

# **Instruction Manual**

## **Desktop vacuum Coater**

VPC-061

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-061. 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.





# Power Supply

 Warning	 Check the capacity	<p>Primary power supply</p> <p>Please prepare the following: Single-phase 100 V, 6.3 A or more Single-phase 200 V, 7.5 A or more</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. The grounding wire for 200-V power supply 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.</p> <p>For 200-V power supply: 2.0 mm<sup>2</sup> or more 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

 Warning	 Avoid this action	<p>Do not apply any shock to the glass bell jar, and avoid heating it to 50°C or higher. In a case of explosion upon vacuum condition, the exploded pieces will spread.</p> <p>This may cause a serious damage to the product.</p>
	 Check ventilation	<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>
 Caution	 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>
	 Leave open air	<p>After the oil sealed rotary vacuum pump stops, open VENT.V to leave the inside of the roughing piping open air.</p> <p>This must be done to prevent reverse oil flow.</p>
	 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>

## Maintenance, Repair, and Disposal

 Warning	 Wear protective gear	<p>Wear a dust-proof mask and gloves to clean the thin film adhered to the inside of the glass bell jar and the base plate.</p> <p>The thin film could be broken into minute particles, and float in the air, which could be inhaled into human body.</p>
	 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>
 Caution	 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.</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>

## Warning Label

 Caution	 Check labels	<p>The warning labels are pasted on the following parts.</p> <ol style="list-style-type: none"> <li>1) Glass bell jar (PL001) (PL005)</li> <li>2) Left back of the rack (PL004)</li> <li>3) Main valve handle (PL008)</li> <li>4) Around the oil diffusion pump (D. P) (PL007)</li> <li>5) Liquid nitrogen trap (PL006)</li> </ol> <p>When accompanied by a bell jar cover.</p> <ol style="list-style-type: none"> <li>6) Bell jar cover (PL002) (PL005)</li> </ol> <p>Contact us if the label is contaminated or peeling off.</p>
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## (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.

### 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 coater as a vacuum vessel.

Putting in materials other than evaporation materials and sample materials in the glass bell jar.

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
 Avoid this action	Operation with the safety devices above disabled is prohibited.		

### 3. Product Specifications

Ultimate pressure	1.3 x 10 <sup>-3</sup> Pa (Upon no-load cleaning in vacuum chamber) 6.6 x 10 <sup>-4</sup> Pa (Using liquid nitrogen, upon no-load cleaning in vacuum chamber)
Evacuation time	20 minutes or less up to the 4.0 x 10 <sup>-3</sup> Pa (Upon no-load cleaning in vacuum chamber) 20 minutes or less up to the 1.3 x 10 <sup>-3</sup> Pa (Using liquid nitrogen, upon no-load cleaning in vacuum chamber)
Necessary power	Single-phase 100 V, 0.63 kVA Single-phase 200 V, 1.5 kVA
External dimensions (Main unit)	Width:434 mm × Depth: 422 mm × Height: 673 mm
Weight(Main unit)	Approx. 28 kg
Finished color(Rack)	baking finish (Munsell 6Y 8/0.8)
(Panel)	baking finish (Munsell 6Y 8/0.8)

Refer to the specification sheet for special models.

### 4. Individual Unit Specifications

Unit	Model and Specifications	Quantity
1) Glass bell jar	- Dimensions: Internal diameter 150 mm × Height 200 mm - Material: Hard glass	1 pc.
2) Base plate	- Dimensions: External diameter 200 mm - Material: Iron and nickel coating - Accessories: 1-point electrode Hermetic port Shutter Column	2 pc. 1 pc. 1 set 4 pc.

#### 4. Individual Unit Specifications

Unit	Model and Specifications	Quantity
3) Evaporation power supply	<ul style="list-style-type: none"> <li>- Model: PSE-150C</li> <li>- Dimensions: 480 mm × Depth 435.3 mm × Height 149 mm (exclude projection and attached component)</li> <li>- Weight: Approx. 40 kg</li> <li>- Input: Single-phase 200 V</li> <li>- Output: Max. 150 A</li> <li>- Control method: Constant current (Constant voltage/Fixed electric power)</li> <li>- Output control: 10 V</li> <li>- Load output: 1 - Position</li> <li>- Rating: 30 minutes</li> <li>- Attached component: Output cable (38 mm<sup>2</sup> × 2 m)</li> </ul>	1 set
4) Oil diffusion pump (MAIN. PUMP)	<ul style="list-style-type: none"> <li>- Model: DPF-050</li> <li>- Evacuation speed: 50 L/sec</li> <li>- Ultimate pressure: 10<sup>-5</sup> Pa</li> <li>- Evacuation or suction opening: VG 25 or equivalent, φ13.6 or equivalent</li> <li>- Required power: 0.25 kVA</li> <li>- Oil for use: SY, 0.02L</li> </ul>	1 set
5) Oil sealed rotary vacuum pump (BACK. PUMP)	<ul style="list-style-type: none"> <li>- Model: G-20DA</li> <li>- Evacuation speed: 20 L/min</li> <li>- Ultimate pressure: 1.3 × 10<sup>-1</sup> Pa</li> <li>- Required power: 0.1 VA</li> <li>- Oil for use: SMR-100, 0.18L</li> </ul>	1 set
6) Main valve	<ul style="list-style-type: none"> <li>- Model: Butterfly Valve</li> <li>- Internal diameter: VG-25</li> </ul>	1 set
7) Liquid nitrogen trap	<ul style="list-style-type: none"> <li>- Bore diameter: 25 A</li> <li>- Injection volume: Approx. 0.4L (including evaporation amount)</li> </ul>	1 set
8) Three-way valve	<ul style="list-style-type: none"> <li>- Model: Ball valve type</li> </ul>	1 set

Refer to the specification sheet for special models.

## 5. Standard Accessories

1) Power supply cable	- For the main unit: 100 V single-phase, with plug, 2 m - For evaporation power: 200 V single-phase, with crimp-type terminal, 2 m	1 pc. 1 pc.
2) Instruction manual	- Standard paper	1 pc.
3) Vacuum performance test result table	- Standard paper	1 pc.
4) Cap for LEAK V	- Cap for the leak valve of the roughing piping	1 pc.
5) Hexagonal wrench	- 3 mm	1 pc.

Refer to the specification sheet for special models.

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



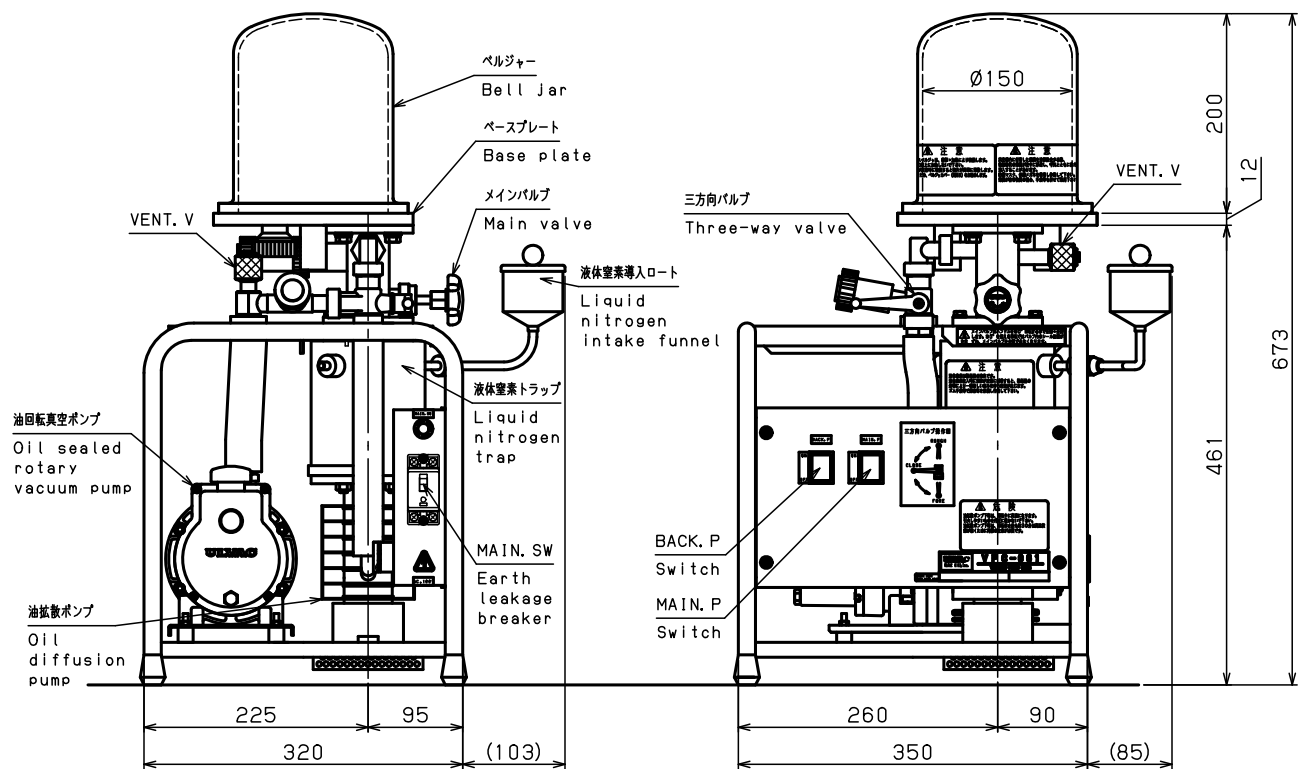
Confirm

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

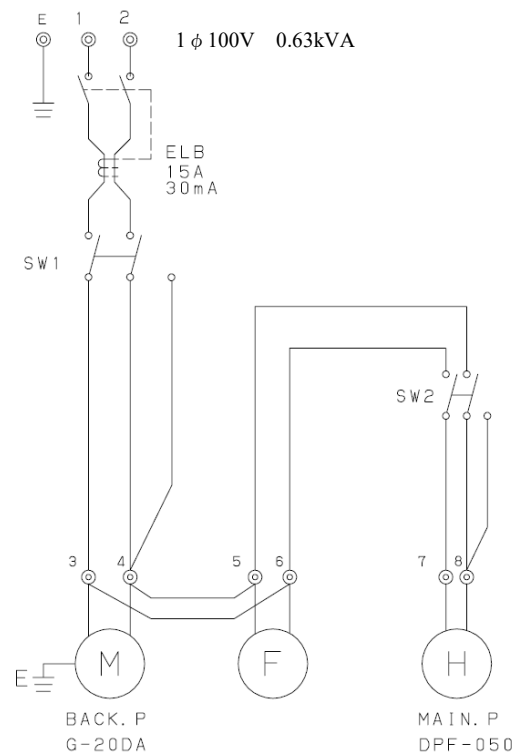
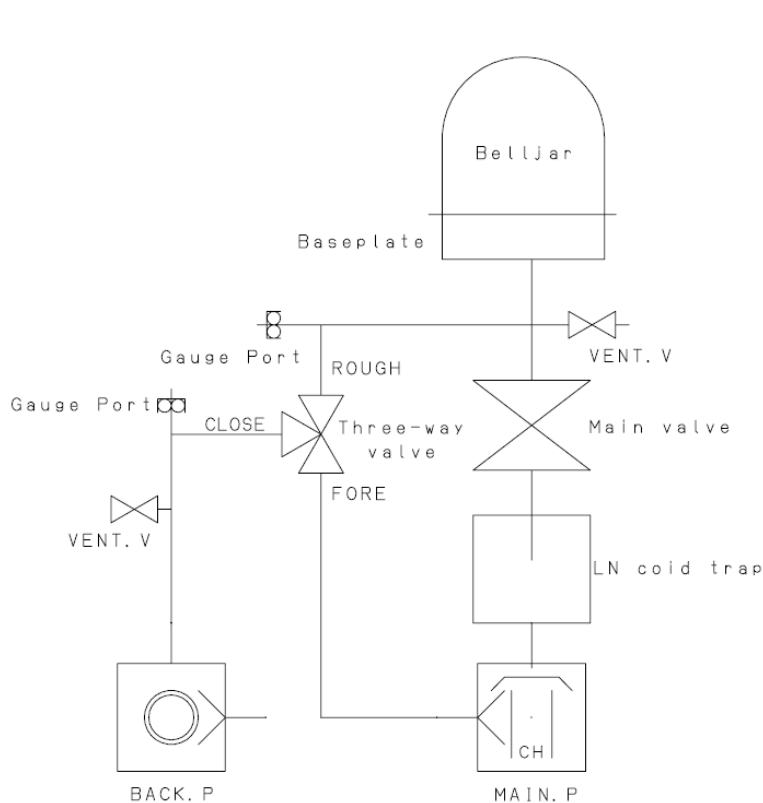
\* Refer to each manual for detailed description of switches of units.

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

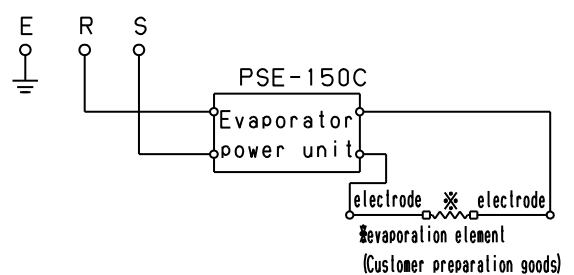


Evacuation system drawing

Electrical system drawing




AC200V, 1φ, 1.5kVA (50/60Hz)



### (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 0.3 m 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.

#### 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	<p>After the installation, make sure that the product has a clearance of at least 30 cm from the wall to make space without any hindrance for maintenance and for safety.</p>	

#### 4. Power Supply

 Warning	 Check the capacity	<p>Primary power supply Please prepare the following: Single-phase 100 V, 6.3 A or more Single-phase 200 V, 7.5 A or more</p> <p>Smaller power supply capacity may cause the breaker to trip due to overcurrent during the operation.</p>
<p><b>Specifications of Primary Cable Connection (Portions Connecting with the Equipment)</b></p> <p>For 100-V power supply, Cable length: 2 m End: 3P plug with ground (with adapter) For 200-V power supply, Cable length: 2 m End: <math>\Phi</math> 5 crimp-type terminal</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 for 200-V power supply 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 200-V power supply: 2.0 mm<sup>2</sup> or more 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
Phillips head (+) screwdriver	Installation of the evaporation input power cable
Torque wrench/socket (WAF 13)	Installation of the evaporation output power cable
25-mm crescent wrench	Installation of the evaporation output power cable

## 6. How to change the Oil cap into Exhaust cap

1. Twist the black oil cap to the left and remove it.



Oil cap

2. Mount the Exhaust cap attached with the pump.



Exhaust cap

3. After changing the Oil cap into the Exhaust Cap, remove the wire band tied around the plug.











Exchange confirmation indication

※Please carefully be aware that there is a possibility that the oil level gauge will be blown off by switching on the pump without changing the cap.

#### (4) Operations

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

 Warning	 Avoid this action	<p>Do not apply any shock to the glass bell jar, and avoid heating it to 50°C or higher.</p> <p>In a case of explosion upon vacuum condition, the exploded pieces will spread.</p> <p>This may cause a serious damage to the product.</p>
	 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>
 Caution	 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>
	 Leave open air	<p>After the oil sealed rotary vacuum pump stops, open VENT V to leave the inside of the roughing piping open air.</p> <p>This must be done to prevent reverse oil flow.</p>
	 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>
	 Exchange confirmation	<p>Please carefully be aware that there is a possibility that the oil level gauge will be blown off by switching on the pump without changing the cap.</p>

## 2. Evacuation Device Operation Procedure

### 2-1 Preparation

- 1) Close completely by attaching VENT. V cap.
- 2) Three-way valve, main valve: CLOSE
- 3) All switches on the operation panel: OFF
- 4) Attach the probe to the gauge port when using the ionization gauge.
- 5) 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 2-min evacuation, MAIN. P: ON
- 5) D.P warming up in 15 mins: COMPLETE
- 6) Liquid nitrogen (when necessary): INJECT

#### Note

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.

### 2-3 Stop

#### Unit shutdown

- 1) Vacuum evacuation for maintaining vacuum condition inside the bell jar
- 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
- 11) If there is any liquid nitrogen inside, it evaporates naturally.

### 3. Deposition Steps

3-1 Opening bell jar	
1) When an ionization gauge is use. Filament:	OFF
2) Main valve:	COMPLETE CLOSE
3) Three-way valve:	FORE Confirm
4) VENT. V (of Main Valve) when necessary:	Open gradually
3-2 Vacuum evacuation of bell jar	
1) VENT. V (of Main Valve):	CLOSE
2) Bell jar:	Install
3) Three-way valve:	ROUGH
Rough evacuation of the inside of the bell jar, Check: 13 Pa or lower	
4) Three-way valve:	FORE
5) Main valve:	COMPLETE OPEN
6) When an ionization gauge is use. Filament:	ON

## 4. Film Formation Steps









<p>4-1 Preparation</p> <ol style="list-style-type: none"><li>1) Opening bell jar: Steps of 3-1</li><li>2) Attaching the evaporation source (substrate or filament) to the electrode</li><li>3) Provide the evaporation material to evaporation source</li><li>4) Shutter: CLOSE</li><li>5) Attaching the material (substrate)</li><li>6) Vacuum evacuation of bell jar: Steps of 3-2<ul style="list-style-type: none"><li>- Executing the vacuum evacuation up to a certain pressure</li></ul></li></ol>
<p>4-2 Film formation</p> <ol style="list-style-type: none"><li>1) User side breaker: ON</li><li>2) Evaporation power supply MAIN switch: ON</li><li>3) Turn on the evaporation select switch.</li><li>4) HIGH (Lamp on): Confirm</li><li>5) MANUAL (Lamp off): Confirm</li><li>6) POWER (Lamp on): ON</li><li>7) The current is gradually thrown to the evaporation source pushing the UP ▲ key.</li><li>8) Observe the condition of the evaporation source. When the evaporation source starts melting or subliming, allow the impurities and dirt to adhere to the shutter so as to remove them.</li><li>9) Open the shutter and form the film on the material (substrate)</li><li>10) Run evaporation test.</li><li>11) After film is formed, close the shutter.</li><li>12) POWER (Lamp off) : OFF</li><li>13) Evaporation power supply MAIN switch: OFF</li><li>14) Open the vacuum chamber, as described in section 3-1, and remove the coated material (substrate).</li></ol> <p>Repeat as necessary from step 4-1.</p>
<p><b>Note</b></p> <ul style="list-style-type: none"><li>- Film thickness: Adjusted by the time of formation</li><li>- Sputtering speed: Adjusted by the current flown through the evaporation source</li></ul>

## 5. Measures upon Abnormal Conditions

5-1 Instantaneous power outage	
- All devices automatically return to the conditions before the power outage.	
5-2 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
5-3 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 clean the thin film adhered to the inside of the glass bell jar and the base plate.</p> <p>The thin film could be broken into minute particles, and float in the air, which could be inhaled into the human body.</p>
	 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)
  - 4) Cleaning of the inside of the base plate and the glass bell jar.
- 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.

#### 3-4 O-ring at gas bell jar

- 1) Required tools None
- 2) Removal procedure
  - Remove the O-ring. In this case, do not cause any damage on the O-ring groove.
- 3) Order of attachment
  - Apply vacuum grease on the surface of a new O-ring.  
(Apply thin layer of oil)
  - Clean the inside of the O-ring groove.
  - Place the O-ring into the groove.

#### 3-5 Glass bell jar

- Lift the glass bell jar to remove.
- 3) Cleaning
    - Wear protective equipment (dust-proof mask and gloves) and wipe the adhered materials using alcohol.
  - 4) Order of attachment
    - Attach the jar in such a way that the flange at the lower part of the glass bell jar contacts with the O-ring face in parallel. (Caution: If it is tilted, it may contact with the metal part, causing damage.)



#### 4. Maintenance and Inspection Points

Unit	Maintenance and Inspection	Timing of Maintenance and Inspection
Glass bell jar	Clean the inside.	As necessary
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
Wiring cable	Confirm that there is no looseness in wiring terminals and screws.	As necessary

## 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. (e.g., Hermetic)
		Clean glass bell jar and O-ring, or replace consumables.
	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.
	Material (substrate) that involves large-amount gas release was used (e.g., resin substrate).	Change the material. Take longer evacuation time.
	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.
No current flows through the electrode even when the CONTROL of the evaporation power supply is operated.	Evaporation power supply is disconnected.	Replace the evaporation power supply.
	The electrode may be shorted in the feed-through collar.	Repair the point of short to recover isolation.
The thermal relay for oil sealed vacuum pump operates.	Overloaded	Refer to the Oil Sealed Vacuum Pump User's Manual. Thermal relay set
Pressure measured on the roughing side indicates wrong values when the bell jar is exposed to open air.	The main valve is not opened completely.	Clean the internal face of the valve seat seal on the main valve.
		Overhaul of the main valve (at our factory)

## 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 bell jar

## 7. Consumable List

Location of Use	Parts	Specifications	Material	Quantity	Replacement by user
Base plate	O-ring for flange	P-160	NBR	1	OK
	O-ring for hermetic sealing	P-26	NBR	1	OK
	O-ring for shutter	N-8	NBR	1	OK
	Electrode pole gasket	KV-1020-01-019	FPM	2	OK
Rack	Rubber Foot	KP-5	---	4	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=220	Special rubber	1	OK



## 7. Consumable List

Location of Use	Parts	Specifications	Material	Quantity	Replacement by user
Oil sealed rotary vacuum pump	Oil	SMR-100	---	0.18L	OK
	Vibration-control rubber	ME-20	---	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
Liquid nitrogen trap	O-ring for suction flange	V-40	NBR	1	OK



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.
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
Evaporation power supply	Power supply for deposition.	Factory assembled
Evaporation power supply cable	Evaporation power supply output cable	Factory assembled
Electrode set	Evaporation electrode	Installable by user
Filament holder	Secure the evaporation power.	Installable by user
Filament	Evaporation power	Installable by user
φ140 material holder	Fixing material	Installable by user
8P Hermetic	Terminals for energizing.	Installable by user
Socket for 8P Hermetic	Terminal socket for energizing.	Installable by user
Glass bell jar	Glass container for film formation.	Installable by user
Bell jar cover	Glass bell jar handle Prevents glass explosion.	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
φ15GP Attachment	Attachment to convert the bore diameter	Installable by user