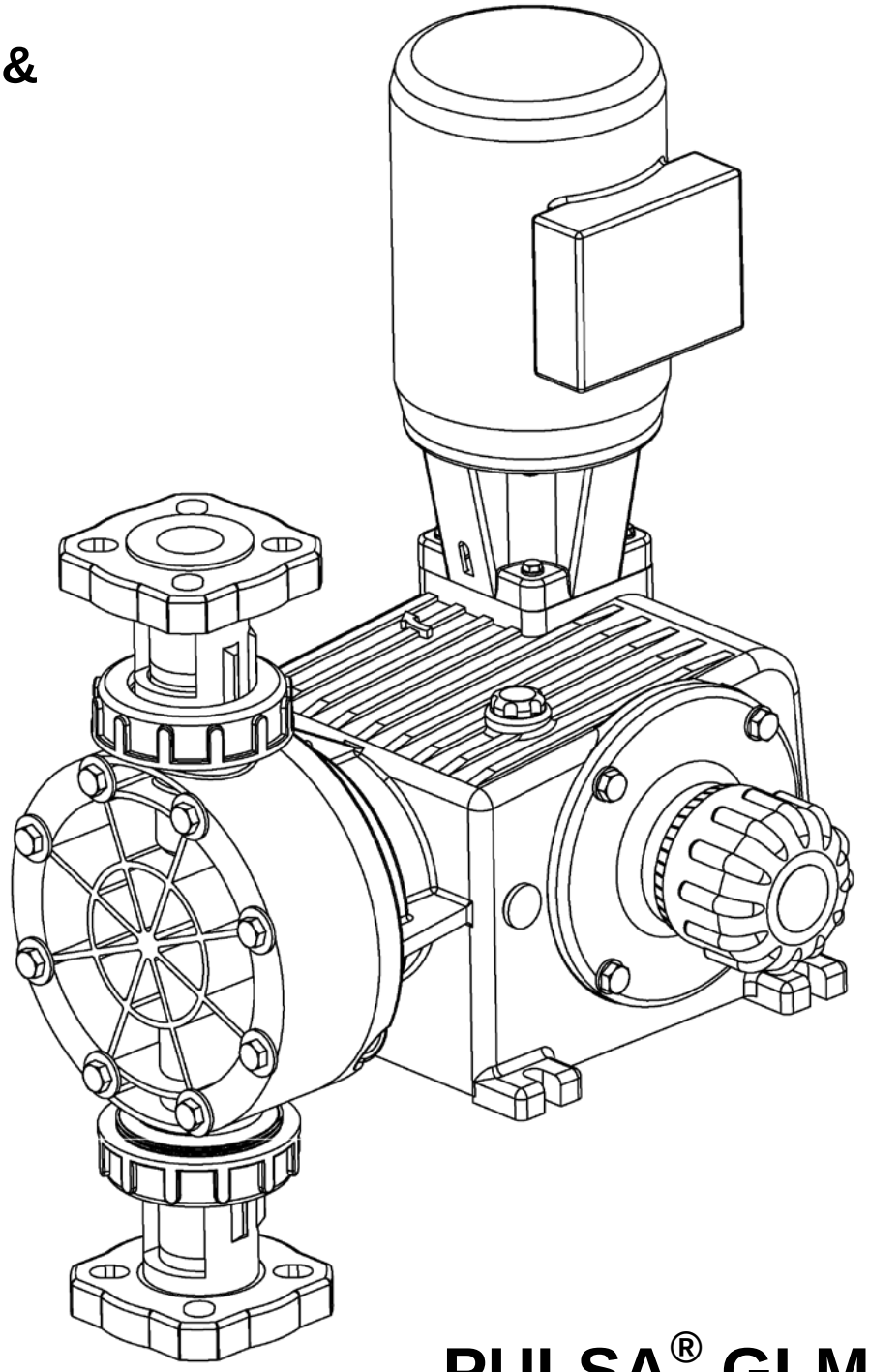
PULSAFEEDER®
ENGINEERED PRODUCTS

Installation, Operation & Maintenance Manual

Models: GLM7



PULSA® GLM

MECHANICAL DIAPHRAGM METERING PUMP

Bulletin: IOM-GLM-5001-Rev.B

Pulsafeeder Factory Service Policy

Should you experience a problem with your GLM pump, first consult the troubleshooting guide in this installation, operation and maintenance manual. If the problem is not covered or cannot be solved, please contact your local Pulsafeeder 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.

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

http://www.pulsa.com/pulsa-docs/Pulsafeeder-EPO-Limited-Warranty-Statement.pdf

Conventions:

For the remainder of this bulletin, the following conventions are in effect.

A warning defines a condition that could cause damage to both the equipment and the personnel operating it. This manual must be consulted in all cases where the warning symbol is marked in order to find out the nature of the potential hazards and any actions which have to be taken to avoid them.

Notes are general information meant to make operating the equipment easier.

Revision History:

Rev A	Release Date February 2015 First revision
Rev B	Release Date July 2015 Introduction and Safety Considerations updated

Table of Contents

1. Introduction

1.1 General Description

The PULSA GLM7 metering pump is positive displacement, mechanically operated reciprocating diaphragm pump. Each pump consists of a power end and a process end separated by a composite Teflon® diaphragm. Individual pumps will vary in appearance due to various liquid ends and accessories; however, the basic principles of operation remain the same.

1.2 Safety Considerations

The PULSA GLM7 metering pumps yield both mechanical and hydraulic capabilities. In consideration of safety, the user should be mindful of the following considerations in regards to personal, nearby personnel, and environmental safety. Please consider the following prior to the installation and operation of a PULSA GLM7 pump.

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.

5. As a positive displacement pump, a PULSA GLM7 pump will continue to build pressure if the fluid pathway is closed or blocked and can result in excessive and unsafe pressure or pump failure.

Never place fingers or hands into any part of the pump while the pump is running.

1.3 Liability Exclusions

Pulsafeeder, Inc. is unable to monitor the observance of the instructions given in this manual, nor verify the actual working conditions and installation of the equipment, the correct operation and maintenance of the equipment and accessories. An incorrect installation, or misuse of the equipment, may cause serious damage and may pose a danger to persons or property. Any anomalies must be reported to the maintenance supervisor. The user is not authorized to tamper with the machine for any reason.

Attempts to disassemble, modify or tamper in general by unauthorized personnel will void the guarantee and will release Pulsafeeder, Inc. from any liability for damage caused to persons or property resulting from such actions.

Pulsafeeder, Inc. is considered released from any liability in the following cases:

- Improper installation
- Improper use of the equipment by non-professional or inadequately trained operators
- Use not in compliance with regulations in the Country of use
- Lack of maintenance or improperly performed
- Use of non-original spare parts or incorrect parts for the model in question
- Total or partial failure to observe the instructions
- Exceptional environmental events

1.4 Handling and Lifting

Boxes, crates, pallets or cartons may be unloaded using fork lift vehicles or slings dependent on their size and construction. A crane must be used for all pumps in excess of 25 kg (55 lb). Fully trained personnel must carry out lifting, in accordance with local regulations. Slings, ropes and other lifting gear should be positioned where they cannot slip and where a balanced lift is obtained.

1.5 Recycling and End of Product Life

At the end of the service life of a PULSA GLM7 pump or its parts, the materials and parts should be recycled or disposed of using an environmentally acceptable method and following all local requirements. If the product contains substances that are harmful to the environment, these should be removed and disposed of in accordance with current regulations. This also includes the liquids and/or gases that may be used in the "seal system" or other utilities.

Make sure that hazardous substances are disposed of safely and that the correct personal protective equipment is used. The safety specifications must be in accordance with the current regulations at all times.

2. Principles of Operation

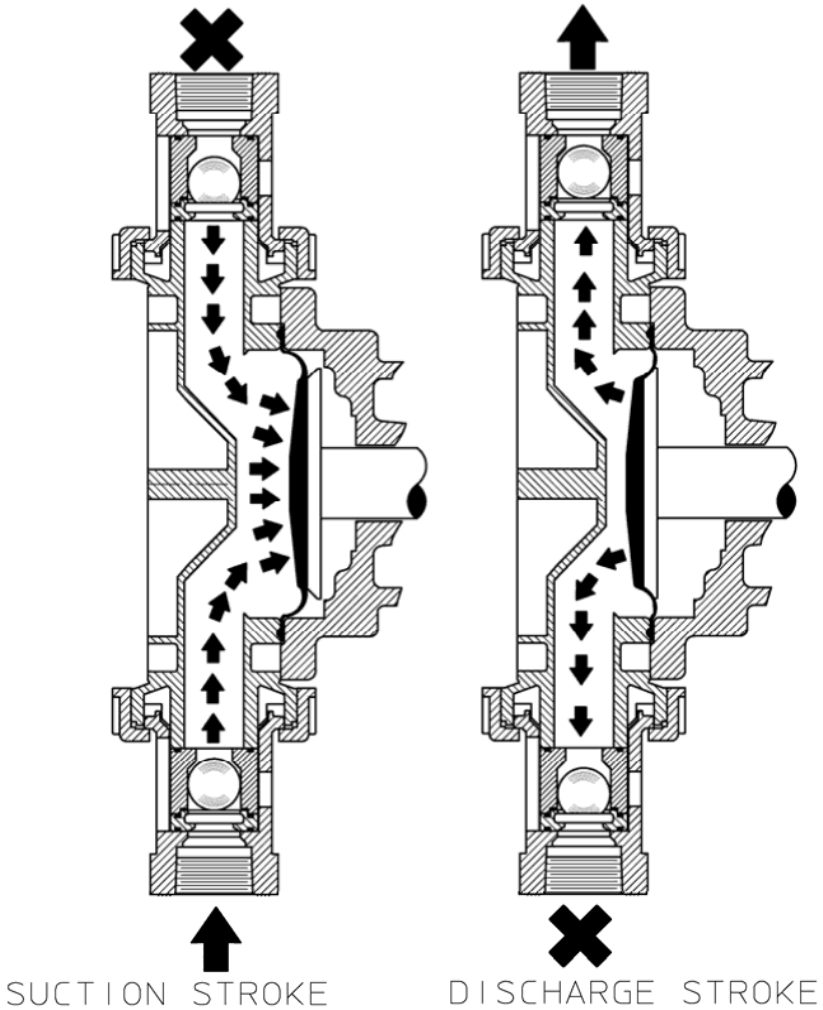


Figure 1, reagent head operation

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 GLM7 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.

For automatic flow rate control, users can consider the Pulsafeeder MPC speed based control system, please contact your local Pulsafeeder dealer or representative for more information.

2.3 Gear Ratio Assembly

GLM7 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.

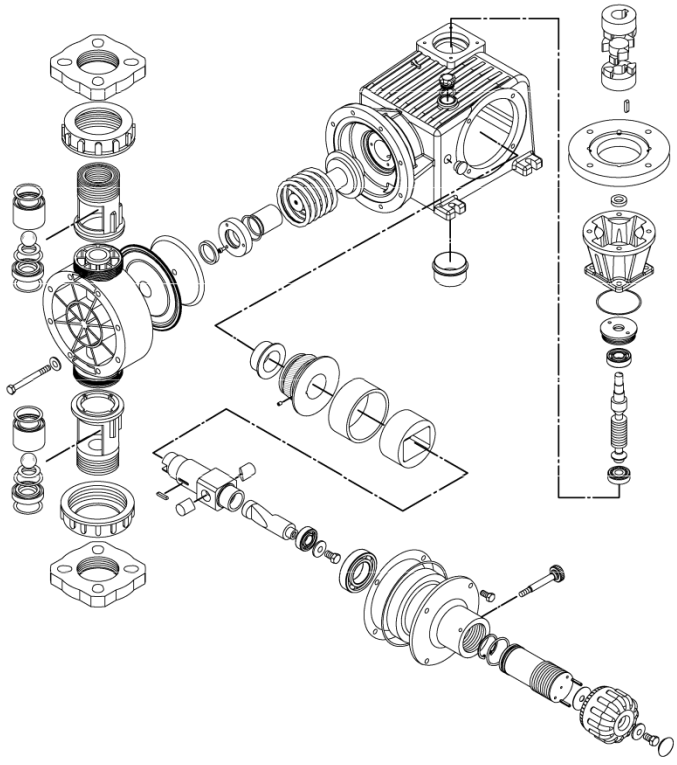


Figure 2, isometric view

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 GLM7 pumps.

4. Storage

4.1 Short Term

Storage of your GLM7 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.

4.2 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.

GLM7 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 0° C (32° F) 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 GLM7 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 GLM7 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 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 pump’s rating are to be avoided as they will cause damage to the pump components.

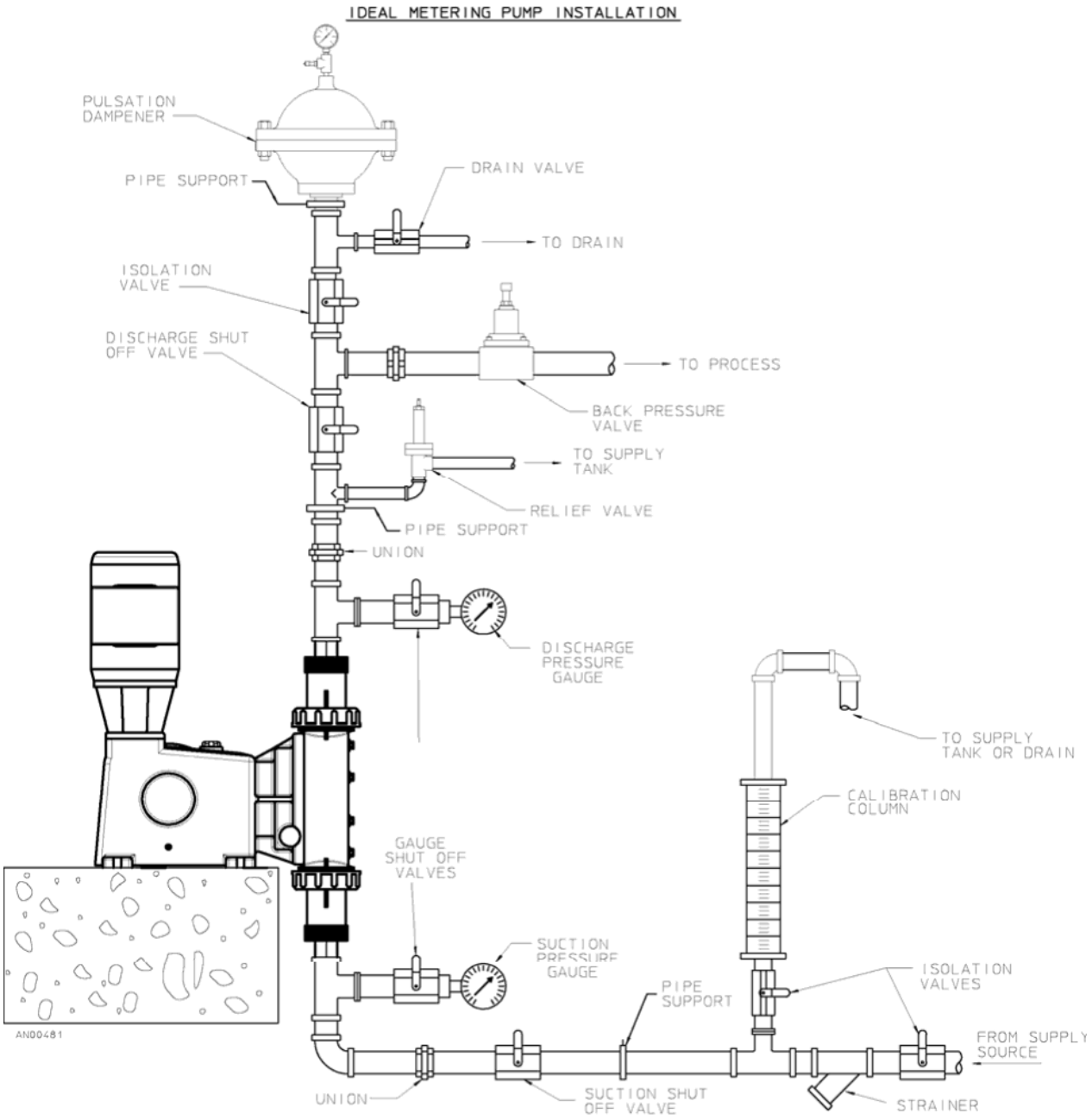


Figure 3, sample system configuration

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
GLM7	Plastic	(8) M10 * 1.5	8.5	75
	Metal	(8) M10 * 1.5	8.5	75

6.2 Output Adjustment

All GLM7 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.

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

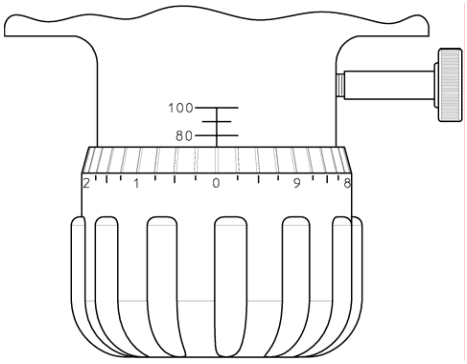


Figure 4, stroke adjustment knob and scale

2. Adjust the knob 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.

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

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.

NOTE **Note – 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 PULSALube oil be on hand for periodic changes and emergency requirements. The approximate amounts of oil required to fill the GLM7 pump to specified levels are:

Pump Capacity	**Gearbox, Model GLM7**
PULSALube EP Gear Oil	2,500 ml (2.6 Qt)

Pulsafeeder Part No.	**Description**	**Container Size**
9M-1QT	PULSALube EP Gear Oil	1 liter
9M-1GL	PULSALube EP Gear Oil	2.5 liter
9M-5GL	PULSALube EP Gear Oil	18 liter

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 EP Gear Oil) 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.

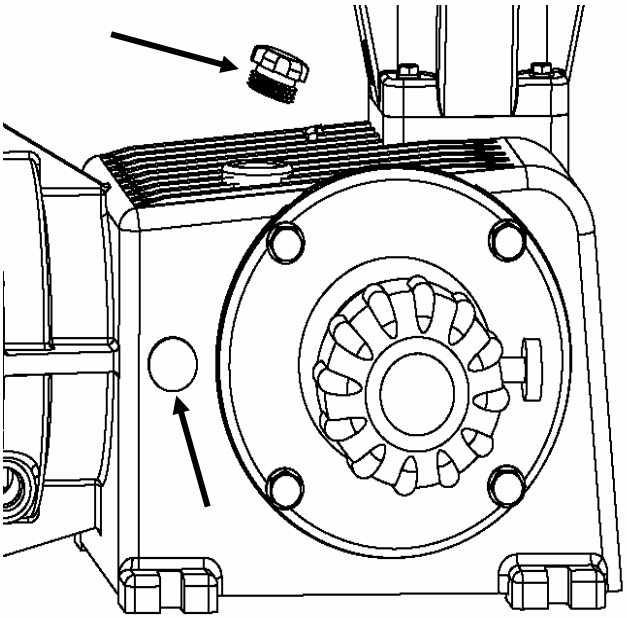


Figure 5, oil filler cap and sightglass

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 0^0 C to 40^0 C (32^0 F to 104^0 F) and up to 2,000 annual operating hours.

Severe Service: Humid atmosphere, an ambient operating temperature below 0^0 C (32^0 F) or above 40^0 C (104^0 F), 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 PulsaLube 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 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.

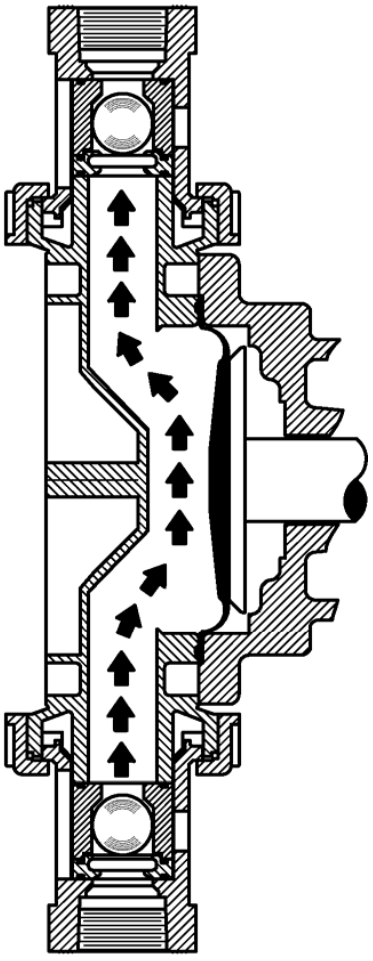


Figure 6, process flow

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

6.5 Calibration

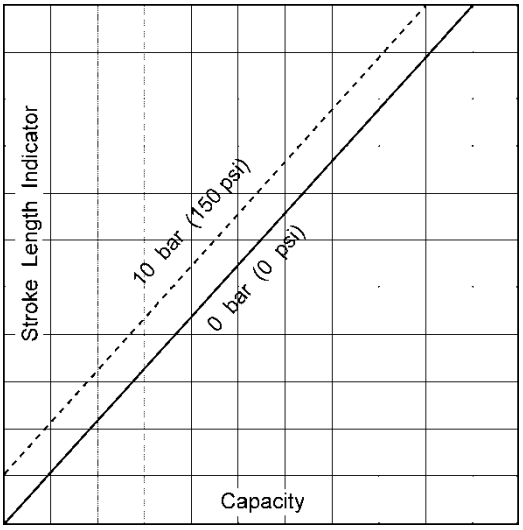


Figure 7, sample flow calibration curve

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

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.

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 GLM KOPkit® will contain all replacement parts normally used in a preventative maintenance program. It is recommended that KOPkits and PULSAlube® 9M be kept available at all times.

WARNING

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.

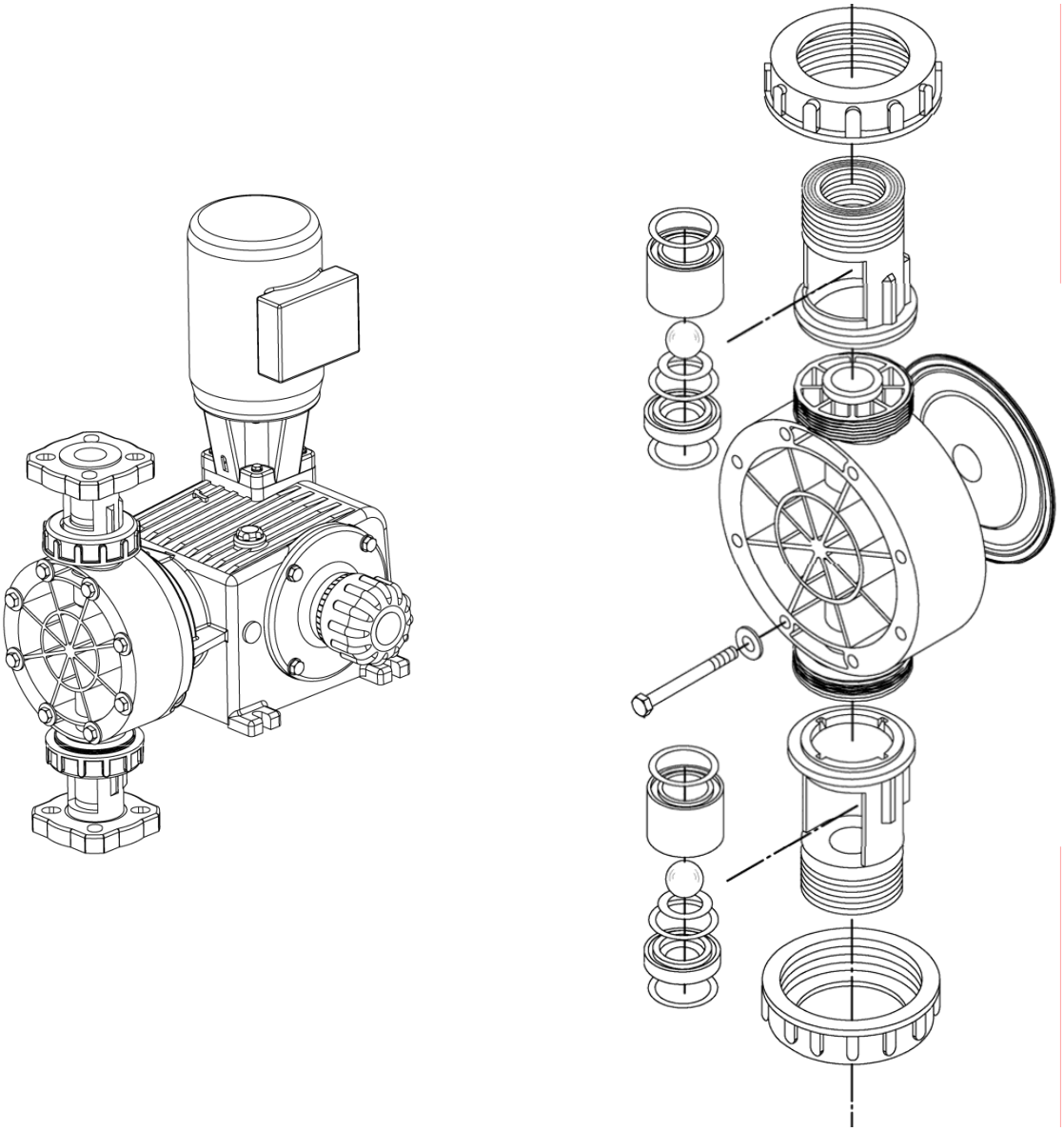


Figure 8, wet end components

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.

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.

WARNING **Take all precautions described in 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.

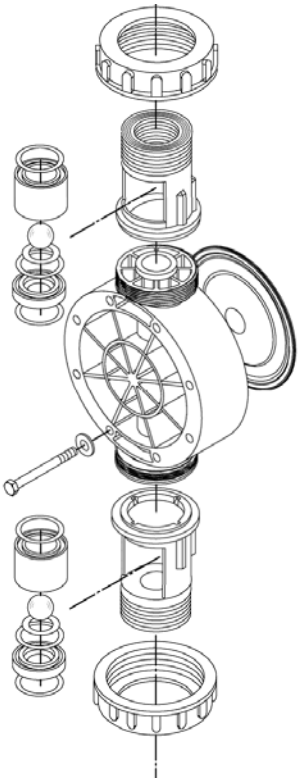


Figure 9, wet end components

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.

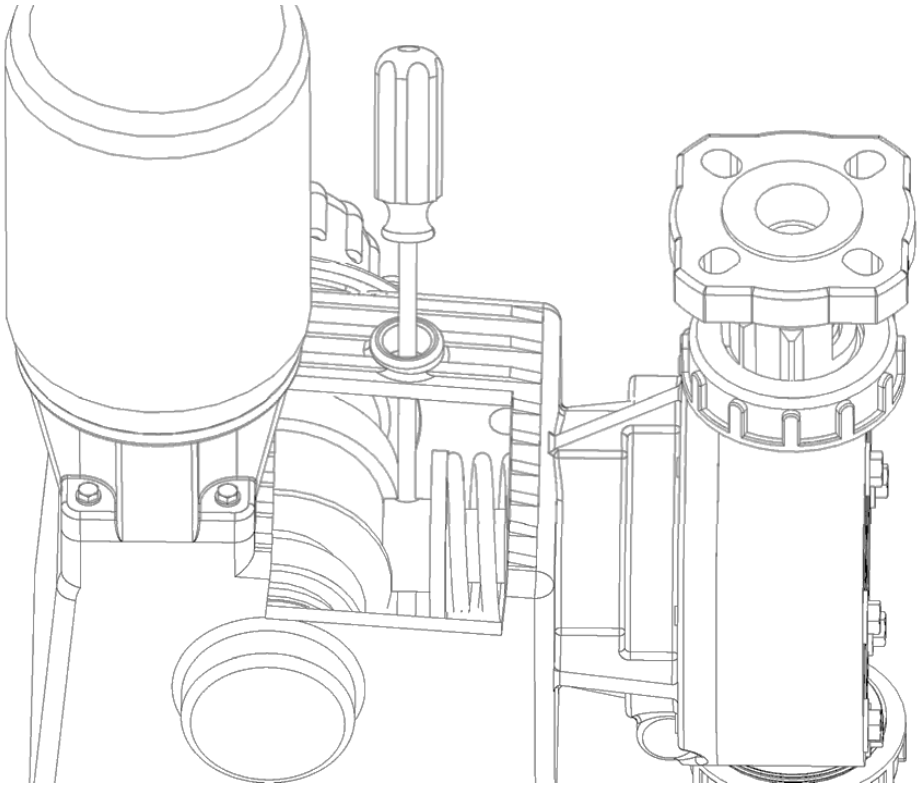


Figure 10, securing pushrod

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.
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 6.4.***

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.

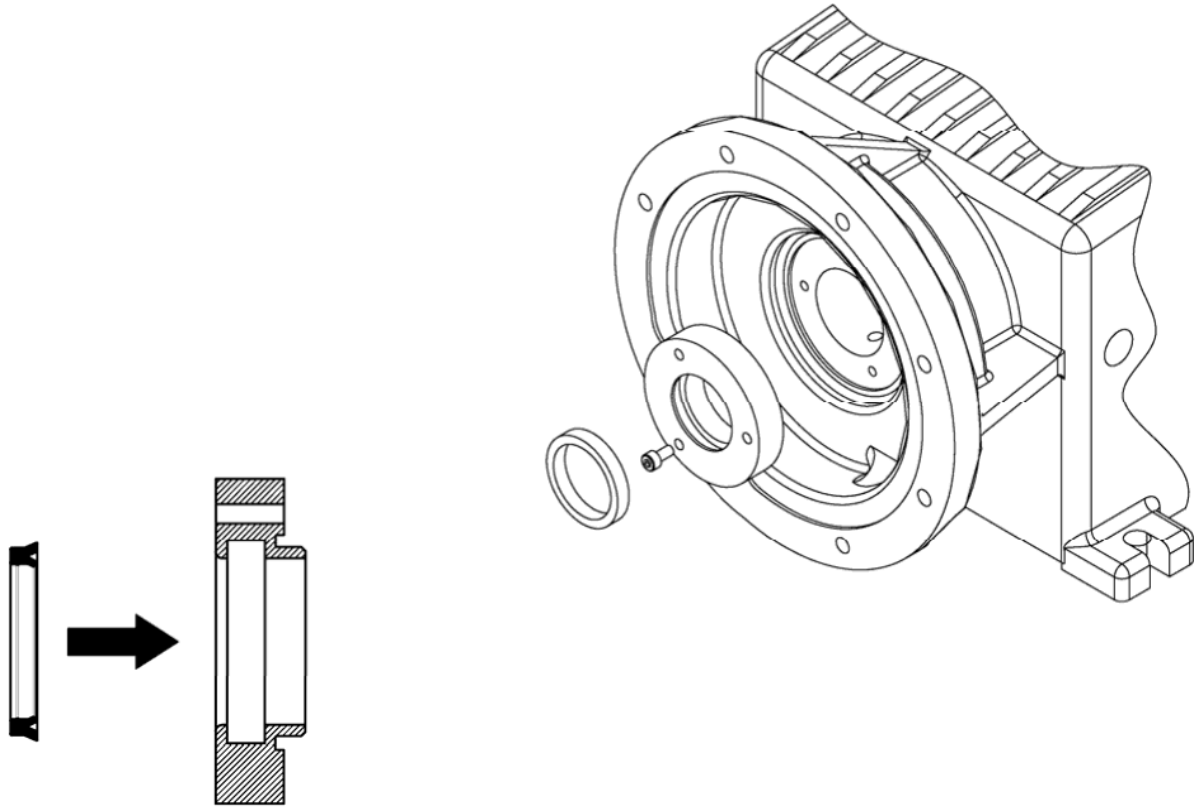


Figure 11, piston shaft seal replacement

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.

GLM7 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).

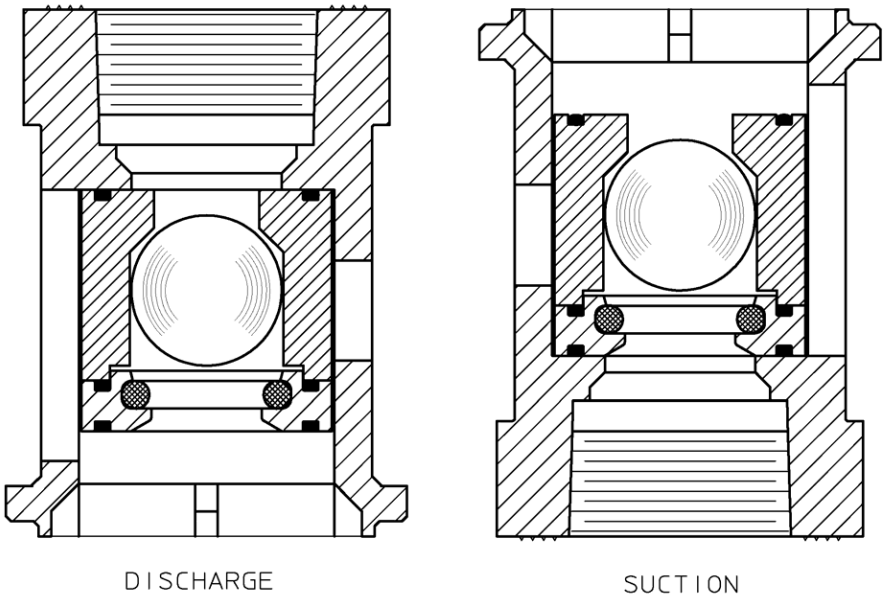


Figure 12, check valves GLM7

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.

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

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. Note carefully 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.**

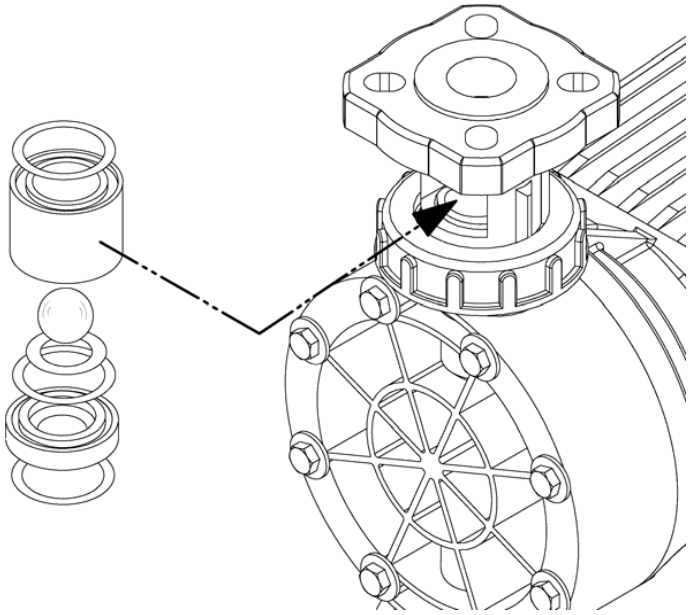


Figure 13, union-nut type check valve

NOTE **Inserting the check valve assembly into the pump in the wrong directiom, 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 & 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.

WARNING **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.
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.

NOTE **Inserting the check valve assmbly into the pump in the wrong directiom, 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.

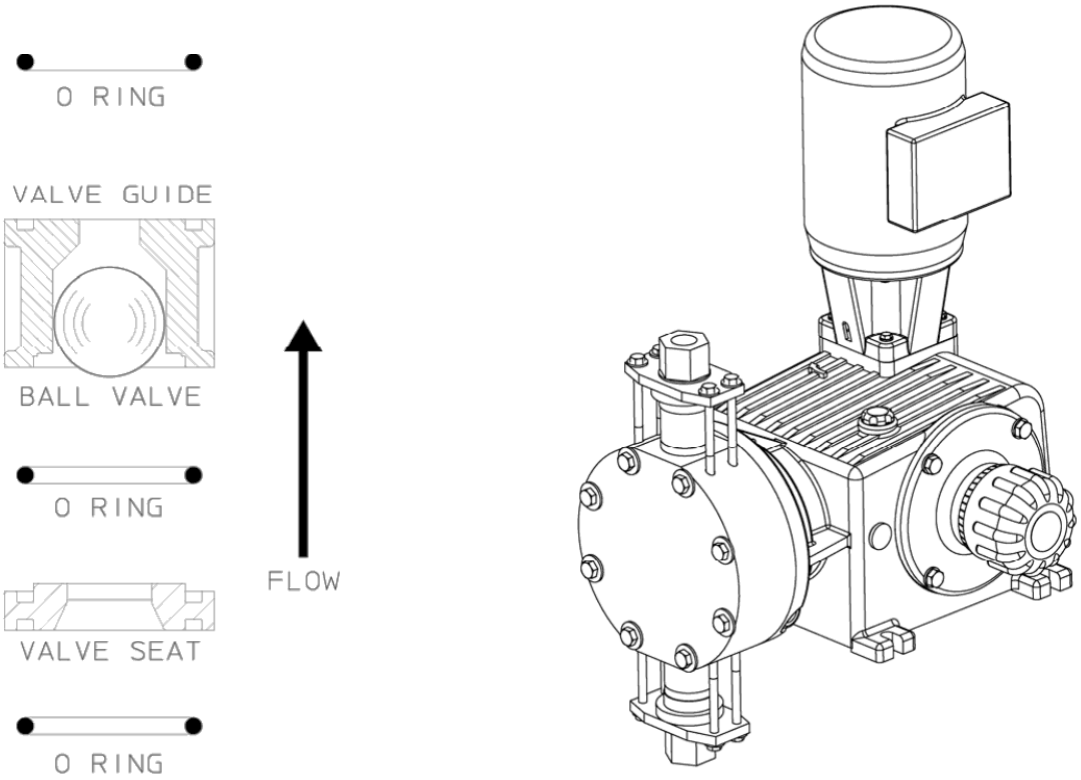


Figure 14, check valves, metal construction

7.6 Motor Removal & Reinstallation

1. Disconnect 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. 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.

NOTE **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.**

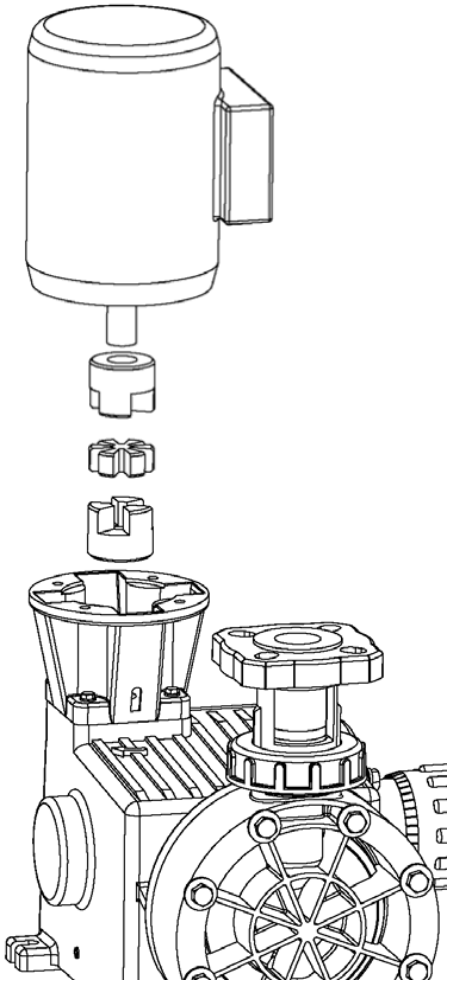


Figure 15, motor mounting

8. Replacement Parts

8.1 KOPkit® Program

GLM7 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 GLM® pump model. Each KOPkit is vacuum-packed for extended storage. All 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 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.

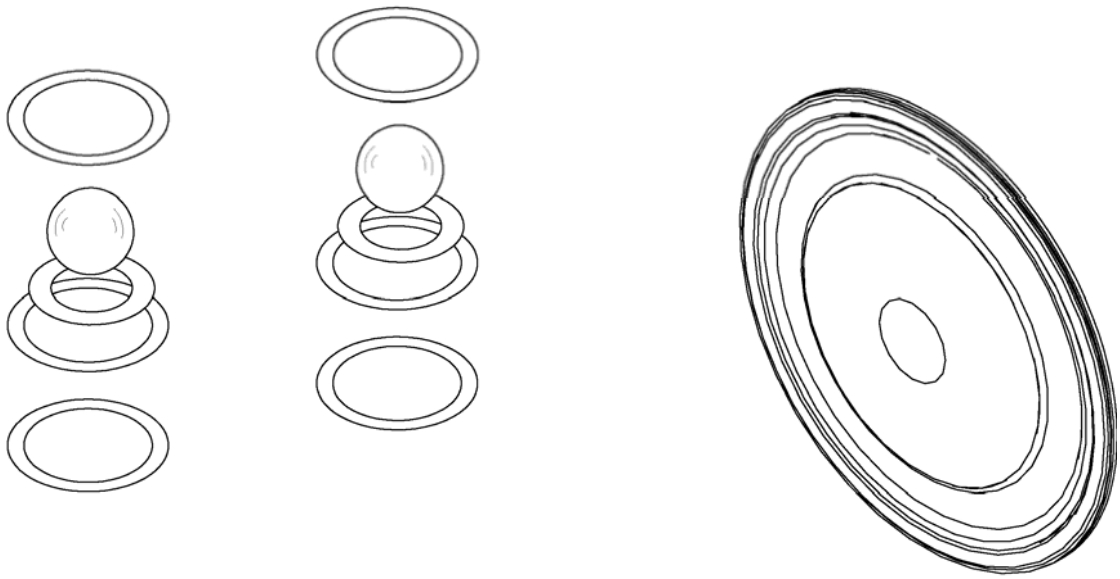


Figure 16, KOPkit parts

8.2 Ordering KOPkits or Parts

When ordering replacement parts always specify:

- Pump model and serial number (from pump nameplate), e.g., Model No. (GLM7) with Serial No. F406365-3.
- Part number and description from the GLM® parts list. Include the three-character suffix. (Note: GLM® part numbers begin either with the letters **GL**, **NP**, or **W**, e.g., NP170001-THY or W210221-001.)

8.3 KOPkit numbers by model:

Pump Model	Wetted Material	Lite KOPkit (O-ring material)	Standard KOPkit (O-ring material)
GLM7 & GLM7 Duplex	**PP**	KM7PX-LTE (Viton®)	KM7PX (Viton®)
GLM7 & GLM7 Duplex	**PVDF**	KM7FX-LTE (Viton®)	KM7FX (Viton®)
GLM7 & GLM7 Duplex	**316SS**	KM7AX-LTE (PTFE)	KM7AX (PTFE)

NOTES:
(1) GLM1-6 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 – 5	GLM	Pump Size	**GLM** GLM
6	Y	Motor Frame Selection	**A** NEMA 56C **B** IEC 71B14 **D** NEMA 143/5TC (GLM7 only)
7	P	Wet End Materials	**A** 316/PTFE-316SS 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 **P** PP/Viton - PP liquid end - PTFE diaphragm and Viton O-rings - ceramic ball valves
8	P	Connections	**P** NPT **B** BSP **T** 3/8” tube connection, Plastic only (GLM1&2)

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 lenth 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 piiping 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
	Vack 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 sampener 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 cecessary

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 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.

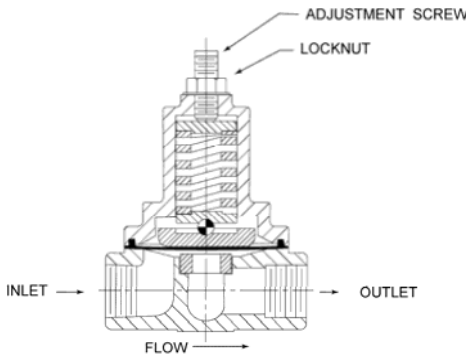
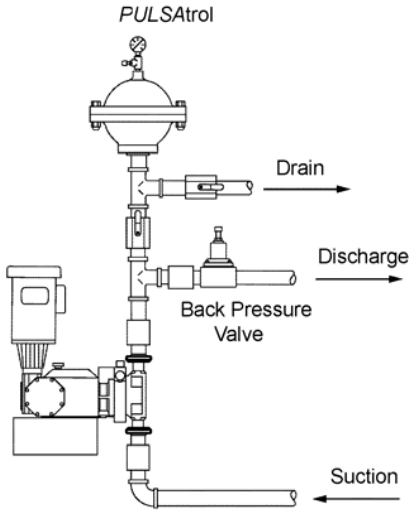


Figure 17

Pulsation Dampener

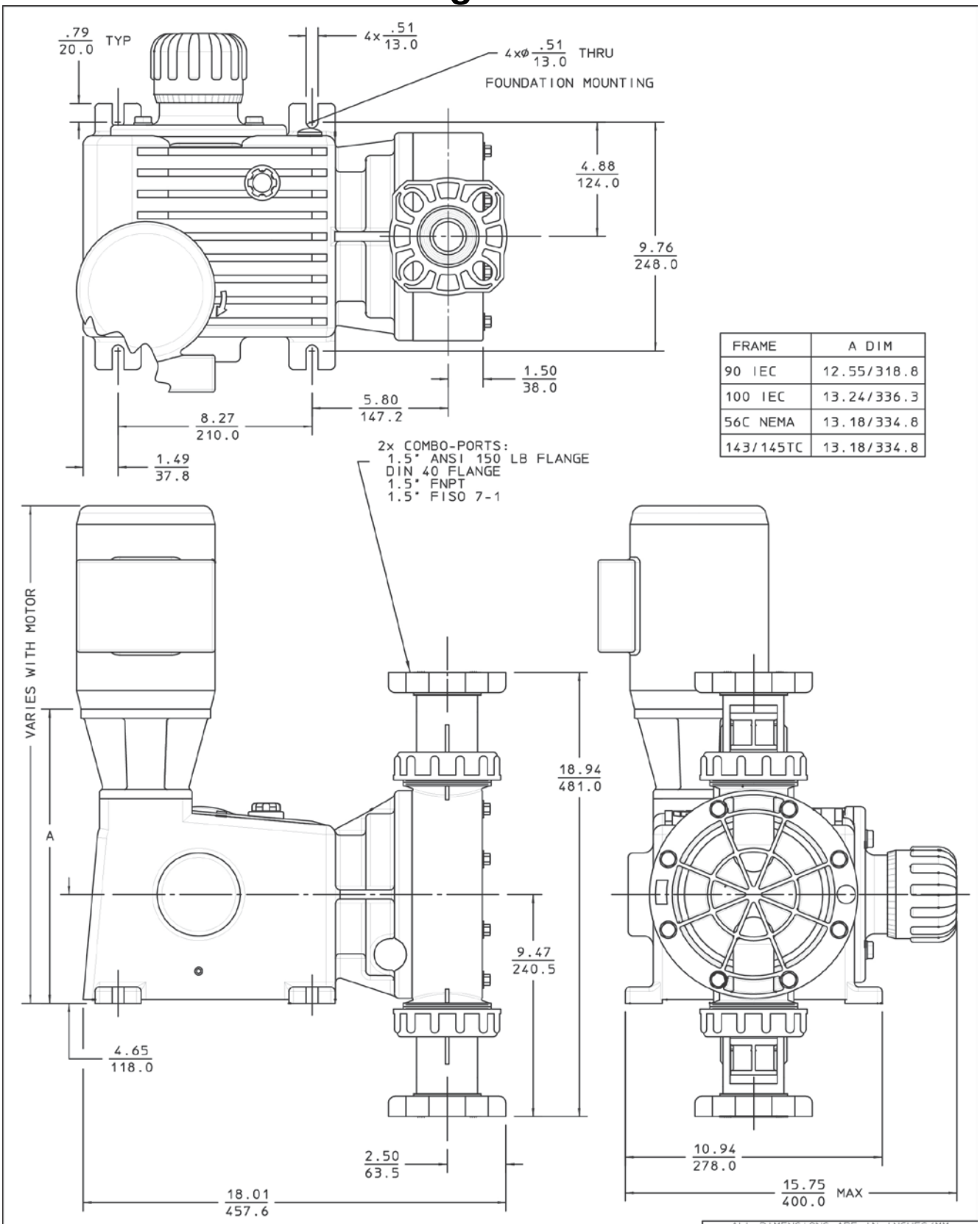
A pulsation dampener is a pneumatically charged diaphragm-type chamber that intermittently stores hydraulic energy. Used on the inlet, it can improve NPSHA (Net Positive Suction Head Available) characteristics of the suction piping system. On the discharge line it will reduce discharge pressure peaks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



DISCHARGE INSTALLATION

Figure 18

12. Dimensional Drawing



FRAME	A DIM
90 IEC	12.55/318.8
100 IEC	13.24/336.3
56C NEMA	13.18/334.8
143/145TC	13.18/334.8

ALL DIMENSIONS ARE IN INCHES/MM

PULSAFEEDER
A Unit of IDEX Corporation

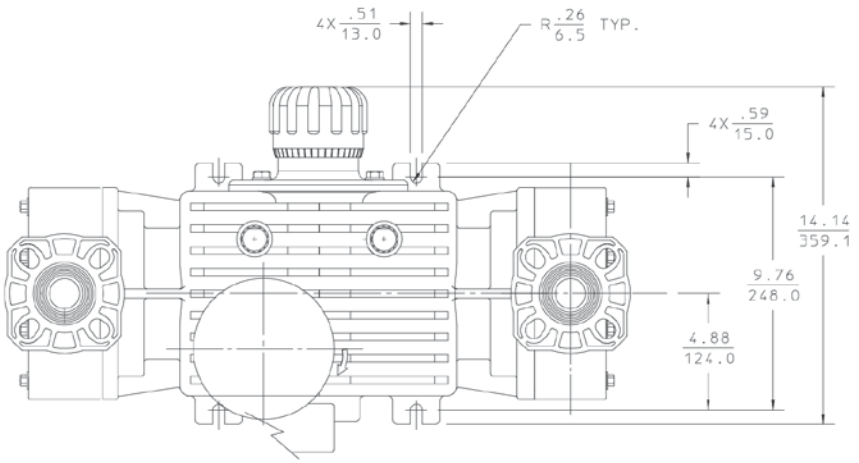
GLM7 PLASTIC HEAD
DIMENSIONAL DRAWING

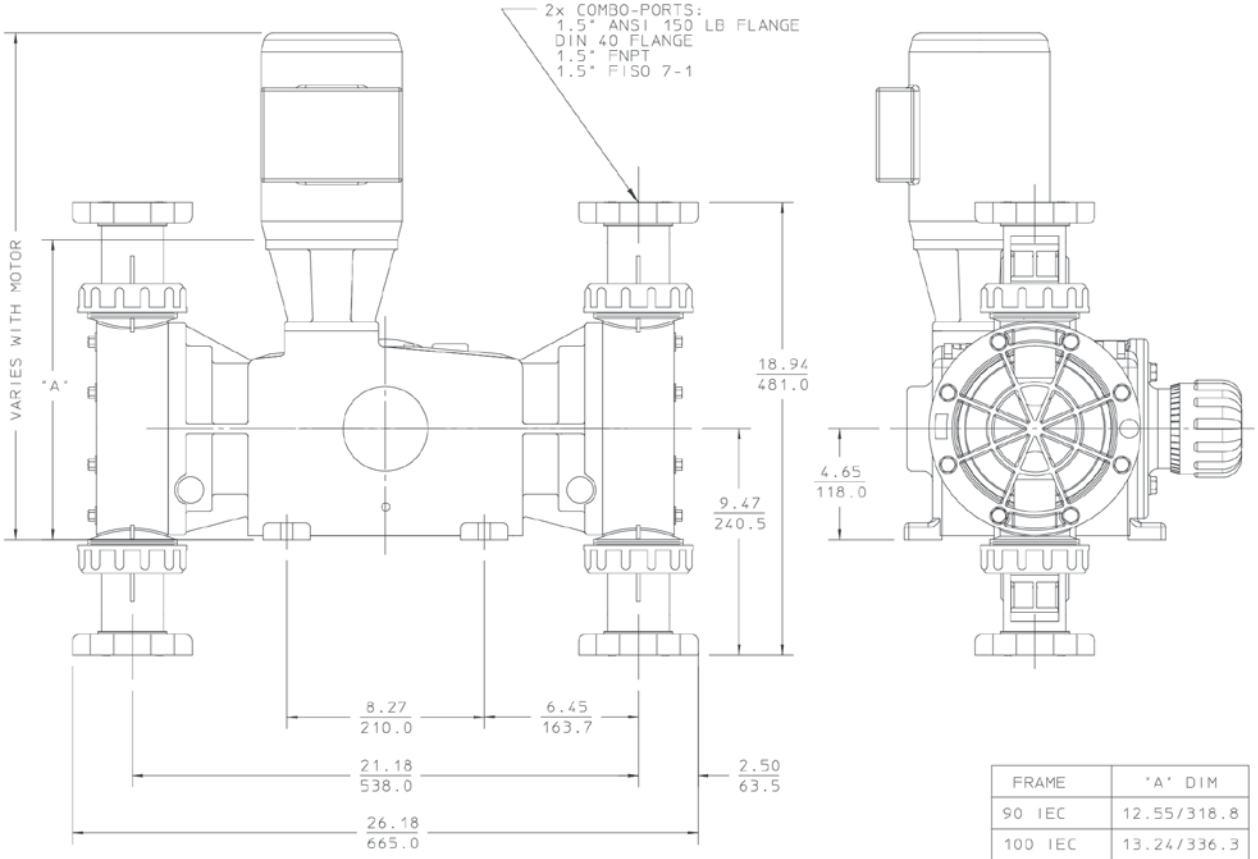
REV	REVISION UPDATE	DATE

SECTION/PAGE	GLM
EFFECTIVE	01/17/14
SUPERSEDES	NEW

DWN BY: KLM
DATE: 01/17/14

23964-000





FRAME	'A' DIM
90 IEC	12.55/318.8
100 IEC	13.24/336.3
56C NEMA	13.18/334.8
143/145TC	13.18/334.8

ALL DIMENSIONS ARE IN INCHES/MM

PULSAFEEDER
A Unit of IDEX Corporation

GLM7 DUPLEX HEAD DIMENSIONAL DRAWING

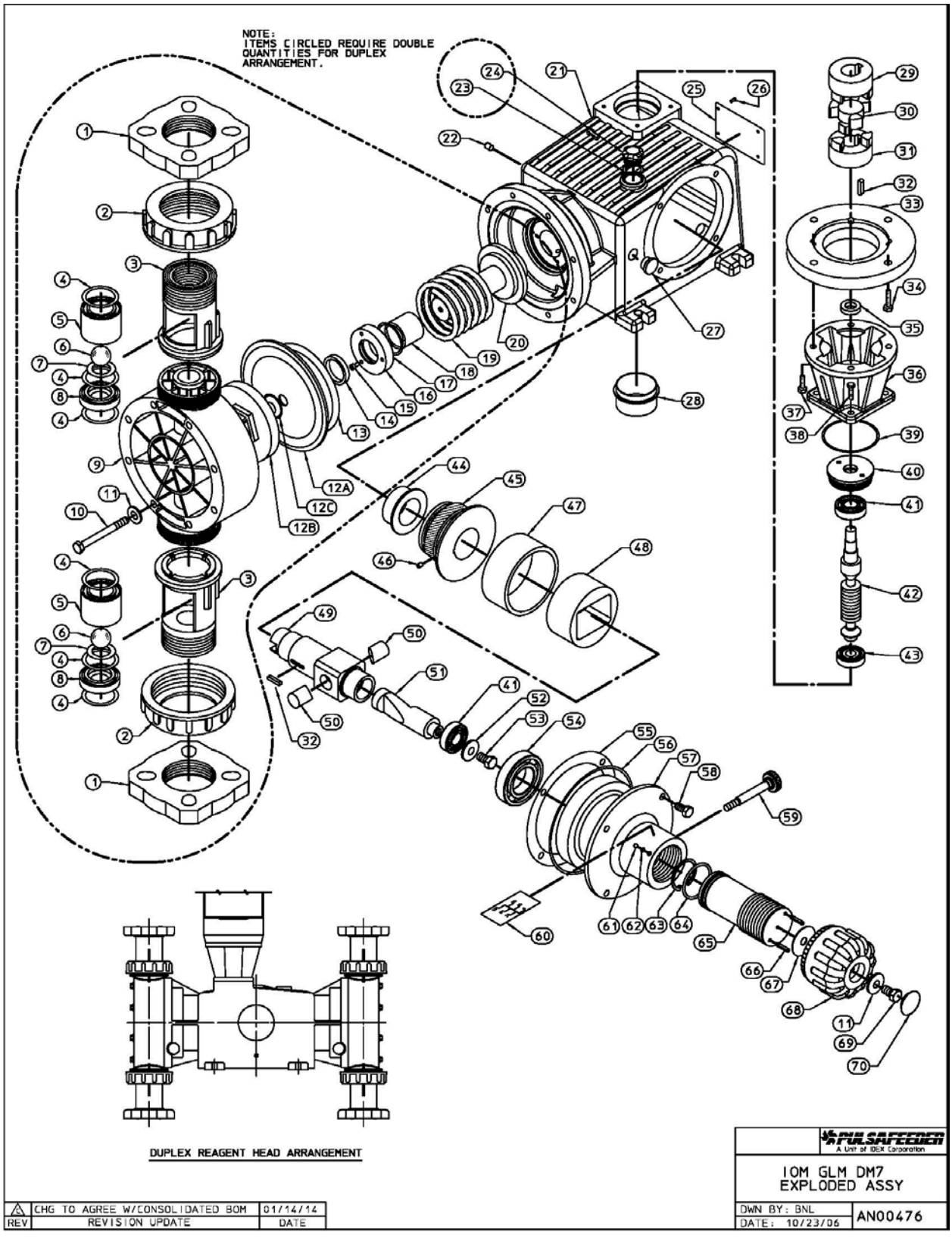
REV	REVISION UPDATE	DATE

SECTION/PAGE	GLM
EFFECTIVE	01/17/14
SUPERSEDES	NEW

DWN BY: KLM
DATE: 01/17/14

24902-000

13. Parts Diagrams and Parts List



ITEM	DESCRIPTION	DUP QTY	SPX QTY	PART NUMBER
1	Flange Adaptor	4	2	NP300248
2	Union Nut	4	2	NP999107
3	Valve Adaptor	4	2	NP320019
4	Check Valve O-Ring	12	6	NP440129-TFE
5	Valve Guide	4	2	NP310048
6	Valve Ball	4	2	NP340036
7	Seat O-ring	4	2	NP440317-VTA
8	Valve Seat	4	2	NP330095
9	Reagent Head	2	1	NP160078
10	Reagent Head Screw	16	8	NP999091-188
11	Washer	18	9	NP991019-188
12A	Diaphragm	2	1	NP170040-TFE
12B	Front Knob Assy	2	1	NP260017-PVD
12C	Gasket, O-Ring	2	1	NP440122-VTN
13	Deflection Plate	2	1	NP140082-STL
14	Pushrod Seal	2	1	NP450031-URE
15	Pushrod Seal Retainer Screw	6	3	NP999097-STL
16	Pushrod Seal Retainer	2	1	NP999101-STL
17	Seal Retainer O-ring	2	1	NP440132-NTR
18	Pushrod Bearing	2	1	NP400059-OLT
19	Compression Spring	2	1	NP430040-000
20	Pushrod	2	1	NP100057-STL
21	Gearbox	1	---	NP010026-ALU
21	Gearbox	---	1	NP010025-ALU
22	Drain Plug	1	1	NP992467-STL
23	Oil Cap Gasket	2	1	W200781-NTR
24	Oil Fill Cap	2	1	W203180-000
25	Nameplate	1	1	NP550130-000
26	Nameplate Screws	4	4	W771000-188
27	Oil Level Indicator	1	1	NP560026-000
28	Bearing Cap	1	1	NP250052-000
29	Motor Coupling IEC 90	1	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	1	NP410094-NTR
31	Pump Coupling	1	1	NP410095-IRN
32	Square Key	2	2	NP420002-000
33	Motor Adaptor Plate 100 IEC	1*	1*	NP490034-ALU
	Motor Adaptor Plate NEMA 56C,145TC			NP490033-ALU
34	Motor Bolt IEC 100	4*	4*	W770534-188
	Motor Bolt NEMA 56c,145TC			W770424-188
35	Oil Seal	1	1	NP450001-NTR
36	Motor Adaptor	1	1	NP490032-ALU
37	Motor Adaptor Top Screw	4	4	W770534-188
38	Motor Adaptor Bottom Screw	4	4	W770541-188
39	Motor Adaptor O-ring	1	1	NP440147-NTR
40	Input Shaft Adjustment Nut	1	1	NP410089-STL
41	Bearing	2	2	NP400002-000

ITEM	DESCRIPTION	DUP QTY	SPX QTY	PART NUMBER
42	Worm 8:1	1	1	NP060041-008
	Worm 10:1			NP060041-010
43	Worm Bottom Bearing	1	1	NP400058-000
44	Gear Bearing	1	1	NP400055-BRS
45	Gear 8:1	1	1	NP060040-003
	Gear 10:1			NP060040-000
46	Gear Set Screw	1	1	NP991004-014
47	Eccentric Rider Bearing	1	1	NP400056-000
48	Cam	1	1	NP200028-IRN
49	Outer Shaft	1	1	NP410091-STL
50	Plunger	2	2	NP070024-STL
51	Inner Shaft	1	1	NP410088-STL
52	Washer	1	1	NP999099-STL
53	Bearing Retention Screw	1	1	NP999098-STL
54	Eccentric Shaft Bearing	1	1	NP400057-000
55	Side Cover Shim	**	**	NP470061
56	Side Cover O-ring	1	1	NP440255-NTR
57	Side Cover	1	1	NP250093-IRN
58	Side Cover Bolt	4	4	NP990448-188
59	Stroke Adj. Lock Assy.	1	1	NP260024-STL
60	Side Cover Label	1	1	NP550138-000
61	Detent Ball	1	1	NP999095-STL
62	Detent O-ring	1	1	NP440005-NTR
63	Bearing Snap Ring	1	1	NP999032-STL
64	Stroke Adj. Shaft O-ring	1	1	NP440227-NTR
65	Stroke Adj. Shaft	1	1	NP410092-STL
66	Roll Pin	2	2	NP999105-STL
67	Knob Shim	**	**	NP470062
68	Stroke Adj. Knob	1	1	NP260013-GPC
69	Knob Screw	1	1	NP999104-STL
70	Knob Cover	1	1	NP999092-NYL

Note:

* - Not required when using an IEC 90 frame motor.
** - Use as needed to maintain proper fit per assembly instructions.

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

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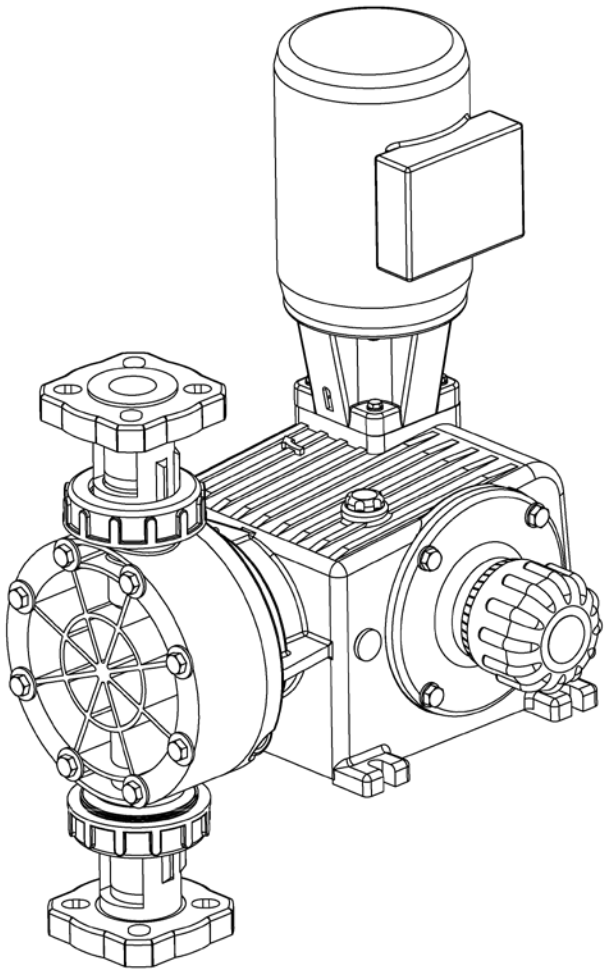
IOM GLM DM7
BILL OF MATERIALS

DRAWN BY:	BNL		AN00476
DATE:	10/23/06		



PULSA® GLM

MECHANICAL DIAPHRAGM METERING PUMP

Bulletin: IOM-GLM-5000-Rev.B

PULSAFEEDER® ENGINEERED PRODUCTS

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