

KOSMO series-MM1/MM2

INSTALLATION MANUAL

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HANDBUCH

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MANUAL DE INSTALACION

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MANUEL D'INSTALLATION

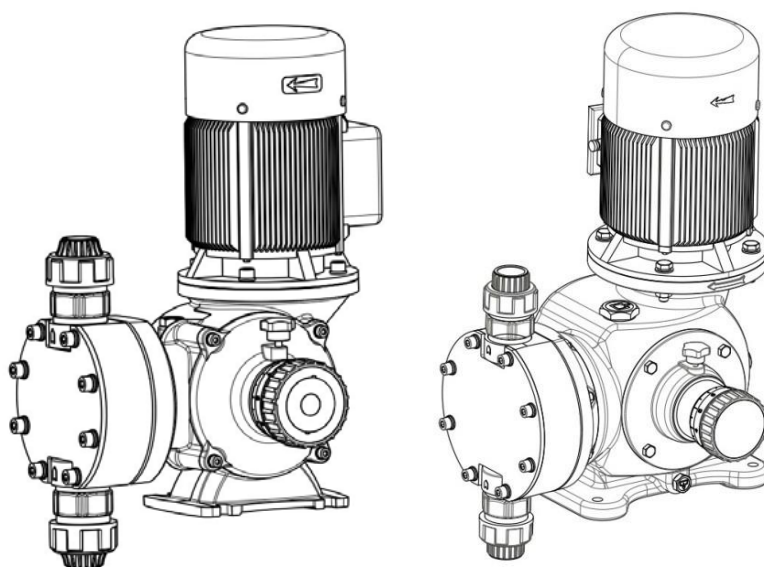
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MANUALE D'INSTALLAZIONE

IT

Instruction Manual for Mechanical Diaphragm Pump

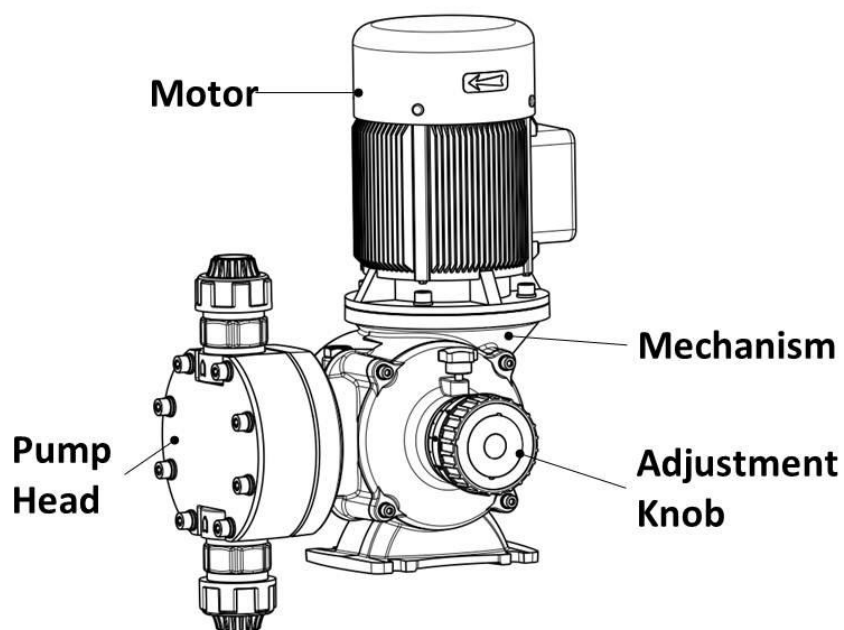
Kosmo series - MM1/MM2



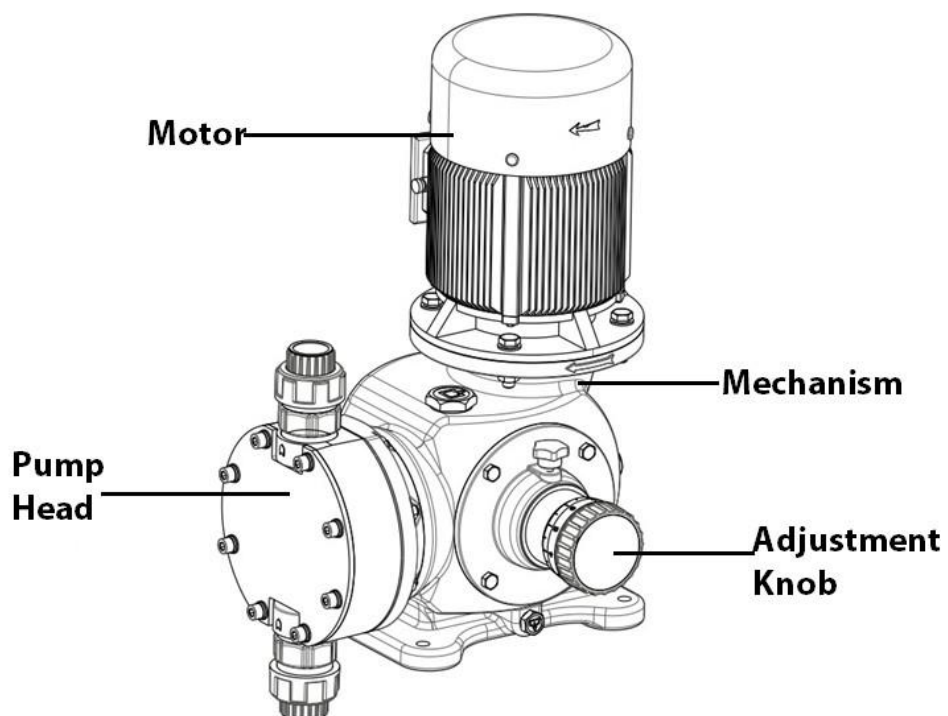
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Structure of MM1/MM2

1. MM1



2. MM2



1. Allgemeines

The metering pump is a reciprocating positive displacement pump; basic components are: the motor, the gearbox, the mechanism, the stroke length adjustment and the liquid end (pump head).

Safety instruction:

WARNING

**Exceeding the maximum allowed operating pressure must be prevented
(e.g. by using a pressure relief valve)**

Before starting to work on the metering pump, carefully verify the following:


- that the motor is disconnected from the power source.
- parts such as the pump head and piping are depressurized.
- parts that have been in contact with aggressive substances are washed before handling personal protection is carried out according to local regulations.

1.1 Application and product identification

The metering pump is a process component capable of transferring defined volumes of liquid with high accuracy; moreover, it is possible to vary the flow rate by adjusting the internal mechanism.

Pump selection should consider the duty required and the compatibility of the construction materials of the contact parts in order to obtain the best performance. Please contact us for information before using a pump for a duty other than that in the original specification.

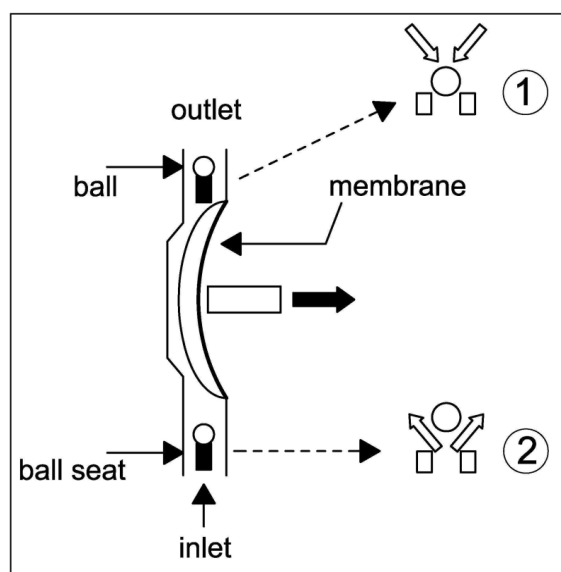
Actual dimensions of product identification: 65x35 mm

Model	
Type	
○	○
S.N.	
Year	
Flow Rate	
Pressure	
	L / h
	Bar
	

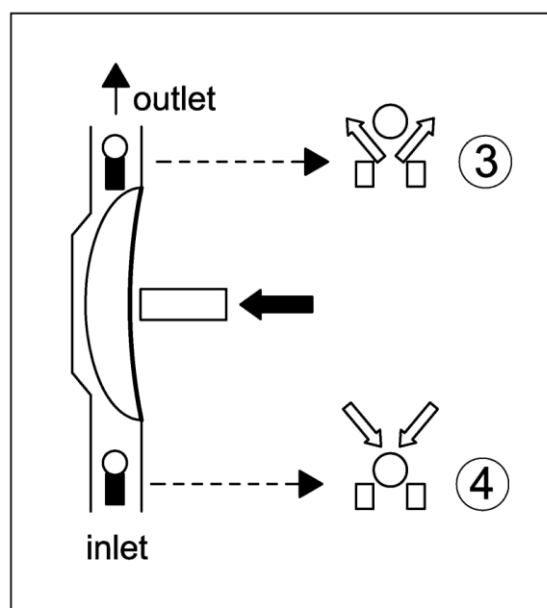
1.2 Operational principle of mechanical diaphragm pump

The gearbox mechanism transforms the rotary motion of the electric motor into reciprocating movement. This reciprocating movement acts on a membrane: when drawing on the membrane, it increases the volume of the pump chamber, reducing the pressure and drawing in fluid; pushing the membrane increases pressure in the pump chamber and forces the fluid out. Flow direction is controlled by one-way ball valves, and the rate of flow can be regulated by adjusting the length of the reciprocating stroke.

The operational principle is illustrated below:



1. As the membrane is drawn back, the ball of the outlet valve drops and seals to the valve seat ①; the ball of the inlet valve is lifted up by the low pressure formed between the membrane and pump head ②; the low pressure also draws in fluid from the inlet pipe.



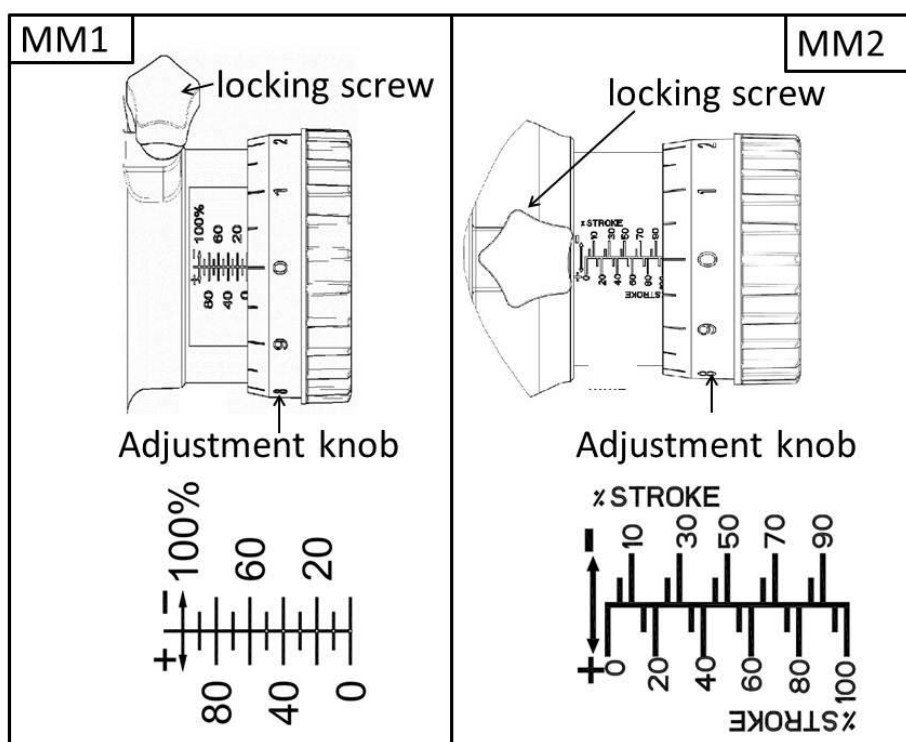
2. As the membrane is pushed forward, high pressure is generated in the pump chamber. This is sealing the ball of the inlet valve to the valve seat ④, blocking fluid flow, and pushes up the ball of outlet valve, allowing fluid to flow through the discharge pipe. The pump must operate under conditions of constant speed, pressure and viscosity in order to obtain highly accuracy performance.

1.3 Adjustment of the stroke length

The adjustment of stroke length is realized by changing the stroke of membrane.

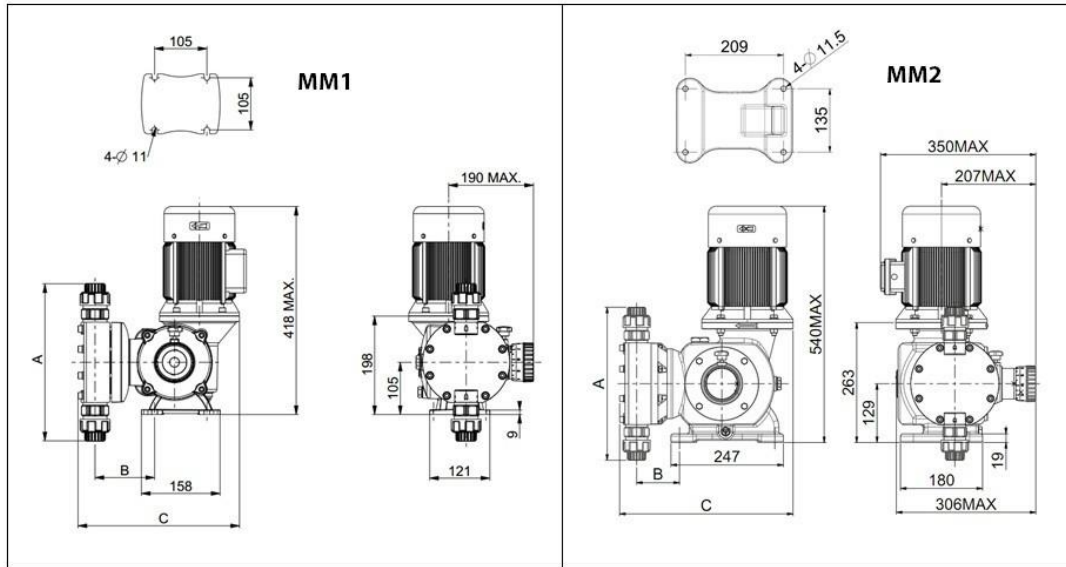
MM1/MM2

To adjust pump capacity, loosen the stroke locking screw located on the pump side cover. Pump capacity is adjusted by turning the stroke adjustment knob clockwise to decrease capacity or counterclockwise to increase capacity as required. The adjustment scale is marked in percent (%) of a full stroke, with calibration lines on the knob at 1% intervals. After adjusting the knob to the desired capacity setting, hand-tighten the stroke locking screw to maintain the capacity setting.



2. Installation

2.1 Installation dimensions



Model	Diaphragm Diameter (mm)	Pump (head)	Connection	A	B	C
MM1	65	PVC	8X12	166	104	303
		PVDF	8X12	166	104	303
		316L	G1/4"F	175	108	294
	96	PVC	G3/8"F	222	108	301
		PVDF	G3/8"F	222	108	301
		316L	G3/8"F	167	107	293
	124	PVC	G3/4"F	293	118	322
		PVDF	G3/4"F	293	118	322
		316L	G3/4"F	216	113	306
	140	PVC	G1"F	316	119	323
		PVDF	G1"F	316	119	323
		316L	G1"F	251	120	319
MM2	124	PVC	G3/4"F	293	89	372
		PVDF	G3/4"F	293	89	372
		316L	G3/4"F	216	85	357
	140	PVC	G1"F	316	92	377
		PVDF	G1"F	316	92	377
		316L	G1"F	251	96	378
	157	PVC	G1"F	334	98	379
		PVDF	G1"F	334	98	379
		316L	G1"F	295	98	381
	179	PVC	G1-1/2"F	424	104	395
		PVDF	G1-1/2"F	424	104	395
		316L	G1-1/2"F	382	117	407

2.2 Instructions for installation

Safety precautions

In order to successfully install and use our products, please make sure you follow the instructions contained in 6.1 and the following precautions:

- a. don't work alone
- b. connect motor to grounding
- c. verify that the electric motor or servomotor is disconnected from mains electricity before working on the pump
- d. when using electric tools in hazardous areas, pay attention to special regulations
- e. keep a first aid kit available
- f. observe local laws and safety regulations
- g. the pump foundation should be at a height that facilitates maintenance operations, handling, oil draining and refilling, and disassembly of the pump head
- h. install the pump free of strain on its base, pump head connections and foundation.

Precautions for electrical connection:

1. Electric motors and electrical components should be connected in accordance with local regulations and by qualified personnel only.
2. Install overload protection or a temperature sensor.
3. Check voltage, frequency, motor speed and power.
4. In hazardous areas special regulations must be applied.

Correct pump installation is fundamental to good operation.

Before carrying out hydraulic connections, make sure that the inside of pipes, tanks, etc. have been thoroughly cleaned/washed. However, we recommend the installation of a filter near the suction nozzle in order to stop plant residues and slags.

Install pipes correctly sized for the maximum flow rate of the pump

Avoid necks and tortuosity where gas could be trapped.

Warning:

To prevent serious damage, the suction and discharge lines must be properly designed, sized and connected to the pump.

Warning:

Pump has no oil for functioning. Remove the adhesive label from the oil cap.

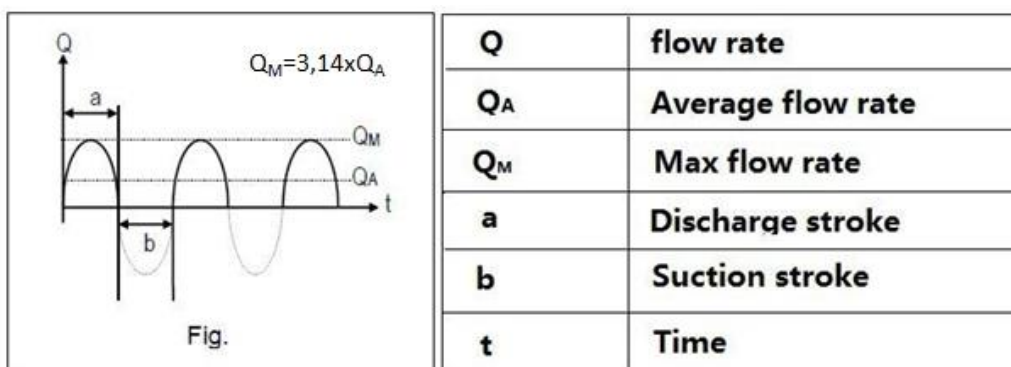


Fill the pump with the oil provided inside the package.

2.3 Suction line

Keep the suction line as short as possible and avoid tortuous paths. Avoid situations where the pressure in the discharge line is lower than in the suction line (suction uplift) as this will affect the accuracy of the metering. If the temperature of the fluid to be dosed is close to its boiling point, sufficient head should be provided on the suction line to prevent the fluid from vaporizing as it is drawn through the suction line.

The pipe diameter should be decided in accordance with instantaneous max flow rate (see figure below), and the pipe diameter should be 1.5 times the diameter of the pump nozzles.



In cases where the pump needs to dose high viscosity fluids, the diameter of the discharge pipe must be 4 times that of the pump suction nozzle in order to reduce loss of fluid. There will be loss of flow when the pumps are dosing high viscosity fluid, please contact the supplier for specifics and model selection. In order to prevent impurities, do not place the suction line close to the bottom of the chemical tank. The suction line must be air-proof to ensure a precise flow rate.

2.4 Discharge line

The rated pressure of the discharge line should be larger than the max rated working pressure of the pump.

It is very important to prevent air entering into the discharge line.

The flow rate can be controlled only when the discharge pressure is larger than the suction pressure. Please observe the following instructions when pumping liquids that tend to crystallize or suspensions that tend to sediment:

- Keep suspension correctly agitated in order to prevent sedimentation
- Avoid installation of vertical lines over the pump discharge nozzle
- Perform a wash cycle before stopping the pump
- Design the suction and discharge lines to permit complete emptying.

3. Start-up

Connect the motor to the power supply.

Check the direction of rotation of the electric motor; an arrow on the electric motor shows the correct direction of rotation.

The electric motor should be connected by qualified personnel only!

WARNING:

Don't start the pump with the suction and/or discharge check valves closed.

Don't close the check valves while the pump is in operation.

Check the following points before starting the pump: Check the mechanism for the correct oil filling. Check the metering pump for over-pressure protection (installation of a pressure relief valve is advised).

Verify that all hydraulic connections are correctly tightened

Position the adjustment knob at "zero" flow rate

Start the pump without discharge pressure and progressively increase the flow rate up to 100%.

Check for the presence of bubbles in the pump chamber.

WARNING 1

DON'T EXCEED THE MAXIMUM PERFORMANCE STENCILLED ON THE PUMP LABEL.
If no pressure gauge is fitted on the plant, the installation of a temporary pressure gauge is recommended in order to check that the actual pressure at the start-up doesn't exceed the maximum allowable pressure.

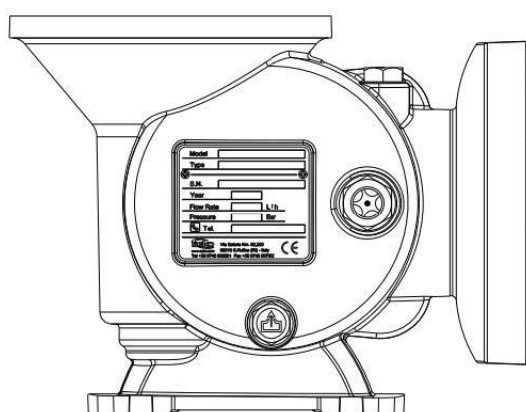
WARNING 2

If the pumped liquid is toxic, poisonous, aggressive, and flammable or for any reason dangerous, use particular care to avoid accidental leakages through gaskets or pipes during start-up or maintenance operations.

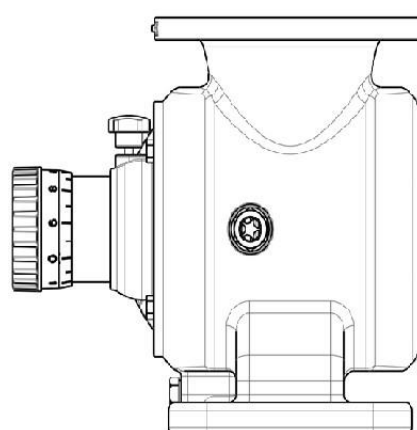
Moreover, follow all the recommendations of the manufacturer for handling and the local laws relevant to safety during handling and disposal of dangerous substances.

4. Maintenance

4.1 Instructions for oil-filling



MM1



MM2



Attention:

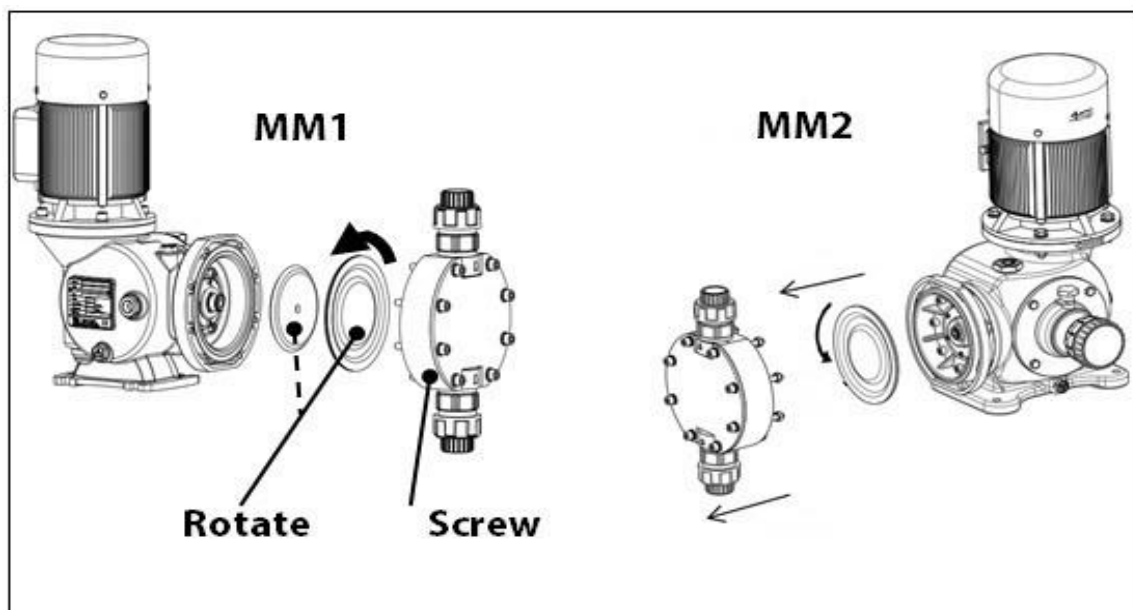
Fill the pump with the oil provided inside the package (applicable only for MM2).

The lubrication oil recommended: EP320. If EP320 is not available for you, you can choose any lubrication oil with the ending number of 320.

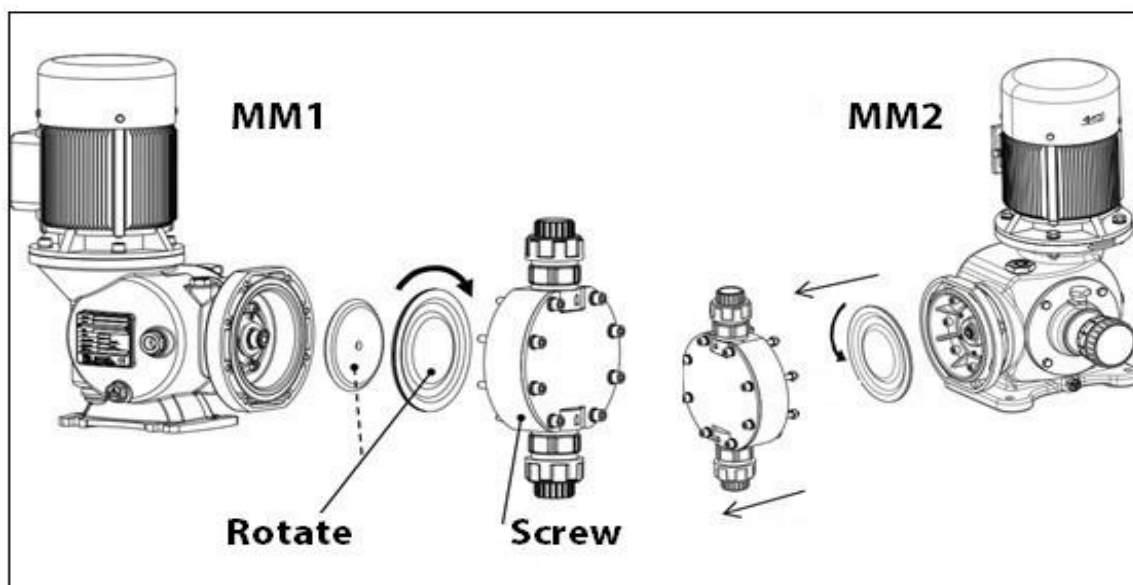
Replace the first oil filling after 1500 operation hours and afterwards every 4000 hours.

4.2 Disassembly and installation of pump head

Disassembly sequence



Assembly sequence

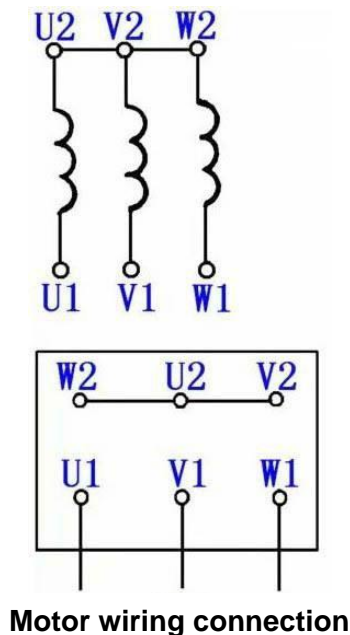


Please note:

1. Before disassembling the diaphragm, please position the knob at “Zero” flow rate
2. The tightening torque for the diaphragm is 5 to 6 N/m
3. After installation of the diaphragm, the knob must be positioned at “100%” flow rate before installing the pump head.

4.3 Instructions for motor operation

1. The intended ambient environment for the motor is below 1000m altitude, between temperatures of -15°C to 40°C.
2. A stable voltage power supply must be provided, either single or three-phase according to the motor. It is vital that all three phases are the same voltage, without failure, to prevent motor burnout.
3. Ensure safe and reliable connection of the motor to the power supply to avoid connection failure or incorrect connections (especially for three-phase):



Virtual connection: the screw holding the wire is not tightened or dropped.

Phase-losing connection: two phases are connected, and the remaining phase is disconnected.

4. The motor should be installed in a dry, dust-free environment with good ventilation and heat dissipation.
5. Under normal working conditions, the motor needs to be maintained at least once a year, with the main maintenance being external cleaning of the motor (including the internal fan cover, the fan blade surface and the surface of the external housing ventilated rib). In harsh working conditions (outdoors or more dust), the maintenance period should be shortened (six months, three months or even shorter).
6. The connecting wire between motor and power supply should be checked yearly for aging.
7. In terms of motor selection, under rated voltage, the torque should be corresponding to its related equipment, not exceeding the rated torque; otherwise, the shaft of motor might be broken or burned.
8. The motor must connect to grounding to avoid creepage, causing injury of person
9. The motor must be correctly handled and stored.
10. Some simple solutions for motor troubles.

Trouble 1 - The motor buzzes but does not start.

Cause 1: Part of the wiring is incorrect, causing the motor to operate using a single phase (likely to cause motor burnout)

Solution:

A Check if the connection between the switch and the stator winding is correct

B Check if the terminal is loose

C Check if the wire is broken or has a virtual connection, use a multi-meter to check.

D Check if the starting device is connected correctly.

Cause 2: Low voltage

The power supply cable is too thin to handle the large starting current

Solution:

A Change to a thick cable.

B Check if the motor that should be connected by a triangle connection is wrongly connected by a star connection

C Check if the motor is started under heavy load.

Trouble 2 - The motor temperature is too high and the motor is smoking

Cause 1: the voltage is too low or the load too heavy; the pump has stopped operation or has inadequate lubrication

Solution:

A Measure if the voltage is too low

B Measure if the current is too large. If it exceeds the rated current, the motor might be overloaded, in which case reduce the load

C Solve the pump's stoppage issue and fill lubrication oil

Cause 2: The motor suffers from bad ventilation or poor electrical isolation

Solution:

A Check if the fan leaf is damaged or fixed

B Check if the fan cover is jammed by dust

C Remove dirt affecting ventilation and heat dissipation

D Provide necessary shield for motor

Cause 3: the voltage is too high or the electrical connections are wrong

Solution:

A If the voltage is too high, connect to an appropriate power supply

B The motor that should be done by triangle connection is wrongly connected by star connection, so the phase voltage is reduced and light load can be burdened, but for heavy load, the motor heats and might be burned even.

C The motor that should be done by star connection is wrongly connected by triangle connection, so the phase voltage is increased and immediately stop motor operation, otherwise, the motor might be burned.

Cause 4: the motor is started frequently or its rotation direction is changed very often

Solution: Reduce frequency of start-up and rotation direction change

Cause 5: Friction between stator and rotor

Solution:

A The screw of the motor cover is loose, forming a gap between the cover and the housing
the solution is to tighten the screw

B The rotor bearing block is too small or the bearing chamber of the motor cover is too big

Trouble 3 - The fuse is burnt out or tripped

Cause 1: Motor started using only single-phase power supply

Solution: Check switch and fuse

Cause 2: There is short circuit between the switch and motor

Solution: Check if there is short circuit between motor terminal and if there is short circuit on the connecting wire between motor and power supply

Cause 3: The stator winding is not earthed or there is short circuit on the stator winding.

Solution: The motor should be earthed and the short circuit isolated

Cause 4: the fuse is too thin

Solution: Replace the fuse with the one that corresponds to the rated current of motor

Trouble 4 - The housing of the motor is electrified

Cause 1: The outgoing wire of the motor is broken and in contact with the housing

Solution: Open the wire box and tape the broken part with insulation tape

Cause 2: The power supply wire is broken and contacts with the housing

Solution: Tape the power supply wire with insulation tape

Cause 3: The winding of stator is aged and electrical creepage is occurring

Solution: Re-dip for painting and dry

Trouble 5 - The resistance of the winding insulation is low

Cause 1: the working conditions of the motor are harsh, with moisture dripping into the motor, damaging the insulation layer and reducing resistance

Solution: Dry the stator and use the Megohmmeter to check the insulation

Cause 2: the insulation layer is aged

Solution: The stator winding should be dried and re-dipped.

4.4 Notes

Before servicing the pump or its related equipment verify that all electric connections (power and control unit) have been disconnected from mains;

Completely depressurize the pump and pipes and drain the section where maintenance is required. Dispose of polluting substances (pumped chemicals, hydraulic liquid, lubricating oil, etc.) appropriately, in line with local regulations.

Before servicing the pump or its related equipment, read carefully the technical specification of the handled fluids with particular respect to the actions that must be done in case of accidental contact with a dangerous fluid.

At least every six months, dismount the pump head as follows:

- Disconnect suction and discharge pipes
- Drain processed liquid in the pump head and pipes
- Unscrew bolts fixing the pump head to mechanism
- Dismount suction and discharge valves.

4.5 Recommended spare parts

In order to fix normal service problems and to avoid a possible waste of time, we suggest keeping a small supply of the following spares in stock:

One complete suction valve; one complete discharge valve;

One complete discharge valve; one membrane; one pump head;

When ordering spares, please always indicate the model and the serial number of the pump.

5. Trouble shooting

Trouble	Possible cause	Solution
Pump cannot work	The check valve is damaged or polluted by fluid	Clean or replace new check valve
	The chemical level in the tank is too low	inject more chemical
	The discharge tube is jammed	Clean and dredge the tube
	Disconnect motor from power supply	Connect to power supply
	The power supply cable is disconnected	Find the disconnected part and repair
	Position the knob at “zero” flow rate	Readjust the knob
	The voltage is not stable, burning the motor	Measure and rectify the voltage, repair or replace new motor
Low flow rate	The chamber and tube remain gas	Discharge the gas
	The suction line is jammed	Clean the suction line
	The suction head is too high	Relocate the pump to reduce suction head
	The fluid temperature is too high	Cool the liquid
	The fluid viscosity is too high	Reduce the viscosity (through heating or dilution)
	The check valve is too dirty or damaged	Clean or replace check valve
	The suction line is incorrectly sized	Check the length and diameter of suction line
	The stroke length is wrongly regulated	Check and readjust stroke length
	The speed of pump is abnormal	Choose power supply and frequency that corresponds to that of motor label
Excessively big flow rate	The discharge pressure is lower than suction pressure	Install back pressure valve
	Wrong stroke length	Check and adjust stroke length
Motor overheats	The discharge pressure is too high	Check the setting of pressure relief valve
	The discharge line is incorrectly sized	Check the length and diameter of discharge line
	The power supply does not correspond the electronic specifications	Make sure that the power supply corresponds to motor
Work with noise	Wrong electrical connections	Check and rectify connections
	Lack of lubricant in the mechanism/gearbox	Refill with the correct lubricant
	Excessive wear of the mechanism/gearbox	Overhaul mechanism/gearbox
The pipeline vibrates	Pipe diameter too small	Enlarge pipe diameter
	Pulsation damper out of operation or too small	Repair or recalculate damper volume

6. Handling and storage

The correct way to handle the pump is shown on the drawing below:

Here are instructions for handling:

Do not sling, pull, and push the pump head, nozzles or flanges

Do not sling, pull, or push the adjustment knob

6.1 Handling

When lifting loads pay attention to the following:

Wear helmet, accident protective shoes and gloves; do not stand under hanging loads

Do not lift excessive loads by hand

When lifting heavy loads by hand, adopt a position that is not harmful to the spine or back muscles.

6.2 Storage

Precautions:

During shipment and storage, protect against rain, sand, dust, dirt and direct sunlight.

Should the pump be stored for a long time, please store it in a dry and well-ventilated place.

Important Instruction for Kosmo Series

1. Please make sure that these instructions are attached to the pump
2. Make sure that the correct voltage and frequency are supplied. Power supply: 380V/50Hz (or 220V/50z, refer to label for details)
3. The motor temperature should be lower than 80°C under normal operation;
4. It is strictly forbidden to operate the pump without liquid for long time (not exceeding 3 minutes)
5. The pump should not be operated at a pressure exceeding its rated pressure (max working pressure), which is marked on the label, expressed in bar(1bar=1kg/cc=10mlift). If the pump works above its rated pressure, it might be damaged.
6. When the chemical to be dosed reacts to water, for example concentrated sulfuric acid, the chamber must be cleaned and dried (some water drops might be left after testing at our factory)
7. When the adjustment knob is positioned below the 100% graduation, the noise from the internal mechanism is relatively large, this is normal. In addition, we suggest that you do not position the knob below 30%.
8. Please make sure that the discharge and suction lines are installed correctly: the suction line (suction valve) is installed vertically downward; the discharge line (discharge valve) is installed vertically upward; ensure the two valves are not interchanged. Loss of any part of pump can lead to pump's failure to operate correctly.
9. The suction/discharge valve should not be connected to the thread of pump head with PTFE tape.
10. Ensure that the insides of the discharge valve and suction valve are clean.
11. The lubricating grease should be replaced at least every year
12. The pressure in the discharge line must be greater than in the suction line in order to prevent siphoning.

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- 13.** We strongly recommend you to install a safety valve and pulse damper.

Check if the pipeline connection, installation and support are correct and firmly mounted. The pump is not intended to bear the pipeline weight; check if the check valve, safety valve and Y-shape filter are installed correctly; the pulse damper should be fixed with support; check if the center point of pump is correct after connecting the pump and pipeline, if it has moved, please adjust it;

- 14.** Calibration of flow rate: It is normal for the actual flow rate to differ from the rated flow rate due to the actual working conditions. In order to ensure an accurate flow rate, you can calibrate by measuring the decrease of chemical in the tank in a specified time. During normal operation, you can set the pump flow rate by adjusting the stroke length percentage in accordance with the calibration result.
- 15.** Operation test: start the pump without load and check the voltage, current and operation of pump (rotation speed of motor, start-up current, motor temperature, leakage, vibration and noise of the pump);
- 16.** Perform tests at rated load to check whether the pump works well and record important information including pressure, motor rotation speed, noise and vibration as well as leakage, and take corresponding measures.