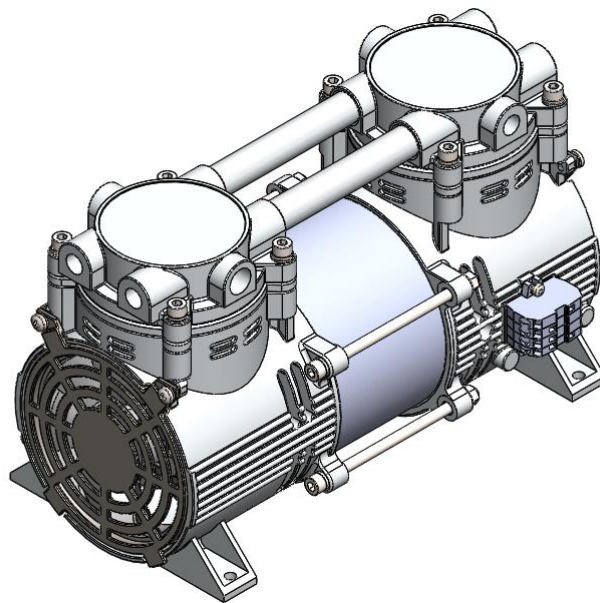


# User Manual

Rocking piston type dry vacuum pump

DOP-120SX

DOP-120SY



## Request

In order to safely and efficiently use this product, please read the instruction manual before use.

Keep the user manual in a safe place.

The dimensions and specifications stated in this manual are subject to change without notice in order to improve performance.

**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,

<b>Type of Product</b>	<b>:</b>	<b><u>Oscillating Piston Type Dry Vacuum Pump</u></b>
<b>Model Name</b>	<b>:</b>	<b>DOP-120SX</b>
		<b>DOP-120SY</b>

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

**31.Mar, 2023**  
**Miyazaki , Japan**  
(date & place)

**Makoto Uchimura**  
**Development manager** *Makoto Uchimura*  
(name, function, signature)



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** : **Oscillating Piston Type Dry Vacuum Pump**

**Model Name** : **DOP-120SX**  
**DOP-120SY**

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

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

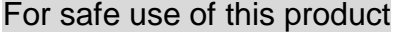
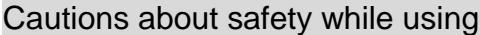

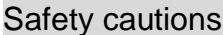
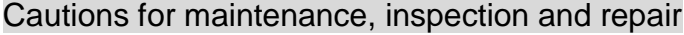
**31.Mar, 2023**  
**Miyazaki , Japan**  
(date & place)

**Makoto Uchimura**  
**Development manager** *Makoto Uchimura*  
(name, function, signature)



# Table of Contents

 indicates a page with safety-related content.

0. Before using .....	P.01
0-1. Check when opening the package .....	P.02
0-2.  For safe use of this product .....	P.03
· Safety symbols .....	P.03
·  Cautions about safety while using .....	P.04
1. Product Outline .....	P.1
1-1. Purpose of Use and Prohibited Items .....	P.1
1-2. Product Specification .....	P.1
1-3. Protective equipment (Thermal protector) .....	P.2
2. External drawings.....	P.2
3. Installation and storage .....	P.4
3-1.  Safety cautions for installation and storage .....	P.4
3-2. Ambient conditions during installation, storage and operation .....	P.4
3-3. Installation location .....	P.5
3-4. Operation check when installing .....	P.5
3-5. Wiring .....	P.5
3-6. Fluctuations in the power supply voltage and frequency .....	P.6
3-7. Piping.....	P.6
3-8. Storage .....	P.6
4.  Safety cautions.....	P.7
4-1. Safety cautions .....	P.7
4-2. When the thermal protector trips.....	P.7
4-3. Precautions when starting .....	P.7
5. Pump performance.....	P.8
5-1. Ultimate pressure.....	P.8
5-2. Exhaust velocity .....	P.8
5-3. Required power .....	P.8
6. Maintenance, inspection and repair .....	P.9
6-1.  Cautions for maintenance, inspection and repair .....	P.9
6-2. Maintenance .....	P.9
6-3. Periodic inspection.....	P.10
6-4. Replacement and cleaning of consumables .....	P.11
6-5. Disposal.....	P.12
6-6. Trouble checklist.....	P.13



7. Final notes.....	P.14
• Warranty .....	P.14
• Usage Status Check Sheet (Used when requesting disassembly and repair)	
• Product information, service bases, and contact information	

## Tables and figures

Fig. 2-1. DOP-120SX external drawing .....	P.2
Fig. 2-2. DOP-120SY external drawing .....	P.3
Fig. 3-1. Ground cable wiring position .....	P.5
Fig. 3-2. Power supply installation example .....	P.5
Fig. 3-3. Fluctuations in the power supply voltage and frequency .....	P.6
Fig. 3-4. Piping example for evacuating container .....	P.6
Fig. 6-1. Disassembly drawings .....	P.12
Table 1-1. DOP-120SX/Y product specifications.....	P.1
Table 1-2. Thermal protector characteristics .....	P.2
Table 4-1. Thermal protector characteristics .....	P.7
Table 6-1. List of consumable parts .....	P.10
Table 6-2. Maintenance and Inspection Locations .....	P.10
Table 6-3. Trouble checklist .....	P.13
Attached document: Wiring method .....	P.15



## 0. Before using

Thank you for purchasing this product.

This pump is only for evacuating vacuums. If it is not handled correctly, it may lead to damage or accidents. Use after reading the instruction manual and pay attention to inspections, maintenance and safety, etc.

### Users

This product is only to be handled by people who have read the instruction manual, and sufficiently understood the items related to the safety cautions, pump specifications and operation method.

### Reading and Understanding the Manual

Read the manual thoroughly before use, and ensure that the equipment is used correctly. It is particularly important to read the section entitled "For safe use of this product."

### Storing the User Manual

Keep the user manual in a safe place.  
After reading the manual, store it in a safe place where it is readily available to users.

### Copying of the Instruction Manual Prohibited

Copying of any part of this manual for use by a third party is prohibited without permission of ULVAC.

### Legal Compliance

Ensure that the pump is disposed of in accordance with national legislation, and as required by your local authority.

### Safety During Repairs

To ensure the safety of repair personnel, please note the usage conditions, particularly the presence of any dangerous substances, when making a repair request to the manufacturer.  
The repair request may be refused if the usage conditions are unclear.



## 0-1. Check when opening the package

Check the following after opening the packaging.

- (1) Check that the product is as ordered.
- (2) Check that all the accessories are there.

<Standard Accessories>

- User Manual	..... 1
- Intake/exhaust plug (attached to pump)	..... 2
- Rubber feet (attached to pump)	..... 4
- Nylon clip (attached to pump)	..... 1

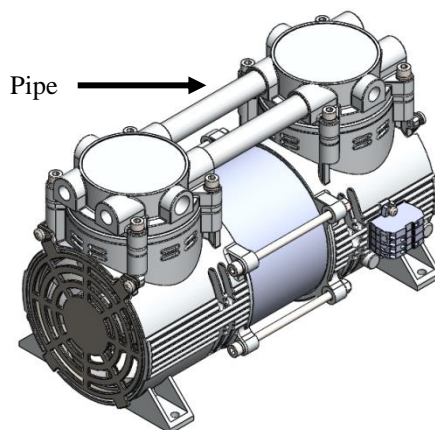
- (3) Check that there is no damage.
- (4) Check that the screws on the outside are not loose or missing.

Contact your dealer or ULVAC sales department if a problem has occurred.



## Attention

1. When taking the pump out of the packaging box, don't hold the pipe on the top of the pump and press or bend it. Doing so may lead to damage to the pipe and reduced pump performance.
2. Remove the intake/exhaust plug before using the pump.
3. If there is a possibility of foreign matter or dust entering the pump, attach an intake filter.
4. In order to lower the pump ambient temperature, open ventilation holes into the device and attach a cooling fan. Do not block the cooling fan ventilation holes. Ensure there is at least 100 mm space from the pump.
5. Attach a silencer to reduce the operation noise.



DOP-120SX/Y



## 0-2. For safe use of this product

Read the section “For safe use of this product” thoroughly before using the equipment. This manual and the pump warnings include safety icons to assist in understanding points to be followed.

The safety symbols noted here are provided to ensure that the product is used safely, and to avoid danger and injury to users and other personnel. Ensure that these precautions are always followed.

### - Safety symbols

The meanings of these symbols are as described below.



#### Danger

Incorrect use poses an imminent threat and can result in a fatality or a serious injury for the users.



#### Warning

There is a danger of death or serious injury to the operator if the equipment is used incorrectly.



#### Caution

Incorrect use poses a risk and can result in light or moderate injury to users, or physical damage.



#### Attention

Incorrect use poses a possibility of damage to the equipment, or problems with operation.



#### Caution – high temperatures

Parts of the pump surface may reach temperatures in excess of 60°C while the pump is operating.  
Don't touch the pump while it is operating. It may result in burns.



#### Caution – electric shock

Turn OFF the main power supply when performing work involving electricity such as wiring.  
Failure to do so may lead to electric shocks.



Pump Intake pipe



Pump exhaust pipe



## - Cautions about safety while using

### Danger

#### <Purposes>

- (1) This pump does not have an explosion-proof structure. Don't use it to evacuate explosive gasses.
- (2) The gas sucked in by the pump may leak out from places other than the exhaust. Don't use it for anything other than clean, room-temperature air or N<sub>2</sub>.

#### <Maintenance and repair>

- (3) When requesting ULVAC's service division for disassembly or repair, always note the gases used, and complete the check list at the end of this manual. If the pump has been used to exhaust toxic gases, the pump itself will also be toxic. Use with some gases may render disassembly and repair impossible. Pay sufficient attention.

### Warning

#### <Installation>

- (1) Do not use the pump in an explosive atmosphere. Use under such conditions may result in injuries or a fire.
- (2) Ensure that the vicinity of the pump is completely free of inflammable material such as flammable solvents, etc.  
Failure to follow this requirement may result in fire.
- (3) Ensure that the vicinity of the motor is free of obstacles which may obstruct ventilation.  
Obstructed ventilation may result in burns or a fire.
- (4) In order to avoid the possibility of fires and explosions, protect the pump with a nonflammable cover.

#### <Power supply>

- (5) When inspecting and repairing the pump, turn OFF the main power supply of the device and check the pump has stopped before starting it.
- (6) Ensure that all wiring work is performed in accordance with electrical equipment standards and internal wiring regulations. Incorrect wiring work may result in fire.
- (7) When performing electrical wiring, turn OFF the main power supply of the device before starting it. Never perform the work while the electricity is still flowing. Working under such conditions may lead to electric shock.
- (8) Ensure that the equipment is earthed correctly. Failure to earth the equipment correctly may result in electric shock in the event of a malfunction or earth leakage.
- (9) Use the motor only at the rated voltage. Use at a different voltage may result in the overload protection not operating correctly, motor burnout, or fire.
- (10) Do not damage the pump-side power supply lead or modify it, pull it, or put anything on top of it. It may result in earth leakages or electric shocks or fires.

[Continued on the next page]



- (11) When attaching the electric cord to the pump, attach it firmly to the terminal block in an appropriate manner.  
Failure to do so may lead to electric shocks. Ensure that wiring and installing work is done in accordance with local regulations and safety requirements. Connect the earth to the bottom of the pump terminal block.  
(Refer to 3-4 and 3-5.) (Attached document: wiring method)

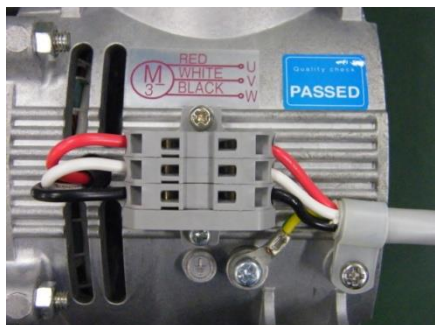


Photo: attachment example

- (12) When removing the attached power cord, remove it from the terminal block after turning OFF the main power supply of the device. Failure to do so may lead to electric shock.
- (13) Do not touch the electric cord with wet hands. Doing so may lead to electric shocks.
- (14) If the electric cord is connected to the terminal block, do not touch the electrical wiring. Doing so may result in electric shocks.

#### <Operation>

- (15) This pump does not have an explosion-proof structure. Do not use the pump near inflammable material such as flammable solvents, etc. or in an explosive atmosphere. Use under such conditions may result in injuries or a fire.
- (16) Do not put your fingers or anything else in the motor openings. Failure to follow this requirement may result in electric shocks, injuries, or fire.
- (17) There is a danger of bursting. Do not operate the pump with the exhaust blocked, or with the passage of gas on the exhaust side obstructed. Under these conditions, the pump pressure increases, and this may cause it to burst, or the motor to become overloaded. This pump does not have a pressure-resistant structure.  
The internal pressure limit of this pump is 0.03 MPa (gauge pressure).

#### <Maintenance and repair>

- (18) Ensure that this pump is dismantled and repaired only by a repair technician.  
Repair technician: Somebody who has received technical education from us.
- (19) Wear a dust mask and gloves when replacing the cup packing, intake valve, exhaust valve or gasket, etc. Fine wear particles disperse into the air and can enter your body through inhalation.



# Caution

## <Installation>

- (1) Wear debris from the cup packing is discharged from the exhaust and contaminates the room. If necessary, attach a pipe, etc. and discharge it outside.
- (2) This pump is designed with very precise clearances, and the following conditions must therefore be satisfied during storage, mounting, and operation.
  1. Ambient temperature during operation: within the ambient temperature in the product specifications (refer to Table 1-1).
  2. Ambient humidity during operation: 85% RH (relative humidity) or less
  3. Other (during storage and operation)
    - a) A level location with sufficient floor strength.
    - b) No condensation.
    - c) No dust.
    - d) Inside a room with good ventilation.
    - e) No corrosive or explosive gas.
    - f) Not in direct sunlight.
    - g) No danger of ignition.
    - h) When assembling the pump, temperature around the pump not to exceed the ambient temperature upper limit in the product specifications (refer to Table 1-1).
    - i) There is sufficient space around the pump and the pump cooling fan is not blocked.
- (3) In order to lower the pump ambient temperature, open ventilation holes into the device and attach a cooling fan.  
Do not block the cooling fan ventilation holes.  
Ensure there is at least 100 mm space from the pump.

## <Operation>

- (4) Do not touch the rotating parts such as the motor and cooling fan, etc. while the pump is operating.  
Doing so may result in injury.
- (5) The entire pump becomes very hot when the thermal protector trips. Do not touch it. It may lead to burns. **Turn OFF the main power supply of the device.**
- (6) The pump becomes very hot during operation, and the motor should therefore not be touched, either during operation or immediately after it has stopped. Contact with the hot pump may result in burns.
- (7) Do not put your fingers or any objects in, or look into, the intake or exhaust while the pump is operating.  
Doing so may lead to injuries or malfunctions.

[Continued on the next page]





## Caution

### <Maintenance and repair>

- (8) If the pump does not operate, or a fault occurs, switch OFF the main power supply of the pump immediately and unplug the power cord to prevent from any accidents, and contact your dealer or ULVAC, for inspection or repair.
- (9) Leave the pump for at least 30 minutes after it stops and check that it has cooled down before starting work. The inside of the pump is hot immediately after the pump stops, and touching it may lead burns.



## Attention

### <Installation>

- (1) Do not subject the pump to impacts or lay it on its side. Doing so may lead to malfunctions.
- (2) Do not hold the pipe on the top of the pump and press or bend it. Doing so may lead to damage to the pipe and reduced pump performance.
- (3) If there is a possibility of foreign matter or dust entering the pump, attach an intake filter.

### <Purposes>

- (4) This pump does not have corrosion-resistant specifications. Do not use it for anything other than clean, room-temperature air or a gas with the same characteristics.
- (5) This pump is only for evacuating vacuums. Do not operate it close to atmospheric pressure for long periods.  
Doing so may lead to malfunctions.

### <Operation>

- (6) Use at an ambient temperature within the ambient temperature in the product specifications (refer to Table 1-1).  
If operated at higher temperatures, the life of the pump is extremely shortened.
- (7) Do not apply back pressure to the pump exhaust side when starting the pump. It will apply a load on the motor and may prevent the pump from starting.

### <Maintenance and repair>

- (8) This pump is designed with precise clearances. As it requires special skills to assemble the pump, please ask our service department to replace the consumable parts if a repair technician is not available.



# 1. Product Outline

## 1-1. Purpose of Use and Prohibited Items

This is a piston type dry vacuum pump that evacuates vacuums by moving a special resin (cup packing) in a reciprocating motion. It is designed to be built-in, so do not use it as a stand-alone pump.

Observe the prohibited items below to ensure that the product is used correctly.

### <Prohibited>



#### Warning

- 1) This pump is only for evacuating vacuums. Do not use it for pressurizing.
- 2) Do not perform any operation, repairs or modifications that are not approved by us.



#### Attention

- 3) This pump does not have corrosion-resistant specifications. Do not use it for anything other than clean, room-temperature air or a gas with the same characteristics.
- 4) Do not use the pump with any gases that contain any dirt, dust, moisture or corrosive gases, etc.
- 5) Do not operate it close to atmospheric pressure for long periods. Doing so may lead to malfunctions.

## 1-2. Product Specification

Table 1-1. DOP-120SX/Y product specifications

Model		DOP-120SX/Y	
Exhaust velocity	(L/min)	120/140	
Ultimate pressure	(kPa)	8	
Motor		3-phase, 120 W, 4 pole	
		With built-in automatic-recovery type thermal protector	
Frequency	(Hz)	50/60	
Voltage	(V)	200	220
Rated current	(A)	1.4/1.4	1.6/1.4
Noise level	dB(A)	60 or less (at ultimate pressure and 1m)	
Intake Exhaust		Rc1/4	
Mass	(kg)	6.4	
Ambient temperature	(°C)	7 ~ 40	
External dimensions (W × L × H)	(mm)	(139.5) × (255) × (167)	
Overvoltage category		II	
Pollution degree		2	
Electric shock protection class		Class 1	





### 1-3. Protective equipment (Thermal protector)

- 1) An automatic-recovery type thermal protector is built-in to this pump as an overload protection device.  
This automatically breaks the circuit of the motor power supply and prevents the motor from being burnt out if the pump stops rotating during operation or if the motor temperature increases due to an overload.
- 2) Attach protection devices other than the overload protection device (earth leakage breaker, motor breaker).

Table 1-2. Thermal protector characteristics

Operating temperature	115 ± 5°C
Recovery temperature	75 ± 15°C

 <b>Warning</b>	Refer to Warning (9) on page 4.
 <b>Caution</b>	Refer to Caution (5) on page 6.

## 2. External drawings

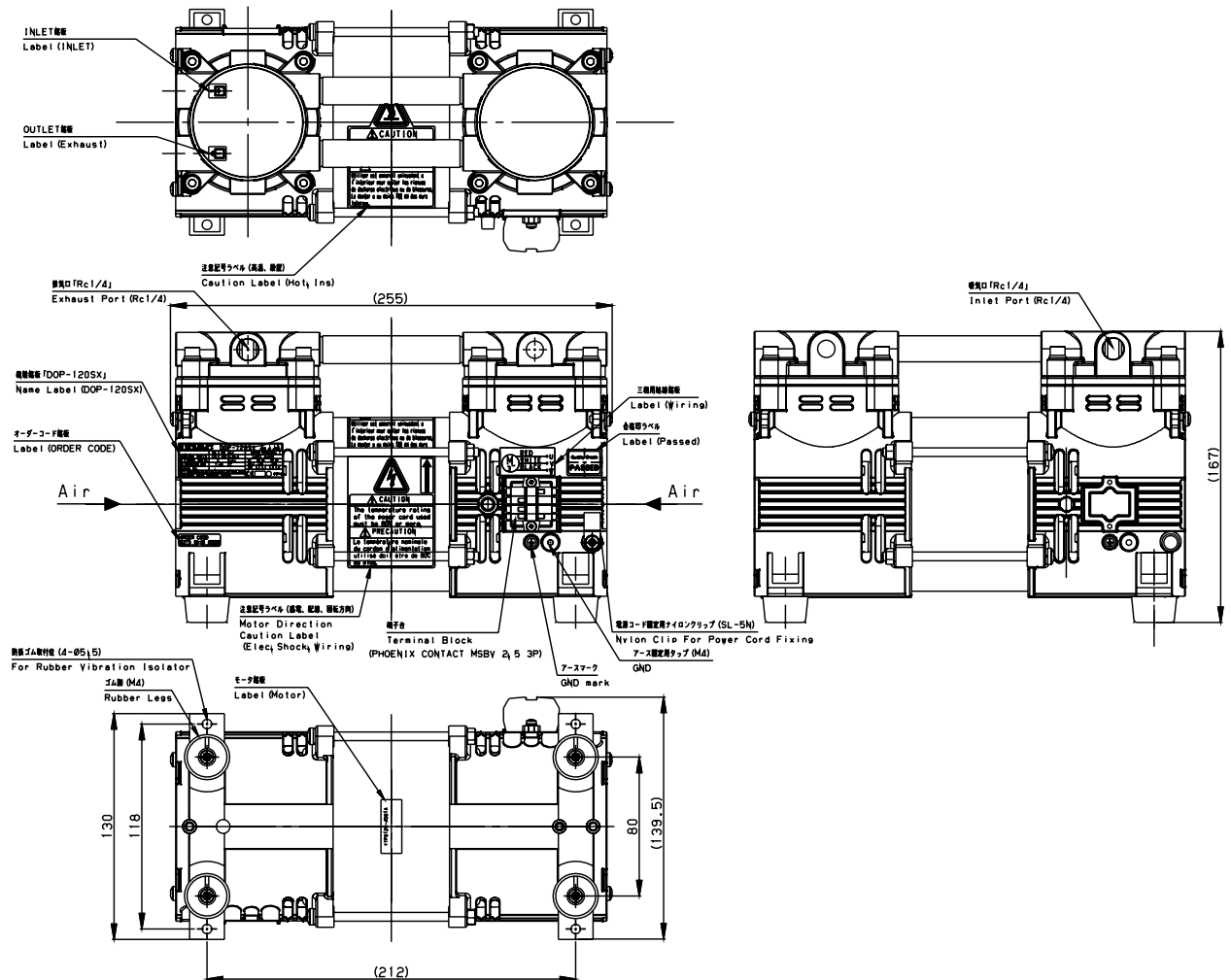


Fig. 2-1. DOP-120SX external drawing



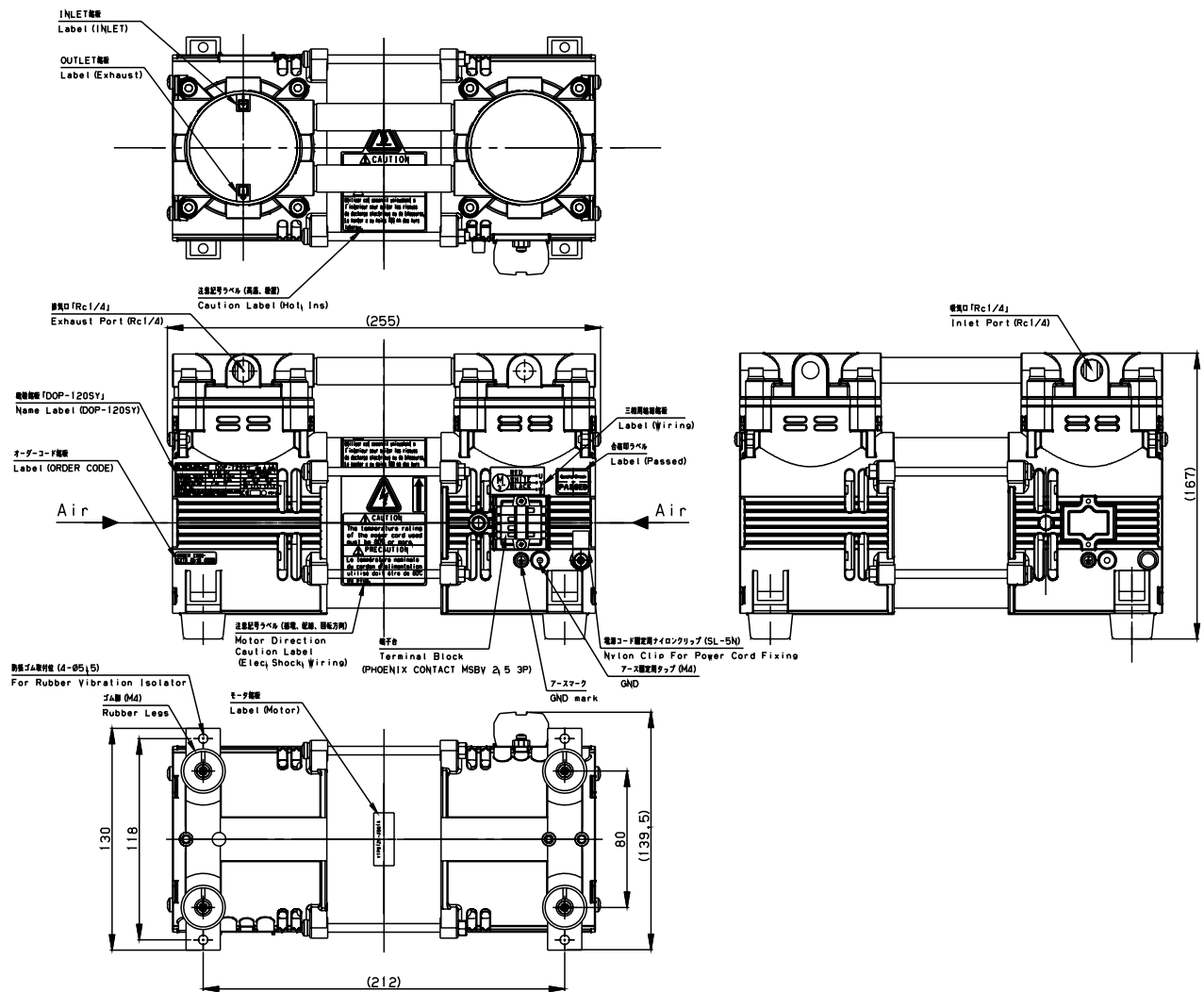





Fig. 2-2. DOP-120SY external drawing



### 3. Installation and storage

#### 3-1. Safety cautions for installation and storage

 <b>Warning</b>	Refer to Warnings (1), (2), (3), (4), (6), (7), (8) and (9) on page 4, and (10), (11), (12), (13) and (14) on page 5.
 <b>Caution</b>	Refer to Cautions (1), (2) and (3) on page 6.
 <b>Attention</b>	Refer to Attentions (1), (2) and (3) on page 7.

#### 3-2. Ambient conditions during installation, storage and operation

This pump is designed with very tight tolerances, and the following conditions must therefore be satisfied during storage, mounting, and operation.

- (1) Operation altitude: 1,000 m or lower
- (2) Temperature during operation: within the ambient temperature in the product specifications (refer to Table 1-1).
- (3) Ambient humidity during operation: 85% RH (relative humidity) or less
- (4) Other (during storage and operation)
  - a. A level location with sufficient floor strength.
  - b. No condensation.
  - c. No dust.
  - d. Inside a room with good ventilation.
  - e. No corrosive or explosive gas.
  - f. Not in direct sunlight.
  - g. No danger of ignition.
  - h. When assembling the pump, temperature around the pump not to exceed the ambient temperature upper limit in the product specifications (refer to Table 1-1).
  - i. There is sufficient space around the pump and the pump cooling fan is not blocked.



### 3-3. Installation location

Select a location with as little dust and humidity as possible for the installation, and ensure that the pump is installed level. Select a location that will enable installation, removal, inspection, and cleaning operations. Pay particular attention to the ambient temperature and ensure that the cooling fan air is not blocked, when installing the pump inside another device. Place the pump on anti-vibration rubber, etc. to ensure that vibrations do not reach the pump. If the pump is directly fixed, the pump may be damaged due to the vibrations. Refer to “3-2. Ambient conditions during installation, storage and operation” for details of the ambient conditions.

### 3-4. Operation check when installing

- 1) Remove the rubbers plugs attached to the intake and exhaust.
- 2) Attach the U, V and W power supply leads in accordance with the plate on the top of the pump terminal block. (Attached document: Wiring method)
- 3) Attach the ground cable to the pump body, fix the power supply leads with nylon clips. When fixing the cords, pay attention to the minimum bending radius and do not apply a load to the power supply cords. (Figs. 3-1 and 3-2)

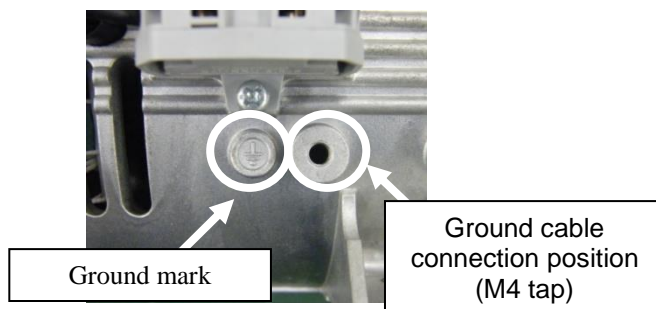


Fig. 3-1. Ground cable wiring position

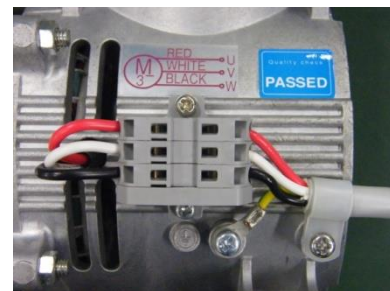



Fig. 3-2. Power supply installation example

- 4) Turn ON the main power supply of the device, and check the rotational direction and fan cooling air. (Refer to Fig. 2-1or2-2.)
- 5) After you have finished checking, turn OFF the device main power supply and check that it has stopped.

Note: Recommended power supply cord


4-core power supply cord: lead size min. 0.75 mm<sup>2</sup>, min. 300 V, min. 5 A, 1 is ground cable  
Cable diameter: 7.5 – 8 mm (prepare silicon clips for other sizes)

 <b>Caution</b>	<p>Use a power supply cord with a temperature resistance of 80°C or higher. Do not bend the power supply cord more than its minimum bending radius. Doing so may result in the wire breaking or fires.</p>
--	--

### 3-5. Wiring

- 1) Attach protection devices other than the overload protection device (earth leakage breaker, motor breaker).
- 2) Ensure that a ground cable is attached to the pump.
- 3) When using an extension cable, select one with an appropriate type, electrical ratings and maximum length, etc.
- 4) Ensure that wiring and earth work follows the local regulations and safety requirements.
- 5) After the wiring is completed, check that the pump rotation direction is correct.  
(Refer to Fig. 2-1or2-2.)



 <b>Warning</b>	Refer to Warnings (7) and (8) on page 4, and (10), (12), (13) and (14) on page 5.
--	--

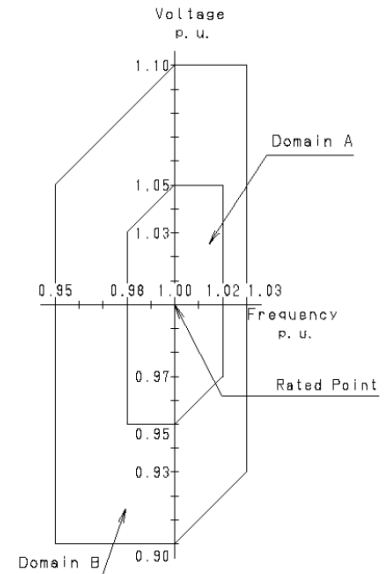
### 3-6. Fluctuations in the power supply voltage and frequency

Standard: Rotating electric machine general rules IEC 60034-1:2004.

There is no problem to main parts when operated continuously under the voltage and frequency fluctuations in area A, and no problem to main parts when operated under the voltage and frequency fluctuations in area B.

Here, “no problem” means that the pump can be operated safely and without the life of the parts being shortened, and does not refer to the pump characteristics or the rated conditions such as a rise in temperature.

The ratings are the rated torque (N.m).



### 3-7. Piping

- 1) Perform the piping so that there are no leaks, and attach a filter in front of the intake.  
(Intake/exhaust screw pitch: Rc 1/4, tightening torque: 6 N.m)
- 2) Use rubber hoses, etc. to ensure that pump vibrations do not reach between the pump and piping, otherwise the pump or piping may be damaged.
- 3) Use piping with an inner diameter of 10 mm or more for the intake.
- 4) Perform the piping so that there is no back pressure on the exhaust. If there is any back pressure, ensure it is 0.03 MPa (gauge pressure) or less.
- 5) If the pump is used to evacuate a container, perform the piping as shown in Fig. 3-3 with a shut-off valve to maintain the vacuum between the pump intake pipe and container.

Fig. 3-3. Fluctuations in the power supply voltage and frequency

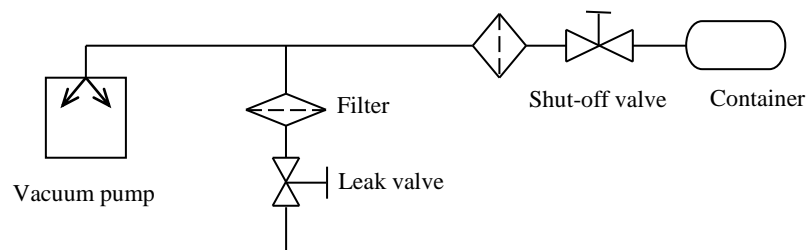


Fig. 3-4. Piping example for evacuating container

- 6) When starting the pump, it may not start if the intake-side pressure is lower than the atmospheric pressure.

Attach an atmospheric release leak valve between the pump intake pipe and container, and set the intake-side pressure to atmospheric pressure when starting the pump.





### 3-8. Storage

Turn OFF the main power supply of the device, check that the pump has stopped, remove the power supply cable connected to the pump, attach rubber plugs to the intake/exhaust, and store it in a place with lower humidity.



## 4. Safety cautions

### 4-1. Safety cautions

 <b>Danger</b>	Refer to Dangers (1) and (2) on page 4.
 <b>Warning</b>	Refer to Warning (9) on page 4, and (13), (14), (15), (16) and (17) on page 5.
 <b>Caution</b>	Refer to Cautions (3), (4), (5), (6) and (7) on page 6, and (8) on page 7.
 <b>Attention</b>	Refer to Attentions (3), (4), (5), (6) and (7) on page 7.

### 4-2. When the thermal protector trips

If the thermal protector has activated, turn OFF the main power supply and contact ULVAC. The motor is extremely hot at this time. Do not touch it .

When the cause of malfunction is solved, check that the motor has cooled down, turn ON the main power supply of the device, and check that the pump is operating correctly.


 <b>Caution</b>	Refer to Cautions (5) and (6) on page 6 and (9) on page 7. If the thermal protector has activated, turn OFF the main power supply and contact ULVAC.
--	---

Table 4-1. Thermal protector characteristics

Operating temperature	115 ± 5°C
Recovery temperature	75 ± 15°C

### 4-3. Precautions when starting

#### 1) Starting when it is cold

When it is cold, the bearing grease and cup packing, etc. may become hard making it difficult to start the pump. Follow the following procedure when it is difficult to start the pump.

- Open the intake to the atmosphere and turn ON/OFF the main power supply of the device 2 or 3 times until the pump starts operating. If the pump still does not start, raise the ambient temperature to 7°C or higher.
- Operate the pump for a few minutes with the intake open to the atmosphere to warm the pump up. After the pump has warmed up, use it normally.

#### 2) Precautions regarding the intake-side pressure

Set the intake-side pressure to atmospheric pressure when starting the pump.

If the pressure is lower than atmospheric pressure, it will apply a load on the motor and may prevent the pump from starting.

If it is necessary to maintain a vacuum, attach a cut-off valve or three-way valve between the pump and container.

Refer to fig. 3-4 for a piping example using a cut-off valve.



## 5. Pump performance

### 5-1. Ultimate pressure

The “ultimate pressure” referred to in catalogs and this instruction manual means “the lowest pressure attainable when the pump is operated without any gas being introduced through the intake (no-load operation)”.

Be aware that the displayed pressure may differ depending on the type of vacuum gauge.

Also, in actual vacuum devices, the ultimate pressure may be higher than the values stated in catalogs.

This is for the following reasons.

The vacuum gauge is installed far from the pump, and also water vapor produced by the drops of water and rust that are on the inside walls of the device and on the piping, etc. increase the ultimate pressure.

Vacuum leaks in the vacuum path that lead to gas being introduced increase the ultimate pressure.

### 5-2. Exhaust velocity

The exhaust velocity of a pump varies depending on the type gas being introduced and the pressure. Generally, the exhaust speed is highest when introducing atmospheric air and reduces together with the pressure.

Also, the smaller the piping diameter and longer the pipe, the higher the pipe resistance and the more the exhaust velocity decreases.

The nominal exhaust velocity of this pump is the maximum value when introducing dry air to the pump.

### 5-3. Required power





The power required to drive the pump is the total of that for the rotation friction (mechanical work) and that for compressing the air (compression work), and reaches a maximum at approximately an intake pressure of  $4 \times 10^4$  to  $6 \times 10^4$  Pa.

At lower pressures, there is little compression work, and the power is consumed by mechanical work.



## 6. Maintenance, inspection and repair

### 6-1. Cautions for maintenance, inspection and repair

 <b>Danger</b>	Refer to Danger (3) on page 4.
 <b>Warning</b>	Refer to Warning (5) on page 4, and (18) and (19) on page 5.
 <b>Caution</b>	Refer to Cautions (8) and (9) on page 7.
 <b>Attention</b>	Refer to Attention (8) on page 7.

There are 5 items of maintenance and repair that are able to be performed by the customer's repair technician. Do not perform any other repairs or make any modifications beyond the manufacturer's standard options.

- (1) Cup packing replacement
- (2) Head gasket replacement
- (3) Cylinder replacement
- (4) Cup packing retainer plate replacement
- (5) Intermediate pipe O-ring replacement

### 6-2. Maintenance

Check the following at least once every three days when using the pump.

- 1) Check that there are no abnormal noises.
- 2) Check that the pump is not abnormally hot.
- 3) Check that it is evacuating normally.
- 4) Check that the silencer is not clogged.

If any problem is found, deal with it according to "6-6. Trouble checklist".



### 6-3. Periodic inspection

After every 3,000 hours of use, perform a periodic inspection of the consumable parts, and replace and clean them in accordance with the “Replacement and cleaning criteria”. Refer to “6-4. Replacement and cleaning of consumables” for how to do this.  
Contact our service department if a repair technician is not available.

<List of consumable parts>

Table 6-1. List of consumable parts

Part name	Qty.	Material	Average life
Cup packing	2	PTFE	6000 h
Cylinder assembly	2	ADC	6000 h
Head gasket	2	EPDM	6000 h
Intermediate pipe O-ring	4	EPDM	6000 h
Cup packing retainer plate	2	ADC	6000 h

These life of these parts may differ depending on the usage conditions.

By observing “4-1. Safety cautions” and operating the pump with a small load, the life is lengthened.

(The “small load” referred to here is operation at ultimate pressure (intake closed).)

<Replacement and cleaning criteria>

If the performance drops or the following symptoms are observed, replace or clean parts as necessary.

Cup packing: replace if abnormal wear, hardening, cracking, etc. is observed.

Cylinder assembly: replace if abnormal wear of the cylinder, surface wear, intake and exhaust valve deformation, chipping, etc. is observed.

Head gasket: replace if deformation, abnormal wear, hardening, cracking, etc. is observed.

Cup packing retainer plate: replace when replacing the cup packing.

Intermediate pipe O-ring: replace if deformation, abnormal wear, hardening, cracking, etc. is observed.


<Maintenance and Inspection Locations>

Table 6-2. Maintenance and Inspection Locations

Operating time	Inspection locations	Details of inspection	Inspection method
Every 3,000 hours	Cup packing	Abnormal wear, hardening, cracking, etc.	Visual
	Cup packing retainer plate	Deformation, chipping	Visual
	Cylinder assembly	Deformation, wear, hardening, cracking, etc.	Visual
	Head gasket	Deformation, wear, hardening, cracking, etc.	Visual
	Bearing	Abnormal noise	Auscultation
	Intermediate pipe O-ring	Deformation, wear, hardening, cracking, etc.	Visual



## 6-4. Replacement and cleaning of consumables

	<b>Caution</b>	Refer to Caution (9) on page 7.
---	----------------	---------------------------------

- (1) As the inside of the pump becomes hot immediately after operation is started, turn the pump OFF, wait 30 minutes, and then check that the pump has cooled down before replacing parts or cleaning, etc.
- (2) When replacing consumable parts, wear a dust mask and gloves.  
Fine wear particles disperse into the air and can enter your body through inhalation.
- (3) When replacing consumable parts, wear gloves.  
Failure to do so may result in injuries.

Prepare the following tools, and replace and clean the parts in accordance with the diagrams. Contact our service department if you can't arrange the tools.

- Tools
  1. Hexagonal wrench: 4 mm
  2. Torque wrench: 4 mm, 3.0 N.m
  3. Hexagonal wrench: 5 mm
  4. Torque wrench: 5 mm, 8.0 N.m
  5. Wiping solvent: a solvent that doesn't harm rubber such as ethyl alcohol
  6. Waste cloth
  7. Dust mask, gloves, protective goggles, air compressor (for air blower)

\* Use tool number 5 and 6 to clean the tools as necessary.

Wear protective goggles, a dust mask and gloves, and be careful when using the air blower as fine dust may be dispersed.

Consumable part replacement procedure

This explains the replacement method using the maintenance kit.

The cylinder assembly is the cylinder with the intake valve, exhaust valve and gasket already attached.

### 6-4-1. Preparation

Turn OFF the pump primary side power supply. The pump surface temperature lowers to room temperature.

Check that power is not being supplied and remove the wiring and piping.

### 6-4-2. Pump disassembly

Refer to Fig. 6-1. Disassembly drawings.

Remove the hexagon socket head cap screws (M5x25, (3)) that are fixing the pump head (4) to the casing.

Remove the pump head (4).

Remove the cylinder assembly (5).

(cylinder, head gasket, intake valve, intake valve retainer, exhaust valve and exhaust valve retainer)

Remove the hexagon socket head cap screws (M8x18, (6)) that are fixing the cup packing retainer (7) to the connecting rod (9).

Remove the cup packing (8).

### 6-4-3. Cup packing replacement

Refer to Fig. 6-1. Disassembly drawings and section 6-4-2. Pump disassembly.

Replace the cup packing (8).

Place the cup packing (8) on the connecting rod (9) with the curved part facing downwards, and put



the cup packing retainer plate (7) on top.

Tighten the hexagon socket head cap screws (M8×18) to 8.0 N.m with a torque wrench.

#### 6-4-4. O-ring replacement

Pull out the intermediate pipe (2) from the pump head, and remove the O-ring (1) that is attached to the intermediate pipe.

Replace with the new O-ring that is included in the maintenance kit after checking that grease has been applied to it.

#### 6-4-5. Cylinder assembly replacement and pump reassembly

Refer to Fig. 6-1. Disassembly drawings and section 6-4-2. Pump disassembly.

Insert the new cylinder assembly (5).

Attach the pump head (4) that was removed when disassembling in the correct orientation and, after temporarily tightening the 8 hexagon socket head cap screws (M5×25), tighten them to 3.0 N.m with a torque wrench.

This completes the reassembly.

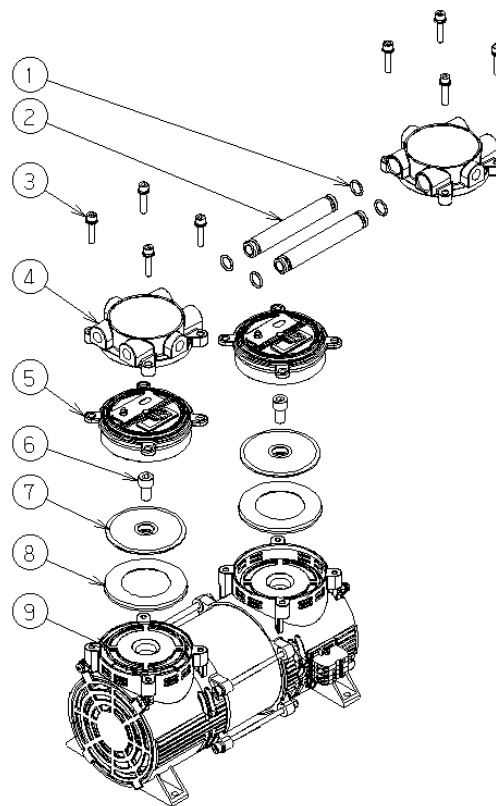


Fig. 6-1. Disassembly drawings

#### 6-5. Disposal

Ensure that the pump is disposed of in accordance with national legislation, and as required by your local authority.



## 6-6. Trouble checklist

Table 6-3. Trouble checklist

Details of defect	Cause	Countermeasure	Ref.
Pump starting or rotating defective	(1) Not connected to power supply	(1) Connect to power supply	3-6
	(2) Device main power supply switch is not ON	(2) Turn the switch ON	
	(3) Input power supply voltage abnormal	(3) Adjust voltage fluctuation to $\pm 10\%$ or less	
	(4) Defective pump wiring	(4) Redo the pump wiring and contact us	3-4 3-5
	(5) Breaker trips	(5) Investigate cause of tripping	4-2
	(6) Thermal protector trips	(6) Turn OFF power supply, remove cause of tripping and contact us	
	(7) Low ambient temperature	(7) Use within the ambient temperature in the product specifications	4-3
	(8) Intake-side pressure is lower than atmospheric pressure	(8) Set the intake-side pressure to atmospheric pressure	4-3
	(9) Exhaust-side pressure is high	(9) Remove the exhaust-side pressure	3-4 3-6
	(10) Low voltage	(10) Check power supply voltage and consider power supply cable	
	(11) Power supply malfunction	(11) Replacement or repair	
	(12) Power supply switch defective	(12) Replacement or repair	6-3
	(13) Broken cord	(13) Replace the pump with a new one.	
	(14) Defective motor	(14) Replace the pump with a new one.	6-3
	(15) Connecting rod lock	(15) Disassemble pump head and cylinder, and inspect inside	6-3
	(16) Problem with bearings	(16) Replace the pump with a new one.	6-3
	(17) Other pump internal parts have broken	(17) Disassemble and repair (replace the broken parts)	6-3
Pressure doesn't drop	(1) Pump evacuation capacity is too small for the vacuum container	(1) Select another pump	5-1
	(2) Incorrect pressure measurement method	(2) Measure pressure correctly	5-1
	(3) Vacuum gauge not suitable	(3) Measure the pressure with a vacuum gauge that is suitable for the pressure range and has been calibrated	5-1
	(4) The pipe connected to the intake is small, or the pipe is too long	(4) Connect a pipe with a inner diameter greater than that of the intake, and reduce the length of the pipe between the pump and vacuum container	5-1
	(5) Low voltage	(5) Check voltage and consider power supply cable	3-6
	(6) Inappropriate ambient temperature	(6) Use within the ambient temperature in the product specifications	4-3
	(7) Intake pipe leak	(7) Clean or replace	6-4
	(8) Leak from piping and connections	(8) Investigate piping leak, diameter and length, and repair	
	(9) Foreign matter introduced into pump	(9) Remove foreign matter, disassemble, clean, replace	6-4
	(10) The inside of the pump has a problem due to moisture or solvents being introduced	(10) Disassemble and repair (replace the consumable parts)	6-4
	(11) Broken motor	(11) Replace the pump with a new one.	6-3
	(12) Worn or broken intake and exhaust valves	(12) Replace	6-4
	(13) Worn or broken cup packing	(13) Replace	6-4
	(14) Other pump internal parts have broken	(14) Disassemble and repair (replace the broken parts)	6-3
Pump surface is abnormally hot (room temperature + 30°C or higher)	(1) Continuous operation with high intake pressures	(1) Do not operate it close to atmospheric pressure for long periods.	3-6
	(2) The intake gas is hot	(2) Attach a cooling device such as a gas cooler to the intake side	
	(3) Input power supply voltage abnormal	(3) Adjust voltage fluctuation to $\pm 10\%$ or less	
	(4) The motor is locked	(4) Refer to the column about defective pump rotation	3-4
	(5) The silencer is clogged	(5) Clean or replace	
	(6) Pump is rotating in the reverse direction	(6) Perform the wiring correctly	



## 7. Final notes

Please contact our sales department if you have any questions.

### Warranty

- (1) The warranty for this pump extends for one year from the date of shipment.
- (2) Malfunctions occurring under normal conditions of use during the period of the warranty will be repaired free of charge.

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

Normal conditions of use are as follows:

  - a) Ambient temperature and humidity during operation: ambient temperature in product specifications, below 85% RH
  - b) Operation in accordance with the user's manual.
- (3) Repairs are chargeable during the warranty period in the following cases:
  - a) Malfunctions due to natural disasters and fire.
  - b) Malfunctions due to salt damage, inflammable gases, corrosive gases, radiation, or particular atmospheres (e.g. pollution).
  - c) Malfunctions due to conditions of use which differ from those noted in the user's manual (e.g. performance details, maintenance, inspection).
  - d) Malfunctions caused by modification or repair that is 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 judged by Ulvac technical personnel to be due to conditions of use not suited to the vacuum pump.
  - j) Consumables
- (4) Disclaimer
  - a) We shall not be liable for any malfunctions of our products caused by the customer, regardless if the malfunction falls within the warranty period, nor be liable for any loss of opportunity for the customer's clients or for compensation of any damages to other products, labor costs, production loss, transportation expenses and other related work.
  - b) We shall not be liable for any secondary damages that occur for the customer due to filed claims and patent infringements of a third party.



# Attached document: Wiring method

This page explains the method for connecting the power supply cords to the terminal block.

This method is for when the lead line is a stranded wire.

## 1. Tools required

- Flat screwdriver  
“Edge thickness 0.6 mm x edge width 3.5 mm x edge length 16 mm or longer” (Fig. 1-1)  
(Recommend tool: SZF 1-0.6×3.5-1204517 made by Phoenix Contact) (Photo 1)
- 4-core electric cord  
(Lead size: 0.75 mm<sup>2</sup> or more, 300 V or more, 5 A or more, use 1 for earth)
- Round crimped terminals (inner diameter 4.3 mm, outer diameter 8 mm)
- Special crimping tool
- Wire stripper

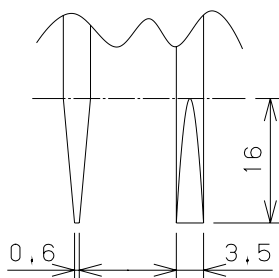


Fig. 1-1. Recommended flat screwdriver edge drawing (unit: mm)



Photo 1. Recommended tool

## 2. Connection method

Note: Connect one at a time.

Note: Use tools of the correct size; the terminal block may be broken.

Note: Turn the power supply OFF before performing the work; there is a risk of electric shocks.

1. Peel away 8-10 mm of the lead insulation. (Photo 2-1-1)

Note: The insulation may be caught when the lead is attached if not enough insulation is peeled away.  
If too much is peeled away, copper wire may protrude from the terminal block and that may lead to electric shocks or short circuits.

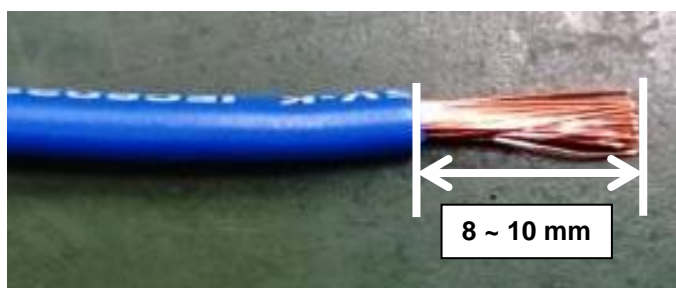


Photo 2-1-1. Lead dimensions



2. Insert a flat screwdriver fully into the part of the terminal block circled in the photo. (Photos 2-2-1 and 2-2-2)

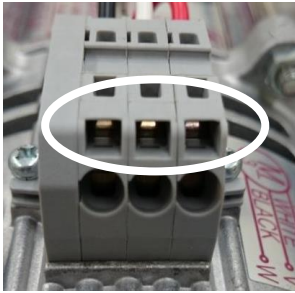


Photo 2-2-1. Screwdriver insertion position



Photo 2-2-2. Screwdriver insertion

3. Insert the lead.

After performing the work described in 2, insert the lead prepared in 1 into the part of the terminal block circled in the photo.  
(Photos 2-3-1 and 2-3-2)

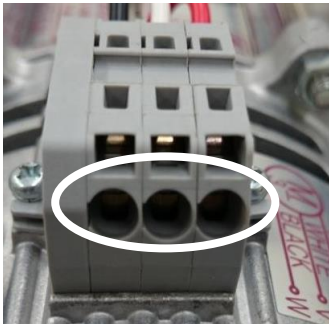


Photo 2-3-1. Lead insertion position

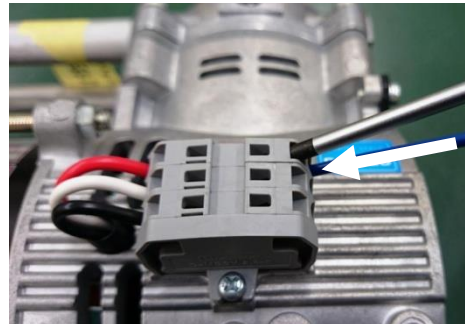


Photo 2-3-2. Lead insertion position

4. Pull out the flat screwdriver.

By pulling out the flat screwdriver, the lead is fixed in the terminal block. (Refer to photo 2-4-1.)  
Gently pull the lead and check that it doesn't come out.



Photo 2-4-1. Pull out the screwdriver

5. Connect each of the U-phase, V-phase and W-phase with the steps 1-4.
6. Attach crimped terminals to the ground cable.



7. Attach the ground to the specified position.

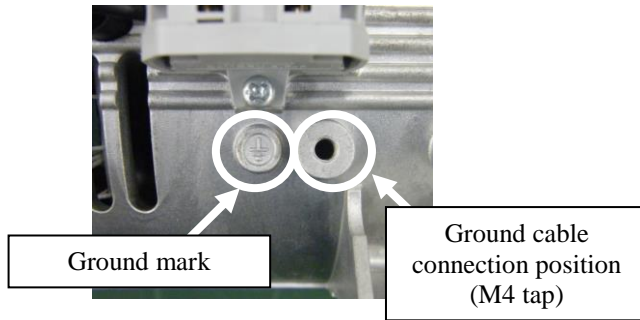


Photo 2-7-1. Ground attachment position

8. Fix the electric cord with the nylon clip.

The purpose of the nylon clip is to prevent the pump vibration, etc. from exerting a load on the power supply cord terminal block connection.

When fixing the cords, pay attention to the minimum bending radius and do not apply a load to the power supply cords.

The nylon clip already attached to the product is for a power supply cord with an outer diameter of 7.5-8 mm.

If the power supply cord doesn't match the supplied nylon clip, prepare a suitable nylon clip.

The nylon clip attaching screw size is M4.

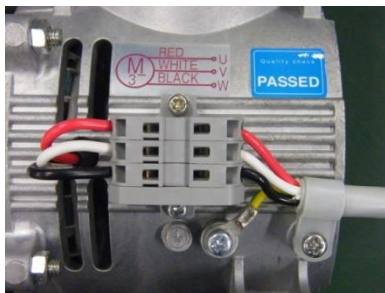


Photo 2-8-1. Power supply installation example

### 3. How to remove

Note: Remove the leads one at a time.

Note: Use tools of the correct size; the terminal block may be broken.

Note: Turn the power supply OFF before performing the work; there is a risk of electric shocks.

Insert a flat screwdriver fully into the part of the terminal block circled in the photo and remove the leads. (Photos 3-1 and 3-2)

Remove each of the U-phase, V-phase and W-phase with the above procedure.

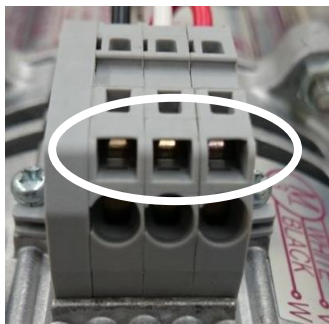


Photo 3-1. Screwdriver insertion position

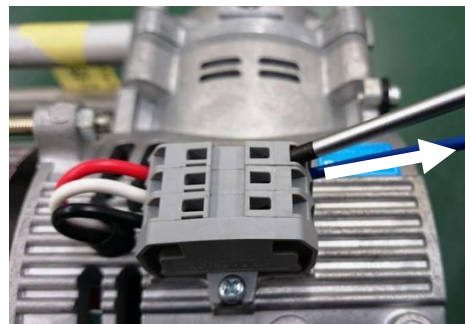


Photo 3-2. Screwdriver removal



## 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/>

株式会社アルバック  
規格品事業部 東日本営業部  
〒253-8543  
神奈川県茅ヶ崎市萩園2500  
TEL:0467-89-2416

株式会社アルバック  
規格品事業部 西日本営業部  
〒532-0003  
大阪府大阪市淀川区宮原3-3-31 上村ニッセイビル5F  
TEL:06-6397-2286

ULVAC KIKO,Inc.

<https://ulvac-kiko.com/en>

Please contact us for products, Service Base or other Inquiries from here.



<https://showcase.ulvac.co.jp/en/>

ULVAC,Inc.  
Components Division  
2500 Hagisono, Chigasaki, Kanagawa, 253-8543, Japan  
TEL:+81-467-89-2261