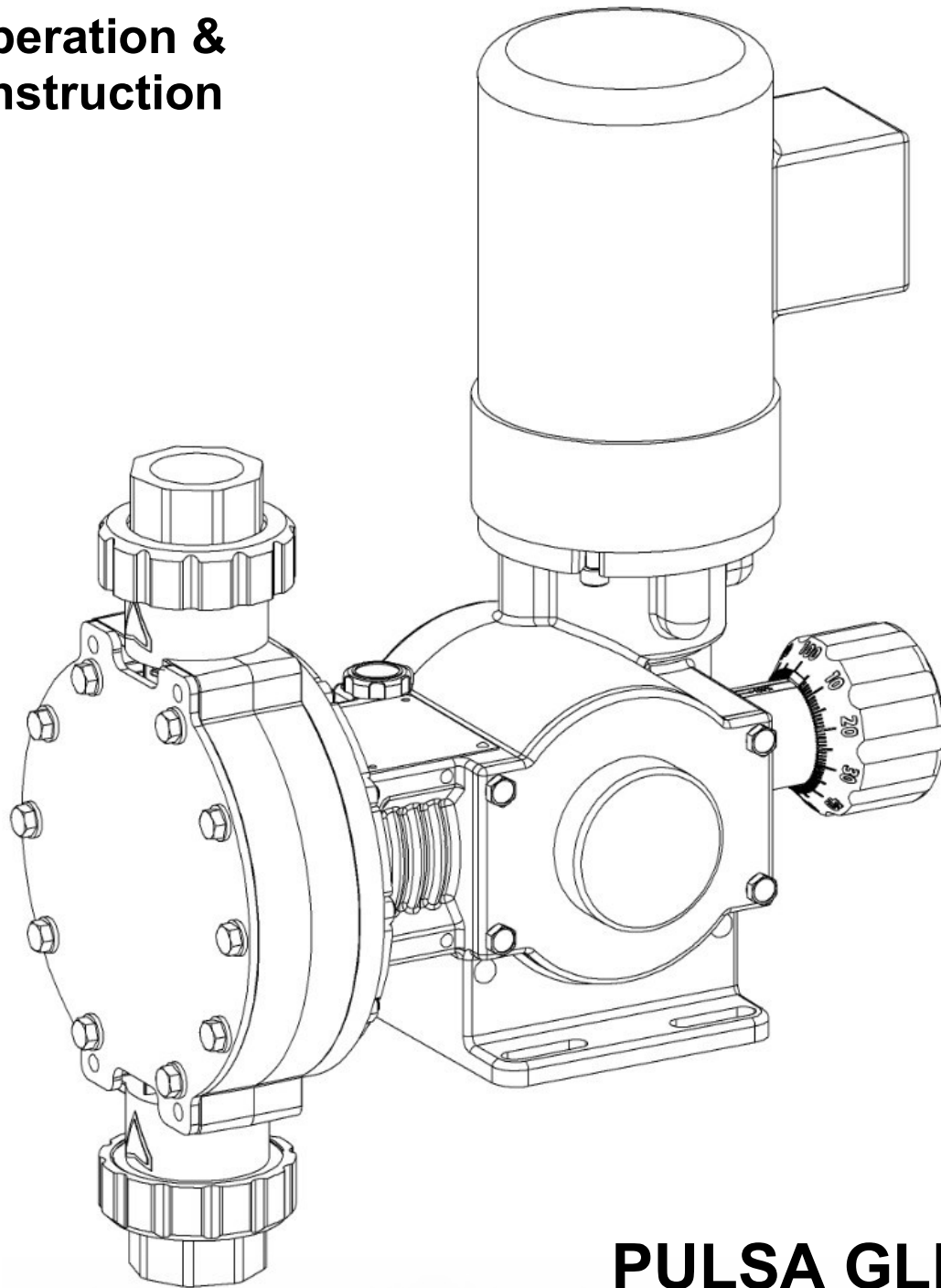


Installation, Operation & Maintenance Instruction

Models: GLM1 – 6



Bulletin #: IOM-GLM-2003-I

PULSA GLM[®]
**MECHANICAL DIAPHRAGM
METERING PUMP**

Pulsafeeder Factory Service Policy

Pulsafeeder's Factory Service Policy is maintained on its website. Please source this document at this URL:

<http://www.pulsa.com/downloads/pdf/Pulsafeeder%20EPO%20Limited%20Warranty%20Statement.pdf>

Safety Considerations:

1. Read and understand all related instructions and documentation before attempting to install or maintain this equipment.
2. Observe all special instructions, notes, and cautions.
3. Act with care and exercise good common sense and judgment during all installation, adjustment, and maintenance procedures.
4. Ensure that all safety and work procedures and standards that are applicable to your company and facility are followed during the installation, maintenance, and operation of this equipment.

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1. Equipment Inspection

Check all equipment for completeness against the order and for any evidence of shipping damage. Shortages or damage must be reported immediately to the carrier and your authorized representative or distributor of PULSA GLM® pumps.

Included Items:

- PULSA GLM® Metering Pump with Motor Adaptor

Optional Items:

- Motor (pre-installed at the factory)
- Foot Valve Kit (provided on PULSA GLM® models M1 and M2 only).

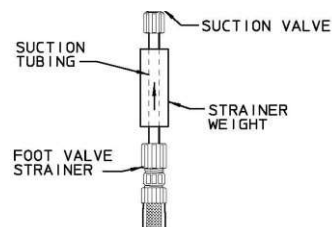


Figure 1: Foot Valve Kit

2. Installation

2.1 Location

When selecting an installation site or designing a chemical feed system, plan for operation and routine maintenance. Provide 1M (3.25FT) of space around the pump for this purpose.

PULSA GLM® pumps are designed to operate in an environment where the pump is protected from direct sunlight, and precipitation (i.e., under shelter). The ambient temperature must be between 0° C (32° F) and 40° C (104° F). If necessary add environmental controls.

The pump must be rigidly bolted to a solid and flat foundation to minimize vibration and prevent loosening of the connections. The pump must be level within 5° to assure proper check valve operation.

2.2 Motor

The PULSA GLM® is typically shipped with the motor pre-installed. It must be wired in accordance with local and national requirements by a qualified electrician. Please refer to the motor nameplate for further manufacture specific information.

If the PULSA GLM® was purchased less motor, please refer to section 4.4 Motor Installation for further instructions.

2.3 Piping System

Attention to piping detail will assure an easy startup and long life of your GLM[®]. Please follow these guidelines:

Suction Piping

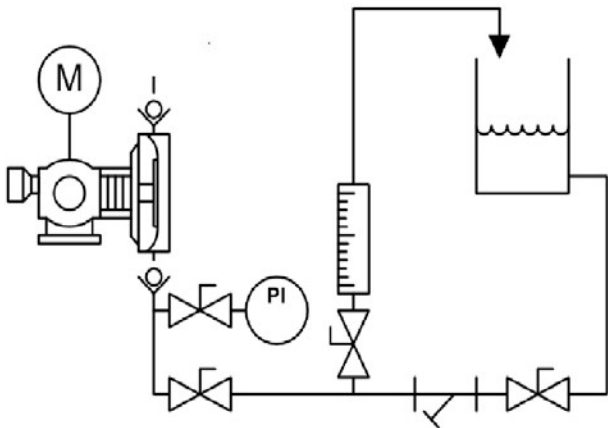


Figure 2: Suction P&ID

Isolation Valve and Unions: Isolation valves allow the system to be isolated from the process fluid to facilitate safe servicing. They also aid in the operation of Calibration columns. Valves should include good visible indications of open/closed condition. Unions assist with installation and maintenance. Valves that integrate union fittings are ideal.

Strainer: Successful installations always include a strainer on the suction side of the pump to exclude material that can cause the check valves to malfunction or the diaphragm to rupture. Select the material, size and mesh to be compatible with the fluid type, intended flow rate and service interval. A 100 mesh screen is generally recommended.

Calibration Column (Optional): Used to calibrate pump performance. Include an isolation valve and vent line back to the supply tank to facilitate safe operation.

Pressure Gage (Optional): A pressure gage should be included on the suction side of the pump when the suction pressure of the system is unknown or variable. The gage is also a good indicator of Strainer maintenance status.

Discharge Piping

Discharge Pressure Gage: Install a pressure gage no less than 2 pipe diameters from the threaded fitting on the discharge valve. A discharge pressure gage is critical to confirming proper operation of the pump and setting the pressure relief and back pressure valves.



IMPORTANT: DO NOT install an elbow directly into the discharge valve threaded fitting as it will create excessive back pressure that can lead to premature diaphragm failure.

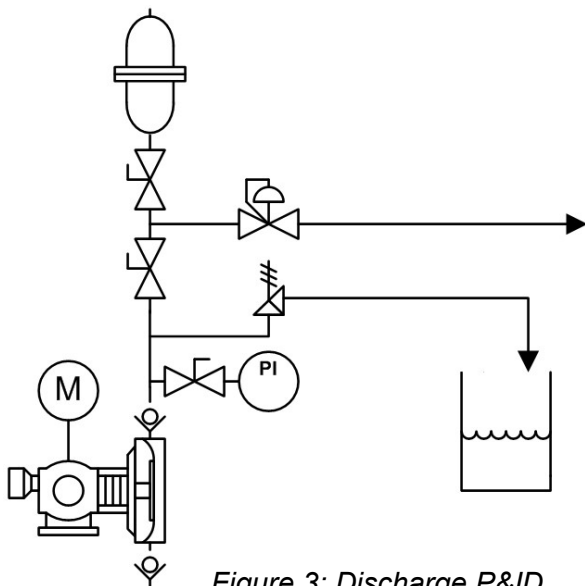


Figure 3: Discharge P&ID

Pressure Relief Valve: Install a Pressure Relief Valve as close to the pump as possible. Using the leg of a T fitting for this purpose is acceptable (with the normal discharge taking the straight path and the relief flow taking the leg). The relief pressure must be set at or below the rated pressure indicated on the pumps nameplate.



NOTE: Failure to install and properly set a Pressure Relief Valve can lead to damage of the Pumps drive mechanism that will not be covered under warranty.

Back Pressure Valve: Install a Back Pressure Valve to generate a consistent Back Pressure to the pump for accurate operation and to prevent siphoning.

Pulsation Dampener: Reciprocating diaphragm metering pumps only discharge fluid for ½ of a pump cycle. A Pulsation Dampener will smooth the associated flow/pressure variation to the down stream process.

Piping System Recommendations

1. When making the threaded joint to the valve cap assembly, use a sealing compound chemically compatible with the process material (for example Loctite® 8551 [Loctite is a registered Trade Mark of Henkel Corporation] for water service). Do not use sealing tape. The valve cap should be tightened by hand and then tightened 1 additional turn (i.e., 360 degrees) with the aid of an adjustable wrench.
2. Both new and existing piping should be cleaned, preferably by flushing with a clean liquid (compatible with process material) and blown out with air, prior to connection to the pump.



Note - Debris from manufacturing the piping system (e.g., PVC shavings, TFE Tape, dirt, etc.) can be unknowingly assembled inside the pipe. When fluid is introduced this material can be transferred to the pump and prevent proper check valve operation. This is a common startup issue.

3. Piping weight must **not** be supported by valve housings or other portions of the reagent head, as the resulting stresses can cause leaks. Valve loads must not exceed 13.5 N-M (10 FT-LBF) moment or 22N (5 LBF) in any direction. When temperature variations are expected provide for thermal expansion and contraction of piping components so that force and/or moments are controlled within the allowable range.
4. When making process connections, ensure that pipe joint cement and thread sealants do not run into the check valve assemblies as this will inhibit valve operation. This is a common startup issue.

2.4 Suction Pressure Requirements

Although PULSA GLM® metering pumps have some suction lift capability, a flooded suction (i.e., suction pressure higher than atmospheric pressure) is preferable whenever possible. The pump should be located as close as possible to the suction side reservoir or fluid supply source.

For fluid with a vapor pressure of 0.35 Bar (5 psia) or less (at operating temperature) the wet suction lift capability is approximately 3 meters (10 feet). If this requirement is not met, the pump will not provide reliable, accurate flow. In suction lift conditions, the use of a foot valve is recommended at the lowest point of the pickup tube or pipe. Pumps operating under suction lift conditions may require some liquid priming before they will operate reliably.

2.5 Discharge Pressure Requirements

All PULSA GLM[®] metering pumps are designed for continuous service at the rated discharge pressure. If the system suction pressure exceeds the discharge pressure (a condition sometimes described as “pumping downhill”), flow will be generated in addition to that generated by the pump. This results in a reduction in accuracy and loss of control over the metering process. To prevent this flow-through condition, the discharge pressure must exceed the suction pressure by at least 0.35 BAR (5 PSI). This can be achieved, where necessary, by the installation of a backpressure valve in the discharge line.

Conditions where the actual discharge pressure exceeds the pumps rating are to be avoided as they will cause damage to the pump components.

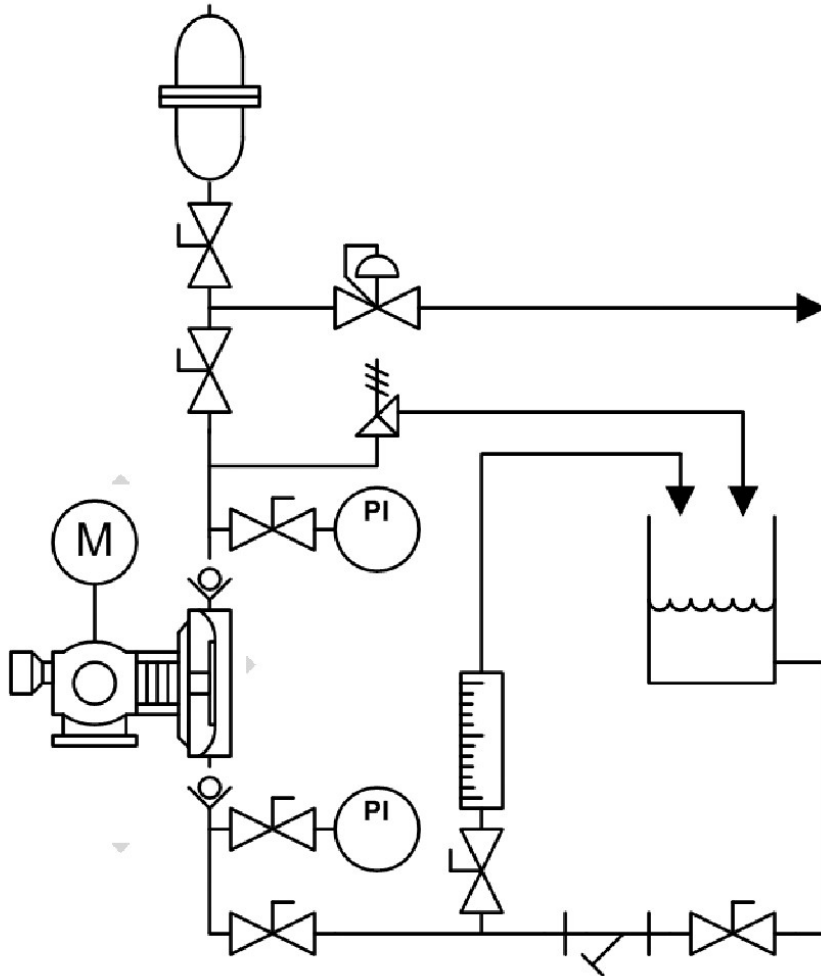


Figure 4: PULSA GLM P&ID

3. Equipment Startup

3.1 Fastener Inspection

All pump fasteners should be checked (proposal once a month when using process) prior to pump operation, and occasionally during use. This would include reagent head mounting bolts, motor mounting bolts, and the hardware that secures the pump to its foundation.

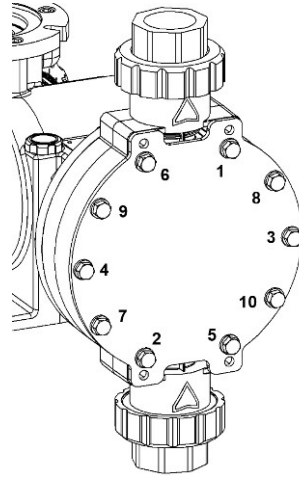


Figure 5: Reagent Head Bolt tightening

The motor and reagent head mounting bolts should be torqued to 4.5 N-M (40 IN-LBF). Bolts should be tightened in a star pattern across the head to assure uniform clamping of the diaphragm (see recommended tightening sequence in above diagram).

3.2 Output Adjustment

All PULSA GLM[®] pumps have a knob for manual stroke length adjustment. The knob can be adjusted to any value between 0 to 100%. The stroke length setting is directly proportional the flow rate of the pump.

1. Push the knob in towards the gearbox to release the locking mechanism.



Note - Making adjustments without releasing the lock may damage the locking mechanism.

2. Adjust the knob to the desired output.
 - a) Read the setting directly from the knob marking where it aligns with the stroke barrel.
 - b) The knob is labeled in 10% increments with 1% graduation marks. The knob will lock in 0.5% increments.



Note – Do not adjust the knob beyond the indicated range.

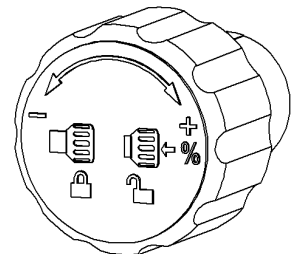
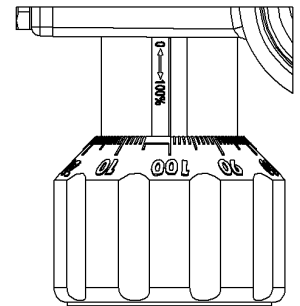
Figure 6: Stroke Adjustment Knob

For example, to set the pump to 75% stroke length (starting from the factory default setting of 0%) push the knob in (to unlock) and turn it approximately $\frac{3}{4}$ turn clockwise until the 75% indicator is aligned with the line on the stroke adjustment barrel.

3. Release the knob to re-engage the locking mechanism.



Note – Stroke adjustments should be made while pump is operating.



3.3 Priming the Reagent Head

1. When handling process liquids, follow all applicable personal and facility safety guidelines.
2. Ensure that the pump is ready for operation and that all process connections are secure.
3. Open the suction and discharge line shutoff valves.
4. If the piping system design and the storage tank are such that the product flows due to gravity through the pump, reduce the discharge pressure and the system will self prime when the pump is started. In the event the discharge line contains a significant amount of pressurized air or other gas, it may be necessary to lower the discharge pressure to enable the pump to self-prime.
5. If the installation involves a suction lift, it may be necessary to prime the reagent head and suction line. Operate the pump as in step 4 above - many times the pump will be capable of self priming. If it does not begin to pump fluid, remove the discharge valve assembly. Carefully fill the reagent head through the discharge valve port with process (or compatible) liquid, and then reinstall the check valve.
6. Start the pump at the 0% stroke length setting and slowly increase the setting to 100% to prime the pump. If this does not work, it will be necessary to fill the suction line.
7. Filling of the suction line will necessitate the use of a foot valve or similar device at the end of the suction line so that liquid can be maintained above the reservoir level. Remove the suction valve assembly, fill the line with fluid, replace the suction valve, then remove the discharge valve assembly and fill the reagent head as described in Step 5 above. The pump will now self-prime when started up per step 6 above.



Use appropriate precautions if handling process fluid. Ensure that any other fluid used for priming is compatible with the product that will be pumped.

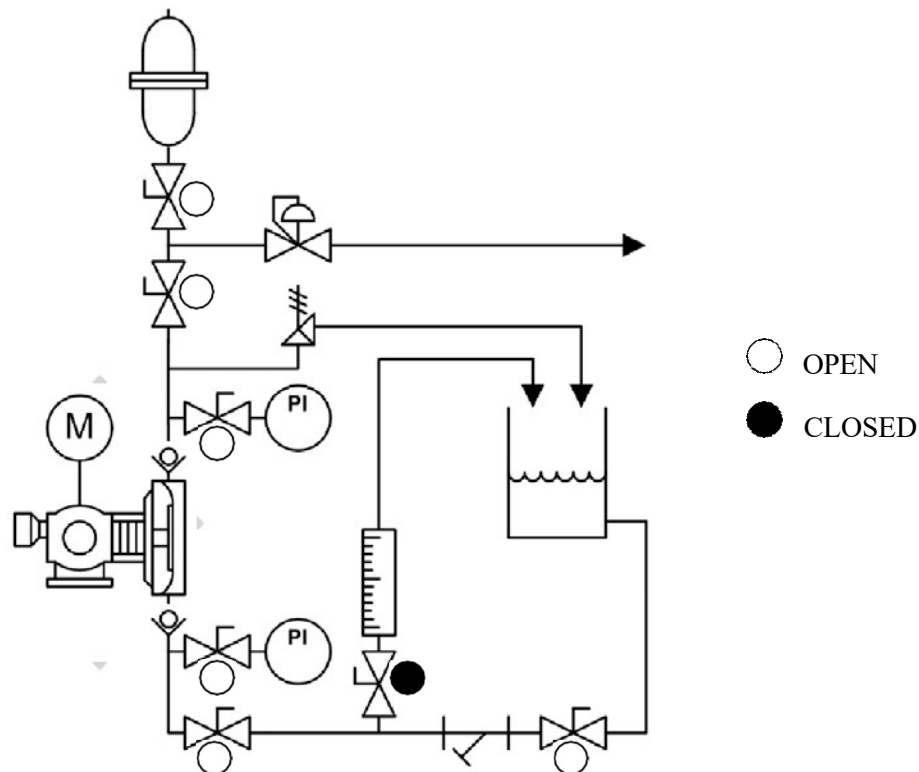


Figure 7: System Configured for Self-Priming

3.4 Calibration

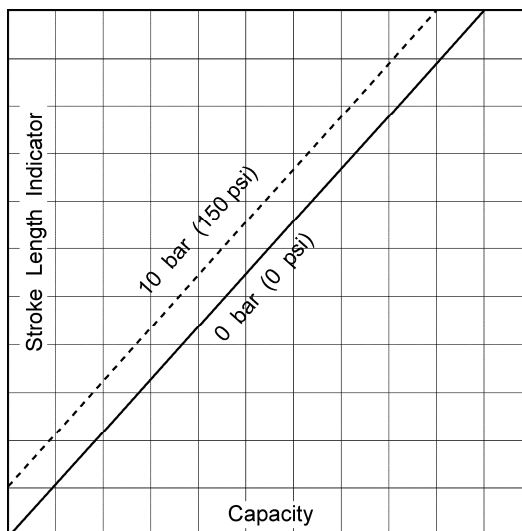


Figure 8: Sample Flow Calibration Curve

All metering pumps must be calibrated to accurately correlate stroke length settings to measured flow rates.

A typical calibration chart is shown above. Although output is linear with respect to the stroke length setting, an increase in discharge pressure decreases output uniformly, describing a series of parallel lines, one for each pressure (only two are shown).

The theoretical output flow rate at atmospheric discharge pressure is based on the displacement of the diaphragm, stroke length and the stroking rate of the pump. With increasing discharge pressure there is a corresponding decrease in output flow. Pumps are rated for a certain flow at a rated pressure (check nameplate). Whenever possible, calibration should be performed under actual process conditions (i.e., the same or a similar process liquid at system operating pressure).

To construct a calibration chart, measure the flow rate several times at three or more stroke settings (e.g., 25, 50, 75, and 100), plot these values on linear graph paper, and draw a best-fit line through the points. For stable conditions, this line should predict settings to attain required outputs.



Note - All users are encouraged to test the flow rate of their pump once installed in their system, to ensure best accuracy and reliable operation.

4. Maintenance



BEFORE PERFORMING ANY MAINTENANCE REQUIRING REAGENT HEAD OR VALVE (WET END) DISASSEMBLY, BE SURE TO RELIEVE PRESSURE FROM THE PIPING SYSTEM AND, WHERE HAZARDOUS PROCESS MATERIALS ARE INVOLVED, RENDER THE PUMP SAFE TO PERSONNEL AND THE ENVIRONMENT BY CLEANING AND CHEMICALLY NEUTRALIZING AS APPROPRIATE. WEAR PROTECTIVE CLOTHING AND EQUIPMENT AS APPROPRIATE.

Accurate records from the early stages of pump operation will indicate the type and levels of required maintenance. A preventative maintenance program based on such records will minimize operational problems. It is not possible to forecast the lives of wetted parts such as diaphragms and check valves. Since corrosion rates and operational conditions affect functional material life, each metering pump must be considered according to its particular service conditions.

The PULSA GLM[®] KOPkit will contain all replacement parts normally used in a preventative maintenance program. It is recommended that KOPkits and GLM Gear Oil be kept available at all times.

4.1 Lubrication

PULSA GLM[®] pumps have an oil bath reservoir that is pre-filled with 350mL of GLM Gear Oil at the factory. For optimum pump performance under normal conditions, the GLM Gear Oil should be replaced every 3,000 hours. For severe service in non-temperature controlled and/or dirty environments the GLM Gear Oil should be replaced every 1,500 hours.

1. Disconnect the power source to the drive motor, and relieve all pressure from the piping system.
2. Remove the Vent/Fill cap on top of the Gear Box under the motor adaptor lip.
3. Locate the Gear Box drain plug at the bottom of the Gear Box under the Stroke Adjustment Knob (see Figure below).
4. While holding the Gear Box over a catch reservoir, remove the drain plug (be sure to retain the sealing o-ring on the plug).
5. Replace the Drain Plug and sealing o-ring.
6. Fill the Gear Box with 350mL of GLM Gear Oil so that the level indicates in the center of the sight glass on the side.
7. Replace the Vent/Fill cap and sealing o-ring.

Pulsafeeder Part	Description	Container Size
GL980002-000	GLM Gear Oil	5L

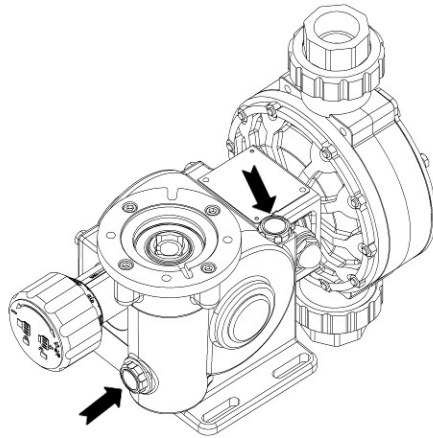


Figure 9: Gear Box Fill/Drain Points

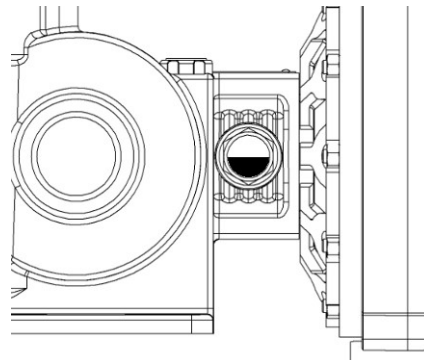


Figure 10: Gear Box GLM Gear Oil Normal Level

4.2 Wet End Removal, Inspection, & Reinstallation



IF THE DIAPHRAGM HAS FAILED, PROCESS FLUID MAY HAVE CONTAMINATED OTHER PARTS OF THE PUMP INCLUDING THE DRIVE COMPONENTS (ALTHOUGH NORMALLY, ANY PROCESS FLUID BEHIND A FAILED DIAPHRAGM WOULD PASS THROUGH THE BOTTOM DRAIN HOLE). HANDLE WITH APPROPRIATE CARE.

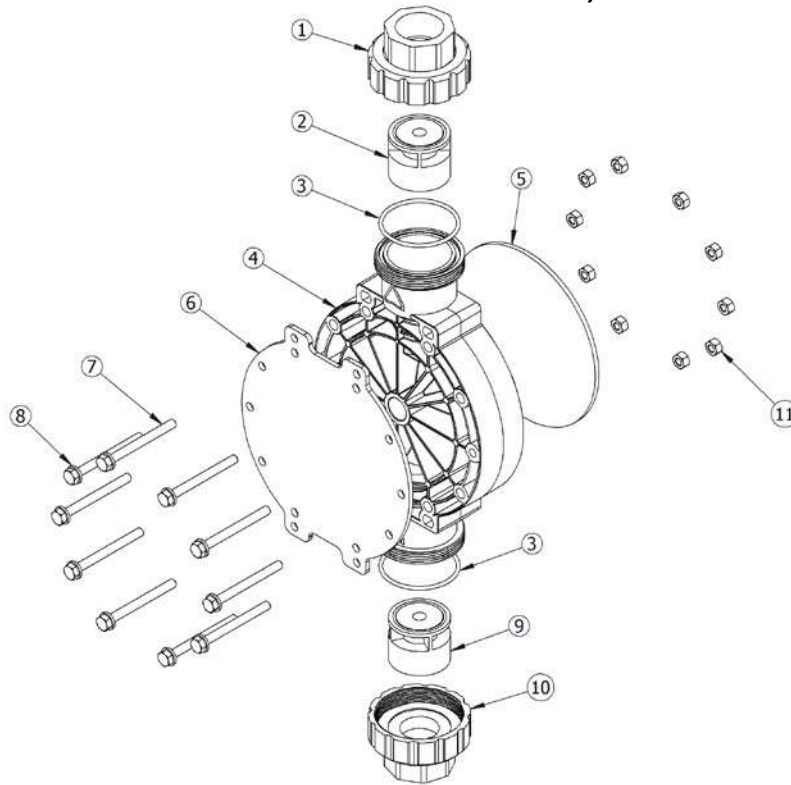


Figure 11: Wet End Components

Item	Description	Qty.		
		DM1 and DM2	DM3 and DM4	DM5 and DM6
1	Discharge Connection Assembly	1	1	1
2	Discharge Valve Assembly	1	1	1
3	O-ring	2	2	2
4	Reagent Head	1	1	1
5	Diaphragm	1	1	1
6	Front Cover Plate	1	1	1
7	Hex Head Bolt	8	10	12
8	Flat Washer	8	10	12
9	Suction Check Valve Assembly	1	1	1
10	Suction Connection Assembly	1	1	1
11	Hex Nuts	8	n/a	n/a

PULSA GLM[®] diaphragms do not have a specific cycle life; however, the accumulation of foreign material or debris sufficient to deform the diaphragm can eventually cause failure. Failure can also occur as a result of system over pressure or chemical attack. Periodic diaphragm inspection and replacement are recommended. Each user should perform regular inspections to determine the replacement interval that is appropriate to their system conditions.

4.2.1 Diaphragm Removal & Reinstallation

1. Adjust the stroke setting to 0% and disconnect the power source to the drive motor.
2. Relieve all pressure from the piping system.
3. Close the inlet and outlet shutoff valves.
4. Place a pan underneath the pump head adaptor to catch any liquid leakage.
5. Disconnect piping to the reagent head and drain any process liquid, following all recommended material safety precautions.
6. Remove all but one top reagent head bolt. Product will leak out between the pump head adaptor and reagent head as the bolts are loosened. Use prescribed engineering controls to prevent exposure and accidental discharge to environment.
7. Tilt the head and pour out any liquids retained by the check valves into a suitable container, continuing to follow safety precautions as appropriate.
8. Remove the final bolt and rinse or clean the reagent head with an appropriate material.
9. Remove the diaphragm by turning it counter-clockwise.
10. Inspect the diaphragm. The diaphragm must be replaced if it is cracked, separated, or obviously damaged.
11. Install the diaphragm.
 - a) Ensure that the critical sealing areas of diaphragm, reagent head, and pump head are clean and free of debris.
12. Thread the diaphragm (clockwise) fully onto the shaft.
13. Install the reagent head bolts and tighten in an alternating pattern to ensure an even seating force. Torque bolts to 7.9 N-M (70 IN-LBF).
14. Re-prime the pump following the procedure outlined in **Section 3.3**

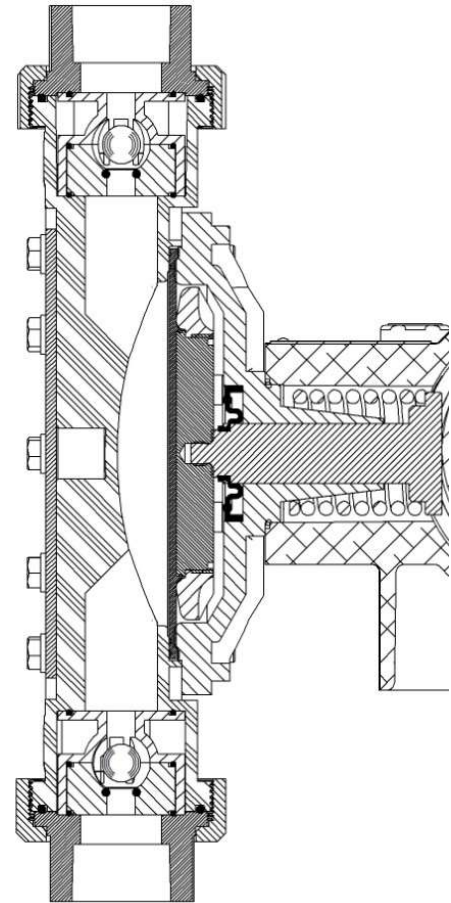


Figure 12: Reagent Head Assembly Cross Section

4.3 Check Valves

4.3.1 General Description

The valve incorporates a ball, guide, and seat. Flow in the unchecked direction lifts the ball off the seat, allowing liquid to pass through the guide. Reverse flow forces the ball down, sealing it against the bevel edge of the seat and o-ring. The guide permits the ball to rotate but restricts vertical and lateral movement in order to minimize “slip” or reverse flow. Ball rotation prolongs life by distributing wear over the entire surface of the ball. Since ball return is by gravity, the valve must be in the vertical position in order to function properly. Parts are sealed by o-rings.

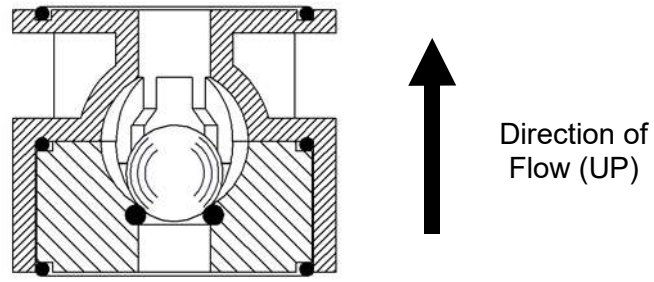


Figure 13: Cartridge Check Valve

4.3.2 Check Valve Removal & Reinstallation, Cartridge type



Valving that is of the cartridge design is intended to be replaced as an assembly.

1. Disconnect and Lockout the power supply to the drive motor.
2. Relieve all pressure from the piping system.
3. Take all precautions necessary to prevent contamination to the environment and personnel exposure to hazardous materials.
4. Close the inlet and outlet shutoff valves.
5. Disconnect the suction piping at the suction shut-off valve union by releasing the union retaining nut.



Caution – Process fluid may drain from the Piping. Take necessary precautions.

6. Disconnect the discharge piping at the discharge shut-off valve union by releasing the union retaining nut.



Caution – Process fluid may drain from the piping. Take necessary precautions.

7. Loosen and remove the suction valve cartridge retaining nut and drain any liquid from the reagent head.
8. Disconnect the discharge piping at the installed union near the discharge port.
9. Loosen and remove the discharge valve cartridge slowly to drain any trapped liquid.
10. Reinstall both new valve assemblies. For both the suction and discharge the valve orientation should be as shown in Figure 13.



Take care to assure o-rings are fully seated in groves and are not displaced during assembly. A pinched o-ring can cause the assembly to leak. If necessary use a compatible o-ring retaining compound.

4.3.3 Check Valve Removal & Reinstallation, Tie-bar type

1. Disconnect and Lockout the power supply to the drive motor.
2. Relieve all pressure from the piping system.
3. Take all precautions necessary to prevent contamination to the environment and personnel exposure to hazardous materials.
4. Close the inlet and outlet shutoff valves.
5. Loosen the suction valve tie-bar bolts (4) and spring the suction piping slightly away from the head, allowing liquid to drain. It may be necessary to loosen a union or flange.



Caution – Process fluid may drain from the Piping. Take necessary precautions.

6. Remove the suction check valve assembly by sliding it towards you, holding it together as a unit. Note carefully the position of the component parts, to assist in re-assembly.
7. Loosen the discharge valve tie-bar bolts (4) and spring the discharge piping slightly away from the head, allowing liquid to drain. It may be necessary to loosen a union or flange.

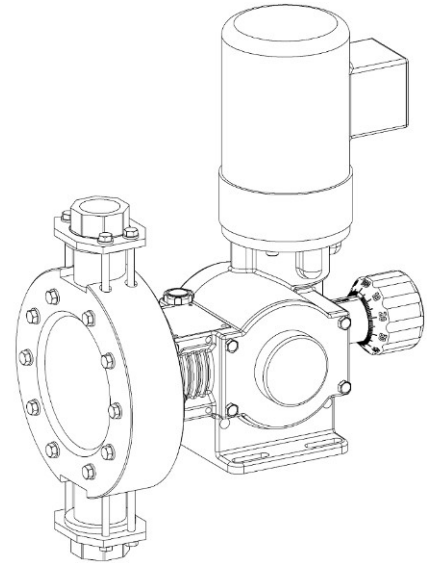


Figure 14: Tie Bar Style Metal Valves



Caution – Process fluid may drain from the Piping. Take necessary precautions.

8. Remove the discharge check valve assembly by sliding it towards you, holding it together as a unit. Note carefully the position of the component parts, to assist in re-assembly.
9. Disassemble both valves and check components for wear or damage. The seats should have a sharp edge and be free from dents or nicks. Hold a ball firmly against the seat in front of a bright light and inspect for fit. Observation of light between the ball and seat is cause for replacement.
10. Reassemble both valves using new parts as required. Sealing o-rings should always be replaced.
11. Replace both valve assemblies onto the pump, taking care to ensure they are oriented correctly, with the balls above the seats, and the seats oriented with the sharp edge up and the chamfered edge down.

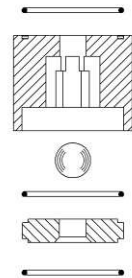


Figure 15: Metal Valve



Inserting the check valve assembly into the pump in the wrong direction, or having the check seat upside down, will prevent proper seals at the o-rings, decrease pump performance, and can cause damage to the diaphragm.

12. Carefully make sure that the check assemblies are in proper position, and tighten the four tie-bar bolts, using a star pattern, to a torque of 6 Ft-lbs (8 N-m).
13. Retighten any unions, flanges, or other process connections that may have been loosened previously.

4.4 Motor Removal & Reinstallation

Removal

1. Disconnect and Lockout the power supply to the drive motor.
2. Disconnect the motor wiring from the motor.
3. Remove the four bolts retaining the motor to the motor adaptor.
4. The motor shaft is keyed to a plastic coupling that slides into a splined bore in the pump input shaft. Lift the motor straight up to slide the motor shaft coupling out of the pump input shaft.

Installation

1. Install the plastic coupling over the motor key onto the motor shaft. For the 71 frame motor the coupling should be installed over the shaft up to the collar (the end of the shaft will be slightly recessed into the coupling).



Note: Assure the motor key is fully covered by the motor coupling.

2. Reinstall the motor by sliding the motor vertically into the pump input shaft.
3. Align the motor bolts holes to the motor adaptor plate.
4. Install the 4 motor retaining bolts. Torque to 4.5 N-M (40 IN-LBF).
5. Connect the motor wiring to the motor in accordance with Local, National and Motor Manufacturer requirements.
6. Restore power.

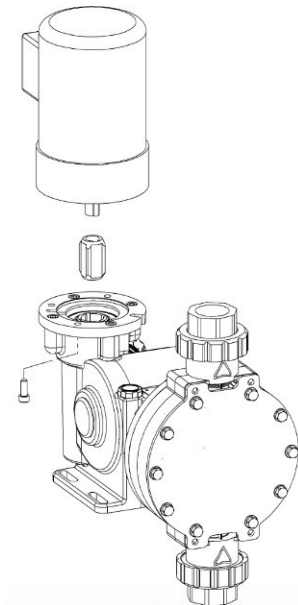


Figure 16: Motor Mounting



The PULSA GLM® is designed to operate with Motor rotation direction clockwise viewing from the fan side.

4.5 Pump Head Removal

The PULSA GLM® includes a Pump Head that clamps the diaphragm to the Reagent Head. In the event of diaphragm failure process fluid can come into contact with this part (it includes a drain hole to prevent fluid accumulation). Over time, it is possible for this part to suffer some level of deterioration and need replacement.

1. Disconnect and Lockout the power supply to the drive motor.
2. Relieve all pressure from the piping system.
3. Take all precautions necessary to prevent contamination to the environment and personnel exposure to hazardous materials.
4. Close the inlet and outlet shutoff valves.
5. Remove the Valving, Reagent Head and Diaphragm as described in section 4.2.1.
6. Drain the oil from the pump.
7. Set the pump stroke setting to 100%.
8. Rotate the pump motor until the Cross Head (the part that the Diaphragm threads onto) is fully retracted into the Gear Box.
9. Evenly loosen all (4) bolts that retain the Pump Head to the Gear Box.



Warning – Stored energy release possible - use caution!
The pump head compresses a large spring that is used to return the diaphragm to its retracted position. Special tools may be required to reattach the pump head.

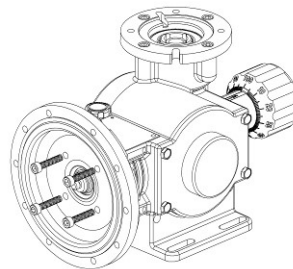
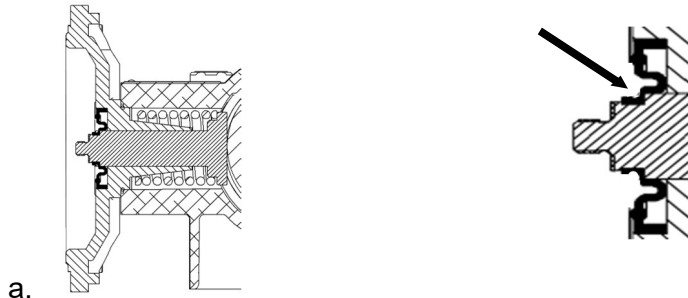


Figure 17: Pump Head Retaining Bolt Removal

10. Remove old pump head from front of Gear Box.



a.
b. Figure 18, Pump Head Cross Section and Bellows Seal

11. Orient replacement Pump Head with drain hole pointed down. Assure o-ring is in place on Gearbox side.
12. Ensure the bellows oil seal is seated on the end of the cross head as shown above.
13. Insert Spring Guide of Pump Head over Cross Head and into spring. Take care to assure spring does not catch on tapered guide during installation.
14. Install the four retaining bolts. Tighten evenly. Torque to 7.9N-M (70IN-LBF) for DM1-DM2, 18.1N-M (160IN-LBF) for DM3-DM6
15. Install Diaphragm, Reagent Head and Valving as defined in Section 4.2.1.



The O ring is quick-wear part. Need to change when leakage is happened.

5. Replacement Parts

5.1 KOPkit Program

PULSA GLM[®] KOPkits contain all replacement parts normally used in a preventative maintenance program. (*PULSA*lube is also available separately for preventative maintenance programs. Refer to **Section 3 – Equipment Startup**). There is a specific KOPkit for every PULSA GLM[®] pump model. Each KOPkit is vacuum-packed for extended storage. All PULSA GLM[®] pumps have the KOPkit number identified on the pump nameplate and Pulsafeeder order documents. KOPkits can also be selected from the technical data sheet shipped with the pump or by a Pulsafeeder representative. A list of the PULSA GLM KOPkit numbers can also be found on the next page. The kit is identified by the model number of the pump, the wetted end material, and the process connection thread type. For models with tie-bar type check valves, the appropriate components (check valve balls, seats, and o-rings) are supplied instead of the cartridges pictured.

5.2 Ordering KOPkits or Parts

When ordering replacement parts always specify:

- Pump model and serial number (from pump nameplate), e.g., Model No. (M2) with Serial No. F406365-3.

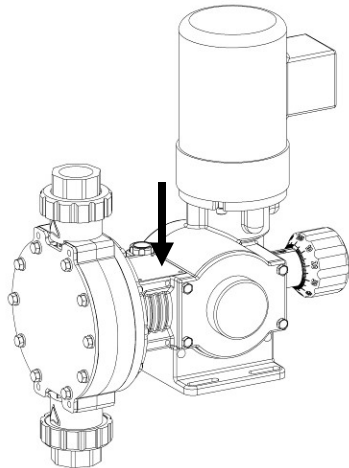


Figure 19: PULSA GLM[®] Nameplate

- Part number and description from the PULSA GLM[®] parts list. Include the three-character suffix. (Note: PULSA GLM part numbers begin either with the letters **NP**, or the letter **W**, e.g., NP170001-THY or W210221-001.)

5.3 KOPkit numbers by model:

Pump Model	Wetted Material	KOPkit Number
DM1	PP	KD1PX
DM2		KD2PX
DM3		KD3PX
DM4		KD4PX
DM5		KD5PX
DM6		KD6PX
DM7 & DM7 Duplex		KD7PX
DM1	PVDF	KD1FX
DM2		KD2FX
DM3		KD3FX
DM4		KD4FX
DM5		KD5FX
DM6		KD6FX
DM7 & DM7 Duplex		KD7FX
DM1	316SS	KD1AX
DM2		KD2AX
DM3		KD3AX
DM4		KD4AX
DM5		KD5AX
DM6		KD6AX
DM7 & DM7 Duplex		KD7AX
DM2	KOP kits for alkaline media	GL87XLKECC-000
DM3		GL87XLKEEE-000
DM4		GL87XLKEEE-000
DM5		GL87XLKEFJ-000
DM6		GL87XLKEFJ-000
DM7 & DM7 Duplex		GL870001-000

6. Troubleshooting

Difficulty	Probable Cause	Remedy
Pump motor does not start	Faulty power source.	Check power source.
	Blown fuse, circuit breaker.	Replace - eliminate overload.
	Broken wire.	Locate and repair.
	Wired improperly.	Check diagram.
	Process piping blockage.	Open valves, clear other obstructions. Test by setting stroke to 0%.
No fluid delivery	Motor not running.	Check power source. Check wiring diagram (see above).
	Supply tank empty.	Fill tank.
	Line clogged.	Clean and flush.
	Closed in-line valve(s).	Open valve(s).
	Ball check valves held open with solids.	Clean – inspect, flush with clear fluid.
	Vapor lock, cavitation.	Increase suction pressure.
	Prime lost.	Re-prime, check for leak.
	Strainer clogged.	Remove and clean. Replace screen if necessary.
	Stroke adjustment set at zero.	Increase stroke length setting.
Low fluid delivery	Motor speed too low.	Check voltages, frequency, wiring, and terminal connections. Check nameplate vs. Specifications.
	Check valves worn or dirty.	Clean, replace if damaged.
	Calibration system error.	Evaluate and correct.
	Product viscosity too high.	Lower viscosity by increasing product temperature or dilution. Increase pump and/or piping size.
	Product cavitating.	Increase suction pressure.
Delivery gradually drops.	Check valve leakage.	Clean, replace if damaged.
	Leak in suction line.	Locate and correct.
	Strainer fouled.	Clean or replace screen.
	Product change.	Check viscosity and other variables.
	Supply tank vent plugged.	Unplug vent.
Delivery erratic.	Leak in suction line.	Locate and correct.
	Product cavitating.	Increase suction pressure.
	Entrained air or gas in product.	Consult factory for suggested venting.
	Motor speed erratic.	Check voltage and frequency.
	Fouled check valves.	Clean, replace if necessary.
	Inadequate backpressure	Increase discharge pressure to obtain a minimum pressure difference of 5 psi from suction to discharge.
Delivery higher than rated.	Suction pressure higher than discharge pressure.	Install backpressure valve or consult factory for piping recommendations.
	Back pressure valve set too low.	Increase setting.
	Back pressure valve leaks.	Repair, clean, or replace.
Noisy gearing, knocking	Discharge pressure too high.	Reduce pressure.
	Water hammer.	Install pulsation dampener.
	Stroke length at partial setting.	Some operating noise is characteristic of lost motion pumps.
	Low grease level.	Add or replace grease.

Difficulty	Probable Cause	Remedy
Piping noisy.	Pipe size too small.	Increase size of piping - install pulsation dampener.
	Pipe runs too long.	Install pulsation dampener in line.
	Pulsation dampener inoperative or flooded.	Refill with air or inert gas. Inspect and replace diaphragm and recharge.
	No surge chamber or dampener used.	Install pulsation dampeners.
Motor overheats.	Pump overloaded.	Check operating conditions against pump design. Verify discharge pressure.
	High or low voltage.	Check power source.
	Loose wire.	Trace and correct.
	Incorrect motor wiring.	Verify and correct.

7. Piping Accessories

Pressure Relief Valves

Pressure relief valves are designed to protect chemical feed systems from damage that may be caused by defective equipment or a blockage in the discharge line. These valves function to limit the pressure downstream of the pump. Field adjust the pressure relief valve to operate when the discharge pressure exceeds operating pressure by 10-15%. Pressure relief valve should always be adjusted to a setting below the maximum rated pressure of the pump. No potentially restrictive components, such as a valve, should be installed between the pump discharge and the PRV.

Diaphragm Backpressure Valve

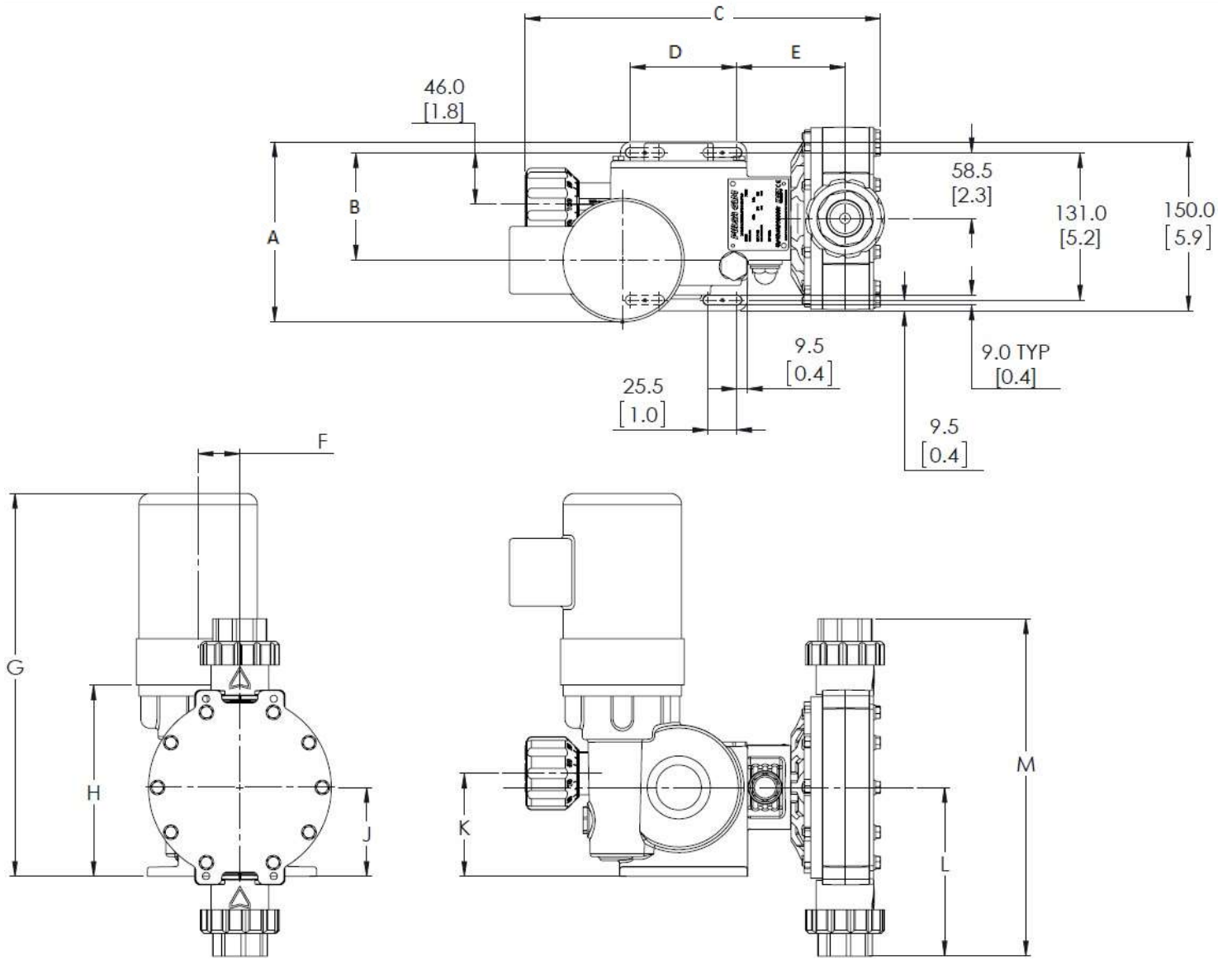
A diaphragm style backpressure valve creates constant back pressure. A PTFE or PTFE-faced diaphragm offers maximum chemical protection and service life, and seals spring and bonnet from product.

Be sure to install with fluid flow in direction of arrow on valve body.

Pulsation Dampener

A pulsation dampener is a pneumatically charged diaphragm-type chamber that intermittently stores hydraulic energy. Used on the inlet, it can improve NPSHA (Net Positive Suction Head Available) characteristics of the suction piping system. On the discharge line it will reduce discharge pressure peaks and pulsating flow variations.

8. Dimensional Drawing



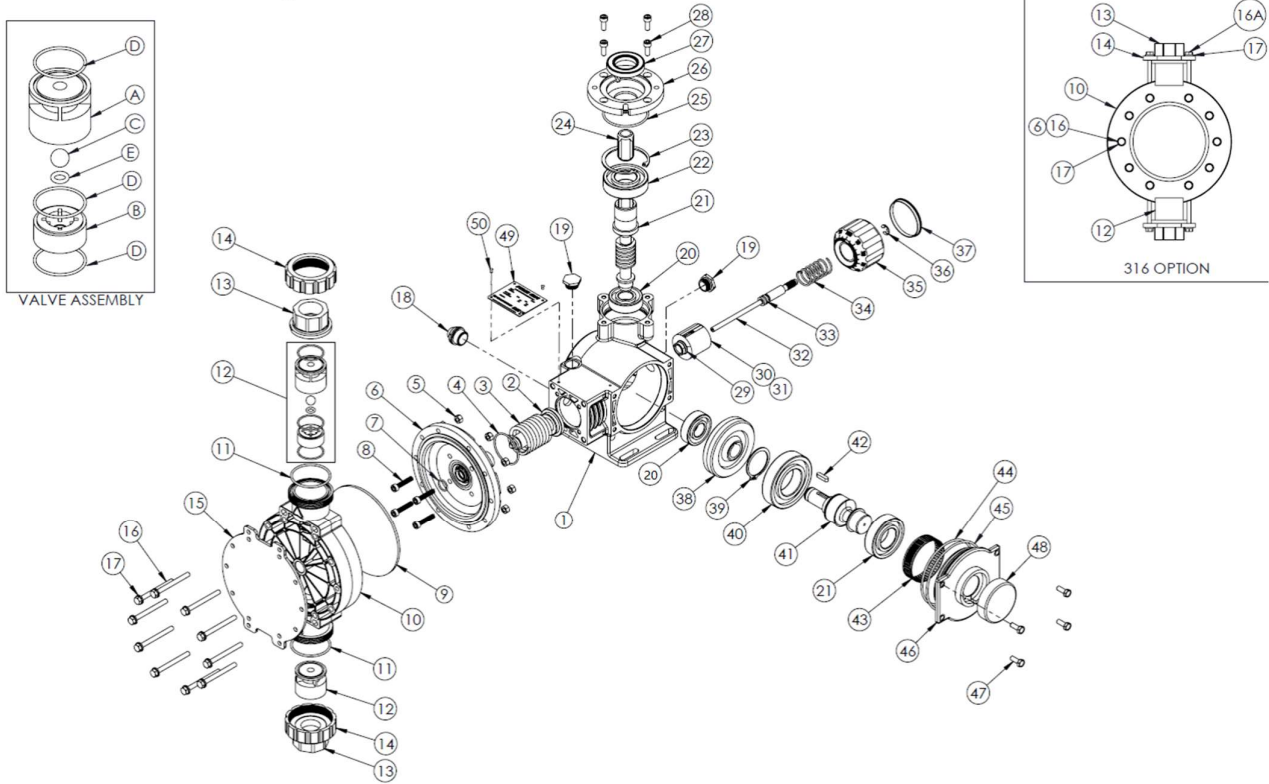
Dimension table in mm / inches

Dimensions are with standard IEC 71 B14 frame motor

Model	Dimension						
		A	B	C	D	E	F
DM1 & DM2	71	160.0 / 6.3	95.5 / 3.8	300.0 / 11.8	94.5 / 3.7	85.5 / 3.4	37.0 / 1.5
DM3 & DM4	71	160.0 / 6.3	95.5 / 3.8	315.0 / 12.4	94.5 / 3.7	95.8 / 3.7	37.0 / 1.5
DM5 & DM6	71	160.0 / 6.3	95.5 / 3.8	325 / 12.8	94.5 / 3.7	99.3 / 3.9	37.0 / 1.5

Model	Dimension								
		G	H	J	K	L		M	
DM1 & DM2	71	340.0 / 13.4	170.0 / 6.7	79.0 / 3.1	91.5 / 3.6	103.0 / 4.1	TUBING	206.0 / 8.1	TUBING
DM3 & DM4	71	340.0 / 13.4	170.0 / 6.7	79.0 / 3.1	91.5 / 3.6	150.0 / 5.9	N/A	300.0 / 11.8	N/A
DM5 & DM6	71	340.0 / 13.4	170.0 / 6.7	79.0 / 3.1	91.5 / 3.6	172.0 / 6.8	N/A	344.0 / 13.5	N/A

9. Parts Diagrams and Item Numbers



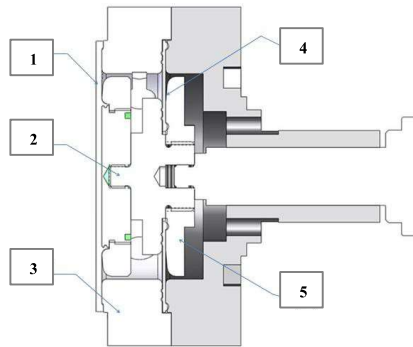
Item Number	Description	QTY / PUMP	Part Number (DM1)	Part Number (DM2)	Part Number (DM3)	Part Number (DM4)	Part Number (DM5)	Part Number (DM6)
1	GEARBOX	1	GL010001-ALU					
2	CROSSHEAD	1	GL120001-000					
3	RETURN SPRING	1	GL430001-000					
4	GASKET	1	GL440002-NTR					
5	NUT	--	N/A		N/A		N/A	
6	PUMP HEAD	1	GL150001-000			GL150002-000	GL150003-000	
7	BELLOWS O-RING	1	NP440110-VTN					
7A	BELLOWS SEAL	1	GL450001-000					
8	PMP HEAD BOLT	4	GL990007-STL					
9	DIAPHRAGM ASSY	1	GL170013-074			GL170014-118	GL170015-145	
10	REAGENT HEAD (P)	1	GL160001-FPP		GL160002-FPP		GL160008-FPP	
	REAGENT HEAD (F)		GL160001-PVD		GL160002-PVD		GL160008-PVD	
	REAGENT HEAD (A)		GL160004-000		GL160005-000		GL160006-316	
11	BACKUP SEAL(P&F)	2	NP440123-VTN		NP440136-VTN		NP440144-VTN	
	BACKUP SEAL (A)	N/A	N/A					
12	VALVE ASSY (P&F)	2	GL87XLFVCA-XXXX	GL87XLFVCC-XXXX	GL87XLFVVEE-XXXX		GL87XLFVFJ-XXXX	
12A	VALVE GUIDE (P&F)	2	GL310001-PVD	GL310005-PVD	GL310002-PVD		GL310004-PVD	
12B	VALVE SEAT (P&F)	2	GL330006-PVD	GL330005-000	GL330002-000		GL330004-000	
12C	BALL (P&F)	2	L1000400-ALA	W032580-ALA	W041935-ALA		W034581-ALA	
12D	VALVE SEALS (P&F)	6	NP440018-TFE		NP440027-TFE		NP440031-TFE	
12E	ORING SEAT (P&F)	2	N/A	W049855-VTN	NP440110-VTN		NP440210-VTN	
Item Number	Description	QTY / PUMP	Part Number (DM1)	Part Number (DM2)	Part Number (DM3)	Part Number (DM4)	Part Number (DM5)	Part Number (DM6)
12	ALVE ASSY (A)	2	GL87XAATCA-XXXX	GL87XAATCC-XXXX	GL87XAATEE-XXXX		GL87XAATFJ-XXXX	
12A	VALVE GUIDE (A)	2	GL310006-000	GL310007-000	GL310008-000		GL310010-000	
12B	VALVE SEAT (A)	2	GL330006-316	GL330007-316	GL330008-316		GL330010-316	

12C	BALL (A)	2	W046646-316	W032580-316	W041935-316	W034581-316
12D	VALVE SEALS (A)	6	NP440018-TFE	NP440018-TFE	NP440027-TFE	NP440031-TFE
12E	ORING SEAT (A)	N/A	N/A			
13	VALVE CAP (PT)	2	GL300001-FPP, L1100400-FPP		N/A	N/A
	VALVE CAP (FT)		GL300001-PVD, L1100400-FPP		N/A	N/A
	VALVE CAP (PB)		GL300002-FPP		GL300003-FPP	GL300004-FPP
	VALVE CAP (FB)		GL300002-PVD		GL300003-PVD	GL300004-PVD
	VALVE CAP (AB)		GL300005-000		GL300006-000	GL300007-000
14	UNION NUT (P)	2	GL360001-FPP		GL360002-FPP	GL360003-FPP
	UNION NUT (F)		GL360004-STL		GL360005-STL	GL360006-STL
	TIE BAR (A)		GL140011-STL		GL140012-STL	GL140013-STL
15	PLATE (P&F ONLY)	1	GL140011-STL		GL140012-STL	GL140013-STL
16	RH BOLT	--	GL990008-188 (8)		GL990001-188 (10)	GL990001-188 (12)
17	RH WASHER	--	NP991017-188 (8)		NP991017-188 (10)	NP991017-188 (12)
18	OIL SIGHT GLASS	1	GL994001-000			
19	OIL PLUG	2	GL030002-001			
			NP440014-NTR			
20	SMALL BEARING	2	GL400002-000			
21	WORM SHAFT	1	N/A(Customer provides model number to factory to get the PN for replacement)			
22	UPPER BEARING	1	GL400003-000			
23	RETAINING RING	1	GL995001-STL			
24	COUPLING	1	GL410001-071			
25	GASKET	1	NP440141-NTR			
26	MOTOR ADAPTOR	1	GL490001-ALU			
27	MOTOR SEAL	1	GL450002-000			
28	ADAPTOR BOLTS	4	NP990024-188			
29	GASKET	1	GL440001-NTR			
30	BARREL	1	GL410002-000			
31	STROKE LABEL	1	N/A			
31A	OUTER ADJ SHAFT	1	GL410005-001	GL410005-003	GL410005-004	GL410005-006
31B	SNAP RING	1	GL995004-STL			
32	INNER ADJ SHAFT	1	GL410004-001	GL410005-003	GL410005-004	GL410005-006
33	GASKET	1	NP440012-NTR	GL410004-003	GL410004-004	GL410004-006
34	LOCK SPRING	1	GL430002-000			
35	STROKE KNOB	1	GL260001-000			
36	STROKE	1	GL995003-STL			
37	STROKE CAP	1	GL250002-PEB			
38	GEAR	1	N/A(Customer			
39	RETAINING RING	1	GL995002-STL			
40	INNER ECC	1	GL400005-000			
40A	OUTER ECC	1	GL400004-000			
40B	SPACER	2	GL470001-STL			
41	ECC SHAFT	1	GL070001- 001			
42	GEAR KEY	1	GL420001-STL	GL070001-003	GL070001-004	GL070001-006
42A	LARGE BEARING	1	GL400006-000			
43	TOLERANCE RING	1	NP470002-000			
44	INNER GASKET	1	NP440152-NTR			
45	OUTER GASKET	1	NP440155-NTR			
46	SIDE CAP	1	GL030001-ALU			
47	SIDE CAP BOLTS	4	NP990415-188			
48	COVER	1	NP530138-PVC			
49	PUMP TAG	1	GL550001-000			
50	TAG BOLTS	2	W771000-188			

Comments : Part number as below (DM1,DM2 Tubing Connection spare parts)

51	Tubing Connection (PP)	1	J30545(Valve Kits)	J00023(Discharge Tubing)	00008(Suction Tubing)
	Tubing Connection (PVD)	1	J30605 (Valve Kits)		

10. Leak Detection Parts Diagrams & Item Numbers



10-1 Leak Detection BOM List

Item Number	Description	QTY / PUMP	Part Number (DM1)	Part Number (DM2)	Part Number (DM3)	Part Number (DM4)	Part Number (DM5)	Part Number (DM6)
1	DIAPHRAGM ASSY	1	GL170013-074		GL170014-118		GL170015-145	
-	Leak Detection DIAPHRAGM ASSY (Item Number 2,4,5)	1	GL89CS00-SZ		GL89ES00-SZ		GL89FS00-SZ	
3	SPACER RING	1	GL180001-316		GL180002-316		GL180003-316	
-	SWITCH,LEAK DETECTION	1	NP530227-000					
-	GAUGE	1	NP560030-316					
-	1/4" NPT PIPE PLUG, 316 SS	1	NP990544-188					

10-2 Leak Detection Kit-Wet Hardware

KIT-WET	QTY / PUMP	Part Number (DM1&DM2)	Description
Component Part No.	/	GL93SCCKKS-XXXX	Kit-Wet Hardware-Plastic Pump Head
Material Bill List (Plastic Pump Head)	8	GL990009-188	M6-1.00X90 BOLT HEX HD
	8	NP991017-188	M 6 FLT NARR WSHR
	8	NP991217-188	M6-1.00 NUT(CLASS 9)300
Component Part No	/	GL93SCCBBS-XXXX	Kit-Wet Hardware-Metal Pump Head
Material Bill List (Metal Pump Head)	8	GL990002-188	M 6-1.00 X 35 HEXHD BOLT
	8	NP990541-188	M 6-1.00 X 80 BOLT HEXHD 933
	16	NP991017-188	M 6 FLT NARR WSHR
	8	NP991217-188	M6-1.00 NUT(CLASS 9)300

KIT-WET	QTY / PUMP	Part Number (DM3&DM4)	Description
Kits Part No	/	GL93SCEKKS-XXXX	Kit-Wet Hardware- Plastic Pump Head
Material Bill List (Plastic Pump Head)	10	GL990009-188	M6-1.00X90 BOLT HEX HD
	10	NP991017-188	M 6 FLT NARR WSHR
	10	NP991217-188	M6-1.00 NUT(CLASS 9)300
Kits Part No	/	GL93SCEBBS-XXXX	Kit-Wet Hardware-Metal Pump Head
Material Bill List (Metal Pump Head)	10	GL990009-188	M6-1.00X90 BOLT HEX HD
	8	GL990004-188	M 6-1.00X55 BOLT HEX
	18	NP991017-188	M 6 FLT NARR WSHR
	10	NP991217-188	M6-1.00 NUT(CLASS 9)300

KIT-WET	QTY / PUMP	Part Number (DM5&DM6)	Description
Kits Part No	/	GL93SCFKKS-XXXX	Kit-Wet Hardware-Plastic Pump Head
Material Bill List (Plastic Pump Head)	12	GL990009-188	M6-1.00X90 BOLT HEX HD
	12	NP991017-188	M 6 FLT NARR WSHR
Kits Part No		GL93SCFBBS-XXXX	Kit-Wet Hardware Metal Pump Head
Material Bill List (Metal Pump Head)	12	GL990009-188	M6-1.00X90 BOLT HEX HD
	8	GL990006-188	M 6-1.00 X 75 BOLT HEXHD
	20	NP991017-188	M 6 FLT NARR WSHR

Policies and Procedures

1. Manufacturer's Equipment Warranty

- a. Pulsafeeder warrants all pumps and controllers of its manufacture to be free of defects in material or workmanship. Liability under this policy extends for 24 months from date of shipment from the factory. The manufacturer's liability is limited to repair or replacement of any failed equipment or part which is proven defective in material or workmanship upon manufacturer's examination. This warranty does not include removal or installation costs and in no event shall the manufacturer's liability exceed the selling price of such equipment or part.
- b. The manufacturer disclaims all liability for damage to its products through improper installation, maintenance, use or attempts to operate such products beyond their functional capacity, intentionally or otherwise, or any other unauthorized repair. The manufacturer is not responsible for consequential or other damages, injuries or expense incurred through the use of its products.
- c. The above warranty is in lieu of any other warranty, whether expressed or implied. The manufacturer makes no warranty of fitness or merchantability. No agent of ours is authorized to provide any warranty other than the above.

2. Pulsafeeder's Parts and Accessory Warranty

- a. Pulsafeeder, Inc. warrants parts and accessories provided to be free of defects in material or workmanship. Unless otherwise noted below, liability under this policy extends for 90 days from date of shipment from the factory when sold as service parts. (Replaceable elastomeric parts are expendable and are not covered by any warranty either expressed or implied.)
- b. The manufacturer's liability is limited to repair or replacement of any failed equipment or part which is proven defective in material or workmanship upon manufacturer's examination. This warranty does not include removal or installation costs and in no event shall the manufacturer's liability exceed the selling price of such equipment or part.
- c. The manufacturer disclaims all liability for damages to its products through improper installation, maintenance, use or attempts to operate such products beyond their functional capacity, intentionally or otherwise, or any unauthorized repair. The manufacturer is not responsible for consequential or other damages, injuries or expense incurred through the use of its products.
- d. The above warranty is in lieu of any other warranty, whether expressed or implied. The manufacturer makes no warranty of fitness or merchantability. No agent of ours is authorized to provide any warranty other than the above.

3. Process for All Returned Goods

- a. Please contact our Customer Service Department to request a RMA (Return Material Authorization) number prior to returning any goods. The following information will be required:
 - Billing and ship-to address
 - Model number and serial number Contact name and phone number Reason for return
 - Purchase order (where applicable)
 - A packing slip will be provided to the shipper and MUST accompany the product being returned. Packages received without our proper packing list will be refused by the receiver.
- b. All material must be returned freight prepaid.
- c. All material must be properly packaged to prevent damage in shipment.
- d. All products MUST be wiped and flushed clean of any and all chemicals, solvents or buffers and be warranted to be safe for handling. You will be requested to acknowledge the condition of the product being returned on our packing list. Any product received that is deemed to be unsafe for handling or without this acknowledgement will be refused by our receiver.
- e. RMA for returning product for credit is effective for 90 days from the date of issue. After 90 days if the product has not been returned to Pulsafeeder the RMA number will be cancelled, and a new request must be made by the customer to continue with the return procedure.

4. Non-Warranty Return Procedure

- a. If you are experiencing a concern with your Pulsafeeder product, first consult the distributor, dealer or Regional Sales Manager or the operation and maintenance manual for assistance. If service of your non-warranty unit is necessary, you must request a return material authorization. A RMA form will be issued and must be used as the packing list attached to the outside of the box. Please send the unit freight prepaid with the RMA number visibly displayed on the outside of the carton. All products MUST be wiped and flushed clean of any and all chemicals, solvents or buffers and be warranted to be safe for handling. You will be re-quested to acknowledge the condition of the product being returned on our packing list. Any product received that is deemed to be unsafe for handling or without this acknowledgement will be refused by our receiver.
- b. The charges listed in the following table will apply.

Product	Repair Cost
Pumps and Pump Accessories – within 5 years of sale date	Current List Price x .50 x Part Discount Multiplier
Controllers and Controller Accessories within 5 years of sale date	Current List Price x .50 x Part Discount Multiplier
Any item older than 5 years from date of sale	With purchase order, \$50 bench fee to evaluate. The \$50 bench fee may be applied towards repair cost of unit or towards a new controller

5. Credit for Return of New, Unused Equipment

- a. No equipment will be accepted beyond six months after date of shipment from factory for credit.
- b. Only new, unused and undamaged standard equipment will be accepted for return to stock.
- c. All credits are based on evaluation and acceptance of material as new and unused by Pulsafeeder. You will be requested to acknowledge the condition of the product being returned on our packing list. Any product received that is deemed to be unsafe for handling or without this acknowledgement will be refused by our receiver.
- d. A restocking fee of 25% will apply to returned goods. When a PO is provided for a replacement item at the time of the return request the restocking fee will be 15%. Note: any product mounted on a panel or skid will be charged a 50% re-stocking fee.
- e. A request for a Returned Material Authorization (RMA) number must be made prior to returning product to Pulsafeeder.
- f. All equipment shall be returned with the RMA Packing List form attached to the outside of the box.
- g. If any chemical, solvent or buffer has been introduced into the product it must be wiped and flushed clean of any and all substances prior to returning to Pulsafeeder.
- h. All material shall be returned freight prepaid.
- i. Private label products or Engineered Panel Mount Systems are not returnable.

6. Pricing Errors

- a. Pulsafeeder does their very best to avoid errors in billing. You will receive a confirmation of your order within 24 hours of order entry. If upon review the customer feels there is a discrepancy, they should contact Pulsafeeder Customer Service as soon as possible to resolve.
- b. Should an invoice be received that the customer believes to have incorrect pricing, they should notify Pulsafeeder Customer Service to investigate.

7. Missing Items

- a. If a product is received by the customer with an item missing the customer must notify Pulsafeeder Customer Service within 7 days of receipt of the product by the end user. A replacement item will be sent at no charge as quickly as possible.
- b. If a shipment is received by the customer with a line item missing they must notify Pulsafeeder Customer Service within 7 days of receipt of the product by the end user. If the customer had been billed for that item, a credit will be issued against the original Sales Order and a new Sales Order will be created for the replacement product.
- c.

8. Damaged Items

- a. Should the customer receive an order that was damaged in transit, the customer must notify the carrier directly to initiate a claim on the day of delivery.
- b. Should the customer receive a product with damaged components due to improper packaging they should notify Pulsafeeder Customer Service within 7 days of receipt of product by end user. A replacement item will be sent at no charge as quickly as possible.
- c.

9. Technical Support Services Available

- a. Pulsafeeder's Technical Sales Support team is available to provide all your sales and support needs. The principle mission of this group is to sell and support our customer base in a timely and effective manner. This includes the ability to provide in-field service training, assistance in start-up of our products and perform field repair of goods when required.
- b. Scope
Pulsafeeder, Inc. factory Field Service Technicians are available throughout the World for field services on all Pulsafeeder products. Services include:
 - i. Maintenance Training Seminars, including Classroom slide presentations and or Hands-on Training. The seminar will take approximately four to five hours, and if time permits minor repair and or adjustments may be made to the customer's pumps, controllers or accessories.
 - ii. Pre-start up inspections and start up testing/calibration of pumps, controllers and accessories.
 - iii. Field repairs of pumps controllers and accessories
 - iv. Diagnosing and recommending solutions to systems problems.
 - v. Field Service Rates are available upon request.

Introduction of QR code

Thanks for purchasing Pulsafeeder metering pump, you can scan the QR code on the name plate to check the security information, KOPkits information, Manual and connection information.

Using description is below:

- 1, Scan the QR code on the name plate
- 2, Complete register by clicking on the confirming button
- 3, Check security information by clicking on the security searching button
- 4, Check KOPkits information by clicking on the KOPkits button
- 5, Check related information by clicking on manual button
- 6, Check connection information by clicking on connecting us button



Collecting tips:

Use Wechat to scan QR code to open the Web, click on the collecting button on top right, then you can find the information quickly through collecting function.



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