Cheonsei

CE

KEMPION METERING PUMPS

AX Series

Small Diaphragm Type Metering Pump

Instruction Manual

www.cheonsei.co.kr

Instruction

Thank you very much for purchasing Cheon-Sei AX Metering pump. Before beginning operation, please read this instruction manual carefully. We hope the pump will provide you with many year of trouble-free operation.

Warranty

1. Cheon-Sei will warrant all products to be free of defects in material or workmanship for a period of eighteen(18) months from date of shipment or one(1) year from the date of installation, whichever occurs first.

2. Any customer complaints will be reviewed by Cheon-Sei. Cheon-Sei will provide such technical advice and assistance as necessary to resolve customer complaints on a timely basis.

3. Cheon-Sei's liability for any breach of this warranty shall be limited solely to replacement or repair (at the sole option of Cheon-Sei of any part or parts found to be defective during the warranty period, provided the product is properly installed and is being used as originally intended.
The customer must notify Cheon-Sei of any breach of this warranty within the above mentioned warranty period.
Defective parts must be shipped by customer or Agency to Cheon-Sei's point of manufacture, transportation charges prepaid.

We will make every efforts to minimize losses and damage resulting from defect. However, please bear in mine that we cannot guarantee against damage resulting from problems with consumable parts, unsuitable or incorrect operation, or natural disaster, etc.

Contents

1 Notice for Safety

1-1 Introduction

- To use the articles safely the signs will be showed on the manual.
- Please keep the manual certainly for important matters of safety.
- The signs and indications are as followings.

⚠ Warning Person death or serious injury will be occurred if warnings is not kept by wrong handling.

⚠ Caution Person injury or property damage will be occurred if cautions is not kept by wrong handling.

1-2 Cautions for use condition

⚠ Caution

- The pump should not be used by other purpose except for liquid injection, otherwise, accident or damage may be occurred.
- The pump should never be used for kinds of liquids which caused liquid end parts to be damaged.
- Please keep as followings or may be caused trouble.
  Ambient temperature : 0~40℃
  Temperature of handling liquid : 0~50℃ where head materials are PP, PVDF.
  0~80℃ where head materials are SS304, SS316.
  Piping Pressure : below maximum discharging pressure indicated on the specifications.
- Never use this pump to transfer the liquids containing slurry as a injection liquid.
- This pump is designed for indoor use. Be sure to use the pump cover if installed outside.
- If PVC hose should not be used, the heat-proof hose should be used, instead.

1-3 Cautions for handling condition

⚠ Warning

- Install the pump at place not to touch by outsider or children except authorized person.
- Put off power and stop pump and other equipments when repair or disassembly pump. Electric shock may be caused, if power is on during working.
- Do not operate when discharge valve is closed or do not close valve during operation. Pump and piping may be damaged with exaggerated pressure rising and liquid spout when operation under valve closing.
- Be careful not to insert fingers or alien materials on rotation or reciprocation equipments when pump operation. Hurt may be occurred when touch during operation.
- Do not touch with wetted hand. Electric shock may be occurred.
- Use specified accessories certainly. Accident or trouble may be occurred.
- Absolutely do not modify pump arbitraily, accident or trouble may be occurred.
- In case of vague liquid for dangerous objects and character, wear safety equipments certainly as like gloves and goggles when repair and check of pump.

⚠ Caution

- Absolutely do not use damaged pump, accident or damage may be occurred.
- Do not install pump in place with heavy moisture and dust. Electric shock and trouble may be caused.
- Do not touch with bare hand on motor part when operation. A burn caused by high temperature may be occurred.
- Do not use other power except the power which is instructed on name plate of motor. Trouble and fire may be caused.
- Electric shock may be occurred unless earthing to earth wire, connect to earth wire certainly.
- Do work after releasing of pressure of discharge piping and eliminating liquid in liquid end prior to repair or maintenance of pump.
- Pump may be damaged when ambient temperature lows down below freezing point of liquid used. Do eliminate the liquid in pump and piping certainly after operation stop.
- Do proper protection under considering exposure of liquid, when pump and piping may be damaged.
- Dispose a disused pump in accordance with relation law.

2 Confirmation of Articles to be supplied

2-1 Check point when unpacking

1 Are the products the same as you ordered ?
2 Are all accessories included ?
3 Is there any visible damage caused by vibration or shock during transport ?
4 Are any of the screws loose or missing ?

We take great care to assure our products leave the factory in perfect condition. However, in the event that this pump is found to be defective, please report the details to CHEON-SEI or your local representative. We will do our best to solve the problem as quickly as possible.

2-2 Standard accessories

Name of part \ Connection	Hose	Flange
Hose	3 m	–
Strainer Foot Valve	1 set	–
Anti-Siphon check valve	1 set	–
Pump intsatllation bolt(includes nut M5x20)	3 set	3 set
L-wrench spanner (subtense 2.5)	1 ea	1 ea
Manual	1 copy	1 copy

Note) 1. However, the quantities are for single type.
In case of duplex(2) or triplex(3), the quantities are each quantity times head number.
(excluded hose pump, spanner, manual)
2. For attachment type of air relief valve, 1 meter of air vent hose is provided.
(PVC ø4xø6, PTFE ø4xø6)
3. Flange joint, tee, and elbow are separate request accessories.

3 General

The AX-Series is a reciprocating diaphragm metering pump constructed of top-quality chemical-resistant liquid-end materials and a highly-rigid body. Applications include injection of boiler compounds, chlorine disinfectants and food additives in the scientific, water treatment and waste-water treatment fields.

4 Model Code

AX	1	-	1	2	-	P	F	C	-	H	W	S	-	K
❶	❷		❸			❹-a	❹-b	❹-c		❺-a	❺-b	❺-c		❻

❶ Series name

AX : AX Series

❷ Head number

1 : Single 2 : Duplex 3 : Triplex

❸ Model No. for capacity

1 2 = 100 ㎖/min(60Hz)

1 is the figure on the left and
2 is the no. of zero following.

※ For duplex and triplex, this refers to the capacity of each head.

❹ Liquid-end materials

(a) Pump head

P : PP F : PVDF S : SS304
6 : SS316 X : Special

(b) Ball seat

F : FKM E : EPDM
T : PTFE X : Special

(c) Check ball

C : Ceramic S : SS304
6 : SS316 X : Special

Notice

1. Please note that the combination of liquid-end materials is not unlimited. Refer to the standard liquid-end parts material list table for each model.
2. The diaphragm material is PTFE for all models.

❺ Specification

(a) Joint type

H : Hose F : Flange X : Special

(b) Viscosity Limit

W: Standard (less than 50cp)
V : High viscosity (50 to 1000cp)

(c) Others

S : Standard A : Air relief valve
B : Boiler specifications C : A+B type
F : Relief Valve G : F+B type X : Special

❻ Motor type

K : Shaded pole motor
Z : Totally enclosed non-ventilated motor
X : Special

5 Specifications

■ Specification table

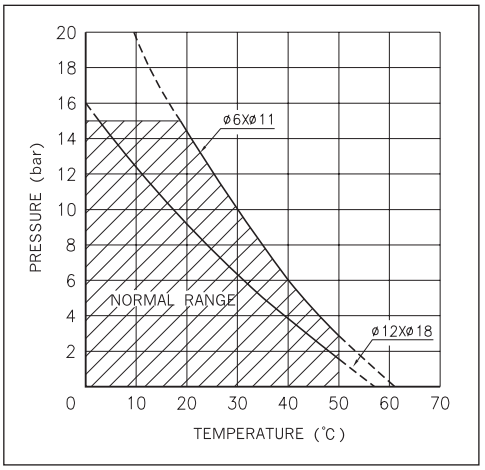
Specifications \ Model			AX1-21	AX1-51	AX1-12	AX1-32	AX1-52	AX1-13
Max. capacity (mL/min)		50Hz	20	40	90	300	460	1040
		60Hz	25	50	110	360	550	1250
Max. discharge pressure(bar)			15		10	5	3	
Stroke number (SPM)		50Hz	57	114				
		60Hz	68	136				
Stroke length (mm)			3			6		
Connection	PVC Hose	HWS	ø6× ø11				ø12× ø18	
		HVS	ø12× ø18					
	PTFE Hose	HWS	ø10× ø12					
	Flange	FWS	KS 10K 15A					
Motor(W)	Totally enclosed non-ventilated motor		25					37
	Shaded pole motor		6	14				20
Weight(kg) (PFC-HWS-Z)			3.4				3.8	4.1
Painting			Munsell No. 0.6PB 4.8/10.6 Acrylic paint					

■ Motor specification

Type	Output	Insulation	Voltage	Phase	Frequency
Shaded pole type induction motor	6W	B	220~230V	Single	50/60Hz
	14W				
	20W				
Totally enclosed non-ventilated type induction motor	25W	B	220~230V	Single	50/60Hz
	37W				

Notes

1. The max. capacity is that at max. discharge pressure.
2. The standard valve structure can only allow the maximum possible viscosity for discharge up to a maximum of 50cp.
3. The curve picture on the right shows how the limit of PVC hose internal pressure is. If you ask us for high pressure hose specially, it is available for us to provide it.
4. The motor is not explosion proof, please consider the purpose of use fully before choosing.
5. This pump is designed for indoor use. Be sure to use a pump cover if installed out of doors.
6. Never use this pump to transfer liquids containing slurry. (In such a case please consult CHEONSEI).
7. Specifications are subject to change without notice.



6 Materials of Standard Liquid End

1 Standard liquid end materials table

Type \ Part	Head	Diaphragm	Check ball	Ball seat	Ball guide	Joint	O-ring	Hose
PFC	PP	PTFE	CERAMIC	FKM	PP	PP	FKM	PVC
PEC	PP	PTFE	CERAMIC	EPDM	PP	PP	EPDM	PVC
FTC	PVDF	PTFE	CERAMIC	PTFE	PVDF	PVDF	FEP(+SIL)	PTFE
STS	SS304	PTFE	SS304	PTFE	PVDF	SS304	FEP(+SIL)	PTFE
6T6	SS316	PTFE	SS316	PTFE	PVDF	SS316	FEP(+SIL)	PTFE

2 Strainer foot valve

Type \ Part	Main body	Joint	Check Ball	Ball Seat	Ball Guide	Strainer mesh	O-ring
PFC	PP	PP	CERAMIC	FKM	PP	PP	FKM
PEC	PP	PP	CERAMIC	EPDM	PP	PP	EPDM
FTC, STS, 6T6	PVDF	PVDF	CERAMIC	PTFE	PVDF	PVDF(+SUM24L)	PTFE

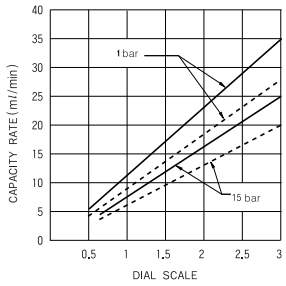
3 Anti-siphon check valve

Type \ Part	Main body	Joint	Siphon head	Siphon seat	Spring	O-ring
PFC	PP	PP	FKM	PP	HC-276	FKM
PEC	PP	PP	EPDM	PP	HC-276	EPDM
FTC, STS, 6T6	PVDF	PVDF	FKM(ETP)	PVDF	HC-276+PTFE	PTFE
Boiler	PPS	PP	EPDM	PPS	HC-276	EPDM

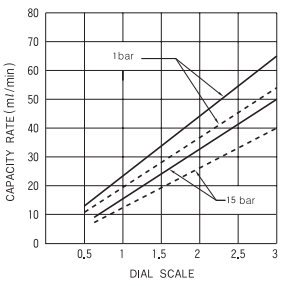
7 Performance Curves

—— 60Hz, - - - 50Hz Condition:Room temperature, Clean water, Suction height - 1m

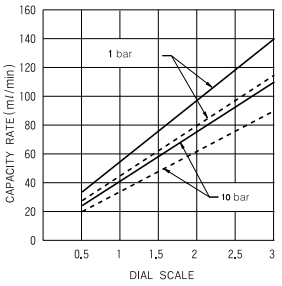
AX1-21



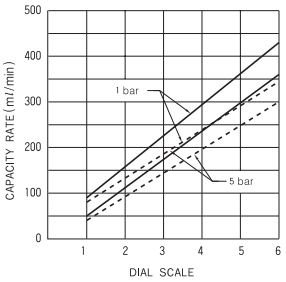
AX1-51



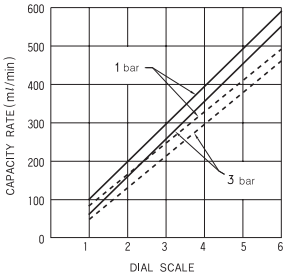
AX1-12



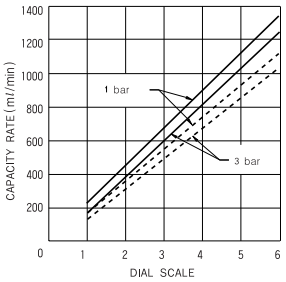
AX1-32



AX1-52



AX1-13



Note) 1. The performance curves show at our testing facility under constant conditions. Performance curves differ at each local site.
2. The discharge quantity can be varies according to conditions of suction and discharge piping and liquid property, please measure discharge quanity(make performance curve) to use more effectively when test operation after installation of pump .
3. Exchange standard date can be knowed for consumable parts of liquid end if checks discharge quantity of pump requlary.

8 Principle of Operation & Structure

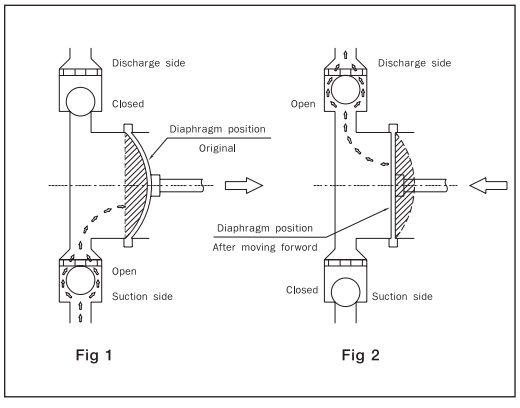
8-1 Operating Principle

1 The eccentric cam mechanism converts the motor's rotating motion into the reciprocating motion of the pump shaft.

2 As a result of the reciprocating of the diaphragm above the pump shaft, the pump head chamber volume alternately increases and decreses. As the same time positive and negative pressure is alternately generated in the pump head, and this results in the suction and discharge of the chemical solution being transferred.

3 When the diaphragm moves backward, it generates a negative pressure (Fig.1). At this time the check ball on the discharge side closes in order to prevent the reverse flow of liquid from the discharge-side piping. At the same time the check ball on the suction side opens to allow chemical solution to flow into the pump head from the suction-side piping.

4 When the diaphragm moves forward, it generates a positive pressure. The check ball on the suction side closes and that on the discharge side opens to discharge the chemical solution (Fig.2).



8-2 Driving unit

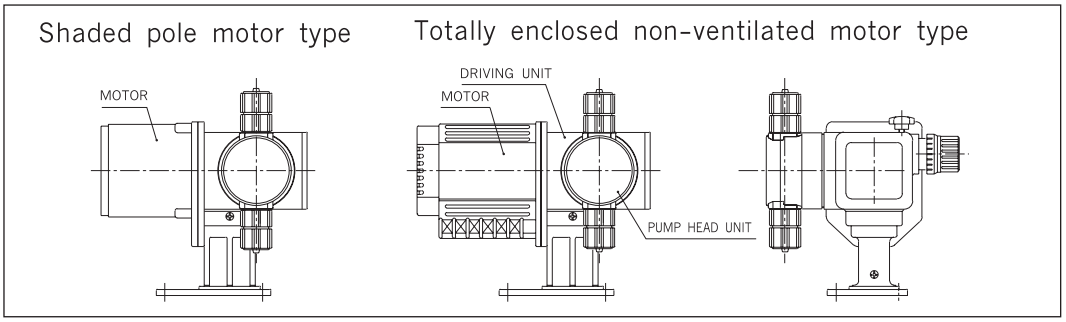
The following are included in the driving unit.

1 Cam shaft : Converts the motor's rotary motion into a fixed stroke reciprocal motion.

2 Slider shaft : Transmits the reciprocal motion to the diaphragm at the back of the shaft.

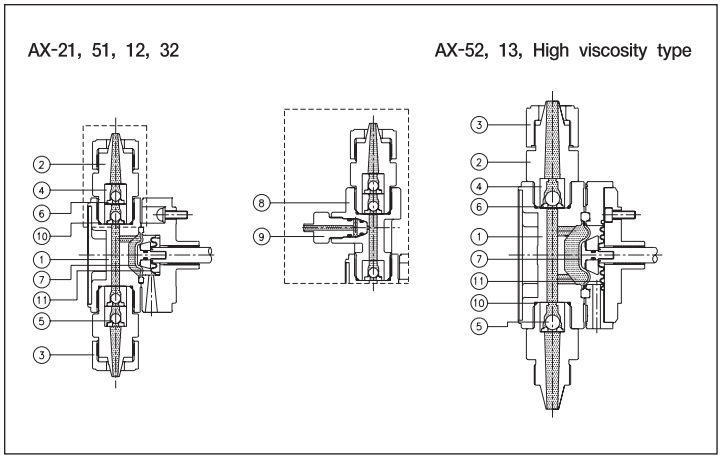
3 Spring-back function : The spring-back function is necessary during the suction process. It assures a fixed discharge capacity of solution.

4 Injection amount adjustment function : During operation, it is possible to adjust from 0 to 100% on the vernier scale system.



8-3 Pump head unit

①	Head
②	Hose joint
③	Hose nut
④	Ball guide
⑤	Check ball
⑥	Ball seat
⑦	Diaphragm
⑧	Air relief joint
⑨	Air relief coke
⑩	O-ring
⑪	Bellows



Notes

1. The dotted line shows the parts in which the Air relief valve is attached. (In case of AX- 52, 13 and high viscosity type are not available.)
2. For high viscosity pumps, spring inserted check balls are to be installed.

9 Installation

⚠ Caution

- Do not install the pump in place which ambient temperature is high (above 40℃) or lows down below freezing point, pump internal may be damaged.
- This pump is designed for indoor use. Be sure to use a pump cover if installed outside.

9-1 Place of installation

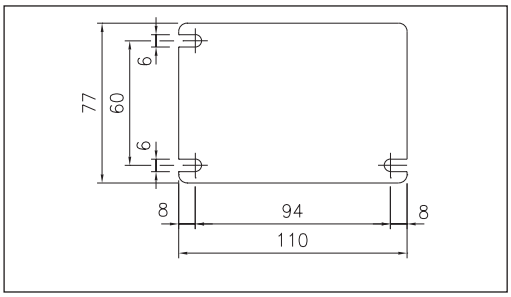
Select the place for installing the metering pump after taking the following points into consideration.

1 The place should not be exposed to direct sunlight or rain.
This pump is designed for indoor use. Exposure to direct sunlight may cause the metal parts to overheat and the plastic parts to distort due to the effects of ultraviolet light. Also, dust, wind and rain may damage the pump. If installed outside, the pump should be protected by a roof pump cover in order to maximize it's working life.

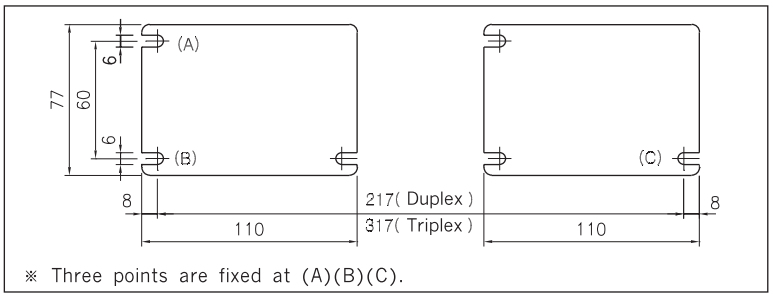
2 The place should be well ventilated in summer and not frozen in winter.
Take care not to use in closed room in which the temperature and humidity are high in summer, as the motor may overheat and the metal parts may rust rapidly in such a situation. If the pump is used to transfer a chemical solution that may freeze in winter, install a heater and/or insulation in order to prevent freezing.

3 Maintain sufficient space around the machine for servicing.
Several tools are required for disassembly of the pump, so make sure there is enough space to accommodate tool movement at the place of installation.

● Pump Installation pitch of single head

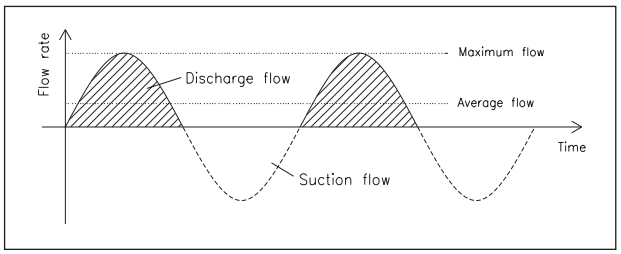


● Pump Installation pitch of duplex and triplex head



9-2 Piping

9-2-1 Pulsation



It is in the nature of a reciprocating pump to pulsate. This pulsation has the characteristics of a sine curve, and the momentary flow rate is π (3.14159) times the average flow.
For example, a reciprocating pump averaging 100㎖/min, delivers the equivalent of 314㎖/min, at the time of maximum flow.
Therefore, (unlike in the case of a continuous pump such as a volute pump) piping capable of handing π times the required discharge should be used.
➞ If an air chamber is used, the degree of pulsation can be reduced.

* The extendable length of the hose varies according to the viscosity of the liquid and diameter of the piping. Be careful when changing the piping.

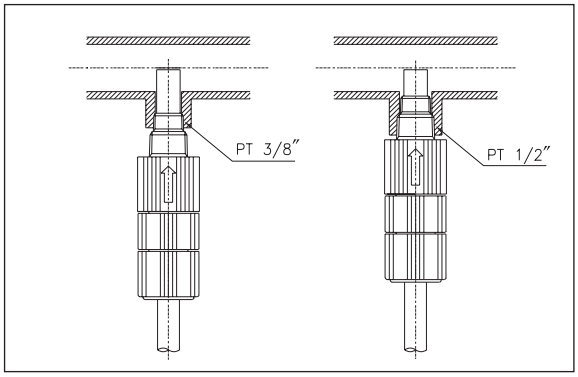
9-2-2 Installation of piping (Hose type)

1 Bend the hose, where necessary, by a sufficient radius so as not to fold or break it.
2 In case of a reciprocation pump, pulsation occurs and the hose oscillates. Support the hose securely by fixing with string, etc.
3 Consider temperature factors when installing piping. Especially avoid exposing pipes to direct sunlight in summer and protect them against freezing in winter. (Install a roof or provide heating)

■ Anti-siphon check valve

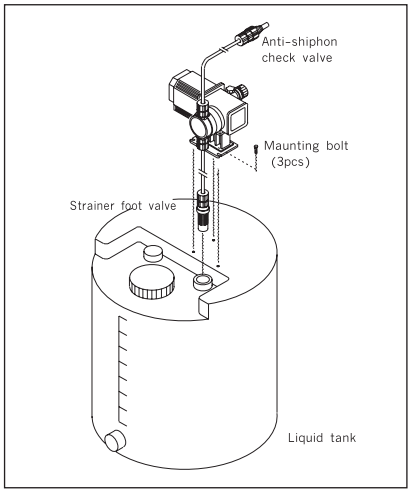
The hose type is furnished with a Anti-siphon check valve. Use it on the following occasions.
1 When the feed point is opened to the atmosphere and solution is fed to a point lower than the liquid level of the solution tank.
➞ Siphon : The continuous flow of liquid after the pump has stopped, caused when the lower end of the discharge piping is below the level of the suction-side supply tank.
➞ If there is always pressure at the feeding point, the valve can be used as a non-return valve.
2 When feeding into the suction-side piping of a volute pump.
3 When the flow is much larger (more than 1.5 times) than the rated discharge. In the case of excessively long piping, overfeeding may occur.
➞ Overfeeding : Overfeeding stands for the excessive discharge flow due to abnormal functioning of the check valve caused by pulsation of the liquid in piping. Check carefully if the differential pressure of pump between suction side and discharge side is low and discharge piping is too long even through the differential pressure between them is around 0.3 bar

■ Installation of anti-siphon check valve



1 Install the feed point with a 3/8 ″PT or 1/2 ″PT female Thread.
The anti-siphon check valve has both 3/8 ″PT and 1/2 ″PT male threads, and sop fits both sizes.
2 Since the anti-siphon check valve is made from plastics such as PP, PVDF and PPS, it is fragile against impacts. Install in a position sheltered from impacts and free from obstacles.
3 Cut off the end of the feed nozzle properly. It is all right when the end is positioned in the middle of the water feed pipe.

■ Connection with liquid tank

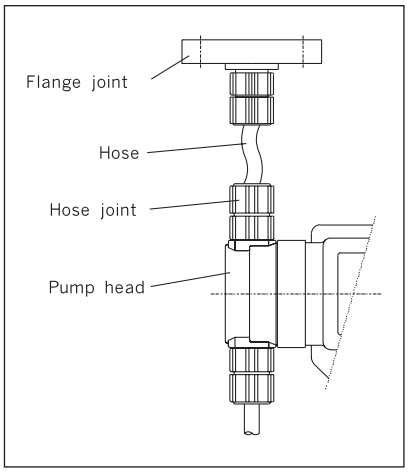


1 Fix the pump to the attachment support on the tank, using the attached pump mounting bolts.
2 Pass the hose nut into the hose and connect it to the strainer foot valve.
3 Set the strainer foot valve into the tank.
4 Pass the hose nut into the discharge side hose and connect it to the discharge side of the pump.
Drive the anti-siphon check valve into the feed point, and connect the hose.

9-2-3 Piping attachment (Flange type)

■ Connection hose and flange

Flange joint is not kinds of standard accessories. Therefore, it should be requested separately by customer.



1 Cut the hose in suitable length and connect to the pump joint.
2 Connect the another end of cut hose to the flange joint.
3 For easy of maintenance, install shut-off valves near the pump at both the discharge and suction sides. However, always keep these valves open during pump operation.
4 Install the pump as close as possible to the supply tank. If the suction-side piping is too long, cavitation may occur, and a constant discharge capacity may not be maintained.
➞ Cavitation : A phenomenon consisting of unusual noise and vibration plus the formation of bubbles and a decrease in the discharge capacity, caused by negative pressure in the pump head.
5 Minimize the use of joints, bends, etc, which cause resistance to the flow of solution. As dust or foreign matter may get into the pump head, keep the suction side piping as short as possible as use an intermediate Y-strainer.
6 When releasing to less than atmospheric pressure, keep the end of the piping higher than the liquid tank level in order to prevent dripping, and connect a ventliation pipe close to the feed pipe.

■ Flange mounting

The standard flange is a RF(Raised Face) type.
Insert the sheet gasket between the companion flange and tighten uniformly with hexagonal bolts.

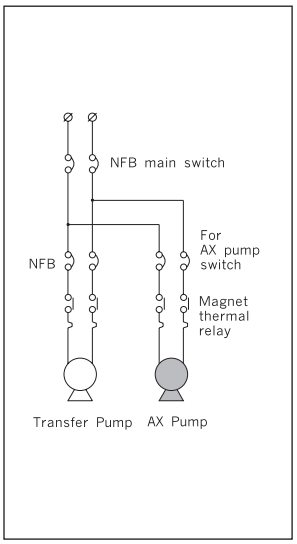
9-3 Electrical wiring

⚠ Warning

- Do not touch with wetted hand, electric shock may be occurred.

⚠ Caution

- Check voltage constant and frequency of motor prior to wiring and connect to specificated power.
- Earth grounding wire with wiring to protect electric shock.
- Entrust to electrical technician for wiring.
- Install specified magnetic switch and thermal relay to control and maintenance, etc. of pump.
- Do use standardized goods for wiring and be carefully safety in accordance with technical standard and wiring regulations.
- Connect power of motor to set rotation direction, reverse rotation of motor may be caused trouble.



※ Wire each pump to operate independently to connect intermediate switch as shown on the drawing if working together with transfer pump.
Note) Special motor is different. Please inquiry separately.

10 Operation

10 - 1 Start

⚠ Warning

- Operate pump after opening certainly of valves on discharge piping and suction piping. Pump and piping may be damaged with exaggerated pressure rising and liquid spout if operation under valve closing.
- In case of using a dangerous liquid, be sure to wear safety equipments like gloves, goggles and mask, etc.

⚠ Caution

- Be cautious not to be damaged on the piping, caused by pressure rising and liquid spout, when alien material is inserted in the valve on discharge piping of pump.
- Some water may be remained in pump head after final performance test.
  Remove the water in pump head and dry the pump necessarily, to avoid the problem that may be caused by abnormal phenomena of some liquid which may be occurred by a reaction with water.

1 Run for a while at dial 0 position to check for unusual noise of abnormal vibration in the motor and drive unit.
2 Turn the dial to the maximum stroke to open the discharge side to the atmosphere, and operate the pump. Make sure the liquid is getting into the pump, connect the discharge-side joint, and enter into normal operation.

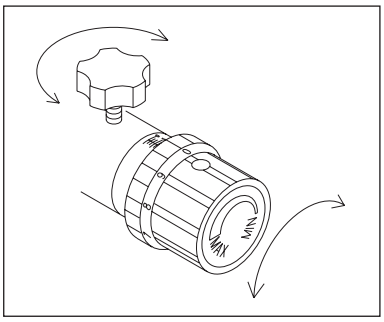
■ If liquid is not drawn up during the above procedure
Fine dust particles may be caught in the ball seat of the discharge or suction side (where the check ball is located).
Detach the joint and clean the check ball and ball seat with fresh water. Then replace the joint in the pump head while still wet, being careful to obsreve the correct configuration. (If the chemical solution being transferred is affected by contact with water, replace the joint after drying it completely.)

10-2 How to adjust the stroke length

⚠ Caution

• Please take care not to turn dial below “0” scale or above maximum scale(“3” or “6”).

The stroke length is adjusted using the vernier scale dial.
Do not turn the dial to below “ 0 ” or to above the max. position.
After adjustment, fix firmly a dial fastening bolt.



Notice
Please take a note that the scale of flow adustment is different according to each model.

Model	AX-21, 51, 12	AX-32, 52, 13
Effective graduation	3	6

The discharge does not increase if the dial even is turned beyond the effective graduation.

11 Maintenance

⚠ Warning

• Electric shock may be caused when work, turn off power and stop pump and equipments.
• Be careful big accidents may be occurred when put fingers or cloth in rotator.
• Wear safety equipments certainly, because the remained liquid in pump internal may be flowed when disassembly or assembly.

⚠ Caution

• Do work after a release of the discharge piping pressure, and remove the remained liquid in the pump head prior to repair or maintenance.

11-1 Checking before operation

1 Make sure if the tank is filled with sufficient chemical solution. If insufficient, replenish with solution.
2 Make sure if the valve at suction and discharge side are open.
3 Check for detached of broken piping.
4 Check for incorrect or faulty electrical wiring. Make sure if there are no short circuits or leaks.

11-2 Checking during operation

1 Check the level in the supply tank. If insufficient, replenish with solution.
2 Check the joints and other parts for liquid leaks, and tighten where leaking. If a leak cannot be stopped, check the packing or o-ring and replace if defective.
3 Check the motor and the pump main body and replace if defective.
4 Make sure that the pressure gauge needle registers a value within the normal range.

11-3 Maintenance prior to long shutdown

1 Clean the pump head by charging and discharging fresh water in the pump for about 30 minutes.
2 Protect the pump against dust, damp and corrosive effects by installing a cover.
3 Keep the full stroke in order to prevent deformation of the diaphragm.
4 When restarting after a long shutdown, check the check ball and ball seat in particular, and make sure that foreign matter is not present.

11-4 Other maintenance

1 When using a diluted watery solution or high-viscosity solution in a cold location, the solution may freeze in the pump head or in the piping in winter, which may cause the pump or peripheral parts to break. In such a situation, be sure to provide adequate heating or insulation.
2 Clean the inside of the supply tank and the joints every threes months.

12 Cause of Trouble and Troubleshooting

Trouble		Cause	Remedy
Pump is running but solution is not transferred	Air gets in	Gas generated depending on the liquid	Remove the cause
		Leaks from joint or seal	Check o-ring and tighten
		Tank empty	Fill up and get rid air
	Liquid is not raised	The strainer is clogged	Clean the strainer unit and tank
		Insufficient NPSH(Cavitation)	Examine suction condition
		Ball seat is worn out	Replace
Faulty Discharge		Check ball or joint damaged	Replace
		Spring is broken	Replace
		Diaphragm is aged or broken	Replace
		Stroke length dial is shifted	Readjust
		Liquid being treated is changed	Reexamine pump specifications
Liquid leaks		Pressure is increase by dust or clogging	Overhaul
		Hose or diaphragm broken due to fatigue	Replace
Pump does not run	Motor does not operate	Power supply of voltage is faulty	Check and correct
		Wiring to pump is faulty	Check piping and correct
		Cord is disconnected	Repair or replace
		Switch is cut off	Turn on correctly
		Fuse is broken	Seek cause and replace fuse
		Water gets into motor	Seek cause and dry the motor
		Insulation is faulty	Replace the motor
		Magnet switch is faulty	Replace
	Motor operates	Reduction mechanism is broken	Overhaul or replace
		Eccentric bearing is broken	Overhaul or replace
		Gear is burnt out	Overhaul or replace
Noise or abnormal heat generation		Overload	Check discharge pressure and for clogging of parts
		The grease of gear in not sufficient	Filling for the grease
		Ambient temperature is too high	Improve installation conditions
		Eccentric bearing is worn	Overhaul or replace
		Spring is broken	replace

13 Replacement of Parts

⚠ Warning

- Wear safety equipments certainly, because the remained liquid in pump internal may be flowed when disassembly.

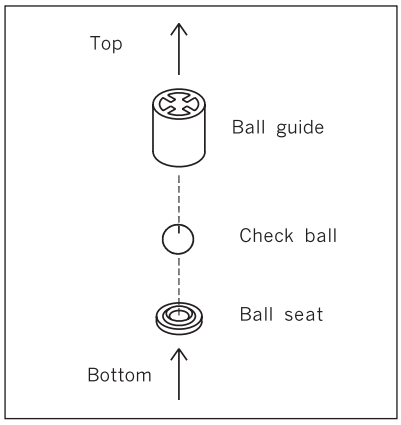
⚠ Caution

- Assembly correctly according to sequence(top : ball guide, middle : check ball, bottom : ball seat). If the sequence is wrong, liquid flow backward and pump may be damaged.

* Refer to the name of the components in section 18 'Structure and Name of Each Parts' for disassembly and assembly.

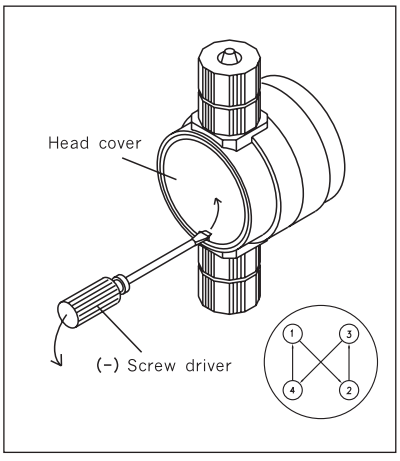
13-1 Replacement of valve unit

1. First, remove the hose on the suction and discharge connecting parts.
2. After remove the suction and discharge hose joint, and take out the valve parts (check ball, ball guide, ball seat).
3. Check the O-ring and check ball for scarring, and observe the ball seat for flaws or deposits of dust.
4. When both the upper and lower joints are dismounted, be careful not to mistake one for the other to keep correct direction when reassembling.
5. In particular, do not forget to put back the O-ring, ball guide or check ball.



13-2 Replacement of pump head

1. Detach the hose and piping from the discharge-side upper joints.
2. Put a minus(-) screwdriver into the head cover bottom clearance, and detach the cover.
3. Detach the head bolt using the hexgonal key wrench. The pump head can then be drawn out when you pull in the direction indicated by the arrow.
4. Reassemble in the reverse order of disassembly.

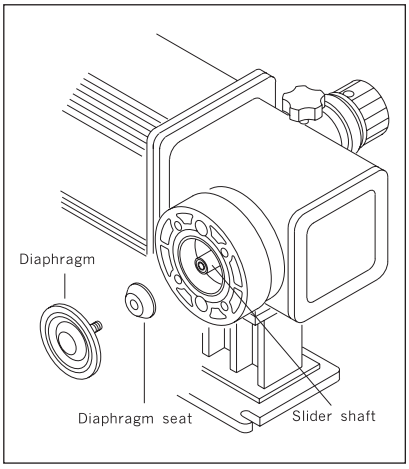


⚠ Caution

- When tighten the bolts of the pump head, clamp in the numerical sequence shown above. For example, if you tighten the bolts in the order 1-3-2-4, one side may be more tighten than the other, which can it ture result in leakage from the pump head.

13-3 Replacement of diaphragm

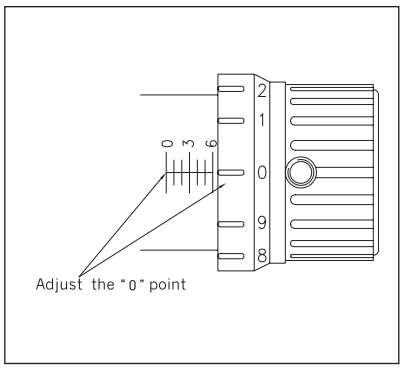
1. Dismount the pump head according to the procedure detailed in 13-2, above.
2. Set stroke length to 0% and turn off when the diaphragm comes to the top dead point. The diaphragm is screwed into the slider shaft. Turn the diaphragm counterclockwise, then the diaphragm can be simply removed.
3. Take off the diaphragm seat and replace the diaphragm with a new one.
4. Fix the new diaphragm firmly to the slider shaft by turning it clockwise.
5. Set stroke length to 100%(dial scale "3" or "6") of bottom dead point, before reassembly the diaphragm. In this case, connect power supply and run motor temporarily by on-off until the diaphragm will be located to the bottom dead point.
6. Fit the pump head to the gear box with bolts.



13-4 Disassembling the flow control unit and 0-point adjustment

The flow control unit may be disassembled as shown section 18-1,2 'driving parts' . Reassemble according to the following procedure.

1 Insert the dial into the dial shaft and tighten the hexagonal socket head setscrew lightly.
2 Dirive the dial unit assembled in step into the adjusting shaft bearing.
3 Turn on the power switch and operate the motor. At this time, keep the piping detached from the joints.
4 While operating the motor and pump, continue to turn the control dial clockwise. At this time, the clicking of the slider shaft can be heard as it contacts the dial shaft. When turned further, this clicking sound stops, this is the zero point.
5 Loosen the hexagonal socket head screw, and match the zero point of the dial shaft bearing with that of the control dial, and tighten the hexagonal socket head setscrew firmly this time.
6 Return to desired dial position, and tighten the knob bolt a little firmly.



14 Consumable Parts and Spare Parts

14-1 Consumable parts

■ Pump head

Name of part	Q'ty
Diaphragm	1
Ball seat	4(2※1)
Check ball	4(2※1)
O-ring(P-18)	2
Spring(high viscosity)	2※2

※ 1. For AX-52, 13 and high viscosity type.
※ 2. For high viscosity types only.
Q'ty is in respect of the single type.

■ Anti-siphon check valve

Name of part	Q'ty
Siphon head	1
Spring	1
O-ring(P-18)	1

■ Strainer foot valve

Name of part	Q'ty
Check ball	1
Stainer	1
O-ring(P-18)	1

14-2 Spare parts

● Hose nut ● Hose joint ● Ball seat ● Ball guide ● Check ball

15 Warranty

⚠ Warning

- CHEONSEI will not warrant if the pump is reconstructed arbitrarily or used by other parts except specified parts. And be cautious not to be compensated for a various expense happened by a accident and trouble.

1 CEONSEI will warrant all products to be free of defects in material or workmanship for a period of eighteen(18) months from date of shipment or one(1) year from the date of installation, whichever occurs first.

2 During guarantee period repair or change of pump is free of charge, if trouble or damage of pump due to design or manufacturing of CHEONSEI.
※ Consumable parts are excluded.

3 Repair or change for pump having a trouble or damage caused by the following reasons should be charged regardless of the guaranteed period.
① Trouble or damage of pump expired guarantee period
② Trouble of using by careless handling
③ Trouble or damage due to using parts except of specified by CHEONSEI.
④ Trouble or damage due to repair or reconstruction by person except by Cheon-Sei or designated by CHEONSEI.
⑤ Trouble by inevitability of fire or natural calamity

16 Repair Service

⚠ Caution

- Prior to sending the pump for repair, wash the pump head's internal clearly.
- Do not return the pump if the pump has been used with harmful and fatal liquids to health.

1 Contact to A/S Department of Cheon-Sei or Local Distributor as shown on back of the manual when occurred abnormal of pump or has inquiry.

2 Inform following items when request repair of pump.
① Model Name and Production No. as shown on name plate of pump
② Used period and using condition, status, transfer liquid

3 Inquire to Local Distributor whether charge or not for repair when expired guarantee period of pump.

4 Minimum retain period of performance parts for repair of Cheon-Sei is 5 years from the date of production.

17 Accessory

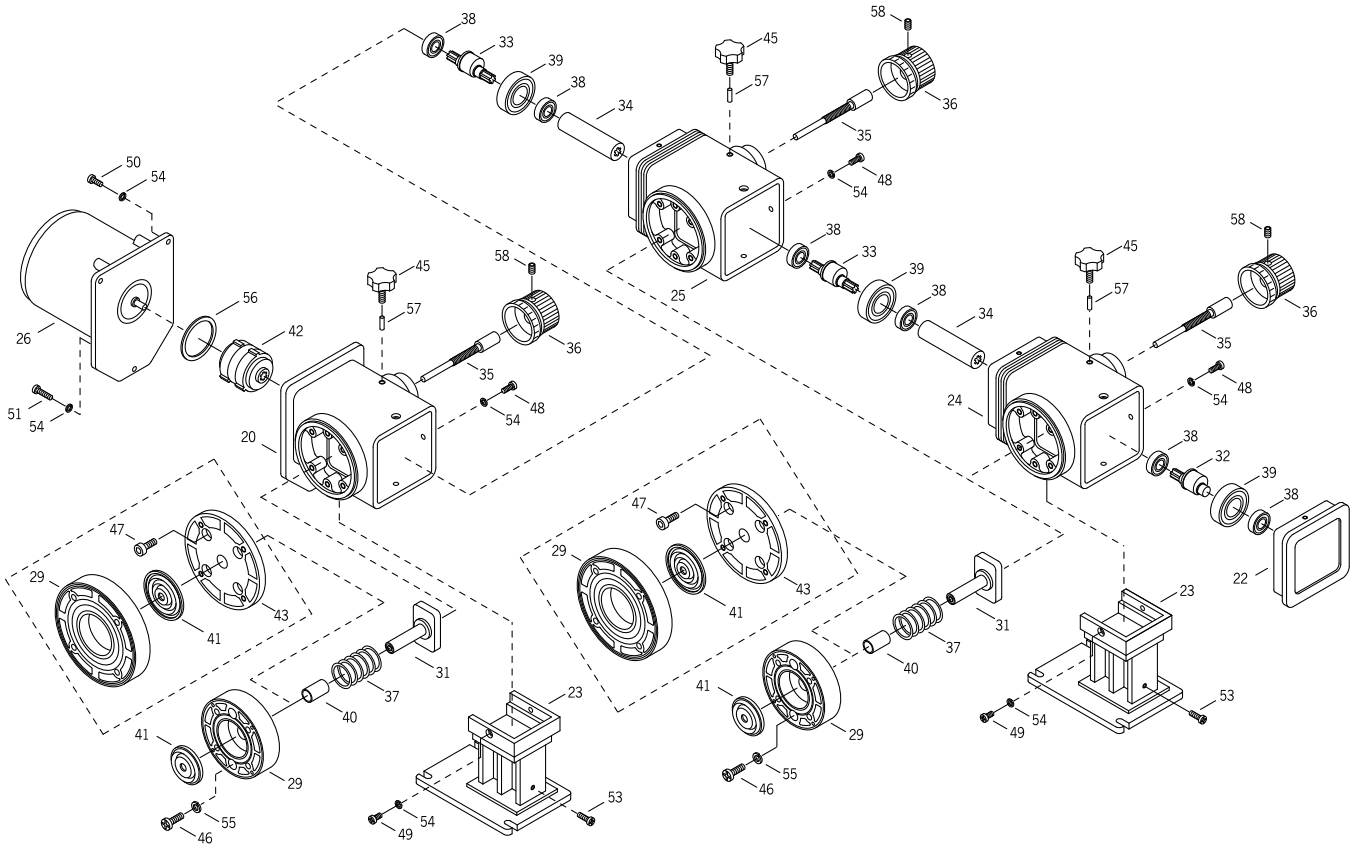
1 Back Pressure Valve
In case that overfeed or siphon phenomena is occurred, according to piping condition, a discharge liquid flows with a excessive quantity during operation, or liquids flows continuously despite stoppage of pumping.

2 Safety Valve(Relief Valve)
This is the valve to be opened automatically when the pressure in the piping is occurred excessively. Usually, the excessive pressure could be occurred , in case that alien material is entered into inside of discharge piping or valve is closed on discharge piping.

3 Air Chamber
Usually, a reciprocating pump has a peculiar pulsation which results in vibration of piping and overfeed phenomena. Air Chamber will be used to solve such a problem caused by pulsation.

18 Structure and Name of Each Parts

18-1 Driving parts(Totally enclosed non-ventilated motor)



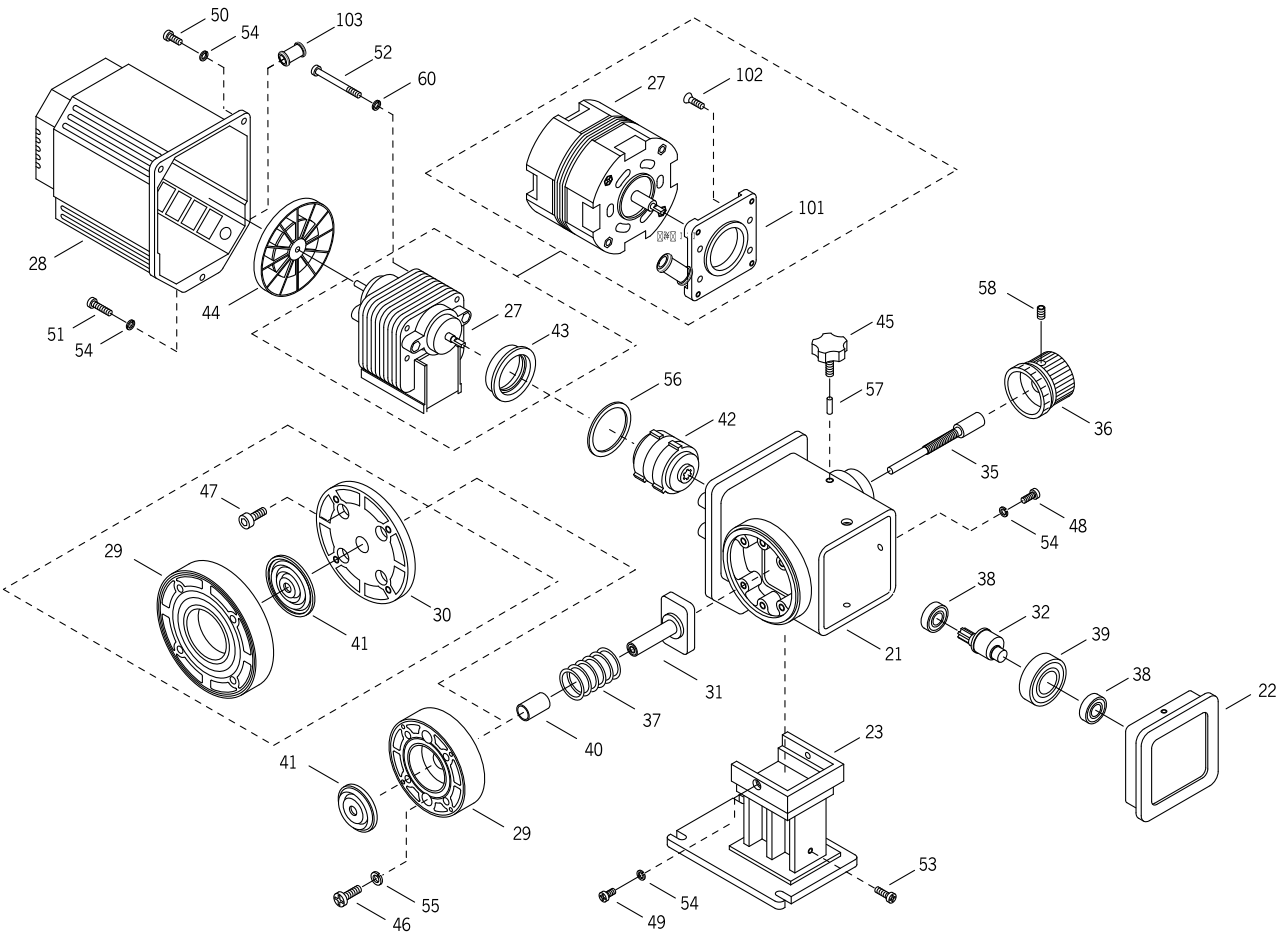
NO.	Part name	Q'ty
20	Gear Box(TESC)	1
22	Gear cover	1
23	Bed	1(2)
24(3)	Frame	1
25(4)	Frame	1
26	Motor(TESC)	1
29	Support ring	1(2/3)
30(2)	Auxiliary ring	1(2/3)
31	Slider shaft	1(2/3)
32	Cam shaft	1
33(3)	Cam shaft	(1/2)

NO.	Part name	Q'ty
34(3)	Shaft	(1/2)
35	Dial shaft	1(2/3)
36	Dial	1(2/3)
37	Spring	1(2/3)
38	Bearing(Ball)	2(4/6)
39	Bearing(Ball)	1(2/3)
40	Bearing(D.U.)	1(2/3)
41	Bellows	1(2/3)
42	Planetary gear	1
45	Bolt(Knob)	1(2/3)
46(1)	Bolt(Pan head+)	2(4/6)

NO.	Part name	Q'ty
47(2)	Bolt(Wrench)	4(8/12)
48	Bolt(Pan head+)	3(6/9)
49	Bolt(Pan head+)	2(4)
50	Bolt(Pan head+)	2
51	Bolt(Pan head+)	1
53	Bolt(Earth)	1
54	Washer(Spring)	8(13/16)
55(1)	Washer(Spring)	2(4/6)
56	Packing(Motor)	1
57	Break pin	1(2/3)
58	Set screw	1(2/3)

Notice) (1) For only AX-21, 51, 12, 32
(2) For only AX-52, 13
(3) For only duplex head
(4) For only triplex head
(5) For duplex and triplex

18-2 Driving parts(Shaded pole motor)



NO.	Part name	Q'ty
21	Gear box(Shaded)	1
22	Gear cover	1
23	Bed	1
27	Motor(Shaded)	1
28	Motor cover	1
29	Support ring	1
30(2)	Auxiliary ring	1
31	Slider shaft	1
32	Cam shaft	1
35	Dial shaft	1
36	Dial	1
37	Spring	1
38	Bearing(Ball)	2

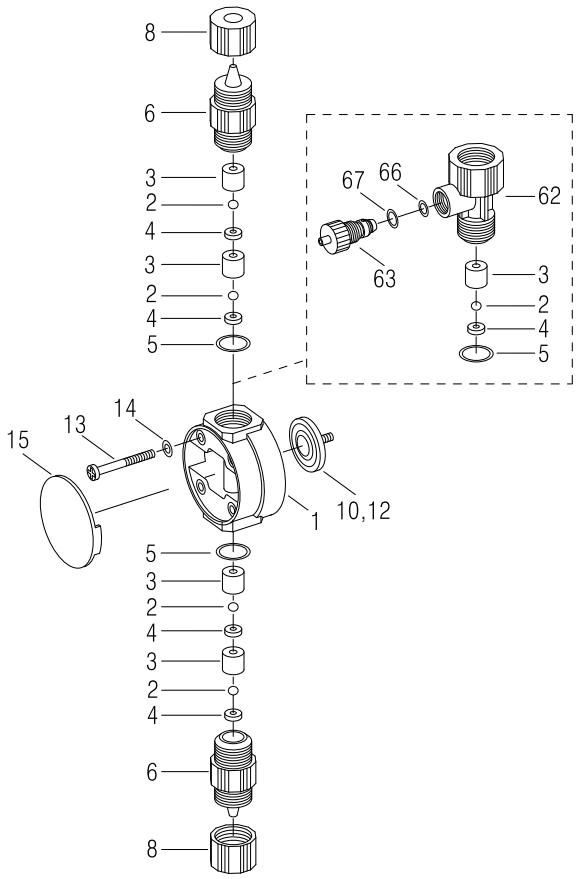
NO.	Part name	Q'ty
39	Bearing(Ball)	1
40	Bearing(D.U.)	1
41	Bellows	1
42	Planetary gear	1
43(5)	Fixed ring(Motor)	1
44	Motor fan	1
45	Bolt(Knob)	1
46(1)	Bolt(Pan head+)	2
47(2)	Bolt(Wrench)	4
48	Bolt(Pan head+)	3
49	Bolt(Pan head+)	2
50	Bolt(Pan head+)	2
51	Bolt(Pan head+)	1

NO.	Part name	Q'ty
52	Bolt(Pan head+)	4(2)
53	Bolt(Earth)	1
54	Washer(Spring)	8
55(1)	Washer(Spring)	2
56	Packing(Motor)	1
57	Break pin	1
58	Set screw	1
60	Washer(Spring)	4(2)
101(3)	Auxiliary plate	1
102(3)	Bolt(Pan head+)	4
103	Wire bushing	1

Notice) (1) For only AX-21, 51, 12, 32
(2) For only AX-52, 13
(3) For only AX-21
(4) In case of AX-21 which should be applied by the number of "( )".
(5) Except AX-21

18-3 Liquid end parts(Hose type)

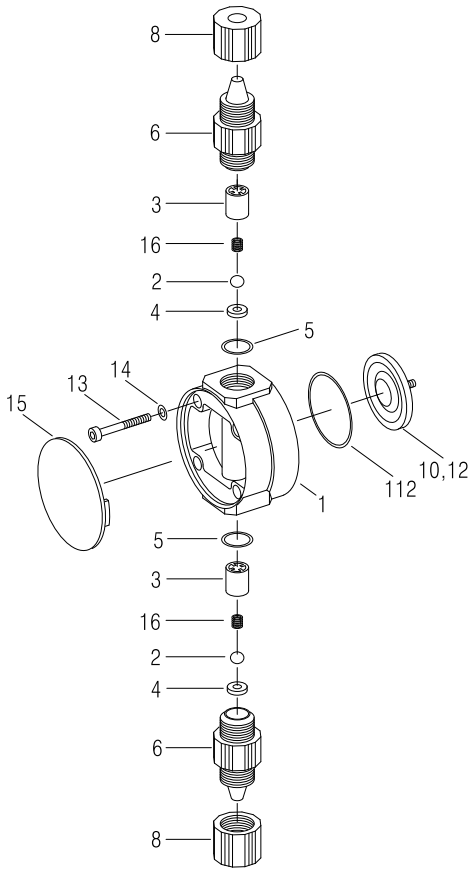
1 Model:AX-21,51, 12, 32-P□□, F□□ Type



NO.	Part name	Q'ty
1	Head	1
2(1)	Check ball	4(5)
3(1)	Ball guide	4(5)
4(1)	Ball seat	4(5)
5(1)	O-ring	2(3)
6	Hose joint	2
8	Hose nut	2
(10)	Diaphragm	1
(12)	Diaphragm seat	1
10,12	Diaphragm set	1
13	Bolt(Wrench)	4
14	Washer(Flat)	4
15	Head cover	1
62(2)	Air relief joint	1
63(2)	Air relief coke	1
66(2)	O-ring	1
67(2)	O-ring	1

Notice) (1) In case of Air relief valve, which should be applied by the number "( )".
(2) For only Air relief valve

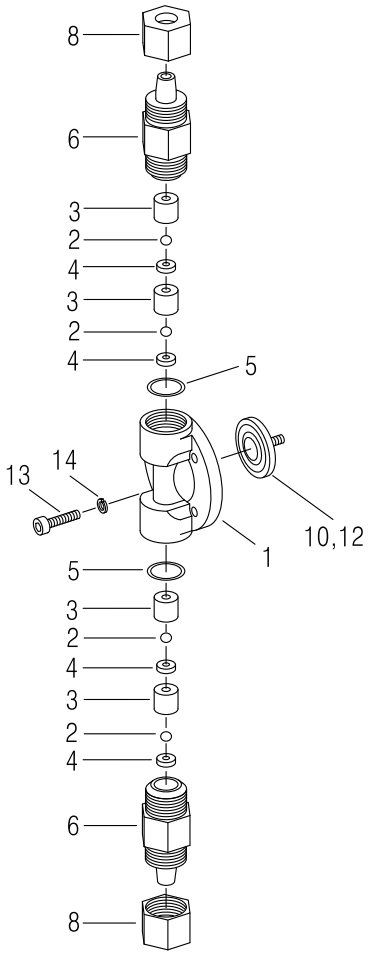
2 Model:AX-52,13 -P□□ , F□□ & high viscosity Type



NO.	Part name	Q'ty
1	Head	1
2	Check ball	2
3	Ball guide	2
4	Ball seat	2
5	O-ring	2
6	Hose joint	2
8	Hose nut	2
(10)	Diaphragm	1
(12)	Diaphragm seat	1
10,12	Diaphragm set	1
13	Bolt(Wrench)	4
14	Washer(Flat)	4
15	Head cover	1
16(1)	Spring(High viscosity)	2

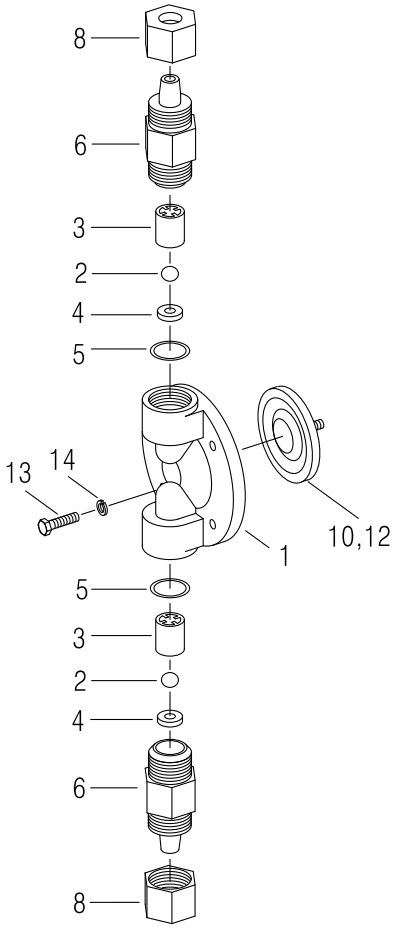
Notice) (1) For only high viscosity

3 Model : AX-21, 51, 12, 32-S□□, 6□□ Type



NO.	Part name	Q'ty
1	Head	1
2	Check ball	4
3	Ball guide	4
4	Ball seat	4
5	O-ring	2
6	Hose joint	2
8	Hose nut	2
(10)	Diaphragm	1
1(2)	Diaphragm seat	1
10,12	Diaphragm set	1
13	Bolt(Wrench)	4
14	Washer(Spring)	4

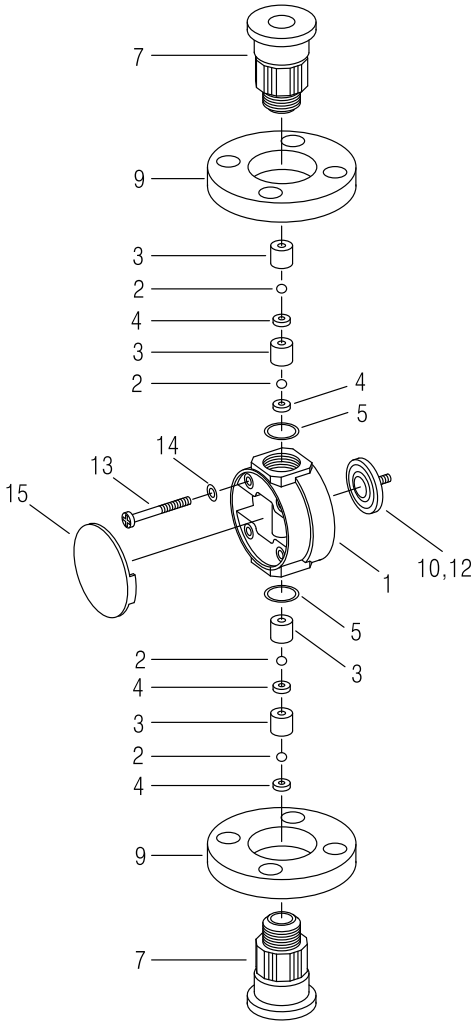
4 Model : AX-52, 13-S□□ , 6□□ Type



NO.	Part name	Q'ty
1	Head	1
2	Check ball	2
3	Ball guide	2
4	Ball seat	2
5	O-ring	2
6	Hose joint	2
8	Hose nut	2
(10)	Diaphragm	1
(12)	Diaphragm seat	1
10,12	Diaphragm set	1
13	Bolt(Wrench)	4
14	Washer(Spring)	4

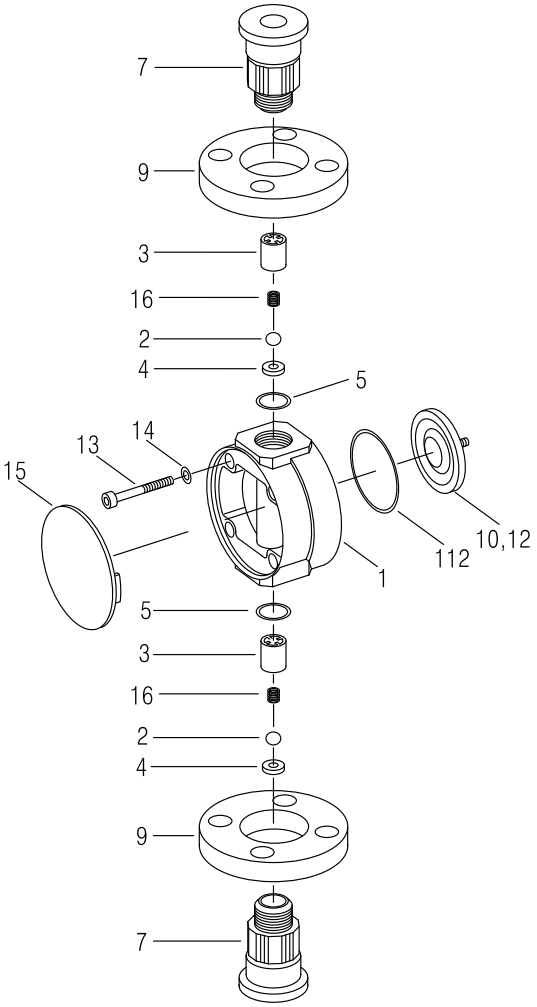
18-4 Liquid end parts(Flange type)

1 Model : AX-21,51, 12, 32-P□□ , F□□ Type



NO.	Part name	Q'ty
1	Head	1
2	Check ball	4
3	Ball guide	4
4	Ball seat	4
5	O-ring	2
7	Joint	2
9	Flange	2
(10)	Diaphragm	1
(12)	Diaphragm seat	1
10,12	Diaphragm set	1
13	Bolt(Wrench)	4
14	Washer(Flat)	4
15	Head cover	1

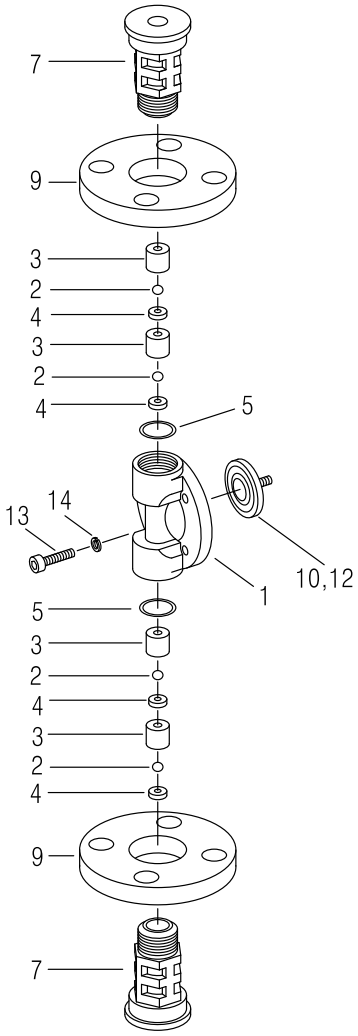
2 Model : AX-52,13 -P□□ , F□□ & high viscosity Type



NO.	Part name	Q'ty
1	Head	1
2	Check ball	2
3	Ball guide	2
4	Ball seat	2
5	O-ring	2
7	joint	2
9	Flange	2
(10)	Diaphragm	1
(12)	Diaphragm seat	1
10,12	Diaphragm set	1
13	Bolt(Wrench)	4
14	Washer(Flat)	4
15	Head cover	1
16(1)	Spring(High viscosity)	2
112	O-ring	1

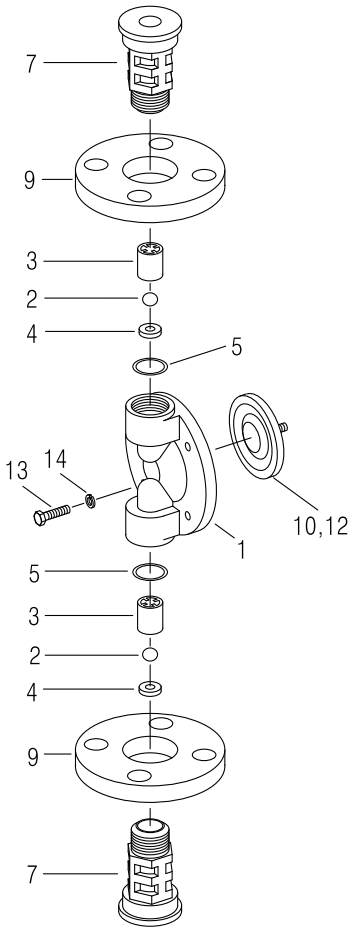
Notice) (1) For only high viscosity

3 Model : AX-21,51, 12, 32-S□□ , 6□□ Type



NO.	Part name	Q'ty
1	Head	1
2	Check ball	4
3	Ball guide	4
4	Ball seat	4
5	O-ring	2
7	Joint	2
9	Flange	2
(10)	Diaphragm	1
(12)	Diaphragm seat	1
10,12	Diaphragm set	1
13	Bolt(Hex. head)	4
14	Washer(Spring)	4

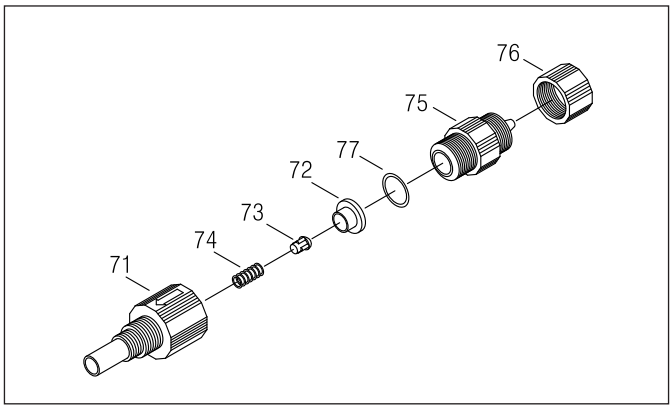
4 Model : AX-52,13 - S□□ , 6□□ Type



NO.	Part name	Q'ty
1	Head	1
2	Check ball	2
3	Ball guide	2
4	Ball seat	2
5	O-ring	2
7	Joint	2
9	Flange	2
(10)	Diaphragm	1
(12)	Diaphragm seat	1
10,12	Diaphragm set	1
13	Bolt(Hex. head)	4
14	Washer(Spring)	4

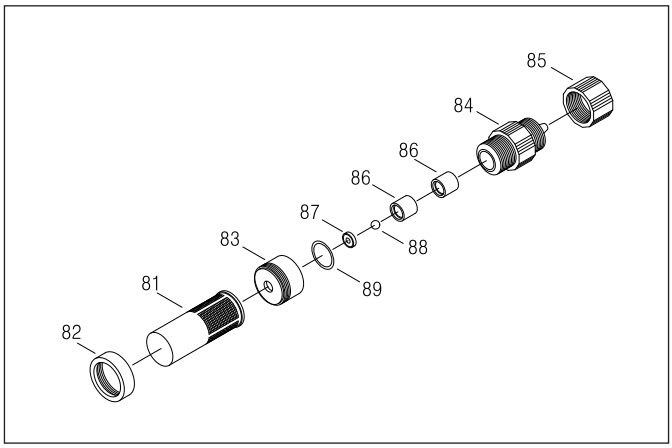
18-5 Accessary parts

1 Anti-siphon Check Valve



NO.	Part name	Q'ty
71	Siphon body	1
72	Siphon seat	1
73	Siphon Head	1
74	Spring(siphon)	1
75	Hose Joint	1
76	Hose nut	1
77	O-ring	1

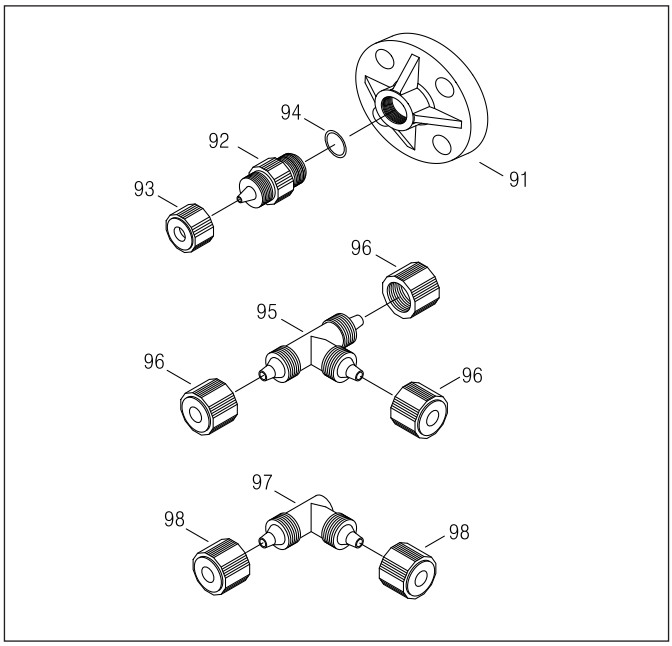
2 Strainer Foot Valve



NO.	Part name	Q'ty
81	Strainer	1
82	Ring nut	1
83	Adapter	1
84	Hose joint	1
85	Hose nut	1
86(1)	Ball guide	2(1)
87	Ball seat	1
88	Check ball	1
89	O-ring	1

Notice) (1) In case of AX-52, 13 AX-21~32-F□□, S□□, 6□□ type, which should be applied by the number of "( )".

3 Flange Joint, Tee, Elbow



NO.	Part name	Q'ty
91	Flange	1
92	Hose joint	1
93	Hose nut	1
94	O-ring	1
95	Tee	1
96	Hose nut	3
97	Elbow	1
98	Hose nut	3

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