



INSTRUCTION MANUAL

Oscillating Piston Dry Vacuum Pump

DOP-181S series

Model

DOP-181SA / DOP-181SB

DOP-181SC / DOP-181SD

DOP-181SE



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.



Declaration of Conformity



We, Company:ULVAC KIKO,Inc.

of Address:291-7 Chausubaru Saito-city,Miyazaki (ZIP Cord:881-0037) Japan.

This declaration is issued under the sole responsibility of the manufacturer.
In accordance with the following Directive:

2006/42/EC	Machinery Directive
2011/65/EU+(EU)2015/863	RoHS Directive

declare under our sole responsibility that the product,

Type of Product	: Oscillating Piston Type Dry Vacuum Pump
Model Name	: DOP-181SA, DOP-181SB, DOP-181SC DOP-181SD, DOP-181SE

to which this declaration related is in conformity with the following standards:

EN 1012-2:1996+A1:2009
Compressors and vacuum pumps – Safety requirements, Part2. Vacuum pumps
IEC EN 61010-1:2010+A1:2019
Safety requirement for electrical equipment for measurement, control and laboratory use
Part1.General requirement

following the provisions of

The person stated below will keep the following technical documentation:

- operating and maintenance instructions
- technical drawings
- description of measures designed to ensure conformity
- other technical documentation, e.g. quality assurance measures for design and production

Person authorized to compile the technical file:

(Name and address) Chris Goebel
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31.Mar, 2023
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We, Company:ULVAC KIKO,Inc.

of Address:291-7 Chausubaru Saito-city,Miyazaki (ZIP Cord:881-0037) Japan.

This declaration is issued under the sole responsibility of the manufacturer.
In accordance with the following Directive:

Supply of Machinery (Safety) Regulations 2008
(S.I. 2008 No. 1597, as amended by S.I. 2019 No. 696)

The Restriction of the Use of Certain Hazardous Substances in Electrical and
Electronic Equipment Regulations 2012 (S.I. 2012 No. 3032)

declare under our sole responsibility that the product,

Type of Product	:	<u>Oscillating Piston Type Dry Vacuum Pump</u>
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0 . Before Using the Equipment

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

This pump is only for vacuum pumping, 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 may be refused if these circumstances are unclear.

0. 1 Checks When Opening Packaging

Check the following after opening the packaging.

- (1) Whether the pump accords with requirement?
- (2) Are the accessories and necessary parts included?

Standard accessories

- Instruction manual ----- x 1
- Rubber plug (Inlet / Outlet Port) ----- x 2
- Rubber leg ----- x 4
- Screw (For rubber leg fixation) ----- x 4

- (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. When take out a pump from a packing box, Do not grip the pipe of the upper of the pump. In addition, please do not do an act bending by pushing. A pipe is damaged, and pump performance decreases.
2. Always remove the rubber plug from Inlet / Outlet Port before using 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.
5. Please attach a silencer to suppress the operating sound.



DOP-181S

0. 2 Using the Pump Safety

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 symbols

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 Caution

Some parts of the pump may reach temperatures of 60°C or more during operation.
Touching such components may result in burns.

Electric Shock Caution

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.



The Inlet port of the pump



The outlet port of the pump

Cautions for Safety in Use



Danger

Applications

- (1) This pump is not designed to be explosion-proof, and should therefore not be used to evacuate explosive gases.
- (2) In addition to discharge of gas via the pump outlet, gas may leak from the pump itself. Use it only with dry air and N₂ at normal temperature, or gases of equivalent characteristics.

Maintenance and Repair

- (3) When sending the pump to the manufacturer's service division for dismantling and repair, always note the type of gas that has been used on the 'Pump Usage Check Sheet'.



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. Such use may result in fire.
- (3) Ensure that the motor is freely ventilated to prevent overheating which may result in fire or burns. The pump is polluted with a poisonous gas when exhaust a poisonous gas with this pump. Depending on a kind of the gas may decline an overhaul. Please pay attention enough.
- (4) To reduce the risk of fire and explosion-damage, enclose the pump by non-flammable cover.

Power Supply

- (5) Always switch off the main power supply, and make sure that the pump has stopped, before carrying out inspection and repair.
- (6) Ensure that the relevant wiring is in accordance with technical standards for electrical equipment and wiring regulations. Incorrect wiring may result in fire.
- (7) 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.
- (8) 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 malfunction or earth leakage occurs.
- (9) Use the pump only at the rated voltage. Use at other than the rated voltage will interfere with operation of the overload protection relay, and this may result in the motor burning out, or fire.
- (10) Do not damage/ modify/pull the power cord. Do not place objects on it. Damage to the cord may result in electric shock or fire.

[Continued on next page]

- (11) Please connect a pump to a power supply. Please attach an appropriate terminal to an installation terminal stand surely by all means. It causes the electric shock. Please perform wiring, setting construction according to use local laws and ordinances, safety requirements. A green insulation coated electric wire is a ground with or without a yellow stripe.
- (12) When take off the power supply cord of the pump, turn off a device main power supply by all means, and please exclude a code from a terminal stand. It causes the electric shock.
- (13) Touching the power cord with wet hands may result in electric shock.
- (14) Touching electrical wiring etc while inserting the power cord may result in electric shock.
- (15) Do not remove the cover of capacitor, it causes the electric shock.

Operation

- (16) This pump is not designed to be explosion-proof, and should therefore not be used in the vicinity of inflammable substances (e.g. inflammable solvents) or in explosive atmospheres. Failure to follow these requirements may result in injury or fire.
- (17) Inserting fingers or objects into the motor inlet may result in electric shock, injury, or fire.
- (18) 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

- (19) The pump should be dismantled or repaired only by a repair technician trained by the manufacturer.
- (20) 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.
 - 1. Ambient temperature during operation : Ambient temperature range of product specification .(refer to table1-1)

[Continued on next page]



Caution

2. Ambient humidity of 85% or less during operation.
3. 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) Do not exceed the maximum ambient temperature of the temperature range of product specification at the time of pump installation. (refer to table1-1)

(3) Attach a vent and a fan for cooling in a device to lower pump use atmosphere temperature.
In addition, please do not block up the vent of the pump cooling fan.

Leave the space more than 100mm than the pump appearance.

Operation

- (4) Touching rotating components (eg motor, main shaft, axial joints, cooling fan) while the pump is in operation may result in injury.
- (5) When the thermal protector operates, the pump will become extremely hot. Please do not touch the pump. Touching the pump in that condition will cause burn injury. **Turning off the main power supply of the system, please contact us.**
- (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) Inserting fingers or objects, or peering, into, the inlet or outlet during operation may result in injury or malfunction.

Maintenance and Repair

- (8) If the pump ceases operation, switch off the main power supply immediately to prevent accidents, remove the power cord from the power supply, and contact your dealer or the manufacturer for inspection and repair.
- (9) After stopping the pump, leave it for 30 minutes or more and begin work on it only after checking that it has cooled sufficiently. The interior of the pump is extremely hot immediately after it has been switched OFF, and burns may result if it is touched in this condition.

Note

Installation

- (1) Application of shock to the pump, or allowing it to fall over, may result in a malfunction.
- (2) Do not grip or bend the pipe of the upper 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.

Application

- (4) This pump is not designed to be corrosion-resistant. It should only be used with dry air and N₂ at normal temperatures, or gases with equivalent characteristics.
- (5) This pump is only for vacuum pumping. Use at near-atmospheric pressures for long periods of time may result in a malfunction.

Operation

- (6) Use the pump at an ambient temperature of Ambient temperature range of product specification .(refer to table1-1). The life of the pump will be severely reduced if it is operated at high temperatures.
- (7) Application of back pressure at the pump outlet will overload the motor and may prevent the pump starting.

Maintenance and Repair

- (8) This pump operates with precision clearances and therefore requires particular skill for assembly. If a repair technician is not available, contact the manufacturer's service division for replacement of consumables.

1. Product Outline

1.1 Purpose of Use and Prohibitions

This product is a piston dry vacuum pump employing reciprocating motion of cup packing.

In addition, please do not use it in a simple substance because integration is for exclusive use. 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 dry air and N2 at normal temperature, or gases of equivalent characteristics.
- (4) Do not attempt to evacuate 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 (DOP-181S series)

Mode		DOP-181SA	DOP-181SB	DOP-181SC	DOP-181SD		DOP-181SE
Pumping speed	(L/min)	180(50Hz) / 200(60Hz)					
Ultimate pressure	(kPa)	10					
Motor		1 Phase 400W 4Poles					3 Phase 400W 4Poles
		fitted with an automatic reset thermal protector					
Amb. Temp.	(°C)	7 – 40				10 – 30	7 – 40
frequency	(Hz)	50 / 60	50 / 60	50 / 60	50 / 60	50 / 60	50 / 60
Voltage	(V)	100	115	200	220	200-230	200-220
current	(A)	6.3/5.8	5.3/5.1	3.2/2.9	2.9/2.6	3.1/2.9	2.0-1.9/1.9-1.8
Noise level	dB(A)	<65dB (at Ultimate pressure , 1m)					
Inlet Port Outlet port		Rc3/8					
Weight	(kg)	12					
Dimensions (WxLxH)	(mm)	172x266x235		162x266x235			160x266x235
Over Voltage Category		II					
Pollution Degree		2					
Insulation Category		Class 1					

1.3 Thermal Protector

- 1) This pump is fitted with an automatic reset thermal protector 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.
- 2) Always fit other protective devices (eg earth leakage breaker, motor breaker) in addition to the overload protection relay.

 Warning	See "Warning" (9) on p.04.
 Caution	See "Caution" (5) on p.06.

2. Dimensions

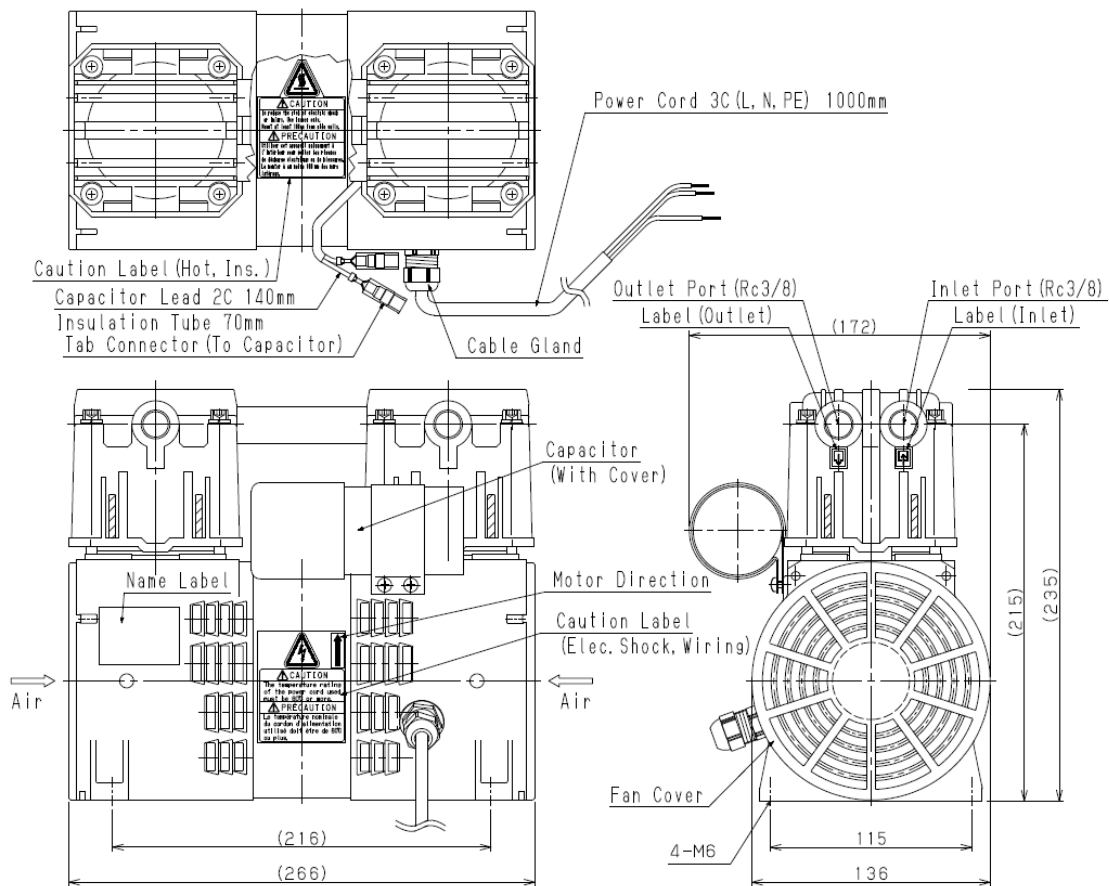


Fig. 2.1 DOP—181SA/181SB

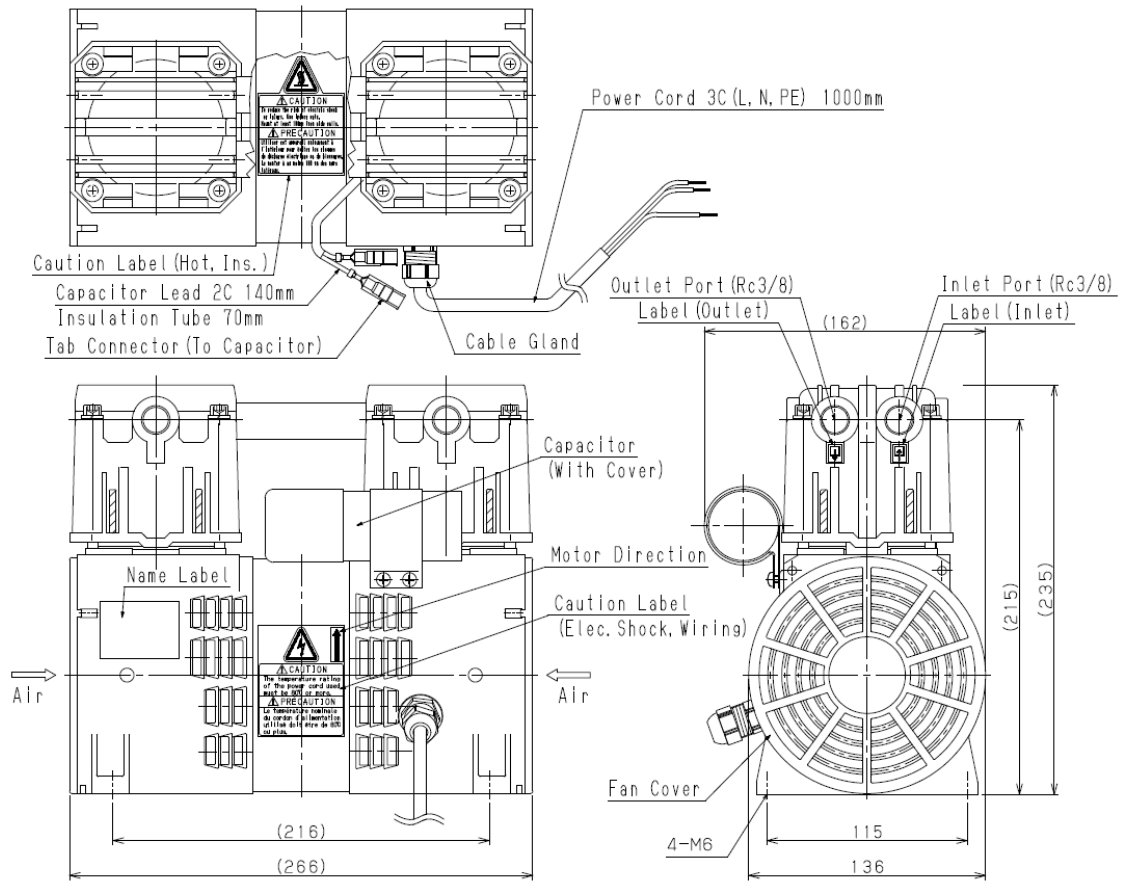


Fig. 2.2 DOP—181SC/181SD

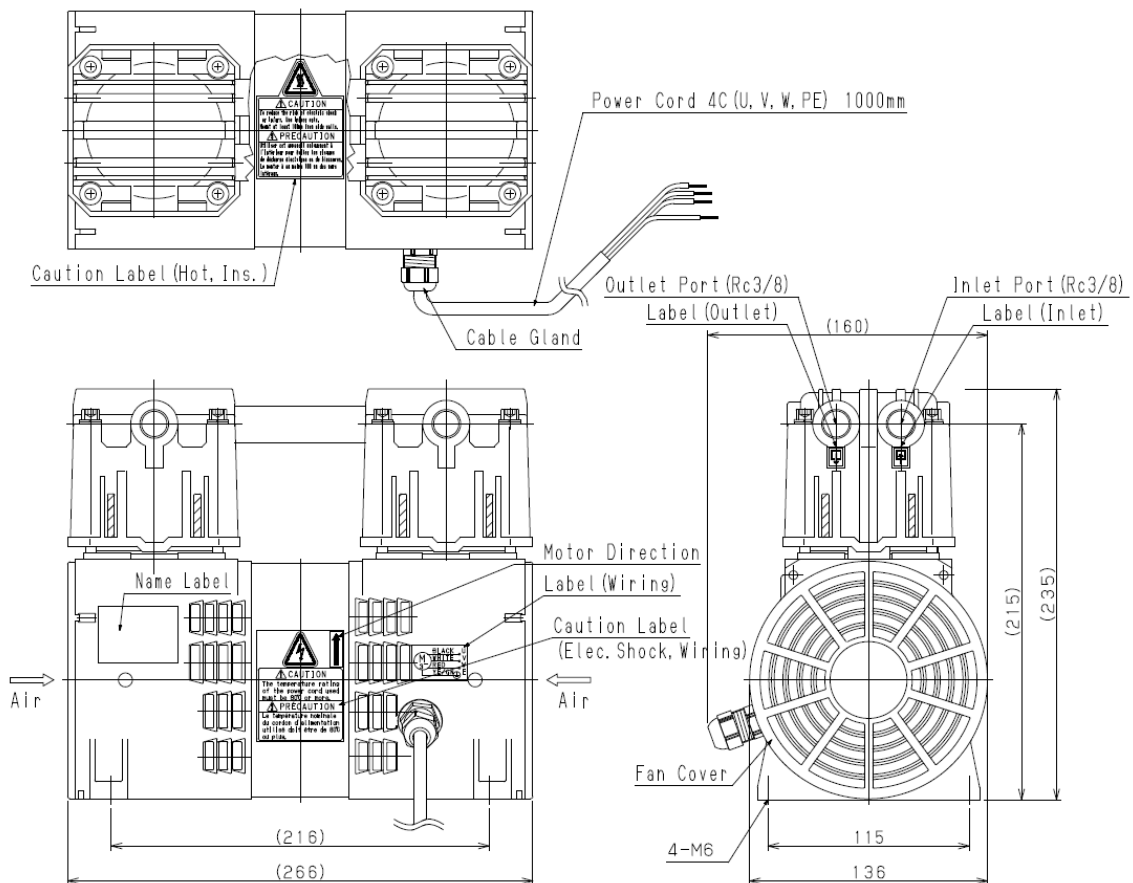





Fig. 2.3 DOP—181SE

3. Installation and Storage

3.1 Cautions for Installation and Storage

 Warning	See "Warning" (1), (2), (3), (4), (6), (7), (8), (9), (10), (11), (12), (13), (14) and (15) on p.04 and P.05.
 Caution	See "Caution" (1), (2) and (3) on p.05 and P.06
 Note	See "Note" (1), (2), and (3) on p.07.

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) Operating altitude less than 1,000m.
- (2) Ambient temperature during operation : Ambient temperature range of product specification .(refer to table1-1)
- (3) Ambient humidity of 85% or less during operation
- (4) 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) Do not exceed the maximum ambient temperature of the temperature range of product specification at the time of pump installation. (refer to table1-1)
 - i) Sufficient space is available on all sides of the pump, and the pump cooling fan inlet is not blocked.

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.

When it incorporates a pump in equipment, please do not disturb the ventilation of the cooling fan. 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.

When it locks a pump to the direct equipment parts, The touch circumference stress of the pump opmoving element amplifies. Therefore, it may cause an early trouble in a bearing and

the cylinder department which how about to learn.

When it considers that any natural vibration occurs because of a condition of the equipment side, It isolates a pump (a vibration part) in damper materials, and, with the avoidance of a resonance phenomenon to occur between pump / equipment, it becomes the purpose to suppress the self-excitation vibration.

See 3.2 Environmental Conditions for Installation, Storage, and Operation for details.

3.4 Operational Checks Following Installation

- 1) Remove a rubber cap attached to an inlet port, a vent.
- 2) Turn on the main power supply, and confirm rotating direction and the pump cooling air.
- 3) After confirmation, turn off device main power supply and confirm the pump stopped.

Caution: 1 Phase motor

3-Core-cable(Size of the wire lead: 1.0mm² or larger, 300V or more, 10A or more, 80°C or higher, one earth wire included)

3 Phase motor

4-Core-cable(Size of the wire lead: 1.0mm² or larger, 300V or more, 10A or more, 80°C or higher, one earth wire included)



Caution

The temperature rating of the power cord used must be 80°C or more.

3.5 Electric connection

- 1) Please attach the protector (a short circuit crossing gate, motor breaker) except the overload protection device by all means.
- 2) Please use power supply cord having an earthed line for a pump.
- 3) When the extension cord is not furnished by the manufacturer with the product, the instructions shall specify the type, electrical rating, and maximum length of the extension cord to be used with the product.
- 4) Wire it according to use local laws and ordinances, safety requirements, and ground, and please construct it.
- 5) After connection, three-phase motor specifications please confirm that the rotatory direction of the pump is prescribed rotatory direction.
- 6) Please wire it so that surplus flexure and tension and vibration do not occur to the power supply cord.

3.6 Fluctuations in the power voltage and frequency

Standard: Rotation electricity machine general rules
IEC60034-1:2004

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).

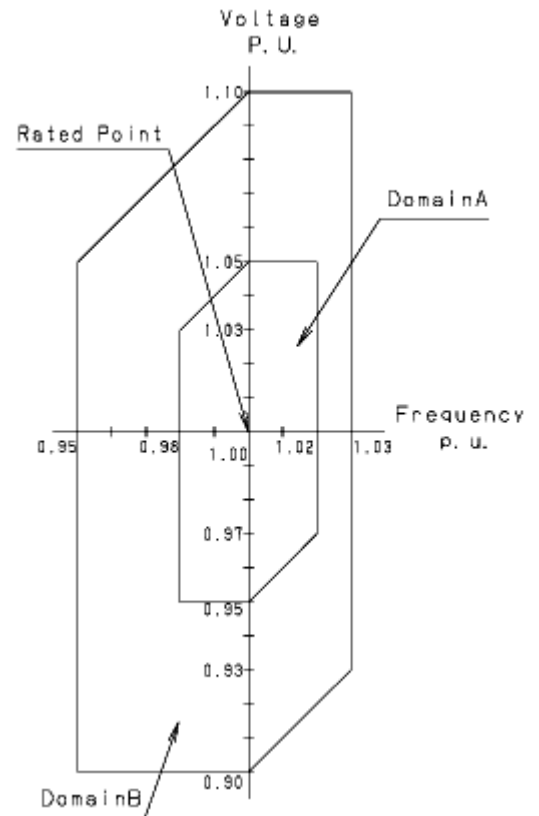


Fig.3-1 Change region of the voltage and frequency

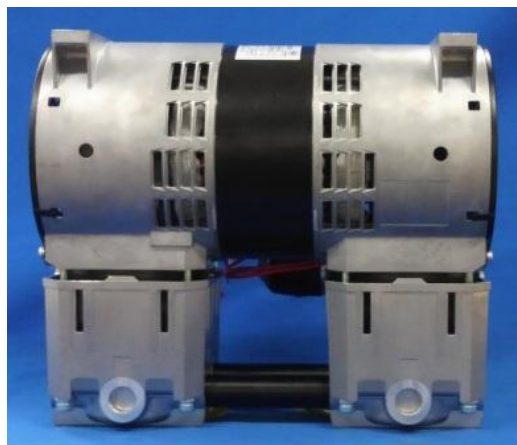
3.7 The rubber leg installation method of accessories

3-7-1. Necessary part / tool

- Rubber leg (accessories) ----- x 4
- A screw for rubber leg installation (accessories) ----- x 4
- Phillips head screwdriver (# 2) ----- x 1

3-7-2. Installation procedure

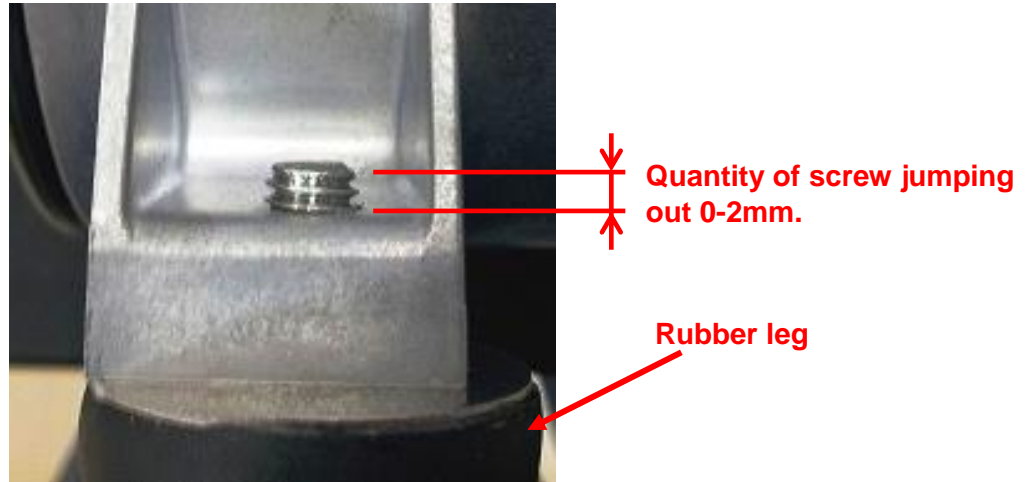
(1) It puts the pump upper part under.



(2) It places a rubber leg to a screw hole.

(3) It inserts an installation screw and tighten it by a Phillips head screwdriver.

Recommended clamping torque 0.2-0.5N · m.(Quantity of screw jumping out 0-2mm.)



Recommended clamping torque $0.2-0.5\text{N} \cdot \text{m}$.

With the above installation of the rubber leg is completion.

3.8 Piping

- 1) The plumbing of the leak perform it surely, and please attach a filter before a pump inlet port so that there is not it.
- 2) The plumbing to the inlet port, use 12mm inside diameter or more.
- 3) The plumbing to the outlet port, use pipes not to take backing pressure. When it takes backing pressure, please do below 0.03MPa (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) Please attached the Shut off valve like figure 3-2 when evacuating a vessel.

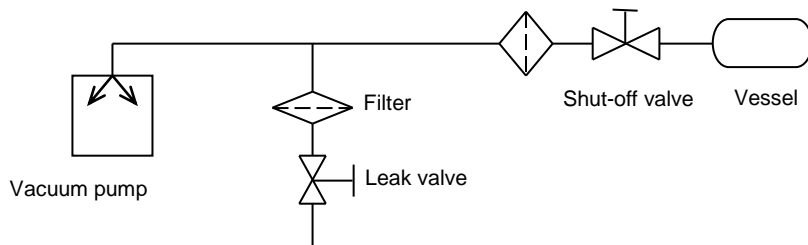


Fig. 3-2 Example of Piping Used When Evacuating a Vessel





3.9 Storage

Switch off the main power supply and check that the pump remove the power cord connected to the pump.

Place the rubber cap on the inlet / outlet port, and store in a location with low humidity.

4. Cautions for Operation

4.1 Cautions for Operation

 Danger	See "Danger" (1) and (2) on p.04.
 Warning	See "Warning"(9), (16), (17) and (18) on p.04 and p.05.
 Caution	See "Caution"(3), (4), (5), (6), (7) and (8) on p.06.
 Note	See "Note" (3), (4), (5), (6) and (7) on p.07.


4.2 Operation of the Thermal Protection relay

If the thermal protector 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.

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.

Table 4-1 Characteristics of the thermal protector

Operation temperature	120±5°C
Reset temperature	77±15°C

 Caution	See "Caution"(5), (6), and (9) on p.06. Immediately switch off the main power and contact to the manufacturer, when thermal protector is activated.
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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.
- 2) With the inlet open to atmosphere, run the pump for a few minutes to warm it.
Commence normal operation once the pump has warmed.

5. Pump Performance

5.1 Ultimate Pressure

The term "Ultimate Pressure" 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.

Pressure 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 Pumping Speed

Pumping Speed varies with the type of gas used, and its pressure. The maximum Pumping Speed 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 Pumping Speed for this pump is the maximum value achieved with dry air.

5.3 Power Requirements

The power required to operate 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 $5.0 \times 10^4 - 7.0 \times 10^4$ 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

 Danger	See "Danger" (3) on p.04.
 Warning	See "Warning" (5), (19) and (20) on p.04 and p.05.
 Caution	See "Caution" (8) and (9) on p.06.
 Note	See "Note" (8) on p.07.

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) Replace the cylinder gasket, cup packing
- 2) Replace the inlet / outlet valve
- 3) Replace the O ring
- 4) Replace the Head gasket

6.2 Maintenance

Ensure that the following checks are conducted at least once every three days while the pump is in operation.

- 1) Does the pump emit abnormal noises?
- 2) Is the pump abnormally hot?
- 3) Is gas evacuated normally?
- 4) Is the silencer blocked?

Resolve any problems in accordance with "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.

In addition, change it in our Service Section when there is not a repair engineer.

<Consumables List>

Table 6.1 Consumables List (DOP-181S)

Components	Quantity	Material	Average life
Cup packing	2	PTFE	6000 Hr
Cylinder gasket	2	———	6000 Hr
Inlet / Outlet valve	2	SUS	6000 Hr
O ring	4	EPDM	6000 Hr
Head gasket	2	EPDM	6000 Hr
Bearing	1 set	———	15000 Hr
Power supply cord	1 set	———	At any time

Life of these components tends to be extended when the requirements in "4.1 Cautions for Operation" are followed, and the pump is operated under a light load. The term 'light load' refers to operation at 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.
Cylinder gasket:	Replace in the event of deformation, hardening, or cracking.
Inlet / Outlet valve:	Replace in the event of deformation, hardening, or chipping.
O ring:	Replace in the event of deformation, hardening, or chipping.
Head gasket:	Replace in the event of deformation, hardening, or cracking.
Bearings:	Contact the manufacturer for repair in the event of abnormal noises or abnormal motor vibration (chattering).


Power supply cord: Contact the manufacturer for repair in the event of hardening, or cracking.

<Locations for Maintenance and Inspection>

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
	Cylinder gasket	Deformation, cracking.	Visual inspection
	Inlet /Outlet valve	Deformation, cracking.	Visual inspection
	O ring	Deformation, hardening, cracking.	Visual inspection
	Head gasket	Deformation, hardening, cracking.	Visual inspection
	Bearings	Abnormal noises.	Listen
	Power supply cord	Hardening, cracking.	Visual inspection

6.4 Replacing Consumables and Cleaning

 Caution	See "Caution" (9) on p.06.
---	----------------------------

- (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

1. Hex wrench: 5 mm across flats
2. Torque wrench: Hexagon socket, 5 mm across flats (torque settable to 5.0 N·m)
3. Hex wrench: 6 mm across flats
4. Torque wrench: Hex key socket, 6 mm across flats (torque settable to 12.0 N·m)
5. Cleaning solvent: Solvent which does not affect rubber components (eg. ethyl alcohol)
※When using, please read carefully the instruction for solvent
6. Paper: Paper or soft cloth to remove contamination

7. Dust mask, gloves, air compressor

*Wipe off the stained parts at the time of parts replacement, with use tool No .5, 6.

Because small mine dust may be scattered in the case of an air blow, please wear protection glasses, a dust protective mask, gloves by all means.

Please be careful about work enough.

Procedure for replacing consumables

This product has two pump heads. Following description is procedure for a single head.

For other pump-head also can use this procedure.

6-4-1. Preparations

Turn off the power supply, and make sure that the pump has stopped.

After stopping the pump, leave it for 30 minutes and check that surface temperature cooled.

Remove the pump from the wiring and the equipment.

6-4-2. Disassembling the pump

Refer to the exploded view. (Fig 6-1)

Remove all cap screws (M6 *95L*8, No.1) that fasten the pump-head (No.2) to the Casing.

Remove the pump-heads assembly (No.5).

* Head-gasket (No.6) is attached inside the pump-head.

Separate the connection-pipe (No.3) from the pump-head.

*Connecting-pipe is inserted to the pump-head.

*Two O rings (No. 4) attached to each connection pipe.

Remove the valve-retainer (No.7), inlet/outlet valve (No.8).

Remove the cylinder parts. (Photo.5-8)

(cylinder-plate (No.9), cylinder-gasket (No.10), cylinder (No.11)).

Remove the cap screw (M8*20, No.12) that fasten cup-packing-retainer (No.13) to the connecting-rod (No.15).

Remove the cup-packing (No.14).



Photo 1: Pump-head disassembly, installation

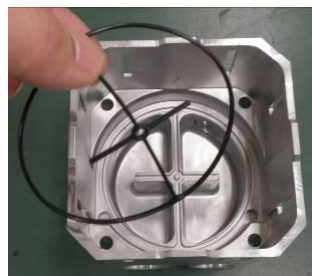


Photo 2: Head-gasket disassembly, installation

6-4-3. Replace the pump head gasket (No.6)

Refer to the exploded view (Fig 6-1), clause 6-4-2(Disassembling the pump).

Remove the head-gasket that attached inside the pump-head and place a new gasket.

*The head-gasket gets pinched when extruding from the gasket groove.
Ensure that head-gasket are fully assembled in grooves and not pinched.

6-4-4. Replace the O ring (P10, No.4)

Refer to the exploded view (Fig 6-1), clause 6-4-2(Disassembling the pump).

Two O rings attached to each connection pipe.

Remove the O rings and place a new O rings.

*Clean a connecting pipe's O ring groove, installation hole before replace.

The head-gasket gets pinched when extruding from the gasket groove.

Ensure that head-gasket are fully assembled in grooves and not pinched.



Photo 3: Connecting-pipe disassembly



Photo 4: O ring installation

6-4-5. Replace the inlet / exhaust valve (No.8)

Refer to the exploded view (Fig 6-1), clause 6-4-2(Disassembling the pump).

Inlet / exhaust valve is on the cylinder plate.

Remove the inlet / exhaust valve and place a new inlet / exhaust valve.

6-4-6. Replace the cylinder-gasket (No.10), Cup-packing (No.14).

Refer to the exploded view (Fig 6-1), clause 6-4-2(Disassembling the pump).

Remove the cylinder and the cylinder-plate.

Cylinder-gasket assembled between the cylinder and the cylinder-plate.

Remove the cylinder gasket and place a new cylinder gasket.

Cup-packing assembled between the cup-packing-retainer and the connecting-rod.

Remove the bolts (M8 *20) that fasten the cup-packing-retainer to the connecting-rod.

Remove the cup-packing and place a new cup-packing.

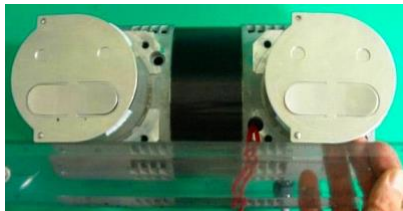


Photo 5: Cylinder Parts Direction

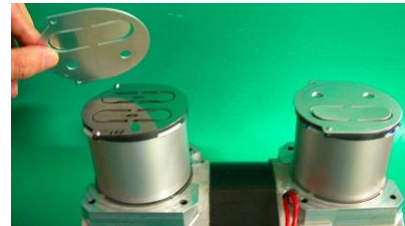


Photo 6: Cylinder Parts

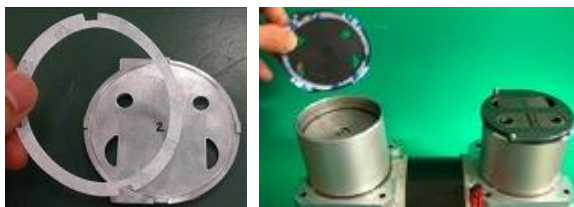


Photo 7: Cylinder Gasket



Photo 8: Cup-packing, Connecting-rod

6-4-7. Reassembling the pump

Refer to the exploded view (Fig 6-1), clause 6-4-2(Disassembling the pump).

Place the cup-packing, cup-packing-retainer to the connecting-rod and tighten bolt (M8*20) in 12.0 N.m.

Carefully insert the cylinder to the connecting-rod assembly.

Place the cylinder gasket to the cylinder-plate.

Place the cylinder-plate (with gasket), inlet/outlet valve, valve-retainer to the cylinder.

Carefully insert the connection-pipe (with O rings) to the pump-head.

Place the head-gasket into the gasket groove in the pump head.

Place the pump-head assembly to the cylinder assembly.

Tighten all bolts (M6 *90L*8, No.1) temporary to the casing at first, and tighten it at the opposite angle in 5.0 N.m.

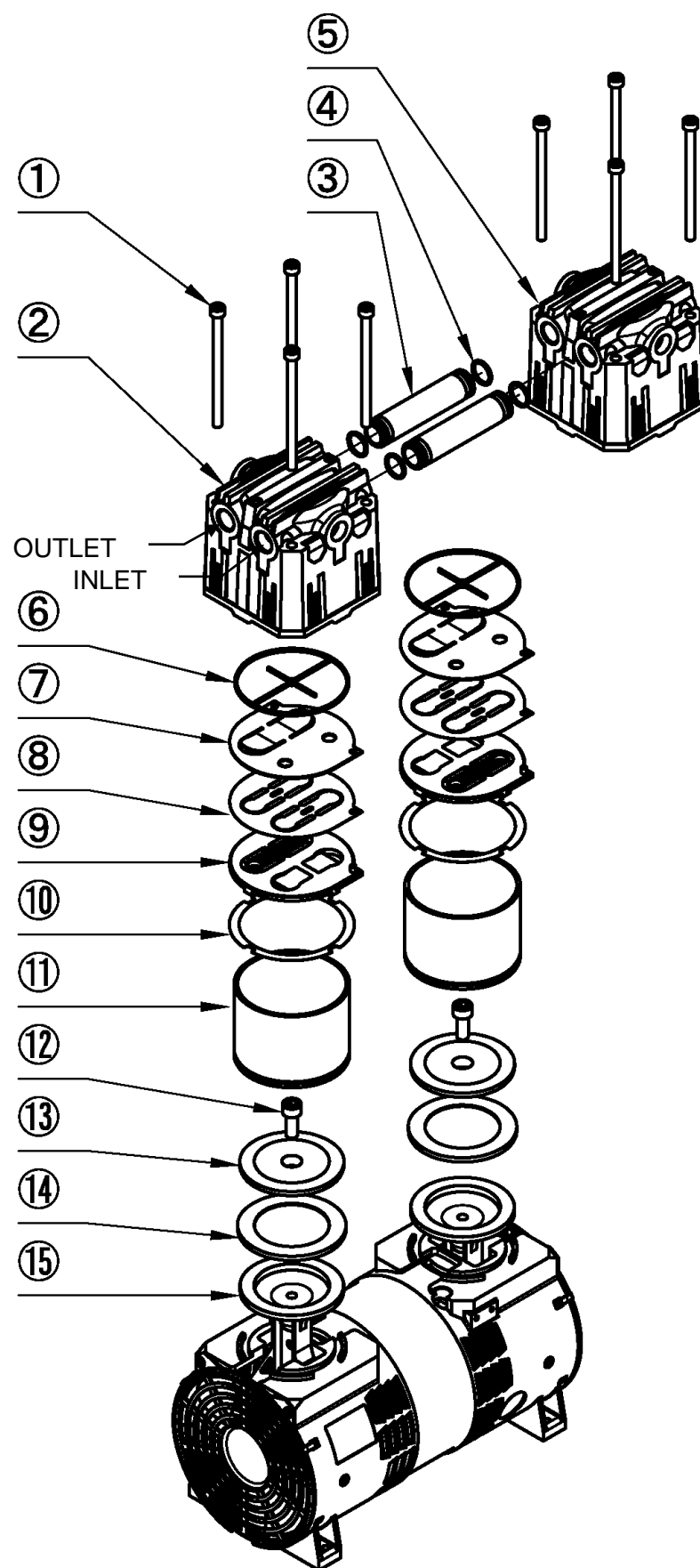


Fig. 6.1 Exploded view

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.	3-6
	(2) The main power supply switch is not ON.	(2) Set switch to I.	
	(3) Problem with power supply voltage.	(3) Ensure that voltage variation is within +/-10%.	
	(4) Problem with pump wiring.	(4) Rewire the pump and contact the manufacturer.	3-4 3-5
	(5) The breaker has operated.	(5) Investigate the reasons for operation.	4-2
	(6) The thermal protector has operated.	(6) Switch power OFF, and eliminate the cause of operation of the relay. Contact the manufacturer.	
	(7) Low ambient temperature.	(7) Ensure that ambient temperature is ambient temperature range of product specification.	4-3
	(8) Low voltage.	(8) Adjust the power supply voltage, and check the power supply cable.	3-4 3-6
	(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.	6-3
	(12) Problem with motor.	(12) Replace or repair.	6-3
	(13) Locked connecting rod.	(13) Dismantle the head cover and cylinder, and check the interior.	6-3
	(14) Problem with bearings.	(14) Replace.	6-3
	(15) Miscellaneous damage to pump components.	(15) Disassemble and repair (replace damaged components).	6-3
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.	5-1
	(3) Vacuum gauge is unsuitable.	(3) Measure with a calibrated vacuum gauge suitable for the pressure range.	5-1
	(4) The inlet piping is too small in diameter, or too long.	(4) Connect piping of an inside diameter greater than the inlet diameter, and reduce the distance between the pump and vacuum vessel.	5-1
	(5) Low voltage.	(5) Adjust the voltage, and check the power supply cable.	3-6
	(6) Ambient temperature unsuitable.	(6) Ensure that ambient temperature is ambient temperature range of product specification.	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.	6-4
	(10) Water or solvent etc has been sucked into pump causing problems.	(10) Disassemble and repair (replace valves and cup packing etc).	6-4
	(11) Damage to motor.	(11) Replace and repair.	6-3
	(12) Damage to inlet/outlet 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).	6-3
Pump surfaces are abnormally hot (more than room temperature + 30 °C)	(1) Continuous operation with high pressure gas.	(1) Do not run the pump continuously at near-atmospheric pressure.	3-6
	(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.	
	(5) The silencer is blocked.	(5) Clean and replace.	

7. In Conclusion

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

Warranty

(1) The warranty for this pump 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: Ambient temperature range of product specification, 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



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