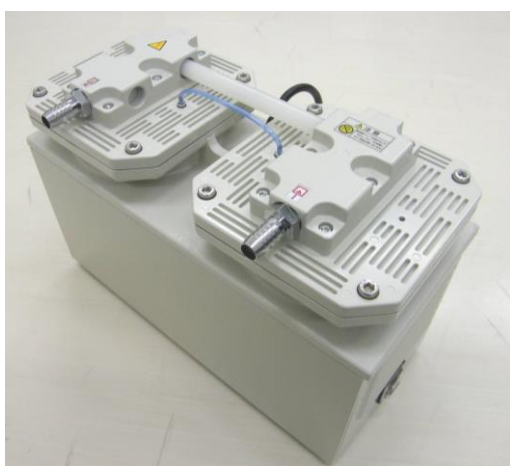




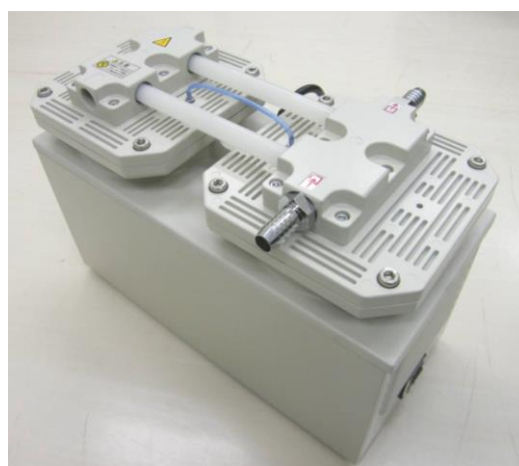
INSTRUCTION MANUAL

Diaphragm-type Dry Vacuum Pump

Model: DA-121D, DA-241S



DA-121D series



DA-241S series

Request to Users

Please read this manual thoroughly to ensure safe and effective use of the equipment.
Keep this manual in a safe place.
Due to periodic improvements in performance, the equipment described in this manual is subject to changes in dimensions and specifications without prior notice.

ULVAC KIKO, Inc.

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

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Before Using the Equipment

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

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

Personnel Handling the Equipment

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

Read the Manual Thoroughly

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

Keep This Manual in a Safe Place

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

Copying This Manual Is Prohibited

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

Statutory Requirements for Disposal

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

Safety During Repair

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

Checks When Opening Packaging

Check the following after opening the packaging.

(1) Is the product as you requested?

(2) Are the accessories and necessary parts included?

Standard accessories

- User's manual ×1
- Inlet and outlet caps (fitted to inlet and outlet) ×2
- Power plug adapter ※100V only (attached to power cord) ---- ×1

(3) Is the pump damaged in any way?

(4) Are any external screws or inlet and outlet pipes loose? Are any components missing?

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

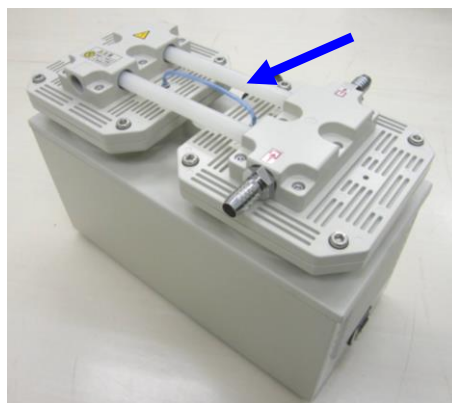
Caution

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

Damage to the tube may affect performance of the pump.



DA-121D



DA-241S

Using the Pump Safely

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

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

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

- **Safety icons**

The meanings of the safety icons are as follows.

Danger

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

Warning

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

Caution

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

Note

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

High Temperature

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

Electric Shock

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

• Cautions for Safety in Use

Danger

Applications

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

Maintenance and Repair

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

Warning

Installation

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

Power Supply

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

Warning

Operation

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

Maintenance and Repair

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

Caution

Installation

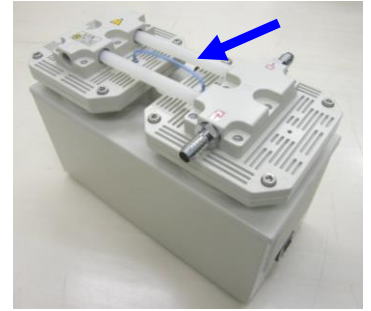
- (1) To prevent back injuries, always use at least two people when lifting and moving the pump.
- (2) Microscopic particles resulting from wear of components are discharged from the outlet and contaminate the room. If necessary, connect a pipe from the discharge outlet to the outside of the building.
- (3) The fine clearances used in this pump require that the following conditions be satisfied during storage, installation, and operation.
 - 1. Ambient temperature of 0~40°C and maximum relative humidity of 85% during operation.
 - 2. Other conditions for storage and operation.
 - a) Level floor of sufficient strength.
 - b) No condensation
 - c) Dust-free environment
 - d) Well ventilated
 - e) Environment free of corrosive or explosive gas.
 - f) Not subject to direct sunlight.
 - g) No danger of fire.
 - h) Maximum ambient temperature of 40°C during assembly of pump.

Caution

- (4) Do not hold or push the tube at the top of the pump (see below). Damage to the tube may affect performance of the pump.



DA-121D



DA-241S

Operation

- (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.

Maintenance and Repair

- (9) 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.
- (10) 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.

Applications

- (2) This pump is not designed to be corrosion-proof. Use it only with clean air at normal temperature, or with gases of equivalent characteristics.
- (3) This pump is designed solely for vacuum extraction. Operation for long periods at near-atmospheric pressures may result in a malfunction.
- (4) 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.
- (5) Entry of corrosive gases, organic solvents, fluids, or gases able to be condensed (eg. steam) may result in damage to the pump and prevent normal operation.
- (6) Entry of gases containing dust and particles may prevent normal operation of the pump.

Operation

- (7) Use the pump within an ambient temperature range of 40°C. Use at high ambient temperatures will dramatically reduce the life of the pump.
- (8) Back pressure at the outlet while the pump is starting may overload the motor.
- (9) 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

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

1. Product Outline

1.1 Purpose of Use and Prohibitions

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

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

Prohibitions

Warning

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

Note

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

1.2 Specifications

Table 1.1 Product Specifications (50/60 Hz)



Model	DA-121D				DA-241S			
Motor	AC100V (±10%)	AC115V (±10%)	AC200V (±10%)	AC220-230V (±10%)	AC100V (±10%)	AC115V (±10%)	AC200V (±10%)	AC220-230V (±10%)
	Single phase,400W,4P,with condenser-run, thermal protector (automatic reset)							
Rated current (A)	4. 8/5. 8	4. 2/5. 0	2. 5/3. 0	2. 3/2. 6 -2. 3/2. 5	5. 2/6. 0	4. 6/5. 2	2. 6/3. 1	2. 5/2. 7 -2. 4/2. 6
Speed (rpm)	1450/1700	1450/1720	1450/1700	1450/1720 -1450/1720	1450/1700	1450/1720	1450/1700	1450/1700 -1450/1700
Discharge rate (L/minute)	120/145				240/260			
Ult.P.(kPa)	3.3				16.0			
Inlet and outlet piping	O.D. ϕ 16×I.D. ϕ 12(G1/2)							
Weight (kg)	26.0							
Air temperature (°C)	0~40							
Dimensions (mm)	193.5(W)×411(L)×285(H)				207(W)×411(L)×285(H)			
Excess Voltage Category	Ⅱ							
Pollution Degree	2							
Installation Category	Class 1							
Installation features	Indoor use only							

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.

Operating temperature : 120±5°C

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

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

2. Dimensions

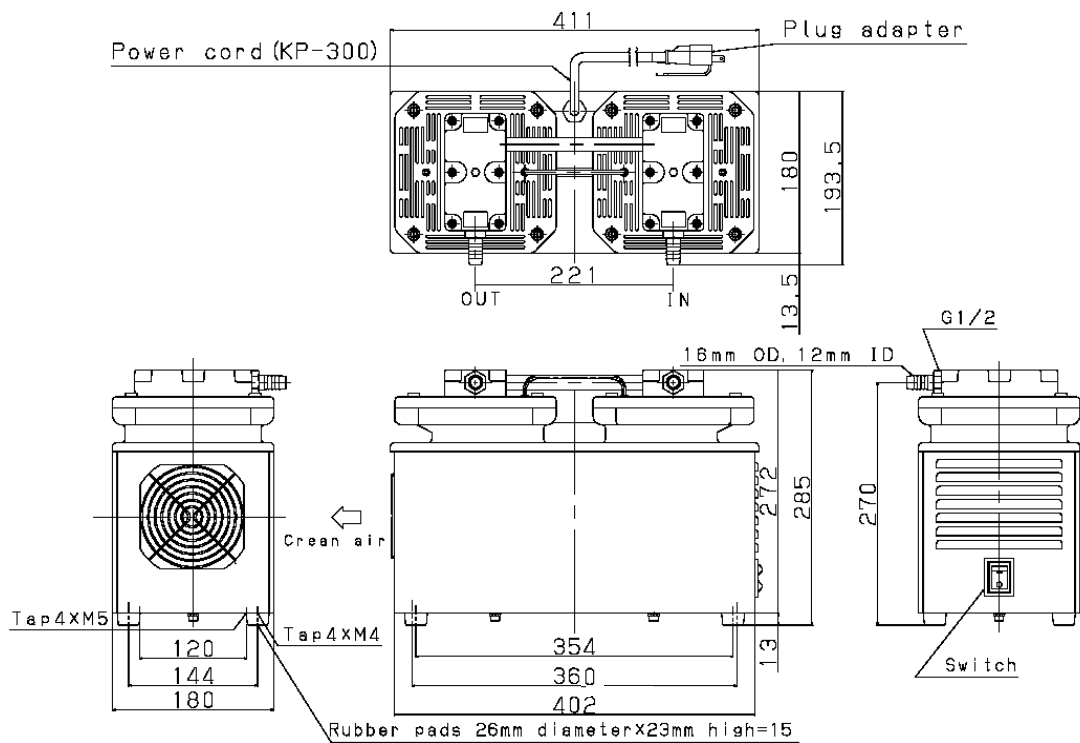


Fig.2.1 DA-121D series Dimensions

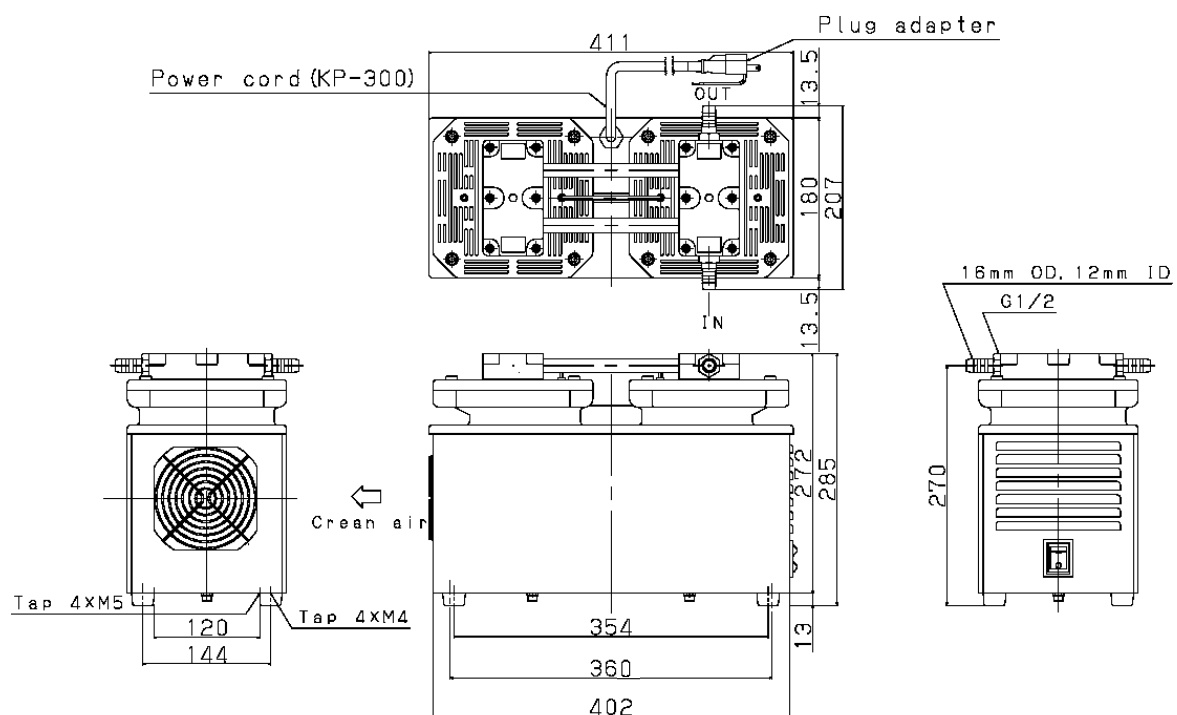





Fig.2.2 DA-241S series Dimensions

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 (4),P06
 Note	See Note (1), P07

3.2 Environmental Conditions for Installation, Storage, and Operation

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

1. Ambient temperature of 0~40°C and maximum relative humidity of 85% during operation.
2. Other conditions (during storage and operation).
 - a) Level floor of sufficient strength.
 - b) No condensation
 - c) Dust-free environment
 - d) Well ventilated
 - e) Environment free of corrosive or explosive gas.
 - f) Not subject to direct sunlight.
 - g) No danger of fire.
 - h) Maximum ambient temperature of 40°C during assembly of pump.

3.3 Location

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

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

3.4 Electric wiring

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

3.5 Fluctuations in the power voltage and frequency

Standard: Rotation electricity machine general rules

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

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

used practically convenient.

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

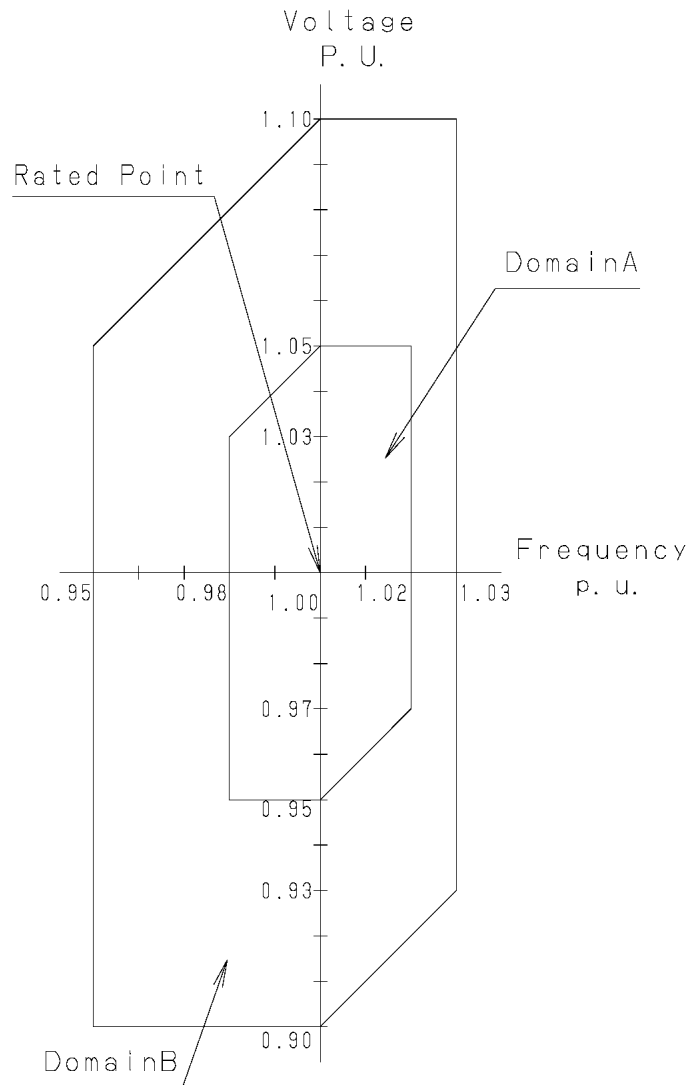


Fig. 3.1 Change region of the voltage and frequency

3.6 Checking Operation After Installation

- 1) Remove the rubber caps from the inlet and outlet.
- 2) Check that the pump switch is OFF (set to O), and connect the power supply.
Note: Ensure that the power cord is sufficient for the rated voltage and current.
Note: Extension cords should be 3-wire, with lead wires having a cross-sectional area of at least 1.0 mm².
- 3) Turn the switch ON (set to I) and check that gas is being drawn into the inlet.
- 4) When this check is complete, turn the power switch OFF (set to O) to stop the pump.

3.7 Piping

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

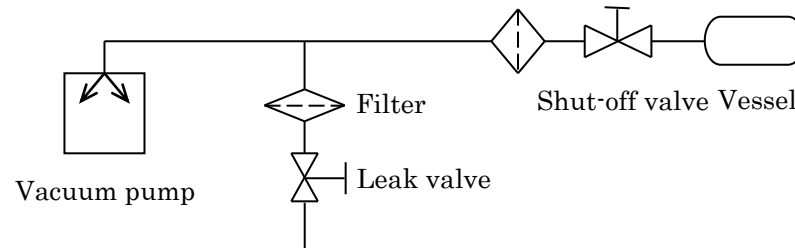






Fig.3.2 Example of Piping Used When Evacuating a Vessel

3.8 Storage

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

4. Cautions for Operation

4.1 Cautions for Operation

 Danger	See Danger (1)(2), P04
 Warning	See Warning (8), P04 (14)(15)(16),P05
 Caution	See Caution (5)(7)(8), P06
 Note	See Note (2)(3)(4)(5)(6)(7)(8)(9), P07

4.2 Operation of the Thermal Protector

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

 Caution	See Caution (6), P06
---	----------------------

4.3 Starting in Cold Weather

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

- 1) Turn the switch ON/OFF 2~3 times with the inlet open to atmosphere until the pump starts. If the pump still does not start, raise the ambient temperature to beyond 0°C.
- 2) With the inlet open to atmosphere, run the pump for a few minutes to warm it.
- 3) Commence normal operation once the pump has warmed.

5. Pump Performance

5.1 Pressure Achieved

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

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

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

5.2 Evacuation Rate

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

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





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

5.3 Power Requirements

The power required to drive the pump is the total of the work required to overcome the rotational resistance of the pump (mechanical work), and the work required to compress the air (compression work), and is at a maximum at an inlet pressure of $2.7 \times 10^4 \sim 4 \times 10^4$ 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 (17)(18), P05
 Caution	See Caution (9)(10), P06
 Note	See Note (10), P07

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

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

6.2 Maintenance

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

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

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

6.3 Regular Inspections

Inspect consumables after the first 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.

<Consumables List>

Table 6.1 Consumables List(DA-121D,241S series)

Components	Quantity		Material	Average life
	121D	241S		
Inlet Filter	1	1	Stainless steel	———
Outlet Filter	1	1	Urethane	6000 h
Diaphragms	2	2	Synthetic rubber (EPDM)	6000 h
A valve	3	2	PTFE	6000 h
C valve	1	2	PTFE	6000 h
B valve Retainer	2	2	SUS	6000 h
A valve Retainer	2	2	PTFE	6000 h
O rings (P-48)	4	4	Synthetic rubber (FPM)	6000 h
O rings (P-18)	2	2	Synthetic rubber (FPM)	6000 h
O rings (N-15)	2	4	Synthetic rubber (FPM)	6000 h
Bearings	1 set	1 set	———	15000 h

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

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

Bearings are replaced by the manufacturer's service division.

<Replacement and Cleaning Guide>

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

Inlet Filters : Clean if dirty, or covered with particles.

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

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

Valves : Replace if deformed, hard, or cracked.

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

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

<Locations for Maintenance and Inspection>

Table 6.2 Locations for Maintenance and Inspection

Period of operation	Inspection item	Inspection details	Method of inspection
3000 hours	Outlet Filters	Dirty, or covered with particles	Visual inspection
	Inlet Filters	Dirty,hard or stuffed	Visual inspection
	Valves	Deformed, hard, or cracked	Visual inspection
	O rings	Hard, cracked, or stretched	Visual inspection
	Bearings	Abnormal noises	Listen
	Diaphragms	Wear, hard, or cracked	Visual inspection

6.4 Replacing and Cleaning Consumables



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

Use the following tools, and refer to the photographs, when replacing cleaning components. Contact the manufacturer's service division for this work if the necessary tools are not available.

• Tools

1. Spanners : For 4 and 6 mm nuts.
2. Torque wrench : With 6 mm socket. Ensure that it is capable of being set to 16 and 18 N.m torque.
3. Adjustable spanner : For 24 mm nuts.
4. Vacuum grease : For replacing O rings.
5. Solvent : For cleaning. Use a solvent such as ethylalcohol which has no effect on rubber components.
6. Paper towels etc : Used for wiping grease and dirt.
7. Dust Mask and Gloves

※ Use tool Nos. 5 and 6 to wipe areas contaminated while replacing components.

1) Cleaning DA-121D series and DA-241S series Inlet Filters

It is recommended that diaphragms, valves, and O rings be cleaned when they are replaced.

Use tools 3, 5, and 6 listed above.

- (1) Remove the inlet pipe with the spanner and withdraw the filter from the valve retainer hole using a thin rod.
- (2) Remove all particles from the filter and wipe it with solvent.
- (3) Replace the cleaned filter in the valve retainer hole.
- (4) Replace the inlet pipe and tighten it with the spanner.

Note: Tighten the inlet pipe until it contacts the valve retainer.

2) Replacing DA-121D series and DA-241S series Diaphragms

It is recommended that both diaphragms be replaced simultaneously.

Use tools 1, 2, 4, 5, 6 and 7 listed above. (Note: Always wear gloves.)

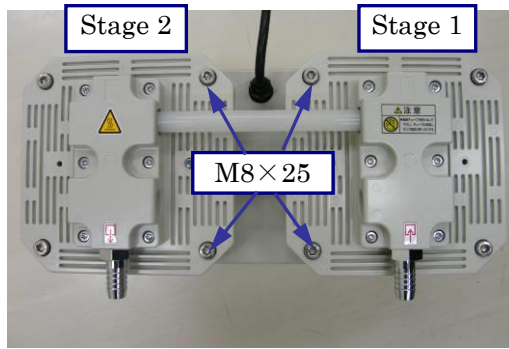


Photo 1

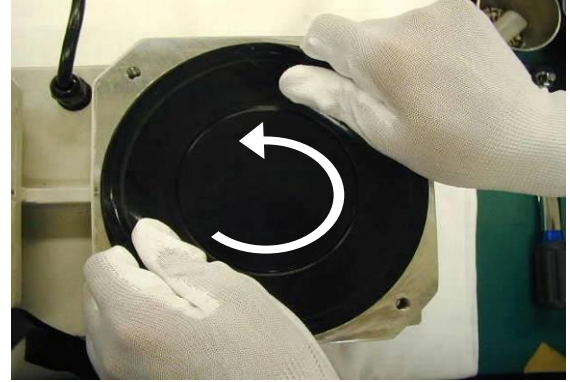


Photo 2

- (1) Remove the eight M8×25 hex socket head screws shown in Photo 1.
- (2) Lift the edge of the stage 1 diaphragm shown in Photo 2, turn it anti-clockwise, and remove it.

Note: The diaphragm is more easily removed by two persons.

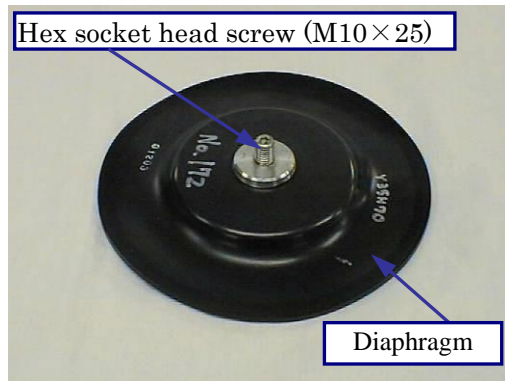


Photo 3

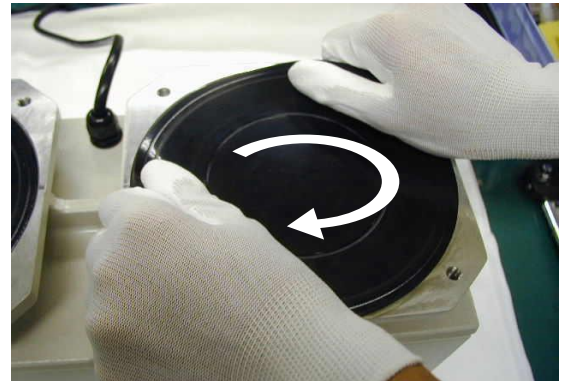


Photo 4

- (3) Apply a small amount of vacuum grease to the hex socket head screw (M10×25, Photo 3) at the rear of the new diaphragm to prevent scoring.
- (4) Turn the diaphragm in the clockwise direction as shown in Photo 4 as far as it will go, and tighten it a further 5~10°. Take care not to overtighten the diaphragm.
- (5) Replace the stage 2 diaphragm as described in (2), (3) and (4).
- (6) Using the torque wrench, tighten diagonally opposite pairs of the four stage 1 pump head hex socket head screws (M8×25) equally to 18 N·m as shown in Photo 5.
- (7) Fit the connecting pipe to the stage 1 side.
Note: Always fit the connecting piping from the stage 1 side, and push it in as far as possible.
- (8) Using the torque wrench, tighten diagonally opposite pairs of the four stage 2 pump head hex socket head screws (M8×25) equally to 18 N·m.
- (9) Close the inlet, set the switch to ON (ie to I), and 2 hours later, use the torque wrench to tighten diagonally opposite pairs of the eight hex socket head screws (M8×25) equally to 20 N·m.

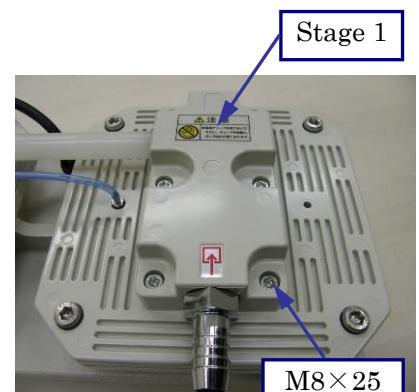


Photo 5

3) Replacing DA-121D series Valves

It is recommended that these valves be replaced at the same time as the diaphragms. Use tools 1, 2, 5, and 6 listed above.

- (1) Remove the stage 1 and stage 2 pump heads as described in 2) Replacing DA-121D and DA-241S Diaphragms, step (1).

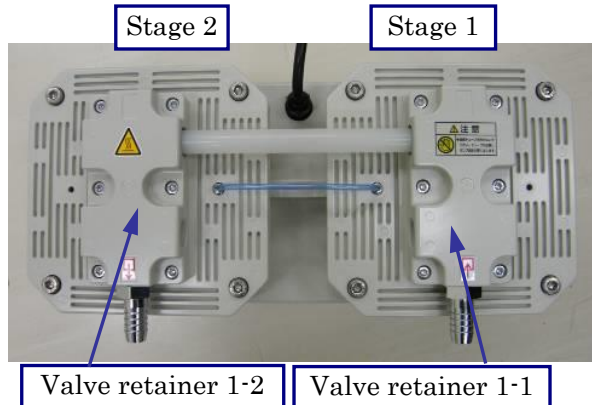


Photo 6

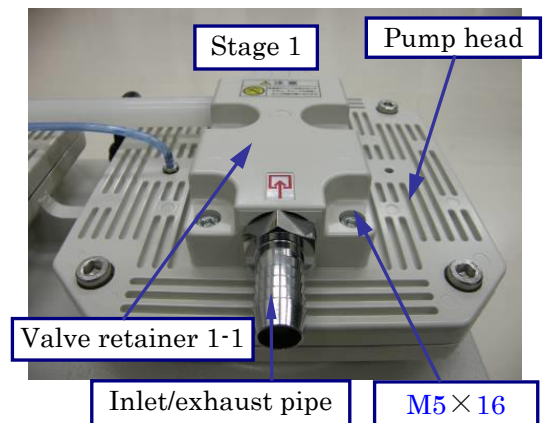


Photo 7

- (2) Remove the hex socket head screws ($M5 \times 16$) holding the valve retainer, and remove the valve retainer from the pump head.
- (3) Remove the old valves (A valve, C valve) and valve retainers (A valve retainer, B valve retainer).
- (4) Fit one new A valve to the pump head stage 1 inlet (mark facing downwards), one to the outlet (mark facing upwards) and one to the pump head stage 2 inlet (mark facing downwards). (Photo 8)

Attach a valve retainer on top of the A valve of the pump head stage 1 outlet. (Photo 8-2)

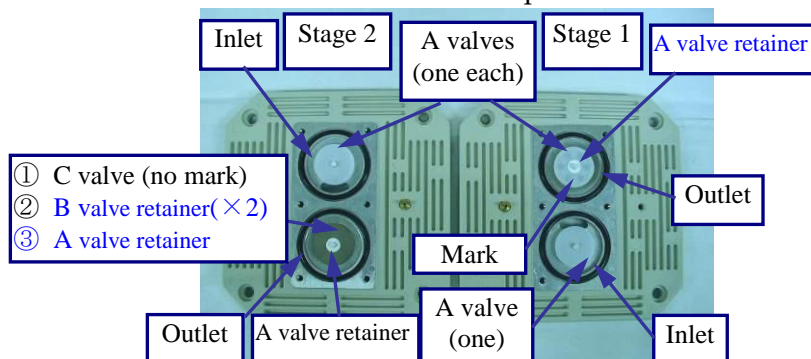


Photo 8

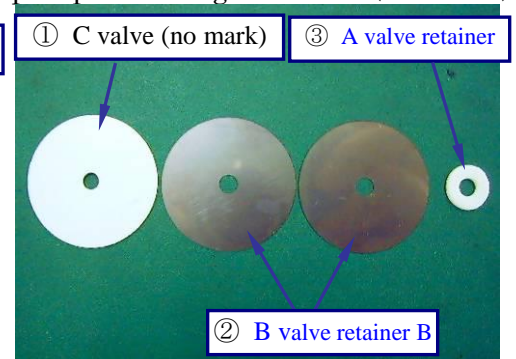


Photo 8-1

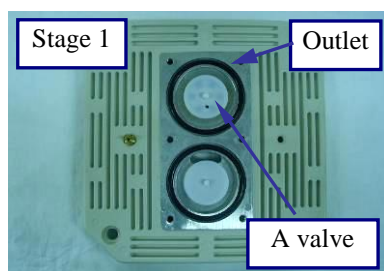
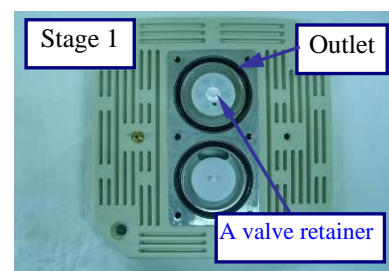


Photo 8-2 121D series Stage 1



- (5) Attach one new valve C (no mark) followed by two pieces of B valve retainer and then a A valve retainer to the pump head stage 2 outlet. (Photos 8-3)
- (6) Fit the valve retainer to the pump head in the position shown in Photo 6, and tighten diagonally opposite pairs of hex socket head screws ($M5 \times 16$) equally.
Note: Check that the O ring is flattened to the extent that it is no longer visible when viewed from the side.
- (7) Fit the pump head to the pump while referring to 2) Replacing DA-121D and DA-241S Diaphragms.

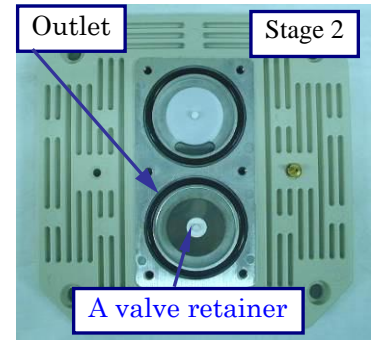
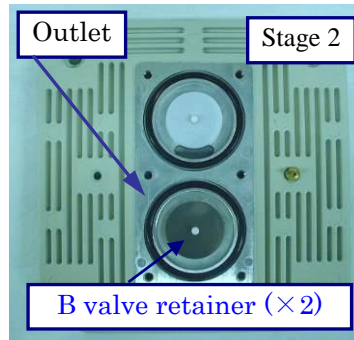
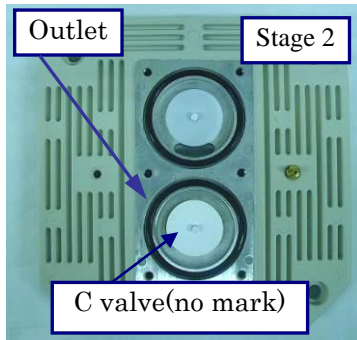


Photo 8-3 121D series Stage 2

4) Replacing DA-241S series Valves

It is recommended that these valves be replaced at the same time as the diaphragms. Use tools 1, 2, 5, and 6 listed above.

- (1) Remove the pump head, valve retainers, and valves as described in 3) Replacing DA-121D series Valves, steps (1)~(3).

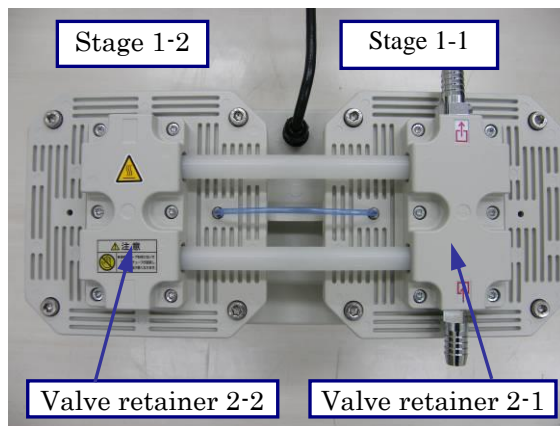


Photo 9

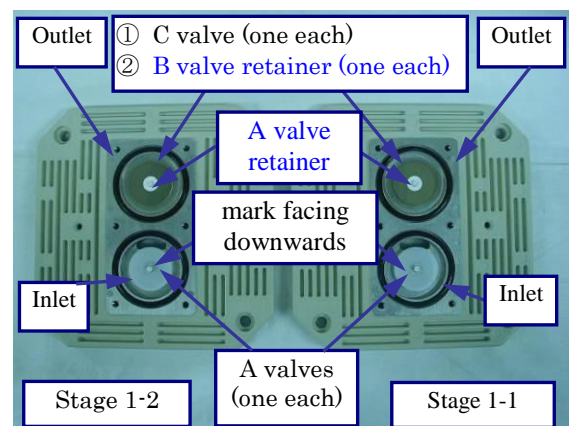


Photo 10

- (2) Fit a new A valve to the pump head stage 1-1 inlet, and the pump head stage 1-2 inlet (mark facing downwards). See Photo 10.

Note: Check that the valve is not back to front. (Refer to Photo 10.)

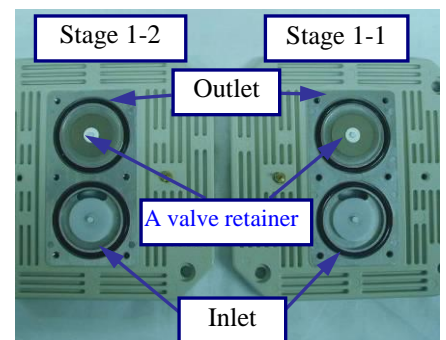
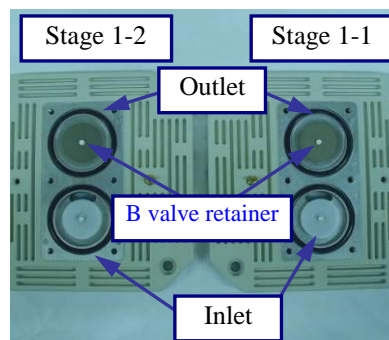
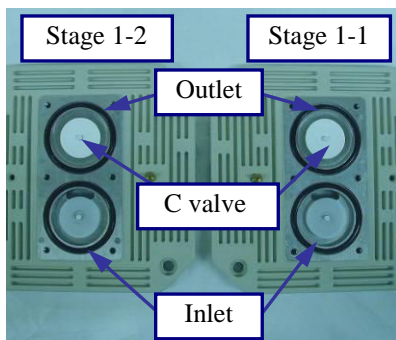


Photo 10-1

- (3) Place a new C valve on the pump head stage 1-1 outlet and stage 1-2 outlet, and fit a B valve retainer and A valve retainer to each in that order. See Photo 10-1.
- (4) Fit the valve retainer to the pump head in the position shown in Photo 9, and tighten diagonally opposite pairs of hex socket head screws (M5×16) equally. See Photo 7. Note: Check that the O ring is flattened to the extent that it is no longer visible when viewed from the side.
- (5) Fit the pump head to the pump while referring to 2) Replacing DA-121D series and DA-241S series Diaphragms.

5) Replacing the DA-121D series outlet filter

(Use tool 1)

- ① Use step (1) of 3) Replacing DA-121D Valves to remove the stage 2 valve retainer.
- ② Remove the urethane outlet filter from the stage 2 valve retainer outlet side.
- ③ Replace it with a new outlet filter. Install the outlet filter all the way in and check that it is not deformed after it has been installed. (Photos 11-1, 11-2)

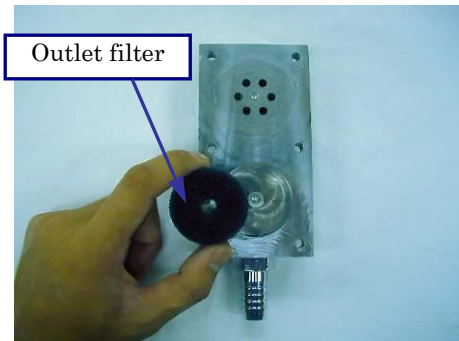


Photo 11-1



Photo 11-2

6) Replacing the DA-241S series outlet filter

(Use tool 1,5)

- ① Use 5) Replacing the DA-121D series outlet filter to replace the stage 1 outlet filter. (Photo 12)

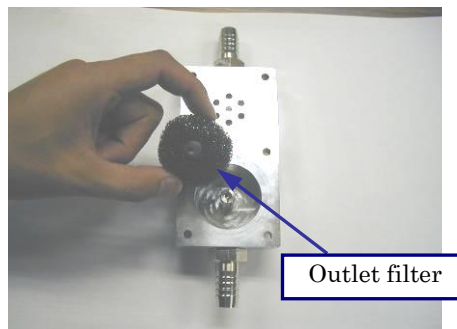


Photo 12

7) Replacing DA-121D and DA-241S series O Rings

It is recommended that these O rings be replaced at the same time as the diaphragms. Use tools 1, 2, 3, 4, 5, and 6 listed above.

- (1) Remove the valve retainers as described in 3) Replacing DA-121D Valves, steps (1)~(2).

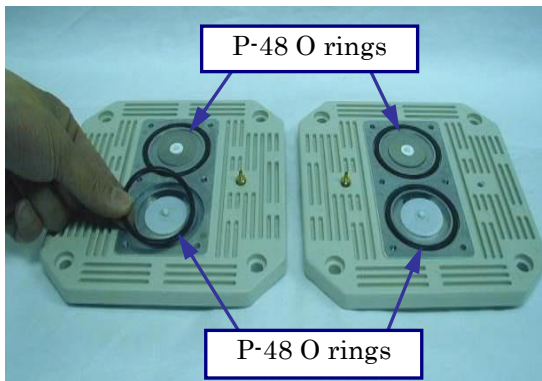


Photo 11



Photo 12

- (2) Remove the old P-48 O ring as shown in Photo 11 and wipe the O ring groove with solvent.
- (3) Wipe a thin layer of vacuum grease evenly over the new O ring, and place it in the O ring groove.
- (4) Remove the inlet and outlet pipes with the spanner and remove the old O ring shown in Photo 12.
- (5) Wipe the inlet and outlet pipes with solvent.
- (6) Wipe a thin layer of vacuum grease evenly over the new O rings, and fit them to the inlet and outlet pipes.
- (7) Fit valve retainer 1-1 and 1-2 to the inlet and outlet pipes.
Note: On the DA-241S, fit valve retainer 2-1.
Note: Tighten the valve retainers until they are in contact with the inlet and outlet pipes.

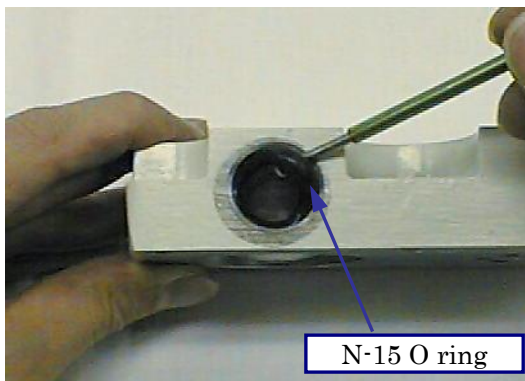


Photo 13

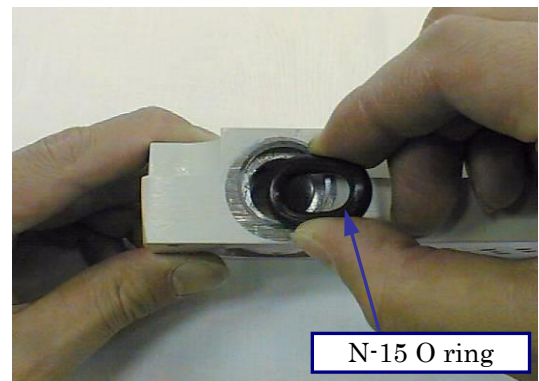


Photo 14

- (8) Using a long, thin hook, remove the N-15 O rings from the sides of the valve retainers 1-1 and 1-2. See Photo 11.
Note: On the DA-241S, remove the four O rings from the holes in the sides of the valve retainers 2-1 and 2-2.
- (9) Wipe a thin layer of vacuum grease evenly over the new O rings, and fit them in the holes in the sides of valve retainers 1-1 and 1-2. See Photo 12.
Note: On the DA-241S, fit the four O rings in the holes in the sides of the valve retainers 2-1 and 2-2.
- (10) Assemble the valve retainer and pump head while referring to 3) Replacing DA-121D Valves.

6.5 Troubleshooting List

Table 6.3 Troubleshooting List

Problem	Causes	Solutions	Reference
Problems with starting and rotation of pump	(1) Not connected to power supply. (2) Switch is OFF. (3) Problem with power supply voltage. (4) Problem with pump wiring. (5) The breaker has operated. (6) The thermal protector has operated. (7) Low ambient temperature. (8) Low voltage. (9) Fault in power supply. (10) Problem with power supply switch. (11) Broken wire in power cord. (12) Problem with motor. (13) Damaged condenser, or connection problem. (14) Locked connecting rod. (15) Problem with bearings. (16) Miscellaneous damage to pump components.	(1) Connect power supply. (2) Set switch to I. (3) Ensure that voltage variation is within $\pm 10\%$. (4) Rewire the pump. Contact the manufacturer. (5) Investigate the reasons for operation. (6) Switch power OFF, and eliminate the cause of operation of the relay. Contact the manufacturer. (7) Ensure that ambient temperature is $0\sim 40\text{ }^{\circ}\text{C}$. (8) Adjust the power supply voltage, and check the power supply cable. (9) Replace or repair. (10) Replace or repair. (11) Replace or repair. (12) Replace or repair. (13) Replace or repair. (14) Disassemble pump head and check interior. (15) Replace or repair. (16) Disassemble and repair (replace damaged components).	3-6. 4-2. 4-3. 6-4. 6-4.
Pressure does not diminish	(1) Pump is too small for capacity of vacuum vessel. (2) Pressure measurement is incorrect. (3) Vacuum gauge is unsuitable. (4) The inlet piping is too small in diameter, or too long. (5) Low voltage. (6) Ambient temperature unsuitable. (7) Leaks in inlet piping. (8) Leaks from piping or connections. (9) Foreign matter inside pump. (10) Water or solvent etc has been sucked into pump causing problems. (11) Damage to motor. (12) Damage to valves. (13) Damage to diaphragm. (14) Miscellaneous damage to pump components.	(1) Select another pump. (2) Measure the pressure correctly. (3) Measure with a calibrated vacuum gauge suitable for the pressure range. (4) Connect piping of an inside diameter greater than the inlet diameter, or reduce the distance between the pump and vacuum vessel. (5) Adjust the voltage, and check the power supply cable. (6) Ensure that ambient temperature is $0\sim 40\text{ }^{\circ}\text{C}$. (7) Clean and replace. (8) Check for leaks in piping, check diameter and length of piping, and repair. (9) Remove foreign matter, disassemble and clean, and replace components. (10) Disassemble and repair (replace valves and diaphragm etc). (11) Replace and repair. (12) Replace. (13) Replace. (14) Disassemble and repair (replace damaged components).	5-1. 5-1. 5-1. 6-4. 6-4. 6-4.
Pump surfaces are abnormally hot (more than room temperature + $30\text{ }^{\circ}\text{C}$)	(1) Continuous operation with high pressure gas. (2) High temperature gas. (3) Problem with power supply voltage. (4) Motor has seized.	(1) Do not run the pump continuously at near-atmospheric pressure. (2) Fit cooling equipment (eg. gas cooler) to the inlet. (3) Ensure that voltage variation is within $\pm 10\%$. (4) See the section on problems with pump rotation.	

7. In Conclusion

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

Warranty

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

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

Normal usage conditions refer to the following:

- a) Ambient temperature and humidity during operation: 0 - 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			
<input type="checkbox"/> Continuous Operation <input type="checkbox"/> Intermittent Operation			
Usage: _____			
3. Failure Status <input type="checkbox"/> Unusual Noise <input type="checkbox"/> Abnormal Pressure <input type="checkbox"/> Abnormal Actuation <input type="checkbox"/> Oil Leakage			
Other Symptoms: _____			
4. Detail of Request <input type="checkbox"/> Repair (Overhaul) <input type="checkbox"/> 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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