

ULVAC

INSTRUCTION MANUAL

DIAPHRAGM DRY VACUUM PUMP

MODEL

DA-15D , DA-30S

Prior to use

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

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

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

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

- User's manual ----- x1
- Inlet and outlet caps (fitted to inlet and outlet)

〈In case motor specification is 100V〉

- Power plug adapter (attached to power cord) ----- x1

(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.

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

To prevent electric shock, always shut-off the primary power supply before working on electrical wiring, or engaging in any electrical work.

• Cautions for Safety in Use

Danger

Applications

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

Maintenance and Repair

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

Warning

Installation

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

Power Supply

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

Warning

Operation

- (15) 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.
- (16) Inserting fingers or objects into the motor inlet may result in electric shock, injury, or fire.
- (17) 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 30 kPa (gauge pressure).

Maintenance and Repair

- (18) The pump should be dismantled or repaired only by a repair technician trained by the manufacturer.
- (19) To prevent ingestion of microscopic particles resulting from wear of components, use a dust mask and gloves during repair work.

Caution

Installation

- (1) 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. Equal to or less than meters above the sea level 1000m storage and 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) Maximum ambient temperature of 40°C during assembly of pump.
 - i) Free of soot and oil.
 - j) Free of splashing or flooding.
 - k) Keep it indoor ventilated.
 - l) When installing the pump, avoid mounting a vacuum pump directly on the base. Employ anti-vibration rubber between the base and the vacuum pump.
- (2) To prevent back injury, always use both hands to lift pumps.
- (3) 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.

Caution

Operation

- (4) Do not use in applications involving organ transplants, or contact with body fluids or living tissue.
- (5) Touching rotating components (eg motor, main shaft, axial joints, cooling fan) while the pump is in operation may result in injury.
- (6) The overload protector operates when the pump becomes excessively hot. Touching it in this condition may result in burns.
- (7) 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.
- (8) Do not insert fingers or objects into, or peer into, the inlet or outlet during operation.
- (9) Ensure that the customer installs a trap if steam is generated. Ensure that condensate does not enter the vacuum pump. A malfunction may result if condensate enters the pump.

Maintenance and Repair

- (10) Dispose in accordance with legislation for disposal and cleaning of waste products, handle as industrial waste, and do not incinerate.
- (11) If the pump ceases operation, turn power OFF (set switch to O) immediately to prevent accidents, remove the power cord from the wall outlet, and contact your dealer or the manufacturer for inspection and repair.
- (12) 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.
- (13) As the pump is not protected against entry of water, it is not guaranteed against splashing or flooding.

Note

Installation

- (1) The pump may malfunction if it is subjected to shocks or tipped over on its side.
- (2) Do not place objects on, or stand on, the pump. A malfunction may result if the pump is handled in this manner.
- (3) Float the pump from the system using a rubber shock absorber; install the pump so that vibration is not transmitted to the system.
- (4) By removing the fixed rubber legs, do not install the pump directly to the system. There would be a case that the pump casing is deformed and a load occurs to the motor bearing.

Applications

- (5) This pump is not designed to be corrosion-proof. Use it only with clean air at normal temperature, or with gases of equivalent characteristics.
- (6) Do not use the pump for pressurization (Do not use the pump with a pressurized air supply).
- (7) Ingestion of liquids into the pump will result in damage and prevent proper operation.
- (8) Ingestion of rubbish and dust in the air entering the pump will interfere with its proper function. If the air is likely to contain rubbish or dust, a filter should be fitted to the inlet to protect the pump



Note

Operation

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

Maintenance and Repair



- (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 dry vacuum pump which employs reciprocating motion of a rubber diaphragm for vacuum discharge.

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

< Prohibitions >	
 Warning	(1) This pump employs only vacuum operation, and must not be pressurized. (2) Do not re-sell, repair, or modify this pump without the approval of the manufacturer.
 Note	(3) Ensure that the gas entering the pump does not contain rubbish, dust, or water (except steam). (4) Do not operate the pump for long periods at near-atmospheric pressure.

1.2 Specifications



Table 1 Product Specifications

Model	DA-15D	DA-30S
Pumping Speed (50Hz/60Hz)	12/15 L/min	24/30 L/min
Ultimate Pressure	6.65 kPa	26.6 kPa
Weight	3.9 kg	
Suction/Exhaust Pipe	O.D. $\phi 9 \times$ I.D. $\phi 5$ mm	
Operating Ambient Temperature	7°C~40°C	
Outside Dimension	135 (W) \times 203 (L) \times 182 (H) mm	

Voltage specification	100 V	115 V (60Hz)	200 V	220 V	230 V
Motor	1 ϕ , 4P, Capacitor run				
Output power (50Hz/60Hz)	39/43 W	40 W (60Hz)	35/37 W	40 W	
Rated Current (50Hz/60Hz)	0.79/0.82 A	0.79 A (60Hz)	0.33/0.39 A	0.32/0.34 A	0.34/0.34 A
Motor Speed (50Hz/60Hz)	1,250 / 1,550 r/min		1,250 / 1,500 r/min		

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 a pump fault which prevents rotation, or if load becomes excessive.
- 2) It is recommended that additional protective devices (eg. earth leakage breaker, motor breaker) be fitted.

 Warning	See Warning (8),(14) P04
 Caution	See Caution (6), P06

2. Dimensions

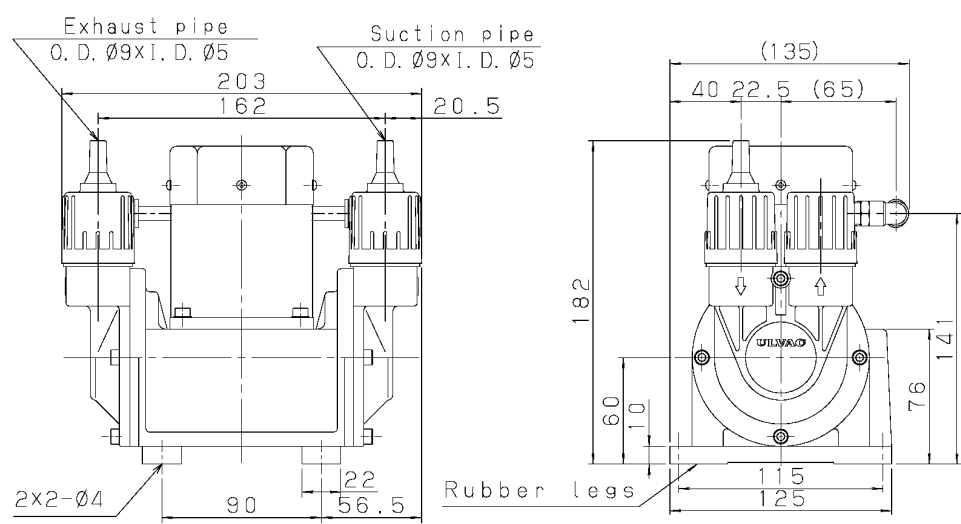


Fig.1 DA-15D Dimensions

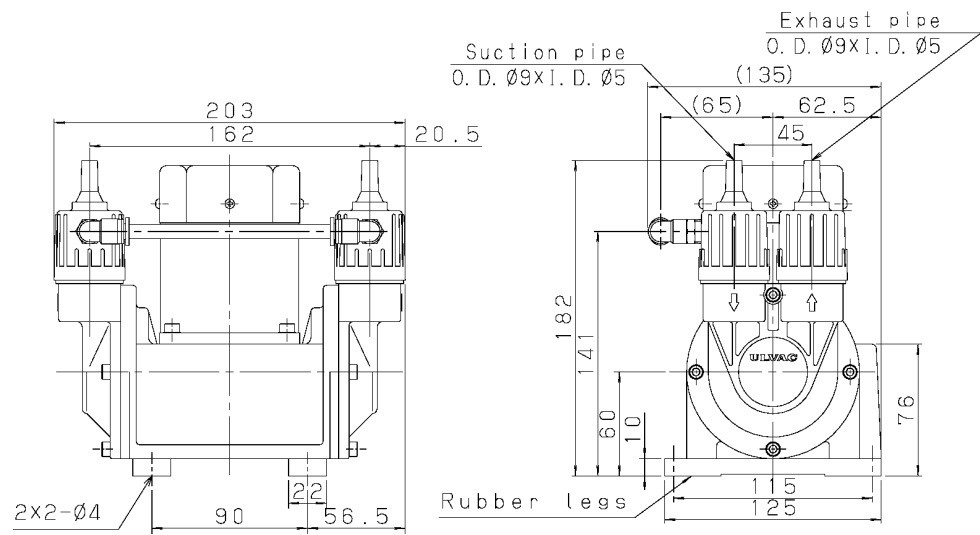





Fig.2 DA-30S Dimensions

3. Installation and Storage

3.1 Cautions for Installation and Storage

 Warning	See Warning (1)(2)(3)(5)(6)(7)(9)(10)(11)(12)(13),P04, (15),P05
 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. Equal to or less than meters above the sea level 1000m storage and 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) Maximum ambient temperature of 40°C during assembly of pump.
 - i) Free of soot and oil.
 - j) Free of splashing or flooding.
 - k) Keep it indoor ventilated.
 - l) When installing the pump, avoid mounting a vacuum pump directly on the base. Employ anti-vibration rubber between the base and the vacuum pump.

3.3 Location

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

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

3-4 Electric Wiring

- (1) 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) The attaching screw for earth terminal must have earth mark indicated.
Please attach earth terminal as shown in Fig.3
- (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.

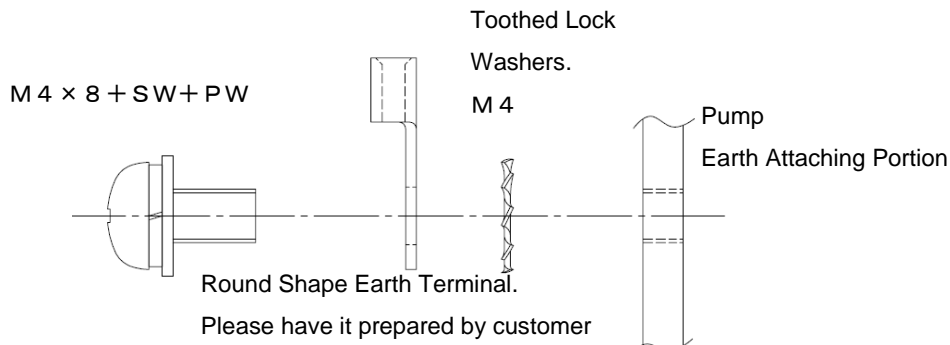


Fig.3 Instillation Method of Earth Screw

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).

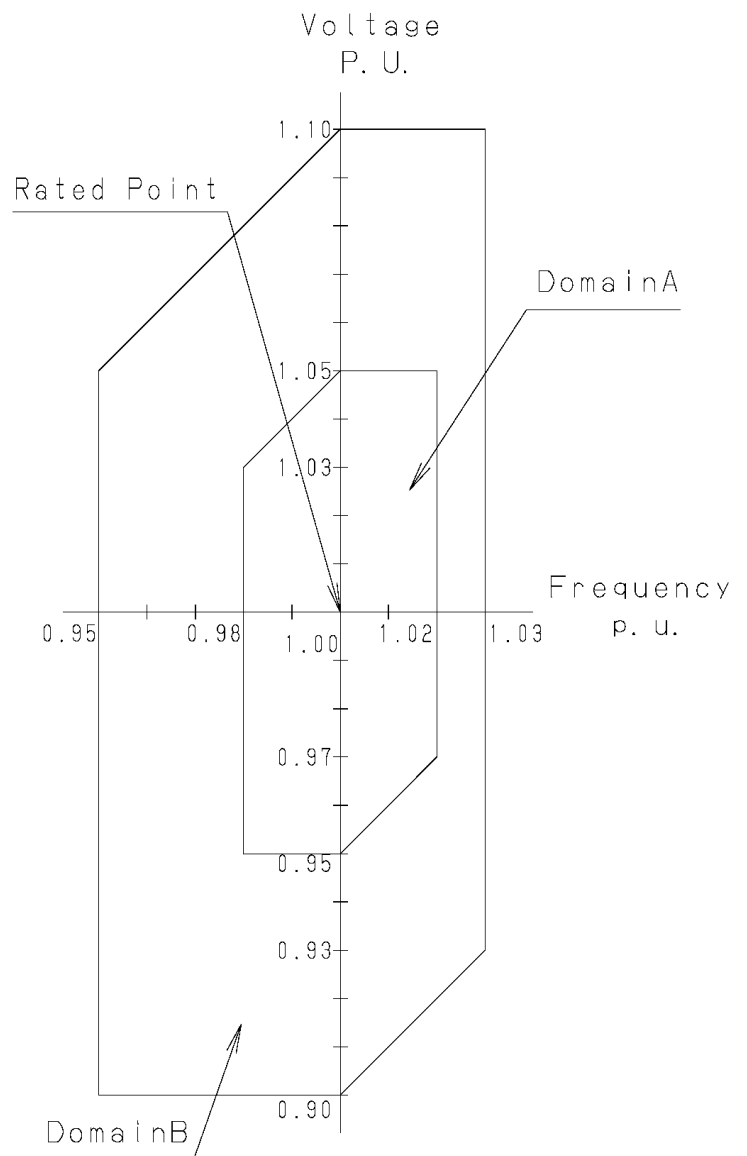


Fig. 4 Change region of the voltage and frequency

3.6 Checking Operation After Installation

- 1) Remove the rubber caps from the inlet and outlet.
- 2) Check that the pump switch is OFF, and insert the plug into the 100 V wall socket.
Note: Ensure that the power plug is sufficient for the rated voltage and current.
- 3) Turn the switch ON and check that gas is being drawn into the inlet.
- 4) When this check is complete, turn the power switch OFF to stop the pump.

3.7 Piping

- 1) Install piping carefully to prevent leaks.
- 2) Piping connected to the inlet should be at least 6 mm inside diameter.
- 3) 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.5).

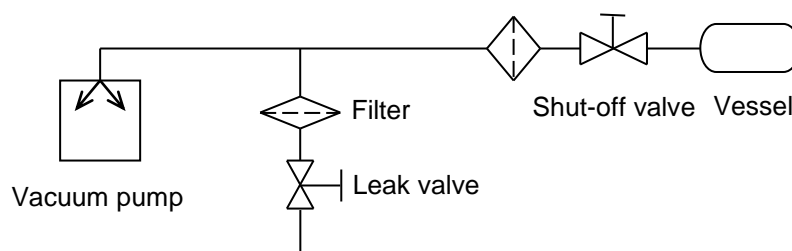






Fig.5 Example of Piping Used When Evacuating a Vessel

3.8 Storage

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

4. Cautions for Operation

4.1 Cautions for Operation

 Danger	See Danger (1)(2), P04
 Warning	See Warning (8) , P04 ,(15)(16)(17),P05
 Caution	See Caution (4)(5)(6)(7)(8), P06
 Note	See Note (3)(4)(5)(6)(7)(8) ,P06, (9)(10)(11) (12),P07

Consult the manufacturer if the pump is to be used in a special application.

4.2 Operation of the Thermal Protector

- 1) When the thermal protector operates, switch the pump power supply OFF, remove the power cord from the outlet, and contact the manufacturer. Note that the pump will be very hot and should not be touched.
- 2) The pump operates automatically when temperature drops. Shut-off the power supply, and determine the cause of operation of the thermal protector.
- 3) Once the cause of the fault has been removed, wait until the motor cools and restart operation.

Automatic reset thermal protector

Operating temp : $120 \pm 5^{\circ}\text{C}$

Return temp : $76 \pm 15^{\circ}\text{C}$



4.3 Starting in Cold Weather

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

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

5. Pump Performance

5.1 Pressure Achieved

The term “pressure achieved” as employed in the catalogue and in this manual is defined as “the minimum pressure obtained by the pump without introduction of gas from the pump inlet (ie 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 maximum rate of evacuation is reached when air is introduced, and decreases slightly as pressure is reduced.

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





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

5.3 Power Requirements

The power required to drive the pump is the total of the work required to overcome the rotational resistance of the pump (mechanical work), and the work required to compress the air (compression work), and is at a maximum at an inlet pressure of $2.0 \times 10^4 \sim 4.0 \times 10^4$ Pa. At pressures below this range the compression work is considerably reduced and power is expended in mechanical work.

6. Maintenance, Inspection, and Repair

6.1. Cautions for Maintenance, Inspection, and Repair

 Danger	See Danger (3), P04
 Warning	See Warning (4), P04, (18)(19), P05
 Caution	See Caution (10)(11)(12)(13), P06
 Note	See Note (11), P07

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

- 1) Replacing diaphragms
- 2) Replacing valves
- 3) Replacing O rings
- 4) Replacing air filter

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 7 Troubleshooting List.

6.3 Regular Inspections

Inspect consumables after the first 3000 hours of operation, and replace and clean in accordance with the Replacement and Cleaning Guide on the following page. Refer to 6.4 Replacing and Cleaning Consumables for procedures.

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

Table 2 Consumables List

Components	Quantity	Material	Average life
Diaphragms	2	Synthetic rubber (NBR)	3,000~5,000hr
valves	2	Synthetic rubber (FPM)	3,000~5,000hr
Air filter	4	urethane	3,000~5,000hr
O rings	4	Synthetic rubber (NBR)	3,000~5,000hr
Bearings	1 set	———	3,000~5,000hr

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

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

Bearings are replaced by the manufacturer's service division.



<Replacement Guide>

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

Table 3 Locations for Maintenance and Inspection

Period of operation	Inspection item	Replacement guidelines	Method of inspection
3,000 hours	Diaphragms	Deformation, crack, hardening,	Visual inspection
	valves	Deformation, crack	Visual inspection
	Air filter	Dirt, clogged, hardening,	Visual inspection
	O rings	Damage, leak	Visual inspection
	Bearings	Abnormal noises.	Listen

6.4 Replacing and Cleaning Consumables

 Warning	See Danger (19), P05
 Caution	See Caution (11)(12), P06

- ※ 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

1. Torque wrench - bit size 5 mm (5.0 Nm)
2. Phillips head (+) screwdriver- No.2
3. Torque screwdriver- No.2 (4.0 Nm, 2.0 Nm)
4. Loctite 242
5. Rag
6. Solvent for wiping (something that has no effect on rubber, such as ethanol)
7. Dust mask (for nose and mouth), gloves, protective eyewear

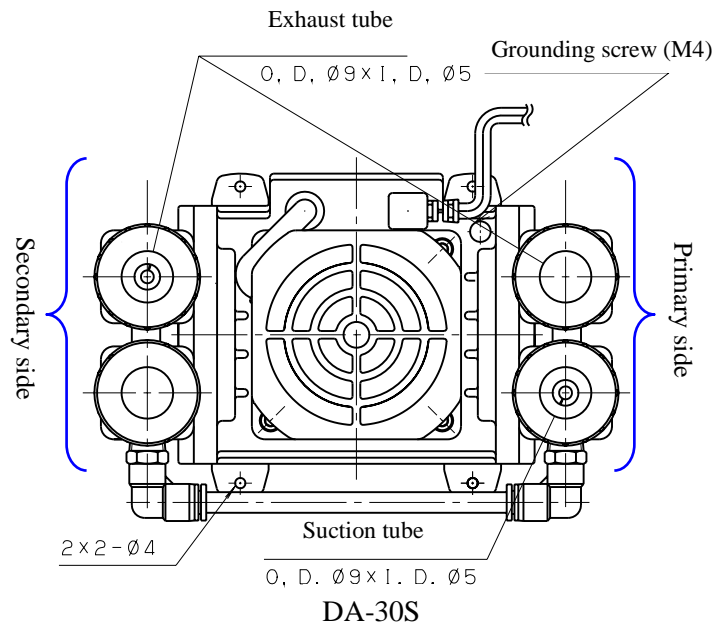
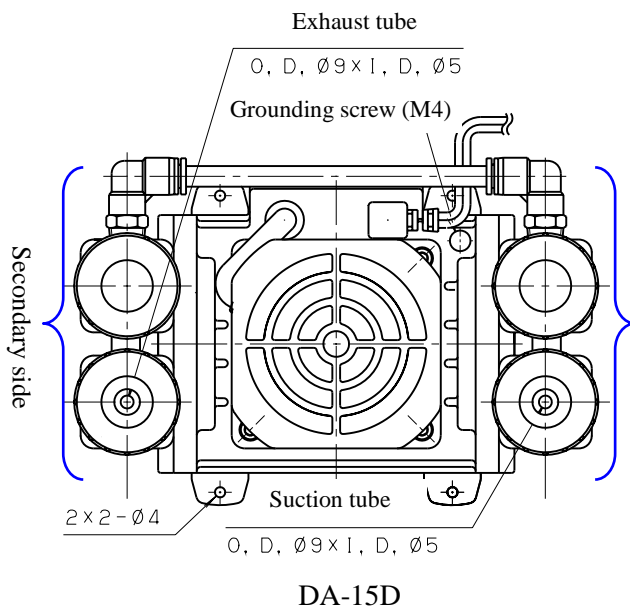
*Use items No.5 and 6 to wipe down any dirty areas when replacing the part.

Part Replacement Procedure

Definition of Terms

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

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

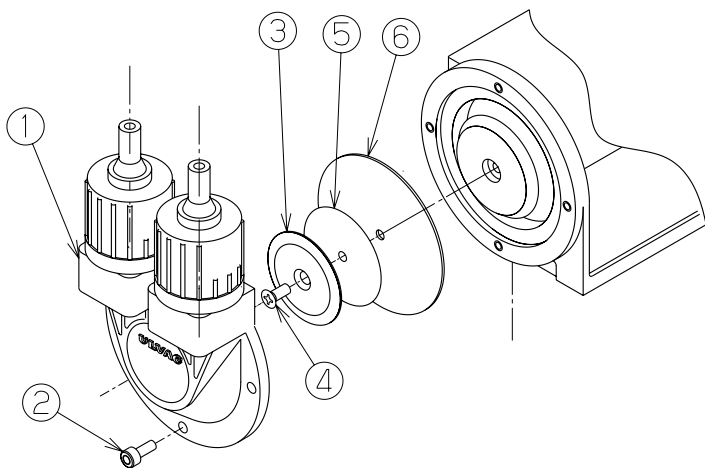
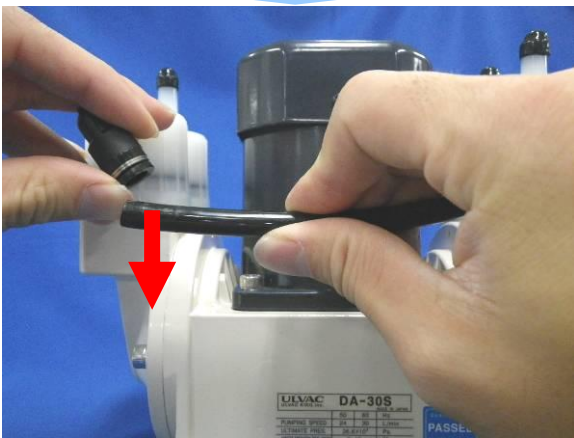


i. Parts Removal



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

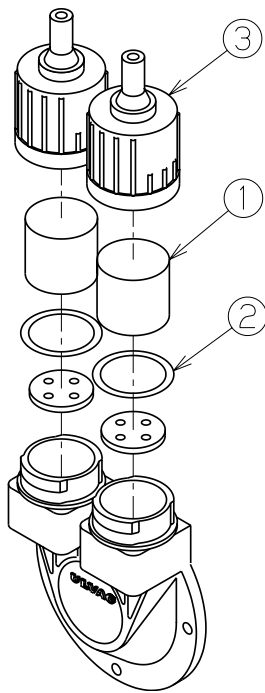
Step 1: Remove the connecting tubes between the primary and the secondary side pump heads. Remove the connecting tubes by bending the one-touch joint and the connecting tube downward while pushing the one-touch joint in the direction of the arrow.



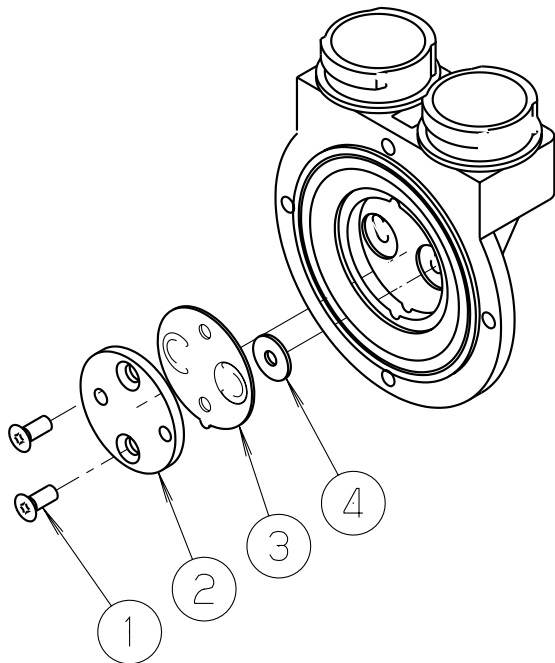
Step 2: Remove the diaphragm. First, remove (2) the hex socket bolts ($M5 \times 12$) \times Qty.4 from (1) the pump head, and then remove (1) the pump head itself. When doing this, do not hold the cap attached to the pump head, or it might damage the cap.

Remove (4) the small flat head screw ($M5 \times 14$), and then remove (3) the push plate for the diaphragm, (5) the Teflon liner and (6) the diaphragm.

*Please note that the diaphragm tends to adhere to the pump side and it is therefore hard to remove.



Step 3: Remove the air filter and the O-ring. Rotate (3) the cap counter-clockwise (when looked from above) for 90°, then pull it upward to remove. After removing (3) the cap, you can remove (1) the air filter and (2) the O-ring. (2) The O-ring is fitted in the groove on the inner side of (3) the cap. Use your hand to remove it.



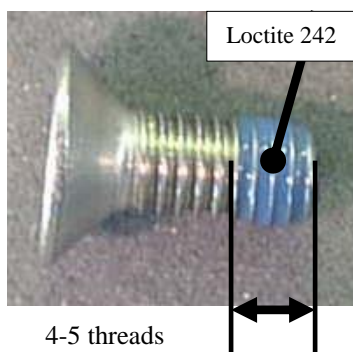
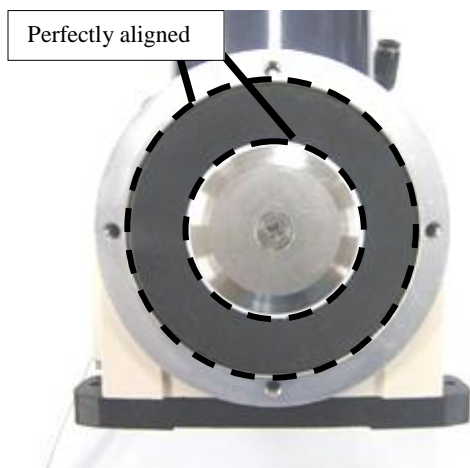
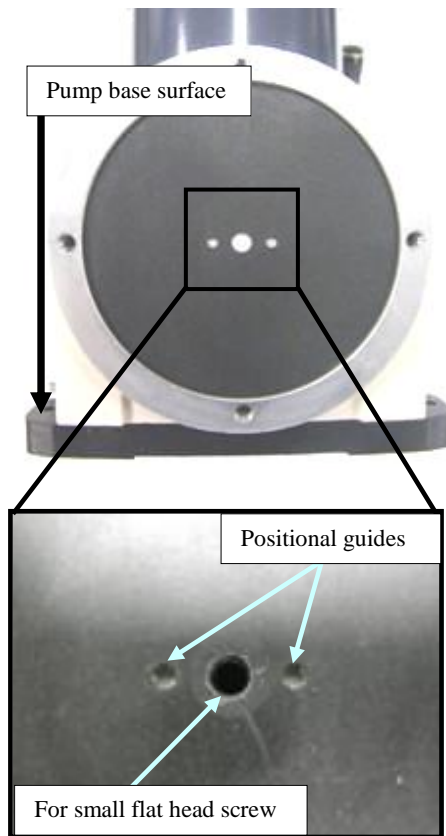
Step 4: Remove the valve. Remove (1) the small flat head screws with cross holes (M5×12) from inside the pump head, and then remove (2) the valve holder and (3) the valve. When removing (3) the valve, please be careful as (4) the switching ring may adhere to the valve and you might lose it.

Do the same on the opposing pump head. Please refer to Step 2 to 4 to remove the components.

This step completes the parts removal procedure.

The next section is the assembly.

ii. Attaching Parts & Assembly



*Step 5 is only applicable for the diaphragm with three holes. If the diaphragm of your unit has only one hole, simply attach the diaphragm and then proceed to Step 6.

Step 5: Attach the diaphragm. The diaphragm needs to be attached in the correct orientation. Please check the picture on the left to make sure that it is not in a wrong position. Besides the hole for the small flat head screw, there are two more holes to be used as positioning guides. Adjust the orientation of the diaphragm so that these holes form a parallel line against the surface of the pump base.

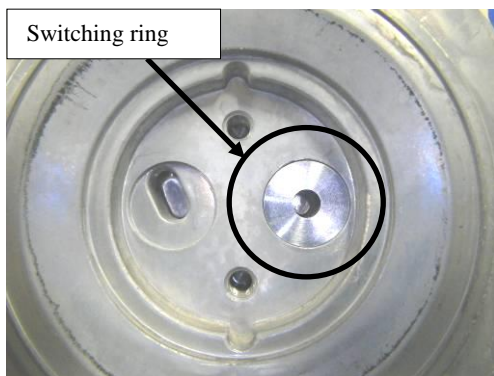
Step 6: Place the Teflon liner and the push plate for the diaphragm on the diaphragm, and then using a torque screwdriver (4.0 Nm), fasten them with a small flat head screw (M5×14).

Before fastening, apply the Loctite 242 onto 4-5 threads from the screw tip for the small flat head screws.

After attaching the small flat head screw, check the alignment of the Teflon liner and the diaphragm.

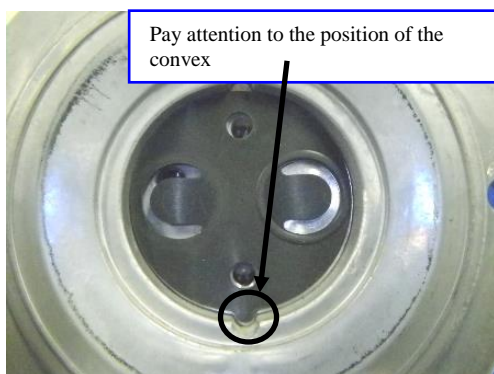
*Be careful when applying Loctite 242, as too much or too little can cause damage.

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

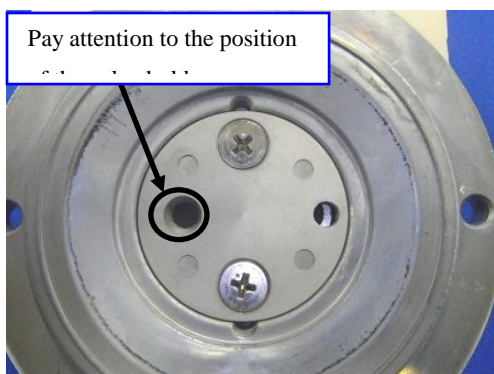


*Steps 7 to 9 are intended for the primary side of DA-30S and the primary and secondary sides of DA-15D. Please refer to Steps 10 to 12 for the secondary side of DA-30S.

Step 7: Replace the valve with a new one. First, make sure that the switching ring is on the right when the exhaust/suction tubes are facing upward.



Step 8: The valve has a convex positioning guide. Place the valve so that the guide faces downward.

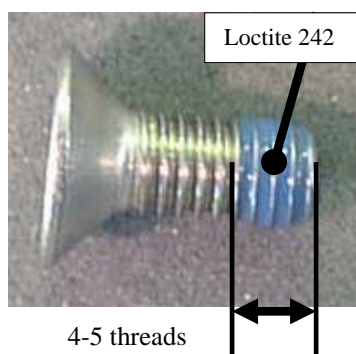


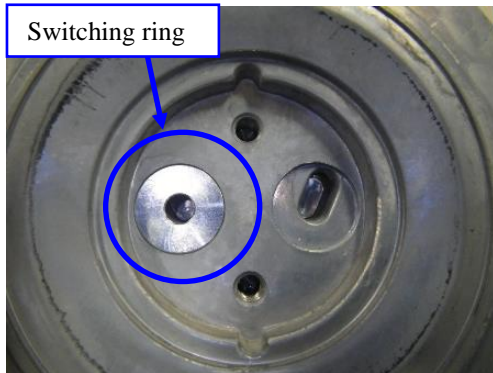
Step 9: Attach the valve holder. Place it so that the bigger of its two holes (other than the countersunk holes for the screws) comes to the left.

Fasten in the small flat head screws (M5×12) × Qty. 2 using the torque screwdriver (4.0 Nm). Before fastening, apply the Loctite 242 onto 4-5 threads from the screw tip for the small flat head screws.

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

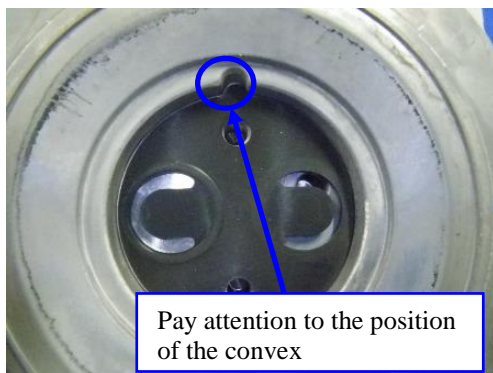
*Be sure to always follow the appropriate tightening torque. Failure to do so can lead to product damage



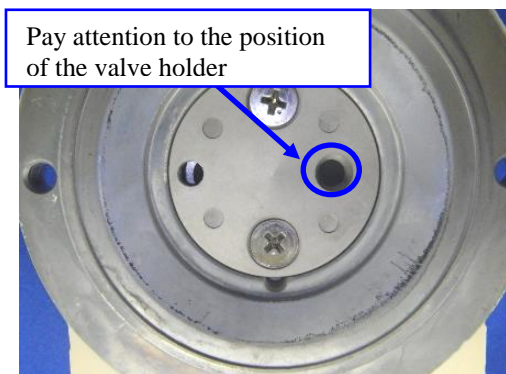


*Steps 10 to 12 are intended for the secondary side of DA-30S. Please refer to Steps 7 to 9 for the primary side of DA-30S and the primary and secondary sides of DA-15D.

Step 10: Replace the valve with a new one. First, make sure that the switching ring is on the left when the exhaust/suction tubes are facing upward.



Step 11: The valve has a convex positioning guide. Place the valve so that it faces upward.

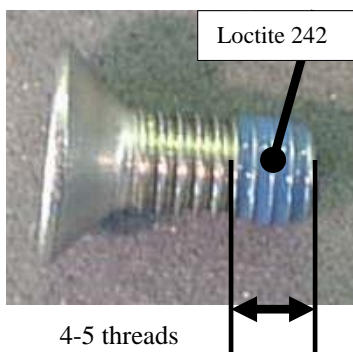


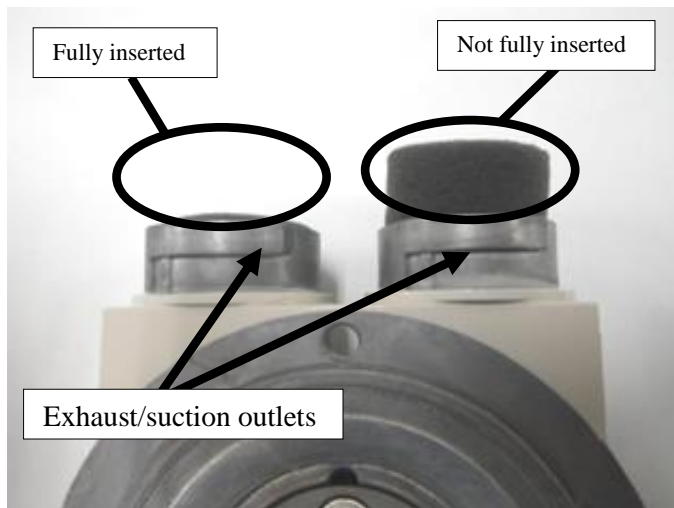
Step 12: Attach the valve holder. Place it so that the bigger of its two holes (other than the countersunk holes for the screws) comes to the right.

Fasten in the small flat head screws (M5×12) × Qty. 2 using the torque screwdriver (4.0 Nm). Before fastening, apply the Loctite 242 onto 4-5 threads from the screw tip for the small flat head screws.

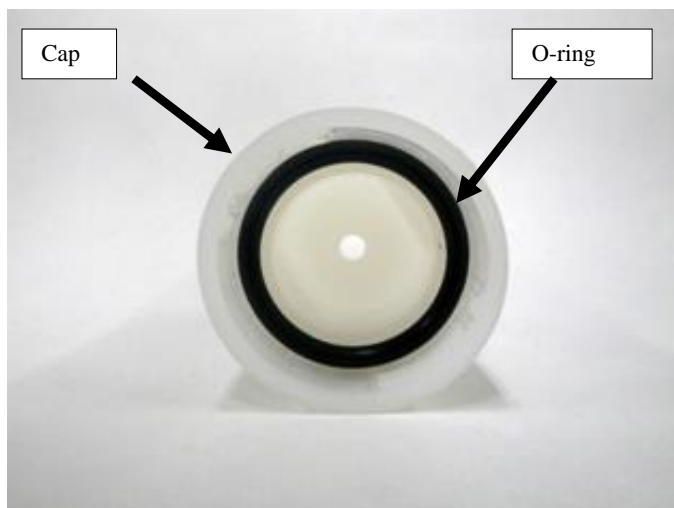
*Be careful when applying Loctite 242, as too much or too little can cause damage.

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



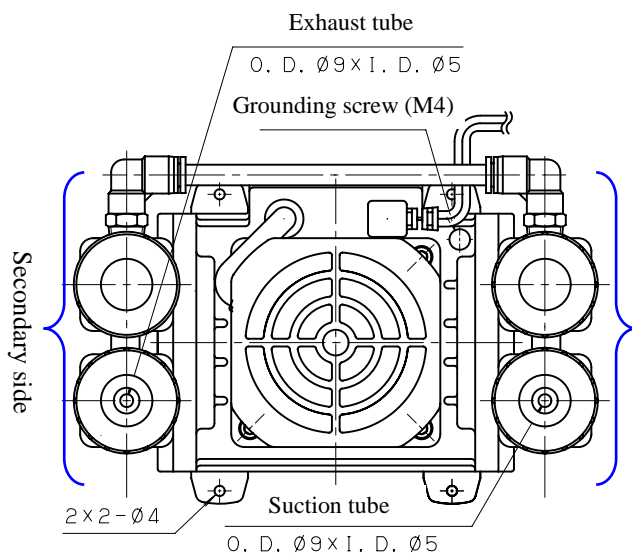


Step 13: Attach the filter. Attach the filter inside the exhaust/suction outlets of the pump head. If the filter is not fully inserted as shown in the picture, it may cause the filter to get caught in other components.

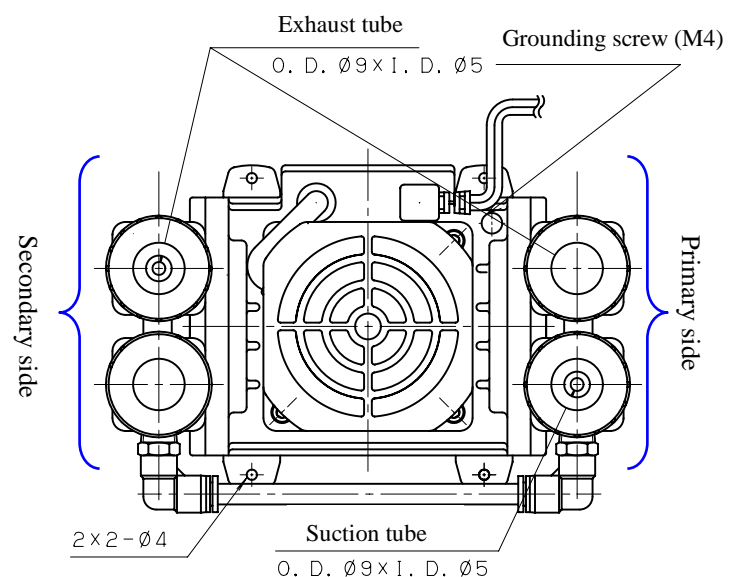


Step 14: Attach the O-ring to the cap. Insert the O-ring into the groove on the inner side of the cap. Attach an O-ring to all caps repeating the same procedure.

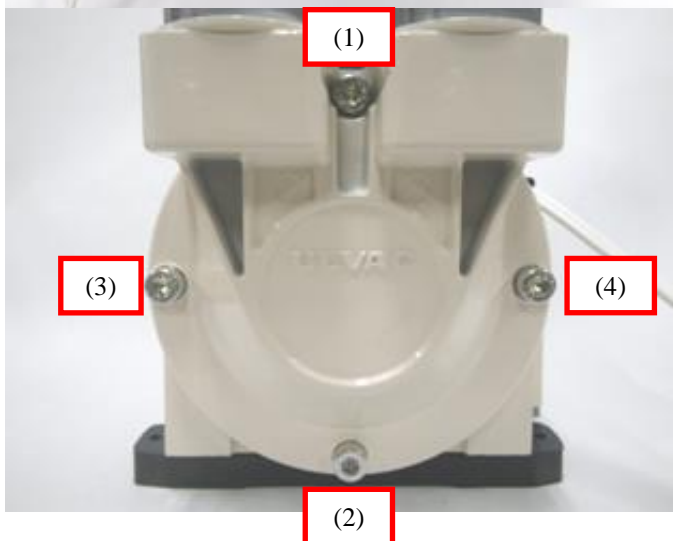
Step 15: Attach the cap to the pump head. Follow the removing procedure in the reverse order. The cap can be fastened using your hand. See the diagrams below to check the position of the cap. Please make sure that each cap is attached to the correct location of the correct side, otherwise it may hinder the machine's performance.



DA-15D



DA-30S



Step 16: Attach the pump head.

*Please be careful not to attach pump heads to the wrong sides. Please refer to the diagrams in Definition of Terms to check the correct orientation of the pump heads.

*Before attaching the pump heads, check the alignment of the diaphragm. After checking that it is perfectly aligned, place the pump head on the diaphragm, and fasten it with hex socket bolts ($M5 \times 12$) \times Qty. 4 using the torque screwdriver (5.0 Nm). When tightening the screws, do so in order (1) through (4), going over them three times, gradually tightening each one of them.

Do the same on the opposing pump head.

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

Step 17: Attach the connecting tubes. Make sure that they are not twisted or tilted.

The parts replacement procedure is now complete.

7. Troubleshooting List

Table 4 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.		4-2.
	(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.	6-3.	
	(5) The breaker has operated.	(5) Investigate the reasons for operation.		6-4.
	(6) The thermal protector has operated.	(6) Switch power OFF, and eliminate the cause of operation of the protector. Contact the manufacturer.		
	(7) Low ambient temperature.	(7) Ensure that ambient temperature is 7~40 °C.	6-4.	
	(8) Low voltage.	(8) Adjust the power supply voltage, and check the power supply cable.		6-4.
	(9) Fault in power supply.	(9) Replace or repair.		
	(10) Problem with power supply switch.	(10) Replace or repair.	6-4.	
	(11) Broken wire in power cord.	(11) Replace or repair.		6-4.
	(12) Problem with motor.	(12) Replace or repair.		
	(13) Damaged condenser, or connection problem.	(13) Replace or repair.	6-4.	
	(14) Locked connecting rod.	(14) Disassemble pump head and check interior.		6-4.
	(15) Problem with bearings.	(15) Replace or repair.		
	(16) The air filter is blocked.	(16) Clean and replace.	6-4.	
	(17) Miscellaneous damage to pump components.	(17) 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.		
	(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) Low voltage	(5) Adjust the voltage, and check the power supply cable.	6-4.	
	(6) Ambient temperature unsuitable.	(6) Ensure that ambient temperature is 7~40 °C.		6-4.
	(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.	6-4.	
	(9) Foreign matter inside pump.	(9) Remove foreign matter, disassemble and clean, and replace components.		6-4.
	(10) Foreign matter inside pump.	(10) Disassemble and repair (replace valves and diaphragm etc).		
	(11) Damage to motor	(11) Replace or repair.	6-4.	
	(12) Damage to valves	(12) Replace.		6-4.
	(13) Damage to diaphragm.	(13) Replace.		
	(14) Miscellaneous damage to pump components.	(14) Disassemble and repair (replace damaged components).	6-4.	
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.		
	(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.		

8. 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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