MILTON ROY

Instruction Manual

Series G Model “M” Pump

GM.MR.ENG.339-0080-000.09/2023

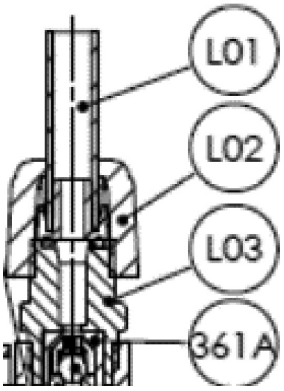
GM Series Injection Valve & Foot Valve Installation

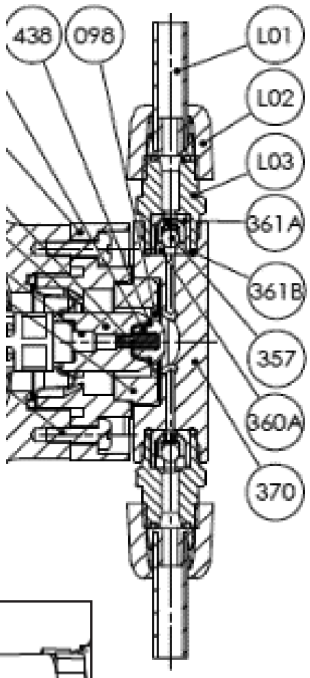
1. The injection valve and foot valve are not standard configuration, and will be used in special application. pressure cap (8.03) can’ t be disassembled from lock ring (8.02) and bushing (8.01) assembly, only when connect with tubing(P), press fitting pressure cap to check valve assembly.

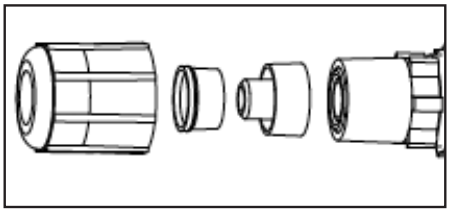
2. Assembly 7 and series 1~6 parts are assembled as component. Assembly 8 (contain 8.1~8.3) are delivered as completely knock down.

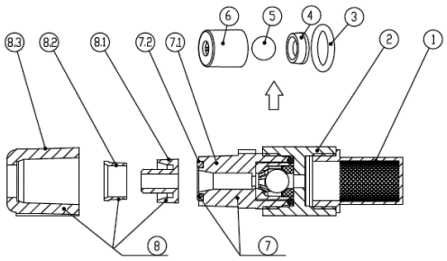
3. Put tubing P across pressure cap (8.03) and lock ring (8.02), connect to bushing (8.01), then tighten pressure can to check valve body.

4. Replacement of pressure cap (8.03) and lock ring (8.02) and bushing (8.01) as assembly when need to disassembled or change tubing.

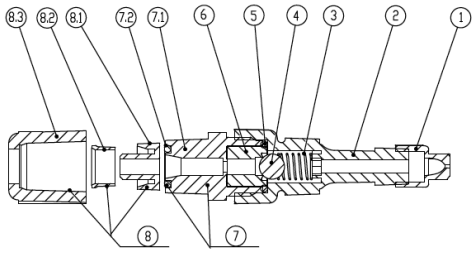


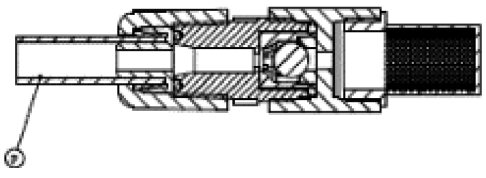




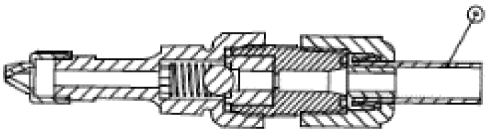


Before connect to tubing





After connect to tubing



Note

- Sulfuric acid, nitric acid and other strong acid material, strong recommend to use PE hose, and regular inspection, changing in time when hose is aging and damaged.

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LIST OF ILLUSTRATIONS

SECTION 1 DESCRIPTION

1.1 GENERAL INFORMATION

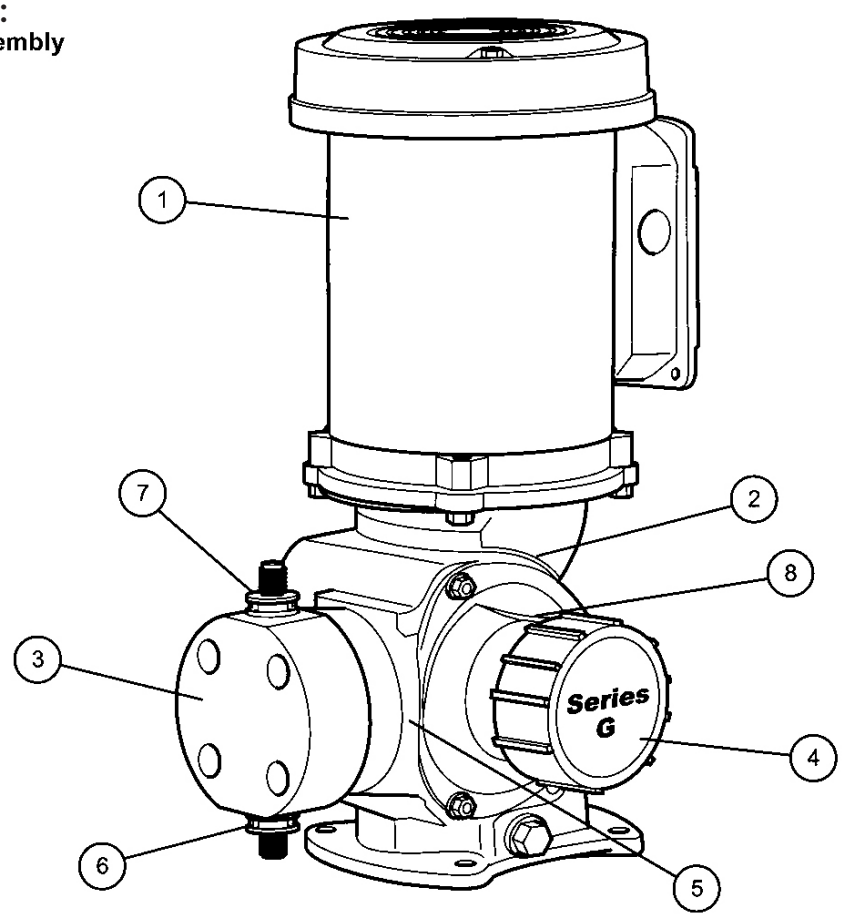
The Series G Model M is a reciprocating, chemical dosing pump capable of producing flows up to 500 liters per hour at pressures up to12 Bar. These pumps feature a mechanically actuated diaphragm Iiquid end, which eliminates the need for flow-restricting contour plates, and a stroke adjustment mechanism based on the variable eccentric principle instead of the traditional lost-motion design. It is designed for industrial service and offers an accuracy of ±1.5% of full rated flow between 10% and 100% of its flow range.

The basic pump components as illustrated in Figure 1-1 are:

a drive device comprising a motor (1)
a mechanical assembly (2)
a liquid end (3)

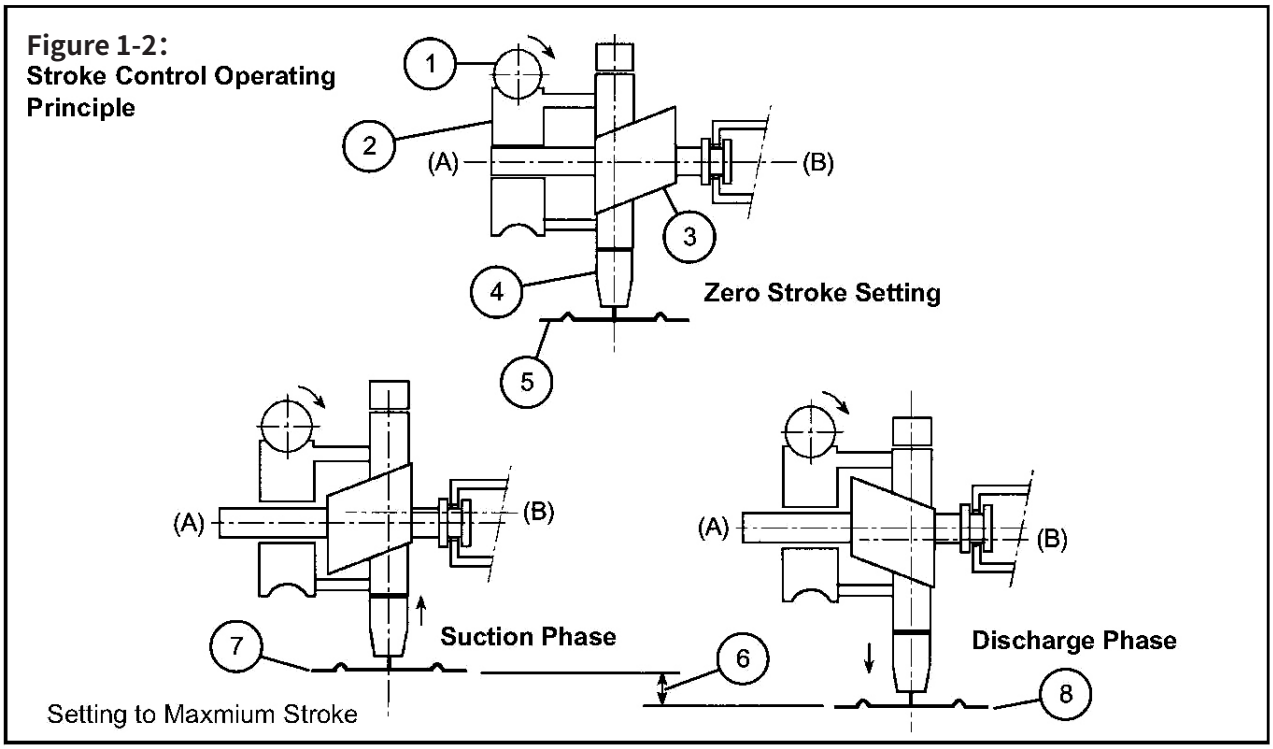
An elastomeric bellows provides an Ieak-tight seal between the mechanical assembly and the liquid end.

Figure 1-1:
Pump Assembly



1	Motor	5	Liquid End Mounting Assembly
2	Mechanical Assembly	6	Check Valve Assembly (Suction)
3	Liquid End	7	Check Valve Assembly (Discharge)
4	Stroke Adjustment Knob	8	Stroke Lock Knob

Figure 1-2:
Stroke Control Operating Principle



1	Worm	5	Diaphragm
2	Worm Gear	6	Stroke: two times the distance between (A) and (B)
3	Eccentric	7	Position at rear neutral point
4	Connecting Rod	8	Position at forward neutral point

Capacity adjustment is manually controlled by a stroke adjustment knob (4).

1.2 PRINCIPLES OF OPERATION DRIVE ASSEMBLY(SEE FIGURE 1-2)

The pump consists of two major assemblies; the drive and the liquid end. Pump delivery is a function of the drive's stroke rate, liquid end size and stroke length. Stroke length can be increased while the pump is running by counterclockwise turning of the stroke adjustment knob. The drive assembly works on the principle of a variable eccentric. The rotational motion of the motor is transmitted by the worm (1) to the worm gear(2) which is linked to an eccentric system (3). The eccentric system then converts the rotary gear motion into linear reciprocating motion of the connecting rod(4). At 0% capacity setting, the connecting rod axis (B) is aligned with the gear axis (A) and no movement of the connecting rod takes place. At 100% capacity setting, an eccentricity exists between the connecting rod axis (B) and the gear axis (A) which results in linear movement of the connecting rod and resulting pumpage.

Mechanically Actuated Diaphragm Liquid End(See Figure 1-2)

The diaphragm assembly (5) is mechanically linked to the connecting rod (4) and has the same reciprocating motion. As the diaphragm starts back on the suction stroke, the pressure immediately drops inside the liquid end. When the pressure in the liquid end drops below the suction line pressure, the suction ball check is "pushed" upward and the process fluid in the suction line flows into the liquid end chamber (diaphragm head). When the suction stroke ends, the diaphragm movement momentarily stops and the pressure in the liquid end equalizes with the pressure in the suction line causing the suction ball check to reseat.

NOTE: *It is important that the pressure in the liquid end remain above the vapor pressure of the process fluid during the suction stroke. If the fluid pressure drops below the vapor pressure, cavitation will occur which will have a negative impact on the performance of the pump. If you suspect the possibility of*

cavitation, contact your dealer for assistance.

As the diaphragm starts forward on the discharge stroke the pressure immediately rises inside the liquid end. When the liquid end pressure rises above the discharge line pressure; the discharge ball check is "pushed" upward and the process fluid in the liquid end flows into the discharge line. When the discharge stroke ends, the diaphragm momentarily stops again. The pressure in the liquid end equalizes with the discharge line pressure and the discharge ball check reseats. The cycle then starts again.

1.3 GENERAL SPECIFICATIONS

FLOW RATE:
Up to 500 L/H (depending on pump code)

PRESSURE:
Up to 12 BAR (depending on pump code)

LIQUID END TYPE:
Mechanically Actuated Diaphragm

DRIVE TYPE:
Variable Eccentric

STEADY STATEACCURACY:
±1.5% of pump full rated capacity between 10% and 100% of rated capacity.

CAPACITY ADJUSTMENT:
Lockable stroke adjustment knob is adjustable from 0% to 100% while pump is running.

LUBRICATION:
Drive is lubricated in an oil bath (Oil model refer to chapter 3.1).

TEMPERATURE:
Ambient and Liquid:
40 °C Maximum
-10 °C Minimum

SUCTION LIFT:
2 meters of water column maximum
11.5 psia minimum internal pressure(3.2 psi maximum Vacuum)

SECTION 2 INSTALLATION

2.1 UNPACKING

Pumps are shipped f.o.b. factory or representative warehouse and the title passes to the customer when the carrier signs for receipt of the pump. In the event that damages occur during shipment, it is the responsibility of the customer to notify the carrier immediately and to file a damage claim. Carefully examine the shipping crate upon receipt from the carrier to be sure there is no obvious damage to the contents. Open the crate carefully so accessory items fastened to the inside of the crate will not be damaged or lost. Examine all material inside the crate and check against packing list to be sure that all items are accounted for and intact.

2.2 STORAGE

Short Term Storage (Less than 6 Months)

It is preferable to store the material under a shelter in its original package to protect it from adverse weather conditions. In condensing atmospheres follow the long term storage procedure.

Long Term Storage (Longer than 6 Months)

The primary consideration in storage of pump equipment is to prevent corrosion of external and internal components. This corrosion is caused by natural circulation of air as temperature of the surroundings change from day to night, day to day, and from season to season. It is not practical to prevent this circulation which carries water vapor and other corrosive gasses, so it is necessary to protect internal and external surfaces from their effects to the greatest extent possible.

When the instructions given in this section are completed, the equipment is to be stored in a shelter; protected from direct exposure to weather. The prepared equipment should be covered with a plastic sheet or a tarpaulin, but in a manner which will allow air circulation and prevent capture of moisture. Equipment should be stored 12 inches or more above the ground.

If equipment is to be shipped directly from the factory into long term storage, contact the factory to arrange for factory preparation.

Pump Drive

1. Remove motor and flood the gearbox compartment (ltem 2 in Figure 1-1) with a high grade lubricating oil/rust preventative such as Mobile Oil Corporation product Mobilarma 524. Fill the compartment completely to minimize air space and water vapor condensation. After storage, drain this material and refill the equipment with the recommended lubricant for equipment commissioning.

2. Brush all unpainted metal surfaces with multipurpose grease (NLGI grade 2 or 3). Store these unattached.

Electrical Equipment

1. Motors should be prepared in the manner prescribed by their manufacturer. If information is not available, dismount and store motors as indicated in step 3 below.

2. Dismount electrical equipment (including motors) from the pump.

3. For all electrical equipment, place packets of Vapor Phase Corrosion Inhibitor (VPCI) inside of the enclosure, then place the entire enclosure, with additional packets, inside a plastic bag. Seal the bag tightly.

LE Material	GM0002~GM0050				GM0090~GM0500			
	Conn.Code	A	B	C	Conn.Code	A	B	C
PVC	6x12	108	104	250	DN15	127	148	320
PVDF	6x12				NPT 1/2"F			
PP	NPT 1/4"M	72						
316SS	NPT 1/2"F	102			NPT 1/2"F	131		

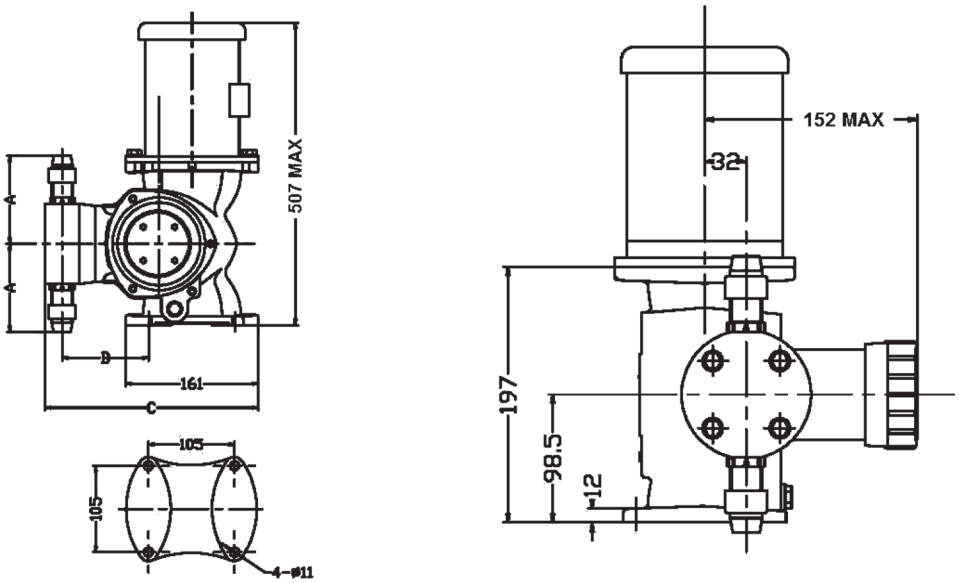


Figure 2-1:
Series G Model M
Dimensional Outline

2.3 SAFETY PRECAUTIONS

WARNING

WHEN INSTALLING, OPERATING, AND MAINTAINING THIS PUMP, KEEP SAFETY CONSIDERATIONS FOREMOST. USE PROPER TOOLS, PROTECTIVE CLOTHING, AND EYE PROTECTION WHEN WORKING ON THE EQUIPMENT AND INSTALL THE EQUIPMENT WITH A VIEW TOWARD ENSURING SAFE OPERATION. FOLLOW THE INSTRUCTIONS IN THIS MANUAL AND TAKE ADDITIONAL SAFETY MEASURES APPROPRIATE TO THE LIQUID BEING PUMPED. BE EXTREMELY CAREFUL IN THE PRESENCE OF HAZARDOUS SUBSTANCES (E.G., CORROSIVES, TOXINS, SOLVENTS, ACIDS, CAUSTICS, FLAMMABLES, ETC.).

CAUTION

THE PERSONNEL RESPONSIBLE FOR INSTALLATION, OPERATION AND MAINTENANCE OF THIS EQUIPMENT MUST BECOME FULLY ACQUAINTED WITH THE CONTENTS OF THIS MANUAL.

ANY SERVICING OF THIS EQUIPMENT MUST BE CARRIED OUT WHEN THE UNIT IS STOPPED AND ALL PRESSURE HAS BEEN BLED FROM THE LIQUID END. SHUT-OFF VALVES IN SUCTION AND DISCHARGE SIDES OF THE LIQUID END SHOULD BE CLOSED WHILE THE UNIT IS BEING SERVICED. ACTIONS SHOULD BE TAKEN TO ELIMINATE THE POSSIBILITY OF ACCIDENTAL START-UP WHILE SERVICING IS TAKING PLACE. A NOTICE SHOULD BE POSTED BY THE POWER SWITCH TO WARN THAT SERVICING IS BEING CARRIED OUT ON THE EQUIPMENT. SWITCH OFF THE POWER SUPPLY AS SOON AS ANY FAULT IS DETECTED DURING OPERATION (EXAMPLES: ABNORMALLY HIGH DRIVE TEMPERATURE, UNUSUAL NOISE, DIAPHRAGM FAILURE).

2.4 MOUNTING

Support the pump firmly in a level position on a solid, vibration-free foundation. The pump should preferably be positioned with the base above floor level to protect the pump from wash downs and to provide easier access for service. Be sure to allow enough space around the pump for easy access during maintenance operations and pump adjustments.

The pumps are provided with mounting holes to accommodate anchor bolts. Refer to Figure 2-1 for mounting hole dimensions.

Pumps installed outdoors should be protected by a shelter.

2.5 DRIP COLLECTION

In the event of a failure of the diaphragm or oil seal bellows, provisions need to be made to contain the process fluid or pump oil. This is particularly important when handling fluids which may be harmful to plant personnel.

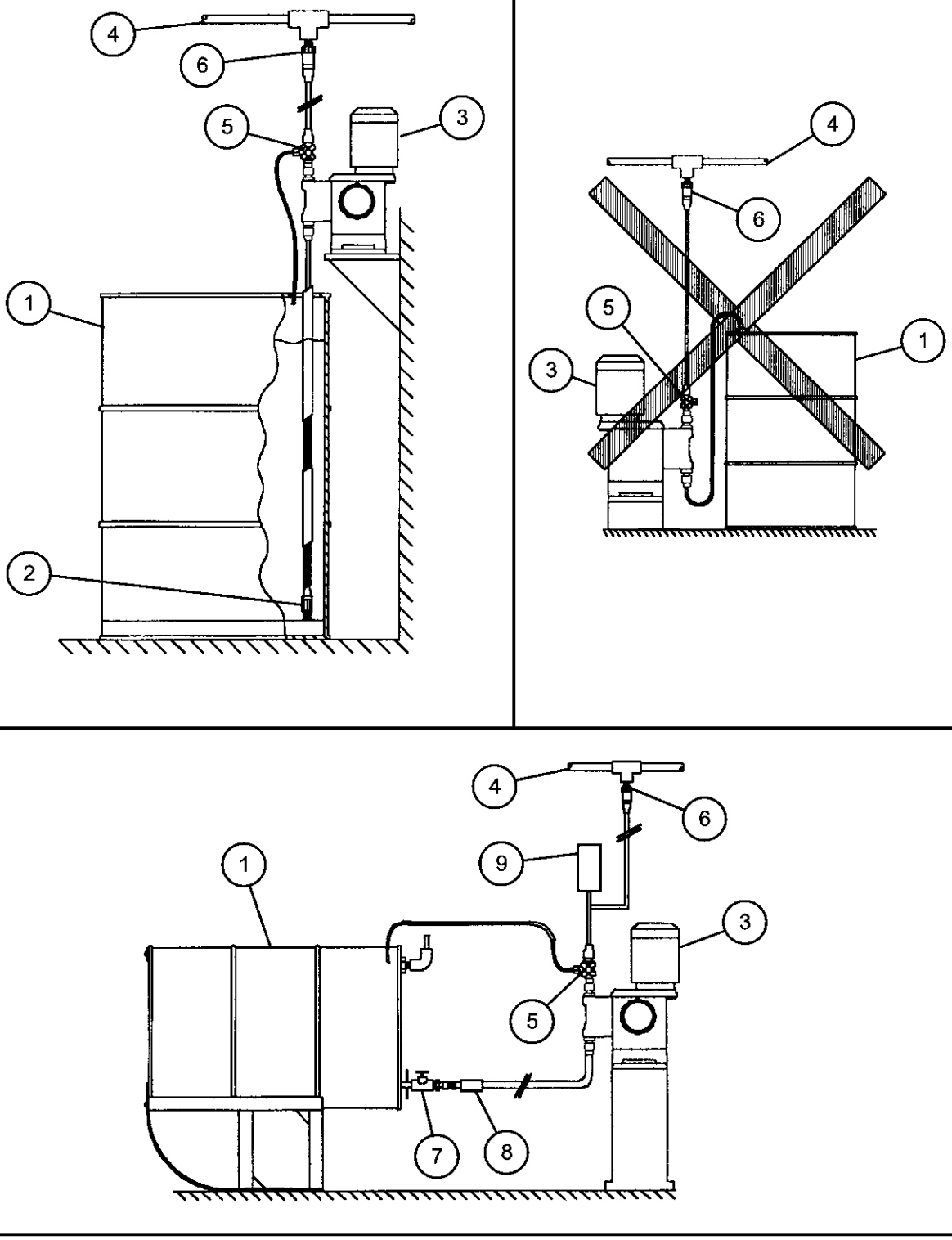
To collect fluid in the event of a diaphragm or oil seal rupture, (See Figure 1-1) position a tray under the plain hole located at the bottom of the liquid end mounting assembly (5). For GM0090 ~ GM0500 pumps, position tray under tube fitting located at bottom of liquid end mounting assembly. Alternatively, a tube may be installed onto this tube fitting to drain any leakage to a suitable container.

2.6 INSTALLATION

Figure 2-2 displays typical installations (both correct and incorrect). Figure 2-3 illustrates the recommended piping and accessories in a metering pump installation.

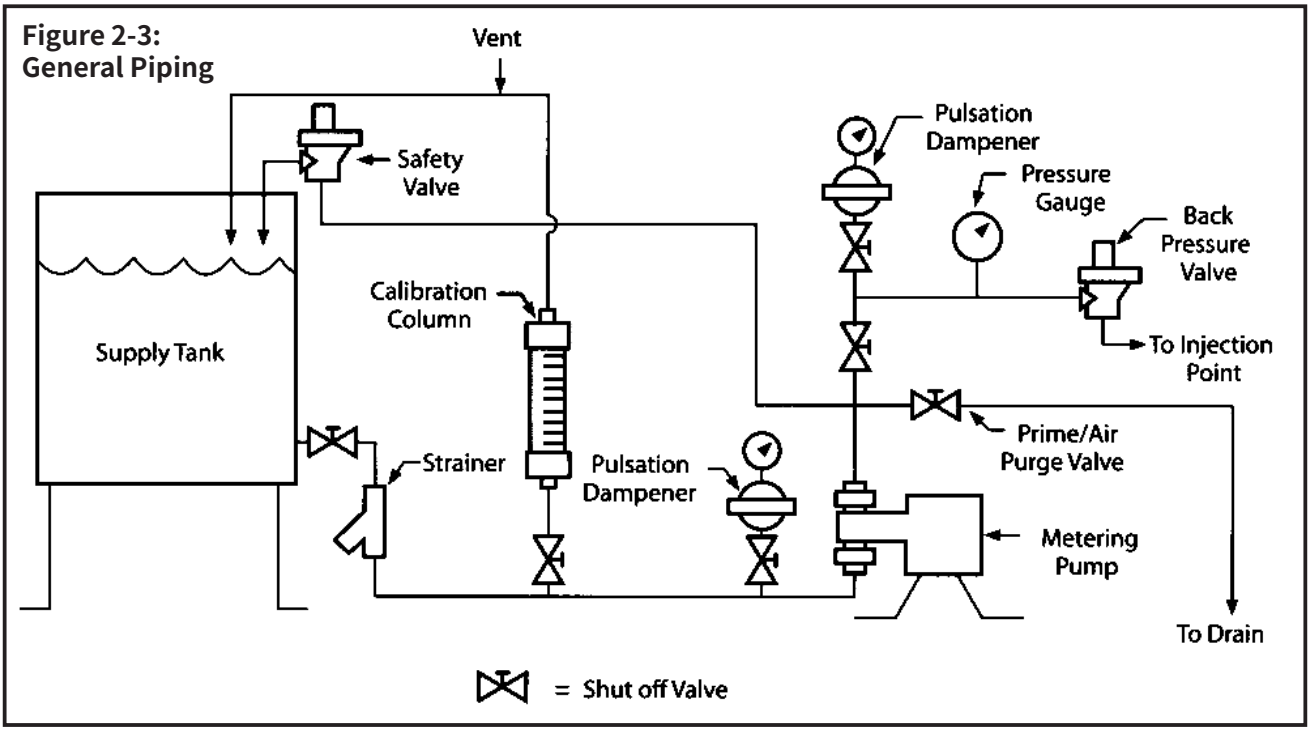
As illustrated in the upper right portion of Figure 2-2, there must be no swan-necks or stagnant volumes in the suction line. In this illustration, the loop at the top of the tank forms an air trap. Eventually, air or gases will bubble out of solution and accumulate in the trap leading to a loss of prime condition.

Figure 2-2:
Typical Installation



1	Tank	6	Injection Nozzle
2	Foot Valve (with Filter)	7	Shut-off Valve
3	Metering Pump	8	Filter
4	Process Piping	9	Pulsation Damper
5	Bleed Valve	-	-

Figure 2-3:
General Piping



2.6.1 NPSH CONSIDERATIONS

Size piping to accommodate peak instantaneous flow. Because of the reciprocating motion of the pump diaphragm, peak instantaneous flow is approximately equal to 3.14 times the average flow. For example, a pump rated for 100 L/hr per hour requires piping sufficient for 3.14 x 100 L/hr (314 L/hr.).

To minimize viscous flow losses when handling viscous liquids, it may be necessary to use suction piping up to four times larger than the size of the suction connection on the pump. If in doubt, contact your dealer to determine the necessary pipe size.

2.6.2 GENERAL PIPING CONSIDERATIONS

Use extreme care in piping to plastic liquid end pumps with rigid pipe such as PVC. If excessive pipe stress or vibration is unavoidable, flexible connections are recommended.

Use piping materials that will resist corrosion by the liquid being pumped. Use care in selecting materials to avoid galvanic corrosion at pump liquid end connections.

Use piping heavy enough to withstand maximum pressures. Remove burrs, sharp edges, and debris from inside piping. Blow out all pipelines before making final connections to pump.

Because vapor in the liquid end will cause inaccurate pump delivery, piping should be sloped up from pump suction check to the supply tank to prevent formation of vapor pockets.

When pumping suspended solids (such as slurries), install plugged crosses at all 90°line turns to permit line cleaning without dismantling piping.

See Figure 2-3 for a typical recommended pump installation scheme.

2.6.3 SUCTION PIPING CONSIDERATIONS

It is preferable to have the suction of the pump flooded by locating the liquid end below the lowest level of the liquid in the supply tank.

To minimize the chances of a loss-of-prime condition, the pump should be installed as close as possible to the supply vessel.
Avoid negative suction pressure conditions (suction lift), as such conditions adversely affect metering accuracy. A lift of 2 meters of water column is the maximum permissible suction lift.

Series G pumps are designed to operate with process liquid supplied at or above atmospheric pressure. Although these pumps can move liquids supplied at less than atmospheric pressure (suction lift), in these negative pressure applications it is important that all connections be absolutely drip free and vacuum tight, and that a foot valve be installed at the bottom of the suction line (see upper left illustration of Figure 2-2).

When pumping a liquid near its boiling point, provide enough suction head to prevent the liquid from "flashing" into vapor when it enters the pump liquid end on the suction stroke.

If possible, use metal or plastic tubing for the suction line because tubing has a smooth inner surface and can be formed into long, sweeping bends to minimize frictional flow losses.

A strainer should be used in the suction line to prevent foreign particles from entering the liquid end. This and any other measures which prevent debris from entering and fouling the liquid end check valves will give increased maintenance-free service. Check strainer frequently to prevent blockage which could lead to cavitation. Keep suction piping as short and straight as possible.

Piping size should be larger than the liquid end suction fitting to prevent pump starvation.

If long suction lines are unavoidable, install a stand pipe near the pump in the suction line.

Suction piping must be absolutely airtight to ensure accurate pumping. After installation, test suction piping for leaks with air and soap solution.

2.6.4 DISCHARGE PIPING CONSIDERATIONS

Install pipe large enough to prevent excessive pressure losses on the discharge stroke of the pump. Maximum pressure at the discharge fitting on the liquid end must be kept at or below the rated pressure (shown on the pump nameplate).

The pump will not deliver a controlled flow unless the discharge line pressure is 10 psi greater than the suction line pressure. One way to create an artificial pressure is the installation of a back pressure valve. (Please contact your dealer for recommendations to increase back pressure in slurry applications).

When pumping water treatment chemicals directly into boiler drums, use one liquid end assembly for each boiler drum. Discharging into a manifold having the slightest pressure difference between its several discharge connections can diminish metering accuracy as the outlet with the lowest pressure will receive more liquid than the other outlets.

2.7 VALVES

Back Pressure Valves

All metering pumps are prone to overpumping (excessive output) at low discharge pressures. To prevent this condition from occurring, it is necessary to maintain approximately 10 psi (0.7 bar) back pressure against the pump. This can be accomplished through the installation of a back pressure valve in the discharge line. Typically, the valve should be located near the pump. However, back pressure valves for large pumps with long and extremely small discharge lines may have to be installed near the point of discharge into the process (to minimize siphoning tendencies).

Pulsation Dampeners

An accumulator, surge chamber, surge suppressor, or pulsation dampener should be used with the back pressure valve in the discharge line to absorb the flow peaks between the pump and the back pressure valve. Without the pulsation dampener the valve mechanism will snap open and closed with the surge from each pump stroke. The pulsation dampener will allow the back pressure valve to oscillate about a partly-closed position, thus minimizing wear on the valve. Discharge line pulsation dampeners offer the further advantage of limiting the flow and pressure variations characteristic of this kind of pump. Installing a properly sized pulsation dampener will improve pump performance and may reduce system costs dramatically by permitting the substitution of smaller piping. Please contact your dealer for further information on pulsation dampeners.

Safety Valves and Priming Valves

Motor-driven positive displacement pumps can develop excessive discharge pressure long before thermal overload devices interrupt the motor electrical circuit. To prevent a blocked discharge line from causing damage to the pump, piping, or process equipment, install a safety valve in the pump discharge line. This valve is designed and sized to handle system flow rates and pressures safely while resisting corrosion by the process liquid.

To aid in pump start-up, it is advisable to install a priming valve on the discharge side of the liquid end.

Shut-off Valves

Provide shut-off valves in both suction and discharge lines next to the pump. Locate discharge line shut-off valve downstream from the inlet connection of the safety valve. Figure 2-3 shows recommended valve locations.

2.8 ELECTRICAL CONNECTIONS

CAUTION

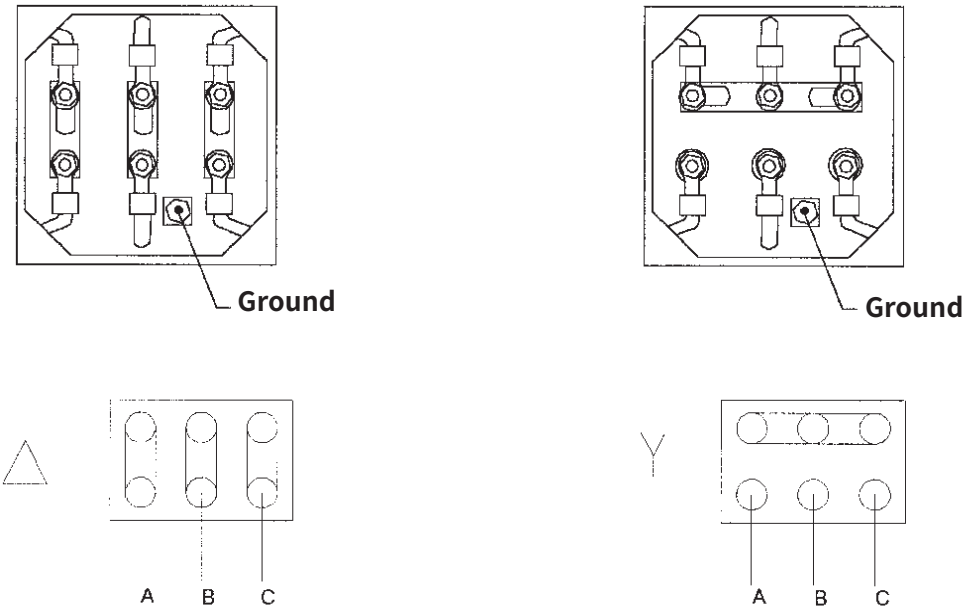
OPERATION WITH THE WRONG MOTOR ROTATION MAY DAMAGE THE PUMP AND MOTOR AND VOID THE WARRANTY.
DO NOT FORGET TO CONNECT THE EARTH TERMINAL ON THE MOTOR TO THE EQUIPMENT EARTH CONDUCTOR.

Ensure that the electrical supply matches the pump motor nameplate characteristics. Connect the motor in accordance with the instructions and connection diagrams on the motor (or in the motor terminal box).

Note: *Before operating the pump, check the direction of rotation of the motor to be sure it matches the direction of the arrow on the motor fan cover (rotation should be clockwise when viewed from the top of the motor).*

The electrical protection installed for the motor (fuse or thermal protection) must be suitable for the motor's rated current.

Figure 2-4:
Terminal Connection for 3-Phase Electrical Motor



230V Delta Connection

380V Star Connection

SECTION 3 OPERATION

3.1 START-UP PROCEDURES AND CHECKS

Check that the pump is secured to its support.

If oil was previously removed for any reason, make sure pump drive has the correct volume (650 ml) of oil as below:

Recommendation oil:

	Surround Temp.>-5 °C	Surround Temp.-10 °C to -5 °C
Model	MOBILGEAR 600 XP 220	MOBILGEAR 600 XP 68
	Great Wall L-CKD220	

Note: Equivalent oil of other brand is allowed.

Caution: Pump is required to stop running providing the surround temperature is below -10°C.

Make sure all isolation valves installed on the suction and discharge lines are open. If the discharge line is equipped with an injection nozzle or a back-pressure valve, open the priming valve for discharge (if there is no priming valve, disconnect the discharge pipe). This allows for verification that liquid is present in the liquid end when the pump is installed in flooded suction condition. If the pump is installed in a suction lift condition, this allows for priming of the pump during start-up.

Make sure that pump is set at 0% capacity.

3.2 CHECKING THE ELECTRICAL CONNECTION OF THE MOTOR

Start up the pump to check the motor's direction of rotation. It must comply with that indicated by the arrow marked on the motor mount flange of housing (counter clockwise as viewed from the top of the motor). If the rotation is incorrect, refer to Section 2.8 Electrical Connections.

3.3 START-UP

Once all the checks and procedures described above have been carried out, start the pump.

Conduct a visual and audio check of the pump (in particular, listen for the presence of any "suspicious" noises).

Make sure that the stroke adjustment knob is unlocked.

Gradually increase the capacity until liquid can be seen flowing from the priming valve. If no priming valve is in place, when the liquid end is primed, the discharge check valves can be heard to be operating (should hear a clicking noise caused by movement of check valve balls). When liquid end is primed, stop the pump and close the priming valve.

Adjust the pump to the desired capacity. Lock the stroke adjustment knob (Item 320 in Figure 5-2).

3.4 CAPACITY CALIBRATION

After the first 12 hours of operation, the pump may be tested and calibrated to find the exact pump capacity under specific operating conditions. Usually, calibrating the pump at only 100, 50, and 10 percent capacity settings is enough to Indicate pump performance through-out the adjustment range.

The pump can be calibrated by measuring the decrease in liquid level pumped from a calibrated vessel. This method is recommended for hazardous liquids because it eliminates operator contact with the liquid. Calibration columns are available for convenient and accurate calibration of the pump. Contact your dealer for more information.

WARNING

THIS METHOD IS GENERALLY NOT RECOMMENDED AS IT MAY EXPOSE OPERATING PERSONNEL TO HAZARDOUS LIQUIDS. FURTHERMORE, IF NO BACK PRESSURE IS PRESENT ON THE DISCHARGE SIDE, THE PUMP MAY OVER-PUMP DRAMATICALLY IN WHICH CASE THE POSITION OF THE CAPACITY ADJUSTMENT KNOB MAY HAVE LITTLE EFFECT ON ACTUAL FLOW RATE.

WARNING

FOR SAFETY REASONS, A CHECK VALVE IS RECOMMENDED FOR USE IN THE DISCHARGE LINE NEAR THE POINT WHERE THE LINE ENTERS A HIGH-PRESSURE PROCESS VESSEL.

The pump can also be calibrated by collecting and measuring pumped liquid at the pump discharge port. It may be necessary to create backpressure at the collection point to allow for proper pump operation (see Section 2.7 Back Pressure Valves for recommendations).

SECTION 4 MAINTENANCE

4.1 PREVENTATIVE MAINTENANCE

Drive

Initially, change the oil in the pump drive assembly after the first 1000 hours of operation. Thereafter, change drive oil on an annual basis or after every 5000 hours of operation.

Drive oil: MOBILGEAR 600 XP 220 or Great Wall L-CKD220 (Surround Temp > -5 °C), Qty: 650ml
Viscosity @ 40°C = 209 cSt
Viscosity Index = 95
ISO Grade =220

Diaphragm Assembly

The Series G Model M diaphragm should be replaced annually or every 5000 hours of operation to avoid the possibility of failure. Refer to the instructions in Section 4.6 Diaphragm and Oil Seal Bellows Replacement.

Oil Seal Bellows

The Series G Model M oil seal bellows should also be replaced annually. Oil seal bellows replacement requires the removal of the diaphragm assembly, so it is recommended that the oil seal and diaphragm assembly be replaced at the same time. Refer to the instructions in Section 4.6 Diaphragm and Oil Seal Bellows Replacement.

Check Valves

As in the case of the diaphragm, Milton Roy Company recommends that check valve balls, seats, gaskets, and O-rings be replaced on an annual basis or every 5000 hours of operation. If highly corrosive material (acids, slurries, etc.) is being pumped, more frequent replacement may be required. Complete instructions for replacement of worn check valves are given in Section 4.5 Corrective Maintenance.

4.2 RETURNING PUMPS TO THE FACTORY FOR REPAIR

Pumps can not be accepted for repair without a Return Material Authorization. Pumps should be clearly labeled to indicate the liquid being pumped. Process liquid should be flushed from the pump liquid end and oil should be drained from the pump housing before the pump is shipped.

> ***Note:*** *A completed Material Safety Data Sheet (MSDS) must be packed in the shipping crate with any pump shipped for repair. These safety precautions will aid the troubleshooting and repair procedure and preclude serious injury to repair personnel from hazardous residue in pump liquid end. A Materials Safety Data Sheet must accompany all re-turns.*

All inquiries or parts orders should be addressed to your local representative or distributor.

4.3 ROUTINE MAINTENANCE

Milton Roy Series G pumps are carefully designed, manufactured, assembled, and quality tested to give reliable service with minimal maintenance. However, a weekly maintenance check is recommended to confirm proper operation of the pump.

Visual Check of Seal Integrity of Mechanical Assembly

Check for leaks in the following components. If leaks exist, contact the factory for assistance.
1. Motor flange: If leaking, replace motor flange sealing gasket (Item 11 in Figure 5-2).
2. Stroke adjustment knob: If leaking, replace stroke adjustment seal (Item 160 in Figure 5-2).

Checking the Pump Capacity

Assuming the pump has been calibrated as described in Section 3, the capacity can be checked by shutting the valve from the supply vessel and opening the valve from the calibration column to the suction side of the liquid end. Measure the volume of pumped liquid for a given period of time at the various settings.

If a Calibration column is not installed in the suction piping, place the foot valve (or suction line) in a calibrating chamber (graduated reservoir). Measure the volume of pumped liquid for a given period of time at the various settings.

Occurrence of Leak From Detection Ports

Determine whether the product collected at the detection port in the liquid end mounting assembly is lubricating oil or the pumped fluid.
If the product is pumped fluid, the diaphragm has failed. If the product is lubricating oil, the oil seal bellows has failed. Proceed with its replacement (see Section 4.6 Diaphragm and Oil Seal Bellows Replacement).

4.4 SPARE PARTS

The following spare parts should be stocked for each pump to prevent serious delays in repairs.

Parts orders must include the following:

1.Quantity required
2.Part number
3.Part description
4.Pump serial number (found on nameplate)
5.Pump product code (found on nameplate)

Note: *Always include the serial number and product code in all correspondence regarding the unit*

4.4.1 GM0002~GM0050 LIQUID ENDS-PVC AND PVDF

1 each, Diaphragm Assembly
1 each, Oil Seal Bellows
1 each, Suc../Dis. Cartridge Valve Assembly

4.4.2 GM0002~GM0050 LIQUID ENDS-STAINLESS STEEL

1 each, Diaphragm Assembly
1 each, Oil Seal Bellows
2 each, Ball Check D. 9.52

2 each, Ball Check D. 14
4 each, O-rings

Note: *Liquid end sizes GM0002~GM0050 metallic check valves are precision assembled at the factory. Do not attempt to disassemble these cartridges.*

4.4.3 GM0090~GM0500 LIQUID ENDS-PVC AND PVDF

1 each, Diaphragm Assembly
1 each, Oil Seal Bellows
2 each, Seat, Ball Check
4 each, O-rings

4.4.4 GM0090~GM0500 LIQUID ENDS-STAINLESS STEEL

1 each, Diaphragm Assembly
1 each, Oil Seal Bellows
2 each, Ball Check D.14
2 each, Ball Check D.22
4 each, O-rings

4.5 CORRECTIVE MAINTENANCE

WARNING

BEFORE CARRYING OUT ANY SERVICING OPERATION ON THE PUMP OR PIPING, DISCONNECT ELECTRICAL POWER FROM THE PUMP, AND TAKE THE NECESSARY STEPS TO ENSURE THAT ANY HARMFUL LIQUID CANNOT COME INTO CONTACT WITH PERSONNEL. SUITABLE PROTECTIVE EQUIPMENT MUST BE PROVIDED. BE SURE THAT THERE IS NO FLUID PRESSURE IN THE PUMP LIQUID END AND PIPING.

Cleaning Fouled Check Valves

Check valve assemblies are designed to be self-cleaning and should seldom need servicing. Fouled check valves can usually be cleaned by pumping a solution of mild detergent and warm water (if compatible with liquid being pumped) for 15 minutes, followed by flushing with water.

Check Valve Replacement General

Before beginning work on the valve assemblies, make sure the suction and discharge shut-off valves are closed and that pressure has been bled from the pump liquid end. When replacing the valves, be sure to replace the valve O-rings. Pay close attention to the proper assembly and orientation of the check valves as shown in each Liquid End figure. In the case of plastic check valves for liquid end size GM0090~GM0500, be certain that the ball is placed on the sharp edge of the valve seat.

CAUTION

BE SURE TO FOLLOW INSTRUCTIONS CAREFULLY AND REFER TO THE APPRO-PRIATE FIGURE WHEN

REASSEMBLING CHECK VALVES. IF CHECK VALVE CARTRIDGES ARE INSTALLED INCORRECTLY, ONE OF THE FOLLOWING WILL OCCUR:

(A) IMMEDIATE AND SEVERE DAMAGE TO PUMP MECHANISM.
(B) NO PUMPING OF FLUIDS.
(C) REVERSE PUMPING ACTION (FROM DISCHARGE LINE INTO SUCTION LINE).

Preliminary Operations

1. Set the pump capacity knob to 0%. If stroke locking screw (Item 320 in Figure 5-2) was previously tightened, slightly loosen the locking screw.
2. Disconnect power to pump motor. Check that the equipment cannot be accidentally started. Place a notice at the location of the power switch indicating that the pump is being serviced.
3. Disconnect the pump hydraulically by removing pipe or tubing connections to suction and discharge check valves.

4.5.1 CHECK VALVE ASSEMBLIES REPLACEMENT:LIQUID ENDS GM0002~GM0050-PVC AND PVDF (SEE FIGURE 5-3 OR 5-7)

CAUTION

IMPROPER BALL AND SEAT INSTALLATION CAN CAUSE DAMAGE TO THE PUMP. SEE FIGURE 5-3 OR 5-6 FOR PROPER BALL AND SEAT ORIENTATION FOR BOTH THE SUCTION AND DISCHARGE VALVES

CAUTION

DO NOT APPLY PTFE TAPE TO THE THREADS OF CHECK VALVE BODY THAT SCREWS INTO THE HEAD. AS THIS MAY PREVENT ADEQUATE SQUEEZE FROM BEING APPLIED TO THE VALVE O-RING WHICH COULD RESULT IN LEAKAGE.

1. Unscrew the valve body (360) from the pump head (370).

2. Remove the cartridge valve assembly: cartridge includes ball (357), seat (360A), cartridge (361A), O-ring (361B), and washer (361).

3. Clean the valve body (360) and threaded port in the head (370).

4. Press a new washer (361) into valve body (360).

5. Install new check valve assembly in orientation shown.

On discharge side, drop the discharge valve assembly into threaded port in head. The O-ring should be stretched around outside of cartridge on same end as ball seat. Screw valve body into discharge side of diaphragm head until valve is hand tight. DO NOT OVERTIGHTEN.

On suction side, drop the suction valve assembly into check valve body. The O-ring should be stretched around outside of cartridge on opposite end of ball seat. Screw the suction valve body with cartridge valve into suction side of head. DO NOT OVERTIGHTEN.

4.5.2 CHECK VALVES REPLACEMENT: LIQUID END GM0002~GM0050-GM0050-STAINLESS STEEL (SEE FIGURE 5-6 OR 5-11)

The metallic check valves used on liquid end sizes GM0002~GM0050 are precision assembled at the factory. Do not attempt to disassemble these cartridges. If they become inoperative, flush them with solvent, wash them with warm detergent and blow them out with compressed air to remove any foreign matter. If this treatment does not eliminate the trouble, the cartridge assembly should be replaced.

Disassembly

Remove the check valves by unscrewing them from the pump head.

Reassembly

Apply a small amount of thread sealing compound and PTFE pipe tape to check valve threads and install check valves by screwing them into the pump head with the flow arrows pointing up. DO NOT OVERTIGHTEN CHECK VALVES.

CAUTION

PUMP DAMAGE WILL OCCUR IF CHECK VALVES ARE INSTALLED UPSIDE DOWN. INSTALL CHECK VALVES WITH THE FLOW ARROW POINTING IN THE DIRECTION OF PROCESS FLOW (UP). TURN CHECK VALVE ASSEMBLIES INTO LIQUID END AND TIGHTEN BY HAND. DO NOT OVERTIGHTEN, DAMAGE TO THE CHECK VALVES MAY OCCUR.

4.5.3 REPLACEMENT OF BALL, SEAT, & SEAL: LIQUID END GM0090~GM0500-PVC AND PVDF (SEE FIGURE 5-14)

Disassembly

1. Unscrew the union nut (008). The union end (432) is held in place by the union nut and will separate easily from the other liquid end parts.

2. Unscrew the check valve assembly from the pump head (370).

3. Screw the union nut part way (one or two turns) onto the end of the ball guide (003) that has the seat in it. Be sure the union nut is on loosely. This will allow a gap for the seat (024) to fall into as it is removed from the ball guide.

4. Set the ball guide/union nut on a flat surface with the union nut down. Looking into the top of the ball guide, you will see four large holes surrounding one small hole. Insert a thin, blunt instrument such as a hex head screwdriver into the small center hole until it rests on the top of the ball (437).

5. Tap screwdriver gently with a hammer until the ball and seat are released from the ball guide.

CAUTION

IF THE UNIT IS DISASSEMBLED FOR INSPECTION ONLY, BE SURE TO USE A BLUNT INSTRUMENT AND TAP GENTLY TO AVOID DAMAGING THE BALL. IF THE BALL AND/OR SEAT ARE DAMAGED DURING DISASSEMBLY, THEY WILL HAVE TO BE REPLACED. IF AVAILABLE, TO AVOID DAMAGE, IT IS ADVISABLE TO USE GENTLE AIR PRESSURE (APPLIED AT END OPPOSITE THE SEAT (024) FOR BALL AND SEAT REMOVAL.

6. Carefully remove the two O-rings (438) from the ball guide and seat.

7. Carefully clean any parts to be reused. If any chemicals are used in the cleaning process, ensure that they are compatible with the process liquid.

Reassembly

CAUTION

THE ORDER OF ASSEMBLY AND ORIENTATION OF THE SUCTION AND DISCHARGE CHECK VALVES IS DIFFERENT. REFER TO FIGURE 5-14 FOR PROPER ASSEMBLY ORDER AND ORIENTATION. IF CHECK VALVE CARTRIDGES ARE INSTALLED INCORRECTLY, ONE OF THE FOLLOWING WILL OCCUR:
(A).IMMEDIATE SEVERE DAMAGE TO PUMP MECHANISM
(B).NO PUMPING
(C).REVERSE PUMPING ACTION (FROM DISCHARGE LINE INTO SUCTION LINE)

1. Drop the ball (437) into the curved inner chamber end of the body (003).

2. Set the body on a flat surface so that the end with the ball faces upward. Position seat (024) on the body, with the beveled edge of the seat facing outward. When the seat is pressed into the body the ball should be sitting on the side with sharp corners as shown in Figure 5-14. The bevel should not face the inside of the check valve. Use a flat surface such as a board to press the seat into the body with firm, even pressure.

If the seat is improperly positioned, the ball will not create a tight seal and poor pumping performance will result.

3. Fit new O-rings (438) into position on the body (003) and seat (024).

CAUTION

DO NOT APPLY PTFE TAPE TO THREADS OF CHECK VALVE BODY AS THIS MAY PREVENT ADEQUATE SQUEEZE FROM BEING APPLIED TO THE VALVE O-RING WHICH WOULD RESULT IN LEAKAGE.

Note: *To assure a tight, leak free seal, new O-rings should be used each time the check valves are disassembled.*

4. Position the union end (432) onto the correct end of the body. Refer to Figure 5-14, as the correct end is determined by whether the valve is intended for the suction or discharge port of the liquid end. Slip the union nut (008) over the union end and screw tightly (hand tight only) onto the body.

5. Screw the valve assembly into the pump head (hand tight only). DO NOT OVERTIGHTEN.

4.5.4 CHECK VALVE REPLACEMENT: LIQUID ENDS GM0090~GM0500-STAINLESS STEEL (SEE FIGURE 5-15)

Disassembly

Stainless steel check valves differ from the plastic versions in that the ball seat is integral to the ball

guide. The seats cannot easily be inspected for damage or wear. If you suspect that the check valve may be damaged or worn, replace the entire check valve assembly as per the instructions below.

1. Unscrew the threaded connector.
2. Unscrew the check valve assembly from the liquid end.

Reassembly

CAUTION

THE ORDER OF ASSEMBLY AND ORIENTATION OF THE SUCTION AND DISCHARGE CHECK VALVES IS DIFFERENT. REFER TO FIGURE 5-15 FOR PROPER ASSEMBLY ORDER AND ORIENTATION. IF CHECK VALVE CARTRIDGES ARE INSTALLED INCORRECTLY, ONE OF THE FOLLOWING WILL OCCUR:
(A). IMMEDIATE SEVERE DAMAGE TO PUMP MECHANISM
(B). NO PUMPING
(C). REVERSE PUMPING ACTION (FROM DISCHARGE LINE INTO SUCTION LINE)

1. Screw the correct end of the check valve assembly into the pump head, trapping a new O-ring between the pump head and the check valve assembly.

CAUTION

DO NOT APPLY PTFE TAPE TO THREADS OF CHECK VALVE BODY AS THIS MAY PREVENT ADEQUATE SQUEEZE FROM BEING APPLIED TO THE VALVE O-RING WHICH WOULD RESULT IN LEAKAGE.

Note: *To assure a tight, leak free seal, new O-rings should be used each time the check valves are disassembled.*

2. Screw the threaded connector onto the check valve assembly, trapping a new O-ring (438) between the coupling and the check valve assembly.

4.6 DIAPHRAGM AND OIL SEAL BELLOWS REPLACEMENT

CAUTION

BEFORE BEGINNING DIAPHRAGM REPLACEMENT, MAKE SURE THAT ALL SHUTOFF VALVES ARE CLOSED AND ALL PRESSURE IS BLED FROM THE LIQUID END.

If failure of the oil seal bellows has occurred, it is recommended that the diaphragm assembly and oil seal bellows be replaced at the same time.

4.6.1 DIAPHRAGM REPLACEMENT: LIQUID END SIZE GM0002~GM0050 (SEE FIGURES 5-3, 5-4, 5-6 AND 5-7)

1. Loosen the head screws (Item 103 in Figure 5-3 & 5-6) and remove the head (Item 370 in Figure 5-3 & 5-6). Mark the suction and discharge ports on the diaphragm head prior to removal.

2. Remove the motor fan cover and turn the motor by hand while adjusting the capacity control

knob to 100%. With the capacity set at 100%, turn the motor fan until the diaphragm is in the full forward position (top dead center).

3. Hold the outer edge of the diaphragm and turn it counterclockwise to unscrew it from the pump drive.

4. Discard and replace with new diaphragm. Make sure that diaphragm support ring (Item 700A in Figure 5-3) is in place. Holding the edges of the diaphragm, screw the diaphragm assembly onto the male thread of the connecting rod (Item 60 in Figure 5-1) until it reaches its mechanical stop.

5. With the capacity still set at 100% turn the motor fan until the new diaphragm is in the farthest rearward position (bottom dead center).

6. Reattach the diaphragm head with the suction and discharge ports in the correct positions. Tighten the screws in a crosswise pattern to a torque of 45 in-lb.

7. While turning the motor fan, set the stroke adjustment knob to the 0% position.

8. Reinstall motor fan cover.

4.6.2 DIAPHRAGM REPLACEMENT: LIQUID END SIZE GM0090~GM0500 (SEE FIGURES 5-13, 5-14, 5-15)

1. Mark the suction and discharge ports on the diaphragm head prior to removal. Loosen the head screws (435) and remove the diaphragm head (370).
2. Remove the motor fan cover and turn the motor by hand while adjusting the capacity control knob to 100%. With the capacity set at 100%, turn the motor fan until the diaphragm is in the full forward position (top dead center).
3. Hold the outer edge of the diaphragm and turn it counterclockwise to unscrew it from the pump drive.
4. Make sure that diaphragm support nut is clean and free of corrosion. When cleaning the support nut, take care not to scratch the smooth angled surface of the support nut. If corrosion cannot be removed without damaging the support nut, replace with a new diaphragm assembly.
5. Make sure that diaphragm support ring (700A) is in place and then reinstall diaphragm assembly.
6. Make sure that spring and cross piece is in place and connecting rod is in full-forward position (at 100% capacity setting). Screw diaphragm assembly into connecting rod cross piece (Item 701 in Figure 5-13) until it reaches its mechanical stop.
7. With the capacity still set at 100% turn the motor fan until the diaphragm is pulled back to the rearward position (bottom dead center).
8. Reattach the diaphragm head with the suction and discharge ports in the correct positions. Torque the head assembly screws in a crosswise pattern as follows:
   a) Liquid End Size GM0002~GM0050 to 45 inch pounds.
   b) Liquid End Size GM0090~GM0500 to 90 inch pounds.
9. While turning the motor fan, set the stroke adjustment knob to the 0% position.
10. Reinstall motor fan cover.

4.7 OIL SEAL BELLOWS REPLACEMENT (ITEM 70 IN FIGURE 5-1)

CAUTION

BEFORE BEGINNING OIL SEAL REPLACEMENT, MAKE SURE ALL SHUT-OFF VALVES ARE CLOSED AND ALL PRESSURE HAS BEEN BLED FROM THE LIQUID END (PUMP HEAD). WHEN REPLACING THE OIL SEAL, THE DIAPHRAGM ASSEMBLY MUST BE REMOVED FIRST. FOR EASE OF SERVICE, IT IS RECOMMENDED THAT THE OIL SEAL BE REPLACED IN CONJUNCTION WITH THE DIAPHRAGM ASSEMBLY.

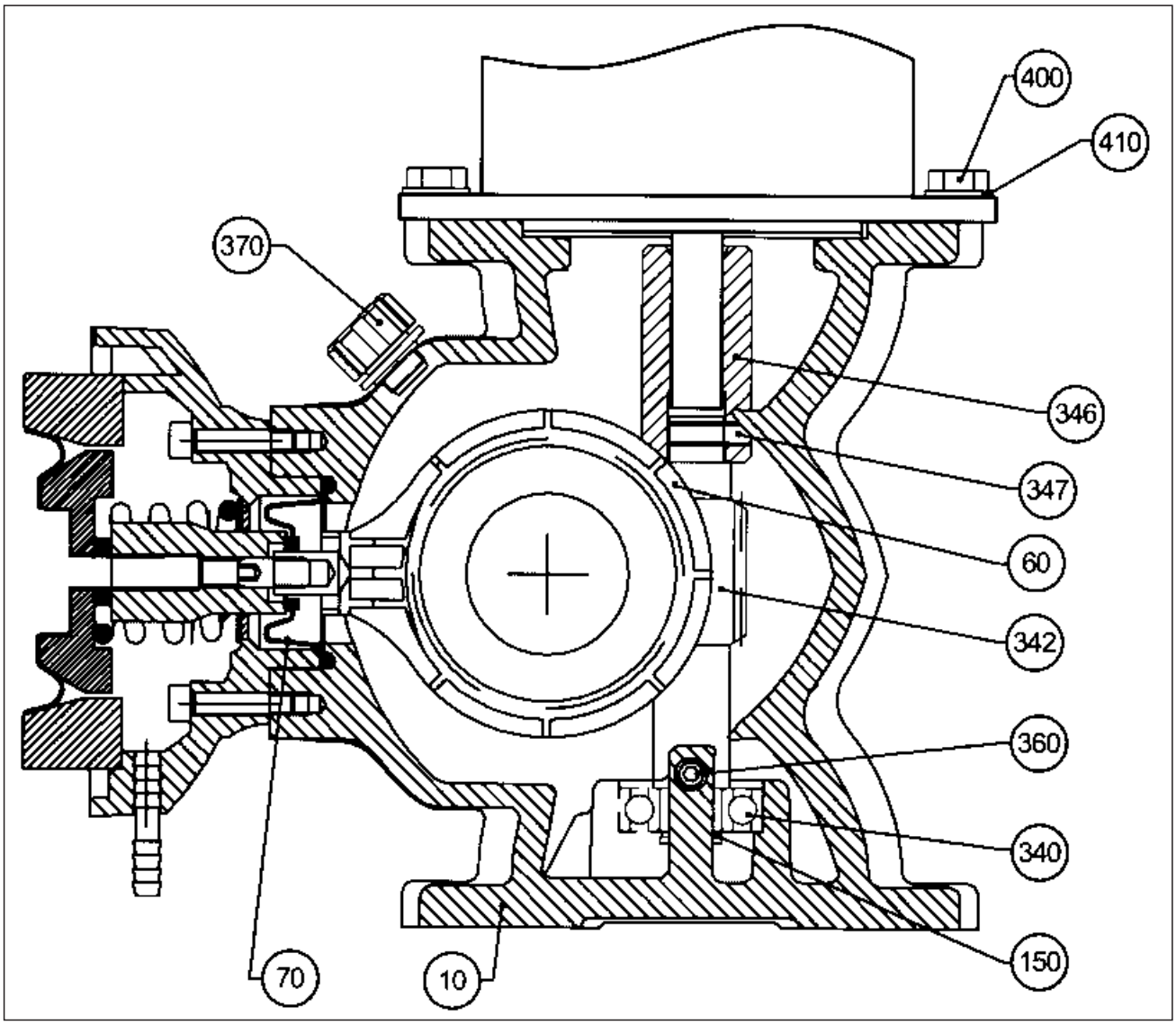
1. Set the stroke adjusting knob to 100%.
2. Disconnect the suction and discharge connections to the pump head check valves.
3. Mark the suction and discharge ports on the diaphragm head prior to removal. Loosen the head screws (Item 103 or/ 435) and remove the diaphragm head (Item 370 in Figure 5-8).
4. Remove the motor fan cover and turn the motor by hand while adjusting the capacity control knob to 100%. With the capacity set at 100%, turn the motor fan until the diaphragm assembly is in the full forward position (top dead center).
5. Hold the outer edge of the diaphragm assembly and turn it counterclockwise to unscrew it from the pump drive.
6. Remove the diaphragm support ring (Item 700A) from the spacer.
7. Drain the oil out of the pump drive by removing the drain plug (Item 20 in Figure 5-2) from the pump housing.
8. Remove oil seal bellows as follows:
   a) On Liquid End Size GM0002~GM0050 models, remove mounting screws (700F), and spacer(351).
   b) On Liquid End Size GM0090~GM0500 models, remove un-screw cross piece (701), mounting screws (435B), and spacer (072A).
9. Pull the oil seal (70) off the connecting rod (60).
10. Install a new oil seal onto connecting rod.
11. Apply a thin layer of O-ring type grease to top of oil seal (part adjacent to connecting rod).
12. Reinstall parts removed in step 8. For Liquid ends GM0002~GM0010, GM0090~GM0500 install cross piece (701) before mounting spacer.
13. Refill pump drive with oil (650 ml, oil model refer to chapter 3.1).
14. Reinstall liquid end components in accordance with the procedures found in the following:
   a) For Liquid End Size GM0002~GM0010 models, refer to paragraph 4.6.1, steps 3 thru 6.
   b) For Liquid End Sizes GM0025~GM0500 models, refer to paragraph 4.6.2, steps 5 thru 6.

4.8 RESTARTING THE PUMP

1. Reconnect the pump to the piping system.
2. Check that capacity is set to 0%.
3. Open system suction and discharge shut-off valves and restart pump.
4. Set the pump to 100% to obtain faster priming of liquid end.
5. After priming, set the pump to the desired capacity. Retighten locking screw (320).

SECTION 5 PARTS LIST

FIGURE 5-1 GM DRIVE SIDE VIEW



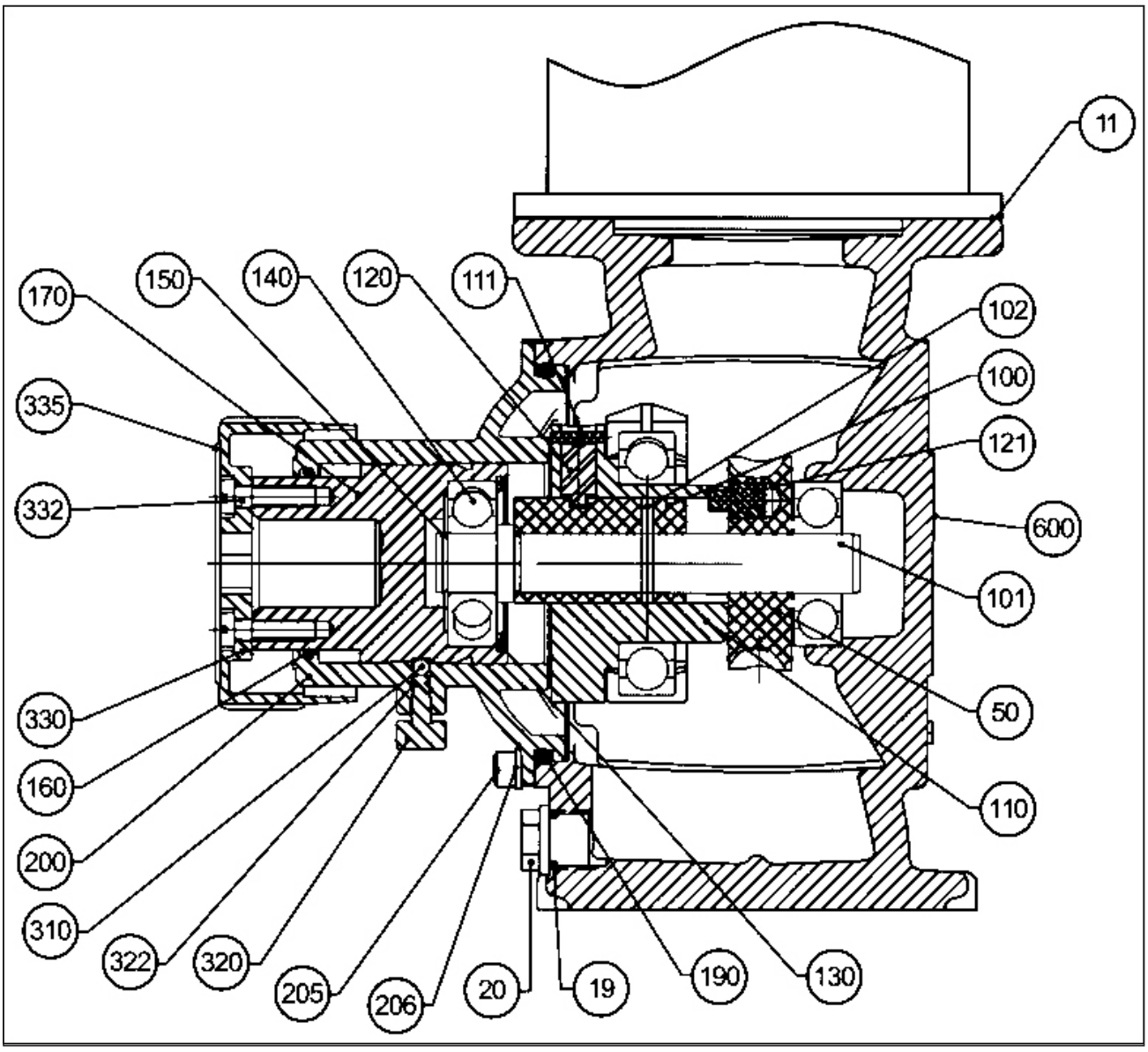
5.1 PARTS LIST FOR GM DRIVE SIDE VIEW (REFERRING TO FIGURE 5-1)

Item Number	Description	Part Number	Qty.
10	Pump Housing (IEC 71 Motor)	S61021	1
	Pump Housing (NEMA 56C Motor)	61345	1
60	Connecting Rod	S70003	1
70	Oil Seal	35330	1
342	Worm Assembly, 8:1, 180SPM, IEC71	H60630	1
	Worm Assembly, 8:1, 180SPM, NEMA 56C	H60635	1
	Worm Assembly, 10:1, 173SPM/144SPM, IEC71	H60631	1
	Worm Assembly, 10:1, 173SPM/144SPM, NEMA 56C	H60636	1
	Worm Assembly, 14:1, 124SPM/103SPM, IEC71	H60634	1
	Worm Assembly, 14:1, 124SPM/103SPM, NEMA 56C	H60639	1
	Worm Assembly, 20:1, 86SPM/72SPM, IEC71	H60632	1
	Worm Assembly, 20:1, 86SPM/72SPM, NEMA56C	H60637	1
	Worm Assembly, 40:1, 43SPM/36SPM, IEC71	H60633	1
	Worm Assembly, 40:1, 43SPM/36SPM, NEMA 56C	H60638	1
360	Set Screw, M8 x 12	S61122	1
370	Vent	H60724	1
400	Motor Mounting Bolts	S4350038522	4
	Motor Mounting Bolts	S4050018119	4
410	Motor Mounting Washer（IEC Motors：Spring Lockwasher）	S4340009002	4
	Motor Mounting Washer（NEMA 56C Motors：Spring Lockwasher）	N/A	4
	Lubricating Oil（800ml）	H69007	1
	Nameplate	N/A	1

Note:

1. Replacement of worm (342), only as assembly of item Worm (342), retaining ring (150), bearing (340), worm coupling (346) and pin (347).

FIGURE 5-2 GM DRIVE END VIEW



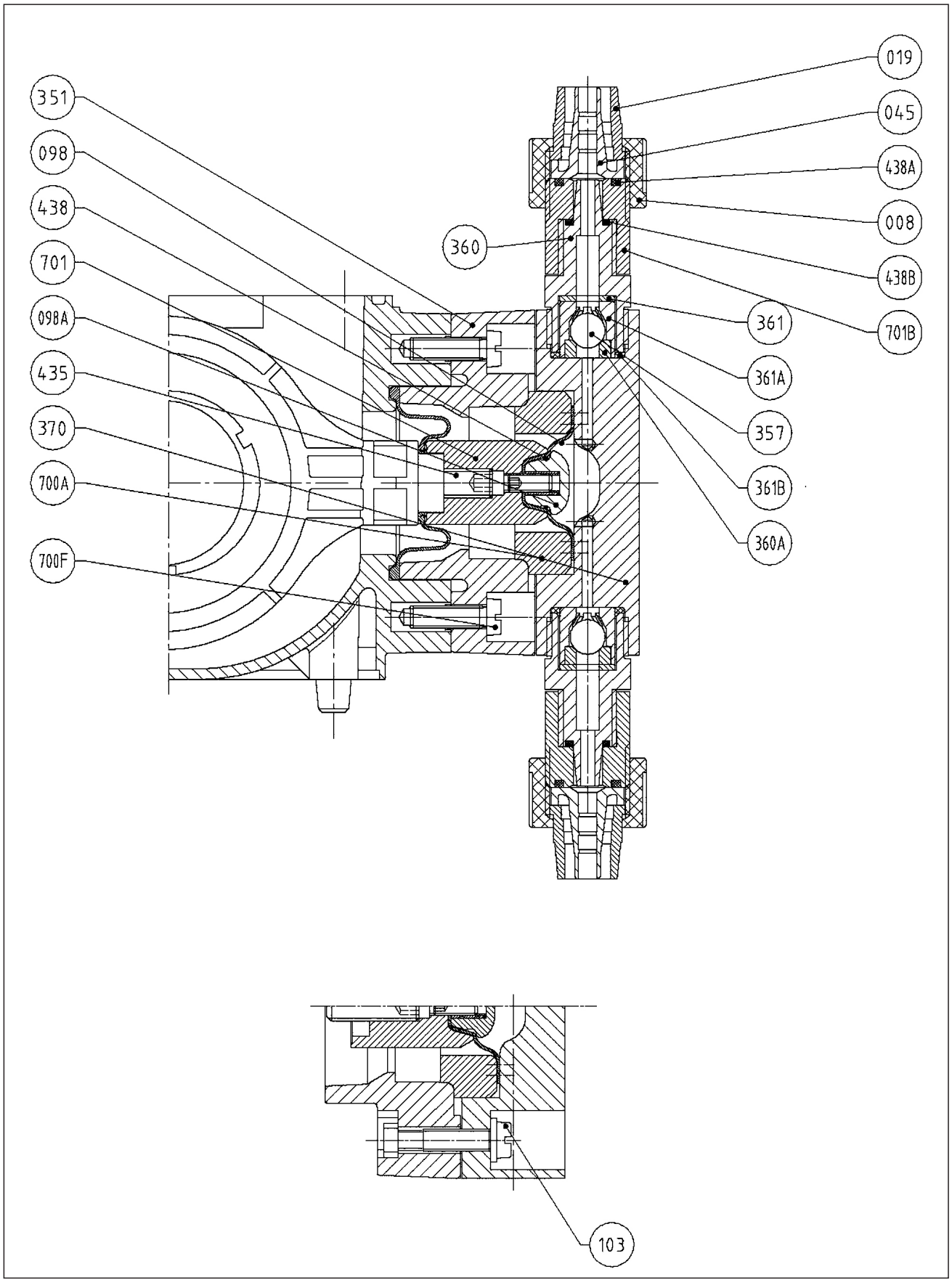
5.2 PARTS LIST FOR GM DRIVE END VIEW (REFERRING TO FIGURE 5-2)

Item Number	Description	Part Number	Qty.
11	Gasket Motor（IEC 71,Flange）	H60731	1
	Gasket Motor（NEMA 56C,Flange）	S2250115099	1
19	O-Ring GB3452, 1-82-14 x 2.65	S4080068031	1
20	Oil Drain Plug	S60086	1
50	Gear, 8:1, 180SPM	S05203091085N	1
	Gear, 10:1, 173SPM/144SPM	S05203092085N	1
	Gear, 20:1, 86SPM/72SPM	S05203093085N	1
	Gear, 40:1, 43SPM/36SPM	S05203094085N	1
100	Male Eccentric Assembly, 10mm (GM0400-GM0500)	H60625	1
	Male Eccentric Assembly, 8mm (GM120-GM330)	H60626	1
	Male Eccentric Assembly, 6mm (GM0025-GM170)	H60627	1
	Male Eccentric Assembly, 4mm (GM0002-GM0010)	H60628	1
	Male Eccentric Assembly, 1.2mm Stroke Length	H60629	1
110	Female Eccentric	S01600260071N	1
111	Spring Pin	S4310006455N	1
120	Stroke Adjust Key	3701310039	1
121	Gear Pin	61108	1
130	Retaining Ring, Stroke Adjusting	S4340020471N	1
160	Oil Seal, Stroke Screw	60766	1
170	Stroke Adjusting Screw	61331	1
190	O-Rings	S4380024051N	1
200	Side Cover	60729	1
205	Socket Head Screw, GB70-85-M6×16	S4350003375N	3
206	Washer	S4340009065N	3
310	Stroke Lock Ball, 3/16”	4370040050N	1
320	Stroke Lock Screw	S05600400022N	1
322	O-Ring	S4380249031N	1
330	Stroke Adjusting Knob	S70066	1
332	Pan Screw	H65525	2
335	Knob Sticker, 316SS	H60020	1

Note:

1. Replacement of male eccentric assembly (100), only as assembly of item male eccentric (100), drive shaft (101), spring pin (102), bearing (140) & retaining ring (150).

FIGURE 5-3 GM0002~GM0010 PVC, PVDF & MIXED LIQUID END-TUBING CONNECTION



5.3 PARTS LIST FOR GM0002~GM0010 PVC, PVDF & MIXED LIQUID END TUBING CONNECTION (REFERRING TO FIGURE 5-3)

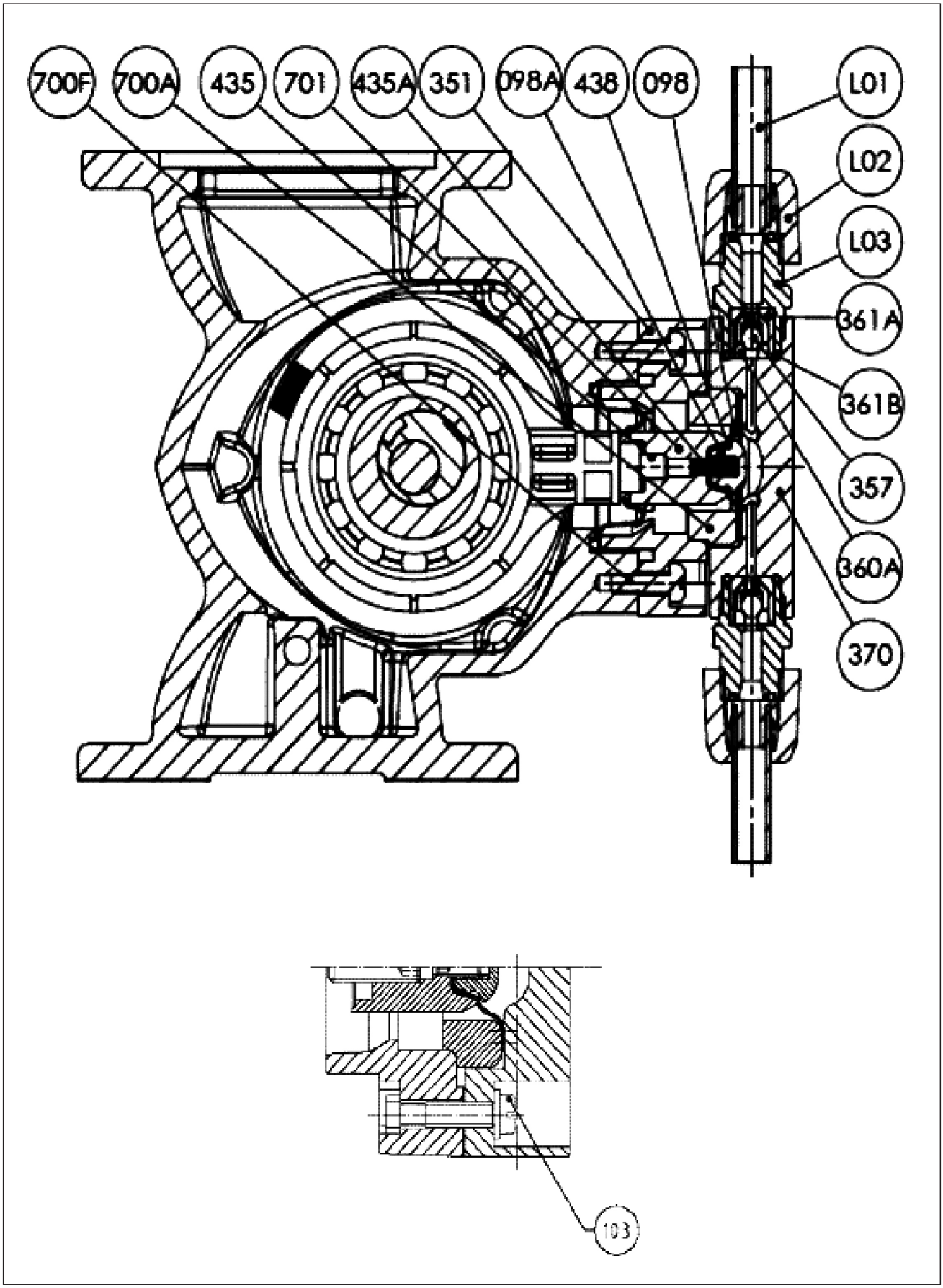
Item Number	Description	Material	Part Number	Qty.
	Suction/Discharge Check Valve Assembly (PVC LE) (Before 2019.11)	PVC	H60600	2
	Suction/Discharge Check Valve Assembly (PVC LE) (After 2019.11)	PVC	P300120099	2
	Suction/Discharge Check Valve Assembly 3/8" (Mixed LE)	PVC	H60601	2
	Suction/Discharge Check Valve Assembly (PVDF LE)	PVC/PVDF	H60603	2
098	Diaphragm Assembly (PVC & Mixed LE)	PVC/PTFE	H60602	1
	Diaphragm Assembly (PVDF LE)	PVDF/PTFE	H60604	1
103	Screw	-	S10340	4
700F	Screw	-	S70054	4
351	Spacer	-	S35116	1
435	Screw	A2-70	S4350016075N	1
700A	Diaphragm Support Ring	PVC	S70180	1
370	Head (PVC & Mixed LE)	PVC	S70139	1
	Head (PVDF LE)	PVDF	S70134	1
	Weight	Ceramic	S10322	1
	Tube,6×12,(PVC LE)		S70121-6M	1

Notes:

1. Replacement of suction/discharge check valve assembly, only as assembly of item nut (008), locked ring (019), connection nozzle (045), ball check (357), check valve body (360), seat (360A), washer (361), cartridge (361A), O-ring (361B), adaptor (701B), O-ring (361B, 438A, 438B).

2. Replacement of diaphragm assembly (098), only as assembly of item diaphragm (098), plate (098A), diaphragm seat (701), O-ring (438), screw (435A).

FIGURE 5-4 GM0002~GM0010 PVC, PVDF LIQUID END-LMI (PE) TUBING CONNECTION



5.4 GM0002 PARTS LIST FOR GM0002~GM0010 PVC, PVDF LIQUID END-LMI (PE) TUBING CONNECTION (REFERRING TO FIGURE 5-4)

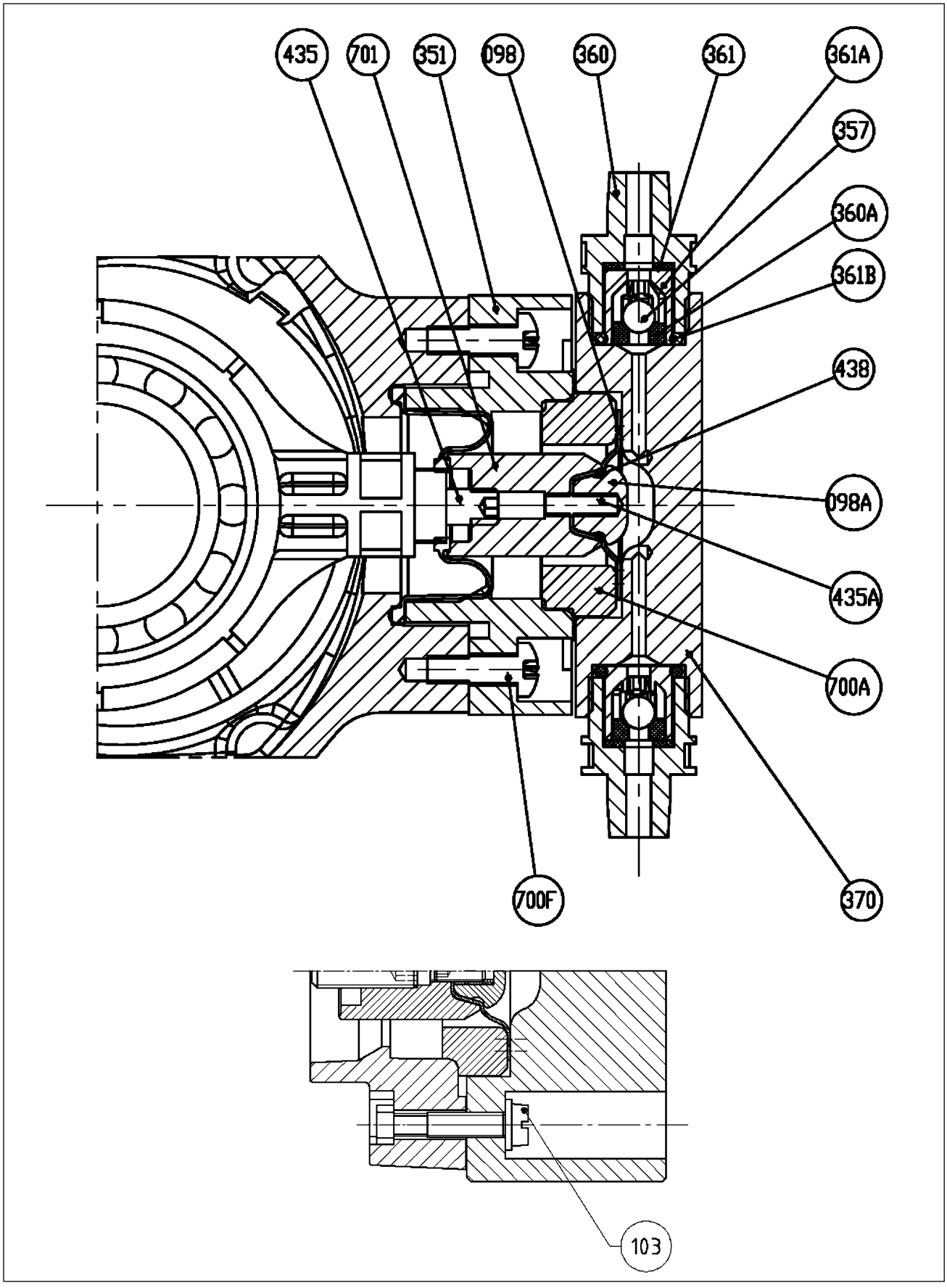
Item Number	Description	Material	Part number	Qty
	Suction/Discharge Check Valve Assembly (PVC LE)(Before 2019.11)	PVC	H75301	2
	Suction/Discharge Check Valve Assembly (PVC LE)(After 2019.11)	PVC	P300126099	2
	Suction/Discharge Check Valve Assembly (PVDF LE)	PVC/PVDF	H75302	2
098	Diaphragm Assembly (PVC LE)	PVC/PTFE	H60602	1
	Diaphragm Assembly (PVDF LE)	PVDF/PTFE	H60604	1
103	Screw	-	S10340	4
700F	Screw	-	S70054	4
351	Spacer	-	S35116	1
435	Screw	A2-70	S4350016075N	1
700A	Washer	PVC	S70180	1
370	Head (PVC LE)	PVC	S70139	1
	Head (PVDF LE)	PVDF	S70134	1
	Weight	Ceramics	S10322	1
L01	Tube，3/8” ×1/2”	-	10142-16	1

Notes:

1. Replacement of suction/discharge check valve assembly, only as assembly of item pressure cap assembly (L02),valve body(L03),valve seat(360A),ball(357),valve body(361A),O-ring(361B).

2. Replacement of diaphragm only as assembly of item diaphragm (098), plate (098A), diaphragm seat (701), O-ring (438), screw (435A)

FIGURE 5-5 GM0002~GM0010 PVC LIQUID END-THREAD CONNECTION



5.5 GM0002~GM0010 PVC LIQUID END THREADED CONNECTION (REFERRING TO FIGURE 5-5)

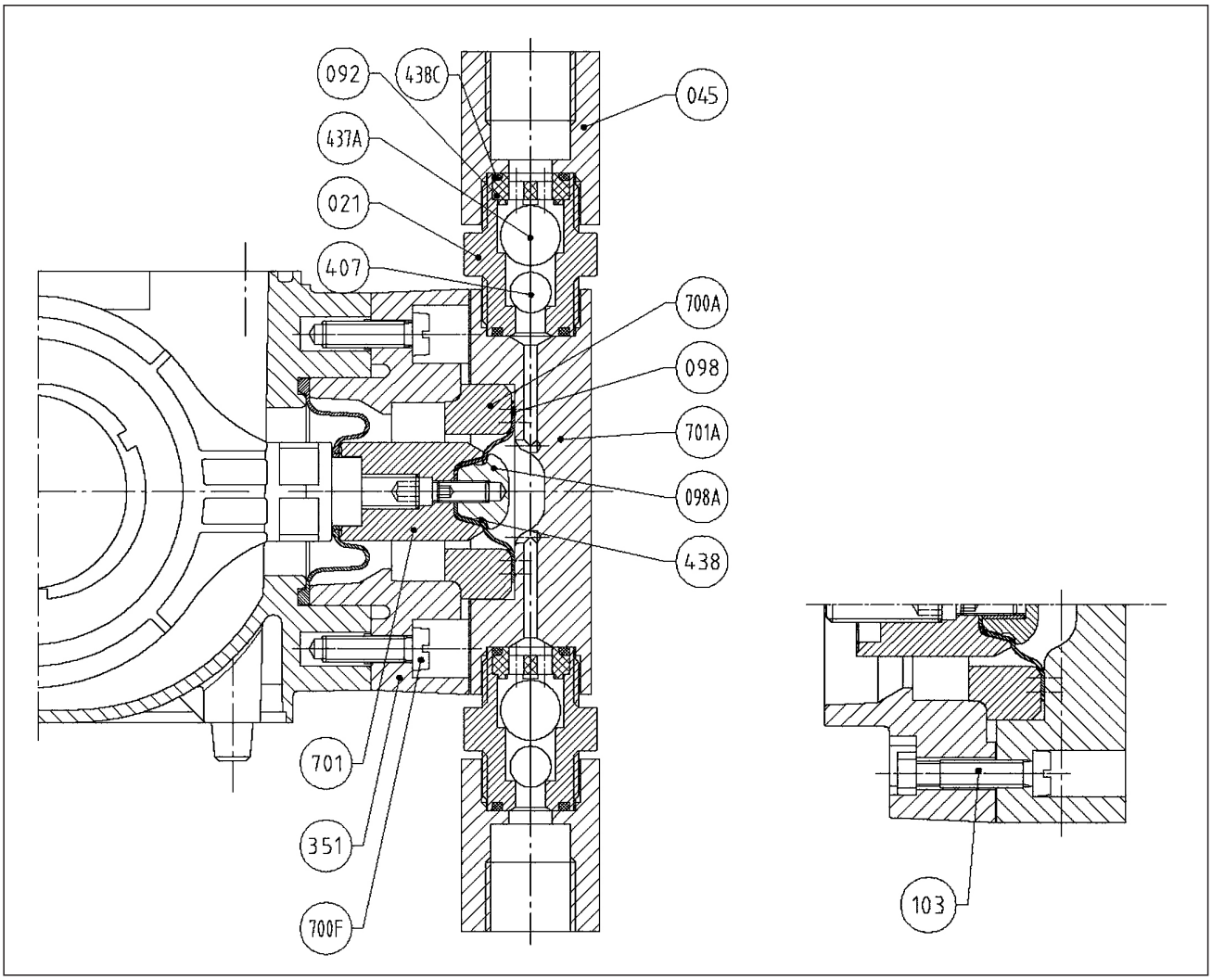
Item Number	Description	Material	Part number	Qty
	Check Valve Assy-Thread Connection(PVC LE) (Before 2019.11)	PVC	H60622	2
	Suction/Discharge Check Valve Assembly (PVC LE) (After 2019.11)	PVC	P300127099	2
098	Diaphragm Assy（PVC LE）	PVC/PTFE	H60602	1
103	Screw	-	S10340	4
700F	Screw	-	S70054	4
351	Spacer	-	S35116	1
435	Screw	A2-70	S4350016075N	1
700A	Washer / N1	PVC	S70180	1
370	Liquid End Body / 1.0	PVC	S70139	1

Notes:

1. Replacement of suction/discharge check valve assembly, only as assembly of check valve ball(375), check valve body(360),s eat(360A), washer(361), cartridge(361A), O-ring(361B&438).

2. Replacement of diaphragm assembly (098), only as assembly of item diaphragm (098), plate(098A), diaphragm seat (701), O-ring (438), screw(435A).

FIGURE 5-6 GM0002~GM0010 STAINLESS STEEL LIQUID END-THREADED CONNECTION



5.6 PARTS LIST FOR GM0002~GM0010 STAINLESS STEEL LIQUID END THREADED CONNECTION (REFERRING TO FIGURE 5-6)

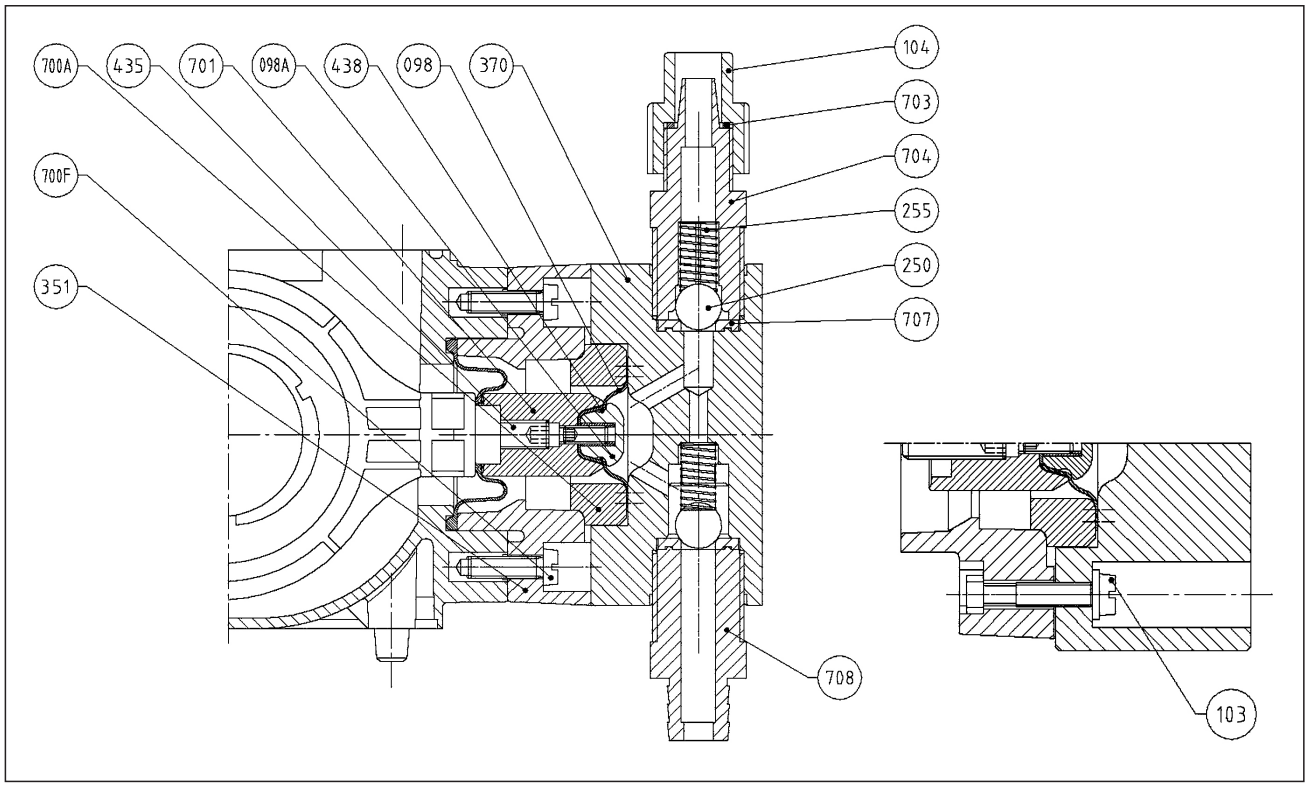
Item Number	Description	Material	Part Number	Qty.
	Suction/Discharge Check Valve Assembly	AISI 316SS	H60605	2
098	Diaphragm Assembly	316SS/PTFE	H60606	1
103	Screw	-	S10340	4
700F	Screw	-	S70054	4
351	Spacer	-	S35116	1
435	Screw	A2-70	S4350016075N	1
700A	Diaphragm Support Ring	PVC	S70180	1
701A	Head	AISI 316SS	S70137	1

Notes:

1. Replacement of suction/discharge check valve assembly, only as assembly of item ball guide (021), union connection (045), ball stop (092), ball (407), ball check (437A), O-ring (438C).

2. Replacement of diaphragm assembly (098), only as assembly of item diaphragm (098), plate (098A), diaphragm seat (701), O-ring (438), screw (435A).

FIGURE 5-7 GM0002~GM0010 HIGH VISCOSITY LIQUID END- TUBING CONNECTION



5.7 PARTS LIST FOR GM0002~GM0010 HIGH VISCOSITY LIQUID END TUBING CONNECTION (REFERRING TO FIGURE 5-7)

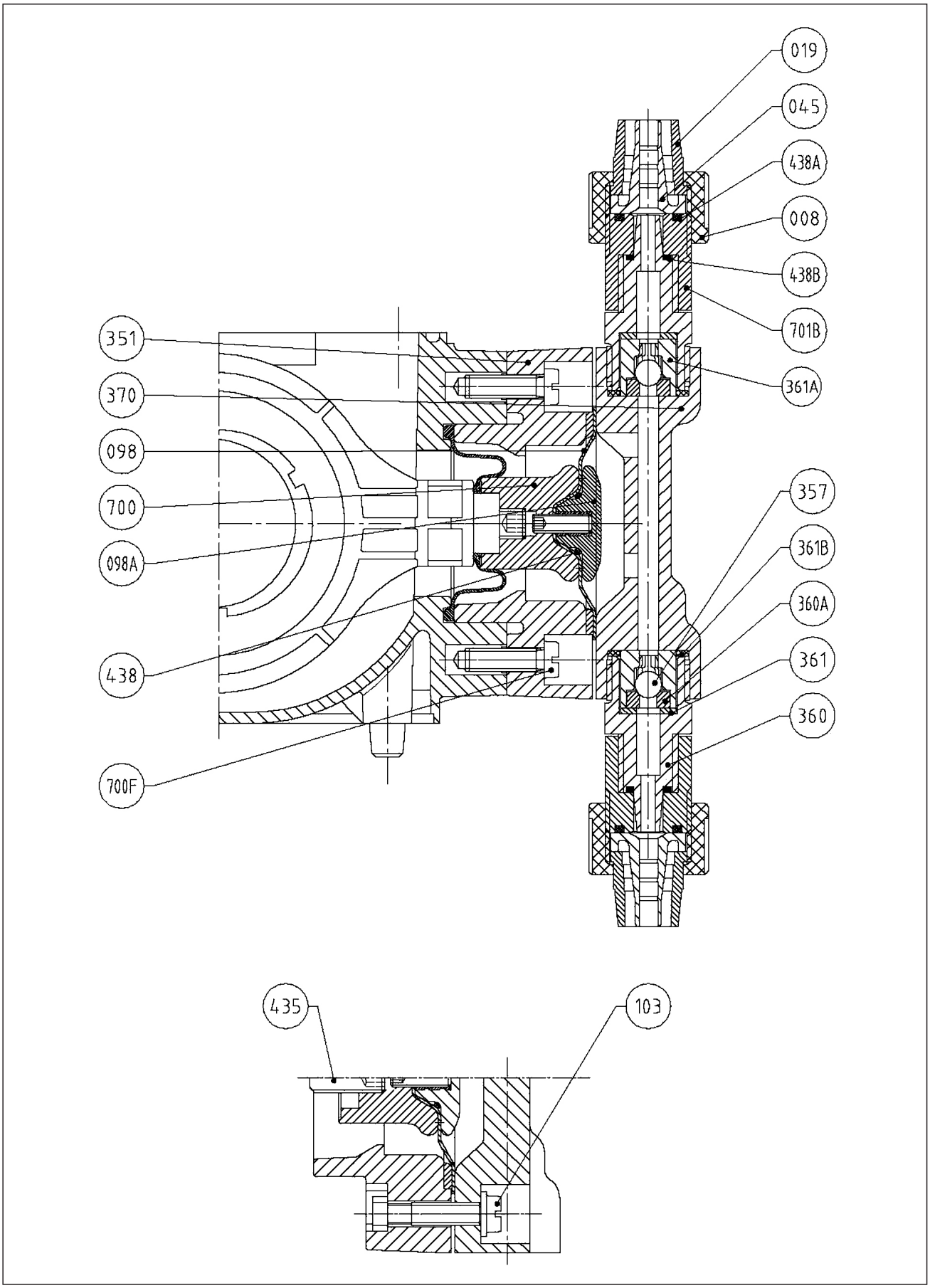
Item Number	Description	Material	Part Number	Qty.
	Suction Check Valve Assembly	PVC	H60607	1
	Discharge Check Valve Assembly	PVC	H60608	1
098	Diaphragm Assembly	316SS/PTFE	H60606	1
103	Screw	-	S10340	4
700F	Screw	-	S70054	4
351	Spacer	-	S35116	1
435	Screw	A2-70	S4350016075N	1
700A	Diaphragm Support Ring	PVC	S70180	1
370	Head	PVC	70141	1
	Injection Valve PP	-	77031	1
	Threaded Connection	-	25650	1
	Cover, G1/2	-	4320531150N	1
	Collar, D18-28	304SS	4340029020N	2

Notes:

1. Replacement of suction/discharge check valve assembly, only as assembly of item nut (104), ball check (250), spring (255), washer (703), adaptor (704), seat (707), threaded connection (708).

2. Replacement of diaphragm assembly (098), only as assembly of item diaphragm (098), plate (098A), diaphragm (701), O-ring (438), screw (435A)

FIGURE 5-8 GM0025~GM0050 PVC, PVDF & MIXED LIQUID END-TUBING CONNECTION



5.8 PARTS LIST FOR GM0025~GM0050 PVC, PVDF & MIXED LIQUID END TUBING CONNECTION (REFERRING TO FIGURE 5-8)

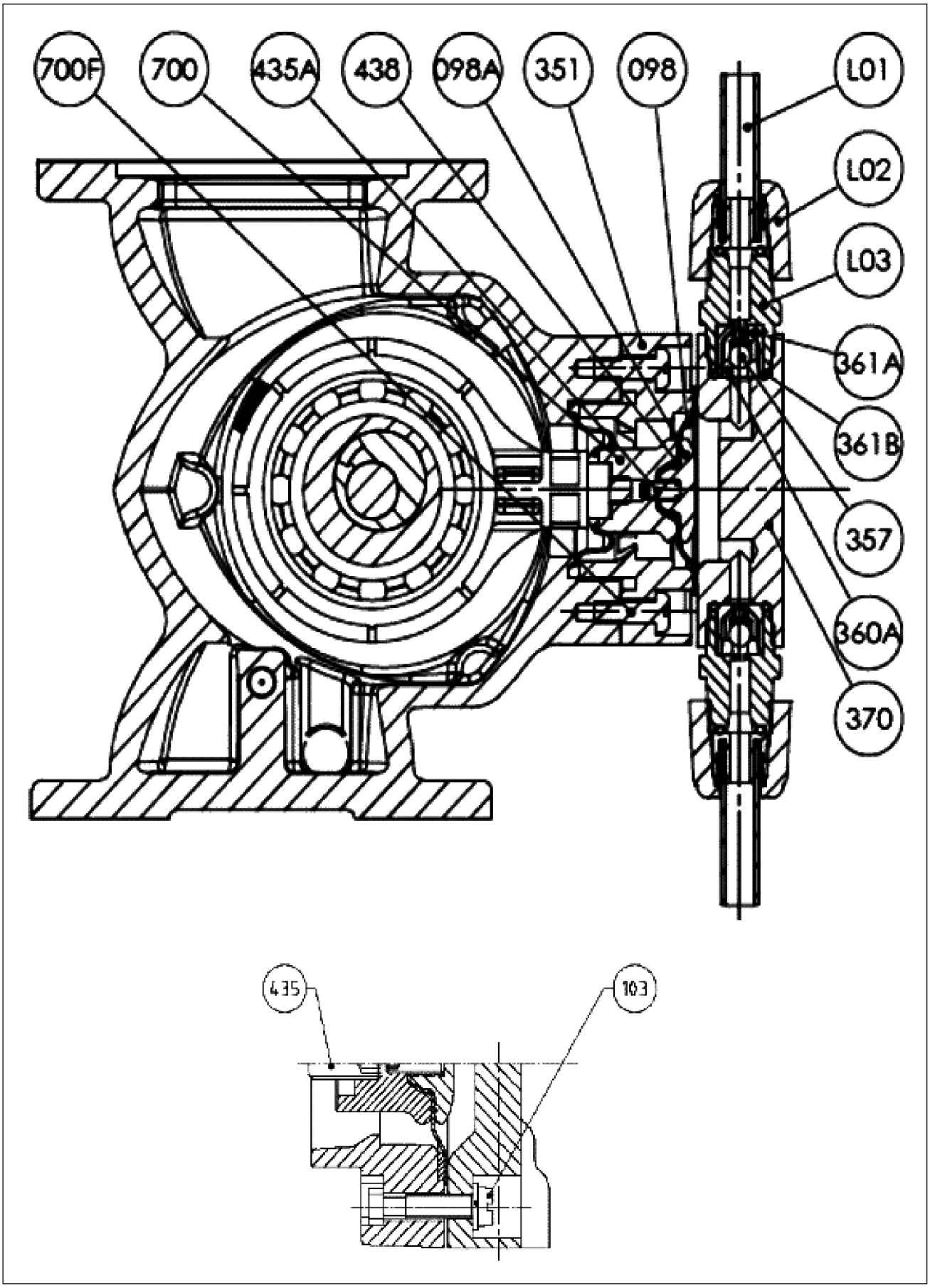
Item Number	Description	Material	Part Number	Qty.
	Suction/Discharge Check Valve Assembly (PVC LE)(Before 2019.11)	PVC	H60600	2
	Suction/Discharge Check Valve Assembly (PVC LE) (After 2019.11)	PVC	P300120099	2
	Suction/Discharge Check Valve Assembly (Mixed LE)	PVC	H60601	2
	Suction/Discharge Check Valve Assembly (PVDF LE)	PVDF	H60603	2
098	Diaphragm Assembly	PVDF/PTFE	H60610	1
103	Screw	-	S10340	4
700F	Screw	-	S70054	4
351	Spacer	-	S35116	1
435	Screw	A2-70	S4350016075N	1
370	Head (PVC & Mixed LE)	PVC	S37012	1
	Head (PVDF LE)	PVDF	S70117	1
	Weight	Ceramics	S10322	1
	Tube , 6 x 12,(PVC LE)		S70121-6M	1

Notes:

1. Replacement of suction/discharge check valve assembly, only as assembly of item nut (008), locked ring (019), connection nozzle (045), ball check (357), check valve body (360), seat (360A), washer (361), cartridge (361A), O-ring (361B), adaptor (701B), O-ring (361B, 438A, 438B).

2. Replacement of diaphragm assembly (098), only as assembly of item diaphragm (098), plate (098A), diaphragm seat (701), O-ring (438), screw (435A).

FIGURE 5-9 GM0025~GM0050 PVC, PVDF LIQUID END-LMI (PE) TUBING CONNECTION



5.9 GM0025~GM0050 PVC, PVDF LIQUID END-LMI (PE) TUBING CONNECTION (REFERRING TO FIGURE 5-9)

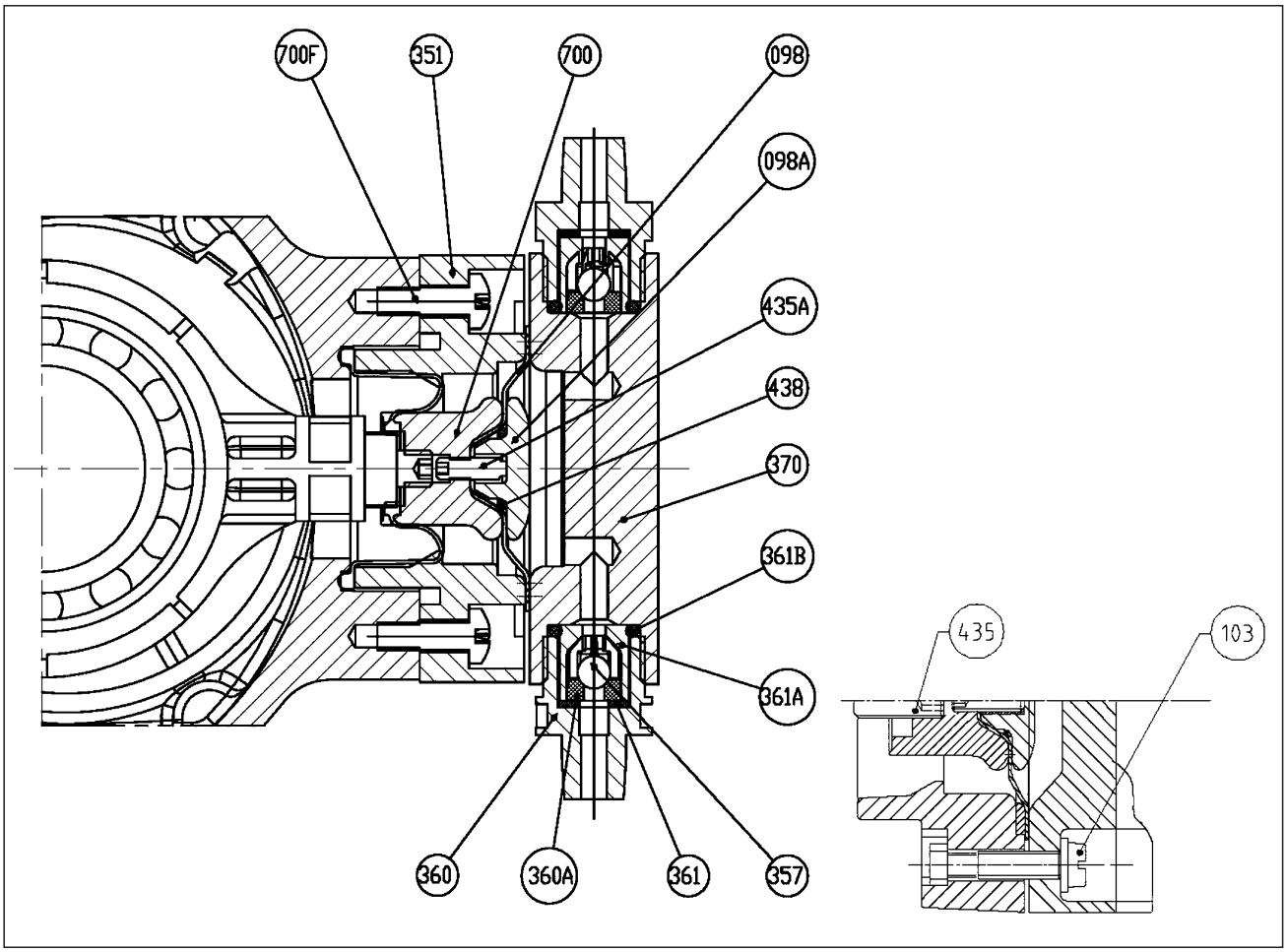
Item Number	Description	Material	Part number	Qty
	Suction/Discharge Check Valve Assembly (PVC LE) (Before 2019.11)	PVC	H75301	2
	Suction/Discharge Check Valve Assembly (PVC LE)(After 2019.11)	PVC	P300126099	2
	Suction/Discharge Check Valve Assembly (PVDF LE)	PVDF	H75302	2
098	Diaphragm Assembly (PVC LE)	PVC/PTFE	H60610	1
	Diaphragm Assembly (PVDF LE)	PVDF/PTFE	H60611	1
103	Screw	-	S10340	4
700F	Screw	-	S70054	4
351	Spacer	-	S35116	1
435	Screw	A2-70	S4350016075N	1
370	Head (PVC LE)	PVC	S37012	1
	Head (PVDF LE)	PVDF	S70117	1
	Weight	Ceramics	S10322	1
L01	Tube，3/8”×1/2”	-	10142-16	1

Notes:

1. Replacement of suction/discharge check valve assembly, only as assembly of item pressure cap assembly (L02),valve body(L03),valve seat(360A),ball(357),valve body(361A),O-ring(361B).

2. Replacement of diaphragm only as assembly of item diaphragm (098), plate (098A), diaphragm seat (701), O-ring (438), screw (435A).

FIGURE 5-10 GM0025~GM0050 PVC LIQUID END-THREADED CONNECTION



5.10 GM0025~GM0050 PVC LIQUID END THREADED CONNECTION(REFERRING TO FIGURE 5-10)

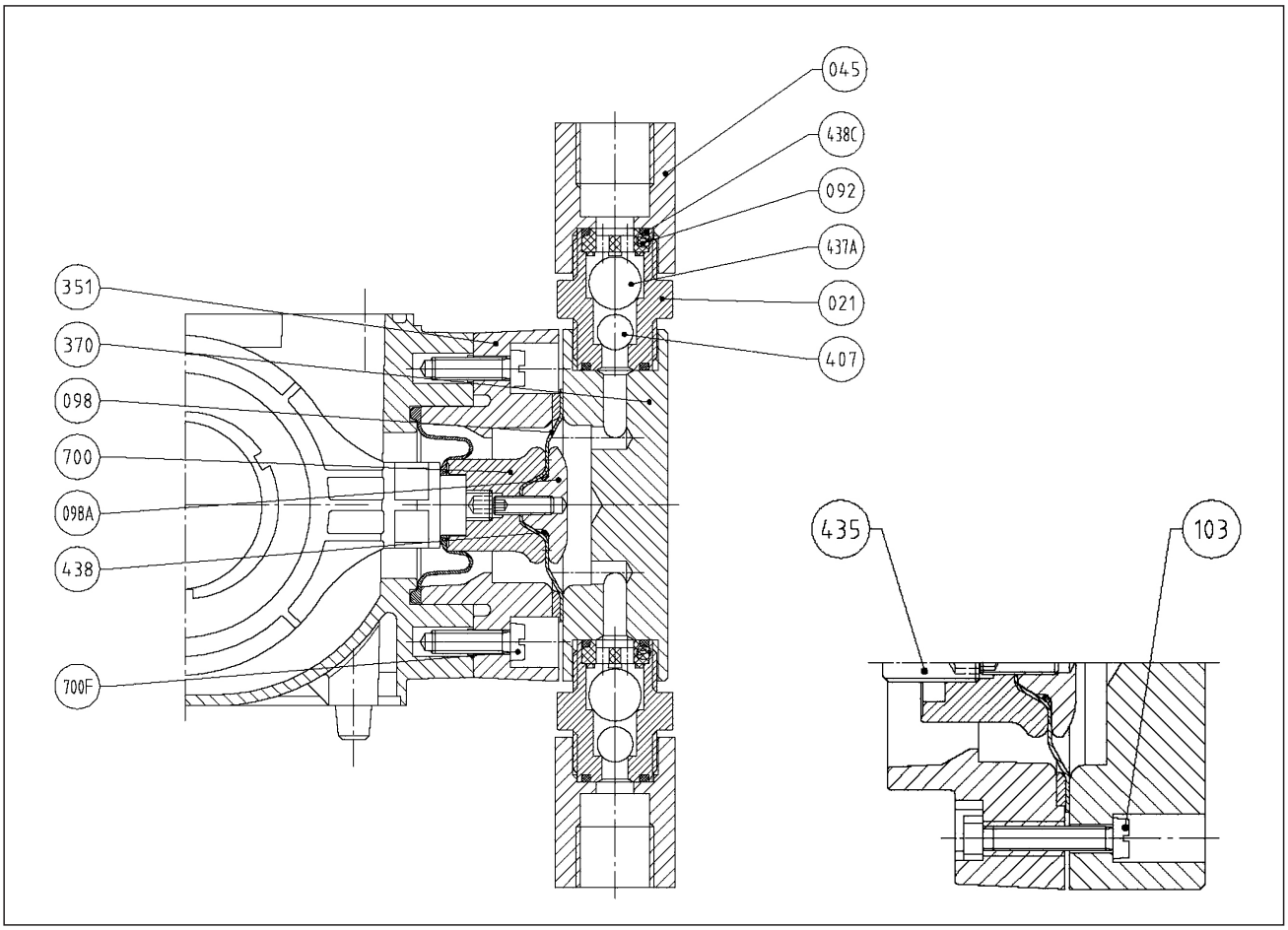
Item Number	Description	Material	Part number	Qty
	Check Valve Assy-Thread Connection(PVC LE) (Before 2019.11)	PVC	H60622	2
	Check Valve Assy-Thread Connection（PVC LE） (PVC LE)(After 2019.11)	PVC	P300127099	2
098	Diaphragm Assy（PVC LE）	PVC/PTFE	H60610	1
103	Screw	-	S10340	4
700F	Screw	-	S70054	4
351	Spacer	-	S35116	1
435	Screw HC	A2-70	S4350016075N	1
370	Liquid End Body / 1.0	PVC	S37012	1
	Stone For Suction Strainer	Ceramics	S10322	1

Notes:

1. Replacement of suction/discharge check valve assembly, only as assembly of check valve ball 375), check valve body(360),seat(360A), washer(361), cartridge(361A), O-ring(361B&438).

2. Replacement of diaphragm assembly (098), only as assembly of item diaphragm (098), plate(098A), diaphragm seat (701), O-ring (438), screw(435A).

FIGURE 5-11 GM0025~GM0050 STAINLESS STEEL & SLURRY LIQUID END-THREADED CONNECTION



5.11 PARTS LIST FOR GM0025~GM0050 STAINLESS STEEL & SLURRY LIQUID END THREADED CONNECTION (REFERRING TO FIGURE 5-11)

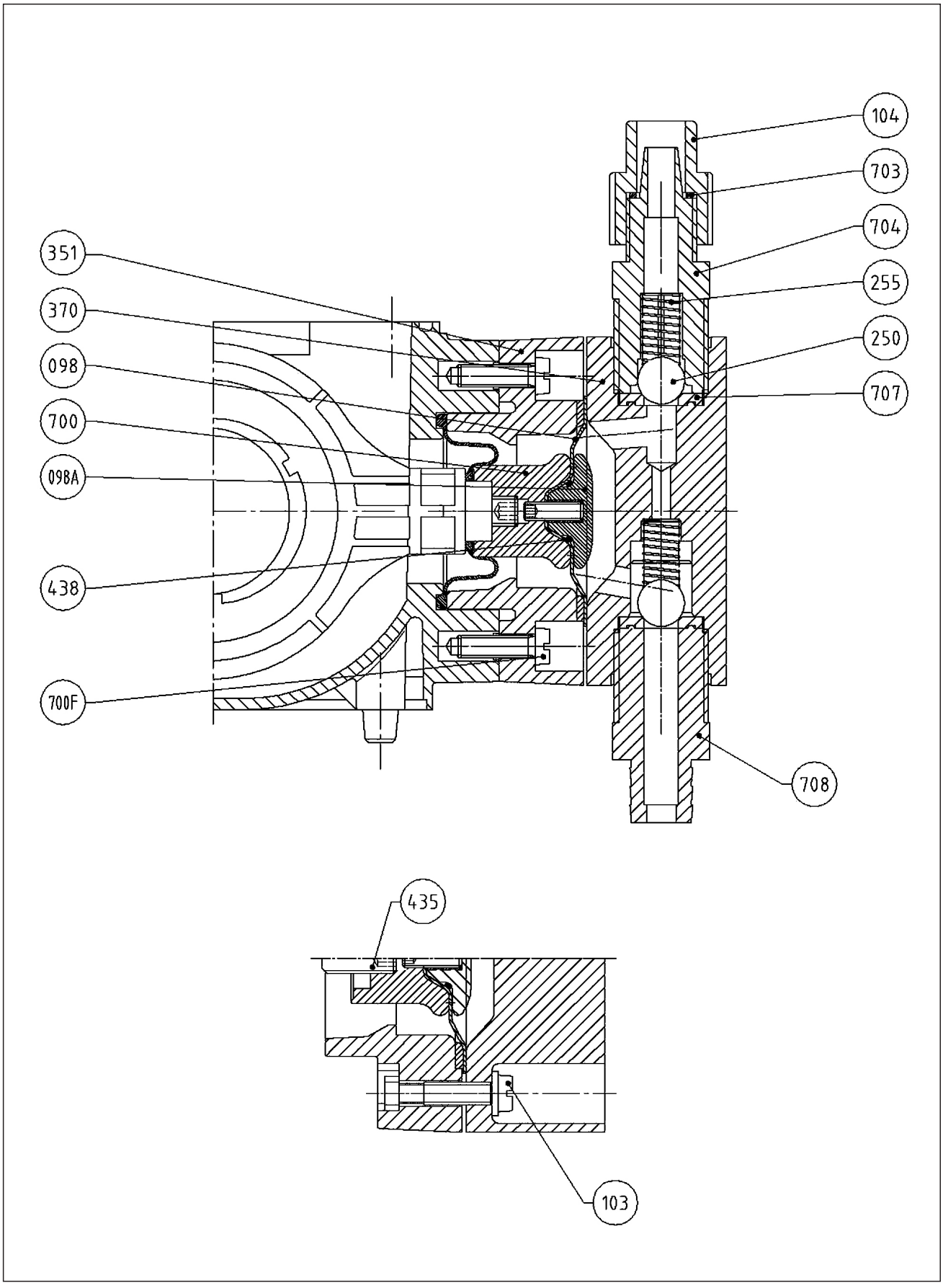
Item Number	Description	Material	Part Number	Qty.
	Suction/Discharge Check Valve Assembly (316SS LE)	AISI 316SS	H60605	2
	Suction/Discharge Chekc Valve Assembly (Slurry LE)	AISI 316SS	H60612	2
098	Diaphragm Assembly	316SS/PTFE	H60613	1
103	Screw	-	S10340	4
700F	Screw	-	S70054	4
351	Spacer	-	S35116	1
435	Screw	A2-70	S4350016075N	1
370	Head	AISI 316L	S70033	1

Notes:

1. Replacement of suction/discharge check valve assembly, only as assembly of item ball guide (021), union connection (045), ball stop (092), ball (407), ball check (437A), O-ring (438C).

2. Replacement of diaphragm assembly (098), only as assembly of item diaphragm (098), plate (098A), diaphragm seat (701), O-ring (438), screw (435A).

FIGURE 5-12 GM0025~GM0050 HIGH VISCOSITY LIQUID END-TUBING CONNECTION



5.12 PARTS LIST FOR GM0025~GM0050 HIGH VISCOSITY LIQUID END TUBING CONNECTION (REFERRING TO FIGURE 5-12)

Item Number	Description	Material	Part Number	Qty.
	Suction Check Valve Assembly	PVC	H60607	1
	Discharge Check Valve Assembly	PVC	H60608	1
098	Diaphragm Assembly	PVDF/PTFE	H60610	1
103	Screw	-	S10340	4
700F	Screw	-	S70054	4
351	Spacer	-	S35116	1
435	Screw	A2-70	S4350016075N	1
370	Head	PVC	35031	1
	Tubing,15×23	PVC	70122-2M	1
	Tubing,9.52×12.7	PE	10142-3M	1
	Threaded Connection, 1/2” NPT	-	25650	1
	Collar	-	4340029020N	2

Notes:

1. Replacement of Suction/Discharge Check Valve Assembly, only as assembly of item Nut (104), Ball Check (250), Spring (255), Washer (703), Adaptor (704), Seat (707), Threaded Connection (708).

2. Replacement of Diaphragm Assembly (098), only as assembly of item Diaphragm (098), Plate (098A), Diaphragm (701), O-Ring (438), Screw (435A)

FIGURE 5-13 GM 0090~GM0500 SPACER

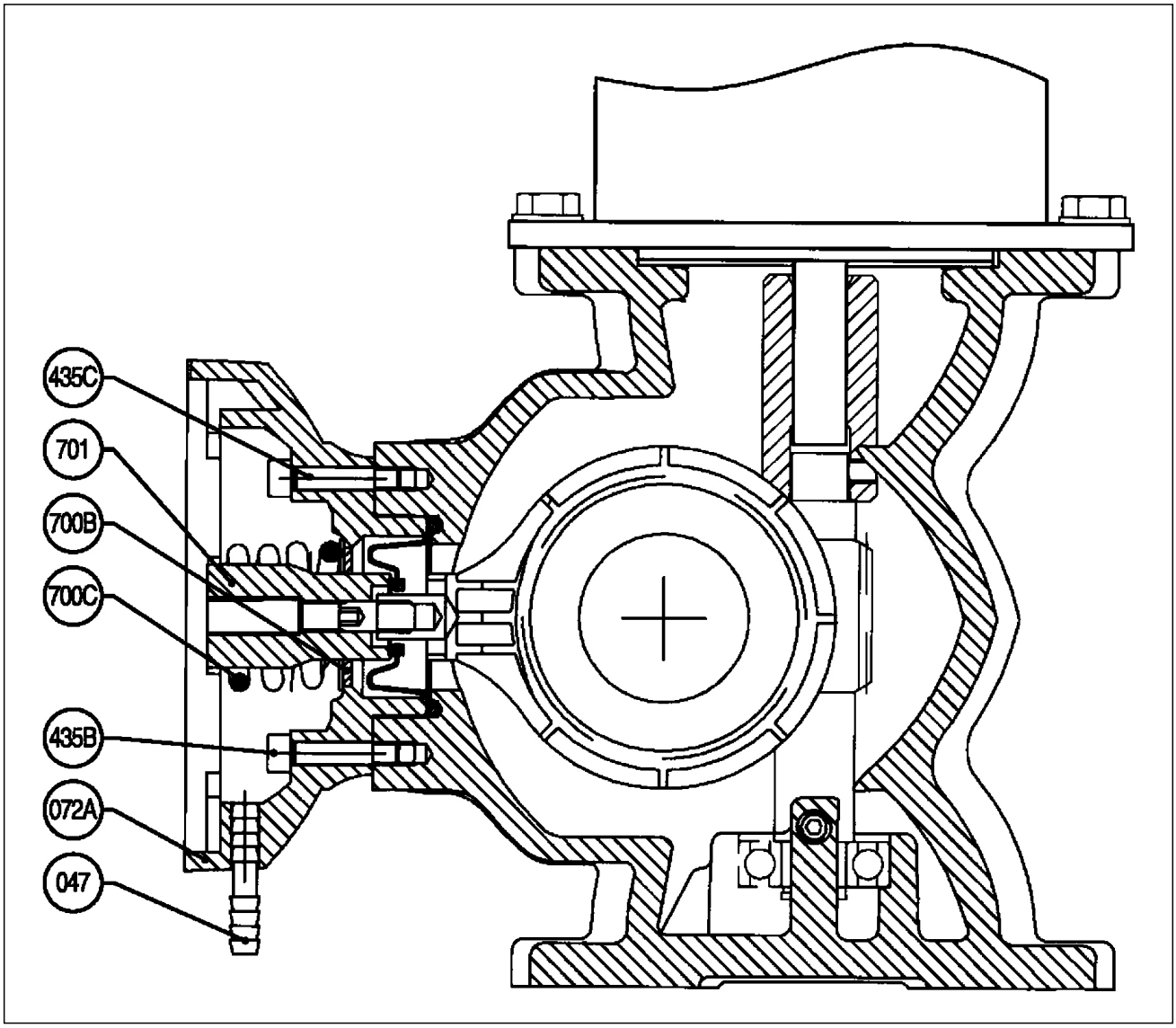
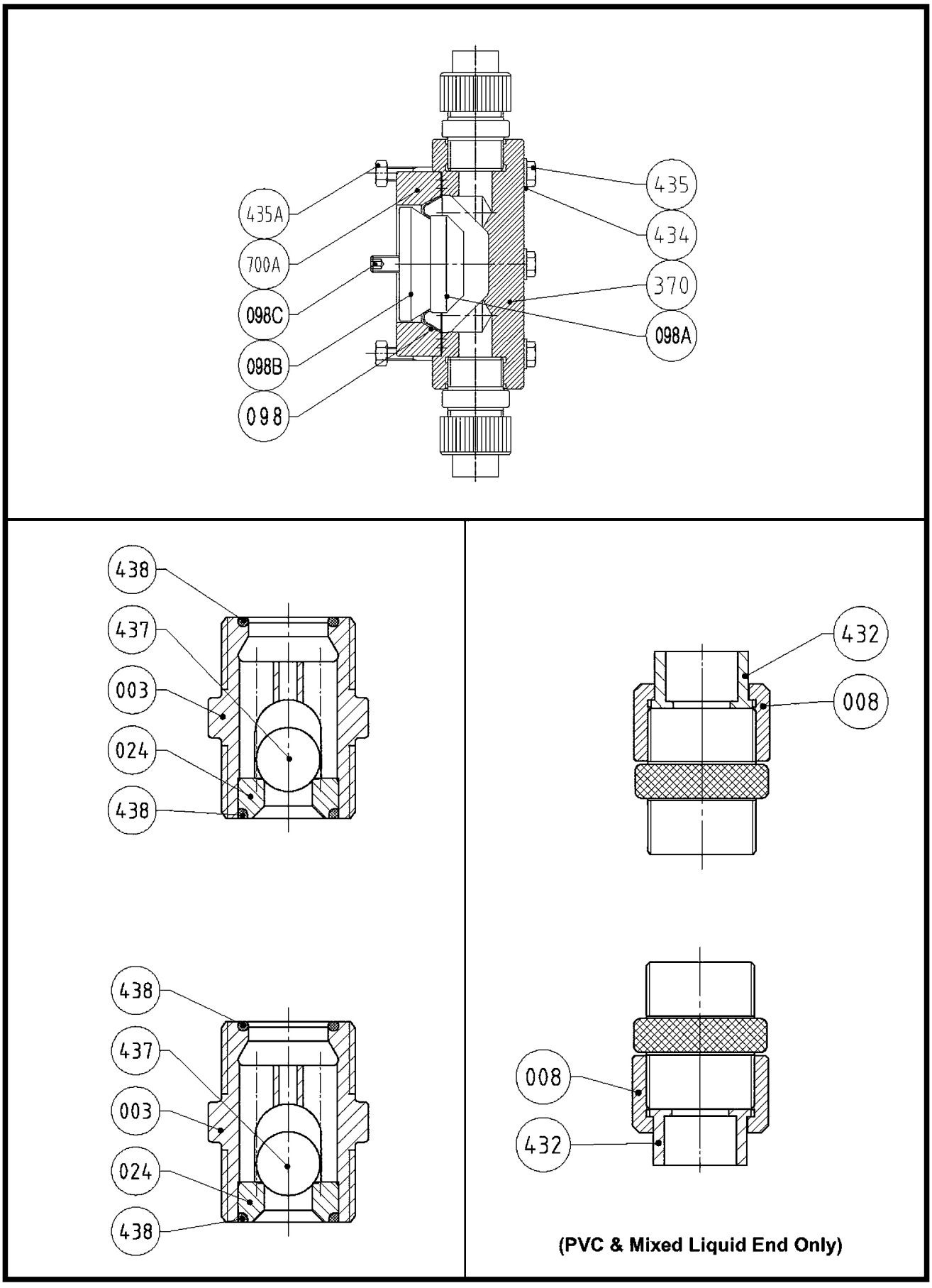


FIGURE 5-14 GM0090~GM0500 PVC, PVDF & MIXED LIQUID END



5.13 PARTS LIST FOR GM0090~GM0500 PVC & MIXED LIQUID END (REFERRING TO FIGURE 5-13 & 5-14)

Item Number	Description	Material	Part Number	Qty.
	Suction/Discharge Valve Assembly (PVC LE , Code Q, DN 15) (Before 2019.11)	-	H60615	2
	Suction/Discharge Valve Assembly (PVC LE , NPT1/2") (Before 2019.11)	-	H60624	2
	Suction/Discharge Valve Assembly (PVC LE , NPT1/2") (After 2019.11)	-	P300125099	2
	Description 'Suction/Discharge Valve Assembly (PVC LE , Code Q, DN 15) (After 2019.11)	-	P300121099	2
	Suction/Discharge Valve Assembly (Mixed LE)	-	H60616	2
047	Tubing Connector	PE	S0470096073N	1
072A	Spacer(After 2008 New Spring Structure)	ASTM 2017	H60673	1
	Spacer LE03/04 (35330 OIL SEAL) (Before 2008 Old Spring Structure)	ASTM 2017	H70096	1
098 098B 098A 098C	Diaphragm Assembly (D.82), PTFE GM0090-GM0240 PP/PVC (After 2019.11)	PVDF/PTFE	P300116099	1
098 098B 098A 098C	Diaphragm Assembly (D.82), PTFE GM0090-GM0240 PP/PVC (2008 ~2019.11 New Spring Structure)	PP/PTFE	3050976111N	1
098 098B 098A 098C	Diaphragm Assembly (D.82), PTFE GM0090-GM0240 PP/PVC (Before 2008 Old Spring Structure)	PP/PTFE	3050976110N	1
098 098B 098A 098C	Diaphragm Assembly (D.93), PTFE GM0330-GM0500 PP/PVC(After 2019.11)	PVDF/PTFE	P300117099	1
098 098B 098A 098C	Diaphragm Assembly (D.93), PTFE GM0330-GM0500 PP/PVC (2008-2019.11 New Spring Structure)	PP/PTFE	3050976091N	1
098 098B 098A 098C	Diaphragm Assembly (D.93), PTFE GM0330-GM0500 PP/PVC (Before 2008 Old Spring Structure)	PP/PTFE	3050976090N	1
370	Head (GM0090~GM0240)	PVC	S60033	1
	Head (GM0330~GM0500)	PVC	H60748	1

434	Washer	A140	S4340005085N	6
435	Bolt	A2-70	H65281	6
435A	Nut	A2-70	S4350000043N	6
435B	Screw	A2-70	S4350047395N	4
700A	Diaphragm Support Ring (GM0090~GM0240 only)	PVC	P300203075	1
	Diaphragm Support Ring (GM0330~GM0500 only)	PVC	H60672	1
700B	Washer	-	S70029	1
700C	Spring, (After2008 New Spring Structure)	-	08001870017N	1
	Spring, LE03/04 (Before 2008 Old Spring Structure)		S70081	
701	Cross Piece (After2008 New Spring Structure)	ASTM 2017	S01903850071N	1
	Cross Piece (Before 2008 Old Spring Structure)	ASTM 2017	H60500	

Note:

1. Replacement of suction/discharge check valve, only as assembly of item check valve body (003), nut (008), seat (024), union (432), ball check (437), O-ring (438), threaded connector.

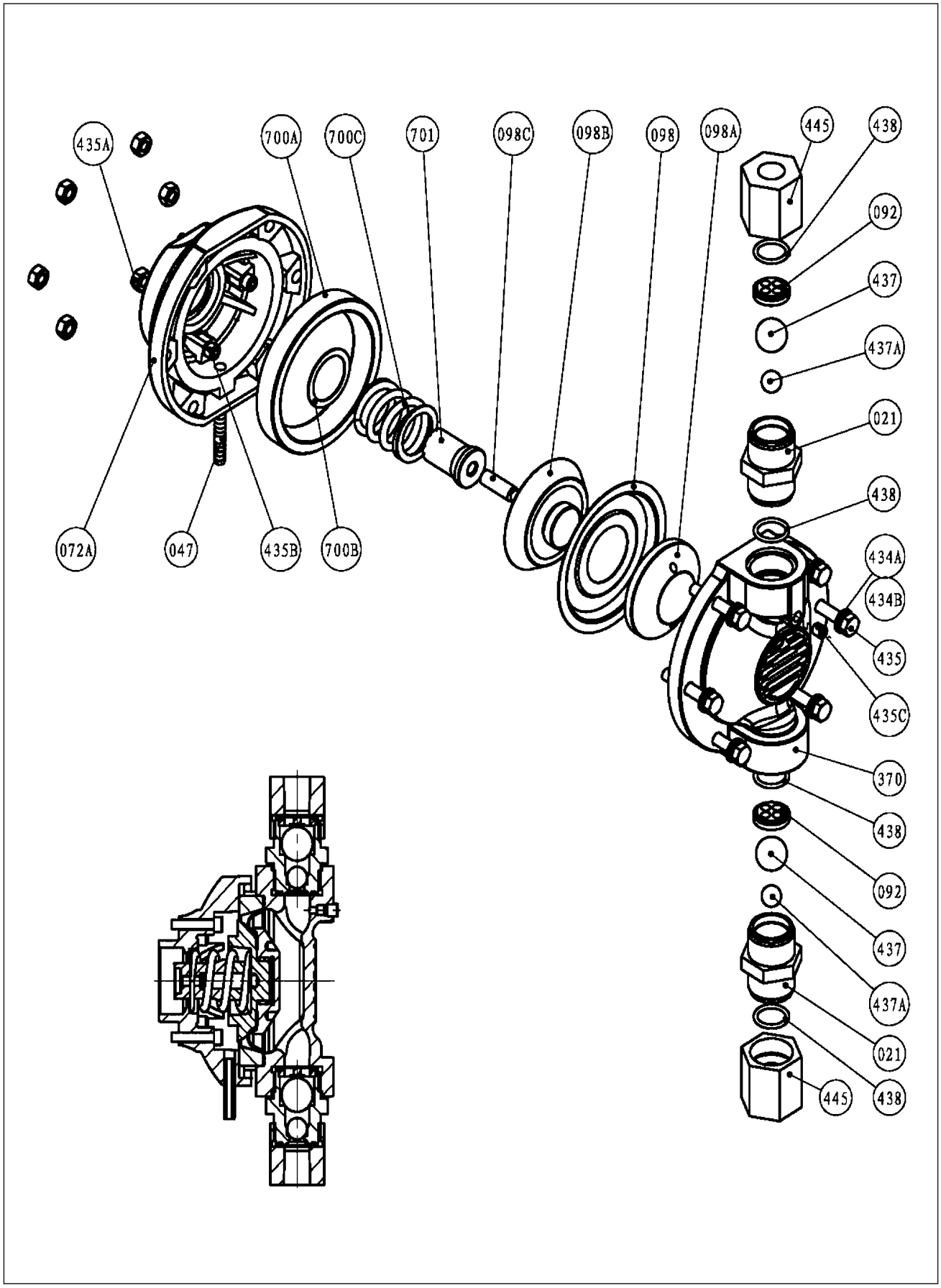
5.14 PARTS LIST FOR GM0090~GM0500 PVDF LIQUID END (REFERRING TO FIGURE 5-13 & 5-14)

Item Number	Description	Material	Part Number	Qty.
	Suction/Discharge Valve Assembly		H60673	2
047	Tubing Connector	-	S0470096073N	1
072A	Spacer(After2008 New Spring Structure)	ASTM 2017	H60673	1
	Spacer LE03/04 (35330 OIL SEAL) (Before 2008 Old Spring Structure)	ASTM 2017	H70096	1
098 098B 098A 098C	Diaphragm Assembly (D.82), PTFE GM0090-GM0240 PVDF (After2008 New Spring Structure)	PVDF /PTFE	3050976131N	1
098 098B 098A 098C	Diaphragm Assembly (D.82), PTFE GM0090-GM0240 PVDF (Before 2008 Old Spring Structure)	PVDF /PTFE	3050976130N	1
098 098B 098A 098C	Diaphragm Assembly (D.93), PTFE GM0330-GM0500 PVDF (After2008 New Spring Structure)	PVDF /PTFE	3050976231N	1
098 098B 098A 098C	Diaphragm Assembly (D.93), PTFE GM0330-GM0500 PVDF(Before 2008 Old Spring Structure)	PVDF /PTFE	3050976230N	1
370	Head (GM0090~GM0240)	PVDF	S0210780078N	1
	Head (GM0330~GM0500)	PVDF	H60650	1
434	Washer	A140	S4340005085N	6
435	Bolt	A2-70	H65281	6
435A	Nut	A2-70	S4350000043N	6
435B	Screw	A2-70	S4350047395N	4
700A	Diaphragm Support Ring (GM0090~GM0240)	PVC	P300203075	1
	Diaphragm Support Ring (GM0330~GM0500)	PVC	H60672	1
700B	Washer	-	S70029	1
700C	Spring, (After2008 New Spring Structure)	-	08001870017N	1
	Spring, LE03/04 (Before 2008 Old Spring Structure)		S70081	
701	Cross Piece (After2008 New Spring Structure)	ASTM2071	S01903850071N	1
	Cross Piece (Before 2008 Old Spring Structure)		H60500	

Note:

1. Replacement of suction/discharge check valve, only as assembly of item check valve body (003), seat (024), ball check (437), O-ring (438), threaded connector.

FIGURE 5-15 GM0090~GM0500 STAINLESS STEEL & SLURRY LIQUID END



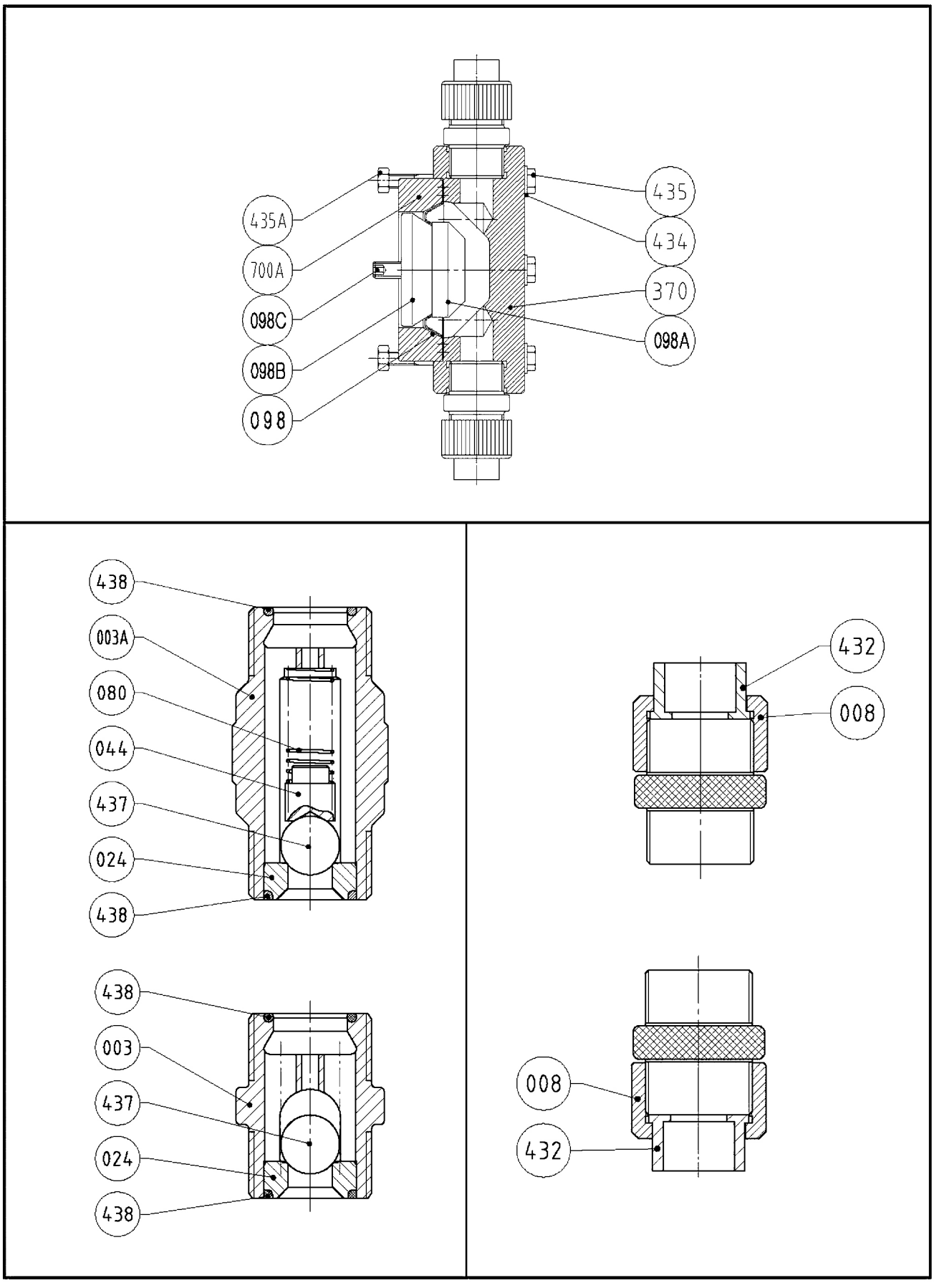
5.15 PARTS LIST FOR GM0090~GM0500 STAINLESS STEEL & SLURRY LIQUID END (REFERRING TO FIGURE 5-13 & 5-15)

Item Number	Description	Material	Part Number	Qty.
	Check valve assembly：445, 419, 420, 422, 421, 424			
	Check Valve Assembly (316SS LE)	AISI 316SS	H60618	2
	Check Valve Assembly (Slurry LE)	AISI 316SS	H60619	2
047	Tubing Connector	-	S0470096073N	1
072A	Spacer (After2008 New Spring Structure)	ASTM 2017	H60673	1
	Spacer LE03/04 (35330 OIL SEAL) (Before 2008 Old Spring Structure)	ASTM 2017	H70096	
	Diaphragm assembly：098A, 098, 098B, 098C			
	Diaphragm Assembly (D.82), PTFE, GM0090-GM0240 316SS (After2008 New Spring Structure)	316SS/PTFE	3050976121N	**1**
	Diaphragm Assembly (D.82), PTFE, GM0090-GM0240 316SS (Before 2008 Old Spring Structure)	316SS/PTFE	3050976120N	**1**
	Diaphragm Assembly (D.82), PTFE, GM0330-GM0500 316SS (After2008 New Spring Structure)	316SS/PTFE	3050976321N	**1**
	Diaphragm Assembly (D.82), PTFE, GM0330-GM0500 316SS (Before 2008 Old Spring Structure)	316SS/PTFE	3050976320N	**1**
370	Head(GM0090-GM0240) Cast	AISI 316SS	H60977	1
	Head(GM0330-GM0500) Cast	AISI 316SS	H60693	1
434A	Washer	A4	S4340005085N	6
434B	Washer	A2	S4340009002	6
435	Bolt	A2-70	H65085	6
435A	Nut	A2-70	S4350000043N	6
435B	Screw	A2-70	S4350047395N	4
435C	Bleed Plug1/16”	316SS	H69817	1
700A	Diaphragm Support Ring (GM0090~GM0240)	PVC	P300203075	1
	Diaphragm Support Ring (GM0330~GM0500)	PVC	H60672	1
700B	Washer	-	S70029	1
700C	Spring, (After2008 New Spring Structure)	-	08001870017N	1
	Spring, LE03/04 (Before 2008 Old Spring Structure)		S70081	
701	Cross Piece (After2008 New Spring Structure)	ASTM2071	S01903850071N	1
	Cross Piece (Before 2008 Old Spring Structure)	ASTM 2017	H60500	

Note:

1. Replacement of suction/discharge check valve, only as assembly of item ball guide (021), ball stop (092), ball check (437&437A), O-ring (438) & threaded connector.

FIGURE 5-16 GM0090~GM0500 HIGH VISCOSITY LIQUID END



5.16 PARTS LIST FOR GM0090~GM0500 HIGH VISCOSITY LIQUID END (REFERRING TO FIGURE 5-13 & 5-16)

Item Number	Description	Material	Part Number	Qty.
	Suction Check Valve Assembly	-	H60621	1
	Discharge Check Valve Assembly	-	H60620	1
047	Tubing Connector	-	S0470096073N	1
072A	Spacer(After2008 New Spring Structure)	ASTM 2017	H60673	1
	Spacer LE03/04 (35330 OIL SEAL) (Before 2008 Old Spring Structure)	ASTM 2017	H70096	1
098	Diaphragm Assembly (D.82), PTFE GM0090-GM0240 PP/PVC (After 2019.11)	PVDF/PTFE	P300116099	1
098B				
098A				
098C				
098	Diaphragm Assembly (D.82), PTFE GM0090-GM0240 PP/PVC (2008 -2019.11New SpringStructure)	PP/PTFE	3050976111N	1
098B				
098A				
098C				
098	Diaphragm Assembly (D.82), PTFE GM0090-GM0240 PP/PVC (Before 2008 Old Spring Structure)	PP/PTFE	3050976110N	1
098B				
098A				
098C				
098	Diaphragm Assembly (D.93), PTFE GM0330-GM0500 PP/PVC(After 2019.11)	PVDF/PTFE	P300117099	1
098B				
098A				
098C				
098	Diaphragm Assembly (D.93), PTFE GM0330-GM0500 PP/PVC (2008 -2019.11New SpringStructure)	PP/PTFE	3050976091N	1
098B				
098A				
098C				
098	Diaphragm Assembly (D.93), PTFE GM0330-GM0500 PP/PVC (Before 2008 Old Spring Structure)	PP/PTFE	3050976090N	1
098B				
098A				
098C				
370	Head, (GM0090-GM0240)	PVC	S60033	1
	Head, (GM0330-GM0500)	PVC	H60748	1
434	Washer	-	S4340005085N	6
435	Bolt	-	H65281	6
435A	Nut	-	S4350000043N	6
435B	Screw	-	S4350047395N	4
700A	Diaphragm Support Ring (GM0090~GM0240)	PVC	P300203075	1
	Diaphragm Support Ring (GM0330~GM0500)	PVC	H60672	1

700B	Washer	-	S70029	1
700C	Spring,(After2008 New Spring Structure)	-	08001870017N	1
	Spring, LE03/04 (Before 2008 Old Spring Structure)		S70081	
701	Cross Piece (After2008 New Spring Structure)	ASTM2071	S01903850071N	1
	Cross Piece (Before 2008 Old Spring Structure)	ASTM 2017	H60500	

Note:

1. Replacement of suction/discharge check valve, only as assembly of item ball guide ball guide (003&003A), nut (008), seat (024), push-button (044), spring (080), union end (432), ball check (437), O-ring (438)

FIGURE 5-17 GM DOUBLE DIAPHRAGM LEAKAGE DETECTION WITH PRESSURE GAUGE SECTIONAL VIEW

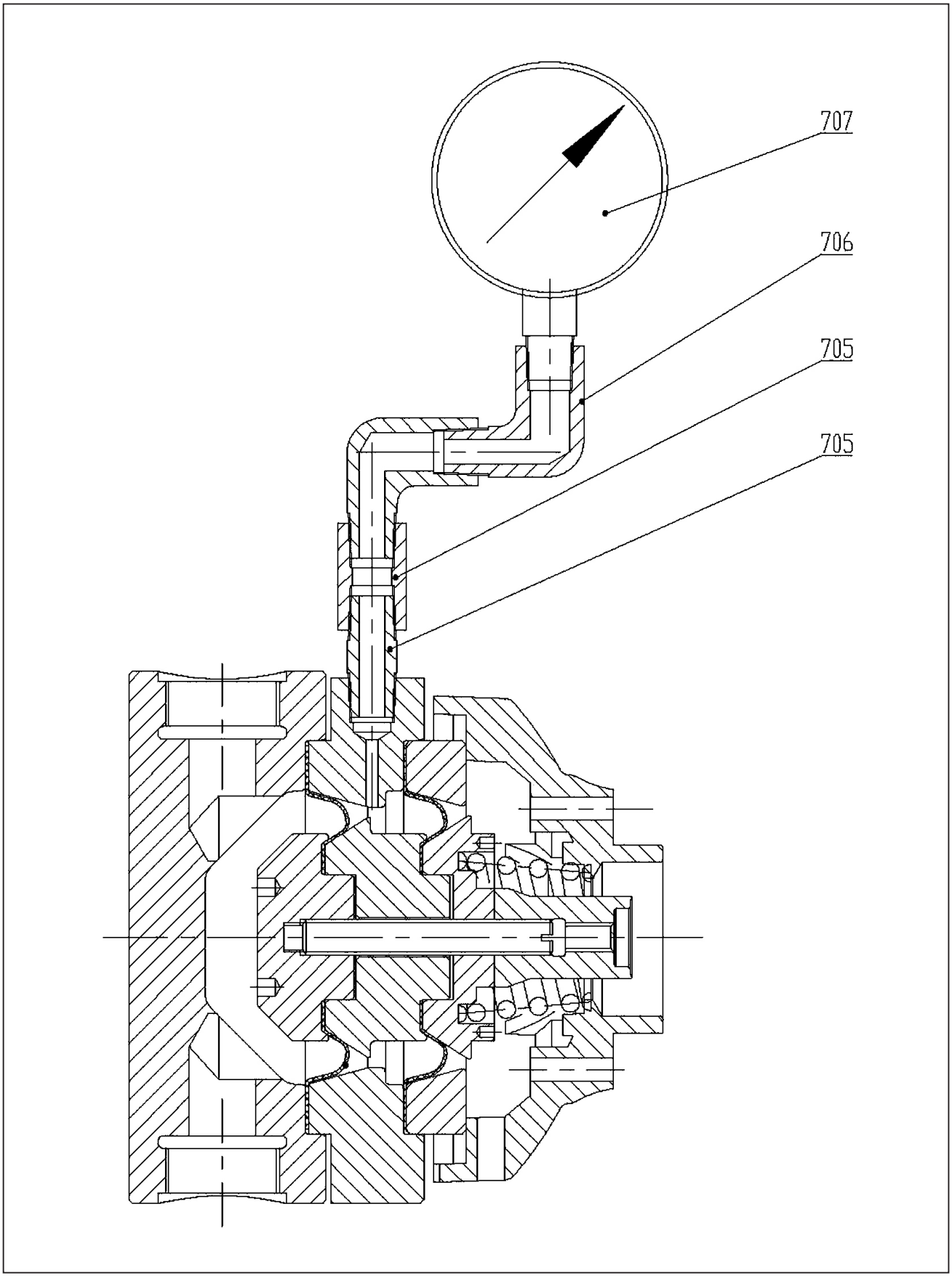
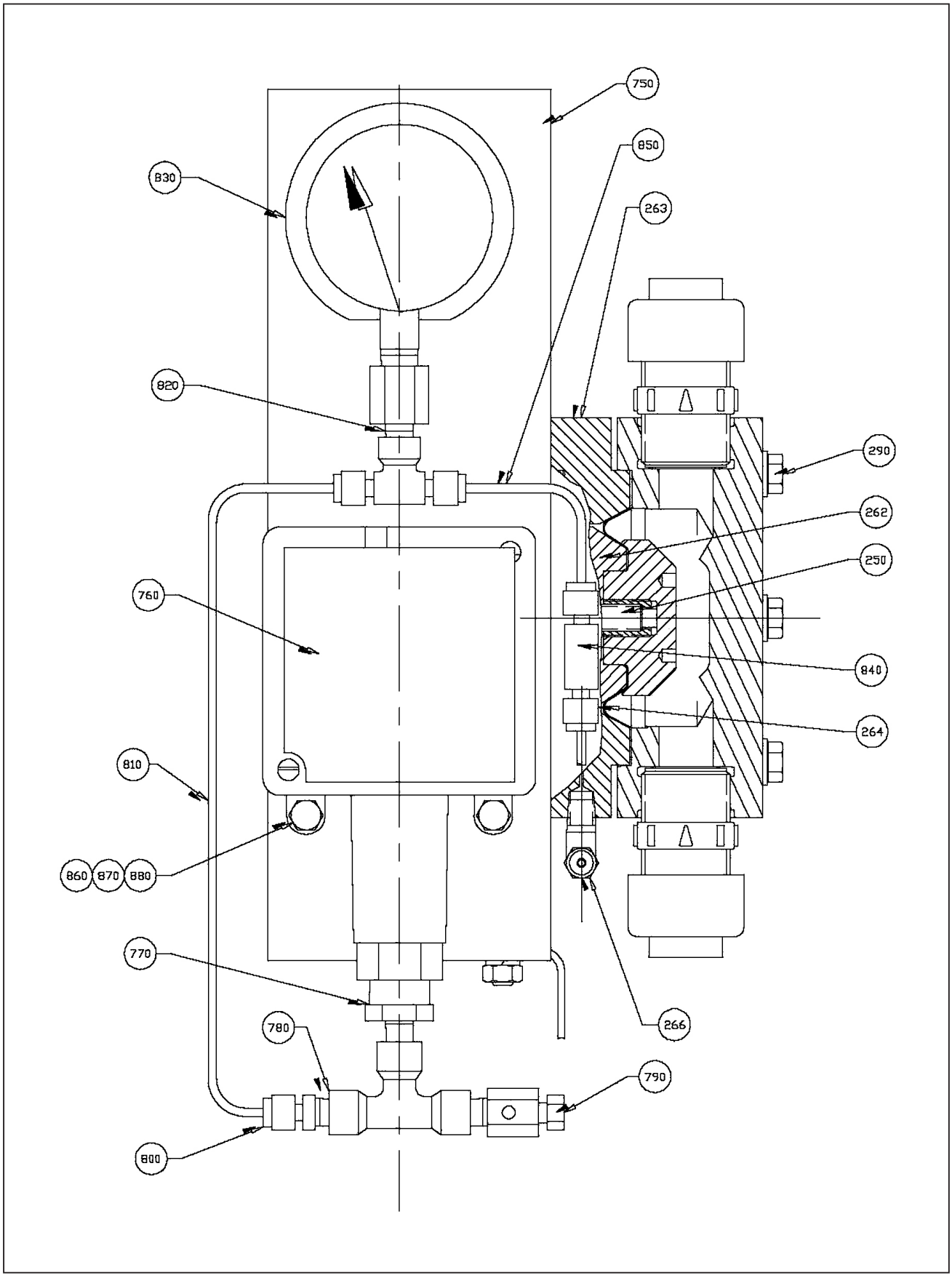


FIGURE 5-18 GM DOUBLE DIAPHRAGM LEAKAGE DETECTION WITH PRESSURE GAUGE AND SWITCH SECTIONAL VIEW



5.17 PARTS LIST FOR DOUBLE DIAPHRAGM ASSEMBLY(REFERRING TO FIGURE 22 & 23)

Common Parts

Item Number	Description	Material	Part Number	Qty.
	Double Diaphragm Assy., GM0002-GM0010, PVC	-	H70138	1
	Double Diaphragm Assy., GM0002-GM0010, PVDF	-	H70139	1
	Double Diaphragm Assy., GM0002-GM0010, 316SS	-	H70140	1
	Double Diaphragm Assy., GM0025-GM0050, PVC	-	H70135	1
	Double Diaphragm Assy., GM0025-GM0050, PVDF	-	H70136	1
	Double Diaphragm Assy., GM0025-GM0050, 316SS	-	H70137	1
	Double Diaphragm Assy., GM0090-GM0240, PVC (After 2019.11)	-	P300118099	1
	Double Diaphragm Assy., GM0090-GM0240, PVC (2008-2019.11 New Spring Structure)	-	H70152	1
	Double Diaphragm Assy., GM0090-GM0240, PVC (Before 2008 Old Spring Structure)		H70141	1
	Double Diaphragm Assy., GM0090-GM0240, PVDF (After2008 New Spring Structure)	-	H70153	1
	Double Diaphragm Assy., GM0090-GM0240, PVDF (Before 2008 Old Spring Structure)		H70142	1
	Double Diaphragm Assy., GM0090-GM0240, 316SS (After2008 New Spring Structure)	-	H70154	1
	Double Diaphragm Assy., GM0090-GM0240, 316SS (Before 2008 Old Spring Structure)		H70143	1
	Double Diaphragm Assy., GM0330-GM0500 PVC (After 2019.11)	-	P300119099	1
	Double Diaphragm Assy., GM0330-GM0500 PVC (2008-2019.11 New Spring Structure)	-	H70155	1
	Double Diaphragm Assy., GM0090-GM0240, PVC (Before 2008 Old Spring Structure)		H70144	1
	Double Diaphragm Assy., GM0090-GM0240, PVDF (After2008 New Spring Structure)	-	H70156	1
	Double Diaphragm Assy., GM0090-GM0240, PVDF (Before 2008 Old Spring Structure)		H70145	1
	Double Diaphragm Assy., GM0090-GM0240, 316SS (After2008 New Spring Structure)	-	H70157	1
	Double Diaphragm Assy., GM0090-GM0240, 316SS (Before 2008 Old Spring Structure)		H70146	1
	Double Diaphragm Assy., GM0330~GM0500,BLACK PP(After2008 New Spring Structure)		H70159	1
290	Bolt,#10UNCx2” GB5783-86,M8X120 (GM0002-GM0050)	-	H65530	4
290	Bolt. GB5782-86 M8 X 120 (GM0090-GM0500)	-	H65078	6

With Pressure Gauge and Switch

Item Number	Description	Material	Part Number	Qty.
750	Bracket, Pressure Switch	-	H70120	1
760	NEMA 4 Pressure Switch, 5-30psi	-	S4060388001	1
770	Red Nipple, 1/2’’ x 1/8’’ M	316SS	S40064	1
780	Tee, 1/8’’ NPT	316SS	S40062	2
790	Bleed Valve, 1/8’’ NPT	316SS	S40063	1
800	Tube Conn., 1/8” tube x 1/8’’ NPT	316SS	S40061	3
810/850	Tube 1/8”	316SS	H68031	0.6 m
820	Red Adapter, 1/4F x 1/8” M NPT	316SS	S40067	1
830	Pressure Guard, 0-400psi Dual Flange Mount	316SS	S40066	1
840	Cheek Valve,1/8” Tube,1/3psi	316SS	S40065	1
860	Hex Screw, 1/4-20×3/4	A2-70	S4050016095	2
870	Spring Lock Washer	A2	S4040039022	2
880	Hex Nat 1/4-20NC	A2	S4050064012	2
226	Make Elbow, 1/8’’	316SS	H69049	1
	Base plate	CS	H70099	1

Only With Pressure Switch

Item Number	Description	Material	Part Number	Qty.
750	Bracket, Pressure Switch	-	H70120	1
760	NEMA 4, Pressure Switch, 5~30psi	-	S4060388001	1
770	Red Nipple, Hex1/2’’ x 1/8’’ M	316SS	S40064	1
780	Branch Tee, 1/8’’ NPT	316SS	S40062	2
790	Bleed Valve,1/8’’ NPT	316SS	S40063	1
800	Tube Conn., 1/8” tube x 1/8’ NPT	316SS	S40061	3
810	Tube, 1/8”	316SS	H68031	0.6 m
820	Red Adapter, 1/4” F x 1/8 M NPT	316SS	S40067	1
840	Cheek Valve,1/8” Tube,1/3psi	316SS	S40065	1
860	Hex Screw, 1/4-20 x 3/4	A2-70	S4050016095	2
870	Spring Lock Washer	A2	S4040039022	2
880	Hex Nat 1/4-20NC	A2	S4050064012	2
226	Make Elbow, 1/8’’ x 1/4”	316SS	H69049	1
	Base plate	CS	H70099	1

Only With Pressure Gauge

Item Number	Description	Material	Part Number	Qty.
705	Tube Connector	316SS	H60804	1
706	Tube Connector	316SS	H69023	1
707	Pressure Gauge, 2.5MPa, YN-63(2.5’’)ZG14	316SS	H60805	1

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