

# **IWAKI**

## **Gas-Liquid Transfer Pump**

### **APN-05/10/20/30/60-W (built-in type)**

## **Instruction Manual**

 Read this manual before use of product

Thank you for selecting the IWAKI APN series 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.



Electrical shock

- **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.



Prohibited

- **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.



No remodeling

- **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.



Wear protectors

## **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.



Prohibited

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

Do not place explosive or flammable material near the pump.



Electrical shock

## **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.



# Safety Instructions



## CAUTION

- **Do not install or store the pump:**

1. Where ambient temperature falls below 5°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

- **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



## CAUTION

- **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.



- **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.



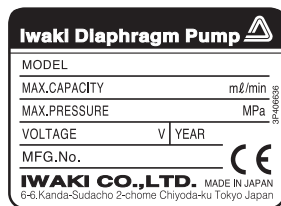
# Outline

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.

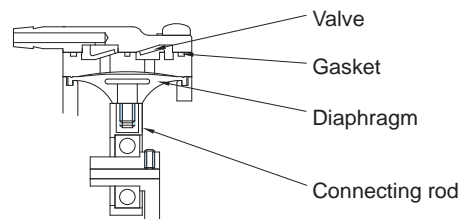


2. Check for transit damage, deformation and loose bolts.

## 2. Operating principle

The APN-05/-10/-20/-30/-60-W is a gas-liquid transfer pump with a small size diaphragm.

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.



## 3. Identification code

**APN - 10 G E D2 - W 02**

a   b   c   d   e   f

- a. Pump size      05 : APN-05 type  
                      10 : APN-10 type  
                      20 : APN-20 type  
                      30 : APN-30 type  
                      60 : APN-60 type
- b. Bracket type      No code : without base  
                          G : with base
- c. Diaphragm/Valve/Gasket materials  
                          No code : FKM  
                          E : EPDM
- d. Rated voltage      D1 : 12VDC  
                          D2 : 24VDC
- e. Gas-liquid transfer type
- f. Special specification

## 4. Specifications

### ■ Pump

Type	Air flow rate (ml/min)	Maximum discharge pressure (MPa)	Maximum vacuum (kPa)	Liquid flow rate (ml/min)	Motor		Inlet/outlet I.D. (mm)	Weight (g)	Lowest starting temperature (°C)
					Rated current (A)				
					12VDC	24VDC			
APN-05	100	0.01	87.99	50	0.4	0.2	ø4.5	110	5
APN-10	200	0.03	74.66	100					
APN-20				200					
APN-30	1200	0.08	47.99	300	0.96	0.48	ø5.5	210	
APN-60				600					

NOTE 1. Observe the allowable maximum discharge pressure.

NOTE 2. Observe the allowable gas temperature range of 5-40°C.

Observe the allowable liquid temperature range of 10-40°C.

NOTE 3. Observe the allowable ambient temperature range of 5-40°C.

NOTE 4. Observe the allowable maximum noise level of 56dB at 1m (A scale).

# Outline

## ■ Wet end material

Parts	Material	FKM type	EPDM type
Pump head	GFRPP		
Diaphragm		FKM	EPDM
Valve		FKM	EPDM
Valve seat	GFRPP		
Gasket		FKM	EPDM

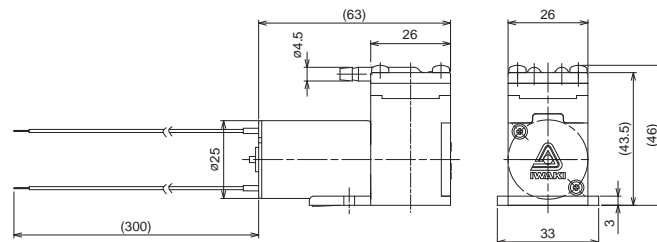
GFRPP : Glass fibre reinforced polypropylene

FKM : Fluorine-contained rubber

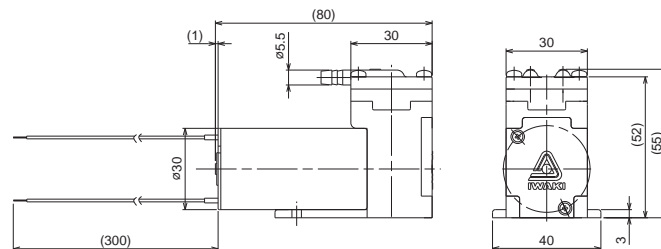
EPDM : Ethylene propylene diene monomer

## 5. Outer dimension

### ■ APN-05/-10/-20-W

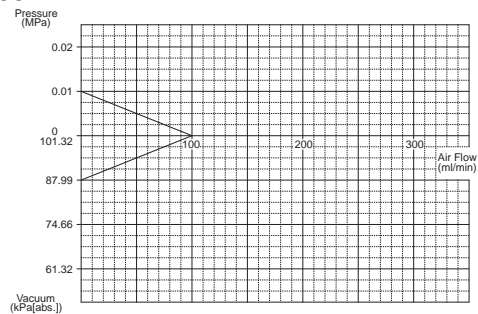


### ■ APN-30/-60-W

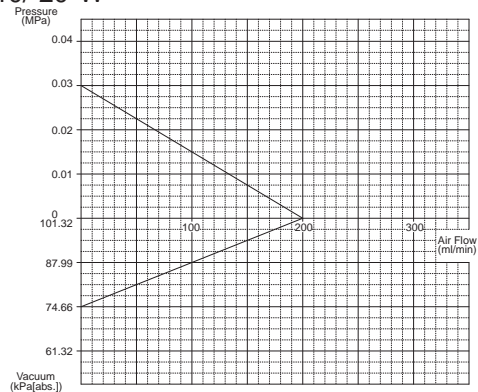


## 6. Performance curve (gas transfer)

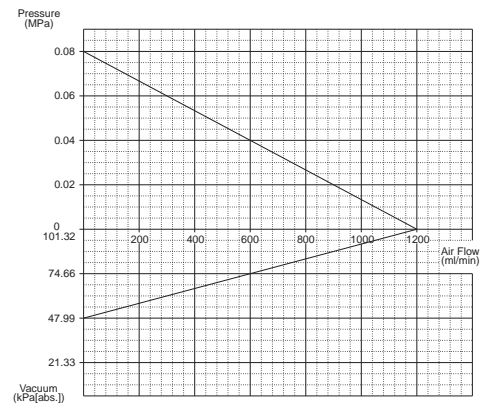
### ■ APN-05-W



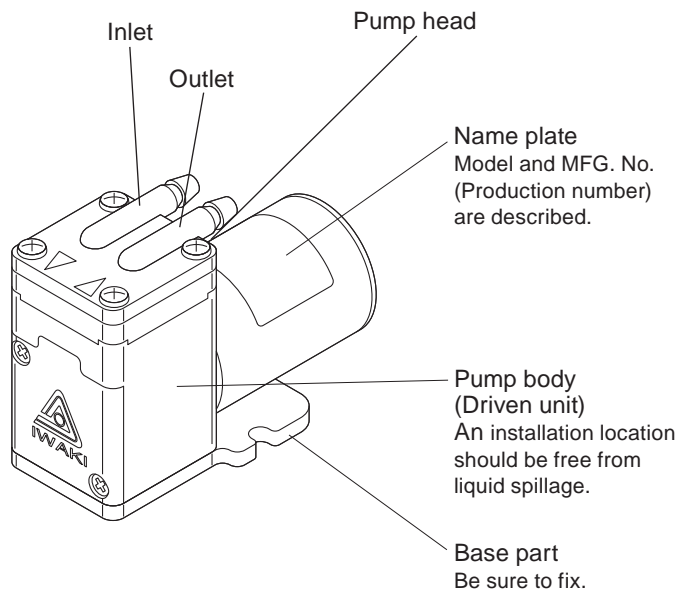
### ■ APN-10-20-W



### ■ APN-30/-60-W

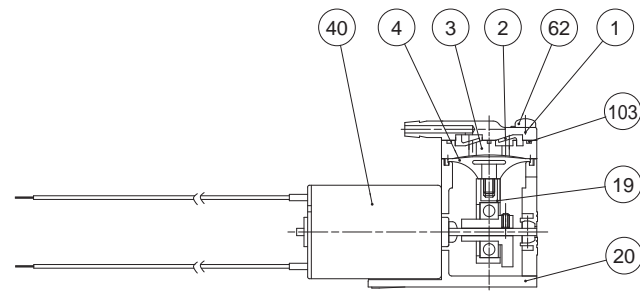


## 7. Overview & Label



## 8. Part names & Structure

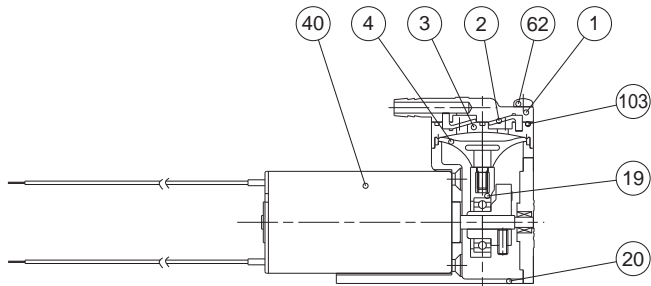
■ APN-05/-10/-20-W



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

No.	Part names	Q'ty
20	Bracket	1
40	Motor	1
62	Screw	4
103	Gasket	1

## ■ APN-30/-60-W



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

No.	Part names	Q'ty
20	Bracket	1
40	Motor	1
62	Screw	4
103	Gasket	1

# Installation

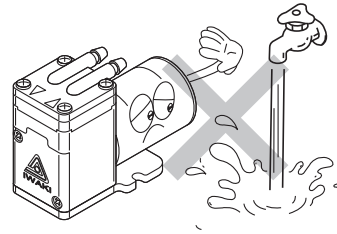
## 1. Before Installation

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

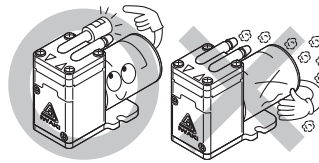


### CAUTION

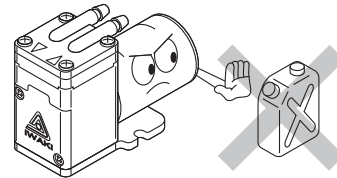
- **Do not operate the pump in a flammable atmosphere**  
Do not place explosive or flammable material near the pump.
- **Do not use a damaged pump**  
Use of a damaged pump could lead to an electric shock or death.



- Install the pump where it can be kept dry.

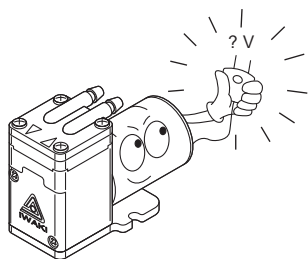


- For gas transfer, do not use the pump in a dusty place. Be sure to provide the inlet with a filter to prevent foreign matters from getting into the pump. Otherwise, the pump performance may reduce or the lives of the valves and diaphragm may remarkably shorten.

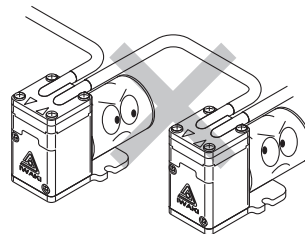


- Do not install the pump in a corrosive or flammable gas atmosphere. Keep good ventilation in a working area. Ambient temperature should not fall below 5°C or exceed 40°C. Observe the allowable gas temperature range of 5 and 40°C and liquid temperature range of 10 and 40°C.

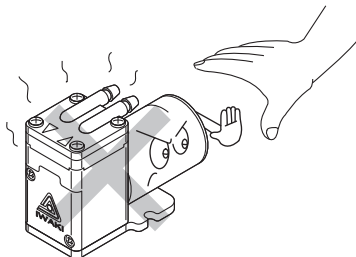
# Installation



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



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



- 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.

# Installation

## 2. Installation/ Tubing/ Electrical wiring

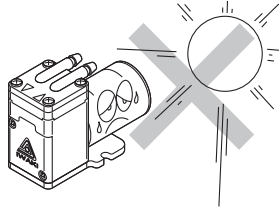
### **WARNING**

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

### 2.1 Installation

#### 1. Installation location

- 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 5°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

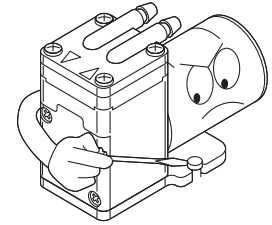
Secure the pump by fixing the base.

### **CAUTION**

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

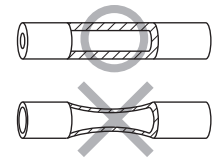
#### 3. Tube preparation

Cut the tube ends flat before hand.



### 2.2 Tubing

1. The short tubing with the minimum bends is optimal to reduce resistance.
2. Use the vinyl tubes sustainable under the maximum possible pressure.



### **CAUTION**

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

## *Installation*

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3. 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 4mm O.D. to maintain a certain amount of outgoing flow and assures the rated pump performance will be kept.
4. Install a valve in a suction line between the pump and a supply tank for adjusting an air/liquid flow and the degree of vacuum.
5. Push the tubes into the inlet and outlet as far as they will go.
6. Tube should be thick enough. The use of a thin and light tube may reduce suction force and an air flow.
7. Use tube bands to ensure firm connections.

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. This product is not protected against an electromagnetic field. Take appropriate measures as necessary.
5. After wiring work, check that the system is free from the inductive noise at start-up.
6. The drive circuit generates noise because of its high-speed switching. Check if peripheral devices are not affected by the noise.
7. This product, especially for the motor PCB, is not protected against (and therefore breaks at) the occurrence of a high voltage spike such as a lightening surge. Use a varistor as necessary.
8. 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.

### ■ Wiring

#### *1. Power lead polarity*

The red power lead leading from the pump is positive polarity and must be connected to a positive contact of a DC power supply, and the black power lead leading from the pump is negative polarity and must be connected to a negative contact of the DC power supply. Or motor failure may result.

#### *2. External fuse*

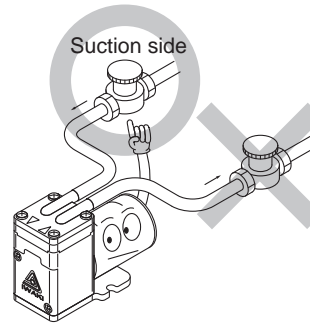
Install an external fuse in the power line for overcurrent protection.

# Operation

## 1. Before operation

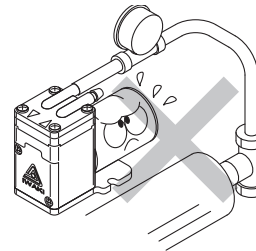


- Use care handling the pump. Do not drop. An impact may affect pump performance. Do not use a pump that has been damaged to avoid the risk of electrical damage or shock.



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

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

- 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.
4. Do not apply an unspecified voltage or leave the motor locked during operation. The motor heats up abnormally and the coil may break.

### ■ 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>

# Maintenance

## ■ 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.
- Do not store the pump:
  - Where ambient temperature can exceed 5-40°C.
  - In a dusty/humid environment.
  - In a flammable/corrosive atmosphere.
  - Under mechanical vibration or wind & rain.

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

# Maintenance

## 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>

### ■ Pump replacement

Replace the pump at the end of life span or when performance has remarkably reduced.

Model	Load	Life span
APN-05/-10/-20/-30/-60	The allowable pressure/vacuum at each model	1000hr

\*Part lives vary with the pressure, temperature and character of gas/liquid. Values on the above table are collected in continuous operation at the rated voltage and 20°C ambient temperature with 20°C gas or gas-liquid mixture.



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<b>France</b>	<b>IWAKI France S.A.</b>	TEL : (33)1 69 63 33 70	FAX : 1 64 49 92 73	<b>Taiwan</b>	<b>IWAKI Pumps Taiwan (Hsin-chu) Co., Ltd.</b>	TEL : (886)3 573 5797	FAX : (886)3 573 5798
<b>Germany</b>	<b>IWAKI EUROPE GmbH</b>	TEL : (49)2154 9254 0	FAX : 2154 9254 48	<b>Thailand</b>	<b>IWAKI (Thailand) Co., Ltd.</b>	TEL : (66)2 322 2471	FAX : 2 322 2477
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<b>Indonesia</b>	<b>IWAKI Singapore (Indonesia Branch)</b>	TEL : (62)21 690 6606	FAX : 21 690 6612	<b>Vietnam</b>	<b>IWAKI pumps Vietnam Co., Ltd.</b>	TEL : (84)613 933456	FAX : 613 933399