

**DIAPHRAGM DRY VACUUM PUMP****INSTRUCTION MANUAL**

**MODEL DA-60D**  
**MODEL DA-120S**

**Prior to use**

*For safe and efficient use of this pump, please read this manual carefully before operation.*

*After reading the manual, keep it in your file for future reference.*

*Specifications in this manual are subject to change without notice due to future improvement.*

# Contents

Pages with a shaded background are those which contain items related to safety.

Before Using the Equipment.....	0 1
Checks When Opening Packaging .....	0 2
Using the Pump Safely.....	0 3
• Safety icons.....	0 3
• Cautions for Safety in Use .....	0 4
1.Product Outline .....	1
1.1 Purpose of Use and Prohibitions.....	1
1.2 Specifications.....	1
1.3 Thermal Protector .....	1
2.Dimensions .....	2
3.Installation and Storage.....	3
3.1 Cautions for Installation and Storage .....	3
3.2 Environmental Conditions for Installation, Storage, and Operation .....	3
3.3 Location .....	3
3.4 Electric wiring.....	3
3.5 Fluctuations in the power voltage and frequency .....	4
3.6 Checking Operation After Installation.....	5
3.7 Piping .....	5
3.8 Storage.....	5
4.Cautions for Operation.....	6
4.1 Cautions for Operation.....	6
4.2 Operation of the Thermal Protector .....	6
4.3 Starting in Cold Weather .....	6
5.Pump Performance .....	7
5.1 Pressure Achieved.....	7
5.2 Evacuation Rate .....	7
5.3 Power Requirements .....	7
6.Maintenance, Inspection, and Repair .....	8
6.1 Cautions for Maintenance, Inspection, and Repair.....	8
6.2 Maintenance.....	8
6.3 Regular Inspections.....	8
6.4 Replacing and Cleaning Consumables .....	1 0
6.5 Troubleshooting List .....	1 9
7.In Conclusion.....	2 0
• Warranty .....	2 0
• Usage Status Check Sheet	
• Product information, service bases, and contact information	

## Figures and Tables

Fig.2.1 DA-60D Dimensions .....	2
Fig.2.2 DA-120S Dimensions .....	2
Fig.3.1 Change region of the voltage and frequency .....	4
Fig.3.2 Example of Piping Used When Evacuating a Vessel .....	5
Table 1.1 Product Specifications (50/60 Hz) .....	1
Table 2 Protector Specifications .....	6
Table 6.1 Consumables List .....	9
Table 6.2 Locations for Maintenance and Inspection.....	9
Table 6.3 Troubleshooting List .....	1 9

## Before Using the Equipment

Thank you for purchasing this product. Your custom is very much appreciated.

This pump is designed solely for vacuum discharge, and may malfunction or cause accidents if not handled appropriately. Read the manual thoroughly, and pay due attention to inspections, maintenance, and safety.

### Personnel Handling the Equipment

Only persons who have read this manual thoroughly, and have sufficient understanding of safety, pump specifications, and method of operation, may operate this pump.

### Read the Manual Thoroughly

Read the manual thoroughly in order to use the equipment correctly. Read the section on Safe Use particularly closely.

### Keep This Manual in a Safe Place

After reading this manual, be sure to keep it in a safe place which is readily accessible to others needing to use it.

### Copying This Manual Is Prohibited

No part of this manual may be copied for use by a third party without the express permission of the manufacturer.

### Statutory Requirements for Disposal

Follow all statutory and local authority regulations when disposing of this pump.

### Safety During Repair

Please provide a full description of the circumstances of use (particularly the use of dangerous materials) for the safety of repair personnel when requesting the manufacturer for repairs to the pump. Your request for repair of may be refused if these circumstances are unclear.

## Checks When Opening Packaging

Check the following after opening the packaging.

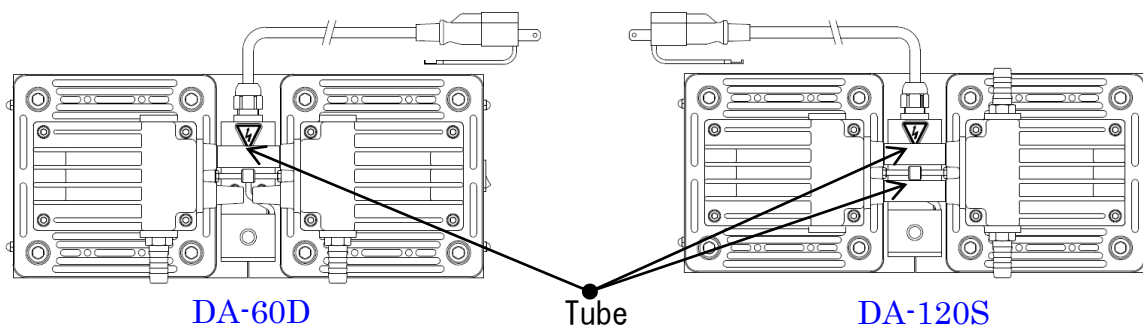
- (1) Is the product as you requested?
- (2) Are the accessories and necessary parts included?  
Standard accessories
  - User's manual ..... ×1
  - Inlet and outlet caps (fitted to inlet and outlet) ..... ×2
  - Power plug adapter ※100V only (attached to power cord) ---- ×1
- (3) Is the pump damaged in any way?
- (4) Are any external screws or inlet and outlet pipes loose? Are any components missing?

Contact your agent or the sales division of the manufacturer if there are any problems with the pump.

### Note

Do not hold or push the tube at the top of the pump while removing it from the packaging.

Damage to the tube may affect performance of the pump.



## Using the Pump Safely

To ensure that the pump is handled correctly, read this section thoroughly before use.

This manual and the warning labels on the pump include safety icons as an aid to understanding safety requirements.

These safety icons warn the operator and others of possible dangers and damage and should always be followed.

- **Safety icons**

The meanings of the safety icons are as follows.

### **Danger**

Incorrect handling of the equipment is very likely to result in death or serious injury to the operator.

### **Warning**

Incorrect handling of the equipment may result in death or serious injury to the operator.

### **Caution**

Incorrect handling of the equipment may result in light or medium injuries to the operator or damage to the equipment.

### **Note**

Incorrect handling of the equipment may result in damage to the equipment and hinder its correct operation.

### **High Temperature**

The surface of some parts of the part reach temperature of more than 60°C during operation. Do not touch. It may lead to burns.

### **Electric Shock**

Turn off the main power supply before performing electrical work or wiring. It may lead to electric shocks.

## • Cautions for Safety in Use

### **Danger**

#### Applications

- (1) This pump is not designed to be explosion-proof, and should therefore not be used to discharge explosive gases.
- (2) In addition to discharge of gas via the outlet, gas may also leak from other parts of the pump, and it should therefore not be used with toxic gases. If toxic gas is discharged for any reason it is important to note that the interior of the pump will be contaminated by the gas, requiring appropriate caution during maintenance.

#### Maintenance and Repair

- (3) When requesting the manufacturer's service division to dismantle and repair the pump, always note the gas which the pump has been used with on the Usage Check Sheet. Note that if it has been used to discharge toxic gas for any reason it will be contaminated. Please be aware that use with some gases will preclude dismantling and repair.

### **Warning**

#### Installation

- (1) Do not use the pump in an explosive atmosphere. Such use may result in injury and fire.
- (2) Ensure that there are no inflammable materials such as solvents in the vicinity when using the pump.
- (3) Ensure that the motor is freely ventilated to prevent overheating which may result in fire or burns.

#### Power Supply

- (4) Always remove the power cord from the wall socket before checking or repairing the pump. Failure to do so may result in electric shock, or the pump suddenly starting and causing injury.
- (5) Ensure that the relevant wiring is in accordance with technical standards for electrical equipment and wiring regulations. Incorrect wiring may result in fire.
- (6) Remove the power cord from the wall socket before connecting any wiring. Connecting wiring with the power on may result in electric shock.
- (7) Always ensure that the pump is correctly earthed. A dedicated earth leakage breaker is recommended. Failure to earth the pump correctly may result in electric shock if a fault or earth leakage occurs.
- (8) Use the pump only at the rated voltage. Use at other than the rated voltage will interfere with operation of the overload protection device, and this may result in the motor burning out, or fire.
- (9) Do not damage, modify, pull the power cord, or place objects on it. Damage to the cord may result in electric shock or fire.
- (10) Always fully insert the power cord into the socket. Partial insertion may result in electric shock.
- (11) Remove the cord from the socket while holding the plug. Failure to do so may result in electric shock.
- (12) Touching the power cord with wet hands may result in electric shock.
- (13) Touching electrical wiring etc while inserting the power plug may result in electric shock.

## **Warning**

### **Operation**

- (14) This pump is not designed to be explosion-proof. When using the pump, ensure that there are no inflammable materials such as solvents, or explosive gases, in the vicinity. Use under such conditions may result in injury or fire.
- (15) Inserting fingers or objects into the motor inlet may result in electric shock, injury, or fire.
- (16) Operating the pump with the discharge outlet blocked, or with a device which prevents passage of gas to the discharge outlet, may result in rupture of the pump. The internal pressure of the pump rises and the pump body may rupture and the motor become overloaded.  
This pump is not designed to be pressure-resistant. The internal pressure of the pump is limited to 0.03 MPa (gauge pressure).

### **Maintenance and Repair**

- (17) The pump should be dismantled or repaired only by a repair technician trained by the manufacturer.
- (18) To prevent ingestion of microscopic particles resulting from wear of components, use a dust mask and gloves when replacing diaphragms, valves, and O rings.

## **Caution**

### **Installation**

- (1) To prevent back injuries, always use at least two people when lifting and moving the pump.
- (2) Microscopic particles resulting from wear of components are discharged from the outlet and contaminate the room. If necessary, connect a pipe from the discharge outlet to the outside of the building.
- (3) The fine clearances used in this pump require that the following conditions be satisfied during storage, installation, and operation.
  - 1. Ambient temperature of 7~40°C and maximum relative humidity of 85% during operation.
  - 2. Other conditions for storage and operation.
    - a) Level floor of sufficient strength.
    - b) No condensation
    - c) Dust-free environment
    - d) Well ventilated
    - e) Environment free of corrosive or explosive gas.
    - f) Not subject to direct sunlight.
    - g) No danger of fire.
    - h) Maximum ambient temperature of 40°C during assembly of pump.



## **Caution**

### **Operation**

- (4) Touching rotating components (eg motor, main shaft, axial joints, cooling fan) while the pump is in operation may result in injury.
- (5) The overload protector operates when the pump becomes excessively hot. Touching it in this condition may result in burns.
- (6) Touching the motor while the pump is in operation or while it is still hot immediately after having been switched off may result in burns.
- (7) Do not insert fingers or objects into, or peer into, the inlet or outlet during operation.

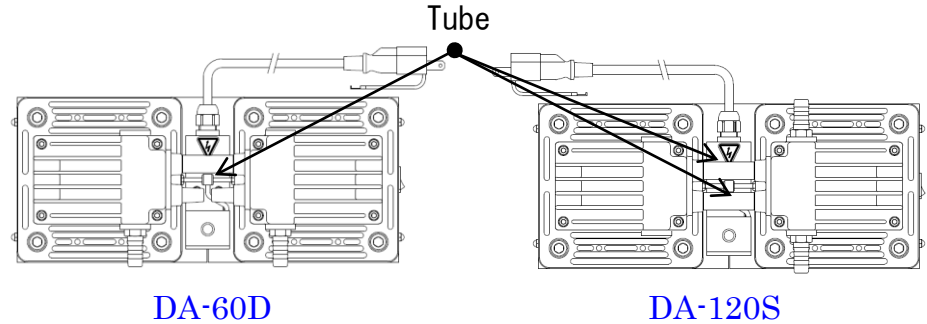
### **Maintenance and Repair**

- (8) If the pump ceases operation, turn power OFF (set switch to O) immediately to prevent accidents, remove the power cord from the wall outlet, and contact your dealer or the manufacturer for inspection and repair.
- (9) Leave the pump for at least 30 minutes until it has cooled, and begin operation again. Touching the pump immediately after it has stopped may result in burns.

## Note

### Installation

- (1) The pump may malfunction if it is subjected to shocks or tipped over on its side.
- (2) Do not hold or push the tube at the top of the pump (see below). Damage to the tube may affect performance of the pump.



### Applications

- (3) This pump is not designed to be corrosion-proof. Use it only with clean air at normal temperature, or with gases of equivalent characteristics.
- (4) This pump is designed solely for vacuum extraction. Operation for long periods at near-atmospheric pressures may result in a malfunction.
- (5) In addition to discharge of gas via the outlet, gas may also leak from other parts of the pump, and it should therefore not be used with toxic gases. If toxic gas is discharged for any reason it is important to note that the interior of the pump will be contaminated by the gas, requiring appropriate caution during maintenance.
- (6) Entry of corrosive gases, organic solvents, fluids, or gases able to be condensed (eg. steam) may result in damage to the pump and prevent normal operation.
- (7) Entry of gases containing dust and particles may prevent normal operation of the pump.

### Operation

- (8) Use the pump within an ambient temperature range of 7~40°C. Use at high ambient temperatures will dramatically reduce the life of the pump.
- (9) Back pressure at the outlet while the pump is starting may overload the motor.
- (10) The thermal protector operates when the pump reaches a very high temperature. Touching the pump in this condition may result in burns.

### Maintenance and Repair

- (11) The fine clearances used in this pump require skill in its assembly. If a repair technician is unavailable, replacement of all consumables should be left to the manufacturer's service division.

# 1. Product Outline

## 1.1 Purpose of Use and Prohibitions

This product is a dry vacuum pump which employs reciprocating motion of a rubber diaphragm for vacuum discharge.

Observe the following prohibitions to ensure normal operation of the pump.

### Prohibitions

#### **Warning**

- (1) This pump employs only vacuum operation, and must not be pressurized.
- (2) Do not re-sell, repair, or modify this pump without the approval of the manufacturer.

#### **Note**

- (3) This pump is not designed to be corrosion-proof. Use it only with clean air at normal temperature, or gases of equivalent characteristics.
- (4) Do not attempt to discharge gases containing particles, dust, water, or corrosive gases.
- (5) Do not operate the pump for long periods at near-atmospheric pressure.

## 1.2 Specifications

Table 1.1 Product Specifications

(50/60 Hz)

Model		DA-60D	DA-120S
Pumping Speed	50Hz	60L/min	120L/min
	60Hz	72L/min	144L/min
Ultimate Pressure		$3.32 \times 10^3$ Pa	$13.3 \times 10^3$ Pa
Motor		single phase, 200 W, 4P, capacitor operation	
Rated Current	100V	5.0/5.0 A	
	115V	4.6/4.6 A	
	200V	2.5/2.5 A	
	220V	2.4/2.4 A	
Revolution		1423/1707 r/min	
Weight		19 kg	
Suction/Exhaust Pipe		14mm-OD $\times$ 9mm-ID (G3/8)	
Operating Ambient Temperature		7°C to 40°C	
Outside dimensions (mm)		156(W) $\times$ 358(L) $\times$ 238(H)	162(W) $\times$ 358(L) $\times$ 238(H)

## 1.3 Thermal Protector



- 1) This pump is fitted with thermal protector for overload protection.

100V,200V,115V : manual reset thermal protector

220V : automatic reset thermal protector

This device shuts off the motor power supply circuit automatically to prevent burn-out if the motor temperature rises due to a pump fault which prevents rotation.

- 2) It is recommended that additional protective devices (e.g. earth leakage breaker, motor breaker) be fitted.

 <b>Warning</b>	See Warning (8), P04
 <b>Caution</b>	See Caution (5), P06

## 2. Dimensions

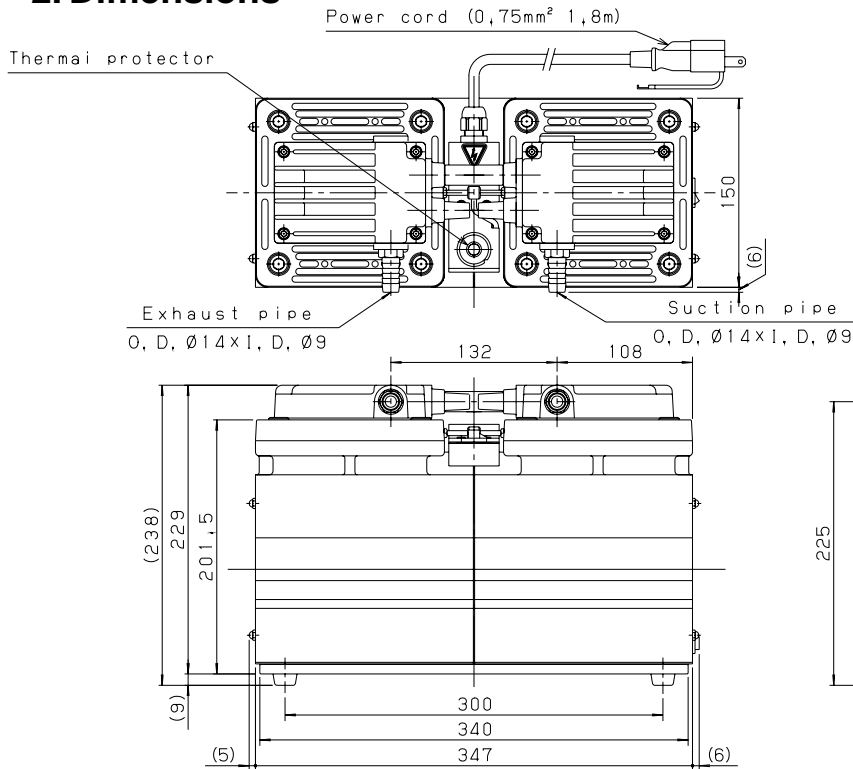


Fig.2.1 DA-60D Dimensions

※ When motor specifications are 115V,200V,220V, a cable termination is "loose end".  
 ※ When motor specification is 220V, the manual reset type thermal protector is not attached.

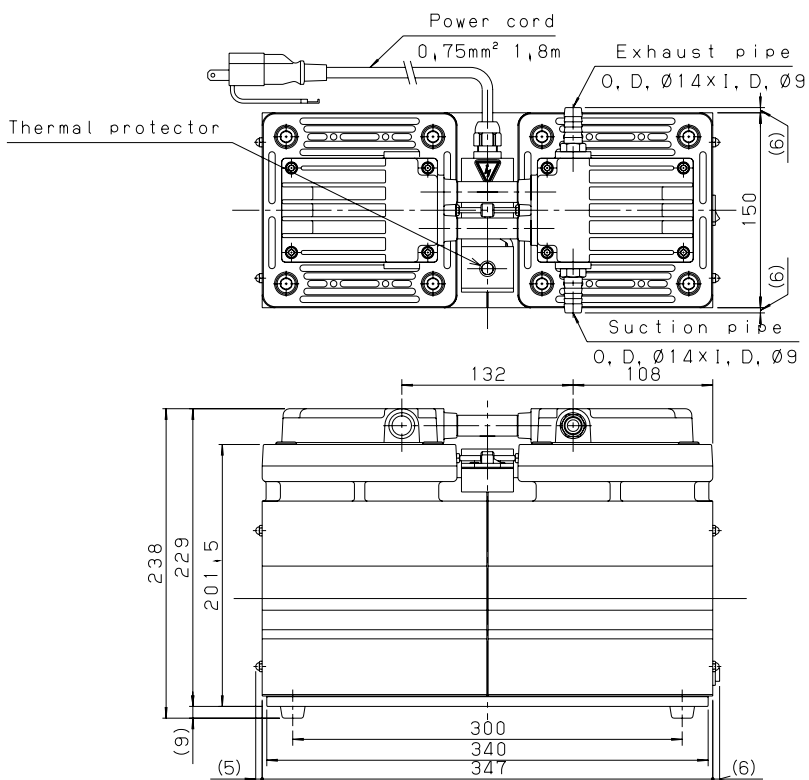





Fig.2.2 DA-120S Dimensions

※ When motor specifications are 115V,200V,220V, a cable termination is "loose end".  
 ※ When motor specification is 220V, the manual reset type thermal protector is not attached.

### 3. Installation and Storage

#### 3.1 Cautions for Installation and Storage

 <b>Warning</b>	See Warning (1)(2)(3)(5)(6)(7)(8)(9)(10)(11)(12)(13), P04
 <b>Caution</b>	See Caution (1)(2)(3), P05
 <b>Note</b>	See Note (1)(2), P07

#### 3.2 Environmental Conditions for Installation, Storage, and Operation

The fine clearances used in this pump require that the following conditions be satisfied during storage, installation, and operation.

1. Ambient temperature of 7~40°C and maximum relative humidity of 85% during operation.
2. Other conditions (during storage and operation).
  - a) Level floor of sufficient strength.
  - b) No condensation
  - c) Dust-free environment
  - d) Well ventilated
  - e) Environment free of corrosive or explosive gas.
  - f) Not subject to direct sunlight.
  - g) No danger of fire.
  - h) Maximum ambient temperature of 40°C during assembly of pump.

#### 3.3 Location

The pump should be installed level in a location with minimal dust and humidity. This location should be selected in consideration of ease of installation and removal, inspection, and cleaning.

Particular attention should be paid to ambient temperature when fitting the pump to equipment. Use anti-vibration rubbers to isolate the pump from vibrations in the equipment. See 3.2 Environmental Conditions for Installation, Storage, and Operation for details.

#### 3.4 Electric wiring

- 1) We recommend end-user to equip protection device such as earth leakage breaker motor breaker on electric wiring to prevent from motor burnout which may occur by overcurrent.
- 2) This pump is equipped with power cord and plug with ground wire. Wiring and grounding construction should be done subject to the laws of each area this pump is used.

### 3.5 Fluctuations in the power voltage and frequency

Standard: Rotation electricity machine general rules

JIS C 4034-1:1999, JEC-2137-2000

To the voltage change and frequency change in Domain A, in main rated values, it operates continuously, and can be used practically convenient, and to the voltage change and frequency change in Domain B, it shall operate with main rated values and shall be used practically convenient.

However, operation with "it is convenient and safe is maintained on "practical use, it means not resulting in the grade which shortens a life remarkably, and the characteristic, a temperature rise, etc. do not apply correspondingly in the state of rating. Moreover, main rating shows rated torque (N·m).

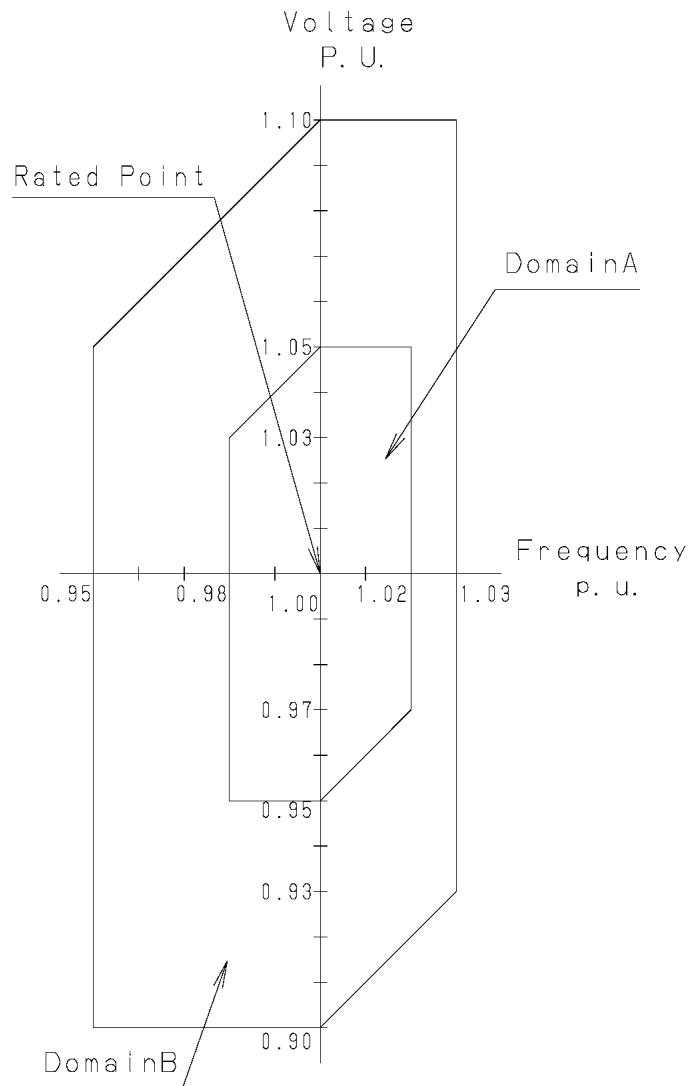


Fig. 3.1 Change region of the voltage and frequency

### 3.6 Checking Operation After Installation

- 1) Remove the rubber caps from the inlet and outlet.
- 2) Check that the pump switch is OFF (set to O), and connect the power supply.  
Note: Ensure that the power cord is sufficient for the rated voltage and current.  
Note: Extension cords should be 3-wire, with lead wires having a cross-sectional area of at least 1.0 mm<sup>2</sup>.
- 3) Turn the switch ON (set to I) and check that gas is being drawn into the inlet.
- 4) When this check is complete, turn the power switch OFF (set to O) to stop the pump.

### 3.7 Piping

- 1) Install piping carefully to prevent leaks.
- 2) Piping connected to the inlet should be at least 10 mm inside diameter.
- 3) Ensure that piping connected to the outlet does not cause back pressure. Maximum back pressure is 0.03 MPa (gauge pressure).
- 4) In case of selecting the inlet pipe and exhaust pipe that are not from our products, please select the exhaust pipe that has same or larger inner diameter length with the inlet pipe.
- 5) When evacuating a vessel, ensure that a shut-off valve is placed between the pump inlet pipe and the vessel (see Fig.3.1).

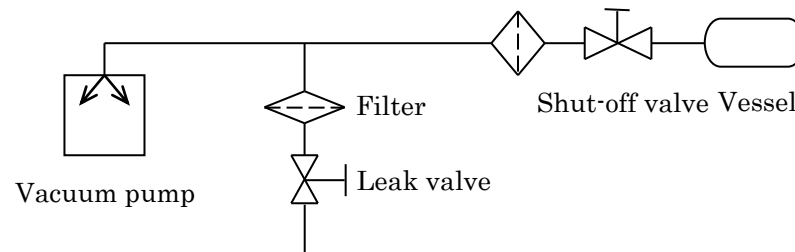






Fig.3.2 Example of Piping Used When Evacuating a Vessel

### 3.8 Storage

Turn the switch OFF (set to O), remove the power plug from the outlet, place the rubber caps over the inlet and outlet, and store the pump in an area of low humidity.

## 4. Cautions for Operation

### 4.1 Cautions for Operation

 <b>Danger</b>	See Danger (1)(2), P04
 <b>Warning</b>	See Warning (8)(14)(15)(16), P04, 05
 <b>Caution</b>	See Caution (4)(6)(7), P06
 <b>Note</b>	See Note (3)(4)(5)(6)(7)(8)(9)(10), P07

### 4.2 Operation of the Thermal Protector

- 1) When the thermal protector operates, switch the pump power supply OFF (set to O), remove the power cord from the outlet, and contact the manufacturer. Note that the motor will be very hot and should not be touched.
- 2) Once the cause of the fault has been removed, wait until the motor cools and restart operation.

Table.2 Protector Specifications

	Temperature characteristic		Current characteristic		
	Operation temp (°C)	Return temp (°C)	Operating time	Non-operating characteristic	Operating characteristic
100V	110-140	-10	7-25 at 25°C 12A	65°C 5.4A	65°C 7.3A
115V	110-140	-10	7-25 at 25°C 10A	60°C 4.9A	60°C 6.6A
200V	115-135	-10	5-20 at 25°C 7A	60°C 2.8A	60°C 3.8A
220V	120-130	64-94	—	—	—

 <b>Caution</b>	See Caution (5), P06
--	----------------------

### 4.3 Starting in Cold Weather

Cold weather will increase the viscosity of bearing grease and harden diaphragms, resulting in the pump being difficult to start. Follow the procedure below in such conditions.

- 1) Turn the switch ON/OFF 2~3 times with the inlet open to atmosphere until the pump starts. If the pump still does not start, raise the ambient temperature to beyond 7°C.
- 2) With the inlet open to atmosphere, run the pump for a few minutes to warm it.
- 3) Commence normal operation once the pump has warmed.



## 5. Pump Performance

### 5.1 Pressure Achieved

The term “pressure achieved” as employed in the catalogue and in this manual is defined as “the minimum pressure obtained by the pump without introduction of gas from the pump inlet .

Note that the indicator values for pressure may differ between types of vacuum gauges. Pressure achieved in practice, occasionally becomes higher than that noted in the catalogue for the following reasons.

- (1) The fact that the vacuum gauge is mounted a distance from the pump, the steam generated by water droplets and rust etc on the inside walls of the pump and piping, and a variety of gases present in the system result in increased pressure.
- (2) Leaks into the vacuum system introduce other gases, resulting in increased pressure.

### 5.2 Evacuation Rate

The rate of evacuation for the pump varies with the type of gas entering the inlet, and its pressure. The maximum rate of evacuation is reached when air is introduced, and decreases slightly as pressure is reduced.

The resistance of the piping system increases with small bore piping which extends over long distances, and this reduces the rate of evacuation.





The declared rate of evacuation for this pump is the maximum value achieved with dry air.

### 5.3 Power Requirements

The power required to drive the pump is the total of the work required to overcome the rotational resistance of the pump (mechanical work), and the work required to compress the air (compression work), and is at a maximum at an inlet pressure of  $4.0 \times 10^4 \sim 8.0 \times 10^4$  Pa. At pressures below this range the compression work is considerably reduced and power is expended in mechanical work.

## 6. Maintenance, Inspection, and Repair

### 6.1. Cautions for Maintenance, Inspection, and Repair

 <b>Danger</b>	See Danger (3), P04
 <b>Warning</b>	See Warning (4)(17)(18), P04, 05
 <b>Caution</b>	See Caution (8)(9), P06
 <b>Note</b>	See Note (11), P07

Maintenance and repair by the customer's repair technician is limited to the following procedures. Do not undertake other repairs, or make modifications other than the standard options supplied by the manufacturer.

- 1) Cleaning filters
- 2) Replacing diaphragms
- 3) Replacing valves
- 4) Replacing O rings

### 6.2 Maintenance

The following checks are required at least once every three days during operation.

- (1) Check for abnormal noises.
- (2) Check for abnormal heating of the pump.
- (3) Check that gas is discharged normally.

If a problem is found, take the measures described in 6.5 Troubleshooting List.

### 6.3 Regular Inspections

Inspect consumables after the first 6000 hours of operation, and replace and clean in accordance with the Replacement and Cleaning Guide on the following page. Refer to 6.4 Replacing and Cleaning Consumables for procedures.

Request replacement by the manufacturer's service division if a repair technician is not available.

<Consumables List>

Table 6.1 Consumables List(DA-60D,120S)

Description	Qty	Material	Life expectancy
Diaphragm	2 pcs	EPDM	6,000~8,000 hrs
Suction/exhaust valve	16 pcs	SUS	6,000~8,000 hrs
Pump head cover gasket	2 pcs	NBR	6,000~8,000 hrs
Air filter	2 pcs	Urethane foam	6,000~8,000 hrs
O-ring (S-14)	2 pcs	NBR	6,000~8,000 hrs
Bearing	1 set	—	Approx. 15,000 hrs

Note that the average life for a component varies with the conditions of use.

Always follow 4.1 Cautions for Operation, and remember that life is extended by running the pump at minimal load (running the pump at minimal load is operation at the achieved pressure (inlet closed)).

Bearings are replaced by the manufacturer's service division.

<Replacement and Cleaning Guide>

Replace or clean components if performance is reduced or the following symptoms become apparent.

Air Filters : Replace if dirty, hard, or stuffed.

Pump head cover gasket : Replace if hard, cracked, or stretched.

Diaphragms : Replace if rubber is deformed, hard, or cracked.

Valves : Replace if deformed, hard, or cracked.

O rings : Replace if hard, cracked, or stretched.

Bearings : Request manufacturer for repair if abnormal noises, or abnormal motor vibration, is noted.

<Locations for Maintenance and Inspection>

Table 6.2 Locations for Maintenance and Inspection

Operating hours	Location	Check	Checking method
6,000 hrs	Diaphragm	Deformation, crack and hardening	Visual check
	Suction/exhaust valve	Deformation and crack	Visual check
	Pump head cover gasket	Damage and leak	Visual check
	Air filter	Dirt, clogged and hardening	Visual check
	O-ring	Damage and leak	Visual check
	Bearing	Unusual sound	Auditory check

## 6.4 Replacing and Cleaning Consumables

 <b>Caution</b>	See Caution (9), P06
--	----------------------

- ① The pump becomes very hot after operation. After stopping the pump, leave it for 30 minutes to cool, and replace and clean components only after it has cooled to a safe temperature.
- ② Use a dust mask and gloves when replacing diaphragms and valves to prevent ingestion of fine particles in the air produced by wear of components.
- ③ Always use gloves to prevent injury when replacing diaphragms.

### Tools Required for Setup

Have the following tools on hand and perform the replacement while referring to the diagram.

**If there is no repair technician available,** or if you do not have access to the required tools, please make the appropriate request to our repair services department.

#### • Required Tools

1. Torque wrench- bit size 4 mm (5.0 Nm), bit size 8 mm (18.0 Nm)
2. Phillips head (+) screwdriver- No.2
3. Torque screwdriver- No.2 (0.8 Nm)
4. Rag
5. Solvent for wiping (something that has no effect on rubber, such as ethanol)
6. Dust mask (for nose and mouth), gloves, protective eyewear
7. Loctite 242

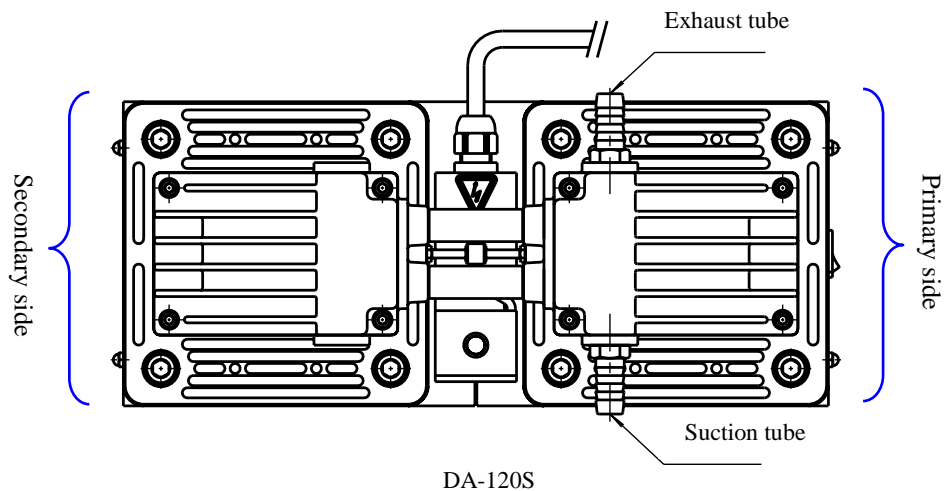
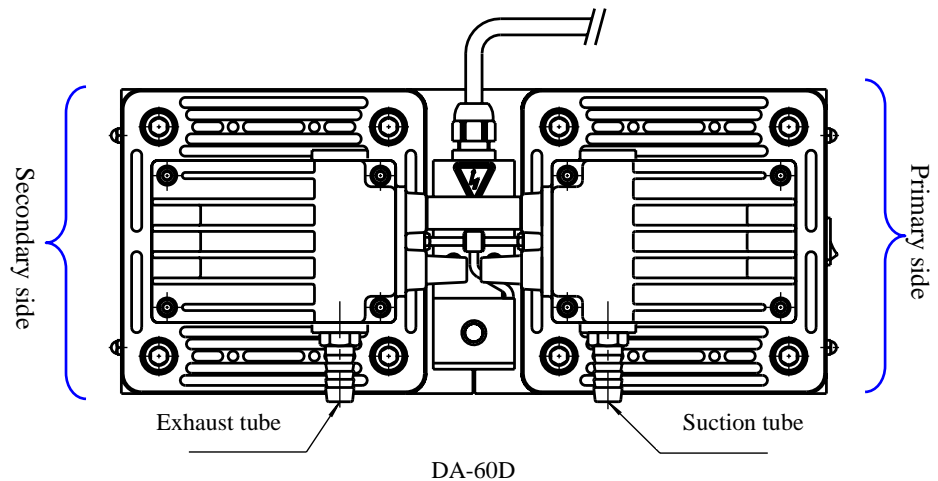
\*Use items No.4 and 5 to wipe down any dirty area when replacing the part.

### Part Replacement Procedure

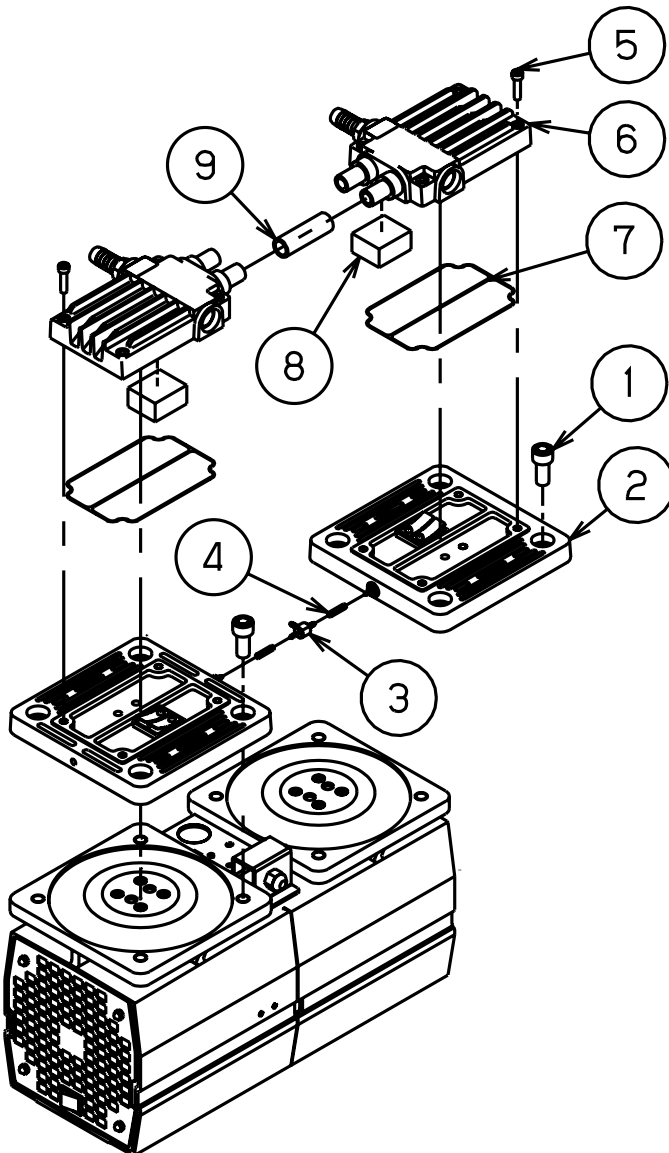
#### Definition of Terms

In the replacement procedure, the terms “primary side” and “secondary side” shall be used to refer to specific locations.

Refer to the terms and diagram below when performing the replacement.



## i. Parts Removal



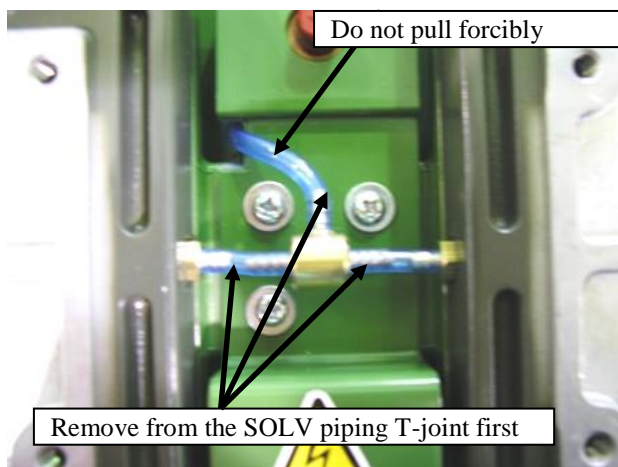
\*First unplug the pump's power cable from the main power supply.

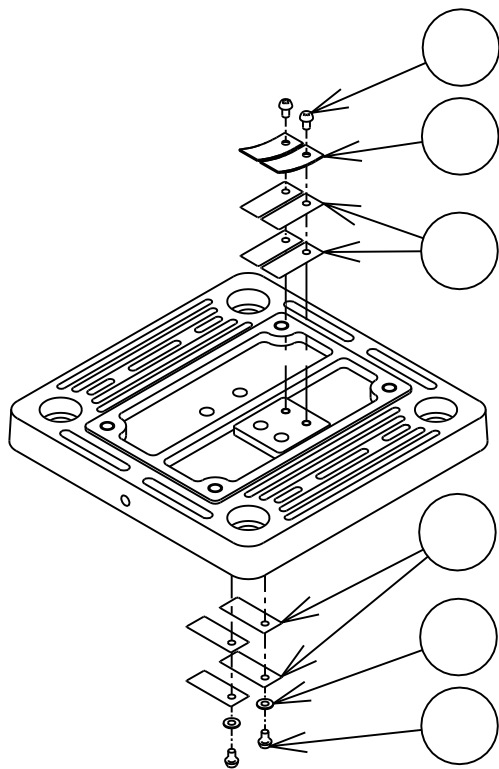
\*The picture shown is the DA-60D, but the procedure is the same for the DA-120D.

Step 1: Remove (1) the hex socket bolts (M10×22) × Qty.8 (4 each on both the primary and secondary sides), and then remove (2) the pump heads. As shown in the picture below, the pump heads are connected to the main pump units by (3) the SOLV piping T-joint and (4) the SOLV hose, so please remove them first and then remove the pump heads. Do not forcibly pull the SOLV hose connected to the main pump units.

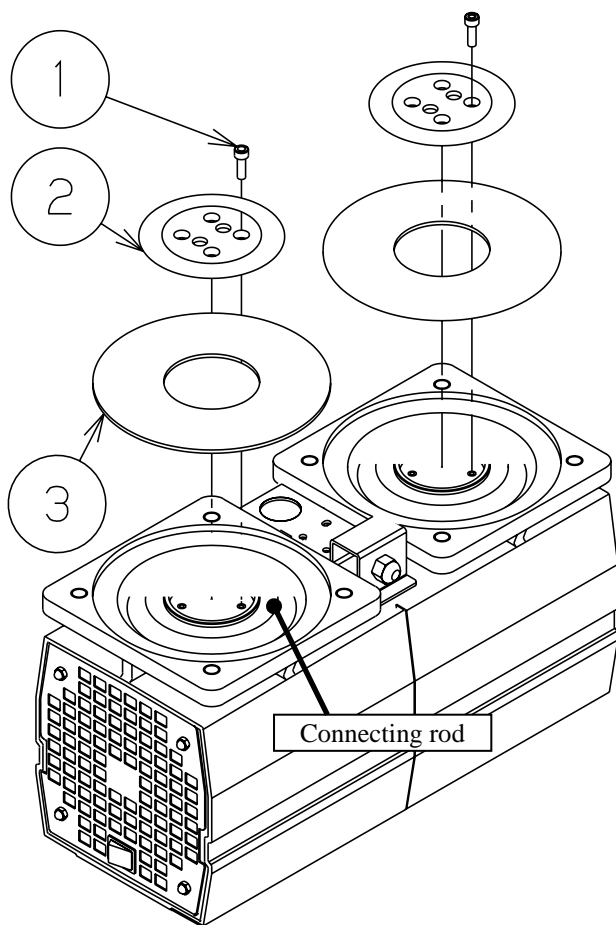
Next, remove (5) the hex socket bolts (M5×20) × Qty.8 (4 each on both the primary and secondary sides), and then remove (6) the pump head covers. Inside the pump head covers are (7) the pump head cover gaskets and (8) the air filters. These should all be removed.

Remove (9) the connecting tube (2 tubes on DA-120S) linking the primary and the secondary side pump heads.





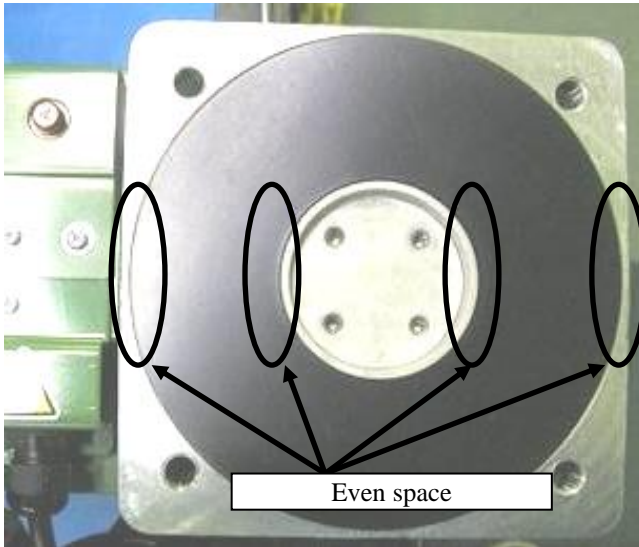
Step 2: Remove (1) the small pan head screws (M3×5) Qty. × 4, (2) the exhaust valve holders ((4) the plain washers on the suction side) and (3) the suction/exhaust valves from the pump heads. The valves come in pairs and each one is placed on top of the other. There are therefore, 8 in total counting all the suction and exhaust valves.



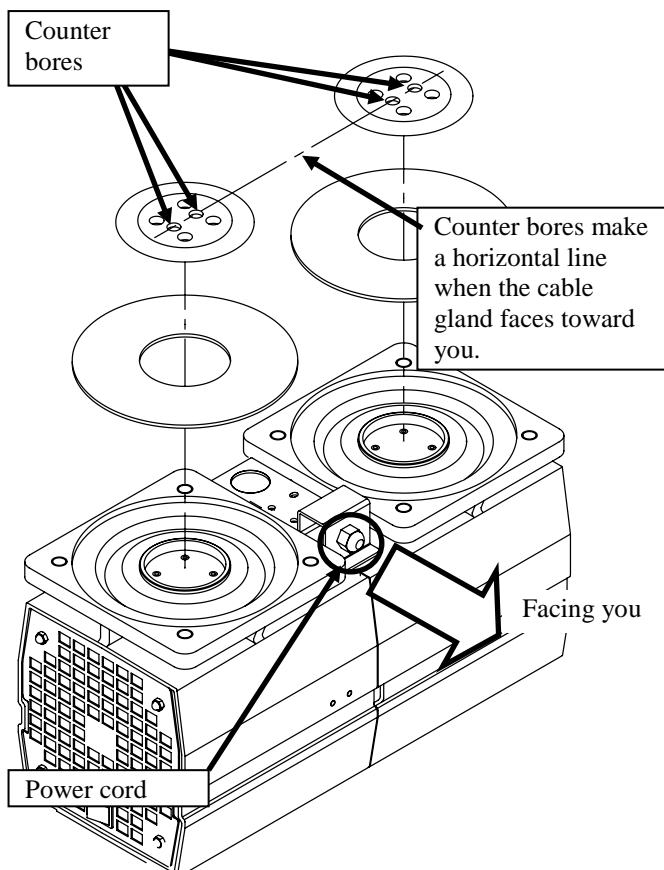
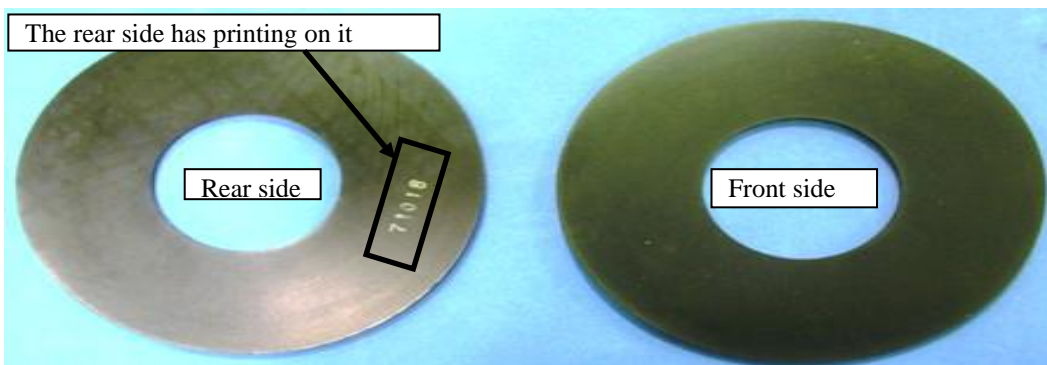
Step 3: Remove (1) the hex socket bolts (M5×16) × Qty.8 (4 each on both the primary and secondary sides), and then remove (2) the push plates for the diaphragms and (3) the diaphragms from the connecting rods.

This step completes the parts removal procedure. The next section is the assembly.

## ii. Attaching Parts & Assembly



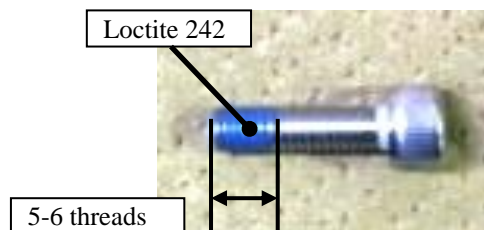
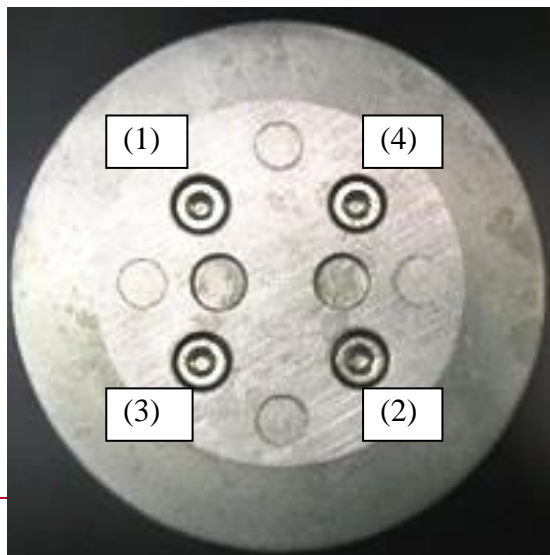
Step 4: Put the new diaphragm on the connecting rod to replace the old one removed in Step 3. The front and rear sides of the diaphragm are different from each other. Refer to the pictures below to ensure that the front side is the side which is facing up. Also, when you place the diaphragm on the main pump unit, adjust its position so that the spacing between the main pump unit, the connecting rod and the diaphragm are even.



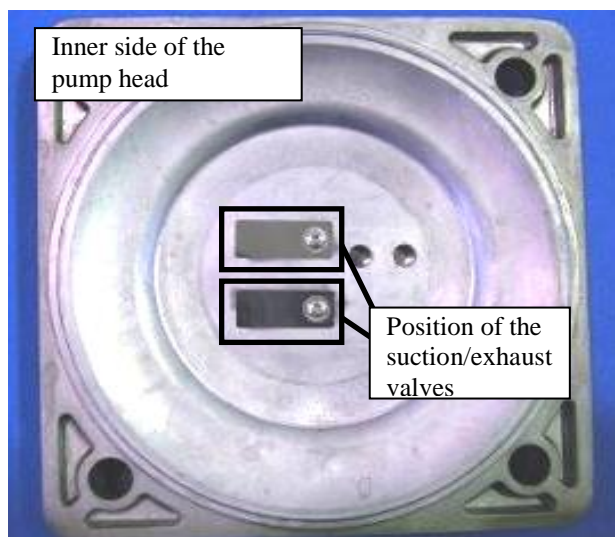
Step 5: After adjusting the position of the diaphragms, attach the push plates for the diaphragms. These push plates need to be attached in the correct orientation. Refer to the diagram on the left to ensure that they are positioned so that the counter bores make horizontal lines when the power cord is facing toward you.

\*Please pay extra attention to this procedure as attaching the push plates in an incorrect orientation will lead to product damage.

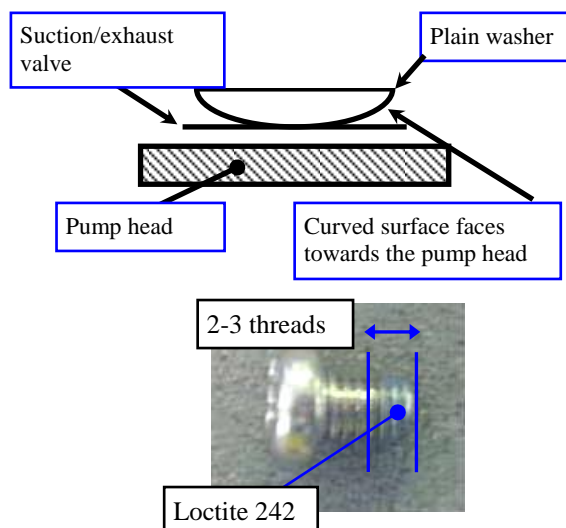




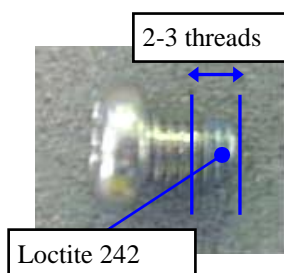
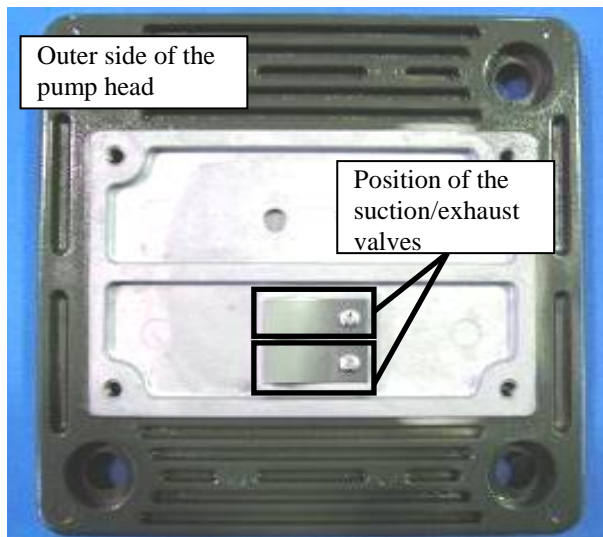
Step 6: Using the torque wrench with a bit size of 4 mm (5.0 Nm), fasten the push plates for the diaphragms with hex socket bolts (M5×16) that have Loctite 242 applied onto 5 to 6 threads from their screw tip. When tightening the bolts, do so in the order shown in the picture on the left, going over them three times, gradually tightening each one of them. In order to ensure that they are securely tightened, go over them again five times with the torque wrench (5.0 Nm) following the same order. \*Be sure to always follow the appropriate tightening torque. Failure to do so can lead to product damage.



Step 7: Replace the suction/exhaust valves removed in Step 2 with new ones, and place them at the two locations on the inner side of the pump heads, two valves positioned together at each location. Next, place the plain washers on top of them with their curved surface facing toward the pump heads, then, using the torque screwdriver (0.8 Nm), fasten them with small pan head screws (M3×5) that have Loctite 242 applied onto 2 to 3 threads from their screw tips. After tightening, check that the suction/exhaust valves are firmly fixed to the pump heads without any space between them.



\* After tightening, make sure that there is no gap between the suction valve and the pump head, or that the valve does not move to right or left, as these will lead to poor performance.  
\*Be careful when applying Loctite 242, as too much or too little can cause damage.  
\*Be sure to always follow the appropriate tightening torque. Failure to do so can lead to product damage.

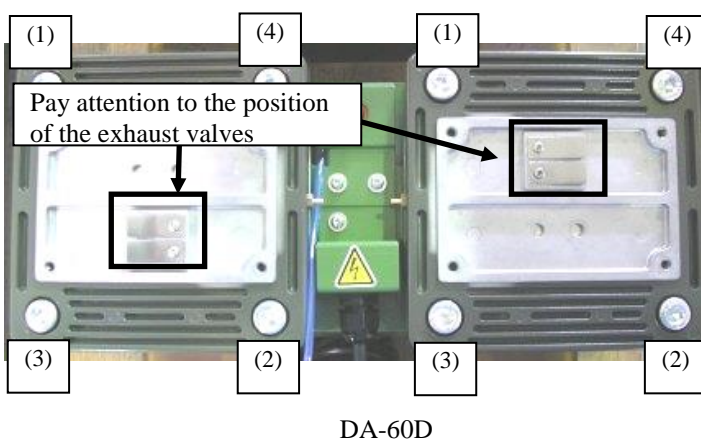


Step 8: Replace the suction/exhaust valves removed in Step 2 with new ones, and place them at the two locations on the outer side of the pump heads, two valves positioned together at each location. Next, place the suction/exhaust valve holders on top of them, then, using the torque screwdriver (0.8 Nm), fasten them with small pan head screws (M3×5) that have Loctite 242 applied onto 2 to 3 threads from their screw tips. After tightening, as with Step 4, check that the suction/exhaust valves are firmly fixed to the pump heads without any space between them.

\* After tightening, make sure that there is no gap between the suction valve and the pump head, or that the valve does not move to right or left, as these will lead to poor performance.

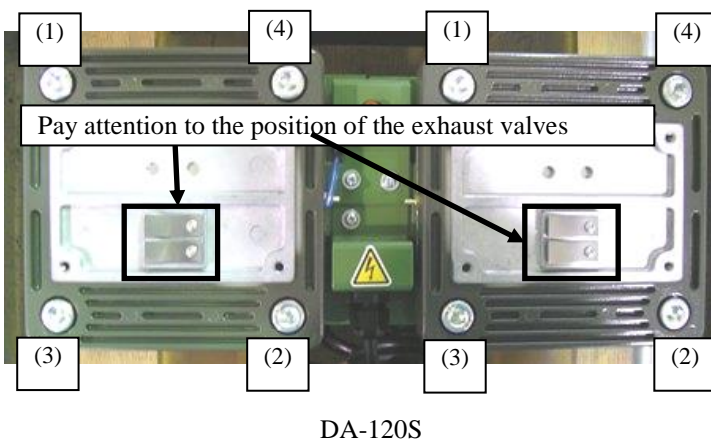
\*Be careful when applying Loctite 242, as too much or too little can cause damage.

\*Be sure to always follow the appropriate tightening torque. Failure to do so can lead to product damage.

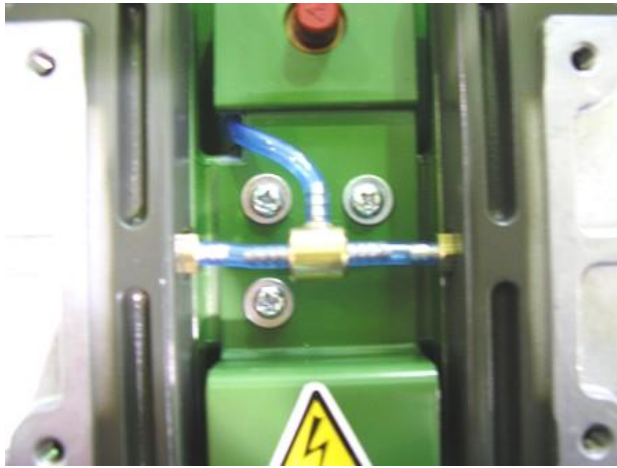


Step 9: Place the pump heads with suction/exhaust valves attached in Step 8 on the main pump units, then, using the torque wrench with a bit size of 8 mm (18.0 Nm), fasten them with hex socket bolts (M10 × 22) × Qty. 8 (4 each on both the primary and secondary sides). When tightening the bolts, do so in the order shown in the picture on the left, going over them three times, gradually tightening each one of them. In order to ensure that they are securely tightened, go over them again two times with the torque wrench (18.0 Nm) following the same order.

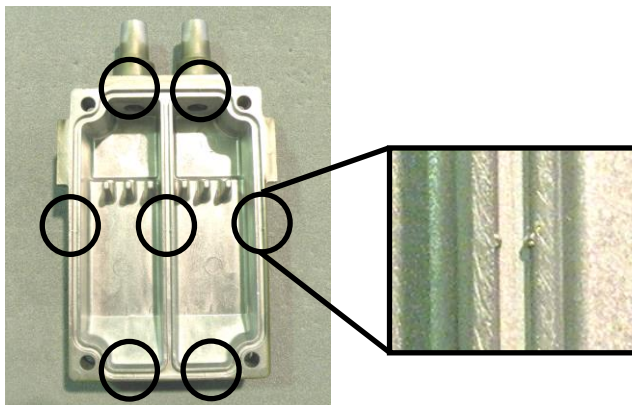
\*Please note that the mounting orientation of the pump head is different for DA-60D and DA-120S. Refer to the pictures on the left to make sure that the pump heads are attached correctly.



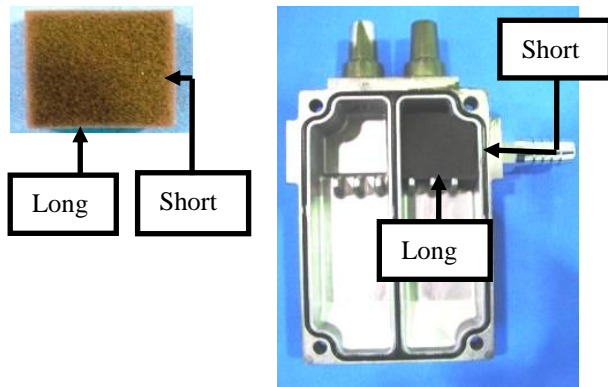
\*Be sure to always follow the appropriate tightening torque. Failure to do so can lead to



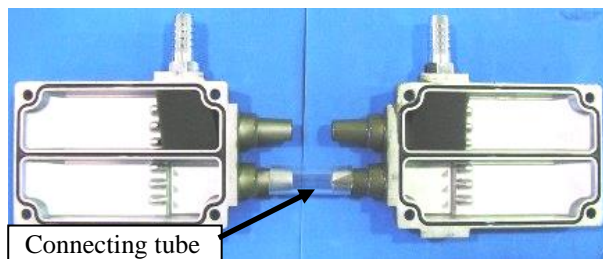
Step 10: Referring to the picture on the left, re-attach the SOLV piping T-joint and the SOLV hose removed in Step 1. Do not forcibly pull the SOLV hose connected to the main pump units.



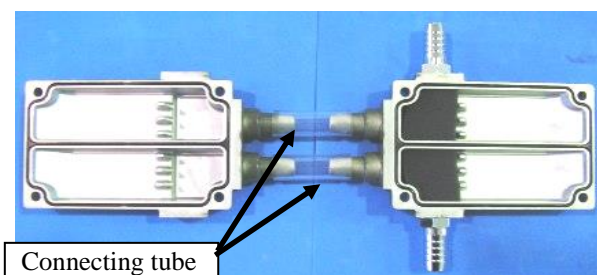
Step 11: Insert new pump head cover gaskets into the grooves on the inner side of the pump heads to replace the old ones removed in Step 1. There are small bulges at 7 locations along the grooves to stop the pump head cover gaskets from falling out, which might make it hard to insert them. Push a little harder in order to insert them all the way in.



Step 12 : Insert new air filters inside the pump heads to replace the old ones removed in Step 1. The air filters are rectangular. Insert them so that their shorter side makes contact with the suction/exhaust outlet. Please note that the mounting position of the air filter is different for DA-60D and DA-120S. Refer to the pictures on the left to ensure that the filters are attached correctly. After inserting the air filters, connect the primary and secondary side pump heads with connecting tubes.

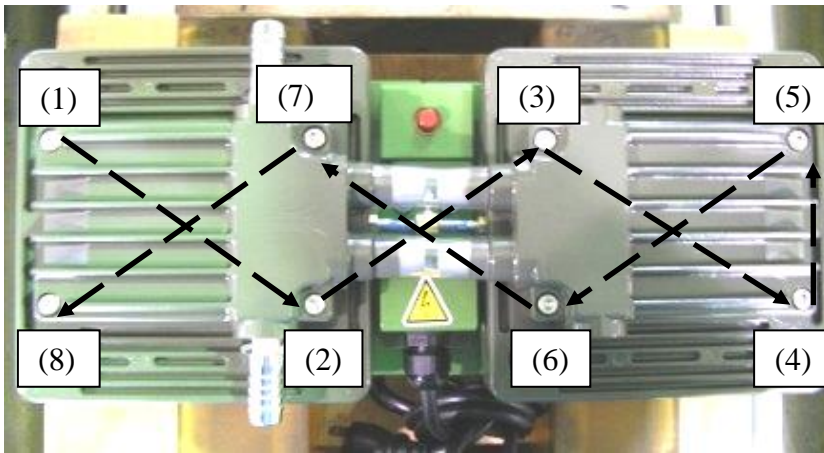


DA-60D



DA-120S

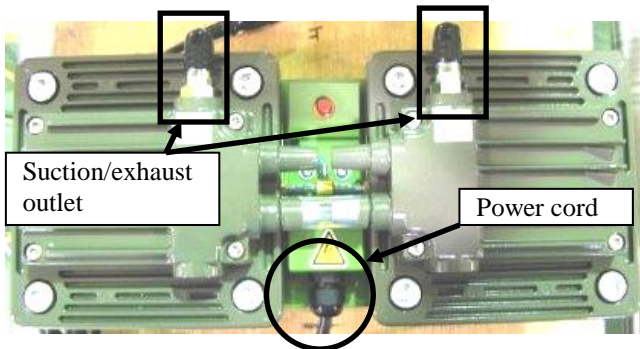




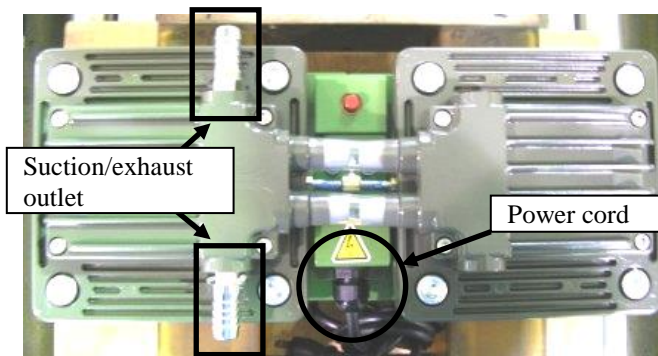
Step 13: Place the pump head covers on the pump heads, then, using the torque wrench with a bit size of 4 mm (5.0 Nm), fasten them with hex socket bolts (M5×20) × Qty. 8 (4 each on both the primary and secondary sides). When tightening the bolts, do so in the order shown in the picture on the left, going over them three times, gradually tightening each one of them.

\*Please note that the mounting orientation of the pump head is different for DA-60D and DA-120S. Refer to the pictures on the left to ensure that the pump heads are attached correctly.

\*Be sure to always follow the appropriate tightening torque. Failure to do so can lead to product damage.



DA-60D



DA-120S

The parts replacement procedure is now complete.

## 6.5 Troubleshooting List

Table 6.3 Troubleshooting List

Problem	Causes	Solutions	Reference
Problems with starting and rotation of pump	(1) Not connected to power supply. (2) Switch is OFF. (3) Problem with power supply voltage. (4) Problem with pump wiring. (5) The breaker has operated. (6) The thermal protector has operated. (7) Low ambient temperature. (8) Low voltage. (9) Fault in power supply. (10) Problem with power supply switch. (11) Broken wire in power cord. (12) Problem with motor. (13) Damaged condenser, or connection problem. (14) Locked connecting rod. (15) Problem with bearings. (16) Miscellaneous damage to pump components.	(1) Connect power supply. (2) Set switch to I. (3) Ensure that voltage variation is within $\pm 10\%$ . (4) Rewire the pump. Contact the manufacturer. (5) Investigate the reasons for operation. (6) Switch power OFF, and eliminate the cause of operation of the relay. Contact the manufacturer. (7) Ensure that ambient temperature is $7\sim 40\text{ }^{\circ}\text{C}$ . (8) Adjust the power supply voltage, and check the power supply cable. (9) Replace or repair. (10) Replace or repair. (11) Replace or repair. (12) Replace or repair. (13) Replace or repair. (14) Disassemble pump head and check interior. (15) Replace or repair. (16) Disassemble and repair (replace damaged components).	3-6. 4-2. 4-3. 6-4. 6-4.
Pressure does not diminish	(1) Pump is too small for capacity of vacuum vessel. (2) Pressure measurement is incorrect. (3) Vacuum gauge is unsuitable. (4) The inlet piping is too small in diameter, or too long. (5) Low voltage. (6) Ambient temperature unsuitable. (7) Leaks in inlet piping. (8) Leaks from piping or connections. (9) Foreign matter inside pump. (10) Water or solvent etc has been sucked into pump causing problems. (11) Damage to motor. (12) Damage to valves. (13) Damage to diaphragm. (14) Miscellaneous damage to pump components.	(1) Select another pump. (2) Measure the pressure correctly. (3) Measure with a calibrated vacuum gauge suitable for the pressure range. (4) Connect piping of an inside diameter greater than the inlet diameter, or reduce the distance between the pump and vacuum vessel. (5) Adjust the voltage, and check the power supply cable. (6) Ensure that ambient temperature is $7\sim 40\text{ }^{\circ}\text{C}$ . (7) Clean and replace. (8) Check for leaks in piping, check diameter and length of piping, and repair. (9) Remove foreign matter, disassemble and clean, and replace components. (10) Disassemble and repair (replace valves and diaphragm etc). (11) Replace and repair. (12) Replace. (13) Replace. (14) Disassemble and repair (replace damaged components).	5-1. 5-1. 5-1. 6-4. 6-4. 6-4.
Pump surfaces are abnormally hot (more than room temperature + $30\text{ }^{\circ}\text{C}$ )	(1) Continuous operation with high pressure gas. (2) High temperature gas. (3) Problem with power supply voltage. (4) Motor has seized.	(1) Do not run the pump continuously at near-atmospheric pressure. (2) Fit cooling equipment (eg. gas cooler) to the inlet. (3) Ensure that voltage variation is within $\pm 10\%$ . (4) See the section on problems with pump rotation.	

## 7. In Conclusion

Please contact the manufacturer's sales division if you have any questions.

### **Warranty**

- (1) The warranty for this pump (this equipment) extends for a period of one year from the date of shipment.
- (2) Any malfunctions or defects which occur under normal usage conditions during the warranty period will be repaired free of charge.

Note, the warranty stated here is an individual warranty covering the pump. In addition, the scope of the warranty coverage concerning repairs is limited to the repair and/or replacement of parts.

Normal usage conditions refer to the following:

- a) Ambient temperature and humidity during operation: 7 - 40°C, below 85% RH
  - b) Operation in accordance with the user manual
- (3) Repair fees will incur during the warranty period for the following cases:
    - a) Malfunctions due to a natural disaster or fire.
    - b) Malfunctions caused by special atmospheric conditions, such as salt damage, inflammable gas, corrosive gas, radiation or pollution.
    - c) Malfunctions caused by usage conditions that differ from those stated in the user manual (performance specifications, maintenance and inspection, etc.).
    - d) Malfunctions caused by modifications or repairs carried out by a party other than the manufacturer, or by a service company not approved by the manufacturer.
    - e) Malfunctions caused by noise (electric disturbance).
    - f) Malfunctions that occur when not using a rated power supply.
    - g) Malfunctions that occur when there is an abnormal rise in internal pressure due to the pump exhaust outlet being blocked during operation, etc.
    - h) Malfunctions that occur, when the pump is damaged as a result of being dropped or falling, etc.
    - i) Malfunctions which are determined by the manufacturer's technical personnel to be caused by conditions that do not comply with the usage conditions for this vacuum pump.
    - j) Malfunctions due to the replacement of consumables.
  - (4) Disclaimer
    - a) We shall not be liable for any malfunctions of our products caused by the customer, regardless if the malfunction does not fall within the warranty period, nor shall we be liable for any loss of opportunity for the customer's clients or for compensation for any damages to other products, labor costs, production loss, transportation expenses and other related work.
    - b) We shall not be liable for any claims and patent infringements, including secondary damages, filed a claim by a third party against the customer.

## Usage Status Check Sheet (for use in Instruction Manual)

- \* For the purpose of safety control of repair personnel, fill in within the heavy line frame and attach the sheet to the item of which repair is requested.
- \* In case this sheet were not attached or filled in, your request of repair and service may not be accepted.
- \* In accordance with the Private Information Protection Law, the provided information will be used only for determining the cause of failure and whether detoxifying washing should be conducted. It will never be provided to any third person.

Model Name: \_\_\_\_\_ Manufacturer's Serial No.: \_\_\_\_\_

1. Inhaled Gas \* Please be sure to fill in.

(1) Whether there is harmful effect on human bodies Yes No (Sing your name below.)

(2) Whether there is unusual smell Yes No

(3) Type and Name of Gas: \_\_\_\_\_

\* Industrial Safety and Health Law designates particular substances as the materials to be notified.

2. Usage Status

Operation Method: Approx. ( ) hours per day, ( ) years and ( ) months

☐ Continuous Operation ☐ Intermittent Operation

Usage: \_\_\_\_\_

3. Failure Status ☐ Unusual Noise ☐ Abnormal Pressure ☐ Abnormal Actuation ☐ Oil Leakage

Other Symptoms: \_\_\_\_\_

4. Detail of Request ☐ Repair (Overhaul) ☐ Regular Checks

5. Others: \_\_\_\_\_

Company Name: \_\_\_\_\_ Personnel in charge: \_\_\_\_\_

Address: \_\_\_\_\_

Tel: \_\_\_\_\_ Fax: \_\_\_\_\_ E-mail: \_\_\_\_\_

Agent Name: \_\_\_\_\_ Personnel in charge: \_\_\_\_\_

Address: \_\_\_\_\_

Tel: \_\_\_\_\_ Fax: \_\_\_\_\_

\* In case you do not have any direct transaction with us, please be sure to fill in the agent name.

6. Confirmation

The gas and substance used in this pump or unit is harmless to human bodies, or it is not contaminated by any substance harmful to human bodies.

Signed \_\_\_\_\_ (seal) Date: \_\_\_\_\_

\* Please send the parcel to our Service Division. (See attached contact information.)

\* In order to avoid a trouble during transportation, please evacuate oil from any oil pump before shipping.

アルバック機工株式会社

<https://ulvac-kiko.com>

製品情報・サービス拠点・お問い合わせはこちらから



<https://showcase.ulvac.co.jp/ja/>

株式会社アルバック  
規格品事業部 東日本営業部  
〒253-8543  
神奈川県茅ヶ崎市萩園2500  
TEL:0467-89-2416

株式会社アルバック  
規格品事業部 西日本営業部  
〒532-0003  
大阪府大阪市淀川区宮原3-3-31 上村ニッセイビル5F  
TEL:06-6397-2286

ULVAC KIKO,Inc.

<https://ulvac-kiko.com/en>

Please contact us for products, Service Base or other Inquiries from here.



<https://showcase.ulvac.co.jp/en/>

ULVAC,Inc.  
Components Division  
2500 Hagisono, Chigasaki, Kanagawa, 253-8543, Japan  
TEL:+81-467-89-2261