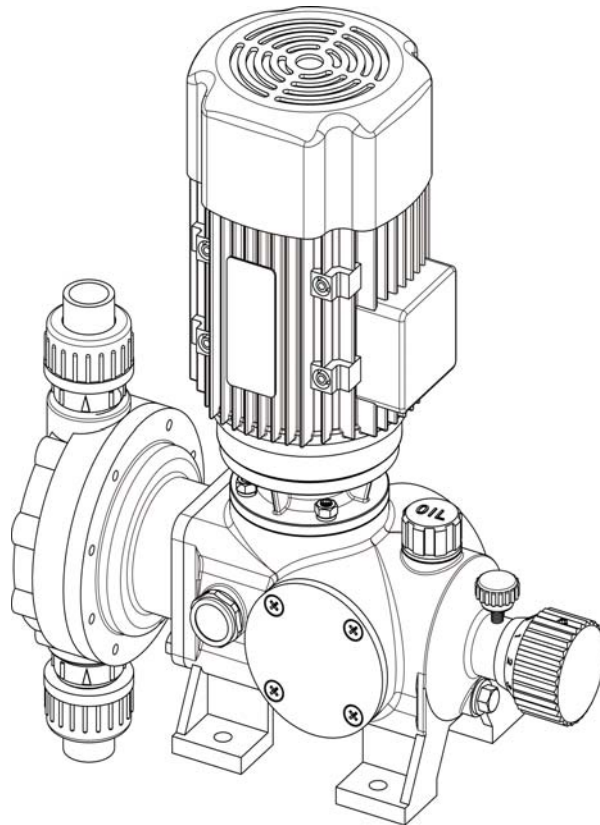

USER'S MANUAL



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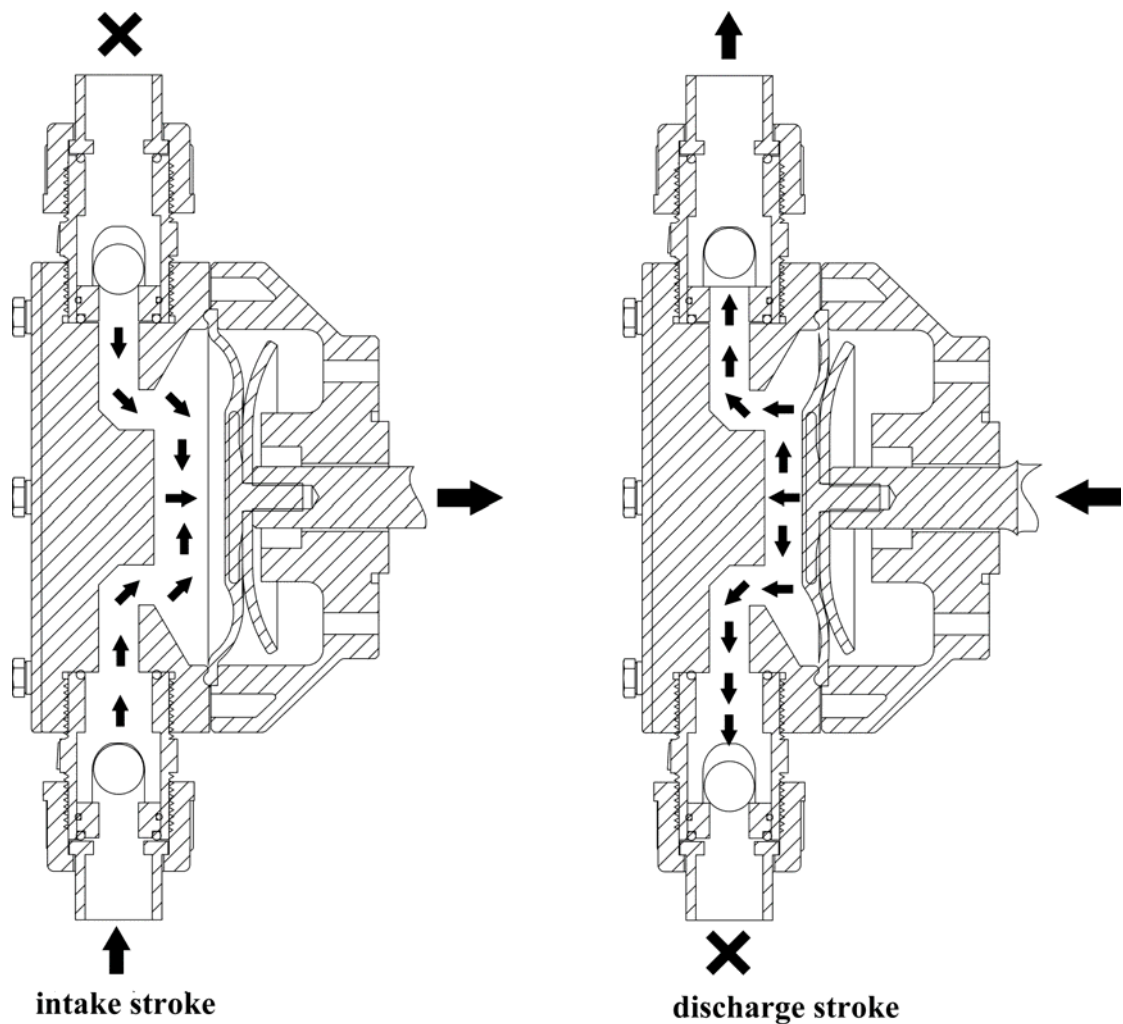
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1. Introduction

Diaphragm metering pump is a kind of mechanically controlled volumetric and reciprocating pump. It includes a power system and a fluid section, separated by PTFE diaphragm. The appearance may vary due to different fluid sections and accessories, but the operation principle is the same.

2. Working Principle

2.1. Pump Head Structure



The diaphragm makes reciprocating motion within the range of preset stroke length, causing the transfer of designated volume fluid. When the diaphragm is pulled back, a certain amount of fluid is sucked into the pump head through the check valve. When the diaphragm is pushed forward, the same amount of fluid is discharged by the outlet check valve.

2.2. Pump Head Components

A typical pump head components consist of a pump head, a piece of diaphragm, and a set of inlet and outlet check valves. It is very important to maintain these components, as they are the only parts that touch the pumped mediums.

2.3. Adjusting components

The stroke adjusting system is the main part of the adjusting components. The stroke length could be seen from the marks on the adjusting components (from 0%-100%).

The stroke length could be changed by loosening the adjusting lock handle and rotating the adjusting handle wheel. More information please see article 6.2.

If automatic flow control equipment or variable-frequency motor is needed, please contact your local dealer or our company for more information.

2.4. Drive System Components

The pump is driven by the motor. The motor drives the worm, which converts the rotation speed to torque. The worm provides power to the eccentric shaft components, thus it changes the rotary motion to the reciprocating motion.

3. Open Package Inspection

Check the equipment according to the packing list. If there is any shortage or damage, please contact the carrier or our authorized sales representative or our local distributors.

4. Storage

4.1. Short-term Storage

Storage within 6 months is considered as short-term storage. The following storage instructions are to be observed:

1. Storage environment: Dry, indoor and normal temperature.
2. Avoid exposing to humid environment. A protective film may be needed outside the original package according to the actual operation environment.
3. Check the equipment again before start-up and follow the manual instruction.

4.2. Long-term Storage

Besides instructions mentioned above, let the pump run at least 1 hour every 12months. It is not necessary to pump liquid, but the inlet and outlet should be open. Accessories like seals, pads and packings are out of warranty if they are kept exceeding 12 months.

If the storage exceeds 12 months, check or replace the accessories mentioned above. Cost for accessories and labor charge should be borne by the buyer.

5. Installation

5.1. Installation Place

The installation place should be convenient for daily maintenance. This pump can be both used indoor or outdoor. Hood or covering is needed if it is used outdoor. When the environment temperature is below 0 °C, the pump should be external heated.(Especially it is under intermittent running.) Pump should be installed on solid plat mount firmly, in order to minimize the vibration. The level deviation should be less than 1° to ensure that the check valve work normally. The dimensional drawing of the pump seat and the exterior please refer to installation diagram.

5.2. Piping System

The piping system should include the followings:

1. Safety valves. They are used to protect the piping system and the equipment and may avoid the loss due to over pressure.
2. Break valve and connecting joint (or flange) .These accessories can help us check the check valves without emptying the pipelines. The specification of the break valve should be in accordance with the pipe specification. Globe ball valve is the priority, as it has a less limit on the flow.
3. Inlet filter or Y shape filter(Y type strainer). The pump head and check valve are easily blocked by the solid contamination which may cause the system malfunction. Thus it is necessary to install filters before the break valve and inlet valve. The size of filter should be in accordance with the flow and the solid contamination viscosity. 80-100 meshes filter is suggested.
4. Vacuum gauge or pressure meter on the inlet and outlet pipes. Pressure meter should be installed in conjunction with the break valve, which could protect the meter when it is not in use.
5. A separated holder is needed, as the valve or the pump head cannot bear the weight of the pipe, or it may cause leakage.
6. The sealant used on the pipe. The sealant should be compatibility for your medium. Do not block the pipe head if use sealing tape. Make sure remove the used sealing tape completely. Clean the pipe with liquid (be compatible with the material) for the first time, and dry it before connect to the pump. Make sure there is no object in the pipes that will block the check valve.

5.3. Inlet Pressure

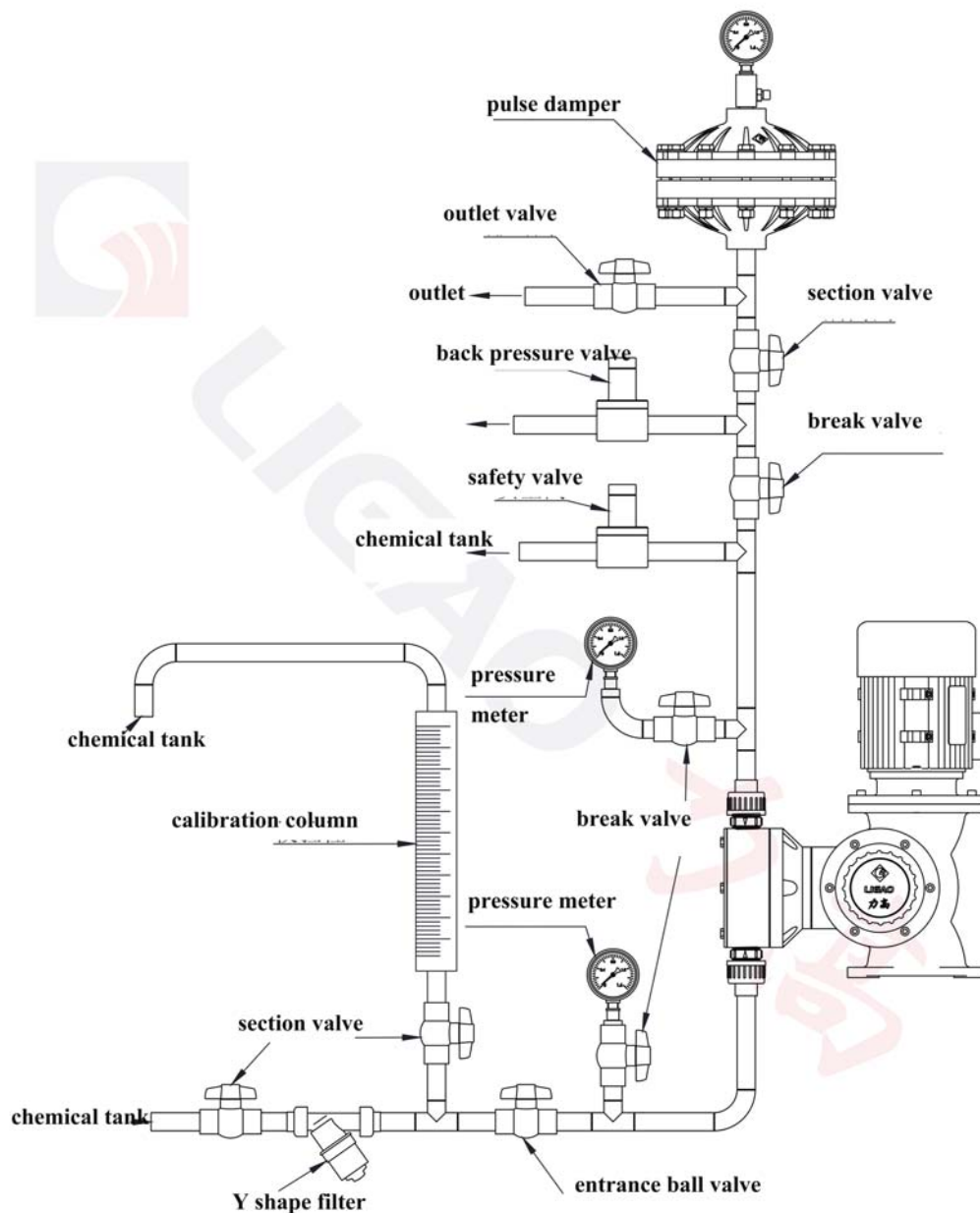
Though the metering pump has the function of self-suction, it is better to adopt perfusion inhalation which causes inlet suction pressure higher than the atmospheric pressure. The pump should be near the chemical tank, and the inlet pipe should less than 3 meters vertically. The pump may not provide reliable and accurate flow if it can't satisfy above requirements. And the foot valve is required for the inlet pipe at the lowest point. For the first start-up, it may need perfusion operation to make the pump work normally.

5.4. Outlet Pressure

All metering pumps are designed for continuous operation at rated outlet pressure. If the inlet

pressure is higher than the outlet pressure, it will cause additional flow, which will reduce the accuracy of the pump and be out of control of the flow. In order to avoid such situation, the outlet pressure should be at least 0.35bar higher than the inlet pressure. A back-pressure valve can be installed when necessary. The outlet pressure should not higher than the rated pressure. To prevent the pump from being damaged due to over pressure, the safety valve should be also installed on the pipe. The following installation diagram is for your reference.

Metering Pump Installation



6. Start-up

6.1. Fastening Piece Check

Check all the fastening pieces before start-up, including the pump head bolts, motor bolts, connecting pieces on the mount.

6.2. Lubricating Oil Adding

The lubricating oil is emptied before leave the factory in order to facilitate transportation. Add lubricating oil before first start-up. Please refer to article 7.1.

6.3. Flow Adjustment

The metering pump is equipped with a handwheel for manual adjustment of the flow. The adjustment range of the handwheel is from 0% to 100%.The adjustment value indicates the percentage of the rated flow. Please take the actual measured flow as the criterion.

1. Loosen the adjusting lock handle by the anticlockwise rotation.

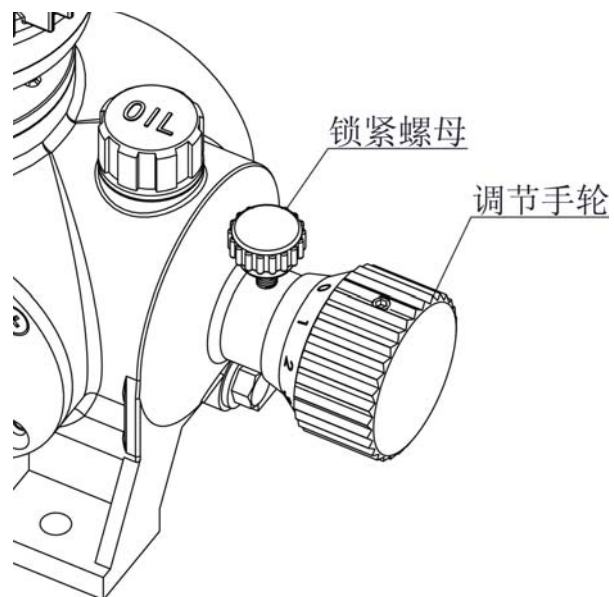
Noted: The mechanism may be damaged if rotating the handle wheel without loosening the adjusting lock handle.

2. Rotate the handwheel to the value needed.

For example: If we need the stroke length at 55 % (factory default setting is 0%), rotate the handwheel by clockwise rotation, until the scale value pointing to 55%. Thus the flow becomes to 55% of the rated flow.

Noted: Mark from 0-9 on the handwheel is for one turn, corresponding to 10% of the rated flow.

3. Tight the adjusting lock handle by clockwise rotation after the value is set. This adjustment could be done either when the pump is on running or at stop.



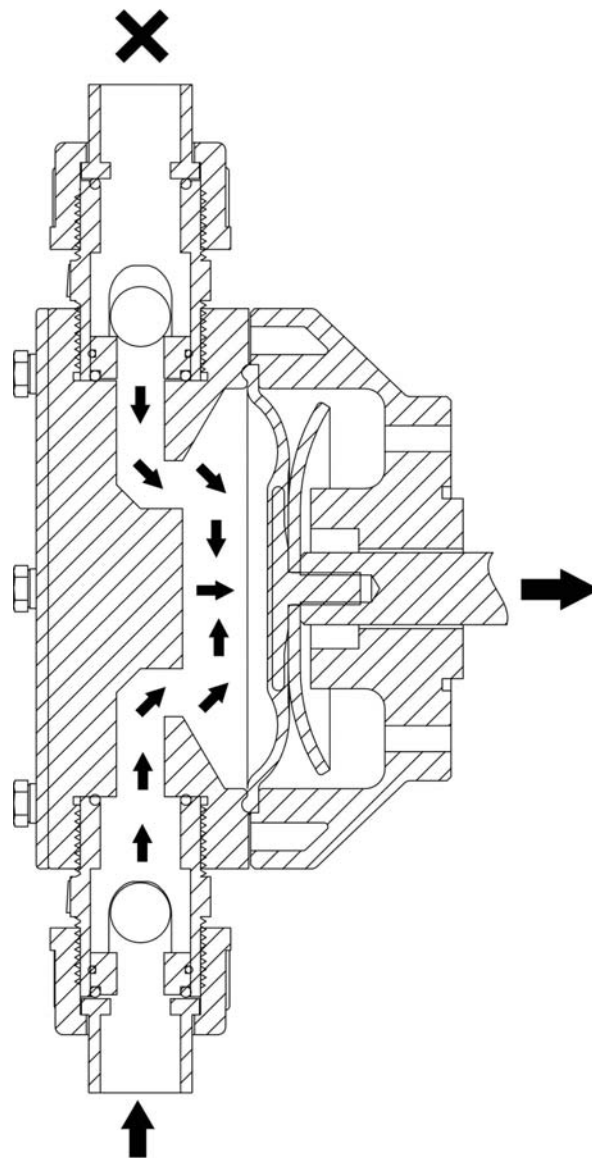
6.4. Pump Perfusion

1. Please follow the equipment safety instruction, and by a professional worker when operating.
2. Make sure all the fastening pieces are tightened up.
3. Open the break valves on the inlet and outlet pipes.
4. If the pipe or the chemical tank is designed for feeding medium by its gravity, the pump will be self-filling when it starts reducing the outlet pressure. If the outlet pipe contains a lot of air or other gases, it is necessary to reduce the outlet pressure to make the pump self-suck.

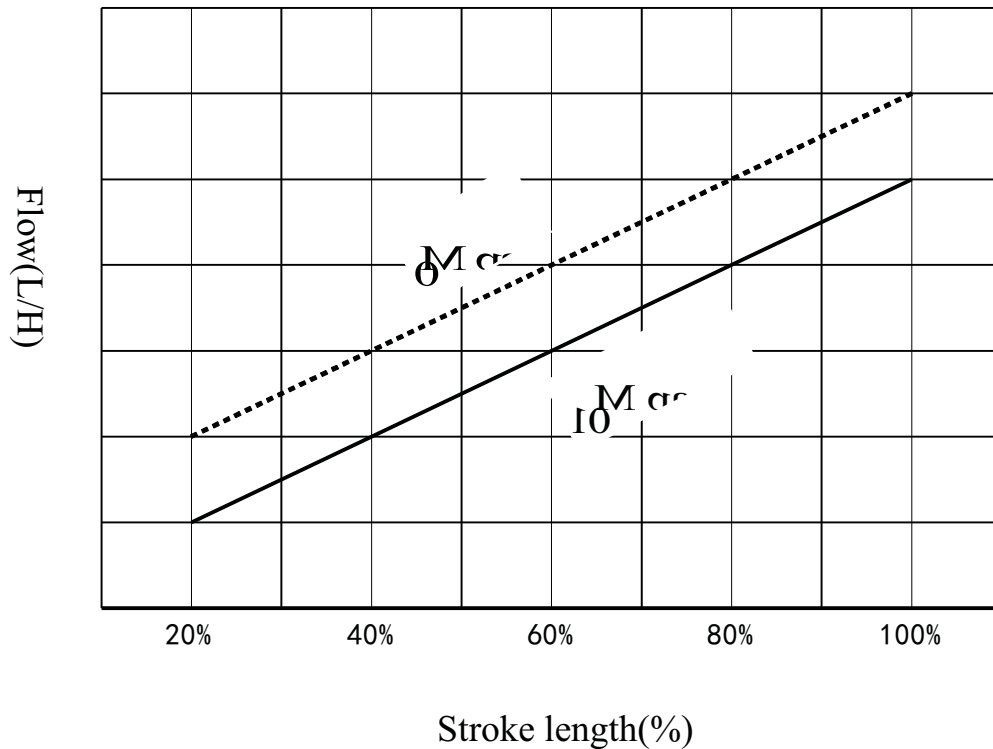
5. If the pump suction height is too long, it is necessary to make perfusion operation for the pump head and inlet pipe. If the pump still fails in suction after following step 4, please disassemble the outlet valves. Fill the pump head, then install back the break valves.

6. Set the stroke length at 0 position when starts the pump, increase the stroke length to 100 position gradually. If it fails, perfuse the the inlet pipe.

7. A foot valve is needed at the bottom of the inlet pipe to make the fluid inside the pipe above the fluid level in the chemical tank. Uninstall the inlet valves, fill the inlet pipe, then install back the inlet valves. Uninstall the outlet valves, fill the pipe following (3).Start the pump following (4), the pump will be self-filling. If the perfusion liquid is different from the medium, make sure they are compatible.



6.5. Calibration



All metering pumps need calibration, and set the stroke length according to the actual flow accurately. The above table is a typical calibration table. Though the stroke length has linear relationship with the outlet flow, the increasing of outlet pressure will reduce the outlet flow. Every outlet pressure will draw a line (the above table only shows two lines). Under the atmospheric pressure, the flow is decided by the size of the diaphragm, length of the stroke and the frequency of the stroke. The increase of the outlet pressure will reduce the outlet flow. It has rated flow under the rated pressure (please check the date plate). It is better to take the calibration under the actual operation condition (under same pressure and same or similar medium). To create a calibration table, it needs to measure the flow at three or more stroke length values (for example, 25, 55, 75 and 100). Mark down the measurement value and draw a curve according to the point marked on the table. Under the same condition, this curve can show us the relationship between the flow and the stroke length. All the users are recommended to calibrate the flow after the metering pump is completely installed.

7. Maintain



Warning

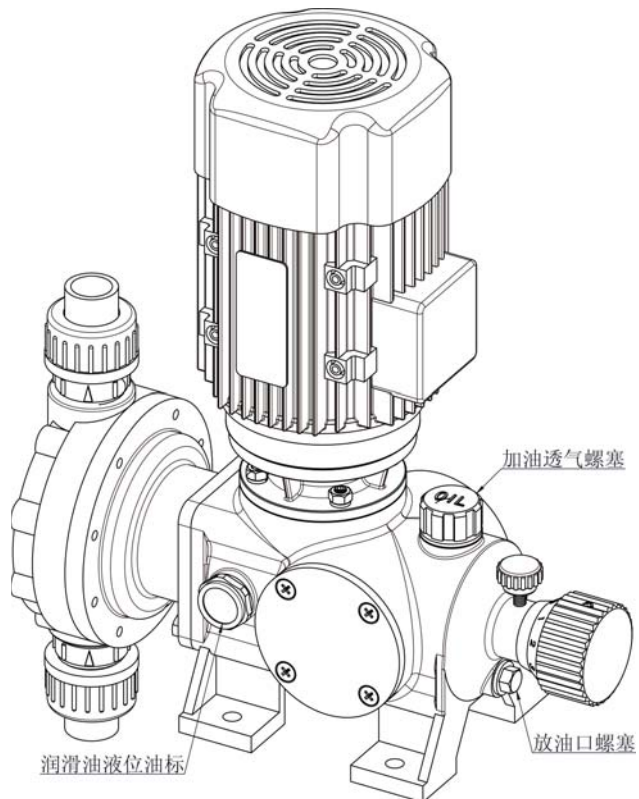
Before the maintenance of the pump head or the valves, please make sure the pressure has been released. When pump dangerous medium, please use correct chemicals to neutralize it. Wear protective clothes and use protective equipment.

Type and level of maintenance to be taken should according to the previous calibration data. Maintenance based on this data will reduce the incidence of malfunction. Service life time of some pump accessories, such as diaphragm and the check valves, are difficult to estimate, as it is influenced by the corrosion rate or the operation condition. Recommend to prepare oil seal, diaphragm, check valves and lubricant as spare parts.

7.1. Lubrication

The pump has been lubricated at factory. Change the lube oil after the pump operates 300-500 hours for the first time. And change lube oil every 1500 hours operation after then. (#220 synergy worm gear oil and #50gear oil are suggested) Shorten the time interval for changing oil at extreme high or low temperature or in dusty environment. Check the oil position from time to time, and replenish oil with the same brand and type oil when needed.

1. Disconnect the power of the motor, release the pipe pressure and close the inlet and outlet break valves.
2. Unscrew the oil drain plug, drain off the lube oil, and clean the inner pump body thoroughly. Put the oil drain plug back (check the seals, changed for a new one if it is damaged).
3. Unscrew the oil changing plug, and add the new lube oil until it reach the center of the oil level (refer to below picture).,
4. Put back the oil changing plug.

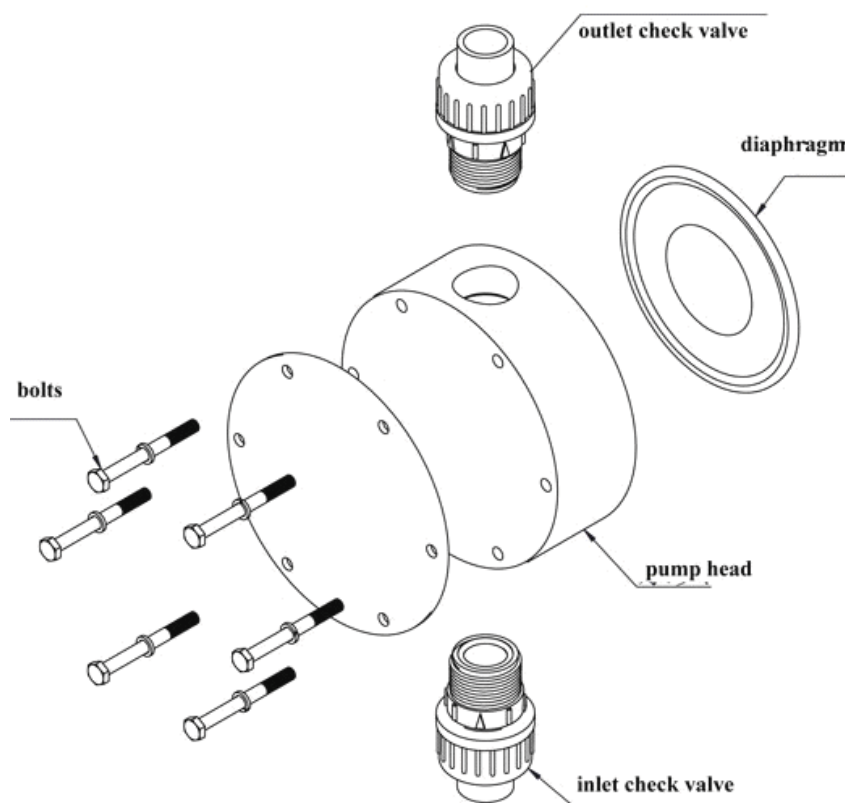


7.2. Diaphragm Uninstall, Check and Install



Warnings

If the diaphragm is ruptured, the leakage medium may pollute the pump or the environment, even though the leakage medium will drain off from the discharge hole. Please take care with this operation.



Diaphragm does not have fixed service life. The accumulation of impurities or mediums may cause diaphragm deformation, which will lead to pump system malfunction. Over pressure or chemical corrosion will also cause system malfunction. Please check and change the diaphragm regularly. Users should determine the appropriate maintenance interval based on the actual system conditions.

7.2.1. Diaphragm uninstall and reinstall

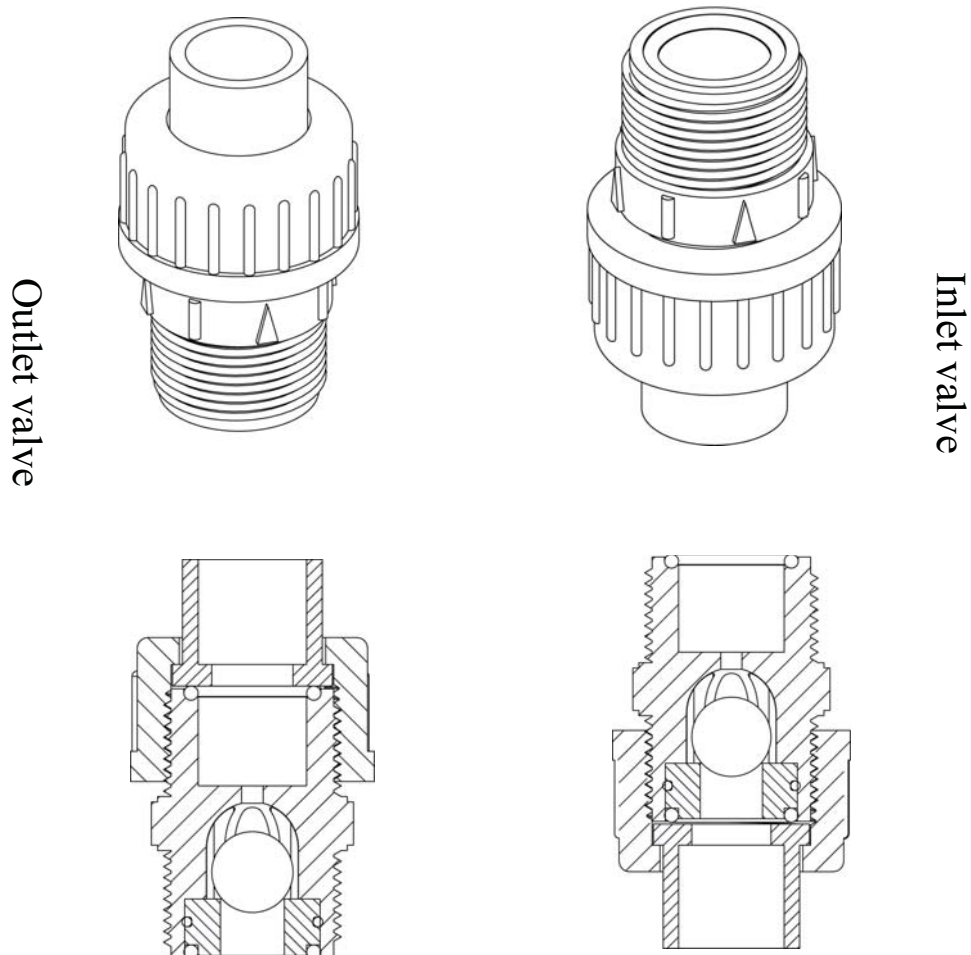
1. Set the stroke length value at 50% and disconnect the motor power.
2. Release the pipe pressure.
3. Close the inlet and outlet break valves.
4. Put a container under the pump head for holding the leakage medium.
5. Disconnect the pipe from the pump, and discharge the medium in compliance with the material safety measures.
6. Unscrew all the bolts except the one on the top. When the bolts loose, the medium will leak from the pump head.
7. Tilt the pump head to remove the residual liquid in the check valve.
8. Unscrew the remained bolt, and clean the pump head with appropriate medium.
9. Uninstall the diaphragm at the counterclockwise rotation.
10. Check the diaphragm. Change it for a new one if it is ruptured.
11. Install the diaphragm.
 - a. Make sure the diaphragm seal area and pump head is clean.
 - b. Lubricate the rubber side of the diaphragm. This side touches the pump head and plate washer directly. Siliceous grease or silicone lubricant is suggested. But make sure these lubrications are compatible with the pumped medium.
12. Install the diaphragm at clockwise rotation to the shaft.
13. Screw all the bolts back and tight them up alternatively.
14. Perfuse the pump head following article 6.4.

7.3. Check Valve

7.3.1. Summarize

Most of the problems come from the check valves. The problems are usually caused by the pile of particles between the check valve and the valve seat, the corrosion of the valve seat, damage due to the wear or extraneous dirt.

Check valves including valve balls, valve body, and valve seat. In the flow direction, the flow jacks up the valve ball, and let the liquid flow through the valve body. If the liquid flow at the opposite direction, the flow will force the valve ball back. The sharp valve seat edge and the valve ball then block the flow. The valve ball is allowed to rotate, but it cannot make vertical and horizontal movements, in order to reduce the backflow or reverse flow. The rotation will make the wear of the valve ball in balance, thus increase the service life. Because the valve ball reseats by its gravity, the valve ball must be used in vertical position..These parts are sealed with O-ring.



7.3.2. Check Valve Uninstall and Reinstall

Check valve is in lumped design.

1. Disconnect the power.
2. Release the pressure in the pipes.
3. Take necessary precautions to prevent hazardous substances causing damage to the environment or human.
4. Close inlet and outlet valves.
5. Disconnect the inlet pipe connecting joints.
6. Unscrew and disconnect the inlet break valves; Discharge the residual liquid in the pump head; Place the parts in order to avoid dislocation assembly.
7. Disconnect the outlet pipe connecting joints.
8. Unscrew and disconnect the outlet break valves; Discharge the residual liquid. Place the parts in sequence to avoid dislocation assembly.
9. Remove the deposits in the valves; Check the spring, valve core, valve seat and spacer; Replace it if necessary.
10. Reinstall the break valves; Pay attention to the assembly sequence; Make sure the spring, valve core are at their positions.
11. When assemble the break valves, please refer to figure 7. It is no necessary to use sealant on the valve thread. Tight the lock nut up.
12. Reinstall the inlet and outlet pipes.

8. Troubleshooting

Problem	Condition	Solution
The pump cannot start.	Power failure	Check the power supply.
	The fuse blowouts	Eliminate over load; Replace the fuse.
	Circuit is interrupted.	Find the position and handle it.
	Wrong wire connection	Check the diagram.
	Pipe blockage	Open the valves and clean it.
No flow	Motor does not work	Check the power and wire connection.
	Chemical tank is empty	Fill the tank.
	Pipe blockage	Clean the pipe.
	Valves are closed.	Open the valves.
	Break valves are blocked.	Check the valves and clean it.
	cavitations	Increase the inlet pressure and shorten the inlet pipe.
	Perfusion fails	Perfuse again and check the leakage.
	Filter is blocked.	Disassemble and clean the filter; Replace it if necessary.
	Stroke is at 0 position.	Increase the stroke length.
Low flow	Motor speed is too low.	Check the voltage, frequency, wire connection; Check the data plate and specification.
	Break valves are broken or seriously deposited.	Clean the break valves and replace it if necessary.
	Calibration is not accurate.	Evaluate and correct it.
	Medium viscosity is too high	Increase products temperature; lower the viscosity; Enlarge the pipe size.
	Medium cavitations.	Increase the inlet pressure; Lower the inlet pipe height; Install foot valve.
Flow gradually declines.	Break leaks.	Clean it and replace it if necessary.
	Inlet pipe leaks.	Find out the position and handle it.
	Filter is blocked.	Clean or replace.
	Medium changed.	Check the viscosity and other parameter of the medium.
	Breath hole of the chemical tank is blocked.	Open the breath hole.

Problem	Conditions	Solutions
Flow not steady	Inlet pipe leaks.	Find out the position and handle it.
	Medium cavitations.	Increase inlet pressure.
	Medium with air	Exclude the air.
	Motor doesn't work stably	Check the voltage and frequency.
	The break valve is blocked.	Clean it and replace it if necessary.
Real flow is higher than rated flow.	Inlet pressure is higher than outlet pressure.	Install back-pressure valves.
	back-pressure value set too low	Increase the back-pressure valve value.
	Back-pressure valve leaks.	Clean or replace it.
Noise or vibration from the gear	Outlet pressure too high	Reduce the outlet pressure.
	Water pulsation	Install pulsation tamper
	The stroke is at the middle	Sometimes it is the feature of stroke metering pumps.
	Low oil volume	Add or change oil.
Noise from the pipes	Pipe is too small	Change larger pipes or install pulsation tamper.
	Pipe is too long	Install pulsation tamper and fix the pipe
	Pulsation tamper does not work or overflow.	Check the and replace diaphragm; Refill the air
	No pulsation tamper	Install pulsation tamper.
Motor overheat	The pump overload	Check the operation condition
	Voltage too high or too low	Check the power
	Wire connection loose	Find out the position and repair it

9. Dimension, Part drawing

KD Installation Dimension

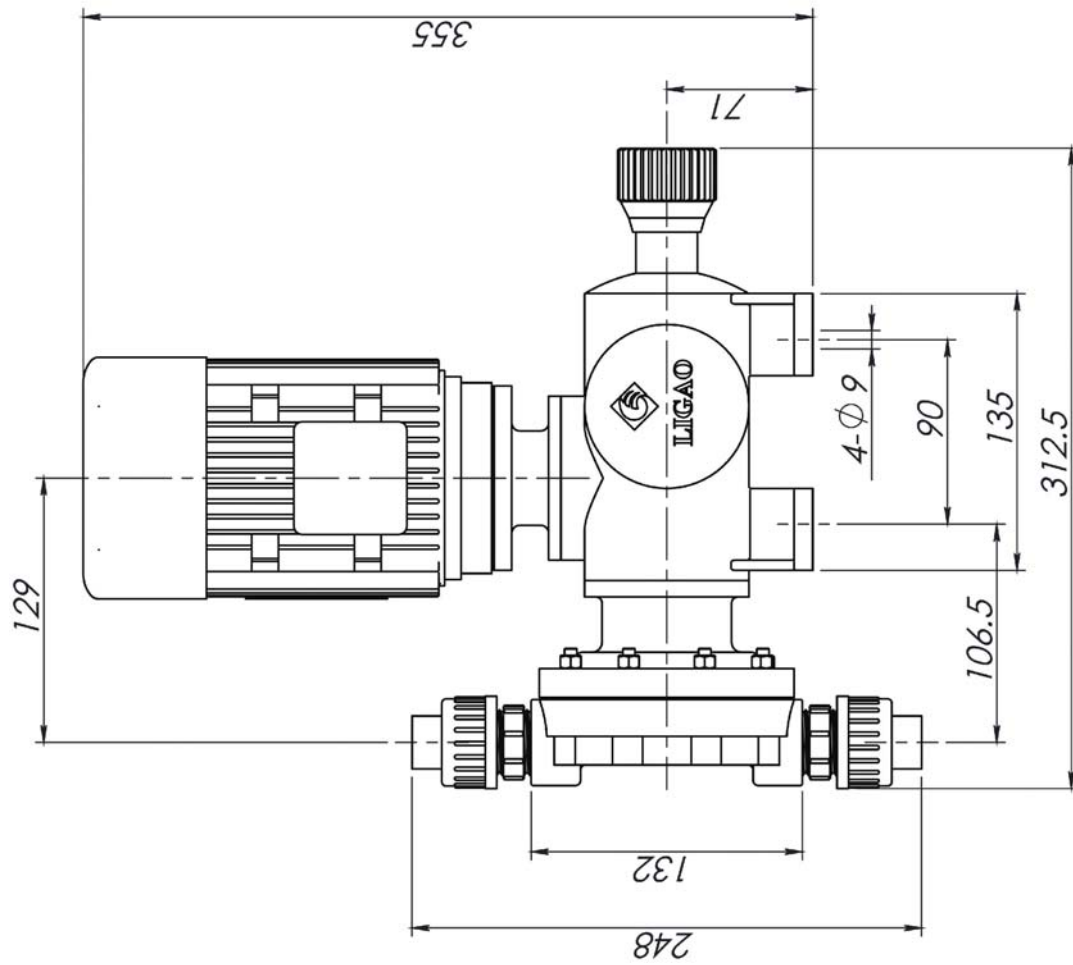
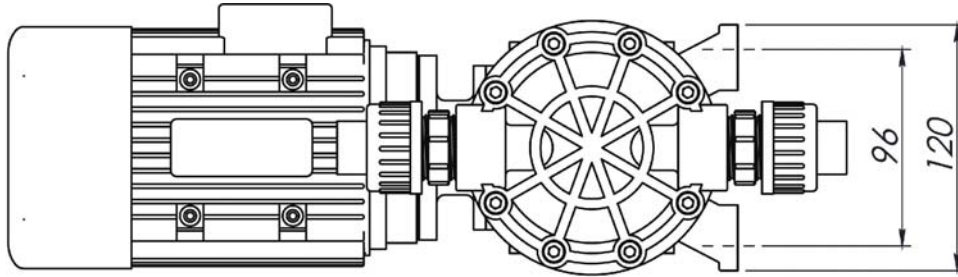
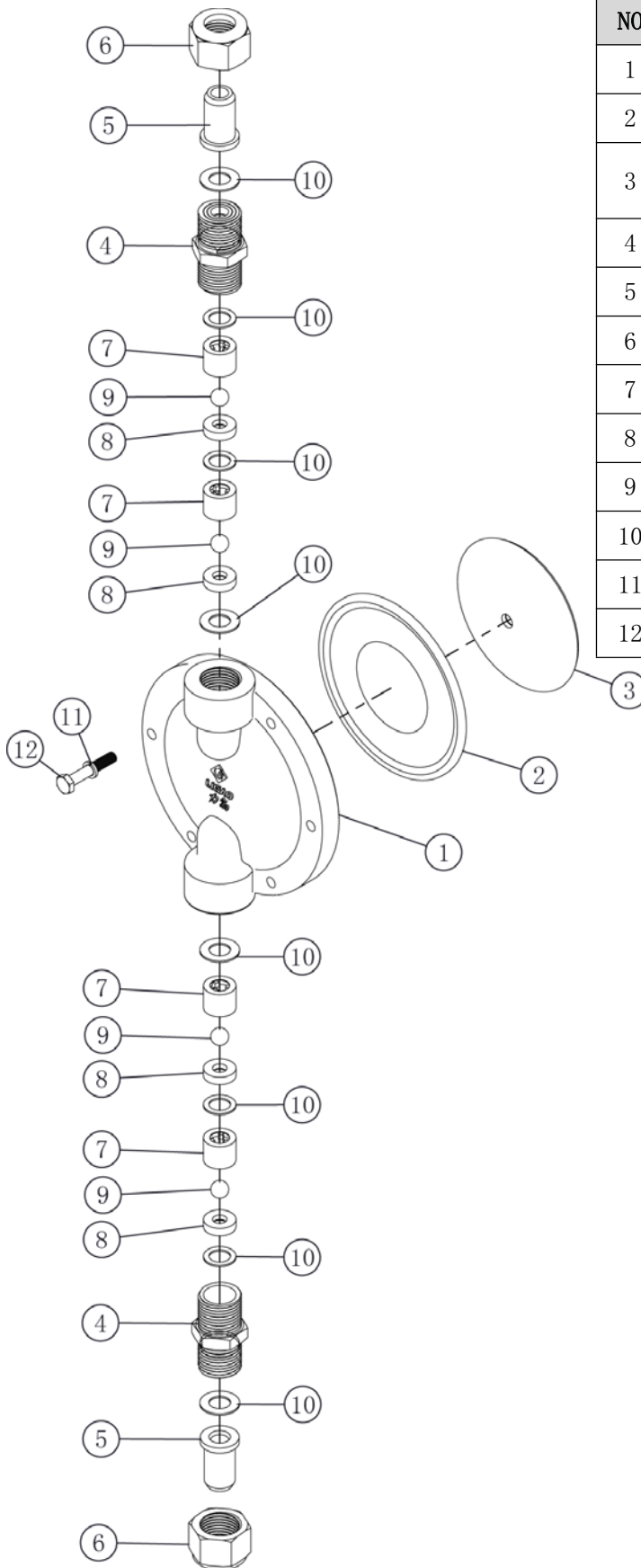


Figure1

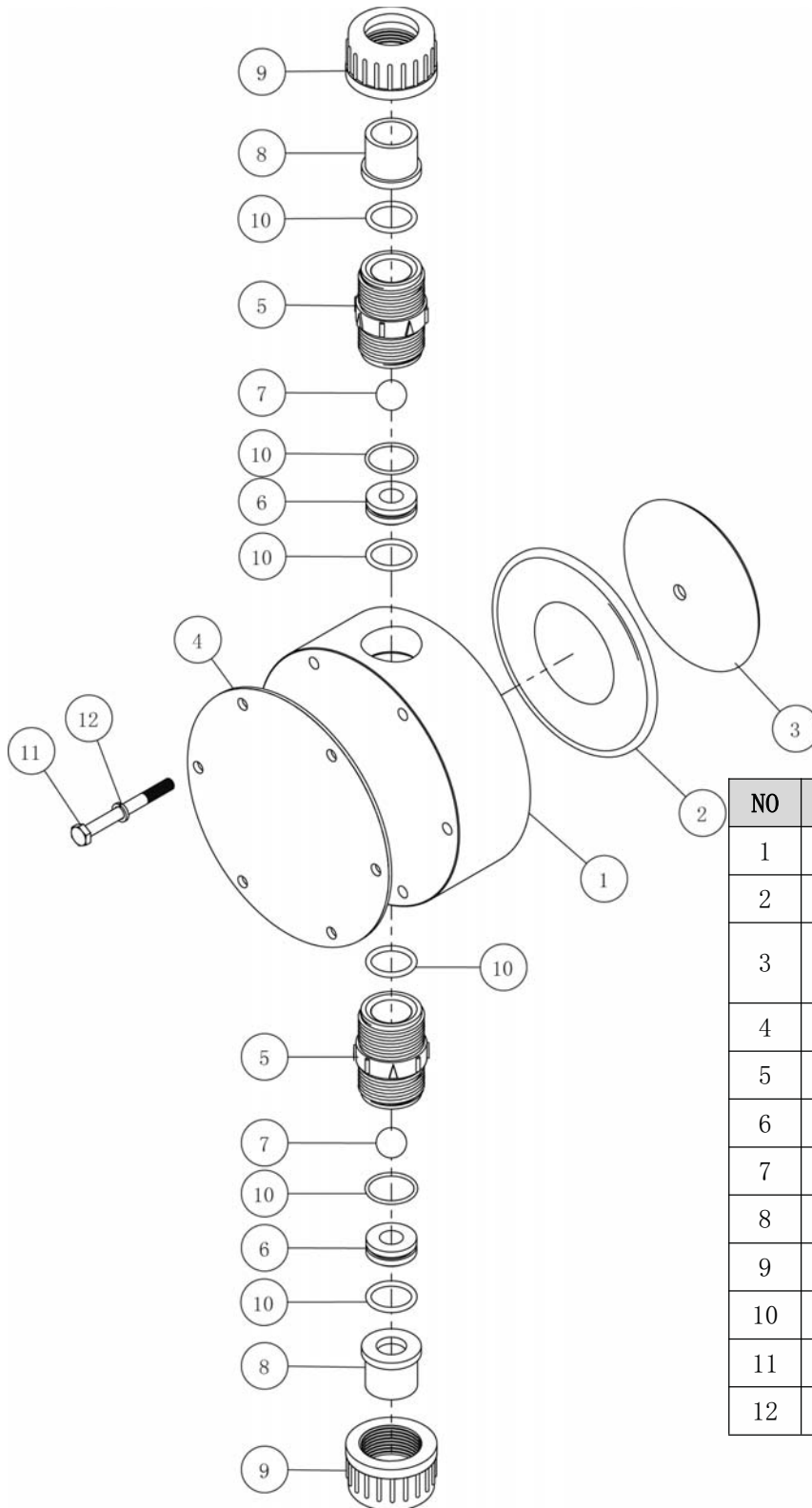
Stainless Pump Head



NO	Name	QTY
1	Pump head	1
2	diaphragm	1
3	Reinforced plate	1
4	Valve body	2
5	Hose nipple	2
6	Valve cap	2
7	spool	4
8	Valve seat	4
9	Valve ball	4
10	gasket	8
11	Spring ring	6
12	bolts	6

Figure2

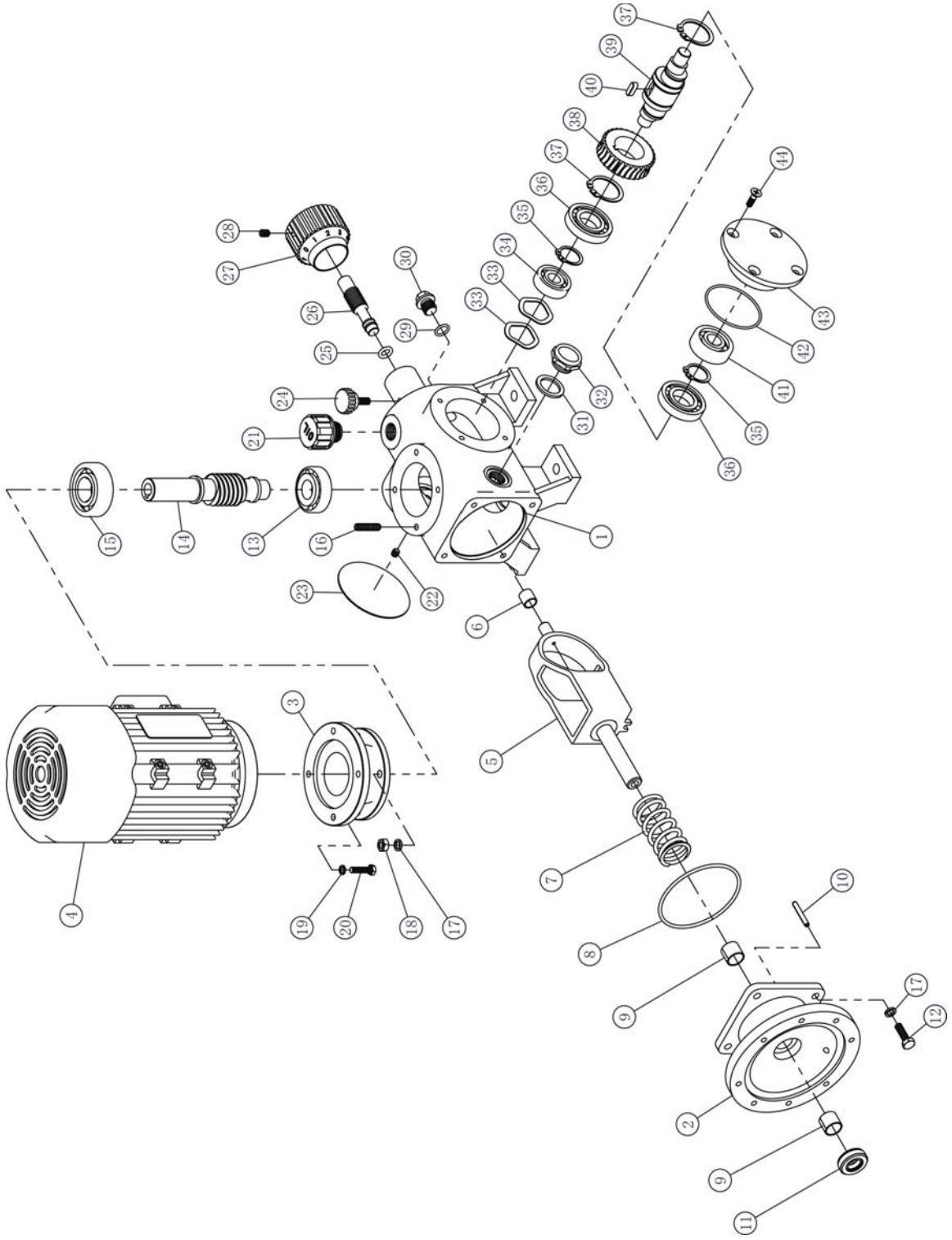
PVC Pump Head



NO	Name	QTY
1	Pump head	1
2	Diaphragm	1
3	Reinforced plate	1
4	Pump head board	1
5	Valve body	2
6	Valve seat	2
7	Valve ball	2
8	Hose nipple	4
9	Valve cap	4
10	O ring	4
11	bolts	8
12	Spring ring	6

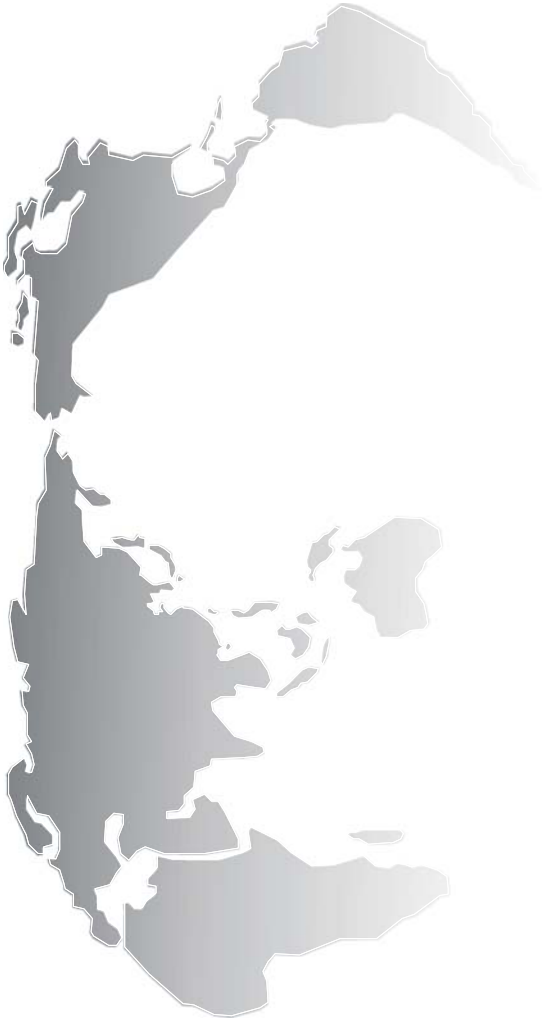
Figure3

KD Part Drawing



Part List

No	Name	Qty	No	Name	Qty	No	Name	Qty
1	pump body	1	16	bolt	4	31	O-ring	1
2	pump head connector	1	17	spring	8	32	oil level	1
3	motor connector	1	18	screw cap	4	33	spring	2
4	motor	1	19	spring	4	34	Deep groove ball bearing	2
5	Connecting rod	1	20	hex bolts	4	35	gasket	2
6	composite bearing	1	21	oil permeability cover	1	36	Deep groove ball bearing	2
7	spring	1	22	screw	1	37	gasket	2
8	O-ring	1	23	nameplate	1	38	Worm gear	1
9	Composite bearing	2	24	Locking knob	1	39	eccentric shaft	1
10	pin	1	25	O-ring	1	40	key	1
11	oil seal	1	26	adjusting bolt	1	41	Deep groove ball bearing	1
12	hex bolts	4	27	hand wheel	1	42	O-ring	1
13	tapered roller bearing	1	28	screw	1	43	bearing plate	1
14	worm	1	29	O-ring	1	44	cross screw	4
15	Deep groove ball bearing	1	30	oil drain plug	1			



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