No. 27500-2-01-7

ULVAC

Instruction Manual

Diaphragm Type Dry Vacuum Pump

DA-41D, DA-81S
DA-41DK, DA-81SK

Indoor specification

Request

Please read this Instruction Manual before starting the pump in order to use the pump effectively and safely. Please keep this Instruction Manual carefully.

We reserve our right to change dimensions or specifications of the motors described in this Instruction Manual for improvement of the performance without prior notice.

ULVAC KIKO Inc.

CONTENTS

Drawing List

Before use

We would like to express our sincere appreciation for purchasing ULVAC pump.
This pump is designed for evacuation exclusive use. Improper handling may cause failure and trouble. Please read this Instruction Manual carefully and use the pump in paying attention to inspection / maintenance / safety.

Operators of this pump

This pump shall be operated by those who have read this Instruction Manual and fully understood caution in safety, specifications and operating method of this pump.

Perusal of Instruction Manual

Please read this Instruction Manual before using the pump correctly.
Always read "Directions to use safely" in particular.

Storage of Instruction Manual

Please keep Instruction Manual carefully.
After reading, store this Instruction Manual on the location where available for reading by operators.

Prohibited copying of Instruction Manual

Any portion of this Instruction Manual cannot be copied for use by the third party without ULVAC's consent.

Observance of laws and ordinances

When disposing this pump, please handle by observing laws and the regulations that the local government established.

Safety control in repair

When requesting ULVAC of repair, please inform us of usage status and presence of hazardous substance in particular for safety control of repair personnel.
In case usage status is not clear, the repair / checking may not be accepted.

Confirmation in unpacking

When unpack the pump from the shipping case, please check the following items.

(1) Whether the pump accords with required pump.
(2) Whether the accessories and prescribed items are accompanies.

<Standard accessories>

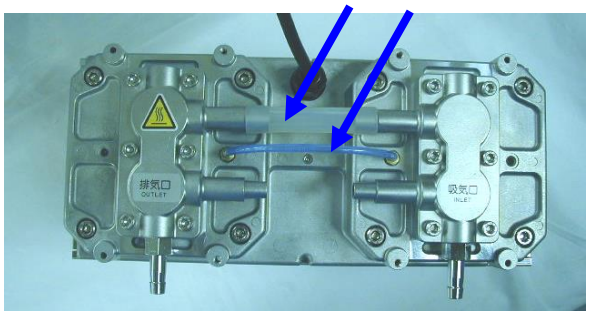
Instruction Manual ----------1 copy
Inlet-exhaust pipe protection cap (attached to Inlet-exhaust pipe) ----------2 pcs.
Power plug adapter (attached to power cord)----------1 pcs.

(3) Whether damaged positions are found.
(4) Whether loosen external screws or inlet-exhaust pipe. Whether coming off positions are found.

In case there is trouble by any chance, please contact vendor or ULVAC Sales Department.

ATTENTION

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.



Example of photograph:DA-41DK
※In DA-81SK, a white, half transparent connected tube is two

Directions to use safely

Please read this "Directions to use safely" before start using the pump and operate the pump correctly.

Safety logotype is enumerated in this Instruction Manual and alarm indication on the pump so that operators may understand the items to be observed.

Safety logotype is prepared to use the pump correctly and safely and to prevent injury and damage of operators, etc. Please observe them always.

Safety logotypes

Expressions used in logotypes mean as follows.

DANGER	**Incorrect operation may immediately result in possibility to cause death or heaviest injuries of users.**
WARNING	**Incorrect operation may result in possibility to cause death or heaviest injuries of users.**
CAUTION	**Incorrect operation may cause right or medium injury of users or occur damage of the instrument only.**
ATTENTION	**Incorrect operation may cause damage of the instrument or hinder normal operation.**
CAUTION TO HEAT	**Temperature of some part of pump surface rises higher than 60℃ (140 degF) when operated.** **Do not touch the pump during operation. There is a risk of burn.**
CAUTION TO ELECTRIC SHOCK	**Never fail to turn OFF the Power Supply of the pump when conducting the work related to electric wiring or electric parts.** **There is a risk of electric shock.**

Precautions about safety in operation

DANGER

<Application>

(1) This pump is not designed for explosion-proof construction. Do not use for exhaust of explosive gas.

(2) Suction gas may leak out of the pump main unit from other area than exhaust vent. Do not use for exhaust of toxic gas. When toxic gas is exhausted by any chance, internal pump may be polluted by the toxic gas.
Please pay attention during maintenance work.

<Maintenance / repair>

(3) When requesting ULVAC overhaul, fill the type of suction gas in "Usage Status Check Sheet" provided at the end of this Instruction Manual. In case the pump is used for exhaust of toxic gas by any chance, internal pump unit is polluted by the toxic gas. Overhaul of some contaminated pump cannot be made according to the type of toxic gas. Please pay enough attention.

WARNING

<Installation>

(1) Do not use in explosive atmosphere. There is a risk of injury or fire.

(2) Do not place inflammables such as flammable solvent in periphery of the pump definitely. There is a risk of fire.

(3) Do not place obstacles that likely to disturb the ventilation in periphery of the pump. There is a risk of fire by abnormal heat generation.

<Power source>

(4) Never fail to disconnect the power cord when start inspection / repair definitely.
There is risk of electric shock or injury attributed to sudden start of the pump.

(5) Conduct wiring work correctly by observing Electric System Design Standard and the in-house rules.
Incorrect wiring work causes a fire.

(6) Never fail to disconnect the power cord when start electric wiring work.
Do not conduct wiring work while electric current is supplied definitely. Otherwise, gets an electric shock.

(7) Perform secure grounding of the pump definitely. It is recommended to install the dedicated circuit breaker.
Use of the pump without connecting earth may result in electric shock when the motor is failed or short circuit.

(8) Do not use the motor by other power voltage than rated voltage. Overload protection device may not operate normally, and cause burning of the motor or a fire.

(9) Do not tear, process or pull the power cord. Never put substance on the power cord.
Short circuit may occur from the damaged portion causing electric shock or a fire.

(10) When inserting power cord to a wall socket, always insert the plug to the depths of wall socket.
There is a risk of electric shock.

(11) When pulling the power cord out, grab the plug definitely. There is a risk of electric shock.

(12) Do not insert or pull the power cord with wet hands. There is a risk of electric shock.

(13) When the power cord is inserted in wall socket, do not touch electric wiring portion. Otherwise, gets an electric shock.

WARNING

<Operation>

(14) This pump is not designed for explosion-proof construction. Do not use the pump near inflammables such as flammable solvent and in explosive atmosphere. There is a risk of injury or fire.

(15) Do not insert a finger and substances into opening of the motor. There is a risk of electric shock, injury and a fire.

(16) There is a risk of rupture. Do not operate the pump in the status that exhaust vent is blocked or mounting equipment that hinder gas passage in the exhaust vent side. Increased internal pressure of the pump may cause rupture of the main unit of the pump or overload to the motor. This pump is not designed for pressure withstanding construction. Threshold value of pump internal pressure is 0.03 MPa (gauge pressure).

<Maintenance / repair>

(17) Do not allow other personnel than **repair engineers** *1 to disassemble or repair the pump.

* 1 Repair engineers: Those who are trained by ULVAC technical training.

(18) Wear dust mask and gloves when conducting replacement work. A minute abrasive particle suspends in the air, and there is a risk to go into the human body when breathing.

CAUTION

<Installation>

(1) This pump is a machine having precise clearance. Satisfy the following requirements when conducting storing, installation and operation

1. Operation temperature and the humidity 0℃ to 40℃ in temperature, Lower than 85% (relative humidity) in humidity
2. Others (applicable both storing and operation)
   a. Level location where enough floor strength.
   b. No condensation.
   c. No dust.
   d. Well ventilated indoor.
   e. No explosive gas.
   f. No direct sun rays.
   g. No flammability risk.
   h. When Equipment is installed, temperature in pump circumference shall not exceed 40℃

(2) There is a risk of hurting lower back. Lift the pump with both hands definitely to move and conduct work.

(3) Abrasive particles of diaphragm may drain from the exhaust vent and pollute the room. Exhaust it to out of the chamber by connecting pipes if necessary.

<Operation>

(4) Please do not use it to application coming in contact with human body transplant and body fluid / a living body organization.

(5) Definitely do not touch the rotating section such as a motor, main spindle, coupling, cooling fan while driving the pump. There is a risk of injury.

CAUTION

<Operation>

(6) When the overload protection device is operated, the entire pump is hot. Do not touch the pump by hands definitely.
There is a risk of burn.

(7) Do not touch the pump during operation or after stopped but the main unit of the pump is hot.
There is a risk of burn due to high temperature.

(8) Do not insert a finger and substances into inlet-exhaust port or look inside of the motor during operation.
There is a risk of injury or failure.

<Maintenance / repair>

(9) When disposing of a scrapping pump, handle as the Industrial Waste observing "Wastes Disposal and Public Cleaning Law ". Never conduce burnout disposal.

(10) When the pump failed to operate or abnormal, turn off the power supply to the pump (push switch to ○ side) and disconnect power cable. Contact the vendor or ULVAC for inspection / repair immediately.

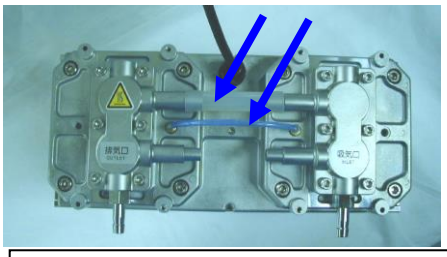
(11) Expose the pump for cooling for about 30 minutes and start work after confirming the pump is cooled down.
Internal pump is hot soon after operation and there is a risk of burn.

ATTENTION

<Installation>

(1) Do not apply impact to the pump, and not falling sidelong.
There is a risk of failure.

(2) "DA-41DK,DA-81SK" to the customer of purchase.
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.



Example of photograph: DA-41DK
※In DA-81SK, a white, half transparent connected tube is two

(3) Piping must tie to the exhaust opening whenever there is a possibility of sucking the gas and steam that influences the human body and prevent the suck gas from indoors diffusing.

<Application>

(4) This pump is designed for evacuation exclusive use. Do not operate long time in near the atmospheric pressure.
There is a risk of failure.

(5) This pump is not designed for corrosion resistance specifications. Do not use the pump for gas other than clean normal temperature air and gasses of equivalent property.

(6) Suction gas may leak out of the pump main unit from other area than exhaust vent. Do not use for exhaust of toxic gas. When toxic gas is exhausted by any chance, internal pump may be polluted by the toxic gas.
Please pay attention during maintenance work.

ATTENTION

(7) The pump may be damaged and normal operation cannot be expected. Do not suck fluid.

(8) Do not suck gas that contains trash and dust. Normal operation of the pump may be jeopardized. In case there is possibility to such trash and dust, mount filters at inlet port to remove them to protect a pump

(9) Corrosion-resistant plastic is used in the external covering of the DA-41D, DA-81S however it is not resistant to all chemicals.
Ensure that the following chemicals do not come in contact with the pump. Any chemical, including the following, which comes into contact with the pump should be wiped off immediately.
• Acetone • Ethyl ether • Ethyl acetate • Animal fats

<Operation>

(10) Please use the pump in ambient temperature in range of 0 to 40℃.
If the temperature was over 40 degrees, put a cooling fan or similar device to cool it down to the ambient temperature. If operated in high temperature, life of the pump shall be extremely reduced.

(11) Do not apply back pressure in the pump exhaust side when start. Load to the motor may cause starting operation failure.

(12) When the thermal protector is operated, the entire pump is hot. Do not touch the pump by hands definitely.
There is a risk of burn.

(13) It is effective to clean internal pump when stopped operation in order to maintain pump performance.
Have the pump to absorb clean air for 3 - 5 minutes and conduct idling operation.

<Maintenance / repair>

(14) This pump is a machine having precise clearance. In case there is no repair engineers, request replacement of consumable parts that require assembling technology to ULVAC Service Section.

1. Outline of Equipment

1-1. Intended Use and Prohibitions of Equipment

This diaphragm type dry vacuum pump performs evacuation by reciprocating motion of rubber membrane (diaphragm).
Please take note of the following prohibitions to use Equipment correctly.

<Prohibitions>	
WARNING	**(1) This pump is for evacuation only. Never use for pressurization.** **(2) Do not do resale, repair, and remodeling that we agreed on.**
CAUTION	**(3) This pump is not made of corrosion resistant specification. Be sure to apply it to the clean normal temperature air or gas of equivalent characteristics.** **(4) Although corrosion resistance resin for external packaging of DA-41D, DA-81S partly, there are chemicals that erode the corrosion resistance. Prevent splashing the following chemicals on the pump. It is recommended to wipe off chemicals attached regardless description in the followings.** **Acetone · Ethyl ether · Ethyl acetate · Flora and fauna oil, etc.** **(5) Never absorb the gas that mixed dust, dust, moisture.** **(6) Do not operate long time in environment near the atmospheric pressure.**

1-2. Equipment Specifications

Table 1 –1 Equipment Specifications

Model Name		DA-41D	DA-41DK	DA-81S	DA-81SK
Exhaust velocity (L/min)	50Hz	40		75	
	60Hz	46		85	
Ultimate pressure(kPa)		3.3		13.3	
Motor Specifications		Standard	Substandard		
		1 φ ,AC100V±10% (50/60Hz)	1 φ ,AC115V±10% (60Hz)	1 φ ,AC200V±10% (50/60Hz)	1 φ ,AC220V±10% (50/60Hz)
		100W,4P with condenser-run, thermal protection relay (automatic reset)			
Rated current (A)	50Hz	2.5		1.3	1.2
	60Hz	2.7	2.3	1.3	1.25
Rotating speed (rpm)	50Hz	1370		1400	1410
	60Hz	1620	1690	1690	1690
Inlet / exhaust pipe		O.D. φ 12×I.D. φ 8 mm(G1/4)			
Weight(kg)		10.3	10.2	10.3	10.2
Operating ambient temperature(℃)		0~40			
External dimensions (W up to inlet / exhaust pipe tip)		157mm(W)× 336.5mm(L)× 217mm(H)	140mm(W)× 288mm(L)× 202mm(H)	181mm(W)× 336.5mm(L)× 217mm(H)	153mm(W)× 288mm(L)× 202mm(H)

1-3. Protector (thermal protector)

1) A autoreset type thermal protector for overload protection is built in this pump.
   This protector prevents motor burnout trouble by shutting the power supply to the motor automatically when rotation stops during operation due to pump failure or current supplied to the motor exceeded due to overload.
2) It is recommended to adopt the other protector (electromagnetic switch, short circuit breaker, etc.) in addition to this protector.

WARNING	**See "Warning" (8) on P. 04.**
CAUTION	**See "Caution" (6) on P. 06.**

2. Appearance

Fig. 2 -1 DA-41D, DA-81S Appearance

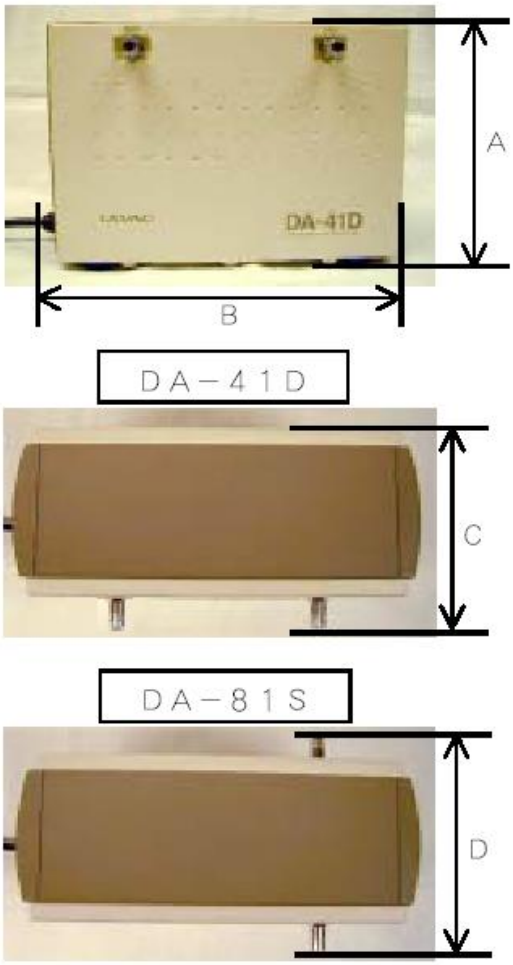
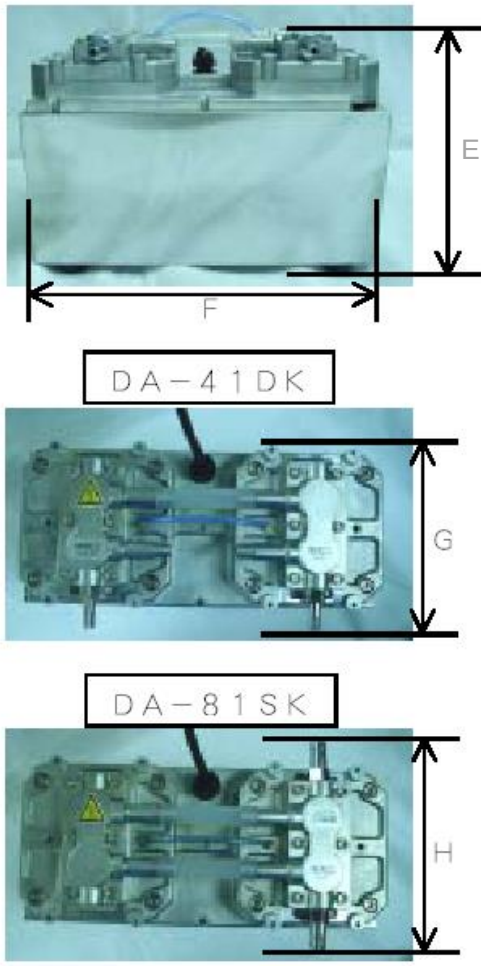


Fig. 2 -2 DA-41DK, DA-81SK Appearance



Model No.	Symbols on drawing	Dimensions
DA-41D,81S	A	217mm (8.5”)
DA-41D,81S	B	336.5mm (13.2”)
DA-41D	C	157mm (6.2”)
DA-81S	D	181mm (7.1”)

Model No.	Symbols on drawing	Dimensions
DA-41DK,81SK	E	202mm (8”)
DA-41DK,81SK	F	288mm (11.3”)
DA-41DK	G	140mm (5.5”)
DA-81SK	H	153mm (6”)

3. Installation / Storage

3-1. Precautions in Installation / Storage

WARNING	**See "Warning" (1) (2) (3) (5) (6) (7) (8) (9) (10) (11) (12) (13) on P. 04.**
CAUTION	**See "Caution"(1) (2) (3) on P. 05.**
ATTENTION	**See "Attention" (1) (2) (7) on P. 06.07.**

3-2 Installation / Storage and Ambient Condition during Operation

This pump is a machine having precise clearance. Satisfy the following requirements when conducting storing, installation and operation.

(1) Altitude / temperature and humidity when operating
Lower than 1000 m (3281') 0℃ to 40℃ in temperature, Lower than 85% (relative humidity) in humidity.

(2) Miscellaneous (applicable both storing and operation)
a. Level location where enough floor strength.
b. No condensation.
c. No dust.
d. Well ventilated indoor.
e. No explosive gas.
f. No direct sun rays.
g. No flammability risk.
h. When Equipment is installed, temperature in pump circumference shall not exceed 40℃ (104 degF).

3-3 Installation location

Select a location where dust and moisture are small, and install the equipment in level at the installation location. Arrange considering work such as mounting, detachment, inspection, cleaning of a pump.

In case building in equipment, pay enough attention to ambient temperature in particular. Loosen from the equipment by using a rubber cushion, etc. so that no vibration may be conveyed between the pump and equipment.

Refer "3-2 Installation / Storage and Ambient Condition during Operation" for ambient conditions.

3-4 Verification Run in Installation

1) Detach rubber screen that attached to the inlet / exhaust pipe.
2) Confirm that the pump switch is set to OFF (pushed to ○ side) and connect it to power source.

CAUTION	**Please use the three core power supply cable (lead wire size 0.75mm^2 or more) as the extension cable, if necessary.**

3) Turn the switch ON (push to |side) and confirm the unit is absorbing.
4) After confirmation is finished, turn the power switch OFF (pushed to ○ side) and stop the pump operation.

3-5 Piping

1) Connect piping tightly so that no leak is found.
2) Use the pipe larger than 8 mm internal diameter for inlet / exhaust port piping.
3) In case the back pressure is inevitable, make it less than 0.03MPa.
4) Piping for evacuation of the container shall have a blocking valve as shown on Fig. 3-1 in order to maintain vacuum status between an inlet pipe and container of the pump.
5) 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.
6) When connecting a pipe to inlet / exhaust port, always hold the inlet / exhaust port by hands. Also, hold the inlet / exhaust port by hands when detach the pipe.

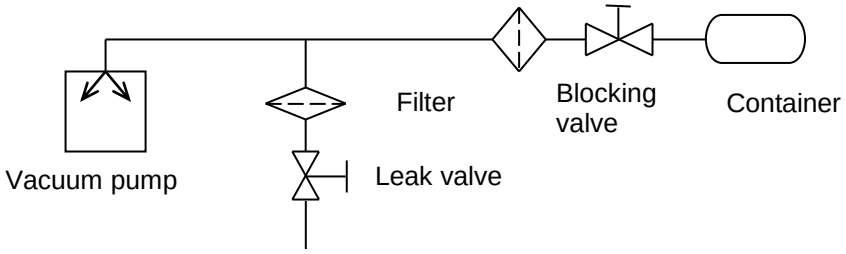


Fig. 3 -1 Piping Example for Evacuation of Container

3-6 Storage

Make a switch of a pump OFF (be clicked by ○ side), and pull power cord, and install rubber screen in inlet / exhaust pipe, and please archive it in a few places of moisture.

4 Caution in Operation

4-1 Caution in Operation

DANGER	**See "Danger" (1) (2) on P. 04.**
WARNING	**See "Warning" (8) (14) (15) (16) on P. 04. 05.**
CAUTION	**See "Caution" (4) (5) (6) (7) (8) on P. 05. 06.**
ATTENTION	**See "Attention" (3) (4) (5) (6) (7) (8) on P 06.07.**

1) It is necessary to clean internal pump when stopped operation in order to maintain the pump performance.
   Have the pump to absorb clean air for 3 - 5 minutes and conduct idling operation.
2) Consult factory in case of special application usage.

4-2 When Thermal Protector Operated

1) When a thermal protector operated, at first turn off the pump power supply (push to ○ side) and disconnect power cable. Contact ULVAC or local agent. Temperature of the pump is very high at this time.
   Do not touch the pump by hand definitely.
2) The pump operates automatically when temperature drops. Shut-off the power supply, and determine the cause of operation of the thermal protector.
3) When the cause of failure was corrected, start operation after confirming the motor temperature is cooled down.

CAUTION	**See "Caution" (6) on P. 06.**

4-3 Starting in Cold Ambient

In the cold ambient, there is a case to confront with difficulty in start because of hardened grease and diaphragm of the bearing.

When it is difficult to start, follow the procedure described below.

1) Open the inlet port to atmosphere and repeat switch ON, OFF two or three times until the pump starts.

   If still it does not start, warm up the ambient temperature to 0℃ (32 degF).

2) Operate the pump a few minutes while the inlet port is open so that the temperature of the pump become warmer gradually.

3) When the pump is warmed up, operate the pump as usual.

5 Pump Performance

5-1 Ultimate pressure

"Ultimate Pressure" mentioned in Catalog and this Instruction Manual means "the lowest pressure obtained by a pump in the status that no gas is filled from the pump inlet port (idling operation status)". Ulvac is measuring the pressure by connecting a film-type (diaphragm type) vacuum gauge to inlet port of the pump.

Please note that the indicated value of the pressure may be different depend on the type of the vacuum gauge.

Ultimate pressure of the actual vacuum devises usually higher pressure than the catalog value. Reason of this phenomena is as follows.

(1) The mounting location of the vacuum gauge is far from the pump and steam and various kinds of gases generated from drops of water or rust that attached to the inner wall of the equipment and piping make the ultimate pressure higher.

(2) Ultimate pressure becomes higher in case there is resource of gas such as vacuum leakage in the vacuum route.

5-2 Exhaust velocity

Flow rate of the diaphragm type dry vacuum pump varies according to the type and pressure of gas to intake. Generally, it shows the maximum exhaust velocity in atmosphere introduction that becomes lower little by little as the pressure becomes low.

In addition, the thinner diameter of piping and longer piping would make piping resistance large resulting the slower discharge velocity.

Nominal discharge velocity of this pump shows the maximum when breathe dry air.

5-3 Power Required

Power to drive a pump is the sum of the work for rotating friction of the machine element (machine work) and the work to compress air (work of compression). It becomes the largest in the vicinity of 2.7 x 10^3 to 4 x 10^4 Pa inlet pressure. When this becomes lower, work of compression is small and power is consumed by machine work.

6. Maintenance・Inspection・Repair

6-1 Caution in Maintenance/Inspection/Repair

DANGER	**See "Danger" (3) on P. 04.**
WARNING	**See "Warning" (4)　(17) (18) on P. 04. 05.**
CAUTION	**See "Caution" (9) (10) (11) on P. 06.**
ATTENTION	**See "Attention" (12) on P. 07.**

Maintenance / repair range that allowed to perform by repair engineers in the Customers are the following 4 items. Do not conduct the other repair and remodeling other than Ulvac standard option.

1) Replacement of diaphragms
2) Replacement of valves
3) Replacement of inlet / exhaust filters
4) Replacement of O rings

6-2 Maintenance

During an operation of the vacuum pump, check the following items at least once in 3 days.

(1) Generation of abnormal noise.
(2) Abnormally hot temperature of the pump.
(3) Normal exhausting.

When there is abnormality, conduct necessary measure according to "6-4. Trouble Check List".

6-3 Periodic Inspection

Conduct periodic inspections of consumable parts in every 4,500 hours after started using and replace parts according to "Guideline of Parts Replacement". Replacement method [6-4. refer to replacement of consumable part]. In case there is no repair engineer, Ulvac Service Section shall be happy to replace the parts.

Table 6 -1 Consumable Parts List

Part name	Quantity		Material	Reference life
	41D(K)	81S(K)		
Diaphragm	2	2	Synthetic rubber (EPDM) PTFE affixed	9,000hr
Valve A	3	2	PTFE	9,000hr
Valve B	1	2	PTFE	9,000hr
Valve holder A	2	2	EPDM	9,000hr
Valve holder B	1	2	SUS	9,000hr
Inlet / exhaust filter	2	3	Urethane cellular porous medium	9,000hr
O ring (S-28)	6	6	Synthetic rubber (FPM)	9,000hr
O ring (P-10A)	2	2	Synthetic rubber (FPM)	9,000hr
Bearing	1 set	1 set	———	15,000hr

These lives may differ according to the working conditions.

Lives may be extended by operating the pump with smaller load by observing "4-1 Caution in Operation".

Operating the pump with smaller load means the operation at ultimate pressure (inlet port closed).

Bearings shall be replaced by Ulvac Service Section.

<Guideline of Parts Replacement>

Replace parts when declined performance and symptom described in Table 6-2 are found.

Table 6 -2 Inspection Positions and Guideline of Parts Replacement

Operating time	Inspection method	Guideline of Parts Replacement	Inspection method
Every 4,500 hours	Diaphragm	Wear Deformation hardening, crack	Visual
	Valve A	Deformation hardening, crack	Visual
	Valve B	Deformation hardening, crack	Visual
	Valve holder A	Deformation hardening, crack	Visual
	Valve holder B	Deformation hardening, crack	Visual
	Inlet / exhaust filter	Contamination, clogging, hardening	Visual
	O ring(S-28)	Hardening, crack, elongation	Visual
	O ring (P-10A)	Hardening, crack, elongation	Visual
	Bearing	Allophone	Auscultation

6-4 Replacement of Consumable Parts

CAUTION

See "Caution" (11) on P. 06.

(1) Internal pump is hot soon after operation. Expose the pump for cooling for about 30 minutes and start replacement work after confirming the pump is cooled down.

(2) Wear a dust mask and gloves when replacing diaphragms and valves. A minute abrasive particle suspends in the air, and there is a risk to go into the human body when breathing.

(3) Wear gloves when replacing diaphragms and valves always. There is a risk of injury.

Prepare the following tools and refer to drawing when working replacement. When having difficulty in preparing the tools, ask Ulvac Service Section.

1 Phillips screwdriver: No. 2

2 Hexagonal wrench: (1) Opposite sides 4 mm (2) Opposite sides 5 mm

3 Torque wrench: (1) Hexagon socket of opposite side 4 mm , set tightening torque to 5N·m
(2) Hexagon socket of opposite side 5 mm、set tightening torque to 11N·m

4 Spanner: Opposite side 14 mm or equivalent monkey spanner

5 Vacuum grease: Use for replacement of diaphragms and O rings

6 Wipe off solvent: Chemical without influence to rubber parts such as ethyl alcohol.

7 Paper (paper rags): Substances that wipe off dirt such as paper rags.

8 Dust mask, gloves: Wear gloves when replacing diaphragms.

* Wipe off the polluted portion in parts replacement with tool No. 6 or 7.

1) Replacement of diaphragm.

(It is recommended to replace 2 sheets at the same time.)

CAUTION

Wear gloves when mounting or replacing diaphragms always. There is a risk of injury.

Use tool No. 1, 2, 3, 4, 5, 6, 7, and 8

1) -1 In case of DA-41D, 81S (* Used DA-81S for reference Photo)

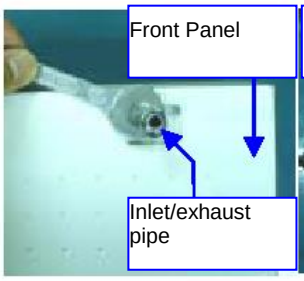


Photo 1

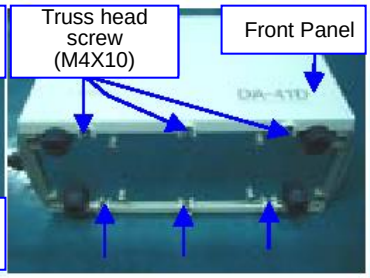


Photo 2

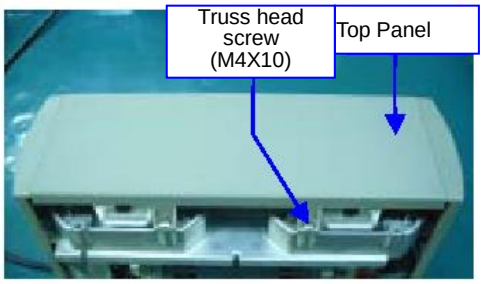


Photo 3

Photo 4

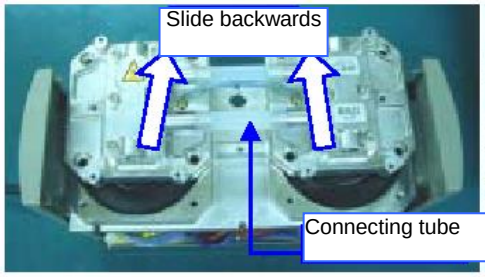


Photo 5

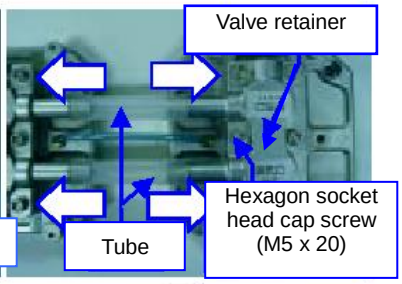


Photo 6

(1) Detach inlet / exhaust pipe, and place the pump on soft cloth. (Photo 1)

(2) Loosen 6 truss head screws (M4 x 10) on pump base and detach the front panel (white panel).

(3) Raise the pump, remove 4 pcs. of truss head screws (M4 x 10) and remove the top panel. (Photo 3)

(4) Remove 8 pcs. of hexagon socket head cap screw (M6 x 25) and detach the pump head. (Photo 4, 5)

CAUTION

- **Do not grab or pull the connection tubes. There is a risk that tube comes off suddenly.**
- **Place the detached pump head on soft cloth.**

(5) Pull connecting tube from the valve retainer, and separate the pump head of left and right. (Photo 6)

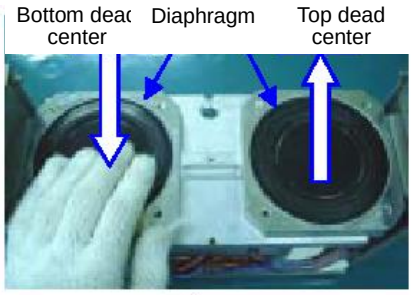


Photo 7

Photo 8

Photo 9

(6) Detach the diaphragm from the main unit. The edge of the diaphragm at the top dead center position (circumference portion) can be grabbed.

* When one diaphragm is pushed down (bottom dead center), another diaphragm comes up (top dead center).

(Photo 7)

(7) Grab the edge of the diaphragm and turn it counterclockwise to detach the diaphragm.

(Photo 8)

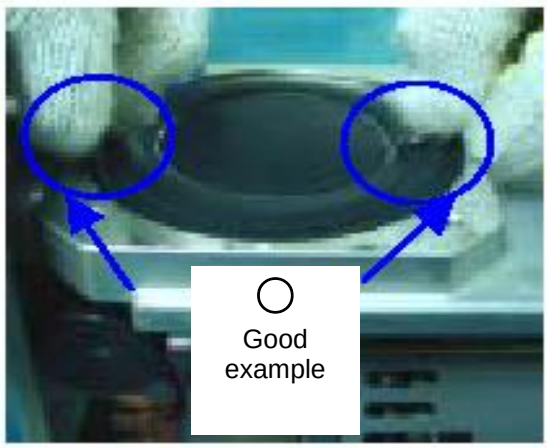
(8) Remove remaining diaphragms likewise.

CAUTION

- **When it is hard to detach, grab it by two people to work.**
- **<u>There is a risk that the connecting rod falls into pump.</u>**
- **It is convenient if insert the pump head and hexagon socket head cap screw (M6 x 25) for fixing to the tap portion of connecting rod after detached diaphragm. (Photo 9)**

(9) Wipe off dirt on the tap portion of the connecting rod with solvent cleanly.

(10) Apply small quantity of vacuum grease on hexagon socket head cap screws (M8 x 18) portion on back of the new diaphragm (to prevention of scoring of a screw) and mount it on the connecting rod by turning clockwise. (Photo 10)



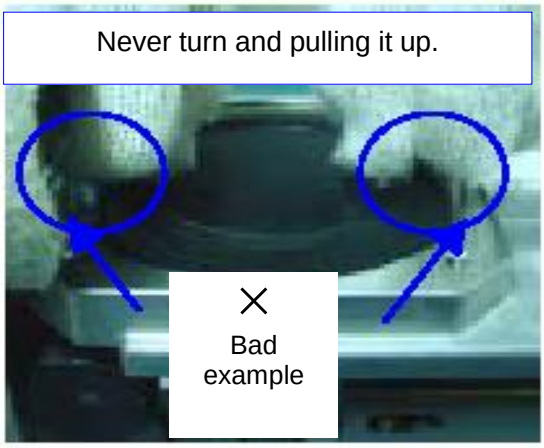


Photo 10

CAUTION

- **As shown in Photo 10 [Good example], grab diaphragm to prevent wrinkle of diaphragm and mount it securely.**
- **Tighten by turning 5 to 10° from the position stopped to mount the diaphragm.**
  Be careful not to tighten too much.

(11) Mount the remaining diaphragms likewise.

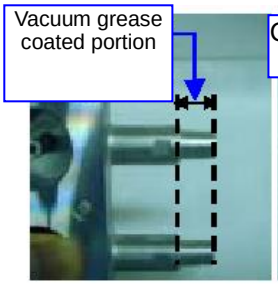


Photo11

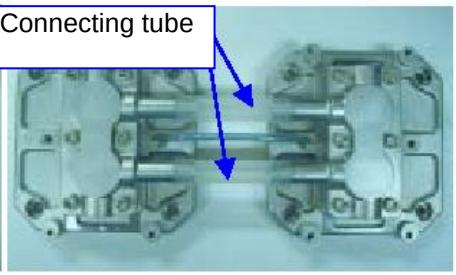


Photo12

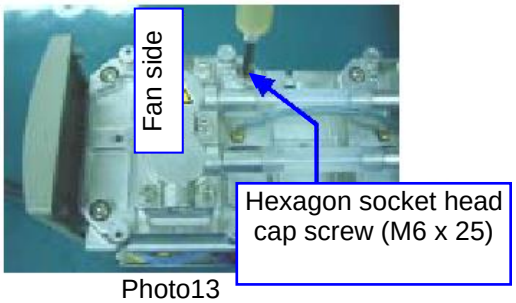


Photo13

(12) Apply small quantity of vacuum grease to the connecting tube mounting portion of valve retainer, and mount the connecting tube. (Photo 11, 12)

(13) Cover casing with the connected pump head and fix it with hexagon socket head cap screw (M6 x 25).

(Photo 13)

CAUTION

- **Tighten hexagon socket head cap screw (M6 x 25) in diagonal / even in tightening torque 11 N·m.**
- **Pay attention to the mounting direction of the pump head.**
  (Photo 13)

(14) Cover top panel and fix it with truss head screws (M4 x 10). (Photo 3)

(15) Lay the pump and fix the front panel with truss head screws (M4 x 10). (Photo 2)

CAUTION

- **When carry out process (14), (15), attach them so that no clearance between each resin panel.**

(16) Raise the pump and mount the inlet / exhaust pipe. (Photo 1)

1) - 2.In case of DA-41DK, 81SK

* Replace the diaphragm according to the procedure for 1)-1 DA-41D, 81S (4) to (13).

2) Replacement of valves

(It is recommended to replace at the same time when replacing diaphragms.)

Use tool No. 1, 2, 3, 4, 6 and 7

DA-41D (K), 81S (K) common procedure

Reference photographs (Photo 14 -) show the cases when replaced the diaphragm and the valve at the same time. When replacing a valve only, carry out the following process while attaching the pump head to the main unit.

(1) Remove DA-41D,81S inlet / exhaust pipe, front panel, and top panel

* Procedure is the same as (1) to (3) of 1) replacement of diaphragm.

It is not necessary to detach DA-41DK ,81SK inlet / exhaust pipe, panels.

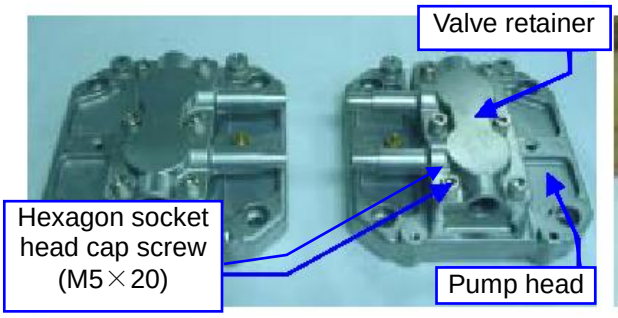


Photo14

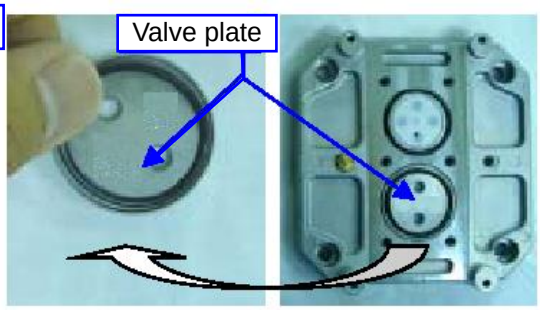


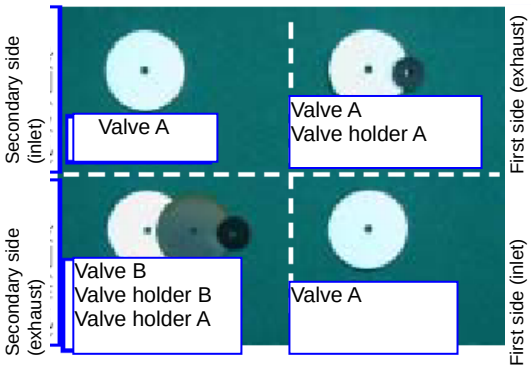
Photo15

(2) Remove 6 pcs. of hexagon socket head cap screw (M5 x 20) and disassemble pump head and valve retainer. When the work on the one step is finished, disassemble another pump head similarly. (Photo 14)

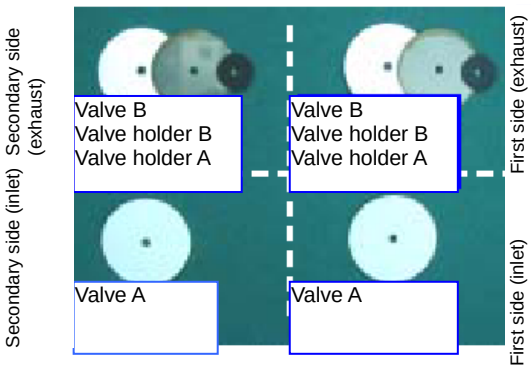
(3) Detach valve plate.

* No adhesive / screws are used for mounting the valve plate. Valve plate can be detached easily by hands since the valve plate is simply embedded in a circular form groove. (Photo 15)

* Valve plates of 2 pcs. each DA-41D (K) and 81S (K) are embedded.



(DA-41D(K) valve to be removed in replacement)



(DA-81S (K) valve to be removed in replacement)

Valve A: White ϕ 24 (hard PTFE)	Valve holder A: Black ϕ 10 (EPDM)
Valve B: White ϕ 24 (soft PTFE)	Valve holder B: Silver ϕ 23 (SUS)

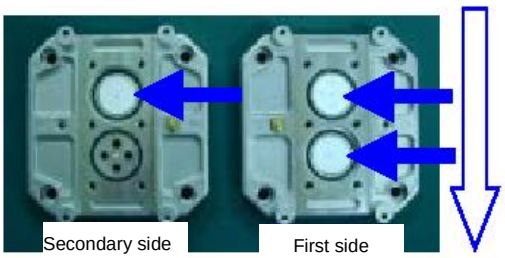
Photo16

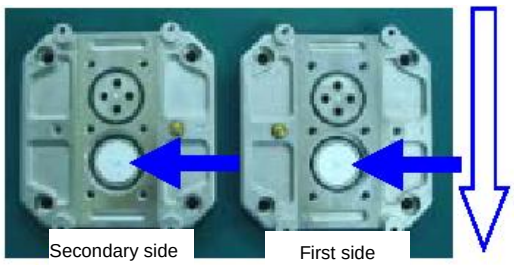
(4) Detach used valves. (Photo 16)

(5) Clean the pump head and the valve retainer with solvent.

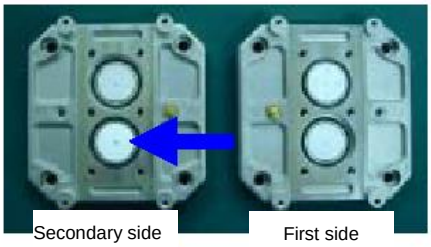
* When clean pump heads, clean both faces of the valve surface side and diaphragm side.

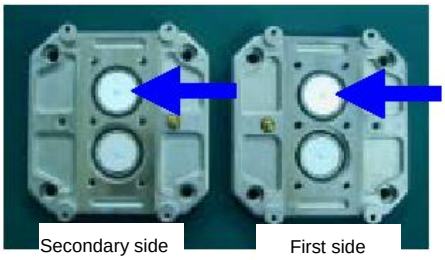
Valve mounting order of DA-41D, DA-41DK	Valve mounting order of DA-81S, DA-81SK



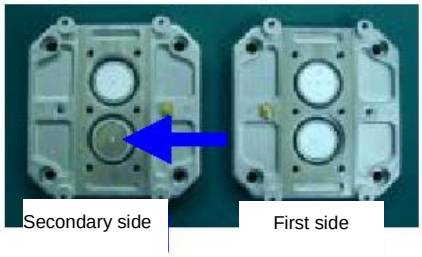


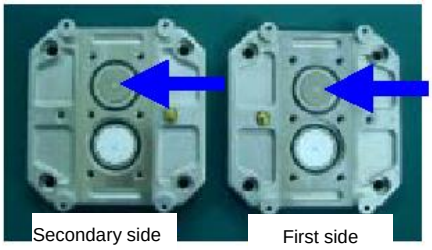
Valve mounting (1): Mount valve A to the position shown by the above Photo one by one. (mount to arrow position)



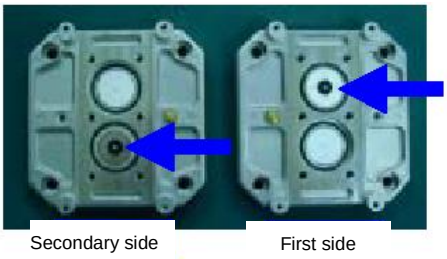


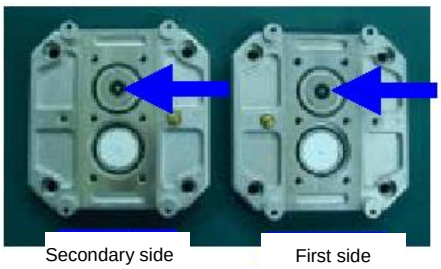
Valve mounting (2): Mount valve B to the position shown by the above Photo one by one. (mount to arrow position)



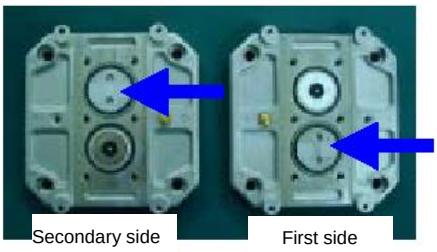


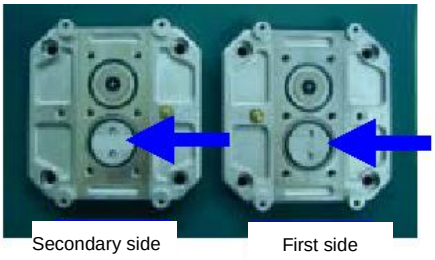
Valve mounting (3): Mount valve holder B to the position shown by the above Photo one by one .(Mount to arrow position)





Valve mounting (4): Mount valve holder A to the position shown by the above Photo one by one.





Valve mounting (5): Mount valve plate to the position shown by the above Photo one by one. (mount to arrow position)

Photo17

(6) Mount a new valve according to Photo 17.

CAUTION	● **Be careful not to make a mistake in type / number of sheets. (Photo 17)** ● **There is no front and back control in valve mounting. Mount it arbitrary.**

(7) Mount the pump head on valve retainer.

CAUTION	● **Make sure no gripping of valves and O rings.** ● **Tighten several times in diagonal / even 5 N· m tightening torque.**

(8) DA-41D (81S) Mount inlet / exhaust pipe, front panel, and top panel.

* Procedure is the same as (14) to (16) of 1) replacement of Diaphragm.

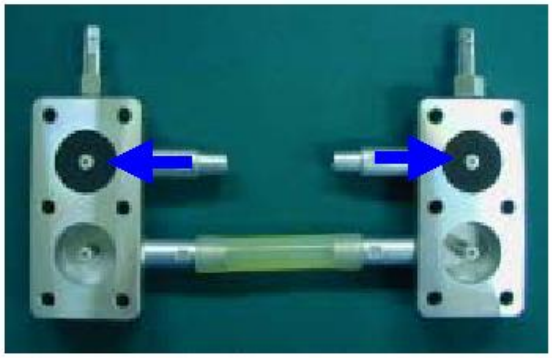
.

3) Replacement of inlet / exhaust filter

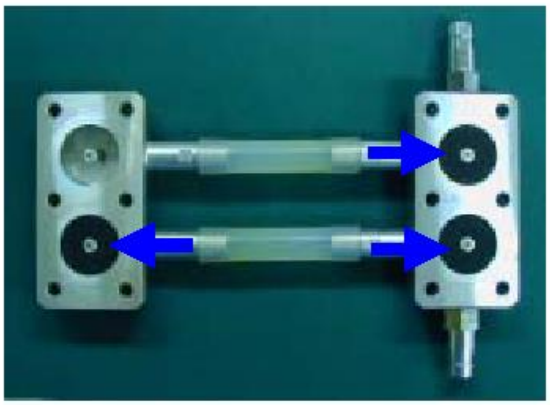
(It is recommended to replace at the same time when replacing diaphragms.)

Use tool No. 1, 2, 3, 4, 6 and 7

DA-41D (K), 81S (K) common procedure



(DA-41D (K) filter mounting portion)



(DA-81S (K) filter mounting portion)

Photo 18

(1) Remove valve retainer from the pump head. (Photo 14)

Procedure is the same as (1) to (2) of 2) replacement of valves.

(2) Detach used inlet / exhaust filter. (Photo 18)

(3) Clean filter mounting portion of valve retainer with solvent.

(4) Mount new inlet / exhaust filter according to Photo 18.

CAUTION

- **Be careful not to make a mistake in mounting portion. (Photo 18)**
- **Embed the inlet-exhaust filter to the depths not to be smashed. After mounting, confirm whether it is not deformed.**

(5) Mount the pump head on the valve retainer.

Procedure is the same as (7) to (8) of 2) replacement of valves.

4) Replacement of O rings

(It is recommended to replace at the same time when replacing diaphragms.)

DA-41D(K), 81S (K) common procedure

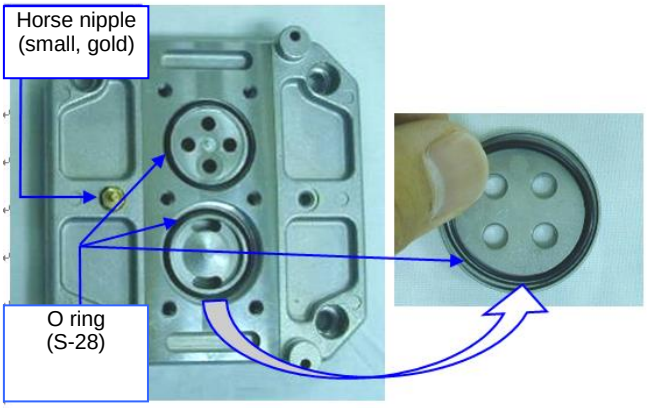


Photo 19

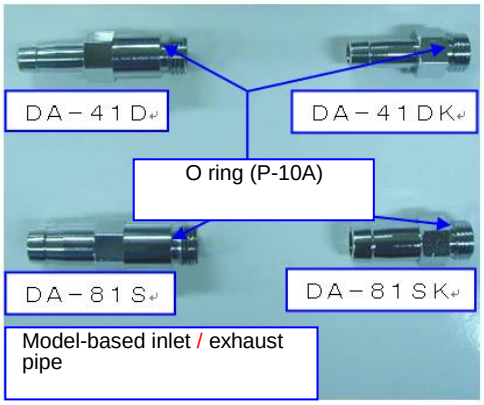


Photo 20

(1) Remove valve retainer from the pump head. (Photo 14)

Procedure is the same as (1) to (2) of 2) replacement of valves.

(2) Remove the valve plate from the pump head. (Photo 15)

Procedure is the same as (3) of 2) replacement of valves.

(3) Remove the O ring (S-28). (Photo 19)

CAUTION

- **3 pcs. each O rings (S -28) (6 pcs. per set) are mounted on the single step pump head.**

(4) Disassemble the horse nipple (Spanish yellow), and remove the O ring (S-4). (Photo 19 upper right drawing)

(5) Disassemble inlet / exhaust pipe from valve retainer and remove O ring (P-10A)

CAUTION

- **Although Inlet / exhaust pipe are different for DA-41D (K) and DA-81S (K), O rings used (P-10A) are same. (Photo 20)**
- **O rings can be removed by hands. In case a tool is used, pay attention not to produce scar on each metal parts.**

(6) Clean pump head, valve retainer, horse nipple (Spanish yellow), inlet / exhaust pipe with solvent.

(7) Apply small quantity of vacuum grease to hose connection of horse nipple (Spanish yellow)

CAUTION

- **Never fill vacuum grease in a hole (φ 0.5 mm) of horse nipple (Small, Spanish yellow).**

(8) Apply vacuum grease slightly on the entire new O rings (S-28, P-10A) and embed to each mounting portion.

CAUTION

- **Referring the above disassembly process, parts to mount and quantities shall be accurate.**

(9) Mount each part. Procedure is the same as (7) to (8) of 2) replacement of valves.

5) Replacement of bearing

Request Ulvac Service Section.

6-5 DA-41D (K), 81S (K) Major Parts Material Indication

Table 6-3 DA-41D(K)、81S(K) Material Indication Table

DA-41D、81S			DA-41DK、81SK		
№	Part Name	Material	№	Part Name	Material
1	Casing	ADC	1	Casing	ADC
2	Pump head	ADC	2	Pump head	ADC
3	Connecting lod	ADC	3	Connecting lod	ADC
4	Eccentric axis	S45C	4	Eccentric axis	S45C
5	Balance weight	S45C (galvanizing)	5	Balance weight	S45C (galvanizing)
6	Valve plate	ADC	6	Valve plate	ADC
7	Valve retainer	ADC	7	Valve retainer	ADC
8	Inlet / exhaust pipe	C3604 (chrome plated)	8	Inlet / exhaust pipe	C3604 (chrome plated)
9	Base	SUS	9	Base	SUS
10	Top panel	Denaturant PPO	10	Panel for fan	SUS
11	Panel for fan	Denaturant PPO	11	Panel for switch	SUS
12	Panel for switch	Denaturant PPO	12	Side panel	SUS
13	Front(side)panel	Denaturant PPO	13	Finger guard	-
14	Cap for front panel	Denaturant PPO	14	Free bush	Nylon 6
15	Diaphragm NT (PTFE affixed)	Metal fittings: ADC Rubber: EPDM Surface: PTFE affixed	15	Diaphragm NT (PTFE affixed)	Metal fittings: ADC Rubber: EPDM Surface: PTFE affixed
16	Valve A	PTFE	16	Valve A	PTFE
17	Valve B	PTFE	17	Valve B	PTFE
18	Valve holder A	EPDM	18	Valve holder A	EPDM
19	Valve holder B	SUS	19	Valve holder B	SUS
20	Pin for pump head	PTFE	20	Pin for pump head	PTFE
21	Inlet / exhaust filter	Urethane cellular porous medium	21	Inlet / exhaust filter	Urethane cellular porous medium
22	Nipple for balance ports	C3604	22	Nipple for balance ports	C3604
23	Horse for balance ports	Polyurethane	23	Horse for balance ports	Polyurethane
24	Connecting tube	Q (silicone)	24	Connecting tube	Q (silicone)
25	O ring (S-28)	FPM	25	O ring (S-28)	FPM
26	O ring (P-10A)	FPM	26	O ring (P-10A)	FPM
27	Rubber leg	NBR	27	Rubber leg	NBR
28	Rubber cap	NR	28	Rubber cap	NR
29	Bearing	-	29	Bearing	-
30	Motor (1 ϕ ,100V) 100 w	-	30	Motor (1 ϕ ,100V) 100 w	-
31	AC axial fan (□ 92 x 38)	-	31	AC axial fan (□ 92 x 38)	-
32	Screws (for Connecting lod)	SUS	32	Screws (for Connecting lod)	SUS
33	Screws (others)	SCM	33	Screws (others)	SCM
34	C form snap ring (for axis)	SS	34	C form snap ring (for axis)	SS
35	Wiring	Connector: Oxygen free copper pipe (electric tin plated) Insulator: Nylon, etc.	35	Wiring	Connector: Oxygen free copper pipe (electric tin plated) Insulator: Nylon, etc.
36	Condensor	EP	36	Condensor	EP
37	Capacitor bracket	SPCC	37	Capacitor bracket	SPCC
38	Cable ground	Nylon 6	38	Cable ground	Nylon 6
39	Gasket	Neoprene rubber	39	Gasket	Neoprene rubber
40	Plastics nut	Nylon 6	40	Nylon clip	Nylon 66
41	Nylon clip	Nylon 66	41	Spiral tube	PE
42	Spiral tube	PE	42		
43			43		
44			44		
45			45		
46			46		

6-6 Trouble Check List

Table 6 -4 Trouble Check List

Trouble contents	Cause	How to resolve problem	Ref.
Start failure · Rotation failure of pump	(1) Not connected to power supply	(1) Connected to power supply	
	(2) Switch is not turned ON	(2) Push switch to | side	
	(3) Abnormal voltage of power source input	(3) Adjust voltage fluctuation to lower than ±10%	
	(4) Wire connection to pump failure	(4) Conduct wire connection to pump again. Consult factory.	3-4.
	(5) Circuit breaker tripped	(5) Investigate cause of breaker trip	
	(6) Thermal protector operated	(6) Shut off power supply and eliminate cause of protector operation. Consult factory.	4-2.
	(7) Ambient atmosphere is low temperature	(7) Adjust temperature 0 to 40℃	4-3.
	(8) Voltage drop	(8) Adjust supply voltage, evaluation of supply cable	
	(9) Power source is failed	(9) Replace or repair	
	(10) Power switch failure	(10) Replace or repair	
	(11) Disconnection of cord	(11) Replace or repair	
	(12) Motor failure	(12) Replace or repair	
	(13) Damage or connection failure of capacitor	(13) Replace or repair	
	(14) Locked connecting rod	(14) Disassembly / inside inspection of pump head	
	(15) Abnormal bearing	(15) Replacement	6-4.
	(16) Miscellaneous. Damage of pump internal parts	(16) Overhaule (replacement of damaged parts)	6-4.
Pressure failed to drop	(1) Pump is small for cubic capacity of vacuum chamber	(1) Select pump again	
	(2) Pressure measuring method of is wrong	(2) Measure pressure correctly	5-1.
	(3) Vacuum gauge is not appropriate	(3) Measure with a vacuum gauge that covers pressure range to measure and calibrated	5-1.
	(4) Connected piping to inlet port is small or length of piping is long	(4) Connect piping thicker than the inlet port inside diameter and make distance from the vacuum chamber	5-1.
	(5) Ambient temperature is not appropriate	(5) Adjust temperature 0 to 40℃	
	(6) Leakage from inlet pipe	(6) Cleaning, replacement	
	(7) Leakage from piping and joint	(7) Investigate leak, diameter, length of piping and repair	
	(8) Foreign material is in the pump	(8) Removal of foreign material, disassembly cleaning or replacement	
	(9) Abnormality occurred in the pump by absorbing fluid, condensable gas	(9) Overhaule (replacement of valve, diaphragm, etc.)	6-4.
	(10) Damage of inlet / exhaust valve	(10) Replacement	6-4.
	(11) Damage of diaphragm	(11) Replacement	6-4.
	(12) Miscellaneous. Pump internal parts were damaged	(12) Overhaul (replacement of damaged parts)	

Trouble contents	Cause	How to resolve problem	Ref.
Temperature of pump surface is abnormally high (higher than room temperature +30℃ (86 degF))	(1) Performing continuous operation in the status that absorption gas pressure is high (2) Absorption gas is high temperature (3) Abnormal voltage of power source input (4) Motor is locked	(1) Do not conduct continuous operation in vicinity of atmospheric pressure (2) Mount refrigerating machine such as gas air conditioners at inlet (3) Adjust voltage fluctuation to lower than ±10% (4) Refer to pump rotation failure description	

7. Conclusion

In case you have questions, please feel free to contact ULVAC Sales Department.

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

□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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