KEMPION

CE SPEC KAB KAB-QC-18 ISO 9001 Certified Company

Hydraulic Metering Pumps

KH Series

Instruction Manual

전세산업 (주)

Thank you very much for purchasing Cheonsei KH-Series. Before beginning operation, please read this instruction manual carefully. Correct handling, repair, & maintenance are described easily.
Please use this pumps safely to be guaranteed performance & long life of the pump after reading this instruction manual.
Please keep this instruction manual at the place where you can see it easily.

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1 Notice for Safety

1-1 Introduction

- To use the products safely, the signs are showed on the manual like below.
- As it is a matter of safety, please be sure to keep the directions in manual.
- The signs and indication are as follows.

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

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

1-2 Cautions for Use Condition

⚠ Caution

- Do not use this pump for other purposes except liquid injection.
  Otherwise it may cause trouble.
- Do not use for kinds of liquid which cause damage to liquid end parts.
- Please keep the followings, otherwise it may cause trouble.
  Ambient temperature : 0~40℃
  Temperature of the handling liquid : Head material of PVC 0~50℃
  Head material of PVDF, SS304, & SS316 0~80℃
  Piping pressure : Below the max. discharge pressure indicated on the Specifications.

1-3 Cautions for Handling Condition

⚠ Warning

- Install this pump beyond the reach of children and/or unauthorized person.
- Turn off the power and stop the pump & other equipments when repairing or disassembling pumps.
  If power is on during work, it may cause electric shock
- Please do not operate when the discharge valve is closed or do not close the valve during operation.
- Be careful not to insert fingers or any foreign substances into rotating or reciprocating objects during operating pump. if you touch it during operation, you may get injury.
- Do not touch with wet hands. Electric shock may occur.
- Use only designated parts. If undesignated parts are used to the pump, it may cause accident & trouble.
- Do not arbitrarily reconstruct the pump. If the pump is arbitrarily reconstructed, it may cause accident & trouble.

⚠ Caution

- Do not use damaged pump. It may cause accident.
- Do not install pump in the heavy moist or dusty place. It may cause electric shock and trouble.
- Do not touch motor with bare hands during operation. High temperatures can cause burns.
- Wear suitable protective clothing(gloves, mask, goggles, working clothes, & etc.) when pumping hazardous liquids.
- Do not use power other than that specified in the motor nameplate. Otherwise, it may cause malfunction or fire.
- Pump should be properly grounded. If pump is not grounded, it may cause electric shock.
- Work after releasing pressure from discharge piping and remove liquid from Liquid End Part prior to repair or maintenance of pump.
- Pump may be damaged when ambient temperature go down below freezing pont of liquid. Remove the liquid in the pump and piping certainly after operation stop.
- Make proper protection in consideration of indeliberate leakage from damage of pump & Piping.
- Dispose of waste pump in accordance with related national law.

2 Confirmation of Product

2-1 Check Point When Unpacking

Please check following points immediately after receiving the pump.
If the defect is found from pump, please request it to local agent or CHEONSEI.
We will do our best to solve the problem as soon as possible.

1 Is specification correct as ordered?
2 Is there any missing parts ?
3 Is there any visible damage caused by vibration or shock during transport?
4 Is there any loosened bolt or nut?

2-2 Standard Accessories

1 Instruction Manual ····· 1 Copy
2 Mounting bolts (M10 × 40L Including Washers & Nuts) ··· 4 SET
3 Tool for Hydraulic Pressure Control····· 1 PC
4 Working Oil(Silicon Oil)····· 1 bottle

3 General

Hydraulic Diaphragm Metering Pumps, KH Series, are pumps applied with hydraulic regulator valve to extend the high safety and durability and taking the advantages of the general diaphragm pumps and plunger pump of high precision, high pressure.
It can be used for precious injection of liquids including slurry & hazardous liquids because the leakage risk of liquid has been remarkably reduced in comparison with general diaphragm pumps. Silicon oil is used as hydraulic working oil in order to ensure high efficiency for long time and maintain safety also. The advantages of silicone oil are non-toxic and high chemical stability, very low volatility and safety working oil unaffected by ambient temperature.
In addition, KH Series have various choice for pump as vertical motor type in which field condition is considered, horizontal type to which various motors can be connected, & etc. KH Series can be ideally used in various industries from petro-chemical field to food processing field because the Discharge volume can be controlled by manual operation or automatical operation with the BLDC motor.

4 Model Code

❶	❷	❸		❹		❺a	❺b	❻		❼a	❼b	❼c		❽	❾
KH	V	1	-		-	3	3	S	-	P	T	C	-	F	S

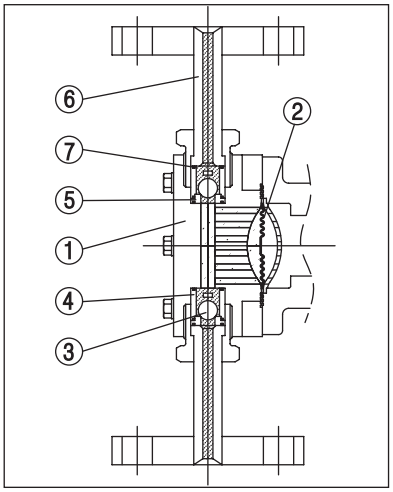
① Series Name	KH : Hydraulic Diaphragm Metering Pump
② Construction	V : Vertical Type (Direct motor mounting) H : Horizon Type (Indirect motor mounting)
③ Head Number	1 : Single 2 : Duplex ※ Duplex head is applicable only for vertical type and, in case of over Triplex head, please contact sales engineer or distributor.
④ Options	No mark : None A : BLDC Automatic Control D : Inverter Unit E : Air Relief Valve
⑤ Nominal Capacity (Based on Discharge Volume)	a × 10b⇒ 3 × 103=3000 (mL/min) ※ in case of Duplex head, discharge capacity is twice of nominal capacity.
⑥ Diaphragm Number	S : Single
⑦ Liquid End Material	a : Head Material (P : PVC F : PVDF S : SS304 6 : SS316 X : Special) b : Diaphragm Material (T:PTFE X : Special) c : Check Ball Material (C : Ceramic S : SS316 6 : SS316 X : Special)
⑧ Connection	F : Flange X : Special
⑨ Power Supply	S : 3ø 60Hz 220/380V A : 3ø 60Hz 440V X : Special

5 Specifications

Model \ Spec	Max. Capacity (mL/min)		Max Discharge Pressure (bar)		Stroke Frequency (SPM)		Dia. of Piston (mm)	Stroke Length (mm)	Connection (STS)	Motor (kW)	Weight(kg) Vert./ Hori.
	50Hz	60Hz	PTC-FTC	STS	50Hz	60Hz					
KH-51	40	50	10	30	48	58	12	10	KS 20K 15A	0.2	19.5/22
KH-12	80	100	10	30	96	116	12				
KH-32	300	360	10	25	48	58	30				20/22.5
KH-72	600	720	10	20	96	116	30				
KH-13	915	1100	10	20	48	58	40	17.5		0.4	61.5/67
KH-23	1830	2200	10	15	96	116	40				
KH-33	2830	3400	10	12	48	58	68		KS 10K 25A		63/68.5
KH-63	5660	6800	7	7	96	116	68				
KH-33H	2830	3400	10	20	48	58	68		KS 20K 25A	0.75	84
KH-63H	5660	6800	10	14	96	116	68				
KH-14	8750	10500	8	8	48	58	122		KS 10K 40A		98
KH-24	17500	21000	4	4	96	116	122				

Note) 1. Max. capacity is the volume at standard condition(room temperature & pure water) & max. discharge pressure.
2. Effective flow control range is 10~100%, precision is ±1%F.S., and linearity is ±2%F.S.
3. The Munsell No. of painting is 6.51B 4.99/9.55 except motor(motor is manufacturer's standard).

6 Standard Liquid End Material



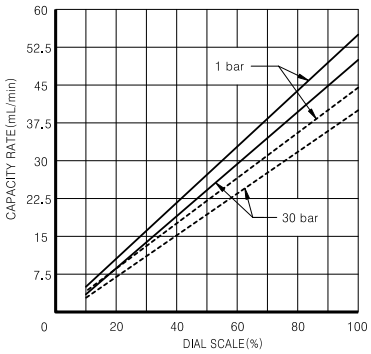
No.	Part \ Type	PTC		FTC	STS	6T6
		51~72	13~24			
L	Head	PVC		PVDF	STS304	STS316
M	Diaphragm	PTFE		PTFE	PTFE	PTFE
N	Check Ball	CERAMIC		CERAMIC	SS316	SS316
O	Ball Guide	PP	PVC	PVDF	SSC14A	SSC14A
P	Ball Seat	FKM	PVC	PTFE	SS316	SS316
Q	Joint	PVC		PVDF	SS304	SS316
R	O-ring, Packing	FKM(EPDM)		PTFE	PTFE	PTFE

Note) 1. In case of special materials other than the standard, please contact separately.
2. Above standard material may be revised for improvement without prior notice.

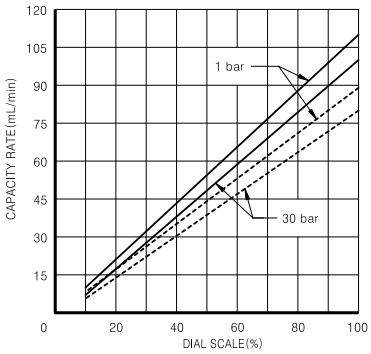
7 Performance Curves

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

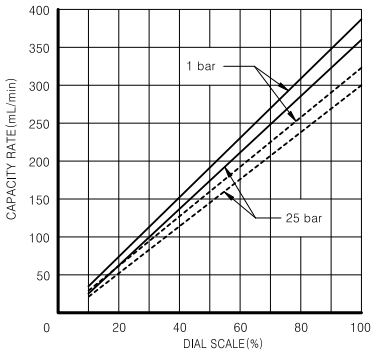
● KH-51



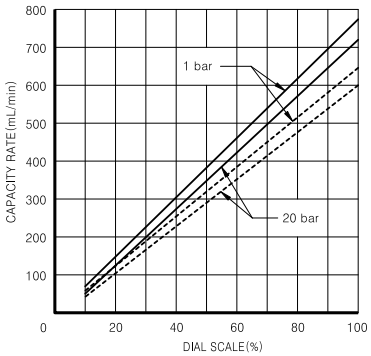
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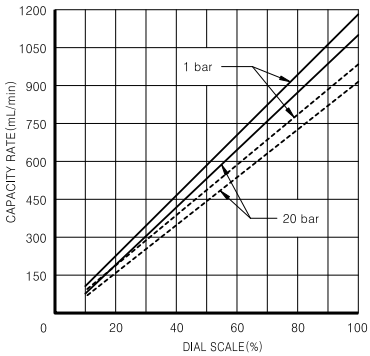
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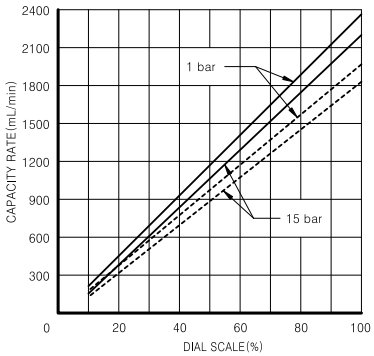
● KH-72



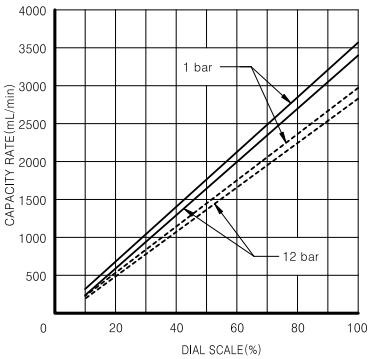
● KH-13



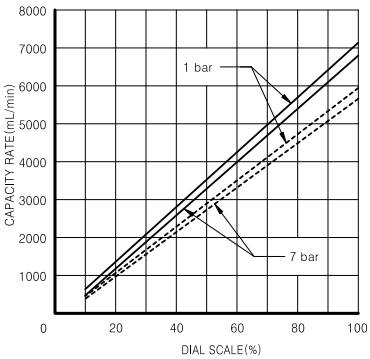
● KH-23



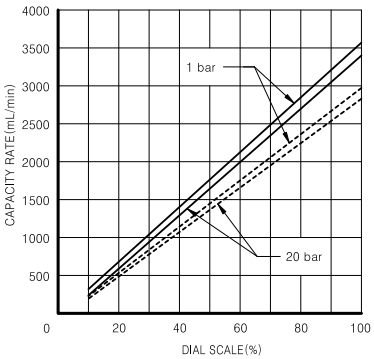
● KH-33



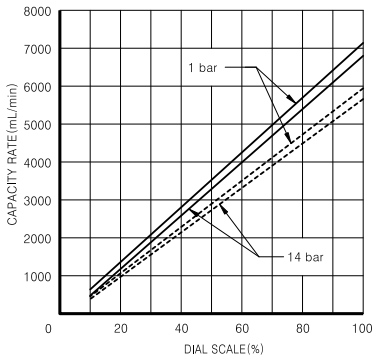
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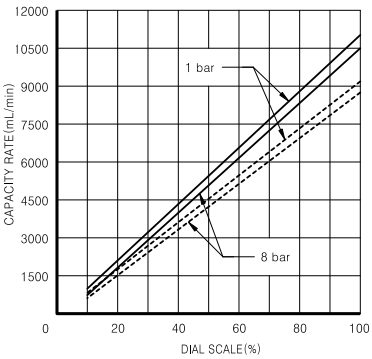
● KH-33H



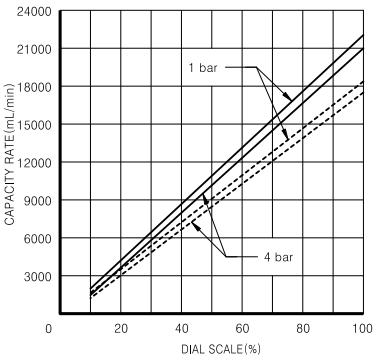
● KH-63H



● KH-14



● KH-24



8 Operation Principle and Structure

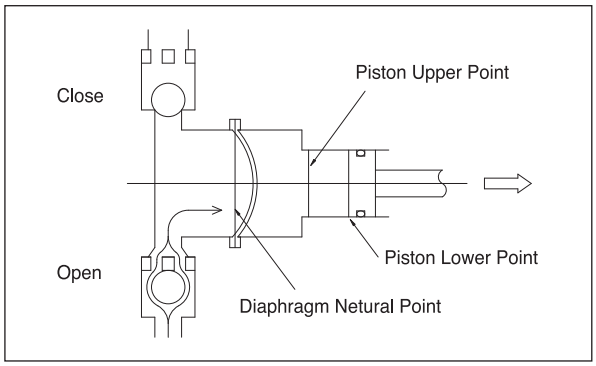
8-1 Operation Principle

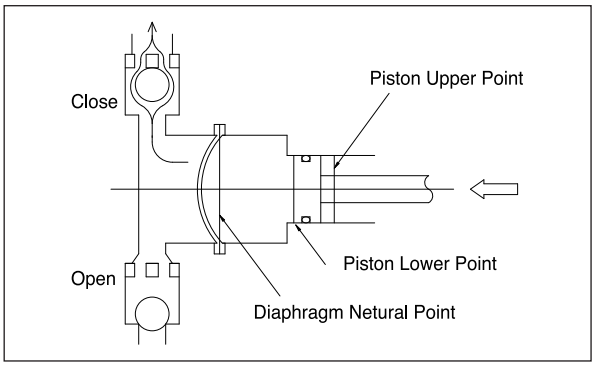
1 Motor rotation is reduced by the Worm Gear and rotating motion is converted to reciprocating motion by eccentric unit(Worm Wheel Shaft, Eccentric Cam, Slider).

2 When the Piston connected to the Slider Shaft performs reciprocating motion, the volume of Working Oil Chamber repeats increase and decrease.
This makes that Working Oil can be moved inside Working Oil Chamber and Diaphragm in front of Working Oil Chamber can be reciprocated also.

3 The reciprocating motion of diaphragm increases the pressure of pump head repeatedly and this change of pressure makes suction & discharge action of pump.

4 When diaphragm moves backward, minus(-) pressure is generated in pump head. At this time, check ball of discharge side is closed in order to prevent flowing backward of liquid from piping of discharge side to pump head. On the contrary, check ball of suction side is opened so that liquid can be flowed into the pump head.





5 When diaphragm moves forward, plus(+) pressure is generated in pump head. At this time check ball of suction side is closed and check ball of discharge side is opened so that liquid can be discharged.

8-2 Structure

The pump consists of Driving Part, Hydraulic Part and Liquid End Part. For detailed structure, please refer to the picture at page 9.

1 Driving Part

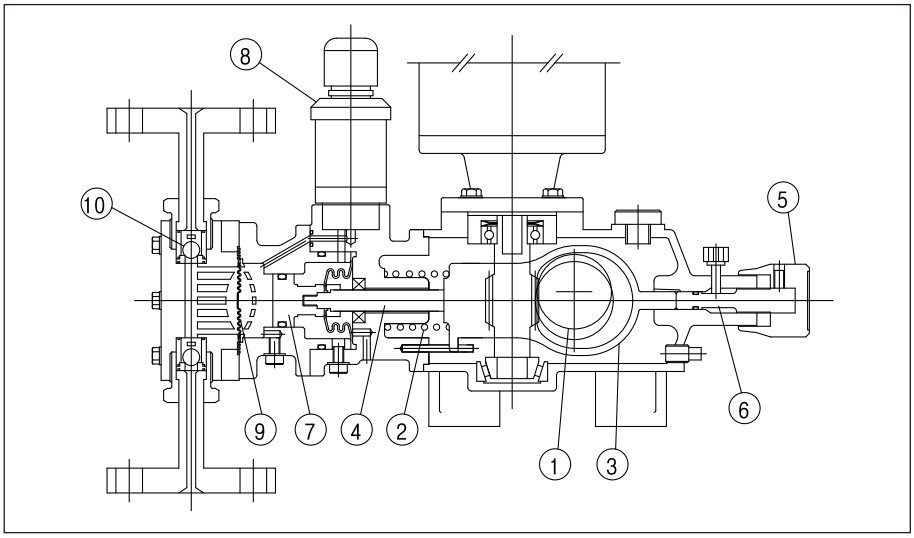
It consists of gear box & motor and it is classified into vertical type and horizontal type depend on motor mounting type.

① Warm Gear : Reduce revolution number of motor to 1/15 or 1/30.
② Warm Wheel Shaft, Eccentric Cam : Convert the rotating motion to reciprocating motion.
③ Slider, Slider Shaft : Transfers the reciprocating motion to Piston.
④ Spring : Put the Piston back to keep a constant discharge volume during suction cycle.
⑤ Dial, Dial Shaft : Adjust discharge volume by 0~100%.

2 Hydraulic Part

It consists of Working Oil Chamber and Hydraulic Regulator.

① Piston : Transfers reciprocating motion to diaphragm via working oil (Silicon Oil) as a medium.
② Hydraulic regulator : Consists of Relief Valve and Supply Valve. It adjust hydraulic pressure.
③ Diaphragm :Isolates liquid from working Oil and increase or decrease the pressure by converting reciprocating motion into volume change.
④ Back Up Plate : Prevents overexpansion of diaphragm when suction cycle



No.	Part Name
①	Worm Wheel Shaft
②	Spring
③	Slide
④	Slide Shaft
⑤	Dial
⑥	Dial Shaft
⑦	Piston
⑧	Hydraulic Regulator
⑨	Diaphragm
⑩	Check Ball

3 Liquid End Part

① Pump head : A space where suction and discharge of liquid is carried out.
② Ball Seat, Check Ball : Closes or opens liquid path when the suction cycle or discharge cycle.
③ Ball Guide : Support or guide the movement of check ball.

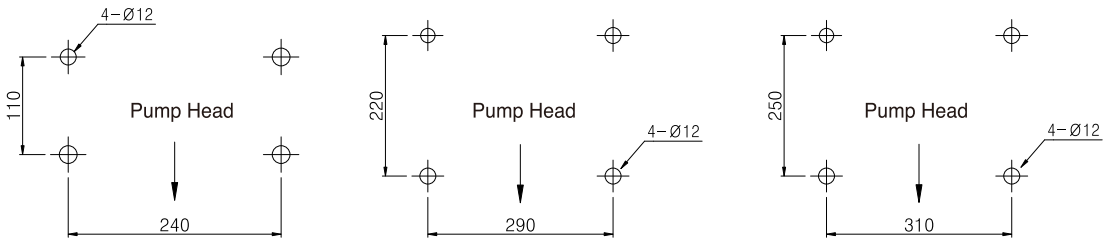
9 Installation

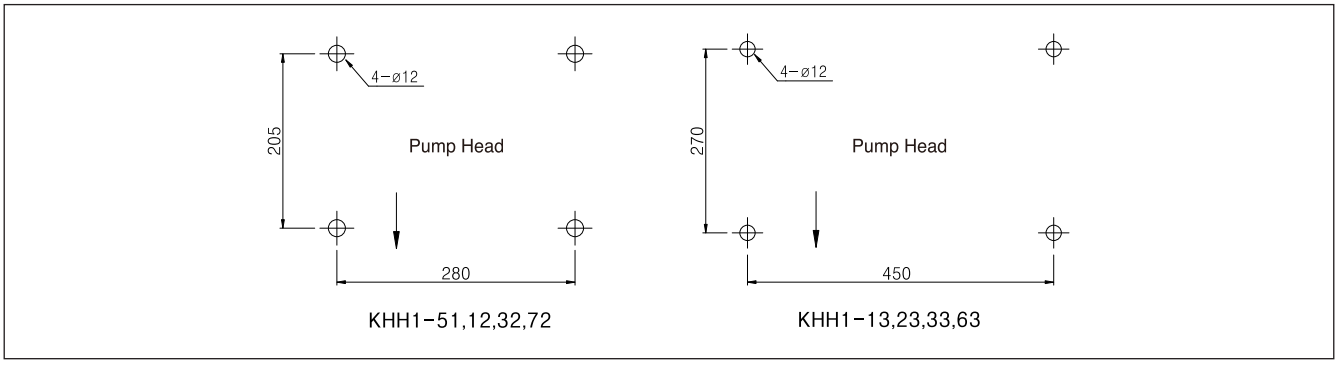
9-1 Installation Place

⚠ Caution

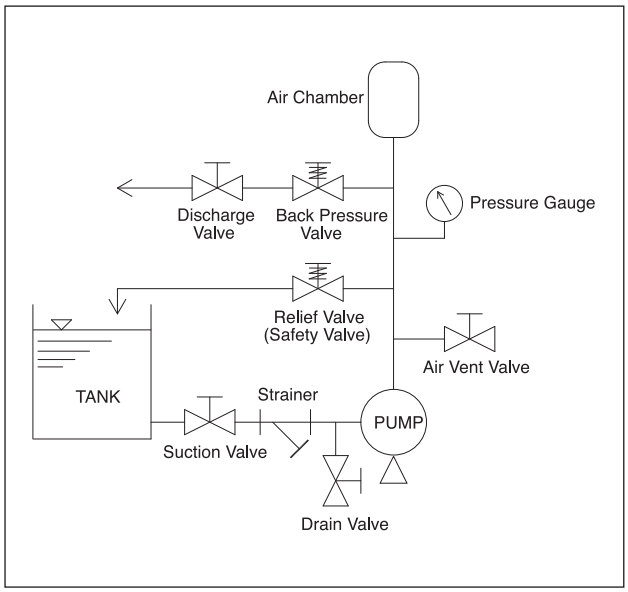
- Do not install this pump at the place where ambient temperature is high(over 40℃) and the temperature downs below freezing point. If the pump is installed at the place, inside of the pump may be damaged.
- Do not install pump in place with heavy moisture and dust, or in place with rain, and wind, electric shock and trouble may be caused.

1 If possible, install the pump lower than the minimum level of the tank.
2 Take sufficient space around the pump to facilitate maintenance or repair and also the motor and wiring should be connected safely in consideration of flooding.
3 The pump should be installed at the place where is flat surface & not affected by vibration of other equipments.
4 Pump should be installed on the concrete foundation or on the pedestal can be sufficiently supported. Also, check the level with a leveling instrument so that pump can be installed horizontally.





9-2 Piping



1 Decide the piping system which can sufficiently satisfy suction & discharge condition.
2 Piping should be short and less bending as far as possible and be careful not to make the cavity at which air stay.
3 Install piping support lest piping load fall on the pump. Especially, in case of liquid end material of PVC, be careful about handling.
4 Be careful that piping is not to be influenced with thermal stress, when transferring hot liquid or cold liquid.
5 Don't make ' U 'shaped bend in the piping, when transferring easily precipitable slurry.
(Note) Slurry particle size : below 100㎛,
Concentration : below100wt%.
6 Install a flushing pipe line for maintenance and inspection, when transferring viscous liquid, poisonous liquid or coagulative liquid.
7 Choose the piping material that has sufficient corrosion resistance to the liquid and can endure the pressure applied in the piping.
8 Connect piping after flushing the inside of piping cleanly and remove the inspection sticker for preventing entrance a foreign substance on the discharge port.
9 Although Hydraulic Diaphragm Metering Pump has a built-in Safety Valve, it is recommended to install safety valve on the discharge piping additionally in order to protect the pump & piping.
10 Protect the piping with insulating material or keeping warm device, if the liquid may freeze inside of piping.
Or, Install drain valve at the suction & discharge side in order to drain the liquid inside piping after operation stopped.

9-3 Suction Piping

1 Suction piping is made with drop method as far as possible.
Also, the diameter of the suction piping should be larger than or same with the suction diameter of the pump.
2 Carefully connect the joint of suction piping in order to prevent air inflow into the piping.
Discharge rate of pump can be destabilized by air Inflow into the piping.
3 Make piping length of suction side as short as possible. If it is too long, cavitation occurs and regular discharge rate can't be assured
4 Install a strainer on the suction piping because it make unstable performance that foreign substances flows into pump head.

9-4 Discharge Piping

1 Use a discharge pipe of which internal pressure is higher than the set value of the safety valve.
2 In case liquid is discharged to less than atmospheric pressure, install the end of discharge piping higher than liquid level of tank in order to prevent the Siphon phenomenon.
3 Basically reciprocating pump have pulsation. Therefore, it is recommended to install Air Chamber in order to prevent the pulsation.

9-5 Electrical Wiring

⚠ Warning

- Do not touch with wet hands. Electric shock may occur.

⚠ Caution

- Before wiring, check voltage, phase, & frequency of motor and connect the pump with correct power. It may cause trouble and fire, if connecting with incorrect power.
- Pump should be properly grounded in order to prevent electric shock.
- entrust the wiring to electrical engineer.
- Install regulated Magnet Switch and Thermal Relay for the adjustment and maintenance of the pump.
- Use standardized parts in wiring and fully pay attention to safety in accordance with the technical standard & wiring regulation of the electrical equipment.

1 The standard motor of pump is 3 phase 220/380V and 440V.
2 Refer to the wiring diagram attached to the cover of motor terminal box and connect wiring according to the voltage which is being used.
3 Connect wiring according to direction indicated by arrow of name plate for rotation direction of motor(clockwise from)
If rotation is reverse, change 2 lines among 3 lines.
4 Wiring method(3 phase 220/380V combined)

220V Wiring	380V Wiring
①-⑥ ← ②-④ ← (△Wiring) ③-⑤ ←	⑥ ① ← ④ ② ← (Y Wiring) ⑤ ③ ←

10 Operation

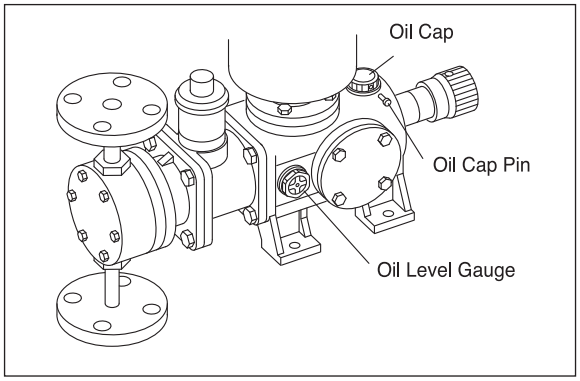
10-1 Preparation

⚠ Caution

- Some water may be remained in the liquid end part of pump after final performance test. In case of use for some liquids reacting radically to water, remove water in the pump and dry the pump necessarily.

1 Check if there is oil leakage caused by any damaged parts or loosened bolt.
Excessive leakage of working oil may affect the discharge volume.

2 Check the oil gauge to see if the driving part of pump is filled with the oil of regulated amount. The normal position of the oil level is the middle of the gauge.
3 Remove the black pin of the oil cap. This is attached to prevent oil leakage during delivery. If the pump is operated without removing the pin, the humidity inside the driving part will be raised and it may cause overflow of the oil.
4 Check if accessories, liquid, power supply, & etc. for pump operation are ready.

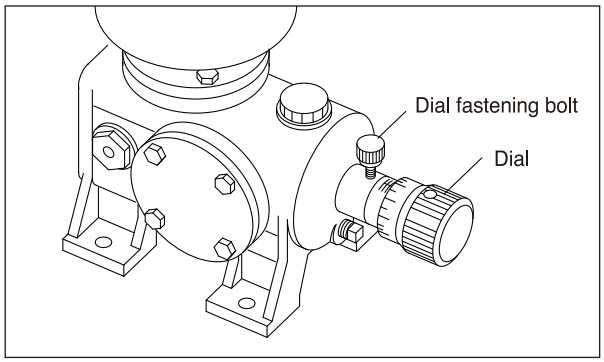


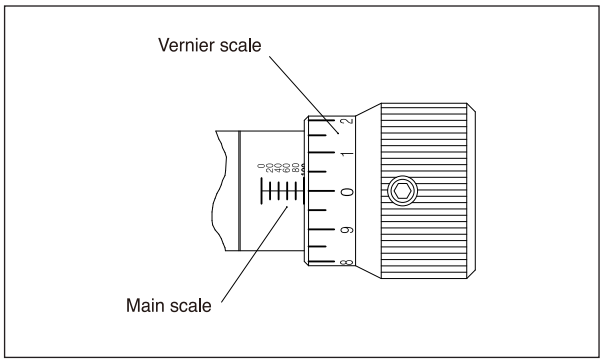
10-2 How to Adjust the Stroke Length

⚠ Caution

- Be careful not to turn the dial scale below "0%" or over "100%".

1 Discharge volume can be controlled by adjustment of stroke length and stroke length can be adjusted by changing movement length of slider shaft(it is caused by turning the dial).
Dial adjustment must be done during operation.
2 The scale of the stroke length is indicated with ' %' according to test report.
3 Unfasten the knob bolt fix dial shaft in counterclockwise.
4 Set the proper stroke length. The setting will be the sum of the main scale(10 digit value) and vernier scale(1digit value) as micrometer method. Rotation number of dial is total 10 turns.





5 After setting of discharge volume, fix the dial with knob bolt tightly.

10-3 Operation

⚠ Warning

- Do not operate when suction valve and discharge valve are closed or do not close suction valve and discharge valve during operation.

When operating pump for the first time after installation, operate the pump according to following sequency.
1 Turn on the power switch of the motor and check if the motor fan rotates clockwise when operating the pump.
2 Set the dial at '0%' and operate test run for 10 minute in order to check any abnormal noise and vibration in the motor or driving part.
Note) In case ambient temperature is low, overload phenomenon may occur temporarily. Since it is caused by the low temperature of the lubricant oil, operate pump under no load and wait until the lubricant temperature increases.
3 After opening the discharge side as condition of atmospheric pressure, set the dial at 100% of stroke length and operate test run for 10~30 minutes.

4 If it is no problem during test run, raise the pressure of discharge side a little by little and slowly until it reaches to the setting pressure. At this time, check if motor current is less than rated current and other parts have no problems.

10-4 Check of Discharge Volume

If pump has no problem, check the discharge volume under actual running condition with measuring device such as mass cylinder.

1 If discharge volume had no fluctuation after repeated measurements, the pump is judged to be running normally.

2 Make a graph of relationship between the discharge volume and stroke length under the actual running conditions and determine an optimum discharge volume in accordance with this graph.

3 In case the discharge volume is increased/decreased by the change of the stroke length, measure the discharge volume after passing more than one minute.

Note) In case customer requests Test Report when placing order, we offer Test Report obtained under room temperature & clean waaater in our company.
Take a note that it is not test result under actual piping & actual liquid.

10-5 Function and adjustment of Hydraulic Regulator

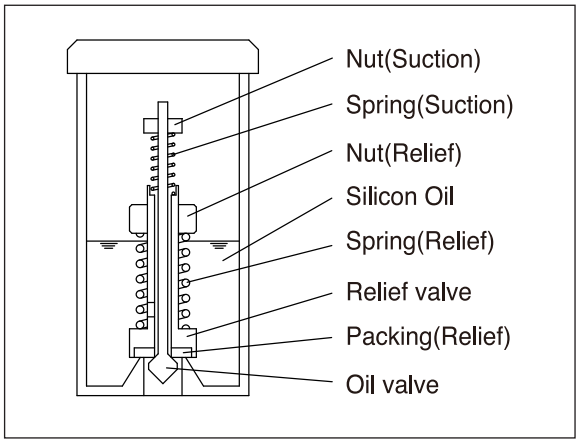
- Hydraulic control valve in the regulator consists of relief valve and supply valve.
- The relief valve makes the working oil to come out when the pressure in the working oil(silicon oil) chamber goes up to higher than the setting pressure and/or max. allowable pressure.
- When the pressure of discharge become normal, working oil(silicon oil) is to be supplied to the chamber by pushing the oil supply valve several times until the relief valve actuate once more. It prevents pump from severe damage and maintain the diaphragm position close to the pump head side for accurate discharge flow rate.

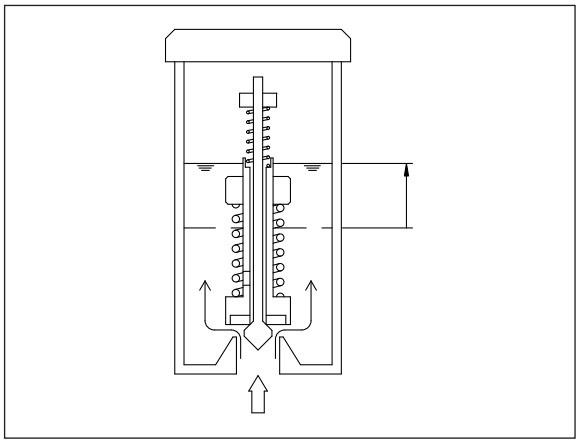
1 Function of Relief Valve

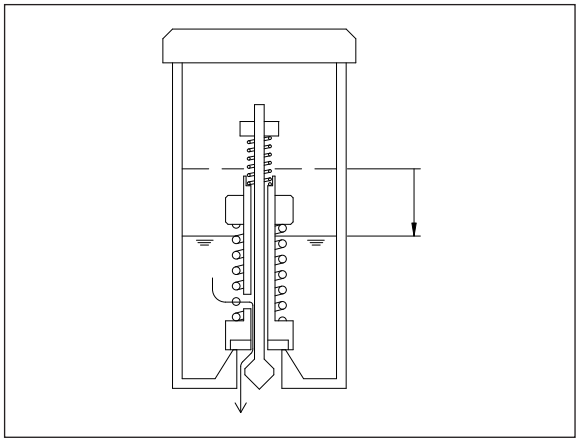
- The relief valve is actuated to prevent pump damage caused by over pressure when the pressure in the oil chamber is higher than the setting pressure.
- The operation of the relief valve can be identified by abrupt going up the oil level in the regulator.
- When pump comes out from factory, the pressure of the relief valve is set at 120~130% of max. discharge pressure of pump.
- In case the actual operating pressure is considerably lower than the max. discharge pressure of the pump or the internal pressure of the installed piping accessories is lower, adjust the setting pressure of the relief valve in order to meet the field condition by adjusting the control nut (Relief) with the control tool.

2 Control of Oil Supply Valve

- After the actuation of relief valve, working oil(silicon oil) becomes insufficient in the working oil chamber. Accordingly, the pressure in the chamber falls downs to negative in process of suction and the oil is to be supplied to the chamber by pushing the oil supply valve several times until the relief valve actuate once more.
- When vapor comes in the chamber(the actual flow rate becomes lower than it' s intended flow rate), push several times the valve for vapor to come out.
- Resetting of oil supply valve is not required even though the relief valve actuate again. If the factory setting were changed indeliberately, fasten the control nut(suction) until the oil supply valve can not be pushed, then loosen the control nut(suction) 2~3 turns.







Note) Silcon oil in the rear of the working oil chamber is same with the oil in the hydraulic regulator. According to the reciprocating motion of the piston, oil level in the regulator is also up and down. It does not affect pump operation and it is definitely distinguished from sudden rise of oil level caused by actuation of relief valve.
However, in case of KH-14 & 24, there is no fluctuation of oil level during normal operation.

10-6 Restart of Pump

1 In case of stop of pump operation for short period(less than 1 week), it is no problem to start the pump at a desired stroke length & prescribed discharge pressure.
2 However, in case of stop of pump operation for a long period(over 1 week), pump should be run at 0% stroke length & no load for 10 minutes before going into normal operation.
Do not start regular operation before above warming up.
3 It is concern that pump is damaged by freezing during winter season.
Without regard to stop period of operation, drain the liquids in the piping and pump by operating dry run after opening the drain valve on the suction piping.

10-7 Cautions in Operation

1 When foreign substances lay on the ball seat in the pump, it may cause no pumping or no rise of discharge pressure.
2 Air in the Air Chamber is dissolved into the liquid because air is constantly contacting the liquid.
As the time goes by, and air decrease little by little and finally the air chamber can' t be functioned sufficiently.
Therefore, supplement air into the Air Chamber periodically.

11 Maintenance

⚠ Warning

- Turn off the power and stop the pump & other equipments when repairing or disassembling pump, otherwise it may cause electric shock.
- Be careful of big accidents occur caused by inserting fingers or cloth in rotator.

⚠ Caution

- Wear suitable protective clothing during assemble and disassemble work.
- Work after releasing pressure from discharge piping and remove liquid from Liquid End Part prior to repair or maintenance of pump.

11-1 Check before Operation

- Check the level of liquid tank and, if it is insufficient, supplement the liquid.
- Check if the suction & discharge valve are opened.
- Check if piping is safe and undamaged.
- Check electrical wiring if there are no electrical short & disconnection.

11-2 Check during Operation(Daily inspection)

1 Check the level of liquid tank and, if it is insufficient, supplement the liquid. Specially, be careful in the process which handle the chemical solution or required Air-Free circumstance.
2 Check if liquid or air is leaked out the Joint or other parts. If necessary, fasten it again.
If leakage doesn't stop, check O-ring and/or Packing of each parts and replace the damaged O-ring and/or Packing with new one.

3 Check if noise sounds from the motor or pump.
4 Check if the oil in the driving part is sufficient or leaky. If insufficient, refill the oil up to regulated level of the oil level gauge.
5 Check if there is no problem in the setting discharge rate & discharge pressure.
6 Check if the pressure gauge is normal.
7 If there is standby pump, operate it from time to time and maintain it for using it any time.

11-3 Stop of Operation for Long Time

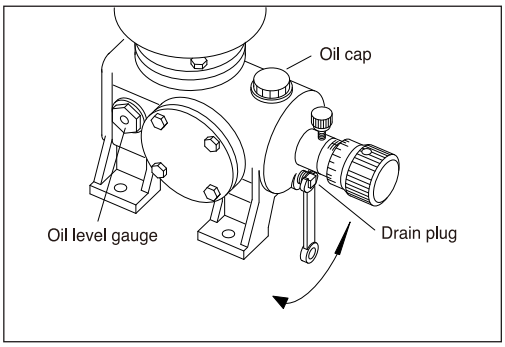
1 Wash inside Pump Head of suction side and flush water or cleansing solution through Pump Head for about 30 minutes.
2 Put the cover on the pump to protect the pump from dust and/or corrosion.
3 Set the dial at 50% of stroke length in order to prevent deformation of diaphragm.
4 Check foreign substances lay on the Check Ball and/or Ball Seat before restarting the pump

11-4 Other maintenance

1 When diluted liquid is used at freezing place in the winter, install HEAT TRACING to prevent the pump from freezing because it causes the damage of the pump & other devices with freezing on the liquid end part of pump and inside piping.
2 Clean the inside of Tank and Joint every 3 months at least.

11-5 Supplement of oil

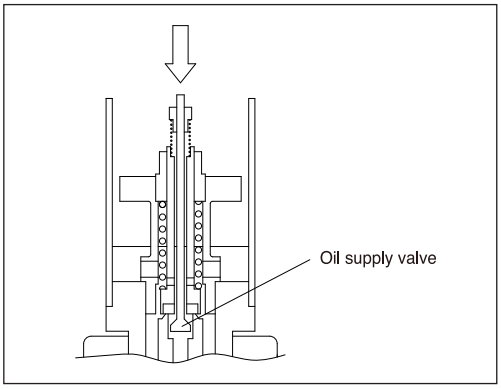
1 Change of oil in the driving part
① Changing interval
Change oil after 500 hours when initial operation after buying it, and thereafter, change oil every 4,000 hours of continuous operation.
However, when emulsification or deterioration of the oil occurs, change the oil immediately.
② Changing method
Loosen the plug (square) with spanner and drain the used oil. Next, clean the inside with flushing oil. refill new oil slowly through the oil inlet(Oil Cap) up to the regulated level(Red points) of the oil level gauge after fastening the plug.
③ Recommended oil quantity
④ Recommended oil
Omala oil #220 of Shell company (※ Used by our company)
Mobile gear oil #220 of Mobile company
Sparta #220 of ESSO Company
Other ISO VG220, SAE90 density equivalent gear oil



Model	KHV-51~72	KHH-51~72	KHV-13~63	KHH-13~63	KHV-33H~24
Oil Quantity	230 mL	240 mL	1.6 L	2.3 L	2.7 L

2 Change of Working Oil(Silicon Oil) in the hydraulic part
①Changing interval : When changing Piston O-ring
②Changing method
- Tighten the drain bolt located at the bottom between the working oil chamber and gear box flange together washer(seal).
- Loosen the bolt (wrench) at the top of the hydraulic regulator and remove the cover of the regulator.

- Loosen the adjusting nut of the relief valve completely and adjust the dial to max. stroke length and operate pump.
- Vent the air inside of the working oil chamber completely while refilling the regulated amount of oil by small and small..
- Oil can be injected smoothly by pushing the supply valve about 2~3mm.
- After stopping the pump, adjust the dial to min. stroke length and tighten the adjusting nut of the relief valve.
- After adjusting the dial to max. stroke length again, operate the pump and set the pressure of the relief valve.



③ Quantity of working oil to be changed

Model	KH-51,12	KH-32,72	KH-13,23	KH-33,63	KH-33H,63H	KH-14,24
Oil Quantity	55 mL	60 mL	300 mL	335 mL	700 mL	950 mL

④ Recommended Working oil
Silicone oil (viscosity : 100cSt, the viscosity temperature coefficient 0.59)

12 Cause of Trouble and Troubleshooting

Trouble	Cause	Troubleshooting
No working	Circuit breaker is open or fuse is broken	Check the cause and take action
	Cable is disconnected	Connection or replace
	Wrong wiring	Check the wiring diagram
	Low voltage	Check the voltage and take action
	Bad insulation	Replacement
	Damaged eccentric bearing	Check or replacement
	Damaged reduction gear	Check or replacement
Working but not discharging	Tank is empty	Fill up liquid
	Cavitation occurs at the pump	Check the cause and take action
	Air flow in the suction side piping	Check the piping and repair
	Precipitates are accumulated in the piping	Clean the piping and check the status of liquid
	Ball seat is clogged by foreign substance	Wash the ball seat & install strainer after checking
	Leakage from the safety valve	Readjust set pressure and check & repair
Insufficient discharge Volume	Low speed of motor rotation	Check the voltage frequency and wiring
	Incorrect calibration of discharge volume	Check the method of measurement and measuring device
	Insufficient suction pressure	Raise liquid level of supply tank and enlarge pipe diameter
	Insufficient Discharge pressure	Install back pressure valve

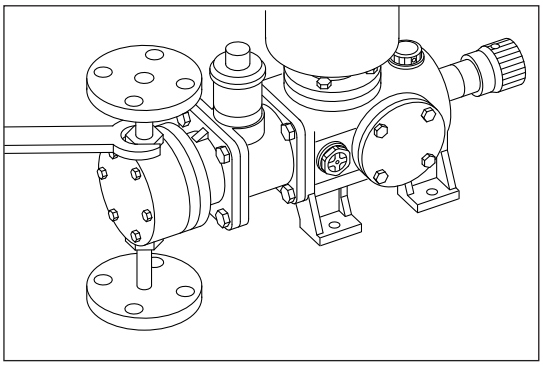
Trouble	Cause	Troubleshooting
insufficient discharge volume	Clogging of suction piping	Clean the piping
	Air flow in suction piping	Check the piping and repair
	Ball seat or check ball gets dirty or is damaged	Washing or replacement
	Leakage from the piping and liquid end part of the pump	Repair after checking
	O-ring of piston is worn out or hardened	Replacement
	Low setting pressure of relief valve in hydraulic regulator	Readjustment (Within the limit of the pump design)
	Low oil level of the working oil	Supplement of working oil
	Diaphragm is aged or damaged	Replacement
	Chemical change occurs in the working oil	Check the load of pump and Temperature
Overheating of motor	Wrong wiring	Check wiring diagram
	Overload of the motor	Check and adjust discharge piping
	Low voltage	Check the voltage and take action
	Trouble in driving part	Check wear and corrosion of the parts of driving unit
Noise or vibration from the piping	Piping length is too long or pipe diameter is too small.	Adjust piping or install air chamber
	Air in the air chamber is reduced	Supplement air
	Capacity of air chamber is insufficient.	Replace after checking the specification of air chamber.
	Cavitation phenomenon occurs in the dosing liquid	Take action after checking NPSH
Leakage of lubricating oil	Lubricating oil is overfilled	Check oil level and adjust
	Oil seal is damaged	Replacement
	Lubricating oil is contaminated	Check the cause and replace
	Clogging of the vent in oil cap	Remove the pin of the oil cap
Large leakage of liquid	Damaged pressure gauge	Replacement
	Damaged diaphragm	Replacement
	Damaged o-ring & packing of valve or faulty	Replacement
Noise or abnormal heat from driving part	Ambient temperature is too high	Improve installation conditions
	Setting pressure of relief valve is high	Readjust within the limit of pump design
	Bearing is damaged	Replacement after checking
	Warm gear is damaged	Replacement after checking
	Spring is broken	Replacement after checking
	Insufficient or excessive lubricating oil	Reduce or refill Lubricating oil to the regulated level
	Coupling rubber is worn out	Readjustment after replacement
	Lubricating oil is unsuitable	Replacement with the regulated quality of oil
	Overload	Check discharge piping and adjust
	Hydraulic regulator does not run	Check cause and adjust

13 Replacement of Parts

> ⚠ Caution
>
> • Wear suitable protective clothing during assembly and disassembly work.

Refer to section 18「Structure and Name of Each Parts」 when assembly or disassembly.

13-1 Replacement of Ball Seat, Ball Guide and Check Ball



1 Disassembly

- Disconnect the piping of suction & discharge from the pump.
- Loosen the union nut of suction & discharge side and Disassemble each parts.
  Be careful of flowing out the remaining liquid when disassembly.
- Check the damage & sticking of foreign substances on the each parts and replace or wash if necessary.

2 Assembly

- Refer to the section 18「Structure and Name of Each Parts」 during assembly and be careful not to change upper part and lower part reversely.
- Tighten the union nut firmly after connecting counter piping at the state which union nut is temporarily assembled
- If gasket or packing is damaged, although tighten parts, leakage may occur.
  Be careful that gasket or packing don't be damaged.

> ⚠ Caution
>
> • Be careful to assemble valve parts 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

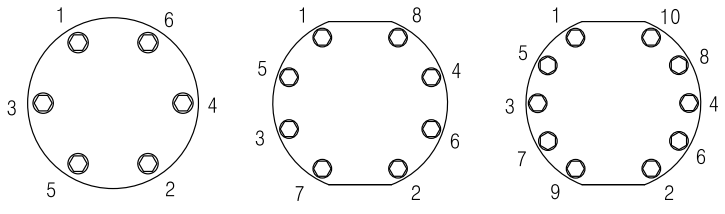
13-2 Replacement of Pump Head

1 Disassembly

- Disconnect the piping from the joint of suction and discharge side.
- Loosen the head fixing bolts with spanner etc.
- Grip on the upper & lower joint and pull out the head while turning the head from side to side to detach it easily.

2 Assembly

- Tighten the head fixing bolts up to 0.2mm gap between the pump head and the surface of strong pressure ring.
- Assemble the head in the order of following picture and tighten the bolts with equal torque.

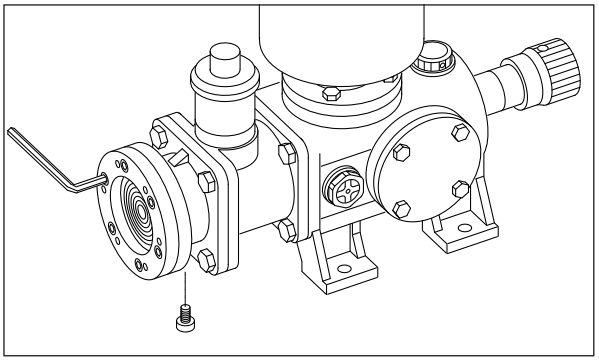


Model	KH-51~72		KH-13~63		KH-14, 24	
	PTC·FTC	STS	PTC·FTC	STS	PTC·FTC	STS
Torque N·m(kgf·cm)	2.9(30)	3.9(40)	9.8(100)	11.8(120)	11.8(120)	14.7(150)

13-3 Replacement of Diaphragm

1 Disassembly

- Remove the drain plug located at the bottom of working oil chamber with wrench spanner and drain the silicon oil into the beaker.
- Oil can be drained smoothly by pushing the supply valve.
- Disassemble the head in accordance with the explanation in the article 11-2.
- Diaphragm can be easily detached by removing wrench bolt of the strong pressure ring.
- If the shape of diaphragm is inflated & twisted partially, it reached the limit of service life by the fatigue, so it has to be replaced.



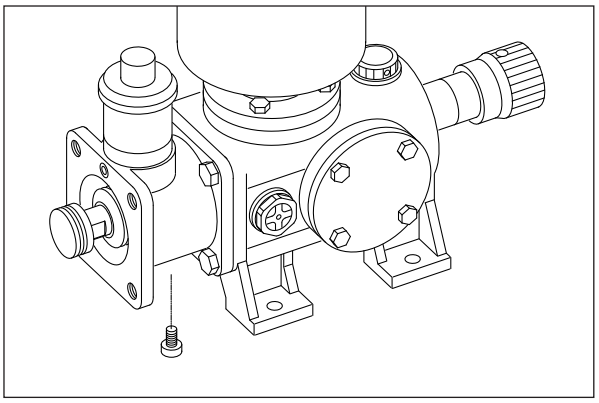
2 Assembly

- Insert diaphragm to strong pressure ring which convex surface of diaphragm can be faced to the front and tighten wrench bolts as assembly sequence of the head bolt.
- Reassemble in the reverse order of the disassembly.

13-4 Replacement of Piston and O-ring

1 Disassembly

- Disassemble diaphragm according to article 13-3.
- Remove the drain bolt located at the bottom of gear box flange with wrench spanner and drain the lubricant oil in the beaker.
- Loosen the bolts fixed between the working oil chamber and gear box flange.
- pull out the working oil chamber while turning the working oil chamber from side to side to detach it easily.
- forward the piston up to the max. front by turning the motor fan and detach the piston with spanner after disassembling the set screw fixed on the piston.



2 Assembly

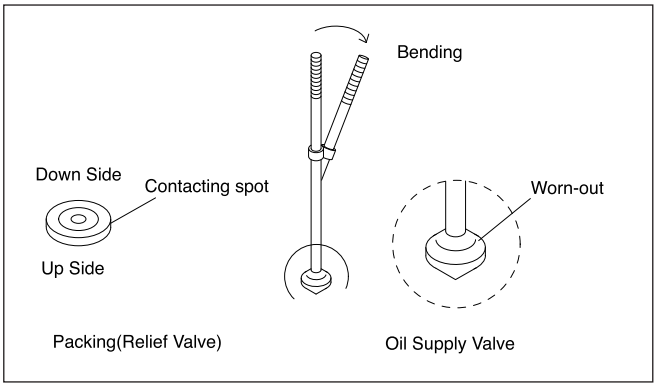
- After assembling piston and O-ring (including back-up ring), mount the bellows on the circular groove of the gear box flange.
- Check whether the gasket & pushing which should be assembled to the top of the contact surface are mounted or not, when assembling working oil chamber.
  Note) Please cover the Piston O-ring with lubricant before assembly.

13-5 Replacement of hydraulic regulator

1 Disassembly

- After removing drain bolt located at the bottom of gear box flange with wrench spanner, drain the silicon oil into the beaker.
- After removing the fixing bolt of the hydraulic regulator cover, disassemble the regulator cover and the tube.

- Loosen the control nut (suction) & the control nut(relief) completely with adjusting tool.
- When loosen regulator guide, the supply valve & the relief vale will be disassembled.
- If oil supply valve is bent or warn out, replace it.
- If the packing assembled to relief valve is seriously damaged, replace it.
- The regulator base can be easily detached from gear box flange with adjusting tool.



[2] Assembly

- Reassemble in the reverse order of the disassembly.
- Supply silicon oil in accordance with the article 11-5 and set relief pressure in accordance with the article 10-5.

14 Consumable parts and Spare parts

14-1 Consumable parts

Parts name	Q'ty	Recommended replacement period
Check Ball	2	1 year
Diaphgram	1	4000 hour
Ball Guide	2	1 year
Ball Seat	2	1 year
O-ring·Packing	2	1 year
Gaasket(Valve)	6	1 year
Packing(Relife Valve)	1	1 year
O-ring(Piston)	1	4000 hour
Oil Seal	1	1 year

Note) 1. The quantity is for 1 unit of Pump.
2. The recommended replacement period is not guaranteed.
The period may depend on the using condition.

14-2 Spare Part

[1] Spare parts for 3 years

- Bearing
- Gasket(Driving parts)
- Warm gear (Warm, Warm wheel)
- Coupling rubber (Horizontal Driving part)
- Supply valve (Hydraulic regulator)

[2] Spare parts for over 3 years

- Motor
- Coupling (Horizontal Driving part)
- Slider Shaft

15 Warranty

⚠ Warning

If the pump is reconstructed arbitrarily or the undesignated parts are used into the pump, Cheonsei will not warrant and Chensei is not responsible for any expense caused by accident or trouble.

1 Warranty period is one year from purchase date.
2 During warranty period, repair or change of pump is free of charge, if trouble or damage of pump due to design or manufacturing of CHEONSEI.
3 Repair or change product due to following reasons will be charged regardless the warranty period.
① Trouble or damage of pump expired warranty period.
② Trouble of using by careless handling.
③ Trouble or damage due to using non-designated part & reconstructing the pump arbitrarily.
④ Trouble by fire or natural disaster

16 Repair Service

⚠ Caution

- When the pump is sent to factory for repair service, clean out inside of pump.
- Do not send the pump, if the pump has been used for harmful & fatal liquid to health.

1 Contact to CHEONSEI or local distributor as shown on back of the manual, if you have any problem or questions.
2 If you want to repair, please inform the following.
① Model Name & manufacture number written in name plate
② Used period, using condition, state, and transfer liquid
3 If warranty period is over, it may charge according to repair part. Please contact with sales agent for more information.
4 Minimum retention period of parts for repair is 5 years from the date of production.

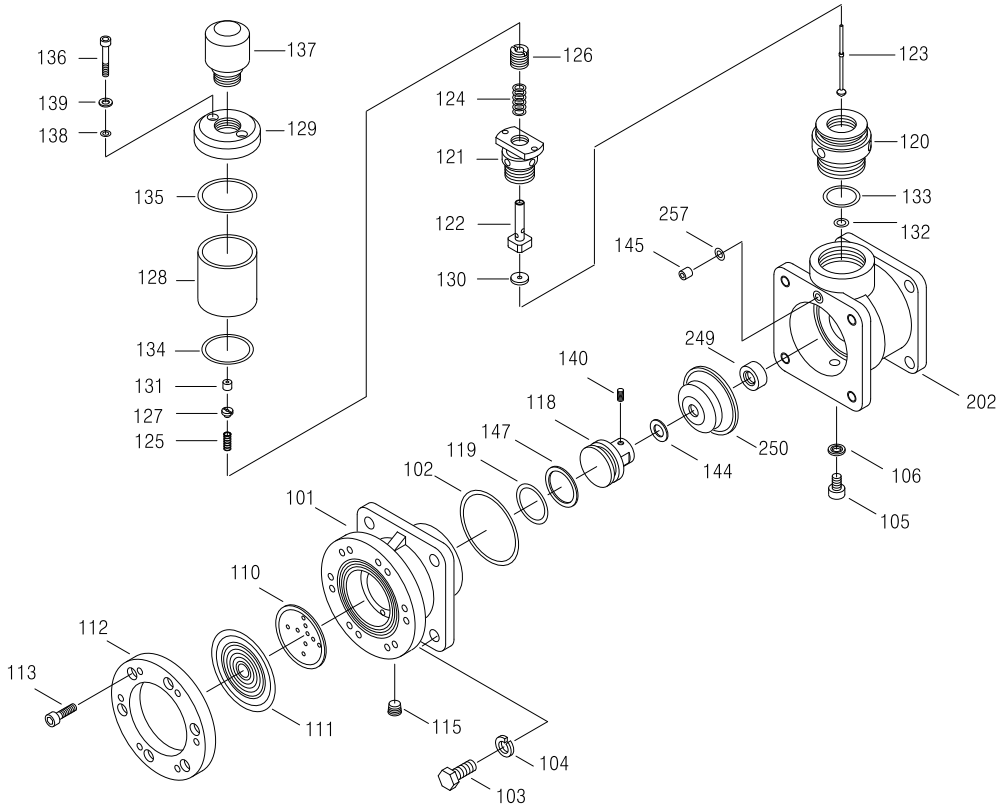
17 Accessories

1 Back Pressure Valve
According to the conditions of the piping, the discharge rate may be excessive or the pumping liquid may be continuously leaked in spite of stopping the pump which is caused by overfeed or siphon phenomena. The back pressure valve is for preventing such things.
2 Safety Valve(Relief Valve)
When the discharge pressure increases to more than a setting point due to choking the valve with debris or closing the valve, the safety valve will open automatically to relieve the pressure.
Relief valve prevents pump and piping from damages.
3 Air Chamber
Reciprocating pump has a peculiar pulsation which results in vibration of piping and overfeed phenomena.
Air chamber will be used to solve such problems caused by pulsation.

18 Structure and Name of Each Parts

18-1 Hydraulic Part

1 Model : KH-51, 12, 32, 72, 13, 23, 33, 63



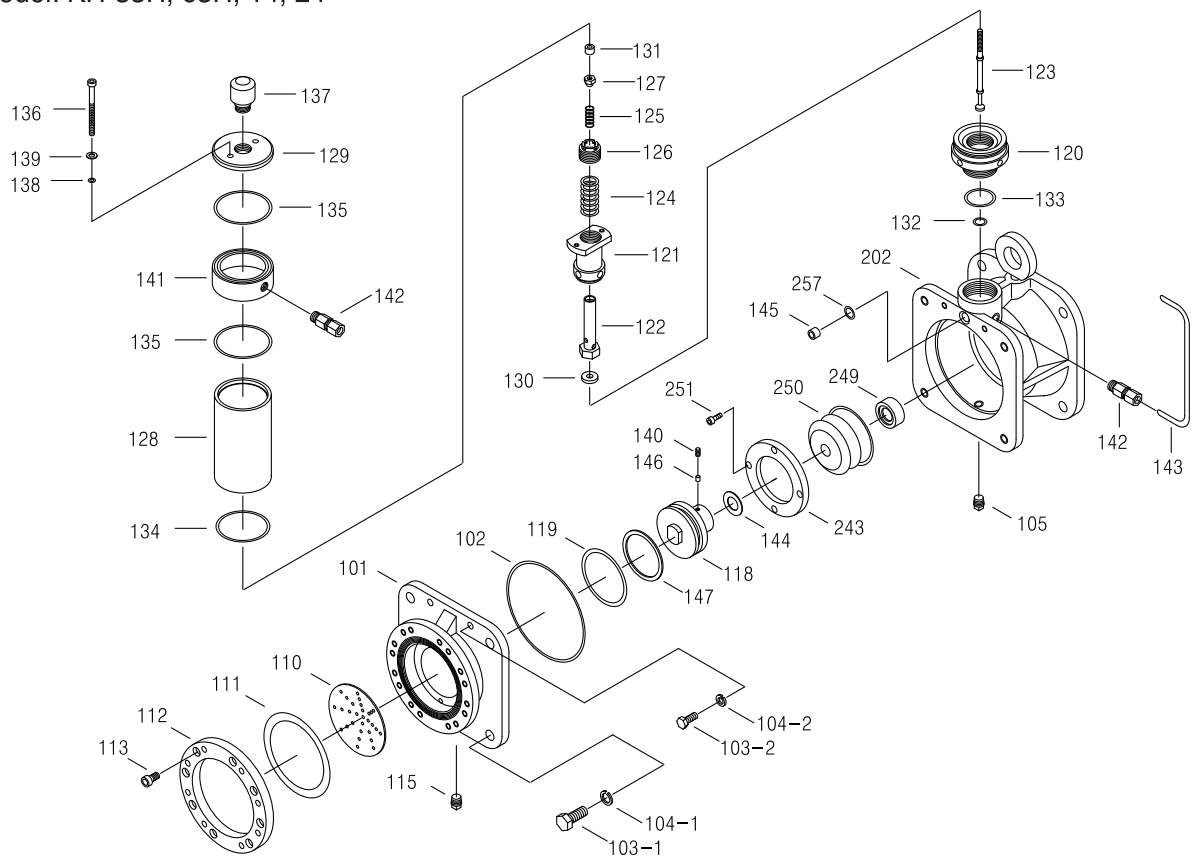
NO.	Part Name	Q'ty
101	Silicon Oil Chamber	1
102	O-ring	1
103	Bolt(Hex. head)	4
104	Washer(Spring)	4
105	Bolt(Wrench)	1
106	Washer(Seal)	1
110	Back-up Plate	1
111	Diaphragm	1
112	Strong Pressure Ring	1
113(1)	Bolt(Wrench)	6(8)
115	Plug(Wrench)	1
118	Piston	1
119	O-ring	1
120	Adjuster base	1

NO.	Part Name	Q'ty
121	Adjuster Guide	1
122	Relief Valve	1
123	SupplyValve	1
124	Spring(Relief)	1
125	Spring(Suction)	1
126	Adjust Nut(Relief)	1
127	Adjust Nut(Suction)	1
128	Adjuster Tube	1
129	Adjuster Cover	1
130	Packing(Relief Valve)	1
131	Fixing Ring	1
132	O-ring	1
133	O-ring	1
134	O-ring	1

NO.	Part Name	Q'ty
135	O-ring	1
136	Bolt(Wrench)	2
137	Oil Cap	1
138	O-ring	2
139(2)	Washer(Flat)	2
140(2)	Bolt(Set Screw)	1
144	Packing(Piston)	1
145	Bushing	1
147	Back-Up Ring	1
202	Gear Box Flange	1
249	Sleeve	1
250	Bellows	1
257	Gasket(Silicon Oil Chamber)	1

Notice) 1. ( ) Q'ty For only KH-13~63
2. For only KH-13~63

2 Model: KH-33H, 63H, 14, 24



NO.	Part Name	Q'ty
101	Silicon Oil Chamber	1
102	O-ring	1
103-1	Bolt(Hex. head)	4
103-2	Bolt(Hex. head)	2
104-1	Washer(Spring)	4
104-2	Washer(Spring)	2
105	Plug(Hex. head)	1
110	Back-up Plate	1
111	Diaphragm	1
112	Strong Pressure Ring	1
113(1)	Bolt(Wrench)	8(10)
115(2)	Plug(Wrench)	1
115(3)	Plug(Hex. head)	1
118	Piston	1
119	O-ring	1
120	Adjuster Base	1
121	Adjuster Guide	1

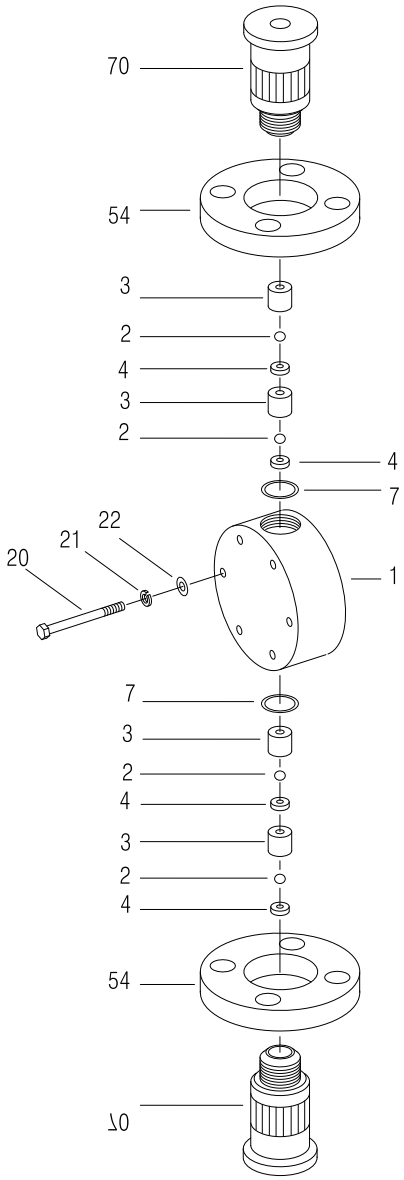
NO.	Part Name	Q'ty
122	Relife Valve	1
123	Supply Valve	1
124	Spring(Relief)	1
125	Spring(Suction)	1
126	Adjust Nut(Relief)	1
127	Adjust Nut(Suction)	1
128	Adjuster Tube	1
129	Adjuster Cover	1
130	Packing(Relief Valve)	1
131	Fixing Ring	1
132	O-ring	1
133	O-ring	1
134	O-ring	1
135(1)	O-ring	1(2)
136	Bolt(Wrench)	2
137	Oil Cap	1
138(2)	O-ring	2

NO.	Part Name	Q'ty
139(2)	Washer(Flat)	2
139(3)	Washer(Seal)	2
140	Bolt(Set Screw)	1
141(3)	Central Ring	1
142(3)	Male Connector	2
143(3)	Cupper Pipe	1
144	Packing(Piston)	1
145	Bushing	1
146(3)	Break Pin	1
147	Back-up Ring	1
202	Gear Box Flange	1
243	Bellows Guide	1
249	Sleeve	1
250	Bellows	1
251	Bolt(Wrench)	4
257	Gasket(Silicon Oil Chamber)	1

Notice) 1. ( ) Q'ty For only KH-14,24
2. For only KH-33H,63H
3. For only KH-14,24

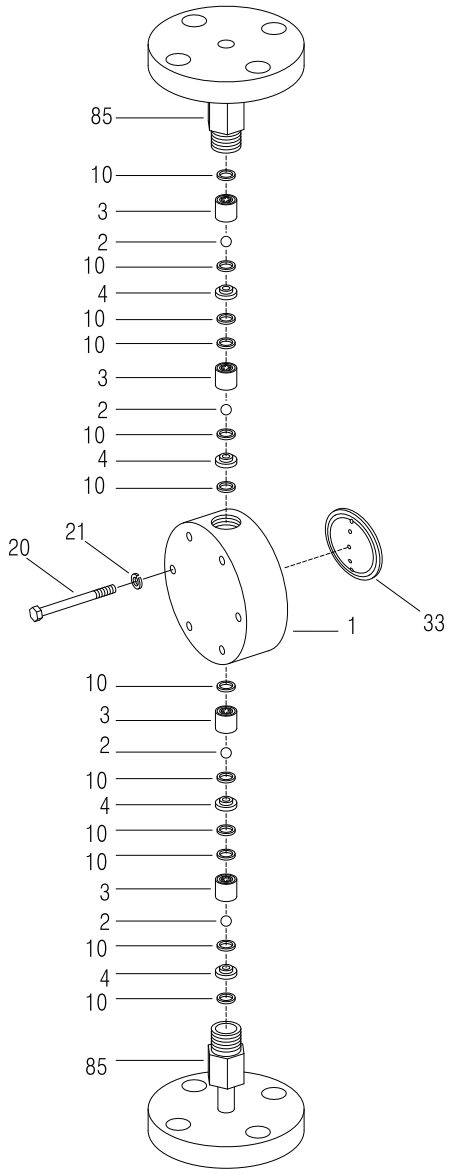
18-2 Liquid End Parts

1 Model: KH-51, 12-P□□, F□□



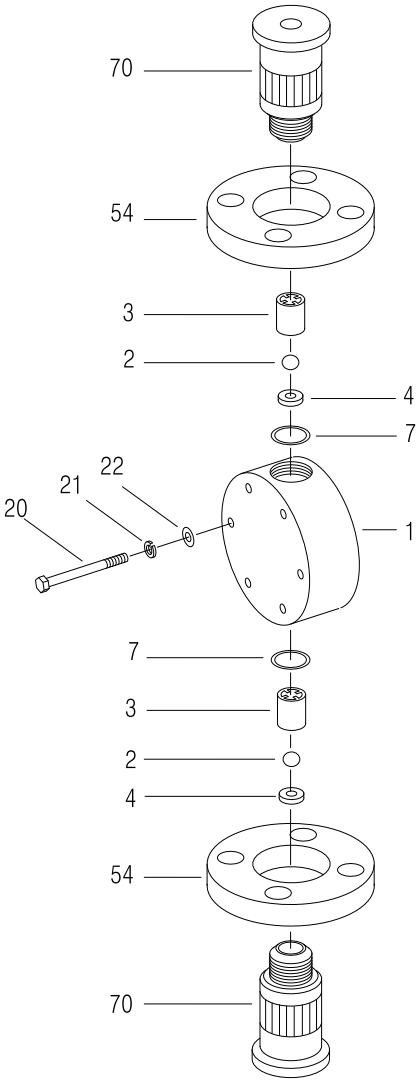
NO.	Part Name	Q'ty
1	Head	1
2	Check Ball	4
3	Ball Guide	4
4	Ball Seat	4
7	O-ring	2
20	Bolt(Hex. head)	6
21	Washer(Spring)	6
22	Washer(Flat)	6
54	Flange	2
70	Joint	2

2 Model: KH-51, 12-S□□, 6□□



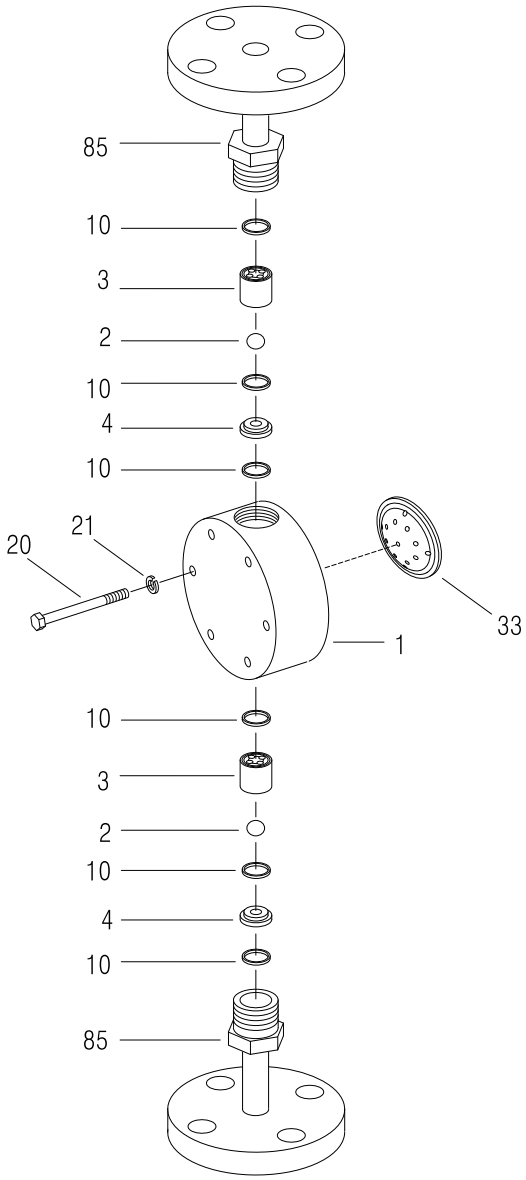
NO.	Part Name	Q'ty
1	Head	1
2	Check Ball	4
3	Ball Guide	4
4	Ball Seat	4
10	Gasket(Valve)	12
20	Bolt(Hex. head)	6
21	Washer(Spring)	6
33	Front Plat	1
85	Joint(Flange)	2

3Model: KH-32, 72-P□□ , F□□



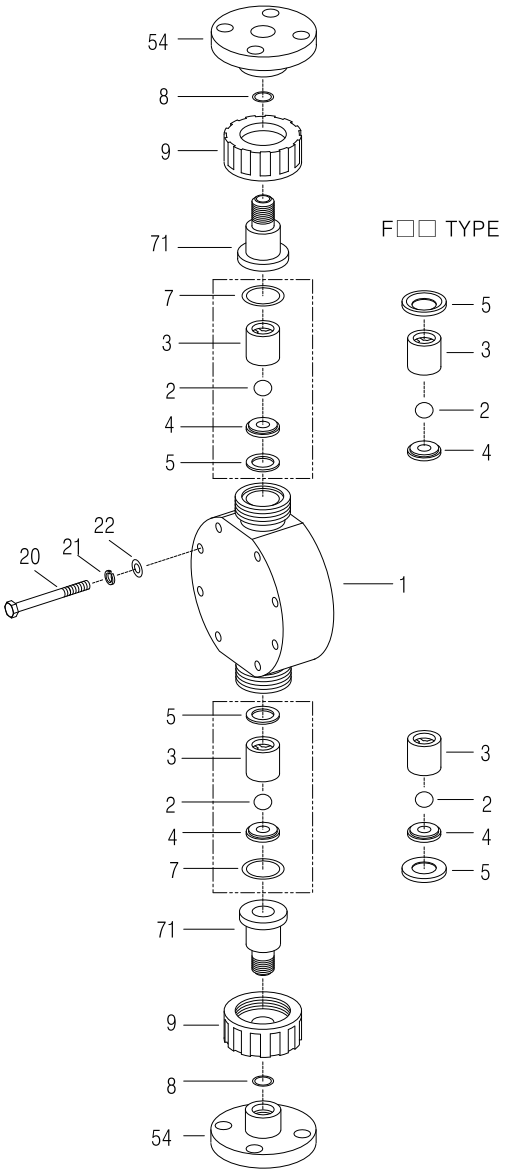
NO.	Part Name	Q'ty
1	Head	1
2	Check Ball	2
3	Ball Guide	2
4	Ball Seat	2
7	O-ring	2
20	Bolt(Hex. head)	6
21	Washer(Spring)	6
22	Washer(Flat)	6
54	Flange	2
70	Joint	2

4Model: KH-32, 72-S□□ , 6□□



NO.	Part Name	Q'ty
1	Head	1
2	Check Ball	2
3	Ball Guide	2
4	Ball Seat	2
10	Gasket(Valve)	6
20	Bolt(Hex. head)	6
21	Washer(Spring)	6
33	Front Plat	1
85	Joint(Flange)	2

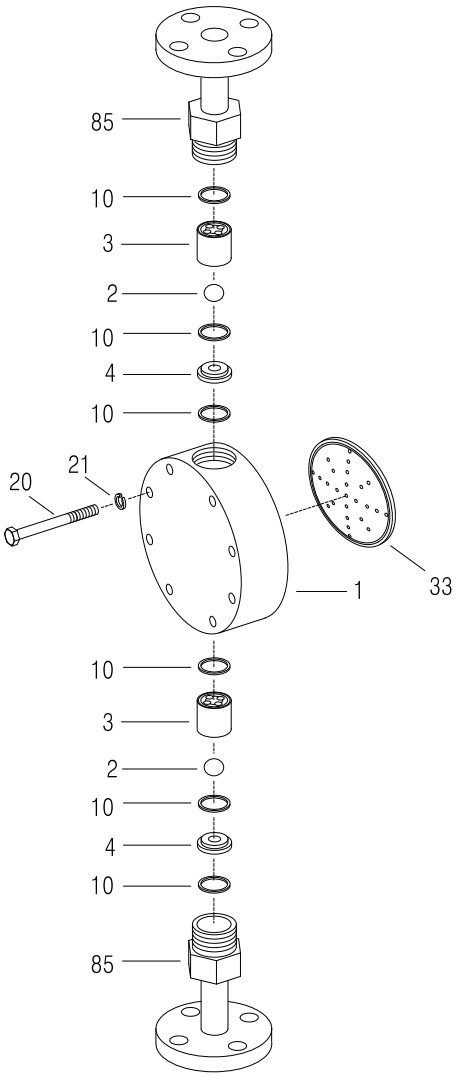
5 Model: KH-13, 23, 33, 63-P□□ , F□□



NO.	Part Name	Q'ty
1	Head	1
2	Check Ball	2
3	Ball Guide	2
4	Ball Seat	2
5	Packing	2
7	O-ring	2
8	O-ring(1) / Packing(2)	2
9	Union Nut	2
20	Bolt(Hex. head)	8
21	Washer(Spring)	8
22	Washer(Flat)	8
54	Flange	2
71	JointPipe	2

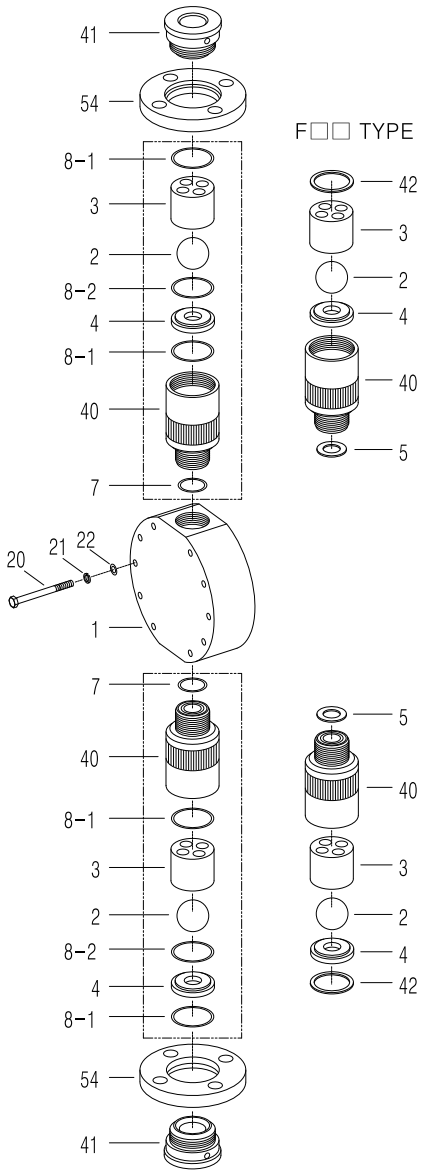
Notice) 1.For only P
2.For only F

6 Model: KH-13, 23, 33, 63-S□□ , 6□□



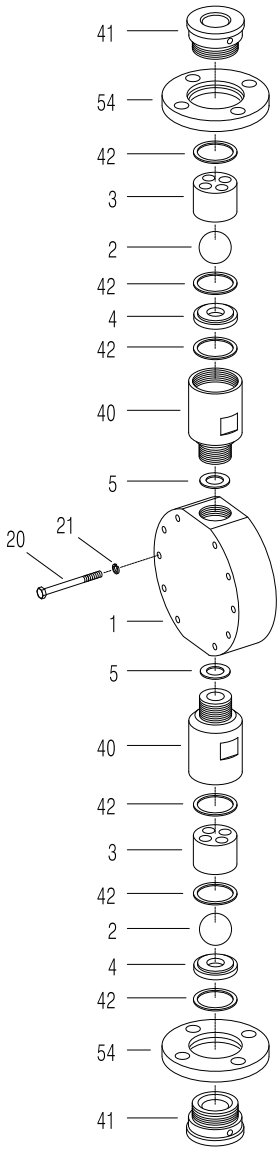
NO.	Part Name	Q'ty
1	Head	1
2	Check Ball	2
3	Ball Guide	2
4	Ball Seat	2
10	Gasket(Valve)	6
20	Bolt(Hex. head)	8
21	Washer(Spring)	8
33	Front Plat	1
85	Joint(Flange)	2

7 Model: KH-14, 24-P□□ , F□□



NO.	Part Name	Q'ty
1	Head	1
2	Check Ball	2
3	Ball Guide	2
4	Ball Seat	2
5	Packing	2
7	O-ring	2
8-1	O-ring	4
8-2	O-ring	2
20	Bolt(Hex. head)	10
21	Washer(Spring)	10
22	Washer(Flat)	10
40	Joint	2
41	Joint	2
42	Packing(Joint)	2
54	Flange	2

8 Model: KH-14, 24-S□□ , 6□□



NO.	Part Name	Q'ty
1	Head	1
2	Check Ball	2
3	Ball Guide	2
4	Ball Seat	2
5	Packing(Head)	2
20	Bolt(Hex. head)	10
21	Washer(Spring)	10
40	Joint	2
41	Joint	2
42	Packing(Valve)	6
54	Flange	2

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