ULVAC

No.21700-2-01-12

INSTRUCTION Manual

Diaphragm-type Dry Vacuum Pump

DAP-15

DAP-30

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.

Contents

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

Figures and Tables

Before Using the Equipment

Thank you for purchasing this product. Your custom is very much appreciated.
This pump is designed for vacuum and pressurizing, 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

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 2

(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. Always remove the vent plug before using the pump.
2. 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 60ºC 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^2 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) There is fear of the explosion. Please do not drive the pump with the exhaust side shut. Pressure in the pump rises, and the main body of the pump might explode, and the motor become an overload. The limit value of pump internal pressure is 0.15MPa (gage pressure). Please install the protection instrument such as safety valves when it is used by pressurizing.

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 diaphragm, 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) Fit an inlet filter if there is a possibility of foreign matter or dust particles entering the pump.

(3) 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.

(4) When attaching the pipe to the DAP-15, tighten the pipe to a torque of 2 N・m.

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) 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.

(7) The pump will not often operate normally if it is used with corrosive gases, organic solvents, liquids, or condensed gases (eg steam).

(8) 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

(9) 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.

(10) Application of back pressure at the pump outlet will overload the motor and may prevent the pump starting.

(11) When the thermal protecter operates the pump will be extremely hot. Touching the pump in this condition may result in burns.

Maintenance and Repair

(12) 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 diaphragm type dry vacuum pump that reciprocates, and the vacuum exhaust or pressurizes it as for the film of rubber (diaphragm).

Prohibitions

⚠ Warning

(1) Do not re-sell, repair, or modify this pump without the approval of the manufacturer.

⚠ Note

(2) This pump is not designed to be corrosion-proof. Use it only with clean air at normal temperature, or gases of equivalent characteristics.

(3) Do not attempt to evacuate gases containing particles, dust, water, or corrosive gases.

1.2 Specifications

Table 1.1 Product Specifications

Model		DAP-15	DAP-30		
Discharge rate	50Hz	15 L/min	30 L/min		
	60Hz	18 L/min	36 L/min		
Pressure (Vacuum)		39.9 kPa	33.3 kPa		
Pressure (Pressurizing)		0.15MPaG			
Motor		1φ, 40W, 4P , capacitor operation	1φ, 90W, 4P , capacitor operation		
Rated current	Rated Voltage	100	100	200	220
	50Hz	1.0	2.0	1.0	1.0
	60Hz	1.0	2.0	1.0	1.0
Speed		1200 / 1450 r/min	1300/1550 r/min		
Weight		3.6 kg	5.0 kg		
Inlet and outlet piping		O.D.φ9 × I.D.φ5 (R1/4)	O.D.φ9 × I.D.φ5 (G1/4)		
Air temperature		7 ～ 40 ℃			
Dimensions		115(W) × 178.5(L) × 153.5(H)	142(W) × 215(L) × 180(H)		

1.3 Thermal Protecter

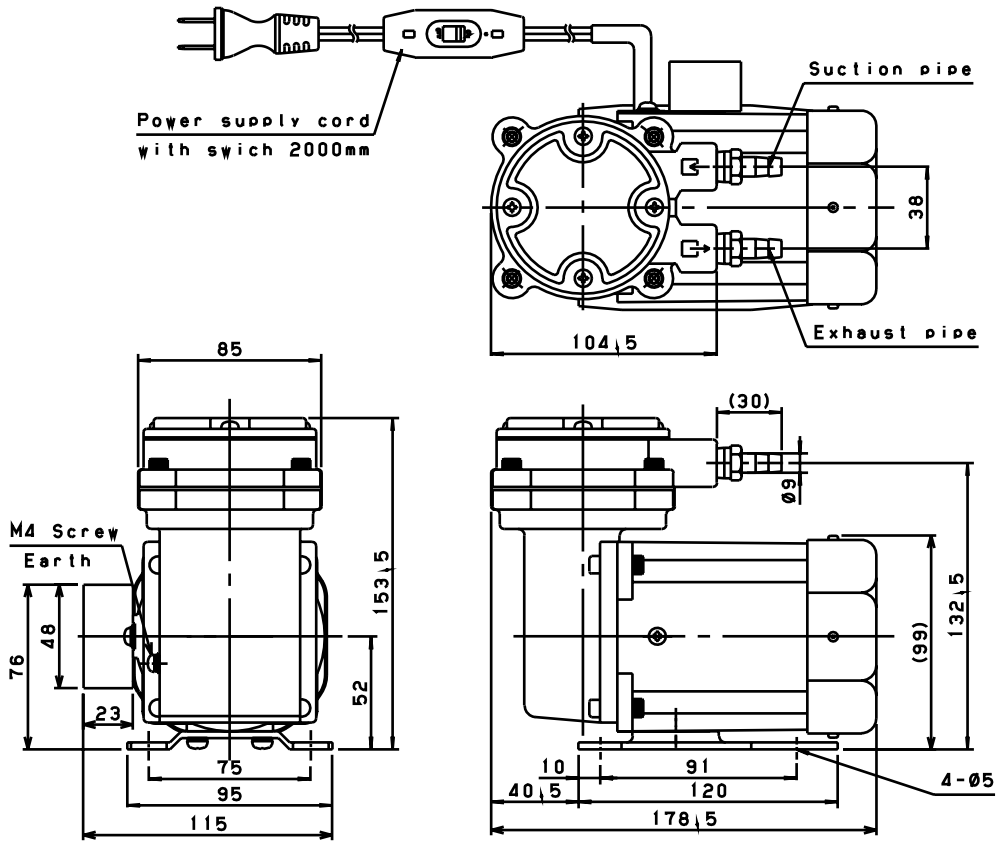
1) This pump is fitted with an automatic reset thermal protecter for overload protection. This device shuts off the motor power supply circuit automatically to prevent burn-out if the motor temperature rises due to overloading, or there is a pump fault which prevents rotation.
Operating temperature:120±5℃

2) Always fit other protective devices (eg earth leakage breaker, motor breaker) in addition to the overload protection relay.

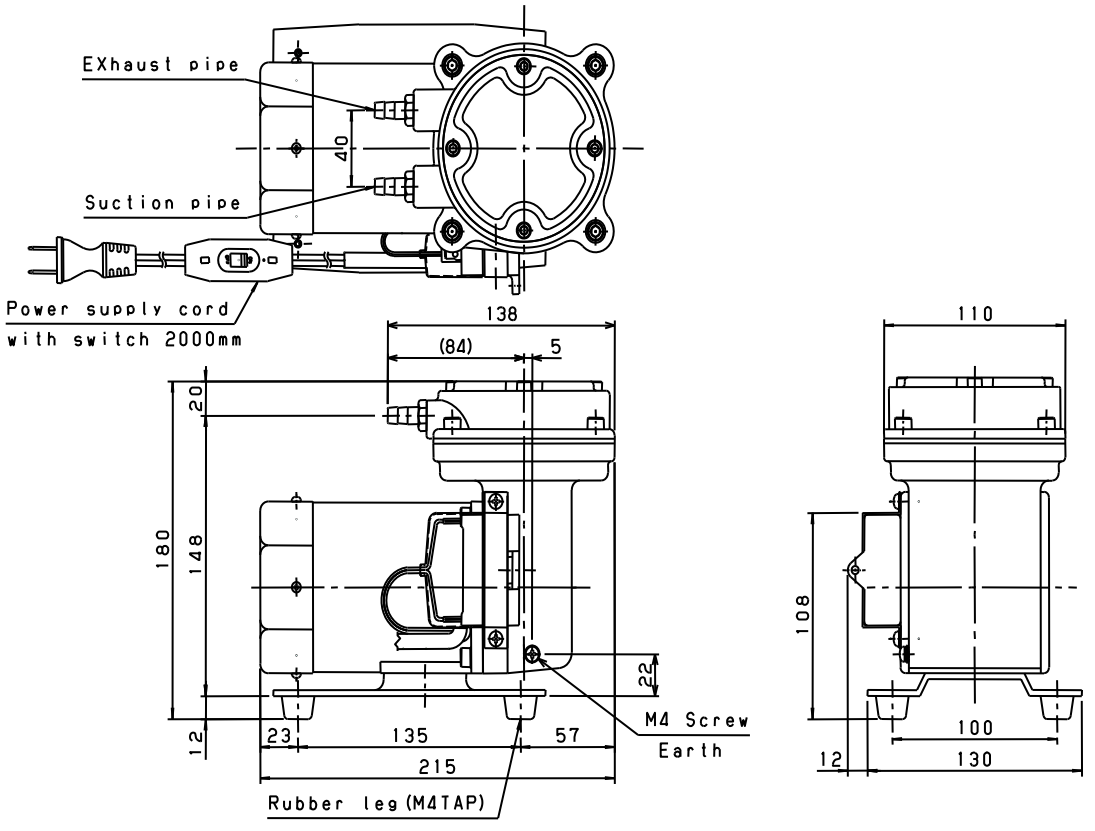
⚠ Warning	See Warning (8), P04
⚠ Caution	See Caution (5), P05

2.Dimensional drawing

DAP-15



DAP-30



3. Installation and Storage

3.1 Cautions for Installation and Storage

⚠ **Warning**	See Warning (1)(2)(3)(5)(6)(7)(8)(9)(10)(11)(12)(13), P04
⚠ **Caution**	See Caution (1)(2)(3), P05
⚠ **Note**	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 φ1.0mm^2 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) The attaching screw for earth terminal must have earth mark indicated.
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 beφ1.0mm^2 or more.
Notice: Before operating wire connection, be sure to unplug the power plug.

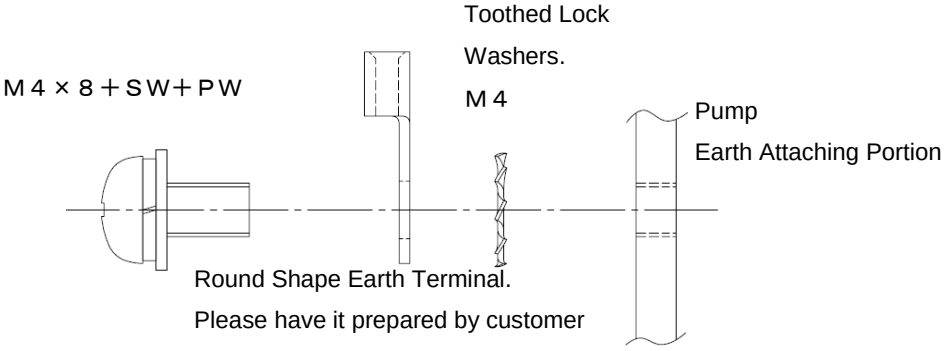


Fig.3.1 Instillation Method of Earth Screw

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).

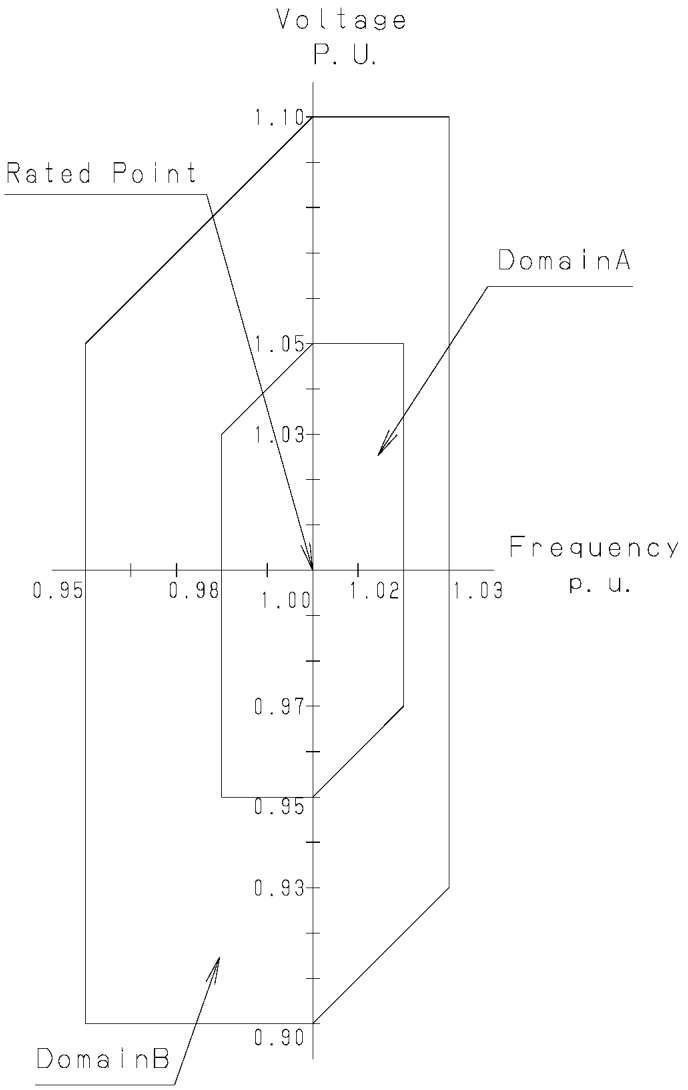


Fig. 3.2 Change region of the voltage and frequency

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^2 or more.

3.7 Piping（Vacuum）

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 0.15 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).

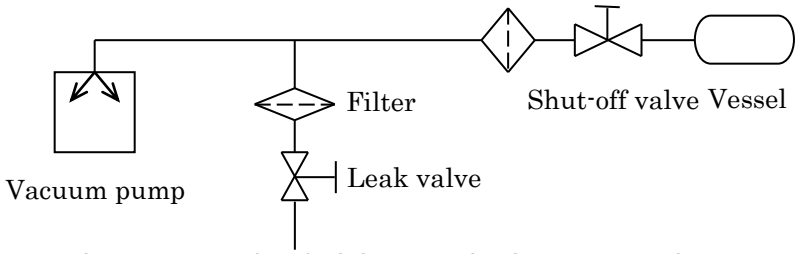


Fig.3.3 Example of Piping Used When Evacuating a Vessel

3.8 Piping（Pressurizing）

1) Ensure that all piping is installed without leaks, and fit a filter on the pump inlet.
2) Use outlet piping with an internal diameter of 5 mm or more.
3) 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.
4) Install the protection instrument such as safety valves about piping like Figure 3.4 between the exhaust tube and the container of the pump.

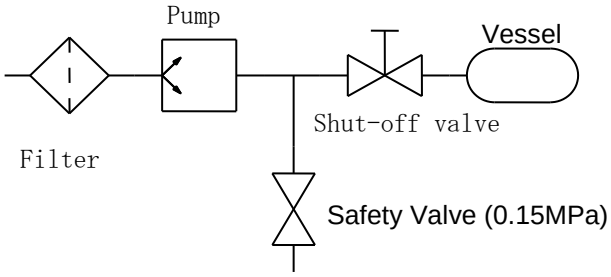


Fig.3.4 Example of Piping Used When Pressurizing a Vessel

3.9 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

⚠ **Danger**	See Danger (1)(2), P04
⚠ **Warning**	See Warning (8)(14)(15)(16), P04,P05
⚠ **Caution**	See Caution (4)(6)(7), P05
⚠ **Note**	See Note (3)(5)(6)(7)(8)(9)(10)(11), P06

4.2 Operation of the Thermal Protecter

1) If the thermal protecter 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.

⚠ **Caution**	See Caution (5), P05
⚠ **Note**	See Caution (11),P06

4.3 Starting in Cold Weather

The bearing grease and diaphragm 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 3×10^4 ~9×10^4 Pa. If pressure drops below this level, compression work is considerably reduced and power is expended in mechanical work.

6.Inspection and maintenance

6.1 List of Consumable parts

Description	Qty	Material	Life expectancy
Diaphragm	1 pcs	CR	3000~5000 hrs
Suction/exhaust valve	2 pcs	SUS	3000~5000 hrs
Air filter	2 pcs	Urethane foam	3000~5000 hrs
Pump head gasket	1 pcs	NBR	3000~5000 hrs
Bearing	1 set	-	Approx. 15,000 hrs

The life time of these parts vary considerably depending on the operating conditions. Replacement of the bearing will be undertaken by ULVAC KIKO.

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 6.7 Troubleshooting List.

6.3 Scheduled Inspection

Periodically check consumable parts in "6-1 List of Consumable parts" once every 3000 hours of operation and replace them according to the "Guideline for replacement".
Guideline for replacement:

・Diaphragm

Replace the diaphragm if a small crack, wear, hardening or deformation is found on the surface.

・Suction/exhaust valve

Replace the Suction/exhaust valve if deformation, breakage, bend or the similar is found.

・Air filter

Replace the air filter if dirt, clogged, hardening or the similar is found.

・Pump head gasket

Replace the Pump head gasket if hardening, crack, elongation or the similar is found.

・Bearing

If grease runs out or unusual sound or vibrating sound of the motor is perceived, contact our representative for repair.

Operating hours	Location	Check	Checking method
3000 hrs	Diaphragm	Deformation, crack and hardening	Visual check
	Suction/exhaust valve	Deformation and crack	Visual check
	Air filter	Dirt, clogged and hardening	Visual check
	Pump head gasket	Damage and leak	Visual check
	Bearing	Unusual sound	Auditory check

6.4 Replacing and Cleaning Consumables

⚠ **Warning**	See Warning (17),(18),P05
⚠ **Caution**	See Caution(8) (9),P06
⚠ **Note**	See Note (12),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.

6.5 Replacement of Consumable parts

Replacement of Consumable parts

CAUTION: Before replacing consumable parts, be sure to turn OFF the power.

Refer to Fig.-2 while replacing. [ ] represents the parts of DAP-30

※ 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.

※ Always put on dust mask and gloves before replacing diaphragms and valves. Any fine particles produced by mechanical wearing may become airborne causing a health risk if inhaled.

※ 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.

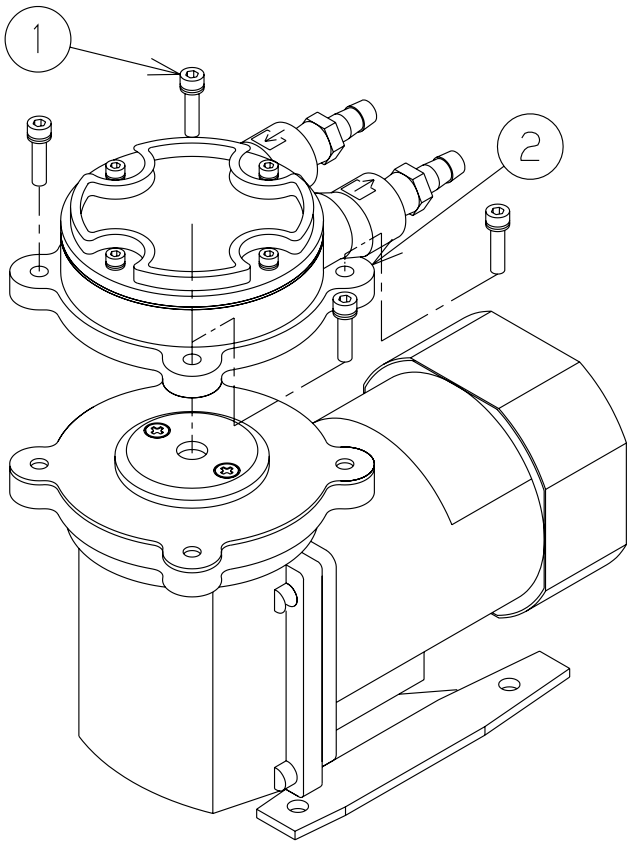
- Required Tools [For DAP-30]

1. Torque wrench - bit size 4 mm (5.0 Nm)
   [Torque wrench- bit size 5 mm (7.0 Nm), bit size 4 mm (3.5 Nm)]
2. Phillips head (+) screwdriver- No.2
   [Phillips head (+) screwdriver- No.2]
3. Torque screwdriver- No.2 (0.8 Nm, 2.0 Nm)
   [Torque screwdriver- No.2 (0.8 Nm, 3.0 Nm)]
4. Rag [Same for DAP-30]
5. Solvent for wiping (something that has no effect on rubber, such as ethanol) [Same for DAP-30]
6. Dust mask (for nose and mouth), gloves, protective eyewear [Same for DAP-30]
7. Loctite 242 [Same for DAP-30]

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

Part Replacement Procedure

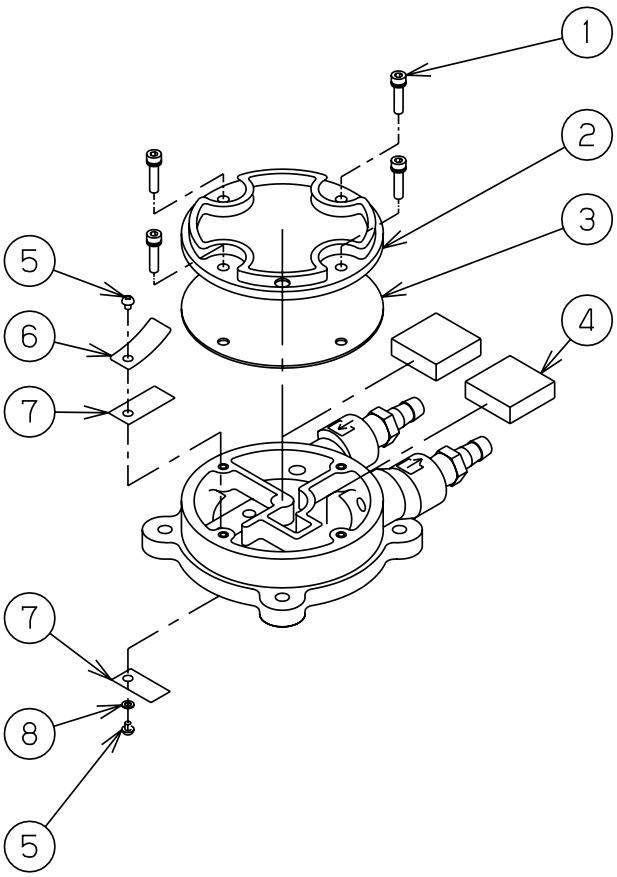
i. Parts Removal



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

* Inside [brackets] there are part names for DAP-30 only. Procedures without [brackets] are those common for all models.

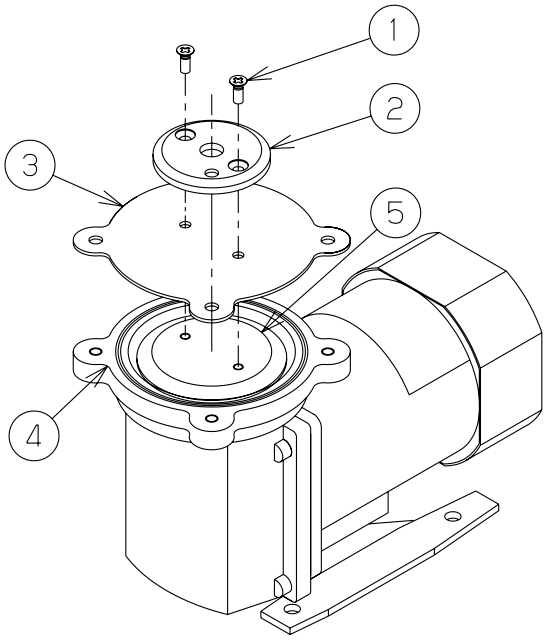
Step 1: Remove (1) hex socket bolts (M5×16) [M6×25] × Qty. 4, and then remove (2) the pump head.



Step 2: Remove the pump head gasket, air filter and the air release valve.

Next, remove (1) the small pan head screws (M4×12) [hex socket bolts (M5×12)] × Qty. 4, (2) the pump head cover and then (3) the pump head gasket. Please be careful when removing the pump head cover and the pump head gasket as they tend to adhere to each other and they are therefore hard to remove. Remove (4) the air filters from the pump head.

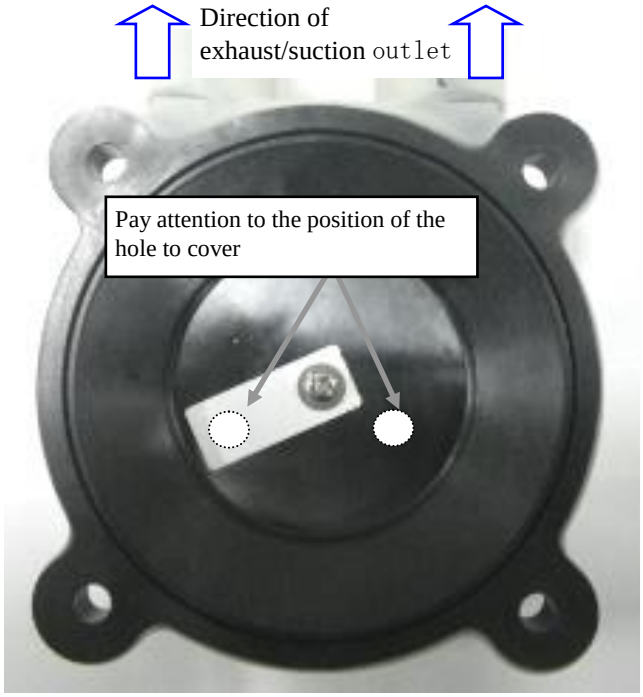
Remove (5) the pan head self-tapping screw (M3×5) [small pan head screws (M3×5)] × Qty. 2, and then remove (6) the exhaust valve holder, (7) the air release valves and (8) the plain washer.



Step 3: Remove the diaphragm. First, remove (1) the small flat head screws (M4×12) [M5×14] × Qty. 2, and then remove (2) the push plate for the diaphragm. Please be careful when removing (3) the diaphragm, (4) the casing and (5) the connecting rod, as they tend to adhere to each other and they are therefore hard to remove.

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

ii. Attaching Parts & Assembly

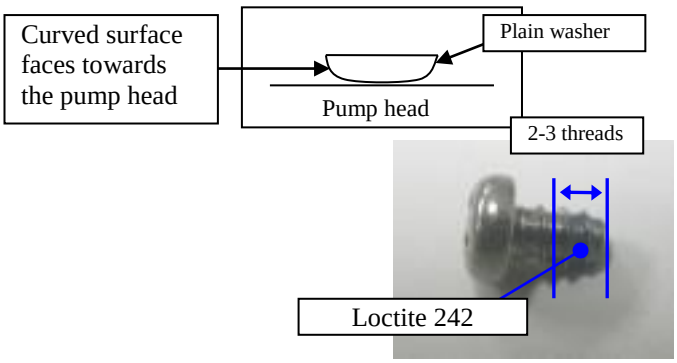


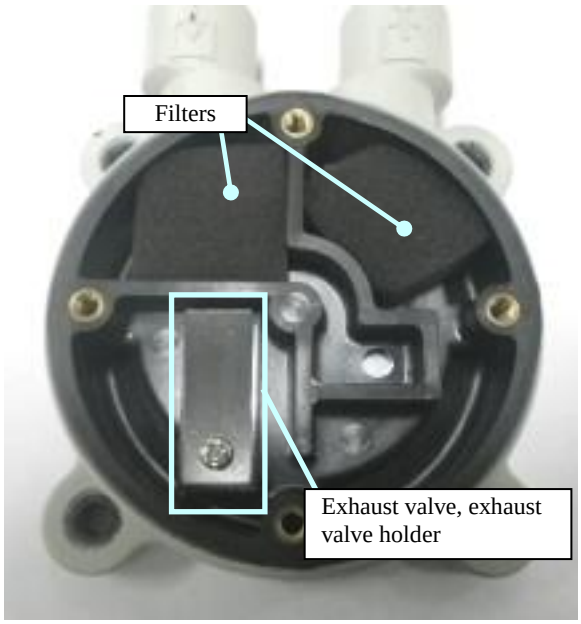
Step 4: Attach the suction valve. Replace the old suction valve with a new one, place a plain washer on it, and then fasten them with a pan head self-tapping screw (M3×5) [small pan head screw (M3×5)]. Place the suction valve so that it covers the left one of the two holes on the pump head when the exhaust/suction outlet is facing the direction shown in the picture on the left. Also, the plain washer should be placed so that its curved surface faces towards the pump head. Before inserting the screw, apply the Loctite 242 onto the 2-3 threads from the screw tip and then tighten it using the torque screwdriver (0.8 Nm).

* 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.





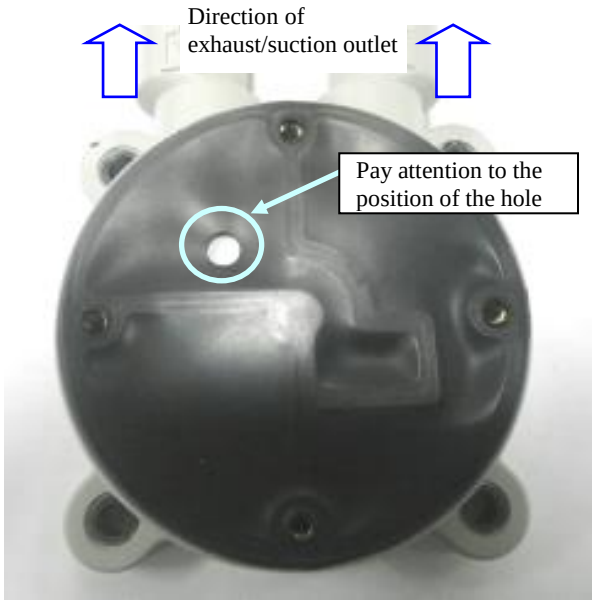
Step 5: Replace the old exhaust valve with a new one, place an exhaust valve holder on it, and then fasten them with a pan head self-tapping screw (M3×5) [small pan head screw (M3×5)]. Before inserting the screw, apply the Loctite 242 onto the 2-3 threads from the screw tip and then tighten it using the torque screwdriver (0.8 Nm).

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

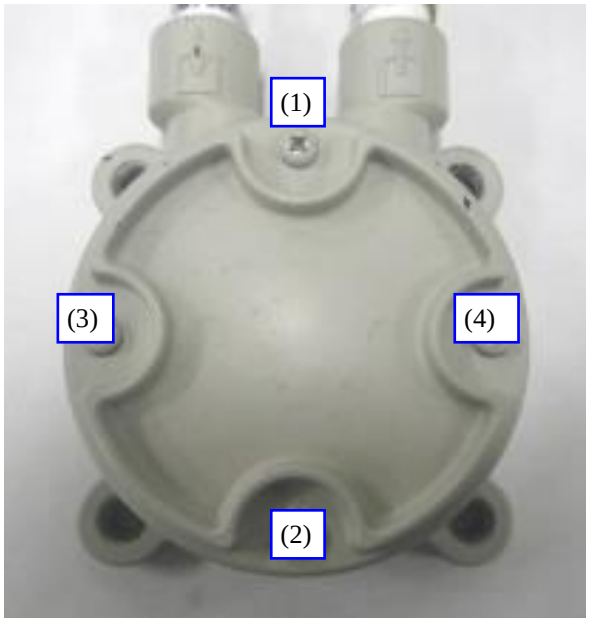
*Be careful when applying Loctite 242, as too much or too little can cause damage.

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

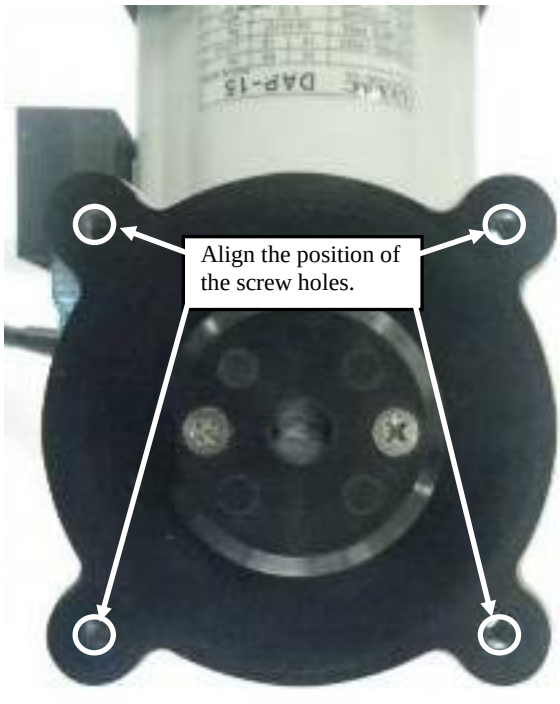
Insert new filters into the position indicated in the picture on the left.



Step 6: Put a new head gasket on the pump head to replace the old one. Adjust its position so that the hole not intended for the screw comes to the position indicated in the picture on the left.



Step 7: Place the pump head cover, and then using the torque screwdriver (2.0 Nm) [torque wrench (3.5 Nm)], tighten the small pan head screws (M4×12) [hex socket bolts (M5×12)] in order (1) through (4), going over them three times, gradually tightening each one of them.

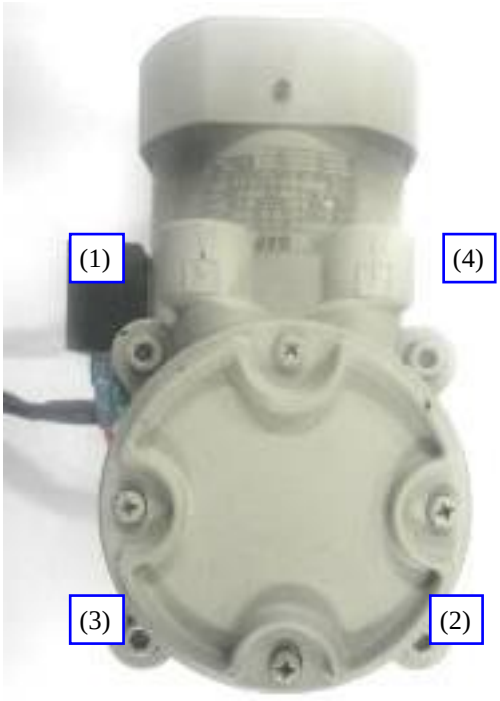


Step 8: Attach the diaphragm. Place the diaphragm on the casing and align the position of their screw holes. Place the push plate for the diaphragm, and then tighten the small flat head screws (M4×12) [M5×14] by using the torque screwdriver (3.0 Nm), going over them twice. Also, before tightening the screw, apply the Loctite 242 onto the 2-3 threads from the screw tip.

*After tightening the screws, check the alignment of the diaphragm.

*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: Attach the pump head. Place the pump head assembled in Step 1 to 6 on the diaphragm assembled in Step 7. Using the torque wrench with a bit size 4 mm (5.0 Nm) [torque wrench with a bit size 5 mm (7.0 Nm)], tighten the screws in order (1) through (4), going over them three times, gradually tightening each one of them.

*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.

The parts replacement procedure is now complete.

6.6 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.	
	(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 protecter 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.	
	(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).	
Pressure does not diminish	(1) Pump is too small for capacity of vacuum vessel.	(1) Select another pump.	
	(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, 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.	
	(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 socked into pump causing problems.	(10) Disassemble and repair (replace valves and diaphragm etc).	6-4.
	(11) Damage to motor.	(11) Replace and repair.	
	(12) Damage to suction / exhaust valve	(12) Replace.	6-4.
	(13) Damage to diaphragm.	(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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