

**ULVAC**

# **INSTRUCTION Manual**

Oscillating Piston Dry Vacuum Pump

DOP-40D

DOP-80S

## **Request to Users**

Please read this manual thoroughly to ensure safe and effective use of the equipment.

Keep this manual in a safe place.

Due to periodic improvements in performance, the equipment described in this manual is subject to changes in dimensions and specifications without prior notice.

**ULVAC KIKO, Inc.**

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

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## **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

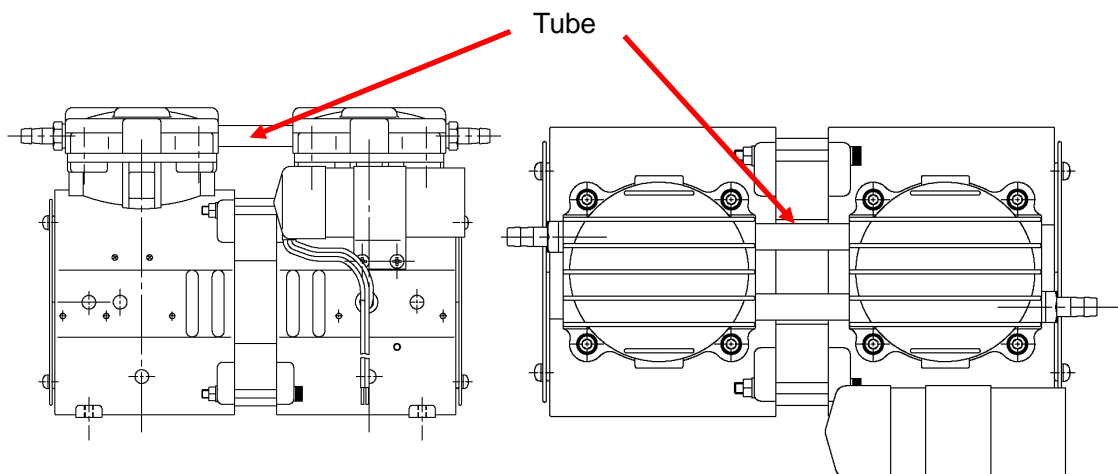
- Instruction manual ----- x 1
- Inlet and outlet caps (fitted to inlet and outlet) ----- x 1

- (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

1. Ensure that the tube on the side of the pump is not gripped or bent when removing the pump from the packaging. Holding the pump by this tube may damage it, thus reducing pump performance.
2. Always remove the vent plug before using the pump.
3. Fit an inlet filter if there is a possibility of foreign matter or dust particles entering 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 Temperatures**

Some components reach surface temperatures in excess of 60°C during pump operation. Burns may result if these components are touched during operation.



### **Electric Shock**

Always switch off the main power supply before installing electrical wiring or performing any electrical work on the pump. Failure to do so may result in electric shock.

## • 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 switch off the main power supply, and make sure that the pump has stopped, before carrying out inspection and repair.
- (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) Always switch off the main power supply before installing electrical wiring. Carrying out work on the pump while the power is connected 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) Ensure that the power cord used for the pump is appropriate for the rated voltage and current. With each core wire having a cross-section area of 1.0mm<sup>2</sup> or more.
- (11) Switch off the main power supply, before disconnecting the power cord from the pump. 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 cord 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 cup packing, inlet and outlet valves, and gaskets.

## **Caution**

### **Installation**

- (1) 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.
- (2) The fine clearances used in this pump require that the following conditions be satisfied during storage, installation, and operation.
- (3)
  - 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.
    - i) There is a space which is sufficient for pump surroundings, the pump cooling fan part is not covered.

### **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.



## **Caution**

### **Maintenance and Repair**

- (8) If the pump ceases operation, turn power OFF 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 grip or bend the tube on the side of the pump. Any damage to this tube may reduce the performance of the pump.
- (3) Fit an inlet filter if there is a possibility of foreign matter or dust particles entering the pump.
- (4) Use ventilation holes, and fit a cooling fan, to reduce the temperature in the vicinity of the pump. Ensure that the pump cooling fan inlet is not blocked. Ensure that a space of at least 100mm is available on all sides of the pump.

### **Application**

- (5) This pump is not designed to be corrosion-resistant. It should only be used with clean air at normal temperatures, or gases with equivalent characteristics.
- (6) This pump is only for vacuum pumping.
- (7) In addition to discharge of gas via the pump outlet, gas may leak from the pump itself. Do not use the pump to evacuate toxic gases. If the pump is used to evacuate toxic gas, appropriate care is required during maintenance.
- (8) The pump will not often operate normally if it is used with corrosive gases, organic solvents, liquids, or condensed gases (eg steam).
- (9) The pump will not often operate normally if it is used with gases containing particles or dust etc. Always fit a filter to the inlet.

### **Operation**

- (10) Use the pump at an ambient temperature of 7 – 40°C. The life of the pump will be severely reduced if it is operated at high temperatures.
- (11) Application of back pressure at the pump outlet will overload the motor and may prevent the pump starting.
- (12) When the thermal protection relay operates the pump will be extremely hot. Touching the pump in this condition may result in burns.

### **Maintenance and Repair**

- (13) 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 piston dry vacuum pump employing reciprocating motion of cup packing.  
Observe the following prohibitions to ensure normal operation of the pump.

### Prohibitions

#### **Warning**

- (1) This pump is only for vacuum pumping, 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 evacuate gases containing particles, dust, water, or corrosive gases.



## 1.2 Specifications

Table 1.1 Product Specifications

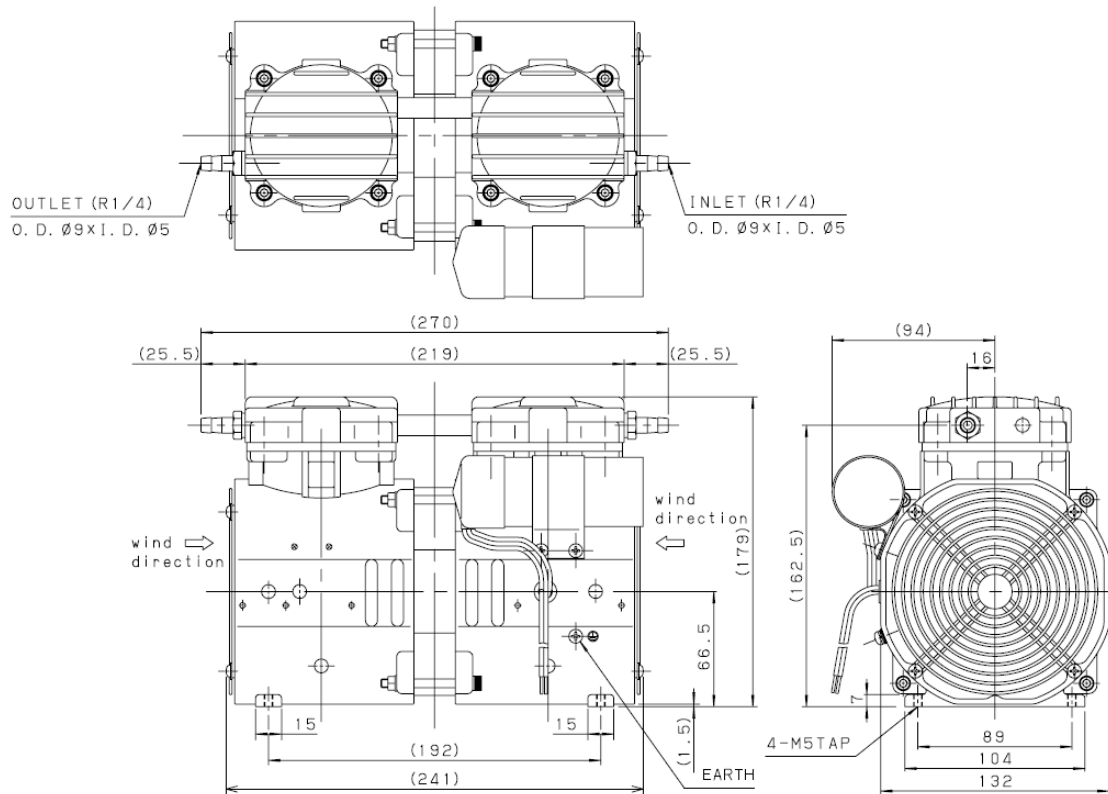
Model		DOP-40D		DOP-80S	
Discharge rate	50Hz	40 L/min		80 L/min	
	60Hz	44 L/min		88 L/min	
Pressure achieved		1.20 kPa		5.33 kPa	
Motor		1 $\phi$ , 210W, 4P , capacitor operation			
Rated current	50Hz	3.2A	3.15A	1.6A	1.4A
	60Hz	3.9A	3.42A	1.7A	1.4A
	Rated Voltage	100V	115V	200V	220V
Speed		1400 / 1680 r/min			
Weight		7 kg			
Inlet and outlet piping		D.O. $\phi$ 9 $\times$ I.D. $\phi$ 5 (R1/4)			
Air temperature		7 $\sim$ 40 $^{\circ}$ C			
Dimensions		160(W) $\times$ 270(L) $\times$ 179(H)			

## 1.3 Thermal Protection Relay

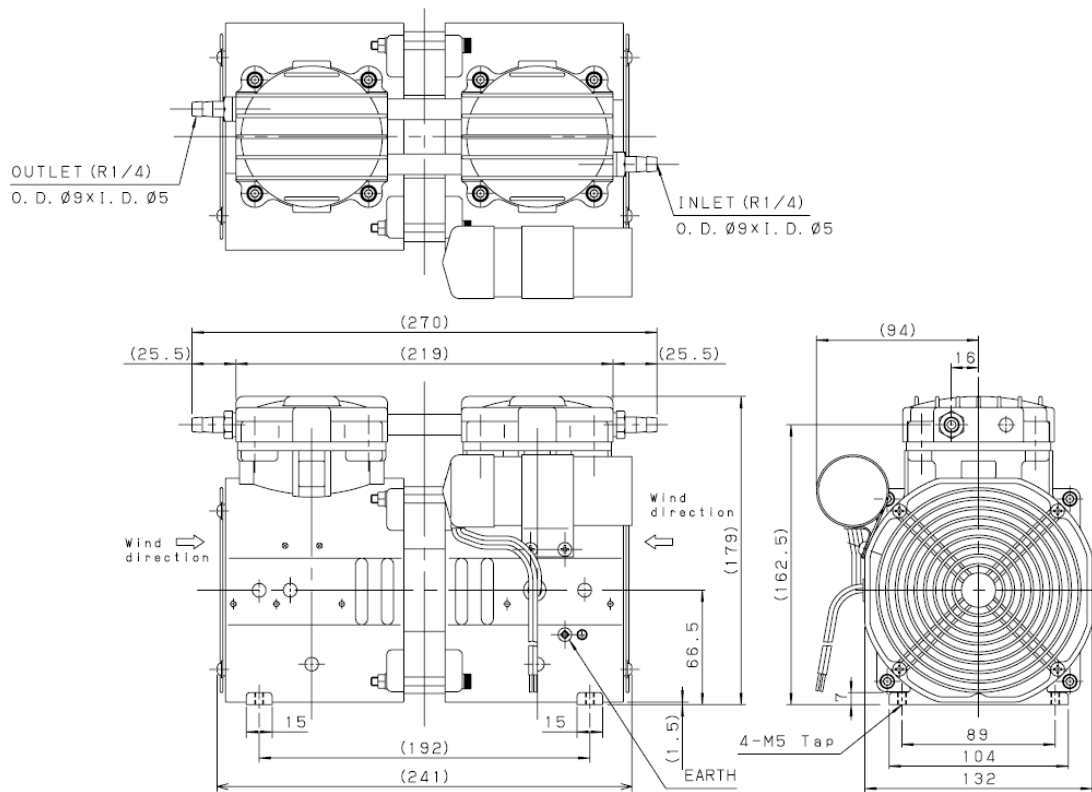
- 1) This pump is fitted with an automatic reset thermal protection relay for overload protection.  
This device shuts off the motor power supply circuit automatically to prevent burn-out if the motor temperature rises due to overloading, or there is a pump fault which prevents rotation.  
Thermal protection relay specifications : Operation temperature 120 $^{\circ}$ C $\pm$ 5 $^{\circ}$ C
- 2) Always fit other protective devices (eg earth leakage breaker, motor breaker) in addition to the overload protection relay.

 <b>Warning</b>	See Warning (8), P04
 <b>Caution</b>	See Caution (5), P05

## 2. Dimensions






**Fig.2.1 DOP-40D Dimensions**



**Fig.2.2 DOP-80S Dimensions**

### 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)(3)(4), P06

#### 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.
  - i) There is a space which is sufficient for pump surroundings, the pump cooling fan part is not covered.

#### 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) The wire diameter of power cord must be  $\phi 1.0\text{mm}$  or more.
  - (2) 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.
  - (3) Be sure to ground to the screw next to the earth mark.  
Please attach earth terminal as shown in Fig.3-1
  - (4) The electric wire which will be connected to the earth must be a green colored insulating coating wire, with or without yellow stripes. Its wire diameter must be  $\phi 1.0\text{mm}$  or more.
- Notice: Before operating wire connection, be sure to unplug the power plug.

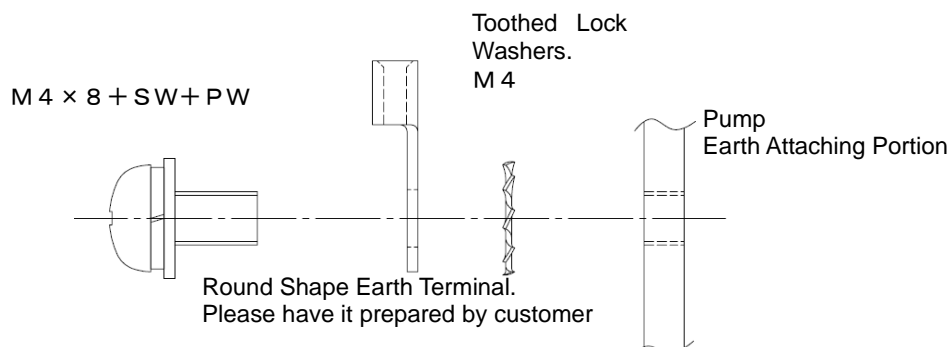


Fig.3-1 Installation Method of Earth Screw

### 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).

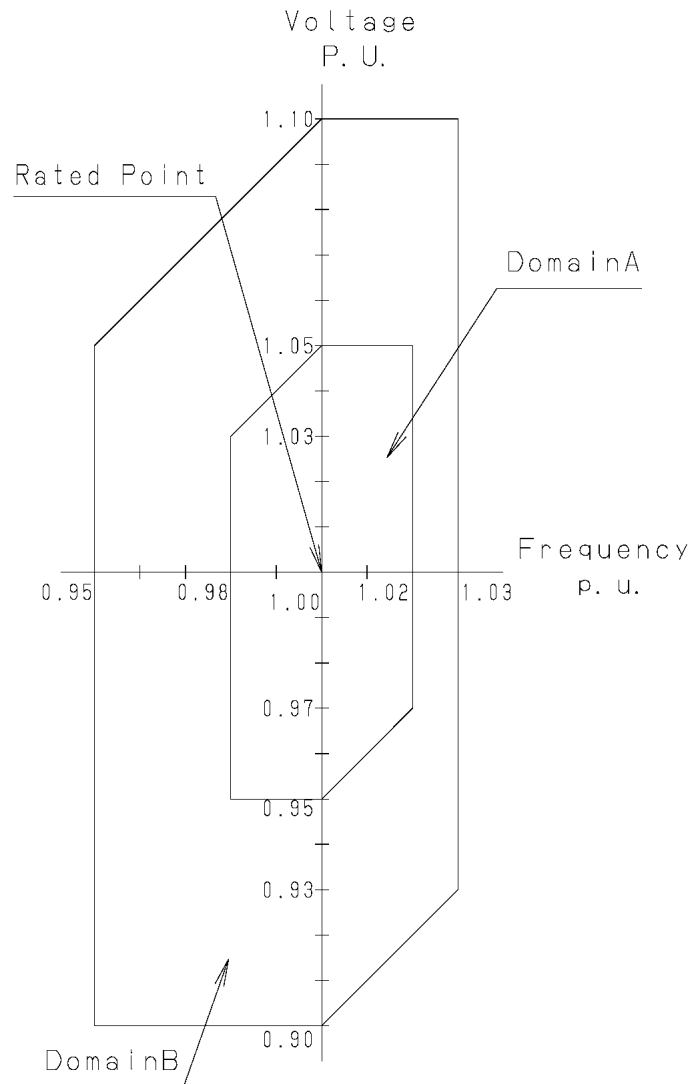


Fig. 3.2 Change region of the voltage and frequency

### 3.6 Checking Operation After Installation

- 1) Remove the rubber cap and vent plug on the inlet pipe.
- 2) Switch power ON, check the direction of rotation, and check for suction.
- 3) When checks are complete, switch off the main power supply and stop the pump. Check that the pump has stopped.

Caution: Use cable, with each core wire having a cross-section area of 1.0 mm<sup>2</sup> or more.

### 3.7 Piping

- 1) Ensure that all piping is installed without leaks, and fit a filter on the pump inlet.
- 2) Use inlet piping with an internal diameter of 5 mm or more.
- 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.3.3).

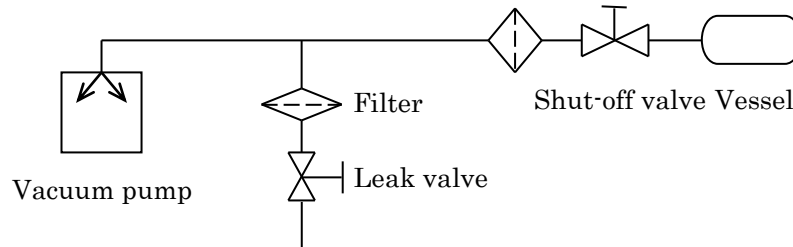






Fig.3.3 Example of Piping Used When Evacuating a Vessel

### 3.8 Storage

Switch off the main power supply and check that the pump has stopped.  
Remove the power cord connected to the pump, place the rubber caps over the inlet and outlet, and store in a location with 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,P05
 <b>Caution</b>	See Caution (4)(6)(7), P05
 <b>Note</b>	See Note (3)(4)(5)(6)(7)(8)(9)(10)(11), P06

### 4.2 Operation of the Thermal Protection Relay

- 1) If the thermal protection relay operates, switch off the main power supply immediately and contact the manufacturer. The motor will be extremely hot and should not be touched under any circumstances.
- 2) When the cause of the problem has been eliminated, check that the motor has cooled, switch on the main power supply, and check that the pump is operating.

 <b>Caution</b>	See Caution (5), P05
 <b>Note</b>	See Note (12),P06

#### 4.3 Starting in Cold Weather

The bearing grease and cup packing may harden under cold conditions, and the pump may be difficult to start. Use the following procedure in this case.

- 1) Open the inlet to atmosphere, and switch power ON-OFF two or three times until the pump starts. If the pump still does not start, raise the ambient temperature above 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 (i.e. the no-load condition)”.

Note that the indicator values for pressure may differ between types of vacuum gauges.

The pressure achieved in practice is 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 varies with the type of gas used, and its pressure. The maximum rate of evacuation is reached when air is introduced, and slowly decreases 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  $4 \times 10^4$  ~  $6 \times 10^4$  Pa. If pressure drops below this level, 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,P05
 <b>Caution</b>	See Caution (8)(9), P06
 <b>Note</b>	See Note (13), P06

Customer repair technicians are able to perform the following maintenance and repairs. Other repairs and modifications (except for the standard options available from the manufacturer) should not be performed by the customer.

- 1) Replacing cup packing
- 2) Replacing suction and exhaust valves
- 3) Replacing gaskets
- 4) Replacing suction valve rubber separator

### 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 3000 hours of operation, and replace and clean in accordance with the " Guidelines for Replacement and Cleaning "on the following page. Refer to 6.4 Replacing Consumables and Cleaning for procedures.

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

Table 6.1 Consumables List

Components	Quantity	Material	Average life
Cup packing	2	PTFE	5,000 Hr
Suction valves	2	SUS	5,000 Hr
Exhaust valves	2	SUS	5,000 Hr
Gaskets (for 40D)	2	NBR	5,000 Hr
Gaskets (for 80S)	2	FPM	10,000 Hr
O ring (for 40D)	4	NBR	5,000 Hr
O ring (for 80S)	6	FPM	10,000 Hr
Bearing	2	-	15,000 Hr
Suction valve rubber separator	2	Q	5,000 Hr

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.



< Guidelines for Replacement and Cleaning >

Replace or clean components if performance is reduced and/or the following symptoms appear.

Cup packing: Replace in the event of abnormal wear, hardening, or cracking.

Suction and exhaust valves:

Replace in the event of deformation, hardening, or chipping.

Bearings:

Contact the manufacturer for repair in the event of abnormal noises or abnormal motor vibration (chattering).

Suction valve rubber separator:

Replace in the event of deformation, wear, hardening, or cracking.

Connecting tubes: Replace in the event of deformation, wear, hardening, or cracking.

Gaskets: Replace in the event of deformation, hardening, or cracking.




Electric Wiring: Replace in the event of cracking.

Tighten in the event of slack terminal.

Table 6.2 Locations for Maintenance and Inspection

Period of operation	Inspection item	Inspection details	Method of inspection
Every 3000 hours	Cup packing	Abnormal wear, hardening, cracking.	Visual inspection
	Suction and exhaust valves	Deformation, hardening, chipping.	Visual inspection
	O ring	Deformation, Abnormal wear hardening, cracking.	Visual inspection
	Gaskets	Deformation, hardening, cracking.	Visual inspection
	Bearings	Abnormal noises.	Listen
	Suction valve rubber separator	Deformation, wear, hardening, cracking.	Visual inspection
	Electric Wiring	Cracking (power cord)	Visual inspection
		Slack (terminal)	Tighten

#### 6.4 Replacing and Cleaning Consumables

 <b>Warning</b>	See Warning (17),(18),P05
 <b>Caution</b>	See Caution (9),P06
 <b>Note</b>	See Note (13),P06

- (1) The interior of the pump is extremely hot immediately after operation. After stopping the pump, leave it for 30 minutes or more and begin replacing consumables and cleaning only after checking that it has cooled sufficiently.
- (2) To prevent ingestion of microscopic particles in the air, use a dust mask and gloves when replacing components and cleaning.
- (3) To prevent injury, wear gloves when replacing consumables.

Prepare the following tools, and refer to photographs, before replacing components and cleaning. Contact the manufacturer's service division if the required tools are not available.

\* Tools

- Hexagonal Allen wrench 4 mm diameter across flats
- Phillips screw driver
- Torque wrench 4 mm diameter across flats Wrench which can fasten at 5 N·m
- Torque driver (+) Driver which can be fastened at 0.8 N·m and 3 N·m
- Sealing/anti-loosening agent for screws

Replacing Cup packing : NK-4 or LOCTITE 242 or LOCTITE 243

Replacing suction and exhaust valves : LOCTITE 242 or LOCTITE 243

- Vacuum grease

## 1) Replacing Gaskets

Remove the four hexagonal socket bolts (M5×20) ⑩ from the pump head covers② (total of 8 bolts).

There is one black gasket ⑪ inside each of the pump head covers. Remove these and replace with new gaskets.

Tighten the M5×20 bolts orthogonally to fix the pump head covers back in place at torque of 5.0 N·m.

\* Make sure the gaskets are securely inside the pump head cover gasket grooves and that there is no biting between the pump head covers and plates.



Photo 1: Pump head cover removal

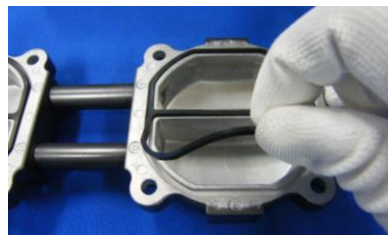


Photo 2: Gasket removal

## 2) Replacing O Rings (S-67 · P-10)

Remove pump head plates ③ according to the procedure provided for gasket replacement. Replace the O-rings (S-67) ⑩ are inserted into the top of cylinders ④.

In addition, there are 2 O-rings (P-10) in each of the Connecting tubes which connect the pump head covers to each other. (\*80S : 4 O-rings, 40D : 2 O-rings) Replace with new O-rings (P-10) coated with vacuum grease using a cloth.

Tighten the M5×20 bolts orthogonally to fix the pump head covers back in place at torque of 5.0N·m.

\* When attaching the Connecting tubes to the pump head covers, make sure the O-rings are coated with vacuum grease, and be careful not to damage the O-rings when inserting.



Photo 3: O-ring (S-67) removal

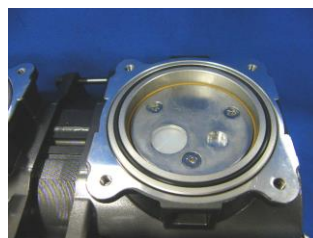


Photo 4: O-ring (S-67) attachment

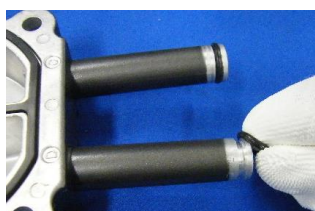


Photo 5: O-ring (P-10) removal



Photo 6: O-ring (P-10) attachment

### 3) Replacing Cup packing

Cup packings ⑦ are inserted in between connecting rods ⑤ and retainer ⑥ Suction valve rubber separator ⑭. First, remove the 3 (total of 6) flat countersink screws (M4×8) ⑰ and then remove the retainer , Suction valve rubber separator , cup packings and cylinder ④.

\* Carefully remove debris from cylinder and retainer.

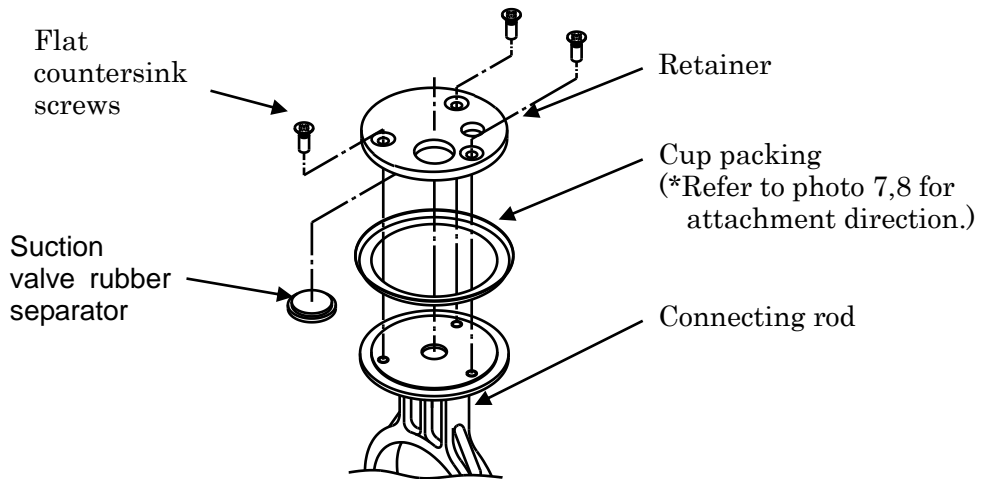


Fig.6.1 Cup packing attachment figure

Next, set the cleaned cylinder into casing ① and line up centers of the new cup packings with the centers of cup packing attachment position on the connecting rod and insert the cylinder by hand. Place the retainer with the newly attached Suction valve rubber separator on top of the cup packings and fasten sealing/anti-loosening agent for screws (NK-4 or LOCTITE 242 or LOCTITE243)-coated flat countersink screws (M4×8) with a torque of 3.0 N·m.

\*Cup packing attachment direction

DOP-40D: Facing downwards

DOP-80S: Facing upwards



Photo 7: DOP-40D



Photo 8: DOP-80S

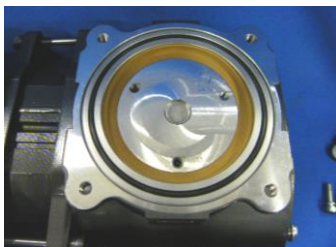


Photo 9: Cup packing attachment position

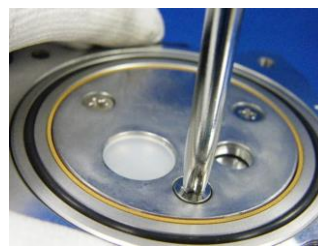


Photo 10: Retainer attachment

#### 4) Replacing suction and exhaust valves

A single exhaust valve ⑬ is located on the front of the pump head plates ③ and a single suction valve ⑧ on the back of the pump head plates.

First loosen the small cap head screws (M3×5) ⑱ and remove the exhaust valve clamp ⑫ and exhaust valve .

Wipe the pump head plates clean, and replace the exhaust valves with new valves.

Lay the exhaust valve clamps ⑫ on the pump head plates and fasten them in place by tightening the small cap head screws (M3×5) coated with LOCTITE 242 or LOCTITE 243 anti-loosening agent at 0.8 N·m torque.

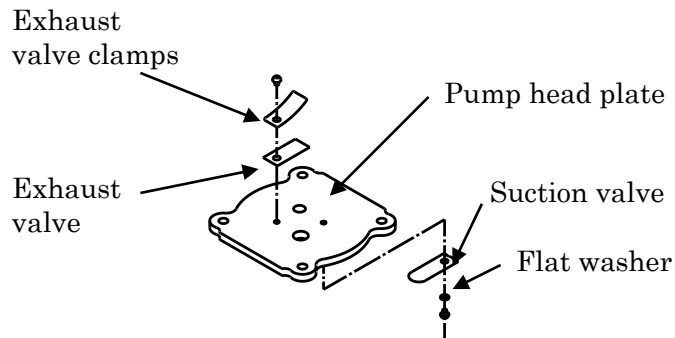


Fig.6.2 Suction and exhaust valves attachment figure

LOCTITE coating amount



\*Coat the bottom 2-3 threads of the screws completely  
\* Do not coat the tip surface

Next loosen the small cap head screws (M3×5) and remove the suction valve and flat washers.

Wipe the pump head plates clean, and replace the suction valves with new valves.

Lay the flat washers on the pump head plates and fasten them in place by tightening the small cap head screws (M3×5) coated with LOCTITE 242 or LOCTITE 243 anti-loosening agent for screws at 0.8 N·m torque.

\*Make sure to attach suction and exhaust valves so that they completely cover the suction and exhaust holes.

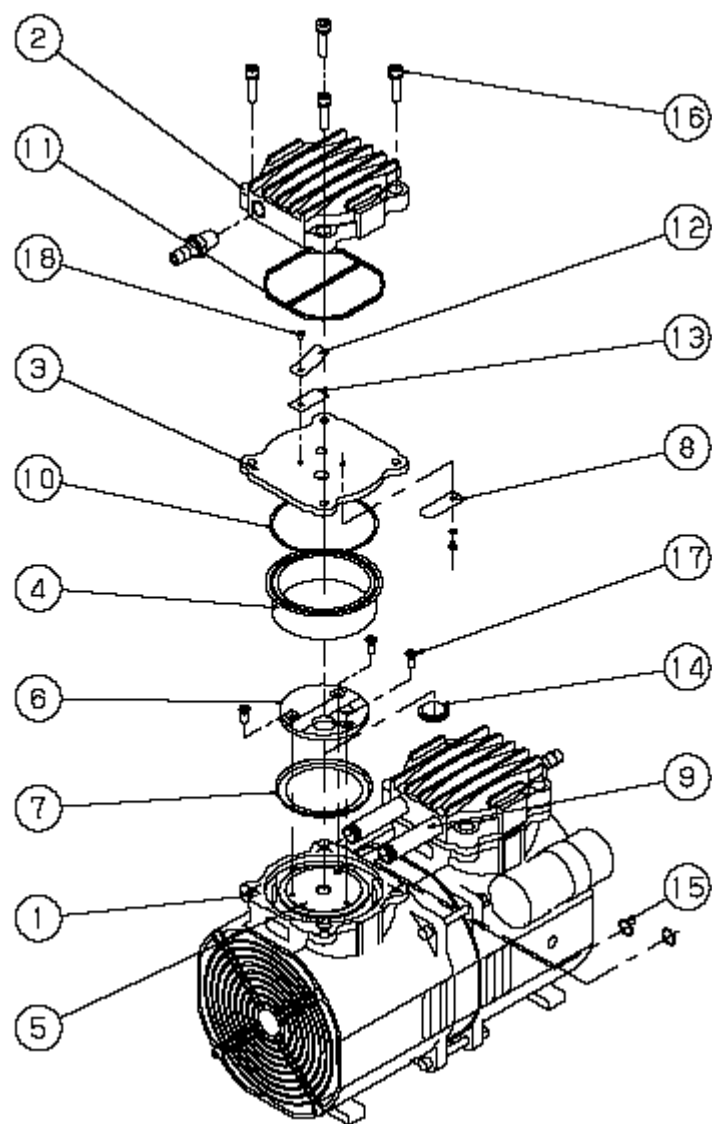


Fig.6.3. Exploded View (DOP-80S)

## 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.	(1) Connect power supply.	3-4.
	(2) Switch is OFF.	(2) Set switch to on.	
	(3) Problem with power supply voltage.	(3) Ensure that voltage variation is within +/-10%.	
	(4) Problem with pump wiring.	(4) Rewire the pump. Contact the manufacturer.	
	(5) The breaker has operated.	(5) Investigate the reasons for operation.	
	(6) The thermal protection relay has operated.	(6) Switch power OFF, and eliminate the cause of operation of the relay. Contact the manufacturer.	4-2.
	(7) Low ambient temperature.	(7) Ensure that ambient temperature is 7~40 °C.	4-3.
	(8) Low voltage.	(8) Adjust the power supply voltage, and check the power supply cable.	3-5
	(9) Fault in power supply.	(9) Replace or repair.	6-3.
	(10) Problem with power supply switch.	(10) Replace or repair.	
	(11) Broken wire in power cord.	(11) Replace or repair.	
	(12) Problem with motor.	(12) Replace or repair.	
	(13) Locked connecting rod.	(13) Disassemble pump head cover, and cylinder; and check interior.	
	(14) Problem with bearings.	(14) Replace or repair.	
	(15) Miscellaneous damage to pump components.	(15) Disassemble and repair (replace damaged components).	6-4.
Pressure does not diminish	(1) Pump is too small for capacity of vacuum vessel.	(1) Select another pump.	5-1.
	(2) Pressure measurement is incorrect.	(2) Measure the pressure correctly.	
	(3) Vacuum gauge is unsuitable.	(3) Measure with a calibrated vacuum gauge suitable for the pressure range.	
	(4) The inlet piping is too small in diameter, or too long.	(4) Connect piping of an inside diameter greater than the inlet diameter, or reduce the distance between the pump and vacuum vessel.	5-1.
	(5) Low voltage.	(5) Adjust the voltage, and check the power supply cable.	3-5
	(6) Ambient temperature unsuitable.	(6) Ensure that ambient temperature is 7~40 °C.	4-3
	(7) Leaks in inlet piping.	(7) Clean and replace.	6-4.
	(8) Leaks from piping or connections.	(8) Check for leaks in piping, check diameter and length of piping, and repair.	
	(9) Foreign matter inside pump.	(9) Remove foreign matter, disassemble and clean, and replace components.	
	(10) Water or solvent etc has been soaked into pump causing problems.	(10) Disassemble and repair (replace valves and diaphragm etc).	
	(11) Damage to motor.	(11) Replace and repair.	
	(12) Damage to suction / exhaust valve	(12) Replace.	6-4.
	(13) Damage to cup packing.	(13) Replace.	6-4.
	(14) Miscellaneous damage to pump components.	(14) Disassemble and repair (replace damaged components).	
Pump surfaces are abnormally hot (more than room temperature + 50 °C)	(1) Continuous operation with high pressure gas.	(1) Do not run the pump continuously at near-atmospheric pressure.	3-5
	(2) High temperature gas.	(2) Fit cooling equipment (eg. gas cooler) to the inlet.	
	(3) Problem with power supply voltage.	(3) Ensure that voltage variation is within +/-10%.	
	(4) Motor has seized.	(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/>

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



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