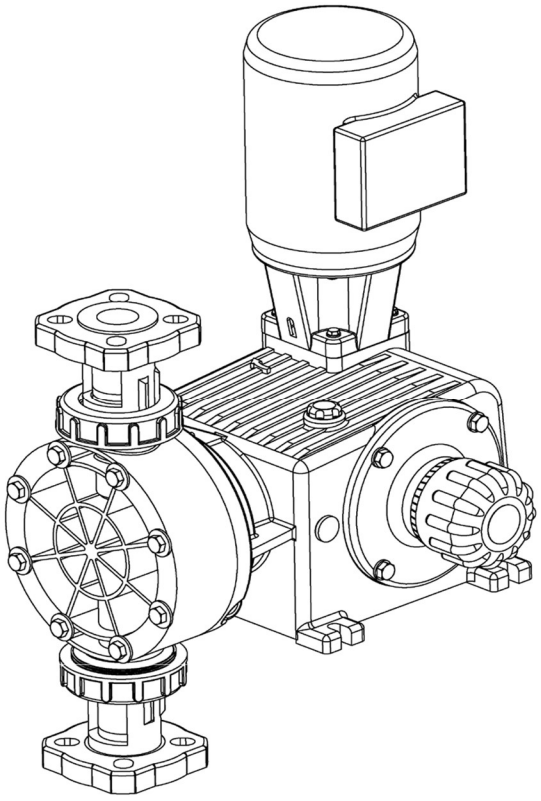
GreenLine - GLM

MECHANICAL DIAPHRAGM METERING PUMP

2 YEAR LIMITED WARRANTY

Installation Operation Maintenance Instruction



Bulletin #: IOM-GLM-DM7-US-009

Models: DM7

PULSAFEEDER®

A Unit of IDEX Corporation
Manufacturers of Quality Pumps, Controls and Systems.

https://pulsafeeder.com/

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Pulsafeeder Factory Service Policy

Should you experience a problem with your Pulsafeeder pump, first consult the troubleshooting guide in your operation and maintenance manual. If the problem is not covered or cannot be solved, please contact your local Pulsafeeder Sales Representative or Distributor, or our Technical Services Department for further assistance.

Trained technicians are available to diagnose your problem and arrange a solution. Solutions may include purchase of replacement parts or returning the unit to the factory for inspection and repair. All returns require a Return Authorization number to be issued by Pulsafeeder. Parts purchased to correct a warranty issue may be credited after an examination of original parts by Pulsafeeder. Warranty parts returned as defective which test good will be sent back freight collect. No credit will be issued on any replacement electronic parts.

Any modifications or out-of-warranty repairs will be subject to bench fees and costs associated with replacement parts.

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.

Table of Contents

1. Introduction

The GreenLine - GLM DM7 metering pump is positive displacement, mechanically operated reciprocating diaphragm pump. Each pump consists of a power end and a process end separated by a Teflon faced diaphragm. Individual pumps will vary in appearance due to various liquid ends and accessories; however, the basic principles of operation remain the same.

2. Principles of Operation

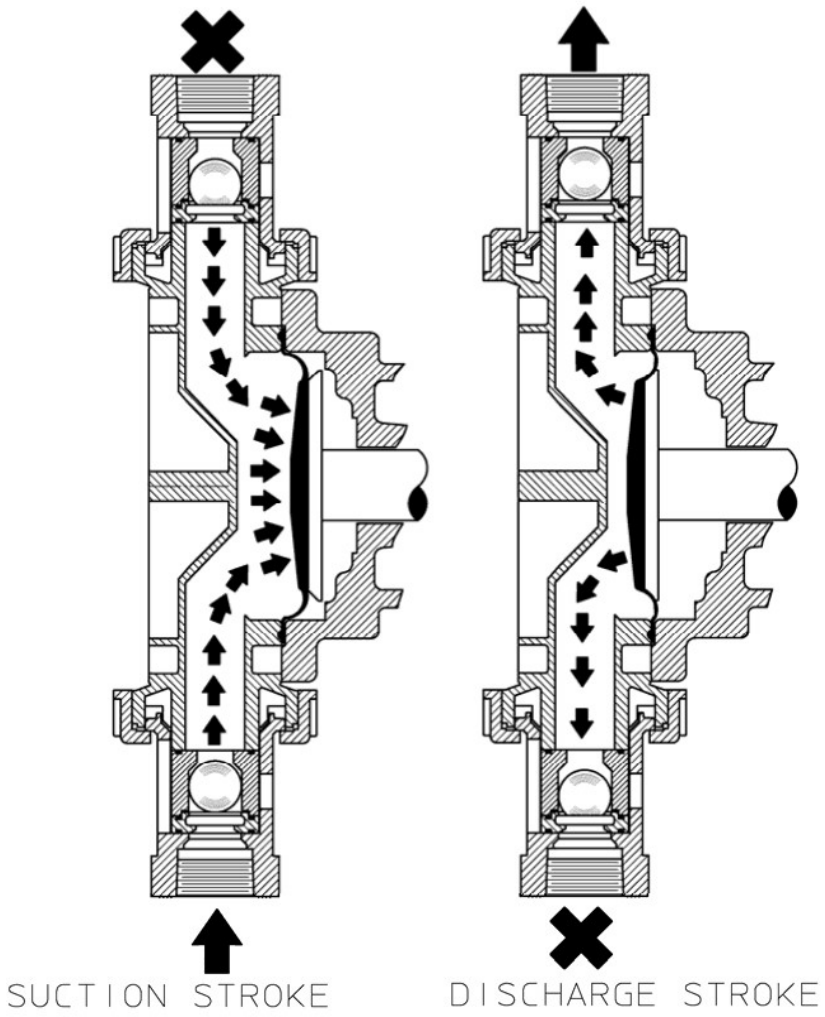


Figure 1, reagent head operation

A diaphragm reciprocates at a preset stroke length, displacing an exact volume of process fluid. Diaphragm retraction causes the product to enter through the suction check valve. Diaphragm advance causes the discharge of an equal amount of the product through the discharge check valve.

2.1 Reagent Head Assembly

The typical reagent head assembly consists of reagent head, diaphragm, and suction and discharge cartridge check valves. This assembly is the only part of the pump to contact the process liquid; consequently, maintenance is critical to pump performance.

2.2 Control Assembly

The GreenLine - GLM DM7 pump incorporates a full motion style of stroke length adjustment. The stroke length setting is indicated by a (0% – 100%) scale located on the stroke adjustment assembly.

Stroke length is changed by loosening the locking screw and turning the hand knob. This turns a mechanism, which changes the amplitude of the stroke length. As the stroke adjustment knob is turned towards 100%, it displaces the cam eccentrically to the rotating drive shaft. This in turn causes the pushrod and diaphragm to travel over a longer distance. Refer to ***Section 6.2*** for further information.

2.3 Gear Ratio Assembly

GreenLine - GLM DM7 pumps are driven by an electric motor mounted on the motor adaptor input flange. The motor drives a set of worm gears that convert rotational speed into torque. They, in turn, power the eccentric shaft assembly that converts rotary motion into reciprocating motion. The gear assembly and eccentric shaft run submerged in a lubricating oil bath.

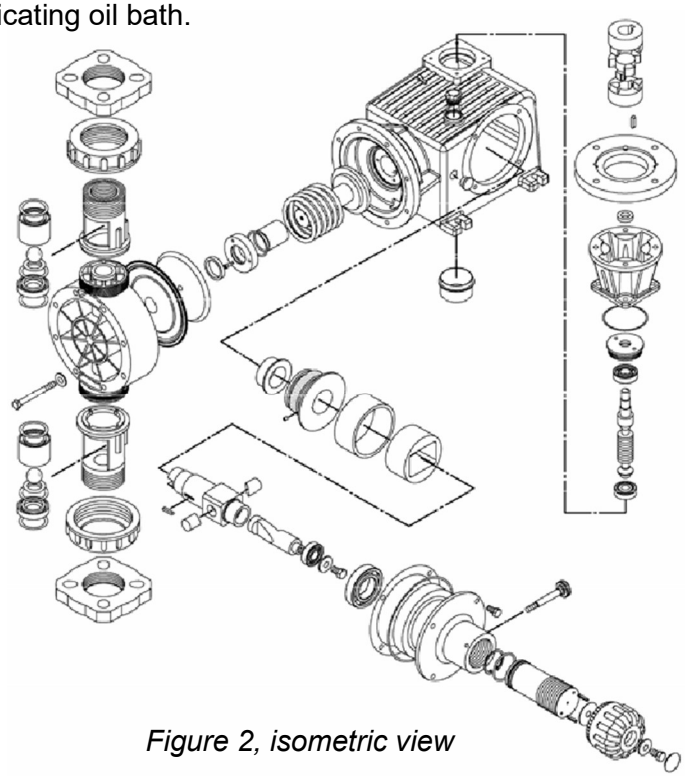


Figure 2, isometric view

3. 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 GreenLine - GLM DM7 pumps.

4. Storage

4.1.1 Short Term

Storage of your GreenLine - GLM DM7 pump for up to 12 months is considered short-term. The recommended short-term storage procedures are:

a. Store the pump indoors at room temperature in a dry environment.
b. The lubricating oil should be added to the gearbox prior to storage
c. If required by the operating environment, take precautions to prevent entry of water or humid air into the eccentric enclosure.
d. Prior to startup, perform a complete inspection and then start up in accordance with instructions in this manual.

4.1.2 Long Term

Every twelve months, in addition to the above short-term procedures, power up the motor and operate the pump for a minimum of one hour. It is not necessary to have liquid in the reagent head during this operation, but the suction and discharge ports must be open to atmosphere.

After twelve months of storage, Pulsafeeder's warranty cannot cover items that are subject to deterioration with age, such as seals, gaskets, and diaphragms. If the pump has been in storage longer than 12 months it is recommended that these items be inspected and replaced as necessary prior to startup. Lubricating oil should also be changed prior to startup. Materials and labor to replace this class of item under this circumstance are the purchaser's responsibility. Consult your local Pulsafeeder representative for assistance in obtaining parts and service for your pump.

5. Installation

5.1 Location

When selecting an installation site or designing a chemical feed system, consideration should be given to access for routine maintenance.

GreenLine - GLM DM7 pumps are designed to operate indoors and outdoors, but it is desirable to provide a hood or covering for outdoor service. External heating is required if ambient temperatures below 32° F (0° C) are anticipated, especially if pumps are not in continuous duty. Check with the factory if concerned with the suitability of the operating environment.

The pump must be rigidly bolted to a solid and flat foundation to minimize vibration, which can loosen connections. When the pump is bolted down, care must be taken to avoid distorting the base and affecting alignments. The pump must be level within 5°. This will assure that the check valves can operate properly.

5.2 Piping System

1. All systems should include a pressure relief valve on the discharge side, to protect piping and process equipment, including the pump, from excess process pressures. An external relief valve is required! There should be no devices capable of restricting flow (such as a valve) located between the pump and the relief device.

2. Shutoff valves and unions (or flanges) on suction and discharge piping are recommended. This permits check valve inspection without draining long runs of piping, making periodic maintenance and inspection easier.

3. Shutoff valves should be of the same size as connecting pipe. Ball valves are preferred since they offer minimum flow restriction.

4. Suction systems should include an inlet strainer, if appropriate for the product being pumped. Pump check valves are susceptible to dirt and other solid contaminants, and any accumulation can cause malfunction. The strainer should be located between the suction shutoff valve and the pump suction valve. It must be sized to accommodate the flow rate and the anticipated level of contamination. A 100 mesh screen size is generally recommended.

5. Vacuum/pressure gauges in the suction and discharge lines are helpful in order to check system operation. Gauges should be fitted with protective shutoff valves for isolation while not in use.

6. Piping weight must not be supported by valve housings or other portions of the reagent head, as the resulting stresses can cause leaks. If appropriate, provide for thermal expansion and contraction so that no excess force or moments are applied to the pump.

7. In piping assembly, use a sealing compound chemically compatible with the process material. Users of sealing tape are cautioned to ensure that the entering pipe thread ends are not taped, and that tape is removed from previously-used threads to the maximum practical extent prior to re-use. 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. Debris from the piping system that prevents proper check valve operation is a common startup issue.

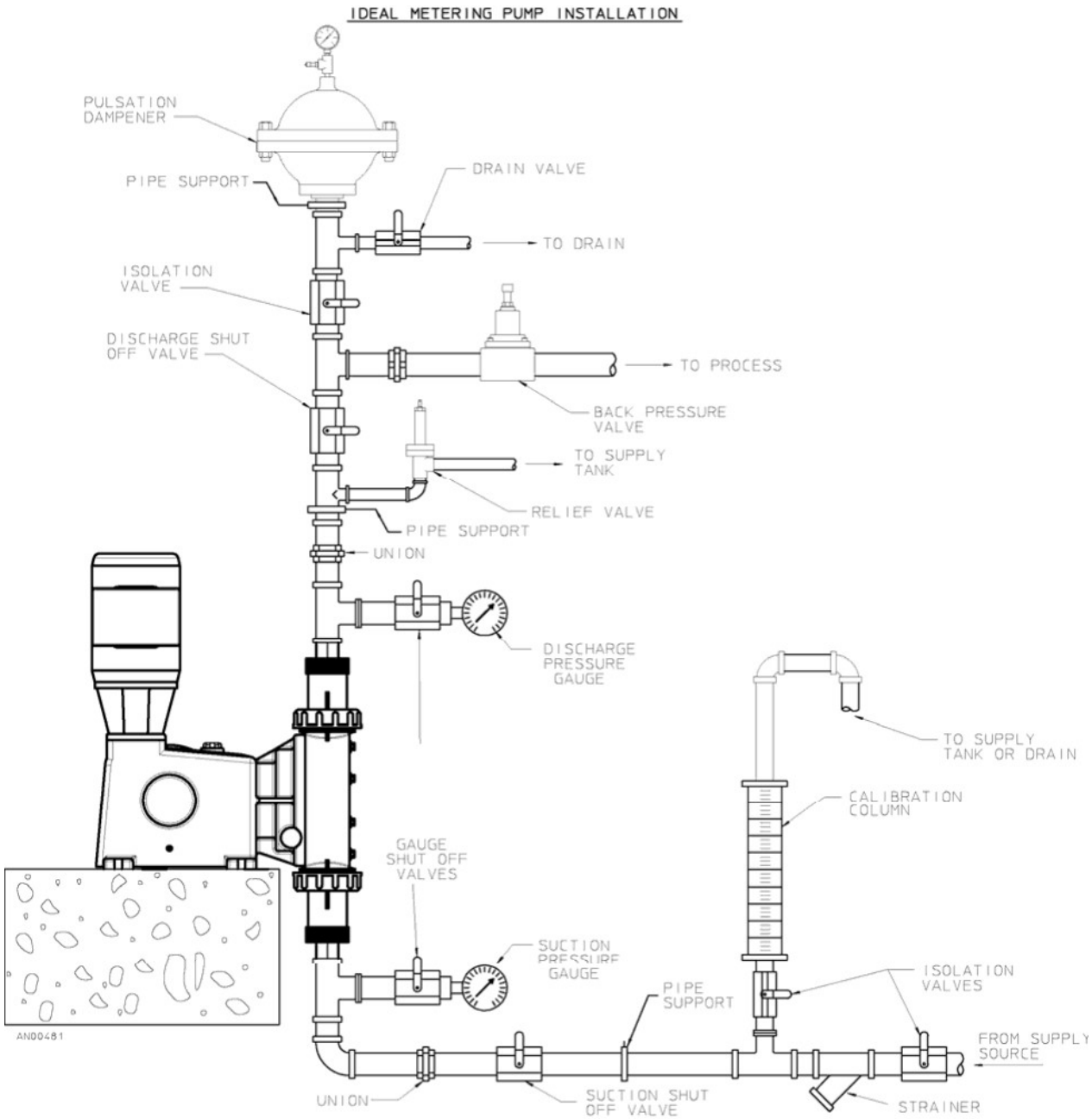
5.3 Suction Pressure Requirements

Although GreenLine - GLM DM7 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 5 psia or less (at operating temperature) the wet suction lift capability is approximately ten (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 under suction lift conditions may require some liquid priming before they will operate reliably.

For long suction lines, and also for pumps that have a high stroking rate, the largest possible suction line diameter should be used to provide best suction conditions. In some cases, the proper line size may exceed the suction connection size on the pump. Consult your local Pulsafeeder Representative for assistance and further information on proper suction system design.

5.4 Discharge Pressure Requirements

All GreenLine - GLM DM7 metering pumps are designed for continuous service at the rated discharge pressure. If system suction pressure exceeds discharge pressure (a condition sometimes described as “pumping downhill”), flow would be generated (siphoning) in addition to that caused 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 suction pressure by at least 5 Psi (0.35 Bar). 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 pump’s rating are to be avoided as they will cause damage to the pump



components.

Figure 3, sample system configuration

6. Equipment Startup

6.1 Fastener Inspection

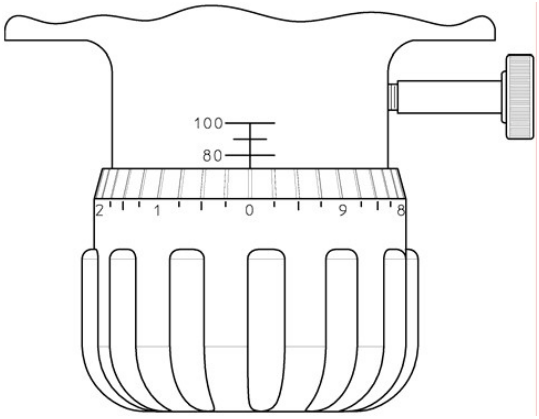
All pump fasteners should be checked prior to pump operation, and occasionally during use. This would include reagent head mounting bolts, motor mounting bolts, and the hardware that secures the pump to its foundation. Most hardware can be checked simply to ensure it is not loose. However, utilize the following values when checking reagent head bolt torque:

Model	Material	Reagent Head Bolt Torque		
		# Bolts and size	N-m	In. - Lbs
DM7	Plastic	(8) M10 * 1.5	8.5	75
	Metal	(8) M10 * 1.5	8.5	75

6.2 Output Adjustment

All GreenLine - GLM DM7 pumps have a hand wheel for manual stroke adjustment. The hand wheel can be adjusted to any point from 0 to 100%. This value represents the stroke length setting and therefore the flow rate of the pump relative to its maximum output.

1. Turn the red lock screw counterclockwise to release the stroke lock. **Making adjustments without releasing the lock may damage the mechanism.**



Notes:
Quickly tighten the stroke lock when complete the regulating actions.

Figure 4, stroke adjustment knob and scale

2. Adjust the hand wheel to the desired output.
   a. The stroke barrel indicates stroke length in 20% increments.
   b. The hand wheel indicates stroke length in 0.25% increments.

   For example, to set the pump to 75% stroke length, (starting from the factory default setting of 0%) turn the hand wheel clockwise until the 60% indicator on the stroke barrel is aligned with the edge of the knob at the “0” position on the knob scale.

   Continue the clockwise rotation until the hand wheel indicator passes zero again (this is 70%) and comes to 5, this is 75%. Refer to *Figure 4.*

3. Turn the lock screw clockwise to lock the stroke adjustment into position.

   Adjustments can be made while the pump is at rest or operating, although adjustments are easier to make while the pump is in operation.

6.3 Oil Fill and Maintenance

6.3.1 Oil Capacities

It is recommended that adequate supplies of GreenLine - GLM gear oil be on hand for periodic changes and emergency requirements. The approximate amounts of oil required to fill the GreenLine - GLM DM7 pump to specified levels are:

Pump Capacity	Gearbox, Model DM7
PULSALUBE 9M	2,500 ml (2.6 Qt)

Pulsafeeder Part No.	Description	Container Size
9M-1GL	PULSALUBE PREMIUM 9M	1 Gallon
9M-1QT	PULSALUBE PREMIUM 9M	1 Quart

6.3.2 Gearbox Oil Fill

Fill the gearbox with oil by removing the threaded oil fill cap on the top of the pump. Fill with the proper oil (Pulsalube 9M) to the upper edge of the sight glass on the side of the pump. Replace the cover or controller. Replace the oil fill cap. See *figure 5.* Note that during operation, the oil should be visible at the middle of the sight glass.

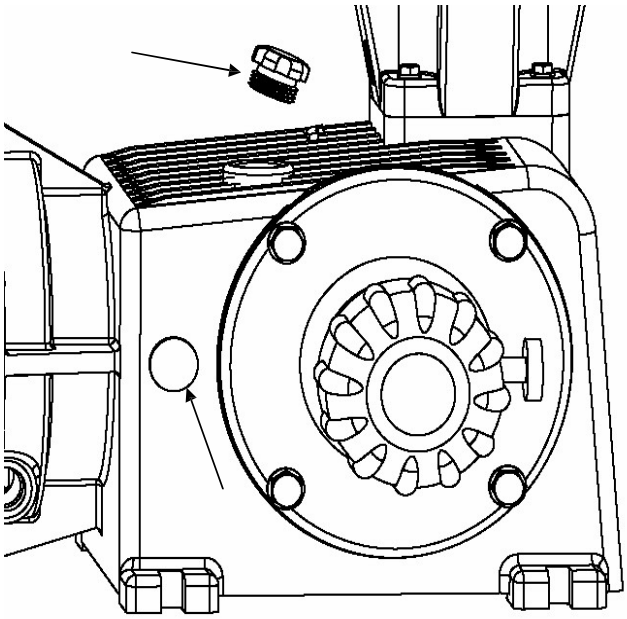


Figure 5, oil filler cap and sight glass

6.3.3 Oil Changes

The recommended oil change intervals are dependent upon the operating environment and level of pump usage, classified as follows:

Normal service: Clean/dry atmosphere, an ambient operating temperature of 32^0 F to 104^0 F (0^0 C to 40^0 C) and up to 2,000 annual operating hours.

Severe Service: Humid atmosphere, an ambient operating temperature below 32^0 F to 104^0 F (0^0 C to 40^0 C) and over 2,000 annual operating hours.

The recommended eccentric oil change interval is two (2) years for normal service and one (1) year for severe service. The procedure is as follows:

1. Disconnect the power source to the drive motor
2. Relieve all pressure from the piping system.
3. Remove the fill plug from the top of the pump gearbox.
4. Drain the oil by removing the drain plug on the bottom of the gearbox, opposite the stroke adjustment knob.
5. Replace the drain plug.
6. Fill the eccentric box with GreenLine - GLM gear oil as described under ***Gearbox Oil Fill***.
7. Replace the fill plug and double check that the drain plug is secure.

6.4 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, 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 zero 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, replace the suction valve, then remove the discharge valve assembly and fill the reagent head as described in Step (3) above. The pump will now self-prime when started up per step (4) 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.

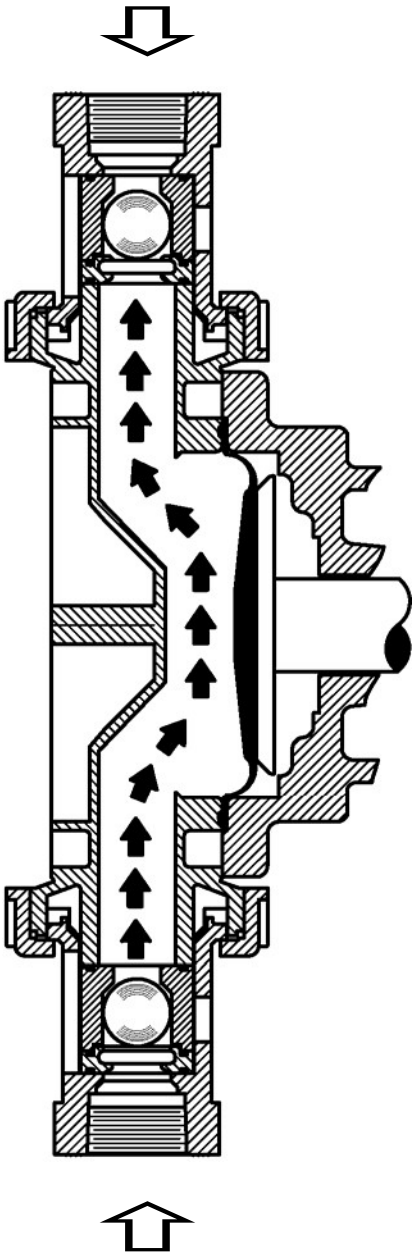


Figure 6, process flow

6.5 Calibration

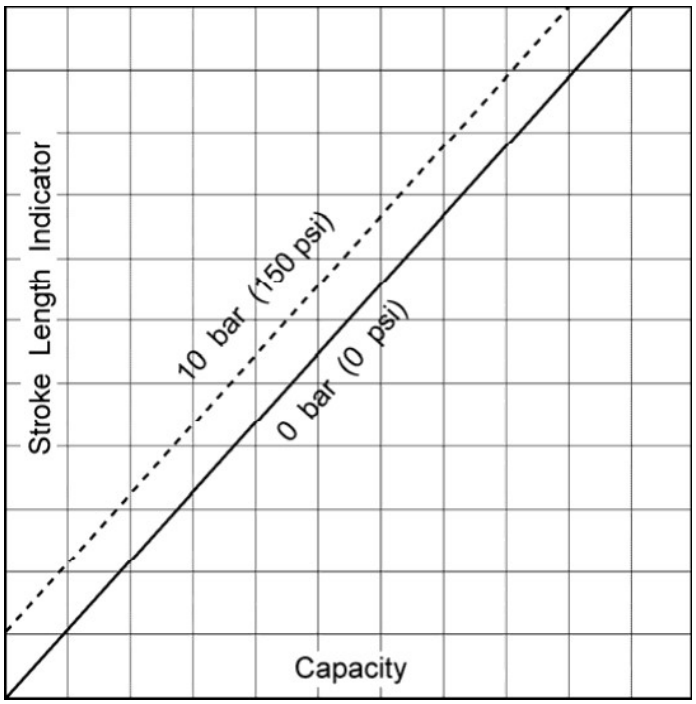


Figure 7, sample flow calibration curve

All metering pumps must be calibrated to accurately specify stroke length settings for required flow rates.

A typical calibration chart is shown above. Although output is linear with respect to 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 (i.e., 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.

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

7. Maintenance

WARNING

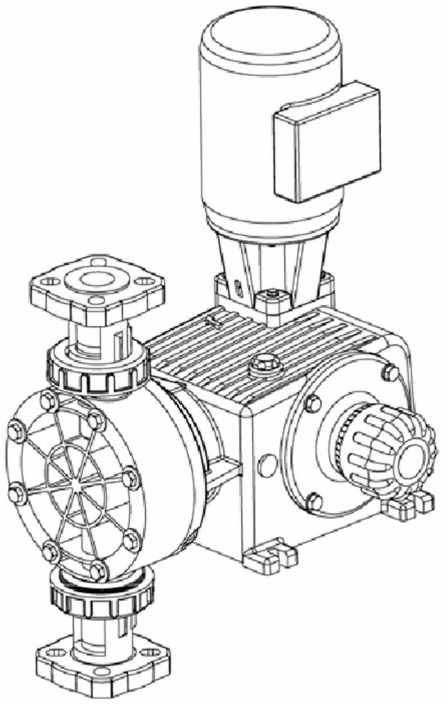
BEFORE PERFORMING ANY MAINTENANCE REQUIRING REAGENT HEAD OR VALVE (WET END) DISASSEMBLY, BE SURE TO RELIEVE PRESSURE FROM THE PIPING SYSTEM AND, WHERE HAZARDOUS PROCESS MATERIALS ARE INVOLVED, RENDER THE PUMP SAFE TO PERSONNEL AND THE ENVIRONMENT BY CLEANING AND CHEMICALLY NEUTRALIZING AS APPROPRIATE. 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 GreenLine - GLM KOPkit will contain all replacement parts normally used in a preventative maintenance program. It is recommended that KOPkits and PULSALube EP Gear Oil be kept available at all times.

WARNING

IF THE DIAPHRAGM HAS FAILED, PROCESS FLUID MAY HAVE CONTAMINATED THE PUMP ECCENTRIC HOUSING (ALTHOUGH NORMALLY, ANY PROCESS FLUID BEHIND A FAILED DIAPHRAGM WOULD PASS THROUGH THE BOTTOM DRAIN HOLE). HANDLE WITH APPROPRIATE CARE.



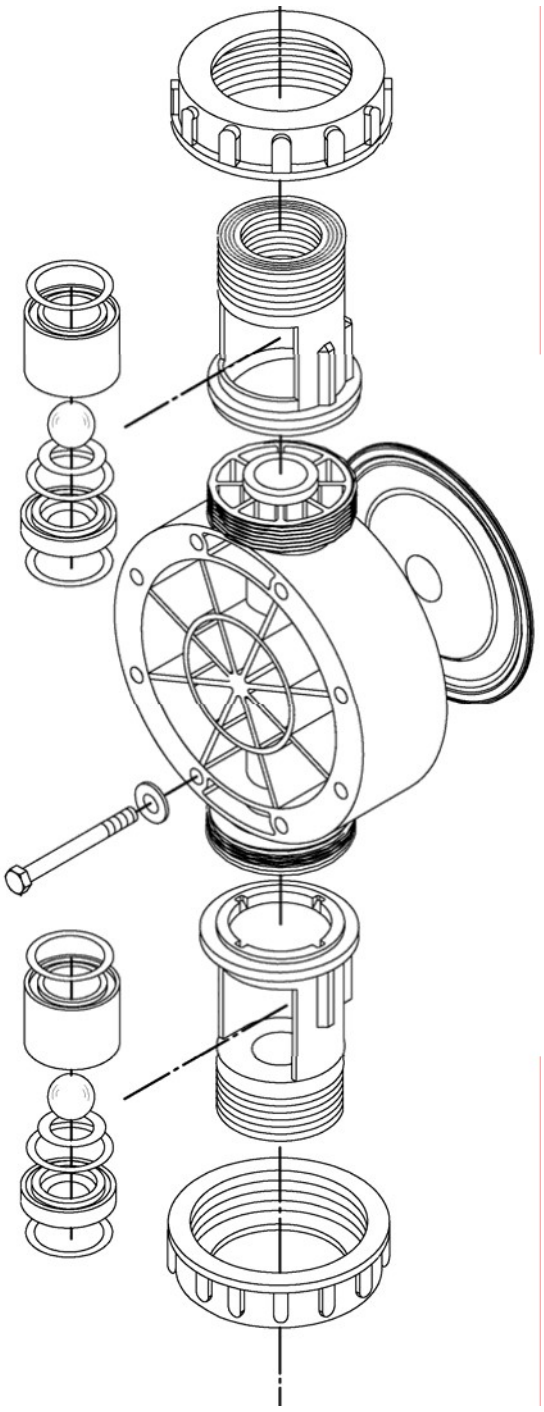


Figure 8, wet end components

GreenLine - GLM DM7 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.

7.1 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.

> Take all precautions described under the **WARNINGS** on page 14, ***Section 7*** to prevent environmental damage and exposure of personnel to hazardous materials.

3. Close the inlet and outlet shutoff valves.
4. Place a pan underneath the pump head adaptor to catch any liquid leakage.
5. Note the orientation of the existing check valve components. Loosen the union nuts holding the check valves and piping to the reagent head. Remove the check valve assemblies, drain and rinse them, and set them aside in a safe place. Unscrew the union nuts completely from the regent head.

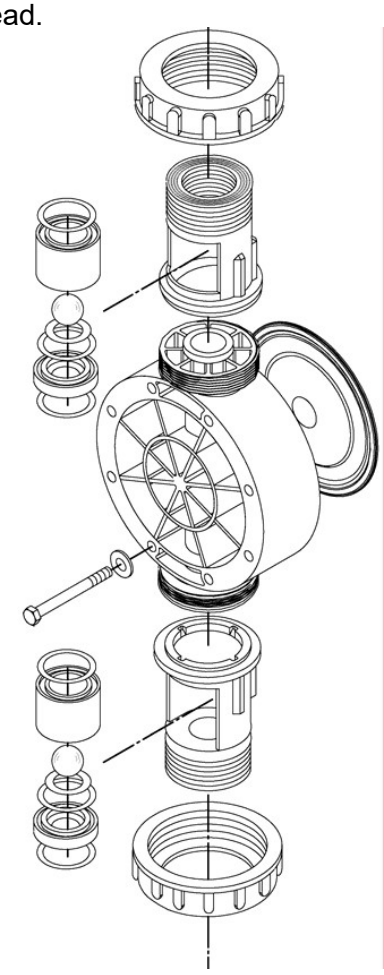


Figure 9, wet end components

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.
7. Remove the final bolt and rinse or clean the reagent head with an appropriate material.
8. Insert a screwdriver or similar tool through the oil fill hole and into the hole provided in the pushrod, this will keep the pushrod from turning as the diaphragm is removed. Note that depending on pushrod position, you may have to rotate the motor coupling or the diaphragm to access the hole.

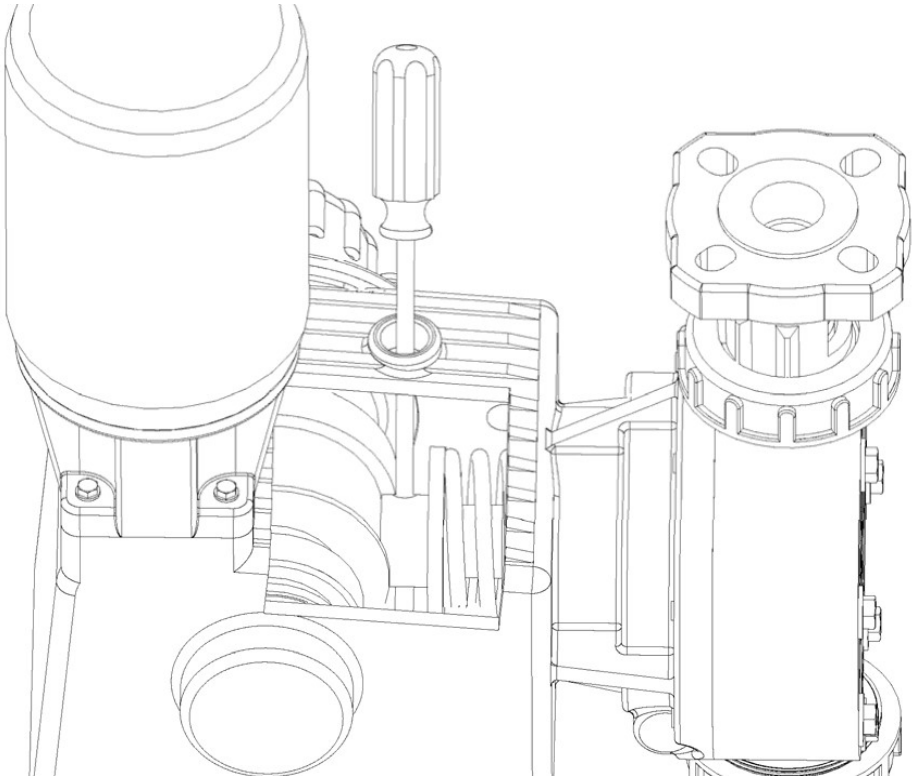


Figure 10, securing pushrod

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.
    b) Lubricate the elastomer side of the diaphragm liberally, where it is in contact against the pump head and deflection plate. Use a silicone grease or silicone-based o-ring lubricant.
    c) Coat the threads and the end of the pushrod with an anti-seize paste or lubricant.

12. Thread the diaphragm (clockwise) fully onto the shaft.

    When reinstalling a used diaphragm it is not necessary to maintain the previous orientation relative to the reagent head or pump head hole pattern.

13. Remove the screwdriver from the oil fill hole and replace the cap.

14. Install the reagent head bolts and tighten in an alternating pattern to ensure an even seating force. Torque to the values recommended in ***Section 6.1.***

15. Reassemble the piping connections and check valves to the reagent head, using care to orient all check valve parts properly (refer to *figures 9 and 12).*

16. Re-prime the pump following the procedure outlined in ***Section 6.3.***

7.2 Diaphragm Shaft Seal

While the diaphragm is removed, inspect the shaft seal located in the pump head. If there is evidence of damage or wear and/or oil leakage, the seal should be replaced.

1. Remove the three retainer screws and the seal retainer.
2. Pry the old seal out of the retainer.
3. Ensure the surfaces of the retainer are clean and clean of debris, scratches, or burrs.
4. Insert the new seal into the retainer by hand, do not use tools to prevent damage to the seal.
5. Inspect the piston shaft and remove any scratches, burrs, or surface corrosion or damage.
6. Lubricate the shaft with a small amount of pump oil.
7. Slide the seal and retainer back into position and secure with the three screws.

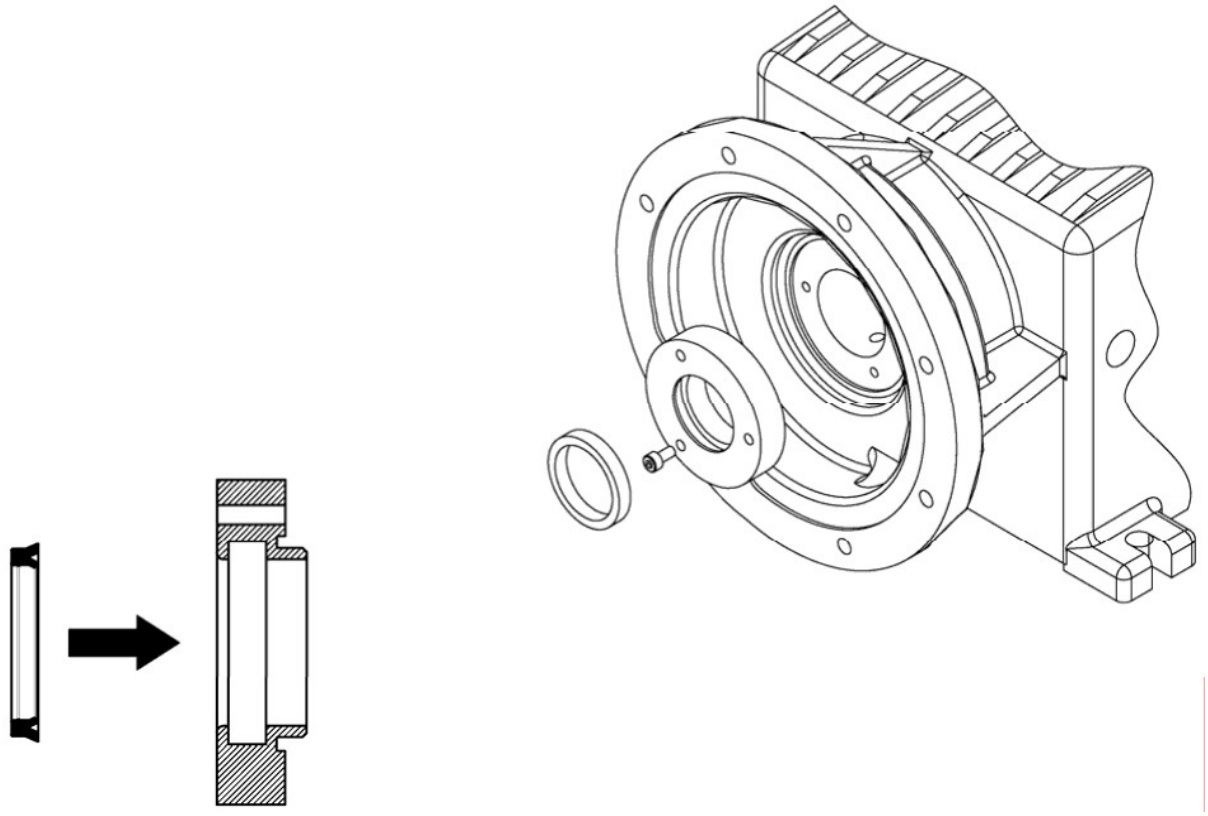


Figure 11, piston shaft seal replacement

7.3 Check Valves

Most fluid metering problems are related to check valves. Problems usually stem from solids accumulation between valve and seat, corrosion of seating surfaces, erosion, or physical damage due to wear or the presence of foreign objects.

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 sharp edge of the seat. 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.

GreenLine - GLM DM7 pumps utilize a multi-part check valve assembly, secured to the reagent head with a union nut clamping arrangement (plastic construction) or a tie-bar arrangement (metal construction).

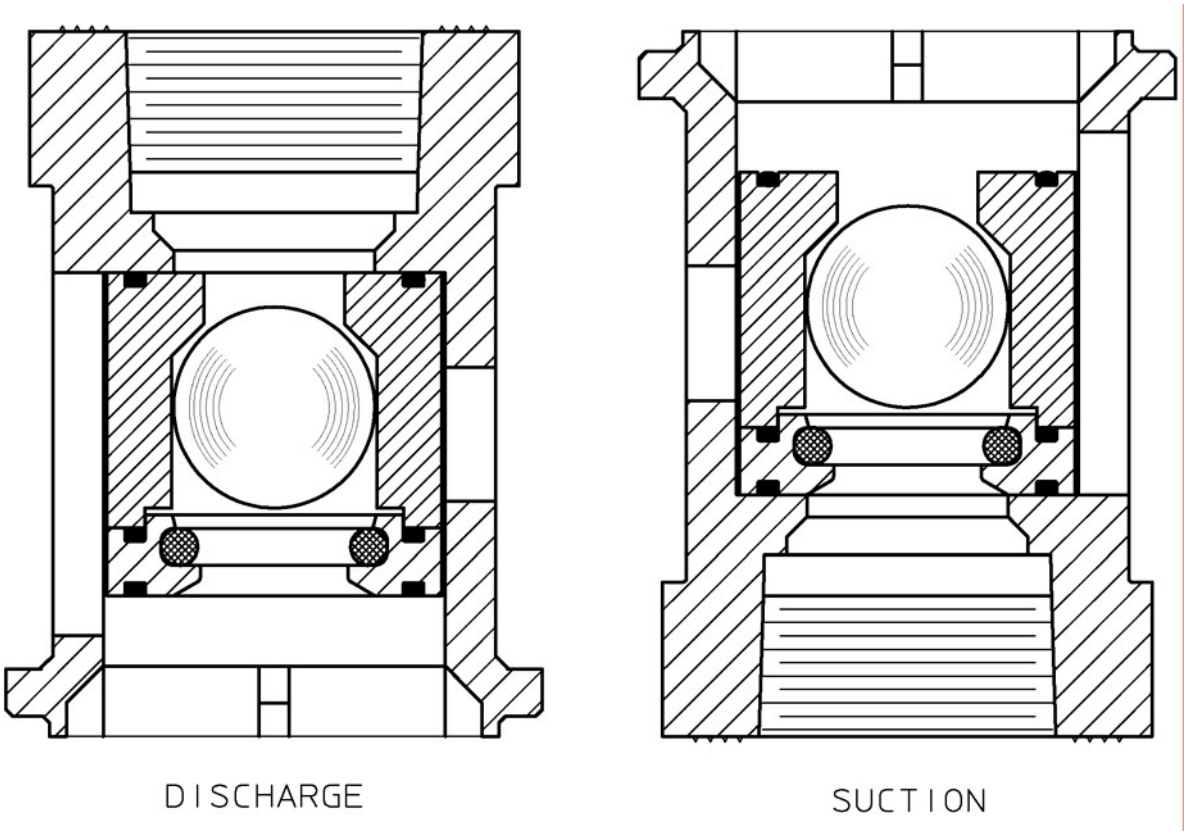


Figure 12, check valves DM7

7.4 Check Valve Removal & Reinstallation, Plastic Union-Nut type

1. Disconnect the power source to the drive motor.
2. Relieve all pressure from the piping system, and take all precautions necessary to prevent contamination to the environment and personnel exposure to hazardous materials.
3. Close the inlet and outlet shutoff valves.
4. Loosen the union nuts that hold the check valves in place. It is not necessary to completely remove the nut.
5. Push the check valve assembly out of the front by inserting your finger or a tool into the clearance hole at the back of the holder. Carefully note the position of the component parts, to assist in re- assembly. Be aware that product may leak out as the check valve parts are removed.
6. 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 o-ring seat facing up and the chamfered edge down.

NOTE **The check assemblies must be pushed into the holder until they stop against the back surface. Replace parts with new as required. Sealing o-rings should generally be replaced even if the check components are re-used.**

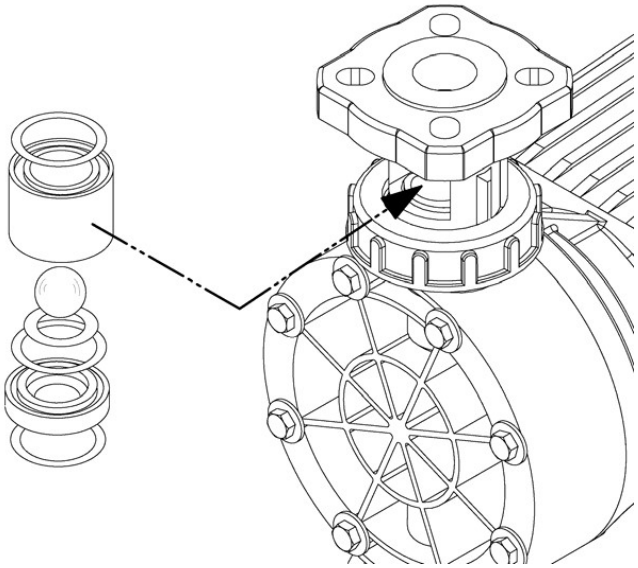


Figure 13, union-nut type check valve

NOTE **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. Each union nut should be tightened only until the o-ring seal makes good contact.**

7. Carefully make sure that the check assemblies are in proper position, and tighten the union nuts.
8. Retighten any unions, flanges, or other process connections that may have been loosened previously.

7.5 Check Valve Removal and Reinstallation, Metal Tie-Bar type

1. Disconnect the power source 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.
6. Remove the suction check valve assembly by sliding it towards you, holding it together as a unit. Carefully note 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.
8. Remove the discharge check valve assembly by sliding it towards you, holding it together as a unit. Carefully note 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.

NOTE **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 8 N-m (6 Ft-lbs).
13. Retighten any unions, flanges, or other process connections that may have been loosened previously.

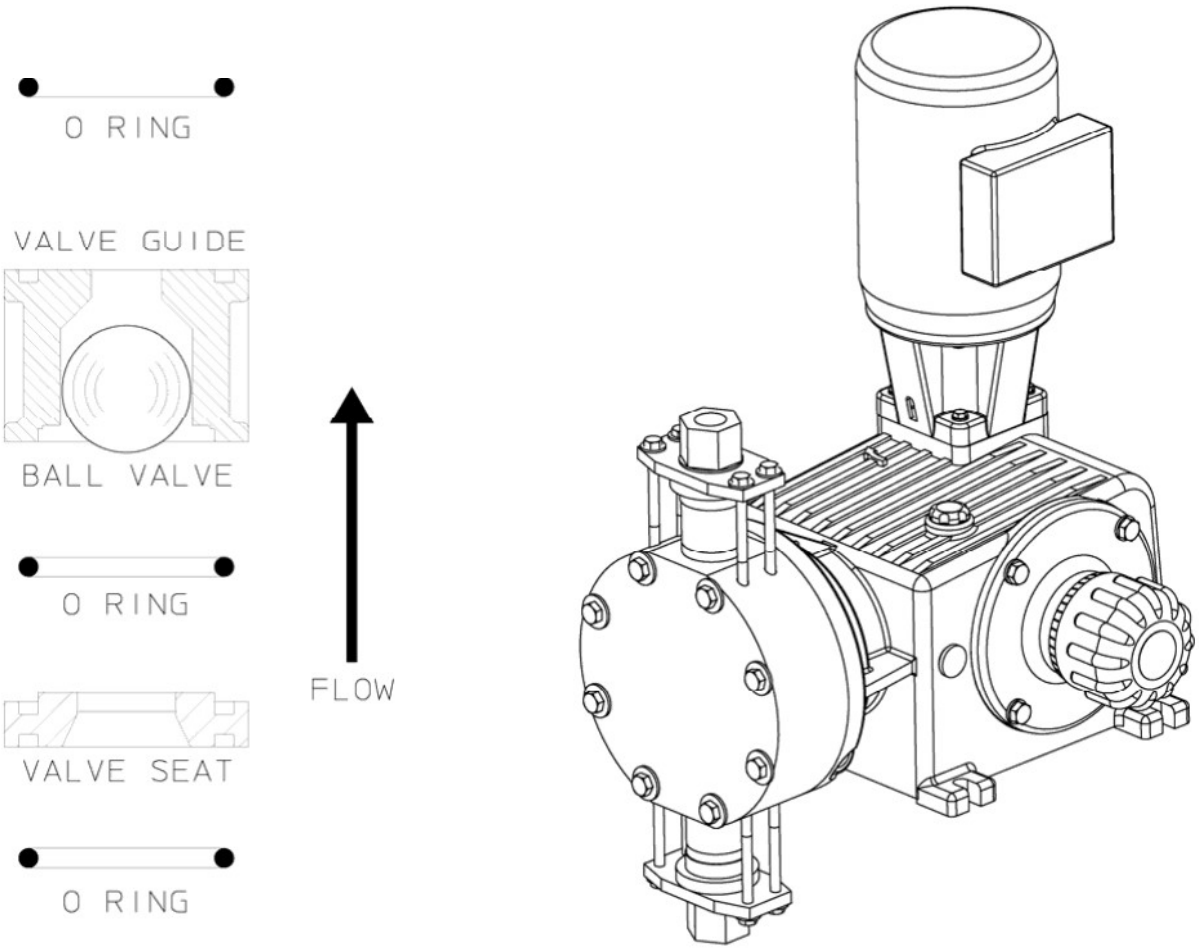


Figure 14, Check valves, metal construction

7.6 Motor Removal & Reinstallation

1. Disconnect the power source to the drive motor.
2. Disconnect the motor wiring from the motor.
3. Remove the four bolts retaining the motor to the motor adaptor. Lift the motor upwards away from the pump.
4. Apply an anti-seize paste or lubricant to all bolts, setscrews, and keys before reassembling..
5. Reinstall the motor in the reverse from removal.
6. Insert and tighten the four bolts removed in step 3.
7. Reconnect the motor wiring to the motor.
8. Connect power to the drive motor.

Motor rotation must be wired for CW rotation, as viewed from the top of the motor, as noted by the arrow on the top of the pump housing.

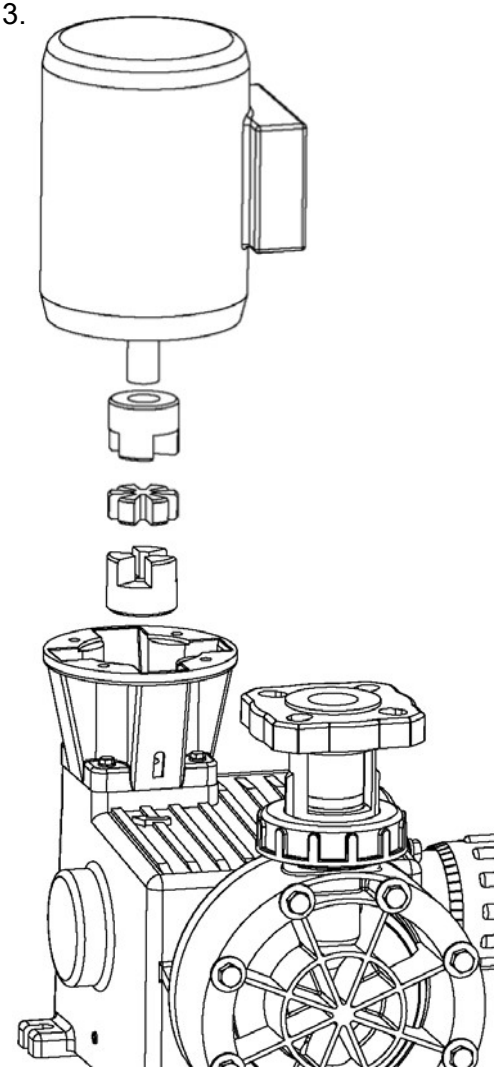


Figure 15, motor mounting

8. Replacement Parts

8.1 KOPkit Program

GreenLine - GLM DM7 KOPkits contain all replacement parts normally used in a preventative maintenance program. (*PULSAlube* oil is also available separately for preventative maintenance programs. Refer to ***Section 6 – Equipment Startup***). There is a specific KOPkit for every GreenLine - GLM pump model. Each KOPkit is vacuum-packed for extended storage. All GreenLine - 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 GreenLine - 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.

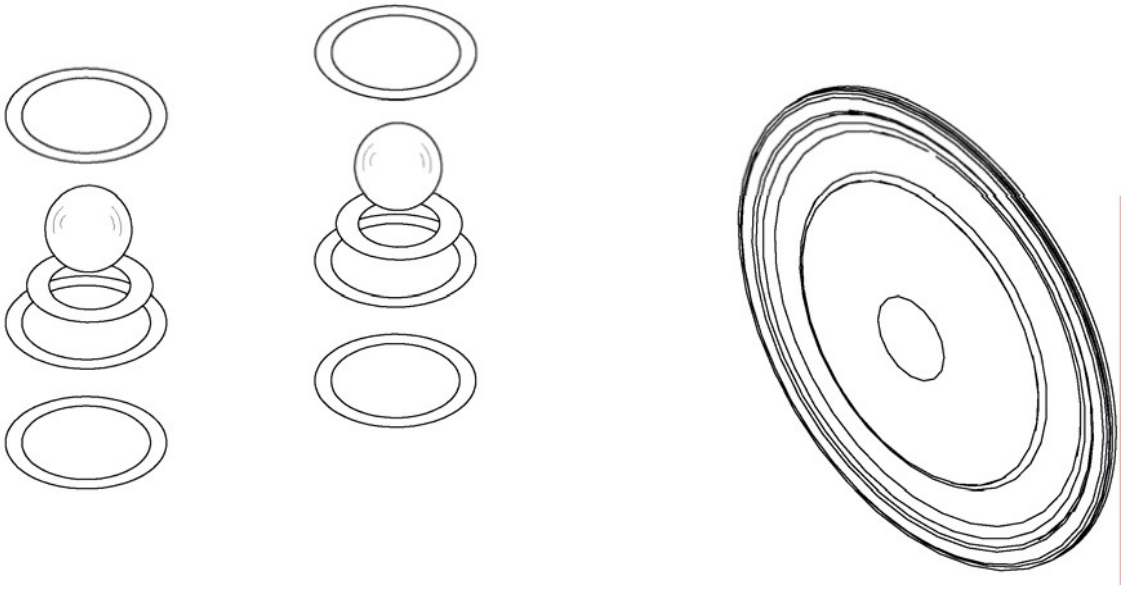


Figure 16, KOPkit parts

8.2 Ordering KOPkits or Parts

When ordering replacement parts always specify:

- Pump model and serial number (from pump nameplate), e.g., Model No. (DM7) with Serial No. F406365-3.
- Part number and description from the GreenLine - GLM parts list. Include the three-character suffix. (Note: GreenLine - GLM part numbers begin either with the letters **NP**, or the letter **W**, e.g., NP170001-THY or W210221-001.)

8.3 KOPkit numbers by model:

Pump Model	Wetted Material	Connection Type	KOPkit number
DM7	Polypropylene	NPT / ISO / FLG	KD7F
DM7	316	NPT	KD7A

NOTES:
(1) DM1 through 6 models are covered in a separate publication
(2) Polypropylene KOPkits are identical as only balls and insert o-rings are supplied

9. Model Number Identification

Position	Sample	Specifies	Options
1 – 4	DM	Size/Flow	**DM** GLM
5	Y	Motor Frame and Size	**1** TEFC, 115/230V, 60Hz, 1PH, NEMA 143/145TC Frame **3** TEFC 230/460V, 60Hz, 3PH, NEMA 143/145TC Frame **V** TEFC 230/460V, 60Hz, 3PH with VFD, NEMA 143/145TC Frame **9** NEMA 143/145TC Special Motor, or Motor with Controller **Y** Without Motor. with NEMA 143/145TC Frame Adapter
6	F	Wetted Materials	**A** 316L SS Liquid End - PTFE Diaphragm and PTFE O-rings – 316SS Ball Valves **F** PVDF/Viton - PVDF Liquid End - PTFE Diaphragm and Viton® O-rings - Ceramic Ball Valves
7	H	Connection	**H** 1.5” FNPT with 1.5” ANSI/DIN flange ring as standard

10. Troubleshooting

DIFFICULTY	PROBABLE CAUSE	REMEDY
Pump does not start	Faulty power source	Check power source
	Blown fuse, circuit breaker overload	Replace - eliminate
	Broken wire	Locate and repair
	Wired improperly	Check diagram
	Process piping blockage	Open valves, clear other obstructions
No delivery	Motor not running	Check power source. Check wiring diagram (see above)
	Supply tank empty	Fill tank
	Lines clogged	Clean and flush
	Closed line valves	Open valves
	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 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

DIFFICULTY	PROBABLE CAUSE	REMEDY
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
	Low oil level	Examine sight glass on side of pump, add or replace oil as required.
Piping noisy	Pipe size too small	Increase size of piping - install pulsation dampener
	Pip runs too long	Install pulsation dampener in line
	Pulsation dampener inoperative or flooded	Refill with air or insert gas. Inspect and replace diaphragm and recharge
	No surge chamber or dampener used	Install pulsation dampener
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
	Oil level low	Check and add as necessary

11. Piping Accessories

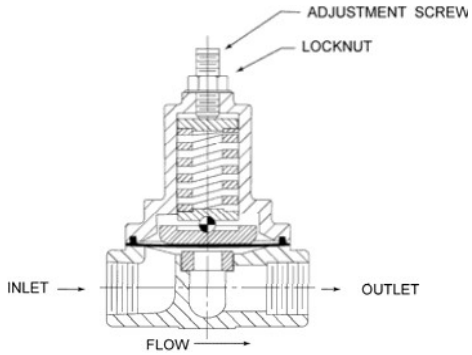
Pressure Relief Valves

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

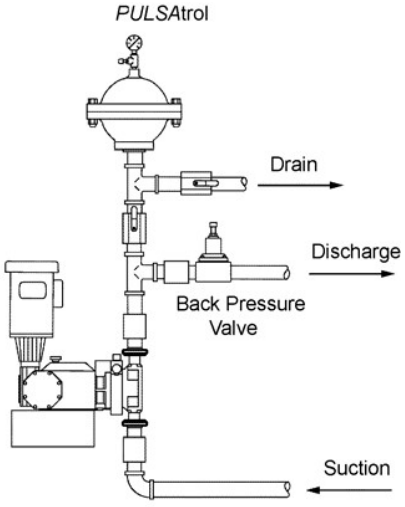
A diaphragm backpressure valve creates constant back pressure. A PTFE or PTFE-faced diaphragm offers good chemical protection and service life, and seals spring and bonnet from product.

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



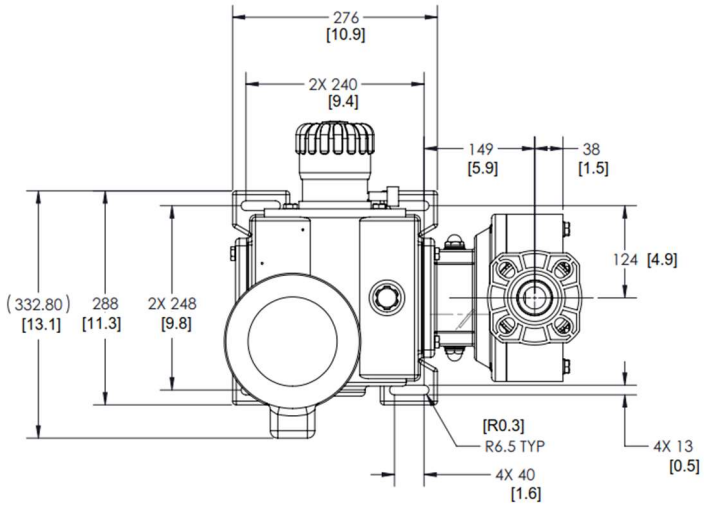
Pulsation Dampener

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 and pulsating flow variations.



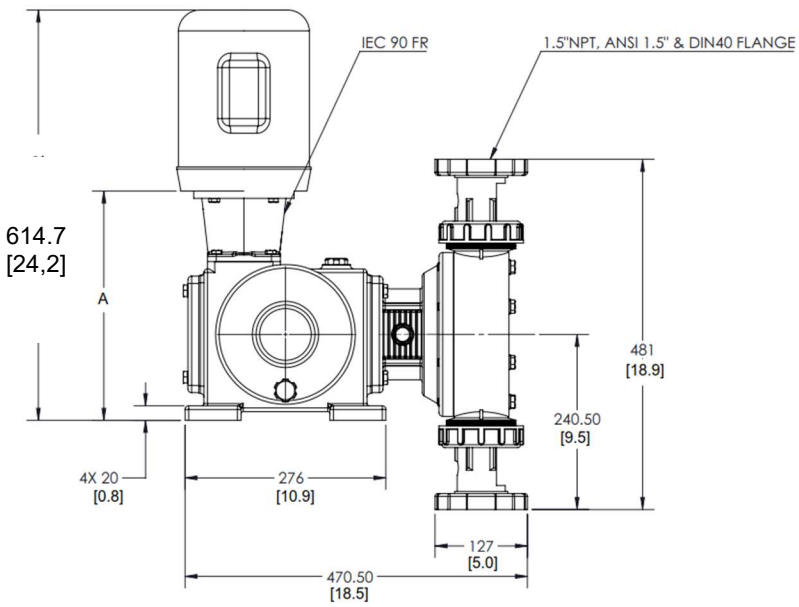
DISCHARGE INSTALLATION

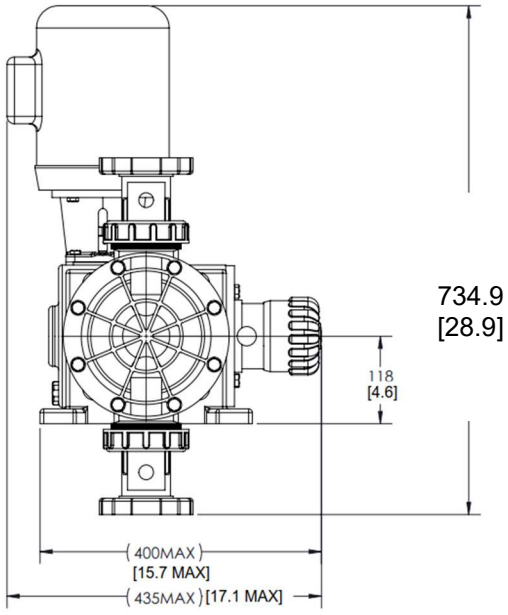
12. Dimensional Drawings

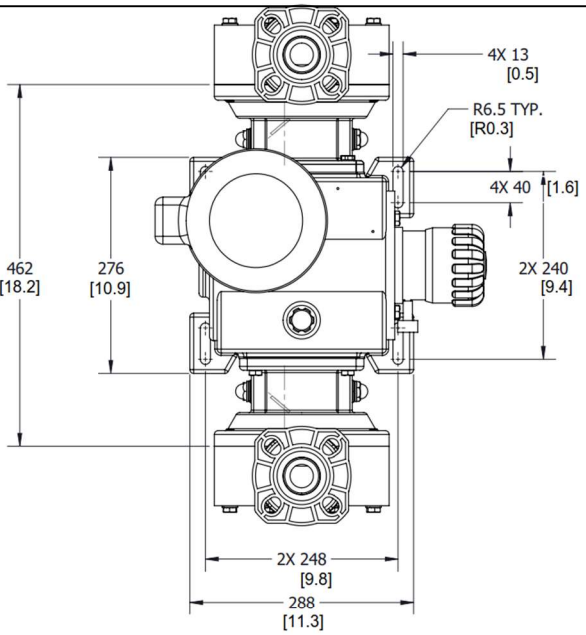


143/145TC	315.0/12.4

	"B" DIM	"C" DIM
Without LD	149.0/5.9	470.5/18.5
With LD	175.0/6.9	496.5/19.5

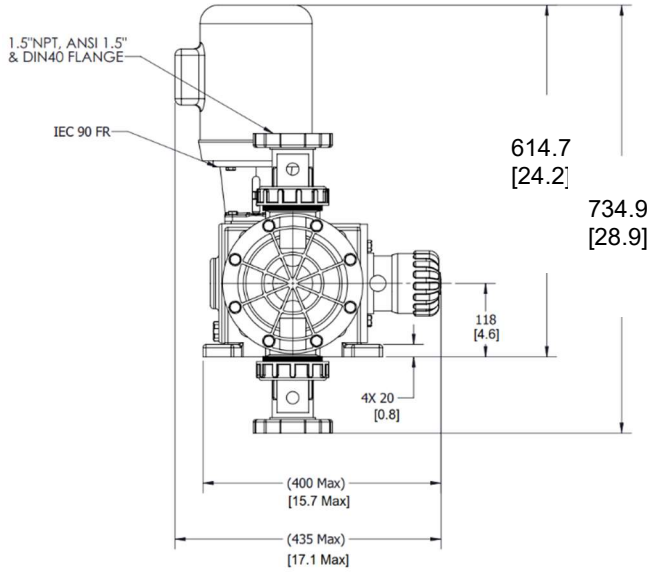


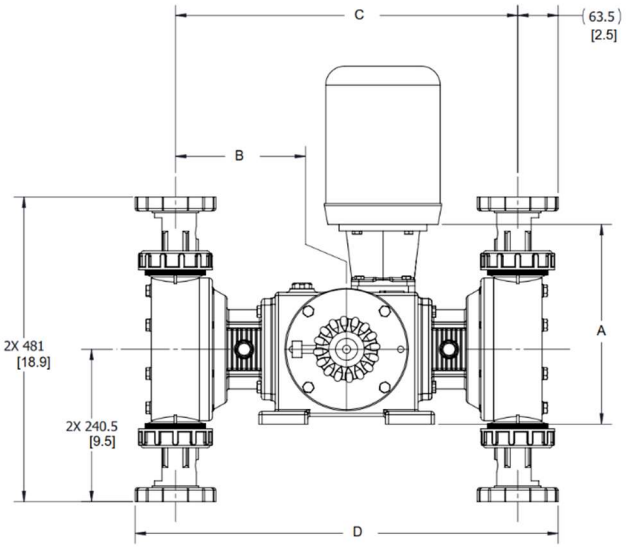




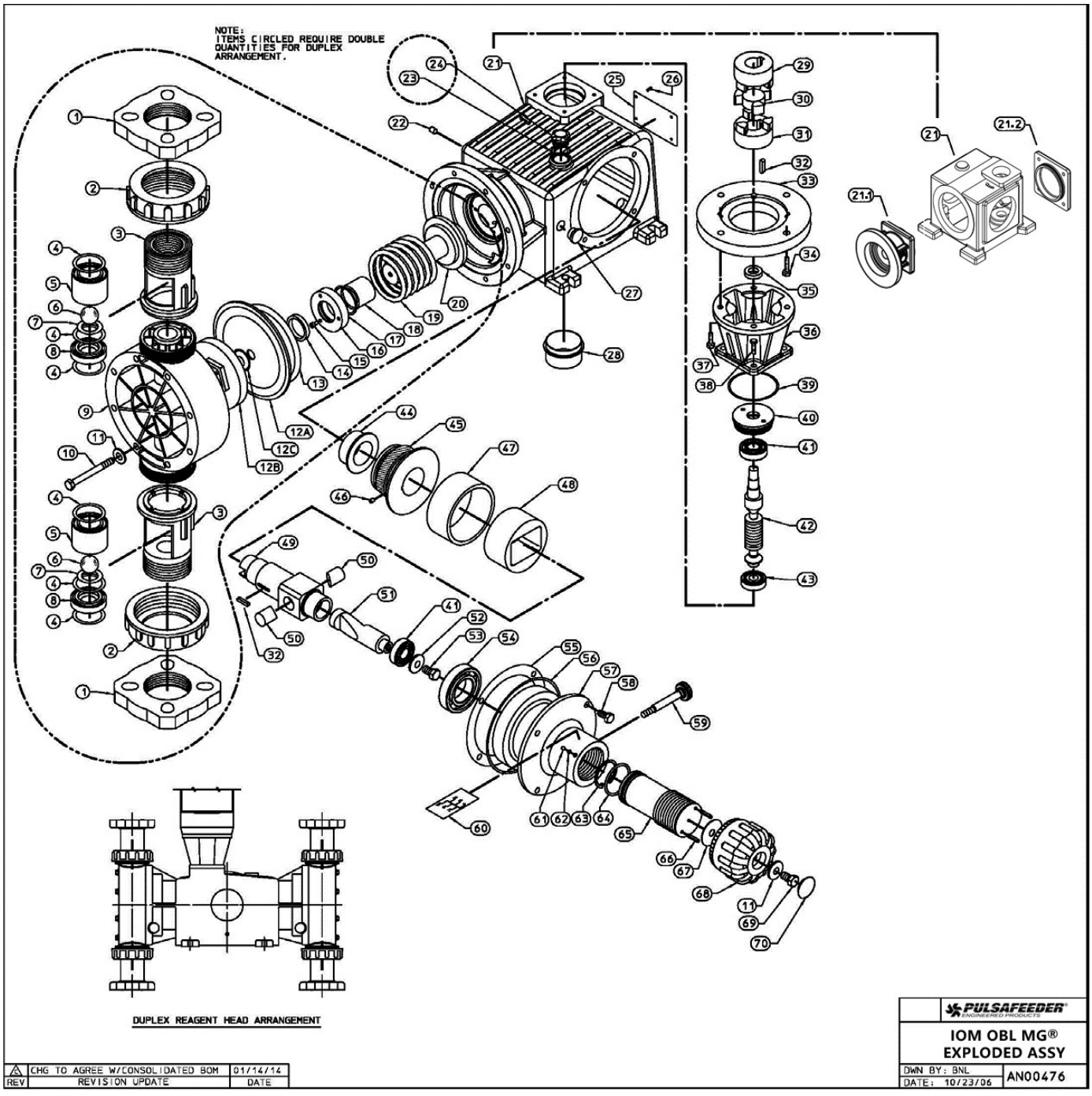
FRAME	"A" DIM
143/145TC	315.0/12.4

	"B" DIM	"C" DIM	"D" DIM
Without LD	269.0/10.6	538.0/21.2	665.0/26.2
With LD	295.0/11.6	590.0/23.2	717.0/28.2





13. Parts Diagrams and Parts Lists



ITEM	DESCRIPTION	DUP QTY	PART NUMBER
1	Flange Adaptor (P)	2	NP300248-PPL
	Flange Adaptor (F)	2	NP300248-KYN
	Flange Adaptor(A)	2	GL360008-STL
	Flange Adaptor BOLT (A)	8	NP993931-188
	Flange Adaptor WASHER (A)	8	NP991019-188
	Flange Adaptor NUT (A)	8	NP991219-188
2	Union Nut(P)	2	NP999107-PPL
	Union Nut(F)	2	NP999107-KYN
	Union Nut(A)	0	/
3	Valve Adaptor(P)	2	GL360007-PPL
	Valve Adaptor(F)	2	GL360007-PVD
	Valve Adaptor(A)	2	GL300015-NPT
4	Check Valve O-Ring(P&F)	6	NP440129-VTN
	Check Valve O-Ring(A)	6	W202966-TFE
5	Valve Guide(P)	2	NP310048-PPL
	Valve Guide(F)	2	NP310048-000
	Valve Guide(A)	2	W202946-316
6	Valve Ball(P&F)	2	NP340036-ZIRA
	Valve Ball(A)	2	W041472-316
7	Seat O-Ring(P&F)	2	NP440317-VTA
	Seat O-Ring(A)	0	/
8	Valve Seat (P)	2	NP330095-PPL
	Valve Seat (F)	2	NP330095-KYN
	Valve Seat (A)	2	W202944-316
9	Reagent Head(P)	1	GL160009-FPP
	Reagent Head(F)	1	GL160009-PVD
	Reagent Head(A)	1	GL160007-000
10	Reagent Head Screw(P&F)	8	NP999091-188
	Reagent Head Screw(A)		
11	Washer(P&F&A)	8	NP991019-188
12-1	Diaphragm Sub-Assembly-PVD	1	NP170041-000
12-2	Diaphragm Sub-Assembly-FPP	1	NP170041-FPP
13	Deflection Plate	1	NP140082-STL
14	Pushrod Seal	1	NP450031-URE
15	Pushrod Seal Retainer Screw	3	NP999097-STL
16	Pushrod Seal Retainer	1	NP999101-STL
17	Seal Retainer O-Ring	1	NP440132-NTR
18	Copper brush	1	NP400059-OLT
19	Compression Spring	1	NP430040-000
20	Pushrod	1	NP100057-STL
21	Gearbox	1	GL010005-ALU
	Gearbox O-Ring	2	NP440255-NTR
21.1	Gearbox Pump Head	1	GL150004-ALU
	O-RING	1	NP440248-NBR
	M10 BOLT	4	NP999110-188
21.2	Cover, Side	1	GL250003-ALU
	Cover, Side O-RING	1	NP440248-NBR
	Cover, Side O-RING M10 BOLT	4	NP999110-188
22	Drain Plug	1	NP992467-STL
23	Oil Cap Gasket	1	W200781-NTR
24	Oil Fill Cap	1	W203180-000
25	Nameplate	1	GL550001-000
26	Nameplate Screws	4	W771000-188
27	Oil Level Indicator	2	GL994001-000
28	Bearing Cap	0	/
29	Motor Coupling IEC 90	1	NP410090-IRN
	Motor Coupling IEC 100		NP410093-001
	Motor Coupling NEMA 56C		NP410093-002
	Motor Coupling NEMA 145TC		NP410093-003
30	Coupling Spider	1	NP410094-NTR
31	Pump Coupling	1	NP410095-IRN
32	Square Key	2	NP420002-001

ITEM	DESCRIPTION	DUP QTY	PART NUMBER
33	Motor Adaptor Plate 100 IEC	1*	NP490034-ALU
	Motor Adaptor Plate NEMA 56c,145TC		NP490033-ALU
34	Motor Bolt IEC 100	4*	W770534-188
	Motor Bolt NEMA 56c,145TC		W770424-188
35	Oil Seal	1	NP450001-NTR
36	Motor Adaptor	1	NP490032-ALU
37	Motor Adaptor Top Screw	4	W770534-188
38	Motor Adaptor Bottom Screw	4	W770541-188
39	Motor Adaptor O-ring	1	NP440147-NTR
40	Input Shaft Adjustment Nut	1	NP410089-STL
41	Bearing	2	NP400002-000
42	Worm 8:1	1	NP060041-008
	Worm 10:1		NP060041-010
	Worm 12.5:1		NP060041-125
	Worm 20:1		NP060041-020
43	Worm Bottom Bearing	1	NP400058-000
44	Gear Bearing	1	NP400055-BRS
45	Gear 8:1	1	NP060040-003
	Gear 10:1		NP060040-000
	Gear 12.5:1		NP060040-001
	Gear 20:1		NP060040-002
46	Gear Set Screw	1	NP991004-014
47	Eccentric Rider Bearing	1	NP400056-000
48	Cam	1	NP200028-IRN
49	Outer Shaft	1	NP410091-STL
50	Plunger	2	NP070024-STL
51	Inner Shaft	1	NP410088-STL
52	Washer	1	NP999099-STL
53	Bearing Retention Screw	1	NP999098-STL
54	Eccentric Shaft Bearing	1	NP400057-000
55	Side Cover Shim	**	NP470061*
	Side Cover Shim 0.5mm	1	NP470061-500
	Side Cover Shim 0.25mm	1	NP470061-250
	Side Cover Shim 0.1mm	1	NP470061-100
	Side Cover Shim 0.05mm	1	NP470061-050
56	Side Cover O-ring	1	NP440255-NTR
57	Side Cover	1	NP250093-IRN
58	Side Cover Bolt	4	NP999110-188
59	Stroke Adj. Lock Assy	1	NP260025-STL
		1	NP260026-STL
		1	NP994066-STL
60	Side Cover Label	1	NP550138-000
61	Detent Ball	1	NP999095-STL
62	Detent O-ring	1	NP440005-NTR
63	Bearing Snap Ring	1	NP999032-STL
64	Stroke Adj. Shaft O-ring	1	NP440227-NTR
65	Stroke Adj. Shaft	1	NP410092-STL
66	Roll Pin	2	NP999105-STL
67	Knob Shim	**	NP470062-000
68	Stroke Adj. Shaft	1	NP260016-GPC
69	Knob Screw	1	NP999104-STL
70	Knob Cover	1	NP999092-NYL

Note :

*-Not required when using an IEC 90 frame motor.

**-Use as needed to maintain proper fit per assembly instructions.

-Item 21 、 21. 1 、 21. 2 、59 includes in all parts need to fully purchase as a standard replacement

PULSAFEEDER® ENGINEERED PRODUCTS

IOM OBL MG®
BILL OF MATERIALS

REV	REVISION UPDATE	DATE
C	Update BOM TO AGREE WITH CONSOLIDATED BOM	1/14/14

DRAWN BY	BNL		AN00476
DATE2018:	10/23/06		

14. Leak Detection Standard KOPKIT List

KOPKIT P/N: KD7FL

KD7FL KOPKIT BOM List			
Item#	Part Number	Part Description	Q'ty
1	NP170042-000	Diaphragm Assembly Rear	1
2	NP870001-PVD	Check Valve Ass'y-PVDF	2
3	GL440226-VTA	GASKET,O-RING	2
4	NP170041-0002	Diaphragm Assembly	1

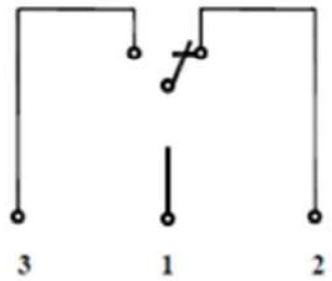
15. LEAK DETECTION PRESSURE SWITCH

a. **Function.** Pressure switch has an internal piston and precision spring, is ideal for high pressure resistance and long service life and is designed for small size and excellent sealing. Switch will allow for alarm indication when the pressure reaches a set value.

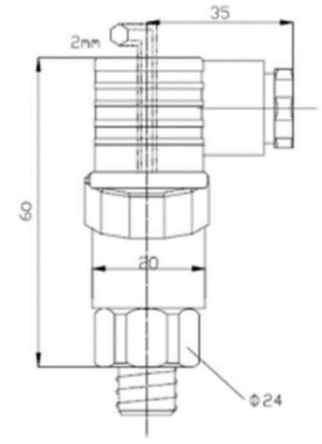
b. **Features.** Small and economical, the switch has standard DIN connections, is easy to wire and has a wide measuring range, with high capacity overload and NO and NC contacts.

c. **Specification.**
   - **i.** Range: 11.6-360 psi (0.8-24.8 bar)
   - **ii.** Retardation: 10-20% set value
   - **iii.** Output: NO + NC (SPDT)
   - **iv.** Voltage: 24VDC +/- 20%
   - **v.** Amperage: 0.5A
   - **vi.** Medium Temperature: 32F to 176F (0C to 80C)
   - **vii.** Environment Temperature: -13F to 176F (-25C to 80C)
   - **viii.** Lifetime: 1x10E6 Cycles
   - **ix.** IP Grade: IP65

d. **Wiring Diagram:**



e. **Dimensions (mm):**



f. Installation:

i. Install gauge and switch with Teflon® tape
ii. Gauge and switch locations and orientation can be as needed
iii. Maximum torque for gauge and switch is 120 in-lb.

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 the date of shipment. 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. (Any pump warranty claim due to a replaceable elastomeric part (PTFE) is not covered by any warranty, either expressed or implied)

b. This policy is extended to a full 12 months from the date of installation or 18 months from shipment from the factory whichever comes first on the following accessories;

Digital Glycol Feeders	Pre-Engineered Systems	Corrosion Coupon Racks
Analog Timers	Water Meters	Flow Controllers

c. Toroidal probes are warranted for 24 months from date of shipment from the factory when purchased as a spare.
MicroVision EX when purchased as a spare a part is warranted for 24 months.
All other electrodes/probes and sensors are considered maintenance items and such are warranted for six (6) months from the date of shipment when purchased in conjunction with the controller.
Any electrodes/probes other than toroidal and sensors purchased as spare parts are warranted for 90 days from date of shipment.

d. 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.

e. 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.

f. 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 (Warranty Items)

a. Please contact our Technical Service Department to request a RMA (Return Material Authorization) number prior to returning any goods. The following information will be required:
SDS sheet
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 used in a chemical application MUST accompany an MSDS

e. 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.

f. All warranty repairs will follow the 2 year warranty policy and will refer to the original purchase date.

4. Credit for Return of New, Unused Equipment

a. RMA for returning product for credit is effective for 60 days from the date of issue. After 60 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.

b. No equipment will be accepted beyond 6 months after date of shipment from factory for credit.

c. Only new, unused and undamaged standard equipment will be accepted for return to stock.

d. 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.

e. 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.

f. A restocking fee of up to 75% will apply to (NSF 61) returned goods. a. National Sanitation Foundation (NSF 61) - is an American National Standard that establishes minimum health-effects requirements for chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems.

g. A request for a Returned Material Authorization (RMA) number must be made prior to returning product to Pulsafeeder.

h. All equipment shall be returned with the RMA Packing List form attached to the outside of the box.

i. 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.

j. All material shall be returned freight prepaid.
k. Private label products or Engineered Panel Mount Systems and Pre-Engineered System are not returnable.

5. Pricing Errors

a. Pulsafeeder does our 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.

6. 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.

7. Damaged Items

a. Should the customer receive an order that was damaged in transit, whoever paid the freight charges is responsible for filing the freight damage claim.
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.

8. 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.

Introduction of QR Code

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

Use QR Code:

Scan QR code to open the Web.

How To Use:

1. Scan the QR code on the name plate
2. Check KOPkits information located just below the Serial Number
3. Check related information by clicking on replacement parts list, tech sheet or manual button, etc
4. Speak to someone or email Technical Services clicking on buttons
5. Email This Information to yourself or someone else by clicking on the buttons