

# **User's Manual**

## **Vacuum Pump Unit**

VPC-051

Please read this manual thoroughly to ensure safe and effective operation of this equipment. Keep this manual in a safe place.

Please note that due to performance upgrade, the equipment described in this manual is subject to changes in dimensions and specifications without prior notice.

**Ulvac Kiko, Inc.**

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Items with shade include description on safety.

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## To Safely Use This Equipment






Thank you for purchasing our product. This pump is designed exclusively for vacuum evacuation, and it may malfunction or cause accidents if operated inappropriately. Please read the manual thoroughly, and pay specific attention to inspection, maintenance and safety guidelines. Read and fully understand the description of this manual to prevent serious accidents from occurring.

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Read this section before using the VPC-051. Always follow the instructions below to safely use the device and prevent personal injuries from occurring.

The symbols below have the following meaning.








	Danger	Incorrect handling of the equipment is very likely to result in death or serious injury to the operator.
	Warning	Incorrect handling of the equipment may result in death or serious injury to the operator.
	Caution	Incorrect handling of the equipment may result in light or medium injuries to the operator or damage to the equipment.

	This indicates action or practice that should be made.
	Always make connection with the earth.
	This indicates the action or practice that should be prohibited.
	Do not disassemble.
	Do not touch.








## Warning Label

 Caution	 Check labels	<p>The warning labels are pasted on the following parts.</p> <ol style="list-style-type: none"> <li>1) Left back of the rack (PL004)</li> <li>2) Main valve handle (PL008)</li> <li>3) Around the oil diffusion pump (D. P) (PL007)</li> </ol> <p>When accompanied by a liquid nitrogen trap.</p> <ol style="list-style-type: none"> <li>4) Liquid nitrogen trap (PL006)</li> </ol> <p>Contact us if the label is contaminated or peeling off.</p>
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## Power Supply

 Warning	 Check the capacity	<p>Primary power supply</p> <p>Please prepare the following: Single-phase 100 V, 6.3 A</p> <p>Smaller power supply capacity may cause the breaker to trip due to overcurrent during the operation.</p>
	 Do not share	<p>For the primary power supply, a single power supply should be provided for the device, and other equipment should not be connected with it.</p> <p>Breaker capacity shortage may cause the breaker to trip due to overcurrent during the operation.</p>
	 Ground the grounding wire	<p>Employ Level D grounding.</p> <p>Use a plug with grounding wire for 100-V power supply. If you use a plug adapter, connect the grounding wire with a nearest grounding terminal.</p> <p>If incorrect grounding is made, this may cause electrical shock in case of failure or current leakage.</p>
	 Check the cable capacity	<p>Avoid using an extension cable. However, if it must be used by necessity, use the following cable.</p> <p>For 100-V power supply: 1.25 mm<sup>2</sup> or more</p> <p>If a thinner cable is used, this may cause overheating, ignition, or fire.</p>
	 Avoid this action	<p>Do not place any object on the cable for the primary side. Otherwise, such action may cause electrical shock or fire.</p>
	 Avoid electrical shock	<p>Do not touch the terminal block or other connectors if the primary cable plug is being inserted in a socket.</p> <p>Otherwise, the operator may suffer electrical shock.</p>






## Environment

 Warning	 Avoid this action	<p>This product does not have explosion-proof design, and thus use in environments where inflammable substances are present should be avoided.</p> <p>Otherwise, explosion could occur, causing fire and burns.</p>
	 Avoid this action	<p>Temperature at a lower part of the oil diffusion pump is extremely high during operation. Do not place flammable objects around it.</p> <p>This can cause fire.</p>
	 Do not touch	<p>Do not touch the product with a bare hand during operation or within 30 minutes after operation ceases because the temperature of the oil diffusion pump and the oil sealed rotary vacuum pump temperature rise.</p> <p>Otherwise, your hands may be burned.</p>
 Caution	 Use oil mist trap	<p>Oil mist will be spread from the evacuation outlet of the oil sealed rotary vacuum pump during roughing operation. Use an oil mist trap (sold separately).</p> <p>Otherwise, oil spread may contaminate the room or affect human health.</p>
	 Ventilate	<p>Pump is heated during operation.</p> <p>Room temperature rises.</p>






## Installation

 Warning	 Check the environment	<p>Install the equipment where the following conditions are satisfied.</p> <ol style="list-style-type: none"> <li>1) Flat surface</li> <li>2) Floor with sufficient strength</li> <li>3) Well-ventilated place</li> <li>4) Place without direct sunlight</li> <li>5) Room with temperatures between 7°C and 30°C.</li> <li>6) Location where there is no risk of fire</li> <li>7) Location where no corrosive chemicals or gases are present.</li> <li>8) Place without electrical noises, which may cause adverse effect to the product.</li> </ol> <p>Otherwise, operation failure or durability degradation may occur.</p>
 Caution	 Work by two or more people	<p>Lifting and moving of the equipment should be made by two or more people.</p> <p>Otherwise, you could injure your back.</p>

## Operations

 <p>Warning</p>	 <p>Check ventilation</p>	<p>Please make sure to ventilate the room when using liquid nitrogen. The nitrogen can potentially reduce the oxygen in the room.</p> <p>This may cause an oxygen deficiency accident.</p>
 <p>Caution</p>	 <p>Wear gloves</p>	<p>When using liquid nitrogen, wear gloves to protect your hands.</p> <p>If liquid nitrogen splashes and adheres to your skin, you may feel acute pain momentary.</p>
	 <p>Confirm complete close</p>	<p>After confirming complete closure of the main valve, let out the air in the bell jar.</p> <p>If air comes into the oil diffusion pump during operation, it deteriorates the oil and lowers the performance.</p> <p>Operation failure of the three-way valve may occur.</p> <p>An inflow of air during liquid nitrogen injection will cause condensable gases to adhere to the trap excessively, thus degrading the performance.</p>

## Maintenance, Repair, and Disposal

 Caution	 Maintenance and repair range	<p>Maintenance and Repair that Can be Made by User.</p> <ol style="list-style-type: none"> <li>1) Replacement of oil for the sealed vacuum pump and oil diffusion pump.</li> <li>2) Replacement of the element of oil mist trap (sold separately)</li> <li>3) O-ring replacement (except for oil sealed rotary vacuum pump)</li> <li>4) Replacement of the heater of the oil diffusion pump.</li> <li>5) Cleaning of the inside of the base plate and the glass bell jar.</li> </ol> <p>To make repair or maintenance other than the above, contact us.</p>
	 Replace periodically	<p>Oil mist trap (sold separately) should be replaced every six months to one year.</p> <p>Clogging in the element increases evacuation resistance, which may cause oil leakage from the axis sealing area or oil level gauge damage.</p>
	 Comply with regulations	<p>To dispose the oil (waste oil) for the pump, comply with industrial waste disposal rules.</p> <p>Comply with regulations upon disposal. For details on disposal, contact us.</p>
	 Avoid this action	<p>Do not use other manufacturer's optional parts for modification.</p> <p>We do not assume any responsibility for any damage due to such modifications.</p>



## (1) Before Using

### 1. Target Users

Only persons who have used vacuum deposition equipment or trained based on this manual may operate this equipment.

### 2. Read the Manual Thoroughly

Please read this manual thoroughly in order to use the equipment in a safe and correct manner.

Please pay particular attention when reading the section "To Safely Use This Equipment".

### 3. Keep This Manual in a Safe Place

Keep this manual in a safe place.

After reading this manual, be sure to keep it in a safe place where it is readily accessible to other users.

### 4. Warranty

(1) The warranty for this pump (this equipment) extends for a period of one year from the date of shipment.

(2) Any malfunctions or defects which occur under normal usage conditions during the warranty period will be repaired free of charge.

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

Normal usage conditions refer to the following:

- a) Ambient temperature and humidity during operation: 7 - 30°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.

### 5. Statutory Requirements for Disposal

Follow all statutory and local authority regulations when disposing of this equipment including used oil.

Comply with regulations upon disposal. For details on disposal, contact us.

### 6. Safety during Repair

When requesting repairs to this product, provide a full description of the conditions of use (particularly any use of dangerous materials) for the safety of repair personnel.

In this case, fill in the Use Condition Check Sheet and attach to the product.

If the use conditions are unknown, repair may be refused.

## (2) Product Overview

### 1. Purpose of This Product and Actions that are Prohibited

This product is a system that evaporates substances in a vacuum space by means of resistance heating evaporation source to form a thin film.


To safely and correctly use this product, avoid the following actions that are prohibited.



Avoid this action

Using this vacuum pump unit as a vacuum vessel.  
Reselling, repairing, and refurbishing of the product that are not permitted by us.

### 2. Safety Device and its Purpose and Functions

Item	Purpose	Functions	How to Check
Overload Short-circuit	Protection for the oil-sealed rotary vacuum pump, oil diffusion pump and short-circuit	Earth leakage breaker located in vapor deposition unit main breaker.  Manual reset after troubleshooting	N/A
	Operation with the safety devices above disabled is prohibited.		
Avoid this action			

### 3. Product Specifications

Ultimate pressure	$7.0 \times 10^{-4}$ Pa (Upon no-load cleaning in vacuum chamber) $1.5 \times 10^{-4}$ Pa (Using liquid nitrogen, upon no-load cleaning in vacuum chamber)
Evacuation time	15 minutes or less up to the $1.0 \times 10^{-3}$ Pa (Upon no-load cleaning in vacuum chamber) 10 minutes or less up to the $1.0 \times 10^{-3}$ Pa (Using liquid nitrogen, upon no-load cleaning in vacuum chamber)
Necessary power	Single-phase 100 V, 0.63 kVA
External dimensions (Main unit)	Width: 350 mm × Depth: 320 mm × Height: 461 mm
Weight (Main unit)	Approx. 20 kg
Finished color (Rack)	baking finish (Munsell 6Y 8/0.8)
(Panel)	baking finish (Munsell 6Y 8/0.8)

### 4. Individual Unit Specifications

Unit	Model and Specifications	Quantity
1) Oil diffusion pump (MAIN. PUMP)	- Model: DPF-050 - Evacuation speed: 50 L/sec - Ultimate pressure: $10^{-5}$ Pa - Evacuation or suction opening: VG 25 or equivalent, $\phi 13.6$ or equivalent - Required power: 0.25 kVA Oil for use: SY, 0.02L	1 set
2) Oil sealed rotary vacuum pump (BACK. PUMP)	- Model: G-20DA - Evacuation speed: 20 L/min - Ultimate pressure: $1.3 \times 10^{-1}$ Pa - Required power: 0.1 VA Oil for use: SMR-100, 0.18L	1 set
3) Main valve	- Model: Butterfly Valve - Internal diameter: VG-25	1 set
4) Three-way valve	- Model: Ball valve type	1 set

## 5. Standard Accessories

1) Power supply cable	- For the main unit: 100 V single-phase, with plug, 2 m	1 pc.
2) Gauge port cork	- For $\phi 18$	2 pc.
3) Flange cap	- For 25A	1 pc.
4) Screw for flange	- Hexagon head bolt - Flat washer - Spring washer - Hexagon nut	4 pc. 8 pc. 4 pc. 4 pc.
5) User's manual	- Standard paper	1 pc.
6) Vacuum performance test result table	- Standard paper	1 pc.

Refer to the specification sheet for special models.

## 6. How to Use Switches, Handles, and Operation Levers



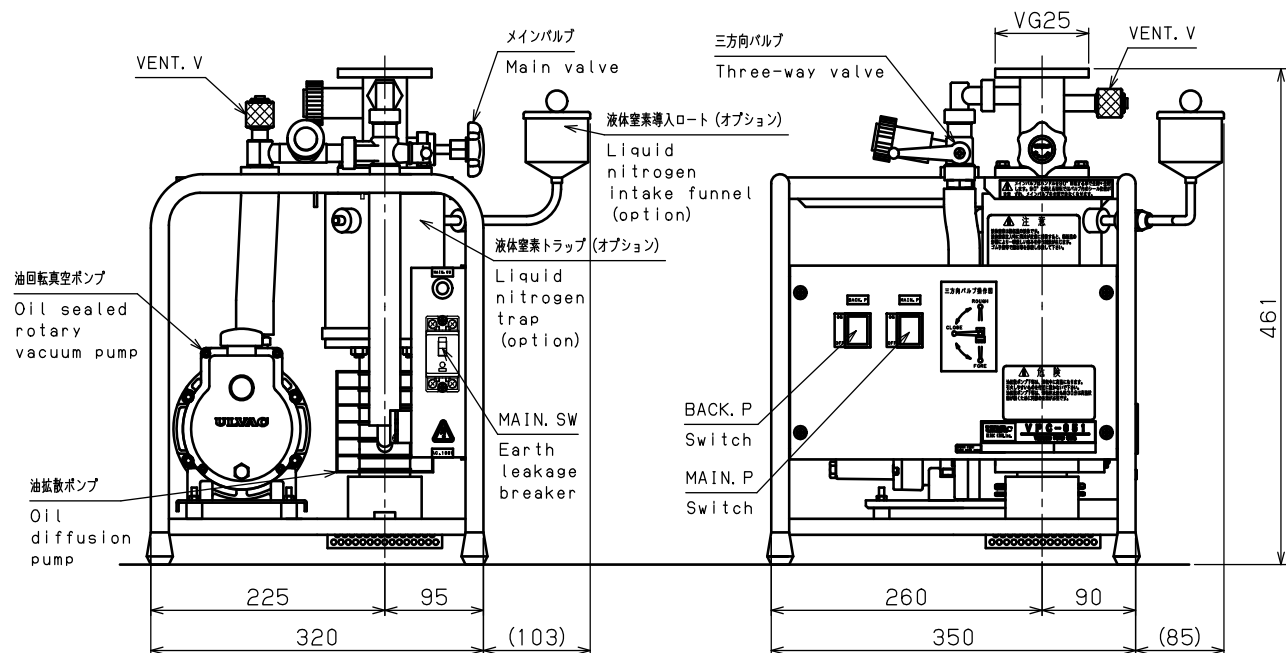
Confirm

Before handling switches, handles, or operation levers, confirm the safety and conditions.

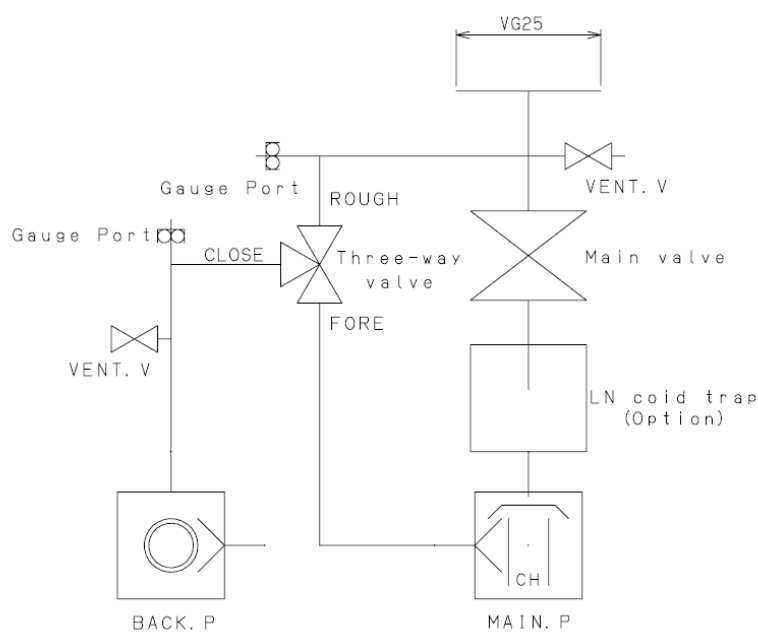
Name	How to Operate
MAIN switch	Manual ON-OFF
BACK. P switch	Manual ON-OFF    ON: lamp illumination
MAIN. P switch	Manual ON-OFF    ON: lamp illumination
Main valve handle	Counter clockwise: OPEN    Clockwise: CLOSE Complete open: Turn the handle 90 degrees counter clockwise. Complete close: Turn the handle 90 degrees clockwise.
Three-way valve	Lever operation to the direction or FORE, CLOSE, or ROUGH.
VENT. V	Screw tightening type OPEN: Counter clockwise    CLOSE: Clockwise

\* Refer to each manual for detailed description of switches of units.

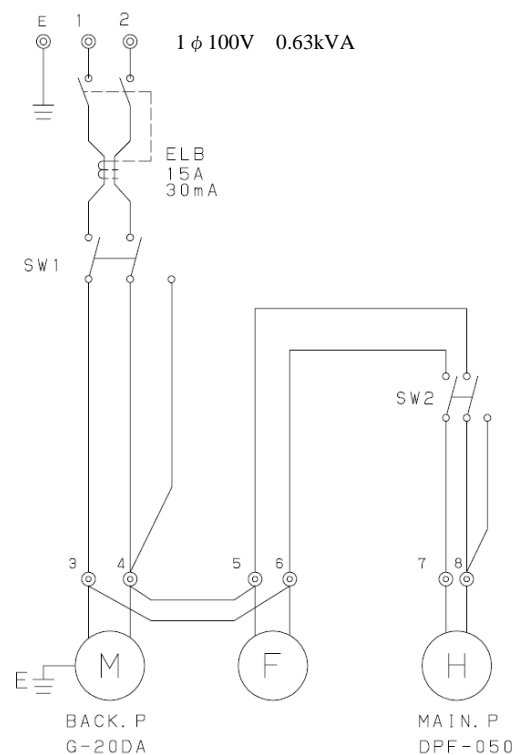
## 7. Layout of Switches, Handles, and Operation Levers



Evacuation system drawing




Electrical system drawing



### (3) Opening the Package and Installation




#### 1. General Cautions

 Confirm	<ol style="list-style-type: none"><li>1) Is the product what you requested?</li><li>2) Are the accessories and all necessary parts included?</li><li>3) Maintain a space of more than 0.1m from the equipment for safety upon installation.</li></ol>
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#### 2. Package upon Delivery

The main unit and accessories are packed in wooden crate when delivered.
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#### 3. Installation Site

 Warning	 Check the environment	<p>Install the equipment where the following conditions are satisfied.</p> <ol style="list-style-type: none"><li>1) Flat surface</li><li>2) Floor with sufficient strength</li><li>3) Well-ventilated place</li><li>4) Place without direct sunlight</li><li>5) Room with temperatures between 7°C and 30°C.</li><li>6) Location where there is no risk of fire</li><li>7) Location where no corrosive chemicals or gases are present.</li><li>8) Place without electrical noises, which may cause adverse effect to the product.</li></ol> <p>Otherwise, operation failure or durability degradation may occur.</p>
 Confirm	After the installation, make sure that the product has a clearance of at least 10 cm from the wall to make space without any hindrance for maintenance and for safety.	

#### 4. Power Supply






 Warning	 Check the capacity	<p>Primary power supply Please prepare the following: Single-phase 100 V, 6.3 A or more</p> <p>Smaller power supply capacity may cause the breaker to trip due to overcurrent during the operation.</p>
<p>Specifications of Primary Cable Connection (Portions Connecting with the Equipment)</p> <p>For 100-V power supply, Cable length: 2 m End: 3P plug with ground (with adapter)</p>		
 Warning	 Do not share	<p>For the primary power supply, a single power supply should be provided for the device, and other equipment should not be connected with it.</p> <p>Breaker capacity shortage may cause the breaker to trip due to overcurrent during the operation.</p>
	 Ground the grounding wire	<p>Employ Level D grounding. The grounding wire is the green wire. Use a plug with grounding wire for 100-V power supply. If you use a plug adapter, connect the grounding wire with a nearest grounding terminal.</p> <p>If incorrect grounding is made, this may cause electrical shock in case of failure or current leakage.</p>
	 Check the cable capacity	<p>Avoid using an extension cable. However, if it must be used by necessity, use the following cable. For 100-V power supply: 1.25 mm<sup>2</sup> or more</p> <p>If a thinner cable is used, this may cause overheating, ignition, or fire.</p>
	 Avoid this action	<p>Do not place any object on the cable for the primary side.</p> <p>Otherwise, such action may cause electrical shock or fire.</p>
	 Avoid electrical shock	<p>Do not touch the terminal block or other connectors if the primary cable plug is being inserted into a socket</p> <p>Otherwise, the operator may suffer electrical shock.</p>

## 5. Necessary Tool List

Tool	Where to be Used
13 Spanner	Inspiratory port piping attachment

### (4) Operations

#### 1. Risks and Safety Measures upon Operations

 Warning	 Check ventilation	<p>Please make sure to ventilate the room when using liquid nitrogen.</p> <p>The nitrogen can potentially reduce the oxygen in the room.</p> <p>This may cause an oxygen deficiency accident.</p>
	 Wear gloves	<p>When using liquid nitrogen, wear gloves to protect your hands.</p> <p>If liquid nitrogen splashes and adheres to your skin, you may feel acute pain momentary.</p>
 Caution	 Confirm complete close	<p>After confirming complete closure of the main valve, let out the air in the bell jar</p> <p>If air comes into the oil diffusion pump during operation, it deteriorates the oil and lowers the performance.</p> <p>Operation failure of the three-way valve may occur.</p> <p>An inflow of air during liquid nitrogen injection will cause condensable gases to adhere to the trap excessively, thus degrading the performance.</p>



## 2. Evacuation Device Operation Procedure

### 2-1 Preparation

- 1) VENT. V, three-way valve, main valve: CLOSE
- 2) All switches on the operation panel: OFF
- 3) Attach the probe to the gauge port when using the ionization gauge.
- 4) User side breaker: ON

### 2-2 Operations

#### Unit setup

- 1) MAIN.SW: ON
- 2) BACK. P: ON  
MAIN. PUMP cooling fan: ROTATE
- 3) Three-way valve: FORE
- 4) After 1-min evacuation, MAIN. P: ON
- 5) D.P warming up in 15 mins: COMPLETE

#### Vacuum evacuation start

- 1) It is exhausting chamber connection to a main valve flange.  
CHECK
- 2) VENT. V (main valve): CLOSE
- 3) Three-way valve: ROUGH  
13pa or less CHECK
- 4) Three-way valve: FORE
- 5) Main valve: COMPLETE CLOSE
- 6) When an ionization gauge is use. Filament: ON

### 2-3 Stop

#### Vacuum evacuation stop

- 1) When an ionization gauge is use. Filament: OFF
- 2) Main valve: COMPLETE CLOSE
- 3) VENT. V (main valve): It opens gradually

#### Unit shutdown

- 1) Vacuum evacuation for maintaining vacuum condition inside the chamber.
- 2) When an ionization gauge is use. Filament: OFF
- 3) Main valve: COMPLETE CLOSE
- 4) MAIN. P: OFF
- 5) Cooling MAIN. PUMP for 30 mins.
- 6) Three-way valve: CLOSE
- 7) VENT. V (of roughing piping): OPEN
- 8) BACK. P: OFF  
MAIN. PUMP cooling fan: STOP
- 9) MAIN.SW: OFF
- 10) Breaker of user side: OFF

**Note** In the case of with liquid nitrogen trap.

Liquid nitrogen volume

Max. fill-in volume: Approx. 0.4 liters

(including vaporization volume upon fill-in)

The liquid nitrogen lasts approx. 4 hours when a volume of 0.4 liters is filled.

If all of the liquid nitrogen is vaporized, the trapped condensable gases are released, which causes an adverse effect on the pressure for about 30 minutes.

This is not a failure.

Close the MAIN valve to prevent inside of the bell jar from contamination.

### 3. Measures upon Abnormal Conditions

#### 3-1 Instantaneous power outage

- All devices automatically return to the conditions before the power outage.

#### 3-2 Long power outage








- |   |                     |       |
|---|---------------------|-------|
| 1) Main valve:                          | PROMPT and COMPLETE | CLOSE |
| 2) Three-way valve:                     |                     | CLOSE |
| 3) VENT. V (of roughing piping):        |                     | OPEN  |
| 4) All switches on the operation panel: |                     | OFF   |

#### 3-3 Operation after power recovery

Please refer to 2-1 Preparation and 2-2 Operations in "2. Evacuation Device Operation Procedure".

## (5) Maintenance and Repair

### 1. Risks and Safety Measure upon Maintenance and Repair

 Warning	 Wear protective gear	<p>Wear a dust-proof mask and gloves to replace the oil of the oil diffusion pump.</p> <p>This could cause risk to human health.</p>
 Caution	 Comply with regulations	<p>To dispose the oil (waste oil) for the pump and container, comply with industrial waste disposal rules.</p> <p>Comply with regulations upon disposal. For details on disposal, contact us.</p>
	 Replace periodically	<p>Oil mist trap (sold separately) should be replaced every six months to one year.</p> <p>Clogging in the element increases evacuation resistance, which may cause oil leakage from the axis sealing area or oil level gauge damage.</p>
	 Work by two or more people	<p>Installation and removal of the oil diffusion pump and oil sealed rotary vacuum pump should be performed by two or more people.</p> <p>Otherwise, you could injure your back.</p>
	 Avoid this action	<p>Do not make any modification of the product that is not permitted by Ulvac Kiko, Inc.</p> <p>We do not assume any responsibility for any damage due to such modifications.</p>

### 2. Maintenance and Repair that Can be Made by User

- 1) Replacement of oil for the sealed vacuum pump and oil diffusion pump.
- 2) Replacement of the element of oil mist trap (sold separately)
- 3) O-ring replacement (except for oil sealed rotary vacuum pump)

To make repair or maintenance other than the above, contact us.

### 3. Removal, Maintenance, and Installation of Devices

#### 3-1 Oil sealed rotary vacuum pump

1) Required tool: 8 mm Spanner x 1

##### 2) Removal procedure

- All devices of the coater stop.: Confirm
- The primary power supply of the coater is removed.: Confirm
- Remove the roughing piping by loosening the roughing piping fixing nut.
- Remove the vacuum hose.
- Remove the Mate N Lock for the motor wiring.
- Remove the vibration-control rubber nuts (4 points).
- Remove the pump unit by lifting the motor portion and front cover.

##### 3) Oil replacement

Refer to the separate sheet – Oil Sealed Rotation Vacuum Pump User's Manual

##### 4) Order of attachment

- Attach the motor portion and front cover by lifting them.
- Attach the nuts for vibration control (4 points)
- Attach the Mate N Lock for the motor wiring.
- Attach the vacuum hose and insert the roughing piping.
- Attach the roughing piping fixing nut.

#### 3-2 Oil diffusion pump

1) Required tool: 13mm Spanner x 1

##### 2) Removal procedure

- All devices of the coater stop.: Confirm
- The primary power supply of the coater is removed.: Confirm
- VENT. V (of roughing piping) is open.: Confirm
- Three-way valve: FORE (Leave the inside of the DP open air)
- Remove the Mate N Lock for the heater and the cooling fan wirings.
- Remove the tightening nut from the suction opening flange, and draw out the vacuum hose attached to the exhaust outlet.  
(Remove the nut while holding the oil diffusion pump.)
- Draw the oil diffusion pump forward and remove it.

##### 3) Oil replacement

Refer to the separate sheet – DPF-050 Oil Diffusion Pump User's Manual

##### 4) Order of attachment

- Position the oil diffusion pump with its pump suction opening faced to the front of the roughing piping and below the liquid nitrogen trap.
- Lift the oil diffusion pump, insert the vacuum hose to the roughing piping and tighten the M8 nuts (2 locations) by three or four ridges. Then tighten the other two locations left.
- Tighten the fixing nuts evenly (orthogonally).
- Attach the Mate N Lock for the heater and the cooling fan wirings.
- Insert the roughing piping to the exhaust outlet of the oil diffusion pump.

### 3. Removal, Maintenance, and Installation of Devices

#### 3-3 Oil Mist Trap OMT-050A (Sold Separately)

1) Required tools None

2) Removal procedure

- Rotate the lower portion of the oil mist trap counter-clockwise with both hands

3) Replace the element.

Please refer to Oil Mist Trap OMT-050A User's Manual

4) Order of attachment

- Place the attached O-ring on the lower face of the oil mist trap body.
  - Rotate the lower portion of the oil mist trap clockwise with both hands to adjust to the evacuation opening of the oil sealed vacuum pump.
- Caution: Tighten with the O-ring held.

### 4. Maintenance and Inspection Points

Unit	Maintenance and Inspection	Timing of Maintenance and Inspection
Oil sealed rotary vacuum pump	Confirm that the oil level of the oil level gauge is within the indicated lines.	Every time before using
	Replace oil. If the pressure during isolated operation is 5 Pa or more.	As necessary
Oil diffusion pump	Replace oil.  If the ultimate pressure and the exhaust time is changed after an incorrect air intake. If the ultimate pressure and the exhaust time is changed after long years of continuous use.	As necessary
Cooling fan	Confirm that cooling fan rotates.	Every time before using
Main valve	Clean the surface of the valve seat.	6 months to 1 year When foreign material is dropped on the surface.
Oil mist trap	Replace the element.	6 months to 1 year

## 5. Troubleshooting

Symptom	Cause	Troubleshooting
Ultimate pressure is low or unstable, or evacuation performance is low.	The ambient temperature at the installation site is high.	Decrease the ambient temperature to 25°C by cooling.
	Operation time is too long after installation or long termination.	Operate 24 hours to 48 hours, and then perform checking.
	Leakage is detected.	Check components that were maintained before ultimate pressure changes.
	Deterioration of the oil for the oil diffusion pump.	If the cause of the deterioration is clear (incorrect air intake, leakage, etc.), replace the oil.
	Failure in the oil sealed vacuum pump	Refer to the Oil Sealed Vacuum Pump User's Manual.
	Failure in measuring instrument	Replace the measuring instrument.
The oil diffusion pump stays cold.	The heater is disconnected.	Replace the heater.
The thermal relay for oil sealed vacuum pump operates.	Overloaded	Refer to the Oil Sealed Vacuum Pump User's Manual. Thermal relay set

## 6. Storage of Equipment

Observe the following guidelines to store the equipment.
1) Place of storage - Floor with sufficient strength - Location with good ventilation - Location without direct sunlight - Location where no corrosive chemicals or gases are present.
2) Cautions before and upon storing - Perform roughing evacuation inside the chamber



## 7. Consumable List

Location of Use	Parts	Specifications	Material	Quantity	Replacement by user
Rack	Rubber Foot	KP-5	---	4	OK
	Warning Label	PL004	---	1	OK
	Warning Label	PL007	---	1	OK
	Warning Label	PL008	---	1	OK
Main valve	O-ring for suction flange	V-40	NBR	1	OK
	O-ring for exhaust flange	P-12	NBR	1	OK
	O-ring for axis	N-7	NBR	1	NG
	Rubber lining for valve seat	---	NBR	1	NG
	O-ring for gauge port	N-16	NBR	1	OK
	O-ring for leakage valve	N-8	NBR	1	OK
Oil diffusion pump	Gasket for suction flange	$\phi 57 \times \phi 48 \times t5$	NBR	1	OK
	Oil for use	SY	---	0.02L	OK
	Mica heater	Single-phase 100 V, 0.25 kW	---	1	NG
	Vacuum hose for MAIN.P	$\phi 12 \times \phi 30$ L=70	Special rubber	1	OK
Oil sealed rotary vacuum pump	Oil	SMR-100	---	0.18L	OK
	Vibration-control rubber	ME-15	---	4	OK
	Vacuum hose for BACK.P	$\phi 15 \times \phi 36$ L=165	Special rubber	1	OK
Three-way valve	O-ring for leakage valve	N-8	NBR	1	OK
	O-ring for gauge port	N-16	NBR	1	OK
	O-ring for Piping roughing	P-12	NBR	2	OK
	Packing set for re-grease	---	---	1	NG



Specifications and quantity is different for special models.

## (6) Disposal

### 1. Cautions upon Disposal

 Caution	 Comply with regulations	To dispose the oil (waste oil) for the pump and container, comply with industrial waste disposal rules.  Comply with regulations upon disposal. For details on disposal, contact us.
Applied regulations: Rules of waste disposal and cleaning		
Consign the disposal work to: 1) Transportation: Collector and carriers of industrial waste. 2) Disposal: Assigned to collector and carriers of industrial waste.		

## (7) Optional Parts

 Caution	 Avoid this action	Do not use other manufacturer's optional parts for modification.  We do not assume any responsibility for any damage due to such modifications.
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### 1. Standard Optional Parts List

Name of optional parts	Applications	Installation conditions
Liquid nitrogen trap	Adverse current oil and condensation gas adsorption	Factory assembly
φ15GP Attachment	Attachment to convert the bore diameter	Installable by user
A flange with a hose mouth	Attachment to convert the bore diameter	Installable by user
Oil mist trap	To prevent from oil and smoke flow from the exhaust opening of the oil sealed rotary vacuum pump	Installable by user
Vacuum meter	Meter to measure pressure	Installable by user