VEOLIA

Hydra-Pol ™

Polymer Preparation System

Installation, Operation and Maintenance Manual

Document No: IOM_0001_HYDP
Revision: 02
Date: 2018.05.07

WATER TECHNOLOGIES

LEFT BLANK

TABLE OF CONTENTS

1 INTRODUCTION

This document provides handling, storage, installation, operation and maintenance instructions for the Hydra-Pol™ polymer preparation system. The components of the Hydra-Pol™ are supplied by Veolia Water Technologies Canada (**VWTC**).

To obtain any additional information regarding characteristics or instructions on this equipment, please do not hesitate to contact us.

The system was designed in Canada by:

Veolia Water Technologies Canada
4105, Sartelon
Saint-Laurent, Qc.
Canada H4S 2B3
Phone: 514-334-7230
Fax: 514-334-5070

For technical support or service needs, for spare parts or to get assistance during your warranty period, you may contact us at the following number during regular business hours or write us at:

Veolia Water Technologies Canada After Sales Support
1-844-SER-VWT9 | 1-844-737-8989 | vwtservicecanada@veolia.com

Our business hours are from
Monday to Friday
8:30am to 5pm EST

2 SAFETY

2.1 INTRODUCTION

It is important that the operator has understood the instructions of use, security and maintenance before using the Hydra-Pol™ system. The manufacturer cannot be held responsible for use or improper maintenance resulting from a breach or non-compliance with instructions. The Operation and Maintenance manual contents must be kept permanently close to the system in a safe place.

It is important for Operations and Maintenance individuals to understand the nature of the chemicals they are working with. Hydra-Pol™ systems are for the preparation and dosage of different chemicals, some of which can pose extreme slip/trip hazards if spilled. Other chemicals create fine dust and pose a risk to respiratory health.

The safety rules and guidelines issued to the operators are the primary precautions that are necessary for the prevention of accidents. The operators should be very familiar with these rules. The safety pictograms used in the plant are to be respected at all times.

Operators should always wear the safety equipment that is provided or required by their management. Such items as hard hats, safety shoes, safety glasses, gloves, breathing protection, protective clothing, protection harness and hearing protection are very basic and go a long way in preventing accidents.

Operators should be aware of the location of eye wash stations, safety showers, self-contained breathing apparatus, first aid stations, and other safety equipment furnished for the plant.

Good housekeeping will also eliminate safety hazards such as tripping or slipping. When spills happen, the floor should be cleaned as soon as possible (see Chemicals Hazards section).

2.1.1 Utility Hazards

Utility hazards exist on a system including high-voltage electricity, pressurized water, and high pressure air. Care should be taken when utilizing this system.

2.1.1.1 Electrical

Electrical connections must be made by certified electricians in compliance with all applicable codes and regulations. Electrical equipment should never be worked on unless it is turned off and locked and tagged out. The lockout system key should belong to the person doing the repair or the on-site electrician. This will remove the potential danger for electrical shock or accidental start-up.

Even though most electrical motors and switch boxes are designed to be water tight, the presence of water around electrical equipment always presents a hazard and therefore should be used with care.

2.1.1.2 Pressurized Water

Only the proper pressure fittings should be used in the piping system. Leaks should be repaired as soon as possible. Isolation valves on piping that are being repaired should be shut tight and locked out. Lock out the water inlet and remove pressure before starting any maintenance.

2.1.2 Equipment Hazards

2.1.2.1 Rotating Parts

<u>General instructions</u>

Since the system includes equipment with rotating parts (Dry polymer feeder and mixer), operators should avoid wearing loose clothing and jewellery. Loose clothing can present one of the biggest safety hazards that exist when working near equipment in process.

<u>Dry polymer Feeder</u>

- Never introduce hands into a running micro-batch feeder.
- Never open the inspection hatch when the feeder is running.
- It is however necessary fitting upstream the machine a fix safety grid or a hopper high enough to prevent damages to limbs according to the Machine Directive inforce. The same approach is necessary for the outlet: it is required using a vertical outlet or similar systems meant to prevent foreign bodies from entering the machine and cause damage to it, to persons or to their limbs. Always ensure the Machine Directive in force is being followed.
- Lock out the system before starting any maintenance.

<u>Mixer</u>

- Never introduce hands into the preparation tank if the system is not locked out.
- Lock-out the motor starter before starting any maintenance.

2.1.2.2 Operation and Maintenance

The system in its normal use can present a hazard if not operated or repaired in a safe manner.

All equipment should only be operated and repaired according to the recommended procedures of the manufacturer, and by qualified individuals.

Only recommended spare parts should be used.

Maintenance on pumps, piping, etc. should be performed only after valves are locked and tagged or slip blanks are installed to completely isolate the equipment being worked on. Instrumentation and controls should always be kept in good working order to help assure the safe operation of equipment. Never remove instruments or controls out of service until having communicated with the operator and have established a plan to define the operation maintenance steps. If air operated valves are used for isolation, the air line should be removed to prevent inadvertent operation of the valves. When possible the valve can also be locked in position.

When maintenance is finished on equipment, the protective caps provided must be reinstalled. If a protection must be left off, unwary personnel should be notified by using safety pictograms or installing temporary protection. Equipment should never be inspected or maintenance attempted while the equipment is operating. All pumps and various automatic valves may cause harm to an operator if care is not taken.

2.1.3 Chemical Hazards

Dry Polymer Material Safety Data Sheets (MSDS) should be available close to the system.

Since chemicals or chemical dosage are used during normal operation of treatment facility, the risks of exposure to toxic chemicals or chemical burns are present.

All plant personnel should be required to wear proper protective clothing when handling or working near these chemicals. A minimum wardrobe should include, but not be limited to, a plastic hard hat, coat, boots and gloves of a resistant material as well as a pair of safety glasses. Safety glasses, even with shields, are not adequate for use in areas where very acidic or basic materials are handled.

In the presence of water, polymer becomes very slippery. Spill recovery or remediation kits that include cat litter, rock salt and absorbent pads are very helpful in preventing trip/slip risks that result from polymer spills. In case of spill, wear appropriate personal protective equipment. Ventilate area. Prevent material from entering sewers, remove as much dry polymer as possible with a vacuum.

If the polymer has been wetted, the operator will remove as much as possible the wet polymer with a can and then, he will add an absorbent material (cat litter). He will let it soak it up for a while before he will shovel it into a disposal container. After the spill has been dried then a floor drain will allow washing the containment with a hose garden (warmest water possible).

3 SHIPPING

Most of the equipment and material for this project will be drop shipped from **VWTC** facilities and delivered directly to the site.

- All items delivered will be clearly identified with **VWTC**'s name, **VWTC**'s project name, **VWTC**'s project number.
- All shipments will have a clear Packing List identifying all parts in the shipment.
- All equipment will be tagged with the corresponding tag numbers shown on the design drawings (if applicable).

If there are more stringent requirements in the contract documents, they will take precedence over the above. If any of these requirements are not being followed, please notify the **VWTC** Project Manager immediately.

4 RECEIVING

The condition of all delivered equipment must be verified by the responsible party upon arrival at site. Verification that all equipment has been delivered as per contract must also be done upon arrival at site. Notification of missing or damaged items must be sent to Veolia Water Technologies Canada within five (5) working days of receipt of equipment. If there is no documented notification of missing or damaged parts within five (5) working days, Veolia Water Technologies Canada is not responsible for replacement of any items found to be missing or damaged at the time of installation and start-up of the supplied equipment. It is the responsibility of the party receiving the equipment to ensure all packaging is opened at the time of receipt to uncover and document any and all damages to the Freight Company and Veolia Water Technologies Canada.

Photographs and written documentation should be provided for all damaged equipment.

5 HANDLING

5.1 GENERAL

Equipment will arrive at the project site in several different shipments, from various freight companies and in several different packaging containers. Typically a flatbed truck is used which requires a fork lift or a crane to remove the items.

The Contractor is responsible for unloading and handling the equipment.

5.2 STAINLESS STEEL MATERIAL HANDLING

In order to minimize potential corrosion damage or unsightly surface marking, measures shall be taken to prevent contamination by iron, aluminium, copper, chlorides, and sulphides from lifting equipment. Stainless steel slippers or wooden packers should be used on forklift trucks to prevent contamination. Any resultant incidental contamination shall be removed at the earliest opportunity.

6 STORAGE

6.1 GENERAL

The following instructions outline the duties and responsibilities of the responsible party for equipment storage. The responsible party shall assume responsibility for the equipment upon arrival at the project site. These instructions shall define the minimum expectations for storage of all equipment. While this storage specification takes into account common environmental issues that may affect the system during storage, common sense should be the overriding factor in determining the best method to ensure the integrity and proper storage of the **VWTC** equipment.

For contractual purposes, **VWTC** demands the Client to send pictures of major equipment once it is placed in storage, any time it gets moved during storage and again prior to removing from storage. For outside storage, pictures must be sent every month. Alternatively, a written document (check list, etc.) confirming that proper storage conditions are maintained will suffice. Failing to do so would cancel the proposed warranty.

Should it be necessary to delay installation and subsequent operation of a unit for more than one month from date of receipt at Site, special precautions must be taken.

Although some equipment can be stored outdoors, indoor storage is preferred for most equipment.

The storage environment into which a system is placed can have a severe effect on the long-term usefulness of some parts. Key environmental factors are:

- Temperature
- Relative humidity
- Pollutants

Air may contain excessive moisture, pollutants, microorganisms, and other particulates that accelerate the deterioration of some materials. Humidity and pollutants can produce an aggressive atmosphere.

Indoor storage refers to storage in a climate controlled environment in a clean, non-aggressive, dry (non-condensing) and sheltered environment having a relatively constant temperature (especially for gear reducers, motors, bearings, etc.). Storage volume depends on the size of the project.

The environmental indoor conditions should not exceed the following ranges:

Min/Max Temperature Range between:	5°- 40°C
Relative Humidity (RH) Range between:	35% - 70%

1. Equipment should be stored in such a manner that it is free from allowing insects/rodents etc. from entering the equipment.
2. Cover the equipment with a tarp or similar protective shield to prevent direct exposure to dust or any other contamination. However, never enclose the unit or components totally in plastic covers; always leave adequate ventilation of air to prevent condensation.

Equipment must be checked on a weekly basis for tarp/wrap integrity and accumulation of dust or contaminants.

To avoid damage, do NOT stack crates.

To avoid damage, do NOT stack enclosures.

Do not store equipment or spares parts in barns, equipment sheds, or any other building without the capacity for heating and cooling as needed.

6.2 STAINLESS STEEL MATERIAL STORAGE

Stainless steel materials and products shall be stored separately from carbon steels and nonferrous materials. Materials should be stored under conditions that minimise the accumulation of dust and deposits. Any resultant incidental contamination shall be removed at the earliest opportunity.

6.3 SPECIAL MAINTENANCE REQUIREMENTS DURING STORAGE

After three (3) months of storage, long term storage methods must be applied to the unit including complete fill with lubricant. Protect machined surfaces and rotate shafts periodically (every month). Five (5) complete rotations of the output shafts are recommended each time.

Periodic checks should be made to ensure that no rusting or other damage has occurred. Should such be noted, corrective action should be taken immediately. Prior to putting the unit into service, drain lubricant and refill to the proper level as determined by the mounting position. Refer to manufacturer documentation.

All motors must be run every 3 month as a preventive measure against the formation of corrosion.

6.4 EQUIPMENT CLEANING

VWTC is not responsible for cleaning of any equipment prior to installation and start-up due to the storage of the equipment. This is the complete responsibility of others.

7 HYDRA-POL™ PRINCIPLE AND DESCRIPTION

7.1 POLYMER HYDRATION PRINCIPLE

Dry polymers must be diluted with water before use. The Hydra-Pol™ system is designed to handle all kind of dry polymer encountered in water treatment application (cationic, anionic and non-ionic). The uses of the Hydra-Pol™ polymer make up system allow activating between 90% and 100% of the dry polymer and help to minimize shipping and handling costs.

The challenge of dry polymer wetting is that the best activation each dry polymer particle should be wetted individually. When a clump of particles is wet, it forms an agglomeration called fisheyes that will dissolve slowly.

To avoid large agglomeration, the first polymer wetting and dilution must be done with a ratio between the service water and the dry polymer dosage. The wetting cone is designed for an optimal dissolving of dry polymer. The whirl created in the cone a high shearing stream that allows the polymer dispersion. After the powder dosage it cleans the cone. After the fast dispersion, the polymer hydration starts by forming a gel layer all around the polymer particles.

This dilution ratio is different depending on the type of polymer and the particle size. Anionic polymer must be more diluted than cationic polymer (see Table below).

The wetted polymer needs an aging time to reach its full activity; this aging time depends also on polymer type.

Polymer Powder	First Dilution	Aging Time
Anionic	0.2% – 0.25%	60 – 90 min
Cationic	0.3% – 0.5%	45 – 60 min

The polymer hydration changes its properties:

- Increase in molecule weight
- Charge interaction increase molecule size
- Entanglement in molecule increase viscosity
- Increase of conductivity

Dry polymers are susceptible to caking if stored under humid conditions. Caking interferes with the dilution process. It is recommended to store dry polymer in dry environment and respect powder life time.

7.2 DESIGN SUMMARY

7.2.1 Datasheet

If this polymer preparation system is integrated to a processing plant, refer to the Detailed Technical Documentation section of the Operation and Maintenance Manual for the preparation system datasheet.

7.2.2 P&ID

If this polymer preparation system is integrated to a processing plant, refer to the Process and/or Detailed Technical Documentation section of the Operation and Maintenance Manual for the preparation system drawings.

7.2.3 General Arrangement Drawings

If this polymer preparation system is integrated to a processing plant, refer to the Process and/or Detailed Technical Documentation section of the Operation and Maintenance Manual for the preparation system drawings.

7.3 COMPONENTS DESCRIPTION

The components of the Hydra-Pol™ system provide four main functions:

- Dry polymer storage and dosing
- Polymer wetting and transfer to the maturation tank
- Polymer maturation
- Polymer solution storage

7.3.1 Dry Polymer Storage and Dosing

7.3.1.1 Hopper with Vacuum or Bulk Bag Unloader

An integrated vacuum can fill a storage hopper located above the feeder. This vacuum allows manual transfer of polymer from dry bulk bags or other containers to the Hydra-Pol™ system.

The Hydra-Pol™ system is available with a bulk bag unloader option. It may be configured with a hoist and trolley or with a special frame for forklift loading. Each bulk bag unloader includes four (4) attachment points that raise the bulk bag to the polymer preparation system. An iris valve allows the discharge of the powder to a storage hopper.

7.3.1.2 Volumetric Feeder

WAM, model MBF, is a volumetric feeder that doses a dry material at a constant rate. It includes a homogenizer agitator installed in a hopper for a better material flow. The feed screw is made of stainless steel 304. The feeder includes, at the outlet, a T nozzle which directs the flow of the material, allows for isolation of the dosing screw, and has an inspection window where the powder dosing can be observed. The feeder contains a level switch, preventing the volumetric feeder from running when empty. A transition hopper is optional. It can be integrated with the volumetric feeder. It is made of stainless steel 304 and has a capacity of 100 L.

The feeder is also composed of a plunger which closes the T nozzle (at the exit of the metering) of the wetting cone. The operation of this device is controlled by a solenoid valve that allows a flow of water to the cylinder.

7.3.2 Polymer Wetting and Transfer to the Maturation Tank

7.3.2.1 Isolation Valve

An isolation ball valve is placed at the entry of the system to close the water inlet to the Hydra-Pol™. Two (2) others valves are placed at the outlet of the storage tank to drain or to close the conduit of the system. The valve is made of PVC with EPDM seals.

7.3.2.2 Solenoid Valve

Two solenoid valves are placed in the system. The first valve monitors the pressure of the inlet to the service water line. When the switch detects a fault, a switch commands the solenoid valve to close.

The second valve is used to let the water flow to the cylinder that triggers the opening of the dispenser. The return of this cylinder water flow goes to the wetting cone.

7.3.2.3 Service Water Pressure Switch

The pressure switch activation will trigger an error message and close the service water inlet valve if the inlet pressure is below its set point.

7.3.2.4 Pressure Gauge

The gauge is used to read the water inlet pressure.

7.3.2.5 Wetting Cone and Eductor

The wetting cone is a device that wets the metered powder and prevents material accumulation in the cone at the feeder output. It includes a tangential inlet to the cone that is controlled by a manual ball valve. It is very important to have the right amount of flow from this inlet into the cone to avoid having too little flow and a resulting accumulation of half-dry powder. However too much flow is also an issue, as it can cause water to splash up out of the cone and into the T nozzle.

An eductor, installed at the bottom of the wetting cone, draws the powder into the water flow through the system.

7.3.2.6 Check Valve

A check valve is placed after the output of the eductor. It prevents the return of the solution into the wetting cone when the system stops.

7.3.2.7 Static Mixer

The static mixer is a device which uses the flow energy to mix the water and the pre-wet polymer powder by means of mixing elements.

7.3.2.8 Level Switch

A level switch is installed in the hopper to signal the operator and stop the system when the level of powder becomes too low.

7.3.3 Polymer Maturation

7.3.3.1 Preparation Tank

The cylindrical preparation tank, made of stainless steel, allows the maturation process of the polymer solution. As stated in section 7.1, this timing depends on the volume of the batch, type of polymer and dosage. The tank plastic cover includes an access trap made of stainless steel. A butterfly valve is installed at the bottom of the tank to allow the transfer of the polymer solution to the storage tank. A hydrostatic pressure transmitter installed at the bottom of the tank to measure the level in the tank. An overflow is installed at the top of the tank.

7.3.3.2 Mixer

A mixer is installed on the cover of the preparation tank to allow maturation of the polymer solution. During the batching sequence, the mixer does not begin to run until the water level has reached the impellers. This level is set during commissioning and also dictates the point during the batching sequence when the volumetric feeder begins dosing.

7.3.3.3 Butterfly Valve

An open/closed actuated butterfly valve allows the solution transfer from the preparation tank to the storage tank when tanks are superimposed.

7.3.3.4 Conductivity Probe (optional)

A conductivity probe is installed in the preparation tank. Given experience, this conductivity probe will be able to reflect how the batch turned out. The conductivity is dependent on the service water, the temperature, the mixing/blending of the polymer, the polymer type and the dosage of polymer.

7.3.3.5 Pressure Transmitter

A hydrostatic pressure transmitter installed at the bottom of the tank measures the level in the tank. This level is set on commissioning and is integral to the batching sequence.

7.3.4 Polymer Solution Storage

7.3.4.1 Storage Tank

The cylindrical storage tank, made of stainless steel, allows the storage of the polymer solution. A support structure mounts the preparation tank above the storage tank. However, with tanks that have a larger capacity, tanks can be installed side by side and a pump allows the solution to be transfer from the

preparation tank to the storage tank. Anchor points are provided for fastening. An overflow is installed at the top of the tank.

7.3.4.2 Pressure Transmitter

A hydrostatic pressure transmitter installed at the bottom of the tank measures the level in the tank. This level is set on commissioning and controls when the batch in the preparation tank is transferred to the storage tank.

7.3.4.3 Control Panel

A control panel allows the fully automated system operation. It also allows the transmission of alarm signals to an external system.

8 INSTALLATION

8.1 SERVICE WATER

The Hydra-Pol™ system needs a clean water supply for the polymer activation a clean water supply. This water must meet quality criteria. The installer must connect the water supply as indicated on the general arrangement drawing.

8.1.1 Flowrate and Inlet Pressure

The required flow and pressure indicated on the technical data sheet are important to ensure proper system operation. These conditions must be met as a requirement for starting a batching sequence. When setting these inlet water standards, the dynamic head losses have to be taken into account. Non-compliance can lead to overflows at the wetting cone or plugging of the wetting cone due to improper blending. Inlet pressure is not to exceed 120 psig working pressure and must exceed 65 psig.

8.1.2 Water Temperature

The water temperature for the polymer make-up must preferably be between 10°C and 30°C. The ideal temperature is 15°C.

8.1.3 Water Quality

The service water should have preferably a low residual chlorine content (<0.5 mgCl_2/L). Chlorine can quickly deteriorate polymer solutions and thus reduce their effectiveness. Water having a high content of hardness (> 300 ppm $CaCO_3$) or alkalinity (>75 ppm) should also be avoided.

Parameter	Impact	Upper Allowable Limit
Total Hardness	High hardness causes precipitation in makedown vessels (most prevalent in high charge products)	<300 mg/L as Ca CO_3
pH	Low pH causes precipitation in makedown vessels	Makedown water pH in range of 6.0 to 8.0
Conductivity	High conductivity slows dissolution and reduces viscosity Low conductivity slows dissolution and reduces viscosity	< 10,000 µS/cm See following notes on conductivity
Chloride	No specific impacts distinct from that of conductivity as indicated above.	None specified. Refer to Conductivity limits.
Suspended Solids	High TSS promotes flocculation in makedown tank. Possible plugging of feed system.	< 5 mg/l (filtration at 100 µm).
Temperature	Warmer water promotes dissolution. Low temperature result in increased mixing time and potential for incomplete dissolution. Higher solution viscosities develop in low temperature solutions.	10 to 30°C
Metals(Fe^{2+}, Cu^{2+}...)	Cleavage of polymer chain and loss of activity.	< 1 mg/l each
Residual Oxidant	Degradation of polymer chain.	< 0.5 mg/l
Microbiological Activity	Degradation of polymer chain	< 10^3 CFU/ml aerobic or SRB

8.2 RECOMMENDED ARRANGEMENT

The installation should be performed by qualified personnel.

Select a location providing:

- An easy access to the system and an easy polymer handling.
- At least a clearance of one meter in front of the electrical panel.
- At least 72 inches of clearance behind the feeder for the maintenance.

In the presence of water, polymer becomes very slippery, it is recommended to take this hazard into account in the equipment layout.

It is recommended:

- To build a curb all around the area or install a plastic secondary containment.
- To secure the access to the top of tanks without entering into the secondary containment.
- To install a resistant coating and easy-to-wash on floors and curbs.
- To install tempered water hose close to the system.
- To install a closed floor drain in the secondary containment into which deteriorated polymer and the total volume of the Hydra-Pol™ tanks can be emptied.
- To design a concrete pad under the polymer tank to avoid flood damage to the instruments.
- To do not install equipment in areas of extreme heat, cold, dust or humidity. Avoid areas where objects or fluids can drop from overhead. Units are to be installed as close to the point of application as possible.

After selecting the optimal location, the installer will:

- Unpack the components.
- Install the preparation tank above the storage tank (if any) on a sturdy level surface. Fasten to prevent movement.
- Position powder dosing skid as the corresponding drawings on a sturdy level surface. Fasten to prevent movement.

8.3 PIPES CONNECTIONS

The installer has to connect the following pipes:

- Service water inlet.
- Tanks overflows and drains (they should be directed to an appropriate location according to local regulations).
- Pipe between the dosing system and the preparation tank. The dosing system should be located as close as possible from the preparation tank to reduce at the maximum the interconnecting pipe as shown on the General Arrangement drawing. Any extension of the pipe could bring an additional backpressure on the educator and change its performance.
- Transfer pipe between the two tanks (model over Hydra-Pol™ 7500).

8.4 ELECTRICAL REQUIREMENT

Electrical connections and maintenance must only be performed by qualified personnel. Electrical elements have to be connected according to local regulations. The Hydra-Pol™ system is usually provided with its own control panel.

The electrician has to connect:

- The mixer motor to the control panel
- Main power supply to the control panel
- Cables of instruments to the control panel

It is recommended to ground the dosing system frame and the two tanks (if made of steel).

9 INSTALLATION AND PRE START-UP INSPECTION

9.1 PRE-OPERATIONAL CHECKOUT

Included in appendices of this manual are standard **VWTC** checklist forms to be completed by the installer and returned to **VWTC** project manager prior **VWTC** onsite installation inspection. **VWTC** will schedule our field service visits prior to return of completed checklists but it is our policy to not dispatch field personnel to the jobsite until the completed and signed checklist is received by our project manager or field service manager.

9.2 START-UP CHECKOUT

9.2.1 Mechanical, Electrical and Control Start-Up

The mechanical and electrical start-up of the polymer make-up system includes the connection, verification and inspection of the following elements:

- Mounting
- Motors
- Mixers
- I/O Check
- Tubing and process connections
- Power connections and supply
- Valves
- Instrument calibration

9.2.1.1 Initial Checking and Adjustment

Prior to calibration the following elements will be verified:

FUNCTIONAL START-UP CHECKOUT	
Vacuum	Check that the air filter is in place.
	Check suction of the system. Do not put your hands on the suction nozzle.
Hoist & Trolley	Check that the hoist and the trolley operate correctly.
Feeder	Check whether foreign substances or water have entered the feeder. In such a case, clean thoroughly.
	Avoid any friction between the metering screw and the body. This requires opening the hopper and removing the T nozzle. Inspecting the screw/auger to be sure that it is flush with the walls of the hopper and inside the T nozzle is very important because removing the material can be difficult and risky.
	Check that the inspection hatch is closed (stainless steel feeder only).
	Check oil level in gear reducer.
	Check that the metering screw rotates counter clockwise when looking from the rear of the drive unit.
	Check that the feeder is working properly.
	Minimum speed and maximum speed must be verified.
Wetting Cone	Check that the wetting cone is completely clean and free from dirt or foreign objects.
	Check that the water flows tangentially into the cone.
	Ensure that the water speed is sufficient to create a vortex.
	Ensure that water speed is not too great to create splashing up into the T nozzle.
	Check that the metered powder falls vertically in the middle of the wetting cone.
Eductor	Check that the eductor is completely clean and free from dirt or foreign objects.
	Check that the service water pressure is higher than 65 psig in operation.
	Check that the eductor is working properly.
Piping	Check that the pipework are completely clean and free from dirt or foreign objects.
Manual valves	Check that all manual valves are working properly.
	The manual valves control the whirl and blending of the powder. Ensure that the flow is appropriate.
Automatic valves	Check that all automatic/electric valves are connected to the control panel.
	Check that all automatic/electric valves are working at proper times and the limit switches are set.
Instruments	Check that all instruments are properly calibrated.
	Check that all instruments are properly installed.
Pressure switch	Check that the pressure switch works properly by closing the water inlet valve.
	Check that the pressure switch is connected to the control panel.
	Check that the pressure switch works properly.
	Check the pressure gauge is working correctly.
Mixer	Check all bolts and nuts are properly tightened.
	Check the oil level in the gearbox.
	Check if installation of the mixer shaft is adequate.
	Check the direction of rotation of the agitator.
	Adjust the motor overload protection to the value shown on each motor nameplate.
	During start-up, listen for unusual noises and check for excessive vibration.
	Check the temperature of the motor and the gear reducer. The temperature should not exceed 180°F (82°C).
Static mixer	Check that the static mixer works properly.
Level transmitter	Check the calibration of the level transmitter.

9.2.2 Hydraulic Test

Due to the nature of the materials used in the Hydra-Pol™ systems, it is important that the hydraulic integrity of the system is verified even before the Control Start-Up is performed. The hydraulic inspection and testing is comprised of the following elements:

- Connect all fittings and walk the piping to be sure that the hydraulic pathway meets operational specifications.
- Verify that the service water system is ready to provide water and that the client is ready to accept water into their downstream system.
  - NOTE: this step is of extreme importance as during the construction phase, often communication with other workers is complicated and difficult. Be sure that you yourself check the discharge point and that no one is working in the area and that all risks are mitigated.
- Briefly allow water through the system by manually operating the valves. Check for leaks. Provided no leaking or loose connections are found, continue to the next step.
- Verify that the preparation tank and storage tank are clean and have head space to accept a few minutes of water. Manually operate the valves and booster pumps to allow for the operational pressure of the system is met. Walk the Hydra-Pol™ to verify that all tubing fittings are tight, that the T nozzle plunger is pulled back, and that the whirl in the wetting code is adequate.
  - NOTE: this step is of importance. If the whirl of the wetting cone is not adequate, then the wetting cone will clog with polymer and the clean-up will take hours.
- Allow the preparation and storage tank to fill with service water. Check that the level set-points give the desired volume for the sequencing and batching in the Process Start-Up section.
- Stop the system and do a final walk-through of all hydraulic and mechanical integrity.

9.2.3 Control Start-Up

The control start-up for the polymer make-up system include; connection, verification and inspection of the following elements:

- The alarms, start-up and shut down of the motors.
- The transmission of the electric signals of the different components as well as their configuration parameters if needed.
- The pumps alarm transmission to the plant system.
- I/O verification of instrumentation.
- Sequencing.
- The proper functioning of the electrical and process alarms.
- The variable frequency drives connection.
- The control panel.
- Other elements of control, if required.

Start-up and shut down sequencing will be checked:

- Normal start and stop sequencing.
- Alarms stop sequencing.
- Clearing alarms and restarting the process.

9.2.4 Process Start-Up

Once the mechanical, electrical, hydraulic and control start-up of the preparation system have been completed, the equipment commissioning can begin. The following steps will be performed.

9.2.4.1 Screw Calibration Procedure

Tests will be performed using water for the initial testing and the specific chemical for the final test.

- Calibration of the dosing screw at minimum, full range and intermediate speeds to set the functional output curve.
- Preparation unit concentration and dosage settings.

Powder polymer is injected into a preparation tank using a dosing apparatus. The apparatus operating time is calculated based on its capacity and the desired concentration.

9.2.4.1.1 Dosage Calculation

The operating dosing time is calculated based with the following formula:

$$T_s = \frac{CONC \times \left(\left(LEV_{stop} - LEV \right) \times SURF \right)}{CAP} \times 60$$

T_s:	Dosing apparatus operating time (sec)
CONC:	Polymer concentration adjustable to operator interface (g/l)
LEV:	Preparation tank current level (m)
LEV_{stop}:	Preparation stop level set point (m)
SURF:	Preparation tank surface (m^2)
CAP:	Dosing apparatus capacity adjustable to operator interface (kg/min)

Note: This formula may also be used to perform a manual preparation in case of automatic system failure. To ensure dosing accuracy of the tank, capacity must be validated by the operator.

9.2.4.1.2 Feeder Capacity

The feeder capacity must be checked by weighing the discharged amount of polymer powder/time.

The operator must repeat four (4) times the following procedure:

- Set a frequency on the VFD – Start with 60 Hz.
- Hold a sample shovel just under the outlet of the powder feeder.
- Then turn the switch for FEEDER to position H for a specific time.
- Weigh the contents in the sample shovel.

EXAMPLE (dry polymer):

Obtained value 2000 g/20 sec = 6 kg/min = feeder capacity

Assume that 0,3% concentration is to be mixed in a 400 L tank (see the actual value on the data sheet). The amount needed for each batch will be:

$$\frac{0.3 \times Size\ of\ tank\ (dm^3)}{100} = \frac{0.3 \times 400}{100} = 1.2\ kg$$

The dosing time of the powder feeder will then be:

$$\frac{1.2\ [Amount\ of\ polymer\ in\ kg]}{6\ [Capacity\ of\ feeder\ in\ kg/min]} = 0.2\ minute$$

This dosing time is set on the interface. Record the test procedures and test results/settings within the manual.

9.2.5 Process Start-Up Records

The personal in charge of the commissioning will furnish inspection sheets for equipment including:

- Project name
- Tag number and description
- Manufacturer
- Model and serial number
- Date, time and person who will perform calibration
- Calibration data to include:
  - Input, output and error at minimum, intermittent and maximum output range
- Space for comments
- Certification by installer and acknowledgment by contractor and date
- Adjustment of the service water flow rate and pressures (if required)

10 TROUBLESHOOTING GUIDE

COMPONENT	ISSUES	POSSIBLE CAUSES	ACTION
SERVICE WATER INLET	Service water low pressure.	Service water feed system low pressure.	Inspect service water system and booster pumps.
		Obstruction.	Clean pipes.
VACUUM	Reduction of the suction capacity at the vacuum filling of the polymer powder.	Clogging of the dust filter.	Remove the external filter and clean. Verify that the lid and viewport have no leaks.
		Max level in the powder hopper is exceeded and/or malfunctioning level sensors.	Stop the filling. Inspect the feedback from level indicators. If not reflective of material's level, inspect wiring and ability to detect material.
		The feeder shutter at the outlet of the feeder is not shut.	Filling must not be done while the feeder is operating. Wait until the feeder has stopped.
WETTING CONE	Clogging of the wetting cone.	The feeder shutter at the outlet of the feeder is not shut.	Check the function of the solenoid valve to the feeder shutter, or clean the shutter from possible polymer powder clogging.
		The water whirl in the wetting cone is too small.	Check water pressure.
FEEDER	Feeder does not run.	No power to the feeder.	Check the button or the on / off switch of the machine is turned on.
			Check that the isolating switch is in the on position.
			Check that the inverter is not set to 0 Hz.
			Check if there are short circuits, blown fuses or tripped breakers.
			Check that the power supply corresponds to control and motor requirements.

			Check if there are error messages in the drive controller screen.
	Feeder screw or agitator is damaged.	Foreign body inside feeder.	Remove foreign body and replace damaged components
	Feeder screw or agitator stops.	Hygroscopic material inside feeder has absorbed humidity.	Unload feeder completely when shutting down for long periods.
	Feeder – Rotating components unscrewed, no material handled.	Motor incorrectly wired.	Rewire (metering screw must turn counter clockwise when viewed from behind drive unit).
	Feeder – Sticking of hygroscopic products; Agglomeration of viscous materials; Contamination of the product.	Long shutdown period.	Unload feeder completely when shutting down for longer periods.
	Feeder makes scraping or grinding noise.	Foreign body inside feeder. Poor alignment of gearbox, hopper wall welding.	Visually inspect the hopper and the level of the auger by removing the T nozzle.
TANK	Maturation tank or storage tank overflow.	Level transmitter default.	Inspect level transmitter.
	Incorrect concentration of the polymer solution.	Wrong dosing time set point	Calibrate the dosing screw and adjust parameter.
		Polymer density change.	Calibrate the dosing screw and adjust parameter.
TRANSFER VALVE	Transfer valve not closing tight.	Debris present in the valve.	Remove the foreign object and check for possible damages.
		The adjustment of the travel stop is incorrect.	Adjust the actuator travel stop according to the manufacturer's instructions.
		Prepared polymer solution concentration is too high	Adjust the concentration

Note: If the preparation sequence is interrupted by a power failure or by component failure then the current polymer batch will be lost and will have to be drained. Broken components will have to be replaced before starting a new polymer batch.

11 MAINTENANCE

Any manipulation of metering equipment and chemicals should be done by qualified and trained personnel. Refer to product MSDS for safe material handling.

ITEM	DESCRIPTION	WEEKLY	MONTHLY	BI-MONTHLY	YEARLY	COMMENTS
MIXER	Gearbox visual inspection and noise	X				
	Check gearbox oil level	X				
PREPARATION TANK AND STORAGE TANK	Empty storage and preparation tanks. Check the presence of foreign matter at the bottom. Clean if necessary.				Every 6 months	Dispose of chemical residues appropriately
PIPING	Check for leaks.	X				
	Rinse pipes with lukewarm water.				Every 6 months	
LEVEL TRANSMITTER	Calibrate on a regular basis and / or when readings become inaccurate (specific to each type of use).				Every 6 months	
STATIC MIXER	Visual check. Clean if required	X				
FEEDER	If the feeder uses MBTX, MBTN or MBTT type shaft seals, check these on a monthly basis to make sure they are in good working condition.		X			Grease monthly
DISSOLVER CONE	Inspect the cone for the presence of polymer agglomeration. In case of loss of suction, remove and clean eductor with hot water. Inspect weekly to ensure that there is no accumulation of polymer or fouling and, if necessary, clean by draining the cone and the eductor with water.	X				
VALVES	Inspected and clean if required. Refer to supplier's maintenance manual.				Every 6 month	
DOSING SKID FRAME OR BULK BAG UNLOADER	Check the appearance of the structure, paying particular attention to the state of welds.		X			
	Check that all bolts are correctly tightened, in particular the vibrator fixing bolts.		X			

12 SPARE PARTS

It is highly recommended to keep in stock spare parts in sufficient quantity for all critical components to the proper functioning of the system.

Only the use of original Veolia spare parts will ensure proper and reliable operation of the system.

When ordering a spare part, please give the following information:

- Veolia's project number
- Veolia's project name
- Part number

APPENDIX A

START-UP CHECKOUT CHECKLIST
(TO BE COMPLETED BY CONTRACTOR)

LEFT BLANK

VEOLIA	HYDRA-POL START-UP CHECKOUT CHECKLIST		
Project		Date	
Structure		Revision	
Number		Doc. N°	
Reactor		Written by	

N°	ITEMS	X	COMMENTS
1	**AUXILIARY COMPONENTS TEST PROCEDURE**		
1.1	Place Main Disconnect to "ON"		
1.2	Put Water inlet valve in manual mode "OPEN" position		
1.3	Check service water pressure when valve placed in OPEN position		
1.4	Check water whirl in wetting cone		
1.5	Adjust manual wetting cone valve for desired whirl level		
1.6	Check service water is going to mixing tank		
1.7	Close manual water inlet valve		
1.8	Verify that water pressure switch alarm activates after **2 seconds**		
1.9	Open manual water inlet valve		
1.10	Verify that water pressure switch alarm is disabled		
1.11	Simulate (if possible) the function of powder hopper level switch		
1.12	Start powder vacuum conveyor (if supplied)		
1.13	Stop powder vacuum conveyor (if supplied)		
1.14	Start hoist & trolley (if supplied)		
1.15	Stop hoist & trolley (if supplied)		
1.16	AUXILIARIES COMPONENTS TEST PROCEDURE COMPLETED		
2.0	**MANUAL WET TEST PROCEDURE**		
2.1	Place Main Disconnect to "ON"		
2.2	Put water inlet valve in manual mode "OPEN" position		
2.3	Check service water pressure when valve placed in OPEN position		
2.4	Check water whirl in wetting cone		
2.5	Adjust manual wetting cone valve for desired whirl level		
2.6	Check service water is going to mixing tank		
2.7	Wait water level in mixing tank reaches mixer level + 100 mm (fully covering the impeller)		
2.8	Place mixer selector in manual mode "START" position		
2.9	Confirm impeller rotation follows supplier requirement		
2.10	Put feeder discharge valve in manual mode "OPEN" position		
2.11	Check feeder discharge valve is "OPEN"		
2.12	Place blending motor (if applicable) selector in manual mode "START" position		
2.13	Check blending motor (if applicable) is in"RUN" mode		

N°	ITEMS	X	COMMENTS
2.14	Place feeder motor selector in Manual mode "START" position		
2.15	Check feeder motor (if applicable) is in "RUN" mode		
2.16	Confirm screw feeder rotation follows requirement		
2.17	Place feeder motor selector in manual mode "STOP" position		
2.18	Place blending motor (if applicable) selector in manual mode "STOP" position		
2.19	Put feeder discharge valve in manual mode "CLOSE" position		
2.20	Put mixer in manual mode "STOP" position		
2.21	Put water inlet valve in manual mode "CLOSE" position		
2.22	Put mixing tank transfer valve in manual mode "OPEN" position		
2.23	Verify that water transfers from mixing tank to storage tank		
2.24	Put mixing tank transfer valve in manual mode "CLOSE" position		
2.25	MANUAL WET TEST PROCEDURE COMPLETED		
3.0	**FEEDER CALIBRATION PROCEDURE**		
3.1	Place polymer powder in storage hopper		Follow IOM for specific requirements
3.2	Put water inlet valve in manual mode "OPEN" position		
3.3	Check service water pressure when valve placed in OPEN position		
3.4	Check water whirl in wetting cone		
3.5	Adjust manual wetting cone valve for desired whirl level		
3.6	Check service water is going to mixing tank		
3.7	Wait water level in mixing tank reaches mixer level + 100 mm (fully covering the impeller)		
3.8	Place mixer selector in manual mode "START" position		
3.9	Put feeder discharge valve in manual mode "OPEN" position		
3.10	Check feeder discharge valve is "OPEN"		
3.11	Place blending motor (if applicable) selector in manual mode "START" position		
3.12	Install powder test sampling collection device at feeder discharge		
3.13	Place feeder motor selector in manual mode "START" position		
3.14	Let feeder run for 2-3 minutes until flowrate reach steady state is reached		
3.15	Place feeder motor selector in manual mode "STOP" position		
3.16	Dispose collected powder in storage hopper		
3.17	Install powder test sampling collection device at feeder discharge		
3.18	Place feeder motor selector in manual mode "START" position		
3.19	Run feeder for 1 minute and weigh collected powder sample		
3.20	Dispose collected powder in storage hopper		
3.21	Place feeder motor selector in manual mode "STOP" position		
3.22	Repeat 4 times the powder sampling procedure (1 min for each test)		
3.23	Remove highest and lowest weighted values and determine feeder real capacity by calculating the average value between the three closest values		
3.24	Insert feeder real capacity value in Hydra-Pol HMI (feeder calibration screen)		

N°	ITEMS	X	COMMENTS
3.25	Place all motor selectors on "STOP"		
3.26	Place all valve switches on "OFF"		
3.27	FEEDER CALIBRATION PROCEDURE IS COMPLETED		
4.0	**AUTOMATIC START-UP PROCEDURE**		
4.1	Put all valve selector switches in "AUTO" position		
4.2	Put all motor selector switches in "AUTO" position		
4.3	Check service water pressure when valve placed in AUTO position		
4.4	Check water whirl in wetting cone		
4.5	Adjust manual wetting cone valve for desired whirl level		
4.6	Check service water is going to mixing tank		
4.7	Confirm that mixer starts automaticaly		
4.8	Confirm that feeder discharge valve opens		
4.9	Confirm that blending motor starts		
4.10	Confirm that feeder starts		
4.11	Confirm that powder is fed to wetting system		
4.12	Confirm that feeder motor stops when feeding time is completed		
4.13	Confirm that blending motor stops		
4.14	Confirm that feeder discharge valve closes		
4.15	Confirm that water inlet valve closes when water level reaches HIGH LEVEL		
4.16	Confirm that mixer stops when mixing time is completed		
4.17	Confirm that mix tank discharge valve opens when mixing time is completed and liquid level in storage tank is under low level storage tank		
4.18	Confirm that mix tank discharge valve closes after transfer		
4.19	Confirm that new batch restarts automaticaly		
4.20	AUTOMATIC START-UP PROCEDURE IS COMPLETED		
5.0	**HYDRASTAT START-UP PROCEDURE**		
5.1	Calibrate probes according to MFG procedure		
5.2	Start SC-200 according to MFG procedure		
5.3	Wait until 2-3 automatic batches are completed		
5.4	Put Hydra-Stat in "Autocalibration mode" on HMI		
5.5	Hydra-Stat will generate setpoints and reference curve		
5.6	If make-up concentration is changed, new auto-calibration is required		

LEFT BLANK

APPENDIX B

COMPONENTS DATA SHEETS AND MAINTENANCE MANUALS

If this polymer preparation system is integrated to a processing plant, refer to the Manufacturer Operation and Maintenance Manual section of the Operation and Maintenance Manual for the preparation system component manufacturer manuals.

LEFT BLANK

6 – OPERATION AND MAINTENANCE

6.3 – SULFURIC ACID DOSING SKID

LEFT BLANK

Installation, Operation and Maintenance Manual

ELECTROMAGNETIC PUMPS – DOSING SKID SYSTEM

DOCUMENT NO: IOM_0041_PCH

SEPTEMBER 2016, REVISION 1

Veolia Water Technologies Canada Inc.
ISO 9001:2008
4105 Sartelon, St-Laurent (QC) H4S 2B3
Tel: 514-334-7230 ● Fax: 514-334-5070
www.veoliawatertechnologies.ca

TABLE OF CONTENTS

1 INTRODUCTION

This document provides installation, operation and maintenance instructions for a dosing skid equipped with a solenoid driven diaphragm metering pump (electromagnetic pump). For specific information regarding the pump installed on the dosing system, refer to the manual of the manufacturer.

The skid components are supplied by Veolia Water Technologies Canada (VWTC).

Skid design and equipment selection are done by VWTC.

To obtain any additional information regarding characteristics or instructions on this equipment, please do not hesitate to contact us.

The system was designed in Canada by:

Veolia Water Technologies Canada
4105, Sartelon
Saint-Laurent, Qc.
Canada H4S 2B3
Phone: 514-334-7230
Fax: 514-334-5070

For technical support or service needs, for spare parts or to get assistance during your warranty period, you may contact us at the following number during regular business hours or write us at:

Veolia Water Technologies Canada After Sales Support
1-844-SER-VWT9 | 1-844-737-8989 | vwtservicecanada@veolia.com

Our business hours are from
Monday to Friday
8:30am to 5pm EST

2 SAFETY

2.1 INTRODUCTION

Your safety is of the utmost concern. Dosing pumps and systems can handle harsh or toxic chemicals and exposure can lead to serious injury or death. Always wear appropriate protective clothing (for example, safety glasses, gloves, coveralls, etc.) and follow safe handling procedures. Pay attention to what you're doing and note safety advisories where they are shown throughout this manual. Some examples of safety issues and precautions for chemical dosing systems are:

- Do not use dosing skid systems for flammable liquids.
- Prior to working on any portion of the skid system, disconnect pump(s) from power supply, de-pressurize the system and drain chemicals from the lines.
- Inspect tubing regularly and replace as necessary. When inspecting tubing, wear protective clothing and safety glasses.
- If skid system is exposed to sunlight, use UV-resistant tubing.
- Follow directions and warnings provided with chemicals from the chemical manufacturer. User/Owner is responsible for determining chemical compatibility with chemical feed pump(s) and system components.
- Secure chemicals, metering pump(s) and system, making them inaccessible to children, pets, and unauthorized personnel.
- Always wear protective clothing, including gloves and safety goggles when working on or near chemical metering pump(s) and system.
- All connections (threaded, screwed or bolted) may only be loosened when the system is not under pressure.
- Installation and start-up of chemical dosing system will require both mechanical (plumbing) and electrical work. Only qualified and licensed plumbers and electricians should perform this.

2.2 FALL HAZARDS

Common causes of slips are due to wet or oily surfaces and occasional spills.

Operators should reduce the risk of slipping on wet flooring by:

- Cleaning all spills immediately.
- Marking spills and wet area by using a cone or other warning device.

2.3 CHEMICALS HAZARDS

WHMIS Material Safety Data Sheets (MSDS) should be available for each chemical product. Since chemicals or chemical dosage are used during normal operation of treatment facility, the risks of fire, explosion and exposure to toxic chemicals or chemical burns are present. Chemicals typically used with dosing system are coagulant and polymer.

Operators should be made aware of the following:

- All chemicals which are used and any potentially dangerous reaction that could occur.
- Toxicity of all chemicals that are used or could be formed via reactions.
- Acidic or basic properties of all materials used.
- Potential fire or explosion hazards posed by the chemicals.
- Antidotes for exposure to toxic materials.
- Protective clothing that is recommended.
- Chemicals spills may be slippery.

2.4 ELECTRICAL CONNECTIONS

Electrical connections must be made by certified electricians in compliance with all applicable codes and regulations.

3 SHIPPING

Most of the equipment and material for this project will be drop shipped and delivered directly to the site.

- All items delivered will be clearly identified with VWTC's name, VWTC's project name and VWT's project number.
- All shipments will have a clear packing list identifying all parts in the shipment.
- All equipment will be tagged with the corresponding tag numbers shown on the design drawings (if applicable).

If there are more stringent requirements in the contract documents, they will take precedence over the above. If any of these requirements are not being followed, please notify the VWTC project manager immediately.

4 RECEIVING

The condition of all delivered equipment must be verified by the responsible party upon arrival at site. Verification that all equipment has been delivered as per contract must also be done upon arrival at site. Notification of missing or damaged items must be sent to VWTC within 10 days of receipt of equipment. If there is no documented notification of missing or damaged parts within 10 days, VWTC is not responsible for replacement of any items found to be missing or damaged at the time of installation and start-up of the supplied equipment. It is the responsibility of the party receiving the equipment to ensure all packaging is opened at the time of receipt to uncover and document any and all damages to the Freight Company and VWTC.

Photographs and written documentation should be provided on all damaged equipment.

5 HANDLING

5.1 GENERAL

The Contractor is responsible for the equipment unloading and handling.

5.2 POLYPROPYLENE MATERIAL HANDLING

Care should be taken to avoid damages to the surface of the polypropylene panels due to dragging or from sharp objects.

6 STORAGE

6.1 GENERAL

The following instructions outline the duties and responsibilities of the responsible party for equipment storage. The responsible party shall assume responsibility for the equipment upon arrival at the project site. These instructions shall define the minimum expectations for storage of all equipment.

While this storage specification takes into account common environmental issues that may affect the system during storage, common sense should be the overriding factor in determining the best method to ensure the integrity and proper storage of the VWTC equipment.

For contractual purposes, VWTC demands the Client to send pictures of major equipment once it is placed in storage, any time it gets moved during storage and again prior to removing from storage. For outside storage, pictures must be sent every month. Alternatively, a written document (check list, etc.) confirming that proper storage conditions are maintained will suffice. Failing to do so would cancel the proposed warranty.

Should it be necessary to delay installation and subsequent operation of a unit for more than one month from date of receipt on site, special precautions must be taken.

Although some equipment can be stored outdoors, indoor storage is preferred for most equipment.

The storage environment into which a system is placed can have a severe effect on the long-term usefulness of some spare parts. Key environmental factors are:

- Temperature
- Relative humidity
- Pollutants

Air may contain excessive moisture, pollutants, microorganisms, and other particulates that accelerate the deterioration of some materials. Humidity and pollutants can produce an aggressive atmosphere.

6.1.1 INDOOR STORAGE

Indoor storage refers to storage in a climate controlled environment under a clean non-aggressive, in a dry (non-condensing) and sheltered environment having a relatively constant temperature (especially for gear reducers, motors, bearings, etc.).

The environmental indoor conditions should not exceed the following ranges:

Min/Max temperature range between: 5°- 40°C
Relative humidity range between: 35% - 70% (RH)

1. Equipment should be stored in a manner to be kept free from allowing insects/rodents etc. from entering the equipment.
2. Cover the equipment with a tarp or similar protective shield to prevent direct exposure to dust or any other contamination. However, never enclose the unit or components totally in plastic covers; always leave adequate ventilation of air to prevent condensation.
3. Equipment stored near a window should be protected from UV rays.
4. Storage volume depends on the size of the project.
5. Equipment must be checked on a weekly basis for tarp/wrap integrity and accumulation.
6. To avoid damage, do NOT stack crates.
7. To avoid damage, do NOT stack enclosures.

8. Do not store spares in barns, equipment sheds, or any other building without the capacity for heating and cooling as needed.

6.2 EQUIPMENT CLEANING

VWTC is not responsible for cleaning of any equipment prior to installation and start-up due to the storage of the equipment. This is the complete responsibility of others.

7 INSTALLATION

7.1 GENERAL

The installation of the chemical dosing skids must be completed on site by the installation contractor.

Please find below the list of tasks that need to be performed by the contractor at job site:

- Installation should be performed by a qualified contactor.
- The installation contractor must ensure that the necessary lifting equipment is available on site to carry out the installation.
- All nuts & bolts need to be verified, accounted for and tightened.

7.2 SYSTEM OVERVIEW

The system is designed to pump chemicals at precisely controlled rates into another process or system.

Proper arrangement of piping and appurtenances on both the supply side and the process side are critical to the successful operation of the overall system. These are the responsibility of the installer of the system, and attention should be paid to the comments below:

Most VWTC pre-engineered skids will have electromagnetic pump(s) mounted on them at the factory, and the pump(s) will be connected to the piping integral to the skid with tubing.

7.2.1 SUPPLY SIDE

Dosing chemicals are usually sourced from a barrel or tote container. The source may be located above the centerline of the pump(s) which is referred to a 'flooded suction' or it may be located slightly below the centerline of the pump(s) which is referred to as 'suction lift'. Connections to and from the solution tank are most commonly made with hard piping. The solution tank should be covered to prevent contamination.

7.2.1.1 FLOODED SUCTION

This is the most trouble free type of installation. Since the supply line tubing is filled with chemical, priming is accomplished quickly and the chance of losing prime is reduced.

Recommended for very low flow rate applications, e.g. 2 ml/hr, or where pumping solutions such as sodium hypochlorite or hydrogen peroxide which can form air bubbles.

Supply line should gradually slope downward from the solution tank to the skid suction connection.

It is strongly recommended to add a drain provision on the suction side to facilitate emptying and flushing of the system for maintenance.

The next figure illustrates a typical pump skid system for flooded suction (chemical source above the pump centerline).

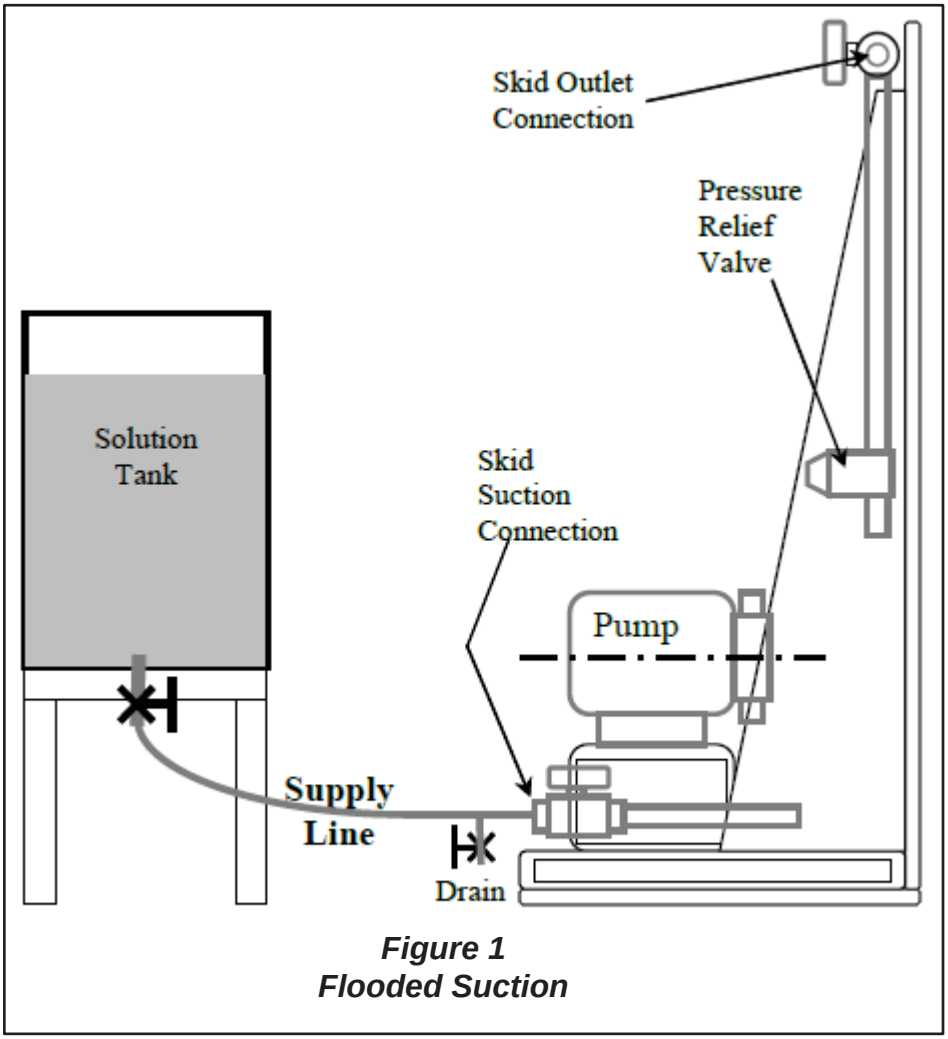


Figure 1
Flooded Suction

7.2.1.2 SUCTION LIFT

This is the most common arrangement for chemical metering applications since there is less chance of spillage.

Note that the maximum recommended lift is 5 feet (1.5 m). Verify specific recommended lift in pump manual.

Since the supply line will be in a vacuum condition, attention should be paid to the vapor pressure of the pumped liquid. Vapor formation in the supply line will prevent the pump from pumping.

Supply line should gradually slope up to the skid suction connection to prevent air pocket(s) which can impede flow.

It is strongly recommended to add a drain provision on the suction side to facilitate emptying and flushing of the system for maintenance.

The next figure illustrates a typical pump skid system with a suction lift arrangement.

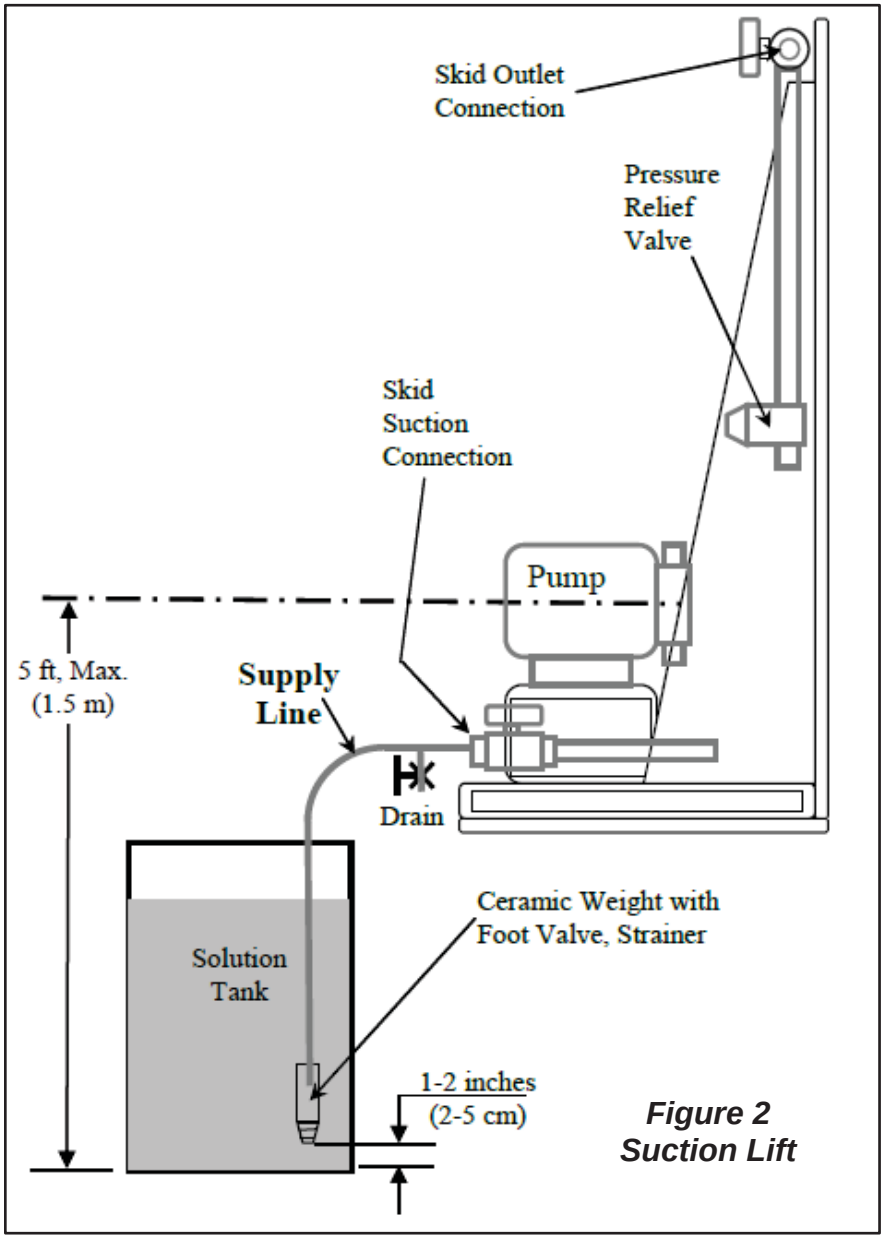


Figure 2
Suction Lift

Process Side

The injection point in the served process or system must be higher than the top of the solution supply tank to prohibit gravity feeding unless suitable backpressure is always present at the injection point.

In applications where the injection point is below the solution supply tank (e.g. injection into a well) or where the injection point may be at reduced pressure (e.g. injection into the suction side of a pump), installation of a back pressure/anti-siphon valve in the process feed line will prevent gravity feeding.

Note comments on process side piping/tubing on the next illustration.

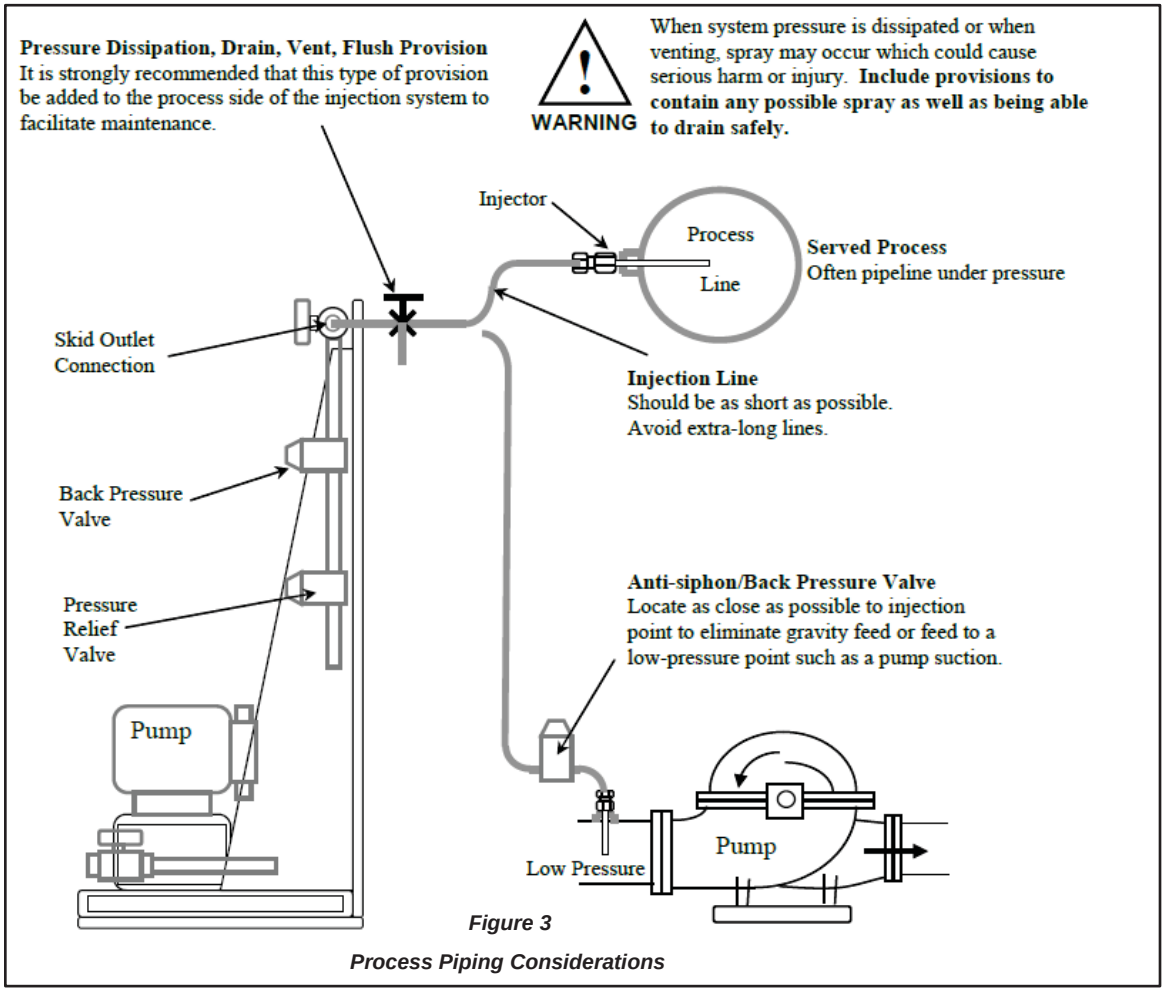
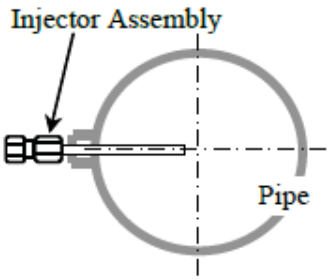


Figure 3

Process Piping Considerations



Injection Point

Injected chemicals may be corrosive to piping. To minimize corrosive effects, locate injector tip near center of process flow where velocities and mixing are at their highest rate. Trim tip as necessary. For larger pipe installations, longer injection assemblies are available.

Figure 4
Injection Point

Installation

Prior to attempting installation, familiarize yourself with the layout and components furnished with your pre-engineered skid system. These vary from system to system. Review the documentation supplied with your order.

Skid systems (and pumps) have been tested with water at the factory.

Some dosing chemicals will react with water, e.g., acids, polymers, etc. Check MSDS for the chemical to be handled. If adverse reaction with water is indicated, ensure that all portions of the skid piping, its components (and the pump) are free from the water prior to filling skid system with chemical.

Securely attach skid in its installation position to prevent falling or tipping.

Installation area should provide ease of access to skid components (and pumps) and the area should be kept free of clutter to enable safe operation and maintenance.

Note that skids are designed for ambient temperatures of 104°F (40°C) maximum. It is preferable that skid systems (and pumps) be located out of direct sunlight. If skid system is exposed to sunlight, provide protection for the pump/motor to prevent overheating and if skid is exposed to sunlight, use UV resistant tubing.

Connect the pump suction and discharge (refer to next figure) to the corresponding piping connections on the skid-mounted piping. Refer to installation drawing for location(s) of these piping connections. This is usually done with tubing, however always ensure that the connection material is compatible with the chemical to be pumped and suitable for the pressures and temperatures. Tubing connection fittings are usually plastic in which case they should be hand-tight only.

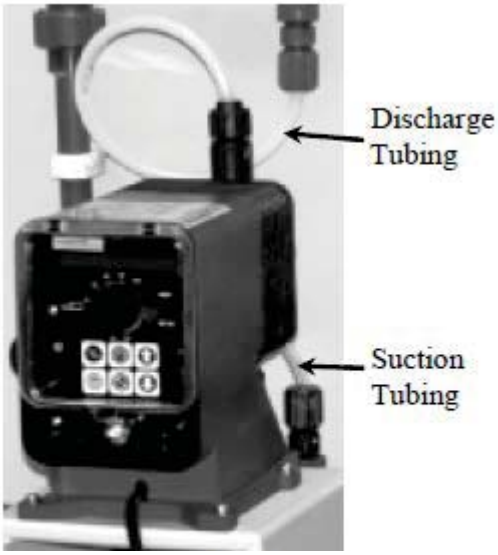


Figure 5
Typical Pump-to-Skid Tubing Connections

7.2.2 INTERCONNECTING PIPING

The next series of steps are the connection of your piping/tubing which include the chemical supply line, discharge line, pressure relief/bypass line and an air bleed return line.

These are your responsibility:

Ensure that for all piping, tubing, fittings and other appurtenances, their materials are compatible with the liquid to be pumped and the design is suitable for the pressures and temperatures of the application. System design must ensure safety for operation and maintenance as well as for anyone who may be in proximity to the system. Failure to do so may result in damage to equipment, personal injury or death.

7.2.3 SUCTION LINE

This line connects the source of the dosing chemical to the pre-engineered skid. Please refer to Figure 1 and Figure 2 on pages 10 and 11 respectively. If the source is below the centerline of the pump (suction lift condition), ensure that the suction line has a gradual rise up to the skid suction connection. If the source is above the centerline of the pump, ensure that the suction line has a gradual slope down to the skid suction connection. The purpose of this is to prevent air pocket(s) in the suction line which could affect proper operation of the pump. Include whatever provisions you consider necessary to facilitate the maintenance and operation such as isolation valve(s), drain and/or flush connections, etc., making sure that this sub-system enables SAFE OPERATION.

A foot valve is supplied with pumps, for use in suction lift arrangement.

7.2.4 DISCHARGE LINE

This line connects the skid to your served process. Please refer to the general description on page 12 and 13 and Figure 3 and Figure 4. This line should include the injector assembly that is usually furnished with the pump. If the injection point is below the dosing chemical source or if injecting into a low pressure area such as the suction of a pump, an anti-siphon/back pressure valve should be located as close as possible to the injection point to prevent unwanted chemical feeding. Include whatever provisions you consider necessary to facilitate maintenance and operation such as isolation valve(s), drain and/or flush connections, etc., making sure that this sub-system enables SAFE OPERATION.

7.2.5 AIR BLEED VALVE BYPASS LINE (if applicable)

Although most metering pumps are self-priming, they cannot pump against pressure when handling air in the priming cycle. An air bleed is necessary to enable the pump to prime, and an air bleed valve is provided for this. During the priming process, the air bleed valve is opened with the opening knob. Air will pass through the air bleed bypass line until the pump body is filled with process fluid. When the process fluid flows through the bypass line without any air bubbles, the pump is primed. The opening knob is then closed and the pump is ready for operation. Connect the air bleed bypass line to a suitable receptacle. This is often the suction source but can be a separate container. Firmly fix the outlet of the air bleed bypass line within the receiving receptacle to prevent any possible spraying.

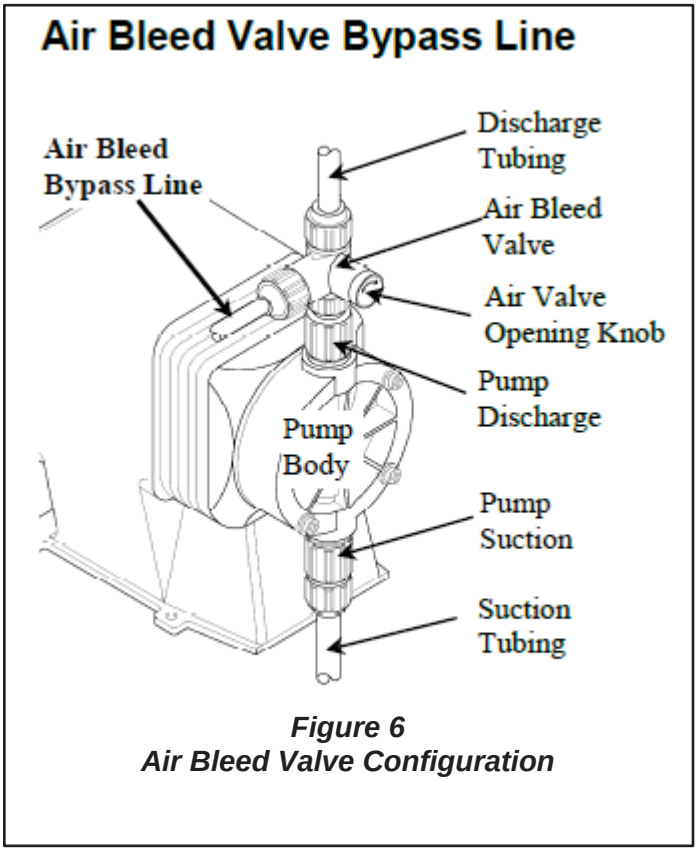


Figure 6
Air Bleed Valve Configuration

Check all piping and tubing connections on the skid to ensure they are tight.

Check all other system piping and/or tubing connections to ensure they are tight.

7.3 START-UP

7.3.1 INITIAL PRIME

The pump must be primed before it can function within the system. This will require an initial start of the pump.

Thoroughly review the installation, operation and maintenance manual for your pump prior to starting. Follow pump start-up instructions. Failure to do so may result in damage to equipment or serious injury.

Flooded Suction System

1. Close skid discharge valve and column isolation valve.
2. Open air bleed valve (turn opening knob counter clockwise, refer to Figure 6).
3. Open all valve(s) on the suction side – Skid suction connection valve and any valve(s) in your suction line.
4. Connect pump/motor to power source (pump/motor off).
5. Start pump using manufacturer's recommendations for initial operation settings.
6. Observe flow through air bleed bypass. When solid stream (no air bubbles) is observed, pump is primed.
7. Shut off pump.
8. Close air bleed valve (turn opening knob clockwise).

System with Suction Lift

With a suction lift configuration, the entire suction arrangement (suction line and skid suction piping) as well as the pump must be purged of air before the pump can function. The pump can evacuate the air, however this may take considerable time.

Optional:
If the dosing chemical can be handled safely, it may be helpful to add dosing chemical to the suction assembly via the top of the calibration column. This requires the installation of a foot valve at the entrance to the suction line within the chemical source container. Open the air bleed valve turning the opening knob counter clockwise (refer to Figure 6). Open column isolation valve. Open all valves in the suction line. Add dosing chemical into the top of the calibration column until liquid remains visible. Follow steps, below. Note that air bleed valve is open.

1. Close skid discharge valve and column isolation valve.
2. Open air bleed valve (turn opening knob counter clockwise, refer to Figure 6).
3. Open all valve(s) on the suction side – skid suction connection valve and any valve(s) in your suction line.
4. Connect pump/motor to power source (pump/motor off).
5. Start pump using manufacturer's recommendations for initial operation settings.
6. Observe flow through air bleed bypass. When solid stream (no air bubbles) is observed, pump is primed.
7. Shut off pump.
8. Close air bleed valve (turn opening knob clockwise).

7.3.2 SETTING VALVES

If furnished with your pre-engineered skid system, the pressure relief valve and back pressure valve will be pre-set at the factory. These pressure settings are related to the piping and components furnished with your skid as well as the pump(s) if furnished with the skid. Your system requirements may require changes to these settings and the valves will have to be re-set after maintenance. A general description and the setting procedures for these components are as follows:

Pressure Relief Valve (PRV)

A pressure relief valve must always be used with a chemical metering system that uses a positive displacement pump. This device is designed to protect the pump and system from over pressurization and it must be set to relieve at the maximum allowable pressure for the weakest point in the total system. This may be in your piping on the discharge side of the skid.

It is extremely important that you determine this pressure limitation and set the PRV accordingly.

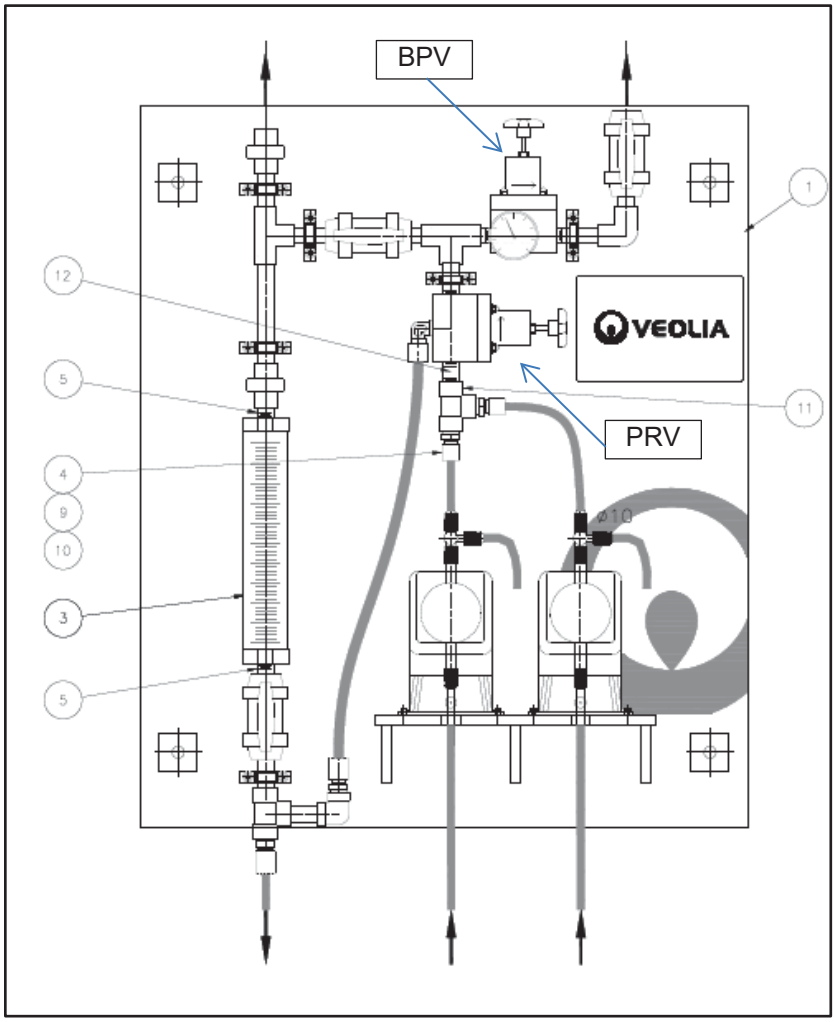


Figure 7 - Skid component locations (TYPICAL)

Back Pressure Valve (BPV)

The back pressure valve enables the pump to work against a constant pressure and will also function as an anti-siphon valve. This is especially important for injection systems that operate at low pressures or where there may be fluctuations in injector system pressure. The BPV is typically set at 50 PSIG, but a lower set pressure may be required depending upon your pump and your system configuration.

7.3.3 SETTING VALVES PROCEDURE

Prior to setting valve pressure, the skid discharge piping should be filled with liquid.

1. Set pulsation dampener air pressure (see above).
2. Adjust PRV and BPV to their lowest pressure setting (fully open).
3. Adjust skid discharge valve and/or system piping to allow venting from the skid discharge piping.
4. With pump primed, run pump until air is evacuated from the skid discharge piping.
5. Shut off pump.

7.3.3.1 SET PRESSURE RELIEF VALVE (PRV)

With pressure relief valve and back pressure valve fully open (lowest pressure setting):

1. Close skid discharge valve.
2. Start pump, monitor skid discharge gauge pressure. It should pulse slightly.
3. Gradually increase pressure at PRV until the skid pressure gauge reads the maximum allowable pump and/or system pressure at the highest pulsation pressure.
4. Shut down pump.
5. PRV is now set.

7.3.3.2 SET BACK PRESSURE VALVE (BPV)

After the pressure relief valve has been set, check to see that the BPV is fully open (lowest pressure setting):

1. Adjust skid discharge valve and/or system piping to allow free discharge from the skid discharge piping. Capture free discharge in an appropriate manner.
2. Start pump, monitor skid discharge gauge pressure.
3. Gradually increase pressure at BPV until correct pressure is indicated on the skid discharge gauge.
4. Shut down pump.
5. BPV is now set
6. Re-adjust system discharge piping/tubing to enable flow into the served process.

Check all system piping/tubing connections to ensure that they are properly tightened (hand-tight for plastic fittings) and leak-free.

Pumping system is now ready for operation.

7.3.4 FLOW CALIBRATION

Chemical metering systems are designed to provide chemicals to a process at precise flow rates. Metering pump output (flow rate) can be set as a function of both stroke lengths and stroke frequency. A calibration column is used to determine pump flow rate and to enable flow rate adjustments. The column must be filled with the dosing chemical prior to performing the calibration.

Use extreme care when handling chemicals.
Avoid any spray, splatter or spilling.
Always wear appropriate protective clothing.

Filling calibration Column

For a skid system with a cross-connect, the calibration column is filled by the pump.

1. Turn the column isolation valve to allow flow from the cross-connect into the calibration column.
2. Then turn the flow diverter valve to direct flow from the discharge header through the cross-connect into the calibration column.
3. Once the liquid level in the calibration column reaches slightly above the topmost scale mark, turn the flow diverter valve to re-direct flow into the system. Do not overfill.
4. Close column isolation valve.
5. Calibration column is filled and ready for the calibration procedure.

Note: While the calibration column is being filled in this manner, dosing chemical will not be provided to the served process.

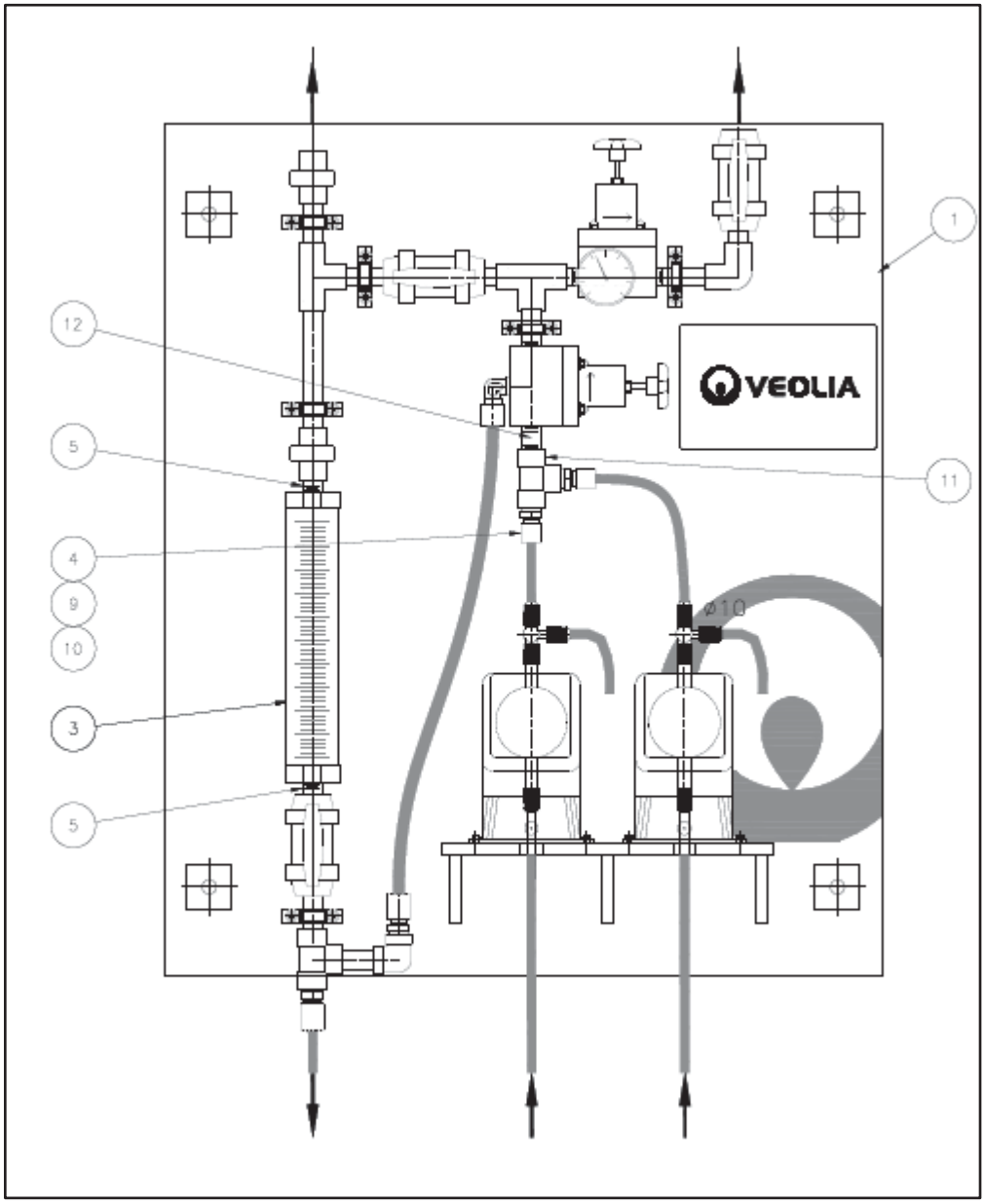


Figure 8 - Skid system with cross-connect (EXAMPLE)

For systems on suction lift (refer to Figure 2 on page 11)

1. Partially fill the calibration column through the top.
2. Open the column isolation valve briefly to vent any air that may be present in the suction header piping. Close the column isolation valve.
3. Fill the calibration column too slightly above the top scale mark.

Calibration column is filled and ready for the calibration procedure.

7.3.5 FLOW CALIBRATION PROCEDURE

The calibration column is filled to slightly above the top mark of the scale. The pump is then run in the system while being fed from the calibration column. After a 30 second time period, the liquid level reading on the scale will be a direct readout of the pump flow rate in US Gal/hr (note that a milliliter scale is also shown on the calibration column).

With the pump running in the system:

1. Open the column isolation valve so that the column feeds into the suction header, and immediately close the skid suction valve (refer to Figure 9 and 10).
2. Observe the liquid level in the calibration column. When it reaches the top scale mark, begin timing.
3. Allow 30 seconds to pass.
4. Open the skid suction valve and immediately close the column isolation valve.
5. Read pump output flow rate directly on the scale in US Gal/hr.

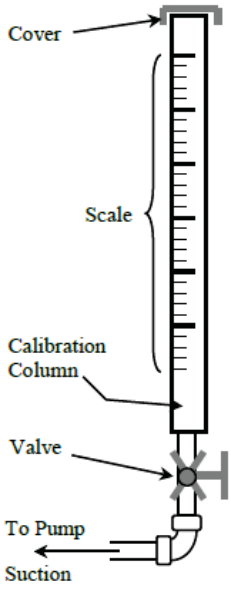


Figure 9
Calibration Column

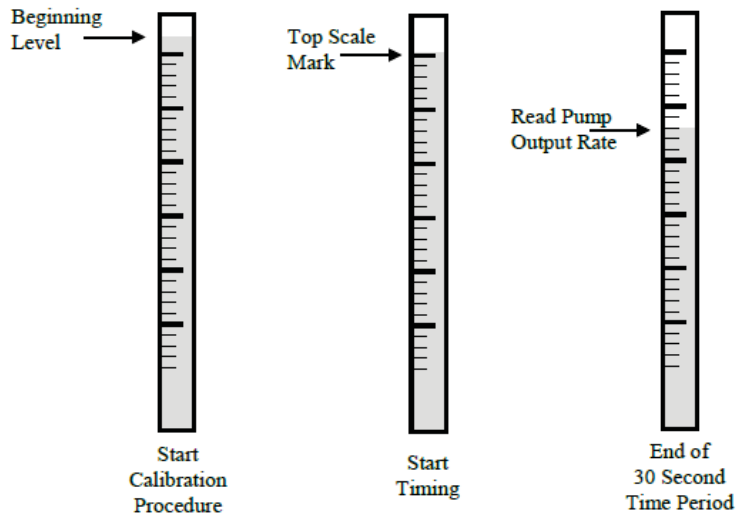


Figure 10
Liquid Levels During Calibration

Once the calibration is complete, compare the reading to the desired rate for your system. Refer to your pump operation manual and adjust flow rate up or down accordingly (this is usually done by changing stroke frequency). After pump adjustment is made, repeat calibration procedure. Continue until the desired flow rate is achieved.

7.4 ROUTINE MAINTENANCE

Before performing any Maintenance on your skid system or pump,

Skid components, pump(s) and your process piping may be under pressure!
Prior to working on any portion of the skid system, disconnect pump(s) from power supply, de-pressurize the entire system and drain chemicals from the lines.
Flush and neutralize as necessary.
Always wear suitable protection (gloves, safety glasses/goggles, etc.).

Routine maintenance will depend upon your service requirements: dosing chemical(s) being handled, environmental conditions, duty cycle(s) of pump(s), etc. When working on any component of your system, i.e., pump, valves, pulsation dampener, refer to the installation, operation and maintenance manual for that particular item. Some operational and maintenance checks that need to be performed are:

ITEM	MAINTENANCE	DAILY	WEEKLY	MONTHLY	YEARLY
Strainer	Check this for the presence of trapped solids and clean as necessary.		X		
Piping/Tubing Integrity	Routinely check piping, tubing, isolation valves and connections for leaks. Replace tubing as necessary.		X		
System Operation	Perform flow calibration regularly to ensure that dosing chemical is being added at the proper rate.			X	
Pressure Relief and Back Pressure Valves	Check to ensure that bolts are tight. Recommend monthly. Diaphragms should be replaced on an annual basis.				X
Calibration Column	If handling sticky chemicals, may require cleaning to view liquid level inside. Perform as				

ITEM	MAINTENANCE	DAILY	WEEKLY	MONTHLY	YEARLY
	necessary.				
Foot Valve	The pumps come equipped with a foot valve for the suction line. This valve should be checked for solids build up and blockages.		**X**		

7.5 TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	REMEDY
Pump doesn't deliver product	Air entering suction line	Check fittings for tightness Check integrity of tubing Check level in suction source-must be above foot valve at inlet
	Air trapped in suction line	Re-configure suction line to eliminate air pocket(s)
	Suction line kinked or clogged	Inspect, replace tubing
	Chemical source empty	Refill, re-prime pump
	Pump not primed, air/gas in system	Re-prime pump
	Air/gas bubbles forming in chemical	Reduce suction lift or change to flooded suction Consider chemical storage temperature
	Strainer clogged	Check strainer, clean
	Pressure Relief Valve Open	Check Pressure Relief Valve integrity Check Pressure Relief Valve setting
	Pump problem(s) may be: Diaphragm wear, rupture Check valves worn or clogged Low pump flow setting Voltage/electrical difficulty	Refer to pump instructions
Piping Vibration/chatter	Pulsation Dampener malfunction	Check Pulsation Dampener Integrity Check Dampener air pressure
Injection rate too high, too low	Pump output setting incorrect	Perform flow calibration
	Chemical concentration too high, low	Adjust chemical source strength
	Siphoning into well or low pressure point	Add Back Pressure Valve at injection point.
	Injector clogged, scaled, restricted	Check injector for solids or corrosion Clean as necessary or replace
Injection rate varies	Back Pressure Valve	Check Back Pressure Valve integrity Check Back Pressure Valve setting
Tubing failure	Sunlight/UV exposure	Change to UV-resistant tubing
	Corrosive attack	Determine material compatibility, change as necessary
Leaky fittings	Loose fittings	Tighten fittings-plastic fittings should be hand-tight only
	Corrosive attack	Determine material compatibility, change as necessary

6 – OPERATION AND MAINTENANCE

6.4 – COAGULANT AND $KMnO_4$ DOSING SKID

LEFT BLANK

Installation, Operation and Maintenance Manual

PULSAR SHADOW MECHANICAL DIAPHRAGM METERING PUMP DOSING SKID SYSTEM

DOCUMENT NO: IOM_0021_PCH

MARCH 2016, REVISION 1

Veolia Water Technologies Canada Inc.
ISO 9001:2008
4105 Sartelon, St-Laurent (QC) H4S 2B3
Tel: 514-334-7230 ● Fax: 514-334-5070
www.veoliawatertechnologies.ca

TABLE OF CONTENTS

1 INTRODUCTION

This document provides installation, operation and maintenance instructions for a chemical dosing skid equipped with Pulsafeeder Pulsar Shadow mechanical diaphragm metering pump(s). For specific information regarding the pump installed on the dosing system, refer to the manual of the manufacturer.

The skid components are supplied by Veolia Water Technologies Canada (VWTC).

To obtain any additional information regarding characteristics or instructions on this equipment, please do not hesitate to contact us.

The system was designed in Canada by:

Veolia Water Technologies Canada
4105, Sartelon
Saint-Laurent, Qc.
Canada H4S 2B3
Phone: 514-334-7230
Fax: 514-334-5070

For technical support or service needs, for spare parts or to get assistance during your warranty period, you may contact us at the following number during regular business hours or write us at:

Veolia Water Technologies Canada After Sales Support
1-844-SER-VWT9 | 1-844-737-8989 | vwtservicecanada@veolia.com

Our business hours are from
Monday to Friday
8:30am to 5pm EST

2 SAFETY

2.1 INTRODUCTION

Your safety is of the utmost concern. Dosing pumps and systems can handle harsh or toxic chemicals and exposure can lead to serious injury or death. Always wear appropriate protective clothing (for example, safety glasses, gloves, coveralls, etc.) and follow safe handling procedures. Pay attention to what you're doing and note safety advisories where they are shown throughout this manual. Some examples of safety issues and precautions for chemical dosing systems are:

- Do not use dosing skid systems for flammable liquids.
- Prior to working on any portion of the skid system, disconnect pump(s) from power supply, de-pressurize the system and drain chemicals from the lines.
- Inspect tubing regularly and replace as necessary. When inspecting tubing, wear protective clothing and safety glasses.
- If skid system is exposed to sunlight, use UV-resistant tubing.
- Follow directions and warnings provided with chemicals from the chemical manufacturer. User/Owner is responsible for determining chemical compatibility with chemical feed pump(s) and system components.
- Secure chemicals, metering pump(s) and system, making them inaccessible to children, pets, and unauthorized personnel.
- Always wear protective clothing, including gloves and safety goggles when working on or near chemical metering pump(s) and system.
- All connections (threaded, screwed or bolted) may only be loosened when the system is not under pressure.
- Installation and start-up of chemical dosing system will require both mechanical (plumbing) and electrical work. Only qualified and licensed plumbers and electricians should perform this.

2.2 FALL HAZARDS

As per OSHA statistic's, the majority of falls results from trips and slips. Common causes of slips are due to wet or oily surfaces and occasional spills.

Operators should reduce the risk of slipping on wet flooring by:

- Cleaning all spills immediately.
- Marking spills and wet area by using a cone or other warning device.

2.3 CHEMICALS HAZARDS

WHMIS Material Safety Data Sheets (MSDS) should be available for each chemical product. Since chemicals or chemical dosage are used during normal operation of treatment facility, the risks of fire, explosion and exposure to toxic chemicals or chemical burns are present. Chemicals typically used with dosing system are coagulant and polymer.

Operators should be made aware of the following:

- All chemicals which are used and any potentially dangerous reaction that could occur.
- Toxicity of all chemicals that are used or could be formed via reactions.
- Acidic or basic properties of all materials used.
- Potential fire or explosion hazards posed by the chemicals.
- Antidotes for exposure to toxic materials.
- Protective clothing that is recommended.
- Chemicals spills may be slippery.

2.4 ELECTRICAL CONNECTIONS

Electrical connections must be made by certified electricians in compliance with all applicable codes and regulations.

3 SHIPPING

Most of the equipment and material for this project will be drop shipped and delivered directly to the site.

- All items delivered will be clearly identified with VWTC's name, VWTC's project name and VWT's project number.
- All shipments will have a clear Packing List identifying all parts in the shipment.
- All equipment will be tagged with the corresponding tag numbers shown on the design drawings (if applicable).

If there are more stringent requirements in the contract documents, they will take precedence over the above. If any of these requirements are not being followed, please notify the VWTC Project Manager immediately.

4 RECEIVING

The condition of all delivered equipment must be verified by the responsible party upon arrival at site. Verification that all equipment has been delivered as per contract must also be done upon arrival at site. Notification of missing or damaged items must be sent to VWTC within five (5) working days of receipt of equipment. If there is no documented notification of missing or damaged parts within five (5) working days, VWTC is not responsible for replacement of any items found to be missing or damaged at the time of installation and start-up of the supplied equipment. It is the responsibility of the party receiving the equipment to ensure all packaging is opened at the time of receipt to uncover and document any and all damages to the Freight Company and VWTC.

Photographs and written documentation should be provided for all damaged equipment.

5 HANDLING

5.1 GENERAL

Equipment will arrive at the project site in several different shipments, from various freight companies and in several different packaging containers. Typically a flatbed truck is used which requires a fork lift or a crane to remove the items.

The Contractor is responsible for unloading and handling the equipment.

5.2 POLYPROPYLENE MATERIAL HANDLING

Care should be taken to avoid damages to the surface of the polypropylene panels due to dragging or from sharp objects.

6 STORAGE

6.1 GENERAL

The following instructions outline the duties and responsibilities of the responsible party for equipment storage. The responsible party shall assume responsibility for the equipment upon arrival at the project site. These instructions shall define the minimum expectations for storage of all equipment.

While this storage specification takes into account common environmental issues that may affect the system during storage, common sense should be the overriding factor in determining the best method to ensure the integrity and proper storage of the VWTC equipment.

For contractual purposes, VWTC demands the Client to send pictures of major equipment once it is placed in storage, any time it gets moved during storage and again prior to removing from storage. Alternatively, a written document (check list, etc.) confirming that proper storage conditions are maintained will suffice. Failing to do so would cancel the proposed warranty.

Should it be necessary to delay installation and subsequent operation of a unit for more than one month from date of receipt at site, special precautions must be taken.

The chemical dosing skid shall be stored indoor at a temperature above 5°C. The storage environment into which a system is placed can have a severe effect on the long-term usefulness of some spare parts. Key environmental factors are:

- Temperature
- Relative humidity
- Pollutants

Air may contain excessive moisture, pollutants, microorganisms, and other particulates that accelerate the deterioration of some materials. Humidity and pollutants can produce an aggressive atmosphere.

6.2 PVC PIPING STORAGE CONDITIONS

Pipe units should be stored and placed on level ground. Caution shall be taken to avoid compression, damage or deformation to the ends of the pipes. Racks or dunnage shall be used to prevent damage to the bottom pipes during storage and to support them. Supports should be spaced to prevent pipe bending.

When exposure in excess of one year to direct sunlight is unavoidable, the pipes should be covered with an opaque material while permitting adequate air circulation above and around the pipes as required preventing excess heat accumulation. The interior of the pipes, as well as all end surfaces, should be kept free from dirt and foreign matter until the pipes are ready to be used.

7 SKID OVERVIEW

The dosing skid system is designed to pump chemicals at precisely controlled rates into another process or system.

Proper arrangement of piping and appurtenances on both the supply side are critical to the successful operation of the overall system. These are the responsibility of the owner/operator of the system, and attention should be paid to the comments below:

SUPPLY SIDE

Dosing chemicals are usually sourced from a storage tank. When the source is located above the centerline of the pump(s) this is referred to as a 'flooded suction'. Connections to and from the solution tank are most commonly made with hard piping. The feed tank should be covered to prevent contamination.

Supply line should gradually slope downward from the feed tank to the skid suction connection.

It is strongly recommended to add a drain provision on the suction side to facilitate emptying and flushing of the system for maintenance.

8 INSTALLATION

Prior to attempting installation, familiarize yourself with the layout and components furnished with your dosing skid system. These vary from system to system and review the documentation supplied with your system. Inspect your skid system for damages which may have occurred during transit. If damages are discovered, immediately file a claim with the carrier and contact Veolia Water Technologies for any required parts or components.

Skid systems, including pump(s), have been tested with water prior to shipment.

Some dosing chemicals will react with water, e.g., acids, polymers, etc. Check the MSDS for the chemical to be handled. If adverse reaction with water is indicated, ensure that all portions of the skid piping, its components and the pump, are free of water prior to filling the skid system with chemical.

Skid systems may be wall or floor mounted. Mounting holes are provided or can be drilled on the skid for both types of mounting. Securely attach the skid in its installation position to prevent falling or tipping.

The installation area should provide ease of access to skid components, including pump(s), and the area should be kept free of clutter to enable safe operation and maintenance.

Note that pumps/motors are designed for ambient temperatures of 104°F (40°C) maximum. It is preferable that skid systems and pump(s) be located out of direct sunlight. If the skid system is exposed to sunlight, provide protection for the pump/motor to prevent overheating and if the skid is exposed to sunlight, use UV resistant tubing.

If skid is exposed to sunlight, use UV-resistant tubing.

Most chemical dosing skids will have pump(s) mounted on them before shipment, and the pump(s) will be connected to the skid integral piping with tubing.

8.1 OWNER-INSTALLED PIPING / TUBING

The next series of steps are the connection of your piping/tubing which include the chemical supply line, discharge line, pressure relief/bypass line and an air bleed return line.

These are your responsibility and ensure that for all piping, tubing, fitting and other appurtenances, their materials are compatible with the liquid to be pumped and the design is suitable for the pressures and temperatures of the application. System design must ensure safety for operation and maintenance as well as for anyone who may be in proximity to the system. Failure to do so may result in damage to equipment, personal injury or death.

8.2 SUCTION LINE

This line connects the source of the dosing chemical to the dosing skid. Include whatever provisions you consider necessary to facilitate the maintenance and operation such as isolation valve(s), drain and/or flush connections, etc., making sure that this sub-system enables safe operation.

8.3 DISCHARGE LINE

This line connects the dosing skid to the served process. Include whatever provisions you consider necessary to facilitate maintenance and operation, such as isolation valve(s), drain and/or flush connections, etc., making sure that this system enables **SAFE OPERATION**.

9 INITIAL START-UP

The pump must be primed before it can function within the system. This will require an initial start of the pump.

Thoroughly review the installation, operation and maintenance manual for your pump prior to starting. Follow pump start-up instructions. Failure to do so may result in damage to equipment or serious injury.

FLOODED SUCTION SYSTEM

1. Close skid discharge valve and column isolation valve.
2. Connect pump/motor to power source (pump/motor off).
3. Start pump using manufacturer's recommendations for initial operation settings.
4. Shut off pump.

9.1 SETTING VALVES

If furnished with your dosing skid system, the pressure relief valve and back pressure valve will be preset prior to shipment. These pressure settings are related to the piping and components furnished with your skid as well as the pump(s) if furnished with the skid. Your system requirements may demand changes to these settings and the valves will have to be reset after maintenance such as diaphragm replacement. A general description and the setting procedures for these components are as follows.

9.2 PRESSURE RELIEF VALVE

A pressure relief valve (PRV) must always be used with a chemical metering system that uses a positive displacement pump. This device is designed to protect the pump and system from over pressurization and it must be set to relieve at the maximum allowable pressure for the weakest point in the total system. This may be in your piping on the discharge side of the skid. The pressure relief valves are factory set and cannot be modified. If the pressure set point is surpassed, the valve will need to be replaced. The pressure setting is indicated on the P&ID drawings.

Most dosing skid systems include a pressure relief valve and suction header where the PRV is directly connected from the discharge header to the suction header. If your skid system does not include a suction header, or if you are providing your own PRV, relief flow from the pressure relief port on the PRV must be directed to either the suction source or a separate receptacle. This is usually done with tubing.

Care must be taken to channel any free flow from the pumping system into an appropriate receptacle. Eliminate any possibility of splashing, spraying or spillage. Always wear suitable protective equipment (gloves, safety goggles/glasses, coveralls, etc.) when working with or around chemical dosing systems.

Check all system piping/tubing connections to ensure that they are properly tightened (handtight for plastic fittings) and leak free.

Pumping system is now ready for operation.

9.3 FLOW CALIBRATION

Chemical metering systems are designed to provide chemicals to a process at precise flow rates. Metering pump output (flow rate) can be set with a variable frequency drive (VFD). A calibration column is used to determine pump flow rate and to enable flow rate adjustments.

The procedures for filling the calibration column and for calibrating the pumps are described below. Review both complete procedures before proceeding with next steps.

FILLING THE CALIBRATION COLUMN BY OPENING THE COLUMN ISOLATION VALVE

- Use extreme care when handling chemicals.
- Avoid any spray, splatter or spilling.
- Always wear appropriate protective clothing.

FOR SYSTEMS WITH FLOODED SUCTION:

1. Open column isolation valve.
2. Liquid level in the column should rise to the level in the suction source. This may be higher than the top of the column, so prevent overfill by closing the column isolation valve when the liquid level in the calibration column reaches slightly above the top scale mark.
3. If the liquid level in the suction source is lower than the top scale mark, close the column isolation valve and add liquid through the top of the column to a point slightly above the top scale mark.

Calibration column is filled and ready for the calibration procedure.

9.4 VARIABLE FREQUENCY DRIVE SETTINGS

When powered up, the operator should check the direction of rotational direction of the pump. The following checklist indicates the steps to set the VFD parameters of an AC Tech drive. Other VFD may require different parameters.

1. Set start control source to terminal strip or local keypad.
2. Set acceleration parameter.
3. Set deceleration parameter.
4. Set motor overload in %.
5. Set start method on start on power up.
6. Set input function to 4-20 mA.
7. Set relay output to run (energizes when the drive is running).
8. Set drive mode to vector speed.
9. Set motor rated voltage.
10. Set motor rated current.
11. Set motor rated speed.
12. Run motor auto-calibration.

For more information refer to the VFD manual.

10 OPERATION PROCEDURES

The calibration column is filled to slightly above the top mark of the scale. The pump is then run in the system while being fed from the calibration column. After a 30 second time period, the liquid level reading on the scale will be a direct readout of the pump flow rate in US Gallons/hr (note that a millilitre scale is also shown on the calibration column).

With the pump running in the system:

1. Open the column isolation valve so that the column feeds into the suction header and immediately close the skid suction valve.
2. Observe the liquid level in the calibration column. When it reaches the top scale mark, begin timing.
3. Allow 30 seconds to pass.
4. Open the skid suction valve and immediately close the column isolation valve.
5. Read pump output flow rate directly on the scale in US Gallons/hr.

Once the calibration is complete, compare the reading to the desired rate for your system. Refer to your pump operation manual and adjust flow rate up or down accordingly (this is usually done by changing the frequency). After pump adjustment is made, repeat calibration procedure. Continue until the desired flow rate is achieved.

11 ROUTINE MAINTENANCE

Before performing any maintenance on your skid system or pump(s), skid components, pump(s) and your process piping may be under pressure!

Prior to working on any portion of the skid system:

- Disconnect pump(s) from power supply.
- De-pressurize the entire system.
- Drain chemicals from the lines.
- Flush and neutralize as necessary.
- Always wear suitable protection (gloves, safety glasses/goggles, etc.).

Routine maintenance will depend upon your service requirements: dosing chemical being handled, environmental conditions, duty cycle(s) of pump(s), etc. When working on any component of your system, i.e., pump(s) and valves, refer to the installation, operation and maintenance manual for that particular item.

Some operational and maintenance checks that need to be performed are:

Piping/Tubing Integrity: Routinely check piping, tubing, isolation valves and connections for leaks. Replace tubing as necessary. Recommend weekly check.

System Operation: Perform flow calibration regularly to ensure that dosing chemical is being added at the proper rate. Recommend monthly.

Pressure Relief: Check to ensure that bolts are tight. Recommend monthly. Diaphragms should be replaced on an annual basis.

Calibration Column: If handling sticky chemicals, may require cleaning to view liquid level inside. Perform as necessary.

Mechanical Diaphragm Metering Pump: Maintenance shall be as recommended in Manufacturer O&M Manual.

Note: Special tools may be required for dismantling and re-assembly of the pump. Before starting the dismantling, refer to the installation, operation and maintenance manual of the pump.

12 TROUBLESHOOTING GUIDE

DIFFICULTY	PROBABLE CAUSE	REMEDY
Pump does not start	Coupling disconnected	Connect coupling
	Faulty power source	Check power source
	Blown fuse and circuit breaker	Replace - Eliminate overload
	Broken wire	Locate and repair
	Wired improperly	Check diagram
	Pipe line blockage	Open valves
No Delivery	Motor not running	Check power source and wiring diagram
	Supply tank empty	Fill tank
	Lines clogged	Clean and flush
	Closed line valves	Open valves
	Ball check valves held open with solids	Clean and inspect
	Vapor lock, cavitation	Increase suction pressure
	Prime lost	Reprime, and check for leak
	Strainer clogged	Remove and clean. Replace screen if necessary
Low delivery	Motor speed too low	Check voltages, frequency, wiring and terminal connections. Check nameplate vs specifications
	Check valves worn or dirty	Clean, replace if damaged
	Calibration system error	Evaluate and correct
	Product viscosity too high	Lower viscosity by increasing product temperature. Increase pump and/or piping size
	Product cavitating	Increase suction pressure. Cool product as necessary
Delivery gradually drops	Check valve leakage	Clean, replace if damaged
	Leak in suction line	Locate and correct
	Strainer fouled	Clean or replace screen
	Product change	Check viscosity
	Supply tank vent plugged	Unplug vent
Delivery erratic	Leak in suction line	Locate and correct
	Product cavitating	Increase suction pressure
	Entrapped air or gas in product	Consult factory for suggested venting
	Motor speed erratic	Check voltage and frequency
	Fouled check valves	Clean, replace if necessary
Delivery higher than rated	Suction pressure higher than discharge pressure	Install backpressure valve or consult factory for piping recommendations
	Back pressure valve set too low	Increase setting
	Back pressure valve leaks	Repair, clean or replace
Pump loses internal oil	Diaphragm ruptured	Replace
	Leaky seal	Replace
	Cover gasket leaks	Replace or retighten
	Pump overfilled	Remove excess oil
Noisy gearing, knocking	Discharge pressure too high	Reduce pressure
	Water hammer	Install pulsation dampener
	Stroke length at partial setting	Non-destructive knocking is characteristic of lost motion pumps
	No oil or level incorrect	Replace or refill oil
Pump noisy	Pipe size too small	Increase size of piping - Install pulsation dampener
	Pipe runs too long	Install pulsation dampener in line
	Surge chambers flooded	Replace with air or inert gas. If a pulsation dampener is installed, replace diaphragm and recharge
	No surge chambers used	Install pulsation dampener
Motor overheats	Pump overloaded	Check operating conditions against pump design
	High or low voltage	Check power source
	Loose wire	Trace and correct
	Excessive discharge pressure	Correct conditions so ratings of pump are note exceeded

If problem(s) persist, please contact Veolia Water Technologies

13 LUBRICATION SCHEDULE - INSPECTION

ITEM	ACTION	FREQUENCY	TYPE OF LUBRICANT
Wet end inspection	Inspection (If diaphragm has failed, replace eccentric oil)	Refer to section 11	Refer to eccentric oil change
Check valve	Inspection	Refer to section 11	See note
Oil seals (qty 4) Pump shaft seal Motor adapter seal Gearbox oil seal Eccentric box seal	Inspection	Refer to section 11	See note
Motor bearing	Inspection/Lubrication	Refer to section 11	Lubricant (refer to motor nameplate)
Eccentric oil	Change oil	2 years (normal service) 1 year (severe service)	Pulsalube 9M (refer to Pulsafeeder Shadow maintenance manual)
Gear oil	Change oil	5 years (normal service) 2 years (severe service)	Pulsalube 8G (refer to Pulsafeeder Shadow maintenance manual)

Note: PULSAR Shadow KOPkits contain all replacement parts normally used in a preventive maintenance program

14 SPARE PARTS

It is highly recommended to keep in stock spare parts in sufficient quantity for all critical equipment to the proper functioning of the process.

Only the use of original Veolia spare parts will ensure proper and reliable operation.

When ordering a spare part, please give the following information:

- Veolia project number.
- Project name.
- Part number

15 DRAWINGS

If this dosing system is integrated to a processing plant, refer to the Process and/or Detailed Technical Documentation section of the Operation and Maintenance Manual for the dosing system drawings.

16 COMPONENTS TECHNICAL DATA SHEET

If this dosing system is integrated to a processing plant, refer to the Detailed Technical Documentation section of the Operation and Maintenance Manual for the dosing system data sheets.

17 MANUFACTURERS OPERATION AND MAINTENANCE MANUAL

If this dosing system is integrated to a processing plant, refer to the Manufacturer Operation and Maintenance Manual section of the Operation and Maintenance Manual for the dosing system manufacturer manuals.

LEFT BLANK

6 – OPERATION AND MAINTENANCE

6.5 – POLYMER DOSING SKID

LEFT BLANK

Installation, Operation and Maintenance Manual

SEEPEX PROGRESSIVE CAVITY PUMP DOSING SKID SYSTEM

DOCUMENT NO: IOM_0011_PCH

FEBRUARY 2016, REVISION 1

Veolia Water Technologies Canada Inc.
ISO 9001:2008
4105 Sartelon, St-Laurent (QC) H4S 2B3
Tel: 514-334-7230 ● Fax: 514-334-5070
www.veoliawatertechnologies.ca

WATER TECHNOLOGIES

TABLE OF CONTENTS

1 INTRODUCTION

This document provides installation, operation and maintenance instructions for a polymer dosing skid equipped with Seepex progressive cavity pump(s). For specific information regarding the pump installed on the dosing system, refer to the manual of the manufacturer.

The skid components supplied by Veolia Water Technologies Canada (VWTC).

To obtain any additional information regarding characteristics or instructions on this equipment, please do not hesitate to contact us.

The system was designed in Canada by:

Veolia Water Technologies Canada
4105, Sartelon
Saint-Laurent, Qc.
Canada H4S 2B3
Phone: 514-334-7230
Fax: 514-334-5070

For technical support or service needs, for spare parts or to get assistance during your warranty period, you may contact us at the following number during regular business hours or write us at:

Veolia Water Technologies Canada After Sales Support
1-844-SER-VWT9 | 1-844-737-8989 | vwtservicecanada@veolia.com

Our business hours are from
Monday to Friday
8:30am to 5pm EST

2 SAFETY

2.1 INTRODUCTION

Your safety is of the utmost concern. Dosing pumps and systems can handle harsh or toxic chemicals and exposure can lead to serious injury or death. Always wear appropriate protective clothing (for example, safety glasses, gloves, coveralls, etc.) and follow safe handling procedures. Pay attention to what you're doing and note safety advisories where they are shown throughout this manual. Some examples of safety issues and precautions for chemical dosing systems are:

- Do not use dosing skid systems for flammable liquids.
- Prior to working on any portion of the skid system, disconnect pump(s) from power supply, de-pressurize the system and drain chemicals from the lines.
- Inspect tubing regularly and replace as necessary. When inspecting tubing, wear protective clothing and safety glasses.
- If skid system is exposed to sunlight, use UV-resistant tubing.
- Follow directions and warnings provided with chemicals from the chemical manufacturer. User/Owner is responsible for determining chemical compatibility with chemical feed pump(s) and system components.
- Secure chemicals, metering pump(s) and system, making them inaccessible to children, pets, and unauthorized personnel.
- Always wear protective clothing, including gloves and safety goggles when working on or near chemical metering pump(s) and system.
- All connections (threaded, screwed or bolted) may only be loosened when the system is not under pressure.
- Installation and start-up of chemical dosing system will require both mechanical (plumbing) and electrical work. Only qualified and licensed plumbers and electricians should perform this.

2.2 FALL HAZARDS

As per OSHA statistic's, the majority of falls results from trips and slips. Common causes of slips are due to wet or oily surfaces and occasional spills.

Operators should reduce the risk of slipping on wet flooring by:

- Cleaning all spills immediately.
- Marking spills and wet area by using a cone or other warning device.

2.3 CHEMICALS HAZARDS

WHMIS Material Safety Data Sheets (MSDS) should be available for each chemical product. Since chemicals or chemical dosage are used during normal operation of treatment facility, the risks of fire, explosion and exposure to toxic chemicals or chemical burns are present. Chemicals typically used with dosing system are coagulant and polymer.

Operators should be made aware of the following:

- All chemicals which are used and any potentially dangerous reaction that could occur.
- Toxicity of all chemicals that are used or could be formed via reactions.
- Acidic or basic properties of all materials used.
- Potential fire or explosion hazards posed by the chemicals.
- Antidotes for exposure to toxic materials.
- Protective clothing that is recommended.
- Chemicals spills may be slippery.

2.4 ELECTRICAL CONNECTIONS

Electrical connections must be made by certified electricians in compliance with all applicable codes and regulations.

3 SHIPPING

Most of the equipment and material for this project will be drop shipped and delivered directly to the site.

- All items delivered will be clearly identified with VWTC's name, VWTC's project name and VWT's project number.
- All shipments will have a clear Packing List identifying all parts in the shipment.
- All equipment will be tagged with the corresponding tag numbers shown on the design drawings (if applicable).

If there are more stringent requirements in the contract documents, they will take precedence over the above. If any of these requirements are not being followed, please notify the VWTC Project Manager immediately.

4 RECEIVING

The condition of all delivered equipment must be verified by the responsible party upon arrival at site. Verification that all equipment has been delivered as per contract must also be done upon arrival at site. Notification of missing or damaged items must be sent to VWTC within five (5) working days of receipt of equipment. If there is no documented notification of missing or damaged parts within five (5) working days, VWTC is not responsible for replacement of any items found to be missing or damaged at the time of installation and start-up of the supplied equipment. It is the responsibility of the party receiving the equipment to ensure all packaging is opened at the time of receipt to uncover and document any and all damages to the Freight Company and VWTC.

Photographs and written documentation should be provided for all damaged equipment.

5 HANDLING

5.1 GENERAL

Equipment will arrive at the project site in several different shipments, from various freight companies and in several different packaging containers. Typically a flatbed truck is used which requires a fork lift or a crane to remove the items.

The Contractor is responsible for unloading and handling the equipment.

5.2 POLYPROPYLENE MATERIAL HANDLING

Care should be taken to avoid damages to the surface of the polypropylene panels due to dragging or from sharp objects.

6 STORAGE

6.1 GENERAL

The following instructions outline the duties and responsibilities of the responsible party for equipment storage. The responsible party shall assume responsibility for the equipment upon arrival at the project site. These instructions shall define the minimum expectations for storage of all equipment.

While this storage specification takes into account common environmental issues that may affect the system during storage, common sense should be the overriding factor in determining the best method to ensure the integrity and proper storage of the VWTC equipment.

For contractual purposes, VWTC demands the Client to send pictures of major equipment once it is placed in storage, any time it gets moved during storage and again prior to removing from storage. Alternatively, a written document (check list, etc.) confirming that proper storage conditions are maintained will suffice. Failing to do so would cancel the proposed warranty.

Should it be necessary to delay installation and subsequent operation of a unit for more than one month from date of receipt at site, special precautions must be taken.

The polymer dosing skid shall be stored indoor at a temperature above 5°C. The storage environment into which a system is placed can have a severe effect on the long-term usefulness of some spare parts. Key environmental factors are:

- Temperature
- Relative humidity
- Pollutants

Air may contain excessive moisture, pollutants, microorganisms, and other particulates that accelerate the deterioration of some materials. Humidity and pollutants can produce an aggressive atmosphere.

6.2 PVC PIPING STORAGE CONDITIONS

Pipe units should be stored and placed on level ground. Caution shall be taken to avoid compression, damage or deformation to the ends of the pipes. Racks or dunnage shall be used to prevent damage to the bottom pipes during storage and to support them. Supports should be spaced to prevent pipe bending.

When exposure in excess of one year to direct sunlight is unavoidable, the pipes should be covered with an opaque material while permitting adequate air circulation above and around the pipes as required preventing excess heat accumulation. The interior of the pipes, as well as all end surfaces, should be kept free from dirt and foreign matter until the pipes are ready to be used.

7 SKID OVERVIEW

The dosing skid system is designed to pump chemicals at precisely controlled rates into another process or system. Dilution water provides a minimum dilution ratio of 3:1 of dilution water to dosing chemical.

Proper arrangement of piping and appurtenances on both the supply side are critical to the successful operation of the overall system. These are the responsibility of the owner/operator of the system, and attention should be paid to the comments below:

SUPPLY SIDE

Dosing chemicals are usually sourced from a preparation system. When the source is located above the centerline of the pump(s) this is referred to as a 'flooded suction'. Connections to and from the solution tank are most commonly made with hard piping. The solution tank should be covered to prevent contamination.

Supply line should gradually slope downward from the solution tank to the skid suction connection.

It is strongly recommended to add a drain provision on the suction side to facilitate emptying and flushing of the system for maintenance.

8 INSTALLATION

Prior to attempting installation, familiarize yourself with the layout and components furnished with your dosing skid system. These vary from system to system and review the documentation supplied with your system. Inspect your skid system for damages which may have occurred during transit. If damages are discovered, immediately file a claim with the carrier and contact Veolia Water Technologies for any required parts or components.

Skid systems, including pump(s), have been tested with water prior to shipment.

Some dosing chemicals will react with water, e.g., acids, polymers, etc. Check the MSDS for the chemical to be handled. If adverse reaction with water is indicated, ensure that all portions of the skid piping, its components and the pump, are free of water prior to filling the skid system with chemical.

Skid systems may be wall or floor mounted. Mounting holes are provided or can be drilled on the skid for both types of mounting. Securely attach the skid in its installation position to prevent falling or tipping.

The installation area should provide ease of access to skid components, including pump(s), and the area should be kept free of clutter to enable safe operation and maintenance.

Note that pumps/motors are designed for ambient temperatures of 104°F (40°C) maximum. It is preferable that skid systems and pump(s) be located out of direct sunlight. If the skid system is exposed to sunlight, provide protection for the pump/motor to prevent overheating and if the skid is exposed to sunlight, use UV resistant tubing.

If skid is exposed to sunlight, use UV-resistant tubing.

Most chemical dosing skids will have Seepex pump(s) mounted on them before shipment, and the pump(s) will be connected to the skid integral piping with tubing.

8.1 OWNER-INSTALLED PIPING / TUBING

The next series of steps are the connection of your piping/tubing which include the chemical supply line, discharge line, pressure relief/bypass line and an air bleed return line.

These are <u>your</u> responsibility and ensure that for all piping, tubing, fitting and other appurtenances, their materials are compatible with the liquid to be pumped and the design is suitable for the pressures and temperatures of the application. System design must ensure safety for operation and maintenance as well as for anyone who may be in proximity to the system. Failure to do so may result in damage to equipment, personal injury or death.

8.2 SUCTION LINE / TRANSPORT WATER LINE

This line connects the source of the dosing chemical to the dosing skid. Include whatever provisions you consider necessary to facilitate the maintenance and operation such as isolation valve(s), drain and/or flush connections, etc., making sure that this sub-system enables safe operation.

8.3 DISCHARGE LINE

This line connects the dosing skid to the served process. Include whatever provisions you consider necessary to facilitate maintenance and operation, such as isolation valve(s), drain and/or flush connections, etc., making sure that this system enables **SAFE OPERATION**.

9 INITIAL START-UP

The pump must be primed before it can function within the system. This will require an initial start of the pump.

Thoroughly review the installation, operation and maintenance manual for your pump prior to starting. Follow pump start-up instructions. Failure to do so may result in damage to equipment or serious injury.

FLOODED SUCTION SYSTEM

1. Close skid discharge valve and column isolation valve.
2. Connect pump/motor to power source (pump/motor off).
3. Start pump using manufacturer's recommendations for initial operation settings.
4. Shut off pump.

9.1 SETTING VALVES

If furnished with your dosing skid system, the pressure relief valve and back pressure valve will be preset prior to shipment. These pressure settings are related to the piping and components furnished with your skid as well as the pump(s) if furnished with the skid. Your system requirements may demand changes to these settings and the valves will have to be reset after maintenance such as diaphragm replacement. A general description and the setting procedures for these components are as follows.

9.2 PRESSURE RELIEF VALVE

A pressure relief valve (PRV) must always be used with a chemical metering system that uses a positive displacement pump. This device is designed to protect the pump and system from over pressurization and it must be set to relieve at the maximum allowable pressure for the weakest point in the total system. This may be in your piping on the discharge side of the skid. The pressure relief valves are factory set and cannot be modified. If the pressure set point is surpassed, the valve will need to be replaced. The pressure settling is indicated on the P&ID drawings.

Most dosing skid systems include a pressure relief valve and suction header where the PRV is directly connected from the discharge header to the suction header. If your skid system does not include a suction header, or if you are providing your own PRV, relief flow from the pressure relief port on the PRV must be directed to either the suction source or a separate receptacle. This is usually done with tubing.

Care must be taken to channel any free flow from the pumping system into an appropriate receptacle. Eliminate any possibility of splashing, spraying or spillage. Always wear suitable protective equipment (gloves, safety goggles/glasses, coveralls, etc.) when working with or around chemical dosing systems.

Check all system piping/tubing connections to ensure that they are properly tightened (handtight for plastic fittings) and leak free.

Pumping system is now ready for operation.

9.3 FLOW CALIBRATION

Chemical metering systems are designed to provide chemicals to a process at precise flow rates. Metering pump output (flow rate) can be set with a variable frequency drive (VFD). A calibration column is used to determine pump flow rate and to enable flow rate adjustments.

The procedures for filling the calibration column and for calibrating the pumps are described below. Review both complete procedures before proceeding with next steps.

FILLING THE CALIBRATION COLUMN BY OPENING THE COLUMN ISOLATION VALVE

- Use extreme care when handling chemicals.
- Avoid any spray, splatter or spilling.
- Always wear appropriate protective clothing.

FOR SYSTEMS WITH FLOODED SUCTION:

1. Open column isolation valve.
2. Liquid level in the column should rise to the level in the suction source. This may be higher than the top of the column, so prevent overfill by closing the column isolation valve when the liquid level in the calibration column reaches slightly above the top scale mark.
3. If the liquid level in the suction source is lower than the top scale mark, close the column isolation valve and add liquid through the top of the column to a point slightly above the top scale mark.

Calibration column is filled and ready for the calibration procedure.

9.4 VARIABLE FREQUENCY DRIVE SETTINGS

When powered up, the operator should check the direction of rotational direction of the pump. The following checklist indicates the steps to set the VFD parameters of an AC Tech drive. Other VFD may require different parameters.

1. Set start control source to terminal strip or local keypad.
2. Set acceleration parameter.
3. Set deceleration parameter.
4. Set motor overload in %.
5. Set start method on start on power up.
6. Set input function to 4-20 mA.
7. Set relay output to run (energizes when the drive is running).
8. Set drive mode to vector speed.
9. Set motor rated voltage.
10. Set motor rated current.
11. Set motor rated speed.
12. Run motor auto-calibration.

For more information refer to the VFD manual.

10 OPERATION PROCEDURES

The calibration column is filled to slightly above the top mark of the scale. The pump is then run in the system while being fed from the calibration column. After a start-up period, the liquid level reading on the scale will be a direct readout of the pump flow rate in US Gallons/hr (note that a millilitre scale is also shown on the calibration column).

With the pump running in the system:

1. Open the column isolation valve so that the column feeds into the suction header and immediately close the skid suction valve.
2. Observe the liquid level in the calibration column. When it reaches the top scale mark, begin timing.
3. Allow 30 seconds to pass.
4. Open the skid suction valve and immediately close the column isolation valve.
5. Read pump output flow rate directly on the scale in US Gallons/hr.

Once the calibration is complete, compare the reading to the desired rate for your system. Refer to your pump operation manual and adjust flow rate up or down accordingly (this is usually done by changing the frequency). After pump adjustment is made, repeat calibration procedure. Continue until the desired flow rate is achieved.

11 ROUTINE MAINTENANCE

Before performing any maintenance on your skid system or pump(s), skid components, pump(s) and your process piping may be under pressure!

Prior to working on any portion of the skid system:

- Disconnect pump(s) from power supply.
- De-pressurize the entire system.
- Drain chemicals from the lines.
- Flush and neutralize as necessary.
- Always wear suitable protection (gloves, safety glasses/goggles, etc.).

Routine maintenance will depend upon your service requirements: dosing chemical being handled, environmental conditions, duty cycle(s) of pump(s), etc. When working on any component of your system, i.e., pump(s) and valves, refer to the installation, operation and maintenance manual for that particular item.

Some operational and maintenance checks that need to be performed are:

Piping/Tubing Integrity:	Routinely check piping, tubing, isolation valves and connections for leaks. Replace tubing as necessary. Recommend weekly check.
System Operation:	Perform flow calibration regularly to ensure that dosing chemical is being added at the proper rate. Recommend monthly.
Pressure Relief:	Check to ensure that bolts are tight. Recommend monthly. Diaphragms should be replaced on an annual basis.
Calibration Column:	If handling sticky chemicals, may require cleaning to view liquid level inside. Perform as necessary.
Progressive Cavity Pump:	Weekly check oil level. Oil should be changed on a 3 years basis. Motor bearings shall be repacked with grease every 3 years. Pump bearings shall be repacked every 3000 operating hours.

Note: Special tools are required for dismantling and re-assembly of the pump. Before starting the dismantling, refer to the installation, operation and maintenance manual of the pump.

12 TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	REMEDY
Pump doesn't deliver product	Air entering suction line	Check fittings for tightness Check integrity of tubing Check level in suction source-must be above foot valve at inlet
	Air trapped in suction line	Re-configure suction line to eliminate air pocket(s)
	Suction line kinked or clogged	Inspect, replace tubing
	Chemical source empty	Refill, re-prime pump
	Pump not primed, air/gas in system	Refer to pump instructions
	Air/gas bubbles forming in chemical	Reduce suction lift or change to flooded suction Consider chemical storage temperature
	Strainer clogged	Check strainer, clean
	Pressure relief valve open	Check pressure relief valve integrity Check pressure relief valve settings
	Pump problem(s) may be: Stator wear, rupture Check valves worn or clogged Low pump flow setting Voltage/electrical difficulty	Refer to pump instructions
	TSE alert is triggered (overheating)	Check overheating causes Acknowledge the alert/release relay: - Press reset button (at TSE control for 1 sec) - Shut-off operating voltage at the TSE control unit (terminal 1-3) - Actuate external contact (reset button close for 1 sec)
Piping Vibration/chatter	Pulsation dampener malfunction (if applicable)	Check pulsation dampener integrity Check dampener air pressure
Injection rate too high, too low	Pump output setting incorrect	Perform flow calibration
	Chemical concentration too high, low	Adjust chemical source strength
	Injector clogged, scaled, restricted	Check injector for solids or corrosion Clean as necessary or replace
Tubing failure	Sunlight/UV exposure	Change to UV resistant tubing
	Corrosive attack	Determine material compatibility, change as necessary
Leaky fittings	Loose fittings	Tighten fittings-plastic fittings should be handtight only
	Corrosive attack	Determine material compatibility, change as necessary

If problem(s) persist, please contact Veolia Water Technologies

13 LUBRICATION SCHEDULE

ITEM	ACTION	FREQUENCY	TYPE OF LUBRICANT
Gear reducer	Check oil level Change Oil	Weekly 3 years	ISO VG 220 (mineral oil) (ambient T°: -5 to 40°C)
Motor Bearing	Repack with grease	3 years	NLGI EP 2 (grease) (refer to motor nameplate)
Pump Bearing	Repack with grease	3000 operating hours	NLGI EP 2 (grease)
Pump Pin Joints	Repack with grease	Rotor replacement or 10000 operating hours whichever is first	Seepex special joint grease only (refer to Seepex manual)

14 SPARE PARTS

It is highly recommended to keep in stock spare parts in sufficient quantity for all critical equipment to the proper functioning of the process.

Only the use of original Veolia spare parts will ensure proper and reliable operation.

When ordering a spare part, please give the following information:

- Veolia project number.
- Project name.
- Part number

15 DRAWINGS

If this dosing system is integrated to a processing plant, refer to the Process and/or Detailed Technical Documentation section of the Operation and Maintenance Manual for the dosing system drawings.

16 COMPONENTS TECHNICAL DATA SHEET

If this dosing system is integrated to a processing plant, refer to the Detailed Technical Documentation section of the Operation and Maintenance Manual for the dosing system data sheets.

17 MANUFACTURERS OPERATION AND MAINTENANCE MANUAL

If this dosing system is integrated to a processing plant, refer to the Manufacturer Operation and Maintenance Manual section of the Operation and Maintenance Manual for the dosing system manufacturer manuals.

PACKAGE NUMBER: 6115-S-265-001
PURCHASE ORDER NUMBER: OC-671670

AGNICO EAGLE MINES
AMARUQ WTP, NUNAVUT
VEOLIA Project 5000 218 009

Operation and Maintenance Manual
Volume 2

Prepared by:
Veolia Water Technologies Canada Inc.
4105, Sartelon
Montreal, Quebec, Canada
H4S 2B3
Tel.: 514-334-7230

Revision: 1
Date: August 2018

VEOLIA DOCUMENT NO: 5000218009_OMM_0001_GEN_VWT

LEFT BLANK

TABLE OF CONTENTS
Operation & Maintenance Manual
Amaruq WTP, Nunavut

TABLE OF CONTENTS
Operation & Maintenance Manual
Amaruq WTP, Nunavut

The system was manufactured in Canada by:

Veolia Water Technologies Canada
4105, Sartelon
Saint-Laurent, Qc.
Canada H4S 2B3
Phone: 514-334-7230
Fax: 514-334-5070

For technical support or service needs, for spare parts or to get assistance during your warranty period, you may contact us at the following number during regular business hours or write us at:

Veolia Water Technologies Canada – After Sales Support
1-844-SER-VWT9 | 1-844-737-8989 | vwtservicecanada@veolia.com

Our business hours are from:
Monday to Friday
8:30am to 5pm (EST)

Have the following information on hand for each request or call:

Project Name:
VWTC Reference Number:

LEFT BLANK

OPERATION AND MAINTENANCE MANUAL

VOLUME 2

LEFT BLANK

7 – MANUFACTURER MAINTENANCE MANUAL

7.1 – MANUFACTURER LIST

LEFT BLANK

AMARUQ WTP - NUNAVUT			
MANUFACTURER INSTALLATION, OPERATION AND MAINTENANCE MANUAL			
SECTION		MANUFACTURER LIST	
7.2			
	001	ALLEN BRADLEY	
		Model 836T, Pressure switch	
	002	ANDRITZ	
		Model D4L, Centrifuge	
	003	ASCO	
		EF8210G004, Solenoid valve	
		EF8210G022, Solenoid valve	
		8210G089, Solenoid valve	
		8210G094, Solenoid valve	
		(EF) 8345G001, Solenoid valve	
	004	ASCHROFT	
		Type 1009, Pressure gauge	
		Type 101, Diaphragm seal	
		Type 310, Diaphragm seal	
	005	BALDOR	
		Intergral horsepower series, Motor	
	006	CFF	
		Series SS-2, Ball valve	
	007	CHEMLINE	
		Type 21, Ball valve	
		Type SM2, Metering ball valve	
		Series BT-BC-FV-FT, Ball check and foot valves	
		Type 57, Butterfly valve	
		Series E, Electric actuator	
		Series PA, Pneumatic actuator	
		Series GV, Globe valve	
		Series SB12, Back pressure/relief valve	
		Series SG, Diaphragm seal w/ pressure gauge	
		Series FC/FS, Variable area flow meter	
	008	ENDRESS + HAUSER	
		Proline Promag 50W, Electromagnetic flowmeter	
		Liquiphant M FTL51, Level switch (vibronic)	
		Soliswitch FTE31, Level switch (paddle type)	
		Cerabar T PMC131, Pressure transducer	
		Cerabar S PMC71, Pressure transmitter	
	009	ENVIREQUIP	
		Series EVG/EVGX, Mixers	
		c/w Nord gear box	
	010	FLOWROX	
		Series PVE, Pinch valve	
	011	FLSMIDTH KREBS	
		Model U10-Gmax-9.5 SQIN, Hydrocyclone	
	012	FLYGT	
		ENM-10, Level switch	

SECTION		MANUFACTURER LIST
	013	GRUNDFOS
		DDA Series, Dosing pump
		CRN Series, Multi-stage centrifugal pump
	014	HACH
		Model Solitax sc, Turbity sensor
		Model sc200, Universal controller
		Model DPD1R1, pH sensor
		Model DRD1R5, ORP sensor
	015	HAPMAN
		Vacuum conveyor system
	016	KOFLO
		Model 1.5-40C-4-6-2, Static Mixer
		Model 2-40C-4-6-2, Static Mixer
	017	McLANAHAN
		Model M3H-CR 3/3, Microsand recirculation pump (P2-011/012/021/022)
		Model M3H-CR 1.5/1.5, Multiflo extraction pump (P2-014/023)
	018	NORD
		Clincher Series, Gear reducer
		c/w Nord motor
	019	ONYX VALVE
		Series PSW, Pressure gauge isolator ring
	020	PMP
		Model A201, Ball valve
	021	PRATT
		Series 601, Ballcentric plug valve
	022	PRIMARY FLUID SYSTEM
		Accudraw PVC Series, Calibration cylinder
		Accudraw Glass Series, Calibration cylinder
		Accupulse Series, Pulsation dampener
	023	PULSAFEEDER
		Pulsar Shadow Series, Mechanical diaphragm dosing pump
	024	SCHUTTE & KOERTING
		Figure 264, Eductor
	025	SEEPEX
		Series BN 05-12, Progressive cavity pump (cationic polymer) (P9-621/622/623)
		Series BN 05-12, Progressive cavity pump (anionic polymer) (P9-524/525/526)
		Series BN 17-06, Progressive cavity pump (sludge treatment) (P5-011/012)
	026	SULZER
		Model EJ 15D-2, Submersible pump
	027	WAM
		MBF Series, Micro batch feeder
		SBB Series, Flexible intermediate bulk container discharger (FIBC Discharger)
		VL Series, Slide gate valve

7 – MANUFACTURER MAINTENANCE MANUAL

7.2 – MANUFACTURER INSTALLATION, OPERATION AND MAINTENANCE MANUAL

LEFT BLANK

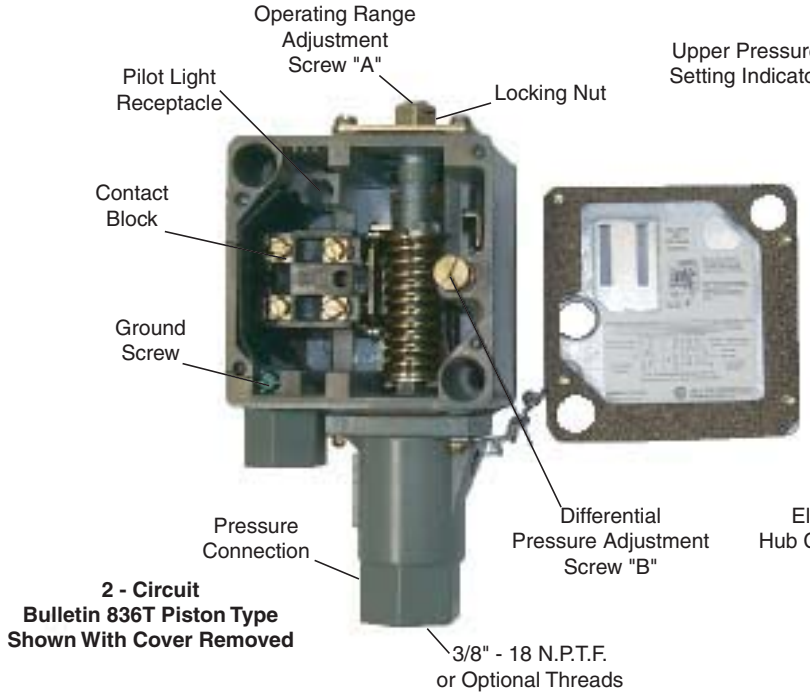
ALLEN BRADLEY

MODEL 386T, PRESSURE SWITCH

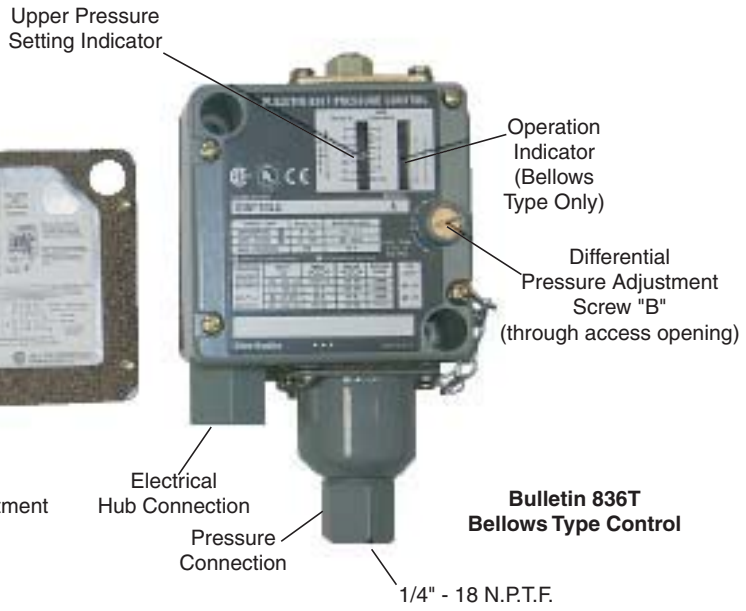
LEFT BLANK

Bulletin 836T Pressure Controls

ATTENTION: To prevent electrical shock, disconnect from power source before installing or servicing.



2 - Circuit Bulletin 836T Piston Type Shown With Cover Removed



Bulletin 836T Bellows Type Control

DESCRIPTION - Bulletin 836T, Type 1, 4, & 13 oiltight pressure controls are designed for use on machine tool applications where a stream of oil or water may flow over the enclosure. Other applications would include areas where it is desirable to resist the entrance of lint, dust, and dirt into the enclosure.

The operating range pressure and differential are adjustable externally.

Bellows type devices are available from vacuum to pressures up to 650 psi.

ATTENTION: Copper alloy bellows may be used on water or air and other liquids or gases not corrosive to this alloy. Type 316 stainless steel bellows are available and are used for the more corrosive liquids and gases.

Piston type devices are available for pressures up to 5000 psi.

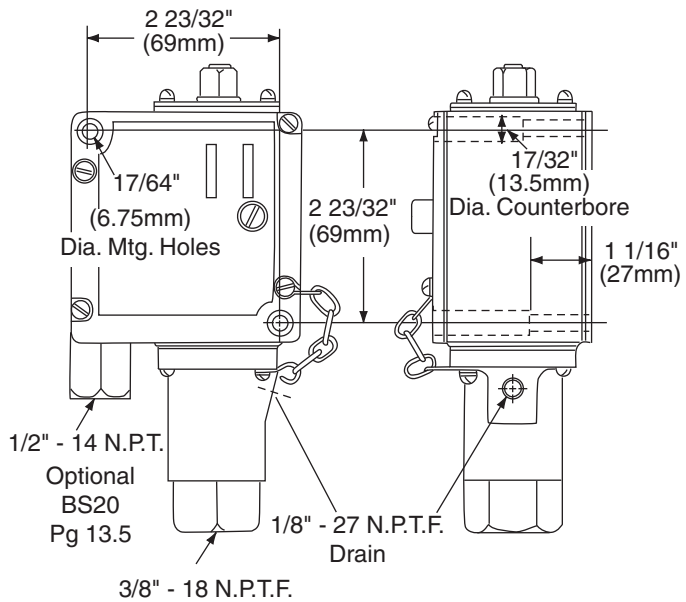
ATTENTION: Stainless steel piston type controls are designed for use on oil, water and waterbased fluids but must not be used on air or gases.

The 2 - Circuit contact block has one set of normally open and one set of normally closed contacts. These contacts may be arranged for single pole double-throw operation or separate circuit operation having the same polarity.

A 4 - Circuit contact block assembly with two normally open and two normally closed contacts is also available. An isolated terminal is furnished to provide a termination point when an optional power source is used. These contacts may be arranged for double pole double-throw operation or two isolated single pole double-throw, electrically isolated circuits. Circuits must be of the same polarity.

MOUNTING - The pressure control should be mounted securely to a firm base using two mounting screws. The recommended fastener for mounting is a 1/4"-20 or M6X1 metric screw. The applied torque should not exceed 70 lb-in (8 Nm).The mounting holes (see sketch) are easily accessible without removing the front cover assembly.

ATTENTION: The control should not be supported by only the electricaland pressure connections. A support wrench should be used when tightening the electrical hub and pressure connections.



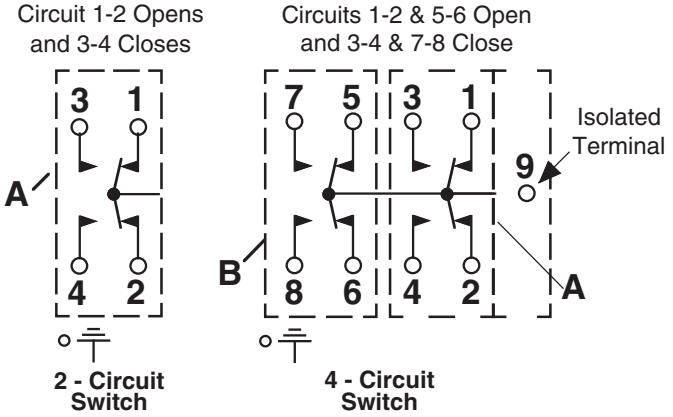
Piston Type Shown

OPERATION - A toggle mechanism operates the snap action switch at a predetermined pressure setting. For the 2 - Circuit snap switch the pressure causes the normally closed circuit 1-2 to open and normally open circuit 3-4 to close. This is known as the trip pressure. When the pressure returns to a lower predetermined setting, the circuit 1-2 will close and circuit 3-4 will open. This is known as the reset pressure. The difference between "trip" and "reset" pressure is the differential.
Similarly, for the 4 - Circuit snap switch, both normally closed circuits, 1-2 & 5-6 would open and both normally open circuits, 3-4 & 7-8 would close on increasing pressure. On decreasing pressure, the contacts would return to their original state at a predetermined setting.

Catalog number 836T-T251J can also be operated in a vacuum. At a higher vacuum setting (lower pressure toward 30" Hg) the 2 - Circuit switch contacts 1-2 will be closed and 3-4 open. At a lower vacuum (higher pressure toward 0 psi) circuit 1-2 will open and circuit 3-4 will close.

EXAMPLE: Control set to close contacts at 15" Hg vacuum, open at 5" Hg vacuum. For the 2 - Circuit switch, circuit 1-2 would be used. For the 4 - Circuit switch, circuits 1-2 or 5-6 would be used.

CONTACT BLOCK WIRING SYMBOL
(Increasing Pressure Operation)



A or B circuits must be the same polarity.

ADJUSTMENT - Generally, unless otherwise specified, controls shipped from the factory are set at the maximum operating range pressure and minimum differential.

The following procedure should be used to set the control to a particular requirement.

OPERATING RANGE ADJUSTMENT: Turn lock nut on adjustment screw "A" counterclockwise to loosen. Turn range adjustment screw "A" clockwise to raise upper and lower pressure settings. To decrease the upper and lower settings, turn screw "A" counterclockwise. The approximate upper pressure setting is shown by an indicator in the left window between the calibration scales on the nameplate. When the proper setting is reached, tighten the lock nut on screw "A" clockwise.

DIFFERENTIAL ADJUSTMENT: When the differential screw "B" is up against the underside of the differential access opening in the cover the control will function at minimum differential. To increase the differential, turn adjustment screw "B" clockwise. This will decrease the lower setting only. The higher setting will not change. Similarly, to decrease the differential turn the differential adjustment screw "B" counterclockwise. This will raise the lower setting only.
Condensed instructions can be found on the inside of the front cover.

NOTE: The use of a pressure gauge is desirable when setting the control.

ATTENTION: The adjustment screw "A" should not be forced beyond the range of the control indicated on the calibrated scale. The adjustment screw "B" should not be adjusted beyond the maximum specified differential of the control.

Operating variables in a system may cause changing pressure requirements. It is recommended that a periodic inspection of the gauge pressure be made and the pressure control adjusted to compensate when necessary for these changes.

PISTON TYPE APPLICATIONS -

ATTENTION: All pistons are provided with a 1/8 inch threaded drainopening which should be connected to an oil return line leading to anoil reservoir which is vented to atmosphere. This reservoir may be at ahigher level of elevation than the control. The controls with seal ringsusually do not require return lines. However, the 1/8 inch threaded drainopening should never be plugged on either type of piston control. Thisalso includes the shipping plug which must be removed upon installa-tion. Filters should be used to reduce contamination of hydraulic fluid.

PILOT LIGHT OPTION - A high intensity neon glow pilot light is available for 120 volt, 60 hertz applications and can be installed at the factory or in the field. To order pilot light kit specify catalog number of existing control and add N9 to this number. Optional pilot lights are available on special orders.

The pilot light is wired to the contact block as follows:

A. **2 - Circuit**
Always connect lamp wires to same set of terminals used for the load. To light on increasing pressure connect across 1-2. To light on decreasing pressure connect across 3-4.

B. **4 - Circuit**
Consists of 2 electrically isolated single pole-double throw circuits. Connect lamp wires to same set of terminals used for load. To light on increasing pressure connect across 1-2 or 5-6. To light on decreasing pressure connect across 3-4 or 7-8.
(or)
An isolated terminal, 9, is provided as a termination point when an optional power source is used. This provides a convenient means for various circuit connections when separation of the load and pilot light is required. Circuits must be the same polarity for pilot light connections and switching of auxiliary equipment.

PAINTING - Standard controls are supplied with a removable paint mask on the nameplate. Remove the mask on final installation.

CONTACT BLOCK REPLACEMENT - To order Bulletin 836T Contact Block 2 - Circuit (SPDT-DB) Replacement Kit specify Catalog Number 836T-N1. For the 4 - Circuit (DPDT-DB) Contact Block Replacement Kit specify Catalog Number 836T-N2.

REPAIRS - Due to the integral construction of the Bulletin 836T Pressure Control, it is recommended it be returned to the factory for repairs (excluding contact block replacement). The control will be adjusted for optimum performance and tested to specifications.

ANDRITZ

MODEL D4L, CENTRIFUGE

LEFT BLANK

VEOLIA WATER TECHNOLOGIES CANADA, INC.
AGNICO EAGLE AMARUQ MINE WTP
SAINT-LAURENT, QC, CANADA

Operation & Maintenance Manual
VOLUME I

CENTRIFUGE SKID SYSTEM

Model: D4LC30CHP

Serial No.'s: 132907052 & 132907053

ANDRITZ Separation, Inc.

1010 Commercial Blvd South
Arlington, TX 76001

Phone: 817-465-5611
Fax: 817-472-8589

Andritz Job No: 831476

REVISION NO.:	0.0	MAY 2018

IMPORTANT!

This manual should be read in its entirety before attempting to install, operate, or repair the equipment supplied by ***ANDRITZ.*** One copy must be kept in the area of equipment installation and be available to operators and maintenance personnel. Failure to follow the instructions contained herein could result in invalidation of warranties or injury to personnel.

This page is intentionally left blank

DIRECTORY OF PARTIES TO THE PROJECT

END USER/OWNER	VEOLIA WATER TECHNOLOGIES CANADA, INC
	4105 Sartelon Saint-Laurent, QC Canada, H4S 2B3 Plant site: Agnico Eagle Amarunq Mine Baker Lake, NU, Canada X0C 0A0
ENGINEER	**VEOLIA WATER TECHNOLOGIES CANADA, INC**
Contact: Clément Bekaert, Engineer & Project Manager E-mail: clement.bekaert@veolia.com Phone: +1 514-334-7230 Mobile: +1 514-246-6232 Fax: +1 514-334-5070	4105 Sartelon Saint-Laurent, QC Canada, H4S 2B3
SPARE PARTS & SERVICE	**ANDRITZ SEPARATION, INC.**
Aftermarket Services Phone: +1 817-419-1768 Fax: +1 817-419-1968	1010 Commercial Blvd South Arlington, TX 76001, USA Phone: +1 817-465-5611 Fax: +1 817-419-1929

MECHANICAL ENGINEER:	ELECTRICAL ENGINEER:
APPROVED BY:	APPROVED BY:
DATE: 6/6/18	DATE: 6/6/2018

This page is intentionally left blank

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

CENTRIFUGE SKID DELIVERY AND INSTALLATION

WARNING: 

1.1 GENERAL SAFETY FOR LIFTING AND TRANSPORTATION

Qualifications

Personnel in charge of machine operation/lifting and transportation, must have the necessary qualifications.

Method

Use only recommended tools and methods.

Do not stand under the loaded hoist or place any parts of the body (hands, feet, etc.) under the machine being lifted.

Do not place fingers, hands, feet, or head in areas where there may be risk of pinching. Beware of sharp edges from worn parts.

CAUTION: An unattended or falling load can cause bodily harm or death as well as consequential equipment damage.

1.2 RECEIVING

The centrifuge skid unit arrives preassembled minus the conveyor. The conveyor frame will be offloaded individually. Refer to M818524-4 for lifting points to offload the skid. Use extreme caution when offloading so as not to dislocate the assembled equipment.

1.3 STORAGE INSTRUCTIONS FOR THE CENTRIFUGE SKID

Short term storage is a period of three months or less where the machine is out of service. ANDRITZ recommends indoor storage for the centrifuge skid system, including its motors, ancillary equipment, tools and spares.

1.3.1 Short Term Storage – 3 Months or Less

The centrifuge skid must be stored in a dry, dust-free, ventilated area with sufficient space around the skid so that it will not come into accidental contact with other equipment or environmental or workplace contaminants. The centrifuge and auxiliary equipment on the skid must be covered and completely enclosed with at least two layers of tarp if stored outside and one layer of tarp if stored inside. The centrifuge skid must be stored in an area where the ambient temperature is greater than 50 ºF.

If the centrifuge has been in use before storage, then it must be washed internally thoroughly, and all electrical switch gear must be locked out, before placing it in storage. New equipment may be stored as it arrives from the manufacturer.

Each centrifuge is lubricated before shipping. However, if the centrifuge has been in use, protect the bearing block bearings from moisture by injecting a third to a half an ounce of grease through the lubricators. Turn the rotating assembly by hand so that rolling elements are properly coated. Repeat this procedure every 6 months during storage.

Loosen the belts and coat the pulley with a light lubricant such as WD-40. This procedure is required to keep the belts from becoming deformed and to protect the pulley from corrosion during storage.

Check the manufacturer's manual of each auxiliary equipment for long-term storage recommendations.

CAUTION: A total filling of the bearing housing will result in abnormal heating during startup, which might then require partial disassembly to remove excess grease.

NOTE: The other bearings and the Cyclo reducer are enclosed in a tight housing filled with lubricant, and no maintenance is required.

1.3.2 Tools, Parts and Ancillary Equipment

Tools and spares (if supplied) must be crated and stored on blocks or a wooden pallet. Ancillary equipment should be left as it is shipped (wrapped on a pallet or crated).

1.3.3 Long Term Storage

It is recommended that a centrifuge skid system which is to be stored for a period in excess of three months be stored indoors in a heated building with the temperature maintained at a minimum of 50°F (10°C). This should be a warehouse-type building with no rotating machines that may cause floor vibration; the machine must be isolated from floor vibration.

Prior to storage, the machine should be tagged with a list of instructions followed during storage and special precautions to be taken before start-up.

This procedure does not imply any extension of ANDRITZ Standard Warranty.

Prior to start-up after long-term storage, it is mandatory that an ANDRITZ Service Engineer supervise the startup.

If the centrifuge has been in service before putting into long-term storage, then it must be washed internally thoroughly, and all electrical switch gear must be locked out before placing it in storage. The centrifuge must be covered and completely enclosed by a layer of tarp. The centrifuge must be stored in an area where the ambient temperature is greater than 50ºF (10ºC). It is recommended to store the centrifuge inside.

Tools and spares should be crated and stored on blocks or wooden pallet. Ancillary equipment should be left as it is shipped (wrapped on a pallet or crated).

1.3.4 Preparation of Loose Parts for Storage

All loose parts should be placed in a box lined with rust inhibitor paper. Do not put paper on the base of the box, but apply to sides. All machined, unpainted surfaces should be coated with Mobilarma® 355 or equivalent.

1.3.5 Preparation of Machined Surfaces

All exposed, unpainted steel surfaces on the centrifuge should also be coated with Mobilarma® 355 or equivalent.

1.3.6 Preparing to Crate for Long Term Storage Preparation

The entire centrifuge skid should be covered with a tarp made of rust inhibitor, waterproof paper. The tarp should be 8” (200mm) to 10” (250mm) above the base of the machine.

The following standard notes should then be stenciled on the outside surface of the tarp on both sides of the centrifuge, as follows:

TAG / STENCIL	Rotate the assembly by hand at least 5 revolutions in order to rotate the centrifuge.

1.4 STORAGE INSTRUCTIONS FOR CONTROL PANELS

ANDRITZ control panels are covered with stretch wrapping material and bolted to or braced securely in an enclosed wooden crate for shipment. The control panel crate provides exterior protection against weather precipitation and impact damage that could occur during shipment. Control panels with legs are securely bolted to a shipping skid to provide stability for movement of the control panel with a forklift after it is uncrated at the jobsite. The control panel should always remain secured to the shipping skid until it is ready to be removed and placed in its final destination. Control panels without legs are securely braced in the crate with wooden braces. These braces must be removed prior to lifting the control panel from the crate. Removal of control panels either from the crate or from the shipping skid should be done via the use of the lifting eyes on the control panel and with load-rated lifting straps.

The following statements are guidelines for proper short-term and long-term storage of industrial control panels that are delivered to the jobsite. Failure to adhere to the following storage requirements will render any written or implied ANDRITZ warranty null and void. It needs to also be understood that the shipping crate is not designed to be used as a long-term weather proof shelter for the control panel and that waterproof tarps should be placed over the top of the crate to prevent water seepage and material degradation if the crate is going to be subjected to the outdoors for any period of time; outdoor exposure should be only temporary and kept to a minimum.

1.4.1 Short Term Storage for Control Panels (3 Months or Less)

The industrial control panel should be stored indoors in a clean, dry, vibration-free, non-corrosive environment and be kept at a uniform temperature to prevent condensation. The control panel should be placed on a flat surface and in an upright position. If the control panel is removed from its shipping crate, it should be kept in its stretch wrapped material until it is ready for installation. The industrial control panel should not be tipped or laid flat during storage unless intentionally shipped in that manner by the factory. Proper measures should be taken to protect the control panel from exposure to excess dirt, temperature, and humidity. The control panel should be stored in an area where it will not be subjected to a lot of traffic by personnel, lift trucks, and so forth where potential injury to personnel or damage to the equipment could occur.

1.4.2 Long Term Storage for Control Panels

The industrial control panel should be stored indoors in a dry, vibration-free, non-corrosive environment and be kept at a uniform temperature to prevent condensation. The crate should be set on a flat surface and prepped for long-term storage by completely stretch wrapping it to keep it insulated from any excess dirt and any encroaching insects, vermin, etc.. The crated control panel should be stored in an area where it will not be subjected to a lot of traffic by personnel, lift trucks, and so forth where potential injury to personnel or damage to the equipment could occur.

NOTE: If necessary, temporary electrical heating should be installed to prevent condensation within the control panel, approximately 150 watts per section is usually adequate for the average control panel for most environments. All loose packing of flammable materials should be removed prior to energizing space heaters.

1.5 HANDLING

The skids will arrive as shown in drawing M831476-2. The conveyors and vent piping will be shipped loose. It is the contractor's responsibility to ensure the sling and spreader bar(s) are adequately sized to handle the load. It is also the responsibility of the contractor to ensure the crane is sized to lift and place the load as required. The weight of the skid is approximately 5,883 kgs (12,970 lbs).

1.6 CENTRIFUGE SETUP

The contractor should prepare the foundation as shown in drawing M831476-2 with anchor bolts located, as shown in the detail. The skid should be located such that the sludge inlet and centrate connections can be located. Once in place the skid should be levelled in all directions to within 1/16 inch. High strength grout should be used around the anchor bolts.

The conveyor and vent piping can then be installed. The reminder of the piping connection as well as wiring should be completed. The shipping straps which secure the machine to the stand can be removed.

The rotating assembly is locked on both ends by one radial screw. The bolts can be backed off to allow the rotation assembly to turn freely.

1.6.1 Connections

All connecting piping must be self-supporting. Refer to drawing M831476-3 for all connection locations and sizes.
The following connections need to be made:

- Product flanges
- Wash water connection
- Polymer connection
- Check that the flexible expansion joints can absorb both vertical and horizontal displacement. Axial compression – 38mm, (1 ½"), Axial extension – 16mm ($^{5}/_{8}$"), Lateral offset – 19mm (¾").
- Check feed pump

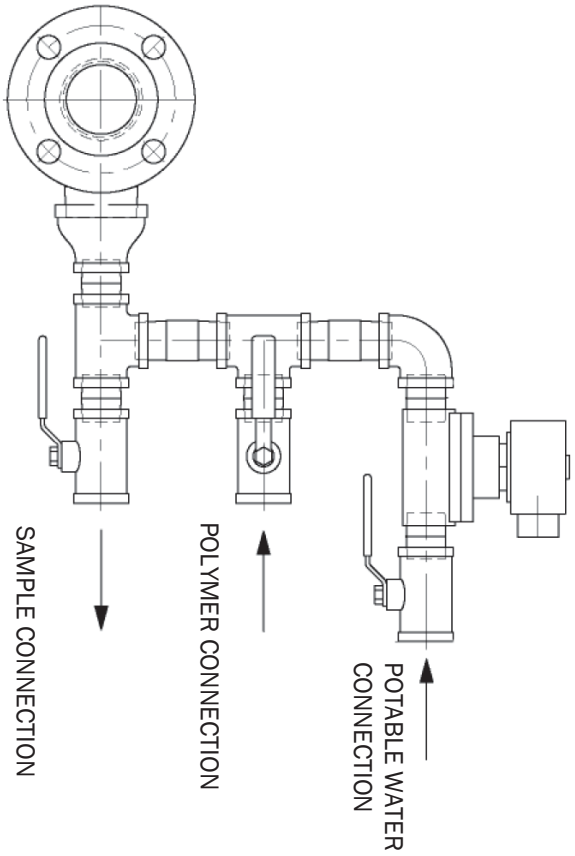


Figure 1-2 Installation of the Feed Head

1.6.2 Installation of the Electricals

Refer to electrical drawings, Chapter 2, §2.2, for all required electrical connections.

1.6.3 Auxiliary Verifications

- Supplied Tools
- Lubrication amounts
- Standard tools
- Test product
- Power and fluids
- Electrician / Automation engineer on site

An Installation Checklist has been included at the end of this chapter.

1.7 INSTALLATION CHECKLIST

This checklist, as well as ensuring equipment is correctly installed will also maximize the efficiency of the Andritz field technician's visit to the site during installation and start-up.

TABLE 1-1. INSTALLATION CHECKLIST FOR ANDRITZ CENTRIFUGES

Check List	**Yes**	**No**	**Not Applicable**
CENTRIFUGE CABLES			
• Inverters			
• Centrifuge Connections			
• Wire Connection			
• Command circuit (relays, I/O/Automate)			
POWER			
• Electricity			
• Raw water or rinse circuit			
• Compressed air			
INSTALLATION			
• Leaks			
• Rotation direction of peripheral motors			
• Sensors			
• Measurement controls (flow meter, flow indicators)			
PRODUCT			
• Quality and quantity			
PRODUCT EVACUATION			
• Trap / Hopper			
• Scroll pump			
MAINTENANCE MEANS FOR MACHINE DISMANTLE			
• Rails, lifting beams			
ELECTRICIAN / AUTOMATION ENGINEER ON SITE			
• Presence required			

This page is intentionally left blank

CHAPTER 2

PROJECT DRAWINGS

2.1 MECHANICAL DRAWINGS

The following certified mechanical drawings are included:

M831476-1 D4L Centrifuge Skid General Arrangement

M831476-2A D4L Centrifuge Skid, Skid Assembly General Arrangement Unit 0601

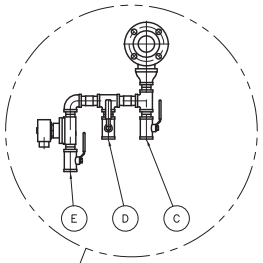
M831476-2B D4L Centrifuge Skid, Skid Assembly General Arrangement Unit 0602

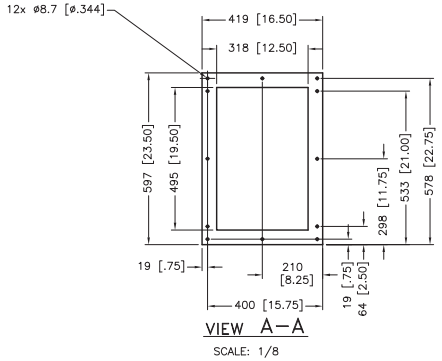
M831476-3 Manifold Assembly

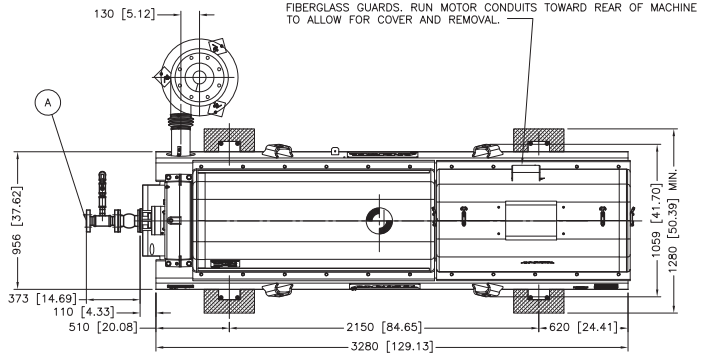
M831476-4 D4L Centrifuge Skid, Skid Assembly General Arrangement (to be provided in submittal of final O&M)

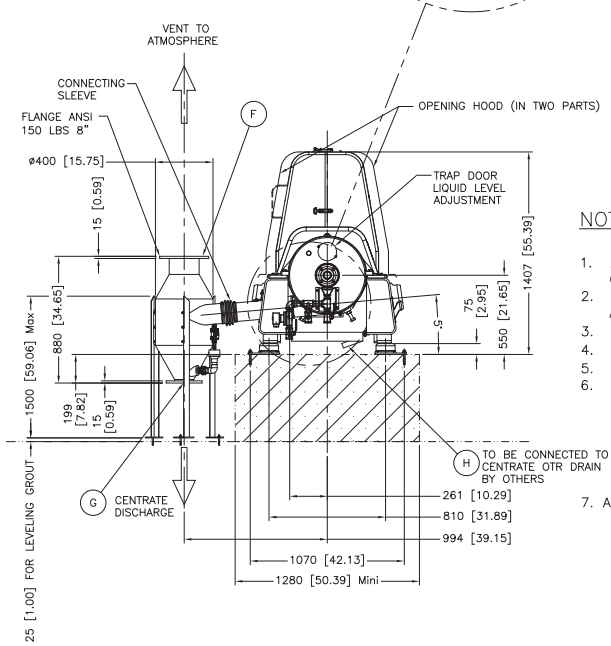
This page is intentionally left blank

PIPING CONNECTIONS		
PORT	SIZE	DESCRIPTION
A	2"–150 LB ANSI FLANGE	FEED INLET
B	RECTANGULAR 12–1/2" x 19–1/2"	SEDIMENTS DISCHARGE
C	1" NPT	SLUDGE SAMPLE
D	1" NPT	POLYMER CONNECTION
E	1" NPT	WASHWATER CONNECTION
F	8"–150 LB ANSI FLANGE	VENT
G	5"–150 LB ANSI FLANGE	EFFLUENTS OUTLET
H	ø1.327"	FRAME DRAIN



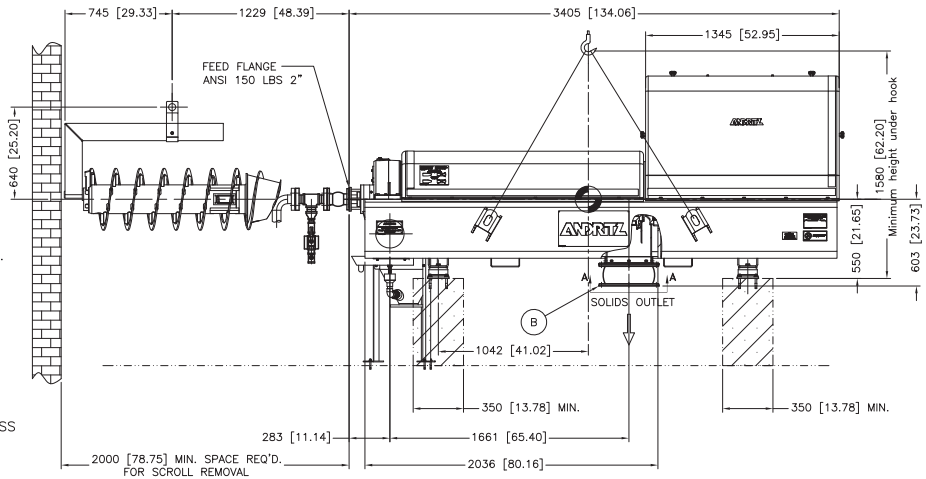






NOTES:

1. ALL PIPING TO AND FROM MACHINE TO BE COMPLETED WITH FLEXIBLE CONNECTIONS.
2. SEE FOUNDATION DETAILS FOR DESIGN LOADS AND CONNECTION DETAILS.
3. ALL DIMENSIONS ARE IN mm WITH inches IN [ ].
4. DRY WEIGHT OF MACHINE 3059 kg [6744 lbs].
5. SCROLL WEIGHT 510 kg [1124 lbs].
6. PROCESS REQUIREMENTS
   WASHWATER: 35.2–70.4GPM @ 43.5–58PSI
   SHUTDOWN: 15min
   CIP: 10min
   AIR FLOW: 118CFM
   MINIMUM SLUDGE INLET PRESSURE: 7.5PSI AT CENTRIFUGE FEED FLANGE.
7. ALL CHUTES TO BE SUPPORTED BY OTHERS UNLESS NOTED OTHERWISE.



ANDRITZ SEPARATION, INC.
1010 COMMERCIAL BLVD, SOUTH
ARLINGTON, TEXAS 76017
Phone: (817)465-5611
Telefax: (817)472-8589

CERTIFIED CORRECT FOR INSTALLATION
BY: T.BARTOSH DATE: 4/10/18
PROJECT No. 831476

THESE DWGS. REFLECT CUSTOMER'S CHANGES AND APPROVAL ON PREVIOUS DWG. TRANSMITTALS

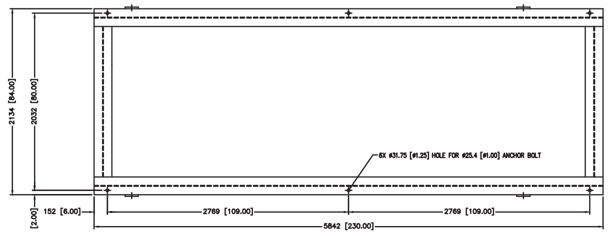
ESTIMATED WEIGHT IN LBS:	DRAWN BY: QG	DATE 04/10/18
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY:	DATE
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	APPROVED BY: JG	DATE 4/10/18
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION	
MILL FINISH ALL OVER		

ANDRITZ SEPARATION, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

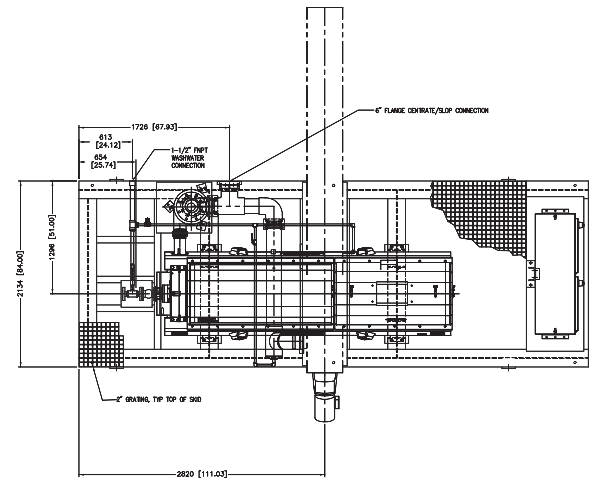
TITLE: VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE
GENERAL ARRANGEMENT

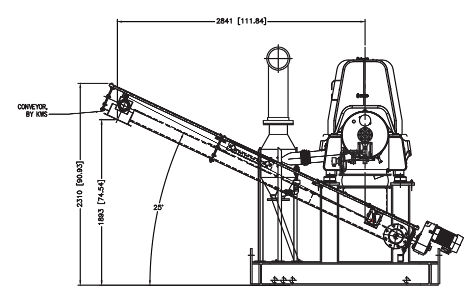
SIZE	DRAWING NUMBER	REV
D	M831476–1	0

SCALE 1/16 | FILE M831476–1 | SHEET 1 OF 1

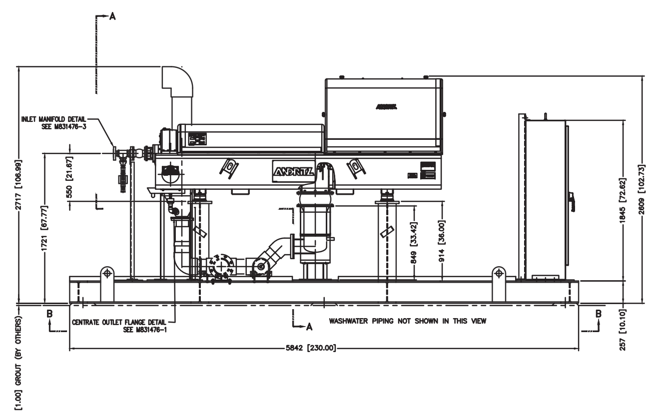


VIEW B–B





VIEW A–A
WASHWATER PIPING NOT SHOWN IN THIS VIEW

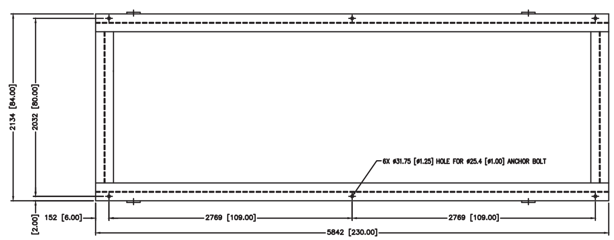


NOTES:
1. FOUNDATION DESIGN TO BE BY OTHERS.
2. ALL DIMENSIONS ARE IN mm WITH inches IN [ ].
3. PIPING TO/FROM SKID IS BY OTHERS.
4. PROCESS REQUIREMENTS: SEE NOTE 6 ON DRAWING M831476-1.
5. APPROXIMATE DRY WEIGHT OF SKID: 5883 kg [12,970 lbs].
   APPROXIMATE OPERATING WEIGHT OF SKID: 6677 kg [14,720 lbs].
6. SKID TO BE LEVEL IN ALL DIRECTIONS WITHIN 1.6mm [.063 inch].

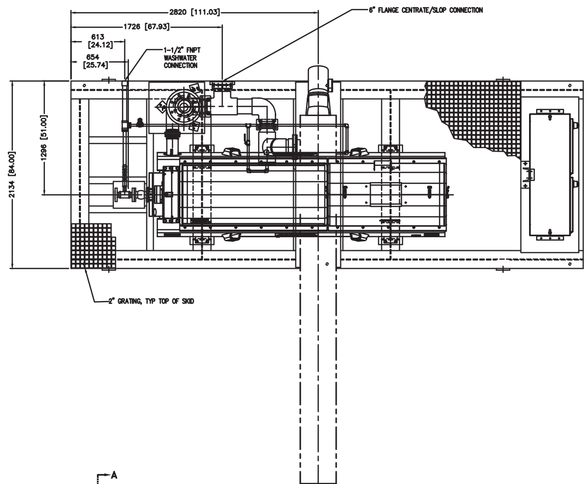
UNIT 0601

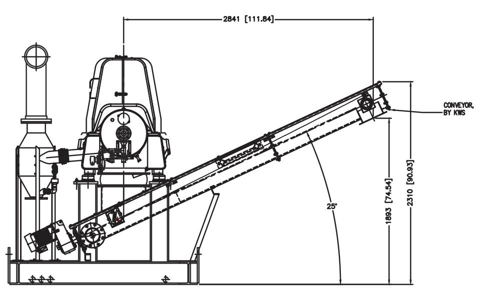
ASAP DOCUMENT No.–

1010 COMMERCIAL BLVD. SOUTH ARLINGTON, TEXAS 76001 Phone: (817)465-5611 Telefax: (817)472-6680	ESTIMATED WEIGHT IN LBS:	DRAWN BY: QG	DATE 06/05/18	ANDRITZ	TITLE VEOLIA AGNICO AMARUQ D4L CENTRIFUGE SKID ASSEMBLY GENERAL ARRANGEMENT UNIT 0601
CERTIFIED CORRECT FOR INSTALLATION BY: T.BARTOSH DATE: 6/6/18	UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY:	DATE	ANDRITZ SEPARATION, INC. 1010 COMMERCIAL BLVD. SOUTH ARLINGTON, TEXAS 76001	SIZE E DRAWING NUMBER M831476-2A REV 0
PROJECT No. 831476	FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	APPROVED BY: JB	DATE 6/6/18	PHONE: (817) 465-5611	SCALE 1/16 FILE M831476-2A SHEET 1 OF 1
THESE DWGS. REFLECT CUSTOMER'S CHANGES AND APPROVAL ON PREVIOUS DWG. TRANSMITTALS	MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020 MILL FINISH ALL OVER	THIRD ANGLE PROJECTION			

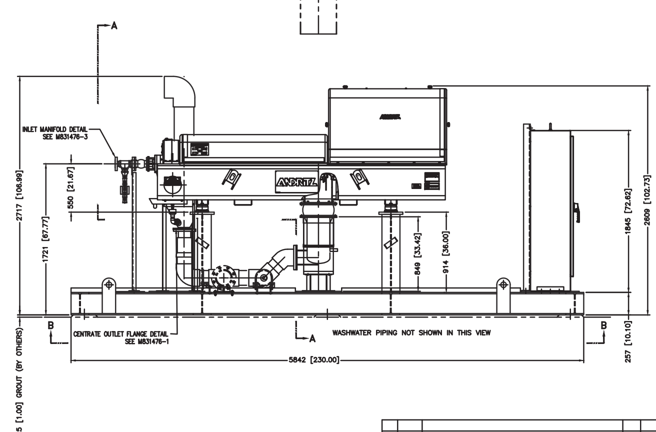


VIEW B–B





VIEW A–A
WASHWATER PIPING NOT SHOWN IN THIS VIEW



NOTES:
1. FOUNDATION DESIGN TO BE BY OTHERS.
2. ALL DIMENSIONS ARE IN mm WITH inches IN [ ].
3. PIPING TO/FROM SKID IS BY OTHERS.
4. PROCESS REQUIREMENTS: SEE NOTE 6 ON DRAWING M831476-1.
5. APPROXIMATE DRY WEIGHT OF SKID: 5883 kg [12,970 lbs]. APPROXIMATE OPERATING WEIGHT OF SKID: 6677 kg [14,720 lbs].
6. SKID TO BE LEVEL IN ALL DIRECTIONS WITHIN 1.6mm [.063 inch].

UNIT 0602

REV	EIR	REVISION	BY	APVD	DATE
A	NONE	UPDATED PER CUSTOMER COMMENTS	QG	JB	6/6/18

ASAP DOCUMENT No.–

ANDRITZ SEPARATION, Inc. 1010 COMMERCIAL BLVD. SOUTH ARLINGTON, TEXAS 76001 Phone: (817)465-5611 Telefax: (817)472-8589

CERTIFIED CORRECT FOR INSTALLATION
BY: T.BARTOSH DATE: 6/6/18
PROJECT No. 831476
THESE DWGS. REFLECT CUSTOMER'S CHANGES AND APPROVAL ON PREVIOUS DWG. TRANSMITTALS

ESTIMATED WEIGHT IN LBS:
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

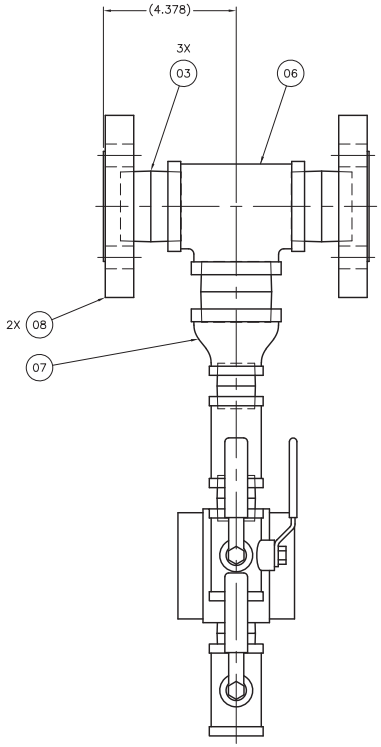
DRAWN BY: QG — DATE 06/05/18
CHECKED BY: — DATE
APPROVED BY: JB — DATE 6/6/18
THIRD ANGLE PROJECTION

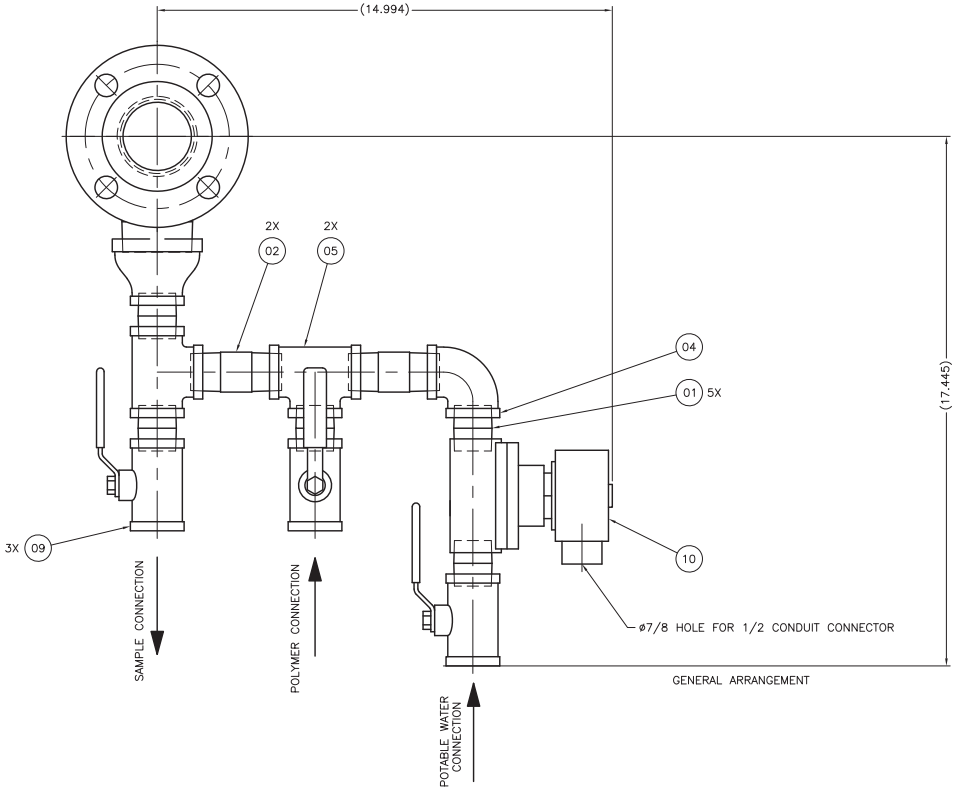
ANDRITZ
ANDRITZ SEPARATION, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID ASSEMBLY GENERAL ARRANGEMENT UNIT 0602

SIZE: E | DRAWING NUMBER: M831476-2B | REV: A
SCALE: 1/16 | FILE: M831476-2B | SHEET 1 OF 1

No	PART No	QTY	DESCRIPTION	MATERIAL
01	PINIX1.0CMN	5	CLOSE NIPPLE, 1"	316L
02	PINIX1.0CMN3	2	NIPPLE, 1 x 3 LG	316L
03	PINIX2.0CMN	3	CLOSE NIPPLE, 2"	316L
04	PI90X1.0CFN	1	90° ELBOW, 1"	316L
05	PITEX1.0CFN	2	TEE, 1" FNPT	316L
06	PITEX2.0CFN	1	TEE, 2" FNPT	316L
07	PIREX2X1CFN	1	REDUCER, CONC., 2 X 1 SCH 40 FNPT	316L
08	PIFLX2.0FFN	2	FLANGE, 2 (150 LB) THREADED	316L
09	VBLX1.0FFN	3	BALL VALVE, 1" FNPT	316L
10	131417950	1	ASCO EF8210G4, 1" SOLENOID VALVE	BRASS





GENERAL ARRANGEMENT

6 NOTE:
1. ALL THREADED PIPE JOINTS TO BE SEALED WITH RECTORSEAL 5 PIPE THREAD SEALANT

1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76017
Phone: (817)465-5611
Telefax: (817)472-8589

CERTIFIED CORRECT FOR INSTALLATION
BY: T.BARTOSH DATE: 4/10/18
PROJECT No.: 831476
THESE DWGS. REFLECT CUSTOMER'S CHANGES AND APPROVAL ON PREVIOUS DWG. TRANSMITTALS

ESTIMATED WEIGHT IN LBS:
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

DRAWN BY:	TB	DATE 4/10/18
CHECKED BY:		DATE
APPROVED BY:	TB	DATE 4/11/18
THIRD ANGLE PROJECTION		

ANDRITZ
ANDRITZ-RUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: CENTRIFUGE
MANIFOLD ASSEMBLY

SIZE	DRAWING NUMBER	REV
D	M831476-3	0

SCALE 1/2 | FILE M831476-3 | SHEET 1 OF 1

2.2 ELECTRICAL DRAWINGS

The following certified electrical drawings are included:

E831476-T1 D4L Centrifuge Skid Drawing Report List

E831476-BM1 D4L Centrifuge Skid Bill of Materials

E831476-BM2 D4L Centrifuge Skid Bill of Materials

E831476-P1 D4L Centrifuge Skid Panel Layout

E831476-P2 D4L Centrifuge Skid Back Panel Layout

E831476-P3 D4L Centrifuge Skid Terminal Block Plan (AC)

E831476-P4 D4L Centrifuge Skid Terminal Block Plan (DC)

E831476-P5 D4L Centrifuge Skid Nameplates

E831476-P6 D4L Centrifuge Skid Control Panel Skid Mounting Angle

E831476-SL1 D4L Centrifuge Skid Single Line Schematic

E831476-S1 D4L Centrifuge Skid Power Distribution Schematic

E831476-S2 D4L Centrifuge Skid 480VAC Power Distribution

E831476-S3 D4L Centrifuge Skid Power Distribution

E831476-S4 D4L Centrifuge Skid Low Voltage Power Distribution

E831476-S5 D4L Centrifuge Skid AC Ctrl Power Distribution (Cont.)

E831476-S6 D4L Centrifuge Skid DC Power Distribution

E831476-S7 D4L Centrifuge Skid Communications

E831476-S8 D4L Centrifuge Skid OIT Schematic

E831476-S9 D4L Centrifuge Skid PLC Power Supply and CPU

E831476-S10 D4L Centrifuge Skid Bank 1 Slot 1 Digital Inputs

E831476-S11 D4L Centrifuge Skid Bank 1 Slot 2 Digital Inputs

E831476-S13 D4L Centrifuge Skid Bank 1 Slot 3 Digital Outputs

E831476-S15 D4L Centrifuge Skid Bank 1 Slot 4 Analog Inputs

E831476-S16 D4L Centrifuge Skid Bank 1 Slot 5 Analog Outputs

E831476-S20	D4L Centrifuge Skid Field Devices
E831476-N1	D4L Centrifuge Skid Network Architecture
E831476-PP1	D4L Centrifuge Skid Point to Point (Centrifuge Loads)
E831476-PP2	D4L Centrifuge Skid Point to Point Instrumentation JB
E831476-PP3	D4L Centrifuge Skid Point to Point (Cont. for Customer Use)
E831476-PP4	D4L Centrifuge Skid Point to Point Sludge
E831476-PP5	D4L Centrifuge Skid Point to Point Polymer
E831476-PP6	D4L Centrifuge Skid Point to Point Conveyor
E831476-IOM1	D4L Centrifuge Skid I/O Map List
E831476-IOM2	D4L Centrifuge Skid I/O Map List

For reference:

E831476-PID	D4L Centrifuge Skid, Skid I&C Legend
E831476-PID-2	D4L Centrifuge Skid, Skid P&ID

ANDRITZ Separation

VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
0

SH	LOCATION	SEC	DWGDESC	FILENAME
1		TRANSMITTALS	DRAWING REPORT LIST	E831476-T1
2	CFG-CP	BILL OF MATERIALS	BILL OF MATERIALS	E831476-BM1
3	CFG-CP	BILL OF MATERIALS	BILL OF MATERIALS	E831476-BM2
4	CFG-CP	PANEL LAYOUT	PANEL LAYOUT	E831476-P1
5	CFG-CP	PANEL LAYOUT	BACKPANEL LAYOUT	E831476-P2
6		PANEL LAYOUT	TERMINAL BLOCK PLAN □AC□	E831476-P3
7		PANEL LAYOUT	TERMINAL BLOCK PLAN □DC□	E831476-P4
8		PANEL LAYOUT	NAMEPLATES	E831476-P5
9	CFG-CP	PANEL LAYOUT	CONTROL PANEL SKID MOUNTING ANGLES	E831476-P6
10		SINGLE LINE SCHEMATICS	SINGLE LINE SCHEMATIC	E831476-SL1
11	CFG-CP	SCHEMATICS	DRAWING REPORT LIST	E831476-S1
12	CFG-CP	SCHEMATICS	480VAC POWER DISTRIBUTION	E831476-S2
13	CFG-CP	SCHEMATICS	POWER DISTRIBUTION SCHEMATIC	E831476-S3
14	CFG-CP	SCHEMATICS	LOW VOLTAGE POWER DISTRIBUTION	E831476-S4
15	CFG-CP	SCHEMATICS	AC CTRL POWER DISTRIBUTION □CONT.□	E831476-S5
16	CFG-CP	SCHEMATICS	DC POWER DISTRIBUTION	E831476-S6
17	CFG-CP	SCHEMATICS	COMMUNICATIONS	E831476-S7
18	CFG-CP	SCHEMATICS	OIT SCHEMATIC	E831476-S8
19	CFG-CP	SCHEMATICS	EMBEDDED PLC POWER SUPPLY	E831476-S9
20	CFG-CP	SCHEMATICS	BANK 1 SLOT 1 DIGITAL INPUTS	E831476-S10
21	CFG-CP	SCHEMATICS	BANK 1 SLOT 2 DIGITAL INPUTS	E831476-S11
22	CFG-CP	SCHEMATICS	BANK 1 SLOT 3 DIGITAL OUTPUTS	E831476-S13
23	CFG-CP	SCHEMATICS	BANK 1 SLOT 4 ANALOG INPUTS	E831476-S15
24	CFG-CP	SCHEMATICS	BANK 1 SLOT 5 ANALOG OUTPUTS	E831476-S16
25	CFG-CP	SCHEMATICS	FIELD DEVICES	E831476-S20
26	CFG-CP	NETWORK ARCHITECTURE	NETWORK ARCHITECTURE	E831476-N1
27		POINT TO POINT	POINT TO POINT □CENTRIFUGE LOADS□	E831476-PP1
28		POINT TO POINT	POINT TO POINT INSTRUMENTATION □B	E831476-PP2
29		POINT TO POINT	POINT TO POINT □CONT FOR CUST USE□	E831476-PP3
30		POINT TO POINT	POINT TO POINT SLUDGE	E831476-PP4
31		POINT TO POINT	POINT TO POINT POLYMER	E831476-PP5
32		POINT TO POINT	POINT TO POINT CONVEYOR	E831476-PP6
33		REPORTS	I/O MAP LIST	E831476-IOM1
34		REPORTS	I/O MAP LIST	E831476-IOM2

SCHEMATIC SYMBOL LEGENDS

Code	Schematic Symbol	Description
AB		Alarm Beacon
AH		Alarm Horn
CB		Circuit Breaker
CR		Relay Coil
		Contact N.O.
		Contact N.C.
DI		Diode
DS		Disconnect
DV		Analog Device
EGND		Earth Ground
FAN		Enclosure Fan/Exhaust
FLT		Level Switch N.C.
		Level Switch N.O.
FS		Flow Switch N.O.
		Flow Switch N.C.
FU	X	Fuse X=Amp Rating
GNDx		Ground X=Isolation Ground Number
LS		Limit Switch N.C.
		Limit Switch N.C.; Held Open
		Limit Switch N.O.
		Limit Switch N.O.; Held Closed
LT		Pilot Light X=color (A=amber,B=blue, G=green,R=red)
		Pilot Light – Push to Test X=color (A=amber,B=blue, G=green,R=red)
M		Contactor Coil
MOT		Motor
OIT		Operator Interface Terminal
OL		Overload Relay

Code	Schematic Symbol	Description
PB		Pushbutton N.O.
		Pushbutton N.C.
		Pushbutton N.O.; Mushroom Head
		Pushbutton N.C.; Mushroom Head
PCS		Pull Cord N.C.
		Pull Cord N.O.
PE		Photo Eye N.O.
		Photo Eye N.C.
PDB		Distribution Block (Power or Ground)
PLUG		Male Plug
PS		Pressure Switch N.C.
		Pressure Switch N.O.
PX		Proximity Switch N.C.
		Proximity Switch N.O.
R		Resistor/Heater
RECPT		120VAC Receptacle
RTD		RTD Transmitter
SOL		Solenoid
SS	OX	Selector Switch N.O.; 2 Pos; Maintained
	OX	Selector Switch N.C.; 2 Pos; Spring Left
	OOX	Selector Switch N.C; 3 Pos; Keyed; Maintained
	OOX	Selector Switch N.O.; 3 Pos; Spring Center
SSLT	OX	Illuminated Selector Switch N.O.; 2 Pos
TAS		Temperature Switch N.O.
		Temperature Switch N.C.
TI		Timer
WLT		Work Light
XF		Transformer

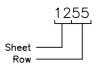
TERMINAL BLOCK LEGEND

Type	Schematic Symbol	Description
PLC	IN-XX X	PLC Input
	OUT-XX X	PLC Output
TB	WIRE#	Terminal Block
	STRIP# WIRE# GNDx	Ground Terminal Block X=Isolation Ground Number
	WIRE# GNDx	Chassis Ground Bar
LUG	▼ ▼ ▼	Lug Line Side
	V V V	Lug Load Side

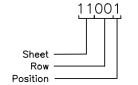
COMPONENT TAGGING AND WIRE NUMBERS

This drawing set was created based on a page line number standard. All device numbers, wire numbers, and referencing follows this standard unless existing devices or wiring is being documented. The following illustrations explain how section, sheet and row numbers are used.

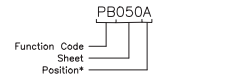
Cross Reference

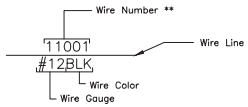


Wire Number



Device Naming





* First Position Blank
** Hidden on wire network with terminal displaying wire number.

WIRING LINES

Wire

To be wired by others

Metal Jumper

MISC. LEGENDS

▲ Supplied By Others

X Revision/Change X=Revision Number

1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020 MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020 MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18
LOCATION:	CFG-CP	

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: VEOLIA AGNICO AMARUQ D4L CENTRIFUGE SKID DRAWING REPORT LIST

SIZE	DRAWING NUMBER	REV
B	E831476-T1	1

PREV. SHEET: | NEXT SHEET: 2 | SHEET 1 OF 34

CENTRIFUGE - CONTROL PANEL COMPONENTS (CFG-CP)

LOC	ITEMS	QTY	CATALOG	MFG	DESCRIPTION	TAGS
CFG-CP	1	1	A72XM5418SSN4	HOFFMAN	FREESTANDING ENCLOSURE, STAINLESS STEEL 304, NEMA 4X, 72"H x 54"W x 18"D, TWO-DOOR, 3 POINT LATCH, FOR FLANGE MOUNT DISCONNECTS	
CFG-CP	2	1	A72PM54	HOFFMAN	PANEL FOR FREE-STAND TYPE 4,4X,12, FITS ENCLOSURE 72.00X54.00	
CFG-CP	3	1	800H-2HRWH2KB6	AB	30.5□□□ TYPE 4/4X/13 SEL SWITCH-ILLUM, 2 POS, UNIVERSAL LED, 12-120AC 50/60HZ, WHITE, STD KNOB MAINT, KB6 MAINTAINED CAM, NO CONTACTS	SSLT436
CFG-CP	4	2	800T-XD1M	AB	CONTACT BLOCK, MAX DUTY BLOCK 1 N.O.	SSLT436
CFG-CP	5	1	800H-TFRXT6A4	AB	NON-ILLUMINATED PUSH BUTTON TRIGGER ACTION, TWO POSITION MAINTAINED, MUSHROOM HEAD, RED, FINGER GUARDS ON TERMINALS, 2-NCLB/2-NC CONTACTS	PB501
CFG-CP CFG-CP	6	2	20-HIM-C6S.	AB	POWERFLEX ARCHITECTURE CLASS REMOTE ENHANCED HIM, IP66 □NEMA 4X/12□INDOOR USE ONLY INC. 1202 C30 CABLE	OIT118 OIT153
CFG-CP	7	1	2711P-T10C22D9P	AB	PANELVIEW PLUS 7 PERFORMANCE TERMINAL, TOUCH SCREEN, 10.4 INCHES, TFT COLOR, TWO ETHERNET PORTS, 24V DC, WINDOWS CE OS LICENSE, PERFORMANCE MODEL	OIT814
CFG-CP	8	1	855BS-N35BL4	AB	ROUND 90□□□ BEACON 1/2" CONDUIT MOUNT, STANDARD, 24/48V AC/DC FULL VOLTAGE, LED STROBE SELECTABLE SINGLE/DOUBLE FLASH, RED	AB1313
CFG-CP CFG-CP	9	2	300837153	ANDRITZ	ANDRITZ SEPARATION STD LOGO	
CFG-CP	10	1	871P-G1	EDWARDS SIGNALING	VIBRATING HORN 24VDC NEMA 4X	AH1304
CFG-CP	11	1	1609-D1000N	AB	UPS, NEXT GEN, DELUXE MODEL, 1000VA, 120VAC INPUT/OUTPUT	UPS445
CFG-CP	12	1	P-R2-K2RF0	GRACE PORT	GFCI RECEPTACLE UL TYPE 4X GFCI/ R□45 ETHERNET	PORT430
CFG-CP	13	3	1609-SBAT	AB	40C BATTERY, UPS ACCESSORY	UPS445
CFG-CP	14	1	199-DR1	AB	ZINC/STEEL DIN RAIL EN 50022 □35□□□ x 7.5□□□ x 1□□□	
CFG-CP	15	1	20G11NE041AA0NNNNN	AB	AC DRIVE, □/EMBEDDED ETHERNET/IP, 600VAC, 3PH, FILTERED, CM □UMPER REMOVED, AC INPUT □/DC TERMINALS, PRECHARGE, DB TRANSISTOR, 40HP ND, 30HP HD, FR5	VFD104
CFG-CP	16	1	20G11NE011AA0NNNNN	AB	AC DRIVE, □/EMBEDDED ETHERNET/IP, 600VAC, 3PH, FILTERED, CM □UMPER REMOVED, AC INPUT □/DC TERMINALS, PRECTARGE, DB TRANSISTOR, 10HP ND, 7.5HP HD, FR3	VFD139
CFG-CP	17	1	800FP-SM22PX21	AB	22□□□, 2 POSITION SELECTOR SWITCH, PLASTIC, MAINTAINED, BLACK, STD KNOB, STD ORIENTATION, 2 N.O. 1 N.C. STD BLOCK	SS436
CFG-CP	18	1	M22-IVS	EATON	ADAPTER, DIN RAIL□FOR M22 MODULAR SWITCHES□MOUNTS ONE SWITCH TO DIN RAIL	SS436
CFG-CP	19	1	1492-FB2C30-L	AB	2 POLE FUSE BLOCK - CLASS CC	FU359
CFG-CP	20	2	FNQ-R-6	BUSSMANN	FUSE - CLASS CC 6A	FU359
CFG-CP CFG-CP	21	2	1492-FB1C30-L	AB	1 POLE FUSE BLOCK - CLASS CC	FU365 FU457
CFG-CP	22	1	FNQ-R-10	BUSSMANN	FUSE - CLASS CC 10A	FU457
CFG-CP	23	1	4983-DC120-20	AB		SP412
CFG-CP	24	1	104-C09E□22	AB	IEC CONTACTOR, DC-OPERATED REVERSING, 104-C SERIES	M1351
CFG-CP CFG-CP	25 47	2	100-SB10	AB	AUXILIARY CONTACT, SIDE MOUNT	M1351 M1354
CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP	26	10	700-HLT12Z24	AB	HL TYPE TERMINAL BLOCK RELAY, DPDT □C/O□,10A CONTACT RATING, W/SCREW TERMINALS, 24VDC, TOUCH SAFE, LIGHT INDICATOR, SURGE SUPPRESSOR	CR1307 CR1310 CR1319 CR1339 CR1342 CR1345 CR1348 CR2008 CR446 CR448
CFG-CP	27	1	140M-C2E-B25	AB	IEC MOTOR PROTECTION CIRCUIT BREAKER, STANDARD MAGNETIC TRIP, 140M □C-FRAME□	MPCB236
CFG-CP	28	1	140M-C-AFAR10A01	AB		MPCB236
CFG-CP CFG-CP	29	2	700-HC24A1-3-4	AB	HC TYPE MINIATURE ICE CUBE RELAY, BLADE TERMINALS AND SOCKET 700-HN103	MCR507 MCR510
CFG-CP CFG-CP	29	2	700-HN103	AB	SCREW TERMINAL SOCKET, GUARDED TERMINAL CONSTRUCTION	MCR507 MCR510
CFG-CP CFG-CP	30	2	100-SA20	AB	AUXILIARY CONTACT, SIDE MOUNT 2 NO	MCR507 MCR510
CFG-CP	31	1	100-C23D200	AB	100-C CONTACTOR, 4-POLE	CR436
CFG-CP	32	1	100-FA20	AB	AUXILIARY CONTACT, FRONT MOUNT	CR436
CFG-CP	33	1	700-HN177.	AB	END BARRIER FOR 700-HL, BLACK	CR446
CFG-CP	34	1	700-TB□08B.	AB	□UMPER LINK, 8-WAY, BLUE	CR446
CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP	35	5	1492-SPM1C030	AB	SUPPLEMENTARY PROTECTORS, 1-POLE, TRIP CURVE C, 3 A, NO NEUTRAL	CB401 CB428 CB501 CB555 CB562
CFG-CP	36	1	1492-SPM1C040	AB	SUPPLEMENTARY PROTECTORS, 1-POLE, TRIP CURVE C, 4 A, NO NEUTRAL	CB522
CFG-CP CFG-CP	37	2	1492-SPM1C050	AB	SUPPLEMENTARY PROTECTORS, 1-POLE, TRIP CURVE C, 5 A, NO NEUTRAL	CB516 CB519
CFG-CP	38	1	1606-XLE240EN	AB	SWITCHED MODE POWER SUPPLY, 1606 SERIES	PW604
CFG-CP	39	1	1492-SPM1C150	AB	SUPPLEMENTARY PROTECTORS, 1-POLE, TRIP CURVE C, 15 A, NO NEUTRAL	CB436
CFG-CP	40	1	FNQ-R-15	BUSSMANN	FUSE - CLASS CC 15A	FU365
CFG-CP	41	1	140G-G6C3-C60	AB	140G - MOLDED CASE CIRCIUT BREAKER, G-FRAME, 65KAIC, T/M - THERMAL MAGNETIC, RATED CURRENT 60A	CB101

CENTRIFUGE - CONTROL PANEL COMPONENTS (CFG-CP)

LOC	ITEMS	QTY	CATALOG	MFG	DESCRIPTION	TAGS
CFG-CP	42	2	140G-G-T C3H	AB	140G - FRAME-G, TERMINAL COVER, 3 POLE, QTY 2, HIGH	CB101
CFG-CP	43	1	140G-G-MTL63.	AB	140G - G-FRAME, MULTI TERMINAL LUG, QTY 3, 6X14-2.2.5-35□	CB101
CFG-CP	44	1	140G-G-TLC13	AB	140G - G-FRAME, TERMINAL LUG, QTY 3, 1X14-1/0 □2.5-50□	CB101
CFG-CP	45	1	140G-G-FCX04	AB	140G - FLEX-CABLE MECHANISM, NON-METALIC FLANGE HANDLE, 4 FT, FOR G-FRAME CIRCUIT BREAKERS	CB101
CFG-CP	48	1	1497B-A13-M11-0-N	AB	CONTROL POWER TRANSFORMER, TYPE 1497B, 2.0KVA, VOLTAGE PRIMARY: 600/575/550V 60H□□, SECONDARY 120V/240V 60H□□WITHOUT FUSE BLOCK	XF362
CFG-CP	49	1	FSC-2	SCHNEIDER ELECTRIC	FINGERSAFE COVER, 2 COVERS PER KIT, FOR 250-5000VA CLASS 9070 TRANSFORMERS	XF362
CFG-CP	50	1	1769-ECR	AB	COMPACT I/O END CAP RIGHT SIDE	
CFG-CP	51	1	1769-OF4	AB	1768/1769 COMPACTLOGIX SYSTEM, 4 CHANNEL ANALOG CURENT/VOLTAGE OUTPUT MODULE	PLC1601
CFG-CP	52	1	1769-IF8	AB	1768/1769 COMPACTLOGIX SYSTEM 8, 8 CHANNEL ANALOG CURRENT/VOLTAGE INPUT MODULE	PLC1501
CFG-CP	53	1	1769-OW16	AB	1769 COMPACTLOGIX RELAY OUTPUT MODULE 16 POINTS	PLC1301
CFG-CP CFG-CP	54	2	1769-IQ16	AB	1769 COMPACTLOGIX PLC 1500 COMPACT SERIES DC INPUT MODULE 16 POINT SINK/SOURCE	PLC1001 PLC1101
CFG-CP	55	1	1769-PA4	AB	COMPACT LOGIX SYSTEM, POWER SUPPLY 120/240VAC INPUT 4AMP□□ 5VDC OUTPUT	PLCPS907
CFG-CP	56	1	1769-L30ER	AB	COMPACTLOGIX 5370 L3 CONTROLLER, DUAL ETHERNET W/DLR CAPABILITY, 1MB MEMORY, 8 I/O EXPANSION, 16 ETHERNET IP NODES, WITH 1GB SD CARD	PLCIO935
CFG-CP	57	1	T60060-3CR	BUSSMANN	3 POLE FUSE BLOCK - CLASS T	FU104
CFG-CP	58	3	□S-50	BUSSMANN	FUSE - CLASS T	FU104
CFG-CP	60	1	1783-US8T	AB	UNMANAGED ETHERNET SWITCH, R□45, 8 PORT	ETH701
CFG-CP	61	1	T32F717D	ENM	ELAPSED TIME METER 24VDC, DIN RAIL MOUNT	ETM1316
CFG-CP	62	1	LEDA1S35	HOFFMAN	LED ENCLOSURE LIGHT, ON/OFF SWITCH, SCREW MOUNTED 90VAC-260VAC 13.82"	WLT401
CFG-CP	63	1	LEDA20C	HOFFMAN	LED LIGHT INPUT CONNECTOR/CABLE ASSEMBLY 2000□□□ FOR AC LED LIGHTS	WLT401
CFG-CP	64	1	DW2503	IFM EFECTOR		SM636
CFG-CP	65	1	2S2/0-HEX	LUGS DIRECT	MECHANICAL LUG DOUBLE WIRE DOUBLE BARREL 2/0-14AWG	
CFG-CP	66	1	US3□2I	MERSEN	FUSE BLOCK FOR DC FUSES	FU145
CFG-CP	67	1	HS□20	MERSEN	600VAC 20A CLASS □HS FUSE	FU145
CFG-CP	68	1	RLW-004605	MTE	RLW LINE/LOAD REACTOR IMPEDANCE 5□□, 46A, OPEN REACTOR	LR104
CFG-CP	69	8	3035467	PHOENIX CONTACT	UNIVERSAL TERMINAL BLOCK - UTTB 4 DOUBLE LEVEL YELLOW	TBEXT
CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP	70	10	3047293	PHOENIX CONTACT	END COVER UT DOUBLE LEVEL D-UTTB 2,5/4 GRAY	TBAC1 TBAC3 TBCDI TBCDO TBEXT
CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP	71	26	0800886	PHOENIX CONTACT	END BRACKET - E/NS 35 N	TBAC1 TBAC2 TBAC3 TBCAI TBCAO TBCDI TBCDO TBDC1 TBEXT
CFG-CP CFG-CP	72	4	3214314	PHOENIX CONTACT	END COVER UT THREE LEVEL D-UT 2,5-3L GRAY	TBCAI TBCAO
CFG-CP CFG-CP	73	28	3214301	PHOENIX CONTACT	3 LEVEL TERMINAL BLOCK WITH PE FOOT UT 2,5-PE/L/L, 24A MAX	TBCAI TBCAO
CFG-CP	74	2	0824581	PHOENIX CONTACT	MARKER FOR TERMINAL BLOCK, WIDTH 5.2□□□ UT-2,5	TBCAI
CFG-CP	75	1	2963860	PHOENIX CONTACT	DIN RAIL MOUNTED RECEPTACLE SINGLE OUTLET 15A NEMA 5-15	RECPT439
CFG-CP CFG-CP CFG-CP	76	69	3044102	PHOENIX CONTACT	UNIVERSAL TERMINAL BLOCK - UT 4 SINGLE LEVEL GRAY	TBAC2 TBDC1 TBDC2
CFG-CP CFG-CP	77	4	3047028	PHOENIX CONTACT	END COVER UT 4,6 SINGLE LEVEL D-UT 2,5/10	TBAC2 TBDC1
CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP	78	124	3044814	PHOENIX CONTACT	UNIVERSAL TERMINAL BLOCK - UTTB 4 DOUBLE LEVEL GRAY	TBAC1 TBAC3 TBCDI TBCDO
CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP	79	76	3030271	PHOENIX CONTACT	PLUG-IN □UMPER FOR UT 4 TERMINAL BLOCKS, 10 POSITIONS, RED	CB612 CB615 CB618 CB621 CB624 CB630 TBAC1 TBCDI

1010 COMMERCIAL BLVD., SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES
1. QUANTITIES SHOWN IN THIS BILL OF MATERIALS ARE FOR 1 (ONE) MACHINE/TRAIN ASSEMBLY, AND TYPICAL FOR 1 (ONE) MACHINES/TRAINS TO BE ORDERED.
2. HOFFMAN OR EQUAL

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES .XX±0.040 ANG±1° HOLE±.020
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18
LOCATION:	CFG-CP	

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
BILL OF MATERIALS

SIZE	DRAWING NUMBER	REV
B	E831476-BM1	1

PREV. SHEET: 1 | NEXT SHEET: 3 | SHEET 2 OF 34

CENTRIFUGE - CONTROL PANEL COMPONENTS (CFG-CP)

LOC	ITEMS	QTY	CATALOG	MFG	DESCRIPTION	TAGS
CFG-CP CFG-CP	80	68	0824589	PHOENIX CONTACT	MARKER FOR TERMINAL BLOCK, WIDTH 6.2□ □ UT-4	TBAC1 TBCDI
CFG-CP	81	2	3047167	PHOENIX CONTACT	PARTITION PLATE FOR UT 4,6 SINGLE LEVEL ATP-UT	TBAC2
CFG-CP CFG-CP	82	2	2800835	PHOENIX CONTACT	THERMOMAGNETIC DEVICE CIRCUIT BREAKER 1 POSITION 0.5A SFB CURVE	CB627 CB636
CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP CFG-CP	83	8	2801305	PHOENIX CONTACT	BASE ELEMENT SCREW CONNECTION	CB612 CB615 CB618 CB621 CB624 CB627 CB630 CB636
CFG-CP CFG-CP	84	2	2800837	PHOENIX CONTACT	THERMOMAGNETIC DEVICE CIRCUIT BREAKER 1 POSITION 2A SFB CURVE	CB615 CB630
CFG-CP CFG-CP	85	2	2800838	PHOENIX CONTACT	THERMOMAGNETIC DEVICE CIRCUIT BREAKER 1 POSITION 3A SFB CURVE	CB612 CB624
CFG-CP CFG-CP	86	2	2800836	PHOENIX CONTACT	THERMOMAGNETIC DEVICE CIRCUIT BREAKER 1 POSITION 1A SFB CURVE	CB618 CB621
CFG-CP	92	1	3011038	PHOENIX CONTACT	MULTI-LEVEL TERMINAL BLOCK - DLKB 2,5-PE	TB1
CFG-CP	96	1	VPCI-111	CORTEC	CORROSION INHIBITOR FOR MOISTURE, AIRBORNE CONTAMINANTS, H2S, SO2, NH3, ETC. 11 CUBIC FEET COVERAGE	

CENTRIFUGE - CONTROL PANEL COMPONENTS (CFG-FLD)

LOC	ITEMS	QTY	CATALOG	MFG	DESCRIPTION	TAGS
CFG-FLD	87	3	3045208	PHOENIX CONTACT	UNIVERSAL TERMINAL BLOCK - UT 6 BLACK	TB3PH
CFG-FLD	88	1	3044157	PHOENIX CONTACT	UNIVERSAL GROUND TERMINAL BLOCK - UT 6-PE	TB3PH
CFG-FLD	89	1	RS-2E	CCC	MODEL RS SAFETY STOP CONTROL ;2 SP/DT SWITCHES NO LIGHT W/EPOXY COATING, NEMA 1,3,3R,4,4X	PCS510
CFG-FLD	90	1	RS-28	CCC	;*****USE CROSBY 1011261 SS-450 AS REPLACEMENT********** ; CABLE END FITTING CABLE CLAMP	PCS510
CFG-FLD	91	15	RS-26	CCC	3/32 ORANGE NYLON COATED CABLE, ;FOOT□	PCS510
CFG-FLD	93	1	NG501A	IFM EFECTOR	INDUCTIVE SENSOR, M18X1 DIAMETER METAL HOUSING, 2 DC WIRE DC, 8.2DC, NORMALLY OPEN NO,MICRO QUICK DISCONNECT, SENSING RANGE 8.□ □, FLUSH MOUNTABLE, EX II	PRS641
CFG-FLD	94	1	ENC05A	IFM EFECTOR	CORDSET ANGLED CONNECTOR M12 FEMALE 5PIN - 4 WIRE, ATEX, FOR USE IN HAZARDOUS AREAS, LENGHT 5M	PRS641

ON-SITE INSTALLED PROGRAMMING SOFTWARE (PROVIDED BY OTHERS)

COMPONENT	MFG	DESCRIPTION	VERSION
PLC	AB	STUDIO50000	24.00
OIT	AB	FACTORY TALK VIEW ME	8.0

1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES
1. QUANTITIES SHOWN IN THIS BILL OF MATERIALS ARE FOR 1 (ONE) MACHINE/TRAIN ASSEMBLY, AND TYPICAL FOR 1 (ONE) MACHINES/TRAINS TO BE ORDERED.
2. HOFFMAN OR EQUAL

REV	BY	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES
.XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES
.XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

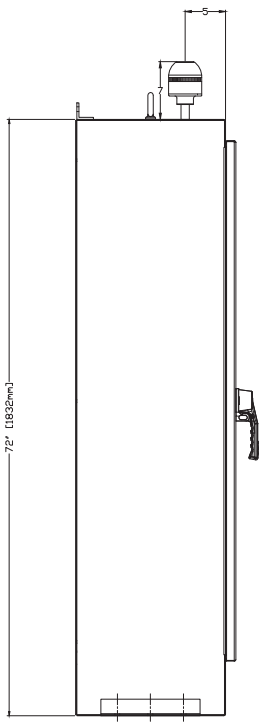
DRAWN BY: HL DATE 04/04/18
CHECKED BY: BJM DATE 04/04/18
APPROVED BY: CMP DATE 04/04/18
LOCATION:

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

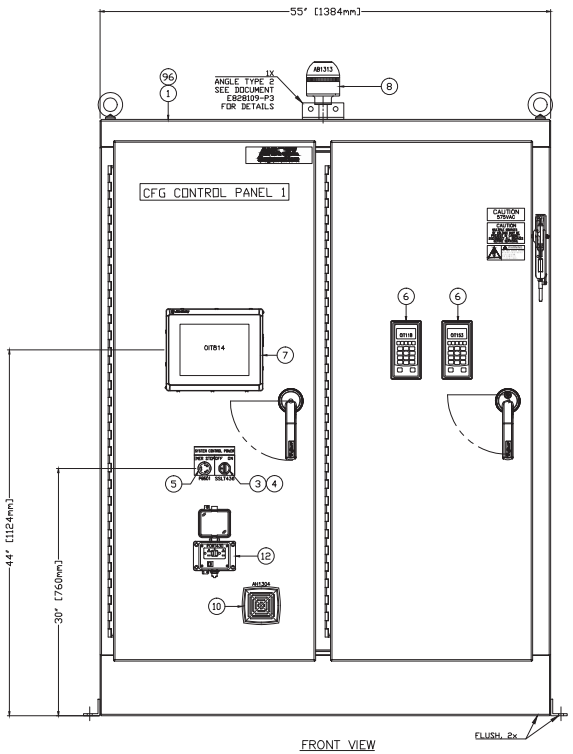
TITLE: VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
BILL OF MATERIALS

SIZE: B | DRAWING NUMBER: E831476-BM2 | REV: 1

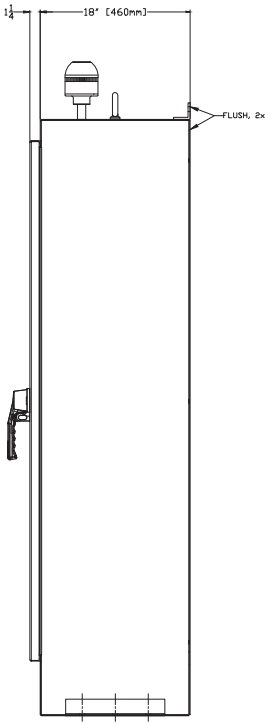
PREV. SHEET: 2 | NEXT SHEET: 4 | SHEET 3 OF 34



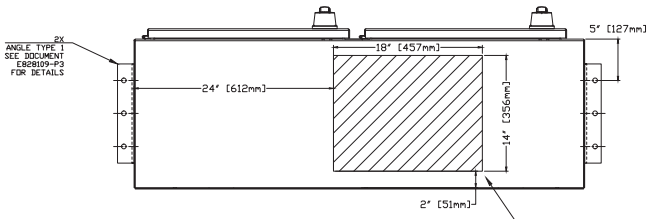
LEFT SIDE VIEW



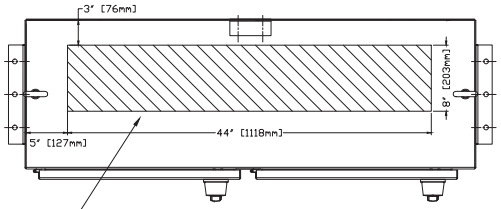
FRONT VIEW



RIGHT SIDE VIEW



BOTTOM VIEW



TOP VIEW

CONDUIT ENTRY AREAS

NOTES:

1. ENCLOSURE IS NEMA 4X 304L SS, WITH FLANGE DISCONNECT. THREE POINT LATCH AND PIANO HINGES.
2. ALL PUSHBUTTON OPERATORS ARE HEAVYDUTY NEMA 4X RATED. CONTACTS ARE RATED 10 AMPS AT 600 VAC.
3. ALL WIRING TO CONFORM TO CANADIAN ELECTRIC CODE AND INCLUDES PERMANENT WIRE MARKERS.
4. ALL CONTROL PANEL COMPONENTS WITH GROUND SYMBOLS OR GROUND SCREWS SHALL BE CHASSIS GROUND.
5. PANEL IS UL508A LISTED AND CSA LISTED.
6. KEYNOTE CALL OUTS REFER TO BILL OF MATERIAL ON SHEET E831476-BM1.
7. CONTROL WIRE SHALL CONFORM TO UL STANDARDS, AND SHALL BE TYPE MTW, COLOR CODED BY VOLTAGE AND FUNCTIONS, WITH IDENTIFICATION FERRULES APPLIED AT EACH WIRE END.

1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES
.XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES
.XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

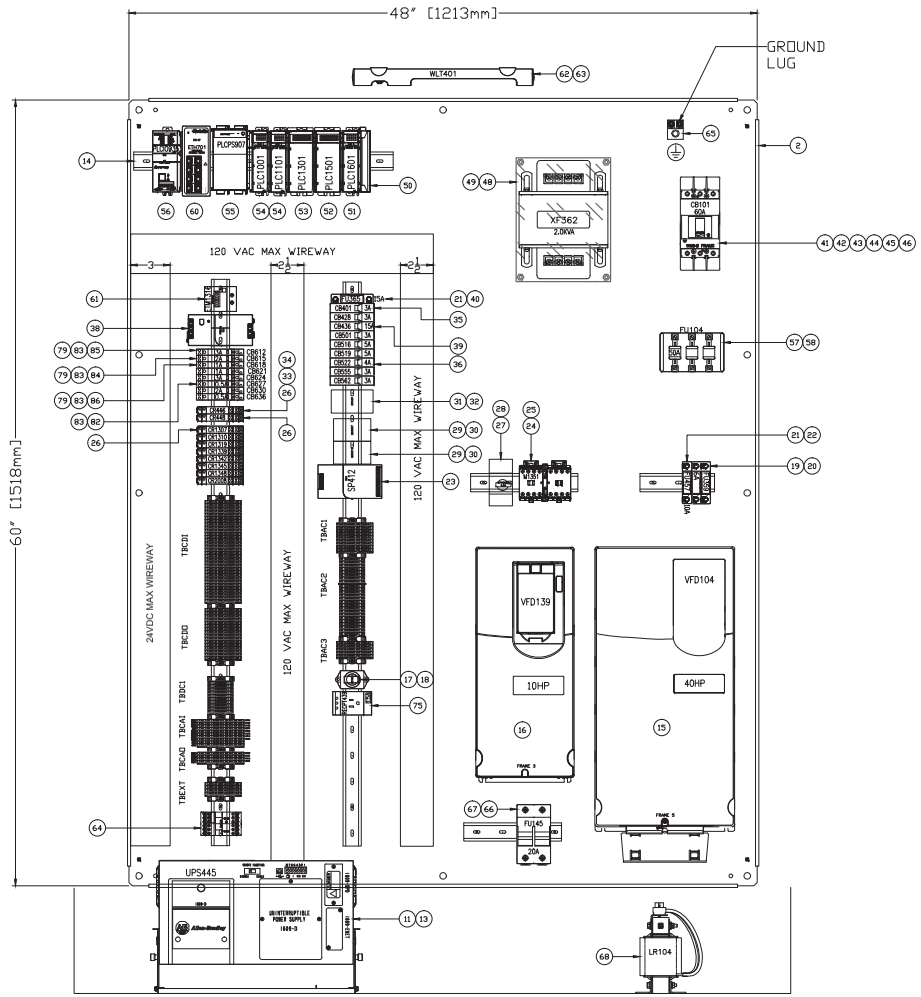
DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18
LOCATION:		

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
PANEL LAYOUT

SIZE	DRAWING NUMBER	REV
B	E831476-P1	1

PREV. SHEET: 3 | NEXT SHEET: 5 | SHEET 4 OF 34



SUBPANEL LAYOUT

NOTES:

1. ENCLOSURE IS NEMA 4X 304L SS, WITH FLANGE DISCONNECT. THREE POINT LATCH AND PIANO HINGES.
2. ALL PUSHBUTTON OPERATORS ARE HEAVYDUTY NEMA 4X RATED. CONTACTS ARE RATED 10 AMPS AT 600 VAC.
3. ALL WIRING TO CONFORM TO CANADIAN ELECTRIC CODE AND INCLUDES PERMANENT WIRE MARKERS.
4. ALL CONTROL PANEL COMPONENTS WITH GROUND SYMBOLS OR GROUND SCREWS SHALL BE CHASSIS GROUND.
5. PROVIDE 20% SPARE TERMINALS.
6. PANEL IS UL508A LISTED AND CSA LISTED.
7. KEYNOTE CALL OUTS REFER TO BILL OF MATERIAL ON SHEET E831476-BM1.
8. CONTROL WIRE SHALL CONFORM TO UL STANDARDS, AND SHALL BE TYPE MTW, COLOR CODED BY VOLTAGE AND FUNCTIONS, WITH IDENTIFICATION FERRULES APPLIED AT EACH WIRE END.

1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020 MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020 MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18

LOCATION:

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

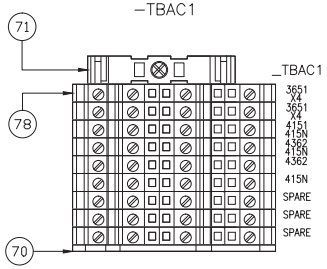
TITLE: VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
BACKPANEL LAYOUT

SIZE	DRAWING NUMBER	REV
B	E831476-P2	1

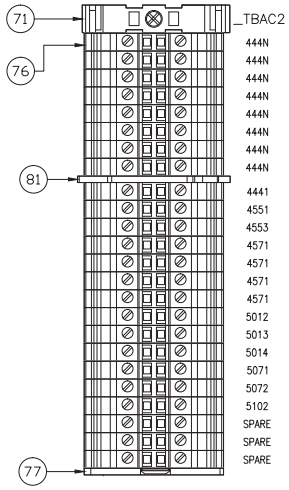
PREV. SHEET: 4 | NEXT SHEET: 6 | SHEET 5 OF 34

TOP

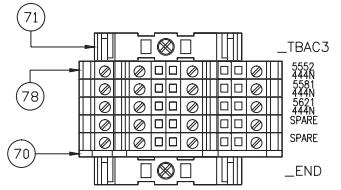
120VAC DISTRIBUTION FROM CPT –TBAC1



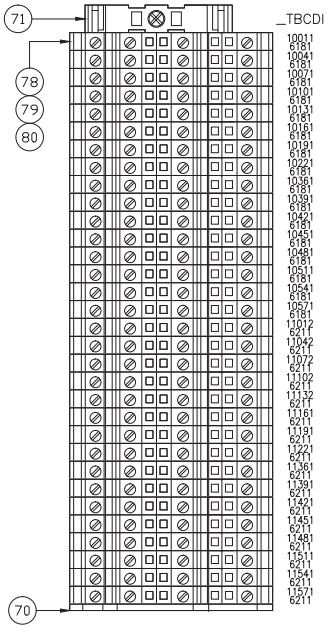
120VAC DISTRIBUTION FROM POWER CTRL SWITCH –TBAC2



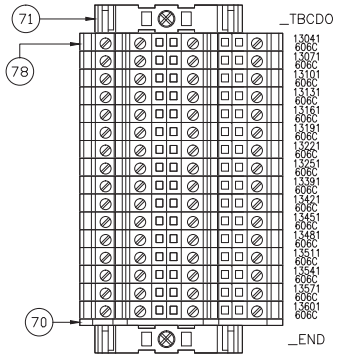
120VAC POWER TO FIELD PROCESS AREA INSTRUMENTS –TBAC3



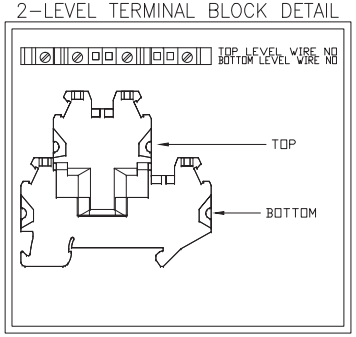
120VAC CONTROLLER (PLC) DIGITAL INPUTS –TBCDI



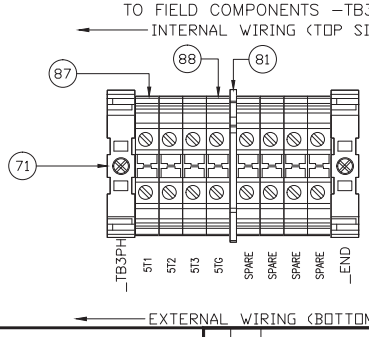
120VAC CONTROLLER (PLC) DIGITAL OUTPUTS –TBCDO



2–LEVEL TERMINAL BLOCK DETAIL



3 PHASE AC POWER TO FIELD COMPONENTS –TB3PH



1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020 MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020 MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18
LOCATION:	CFG–CP	

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465–5611

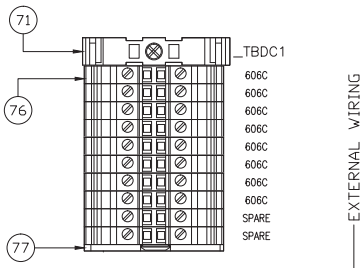
TITLE: VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
TERMINAL BLOCK PLAN (AC)

SIZE: B | DRAWING NUMBER: E831476–P3 | REV: 1

PREV. SHEET: 5 | NEXT SHEET: 7 | SHEET 6 OF 34

TOP

24VDC DISTRIBUTION FROM DC POWER SUPPLY –TBDC1

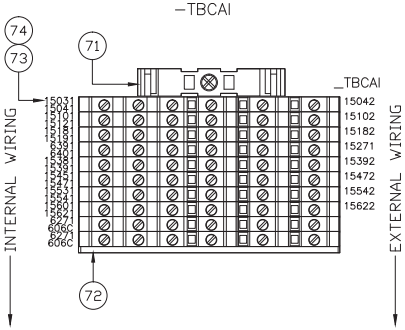


24VDC POWER TO FIELD PROCESS INSTRUMENTS –TBDC2

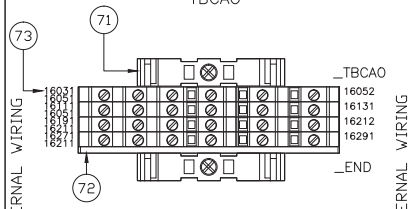
NON–APPLICABLE

INTERNAL WIRING
EXTERNAL WIRING

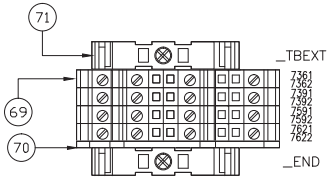
4–20mA CONTROLLER (PLC) ANALOG INPUTS –TBCAI



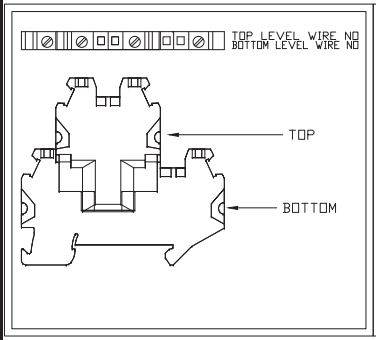
4–20mA CONTROLLER (PLC) ANALOG OUTPUTS –TBCAO



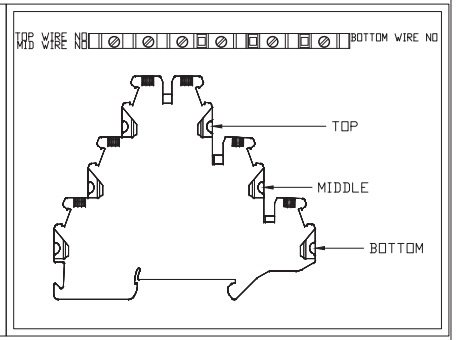
DRY CONTACTS FOR CUSTOMER USE –TBEXT



2–LEVEL TERMINAL BLOCK DETAIL



3–LEVEL TERMINAL BLOCK DETAIL



ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465–5611
Telefax: (817)472–8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No. 831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020 MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020 MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18
LOCATION:	CFG–CP	

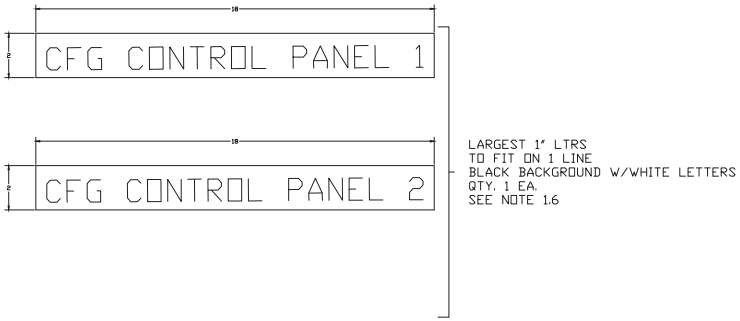
ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465–5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
TERMINAL BLOCK PLAN (DC)

SIZE	DRAWING NUMBER	REV
B	E831476–P4	1

PREV. SHEET: 6 | NEXT SHEET: 8 | SHEET 7 OF 34

NAMEPLATES:

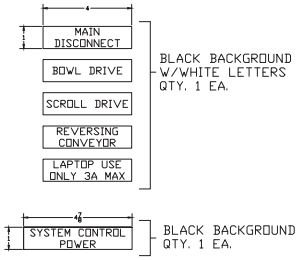


LARGEST 1" LTRS
TO FIT ON 1 LINE
BLACK BACKGROUND W/WHITE LETTERS
QTY. 1 EA.
SEE NOTE 1.6

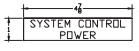
NOTES:

1. FURNISH NAMEPLATES AS INDICATED ON DRAWINGS
   - 1.1. LETTERS SHALL BE GOTHIC UPPER CASE (CAPITAL LETTERS), MINIMUM HEIGHT SHALL BE 1/8 INCH WITH A 3/64 INCH SPACE BETWEEN LINES.
   - 1.2. NAMEPLATES SHALL BE MADE OF LAMINATED ENGRAVING STOCK HAVING CORE AND SURFACE COLORS AS SHOWN ON DRAWINGS.
   - 1.3. THE CHARACTERS SHALL BE ENGRAVED USING AN INDUSTRY STANDARD ENGRAVING MACHINE.
   - 1.4. NAMEPLATES SHALL BE ATTACHED TO THE ENCLOSURE USING HIGH PERFORMANCE ADHESIVE
   - 1.5. ALL LEGEND PLATES SHALL CONFORM TO ISA RECOMMENDED PRACTICE PUBLICATION ISARP60.6.
   - 1.6. LAYOUT AND WIRING DESIGN TYPICAL FOR BOTH CONTROL PANELS, EXCEPT FOR NAMEPLATE.

MACHINE NAMEPLATE KITS
(QUANTITIES PER MACHINE)



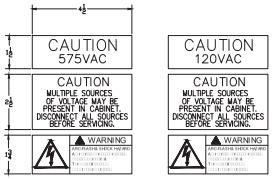
BLACK BACKGROUND
W/WHITE LETTERS
QTY. 1 EA.



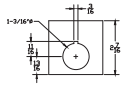
BLACK BACKGROUND W/WHITE LETTERS
QTY. 1 EA.

RED BACKGROUND W/BLACK LETTERS
QTY. 1 EA.

GRAY BACKGROUND W/BLACK LETTERS
QTY. 1 EA.



SAP# 300837153



TYPICAL ALL
SWITCH PLATES

1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18
REV	EIR	REVISION	BY	APVD	DATE

ANDRITZ SEPARATION, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No. 831476

NOTES

ESTIMATED WEIGHT IN LBS:	
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020 MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020 MILL FINISH ALL OVER	
THIRD ANGLE PROJECTION	
DRAWN BY:	HL
DATE	04/04/18
CHECKED BY:	BJM
DATE	04/04/18
APPROVED BY:	CMP
DATE	04/04/18
LOCATION:	CFG-CP

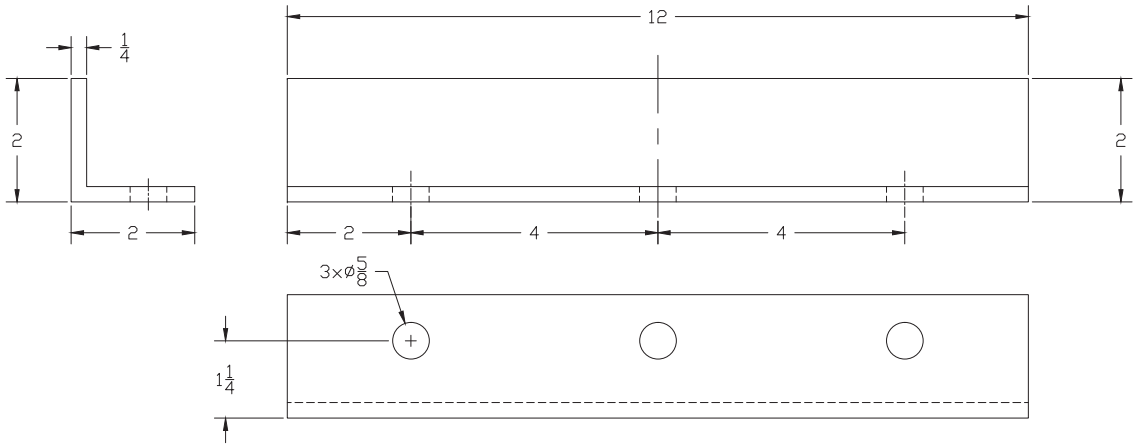
ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
NAMEPLATES

SIZE	DRAWING NUMBER	REV
B	E831476-P5	1

PREV. SHEET: 7 | NEXT SHEET: 9 | SHEET 8 OF 34

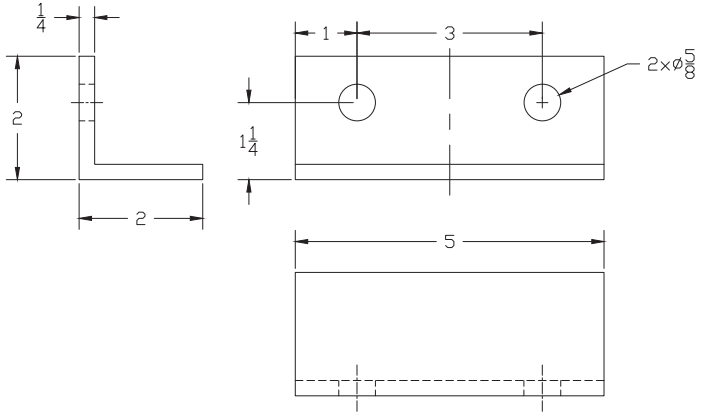
ANGLE TYPE 1 :
QTY 2



NOTES:

1. ANGLE MATERIAL: SAME AS CENTRIFUGE CONTROL PANEL ENCLOSURE
2. ANGLES SHALL BE WELDED TO CENTRIFUGE CONTROL PANEL (CFG–CP) AS SHOWN ON DOCUMENT E828109–P1
3. REINFORCE ZONES WHERE ANGLES ARE TO BE WELDED ACCORDINGLY

ANGLE TYPE 2
QTY 2



1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES
.XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES
.XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18

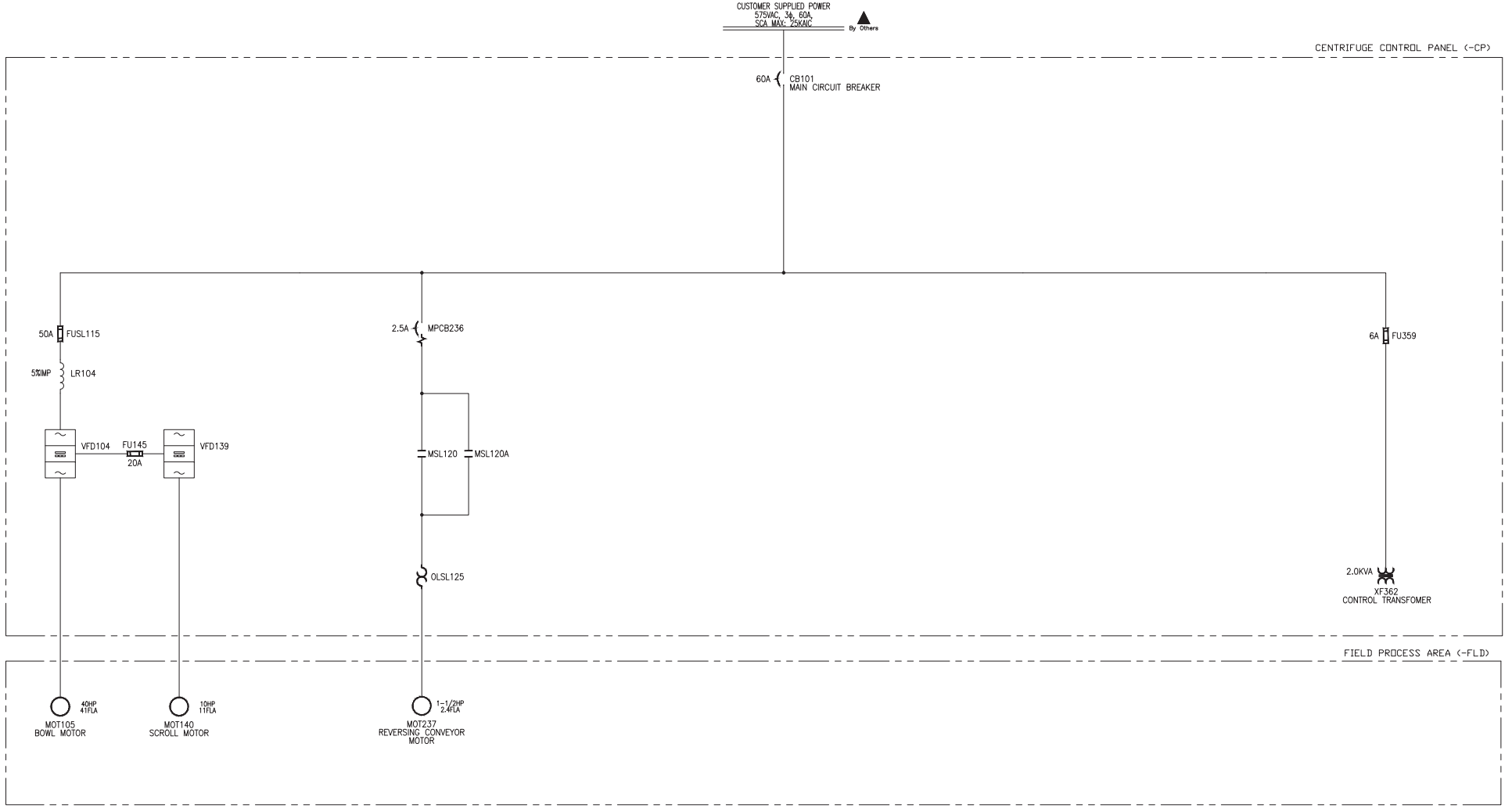
LOCATION:

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465–5611

TITLE: VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
CONTROL PANEL SKID MOUNTING ANGLES

SIZE: B | DRAWING NUMBER: E831476–P6 | REV: 1

PREV. SHEET: 8 | NEXT SHEET: 10 | SHEET 9 OF 34



1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES
.XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES
.XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18

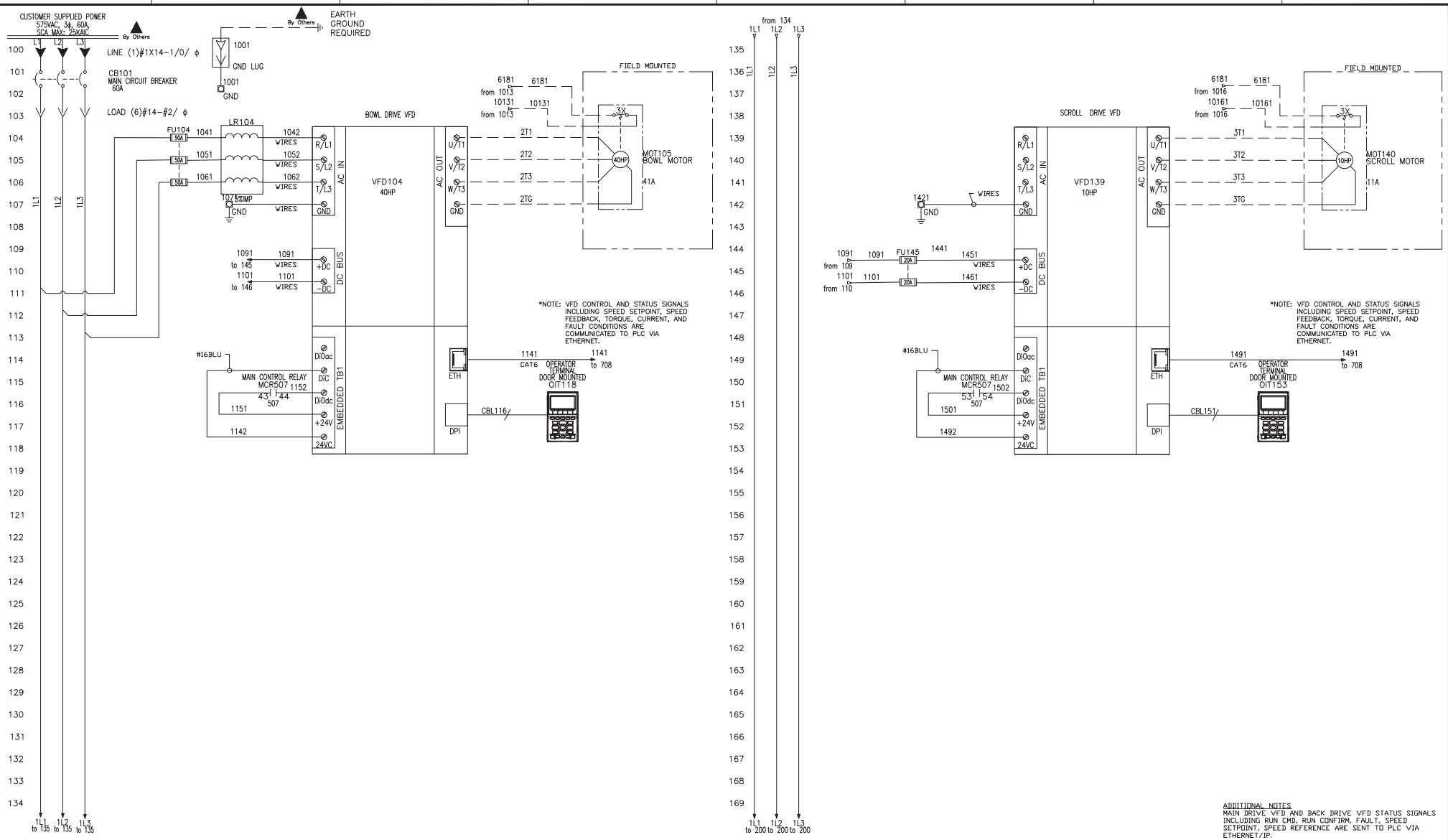
LOCATION:

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
SINGLE LINE SCHEMATIC

SIZE: B | DRAWING NUMBER: E831476-SL1 | REV: 1

PREV. SHEET: 9 | NEXT SHEET: 11 | SHEET 10 OF 34



ADDITIONAL NOTES
MAIN DRIVE VFD AND BACK DRIVE VFD STATUS SIGNALS INCLUDING RUN CMD, RUN CONFIRM, FAULT, SPEED SETPOINT, SPEED REFERENCE ARE SENT TO PLC VIA ETHERNET/IP.

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020 MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020 MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

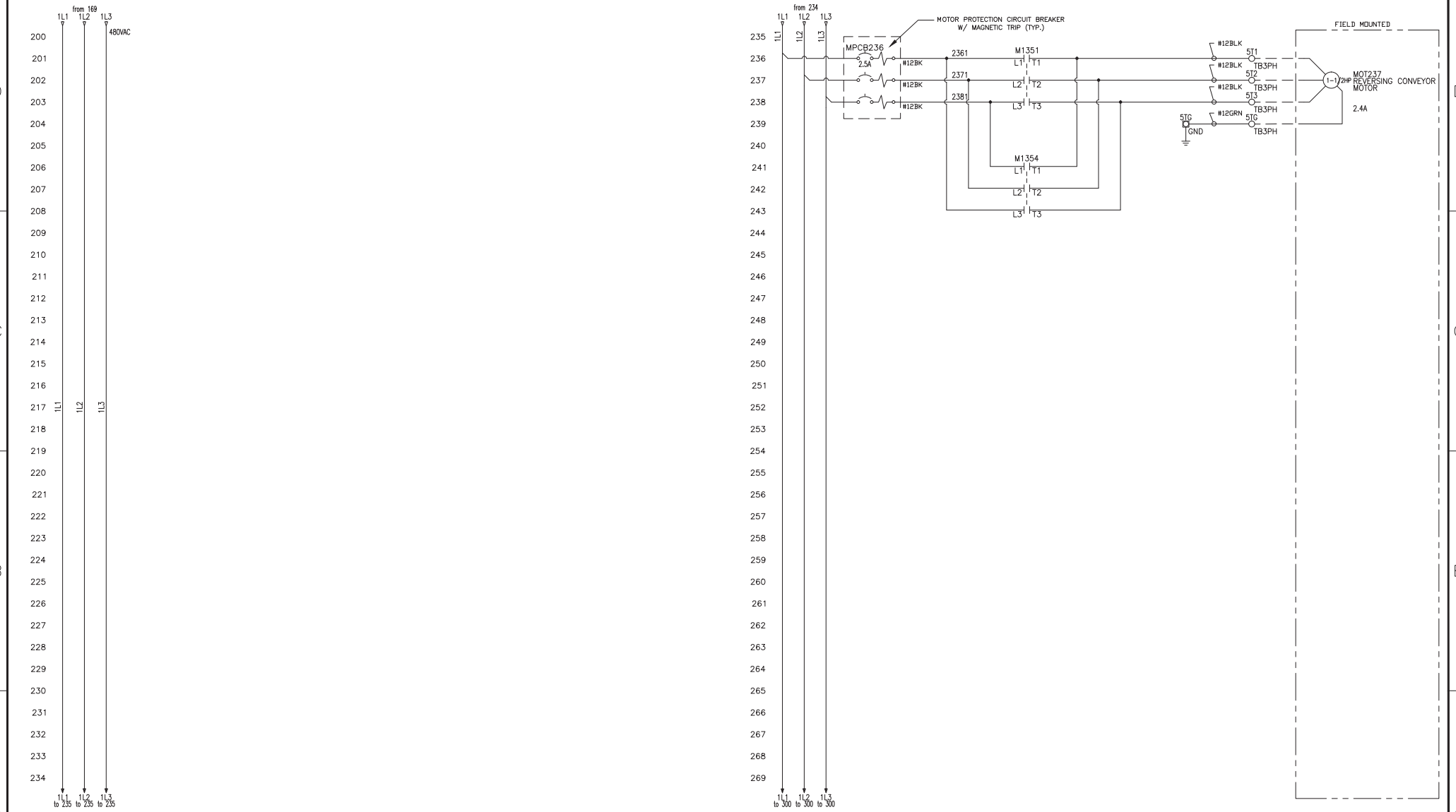
DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18
LOCATION:		

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
POWER DISTRIBUTION SCHEMATIC

SIZE	DRAWING NUMBER	REV
B	E831476-S1	1

PREV. SHEET: 10 | NEXT SHEET: 12 | SHEET 11 OF 34



1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION

BY: BJM DATE:

PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020 MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020 MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18

LOCATION:

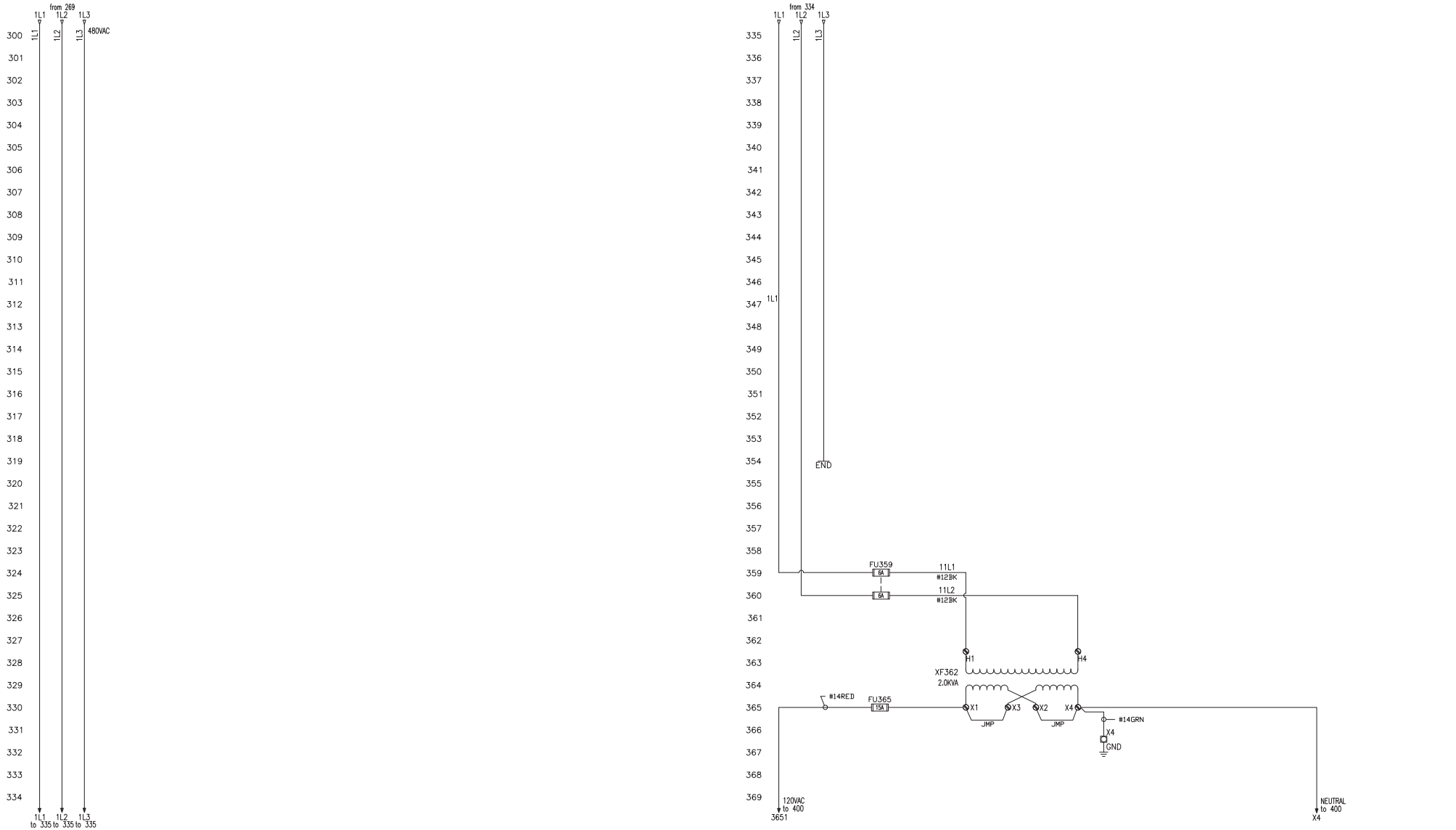
ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE

VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
480VAC POWER DISTRIBUTION

SIZE	DRAWING NUMBER	REV
B	E831476-S2	1

PREV. SHEET:	NEXT SHEET:	SHEET OF
1.1	1.3	1.2 34



1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES
.XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES
.XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18

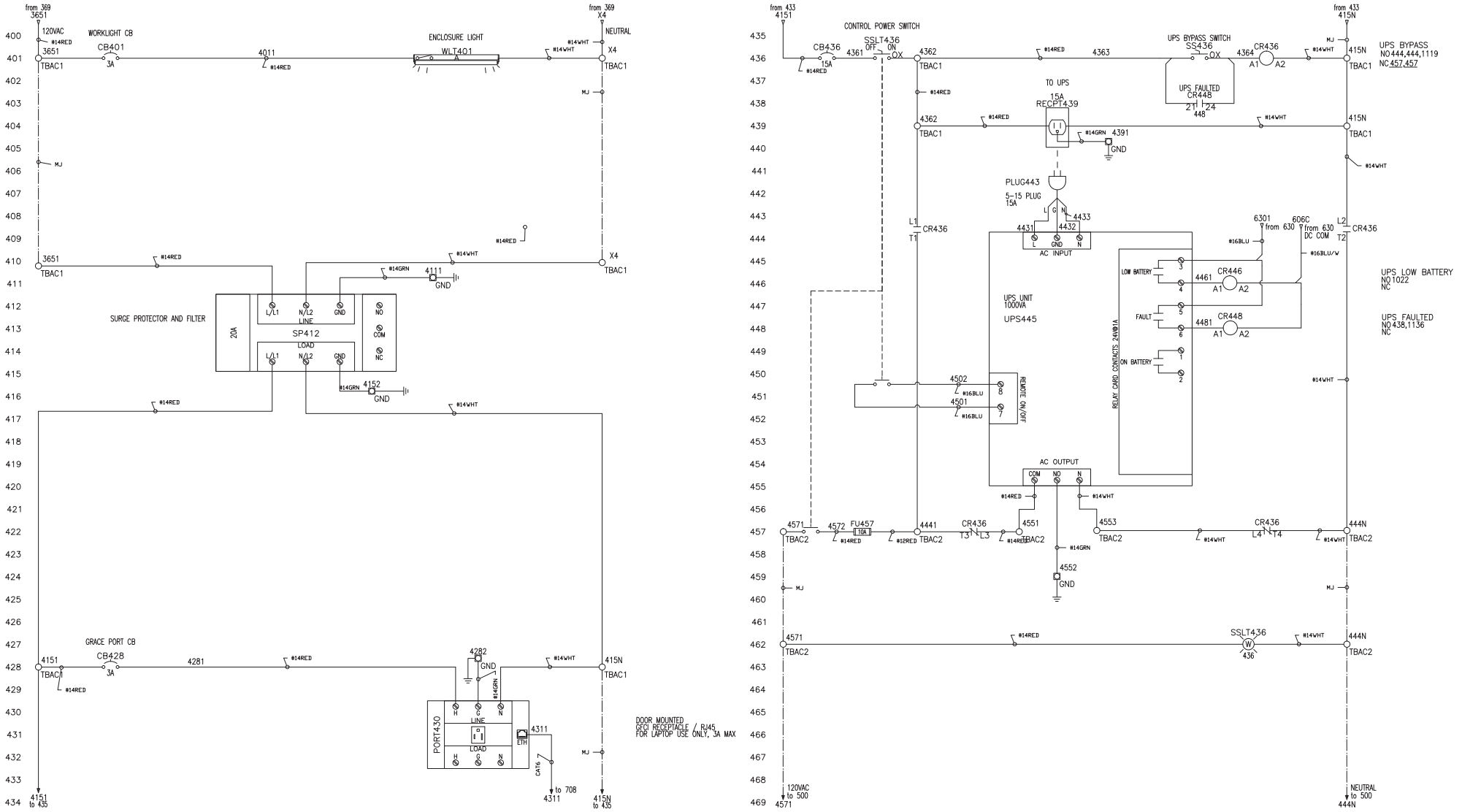
LOCATION:

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
POWER DISTRIBUTION SCHEMATIC

SIZE	DRAWING NUMBER	REV
B	E831476-S3	1

PREV. SHEET:	NEXT SHEET:	SHEET OF
12	14	13 34



1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18
REV	EIR	REVISION	BY	APVD	DATE

1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020 MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020 MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

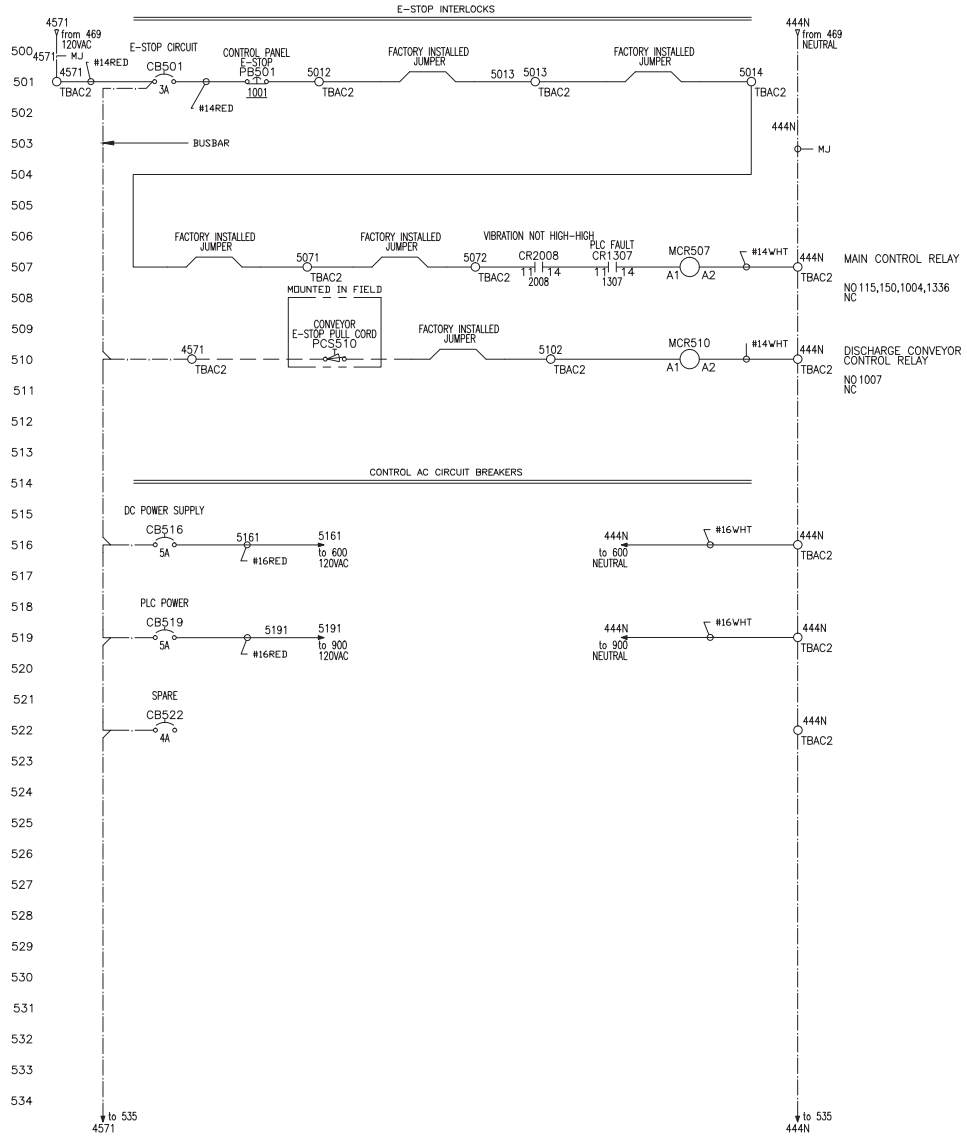
DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18
LOCATION:		

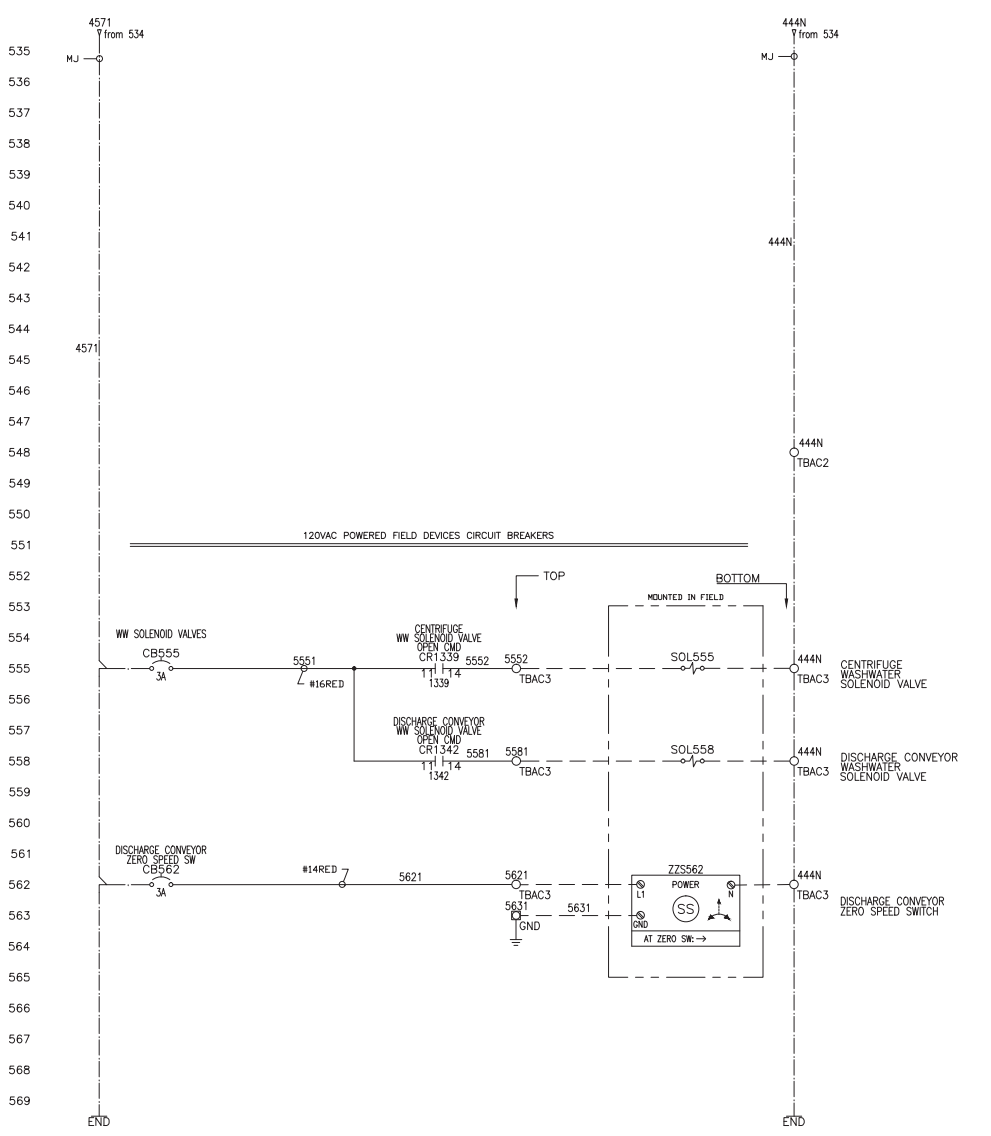
ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
LOW VOLTAGE POWER DISTRIBUTION

SIZE	DRAWING NUMBER	REV
B	E831476-S4	1

PREV. SHEET: 13 | NEXT SHEET: 15 | SHEET 14 OF 34





ESTIMATED WEIGHT IN LBS:	
DRAWN BY:	HL
DATE	04/04/18
CHECKED BY:	BJM
DATE	04/04/18
APPROVED BY:	CMP
DATE	04/04/18
LOCATION:	

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020. MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020. MILL FINISH ALL OVER.

THIRD ANGLE PROJECTION

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No. 831476

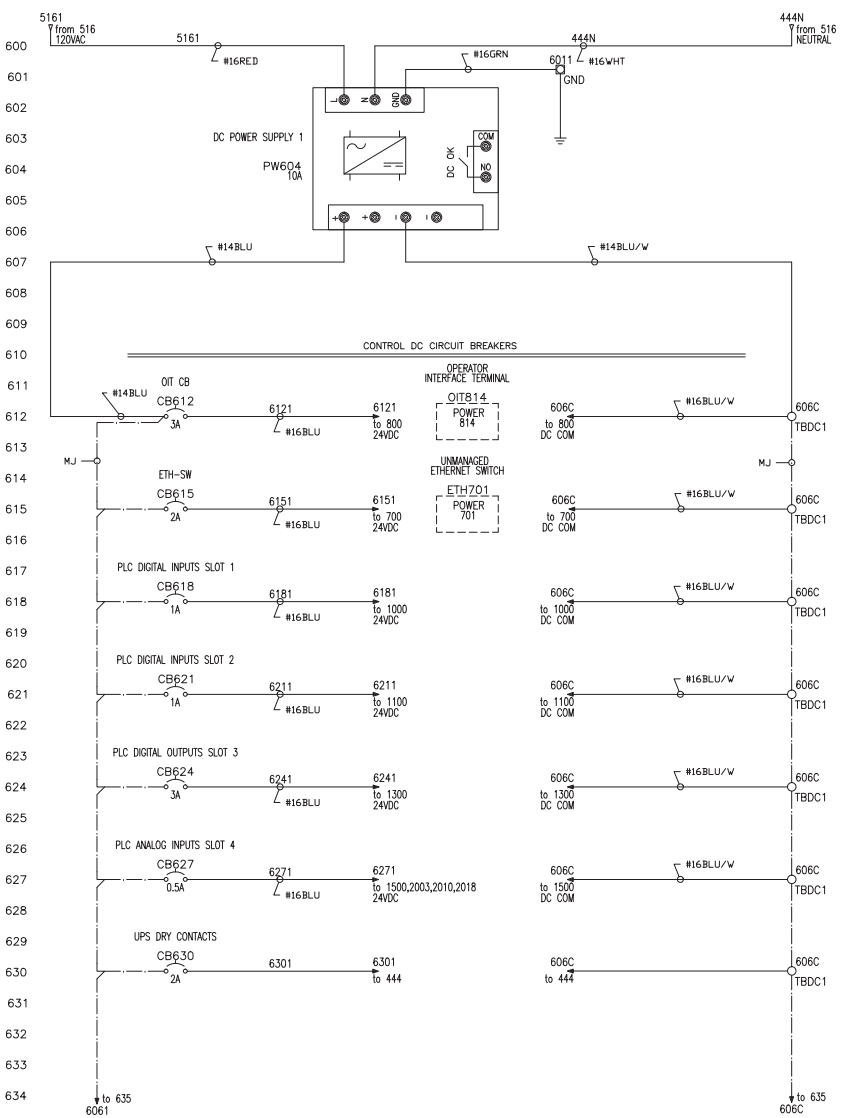
NOTES

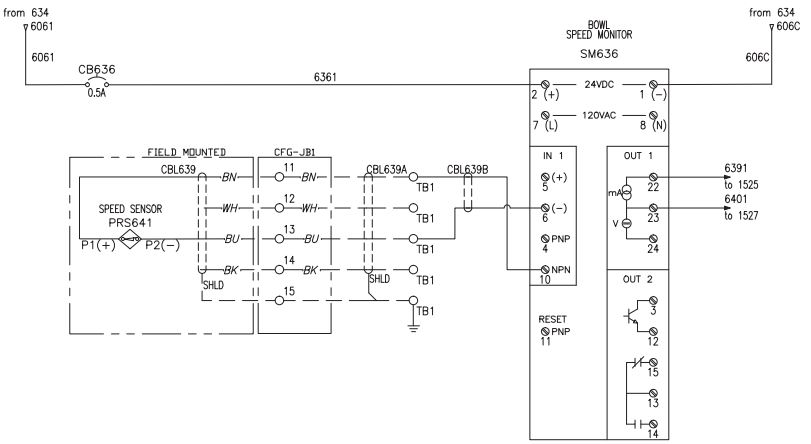
REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
AC CTRL POWER DISTRIBUTION (CONT.)

SIZE	DRAWING NUMBER	REV
B	E831476-S5	1

PREV. SHEET:	NEXT SHEET:	SHEET	OF
14	16	15	34





1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18
REV	EIR	REVISION	BY	APVD	DATE

1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES
.XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES
.XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18

LOCATION:

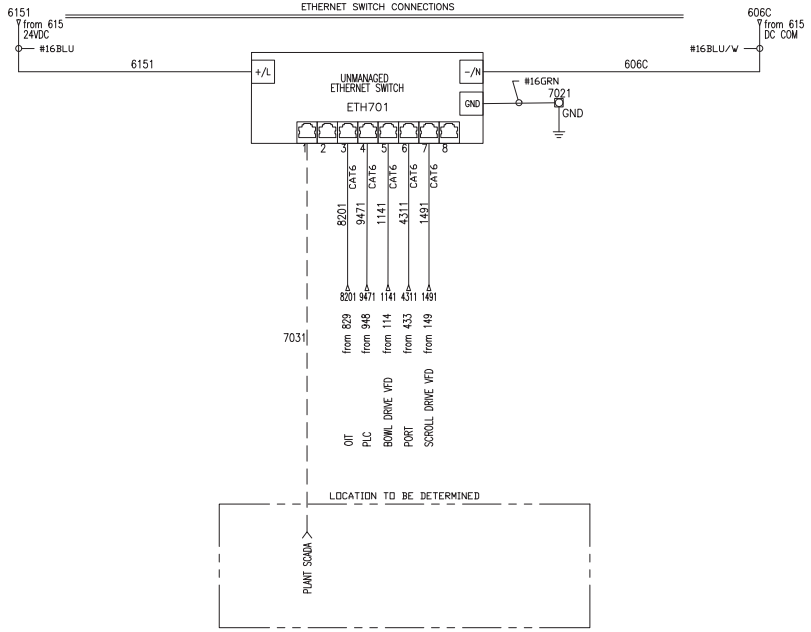
ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
DC POWER DISTRIBUTION

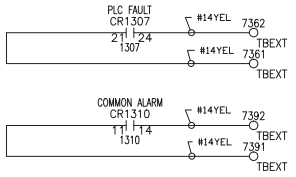
SIZE	DRAWING NUMBER	REV
B	E831476-S6	1

PREV. SHEET: 15 | NEXT SHEET: 17 | SHEET 16 OF 34

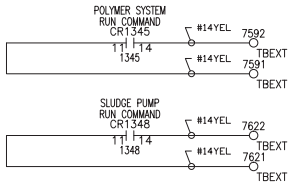
ETHERNET SWITCH CONNECTIONS



DRY CONTACTS FOR CUSTOMER USE (NON-MCR INTERLOCKED) 6A RATED CONTACTS RESISTIVE



DRY CONTACTS (MCR INTERLOCKED) 6A RATED CONTACTS RESISTIVE



1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18

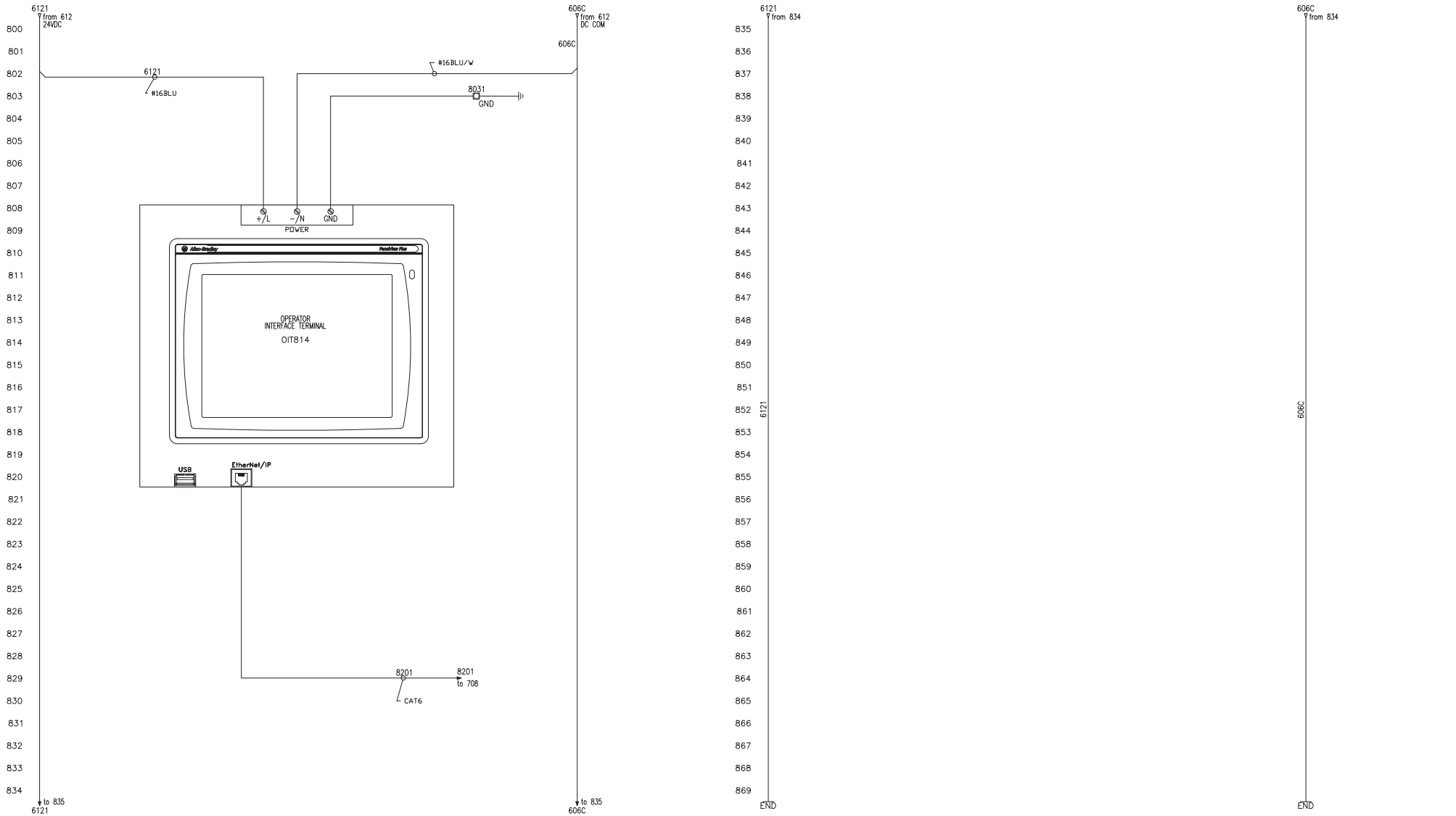
LOCATION:

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
COMMUNICATIONS

SIZE	DRAWING NUMBER	REV
B	E831476-S7	1

PREV. SHEET: 16 | NEXT SHEET: 18 | SHEET 17 OF 34



1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES
.XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES
.XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18

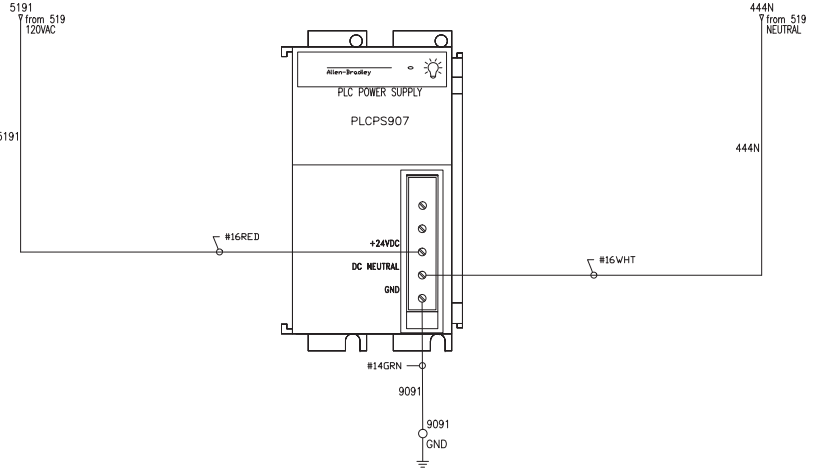
LOCATION:

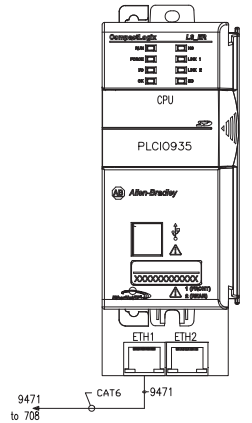
ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
OIT SCHEMATIC

SIZE	DRAWING NUMBER	REV
B	E831476-S8	1

PREV. SHEET: 17 | NEXT SHEET: 19 | SHEET 18 OF 34





1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18
REV	EIR	REVISION	BY	APVD	DATE

1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES
.XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES
.XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18

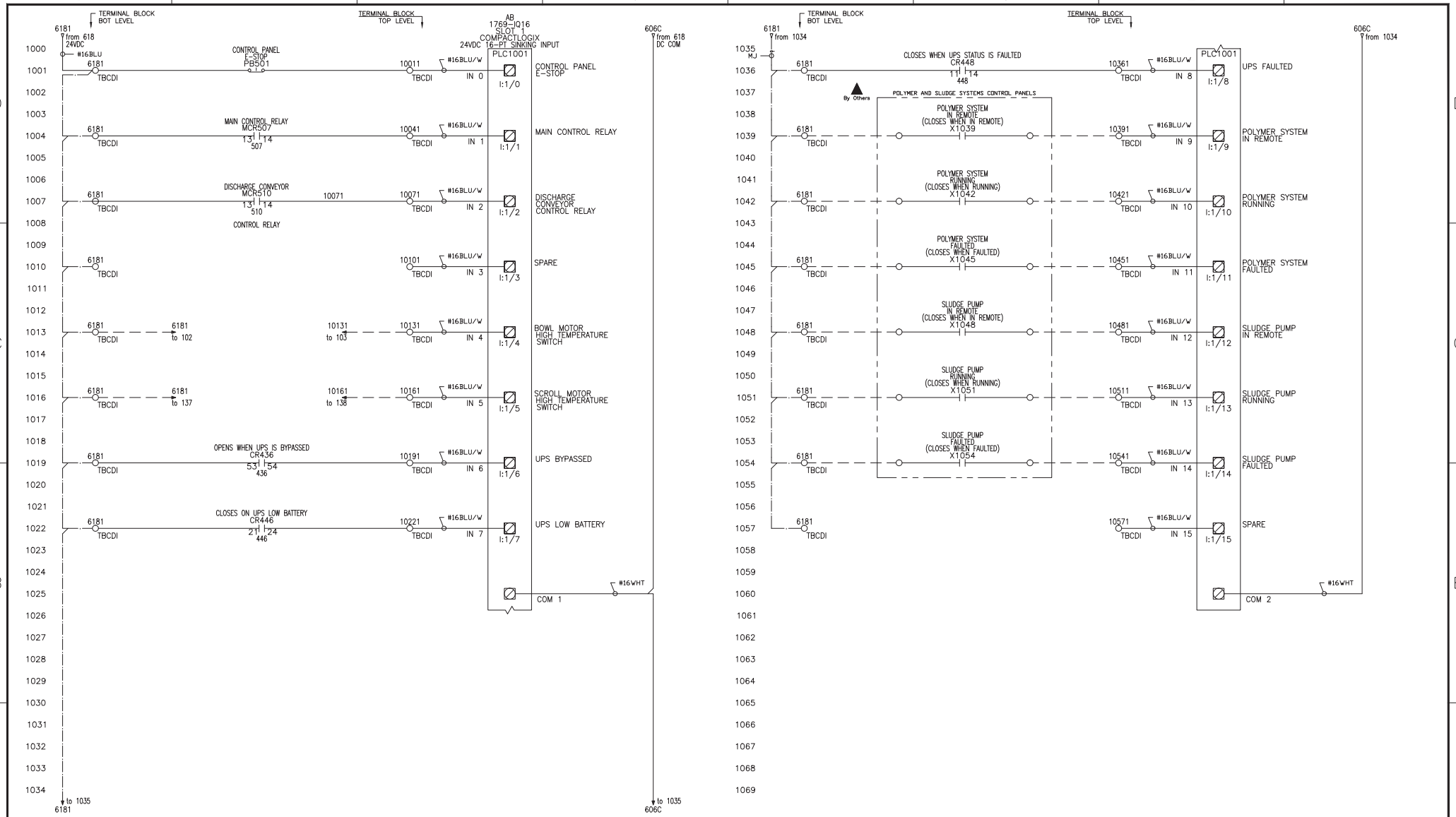
LOCATION:

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
PLC POWER SUPPLY AND CPU

SIZE	DRAWING NUMBER	REV
B	E831476-S9	1

PREV. SHEET:	NEXT SHEET:	SHEET	OF
18	20	19	34



1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FABRICATION TOLERANCES .XXX±.040 ANGLE±1° HOLE±.020 MACHINING TOLERANCES .XXX±.005 ANGLE.5° HOLE±.020 MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

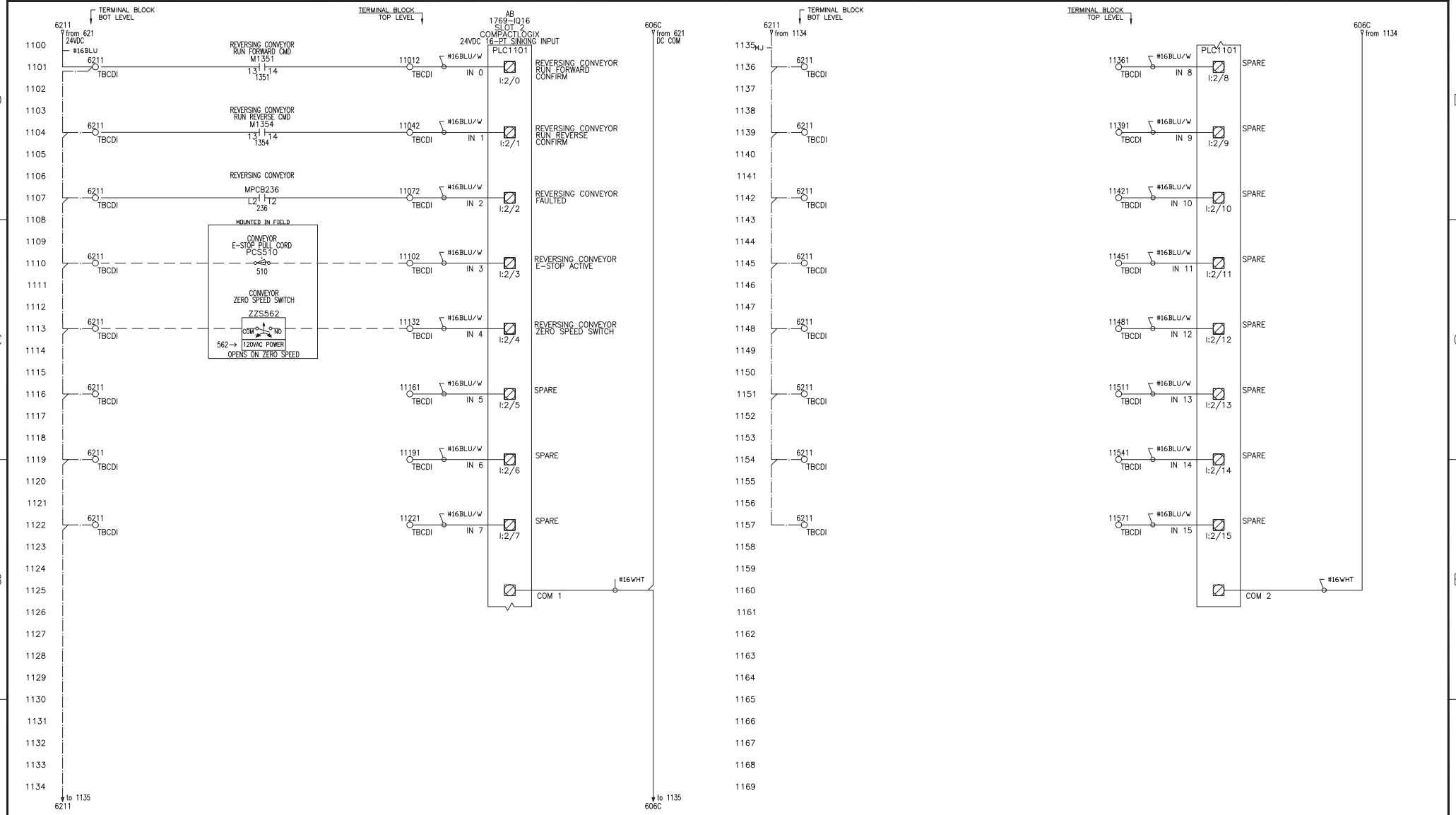
DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18
LOCATION:		

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
BANK 1 SLOT 1 DIGITAL INPUTS

SIZE	DRAWING NUMBER	REV
B	E831476-S10	1

PREV. SHEET: 19 | NEXT SHEET: 21 | SHEET 20 OF 34



NOTES

THIS DRAWING IS COPY RIGHTED THIS DRAWING IS A TRADE SECRET AND ONLY ENTRUSTED TO THE RECEIVER FOR HIS PERSONAL USE, WITHOUT THE EXPRESS WRITTEN CONSENT OF ANDRITZ SEPARATION INC. IT MUST NOT BE COPIED, NOR MADE AVAILABLE TO THIRD PARTIES, INCLUDING COMPETITORS, NOR MADE ACCESSIBLE TO SUCH PARTIES. ANY ILLEGAL USE BY THE RECEIVER OR THIRD PARTIES FOR WHICH HE IS RESPONSIBLE CAN CONSTITUTE A CAUSE FOR LEGAL ACTION. THIS DRAWING MUST BE RETURNED ON REQUEST OF THE COMPANY.

REV	BY	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020 MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020 MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18

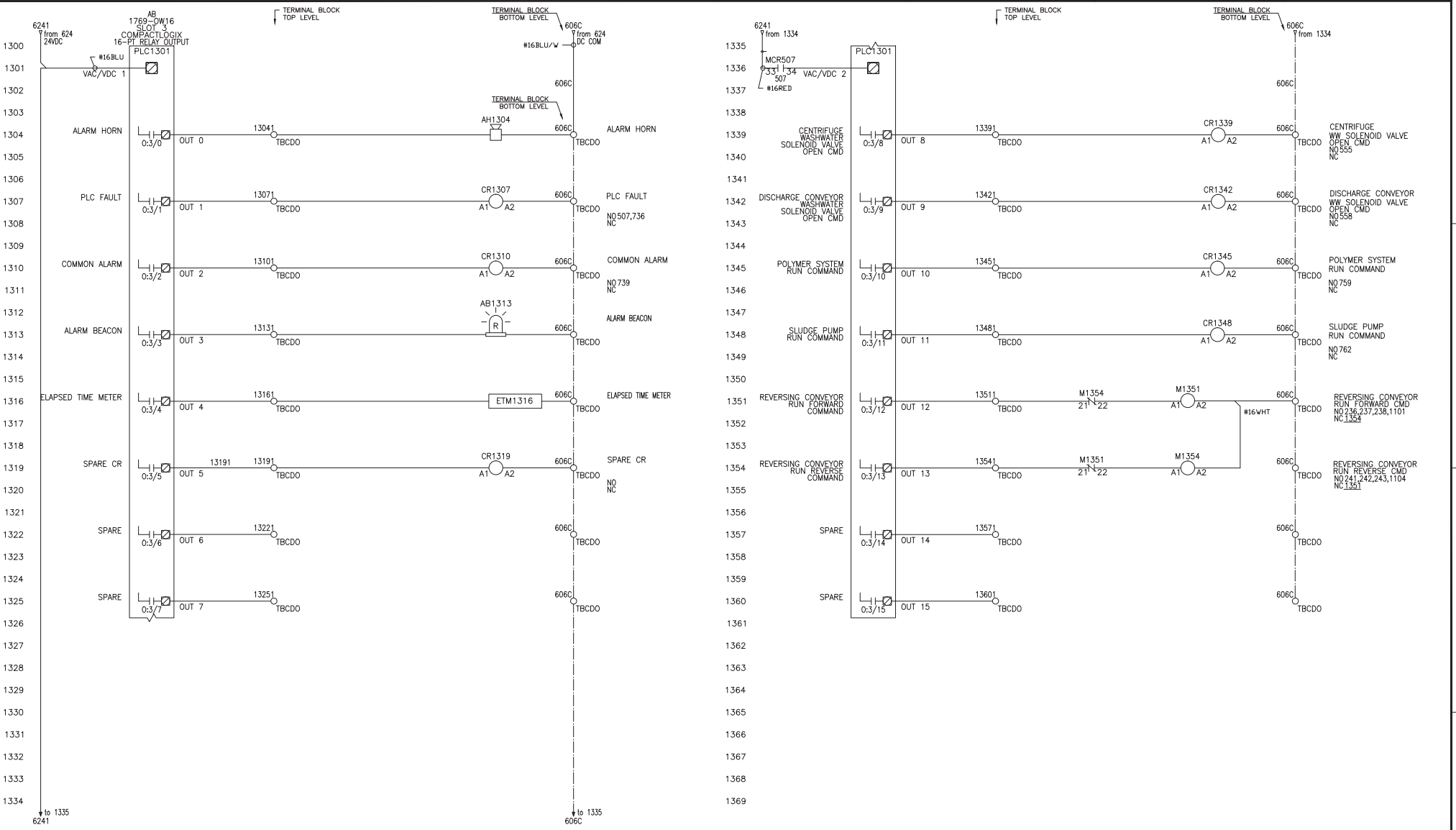
LOCATION:

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
BANK 1 SLOT 2 DIGITAL INPUTS

SIZE	DRAWING NUMBER	REV
B	E831476-S11	1

PREV. SHEET: 20 | NEXT SHEET: 22 | SHEET 21 OF 34



1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No. 831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. FABRICATION TOLERANCES .XX±0.040 ANG±1° HOLE±.020. MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020. MILL FINISH ALL OVER.

THIRD ANGLE PROJECTION

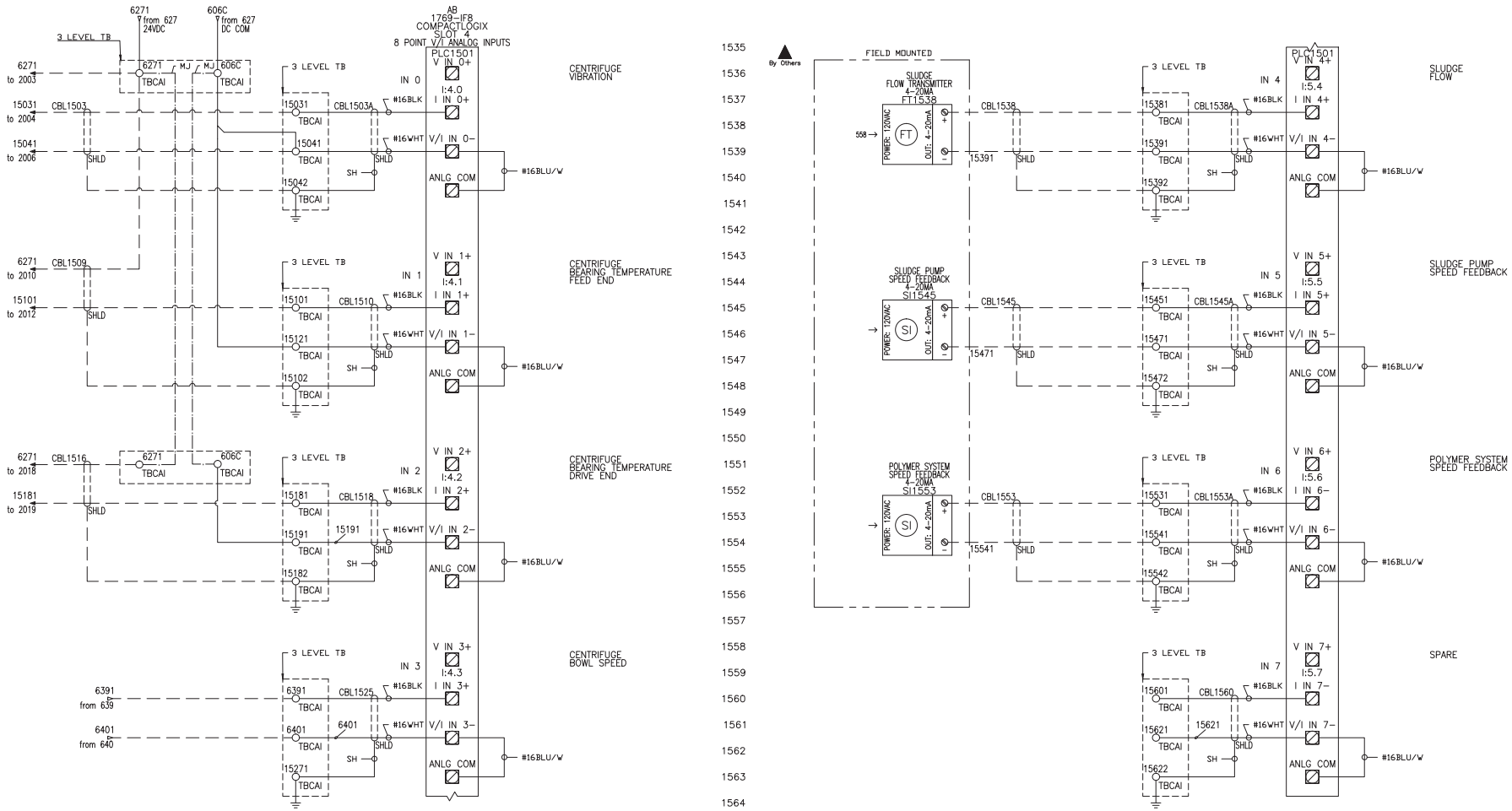
DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18
LOCATION:		

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
BANK 1 SLOT 3 DIGITAL OUTPUTS

SIZE	DRAWING NUMBER	REV
B	E831476-S13	1

PREV. SHEET: 21 | NEXT SHEET: 23 | SHEET 22 OF 34



1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18
REV	EIR	REVISION	BY	APVD	DATE

1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES
.XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES
.XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

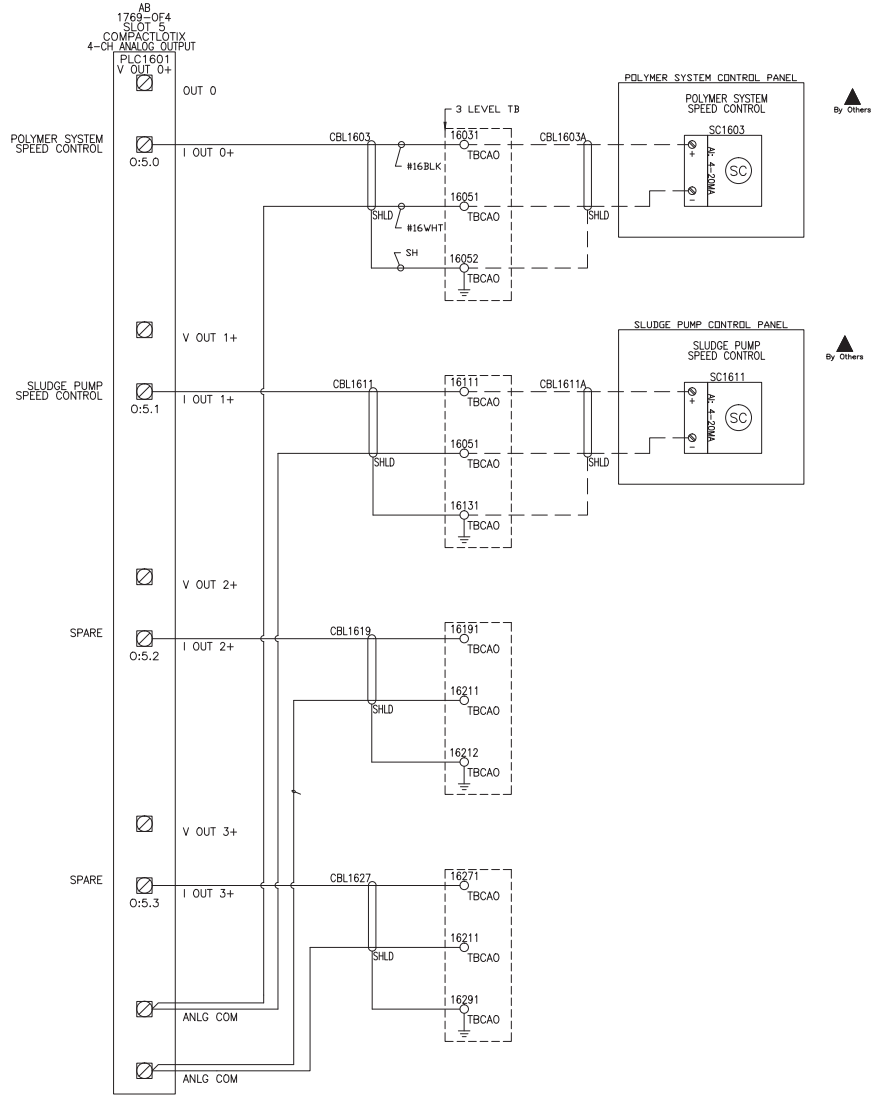
DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18
LOCATION:		

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
BANK 1 SLOT 4 ANALOG INPUTS

SIZE	DRAWING NUMBER	REV
B	E831476-S15	1

PREV. SHEET: 22 | NEXT SHEET: 24 | SHEET 23 OF 34



1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES
.XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES
.XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18

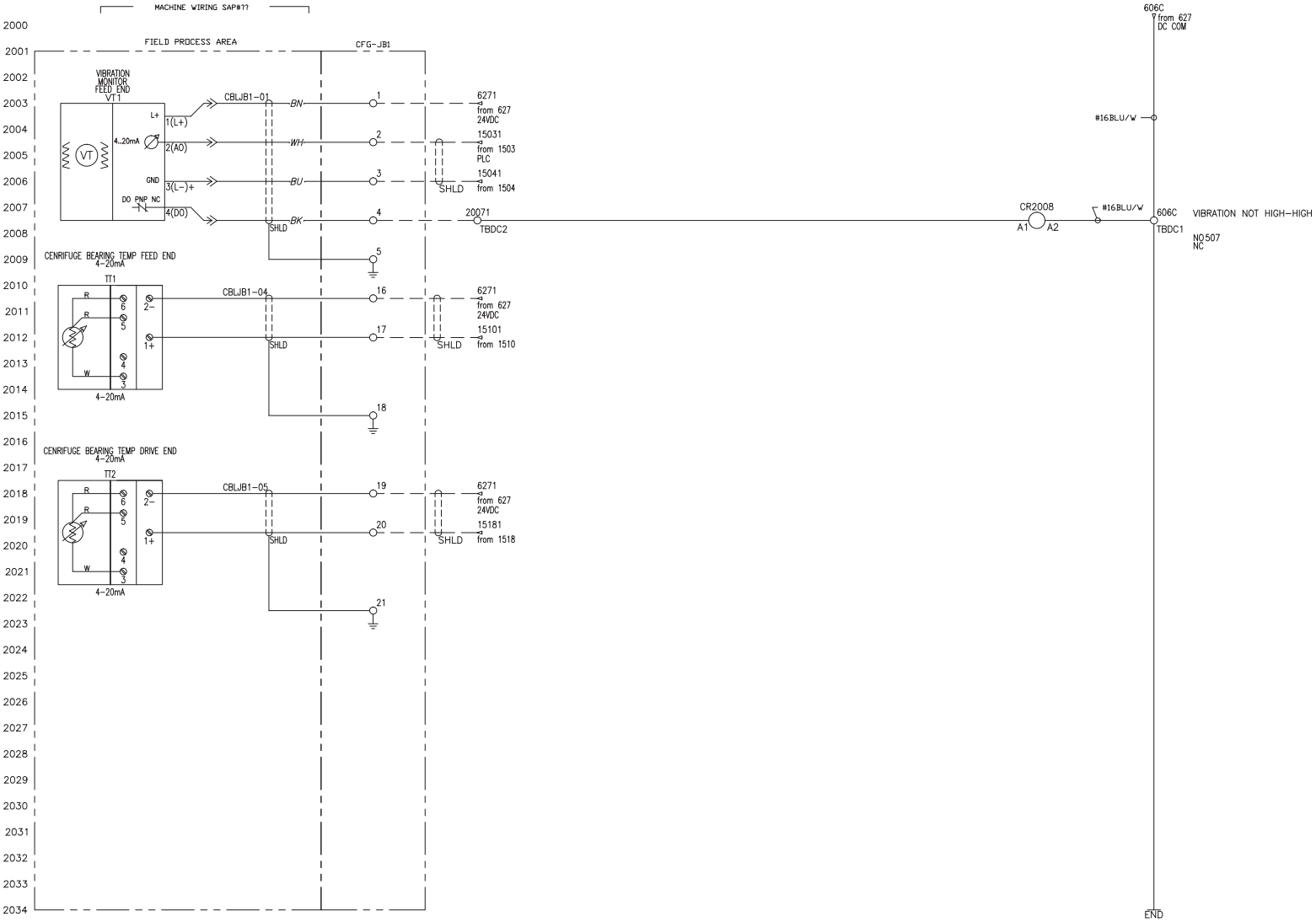
LOCATION:

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
BANK 1 SLOT 5 ANALOG OUTPUTS

SIZE	DRAWING NUMBER	REV
B	E831476-S16	1

PREV. SHEET: 23 | NEXT SHEET: 25 | SHEET 24 OF 34



1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18
REV	EIR	REVISION	BY	APVD	DATE

1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

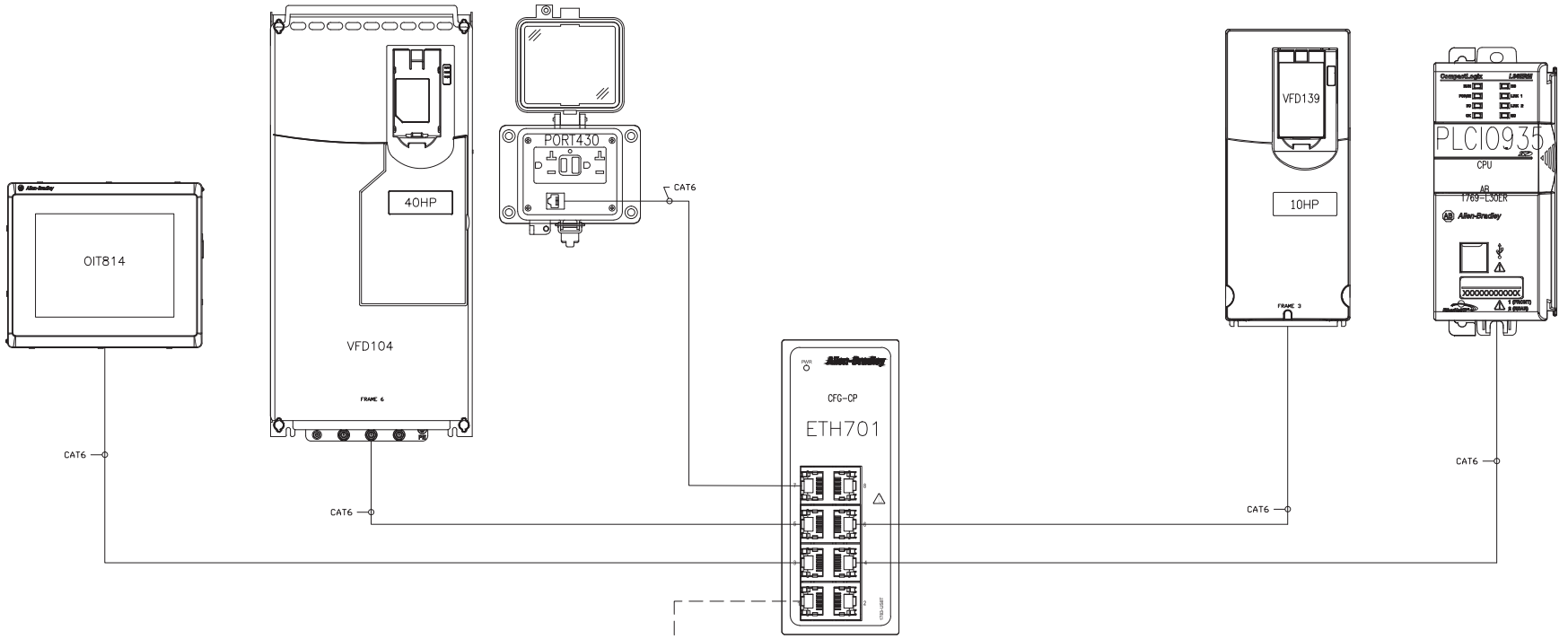
DRAWN BY: HL	DATE 04/04/18	
CHECKED BY: BJM	DATE 04/04/18	
APPROVED BY: CMP	DATE 04/04/18	
LOCATION:		

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
FIELD DEVICES

SIZE	DRAWING NUMBER	REV
B	E831476-S20	1

PREV. SHEET: 24 | NEXT SHEET: 26 | SHEET 25 OF 34



1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

THIS DRAWING IS COPY RIGHTED THIS DRAWING IS A TRADE SECRET AND ONLY ENTRUSTED TO THE RECEIVER FOR HIS MEDICAL USE. WITHOUT THE STATED WRITTEN CONSENT OF ANDRITZ SEPARATION INC. IT MUST NOT BE COPIED, NOR MADE AVAILABLE TO THIRD PARTIES, INCLUDING COMPETITORS, NOR MADE ACCESSIBLE TO SUCH PARTIES. ANY ILLEGAL USE BY THE RECEIVER OR THIRD PARTIES FOR WHICH HE IS RESPONSIBLE CAN CONSTITUTE A CAUSE FOR LEGAL ACTION. THIS DRAWING MUST BE RETURNED ON REQUEST OF THE COMPANY.

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES
.XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES
.XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18
LOCATION:		

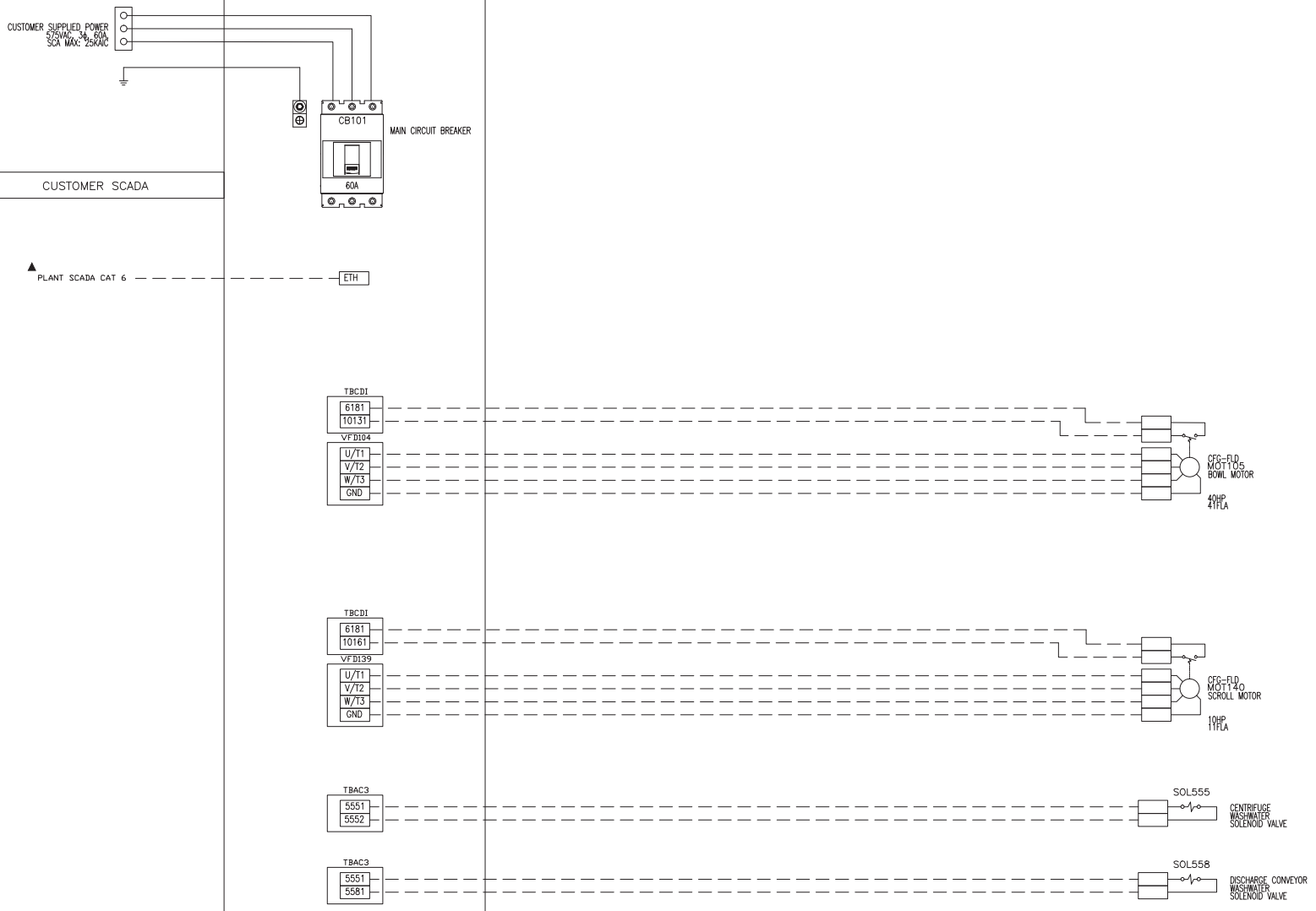
ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
NETWORK ARCHITECTURE

SIZE: B | DRAWING NUMBER: E831476-N1 | REV: 1

PREV. SHEET: 25 | NEXT SHEET: 27 | SHEET 26 OF 34

CUSTOMER FURNISHED SWITCHGEAR/PANELBOARD	CENTRIFUGE CONTROL PANEL (–CP)	FIELD PROCESS AREA (–FLD)	NOTES



CONTROL PANEL MUST BE SUPPLIED WITH POWER SOURCE GROUND FOR PROPER OPERATION OF INSTRUMENTS.

1. MOTOR GROUND WIRE MUST GO DIRECTLY TO VFD GROUND TERMINAL (PE).
2. THIS POINT TO POINT DRAWING IS DERIVED FROM PROJECT SCHEMATICS. REFER TO PROJECT SCHEMATICS FOR FURTHER CLARIFICATION.
3. IF TERMINAL NUMBERS ARE KNOWN FOR EQUIPMENT SUPPLIED BY OTHERS. PLEASE PROVIDE NUMBERS FOR COMPLETION OF DRAWING.

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES
.XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES
.XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18
LOCATION:		

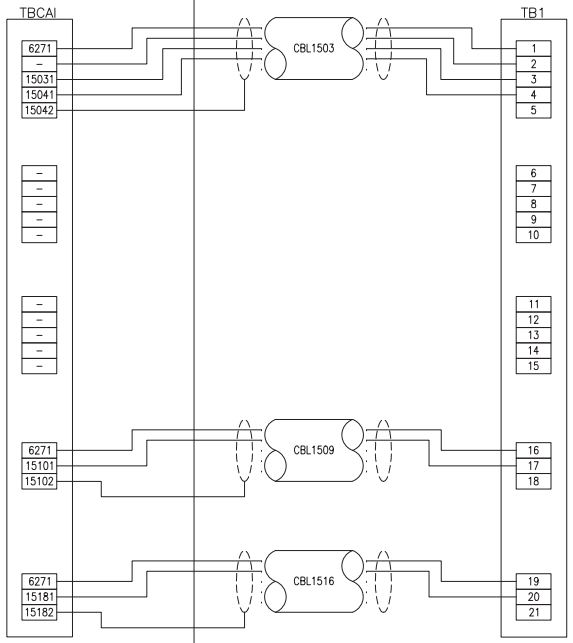
ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
POINT TO POINT (CENTRIFUGE LOADS)

SIZE	DRAWING NUMBER	REV
B	E831476–PP1	1

PREV. SHEET:	NEXT SHEET:	SHEET OF
26	28	27 34

CUSTOMER SCADA	CENTRIFUGE CONTROL PANEL (–CP)	INSTRUMENTATION JB (CFG–JB1)	FIELD PROCESS AREA (–FLD) (SEE MACHINE WIRING DOCUMENTATION)	NOTES



SAP#XXXXXXX
STANDARD MACHINE WIRING

1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES
.XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES
.XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18

LOCATION:

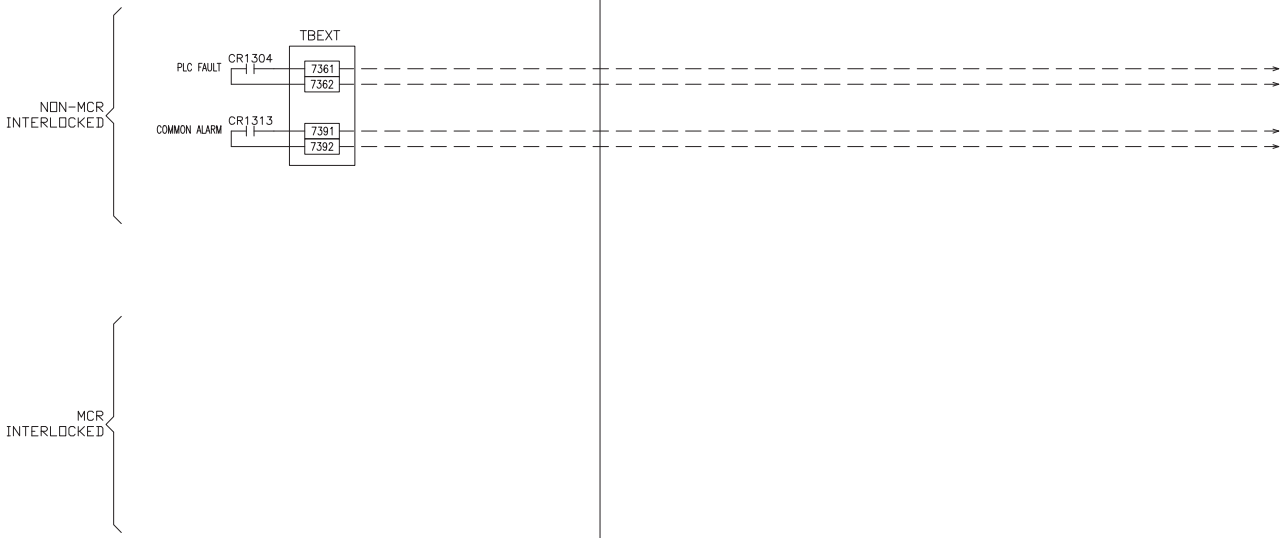
ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
POINT TO POINT INSTRUMENTATION JB

SIZE	DRAWING NUMBER	REV
B	E831476–PP2	1

PREV. SHEET:	NEXT SHEET:	SHEET OF
27	29	28 34

CENTRIFUGE CONTROL PANEL (–CP)	FIELD PROCESS AREA (–FLD)	NOTES



ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465–5611
Telefax: (817)472–8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No. 831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES
.XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES
.XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18

LOCATION:

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465–5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
POINT TO POINT (CONT FOR CUST USE)

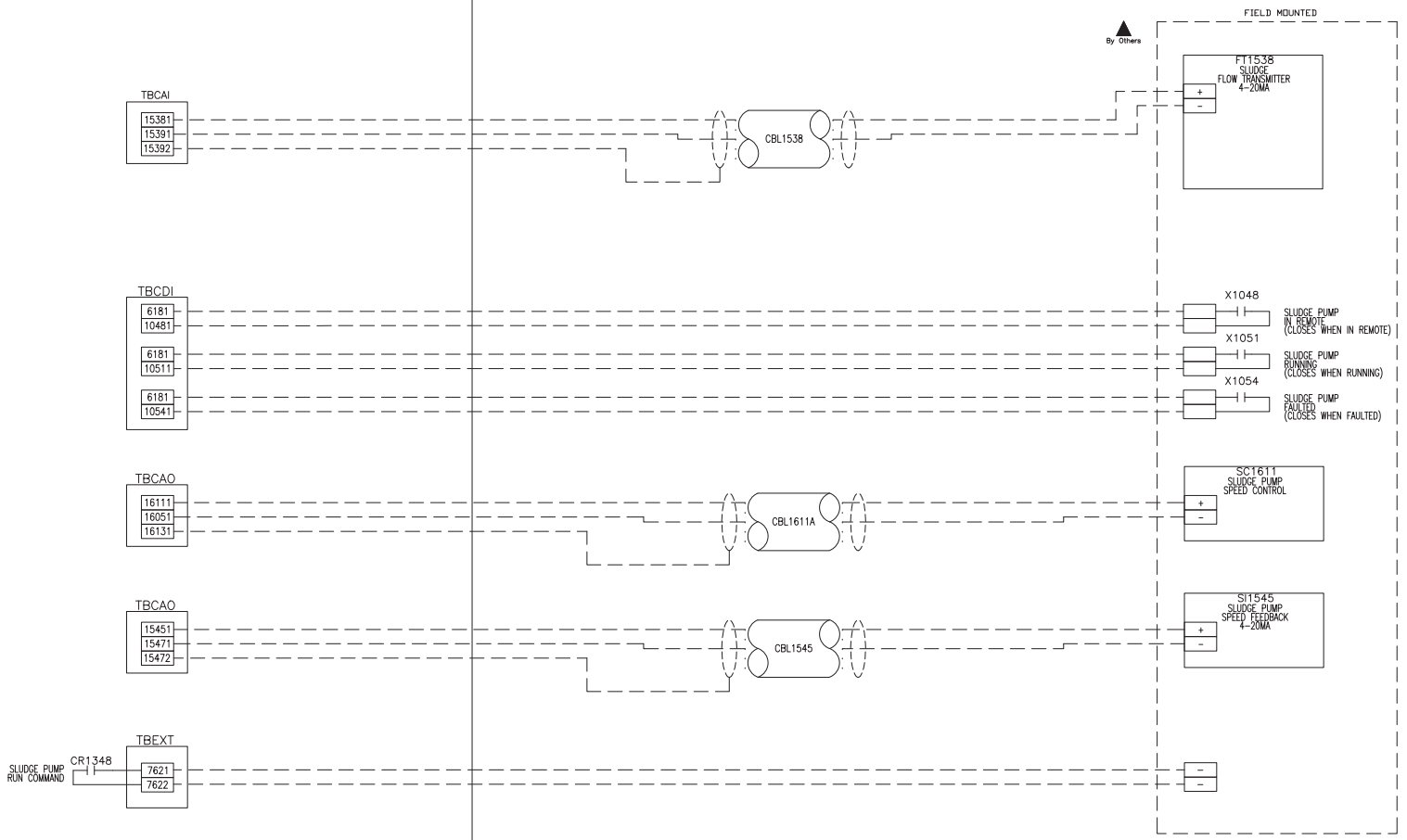
SIZE	DRAWING NUMBER	REV
B	E831476–PP3	1

PREV. SHEET:	NEXT SHEET:	SHEET OF
28	30	29 34

CENTRIFUGE CONTROL PANEL (-CP)

FIELD PROCESS AREA (-FLD)

NOTES



1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION

BY: BJM DATE:

PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES
.XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES
.XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18
LOCATION:		

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
POINT TO POINT SLUDGE

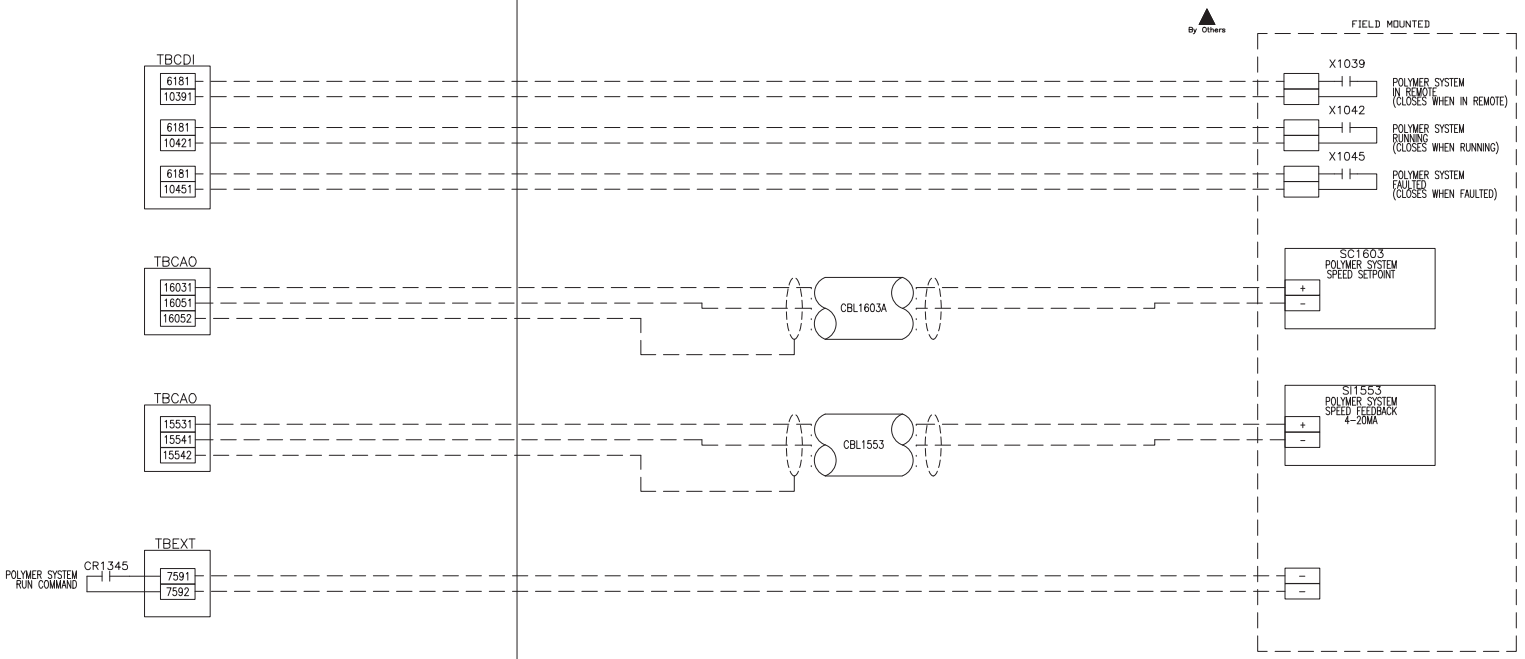
SIZE	DRAWING NUMBER	REV
B	E831476-PP4	1

PREV. SHEET: 29 | NEXT SHEET: 31 | SHEET 30 OF 34

CENTRIFUGE CONTROL PANEL (-CP)

POLYMER SYSTEM CONTROL PANEL (POL-CP)

NOTES



1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION

BY: BJM DATE:

PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020 MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020 MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18

LOCATION:

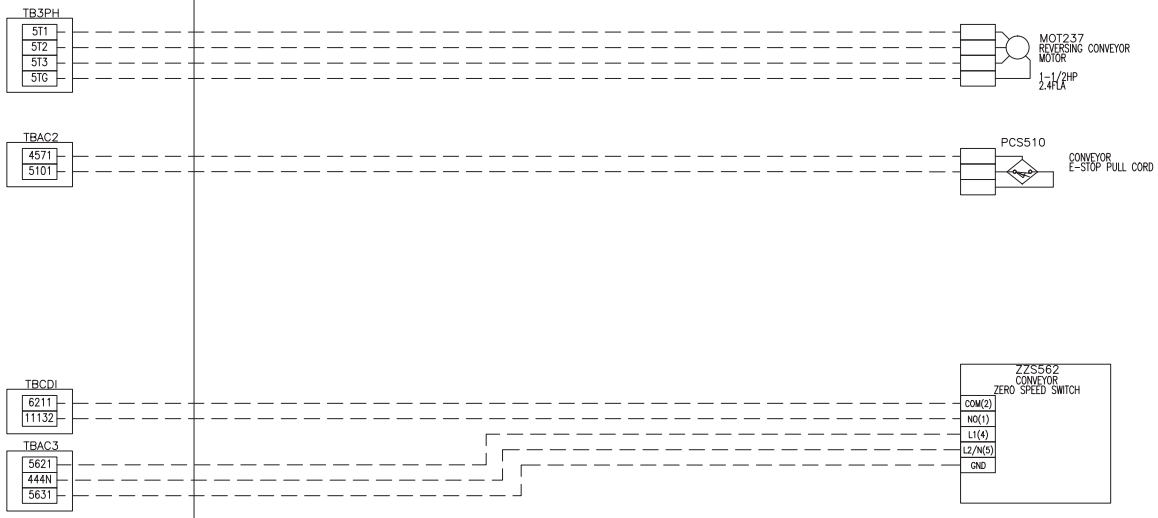
ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
POINT TO POINT POLYMER

SIZE	DRAWING NUMBER	REV
B	E831476-PP5	1

PREV. SHEET: 30 | NEXT SHEET: 32 | SHEET 31 OF 34

CUSTOMER SCADA	CENTRIFUGE CONTROL PANEL (–CP)	FIELD PROCESS AREA (–FLD)	NOTES



1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES
.XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES
.XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18
LOCATION:		

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE
VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
POINT TO POINT CONVEYOR

SIZE	DRAWING NUMBER	REV
B	E831476-PP6	1

PREV. SHEET: 31 | NEXT SHEET: 33 | SHEET 32 OF 34

CFG PLC I/O MAP LIST

TAGNAME	ADDR	TERM	TERMDESC	DESCA	DESCB	DESCC	DESCD	DESCE	LREF
PLC 1001	I:1/0		IN 0	CONTROL PANEL	E-STOP				1001
PLC 1001	I:1/1		IN 1	MAIN CONTROL RELAY					1004
PLC 1001	I:1/2		IN 2	DISCHARGE	CONVEYOR	CONTROL RELAY			1007
PLC 1001	I:1/3		IN 3	SPARE					1010
PLC 1001	I:1/4		IN 4	MAIN DRIVE MOTOR	HIGH TEMPERATURE	SWITCH			1013
PLC 1001	I:1/5		IN 5	SCROLL DRIVE MOTOR	HIGH TEMPERATURE	SWITCH			1016
PLC 1001	I:1/6		IN 6	UPS BYPASSED					1019
PLC 1001	I:1/7		IN 7	UPS LOW BATTERY					1022
PLC 1001			COM 1						1025
PLC 1001	I:1/8		IN 8	UPS FAULTED					1036
PLC 1001	I:1/9		IN 9	POLYMER SYSTEM	IN REMOTE				1039
PLC 1001	I:1/10		IN 10	POLYMER SYSTEM	RUNNING				1042
PLC 1001	I:1/11		IN 11	POLYMER SYSTEM	FAULTED				1045
PLC 1001	I:1/12		IN 12	SLUDGE PUMP	IN REMOTE				1048
PLC 1001	I:1/13		IN 13	SLUDGE PUMP	RUNNING				1051
PLC 1001	I:1/14		IN 14	SLUDGE PUMP	FAULTED				1054
PLC 1001	I:1/15		IN 15	SPARE					1057
PLC 1001			COM 2						1060
PLC 1101	I:2/0		IN 0	REVERSING CONVEYOR	RUN FORWARD	CONFIRM			1101
PLC 1101	I:2/1		IN 1	REVERSING CONVEYOR	RUN REVERSE	CONFIRM			1104
PLC 1101	I:2/2		IN 2	REVERSING CONVEYOR	FAULTED				1107
PLC 1101	I:2/3		IN 3	REVERSING CONVEYOR	E-STOP ACTIVE				1110
PLC 1101	I:2/4		IN 4	REVERSING CONVEYOR	ZERO SPEED SWITCH				1113
PLC 1101	I:2/5		IN 5	SPARE					1116
PLC 1101	I:2/6		IN 6	SPARE					1119
PLC 1101	I:2/7		IN 7	SPARE					1122
PLC 1101			COM 1						1125
PLC 1101	I:2/8		IN 8	SPARE					1136
PLC 1101	I:2/9		IN 9	SPARE					1139
PLC 1101	I:2/10		IN 10	SPARE					1142
PLC 1101	I:2/11		IN 11	SPARE					1145
PLC 1101	I:2/12		IN 12	SPARE					1148
PLC 1101	I:2/13		IN 13	SPARE					1151
PLC 1101	I:2/14		IN 14	SPARE					1154
PLC 1101	I:2/15		IN 15	SPARE					1157
PLC 1101			COM 2						1160
PLC 1301			VAC/VDC 1						1301
PLC 1301	O:3/0		OUT 0	ALARM HORN					1304
PLC 1301	O:3/1		OUT 1	PLC FAULT					1307
PLC 1301	O:3/2		OUT 2	COMMON ALARM					1310
PLC 1301	O:3/3		OUT 3	ALARM BEACON					1313
PLC 1301	O:3/4		OUT 4	ELAPSED TIME METER					1316
PLC 1301	O:3/5		OUT 5	SPARE CR					1319
PLC 1301	O:3/6		OUT 6	SPARE					1322
PLC 1301	O:3/7		OUT 7	SPARE					1325
PLC 1301			VAC/VDC 2						1336
PLC 1301	O:3/8		OUT 8	CENTRIFUGE	WASHWATER	SOLENOID VALVE	OPEN CMD		1339
PLC 1301	O:3/9		OUT 9	DISCHARGE CONVEYOR	WASHWATER	SOLENOID VALVE	OPEN CMD		1342
PLC 1301	O:3/10		OUT 10	POLYMER SYSTEM	RUN COMMAND				1345
PLC 1301	O:3/11		OUT 11	SLUDGE PUMP	RUN COMMAND				1348

CFG PLC I/O MAP LIST

TAGNAME	ADDR	TERM	TERMDESC	DESCA	DESCB	DESCC	DESCD	DESCE	LREF
PLC1301	O:3/12		OUT 12	REVERSING CONVEYOR	RUN FORWARD	COMMAND			1351
PLC1301	O:3/13		OUT 13	REVERSING CONVEYOR	RUN REVERSE	COMMAND			1354
PLC1301	O:3/14		OUT 14	SPARE					1357
PLC1301	O:3/15		OUT 15	SPARE					1360
PLC1501	I:4.0	V IN 0□	IN 0	CENTRIFUGE	VIBRATION				1501
PLC1501		I IN 0□							1503
PLC1501		V/I IN 0-							1504
PLC1501		V/I IN 0-							1504
PLC1501		ANLG COM							1506
PLC1501		ANLG COM							1506
PLC1501	I:4.1	V IN 1□	IN 1	CENTRIFUGE	BEARING TEMPERATURE	FEED END			1509
PLC1501		I IN 1□							1510
PLC1501		V/I IN 1-							1512
PLC1501		V/I IN 1-							1512
PLC1501		ANLG COM							1513
PLC1501		ANLG COM							1513
PLC1501	I:4.2	V IN 2□	IN 2	CENTRIFUGE	BEARING TEMPERATURE	DRIVE END			1516
PLC1501		I IN 2□							1518
PLC1501		V/I IN 2-							1519
PLC1501		V/I IN 2-							1519
PLC1501		ANLG COM							1521
PLC1501		ANLG COM							1521
PLC1501	I:4.3	V IN 3□	IN 3	CENTRIFUGE	BOWL SPEED				1524
PLC1501		I IN 3□							1525
PLC1501		V/I IN 3-							1527
PLC1501		V/I IN 3-							1527
PLC1501		ANLG COM							1528
PLC1501		ANLG COM							1528
PLC1501	I:5.4	V IN 4□	IN 4	SLUDGE	FLOW				1536
PLC1501		I IN 4□							1538
PLC1501		V/I IN 4-							1539
PLC1501		V/I IN 4-							1539
PLC1501		ANLG COM							1541
PLC1501		ANLG COM							1541
PLC1501	I:5.5	V IN 5□	IN 5	SLUDGE PUMP	SPEED FEEDBACK				1544
PLC1501		I IN 5□							1545
PLC1501		V/I IN 5-							1547
PLC1501		V/I IN 5-							1547
PLC1501		ANLG COM							1548
PLC1501		ANLG COM							1548
PLC1501	I:5.6	V IN 6□	IN 6	POLYMER SYSTEM	SPEED FEEDBACK				1551
PLC1501		I IN 6-							1553
PLC1501		V/I IN 6-							1554
PLC1501		V/I IN 6-							1554
PLC1501		ANLG COM							1556
PLC1501		ANLG COM							1556
PLC1501	I:5.7	V IN 7□	IN 7	SPARE					1559
PLC1501		I IN 7-							1560
PLC1501		V/I IN 7-							1562
PLC1501		V/I IN 7-							1562

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020 MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020 MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY: HL	DATE	04/04/18
CHECKED BY: BJM	DATE	04/04/18
APPROVED BY: CMP	DATE	04/04/18
LOCATION:		

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
I/O MAP LIST

SIZE	DRAWING NUMBER	REV
B	E831476-IOM1	1

PREV. SHEET: 32 | NEXT SHEET: 34 | SHEET 33 OF 34

CFG PLC I/O MAP LIST

TAGNAME	ADDR	TERM	TERMDESC	DESCA	DESCB	DESCC	DESCD	DESCE	LREF
PLC 1501		ANLG COM							1563
PLC 1501		ANLG COM							1563
PLC 1601		V OUT 0□	OUT 0						1601
PLC 1601	O:5.0		I OUT 0□	POLYMER SYSTEM	SPEED CONTROL				1603
PLC 1601			V OUT 1□						1609
PLC 1601	O:5.1		I OUT 1□	SLUDGE PUMP	SPEED CONTROL				1611
PLC 1601			V OUT 2□						1617
PLC 1601	O:5.2		I OUT 2□	SPARE					1619
PLC 1601			V OUT 3□						1625
PLC 1601	O:5.3		I OUT 3□	SPARE					1627
PLC 1601		ANLG COM							1631
PLC 1601		ANLG COM							1633

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No.831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES
.XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES
.XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18

LOCATION:

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

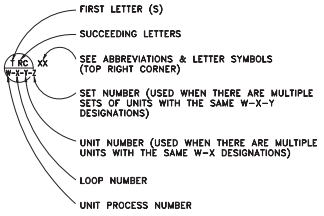
TITLE: VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
I/O MAP LIST

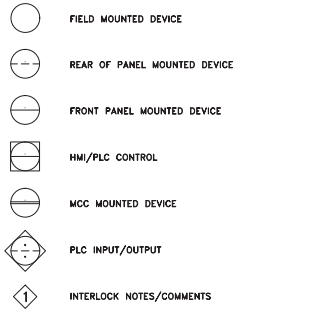
SIZE	DRAWING NUMBER	REV
B	E831476-IOM2	1

PREV. SHEET:	NEXT SHEET:	SHEET OF
33		34 34

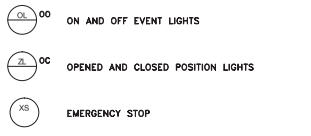
ISA TABLE

INSTRUMENT IDENTIFICATION





SPECIAL CASES



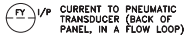
INSTRUMENTATION IDENTIFICATION

LETTER	FIRST-LETTER		SUCCEEDING-LETTERS		
	PROCESS OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE			CONTROL	
D	DENSITY (S,G)	DIFFERENTIAL			
E	VOLTAGE		PRIMARY ELEMENT		
F	FLOW RATE	RATIO			
G	USER'S CHOICE		GLASS, GAUGE VIEWING DEVICE	GATE	
H	HAND (MANUAL)				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOTION	MOMENTARY			MIDDLE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE, RESTRICTION		
P	PRESSURE, VACUUM		POINT (TEST) CONNECTION		
Q	QUANTITY	INTEGRATE			
R	RADIATION		RECORD OR PRINT		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION, MECH. ANALYSIS			VALVE, DAMPER LOUVER	
W	WEIGHT, FORCE		WELL		
X	UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION	Z AXIS		DRIVER, ACTUATOR UNCLASSIFIED FINAL CONTROL ELEMENT	

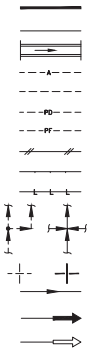
TRANSDUCERS

A	ANALOG	I	CURRENT
D	DIGITAL	P	PNEUMATIC
E	VOLTAGE	PF	PULSE FREQUENCY
F	FREQUENCY	PD	PULSE DURATION
H	HYDRAULIC	R	RESISTANCE

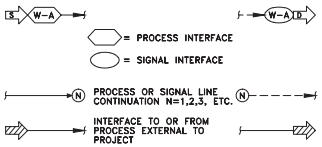
EXAMPLE:



LINE LEGEND



INTERFACE SYMBOLS



ABBREVIATIONS & LETTER SYMBOLS

AC	ALTERNATING CURRENT
ALKY	ALKALINITY
AM	AUTO-MANUAL
CAM	COMPUTER-AUTO-MANUAL
CCS	CENTRAL CONTROL SYSTEM
CL_2	CHLORINE (TYPICAL: USE STANDARD CHEMICAL
CM	COMPUTER-MANUAL ELEMENT ABBREVIATIONS)
COD	CHEMICAL OXYGEN DEMAND
CP-X	CONTROL PANEL NO. X
CS	CONSTANT SPEED
DC	DIRECT CURRENT
DO	DISSOLVED OXYGEN
FAL	FAIL
FCL_2	FREE CHLORINE RESIDUAL
FOS	FAST-OFF-SLOW
FOSA	FAST-OFF-SLOW-AUTO
FOSR	FAST-OFF-SLOW-REMOTE
FP-W-X	FIELD PANEL NO. WX (W=UNIT PROCESS NUMBER
FR	FORWARD-REVERSE
HDNS	HARDNESS
HOA	HAND-OFF-AUTO
HOR	HAND-OFF-REMOTE
LEL	LOWER EXPLOSIVE LIMIT
LOS	LOCKOUT STOP
LR	LOCAL-REMOTE
MA	MANUAL-AUTO
MBAS	METHYLENE BLUE ACTIVE SUBSTANCES
MC	MODULATE-CLOSE
MCC-X	MOTOR CONTROL CENTER NO. X
MS	MOTOR STARTER
OC	OPEN-CLOSE (D)
OCR	OPEN-CLOSE-REMOTE
OCA	OPEN-CLOSE-AUTO
OO	ON-OFF
OOA	ON-OFF-AUTO
OOR	ON-OFF-REMOTE
OP	ORTHO PHOSPHORUS
ORP	OXIDATION REDUCTION POTENTIAL
OSC	OPEN-STOP-CLOSE
pH	HYDROGEN ION CONCENTRATION
RM-X	REMOTE MULTIPLEXING MODULE NO. X
RTU-X	REMOTE TELEMETRY UNIT NO. X
SC	SPEED CONTROL
SF	SLOWER-FASTER
SS	START-STOP
SSC	SUPERVISORY SET POINT CONTROL
TCL_2	TOTAL CHLORINE RESIDUAL
TOC	TOTAL ORGANIC CARBON
TOD	TOTAL OXYGEN DEMAND
TURB	TURBIDITY
VFD	VARIABLE FREQUENCY DRIVE
VHC	VOLATILE HYDROCARBONS
VIB	VIBRATION
VS	VARIABLE SPEED

PROJECT SPECIFIC ABBREV.

PROJ NO.

GENERAL NOTES

1) THIS IS A STANDARD LEGEND, THEREFORE, NOT ALL OF THIS INFORMATION MAY BE USED ON THIS PROJECT.

PROJECT SPECIFIC NOTES

▲ -SUPPLIED BY OTHERS

ANDRITZ SEPARATION, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT NO.: 831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18

LOCATION:

ANDRITZ SEPARATION, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
I & C LEGEND

SIZE	DRAWING NUMBER	REV
B	E831476-PID-1	1

PREV. SHEET: | NEXT SHEET: 2 | SHEET 1 OF 2

MCP

Start/Stop Command
Running
Polymer System Fail
Speed Setpoint
Speed Indication
Load Indication

Start/Stop Command
Running
Sludge Feed Pump Fail
Speed Setpoint
Speed Indication
Load Indication

Differential Speed Indication
Centrifuge Vibration Indication
Scroll Speed Indication
Bowl Speed Indication
Polymer Pump Feed Rate
Sludge Pump Feed Rate
Centrifuge Wash Water Valve
Reversing Conveyor WW Valve
Feed Bearing Temperature
Centrifuge Vibration Monitor
Centrifuge Speed Monitor
Drive Bearing Temperature
Bowl Motor High Temp.
Scroll Motor High Temp.
Power Failure Alarm
Vibration (3rd Strike)
Bowl Drive Motor Overheated
Bowl Drive Motor Failure
Bowl Drive Motor VFD fault
Scroll Drive Motor Overheated
Scroll Drive Motor VFD Fault
Scroll Drive High Torque alarm
Centrifuge Bowl Overspeed

Start/Stop Command
Running
Fail
Speed Setpoint
Speed Indication
Load Indication

Start/Stop Command
Forward/Reverse
2nd ACCEL/DECEL
Running
Fail
Speed Setpoint
Speed Indication
Torque Indication

Run Forward Command
Run Reverse Command
Running Forward
Running Reverse
Reversing Conveyor Alarm
Emergency Stop
Zero Speed Sensor

S/S HS | FAIL FAL | SPEED SETPT SC | SPEED IND SI | RUNNING YI
POLYMER PUMP

S/S HS | FAIL FAL | SPEED SETPT SC | SPEED IND SI | RUNNING YI
SLUDGE PUMP

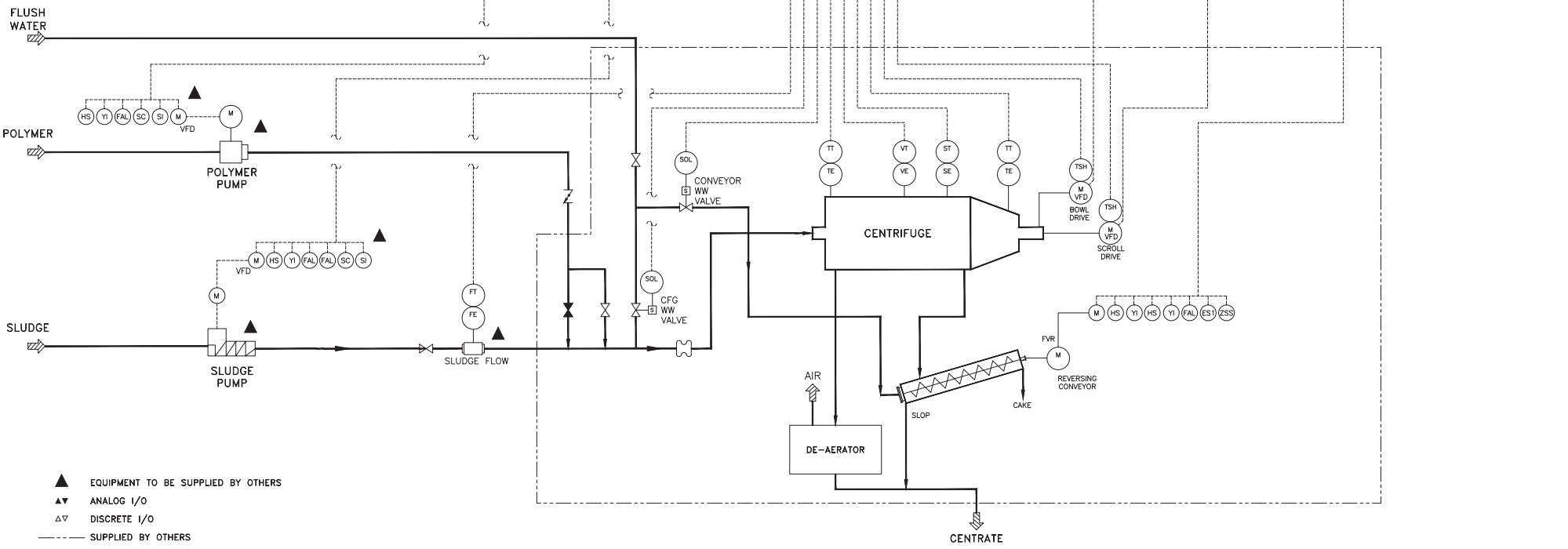
S/S HS | FAIL FAL | SPEED IND SI | SPEED SETPT SC | LOAD IND II | RUNNING YI
BOWL DRIVE VFD

S/S HS | ACCEL/DECEL WSHH | FAIL FAL | SPEED IND SI | F/R HS | RUNNING YI | SPEED SETPT SC | TORQUE IND WI
SCROLL DRIVE VFD

RUN HS | RUN HS | FAIL FAL | ZERO SPEED ZSS | RUNNING YI | RUNNING YI | ESTOP ES1 | TORQUE IND WI
REVERSING CONVEYOR

CENTRIFUGE CONTROL PANEL

NOTE: SOME SIGNALS MAY BE HARDWIRED OR TRANSMITTED VIA ETHERNET



▲ EQUIPMENT TO BE SUPPLIED BY OTHERS
▲▼ ANALOG I/O
△▽ DISCRETE I/O
——— SUPPLIED BY OTHERS

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE:
PROJECT No. 831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/13/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18
LOCATION:		

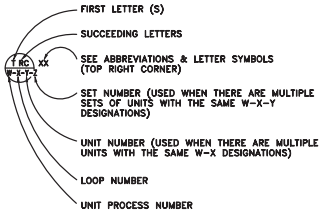
ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
P & ID

SIZE: B | DRAWING NUMBER: E831476-PID-2 | REV: 1
PREV. SHEET: 1 | NEXT SHEET: | SHEET 2 OF 2

ISA TABLE

INSTRUMENT IDENTIFICATION




FIELD MOUNTED DEVICE


REAR OF PANEL MOUNTED DEVICE


FRONT PANEL MOUNTED DEVICE


HMI/PLC CONTROL


MCC MOUNTED DEVICE


PLC INPUT/OUTPUT


INTERLOCK NOTES/COMMENTS

SPECIAL CASES


ON AND OFF EVENT LIGHTS


OPENED AND CLOSED POSITION LIGHTS


EMERGENCY STOP

INSTRUMENTATION IDENTIFICATION

LETTER	FIRST-LETTER: PROCESS OR INITIATING VARIABLE	FIRST-LETTER: MODIFIER	SUCCEEDING-LETTERS: READOUT OR PASSIVE FUNCTION	SUCCEEDING-LETTERS: OUTPUT FUNCTION	SUCCEEDING-LETTERS: MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE			CONTROL	
D	DENSITY (S,G)	DIFFERENTIAL			
E	VOLTAGE		PRIMARY ELEMENT		
F	FLOW RATE	RATIO			
G	USER'S CHOICE		GLASS, GAUGE VIEWING DEVICE	GATE	
H	HAND (MANUAL)				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOTION	MOMENTARY			MIDDLE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE, RESTRICTION		
P	PRESSURE, VACUUM		POINT (TEST) CONNECTION		
Q	QUANTITY	INTEGRATE			
R	RADIATION		RECORD OR PRINT		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION, MECH. ANALYSIS			VALVE, DAMPER LOUVER	
W	WEIGHT, FORCE		WELL		
X	UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION	Z AXIS		DRIVER, ACTUATOR UNCLASSIFIED FINAL CONTROL ELEMENT	

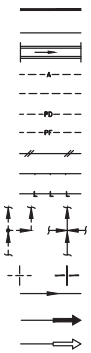
TRANSDUCERS

A	ANALOG	I	CURRENT
D	DIGITAL	P	PNEUMATIC
E	VOLTAGE	PF	PULSE FREQUENCY
F	FREQUENCY	PD	PULSE DURATION
H	HYDRAULIC	R	RESISTANCE

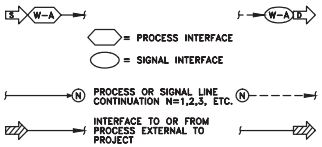
EXAMPLE:


CURRENT TO PNEUMATIC TRANSDUCER (BACK OF PANEL, IN A FLOW LOOP)

LINE LEGEND



INTERFACE SYMBOLS



ABBREVIATIONS & LETTER SYMBOLS

AC	ALTERNATING CURRENT
ALKY	ALKALINITY
AM	AUTO-MANUAL
CAM	COMPUTER-AUTO-MANUAL
CCS	CENTRAL CONTROL SYSTEM
CL_2	CHLORINE (TYPICAL: USE STANDARD CHEMICAL
CM	COMPUTER-MANUAL ELEMENT ABBREVIATIONS)
COD	CHEMICAL OXYGEN DEMAND
CP-X	CONTROL PANEL NO. X
CS	CONSTANT SPEED
DC	DIRECT CURRENT
DO	DISSOLVED OXYGEN
FAL	FAIL
FCL_2	FREE CHLORINE RESIDUAL
FOS	FAST-OFF-SLOW
FOSA	FAST-OFF-SLOW-AUTO
FOSR	FAST-OFF-SLOW-REMOTE
FP-W-X	FIELD PANEL NO. WX (W=UNIT PROCESS NUMBER
FR	FORWARD-REVERSE
HDNS	HARDNESS
HOA	HAND-OFF-AUTO
HOR	HAND-OFF-REMOTE
LEL	LOWER EXPLOSIVE LIMIT
LOS	LOCKOUT STOP
LR	LOCAL-REMOTE
MA	MANUAL-AUTO
MBAS	METHYLENE BLUE ACTIVE SUBSTANCES
MC	MODULATE-CLOSE
MCC-X	MOTOR CONTROL CENTER NO. X
MS	MOTOR STARTER
OC	OPEN-CLOSE (D)
OCR	OPEN-CLOSE-REMOTE
OCA	OPEN-CLOSE-AUTO
OO	ON-OFF
OOA	ON-OFF-AUTO
OOR	ON-OFF-REMOTE
OP	ORTHO PHOSPHORUS
ORP	OXIDATION REDUCTION POTENTIAL
OSC	OPEN-STOP-CLOSE
pH	HYDROGEN ION CONCENTRATION
RM-X	REMOTE MULTIPLEXING MODULE NO. X
RTU-X	REMOTE TELEMETRY UNIT NO. X
SC	SPEED CONTROL
SF	SLOWER-FASTER
SS	START-STOP
SSC	SUPERVISORY SET POINT CONTROL
TCL_2	TOTAL CHLORINE RESIDUAL
TOC	TOTAL ORGANIC CARBON
TOD	TOTAL OXYGEN DEMAND
TURB	TURBIDITY
VFD	VARIABLE FREQUENCY DRIVE
VHC	VOLATILE HYDROCARBONS
VIB	VIBRATION
VS	VARIABLE SPEED

PROJECT SPECIFIC ABBREV.

PROJ NO.

GENERAL NOTES

1) THIS IS A STANDARD LEGEND, THEREFORE, NOT ALL OF THIS INFORMATION MAY BE USED ON THIS PROJECT.

PROJECT SPECIFIC NOTES

▲ -SUPPLIED BY OTHERS

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE: 04/24/18
PROJECT N□: 831476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/24/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18

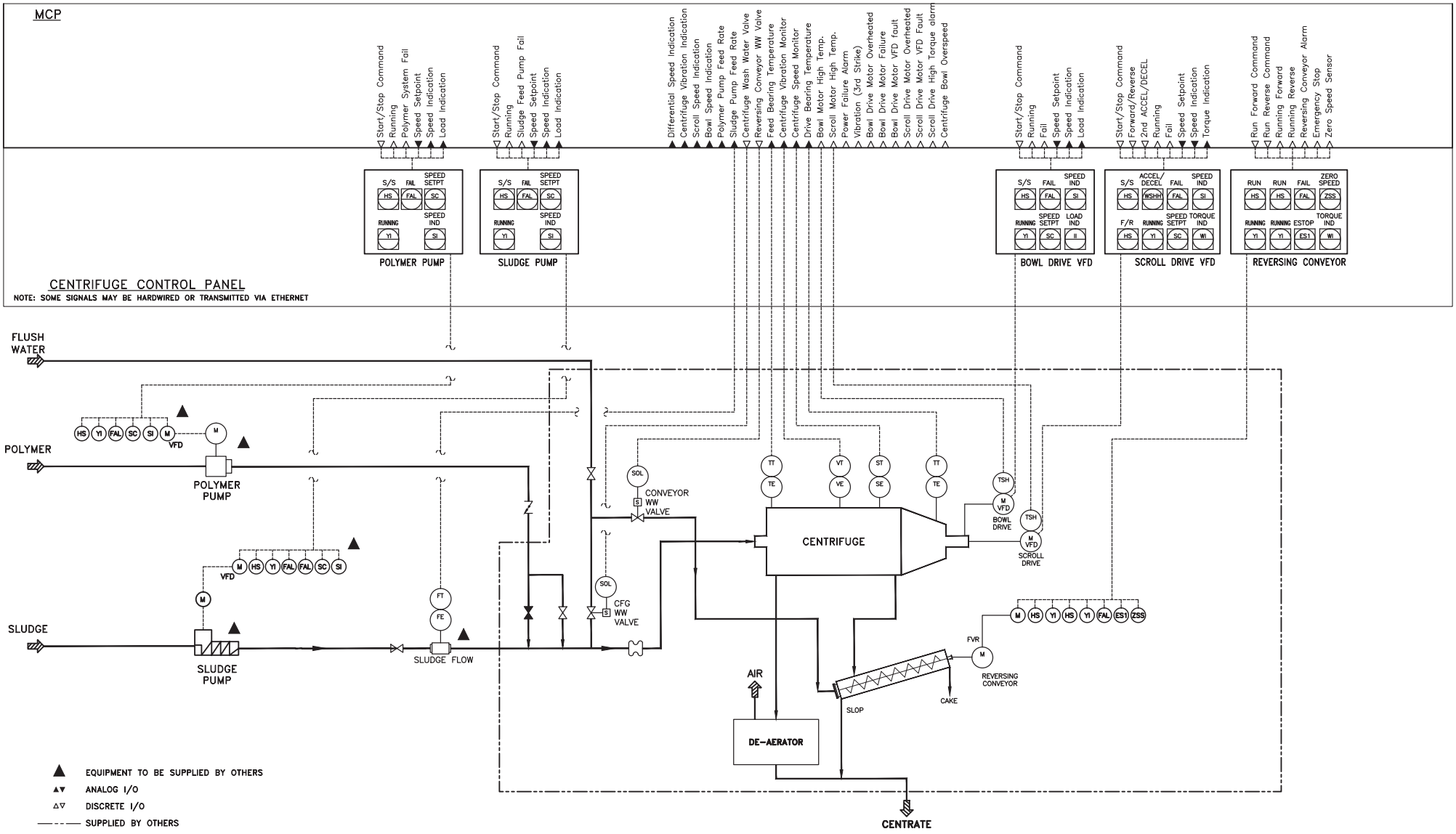
LOCATION:

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
I & C LEGEND

SIZE: B | DRAWING NUMBER: E831476-PID-1 | REV: 1

PREV. SHEET: | NEXT SHEET: 2 | SHEET 1 OF 2



ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BJM DATE: 04/24/18
PROJECT No.: B31476

NOTES

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	HL	BJM	04/24/18
0		APPROVAL DRAWINGS: INITIAL RELEASE	HL	BJM	04/04/18

ESTIMATED WEIGHT IN LBS:

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

THIRD ANGLE PROJECTION

DRAWN BY:	HL	DATE 04/04/18
CHECKED BY:	BJM	DATE 04/04/18
APPROVED BY:	CMP	DATE 04/04/18
LOCATION:		

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: VEOLIA AGNICO AMARUQ
D4L CENTRIFUGE SKID
P & ID

SIZE	DRAWING NUMBER	REV
B	E831476-PID-2	1

PREV. SHEET: 1 | NEXT SHEET: | SHEET 2 OF 2

ASCO

EF8210G004, SOLENOID VALVE
EF8210G022, SOLENOID VALVE
8210G089, SOLENOID VALVE

LEFT BLANK

Installation & Maintenance Instructions

2-WAY INTERNAL PILOT-OPERATED SOLENOID VALVES
NORMALLY CLOSED OPERATION — GENERAL SERVICE
1" , 1¼" OR 1½" NPT

SERIES
8210
8211

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

DESCRIPTION

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

Notice: Brass valves are not certified as lead-free under the Safe Water Drinking Act SWDA 1417 and are not intended for use on drinking water systems. They are intended for control of water in industrial applications. Consult ASCO for valves rated for use in potable water applications.

OPERATION

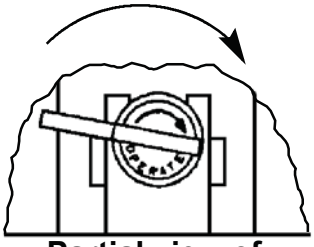
Normally Closed: Valve is closed when solenoid is de-energized; open when energized.

IMPORTANT: Minimum operating pressure differential is 5 psi.

Manual Operator (optional feature)

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

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



Partial view of Manual Operator

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

INSTALLATION

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

Future Service Considerations

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

Temperature Limitations

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

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

Positioning

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

Piping

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

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

MAINTENANCE

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

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

Cleaning

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

Preventive Maintenance

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

Causes of Improper Operation

- **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
- **Excessive Leakage:** Disassemble valve and clean all parts. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

Valve Disassembly

1. Disassemble valve in an orderly fashion using exploded views for identification and placement of parts. Refer to Figure 1 for AC construction; Figure 2 for DC construction. For 1" or 1 ¼" NPT valve construction, see Figure 1; for 1 ½" NPT valve construction, see Figure 2.
2. Remove solenoid enclosure. See separate instructions.

- For valves supplied with optional manual operators,see section on ***Disassembly of Manual Operator.***

3. Unscrew solenoid base sub-assembly from valve body. Then remove core assembly with core spring and solenoid base gasket. For AC construction (Figure 1) core spring is a loose piece.
4. For normal maintenance (cleaning) it is not necessary to remove the valve seat. However, for valve seat removal use a 7/16" thin wall socket wrench
5. Remove bonnet screws, valve bonnet, diaphragm spring, diaphragm assembly, body gasket, body passage eyelet(present on current valve constructions only) and body passage gasket.
6. All parts are now accessible for cleaning or replacement. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

- Service Notice -

When installing a new ASCO Rebuild Kit, please be aware that the diaphragm assembly may not be identical to the diaphragm assembly in the valve. See Figure 1 for alternate diaphragm constructions. The two diaphragm constructions are interchangeable and will perform equally well.

⚠ CAUTION: To ensure proper valve operation, install all parts supplied in ASCO Rebuild Kit. Do not mix old and new parts.

Valve Reassembly

1. Lubricate body gasket, body passage gasket, bonnet gasket and solenoid base gasket with DOW CORNING® 200 Fluid lubricant or an equivalent high-grade silicone fluid.
2. Install body passage gasket, body passage eyelet, diaphragm assembly, diaphragm spring, valve bonnet and bonnet screws. Hand thread screws as far as possible. Then torque bonnet screws in a crisscross manner to 144 ± 15 in-lbs [16,3 ± 1,7 Nm].
3. If removed, install valve seat in valve body. Apply a small amount of thread compound compatible with valve media to valve seat threads. Torque valve seat to 75 ± 10 in-lbs [8,5 ± 1,1 Nm].

- For valves supplied with optional manual operator, see section on ***Reassembly of Manual Operator.***

4. For AC construction (Figure 1), install core spring in core assembly. Wide end of core spring in core first, closed end protrudes from top of core.
5. Install solenoid base gasket, core assembly with core spring and solenoid base sub-assembly in valve body. Torque solenoid base sub-assembly to 175 ± 25 in-lbs [19,8 ± 2,8 Nm].
6. Install solenoid. See separate instructions.

⚠ WARNING: To prevent the possibility of death, serious injury or property damage, check valve for proper operation before returning to service. Also perform internal seat and external leakage tests with a nonhazardous, noncombustible fluid.

7. Restore line pressure and electrical power supply to valve.
8. After maintenance is completed, operate the valve a few times to be sure of proper operation. A *metallic click* indicates the solenoid is operating.

Disassembly of Manual Operator

1. Unscrew solenoid base sub-assembly from manual operator body.
2. Unscrew manual operator body from valve body. Then remove stem retainer from base of manual operator body and stem/spacer sub-assembly.
3. Pull stem/spacer sub-assembly with stem gasket from side of manual operator body. Then remove core assembly with core spring, solenoid base gasket and manual operator bonnet gasket.
4. For further disassembly refer to section on *Valve Disassembly* step 4.

Reassembly of Manual Operator

1. Lubricate stem gasket with DOW CORNING® 111 Compound lubricant or an equivalent high-grade silicone grease.
2. For AC construction (Figure 1), install core spring in core assembly. Wide end of core spring in core first, closed end protrudes from top of core.
3. Holding the manual operator body in a horizontal position, install core assembly with core spring from the bottom end.
4. Insert the stem/spacer sub-assembly with the stem gasket into the side hole of the manual operator body. Rotate the lever of the stem/spacer sub-assembly to the 12 o'clock position.
5. Install stem retainer on base of manual operator body and simultaneously engage it into the slot provided on the stem/spacer sub-assembly.

IMPORTANT: The spacer on the stem/spacer sub-assembly must be inside of the stem retainer for AC construction (Figure 1) and outside of the stem retainer for DC construction (Figure 2).

6. Install manual operator bonnet gasket and body with preassembled parts into valve body. Torque manual operator body to 175 ± 25 in-lbs [19,8 ± 2,8 Nm].
7. Replace solenoid base gasket and solenoid base sub-assembly. Torque solenoid base sub-assembly to 175 ± 25 in-lbs [19,8 ± 2,8 Nm].
8. For further reassembly, refer to *Valve Reassembly* step 6.

Torque Chart

Part Name	Torque Value Inch-Pounds	Torque Value Newton-Meters
Solenoid base sub-assembly	175 ± 25	19,8 ± 2,8
Manual operator body		
Bonnet screw	144 ± 15	16,3 ± 1,7
Valve seat	75 ± 10	8,5 ± 1,1

ORDERING INFORMATION FOR ASCO REBUILD KITS

Parts marked with an asterisk (*) in the exploded view are supplied in Rebuild Kits. When Ordering Rebuild Kits for ASCO valves, order the Rebuild Kit number stamped on the valve nameplate. If the number of the kit is not visible, order by indicating the number of kits required, and the Catalog Number and Serial Number of the valve(s) for which they are intended.

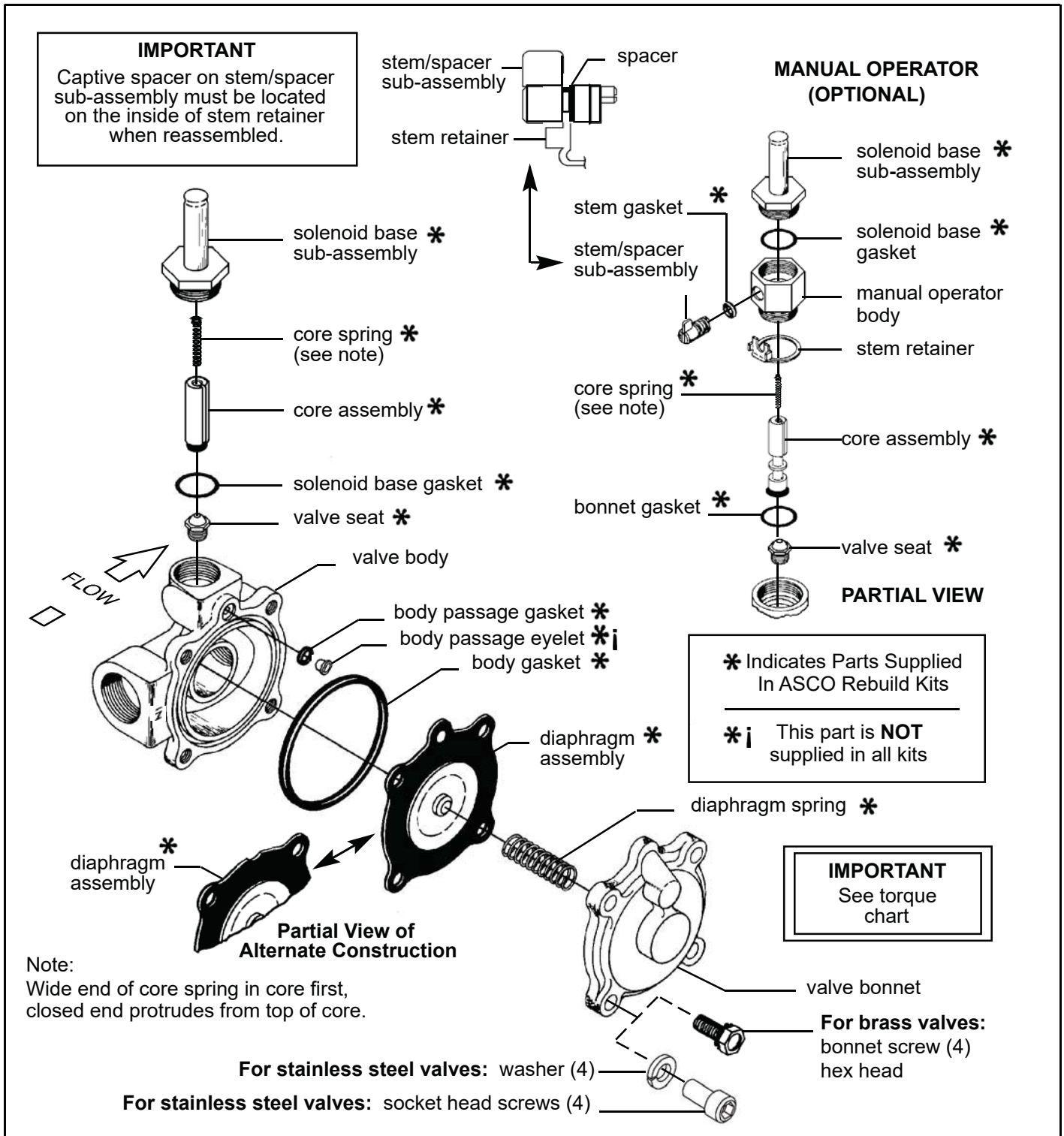


Figure 1. Series 8210 valve without solenoid, AC construction with 1 or 1 ¼" NPT valve body shown.

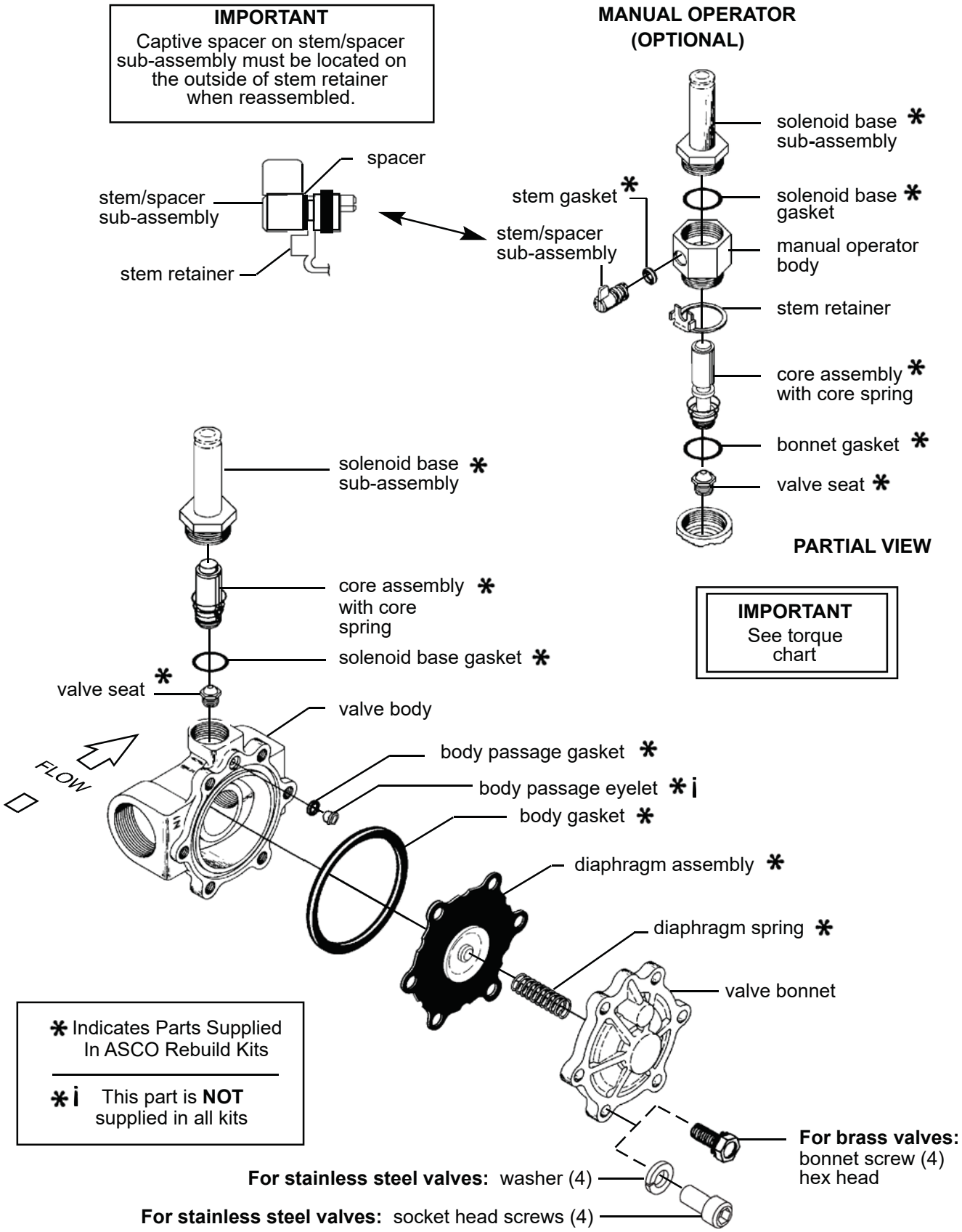


Figure 2. Series 8210 valve without solenoid, DC construction with 1 ½" NPT valve body shown.

Installation&Maintenance Instructions

ASCO Red-Hat II™

OPEN-FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS

SERIES

8016G/H

— SERVICE NOTICE —

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

DESCRIPTION

Catalog numbers 8016G/H1 and 8016G/H2 are epoxy encapsulated pull-type solenoids. The green solenoid with lead wires and 1/2 conduit connection is designed to meet Enclosure Type 1-General Purpose, Type 2-Dripproof, Types 3 and 3S-Raintight, and Types 4 and 4X-Watertight. The black solenoid on catalog numbers prefixed "EF" is designed to meet Enclosure Types 3 and 3S-Raintight, Types 4 and 4X-Watertight, Types 6 and 6P-Submersible, Type7, Explosionproof Class I, Division1 Groups A, B, C, & D and Type 9, -Dust-Ignitionproof Class II, Division1 Groups E, F & G. The Class II, Groups F & G Dust Locations designation is not applicable for solenoids or solenoid valves used for steam service or when a class "H" solenoid is used. See *Temperature Limitations* section for solenoid identification and nameplate/retainer for service. When installed just as a solenoid and not attached to an ASCO valve, the core has a 0.250-28 UNF-2B tapped hole, 0.38 minimum full thread.

Series 8016G/H are available in:

- **Open-Frame Construction:** The green solenoid may be supplied with 1/4″ spade, screw or DIN terminals. (Refer to Figure 4)
- **Panel Mounted Construction:** These solenoids are specifically designed to be panel mounted by the customer through a panel having a .062 to .093 maximum wall thickness. (Refer to Figure 3 and section on *Installation of Panel Mounted Solenoid*).

Optional Features For Type 1 - General Purpose Construction Only

- **Junction Box:** This junction box construction meets Enclosure Types 2, 3, 3S, 4, and 4X. Only solenoids with 1/4″ spade or screw terminals may have a junction box. The junction box provides a 1/2″ conduit connection, grounding and spade or screw terminal connections within the junction box (See Figure 5).
- **DIN Plug Connector Kit No. K236034:** Use this kit only for solenoids with DIN terminals. The DIN plug connector kit provides a two pole with grounding contact DIN Type 43650 construction (See Figure 6).

OPERATION

When the solenoid is energized, the core is drawn into the solenoid base sub-assembly.

IMPORTANT: When the solenoid is de-energized, the initial return force for the core, whether developed by spring, pressure, or weight, must exert a minimum force to overcome residual magnetism created by the solenoid. Minimum return force for AC construction is 0.69lbs (3.1N) and 0.31 lbs (1.38N) for DC.

INSTALLATION

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

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

FOR BLACK ENCLOSURE TYPES 7 AND 9 ONLY

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

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

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

Temperature Limitations

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

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

Temperature Limitations For Series 8016G Solenoids for use on Valves Rated at 6.1, 8.1, 9.1, 10.6 or 11.1 Watts			
Watt Rating	Catalog Number Coil Prefix	Class of Insulation	Maximum § Ambient Temp.
6.1, 8.1, 9.1 & 11.1	None, FB, KF, KP, SC, SD, SF & SP	F	125°F (52°C)
6.1, 8.1, 9.1 & 11.1	HB, HT, KB, KH, SS, ST & SU	H	140°F (60°C)
10.6**	None, KF, SF, SC, HT, KH, ST & SU	F & H	104°F (40°C)
7.1 @ 60Hz (8.1 @ 50Hz)		F & H	175°F (79°C)*
10.6**		F & H	140°F (60°C)

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

* When used with watertight aluminum junction boxers (screw or spade) max. ambient and fluid temperature will be reduced to 157°F (69.4°C)

** 10.6 Watt solenoids rated for 104°F are 8030, 8260, 8316, 8321, 8320, 8360 & 8344 valves while those rated for 140°F are 8040 valves

Temperature Limitations for Series 8003H, 8007H and 8202H solenoids						
		Watt Ratings			Maximum Ambient Temperature	
Prefix ①	Coil Class	AC		DC		
		60 Hz	50 Hz		°C	°F
EF	FT	6.1	8.1	-	52	125
EF	FB	9.1	11.1	-		
	FT	6.1	8.1	-	55	131
	FB	9.1	11.1	-		
	HT	-	-	10.6	40 ②	104②
	HB	-	-	18.6		
EF	HT	-	-	10.6		
EF	HB	-	-	18.6		
	HT	6.1	8.1	-	60 ③	140 ③
	HB	9.1	11.1	-		
EF	HT	6.1	8.1	-		
EF	HB	9.1	11.1	-		

①= EF data applies to Explosionproof coils only.

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

③= Steam Service Valves have a maximum ambient temperature of 55° C/ 131°F.

Positioning

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

Wiring

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

Additional Wiring Instructions For Optional Features:

- **Open-Frame solenoid with 1/4″ spade terminals.**

For solenoids supplied with screw terminal connections use #12-18 AWG stranded copper wire rated at 90°C or greater. Torque terminal block screws to10±2 in-lbs [1,0±1,2 Nm]. A tapped hole is provided in the solenoid for grounding, use a #10-32 machine screw. Torque grounding screw to 15-20 in-lbs [1,7-2,3 Nm]. On solenoids with screw terminals, the socket head screw holding the terminal block to the solenoid is the grounding screw. Torque the screw to 15-20 in-lbs [1,7-2,3 Nm] with a 5/32″ hex key wrench.

- **Junction Box**

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

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

1. The open-frame solenoid is provided with DIN terminals to accommodate the plug connector kit.
2. Remove center screw from plug connector. Using a small screwdriver, pry terminal block from connector cover.
3. Use #12-18 AWG stranded copper wire rated at 90°C or greater for connections. Strip wire leads back approximately 1/4″ for installation in socket terminals. The use of wire-end sleeves is also recommended for these socket terminals. Maximum length of wire-end sleeves to be approximately 1/4″. Tinning of the ends of the lead wires is not recommended.
4. Thread wire through gland nut, gland gasket, washer and connector cover.

NOTE: Connector housing may be rotated in 90° increments from position shown for alternate positioning of cable entry.

5. Check DIN connector terminal block for electrical markings. Then make electrical hookup to terminal block according to markings on it. Snap terminal block into connector cover and install center screw.
6. Position connector gasket on solenoid and install plug connector. Torque center screw to 5±1 in-lbs [0,6±1,1 Nm].

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

Installation of Solenoid

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

Installation of Panel Mounted Solenoid (See Figure 3)

Disassemble solenoid following instruction under *Solenoid Replacement* then proceed.

3/4" Valve Bonnet Construction

1. Install retainer (convex side to solenoid) in 1.312 diameter mounting hole in customer panel.
2. Position spring washer over plugnut/core tube sub-assembly.
3. Install plugnut/core tube sub-assembly through retainer in customer panel then replace solenoid, nameplate and red cap.

15/16" Valve Bonnet Construction

1. Install solenoid base sub-assembly through 0.69 diameter mounting hole in customer panel.
2. Position spring washer on opposite side of panel over solenoid base sub-assembly then replace.

Solenoid Temperature

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

MAINTENANCE

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

Cleaning

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

Preventive Maintenance

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

Causes of Improper Operation

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

Solenoid Replacement

1. On solenoids with lead wires disconnect conduit, coil leads, and grounding wire.

NOTE: Any optional parts attached to the old solenoid must be reinstalled on the new solenoid.

2. Disassemble solenoids with optional features as follows:
   - **Spade or Screw Terminals**

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

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

   - **Junction Box**

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

   - **DIN Plug Connector**

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

3. Snap off red cap from top of solenoid base sub-assembly.
4. Push down on solenoid. Then using a suitable screwdriver, insert blade in slot provided between solenoid and nameplate/retainer. Pry up slightly and push to remove. Then remove solenoid from solenoid base sub-assembly.
5. Reassemble using exploded views for parts identifcation and placement.

Disassembly and Reassembly of Solenoids

1. Remove solenoid, see *Solenoid Replacement*.
2. Remove spring washer from solenoid base sub-assembly.
3. Unscrew solenoid base sub-assembly.

NOTE: Some solenoid constructions have a plugnut/core tube sub-assembly, bonnet gasket and bonnet in place of the solenoid base sub-assembly. To remove bonnet use special wrench adapter supplied in ASCO Rebuild Kit. For wrench adapter only, order ASCO Wrench Kit No. K218948.

4. The core is now accessible for cleaning or replacement.
5. If the solenoid is part of a valve, refer to basic valve installation and maintenance instructions for further disassembly.
6. Reassemble using exploded views for identification and placement of parts.

ORDERING INFORMATION FOR ASCO SOLENOIDS

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

Torque Chart

Part Name	Torque Value in Inch-Pounds	Torque Value in Newton-Meters
solenoid base sub-assembly	175 ± 25	19,8± 2,8
valve bonnet (3/4" bonnet construction)	90 ± 10	10,2 ± 1,1
bonnet screw (3/8" or 1/2" NPT pipe size)	25	2,8
bonnet screw (3/4" NPT pipe size)	40	4,5

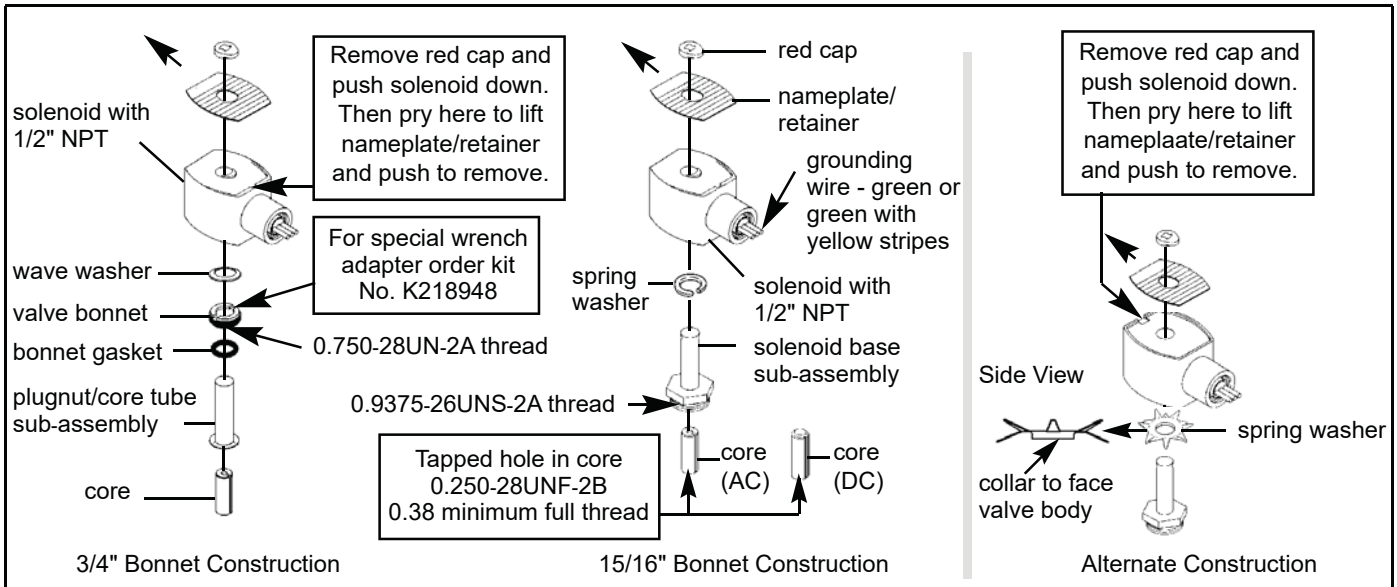


Figure 1. Series 8016G/H solenoids

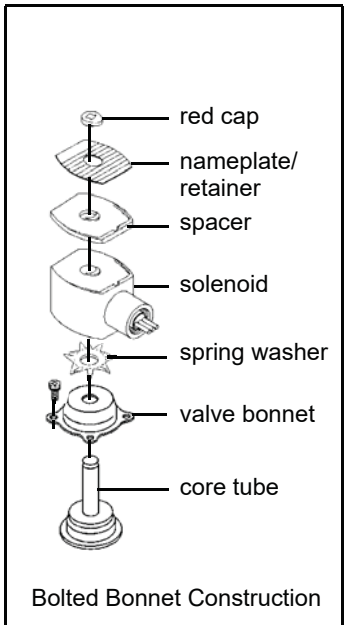


Figure 2. Series 8016G/H solenoids

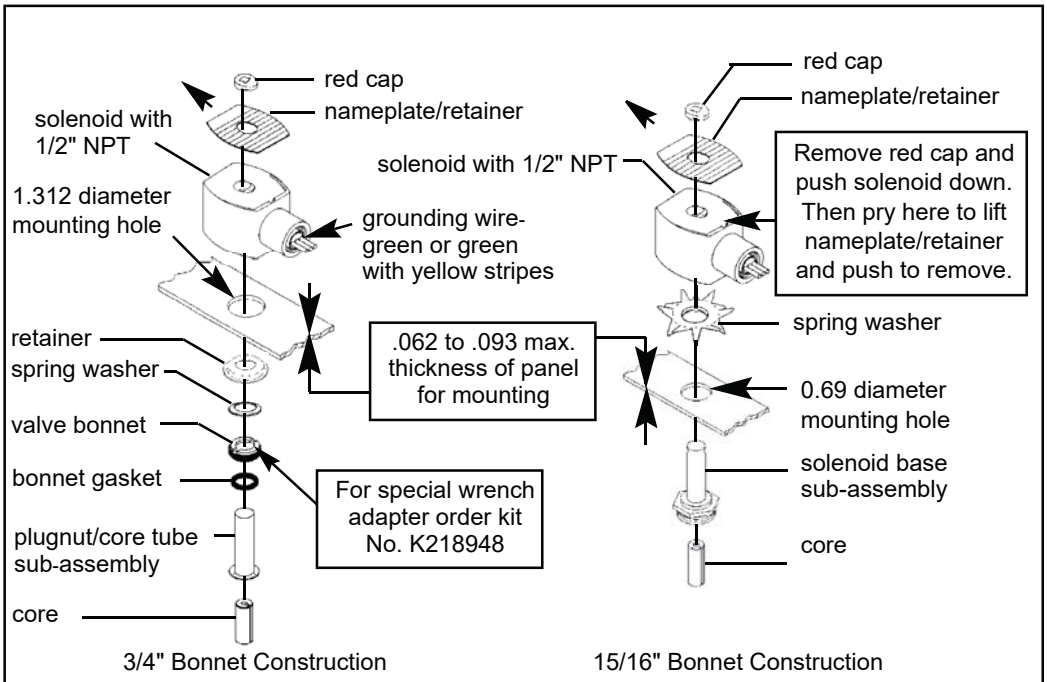


Figure 3. Series 8016G/H panel mounted solenoids

Installation&Maintenance Instructions

ASCO Red-Hat II™

OPEN-FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS

SERIES

8016G/H

NOTICE: See Installation and Maintenance Instructions, I&M No. V6583R11 - Section 1 of 2 for detailed instructions.

Torque Chart

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

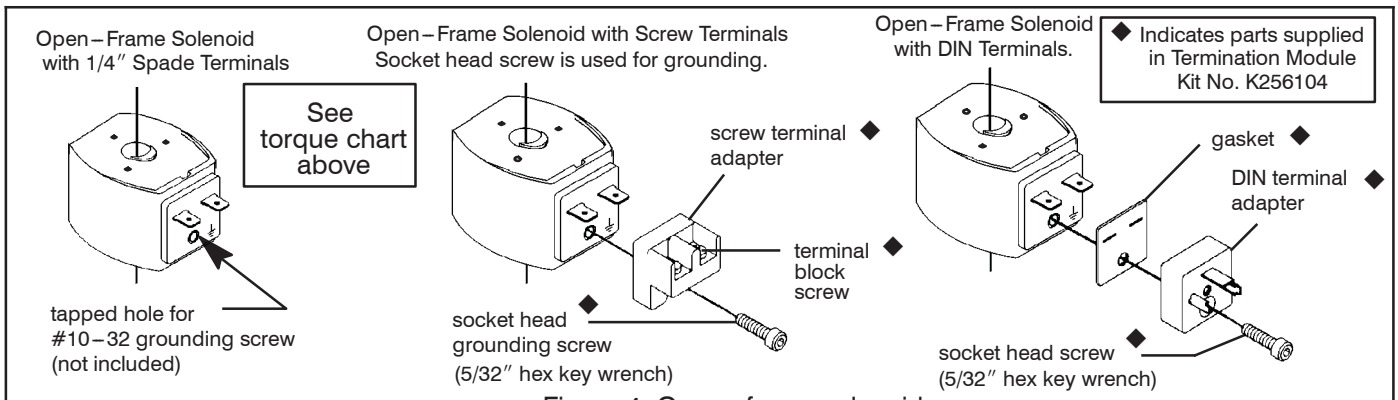


Figure 4. Open–frame solenoids

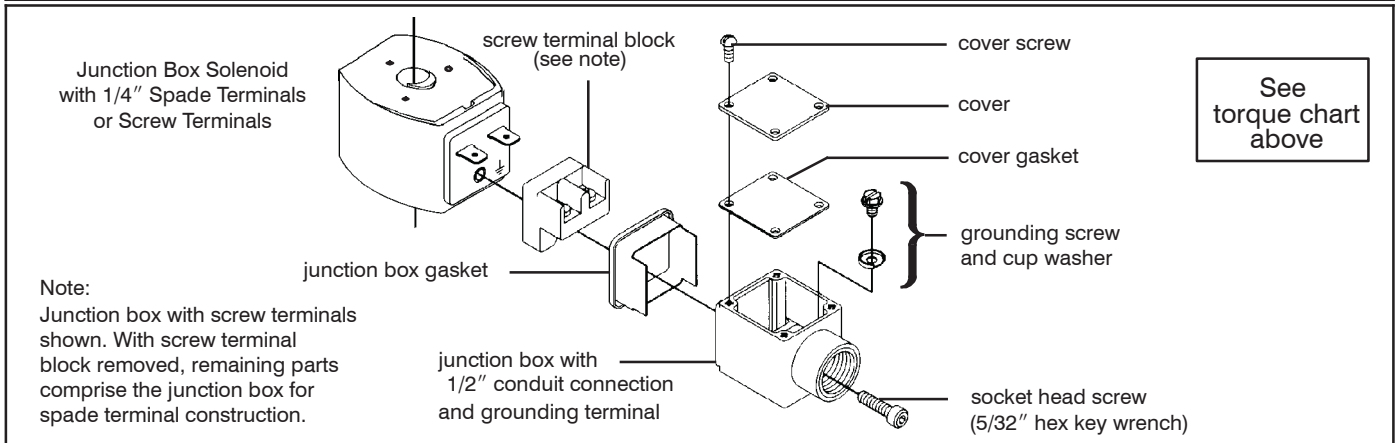


Figure 5. Junction box (optional feature)

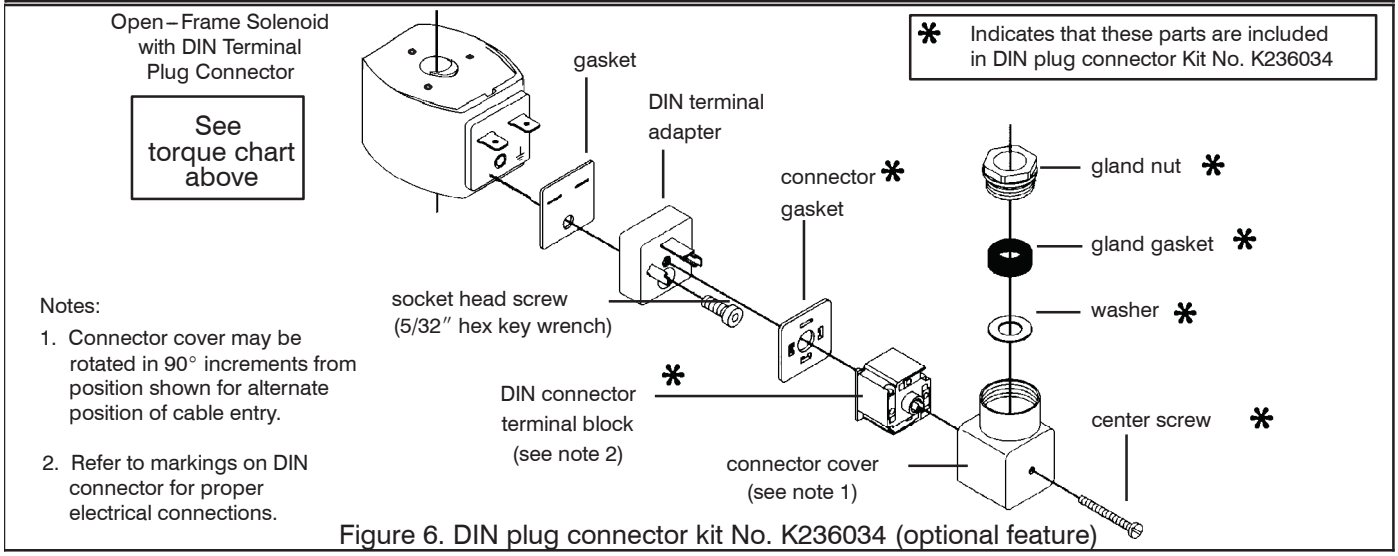


Figure 6. DIN plug connector kit No. K236034 (optional feature)

GB

GENERAL INSTALLATION AND MAINTENANCE INSTRUCTIONS

Note: These general Installation and Maintenance Instructions must be read in conjunction with the Instruction Sheet for the specific product.

INSTALLATION

ASCO Numatics components are intended to be used only within the technical characteristics as specified on the nameplate. Changes to the equipment are only allowed after consulting the manufacturer or its representative. Before installation, depressurize the piping system and clean internally.
The equipment may be mounted in any position if not otherwise indicated on the product by means of an arrow.
The flow direction and pipe connection of valves are indicated on the body.

The pipe connections have to be in accordance with the size indicated on the nameplate and fitted accordingly.

Caution:
- Reducing the connections may cause improper operation or malfunctioning.
- For the protection of the equipment install a strainer or filter suitable for the service involved in the inlet side as close to the product as possible.
- If tape, paste, spray or a similar lubricant is used when tightening, avoid particles entering the system.
- Use proper tools and locate wrenches as close as possible to the connection point.
- To avoid damage to the equipment. DO NOT OVERTIGHTEN pipe connections
- Do not use valve or solenoid as lever.
- The pipe connections should not apply any force, torque or strain to the product.

ELECTRICAL CONNECTION

In case of electrical connections, they are only to be made by trained personnel and have to be in accordance with the local regulations and standards.

Caution:
- Turn off electrical power supply and de-energize the electrical circuit and voltage carrying parts before starting work.
- All electrical screw terminals must be properly tightened according to the standards before putting into service.
- Dependent upon the voltage electrical components must be provided with an earth connection and satisfy local regulations and standards.

The equipment can have one of the following electrical terminals:
- Spade plug connections according to ISO-4400 or 3 x DIN-46244 (when correctly installed, this connection provides IP-65 protection).
- Embedded screw terminals in metal enclosure with "Pg" cable gland
- Spade terminals (AMP type).
- Flying leads or cables.

PUTTING INTO SERVICE

Before pressurizing the system, first carry-out an electrical test. In case of solenoid valves, energize the coil a few times and notice a metal click signifying the solenoid operation.

SERVICE

Most of the solenoid valves are equipped with coils for continuous duty service. To prevent the possibility of personal or property damage, do not touch the solenoid which can become hot under normal operating conditions.

SOUND EMISSION

The emission of sound depends on the application, medium and nature of the equipment used. The exact determination of the sound level can only be carried out by the user having the valve installed in his system

MAINTENANCE

Maintenance of ASCO Numatics products is dependent on service conditions. Periodic cleaning is recommended, the timing of which will depend on the media and service conditions. During servicing, components should be examined for excessive wear. A complete set of internal parts is available as spare parts or rebuild kit. If a problem occurs during installation/maintenance or in case of doubt please contact ASCO Numatics or authorized representatives.

*A separate Declaration of Incorporation relating to EU-Directive 2006/42/EC Annex IIB is available on request for applicable products. Please provide product identification number and serial numbers of products concerned.

The product, , when marked CE, complies with the essential requirements of the EMC 2004/108/EC (until April 20th 2016) and EMC 2014/30/EU (from April 20th 2016) and LVD 2006/95/EC (until April 20th 2016) and LVD 2014/35/EU (from April 20th 2016). A separate Declaration of Conformity is available on request. Please provide product identification number and serial numbers of the products concerned.

FR

INSTRUCTIONS GÉNÉRALES D'INSTALLATION ET D'ENTRETIEN

Note: Ces instructions générales d'installation et d'entretien complètent la notice spécifique du produit.

MONTAGE

Les composants ASCO Numatics sont conçus pour les domaines de fonctionnement indiqués sur la plaque signalétique ou la documentation. Aucune modification ne peut être réalisée sur le matériel sans l'accord préalable du fabricant ou de son représentant. Avant de procéder au montage, dépressuriser les canalisations er effectuer un nettoyage inteme.
A moins qu'une fléche ou la notice n'indique un sens de montage spécifique de la tête magnétique, le produit peut être monté dans n'importe quelle position
Le sens de circulation du fluide est indiqué par repères sur le corps er dans la documentation.
La dimension des tuyauteries doit correspondre au raccordement indiqué sur le corps, l'étiquette ou la notice.

Attention:
- Une restriction des tuyauteries peut entraîner des dysfonctionnements.
- Afin de protéger le matériel, installer une crépine ou un filtre adéquat en amont, aussi près que possible du produit.
- En cas d' utilisation de ruban; pàte, aérosol ou autre lubrifiant lors du serrage, veiller à ce qu" aucun corps étranger ne pénètre dans le circuit.
- Utiliser un outillage approprié et placer les clés aussi près que possible du point de raccordement.
- Afin d'éviter toute détérioration, NE PAS TROP SERRER les raccords des tuyauteries.
- Ne pas se servir de la vanne ou de tête magnétique comme d'un levier.
- The pipe connections should not apply any force, torque or strain to the product.

RACCORDEMENT ÉLECTRIQUE

Le raccordement électrique doit être réalisé par un personnel qualifié et selon les normes et règlements locaux.

Attention:
- Avant toute intervention, couper l'alimentation électrique pour mettre hors tension les composants.
- Toutes les bornes à vis doivent être serrées correctement avant la mise en service.
- Selon la tension, les composants électrique doivent être mis à la terre conformément aux normes et règlements locaux.

Selon les cas, le raccordement électrique s'effectué par:
- Connecteur débrochable ISO-4400 ou 3 x DIN-46244 avec degré de protection IP-65 lorsque le raccordement est correctement effectué.
- Bornes à vis solidaires du bobinage, sous boîter métallique avec presse-étoupe "Pg--".
- Cosses (type AMP).
- Fils ou câbles solidaires de la bobine.

MISE EN SERVICE

Avant de mettre le circuit sous pression, effectuer un essai électrique. Dans le cas d'une électrovanne, mettre la bobine sous tension plusieurs fois er écouter le "clic" métallique qui signale le fonctionnement de la tête magnétique.

FONCTIONNEMENT

La plupart des électrovannes comportant des bobinages prévus pour mise sous tension permanente. Pour éviter toute brûlure, ne pas toucher la tête magnétique qui, en fonctionnement normal et en permanence sous tension, peut atteindre une température élevée.

BRUIT DE FONCTIONNEMENT

Le bruit de fonctionnement varie selon l'utilisation, le fluide et le type de matériel employé. L'utilisateur ne pourra déterminer avec précision le niveau sonore émis qu'après avoir monté le composant sur l'installation.

ENTRETIEN

L'entretien nécessaire aux produits ASCO Numatics varie avec leurs conditions d'utilisation. Il est souhaitable de procéder à un nettoyage périodique dont l'intervalle varie suivant la nature du fluide, les conditions de fonctionnement et le milieu ambiant. Lors de l'intervention. Les composants doivent être examinés our détecter toute usure excessive. Un ensemble de pièces internes est proposé en pièces de rechange pour procéder à la réfection. En cas de problème lors du montage/entretien ou en cas de doute, veuillez contacter ASCO Numatics ou ses représentants officiels.

*Une déclaration d'incorporation relative à la directive UE 2006/42/CE Annexe II B est disponible sur demande pour les produits applicables. Veuillez fournir le numéro d'identification du produit et les numéros de série des produits concernés.

Lorsqu'il est marqué du label CE, le produit est conforme aux exigences essentielles des directives CEM 2004/108/CE (jusqu'au 20 avril 2016) et CEM 2014/30/UE (à partir du 20 avril 2016) et des directives Basse tension 2006/95/CE (jusqu'au 20 avril 2016) et 2014/35/UE (à partir du 20 avril 2016). Une déclaration de conformité peut être fournie sur simple demande. Veuillez fournir le numéro d'identification du produit et les numéros de série des produits concernés.

DE

ALLGEMEINE BETRIEBSANLEITUNG

Achtung: Diese Allgemeine Betriebsanleitung gilt in Zusammenhang mit der jeweiligen Betriebsanleitung für die speziellen Produkte.

EINBAU

Die ASCO Numatics-Komponenten dürfen nur innerhalb der auf den Typenschildern angenebenen Daten eingesetzt warden, Veränderungen an den Produkten sind nur nach Rücksprache mit ASCO Numatics zulässig.
Vor dem Einbau der Ventile muß das Rohrleitungssystem drucklos geschaltet und innen gereinigt werden.
Die Einbaulage der Produkte ist genereil beliebig. Ausnahme: Die mit einem Pfeil gekennzeichneten Produkte müssen entsprechend der Pfeilrichtung montiert werden.
Die Durchflußrichtung und der Eingang von Ventilen sind gekennzeichnet.

Die Rohranschlüsse sollten entsprechend den Größenangaben auf den Typenschildern mit handelsüblichen Verschraubungen durchgeführt werden. Dabei ist folgendes zu beachten:
- Eine Reduzierung der Anschlüsse kann zu Leistungs-und Funktionsminderungen führen.
- Zum Schutz der Ventile sollten Schmutzfänger oder Filter so dicht wie möglich in den Ventileingang integriert werden.
- Bei Abdichtung am Gewinde ist darauf zu achten, daß kein Dichtungsmaterial in die Rohrleitung oder das Ventil gelangt.
- Zur Montage darf nur geeignetes Werkzeug verwendetwerden.
- Konische Verschraubungen sind sorgfältig anzuziehen. Es ist darauf zu achten, daß beim Anziehen das Gehäuse nicht beschädigt wird.
- Spule und Führungsrohr von Ventilen dürfen nicht als Gegenhalter benutzt werde.
- Die Rohrleitungsanschlüsse sollen fluchten und dürfen keine Spannungen auf das Ventil übertragen.

ELECTRISCHER ANSCHLUß

Der elektrische Anschluß ist von Fachpersonal entsprechend den geltenden VDE-und CEE Richtlinien auszuführen. Es ist besonders auf foigendes zu achten:
- Vor Beginn der Arbeiten ist sicherzustellen, daß alle elektrischen Leitungen und Netzteile spannungslos geschaltet sind.
- Alle Anschlußklemmen sind nach Beendigung der Arbeiten vorschriftsmäßig entsprechend den geltenden Regeln anzuziehen.
- Je nach Spannungsbereich muß das Ventil nach den geltenden Regeln einen Schutzleiteranschluß erhalten.

Der Magnetantrieb kann je nach Bauart folgende Anschlüsse haben:
- Anschluß für Gerätesteckdose nach DIN 43650 Form A/ISO 4400 oder 3 x DIN 46244 (durch ordnungsgemäße Montage der Gerätesteckdose wird Schutzklasse IP 65 erreicht).
- Anschlüsse innerhalb eines Blechgehäuses mittels Schraubklemmen. Kabeleinführung ins Gehäuse mit PG-Verschraubung.
- Offene Spulen mit Flachsteckern (AMP-Fahnen) oder mit eingegossenen Kabelenden.

INBETRIEBNAHME

Vor Druckbeaufschlagung des Produktes sollte eine elektrische Funktionsprüfung erfolgen:

Bei Ventilen Spannung an der Magnetspule mehrmals ein-und ausschalten. Es muß ein Klicken zu hören sein.

BETRIEB

Die meisten Ventile sind mit Spulen für Dauerbetrieb ausgerüstet. Zur Vermeidung von Personen-und Sachschäden sollte jede Berührung mit dem Ventil vermieden werden, da die Magnetspule bei längerem Betrieb sehr heiß werden kann.

GERÄUSCHEMISSION

Diese hängt sehr stark vom Anwendungsfall, den Betriebsdaten und dem Medium, mit denen das Produkt beaufschlagt wird, ab. Eine Aussage über die Geräuschemission des Produktes muß deshalb von demjenigen getroffen werden, der das Produkt innerhalb einer Maschine in Betrieb nimmit.

WARTUNG

Die Wartung hängt von den Einsatzbedigungen ab. In entsprechenden Zeitabständen muß das Produkt geöffnet und gereinigt werden. Für die Überholung der ASCO Numatics-Produkte können Ersatzteilsätze geliefert werden. Treten Schwierigkeiten bel Einbau, Betrieb oder Wartung auf, sowie bei Unklarheiten, ist mit ASCO Numatics Rücksprache zu halten.

ASCO Numatics Produkte sind entsprechend der EG-Richtlinie 89/392/EWG gefertigt.

*Eine separate Herstellererklärung im Sinne der Richtlinie 2006/42/EWG Anhang II B ist auf Anfrage für die entsprechenden Produkte erhältlich. Geben Sie bitte die Kennnummer sowie die Seriennummer der betreffenden Produkte an.

Das Produkt, wenn mit CE gekennzeichnet, erfüllt die Anforderungen von EMV 2004/108/EWG (bis 20. April 2016) und EMV 2014/30/EU (vom 20. April 2016) und LVD 2006/95/EWG (bis 20. April 2016) und LVD 2014/35/EU (vom 20. April 2016). Eine separate Konformitätserklärung ist auf Anfrage erhältlich. Geben Sie bitte die Kennnummer sowie die Seriennummer der betreffenden Produkte an.

ASCO
50 Hanover Road
Florham Park, New Jersey 07932
Tel. (973) 966-2000
Fax (973) 966-2628

ASCO
1561 Columbia Highway
Aiken, South Carolina 29801
Tel. (803) 641-9200
Fax (803) 641-9290

ASCO Valves® E 264274 - 04/2016

ASCO

8320G094, SOLENOID VALVE

LEFT BLANK

Installation & Maintenance Instructions

2-WAY INTERNAL PILOT-OPERATED SOLENOID VALVES
HUNG DIAPHRAGM — 3/8 ", 1/2" AND 3/4" NPT
NORMALLY CLOSED OPERATION

SERIES
8210
8211

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

DESCRIPTION

Series 8210 valves are 2-way normally closed, internal pilot operated solenoid valves. Valve body and bonnet are of brass construction. Series 8210 valves may be provided with a general purpose/watertight, open-frame or explosionproof/ watertight solenoid.

Series 8210 and 8211 valves with suffix "HW" in the catalog number are specifically designed for hot water service.

Notice: These valves are not certified as lead-free under the Safe Water Drinking Act SWDA 1417 and are not intended for use on drinking water systems. They are intended for control of water in industrial applications. Consult ASCO for valves rated for use in potable water applications.

OPERATION

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

Manual Operator (Optional)

Valves with suffix "MO" in catalog number are provided with a manual operator which allows manual operation when desired or during an interruption of electrical power. To operate valve manually, push in knurled cap and rotate 180°. Disengage manual operator by rotating knurled cap counterclockwise 180° before operating electrically.

Manual Operator Location (Refer to Figure 3)

Manual operator (when shipped from factory) will be located over the valve outlet. Manual operator may be relocated at 90° increments by rotating valve bonnet. Remove bonnet screws (4) and rotate valve bonnet with solenoid to desired position. Replace bonnet screws (4) and torque in a crisscross manner to 110±10 inch pounds.

If valve is installed in the system and is operational, proceed in the following manner:

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

1. Remove the solenoid - see separate solenoid instructions.
2. Remove bonnet screws (4) and rotate valve bonnet to desire position.
3. Replace bonnet screws (4) and torque in a crisscross manner to 110±10 inch pounds.
4. Replace all solenoid parts.

INSTALLATION

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

Temperature Limitations

For maximum valve ambient and fluid temperatures, refer to chart. The temperature limitations listed are for UL applications. For non UL applications, higher ambient and fluid temperature limitations are available. Consult factory. Check catalog number on nameplate to determine maximum temperatures.

Construction	Max. Fluid Temp, °F
AC Construction (Alternating Current)	180
DC Construction (Direct Current)	150
Catalog Numbers Suffixed "HW" AC Construction (Alternating Current)	210

Note: For Maximum Ambient Temperature specifications, see separate solenoid instructions.

Positioning

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

Mounting

For mounting bracket (optional feature) dimensions, refer to Figure 1.

Piping

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

IMPORTANT: Valves with Suffix "HW" in the catalog number have a special diaphragm material which is specifically compounded for hot water service. This material can be attacked by oil and grease. Wipe the pipe threads clean of cutting oils and use PTFE tape to seal pipe joints.

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

MAINTENANCE

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

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

Cleaning

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

Preventive Maintenance

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

Causes of Improper Operation

- **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
- **Excessive Leakage:** Disassemble valve and clean all parts. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

Coil Replacement (See separate solenoid instructions)

Valve Disassembly (Refer to Figures 2 and 3)

1. Remove the solenoid - see separate solenoid instructions.
2. Unscrew solenoid base sub-assembly and remove bonnet gasket.
3. Remove valve bonnet screws (4) and valve bonnet.
4. For normal maintenance, it is not necessary to disassemble the manual operator (optional feature) unless external leakage is evident. To disassemble, remove stem pin, manual operator stem, stem spring and stem gasket.
5. Remove core spring, core/diaphragm sub-assembly and body gasket. CAUTION: Do not damage or distort hanger spring between core/diaphragm sub-assembly.
6. All parts are now accessible for cleaning or replacement. Replace worn or damaged parts with a complete Spare Parts Kit for best results.

Valve Reassembly

1. Reassemble in reverse order of disassembly paying careful attention to exploded views provided for identification and placement of parts.
2. Lubricate body gasket and solenoid base gasket with DOW CORNING® 200 fluid lubricant or an equivalent high-grade silicone fluid. Lubricate manual operator stem gasket with DOW CORNING® 111 Compound lubricant or an equivalent high-grade silicone grease. On oxygen valves Suffix "N" and special cleaning valves where silicone lubricants are not allowed use FLOROLUBE® GR-362, LG-160 or KRYTOX® GPL -226.

Note: Only the gaskets specified above should be lubricated.

3. Replace body gasket and core/diaphragm sub-assembly. Locate the bleed hole in core/diaphragm sub-assembly approximately 45° from the valve outlet.
4. Replace core spring with wide end in core first; closed end protrudes from top of core.
5. If removed, replace manual operator stem, stem spring, stem gasket and stem pin.
6. Replace valve bonnet and bonnet screws (4). Torque bonnet screws (4) in a crisscross manner to 110±10 inch pounds.
7. Replace bonnet gasket and solenoid base sub-assembly. Put solenoid base sub-assembly to 175±25 inch pounds.
8. Replace solenoid enclosure and retaining cap or clip.
9. After maintenance, operate the valve a few times to be sure of proper opening and closing.

ORDERING INFORMATION FOR ASCO REBUILD KITS

Parts marked with an asterisk(*) in the exploded view are supplied in Rebuild Kits. When Ordering Rebuild Kits for ASCO Valves, order the Rebuild Kit number stamped on the valve nameplate. If the number of the kit is not visible, order by indicating the number of kits required, and the Catalog Number and Serial Number of the valve(s) for which they are intended.

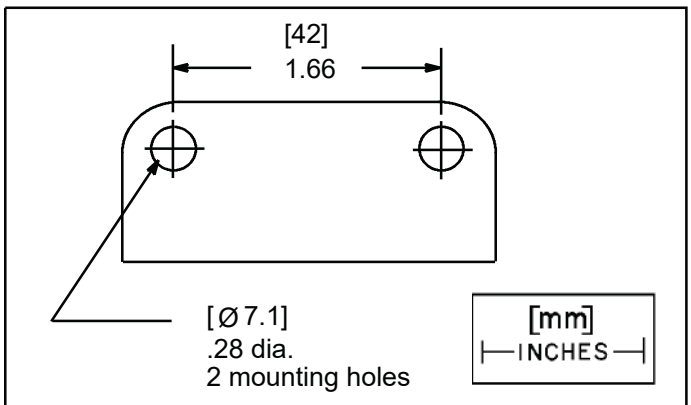
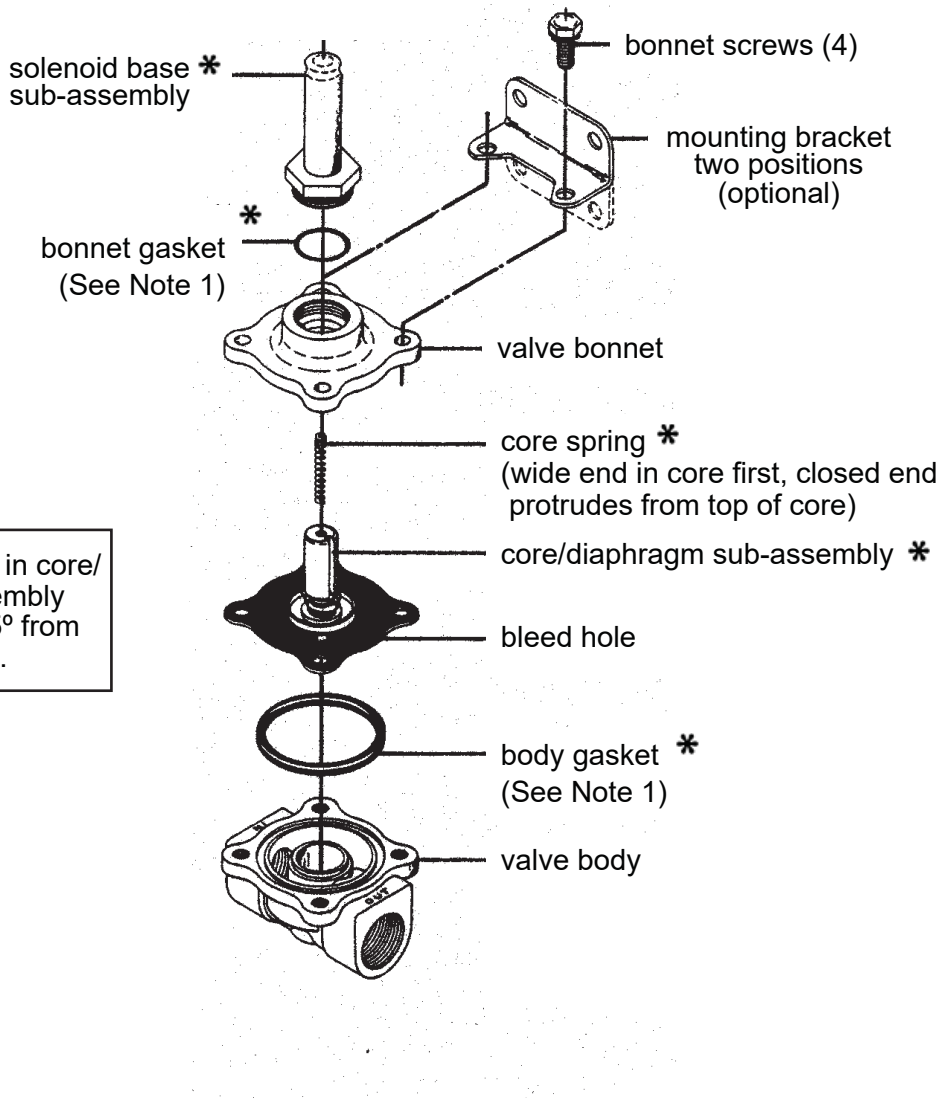


Figure 1. Mounting bracket dimensions

* Indicates parts supplied in ASCO Rebuild Kit

Torque solenoid base sub-assembly to 175±25 inch pounds.

Torque bonnet screws (4) in a crisscross manner to 110±10 inch pounds.



Locate bleed hole in core/ diaphragm assembly approximately 45º from valve outlet.

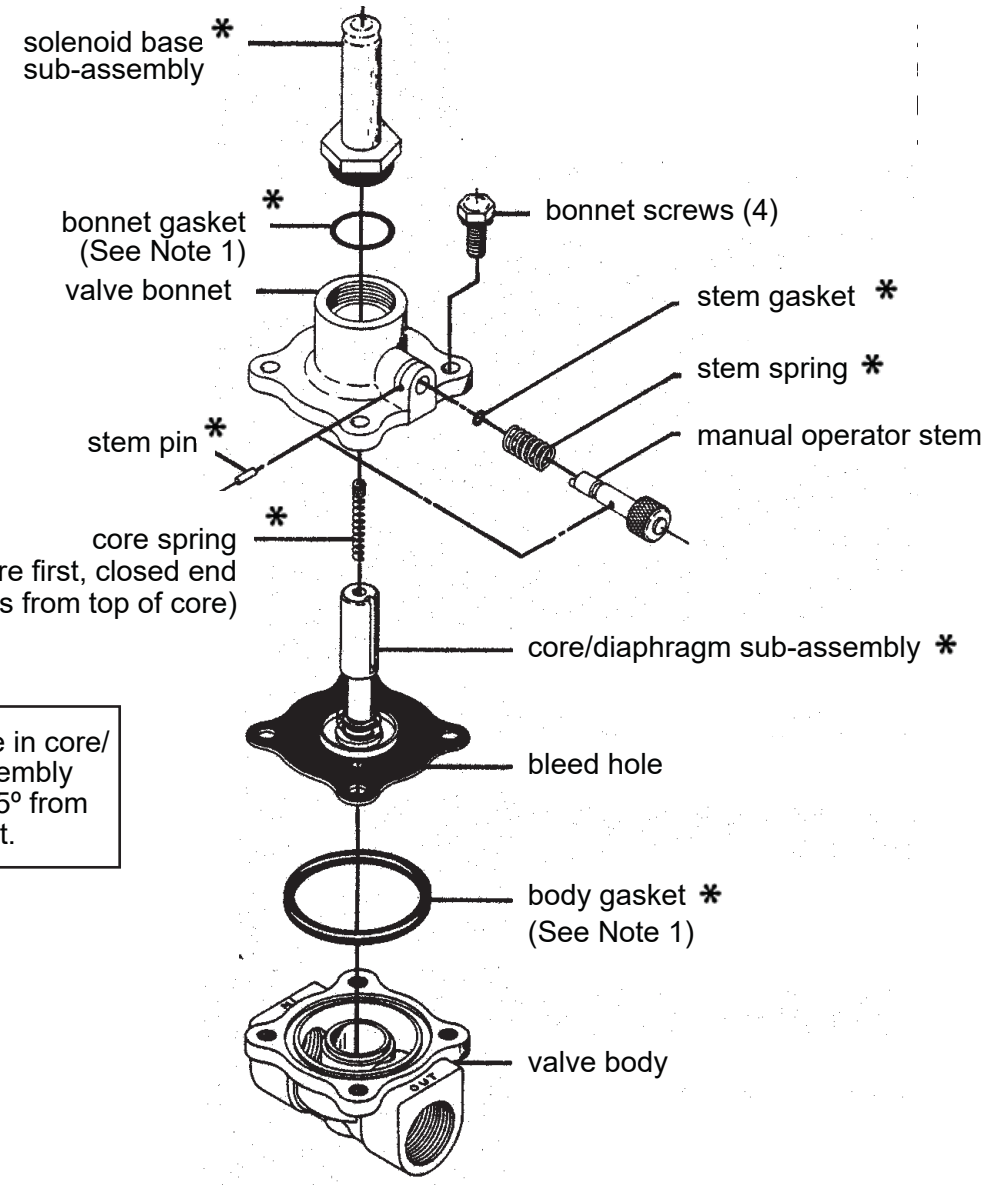
Note 1: Lubrication required for body and bonnet gaskets. See valve reassembly instructions

Figure 2. Series 8210 - 3/8", 1/2" & 3/4" NPT - AC Construction

* Indicates parts supplied in ASCO Rebuild Kit

Torque solenoid base sub-assembly to 175±25 inch pounds.

Torque bonnet screws (4) in a crisscross manner to 110±10 inch pounds.



Locate bleed hole in core/diaphragm assembly approximately 45º from valve outlet.

Note 1: Lubrication required for body and bonnet gaskets. See valve reassembly instructions

Figure 3. Series 8210 - Manual Operator

Installation&Maintenance Instructions

ASCO Red-Hat II™

OPEN-FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS
OPTIONAL FEATURE FOR OPEN FRAME (GENERAL PURPOSE) CONSTRUCTION ONLY

SERIES
8003G/H
8007G/H
8202G/H

— SERVICE NOTICE —

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

See separate instructions for basic valve.

DESCRIPTION

Catalog numbers 8003G/H, 8007G/H and 8202G/H and are epoxy encapsulated pull-type solenoids. The green solenoid with lead wires and 1/2 conduit connection is designed to meet Enclosure Type 1-General Purpose, Type 2-Dripproof, Types 3 and 3S-Raintight, and Types 4 and 4X-Watertight. The black solenoid on catalog numbers prefixed "EF" or "EV" is designed to meet Enclosure Types 3 and 3S-Raintight, Types 4 and 4X-Watertight, Types 6 and 6P-Submersible, Type 7, Explosionproof Class I, Division1 Groups A, B, C, & D and Type 9, -Dust-Ignitionproof Class II, Division1 Groups E, F & G. The Class II, Groups F & G Dust Locations designation is not applicable for solenoids or solenoid valves used for steam service or when a class "H" solenoid is used. See *Temperature Limitations* section for solenoid identification and nameplate/retainer for service. When installed just as a solenoid and not attached to an ASCO valve, the core has a 0.250-28 UNF-2B tapped hole, 0.38 or 0.63 minimum full thread.

NOTE: Catalog number prefix "EV" denotes stainless steel construction.

Solenoid catalog numbers 8202G/H1, 8202G/H3, 8202G/H5 and 8202G/H7 are epoxy encapsulated push-type, reverse-acting solenoids having the same enclosure types as previously stated for Catalog numbers 8003G/H1 and 8003G/H2. 8007G/H are 3-way solenoid operators with a pipe port or adapter, exhaust protector or vent at the top of the solenoid base sub-assembly.

Series 8003G/H, 8007G/H and 8202G/H solenoids are also available in:

- **Open-Frame Construction:** The green solenoid may be supplied with 1/4″ spade, screw or DIN terminals. (Refer to Figure 4)
  - □ **DIN Plug Connector Kit No. K236034:** Use this kit only for solenoids with DIN terminals. The DIN plug connector kit provides a two pole with grounding contact DIN Type 43650 construction (See Figure 6).
- **Panel Mounted Construction:** These solenoids are specifically designed to be panel mounted by the customer. Refer to Figures specified in this I&M and the section on *Installation of Panel Mounted Solenoid* for details.
- **Junction Box:** This junction box construction meets Enclosure Types 2, 3, 3S, 4, and 4X. Only solenoids with 1/4″ spade or screw terminals may have a junction box. The junction box provides a 1/2″ conduit connection, grounding and spade or screw terminal connections within the junction box (See Figure 5).
- **Multipin Connectors:** All Multipin connectors (VT, VB, ZT, ZB) do not have any enclosure ratings.

NOTE: For China RoHS Hazardous Substances table, please go to the link below or scan QR code:
www.asco.com/ChinaRoHSDisclosure

OPERATION

Series 8003G/H and 8007G/H - When the solenoid is energized, the core is drawn into the solenoid base sub-assembly.

IMPORTANT: When the solenoid is de-energized, the initial return force for the core, whether developed by spring,pressure, or weight, must exert a minimum force to overcome residual magnetism created by the solenoid. Minimum return force for AC construction is 11 ounces, and 5 ounces for DC construction.

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

INSTALLATION

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

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

⚠ AVERTISSEMENT: Risque d'accès aux parties électriques actives. Afin d'éviter tout risque de mort, blessure ou dommage, installer la bobine dans un boitier.

FOR BLACK ENCLOSURE TYPES 7 AND 9 ONLY

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

⚠ ATTENTION : Afin d'éviter le risque de de feu ou d'explosion, ne pas installer la bobine ou l'électrovanne ou la température d'inflammation en atmosphère explosible est inferieure à 165°C. Pour les vannes vapeur ou lorsqu'une bobine de classe H est utilisée, ne pas installer en atmosphère explosible lorsque la température d'inflammation est inférieure à 180°C. Consulter les conditions d'utilisations sures indiquées sur le produit ou dans la notice.

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

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

⚠ ATTENTION : Afin de protéger l'électrovanne ou l'actionneur, installer une crépine ou un filtre adapté le plus proche possible en amont de l'électrovanne ou de l'actionneur. Nettoyer périodiquement le filtre en fonction des conditions d'utilisation. Se référer aux séries 8600 et 8601 pour les crépines.

Temperature Limitations

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

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

Temperature Limitations For Series 8003G, 8007G or 8202G			
Watt Rating	Catalog Number Coil Prefix	Class of Insulation	Maximum § Ambient Temp.
10.1 & 17.1	None, FB, KF, KP, SC, SD, SF, SP, VT, VB, ZT & ZB	F	125°F (52°C)
10.1, 17.1 & 24.6	HB, HT, KB, KH, SS, ST, SU, HC	H	140°F (60°C)
11.6 & 22.6	None, FB, KF, KP, SC, SD, SF, SP, VT, VB, ZT & ZB	F	104°F (40°C)
11.6 & 22.6	HP, HT, KB, KH, SS, ST, SU & SV	H	104°F (40°C)
15.6	None, KB, SS, SV	H	104°F (40°C)

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

Temperature Limitations for Series 8003H, 8007H and 8202H solenoids						
		Watt Ratings			Maximum Ambient Temperature	
Prefix [1]	Coil Class	AC 60 Hz	AC 50 Hz	DC	°C	°F
EF, EV	FT	10.1	10.1	-	52	125
EF, EV	FB	17.1	17.1	-		
	FT	10.1	10.1	-	55	131
	FB	17.1	17.1	-		
	HT	-	-	11.6	40 [2]	104 [2]
	HF	-	-	15.6		
	HB	-	-	22.6		
EF, EV	HT	-	-	11.6		
EF, EV	HF	-	-	15.6		
EF, EV	HB	-	-	22.6		
	HT	10.1	10.1	-	60 [3]	140 [3]
	HB	17.1	17.1	-		
EF, EV	HT	10.1	10.1	-		
EF, EV	HB	17.1	17.1	-		
EF, EV	HC	-	-	24.6		

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

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

[3] = Steam Service Valves have a maximum ambient temperature of 55° C/ 131°F.

Positioning

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

Wiring

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

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

⚠ ATTENTION: Application cryogénique. Les câbles électriques ne doivent pas être soumis à des températures cryogéniques. Une protection adequate des cables électriques doit être fournie.

Additional Wiring Instructions For Optional Features:

- **Open-Frame solenoid with 1/4″ spade terminals.**

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

- **Junction Box**

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

Multipin Connector		
Connector Type	Mating Connector	Application
VT / VB	4-Pin, M12, Female, Single Keyway	DC
	4-Pin, M12, Female, Dual Reverse Keyway	AC
ZT / ZB	3-Pin, Mini, Female, Single Keyway	AC / DC

- **DIN Plug Connector Kit No. K236034**
  1. The open-frame solenoid is provided with DIN terminals to accommodate the plug connector kit.
  2. Remove center screw from plug connector. Using a small screwdriver, pry terminal block from connector cover.
  3. Use #12-18 AWG stranded copper wire rated at 90°C or greater for connections. Strip wire leads back approximately 1/4″ for installation in socket terminals. The use of wire-end sleeves is also recommended for these socket terminals. Maximum length of wire-end sleeves to be approximately 1/4″. Tinning of the ends of the lead wires is not recommended.
  4. Thread wire through gland nut, gland gasket, washer and connector cover.

NOTE: Connector housing may be rotated in 90° increments from position shown for alternate positioning of cable entry.

5. Check DIN connector terminal block for electrical markings. Then make electrical hookup to terminal block according to markings on it. Snap terminal block into connector cover and install center screw.
6. Position connector gasket on solenoid and install plug connector. Torque center screw to 5±1 in-lbs [0,6±1,1 Nm].

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

Installation of Solenoid

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

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

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

Solenoid Temperature

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

MAINTENANCE

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

⚠ AVERTISSEMENT: Pour éviter tous danger de mort, de blessure grave ou de dommage matériel, avant d'intervenir sur la vanne, couper le courant, purger la vanne dans une zone sécurisée.

Cleaning

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

Preventive Maintenance

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

Causes of Improper Operation

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

Solenoid Replacement

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

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

2. Disassemble solenoids with optional features as follows:
   - **Spade or Screw Terminals**
     Remove terminal connections, grounding screw, grounding wire, and terminal block (screw terminal type only).

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

   - **Junction Box**
     Remove conduit and socket head screw (use 5/32″ hex key wrench) from center of junction box. Disconnect junction box from solenoid.
   - **DIN Plug Connector**
     Remove center screw from DIN plug connector. Disconnect DIN plug connector from adapter. Remove socket head screw (use 5/32″ hex key wrench), DIN terminal adapter, and gasket from solenoid.
3. Remove red cap or retainer from top of solenoid base sub-assembly. For 3-way construction with pipe adapter (Figure 3), remove pipe adapter, nameplate and solenoid. Omit steps 4 and 5.
4. Push down on solenoid. Then using a suitable screwdriver, insert blade between solenoid and nameplate/retainer. Pry up slightly and push to remove. NOTE: Series 8202G/H solenoids have a spacer between the nameplate/retainer and solenoid.
5. Remove solenoid from solenoid base sub-assembly.
6. Reassemble in reverse order of disassembly. Use exploded views for identification and placement of parts.
7. Torque pipe adapter to 90 inch-pounds maximum [10,2 Nm maximum]. Then make up piping or tubing to pipe adapter on solenoid.

Disassembly and Reassembly of Solenoids

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

ORDERING INFORMATION FOR ASCO SOLENOIDS

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

Torque Chart

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

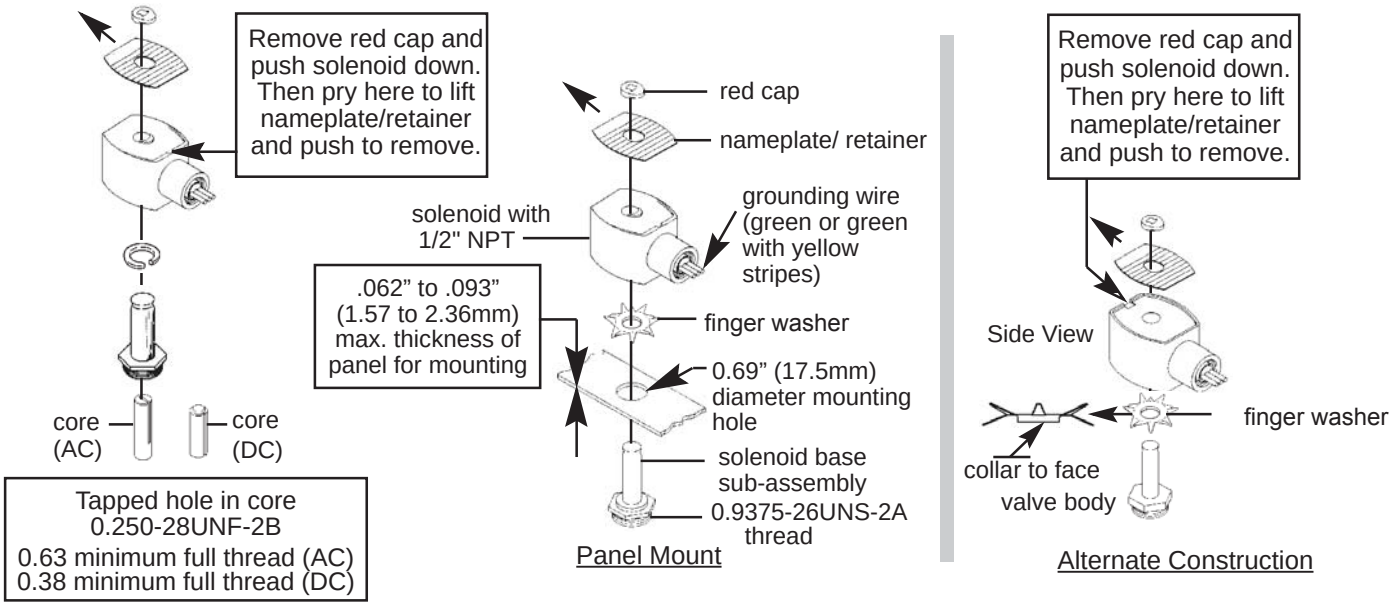


Figure 1. Series 8003G/H Solenoids

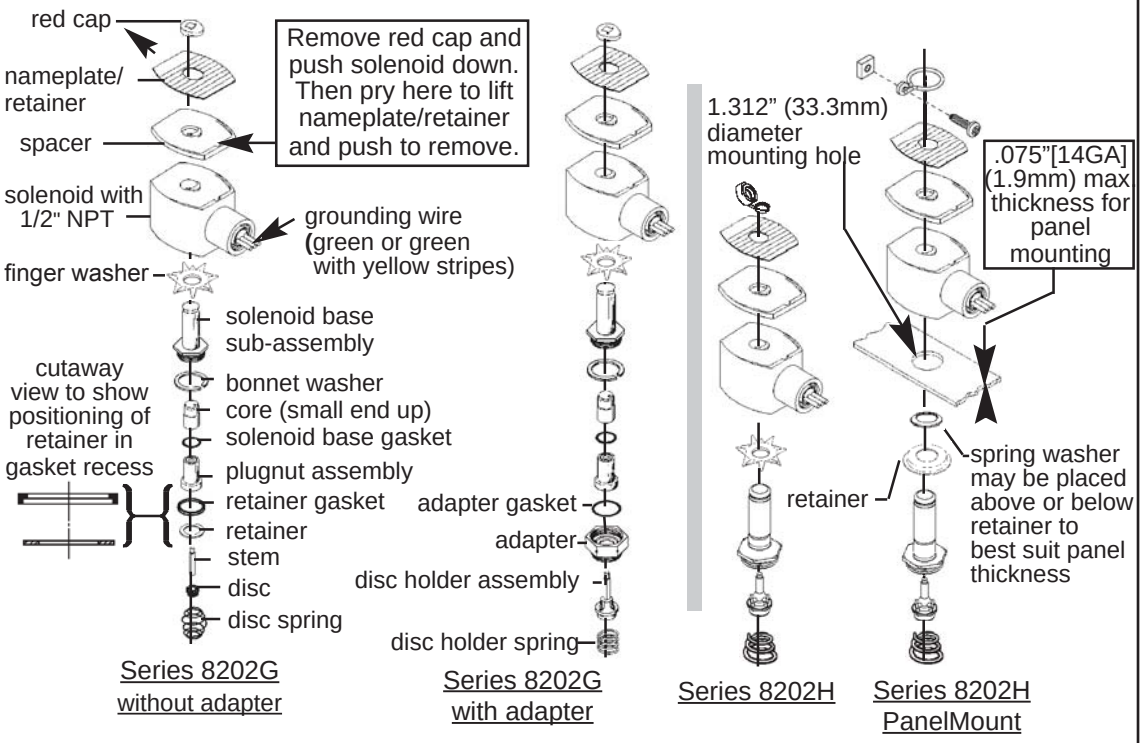


Figure 2. Series 8202G/H Solenoids

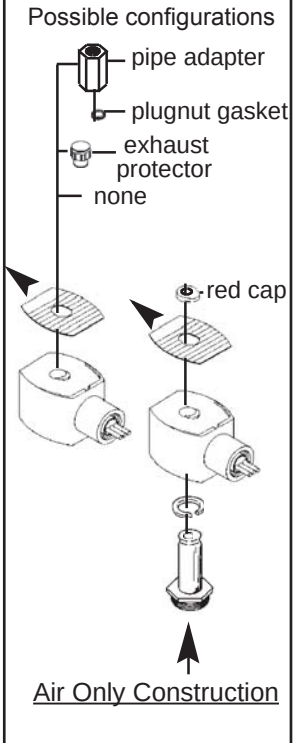


Figure 3. Series 8007G/H

Installation&Maintenance Instructions

ASCO Red-Hat II™

OPEN-FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS
OPTIONAL FEATURE FOR OPEN FRAME (GENERAL PURPOSE) CONSTRUCTION ONLY

SERIES
8003G/H
8007G/H
8202G/H

NOTICE: See Installation and Maintenance Instructions, I&M No. V_6584_R19 - Section 1 of 2 for detailed instructions.

Torque Chart

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

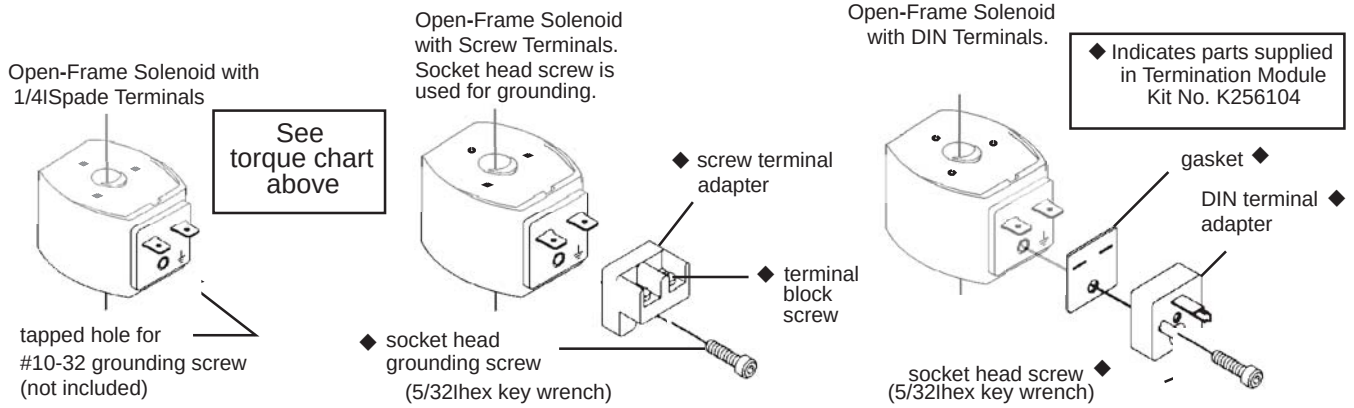


Figure 4. Open-frame solenoids

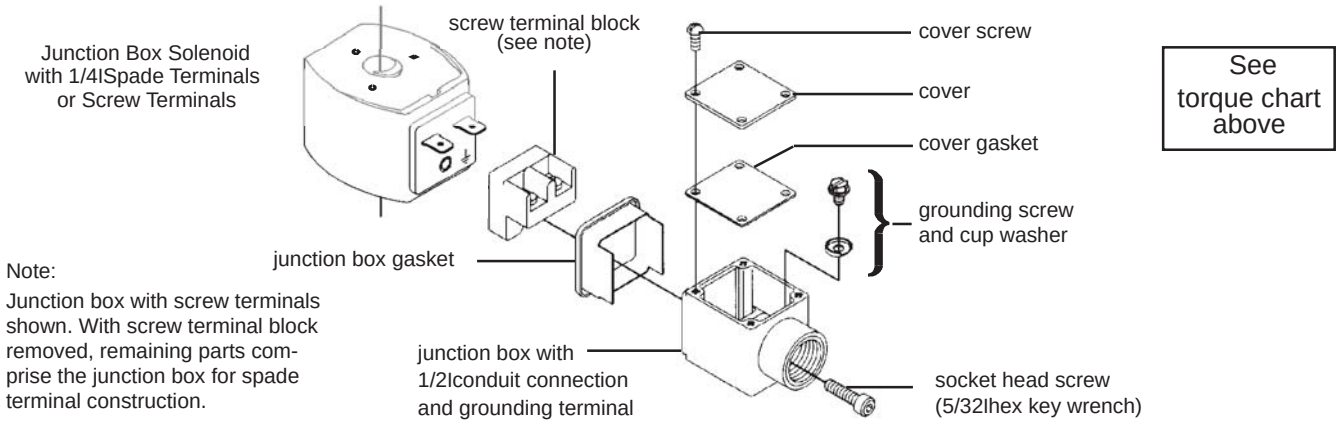


Figure 5. Junction box (optional feature)

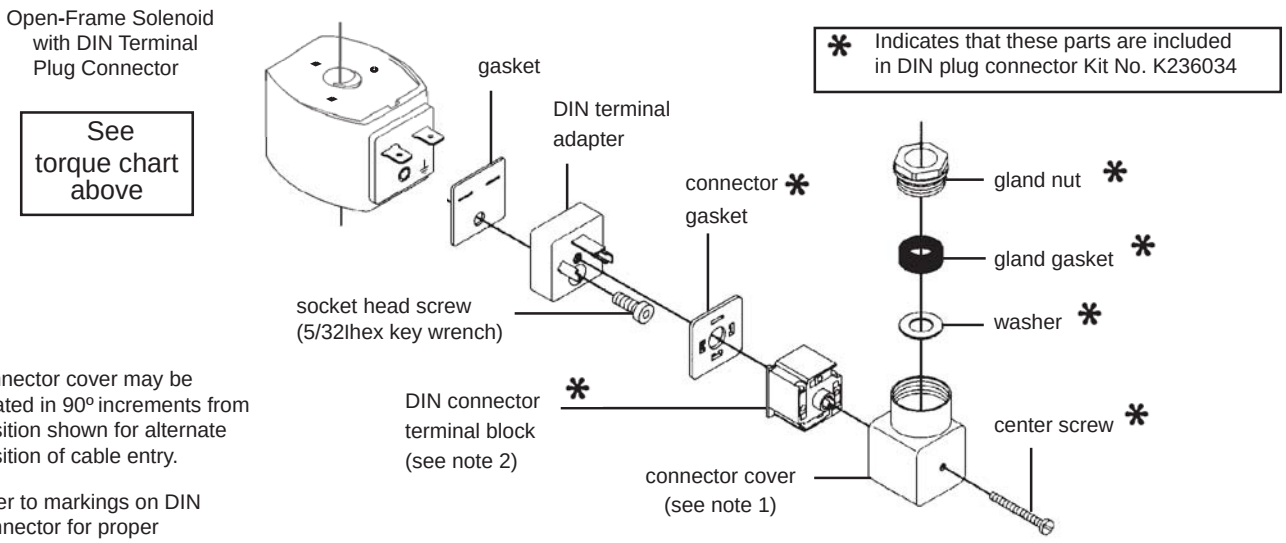
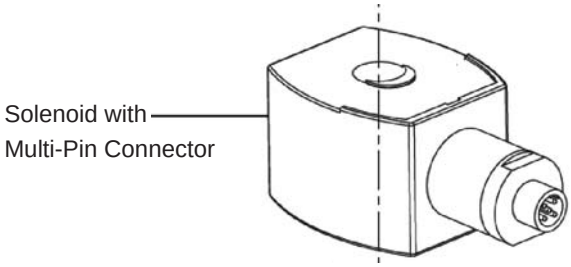
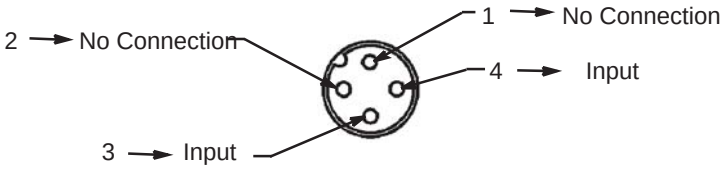


Figure 6. DIN plug connector kit No. K236034 (optional feature)

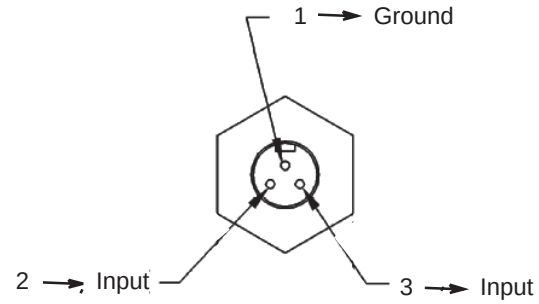


DC: For mating connector, use 4-pin M12 x 1 threaded female connector.



Electrical Connection Size:
DC: Single keyway M12 x 1 (*Not polarity sensitive)*
AC: Dual keyway 1/2-20UNF Thread

Figure 7.
4-Pin Anodized Aluminum Electrical Termination (VT/VB)



Electrical Connection Size:
DC/AC: 7/8-16 UNS-2A

Figure 8.
Mini 3-pin Epoxy Coated Zinc Electrical Termination (ZT/ZB)

GB

GENERAL INSTALLATION AND MAINTENANCE INSTRUCTIONS

Note: These general Installation and Maintenance Instructions must be read in conjunction with the Instruction Sheet for the specific product.

INSTALLATION

ASCO Numatics components are intended to be used only within the technical characteristics as specified on the nameplate. Changes to the equipment are only allowed after consulting the manufacturer or its representative. Before installation, depressurize the piping system and clean internally.
The equipment may be mounted in any position if not otherwise indicated on the product by means of an arrow.
The flow direction and pipe connection of valves are indicated on the body.

The pipe connections have to be in accordance with the size indicated on the nameplate and fitted accordingly.

Caution:
- Reducing the connections may cause improper operation or malfunctioning.
- For the protection of the equipment install a strainer or filter suitable for the service involved in the inlet side as close to the product as possible.
- If tape, paste, spray or a similar lubricant is used when tightening, avoid particles entering the system.
- Use proper tools and locate wrenches as close as possible to the connection point.
- To avoid damage to the equipment. DO NOT OVERTIGHTEN pipe connections
- Do not use valve or solenoid as lever.
- The pipe connections should not apply any force, torque or strain to the product.

ELECTRICAL CONNECTION

In case of electrical connections, they are only to be made by trained personnel and have to be in accordance with the local regulations and standards.

Caution:
- Turn off electrical power supply and de-energize the electrical circuit and voltage carrying parts before starting work.
- All electrical screw terminals must be properly tightened according to the standards before putting into service.
- Dependent upon the voltage electrical components must be provided with an earth connection and satisfy local regulations and standards.

The equipment can have one of the following electrical terminals:
- Spade plug connections according to ISO-4400 or 3 x DIN-46244 (when correctly installed, this connection provides IP-65 protection).
- Embedded screw terminals in metal enclosure with "Pg" cable gland
- Spade terminals (AMP type).
- Flying leads or cables.

PUTTING INTO SERVICE

Before pressurizing the system, first carry-out an electrical test. In case of solenoid valves, energize the coil a few times and notice a metal click signifying the solenoid operation.

SERVICE

Most of the solenoid valves are equipped with coils for continuous duty service. To prevent the possibility of personal or property damage, do not touch the solenoid which can become hot under normal operating conditions.

SOUND EMISSION

The emission of sound depends on the application, medium and nature of the equipment used. The exact determination of the sound level can only be carried out by the user having the valve installed in his system

MAINTENANCE

Maintenance of ASCO Numatics products is dependent on service conditions. Periodic cleaning is recommended, the timing of which will depend on the media and service conditions. During servicing, components should be examined for excessive wear. A complete set of internal parts is available as spare parts or rebuild kit. If a problem occurs during installation/maintenance or in case of doubt please contact ASCO Numatics or authorized representatives.

*A separate Declaration of Incorporation relating to EU-Directive 2006/42/EC Annex IIB is available on request for applicable products. Please provide product identification number and serial numbers of products concerned.

The product, , when marked CE, complies with the essential requirements of the EMC 2004/108/EC (until April 20th 2016) and EMC 2014/30/EU (from April 20th 2016) and LVD 2006/95/EC (until April 20th 2016) and LVD 2014/35/EU (from April 20th 2016). A separate Declaration of Conformity is available on request. Please provide product identification number and serial numbers of the products concerned.

FR

INSTRUCTIONS GÉNÉRALES D'INSTALLATION ET D'ENTRETIEN

Note: Ces instructions générales d'installation et d'entretien complètent la notice spécifique du produit.

MONTAGE

Les composants ASCO Numatics sont conçus pour les domaines de fonctionnement indiqués sur la plaque signalétique ou la documentation. Aucune modification ne peut être réalisée sur le matériel sans l'accord préalable du fabricant ou de son représentant. Avant de procéder au montage, dépressuriser les canalisations er effectuer un nettoyage inteme.
A moins qu'une fléche ou la notice n'indique un sens de montage spécifique de la tête magnétique, le produit peut être monté dans n'importe quelle position
Le sens de circulation du fluide est indiqué par repères sur le corps er dans la documentation.
La dimension des tuyauteries doit correspondre au raccordement indiqué sur le corps, l'étiquette ou la notice.

Attention:
- Une restriction des tuyauteries peut entraîner des dysfonctionnements.
- Afin de protéger le matériel, installer une crépine ou un filtre adéquat en amont, aussi près que possible du produit.
- En cas d' utilisation de ruban; pàte, aérosol ou autre lubrifiant lors du serrage, veiller à ce qu" aucun corps étranger ne pénètre dans le circuit.
- Utiliser un outillage approprié et placer les clés aussi près que possible du point de raccordement.
- Afin d'éviter toute détérioration, NE PAS TROP SERRER les raccords des tuyauteries.
- Ne pas se servir de la vanne ou de tête magnétique comme d'un levier.
- The pipe connections should not apply any force, torque or strain to the product.

RACCORDEMENT ÉLECTRIQUE

Le raccordement électrique doit être réalisé par un personnel qualifié et selon les normes et règlements locaux.

Attention:
- Avant toute intervention, couper l'alimentation électrique pour mettre hors tension les composants.
- Toutes les bornes à vis doivent être serrées correctement avant la mise en service.
- Selon la tension, les composants électrique doivent être mis à la terre conformément aux normes et règlements locaux.

Selon les cas, le raccordement électrique s'effectué par:
- Connecteur débrochable ISO-4400 ou 3 x DIN-46244 avec degré de protection IP-65 lorsque le raccordement est correctement effectué.
- Bornes à vis solidaires du bobinage, sous boîter métallique avec presse-étoupe "Pg--".
- Cosses (type AMP).
- Fils ou câbles solidaires de la bobine.

MISE EN SERVICE

Avant de mettre le circuit sous pression, effectuer un essai électrique. Dans le cas d'une électrovanne, mettre la bobine sous tension plusieurs fois er écouter le "clic" métallique qui signale le fonctionnement de la tête magnétique.

FONCTIONNEMENT

La plupart des électrovannes comportant des bobinages prévus pour mise sous tension permanente. Pour éviter toute brûlure, ne pas toucher la tête magnétique qui, en fonctionnement normal et en permanence sous tension, peut atteindre une température élevée.

BRUIT DE FONCTIONNEMENT

Le bruit de fonctionnement varie selon l'utilisation, le fluide et le type de matériel employé. L'utilisateur ne pourra déterminer avec précision le niveau sonore émis qu'après avoir monté le composant sur l'installation.

ENTRETIEN

L'entretien nécessaire aux produits ASCO Numatics varie avec leurs conditions d'utilisation. Il est souhaitable de procéder à un nettoyage périodique dont l'intervalle varie suivant la nature du fluide, les conditions de fonctionnement et le milieu ambiant. Lors de l'intervention. Les composants doivent être examinés our détecter toute usure excessive. Un ensemble de pièces internes est proposé en pièces de rechange pour procéder à la réfection. En cas de problème lors du montage/entretien ou en cas de doute, veuillez contacter ASCO Numatics ou ses représentants officiels.

*Une déclaration d'incorporation relative à la directive UE 2006/42/CE Annexe II B est disponible sur demande pour les produits applicables. Veuillez fournir le numéro d'identification du produit et les numéros de série des produits concernés.

Lorsqu'il est marqué du label CE, le produit est conforme aux exigences essentielles des directives CEM 2004/108/CE (jusqu'au 20 avril 2016) et CEM 2014/30/UE (à partir du 20 avril 2016) et des directives Basse tension 2006/95/CE (jusqu'au 20 avril 2016) et 2014/35/UE (à partir du 20 avril 2016). Une déclaration de conformité peut être fournie sur simple demande. Veuillez fournir le numéro d'identification du produit et les numéros de série des produits concernés.

DE

ALLGEMEINE BETRIEBSANLEITUNG

Achtung: Diese Allgemeine Betriebsanleitung gilt in Zusammenhang mit der jeweiligen Betriebsanleitung für die speziellen Produkte.

EINBAU

Die ASCO Numatics-Komponenten dürfen nur innerhalb der auf den Typenschildern angenebenen Daten eingesetzt warden, Veränderungen an den Produkten sind nur nach Rücksprache mit ASCO Numatics zulässig.
Vor dem Einbau der Ventile muß das Rohrleitungssystem drucklos geschaltet und innen gereinigt werden.
Die Einbaulage der Produkte ist genereil beliebig. Ausnahme: Die mit einem Pfeil gekennzeichneten Produkte müssen entsprechend der Pfeilrichtung montiert werden.
Die Durchflußrichtung und der Eingang von Ventilen sind gekennzeichnet.

Die Rohranschlüsse sollten entsprechend den Größenangaben auf den Typenschildern mit handelsüblichen Verschraubungen durchgeführt werden. Dabei ist folgendes zu beachten:
- Eine Reduzierung der Anschlüsse kann zu Leistungs-und Funktionsminderungen führen.
- Zum Schutz der Ventile sollten Schmutzfänger oder Filter so dicht wie möglich in den Ventileingang integriert werden.
- Bei Abdichtung am Gewinde ist darauf zu achten, daß kein Dichtungsmaterial in die Rohrleitung oder das Ventil gelangt.
- Zur Montage darf nur geeignetes Werkzeug verwendetwerden.
- Konische Verschraubungen sind sorgfältig anzuziehen. Es ist darauf zu achten, daß beim Anziehen das Gehäuse nicht beschädigt wird.
- Spule und Führungsrohr von Ventilen dürfen nicht als Gegenhalter benutzt werde.
- Die Rohrleitungsanschlüsse sollen fluchten und dürfen keine Spannungen auf das Ventil übertragen.

ELECTRISCHER ANSCHLUß

Der elektrische Anschluß ist von Fachpersonal entsprechend den geltenden VDE-und CEE Richtlinien auszuführen. Es ist besonders auf foigendes zu achten:
- Vor Beginn der Arbeiten ist sicherzustellen, daß alle elektrischen Leitungen und Netzteile spannungslos geschaltet sind.
- Alle Anschlußklemmen sind nach Beendigung der Arbeiten vorschriftsmäßig entsprechend den geltenden Regeln anzuziehen.
- Je nach Spannungsbereich muß das Ventil nach den geltenden Regeln einen Schutzleiteranschluß erhalten.

Der Magnetantrieb kann je nach Bauart folgende Anschlüsse haben:
- Anschluß für Gerätesteckdose nach DIN 43650 Form A/ISO 4400 oder 3 x DIN 46244 (durch ordnungsgemäße Montage der Gerätesteckdose wird Schutzklasse IP 65 erreicht).
- Anschlüsse innerhalb eines Blechgehäuses mittels Schraubklemmen. Kabeleinführung ins Gehäuse mit PG-Verschraubung.
- Offene Spulen mit Flachsteckern (AMP-Fahnen) oder mit eingegossenen Kabelenden.

INBETRIEBNAHME

Vor Druckbeaufschlagung des Produktes sollte eine elektrische Funktionsprüfung erfolgen:

Bei Ventilen Spannung an der Magnetspule mehrmals ein-und ausschalten. Es muß ein Klicken zu hören sein.

BETRIEB

Die meisten Ventile sind mit Spulen für Dauerbetrieb ausgerüstet. Zur Vermeidung von Personen-und Sachschäden sollte jede Berührung mit dem Ventil vermieden werden, da die Magnetspule bei längerem Betrieb sehr heiß werden kann.

GERÄUSCHEMISSION

Diese hängt sehr stark vom Anwendungsfall, den Betriebsdaten und dem Medium, mit denen das Produkt beaufschlagt wird, ab. Eine Aussage über die Geräuschemission des Produktes muß deshalb von demjenigen getroffen werden, der das Produkt innerhalb einer Maschine in Betrieb nimmit.

WARTUNG

Die Wartung hängt von den Einsatzbedigungen ab. In entsprechenden Zeitabständen muß das Produkt geöffnet und gereinigt werden. Für die Überholung der ASCO Numatics-Produkte können Ersatzteilsätze geliefert werden. Treten Schwierigkeiten bel Einbau, Betrieb oder Wartung auf, sowie bei Unklarheiten, ist mit ASCO Numatics Rücksprache zu halten.

ASCO Numatics Produkte sind entsprechend der EG-Richtlinie 89/392/EWG gefertigt.

*Eine separate Herstellererklärung im Sinne der Richtlinie 2006/42/EWG Anhang II B ist auf Anfrage für die entsprechenden Produkte erhältlich. Geben Sie bitte die Kennnummer sowie die Seriennummer der betreffenden Produkte an.

Das Produkt, wenn mit CE gekennzeichnet, erfüllt die Anforderungen von EMV 2004/108/EWG (bis 20. April 2016) und EMV 2014/30/EU (vom 20. April 2016) und LVD 2006/95/EWG (bis 20. April 2016) und LVD 2014/35/EU (vom 20. April 2016). Eine separate Konformitätserklärung ist auf Anfrage erhältlich. Geben Sie bitte die Kennnummer sowie die Seriennummer der betreffenden Produkte an.

ASCO
50 Hanover Road
Florham Park, New Jersey 07932
Tel. (973) 966-2000
Fax (973) 966-2628

ASCO
1561 Columbia Highway
Aiken, South Carolina 29801
Tel. (803) 641-9200
Fax (803) 641-9290

ASCO Valves® E 264274 - 04/2016

LEFT BLANK

ASCO

(EF) 8345G001, SOLENOID VALVE

LEFT BLANK

Installation & Maintenance Instructions

2-POSITION 4-WAY FUNCTION VALVES

MIDGET SIZE - 1/4 NPT

SERIES 8345G/H

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

DESCRIPTION

Series 8345 valves are 2-position 4-way midget size solenoid valves with rugged forged brass or stainless steel bodies. These valves are extremely compact to meet the requirements where space and weight are important and are primarily used to control small double acting cylinders not larger than 4 inches in diameter. Series 8345 valves may be provided with a general purpose or explosionproof solenoid enclosure.

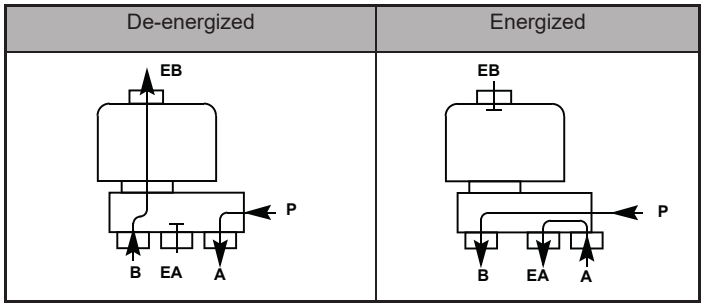
OPERATION

Solenoid De-energized: Flow is from Pressure "P" to Cylinder "A" and from Cylinder "B" to Exhaust "EB". Exhaust "EA" is closed.

Solenoid Energized: Flow is from Pressure "P" to Cylinder "B" and from Cylinder "A" to Exhaust "EA". Exhaust "EB" is closed.

IMPORTANT: Minimum operating pressure differential is 10 psi.

Flow Diagrams



Manual Operator (optional feature)

Manual operator allows manual operation when desired or during an electrical power outage. To operate manual operator, rotate groove pin counter-clockwise 180º. Valve will then remain in the solenoid energized position until stem is rotated clockwise to original position. Manual operator must be in clockwise position for proper electrical operation.

INSTALLATION

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

Temperature Limitations

For maximum valve ambient and fluid temperatures, refer to chart below. Check catalog number on nameplate to determine temperature limitation.

Wattage	Catalog Number Coil Prefix	Coil Class	Max. Ambient Temp.°F	Max. Fluid Temp.°F
10.1	none, KF, SF, SC, EF or EV	F	125	180
10.1	HT, KH, ST, SU, EFHT or EVHT	H	140	180
11.6	none, HT, KF, KH, SC, SF, EF or EV	F or H	104	104

Positioning

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

Mounting

Refer to Figure 1 for Mounting dimensions.

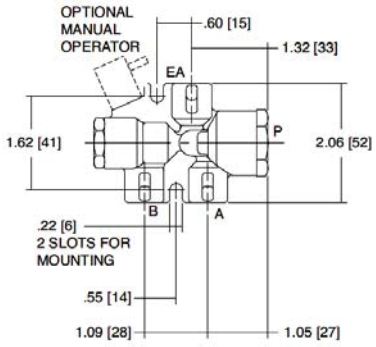


Figure 1. Mounting Dimensions

Piping

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

To ensure proper operation of the valve, the pressure and exhaust lines must be full area without restriction. A minimum differential pressure (10psi), as stamped on the nameplate, must be maintained between pressure and exhaust at the moment of shifting. Air reservoirs must have adequate capacity to maintain this minimum pressure during shifting. To check pressure during shifting, install a pressure gauge in the piping as close to valve as possible.

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

Wiring

Wiring must comply with Local and National Electrical Codes. For valves equipped with an Explosionproof/Watertight Solenoid Enclosure, the electrical fittings must be approved for use in the approved hazardous Location. Housings for all solenoids are provided with accommodations or connections for a 1/2 inch conduit. To facilitate wiring, the solenoid enclosure may be rotated 360°.

Solenoid Temperature

Standard catalog valves are supplied with coils designed for continuous duty service. When the solenoid is energized for a long period, the solenoid becomes hot and can be touched by hand only for an instant. This is a safe operating temperature. Any excess heating will be indicated by smoke and the odor of burning coil insulation

MAINTENANCE

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

Note: It is not necessary to remove the valve from the pipeline for repairs. However, piping or tubing must be removed from Pressure "P" connection and Exhaust "EB" connection on air and liquid constructions.

Cleaning

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

Preventive Maintenance

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

Causes of Improper Operation

- **Faulty Control Circuit:** Check the electrical system by energizing the solenoid. A metallic click signifies that the solenoid is operating. The absence of the click indicates loss of power supply. Check for loose or blown fuses, open-circuited or grounded coil, broken lead wires or splice connections.
- **Burned-Out Coil:** Check for open-circuited coil. Replace if necessary. Check supply voltage; it must be the same as specified on nameplate and as marked on the coil.
- **Low Voltage:** Check voltage across the coil leads. Voltage must be at least 85% of nameplate rating.
- **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
- **Excessive Leakage:** Disassemble valve and clean all parts. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

Valve Disassembly

1. Disassemble valve in an orderly fashion using exploded views for identification and placement of parts.
2. Remove solenoid enclosure. See separate instructions.
3. Unscrew solenoid base sub-assembly and remove bonnet gasket.
4. For normal maintenance (cleaning) it is not necessary to disassemble the manual operator (optional feature) unless external leakage is evident. If disassembly is required, remove stem pin, manual operator stem, stem spring and stem gasket from valve body.
5. Remove core spring and core sub-assembly.
6. Unscrew end cap and remove end cap gasket, body gasket and disc.
7. Unscrew end plug and remove end plug gasket, piston and piston U-cup.
8. All parts are now accessible for cleaning or replacement. If parts are worn or damaged, install a complete ASCO Rebuild Kit

Valve Reassembly

1. Lubricate piston U-cup and all gaskets with Parker Super Lube Compound or an equivalent high-grade silicone grease.
2. Position piston U-cup on piston with mouth or open end facing in the direction of the end plug.
3. Install piston into valve body. Position end plug gasket on end plug and install into valve body. Torque end plug to 200±10 in-lbs [22,6±1,1 Nm].
4. Position body gasket and end cap gasket on end cap. Lubricate disc with DOW CORNING® 111 Compound or an equivalent high grade silicone grease. Install disc and end cap into valve body. Torque end cap to 200±10 in-lbs [22,6±1,1 Nm].
5. If removed, assembly and replace manual operator stem, stem spring, stem gasket and stem pin.
6. Position solenoid base gasket in valve body.
7. Install core assembly and core spring into solenoid base sub-assembly. Thread solenoid base sub-assembly into valve body. Torque solenoid base sub-assembly to 175±25 in-lbs [19,8±2,8 Nm].
8. Install solenoid,see separate solenoid instructions. Then make electrical hookup to solenoid.

⚠ WARNING: To prevent the possibility of death, serious injury or property damage, check valve for proper operation before returning to service. Also perform internal seat and external leakage tests with a nonhazardous, noncombustible fluid.

9 Restore line pressure and electrical power supply to valve.

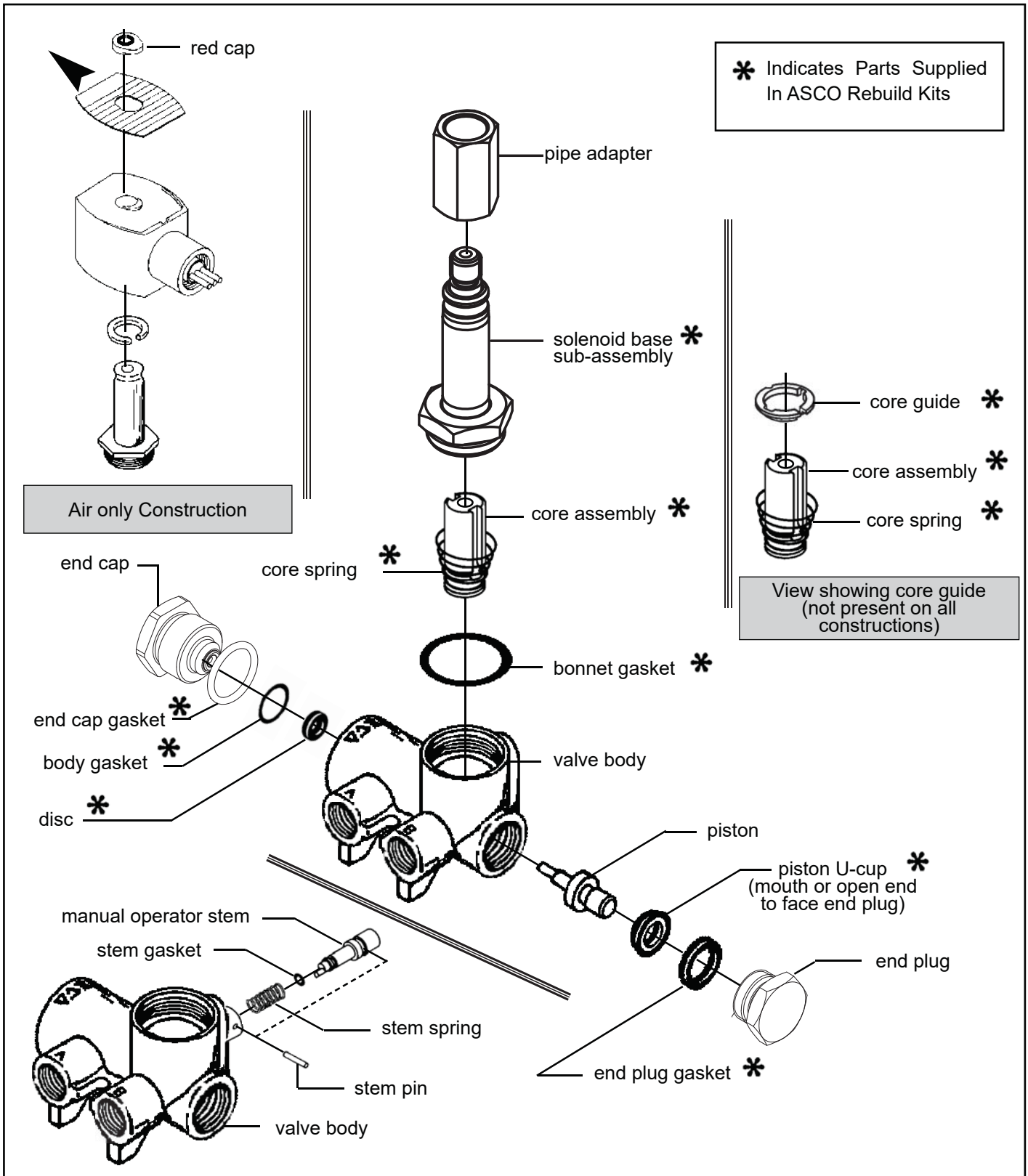
10. After maintenance is completed, operate the valve a few times to be sure of proper operation. A metallic click signifies the solenoid is operating.

ORDERING INFORMATION FOR ASCO REBUILD KITS

Parts marked with an asterisk (*) in the exploded view are supplied in Rebuild Kits. When Ordering Rebuild Kits for ASCO valves, order the Rebuild Kit number stamped on the valve nameplate. If the number of the kit is not visible, order by indicating the number of kits required, and the Catalog Number and Serial Number of the valve(s) for which they are intended.

Torque Chart

Part Name	Toque Value Inch-Pounds	Torque Value Newton-Meters
solenoid base sub-assembly	175 ± 25	19,8 ± 2,8
end cap/end plug	200 ± 10	22,6 ± 1,1



Series 8345 - without solenoid

This page is intentionally left blank

Installation&Maintenance Instructions

ASCO Red-Hat II®

OPEN-FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS

SERIES
8003G/H
8007G/H
8202G/H

— SERVICE NOTICE —

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

See separate instructions for basic valve.

DESCRIPTION

Catalog numbers 8003G/H, 8007G/H and 8202G/H and are epoxy encapsulated pull-type solenoids. The green solenoid with lead wires and 1/2 conduit connection is designed to meet Enclosure Type 1-General Purpose, Type 2-Dripproof, Types 3 and 3S-Raintight, and Types 4 and 4X-Watertight. The black solenoid on catalog numbers prefixed "EF" or "EV" is designed to meet Enclosure Types 3 and 3S-Raintight, Types 4 and 4X-Watertight, Types 6 and 6P-Submersible, Type7, Explosionproof Class I, Division1 Groups A, B, C, & D and Type 9, -Dust-Ignitionproof Class II, Division1 Groups E, F & G. The Class II, Groups F & G Dust Locations designation is not applicable for solenoids or solenoid valves used for steam service or when a class "H" solenoid is used. See *Temperature Limitations* section for solenoid identification and nameplate/retainer for service. When installed just as a solenoid and not attached to an ASCO valve, the core has a 0.250-28 UNF-2B tapped hole, 0.38 or 0.63 minimum full thread.

NOTE: Catalog number prefix "EV" denotes stainless steel construction.

Solenoid catalog numbers 8202G/H1, 8202G/H3, 8202G/H5 and 8202G/H7 are epoxy encapsulated push-type, reverse-acting solenoids having the same enclosure types as previously stated for Catalog numbers 8003G/H1 and 8003G/H2. 8007G/H are 3-way solenoid operators with a pipe port or adapter, exhaust protector or vent at the top of the solenoid base sub-assembly.

Series 8003G/H, 8007G/H and 8202G/H solenoids are available in:

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

Optional Features For Type 1 - General Purpose Construction Only

- **Junction Box:** This junction box construction meets Enclosure Types 2, 3, 3S, 4, and 4X. Only solenoids with 1/4″ spade or screw terminals may have a junction box. The junction box provides a 1/2″ conduit connection, grounding and spade or screw terminal connections within the junction box (See Figure 5).
- **DIN Plug Connector Kit No. K236034:** Use this kit only for solenoids with DIN terminals. The DIN plug connector kit provides a two pole with grounding contact DIN Type 43650 construction (See Figure 6).

OPERATION

Series 8003G/H and 8007G/H - When the solenoid is energized, the core is drawn into the solenoid base sub-assembly.

IMPORTANT: When the solenoid is de-energized, the initial return force for the core, whether developed by spring,pressure, or weight, must exert a minimum force to overcome residual magnetism created by the solenoid. Minimum return force for AC construction is 11 ounces, and 5 ounces for DC construction.

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

INSTALLATION

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

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

FOR BLACK ENCLOSURE TYPES 7 AND 9 ONLY

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

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

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

Temperature Limitations

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

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

Temperature Limitations For Series 8003G, 8007G or 8202G Solenoids for use on Valves Rated at 10.1, 11.6, 15.6, 17.1, or 22.6 Watts			
Watt Rating	Catalog Number Coil Prefix	Class of Insulation	Maximum § Ambient Temp.
10.1 & 17.1	None, FB, KF, KP, SC, SD, SF, SP, VT, VB, ZT & ZB	F	125°F (52°C)
10.1 & 17.1	HB, HT, KB, KH, SS, ST, SU	H	140°F (60°C)
11.6 & 22.6	None, FB, KF, KP, SC, SD, SF, SP, VT, VB, ZT & ZB	F	104°F (40°C)
11.6 & 22.6	HP, HT, KB, KH, SS, ST, SU & SV	H	104°F (40°C)
15.6	None, KB, SS, SV	H	104°F (40°C)

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

Temperature Limitations for Series 8003H, 8007H and 8202H solenoids						
		Watt Ratings			Maximum Ambient Temperature	
Prefix [1]	Coil Class	AC		DC		
		60 Hz	50 Hz		°C	°F
EF, EV	FT	10.1	10.1	-	52	125
EF, EV	FB	17.1	17.1	-		
	FT	10.1	10.1	-	55	131
	FB	17.1	17.1	-		
	HT	-	-	11.6	40 [2]	104 [2]
	HF	-	-	15.6		
	HB	-	-	22.6		
EF, EV	HT	-	-	11.6		
EF, EV	HF	-	-	15.6		
EF, EV	HB	-	-	22.6		
	HT	10.1	10.1	-	60 [3]	140 [3]
	HB	17.1	17.1	-		
EF, EV	HT	10.1	10.1	-		
EF, EV	HB	17.1	17.1	-		

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

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

[3] = Steam Service Valves have a maximum ambient temperature of 55° C/ 131°F.

Positioning

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

Wiring

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

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

Additional Wiring Instructions For Optional Features:

- **Open-Frame solenoid with 1/4″ spade terminals.**

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

- **Junction Box**

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

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

1. The open-frame solenoid is provided with DIN terminals to accommodate the plug connector kit.
2. Remove center screw from plug connector. Using a small screwdriver, pry terminal block from connector cover.
3. Use #12-18 AWG stranded copper wire rated at 90°C or greater for connections. Strip wire leads back approximately 1/4″ for installation in socket terminals. The use of wire-end sleeves is also recommended for these socket terminals. Maximum length of wire-end sleeves to be approximately 1/4″. Tinning of the ends of the lead wires is not recommended.
4. Thread wire through gland nut, gland gasket, washer and connector cover.

NOTE: Connector housing may be rotated in 90° increments from position shown for alternate positioning of cable entry.

5. Check DIN connector terminal block for electrical markings. Then make electrical hookup to terminal block according to markings on it. Snap terminal block into connector cover and install center screw.
6. Position connector gasket on solenoid and install plug connector. Torque center screw to 5±1 in-lbs [0,6±1,1 Nm].

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

Installation of Solenoid

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

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

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

Solenoid Temperature

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

MAINTENANCE

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

Cleaning

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

Preventive Maintenance

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

Causes of Improper Operation

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

Solenoid Replacement

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

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

2. Disassemble solenoids with optional features as follows:
   - **Spade or Screw Terminals**

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

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

   - **Junction Box**

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

   - **DIN Plug Connector**

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

3. Remove red cap or retainer from top of solenoid base sub-assembly. For 3-way construction with pipe adapter (Figure 3), remove pipe adapter, nameplate and solenoid. Omit steps 4 and 5.
4. Push down on solenoid. Then using a suitable screwdriver, insert blade between solenoid and nameplate/retainer. Pry up slightly and push to remove. NOTE: Series 8202G/H solenoids have a spacer between the nameplate/retainer and solenoid.
5. Remove solenoid from solenoid base sub-assembly.
6. Reassemble in reverse order of disassembly. Use exploded views for identification and placement of parts.
7. Torque pipe adapter to 90 inch-pounds maximum [10,2 Nm maximum]. Then make up piping or tubing to pipe adapter on solenoid.

Disassembly and Reassembly of Solenoids

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

ORDERING INFORMATION FOR ASCO SOLENOIDS

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

Installation&Maintenance Instructions

ASCO Red-Hat II®

OPEN-FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS

SERIES
8003G/H
8007G/H
8202G/H

NOTICE: See Installation and Maintenance Instructions, I&M No. V_6584_R16 - Section 1 of 2 for detailed instructions.

Torque Chart

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

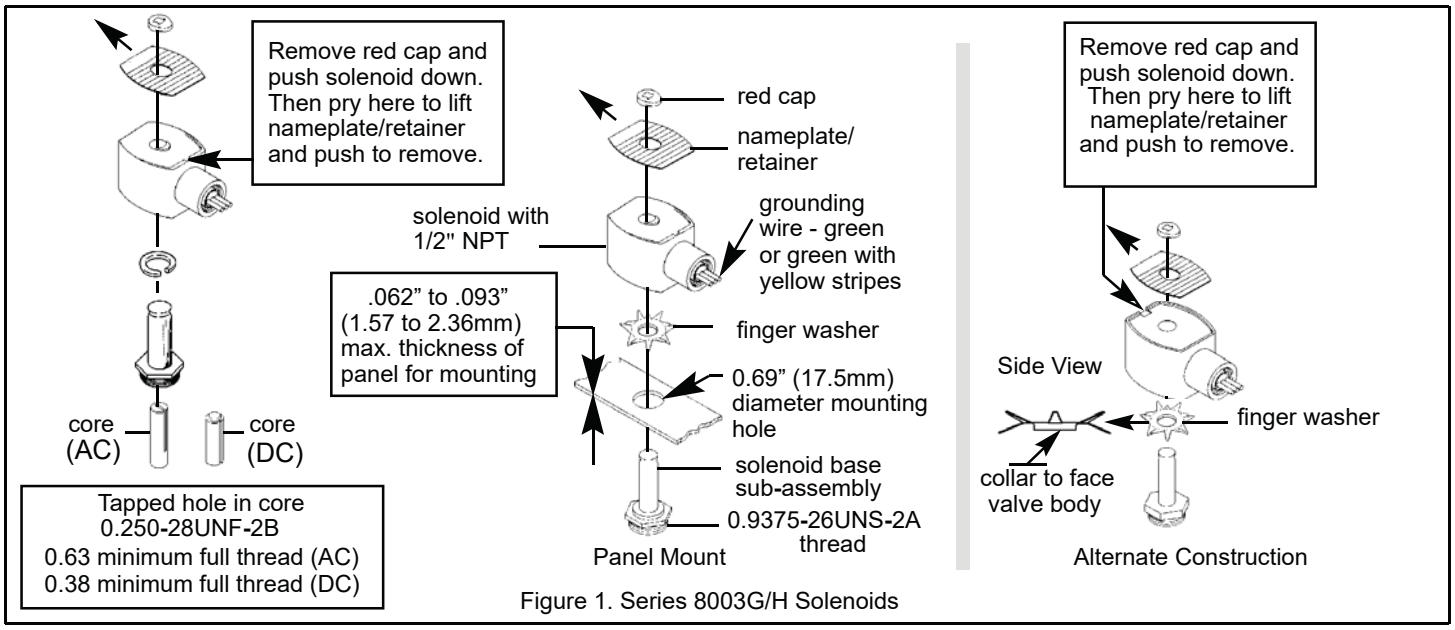


Figure 1. Series 8003G/H Solenoids

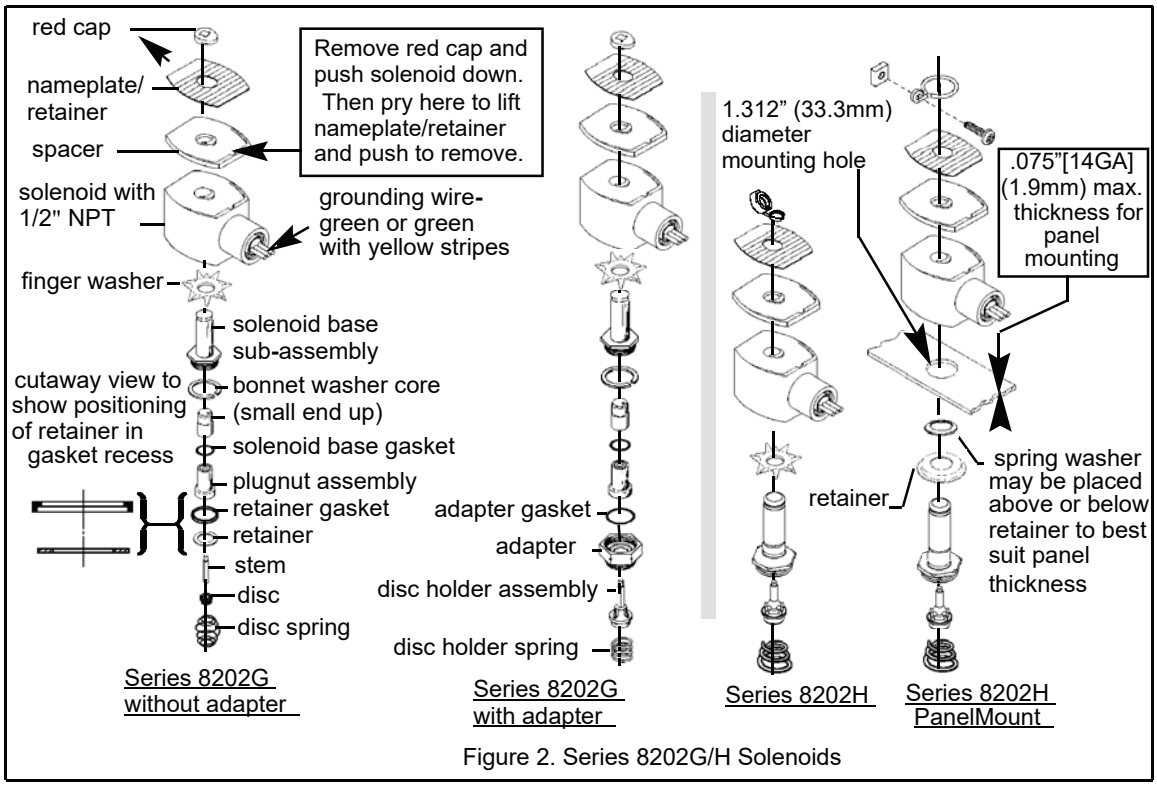


Figure 2. Series 8202G/H Solenoids

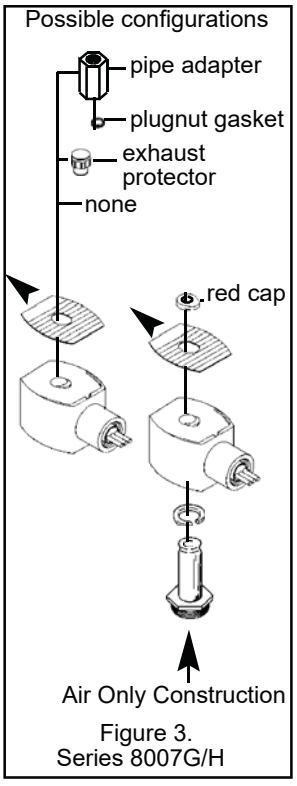


Figure 3. Series 8007G/H

Torque Chart

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

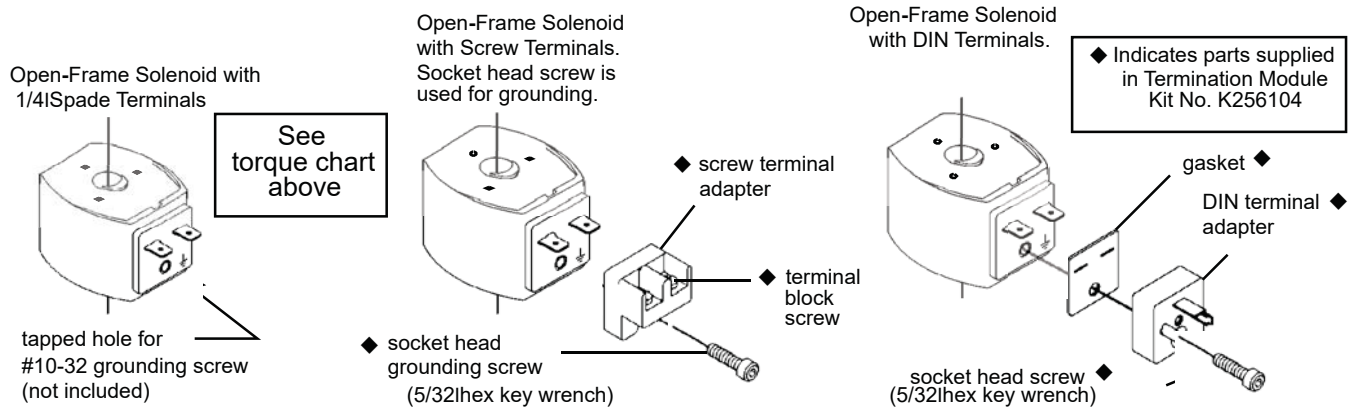


Figure 4. Open-frame solenoids

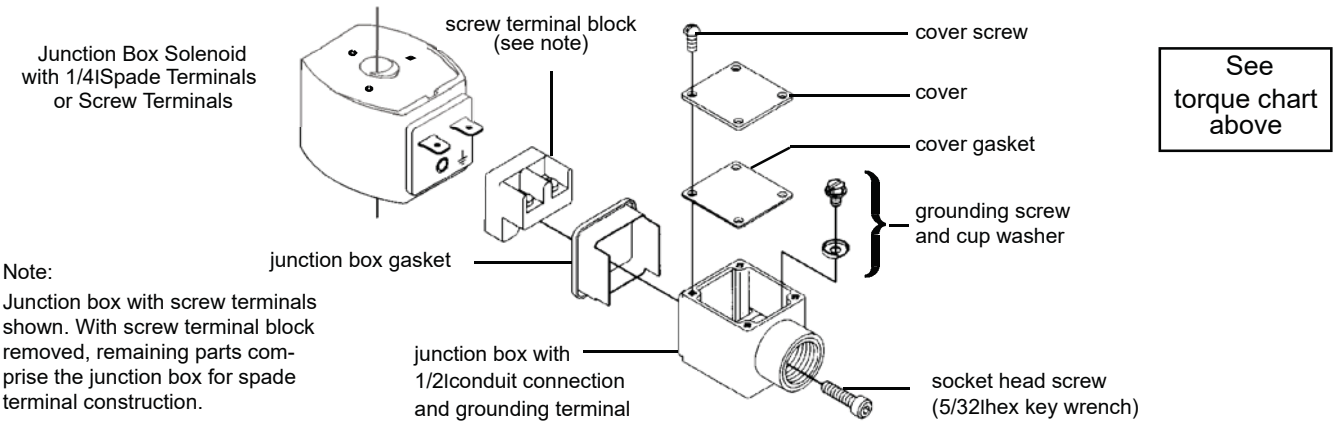


Figure 5. Junction box (optional feature)

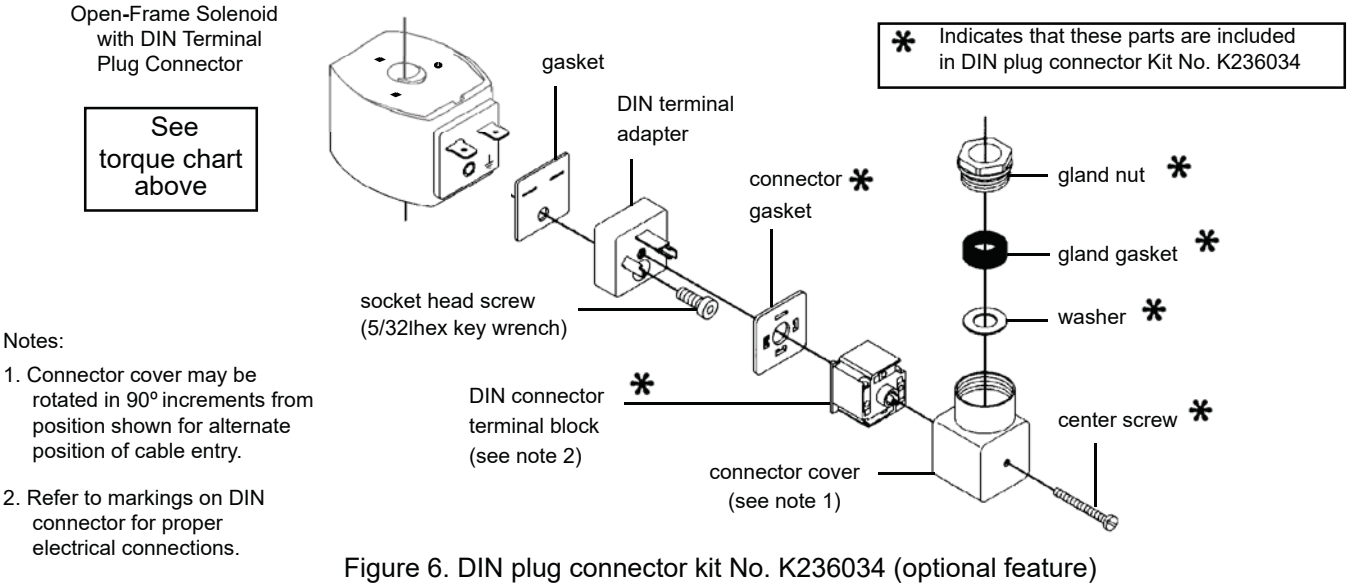
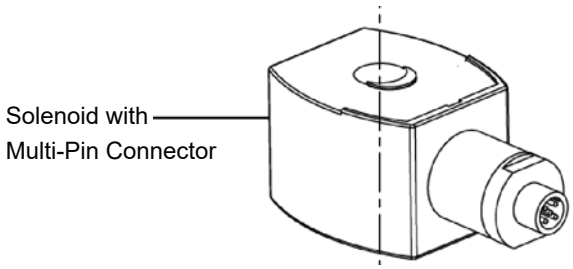
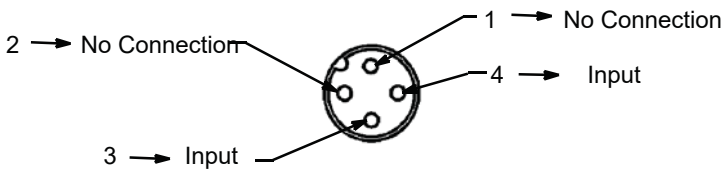


Figure 6. DIN plug connector kit No. K236034 (optional feature)

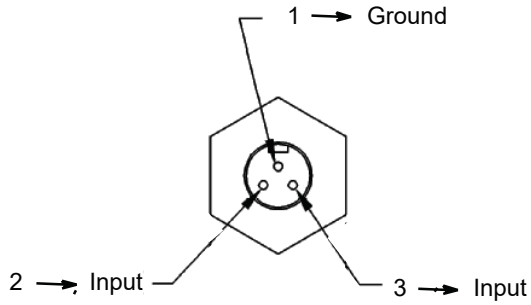


DC: For mating connector, use 4-pin M12 x 1 threaded female connector.



Electrical Connection Size:
DC: Single keyway M12 x 1 (*Not polarity sensitive)*
AC: Dual keyway 1/2-20UNF Thread

Figure 7.
4-Pin Anodized Aluminum Electrical Termination
(VT/VB)



Electrical Connection Size:
DC/AC: 7/8-16 UNS-2A

Figure 8.
Mini 3-pin Epoxy Coated Zinc Electrical Termination
(ZT/ZB)

GB

GENERAL INSTALLATION AND MAINTENANCE INSTRUCTIONS

Note: These general Installation and Maintenance Instructions must be read in conjunction with the Instruction Sheet for the specific product.

INSTALLATION

ASCO Numatics components are intended to be used only within the technical characteristics as specified on the nameplate. Changes to the equipment are only allowed after consulting the manufacturer or its representative. Before installation, depressurize the piping system and clean internally.
The equipment may be mounted in any position if not otherwise indicated on the product by means of an arrow.
The flow direction and pipe connection of valves are indicated on the body.

The pipe connections have to be in accordance with the size indicated on the nameplate and fitted accordingly.

Caution:
- Reducing the connections may cause improper operation or malfunctioning.
- For the protection of the equipment install a strainer or filter suitable for the service involved in the inlet side as close to the product as possible.
- If tape, paste, spray or a similar lubricant is used when tightening, avoid particles entering the system.
- Use proper tools and locate wrenches as close as possible to the connection point.
- To avoid damage to the equipment. DO NOT OVERTIGHTEN pipe connections
- Do not use valve or solenoid as lever.
- The pipe connections should not apply any force, torque or strain to the product.

ELECTRICAL CONNECTION

In case of electrical connections, they are only to be made by trained personnel and have to be in accordance with the local regulations and standards.

Caution:
- Turn off electrical power supply and de-energize the electrical circuit and voltage carrying parts before starting work.
- All electrical screw terminals must be properly tightened according to the standards before putting into service.
- Dependent upon the voltage electrical components must be provided with an earth connection and satisfy local regulations and standards.

The equipment can have one of the following electrical terminals:
- Spade plug connections according to ISO-4400 or 3 x DIN-46244 (when correctly installed, this connection provides IP-65 protection).
- Embedded screw terminals in metal enclosure with "Pg" cable gland
- Spade terminals (AMP type).
- Flying leads or cables.

PUTTING INTO SERVICE

Before pressurizing the system, first carry-out an electrical test. In case of solenoid valves, energize the coil a few times and notice a metal click signifying the solenoid operation.

SERVICE

Most of the solenoid valves are equipped with coils for continuous duty service. To prevent the possibility of personal or property damage, do not touch the solenoid which can become hot under normal operating conditions.

SOUND EMISSION

The emission of sound depends on the application, medium and nature of the equipment used. The exact determination of the sound level can only be carried out by the user having the valve installed in his system

MAINTENANCE

Maintenance of ASCO Numatics products is dependent on service conditions. Periodic cleaning is recommended, the timing of which will depend on the media and service conditions. During servicing, components should be examined for excessive wear. A complete set of internal parts is available as spare parts or rebuild kit. If a problem occurs during installation/maintenance or in case of doubt please contact ASCO Numatics or authorized representatives.

*A separate Declaration of Incorporation relating to EU-Directive 2006/42/EC Annex IIB is available on request for applicable products. Please provide product identification number and serial numbers of products concerned.

The product, , when marked CE, complies with the essential requirements of the EMC 2004/108/EC (until April 20th 2016) and EMC 2014/30/EU (from April 20th 2016) and LVD 2006/95/EC (until April 20th 2016) and LVD 2014/35/EU (from April 20th 2016). A separate Declaration of Conformity is available on request. Please provide product identification number and serial numbers of the products concerned.

FR

INSTRUCTIONS GÉNÉRALES D'INSTALLATION ET D'ENTRETIEN

Note: Ces instructions générales d'installation et d'entretien complètent la notice spécifique du produit.

MONTAGE

Les composants ASCO Numatics sont conçus pour les domaines de fonctionnement indiqués sur la plaque signalétique ou la documentation. Aucune modification ne peut être réalisée sur le matériel sans l'accord préalable du fabricant ou de son représentant. Avant de procéder au montage, dépressuriser les canalisations er effectuer un nettoyage inteme.
A moins qu'une fléche ou la notice n'indique un sens de montage spécifique de la tête magnétique, le produit peut être monté dans n'importe quelle position
Le sens de circulation du fluide est indiqué par repères sur le corps er dans la documentation.
La dimension des tuyauteries doit correspondre au raccordement indiqué sur le corps, l'étiquette ou la notice.

Attention:
- Une restriction des tuyauteries peut entraîner des dysfonctionnements.
- Afin de protéger le matériel, installer une crépine ou un filtre adéquat en amont, aussi près que possible du produit.
- En cas d' utilisation de ruban; pàte, aérosol ou autre lubrifiant lors du serrage, veiller à ce qu" aucun corps étranger ne pénètre dans le circuit.
- Utiliser un outillage approprié et placer les clés aussi près que possible du point de raccordement.
- Afin d'éviter toute détérioration, NE PAS TROP SERRER les raccords des tuyauteries.
- Ne pas se servir de la vanne ou de tête magnétique comme d'un levier.
- The pipe connections should not apply any force, torque or strain to the product.

RACCORDEMENT ÉLECTRIQUE

Le raccordement électrique doit être réalisé par un personnel qualifié et selon les normes et règlements locaux.

Attention:
- Avant toute intervention, couper l'alimentation électrique pour mettre hors tension les composants.
- Toutes les bornes à vis doivent être serrées correctement avant la mise en service.
- Selon la tension, les composants électrique doivent être mis à la terre conformément aux normes et règlements locaux.

Selon les cas, le raccordement électrique s'effectué par:
- Connecteur débrochable ISO-4400 ou 3 x DIN-46244 avec degré de protection IP-65 lorsque le raccordement est correctement effectué.
- Bornes à vis solidaires du bobinage, sous boîter métallique avec presse-étoupe "Pg--".
- Cosses (type AMP).
- Fils ou câbles solidaires de la bobine.

MISE EN SERVICE

Avant de mettre le circuit sous pression, effectuer un essai électrique. Dans le cas d'une électrovanne, mettre la bobine sous tension plusieurs fois er écouter le "clic" métallique qui signale le fonctionnement de la tête magnétique.

FONCTIONNEMENT

La plupart des électrovannes comportant des bobinages prévus pour mise sous tension permanente. Pour éviter toute brûlure, ne pas toucher la tête magnétique qui, en fonctionnement normal et en permanence sous tension, peut atteindre une température élevée.

BRUIT DE FONCTIONNEMENT

Le bruit de fonctionnement varie selon l'utilisation, le fluide et le type de matériel employé. L'utilisateur ne pourra déterminer avec précision le niveau sonore émis qu'après avoir monté le composant sur l'installation.

ENTRETIEN

L'entretien nécessaire aux produits ASCO Numatics varie avec leurs conditions d'utilisation. Il est souhaitable de procéder à un nettoyage périodique dont l'intervalle varie suivant la nature du fluide, les conditions de fonctionnement et le milieu ambiant. Lors de l'intervention. Les composants doivent être examinés our détecter toute usure excessive. Un ensemble de pièces internes est proposé en pièces de rechange pour procéder à la réfection. En cas de problème lors du montage/entretien ou en cas de doute, veuillez contacter ASCO Numatics ou ses représentants officiels.

*Une déclaration d'incorporation relative à la directive UE 2006/42/CE Annexe II B est disponible sur demande pour les produits applicables. Veuillez fournir le numéro d'identification du produit et les numéros de série des produits concernés.

Lorsqu'il est marqué du label CE, le produit est conforme aux exigences essentielles des directives CEM 2004/108/CE (jusqu'au 20 avril 2016) et CEM 2014/30/UE (à partir du 20 avril 2016) et des directives Basse tension 2006/95/CE (jusqu'au 20 avril 2016) et 2014/35/UE (à partir du 20 avril 2016). Une déclaration de conformité peut être fournie sur simple demande. Veuillez fournir le numéro d'identification du produit et les numéros de série des produits concernés.

DE

ALLGEMEINE BETRIEBSANLEITUNG

Achtung: Diese Allgemeine Betriebsanleitung gilt in Zusammenhang mit der jeweiligen Betriebsanleitung für die speziellen Produkte.

EINBAU

Die ASCO Numatics-Komponenten dürfen nur innerhalb der auf den Typenschildern angenebenen Daten eingesetzt warden, Veränderungen an den Produkten sind nur nach Rücksprache mit ASCO Numatics zulässig.
Vor dem Einbau der Ventile muß das Rohrleitungssystem drucklos geschaltet und innen gereinigt werden.
Die Einbaulage der Produkte ist genereil beliebig. Ausnahme: Die mit einem Pfeil gekennzeichneten Produkte müssen entsprechend der Pfeilrichtung montiert werden.
Die Durchflußrichtung und der Eingang von Ventilen sind gekennzeichnet.

Die Rohranschlüsse sollten entsprechend den Größenangaben auf den Typenschildern mit handelsüblichen Verschraubungen durchgeführt werden. Dabei ist folgendes zu beachten:
- Eine Reduzierung der Anschlüsse kann zu Leistungs-und Funktionsminderungen führen.
- Zum Schutz der Ventile sollten Schmutzfänger oder Filter so dicht wie möglich in den Ventileingang integriert werden.
- Bei Abdichtung am Gewinde ist darauf zu achten, daß kein Dichtungsmaterial in die Rohrleitung oder das Ventil gelangt.
- Zur Montage darf nur geeignetes Werkzeug verwendetwerden.
- Konische Verschraubungen sind sorgfältig anzuziehen. Es ist darauf zu achten, daß beim Anziehen das Gehäuse nicht beschädigt wird.
- Spule und Führungsrohr von Ventilen dürfen nicht als Gegenhalter benutzt werde.
- Die Rohrleitungsanschlüsse sollen fluchten und dürfen keine Spannungen auf das Ventil übertragen.

ELECTRISCHER ANSCHLUß

Der elektrische Anschluß ist von Fachpersonal entsprechend den geltenden VDE-und CEE Richtlinien auszuführen. Es ist besonders auf foigendes zu achten:
- Vor Beginn der Arbeiten ist sicherzustellen, daß alle elektrischen Leitungen und Netzteile spannungslos geschaltet sind.
- Alle Anschlußklemmen sind nach Beendigung der Arbeiten vorschriftsmäßig entsprechend den geltenden Regeln anzuziehen.
- Je nach Spannungsbereich muß das Ventil nach den geltenden Regeln einen Schutzleiteranschluß erhalten.

Der Magnetantrieb kann je nach Bauart folgende Anschlüsse haben:
- Anschluß für Gerätesteckdose nach DIN 43650 Form A/ISO 4400 oder 3 x DIN 46244 (durch ordnungsgemäße Montage der Gerätesteckdose wird Schutzklasse IP 65 erreicht).
- Anschlüsse innerhalb eines Blechgehäuses mittels Schraubklemmen. Kabeleinführung ins Gehäuse mit PG-Verschraubung.
- Offene Spulen mit Flachsteckern (AMP-Fahnen) oder mit eingegossenen Kabelenden.

INBETRIEBNAHME

Vor Druckbeaufschlagung des Produktes sollte eine elektrische Funktionsprüfung erfolgen:

Bei Ventilen Spannung an der Magnetspule mehrmals ein-und ausschalten. Es muß ein Klicken zu hören sein.

BETRIEB

Die meisten Ventile sind mit Spulen für Dauerbetrieb ausgerüstet. Zur Vermeidung von Personen-und Sachschäden sollte jede Berührung mit dem Ventil vermieden werden, da die Magnetspule bei längerem Betrieb sehr heiß werden kann.

GERÄUSCHEMISSION

Diese hängt sehr stark vom Anwendungsfall, den Betriebsdaten und dem Medium, mit denen das Produkt beaufschlagt wird, ab. Eine Aussage über die Geräuschemission des Produktes muß deshalb von demjenigen getroffen werden, der das Produkt innerhalb einer Maschine in Betrieb nimmit.

WARTUNG

Die Wartung hängt von den Einsatzbedigungen ab. In entsprechenden Zeitabständen muß das Produkt geöffnet und gereinigt werden. Für die Überholung der ASCO Numatics-Produkte können Ersatzteilsätze geliefert werden. Treten Schwierigkeiten bel Einbau, Betrieb oder Wartung auf, sowie bei Unklarheiten, ist mit ASCO Numatics Rücksprache zu halten.

ASCO Numatics Produkte sind entsprechend der EG-Richtlinie 89/392/EWG gefertigt.

*Eine separate Herstellererklärung im Sinne der Richtlinie 2006/42/EWG Anhang II B ist auf Anfrage für die entsprechenden Produkte erhältlich. Geben Sie bitte die Kennnummer sowie die Seriennummer der betreffenden Produkte an.

Das Produkt, wenn mit CE gekennzeichnet, erfüllt die Anforderungen von EMV 2004/108/EWG (bis 20. April 2016) und EMV 2014/30/EU (vom 20. April 2016) und LVD 2006/95/EWG (bis 20. April 2016) und LVD 2014/35/EU (vom 20. April 2016). Eine separate Konformitätserklärung ist auf Anfrage erhältlich. Geben Sie bitte die Kennnummer sowie die Seriennummer der betreffenden Produkte an.

ASCO
50 Hanover Road
Florham Park, New Jersey 07932
Tel. (973) 966-2000
Fax (973) 966-2628

ASCO
1561 Columbia Highway
Aiken, South Carolina 29801
Tel. (803) 641-9200
Fax (803) 641-9290

ASCO Valves® E 264274 - 04/2016

ASCHROFT

TYPE 1009, PRESSURE GAUGE

LEFT BLANK

ASHCROFT®

PRESSURE GAUGE INSTALLATION, OPERATION AND MAINTENANCE

I&M008-10098-5/02 (250-1353-K) Rev. 11/10

This page is intentionally left blank

CONTENTS

Cover photo courtesy of Johnson/Yokogawa Co.

Chemiquip® is a registered trademark of Chemiquip Products Co. Inc.

1.0 SELECTION & APPLICATION

Users should become familiar with ASME B40.100 (Gauges – Pressure Indicating Dial Type – Elastic Element) before specifying pressure measuring gauges. That document – containing valuable information regarding gauge construction, accuracy, safety, selection and testing – may be ordered from:

ASME International
Three Park Avenue
New York, N.Y. 10016-5990
800-843-2763 (US/Canada)
001-800-843-2763 (Mexico)
973-882-1170 outside North America
email: infocentral@asme.org
www.asme.org

WARNING: To prevent misapplication, pressure gauges should be selected considering media and ambient operating conditions. Improper application can be detrimental to the gauge, causing failure and possible personal injury, property damage or death. The information contained in this manual is offered as a guide in making the proper selection of a pressure gauge. Additional information is available from Ashcroft Inc.

The following is a highlight of some of the more important considerations:

1.1 Range – The range of the instrument should be approximately twice the maximum operating pressure. Too low a range may result in (a) low fatigue life of the elastic element due to high operating stress and (b) susceptibility to overpressure set due to pressure transients that exceed the normal operating pressure. Too high a range may yield insufficient resolution for the application.

1.2 Temperature – Refer to Section 2 of this manual for important information concerning temperature related limitations of pressure gauges, both dry and liquid filled.

1.3 Media – The material of the process sensing element must be compatible with the process media. Use of a diaphragm seal with the gauge is recommended for process media that (a) is corrosive to the process sensing element; (b) contain heavy particulates (slurries) or (c) are very viscous including those that harden at room temperature.

1.4 Oxidizing media – Gauges for direct use on oxidizing media should be specially cleaned. Gauges for oxygen service should be ordered to variation X6B and will carry the ASME required dial marking "USE NO OIL" in red letters. Gauges for direct use on other oxidizing media may be ordered to variation X6W. They will be cleaned but carry no dial marking. *PLUS!*™ Performance gauges or Halocarbon filled gauge or diaphragm fill is required for use with oxidizing media; order variation XCF.

1.5 Pulsation/Vibration – Pressure pulsation can be dampened by several mechanisms; the patented *PLUS! Performance* gauge will handle the vast majority of applications. One exception to this is high frequency pulsation which is difficult to detect. The only indication may be an upscale zero shift due to movement wear. These applications should be addressed with a liquid filled gauge, or in extreme cases, a remotely mounted liquid filled gauge connected with a length of capillary line. The small diameter of the capillary provides excellent dampening, but can be plugged. The Ashcroft 1106 pulsation dampener and 1112 snubber are auxiliary devices which dampen pulsation with less tendency to plug.

1.6 Gauge fills. – Once it has been determined that a liquid filled gauge is in order, the next step is selecting the type of fill. **Glycerin** satisfies most applications. While being the least expensive fill, its usable temperature range is 20/180°F. **Silicone** filled gauges have a broader service range: –40/250°F. Oxidizing media require the use of **Halocarbon,** with a service range of –40/250°F. Pointer motion will be slowed at the low end of the low end of these temperature ranges.

1.7 Mounting – Users should predetermine how the gauge will be mounted in service: stem (pipe), wall (surface) or panel (flush). Ashcroft wall or panel mounting kits should be ordered with the gauge. See Section 3.

2.0 TEMPERATURE

2.1 Ambient Temperature – To ensure long life and accuracy, pressure gauges should preferably be used at an ambient temperature between –20 and +150°F (–30 to +65°C). At very low temperatures, standard gauges may exhibit slow pointer response. Above 150°F, the accuracy will be affected by approximately 1.5% per 100°F. Other than discoloration of the dial and hardening of the gasketing and degradation of accuracy, non-liquid filled Type 1279 (phenolic case) and 1379 (aluminum case) Duragauge® gauge, with standard glass windows, can withstand continuous operating temperatures up to 250°F. Unigauge models 2½″ and 3½″ 1009 and 1008S liquid filled gauges can withstand 200°F but glycerin fill and the acrylic window of Duragauge® gauges will tend to yellow. Silicone fill will have much less tendency to yellow. Low pressure, liquid filled Types 1008 and 1009 gauges may have some downscale errors caused by liquid fill expansion. This can be alleviated by venting the gauge at the top plug (pullout the blue plug insert). To do this the gauge must be installed in the vertical position.

Although the gauge may be destroyed and calibration lost, gauges can withstand short times at the following temperatures: gauges with all welded pressure boundary joints, 750°F (400°C); gauges with silver brazed joints, 450°F (232°C) and gauges with soft soldered joints, 250°F (121°C). For expected long term service below –20°F (–30°C) Duragauge® and 4½″ 1009 gauges should be hermetically sealed and specially lubricated; add "H" to the product code for hermetic sealing. Add variation XVY for special lubricant. Standard Duralife® gauges may be used to –50°F (–45°C) without modification.

2.2 Accuracy – Heat and cold affect accuracy of indication. A general rule of thumb for **dry gauges** is 0.5% of full scale change for every 40°F change from 75°F. Double that allowance for gauges with hermetically sealed or liquid filled cases, except for Duragauge® gauges where no extra allowance is required due to the elastomeric, compensating back. Above 250°F there may exist very significant errors in indication.

2.3 Steam service – In order to prevent live steam from entering the Bourdon tube, a siphon filled with water should be installed between the gauge and the process line. Siphons can be supplied with ratings up to 4,000 psi. If freezing of the condensate in the loop of the siphon is a possibility, a diaphragm seal should be used to isolate the gauge from the process steam. Siphons should also be used whenever condensing, hot vapors (not just steam) are present. Super heated steam should have enough piping or capillary line ahead of the siphon to maintain liquid water in the siphon loop.

2.4 Hot or very cold media – A five foot capillary line assembly will bring most hot or cold process media within the recommended gauge ambient temperature range. For media above

750°F (400°C) the customers should use their own small diameter piping to avoid possible corrosion of the stainless steel. The five foot capillary will protect the gauges used on the common cryogenic (less than –300°F (200°C) gases, liquid argon, nitrogen, and oxygen.) The capillary and gauge must be cleaned for oxygen service. The media must not be corrosive to stainless steel, and must not plug the small bore of the capillary.

2.5 Diaphragm seals – A diaphragm seal should be used to protect gauges from corrosive media, or media that will plug the instrument. Diaphragm seals are offered in a wide variety of designs and corrosion resistant materials to accommodate almost any application and most connections. Visit www.ashcroft.com for details.

2.6 Autoclaving – Sanitary gauges with clamp type connections are frequently steam sterilized in an autoclave. Gauges equipped with polysulfone windows will withstand more autoclave cycles than those equipped with polycarbonate windows. Gauges equipped with plain glass or laminated safety glass **should not be autoclaved.** Gauge cases should be vented to atmosphere (removing the rubber fill/safety plug if necessary) **before** autoclaving to prevent the plastic window from cracking or excessively distorting. If the gauge is liquid filled, the fill should be drained from the case and the front ring loosened before autoclaving.

3.0 INSTALLATION

3.1 Location – Whenever possible, gauges should be located to minimize the effects of vibration, extreme ambient temperatures and moisture. Dry locations away from very high thermal sources (ovens, boilers etc.) are preferred. If the mechanical vibration level is extreme, the gauge should be remotely located (usually on a wall) and connected to the pressure source via flexible tubing.

3.2 Gauge reuse – ASME B40.100 recommends that gauges not be moved indiscriminately from one application to another. The cumulative number of pressure cycles on an in-service or previously used gauge is generally unknown, so it is generally safer to install a new gauge whenever and wherever possible. This will also minimize the possibility of a reaction with previous media.

3.3 Tightening of gauge – Torque should never be applied to the gauge case. Instead, an open end or adjustable wrench should always be used on the wrench flats of the gauge socket to tighten the gauge into the fitting or pipe. NPT threads require the use of a suitable thread sealant, such as pipe dope or teflon tape, and must be tightened very securely to ensure a leak tight seal.

CAUTION: Torque applied to a diaphragm seal or its attached gauge, that tends to loosen one relative to the other, can cause loss of fill and subsequent inaccurate readings. Always apply torque **only** to the wrench flats on the lower seal housing when installing filled, diaphragm seal assemblies or removing same from process lines.

3.4 Process isolation – A shut-off valve should be installed between the gauge and the process in order to be able to isolate the gauge for inspection or replacement without shutting down the process.

3.5 Surface mounting – Also known as wall mounting. Gauges should be kept free of piping strains. The gauge case mounting feet, if applicable, will ensure clearance between the pressure relieving back and the mounting surface.

3.6 Flush mounting – Also known as panel mounting. The applicable panel mounting cutout dimensions can be found at www.ashcroft.com

4.0 OPERATION

4.1 Frequency of inspection – This is quite subjective and depends upon the severity of the service and how critical the accuracy of the indicated pressure is. For example, a monthly inspection frequency may be in order for critical, severe service applications. Annual inspections, or even less frequent schedules, are often employed in non-critical applications.

4.2 In-service inspection – If the accuracy of the gauge cannot be checked in place, the user can at least look for (a) erratic or random pointer motion; (b) readings that are suspect – especially indications of pressure when the user believes the true pressure is 0 psig. Any gauge which is obviously not working or indicating erroneously, should be immediately valved-off or removed from service to avoid a possible pressure boundary failure.

4.3 When to check accuracy – Any suspicious behavior of the gauge pointer warrants that a full accuracy check be performed. Even if the gauge is not showing any symptoms of abnormal performance, the user may want to establish a frequency of bench type inspection.

4.4 When to recalibrate – This depends on the criticality of the application. If the accuracy of a 3-2-3% commercial type gauge is only 0.5% beyond specification, the user must decide whether it's worth the time and expense to bring the gauge back into specification. Conversely if the accuracy of a 0.25% test gauge is found to be 0.1% out of specification then the gauge should be recalibrated.

4.5 Other considerations – These include (a) bent or unattached pointers due to extreme pressure pulsation; (b) broken windows which should be replaced to keep dirt out of the internals; (c) leakage of gauge fill; (d) case damage – dents and/or cracks; (e) any signs of service media leakage through the gauge including its connection; (f) discoloration of gauge fill that impedes readability.

4.6 Spare parts – As a general rule it is recommended that the user maintain in inventory one complete Ashcroft® instrument for every ten (or fraction thereof) of that instrument type in service.

5.0 GAUGE REPLACEMENT

It is recommended that the user stock one complete Ashcroft® instrument for every ten (or fraction thereof) of that instrument type in service. With regard to gauges having a service history, consideration should be given to discarding rather than repairing them. Gauges in this category include the following:

a. Gauges that exhibit a span shift greater than 10%. It is possible the Bourdon tube has suffered thinning of its walls by corrosion.

b. Gauges that exhibit a zero shift greater than 25%. It is likely the Bourdon tube has seen significant overpressure leaving residual stresses that may be detrimental to the application.

c. Gauges which have accumulated over 1,000,000 pressure cycles with significant pointer excursion.

d. Gauges showing any signs of corrosion and/or leakage of the pressure system.

e. Gauges which have been exposed to high temperature or exhibit signs of having been exposed to high temperature – specifically 250°F or greater for soft soldered systems; 450°F or greater for brazed systems; and 750°F or greater for welded systems.

f. Gauges showing significant friction error and/or wear of the movement and linkage.

g. Gauges having damaged sockets, especially damaged threads.

h. Liquid filled gauges showing loss of case fill.

NOTE: ASME B40.100 does not recommend moving gauges from one application to another. This policy is prudent in that it encourages the user to procure a new gauge, properly tailored by specification, to each application that arises.

6.0 ACCURACY: PROCEDURES/DEFINITIONS

Accuracy inspection – Readings at approximately five points equally spaced over the dial should be taken, both upscale and downscale, before and after lightly rapping the gauge to remove friction. **A pressure standard with accuracy at least four times greater than the accuracy of the gauge being tested is recommended.**

Equipment – A finely regulated pressure supply will be required. It is critical that the piping system associated with the test setup be leaktight. The gauge under test should be positioned as it will be in service to eliminate positional errors due to gravity.

Method – ASME B40.100 recommends that **known** pressure (based on the reading from the pressure standard used) be applied to the gauge under test. Readings including any error from the nominal input pressure, are then taken from the gauge under test. The practice of aligning the pointer of the gauge under test with a dial graduation and then reading the error from the master gauge ("reverse reading") can result in inconsistent and misleading data and should NOT be used.

Calibration chart – After recording all of the readings it is necessary to calculate the errors associated with each test point using the following formula: ERROR in percent = 100 times (TRUE VALUE minus READING) ÷ RANGE. Plotting the individual errors (Figure 1) makes it possible to visualize the total gauge characteristic. The plot should contain all four curves: upscale – before rap; upscale – after rap; downscale – before rap; downscale – after rap. "*Rap*" means lightly tapping the gauge **before** reading to remove friction as described in ASME B40.100.

Referring to Figure 1, several classes of error may be seen:

Zero – An error which is approximately equal over the entire scale. This error can be manifested when either the gauge is

FIG. 1

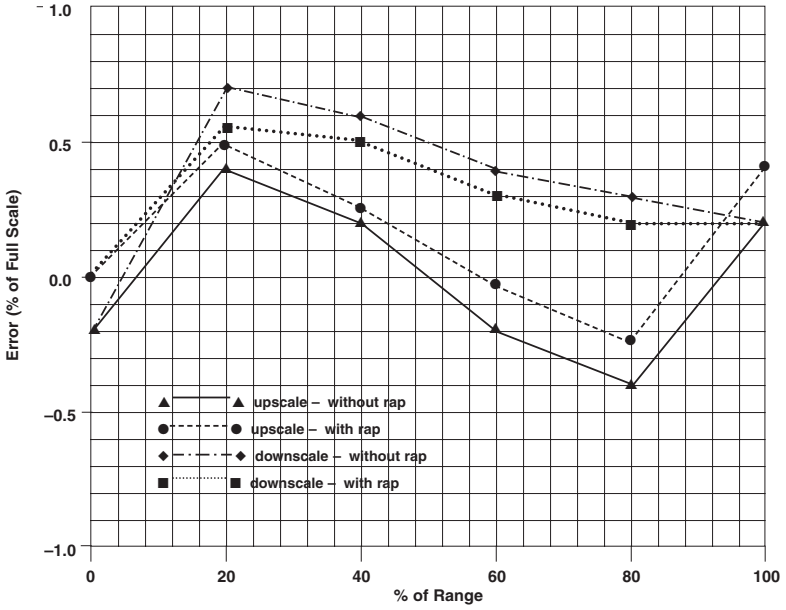
TYPICAL CALIBRATION CHART

INDICATED VALUE (PSI)

True Value – PSI	Increasing – Without RAP	Increasing – With RAP	Decreasing – Without RAP	Decreasing – With RAP
0	–.4	0	–.4	0
40	+.8	+1.0	+1.4	+1.1
80	+.4	+.5	+1.2	+1.0
120	–.4	–1.0	+.8	+.6
160	–.8	–.5	+.6	+.4
200	+.4	+.8	+.4	+.4

ERROR (% OF FULL SCALE)

True Value – % of Range	Increasing – Without RAP	Increasing – With RAP	Decreasing – Without RAP	Decreasing – With RAP
0	–.20	0	–.20	0
20	+.40	+.50	+.70	+.55
40	+.20	+.25	+.60	+.50
60	–.20	–.05	+.40	+.30
80	–.40	–.25	+.30	+.20
100	+.20	+.40	+.20	+.20



dropped or overpressured and the Bourdon tube takes a permanent set. This error may often be corrected by simply repositioning the pointer. Except for test gauges, it is recommended that the pointer be set at midscale pressure to "split" the errors.

Span – A span error exists when the error at full scale pressure is different from the error at zero pressure. This error is often proportional to the applied pressure. Most Ashcroft gauges are equipped with an internal, adjusting mechanism with which the user can correct any span errors which have developed in service.

Linearity – A gauge that has been properly spanned can still be out of specification at intermediate points if the response of the gauge as seen in Figure 1 (Typical Calibration Chart) is not linear. The Ashcroft Duragauge® pressure gauge is equipped with a rotary movement feature which permits the user to minimize this class of error. Other Ashcroft gauge designs (e.g., 1009 Duralife®) require that the dial be moved left or right prior to tightening the dial screws.

Hysteresis – Some Bourdon tubes have a material property known as hysteresis. This material characteristic results in differences between the upscale and downscale curves. This class of error can **not** be eliminated by adjusting the gauge movement or dial position.

Friction – This error is defined as the difference in readings before and after lightly tapping the gauge case at a check point. Possible causes of friction are burrs or foreign material in the movement gearing, "bound" linkages between the movement and the bourdon tube, or an improperly tensioned hairspring. If correcting these potential causes of friction does not eliminate excessive friction error, the movement should be replaced.

6.1 Calibration – Rotary Movement Gauges and Type 1259 Gauges – Inspect gauge for accuracy. Many times gauges are simply "off zero" and a simple pointer adjustment using the micrometer pointer is adequate. If inspection shows the gauge warrants recalibration to correct span and/or linearity errors, proceed as follows:

a. Remove ring, window and, if solid front case, the rear closure assembly.

b. Pressurize the gauge **once** to full scale and back to zero.

c. Refer to Figure 2 (Ashcroft System Assembly w/Rotary Gear Movement) for a view of a typical Ashcroft rotary system assembly with component parts identified. Refer to Figure 2A for link configuration of Type 1259 gauge.

FIG. 2 ASHCROFT SYSTEM ASSEMBLY W/ROTARY GEAR MOVEMENT

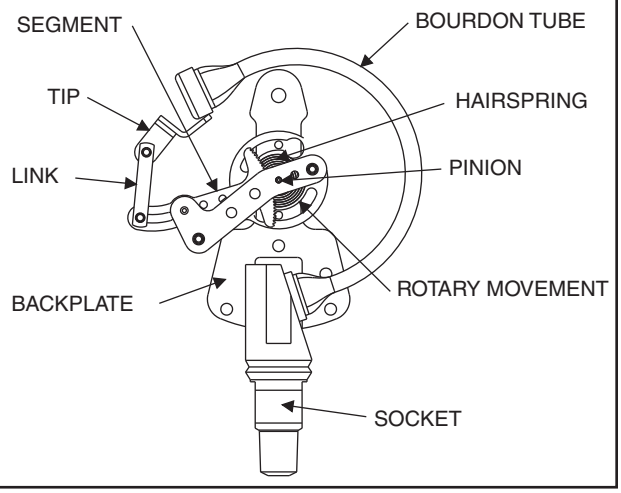
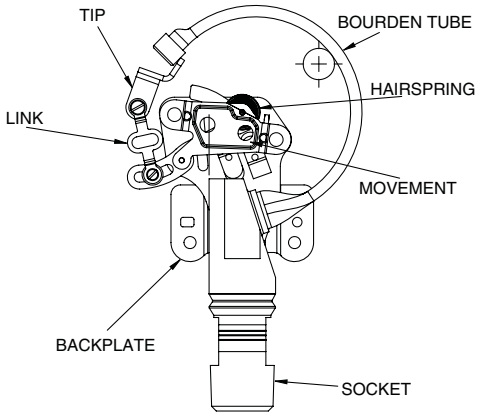


FIG. 2A ASHCROFT TYPE 1259 SYSTEM ASSEMBLY



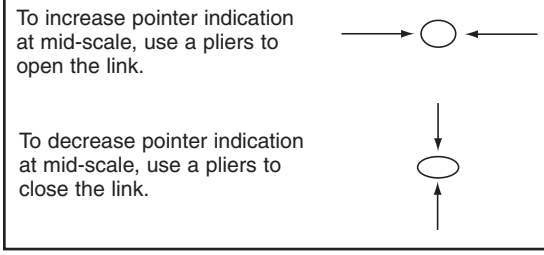
d. Adjust the micrometer pointer so that it rests at the true zero position. For open front gauges the pointer and dial must also be disassembled and the pointer should then be lightly pressed onto the pinion at the 9:00 o'clock position.

e. Apply full scale pressure and note the magnitude of the span error. With open front gauges, ideal span (270 degrees) will exist when at full scale pressure the pointer rests exactly at the 6:00 o'clock position.

f. If the span has shifted significantly (span error greater than 10%), the gauge should be replaced because there may be some partial corrosion inside the Bourdon tube which could lead to ultimate failure. If the span error exceeds 0.25%, loosen the lower link screw and move the lower end of the link toward the movement to increase span or away to decrease span. An adjustment of 0.004 inch will change the span by approximately 1%. This is a repetitive procedure which often requires more than one adjustment of the link position and the subsequent rechecking of the errors at zero and full scale pressure.

g. Apply midscale pressure and note error in reading. Even though the gauge is accurate at zero and full scale, it may be inaccurate at the midpoint. This is called linearity error. For corrections to linearity with the Type 1259 gauges refer to Figure 2B. For rotary movement gauges,

FIG. 2B LINEARITY ADJUSTMENT & LINK CONFIGURATION FOR ASHCROFT TYPE 1259



note the following: if the error is positive, the movement should be rotated counter clockwise. Rotating the movement one degree will change this error by approximately 0.25%. Rotating the movement often affects span and it should be subsequently rechecked and readjusted if necessary according to step 6.1e and 6.1f.

h. While recalibrating the gauge, the friction error – difference in readings taken with and without rap – should be noted. This error should not exceed the basic accuracy

of the gauge. If the friction error is excessive, the movement should be replaced. One possible cause of excessive friction is improper adjustment of the hairspring. The hairspring torque,or tension, must be adequate without being excessive. The hairspring should also be level, unwind evenly (no turns rubbing) and it should never tangle.

NOTES:

1 For operation of test gauge external zero reset, refer to Figure 1 on page 19.

2 For test gauge calibration procedure, refer to Figure 2 on page 20.

7.0 DIAPHRAGM SEALS

7.1 General – A diaphragm seal (isolator) is a device which is attached to the inlet connection of a pressure instrument to isolate its measuring element from the process media. The space between the diaphragm and the instrument's pressure sensing element is solidly filled with a suitable liquid. Displacement of the liquid fill in the pressure element, through movement of the diaphragm, transmits process pressure changes directly to a gauge, switch or any other pressure instrument. When diaphragm seals are used with pressure gauges, an additional 0.5% tolerance must be added to the gauge accuracy because of the diaphragm spring rate.

Used in a variety of process applications where corrosives, slurries or viscous fluids may be encountered, the diaphragm seal affords protection to the instrument where:

- The process fluid being measured would normally clog the pressure element.
- Pressure element materials capable of withstanding corrosive effects of certain fluids are not available.
- The process fluid might freeze due to changes in ambient temperature and damage the element.

7.2 Installation – Refer to bulletin OH-1 for information regarding (a) seal configurations; (b) filling fluids; (c) temperature range of filling fluids; (d) diaphragm material pressure and temperature limits; (e) bottom housing material pressure and temperature limits; (f) pressure rating of seal assembly; (g) accuracy/temperature errors of seal assembly; (h) diaphragm seal displacement. The volumetric displacement of the diaphragm must at least equal the volumetric displacement of the measuring element in the pressure instrument to which the seal is to be attached.

It is imperative that the pressure instrument/diaphragm seal assembly be **properly** filled prior to being placed in service. Ashcroft diaphragm seal assemblies should only be filled by a seal assembler certified by Ashcroft Inc. Refer to section 3.3 for a cautionary note about not applying torque on either the instrument or seal relative to the other.

7.3 Operation – All Ashcroft® diaphragm seals, with the exception of Type 310 mini-seals, are continuous duty. Should the pressure instrument fail, or be removed accidentally or deliberately, the diaphragm will seat against a matching surface preventing damage to the diaphragm or leakage of the process fluid.

7.4 Maintenance – Clamp type diaphragm seals – Types 100, 200 and 300 – allow for replacement of the diaphragm or diaphragm capsule, if that ever becomes necessary. The Type 200 top housing must also be replaced with the diaphragm. With all three types the clamping arrangement allows field disassembly to permit cleaning of the seal interior.

7.5 Failures – Diaphragm failures are generally caused by either corrosion, high temperatures or fill leakage. Process media build-up on the process side of the diaphragm can also require seal cleaning or replacement. Consult Customer Service, Stratford CT for advice on seal failures and/or replacement.

WARNING: All seal components should be selected considering process and ambient operating conditions to prevent misapplication. Improper application could result in failure, possible personal injury, property damage or death.

8.0 DAMPENING DEVICES

8.1 General – Some type of dampening device should be used whenever the pressure gauge may be exposed to repetitive pressure fluctuations that are fairly rapid, high in magnitude and especially when transitory pressure spikes exceeding the gauge range are present (as with starting and stopping action of valves and pumps). A restricted orifice of some kind is employed through which pressure fluctuations must pass before they reach the Bourdon tube. The dampener reduces the magnitude of the pressure pulse thus extending the life of the Bourdon tube and movement. This reduction of the pressure pulsation as "seen" by the pressure gauge is generally evidenced by a reduction in the pointer travel. If the orifice is very small the pointer may indicate the average service pressure, with little or no indication of the time varying component of the process pressure.

Commonly encountered media (e.g. – water and hydraulic oil) often carry impurities which can plug the orifice over time thus rendering the gauge inoperative until the dampener is cleaned or replaced.

Highly viscous media and media that tend to periodically harden (e.g., asphalt) require a diaphragm seal be fitted to the gauge. The seal contains an internal orifice which dampens the pressure fluctuation within the fill fluid.

8.2 Throttle Screws & Plugs – These accessories provide dampening for the least cost. They have the advantage of fitting completely within the gauge socket and come in three types: (a) a screwed-in type which permits easy removal for cleaning or replacement; (b) a pressed in, non-threaded design and (c) a pressed in, threaded design which provides a highly restrictive, helical flow path. Not all styles are available on all gauge types.

8.3 Ashcroft Pulsation Dampener – Type 1106 Ashcroft pulsation dampener is a moving pin type in which the restricted orifice is the clearance between the pin and any one of five preselected hole diameters. Unlike a simple throttle screw/plug, this device has a self-cleaning action in that the pin moves up and down under the influence of pressure fluctuations.

8.4 Ashcroft Pressure Snubber – The heart of the Type 1112 pressure snubber is a thick porous metal filter disc. The disc is available in four standard porosity grades.

8.5 Ashcroft Needle Valves – Type 7001 thru 7004 steel needle valves provide varying degrees of dampening. These devices, in the event of plugging, can easily be opened to allow the pressure fluid to clear away the obstruction.

8.6 Chemiquip® Pressure Limiting Valves – Model PLV-255, PLV-2550, PLV-5460, PLV-5500 and PLV-6430, available with and without built-in snubbers, automatically "shut off" at adjustable preset values of pressure to protect the gauge from damage to overpressure. They are especially useful on hydraulic systems wherein hydraulic transients (spikes) are common.

9.0 TEST EQUIPMENT & TOOL KITS

See our website www.ashcroft.com for more details

9.1 Pressure Instrument Testing Equipment

Type 1305D Deadweight Tester

Type 1327D Pressure Gauge Comparator

Type 1327CM “Precision” Gauge Comparator

9.2 Tools & Tool Kits For Recalibration of 4½˝ and Larger Gauges

Type 2505 universal carrying case for 1082 test gauge

Type 266A132-01 span wrench for 1082 test gauge

Type 1281 socket O-Ring kit for 1279/1379 lower connect

Type 1285 4½˝ ring wrench for 1279/1379 lower & back connect

Type 1286 6˝ ring wrench for 1379 lower & back connect

Type 3220 pointer puller (all gauges except 1009 Duralife®)

Type 3530 pinion back-up tool for 1009 Duralife®

Type 3220 Handjack set

Type 1105 Tool Kit

9.3 Kits to Convert a Dry Gauge to a Liquid Filled or Weather Proof Case Gauge

Type 1280 conversion kit for 4½˝ lower connect 1279/1379

Type 1283 conversion kit for 4½˝ back connect 1279/1379

Type 1284 conversion kit for 6˝ lower & back connect

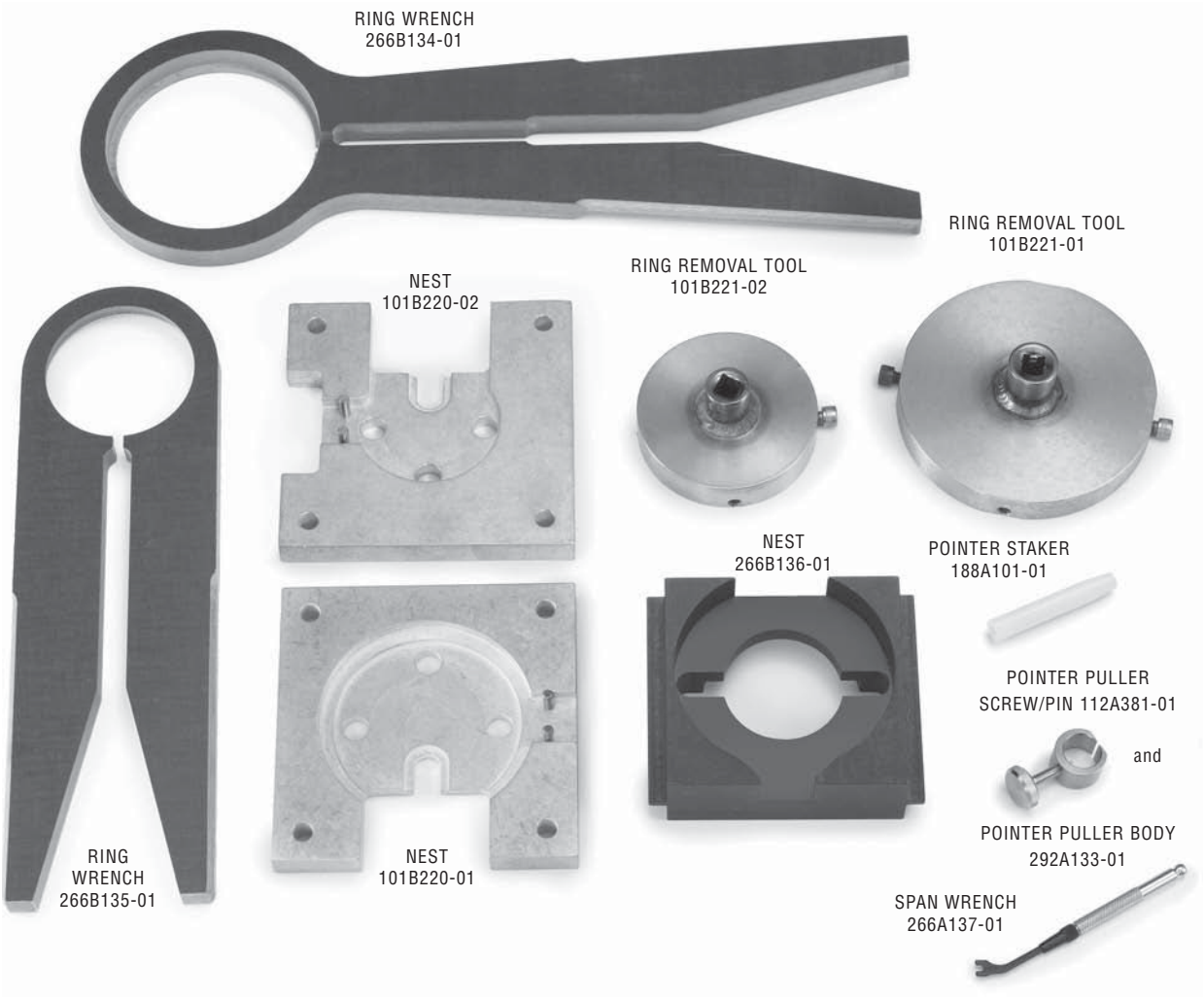
TYPE 1105
TOOL KIT

TYPE 3220
HAND JACK SET

9.4 2½ & 3½ 1009 Duralife® Gauge Tools

Description	Part No.
Pointer Puller Screw/Pin[2][3][4]	112A381-01
Pointer Puller Body[2][3][4]	292A133-01
Pointer Staker[2][4]	188A101-01
Span Wrench[2][5] (to adjust span)	266A137-01
Ring Wrench 3½″[1][5] (for ring removal) (35 1009)	266B134-01
Ring Wrench 2½″[1][5] (for ring removal) (25 1009)	266B135-01
Nest 2½″ & 3½″[1][5] (to hold gauge for ring removal) (25/35 1009)	266B136-01
Ring Removal Tool[6] (25 1009)	101B221-02
Ring Removal Tool[6] (35 1009)	101B221-01
Nest 2½″[6] (to hold gauge for ring removal) (25 1009)	101B220-02
Nest 3½″[6] (to hold gauge for ring removal) (35 1009)	101B220-01
Type 1230 throttle plug insertion (¼ NPT) for 1009 Duralife®	1230
Type 1231 throttle plug insertion (½ NPT) for 1009 Duralife® (body only)	1231
Tool to open orifice on push-in throttle plug	101A206-01

(1) Formerly 1206T Tool Kit.
(2) Formerly some parts in 1205T Tool Kit.
(3) Both parts must be purchased together.
(4) Previous and current design.
(5) Previous design only.
(6) Current design only.



ASHCROFT® Type 1188 Bellows Gauge Calibration Procedure

CALIBRATION & TROUBLE CORRECTION DIAGRAM

RANGE SPAN ADJUSTMENT

RANGE TOO SHORT
Adjust slide "S" inward

RANGE TOO LONG
Adjust slide "S" outward

POINTER JUMPING

STICKY PARTS
Clean all bearings and gear teeth

LOOSE HAIRSPRING
Remove backlash by disengaging pinion & rotate to tighten

COUNTER BALANCE RUBBING
Bend if necessary to clear socket in travel

NOTE: After adjusting range span, set both movement stops. Set the underload stop so that the pointer will stop at zero. Set the overload stop so that the pointer will pass the maximum range approximately 5˝.

After adjusting span re-zero pointer by removing from pinion and re-assembling at the proper dial mark.

SLUGGISH MOVEMENT

TIGHT HAIRSPRING
Loosen by disengaging pinion & rotate

NON LINEAR

NON LINEAR FIRST 3RD.

ADJ. ANGLE OF PULL BY INCREASING ANGLE "A"

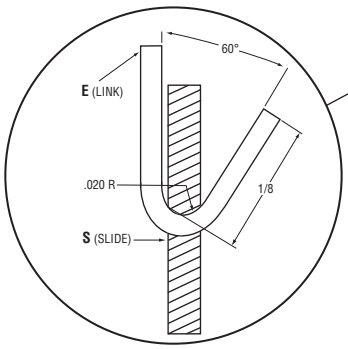
NON LINEAR LAST 3RD.

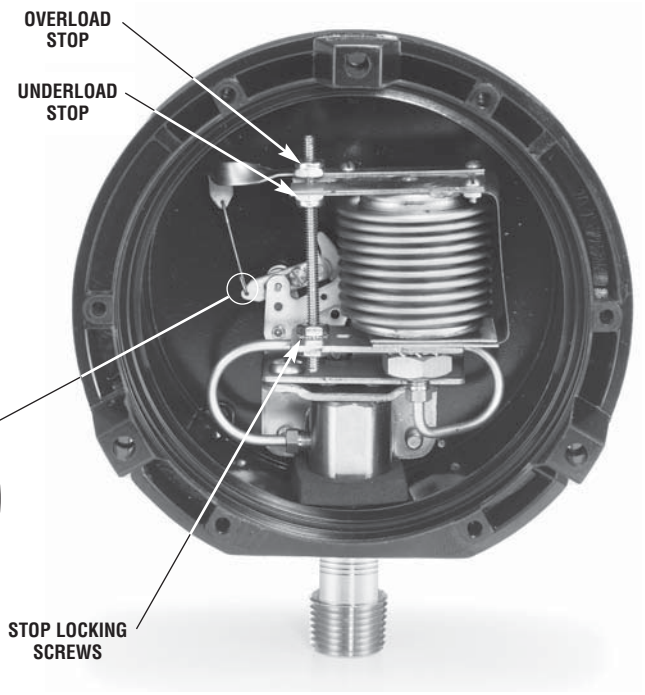
ADJ. ANGLE OF PULL BY DECREASING ANGLE "A"

NOTE: To increase or decrease angle "A," bend tip inward or outward as required. Doing this may run the movement segment off the pinion. This can be corrected by cutting off one end off the link "E" decreasing its length, or makin a new length from .032 dia. phos. bronze wire.
Caution: When reproducing link end, follow figure 44 very closely. this will prevent too much play, or, binding in operation.

REF: Replacing System Bellows
After assembling bellows to the gauge socket securely, subject system to 30 psi for five minutes, allowing bellows to travel approximately 1/8˝ against the overload stop. After this, heat treat system for 15 hours at 250°F, this procedure is necssary to prevent gauge drift.

SLIDE AND LINK (angle "A")
Enlarged view of slide and link



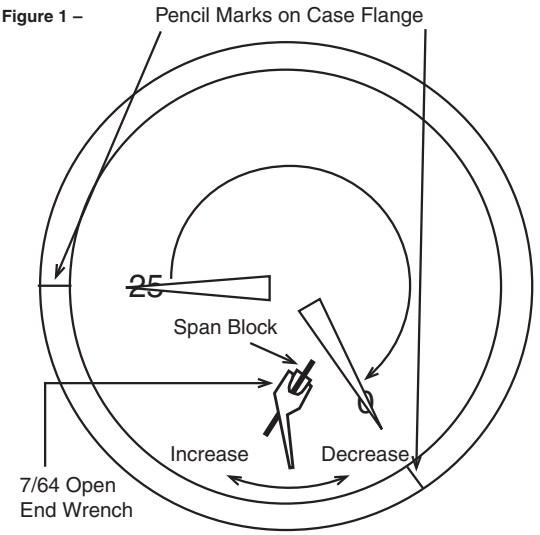


ASHCROFT® Previous Type 1009 Duralife® Calibration Procedure – Vacuum Range

ASHCROFT®

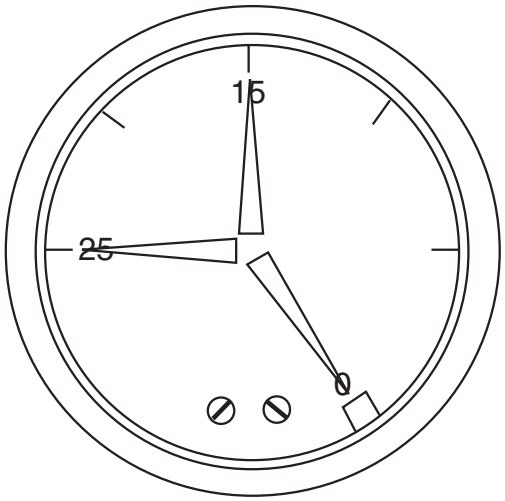
1. Remove ring, window and gasket pointer.
2. Using a pencil, refer to dial and mark the 0 and 25˝ Hg positions on the case flange.
3. Remove dial.
4. Apply 25˝ Hg vac.
5. Lightly press pointer onto pinion carefully aligning it with the 25˝ Hg vac. mark on the flange.
6. Release vacuum fully.
7. Note agreement of pointer to zero mark on flange.
8. If span is high or low, turn span block as shown in Figure 1.

Figure 1 –



9. Repeat steps 4 through 8 until span is correct.
10. Remove pointer.
11. With 25˝ Hg vac applied, reassemble dial, dial screws (finger tight) and point.
12. Apply 15˝ Hg vac. and note accuracy of indication. If required, slide dial left or right to reduce error to 1% maximum.
13. Firmly tighten dial screws.
14. Firmly tap pointer onto pinion.
15. recheck accuracy at 15 and 25˝ Hg vac. (Figure 2).
16. Reassemble window, gasket and ring.

Figure 2 –



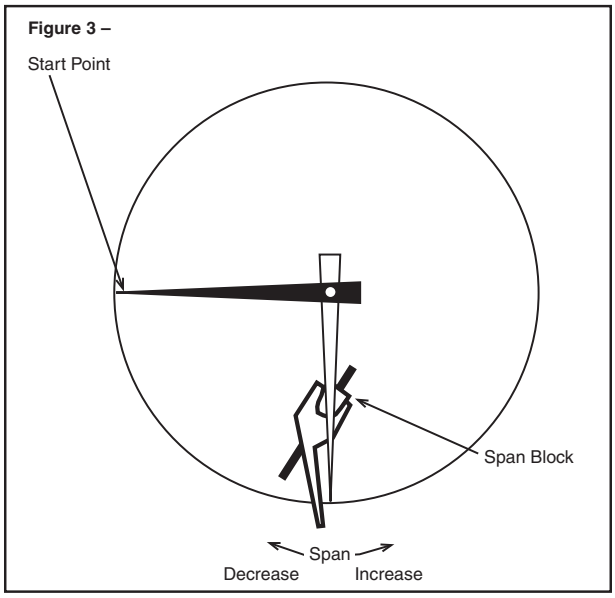
Notes: See page 10 for any tools required to calibrate.

For models produced prior to September 2008 for 2½˝ version and December 2008 for 3½˝ version.
Back of gauge will have a date code sticker.

ASHCROFT® Previous Type 1009 Duralife® Calibration Procedure – Pressure Range

Step 1. With the dial off, install pointer at 9 o'clock "lightly," Figure 3.

Figure 3 –

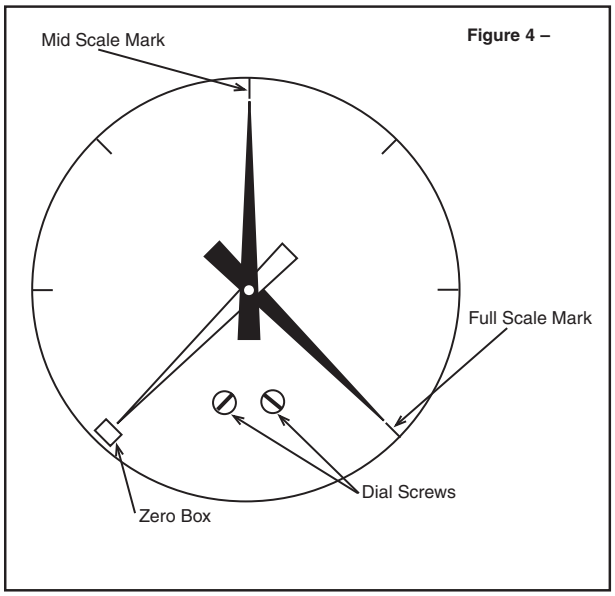


Step 2. Go to full scale pressure…rotate span block with tool until pointer rests at 6 o'clock.

Step 3. Go to zero pressure (9 o'clock)…if pointer has not moved away from start point, go to Step 4. If pointer has moved, repeat Step 1 until span is correct.

Step 4. Install dial with screws snug.

Figure 4 –



Step 5. Install pointer centered in zero box, Figure 4.

Step 6. Go to full scale pressure…check that pointer is within 1% of full scale mark. If not, remove pointer and dial and return to step 1, Figure 4.

Step 7. Go to mid-scale pressure…rotate dial until mid-scale mark is aligned with pointer, Figure 4.

Step 8. Tighten dials screws and stake on pointer.

Step 9. Check zero and full scale. Reassemble window, gasket and ring.

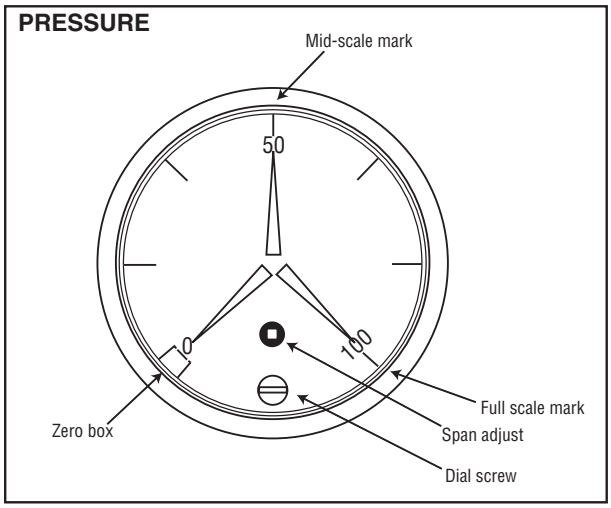
Notes: See page 10 for any tools required to calibrate.

For models produced prior to September 2008 for 2½˝ version and December 2008 for 3½˝ version.
Back of gauge will have a date code sticker.

ASHCROFT® Current Type 1009 Duralife® Calibration Procedure – Pressure and Vacuum Range

Calibration – 1009 Duralife® Gauge –
Inspect gauge for accuracy. At times gauges are simply "off zero" and opening the ventable plug at the top of the gauge will relieve internal gauge pressure and correct the offset. If this is not adequate and inspection shows that the gauge warrants recalibration to correct zero, span and/or linearity errors, proceed as follows:

Remove ring, window, and gasket using Ashcroft Ring Removal Tools P/N 101B220-02 and 101B221-02 for 2½" gauges and 101B220-01 and 101B221-01 for 3½" gauges.



Positive Pressure Ranges –

1. Adjust pointer with a slotted screwdriver until it is in the center of the zero box. This is often all that is required it correct calibration issues.

2. Apply full scale pressure. If error exceeds 1% rotate the black span adjustment device with a #0 square drive bit. Clockwise increases span, counterclockwise decrease span.

3. Fully exhaust pressure and check that pointer still is still in the zero box. If not, repeat step 1 and 2

4. Once 0 and full scale are within tolerance, pressurize gauge to mid-scale.

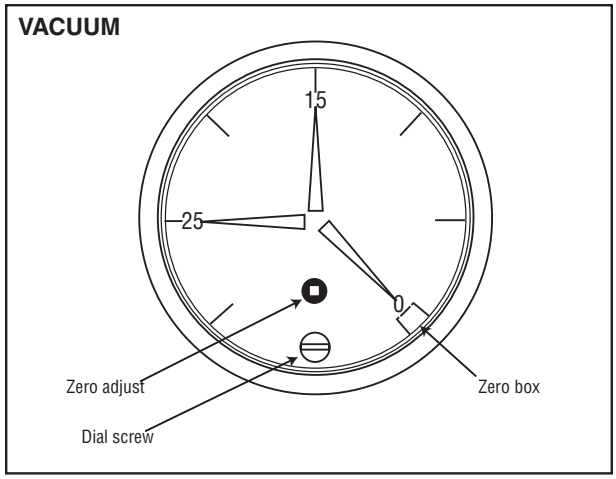
5. If gauge is within 1%, calibration is complete. If not loosen the dial screw and rotate dial left or right to adjust midpoint. Retighten dial screw.

6. If an adjustment was made in step 5, recheck the gauge at zero and full scale, adjust accordingly until zero, mid and full scale points are in tolerance.

Vacuum Range –

1. Adjust pointer with a slotted screwdriver until it is in the center of the zero box. This is often all that is required it correct calibration issues.

2. Apply 25 inches Hg vacuum. If the error exceeds 1% adjust pointer with a slotted screwdriver until gauge is within tolerance.



3. Vent to 0 pressure and check pointer position in the zero box. If error exceeds 1% rotate the black span adjustment device with a #0 square drive bit. Clockwise rotation moves pointer clockwise, counterclockwise rotation moves the pointer counterclockwise.

4. Repeat step 1 and 2 until 0 and 25 inches of Hg are within gauge tolerance.

5. Apply 15 inches Hg vacuum. If gauge is within 1%, calibration is complete. If not loosen the dial screw and rotate dial left or right to adjust midpoint. Retighten dial screw.

6. If an adjustment was made in step 4, recheck the gauge at zero and 25 inches of Hg vacuum, adjust accordingly until zero, 15 and 25 inches Hg are in tolerance.

7. Continue below.

Re-assemble window and ring to gauge:

a. If plastic window is used, push window back into front of gauge, ensure the o-ring does not roll out of window groove (lubricate if necessary). Align the tabs of the window with the tabs of the case front. Once window is in place, install ring and tighten with tools referenced above and shown on page 10.

b If safety glass is used, reinstall window, gasket, and ring. Ensure that the gasket is seated properly under all four tabs of the ring and does not wrinkle when ring is tightened.

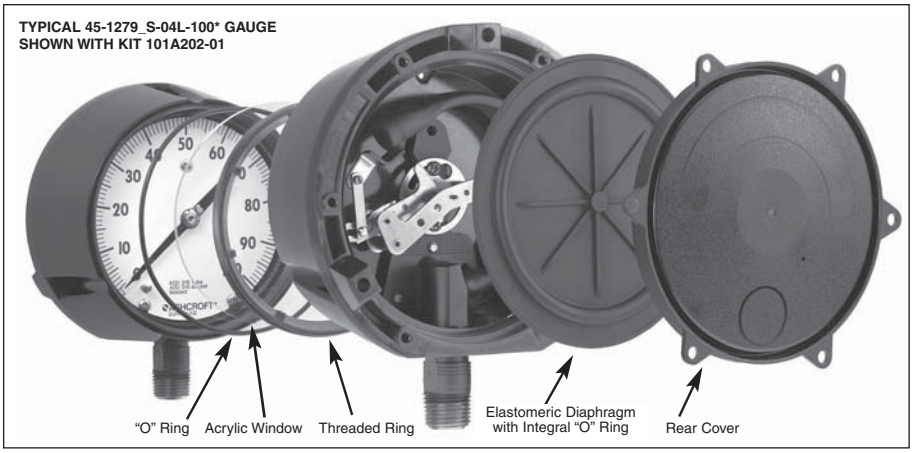
Note: Tighten ring: Apply 120-200inlb of torque. Rotate ring clockwise to tighten. Warning: over tightening of safety glass may induce cracking.

Notes: See page 10 for any tools required to calibrate.

For models produced after September 2008 for 2½˝ version and December 2008 for 3½˝ version.
Back of gauge will have a date code sticker.

Type 1279 & 1379 Solid Front Duragauge® Pressure Gauge Liquid Fill Conversion Instructions

ASHCROFT®



	1279		1379		
	4½˝ LOWER	4½˝ BACK	4½˝ LOWER	4½˝ BACK	6˝ LOWER & BACK
KIT PART NO.	101A202-01	101A203-01	1280	1283	1284
	QUANTITY INCLUDED				
ACRYLIC WINDOW	1	1	1	1	1
FRONT O-RING	1	1	1	1	1
DIAPHRAGM	1	1	1	1	2(1-LC:1-BC)
REAR COVER	1	1	1	1	2(1-LC:1-BC)
COVER SCREWS	4	4	-	-	-
THROTTLE SCREWS	2	2	2	2	2
GARTER SPRING	–	1	1	1	1
FILL IDENTIFICATION	1	1	1	1	1
THREADED RING	–	–	1	1	1

	Ambient Temp. Limits		60 psi and Under Down Scale Zero Shift Required
	°F	°C	
Weatherproof	–50/150	–45/65	N/A
Hermetically Sealed	–10/125	–25/50	N/A
Glycerin Filled	0/150	30/65	.15 psi
Silicone Filled	–50/150	–45/65	.12 psi

1. Unscrew front threaded ring (turn CCW). Remove and discard glass window. For range spans 60 psi and under, shift pointer down scale by the amount shown in the table. With either the glass or plastic window, replace the O-ring with one furnished in the kit.

2. Remove protective paper from acrylic plastic window taking care not to scratch window. Assemble window in gauge.

3. Moisten face of threaded ring with silicone oil or silicone grease where ring bears up against window. Replace front threaded ring and tighten firmly hand tight. See instructions on reverse side for applying proper torque to ring to establish desired squeeze on O-ring seal. **(Fig. 4).**

It is important to hold gauge **rigidly,** otherwise ring lugs may be damaged during removal or assembly process.

4. From rear of gauge, remove and discard these parts: rear cover and cover gaskets from case.

Note: Disregard Step No.s 5a and 5b if converting to hermetically sealed version.

When converting a 45-1379 with the top fill hole configuration, p/n 256A176-01 fill plug is required and must be ordered separately.

5. Filling Procedures:

a. Manual Filling Procedure: Place gauge face down on bench and **tip gauge** by blocking up front with a ⅜ inch block at the 12 o'clock dial position. Tipping of the gauge is necessary so fluid will flow into front cavity of the case. Pour in fill liquid to within about 1⁄16 inch of rear seal lip. When bubbles stop rising, front cavity is filled. Remove ⅜ inch block and pour in liquid until level is about 1⁄16 inch below rear sealing lip.

Note: An alternative method of filling is to fill the front dial cavity, adding the front window, etc., as in Step No. 3. Then fill the rear of the gauge. This method eliminates the need to tip the gauge.

b. Vacuum Pump Fill Procedure: (This procedure is recommended when filling a large number of gauges.) Place gauge face down and insert a 1⁄8 inch diameter tube, connected to a vacuum pump, through the 12 o'clock position hole in the rear, solid front portion of the case **(see Fig. 5).** Evacuate the air from the front dial cavity while pouring in the fill fluid through the case back. The vacuum will displace the air with fluid. When the dial cavity is solidly filled, remove the tubing and continue to pour the fill fluid to within 1⁄16 inch BELOW the O-ring channel lip.

Pre-measuring fill amount is not necessary with above methods. For reference, amount of fill is approximately 400 ml. or 14 fluid oz. (4½˝ GA.) and 455 ml. or 16 fluid oz. (6˝ GA.).

c. Note: The liquid fill level should be ⅜˝ (±1⁄8) as measured from the inside of the ring at the 12:00 o'clock position.

6. On lower connection gauges, assemble rear seal diaphragm to case.

For back connection gauges see instructions on reverse side. **(Fig. 2/4).**

7. For 1279:

Assemble rear cover and six self tapping screws in a criss-cross pattern and torque to 200 in lbs.

For 1379:

- Thread rear ring and torque to 200 in lbs
- Install stainless steel back cover using two screws

8. Assemble throttle screw to threaded hole in socket.

Note: If system is monel (socket wrenc flat stamped "PHS" or "PH") use monel throttle screw.

9. Check appropriate box on fill identification label, and peel off label back, and attach fill label to gauge case.

10. If gauge is to be repackaged:

a. Include enclosed instruction sheet inside carton.

b. Change type number on carton label to:
(1) Hermetically Sealed – 1279(*)SH.
(2) Liquid Filled – 1279(*)SL.
*Bourdon Tube System Code

Glycerin or silicone should not be used in applications involving Oxygen, Chlorine, Nitric Acid, Hydrogen Peroxide or other strong oxidizing agents, because of danger of spontaneous chemical reaction, ignition or explosion. Halocarbon should be specified. Products with this fill can be ordered from factory.The use of fluids other than those listed in the table above (for example, Hydrocarbon-based oils) may result in leakage caused by a reaction between the fluid and the elastomeric seals. Consult the factory before filling with any other fluid.

Type 1279 & 1379 Solid Front Duragauge® Pressure Gauge Liquid Fill Conversion Instructions

ASHCROFT®

INSTRUCTIONS FOR USING CONE TOOL AND RING WRENCH

Garter Spring & Diaphragm Assembly (Back Connection Gauge Only)

A. Place cone tool over socket shank as shown.

B. Moisten lip of socket and outer O-ring surface with silicone oil or grease.

C. Place diaphragm with rib side facing upward over cone into case grove.
Diaphragm O-ring must be completely in socket-shank grove.

D. Place garter spring over cone as shown and slide onto diaphragm in socket grove

E. Assemble rear cover with screws per step 7.

Front Ring Assembly (All Gauges)

A. Assemble ring to case by hand to start.

B. Place ring on wrench as shown

C. Use ½˝ drive extension and torque ring to 200 in. lb

Alternate Method

A. Tighten ring snugly by hand

B. Mark case and ring.

C. Turn ring another 100 to 120 degrees (slightly less than ½ turn) using the ring wrench and ½˝ drive socket wrench or place the blunt end of a wooden or plastic dowel against a ring lug and tap with a hammer.

INSTRUCTIONS FOR LIQUID FILLING ASHCROFT® TYPE 1279 AND 1379 SOLID FRONT DURAGAUGE® PRESSURE GAUGES USING A VACUUM PUMP

A. Insert a length of ⅛ ˝ diameter tubing through the 12 o'clock position hole in the rear, solid front portion of the case, as shown.

B. Evacuate the air from the front dial cavity while pouring in the fill fluid through the case back. The vacuum will displace the air with fluid.*

C. When the dial cavity is solidly filled, remove the tubing and continue to pour the fill fluid to within 1/16 ˝ below the o-ring channel lip, as shown.

D. When converting a 45-1379 with the top fill hole configuration, p/n 256A176-01 fill plug is required and must be ordered separately.

*To prevent breakage, reduce vacuum to 15 in. Hg for plain glass and safety glass.

BACK CONNECTION ASSEMBLED GAUGE

Fig. 2

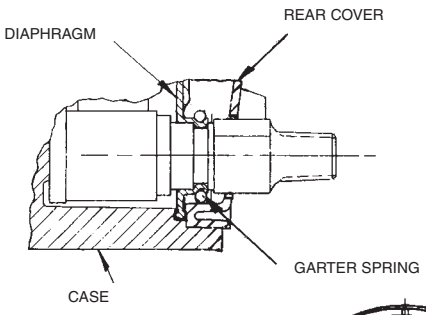


Fig. 3

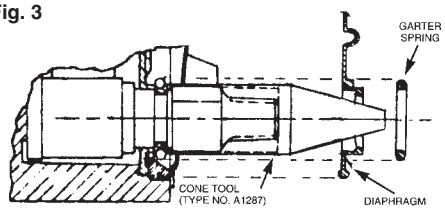


Fig. 4

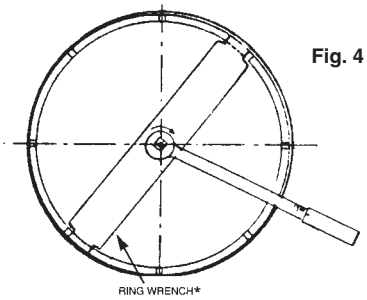
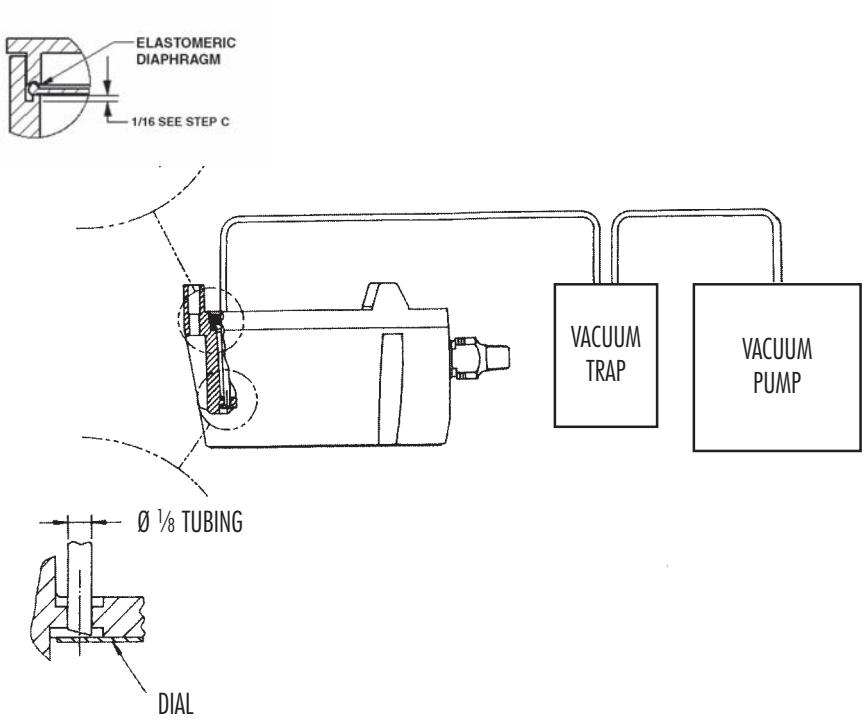
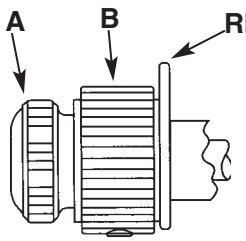


Fig. 5



INSTRUCTIONS FOR USE OF EXTERNAL EASY ZERO™ ADJUST FEATURE*

Fig. 1



1. LOOSEN RING-LOCKING SCREW **A**.
2. OBTAIN REQUIRED ADJUSTMENT BY ROTATING KNOB **B** CLOCKWISE OR COUNTER-CLOCKWISE.
3. TIGHTEN SCREW **A** DOWN ON KNOB **B**.

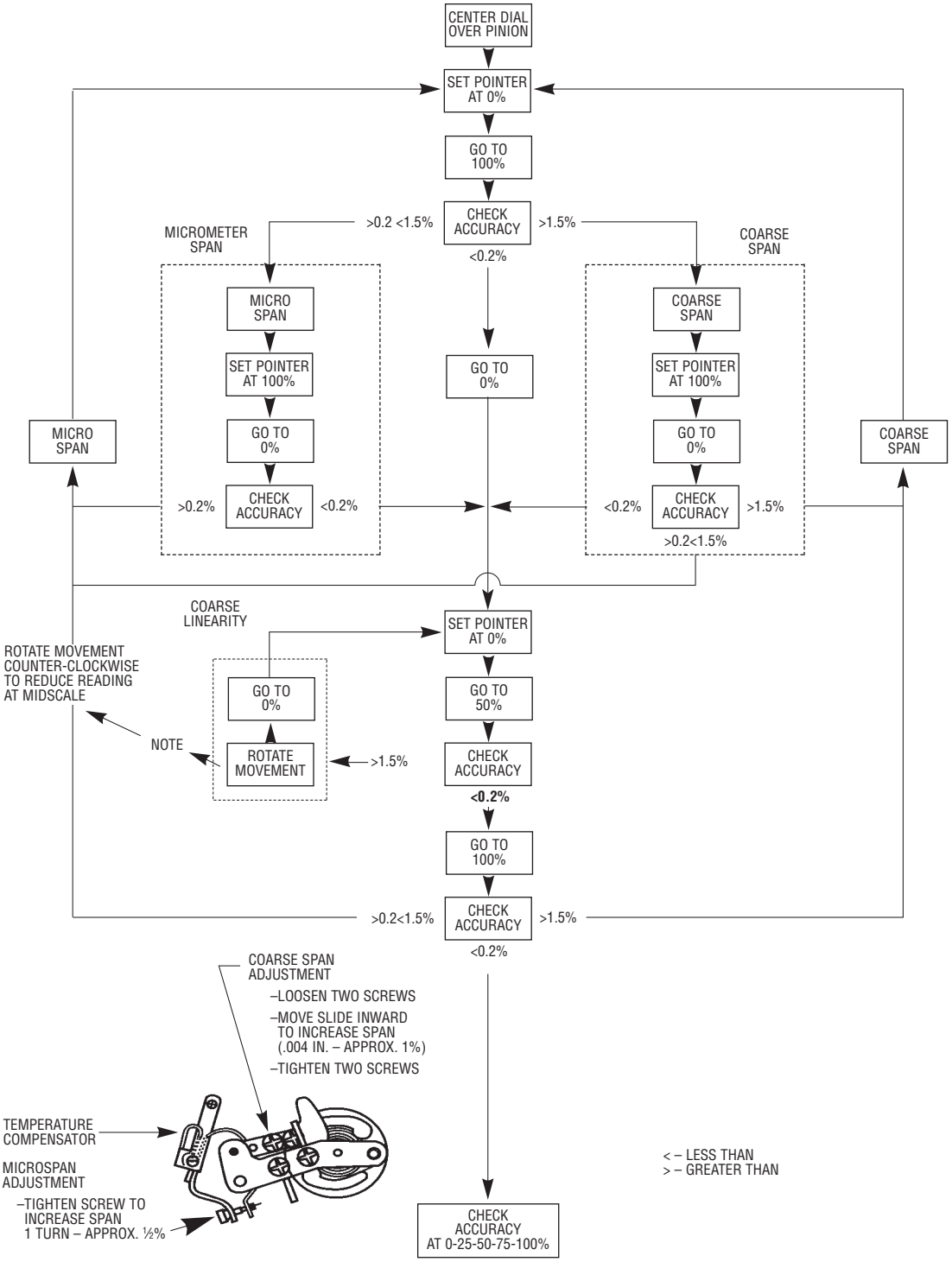
*Applicable only for test gauge with hinged ring design.

ADDITIONAL CALIBRATION INSTRUCTIONS

1) "Standards shall have nominal errors no greater than ¼ of these permitted for the gauge being tested." *(Ref: ASME B40=100-1998)*
2) The instrument used as the calibration standard should have a maximum range no greater than 2x that of the gauge being tested. (i.e. Do not use a 400psi standard to test a 15psi gauge.)
3) "Known pressure shall be applied at each test point on increasing pressure (or vacuum) from one end to the other end of the scale. At each test point the gauge shall be . . .
lightly tapped, and then read . . ."
(*Ref: ASME B40.1 ¶ 6.2.4.1*)
4) To read gauge indication, move eye over red pointer tip at OD of printed dial until red reflection in mirror band is no longer visible, and then read the pointer position in reference to the dial.

Fig. 2

THIS TEST GAUGE IS PROVIDED WITH A MICROSPAN™ ADJUSTMENT TO SIMPLIFY CALIBRATION. THE FLOW CHART BELOW OUTLINES THE RECOMMENDED CALIBRATION PROCEDURE



This page is intentionally left blank

Ashcroft Inc.,
250 East Main Street
Stratford, CT 06614-5145
U.S.A.
Tel: 203-378-8281
Fax: 203-385-0408 (Domestic)
Fax: 203-385-0357 (International)
email: info@ashcroft.com
www.ashcroft.com
I&M008-10098-5/02 (250-1353-K) Rev. 11/10

Visit our web site www.ashcroft.com

ASCHROFT

TYPE 101, DIAPHRAGM SEAL
TYPE 310, DIAPHRAGM SEAL

LEFT BLANK

Type 100 Series Threaded Capsule Diaphragm Seal

TYPE 100 SHOWN

PRODUCT FEATURES

- The top housing and diaphragm capsule are interchangeable with all Ashcroft bottom housings.
- A fill/bleed connection is standard, which permits filling the seal and instrument simultaneously after evacuation and allows the fill to flow into the completed unit.
- A Viton O-ring, compatible with all standard fill fluids, and a Teflon back-up ring provide a seal between the diaphragm capsule and the top housing.
- A thin Teflon PTFE gasket between the diaphragm and bottom housing ensures a leak-tight corrosion resistant seal even at high pressure.
- Top housing and pressure instrument are removable.
- Continuous-duty design will prevent loss of process fluid if pressure instrument is removed or fails.

APPLICATIONS INCLUDE:

- Elevated process temperatures
- Corrosive service
- Isolation of the process for safety
- Suspended solids in the process
- Sanitary connections
- Minimize process dead leg
- Ease of cleaning between batches

When isolation of the process from an instrument is required, Ashcroft® offers a comprehensive line of diaphragm seals. Seal types include threaded, flanged, in-line threaded, in-line flanged, in-line socket weld, in-line butt weld, saddle and sanitary seals. Also available is a complete offering of isolation or iso-rings and isolation or iso-spools.

SPECIFICATIONS

Model Number:	Type 100, 101, 102, 103, 104, 105, 106, 107, 108
Process Connection Size:	See Table A (Pg. 2)
Instrument Connection Size:	¼, ½ NPT
Diaphragm Material:	See Table B (Pg. 2)
Bottom Housing Materials:	See Table C (Pg. 2)
Filling Fluid:	Glycerin, Halocarbon, Silicone, Stylltherm

OPTIONS	**Code**
316 stainless steel top housing	**YT**
Stainless steel clamp rings and flanged ring – includes 300 stainless steel clamping bolts (1500 psi max)	**SE**
300 series stainless steel clamping bolts (max pres is 1500 psi)	**SB**
Pipe plugs for flushing connections – pipe plugs are available in the same materials as bottom housings per Table C (Pg. 2)	**PU**
5000 psi pressure rating – (Type 100 only) threaded inlet only, no flushing connection (metal diaphragm only)	**HP**
Welded instrument to diaphragm seal	**DU**
Dual flushing connections (½ NPT) (Limited to 2″ thru 3″ flanged seals	**DB**
Ring joint (Flanged seal only)	**RJ**
Flat face (Flanged seal only)	**FF**
Clean for gaseous oxygen or strong oxidizing agent applications	**6B**

Ashcroft Inc., 250 East Main Street, Stratford, CT 06614 USA
Tel: 203-378-8281 • Fax: 203-385-0408
email: info@ashcroft.com • www.ashcroft.com

Type 100 Series Threaded Capsule Diaphragm Seal

TYPE 100 SERIES THREADED CAPSULE SEAL TYPES

Type 100 –Threaded
¼, ½, ¾, 1 NPT

Type 101 –Threaded
with flushing connection
¼, ½, ¾, 1 NPT

Type 102 – Raised Face Flanged
½″, ¾″, 1″, 1½″, 2″, 3″

Type 103 – Raised Face Flanged
½″, ¾″, 1″, 1½″, 2″, 3
with flushing conection

Type 104 – In-line Threaded
¼, ½, ¾, 1 NPT

Type 105 – Saddle
3,″ 4″ pipe only

Type 106 – In-line Flanged
½″, ¾″, 1″, 1½″, 2″, 3″, 4″, 6″, 8″

Type 107 – In-line Socket Weld
½″, ¾″, 1″, 1½″, 2″

Type 108 – In-line Butt Weld
¼″, ½″, ¾″, 1″, 1½″, 2″

Table A – Process Connection/Type Number

	Process Connection Size/Code—Inches											Type Number
	Size	¼	½	¾	1	1½	2	3	4	6	8	
Process Connection	Code	25	50	75	10	15	20	30	40	60	80	
Threaded–female NPT		•	•	•	•	•						100
Threaded–female NPT (with flushing conn.)		•	•	•	•	•						101
Flanged(1)			•	•	•	•	•	•				102
Flanged (with flushing conn.)			•	•	•	•	•	•				103
In-line—threaded NPT		•	•	•	•							104
Saddle								•	AND LARGER			105
In-line—butt weld		•	•	•	•	•	•					108
In-line—flanged(2)			•	•	•	•	•	•	•	•	•	106
In-line—socket weld		•	•	•	•	•	•					107

Pressure Ratings—All 2500 psi except flanged seals are per ASME B 16.5, temperature limit determined by diaphragm, bottom housing and/or filling fluid.

Table B – Diaphragm Material

Material	Code
316L stainless steel	S
304L stainless steel	C
Monel 400	P
Nickel	N
Carpenter 20	D
Tantalum	U
Hastelloy B	G
Hastelloy C 22(3)	J
Hastelloy C 276(3)	H
Halar Coated Monel	PH
Gold Plated 304 SS	W

Table C – Housing Materials

Bottom	Code	Top
Steel	B	Nickel
304L SS	C	Nickel
316L SS	S	Nickel
Hastelloy B	G	Nickel
Hastelloy C 22(3)	J	Nickel
Hastelloy C 276(3)	H	Nickel
Carpenter 20	D	Nickel
Monel “400”	M	Nickel
Inconel “600”	W	Nickel
Nickel	N	Nickel
PVC(4)(9)	V	Nickel
Tantalum clad SS(5)	SU	Nickel
Halar coated SS(6)	BH	Nickel
Teflon flanged steel(7)	T	Nickel
Kynar(8)(9)	KY	Nickel
Titanium	TI	Nickel

Table D – Instrument Connection

Size – NPT	Code
¼	02T
½	04T

Notes:

(1) 150, 300, 600, 900, 1500 & 2500 class flanges.
(2) 1″ 150 thru 8″ 300 class flanges only.
(3) Use on applications where NACE standard MR-01-75/ISO 1516 w/Sept. 2005 corrigendums.
(4) Maximum Press./Temp.
Threaded: 200 psi/74°F, 125 psi/125°F, 80 psi/150°F.
Flanged: 75 psi/100°F.
(5) Type 102 only.
(6) Type 102 only – Temp. Limits: –40/300°F.
(7) Only available in 1″, 1½″, & 2″ 150 class, Types 102. Max. Press./Temp. – 270 psi and 150°F. Consult factory for conditions beyond these limits.
(8) Maximum Pressure/Temp.: 200 psi and 180°F.
(9) Type 100: ¼ or ½ NPT only. Larger sizes offered with solvent weld joint. N/A in 101 or 103 design.

Table E – Filling Fluid

Filling	Service	Connection to Instrument	Temperature Range °F	Code
Glycerin	Pressure	Direct Only	0/400	CG
Silicone	Pressure/Vacuum	Direct or Flexible Line	–40/600	CK
Halocarbon	Pressure/Vacuum in presence of strong oxidizing agent	Direct or Flexible Line	–70/300	CF
Sylltherm	Pressure/Vacuum	Direct or Flexible Line	–40/750	HA

Monel is a registered trademark of Huntington Alloys, Inc.
Hastelloy is a registered trademark of Cabot Corp.
Halocarbon is a registered trademark of Halocarbon Products
GYLON 3510 is a registered trademark of Garlock Inc.

HOW TO ORDER:

1. **From Table A...**select TYPE NUMBER based on process connection, process connection size and diaphragm type/construction. (e.g., Threaded/1″/capsule–code-10-100)
2. **From Table B...**select DIAPHRAGM MATERIAL. (e.g., 316L stainless steel–code S)
3. **From Table C...**select BOTTOM HOUSING MATERIAL. (e.g., 316 stainless steel–code S)
4. **From Table D...**select INSTRUMENT CONNECTION size. (e.g., 1/4 NPT–code 02T)
5. **From Table E...**select FILLING FLUID, if diaphragm seal will be attached to instrument. (e.g., Glycerin–code CG)

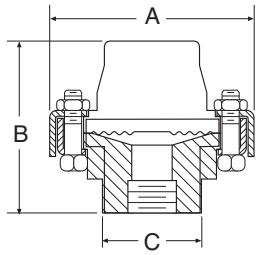
Typical code: 10–100SS–02T–CG

Ashcroft Inc., 250 East Main Street, Stratford, CT 06614 USA
Tel: 203-378-8281 • Fax: 203-385-0408
email: info@ashcroft.com • www.ashcroft.com

Type 100 Series Threaded Capsule Diaphragm Seal

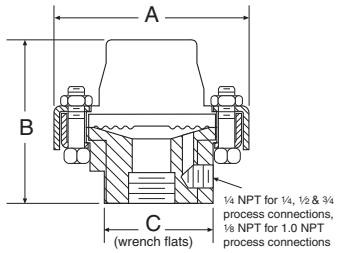
DIMENSIONS

Type 100 – Threaded
¼, ½, ¾, 1 NPT



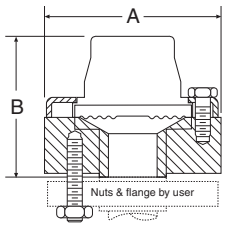
A		B		C	
in	mm	in	mm	in	mm
3¾	(95)	2⅞	(73)	1 13/16	(46)

Type 101 –Threaded
¼, ½, ¾, 1 NPT (with flushing conection)



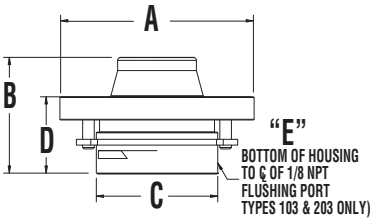
A		B		C	
in	mm	in	mm	in	mm
3¾	(95)	2⅞	(73)	1 13/16	(46)

Type 102 – Flanged
½,″ ¾,″



Flange Size	Flange Rating #	A in	A mm	B in	B mm
	150	3½	(89)	2 15/16	(75)
½″	300 or 600	3¾	(95)	3	(76)
	900 or 1500	4¾	(121)	3 3/16	(81)
	150	3⅞	(98)	2 13/16	(71)
¾″	300 or 600	4⅝	(117)	3	(76)
	900 or 1500	5⅛	(130)	3 3/16	(81)

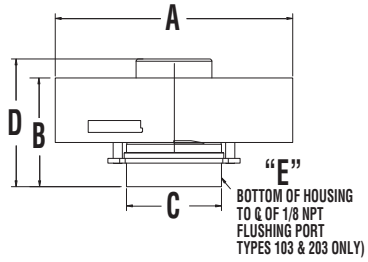
Type 102 – Flanged 1″ (raised face only)
one piece bottom housing, with and without flushing connection



Flange Size	Flange Rating #	A in.	A mm	B in.	B mm	C in.	C mm
1	150 300 or 600	4-1/4 5	(100) (127)	2-9/16	(65)	1-23/32	(69)

Flange Size	Flange Rating #	D in.	D mm	103 & 203 only E in.	E mm
1	150 300 or 600	1-5/8	(41)	3/8	(9)

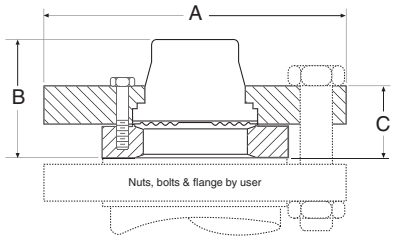
Type 102 – Flanged 1″ (raised face only)
one piece bottom housing, with and without flushing connection



Flange Size	Flange Rating #	A in.	A mm	B in.	B mm	C in.	C mm
1	900 or 1500 2500	5-7/8 6-1/4	(149) (159)	2-7/8	(73)	2-1/4	(57)

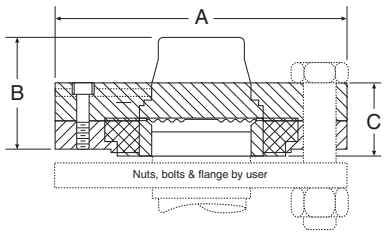
Flange Size	Flange Rating #	D in.	D mm	103 & 203 only E in.	E mm
1	900 or 1500 2500	3-3/8	(86)	3/8	(9)

Type 102 – Flanged (raised face only)
1½,″ 2,″ 3″ one piece bottom housing - all materials except PVC, Teflon and Kynar



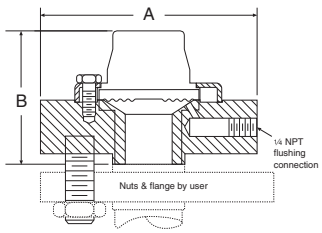
Flange Size	Flange Rating #	A in	A mm	B in	B mm	C in	C mm
	150	5	(127)			1½	(38)
1½″	300 or 600	6¼	(159)	2⅜	(61)	1½	(38)
	900 or 1500	7	(178)			1½	(38)
	150	6	(152)			1⅜	(35)
2″	300 or 600	6½	(165)	1 15/16	(49)	1½	(38)
	900 or 1500	8½	(216)			2⅛	(54)
	150	7½	(191)	2	(51)	1⅝	(41)
3″	300 or 600	8¼	(206)	2 1/16	(52)	1⅞	(47)
	900 or 1500	10½	(267)	2 11/16	(68)	3¼	(82)

Type 102 – Flanged 1″ (raised face only)
two piece bottom housing, 1½,″ 2,″ - PVC, Teflon and Kynar



Flange Size	Flange Rating #	A in	A mm	B in	B mm	C in	C mm
1½″	150	5	(127)	2 5/16	(59)	1 13/32	(39)
2″	150	6	(152)	2⅛	(54)	1 9/16	(40)

Type 103 – Flanged
½,″ ¾″ (with flushing conection)



Flange Size	Flange Rating #	A in	A mm	B in	B mm
	150	3½	(89)	2 15/16	(75)
½″	300 or 600	3¾	(95)	3	(76)
	900 or 1500	4¾	(121)	3 3/16	(81)
	150	3⅞	(98)	2 13/16	(71)
¾″	300 or 600	4⅝	(117)	3	(76)

Ashcroft Inc., 250 East Main Street, Stratford, CT 06614 USA
Tel: 203-378-8281 • Fax: 203-385-0408
email: info@ashcroft.com • www.ashcroft.com