

4.2.3 Start-Up/Priming for AutoPrime™ Heads (LE-XXXAX or LE-XXXHX)

Read this entire section completely before proceeding.

When all precautionary steps have been taken, the pump is mounted, and the tubing is securely attached, you may prime the pump.

1. Plug in or switch on the pump.
2. While the pump is running, set the speed knob and the stroke knob at 100%.
3. The suction tubing should begin to fill with solution from the tank as the AutoPrime™ valve purges air from the pump head.
4. Once the solution begins to exit the pump head through both the discharge valve and the AutoPrime™ valve, **SHUT THE PUMP OFF**.
5. The pump is now primed.
6. Proceed to output adjustment, Section 4.3.

4.3 Output Adjustment

Once the pump has been primed, an appropriate output adjustment **MUST** be made. Pump output should be calculated and adjustments made accordingly.

4.3.1 Total Pump Output

Calculate the **approximate** output of the pump as follows:

When converting between different units, remember these conversion factors:

1 Gallon = 3.785 Liters
1 Day = 1,440 Minutes
120 SPM = 7,200 SPH

PUMP OUTPUT = MAX PUMP OUTPUT x % SPEED x % STROKE

Example: AD251-938SI

Use Max Output (from dataplate on side of pump) = 1 GPH (1 gallon per hour).

If the pump is set at 60 strokes per minute (out of a possible 120 SPM) and 70% stroke length, the approximate pump out-put is:

$$1.0 \times \frac{60}{120} \times 0.70 = 0.35 \text{ GPH.}$$

Multiply by 24 (hours in one day) to calculate in gallons per day.

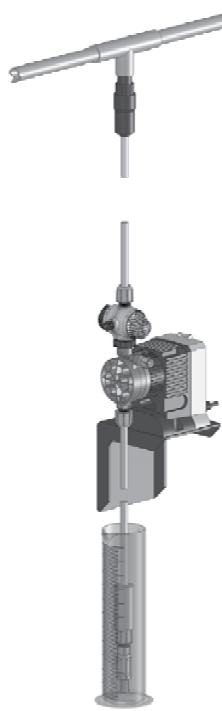


It is important to note that this is only an approximate output and it does not account for tolerance variations in pump components or flow variations due to pressure sensitivity, or viscosity effects. Variations due to these effects can be significant, necessitating calibration for your pump.

OPERATION

4.3.2 Calibrating the Displayed Flow (AD2, AD8)

The Roytronic Excel Pumps are equipped to display a theoretical flow rate based upon the pump's stroke speed and stroke length. These calculations are based upon factory test conditions which may be significantly different from your application. It is necessary for the user to perform the following calibration procedure when the pump is connected to your system, and using the actual chemical. This one-point calibration procedure will greatly improve the accuracy of the pump's calculated flow. The closer the pump's stroke length is to the typical use stroke length, the more accurate the result. We recommend using the approximate settings determined in section 4.3.1 as a starting point for calibration.



1. Prepare a flow measuring device such as a graduated cylinder or a scale sensitive to a gram.
2. Ensure the pump is primed following the procedures in 4.2.
3. Put the pump into Internal Mode and use the Power Button ① to turn the pump off.
4. Hold the Up Button ⌄ and Down Button ⌅ in at the same time for 8 seconds until 'CAL' is displayed on the LCD Display, then release the buttons. Note 'FLO' will be displayed first. Continue to press the buttons until 'CAL' is displayed.
5. Push the Power Button ① and release until a "0" is displayed.
6. Note the reading on the calibration device. If using a graduated cylinder note the starting liquid level. If using a scale note the displayed weight, or reset the scale's display to zero.
7. Push the Power Button ① and release to start the pump. Notice that the display will count the total number of strokes. (The screen will show SPH).
8. Allow the pump to run; the accuracy will improve with more strokes. Use the Power Button ① to stop the pump. The number of strokes will be displayed up to 999 strokes. If you will be pacing the pump externally, note the number of strokes.
9. Press and release the Power Button ① again. This will display the pump's estimated volume pumped in mL. (The screen will show ml/h).
10. Use the Up ⌄ and Down ⌅ Buttons to match the displayed volume to the measured volume. If using a graduated cylinder, the presence of the tubing will cause the measurement to be slightly higher than actual. The measurement should be adjusted using the formulas shown below. If using a scale, the number of grams can be divided by the specific gravity of your chemical to determine the number of mL pumped. If the pump will be controlled externally, the output volume per stroke can be determined by dividing the measured output by the number of strokes.
11. Once the displayed value has been adjusted, hold and release the Power Button ① to return the pump to internal mode.



$$V_{actual} = V_{observed} * R$$

where

$$R = 1 - \left(\frac{D_{tube}}{D_{column}} \right)^2$$

For accuracy, it is important that the water level does not drop below the top of the ceramic foot valve weight.

Note: If you will be using the pump at a different stroke length, or pressure, the pump should be recalibrated under those conditions using the procedure above to ensure accuracy.

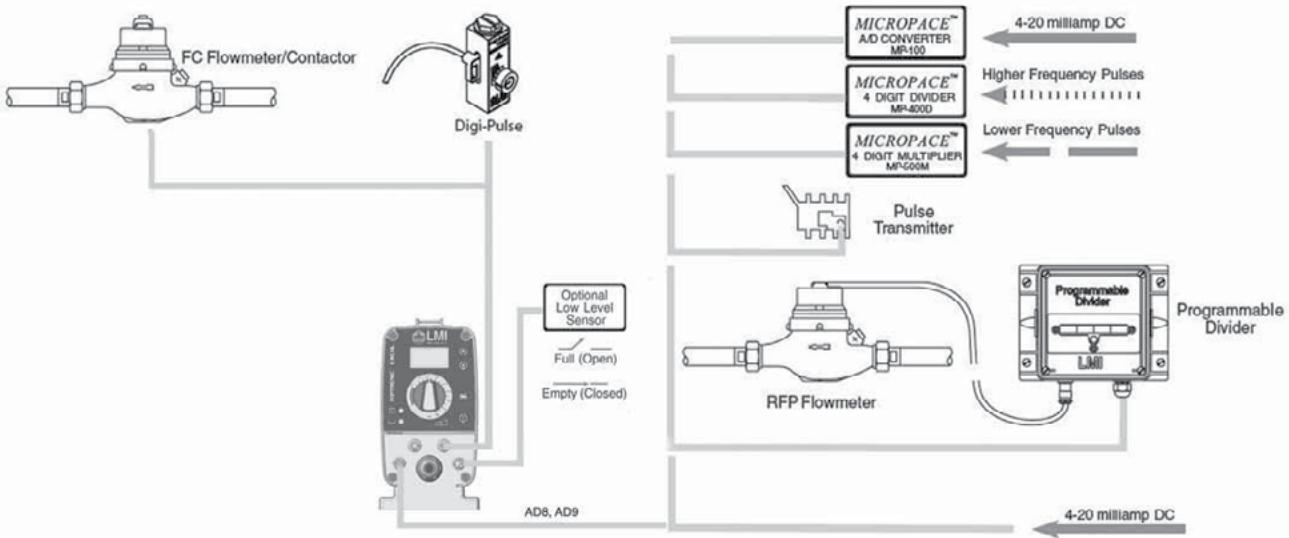
4.4 Methods of Externally Triggering or Pacing AD8 and AD9 Pumps

Method of Triggering AD8 and AD9 Pumps through External Control Connector

	PIN	Description
1. Switch Closure Switch closing triggers pump	Blue 3 White 2	Switch or transistors must be capable of switching 24V DC at 15 milliamperes. Minimum time in low impedance state (ON) is 25 milliseconds. Minimum time in high impedance state (OFF) is 50 milliseconds.
2. NPN Transistor Base goes high to trigger pump	+ Blue 3 - White 2	The remote on/off input (using pins 1 and 2) is active in all modes. In the out-of-box configuration, the pump will run when contacts are open. The pump is monitoring these pins for a change in closure condition. Regardless of the pump being on or off, when the contacts close, then the pump will turn on. When the contacts open, the pump will turn off.
3. PNP Transistor Base goes low to trigger pump	+ Blue 3 - White 2	
4. Opto Isolator	+ Blue 3 - White 2	The Power Button overrides the remote on/off and can still be used to turn the pump on and off. If the contacts are closed when the on/off button is pressed, the pump will turn off. To restart the pump remotely, the contacts must be opened and then closed again.

The Power Button overrides the remote on/off and can still be used to turn the pump on and off. If the contacts are closed when the on/off button is pressed, the pump will turn off. To restart the pump remotely, the contacts must be opened and then closed again.

These pumps have two operating modes: Local (Pulse Indicator Light flashes green) and Remote (Pulse Indicator Light flashes yellow). Pressing the Mode Selection Button switches between Local and Remote modes. The default configuration for operating mode is Local mode.



OPERATION

4.4.1 Control Modes

4.4.1.1 Local/Internal Mode

- When in Local mode Roytronic Excel pumps run at the speed indicated on the LCD Display.
- The stroking speed can be adjusted from the maximum speed of 120 strokes per minute (SPM) down to 1 stroke per hour (SPH).

4.4.1.2 Changing Displayed Flow Units (AD2, AD8)

1. When in Internal Mode use the Power Button to turn the pump off.
2. Hold the Up Button and Down Button in at the same time until 'FLO' is displayed on the LCD Display, then release the buttons.
3. Use the Up or Down Buttons to select the desired units of measure.
4. Press the Power Button and the pump will return to internal mode with the desired units displayed.

4.4.1.3 Remote Mode (for AD8)

In Remote mode the pump can be controlled in a variety of ways: pulse divide, pulse multiply, or analog milliamp input. To cycle through the available modes, start in external mode, then press and hold the Power Button and Mode Selection Button simultaneously for about five seconds.

4.4.1.3.1 Divide Mode (for AD8)

The pump is in Divide Mode when a division symbol (÷) is shown on the left-hand side of the LCD Display. Use the Up Button and Down Button to select the number of incoming pulses received before a stroke occurs. Once the Power Button is pushed to turn the pump on, the LCD Display will show the approximate stroke rate of the pump based on the incoming pulses.

If it is necessary to change the pulse duration required to recognize a pulse from the factory default of 60 ms, hold both the Up Button and Down Button until a number appears followed by the letter 'm'. This number is the minimum required time in milliseconds needed to count as a pulse. Use the Up Button and Down Button to adjust this number as needed. If no button is pressed for about 4 seconds, the pump will save the value and return to the previous screen.

4.4.1.3.2 Multiply Mode (for AD8)

The pump is in Multiply Mode when a multiplication symbol (×) is shown on the left-hand side of the LCD Display. Use the Up Button and Down Button to select the number strokes that will occur for each incoming pulse. Once the Power Button is pushed to turn the pump on, the LCD Display will count down the number of strokes starting at the multiplier value each time a pulse input is recognized. The strokes will occur every half second until it has counted down to zero. The pump will then wait for the next pulse input.

If it is necessary to change the pulse duration required to recognize a pulse from the factory default of 60 ms, hold both the Up Button and Down Button until a number appears followed by the letter 'm'. This number is the minimum required time in milliseconds needed to count as a pulse. Use the Up Button and Down Button to adjust this number as needed. If no button is pressed for about 4 seconds, the pump will save the value and return to the previous screen.

4.4.1.3.3 Analog Mode (for AD8)

The pump is in Analog Mode when 'mA' is shown on the left-hand side of the LCD Display.

Pressing the Up or Down Button will display 'P1' and the milliamp input that corresponds to zero strokes. The Up and Down Buttons can be used to adjust this value. Pressing the Power Button (or waiting for about 8 seconds) will display 'P2' and the milliamp input that corresponds to max stroke rate. Note that the maximum stroke rate will be either 120 strokes per minute or 59 strokes per hour. This depends on the stroke speed set in Internal Mode.



5.0 Spare Parts Replacement and Routine Maintenance

LMI metering pumps are designed for trouble-free operation, yet routine maintenance of elastomeric parts is essential for optimum performance. This involves replacing the Liquifram™, cartridge valves, O-rings, and the injection check valve spring. LMI recommends replacing these parts at least once a year; however, frequency will depend on your particular application.

5.1 Depressurizing the Discharge Line (for Pumps Equipped with a 4-FV Only)



ALWAYS wear protective clothing, face shield, safety glasses and gloves when performing any maintenance or replacement on your pump.

To reduce the risk of chemical splash during disassembly or maintenance, all installations should be equipped with line depressurization capability. Using LMI's Four-Function Valve (4-FV) is one way to include this feature.

Read steps 1 and 2 below before proceeding.

1. Be sure the Injection Check Valve is properly installed and is operating. If a shut off valve has been installed downstream of the Injection Valve, it should be closed.

Be sure your relief tubing is connected to your 4-FV and runs back to your solution drum or tank.

2. Turn the black knob on the 4-FV 1/8 turn to the stop. Turn and hold the yellow knob for a few seconds. The discharge line is now depressurized. Keep both valve knobs open until solution drains back down the discharge tubing into the solution tank or drum. Then release the yellow knob, and turn the black knob to its normal position.

5.2 Depressurizing the Discharge Line (for Single-Ball FastPrime™ Heads Only)

ALWAYS wear protective clothing, face shield, safety glasses and gloves when performing any maintenance or replacement on your pump.

Read steps 1 and 2 below before proceeding.

1. Be sure the Injection Check Valve is properly installed and is operating. If a shut off valve has been installed downstream of the Injection Valve, it should be closed.

Be sure your relief tubing is connected to your FastPrime™ valve and runs back to your solution drum or tank.

2. Turn the FastPrime™ knob one-and-a-half turns counter-clockwise ⌂. The discharge line is now depressurized. Keep valve open until solution drains back down the discharge tubing into solution drum or tank. Then turn the knob clockwise ⌂ to tighten knob to closed position.

MAINTENANCE

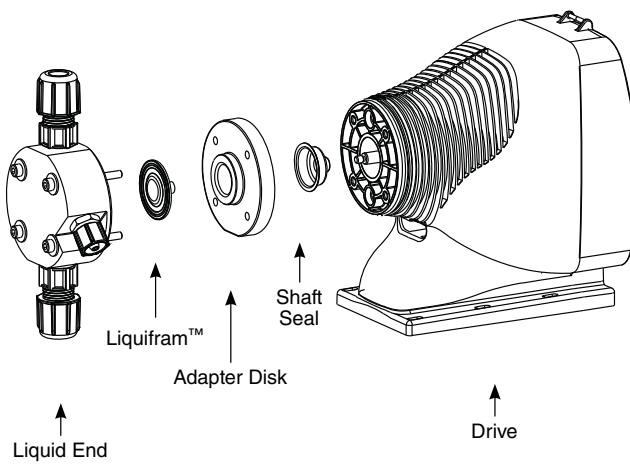
5.3 Liquifram™ (Diaphragm) Replacement



ALWAYS wear protective clothing, face shield, safety glasses and gloves when working near or performing any maintenance or replacement on your pump. See MSDS information from solution supplier for additional precautions.

LMI metering pumps are designed for trouble-free operation, yet routine maintenance of elastomeric parts is essential for optimum performance. This involves replacing the Liquifram™, cartridge valves, O-rings and the injection check valve spring. LMI recommends replacing these parts at least once a year; however, frequency will depend on your particular application.

When replacing the Liquifram™, the cartridge valves, or O-rings, the injection check valve spring should also be replaced (see next Section 5.4). A Spare Parts Kit or RPM Pro Pac™ kit containing these parts may be obtained from your local distributor.



Replacing the Liquifram™:

1. Carefully depressurize, drain, and disconnect the discharge line (see previous sections in this manual).
2. Place the Foot Valve into a container of water or other neutralizing solution. Turn the pump on to flush the head assembly. Once the pump head has been flushed, lift the Foot Valve out of the solution and continue to pump air into the pump head until the pump head is purged of water or neutralizing solution.

If the liquid cannot be pumped due to Liquifram™ rupture, carefully disconnect the suction and discharge tubing using protective clothing, gloves and face shield. Immerse the head in water or other neutralizing solution.

3. Remove the four metric screws using an M4 Allen wrench and washers from the head.
4. Start the pump. While running, set the Stroke Adjustment Knob to 0% and then turn the pump off.
5. With the unit off, unscrew the Liquifram™ by carefully grasping the outer edge and turning it counter-clockwise ⌈. Discard old Liquifram™. Remove the Adapter Disk (located behind the Liquifram™) and ensure that the diameter of the raised section is the same as the diameter of the replacement Liquifram™.
6. Remove Adapter Disk and check condition of the Shaft Seal. Replace Shaft Seal if necessary.
7. Replace the Adapter Disk so that the drain hole of the disk is oriented downward, and the mounting holes line up with the mounting holes of the pump.

Be careful not to scratch the Fluorofilm™ face of the new Liquifram™.

8. Screw on the new Liquifram™ clockwise ⌈ until turned all the way in. Start the pump and turn the stroke knob to 100%. Stop the pump.
9. Remount the pump head using the four (4) screws and washers. Tighten in a criss-cross pattern. Torque screws to 25 inch-pounds. After one week of operation, recheck the screws and tighten if necessary.



5.4 Cartridge Valve and O-ring Replacement



ALWAYS wear protective clothing, face shield, safety glasses and gloves when working on or performing any maintenance or replacement on your pump. See MSDS information from solution supplier for additional precautions.

Refer to the LMI Metering Pump Price List for the proper Spare Parts Kit or RPM Pro Pac™ kit number or contact your local LMI stocking distributor.

1. Carefully depressurize and disconnect the discharge line (see Section 5.1 or 5.2 in this manual).
2. Place the Foot Valve into a container of water or other neutralizing solution. Turn the pump on to flush the head assembly. Once the pump has been flushed, lift the Foot Valve out and continue to pump to let air into the pump head until pump is purged of water or neutralizing solution.

If the liquid cannot be pumped due to Liquifram™ rupture, carefully disconnect the suction and discharge tubing using protective clothing, gloves and face shield. Remove the four screws and washers from the head and immerse the head in water or other neutralizing solution.

Spare part replacement kits include specific instructions for valve replacement. Please follow the instructions included with the replacement kit.

3. Carefully disconnect one tubing connection and fitting at a time, then remove and replace the worn valve and O-rings. If necessary, carefully loosen stuck valves by prying side to side using a small screwdriver through the center hole of the valve.

Before disassembling the check valves, note the orientation of the valve.

4. Install new check valves in each location. Ensure that the cartridges are oriented correctly.

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5.5 Injection Check Valve Parts Replacement

Depressurize and drain pipeline (or isolate Injection Check Valve point using valves) so that Injection Check Valve can safely be disassembled.



ALWAYS wear protective clothing, face shield, safety glasses and gloves when working near or performing any maintenance or replacement on your pump. See MSDS information from solution supplier for additional precautions.

Refer to the LMI Metering Pump Price List for the proper Spare Parts Kit or RPM Pro Pac™ kit number or contact your local LMI stocking distributor.

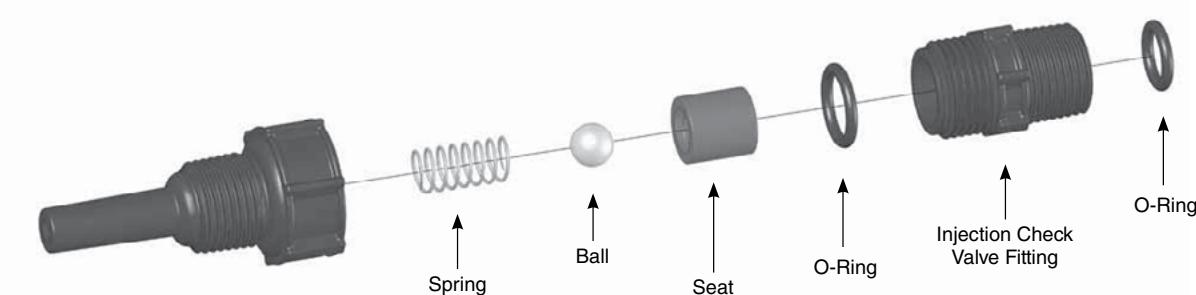
1. Isolate Injection Check Valve and depressurize pipe or drain pipeline.
2. Carefully depressurize and disconnect the discharge line (see Section 5.1 or 5.2 in this manual).

Spare part replacement kits include specific instructions for valve replacement. Please follow the instructions included with the replacement kit.

3. Carefully disconnect the tubing leading to the Injection Check Valve, then remove the Injection Check Valve Fitting. Remove and replace the worn spring, seat, ball, and O-ring.

Before disassembling the check valve, note the orientation of the parts.

4. Install a new spring, seat, ball, and O-ring. Ensure that the parts are oriented correctly.



5.6 FastPrime™ Valve O-Ring Replacement



ALWAYS wear protective clothing, face shield, safety glasses and gloves when performing any maintenance or replacement on your pump.

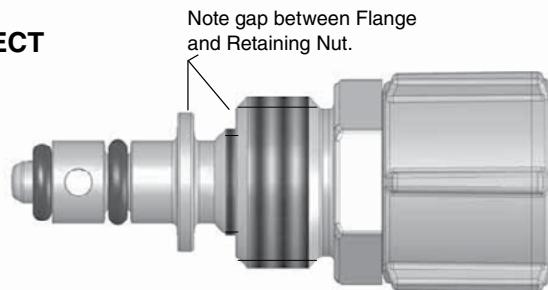
Refer to the LMI Metering Pump Price List for the proper Spare Parts Kit or RPM Pro Pac™ kit number or contact your local LMI stocking distributor.

1. Be sure the Injection Check Valve is properly installed and is operating. If a shut off valve has been installed downstream of the Injection Valve, it should be closed.

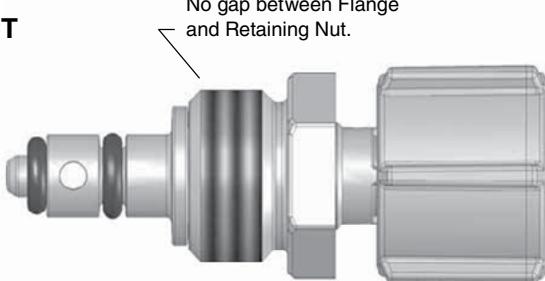
Be sure your relief tubing is connected to your FastPrime™ valve and runs back to your solution drum or tank.

2. Turn the FastPrime™ Knob one-and-a-half turns counter-clockwise ⌈. This will de-pressurize the head. Keep valve open. Carefully remove the return line by gently pulling tubing and moving it from side to side to gradually back tubing off of the barbed fitting.
3. Hold return line tubing upright until solution drains back into solution drum or tank.
4. Using a 3/4" (or 19mm) socket or wrench remove Retaining Nut, and pull out the entire FastPrime™ Valve assembly. Remove and replace the two small O-rings.
5. Reinsert the FastPrime™ Valve assembly and retighten the Retaining Nut. Then turn the FastPrime™ Knob clockwise ⌋ to tighten knob to closed position. To avoid damaging the parts, it is important that the flange on the FastPrime™ Valve is flush with the Retaining Nut prior to reassembly.

INCORRECT



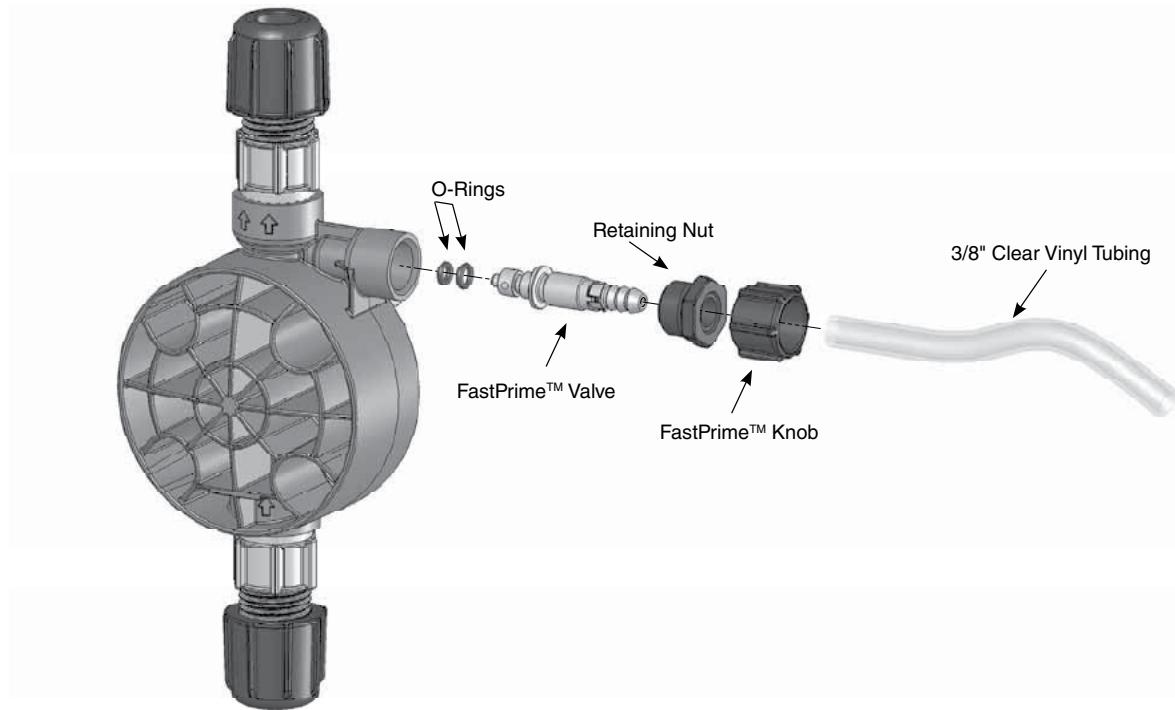
CORRECT

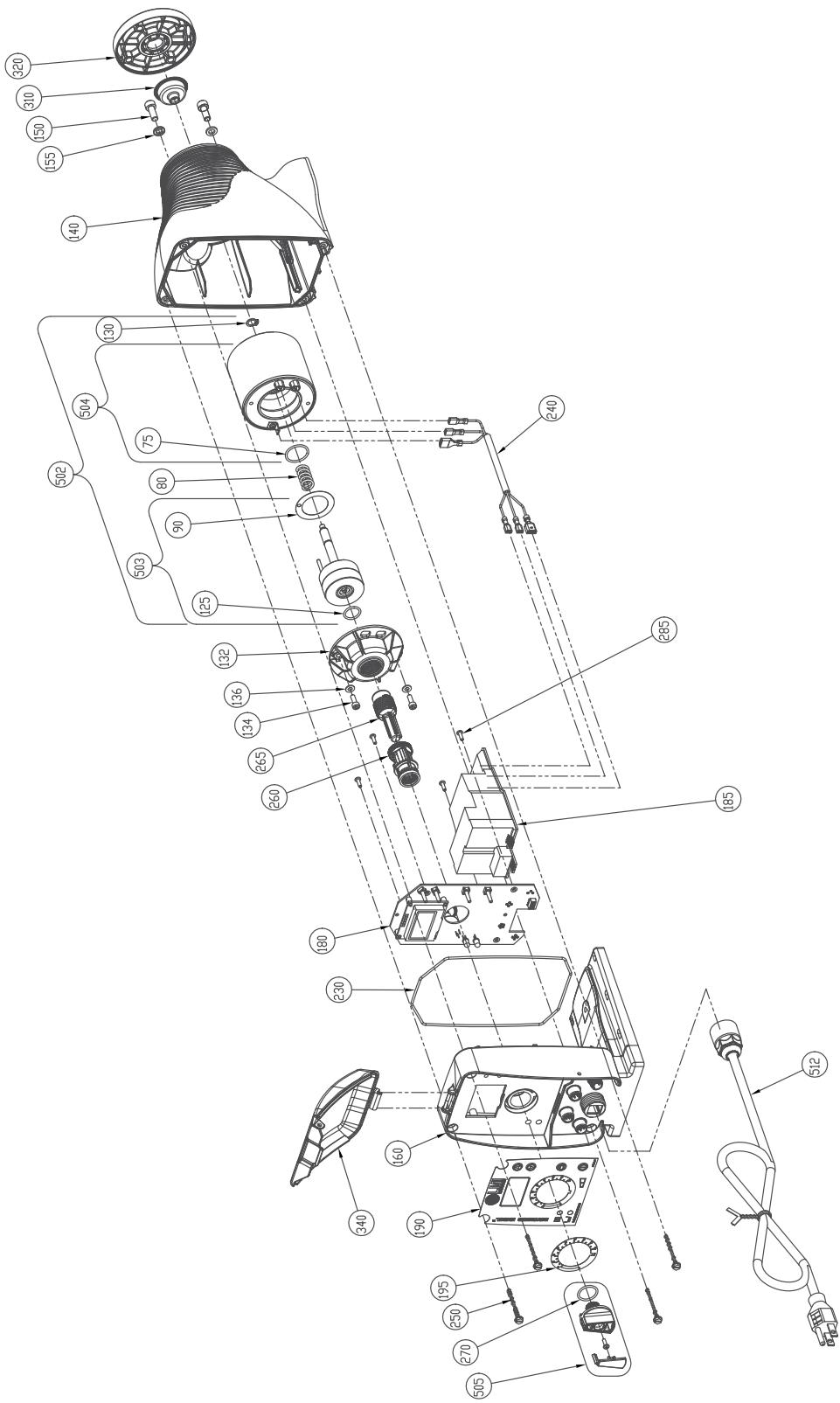


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5.6 FastPrime™ Valve O-Ring Replacement (continued)

6. Recut 1 to 2 inches off the tip of the return line and ensure the end is squared. Press the return line tubing on completely past the barbs.



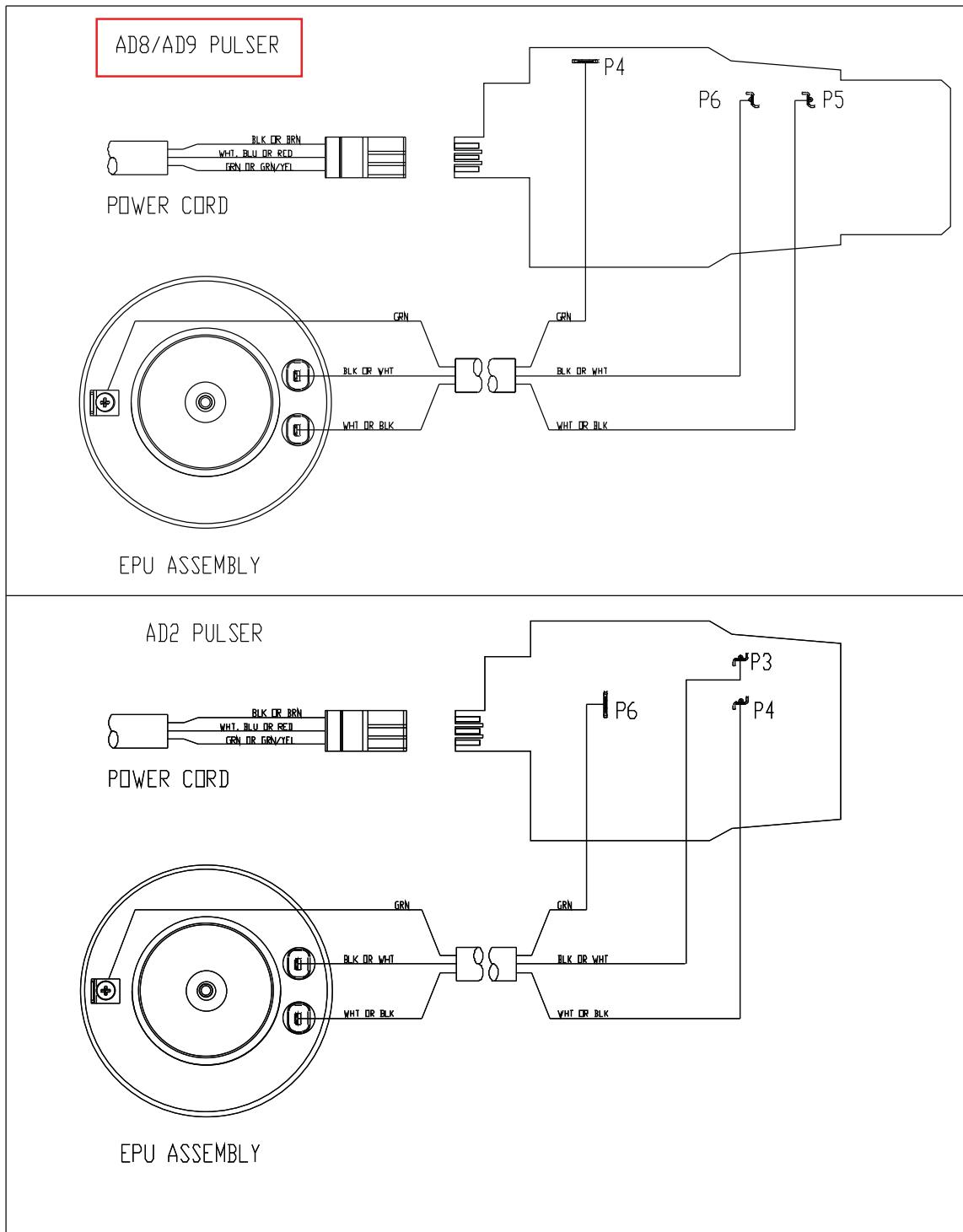
5.7 Drive Parts List

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Bubble Number	Description
75	EPU O-Ring
80	EPU Return Spring
90	EPU Shim
125	Plunger O-Ring
130	Retaining Ring
132	Stroke Bracket
134	Stroke Bracket Screw
136	Stroke Bracket Washer
140	Drive Housing
150	EPU Attachment Bolt
155	EPU Attachment Washer
160	Control Panel
180	Control Board
185	Power Board
190	Nameplate
195	Stroke Dial

Bubble Number	Description
230	Control Panel O-Ring
240	Wire Harness
250	Drive Assembly Screws
260	Female Stroke Shaft
265	Male Stroke Shaft
270	Stroke Shaft O-Ring
285	PCB Attachment Screw
310	Shaft Seal
320	Adapter Disk
340	Clear Cover
502	EPU Assembly
503	Plunger Assembly
504	Pole Piece Assembly
505	Stroke Knob Assembly
512	Power Cord Assembly

5.8 EPU Wiring Diagram



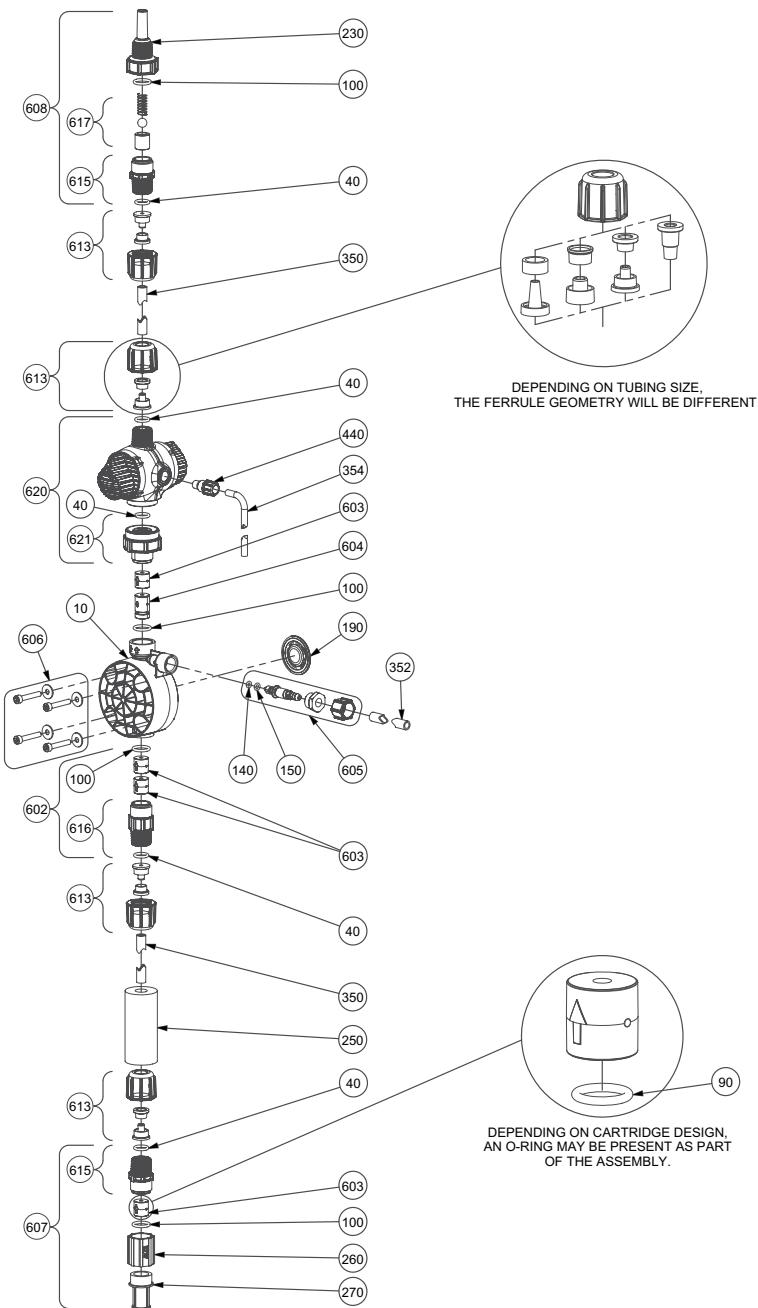
MAINTENANCE

5.9 Liquid End Parts

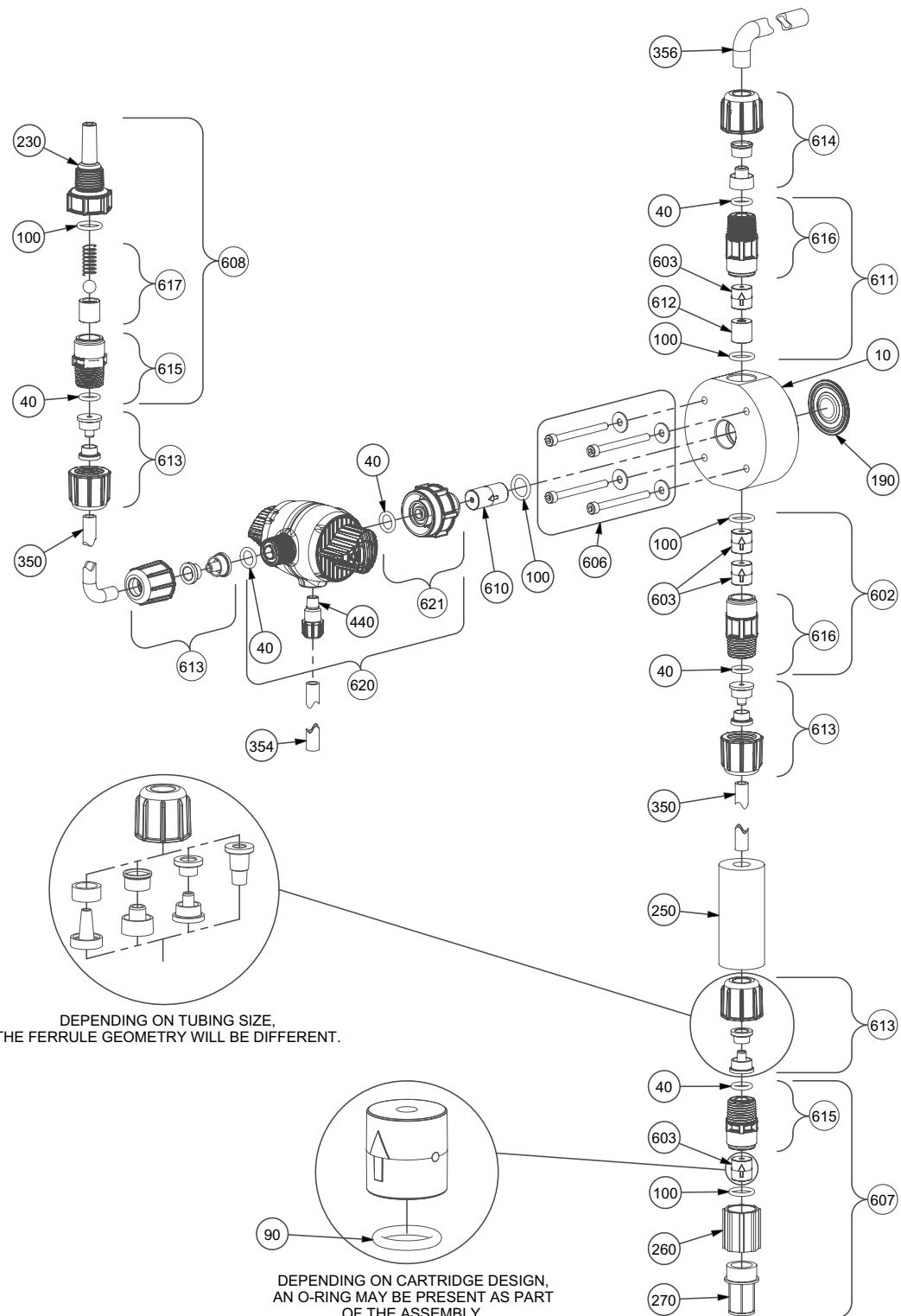
For the latest and most accurate information on your liquid end, please refer to the Liquid End Sheets available in the LMI Online Library at: www.lmipumps.com.

1. Select "Online Literature Library" in the Navigation Bar on left.
2. Once on Online Literature Library use "Product" drop down to select "Liquid Handling Assemblies."
3. Select "Gallery" or "Index" to view Liquid End sheets.

The following images are for reference and may not represent your particular liquid end.

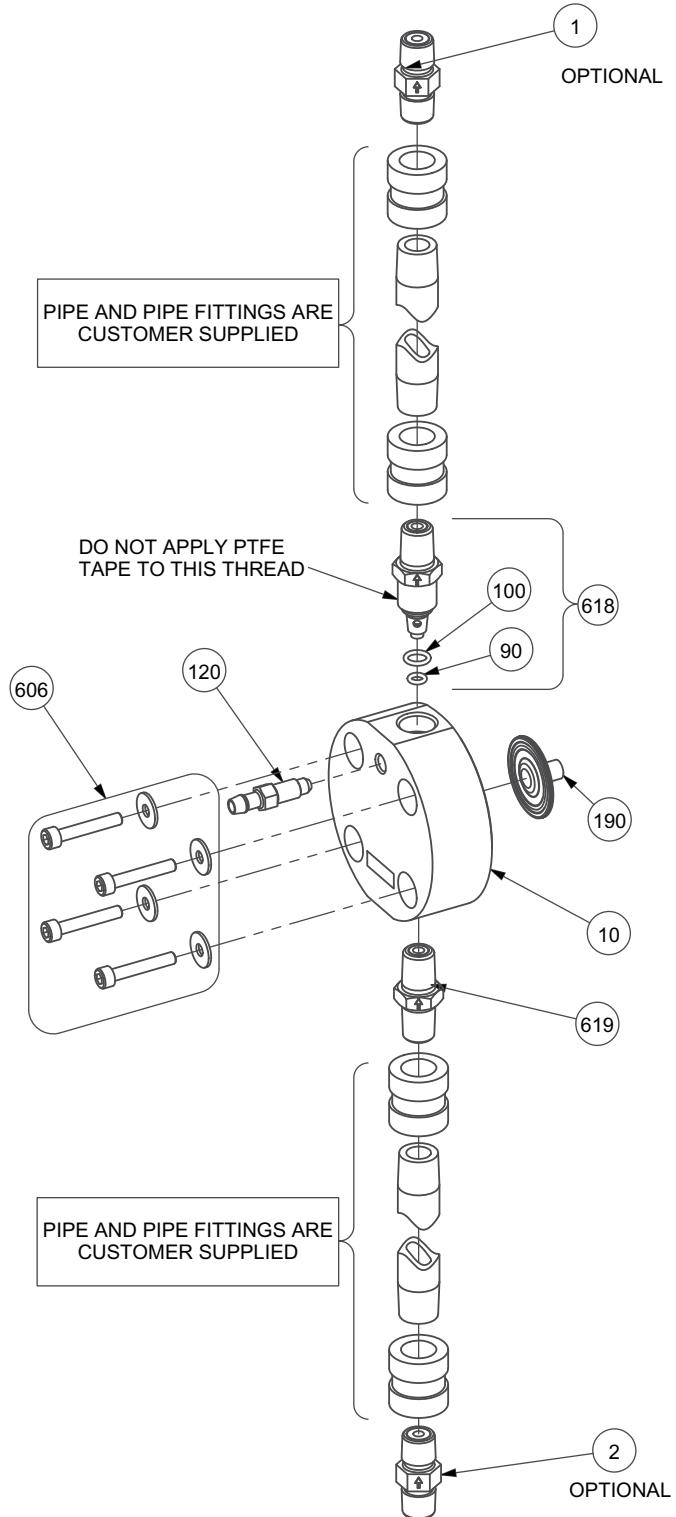


MAINTENANCE



AutoPrime™ Liquid End Assembly

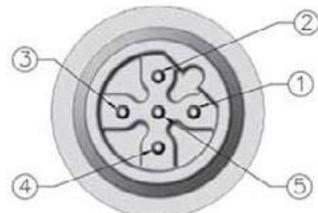
MAINTENANCE



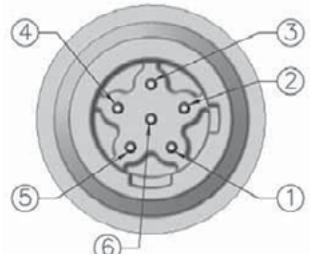
Stainless Steel Liquid End Assembly



6.0 Wiring Diagrams

**5 PIN CONNECTOR****USE 5 PIN CABLE (LMI P/N 48414)**

PIN	WIRE	SIGNAL
1	Brown	Remote On-Off
2	White	Ground-Return
3	Blue	External Pulse Input
4	Black	Power Supply, 24V 75 mA
5	Green-Yellow	4-20 mA Input

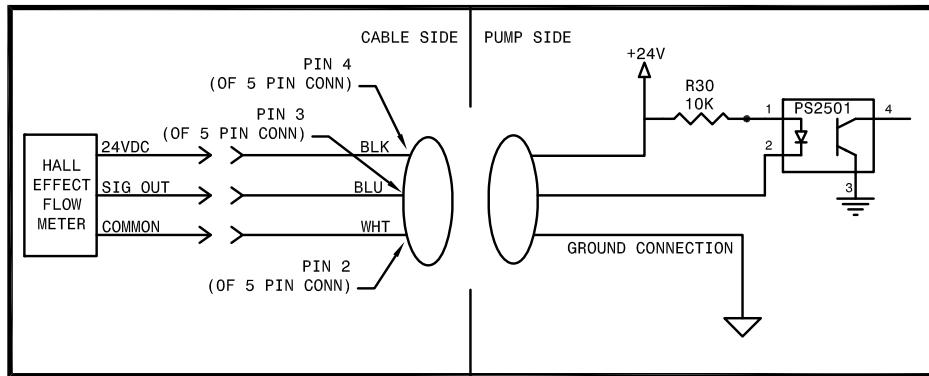
**6 PIN CONNECTOR****USE 6 PIN CABLE (LMI P/N 49035)**

PIN	WIRE	SIGNAL
1	Red-White	Alarm Output or Internal-External indicator
2	Red	Alarm Return
3	Green	Remote Internal-External mode
4	Red-Yellow	Pulse Output
5	Red-Black	4-20 mA Output
6	Red-Blue	Ground-Return

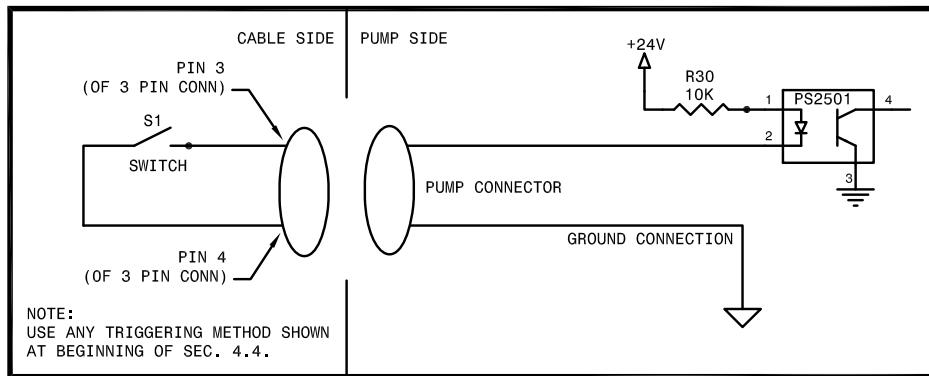
WIRING DIAGRAMS

INPUT WIRING DIAGRAMS

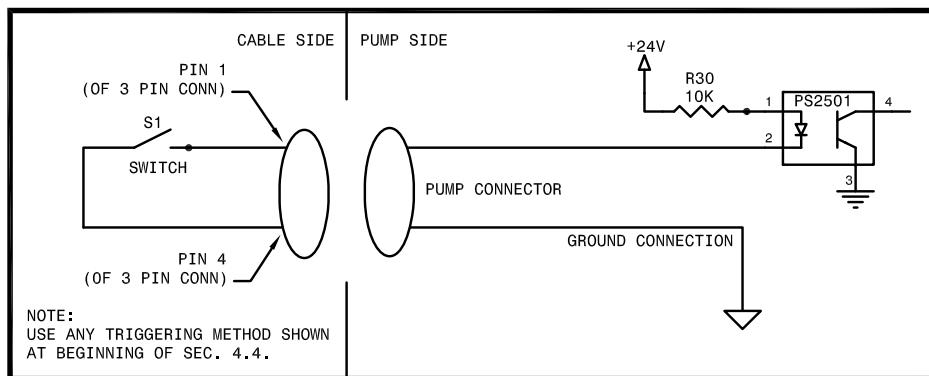
HALL EFFECT FLOWMETER INPUT CONNECTION REFERENCE:



TANK LOW INPUT CONNECTION REFERENCE:

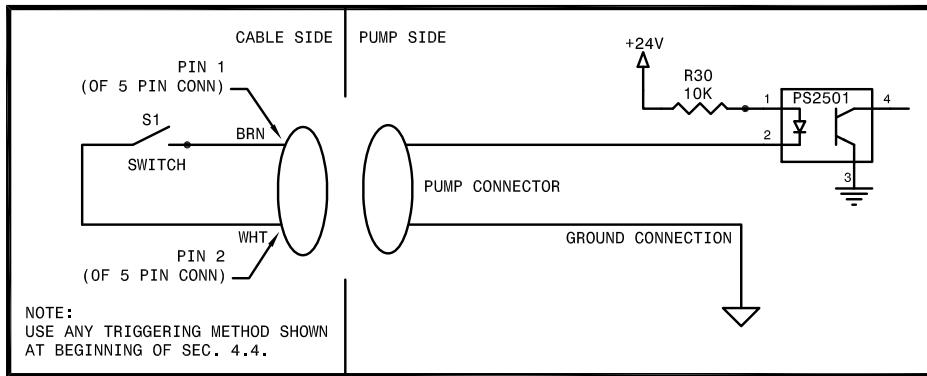


TANK EMPTY INPUT CONNECTION REFERENCE:

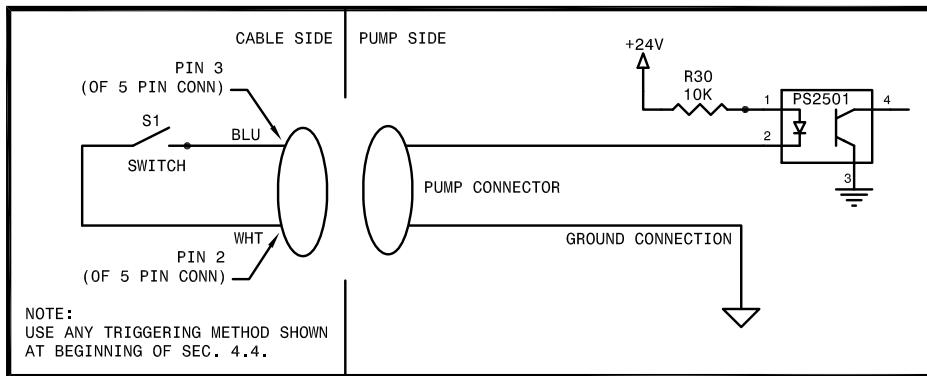


INPUT WIRING DIAGRAMS

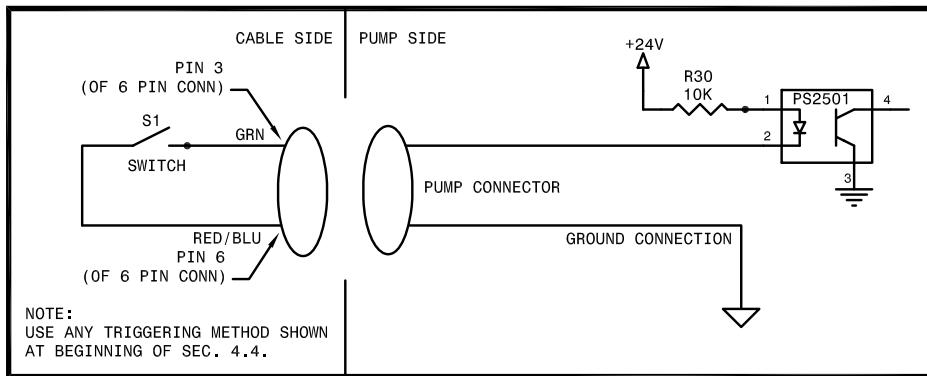
REMOTE ON-OFF INPUT CONNECTION REFERENCE:



EXTERNAL PULSE INPUT CONNECTION REFERENCE:



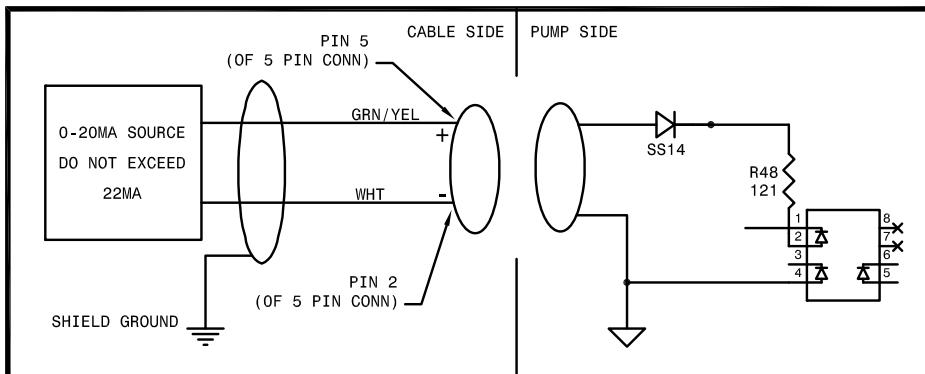
INTERNAL/EXTERNAL CONTROL INPUT CONNECTION REFERENCE:



WIRING DIAGRAMS

INPUT WIRING DIAGRAM

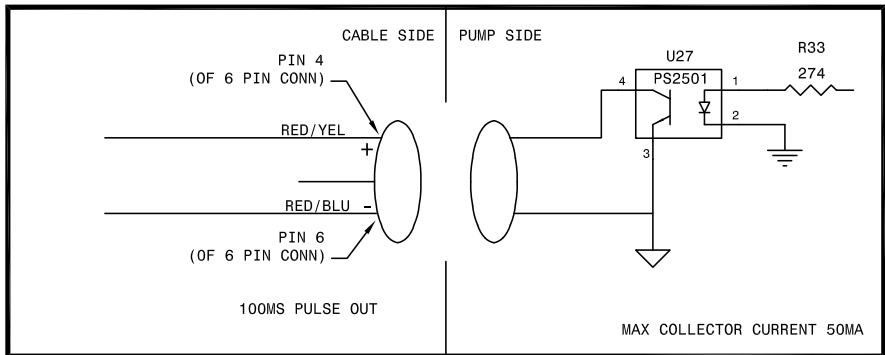
4 - 20 MA INPUT CONNECTION REFERENCE:



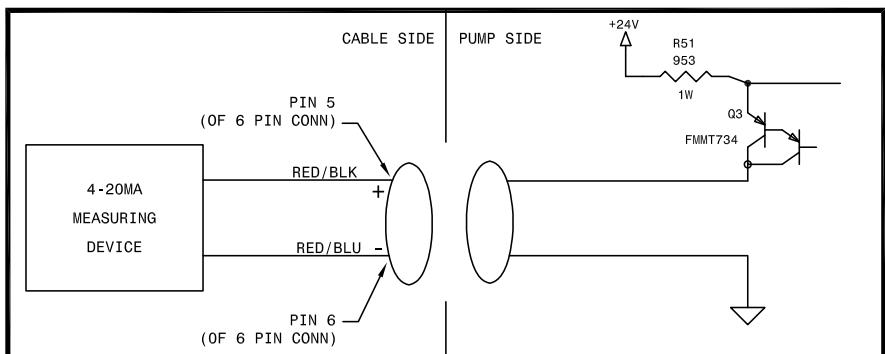
NOTE: 0 TO 20 INPUT IMPEDANCE IS DYNAMIC AND WILL WORK WITH SUPPLY CURRENTS NEEDING 130 OHM OR ABOVE IMPEDANCE

OUTPUT WIRING DIAGRAMS

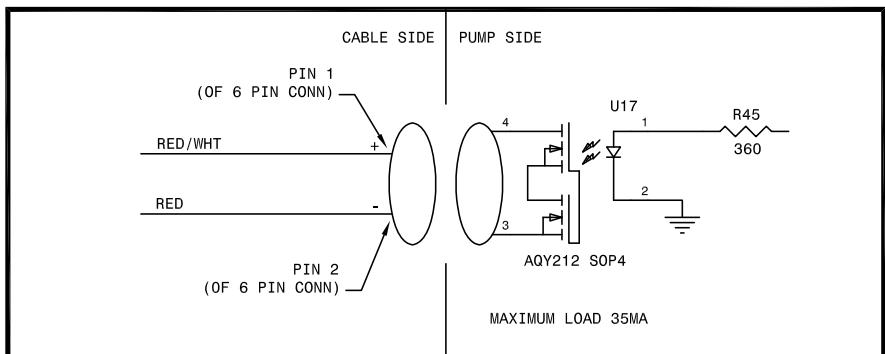
PULSE OUTPUT CONNECTION REFERENCE:



4 TO 20 MA OUTPUT CONNECTION REFERENCE:



ALARM OUTPUT CONNECTION REFERENCE:



TROUBLESHOOTING



7.0 Troubleshooting

PROBLEM	POSSIBLE CAUSE	SOLUTION
Pump Will Not Prime	1. Pump not turned on or plugged in.	1. Turn on pump/plug in pump.
	2. Output dials not set properly.	2. Always prime pump with speed and stroke at 100%.
	3. Foot Valve not in vertical position on bottom of tank.	3. Foot Valve must be vertical (see Foot Valve Installation, Section 3.7).
	4. Pump suction lift too high.	4. Maximum suction lift is 5 ft (1.5 m). Pumps with High Viscosity Liquid Handling Assemblies require flooded suction.
	5. Suction tubing is curved or coiled in tank.	5. Suction tubing must be vertical. Use LMI ceramic weight supplied with pump (see Section 3.7).
	6. Fittings are over tightened.	6. Do not overtighten fittings. This causes seal rings to distort and not seat properly which causes pump to leak back or lose prime.
	7. Air trap in suction valve tubing.	7. Suction tubing should be as vertical as possible. AVOID FALSE FLOODED SUCTION! (see Section 3.2.1).
	8. Too much pressure at discharge. (Pumps without multi-function valve.)	8. Shut off valves in pressurized line. Disconnect tubing at injection check valve (see Priming Section 4.2). When pump is primed, reconnect discharge tubing.
	9. Air leak around fitting.	9. Check for missing or damaged O-rings at ends of fittings.
Pump Loses Prime	1. Solution container ran dry.	1. Refill container with solution and reprime (see Section 4.2).
	2. Foot Valve is not in a vertical position on the bottom of the tank.	2. Foot Valve must be vertical (see Foot Valve Installation, Section 3.7).
	3. Pump suction lift is too high.	3. Maximum suction lift is 5 ft (1.5 m). Pumps with High Viscosity Liquid Handling Assemblies require flooded suction.
	4. Suction tubing is curved or coiled in tank.	4. Suction tubing must be vertical. Use LMI ceramic weight supplied with pump (see Section 3.7).
	5. Fittings are over tightened.	5. DO NOT OVERTIGHTEN FITTINGS. This causes seal rings to distort and not seat properly which caused pump to leak back or lose prime.
	6. Air trap in suction valve tubing.	6. Suction tubing should be as vertical as possible. AVOID FALSE FLOODED SUCTION! (see Section 3.2.1).
	7. Air leak on suction side.	7. Check for pinholes, cracks. Replace if necessary.

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
Leakage at tubing	1. Worn tubing ends.	1. Cut about 1 in (25 mm) off tubing and then replace as before.
	2. Loose or cracked fitting.	2. Replace fitting if cracked. Carefully hand tighten fittings. DO NOT USE PIPE WRENCH. An additional 1/8 or 1/4 turn may be necessary
	3. Worn seal rings.	3. Replace balls and seal rings (see Section 5.4)
	4. Solution attacking Liquid Handling Assembly	4. Consult your local distributor for alternate materials.
Low Output or Failure to Pump Against Pressure	1. Pump's maximum pressure rating is exceeded by injection pressure.	1. Injection pressure cannot exceed pump's maximum pressure. See pump data plate.
	2. Worn Seal Rings.	2. Worn seal rings or cartridge valves may need replacement (see Section 5.4).
	3. Ruptured Liquifram™.	3. Replace Liquifram™ (see Section 5.3).
	4. Incorrect stroke length.	4. Recalibrate Output (see Section 4.3.2)
	5. Tubing run on discharge may be too long.	5. Longer tubing runs may create frictional losses sufficient to reduce pump's pressure rating. Consult factory for more information.
	6. Clogged Foot Valve strainer.	6. Remove Foot Valve strainer when pumping slurries or when solution particles cause strainer to clog.
Failure to Run	1. Pump not turned on or plugged in.	1. Turn on or plug in pump.
	2. EPU failure.	2. Disassemble pump and measure resistance across the EPU terminals. If this measures as an open circuit then the EPU should be replaced. (see Section 5.8).
	3. Pulser failure.	3. The pulser should be replaced if EPU checks out OK. Consult supplier or factory.
Excessive Pump Output	1. Syphoning. (Pumping downhill without a multi-function valve).	1. Move injection point to a pressurized location or install an LMI 4-FV (see Section 3.4).
	2. Little or no pressure at injection point.	2. If pressure at injection point is less than 25 psi (1.7 Bar), an LMI 4-FV should be installed (see Section 3.4).
	3. Excessive strokes per minute.	3. Replace pulser or resistor. Consult factory.



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8.2 Motor

AC & DC Motor Installation & Maintenance

Safety Notice: Be sure to read and understand all of the Safety Notice statements in MN408 or Product Specific manual for your motor. A copy is available at: http://www.baldor.com/support/product_manuals.asp

ACCEPTANCE

Thoroughly inspect this equipment before accepting shipment from the transportation company. If any damage or shortage is discovered do not accept until noted on the freight bill. Report all damage to the freight carrier.

SAFETY

Eye bolts, lifting lugs or lifting openings, if provided, are intended only for lifting the motor and motor mounted standard accessories not exceeding, in total 30% of the motor weight. These lifting provisions should never be used when lifting or handling the motor and driven equipment. Eye bolt lifting capacity rating is based on a lifting alignment coincident with eye bolt center line. Eye bolt capacity reduces as deviation from this alignment is increased. Be sure eye bolts are tight and prevented from turning before lifting.

INSTALLATION OUTSIDE THE USA:

Refer to MN408 and MN1383 for Compliance with European Directives. Copies are available at: http://www.baldor.com/support/product_manuals.asp

MOTOR ENCLOSURE

ODP, Open drip proof motors are intended for use in clean, dry locations with adequate supply of cooling air. These motors should not be used in the presence of flammable or combustible materials. Open motors can emit flame and/or molten metal in the event of insulation failure. TEFC, totally enclosed motors are intended for use where moisture, dirt and/or corrosive materials are present in indoor and outdoor locations. Explosion protected motors, as indicated by a Nationally Recognized Testing Laboratory Certification mark and marking with Class, Division and Temperature Code are intended for installation in hazardous locations as described in Article 500 of the NEC. Refer to MN408 for more details.

MOUNTING

Foot mounted machines should be mounted to a rigid foundation to prevent excessive vibration. Shims may be used if location is uneven.

Flange mounted machines should be properly seated and aligned. Note: If improper rotation direction is detrimental to the load, check rotation direction prior to coupling the load to the motor shaft.

For V-belt drive, mount the sheave pulley close to the motor housing. Allow clearance for end to end movement of the motor shaft. Do not overtighten belts as this may cause premature bearing failure or shaft breakage.

Direct coupled machines should be carefully aligned and the shaft should rotate freely without binding.

GENERAL

The user must select a motor starter and overcurrent protection suitable for this motor and its application. Consult motor starter application data as well as the National Electric Code and/or applicable local codes. Special motors for use by United States Government including special specifications, master plans, etc. refer to the applicable master plans and specifications involved. On motors received from the factory with the shaft blocked, remove blocking before operating the motor. If motor is to be reshipped alone or installed to another

piece of equipment, the shaft block must be installed to prevent axial movement and prevent brinelling of the bearings during shipment.

TESTING

If the motor has been in storage for an extensive period or has been subjected to adverse moisture conditions, check the motor insulation resistance with a meg ohm meter. Depending on storage conditions it may be necessary to re grease or change rusted bearings. Contact Baldor District Office if resistance is less than 5 meg ohms.

WARNING: Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury.

WARNING: Be sure the system is properly grounded before applying power. Electrical shock can cause serious or fatal injury.

INSTALLATION

This motor must be installed in accordance with National Electric Code, NEMA MG-2, IEC standards or local codes.

WIRING

Connect the motor as shown in the connection diagrams. If this motor is installed as part of a motor control drive system, connect and protect the motor according to the control manufacturers diagrams. Refer to MN408 for additional details on lead marking. The wiring, fusing and grounding must comply with the National Electrical Code or IEC and local codes. When the motor is connected to the load for proper direction of rotation and started, it should start quickly and run smoothly. If not, stop the motor immediately and determine the cause. Possible causes are: low voltage at the motor, motor connections are not correct or the load is too heavy. Check the motor current after a few minutes of operation and compare the measured current with the nameplate rating.

GROUNDED

Ground the motor according to NEC and local codes. In the USA consult the National Electrical Code, Article 430 for information on grounding of motors and generators, and Article 250 for general information on grounding. In making the ground connection, the installer should make certain that there is a solid and permanent metallic connection between the ground point, the motor or generator terminal housing, and the motor or generator frame. In non-USA locations consult the appropriate national or local code applicable.

ADJUSTMENT

The neutral is adjustable on some DC motors. AC motors have no adjustable parts.

Noise

For specific sound power or pressure level information, contact your local Baldor representative.

VIBRATION

This motor is balanced to NEMA MG1, Part 7 standard.

BRUSHES (DC Motors)

Periodically, the brushes should be inspected and all brush dust blown out of the motor. If a brush is worn 1/2, (length specified in renewal parts data), replace the brushes.

WARNING: Guards must be installed for rotating parts such as couplings, pulleys, external fans, and unused shaft extensions, should be permanently guarded to prevent accidental contact by personnel. Accidental contact with body parts or clothing can cause serious or fatal injury.

Reassemble and seat the new brushes using a brush seating stone. Be sure the rocker arm is set on the neutral mark.

INSPECTION

Before connecting the motor to an electrical supply, inspect for any damage resulting from shipment. Turn the shaft by hand to ensure free rotation. Motor leads must be isolated before the shaft will turn freely on permanent magnet motors.

DRAIN PLUGS

One or more condensation drain plugs are provided on each endplate for various motor mounting configurations. For Washdown and totally enclosed, fan cooled or non-ventilated motors, the plugs in the lowest portion of the ends shields should be removed for operation (unless the motor has special stainless steel drains). All drains are located in the lowest portion of the ends shields.

MOUNTING

Mount the motor on a foundation sufficiently rigid to prevent excessive vibration. Grease lubricated ball bearing motors may be mounted with the feet at any angle. After careful alignment, bolt motor securely in place. Use shim to fill any unevenness in the foundation. Motor feet should sit solidly on the foundation before mounting bolts are tightened.

IP (Ingress Protection)

IP designations include two numerals, the first characteristic numeral is for ingress solid bodies and from dust. The second for ingress protection from liquid - water. Motors marked less than IP23 require additional protection from water.

GUARDING

After motor installation is complete, a guard of suitable dimensions must be constructed and installed around the motor/gearmotor. This guard must prevent personnel from coming in contact with any moving parts of the motor or drive assembly but must allow sufficient cooling air to pass over the motor. If a motor mounted brake is installed, provide proper safeguards for personnel in case of brake failure. Brush inspection plates and electrical connection cover plates or lids, must be installed before operating the motor.

STARTING

Before starting motor remove all unused shaft keys and loose rotating parts to prevent them from flying off. Check direction of rotation before coupling motor to load. The motor should start quickly and run smoothly and with little noise. If the motor should fail to start the load may be too great for the motor, the voltage is low or the motor has been miswired. In any case immediately shut motor off and investigate the cause.

ROTATION

To reverse the direction of rotation, disconnect and lockout power and interchange any two of the three AC power leads for three phase motors. For two-phase four wire, disconnect and lockout power and interchange the AC line leads on any one phase. For two phase three wire, disconnect and lockout power and interchange phase one and phase two AC line leads.

Maintenance Procedures

WARNING: Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury.

WARNING: Surface temperatures of motor enclosures may reach temperatures which can cause discomfort or injury to personnel accidentally coming into contact with hot surfaces. Protection should be provided by the user to protect against accidental contact with hot surfaces. Failure to observe this precaution could result in bodily injury.

Lubrication Information

Refer to motor nameplate for recommended lubricant. If none is shown, the recommended lubricant for anti-friction bearings (-15°F to 120°) is POLYREX EM. For Min Start Temp -100°F use AEROSHELL #7. For roller bearings is ExxonMobil SHC-220.

Relubrication Intervals

(For motors with re grease capability)

New motors that have been stored for a year or more should be relubricated. Lubrication is also recommended at Table 1 intervals.

LUBRICATION INSTRUCTIONS

Cleanliness is important in lubrication. Any grease used to lubricate anti friction bearings should be fresh and free from contamination. Properly clean the grease inlet area of the motor to prevent grease contamination.

1. Select service conditions from Table 2.
2. Select lubrication interval (Table 1).
3. Adjust lubrication interval with multiplier from Table 3.
4. Select volume of grease from Table 4.

LUBRICATION PROCEDURE

Bearings should be lubricated while stationary and the motor is warm.

1. Locate the grease inlet, clean the area, and replace the pipe plug with a grease fitting.
2. Locate and remove the grease drain plug, if provided.
3. Add the recommended volume of recommended grease or add grease until clean grease appears at the grease drain, at the grease relief, or along the shaft opening.
4. Replace the grease inlet plug and run the motor for 15 minutes.
5. Replace the grease drain plug.

SPECIAL APPLICATIONS

For special temperature applications, consult your Baldor District Office.

Relubrication Intervals

Recommended relubrication intervals are shown in Table 1. It is important to realize that the recommended intervals of Table 2 are based on

average use. Refer to additional information contained in Tables 2, 3 and 4.

Table1 Relubrication Interval

NEMA (IEC) Frame Size	Rated Speed (RPM)			
	3600	1800	1200	900
Up to 210 incl. (132)	5500Hrs.	12000Hrs.	18000Hrs.	22000Hrs.
Over 210 to 280 incl. (180)	3600Hrs.	9500Hrs.	15000Hrs.	18000Hrs.
Over 280 to 360 incl. (225)	2200Hrs.	7400Hrs.	12000Hrs.	15000Hrs.
Over 360 to 5800 incl. (400)	2200Hrs.	3500Hrs.	7400Hrs.	10500Hrs.

* Relubrication intervals are for ball bearings.

For vertically mounted motors and roller bearings, divide the relubrication interval by 2.

** For motors operating at speeds greater than 3600 RPM, contact Baldor for relubrication recommendations.

Table2 Service Conditions

Severity of Service	Hours per day of Operation	Ambient Temperature Maximum	Atmospheric Contamination
Standard	8	40° C	Clean, Little Corrosion
Severe	16 Plus	50° C	Moderate dirt, Corrosion
Extreme	16 Plus	>50° C* or Class H Insulation	Severe dirt, Abrasive dust, Corrosion, Heavy Shock or Vibration
Low Temperature		<-29° C **	

* Special high temperature grease is recommended (Dow Corning DC44).

** Special low temperature grease is recommended (Aeroshell 7).

Note: Different grease types are generally incompatible and should not be mixed. Mixing different types can cause lubricant and bearing failure. Thoroughly clean bearing and cavity before changing grease type.

Table3 Lubrication Interval Multiplier

Severity of Service	Multiplier
Standard	1.0
Severe	0.5
Extreme	0.1
Low Temperature	1.0

Some motor designs use different bearings on each motor end. This is normally indicated on the motor nameplate. In this case, the larger bearing is installed on the motor Drive endplate. For best relubrication results, only use the appropriate amount of grease for each bearing size (not the same for both).

Table4 Amount of Grease to Add

Frame Size NEMA (IEC)	Bearing Description (These are the "Large" bearings (Shaft End) in each frame size)			
	Bearing	Weight of Grease to add * oz (Grams)	Volume of grease to be added in³	teaspoon
56 to 140 (90)	6203	0.08 (2.4)	0.15	0.5
140 (90)	6205	0.15 (3.9)	0.2	0.8
180 (100–112)	6206	0.19 (5.0)	0.3	1.0
210 (132)	6307	0.30 (8.4)	0.6	2.0
250 (160)	6309	0.47 (12.5)	0.7	2.5
280 (180)	6311	0.61 (17)	1.2	3.9
320 (200)	6312	0.76 (20.1)	1.2	4.0
360 (225)	6313	0.81 (23)	1.5	5.2
400 (250)	6316	1.25 (33)	2.0	6.6
440 (280)	6318	1.52(40)	2.5	8.2
440 (280)	6319	2.12 (60)	4.1	13.4
5000 to 5800 (315–400)	6328	4.70 (130)	9.2	30.0
5000 to 5800 (315–400)	NU328	4.70 (130)	9.2	30.0
360 to 449 (225–280)	NU319	2.12 (60)	4.1	13.4
AC Induction Servo				
76 Frame 180 (112)	6207	0.22 (6.1)	0.44	1.4
77 Frame 210 (132)	6210	0.32 (9.0)	0.64	2.1
80 Frame 250(160)	6213	0.49 (14.0)	0.99	3.3

Typical IEC vs NEMA Lead Marking

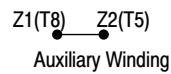
Single Phase Non-Reversible

Refer to the connection diagram provided on the Baldor motor.



Single Phase Reversible

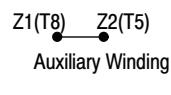
Main Winding



Auxiliary Winding

Dual Voltage Reversible

Main Winding



Auxiliary Winding

DC Motors

Lead markings can be translated between IEC and NEMA designations as follows:

	NEMA	IEC
Armature	A1, A2	A1, A2
Series Field	S1, S2	D1, D2
Shunt Field	F1, F2	E1, E2

Refer to the connection diagram provided on the Baldor motor.

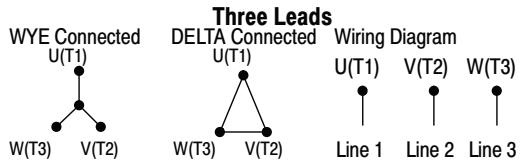
Three Phase

For single winding 3 phase motors, lead markings can be directly translated between IEC and NEMA designations.

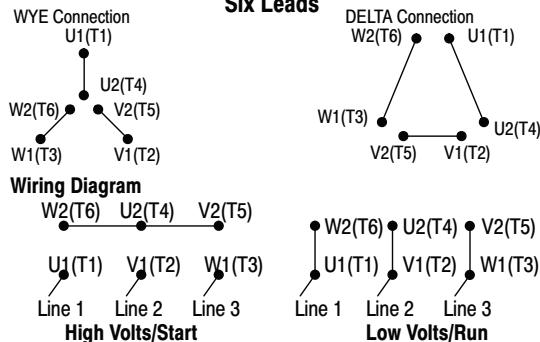
For these motors, the lead markings are:

U1=T1	U2=T4	U3=T7	U4=T10
V1=T2	V2=T5	V3=T8	V4=T11
W1=T3	W2=T6	W3=T9	W4=T12

Refer to the connection diagram provided on the Baldor motor. Some examples are as follows:



Six Leads



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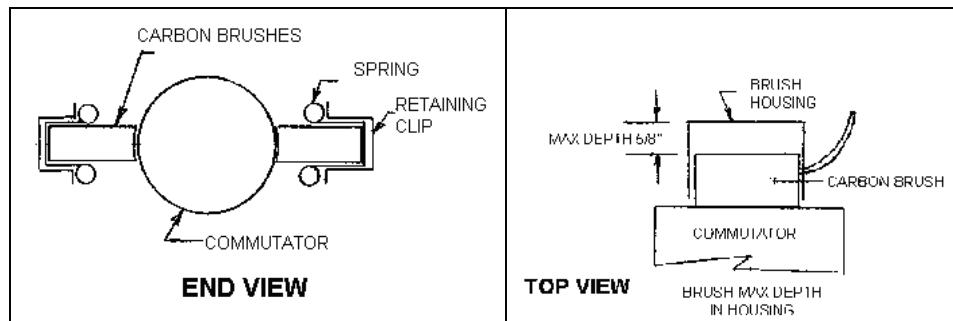
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DC MOTOR BRUSH REPLACEMENT

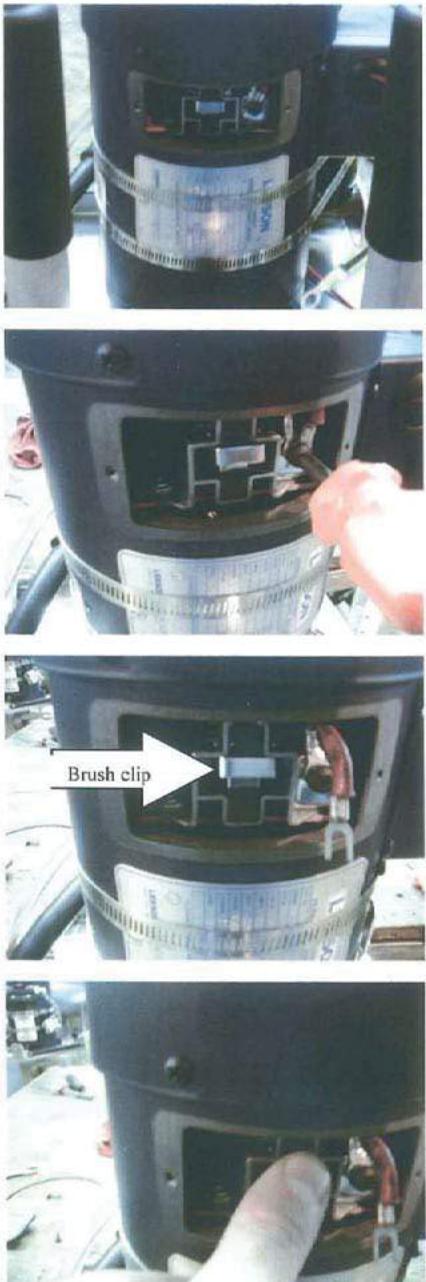
Standard Baldor brushes have an initial length of 1 1/4". When brushes are worn to a length of 5/8" they and the brush springs should be replaced. **Operation of a motor with brushes shorter than this will cause the brushes to jam in the brush housing, arcing and wearing the commutator. A worn or damaged commutator will accelerate brush wear and further damage your motor.** It is normal for one brush to wear more than the other. Check them both.



Tip: In a new motor with new brushes the back of the brush will be flush with the brush housing, as the brush wears the distance into the housing will increase. (See top view drawing below.) A quick measurement of the depth will be sufficient. When the brush is 5/8" into the holder it will need replacement. If in doubt change the brushes. Carry spares.

When changing brushes, be sure the Phillips screw holding the brush wire **and power** lead is tightened properly to assure a good electrical connection.

Commutator wear can be measured by installing new brushes and measuring the depth in the housing. A properly maintained motor will show little wear here (brush end flush with the housing). A worn commutator may need to be resurfaced to prevent excessive and rapid wear of replacement brushes.



- ◆ Remove brush covers, one on each side of the motor.
- ◆ Loosen screw next to the brush assembly.
- ◆ ◆ DO NOT REMOVE THE SCREW; just loosen it enough to remove the fork terminal.
- ◆ Carefully remove wire from motor case.
- ◆ Push inward and down to release the brush clip, then slowly allow clip to slide outward and set it aside.



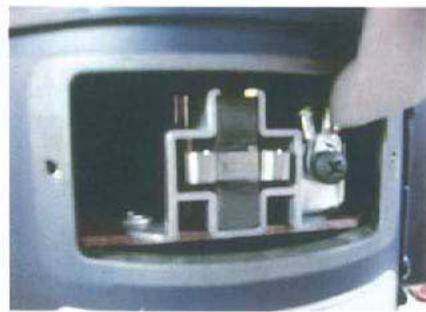
- ♦ Slide brush assembly out of housing.



- ♦ Corrosion block will help lubricate and seal out water.



- ♦ Clean or replace brushes as needed. Use corrosion block on all motor parts to seal from corrosion and keep brushes from sticking.



- ♦ Re-install brush assembly and install fork terminal on screw.



- ◆ Re-install brush clip by pushing in then up and slowly releasing and it will clip into place.



- ◆ Re-install brush cover and spray it with corrosion block to keep moisture out.

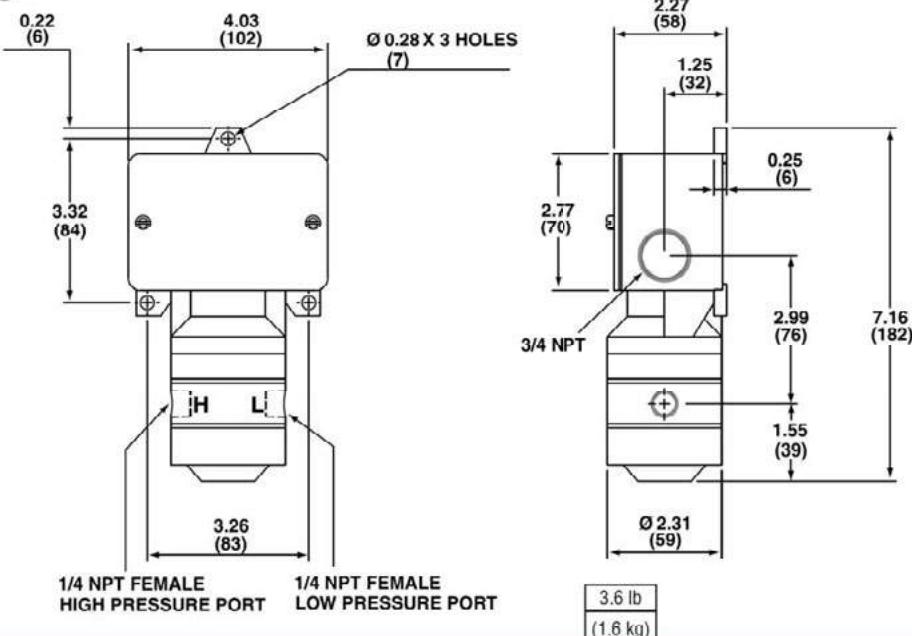
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8.3 Differential Pressure Switch

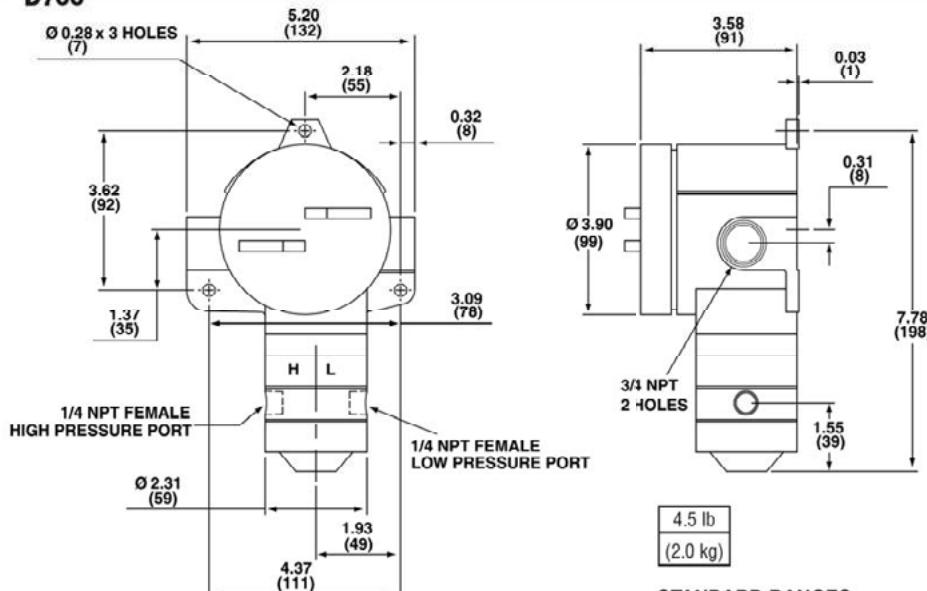
Installation and Maintenance Instructions for
D400 & D700 ASHCROFT® Snap Action
Switches for Differential Pressure Control

ASHCROFT®

D400



D700



STANDARD RANGES
15, 30, 60, 100, 200, 400, 600 psid

INTRODUCTION

The Ashcroft® differential pressure switch is a precision built U.L. and C.S.A. approved control device which features a mechanical snap action switch. Controllers are available for operation on various pressure differentials with fixed or variable switching differentials. Also, manual reset types are available for operation on increasing or decreasing pressure. The manual reset types remain tripped until reset by pressing a button on the top of the enclosure. The standard electrical switch is SPDT and is avail-

able with various electrical characteristics. Two SPDT switch elements mounted together are available except on variable dead-band and manual reset types. Various wetted material constructions for compatibility with a wide range of pressure media may be obtained.

The Ashcroft snap action temperature switch is furnished in the standard NEMA 4 and explosion proof NEMA 7 and 9 enclosure styles. Both enclosures are epoxy coated aluminum castings.

Installation and Maintenance Instructions for D400 & D700 ASHCROFT® Snap Action Switches for Differential Pressure Control

ASHCROFT®

INSTALLATION

These controls are precision instruments and should never be left with internal components exposed. After installation ensure that covers are in place and conduit openings are closed.

MOUNTING D400 AND D700 SERIES

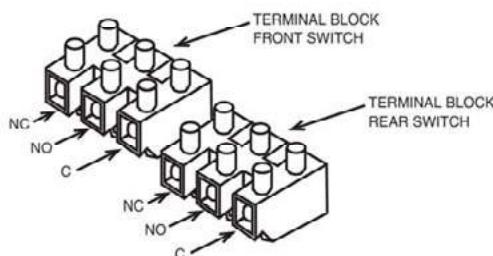
There are three holes external to the enclosures for surface mounting. The locations of these holes is shown on the general dimension drawing. The controls may also be mounted directly on the pressure line using the pressure connections.

ELECTRICAL CONNECTIONS

Remove cover

D400 Series – two screws hold cover to enclosure

D700 Series – cover unscrews



CONDUIT CONNECTIONS

Note – It is recommended that Teflon® tape or other sealant be used on conduit, bushing or plug threads to ensure integrity of the enclosure.

D400 Series standard – one $\frac{1}{4}$ NPT conduit hole right side.

D700 Series standard – two $\frac{1}{4}$ NPT conduit holes with one permanent plug. *NEMA 7 & 9 enclosures require proper conduit seals and breathers as per the National Electrical Code.*

D400 & WT700 Series – XJL variation – two $\frac{3}{4}$ NPT conduit holes with two $\frac{3}{4}$ to $\frac{1}{2}$ NPT reducing bushings.

D400 Series – XJK variation – two $\frac{3}{4}$ NPT conduit holes.

D400 SERIES

SPDT – Wire directly to the switch according to circuit requirements. On controls with pilot lights, wire lights according to circuit diagram on the inside of the cover. See special wiring instruction tag for single switches with two pilot lights and dual switches with one or more pilot lights.

2-SPDT – Dual switching elements consist of two SPDT switches mounted together in a bracket. The switches are calibrated to have simultaneous operation within 1% of range either on increasing or decreasing pressure, but not in both directions. Wire directly to the front and rear switch according to circuit requirements.

Leads provided on rear switch and leads provided for hermetically sealed switch components are color coded as follows:

Common	– White
Normally Closed	– Red
Normally Open	– Blue

See SPDT instructions for pilot light hook-up.

D700 SERIES

SPDT – Wire directly to the switch according to circuit requirements.

2-SPDT – Wire to front switch terminal block (left) and rear switch terminal block (right) as marked. Strip insulation $\frac{5}{16}$ ", insert in proper terminal connector and tighten clamping screw to secure.

ADJUSTMENT OF SETPOINT

D400 & D700 Series – A single setpoint adjustment nut ($\frac{7}{16}$ ") is located centrally at the bottom on the inside of the enclosure. The direction of turning is indicated on a label affixed to the inside of the control enclosure.

A typical calibration procedure would be as follows:

Static Working Pressure	– 600 psig
Adjustable Differential Range	– 30/200 psid
Differential Setpoint	– 150 psi above static working pressure

Simultaneously raise the high and low side pressure to 600 psig. Maintain the low side pressure at 600 psig. Raise the high side pressure to 750 psig to obtain 150 psi differential.

Turn the adjustment nut until the switch changes mode at 150 psi differential. When the setpoint has been achieved, raise and lower the high side pressure to ensure that the differential set-point is correct.

D450 and D750 VARIABLE DEADBAND SWITCHES

Deadband is varied by rotating the wheel on the precision switch. When viewed from the front of the enclosure, rotation to the left increases deadband – rotation to the right decreases deadband. Letters on the wheel may be used as a reference. Deadbands obtainable will vary from 2% to 9% of pressure range depending on range segment and the type of diaphragm.

ADJUSTMENT OF SETPOINT

As received, the differential pressure switch will normally be set to approximately 90% of range. Rotate the wheel on the MICRO SWITCH all the way to the right. This will provide the smallest deadband. Pressurize the system to the required setpoint and turn the adjustment nut until the switch changes mode. Lower the pressure to reset the switch. Rotate the wheel on the MICRO SWITCH until the desired deadband is obtained. The upper setpoint will be changing upward with this adjustment. Lower the pressure to reset the switch. Increase the pressure to the desired setpoint and turn the adjustment nut until the switch changes mode. Lower the pressure and check the reset point and deadband.

Note – As indicated above, adjustment of setpoint is made by use of $\frac{7}{16}$ " nut. The precision switch element mounting screws and bracket adjusting screw are factory sealed and should not be tampered with.

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8.4 Solenoid Valve

Installation & Maintenance Instructions

2-WAY INTERNAL PILOTED—OPERATED SOLENOID VALVES
NORMALLY CLOSED OPERATION
3/4" and 1" NPT — BRASS CONSTRUCTION

SERIES
8210
8211

Form No.V5411R4

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

DESCRIPTION

Series 8210 valves are 2-way normally closed internal pilot-operated solenoid valves designed for general service. Valves are made of rugged forged brass. Series 8210 valves are provided with a general purpose solenoid enclosure.

Series EF8210 and 8211 are the same as Series 8210 except they are provided with an explosionproof or explosionproof/watertight solenoid enclosure.

OPERATION

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

NOTE: No minimum operating pressure differential required.

Manual Operator (optional feature)

Manual operator allows manual operation when desired or during an electrical power outage.

- **For 3/4" NPT Valve Construction** – To engage manual operator (open valve), rotate stem clockwise as far as possible. Valve will now be in the same position as when the solenoid is energized. To disengage manual operator, rotate stem counterclockwise as far as possible.

⚠ CAUTION: For valve to operate electrically, manual operator must be fully disengaged (stem rotated fully counterclockwise).

- **For 1" NPT Valve Construction** – To engage manual operator (open valve), push knobs upward and rotate one quarter turn. Valve will now be in the same position as when the solenoid is energized. To disengage manual operator, rotate manual operator one quarter turn until the manual operator disengages and returns to its original position.

⚠ CAUTION: For valve to operate electrically, manual operator stem must be fully retracted.

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	Coil Class	Maximum Ambient Temp.	Maximum Fluid Temp.
15.4 AC	None, DF or HT	F or H	125°F(51.7°C)	200°F(93°C)
16.1 AC	None, KF, SF or SC	F	125°F(51.7°C)	
	HT, KH, ST or SU	H	140°F(60°C)	
20 AC	None, HB or DP	F or H	77°F(25°C)	
20.1 AC	None, KP, SP or SD	F	125°F(51.7°C)	
	HB, KB, SS or SV	H	140°F(60°C)	
30.6 DC	HT	H	77°F(25°C)	77°F(25°C)

Positioning

Valve must be mounted with solenoid vertical and upright.

Piping

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

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

MAINTENANCE

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

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

Cleaning

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

Preventive Maintenance

- Keep the medium flowing through the valve as free from dirt and foreign material as possible.
- While in service, the valve should be operated at least once a month to insure proper opening and closing.
- 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.

Valve Disassembly

1. Disassemble valve in an orderly fashion using exploded views for identification and placement of parts. Refer to Figure 1 & 2 for AC construction; Figure 3 for DC construction.
2. Remove solenoid enclosure. See separate instructions.
3. Unscrew solenoid base sub-assembly. For DC construction, a special wrench is supplied in ASCO Rebuild Kit. For wrench only, Order ASCO Wrench Kit No. K168146-001.
4. Remove bonnet screws, valve bonnet, bonnet gasket, piston/core sub-assembly with core spring and body gasket from valve body.
5. For normal maintenance, it is not necessary to remove or disassemble the manual operator unless external leakage is evident. If required, proceed as follows:
 - **For 3/4" NPT Valve Construction:** Unscrew bonnet from valve body and remove gasket. Remove stem pin, stem and stem gasket.
 - **For 1" NPT Valve Construction:** Unscrew stuffing box and remove stuffing box gasket. Remove knob pin using a suitable punch. Then remove knob, spring and stem from stuffing box.
6. 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 all gaskets with DOW CORNING® 111 Compound lubricant or an equivalent high-grade silicone grease.
2. Install body gasket in valve body and bonnet gasket in valve bonnet.
3. Insert piston/core sub-assembly in valve bonnet. To prevent damage, compress rider rings and piston ring when preassembling piston/core sub-assembly in valve bonnet. Be sure there is free movement of the piston/core sub-assembly.

4. When replacing bonnet with piston/core assembly compressed inside of it, a flat steel rule (or similar flat tool) may be used to retain the piston/core sub-assembly in the valve bonnet while bonnet is engaged to the valve body.

5. Torque bonnet screws (4) in a crisscross manner to 110 ± 10 in-lbs [$12,4 \pm 1,1$ Nm].

6. Replace core spring, for AC construction install wide end of core spring in core first, closed end protruding from top of core. For DC construction, install core spring with closed end of core spring protruding from top of core.

7. Hand thread solenoid base sub-assembly into valve bonnet as far as possible. Then torque solenoid base sub-assembly to 175 ± 25 in-lbs [$19,8 \pm 2,8$ Nm]. For DC construction, the solenoid base sub-assembly must be placed inside the housing before assembling into the valve body. Before doing this, read separate lubrication instructions in *Solenoid Installation & Maintenance Instructions*.

8. For valves provided with a manual operator, reassemble in reverse order of disassembly. Then torque bonnet or stuffing box to 75 ± 10 in-lbs [$8,5 \pm 1,1$ Nm].

9. 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.

10. Restore line pressure and electrical power supply to valve.

11. 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	Torque Value Inch-Pounds	Torque Value Newton-Meters
Bonnet screws	110 ± 10	$12,4 \pm 1,1$
Solenoid base sub-assembly	175 ± 25	$19,8 \pm 2,8$
Bonnet or Stuffing box	75 ± 10	$8,5 \pm 1,1$

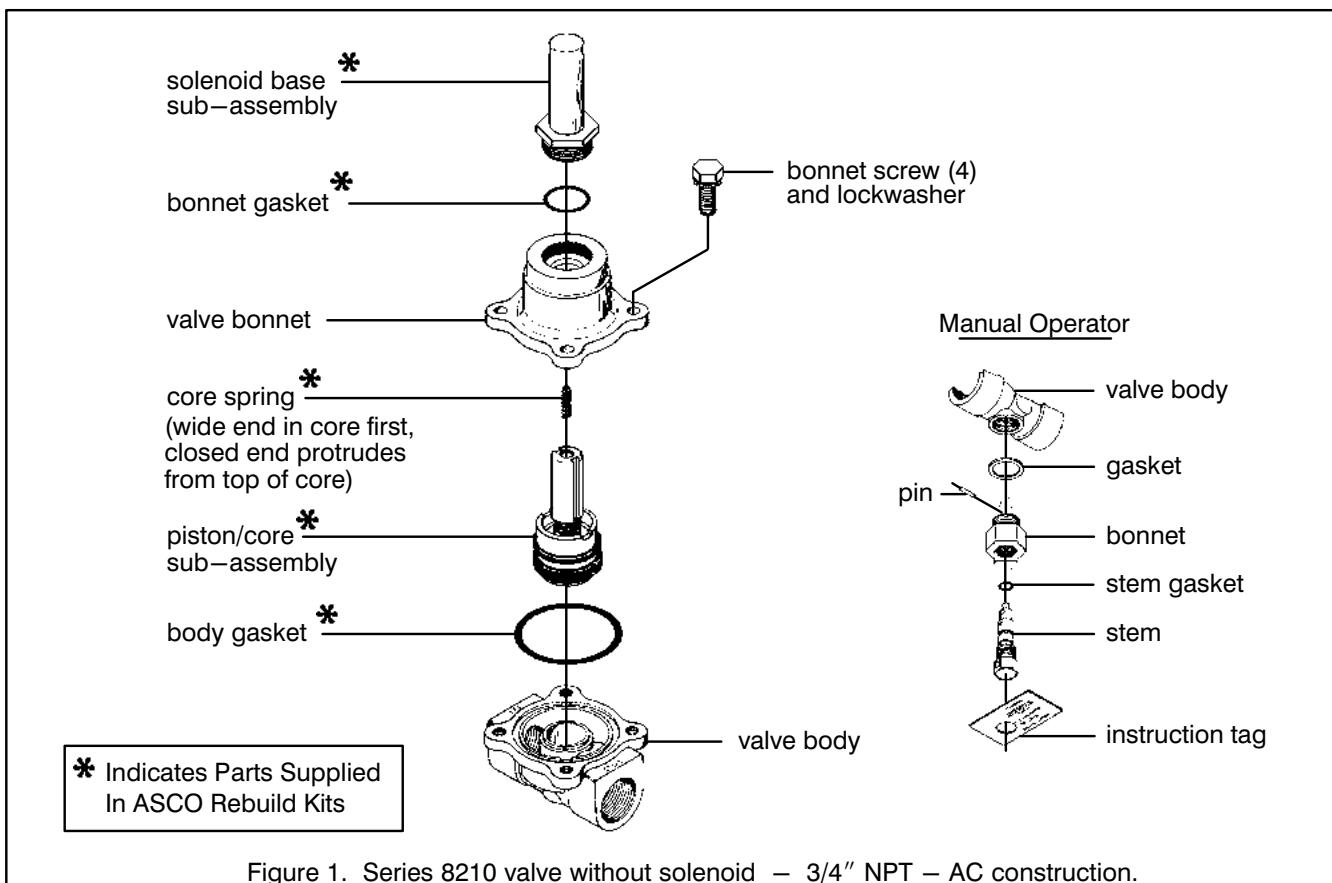


Figure 1. Series 8210 valve without solenoid – 3/4" NPT – AC construction.

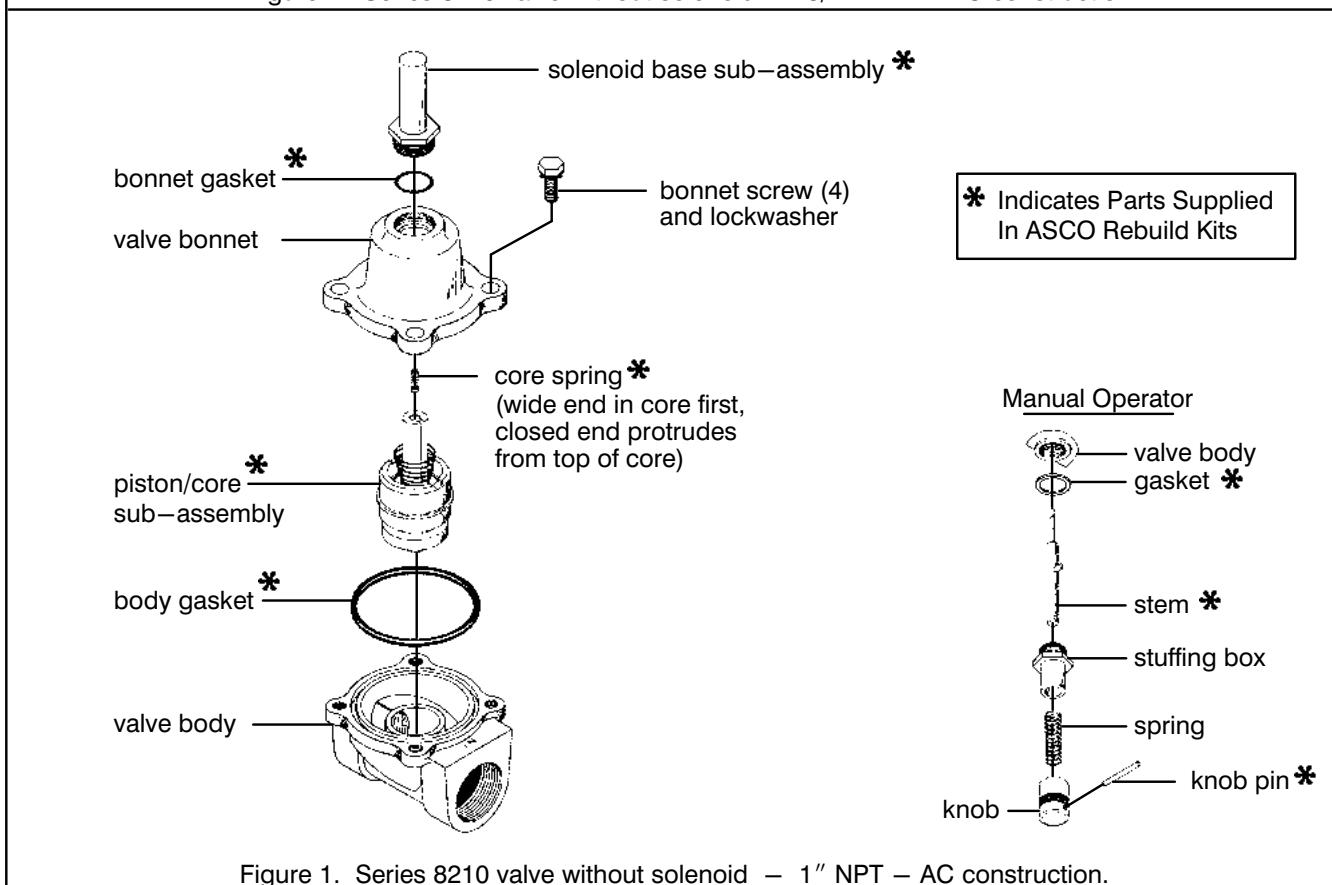


Figure 1. Series 8210 valve without solenoid – 1" NPT – AC construction.

* Special wrench supplied
in ASCO Rebuild Kit.
For wrench kit only
order No. K168146-001

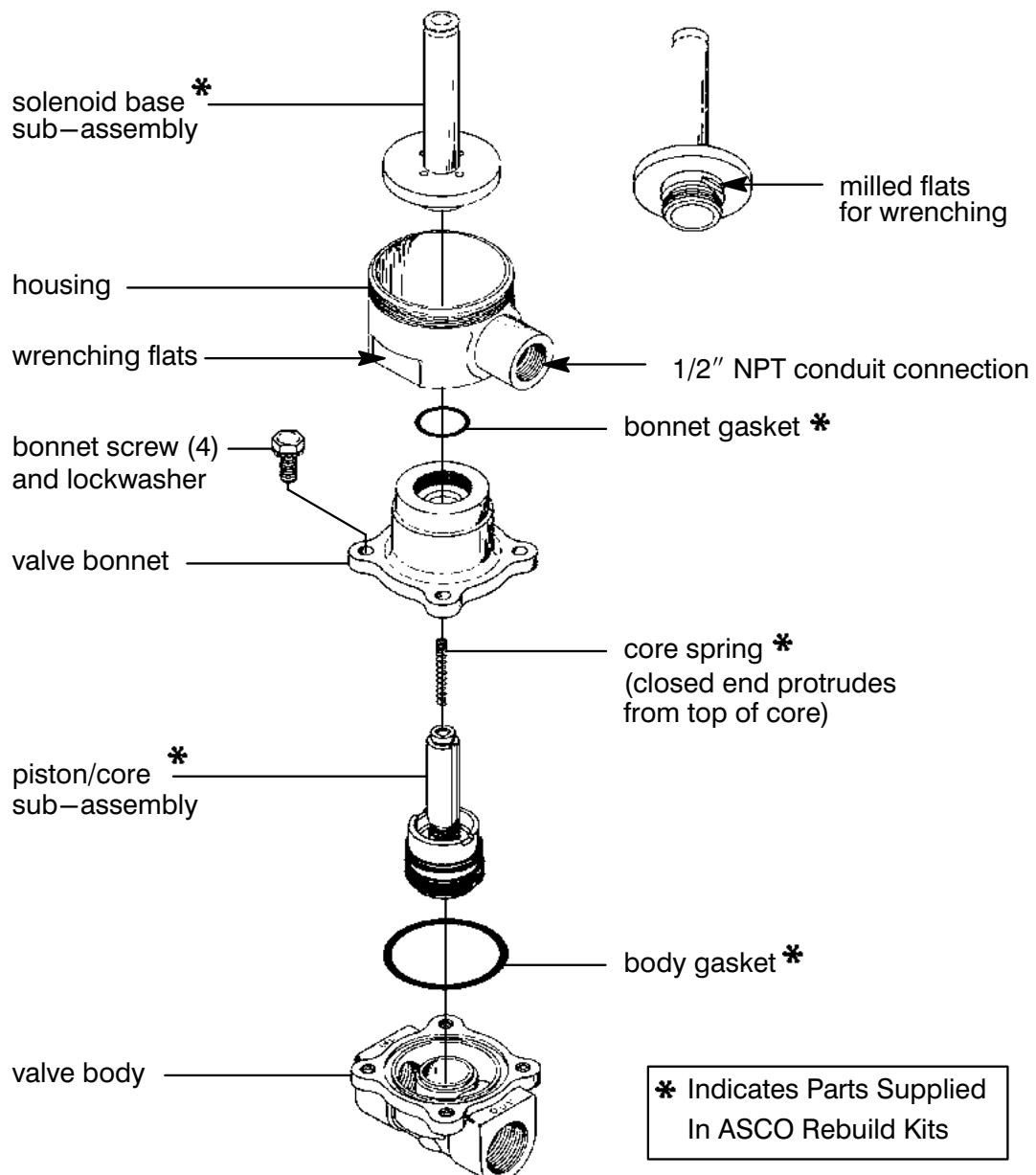


Figure 3. Series 8211/EF8210 valve without solenoid – 3/4" NPT – DC construction.

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8.5 Thermal Flow Sensor



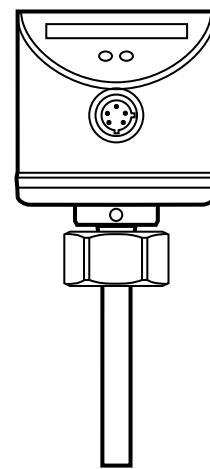
Operating instructions
Flow monitors

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Preliminary note

- An instruction is indicated by "►":
Example: ► Check whether the unit operates correctly.
- A reaction to the action is indicated by ">":
Example: > LED 9 lights.

1 Safety instructions

- Please read the product description prior to set-up of the unit. Ensure that the product is suitable for your application without any restrictions.
- The unit conforms to the relevant regulations and EC directives.
- Improper or non-intended use may lead to malfunctions of the unit or to unwanted effects in your application.
- That is why installation, electrical connection, set-up, operation and maintenance of the unit must only be carried out by qualified personnel authorised by the machine operator.

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2 Functions and features

2.1 Application area

The unit monitors the flow of liquid and gaseous media.

2.2 Operating principle flow monitoring

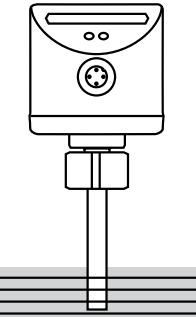
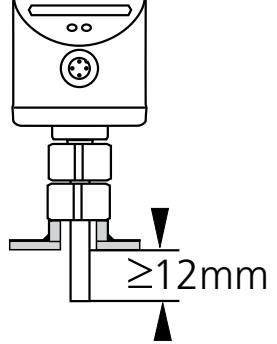
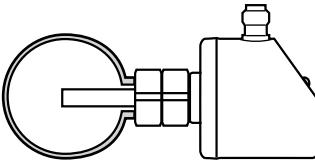
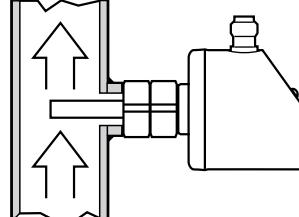
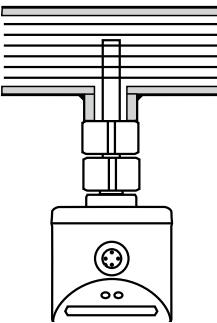
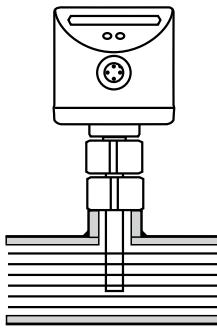
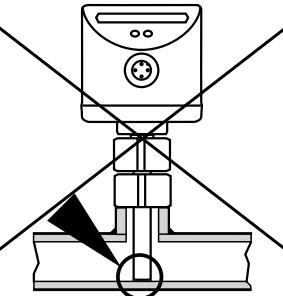
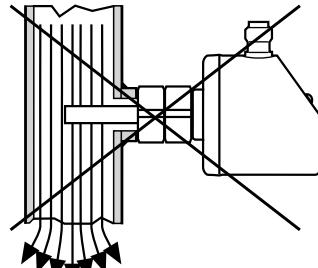
- The unit detects the flow speed to the calorimetric measuring principle and switches the output:
 - output closed if medium is flowing / output open if no medium is flowing.
This applies to the unit on delivery: output = normally open. In case of need you can change the output to normally closed (→ 7.2). It then applies: output open if medium is flowing.
- If the flow speed increases, the switching status changes when the switch point is reached.
- If the flow speed falls again, the switching status changes if the value "SP minus hysteresis" is reached.
The hysteresis changes with the flow speed and it is essentially influenced by the set monitoring range.
It is 2...5 cm/s for the setting 5...100 cm/s (= factory setting), it increases with higher flow speeds.
- The typical response time of the unit is 1...10 s. It can be influenced by the setting of the switch point:
 - Low switch point = quick reaction with rising flow.
 - High switch point = quick reaction with falling flow.

3 Installation

Using process adapters the unit can be adapted to different process connections.

- Adapters have to be ordered separately as accessories.
A correct fit of the unit and ingress resistance of the connection are only ensured using ifm adapters.
- For small flow rates ifm adapter blocks are available.

3.1 Installation location

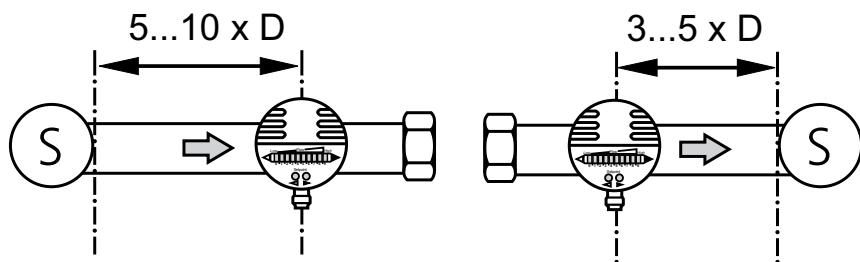
General		
Recommended <ul style="list-style-type: none">• For horizontal pipes: mounting from the side.• For vertical pipes: mounting in the rising pipe.		
Conditional <ul style="list-style-type: none">• Horizontal pipe /mounting from the bottom: if the pipe is free from build-up.• Horizontal pipe /mounting from the top: if the pipe is completely filled with medium.		
To avoid <ul style="list-style-type: none">• The sensor tip must not be in contact with the pipe wall.• Do not mount in downpipes that are open at the bottom!		

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3.2 Sources of interference in the pipe system

Components integrated in the pipes, bends, valves, reductions, etc. lead to turbulence of the medium. This affects the function of the unit.

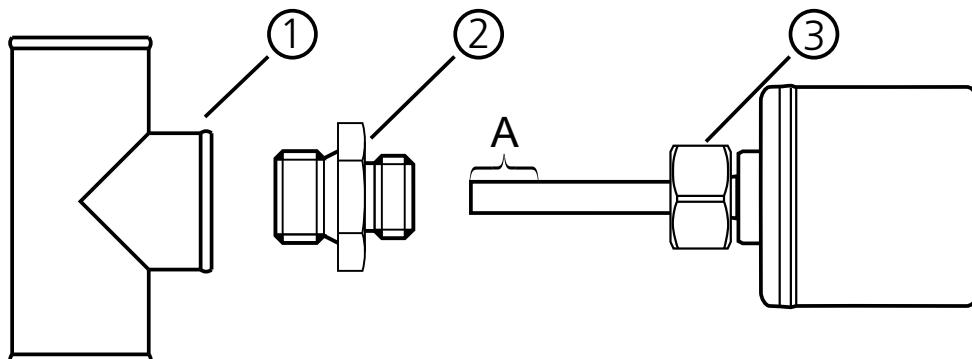
Recommendation: Adhere to the distances between sensor and sources of interference:



D = pipe diameter; S = sources of interference

3.3. Mounting operation

- !**
- ▶ Ensure that the system is free of pressure during installation.
 - ▶ Ensure that no media can leak at the mounting location during installation.



- ▶ Grease the threads of the process connection (1), adapter (2) and nut (3).
Note: The sensor tip (A) must not be in contact with grease.
- ▶ Screw the suitable adapter into the process connection.
- ▶ Place the flow monitor onto the adapter and tighten the nut. Tightening torque max. 50 Nm. Ensure that the unit is correctly oriented.

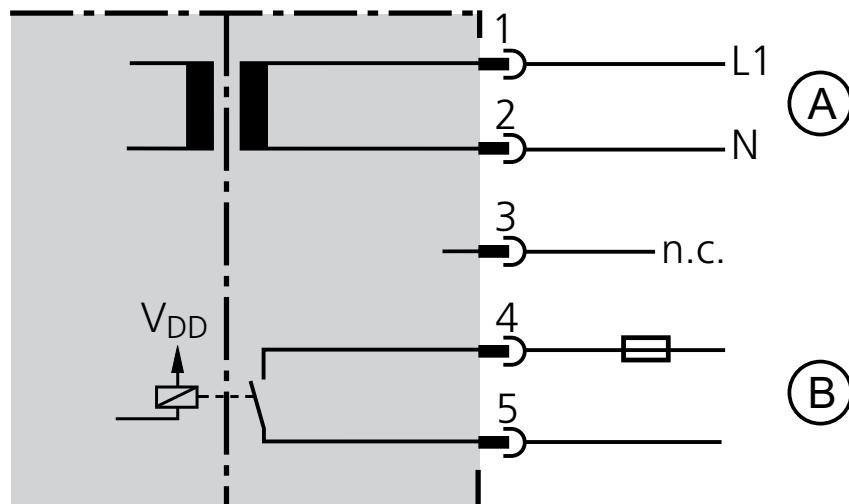
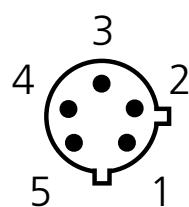
4 Electrical connection



- The unit must be connected by a qualified electrician.
- The national and international regulations for the installation of electrical equipment must be adhered to.
- Caution: For the output circuit the same protective measures as for the supply circuit must be taken.
- Insert a miniature fuse according to IEC60127-2 Sheet 1 ($\leq 5\text{ A}$ fast acting).
- The permissible potential difference between supply and output circuit is max. 300 V.

- Disconnect power.
- Connect the unit as follows:

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A: supply circuit

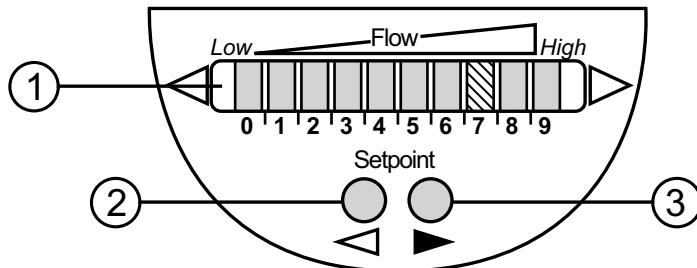
B: output circuit

— — — : safe separation

ifm-sockets are available as accessories:

Order no. E11248, E11249, E11250, E11251

5 Operating and display elements



1: Operation display

- The green LEDs indicate the current flow (the LEDs 0 to 9 represent the range between no flow and maximum flow).
- A lighting LED indicates the position of the switch point (orange = output closed, red = output open).

2, 3: Setting buttons for adjustment and configuration

6 Set-up and settings for water

(For media other than water → 7.1: Low flow adjustment).

- Switch on the supply voltage.
- > All LEDs light and go out again step by step. During this time the output is closed (if configured as normally open). The unit is in the operating mode.
- Let the normal flow circulate in the installation.
- Check the display and determine further actions.

1		The factory setting is suitable for the application. ► No further settings are required.
2		Your normal flow is below the representation range of the display. 2 setting options: ► Change the switch point (→ 6.1). ► Carry out high flow adjustment (→ 6.2).
3		Your normal flow exceeds the representation range of the display (LED 9 flashes). ► Carry out high flow adjustment (→ 6.2).

You can restore the factory setting any time. (→ 7.3).

6.1 Change the switch point (optional)

For the factory setting the switch point is at LED 7. A change makes sense if:

- the display shows example 2.
- the flow fluctuates much or pulsates.
- if a faster response time of the unit is requested (low switch point = fast response with rising flow, high switch point = fast response with falling flow).

► Briefly press the pushbutton < or ►.

> The switch point LED flashes.

► Press the pushbutton < or ► as often as required. Each press of the pushbutton shifts the LED by one position in the indicated direction.

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Note: If no pushbutton is pressed for 2 s, the unit returns to the operating mode with the newly set value.

6.2 High flow adjustment (optional)

The unit determines the existing flow as normal flow and adapts the display representation (all LEDs except the switch point LED light green).

► Let the normal flow circulate in the installation.

► Press the pushbutton ► and keep it pressed.

> LED 9 lights, after approx. 5 s it flashes.

► Release the pushbutton.

The unit is now adapted to your flow conditions. It passes into the operating mode, the display should now show example 1.

Note: The adjustment affects the switch point: It is increased proportionally (maximum up to LED 7).

7 Additional settings (optional)

7.1 Low flow adjustment

If the unit is used in media other than water, you should additionally adapt the unit to the minimum flow.

Note: The following adjustment must only be carried out after the high flow adjustment.

- ▶ Let the minimum flow circulate in the installation or ensure flow standstill.
- ▶ Press the pushbutton < and keep it pressed.
- > LED 0 lights, after approx. 5 s it flashes.
- ▶ Release the pushbutton. The unit adopts the new value and passes into the operating mode.

7.2 Configure the switching output

The unit is delivered as normally open. In case of need you can change the output to normally closed:

- ▶ Press the pushbutton < for at least 15 s.
- > LED 0 lights, after approx. 5 s it flashes.
- > After 10 s the current setting is displayed: LEDs 5...9 light orange (= output normally open).
- > After approx. 15 s LEDs 0...4 flash orange.
- ▶ Release the pushbutton. The output is changed to normally closed operation.

For a new changeover repeat the operation.

7.3 Restore the factory setting (reset)

- ▶ Press the pushbutton ► for at least 15 s.
- > LED 9 lights, after approx. 5 s it flashes.
- > After approx. 15 s LEDs 0...9 flash orange.
- ▶ Release the pushbutton. All settings are reset to the factory setting:
 - operating area: 5 ...100 cm/s for water
 - switch point: LED 7
 - output function: NO
 - unlocked.

7.4 Lock / unlock the unit

The unit can be locked electronically to prevent unintentional settings.

► Press both setting pushbuttons simultaneously for at least 10 s in the operating mode.

> The indication goes out, the unit locks or unlocks.

On delivery: unlocked.

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8 Error during adjustment

If no adjustment is possible, all LEDs flash red. The unit then passes into the operating mode with unchanged values.

Possible cause /aid:

Error during installation.	► Read chapter 3 Installation. Check whether all requirements have been met.
The difference between maximum flow and minimum flow is too small.	► Increase the flow difference and carry out the adjustment once again.
The sequence high flow /low flow adjustment was not adhered to.	► Carry out the two adjustment operations again in the right sequence.

9 Operation

After every power on all LEDs light and go out again step by step (during this time the output is closed if configured as normally open). The unit is then ready for operation.

In case of power failure or interruption all settings remain.

Operating indicators	
	Green LED bar: Current flow within the representation range. Indication of the switch point (SP): - LED orange: output closed. - LED red: output open.
	LED 9 flashes: current flow above the representation range.
	LED 0 flashes: current flow far below the representation range.

Interference indicators

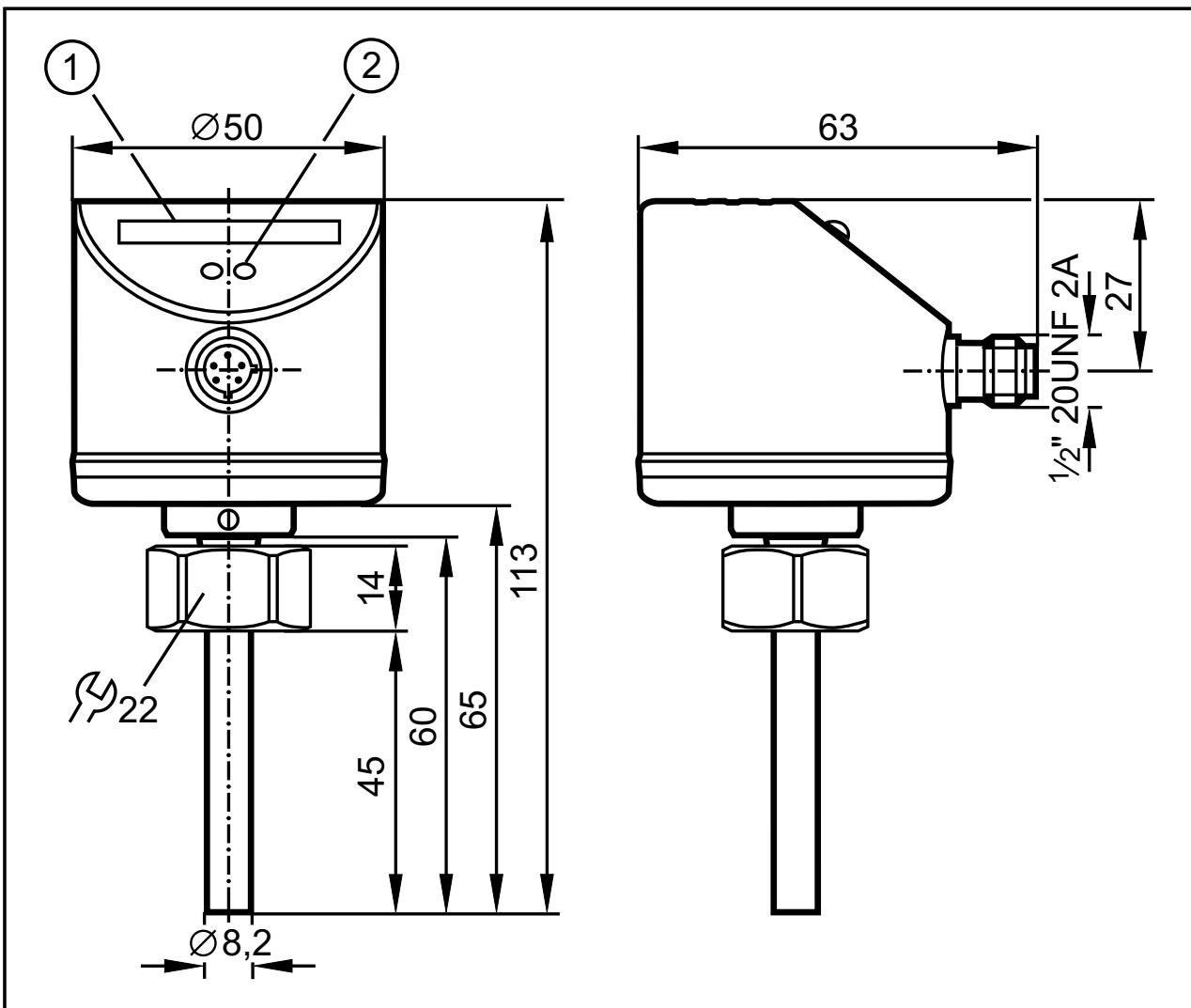
Display OFF (no LED lights):	Operating voltage too low (< 19 V) or failed. Ensure a correct voltage supply.
---------------------------------	---

10 Maintenance

Recommended maintenance:

- Check the sensor tip for build-up from time to time.
- Clean it using a soft cloth. Stubborn build-up (e.g. lime) can be removed using a common vinegar cleaning agent.

11 Scale drawing



1: LED bar display

2: set button

12 Technical data

UK

Application area.....	Liquids and gases
Nominal voltage [V]	90 ... 240 AC (45....65 Hz)
Voltage tolerance [%].....	-5 / +10
Operating voltage [V].....	85 ... 265 AC
Power consumption [VA]	3.5
Relay type:.....	contact closed at work
Switching power of relay.....	3 A (250 V AC / 30 V DC)
Number of switching cycles.....	20 million mechanically
Switching cycles with 3 A load.....	100.000 electrically
Power-on delay time [s].....	10, optically indicated
Liquids	
Medium temperature [°C]	-25 ... +80
Setting range [cm/s].....	3 ... 300
Greatest sensitivity [cm/s]	3...100
Temperature gradient [K/min]	300
Gases	
Medium temperature [°C]	-25 ... +80
Setting range [cm/s].....	200 ... 3000
Greatest sensitivity [cm/s].....	200 ... 800
Switch point accuracy [cm/s]	$\pm 2 \dots \pm 10^1$
Hysteresis [cm/s]	2...5 ¹⁾
Repeatability [cm/s]	1...5 ¹⁾
Temperature drift [cm/s x 1/K].....	0.1 ²⁾
Response time [s].....	1 ... 10
Pressure resistance [bar].....	
Operating temperature [°C]	-25 ... +80
Protection rating / Protection class.....	IP 67 / II
Shock resistance [g]	50 (DIN / IEC 68-2-27, 11 ms)
Vibration resistance [g]	20 (DIN / IEC 68-2-6, 55-2000 Hz)
Housing materials.....	stainless steel (304S15); PC (Makrolon); PBT-GF 20; EPDM/X (Santoprene)
Materials (wetted parts).....	high-grade stainless steel (316S12); O-ring: FPM 8x1.5 gr 80° Shore A
EMC: EN 61000-4-2 ESD:	4 kV CD / 8 kV AD
EN 61000-4-3 HF radiated:	10 V/m
EN 61000-4-4 Burst:	2 kV
EN 61000-4-6 HF conducted:	10 V

¹⁾ for water; 5...100 cm/s; 25°C (factory setting); ²⁾ for water; 5...100 cm/s; 10...70°C

Technical data and further information at
www.ifm.com → Select your country → Data sheet direct:

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8.6 Flow Meter, Rotameter

7510-7511 Series

Installation Instructions



FLOW METER LIMITED WARRANTY

Meters are warranted against defects in materials and workmanship to the original user for a period of thirteen (13) months from the date of factory shipment, provided the meter is installed, operated and maintained in accordance with King Instrument Company's instructions and recommendations.

This warranty does not apply if failure is caused or contributed to by any of the following: improper handling, improper storage, abuse, unsuitable application of the product, lack of reasonable and necessary maintenance, use exceeding suggested pressure and temperature maximums, improper packaging for return, or repairs made or attempted to be made by anyone other than King Instrument Company, Inc.

KING INSTRUMENT COMPANY, INC. MAKES NO WARRANTY AS TO THE FITNESS OF ITS PRODUCTS FOR SPECIFIC APPLICATIONS.

This warranty is valid for the original end-user only and does not apply to products that have been damaged or modified. This warranty is non-transferrable and is limited to replacement or repair. The liability of King Instrument Company arising out of its supply of the products, or their use, shall not in any case exceed the cost of correcting defects in the products as set forth above.

THIS WARRANTY IS A LIMITED WARRANTY AND SHALL BE IN LIEU OF ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THERE ARE NO OTHER WARRANTIES WHICH EXIST BEYOND THE DESCRIPTION OR FACE HEREOF.

IN NO EVENT SHALL KING INSTRUMENT COMPANY BE LIABLE FOR LOSS OF PROFITS, INDIRECT, CONSEQUENTIAL OR INCIDENTAL DAMAGES.

Products should be returned, prepaid, to King Instrument Company, Inc. with proof of purchase. Call factory for Return Merchandise Authorization (RMA) number and return instructions.

THIS IS IMPORTANT INFORMATION. READ IT CAREFULLY BEFORE BEGINNING WORK.

- 1) Inspect meter for damage that may have occurred during shipping. Report any damage to the container to the freight carrier immediately.
- 2) Make sure your pressure, temperature, fluid and other requirements are compatible with the meter.
- 3) Select a suitable location for installation to prevent excess stress on the meter which may result from:

- a) Misaligned pipe.
- b) The weight of related plumbing.
- c) "Water Hammer" which is most likely to occur when flow is suddenly stopped as with quick closing solenoid operated valves. (If necessary, a surge chamber should be installed. This will also be useful in pressure start-up situations.)
- d) Thermal expansion of liquid in a stagnated or valve isolated system.
- e) Instantaneous pressurization which will stress the meter and could result in tube failure.

NOTE: In closed thermal transfer or cooling systems, install the meter in the cool side of the line to minimize meter expansion and contraction and possible fluid leaks at the threaded connections.

- 4) Handle the meter carefully during installation.
 - a) Use an appropriate amount of teflon tape on external pipe threads before making connections. Do not use paste or stick type thread sealing products.

- b) Extreme caution should be exercised when using PVC solvent cement around Acrylic. Solvents can cause acrylic to stress crack.
- c) Over tightening of plastic connections may result in fitting damage.
- 5) Install the meter vertically with the inlet port at the bottom.
- 6) Meters with stainless steel fittings will support several feet of pipe as long as significant vibration or stress resulting from misaligned pipe are not factors.
- 7) Meters with plastic fittings must be installed so that fittings are not made to support any part of the associated plumbing. In addition, meter frame should be fastened to bulkhead, panel or column.
- 8) Meters used in gas service should have suitable valves plumbed in at the inlet and outlet of the meter. These valves should be no more than 1-1/2 pipe diameters from the meter ports. The valve at the outlet should be used to create back pressure as required to prevent float bounce. It should be set initially and then left alone. The inlet valve should be used for throttling purposes. Depending on the installation, valves may not be essential, but they are most useful in many installations. Remember: To get a correct reading of flow in gas service, it is necessary to know the pressure right at the outlet of the meter (before the valve).
- 9) Pressure and temperature maximums must never be exceeded.

When it comes to flow...we're instrumental.

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7510 - 7511 Series

Installation Instructions

Maximum Non-Shock Pressure and Temperature		
Fluid	Temperature	Pressure
Water	130° F	125 psig
Air	100° F	100 psig
Ambient Temp. 33° F -125° F		

CAUTION

- 7510 / 7511 meters are not oxygen cleaned. Use with incompatible fluids may cause o-rings to swell and break.
- O-rings should be replaced if meter is disassembled after it has been in service.
- Extra caution must be exercised when meters are used in high pressure gas cylinder applications. Pressure regulators should be installed at the cylinder and at the inlet of the meter.
- Serious property damage and great personal injury could occur as the result of a meter misused or used in an unsuitable application.

CLEANING

Carefully remove the flowmeter from piping system. Remove the threaded outlet fitting and withdraw the float from the top. All necessary instrument components are now fully accessible for cleaning with a bottle brush and appropriate mild soap solution*. Before the meter is reassembled, inspect all parts for damage. O-rings should be replaced during meter maintenance and cleaning.

To reassemble, carefully guide the float back into the tube. When installing float/guide assembly make certain that the end of the guide fully engages the inlet and/or outlet float stop. Reinstall and tighten fittings in appropriate ports. Reinstall the instrument into the plumbing system after removing the old teflon tape (with a wire brush) and replacing with fresh teflon tape.

*Do not use cleaning agents that will damage float, tube or o-rings.

Meters should be cleaned with a mild soap solution. This will be an effective cleaner of rust stains. Caution must be used so that materials of construction are not damaged by cleaning solutions. Hard water deposits can be removed with 5% acetic acid solution (vinegar).

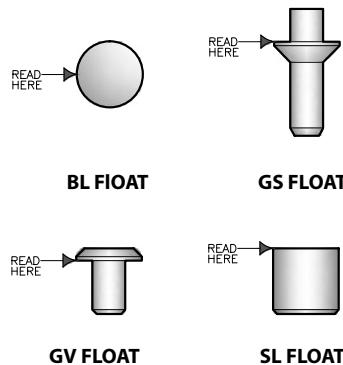
REPAIR

7510 / 7511 meters that require repair should be sent to the factory. Please call for a Return Merchandise Authorization (RMA) number and return instructions.

WARNING:

Pressure and temperature ratings are based on a study of the engineering data for particular materials used in construction and on the design of individual models. This information is supplemented by destructive test results. Meters with stainless enclosures must never be operated without shields securely in place. Meters exposed to difficult environments such as those created by certain chemicals, excessive vibration or other stress inducing factors could fail at or below the suggested maximums. Never operate meters above pressure and temperature maximums. It is strongly recommended that all meter installations utilize an appropriate pressure relief valve and/or rupture disc. The pressure settings and locations of these devices should be such that meters cannot be over pressurized. Meter failure could result in damage to equipment and serious personal injury. Always use suitable safety gear, including OSHA approved eye protection when working around meters in service. We are happy to pass along chemical compatibility information that has been published by the manufacturer's of raw materials used in our products; however, this information should not be construed as a recommendation made by King Instrument Company, Inc. for a specific application.

FLOAT TYPES AND ORIENTATIONS

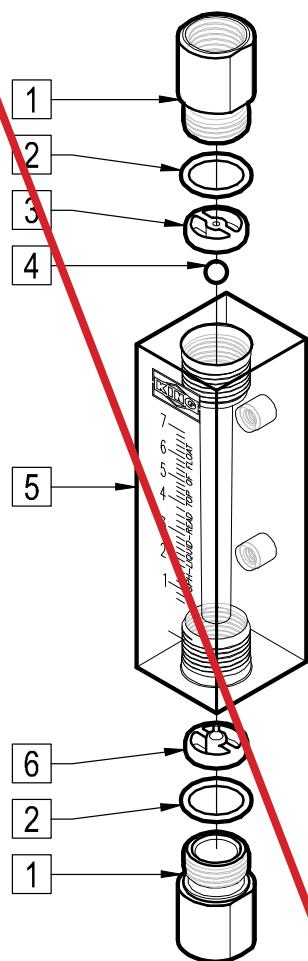


7510–7511 Series

Installation Instructions

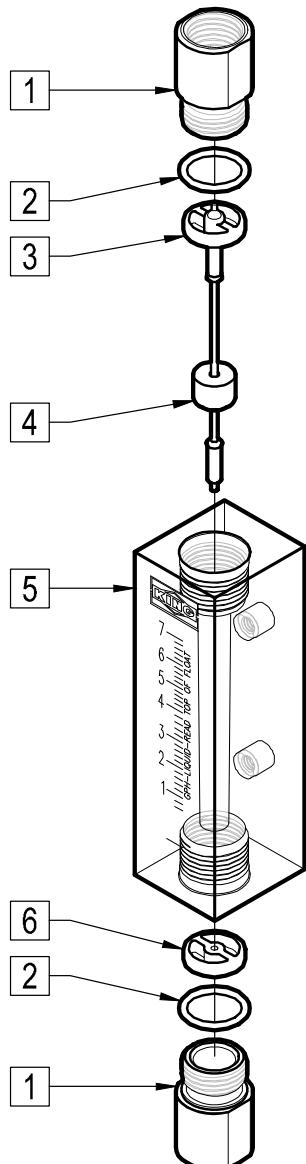
7510/7511 SERIES ASSEMBLY WITHOUT GUIDE ROD PARTS LIST:

1. End Fitting
2. End Fitting O-Ring
3. Outlet Float Stop
4. Float
5. Acrylic Meter Tube
6. Inlet Float Stop



7510/7511 SERIES ASSEMBLY WITH GUIDE ROD PARTS LIST:

1. End Fitting
2. End Fitting O-Ring
3. Outlet Float Stop
Guide Rod Assembly
4. Float
5. Acrylic Meter Tube
6. Inlet Float Stop





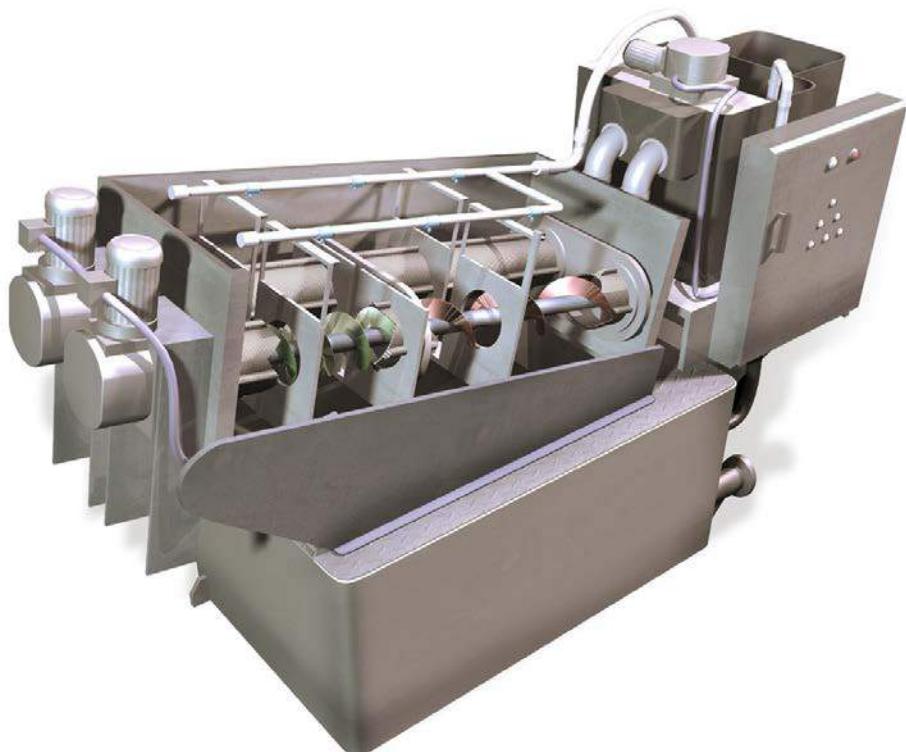
Polymer Activation & Hydration Technologies

Velocity Dynamics, LLC
543 S. Pierce Ave.
Louisville, CO 80027
PH (303) 530-3298 • FX (303) 530-3368
www.velodyn.esystems.com

Volute Dewatering Press System Submittal

**Concannon Winery Project
Arroyo Grande, CA**

November 2016



Process Wastewater Technologies, LLC
9004 Yellow Brick Road, Suite D
Baltimore, MD 21237
Submittal Prepared by Bill Love

General Project Submittal Data

Project name: Concannon Winery Project
Attn: Jason Montgomery-C/O Concannon Proj.

Project address: 2385 Precision Drive
Arroyo Grande, CA 93420

Customer: **Fluid Resource Management**
2385 Precision Drive
Arroyo Grande, CA 93420

Customer PO number: CL16-005-003

Customer PO date: 21 November 2016

Engineer: Darrick Molitor
Cloacina Package Treatment Solutions
2385 Precision Drive
Arroyo Grande, CA 93420

Local sales representative: Brent Cromar, JBI Water

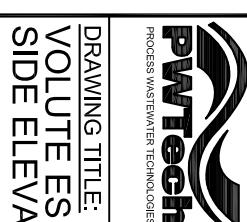
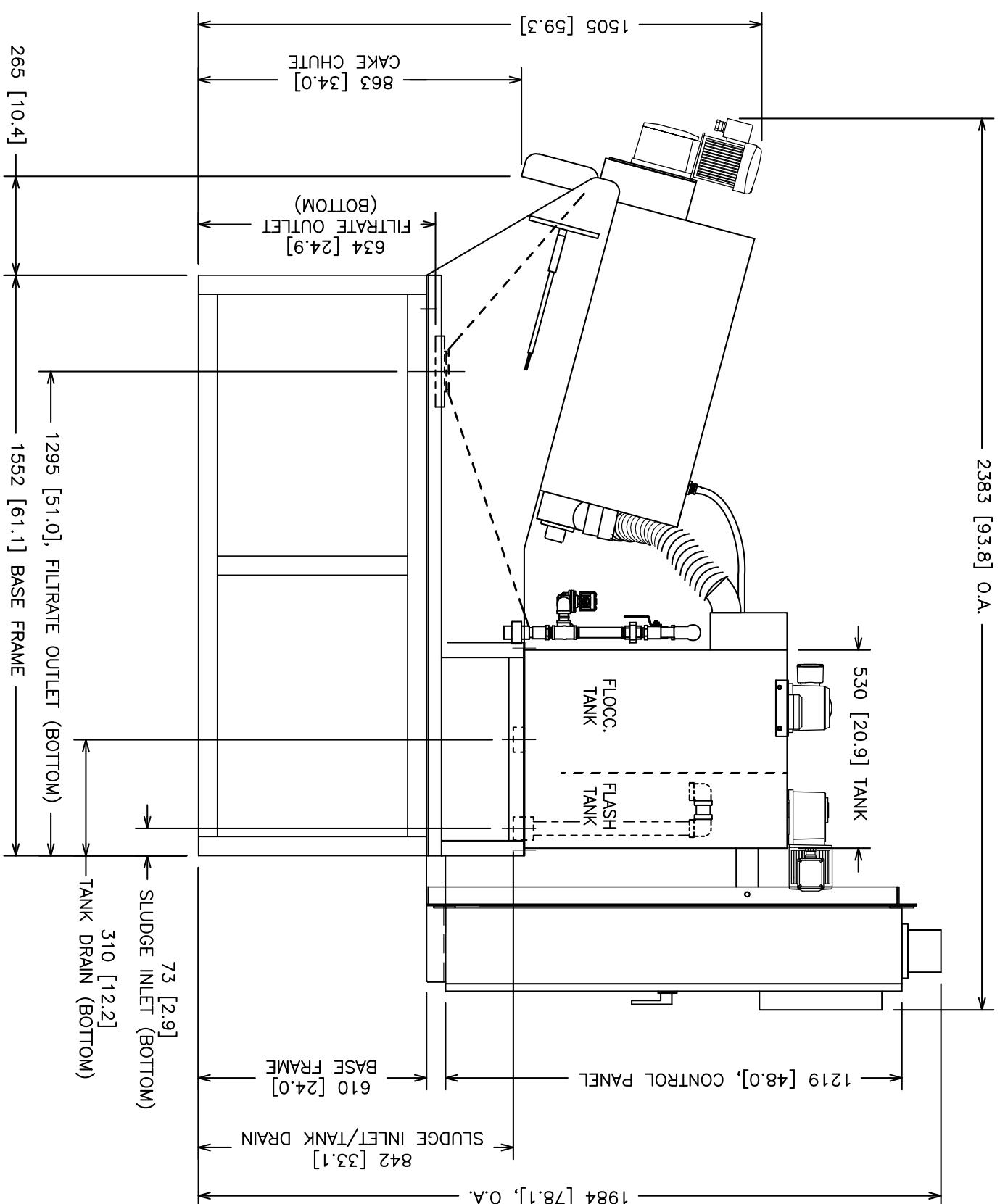
PWT Project number: VDPCA16116

PWT Supply: One (1) PWT Volute Dewatering Press Model ES 131 unit w/2 foot taller skid
One (1) Velodyne Polymer Preparation System
One (1) Control systems for the above

Submittal Sections

Volute Dewatering Press Submittal	Tab 1
Volute Dewatering Press Installation Manual.....	Tab 2
Polymer Preparation System Submittal.....	Tab 3
Electrical and Control.....	Tab 4

Tab 1: Volute Dewatering Press Submittal



SUBMITTAL

REVISION AND ISSUE HISTORY

REV	DATE	DESCRIPTION	DRN	CHKD
A	11/14/16	SUBMITTAL	JS	BL

DRAWING APPROVAL

APPROVED: DATE: SIGNATURE:
A. DAVEY 11/14/16

PROJECT TITLE:

CONCANNON VINEYARD
LIVERMORE VALLEY, CA.

PWT PROJECT NO:

VDPCA16116

SCALE:

NTS

SHEET SIZE:

11X17

DRAWING NO:

20161114 VDPCA16116ES131SSUB

SHEET:

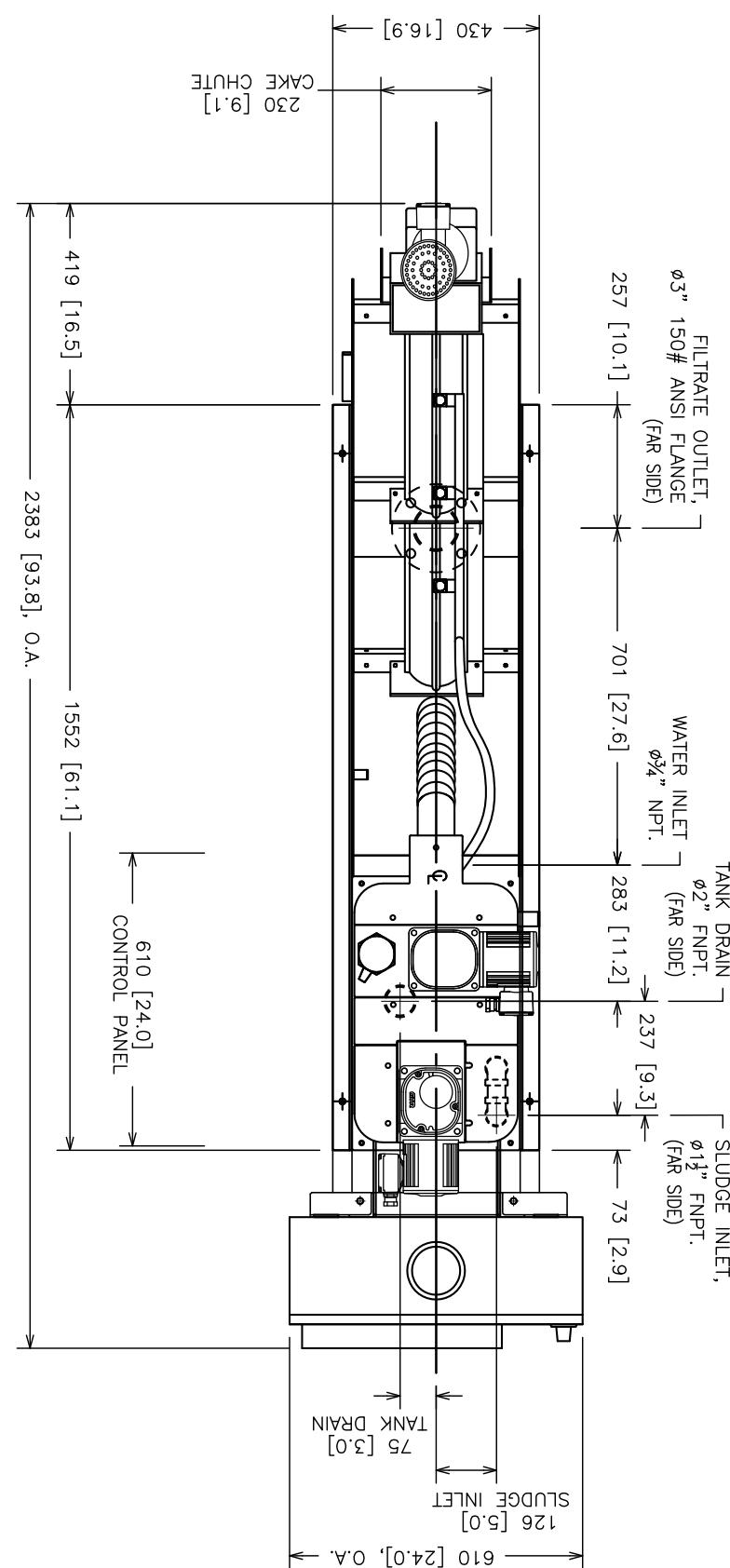
1 OF 5

REV:

A

SIDE ELEVATION

DIMENSIONS: MM [INCH]



REVISION AND ISSUE HISTORY

REV	DATE	DESCRIPTION	DRN	CHKD
A	11/14/16	SUBMITTAL	JS	BL

DRAWING APPROVAL

APPROVED: DATE: SIGNATURE:
A.DAVEY 11/14/16

SUBMITTAL

PWTech
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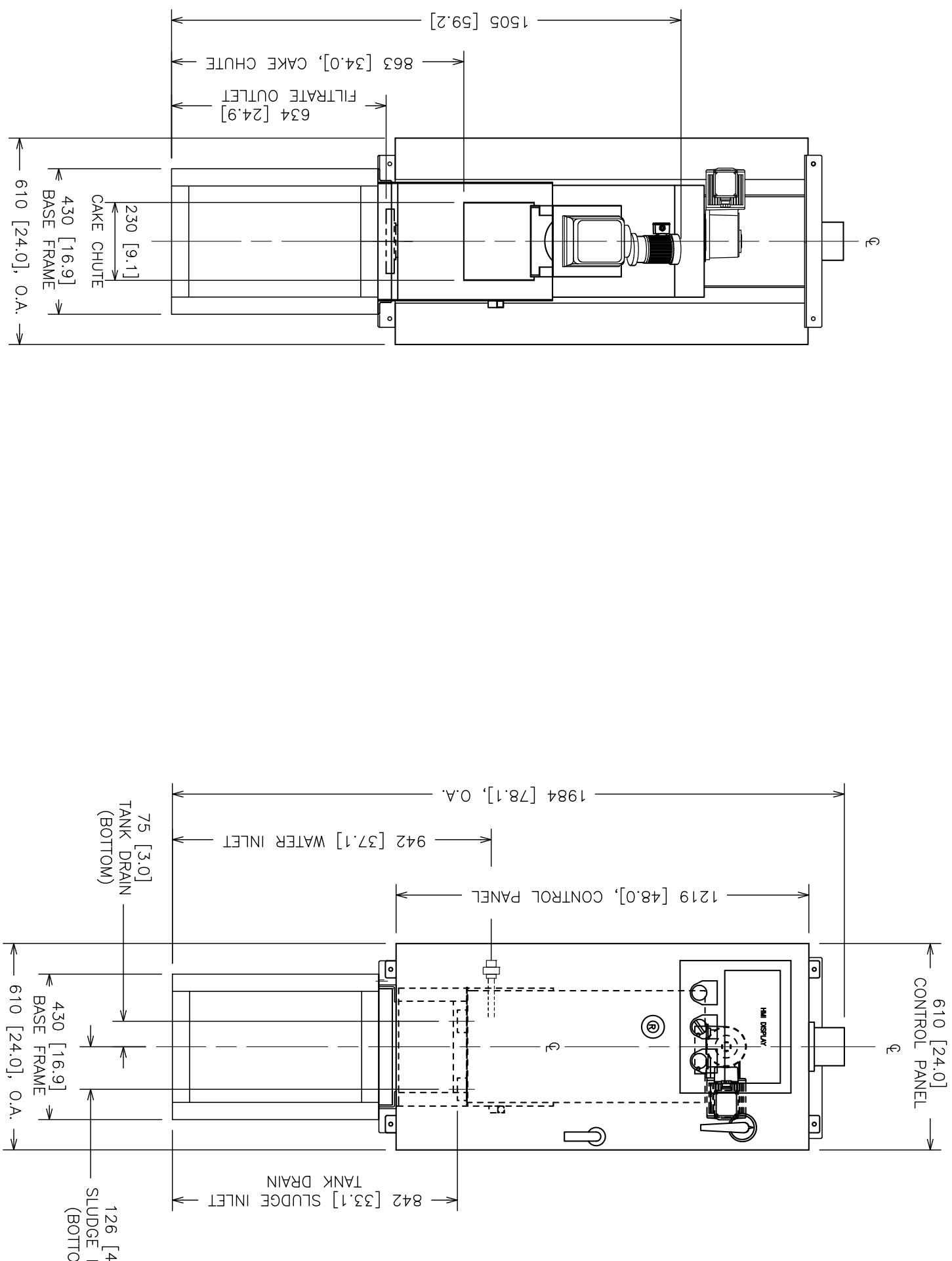
DRAWING TITLE:
VOLUME ES131 DEWATERING PRESS
PLAN VIEW

PROJECT TITLE:
**CONCANNON VINEYARD
LIVERMORE VALLEY, CA.**

PWT PROJECT NO:	SCALE:	SHEET SIZE:
VDPCA16116	NTS	11X17
DRAWING NO:	SHEET:	REV:
20161102 VDPWA160226 ES131 SUB	2 OF 5	A

PLAN VIEW

DIMENSIONS: MM [INCH]



REVISION AND ISSUE HISTORY

REV	DATE	DESCRIPTION	DRN	CHKD
A	11/14/16	SUBMITTAL	JS	BL

DRAWING APPROVAL

APPROVED: DATE: SIGNATURE:
A. DAVEY 11/14/16

SUBMITTAL

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DRAWING TITLE:
**VOLUME ES131 DEWATERING PRESS
PRESS END & TANK END ELEVATION**

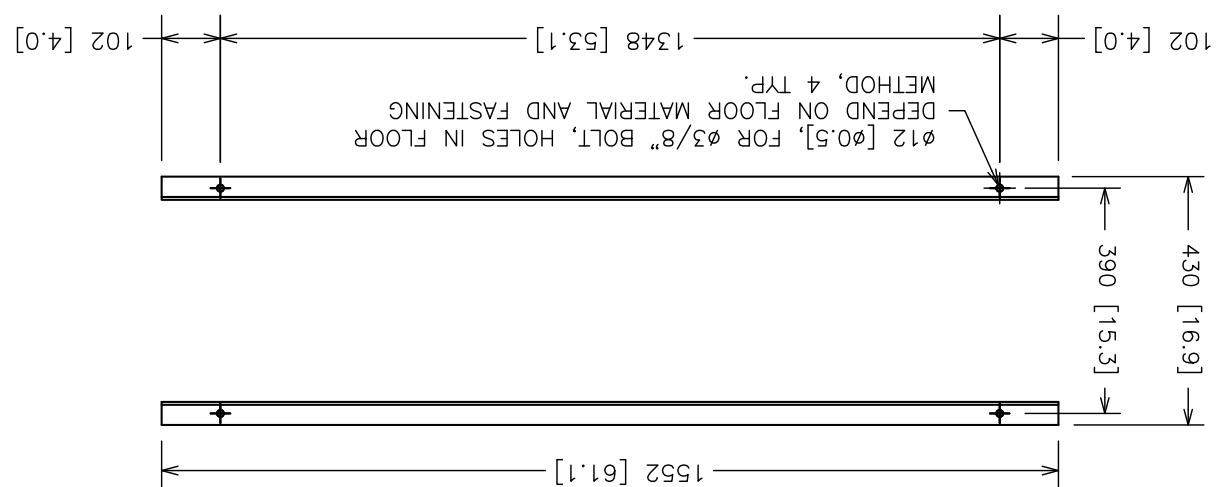
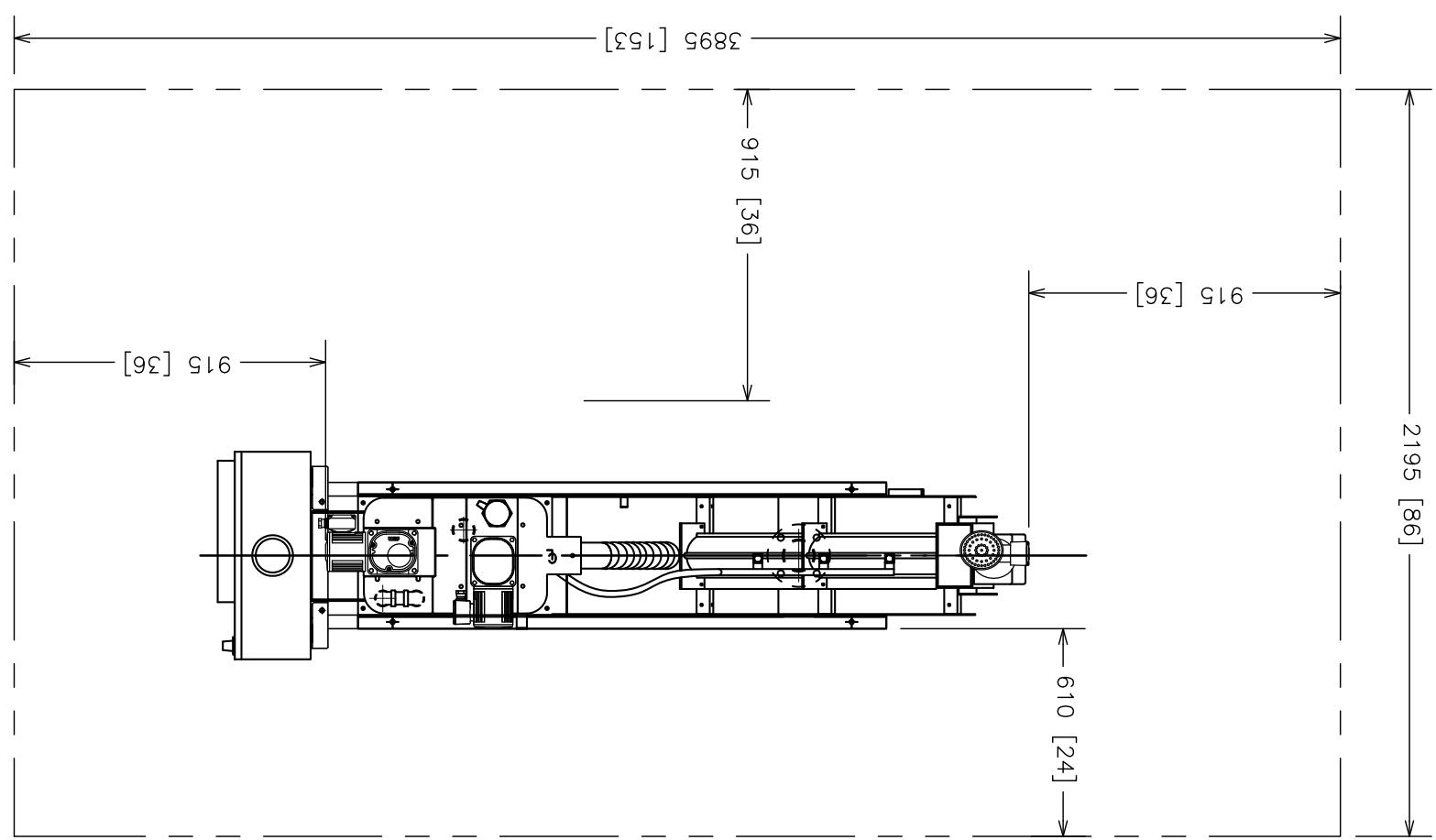
PROJECT TITLE:
**CONCANNON VINEYARD
LIVERMORE VALLEY, CA.**

PWT PROJECT NO:	SCALE:	SHEET SIZE:
VDPCA16116	NTS	11X17
DRAWING NO:	SHEET:	REV:
20161114 VDPCA16116 ES131SS SUB	3 OF 5	A

PRESS END ELEVATION

TANK END ELEVATION

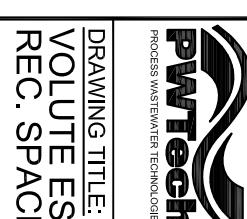
DIMENSIONS: MM [INCH]



FRAME FOOTPRINT AND
FLOOR ANCHOR POINTS

DIMENSIONS: MM [INCH]

RECOMMENDED SPACE



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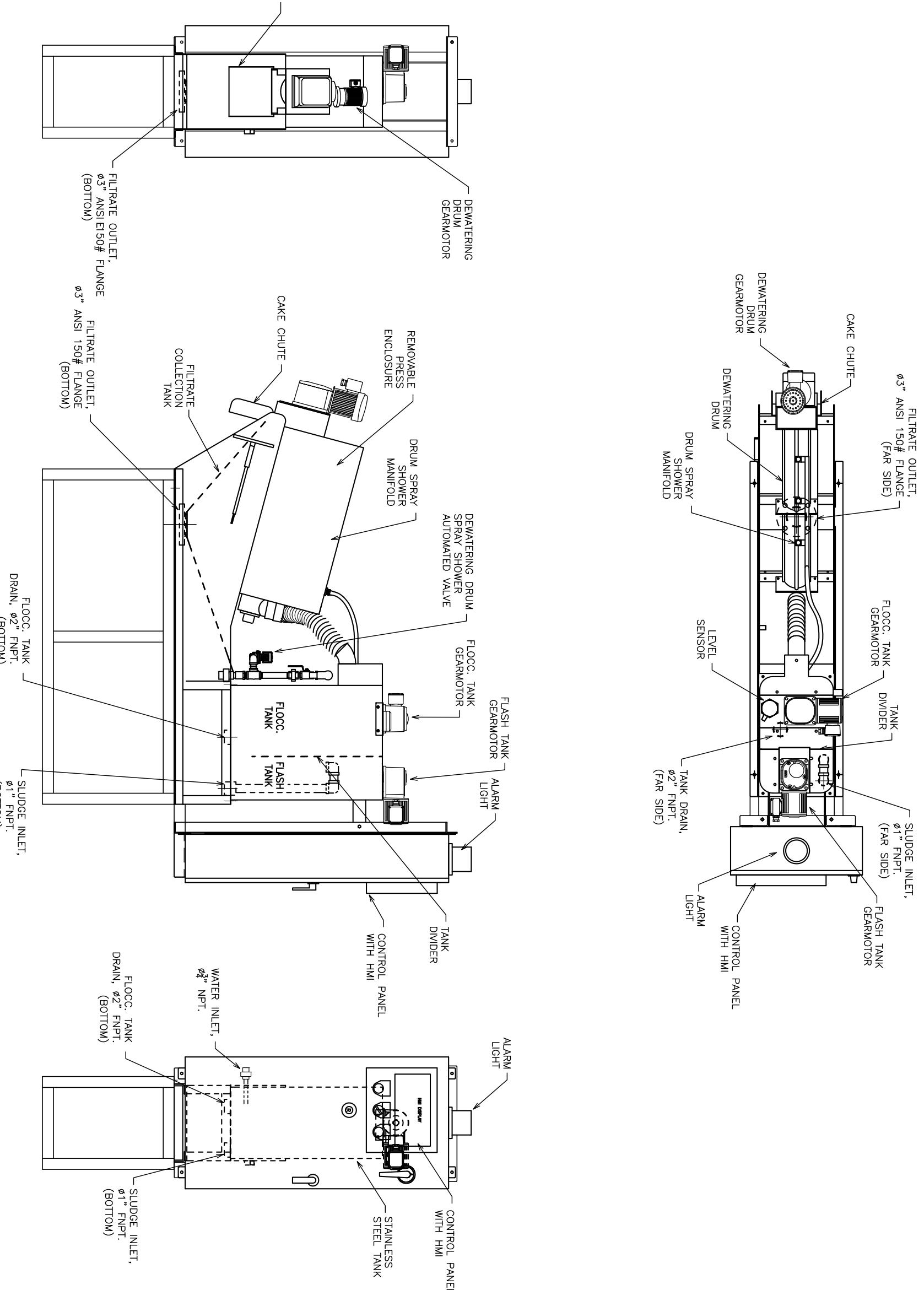
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DRAWING NO: VDPCA16116 **SCALE:** NTS **SHEET SIZE:** 11X17
REV: A **SHEET:** 4 OF 5

REVISION AND ISSUE HISTORY

REV	DATE	DESCRIPTION	DRN	CHKD
A	11/14/16	SUBMITTAL	JS	BL

DRAWING APPROVAL

APPROVED: DATE: SIGNATURE:
A. DAVEY 11/14/16



PW TECH NOTES

N-01	CONNECTIONS:
1.	SLUDGE INLET, Ø1" FNPT.
2.	WATER INLET, Ø3" NPT.
3.	FILTRATE OUTLET, Ø3" ANSI 150# FLANGE.
4.	FLOC. TANK MIXER GEAR MOTOR, 0.1kW.
MOTORS:	
1.	DEWATERING DRUM GEARMOTOR, 0.1kW.
2.	FLASH TANK MIXER GEAR MOTOR, 0.1kW.
3.	FLOC. TANK MIXER GEAR MOTOR, 0.1kW.
N-02	DIMENSIONS SHOWN IN PLAN AND ELEVATION VIEWS.

PROJECT TITLE:	CONCANNON VINEYARD LIVERMORE VALLEY, CA.
PWT PROJECT NO:	VDPCA16116
DRAWING NO:	20161114 VDPCA16116ES131SSUB
SCALE:	NTS
SHEET SIZE:	11X17
SHEET:	5 OF 5
REV:	A

PRESS END

CONNECTIONS AND COMPONENTS

TANK END

DIMENSIONS: MM [INCH]

Tab 2: Volute Dewatering Press Installation Manual



Design and Installation Manual for the

Volute Dewatering Press

Contents

1. Introduction.....	2
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1. INTRODUCTION

The following is a description of the process of setting the unit up on site including housing, plumbing and electrical connections for the ES series Volute Dewatering Press and the associated polymer preparation system. Following the instructions and principles in this manual will ensure that:

1. The dewatering system is designed for minimal operator attention and ease of maintenance
2. The dewatering system will not have any operational issues
3. The installation and connection of equipment on site runs smoothly
4. Start-up will be quick and easy minimizing the chance of additional expense being incurred due to start-up technicians being on site longer than should be required
5. The unit will be ready for performance testing.

Please note that this document is generic and not altered for specific installation. Thus it is designed as a general reference and is superseded by any documentation provided for the project specifically including drawings and submittals, even if this document forms a part of the project documentation.

This document contains information that is important in the design and lay-out phase of any project and should be consulted in regard to all aspects of the dewatering system design from the earliest phases of the design process.

The installer of the unit should pay particular attention to this document, particularly sections in bold print as failure to observe these may result in incurring of additional costs and delays on the project.

2. VOLUTE DEWATERING PRESS COMPONENTS

The following drawing show the important components of the Volute Dewatering Press

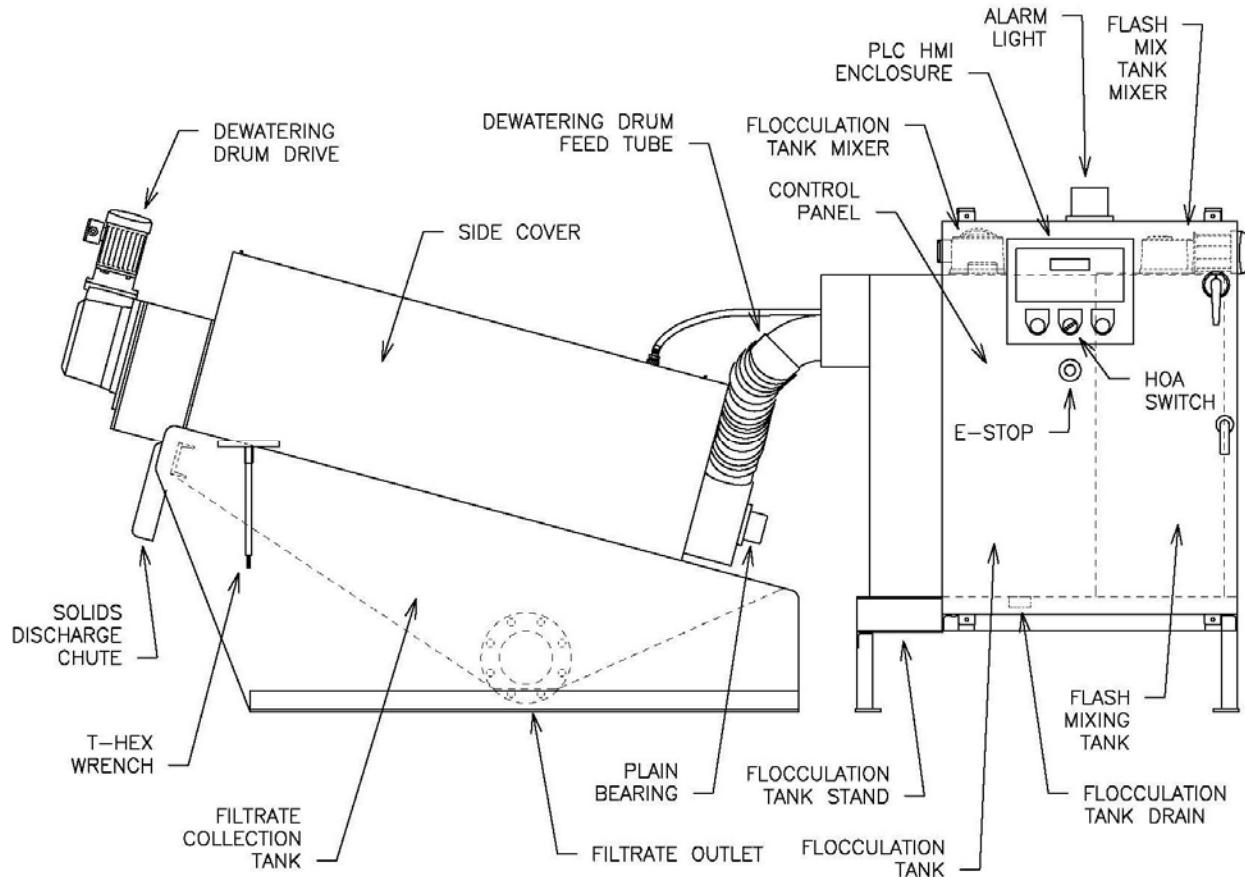
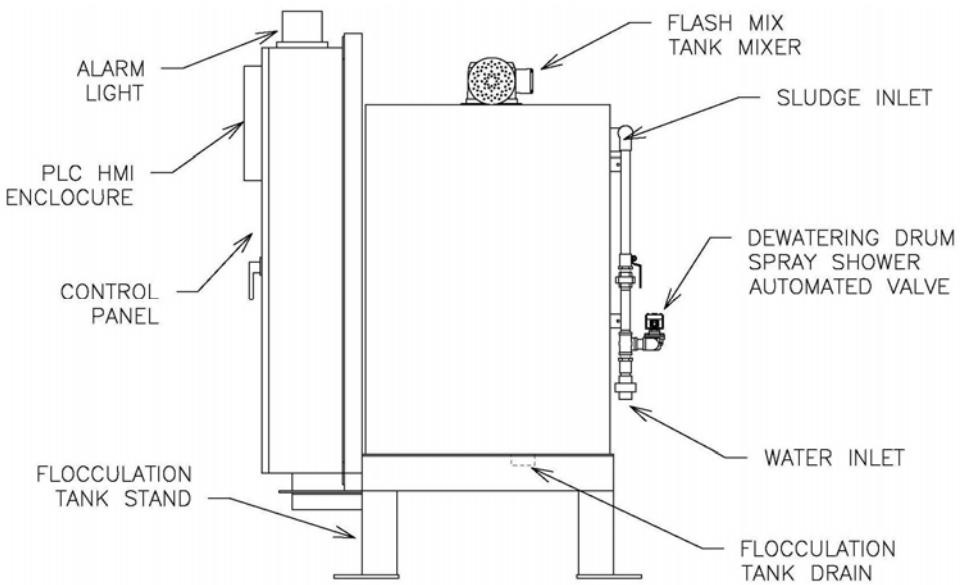


Figure 1 (above). Control panel side elevation. **Figure 2 (below). Floc tank end elevation**



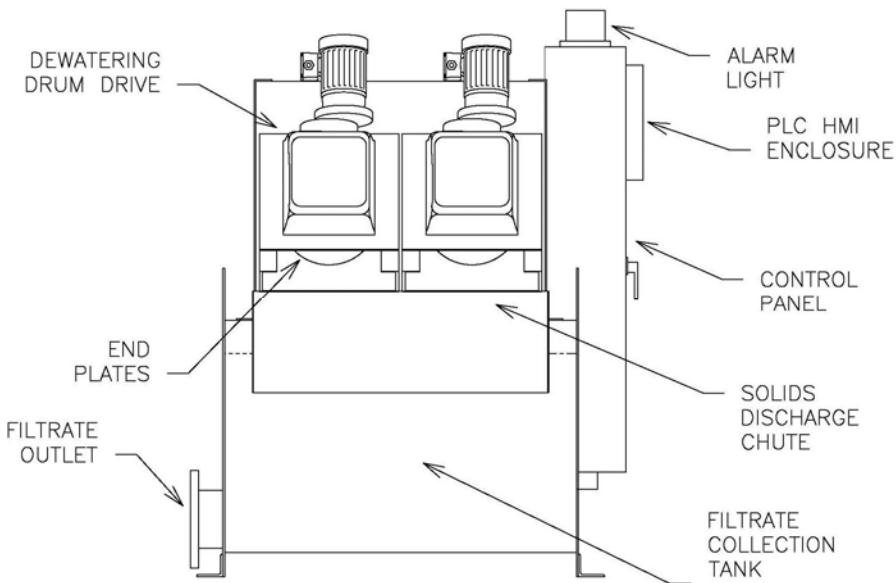
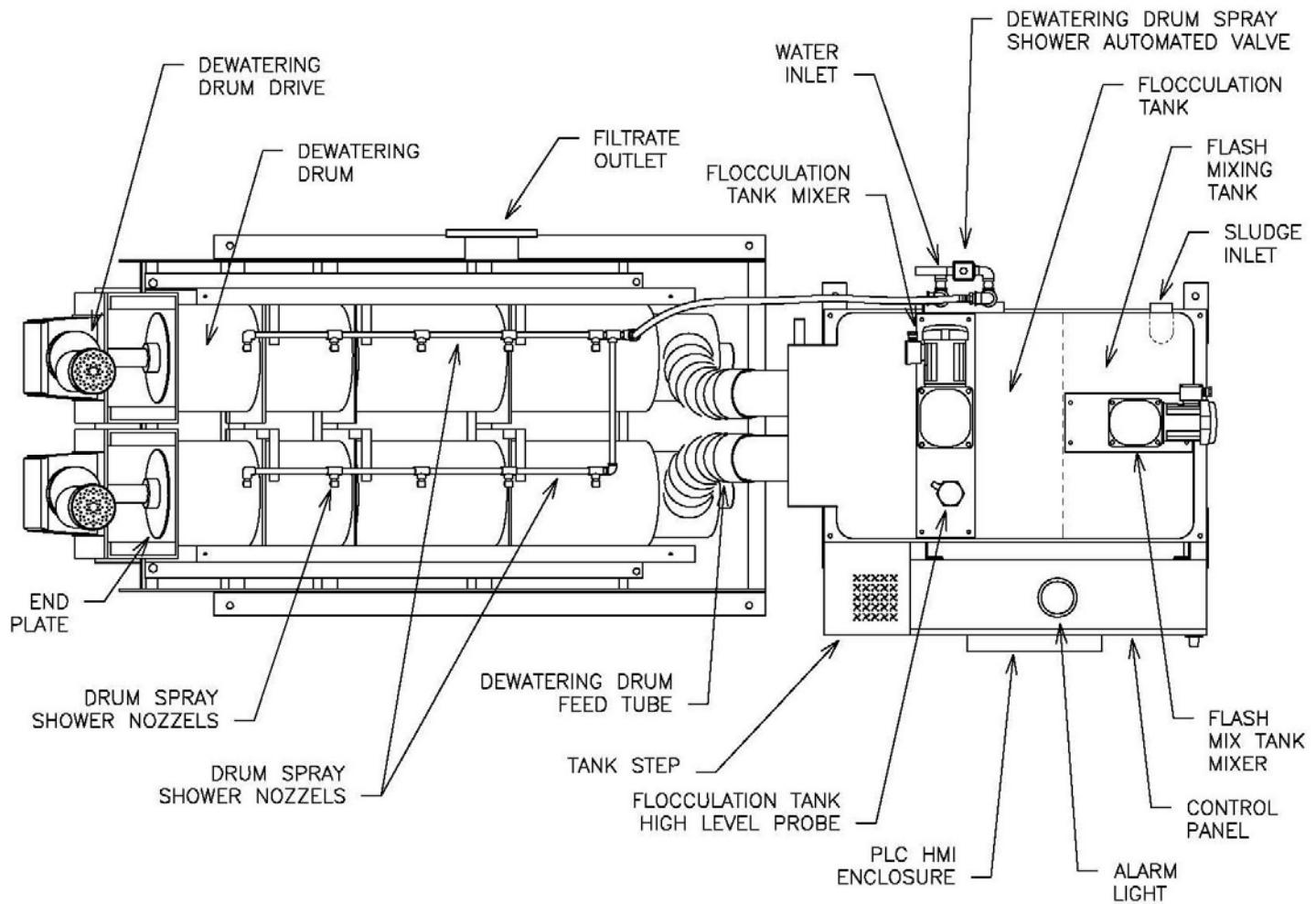


Figure 3 (above). Solids discharge end elevation.

Figure 4 (below). Plan view



3. UNLOADING THE UNIT ON SITE.

The Volute Dewatering Press will typically arrive on site on 2 or 3 skids. One of these skids will house the polymer preparation system. Small dewatering press units will arrive on a single skid as they are 1 piece. The ES202 and 301 will normally also arrive on a single skid. The ES302 and larger units will arrive on 2 skids (plus the polymer skid, so 3 in total).

IMPORTANT! When the units arrive on the truck, prior to unloading, remove any plastic wrapping and inspect for damage prior to removal from the truck. Pay particular attention to damage that may be resultant of incorrect use of straps to tie the unit down on the truck. Any damage must be noted on the trucker's bill of lading. In addition, photographs of any damage are helpful. Failure to record any damage properly will result in the receiving party being liable for any damage to the units.

Care must be taken when removing the units from the skid. Damage to the dewatering drums caused by forklift tynes may render the unit inoperable. Prior to removal of the units from the skid, all wrapping should be removed other than that around the control panel, and the unit should be thoroughly inspected for signs of damage during transport. Any signs of damage must be reported to the manufacturer immediately at unpacking, otherwise they will not be subject to any claim against the supplier or transport company.

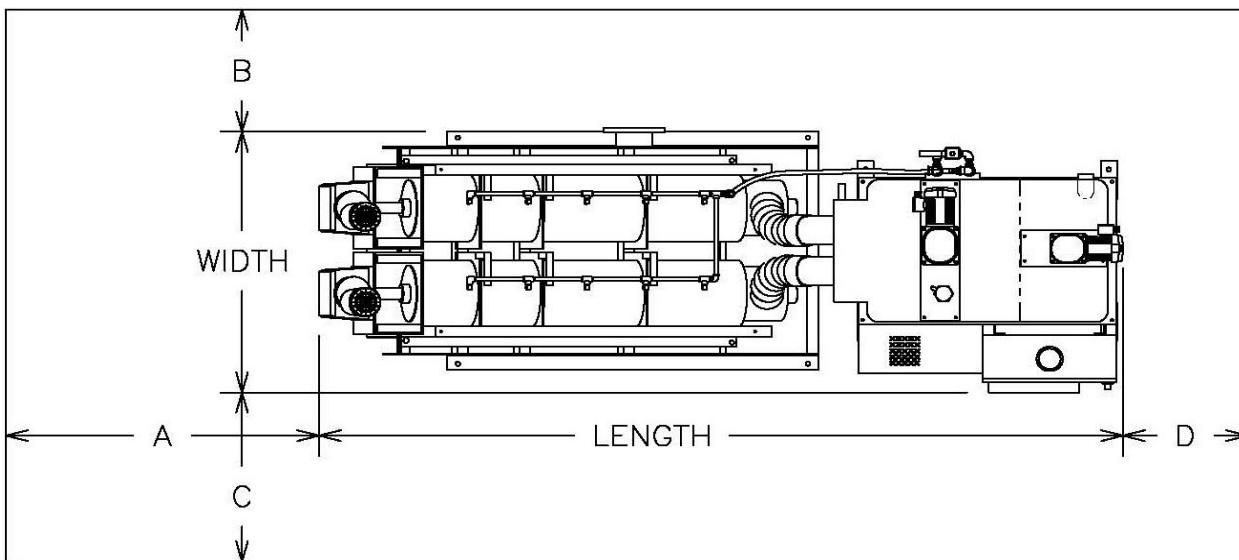
All screws holding the unit down to the skid should also be removed. Units should be lifted off the skids and placed in position with a minimum of 2 lifting straps utilizing the main Dewatering Drum cross supports and the flocculation tank support base to lift the unit. Units supplied on a custom support base (typically the ES202 and 301) will generally have lifting points on the support base.

4. HOUSING

It is strongly recommended that the Volute Dewatering Press be installed under cover or indoors in an environment where the possibility of freezing conditions is minimized. While the Volute Dewatering Press itself is rated for outdoor use and wash-down conditions, the polymer system is particularly susceptible to freezing conditions and handling of polymers in a wet environment can be both hazardous and messy.

It is important the surround housing affords the operator space to access the control panel and room to operate, inspect and carry out required maintenance on the unit. The key dimensional allowance is that at the solids discharge end of the unit where space must be allowed for removal of the dewatering drum screw. Any positioning of ancillary equipments such as conveyors or dump bins must also take into account the need to be able to access the dewatering drum screw.

Other dimensional allowances around the unit are purely for ease of inspection and access to the control panel. Figure 5 and Table 1 show the dimensional requirements for housing different sized units.



Model:	101	131	132	202	301	302	303	351	352	353
Length	68	74	82	106	135	145	154	160	174	187
Width	33	33	39	40	45	52	63	48	61	83
Height	55	55	55	57	68	64	64	89	89	89
"A"	39	51	51	59	102	102	102	110	110	110
"B"	24	24	24	24	24	24	24	24	24	24
"C"	48	48	48	48	48	60	60	60	60	60
"D"	24	24	24	24	24	24	24	24	24	24
Total Length	131	149	157	189	261	271	280	294	308	321
Total Width	105	105	111	112	117	136	146	132	145	159

Figure 5. Size and space requirements for ES series Volute Dewatering Press

Table 1. Approximate dimensions (inches) and recommended space requirements for the ES Series

Should the above recommended space requirements not be available, please consult with PWTech to ensure no issues will result from the proposed installation. The above dimensions for space requirements are the ideal scenario, but not necessarily required.

5. FOUNDATIONS AND ANCHORING

The Volute Dewatering Press requires no special foundations other than a flat sealed surface capable of supporting the operating weight of the system. Ideally, if discharging into a hopper, or dump bin, the height of the foundation provided for the Volute Dewatering Press should be elevated. For the 300 and 350 series units, the area on either side of the unit should be at the same elevation as the unit so that the unit and its control panel is easily accessible.

For other units elevating the unit 12 to 18 inches above where the operator would stand will make the unit height better for operator access. Table 2 below shows the approximate weights of each unit which the foundation must support.

The units are provided with anchor bolt holes, however anchoring is not necessary in most installations

Model:	101	131	132	202	301	302	303	351	352	353
Empty Weight:	578	578	706	1584	1694	2530	3564	3530	5512	7500
Op. Weight:	809	809	1120	2464	2574	4224	6089	5180	8160	11580

Table 2. Approximate empty and operating weights for the ES series Volute Dewatering Press

6. ELECTRICAL CONNECTIONS

When the units arrive on site, most of the system components are pre-wired minimizing the number of connections to be made on site.

In most instances there are 3 main connections to be made. These are:

A main power connection is required to the Volute Control Panel.

A power connection needs to be made from the Volute Control Panel to the sludge feed pump.

Connection from the terminals on the main Volute control panel to the corresponding connections on the polymer preparation system.

In some cases additional connections to items such as conveyors, the plant PLC, flow-meters and other items might be required. Typically the electrical drawings for the project will show which connections need to be made on site. This is normally done on the terminal strip drawing.

Table 3 below is a “typical” conduit list with wires to be run from the Volute Control Panel. The first three (3) conduits are standard for almost all installations. The others will vary from installation to installation. The terminals indicated will also vary for different installations. This data will be on the electrical drawings supplied with the submittal for the project. Appropriately sized ground wire should be run in all conduits.

No.	Connected Device Name	Volute Control Panel Terminal	Device Terminal	Voltage	Recommended Wire
1	Feed Pump VFD	1 2 3	T1 T2 T3	208 - 480VAC/3PH - VFD	#12 Min
2	Polymer System	30 31 32 33 34 35 36	TFS-L TFS-SIG TFS-N SOL-L SOL-N PS-COM PS-NC	120VAC	#14 Min
3	Polymer System	37 38 39 40	PMP-A1 PMP-A2 MIX-A1 MIX-A2	90VDC	#12 Min
4	Conveyer Power (optional)	13 14 15	T1 T2 T3	208 - 480VAC/3PH - Full Voltage	#12 Min
5	Conveyor Estop (optional)	26 27	COM NO	120VAC	#14 Min
6	Remote Dry Contacts (optional)	20 21 22 23	COM NO COM NO	Customer Supplied	Customer Supplied
7	Feed Pump Seal Probe (optional)	24 25	PROBE REF	Low Volt DC	#14 Min
8	Flow Meter Power (optional)	28 29	L N	120VAC	#14 Min
9	Flow Meter mA Output (optional)	41 42 43	Analog Out + Analog Out - Shield	Low Volt DC	#18 TP
10	Remote Flow Indication (optional)	44 45 46	Analog In + Analog In - Shield	Low Volt DC	#18 TP

Table 3. Typical Conduit List for connections from the Volute Control Panel

For the ES302 and larger models, the power connections to the Dewatering Drum drives will be made in the factory prior to shipping and then disconnected at the panel. These will need to be reconnected once the unit is in position, however the conduit and wiring will already be present and ready to be connected so no additional materials will be required for this.

The power requirements for the unit will vary depending on the size of feed pump and whether a conveyor system or other equipment is integrated into the process. Power connections may be 208, 240 or 480 as specified by the client, 3-phase, 60Hertz. The following table shows the power requirements for the units and the additional appurtenances. Conveyor requirements are not included but will typically add between 2 and 7.5 kW depending on the length and configuration.

Model:	101	131	132	202	301	302	303	351	352	353
Base Unit [kW]:	0.3	0.3	0.4	1	1	1.4	2	2	4	6
Poly dosing system:	1	1	1	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Typical PC Pump*:	1.5	1.5	2	2.5	3	5	7.5	5	7.5	10
Total:	2.8	2.8	3.4	5	5.5	7.9	11	8.5	13	17.5

Table 4 Approximate electrical requirements for ES series Volute Dewatering Press

Please note that the feed pump power requirements will vary significantly from site to site and many installations will have additional components to be powered..

Should the control panel be shipped separately, then there will be several additional connections to be made on site. These will include power to the dewatering drums and mixer motors (3-phase, 208/240/460VAC), the spray solenoid valve (1-phase, 120VAC), and the level probe.

7. PLUMBING CONNECTIONS - GENERAL

All connections to the unit, with the exception of the filtrate for the ES132 to 353 models and the sludge inlet for the ES303, 352 and 353 units, are NPT female half couplings, i.e. any connecting pipe work requires a male NPT adaptor of the appropriate size. Filtrate connections for the ES132 to 353 plus sludge inlets for the ES303, 352 and 353 units are ANSI 150# flanges. All models have 2" female NPT drain lines from the flocculation tank and ¾" NPT inlet connections for water.

PWTech recommends Schedule 80 PVC pipe in most installations.

The following table (Table 4) shows the plumbing connections required for the influent sludge and filtrate effluent of each unit. If a feed pump is integrated into the system the feed sludge connection to the pump may be different from the unit. Connections indicated * are ANSI 150# flanges.

Model:	101	131	132	202	301	302	303	351	352	353
Sludge Inlet:	1"	1"	1.5"	2"	2"	2"	3"*	2"	3"*	3"*
Filtrate Outlet:	2"	3" *	3" *	4" *	4" *	6" *	6" *	6" *	6" *	8" *

Table 5 – Influent and filtrate connection sizes (NPT) for ES series

In addition there will be separate connections for the polymer system. These are outlined in Section 12 below.

8. INFLUENT SLUDGE CONNECTION

It is recommended that the influent sludge connection be made with pipe that is the same size as the influent connection for the press. This minimizes the amount of sludge that is stored in the feed line while the unit is not operating. A larger diameter pipe may be better upstream of the sludge feed pump – particularly if the pumps has a larger diameter suction-side connection. It is critical that the feed sludge line is pressure/vacuum tested – particularly upstream of the feed pump if the feed pump has to draw a suction.

The following connections and fittings should also be added to the influent line:

1. Isolation valves either side of the feed pump.
2. A Threaded "T" directly downstream of the sludge feed pump with a plug – this is to allow a hose to be connected to the line to allow pump operation to be tested without running the press and may also be used in priming and cleaning out the sludge feed line.
3. A Threaded "T" directly upstream of the sludge feed pump with a plug – this is to allow a hose to be connected to the line to allow pump operation to be tested without using sludge and to assist in trouble shooting, priming and cleaning out the sludge feed line.
4. A sample port consisting of a reducing "T" fitting and with a ball valve (1/2" recommended), with minimal volume in the fitting for sludge to sit during operation. This fitting must be downstream of the pump but upstream of the polymer injection into the feed line (Section 12)

Figure 6 below shows the preferred set-up for the feed sludge lines to the Volute.

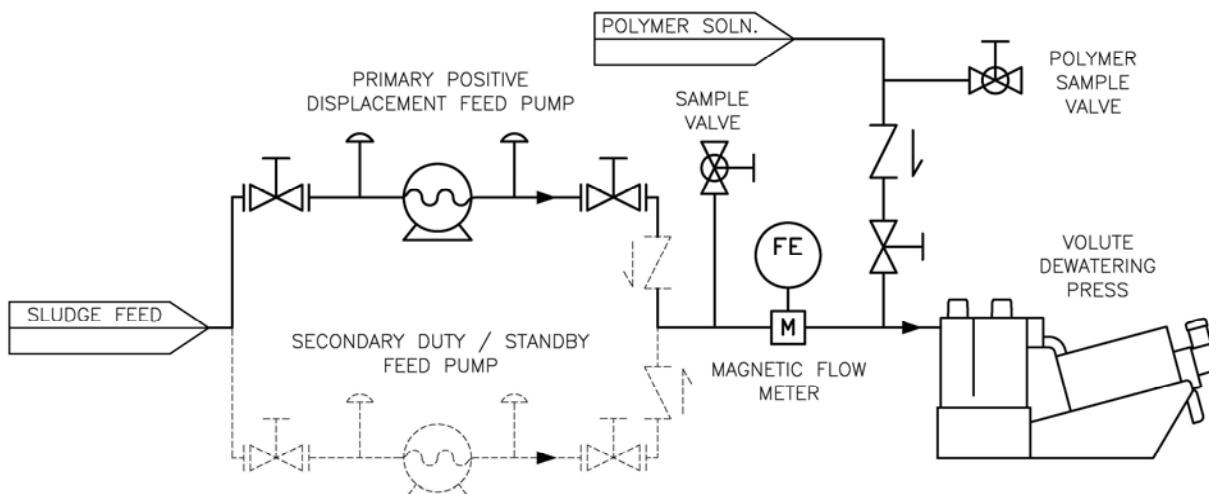


Figure 6. Recommended influent sludge set-up for the Volute Dewatering Press

9. DRAIN CONNECTION

All units have a 2" drain connection from the bottom of the flocculation tanks. It is essential that this is connected with a valve to a suitable drain back into the plant or the sludge storage area. Often this drain is teed into the filtrate line. Any valve that seals completely is fine, however PWTech recommends a ball valve for this application. This connection is not likely to be used often but must be connected prior to unit start-up.

10. FILTRATE CONNECTION

The filtrate connection should be pipe that is the same diameter as the filtrate outlet from the press. In some cases it may be possible to make this a smaller pipe size to reduce space requirements and cost, however PWTech must be consulted as to whether this can be done for the specific case.

In sizing the filtrate piping, and any down stream pits, pumps, etc. care should be taken to make sure the flow that can be handled is about the expected maximum sludge flow to the unit. This is because there will also be additional liquid flow from the polymer system, and then periodic high flows from the spray valves that wash the dewatering drums.

The Filtrate connection should have no valves or other fittings that would impede the flow of filtrate out of the unit. In addition a sample port should be included in the filtrate line for taking filtrate samples

11. WATER CONNECTION.

The unit requires a dedicated water supply primarily for polymer make-up, but also for the Dewatering Drum wash down spray, and wash down hose. This water supply may be potable water or plant water. If plant water is used, the following conditions should be met:

1. TSS must be less than 20ppm.
2. Free Chlorine must be less than 0.5ppm.
3. Because of the spraying of water, Coliforms should be less than 10 counts per 100 ml.

Supply pressure should be a minimum of 40 psi and a maximum of 90 psi. The Dewatering Drum wash down sprays do not run continuously but intermittently. Typically they may operate for 15 second every 10 minutes of operation.

Table 6 below shows the maximum water requirement for each unit. This represents the ideal situation in terms of the availability of water and is not necessarily the amount that will be required. If there is a problem supplying water to meet the peak flows when the sprays are running, it does not matter if the supply pressure drops for the polymer system for these short periods.

In addition the water flow to the polymer system can be reduced to make the polymer solution up at a higher concentration.

The 350 series only wash down the dewatering drum one at a time to reduce instantaneous water requirements. This can be done for smaller units if required. Please consult PWTech during the design phase if the presses water requirements need to be minimized.

Model:	101	131	132	202	301	302	303	351	352	353
Max Polymer Water:	0.5	0.5	1	3	5	8	11	9	18	27
Washwater Rate: (intermittent)	2	2	4	6	4	8	12	6	6	6
Peak Instantaneous flow	2.5	2.5	5	9	9	16	23	15	24	33

Table 6 – Water flowrate requirements for Volute Dewatering Press installations [GPM]

12. POLYMER PREPARATION SYSTEM SET-UP AND CONNECTIONS

The following notes apply to Velodyne Liquid polymer preparation systems that are typically supplied by PWTech with the Volute. If a different system is being used, or a dry polymer system, then only some of the notes below will apply.

The polymer preparation system is normally supplied as a separate item and may be located in a separate location from the Volute Dewatering Press. Typically it should be located in an area designated for non-hazardous chemical storage with provision for spill control and safe handling of the polymer including facility to safely handle bulk containers such as 55 Gallon drums or 250 gallon totes.

Should the location involve a significant variation in level of more than 20 feet and/or a distance of more than 100 feet, please consult with PWTech to make sure that piping head losses from the polymer preparation system to the Volute Dewatering Press do not cause any problems.

While the polymer location in relation to the unit is not important, when the polymer system is located, it is important that access to both the “front” and “back” of the polymer system is easy. This is because the calibration cylinder and feed pump are most easily accessed from the back.

In addition, minimizing the pipe-work from the polymer supply (typically a drum) is important. This means that the location of the unit should ideally allow the polymer supply to be located directly next to the polymer preparation unit. When facing the polymer preparation unit and looking at the side with the junction box, this would mean the polymer supply should be in the right hand side of the polymer preparation unit as this is the side where the connection for the raw polymer supply is.

The polymer supply should also always be above the level of the polymer pump.

Other than the electrical connections covered in Section 5, there are 3 connections that need to be made for the polymer preparation system. These are:

1. Water supply connection
2. Raw polymer supply connection
3. Made-up polymer solution connection from the polymer preparation system to the sludge feed line.

12.1. Water Connection

The water supply connection is typically a 1" NPT connection marked on the polymer preparation system. It is a good idea to have an isolating valve directly prior to the water connecting to the polymer system as the polymer system has a solenoid operated diaphragm valve to control the water supply to it that can periodically require maintenance.

12.2. Raw Polymer Connection

The raw polymer connection is typically a hose barb fitting for smaller units or a 1" FNTP connected to the raw polymer pump on the polymer preparation skid. It is important that the amount of pipe work from the polymer supply is minimized. The line that runs from the polymer to the pump should have a check valve at the low point at the polymer supply end and a separate filling/air-bleed valve at the highest point. This is to allow filling of the line prior to start-up. **It is important that the set-up ensures that the polymer pump is never allowed to run dry, or forced to draw suction.** While manufacturers always say that the pumps can draw suction, PWTech's experience is that it's never a good idea, particularly with smaller pumps to rely on this.

There are two preferred ways of setting up the polymer raw polymer supply shown below in Figures 7a and 7b. These can be used with both Totes and Drums of polymer.

12.3. Raw Polymer set-up Option 1 – Header Tank

Figure 7a below shows the optimal method – option 1. The polymer is actually pumped out of the bulk supply, through a strainer into a day tank – a header tank that holds enough polymer so the unit can run for as long as is required between operator inspections. Typically an electric drum pump is used and the day tank is an open topped tank (with a cover to stop any foreign contaminants). The components for this are all supplied by industrial supply companies (McMaster Carr, Grainger's etc.)

This method has several advantages:

1. Pumping out of the drum means that change over is easy and you have advanced warning of when the drum is empty (as opposed to the system running empty and shutting down)

2. Pumping through a strainer means that any clumps of polymer or other contaminants do not plug up the polymer system.
3. A fine strainer can be used and if it plugs up, it can be cleaned out while the dewatering system is operating, and if it plugs up – an operator will be present so it won't shut the system down while no body is present.
4. The header tank allows air to automatically escape the feed system so there is no manual bleeding required, and no chance of air getting into the polymer feed pump causing it to run dry and lose prime.
5. Changing drums or totes is easy as it is just a case of taking the drum pump from one to the other
6. The operator can easily inspect the polymer in the header tank

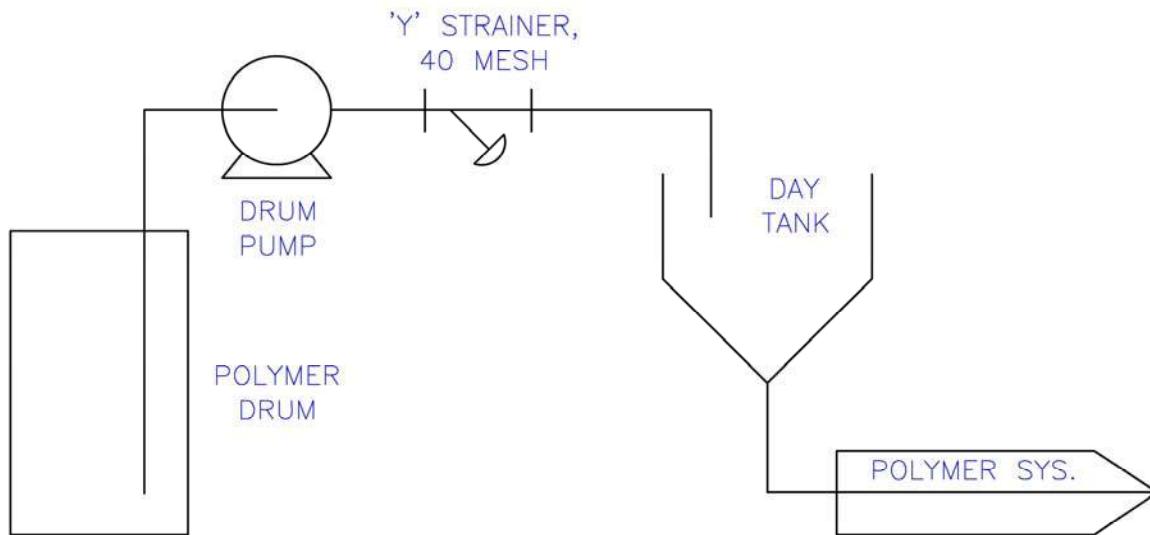


Figure 7a. Recommended polymer feed set-up for the Volute Dewatering Press

12.4. Raw Polymer set-up Option 2 – Elevation of the polymer supply.

Figure 7b shows another set-up that works well. Here the polymer supply (drum, tote, or a permanent polymer feed tank) is elevated and is fed from the bottom of the container such that the container acts as a header tank. The drum or tote needs to vent to atmosphere so that a vacuum doesn't form as polymer is drained from it. Also, if using a drum or a tot that is being changed out, designing a shut-off system and coupling so that

Option 2 method has the advantages:

1. The system can run continuously until the tank is drained without requiring the operator to re-fill the
2. Simplest set-up in terms of parts and cost
3. Drums can be elevated using a trolley stand so the stand doubles as a way of moving and handling the drums in the plant.

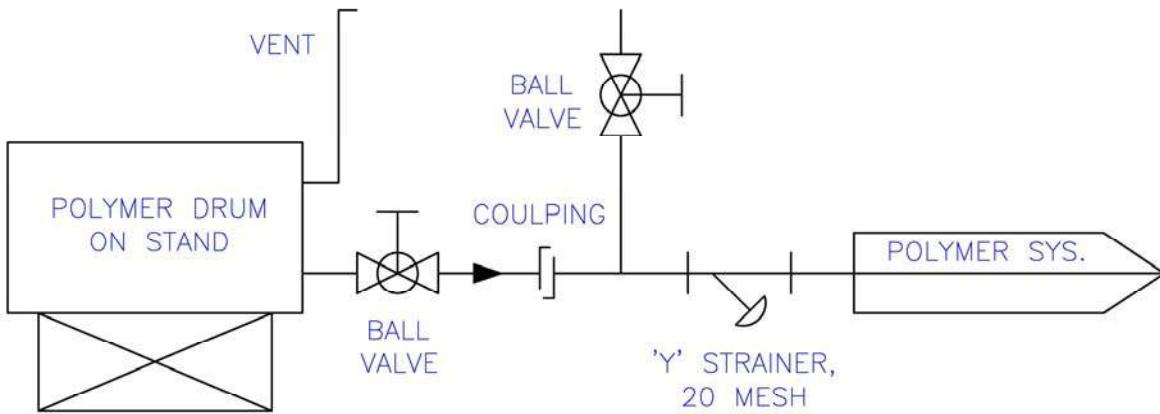


Figure 7b. Recommended polymer feed set-up for the Volute Dewatering Press

12.5. Polymer solution to feed sludge line

The connection for the polymer solution from the preparation system to the Dewatering Press is usually made from the outlet of the polymer system (1" FNPT) to the sludge feed plumbing with a shutoff and non return valve feeding the polymer solution into a tee in the sludge feed line. If the polymer system is to be plumbed to the unit on site, a female NPT threaded port should be installed in the feed sludge connection. For units up to the ES132, a 1/2" NPT female connection is required. For larger units, a 1" NPT port should be used.

Polymer can be injected directly into the flash-mixing or flocculation tank if required, however no actual connection is provided specifically on the unit. There are sections of uni-strut however on the flocculation tank to allow pipe work to be bracketed to the unit.

DIMENSIONS: MM [INCH]

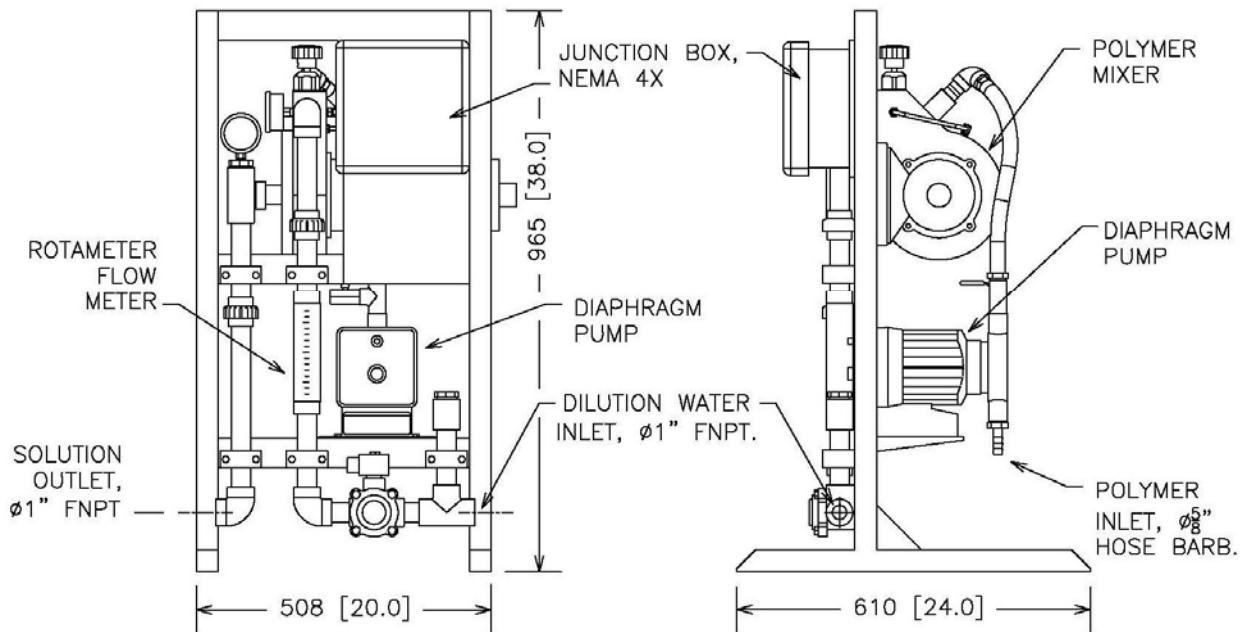


Figure 6. Velodyne Polymer system for Volute Models ES101 - ES132

DIMENSION: MM [INCH]

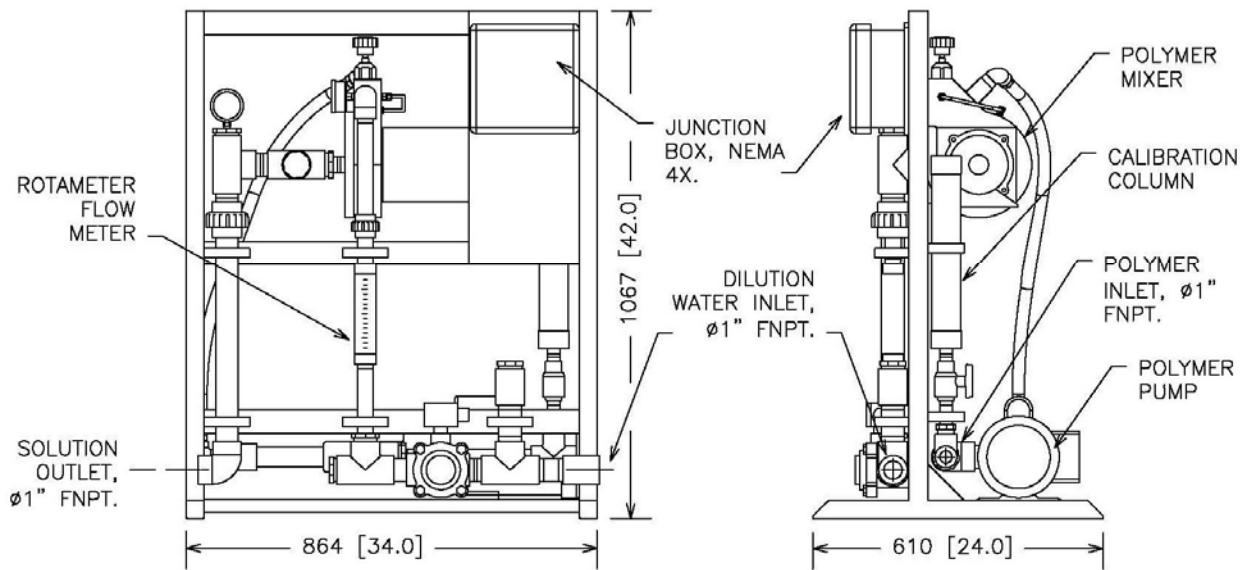


Figure 6. Velodyne Polymer system for Volute Models up to ES202 – ES353

13. FEED PUMP

PWTech recommends the use of positive displacement type pumps and has had good results with progressive cavity, rotary lobe, and double disc type pumps. Care should be taken if utilizing centrifugal pumps as flows from these can vary increasing the amount of operator attention required to periodically inspect the dewatering operation. The following are the guidelines PWTech uses with feed pump selection if we are asked to recommend or supply a feed pump. Hose (peristaltic) pumps are not mentioned here as PWTech has no experience with these pumps, however that is not to say that they are not potentially a good choice of feed pump for a range of applications.

13.1. Progressive Cavity Pumps

Progressive cavity pumps are commonly used and tend to be a good choice when the suction side is submerged giving a consistent, non-pulsing, re-producible flow, especially if there are high head requirements.

Typically PWTech recommends using a progressive cavity pump if there is a large amount of positive pressure differential from the suction side to the discharge side as these will seal best against potential gravity flow of sludge through the system when it is not in use. Using a multi stage pump, and reversing the pump direction (i.e. running the flow from the discharge end to the suction side and running the rotor backwards) are also recommended if there is a lot of positive suction side pressure.

A seal washing system is recommended to prolong pump life, particularly if the sludge is primary, and/or inorganic and/or has a lot of grit or other abrasive material present. This is especially important if there is constant hydrostatic pressure on the suction side of the pump.

Care must be taken to make sure these pumps do not run dry. Using a flowmeter in the system, and ensuring that under all conditions the suction side is flooded will help avoid this. Progressive cavity pumps are better not used if the suction side is not flooded, if there is a chance of hard and sharp particles in the sludge, and they tend to be long, making their use impractical in some applications.

13.2. Double Disc Pumps

PWTech prefers Double Disc pumps specifically in applications where the suction side of the pump is not flooded. These pumps are not damaged even if they run dry for extended periods and are relatively cheap to maintain so better for environments with abrasive and sharp solids present. They are not so good in applications where there is potential for gravity flow through the system and need an additional in line valve to prevent continuous flow through the line. There is a slight pulsing in the flow delivered.

13.3. Rotary Lobe Pumps

Rotary Lobe pumps are a good fit for applications with flooded suction, particularly if space is an issue. Typically they are not as susceptible to damage if run dry as progressive cavity pumps, but

should still not be run dry for more than a few minutes. They are simple to maintain as well and with multi lobe rotors (>2 lobes) they deliver a consistent non-pulsed flow.

13.4. Chopper and Grinder pumps

The use of chopper and grinder pumps is strongly discouraged. These pumps tend to have very poor turn down, and are often not well suited to dealing with the amount of large solids encountered in some sludge applications leading to excessive maintenance requirements.

In the instance of cases where a chopper or grind pump being needed because of the presence of solids it is recommended that the pump is set-up to feed a header tank with an overflow back to the feed source, and a positive displacement pump feeds the dewatering system out of the header tank. This will allow the chopper/grinder to operate at full speed where it will work best while eliminating any issues with flow variation. The header tank should have a level probe in it in the even that the level drops below the connection to the positive displacement pump.

There is also a better option of feeding the header tank with a wastewater pump capable of handling the solids, and screening the sludge prior to the header tank.

13.5. PWTech Pump supply

PWTech has OEM arrangements and can supply a variety of pumps for different applications and installations. If a pump is not supplied by PWTech, information on that pump should be provided to PWTech for control panel design. To prevent additional start-up charges if PWTech does not provide the pump for the installation, please insure it is correctly installed, started up, and able to deliver sludge to the unit prior to requesting PWTech begin its start-up service.

13.6. Pump Installation

The feed pump should be installed in a pit to minimize the chances of sludge being spread if maintenance is required. PWTech recommends installing a duty/standby pump set-up, particularly when high system utilization is required and down time would need to be minimized. Installing the pump with isolation valves and tee connections as per Section 8 will make for the easiest start-up, testing, troubleshooting, operation, and maintenance of the pump.

In addition, if using a progressive cavity pump and if the pump is going to sit on site for more than a month prior to start-up the following should be done:

1. Fill the pump with a solution of clean water and ethylene glycol. This may require disconnecting the incoming pipe work and putting a blank sealed flange on the discharge end of the pump. Make sure the solution stays in the pump.
2. Every two (2) weeks turn the rotor of the pump thought at least one (1) full turn by turning the shaft with a strap wrench.
3. Prior to start-up reconnect the downstream pipework and fill the pump with either the water/ethelene glycol mixture, or water with a large amount of domestic use detergent (dish soap is fine).

This will prevent any seizing of the rotor and stator which can occur if they are allowed to sit without moving for too long. Rotation of the pump should be checked prior to start-up and if the pump does not rotate, filling the pump with ethylene glycol, and turning it with a strap wrench

14. FLOWMETER

Use of a Magnetic flow meter is strongly encouraged for all installations. PWTech is able to provide this if needed. The PWTech control panel comes with power and analogue connections for a flow meter as standard. The flow meter has the following benefits:

1. assists the operators to dial the unit operation in quickly and repeat operating conditions
2. helps to protect against feed pump damage
3. allows the dewatering system operating speed to be set as a flowrate
4. makes for ease of record keeping

The flow meter should be installed in the feed line in a straight section of the feed line that has a minimum of 10 pipe diameters upstream and 5 pipe diameters downstream. The section of pipe should always remain full of fluid during press operation. For installation dealing with heavy solids, vertical installation of the flowmeter is preferable.

The flowmeter should be installed upstream of the polymer injection point (Section 12).

The flowmeter selected must have an infinitely variable 4-20mA output signal as opposed to a fixed range.

15. CONVEYOR

As for the feed pump, if a conveying system is required, PWTech is able to supply this. PWTech typically recommends a shaftless screw conveyor system for most installations. If it is being supplied by another party, then as for the feed pump, providing PWTech with the information about it and making sure it is operational prior to PWTech starting up the Volute Dewatering Press on site will help save time and money.

Specifically the connections and nature of connections for power supply, e-stop, loss of rotation (LOR), alignment, shock relays, actuated gates, and any other components that will connect into the dewatering system control panel need to be relayed to PWTech. Ideally, providing PWTech with a copy of submittals for the conveyor system early in the submittal process will greatly assist the integration of the conveyor into the dewatering control system.

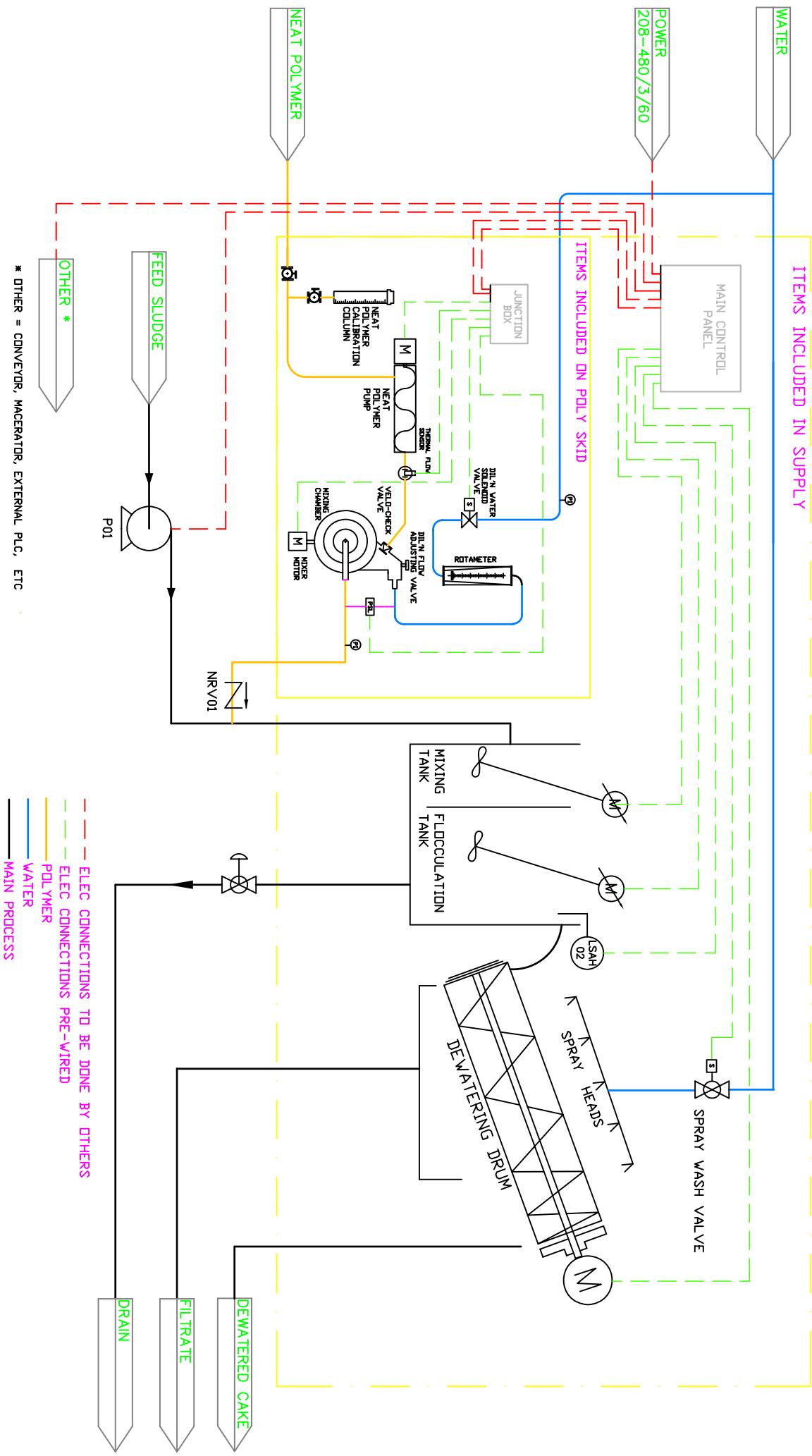
16. PROCESS DIAGRAM

The diagram on the following page show which plumbing and electrical connections are pre-made, and which connections are to be made on site. As noted, this is generic drawing, and is primarily to give people involved in the design and installation of a Volute Dewatering Press system an idea of how the system goes together.

17. INSTALLATION CHECK LIST

PWTech requires that the installation check list (last page) be filled out and signed prior to scheduling start-up services. This checklist allows the contractor to make sure everything that is required for successful start-up of the equipment with minimal chances of delays in the start-up process.

Failure to do this correctly could add time and expense to the start-up process, and in some cases nullify the warranty or performance testing component of the contract.



Schematic showing plumbing and electrical connections to be made on site.



PWTech Volute Installation Checklist

Facility/Project name:

Installation date (Month/Year):

Installation

All components as per the PWTech Scope of supply are installed as per manufacturers instructions?

Are all system components not supplied as part of the PWTech scope (Feed pump, conveyor etc.) fully operational, tested and installed as per the manufacturers instructions?

Are there any visible signs of damage to any of the equipment?

Is the Volute Dewatering Press is level and flocculation tank is located with respect to the dewatering drums as per the submittal drawings?

Is there clear space allowing full access to all components as per submittal drawings?

	YES	NO	N/A
All components as per the PWTech Scope of supply are installed as per manufacturers instructions?	<input type="checkbox"/>	<input type="checkbox"/>	
Are all system components not supplied as part of the PWTech scope (Feed pump, conveyor etc.) fully operational, tested and installed as per the manufacturers instructions?	<input type="checkbox"/>	<input type="checkbox"/>	
Are there any visible signs of damage to any of the equipment?	<input type="checkbox"/>	<input type="checkbox"/>	
Is the Volute Dewatering Press is level and flocculation tank is located with respect to the dewatering drums as per the submittal drawings?	<input type="checkbox"/>	<input type="checkbox"/>	
Is there clear space allowing full access to all components as per submittal drawings?	<input type="checkbox"/>	<input type="checkbox"/>	

Plumbing

Feed sludge line is plumbed and vacuum tested?

Feed sludge lines has recommended connections as per S8 of the installation manual?

Drain line is installed with shut-off valve?

Polymer system is plumbed with water connection and has water supply to it?

Polymer system solution line from polymer system to sludge feed line is installed?

VAC	
<input type="checkbox"/>	<input type="checkbox"/>

Electrical

Measure and record voltage supplied to the dewatering press control panel (at the main breaker):

Polymer System is connected and terminals are connected as per the submittal drawings?

Flowmeter is connected and functional?

Sludge feed pump is connected correctly and rotates the right way?

Any feed pump sensors (Pressure, seal etc.) are checked for function and are correctly wired?

Conveyor(s) are wired and rotating in the correct direction?

Conveyor E-stops / LOR sensors / alignment sensors / shock relays and are working correctly?

	<input type="checkbox"/>

Commissioning, performance testing, and training

Sludge for a minimum of 3 days of operation PLUS enough for testing as per any performance testing requirements is available?

Is the nature of the sludge nature/concentration is as per agreed conditions for performance testing?

Is there a suitable method and location to dispose of solids generated?

Is the sludge feed pump able to rotate freely (See S. 13.6)

Are all activities associated with the installation completed such that start-up will not be hindered by continuing construction or other ongoing activities in the dewatering area?

Proposed dates for commissioning, testing and training:

Will all staff to be trained be present during these dates?

Number of staff to be trained:

Declaration

I hereby declare that the above checks have been conducted and corrective actions taken if required such that all aspects of the installation as per this checklist are complete and the Volute Dewatering Press / Thickener is ready to be started up. I understand that should any of the above items not be ready for start-up, that additional start-up costs as per the quoted scope of supply will be incurred should additional time on site be required.

Signed: _____

Date: _____

Name and Title: _____

Tab 3: Polymer Preparation System Submittal



Concannon Winery, CA Submittal

November 9, 2016

Customer:	Process Wastewater Technologies Bill Love 9004 Yellow Brick Road Suite D Rosedale, MD P: 919.949.3584
Equipment:	VeloBlend Model VMN-0.5D-120-X0D-O-A-X
Specifications Section:	N/A
Application Engineer:	Dave Purcell
VeloDyne Contacts:	Project Manager: Carolyn Heusel 303.530.3298 x209 Fax: 303.530.3368 cheusel@polymersolution.com
Manufacturer's Representative:	N/A

Velocity Dynamics, LLC. (VeloDyne)
543 S. Pierce Ave.
Louisville, CO 80027
303-530-3298
www.polymersolution.com

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Section 1

Company Information

Company History

VeloDyne... a history in chemical feed equipment:

VeloDyne's history dates back to 1985 when Paul Plache, the company's founder, began his career in the polymer equipment industry as an owner and technical director of Fluid Dynamics, Inc. Since then, Mr. Plache has developed numerous technologies in the chemical systems field, including patented and patent-pending chemical blending technologies.

Founded in 2003 as Broad Reach Companies, Mr. Plache began to develop new technologies and provide business consulting services. In 2005 the company's name was changed to VeloDyne ("Velocity Dynamics") and its focus shifted to the sales and marketing of the company's new and improved technologies. While launching VeloDyne, Mr. Plache relied on his core business philosophy ..."it's not about the people, it's about the right people."

VeloDyne's team is comprised of the right people: former employees of his previous polymer systems company, as well as new polymer and chemical system experts. In sum, VeloDyne's team brings approximately 100 years of combined experience to the polymer system and chemical system integration industry.

VeloDyne's products are an extension of and an improvement upon the proven technologies our team has developed over the last twenty years, technologies which have been installed in over 4000 installations world-wide.

For more information please call 303-530-3298 or visit our website: www.polymersolution.com.

Corporate Profile & Capabilities

VeloDyne is a manufacturer of liquid and dry polymer activation & hydration technologies, chemical storage, metering, and mixing equipment and provides chemical systems integration services for the water and wastewater treatment industries. Our technologies are born from experience gained over twenty years and through thousands of installations around the world. We have devoted those twenty years to developing high performing, reliable, and long lasting solutions to your chemical systems needs. Our mission is to strive to build a leadership company in the field of chemical equipment and systems integration for the water and wastewater industry.

Corporate Headquarters & Manufacturing Facility:
Louisville, Colorado

Company Capabilities and Services:

Applications Engineering

- Chemical Equipment & Systems Consulting
- Sales Service & Support

Engineering

- 3-D Modeling
- System Integration & Design
- Mechanical Engineering & Design
- Electrical / Control Engineering & Design
- Research & Development

Manufacturing

- UL 508 Control Panels
- Equipment Manufacturing and Assembly
- Hydraulic, Electrical & Mechanical Equipment Testing

Customer Service & Technical Support

- Equipment start-up
- Equipment service & repair
- Mechanical, Electrical and System Trouble Shooting
- Process Optimization Consulting

Product Trademarks

- VeloDyne® Hybrid Liquid Polymer Activation & Blending Technology
- HydraMax® Dry Polymer Hydration, Activation & Solution Preparation System

Products

Specialty Chemical Systems

- Liquid Polymer
- Dry Polymer
- Chemical Slurry Systems
- Chemical Dissolving / Mixing

Dilution Systems

- Specialty Chemical Mixers
- Mix Tanks
- In-Line Mixers
- Wetting Bowls

Dry Material Metering Systems

- Rotary Valve (Volumetric)
- Screw / Helix (Volumetric)
- Screw / Helix (Gravimetric)
- Weigh Belt (Gravimetric)

Storage Systems

- Silos
- Hoppers
- Tanks

Storage System Accessories

- Rotary Bin Gates
- Slide Gates
- Bag Unloading
- Dust Collectors
- Delumpers
- Live Bin Activators
- Level Switches & Transmitters

Solution Feed Systems

- Metering Pump Systems
- Secondary Dilution Systems
- Eductors

Transfer Systems

- Screw
- Conveyor
- Pump

Control Systems

- UL Certified PLC & Discrete Control Systems

VeloBlend® Liquid Polymer Activation & Feed System References

The following references of the VeloBlend® liquid polymer activation technology are from professionals in the consulting engineering, process equipment, end user and polymer manufacturing sectors of the market.

Keith Williams

Ashbrook Simon-Hartley

512-261-1820

VeloBlend is an Ashbrook's standard polymer system used to help optimize their dewatering technologies.

Carl Malkiewicz - Senior Project Manager

Andritz

(817) 465-5611

VeloBlend is Andritz' standard polymer system used to help optimize their dewatering technologies.

Allen Justice – National Sales Manager

Phoenix Process

(502) 499-1079

VeloBlend is Phoenix Dewatering's standard polymer system used to help optimize their dewatering technologies.

Gene Drake – Centrifuge Operations Expert

Centrisys Corporation

(262) 654-6006

VeloBlend is Centrisys' standard polymer system used to help optimize their dewatering technologies.

Michael Trent – Plant Operator

Tri City WWTP, Clackamas, OR

(503) 557-2803

The VeloBlend technology increased cake solids from 21.02% to 24.25% using the same polymer dosage. A new VeloBlend was purchased for a thickening application as a result of the superior performance witnessed during the trial.

Joe Pichotta - Account Manager

Ashland Chemical

(847) 951-1623

Ashland utilizes the VeloBlend during polymer trials to optimize polymer performance.

Mr. Mark Streed – Lead Operator

Lafayette, CO Water Reclamation

(303) 665-6034 (Ext. 2)

The VeloBlend cut polymer usage by over 25% during a two month long side by side trial against the Stranco M Series.

Mark Marcelletti - Account Manager

Ashland Chemical

(805) 660-8360

Ashland utilizes the VeloBlend during polymer trials to optimize polymer performance.

Mark Wells - Account Manager

Ashland Chemical

(707) 479-2894

Ashland utilizes the VeloBlend during polymer trials to optimize polymer performance.

John Dieckmann

Konline-Sanderson

800-225-5457 x225

VeloBlend is a Komline-Sanderson standard polymer system used to help optimize their dewatering technologies.

Mr. Bob Sembach

Sacramento Regional

(916) 875-9000

SAC Regional ran a trial to evaluate new polymer blending technologies to replace their existing Stranco system. The VeloBlend outperformed the existing Stranco system and resolved ongoing maintenance issues.

Bill Beam

Western Riverside, CA

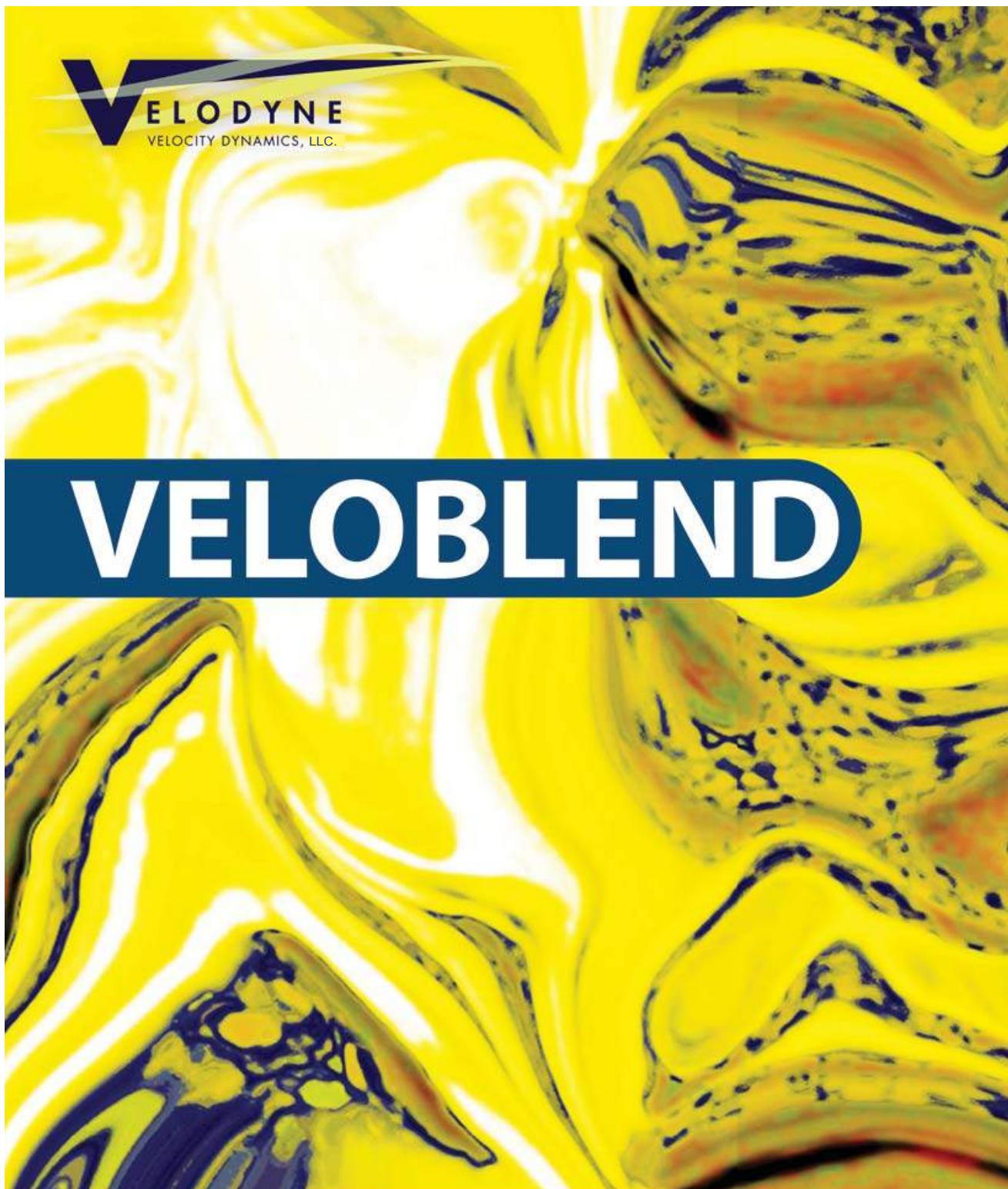
(951) 789-5000

Three VeloBlend systems were purchased to replace existing polymer blenders. Polymer consumption was reduced by approximately 20%.

For additional information please contact Velocity Dynamics, LLC. (VeloDyne) at 303-530-3298 or visit our website at www.polymersolution.com

Section 2

System Information/Specifications



VELOBLEND

THE MOST ADVANCED LIQUID POLYMER ACTIVATION TECHNOLOGY

GUARANTEED PERFORMANCE • SUPERIOR RELIABILITY • UNSURPASSED QUALITY

OPTIMIZING LIQUID POLYMER PERFORMANCE

THE ART OF THE SCIENCE

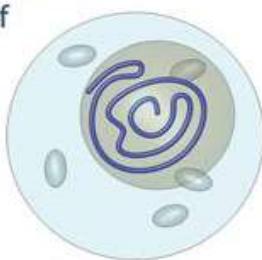
There have been numerous technologies introduced over the last twenty five years designed to activate liquid polymer. The advanced VeloBlend™ technology has proven to more efficiently induce ultra-high, non-damaging mixing energy, delivering the highest polymer performance over any other technology in the industry.

"The VeloBlend is simply the best polymer activation technology ever developed."

- Polymer Consultant with over 30 years of industry experience

NEAT "AS-SUPPLIED" POLYMER

Neat polymer, as supplied, is primarily comprised of coiled-up polymer, oil, water and inverting surfactant.



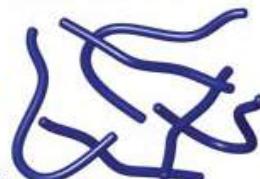
UNACTIVATED POLYMER MOLECULE - CAPABLE OF WITHSTANDING HIGH MIXING ENERGY

In its "neat" (as-supplied) state, the polymer is coiled up like a spring and is capable of withstanding ultra-high mixing energy without damage to its molecular structure.



DAMAGED POLYMER - CAUSED BY EXCESSIVE SHEAR

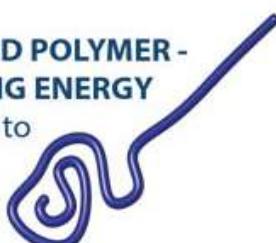
Once the polymer uncoils, the elongated polymer is now susceptible to damage caused by excessive shear.



The result is increased polymer dosage, cost and reduced process performance.

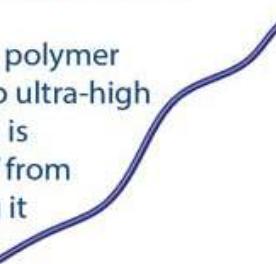
PARTIALLY UNCOILED POLYMER - INSUFFICIENT MIXING ENERGY

If polymer is exposed to insufficient mixing energy, the polymer fails to fully activate with the same negative results in polymer cost and process performance.



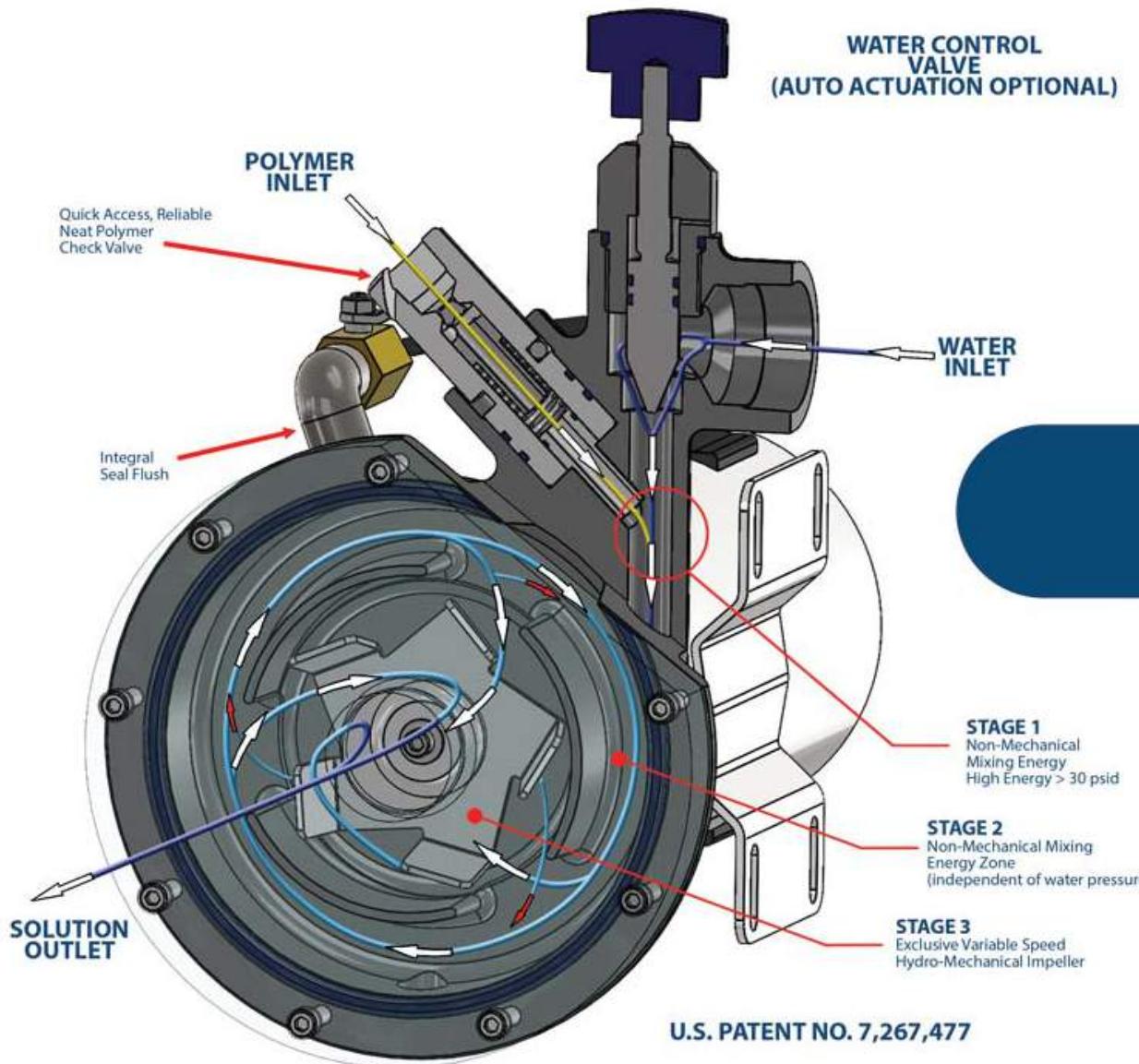
FULLY ACTIVATED, UNDAMAGED POLYMER - DELIVERING OPTIMAL PERFORMANCE

When neat, coiled-up polymer is properly exposed to ultra-high mixing energy, the oil is effectively "scrubbed" from the polymer, allowing it to become highly activated without damage.



The VeloBlend's hybrid technology more effectively induces ultra-high, non-damaging mixing energy over the system's full flow range than any other technology on the market.

EXCLUSIVE HYBRID ACTIVATION TECHNOLOGY



VELOBLEND

THE MOST ADVANCED LIQUID POLYMER ACTIVATION TECHNOLOGY

THE VERSATILE VELOBLEND SYSTEM



SKID CONFIGURATIONS



COMPACT
Skid 1 configuration. Progressive cavity pump, 0.2 to 50 GPM solution. Control level D and E.



FULL
Skid 3 configuration. Progressive cavity pump, 0.2 to 200 GPM solution. Control level D through RpSB.
Solution rates up to 500 GPM available.

BUILD YOUR VELOBLEND MODEL

The Most Complete & Customizable Product Line In The Industry

Model # Example:	BASE MODEL	CONTROL LEVEL	PLC/HMI OPTION (OR "O")	POWER	SKID SIZE
	VM-10P-1200	RpSB	3D	A	2
Your VeloBlend:	VMN-0.5D-120	X0D	O	A	X

BASE MODEL:	SKID SIZE BASED ON CONTROL LEVEL (SEE CHART BELOW)				
	D	E	Rw	Rp	RpSB
VELOBLEND BASE MODEL	POLYMER GPH	WATER GPH			
VM-0.5P-120	0.025 - 0.5	12 - 120			
VM-2P-300	0.1 - 2	30 - 300			
VM-3P-600	0.3 - 3	60 - 600			
VM-10P-1200	0.5 - 10	120 - 1200	1		2
VM-10P-1800	0.5 - 10	180 - 1800			
VM-15P-3000	0.75 - 15	300 - 3000			
VM-30P-6000	1.5 - 30	600 - 6000	2		3
VM-60P-12000	3.0 - 60	1200 - 12000		3	
VM-150P-30000	15 - 150	3000 - 30000			4

* LOWER CAPACITIES AVAILABLE - CONSULT FACTORY ** ALTERNATE PUMP / WATER RATE COMBINATIONS AVAILABLE - CONSULT FACTORY

CONTROL LEVEL:	CONTROL LEVELS				
	DISCRETE		PLC		
STANDARD CONTROL OPTIONS	D	E	Rw	Rp	RpSB
LOCAL & REMOTE START/STOP DISCRETE INPUT	*	*	*	*	*
4-20mA PUMP PACING ANALOG INPUT	*	*	*	*	*
4-20mA SOLIDS DENSITY ANALOG INPUT					*
SYSTEM RUNNING DISCRETE INPUT	*	*	*	*	*
SYSTEM IN REMOTE DISCRETE INPUT	*	*	*	*	*
PUMP RATE ANALOG OUTPUT		*	*	*	*
SOLUTION RATE ANALOG OUTPUT				*	*
COMMON ALARM DISCRETE INPUT	*	*	*	*	*
MANUAL WATER RATIO CONTROL			*		
AUTO WATER RATIO CONTROL				*	*
SMARTBLEND™ RATIO CONTROL					*
ETHERNET COMMUNICATION			*	*	*

* OTHER CONTROL OPTIONS AVAILABLE - CONSULT FACTORY

PLC / HMI OPTION:	COLOR TOUCHSCREEN HMI OPTIONS						
	C-MORE		ALLEN BRADLEY			MAGELIS	
PLC OPTIONS	8"	10"	7"	10"	12"	7"	10"
VELODYNE CONTROLLER	1		INTEGRAL 6" COLOR TFT TOUCHSCREEN				
ALLEN BRADLEY MICROLOGIX	2	*	*	*	*	*	
ALLEN BRADLEY COMPACTLOGIX	3	*	*	*	*	*	
MODICON MOMENTUM	4	*	*			*	*

* OTHER PLC / HMI OPTIONS AVAILABLE - CONSULT FACTORY

POWER OPTION:	SKID SIZES:			WIDTH	DEPTH	HEIGHT
	1	COMPACT	34"			
A 120V/1PH/60HZ	2	TALL	34"	30"	72"	
B 240V/1PH/60HZ	3	FULL	48"	36"	72"	
C 240V/3PH/60HZ						
D 480V/3PH/60HZ						
E 600V/3PH/50HZ						

REQUIRED
200 GPM
WATER &
ABOVE

* STANDARD CONSTRUCTION 304SS, AVAILABLE IN 316SS.

X = Modification to skid size.

VELODYNE

TWENTY-FIVE YEARS OF EXPERIENCE

For over twenty-five years our team has been dedicated to advancing polymer activation technologies through knowledge gained from thousands of installations world-wide. VeloDyne unites proven technology with unsurpassed reliability.

Contact us to learn how our products and services can help optimize your treatment process.

www.polymersolution.com



MORE PROVEN SOLUTIONS FROM VELODYNE



HYDRAMAX DRY POLYMER SYSTEMS



ACCESSORIES



CHEMICAL STORAGE & FEED SYSTEMS



SLUDGE MIXERS



The “No Comparison” Comparison.

The Advanced Technology of the VeloBlend Hydro-Mechanical Polymer Blending System Reduces Polymer Consumption and Increases Process Performance.

The VeloBlend technology is the result of over twenty years of research and development. *The VeloBlend VM series optimizes polymer performance to reduce polymer consumption by an average of 21% in side by side trials through its patented hydro-mechanical hybrid blending process. The VeloBlend Difference is outlined below...*

Polymer Blending Systems Comparison:

Feature	VeloBlend VM Series	VeloBlend VH Series	Dynablend	Polyblend M Series	Polyblend PB Series	Prominent ProMix
Staged, High Energy Mixing	Yes	Yes*	Yes*	Yes	Yes	Yes
High Energy, Non-Mechanical Mixing	Yes*	Yes*	Yes*	No	No	No
Mixing Energy Independent of Water Pressure	Yes	No	No	Yes	Yes	Yes
Mixing Energy Independent of Mechanical Mixer	Yes	Yes	Yes	No	No	No
Non-Damaging Mixing Energy at All Flow Rates	Yes	Yes	Yes	No	No	No
Total Control Over Mixing Energy	Yes	No	No	Optional	No	Optional
Stainless Steel Impeller	Yes	N/A	N/A	No	Yes	No
Mechanical Seal Flush	Yes	N/A	N/A	No	No	No
Polymer Check Valve Accessible Without Tools	Yes	Yes	Yes	No	No	No
Polymer Injection Quill for Improved Polymer Activation	Yes	Yes	No	No	No	No
Clear Viewing Chamber	Yes	Yes	No	Yes	Yes	No
Plug-Free, Build-Up Free Mixing Chamber	Yes	Yes	No	No	No	No
Automatic Control of TOTAL Mixing Energy	Optional	No	No	No	No	No
Solution Flow Rates Up to 400 GPM	Yes	Yes	No	No	No	No
Limited Life-Time Mixing Chamber Warranty	Yes	Yes	Yes	No	No	No

* When adequate water pressure and flow exists.

For more information contact VeloDyne at 303-530-3298

sales@polymersolution.com
www.polymersolution.com

PROPOSED SCOPE OF SUPPLY

Bid Type: Velocity Dynamics is the basis of design.

Velocity Dynamics, LLC is pleased to offer the following proposal for the liquid polymer blending equipment, including options and accessories as indicated below.

QTY.	DESCRIPTION
1	<u>VeloBlend Model VMN-0.5D-120-X0D-O-A-X (Junction Box Only – No Control Panel – Control Signals Provided by Others) Liquid Polymer Blending System</u>
Dilution Water Flow: 12 to 120 GPM Polymer Flow Range: 0.03 to 0.5 GPH	
<u>Each unit shall include the following unless otherwise indicated:</u>	
1	Polymer Mixing Chamber: A. Series: VeloBlend VM B. Type: Staged Hydro-Mechanical C. Mixer Motor: ½ HP, 90 VDC, 1750 RPM, Wash-down duty D. Mixer Shaft Seal: Mechanical with seal flushing assembly E. VeloCheck™ Neat Polymer Check Valve with Quick Release Pin F. Construction: 1. Body: Stainless steel 2. Impeller: Stainless steel 3. Mechanical Seal: Ceramic, Carbon, Stainless steel, Viton 4. Cover: Clear polycarbonate with stainless steel reinforced flange & discharge G. Pressure Rating: 100 psi H. Pressure Relief Valve: Brass
1	Neat Polymer Metering Pump Assembly: A. Type: Solenoid actuated diaphragm type B. 5/8" Barbed hose connection C. Priming assembly D. Thermal type loss of polymer flow sensor
1	Dilution Water Inlet Assembly shall be provided, including the following: A. 1" Stainless steel FNPT water inlet connection B. Dilution water ON/OFF solenoid valve C. Control Valve: Manual rate control valve D. Primary dilution water flow meter type: Rotameter E. Low differential pressure alarm switch F. 0-160 psi inlet water pressure gauge (stainless steel, liquid filled) G. Plumbing – SCH. 80 PVC
1	Solution Discharge Assembly: A. 1" Stainless steel FNPT solution discharge connection B. 0-160 psi solution discharge pressure gauge (stainless steel, liquid filled) C. Plumbing – SCH. 80 PVC



1 Junction Box Only – No Control Panel

Junction Box Features:

- A. NEMA 4X FRP junction box
- B. Numbered terminal block
- C. Terminal block legend
- D. Numbered wires

Junction Box Features:

- A. Dilution water solenoid
- B. Motor (90 VDC mechanical mixing chamber)
- C. Diaphragm metering pump
- D. Differential pressure switch (loss of water pressure)
- E. Loss of polymer flow (low polymer flow)
- F. Ground terminals
- G. Pump 4-20 mA pacing input signal and shielded control wire to LMI pump via LMI plug

(Mixing chamber speed control via SCR motor controller provided by others in system control panel)

Controls and Control Signals to be Provided by Others

1 System Skid:

- A. Frame: 304 stainless steel, open frame design for access to all components
- B. Fasteners: 304 SS
- C. Designed for bolt-down

1 Engineering:

Submittals:

- A. Complete submittal package for approval

O&M Manuals:

- A. Five (5) hard copy and CD versions for approval (if required)
- B. Two (2) final hard copy and CD versions per system

1 Start-Up Services: **Provided By Process Equipment Manufacturer**

Note: four (4) weeks notice required prior to factory services being provided

Clarifications:

1. Any equipment or appurtenances not specifically listed in the scope of supply shall be provided by others.
2. Not included in this proposal: Installation. Chemicals. Interconnecting wiring, conduit, piping, valves. Anchor bolts. Field Painting. Taxes. Bonds.
3. VeloDyne has proposed its' standard equipment modified only to the extent to meet the functional intent of the project requirements as interpreted by VeloDyne. VeloDyne is providing what is detailed in our scope of supply.
4. This proposal is based on equipment delivery within one year of date of customer's purchase order.

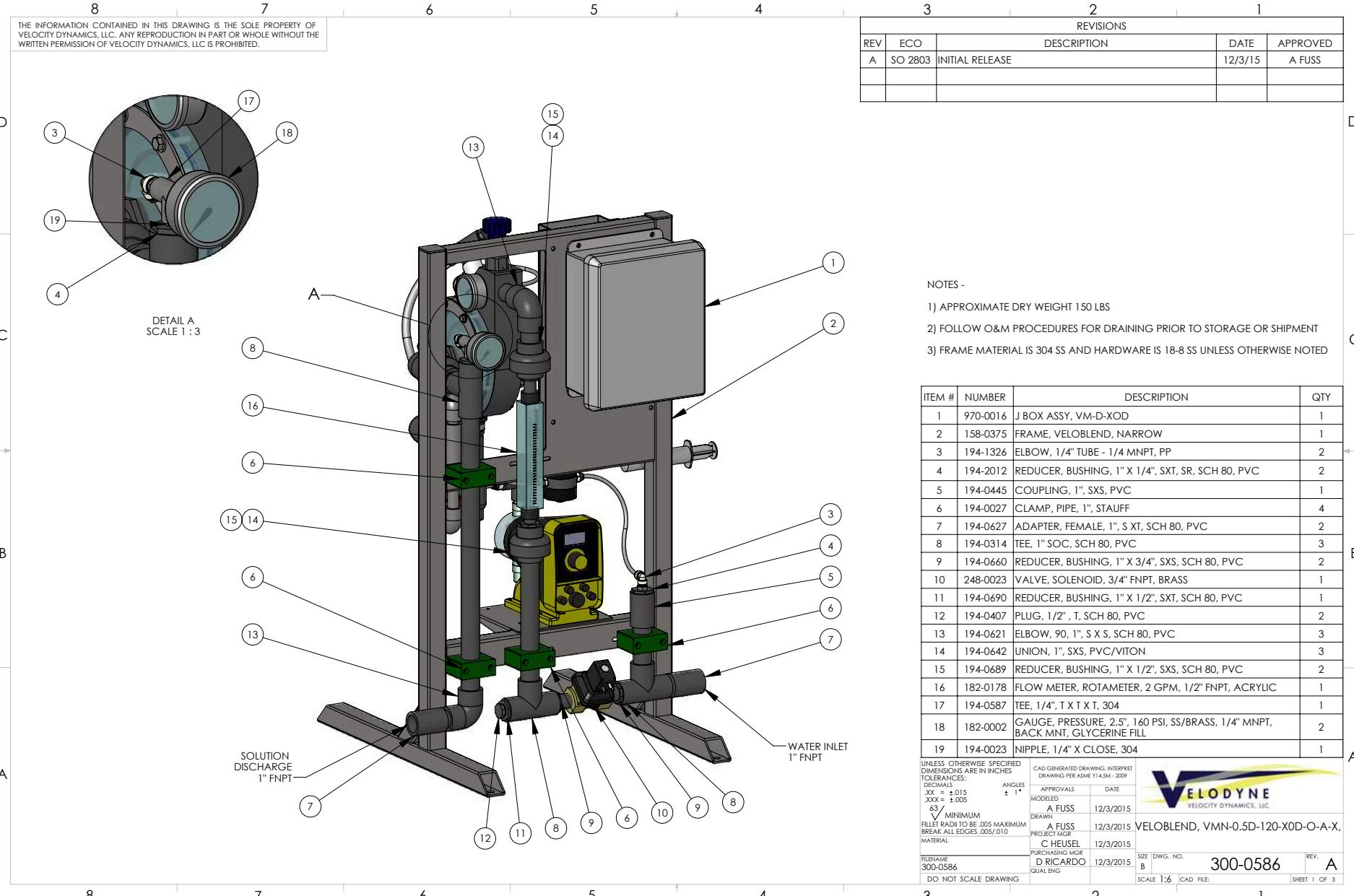
* Note: lead times are estimates based on the current engineering and production work load at the time of bid. Actual lead times may vary based on the work loads at the time of order – consult factory at time for order for actual lead times.

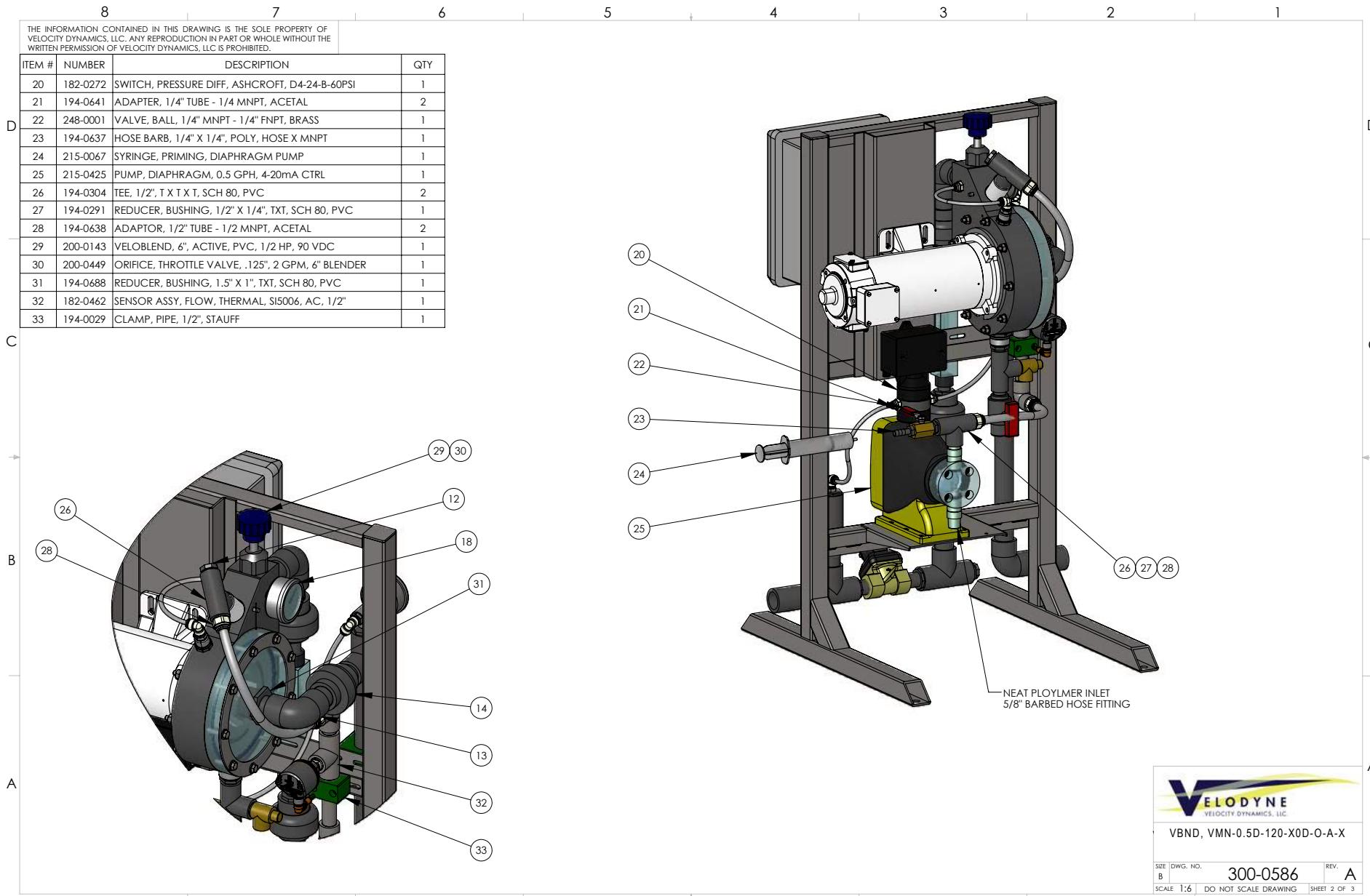
Section 3

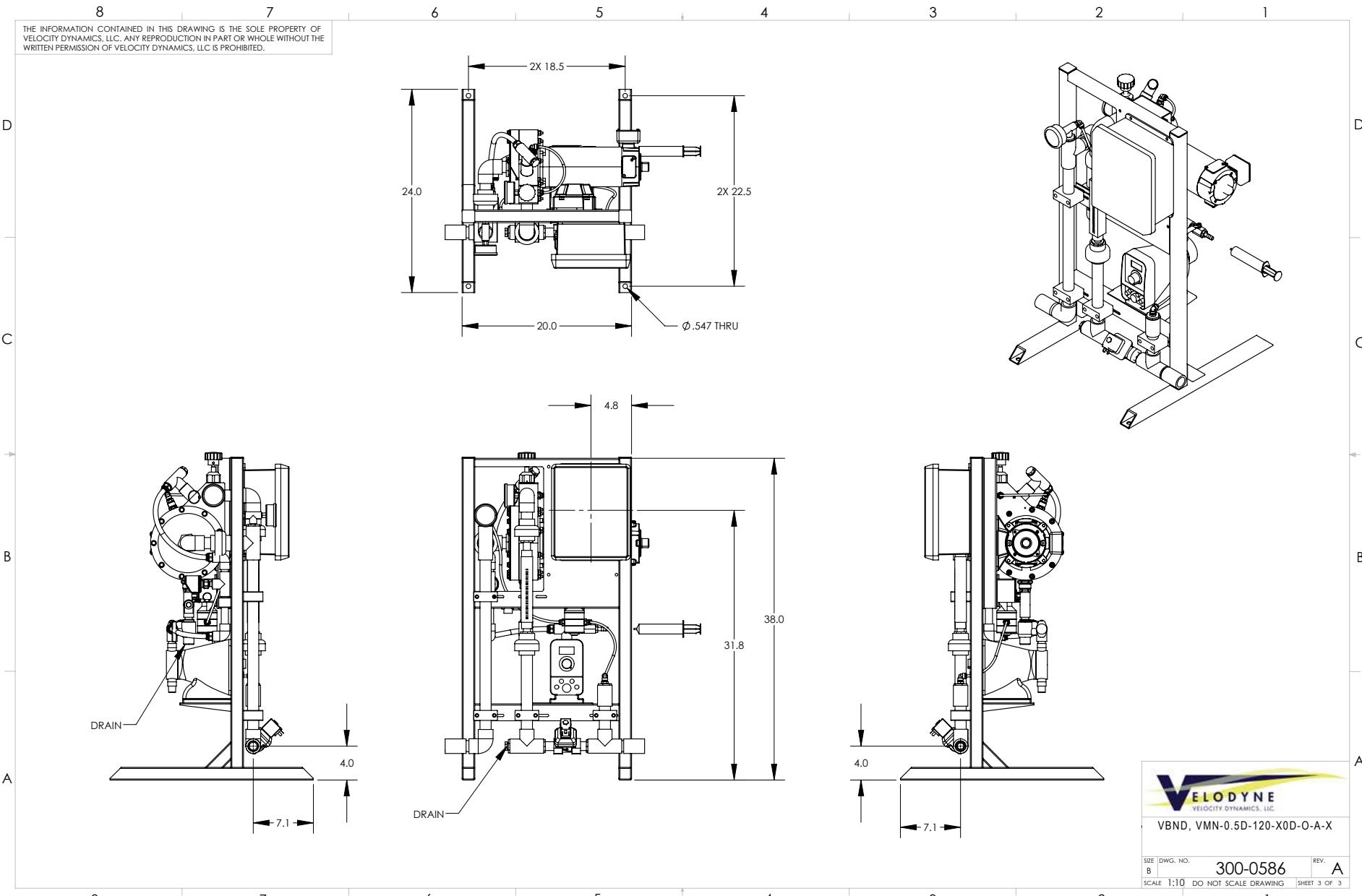
Mechanical

3.1 Mechanical Drawings

3.1.1 VeloBlend System Drawings







3.2 Component Data Sheets

3.2.1 Pump

215-0425 rev A

PUMP, DIAPHRAGM, 0.5 GPH, PULSE CTRL

3/26/2012

LMI #AD841-626VPV

GENERAL

Chemical metering pumps shall be positive displacement, Liquifram™ type pumps with a NEMA 4X/IP-65 enclosure. The external signal/equipment interface shall meet IP-68 standards. Relevant model codes are NSF Certified, UL/CUL or CE certified. Output volume shall be adjustable while pumps are in operation from zero to maximum capacity of:

ROYTRONIC EXCEL™ Series AD with FASTPRIME™ Liquid End

AD91, AD81, AD21	-	0.21 GPH	(0.8 liters per hour)
AD94, AD84, AD24	-	0.50 GPH	(1.9 liters per hour)
AD95, AD85, AD25	-	1.0 GPH	(3.8 liters per hour)
AD96, AD86, AD26	-	2.0 GPH	(7.6 liters per hour)

Chemical metering pumps shall be capable, without a hydraulically backed diaphragm, of injecting solutions against pressures up to:

ROYTRONIC EXCEL™ Series AD with FASTPRIME™ Liquid End

AD91, AD81, AD21	-	250 psi	(17.2 bar)
AD94, AD84, AD24	-	250 psi	(17.2 bar)
AD95, AD85, AD25	-	110 psi	(7.6 bar)
AD96, AD86, AD26	-	50 psi	(3.5 bar)

The FastPrime™ Liquid End² shall be equipped with a valve that allows for opening the head to atmospheric pressure to assist in pump priming. The AutoPrime™ Liquid End³ shall be equipped with a valve that allows for constant removal of vapors and gasses inherent in effervescent chemicals. The AutoPrime™ valve shall enable the pump to be primed automatically.

NOTE: AutoPrime™ liquid ends will recirculate a percentage of discharge chemical back to supply. Depending on application, output may be reduced up to 50%. Variables include supplier piping, stroke length and speed setting. Maximum pressure is 150 psi for ADX1, ADX4, 110 psi for ADX5, 50 psi for ADX6 models¹.

PUMP SPEED:

All models are 120 strokes per minute max.

SERIES AD2

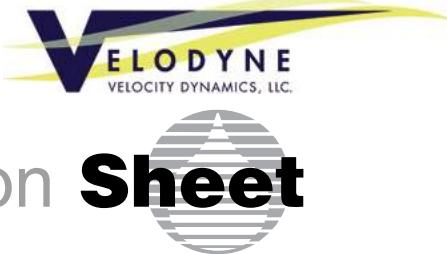
Series AD2 metering pumps shall have a liquid crystal display to indicate stroke speed of the pump and theoretical flow. Control and adjustment for stroke frequency shall be by means of a tactile keypad. Adjustment for stroke length shall be by means of a readily accessible dial knob. A pulse indicator light shall flash green between strokes when pumping. The pump shall be equipped with an on/off button and a low level float switch input. When the low level sensor registers empty, the low level indicator light shall turn red and the pump shall turn off when it registers an empty level.

SERIES AD8

Series AD8 metering pumps shall have a liquid crystal display to indicate stroke speed of the pump and theoretical flow. Control shall be selectable between internal and external modes as well as stroke frequency adjustment by means of a tactile keypad. Adjustment for stroke length shall be by means of a readily accessible dial knob. A pulse indicator light shall flash green between strokes when pumping in internal mode, and yellow between strokes when pumping in external mode. When in external mode, Series AD8 units shall accept 4-20 mA input signal or external pulse signal for control of pump speed. The

Notes:

1. Where X = control codes 9, 8, 2.
2. Liquid End model codes ending with NI, SI, NM, SM, NU, SU, NP or SP.
3. Liquid End model codes ending with AI, HI, AM, HM, AU, HU, AP or HP.
4. Type 316 stainless steel or PTFE may be specified.



Specification Sheet

ROYTRONIC EXCEL™ Series AD Metering Pump

pump shall be capable to support external connection requirements for remote start/stop or pulse divide/multiply functions or a power supply for remote powered devices. The pump shall be equipped with an on/off button and a dual low level float switch input. When the dual low level sensor registers empty, the low level indicator light shall turn yellow when a low level is registered and red when an empty level is registered. The pump shall turn off when it registers an empty level. The pump shall be equipped with a universal voltage supply capability.

SERIES AD9

Series AD9 metering pumps shall have a graphical display to indicate stroke speed of the pump and theoretical flow. Control shall be selectable between internal and external modes as well as stroke frequency adjustment by means of a tactile keypad. Adjustment for stroke length shall be by means of a readily accessible dial knob. The pump shall have the following control modes: Manual, mA, pulse multiply/batch accumulate, pulse divide and timer. Configuration mode settings shall allow for specific pump category settings and adjustments. A pulse indicator light shall flash green between strokes when pumping in internal mode, and yellow between strokes when pumping in external mode. When in external mode, Series AD9 units shall accept 4-20 mA input signal or external pulse signal for control of pump speed. The pump shall be capable to support external connection requirements for remote start/stop or pulse divide/multiply options or output for a power supply for remote powered devices. The pump shall be capable to support external connection capabilities for a digi-pulse or flow meter input or flow meter sensor. The pump shall be capable to support external connection for a remote internal/external input or 4-20 mA output or pacing output or alarm output. The pump shall be equipped with an on/off button and a dual low level float switch input. When the dual low level sensor registers empty, the low level indicator light shall turn yellow when a low level is registered and red when an empty level is registered. The pump shall turn off when it registers an empty level. The pump shall be equipped with a universal voltage supply capability.

DRIVE

The pump drive shall be totally enclosed with no exposed moving parts. Electronic pulser shall be supplied with quick connect terminals at least .110" wide (2.79 mm). Electronics shall be housed in a chemical resistant enclosure for maximum protection against chemical spillage. Electrical power consumption shall not exceed 25 watts per hour under full speed and maximum pressure conditions. Pump weight shall not exceed 10 lbs (4.75 kg).

PRESSURE RELIEF

The LMI 4-Function Valve installed with a FastPrime™ or AutoPrime™ Liquid End is recommended to provide automatic pressure relief.

MATERIAL

Chemical metering pump housing shall be of chemically resistant glass fiber reinforced thermoplastic. All exposed fasteners shall be stainless steel. Chemical metering pump valves shall be ball type, with ceramic balls⁴. Valves shall be serviceable by replacing the cartridge valve assembly. Pump head shall be of transparent acrylic⁵ material capable of resisting the pumped chemical. Fittings and connections at pump head shall be PVC⁶.

CHECK VALVES AND TUBING

A total of 16 ft (4.8 m) of polyethylene tubing⁷ shall be provided per pump complete with compression connections. A foot valve with integral one piece strainer shall be provided for the suction line, and an injection check/back pressure valve with 1/2" NPT male connection for the injection point.

5. PVDF, PVC, Polypropylene, or Type 316 stainless steel may be specified.

6. PVDF, Polypropylene, or Type 316 stainless steel may be specified.

7. 6 ft. (1.8 m) of vinyl suction tubing may be specified in place of polyethylene for the suction side only. 1/4" pipe thread may be specified.



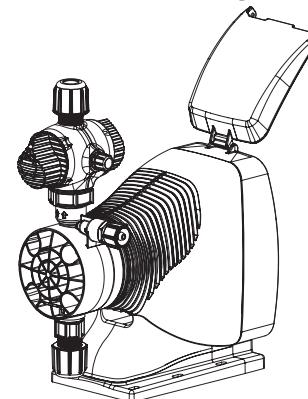
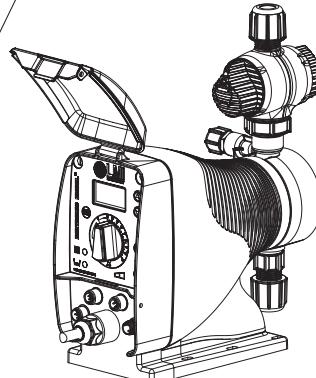
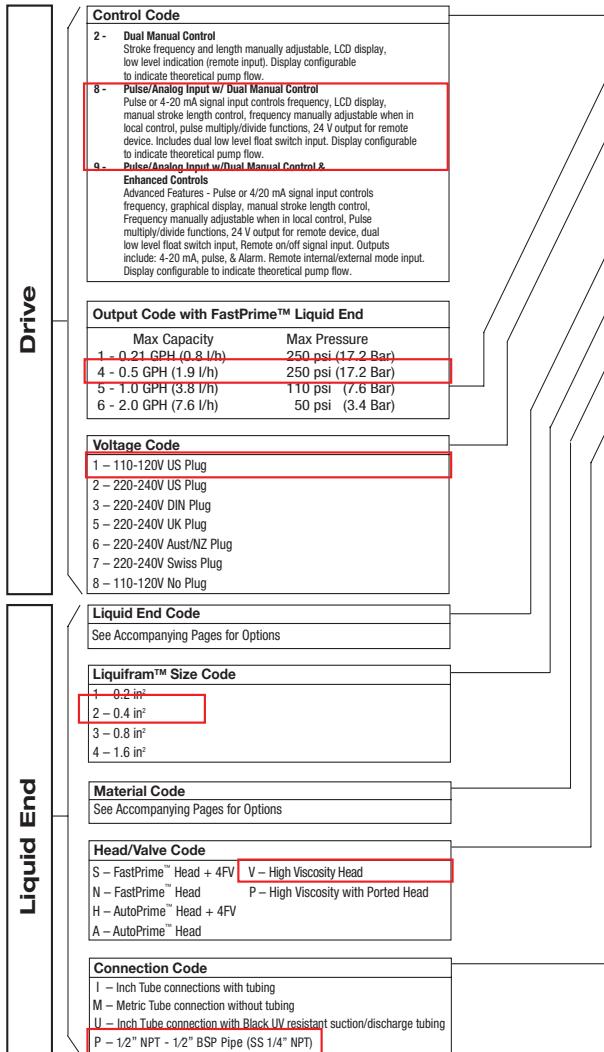
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Ivyland, PA 18974 USA
TEL: (215) 293-0401
FAX: (215) 293-0445
<http://www.lmipumps.com>

Data Sheet

ROYTRONIC EXCEL™ Series AD Electronic Metering Pumps

Model AD **8 4 1 - 6 2 6 VPV**

Model Code Configuration



Specifications

Series	Strokes Per Minute (Adjustable) Min Max	Stroke Length (Adjustable) Recommended Minimum	Average Input Power @ Max Speed and Pressure	Max. Shipping Weight
AD 2X*	1	120	20%	25 watts
AD 8X*				10 lbs (4.75 kg)
AD 9X*				

* where X = output code



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2039.B 6/2011

Standard FastPrime™ Liquid End Configuration Data & Materials of Construction

Drive Assembly	Liquid End	Size Code	Materials of Construction				Accs. Valve	Tubing & Connections Discharge & Suction
			Head/Fittings	Balls	Liquifram™	Seat/O-Ring		
AD91 ■ AD81 ■ AD21 ■	910SI†	1	Acrylic/PVC	Ceramic	Fluorofilm™	PTFE/Polyprel®	4FV	PE 1/4" O.D.
	915SI†	1	PP/PP	Ceramic	Fluorofilm™	PTFE	4FV	PE 1/4" O.D.
	918SI†	1	PVC/PVC	Ceramic	Fluorofilm™	PTFE/Polyprel®	4FV	PE 1/4" O.D.
	919SI†	1	Acrylic/PVDF	PTFE	Fluorofilm™	PTFE/Polyprel®	4FV	PE 1/4" O.D.
	917NP	1	316ss/316ss	316ss	Fluorofilm™	316ss/PTFE	—	1/4" NPT
	812SI†	1	PVDF/PVDF	Ceramic	Fluorofilm™	PTFE/Polyprel®	4FV	PE 1/4" O.D.
	813SI†	1	PVDF/PVDF	Ceramic	Fluorofilm™	PTFE	4FV	PE 1/4" O.D.
	818SI†	1	PVC/PVC	Ceramic	Fluorofilm™	PTFE/Polyprel®	4FV	PE 1/4" O.D.
	718SI†	1	PVC/PVC	Ceramic	Fluorofilm™	PTFE/Polyprel®	4FV	PE 1/4" O.D.

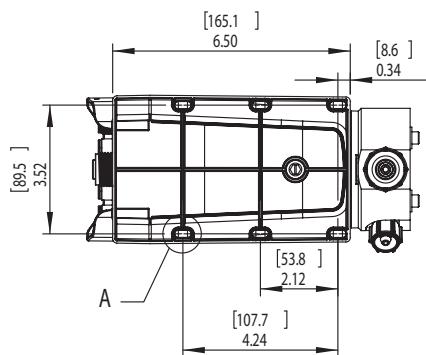
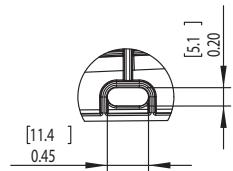
Drive Assembly	Liquid End	Size Code	Materials of Construction				Accs. Valve	Tubing & Connections Discharge & Suction
			Head/Fittings	Balls	Liquifram™	Seat/O-Ring		
AD94 ■ AD84 ■ AD24 ■	920SI†	2	Acrylic/PVC	Ceramic	Fluorofilm™	Polyprel®	4FV	PE 1/4" O.D.
	925SI†	2	PP/PP	Ceramic	Fluorofilm™	PTFE	4FV	PE 1/4" O.D.
	928SI†	2	PVC/PVC	Ceramic	Fluorofilm™	Polyprel®	4FV	PE 1/4" O.D.
	929SI†	2	Acrylic/PVDF	PTFE	Fluorofilm™	Polyprel®	4FV	PE 1/4" O.D.
	927NP	2	316ss/316ss	316ss	Fluorofilm™	316ss/PTFE	—	1/4" NPT
	822SI†	2	PVDF/PVDF	Ceramic	Fluorofilm™	Polyprel®	4FV	PE 1/4" O.D.
	823SI†	2	PVDF/PVDF	Ceramic	Fluorofilm™	PTFE	4FV	PE 1/4" O.D.
	828SI†	2	PVC/PVC	Ceramic	Fluorofilm™	Polyprel®	4FV	PE 1/4" O.D.
	728SI†	2	PVC/PVC	Ceramic	Fluorofilm™	Polyprel®	4FV	PE 1/4" O.D.
	624VI*	2	PP/PP	316ss	Fluorofilm™	PTFE	—	PE.5" O.D. Vinyl.938" O.D.
	626VI	2	Acrylic/PP	316ss	Fluorofilm™	Viton®/ Polyprel®	—	PE.5" O.D. Vinyl.938" O.D.

Drive Assembly	Liquid End	Size Code	Materials of Construction				Accs. Valve	Tubing & Connections Discharge & Suction
			Head/Fittings	Balls	Liquifram™	Seat/O-Ring		
AD95 ■ AD85 ■ AD25 ■	930SI†	3	Acrylic/PVC	Ceramic	Fluorofilm™	Polyprel®	4FV	PE 3/8" O.D.
	935SI†	3	PP/PP	Ceramic	Fluorofilm™	PTFE	4FV	PE 3/8" O.D.
	938SI†	3	PVC/PVC	Ceramic	Fluorofilm™	Polyprel®	4FV	PE 3/8" O.D.
	939SI†	3	Acrylic/PVDF	PTFE	Fluorofilm™	Polyprel®	4FV	PE 3/8" O.D.
	937NP	3	316ss/316ss	316ss	Fluorofilm™	316ss/PTFE	—	1/4" NPT
	832SI†	3	PVDF/PVDF	Ceramic	Fluorofilm™	Polyprel®	4FV	PE 3/8" O.D.
	833SI†	3	PVDF/PVDF	Ceramic	Fluorofilm™	PTFE	4FV	PE 3/8" O.D.
	838SI†	3	PVC/PVC	Ceramic	Fluorofilm™	Polyprel®	4FV	PE 3/8" O.D.
	738SI†	3	PVC/PVC	Ceramic	Fluorofilm™	Polyprel®	4FV	PE 3/8" O.D.
	634VI*	3	PP/PP	316ss	Fluorofilm™	PTFE	—	PE.5" O.D. Vinyl.938" O.D.
	636VI	3	Acrylic/PP	316ss	Fluorofilm™	Viton®/ Polyprel®	—	PE.5" O.D. Vinyl.938" O.D.

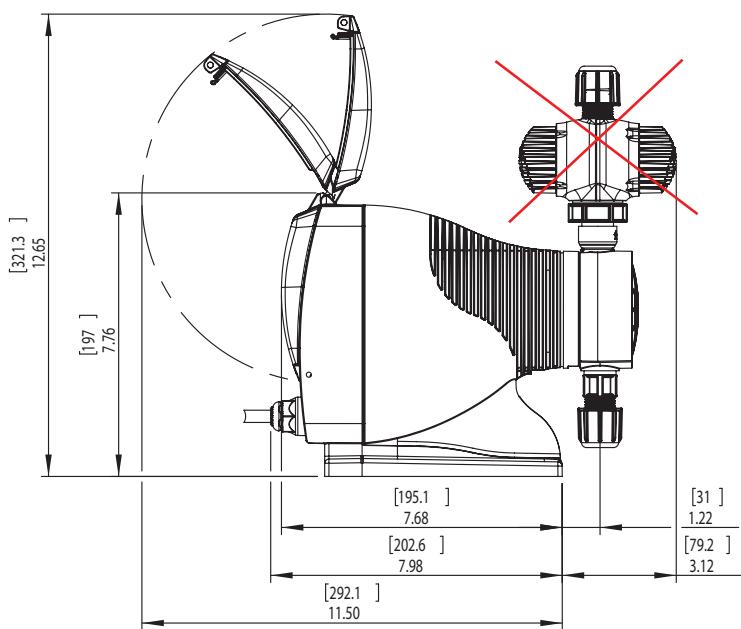
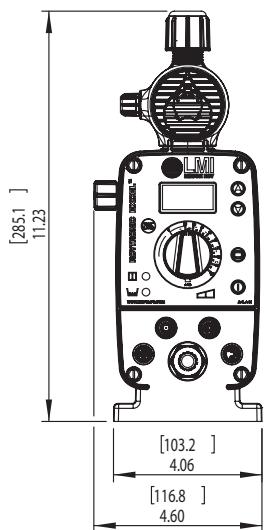
Drive Assembly	Liquid End	Size Code	Materials of Construction				Accs. Valve	Tubing & Connections Discharge & Suction
			Head/Fittings	Balls	Liquifram™	Seat/O-Ring		
AD96 ■ AD86 ■ AD26 ■	940SI†	4	Acrylic/PVC	Ceramic	Fluorofilm™	Polyprel®	4FV	PE 3/8" O.D.
	945SI†	4	PP/PP	Ceramic	Fluorofilm™	PTFE	4FV	PE 3/8" O.D.
	948SI†	4	PVC/PVC	Ceramic	Fluorofilm™	Polyprel®	4FV	PE 3/8" O.D.
	949SI†	4	Acrylic/PVDF	PTFE	Fluorofilm™	Polyprel®	4FV	PE 3/8" O.D.
	947NP	4	316ss/316ss	316ss	Fluorofilm™	316ss/PTFE	—	1/4" NPT
	842SI†	4	PVDF/PVDF	Ceramic	Fluorofilm™	Polyprel®	4FV	PE 3/8" O.D.
	843SI†	4	PVDF/PVDF	Ceramic	Fluorofilm™	PTFE	4FV	PE 3/8" O.D.
	848SI†	4	PVC/PVC	Ceramic	Fluorofilm™	Polyprel®	4FV	PE 3/8" O.D.
	748SI†	4	PVC/PVC	Ceramic	Fluorofilm™	Polyprel®	4FV	PE 3/8" O.D.
	644VI*	4	PP/PP	316ss	Fluorofilm™	PTFE	—	PE.5" O.D. Vinyl.938" O.D.
	646VI	4	Acrylic/PP	316ss	Fluorofilm™	Viton®/ Polyprel®	—	PE.5" O.D. Vinyl.938" O.D.

MOUNTING INFORMATION

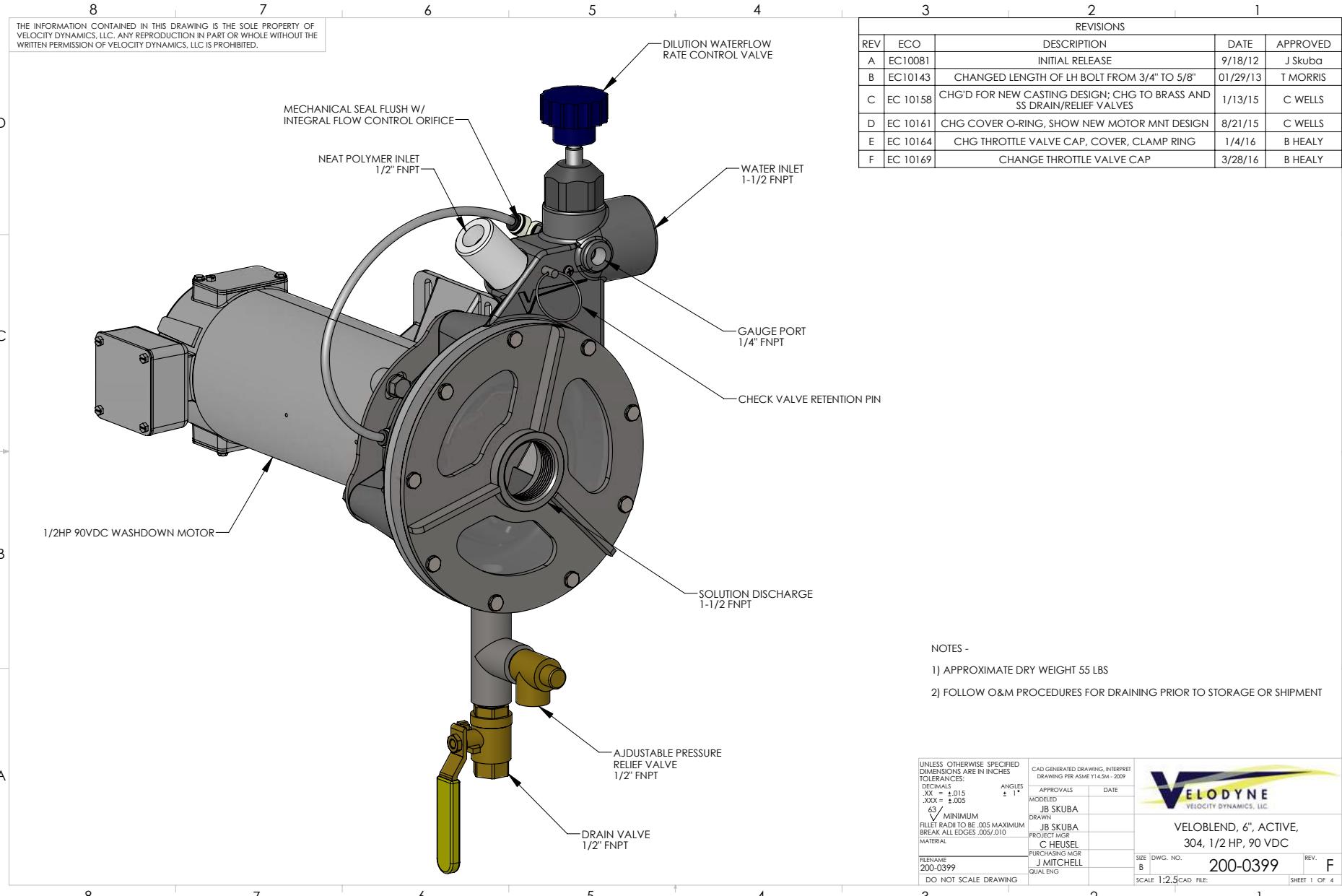
VIEW A

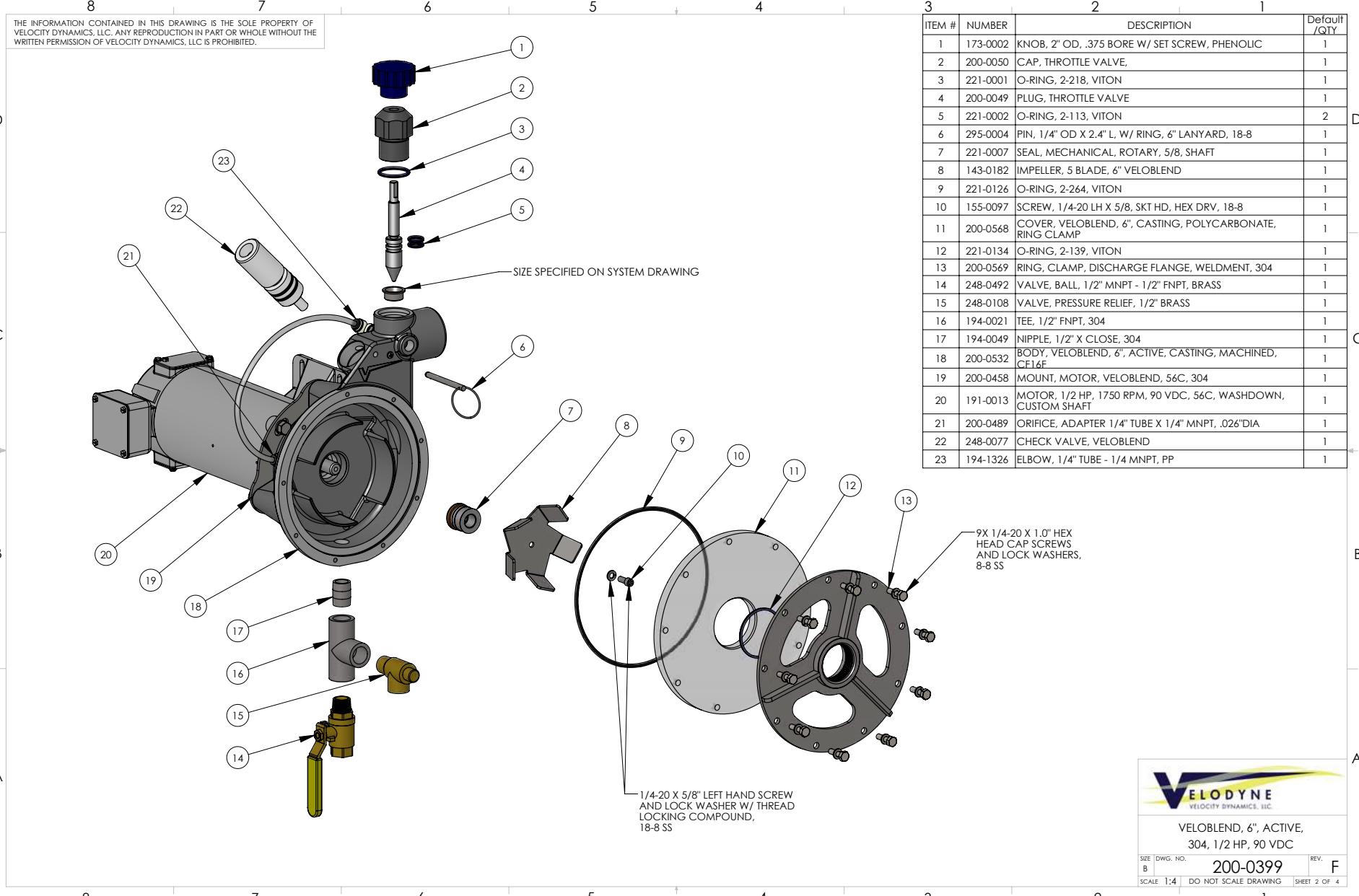


FASTPRIME LIQUID ENDS



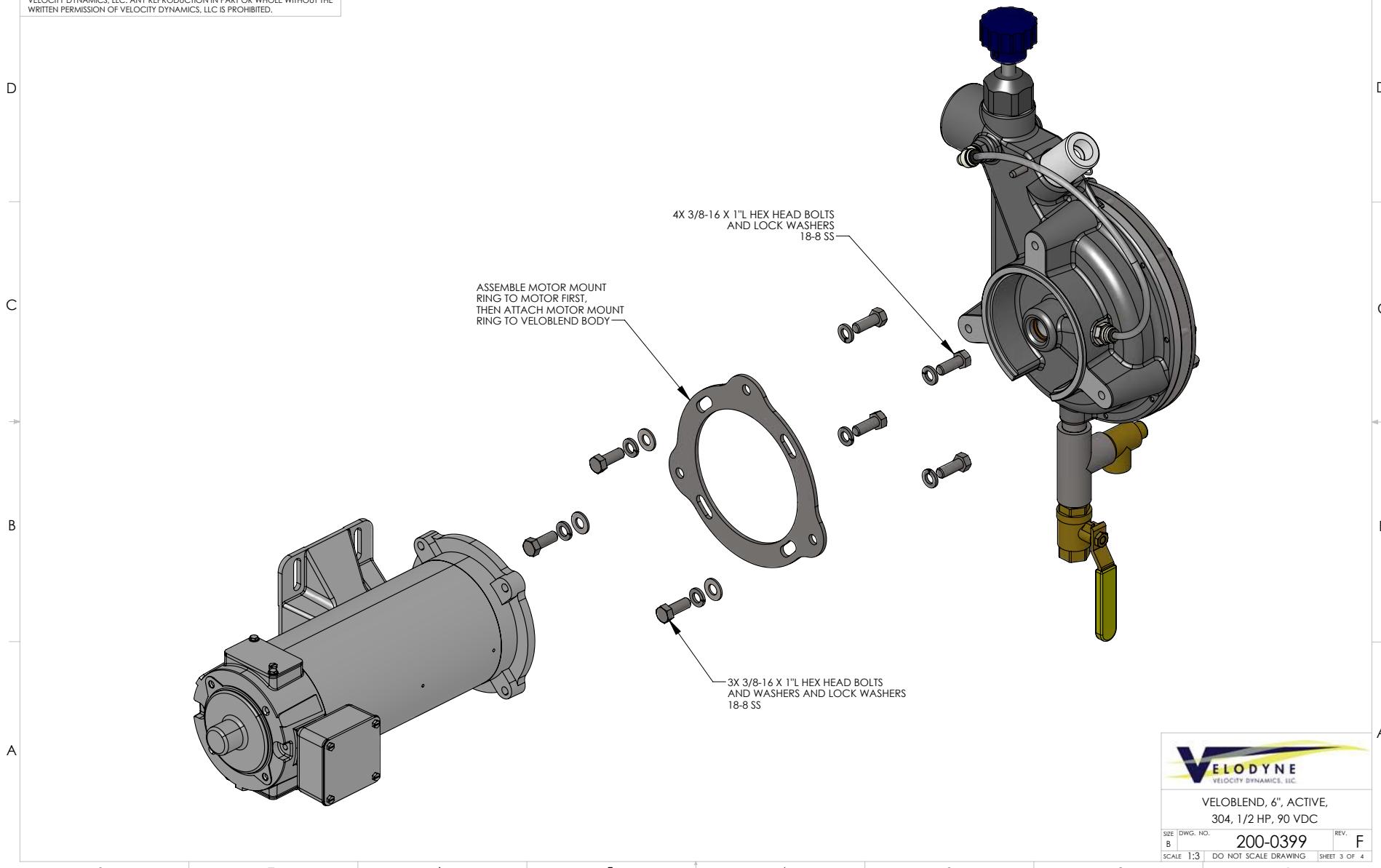
3.2.3 Mixing Chamber





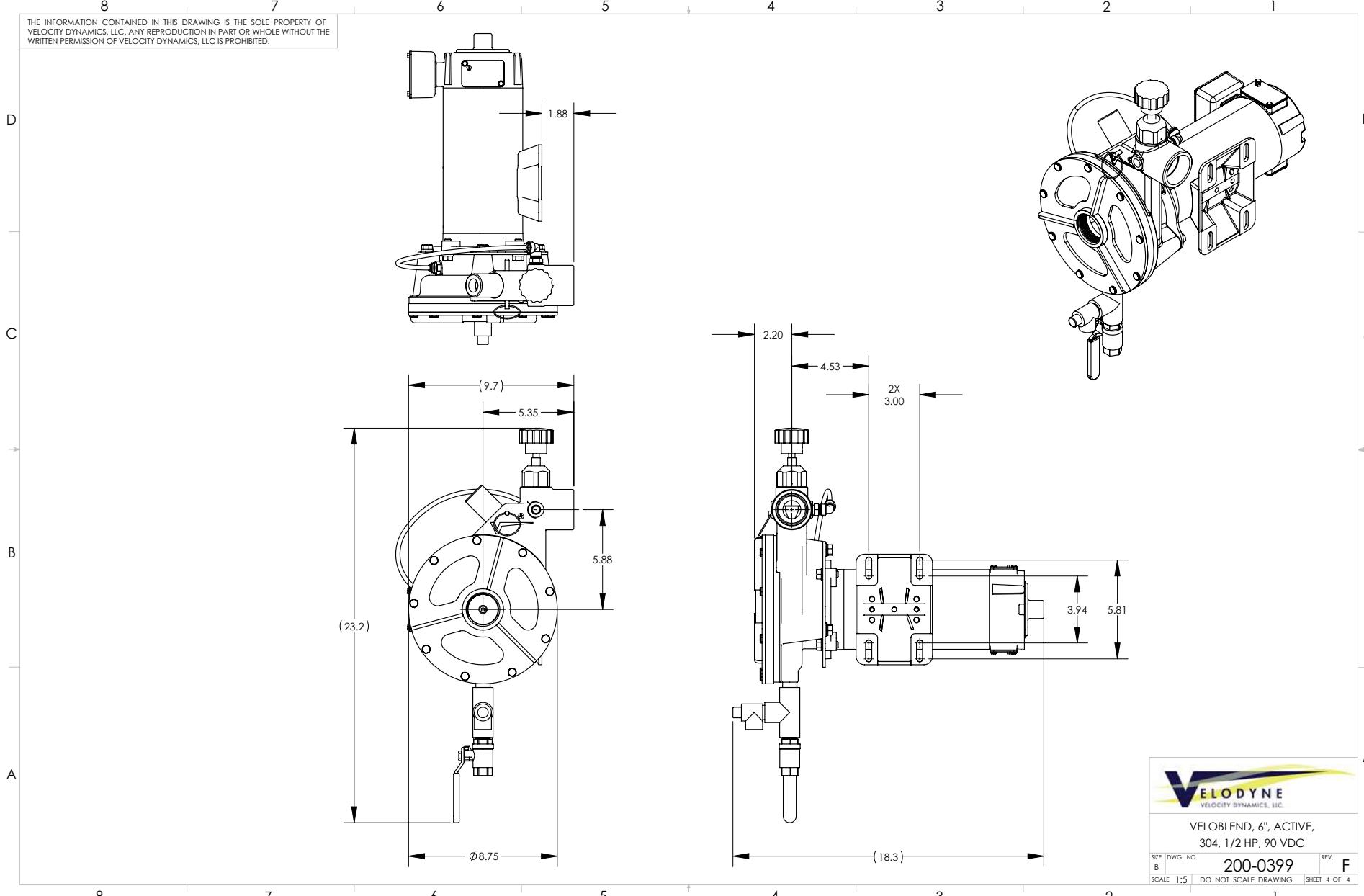
8 7 6 5 4 3 2 1

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SIZE DWG. NO. 200-0399 REV. F
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
SCALE 1:3 DO NOT SCALE DRAWING SHEET 3 OF 4

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SIZE	DWG. NO.	REV.
B	200-0399	F
SCALE	1:5	DO NOT SCALE DRAWING
		SHEET 4 OF 4

VELOBLAST, 6", ACTIVE,
304, 1/2 HP, 90 VDC

191-0013 B1 (BALDOR)
MOTOR 1/2 HP, 1750 RPM, 90 VDC, 56C, WASHDOWN,
CUSTOM SHAFT
BGH, 2/5/2015



BALDOR • RELIANCE

Product Information Packet

CDPWD3330

.5HP, 1750RPM, DC, 56C, 3336P, TENV, F1

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BALDOR • RELIANCE Product Information Packet: CDPWD3330 - .5HP,1750RPM,DC,56C,3336P,TENV,F1

Part Detail							
Revision:	AN	Status:	PRD/A	Change #:		Proprietary:	No
Type:	DC	Prod. Type:		Elec. Spec:	33WGZ122	CD Diagram:	CD0194
Enclosure:	TENV	Mfg Plant:		Mech. Spec:	33-2142	Layout:	33LY2142
Frame:	56C	Mounting:	F1	Poles:	///	Created Date:	
Base:	RG	Rotation:	R	Insulation:	F	Eff. Date:	11-08-2013
Field Type:		Literature:		Elec. Diagram:		Replaced By:	



BALDOR • RELIANCE Product Information Packet: CDPWD3330 - .5HP,1750RPM,DC,56C,3336P,TENV,F1

Nameplate NP1509				
CAT.NO.	CDPWD3330			
SPEC.	33-2142Z122			
HP	.5	ENCL	TENV	
RPM	1750			
FRAME	56C	TYPE	3336P	
ARM V	90	ARM A	4.8	
FLD V		FLD A		
INSUL	F	AMB.	40	
DUTY	CONT	SUPPLY	1.3	
BRG/DE	6203	BRG/ODE	6203	
BRUSHES	2/BP5011T01			
	IP55	BLANK		
SER.				
BLANK				
APRV-CSA		APRV-UL		APRV-CE

BALDOR • RELIANCE

Product Information Packet: CDPWD3330 - .5HP,1750RPM,DC,56C,3336P,TENV,F1

Parts List

Part Number	Description	Quantity
SA005091	SA 33-2142Z122	1.000 EA
AA002740	AA 33-2142Z122	1.000 EA
BP5011T01SP	CARBON BRUSH - 33P, 90V	1.000 EA
BP5012A04SP	BRUSH SPRING FOR DC MOTORS	1.000 EA
33CB3001B02W	CONDUIT BOX, MACH/COATED WHITE	1.000 EA
33GS1013	GASKET - CONDUIT BOX, .062 WHITE NEOPREN	1.000 EA
51XT0832A08	8-32 X 1/2 TY23 HXWS SLDSR	3.000 EA
HW3001B02	BRASS CUP WASHER W/GROUND SYMBOL TAB,	1.000 EA
51XW0832G07	8-32 X 7/16 TY23 HXWS SLDSR GR	1.000 EA
51XW0832A07	8-32 X .44, TAPTRITE II, HEX WSHR SLTD SE	4.000 EA
33EP3101A13W	FR ENDPLATE, MACH W/WHITE EPOXY PAINT	1.000 EA
HW4600A54	SEAL 0.668 X 1.064 X 0.250 DOUBLE SHIELD	1.000 EA
33CB4501A04W	BRUSH INSPECTION COVER, COATED WHITE EPO	2.000 EA
33GS1014	GASKET, BRUSH INSP. COVERTDR 11640	2.000 EA
11XT0832S07	08-32 X 7/16 HX SL WS HD, 304 STAINLESS	6.000 EA
HA6887	SHAFT PROTECTOR STAMPED STEEL 20 GA.	1.000 EA
10XN2520S06	1/4 20X3/8 HX HD CAP S.S.	2.000 EA
HW5100A03SP	WAVY WASHER (W1543-017)	1.000 EA
33EP3302A14W	PULLEY ENDPLATE ENCL 33PM 56C W/WHITE EP	1.000 EA
HW4600A54	SEAL 0.668 X 1.064 X 0.250 DOUBLE SHIELD	1.000 EA
HW4600B39SP	SEAL 0.550 X .790 X .180 FACE SEALING	1.000 EA
11XN1032S20	10-32 X 1-1/4 HEX WASHER HEAD, SLOTTED	2.000 EA
19XA1016S06	10-16X 3/8" TYPE AB SS X	3.000 EA
WD4102A12	SR 6P-4 HEYCO STRN RELIEF OR 23MP06P40 M	1.000 EA

BALDOR • RELIANCE Product Information Packet: CDPWD3330 - .5HP,1750RPM,DC,56C,3336P,TENV,F1

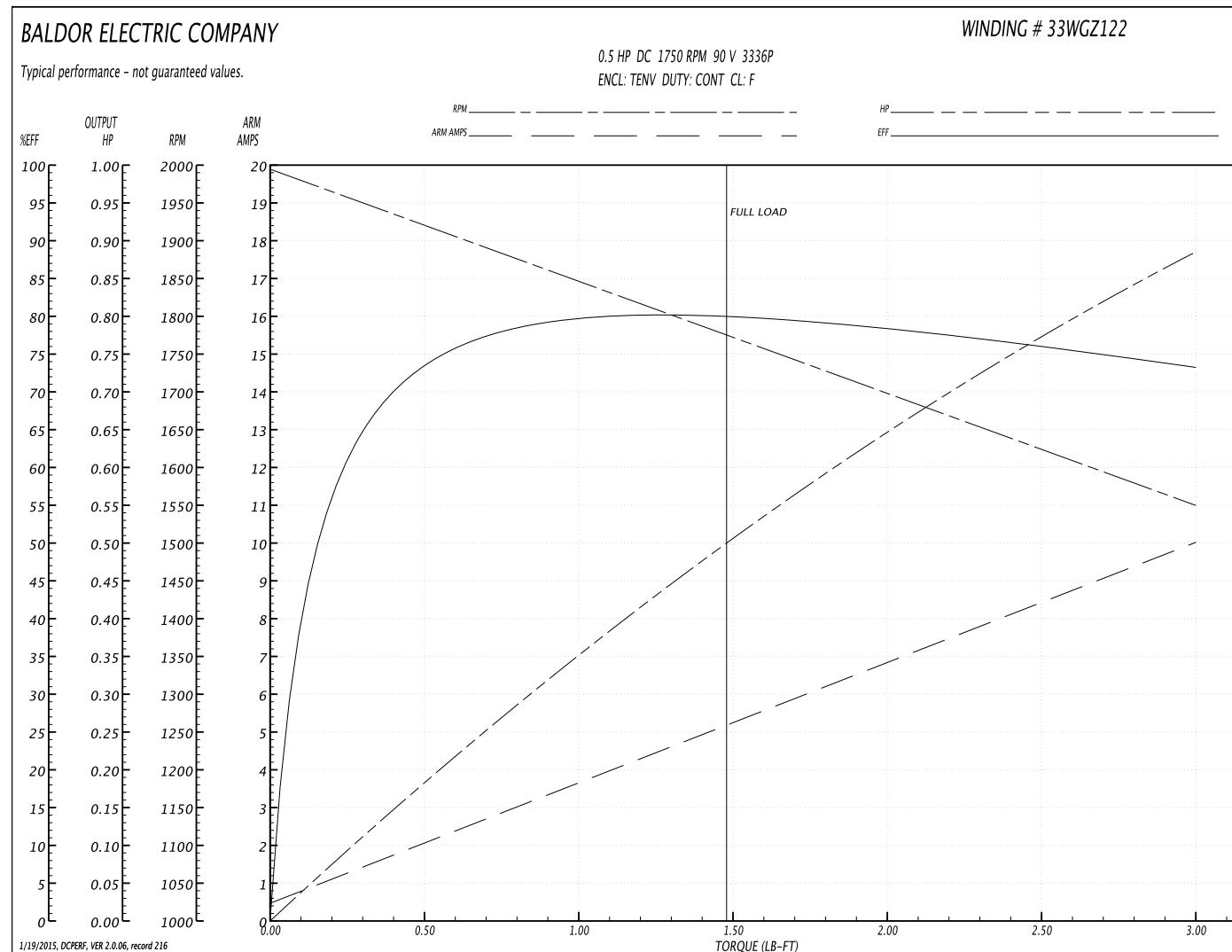
Parts List (continued)

Part Number	Description	Quantity
34CB4500A10W	CONDUIT BOX LID, MACH W/WHITE EPOXY	1.000 EA
33GS1012	GASKET - CONDUIT BOX LID, MODEL 33PM	1.000 EA
59XW0832S07	TAPTTITE II,HEX WSHR UNSLTD SER,410 S.S.,	5.000 EA
HW2502D13	SS KEY, 3/16 SQ X 1.375	1.000 EA
HA7000A04	KEY RETAINER 0.625 DIA SHAFTS	1.000 EA
MG1025W01	RAL9003, SIGNAL WHITE, GLOSS 85	0.013 GA
10XF0440S02	04-40 X 1/8 TYPE F HEX HD STAINLESS STIC	2.000 EA
MJ5001A27	32220KN GRAY SEALER	0.001 QT
33RK5004SP	ROCKERARM	1.000 EA
HA3100S03	THRUBOLT- 10-32 X 10.625 302 OR 303 SS	2.000 EA
MG1500Y02	PRIMER,347.29+347.29C ACTIVATOR WILKOPON	0.013 GA
MN416A01	TAG-INSTAL-MAINT no wire (1200/bx) 10/13	1.000 EA
LB1164	LABEL,WARNING AND DRAIN	1.000 EA
LB1125C01	STD (STOCK) CARTON LABEL BALDOR WITH FLA	2.000 EA
LC0194	CONNECTION LABEL	1.000 EA
NP1509	DC, WD, UL CE CSA, W/O THERMAL	1.000 EA
27PA1001	PACKAGING GROUP	1.000 EA
LB1451	WARNING LABEL, CE WARNING SYMBOLS ONLY	1.000 EA

BALDOR • RELIANCE Product Information Packet: CDPWD3330 - .5HP,1750RPM,DC,56C,3336P,TENV,F1

Performance Data at 90.0 Arm V, 0.5HP (Typical performance - Not guaranteed values)							
General Characteristics							
Armature Resistance:	2.0767 ohms		Commutating Winding Resistance:				
Series Winding Resistance:			Shunt Winding Resistance:				
Armature Inductance:	15.574 mH		Armature Inertia:				
Maximum Rated RPM With Field Weakening:			Maximum Allowable Inrush Amps:	44.0			
Load Characteristics							
Load Point	1	2	3	4	5	6	7
Armature Amps:	0.474	2.065	3.656	5.247	6.838	8.429	10.02
RPM:	1995.0	1920.0	1846.0	1772.0	1698.0	1624.0	1550.0
Torque (LB-FT):	0.0	0.5	1.0	1.5	2.0	2.5	3.0

Performance Graph at 90.0 Arm V, 0.5HP Typical performance - Not guaranteed values

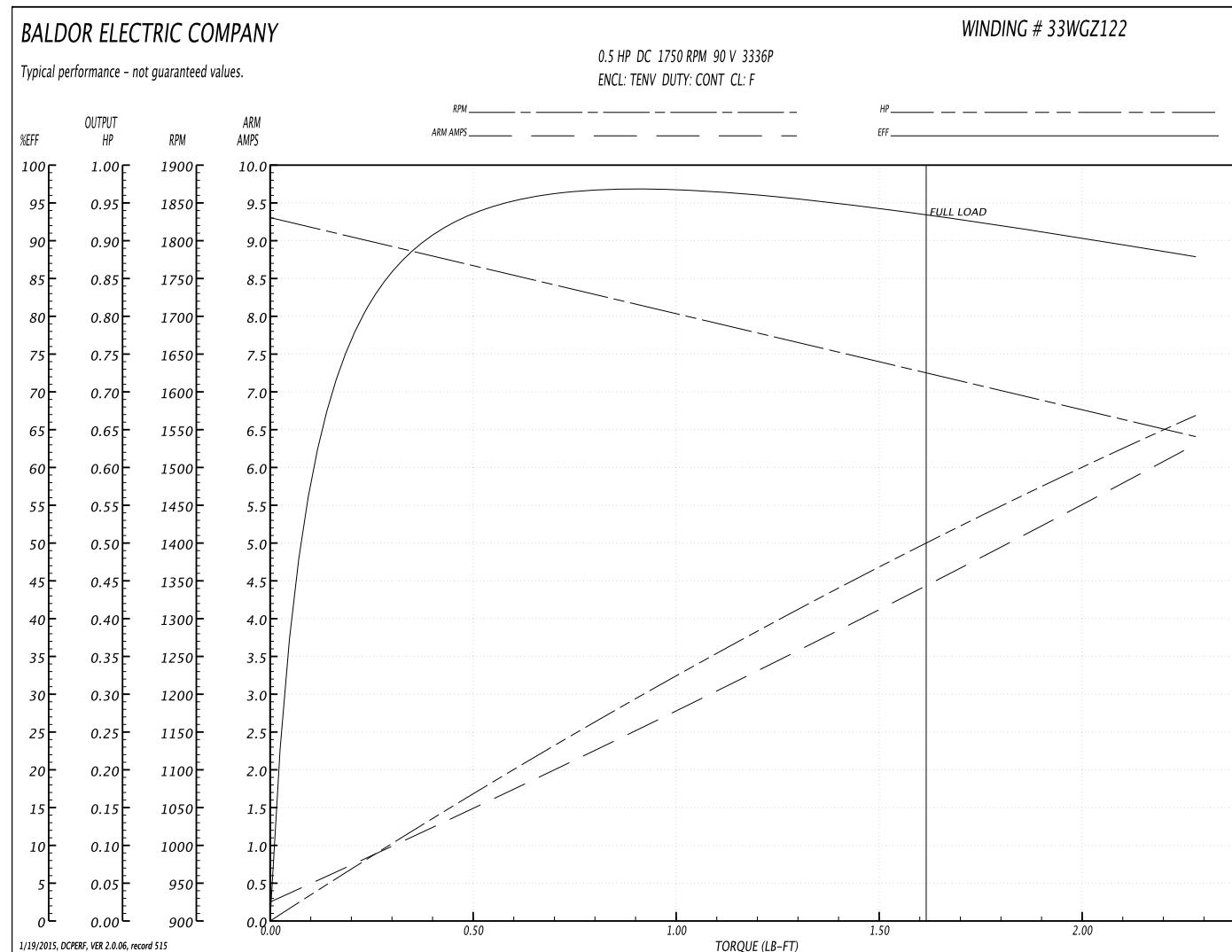


**BALDOR • RELIANCE**

Product Information Packet: CDPWD3330 - .5HP,1750RPM,DC,56C,3336P,TENV,F1

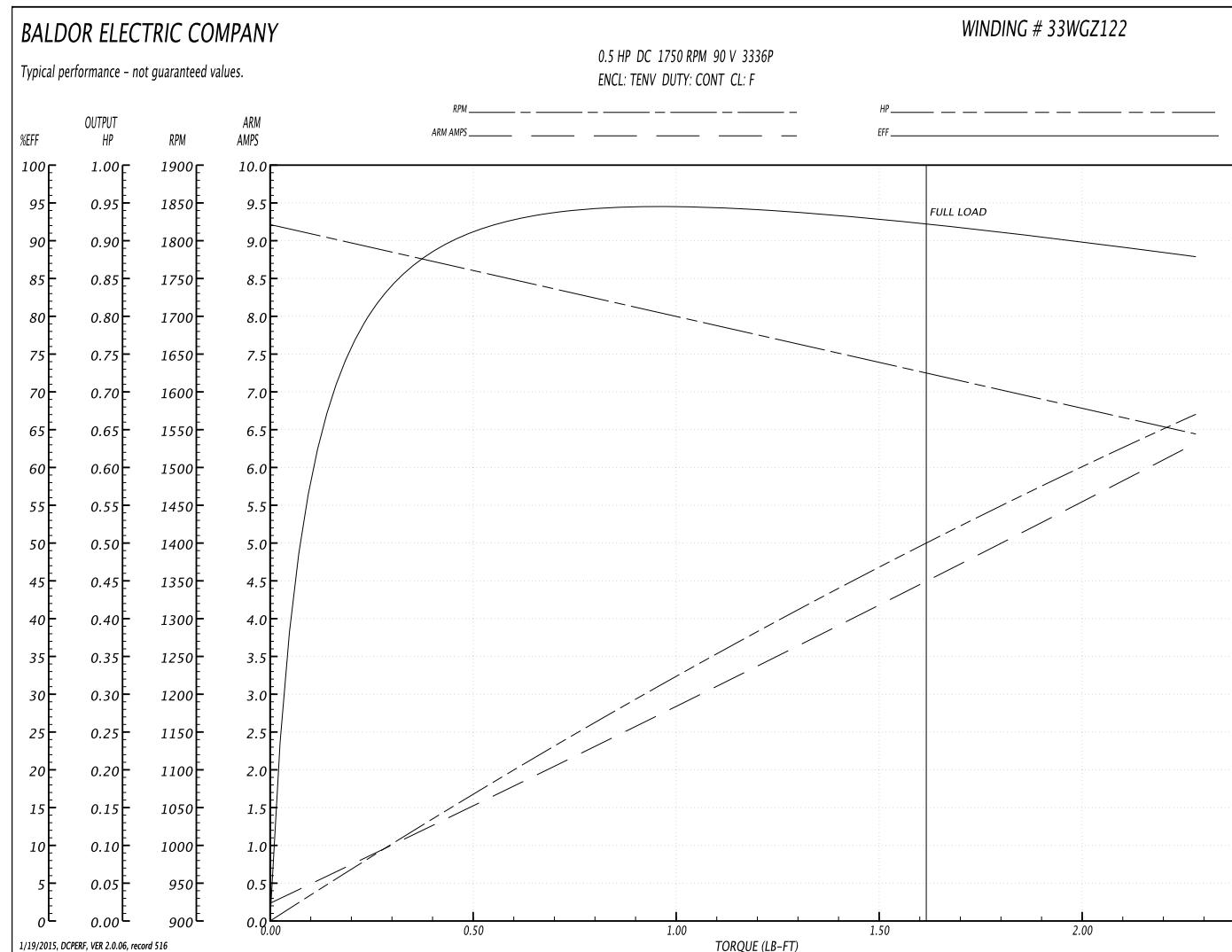
Performance Data at 90.0 Arm V, 0.5HP (Typical performance - Not guaranteed values)							
General Characteristics							
Armature Resistance:		1.2779 ohms			Commutating Winding Resistance:		
Series Winding Resistance:					Shunt Winding Resistance:		
Armature Inductance:		15.798 mH			Armature Inertia:		
Maximum Rated RPM With Field Weakening:					Maximum Allowable Inrush Amps:		
Load Characteristics							
Load Point	1	2	3	4	5	6	7
Armature Amps:	0.24	1.25	2.1	3.15	4.05	5.36	6.25
RPM:	1835.0	1793.0	1721.0	1672.0	1648.0	1584.0	1549.0
Torque (LB-FT):	0.0	0.38	0.76	1.14	1.5	1.9	2.28

Performance Graph at 90.0 Arm V, 0.5HP Typical performance - Not guaranteed values



Performance Data at 90.0 Arm V, 0.5HP (Typical performance - Not guaranteed values)							
General Characteristics							
Armature Resistance:	1.2525 ohms			Commutating Winding Resistance:			
Series Winding Resistance:				Shunt Winding Resistance:			
Armature Inductance:	15.413 mH			Armature Inertia:			
Maximum Rated RPM With Field Weakening:				Maximum Allowable Inrush Amps:			
Load Characteristics							
Load Point	1	2	3	4	5	6	7
Armature Amps:	0.24	1.15	2.35	3.16	4.07	5.37	6.3
RPM:	1835.0	1770.0	1723.0	1683.0	1624.0	1588.0	1559.0
Torque (LB-FT):	0.0	0.38	0.76	1.14	1.5	1.9	2.28

Performance Graph at 90.0 Arm V, 0.5HP Typical performance - Not guaranteed values

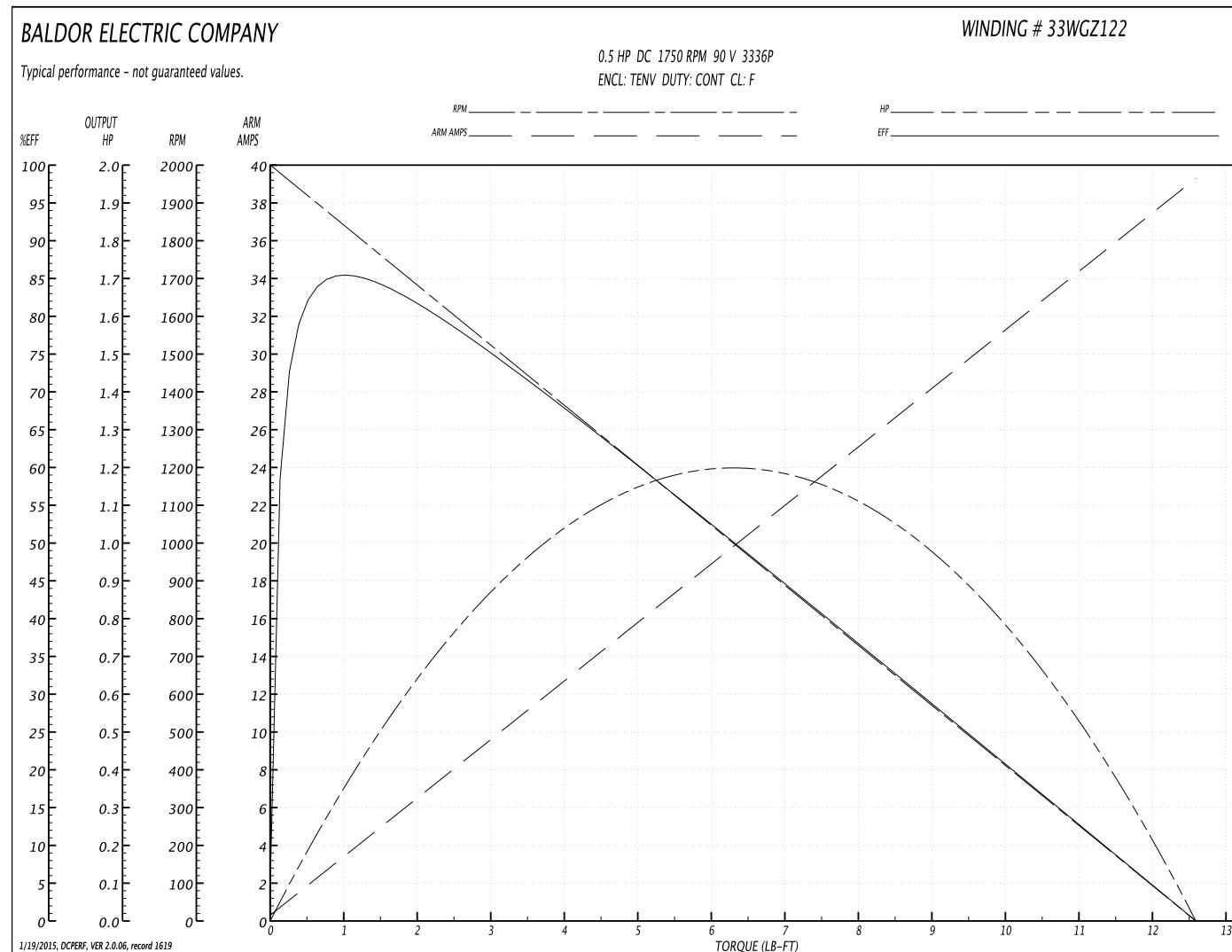


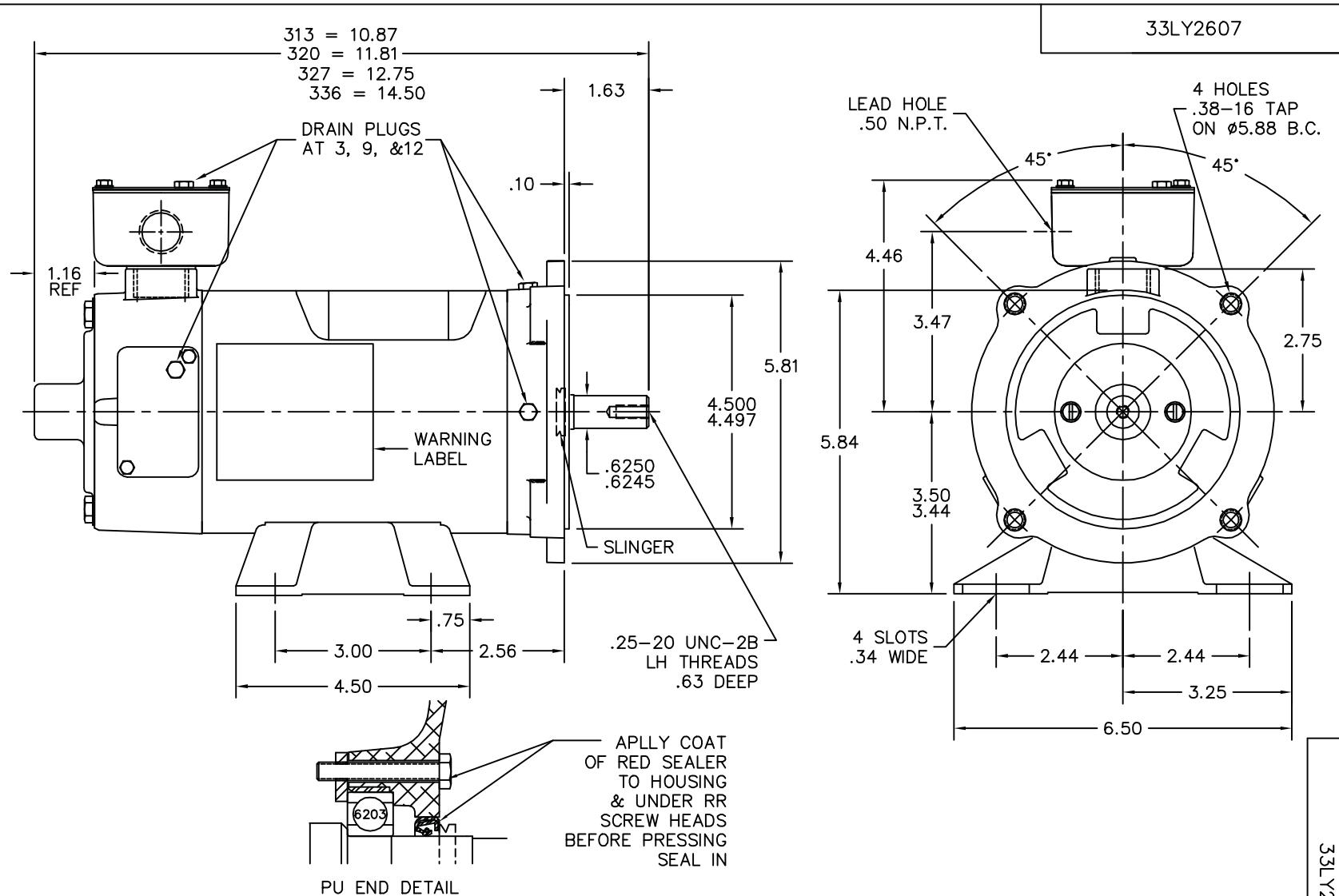
**BALDOR • RELIANCE**

Product Information Packet: CDPWD3330 - .5HP,1750RPM,DC,56C,3336P,TENV,F1

Performance Data at 90.0 Arm V, 0.5HP (Typical performance - Not guaranteed values)							
General Characteristics							
Armature Resistance:	1.22 ohms			Commutating Winding Resistance:			
Series Winding Resistance:				Shunt Winding Resistance:			
Armature Inductance:	15.574 mH			Armature Inertia:			
Maximum Rated RPM With Field Weakening:				Maximum Allowable Inrush Amps:	44.0		
Load Characteristics							
Load Point	1	2	3	4	5	6	7
Armature Amps:	0.32	6.51	12.7	18.89	25.08	31.28	39.3
RPM:	2000.0	1682.0	1365.0	1047.0	729.0	412.0	0.1
Torque (LB-FT):	0.0	2.0	4.0	6.0	8.0	10.0	12.59

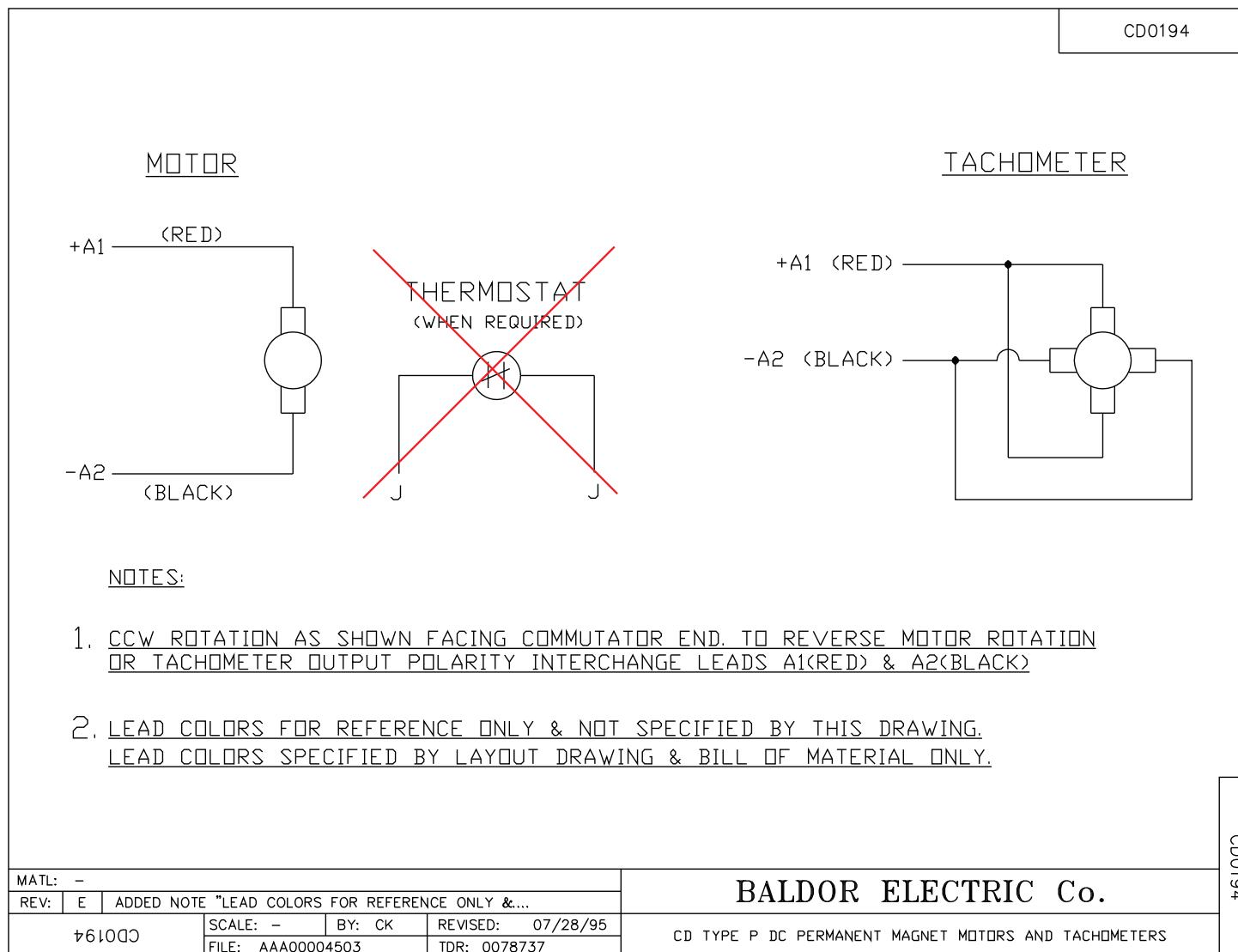
Performance Graph at 90.0 Arm V, 0.5HP Typical performance - Not guaranteed values





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

EV. DESC: DEL NOTE ".09 SLOT"			BALDOR	
EV. LTR: A	VERSION: 01	TDR: 000000796453		
ILE: \AAA\00196\909	REVISED: 06:42:20 04/24/2013		HOR	TENV 33PM NEMA 56CZ,.25-20 UNC-2B LH THDS, WASHDOWN SP#9
ITL: -	BY: ENROSTO		SH 1 of 1	

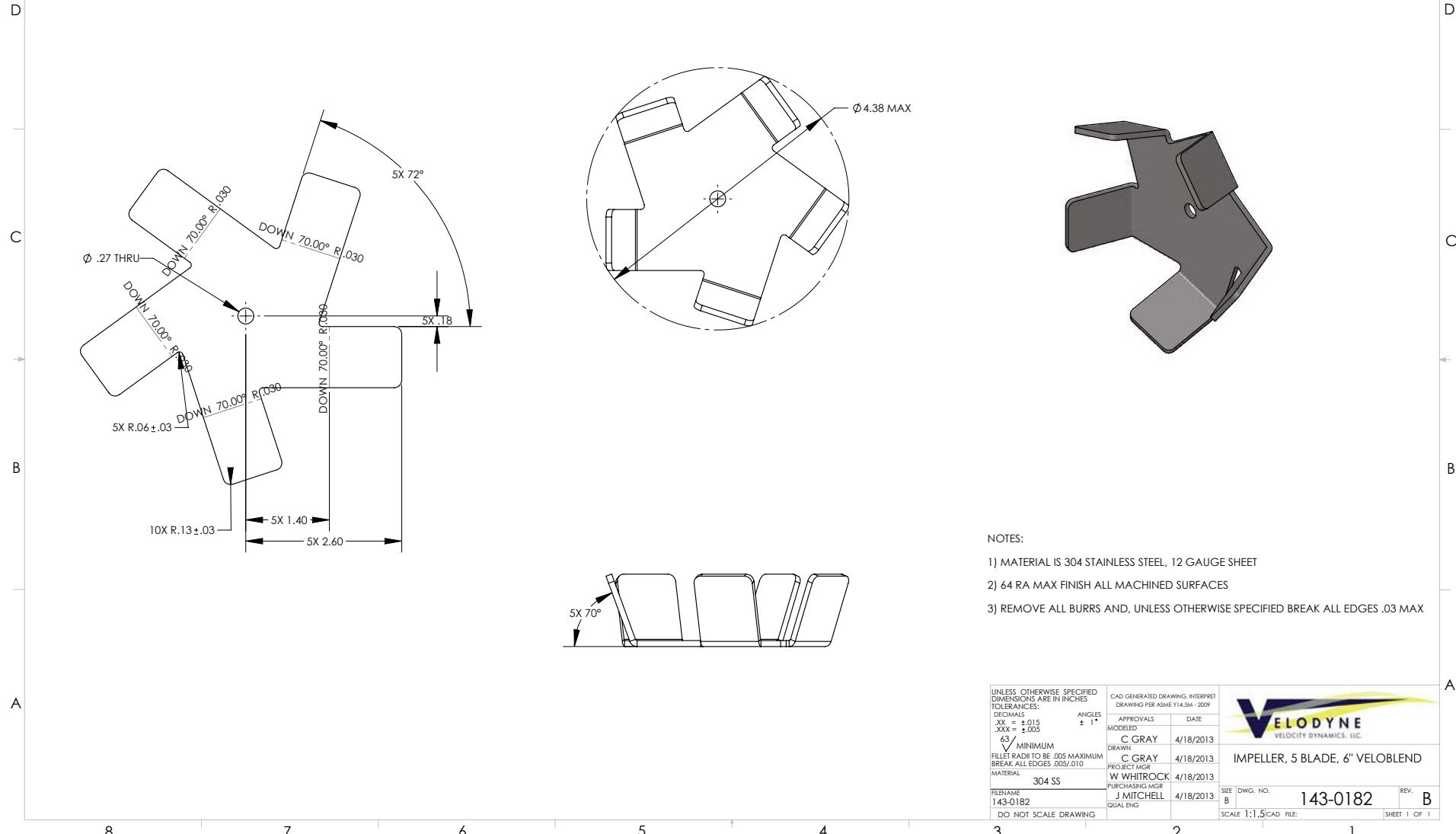


3.2.3.2 Impeller



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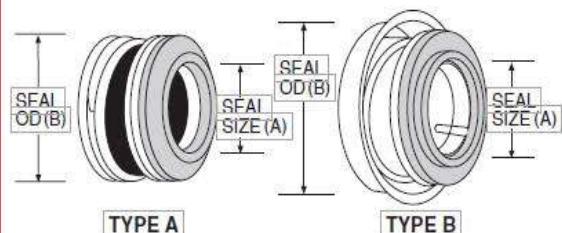
		REVISIONS		
REV	ECO	DESCRIPTION	DATE	APPROVED
A		INITIAL RELEASE	4/18/13	C GRAY
B		UPDATED DESCRIPTION	4/8/16	H COOK



221-0007 REV C
 SEAL, MECHANICAL, ROTARY, 5/8" SHAFT
 CRW 2/6/15

5/8" ROTARY SHAFT SEAL

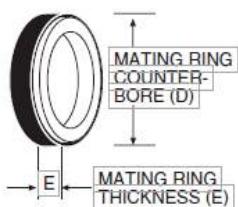
- Type 16 seal
- 304 stainless steel spring and housing
- Viton diaphragm
- Carbon seal & Ceramic seat
- Operating temperatures -25 to 400 °F
- Industry standard seal #200V-CMS
- US SEAL 200V-CMS
- McMaster-Carr #9281K62



SEAL HEADS – TYPES A and B

Identify seal head type - Determine Seal Size:
 Measure the inside diameter (ID) (dimension A)
 Measure the outside diameter (OD) (dimension B)

The operating height is generally the same for all A and B seals of the same shaft size. More positive identification will result from calculating the mating ring dimensions below. If unable to positively identify the seal, consult U.S. Seal Mfg.



MATING RING and GASKET

Identify the mating ring design from those shown on inside of front cover.
 Measure OD of the gasket while assembled on mating ring and subtract approximately .016" additional for rubber squeeze to obtain counterbore dimension (dimension D).
 Measure the combined insert and gasket width (dimension E).

Use the Dimensional Cross Reference guide (pages 130-179) to find the part number of the seal you need, start with Seal Size and find the line in the tables that matches the dimensions and material code.

3.2.3.4 Pressure Relief Valve



GRAINGER
FOR THE ONES WHO GET IT DONE

248-0108
VALVE, RELIEF
1/2", BRASS,
50-175I



Relief Valve, 1/2 In, Brass, M x FNPT

Relief Valve, Inlet/Outlet 1/2 In, MNPT x FNPT Connection, Material of Construction Brass, Pressure Range 50 To 175 PSI, Spring Material Stainless Steel, Temp Range 0 To 180 F, Standards ANSI Z21.22

Grainger Item #	1X624
Brand	WATTS
Mfr. Model #	530-1/2
Ship Qty.	1
Sell Qty. (Will-Call)	1
Ship Weight (lbs.)	0.35
Usually Ships	Today
Catalog Page No.	3672

Price shown may not reflect your price. Log in or register.

Additional Info

Calibrated Pressure and Vacuum Relief Valves

All have a brass body, stainless steel spring, and Buna N disc.

Calibrated Pressure

Protect against excessive pressure build-up in systems that contain water, oil, or air.

Uses: Ideally suited for bypass thermal relief.

Pressure range: 50 to 175 psi
Max. temp.: 180 DegreeF
■
■

Tech Specs

Item: Relief Valve

Inlet/Outlet (In.): 1/2

Connection: MNPT x FNPT

Material of Construction: Brass

Pressure Range: 50 to 175 psi **Spring Material:** Stainless Steel

Temp. Range (F): 0 To 180

Height (In.): 3

Standards: ANSI Z21.22

Notes & Restrictions

Note: Not to be used as an operating control.

MSDS

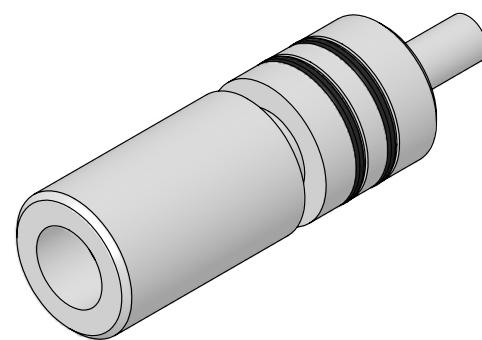
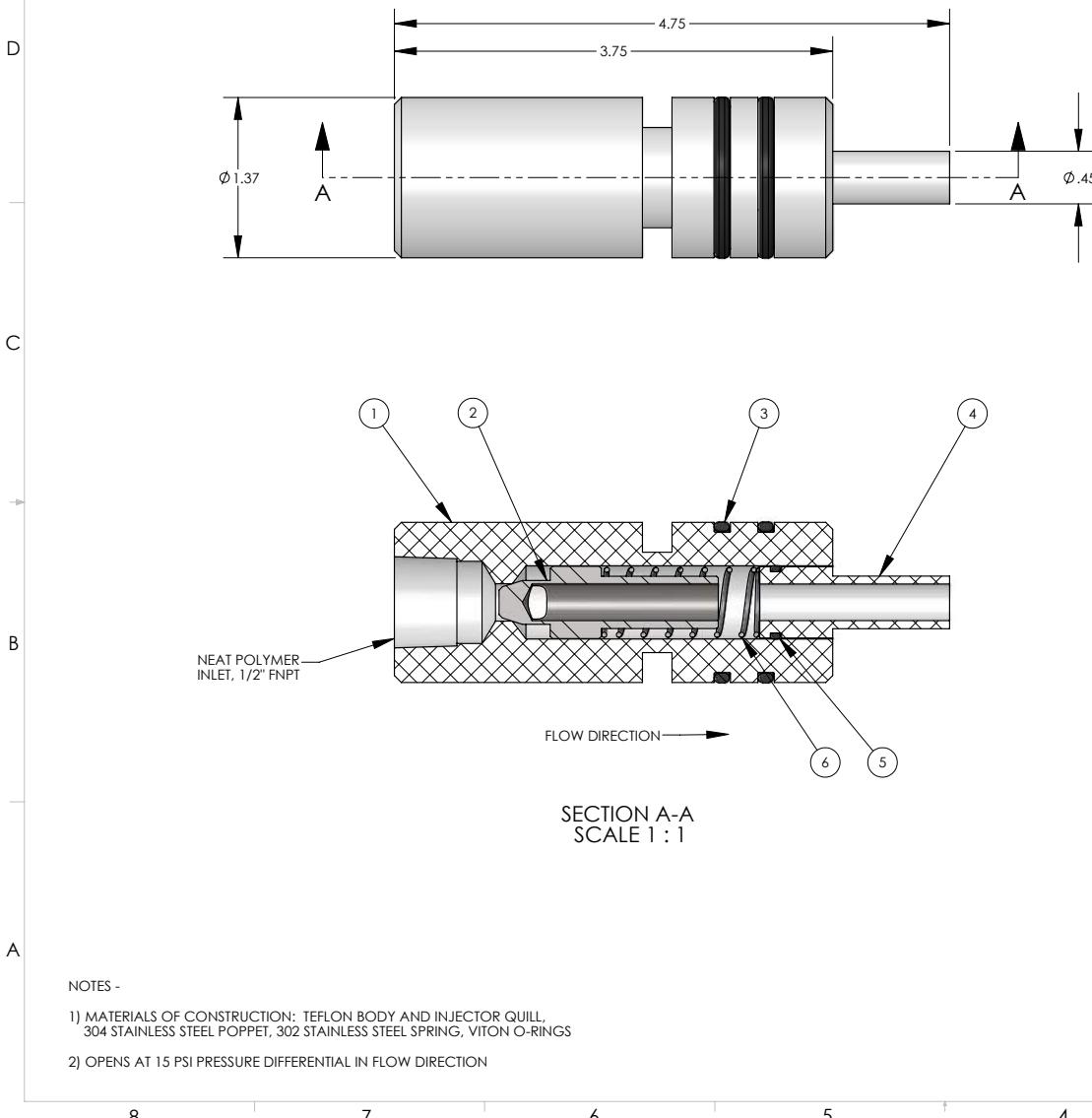
This item does not require a **Material Safety Data Sheet (MSDS)**.

3.2.3.5 Check Valve



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REVISIONS				
REV	ECO	DESCRIPTION	DATE	APPROVED
A	JS050331	INITIAL RELEASE AS A-05001	3/31/05	J SKUBA
B	EC10159	CHANGE TO LIGHTER SPRING (WAS 20 LB/IN AND 40PSI)	3/13/15	C WELLS



ITEM #	NUMBER	DESCRIPTION	QTY
1	200-0040	BODY, CHECK VALVE,	1
2	200-0041	POPPET, CHECK VALVE,	1
3	221-0022	O-RING, 2-123, VITON	2
4	200-0039	INJECTOR, CHECK VALVE,	1
5	221-0016	O-RING, 2-014, VITON	1
6	295-0424	SPRING, COMP., .6 OD X 1.5 FL, 5.6 LB/IN	1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: DECIMALS XX.X ± 0.015 XXX.X ± 0.005 63 ✓ MINIMUM FILE # 248-0077 MATERIAL	ANGLES ± 1° DRAWN P PLACHE PROJECT MGR	CAD GENERATED DRAWING, INTERPRET DRAWING PER ANSI Y14.5M - 1994 APPROVALS MODELED JB SKUBA DRAWN P PLACHE PROJECT MGR
FILENAME 248-0077	PURCHASING MGR	QUAL ENG
DO NOT SCALE DRAWING		

CHECK VALVE, VELOBLEND TEST	
SIZE DWG. NO. B	REV. B
SCALE 1:1	CAD FILE: 248-0077
SHEET 1 OF 1	

3.2.3.6 Drain Valve



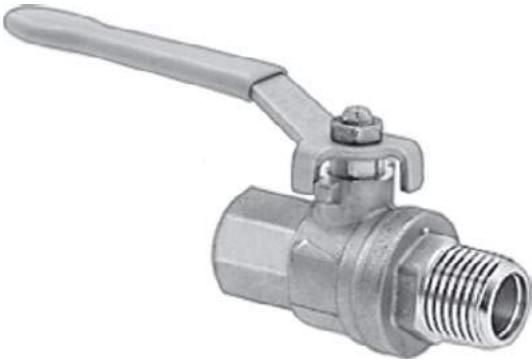
McMASTER-CARR OVER 555,000 PRODUCTS
(630) 833-0300
(630) 834-9427 (fax)
chi.sales@mcmaster.com
Text 75420

248-0492 REV A
VALVE, BALL, 1/2" MNPT - 1/2" FNPT,
BRASS
CRW 1/13/15

Brass Ball Valve

1/2" NPT Connection, Female x Male

47865K43



Pipe Size	1/2"
End-to-End Length	2 3/4"
Maximum Pressure for Water, Oil, and Inert Gas	
1/4"-2"	600 psi @ 100° F
2 1/2"-4"	450 psi @ 100° F
Maximum Pressure for Steam	150 psi @ 366° F
Temperature Range	-50° to +400° F
Vacuum Rating	29.9" Hg
Additional Specifications	NPT Female x Male Lever

The choice for simple on/off control in general applications. Body is brass, ball is chrome-plated brass, and seats are PTFE. Valves have unrestricted flow (full port). Valves with up to 2" pipe size or tube size are UL and C-UL certified.

Male x female have PTFE packing. Valves with up to 2" pipe size are CSA and CSA-US certified and FM approved.

3.2.4 Solenoid Valve



248-0023

VALVE, SOLENOID, 3/4" FNPT, BRASS
7/5/07

BURKERT SOLENOID VALVE

COMPONENT	SOLENOID VALVE					
SERVICE APPLICATION	<input checked="" type="checkbox"/> PRIMARY DILUTION WATER					
	<input type="checkbox"/> SECONDARY DILUTION WATER					
	<input type="checkbox"/> TANK FILL					
MANUFACTURER	BURKERT					
TYPE	2-WAY, NORMALLY CLOSED					
PRESSURE RANGE	0 TO 140 PSI (10 bar)					
MAXIMUM FLUID TEMPERATURE	194° F					
MAXIMUM AMBIENT TEMPERATURE	131° F					
SOLENOID ENCLOSURE	IP65					
DUTY CYCLE	100%					
ELECTRICAL RATINGS	24, 120, 240, 480 VAC; 60 HZ 110, 220 VAC; 50 HZ 6, 12, 24, 120, 240 VDC 18 WATTS MAXIMUM (2" VALVE)					
POWER CONSUMPTION:		VALVE (INCH)				
		1/2	3/4	1	1-1/2	2
INRUSH (VA)		36	38	160	202	202
HOLD (VA)		1	14	38	38	38
HOLD (W)		8	8	18	18	18

MATERIALS OF CONTRUCTION

BODY	BRASS
INNER VALVE	BRASS
SEAL	NBR
COIL	POLYAMIDE (3/8" – 3/4" VALVE) EPOXY (1" – 2" VALVE)

VALVE SIZES

BURKERT PN*		Cv FLOW FACTOR	SIZE
	456-540G	4.19	0.5"
<input checked="" type="checkbox"/>	456 544U	10.49	0.75"
	457-340L	12.82	1.0"
	457-346E	34.95	1.5"
	457-349R	34.95	2.0"

Breather Vents

Corrosion-Resistant Breather Vents

Avoid corrosion in damp environments. These vents are often used to prevent excess pressure in cylinders, gear boxes, and tanks. They trap particles down to 100 microns. Use with air and inert gas. Connection is NPT male.

Type 316 stainless steel vents have a porous Type 316 stainless steel body with a Type 304 stainless steel fitting. Max. pressure is 150 psi. Max. temp. is 400°F.

Polypropylene vents can be cleaned with mineral spirits. Body and fitting are polypropylene. Max. pressure is 100 psi. Max. temp. is 150°F.

Pipe Size	Max. scfm @ 100 psi	Hex Ht.
-----------	---------------------	---------

Hex Size/Dia.



Type 316
Stainless
Steel



Polypropylene

Type 316 Stainless Steel Vents

1/8.....	26.....	1/2".....	7/16".....	4456K11
1/4.....	35.....	11/16"....	9/16".....	4456K12
3/8.....	87.....	13/16"....	11/16".....	4456K13
1/2.....	131.....	15/16"....	7/8".....	4456K14
3/4.....	219.....	15/16"....	11/16".....	4456K15
1.....	306.....	11/4"....	15/16".....	4456K16

Polypropylene Vents

1/8.....	1.....	7/16"....	1/2".....	4471K11
1/4.....	3.....	1/2"....	11/16".....	4471K12
3/8.....	9.....	11/16"....	15/16".....	4471K13
1/2.....	10.....	11/16"....	15/16".....	4471K14
3/4.....	20.....	11/8"....	11/2"....	4471K15
1.....	22.....	13/8"....	17/8".....	4471K16

194-1976 A1

**VENT, BREATHER,
POLYPROPYLENE, 1"**

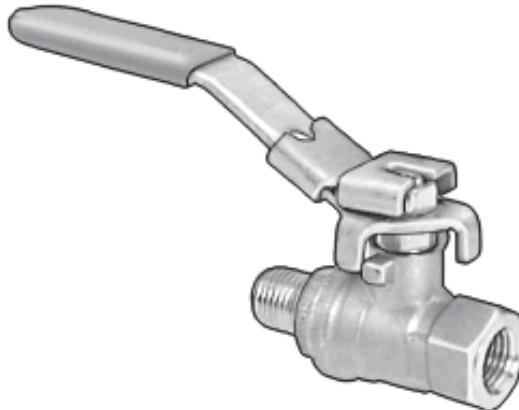
MNPT

McMaster-Carr 4471K16

McMASTER-CARR®

248-0001 REV A
VALVE, BALL, $\frac{1}{4}$ " MNPT – $\frac{1}{4}$ " FNPT, BRASS
2/18/08

1/4" BRASS BALL VALVE



- $\frac{1}{4}$ " male NPT – $\frac{1}{4}$ " female NPT
- Brass body, chrome plated brass ball and stem
- PTFE seats, glass filled PTFE packing
- Carbon steel handle with PVC grip
- Maximum pressure 600 psi @ 100 °F for water, oil, and gas
- Maximum pressure 150 psi @ 366 °F for steam
- Vacuum rating 29.92" Hg
- Operating temperature -40 °F – 366 °F
- 2.33" end to end
- UL listed, WW-V-35C compliant, CSA-US certified
- McMaster-Carr #47865K41

Figure 100A
STAINLESS STEEL BALL VALVES

248-0022 A2
 VALVE, BALL, 1/2" FNPT, 304
 BGH, 3/10/2016

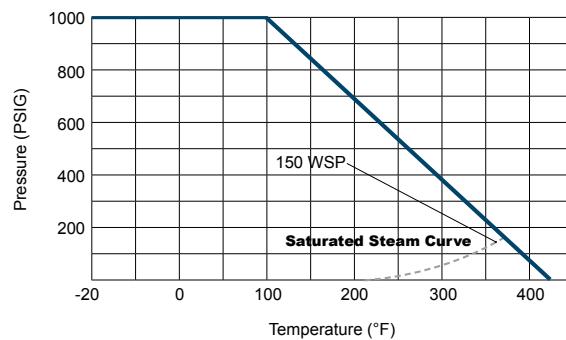
1 PC STANDARD PORT 1000 CWP

Features:

- 1000 PSI CWP Non-Shock
- 150 PSI WSP
- Blow-out Proof Stem
- Investment Cast Body
- Threaded NPT Ends
- Stainless Steel Handle
- Locking Lever
- RTFE Seats
- Vented Ball
- Manufactured Silicone Free

Standards:

- Design: ASME B16.34,
MSS SP-110
- End Connections: ASME B1.20.1
- Seat/Shell Test: MSS SP-110



Cv & Weight

Size	Cv	Wt (Lbs)
1/4	10	0.15
3/8	10	0.25
1/2	12	0.43
3/4	16	0.64
1	18	1.00
1-1/4	36	1.52
1-1/2	48	1.98
2	58	3.27

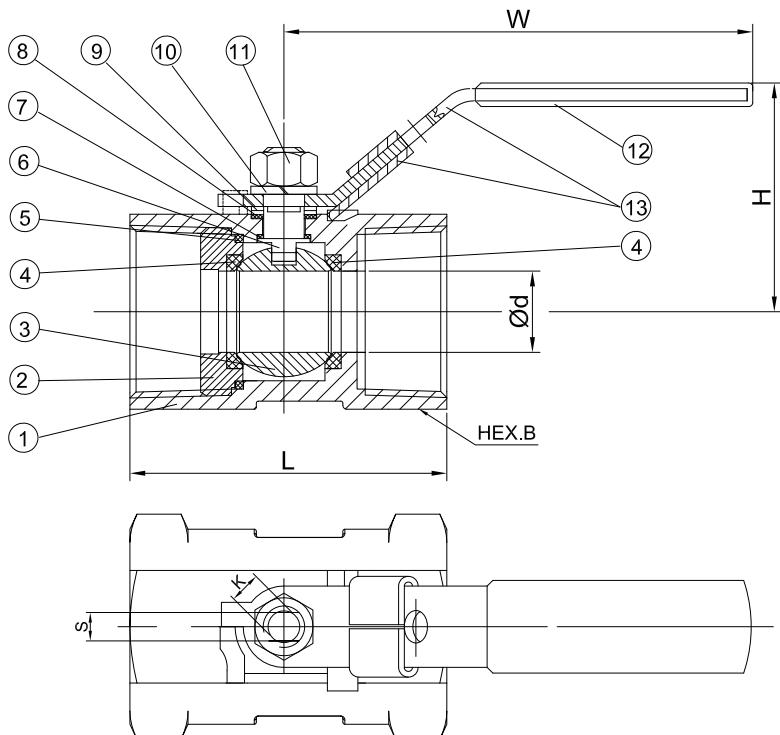
Figure Number Matrix

FNW 100A Size	
SIZE CODE	
1/4 = B	1 = G
3/8 = C	1-1/4 = H
1/2 = D	1-1/2 = J
3/4 = F	2 = K



Figure 100A
STAINLESS STEEL BALL VALVES

1 PC STANDARD PORT 1000 CWP



Dimensions (inches)

SIZE	$\varnothing d$	L	H	W	K	S	B
1/4	0.20	1.63	1.34	2.76	M5x0.8	0.12	0.67
3/8	0.28	1.81	1.38	3.15	M6x1.0	0.16	0.83
1/2	0.36	2.28	1.73	3.62	M8x1.25	0.20	0.98
3/4	0.49	2.40	1.81	3.62	M8x1.25	0.20	1.26
1	0.59	2.89	2.01	4.53	M10x1.5	0.24	1.50
1-1/4	0.79	3.07	2.28	4.53	M10x1.5	0.24	1.89
1-1/2	0.98	3.35	2.60	5.00	M12x1.75	0.31	2.09
2	1.26	4.02	2.83	5.00	M12x1.75	0.31	2.60

Standard Materials

Ref. No.	Description	Material	Qty
1	Body	ASTM A351 Gr. CF8M Stainless	1
2	End Cap	ASTM A351 Gr. CF8M Stainless	1
3	Ball	316SS Stainless	1
4	Seat	PTFE	2
5	Body Gasket*	PTFE	1
6	Stem	316SS Stainless	1
7	Thrust Washer	PTFE	1
8	Stem Packing	PTFE	1
9	Gland	304SS Stainless	2
10	Stem Washer	304SS Stainless	1
11	Stem Nut	ASTM A194-8 Stainless	1
12	Handle Sleeve	Vinyl Plastic	1
13	Locking Handle	304SS Stainless	1

* 1-1/4"~2" only, gasket is integral to seat on smaller sizes.



PVC SCHEDULE 80 FITTINGS

80-2-1000

Performance Engineered & Tested



Full 1/4" Through 12" Availability

Spears comprehensive line of injection molded PVC fittings offers a variety of configurations in molded Schedule 80 sizes 1/4" through 12" conforming to ASTM D 2467 and Spears exclusive CL150 Flanges in sizes 1/2" through 16".

Exceptional Chemical & Corrosion Resistance

Unlike metal, PVC fittings never rust, scale, or pit, and will provide many years of maintenance-free service and extended system life.

High Temperature Ratings

PVC thermoplastic can handle fluids at service temperatures up to 140° F (60°C), allowing a wide range of process applications, including corrosive fluids.

Lower Installation Costs

Substantially lower material costs than steel alloys or lined steel, combined with lighter weight and ease of installation, can reduce installation costs by as much as 60% over conventional metal systems.

SPEARS Schedule 80 PVC fitting designs combine years of proven experience with computer generated stress analysis to yield the optimum physical structure and performance for each fitting. Material reinforcement is uniformly placed in stress concentration areas for substantially improved pressure handling capability. Resulting products are subjected to numerous verification tests to assure obtaining the very best PVC fittings available.

Higher Flow Capacity

Smooth interior walls result in lower pressure loss and higher volume than conventional metal fittings.

Additional Fabricated Configurations through 36"

Extra large, hard-to-find, and custom configurations are fabricated from NSF Certified pipe. Fittings are engineered and tested to provide full pressure handling capabilities according to Spears specifications.

Advanced Design Specialty Fittings

Spears wide range of innovative, improved products include numerous metal-to-plastic transition fittings and unions with Spears' patented stainless steel reinforced (SR) plastic threads.

PVC Valves

SPEARS PVC Valve products are available for total system compatibility and uniformity; see SPEARS' THERMOPLASTIC VALVES PRODUCT GUIDE & ENGINEERING SPECIFICATIONS (V-4).

Sample Engineering Specifications

All PVC Schedule 80 fittings shall be produced by Spears Manufacturing Company from PVC Type I, cell classification 12454, conforming to ASTM Standard D 1784. All injection molded PVC Schedule 80 fittings shall be Certified for potable water service by NSF International and manufactured in strict compliance to ASTM D 2467. All fabricated fittings shall be produced in accordance with Spears General Specifications for Fabricated Fittings. All PVC flanges shall be designed and manufactured to meet CL150 bolt pattern per ANSI Standard B16.5 and rated for a maximum internal pressure of 150 psi, non-shock at 73°F.



PROGRESSIVE PRODUCTS FROM SPEARS INNOVATION & TECHNOLOGY

Visit our web site: www.spearsmfg.com

PVC Thermoplastic Pipe Temperature Pressure De-Rating

To determine the maximum internal pressure rating at an elevated temperature, simply multiply the pipe pressure rating at 73°F by the percentage specified for the desired temperature.

System Operating Temperature °F (°C)	73 (23)	80 (27)	90 (32)	100 (38)	110 (43)	120 (49)	130 (54)	140 (60)
PVC	100%	90%	75%	62%	50%	40%	30%	22%

NOTE: Valves, Unions and Specialty Products have different elevated temperature ratings than pipe.

PVC Basic Physical Properties

Properties	ASTM Test Method	PVC
Mechanical Properties, 73°F		
Specific Gravity, g/cm ³	D 792	1.41
Tensile Strength, psi	D 638	7,000
Modulus of Elasticity, psi	D 638	440,000
Compressive Strength, psi	D 695	9,000
Flexural Strength, psi	D 790	13,200
Izod Impact, notched, ft-lb/in	D 256	.65
Thermal Properties		
Heat Deflection Temperature, °F at 66 psi	D 648	165
Thermal Conductivity, BTU/hr/sq ft/°F/in	C 177	1.2
Coefficient of Linear Expansion, in/in/°F	D 696	3.0 x 10 ⁻⁵
Flammability		
Limiting Oxygen Index, %	D 2863	43
UL 94 Rating		94V-0
Other Properties		
Water Absorption, % 24 hr.	D 570	.05
Industry Standard Color		White / Dark Gray
ASTM Cell Classification	D 1784	12454
NSF Potable Water Approved		Yes

PVC Chemical Resistance

PVC is generally inert to most mineral acids, bases, salts and paraffinic hydrocarbon solutions. For more information on PVC chemical resistance refer to the Chemical Resistance of Rigid Vinyls Based on Immersion Test, published by the GEON® company.

NOT FOR USE WITH COMPRESSED AIR OR GASES

Spears Manufacturing Company DOES NOT RECOMMEND the use of thermoplastic piping products for systems to transport or store compressed air or gases, or the testing of thermoplastic piping systems with compressed air or gases in above and below ground locations. The use of our product in compressed air or gas systems automatically voids any warranty for such products, and its use against our recommendation is entirely the responsibility and liability of the installer.

WARNING: DO NOT USE COMPRESSED AIR OR GAS TO TEST ANY PVC OR CPVC THERMOPLASTIC PIPING PRODUCT OR SYSTEM, AND DO NOT USE DEVICES PROPELLED BY COMPRESSED AIR OR GAS TO CLEAR SYSTEMS. THESE PRACTICES MAY RESULT IN EXPLOSIVE FRAGMENTATION OF SYSTEM PIPING COMPONENTS CAUSING SERIOUS OR FATAL BODILY INJURY.



SPEARS® MANUFACTURING COMPANY

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Section 4

Instrumentation

4.1 Differential Pressure Switch



182-0272 A2
SWITCH, PRESSURE, DIFFERENTIAL 9 - 60
PSI, 1/4" FNPT, NEMA 4X
BGH, 6/18/2015



B-Series Switches – Pressure, Differential Pressure & Hydraulic

FEATURES

B-Series switches have proven reliable in such harsh environments as:

- Offshore oil rigs
- Chemical and petrochemical plants
- Pulp and paper mills
- Steel mills
- Power plants
- Water and sewage-treatment plants
- Other corrosive environments



Ashcroft Inc. supplies highly reliable Ashcroft® switches and controls for industrial and process applications. We begin with rock-solid designs, matching the most appropriate technology with the safety and reliability requirements of the applications. The materials of construction are specified to Ashcroft's exacting standards, and product is built to last in the toughest applications. Our modern, responsive manufacturing facility is supported by an extensive network of stocking distributors and factory sales offices located in virtually every part of the world. Special application assistance is always just a telephone call away.

The Ashcroft B-Series switch line is designed to satisfy most switch requirements. Materials of construction have been selected for long life. A wide variety of precision switch elements are available to meet every application requirement, including hermetically sealed contacts for added reliability and safety. The actuators we use have been proven in more than 20 years of service in the world's plants and mills. Special designs are available for fire safety, NACE, limit control and other more stringent requirements. Simplicity and ease of use are stressed to improve reliability of the installation.

Applications include: pumps, compressors, washers, filters, degreasers, evaporators, recovery systems, food processing, ground support equipment, reverse osmosis systems, heat exchangers, hydraulic systems, lubrication systems, marine equipment, textile machinery, heating and air conditioning equipment.

All specifications are subject to change without notice.
All sales subject to standard terms and conditions.
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BULLETIN SW10-P

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Tel: 203-378-8281 • Fax: 203-385-0408
email: info@ashcroft.com • www.ashcroft.com

B-Series Switches – Pressure, Differential Pressure & Hydraulic

Pressure & Differential Pressure Switches

B-Series pressure, differential pressure and vacuum switches use two different actuators depending on setpoint requirements. For setpoints between 2 and 3000 psi, the simple, rugged diaphragm-sealed piston actuator is used. This design features high reliability and choice of actuator seal materials for virtually every application. An optional welded design is also available for setpoints up to 1000

psi for maximum reliability. This design is available in 316 SS or Monel. Differential pressure models use a unique, dual diaphragm-sealed piston design that features very high static operating pressures and small size.

For setpoints between 4.5 and 150 inches of H₂O, a large diaphragm is used for increased sensitivity in both pressure and differential pressure designs with good choice of materials

of construction.

All standard models feature ± 1 percent of range setpoint repeatability and a minimum of 400 percent of range proof pressures.

These standard designs perform well in applications where shock and vibration could be a problem and may be used in conjunction with Ashcroft diaphragm seals in extreme services such as slurries or abrasive process fluids.

~~PRESSURE/VACUUM SWITCHES~~

Nominal Range ⁽¹⁾			Overpressure Ratings		Approximate Deadband ⁽²⁾ Switch Element				
Vacuum	-30" Hg	-760mm Hg	Proof psi	Burst psi	20, 26, 27	21, 24, 31	50	22	32, 42
Compound									
-15" H ₂ O/	-375mm H ₂ O/	-3.7 kPa/	20	35	0.15-.75/	1.5-2.5/	0.4-2.0/	0.5-1.2/	2.1-3.5/
15" H ₂ O	375mm H ₂ O	7 kPa			0.15-.75	1.5-2.5	0.45-2.0	0.5-1.2	2.1-3.5
-30" H ₂ O/	-760mm H ₂ O/	-7.5 kPa/	20	35	0.30-.60	1.5-2.5	0.45-2.0	0.5-1.5	2.1-3.5/
30" H ₂ O	760mm H ₂ O	7.5 kPa			0.30-.60	1.5-2.5	0.45-2.0	0.5-1.5	2.1-3.5
-30" Hg/	-760mm Hg/	-100 kPa/	250	400	0.5-1.0/	2.0-3.0/	0.75-2.5/	0.7-1.8/	2.8-4.2/
15 psi	1.0 kg/cm ²	100 kPa			0.3-0.7	0.5-1.5	0.5-1.0	0.7-1.4	0.7-2.1
-30" Hg/	-760mm Hg/	-100 kPa/	250	400	1.0-1.5/	3.0-6.0/	1.2-4.5/	1.4-2.4	4.2-8.4/
30 psi	2.0 kg/cm ²	200 kPa			0.3-0.8	1.0-2.0	0.7-1.5	0.4-1.3	1.4-2.8
-30" Hg/	-760mm Hg/	-100 kPa/	250	400	2.0-3.0/	5.0-9.0/	2.5-7.0/	2.8-4.5	7.0-12.0/
60 psi	4.0 kg/cm ²	400 kPa			0.7-1.5	3.0-5.0	1.1-4.0	1.0-2.3	4.2-7.0
Pressure									
10" H ₂ O	250mm H ₂ O	2.5 kPa	20	35	0.2-0.5	1.0-2.0	0.35-1.5	0.4-1.0	1.4-2.8
30" H ₂ O	750mm H ₂ O	7.5 kPa	20	35	0.3-0.6	1.5-2.5	0.45-2.0	0.5-2.0	2.1-3.5
60" H ₂ O	1500mm H ₂ O	15 kPa	20	35	0.5-1.3	1.5-3.5	0.9-2.5	0.7-3.0	2.1-5.0
100" H ₂ O	2500mm H ₂ O	25 kPa	20	35	0.6-1.6	2.5-5.5	1.1-4.0	1.0-4.0	3.5-7.7
150" H ₂ O	3750mm H ₂ O	37 kPa	20	35	1.0-2.5	4.5-8.5	1.7-6.5	2.0-6.0	6.0-12.0
15 psi	1.0 kg/cm ²	100 kPa	500	1500	0.1-0.35	0.5-1.5	0.2-1.0	0.4-1.0	0.7-2.1
30 psi	2.0 kg/cm ²	200 kPa	500	1500	0.1-0.50	0.5-1.5	0.3-1.0	0.4-1.0	0.7-2.1
60 psi	4.0 kg/cm ²	400 kPa	500	1500	0.3-1.0	1.0-3.5	0.7-2.5	0.6-2.0	1.4-5.0
100 psi	7.0 kg/cm ²	700 kPa	1000	3000	0.5-1.7	1.5-5.0	1.1-3.5	1.0-4.5	2.1-7.0
200 psi	14 kg/cm ²	1400 kPa	1000	3000	1-3	5-13	2-9	3.0-7.5	7.0-18.2
400 psi	28 kg/cm ²	2800 kPa	2400	3000	4-7.5	5-24	5.5-15	4.0-11.0	7.0-33.6
600 psi	42 kg/cm ²	4200 kPa	2400	3000	4-11	9-30	7-20	5.0-23.0	2.6-42
1000 psi	70 kg/cm ²	7000 kPa	12000	18000	7-30	30-110	18-70	15-80	42-154
3000 psi	210 kg/cm ²	21000 kPa	12000	18000	15-60	80-235	37-160	30.0-230	112-325

~~DIFFERENTIAL PRESSURE SWITCHES~~

Nominal Range ⁽¹⁾			Pressure Ratings		Approximate Deadband ⁽²⁾ Switch Element						
			Static Working Pressure	Proof psi	20, 26, 27	21	24	31	50	22	32, 42
30" H ₂ O	750mm H ₂ O	7.5 kPa	5.4	21.6	0.3-0.6	1.5-2.5	0.45-2.0	0.5-2.0	2.1-3.5		
60" H ₂ O	1500mm H ₂ O	15 kPa	5.4	21.6	0.5-1.3	1.5-3.5	0.9-2.5	0.7-3.0	2.1-5.0		
100" H ₂ O	2500mm H ₂ O	25 kPa	5.4	21.6	0.6-1.6	2.5-5.5	1.1-4.0	1.0-4.0	3.5-7.7		
150" H ₂ O	3750mm H ₂ O	37 kPa	5.4	21.6	1.0-2.5	4.5-8.5	1.8-6.5	2.0-6.0	6.3-12.0		
15 psid	1.0 kg/cm ²	100 kPa	500	2000	0.5-1.0	2.0-5.0	0.7-3.5	0.7-1.4	2.8-7.0		
30 psid	2.0 kg/cm ²	200 kPa	500	2000	1.0-2.0	2.0-5.0	1.5-3.5	1.4-2.8	2.8-7.0		
60 psid	4.0 kg/cm ²	400 kPa	500	2000	2.0-4.0	3.0-6.0	3.0-4.5	2.8-5.6	4.2-8.5		
100 psid	7.0 kg/cm ²	700 kPa	1000	4000	4.0-10.0	11.0-20.0	7.0-15.0	6.0-14.0	16.0-28.0		
200 psid	14.0 kg/cm ²	1400 kPa	1000	4000	5.0-15.0	12.0-40.0	10.0-26.0	7.0-21.0	17.0-56.0		
400 psid	28.0 kg/cm ²	2800 kPa	1000	8000	10.0-20.0	20.0-60.0	15.0-40.0	14.0-28.0	28.0-84.0		
600 psid	42.0 kg/cm ²	4200 kPa	1000	8000	20.0-40.0	80.0-150.0	30.0-115.0	30.0-56.0	112.0-210.0		

Values shown are for zero static working pressure.

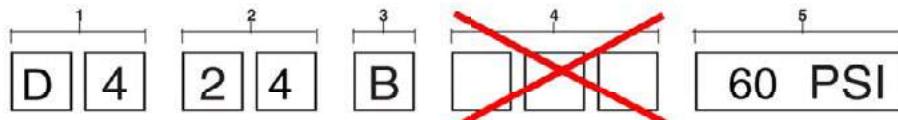
- NOTES:**
- Switches may generally be set between 15% and 100% of nominal range on increasing pressure. Consult factory for applications where setpoints must be lower.
 - All deadbands are given in English units as shown in the nominal range column. Deadbands shown are for switches with Buna N diaphragm. Approximate deadbands for optional diaphragms:

- Viton: Multiply Buna N value by 1.4
Teflon: Multiply Buna N value by 1.2
Stainless Steel: Multiply Buna N value by 1.7
Monel: Multiply Buna N value by 1.7
Dual Switch Element: Multiply single switch element value by 1.6 for approximate deadband.

B-Series Switches – Pressure, Differential Pressure & Hydraulic

B-SERIES PRESSURE AND DIFFERENTIAL PRESSURE SWITCH MODEL NUMBER:

To specify the exact switch desired, select entries from appropriate tables as shown in example below.



1 – ENCLOSURE	
B4	Pressure switch, Type 400, watertight enclosure meets NEMA 3, 4, 4X, 13 and IP66 requirements.
B7	Pressure switch, Type 700, explosion-proof enclosure meets Div. 1 & 2, NEMA 7, 9 and IP66 requirements.
D4	Differential pressure switch, Type 400, watertight enclosure meets NEMA 3, 4, 4X, 13 and IP66 requirements.
D7	Differential pressure switch, Type 700, explosion-proof enclosure meets Div. 1 & 2, NEMA 7, 9 and IP66 requirements.

2 – SWITCH ELEMENT SELECTION		
Order Code	Switch Elements UL/CSA Listed SPDT	
20 ⁽⁷⁾	Narrow deadband ac	15A, 125/250 Vac
21	Ammonia service	5A, 125/250 Vac
22 ⁽⁶⁾	Hermetically sealed switch, narrow deadband	5A, 125/250 Vac
23	Heavy duty ac	22A, 125/250 Vac
24 ⁽¹⁾	General purpose	15A, 125/250/480 Vac ½A, 125 Vdc ¼A, 250 Vdc; 6A, 30 Vdc
25 ⁽²⁾	Heavy duty dc	10A, 125 Vac or dc, ½ HP, 125 Vac or dc
26 ⁽⁷⁾	Sealed environment proof	15A, 125/250 Vac
27	High temperature 300°F	15A, 125/250 Vac
28 ⁽⁵⁾	Manual reset trip on increasing	15A, 125/250 Vac
29 ⁽⁵⁾	Manual reset trip on decreasing	15A, 125/250 Vac
31	Low level (gold) contacts	1A, 125 Vac
32	Hermetically sealed switch, general purpose	11A, 125/250 Vac 5A, 30 Vdc
42	Hermetically sealed switch, gold contacts	1A, 125 Vac
50	Variable deadband	15A, 125/250 Vac
UL/CSA Listed Dual (2 SPDT)		
61 ⁽⁷⁾	Dual narrow deadband	15A, 125/250 Vac
62 ⁽⁷⁾	Dual sealed environment proof	15A, 125/250 Vac
63	Dual high temp. 300°F	15A, 125/250 Vac
64	Dual general purpose	15A, 125/250/480 Vac ½A, 125 Vdc ¼A, 250 Vdc
65	Dual ammonia service	5A, 125/250 Vac
67 ^(4,6)	Dual hermetically sealed switch, narrow deadband	5A, 125/250 Vac
68 ⁽⁴⁾	Dual hermetically sealed switch, general purpose	11A, 125/250 Vac 5A, 30 Vdc
70	Dual low level gold contacts	1A, 125 Vac
71 ⁽⁴⁾	Dual hermetically sealed switch, gold contacts	1A, 125 Vac

3 – ACTUATOR SEAL					
Code and Material	Process Temperature Limits °F ⁽⁹⁾	Range			
		Vac. ~ H ₂ O	0-600 psi	1000 psi	3000 psi
B – Buna-N	0 to 150	•	•	•	•
v – viton	-20 to 300	•	•	•	
T – Teflon	0 to 150	•	•	•	•
S – 316L ⁽⁸⁾	0 to 300		•	•	
P – Monel ⁽⁸⁾	0 to 300		•	•	

4 – OPTIONS	5 – RANGE
Use table from page 5	Select from table on page 2

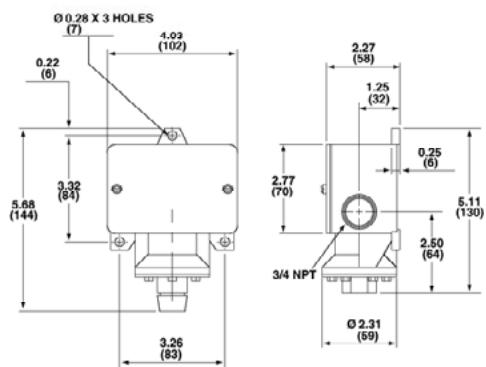
NOTES:

- 1 Standard switch.
- 2 Not available with psid ranges.
- 3 Dual switches are 2 SPDT snap-action switches, not independently adjustable.
- 4 Wires cannot be terminated inside B400 switch enclosure.
- 5 Not available with type 700 enclosure.
- 6 Estimated dc. rating, 2.5A, 28 Vdc (not UL listed).
- 7 Estimated dc rating, 0.4A, 120 Vdc (not UL listed).
- 8 Available on pressure only.
- 9 Ambient operating temperature limits -20 to 150°F, all styles, setpoint shift of ±1% of range per 50°F temperature change is normal. Switches are calibrated at 70°F reference.

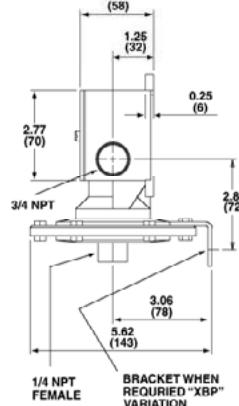
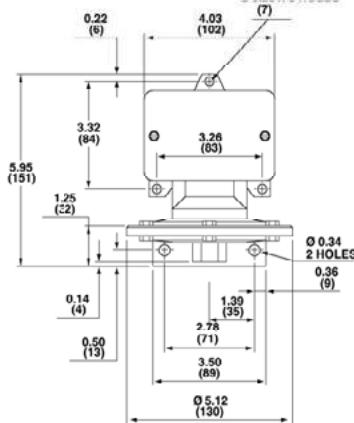
B-Series Switches – Pressure, Differential Pressure & Hydraulic

Dimensions – 400 Series

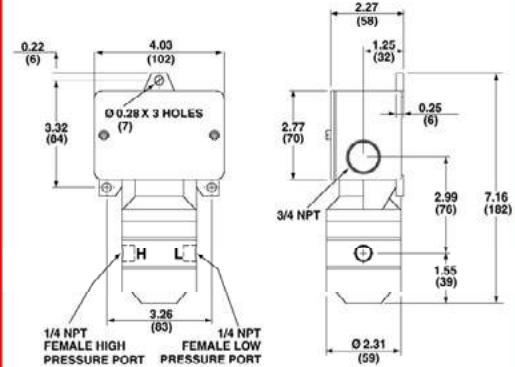
Pressure switch – psi ranges



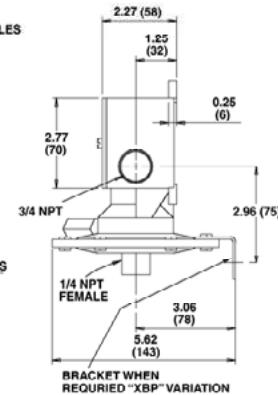
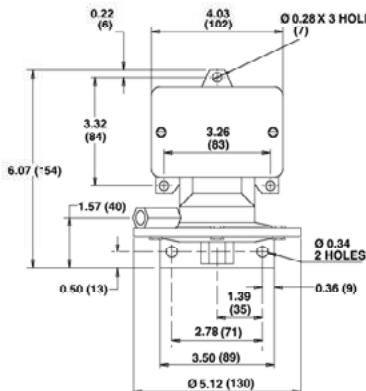
Pressure switch – inches of water ranges



Differential pressure switch – psi differential ranges



Differential pressure switch – inches of water ranges





202L LIQUID FILLED CENTER BACK MOUNT

Glycerine filled for added durability in applications where vibration or pulsation is present
Stainless steel case and bezel, copper alloy internals

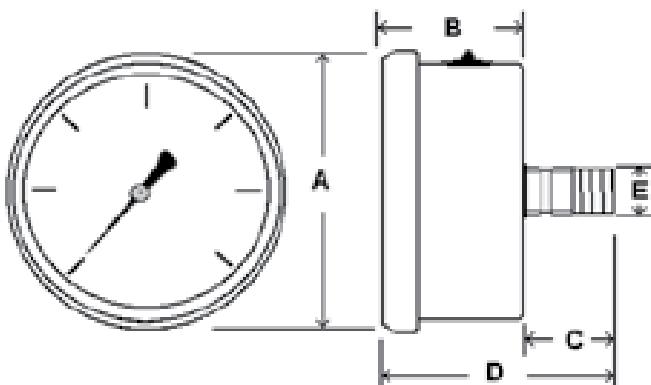
2**SPECIFICATIONS**

Dial	1 1/2" (40 mm), 2" (50 mm), 2 1/2" (63 mm), 4" (100 mm)
Case Wetted Parts	Stainless steel, glycerine filled Copper alloy
Bezel	Stainless steel, fixed
Lens	Polycarbonate
Pointer	Black aluminum
Connection	Center back mount 1 1/2" dial = 1/8" NPT 2" dial = 1/8" or 1/4" NPT 2 1/2" dial = 1/4" NPT 4" dial = 1/4" NPT
Scale	Standard: psi/BAR (x 100 = kPa) Single scale psi available from stock - 2 1/2" Only
Accuracy	3-2-3% of span 1 1/2" & 2" ASME B40.1 Grade B 2-1-2% of span 2 1/2" & 4" ASME B40.1 Grade A
Ambient Temp	Glycerine Filled = 30° F to 160° F Dry = -30° F to 180° F

**AVAILABLE OPTIONS***

- Certificate of Accuracy, NIST traceable
- Custom Dial
- Liquid Fill Options, see p. 162
- Anti-Vibration Movement
- Glass Lens
- Dry, Fillable Case
- Cleaned for Oxygen Service (dry only)
- Special Connection Size
- Protective Rubber Cover, see p. 107
- Max/Min Pointer, see p. 108

*Lead times/minimuns may apply



Dial	Unit	A	B	C	D	E
1 1/2"	In.	1.85"	1.02"	0.72"	1.74"	1/8" NPT
	mm	47	26	18	44	
2"	In.	2.28"	1.18"	1.02"	2.05"	1/8" or 1/4" NPT
	mm	58	30	26	52	
2 1/2"	In.	2.80"	1.34"	0.94"	2.28"	1/4" NPT
	mm	71	34	24	58	

APPROXIMATE SHIPPING WEIGHTS/BOX QUANTITIES

Dial Size	Est. Unit Weight	Box Qty
1 1/2"	0.20 lbs (0.10 kg)	100
2"	0.40 lbs (0.18 kg)	100
2 1/2"	0.55 lbs (0.26 kg)	50
4"	1.50 lbs (0.70 kg)	30

182-0002 REV A
GAUGE, PRESSURE, 2.5", 160 PSI, SS/
BRASS, 1/4" MNPT,
BACK MNT, GLYCERINE FILL, W/LOGO
CRW 2/21/13 MFR: ASHCROFT

1-888-650-6923 / www.picgauges.com

7510 & 7511 Series

Acrylic block construction with direct reading scales have white screen printed backs to enhance scale readability. Connections are in-line for easy installation.

Description

Metering Tube

Machined Cast Acrylic

Internal Components

316L Stainless Steel

Inlet/Outlet Fittings

FNPT, Vertical

Fitting Material

Standard: PVC

Optional: 316L Stainless Steel, Brass

Elastomers

Standard: EPR

Optional: Buna N, Viton®

Options

Certified Calibrations

Conform to ISA RP 16.6

Scales

Can be produced in any volumetric unit



Acrylic Tube

182-0178

FLOWMETER, ROTAMETER, 2GPM, 1/2"
FNPT, ACRYLIC

Performance

Capacities

7 GPH to 20 GPM — Water

2.6 SCFH to 60 SCFM — Air

Scale

50mm, 65mm, 100mm, 127mm, 250mm

Direct reading

Accuracy

± 6% of Full Scale Flow, 50mm scale

± 5% of Full Scale Flow, 65mm scale

± 4% of Full Scale Flow, 100mm scale

± 3% of Full Scale Flow, 127mm scale

± 2% of Full Scale Flow, 250mm scale

Turndown

10:1 to 12.5:1, unless otherwise indicated

Repeatability

3%, 50 mm scale

2%, 75 mm scale

2%, 100 mm scale

2%, 127 mm scale

1/2%, 250 mm scale

Max Temperature

130°F (54°C) - Liquid

100°F (38°C) - Gases

Max Pressure

Water — 125 psig

Air — 100 psig

Ambient Temperature

33°F to 125°F (1°C to 52°C)

Materials Of Construction

Model #	7510	7510	7511
Block #	2A	6A & 7A	2B & 5B
Meter Tube	Cast Acrylic	Cast Acrylic	Cast Acrylic
Fittings	Brass*	PVC*	PVC*
	PVC*	Brass	Brass
	316L SS	316L SS	316L SS
O-Rings	EPR*	EPR*	EPR*
	Buna-N	Buna-N	Buna-N
	Viton®	Viton®	Viton®

*Denotes standard construction.

7510 & 7511 Series

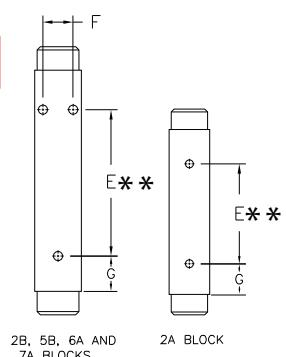
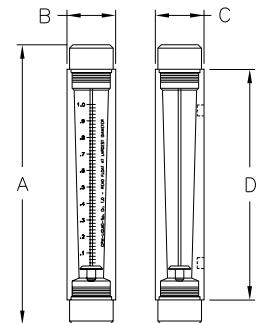
Acrylic Tube

Specifications:

Order Number	Flow Water	Order Number	Flow Air	Connection Size	A	B	C	D	E	F	G
Block #2A, 50mm (2 Inch) Scale											
—	—	2A-01	2.6 SCFH	1/4" FNPT*	4.75	1	1.125	3.50	1.50	—	1
—	—	2A-03	5 SCFH	1/4" FNPT*	4.75	1	1.125	3.50	1.50	—	1
—	—	2A-05	10 SCFH	1/4" FNPT*	4.75	1	1.125	3.50	1.50	—	1
—	—	2A-07	20 SCFH	1/4" FNPT*	4.75	1	1.125	3.50	1.50	—	1
2A-02	7 GPH	2A-09	30 SCFH	1/4" FNPT*	4.75	1	1.125	3.50	1.50	—	1
2A-04	12 GPH	2A-11	70 SCFH	1/4" FNPT*	4.75	1	1.125	3.50	1.50	—	1
2A-06	22 GPH	2A-13	100 SCFH	1/4" FNPT*	4.75	1	1.125	3.50	1.50	—	1
2A-08	44 GPH	2A-15	180 SCFH	1/4" FNPT*	4.75	1	1.125	3.50	1.50	—	1
2A-10	60 GPH	2A-17	4 SCFM	1/4" FNPT*	4.75	1	1.125	3.50	1.50	—	1
2A-12	75 GPH	—	—	1/4" FNPT*	4.75	1	1.125	3.50	1.50	—	1
Block #2B, 65mm (2 1/2 Inch) Scale											
2B-02	1 GPM	2B-01	4 SCFM	1/2" FNPT	6.50	1.375	1.375	5	2.50	.937	1.25
2B-04	2 GPM	2B-03	8 SCFM	1/2" FNPT	6.50	1.375	1.375	5	2.50	.937	1.25
2B-06	3.6 GPM	2B-05	15 SCFM	1/2" FNPT	6.50	1.375	1.375	5	2.50	.937	1.25
2B-08	5 GPM	2B-07	20 SCFM	1/2" FNPT	6.50	1.375	1.375	5	2.50	.937	1.25
Block #5B, 127mm (5 Inch) Scale											
5B-02	1 GPM	5B-01	4.2 SCFM	1/2" FNPT	9.25	1.375	1.375	7.75	5.25	.937	1.25
5B-04	2 GPM	5B-03	8.2 SCFM	1/2" FNPT	9.25	1.375	1.375	7.75	5.25	.937	1.25
5B-06	3.5 GPM	5B-05	15 SCFM	1/2" FNPT	9.25	1.375	1.375	7.75	5.25	.937	1.25
5B-08	5 GPM	5B-07	21 SCFM	1/2" FNPT	9.25	1.375	1.375	7.75	5.25	.937	1.25
Block #6A, 100mm (4 Inch) Scale											
6A-02	10 GPM	6A-01	40 SCFM	1" FNPT	8.375	1.78	1.812	6.625	4	1.25	1.312
6A-04	15 GPM	6A-03	60 SCFM	1" FNPT	8.375	1.78	1.812	6.625	4	1.25	1.312
6A-06	20 GPM	—	—	1" FNPT	8.375	1.78	1.812	6.625	4	1.25	1.312
Block #7A, 250mm (10 Inch) Scale											
7A-02	2 GPM	7A-01	8 SCFM	3/4" FNPT	14.812	1.78	1.812	13	8	1.25	2.50
7A-04	3.5 GPM	7A-03	14.8 SCFM	3/4" FNPT	14.812	1.78	1.812	13	8	1.25	2.50
7A-06	5 GPM	7A-05	20 SCFM	3/4" FNPT	14.812	1.78	1.812	13	8	1.25	2.50
7A-08	10 GPM	7A-07	42 SCFM	3/4" FNPT	14.812	1.78	1.812	13	8	1.25	2.50

* Block 2A has 1/4" FNPT with Brass or Stainless Steel Fitting, 1/4" MNPT with PVC fittings

* * 10-32 female thread. (Mounting Screws Not Supplied)



2B, 5B, 6A AND
7A BLOCKS

Ordering:

Use the following guide to determine the specific product number you require.

7 5 1 1 2 1 5 B 0 4

Meter Series

7510 - 2A, 6A, 7A

7511 - 2B, 5B

Fitting Material

Brass - 1

PVC - 2

316L SS - 3

O-Ring Material

EPR - 1

Buna-N - 2

Viton® - 3

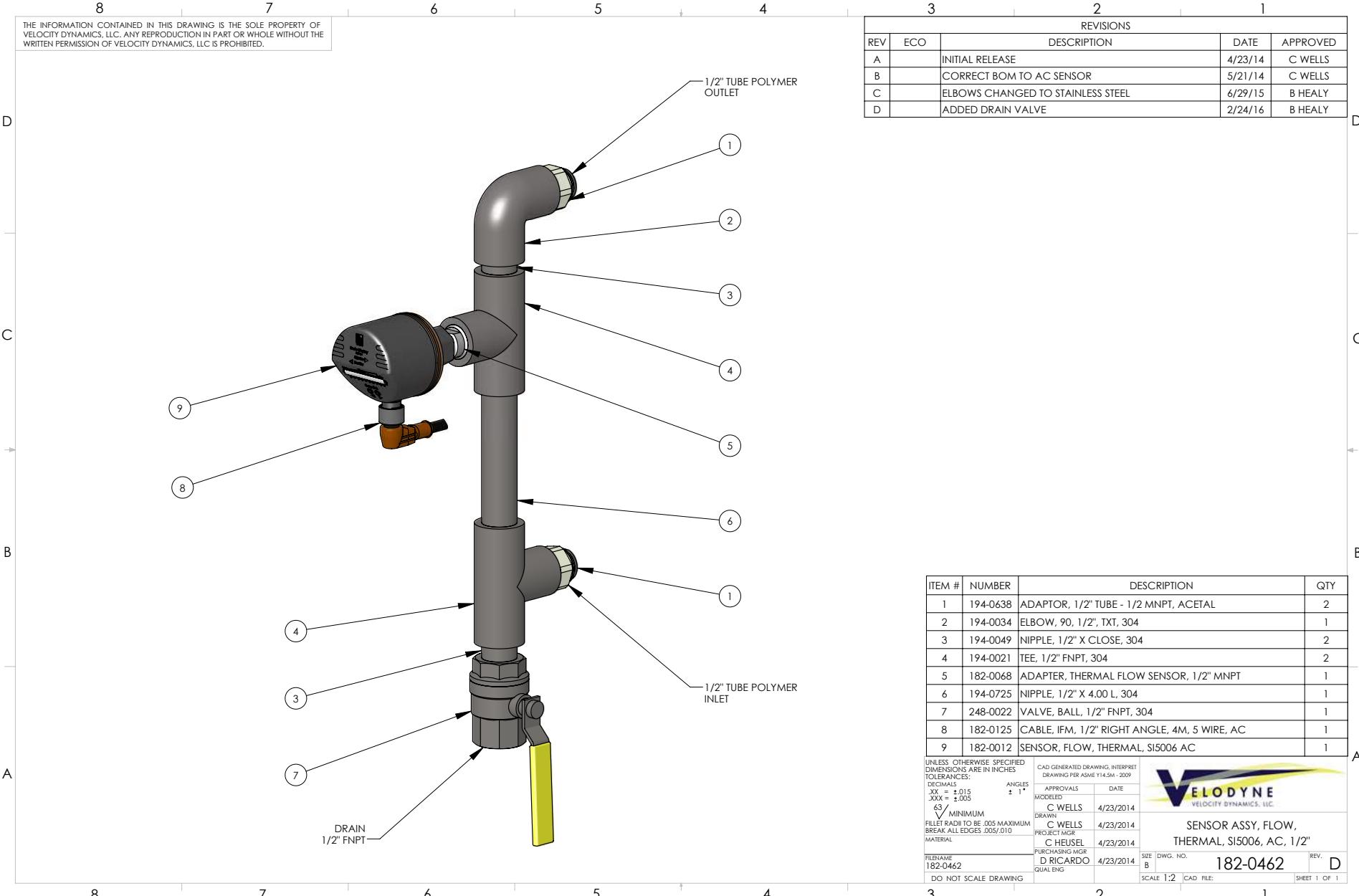
Order Number

See Specifications Table

Example: 7511-2-1-5B-04

29

4.4 Thermal Flow Sensor Assembly



4.4.1 Thermal Flow Sensor

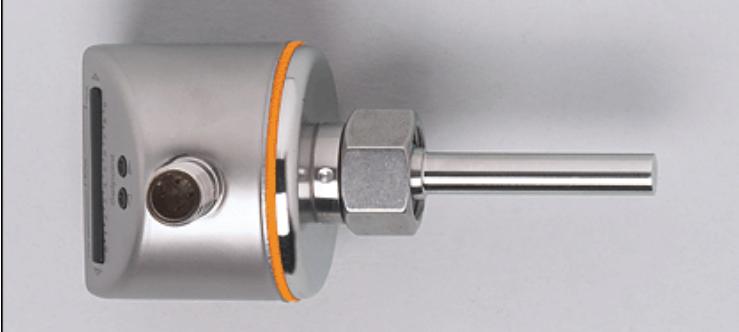


Sensor, Flow, Thermal 1/4" MNPT
 IFM Efector SI5006
 182-0012
 5/12/2009

efector300



Flow sensors

SI5006 SID10ADBFKOW/LS Flow monitor Compact type for adapter Quick disconnect Process connection: internal thread M18 x 1.5 for adapter 1 relay output	  
---	---

Application Electrical design Output	liquids and gases AC / relay normally open / closed programmable
Nominal voltage [V]	90...240 AC (45...65 Hz)
Operating voltage [V]	85...265 AC
Voltage tolerance [%]	-5 / +10
Contact rating	3 A (250 V AC / 30 V DC) ¹⁾
Short circuit proof	no
Reverse polarity protection	no
Overload protection	no
Power consumption [VA]	< 3.5
Max. temperature gradient of medium [K/min]	300
Pressure rating [bar]	300
Liquids	
Medium temperature [°C]	-25...80
Setting range [cm/s]	3...300
Greatest sensitivity [cm/s]	3...100
Gases	
Medium temperature [°C]	-25...80
Setting range [cm/s]	200...3000
Greatest sensitivity [cm/s]	200...800
Adjustment of the switch point	pushbuttons
Switch point accuracy [cm/s]	± 2...± 10 ^{*)}
Hysteresis [cm/s]	2...5 ^{*)}
Repeatability [cm/s]	1...5 ^{*)}

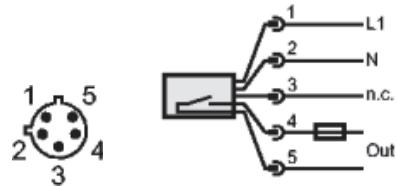
Power-on delay time [s]	10
Response time [s]	1...10
Temperature drift [cm/s x 1/K]	0.1 **)
Operating temperature [°C]	-25...80
Protection	IP 67, II
Shock resistance	DIN IEC 68-2-27:50 g (11 ms)
Vibration resistance	DIN EN 60068-2-6:20 g (55...2000 Hz)
EMC	EN 61000-4-2 ESD: 4 kV CD / 8 kV AD EN 61000-4-3 HF radiated: 10 V/m EN 61000-4-4 Burst: 2 kV EN 61000-4-6 HF conducted: 10 V
Housing material	stainless steel (304S15); PC (Makrolon); PBT-GF 20; EPDM/X (Santoprene)
Materials (wetted parts)	stainless steel (316S12); O-ring: FPM 8 x 1.5 gr 80° Shore A
Function display LED	10 LEDs, three-colour

Connection	1/2" UNF-Connector
------------	--------------------

Remarks	n.c. = not connected 1) number of switching cycles: 20 million mechanically switching cycles with 3 A load: 100.000 electrically relay type: contact closed at work *) for water; 5...100 cm/s; 25°C (factory setting) **) for water; 5...100 cm/s; 10...70°C Recommendation: check the unit for reliable function after a short circuit.
---------	---

Wiring

N.B: no protective insulation between relay circuit and supply voltage



Note: miniature fuse to IEC60127-2 sheet
1,
≤ 5 A (fast acting)



Section 5

Electrical

5.1 Electrical Drawings

5.1.1 Drawing Legend



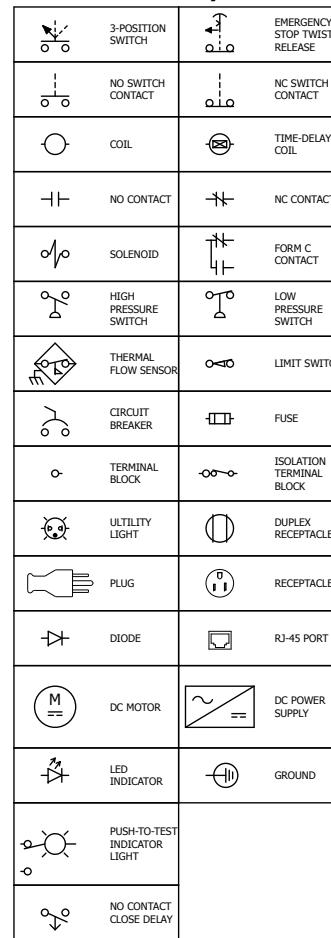
Drawing Index

Drawing	Sheet	Description
971-0314 COVER	1	DRAWING LEGEND
971-0314 ELEC	1	ENCLOSURE LAYOUT
971-0314 ELEC	2	BACK PANEL LAYOUT
971-0314 ELEC	3	ELECTRICAL SCHEMATIC
971-0314 ELEC	4	TERMINAL LEGEND
971-0314 ELEC	5	BILL OF MATERIALS
971-0314 PID	1	PIPING & INSTRUMENTATION

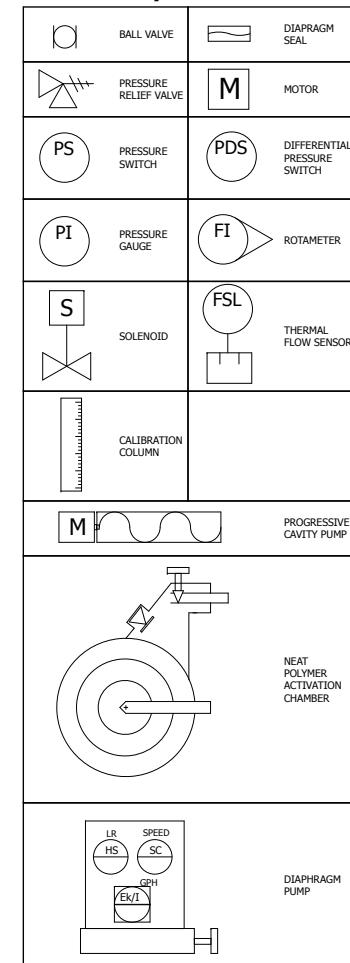
Abbreviation List

2PDT	TWO POLE DOUBLE THROW
A	AMPERES
AC	ALTERNATING CURRENT
AM	AMBER
BK	BLACK
BN	BROWN
BU	BLUE
CB	CIRCUIT BREAKER
CBL	CABLE
COM	COMMON
CON	CONTACTOR
CR	CONTROL RELAY
D	DIODE
DC	DIRECT CURRENT
ES	ETHERNET SWITCH
FLA	FULL LOAD AMPS
FRP	FIBERGLASS REINFORCED POLYESTER
FSL	FLOW SWITCH LOW
FU	FUSE
GN	GREEN
GND	GROUND
HZ	HERTZ
HMI	HUMAN-MACHINE INTERFACE
HMS	HAND MOMENTARY SWITCH
HS	HAND SWITCH
L	LINE
LT	LIGHT
MTR	MOTOR
N	NEUTRAL
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OG	ORANGE
PE	PROTECTIVE EARTH
PH	PHASE
PLC	PROGRAMMABLE LOGIC CONTROLLER
PLG	PLUG
PMP	PUMP
PNL	PANEL (MOUNTED)
PSH	PRESSURE SWITCH HIGH
PSL	PRESSURE SWITCH LOW
PWS	POWER SUPPLY
RD	RED
RECP	RECEPTACLE
SCR	SILICON CONTROLLED RECTIFIER
SKD	SKID (MOUNTED)
SOL	SOLENOID
SPST	SINGLE POLE SINGLE THROW
ST	SPEED TRANSMITTER
TB	TERMINAL BLOCK
TC	TEMPERATURE CONTROL
TDR	TIME DELAY RELAY
TFS	THERMAL FLOW SENSOR
TR	TRANSFORMER
UPS	UNINTERRUPTABLE POWER SUPPLY
UST	UNIVERSAL SWITH & TRANSMIT
V	VOLTS
VFD	VARIABLE FREQUENCY DRIVE
VT	VIOLET
W	WATTS
WT	WHITE
YE	YELLOW
YI	STATUS INDICATOR
ZS	POSITION SWITCH

Electrical Symbols



P&ID Symbols



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Project Name

Sales Order 2490

Rev C ADD PUMP SPEED OUTPUT
B REVISE PER COMMENTS
A FOR SUBMITTAL

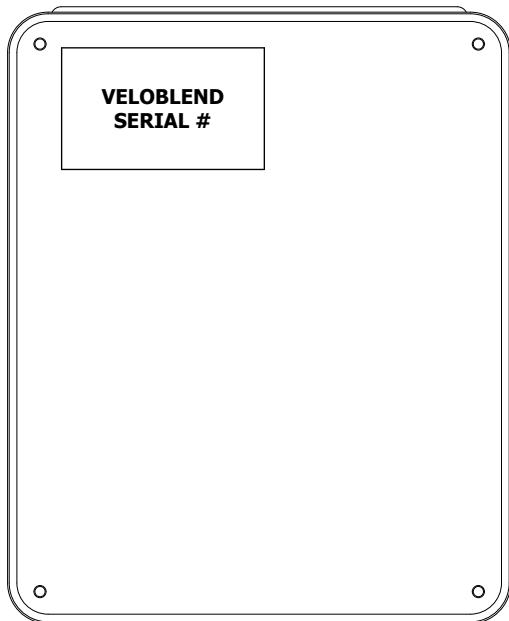
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Modified 02/03/16
Checked 6/18/15
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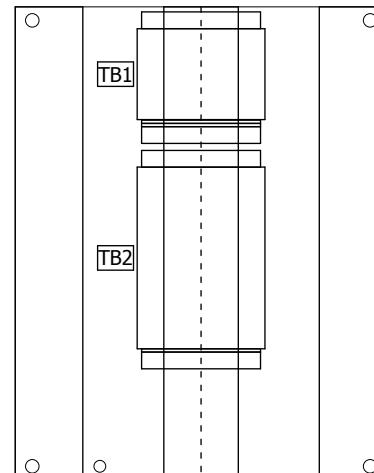
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By JM
Created 06/17/15
Modified 02/03/16
Checked 6/18/15
By JM

DRAWING LEGEND
Drawing Number 971-0314
COVER Rev C
Sheet 1 of 1

5.1.2 Control Panel Layout



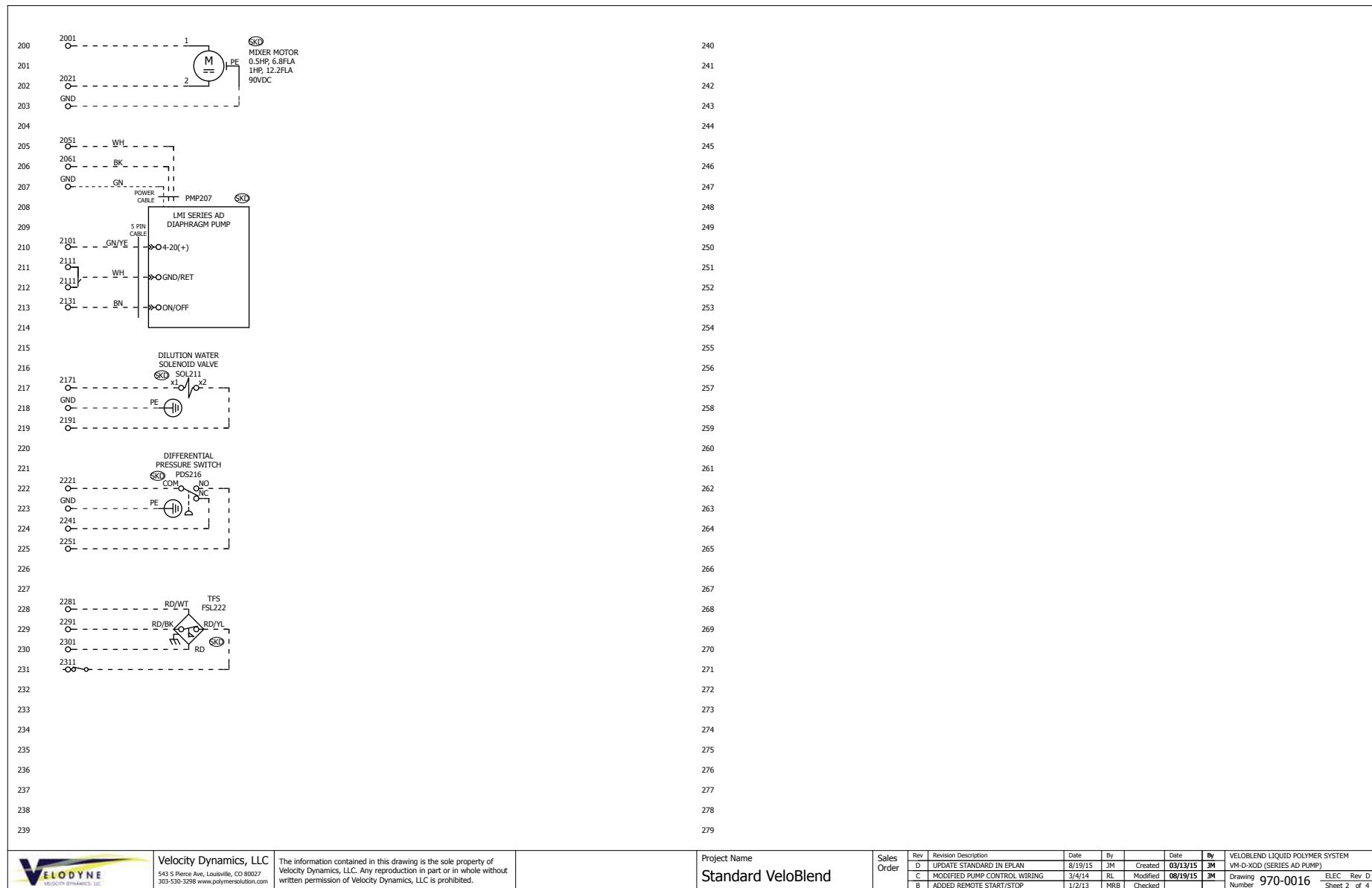
PNL1
ENCLOSURE, 10x8x4.59, FRP



PNL2
BACK PANEL, 10X8

	Velocity Dynamics, LLC 543 S Peoria Ave, Louisville, CO 80027 303-530-3298 www.polymerfusion.com	The information contained in this drawing is the sole property of Velocity Dynamics, LLC. Any reproduction in part or in whole without written permission of Velocity Dynamics, LLC is prohibited.		Project Name Standard VeloBlend	Sales Order	Rev	Revision Description	Date	By	Date	By	VEOBLEND LIQUID POLYMER SYSTEM
						D	UPDATE STANDARD IN EPLAN	8/19/15	JM	Created	03/13/15	JM
						C	MODIFIED PUMP CONTROL WIRING	3/4/14	RL	Modified	08/19/15	JM
						B	ADDED REMOTE START/STOP	1/2/13	MRB	Checked	Drawing Number	970-0016 ELEC Rev D Sheet 1 of 4

5.1.3 Electrical Schematic



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Project Name
Standard VeloBlend

Sales Order	Rev	Revision Description	Date	By	Date	By	VELOBLEND LIQUID POLYMER SYSTEM
D	UPDATE STANDARD IN EPLAN	8/19/15	JM	Created	03/13/15	JM	VM-D-XOD (SERIES AD PUMP)
C	MODIFIED PUMP CONTROL WIRING	3/4/14	RL	Modified	08/19/15	JM	Drawing Number 970-0016 ELEC Rev D
B	ADDED REMOTE START/STOP	1/2/13	MRB	Checked			Sheet 2 of 4

Terminal Legend

VeloDyne Terminal Legend UL

DESCRIPTION	TB1	DESTINATION	TORQUE
MIXER MOTOR (90VDC)	[200]	SKID	9.0 in-lb
MIXER MOTOR (90VDC)	[202]	SKID	9.0 in-lb
DIAPHRAGM PUMP 4-20(+)	[210]	SKID	9.0 in-lb
DIAPHRAGM PUMP 4-20(-)	[211]	SKID	9.0 in-lb
DIAPHRAGM PUMP RETURN	[211]	SKID	9.0 in-lb
DIAPHRAGM PUMP ON/OFF	[213]	SKID	9.0 in-lb
MIXER MOTOR (90VDC)	[GND]	SKID	9.0 in-lb

TERMINALS SHOWN ALPHANUMERICALLY FOR REFERENCE. ACTUAL PLACEMENT MAY VARY.

DESCRIPTION	TB2	DESTINATION	TORQUE
DIAPHRAGM PUMP NEUTRAL	[205]	SKID	9.0 in-lb
DIAPHRAGM PUMP LINE	[206]	SKID	9.0 in-lb
DILUTION WATER SOLENOID (120VAC COIL)	[217]	SKID	9.0 in-lb
DILUTION WATER SOLENOID (120VAC COIL)	[219]	SKID	9.0 in-lb
DIFFERENTIAL PRESSURE SWITCH	[222]	SKID	9.0 in-lb
DIFFERENTIAL PRESSURE SWITCH	[224]	SKID	9.0 in-lb
DIFFERENTIAL PRESSURE SWITCH	[225]	SKID	9.0 in-lb
THERMAL FLOW SENSOR 120VAC L	[228]	SKID	9.0 in-lb
THERMAL FLOW SENSOR COMMON	[229]	SKID	9.0 in-lb
THERMAL FLOW SENSOR 120VAC N	[230]	SKID	9.0 in-lb
THERMAL FLOW SENSOR SIGNAL	[231]	SKID	9.0 in-lb
DIAPHRAGM PUMP GND	[GND]	SKID	9.0 in-lb
DILUTION WATER SOLENOID (120VAC COIL)	[GND]	SKID	9.0 in-lb
DIFFERENTIAL PRESSURE SWITCH	[GND]	SKID	9.0 in-lb

TERMINALS SHOWN ALPHANUMERICALLY FOR REFERENCE. ACTUAL PLACEMENT MAY VARY.



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Project Name
Standard VeloBlend

Sales Order	Rev	Revision Description	Date	By	Date	By	VEOBLEND LIQUID POLYMER SYSTEM
D		UPDATE STANDARD IN EPLAN	8/19/15	JM	Created	03/13/15	JM
C		MODIFIED PUMP CONTROL WIRING	3/4/14	RL	Modified	08/19/15	JM
B		ADDED REMOTE START/STOP	1/2/13	MRB	Checked		

5.1.4 Bill of Materials



Bill of Materials

VeloDyne BOM 50

Tag	Qty	VDI#	Description	MFR	MFR#
PNL	1	131-0003	PLAQUE: VELOBLEND S/N, 3.75"x2.25", WHITE WITH BLACK TEXT		
PNL2	1	152-0011	BACK PANEL, 10x8, PAINTED STEEL	HOFFMAN	A10P8
PNL1	1	152-0096	ENCLOSURE, 10x8x4.59, FRP, NEMA 4X	HOFFMAN	HJ1008HWLG
TB1, TB2	16	700-0000	Feed through screw terminal block 4mm ² gray	ALLEN BRADLEY	1492-J4
TB1, TB2	4	700-0010	ground terminal block 4mm ² green/yellow	ALLEN BRADLEY	1492-JG4
TB2	1	700-0011	Isolation Feed-through screw terminal block 4mm ² gray	ALLEN BRADLEY	1492-JKD4
TB	3	700-0015	End Barrier, Gray	ALLEN BRADLEY	1492-EBJ3
TB	4	700-0016	End Anchor, used w/ Standard 35mm Din Rail, Gray	ALLEN BRADLEY	1492-EAJ35



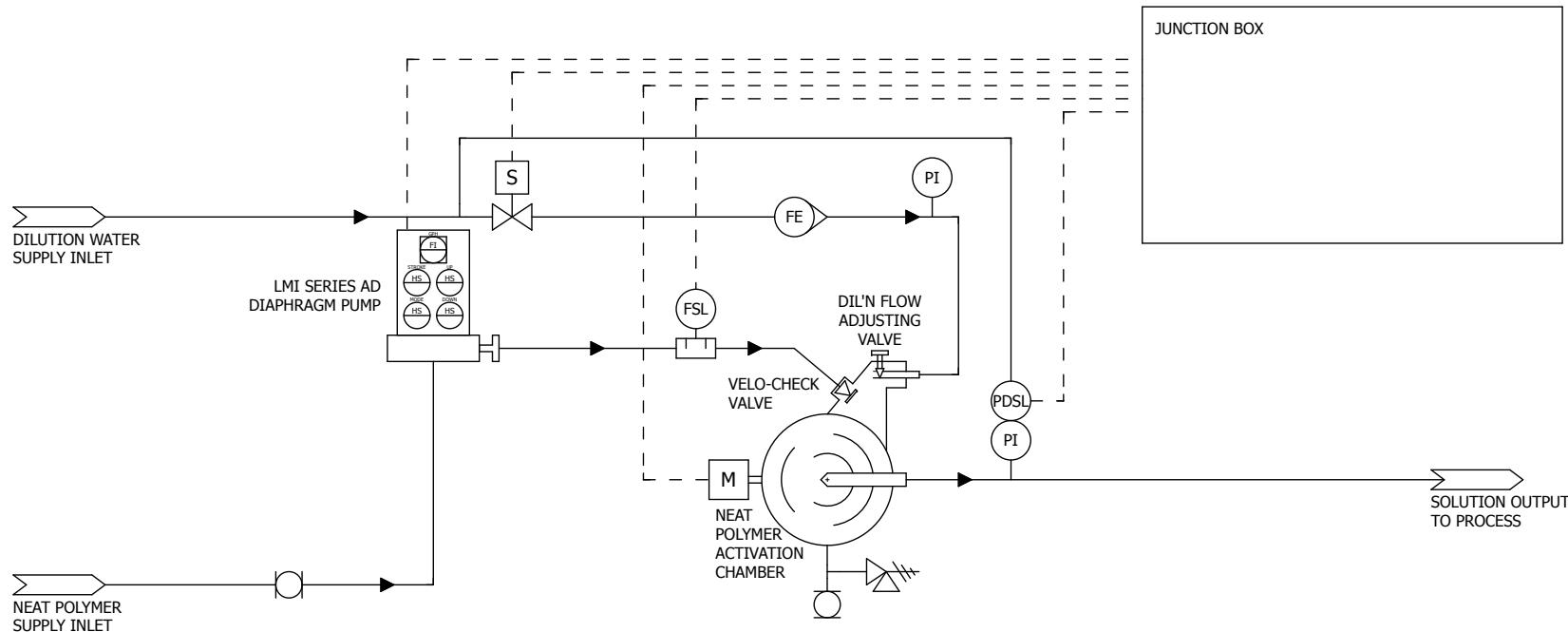
Velocity Dynamics, LLC
543 S Pierce Ave, Louisville, CO 80027
303-530-3298 www.polymersolution.com

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Project Name
Standard VeloBlend

Sales Order	Rev	Revision Description	Date	By	Date	By	VELOBLEND LIQUID POLYMER SYSTEM
	D	UPDATE STANDARD IN EPLAN	8/19/15	JM	Created	03/13/15	JM
	C	MODIFIED PUMP CONTROL WIRING	3/4/14	RL	Modified	08/19/15	JM
	B	ADDED REMOTE START/STOP	1/2/13	MRB	Checked		Drawing Number 970-0016 ELEC Rev D Sheet 4 of 4

5.1.5 Process & Instrumentation Diagram



Velocity Dynamics, LLC		Project Name Standard VeloBlend		Sales Order	Rev	Revision Description	Date	By	Date	By	VELOBLEND LIQUID POLYMER SYSTEM VM-D-XOD (SERIES AD PUMP)	
 543 S Pierce Ave, Louisville, CO 80027 303-530-3298 www.polymersolution.com		The information contained in this drawing is the sole property of Velocity Dynamics, LLC. Any reproduction in part or in whole without written permission of Velocity Dynamics, LLC is prohibited.			D	UPDATE STANDARD IN EPLAN	8/19/15	JM	Created	03/13/15	JM	
					C	MODIFIED PUMP CONTROL WIRING	3/4/14	RL	Modified	08/19/15	JM	
					B	ADDED REMOTE START/STOP	1/2/13	MRB	Checked			
											Drawing Number 970-0016 PID Rev D Sheet 1 of 1	

5.2 Electrical Component Data Sheets

5.2.1 Enclosure



Fiberglass Type 4X Overlapping Cover Enclosures

FIBERGLASS

Bulletin
HJ



152-0096
ENCLOSURE, 10 X 8 X 4.59,
NEMA 4X, ENCLOSURE

Application

The HJ series of fiberglass enclosures includes an overlapping cover and the integral mounting brackets often required in petrochemical, water treatment, and other corrosive environments. Choices of door style and door fasteners and a wide range of sizes provide application flexibility.

Construction

- Made from corrosion-resistant hot compression molded fiberglass-reinforced polyester
- Overlapping solid and window cover models are available in both flat and raised door versions
- Windows are clear polycarbonate
- Cover fastening options include screws or padlockable Type 316 stainless steel latches
- Type 304 stainless steel piano hinges on hinged models
- Integral mounting brackets
- Fifty-four models available in seven different sizes
- Capable of withstanding continuous temperatures from -58°F (-50°C) up to 302°F (150°C)
- Enclosures protect equipment and operators from indirect electrical contact

Finish

Fiberglass material is RAL 7035 light gray inside and out. Optional steel panels are painted white. Optional stainless steel, aluminum, conductive, and composite panels are unpainted.

Industry Standards

UL 508A, File Number E54315: Type 3, 3R, 4, 4X, I2, I3
NEMA/EEMAC Type 3, 3R, 4, 4X, I2, I3
CSA File Number 36508: Type 3, 3R, 4, 4X, I2, I3
IEC 60529, IP66
Enclosure Flammability Rating per UL 508A
Meets Type 3RX requirements

Accessories

Panels
Terminal Kit Assembly
Ventilators
A48 Swing Out Panel Kit

Modification Services Program

You can customize this product to your unique requirements by specifying from these options:

- Colors
- Holes and cutouts in body, doors, panels
- Tapped holes, fasteners in subpanel
- Mounting Brackets
- Panels
- Thermal Accessories
- Threaded Panel Extenders
- Windows Kits
- Standard accessories

To order, contact your local Hoffman sales representative.

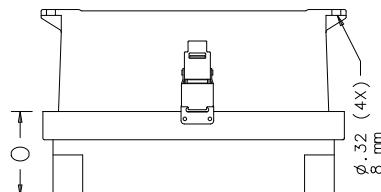
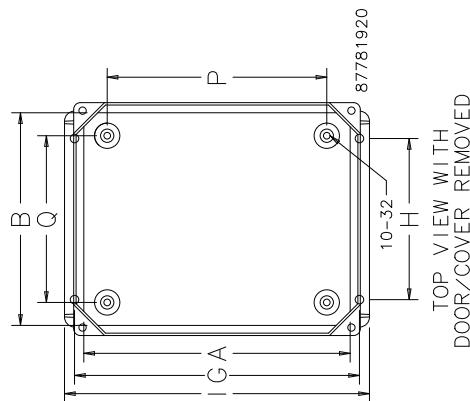
NOTE: For information about modifications outside the scope of the Modification Services program, contact your Hoffman sales representative.

Fiberglass Type 4X Overlapping Cover Enclosures

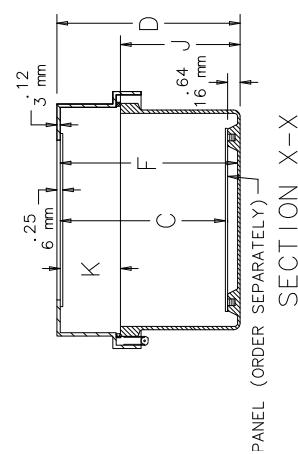
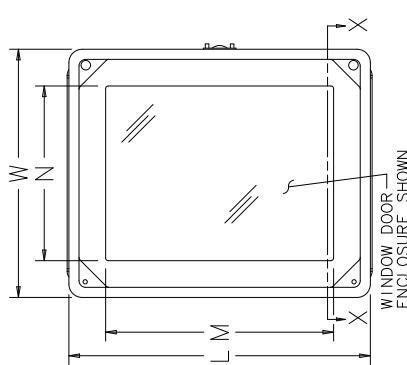
FIBERGLASS

Bulletin
HJ

**Corrosion-Resistant
Enclosures**



Raised Cover Window Enclosures



Fiberglass Type 4X Overlapping Cover Enclosures

Standard Sizes Flat Solid Screw Cover and Flat Solid Hinged Screw Cover Fiberglass Type 4X Enclosures

Catalog Number	Internal Dimensions A x B x C in. (mm)	Door Fasteners	L in. (mm)	W in. (mm)	D in. (mm)	O in. (mm)	K in. (mm)	G in. (mm)	H in. (mm)	P in. (mm)	Q in. (mm)	J in. (mm)	F in. (mm)	I in. (mm)	Panel Catalog Number ^a	Panel Size in. (mm)
HJ606HWLG	6.00 x 6.00 x 4.10 (152 x 152 x 104)	Hinged, 2 screws	7.31 (186)	7.31 (186)	4.96 (126)	1.38 (35)	0.50 (13)	6.77 (172)	4.01 (102)	4.26 (108)	4.25 (108)	4.34 (110)	4.64 (118)	7.52 (191)	A6P6 A6P6AL	4.88 x 4.88 (124 x 124)
HJ606WLG	6.00 x 6.00 x 4.10 (152 x 152 x 104)	4 screws	7.31 (186)	7.31 (186)	4.96 (126)	1.38 (35)	0.50 (13)	6.77 (172)	4.01 (102)	4.26 (108)	4.25 (108)	4.34 (110)	4.64 (118)	7.52 (191)	A6P6 A6P6AL	4.88 x 4.88 (124 x 124)
HJ806HWLG	8.00 x 6.00 x 4.10 (203 x 152 x 104)	Hinged, 2 screws	9.30 (236)	7.31 (186)	4.96 (126)	1.77 (45)	1.65 (42)	8.74 (222)	4.01 (102)	6.25 (159)	4.25 (108)	3.19 (81)	4.64 (118)	9.50 (241)	A8P6 A8P6AL	6.75 x 4.88 (171 x 124)
HJ806WLG	8.00 x 6.00 x 4.10 (203 x 152 x 104)	4 screws	9.30 (236)	7.31 (186)	4.96 (126)	1.77 (45)	1.65 (42)	8.74 (222)	4.01 (102)	6.26 (159)	4.25 (108)	3.19 (81)	4.64 (118)	9.50 (241)	A8P6 A8P6AL	6.75 x 4.88 (171 x 124)
HJ1008HWLG	10.00 x 8.00 x 4.59 (254 x 203 x 117)	Hinged, 2 screws	11.31 (287)	9.31 (236)	5.43 (138)	1.77 (45)	1.65 (42)	10.75 (273)	6.02 (153)	8.25 (210)	3.24 (158)	3.55 (93)	5.12 (130)	11.52 (293)	A10P8 A10P8AL	8.75 x 6.88 (222 x 102)
HJ1008WLG	10.00 x 8.00 x 4.59 (254 x 203 x 117)	4 screws	11.31 (287)	9.31 (236)	5.43 (138)	1.77 (45)	1.65 (42)	10.75 (273)	6.02 (153)	8.25 (210)	3.24 (158)	3.88 (93)	5.12 (130)	11.52 (293)	A10P8 A10P8AL	8.75 x 6.88 (222 x 102)
HJ1210HWLG	12.00 x 10.00 x 4.74 (305 x 254 x 120)	Hinged, 2 screws	13.30 (338)	11.29 (287)	5.58 (142)	1.77 (45)	1.65 (42)	12.75 (324)	8.01 (203)	10.25 (260)	8.25 (210)	3.81 (97)	5.24 (133)	5.24 (133)	A12P10 A12P10AL	10.75 x 8.88 (273 x 226)
HJ1210WLG	12.00 x 10.00 x 4.74 (305 x 254 x 120)	4 screws	13.30 (338)	11.29 (287)	5.58 (142)	1.77 (45)	1.65 (42)	12.75 (324)	8.01 (203)	10.25 (260)	8.25 (210)	3.81 (97)	5.24 (133)	5.24 (133)	A12P10 A12P10AL	10.75 x 8.88 (273 x 226)
HJ1412HWLG	14.00 x 12.00 x 5.74 (356 x 305 x 146)	Hinged, 2 screws	15.32 (389)	13.30 (338)	6.70 (170)	1.77 (45)	1.65 (42)	14.75 (375)	10.00 (254)	12.25 (311)	10.24 (260)	4.93 (125)	6.38 (162)	15.50 (394)	A14P12 A14P12AL	12.75 x 10.88 (324 x 276)
HJ1412WLG	14.00 x 12.00 x 5.74 (356 x 305 x 146)	4 screws	15.32 (389)	13.30 (338)	6.70 (170)	1.77 (45)	1.65 (42)	14.75 (375)	10.00 (254)	12.25 (311)	10.24 (260)	4.93 (125)	6.38 (162)	15.50 (394)	A14P12 A14P12AL	12.75 x 10.88 (324 x 276)
HJ1614HWLG	16.00 x 14.00 x 5.74 (406 x 356 x 146)	Hinged, 2 screws	17.31 (440)	15.30 (389)	6.70 (170)	1.77 (45)	1.65 (42)	16.75 (425)	12.00 (305)	14.25 (362)	12.24 (311)	4.93 (125)	6.38 (162)	14.52 (445)	A16P14 A16P14AL	14.75 x 12.88 (375 x 327)
HJ1614WLG	16.00 x 14.00 x 5.74 (406 x 356 x 146)	4 screws	17.31 (440)	15.30 (389)	6.70 (170)	1.77 (45)	1.65 (42)	16.73 (425)	12.00 (305)	14.25 (362)	12.24 (311)	4.93 (125)	6.83 (162)	17.52 (445)	A16P14 A16P14AL	14.75 x 12.88 (375 x 327)
HJ1816HWLG	18.00 x 16.00 x 8.62 (457 x 406 x 219)	Hinged, 2 screws	19.31 (490)	17.31 (440)	9.58 (243)	1.77 (45)	1.65 (42)	18.74 (476)	12.00 (305)	16.25 (413)	14.25 (362)	7.81 (198)	9.25 (235)	19.50 (495)	A18P16 A18P16AL	16.75 x 14.88 (425 x 378)
HJ1816WLG	18.00 x 16.00 x 8.62 (457 x 406 x 219)	4 screws	19.31 (490)	17.31 (440)	9.58 (243)	1.77 (45)	1.65 (42)	18.47 (476)	12.00 (305)	16.25 (413)	14.25 (362)	7.81 (198)	9.25 (235)	19.50 (495)	A18P16 A18P16AL	16.75 x 14.88 (375 x 378)

^aPurchase panels separately. Panel catalog numbers ending in AL are aluminum. Optional stainless steel, and composite material panels available for most sizes.

Panels for Enclosures

Panels for Junction Boxes

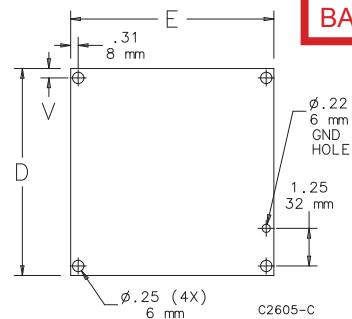


Steel panels are 14 gauge, finished with white polyester powder paint or with a conductive, corrosion-resistant coating. Stainless steel panels are 14 gauge Type 304 and have a commercial #2B finish which is protected on one side with a plastic film. Aluminum panels are 5052-H32 aluminum alloy 0.080 in. (2mm) thick and protected on one side with a plastic film. Panel mounting hardware is furnished with all enclosures which accept these panels.

PANELS AND PANEL ACCESSORIES

Bulletin
PNLC, PNLJ

152-0011
BACK PANEL, 10x8

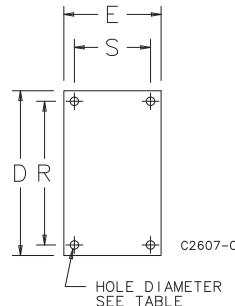


Accessories

Catalog Number Painted	Catalog Number Conductive	Catalog Number Stainless Steel	Catalog Number Aluminum	Panel Size D x E (in.)	Panel Size D x E (mm)	V (in.)	V (mm)
A6P4	A6P4G	A6P4SS	A6P4AL	4.88 x 2.88	124 x 73	0.31	8
A6P6	A6P6G	A6P6SS	A6P6AL	4.88 x 4.88	124 x 124	0.31	8
A8P6	A8P6G	A8P6SS	A8P6AL	6.75 x 4.88	171 x 124	0.25	6
A8P8	—	—	—	8.75 x 6.88	222 x 175	0.25	6
A10P8	A10P8G	A10P8SS	A10P8AL	8.75 x 6.88	222 x 175	0.25	6
A10P10	A10P10G	—	—	8.75 x 8.88	222 x 226	0.25	8
A12P6	A12P6G	—	—	10.75 x 4.88	273 x 124	0.25	6
A12P10	A12P10G	A12P10SS	A12P10AL	10.75 x 8.88	273 x 226	0.25	6
A12P12	A12P12G	A12P12SS	—	10.75 x 10.88	273 x 276	0.25	6
A14P8	A14P8G	—	—	12.75 x 6.88	324 x 175	0.25	6
A14P12	A14P12G	A14P12SS	A14P12AL	12.75 x 10.88	324 x 276	0.25	6
A16P10	A16P10G	—	—	14.75 x 8.88	375 x 226	0.25	6
A16P14	A16P14G	A16P14SS	A16P14AL	14.75 x 12.88	375 x 327	0.25	6
A18P16	A18P16G	A18P16SS	A18P16AL	16.75 x 14.88	425 x 378	0.25	6

Composite Panels for Junction Boxes and Small Wall-Mount Enclosures

Manufactured from light brown reinforced phenolic laminate sheet stock. This material has exceptional strength and chemical resistance, which makes it ideally suited for the most corrosive environments. Composite panels are intended for use in corrosion resistant enclosures. Panel sizes are available for junction boxes and small wall-mount enclosures. Composite panels may be drilled and tapped but work equally as well with self-threading or thread cutting screws. Refer to the table for recommended mounting specifications.



Catalog Number	Panel Size D x E (in.)	Panel Size D x E (mm)	R (in.)	R (mm)	S (in.)	S (mm)	Hole Dia. (in.)	Hole Dia. (mm)	Panel Thickness (in.)	Panel Thickness (mm)
A6P4C	4.88 x 2.88	124 x 73	4.25	108	2.25	57	0.25	6	0.12	3
A6P6C	4.88 x 4.88	124 x 124	4.25	108	4.25	108	0.25	6	0.12	3
A8P6C	6.75 x 4.88	171 x 124	6.25	159	4.25	108	0.25	6	0.12	3
A10P8C	8.75 x 6.88	222 x 175	8.25	210	6.25	159	0.25	6	0.12	3
A12P10C	10.75 x 8.88	273 x 226	10.25	260	8.25	210	0.25	6	0.19	5
A14P12C	12.75 x 10.88	324 x 276	12.25	311	10.25	260	0.25	6	0.19	5
A16P14C	14.75 x 12.88	375 x 327	14.25	362	12.25	311	0.25	6	0.19	5
A18P16C	16.75 x 14.88	425 x 378	16.25	413	14.25	362	0.25	6	0.19	5
A20P16C	17.00 x 13.00	432 x 330	15.25	387	11.25	286	0.50	13	0.19	5
A20P20C	17.00 x 17.00	432 x 432	15.25	387	15.25	387	0.50	13	0.19	5
A24P20C	21.00 x 17.00	533 x 432	19.25	489	15.25	387	0.50	13	0.19	5
A24P24C	21.00 x 21.00	533 x 533	19.25	489	19.25	489	0.50	13	0.19	5
A30P24C	27.00 x 21.00	686 x 533	25.25	641	19.25	489	0.50	13	0.19	5

5.2.2 Terminal Blocks



Bulletin 1492 Screw Connection Terminal Blocks Standard Feed-Through Blocks

1492-J3				1492-J4				1492-J6					
Feed-Through Terminal Block				Feed-Through Terminal Block				Feed-Through Terminal Block					
Certifications	CSA	IEC	EEEx e II	CSA	IEC	EEEx e II	CSA	IEC	EEEx e II	CSA	IEC	EEEx e II	
Voltage Rating	600V AC/DC	800V AC/DC	550V AC/DC	600V AC/DC	800V AC/DC	750V AC/DC	600V AC/DC	800V AC/DC	550V AC/DC	600V AC/DC	800V AC/DC	550V AC/DC	
Maximum Current	25 A	20 A	24 A	21 A	35 A	32 A	28 A	50 A	41 A	36 A	50 A	41 A	36 A
Wire Range (Rated Cross Section)	30...12 AWG	26...12 AWG	2.5 mm ² (20...4 AWG)	2.5 mm ² (20...4 AWG)	22...10 AWG	4 mm ² (20...12 AWG)	4 mm ² (20...12 AWG)	20...8 AWG	6 mm ² (20...10 AWG)	6 mm ² (20...10 AWG)	20...8 AWG	6 mm ² (20...10 AWG)	6 mm ² (20...10 AWG)
Wire Strip Length	0.39 in (10 mm)			0.39 in (10 mm)			0.47 in (12 mm)			0.47 in (12 mm)			
Recommended Tightening Torque	3.7...7.1 lb•in (0.4...0.8 Nm)			4.4...8.8 lb•in (0.5...1.0 Nm)			7.1...12.4 lb•in (0.8...1.4 Nm)			7.1...12.4 lb•in (0.8...1.4 Nm)			
Density (Blocks per ft/meter)	39 per ft/196 per meter			49 per ft/163 per meter			37 per ft/123 per meter			37 per ft/123 per meter			
Housing Temperature Range	-58...+248 °F (-50...+120 °C)			-58...+248 °F (-50...+120 °C)			-58...+248 °F (-50...+120 °C)			-58...+248 °F (-50...+120 °C)			
Terminal Blocks				Cat. No.				Pcs/ Pkg					
Color:	Gray	1492-J3	100	1492-J4	100	1492-J6	100	Cat. No.	Pcs/ Pkg	Cat. No.	Pcs/ Pkg		
Red	1492-J3-RE	100	1492-J4-RE	100	1492-J6-RE	100	1492-J3-B	100	1492-J4-B	100	1492-J6-B	100	
Blue	1492-J3-B	100	1492-J4-B	100	1492-J6-B	100	1492-J3-BL	100	1492-J4-BL	100	1492-J6-BL	100	
Black	1492-J3-BL	100	1492-J4-BL	100	1492-J6-BL	100	1492-J3-G	100	1492-J4-G	100	1492-J6-G	100	
Green	1492-J3-G	100	1492-J4-G	100	1492-J6-G	100	1492-J3-Y	100	1492-J4-Y	100	1492-J6-Y	100	
Yellow	1492-J3-Y	100	1492-J4-Y	100	1492-J6-Y	100	1492-J3-OR	100	1492-J4-OR	100	1492-J6-OR	100	
Orange	1492-J3-OR	100	1492-J4-OR	100	1492-J6-OR	100	1492-J3-BR	100	1492-J4-BR	100	1492-J6-BR	100	
Brown	1492-J3-BR	100	1492-J4-BR	100	1492-J6-BR	100	1492-J3-W	100	1492-J4-W	100	1492-J6-W	100	
Accessories				Cat. No.				Pcs/ Pkg					
Mounting Rails:				199-DR1	10	199-DR1	10	199-DR1	10	199-DR1	10		
1 m Symmetrical DIN (Steel)				1492-DR1	10	1492-DR5	10	1492-DR5	10	1492-DR6	2		
1 m Symmetrical DIN (Aluminum)				1492-DR2	2	1492-DR6	2	1492-DR7	2	1492-DR7	2		
1 m Hi-Rise Sym. DIN (Aluminum)				1492-DR3	2	1492-DR7	2	1492-EBJ3	50	1492-EBJ3-B	50		
1 m Angled Hi-Rise Sym. DIN (Steel)				1492-DR4	2	1492-EBJ3	50	1492-EBJ3-Y	50	1492-EBJ3-Y	50		
End Barriers	Gray	1492-EBJ3	50	1492-EBJ3	50	1492-EBJ3-B	50	1492-EBJ3-Y	50	1492-EBJ3-B	50		
Blue	1492-EBJ3-B	50	1492-EBJ3-B	50	1492-EBJ3-B	50	1492-EBJ3-Y	50	1492-EBJ3-Y	50	1492-EBJ3-Y	50	
Yellow	1492-EBJ3-Y	50	1492-EBJ3-Y	50	1492-EBJ3-Y	50							
End Anchors and Retainers:				1492-EFL35	20	1492-FRI 35	20	1492-FRI 35	20	1492-FRI 35	20		
Screwless End Retainer				1492-EAJ35	100	1492-EAJ35	100	1492-EAJ35	100	1492-EAJ35	100		
DIN Rail — Normal Duty				1492-EAHJ35	50	1492-EAHJ35	50	1492-EAHJ35	50	1492-EAHJ35	50		
DIN Rail — Heavy Duty													
Jumpers:	*			1492-AJJ5-10	20	1492-CJJ6-10	20	1492-CJJ8-10	20	1492-CJJ8-10	20		
Screw Center Jumper — 10 pole				1492-CJJ5-4	50	1492-CJJ6-4	50	1492-CJJ8-4	50	1492-CJJ8-4	50		
Screw Center Jumper — 4 pole				1492-CJJ5-3	50	1492-CJJ6-3	50	1492-CJJ8-3	50	1492-CJJ8-3	50		
Screw Center Jumper — 3 pole				1492-CJJ5-2	50	1492-CJJ6-2	50	1492-CJJ8-2	50	1492-CJJ8-2	50		
Screw Center Jumper — 2 pole				1492-CJJL5-50	10	1492-CJJL6-41 (41-pole)	10	—	—	—	—		
Plug-in Center Jumper — 50 Pole				1492-CJJL5-10	20	1492-CJJL6-10	20	—	—	—	—		
Plug-in Center Jumper — 10 Pole				1492-CJJL5-9	20	—	—	—	—	—	—		
Plug-in Center Jumper — 9 Pole				1492-CJJL5-8	20	—	—	—	—	—	—		
Plug-in Center Jumper — 8 Pole				1492-CJJL5-7	20	—	—	—	—	—	—		
Plug-in Center Jumper — 7 Pole				1492-CJJL5-6	20	—	—	—	—	—	—		
Plug-in Center Jumper — 6 Pole				1492-CJJL5-5	20	—	—	—	—	—	—		
Plug-in Center Jumper — 5 Pole				1492-CJJL5-4	60	1492-CJJL6-4	60	—	—	—	—		
Plug-in Center Jumper — 4 Pole				1492-CJJL5-3	60	1492-CJJL6-3	60	—	—	—	—		
Plug-in Center Jumper — 3 Pole				1492-CJJL5-2	60	1492-CJJL6-2	60	—	—	—	—		
Plug-in Center Jumper — 2 Pole				1492-SJ5B-24	50	—	—	—	—	—	—		
Insulated Side Jumper — 24 Pole				1492-SJ5B-10	50	—	—	—	—	—	—		
Insulated Side Jumper — 10 Pole				1492-T1	1	1492-T1	1	1492-T1	1	1492-T1	1		
Screw Type Jumper Notching Tool													
Other Accessories:				1492-EBJ16	10	1492-EBJ16	20	1492-EBJ16	20	1492-EBJ16	20		
Partition Plate				1492-TPS23	20	1492-TPS23L	50	1492-TPS23L	50	1492-TP23	20		
Test Plug Socket				1492-TP23	20	1492-TP23	20	—	—	—	—		
Test Plug				1492-TPJ5	25	1492-TPJ6	25	—	—	—	—		
Test Plug (Stackable)				1492-EWPJ5	25	1492-EWPJ5	25	1492-EWPJ8	50	1492-EWPJ8	50		
Electrical Warning Plate				1492-GM35	25	1492-GM35	25	1492-GM35	25	1492-GM35	25		
Group Marking Carrier				1492-M5X12 (144/card)	5	1492-M6X12 (120/card)	5	1492-M7X12 (108/card)	5	1492-M7X12 (108/card)	5		
Marking Systems:				1492-M5X5 (200/card)	5	1492-M6X5 (200/card)	5	1492-M8X5 (160/card)	5	1492-M8X5 (160/card)	5		
Snap-in Marker Cards													

* Use of Center Jumpers may affect spacings, requiring derating of terminal blocks. See page 12-148 for details.



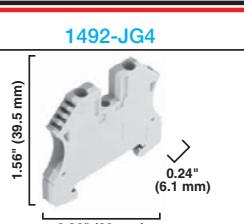
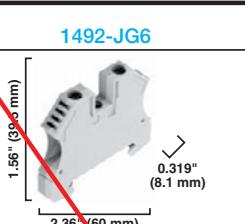
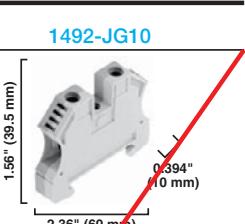
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Bulletin 1492

Screw Connection Terminal Blocks

Grounding Blocks, Continued

	1492-JG4			1492-JG6			1492-JG10											
Dimensions are not intended to be used for manufacturing purposes.																		
Note: Height dimension is measured from top of rail to top of terminal block.																		
																		
																		
																		
Specifications																		
Certifications																		
Voltage Rating																		
Maximum Current																		
Grounding																		
Wire Range (Rated Cross Section)		22...10 AWG	4 mm ²	4 mm ² (20...12 AWG)	22...8 AWG	6 mm ²	6 mm ² (20...10 AWG)	22...6 AWG	10 mm ² (16...8 AWG)									
Wire Strip Length																		
0.39 in (10 mm)																		
Recommended Tightening Torque																		
4.4...8.8 lb•in (0.5...1.0 Nm)																		
Mounting Torque — Center Screw																		
4.4...7.1 lb•in (0.5...0.8 Nm)																		
Density (Blocks per ft/meter)																		
49 per ft/163 per meter																		
37 per ft/123 per meter																		
Housing Temperature Range																		
-58...+248 °F (-50...+120 °C)																		
Terminal Blocks																		
Color:		Green/Yellow	Cat. No.	1492-JG4	Pcs/ Pkg	Cat. No.	1492-JG6	Pcs/ Pkg	Cat. No.									
				100			50		50									
Accessories																		
Mounting Rails:		Cat. No.	Cat. No.	Cat. No.	Pcs/ Pkg	Cat. No.	Cat. No.	Pcs/ Pkg	Cat. No.									
1 m Symmetrical DIN (Steel)		199-DR1	199-DR1	199-DR1	10	199-DR1	199-DR1	10	199-DR1									
1 m Symmetrical DIN (Aluminum)		1492-DR5	1492-DR5	1492-DR5	10	1492-DR5	1492-DR5	10	1492-DR5									
1 m Hi-Rise Sym. DIN (Aluminum)		1492-DR6	1492-DR6	1492-DR6	2	1492-DR6	1492-DR6	2	1492-DR6									
1 m Angled Hi-Rise Sym. DIN (Steel)		1492-DR7	1492-DR7	1492-DR7	2	1492-DR7	1492-DR7	2	1492-DR7									
End Barrier		Not Required	Not Required	Not Required	—	Not Required	Not Required	—	Not Required									
End Anchors and End Retainers:		1492-ERL35	1492-ERL35	1492-ERL35	20	1492-ERL35	1492-ERL35	20	1492-ERL35									
Screwless End Retainer																		
DIN Rail — Normal Duty		1492-EAJ35	1492-EAJ35	1492-EAJ35	100	1492-EAJ35	1492-EAJ35	100	1492-EAJ35									
DIN Rail — Heavy Duty		1492-EAHJ35	1492-EAHJ35	1492-EAHJ35	50	1492-EAHJ35	1492-EAHJ35	50	1492-EAHJ35									
Other Accessories:		1492-GM35	1492-GM35	1492-GM35	25	1492-GM35	1492-GM35	25	1492-GM35									
Group Marking Carrier																		
Marking Systems:		1492-M6X12 (120/card)	1492-M6X12 (120/card)	1492-M7X12 (108/card)	5	1492-M7X12 (108/card)	1492-M7X12 (108/card)	5	1492-M7X12 (108/card)									
Snap-in marker cards		1492-M6X5 (200/card)	1492-M6X5 (200/card)	1492-M8X5 (160/card)	5	1492-M8X5 (160/card)	1492-M8X5 (160/card)	5	1492-M8X5 (160/card)									

Bulletin 1492

Screw Connection Terminal Blocks Isolation Blocks

700-0011
ISOLATION BLOCK, JKD4
ALLEN BRADLEY 1492-JKD4
JM 1/22/15

	1492-JKD3			1492-JKD3TP			1492-JKD4		
Dimensions are not intended to be used for manufacturing purposes. Note: Height dimension is measured from top of rail to top of terminal block.									
Specifications	Knife Disconnect Feed-Through Terminal Block			Knife Disconnect Feed-Through Terminal Block with test plug socket			Single level feed-through terminal block with knife disconnect		
Certifications		CSA	IEC		CSA	IEC		CSA	IEC
Voltage Rating	300V AC/DC	500V AC/DC		300V AC/DC	500V AC/DC		600V AC/DC	300V AC/DC	400V AC/DC
Maximum Current	10 A	24 A		10 A	24 A		22 A	10 A	32 A
Wire Range (Rated Cross Section)	#22...12 AWG	2.5 mm ²		#22...12 AWG	2.5 mm ²		#22...10 AWG	0.05...4.0 mm ²	
Fuse Size (Dummy Fuse Supplied)	—			—			1/4 in. x 1-1/4 in.		
Wire Strip Length	0.39 in. (10 mm)			0.39 in. (10 mm)			0.512 in. (13 mm)		
Recommended Tightening Torque	7.1 lb•in. (0.8 N•m)			7.1 lb•in. (0.8 N•m)			9.0 lb•in. (1.0 N•m)		
Density	49 pcs/ft (163 pcs/m)			49 pcs/ft (163 pcs/m)			49 pcs/ft (163 pcs/m)		
Housing Temperature Range	-58...+248 °F (-50...+120 °C)			-58...+248 °F (-50...+120 °C)			-58...+248 °F (-50...+120 °C)		
Short-Circuit Current Rating	See page 12-43								
Terminal Blocks	Cat. No.	Pkg Qty.	Cat. No.	Pkg Qty.	Cat. No.	Pkg Qty.	Cat. No.	Pkg Qty.	
Color: with Test Points	1492-JKD3	50	1492-JKD3TP	50	1492-JKD4	50	1492-JKD4TP	50	
	—	—	—	—	—	—	—	—	
Accessories	Cat. No.	Pkg Qty.	Cat. No.	Pkg Qty.	Cat. No.	Pkg Qty.	Cat. No.	Pkg Qty.	
Mounting Rails: 1 m Symmetrical DIN (Steel)	159-DR1	10	199-DR1	10	199-DR1	10	199-DR1	10	
1 m Symmetrical DIN (Aluminum)	1492-DR5	10	1492-DR5	10	1492-DR5	10	1492-DR5	10	
1 m Hi-Rise Sym. DIN (Aluminum)	1492-DR6	2	1492-DR6	2	1492-DR6	2	1492-DR6	2	
1 m Angled Hi-Rise Sym. DIN (Steel)	1492-DR7	2	1492-DR7	2	1492-DR7	2	1492-DR7	2	
End Barriers	1492-EBJ3	50	1492-EBJ3	50	1492-EBJ3	50	1492-EBJ3	50	
	Yellow	—	—	—	—	—	1492-EBJ3-Y	50	
End Anchors: Screwless End Retainer	1492-ERL35	20	1492-ERL35	20	1492-ERL35	20	1492-ERL35	20	
DIN Rail — Normal Duty	1492-EAJ35	100	1492-EAJ35	100	1492-EAJ35	100	1492-EAJ35	100	
DIN Rail — Heavy Duty	1492-EAHJ35	50	1492-EAHJ35	50	1492-EAHJ35	50	1492-EAHJ35	50	
Jumpers: Plug-in Center Jumper — 50-Pole	1492-CJLJ5-50	10	1492-CJLJ5-50	10	1492-CJLJ5-50	10	—	—	
Plug-in Center Jumper — 41-Pole	—	—	—	—	—	—	1492-CJLJ6-41	10	
Plug-in Center Jumper — 10-Pole	1492-CJLJ5-10	20	1492-CJLJ5-10	20	1492-CJLJ6-10	20	—	—	
Plug-in Center Jumper — 9-Pole	1492-CJLJ5-9	20	1492-CJLJ5-9	20	—	—	—	—	
Plug-in Center Jumper — 8-Pole	1492-CJLJ5-8	20	1492-CJLJ5-8	20	—	—	—	—	
Plug-in Center Jumper — 7-Pole	1492-CJLJ5-7	20	1492-CJLJ5-7	20	—	—	—	—	
Plug-in Center Jumper — 6-Pole	1492-CJLJ5-6	20	1492-CJLJ5-6	20	—	—	—	—	
Plug-in Center Jumper — 5-Pole	1492-CJLJ5-5	20	1492-CJLJ5-5	20	—	—	—	—	
Plug-in Center Jumper — 4-Pole	1492-CJLJ5-4	60	1492-CJLJ5-4	60	1492-CJLJ6-4	60	—	—	
Plug-in Center Jumper — 3-Pole	1492-CJLJ5-3	60	1492-CJLJ5-3	60	1492-CJLJ6-3	60	—	—	
Plug-in Center Jumper — 2-Pole	1492-CJLJ5-2	60	1492-CJLJ5-2	60	1492-CJLJ6-2	60	—	—	
Insulated Side Jumper — 24-Pole	1492-SJ5B-24	50	1492-SJ5B-24	50	—	—	—	—	
Insulated Side Jumper — 10-Pole	1492-SJ5B-10	50	1492-SJ5B-10	50	—	—	—	—	
Uninsulated Side Jumper — 10-Pole	—	—	—	—	1492-N49	10	—	—	
Side Jumper — Insulating Sleeve	—	—	—	—	1492-SJS	10	—	—	
Screw Type Jumper Notching Tool	1492-T1	1	1492-T1	1	—	—	—	—	
Other Accessories: Partition Plate	1492-EBJ16	20	1492-EBJ16	20	—	—	—	—	
Test Plug	—	—	1492-TP23	20	—	—	—	—	
Group Marking Carrier	1492-GM35	25	1492-GM35	25	1492-GM35	25	—	—	
Marking Systems: Snap-in marker cards	1492-M5X12 (144/card)	5	1492-M5X12 (144/card)	5	1492-MS8X12 (56/card)	5	—	—	
Snap-in marker cards	1492-M5X5 (200/card)	5	1492-M5X5 (200/card)	5	1492-MS8X9 (56/card)	5	—	—	
Adhesive Labels	—	—	—	—	1492-ALHFB (50/sheet)	1	—	—	

Bulletin 1492
Screw Connection Terminal Blocks
 Regulatory Approvals

Allen-Bradley screw terminal blocks generally have been designed to meet the requirements of one or more regulatory bodies. Most products have also been tested per additional standards. The following is a listing of some of the regulatory bodies and standards which apply to Allen-Bradley screw terminal block products. See the particular product description for information on specific approvals and ratings.



(Underwriters Laboratories) — Devices in this catalog with one of these ratings have been tested by Underwriters Laboratories and meet the requirements of one or more of the following United States Standards:

- UL 467 — Grounding and Bonding Equipment
- UL 486E — Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors
- UL 1059 — Standard for Terminal Blocks

Reference UL files E34648, E40735, E65138, E113724, E160646



(Underwriters Laboratories) — Devices in this catalog with this rating have been tested by Underwriters Laboratories and meet the requirements of one or more of the following Canadian Standards:

- CSA 22.2 No. 158 — Terminal Blocks

Reference UL file E40735



(Canadian Standards Association) — Devices in this catalog with this rating have been tested by the Canadian Standards Association and meet the requirements of one or more of the following Canadian Standards:

- CSA 22.2 No. 158 — Terminal Blocks

Reference CSA files LR14074, LR67896, and 220124



Terminal blocks listed in this catalog meet the requirements of the Low Voltage Directive put forth by the European Union. Devices have been tested and comply with one or more of the following European Norms:

- EN 60947-1 — Low Voltage Switchgear and Controlgear: General Rules
- EN 60947-7-1 — Low Voltage Switchgear and Controlgear: Terminal Blocks for Copper Conductors
- EN 60947-7-2 — Low Voltage Switchgear and Controlgear: Protective Conductor Terminal Blocks for Copper Conductors
- EN 60947-7-3 — Low Voltage Switchgear and Controlgear: Safety Requirements for Fuse Terminal Blocks



EEx e II — Devices listed in this catalog with "EEx e II" ratings meet the following European Norms per DEMKO or KEMA, Approval Certification Bodies for the European Union:

- EN 50014 — Electrical Apparatus for Potentially Explosive Atmospheres — General Requirements
- EN 50019 — Electrical Apparatus for Potentially Explosive Atmospheres — Increased Safety "e"

Contact your local Allen-Bradley distributor for a copy of the certificate.

Ex e II — Many 1492-J, 1492-K, 1492-L, and 1492-W terminal blocks in this catalog meet the following Canadian Standards per Underwriters Laboratories:

- E79-0-95 — Electrical Apparatus for Explosive Atmospheres — Part 0 — General Requirements
- E79-7-95 — Electrical Apparatus for Explosive Atmospheres — Part 7 — Increased Safety "e"

These products are suitable for Class I, Zone 1 Hazardous Locations. Reference UL file E187022. Contact your local Allen-Bradley distributor for more information.

AEx e II — Devices listed in this catalog with an "AEx e II" rating meet the following United States Standard per Underwriters Laboratories:

- UL 2279 — Standard for Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations

These products are suitable for Class I, Zone 1 Hazardous Locations. Reference UL file E187022. Contact your local Allen-Bradley distributor for more information.

Lloyd's Register — Many 1492-H, 1492-J, 1492-L, and 1492-W terminal blocks in this catalog have been approved for use in marine, off-shore, and industrial installations per the following standard:

- Lloyd's Register Test Specification No. 1:1996

Contact your local Allen-Bradley distributor for a copy of the certificate.

Materials and Design Features (1492-J and 1492-W)

The 1492 Screw Terminal Block line is designed for safety, installation ease, and ruggedness. Features using these design criteria include:

- High copper content alloy for excellent conductivity
- Tin-plated terminals and zinc chromate steel screws for corrosion resistance (1492-W terminal blocks have nickel-plated terminals and stainless steel screws)
- Four-sided wire funnel guides for easy insertion
- Finger-safe housings to prevent accidental contact with live circuits
- International approvals for worldwide use
- DIN Rail (cat. no. 199-DR1) mountability allowing terminal blocks to be placed on the same channel as contactors, starters, relays, and other DIN Rail-mounted control devices
- Self-extinguishing, polyamide 6.6 housing with UL 94 V0 flammability rating (1492-W terminal blocks have UL 94 V2 flammability rating)
- Backed out screws for fast wiring
- CE mark for use in the European Union



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Bulletin 1492

Screw Connection Terminal Blocks

The Allen-Bradley Line of IEC Terminal Blocks... International Products for a Worldwide Marketplace

Allen-Bradley's Bulletin 1492-J line of internationally approved IEC style terminal blocks offers a wide range of features and benefits ideally suited for many industrial applications. The 1492-J line has been designed to meet the tough requirements of almost every industrial application. Functional, internationally approved, finger-safe, and cost-effective — the Allen-Bradley 1492-J line.

Products Available in the 1492 Screw Terminal Block Line

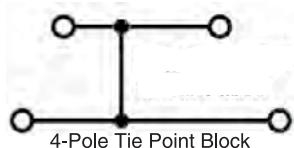
Our family of IEC terminal blocks consists of many different types of blocks, from general feed-through terminal blocks for control wiring to specialty blocks for grounding and isolating. We even offer thermocouple terminal blocks, specifically designed for temperature-dependent process control applications.

Products offered within the 1492 Screw Terminal Block line include:

- **Feed-Through Blocks**, capable of accommodating #30...2/0 AWG (0.2...70 mm²) wire
- **Grounding Blocks** for grounding a given circuit to the DIN Rail
- **Mini Blocks** for applications where panel space is at a premium
- **Two-Level Blocks** that double circuit wiring density
- **Multi-Conductor Blocks** that allow splitting or joining of control circuits
- **Three-Level Sensor Blocks** for coordination of three-wire sensor groups
- **Isolation Blocks** for circuit isolation during testing and troubleshooting
- **Fuse Blocks**, with and without blown fuse indication, for easily integrated overcurrent protection
- **Electrical Component Blocks** that allow the insertion of fixed components into control circuits. Available components include resistors, diodes, surge suppression circuits, and shunt bars.

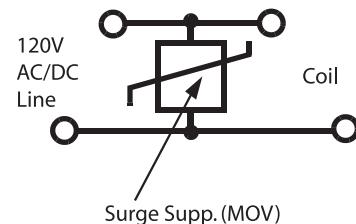
Tie-Point Block
(Cat. No. 1492-JD3C)

Incorporates a shunt bar between the upper and lower current bars to provide a common point among all four terminals.



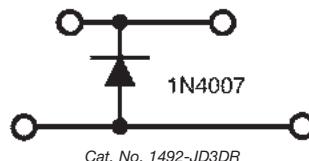
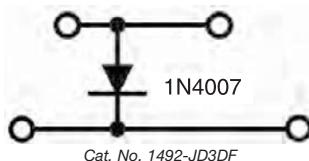
Surge Suppression Block
(Cat. Nos. 1492-JD3SS)

Provides a convenient means of incorporating transient suppression for relays, contactors, and solenoids into a control system.



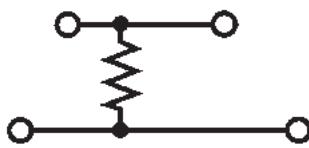
Diode Block
(Cat. Nos. 1492-JD3DF, 1492-JD3DR)

Uses a 1N4007 diode between the upper and lower levels for insertion into a control circuit. This block is useful in low voltage DC control circuits for directioning and suppression.



Resistor Block
(Cat. No. 1492-JD3RB..., JD3RC001)

Permits the introduction of a 10 Ω...4.75 MΩ resistor into a control circuit.



- **Return Blocks** that have both terminations on the same side of the terminal block allowing the rail to be mounted next to the wall of an enclosure
- **Plug-In Style Blocks** that allow the insertion of removable plugs into control circuits. Available plugs include a Disconnect Plug, a Fuse Plug, and a Component Plug which will accommodate various electrical components
- **Thermocouple Terminal Blocks** (Types B, E, J, K, N, S, T) for temperature control applications
- A wide variety of **Snap-In Markers** for individual or group circuit identification
- Multi-pole insulated **Center Jumpers** which provide a convenient method of commoning control circuits



Section 6

Warranty



543 S. Pierce Avenue, Louisville, CO 80027

(PH) 303-530-3298 ♦ (F) 303-530-3368

www.polymersolution.com

LIMITED WARRANTY

New Polymer Equipment Limited Warranty

Warranty Period: One (1) year from start-up, not to exceed 18 calendar months from date of shipment; Limited.

VeloDyne warrants each new Polymer System of VeloDyne's manufacture to be free from defects in material and workmanship, under normal use and service for one (1) year following the date of equipment start-up not to exceed 18 consecutive calendar months from the date the equipment is shipped to you. This Limited Warranty shall apply to the system's mixing chamber for life, and otherwise only to complete polymer systems of VeloDyne's manufacture; parts are covered by a separate Limited Warranty.

Equipment and accessories not of VeloDyne's manufacture are warranted only to the extent of the original manufacturer's warranty and subject to their allowance to VeloDyne (only if found to be defective by such manufacturer).

Warranty Terms

During the Limited Warranty period, any defect in material or workmanship in any warranted item of VeloDyne's Polymer System not expressly excluded below shall be repaired or replaced at VeloDyne's option without charge, provided that (a) the equipment and parts are used according to the manufacturer's recommended usage and in an ordinary manner, and (b) you give us prompt written notice within the time period set forth herein that the equipment or parts manufactured by us fail to function properly under normal and proper use.

Should your unit prove defective within the warranty period, you must contact our Service Department for a return authorization (RMA) number to submit with the returned equipment. This RMA must be noted prominently on the outside of your packaging and on any correspondence related to the return. VeloDyne's liability under this warranty is limited to the repair of or replacement in kind or credit, in VeloDyne's sole option and discretion, of any items proved to be defective, provided the allegedly defective goods are returned to VeloDyne's factory located at 543 S. Pierce Avenue, Louisville, CO 80027, by Purchaser transportation prepaid.

All costs and expense related to shipping of any replacement parts or goods shall be VeloDyne's expense, but Purchaser shall pay for all installation costs. The foregoing shall not apply to equipment or parts that shall have been altered or repaired after shipment to you by anyone except VeloDyne's authorized agents and/or service employees. Purchaser is responsible for determining the suitability of VeloDyne's equipment for Purchaser's intended use, and VeloDyne shall in no event be liable in this respect. Any equipment or parts manufactured by others but furnished to you by us will be repaired or replaced only to the extent of the original manufacturer's warranty. Purchaser must provide prompt written notice to VeloDyne of any warranty issues to obtain its benefits.

Should VeloDyne determine that the reason or action giving rise to the defect or operational issue with your warranted Equipment is the result of Owner's actions (or actions of Owner's employees, agents, representatives or affiliates), then this warranty shall not apply to the repair or replacement and VeloDyne will invoice the Owner for the cost of all parts, repairs, service calls and travel expenses incurred in investigating or repairing your defective equipment.

Purchaser's Responsibility

This Limited Warranty requires proper start-up maintenance and registration, and periodic inspections of the Polymer System Equipment as indicated in the Operator & Maintenance Manual furnished with each new system. The cost of routine or required maintenance and service(s) is the responsibility of Purchaser, and Purchaser is required to keep documented evidence that routine or required maintenance services were performed.

Warranty Exclusions and Limitations

The warranties contained herein SHALL NOT APPLY TO:

- 1: New Polymer System Equipment delivered to the Purchaser in which the warranty registration has not been completed and returned to VeloDyne within thirty (30) days from the date of delivery of the Equipment to Purchaser.
- 2: Any defect which was caused (in VeloDyne's sole judgment) by other than normal use and service of the Polymer System Equipment, or by any of the following:
 - Improper handling, storage, operation, interconnection, installation, alteration or repair by anyone other than VeloDyne or those authorized by VeloDyne.
 - Parts or accessories installed on the Equipment that were not manufactured or installed by VeloDyne authorized representatives.
 - Improper voltage or wiring and/or inconsistent power supply.
 - Use of parts that are not 100% compatible with the Equipment.
 - Improper exposure to the elements.
 - Freezing water or excessive heat.
 - Water damage.
 - Water pressure surges due to owner system.
 - Accidents.
 - Damage after delivery to the Shipping Point.
 - Lack of reasonable and proper maintenance.
 - Misuse or negligence.
 - Natural calamities.
 - Overloading the system.
 - Vandalism.
- 3: Any Polymer System Equipment whose identification numbers or marks have been altered or removed.
- 4: Any Polymer System Equipment which any of the required or recommended periodic inspection or services have been performed using parts not manufactured or supplied by VeloDyne or meeting VeloDyne specifications.
- 5: Any defect which was caused (in VeloDyne's sole judgment) by operation of the Polymer System Equipment not abiding by standard operating procedures outlined in the Operator's Manual.
- 6: Transportation costs, if any, to or from an authorized VeloDyne rep or supplier.
- 7: Travel time of VeloDyne's service personnel to make a repair on the Purchaser's site or other approved location.
- 8: In no event will VeloDyne's liability under this warranty exceed the purchase price of the Polymer System Equipment or component(s).
- 9: VeloDyne will not be responsible to any person, under any circumstances, for any incidental or consequential damages (including but not limited to loss of profits, out of service time, and the like) occurring for any reason at any time.
- 10: Diagnostic and overtime labor premiums are not covered under this Limited Warranty Policy.
- 11: Depreciation damage caused by normal wear, lack of reasonable and proper maintenance, failure to follow operating instructions, misuse, or lack of proper protection during storage.
- 12: Accessory systems or electronic components not of VeloDyne's manufacture are warranted only to the extent of such manufacturer's respective Limited Warranty, if any.
- 13: Tools are not covered under this warranty.

- 14: **Consumables and Wear Items Not Covered:** Air Filters, Ball Valves, Bearings, Belts, Optional Accessories, Pressure Relief Valves, Screens, Disconnect Valves, Hoses, Rotors, Stators, Pump Diaphragms, Pump Seal Kits, and other customary consumables and wear items typically excluded from warranty coverage.
- 15: Any progressive cavity pump, rotor, stator, or packing, whether under normal or abnormal use.

Parts Warranty

Parts replaced during the warranty period will receive the balance of the first year New Polymer System Equipment Limited Warranty, during the first twelve (12) months.

Replacement parts after the original Equipment warranty has expired are warranted to be free from defects of material for thirty (30) days or the part will be repaired or replaced (in VeloDyne's sole judgment and option). Removal and reinstallation labor is not covered.

All parts warranty claims must be filed within ten (10) business days of initial part failure or the warranty claim will be void.

Exclusion of Other Warranties

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, OBLIGATIONS AND LIABILITIES OF ANY KIND, EXPRESS OR IMPLIED, EXCEPT AS STATED HEREIN. THERE ARE NO IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE, WHICH ARE HEREBY EXPRESSLY DISCLAIMED. VELODYNE'S OBLIGATION TO REPAIR OR REPLACE AS SET FORTH ABOVE IS OUR ENTIRE AND EXCLUSIVE LIABILITY AND YOUR EXCLUSIVE REMEDY FOR ANY CLAIM ARISING OUT OF THE GOODS OR SERVICES WE PROVIDE TO YOU, WHETHER SUCH CLAIM IS BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY. IN NO EVENT WILL WE BE LIABLE FOR ANY SPECIAL OR CONSEQUENTIAL DAMAGES. IF CIRCUMSTANCES CAUSE THE LIMITED REMEDY STATED HEREIN TO FAIL OF ITS ESSENTIAL PURPOSES, OUR LIABILITY FOR DAMAGES SHALL NOT EXCEED THE CONTRACT PRICE FOR THE GOODS FOR WHICH LIABILITY IS CLAIMED. ANY ACTION AGAINST US ARISING OUT OF THE GOODS OR SERVICES WE PROVIDE TO YOU SHALL BE BROUGHT WITHIN ONE YEAR OF THE DATE SUCH ACTION ACCRUES. THIS WARRANTY IS SOLELY FOR THE BENEFIT OF PURCHASER AND NO OTHERS.

Tab 4: Electrical and Control



517 Commercial Drive
Fairfield, Ohio 45014
p/888.874.2062 f/513.874.2099
w/www.controlinterface.com

Panel J-978-1
Status Submittal
Date 09 Nov 2016

Data sheet

Panel Data

Name	Press Control Panel	Name	Concannon Winery
Desc		Desc	
Supply	460/480V	Created	09 Nov 2016
Phase	3 Phase, 3 Wire, (No Ntrl)	Loc	CA
Control	Dual 24V-115/120V	Loc #	
FLA	7.50	Client	Process Wastewater Technologies
SCCR	10k RMS Sym; 460/480V Max	Client #	VDPCA16116

Motor Data

Name	Model	Qty	HP	Volt	Phase	FLA	AWG
Sludge Pump	STD	1	1	460	3	2.1	12
Dewatering Drum	STD	1	0.125	460	3	0.25	12
Flash Mixer	STD	1	0.125	460	3	0.29	12
Floc Mixer	STD	1	0.125	460	3	0.29	12

Control Panel

Qty	Name	Manufacturer	Number	Description
1	Breaker	Square D	HDL36015	600V 15A 3P 25k/18k/14k AIC
1	Breaker Lugs	Square D	PDC6HD6	6-#14-#6 AWG H Frame
1	Breaker Oper Shaft	Square D	9421LS8	6-8 IN
1	Breaker Operator	Square D	9421LC43	3" Handle NEMA 4X CHROME PLATED
1	Breaker Operator	Square D	9421LJ7	Mech H/J Frame
1	Contact	Square D	9001KA1	30MM NO/NC Fingersafe
1	Contact	Square D	9001KA2	30MM NO Fingersafe
2	Contact	Square D	9001KA3	30MM NC Fingersafe
1	Contact - Aux	Square D	LADN40	IEC 4 NO
1	DC Drive	Dart Controls	125DV-C	115/120V 0.5HP 90VDC 6.5A
1	Dist Block	Marathon	1422570	600V 175A 2P (1-4)
1	Enclosure	Hoffman	A48H248SSLP3PT	48X24X8 NEMA 4X ***CUSTOM Enclosure*** Hoffman Ref #573CC
1	Enclosure - Handle	Hoffman	CWHNL	Non-Locking
1	Fan	Hoffman	A4AXFN	115/120V 4 IN Panel Fan
1	Fan/Bracket	Hoffman	ABRKT4	4 IN Fan Bracket
1	Flasher	Ingram Products	SSF150W	115/120V 150WATT Inline
5	Fuse	Bussman	AGC-1	250V 1A Non-Time-Del Glass
1	Fuse	Bussman	AGC-1/2	250V 0.5A Non-Time-Del Glass
7	Fuse	Bussman	AGC-2	250V 2A Non-Time-Del Glass
1	Fuse	Bussman	AGC-8	250V 8A Non-Time-Del Glass

1	Fuse	Bussman	FNQ-20	500V 20A Time-Dly Midget
2	Fuse	Bussman	FNQ-R-10	600V 10A Time-Dly Class CC
9	Fuse	Bussman	KTK-R-3	600V 3A Fast-Act Class CC
3	Fuse	Bussman	KTK-R-6	600V 6A Fast-Act Class CC
9	Fuse Block	Allen Bradley	1492-H4	115/120V 15A 1P Disconnect
5	Fuse Block	Allen Bradley	1492-H5	24V 12A 1P Disconnect
1	Fuse Block	Marathon	6SM30A1I	600V 30A 1P Midget Rail Mnt Trip Ind
1	Fuse Block	Marathon	6SM30A2I	600V 30A 2P Midget Rail Mnt Trip Ind
4	Fuse Block	Marathon	6SM30A3I	600V 30A 3P Midget Rail Mnt Trip Ind
2	Ground Lug	Square D	PK7GTA	#14-2/0 Ground Bar
1	Light	Ingram Products	LX40F	Top Mount With Flasher
1	Light - Pilot	Square D	9001SKP38LGG9	115/120V NEMA 4X LED Green
1	Light - Pilot	Square D	9001SKP38LWW9	115/120V NEMA 4X LED White
1	Operator - PB	Square D	9001SKR9P1R	30MM NEMA 4X III Push-Pull Red
1	Operator - SW	Misc Supply	7343K751	2 Pos SPDT 15A ON ON Toggle Quick Disconnect
1	Operator - SW	Square D	9001SKS46B	30MM NEMA 4X 3 POS Cam F
1	PLC - Base Unit	Unitronics	V700-T20BJ	24VDC 7 inch NEMA 4X Indoor Vision 700 800x480 Color HMI
1	PLC - I/O Module	Unitronics	V200-18-E3XB	24VDC 37 Dig/8 Alg Vision Snap-In Combo Block
1	PLC - Network	Square D	LU9GC3	Modbus Hub 10 Port
4	PLC - Network	Square D	VW3A8306R10	1M RS 485 Cable 2xRJ45 Connectors
1	PLC - Network	Square D	VW3A8306R30	3M RS 485 Cable 2xRJ45 Connectors
1	PLC - Network	Square D	VW3A8306RC	Modbus Terminator RJ45 120 ohm
1	PLC - Network	Unitronics	V100-17-RS4X	Vision 700 Isolated RS232/485 Port
1	PLC - SD Card	Standard	STD	Micro SD
1	Panel	Hoffman	A48P24	48X24 Steel
1	Power Supply	Puls	ML60.241	24VDC 2.5A (60W) Din Rail Mount
5	Relay	Idec	RH1B-ULAC120V	115/120V 1P 5 Mini Blade Light
2	Relay	Idec	RH3B-ULAC120V	115/120V 3P 11 Mini Blade Light
1	Relay - Industrial	Square D	CAD50G7	115/120V 5 NO IEC
1	Relay - Seal	Diversified Electronics	SPM-120-AAA-100K	115/120V 2P 11 Pin
5	Socket	Idec	SH1B-05	300V 1P 5 Mini Blade
2	Socket	Idec	SH3B-05	300V 3P 11 Mini Blade
1	Socket	Idec	SR3P-06	300V 3P 11 Pin
1	Tags	Pinnacle Industrial Engraving	W/B 4.5X4 LEGEND PLATE	4.5 X 4 Engraved Legend Plate 11 Lines
28	Term Block	Square D	NSYTRV42	600V 30A 26-10AWG Gray 6mm
18	Term Block	Square D	NSYTRV42BL	600V 30A 26-10AWG Blue 6mm
4	Term Block	Square D	NSYTRV62	600V 50A 24-8AWG Gray 8mm
3	Term End Anchor	Square D	NSYTRAABV35	Gray
6	Term End Barrier	Square D	NSYTRAP22	Gray Partition For 2.5-10mm Width TBs
1	Thermostat	Pfannenburg	17121000010	NO

1	Time Meter	Redington Counters	710-0002	115/120V 99,999.9 Hrs Non-Reset
3	Variable Frequency Drive	Square D	ATV320U04N4C	380-500V 3PH 1.6A in / 1.5A out 0.5HP (0.37kW) Altivar 320 Compact
1	Variable Frequency Drive	Square D	ATV320U07N4C	380-500V 3PH 2.8A in / 2.3A out 1HP (0.75kW) Altivar 320 Compact
1	Vent	Stahlin	BV4XKIT	NEMA 4X Breather
1	Window Kit	Hoffman	AWDH2016N4SS	20X16 316 Stainless Steel Deep Hinged

Remote Mounted

Qty	Name	Manufacturer	Number	Description
2	Electrode	Ametek	6013-SS-P-A-1	115/120V 1' Stainless Rod; PVC Insulated
1	Electrode Holder	Ametek	6012AE2	115/120V 2 Pole Electrode, w/ WaterProof Cover
1	Transformer	Square D	2S1FSS	240/480V 2 KVA 120V Sec SS Dry Type

Spare Parts

Qty	Name	Manufacturer	Number	Description
2	Fuse	Bussman	AGC-1	250V 1A Non-Time-Del Glass
2	Fuse	Bussman	AGC-1/2	250V 0.5A Non-Time-Del Glass
2	Fuse	Bussman	AGC-2	250V 2A Non-Time-Del Glass
2	Fuse	Bussman	AGC-8	250V 8A Non-Time-Del Glass
2	Fuse	Bussman	FNQ-20	500V 20A Time-Dly Midget
2	Fuse	Bussman	FNQ-R-10	600V 10A Time-Dly Class CC
3	Fuse	Bussman	KTK-R-3	600V 3A Fast-Act Class CC
3	Fuse	Bussman	KTK-R-6	600V 6A Fast-Act Class CC



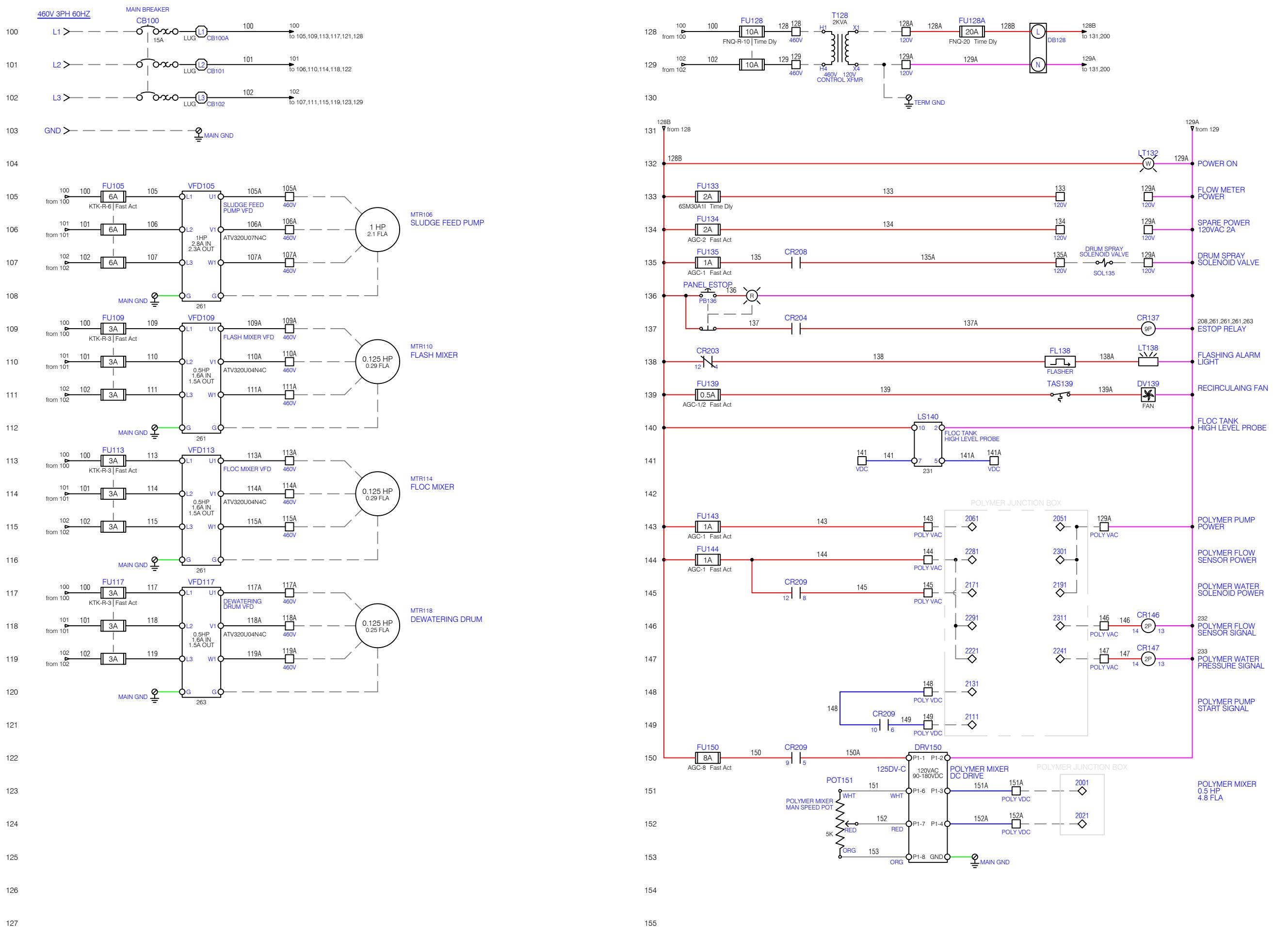
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www.controlinterface.com

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NOTES



ENCLOSED INDUSTRIAL CONTROL PANEL



REVISIONS

CLIENT	Process Wastewater Technologies
CLIENT REF	VDPCA16116
LOCATION	CA
DRAWN BY	C Ingram
CHECKED BY	n/a
JOB	Concannon Winery
PANEL	Press Control Panel
DWG	J-978-1A
STATUS	Submittal
DATE	09 Nov 2016



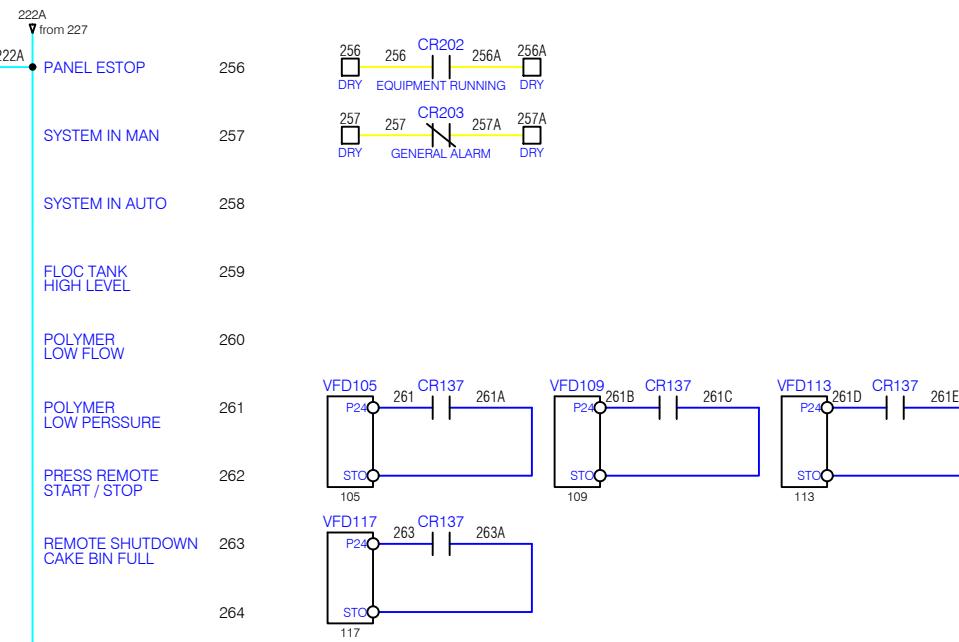
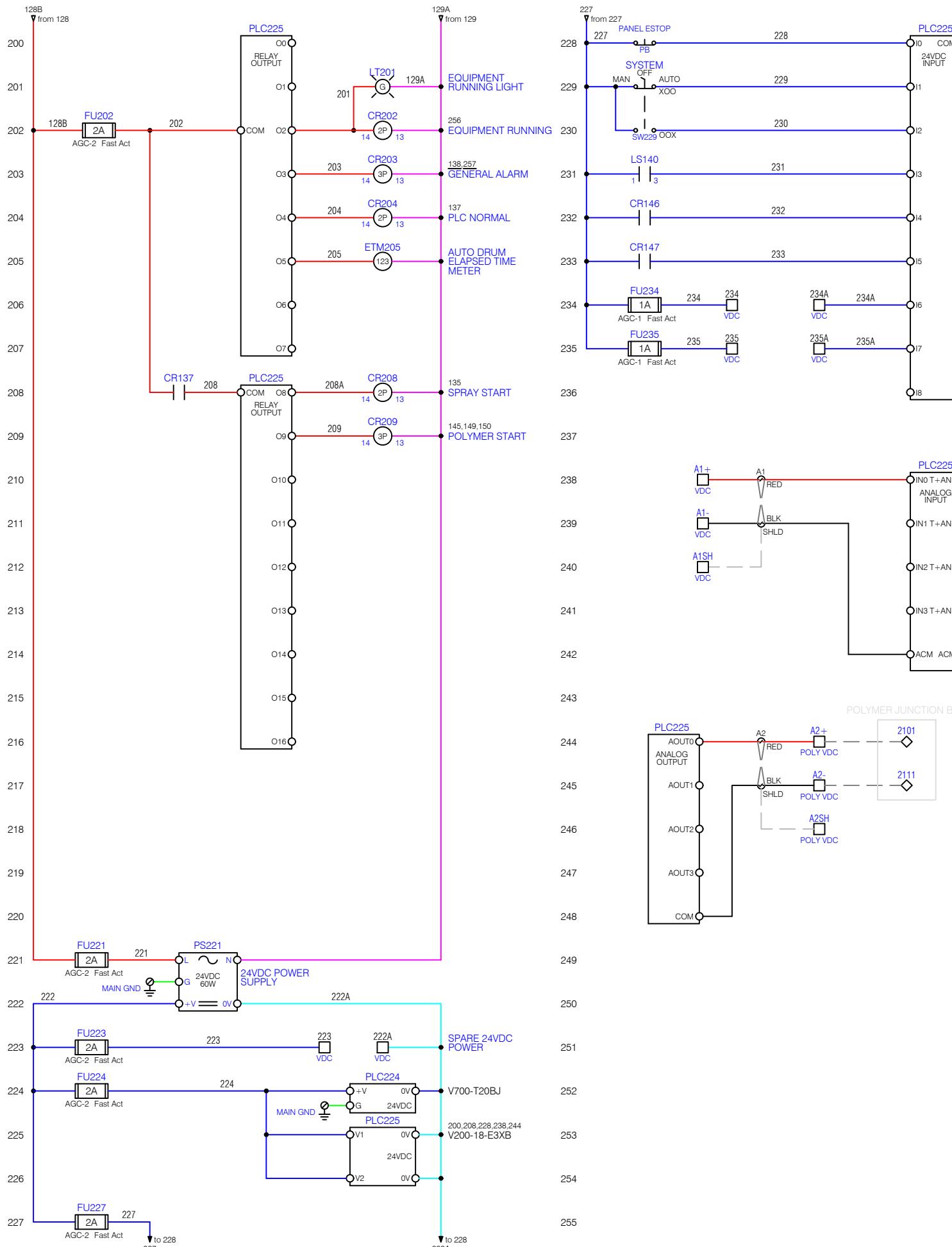
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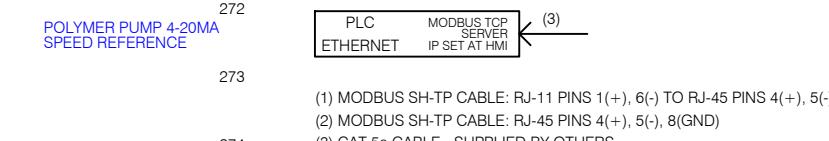
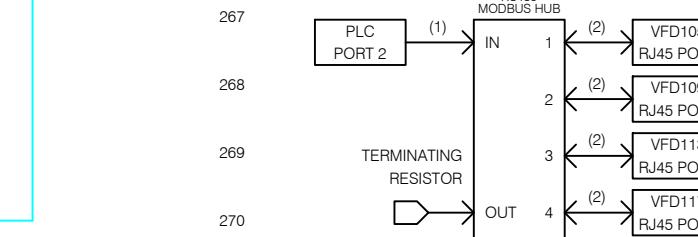
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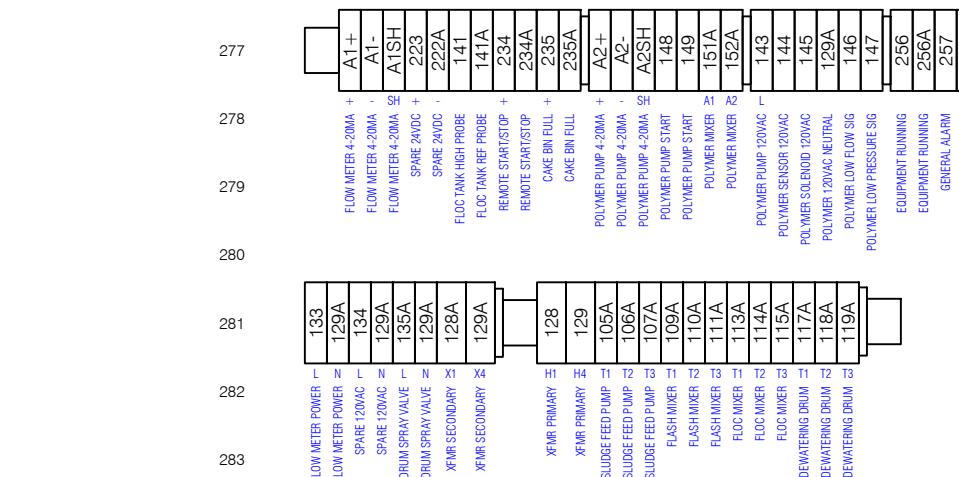
ENCLOSED INDUSTRIAL CONTROL PANEL



NETWORKING LAYOUT



TERMINAL BLOCK LAYOUT



REVISIONS

CLIENT	Process Wastewater Technologies
CLIENT REF	VDPCA16116
LOCATION	CA
DRAWN BY	C Ingram
CHECKED BY	n/a
JOB	Concannon Winery
PANEL	Press Control Panel
DWG	J-978-1B
STATUS	Submittal
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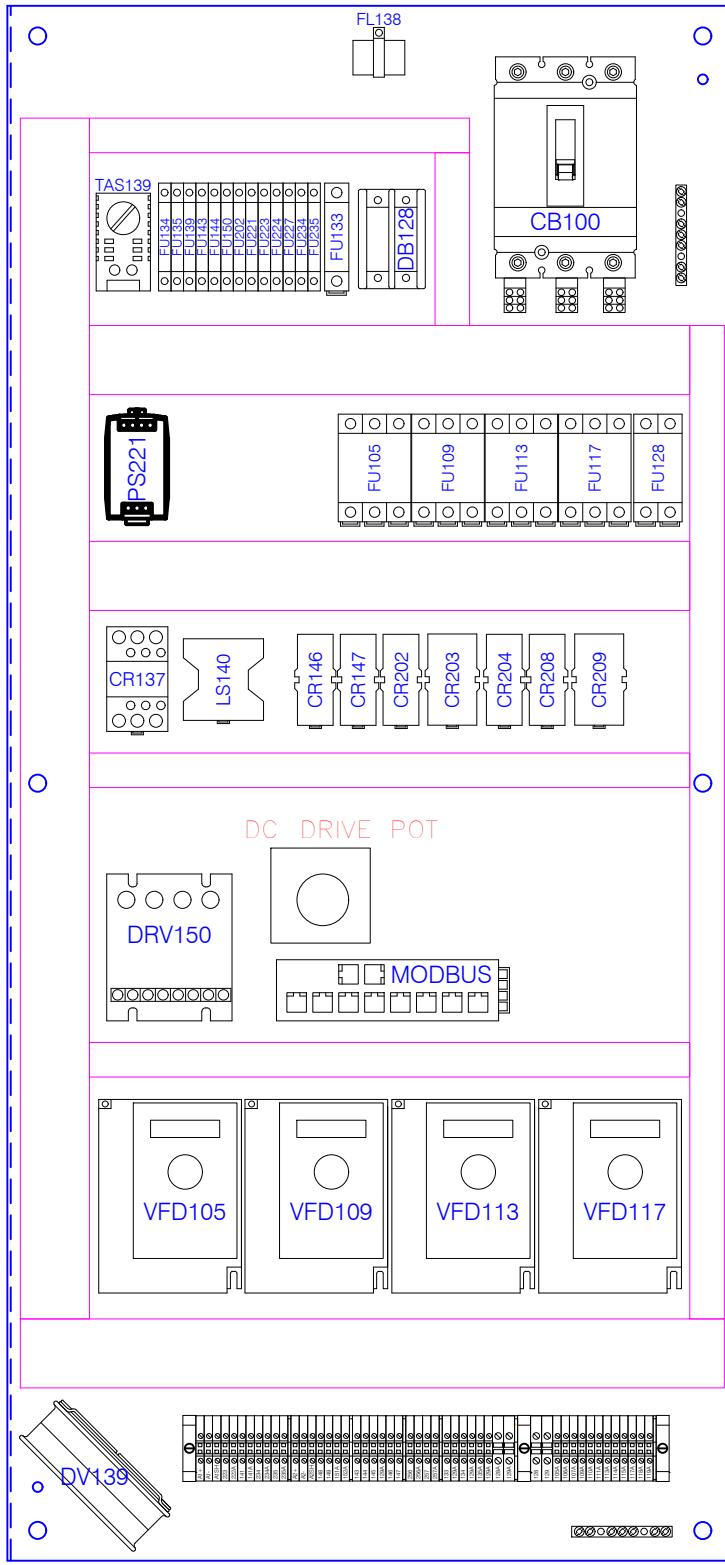
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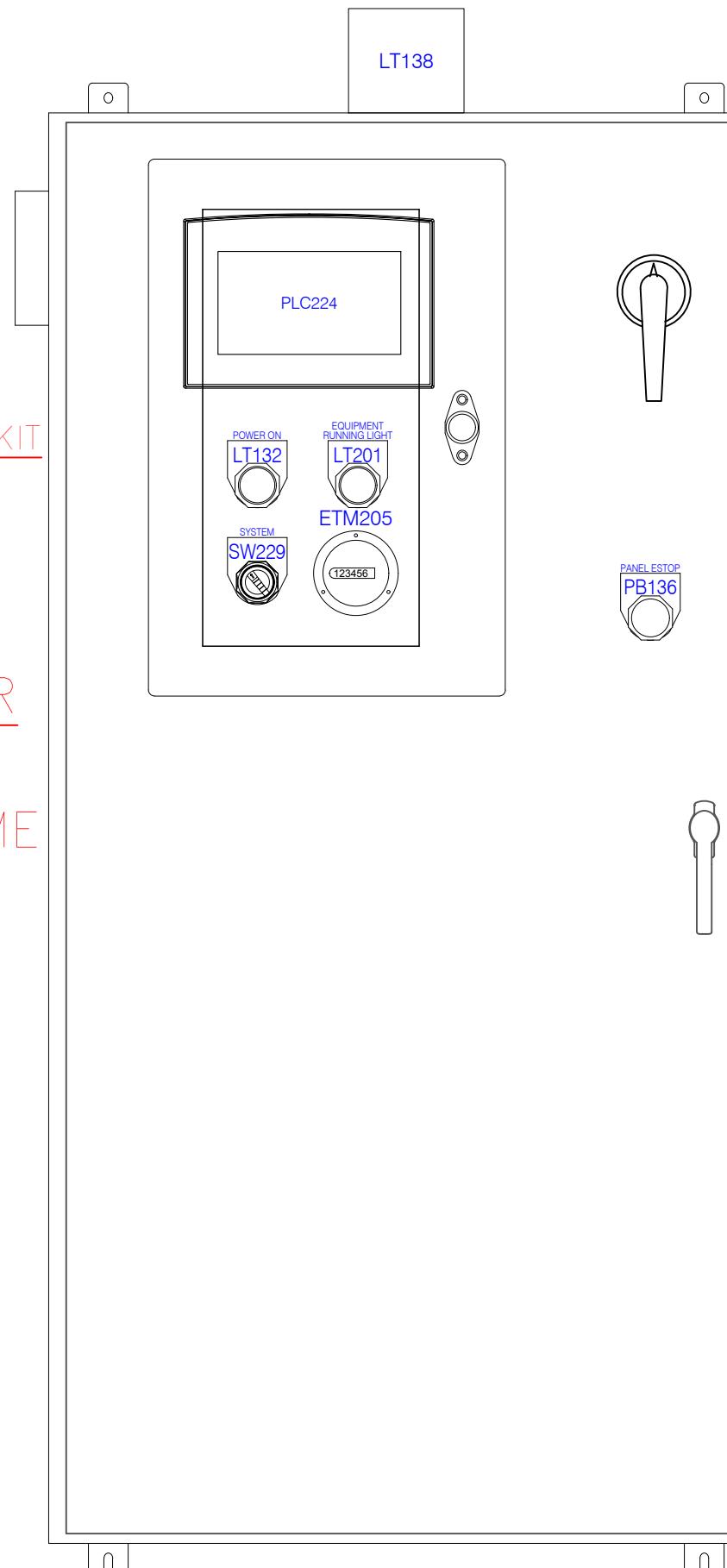
NOTES



SUBPANEL LAYOUT



ENCLOSURE DOOR LAYOUT



NEMA 4X 316SS WINDOW KIT
18.1" X 12.1" X 2.7"

NEMA 3RSS TRANSFORMER
9.56" x 8.68" x 6.56"
MOUNTED ON VOLUTE FRAME



NEMA 4XSS ENCLOSURE
48" H x 24" W x 8" D

REVISIONS

CLIENT	Process Wastewater Technologies	
CLIENT REF	VDPCA16116	
LOCATION	CA	
DRAWN BY	C Ingram	CHECKED BY n/a
JOB	Concannon Winery	
PANEL	Press Control Panel	
DWG	J-978-1C	
STATUS	Submittal	DATE 09 Nov 2016

VISION700™

Advanced PLC from the back - big & beautiful color 7" touchscreen from the front. Snap-in I/Os for an All-in-One; expand up to 1000 I/Os

Features:

HMI

- Up to 1024 user-designed screens
- 500 images per application
- HMI graphs - color-code Trends
- Built-in alarm screens
- Text String Library - easy localization
- Memory and communication monitoring via HMI - No PC needed

PLC

- I/O options include high-speed, temperature & weight measurement
- Auto-tune PID, up to 24 independent loops
- Recipe programs and datalogging via Data Tables
- SD card - log, backup, clone & more
- Date & Time-based control

Communication

- TCP/IP via Ethernet
- Web server: Use built-in HTML pages, or design complex pages to view and edit PLC data via the Internet
- Send e-mail function
- SMS messaging
- GPRS/GSM
- Remote Access utilities
- MODBUS protocol support
- BACnet, M-bus – via 3rd-party converter
- CANbus: CANopen, UniCAN, SAE J1939, and more
- DF1 Slave
- SNMP Agent V1
- FB Protocol Utility: enables serial or TCP/IP communications with 3rd-party device; barcode readers, frequency converters, etc
- Ports: supplied with mini-USB programming port , 1 RS232/RS485 and 1 Ethernet port. 1 ports may be added: 1 Serial/Ethernet/Profinet and 1 CANbus

Vision700™ has Ethernet port onboard, that supports 8 sockets, enabling to communicate with 8 devices simultaneously.



V700

“Reliability, ease of use, connectivity and competitive prices are Unitronics' main strengths”

CE/UL

Mr. Andrea Della Bosca,
EV srl

V700

Article Number	V700-T20BJ
I/O Options	
Snap-in I/O Modules	Plug these modules directly into the back of the Vision unit to create a self-contained PLC with up to 62 I/Os. Inputs may include Digital, Analog, and Temperature measurement. Outputs may include Transistor, Relay, or Analog. (sold separately)
I/O Expansion	Local or Remote I/Os may be added via expansion port or via CANbus
Program	
Application Memory	Application Logic: 2MB • Images: 60MB • Fonts: 1MB
Scan Time	9µsec per 1K of typical application
Memory Operands	8192 coils, 4096 registers, 512 long integers (32-bit), 256 double words (32-bit unsigned), 64 floats, 384 timers (32-bit), 32 counters. Additional non-retainable operands: 1024 X-bits, 512 X-integers, 256 X-long integers, 64 X-double words
Data Tables	120K dynamic RAM data (recipe parameters, datalogs, etc.), up to 256K fixed data
SD Card	Store datalogs, Alarm History, Data Tables, Trend data, export to Excel • Back up Ladder, HMI & OS, clone PLCs
Enhanced Features	Trends: graph any value and display on HMI • Built-in Alarm management system • String Library: instantly switch HMI language
Operator Panel	
Type	TFT LCD
Display Backlight Illumination	White LED
Colors	65,536 colors, 16 bit resolution • Brightness - Adjustable via touchscreen or software
Display Resolution & Size	800 x 480 pixels, 7"
Touchscreen	Resistive, Analog
Keys	Virtual keyboard
General	
Power Supply	12/24VDC
Battery	7 years typical at 25°C, battery back-up for all memory sections and RTC
Clock	Real-time clock functions (date and time)
Environment	IP66/IP65/NEMA4X (when panel mounted)
Standard	CE, UL Many of our products are also UL Class 1 Div 2 and GOST certified - please contact Unitronics

Snap-in I/O Modules



Plug a Snap-in module directly into the back of a Vision PLC.
Compatible with all V200, V500, V1040 and V1210 Vision series models.

Article No.	V200-18-E1B	V200-18-E2B	V200-18-E3XB	V200-18-E4XB	V200-18-E5B	V200-18-E6B	V200-18-E46B ¹	V200-18-E62B ¹
Digital Inputs (isolated)	16 npn/pnp (including 2 Shaft-encoder inputs)	16 npn/pnp (including 2 Shaft-encoder inputs)	18 npn/pnp (including 2 Shaft-encoder inputs)	18 npn/pnp (including 2 Shaft-encoder inputs)	18 npn/pnp (including 2 Shaft-encoder inputs)	18 npn/pnp (including 2 Shaft-encoder inputs)	18 npn/pnp (including 2 Shaft-encoder inputs)	30 npn/pnp (including 2 Shaft-encoder inputs)
Analog Inputs	3 10-bit 0-10V, 0-20mA 4-20mA	2 10-bit 0-10V, 0-20mA 4-20mA	4 isolated 12-14-bit (software dependent) 0-10V, 0-20mA 4-20mA	4 isolated 12-14-bit (software dependent) 0-10V, 0-20mA 4-20mA	3 10-bit 0-10V, 0-20mA 4-20mA	3 10-bit 0-10V, 0-20mA 4-20mA & 2 14-bit 0-10V, 0-20mA 4-20mA	9 0-10V, 0-20mA 4-20mA	2 10-bit 0-10V, 0-20mA 4-20mA
Temperature Measurement	None	None	and/or TC/PT100	and/or TC/PT100	None	TC/PT100	None	None
Digital Outputs (isolated)	4 npn/pnp (including 2 High-speed outputs)	4 npn/pnp (including 2 High-speed outputs)	2 npn/pnp High-speed	15 npn/pnp (including 2 High-speed)	15 npn/pnp (including 2 High-speed)	2 npn/pnp High-speed	2 (including 2 High-speed)	28 npn/pnp 2 npn/pnp High-speed
Relay Outputs (isolated)	10	10	15	None	None	15	15	None
Analog Outputs	None	2 12-bit 0-10V, 0-20mA 4-20mA	4 12-bit 0-10V, 4-20mA isolated	4 12-bit 0-10V, 4-20mA isolated	None	2 12-bit 0-10V, 4-20mA isolated	2 12-bit 0-10V, 4-20mA isolated	None

¹V200-18-E46B, V200-18-E62B are not yet UL certified

Additional COM Modules

Enhance Vision's communication capabilities¹

Vision Model	Ethernet	RS232/RS485	Isolated RS232/RS485	CANbus	Profibus
SAMBA	V100-17-ET2	V100-17-RS4	V100-17-RS4X	V100-17-CAN	None
V130, V350, V430	V100-17-ET2 V100-S-ET2 ²	V100-17-RS4	V100-17-RS4X	V100-17-CAN V100-S-CAN ²	V100-17-PB1
V200, V500, V700, V1040, V1210	V200-19-ET2	V200-19-RS4	V200-19-RS4-X	None	V100-17-PB1 ³

GSM-KIT-41J
Kit Including Enfora GSM1318 Q. Band Modem
GSM-KIT-16J
KIT, MODEM GPRS, CINTERION, BGS2T
GSM-KIT-17J-3G
KIT, MODEM GPRS, CINTERION, EHS6T

DIN-rail Power Supplies

UAP-24V24W	UAP-24V60W	UAP-24V96W
24W 24V 1A	60W 24V 2.5A	96W 24V 4A

¹V200/V500/V1040/V1210: 1 optional port for serial or Ethernet

V130/V350: 1 optional port for serial or Ethernet & 1 optional port for CANbus/Profibus

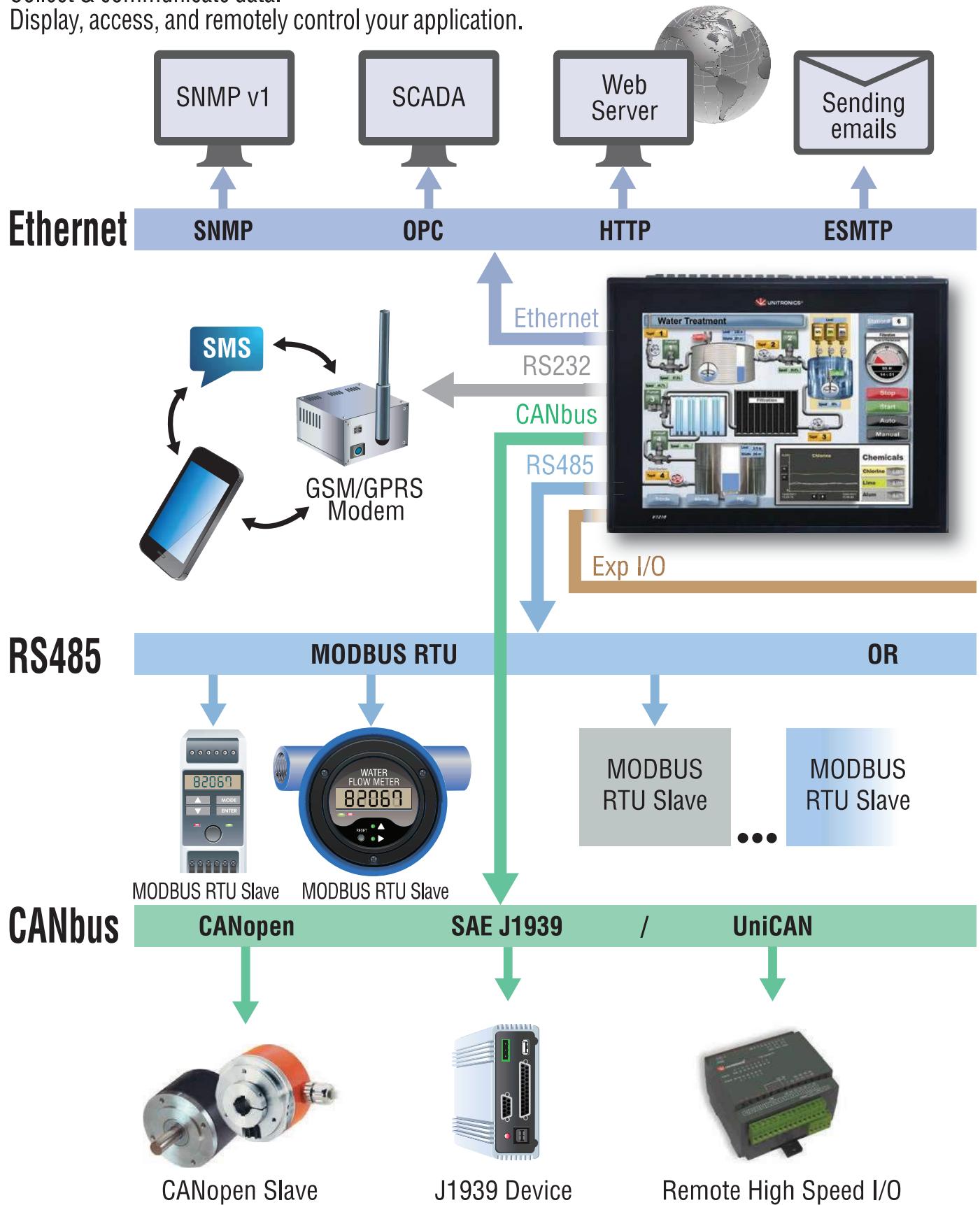
²Extended temperature cards, operational temperature : -30°C to 60°C

³Only for V700

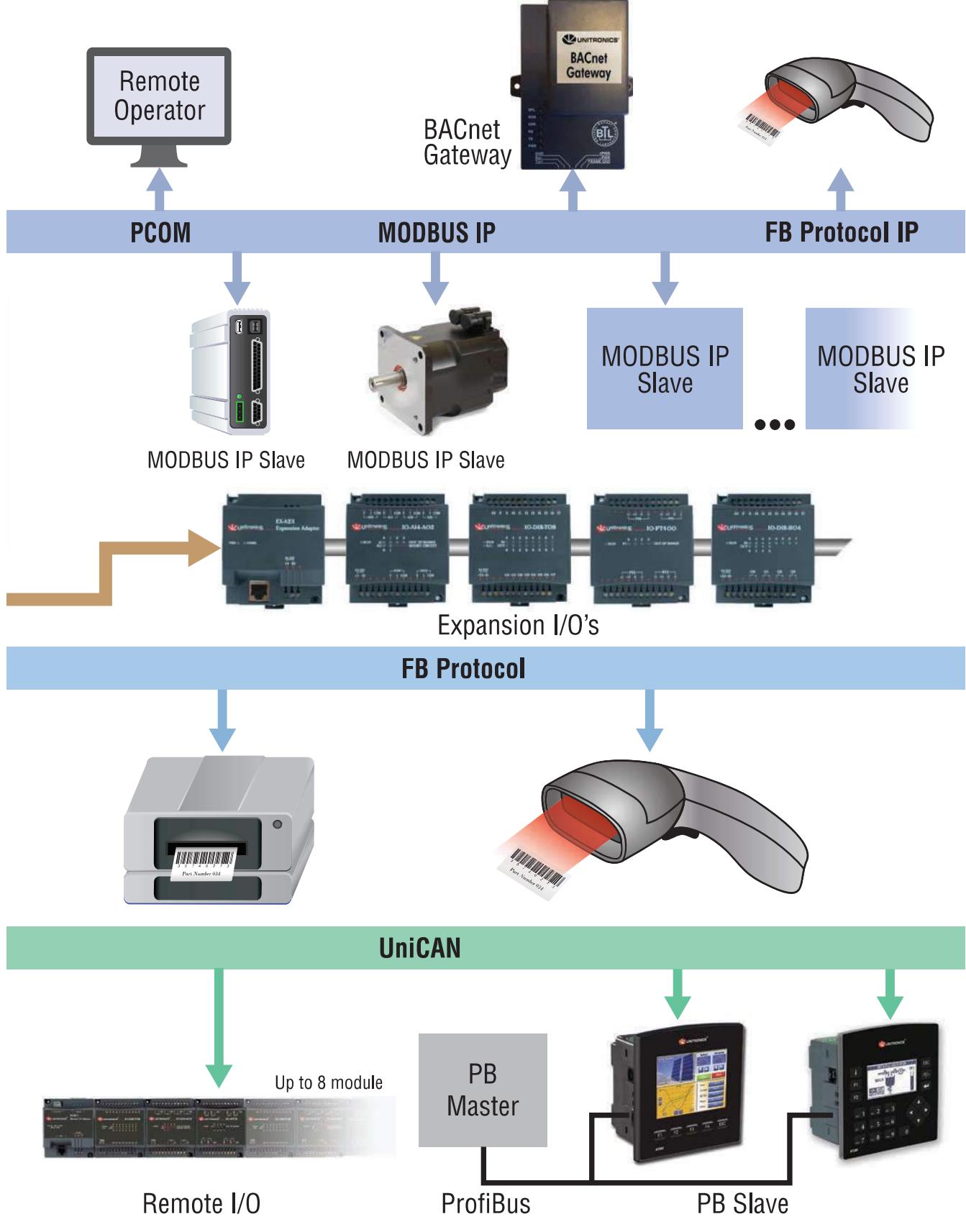


Configure your Network

Collect & communicate data.
Display, access, and remotely control your application.



This image is for illustrative purposes only. Features and capabilities vary according to model.



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125 Series Variable Speed DC Control

125DV-C



cUL[®] us
cULus Recognized



Speed Potentiometer
Kit Included

The 125 Series is a compact, cost efficient, reliable control for PM, shuntwound, and universal motors that incorporates up-to-date design and engineering into a compact package.

Installation and field adjustments are facilitated using a barrier type terminal strip and large, easily adjusted trimpots. Adjustable horsepower range: 120 VAC; 1/50–1/8 and 1/8–1/2; 240 VAC; 1/25–1/4 and 1/4–1.

The 123D-C model operates on a low input voltage of 24/36 VAC with an output of 150mA–5.5 ADC

Standard features include an inhibit circuit for start-stop operation and 1% speed regulation over a 50:1 speed range. Dual voltage 120/240 VAC or 24/36 VAC models are available.

Long life and quality are assured by 100% full load testing. The 125 Series is ideal for applications such as: office machinery, conveyors, office packaging equipment, printers, process equipment, centrifuges, and exercise equipment.

125 SERIES STANDARD FEATURES

- Dual Voltage 120/240 VAC or 24/36 VAC, 50/60Hz
- Adjustable horsepower settings
- Barrier terminal strip
- Full wave bridge supply
- 1% speed regulation with armature voltage feedback; $\pm 1/2\%$ with tach feedback
- Adjustable Minimum speed (0–30% of max)
- Adjustable Maximum speed (60–110% of base)
- Adjustable IR Compensation
- Adjustable Current Limit
- Fixed Acceleration (0.5 sec.)
- Line voltage compensation
- 5K ohm speed potentiometer with 8" leads, dial & knob included
- 50:1 speed range
- Overload capacity: 200% for one minute
- Transient voltage protection
- Voltage following mode or DC tachometer follower by supplying ungrounded analog input signal (0–12 VDC)
- DC tachometer feedback (6V at base speed)
- Inhibit circuit—permits start & stop without breaking AC lines
- Shunt field supply provided (1 Amp max; 100V for 120 VAC; 200V for 240 VAC input)

125 SERIES SELECTION GUIDE

H.P. RANGE	MODEL	INPUT	OUTPUT
150mA - 5.5ADC	123D-C	24/36 VAC	0-20/30 VDC
1/50 - 1/8 }	125D-12C	120 VAC	0-90 VDC
1/25 - 1/4 }		240 VAC	0-180 VDC
1/8 - 1/2*	125DV-C	120 VAC	0-90 VDC
1/4 - 1.0*		240 VAC	0-180 VDC

* With suitable external heatsink, UL rating for output amps can be increased from 5.5 amps DC to 10.0 amps DC.

Horsepower settings are adjustable - see installation manual. Control is tested and calibrated for maximum horsepower in its category.

OPERATING CONDITIONS

Temperature.....-10° to +45° C.
AC Input Voltage±10% Rated Line Voltage
Input Frequency50/60 Hz.

ELECTRICAL SPECIFICATIONS AC INPUT 50/60 Hz

120 VAC Single Phase Input, 0-90 VDC Output

H.P.	MAX. AC AMPS	KVA	MAX. ARM* AMPS DC
1/50	0.5	0.06	0.4
1/20	1.0	0.12	0.8
1/8	2.0	0.24	1.6
1/4	3.5	0.42	2.7
1/3	4.4	0.53	3.4
1/2	6.5	0.78	5.0

240 VAC Single Phase Input, 0-180 VDC Output

H.P.	MAX. AC AMPS	KVA	MAX. ARM* AMPS DC
1/4	1.8	0.42	1.4
1/3	2.2	0.53	1.7
1/2	3.3	0.78	2.5
3/4	4.8	1.15	3.7
1	6.5	1.56	5.0

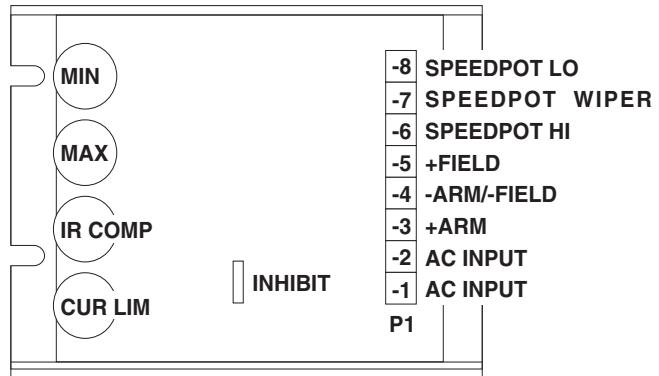
* Minimum Armature Amps: 150mA DC

DIMENSIONAL SPECIFICATIONS

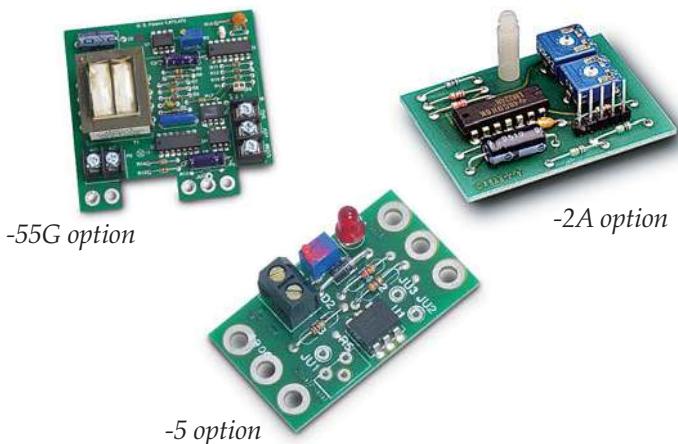
MODEL	WIDTH	HEIGHT	DEPTH	WEIGHT
English (inches)				
Chassis	3.63	4.25	1.30	8 oz.

Metric (centimeters)	WIDTH	HEIGHT	DEPTH	WEIGHT
Chassis	9.20	10.80	3.30	227 gm.

ADJUSTMENTS AND HOOK-UP



POPULAR OPTIONS



OPTION DESCRIPTION

OPTION	SUFFIX
Electronic speed control interlock - when AC power to control is applied, prevents motor from starting until speedpot is first rotated to the zero position, then CW. Also, should AC power be interrupted then restored, prevents automatic restart. (Patent # 4,888,813).....	-1*
Independently adjustable linear accel and decel (0.5 - 8.0 seconds)	-2A*
4-20mA isolated signal follower	-5*
-5 option with Auto/Manual switch	-7*
Acceleration time (approx. 4 seconds).....	-15B
Acceleration time (approx. 6 seconds).....	-K
Forward-Off-Reverse manual switch (center blocked, no Dynamic Brake).....	-29B*
Isolated voltage follower (120/240 VAC input) – controls speed from any external grounded or ungrounded signal: 0-5 VDC thru 0-250 VDC adjustable	-55G*
-55G option with Auto-Manual function	-56G*
Auxiliary heatsink (7" long x 6.25" wide x 1.375" deep).....	-HS(125)*
Other options are available, please consult factory for your requirement.	
* Field installable	

Altivar Machine ATV320 variable speed drives for simple machine requirements



ATV320 drives with compact control block and single-phase supply voltage 200...240 V 50/60 Hz (1) (2)

Motor	Power indicated on plate in kW	0.18	0.37	0.55	0.75	1.1	1.5	2.2
	Power indicated on plate in HP	0.25	0.5	0.75	1	1.5	2	3
Altivar 320	Max. continuous output current (3)	1.5	3.3	3.7	4.8	6.9	8	11
Dimensions: W x H x D (mm) (4)	72 x 143 x 109	72 x 143 x 128	72 x 143 x 138			105 x 142 x 158		
Reference	ATV320 U02M2C	ATV320 U04M2C	ATV320 U06M2C	ATV320 U07M2C	ATV320 U11M2C	ATV320 U15M2C	ATV320 U22M2C	

ATV320 drives with compact control block and three-phase supply voltage 380...500 V 50/60 Hz (1) (2)

Motor	Power indicated on plate in kW	0.37	0.55	0.75	1.1	1.5	2.2	3	4
	Power indicated on plate in HP	0.5	0.75	1	1.5	2	3	4	5
Altivar 320	Max. continuous output current (3)	1.5	1.9	2.3	3	4.1	5.5	7.1	9.5
Dimensions: W x H x D (mm) (4)			105 x 143 x 158				140 x 184 x 158		
Reference	ATV320 U04N4C	ATV320 U06N4C	ATV320 U07N4C	ATV320 U11N4C	ATV320 U15N4C	ATV320 U22N4C	ATV320 U30N4C	ATV320 U40N4C	



ATV320 drives with book control block and single-phase supply voltage 200...240 V 50/60 Hz (1) (2)

Motor	Power indicated on plate in kW	0.18	0.37	0.55	0.75	1.1	1.5	2.2
	Power indicated on plate in HP	0.25	0.5	0.75	1	1.5	2	3
Altivar 320	Max. continuous output current (3)	1.5	3.3	3.7	4.8	6.9	8	11
Dimensions: W x H x D (mm) (5)		45 x 325 x 245			60 x 325 x 245			
Reference	ATV320 U02M2B	ATV320 U04M2B	ATV320 U06M2B	ATV320 U07M2B	ATV320 U11M2B	ATV320 U15M2B	ATV320 U22M2B	

ATV320 drives with book control block and three-phase supply voltage 380...500 V 50/60 Hz (1) (2)

Motor	Power indicated on plate in kW	0.37	0.55	0.75	1.1	1.5	2.2	3	4
	Power indicated on plate in HP	0.5	0.75	1	1.5	2	3	4	5
Altivar 320	Max. continuous output current (3)	1.5	1.9	2.3	3	4.1	5.5	7.1	9.5
Dimensions: W x H x D (mm) (5)		45 x 325 x 245			60 x 325 x 245				
Reference	ATV320 U04N4B	ATV320 U06N4B	ATV320 U07N4B	ATV320 U11N4B	ATV320 U15N4B	ATV320 U22N4B	ATV320 U30N4B	ATV320 U40N4B	

Note: Altivar Machine ATV320 variable speed drives are designed for 3-phase synchronous and asynchronous motors. ATV320 drives are supplied with braking chopper as standard. For braking resistor selection, please refer to the product catalog on our website www.schneider-electric.com.

(1) Altivar Machine ATV320 variable speed drives are compliant with Machinery Directive 2006/42/EC. Compliant safety functions are Safe Torque Off (STO), Safe Stop 1 (SS1), Safe Limited Speed (SLS), Safe Maximum Speed (SMS), and Guard Door Lock (GDL).

(2) Altivar Machine ATV320 variable speed drives are supplied with built-in EMC filters and comply with standard IEC/EN 61800-3. For more information, please refer to the product datasheet on our website www.schneider-electric.com.

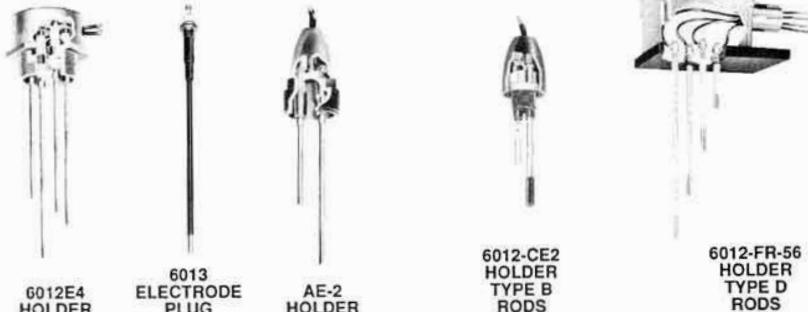
(3) Altivar Machine ATV320 variable speed drives can supply transient output current of $1.5 \times In$ for 60 s for every 10 min. cycle.

(4) For ATV320 drives with compact control block and ATV320 drives with book control > 5.5 kW, EMC plate (or UL type 1 kit) dimensions are not applicable.

(5) For ATV320 drives with book control ≤ 4kW, EMC plate dimensions are applicable.

For more information, please refer to the "Variable speed drives - Altivar Machine ATV320" catalog on our website www.schneider-electric.com.

SOLID ROD ELECTRODES



ELECTRODE MATERIAL SELECTION

The chart below suggests electrode material for some typical liquids. Electrode corrosion is difficult to predict because the rate of corrosion is effected by many factors such as: concentration, temperature and impurities. Therefore, this information should be used as a general guide, and the final choice should be determined from actual application conditions based on previous experience and knowledge.

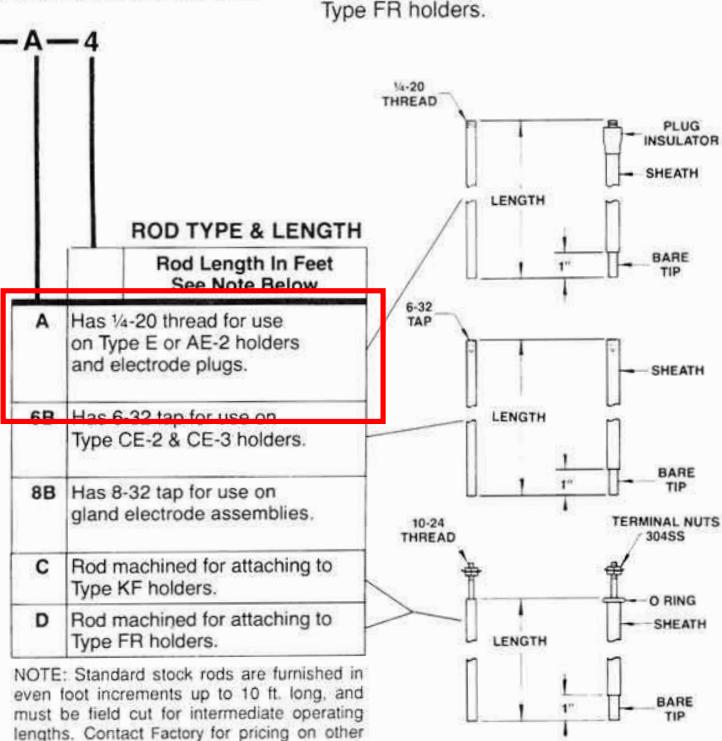
ELECTRODE MATERIAL	TYPICAL LIQUID TO BE CONTROLLED
Brass	Soft Water, Condensate
316 SS	Water, Sewage, Beer, Alcohol, Food Products, Chemicals, Many Mild Acids
Monel	Acetic Acid, Sea Water
Nickel	Boric Acid, Calcium Hydroxide
Carpenter 20	Sulphuric Acid, Alum Solutions
Hastelloy B	Hydrochloric Acid
Hastelloy C	Hydrofluoric Acid
Titanium	Phosphoric Acid, Brine Ferric Chloride, Hot Nitric Acid
Carbon Tip	Hydrochloric Acid Carbonated Water

Contact Factory for specific recommendations.

6013—SS—P—A—4

CATALOG SECTION		INSULATION MATERIAL	ROD TYPE & LENGTH
X	Bare Rod	A	Has 1/4-20 thread for use on Type E or AE-2 holders and electrode plugs.
P	PVC Sheath Max. Temp. 190°F (88°C)	6B	Has 6-32 tap for use on Type CE-2 & CE-3 holders.
T	Teflon Sheath Max. Temp. 550°F (288°C)	8B	Has 8-32 tap for use on gland electrode assemblies.
PC	Carbon Tip Installed On PVC Insulated Rod	C	Rod machined for attaching to Type KF holders.
TC	On Teflon Insulated Rod	D	Rod machined for attaching to Type FR holders.

ROD MATERIAL	
BR	Brass
SS	316 Stainless
MO	Monel
NI	Nickel
CA	Carpenter 20
HB	Hastelloy B
HC	Hastelloy C
TI	Titanium



NOTE: Standard stock rods are furnished in even foot increments up to 10 ft. long, and must be field cut for intermediate operating lengths. Contact Factory for pricing on other lengths and materials.

B|W Controls

Electrode Holders/Electrodes

MOLDED ELECTRODE HOLDERS



Type AE-2
with rod
electrodes

Type CE-2 & CE-3 Holders — These small holders are primarily for use in original equipment applications where available space is limited and where desired level control can be obtained with two or three short solid rod electrodes. They are furnished with a flexible PVC water-tight cover to protect lead wire junctions.

A choice of two thermoplastic materials is available with ratings as shown below. Pressure seal is accomplished with a Buna N gasket included with each holder. They have 303SS studs with 6-32 male thread for electrode connections.

HOLDER MATERIAL	MAXIMUM RATINGS
Butyrate	200 psi @ 100°F (38°C) 160°F (71°C) @ 0 psi
Nylon	200 psi @ 200°F (93°C) 350°F (177°C) @ 0 psi

Type AE-2 Holders — Molded of ABS corrosion-resistant thermoplastic material, these holders are ideal for use in applications involving control of many corrosive liquids. Designed to permit the use of either two solid rod or two wire suspension electrodes, they are supplied with flexible PVC watertight covers to protect the lead wire junctions.

They have 303SS couplings with 1/4-20 female thread for electrode connections.

MAXIMUM RATINGS	
250 psi @ 100°F (38°C) 180°F (82°C) @ 0 psi	



Type CE-2 Holder
For 2 Rod Electrodes
1"-14 Straight Machine Thread



Type CE-3 Holder
For 3 Rod Electrodes
1"-14 Straight Machine Thread

CATALOG NUMBER
6012 — CE2B

Holder Material	Old Part Number
CE2B	Butyrate 12-053600
CE2N	Nylon 12-082500

CATALOG NUMBER
6012 — CE3B

Holder Material	Old Part Number
CE3B	Butyrate 12-073500
CE3N	Nylon 12-082700

NOTE: The required Type 6B rod electrodes must be ordered as separate items.
Maximum recommended bare rod length is 12 inches.
Not available for wire suspension electrodes.

TYPE AE-2 HOLDER



For 2 Rod or Wire
Suspension Electrodes
2" NPT Pipe Thread Mounting

Catalog No. 6012-AE2
Old Part No. 12-034500

NOTE: The required electrodes must be ordered as separate items, see Catalog Section 6013 for information.

Rod Electrodes — Type A rods are used.

Wire Suspension Electrodes — A wire connector is required for each wire suspension electrode.

CONDUIT ELECTRODE HOLDERS



Designed for use with B|W wire suspension electrodes, these versatile low-cost holders are recommended for underground drainage sumps, septic dosing tanks, open sumps and similar applications. Available in cadmium plated cast iron for general purpose applications, or rigid polyvinyl chloride for corrosive situations.

These holders are mounted by attaching to a length of standard conduit extending over the liquid being controlled. They have grommets for each wire suspension electrode, and come in two sizes to accommodate up to eight electrodes.

CATALOG NUMBER
6012 — C4I

	No. of Electrodes	Holder Material	Conduit Size	Connection Type	Old Part Number
C4I	1-4	Cast Iron	1/2" NPT	Threaded	12-056900
C4P	1-4	PVC	1/2" PVC	Cement	12-065400
C8I	1-8	Cast Iron	1" NPT	Threaded	12-081800
C8P	1-8	PVC	1" PVC	Cement	12-081900

NOTE: The required wire suspension electrodes must be ordered as separate items.

CORD GRIP ELECTRODE HOLDERS



Type CG1
with E-IP
Electrode

CATALOG NUMBER
6012 — CG1

No. of Electrodes	Holder Material	Mounting Thread	Old Part Number
CG1	1	Aluminum	1/2" NPT
CG2	2	Aluminum	1/2" NPT

NOTE: The required wire suspension electrodes must be ordered as separate items.

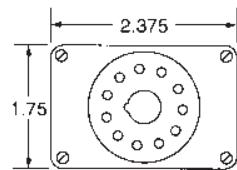
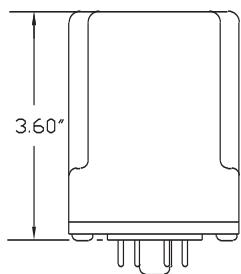


Type CG2
with E-IS
Electrodes

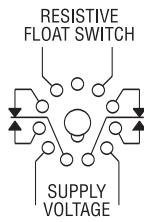
OPERATION

The ATC Diversified SPM Series Single channel seal failure module is a specialized control for monitoring the **shaft seal** of a **submersible pump motor**. A leak is detected by sensing the position of a resistive float switch installed in the seal cavity. When the resistance drops below the sensitivity rating, the output relay energizes and the LED illuminates. When the fault condition clears, the output relay resets automatically.

DIMENSIONS (INCHES)

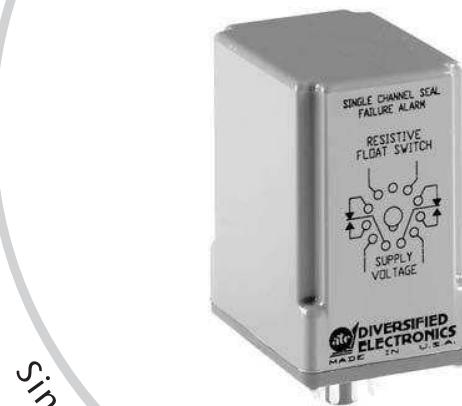


WIRING



RB-11/PF013A

MODEL NUMBER >>>>	SPM	120	AAA
Sensitivity			
470 Ω ±10% Fixed		470	
470 Ω to 10K Ω +10% Adjustable		10K	
4.7K Ω to 100K Ω ±10% Adjustable		100K	



Single Channel Seal Failure Alarm

SPECIFICATIONS

CONTROL VOLTAGE	120 VAC, 50/60 Hz	
SWITCH VOLTAGE	9 VDC	
ISOLATION	2500 Volts	
POWER REQUIRED	2 VA	
DUTY CYCLE	Continuous	
	470 Ω ±10% Fixed	
SENSITIVITY	470 Ω to 10K Ω ±10% Adjustable	
	4.7K Ω to 100K Ω ±10% Adjustable	
CONTACT RATING	DPDT, 10 A @ 250 VAC Resistive, 360 VA Inductive	
RESPONSE TIMES	Operate	15 ms (approximately)
	Release	8 ms (approximately)
LIFE EXPECTANCY	Mechanical	10,000,000 Operations (Minimum)
	Electrical	50,000 Operations @ Rated Load
INDICATORS	Red LED illuminates when leak is detected	
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	11-Pin plug-in "A" style enclosure	
WEIGHT	8 oz.	



GENERAL DESCRIPTION

A compact size, light weight, simple mounting onto the DIN-rail and the utilization of only quality components are what makes the MiniLine power supplies so easy to use and install within seconds.

A rugged electrical and mechanical design as well as a high immunity against electrical disturbances on the mains provides reliable output power. This offers superior protection for equipment which is connected to the public mains network or is exposed to a critical industrial environment.

The MiniLine series offers output voltages from 5 to 56Vdc and a power rating from 15W to 120W.

The supplementary MiniLine decoupling diode module MLY10.241 allows building of redundant systems or to protect against back-feeding voltages.

POWER SUPPLY

- 100-240V Wide Range Input
- NEC Class 2 Compliant
- Adjustable Output Voltage
- Efficiency up to 89.7%
- Low No-load Losses and Excellent Partial-load Efficiency
- Compact Design, Width only 45mm
- Full Power between -10°C and +60°C
- Large International Approval Package
- 3 Year Warranty

SHORT-FORM DATA

Output voltage	DC 24V	
Adjustment range	24 - 28V	
Output current	2.5A at 24V 2.1A at 28V	
Output power	60W	
Output ripple	< 50mVpp	20Hz to 20MHz
Input voltage	AC 100-240V	-15% / +10%
Mains frequency	50-60Hz	±6%
AC Input current	0.98 / 0.58A	at 120 / 230Vac
Power factor	0.58 / 0.5	at 120 / 230Vac
AC Inrush current	typ. 16 / 32A	peak value at 120 / 230Vac 40°C and cold start
DC Input	88-375Vdc	below 110Vdc derating required
Efficiency	87.8 / 89.7%	at 120 / 230Vac
Losses	8.3 / 6.7W	at 120 / 230Vac
Temperature range	-10°C to +70°C	operational
Derating	1.5W/°C	+60 to +70°C
Hold-up time	typ. 24 / 107ms	at 120 / 230Vac
Dimensions	45x75x91mm	WxDxH
Weight	250g / 0.55lb	

ORDER NUMBERS

Power Supply	ML60.241	24-28V Standard unit
Accessory	MLY10.241 UF20.241 ZM3.WALL	Redundancy Module Buffer Module Wall mount bracket

MARKINGS



Ind. Cont. Eq. UL 508



UL 60950-1



Marine



Class I Div 2

**NEC
Class 2**



EMC, LVD

CONTINUOUS HINGE WITH 3-POINT LATCH, TYPE 4X



INDUSTRY STANDARDS

UL 508A Listed; Type 3R, 4, 4X, 12; File No. E61997
cUL Listed per CSA C22.2 No 94; Type 3R, 4, 4X, 12; File No. E61997

NEMA/EEMAC Type 3R, 4, 4X, 12, 13
IEC 60529, IP66
Meets NEMA Type 3RX requirements

APPLICATION

These enclosures feature Hoffman's exclusive POWERGLIDE™ Handle with 3-point latching, ideal for indoor or outdoor applications that require corrosion protection, convenient access, and padlocking security.

SPECIFICATIONS

- 14 gauge Type 304 or 316L stainless steel bodies and doors
- Seams continuously welded and ground smooth
- Seamless foam-in-place gasket
- Rolled lip around three sides of door
- Internal 3-point latch and Type 316L stainless steel padlocking POWERGLIDE Handle
- Remove door by pulling stainless steel continuous hinge pin
- Data pocket is high-impact thermoplastic
- Collar studs provided for mounting optional panels
- Exterior hardware on Type 316L stainless steel enclosures matches enclosure material
- Bonding provision on door; grounding stud on body

FINISH

Door, sides, top and bottom have smooth #4 brushed finish. Handle is electropolished.

ACCESSORIES

See also Accessories.

Panels for Type 3R, 4, 4X, 12 and 13 Enclosures
Steel and Stainless Steel Window Kits
H2OMIT™ Vent Drains, Type 4X
H2OMIT™ Thermolectric Dehumidifier

MODIFICATION AND CUSTOMIZATION

Hoffman excels at modifying and customizing products to your specifications. Contact your local Hoffman sales office or distributor for complete information.

BULLETIN: A4SW3

Standard Product

Catalog Number	AxBxC in./mm	Stainless Steel Type	F in./mm	Steel Panel	Conductive Panel	Stainless Steel Panel	Panel Size D x E in./mm	Data Pocket
A24H2006SSLP3PT	24.00 x 20.00 x 6.00 610 x 508 x 152	304	3.00 76	A24P20	A24P20G	A24P20SS6	21.00 x 17.00 533 x 432	Small
A24H2006SSLP3PT	24.00 x 20.00 x 6.00 610 x 508 x 152	316L	3.00 76	A24P20	A24P20G	A24P20SS6	21.00 x 17.00 533 x 432	Small
A24H2008SSLP3PT	24.00 x 20.00 x 8.00 610 x 508 x 203	304	3.00 76	A24P20	A24P20G	A24P20SS6	21.00 x 17.00 533 x 432	Small
A24H2008SS6LP3PT	24.00 x 20.00 x 8.00 610 x 508 x 203	316L	3.00 76	A24P20	A24P20G	A24P20SS6	21.00 x 17.00 533 x 432	Small
A24H2408SSLP3PT	24.00 x 24.00 x 8.00 610 x 610 x 203	304	3.00 76	A24P24	A24P24G	A24P24SS6	21.00 x 21.00 533 x 533	Small
A24H2408SS6LP3PT	24.00 x 24.00 x 8.00 610 x 610 x 203	316L	3.00 76	A24P24	A24P24G	A24P24SS6	21.00 x 21.00 533 x 533	Small
A30H2408SSLP3PT	30.00 x 24.00 x 8.00 762 x 610 x 203	304	3.00 76	A30P24	A30P24G	A30P24SS6	27.00 x 21.00 686 x 533	Large
A30H2408SS6LP3PT	30.00 x 24.00 x 8.00 762 x 610 x 203	316L	3.00 76	A30P24	A30P24G	A30P24SS6	27.00 x 21.00 686 x 533	Large
A30H3008SSLP3PT	30.00 x 30.00 x 8.00 762 x 762 x 203	304	3.00 76	A30P30	A30P30G	A30P30SS6	27.00 x 27.00 686 x 686	Large
A30H3008SS6LP3PT	30.00 x 30.00 x 8.00 762 x 762 x 203	316L	3.00 76	A30P30	A30P30G	A30P30SS6	27.00 x 27.00 686 x 686	Large
A36H2408SSLP3PT	36.00 x 24.00 x 8.00 914 x 610 x 203	304	3.00 76	A36P24	A36P24G	A36P24SS6	33.00 x 21.00 838 x 533	Large
A36H2408SS6LP3PT	36.00 x 24.00 x 8.00 914 x 610 x 203	316L	3.00 76	A36P24	A36P24G	A36P24SS6	33.00 x 21.00 838 x 533	Large
A36H3008SSLP3PT	36.00 x 30.00 x 8.00 914 x 762 x 203	304	3.00 76	A36P30	A36P30G	A36P30SS6	33.00 x 27.00 838 x 686	Large
A36H3008SS6LP3PT	36.00 x 30.00 x 8.00 914 x 762 x 203	316L	3.00 76	A36P30	A36P30G	A36P30SS6	33.00 x 27.00 838 x 686	Large
A48H3608SSLP3PT	48.00 x 36.00 x 8.00 1219 x 914 x 203	304	3.00 76	A48P36	A48P36G	A48P36SS6	45.00 x 33.00 1143 x 838	Large
A48H3608SS6LP3PT	48.00 x 36.00 x 8.00 1219 x 914 x 203	316L	3.00 76	A48P36	A48P36G	A48P36SS6	45.00 x 33.00 1143 x 838	Large
A24H2010SSLP3PT	24.00 x 20.00 x 10.00 510 x 508 x 254	304	3.00 76	A24P20	A24P20G	A24P20SS6	21.00 x 17.00 533 x 432	Small
A48H2408SSLP3PT	48.00 x 24.00 x 8.00	3.00						CUSTOM MADE ENCLOSURE

Catalog Number	AxBxC in./mm	Stainless Steel Type	F in./mm	Steel Panel	Conductive Panel	Stainless Steel Panel	Panel Size D x E in./mm	Data Pocket
A24H2010SS6LP3PT	24.00 x 20.00 x 10.00 610 x 508 x 254	316L	3.00 76	A24P20	A24P20G	A24P20SS6	21.00 x 17.00 533 x 432	Small
A36H3010SSLP3PT	36.00 x 30.00 x 10.00 914 x 762 x 254	304	3.00 76	A36P30	A36P30G	A36P30SS6	33.00 x 27.00 838 x 686	Large
A36H3010SS6LP3PT	36.00 x 30.00 x 10.00 914 x 762 x 254	316L	3.00 76	A36P30	A36P30G	A36P30SS6	33.00 x 27.00 838 x 686	Large
A42H3010SSLP3PT	42.00 x 30.00 x 10.00 1067 x 762 x 254	304	3.00 76	A42P30	A42P30G	A42P30SS6	39.00 x 27.00 991 x 686	Large
A48H3610SSLP3PT	48.00 x 36.00 x 10.00 1219 x 914 x 254	304	3.00 76	A48P36	A48P36G	A48P36SS6	45.00 x 33.00 1143 x 838	Large
A48H3610SS6LP3PT	48.00 x 36.00 x 10.00 1219 x 914 x 254	316L	3.00 76	A48P36	A48P36G	A48P36SS6	45.00 x 33.00 1143 x 838	Large
A24H2412SSLP3PT	24.00 x 24.00 x 12.00 610 x 610 x 305	304	3.00 76	A24P24	A24P24G	A24P24SS6	21.00 x 21.00 533 x 533	Small
A24H2412SS6LP3PT	24.00 x 24.00 x 12.00 610 x 610 x 305	316L	3.00 76	A24P24	A24P24G	A24P24SS6	21.00 x 21.00 533 x 533	Small
A30H2412SSLP3PT	30.00 x 24.00 x 12.00 760 x 610 x 305	304	3.00 76	A30P24	A30P24G	A30P24SS6	27.00 x 21.00 686 x 533	Large
A30H2412SS6LP3PT	30.00 x 24.00 x 12.00 762 x 610 x 305	316L	3.00 76	A30P24	A30P24G	A30P24SS6	27.00 x 21.00 686 x 533	Large
A36H3012SSLP3PT	36.00 x 30.00 x 12.00 914 x 762 x 305	304	3.00 76	A36P30	A36P30G	A36P30SS6	33.00 X 27.00 838 x 686	Large
A36H3012SS6LP3PT	36.00 x 30.00 x 12.00 914 x 762 x 305	316L	3.00 76	A36P30	A36P30G	A36P30SS6	33.00 X 27.00 838 x 686	Large
A36H3612SSLP3PT	36.00 x 36.00 x 12.00 914 x 914 x 305	304	3.00 76	A36P36	A36P36G	A36P36SS6	33.00 x 33.00 838 x 838	Large
A42H3612SSLP3PT	42.00 x 36.00 x 12.00 1067 x 914 x 305	304	3.00 76	A42P36	A42P36G	A42P36SS6	39.00 x 33.00 991 x 838	Large
A48H3612SSLP3PT	48.00 x 36.00 x 12.00 1219 x 914 x 305	304	3.00 76	A48P36	A48P36G	A48P36SS6	45.00 x 33.00 1143 x 838	Large
A48H3612SS6LP3PT	48.00 x 36.00 x 12.00 1219 x 914 x 305	316L	3.00 76	A48P36	A48P36G	A48P36SS6	45.00 x 33.00 1143 x 838	Large
A60H3612SSLP3PT	60.00 x 36.00 x 12.00 1524 x 914 x 305	304	3.00 76	A60P36	A60P36G	A60P36SS6	57.00 x 33.00 1448 x 838	Large
A60H3612SS6LP3PT	60.00 x 36.00 x 12.00 1524 x 914 x 305	316L	3.00 76	A60P36	A60P36G	A60P36SS6	57.00 x 33.00 1448 x 838	Large
A48H3616SSLP3PT	48.00 x 36.00 x 16.00 1219 x 914 x 406	304	3.00 76	A48P36	A48P36G	A48P36SS6	45.00 x 33.00 1143 x 838	Large
A48H3616SS6LP3PT	48.00 x 36.00 x 16.00 1219 x 914 x 406	316L	3.00 76	A48P36	A48P36G	A48P36SS6	45.00 x 33.00 1143 x 838	Large
A60H3616SSLP3PT	60.00 x 36.00 x 16.00 1524 x 914 x 406	304	3.00 76	A60P36	A60P36G	A60P36SS6	57.00 x 33.00 1448 x 838	Large
A60H3616SS6LP3PT	60.00 x 36.00 x 16.00 1524 x 914 x 406	316L	3.00 76	A60P36	A60P36G	A60P36SS6	57.00 x 33.00 1448 x 838	Large

Purchase panels separately. Optional stainless steel, composite and aluminum panels are available for most sizes.

