NIKKISO

Metering Pump

ADONY Series AH

Instruction Manual

Recommendation

1. **Make sure to read this Instruction Manual before unpacking, installation, wiring, operation and maintenance.**
2. **Keep this instruction manual in a place that allows for easy access by an operator.**
3. **We assume no responsibility in use of this pump outside the contracted specifications.**

SHUN EIKO CO., LTD.

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Table of Contents

1. Using The Pump Safely

1.1 How to use this manual

This instruction manual uses the symbols below for important matters so that you can use NIKKISO ADONY Series AH pumps correctly and safely. Since all items are important for your safety, be sure to follow them.

WARNING

The WARNING mark indicates a dangerous situation that may result in serious injury or even death if you ignore this mark and misuse the equipment.

CAUTION

The CAUTION mark indicates a hazardous situation that may result in bodily injury and/or physical damage if you ignore this mark and misuse the equipment.

NOTE

The NOTE mark indicates information that should be heeded in order to ensure the performance and long life of the equipment.

MEMO

The MEMO mark indicates a supplementary explanation.

ADVICE

The ADVICE mark indicates information for your reference.

1.2 Operational conditions

CAUTION

Using the equipment outside of these conditions for use may lead to a failure.

Use the pump under the following conditions:

- Environmental temperature: –10°C to +40°C
- Relative humidity: ≤85%
- Liquid temperature: PVC:+5°C to +45°C,SUS:+5℃ to +70℃
- Viscosity: ≤50 mPa·s
- Do not use the pump with slurries.

1.3 Operational safety

1.3.1 Precautions for installation

⚠ WARNING

In a volatile gas atmosphere, use a pump in which an explosion-proof motor is installed that can be used in the atmosphere. Using a motor that is not explosion-proof can cause injuries or fire.

⚠ CAUTION

- **As a ground terminal is attached to the motor, make sure to ground the pump at a Class III earth resistance of 100 Ω or lower. Otherwise, an electric shock or fire may occur.**
- **It is recommended to install a ground fault circuit interrupter of 30 mA or lower in the electrical circuit that turns ON and OFF the motor power. Electricity leakage can cause fatal accidents.**
- **It is recommended to install an overcurrent protective device in the electrical circuits.**
- **Use the pump at a discharge pressure that is lower than the pressure indicated on the nameplate. If the liquid ends are damaged due to high discharge pressure, chemicals may leak.**
- **Make sure to install a relief valve on the discharge piping.**
- **If there is a possibility that liquid may freeze, use insulation or drain the liquid to prevent freezing.**
- **Completely tighten piping and joints to prevent liquid leakage.**

1.3.2 Precautions for operation

⚠ CAUTION

- **Keep the discharge piping unclogged. If a relief valve is not installed, the pressure inside the pump can increase and the pump may become damaged.**
- **Do not lock the valve on the discharge piping. If a relief valve is not installed, the liquid ends can be damaged and the liquid may leak.**
- **Do not insert your fingers or tools into the motor fan. Doing so can cause injuries.**
- **As the motor may overheat with fluctuations of the power voltage or overcurrent due to three-phase voltage imbalances, check the current periodically.**
- **If a protective device is activated and the pump shuts off automatically, make sure to remove the cause and then restart the pump.**

1.3.3 Precautions for assembly and disassembly

⚠ CAUTION

- **Turn OFF the power and check that the pump operation has been stopped before performing assembly and disassembly. Otherwise, injuries can occur.**
- **Even after the pump has been stopped, the pressure remains inside the piping and pump and the liquid may blow out when the piping is removed. Make sure to wear protective clothing, glasses, and gloves. Some liquids can cause injuries or burns.**

2. Unpacking

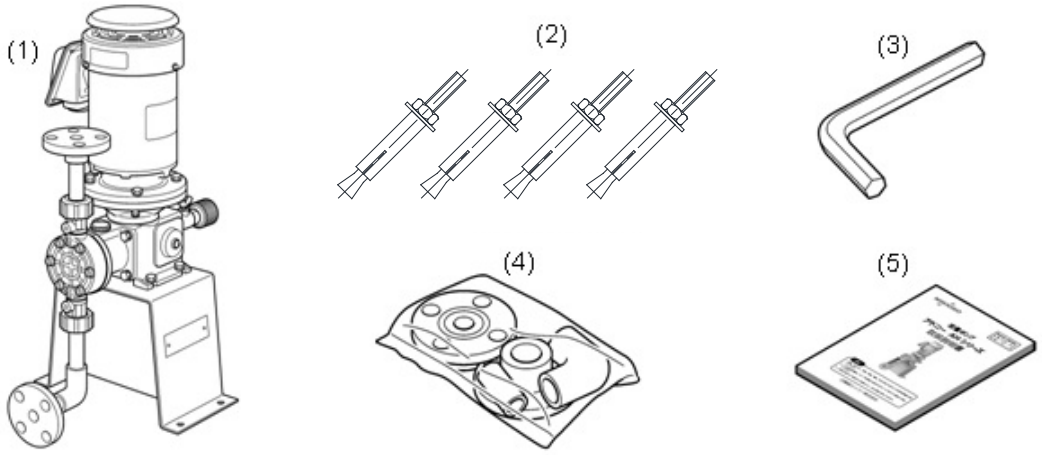
Unpack the equipment and check that it corresponds to your order based on the items below.

1. The model number is the one you ordered (see Section 3. “Model”, on page 4 for information about model number).
2. There was no damage during shipment from an accident or other cause, and no loose bolts or other fasteners.

Packaged items

No.	Part name		Pump model						
			AHA		AHB		AHC		AHD
			01 ∫ 32	41 ∫ 52	41 ∫ 62	71 ∫ 72	51 ∫ 62	71 ∫ 72	81 ∫ 82
(1)	Pump		1						
(2)	All Anchor	¼″ × 2½″	4				—	—	—
		⅜″ × 2½″	—	—	—	—	4		
(3)	Hex wrench		1	1	1	—	1	—	—
(4)	Flange set*	Flange 15AJIS10K	2	—	—	—	—	—	—
		Elbow 15 A	1	—	—	—	—	—	—
		Pipe 15 A, 50 mm	1	—	—	—	—	—	—
(5)	Instruction manual		1						

∗The suction and discharge ports are designed for flange type piping.



NOTE

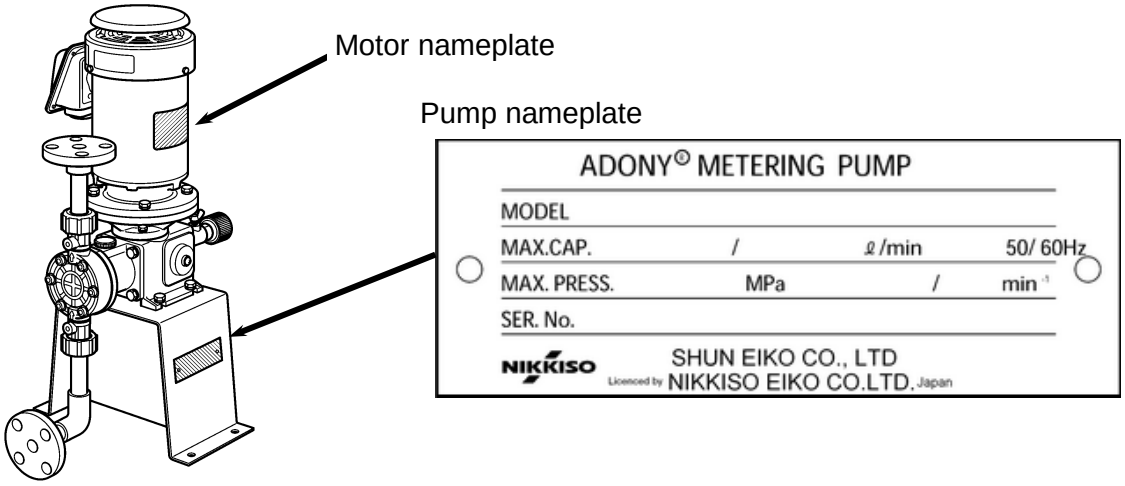
- **If you have any questions, please contact your distributor or the sales office, representative office, or company head office found on the back of this manual.**
- **If damage or an abnormality is found, please attach an accident certificate from the transport company and send it to NIKKISO EIKO immediately.**

ADVICE

If you store the pump temporarily instead of using it immediately after unpacking, then keep it in a location with good ventilation and free from dust.

3. Model

The model on the pump nameplate consists of the following items.



MODEL AH | A | 3 | 2 – P | C | E – F | W | 2 | E | SP

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)

(1) Series

(2) Pump model

Symbols	Motor power
A	0.18 kW (0.37 kW[*1])
B	0.37 kW
C	0.75 kW (1.5 kW[*2])
D	1.5 kW

(3) Diaphragm diameter

Symbols	Outer diameter (Stroke length)
0	φ42 mm (2 mm)
1	φ42 mm (4 mm)
2	φ65 mm
3	φ84 mm
4	φ120 mm
5	φ144 mm
6	φ170 mm
7	φ210 mm
8	φ234 mm

(4) Stroke count (Stroke per minute)

Symbols	Stroke count
1	48/ 58 spm
2	96/ 116 spm

(5) Diaphragm head

Symbols	Material
P	PVC
S	SUS304
M	SUS316
D	PVDF
T	PTFE

(6) Ball valve

Symbols	Material
C	Ceramic
S	SUS304
M	SUS316

(7) O-ring/gasket

Symbols	Material
E	EPDM[*3]
F	FPM[*3]
T	PTFE

(8) Connection (Suction/Discharge)

Symbols	Type
F	Flange
U	Union[*3]
H	Hose[*3]

(9) Motor (flange type)

Symbols	Pump model
W	TEFC-OUT (Totally Enclosed Fan Cooled Outdoor)
V	TEFC-OUT for inverter use
E	eG3: Exe II T3
D	d2G4: Exd II BT4
G	d2G4: Exd II BT4 for inverter use

(10) Multiples

Symbols	Description
None	Single pump
2	Double pumps

(11) Others

Symbols	Description
None	Standard
E	With electric servo
K	High viscosity specifications

(12) Special display

Symbols	Specifications
None	Standard specifications
SP	Special specifications

: Standard equipment: (The (5) and (6) SUS304 are semi-standard for AHA01 to AHB42.)

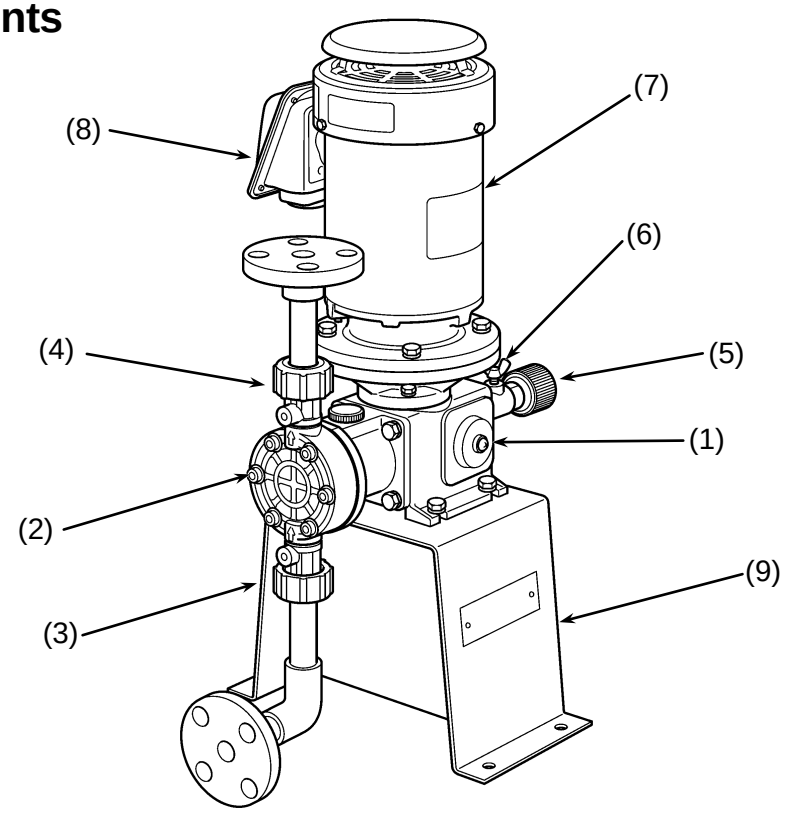
*1: When the AHA41 and 52 inverters are in use

*2: When the AHC71 and 72 inverters are in use

*3: Applicable when the diaphragm head for AHA01 to 32 is PVC

4. Components and Construction

4.1 Components

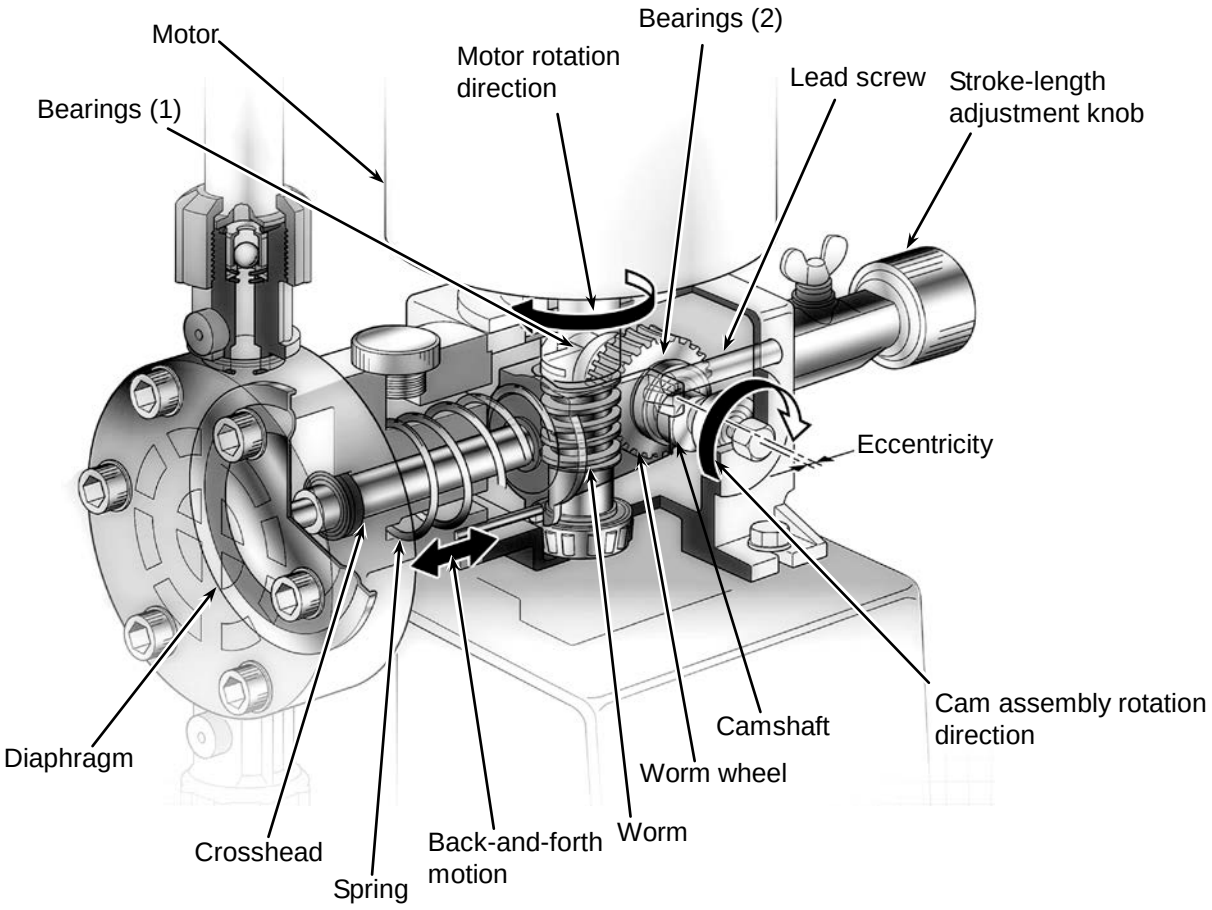


(1)	Pump power end:	Move the diaphragm in a back-and-forth motion.
(2)	Pump liquid end:	Perform suction and discharge using the back-and-forth motion of the diaphragm.
(3)	Suction port:	Connect the suction piping.
(4)	Discharge port:	Connect the discharge piping.
(5)	Stroke-length adjustment knob:	Vary the stroke length of the diaphragm's back-and-forth motion to adjust the flow rate.
(6)	Butterfly bolt (AHA, AHB):	
	Hexagon bolt (AHC, AHD):	Fix the stroke length.
(7)	Motor:	Power the drive unit.
(8)	Terminal box:	Connect the power cable. Wire to the source power (such as a control panel).
(9)	Pump base:	

4.2 Construction

The worm wheel of the cam assembly is rotated by the worm of the motor axle.
Two bearings are fastened eccentrically to the camshaft of the cam assembly.
The crosshead assembly is constantly pressed against the bearings through spring resistance.
When the camshaft turns, it pushes out the crosshead assembly through the eccentric movement of the bearings. Then the diaphragm at the end repeats a suction/discharge motion by the back-and-forth motion of the crosshead.

The end of the lead screw on the stroke-length adjustment knob is connected to the pushed out crosshead assembly.
Turning the lead screw and changing the crosshead assembly stroke length (the length pushed out) thus becomes the mechanism for adjusting the flow rate.



5. Specifications

(Specifications for room temperature and clean water)

Pump model		Diaphragm diameter (mm)	Stroke length (mm)	Stroke count (spm)		Capacity (L/min)		Max. discharge pressure (MPa)	Motor power (kW)	Diameter		
				50 Hz	60 Hz	50 Hz	60 Hz			Flange type	Union type	Hose type
AHA	01	ϕ42	2	48	58	0.035	0.042	1.0	0.18 or 0.2	JIS 10K 15 A	VP16	ϕ6 ID × ϕ11 OD
	11		4	48	58	0.07	0.084					
	12			96	116	0.14	0.17					
	21	ϕ65		48	58	0.23	0.28					
	22			96	116	0.46	0.56					
	31	ϕ84	8	48	58	0.9	1.1					ϕ9 ID × ϕ15 OD
	32			96	116	1.8	2.2					
	41	ϕ120	10	48	58	2.3	2.8	0.5		JIS 10K 20 A		
	42			96	116	4.6	5.6					
	51	ϕ144		48	58	3.3	4.0	0.3		JIS 10K 25 A		
	52			96	116	6.6	8.0					
AHB	41	ϕ120	12	48	58	2.8	3.3	0.7	0.37 or 0.4	JIS 10K 20 A		
	42			96	116	5.6	6.6					
	51	ϕ144	14	48	58	5.0	6.0	0.5		JIS 10K 40 A		
	52			96	116	10.0	12.0					
	61	ϕ170		48	58	6.25	7.5	0.3				
	62			96	116	12.5	15					
	71	ϕ210		48	58	9.5	11.5			JIS 10K 50 A		
	72			96	116	19	23					
AHC	51	ϕ144	14	48	58	5.0	6.0	0.7	0.75	JIS 10K 40 A		
	52			96	116	10.0	12.0					
	61	ϕ170	18	48	58	9.0	10.8	0.5				
	62			96	116	18.0	21.6					
	71	ϕ210	20	48	58	15.5	18.6	0.3		JIS 10K 50 A		
	72			96	116	31.0	37.2					
AHD	81	ϕ234	20	48	58	22.5	27.0	0.3	1.5	JIS 10K 65 A	VP65	
	82			96	116	45.0	54.0					

1MPa = 10.204 kg/cm²

Note 1: The flow rate shown in the table is for each pump at the maximum discharge pressure.

Note 2: The motor is a general-purpose vertical flange motor and is a standard three-phase totally enclosed fan-cooled type.

Note 3: Motors with different voltage and explosion-proof specifications can be created.

Note 4: The motor power when an inverter is used is 0.4 kW for AHA41 and 52 and 1.5 kW for AHC71 and 72.

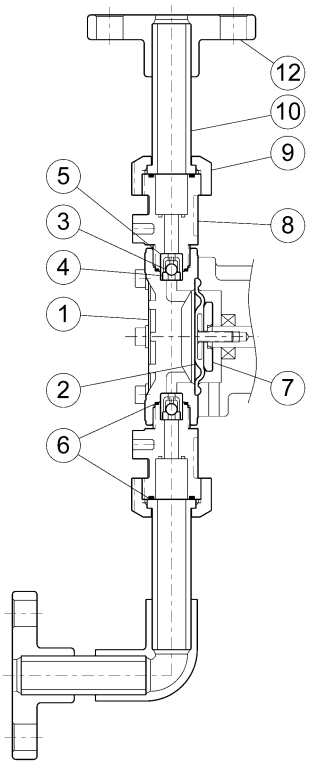
The above specifications may be changed without notice to make improvements. We appreciate your understanding.

6. Part Materials

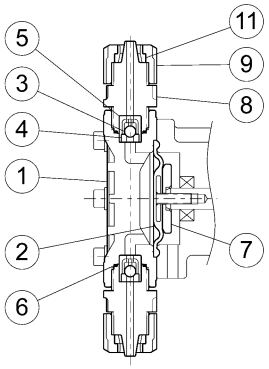
6.1 Pump head

6.1.1 AHA01 to 32 model

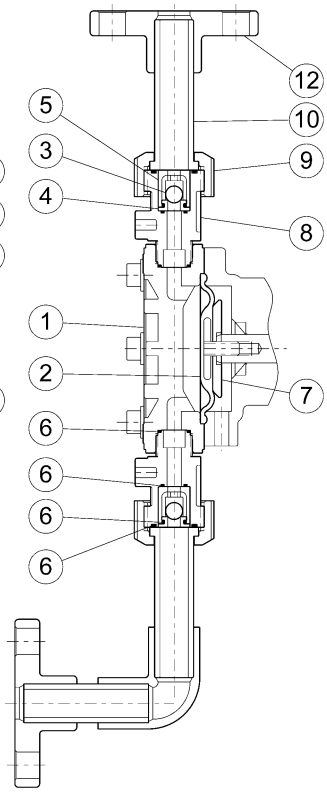
AHA01 to 22
Flange (Union) type



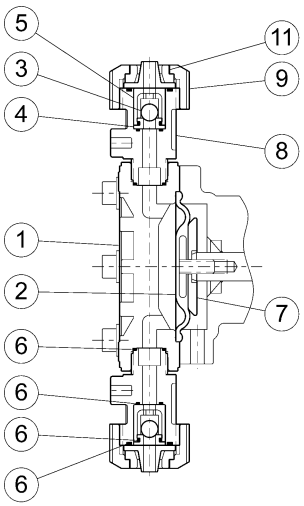
AHA01 to 22
Hose type



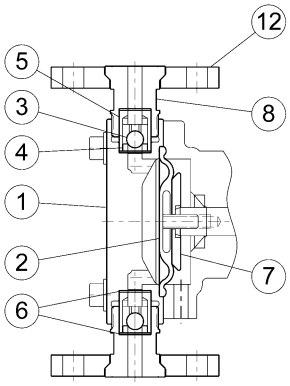
AHA31, 32
Flange (Union) type



AHA31, 32
Hose type



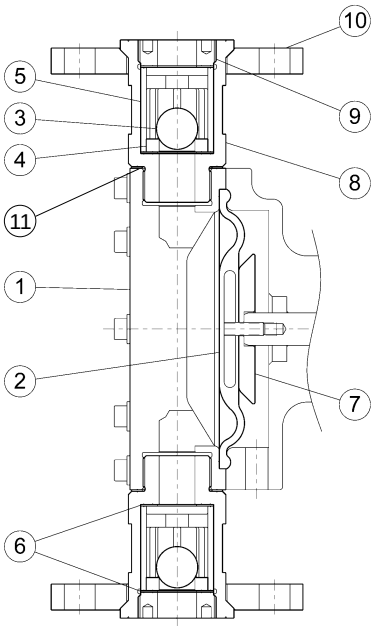
AHA01 to 32 Stainless Steel
Flange type



No.	Part name	Liquid end material code*				
		P･C･E	P･C･F	P･S･E	P･S･F	S･S･T
(1)	Diaphragm head	PVC	PVC	PVC	PVC	SUS304
(2)	Diaphragm	PTFE/ EPDM	PTFE/ EPDM	PTFE/ EPDM	PTFE/ EPDM	PTFE/ EPDM
(3)	Ball valve	Ceramic	Ceramic	SUS304	SUS304	SUS304
(4)	Valve seat	EPDM, PVC	FPM, PVC	EPDM, SUS304	FPM, SUS304	SUS304
(5)	Ball guide	PVC	PVC	PVC	PVC	SUS304
(6)	O-ring/gasket	EPDM	FPM	EPDM	FPM	PTFE
(7)	Backup plate	SS400	SS400	SS400	SS400	SS400
(8)	Joint	PVC	PVC	PVC	PVC	SUS304
(9)	Union nut	PVC	PVC	PVC	PVC	—
(10)	Union socket	PVC	PVC	PVC	PVC	—
(11)	Union nut collar	PVC	PVC	PVC	PVC	—
(12)	Flange	PVC	PVC	PVC	PVC	SUS304

＊The material codes correspond to (5), (6), and (7) of “Model” on page 4.

6.1.2 AHA41 to 52 model/AHB model/AHC model

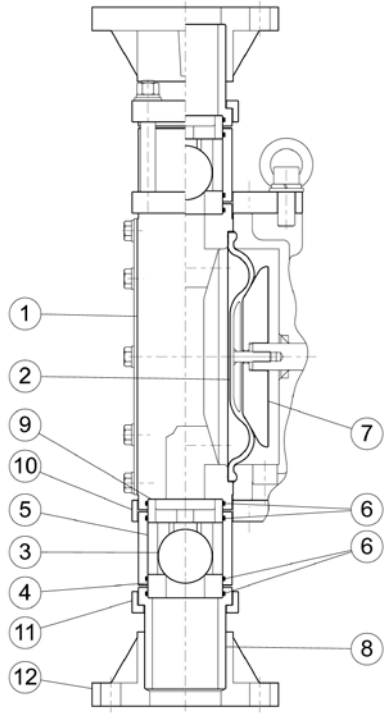


No.	Part name	Liquid end material code*				
		P･C･T	P･S･T	P･M･T	S･S･T	M･M･T
(1)	Diaphragm head	PVC	PVC	PVC	SUS304	SUS316
(2)	Diaphragm	PTFE/ EPDM	PTFE/ EPDM	PTFE/ EPDM	PTFE/ EPDM	PTFE/ EPDM
(3)	Ball valve	Ceramic	SUS304	SUS316	SUS304	SUS316
(4)	Valve seat	PVC	SUS304	SUS316	SUS304	SUS316
(5)	Ball guide	PVC	PVC	PVC	SUS304	SUS316
(6)	Gasket	PTFE	PTFE	PTFE	PTFE	PTFE
(7)	Backup plate	SS400	SS400	SS400	SS400	SS400
(8)	Joint	PVC	PVC	PVC	SUS304	SUS316
(9)	Screw	PVC	PVC	PVC	SUS304	SUS316
(10)	Flange	PVC	PVC	PVC	SUS304	SUS304
(11)	Gasket	PTFE	PTFE	PTFE	PTFE	PTFE

The material codes correspond to (5), (6), and (7) of “Model” on page 4.

＊The ball guide of AHC71,72 is composed of guide and lift piece.

6.1.3 AHD81 and 82 model



No.	Part name	Liquid end material code*				
		P･C･E	P･C･F	P･S･E	P･S･F	S･S･T
(1)	Diaphragm head	PVC	PVC	PVC	PVC	SUS304
(2)	Diaphragm	PTFE/ EPDM	PTFE/ EPDM	PTFE/ EPDM	PTFE/ EPDM	PTFE/ EPDM
(3)	Ball valve	Ceramic	Ceramic	SUS304	SUS304	SUS304
(4)	Valve seat	PVC	PVC	SUS304	SUS304	SUS304
(5)	Ball guide	PVC	PVC	PVC	PVC	SUS304
(6)	O-ring	EPDM	FPM	EPDM	FPM	PTFE
(7)	Backup plate	S20C	S20C	S20C	S20C	S20C
(8)	Joint	PVC	PVC	PVC	PVC	SUS304
(9)	Lift piece	PVC	PVC	PVC	PVC	SUS304
(10)	Guide plate	SUS304	SUS304	SUS304	SUS304	SUS304
(11)	Holder	SUS304	SUS304	SUS304	SUS304	SUS304
(12)	Flange	PVC	PVC	PVC	PVC	SUS304

＊The material codes correspond to (5), (6), and (7) of “Model” on page 4.

7. Installation

7.1 Precautions for installation

- Place the pump as close to the suction tank as possible and install it below the lowest fluid level of the tank.
- Secure sufficient space for easy maintenance inspections at the pump installation location.
- Install the pump on a level concrete foundation or a platform with sufficient strength for supporting the pump.
- Install the pump at a location that is not affected by vibration from other machines.
- The pump is for outdoors use. However, a temperature increase in the metal parts by direct sunlight, deterioration of the plastics due to ultraviolet rays, scratches on the pump due to dust or rain, or corrosion may occur.
- If the pump installation location is not well-ventilated, be aware that the temperature and humidity will increase in summer, which accelerates overheating of the motor and rusting of the metal parts.
- If a chemical that may freeze in winter is used, provide thermal insulation equipment.
  If a chemical freezes inside the pump, there is a danger of damage to the pump.

7.2 Installing the pump

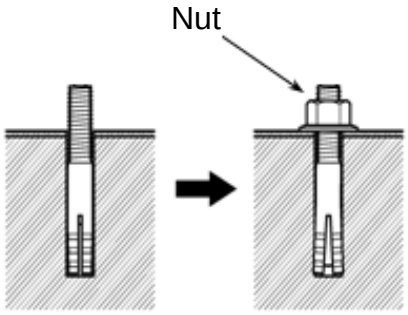
CAUTION

When handling the pump, do not drop it or subject it to a strong impact.
A strong impact may make the pump unable to perform basic functions. Please handle it with care.

(1) Place the pump at the installation location and make a hole for the All Anchor, aligning it with the mounting hole.

(2) Set the All Anchor and tap it using a hammer.

(3) Fasten the nut.
Check the nut is completely secured using a wrench, etc.



8. Piping and Wiring

8.1 Suction/discharge piping

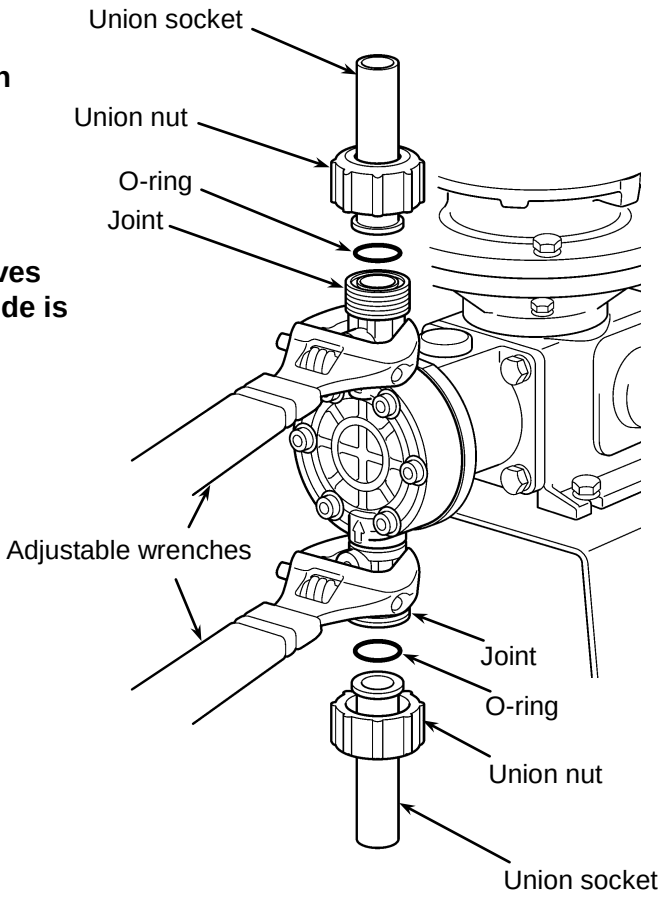
8.1.1 Installing the flange assembly (PVC)

If you purchased AHA01 to 32 with flange type, the flange assembly is shipped without a flange as an accessory with the pump. Bond the flange to suit the conditions at the customer site according to the following procedure.

(1) Loosen the union nut and remove the union socket.

ADVICE

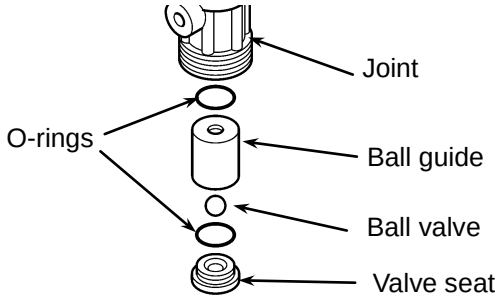
As the joint may become loose, hold it using an adjustable wrench, etc.



CAUTION

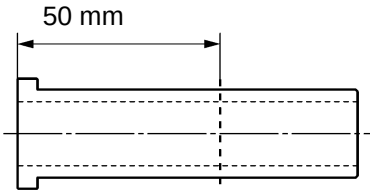
For AHA31 and 32 models, the O-rings and valves fall off when the union socket on the suction side is removed. Be careful not to drop them.

Suction side of AHA31 and 32



ADVICE

Cut the union socket to the desired length as necessary. Make sure that the union socket is 50 mm or longer as the union nut is inserted into it later.

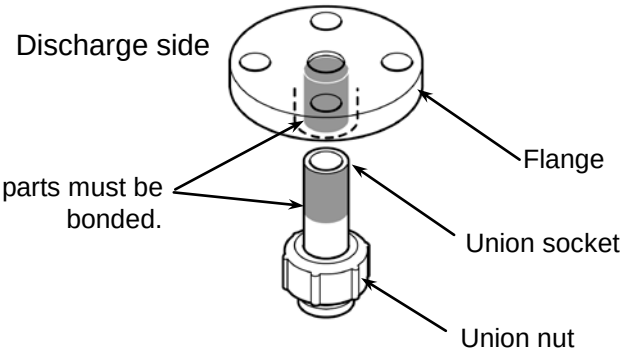


(2) Insert the union socket into the union nut and bond the flange.

CAUTION

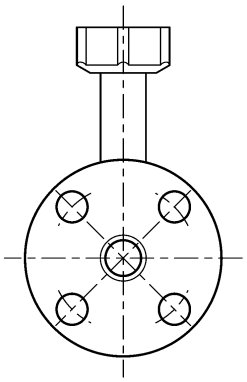
Make sure to attach the union nut before bonding the flange.

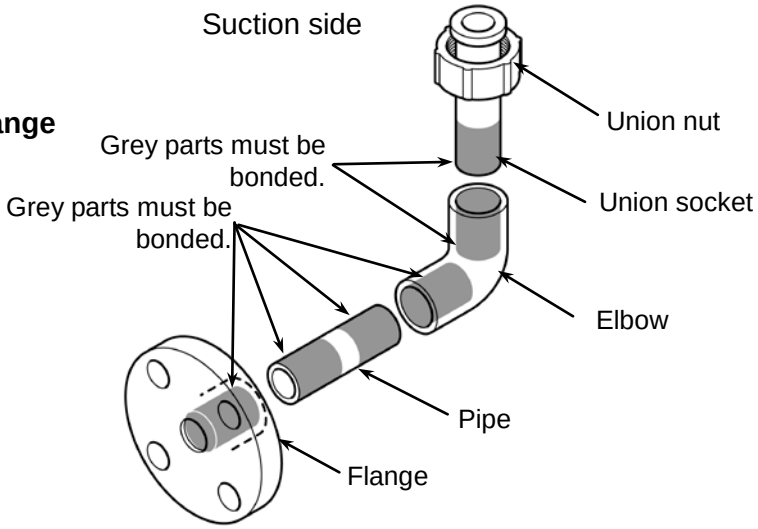
If an elbow is used on the suction side, bond the union socket, elbow, pipe and flange in that order.



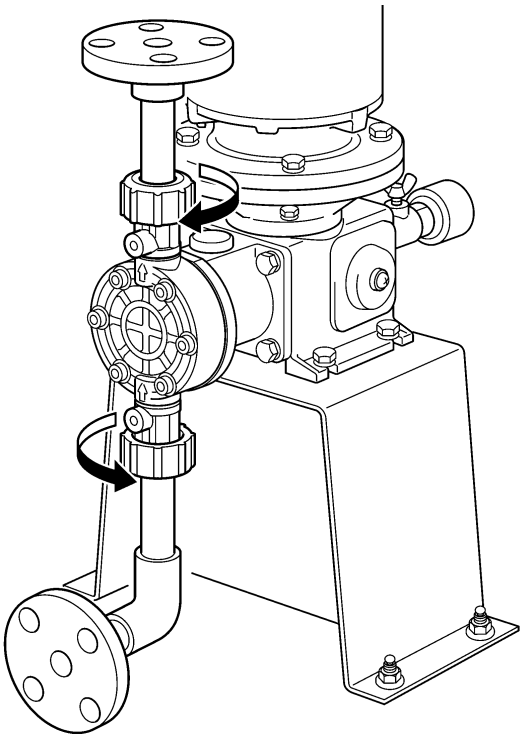
CAUTION

Bond the flange and make each flange bolt hole is at 45°.



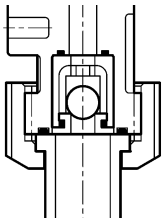


(3) After bonding the flange, attach it to the joint. Press the union socket side against the O-rings and fasten the union nuts.



CAUTION

For AHA31 and 32 models, do not drop the O-rings and valves on the suction side.

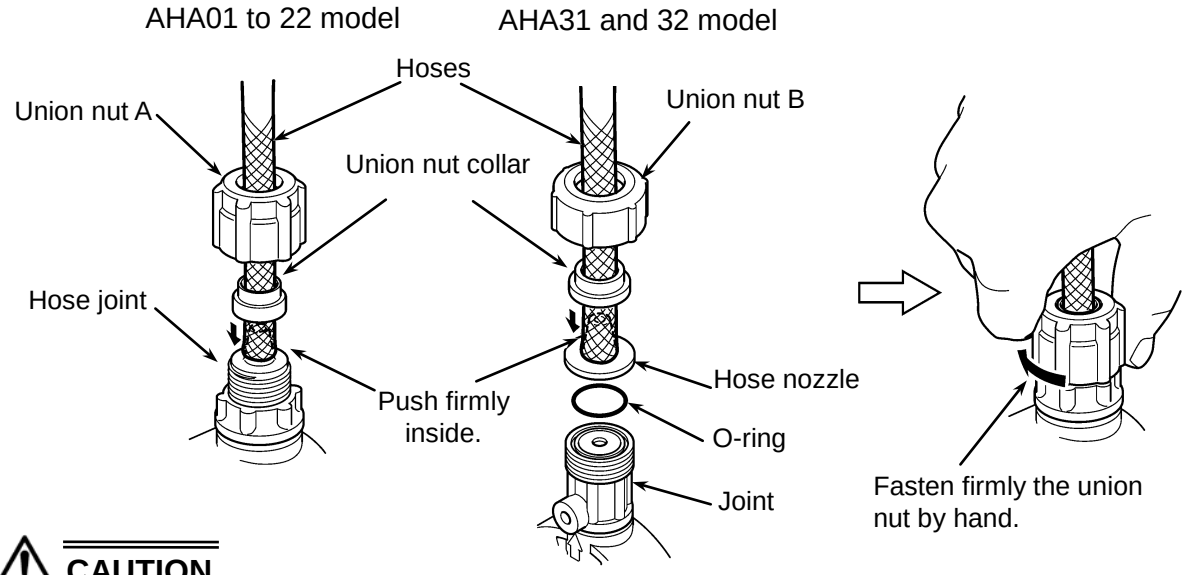


8.1.2 Connecting the hoses

If you purchased AHA01 to 32 model with hose type, connect the hoses according to the following procedure.

(1) Run the braided PVC hose through the union nut collar and union nut, and push the end of the hose well into the hose joint.

(2) Fasten the hose, by setting the union nut collar, and then tightening the union nut by hand.



CAUTION

The union nut is made of plastic. Do not tighten the nut more than necessary.
Also, do not use a wrench or other tools to fasten the nut. The union nut may be broken.

8.2 Piping

8.2.1 General precautions for piping

- Determine the piping so as to meet the suction and discharge conditions including frictional resistance, acceleration resistance, NPSH, and over-feeding.
- Design the piping as short as possible with minimum bends in order to prevent air accumulation.
- Be sure to support the piping near but separately from the pump. Supporting the piping load with the pump can cause damage to the piping. Special care should be taken when the PVC is used for parts that come in contact with liquid.
- Install piping after cleaning the inside.
- When bonding a PVC pipe, be careful not to allow the adhesive to flow into the inside of pipe.

8.2.2 Feeding general chemicals

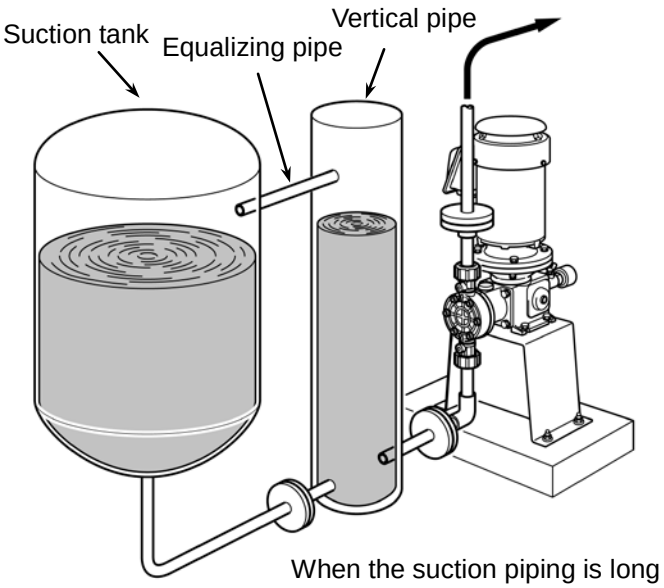
■ Suction piping

(1) Install suction pipe and make the pump located lower than the water level.

(2) Use a suction pipe with a diameter greater than the bore of the suction opening of the pump.

(3) Special care should be taken so that the air does not enter the connection of the suction pipe.

(4) If the suction piping cannot be shortened enough to satisfy NPSH requirements due to some reason, install a vertical pipe and an equalizing pipe.



When the suction piping is long

ADVICE

This work is not necessary when the suction side tank remains at the atmospheric pressure. Simply leave the vertical pipe at the atmospheric pressure.

■ Discharge piping

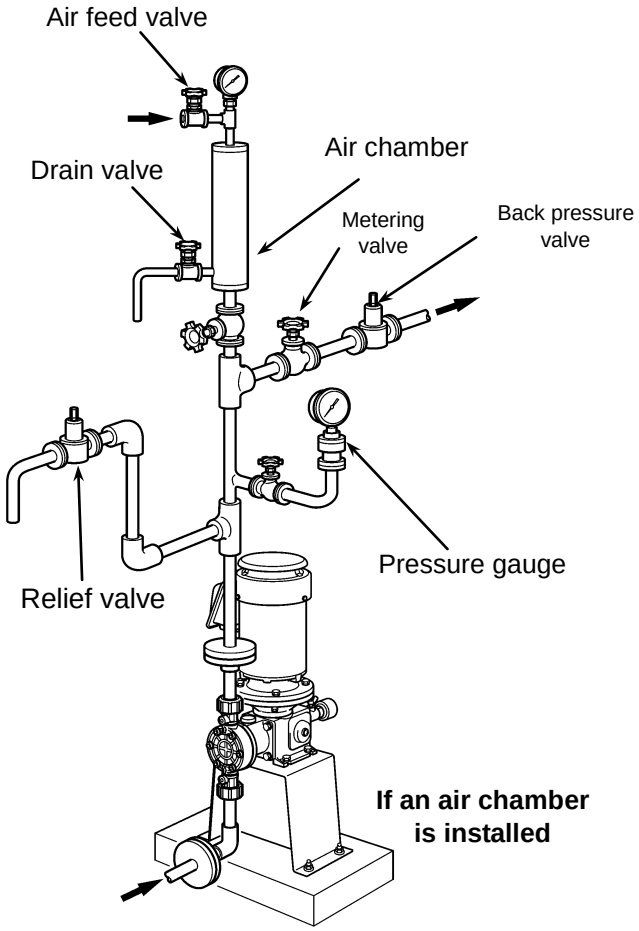
(1) Using the discharge pressure calculation, determine the minimum pipe diameter so that an overload is not applied to the pump.

(2) In order to operate the pump normally, the minimum required differential pressure must be applied to the discharge pressure and the suction pressure.
If the minimum required differential pressure cannot be secured, use a back pressure regulating valve. This valve should be located near the injection point.

(3) Be sure to install a relief valve near the discharge opening of the pump.
Leave the secondary side open at the atmospheric pressure.

(4) To monitor operations, install a pressure gauge on the discharge side.

(5) Install an air chamber as shown in the right figure. Locate a pressure gauge at the top of the air chamber or between the air chamber and the pump.



If an air chamber is installed

ADVICE

If the pressure gauge needle moves significantly, replenish the air.

8.2.3 Feeding sodium hypochlorite (NaClO)

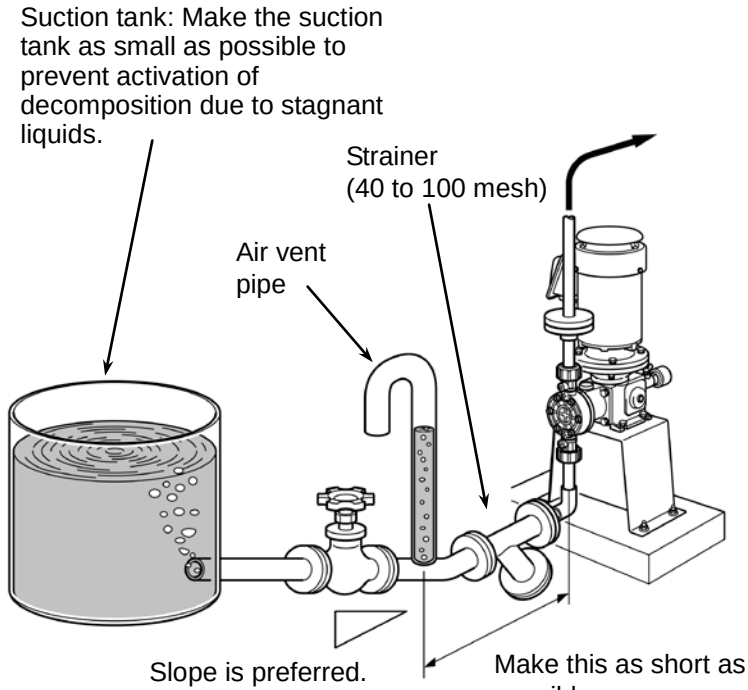
Sodium hypochlorite generates chlorine by spontaneous decomposition due to the properties of the liquid. Design a piping plan while taking the following points into consideration.

(1) The pump and the chemical tank should be installed indoors. If they must be installed outdoors for some reasons, take appropriate measures, such as using a sunshade or the like, to prevent temperature rises in the pump or the chemical tank due to direct sunlight.

(2) Shorten the piping as much as possible. Also plan the piping diameter so it is as small as possible within the range in which piping conditions such as acceleration resistance can be met.

(3) Example of recommended piping

The piping for feeding sodium hypochlorite must be designed to easily release generated gas. Note particularly that the smaller the flow rate, the larger the effect on pump performance. Design the piping with reference to the following examples.

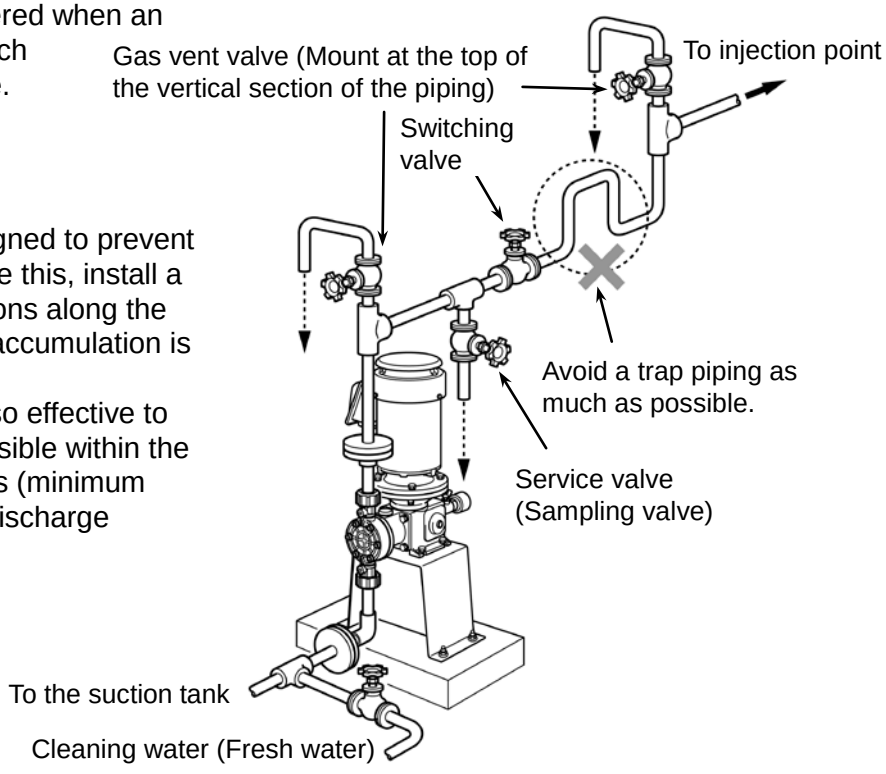


■ Suction piping

It is also effective if the suction pipe diameter is made as small as possible within the range in which the suction pipe conditions (NPSH) are met.
This is because the generation of decomposed gas decreases as the volume of liquid in the piping decreases. This characteristic must be considered when an intermittent operation occurs in which the pump is stopped for a long time.

■ Discharge piping

The discharge piping must be designed to prevent gas accumulation inside. To achieve this, install a gas vent valve on the vertical sections along the piping path and places where gas accumulation is predicted.
Same as the suction piping, it is also effective to make the diameter as small as possible within the range in which the piping conditions (minimum required differential pressure and discharge pressure) are met.



8.3 Wiring

This pump is only supplied as a stand-alone unit. For the power source, provide safety equipment such as breakers and a control panel with an ON/OFF switch. Also, set up an ammeter for monitoring pump operation.

WARNING

- **Wiring work should be done by a certified electrician.**
- **Electrical work should not be conducted until it has been confirmed that the power is OFF. An electric shock may occur.**
- **Be sure to ground the pump with a grounding cable. An electric shock may occur.**

CAUTION

- **Check that the supplied voltage agrees with the rated voltage on the motor nameplate.**
- **Wiring work should be performed in compliance with electrical construction standards and company regulations.**

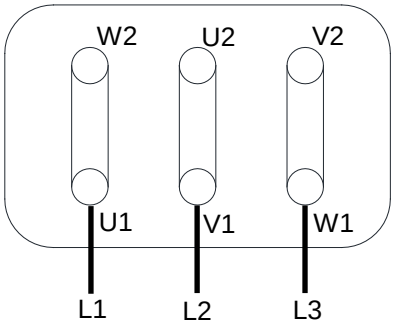
The motor connection depends on the voltage indication on the type plate and the applied supply voltage.

Example: **220/380V**

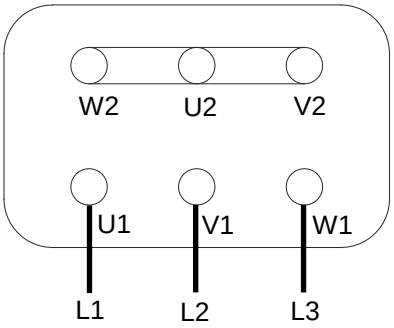
Three-phase power on site: 380V

Correct motor connection:

Star connection (Y)



Delta connection



Y Star connection

NOTE

Make sure the pump rotates in the proper direction when used. To confirm the direction of rotation, see page 17.

9. Operation

9.1 Pre-operation checks

Check the following items when operating the pump for the first time after installation.

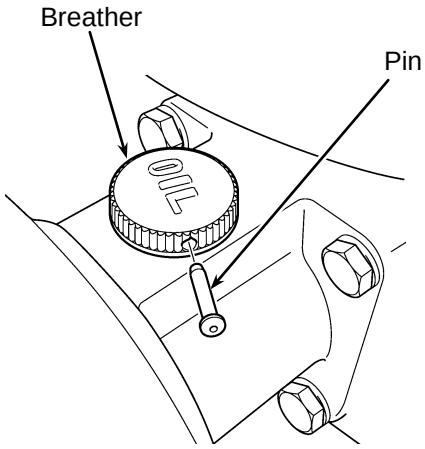
- **The oil cap pin is off.**
- **There is no damage to the pump, or missing components, loose bolts, oil leaks, etc.**
- **There are no errors in the electrical wiring.**
- **The valves in the piping have been set to “Open”.**

WARNING

For your safety, wear rubber gloves, a protective mask, and safety glasses when handling chemicals.

NOTE

Remove the pin from the breather of the filler before starting the operation.
If the pump is operated with the pin, the pressure inside the casing increases, which can cause oil leakage.

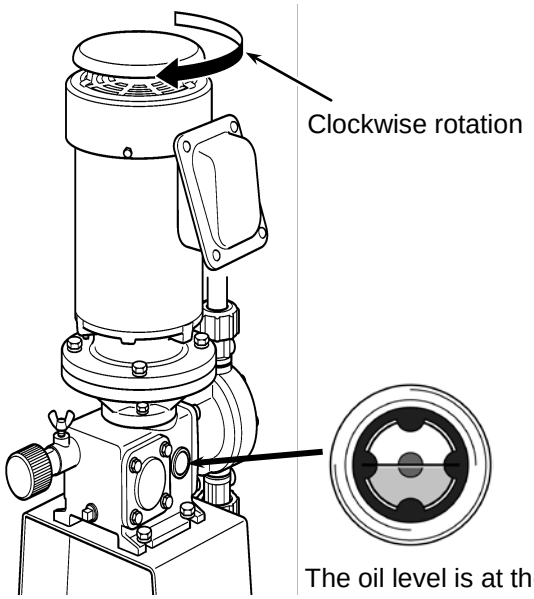


9.1.1 Checking the direction of rotation

Turn ON the control panel switch. Look at the motor from the top and make sure that the motor is rotating clockwise (proper rotation).

CAUTION

If the motor is not rotating properly, redo the wiring.



9.1.2 Checking the oil level of the drive unit

Check that the oil level is at the center of the red circle of the oil gauge on the casing side.

If the oil level is below the center of the red circle, see “10.4 Replacing the lubricating oil” on page 24 to replenish the oil.

The oil level is at the center of the red circle of the oil gauge.

9.2 Adjusting the stroke length

CAUTION

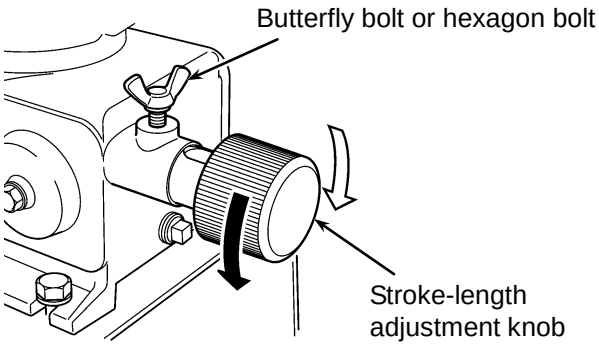
- **The stroke length should be adjusted when the pump is running.**
- **Depending on the movement of the backup while the pump is running, the stroke length adjustment knob may be hard to turn sometimes and easy to turn at other times. Do not force the knob when it is hard to turn. Instead, watch the timing and turn the knob when it is easy to turn.**

(1) Loosen the butterfly bolt (AHA, AHB) or hexagon bolt (AHC, AHD).

(2) Adjust to the desired stroke length (expressed in %) by turning the stroke length adjustment knob.
To shorten the stroke length: turn the knob clockwise.

To lengthen the stroke length: turn the knob counterclockwise.

(3) After adjustment, fasten the butterfly bolt or hexagon bolt securely.



Stroke length display (%)

The stroke length is checked against the scale of a scale plate represented by the position of the numbers (0, 1, 2, 3, 4 for AHA and AHB, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 for AHC and AHD) on the adjustment knob.

The stroke length is displayed in percent, and the knob can be rotated between 0% and 100%.

The number of knob rotations varies depending on the pump model. A label indicating the stroke length (%) for one rotation is attached to the adjustment knob.

Number of Knob Rotation vs Stroke Length

Model		Number of Knob rotation	Stroke length Percent(%)	Maximum stroke length(mm)
AHA	01	0.5 1	50 100	2
	11~22	1 2	50 100	4
	31, 32	1 2 4	25 50 100	8
	41, 42 51, 52	1 2.5 5	20 50 100	10
AHB	41, 42	1 3 6	17 50 100	12
	51, 52	1 3.5 7	14 50 100	14
	61, 62	1 3.5 7	14 50 100	14
	71, 72	1 3.5 7	14 50 100	14
AHC	51, 52	1 3.5 7	14 50 100	14
	61, 62	1 4.5 9	11 50 100	18
	71, 72	1 5 10	10 50 100	20
AHD	81, 82			

CAUTION

If the butterfly bolt is not adequately fastened, then the lead screw may rotate during operation and could cause the pump discharge rate to change.

9.3 Starting operation

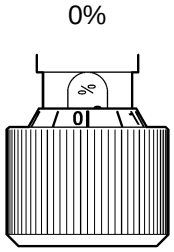
9.3.1 Warm-up operation

When the pump is started up for the first time after installation, warm-up operation is required. Perform warm-up operation according to the following procedure.

(1) Open the valves in the suction and discharge piping.

(2) Loosen the butterfly bolt (AHA, AHB) or hexagon bolt (AHC, AHD) to set the stroke length to 0%.
(See “9.2 Adjusting the stroke length” on page 18.)

(3) After adjustment, fasten the butterfly bolt or hexagon bolt securely.

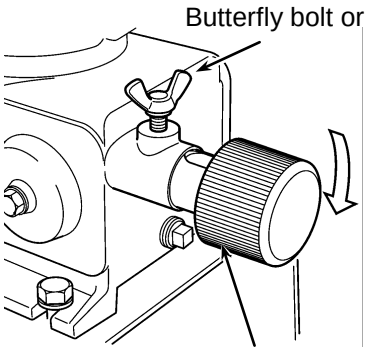


Stroke-length adjustment knob

CAUTION

If the bolt is not fastened securely, the threads of the lead screw can be damaged.

(4) Perform warm-up operation for approximately one hour.



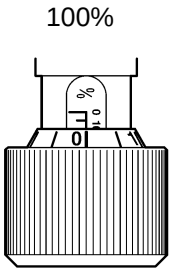
Stroke-length adjustment knob

9.3.2 Full operation

(1) Check that the valve of the suction piping is open and set the stroke length to 100% with no pressure applied to the discharge side. (See “9.2 Adjusting the stroke length” on page 18.)

(2) After the air inside the pump is completely purged, gradually increase the pressure on the discharge side and set the value to the designated value.

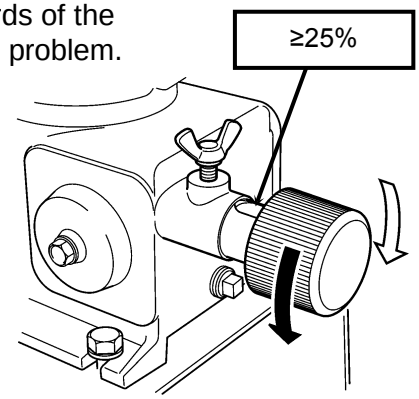
(3) Using an ammeter, check that the load current is within the rated value. The needle of the ammeter moves due to pump load fluctuation. If two-thirds of the amplitude is within the rated current, there should be no problem.



Stroke-length adjustment knob

NOTE

Avoid running the pump at a stroke length below 25%. The discharge accuracy may fall.
We recommend that you operate this pump at a stroke length of 25% or higher as much as possible.



9.3.3 Checking the flow rate

Measure the discharge rate under actual (local) use conditions.

- Repeat the flow rate measurements several times. The pump is operating normally when the discharge rate shows no fluctuation. However, please note that the discharge rate will change if the discharge pressure changes.
- Prepare a graph of the relationship between the stroke length and discharge rate and set the actual measurement of discharge rate.

MEMO

When the discharge rate is changed by adjusting the stroke length, measure the flow rate after the discharge pressure has stabilized.

9.4 Stopping and restarting

Turn the power OFF to stop the pump.
Restarting the pump will not be a problem even if the pump is restarted with the previously set stroke length (discharge pressure).

MEMO

If the pump is started up after it has been stopped for an extended period (1 week or longer), make sure to set the stroke length to 0% and operate the pump with no load for a few minutes. After the drive unit is lubricated, perform full operation.

10. Maintenance Instructions

Inspect the details below. If you find something abnormal, stop pump operation immediately. Take appropriate measures, referring to “Troubleshooting” on page 25 and page 26. Be sure to follow these points when conducting a maintenance inspection:

⚠ WARNING

- **Do not work with wet hands. An electric shock may occur.**
- **For your safety, wear rubber gloves, a protective mask, and safety glasses when handling chemicals.**

⚠ CAUTION

- **When disassembling the pump, be sure to check that the power is shut off and that no voltage is applied to the pump.**
  Also, make sure the power is not turned ON while the pump is being worked on.
- **Before doing pump maintenance, be sure to release the pressure from the discharge piping, let out the liquid from the liquid ends, and clean the equipment.**

NOTE

- **We recommend that you always keep replacement supplies on hand (such as diaphragms, valve seats, O-rings, gaskets, ball valves, and ball guides).**
- **Aim for cleaning the chemical tank every 3 months and keep it free from dirt.**
  This cleaning interval should be set to match dirt conditions.

10.1 Inspections

10.1.1 Routine inspection

(1) Check that there is no change in the discharge pressure.
(2) Check that there is no change in the flow rate.
(3) Check that there is no liquid leak from the liquid ends.
(4) Check that the lubricating oil level in the drive unit is appropriate, and that the oil is not leaking or contaminated.
(5) Check that there is no abnormal vibration, noise, or heating.
(6) Check that the motor load current is normal.

10.1.2 Periodical inspection

(1) Drive unit (power end)

- Lubricating oil replacement: Replace the lubricating oil within 500 hours of the initial operation and once a year after that. (See “10.4 Replacing the lubricating oil” on page 24 for the replacement procedure.)

(2) Liquid end

- Ball valve, valve seat, O-ring, and gasket: Check these parts once a year and clean them if they are contaminated by dirt or foreign substances. Also replace them if they are worn out, corroded, or scratched. (See “12.2 Replacing the ball valve” on page 32 for the replacement procedure.)
- Diaphragm: Check this once a year and replace it if it is significantly deformed. (See “12.3 Replacing the diaphragm” on page 37 for the replacement procedure.)

10.2 Preparations for extended non-use

- Operate the pump with clean water for about 30 minutes, then clean inside the liquid ends. After cleaning is done, turn the pump's power OFF.
- Be sure to clean the inside of the tank, the filter, and the suction piping well.
- Store the pump in a dust-free location that is free from direct exposure to sunlight and has good ventilation.

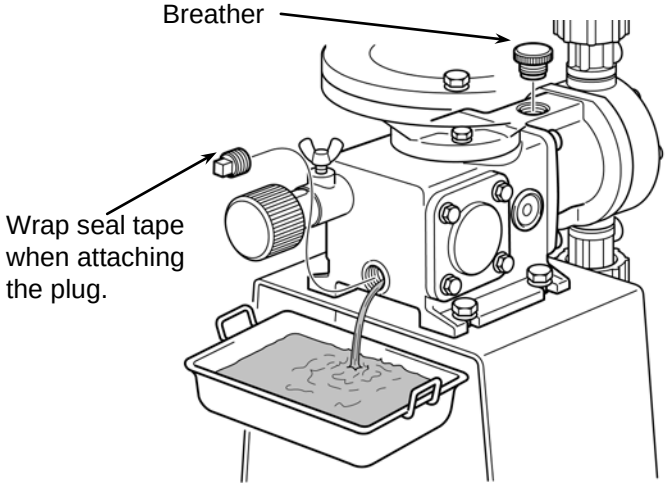
10.3 Preparations for re-use

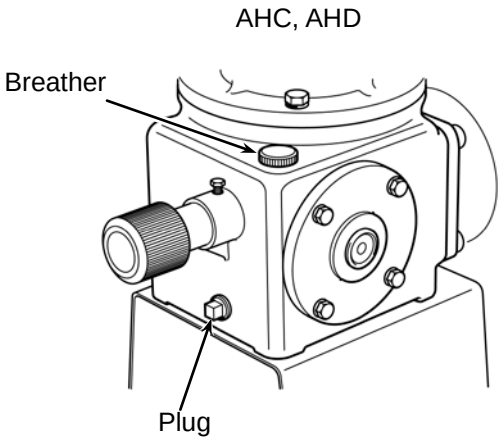
- Check the volume of liquid in the chemical tank. Replenish if low.
- Check that there is no turbidity in the tank from sediment and liquid. If the quality of the liquid has deteriorated, clean inside the tank and replace with new chemicals.
- If liquid leaks due to a loose or damaged pipe, check that there is no blockage.
- Check that the valves on the suction side and in the discharge piping are open.
- Check that the designated power supply is properly connected.
- Inspect the equipment for any wiring errors, short circuits, or electric leakage.
- Check that nothing is stuck to the ball valve or valve seat of the liquid ends.

10.4 Replacing the lubricating oil

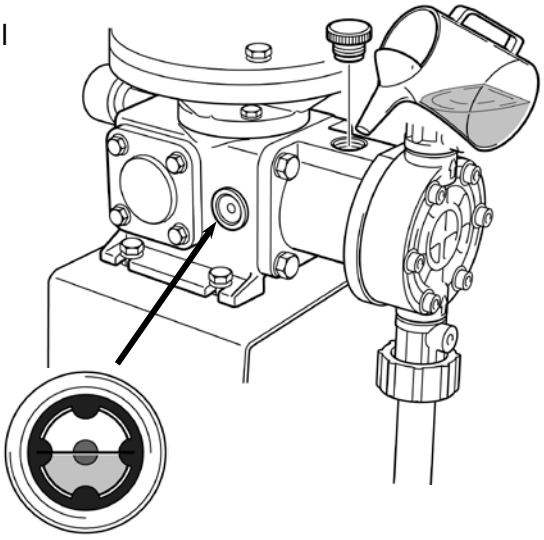
(1) Remove the breather on the top of the crosshead guide or the casing and the drain plug at the bottom of the back of the casing to drain the lubricating oil.

(2) When the oil is completely drained, reattach the drain plug.





(3) Be careful not to let any foreign substances or dust enter the casing and add oil up to the red dot of the oil gauge from the breather hole.



MEMO

"CPC E.P. Lubricant HD-220" is used for the pump at the factory. If the brand is to be changed, refer to the following "Lubricating oil company brand list" table. The oil volume varies depending on the model.

Pump model	Oil volume (mL)
AHA	270
AHB	700
AHC, AHD	1200

(4) After the oil is added, attach the breather.

ISO viscosity grade ISO VG cST (40°C)	150	220
JX Nippon Oil & Energy	BONNOC M 150	BONNOC M 220
Idemitsu Kosan Co., Ltd.	Daphne Super Gear Oil 150	Daphne Super Gear Oil 220
COSMO	COSMO Gear SE 150	COSMO Gear SE 220
Showa Shell Sekiyu K. K.	Shell Omara S4 WE 150	Shell Omara S4 WE 220
Mobil	Mobil Gear 629	Mobil Gear 630

∗If pumps are used in cold areas/places, please use the lubricant with 150 viscosity grade.

MEMO

If any other lubricating oil is used, ensure it is equivalent to the above brands.

11. Troubleshooting

Type of fault	Possible cause / Fault clearance	Suction height too high / Reduce suction height or suction resistance	Suction line leaky / Check gaskets, tighten pipe connections	Shut-off valves in pipe closed / Open shut-off valves or check opening-check pump for damage	No conveying liquid in store tank / Fill store tank	Pump valves leaky / Remove valves and clean	Pump valves(valve seats) damaged / Remove and clean valves, check function, replace valves if necessary	Pump valves incorrectly mounted or Ball valve missing / Check installation position and completeness-replace missing parts or install correctly	Filter in suction line clogged / Clean filter	Electric data of the drive motor do not match mains data / Check order data. Check electric installation. Adjust motor to mains data
	Leakage on pump head			●						
	Damage in stroke mechanism/drive									
	Motor is overloaded									●
	Low service life of the diaphragm									
	High noise development									
	Pipe oscillates heavily			●						
	Drive motor does not start									●
	Maximum discharge capacity exceeded									
	Discharge capacity fluctuates		●			●	●			
	Discharge height is not reached					●	●			
	Discharge capacity is not reached	●	●		●	●				
	Diaphragm pump does not discharge	●	●	●	●	●	●	●	●	
	Diaphragm pump does not draw in	●	●	●	●	●	●	●	●	

Measure pressure with pressure gauge directly above discharge valve and compare with permissible counter-pressure	Counter-pressure too high												
Remove and clean valves	Foreign matter in pump valves												
Install back-pressure valve if necessary	Pressure on suction side higher than at the end of the discharge side												
Check acceleration height on suction and discharge side with pressure gauge and compare with design data-install a pulsation damper if necessary	Acceleration height too high due to pipe geometry												
Check whether the liquid corresponds with the design data and select other materials if necessary	Material which is in contact with the liquid is not suitable for the pumped liquid												
Check viscosity of liquid and compare with the design data-reduce concentration or increase temperature if necessary	Too high viscosity of the pumping liquid												
Check geodetic conditions and compare with the date of the liquid. Operate pump with suction side supply, reduce temperature of the liquid	Pumped liquid outgasses in suction line												
Vent discharge side or open vent valve	Air in suction line while pressure applied to the discharge ball valve												
Tighten connection according to type of material. Be careful with plastic-risk of fracture	Pipe connection leaky												
Check flow ability of the liquid. Temperature of liquid and ambient temperature must not fall below-10°C	Temperature too low												
Remove diaphragm pump and check for damage-increase temperature of the liquid	Pumped liquid frozen in pipe												
Replace diaphragm according to	Diaphragm rupture												

12. Spare Parts

Follow the instructions below when replacing parts.

WARNING

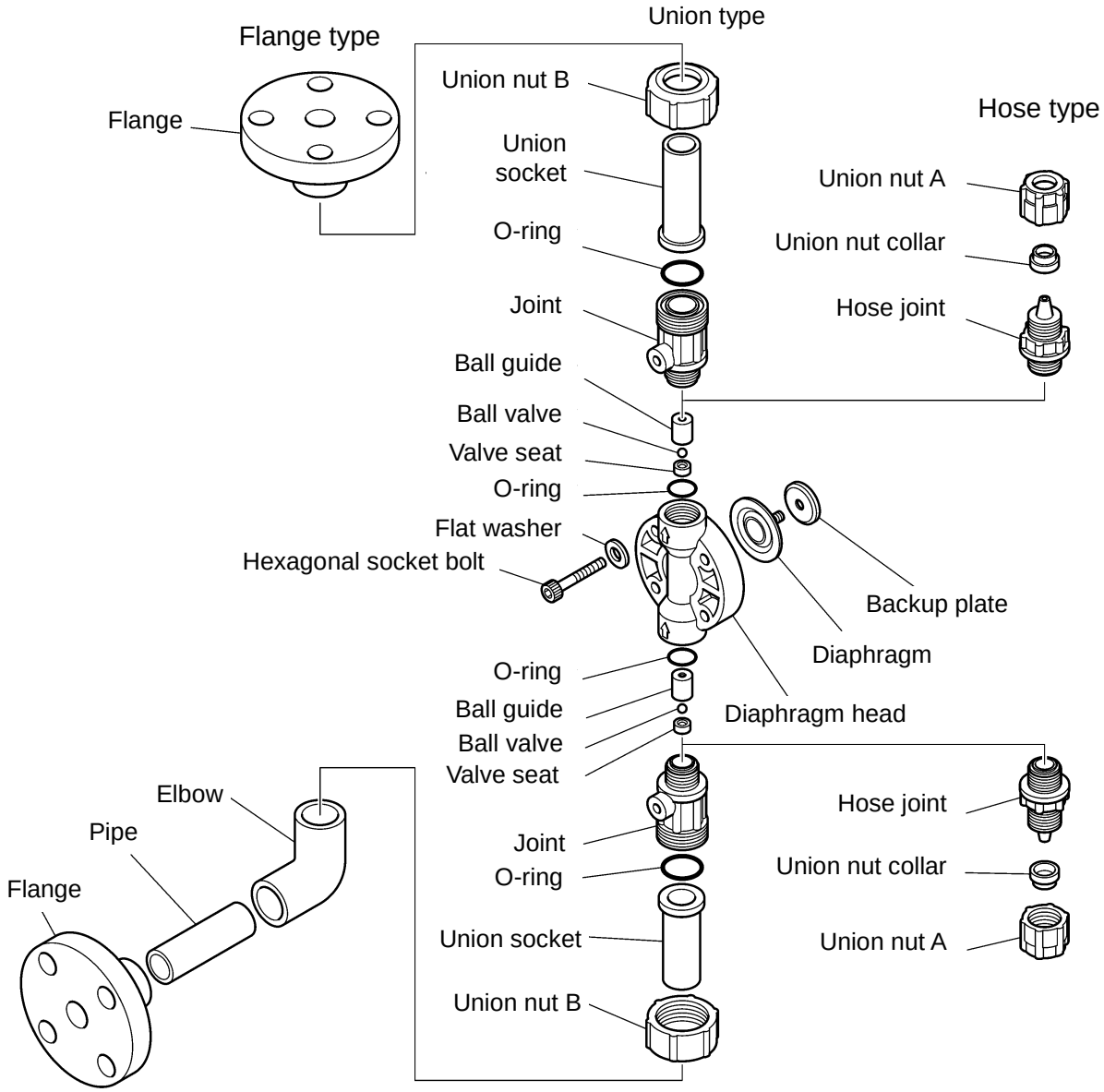
For your safety, wear rubber gloves, a protective mask, and safety glasses when handling chemicals.

CAUTION

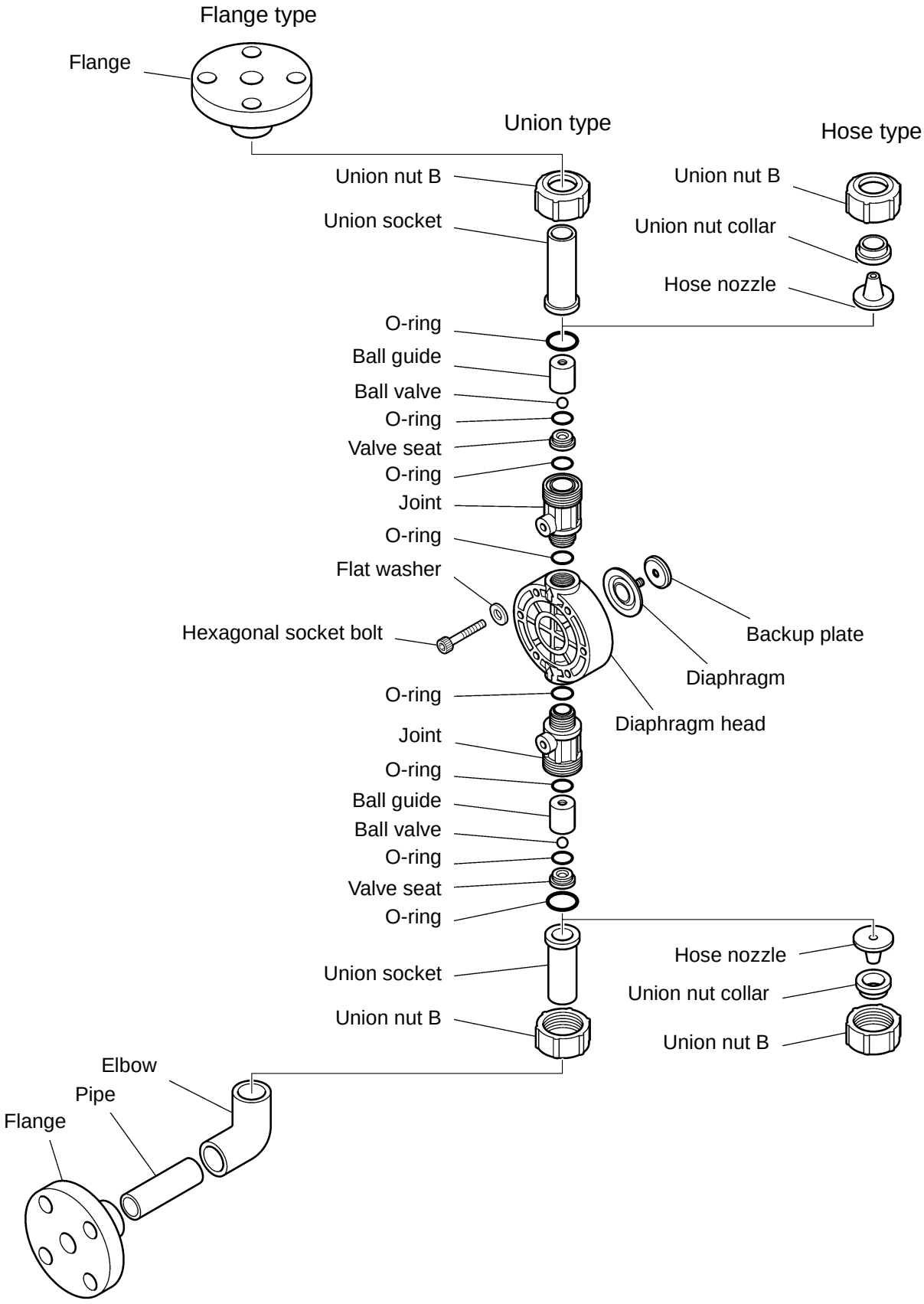
- **Make sure the source power has been turned OFF.**
- **Release the pressure from the discharge hose. Disassemble the unit after atmospheric pressure is reached.**
- **Do not disassemble the electrical circuits.**
- **During assembly, be sure not to drop any parts or leave out any parts from assembly.**

12.1 Component parts

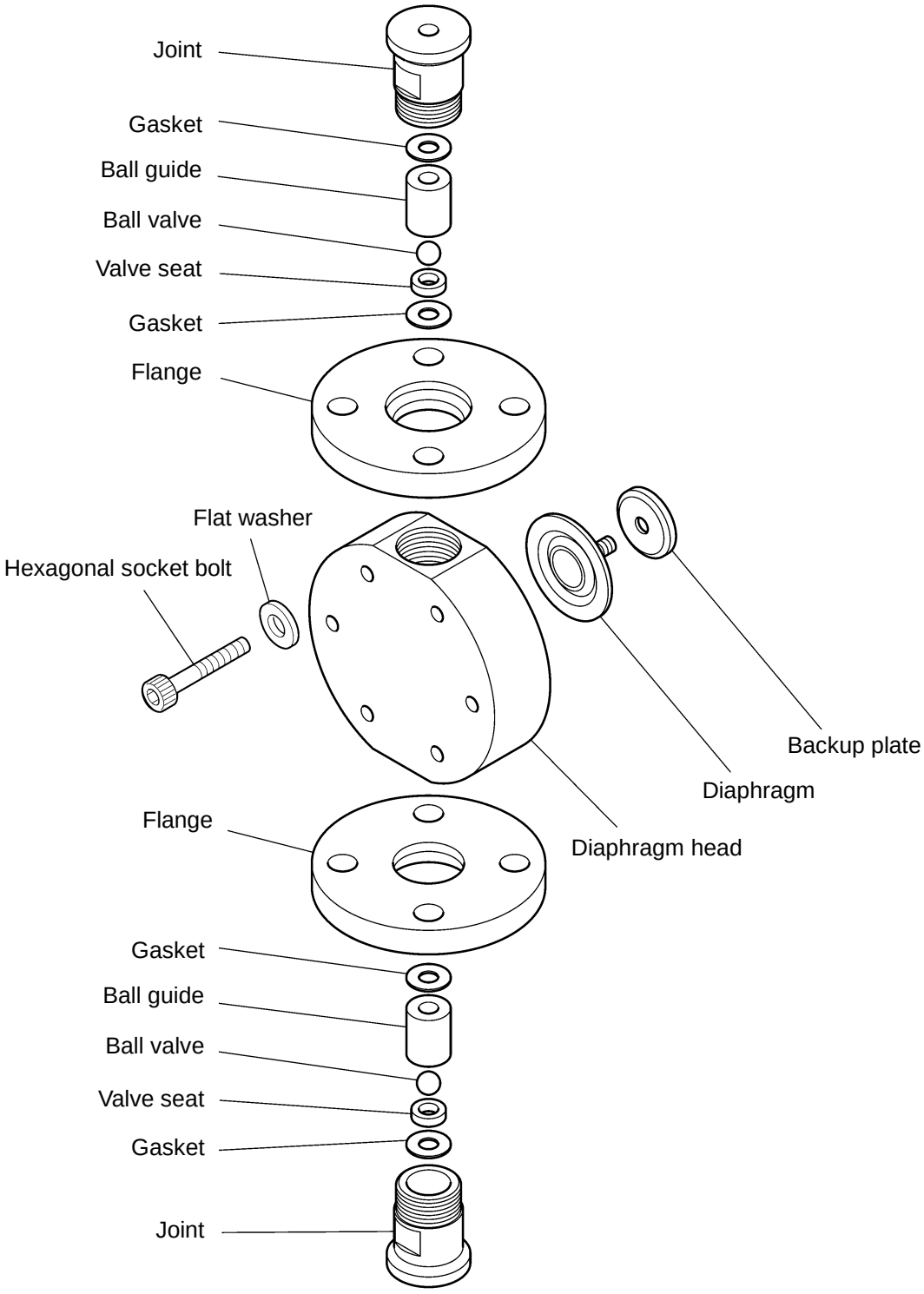
■ AHA01 to 22 (Part material: PVC)



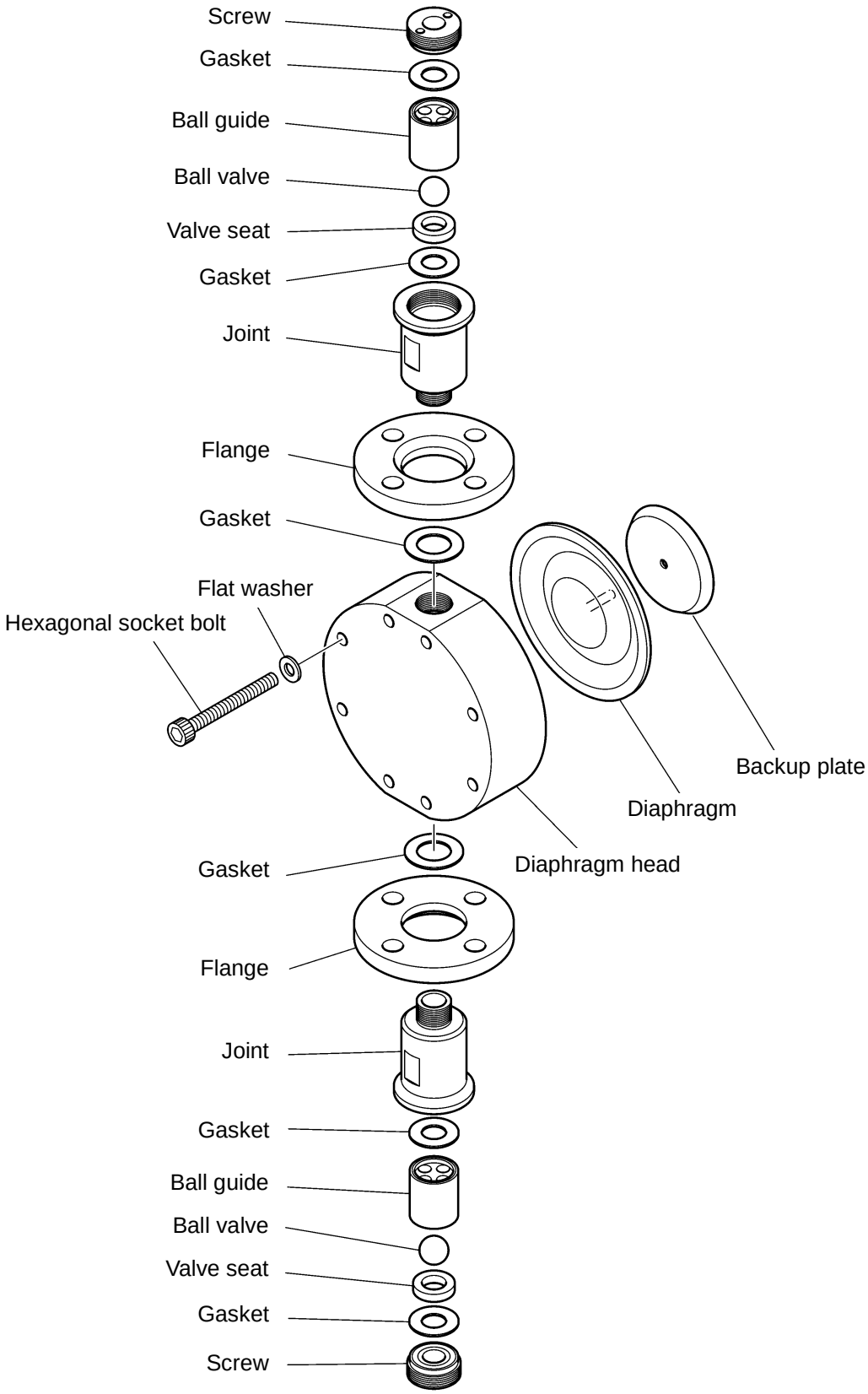
■ AHA31 and 32 (Part material: PVC)



■ AHA01 to 32 (Part material: SUS)

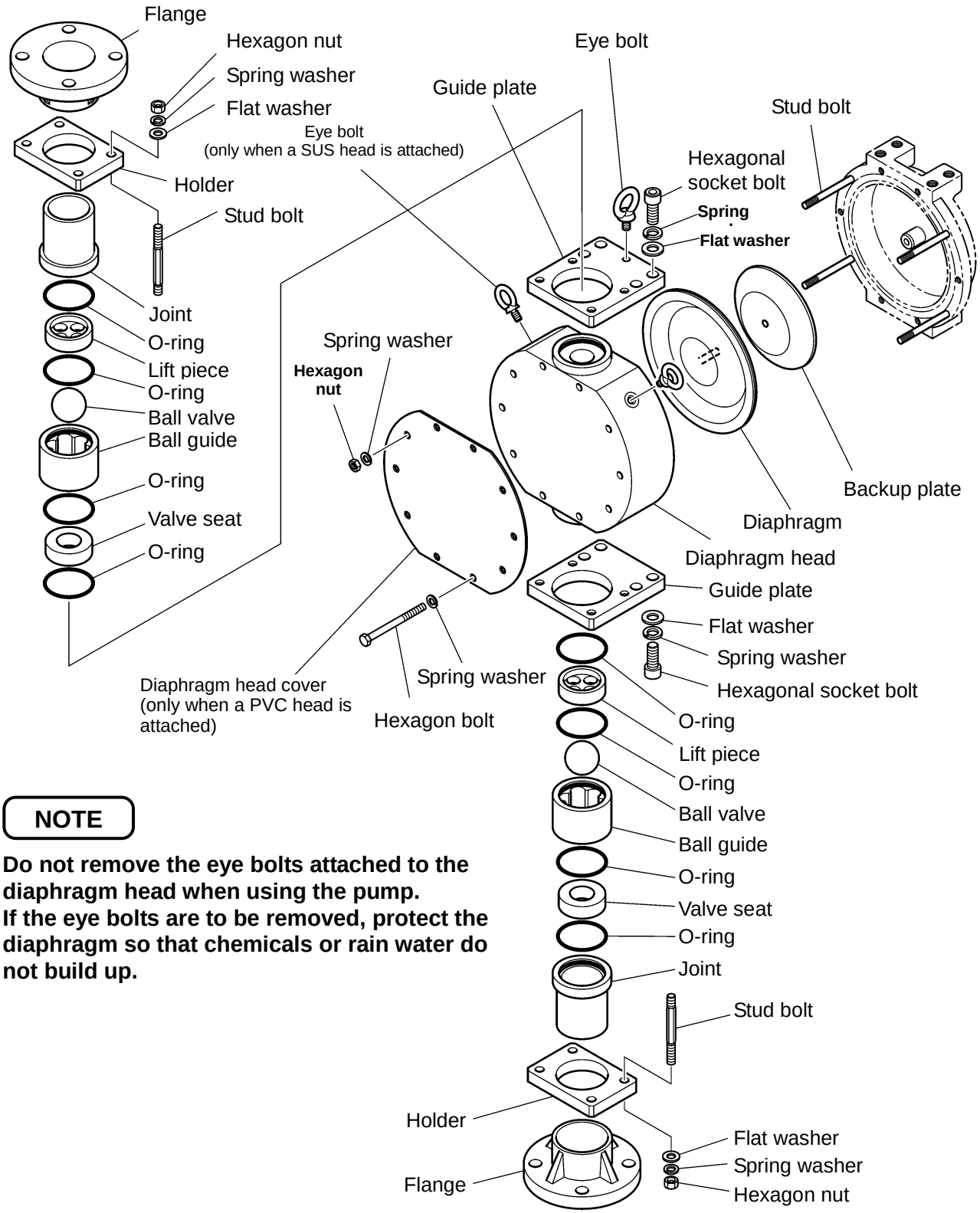


■ AHA41 to AHC72



∗The ball guide of AHC71,72 is composed of guide and lift piece.

■ AHD81 and 82



NOTE

Do not remove the eye bolts attached to the diaphragm head when using the pump.
If the eye bolts are to be removed, protect the diaphragm so that chemicals or rain water do not build up.

12.2 Replacing the ball valve

CAUTION

- **Perform the replacement procedure with care as the liquid remaining inside the diaphragm head flows out when the joint or hose joint is removed from the diaphragm head.**
- **Do not drop or lose the ball valve, ball guide, and valve seat, etc., when removing them from the joint or hose joint.**
- **Clean the ball valve, ball guide, and valve seat if they are contaminated by dirt or foreign substances. Also, if they are worn out or damaged, replace them with new parts.**

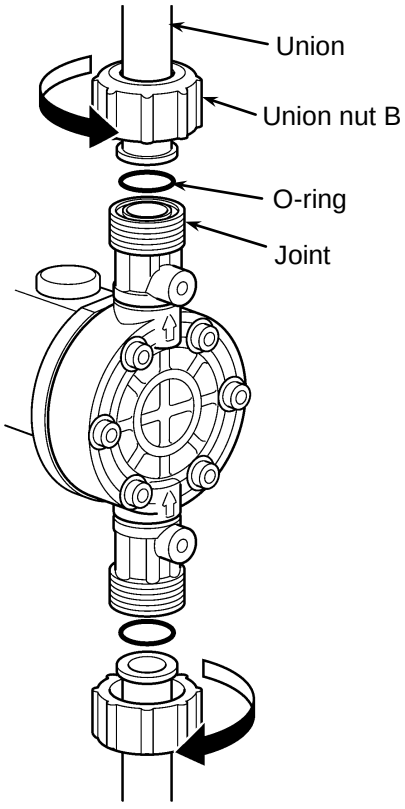
■ AHA01 to 32 (Part material: PVC)

(1) Turn the power OFF

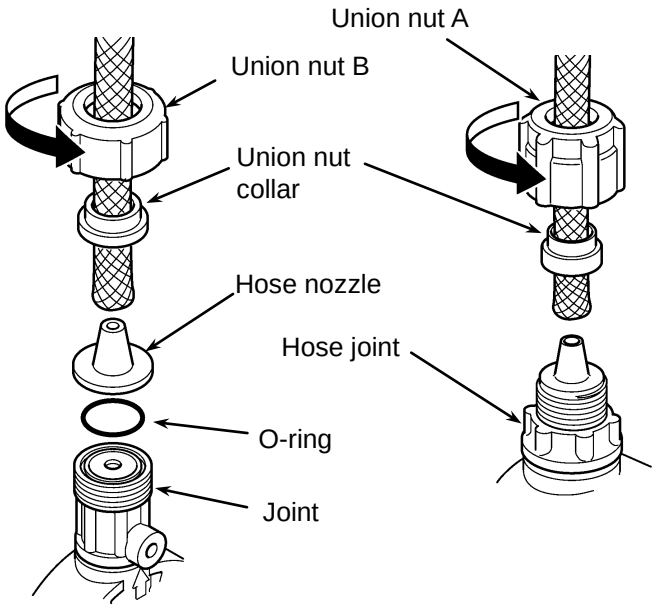
(2) Release the pressure from the discharge piping, then remove the suction and discharge piping.

(3) Loosen union nut A or B and remove the coupling (union or hose) from the joint or hose joint.

Flange/union type



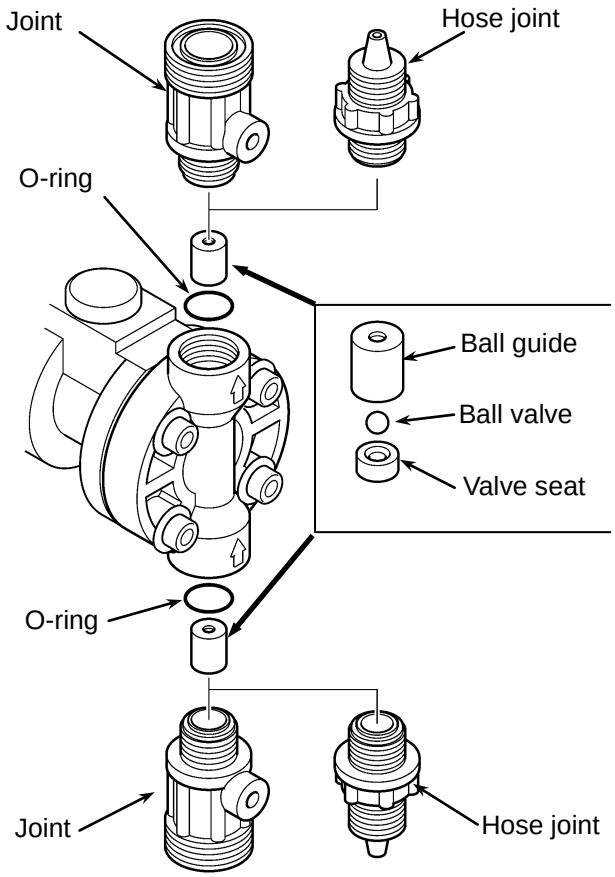
Hose type



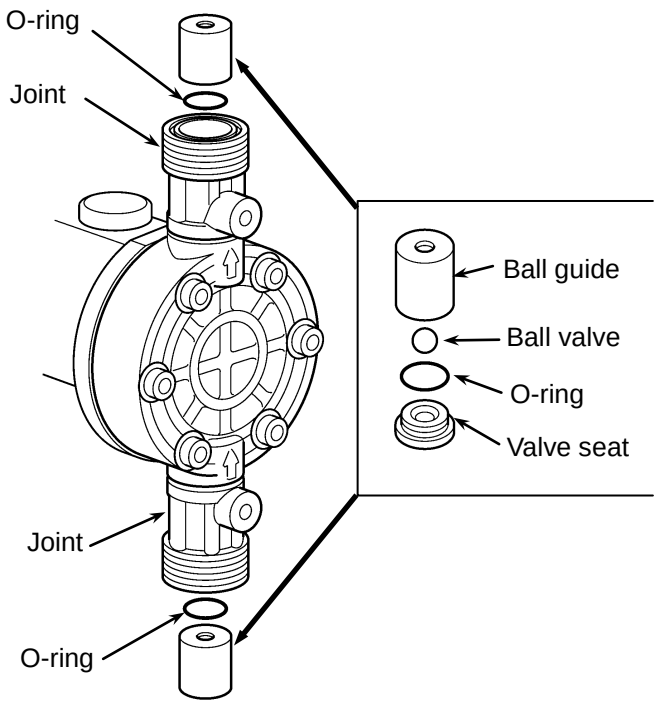
(4) Remove the joint or hose joint. (For AHA31 and 32, the joint or hose joint does not need to be removed.)

(5) Remove the ball guide, ball valve, and valve seat from the joint or hose joint.

AHA01 to 22



AHA31 and 32



(6) Set the new ball valve in place. Re-assemble the pump in reverse order of disassembly. Assemble the pump while paying attention to the position of the O-ring and the direction of the ball guide, ball valve, and valve seat. The direction of the joint or hose joint is opposite for the suction and discharge sides, however, the direction of the valves is the same.

(7) After assembly, operate the pump and vent the air. Confirm that the area where the diaphragm is connected has no leaks.

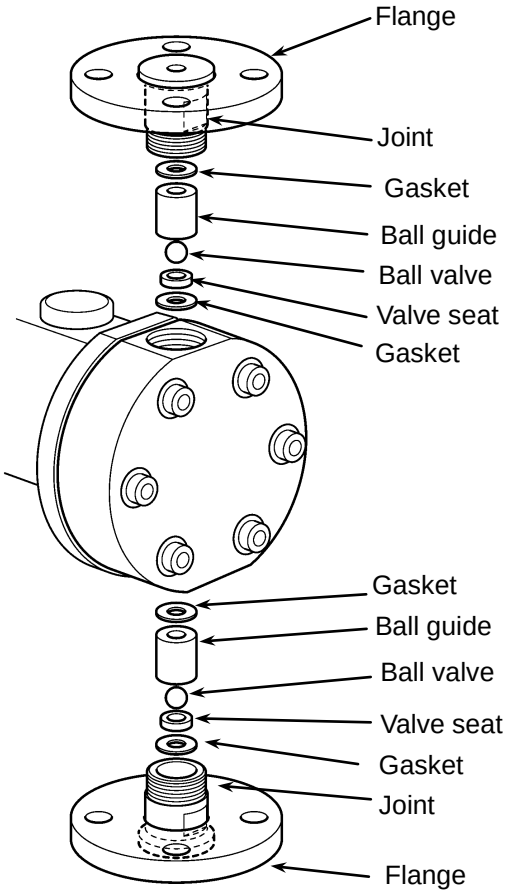
■ AHA01 to 32 (Part material: SUS)

(1) Turn the power OFF.

(2) Release the pressure from the discharge piping, then remove the suction and discharge piping.

(3) Loosen and remove the joint along with the flange from the diaphragm head.

(4) Remove the ball guide, ball valve, and valve seat from the joint.



(5) Set the new ball valve in place. Re-assemble the pump in reverse order of disassembly. Ensure the following at the time of assembly.

- Assemble the pump while paying attention to the position of the gasket and the direction of the ball guide, ball valve, and valve seat.
  The direction of the joint is opposite for the suction and discharge side, however, the direction of the valves is the same.
- Set the valve seat and make the side that is not chamfered faces up.
- Attach the flange before screwing the joint into the diaphragm head.
- Screw the joint into the diaphragm head by hand and retighten it by a quarter rotation using an adjustable spanner.

(6) After assembly, operate the pump and vent the air. Confirm that the area where the diaphragm is connected has no leaks.

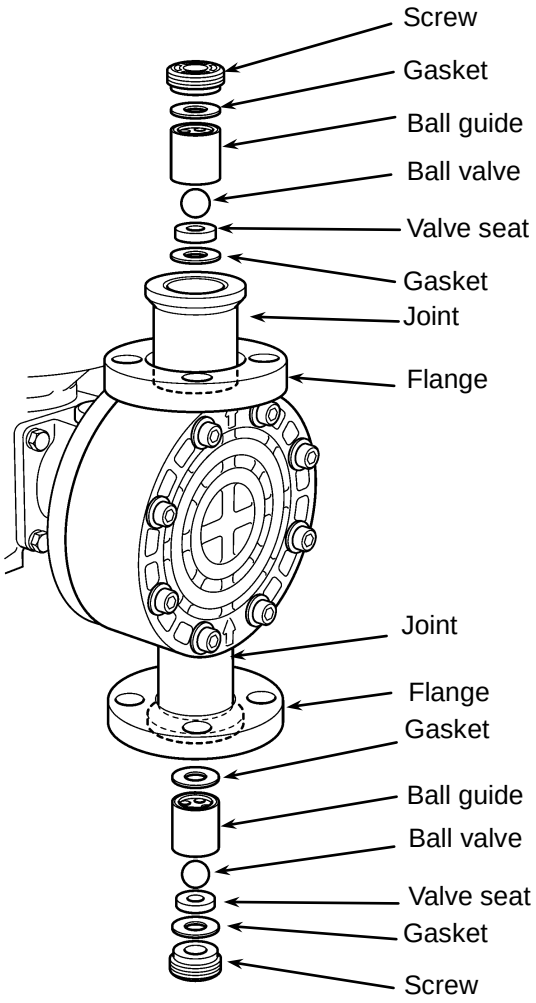
■ AHA41 to AHC72

(1) Turn the power OFF.

(2) Release the pressure from the discharge piping, then remove the suction and discharge piping.

(3) Loosen and remove the joint along with the flange from the diaphragm head.

(4) Remove the screw from the joint and then remove the ball guide, ball valve, and valve seat.



Notes: The ball guide of AHC71,72 is composed of guide and life piece.

(5) Set the new ball valve in place. Re-assemble the pump in reverse order of disassembly. Ensure the following at the time of assembly.

- Assemble the pump while paying attention to the position of the gasket and the direction of the ball guide, ball valve, and valve seat.
  The direction of the joint is opposite for the suction and discharge side, however, the direction of the valves is the same.
- Attach the flange before screwing the joint into the diaphragm head.

(6) After assembly, operate the pump and vent the air. Confirm that the area where the diaphragm is connected has no leaks.

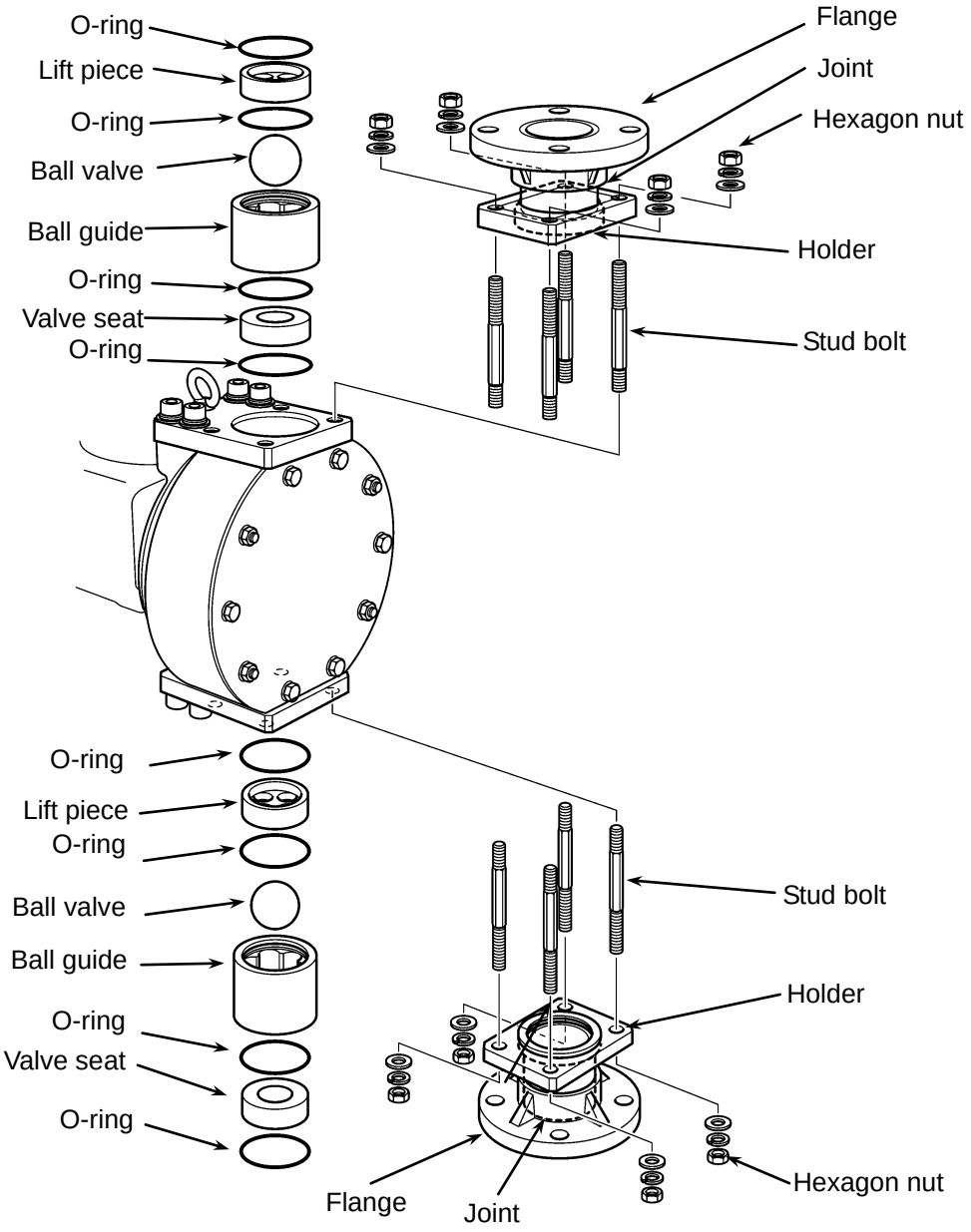
■ AHD81 and 82

(1) Turn the power OFF.

(2) Release the pressure from the discharge piping, then remove the suction and discharge piping.

(3) Loosen the hexagon nut and remove the holder. The joint and flange come off together.

(4) Remove the lift piece, ball guide, ball valve, and valve seat.



(5) Set the new ball valve in place. Re-assemble the pump in reverse order of disassembly.
Assemble the pump while paying attention to the position of the O-ring and the direction of the lift piece, ball guide, ball valve, and valve seat.
The direction of the joint is opposite for the suction and discharge side, however, the direction of the valves is the same.

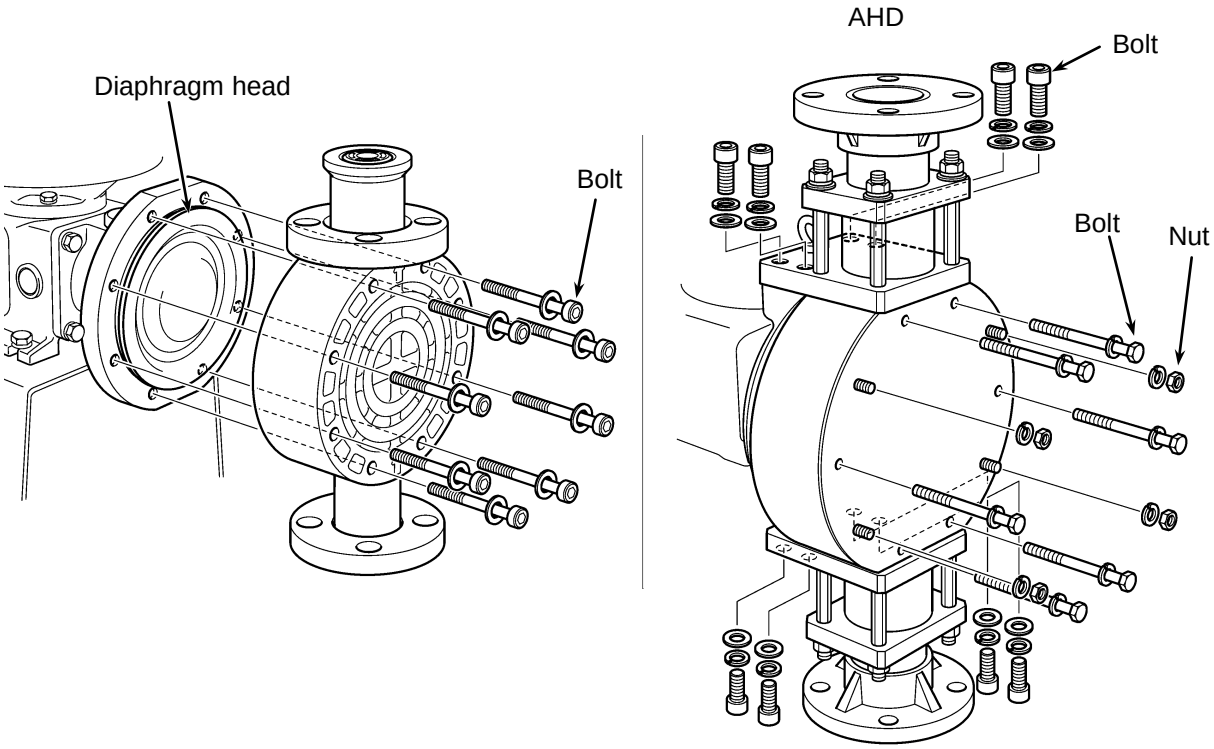
(6) After assembly, operate the pump and vent the air. Confirm that the area where the diaphragm is connected has no leaks.

12.3 Replacing the diaphragm

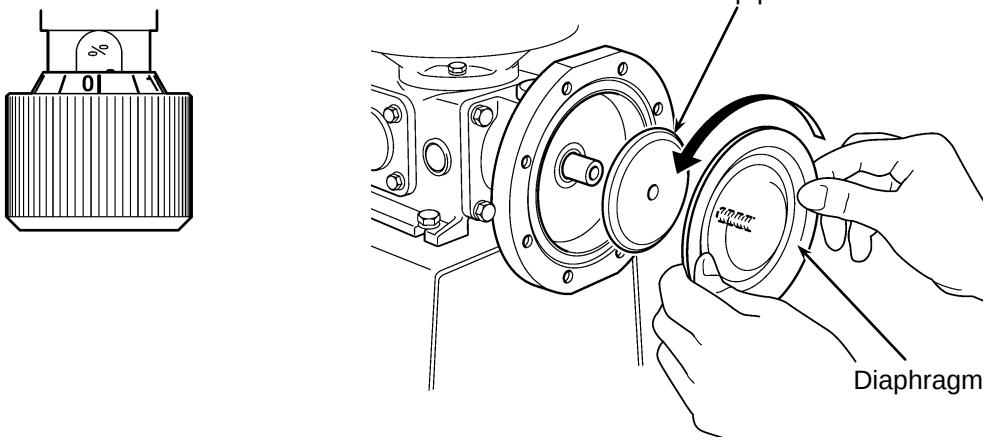
(1) Turn the power OFF.

(2) Release the pressure from the discharge piping, then disconnect the suction and discharge piping or hose.

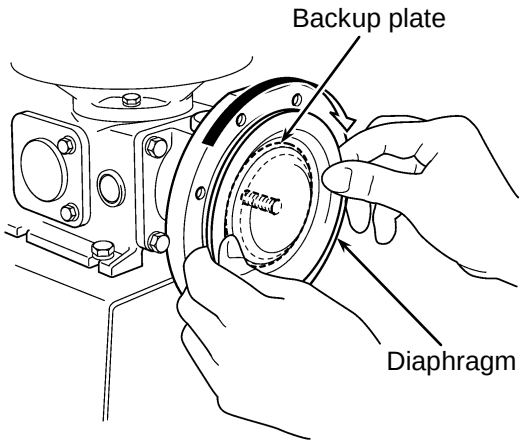
(3) Remove the bolts and nuts from the front of the diaphragm head, then remove the diaphragm head.
For AHD, remove the bolts from the guide plate on the suction and discharge side as well.



(4) Adjust the stroke length to 0%. Remove the diaphragm by turning it counter-clockwise while holding the circumference of the diaphragm.
(Remove the backup plate at the same time.)



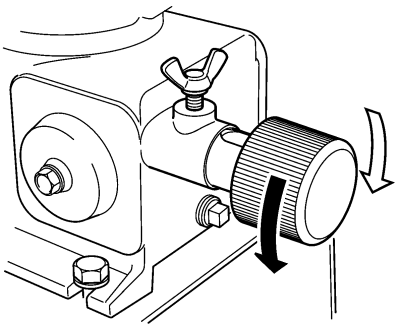
(5) Hold a new diaphragm and backup plate together and install them by turning them clockwise.

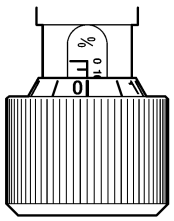


CAUTION

- **Holding the circumference of the diaphragm, turn it clockwise until it stops. The diaphragm does not need to be strongly tightened. It may break if tightened too much.**
- **Pay attention to the direction of the backup plate. Attaching the backup plate in the wrong direction can damage the diaphragm, diaphragm head, and backup plate itself.**

(6) Adjust the stroke length to the percentage indicated in the following table. Turn ON and OFF the motor power to recess the diaphragm to check the diaphragm is recessed.



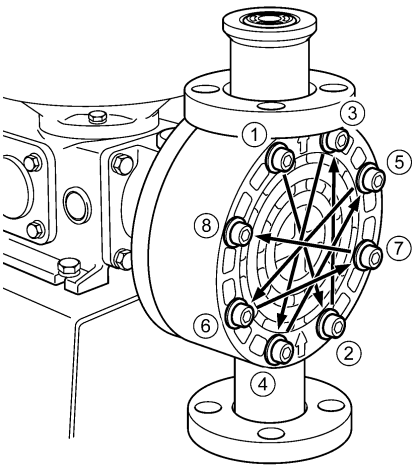


Pump model	Stroke length (%)
AHA 01,21,22	100
AHA 11,12	75
AHA 31,32,41,42,51,52 AHB 41,42,51,52,61,62 AHC 51,52,61,62	65
AHB 71,72 AHC 71,72 AHD 81,82	100

(7) Re-attach the diaphragm head.

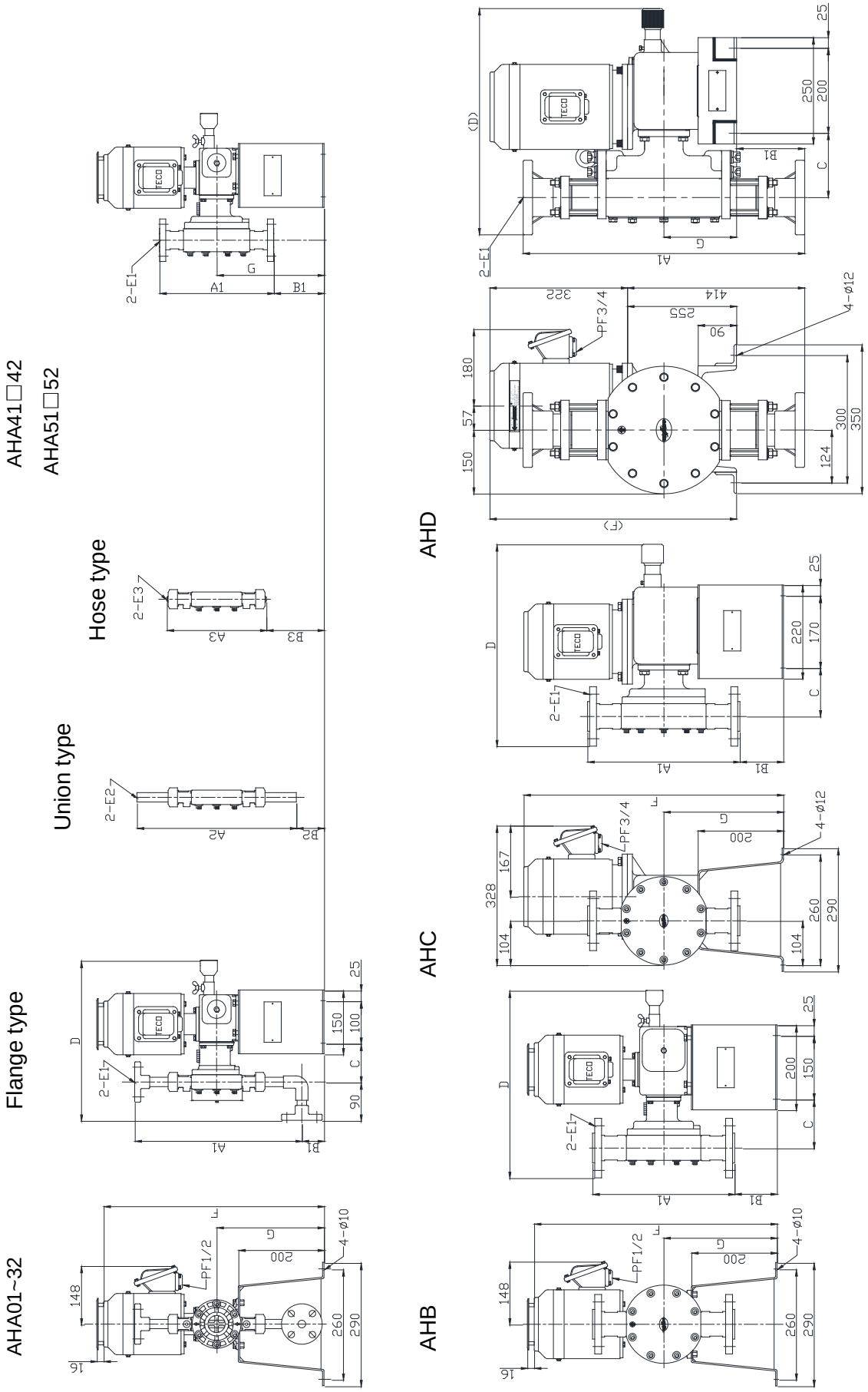
CAUTION

Fasten the bolts for the diaphragm head evenly in their numerical order. Make sure they are not fastened unevenly.
If fastened unevenly, the liquid may leak.



(8) After assembly, operate the pump and vent the air. Confirm that the area where the diaphragm is connected has no leaks.

13. Dimensions



Pump model		A1	A2	A3	B1	B2	B3	C	D	E1	E2	E3	F	G
AHA	01,11,12	361	343	166	67	80	168	84	367	15A JIS 10K Flange	VP16 Union	ψ6ID xψ11OD Hose	515	251
		156			173			84	325					
	21,22	373	355	178	61	74	162	85	368					
		176			163			85	325					
	31,32	391	373	233	52	65	135	92	377			ψ9ID xψ15OD Hose		
		176			165			91	333					
	41,42	267			118			103	349	20A JIS 10K Flange				
		262			120			96	342					
	51,52	286			108			111	369	25A JIS 10K Flange				
		286			108			111	370					
AHB	41,42	267			132			102	407	20A JIS 10K Flange			568	265
		262			134			95	400					
	51,52	332			99			115	441	40A JIS 10K Flange				
		332			99			110	436					
	61,62	356			87			112	437					
		356			87			112	437					
	71,72	448			41			139	471	50A JIS 10K Flange				
		448			41			139	471					
AHC	51,52	332			114			120	473	40A JIS 10K Flange			607	280
		332			114			115	468					
	61,62	356			102			122	476					
		356			102			117	471					
	71,72	448			56			149	511	50A JIS 10K Flange				
AHD	81,82	658			159			151	533	65A JIS 10K Flange	VP65		577	170

AHA01-32 Upper A1, B1 and A2, A3, B2, B3, E2, E3 dimensions are in case of PVC.
Under A1, B1 dimensions are in case of Stainless steel, the shape is the same as
AHA41~AHC62 AHA41,42.Upper C, D dimensions are in case of PVC.
AHC71~AHD82 Under C, D dimensions are in case of Stainless steel.
In case of PVC and Stainless steel are same dimensions.

14.1 Warranty

This provision, if attached to the quotation, constitutes a quotation together with the specifications, and you are deemed to have approved each item described below as a part of the contract unless a written separate agreement has been made when the contract has been concluded. Even if a part of this provision will not be applied by agreement with you, other items except for the associated items shall still become effective.

Warranty provision

1. Warranty

1) Our warranty period based on this provision shall be one year from the delivery date of the object product from us.
2) If our product to be delivered has any failure due to a cause which is clearly judged to be based on a defect of our manufacturing or material, we will assume responsibility for this failure.

2. Limit of warranty

If it is confirmed by both you and us that any defect or trouble has occurred due to any of the following items, we will be free from warranty responsibility based on this provision and the other responsibility of any nature and any kind.

1) If the object product was used under conditions different from our handling instructions, or specifications or the other normal usage.
2) If installation, piping, operation, running, repair or rework of the object product was improperly or inaccurately carried out by any person other than us.
3) If the object product was used for purpose or by usage not specified in the specifications or the product instruction manual.
4) If any failure or damage was caused due to chemical or fluid frictional corrosion by liquid to be handled.
5) If any failure or damage was caused due to a fact that there exists a defect in material of a part which does not directly contact the handling liquid which cannot be found by a normal technical level in the manufacturing process of the object product.
6) If any failure or damage was caused due to use of parts which we do not manufacture or do not specify.
7) If the object product was broken by frost in another status which is not under conditions that the tank discharge port is opened and water is discharged and then the inside is dried.
8) If occurrence of vibration and pressure increase in the piping system of the object product executed by us is due to another factor in the related system.

3. Content of warranty

Our warranty for the object product shall be limited to repair of defective parts or offering of replacement products by us. Please note that we will provide or replace parts such as packing, gaskets, bearings and filtering sand which have consumable characteristics at a charge even in the warranty period. If our technician is dispatched to the specified place and the defective parts are repaired or replaced by the technician based on your request, expense to dispatch our technician shall be separately paid by you based on Article 9.

We will assume no responsibility of any nature and any kind for damages such as passive damage or indirect damage, spillover damage other than contracted objects and damage caused by nuclear accidents in addition to the Article 2.

14.2 Repair procedures

If you find any abnormality during use of this pump, immediately stop operation and inspect whether it is due to failure. Refer to the section of “Troubleshooting” on page 30.

(1) When requesting repair, contact the dealer from which you ordered, or our nearest headquarters, branch or sales office listed on the back cover.

(2) When requesting repair, inform us of the pump model No. and serial No. described on the nameplate, the operating period and operating status and the failure location and its situation.

(3) When returning the pump to us for repair, make sure to sufficiently clean the inside of the pump before returning it because it is dangerous that the handled liquid remaining in the pump flows out during transportation.

NOTE **Instruction Manual may be subject to change without prior notice.**