



Instruction Manual

High Vacuum Diaphragm Type Dry Vacuum Pump

DAU-20x

(X: A=100V, B=115V, C=200V, D=220V, E=230V)

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.



Declaration of Conformity



We, Company:ULVAC KIKO,Inc.

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

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

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

declare under our sole responsibility that the product,

Type of Product	: Diaphragm Type Dry Vacuum Pump
Model Name	: DAU-20A, DAU-20B, DAU-20C DAU-20D, DAU-20E

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

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

following the provisions of

The person stated below will keep the following technical documentation:

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

Person authorized to compile the technical file:

(Name and address) Chris Goebel
ULVAC GmbH
Klausnerring 4 85551 Kirchheim b. München, Germany

05.Apr, 2023
Miyazaki , Japan
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Makoto Uchimura
Development manager *Makoto Uchimura*
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We, Company:ULVAC KIKO,Inc.

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

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

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

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

declare under our sole responsibility that the product,

Type of Product : Diaphragm Type Dry Vacuum Pump

Model Name : DAU-20A, DAU-20B, DAU-20C
DAU-20D, DAU-20E

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

BS EN 1012-2:1996+A1:2009

Compressors and vacuum pumps – Safety requirements, Part2. Vacuum pumps

BS IEC EN 61010-1:2010+A1:2019

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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.

- (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

To customers who purchased "DAU-20"

Never grab or bend the tube on the side part of the pump. When I take out a pump from a packing box.

It might break the tube and/or deteriorate the pump performance.

Be sure to grip the handle to pull out.

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°C (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.

<Suction gas>

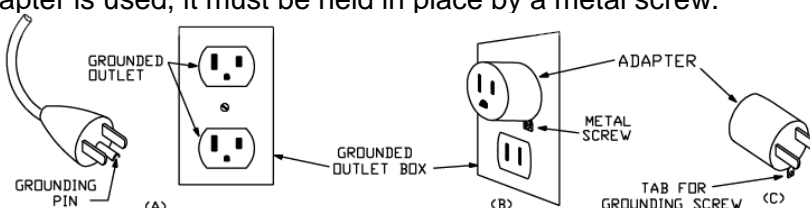
- (4) Suction gas may leak out of the pump main unit from other area than exhaust vent.
Do not use for exhaust of toxic gas.

<Leakage rate>

- (5) The amount of the leakage of this pump is recorded. Use it in consideration of the leak rate. The helium gas is used for the Leak examination. Leakage rate: 2.6×10^{-4} Pa·m³/sec
※ : The measurement of the amount of Leake rate the inside of the pump a vacuum and is a measurement of the amount of penetration of the helium gas.
- (6) The amount inspection of leaks (Flux inspection by the side of an exhaust gas by attainment pressure) 0.03L/min

<Grounding Instructions [Plug]>

- (7) This product must be grounded. In the event of an electrical short circuit, grounding reduces the risk of electric shock by providing an escape wire for the electric current.
If the product is equipped with a cord having a grounding wire with an appropriate grounding plug, the plug must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances.
- (8) Improper installation of the grounding plug can result in a risk of electric shock. If repair or replacement of the cord or plug is necessary, do not connect the grounding wire to either flat blade terminal. The wire with insulation having an outer surface that is green with or without yellow stripes is the grounding wire.
- (9) Check with a qualified electrician or serviceman when the grounding instructions are not completely understood, or when in doubt as to whether the product is properly grounded. Do not modify the plug provided; if it does not fit the outlet, have the proper outlet installed by a qualified electrician.
- (10) DTU-20B is for use on a nominal 115_V circuit, and has a grounding plug similar to the plug illustrated in sketch A in figure. A temporary adapter similar to the adapter illustrated in sketches B and C may be used to connect this plug to a 2_pole receptacle as shown in sketch B when a properly grounded outlet is not available. The temporary adapter shall be used only until a properly grounded outlet (sketch A) is installed by a qualified electrician. The green colored rigid ear, lug, or similar part extending from the adapter must be connected to a permanent ground such as a properly grounded outlet box cover. Whenever the adapter is used, it must be held in place by a metal screw.



Quotation from UL1450



DANGER

<Grounding Instructions [Field Wiring]>

- (11) This product must be connected to a grounded, metallic, permanent wiring system, or an equipment-grounding terminal or lead on the product



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.
Open the distance from the shield to the ventilation entrance part for the fan by 3.5cm or more when you set it up.

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) This pump has thermal protector. But it is detect of temperature only. Overcurrent protection shall be installed at the final installation.
- (9) 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.
- (10) Do not damage, modify, pull the power cord, or place objects on it. Damage to the cord may result in electric shock or fire.
- (11) Always fully insert the power cord into the socket. Partial insertion may result in electric shock.
- (12) Remove the cord from the socket while holding the plug. Failure to do so may result in electric shock.
- (13) Touching the power cord with wet hands may result in electric shock.
- (14) Touching electrical wiring etc while inserting the power plug may result in electric shock..



WARNING

Operation

- (15) This pump is not designed to be explosion-proof. When using the pump, ensure that there are no inflammable materials such as solvents, or explosive gases, in the vicinity. Use under such conditions may result in injury or fire.
- (16) Inserting fingers or objects into the motor inlet may result in electric shock, injury, or fire.
- (17) Operating the pump with the discharge outlet blocked, or with a device which prevents passage of gas to the discharge outlet. The internal pressure of the pump rises 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).
- (18) Do not use it for the human body.
And do not use in applications involving organ transplants, or contact with body fluids or living tissue.

Maintenance and Repair

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



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 5°C to 40°C 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. For indoor use only.
 - e. Well ventilated.
 - f. No explosive gas.
 - g. No direct sun rays.
 - h. No flammability risk.
 - i. When Equipment is installed, temperature in pump circumference shall not exceed 40°C
- (2) There is a risk of hurting lower back. Lift the pump **with both hands definitely** to move and conduct work.
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.
- (3) Install the main disconnection (suitable plug or switch/circuit breaker) device for safety.

<Operation>

- (4) 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>

- (5) 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.
- (6) 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.
- (7) 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>

- (8) When disposing of a scrapping pump, handle as the Industrial Waste observing "Wastes Disposal and Public Cleaning Law ". Never conduce burnout disposal.
- (9) 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.
- (10) 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.



Note

<Installation>

- (1) Do not apply impact to the pump, and not falling sidelong.
There is a risk of failure.
- (2) Never grab or bend the tube on the side part of the pump
It might break the tube and/or deteriorate the pump performance.



<Application>

- (3) This pump is designed for evacuation exclusive use. Do not operate long time in near the atmospheric pressure.
There is a risk of failure.
- (4) 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.
- (5) 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.



Note

- (6) The pump may be damaged and normal operation cannot be expected. Do not suck fluid.
- (7) 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
- (8) Pay attention not to inhale the steam or corrosive gas that may damage human body.

<Operation>

- (9) Please use the pump in ambient temperature in range of 5 to 40°C.
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.
- (10) Do not apply back pressure in the pump exhaust side when start. Load to the motor may cause starting operation failure.
- (11) 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.
- (12) 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>



- (13) 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 DTU-20 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		DAU-20x (X: A=100V, B=115V, C=200V, D=220V, E=230V)			
Exhaust velocity	50Hz	20L/min			
	60Hz	23L/min			
Ultimate pressure		200Pa			
Motor		1 ϕ , AC ($\pm 10\%$)			
		80W, 4 P, condenser driven, w/thermal protector (auto reset type)			
Rated current (A)	A	100V 1.46/1.46(50Hz/60Hz)	D	220V 0.7/0.72(50Hz/60Hz)	
	B	115V 1.30/1.30(50Hz/60Hz)	E	230V 0.67/0.68(50Hz/60Hz)	
	C	200V 0.77/0.74(50Hz/60Hz)			
Rotating speed (min-1)	A	100V 1320/1610	D	220V 1310/1610	
	B	115V 1295/1605	E	230V 1310/1610	
	C	200V 1315/1615			
Inlet-exhaust pipe		O.D. $\Phi 10$ I.D. $\Phi 6$ (Rc1/8)			
Weight		7.5kg			
Operating ambient temperature		5~40°C			
External dimensions		161mm(W)327xmm(L)x217mm(H)			
Noise*		52 dB(A)			
Over Voltage Category		II			
Pollution Degree		2			

1-3. Protector (thermal protector)

- 1) This pump is fitted with an automatic reset thermal protection relay for overload protection. This device shuts off the motor power supply circuit automatically to prevent burn-out if the motor temperature rises due to a pump fault which prevents rotation, or if load becomes excessive.
- 2) It is recommended that additional protective devices (eg. earth leakage breaker, motor breaker) be fitted.



WARNING

See "Warning" (8)(9) on P. 06.



CAUTION

See "Caution" (6) on P. 07.

1-4. Gas Ballast Valve (important)

Standard equipment of this pump includes a gas ballast valve. This valve is effective when absorbing condensable gas. There are cases that ultimate pressure of the pump becomes high after the condensable gas was absorbed as the condensable gas is changed to liquid state and remains in the pump chamber. (This pump is not corrosion resistant.)

When air is inhaling from the gas ballast valve just before of the compression process of the pump, the condensable gas shall be exhausted with air via an exhaust valve without changing to the liquid state. However, the condensable gas remains in the pump chamber if large quantity of condensable gas is exhausted or after having exhausted condensable gas without opening a gas ballast valve because of a limit in throughput capacity of condensable gas by the gas ballast valve

Confirm whether hazardous, explosive compound is generated or not before using the gas ballast valve.



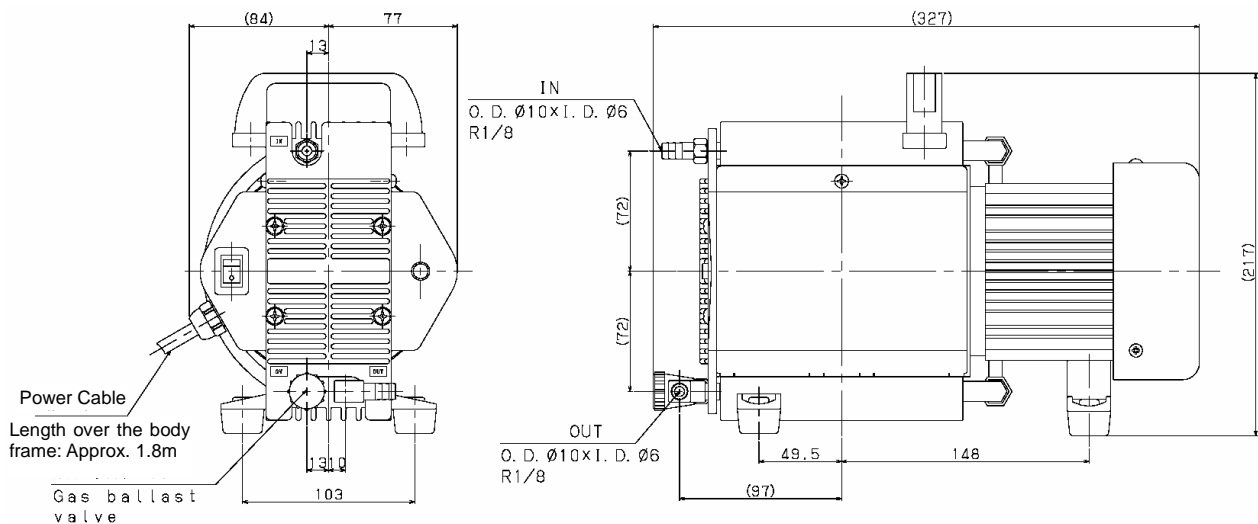
Note

**In case the gas ballast valve is left open when condensable gas is not exhausting, power loss or rise of ultimate pressure shall be resulted.
Close the gas ballast valve when condensable gas is not exhausting.**

**CAUTION**





Temperature of the vacuum pump rises when operated. Do not touch the location other than the valve when the gas ballast valve is operating. Start operation after closing the gas ballast valve always. When the gas ballast valve is used, it is generally considered that the absorbed medium reacts in the pump and exhaust vent. On that occasion, using equipment or facilities shall be damaged and there are risk of personal injury and human life.

2. Appearance



3. Installation / Storage

3-1. Precautions in Installation / Storage

 DANGER	See "Danger" (4) (5) (6) (7) (8) (9) (10) (11) on P. 04.05.
 WARNING	See "Warning" (1) (2) (3) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) on P. 05.
 CAUTION	See "Caution" (1) (2) (3) on P. 06.07.
 Note	See "Note" (1) (2) (7) on P. 07.08.

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') 5°C to 40°C 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°C (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.



Please use the three core power supply cable (lead wire size 0.75m2 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 6 mm internal diameter (close to AWG 3) 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) 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.
- 6) 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.

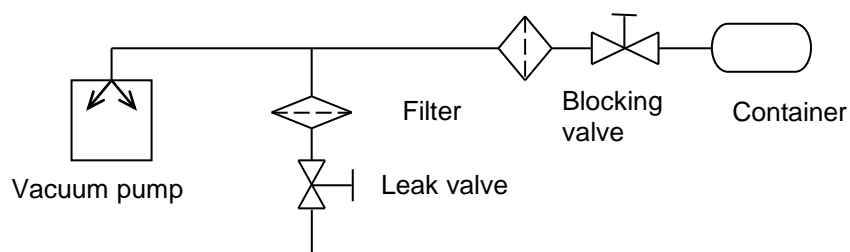






Fig. 3 -1 Piping Example for Evacuation of Container

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) (4) (5) (6) on P. 04.
 WARNING	See "Warning" (9) (15) (16) (17) (18) on P. 05.06.
 CAUTION	See "Caution" (4) (5) (6) (7) (8) on P. 06.07.
 Note	See "Note" (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) on P. 07.08.

- 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

This pump incorporates an automatic reset type thermal protector. It automatically cuts off the motor power circuit to prevent the motor from being damaged by burning when the pump stops rotating due to trouble or when the pump is energized with an over current due to

 CAUTION	See "Caution" (6) on P. 07.
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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 5°C (41 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 devices 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 3×10^4 to 10×10^4 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) (19) (20) on P. 06.
 CAUTION	See "Caution" (8) (9) (10) on P. 07.
 Note	See "Note" (13) on P. 08.

Maintenance / repair range that allowed to perform by repair engineers in the Customers are the following 2 items. Do not conduct the other repair and remodeling other than Ulvac standard option.

- 1) Replacement of diaphragms
- 2) Replacement of valves

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 "6-5. Trouble Check List".

6-3 Periodic Inspection

Conduct periodic inspections of consumable parts in every 3,000 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
Diaphragm	4	Main body: Synthetic rubber (EPDM) Parts exposing to gas: PTFE	6,000 hr
Valve	8	Fluorine Rubber	6,000 hr
Gas ballast cap	1	—	6,000 hr
Rubber leg	4	—	6,000 hr
L form coupling	2	PP	Different according to working condition / application
Gas ballast nipple	1	PP	Different according to working condition / application
Horse nipple	1	PP	Different according to working condition / application
L form nipple	1	PP	Different according to working condition / application
Bearing	1 set	———	15,000 hr

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.

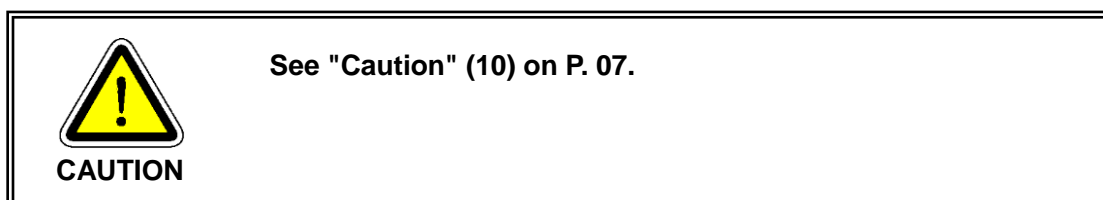
<Guideline of Parts Replacement>

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 3,000 hours	Diaphragm	Peel off or wear of PTFE area Rubber deformation hardening, or crack, etc.	Visual inspection
	Valve	Rubber deformation hardening, or crack, etc.	Visual inspection
	Gas ballast cap	Rubber deformation hardening, or crack, etc.	Visual inspection
	Rubber leg	Rubber deformation hardening, or crack, etc.	Visual inspection
	L form coupling	Deformation hardening, crack, split, leak, etc.	Visual inspection
	Gas ballast nipple	Deformation hardening, crack, split, leak, etc.	Visual inspection
	Horse nipple	Deformation hardening, crack, split, leak, etc.	Visual inspection
	L form nipple	Deformation hardening, crack, split, leak, etc.	Visual inspection
	Abnormal bearing	Allophone	Auscultation

6-4 Replacement of Consumable Parts



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.

Confirm that pump power source is disconnected from outlet or terminal blocks before conducting replacement work without fail.

Confirm whether you do not absorb hazardous solvent for the human body. When it is hazardous, do not conduct disassembly work definitely.

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 2.5 mm (0.1") (2) Opposite sides 5 mm (0.2")
- 3 Torque wrench: (1) Torque driver (plus) set tightening torque to 5N·m

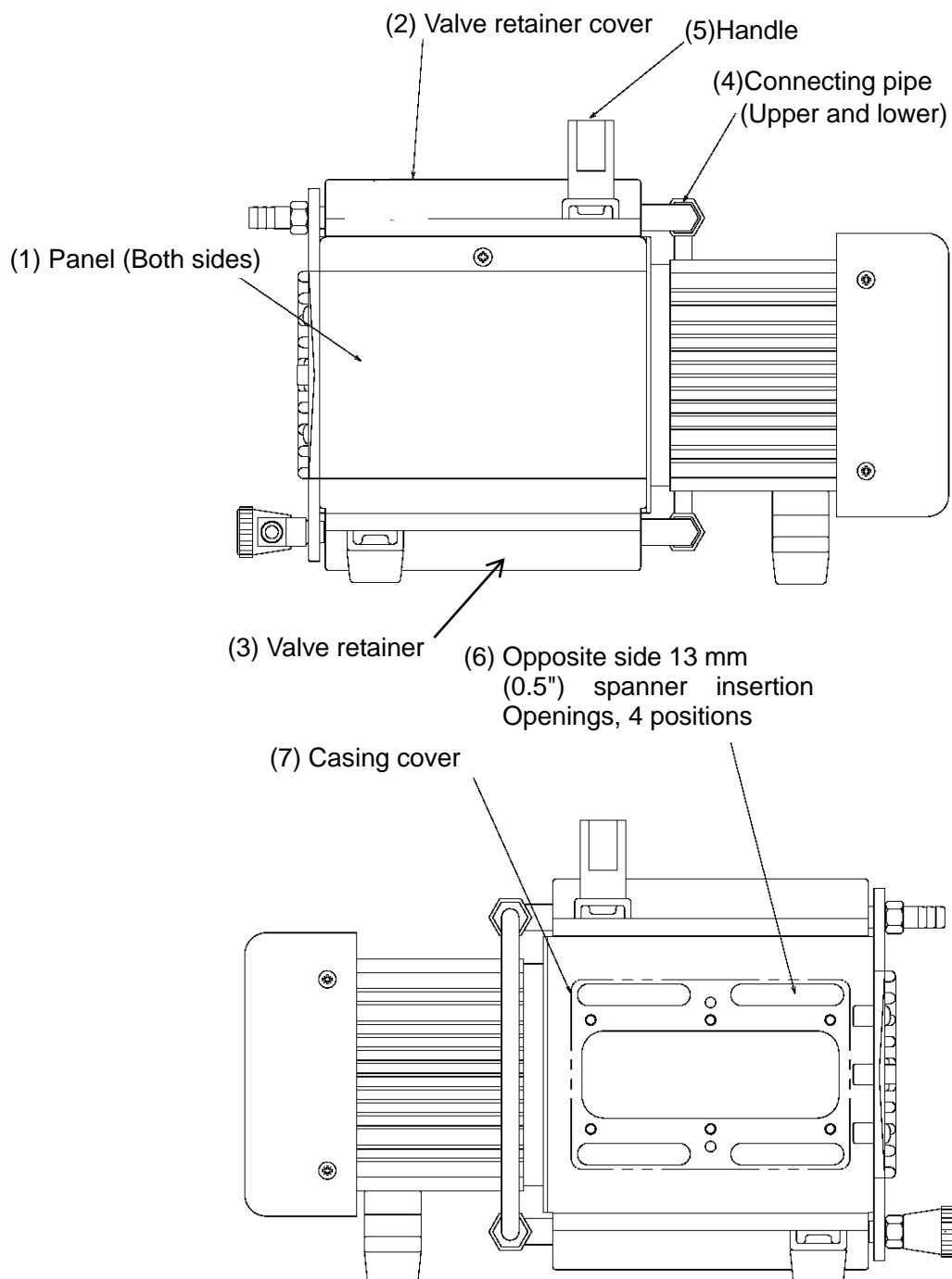
- 4 Spanner: Opposite sides 13 mm (0.5") (thickness lower than 5.5 mm (0.2")) Torque spanner (4 N·m) Opposite sides 17 mm (0.7")
- 5 Wipe off solvent: Chemical without influence to rubber parts such as ethyl alcohol.
- 6 Paper (paper rags)
- 7 Air compressors

- 1) Replacement of diaphragm valves. It is recommended to replace all sheets at the same time.

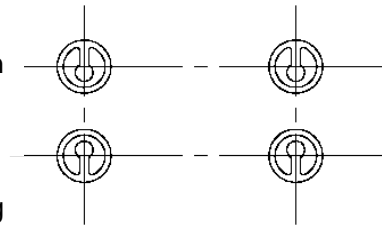


CAUTION

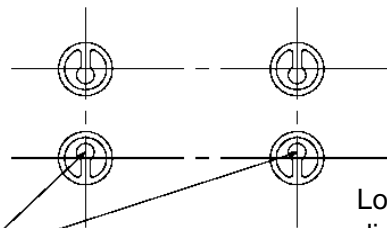
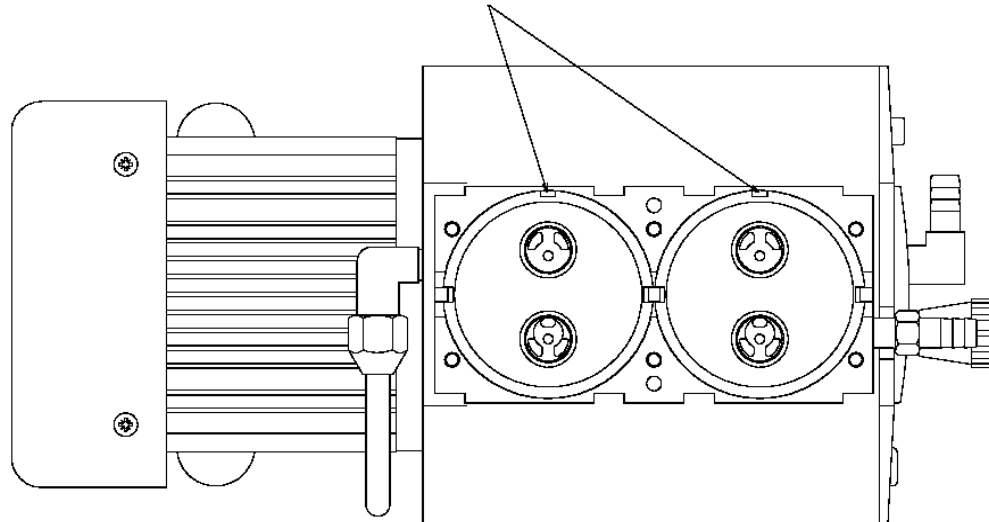
When working on replacement, wear gloves always. There is risk of injury.



Mount upper level valve in orientation
as shown in right drawing



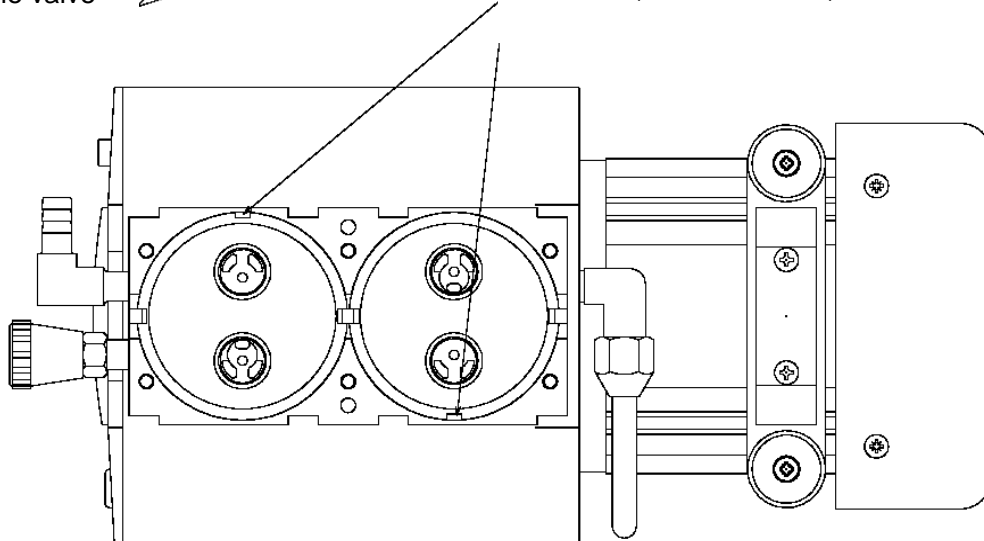
Upper level pump head mounting
direction (Notch direction)



Mount the lower level valve in
orientation as shown in left drawing

Open hole valve

Lower level pump head mounting
direction (Notch direction)



Tools to use No. 1, 2, 3, 4, 5, 6

Replacement work procedure

(Replacement procedure from the upper level)

- 1 Detach handle ⑤ at first.
- 2 Detach panel ① of pump left and right.
- 3 Detach switch plug terminal and ground lead of the side that power cord is connected.
- 4 Loosen 6 pan head small screws and detach Casing Cover ⑦.
- 5 Loosen 6 pan head small screws on pump top face and detach Valve Retainer Cover ②.
- 6 Detach Valve Retainer ② and loosen nuts that fixed Connecting Pipe ④ simultaneously and detach the pipe.
- 7 Detach Valve and Pump Head, and Parallel Pin.
- 8 Insert a spanner of opposite side 13 mm (0.5") into Elongated Hole ⑥ on casing, and detach Diaphragm.



CAUTION

The diaphragm is bonded on the casing in some model. In such case, work after removing the diaphragm from the casing by rotating a shaft.

- 9 In case spacers are attached to the diaphragm and connecting rod, attach the spacers when replacing the diaphragm.
- 10 Attach new diaphragm and tighten with a spanner of opposite side 13 mm (0.5") lightly. Afterwards, tighten with a torque spanner in 4N·m as final tightening.
- 11 Align a direction of the pump head and attach it on the diaphragm.(see P.09 for orientation)
- 12 Confirm a direction of a valve on the circular form shaped portion of pump head and attach it. (see P.09 for orientation)
- 13 Insert Parallel Pins in the casing.
- 14 Attach Valve Retainer and tighten 6 pan head small screws alternatively. Finally, tighten it with a torque driver (5 N·m).
- 15 Attach Connecting Pipe to L Form Coupling on Valve Retainer and tighten nuts with hands. Afterwards, further tighten with a spanner of opposite side 17 mm (0.7") 1/4 to 3/4 turn.



CAUTION

If tighten too much with a spanner, it may cause cracked nuts or leakage. Pay enough attention.

- 16 Conduct replacement work on the lower level by following procedures 4 through 15 described above.

- 17 When replacement work of lower level was finished, rotate the pump 180° so that rubber leg is moved down and attach Casing Cover ⑦.
- 18 Attach Panel ① of left and right and switch plug terminal and ground simultaneously.
- 19 Attach Handle ⑤.
- 20 In the last, confirm whether screws or valves besides the parts replaced are not left. If anything left, it would be conceivable to fail replacement or mounting. Check the procedure from the item 1.
- 21 Before turning the switch ON, check the work, particularly the area related to the power supply, again and start the pump operation. (Attention: Be sure to fully check it!)

2) Replacement of Piping

Replacement of piping may differ according to the application for use and operating time.

As replacement guideline, conduct immediately in case pump performance is not satisfied due to leakage from couplings or crack and split were found.

Refer to the following table for parts to be used.

Name	Name of Manufacturer	Model	Material	Quantity
L form coupling	Nitta Moore	CP-L8-R1/8	PP	2 pcs.
Connecting pipe	PISCO	SFT0860-5-C (5 m (16.4') long)	Fluorine resin (PFA)	300 mm (1') approx.

3) Replacement of bearing

Request ULVAC Service Section.

6-5 Trouble Check List

Table 6 -3 Trouble Check List

Trouble contents	Cause	How to resolve problem	Reference
Start failure - Rotation failure of pump	(1) Not connected to power supply	(1) Connected to power supply	3-4.
	(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 $\pm 10\%$	
	(4) Wire connection to pump failure	(4) Conduct wire connection to pump again. Consult factory.	
	(5) Circuit breaker tripped	(5) Investigate cause of breaker trip	4-2.
	(6) Thermal protector operated	(6) Shut off power supply and eliminate cause of protector operation. Consult factory.	
	(7) Ambient atmosphere is low temperature	(7) Adjust temperature 5 to 40°C (41 to 104 degF)	4-3.
	(8) Voltage drop	(8) Adjust supply voltage, evaluation of supply cable	6-4.
	(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	
	(16) Miscellaneous. Damage of pump internal parts	(16) Overhaul (replacement of damaged parts)	6-4.
Pressure failed to drop	(1) Pump is small for cubic capacity of vacuum chamber	(1) Select pump again	5-1.
	(2) Pressure measuring method of is wrong	(2) Measure pressure correctly	
	(3) Vacuum gauge is not appropriate	(3) Measure with a vacuum gauge that covers pressure range to measure and calibrated	
	(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 5 to 40°C (41 to 104 degF)	
	(6) Leakage from inlet pipe	(6) Cleaning, replacement	
	(7) Leakage from piping and joint	(7) Investigate leak, diameter, length of piping and repair	6-4.
	(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) Overhaul (replacement of valve, diaphragm, etc.)	
	(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	Reference
Temperature of pump surface is abnormally high (higher than room temperature +30°C (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 $\pm 10\%$ (4) Refer to pump rotation failure description	

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: 5- 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.

Disposal

When disposing of a scrapping pump, please handle according to the laws legislated by country and the ordinance issued by local government.



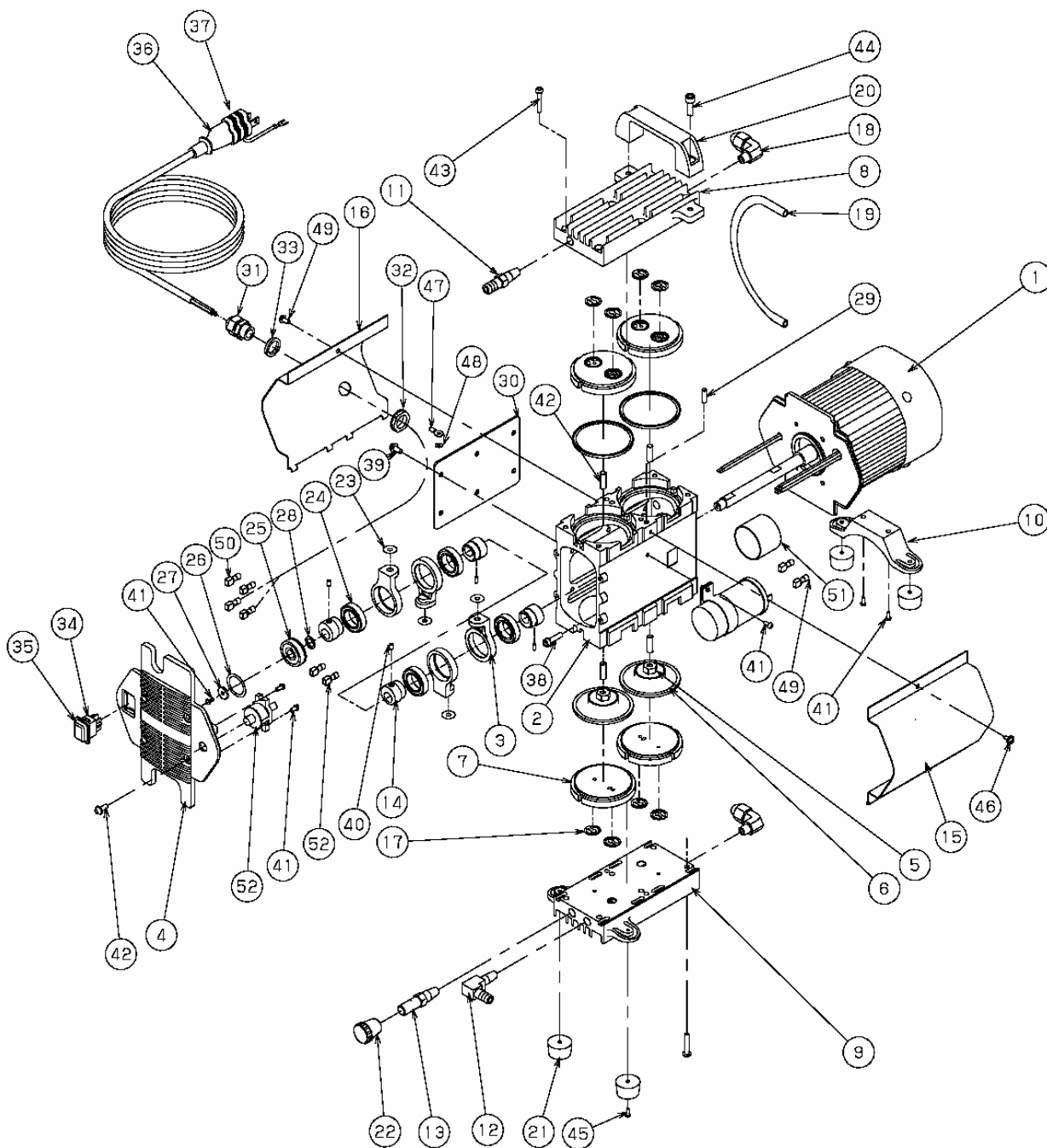
CAUTION

When disposing of poisonous gas that endangers the human body, consign scrapping processing with a specialized disposing vendor. Not only a pump but substance accompanying the pump shall be considered as toxic substance.

Parts Material Table

DAU-20

No.	Name	Quantity	Material	No.	Name	Quantity	Remarks
1	Motor	1	—	31	Cable ground	1	Resin
2	Casing	1	Aluminum	32	Plastics nut	1	Resin
3	Connecting rod	4	Aluminum	33	Gasket	1	Rubber
4	Front cover	1	Aluminum	34	Rocker switch	1	—
5	Metal fittings for diaphragm	4	Aluminum	35	Protection cap	1	—
6	Diaphragm	4	Fluorine EPDM	36	Power cord with plug	1	—
7	Pump head	4	Aluminum	37	Plug adapter	1	—
8	Valve retainer 1	1	Aluminum	38	Bolt with hexagon head hole	4	SUS
9	Valve retainer 2	1	Aluminum	39	Pan machine screw	10	SUS
10	Motor base	1	Aluminum	40	Setscrew	4	SUS
11	Horse nipple	1	PP	41	Pan machine screw	6	SUS
12	L form nipple	1	PP	42	Setscrew	4	SUS
13	Gas ballast nipple	1	PP	43	Pan machine screw	12	SUS
14	Eccentric axis	4	Iron	44	Bolt with hexagon head hole	2	SUS
15	Panel B	1	SUS	45	Pan machine screw	4	SUS
16	Panel A (with hole)	1	SUS	46	Pan machine screw	2	SUS
17	Valve	8	Fluorine rubber	47	Crimped terminal	1	—
18	L form coupling (Chemifoot)	2	PP	48	Shake proof washer	1	SUS
19	Tube (connecting pipe)	1	PFA	49	Plug type joining terminal	4	—
20	Handle	1	Resin	50	Plug type joining terminal	4	—
21	Rubber leg	4	Synthetic rubber / iron	51	Capacitor cap	1	—
22	Gas ballast cap	1	NR	52	Thermal protector	1	—
23	Diaphragm spacer	4	SUS	53			
24	Bearing	4	Iron	54			
25	Bearing	1	Iron	55			
26	Pressurized washer	1	Spring steel	56			
27	Metal washer	1	Iron	57			
28	Metal washer	1	Iron	58			
29	Parallel pin	4	Iron	59			
30	Casing cover	1	Aluminum	60			

Exploded view

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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