

# **IWAKI**

## **Gas-Liquid Transfer Pump**

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**APN-085-W**

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## **Instruction Manual**

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 Read this manual before use of product

Thank you for selecting the IWAKI APN-085-W gas-liquid transfer pump. This instruction manual deals with "Safety Instructions", "Outline", "Installation", "Operation" and "Maintenance" sections.

Please read through this instruction manual to ensure the optimum performance, safety and service of your pump.

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*This instruction manual should be kept on hand by the end user for quick reference.*

*Contact us or your nearest dealer if you have any questions.*



## Important Instruction

### For the Safe and Correct Handling of the Pump

- "Safety Instruction" section deals with important details about handling of the product. Before use, read this section carefully for the prevention of personal injury or property damage.
- Observe the instructions accompanied with "WARNING" or "CAUTION" in this manual. These instructions are very important for protecting pump users from dangerous situations.
- The symbols on this instruction manual have the following meanings:

 <b>WARNING</b>	<b>Nonobservance or misapplication of the contents of "Warning" section could lead to a serious accident which may result in death.</b>
 <b>CAUTION</b>	<b>Nonobservance or misapplication of the contents of "Caution" section could lead to personal injury or property damage.</b>

### Types of Symbols

	Indicates a prohibited action or procedure. Inside or near this circle, a concrete and practical image of the activity to be avoided is depicted.
	Indicates an important action or procedure which must be performed or carried out without fail. Failure to follow the instructions herein can lead to malfunction or damage to the pump.

### Export Restrictions

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

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

# Safety Instructions

## WARNING

- **Turn off power before service**

Risk of electrical shock. Be sure to turn off power to stop the pump and related devices before service is performed.



- **Do not use the pump in any condition other than its intended purpose**

The use of the pump in any conditions other than those clearly specified may result in failure or injury. Use this product in specified conditions only.



- **Do not modify the pump**

Alterations to the pump carries a high degree of risk. It is not the manufacturer's responsibility for any failure or injury resulting from alterations to the pump.



- **Wear protective clothing**

Always wear protective clothing such as an eye protection, chemical resistant gloves, a mask and a face shield during disassembly, assembly or maintenance work.



## WARNING

- **Use specified power only**

Do not apply power other than that specified on the nameplate. Otherwise failure or fire may result. Ensure the pump is properly grounded.



- **Do not damage the power cable**

Do not pull, knot, or crush the power cable. Damage to the power cable could lead to a fire or electrical shock if cut or broken.



- **Do not operate the pump in a flammable atmosphere**

Do not place explosive or flammable material near the pump.



# Safety Instructions

## CAUTION

### • Qualified personnel only

The pump should be handled or operated by a qualified personnel with a full understanding of the pump.



### • Ventilation

Fumes or vapours can be hazardous with certain solutions. Ensure proper ventilation at the operation site.



### • Do not install or store the pump:

1. Where ambient temperature falls below 0°C or exceeds 40°C.
2. Under a flammable/corrosive atmosphere.



Prohibited

### • Spill precautions

Ensure protection and containment of solution in the event of plumbing or pump damage (secondary containment).



### • Keep electric parts and wiring dry

Risk of fire or electric shock. Install the pump where it can be kept dry.



Prohibited

## CAUTION

### • Do not use a damaged pump

Use of a damaged pump could lead to an electric shock or death.



Prohibited

### • Stop operation

If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems.



Electrical shock

### • Do not use the pump in a wet location

The pump is not waterproof. Use of the pump in wet or extremely humid locations could lead to electric shock or short circuit.



Prohibited

### • Do not touch the pump or pipe with bare hands

Risk of burning. The surface temperature of the pump or pipe rises high along with liquid temperature in or right after operation.



Caution

### • Electromagnetic precautions

This product is not protected against an electromagnetic field. Take appropriate measures as necessary.



## Safety Instructions



### CAUTION

- **Damaged power cable**

Do not use any damaged power cable for the prevention of a fire or electrical shock. The cable is not replaceable, so that the whole pump unit needs to be replaced when the cable is damaged.



Prohibited

- **Disposal of a used pump**

Dispose of any used or damaged pump in accordance with local rules and regulations. If necessary, consult a licensed industrial waste disposal company.



- **Release the pressure from the discharge line**

Solution in the discharge line may be under pressure. Release the pressure from the discharge line before disconnecting plumbing or disassembly of the pump to avoid solution spray.



### CAUTION

- **Preventative maintenance**

Follow instructions in this manual for replacement of wear parts. Do not disassemble the pump beyond the extent of the instructions.



- **Grounding**

Risk of electric shock! Always properly ground the pump. Conform to local electric codes.



Grounding

# Outline

Before use, check the specification, limitation and hazardous nature of the pump.

## 1. Unpacking & Inspection

Open the package and check that the product conforms to your order. If any problem or inconsistency is found, immediately contact your distributor.

1. Check the nameplate to see if the information such as model codes, discharge capacity and discharge pressure are as ordered.

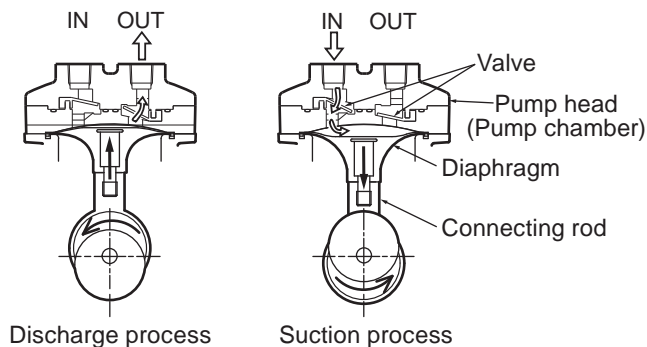
Iwaki Air Pump	
MODEL	
MAX.CAPACITY	ℓ/min
MAX.PRESSURE	MPa
MAX.VACUUM	kPa
VOLTAGE	V
CURRENT	A
POWER CONSUMPTION	W
FREQUENCY	Hz
INDOOR USE ONLY	Year
MFG.No.	
IWAKI CO.,LTD. MADE IN JAPAN	
6-6,Kanda-Sudacho 2-chome Chiyoda-ku Tokyo Japan	

2. Check for transit damage, deformation and loose bolts.

## 2. Operating principle

The APN-085-W is a gas-liquid transfer pump with a small size diaphragm and special valves, and is designed for built-in application.

The rotary motion of the motor is converted via a connecting rod to the reciprocation of the diaphragm in the pump chamber, where the mixture of gas and liquid is transferred from the inlet to outlet.



→ : Diaphragm reciprocation  
⇒ : Flow direction

## 3. Identification code

**APN - P 085 E X - E4 - W 02**  
 a b c d e f g

### a. Pump head

No code : Single head

P : Dual-head with parallel tubing

### b. Series name

### c. Diaphragm materials

E : EPDM

V : FKM

### d. Pump connection

X : Rc1/8 female thread connection (JIS taper pipe thread)

### e. Rated voltage

1 : 100VAC

E4 : 220/240VAC (3-core cabtyre cable)

### f. Gas-liquid transfer type

### g. Special specification

No code : Standard

01-99 : Special design

## 4. Specifications

### ■ Pump

■ Pump						50/60Hz
Type	Max. air flow (L/min)	Max. discharge pressure (MPa)	Max. vacuum (kPa [abs])	Connec- tion	Weight (kg)	Lowest starting temp. (°C)
APN-085E	3/4	0.05	34.66	Rc1/8	2.5	5
APN-085V			37.33			
APN-P085E	5/6		34.66		2.8	
APN-P085V			37.33			

### ■ Motor

Type	Input power (W)		Output power (W)	Power current (A)	
	100V	220/240V	100/220/240V	100V	220/240V
APN-085E	47/44	48 (50Hz)	20	0.60/0.50 (50/60Hz)	0.22 (50Hz)
APN-085V	(50/60Hz)				
APN-P085E	50/48				
APN-P085V	(50/60Hz)				

NOTE 1. Allowable maximum discharge pressure is 0.05MPa.

NOTE 2. Allowable gas temperature range is 0-40°C.

NOTE 3. Allowable liquid temperature range is 5-40°C.

NOTE 4. Allowable ambient temperature range is 0-40°C.

Observe the lowest starting temperature at the start of operation.

NOTE 5. Allowable maximum noise level is 60dB at 1m (A scale).

# Outline

## ■ Wet end material

Parts \ Model	V	F
Pump head	GFRPP	
Diaphragm	FKM	EPDM
Valve		
Valve seat	GFRPP	
Gasket	FKM	EPDM

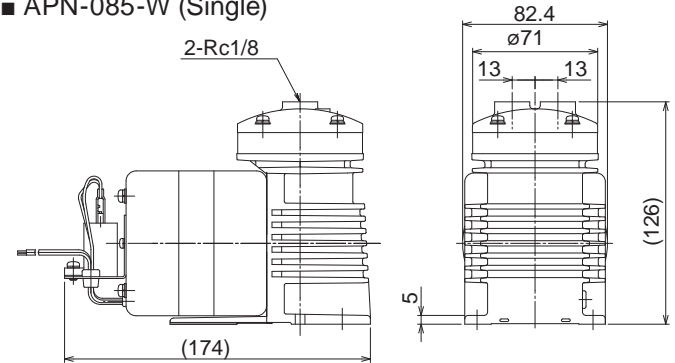
GFRPP : Glass fibre reinforced polypropylene

FKM : Fluorine-contained rubber

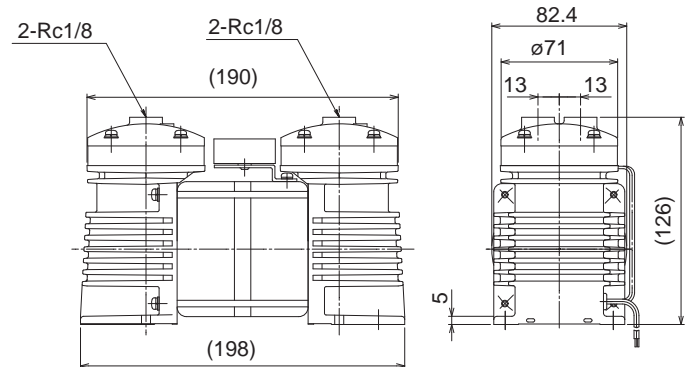
EPDM : Ethylene propylene diene monomer

## 5. Outer dimension

### ■ APN-085-W (Single)

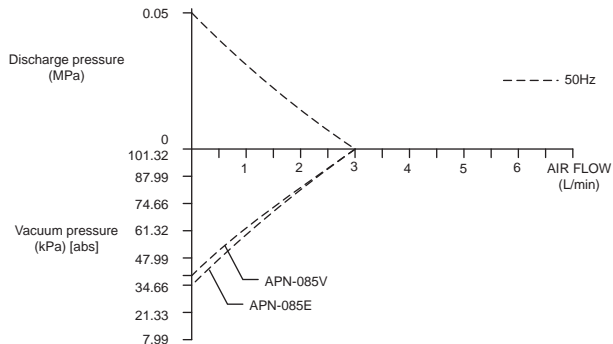


### ■ APN-P085-W (Twin parallel)

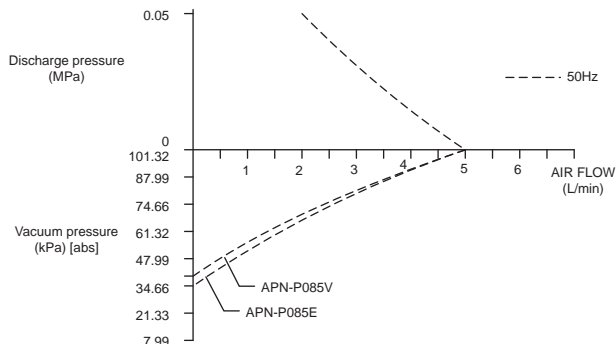


## 6. Performance curve

### ■ APN-085-W (Single)

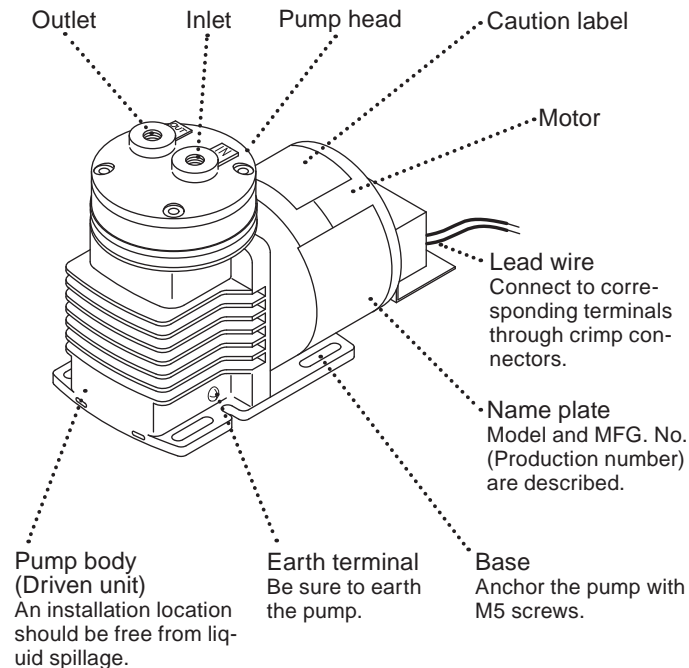


### ■ APN-P085-W (Twin parallel)



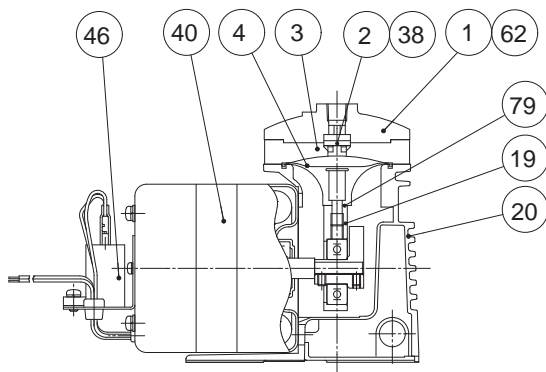
## 7. Overview & Label

The illustration below shows an APN-085-W single head type.



## 8. Part names & Structure

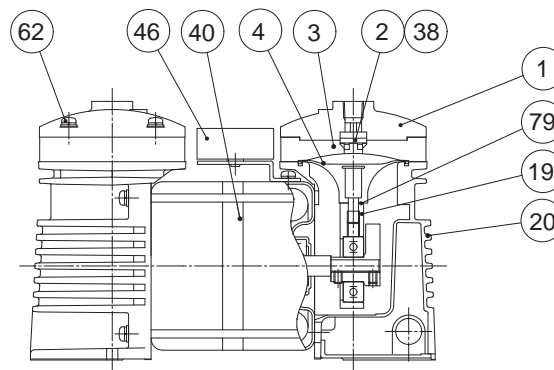
### ■ APN-085-W



No.	Part names	Q'ty
1	Pump head	1
2	Valve	2
3	Valve seat	1
4	Diaphragm	1
19	Connecting rod unit	1 set

No.	Part names	Q'ty
20	Bracket	1
40	Motor	1
46	Capacitor	1
62	Small screw	4
79	Plate washer	1
38	Gasket	2

### ■ APN-P085-W



No.	Part names	Q'ty
1	Pump head	2
2	Valve	4
3	Valve seat	2
4	Diaphragm	2
19	Connecting rod unit	2 set

No.	Part names	Q'ty
20	Bracket	2
40	Motor	1
46	Capacitor	1
62	Small screw	8
79	Plate washer	2
38	Gasket	4

# Installation

## 1. Before Installation

*Read through instructions in this section to ensure the optimum performance, safety and service of your pump.*



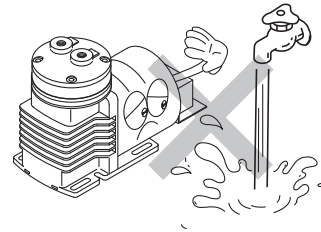
### CAUTION

- **Do not operate the pump in a flammable atmosphere**

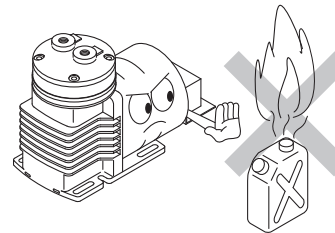
Do not place explosive or flammable material near the pump.

- **Do not use a damaged pump**

Use of a damaged pump could lead to an electric shock or death.



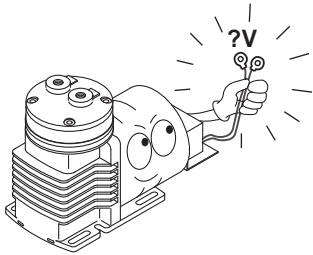
- Install the pump where it can be kept dry.



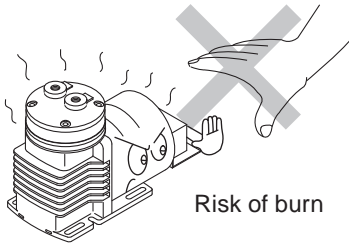
- Do not install the pump in a corrosive or flammable gas atmosphere. Keep good ventilation in a working area.

- Ambient temperature should not fall below 0°C or exceed 40°C. Observe the allowable gas temperature range of 0 and 40°C and liquid temperature range of 5 and 40°C.

# Installation

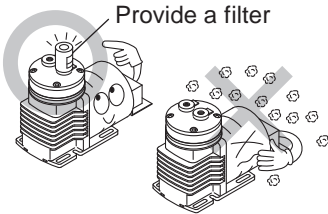


- Observe the rated voltage specified on the nameplate. Applying any voltage than the rated one may result in failure.

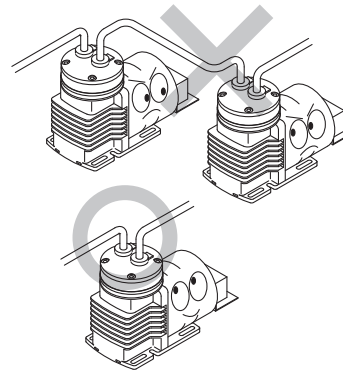


Risk of burn

- Surface temperature may rise high in operation. Do not touch the pump body directly or place the objects which may be deformed by heat close to the pump.

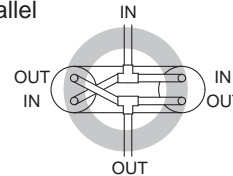


- Do not use the pump in a dusty place. Be sure to provide the inlet with a filter to prevent foreign matters from getting into the pump. Otherwise, the pump performance may reduce or the lives of the valves and diaphragm may remarkably shorten.



- Do not tube two or more pumps in series. It may prevent the motor from starting and lead to a burnout.

Parallel



- The APN-P085-W must be plumbed in parallel. No series tubing is allowed.

Series



# Installation

## 2. Installation/ Tubing/ Electrical wiring

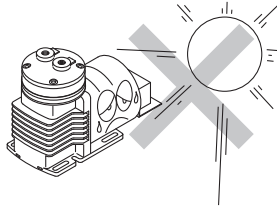
### **WARNING**

If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems.

### 2.1 Installation

#### 1. Installation location

- Do not expose the pump to direct sunlight, vibration and wind & rain.
- Select a level location, free from vibration, that won't hold liquid.
- Keep good ventilation. The pump should always be free from the possibility of getting wet.
- Ambient temperature should not fall below 0°C or exceed 40°C.
- Ambient humidity should not fall below 35%RH or exceed 90%RH.
- Allow sufficient space around the pump for easy access and maintenance.

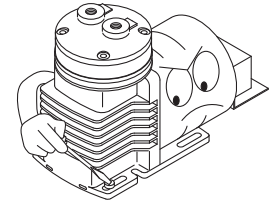


#### 2. Pump fixation

- Set the pump baseplate on a concrete foundation and fasten corrosion-resistant M5 screws tightly to prevent the pump from vibrating during operation.

### **CAUTION**

**Do not install the pump on an unstable place.**



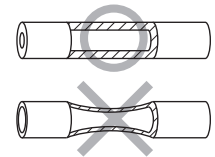
### 2.2 Tubing

1. The short tubing with the minimum bends is optimal to reduce resistance.
2. Avoid sharp turns or bends.

### **CAUTION**

**Do not have tubing bent or pressed. Otherwise, the tube end may break.**

3. Provide tube fittings to the threaded inlet and outlet (Rc1/8) of the pump. Use chemically-resistant tubes or temperature-/pressure-resistant tubes as necessary. Cut the tube ends flat beforehand.



## Installation

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4. When the pump is used for the delivery of liquid, use a suction line of 4mm I.D. to give a certain resistance to an incoming flow for the prevention of an overloaded/locked motor, and a discharge line of 8mm O.D. to maintain a certain amount of outgoing flow and assures the rated pump performance will be kept.

### CAUTION

**Use of a wrong tube size bears the risk of coming off, causing an air and a liquid leak.**

5. Install valves on both discharge and suction lines.
- Suction valve:  
For adjustment of an air/liquid flow and a vacuum.
  - Discharge valve:  
For maintenance and shutoff.
6. Wrap a sealing tape to the thread of tube fittings and screw them into the inlet and outlet of the pump. And then fit and slide tubes down onto the fittings as far as they will go.

NOTE: If the suction line connection is imperfect, the pump entrains air and so the full performance will not be achieved.

### 2.3 Electrical wiring

*Electrical wiring must be performed by a qualified electrician. It is not the manufacture's responsibility for personal injury or property damage resulting from unauthorized service. Contact us or your nearest distributor for wiring as necessary.*

#### ■ Before wiring

1. Check that the main power is turned off.
2. Electrical work should be performed in accordance with local electric codes, with an appropriate wire gauge or so.
3. Apply the specified power voltage. See the spec label.
4. Earth the pump through the earth terminal.
5. When an earth leakage breaker is used and has tripped, always investigate and solve root causes. Be sure to unplug the pump before investigation is performed.

# Operation

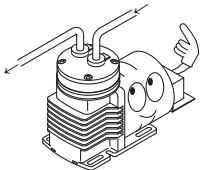
## 1. Before operation



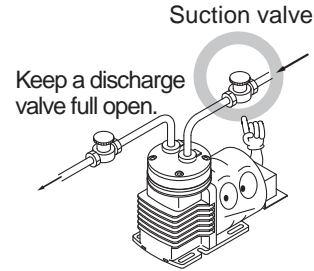
- Use care handling the pump. Do not drop. An impact may affect pump performance. Do not use a pump that has been damaged to avoid the risk of electrical damage or shock.

- The pump can not start with full discharge/suction pressure or liquid. Remove pressure or liquid before operation.

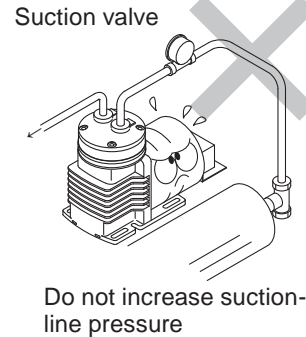
### No load operation



- After a long period of stoppage, pump performance at the beginning of operation becomes occasionally unstable. In this case, warm the pump up for 10 minutes with no discharge line pressure.



- Always use a suction valve to adjust an air/liquid flow.



- If the compressed air or liquid (higher pressure than atmospheric pressure) is transferred to the pump, sharp deterioration to the lives of the valve, diaphragm and bearing may result. Always keep atmospheric or lower pressure in the suction line.
- Do not clean the pump or nameplate with a solvent such as benzene, alcohol or thinner. This may discolour the pump or erase printing. Use a dry or damp cloth or a neutral detergent.

## 2. Pump operation

### ■ Start-up

1. Before pump operation, check that each tube connection is secured.
2. Check that a suction line is connected to the inlet and a discharge line to the outlet.



### CAUTION

**If a suction line and a discharge line are connected the other way around, pumping process is inverted.**

3. Check that the pump is firmly fixed on a mounting position.

### ■ Operation

Operate the pump according to the following steps.

No.	Procedure	Points to be Checked
1	Check tubing, wiring and voltage.	<ul style="list-style-type: none"> <li>• Check installation, tubing and wiring are properly done and wiring system is fused.</li> <li>• Check the spec label to see if power supply voltage is correct.</li> </ul>
2	Open valves.	<ul style="list-style-type: none"> <li>• Fully open both discharge and suction lines.</li> </ul>
3	Supply power to the pump.	<ul style="list-style-type: none"> <li>• Smooth starting may not be obtained when ambient temperature is 10°C or below. In this case, run the pump with no discharge line pressure for a few minutes to warm it up.</li> <li>• Smooth starting may not be obtained when the pump chamber is filled with liquid. Get rid off liquid before operation.</li> </ul>
4	Adjust a liquid/air flow.	<ul style="list-style-type: none"> <li>• Provide a running-in period before full scale operation.</li> <li>• Always adjust a liquid/air flow by a suction valve.</li> </ul>
5	Check the operation.	<ul style="list-style-type: none"> <li>• After starting, check a pressure gauge to see if suction and discharge line pressure are correct and an air flow meter to see if the specified air flow is obtained.</li> <li>• Keep a suction line pressure at or below atmospheric pressure.</li> <li>• In case electric power has failed while the pump is running, switch off main power. Otherwise, the motor may not restart or may burn out depending on a line pressure at the time of power recovery.</li> </ul>

# *Operation*

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## ■ Stop and Storage

- Before a long period of stoppage (1 week or more):
  - Depressurize/empty the pump. Some liquids may harden or crystallize when they are left for a long time. In this case clean wet ends before/after operation.
  - Keep the inside of the pump head free from residual gas/liquid.
- Before resuming operation:
  - Operation may occasionally be upset in the beginning. In this case, warm up the pump with no load operation.
  - Follow the operation table to resume operation.

# Maintenance

## 1. Troubleshooting

**If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems. Contact us or your nearest distributor as necessary.**

Phenomenon					Measures
Causes	Pump does not run.	Pump stops running.	Poor air flow or discharge pressure	Pump makes noise.	
No power distribution	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check wiring.
Motor trouble (disconnection or capacitor failure)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Replace the motor.*
Wrong tubing or poor connection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Check and fix tubing.
Pump head mounting screws are loose.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Tighten the screws.
Diaphragm insertion is loose.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Tighten diaphragm.
Diaphragm is damaged.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Replace diaphragm.
Filter is clogged.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Remove foreign matters.
Valves are worn.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Replace valves.
Motor-Bracket fixing screws are loose.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Secure them.
Eccentric shaft has worn.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Replace the connecting rod.*
Connecting rod bearing has worn.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Replace the connecting rod.*
Motor bearing has worn.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Replace the motor.*
Voltage reduction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Increase voltage to the rated level.
Higher suction pressure than atmospheric	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Reduce suction pressure.
The pump head is filled with liquid.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Drain liquid.

Contact us for the measures marked with \*.

## 2. Maintenance & Inspection

**Handling of the pump, maintenance and inspection should be carried out within the descriptions of this instruction manual.**

**It is not the manufacturer's responsibility for personal injury or property damage resulting from unauthorized service. Contact us or your nearest distributor as necessary.**

### ■ Daily inspection

Check the following points every day. If you notice any abnormal or dangerous conditions, suspend operation immediately and remove problems according to the troubleshooting section. When wear parts come to the life limit, replace them by new ones. Contact your distributor for detail.

No.	Check that:	Measure
1	pump operation is normal.	<ul style="list-style-type: none"> <li>• Apply correct voltage and amperage.</li> <li>• Adjust discharge/suction pressure.</li> </ul>
2	there is no noise or vibration problem.	<ul style="list-style-type: none"> <li>• Unusual noise/vibration may occur when pump operation is not normal.</li> </ul>
3	there is no air leak or air ingress from pump parts and tubing connections.	<ul style="list-style-type: none"> <li>• Retighten connections.</li> </ul>

# Maintenance

## ■ Wear parts

If pump performance has remarkably reduced, replace diaphragms and valves with new ones. Wear part duration varies with the pressure, temperature and characteristics of gas/liquid. Values in the table below are collected in continuous operation at the rated voltage and 20°C ambient temperature with 20°C gas/liquid.

Application	Load range	Life span		
		Valve	Diaphragm	Gasket
Gas transfer	All range	8000hr	8000hr	8000hr
Liquid transfer	No load	4000hr	4000hr	4000hr

\*The above lives are reference values and not warranted.

## ■ Cleaning

Turn off power and wait until the pump has cooled down. Then clean off the surface of the pump with a wet cloth. Use a neutral detergent for greasy dirt as necessary and dry it with a dry cloth. Check the pump surface has dried up before operation.

## CAUTION

**Risk of electrical shock. Do not wet electric parts or wiring.**

## ■ Storage

- Protect the pump from dust during storage.
- Do not store the pump:
  - Where ambient temperature falls below 0°C or exceeds 40°C.
  - In a flammable or corrosive atmosphere.
  - In a dusty/humid place.
  - In direct sunlight or wind & rain.
  - Under vibration.

# Maintenance

## 3. Wear part replacement

*For a long period of operation wear parts need to be replaced periodically.*

### CAUTION

- **Turn off power before service**

Risk of electrical shock. Be sure to turn off power to stop the pump and related devices before service is performed.

- **Do not touch the pump or pipe with bare hands**

Risk of burning. The surface temperature of the pump or pipe gets high in or right after operation.

- **Wear protective clothing**

Always wear protective clothing such as an eye protection, chemical resistant gloves, a mask and a face shield during disassembly, assembly or maintenance work.

See page 8 "**8. Part names & Structure**" as necessary.

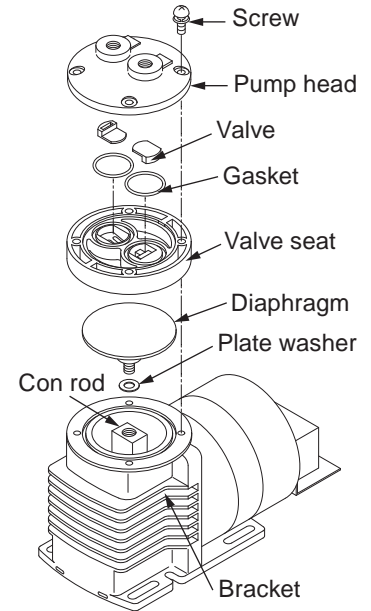
### ■ Diaphragm replacement

1. Unscrew the pump head fixing screws and take out the pump head, valves, gaskets and valve seat.

2. Turn the diaphragm anti-clockwise so as to detach it from the rod.

3. Mount a new diaphragm into the rod and fasten as far as it will rotate.

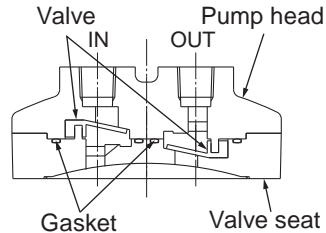
4. Push down the diaphragm until it bottoms out and then reassemble and secure the above parts onto the bracket with the screws by 1.37N•m.



# Maintenance

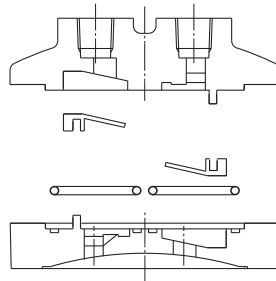
## ■ Valve & Gasket replacement

1. Unscrew the pump head fixing screws and take apart the pump head unit.



2. Replace old valves and gaskets with new ones and then reassemble the pump head unit.

3. Supply air into the pump inlet and check the air is discharged through the outlet.



4. Push down the diaphragm until it bottoms out and then secure the unit onto the bracket with the screws by  $1.37\text{N}\cdot\text{m}$ .

NOTE1. For the pumps with two pump heads, build up each pump head separately.

NOTE2. Do not loosen the motor-bracket fixing screws during maintenance work.

NOTE3. Contact your nearest distributor for the replacement of the connecting rod and the motor.



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