

# **IWAKI Air Pump**

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**APN-051/-052**

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## **Instruction Manual**

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 Read this manual before use of product

Thank you for selecting an IWAKI APN-051/-052 air 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 distributor 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 personnel 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

### • 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.



Prohibited

### • Provide protections

Rotating and charged parts are not protected. Provide a safety protection to your equipment as necessary.



## CAUTION

### • Qualified personnel only

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



Prohibited

### • Ventilation

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



Caution

### • 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).



Caution

### • Keep electric parts and wiring dry

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



Prohibited

# Safety Instructions

## 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.



- **Limit of disassembly**

Wear parts replacement should be carried out within the descriptions of this instruction manual.



- **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.



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

- **Install a GFCI (earth leakage breaker)**

An electrical failure of the pump may adversely affect other devices on the same line. Purchase and install a GFCI (earth leakage breaker) separately.



Electrical shock

- **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.



Electrical shock

- **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.



- **Grounding**

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



Grounding

- **Dedicated pump model**

This dedicated pump is designed for built-in application only.



Caution

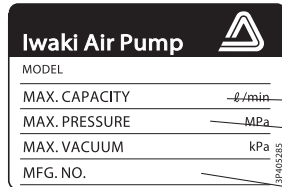
# Outline

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

## 1. Unpacking & Inspection

On unpacking the product, check the following points. If you find any problems, contact your nearest distributor.

1. Check the information on the nameplate to see that the product is delivered as per order.
2. Check for transit damage, deformation, and loose bolts.

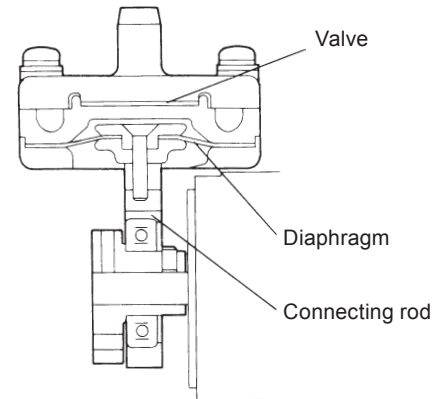


- Flow rate
- Discharge pressure
- Manufacturing number

## 2. Operating principle

The APN-051/-052 is a diaphragm type air pump and is designed to be built into various devices.

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



## 3. Identification code

**APN - S 051 L E 5 - 1 - 01**  
          a   b   c   d   e   f   g

a. Pump head

No code : Single head

S : Dual-head with series tubing

P : Dual-head with parallel tubing

b. Series name

051 : 4P Motor

052 : 2P Motor

c. Pump head

L : Horizontally oriented

H : Vertically oriented

d. Valve/Diaphragm materials

E : EPDM / EPDM

V : FKM / PTFE+EPDM

e. Pump connection

No code :  $\varnothing$ 8 tube connection

5 :  $\varnothing$ 5 tube connection (H type only)

f. Rated voltage

1 : 100VAC

g. Special specification

## 4. Specifications

### ■ Pump

50/60Hz, 100VAC

Type	Max. air flow (L/min)	Max. discharge pressure (MPa)	Max. vacuum (kPa)	Motor			Connection	Weight (kg)	Lowest starting temp. (°C)
				Input power (W)	Output power (W)	Rated current (A)	Tube		
APN-051LV/HV	0.6/0.7	0.05	61.32 (abs.)	14/15	1	0.14/0.15	ø8 or ø5 (H type only)	0.5	5
APN-051LE/HE									
APN-P051LV/HV	1.2/1.4	-	13.33 (abs.)	18/20	3	0.18/0.2	ø8		
APN-P051LE/HE									
APN-S051LV	1.5/1.8	-	13.33 (abs.)	15/15	2.5	0.15/0.15	ø8 or ø5 (H type only)		
APN-S051LE									
APN-052LV/HV	1.8/2.1	0.05	61.32 (abs.)	30/36	5	0.3/0.36	ø8 or ø5 (H type only)		
APN-052LE/HE									
APN-P052LV/HV	3.6/4.2	-	13.33 (abs.)	ø8	0.85				
APN-P052LE/HE									
APN-S052LV	3.0/3.6	-	13.33 (abs.)	ø8	0.85				
APN-S052LE									

NOTE1. Observe the maximum discharge pressure of 0.05MPa.

NOTE2. The APN-S type is designed for vacuum application only with an open-ended discharge line.

NOTE3. Allowable gas temperature range is 5-40°C.

NOTE4. Allowable ambient temperature range is 5-40°C.

NOTE5. The max air flow, discharge pressure and vacuum are based on the operation with ambient air of 20°C and may change with gas/room temperature.

# Outline

## Wet end material

Parts	Model	V	E
Pump head		GFRPP	
Diaphragm		PTFE+EPDM	EPDM
Valve		FKM	
Valve seat		GFRPP	
Retainer plate		GFRPPS	
Screw		SUS304 or equivalent	

GFRPP : Glass fiber reinforced polypropylene

PTFE : Polytetrafluoroethylene

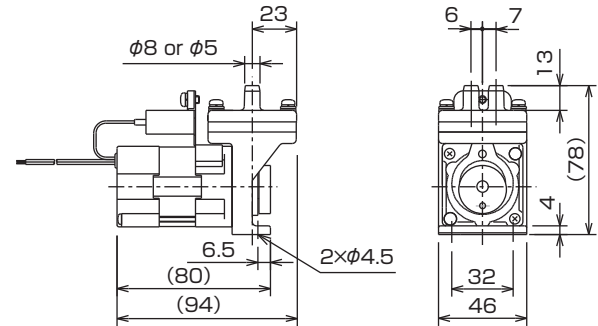
EPDM : Ethylene propylene diene monomer

FKM : Fluorine-contained rubber

GFRPPS : Glass fiber reinforced polypropylene sulfide

SUS304 : Austenite stainless steel

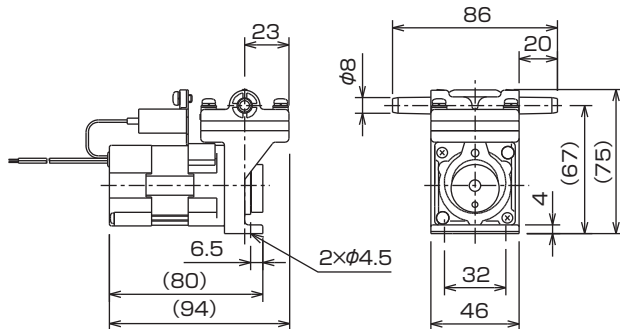
## 051H/-052H



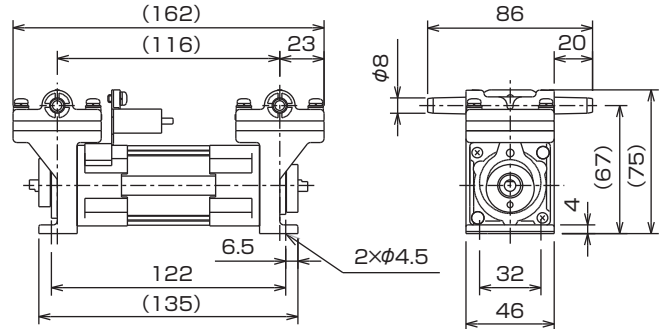
## 5. Outer dimension

mm

### 051L/-052L

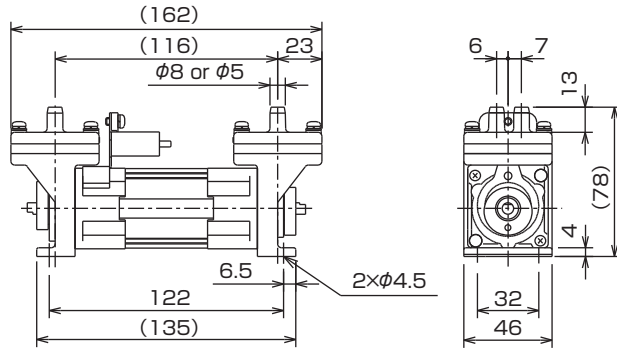


### P051L/-P052L

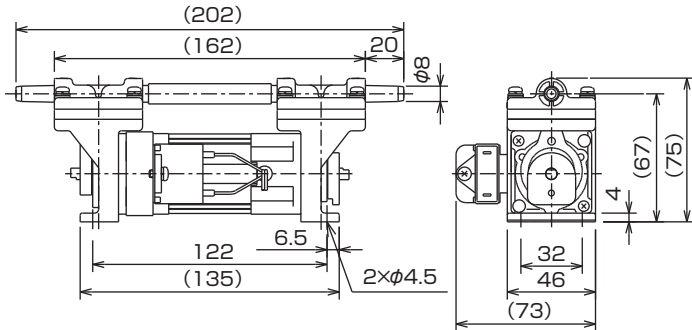




## ■ P051H/-P052H

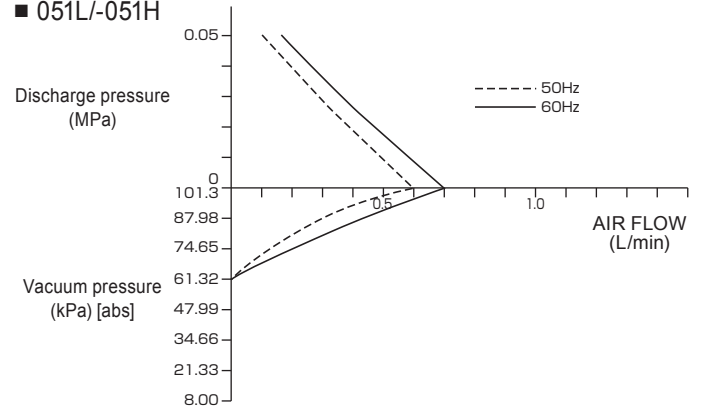


## ■ S051/-S052

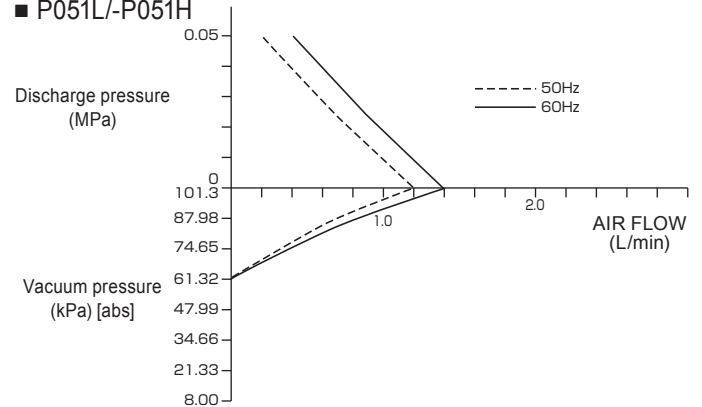


## 6. Performance curve

### ■ 051L/-051H

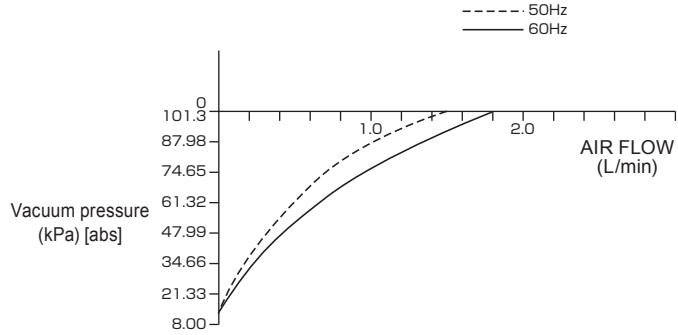


### ■ P051L/-P051H

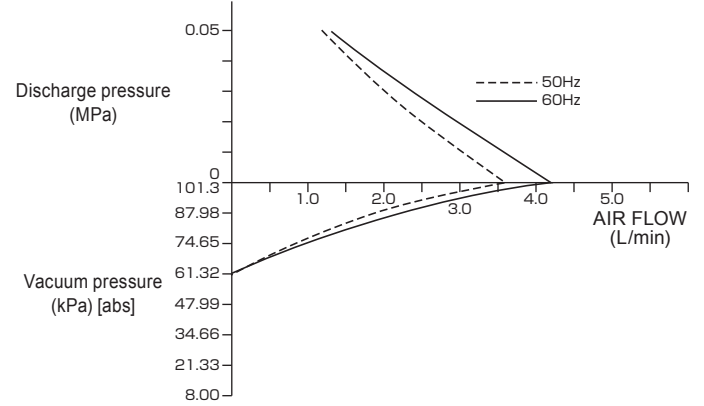


# Outline

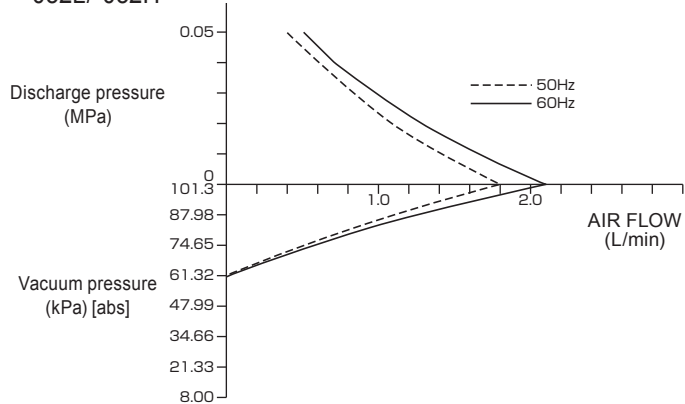
## ■ S051L



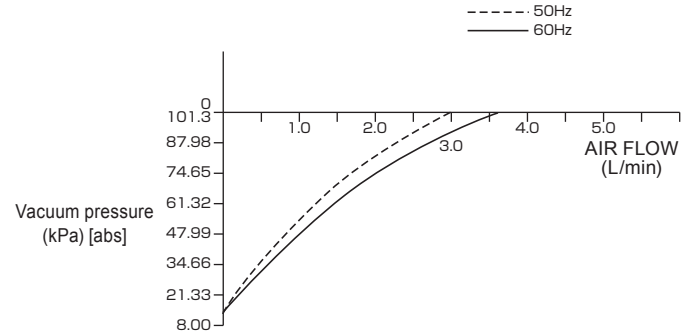
## ■ P052L/-P052H



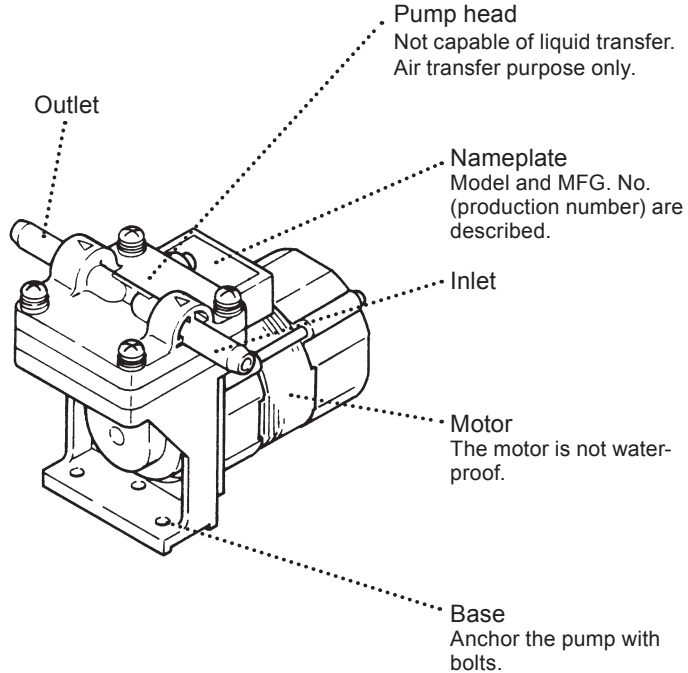
## ■ 052L/-052H



## ■ S052L

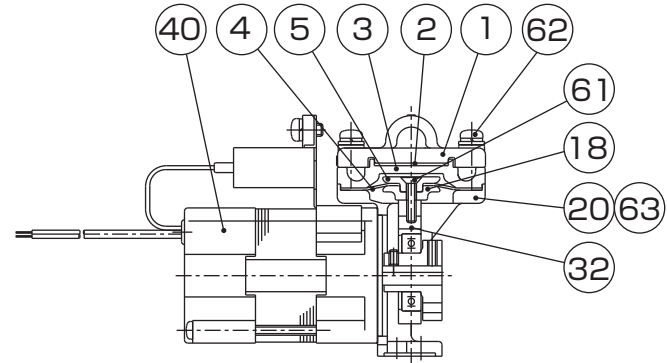


## 7. Overview & Label



## 8. Part names & Structure

■ 051L/-051H/-052L/-052H



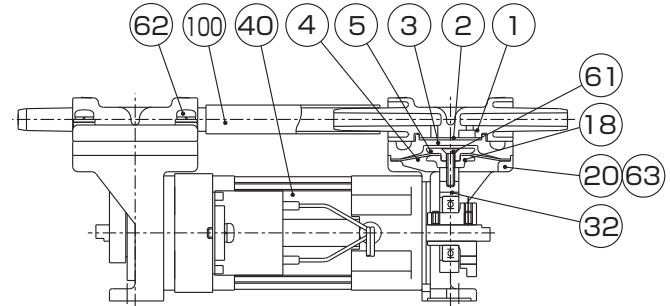
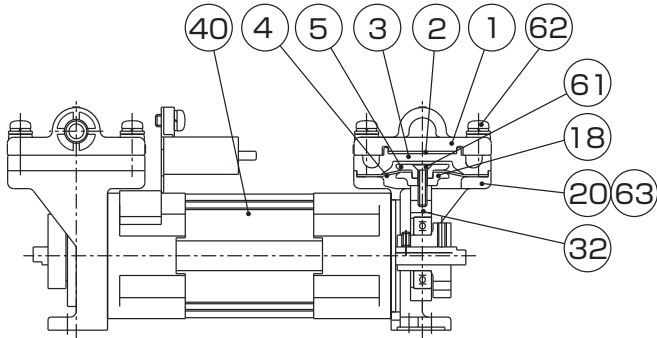
No.	Part names	Q'ty
1	Pump head	1
2	Valve	1
3	Valve seat	1
4	Diaphragm	1
5	Retainer plate	1
18	Under retainer plate	1

No.	Part names	Q'ty
20	Bracket	1
32	Connecting rod	1 set
40	Motor	1
61	M3×14 screw	1
62	M4×20 screw	4
63	M3×8 screw	2

# Outline

## ■ P051L/-P051H/-P052L/-P052H

## ■ S051L/-S052L



No.	Part names	Q'ty
1	Pump head	2
2	Valve	2
3	Valve seat	2
4	Diaphragm	2
5	Retainer plate	2
18	Under retainer plate	2

No.	Part names	Q'ty
20	Bracket	2
32	Connecting rod	2 set
40	Motor	1
61	M3×14 screw	2
62	M4×20 screw	8
63	M3×8 screw	4

No.	Part names	Q'ty
1	Pump head	2
2	Valve	2
3	Valve seat	2
4	Diaphragm	2
5	Retainer plate	2
18	Under retainer plate	2
20	Bracket	2

No.	Part names	Q'ty
32	Connecting rod	2 set
40	Motor	1
61	M3×14 screw	2
62	M4×20 screw	8
63	M3×8 screw	4
100	Hose	1

# Installation

## 1. Before Installation

Read through this instruction manual before use. Carry out installation work with a full understanding.

### ! WARNING

- **Provide protections**

Rotating and charged parts are not protected. Provide a safety protection to your equipment as necessary.

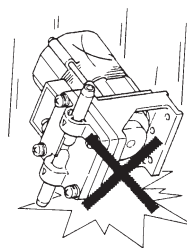
### ! CAUTION

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

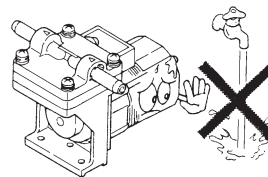
Do not place explosive or flammable material near the pump.

- **Do not use a damaged pump**

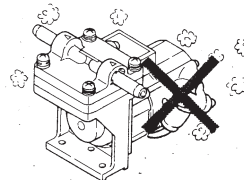
Use of a damaged pump could lead to an electric shock or death.



- Use care handling the pump. Do not drop. An impact may affect pump performance.

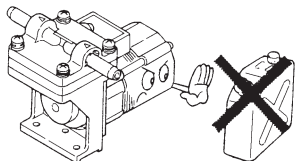


- Do not install the pump in a place where the pump can get wet. Avoid using wet gas, or internal condensation will build up and consequently result in the short lives of the valve and diaphragm.

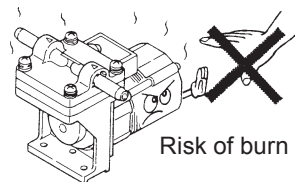


- Do not use the pump in a dusty place. Be sure to provide the inlet with a filter to prevent foreign matters from getting into the pump. Otherwise, the pump performance may reduce or the lives of the valves and diaphragm remarkably shorten.

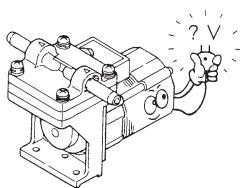
# Installation



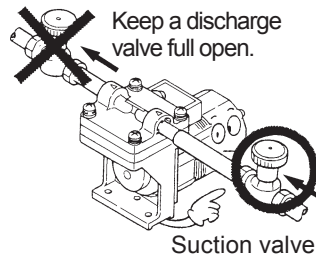
- Do not install the pump in a corrosive or flammable gas atmosphere. Keep good ventilation in a working area. The allowable ambient and air temperature is between 5 and 40°C.



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

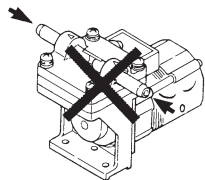


- Observe the rated voltage specified on the name plate. Applying any voltage than the rated one may result in failure.

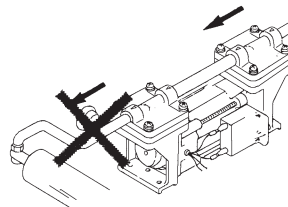


- Always use a suction valve to adjust an air flow.

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

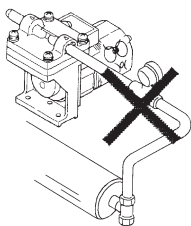


- After a long period of stoppage, pump performance at the beginning of operation becomes occasionally unstable. In this case, warm the pump up by running pump dry for about ten minutes.

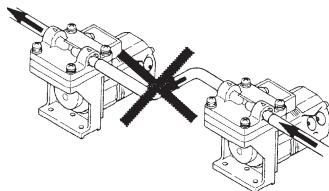


- The APN-S051/-S052 is designed for vacuum application only. Do not pressurize the discharge line of the pumps. The lives of the valves, diaphragm and bearing may be sharply reduced.

# Installation



- If the compressed air (higher pressure than atmospheric pressure) is transferred to the pump, the lives of the valves, diaphragm and bearing may be sharply reduced. Always keep atmospheric or lower pressure in the suction line.



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



- The APN-P051/-P052 is designed to be tubed in parallel only. Do not tube it in series.



- Do not use solvents such as benzine, alcohol, thinner for maintenance or cleaning, otherwise a coat discolours or comes off.

# Installation

## 2. Installation/ Tubing/ Electrical wiring

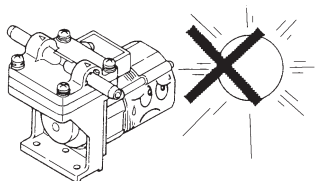
### **WARNING**

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 liquid spillage.
- Observe the allowable ambient temperature of 5-40°C and max ambient humidity of 90%RH.
- Allow sufficient space around the pump for easy access and maintenance.

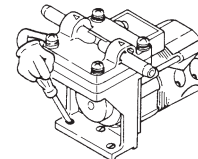


#### 2. Pump fixation

Secure the pump by fixing the base.

### **CAUTION**

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



#### 3. Tube preparation

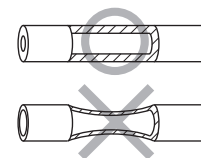
Cut the tube ends flat beforehand.

### 2.2 Tubing

1. The short tubing with the minimum bends is optimal to reduce resistance.
2. Use a pressure-resistant tubes.

### **CAUTION**

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





# Installation

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## 3. Tube size

Select proper tube size and pressure resistance, otherwise air leaks and failure may result.

## 4. Valve mounting

For adjustment of an air flow and a vacuum, install a control valve on a suction line.

## 5. Tube connection

Push the tubes into the inlet and outlet as far as it will go.

**NOTE:** If suction line connection is imperfect, the pump sucks air and it prevents the pump from bringing out full performance.

## 2.3 Electrical wiring

*Electrical wiring must be performed by a qualified electrician. We are not responsible for personal injury or property damage due to nonobservance of this warning. Contact us or your nearest distributor for wiring as necessary.*

### ■ Before wiring

1. Confirm that power is disconnected before work.
2. Wiring work should be done in accordance with local electric codes. Use the recommended wiring accessories.
3. Observe the rated voltage specified on the name plate.
4. 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. 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>• See "2.2 Tubing" and "2.3 Electrical wiring" sections.</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>• Check the item 1 and 2. Then turn on power and start the pump.</li><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></ul>
4	Adjust air flow.	<ul style="list-style-type: none"><li>• After the pump has reached a specified stroke rate, initiate full scale operation.</li><li>• Always adjust an air flow by a suction valve.</li></ul>

# Operation

5	Points to be checked during 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>
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## ■ Stop and Storage

- Before a long period of stoppage (1 week or more):  
Release pressure from the pump and stop air/gas supply.
- Do not store the pump:
  1. Where ambient temperature can exceed 0-40°C.
  2. In a dusty/humid environment.
  3. In a flammable/corrosive atmosphere.
  4. Under mechanical vibration or wind & rain.

# Maintenance

## 1. Troubleshooting

Turn off power on sensing danger and check the following. In case trouble can not be solved, contact us or your nearest distributor.

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.
Discharge pressure is too high. (S type)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Reduce the pressure to atmospheric.

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.

We are not responsible for personal injury or property damage due to nonobservance of this warning. Contact us or your nearest distributor as necessary.

### ■ Daily inspection

Pay attention to the following items during operation. Stop operation on sensing danger and solve problems on the Troubleshooting section. If pump performance has remarkably reduced, replace wear parts.

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.

Application	Estimated life	
	Valve	Diaphragm
051/P051/S051	8000hr	8000hr
052/P052/S052	4000hr	4000hr

\*Wear part duration varies with the pressure, temperature and characteristics of gas and is not warranted.

\*The estimated life above is calculated based on continuous operation with clean water at ambient temperature (room temperature range is 5-40°C.).

## 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

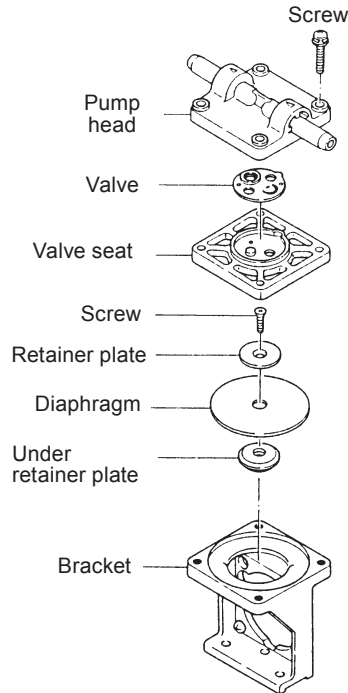
Always wear protective clothing such as an eye protection, chemical resistant gloves, a mask and a face shield during disassembly, assembly or maintenance work.

See page 9 "**8. Part names & Structure**" as necessary.

# Maintenance

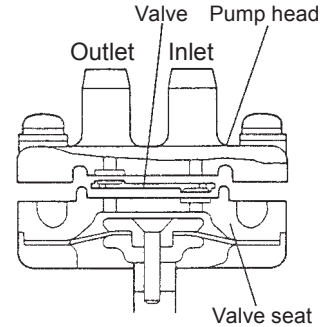
## ■ Diaphragm replacement

1. Unscrew the pump head fixing screws and take out the pump head, valve, and valve seat.
2. Remove the diaphragm fixing screw and detach the retainer plate and diaphragm.
3. Place a new diaphragm onto the under retainer plate.
4. Place the retainer plate onto the diaphragm. Apply the LOCTITE® to the diaphragm fixing screw and tighten it by  $0.78\text{N}\cdot\text{m}$ .
5. Push down the diaphragm until it bottoms out and then rebuild the pump head. Fasten the fixing screws by  $1.37\text{N}\cdot\text{m}$ .



## ■ Valve replacement

1. Unscrew all the pump head fixing screws and take out the pump head and valve.
2. Replace the old valve with new one. Always check the mating points and fit the valve and the pump head correctly.
3. Supply air into the pump head unit through the inlet and check the air is delivered through the outlet.
4. Push down the diaphragm until it bottoms out and then secure the pump head unit onto the bracket with the screws by  $1.37\text{N}\cdot\text{m}$ .



NOTE1. Do not loosen the motor-bracket fixing screws during maintenance work.

NOTE2. Contact your nearest distributor for the replacement of the connecting rod and the motor.





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