	R	137	DRE	132MC4	670	269
	16	40500	113.72	13200	1.75	RF	137	DRE	132MC4	720	270
	17	36800	103.20*	13300	1.90	RM	137	DRE	132MC4	960	270
	20	31600	88.70*	13500	2.2						
	22	28800	80.91*	13500	2.4						
	24	26200	73.49	13600	2.7						
	17	36600	102.53	6810	1.05						
	19	33000	92.70	7070	1.15						
	23	28000	78.57	6830	1.35						
	24	26000	72.88	6720	1.45	R	107	DRE	132MC4	475	267
	27	23400	65.60*	6560	1.60	RF	107	DRE	132MC4	490	268
	30	21200	59.41	6410	1.80	RM	107	DRE	132MC4	680	268
	34	18800	52.68	6220	2.0						
	37	17000	47.63	6070	2.2						
	44	14400	40.37*	5810	2.6						
	25	25700	72.17	3370	1.05						
	27	23200	65.21	4980	1.15						
	30	21300	59.92	4900	1.25						
	33	18900	53.21	4790	1.40						
	37	16900	47.58	4680	1.55	R	97	DRE	132MC4	350	265
41	15200	42.78	4580	1.75	RF	97	DRE	132MC4	385	266	
48	13200	37.13	4430	2.0	RM	97	DRE	132MC4	500	266	
53	11800	33.25	4320	2.2							
64	9840	27.58	4130	2.4							
55	11400	32.05	4280	2.00	R	97	DRE	132MC4	345	265	
65	9700	27.19	4110	2.3	RF	97	DRE	132MC4	380	266	
71	8930	25.03	4030	2.8	RM	97	DRE	132MC4	495	266	
48	13100	36.84*	3460	1.05	R	87	DRE	132MC4	260	262	
54	11600	32.66*	3390	1.20	RF	87	DRE	132MC4	275	263	
64	9950	27.88	3280	1.35	RM	87	DRE	132MC4	340	263	
64	9940	27.84*	3280	1.40							
76	8350	23.40	3160	1.65							
83	7670	21.51	3100	1.75							
93	6810	19.10	3010	1.85	R	87	DRE	132MC4	255	262	
104	6090	17.08*	2930	2.0	RF	87	DRE	132MC4	275	263	
116	5480	15.35	2850	2.2	RM	87	DRE	132MC4	340	263	
133	4750	13.33	2750	2.4							
149	4260	11.93	2670	2.6							
179	3530	9.90*	2540	3.0							
94	6710	18.80	1520	1.05							
100	6360	17.82*	1590	1.10							
114	5560	15.60	1720	1.20							
126	5010	14.05	1810	1.25							
144	4400	12.33	1770	1.40							
163	3880	10.88	1720	1.50	R	77	DRE	132MC4	200	259	
184	3440	9.64	1670	1.60	RF	77	DRE	132MC4	210	260	
207	3060	8.59	1660	1.80	RM	77	DRE	132MC4	265	260	
229	2760	7.74	1610	1.95							
261	2420	6.79	1560	2.1							
296	2130	5.99*	1510	2.2							
334	1890	5.31*	1460	2.4							
140	4530	12.70	1240	1.00							
154	4120	11.54	1340	1.05							
178	3560	10.00	1310	1.15							
204	3100	8.70*	1280	1.25							
228	2780	7.79	1260	1.20	R	67	DRE	132MC4	185	256	
241	2620	7.36*	1240	1.25	RF	67	DRE	132MC4	195	257	
283	2230	6.27	1200	1.30	RM	67	DRE	132MC4	230	257	
312	2030	5.70	1170	1.35							
360	1760	4.93	1130	1.45							
413	1530	4.29	1090	1.55							

Backstop AM../RS

The AM adapter can be configured with a backstop if the application only requires one direction of rotation. Backstops with centrifugally disengaging wedge elements are used. This design offers the advantage that, above a certain speed (lift-off speed), the wedge elements move around inside the backstop without making contact. As a result, the backstops operate with no wear or power loss. They are maintenance-free and can be used at high speeds.

Dimensions:

The backstop is completely integrated within the adapter. This means there is no difference in dimensions between an adapter with or without a backstop (see dimension sheets in the AM adapter section).

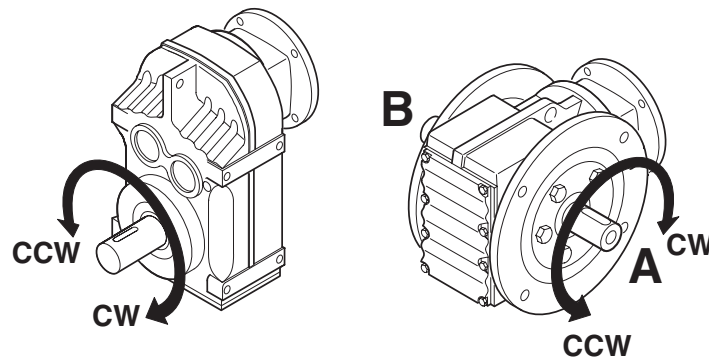
Locking torques:

Type	Maximum locking torque of backstop	Lift-off speed
	lb-in	rpm
AM80/90, AM143/145	796.5	640
AM100/112, AM 182/184	3009	600
AM 132, AM 213/215	6195	550
AM160/180, AM254-286	10620	630
AM 200/225, AM324-365	12832.5	430

Specify output direction of rotation when ordering

When you order a gear unit with an adapter and backstop, the required direction of rotation of the output shaft/output end must be specified. The direction of rotation is specified as viewed onto the output shaft/output end of the gear unit. For drives with shaft extensions at ends A and B, the direction of rotation must be specified as viewed onto end A.

To avoid damage, the direction of rotation of the drive must be checked before starting up the machine.



CCW - Counterclockwise
CW - Clockwise

Section 1.4

Accessories and Instrumentation

1. Functioning of the dry-running protection device (TSE)

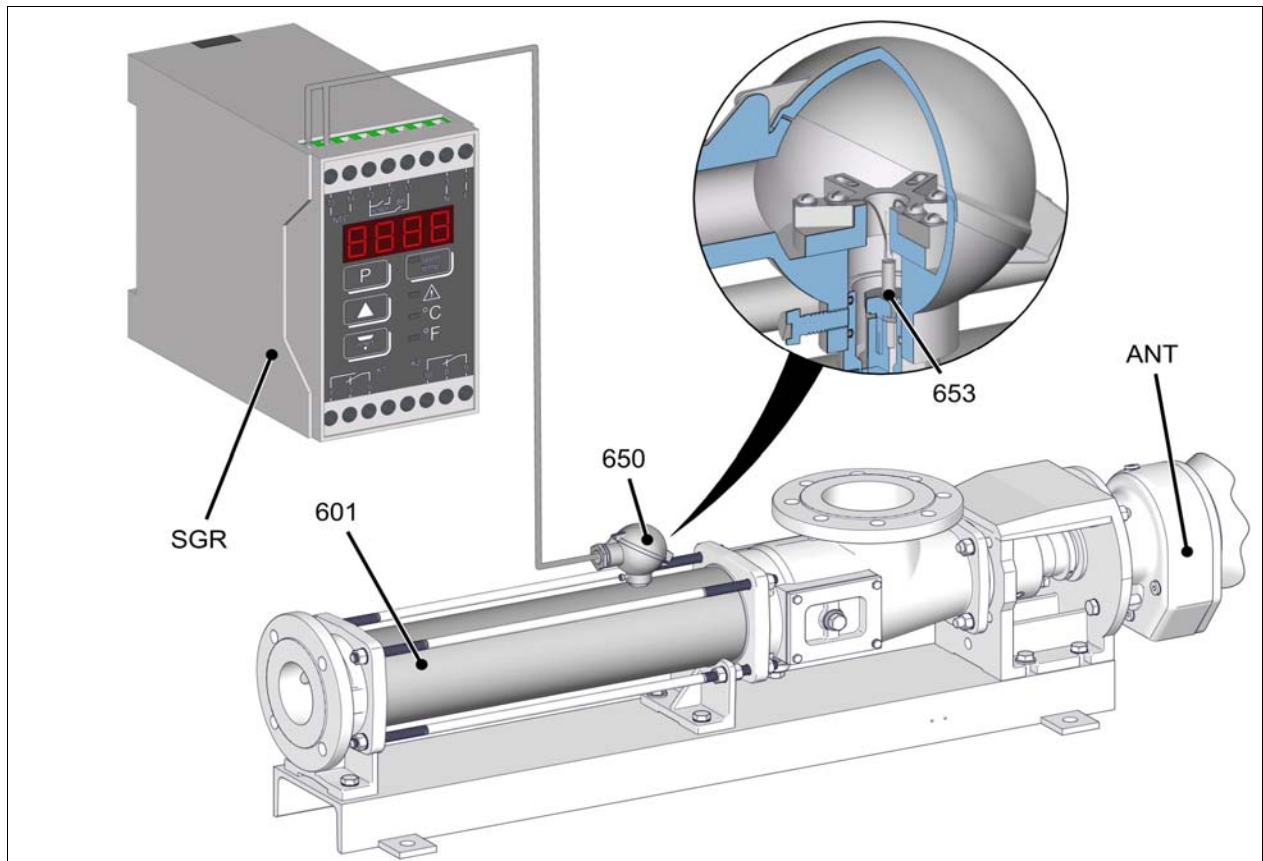


Figure similar

Item	Designation	Item	Designation
SGR	Control device	653	Thermistor sensor
601	Stator	ANT	Drive
650	Connection head		

- The temperature in the stator (**601**) is continuously compared with the set shut-off temperature at the TSE control device (**SGR**).
- The temperature in the stator (**601**) is measured using a thermistor sensor (**653**) in the connection head (**650**).
- Two relays switch in parallel within the TSE control device (**SGR**) on reaching the shut-off temperature.
 - An error message is triggered and the drive (**ANT**) of the pump can be shut off using potential-free change-over contacts.
- Automatic restart of the pump is prevented by a necessary acknowledgement of the error message.

2. Technical data of the dry-running protection device (TSE)

2.1. Structural design connection head (650)

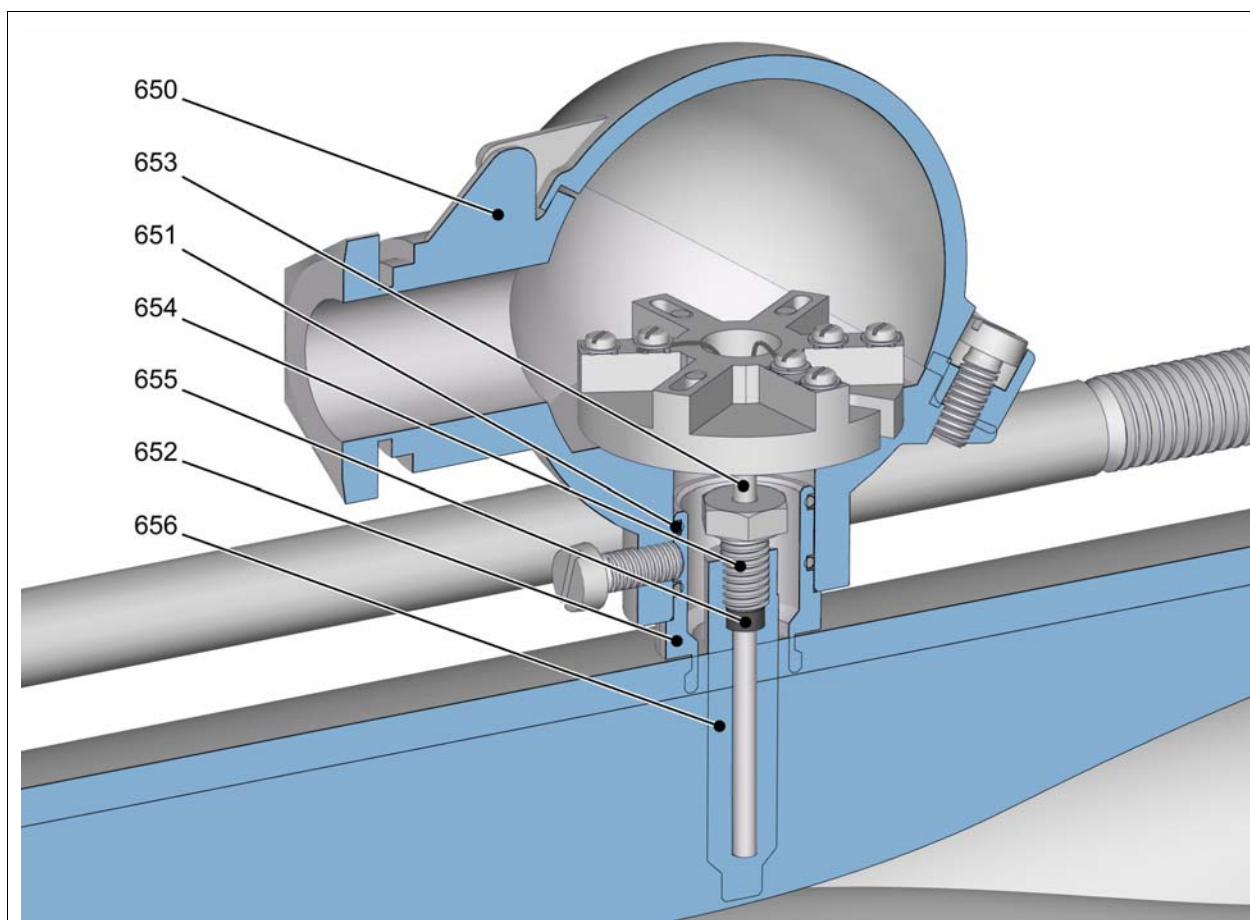


Figure similar

Item	Designation	Item	Designation
650	Connection head	654	Clamping screw
651	O-ring	655	Rubber ring
652	Screw socket	656	Sensor sleeve
653	Thermistor sensor		

Thermistor sensor

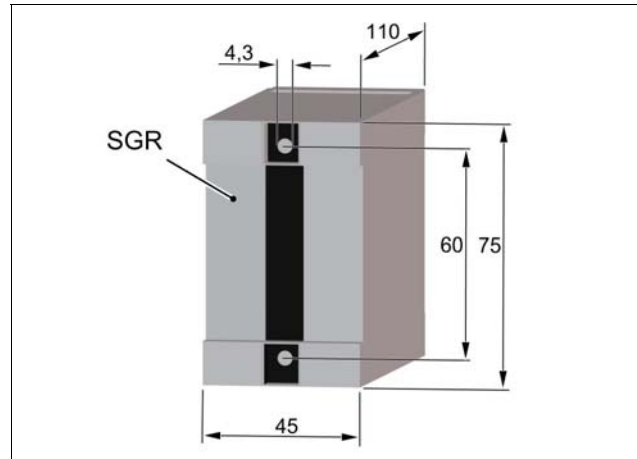
- The temperature is measured at the stator through an NTC resistor (thermistor sensor) with a protective sleeve.
 - Permissible temperature range: 0-150 °C
 - Standard resistor: 10 kΩ at 25 °C
- For more thermistor sensor resistance values (→ chapter 9.).

2.2. TSE control device

i

- Install TSE control device (**SGR**) on the basis of the IP protection in a suitable casing (e.g., switch cabinet).

- Install TSE control device (**SGR**) on DIN rail or with screw connection on mounting plate in the switch cabinet.



Types:	<ul style="list-style-type: none"> – SGRTSE 230 V ACB – SGRTSE 115 V ACB – SGRTSE 24 V ACB – SGRTSE 24 V DCB
Relay output:	2 potential-free changeover contacts (K1, K2), switching capacity 500 VA at 110-230 V resistive load
Input:	NTC thermistor sensor 10 kΩ at 25 °C, with sensor breakage guard at -25 °C
Temperature range:	0 to 150 °C
Power consumption:	maximum 4 VA
Sensor circuit:	<ul style="list-style-type: none"> – Open-circuit voltage maximum 2.5 V DC – Short-circuit current maximum 0.5 mA DC
Display at the device:	<ul style="list-style-type: none"> – Malfunction (dry running) – Shut-off temperature
Operation at the device:	<ul style="list-style-type: none"> – Setup shut-off temperature – Reset alert
Protection:	<ul style="list-style-type: none"> – Casing IP 40 – Terminals IP 20
Ambient temperature:	0 to 50 °C

3. Connect TSE control device

DANGER



Risk of fatal injury from electrical current.

There is an immediate danger of fatal electric shock as a result of contact with live parts.

- Observe safety regulations.
- Disconnect the control device from all energy sources before working on terminals.
- Prevent electrical connections from being switched on again.
- Ensure that residual voltage is not present at any electrical connections of the pump.

3.1. Check line voltage

- Check the line voltage/nominal voltage according to type plate of the control device before connecting and commissioning.
 - Permissible mains voltage variations of the nominal device voltage +/- 10 %.

NOTICE

Mains power failure.

Malfunction and/or irreparable damage to the pump.

- Install the thermistor sensor leads shielded.
- Ground the shield on one side.

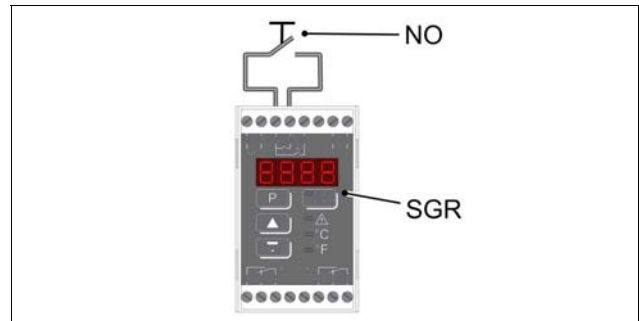
3.2. Terminal connections

1, 3	Operating voltage
11, 13	Operating hours counter of potential-free contact
12, 13	Button (NO) - external fault reset
14, 15	Thermistor sensor
5, 6, 7	Relay output K1 (malfunction message)
8, 9, 10	Relay output K2 (malfunction message)



3.3. Connecting button (NO) (optional)

- Connect button (**NO**) to terminal 12 and 13 of the TSE control device (**SGR**).
- After dry running, release TSE control device (**SGR**) with button (**NO**)
 - See chapter Operation of the dry-running protection device (→ chapter 5.).



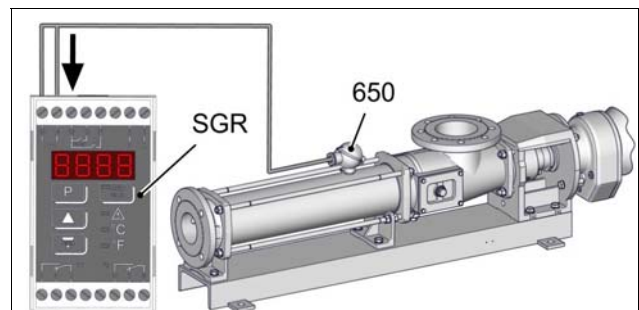
3.4. Use relay function

Actual temperature > shut-off temperature	Malfunction (dry-running)
Contact 6, 5 and 9, 8	closed
Contact 6, 7 and 9, 10	open

- Relays K1 and K2 are in parallel and they work together.
 - K1: Switch-off condition integrated in motor contactor control.
 - K2: optional connection to the fault sensor or process computer (reserve).

3.5. Connect thermistor sensor

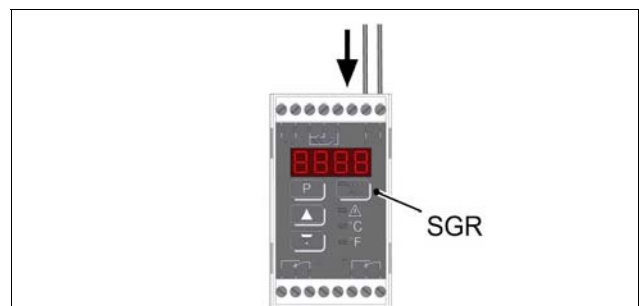
- Connect the connection cable of thermistor sensor of the connection head (**650**) to terminals 14 and 15 of the TSE control device (**SGR**).



Similar illustration

3.6. Connect operating voltage

- Connect operating voltage to terminals 1 and 3 of the TSE control device (**SGR**).
 - See technical data of TSE control device (**SGR**) (→ chapter 2.2.).
 - Note the regulations of the local power supply company and country-specific regulations.



4. Commissioning the dry-running protection device (TSE)

NOTICE

Conveying product temperature different from technical pump data (→ chapter 3).

Malfunction and/or irreparable damage to the pump can occur.

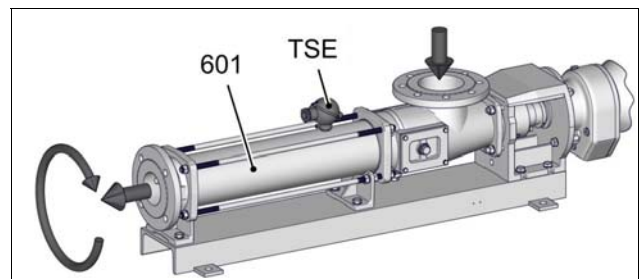
➤ Consult with SEEPEX.

4.1. Note the fitting position of the dry-running protection device (TSE)

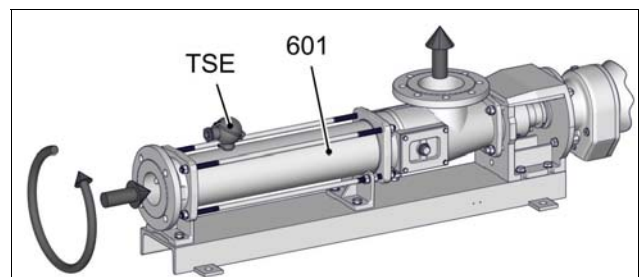
- The dry-running protection device (TSE) is always installed on the suction side during delivery.

⚠ DANGER Installation of the dry-running protection device (TSE) on the pressure side.

- Note the fitting position of the dry-running protection device (TSE).
 - The drilling for the dry-running protection device (TSE) in the stator (601) should always be on the suction side.



counter clockwise rotating pump



clockwise rotating pump

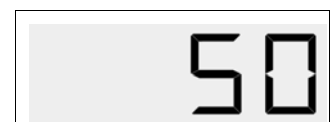
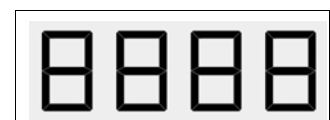
Figures similar

Check the functionality

- Switch on TSE control device.
 - Digital display lights up.
- TSE control device starts self-test.
 - Currently set shut-off temperature is displayed.



- Keep (**stator temp.**) button pressed.
- Read temperature value.



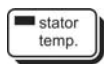
i

- Functionality is present if the display is in accordance with the existing temperature.
- In the case of any discrepancies and functional failures, see chapter Malfunctions, Causes and Rectification (→ Chapter 8).

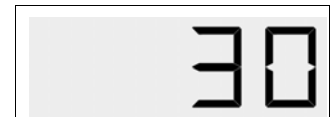
Set the switch-off temperature

Determining stator operating temperature

- Shut-off temperature is set at 50 °C when delivered.
- During commissioning, maintain shut-off temperature of 50 °C.
- Commission the pump for 30 to 60 minutes to stabilise the stator operating temperature.



- Hold **(stator temp.)** button with the pump running.
 - Read operating temperature to set the final shut-off temperature.



- Set shut-off temperature at the TSE control device.
 - Set shut-off temperature 10 °C higher than the displayed or maximum operating temperature during operation.



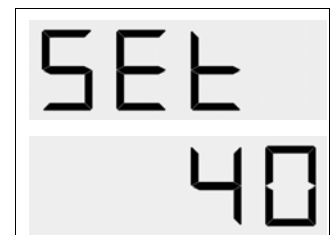
Fine adjustments



- Confirm modification of the corrected shut-off temperature within 10 seconds with button **(P)**, otherwise TSE control device will change without saving the corrected shut-off temperature.



- Press button **(P)** briefly.
 - Setup mode is displayed.
 - The display shows alternating "SET" and the category temperature set last.



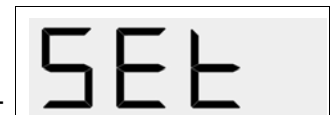
- Increase shut-off temperature.
 - Value changes initially by +1 °C at a time, after approx. 3 s in +10 °C steps.



- Reduce shut-off temperature.
 - Value changes initially by -1 °C at a time, after approx. 3 s in -10 °C steps.



- Press button **(P)** briefly.
 - Operating mode is displayed.
 - Adjusted shut-off temperature is transmitted to the permanent memory and shown on the display.

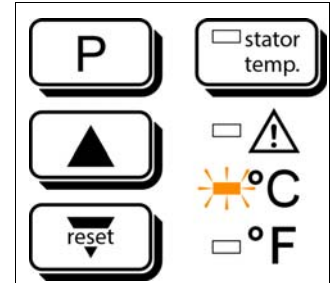


Change the temperature unit

- Changing the temperature unit from °C (degree Celsius) to °F (Fahrenheit):



- To change the temperature unit from °C to °F, press (▲) button for 10 s.
- Yellow LED next to the symbol °C or °F lights up.



5. Operation of the dry-running protection device (TSE)

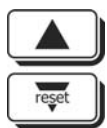
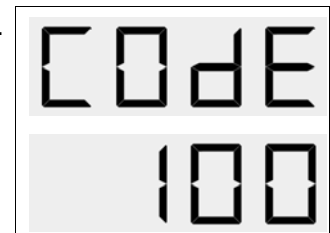
5.1. Call operating hour counter

i

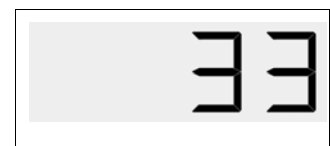
- The TSE control device includes an operating hour counter.
- Activate operating hour counter.
 - Bridge terminal 11 and 13.
- The operating hours can be called on the service level. The access to the service level is possible only after a code number has been entered.



- Press (P) button for approx. 5 s, until display “CodE” appears.
 - The display shows alternating "CodE" and "100".

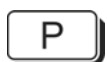


- Using the arrow keys (▼/▲) set code “33”.



- Press button (P) briefly.
 - Code will be acknowledged.
 - Access into the service level.

Display alternating: “Hi” and “value” • No function



- Press button (P) briefly.
 - Change to next parameter/display value.



Display alternating: “bh.Hi” and “value” • Operating hour counter (displayed value x 10000)



- Press button (P) briefly.
 - Change to next parameter/display value.



Display alternating: "bh.Lo" and "value" • Operating hour counter (displayed value x 1)

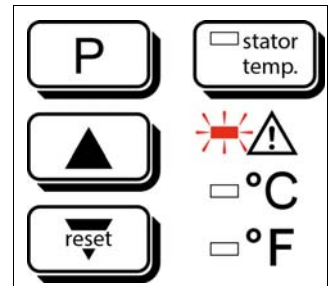


- Press button **(P)** briefly.
 - Change to the operating mode.



5.2. Release TSE control device after dry running

- The installed relays switch off and remain locked in this position if the set shut-off temperature at the TSE control device is exceeded.
 - Red LED lights up and signals an alert.



- Acknowledge alert/release relay:
 - Press button on the TSE control device or external button (closer) on terminal 12 and 13 for at least 1 s, in order to release TSE control device.



- Shut-off operating voltage at the TSE control device (terminal 1 and 3).
 - Press external contact (button, closed for at least 1 s).

6. Functional failure

NOTICE Thermistor sensor or wire break. Short-circuit in the thermistor sensor or in the line. Overshooting or undershooting of the measuring range (-25-150 °C). Alert (**Err I**) is displayed and drive of the pump shuts off.

- Inspection of the TSE control device and sensor circuit including thermistor sensor.



6.1. Thermistor sensor performance check

- Remove thermistor sensor supply line from the connection head (**650**).

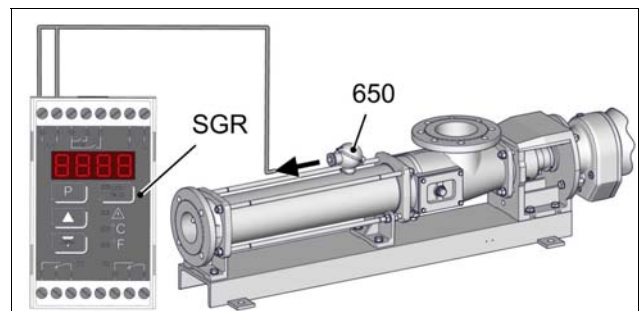


Figure similar

- Connect resistor measuring unit (**MTT**) to connection head (**650**).

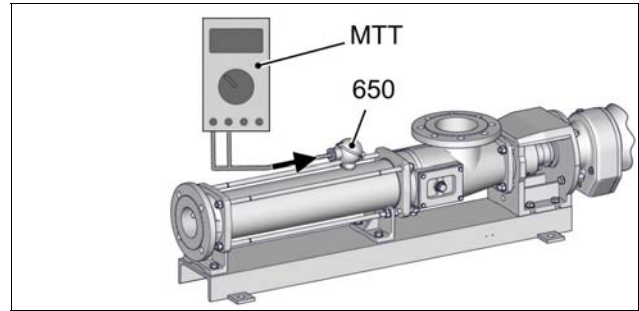


Figure similar

- Determine electrical resistance and compare with temperature of the pump:

Ttemperature °C	0	10	20	25	30	40	50	60
Resistor Ω	32650	19900	12490	10000	8057	5327	3603	2488

Ttemperature °C	70	80	90	100	110	120	130	140
Resistor Ω	1752	1255	950	678	510	389	301	235

- For more thermistor sensor resistance values (→ chapter 9.).
- In the case of discrepancies in the resistor value > 10 % of the set value, there is a defect in the thermistor sensor.
 - Replace thermistor sensor (→ chapter 7. /8. , Dismantling/Assembly of Dry-running protection device).
- In the case of correct values, there is a defect in the thermistor sensor supply line or the connection terminals.
 - Check connections.

6.2. Performance check TSE control device

- Disconnect thermistor sensor supply line from terminals 14 and 15 of the TSE control device (**SGR**).

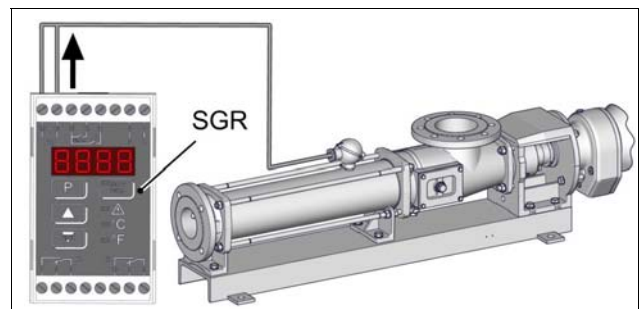
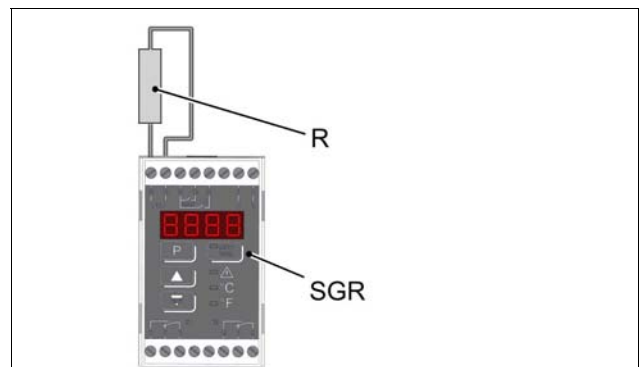


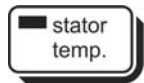
Figure similar

- Connect commercially available carbon film or metal film resistor (**R**) in accordance with the following values to terminals 14 and 15 of the TSE control device (**SGR**):



Resistor Ω	10000	5600	2200	1000	560	220
Switching temperature °C	25	39	63	87	107	143

- Switch on TSE control device.
 - Digital display lights up.



- Keep **(stator temp.)** button pressed and read temperature value.
 - Read value must correspond with the switching temperature allocated to the resistor used.



- In the case of a display deviation of more than 5-10 °C or in the case of no display, replace TSE control device.

7. Dismantle pump-sided parts of dry-running protection device (TSE)

- Follow the instructions in the chapter Shut-down (→ chapter 6).

NOTICE

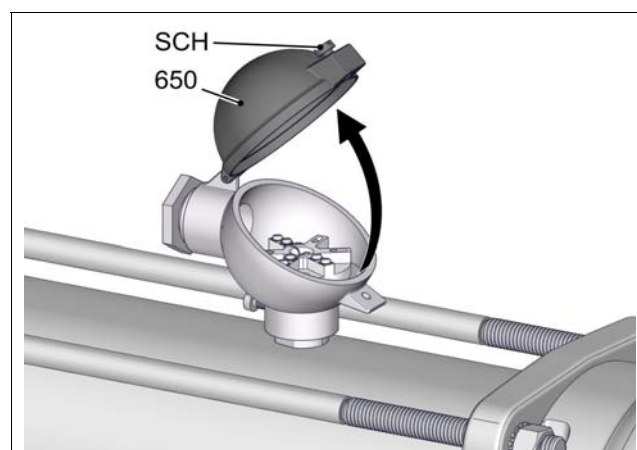
Adjusting the sensor sleeve (656) assembled at the factory.

Damage caused by incorrect readings of the dry-running protection device (TSE).

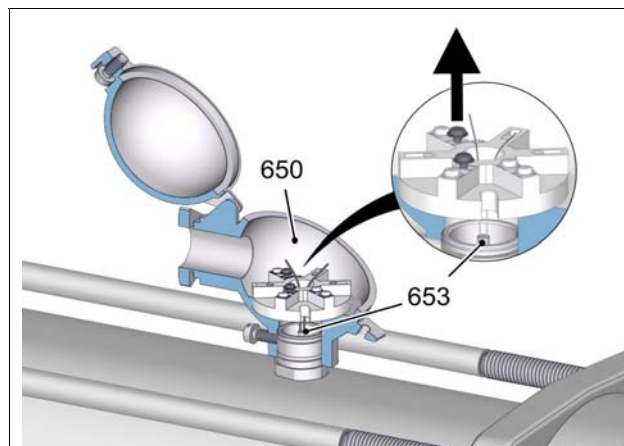
- Retain the location and position of the sensor sleeve (656).
- The pump-side parts of the dry-running protection device (TSE) should be assembled / dismantled only by SEEPEX trained personnel.

7.1. Dismantle connection head (650) and thermistor sensor (653)

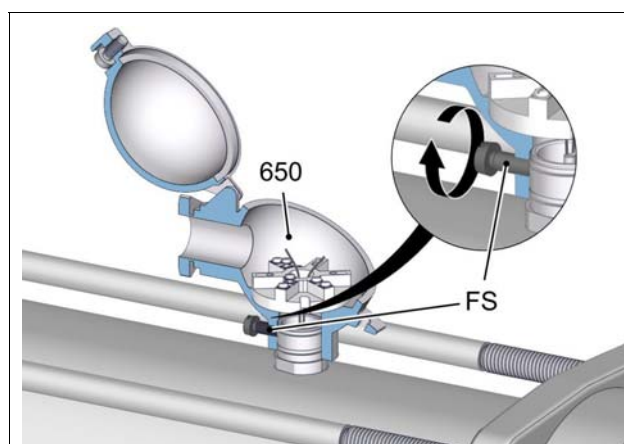
- Loosen screw (**SCH**) on the cover of the connection head (**650**).
- Open the cover of the connection head (**650**).



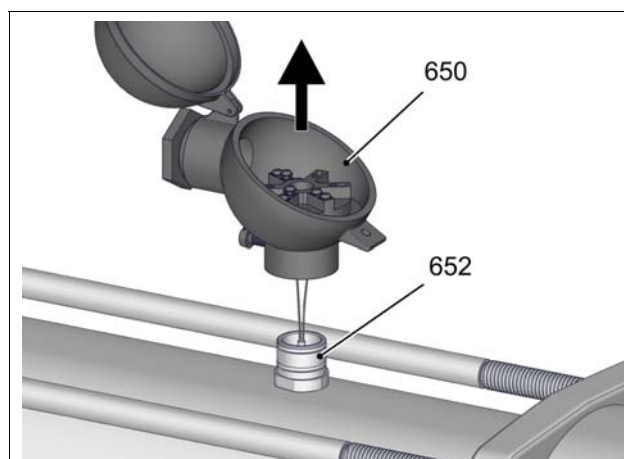
- Loosen connection wires of the thermistor sensor (**653**) on the terminal board of the connection head (**650**).



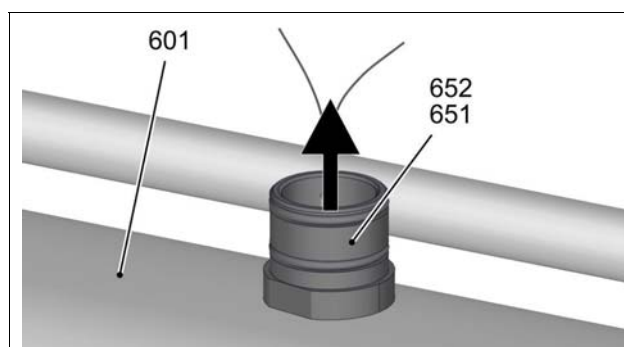
- Loosen fixing screw (**FS**) on the connection head (**650**).



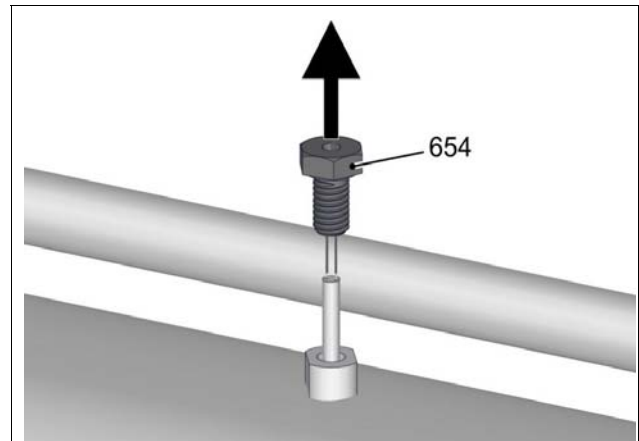
- Remove connection head (**650**) from screw socket (**652**).



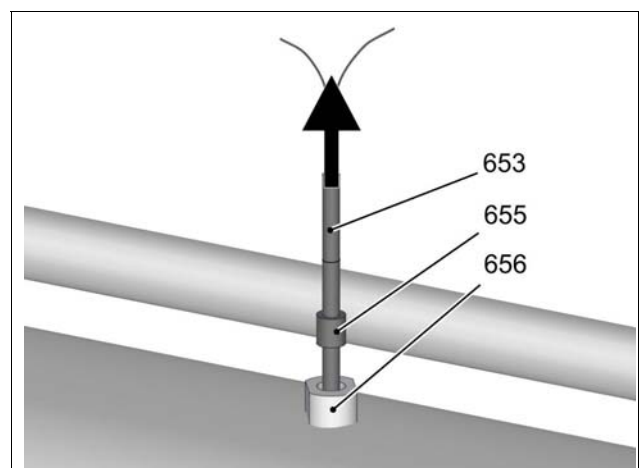
- Dismantle screw socket (**652**) together with two O-rings (**651**) from stator (**601**).



- Remove clamping screw (654).



- Remove thermistor sensor (653) together with rubber ring (655) from sensor sleeve (656).



8. Assemble pump-sided parts of dry-running protection device (TSE)

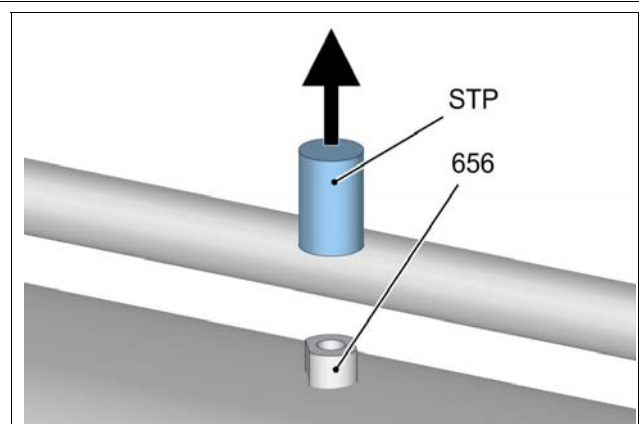
NOTICE

Adjusting the sensor sleeve (656) assembled at the factory.

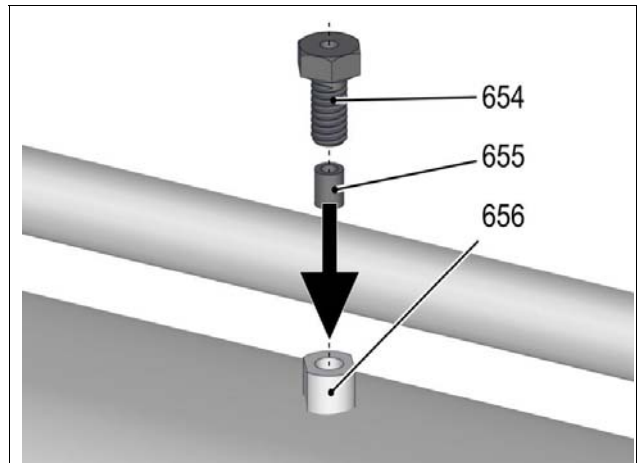
Damage caused by incorrect readings of the dry-running protection device (TSE).

- Retain the location and position of the sensor sleeve (656).
- The pump-side parts of the dry-running protection device (TSE) should be assembled / dismantled only by SEEPEX trained personnel.

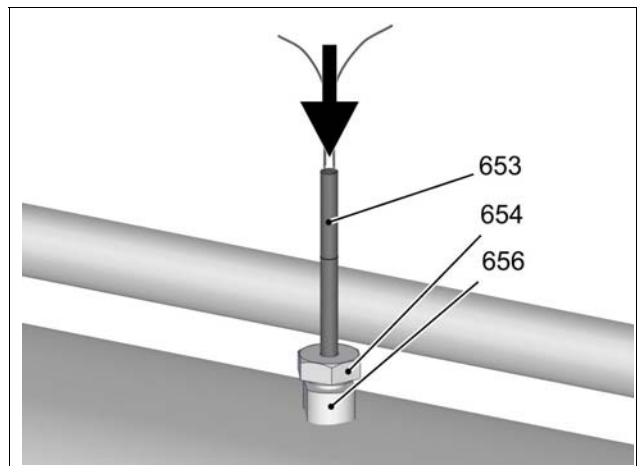
- Remove the transport locks (STP) (if available) from sensor sleeve (656).



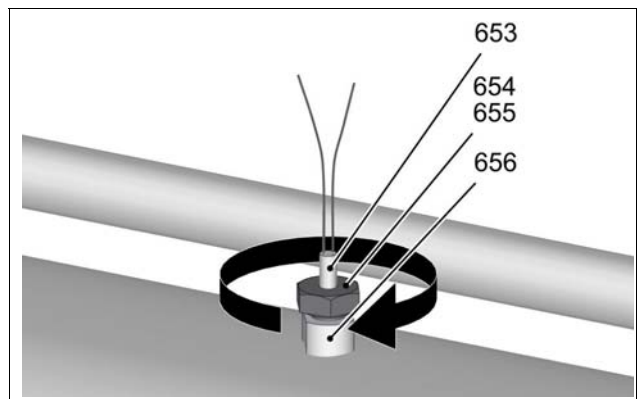
- Mount the clamping screw (654) and rubber ring (655) onto the sensor sleeve (656) and tighten slightly.



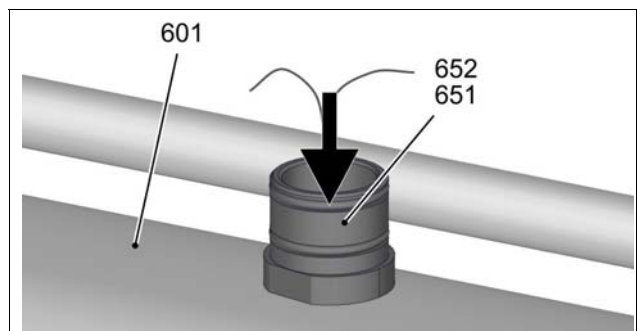
- Insert the thermistor sensor (653) through the opening of the clamping screw (654) down to the bottom of the sensor sleeve (656).



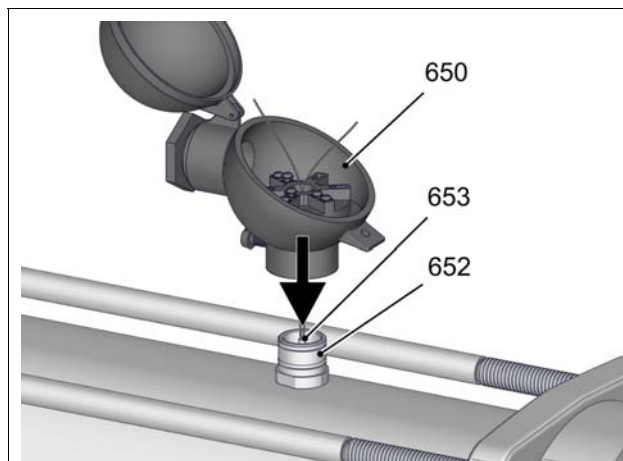
- Tighten the thermistor sensor "finger tight" (653) using clamping screw (654) and rubber ring (655).



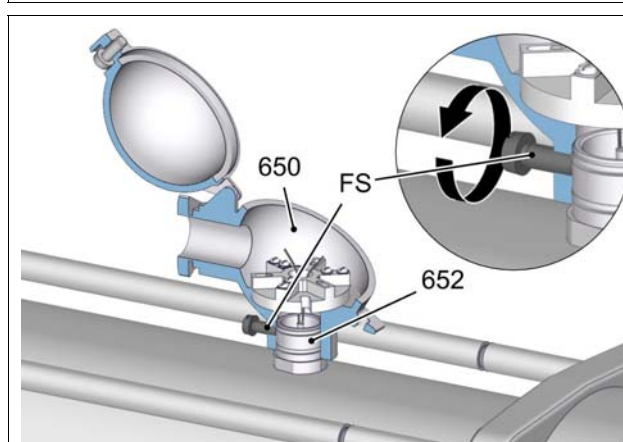
- Assemble screw socket (652) together with two O-rings (651) on stator (601).



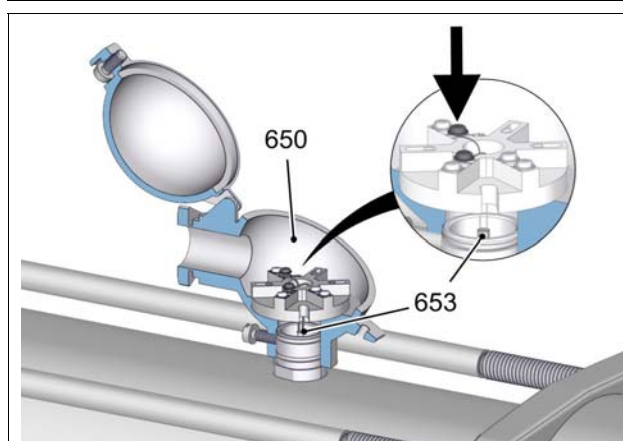
- Install connection head **(650)** on screw socket **(652)**.
 - Route connection wires of the thermistor sensor **(653)** from below through the opening in the terminal board.



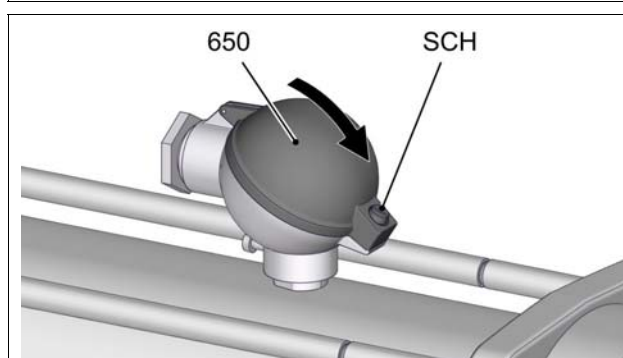
- Fix connection head **(650)** with fixing screw **(FS)** on screw socket **(652)**.



- Secure connection wires of the thermistor sensor **(653)** on the terminal board of the connection head **(650)**.
 - Note the sectional drawing of the TSE connection head (→ chapter 2.1).



- Close the cover of the connection head **(650)**.
- Tighten screw **(SCH)** on the cover of the connection head **(650)**.



9. Thermistor sensor resistor values

NTC thermistor sensor with stainless steel protective sleeve:

Standard resistor: 10 k Ω at 25 °C

Temperature °C	Resistor Ω	Temperature °C	Resistor Ω
-20	97080	16	15000
-19	91610	17	14320
-18	86490	18	13680
-17	81690	19	13070
-16	77180	20	12490
-15	72950	21	11940
-14	68980	22	11420
-13	65240	23	10920
-12	61730	24	10450
-11	58430	25	10000
-10	55330	26	9573
-9	52400	27	9167
-8	49650	28	8777
-7	47060	29	8407
-6	44620	30	8057
-5	42330	31	7723
-4	40160	32	7403
-3	38110	33	7097
-2	36190	34	6807
-1	34370	35	6530
0	32650	36	6267
1	31030	37	6017
2	29500	38	5777
3	28050	39	5547
4	26690	40	5327
5	25390	41	5117
6	24170	42	4917
7	23010	43	4727
8	21920	44	4543
9	20880	45	4370
10	19900	46	4200
11	18970	47	4040
12	18090	48	3890
13	17250	49	3743
14	16460	50	3603
15	15710	51	3467
52	3340	91	887.7
53	3217	92	861

Temperature °C	Resistor Ω	Temperature °C	Resistor Ω
54	3099	93	835.3
55	2986	94	810.3
56	2878	95	786.7
57	2774	96	763.3
58	2675	97	741
59	2579	98	719.3
60	2488	99	698.7
61	2400	100	678.3
62	2316	101	659
63	2235	102	640
64	2157	103	622
65	2083	104	604
66	2011	105	587
67	1942	106	571
68	1876	107	555
69	1813	108	539.7
70	1752	109	525
71	1693	110	510.3
72	1636	111	496.7
73	1582	112	483
74	1530	113	470
75	1479	114	457.3
76	1431	115	445
77	1384	116	433.3
78	1340	117	421.7
79	1297	118	410.7
80	1255	119	400
81	1215	120	389.3
82	1177	121	379.3
83	1140	122	369.7
84	1104	123	360
85	1070	124	350.6
86	1036	125	341.7
87	1004	126	333.1
88	973.7	127	324.7
89	944	128	316.5
90	915.3	129	308.6
130	300.93	141	229.70
131	293.47	142	224.30
132	286.32	143	219.00
133	279.17	144	213.90
134	272.03	145	208.87

Temperature °C	Resistor Ω	Temperature °C	Resistor Ω
135	265.7	146	204.03
136	259.3	147	199.33
137	253	148	194.77
138	246.93	149	190.33
139	241.03	150	185.97
140	235.27		

Type 80 Wafer and Type 81 Bolt-Thru Isolation Ring

FEATURES

- 360° Instrument Rotation with SQR™ Option
- Selection of 1" through 20" Nominal Pipe Size
- Non-Clogging/Low Maintenance
- Complete Instrument Protection
- Ensure Reliable/Accurate Pressure Readings
- Optional Retrofit Flange to Replace Competitive Units

APPLICATIONS

Wafer and Bolt-Thru models provide a solution to applications where plugging is a persistent problem. The durable "ring-like" design eliminates process build-up, ensuring reliable and accurate pressure measurement. The innovative patent pending Safe Quick Release™ (SQR™) allows safe, in-process instrument removal without loss of fill fluid and eliminates the need to shut down the process pressure. Ashcroft also offers a comprehensive line of diaphragm seals.

SPECIFICATIONS

Type/Size:	80 Wafer 2" to 20" 81 Bolt-Thru 1" to 10"
Flexible Liner:	Buna, Teflon®, EPDM, Natural Rubber and Viton®
Liner Process Temperature Limits:	Buna-N -30/225°F (-34/107°C) Teflon -15/350°F (-25/177°C) Viton -15/350°F (-25/177°C) Natural Rubber -30/225°F (-34/107°C) EPDM -40/300°F (-40/149°C)
Flange Material:	316L SS, Carbon Steel, CPVC(1)
Flange (Bolt-Thru):	Class 150, 300 (Type 80 wafer design compatible with class 150 & 300 flanges).
Body:	316L SS, Carbon Steel
Instrument Connection Size:	¼, ½ NPT
Fill Fluids:	Glycerin 0/400°F (0/204°C) Silicone (10Cst): -40/500°F (-40/260°C) Silicone (50Cst): -40/600°F (-40/316°C) Halocarbon -70/300°F (-57/149°C)
<i>Consult Factory for Additional Fluids</i>	
OPTIONS	Code
All Welded Assembly	DU
Retrofit Flange	IR
Safe Quick Release™ (SQR™)	Q
Needle Valve	V
Needle Valve & Safe Quick Release™ (SQR™)	Z
(1) 1" & 1½" only. Others on application.	



SQR OPTION SHOWN

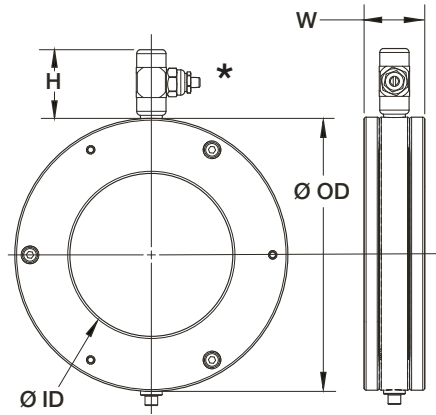
NEEDLE VALVE OPTION SHOWN

DIRECT MOUNT SHOWN



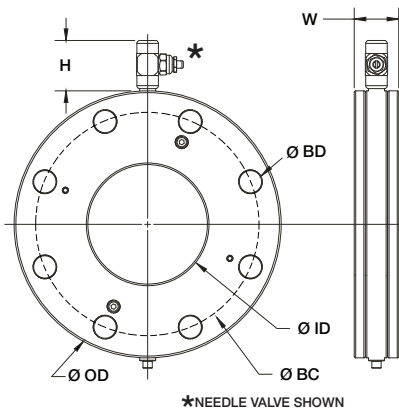
Type 80 Wafer and Type 81 Bolt-Thru Isolation Ring

Type 80 Wafer Isolation Ring



Nominal Pipe Size	Inner Diameter (ID)	Outer Diameter (OD)	Width (W)	Instrument Removal (H)			Weight Lbs.
				Direct	Safe Quick Release	Needle Valve	
2"	2.07	4.00	2.00	1.89	2.04	1.70	4.0
3"	3.07	5.25	2.00	1.89	2.04	1.70	6.3
4"	4.03	6.75	1.50	1.89	2.04	1.70	8.0
6"	6.07	8.63	1.50	1.89	2.67	2.32	10.2
8"	7.98	10.88	1.50	2.39	2.67	2.32	14.9
10"	10.02	13.25	1.50	2.39	2.67	2.32	21.3
12"	12.00	16.00	1.75	2.39	2.67	2.32	39.1
14"	13.25	17.63	1.75	2.89	3.17	2.82	47.8
16"	15.25	20.13	1.75	2.89	3.17	2.82	61.8
18"	17.25	21.50	1.75	2.89	3.67	3.32	58.0
20"	19.25	23.75	1.75	2.89	3.67	3.32	68.6

Type 81 Bolt-Thru Isolation Ring



ANSI ASME Class	Nom. Pipe Size	Inner Dia. (ID)	Outer Dia. (OD)	Width (W)	Bolt Circle (BC)	Bolt Dia. (BD)	No. Of Bolt Holes	Instrument Removal (H)			
								Direct	Safe Quick Release	Needle Valve	Weight Lbs.
150	1" SS/CS	1.05	4.25	2.00	3.12	0.625	4	0	2.04	1.70	5.7
	1" CPVC	1.05	4.25	2.25	3.12	0.625	4	0	2.04	1.70	4.0
	1.5" SS/CS	1.61	5.00	2.00	3.88	0.625	4	0	2.04	1.70	7.9
	1.5" CPVC	1.61	5.00	2.25	3.88	0.625	4	0	2.04	1.70	5.6
	2"	2.07	6.00	2.00	4.75	0.75	4	0	2.04	1.70	12.0
	3"	3.07	7.50	2.00	6.00	0.75	4	0	2.04	1.70	18.4
	4"	4.03	9.00	1.50	7.50	0.75	8	0	2.04	1.70	18.6
	6"	6.07	11.00	1.50	9.50	0.88	8	0	2.04	1.70	23.9
	8"	7.98	13.50	1.50	11.75	0.88	8	0	2.04	1.70	34.5
	10"	10.02	16.00	1.50	14.25	1.00	12	0	2.04	1.70	44.5
300	2"	2.07	6.50	2.00	5.00	0.75	8	0	2.04	1.70	13.8
	3"	3.07	8.25	2.00	6.62	0.88	8	0	2.04	1.70	22.0
	4"	4.03	10.00	1.50	7.88	0.88	8	0	2.04	1.70	24.5
	6"	6.07	12.50	1.50	10.62	0.88	12	0	2.04	1.70	34.9
	8"	7.98	15.00	1.50	13.00	1.00	12	0	2.04	1.70	47.1
	10"	10.02	17.50	1.50	15.25	1.13	16	0	2.04	1.70	58.8

Order Information

TYPE	NOMINAL PIPE SIZE	FLEXIBLE LINER	FLANGE	BODY	INSTRUMENT CONNECTION	INSTRUMENT REMOVAL OPTION	FLANGE CLASS (Type 81 Only)	FILL FLUID OPTIONS	ADDITIONAL OPTIONS
(80) Wafer	(01) 1" NPS	(E) Buna N	(B) Carbon Steel	(B) Carbon Steel	(02T) 1/2" NPT	(N) None	(000) No Flange	(CG) Glycerin	(IR) Retrofit Flange
(81) Bolt-Thru*	(15) 1.5" NPS (02) 2" NPS (03) 3" NPS (04) 4" NPS (06) 6" NPS (08) 8" NPS (10) 10" NPS (12) 12" NPS (14) 14" NPS (16) 16" NPS (18) 18" NPS (20) 20" NPS Consult factory for sizes larger than 20"	(I) Teflon* (P) EPDM (R) Natural Rubber (Y) Viton * N/A in sizes larger than 10", less than 2"	(S) 316L SS (C) CPVC* * 1" & 1.5" Type 81 Only	(S) 316L SS	(04T) 1/2" NPT	(V) Valve/Needle (Q) Safe Quick Release (SQR) (Z) Needle Valve with Safe Quick Release	(150) Class 150* (300) Class 300* * Type 81 Only	(CK) Silicone 50 CTS (CF) Halocarbon (DJ) Silicone 10 Cst (NF) No Fill	(DU) All Welded Stem Assembly Only offered with SS hub; no Safe Quick Release™ (SQR™) or Needle Valve (NH) Wired Tag

Order Coding Example

80	02	E	S	S	02T	Q	000	X	CG	IR
----	----	---	---	---	-----	---	-----	---	----	----

SPECIFY IF OPTIONS

Type 1009 4½" & 6" Stainless Steel Gauge



- 4½" and 6" stainless steel gauges
- Dry and liquid-filled versions
- Micrometer adjustable pointer
- Variety of Bourdon tube materials
- ASME Grade 1A, ±1% of span accuracy
- New PLUS!™ Performance Option:
 - Liquid-filled performance in a dry gauge
 - Fights vibration and pulsations with out liquid-fill headaches
 - Order as option XLL

The 4½" and 6" Ashcroft® Type 1009 gauges are suitable where ambient corrosion is a major concern. Its attractive stainless steel case and ring provides excellent resistance to chemical, weather and corrosion attack. This 1009 has many optional features that allow a user to develop a basic or special product specification. The 1009 is part of the extensive line of Ashcroft stainless steel pressure gauges.

The gauge is available dry, liquid-filled weatherproof or hermetically sealed and now with PLUS!™ Performance option.

TEMPERATURE LIMITS			
	Ambient	Process	Storage
Dry	-20/200°F (-29/93°C)	-20/250°F ⁽¹⁾ (-29/121°C)	-40/250°F (-40/121°C)
LF (glycerin)	20/150°F (7/66°C)	20/200°F (7/93°C)	0/150°F (-18/66°C)
(silicone)	-40/150°F (-40/66°C)	-40/200°F (-40/93°C)	-40/150°F (-40/66°C)
(halocarbon)	-40/150°F (-40/66°C)	-40/200°F (-40/93°C)	-40/150°F (-40/66°C)

Note: Other than discoloration of the dial and hardening of the gasketing that may occur as ambient or process temperatures exceeds 150°F, non-liquid-filled gauges with standard glass windows, can withstand continuous operating temperatures up to 250°F (121°C). Liquid-filled gauges can withstand 200°F (93°C) but glycerin fill and acrylic window will tend to yellow. Accuracy at temperatures above or below the reference ambient temperature of 68°F will be affected by approximately .4% per 25°F. Gauges with welded joints will withstand 750°F (450°F (232°C) with silver brazed joints) for short times without rupture, although other parts of the gauge will be destroyed and calibration will be lost. For continuous use and for process or ambient temperatures above 250°F (121°C), a diaphragm seal or capillary or siphon is recommended.

PRODUCT SPECIFICATIONS

- Model Number:** 1009
- Accuracy:** 1% full scale (Grade A, ASME B40.100)
- Ranges:** Vacuum – 30,000 psi
- Dial Size:** 4½" and 6" diameter
- Case:** Open front
- Case Material:** 304 SS
- Weather Protection:** Dry Case: IP54
Liquid filled or hermetically sealed case: IP 65
- Ring Type:** 304 SS, bayonet
- Window:** Glass
- Dial:** Aluminum, white background, black figures and graduations.
- Pointer:** Micrometer adjustable
- Movement:** 400 SS (conventional)
- Bourdon Tube and Socket:** Bronze/Brass (A)⁽¹⁾
316L SS/316L SS (S)⁽²⁾
Monel/Monel (P)⁽²⁾
- Connection Size:** ¼", ½" NPT
- Connection Location:** Lower and back

PRODUCT OPTIONS

- PLUS! Performance:** XLL
- Fill:** L-Glycerin-Standard
XGV-Silicone-Optional
XGX-Halocarbon-Optional
- Weatherproof Hermetic Seal:** XLJ
- Panel Mount Front Flange:** XFF
- Panel Mount U-Clamp:** XUC
- Surface Mount:** XBF
- Oxygen Clean:** X6B
- Window**
- Acrylic:** XPD
 - Shatterproof Glass:** XSG

⁽¹⁾ Joints silver brazed

⁽²⁾ Joints welded

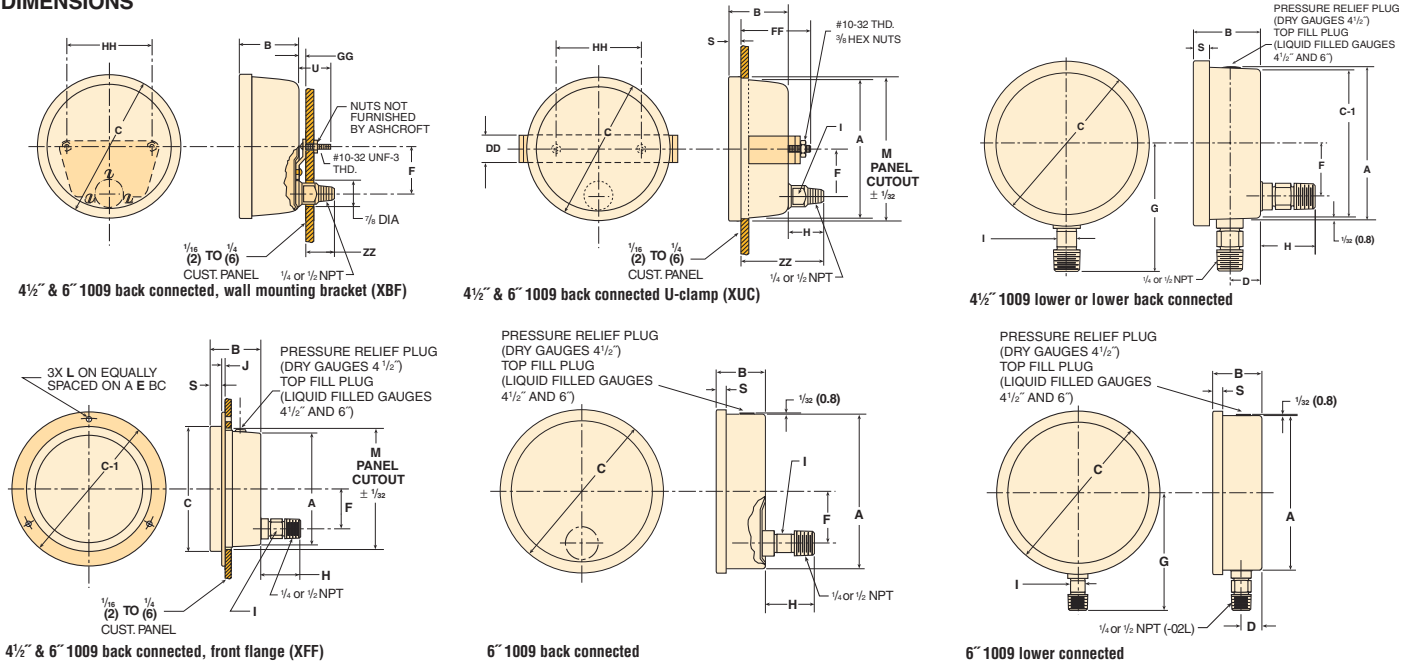
45/60 1009 GAUGE PRODUCT CODING

Typical Code:

45	1009	S	L	04	L	XSG	100#	
SIZE	TYPE NUMBER	SYSTEM (Tube & Socket)	CASE DESIGN	PROCESS CONN. SIZE	CONNECTION LOCATION	VARIATIONS	RANGE	ENGINEERING UNITS ⁽¹⁾
(45) 4½ (60) 6	1009	Code (A) Phos Brz ⁽²⁾ (S) AISI 316SS ⁽²⁾ (P) K Monel ⁽²⁾ (1) To 1000 psi (2) To 30,000 psi	Code (L) Liquid Filled (glycerin std.)	Code (02) ¼ Male ⁽¹⁾ (04) ½ Male ⁽¹⁾ (09) ¾-18 UNF-2B Aminco (standard for high pressure >20,000 psi) (1) Max Pressure 20,000 psi	Code (L) Lower (B) Back (D) Side Conn. (E) Side Conn. (T) Top	(GV) Silicone Case Fill (GX) Halocarbon Case Fill (NH) SS Wired Tag (TS) Throttle Screw ⁽¹⁾ (6B) Oxygen Service (PD) Acrylic Window ⁽¹⁾ (SG) Safety Glass (LJ) Hermetically Sealed Liquid Fittable (IP65) (EP) Maximum Pointer, Adjustable (SH) Red Set Hand, Stationary (LL) PLUS! Performance (FF) Flush Mounting Ring (C4) Individual Calibration Chart (1) Standard with hermetically sealed or liquid filled gauge.	15 30 60 100 160 200 300 400 600 1000 1500 2000 3000 5000 6000 10,000 20,000 30,000	(#) PSI (BR) Bar (KG) Kilograms/ CM ² (KP) Kilopascal (IMV) Inches of Mercury (1) See website for more units of measure

Type 1009 4½" & 6" Stainless Steel Gauge

DIMENSIONS



Gauge Size	A	B	C	C-1	D	DD	E	F	FF	G	GG	H	HH	I	J	L	M	S	U	ZZ	Weight	
																					Dry	LF
4½ (100)	4 ²³ / ₃₂ (120)	2 ¹ / ₁₆ (52)	5 ³ / ₃₂ (129)	4 ²³ / ₃₂ (120)	1 ⁵ / ₁₆ (24)	1 (25)	5 ¹¹ / ₁₆ (144)	1 ⁵ / ₈ (41)	2 ⁵ / ₁₆ (59)	3 ¹⁵ / ₁₆ (100)	3 ³ / ₁₆ (5)	1 ⁵ / ₈ (41)	3 (76)	5 ⁸ / ₁₆ (16)	5 ⁹ / ₃₂ (4)	7 ⁷ / ₃₂ (6)	4 ¹³ / ₁₆ (122)	1 ⁵ / ₃₂ (12)	1 ⁷ / ₁₆ (37)	3 ⁹ / ₃₂ (83)	1.75# .79kg	2.40# 1.1kg
6 (160)	6 ⁵ / ₁₆ (160)	2 (51)	6 ²¹ / ₃₂ (169)	6 ¹ / ₃ (161)	2 ⁷ / ₃₂ (22)	1 (25)	7 ¹ / ₃₂ (179)	1 ⁵ / ₈ (41)	2 ⁵ / ₈ (67)	4 ¹³ / ₁₆ (122)	3 ³ / ₁₆ (5)	1 ⁵ / ₈ (41)	4 ¹ / ₂ (114)	5 ⁸ / ₁₆ (16)	1 ¹ / ₁₆ (2)	1 ¹ / ₄ (7)	6 ⁷ / ₁₆ (163)	1 ¹³ / ₃₂ (10)	1 ⁷ / ₁₆ (37)	3 ³ / ₁₆ (81)	2.25# 1kg	4.12# 1.85kg

Note: Dimensions in brackets () are millimeters.

Standard Ranges (Metric equivalents available)

Pressure – psi			
Range	Figure interval		Minor Graduation
0/15	1		0.1
0/30	5		0.2
0/60	5		0.5
0/100	10		1
0/160	20		2
0/200	20		2
0/300	50		2
0/400	50		5
0/600	50		5
0/800	100		10
0/1000	100		10
0/1500	200		20
0/2000	200		20
0/3000	500		20
0/5000	500		50
0/6000	500		50
0/10,000	1000		100
0/20,000	2000		250
0/30,000	5000		200

Compound				
Range	Figure Interval		Minor Grads	
	in Hg	psi	in Hg	psi
30" Hg/15 psi	5	3	0.5	0.2
30" Hg/30 psi	10	5	1	0.5
30" Hg/60 psi	10	10	1	1
30" Hg/100 psi	10	10	2	1
30" Hg/150 psi	10	20	5	2
30" Hg/200 psi	30	20	5	2
30" Hg/300 psi	30	50	5	2

Vacuum		
Range	Figure Interval	Minor Grads
30/0 in. Hg	5 in	0.2 in
34/0 ft H ₂ O	5 ft	0.5 ft

Data Sheet

B-Series Switches – Pressure, Differential Pressure & Hydraulic

FEATURES

- Adjustable setpoints 15-100% of range
- Fixed or limited adjustable deadband
- Wide selection of switch elements
- Explosion proof enclosure provides uncompromising protection
- Special designs for NACE & fire applications

TYPICAL USES

- Offshore oil rigs
- Chemical and petrochemical plants
- Pulp and papermills
- Steel mills
- Power plants
- Water and sewage-treatment plants
- Other corrosive environments



SPECIFICATIONS

Setpoint:	Factory set or field adjustable
Setpoint Repeatability:	±1% of full range (Additional setpoint shift of ±1% of range per 50°F from initial setpoint set at 70°F typical)
Enclosure Rating:	B4/Hydraulic: NEMA 4X, IP66 B7: NEMA 7/9, IP66
Enclosure Material:	Epoxy coated aluminum (standard) Optional: 316 stainless steel (NEMA 7/9 only)
Diaphragm Material:	Buna N, Viton, Teflon, SS, Monel
Pressure Connection:	1/4 Female NPT (standard) Optional: 1/2 Female NPT, 1/4 Female NPT & 1/2 Male NPT Combo
Electrical Output:	SPDT or DPDT
Electrical Termination:	3/4 Female NPT (standard) Optional: 1/2 Female NPT
Ambient Temperature Range:	-20°F to 150°F (-19°C to 65°C) All units calibrated at 70°F
Process Temperature:	0°F to 150°F (Buna n or Teflon diaphragm) 20°F to 300°F (Viton diaphragm) 0°F to 300°F (SS or Monel diaphragm)
Pressure Ranges:	Pressure: Vac-3000#, Differential: 0-600#D Hydraulic: 1000-7500#
Approvals:	UL, CSA, FM, CE, RoHS (NEMA 4) ATEX, CSA, FM, IECEx, UL, RoHS (NEMA 7) UL: E38812, E34743 CSA: 55541 ATEX: Sira 02ATEX1391X IECEx SIR 14.007X FM: Limit Control and Steam Limit Control

- Highly reliable
- Designed for use in wide range of applications
- Pressure ranges from vacuum to 7500psi

Data Sheet

B-Series Switches – Pressure, Differential Pressure & Hydraulic

PRESSURE, DIFFERENTIAL PRESSURE & HYDRAULIC RANGES

PRESSURE/VACUUM RANGES			Overpressure Ratings		Approximate Deadband Switch Element				
Nominal Pressure			Proof psi	Burst psi	20, 26, 27	21, 24, 31	50	22	32, 42
Vacuum									
-30" Hg	-760mm Hg	-100 kPa	250	400	0.3-0.7	1.5-3.0	0.5-2.2	0.4-1.5	2.1-4.2
Compound									
-15" H ₂ O/ 15" H ₂ O	-375mm H ₂ O/ 375mm H ₂ O	-3.7 kPa/ 3.7 kPa	20	35	0.15-.75/ 0.15-.75	1.5-2.5/ 1.5-2.5	0.45-2.0/ 0.45-2.0	0.5-1.2/ 0.5-1.2	2.1-3.5/ 2.1-3.5
-30" H ₂ O/ 30" H ₂ O	-760mm H ₂ O/ 760mm H ₂ O	-7.5 kPa/ 7.5 kPa	20	35	0.30-.60/ 0.30-.60	1.5-2.5/ 1.5-2.5	0.45-2.0/ 0.45-2.0	0.5-1.5/ 0.5-1.5	2.1-3.5/ 2.1-3.5
-30" Hg/ 15 psi	-760mm Hg/ 1.0 kg/cm ²	-100 kPa/ 100 kPa	250	400	0.3-0.7/ 0.3-0.7	1.5-3.0/ 1.5-3.0	0.5-2.2/ 0.5-2.2	0.4-1.5/ 0.4-1.5	2.1-4.2/ 2.1-4.2
-30" Hg/ 30 psi	-760mm Hg/ 2.0 kg/cm ²	-100 kPa/ 200 kPa	250	400	0.3-0.8/ 0.3-0.8	1.5-3.0/ 1.5-3.0	0.5-2.2/ 0.5-2.2	0.4-1.5/ 0.4-1.5	2.1-4.2/ 2.1-4.2
-30" Hg/ 60 psi	-760mm Hg/ 4.0 kg/cm ²	-100 kPa/ 400 kPa	250	400	0.3-0.8/ 0.7-1.5	1.5-3.0/ 3.0-5.0	0.5-2.2/ 1.1-4.0	0.4-1.5/ 1.0-2.3	2.1-4.2/ 4.2-7.0
Pressure									
10" H ₂ O	250mm H ₂ O	2.5 kPa	20	35	0.2-0.5	1.0-2.0	0.35-1.5	0.4-1.0	1.4-2.8
30" H ₂ O	750mm H ₂ O	7.5 kPa	20	35	0.3-0.6	1.5-2.5	0.45-2.0	0.5-2.0	2.1-3.5
60" H ₂ O	1500mm H ₂ O	15 kPa	20	35	0.5-1.3	1.5-3.5	0.9-2.5	0.7-3.0	2.1-5.0
100" H ₂ O	2500mm H ₂ O	25 kPa	20	35	0.6-1.6	2.5-5.5	1.1-4.0	1.0-4.0	3.5-7.7
150" H ₂ O	3750mm H ₂ O	37 kPa	20	35	1.0-2.5	4.5-8.5	1.7-6.5	2.0-6.0	6.0-12.0
15 psi	1.0 kg/cm ²	100 kPa	500	1500	0.1-0.35	0.5-1.5	0.2-1.0	0.4-1.0	0.7-2.1
30 psi	2.0 kg/cm ²	200 kPa	500	1500	0.1-0.50	0.5-1.5	0.3-1.0	0.4-1.0	0.7-2.1
60 psi	4.0 kg/cm ²	400 kPa	500	1500	0.3-1.0	1.0-3.5	0.7-2.5	0.6-2.0	1.4-5.0
100 psi	7.0 kg/cm ²	700 kPa	1000	3000	0.5-1.7	1.5-5.0	1.1-3.5	1.0-4.5	2.1-7.0
200 psi	14 kg/cm ²	1400 kPa	1000	3000	1-3	5-13	2-9	3.0-7.5	7.0-18.2
400 psi	28 kg/cm ²	2800 kPa	2400	3000	4-7.5	5-24	5.5-15	4.0-11.0	7.0-33.6
600 psi	42 kg/cm ²	4200 kPa	2400	3000	4-11	9-30	7-20	5.0-23.0	12.6-42
1000 psi	70 kg/cm ²	7000 kPa	12000	18000	7-30	30-110	18-70	15-80	42-154
3000 psi	210 kg/cm ²	2100 kPa	12000	18000	15-60	80-235	37-160	30.0-230	112-329

DIFFERENTIAL PRESSURE RANGES			Pressure Ratings		Approximate Deadband Switch Element				
Nominal Pressure			Static Working Pressure	Proof psi	20, 26, 27	21, 24, 31	50	22	32, 42
30" H ₂ O	750mm H ₂ O	7.5 kPa	5.4	21.6	0.3-0.6	1.5-2.5	0.45-2.0	0.5-2.0	2.1-3.5
60" H ₂ O	1500mm H ₂ O	15 kPa	5.4	21.6	0.5-1.3	1.5-3.5	0.9-2.5	0.7-3.0	2.1-5.0
100" H ₂ O	2500mm H ₂ O	25 kPa	5.4	21.6	0.6-1.6	2.5-5.5	1.1-4.0	1.0-4.0	3.5-7.7
150" H ₂ O	3750mm H ₂ O	37 kPa	5.4	21.6	1.0-2.5	4.5-8.5	1.8-6.5	2.0-6.0	6.3-12.0
15 psid	1.0 kg/cm ²	100 kPa	500	2000	0.5-1.0	2.0-5.0	0.7-3.5	0.7-1.4	2.8-7.0
30 psid	2.0 kg/cm ²	200 kPa	500	2000	1.0-2.0	2.0-5.0	1.5-3.5	1.4-2.8	2.8-7.0
60 psid	4.0 kg/cm ²	400 kPa	500	2000	2.0-4.0	3.0-6.0	3.0-4.5	2.8-5.6	4.2-8.5
100 psid	7.0 kg/cm ²	700 kPa	1000	4000	4.0-10.0	11.0-20.0	7.0-15.0	6.0-14.0	16.0-28.0
200 psid	14.0 kg/cm ²	1400 kPa	1000	4000	5.0-15.0	12.0-40.0	10.0-26.0	7.0-21.0	17.0-56.0
400 psid	28.0 kg/cm ²	2800 kPa	1000	8000	10.0-20.0	20.0-60.0	15.0-40.0	14.0-28.0	28.0-84.0
600 psid	42.0 kg/cm ²	4200 kPa	1000	8000	20.0-40.0	80.0-150.0	30.0-115.0	30.0-56.0	12.0-210.0

Data Sheet

B-Series Switches – Pressure, Differential Pressure

ORDERING CODE

Example:

B4 20 B XPK 600 psi

Enclosure

- B4** - Pressure switch, Type 400, watertight enclosure meets NEMA 3, 4, 4X, 13 and IP66 requirements.
- B7⁽¹⁾** - Pressure switch, Type 700, explosion-proof enclosure meets Div. 1 & 2, NEMA 7, 9 and IP66 requirements.
- D4** - Differential pressure switch, Type 400, water-tight enclosure meets NEMA 3, 4, 4X, 13 and IP66 requirements.
- D7⁽¹⁾** - Differential pressure switch, Type 700, explosion-proof enclosure meets Div. 1 & 2, NEMA 7, 9 and IP66 requirements.

Switch Element Selection - UL/CSA Listed SPDT

- 20⁽⁶⁾** - Narrow deadband ac, 15A - 125/250 Vac
- 21** - Ammonia service, 5A - 125/250 Vac
- 22⁽⁷⁾** - Hermetically sealed switch, narrow deadband, 5A - 125/250 Vac
- 23** - Heavy duty ac, 22A - 125/250 Vac
- 24⁽⁸⁾** - General purpose, 15A - 125/250/480 Vac, ½A - 125 Vdc, ¼A - 250 Vdc; 6A, 30 Vdc
- 25⁽⁹⁾** - Heavy duty dc, 10A - 125 Vac or dc, 1/8 HP - 125 Vac or dc
- 26⁽⁶⁾** - Sealed environment proof, 15A - 125/250 Vac
- 27** - High temperature 300°F, 15A - 125/250 Vac
- 28⁽⁶⁾** - Manual reset trip on, increasing 15A - 125/250 Vac
- 29⁽⁶⁾** - Manual reset trip on decreasing, 15A - 125/250 Vac
- 31** - Low level (gold) contacts, 1A - 125 Vac
- 32** - Hermetically sealed switch, general purpose, 11A - 125/250 Vac, 5A - 30 Vdc
- 42** - Hermetically sealed switch, gold contacts, 1A - 125 Vac
- 50** - Variable deadband, 15A - 125/250 Vac

Switch Element Selection - UL/CSA Listed Dual (2 SPDT) ⁽⁴⁾

- 61⁽⁶⁾** - Dual narrow deadband, 15A - 125/250 Vac
- 62⁽⁶⁾** - Dual sealed environment proof, 15A - 125/250 Vac
- 63** - Dual high temp. 300°F, 15A - 125/250 Vac
- 64** - Dual general purpose, 15A - 125/250/480 Vac, ½A - 125 Vdc, ¼A - 250 Vdc
- 65** - Dual ammonia service, 5A - 125/250 Vac
- 67^{(6) (7)}** - Dual hermetically sealed switch, narrow deadband, 5A - 125/250 Vac
- 68⁽⁶⁾** - Dual hermetically sealed switch, general purpose, 11A - 125/250 Vac 5A, 30 Vdc
- 70** - Dual low level gold contacts, 1A - 125 Vac
- 71⁽⁶⁾** - Dual hermetically sealed switch, gold contacts, 1A - 125 Vac

Actuator Seal

Material	Process Temp. Limits °F ⁽¹⁰⁾	Range			
		Vac. H ₂ O	0-600 psi	0-1000 psi	0-3000 psi
B - Buna-N	0 to 150	•	•	•	•
V - Viton	20 to 300	•	•	•	•
T - Teflon	0 to 150	•	•	•	•
S - 316L ⁽⁹⁾	0 to 300		•	•	
P - Monel ⁽⁹⁾	0 to 300		•	•	

Options

Use table from page 6

Range

Select from table page 4

ORDERING CODE NOTES:

- 1 Standard housing epoxy coated aluminum. Use variation code XYW for 316SS housing.
- 2 Standard switch
- 3 Not available with psid ranges.
- 4 Dual switches are 2 SPDT snap-action switches, not independently adjustable.
- 5 Wires cannot be terminated inside B400 switch enclosure.
- 6 Not available with type 700 enclosure.
- 7 Estimated dc. rating, 2.5A, 28 Vdc (not UL listed).
- 8 Estimated dc rating, 0.4A, 120 Vdc (not UL listed).
- 9 Available on pressure only.
- 10 Ambient operating temperature limits -20 to 150°F, all styles, setpoint shift of ±1% of range per 50°F temperature change is normal. Switches are calibrated at 70°F reference.

Data Sheet


B-Series Switches – Pressure, Differential Pressure & Hydraulic

OPTIONAL FEATURES AND ACCESSORIES

		B-SERIES SWITCH OPTIONS					Notes
		Applicable Switch Series					
Code	Description	Pressure		Differential Pressure		H	
		(psi)	(in. H ₂ O)	(psi)	(in. H ₂ O)		
XBP	Wall Mounting Bracket in. H ₂ O		•		•		
XBX	½" Male NPT Bushing					•	
XCH	Chained Cover	•	•	•	•	•	
XC8	CSA Approval	•	•	•	•		10
XCN	ATEX Directive 94/9/EC/IECEx Rating	•	•	•	•		15
XD2	Dual Seal Rating (700 Series only)	•			•		
XFM	FM Approval – Single Element	•	•	•	•		14
	FM Approval – Dual Element	•	•	•	•		14
XFP	Fungus Proofing	•	•	•	•	•	
XFS	Factory Adjusted Setpoint	•	•	•	•	•	2
XG3	Belleville Actuator	•					13,14
XG5	UL Limit Control to 150" H ₂ O					•	1, 14
XG6	UL Limit Control to 600 psi	•					1, 14
XG7	Secondary Chamber with Vent	•					11
XG8	Steam Limit Control to 300 psi	•					
XG9	Fire Safe Welded Actuator	•					7
XHS	High Static Differential Pressure			•			12
	High Pressure, 40 psi, (static) d/p only						
	160 psi (proof) d/p only		•		•		
XHX	100 psi (proof) pressure only (H ₂ O)						
XJK	Left Conduit Connection	•	•	•	•	•	8
XJL	¾" to ½" Reducing Bushing	•	•	•	•	•	
XJM	Metric Electrical Conduit Conn. M20 x 1.5	•	•	•	•	•	
XK3	Terminal Block (700 Series only)	•	•	•	•		6
XLE	6 foot Leads on the Micro Switch	•	•	•	•	•	
XNH	Tagging Stainless Steel	•	•	•	•	•	
XNN	Paper Tag	•	•	•	•	•	
XPK	Pilot Light(s) Top Mounted	•	•	•	•	•	4
XPM	¾" Sealed Conduit Connection with 16" Lead Wires	•	•	•	•	•	
XTA	316 Stainless Steel Pressure Connection for in. H ₂ O Range		•		•		
XTM	2" Pipe Mounting Bracket	•	•	•	•		
XUD	316 Stainless Steel Pressure Conn.			•			
XO6	Pressure Connection:						
	½ NPT Male, ¼ NPT Female 316 Stainless Steel (Combination)	•	•	•	•		5
XO7	½ NPTF Press. Conn., 316 SS	•	•	•	•		9
X6B	Cleaned for Oxygen Service	•	•	•			3
	Diaphragm Seal	•	•	•	•		
X9F	Inches of Water Housing for Outdoor Use		•				
XYW	316SS Housing	•	•	•	•		•

OPTION NOTES:

- 1 Buna N and Viton diaphragm.
- 2 Advise static or working pressure for differential pressure switches.
- 3 Buna N cannot be cleaned for oxygen service.
- 4 N/A on 700 Series.
- 5 Standard with 1000 and 3000 psi ranges. Bottom connection only on DP in H₂O ranges.
- 6 Terminal Blocks standard with 700 dual switches.
- 7 Stainless steel diaphragm only.
- 8 Standard on 700 Series. N/A with DPDT element on 400 Series.
- 9 N/A with Monel diaphragm.
- 10 Standard on 400 Series.
- 11 SS diaphragm required. Teflon diaphragm is the backup. NEMA 7 only.
- 12 Buna N and Viton diaphragm – 15#D & 30#D only.
- 13 24, 32, 64 or 68 element only.
- 14 N/A on all combinations.
- 15 700 Series only.

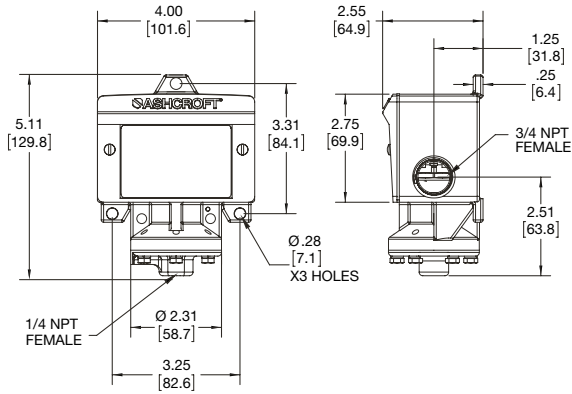
 II 2GD
Ex d IIC T6 Gb
Ex t IIIIC T85° C Db IP 6X
(Ta = -20°C to +60°C)

Data Sheet

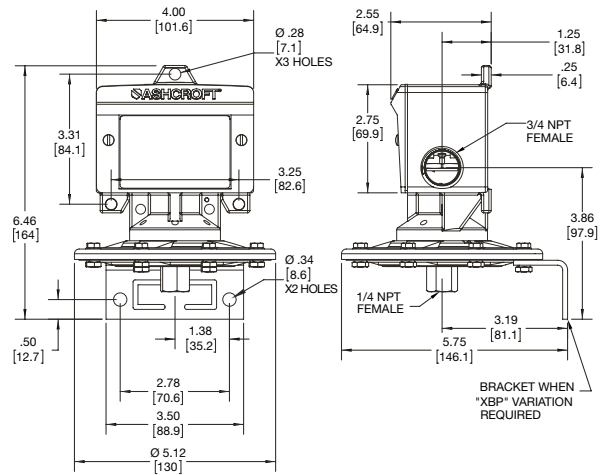
**B-Series Switches –
Pressure, Differential Pressure & Hydraulic**

B 400 DIMENSIONS

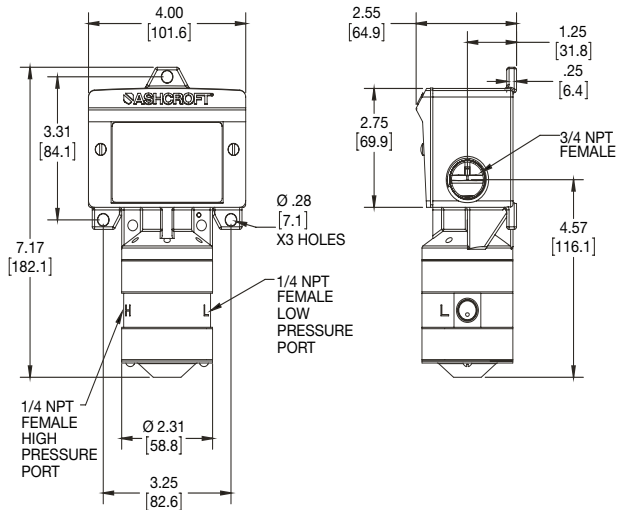
Pressure switch – psi ranges



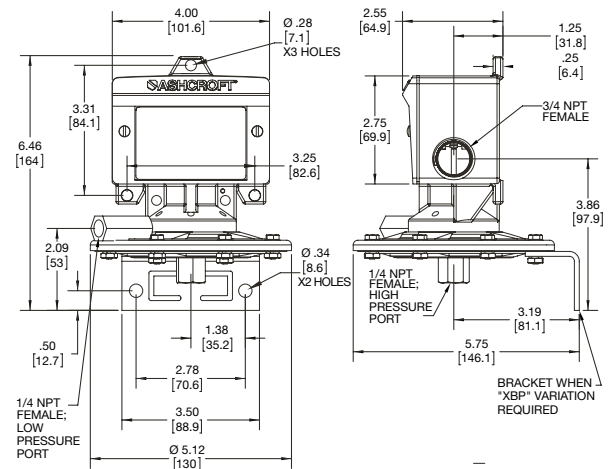
Pressure switch – inches of water ranges



Differential pressure switch – psi differential ranges



Differential pressure switch – inches of water ranges



B-Series Switches – Pressure, Differential Pressure & Hydraulic

Ashcroft Inc. supplies highly reliable Ashcroft[®] switches and controls for industrial and process applications. We begin with rock-solid designs, matching the most appropriate technology with the safety and reliability requirements of the applications. The materials of construction are specified to Ashcroft's exacting standards, and product is built to last in the toughest applications. Our modern, responsive manufacturing facility is supported by an extensive network of stocking distributors and factory sales offices located in virtually every part of the world. Special application assistance is always just a telephone call away.

The Ashcroft B-Series switch line is designed to satisfy most switch requirements. Materials of construction have been selected for long life. A wide variety of precision switch elements are available to meet every application requirement, including hermetically sealed contacts for added reliability and safety. The actuators we use have been proven in more than 20 years of service in the world's plants and mills. Special designs are available for fire safety, NACE, limit control and other more stringent requirements. Simplicity and ease of use are stressed to improve reliability of the installation.

Applications include: pumps, compressors, washers, filters, degreasers, evaporators, recovery systems, food processing, ground support equipment, reverse osmosis systems, heat exchangers, hydraulic systems, lubrication systems, marine equipment, textile machinery, heating and air conditioning equipment.

Pressure & Differential Pressure Switches

B-Series pressure, differential pressure and vacuum switches use two different actuators depending on setpoint requirements. For setpoints between 2 and 3000 psi, the simple, rugged diaphragm-sealed piston actuator is used. This design features high reliability and choice of actuator seal materials for virtually every application. An optional welded design is also available for setpoints up to 1000 psi for maximum reliability. This design is available in 316 SS or Monel. Differential pressure models use a unique, dual diaphragm-sealed piston design that features very high static operating pressures and small size.

For setpoints between 4.5 and 150 inches of H₂O, a large diaphragm is used for increased sensitivity in both pressure and differential pressure designs with good choice of materials of construction.

All standard models feature ± 1 percent of range setpoint repeatability and a minimum of 400 percent of range proof pressures.

These standard designs perform well in applications where shock and vibration could be a problem and may be used in conjunction with Ashcroft diaphragm seals in extreme services such as slurries or abrasive process fluids.

Section 2

Common Details

PRODUCT DESCRIPTION

A quick drying, high gloss alkyd enamel available in a wide range of colors.

INTENDED USES

Used as a high gloss enamel finish for interior and exterior applications. Suitable for mild industrial and commercial environments. Particularly suited for fabrication facility application.

PRACTICAL INFORMATION FOR DEVLAC 1433

Color	Wide range via the Chromascan® system
Gloss Level	Gloss
Volume Solids	37%
Typical Thickness	1.5-2 mils (38-50 microns) dry equivalent to 4.1-5.4 mils (103-135 microns) wet
Theoretical Coverage	390 sq.ft/US gallon at 1.5 mils d.f.t and stated volume solids 9.70 m ² /liter at 38 microns d.f.t and stated volume solids
Practical Coverage	Allow appropriate loss factors
Method of Application	Airless Spray, Roller, Brush

Drying Time

Temperature	Touch Dry	Hard Dry	Overcoating interval with self	
			Minimum	Maximum
50°F (10°C)	1.5 hours	20 hours	24 hours	Extended ¹
59°F (15°C)	1 hour	16 hours	24 hours	Extended ¹
77°F (25°C)	30 minutes	5 hours	20 hours	Extended ¹
104°F (40°C)	15 minutes	2 hours	6 hours	Extended ¹

¹ See International Protective Coatings Definitions & Abbreviations

REGULATORY DATA **Flash Point (Typical)** 79°F (26°C)

Product Weight 10.0 lb/gal (1.2 kg/l)

VOC 4.49 lb/gal (539 g/l) EPA Method 24

See Product Characteristics section for further details

SURFACE PREPARATION

All surfaces to be coated should be clean, dry and free from contamination. Prior to paint application, all surfaces should be assessed and treated in accordance with ISO 8504:2000.

Devlac 1433 should always be applied over a recommended anti-corrosive coating scheme. The primer surface should be dry and free from all contamination, and Devlac 1433 must be applied within the overcoating intervals specified (consult the relevant product data sheet).

Areas of breakdown, damage etc., should be prepared to the specified standard (e.g. SSPC-SP6 or Sa2½ (ISO 8501-1:2007), Abrasive Blasting, or SSPC-SP11, Power Tool Cleaning) and patch primed prior to the application of Devlac 1433.

APPLICATION

Mixing	This material is a one component coating and should always be mixed thoroughly with a power agitator before application.	
Mix Ratio	Not applicable	
Airless Spray	Recommended	Tip Range 13-19 thou (0.33-0.48 mm) Total output fluid pressure at spray tip not less than 2005 psi (141 kg/cm ²)
Air Spray (Pressure Pot)	Not suitable	
Brush	Recommended	Typically 1.0-1.6 mils (25-40 microns) can be achieved
Roller	Recommended	Typically 1.0-1.6 mils (25-40 microns) can be achieved
Thinner	T-5 Thinner	Do not thin more than allowed by local environmental legislation
Cleaner	T-5 Thinner	
Work Stoppages	Do not allow material to remain in hoses, gun or spray equipment. Thoroughly flush all equipment with T-5 Thinner. Partially filled containers may show surface skinning and/or a viscosity increase of the material after storage.	
Clean Up	Clean all equipment immediately after use with T-5 Thinner. It is good working practice to periodically clean equipment during the course of the working day. Frequency of cleaning will depend upon amount sprayed, temperature and elapsed time, including any delays.	
	All surplus material and empty containers should be disposed of in accordance with appropriate regional regulations/legislation.	

PRODUCT CHARACTERISTICS

Level of sheen and surface finish is dependent on application method. Avoid using a mixture of application methods whenever possible.

As with all alkyd systems, Devlac 1433 has limited chemical and solvent resistance and is not suitable for use in immersion situations or in conditions of continuous condensation.

Devlac 1433 is not designed for application over epoxies or polyurethanes, and should not be applied over zinc based primers because of dangers of saponification of the alkyd resin and consequent adhesion loss.

For brush and roller application, and in some colors, two coats of Devlac 1433 may be required to give uniform coverage.

If applying Devlac 1433 in enclosed maintenance conditions ensure adequate ventilation.

Surface temperature must always be a minimum of 5°F (3°C) above dew point.

Note: VOC values are typical and are provided for guidance purpose only. These may be subject to variation depending on factors such as differences in color and normal manufacturing tolerances.

Low molecular weight reactive additives, which will form part of the film during normal ambient cure conditions, will also effect VOC values determined using EPA Method 24.

SYSTEMS COMPATIBILITY

Devlac 1433 is only suitable for application over alkyd or oleoresinous priming systems, e.g.:

Devprime 1401
Devprime 1403
Devprime 1405
Devprime 1407

For other suitable primers consult International Protective Coatings.

Devlac 1433 is only suitable for overcoating with itself, and should not be topcoated with any other product.

ADDITIONAL INFORMATION

Further information regarding industry standards, terms and abbreviations used in this data sheet can be found in the following documents available at www.international-pc.com:

- Definitions & Abbreviations
- Surface Preparation
- Paint Application
- Theoretical & Practical Coverage

Individual copies of these information sections are available upon request.

SAFETY PRECAUTIONS

This product is intended for use only by professional applicators in industrial situations in accordance with the advice given on this sheet, the Material Safety Data Sheet and the container(s), and should not be used without reference to the Material Safety Data Sheet (MSDS) which International Protective Coatings has provided to its customers.

All work involving the application and use of this product should be performed in compliance with all relevant national, Health, Safety & Environmental standards and regulations.

In the event welding or flame cutting is performed on metal coated with this product, dust and fumes will be emitted which will require the use of appropriate personal protective equipment and adequate local exhaust ventilation.

If in doubt regarding the suitability of use of this product, consult International Protective Coatings for further advice.

PACK SIZE	Unit Size	Vol	Pack
	5 US gal	5 US gal	5 US gal
For availability of other pack sizes contact International Protective Coatings			
SHIPPING WEIGHT (TYPICAL)	Unit Size		
	5 US gal	53.8 lb	
STORAGE	Shelf Life	24 months minimum at 77°F (25°C). Subject to re-inspection thereafter. Store in dry, shaded conditions away from sources of heat and ignition.	

Disclaimer

The information in this data sheet is not intended to be exhaustive; any person using the product for any purpose other than that specifically recommended in this data sheet without first obtaining written confirmation from us as to the suitability of the product for the intended purpose does so at their own risk. All advice given or statements made about the product (whether in this data sheet or otherwise) is correct to the best of our knowledge but we have no control over the quality or the condition of the substrate or the many factors affecting the use and application of the product. Therefore, unless we specifically agree in writing to do so, we do not accept any liability at all for the performance of the product or for (subject to the maximum extent permitted by law) any loss or damage arising out of the use of the product. We hereby disclaim any warranties or representations, express or implied, by operation of law or otherwise, including, without limitation, any implied warranty of merchantability or fitness for a particular purpose. All products supplied and technical advice given are subject to our Conditions of Sale. You should request a copy of this document and review it carefully. The information contained in this data sheet is liable to modification from time to time in the light of experience and our policy of continuous development. It is the user's responsibility to check with their local International Paint representative that this data sheet is current prior to using the product.

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SAMPLE NAMEPLATE

		SEEPEX. ALL THINGS FLOW
Commission No.	866809	
Type	BN 5-12	
Year of Manufacture	2017	
		SEEPEX Inc. 511 Speedway Drive Enon, Ohio 45323 USA www.seepepex.com