

**IWAKI METERING PUMP**

**AX-SERIES**

**(MECHANICALLY-**

**DRIVEN DIAPHRAGM**

**TYPE)**

**INSTRUCTION MANUAL**

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Thank you for selecting the Iwaki metering pump AX type. This instruction manual describes the correct handling of the pump, maintenance and inspection procedures, and troubleshooting. You are requested to go through this manual, in order to make maximum use of the pump for a long period of time. This instruction manual should be kept within reach of the end user. After reading it, please keep the manual in a prominent place for ready reference.

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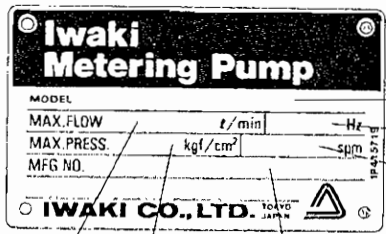
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### Export restrictions

Technical information contained in this instruction manual might be treated as controlled technology in your countries, due to agreements in international regime for export control.

Please be reminded that export license/permission could be required when this manual is provided, due to export control regulations of your country.

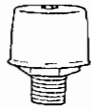
# 1 Unpacking and Inspection



Model  
 Frequency  
 Number of strokes  
 Discharge  
 Discharge pressure  
 Manufacturing no.



Foundation bolt



Air breather



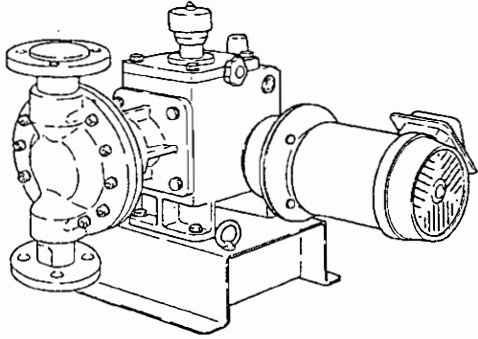
Clamping tool

After unpacking the pump, check the following points to confirm that the product conforms to your order. If you find anything wrong, please contact the dealer with whom you placed the order.

- ① Do the model, discharge pressure, stroke number, and other details on the nameplate correspond to those of the pump you ordered?
- ② Does the package contain the following accessories?
  - ① Air breathers ..... 1
  - ② Foundation bolts ..... 4
  - ③ Diaphragm clamping tool .. 1
- ③ Has the pump been damaged, or nuts and bolts been loosened, during delivery?

## 2 Principle of Operation

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The Iwaki metering pump AX-series has a driving unit that employs an SL crank mechanism, and is designed for chemical processing.

The decelerating mechanism slows the motor speed, and the SL crank mechanism converts rotation to reciprocating motion, which is transmitted to the diaphragm to operate the pump. The discharge is adjusted when a control handle is rotated to change the length of stroke.

### 3 Identification Codes

Driving Unit	Pump Unit	Motor Unit
┌──────────┐	┌──────────┐	┌──────────┐
<b>2 AXAW</b>	<b>— K 90 S 4 S</b>	<b>— 04 E F S</b>
①    ②    ③	④   ⑤   ⑥   ⑦	⑧   ⑨   ⑩   ⑪

Driving Unit	Pump Unit	Motor Unit
┌──────────┐	┌───┐	┌──────────┐
<b>2 AXAW</b>	<b>— MT</b>	<b>— 04 E F S</b>
①    ②	※	⑧   ⑨   ⑩   ⑪

① Serial-use model code

Without symbol 1: Single-use pump

2: Dual (or multiple)-use pump (Indicated for models to be used in series of two or more pumps)

② Driving unit model code

Mode	Stroke Length (at 100% stroke)	Standard Motor Output
AXA-90	8.1mm	0.4kW
AXA-120	10.7mm	

③ Reduction code

Reduction Code	Reduction Ratio	Stroke Rate (50/60Hz)
G	1/30	48/58spm
W	1/20	72/86spm
H	1/15	96/116spm

④ Pump head code

K: Mechanically-driven diaphragm

KE: Mechanically-driven diaphragm for Latex

⑤ Diameter of diaphragm: 90  
: 120

⑥ Material code: For details, see the table of materials in the reference data.

Code	Material of Liquid-Contacting Parts
S4	SUS304
VS	PVC
VC	

⑦ Pump unit made to order

S: Non-standard material

Special valves

Other special specifications of the pump unit and the hydraulic unit

⑧ Motor output

Code	Output
04	0.4kW
07	0.75kW
15	1.5kW

⑨ Stroke length adjustment

Code	Stroke Adjusting Method
Without code	Manual
E	Electric servo

⑩ RPM control

Code	RPM Control
Without symbol	Fixed rpm
F	Inverter motor
V	VS motor

⑪ Motor unit made to order

S: Special base

Pulse generator

Other special specifications of the driving unit and motor unit

※ Code for multiple connection of different types of pumps

W-MT	Connected pumps have the same driving unit but different types of pump heads.
-MT	Driving units have different reduction ratios.

- When pumps with different types of driving units are connected, one which has the largest output is indicated in ②.

## 4 Specifications (Outline)

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### ■ Standard specifications (Single type)

Model	Diaphragm diameter	Stroke length (mm)	Discharge capacity at each spm (l/min)						Maximum discharge pressure MPa (kgf/cm <sup>2</sup> )	Standard motor (kW)
			50Hz			60Hz				
			G:48 spm	W:72 spm	H:96 spm	G:58 spm	W:86 spm	H:116 spm		
AXA-	K90	0-8.1	1.4	2.1	2.8	1.7	2.6	3.4	0.5 (5)	0.4
	K120	0-10.7	3.5	5.3	7.1	4.3	6.4	8.6	0.3 (3)	
	KE90	0-8.1	1.1	1.7	-	1.4	2.1	-	0.2 (2)	
	KE120	0-10.7	2.9	4.4	-	3.5	5.3	-	0.3 (3)	

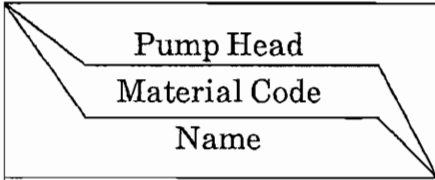
Note 1: The KE type is a mechanically-driven diaphragm pump for use specifically in transferring Latex emulsion liquid.

Note 2: Discharge consists of clear water at normal temperature under the maximum discharge pressure.



■ Common Specifications

1. Materials of Liquid-Contacting Parts

 Pump Head Material Code Name	K			KE
	S4	VS	VC	S4
Pump head	SCS13	PVC		SUS304
Valve seat	SUS304			
Valve	SUS304		Ceramics	
Valve guide	SUS304	PVC		
Valve gasket (O ring)	PTFE	(EPDM)	(FKM)	PTFE
Discharge port · Suction port	SUS304	PVC		SUS304
Diaphragm nut	SUS304		PVC	
Diaphragm seat	PTFE			
Valve case	—			SUS304
Gasket	—			PTFE

- SCS13 : Stainless steel casting  
 SUS304 : Stainless steel  
 PTFE : Ethylene tetrafluoride resin  
 PVC : Poly vinyl chloride  
 EPDM : Ethylene-propylene rubber  
 FKM : Fluororubber

2. Temperature range of liquid: S4.....0~80°C  
VS · VC.....0~50°C
  3. Ambient temperature: 0~40°C
  4. Standard coating color: Munsell 2.5BG 4.5/6 (excluding motor, which is in manufacturer's standard color)
  5. Motor:  
Standard: Flange type (IEC Standard)  
Motors of 1.5kW and above: Foot-mounted type.
- ※ Please note that due to product improvement, sizes are subject to change without notice.

## 5 Description of Pump Mechanism & Points to Note During Operation

### ■ Description of Pump Mechanism

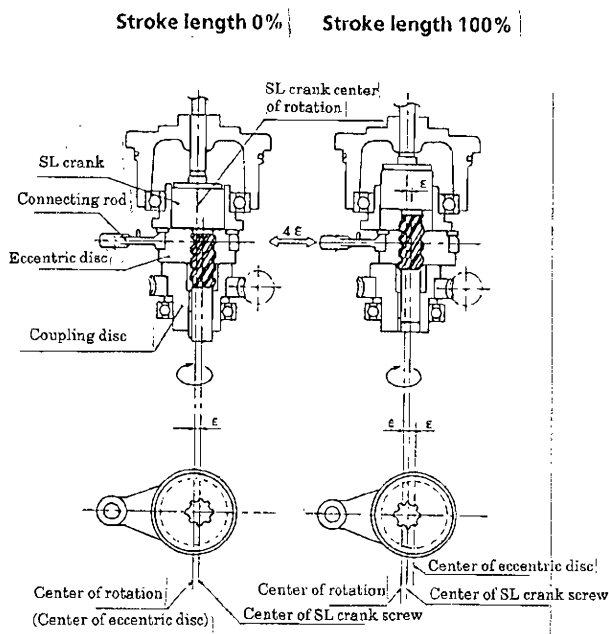
#### ① Gear reducer mechanism

The motor speed is reduced by a worm and a worm wheel. The standard reduction ratios are 1:30, 1:20, 1:15.

#### ② SL crank mechanism

The SL crank is a mechanism designed to adjust the stroke length. It consists of an eccentric disc of the same eccentricity, SL crank, and coupling disc.

#### Principle of SL crank mechanism



- When stroke length is set at 100% (SL crank is pulled up)

When the SL crank is pulled up, the eccentric disc starts rotation via the SL crank screw. At this moment, the eccentric disc is shifted from the center of SL crank rotation, resulting in a stroke length that is double the eccentricity degree. (The example shows that the eccentric disc has rotated 180° and the eccentricity degree is  $2\epsilon$ .)

- When stroke length is set at 0% (SL crank is pushed down)

The center of the eccentric disc is aligned with the center of SL crank rotation. The eccentricity degree  $\epsilon$  of the SL crank against the center of eccentric disc rotation is offset to result in an eccentricity degree of 0.

#### ③ Stroke length control

To set, increase or decrease the discharge rate, the length of stroke is changed, which is carried out by rotating the control handle of the pump.

## ■ Notes on Operation

### ① Shutoff operation prohibited

Never operate the pump without opening the valves in the piping on both the discharge and the suction sides. Do not throttle or close the valves in the discharge and suction piping while the pump is in operation.

### ② Influence of change in temperature

Although the performance of the pump is not affected by a change in temperature, the liquid handled changes in viscosity, steam pressure, corrosion resistance, etc., as the temperature varies. Therefore, close attention should be paid to changes in the properties of the liquid handled likely to be caused by thermal variation.

▶ Temperature range of liquid handled by pump: 0°C~80°C (0°C~50°C for PVC type pumps)

\* For the recommended temperature ranges of chemical liquids, refer to the table of corrosion resistance data. If you have any further questions, please contact the dealer you placed your order with.

▶ Temperature range of atmosphere in which the pump is operated: 0~40°C

### ③ Effect of viscosity on performance

When an AX hydraulic diaphragm pump transfers a viscous liquid, the discharge tends to decrease slightly compared to clear water. In order to maintain precise metering, try to minimize a change in the viscosity through careful control of the temperature of the liquid. As the viscosity of the liquid rises, NPSHr increases. Accordingly, NPSHa should be set at a sufficiently high level if a viscous liquid is transferred.

### ④ Handling of slurry

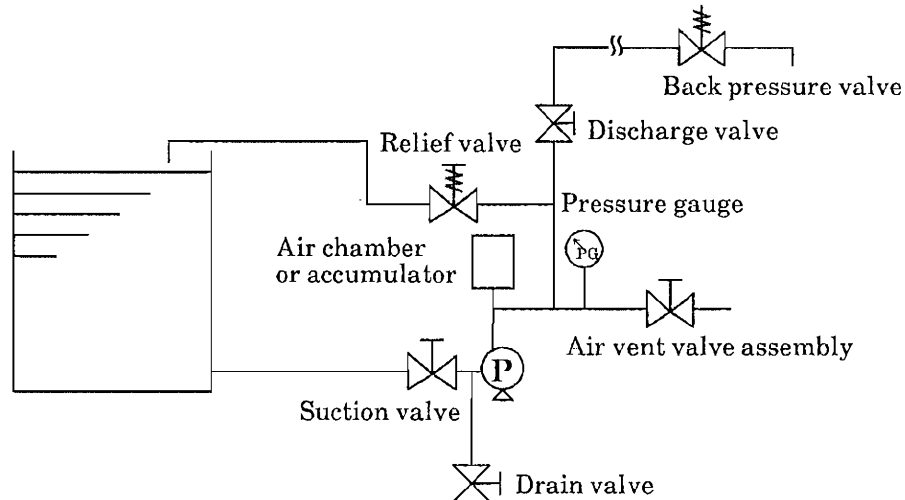
① Please note that a metering capacity similar to that for clear water may not be achieved.

② When a slurry is pumped at a low stroke length, precipitation causes the valves to malfunction and the transfer of the slurry becomes impossible.

③ The diaphragm has a shorter life due to abrasion caused by the slurry.

## 6 Installation, Piping, and Wiring

### ■ Recommended Piping



The piping system should be designed to fully meet the requirements for suction and discharge. Well-planned piping is a must particularly when a precipitable slurry is handled.

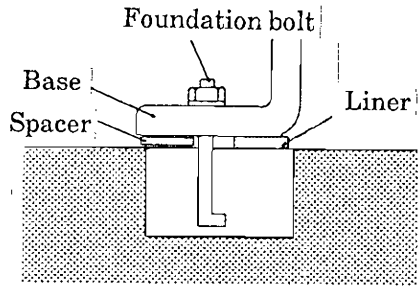
### ■ Installation Site

- ① Position the pump as close to the suction side tank as possible, and lower than the lowest liquid surface of the tank. Choose the position that requires the shortest possible length of suction piping.
- ② For ease of maintenance, have enough space around the installation. Take measures to prevent the danger of damage to the motor and power distribution equipment in disasters such as a flood.
- ③ The pump should be installed in a flat place, that is not subjected to the vibrations caused by other machines.

### ■ Foundation Work

- ① As a concrete floor on soft ground tends to subside or incline, it is necessary to have a space wide enough to bear the weight of the pump and deep enough to prevent the pump from freezing in winter.
- ② For the foundation bolts to be driven into the concrete floor, make holes as marked in the drawing or on the product. Level the floor surface as far as possible. Start installation only after the concrete has set fully.

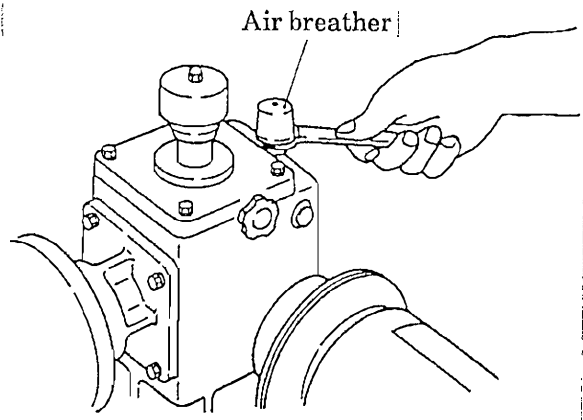
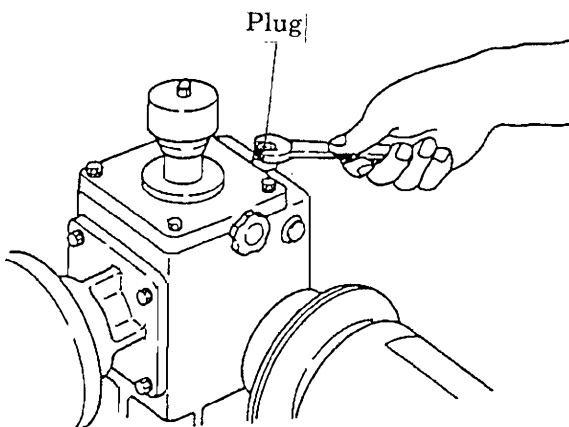
■ Installation



Liner : When the nut is tightened, remove the liner.

- ① After preparing the foundation, position the pump on the concrete.
- ② Insert the liner between the pump base and the concrete foundation to make a gap for mortar grouting. At this time, make sure the liner is inserted evenly (and horizontally) so that the base is not distorted.
- ③ Attach a nut at the head position of the screw of the foundation bolt and leave it hanging down in the hole for the foundation bolt hole in the base.

- ④ Grout mortar into the foundation bolt hole. Leave the mortar for a few days to harden. The surface of the grouted mortar must be at the same level as the surface of the concrete foundation. Use a level to check that the surface is horizontal.
- ⑤ After the mortar has hardened, remove the liner from the base and place a level on the surface of the discharge side flange (or discharge port) to check the levelness again. Next, fasten the nut on the foundation bolt. If it is not level, insert a spacer at the bottom of the base to obtain levelness. Then, fasten the nut to set the pump.
- ⑥ Remove the plug of the driving unit, and mount the air breathers provided (ones with sealing tape wound round them). To mount an air breather, turn its upper hexagonal portion with a wrench.



## ■ Piping (General Matters to be Attended to)

- ① The piping should be as short and with as few bends as possible. Care should be taken to prevent air traps.
- ② Provide a support to prevent the piping from applying a load to the pump. Pay particular attention to this point when liquid contacting ends are PVC.
- ③ If the pump is used to transfer a high or low-temperature liquid, the piping should be designed to protect it from the influence of thermal expansion/contraction.
- ④ If a precipitable slurry is to be transferred, the piping should not have a U-shaped section. It is also necessary to provide a drain plug in the lowermost section of the piping.
- ⑤ If a viscous or toxic liquid, or a liquid likely to stick, is to be transferred, provide piping for flushing to facilitate maintenance and inspection.
- ⑥ When selecting the piping material, take into account corrosion resistance to the liquid to be handled and pressure to be applied to the piping.
- ⑦ Before installing the pipes, clean their insides thoroughly. To prevent foreign matter from entering, blind covers are provided at the inlet and outlet of the pump. Remove them before starting piping work.
- ⑧ If there is a risk of the liquid freezing in the piping, the piping has to be kept warm. To discharge the liquid remaining in the piping, the suction piping should be equipped with a drain cock.
- ⑨ If a PVC pipe is used in the discharge side piping of the pump, care should be taken not to let an adhesive flow into the pump.

## ■ Suction Piping

- ① The press-in method must be used to install suction-side pipes. Use pipes which are larger in diameter than the pump inlet.
- ② Care must be taken when attaching joints to suction piping, so as not to allow air to be sucked in. If air gets inside the suction piping, the discharge rate will become unstable.

## ■ Discharge Piping

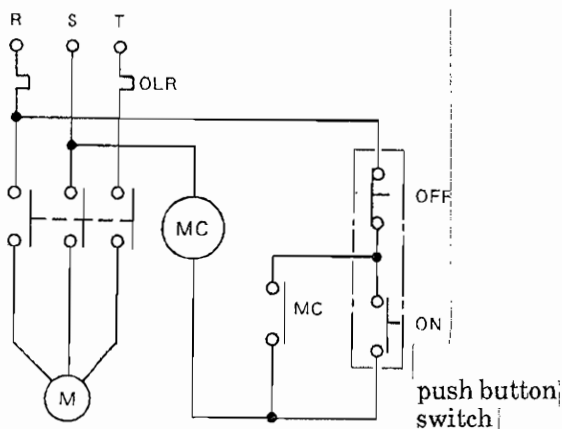
- ① The discharge piping must be able to withstand pressure higher than the relief valve setting. Take special care in fitting joints.
- ② It is recommended to provide an air chamber or an accumulator as a means to suppress pulsation and to eliminate inertia resistance.
- ③ It is recommended to provide a back pressure valve so as to prevent overfeed as a result of insufficient pressure.
- ④ Install a pressure gauge for routine checks of discharge pressure.

## ■ Wiring

For wiring, use good quality materials and comply with the technical standard for electric installation and the indoor wiring regulations. Strict observance of the following is requested:

### Example of Circuit Diagram

power supply



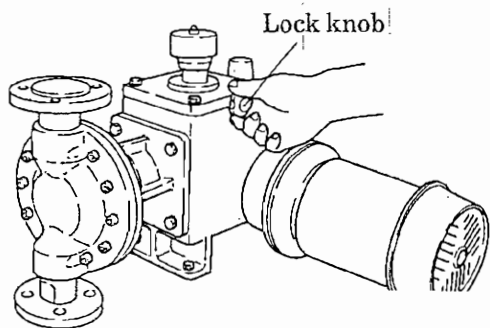
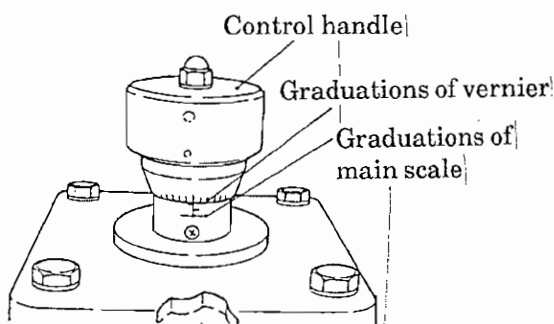
M	.....	motor
MC	.....	electromagnetic switches
ON	.....	push button switches
OFF	.....	
OLR	.....	Overload relay

- ① Use an electromagnetic switch suitable for the specifications of the motor of the pump.
- ② If the pump is used outdoors, wire it so as not to expose the switches to rainwater, etc.
- ③ The electromagnetic switch and push button switches must be installed securely, in a place away from the pump.
- ④ Wire so that the motor can rotate in the direction indicated by the arrow on the plate (clockwise when viewed from the fan cover side of the motor). When you confirm the direction, make sure to set the stroke at 0% before turning the power switch on.
- ⑤ An ampere meter must be installed to monitor the operation of the pump.



## 7 Operation

### ■ Stroke Adjustment



#### < Manual Operation >

A dial-type control handle is used to adjust the stroke. Adjustment is possible regardless of whether the pump is in or out of operation, but it is preferable to make it while the pump is in operation.

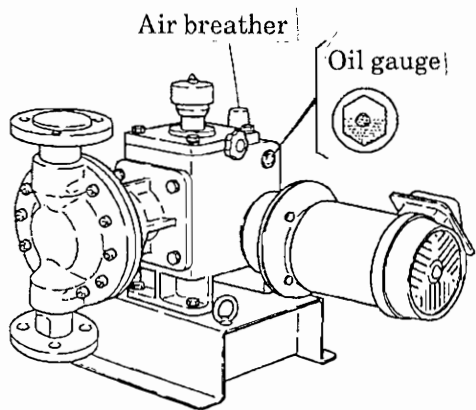
- ▶ Turning to the right (clockwise) decreases the stroke length to reduce the discharge.
- ▶ Turning to the left (counterclockwise) increases the stroke length to raise the discharge.
  
- ④ Select a suitable stroke from the standard performance curve of the pump or the table of test results. The graduations show strokes in %.
  
- ② Loosen the lock knob. (The control handle is freed.)
  
- ③ Set the dial at the value of the intended stroke length. The total of the figure on the main scale and the one on the vernier represents stroke length (%).
  
- ④ After setting the stroke length, tighten the lock knob firmly. Then, try to move the control handle to confirm that it does not move.

<Electric servo or air servo operation >

Please refer to the instruction manuals for the AX-type Electric Servo Unit and the Stroke Setter.

### ■ Preparation for Start-Up

During the initial run of the pump after its installation, the following points should be checked.



- ① Is there any damage, loosened bolt, or oil leakage in the pump?
- ② Have the plug in the driving unit been replaced by the air breathers provided? (See "Installation," Item 6 on page 10.)
- ③ Confirm the gear oil level by means of the oil gauge in the driving unit. (The red label in the middle position of the gauge indicates the prescribed amount.)
- ④ Make sure that the attachments needed for pump operation, liquid to be handled, and power supply are ready.

## ■ Operation

Following is the operation procedure of the pump when it is run for the first time after installation.

	Procedure	Points to be Checked/Noted
1	○ Fully open valves in discharge and suction piping.	
2	○ Set stroke at 0%.	
3	○ Turn on power switch of motor, to activate pump.	● Confirm that motor rotates to right (clockwise) when viewed from fan cover side of motor.
4	○ Run pump with stroke at 0% for 10 minutes for break-in. During this period, confirm that everything is in order in all sections of pump.	● In cold weather, overload (amperage above rating) may be observed for a while after start-up. This phenomenon is due to low temperature of oil in pump. If this happens, keep running pump in that no-load condition until oil temperature rises.
5	○ Set stroke at 100% while avoiding pressurizing discharge side by making use of, for example, drain valve on discharge piping, and carry out break-in for approx. 10 mins.	
6	○ If everything is found to be in order in break-in, close drain valve gradually and feed liquid to predetermined pipeline.	● In this step, confirm that discharge pressure remains below max. pressure level, that amperage stays within rating, and that there is nothing out of order in all sections of pump. (Refer to the nameplates of pump and motor.)

	Procedure	Points to be Checked/Noted
7	<p>[Checking of discharge]</p> <ul style="list-style-type: none"> <li>○ If pump has no problem, check discharge under actual working conditions by using a gauge such as measuring cylinder. (Pump is in order if repeatedly measured discharges change little and linearity of discharges to strokes is maintained.)</li> <li>○ For setting discharge, graph relation between discharges and strokes under actual working conditions.</li> </ul>	<ul style="list-style-type: none"> <li>● If discharge is increased or decreased by changing stroke, wait for a minute or so before measuring it.</li> <li>● If requested while placing order for pump, table of pump test results is supplied. Table shows results of tests on clear water at normal temperature (not on actual liquid or through actual piping).</li> </ul>

■ Notes on Operation

	Precautions	Remarks
1	<ul style="list-style-type: none"> <li>○ Do not forget to open valves in piping both on suction and discharge sides before starting up pump.</li> </ul>	
2	<ul style="list-style-type: none"> <li>○ Take care not to operate with motor rotating in reverse.</li> </ul>	<ul style="list-style-type: none"> <li>● Confirm that motor rotates clockwise when viewed from fan cover side.</li> </ul>
3	<ul style="list-style-type: none"> <li>○ The working pressures of the safety valve and the backpressure valve are set according to your specifications. For further details, see the instruction manuals for the safety valve and the backpressure valve.</li> </ul>	
4	<ul style="list-style-type: none"> <li>○ In case air chamber is provided Air should be fed regularly to air chamber. For details, see instruction manual of air chamber.</li> </ul>	<ul style="list-style-type: none"> <li>● Because liquid and air are directly in contact with each other in air chamber, a small amount of compressed air absorbs into the liquid.</li> <li>● Thus, air keeps decreasing as time goes by, and it becomes difficult for the air chamber to fulfill its functions. To avoid this, air should be supplied at regular intervals.</li> </ul>

## ■ Stoppage of Operation and Restarting

- ① When operation is resumed after a brief stoppage (within a week), the pump can be run with any length of stroke.
- ② If the pump has been out of operation for a longer period (more than a week), the stroke should be set at 0% and about ten minutes' run in a no-load condition must be carried out. Do not start up the pump immediately for regular operation. Prior to that, an air vent run should be made with gradually increased stroke lengths after the inside of the driving unit is fully lubricated.
- ③ If the pump is put out of operation in cold weather (even briefly), open the drain piping on the suction side and run the pump without feeding liquid, to get rid of liquid from the piping and the pump chamber. This is to protect the pump from damage likely to be caused by frozen liquid.  
In case operation is interrupted temporarily and liquid cannot be drained, the pump should be kept warm by a band heater, etc., to prevent the liquid inside from freezing.

## 8 Maintenance and Inspection

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### ■ Routine Operation

No.	Checkpoint	Checking Method
1	<ul style="list-style-type: none"> <li>· Is pump running smoothly?</li> </ul>	<ul style="list-style-type: none"> <li>● By flow meter or visually</li> <li>● Amperage of motor</li> </ul>
2	<ul style="list-style-type: none"> <li>· Is there any change in discharge or discharge pressure?</li> </ul>	<ul style="list-style-type: none"> <li>● By flow meter, pressure gauge or the like.</li> <li>● Compare with figures on nameplate</li> </ul>
3	<ul style="list-style-type: none"> <li>· Is there any leakage from liquid-contacting parts?</li> </ul>	<ul style="list-style-type: none"> <li>● Examine sealed sections visually.</li> </ul>
4	<ul style="list-style-type: none"> <li>· Does oil in gear reducer and driving units run short?</li> <li>· Does oil leak, or is it soiled?</li> </ul>	<ul style="list-style-type: none"> <li>● By oil gauge</li> <li>● Visually</li> </ul>

### ■ Periodic Inspection

If there is a spare pump, run it from time to time. It should be serviced so as to be always ready for use.

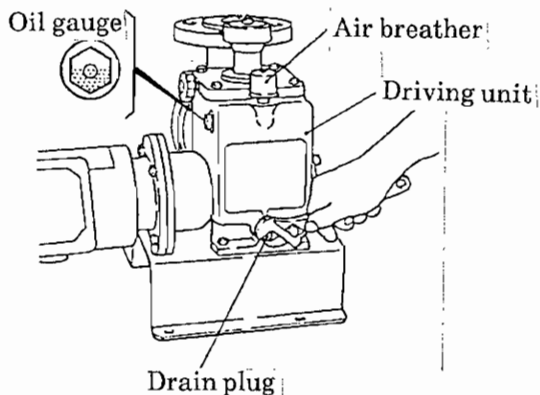
No.	Item	Remarks
1	<ul style="list-style-type: none"> <li>● Inspection of discharge and suction valves               <ul style="list-style-type: none"> <li>▶ Inspect them semiannually.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● If unusual scratch or abrasion is found in any of them, replace it.</li> <li>● For replacement, follow instructions in “Disassembly, Reassembly and Adjustment” section. (Page 24, 25 and 28, 29)</li> </ul>
2	<ul style="list-style-type: none"> <li>Oil change in driving unit               <ul style="list-style-type: none"> <li>▶ ① Replacement period: at least once a year</li> <li>▶ ② Quantity of replacement oil: 2.4ℓ</li> <li>▶ ③ Brand of replacement oil: See the next page.</li> </ul> </li> <li>● Make sure to fill oil up to red label of oil gauge (middle position).</li> </ul>	<p>Oil must be changed more than once a year. In the first run which causes initial wear, replace oil when pump is operated for 500 hours. If the oil becomes foul or emulsification is found in it after a lapse of 2,000~3,000 hours, replace it immediately.</p>

● Suitable Oil Brands (reference)

Company	Product Name
※Nihon Sun Sekiyu	Sunoco Multipurpose Gear Lubricant 80W-90
Idemitsu Kosan	Appolloil Wide Gear LW 80W-90
Mitsubishi Sekiyu	Olbis Gear Oil 80W-90
General Sekiyu	General Gear Oil MP90
Kignus Sekiyu	Gear Oil MP80W-90
Kyodo Sekiyu	Kyoseki 21 Gear 4 80W-90
Esso Sekiyu	Esso Gear Oil GP80W
Showa Shell Sekiyu	Gelco Multi 5 80W-90
Mobil Sekiyu	Mobirub HD 80W-90
Cosmo Sekiyu	Cosmo Gear GL-5 80W-90
Nihon Sekiyu	Gearub SP 80W-90

Iwaki uses the oil marked with ※.

■ Oil Change Procedure



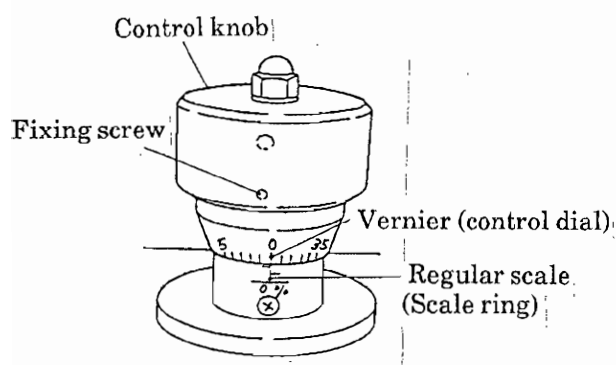
- ① Stop the pump and release it from pressure, for example, by opening the drain valve in the piping.
- ② Remove the drain plug of the driving unit and let the oil out.
- ③ Clean the inside with new oil and flushing oil.
- ④ Wind sealing tape around the drain plugs and replace them in the driving unit.

◇ Next, set the stroke length at 0%.

- ◇ Remove the air breather and feed oil of a suitable brand into the driving unit.
- The red label in the middle of the oil gauge indicates the prescribed quantity.

### ■ Adjustment of Stroke Length Scale

If the scale of the control knob for adjusting the stroke length (the 0 positions of the regular scale and the vernier) is not correctly positioned, adjustment is needed.



#### <How to Adjust>

Remove the pump head. Observe the movement of the diaphragm holder and make sure that when the movement is at its minimum, the stroke length scale is correctly positioned (the regular scale's 0 meets the vernier's 0).

#### <If this is not the case>

Loosen the control dial using the screw which secures it (the lower hex socket setscrew) and adjust the regular scale and the vernier scale so that their 0s meet each other. At that point, tighten the screw on the control dial again.



# 9 Troubleshooting Guide

Problem Cause	Motor does not move.	Discharge is insufficient.	Discharge is excessive.	Discharge is unstable.	Amperage of motor exceeds rating.	Liquid is not discharged.	Discharge pressure does not rise.	Liquid leaks.	Excessive vibrations and/or noise	Oil leaks.	No sucking	High temperature of driving unit	Remedy
Motor out of order.	<input type="checkbox"/>				<input type="checkbox"/>				<input type="checkbox"/>				Replace it.
Breaks or faulty connection	<input type="checkbox"/>				<input type="checkbox"/>								Check wire and mend it.
Power fuse melted.	<input type="checkbox"/>												Find out cause and mend it.
Voltage lowered.	<input type="checkbox"/>				<input type="checkbox"/>								Find out cause and obtain normal voltage.
Insufficient NPSH (cavitation)		<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		Review suction requirements.
Abrasion of valve seat		<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>		Replace it.
Valve blocked with foreign matter.		<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>		Disassemble and clean.
Suction piping and strainer blocked.		<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		Disassemble and clean.
Stroke setting dial out of place.		<input type="checkbox"/>	<input type="checkbox"/>										Readjust.
Liquid overfeed due to insufficient differential pressure.			<input type="checkbox"/>										Increase the differential pressure.
Fluctuation in no. of strokes of pump		<input type="checkbox"/>					<input type="checkbox"/>						Examine power source, motor and gear reducer.
Overload (excessive discharge pressure)	<input type="checkbox"/>				<input type="checkbox"/>				<input type="checkbox"/>		<input type="checkbox"/>		Examine discharge piping system.
Improper specifications of power supply	<input type="checkbox"/>				<input type="checkbox"/>								Investigate and rectify.
Air sucked by suction side piping.		<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>		Inspect piping and mend it.
Liquid handled changed.		<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>						Review pump specifications.
Pressure gauge defective.							<input type="checkbox"/>						Replace it.
Mouth of pressure gauge clogged with dirt.							<input type="checkbox"/>						Clean it.
Leak from safety valve		<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>						Readjust set pressure of safety valve, or check and repair.
Diaphragm deformed.		<input type="checkbox"/>						<input type="checkbox"/>					Replace it.
Valve gasket/O ring out of order.		<input type="checkbox"/>						<input type="checkbox"/>					Replace it.
Oil seal/O ring out of order.										<input type="checkbox"/>			Replace them.
Improper lubricating oil used for driving unit.					<input type="checkbox"/>				<input type="checkbox"/>			<input type="checkbox"/>	Check amount, type and cleanliness of oil.

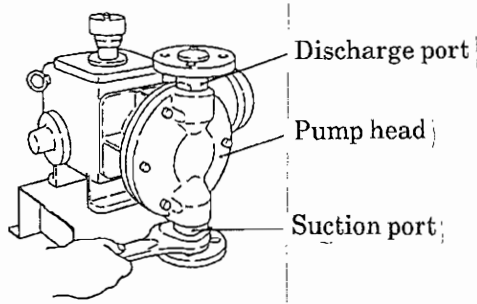
## 10 Disassembly, Reassembly and Adjustment [For K Type]

### Notes:

- Power should always be turned off when the pump is disassembled or reassembled. Then follow the steps described below. Reference should also be made to the “Parts Description and Exploded View” section.
- During the disassembly process, liquid remaining in the pipes and the pump chamber spills out. Be careful of dripping liquid when removing them.
- Some types of liquid are harmful to the human body and/or pump parts. Great care should be exercised
- Don't disassemble the driving unit as it has been fully adjusted prior to shipment. If it needs to be disassembled, be sure to contact us.

### ■ Disassembling and Reassembling Valve the Sets

#### <Disassembly>



- ◇ Remove the pipes on the discharge side and the suction side.
  - They should be removed after letting the liquid out of them and closing the piping valves.
- ◇ Detach the discharge port and the suction port from the pump head and take out the valve sets.
  - If abnormal scratches and /or wear in any of the parts (valves, valve seats, etc.) of the sets during this process is found, the part should be replaced.
  - Dispose of liquid remaining in the pump chamber and valves by wiping it away or transferring it into another container.

\* If the pump is of the VS or VC type, turn the pump head fixing bolt two or three times to loosen it.

③ Wash the disassembled parts and keep them together so they are not lost or damaged.

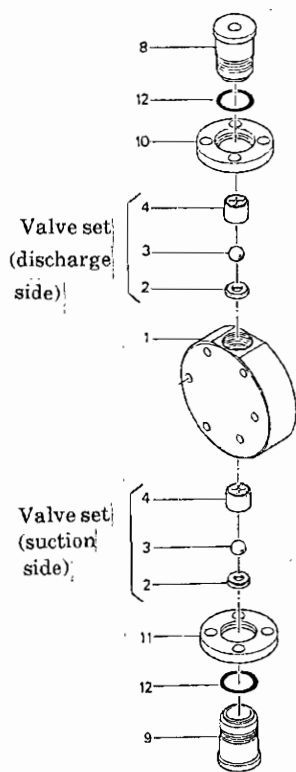
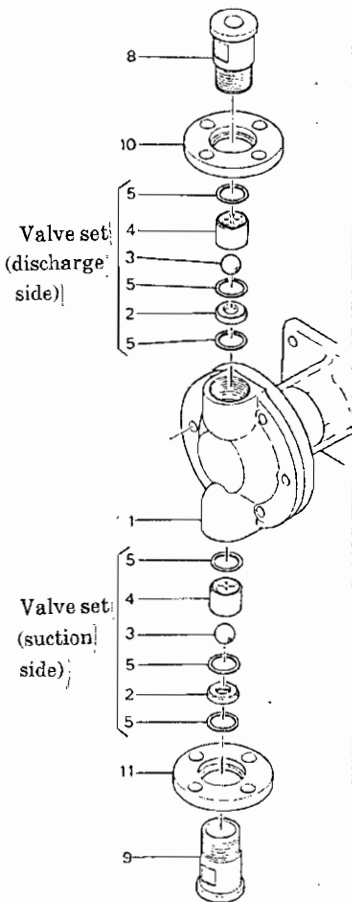
< Reassembly >

For reassembly, inversely follow the steps for disassembly, paying attention to the following points:

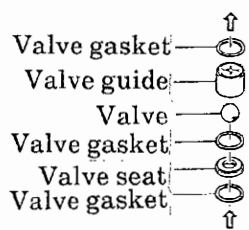
- Errors in the direction of arranging or inserting the valve sets:  
If the parts of the sets are assembled in the wrong order or in the wrong direction, it will lead to unsatisfactory feeding of liquid (leakage).
  - In assembling the valve set on the suction side, insert the set into the suction port in the proper order and then attach it to the pump head.
  - Defective connection or insufficient tightening of parts:  
Connections of pipes and parts should be tightened sufficiently to prevent leakage.
  - Flange surface adjustment:  
Adjust the flange surface using a level to ensure it is horizontal.
- \* If the pump is of the VS or VC type, tighten the suction port first and then tighten the pump head fixing bolt.

● S4 type

● VS and VC type



● Order of arrangement of valve set parts



⇨ : Direction of liquid flow

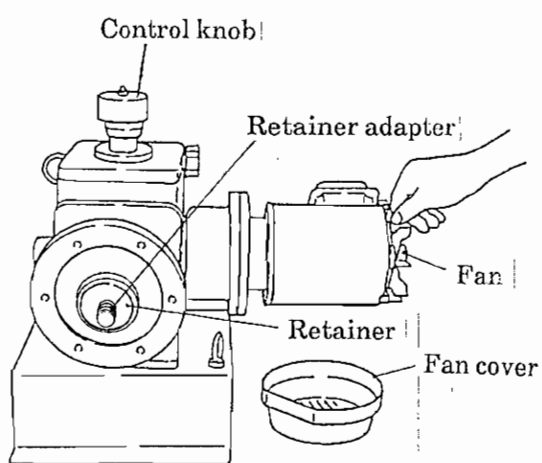
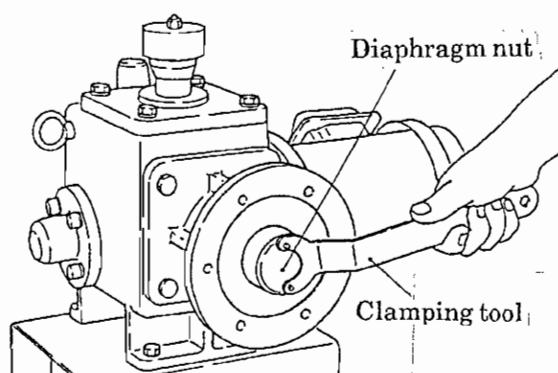
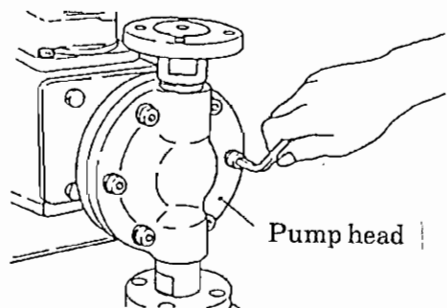
## ■ Disassembling and Reassembling the Diaphragm

### <Disassembly>

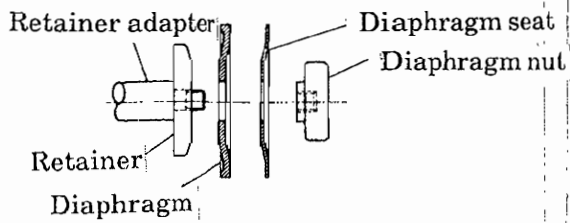
- ① Remove the pipes on the discharge side and the suction side.
  - They should be removed after letting the liquid out of them and closing the piping valves.
- ② Remove the pump head fixing bolt using a wrench (for S4 type, a hexagon bar wrench).
- ③ Remove the diaphragm nut using the diaphragm clamping tool provided.
  - If any wear, scratches or damage is found in the diaphragm or the diaphragm seat, the part should be replaced.

### <Reassembly>

- ① Position the retainer at the bottom dead center when the timing of the stroke length is 100%.
  - Turn the control knob and set the stroke length to 100%. Next, remove the fan cover of the motor and turn the fan by hand to bring the retainer to its innermost position (bottom dead center).
- ② Mount the diaphragm and the diaphragm seat, and tighten the diaphragm nut using the tool provided.



- Mounting direction of diaphragm:



- ③ Mount the pump head.
  - Turn the control knob and set the stroke length to 0%. Mount and temporarily tighten the pump head. Then, set the stroke length to 100% again and tighten the pump head.
  - Fix the pump head by clamping diagonally and uniformly so that the flange surface is horizontal.
- ④ Fit the pipes on the suction side and discharge side.
  - Connections of the pipes and the parts should be tightened sufficiently to prevent leakage.

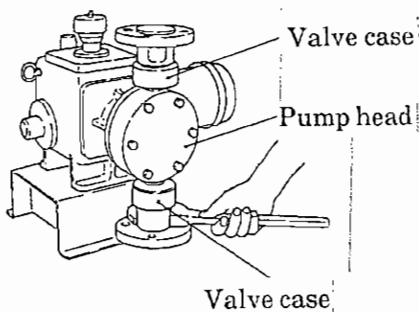
## 11 Disassembly, Reassembly and Adjustment [For KE Type]

### Notes:

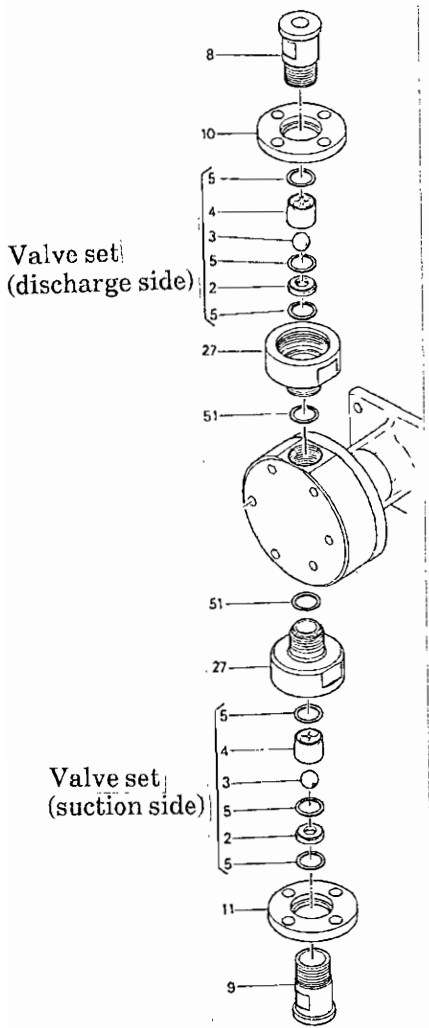
- Power should always be turned off when the pump is disassembled or reassembled. Then follow the steps described below. Reference should also be made to the “Parts Description and Exploded View” section.
- During the disassembly process, liquid remaining in the pipes and the pump chamber spills out. Be careful of dripping liquid when removing them.
- Some types of liquid are harmful to the human body and/or pump parts. Great care should be exercised
- Don't disassemble the driving unit as it has been fully adjusted prior to shipment. If it needs to be disassembled, be sure to contact us.

### ■ Disassembling and Reassembling Valve the Sets

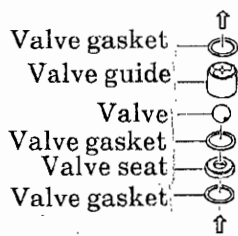
#### <Disassembly>



- ① Remove the pipes on the discharge side and the suction side.
  - They should be removed after letting the liquid out of them and closing the piping valves.
- ② Detach the valve case from the pump head and take out the valve sets.
  - If abnormal scratches and /or wear in any of the parts (valves, valve seats, etc.) of the sets during this process is found, the part should be replaced.
  - Dispose of liquid remaining in the pump chamber and valves by wiping it away or transferring it into another container.



● Order of arrangement of valve



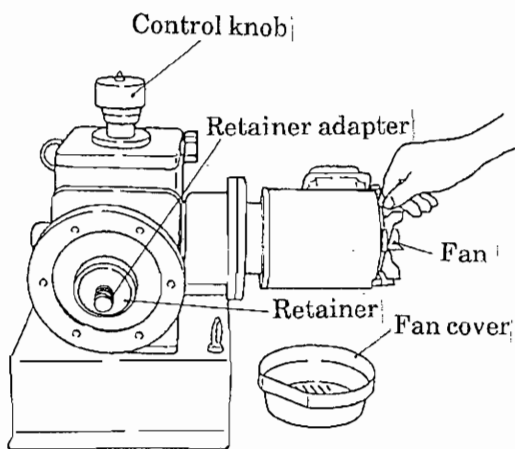
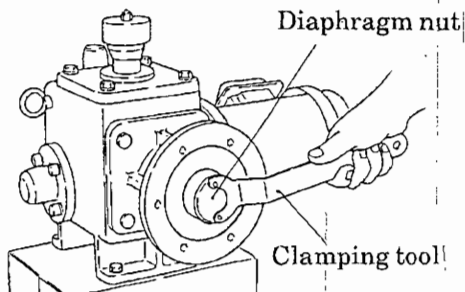
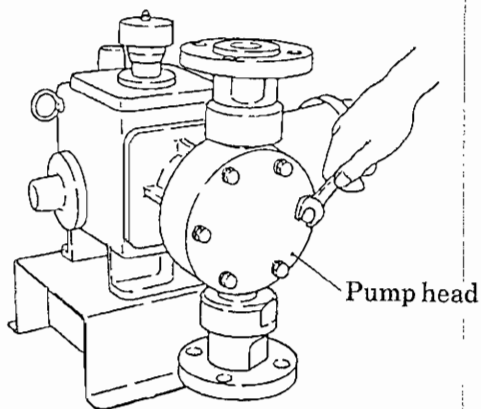
⇒ : Direction of liquid flow

③ Wash the disassembled parts and keep them together so they are not lost or damages.

< Reassembly >

For reassembly, inversely follow the steps for disassembly, paying attention to the following points:

- Errors in the direction of arranging or inserting the valve sets:  
If the parts of the sets are assembled in the wrong order or in the wrong direction, it will lead to unsatisfactory feeding of liquid (leakage).
- In assembling the valve set on the suction side, insert the set into the suction port in the proper order and then attach it to the pump head.
- Defective connection or insufficient tightening of parts:  
Connections of pipes and parts should be tightened sufficiently to prevent leakage.
- Flange surface adjustment:  
Adjust the flange surface using a level to ensure it is horizontal.



## ■ Disassembling and Reassembling the Diaphragm

### <Disassembly>

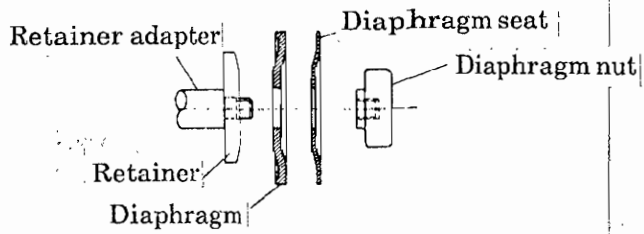
- ① Remove the pipes on the discharge side and the suction side.
  - They should be removed after letting the liquid out of them and closing the piping valves.
- ② Remove the pump head fixing bolt using a wrench.
- ③ Remove the diaphragm nut using the diaphragm clamping tool provided.
  - If any wear, scratches or damage is found in the diaphragm or the diaphragm seat, the part should be replaced.

### <Reassembly>

- ① Position the retainer at the bottom dead center when the timing of the stroke length is 100%.
  - Turn the control knob and set the stroke length to 100%. Next, remove the fan cover of the motor and turn the fan by hand to bring the retainer to its innermost position (bottom dead center).
- ② Mount the diaphragm and the diaphragm seat, and tighten the diaphragm nut using the tool provided.



● Mounting direction of diaphragm



- ④ Mount the pump head.
- Turn the control knob and set the stroke length to 0%. Mount and temporarily tighten the pump head. Then, set the stroke length to 100% again and tighten the pump head.
- Fix the pump head by clamping diagonally and uniformly so that the flange surface is horizontal.
- ④ Fit the pipes on the suction side and discharge side.
- Connections of the pipes and the parts should be tightened sufficiently to prevent leakage.

## 12 Normal Consumable Parts

When the pump is operated continuously for a long period of time, appropriate spare parts are needed. It is recommended that you always have expendable parts ready. When parts are ordered, we need the following information:

- ① the name of the product and product no. (as per the diagrams in this instruction manual)
- ② the model code and manufacturing no. of the pump (written on the nameplate)
- ③ if approved diagrams have been submitted to you, the diagram no.

### ■ S4 Type

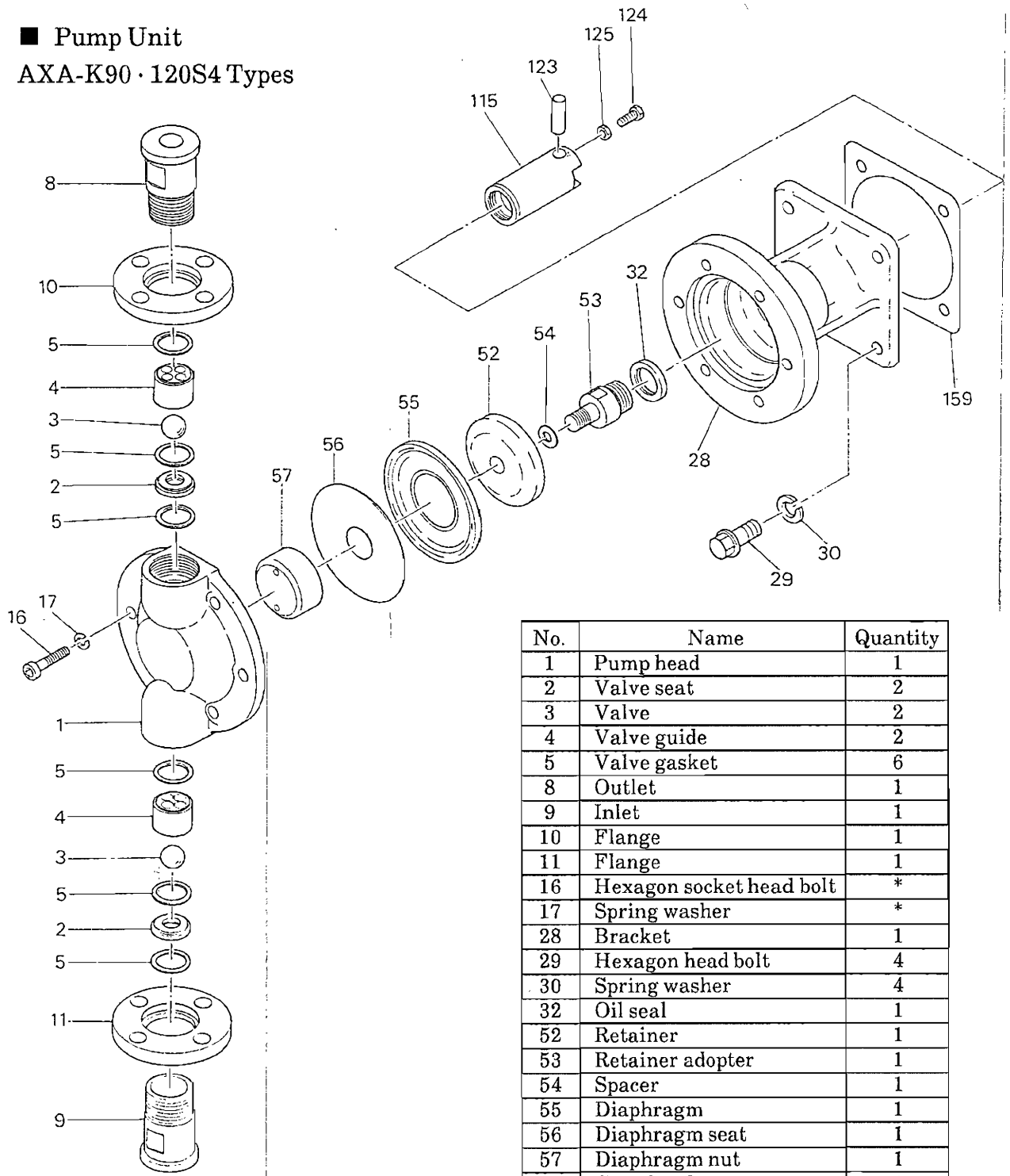
No.	Name	Expected Life (Reference Value)	K90	K120	KE90	KE120
			Quantity			
2	Valve seat	1 year	2			
3	Valve					
4	Valve guide		6			
5	Valve gasket					
51	Gasket		—	2		
55	Diaphragm		1			
56	Diaphragm seat					

### ■ VS·VC Type

No.	Name	Expected Life (Reference Value)	K90	K120
			Quantity	
2	Valve	1 year	2	
3	Valve seat			
4	Valve guide			
12	O ring		1	
55	Diaphragm			
56	Diaphragm seat			

# 13 Parts Description and Exploded View

## ■ Pump Unit AXA-K90 · 120S4 Types

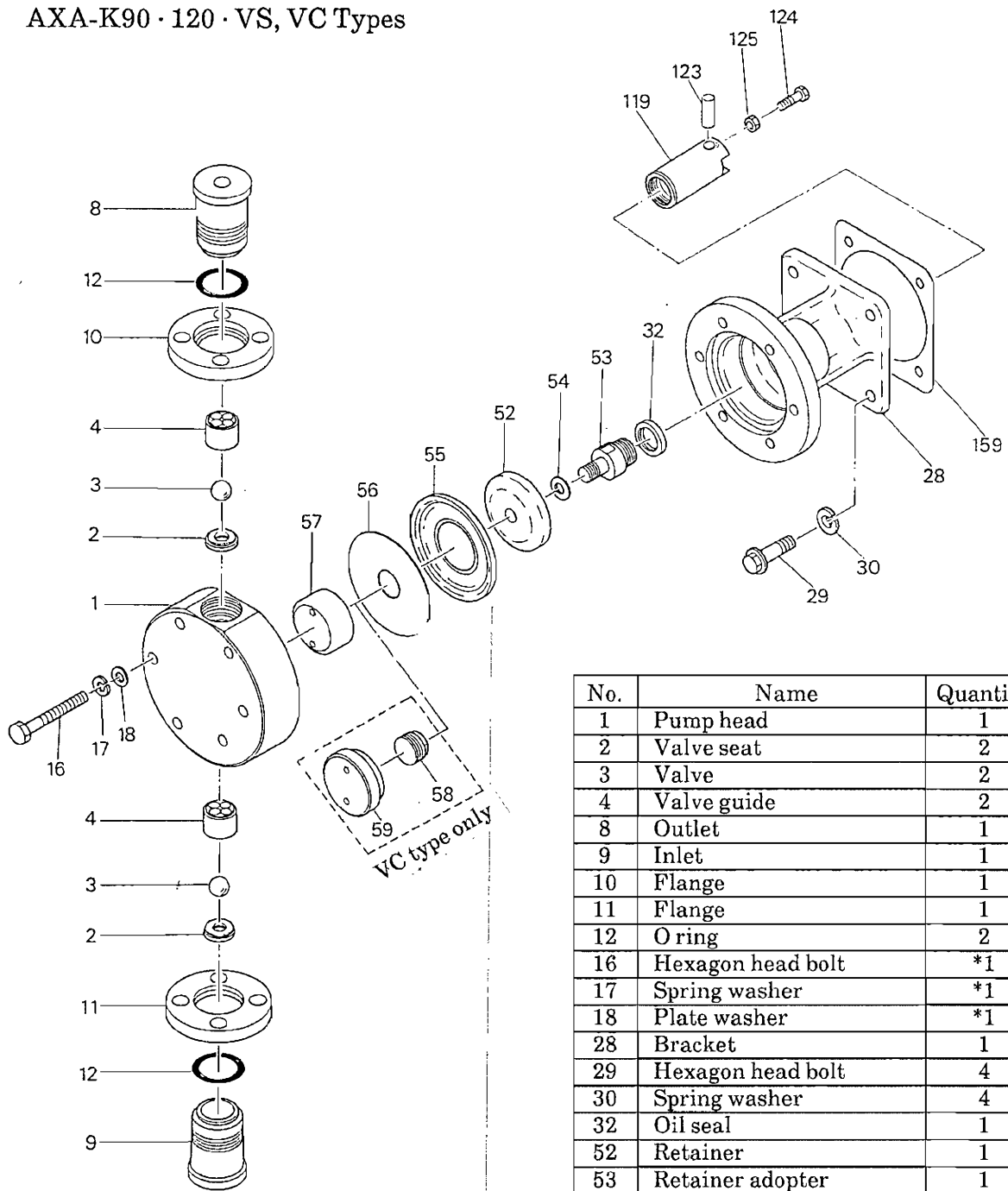


No.	Name	Quantity
1	Pump head	1
2	Valve seat	2
3	Valve	2
4	Valve guide	2
5	Valve gasket	6
8	Outlet	1
9	Inlet	1
10	Flange	1
11	Flange	1
16	Hexagon socket head bolt	*
17	Spring washer	*
28	Bracket	1
29	Hexagon head bolt	4
30	Spring washer	4
32	Oil seal	1
52	Retainer	1
53	Retainer adopter	1
54	Spacer	1
55	Diaphragm	1
56	Diaphragm seat	1
57	Diaphragm nut	1
119	Crosshead	1
123	Crosshead pin	1
124	Hexagon head bolt	1
125	Hexagon head nut	1
159	Gasket	1

\* K90 type : M10×30L ..... 6  
 K120 type : M10×35L ..... 10

## ■ Pump Unit

AXA-K90 · 120 · VS, VC Types



No.	Name	Quantity
1	Pump head	1
2	Valve seat	2
3	Valve	2
4	Valve guide	2
8	Outlet	1
9	Inlet	1
10	Flange	1
11	Flange	1
12	O ring	2
16	Hexagon head bolt	*1
17	Spring washer	*1
18	Plate washer	*1
28	Bracket	1
29	Hexagon head bolt	4
30	Spring washer	4
32	Oil seal	1
52	Retainer	1
53	Retainer adopter	1
54	Spacer	1
55	Diaphragm	1
56	Diaphragm seat	1
57	Diaphragm nut	1
58	Body of diaphragm nut *2	1
59	Diaphragm nut cover *2	1
119	Crosshead	1
123	Crosshead pin	1
124	Hexagon head bolt	1
125	Hexagon head nut	1
159	Gasket	1

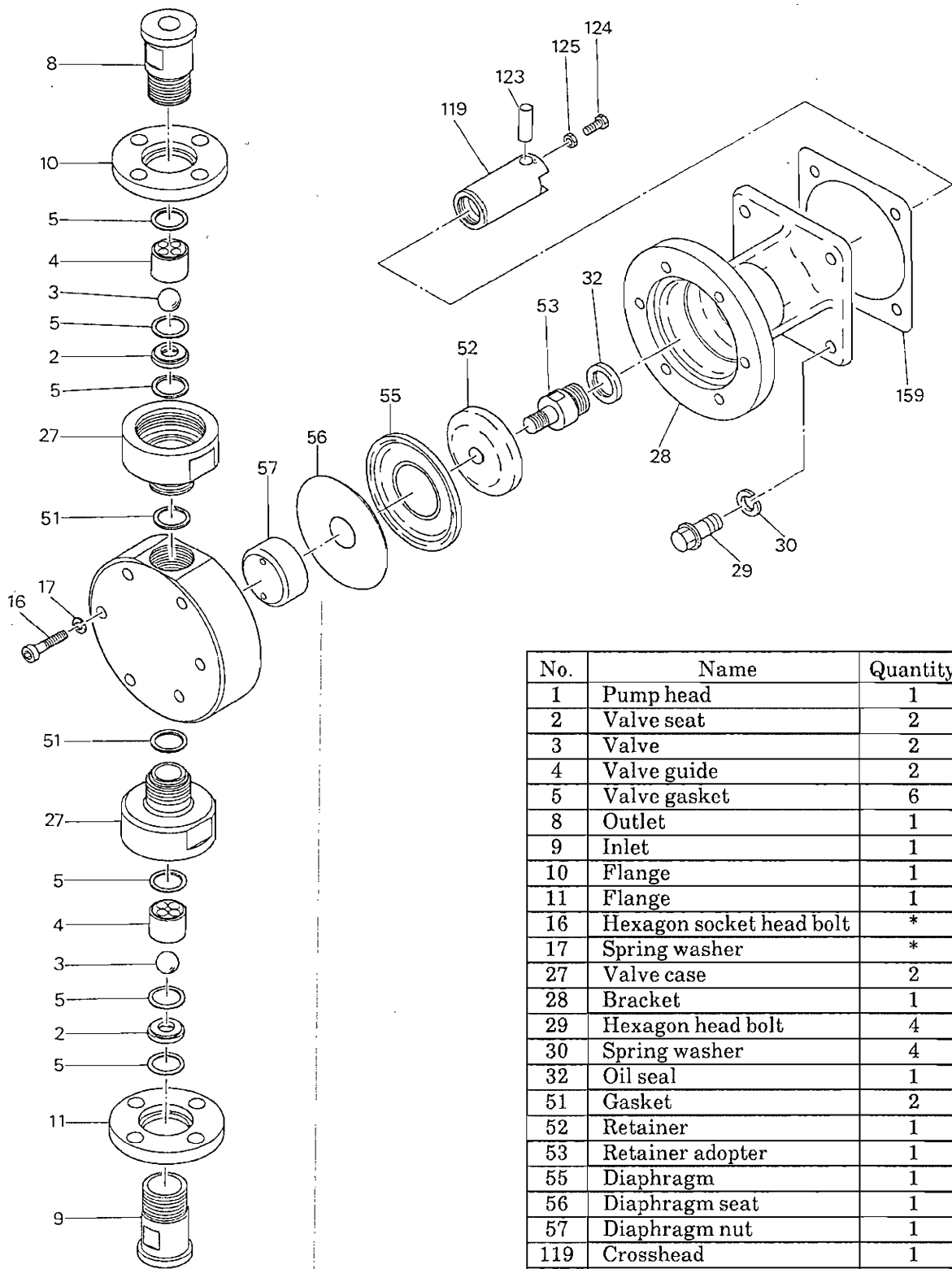
\*1 K90 type : M10×90L ..... 6

K120 type : M10×100L ..... 10

\*2 VC type only

■ Pump Unit

AXA-KE90 · 120S4 Types



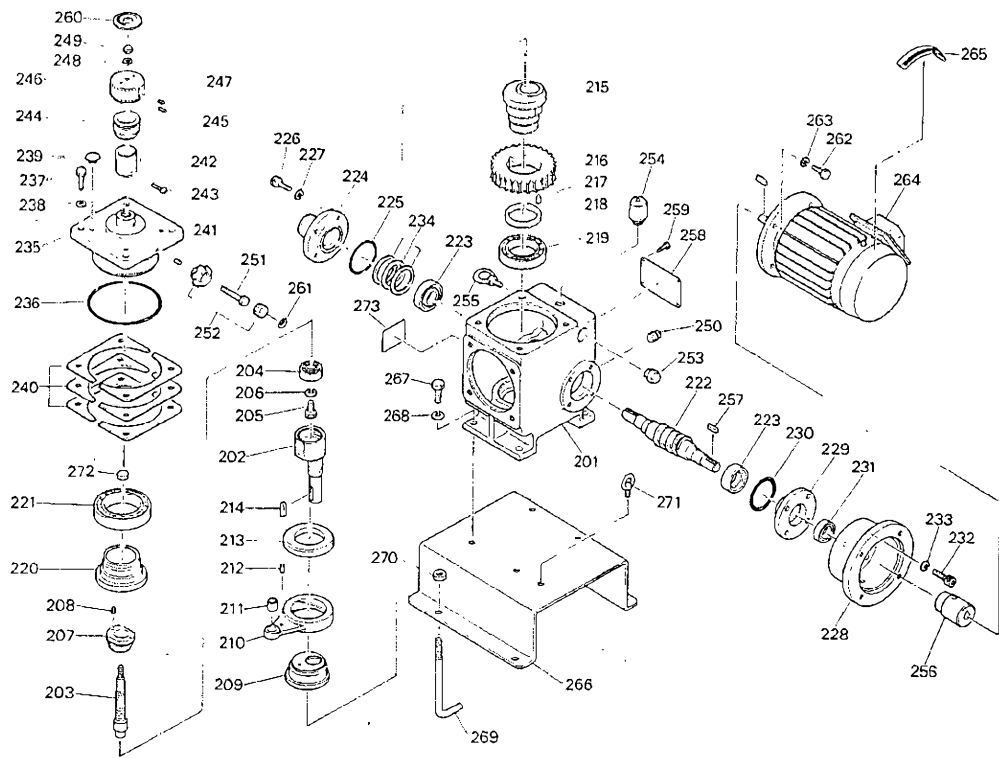
No.	Name	Quantity
1	Pump head	1
2	Valve seat	2
3	Valve	2
4	Valve guide	2
5	Valve gasket	6
8	Outlet	1
9	Inlet	1
10	Flange	1
11	Flange	1
16	Hexagon socket head bolt	*
17	Spring washer	*
27	Valve case	2
28	Bracket	1
29	Hexagon head bolt	4
30	Spring washer	4
32	Oil seal	1
51	Gasket	2
52	Retainer	1
53	Retainer adopter	1
55	Diaphragm	1
56	Diaphragm seat	1
57	Diaphragm nut	1
119	Crosshead	1
123	Crosshead pin	1
124	Hexagon head bolt	1
125	Hexagon head nut	1
159	Case gasket	1

\* KE90 type : M10×65L ..... 6

KE120 type : M10×65L ..... 10

□ Driving Unit

● AXA types



No.	Name	Quantity	No.	Name	Quantity	No.	Name	Quantity
201	Case	1	226	Hexagon socket head bolt	4	251	Hexagon head bolt	1
202	SL crank	1	227	Spring washer	4	252	Knobster	1
203	Control screw	1	228	Motor adaptor	1	253	Oil gauge	1
204	Deep groove ball bearing	1	229	Cover B	1	254	Air breather	1
205	Hexagon head bolt	1	230	O ring	1	255	Eyebolt	1
206	Spring washer	1	231	Oil seal	1	256	Coupling	1
207	Bearing holder	1	232	Hexagon socket head bolt	4	257	Key	1
208	Hexagon socket set screw	1	233	Spring washer	4	258	Specification nameplate	1
209	Eccentric disk	1	234	Shim B	—	259	Driving rivet	4
210	Con rod	1	235	Control disk	1	260	Adjustment nameplate	1
211	Sliding bearing	1	236	O ring	1	261	Lock nameplate	1
212	Spring pin	1	237	Hexagon head bolt	4	262	Hexagon head bolt	4
213	Thrust needle roller bearing	1	238	Spring washer	4	263	Spring washer	4
214	Key	1	239	Slip-on bumper	4	264	Motor	1
215	Coupling disk	1	240	Shim A	—	265	Arrow nameplate	1
216	Worm wheel	1	241	Lock pin	1	266	Base	1
217	Parallel pin	2	242	Scale ring	1	267	Hexagon head bolt	4
218	Wheel ring	1	243	Machine screw	2	268	Spring washer	4
219	Deep groove ball bearing	1	244	Control dial	1	269	Foundation bolt	4
220	Disk	1	245	Hexagon socket set screw	1	270	Hexagon head nut	4
221	Deep groove ball bearing	1	246	Control handle	1	271	Eyebolt	1
222	Worm	1	247	Hexagon socket set screw	1	272	Stopper	1
223	Conical roller bearing	2	248	Seal washer	1	273	Caution nameplate	1
224	Cover A	1	249	Hexagon cap nut	1			
225	O ring	1	250	Plug	1			



