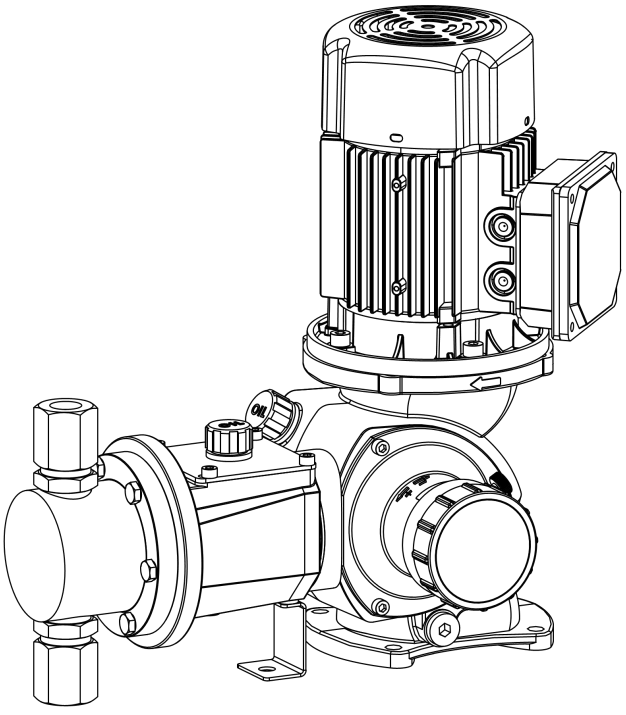
Use Manual

KLS Series Plunger Metering Pump



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Contents

Safety Precautions for Metering Pump Operation

 **Warning:**

1. The power supply must be cut off in the installation or maintenance, and a power failure warning sign shall be hung at the switch to prevent against personal injuries or property damaged caused by misuse.

2. In the course of operation, if finding dangerous signal or abnormal circumstance, please immediately suspend the operation.

3. If the pump with a selected operating range is used in other range or under other operating conditions, it will result in personal injuries or pump damage. Please use the pump in strict accordance with the instructions and usable range of the pump.

4. Do no modify the pump or use the accessories that have not been tested or approved. Otherwise, the user will bear the personal injury or property damage arising therefrom.

5. The operator must wear safety glasses, protective gloves, and protective clothing when operating or servicing the metering pump if the metered medium is a hazardous or unknown fluid.

6. Pump external circuit must be installed with thermal overload protector that matches to the motor.

 **Attention:**

7. Please make sure that all operators of the equipment have been informed or trained in the safe operation specification of the equipment.

8. The pump cannot be operated in the absence of lubricant, or the interior parts will generate heat by friction and directly damage the pump.

9. If out of service for a long time, the pump shall be shut down and the power supply shall be cut off. If the medium is easy to crystallize, more viscous, solidified and has other similar physical properties, the hydraulic end shall be cleaned up in a timely manner.

10. In the transmission of toxic and volatile odor liquid, the operating point must be ventilated adequately.

I. Introduction

1.1 Profile

KLS series pump is a reciprocating plunger metering pump with the max. flow rate of 240L/h and the max. rated pressure of 13MPa. The metering pump is used to deliver the thin slurry and common corrosive or toxic chemical medium with delivery temperature of -10~100℃, containing no solid particles, and with kinematic viscosity of 0.5~800mm^2/s (cst). Under rated conditions, the steady-state accuracy of the pump can reach ±1% within the range of 10%~100%.

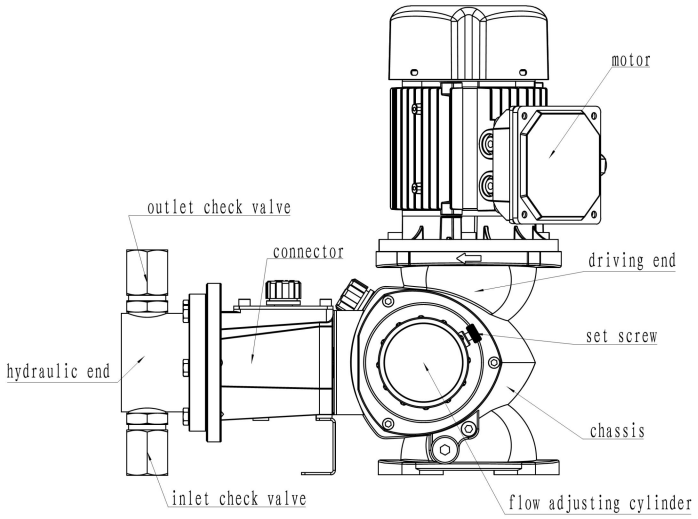


Fig. 1 Structure of KLS Pump

1.2 Working Principle

The pump consists of two main parts, i.e., the drive part and the hydraulic end. The output flow of the pump is a function of the stroke speed of the drive section, plunger size and the current stroke length. The motor rotates to drive the worm and worm gear which drives the variable eccentric crankshaft. The adjustable crankshaft converts the rotating power into reciprocating motion of plunger through the connecting rod. Plunger, pump head, inlet and outlet check valves and gland packing constitute a closed volume cavity, i.e., the hydraulic end.

Suction stroke: when the plunger moves backward, the pressure in the volume cavity decreases, the inlet check valve opens, and the medium in the inlet pipe enters the pump head; at the end of the suction stroke, the plunger stops moving instantaneously, the pressure in the pump head is balanced with that in the inlet pipe, and the inlet check valve is reset;

Discharge stroke: when the plunger moves forward, the pressure in the volume cavity increases, the outlet check valve opens, and the medium is pressed from the pump head to the outlet pipe; at the end of the discharge stroke, the plunger stops instantaneously, the pressure in the pump head is balanced with that in the outlet pipe, and the outlet check valve is reset; then, start the next cycle. The stroke length can be adjusted by changing the position of the variable eccentric crankshaft on the connecting rod. When the pump is running or stops running, the stroke length can be changed through the flow adjusting cylinder.

1.3. Technical Performance

Flow range: 0-240L/h (depending on pump model)

Max. pressure: 13Mpa

Design: plunger type

Drive: variable eccentric mechanism

Steady-state accuracy: under rated conditions, the steady-state accuracy of the pump can reach ±1% within the range of 10%~100%.

Adjustment: no matter whether the pump is running or not, the flow can be adjusted from 0% to 100%

Lubrication: oil bath lubrication

Temperature: the max. temperature of the liquid conveyed: 100 ℃, the min. temperature: -10 ℃.

Suction stroke: the max. water column height: 2.5m.

Paint: yellow

II. Installation

2.1 Unpacking/Inspection

When the transport contractor receives the pump, the pump will be shipped to the customer from the manufacturer. The customer should immediately notify the transport contractor and claim compensation for any damage during transport.

Before the formal acceptance, carefully check the package to confirm there is no damage in transport. Open the package to confirm that all the items including the accessories are in good condition and the number is consistent with the packing list. In case of any error, please contact us in time.

2.2 Pump Storage

2.2.1 Temporary Storage (less than six months)

Add a protection layer inside the original package so as to isolate the pump from the external. In humid climates, follow the long-term storage procedure.

2.2.2 Long-term Storage (more than six months)

The basic condition of equipment storage is to prevent the corrosion of internal and external parts. Such corrosion is caused by diurnal and seasonal variations. It is impossible to prevent water vapor and other harmful gases resulted from such changes, so it is necessary to protect the internal and external parts to reduce the degrees of damage caused by corrosion.

This section is about equipment storage to avoid direct exposure of the equipment to the air. The equipment should be more than 0.3m above the ground with the surface covered with plastic film or linoleum and should be ventilated so as to avoid surface moisture.

If the equipment is kept for long term after delivered from the manufacturer, please contact the manufacturer for pre-treatment.

2.2.2.1 Pump Drive Part

The pump case shall be full of appropriate lubricating oil to avoid rust. The case should be filled to reduce the possibility of water vapor as far as possible. After the end of the storage period, thoroughly drain the oil and add the recommended lubricating oil again for equipment commissioning.

Remove hydraulic end and drive motor, coat all the painted parts with versatile grease and save the removed parts.

2.2.2.2 Electrical Equipment

The motor shall be treated according to the requirements of the manufacturer, and if there is no related document, remove the motor and save it as Step 3.

Remove all the electrical equipment (including motor).

For all electrical equipment, place the moisture proof agent inside the package, and repack the original packaging with a sealing plastic bag. Contact the factory to get the recommended moisture proof agent material.

2.3 Safety Measures

Read the user manual carefully before installing and operating this product.

This product shall be installed in the place with good ventilation and heat dissipation, and the place with high temperature and high humidity is easy to cause equipment fault.

Please ensure the power specification is correct before connecting the power supply.

If the inlet and outlet of the product are directly connected with the pipe, ensure that the pipe has been vented without pressure before installation, so as to avoid danger.

Please operate this product under the pressure and temperature of no more than the specified values (the max. temperature that allows the material to pass is 100℃).

This product is not suitable for all fluids. Some solvents, high concentration acids or highly oxidizing fluids may reduce the service life of the parts bearing fluids.

Please wear chemical safety gloves and protective mask before maintaining this product.

Please do not modify this product. No user is allowed to modify the design of this product.

Special attention: failure to install or operate the product in accordance with this manual may cause equipment fault or personal injury.

Stop the operating equipment before any maintenance on the metering pump. Release the system pressure. Close the inlet and outlet valves connected to the system. During the maintenance, prevent any actions that may cause accident. Post a notice at the power switch to inform that the equipment is in maintenance. In case of any fault found during operation (such as abnormal temperature and abnormal noise), cut off the power supply immediately.

2.4 Installation

Support the pump with a horizontal, solid and vibration resistant foundation. The foundation is better to be higher than the ground, so as not to be washed by water, and it shall be easy to maintain. Enough space shall be reserved around the pump for pump maintenance, adjustment and oil filling or discharge. The pump is provided with mounting holes for the installation of anchor bolts. Refer to the installation dimension drawing for installation. The pump installed outdoors shall be protected with a canopy.

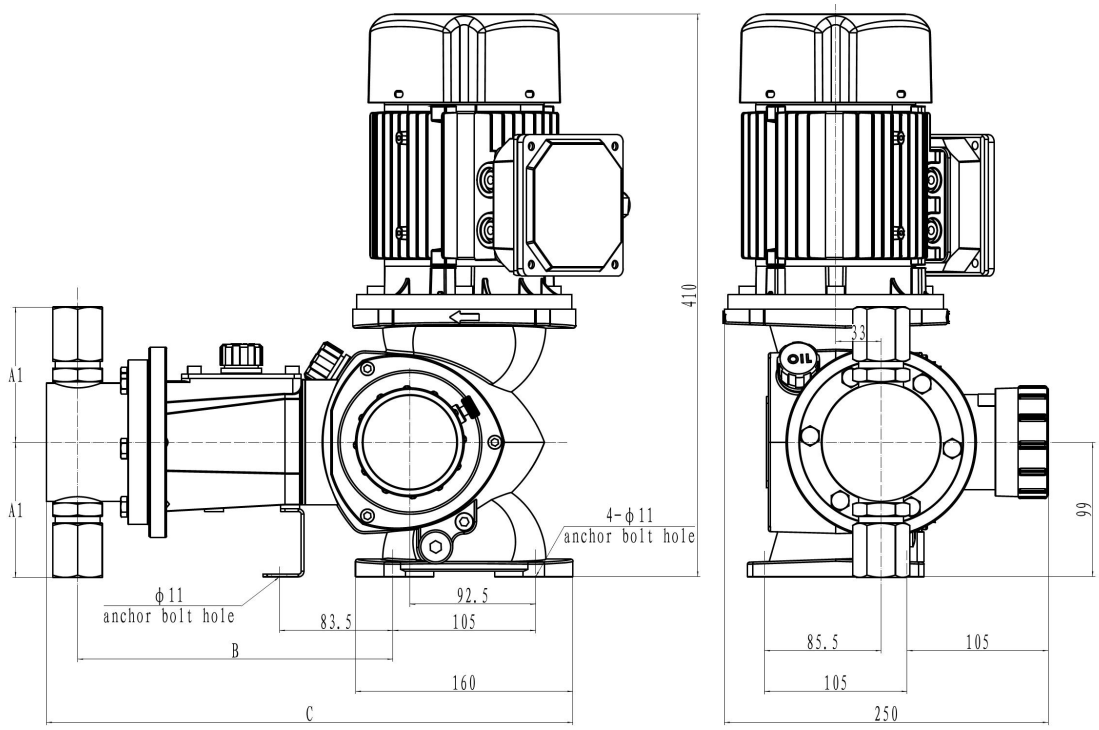


Fig. KLS Installation Dimensions

Dimensions Table

Coding	Joint Type	A1 (mm)	A2 (mm)	B (mm)	C (mm)
KS240/0.8	NPT1/2” Internal thread	117.5	117.5	219	375
KLS240/0.6					
KLS210/0.9					
KLS210/0.7					
KLS160/1.1					
KLS160/0.9					
KLS130/1.4					
KLS130/1.2					
KLS100/1.8		101	101	232	390
KLS100/1.5					
KLS80/2.4	Ferrule interface DN15	142	142		
KLS80/2.0					
KLS60/3.0		138	138		
KLS60/2.8					
KLS40/4.5					
KLS40/4.0					
KLS30/6.0					
KLS30/5.0					
KLS25/7.0					
KLS25/6.0					
KLS20/9.0					
KLS20/7.5					
KLS13/13.0					
KLS13/11.0					

2.5 Leakage Collection

A container shall be prepared to collect the media or lubricating oil leaking after the plunger packing is worn or the oil seal is broken. During proposal of some harmful media, the work is particularly important. The container is located at the bottom of the connector (see Fig. 1), or connect a hose to the connector to discharge the leakage into a suitable container.

2.6 Installation

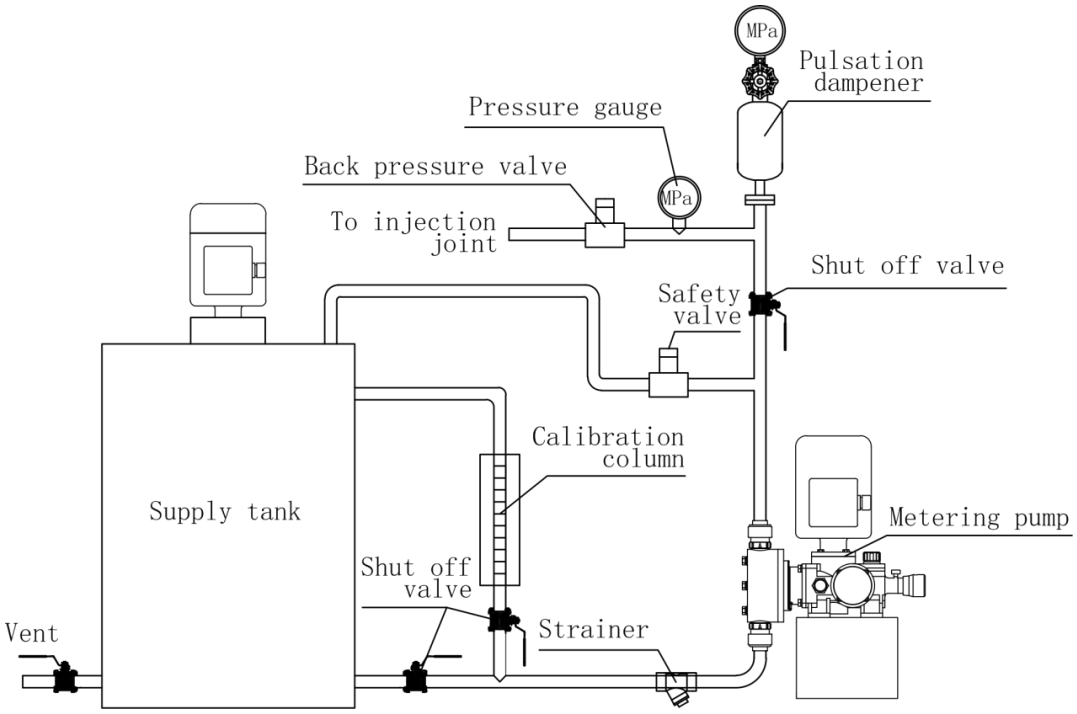


Fig. 4 Classic Installation Diagram of Metering Pump

2.6.1 NPSH Condition

The pipe diameter shall be subject to the instantaneous peak flow rate. Because of the reciprocating motion of the metering pump plunger, the output flow of the pump follows an approximate sine curve. The instantaneous flow rate at the peak is about 3.14 times of the rated flow rate, so the pipe must be designed according to 3.14 times of the rated flow rate. For example, if the rated flow of pump is 10L/h, the rated flow of pipe shall be designed as 31.4L/h.

To reduce the flow loss of viscous liquids when conveying viscous liquids, it is necessary to use a suction pipe that is four times larger than the pump inlet size. If you are not sure, please contact the factory to ensure the necessary pipe size.

2.6.2 General Pipe Condition

Use pipes that can prevent corrosion of solutions. The material shall be carefully selected to avoid electro-chemical corrosion at the junction between the pump head and the external pipe.

Pressure borne by pipes must meet the highest pressure requirement. Remove burrs, sharp edges and debris from the inside of the pipe. All pipes shall be cleaned before final connection.

The pipe shall be slightly inclined to avoid the formation of air section. This is because the air in the pump head will lead to inaccurate the output flow of the pump.

For conveying a medium containing suspended solids (like mud), a four-way valve with a pipe plug shall be installed at all 90° elbows so that the pipe can be cleaned without disassembly.

2.6.3 Suction Pipe

It is better to make the pump suction end lower than the minimum level of supply tank so that the solution can be directly injected into the suction end of the pump. In order to reduce the loss of suction pipe of metering pump, the metering pump shall be mounted as close to the supply tank as possible.

Negative pressure liquid suction condition (suction stroke) shall be avoided for it will affect the measurement accuracy. The suction stroke of the 2.5m water column is the maximum allowable suction height.

The pump shall operate under the condition that the inlet pressure is equal to or slightly higher than the atmospheric pressure. Although the pump can operate when the inlet pressure is lower than the atmospheric pressure, under the negative pressure condition, it is important that all joints are absolutely leak-free and vacuum tight. At the same time, a foot valve shall be installed at the bottom of the suction pipe.

When conveying liquid close to the boiling point, sufficient suction pressure shall be provided to avoid vaporization of the liquid as it enters the pump head during suction stroke.

If possible, a metal suction pipe shall be used as far as possible. This is because such a pipe has a smooth inner wall and uses a large turning radius to reduce the resistance loss of pipe.

The suction pipe shall be installed with a Y-type filter with more than 60 meshes to prevent external particles from entering into the pump head. Avoid maintenance due to the blockage of the check valve by residue. It is necessary to inspect the filter regularly to prevent blockage. The suction pipe shall be as short and straight as possible.

The diameter of the suction pipe shall be larger than the size of the pump head inlet to avoid lack of liquid.

When a long-distance suction pipe must be used, a vertical pipe riser shall be installed in the suction pipe near the pump.

The suction pipe must be absolutely airtight to ensure accurate flow. After the pipe is installed, test the suction pipe for leakage with air and soap.

2.6.4 Discharge Pipe

Install a large enough pipe to avoid excessive pressure loss during pump discharge stroke. The maximum pressure of the outlet pipe must be maintained at or below the maximum allowable working pressure indicated on the pump nameplate.

If the pressure difference between the inlet and outlet of the metering pump is small, to ensure the metering accuracy, you can establish the outlet pressure manually by installing the back pressure valve. When transferring water treatment chemicals directly to the boiler, use a separate metering pump for each boiler. The discharge to

the branch will reduce the measuring accuracy; even if the pressure difference at each dosing point is slight, the flow at lowest pressure dosing point is greater than that of other dosing points.

2.7 Valves

2.7.1 Back Pressure Valve

When all metering pumps work under low system pressure, there will be excessive transmission. To prevent similar problems, it is necessary to maintain a certain back pressure at the outlet of the metering pump. The purpose can be achieved by installing back pressure valve in the outlet pipe of metering pump. Generally, the back pressure valve shall be installed close to the pump outlet. However, for large flow pump and long and thin outlet pipe, the back pressure valve shall be installed close to the outlet to reduce the siphon trend.

2.7.2 Pulsation Damper

The pulsation damper is used together with the back pressure valve in the outlet pipe to absorb the peak flow between the pump and the back pressure valve. Without pulsation damper, the back pressure valve will open and close rapidly with each pump stroke. When there is a pulsation damper, the back pressure valve will oscillate in the half open and half closed positions, thus reducing the wear rate of the back pressure valve. The greater advantage of the pulsation damper of the outlet pipe is to limit the flow and pressure variation characteristics of the metering pump. Installing a pulsation damper of appropriate volume will improve the pump's working performance, a small-diameter pipe can be used, which greatly reduces the cost of the system.

2.7.3 Safety Valve

A motor-driven metering pump may have a large discharge pressure before the thermal protection element cuts off the electrical control circuit of the motor. To avoid damage to the pump, pipe or equipment due to the blocked outlet pipe, a safety valve shall be installed on the outlet pipe of the pump. The safety valve can safely and effectively control the flow and pressure of the system, and the material of the safety valve shall be resistant to the corrosion by liquid.

Installing a safety valve on the outlet pipe between the pump and the nearest stop valve can avoid pump damage due to accidental closing of the valve. Liquid from the safety valve outlet pipe returns to the supply tank or is drained. However, in any case, the end part of the pipe shall be visible so that the leakage from the safety valve can be easily detected. The safety valve must be installed at the top of the supply tank to ensure normal operation (see Fig. 4).

2.7.4 Check Valve

A check valve shall be installed before the outlet pipe reaches the boiler or other high pressure vessel, which can avoid back flow of the outlet pipe and isolate the pump discharge end from system pressure (for the sake of safety).

2.7.5 Globe Valve

Stop valves shall be installed at both ends of the suction pipe and the outlet pipe of the pump. The stop valve of the outlet pipe shall be located downstream of the safety valve inlet connection pipe. Fig. 4 shows the recommended installation position of the stop valve.

2.8 Electrical Wire

Warning: reverse running of the motor will damage the pump and motor and is not covered by the warranty. Don't forget to ground the pump and equipment. Ensure that the power supply parameters are consistent with the parameters specified on the pump motor nameplate. Conduct wiring according to the motor wiring diagram (possibly in the junction box) and user manual.

Attention: before running the pump, check the rotation direction of the motor and ensure that it is consistent with the arrow on the motor mounting flange (clockwise when viewed downwards from the fan blade side of the motor). The electrical protection of the motor (fuse or thermal protection) shall correspond to the rated current of the motor.

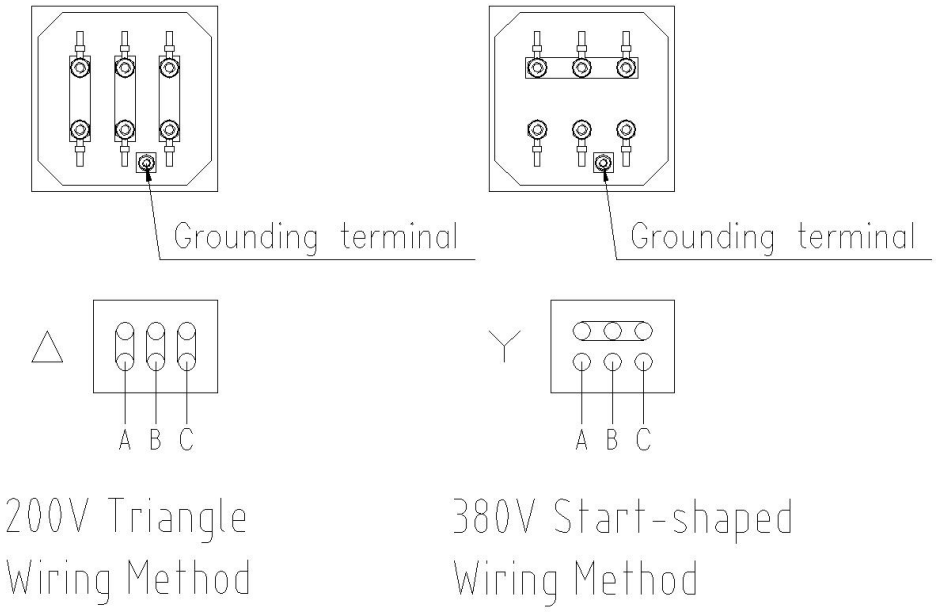


Fig. 5 Sketch of Motor Junction Box and Wiring Method

Attention: the motors of different manufacturers are wired differently. Please refer to the specific instructions of the motor junction box. Do not forget to ground the pump!

III. Operation

3.1 Initial Start

Inspect whether all the assembling bolts are secure, the pipe is installed correctly, the discharge pipe is open. Check whether the gear oil drain plug is tightened, remove the gear oil filler cap, and fill the pump body with proper amount of gear oil (amount: 0.8±0.1).

 **Attention: the gear oil had been discharged thoroughly before delivery and the pump must be filled with gear oil before start, or worm gear and worm will be damaged.**

Gear oil grades are listed as follows.

	Ambient temperature >-5℃	Ambient temperature -10℃~-5℃
Gear oil grade	MOBILGEAR 600 XP 220	MOBILGEAR 600 XP 68

Cautions: The pump is strongly proposed to stop running below -10℃.

Before the pump is powered on, adjust the flow adjusting cylinder to zero. Before the flow adjusting cylinder is adjusted increasingly from zero, inspect the suction and discharge pipes to ensure all the globe valves are open.

3.2 Inspection

Start the metering pump and check the rotation direction of the motor. The rotation direction must be consistent with the arrow on the fan cover of the motor (clockwise when viewed downwards from the fan blade side of the motor). If the rotation direction is not correct, refer to the motor nameplate or "2.8 Electrical Wiring" and change the wiring.

3.3 Start

3.3.1 Manual Flow Adjustment

As shown in Fig. 1 Structure of KLS Pump, unscrew the set screw on the side of the pump casing for adjustment of the pump flow. Rotate the flow adjusting cylinder to change the flow rate of the pump. Rotate clockwise to decrease the flow rate and counterclockwise to increase the flow rate. The whole stroke range is marked by percentage and the minimum interval calibration line on the adjusting handle is 1%. After the flow is adjusted to the required value through the adjusting handle, tighten the set screw manually to maintain the set flow.

3.3.2 Pumping System Filling

Exhaust from the pump suction pipe and outlet pipe is a very important step. Thus before pressure test, run the pump under the condition of no discharge of pressure to fill the delivery system with liquid. A simple way to ensure filling is to install a three-way valve and stop valve at the outlet end of the pump.

If the pump is kept used for a long time, the liquid temperature change can generate gas in the system. To discharge the air, one valve can be mounted on the outlet pipe to discharge the air through the process material at the start of the pump.

3.3.3 Flow Calibration

After the initial 12 hours of the pump operation, the flow calibration test shall be carried to find out the exact flow under the specific operation conditions. Generally, pump flow set at only 100%, 50% and 25% flow can show the performance of the pump within the entire adjustment range.

The pump flow can be calculated by measuring the change in the liquid level of a calibration vessel. The liquid collected and measured atpump outlet can also be used to calibrate the pump flow, but it is necessary to set hydraulicpressure at the liquid discharge port to ensure the pump can work accurately.

 **Warning: it is suggested not to adopt the later method to calibrate the flow because the operator will face the dangerous liquid directly, which may result in accidents. Besides, when the flow is measured by this method, it is likely that the pump is in a self-flowing state, and the measured data will not be accurate.**

IV. Maintenance

4.1 Preventive Maintenance

4.1.1 Drive Part

After the first 1,000 hours of operation, the gear oil for metering pump drive part shall be replaced. After that, replace the gear oil every 5,000 hours or half a year later.

Refer to "3.1 Initial Start" for gear oil grade.

4.1.2 Plunger Packing

The plunger packing for KLS series pump shall be checked and replaced every 4,000 hours of operation to avoid fault. To replace the worn plunger packing, refer to "4.5 Proper maintenance".

Refer to GB/T7782 for the leakage rate at the plunger packing (see the Table below for details). If the leakage rate exceeds the standard, the packing lock ring shall be properly tightened after pump stop, but it shall not be too tight, or the packing temperature will rise, leading to journal sticking or burnout of plunger seal packing.

Rated pump flow Qr (L/h)	Leakage≤
≤1	0.1%Qr
>1~10	0.05%Qr
>10	0.01%Qr

4.1.3 Check Valve

recommends replacing the ball, seat and O-ring of the check valve every 5000 hours or every year. If the pump delivers highly corrosive materials (such as acid, sizing agent, etc.), it is necessary to check and replace the spare parts frequently. To replace the worn check valve, refer to "4.5 Proper Maintenance".

4.2 Equipment Repair

If the "repair authorization" is not obtained from the factory, the factory cannot accept the repair of the pump. The pump to be repaired shall be clearly marked with the material delivered, and the pump head shall be flushed and the gear oil in the casing shall be drained before the pump is delivered.

Attention: a complete material safety data sheet shall be provided in the packaging box for the equipment to be repaired. These safety measures are helpful for fault inquiry and repair and can also avoid injury of maintenance personnel due to residual materials in the pump head.

4.3 Maintenance Procedures

4.3.1 Visual Inspection of the Sealing of Mechanical Parts

1. Flow adjusting cylinder: in case of any leakage, replace the seal ring of stroke adjusting rod.

2. Connector bottom hole: in case of any leakage of gear oil, replace the framework oil seal; in case of any leakage of material delivered, pre-tighten the locking ring again or replace the plunger packing.

4.3.2 Inspection of the Flow of Metering Pump

Confirm that the metering pump flow has been calibrated according to the content of "3.3.3 Flow calibration". Close the valve connecting the supply tank to open the globe valve of calibration column. Measure the flow delivered by the metering pump under different flow settings.

If there is no calibration column in the suction pipe, a calibration container (with scale) shall be connected to the outlet pipe. Measure the flow delivered by the metering pump under different flow settings.

4.4 Spare Parts

KLS13-KLS80 hydraulic end

Legend	Spare Parts Name	Qty.	Legend	Spare Parts Name	Qty.
Fig. 7	KXS high-pressure sealing gasket 20x26.5x1.5 (PVDF)	10	Fig. 7	Packing 1	1
	KXS high-pressure sealing gasket 17x28.5x2 (PVDF)	2		Packing 2	3 pieces in 1 set
	KXS high-pressure valve seat	4			
	Valve ball Φ9.5	4			

KLS100-KLS240 hydraulic end

Legend	Spare Parts Name	Qty.	Legend	Spare Parts Name	Qty.
Fig. 8	O-ring d21x2.5	4	Fig. 8	Packing 1	1
	GMS middle valve seat 316	2		Packing 2	3 pieces in 1 set
	Valve ball Φ22.2	2			
	Valve ball Φ14	2			

The ordering of spare parts must include the following:

1. Quantity required

2. Spare Parts Name

3. Pump Serial Number (indicated on pump nameplate)

4. Pump model (indicated on pump nameplate)

Note: Product code and serial number should be in compliant with the equipment.

4.5 Proper Maintenance

Warning: before any maintenance of the metering pump and pipes, the power supply shall be cut off and necessary measures shall be taken to prevent harmful materials from contacting with operators. Proper protective equipment must be provided to ensure that there is no pressure in the pump or system.

4.5.1 Preparatory Work

1. Adjust the scale of the flow adjusting cylinder to 0%. If the stroke set screw is locked, loosen the set screw.

2. Cut off the power supply to ensure that the equipment will not be accidentally started up. Hang a notice at the power switch to inform that "The equipment is in maintenance".

3. Cut off the connection between the inlet and outlet check valves of metering pump and the system.

4.5.2 Cleaning of the Blocked Check Valve

The check valve is designed as self-cleaning mode, rarely requiring maintenance. Blocked check valve usually can be cleaned with dilute neutral detergent and warm water (if compatible with the conveyed material) pumped for 15min, and then rinsed with water.

4.5.3 Replacement of Check Valve

Prior to the treatment of check valve, it is necessary to confirm the globe valve is closed and the system pressure is released. The O-ring must be replaced when the check valve is replaced. Refer to Fig. 9 KLS Sectional View and pay attention to the correct assembly sequence of the check valve.

4.5.4 Replace Plunger Packing

Packing 1:

1. Remove the pump head and take out the packing 1 in the pump head;

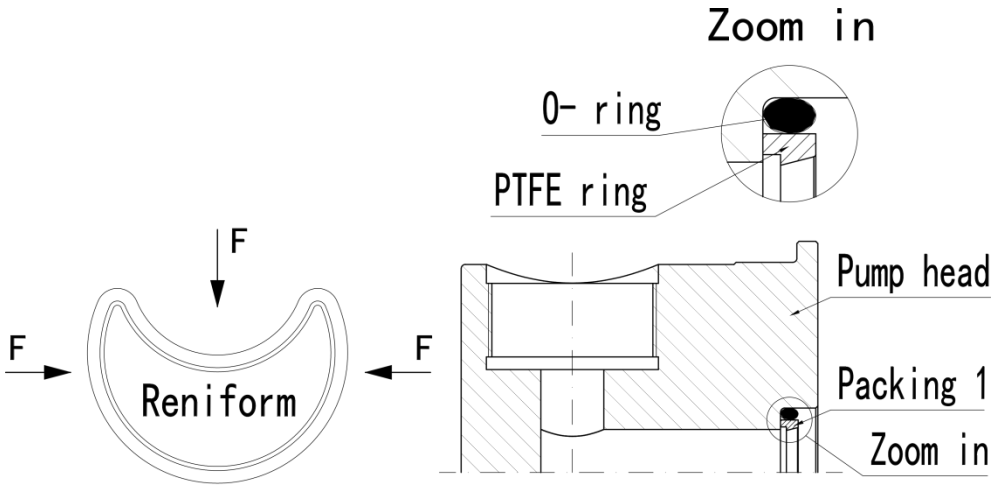
2. Dress the new packing O-ring on the pump head, press the PTFE ring into the reniform shape shown in Fig. 6a without sharp corner, make the gap face the pump head, install it into the O-ring, and then rotate the calibration spindle for recovery.

Packing 2:

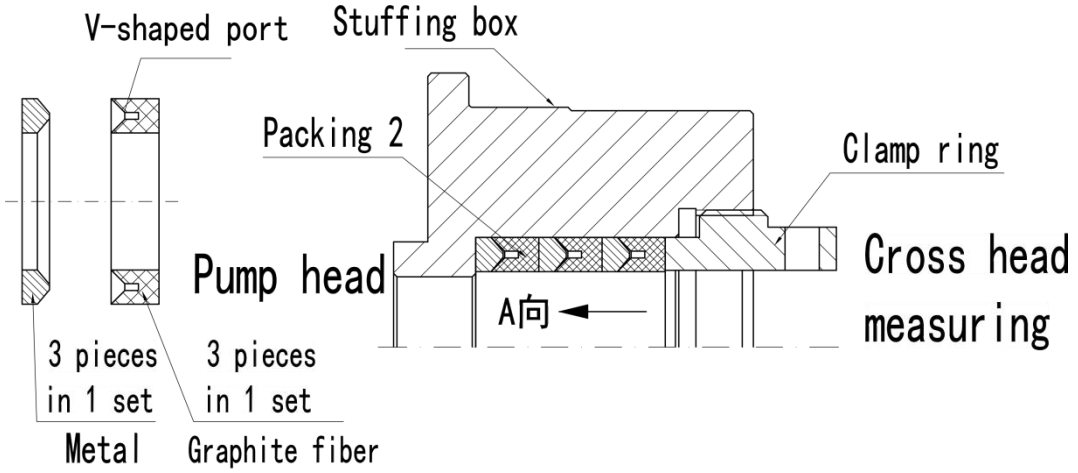
1. Remove the pump head, take out the packing box, and take out a group of six pcs. of packing 2;

2. Install the new packing as shown in "Fig. 6b": install a piece of metal packing (convex V-side facing outward) into the packing box, and then install a piece of graphite fiber packing (concave V-side facing inward) into the packing box in "Direction A" as shown in the Figure; after that, install the four pieces according to the sequence and direction, install the metal packing and graphite packing at intervals, and properly tighten the locking ring.

Attention: the packing is a vulnerable part, and the locking ring shall be adjusted periodically.



Packing 1 Installation Diagram (Fig. 6a)



Packing 2 Installation Diagram (Fig. 6b)

Fig. 6 Packing Installation Diagram

Warnings: the assembly position and sequence of inlet and outlet check valves are different, and please follow the instructions carefully and refer to the correct legend during disassembly and assembly of check valves. If the check valve is not installed properly, the following phenomena will occur:

(A)The mechanical structure of metering pump may be badly damaged immediately.

(B)No material is output.

(C)The liquid is conveyed in a reverse direction (from the outlet pipe to the inlet pipe).

 **Attentions:**

1. To ensure sealing without leakage, a new O-ring shall be used every time the check valve is disassembled.

2. PTFE tape shall not be used on the expansion joint thread, so as to prevent the O-ring from being pressed tightly and causing leakage.

Fig. 7 KLS13-KLS80 Check Valve Assembly

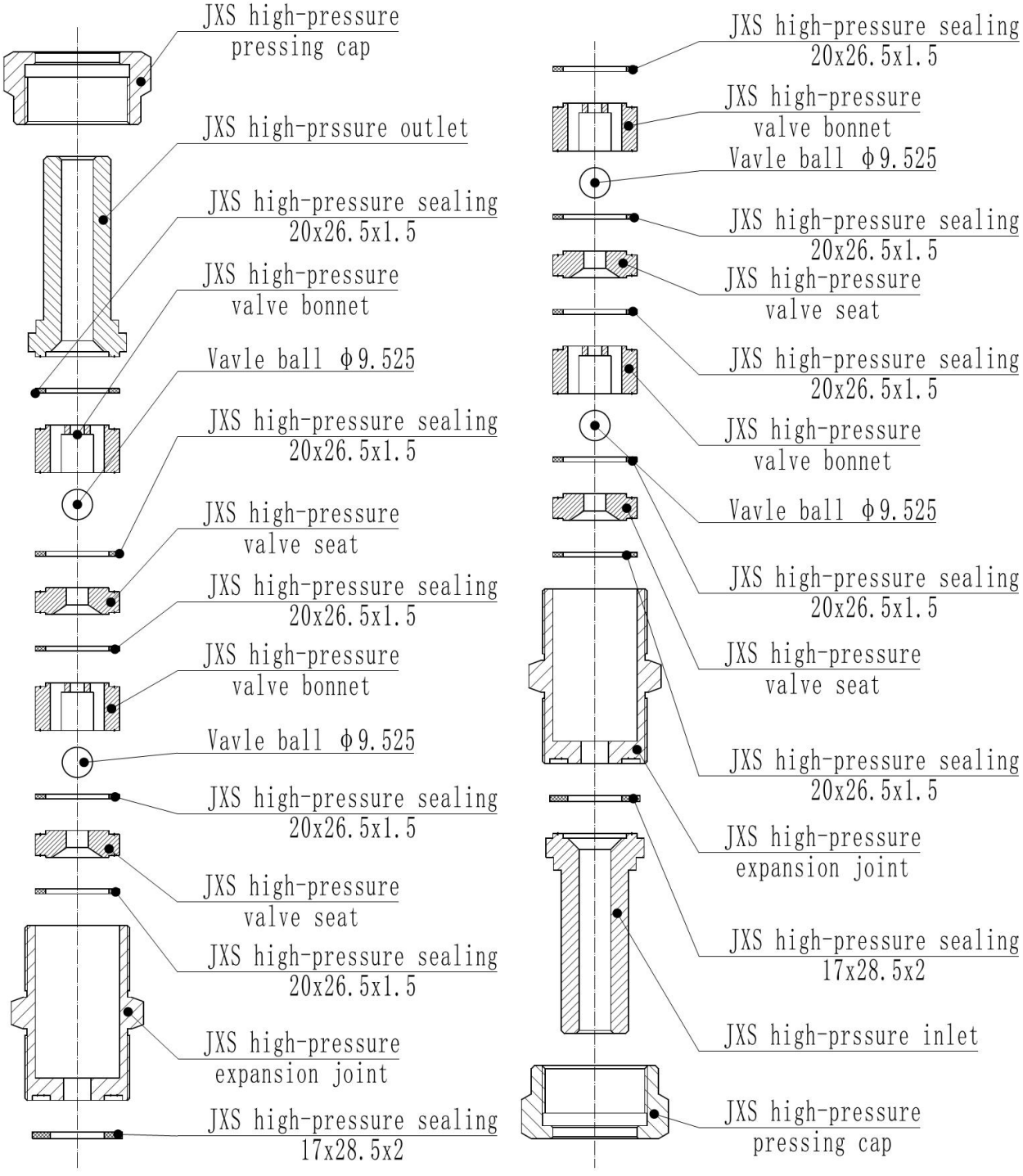
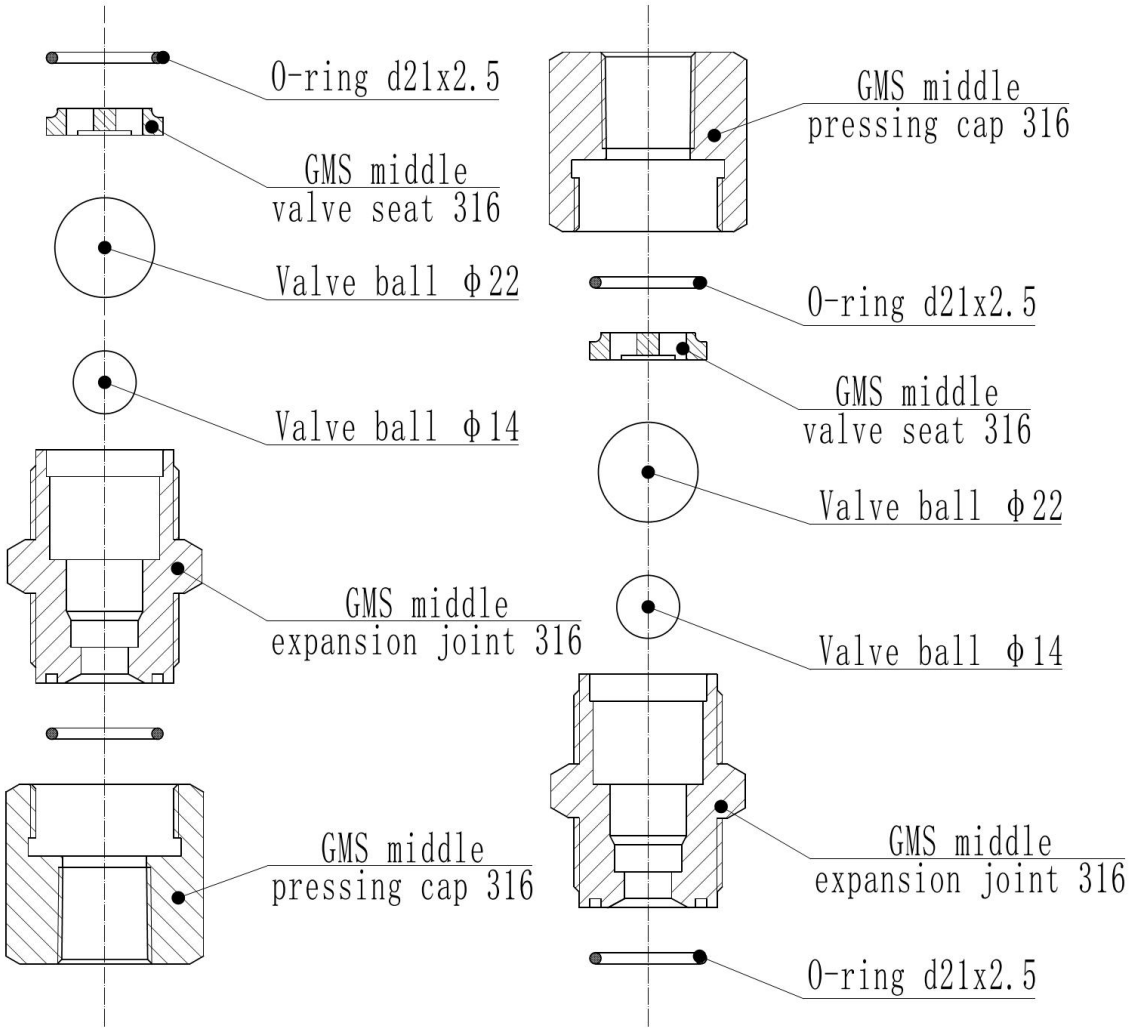


Fig. 8 KLS100-KLS240 Check Valve Assembly



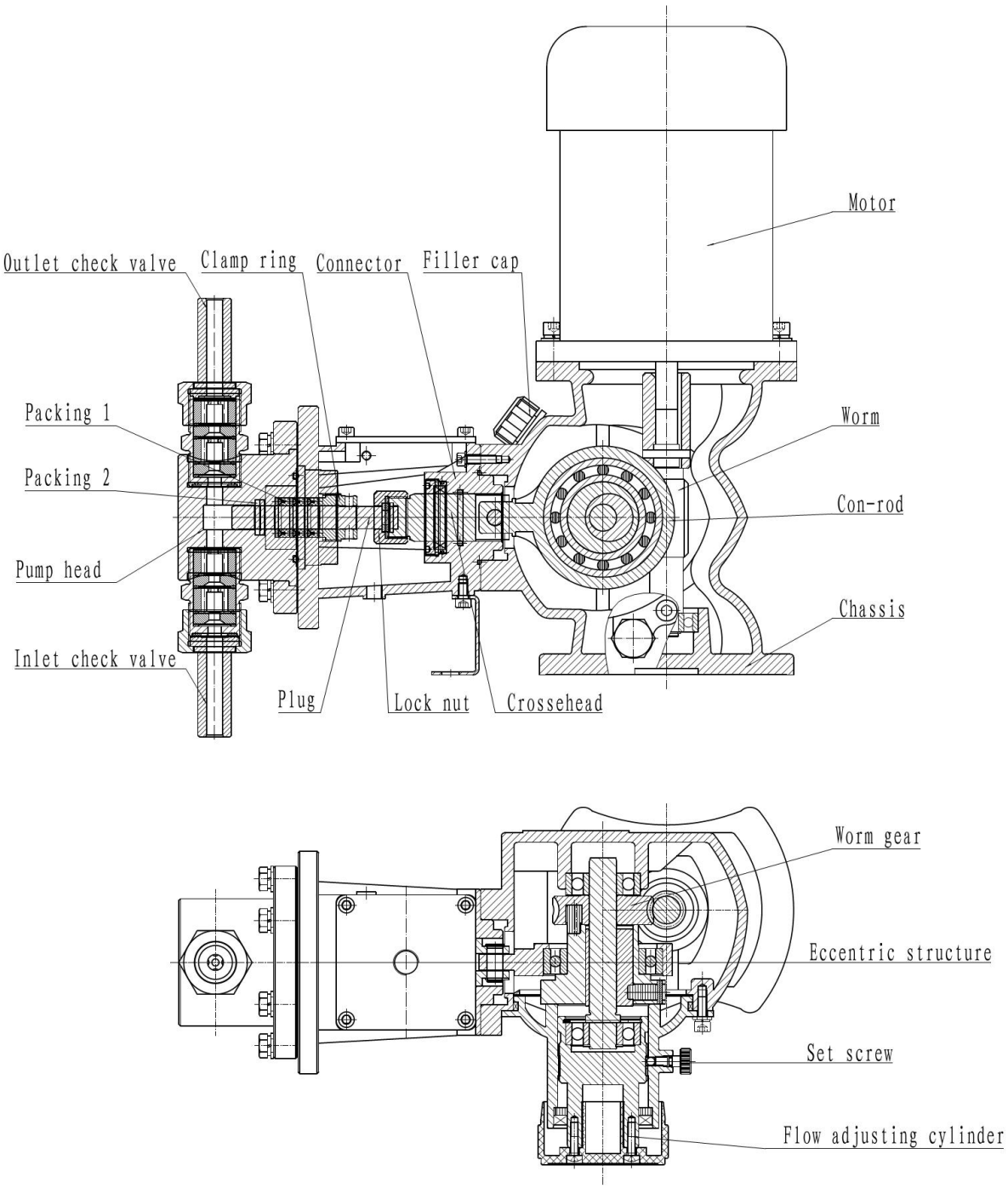
V. Fault Inquiry

Faults Description	Fault Reason	Troubleshooting Method
Operation failure of pump	The liquid level is low (adopt low level to disconnect the device)	Add solution to the storage tank.
	Check valve is blocked or damaged.	Clean or replace the check valve.
	The outlet pipe is blocked.	Clean and unblock the pipe.
	Liquid is frozen.	Melt frozen liquid in the entire dosing system.
	The fuse is blown.	Replace the fuse.
	The thermal overload device in the motor starter trips.	Reset the thermal overload device.
	The cable is disconnected.	Find out its location and repair it.
	The voltage is excessively low.	Test and correct it (the cable may be too thin).
	The pump is not filled with liquid.	Before conveying the liquid to the pressure pipe, the suction pipe and the pump head shall be filled with liquid. Please refer to "3.3.2 Pumping system filling".
	Stroke is set to zero.	Readjust stroke setting
insufficient quantity of liquid pumped out	Stroke setting is improper.	Readjust stroke setting
	Pump operating speed is improper.	Make the supply voltage and frequency match the data on the pump motor nameplate.
	Insufficient suction	To increase suction tube aperture or suction pressure.
	The suction pipe leaks.	The valve is blocked or valve seat is worn out.
	Suction lift is excessively high.	Rearrange the equipment to reduce the suction lift.
	Liquid is too close to boiling point	Reduce temperature or increase suction pressure.
	Safety valve in the outlet pipe leaks.	Repair or replace the safety valve.
	Liquid viscosity is too high	Reduce the viscosity by heating or other means, or increase the suction diameter, or increase the suction pressure.
	Check valve seat is worn or contaminated.	Clean or replace it.
	There is air in the pipeline system.	To empty air in the system.
Suction tube is leaking.	The suction pipe leaks.	The valve is blocked or valve seat is worn out.

	The check valve is blocked or valve seat is worn out.	Clean or replace the check valve assembly.
	Suction pressure is insufficient.	Raise the liquid level of storage tank or boost the storage tank.
	Liquid is too close to boiling point	Reduce temperature or increase suction pressure.
	The pipe filter is blocked or polluted.	To wash the filter.
	Safety valve in the outlet pipe leaks.	Repair or replace the safety valve.
Overheating of the motor and pump body	Operating temperature of motor and pump body is too hot frequently via touch	Normal temperature shall not exceed 93℃.
	The power supply is inconsistent with the motor's electrical specification.	To confirm that the power supply matches with the motor correctly.
	Pump operates under the condition of exceeding the rated performance.	To reduce the pressure or stroke speed. If this doesn't work, please contact.
	The lubricant is incorrectly filled into the pump.	Drain the oil and refill the proper amount of recommended lubricating oil.
Liquid continuously conveyed by the pump with zero stroke	Flow calibration is improper.	Re-calibrate it.
	Adjust the adjusting cylinder improperly.	Readjust stroke setting
	Insufficient difference of outflow	Change the operation conditions (add a back pressure valve, for example).
Gear noise is too loud.	The bearing is worn	Please contact Pump.
	Lubricant grade is wrong or filling amount is insufficient.	To replace or add the lubricant
Loud impact during every stroke	The gear component has excessive lose.	Please contact Pump.
	The bearing is worn	Please contact Pump.
Noise at hydraulic end in operation	Noise in the check valve	The valve ball moves up and down under a certain external force, and a kind of special "click" noise is normal, especially in the metal pipeline system.
There is material leaking from the detection hole.	Plunger packing is worn.	It is necessary to pre-tighten the locking ring again or replace the plunger packing.
There is material leaking from the lubricating oil.	The framework oil seal is ruptured.	It's necessary to replace the framework oil seal.

VI. Components

Fig. 9 KLS Sectional View



VII. Table of KLS Parameters

Model	Plunger Diameter (mm)	Max. Flow (L/h)	Pressure Mpa	Motor kW	Interface Mode
KLS240/0.8	60	240	0.8	0.37	NPT1/2" Internal thread
KLS240/0.6			0.6	0.25	
KLS210/0.9	56	210	0.9	0.37	
KLS210/0.7			0.7	0.25	
KLS160/1.1	50	160	1.1	0.37	
KLS160/0.9			0.9	0.25	
KLS130/1.4	45	130	1.4	0.37	
KLS130/1.2			1.2	0.25	
KLS100/1.8	40	100	1.8	0.37	
KLS100/1.5			1.5	0.25	
KLS80/2.4	35	80	2.4	0.37	Ferrule interface DN15
KLS80/2.0			2.0	0.25	
KLS60/3.0	30	60	3.0	0.37	
KLS60/2.8			2.8	0.25	
KLS40/4.5	25	40	4.5	0.37	
KLS40/4.0			4.0	0.25	
KLS30/6.0	22	30	6.0	0.37	
KLS30/5.0			5.0	0.25	
KLS25/7.0	20	25	7.0	0.37	
KLS25/6.0			6.0	0.25	
KLS20/9.0	18	20	9.0	0.37	
KLS20/7.5			7.5	0.25	
KLS13/13.0	15	13	13.0	0.37	
KLS13/11.0			11.0	0.25	