Rotary Evaporator
RE202-A/212-A

Instruction Manual

First Edition

- **Thank you for choosing RE series Rotary Evaporators from Yamato Scientific Co., Ltd.**
- **For proper equipment operation, please read and become thoroughly familiar with this instruction manual before use. Always keep equipment documentation safe and close at hand for convenient future reference.**

⚠Warning: Read instruction manual warnings and cautions carefully and completely before proceeding.

Yamato Scientific Co., Ltd.

Printed on recycled paper

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1. SAFETY PRECAUTIONS

Explanation of Symbols

A Word Regarding Symbols

Various symbols are provided throughout this text and on equipment to ensure safe operation. Failure to comprehend the operational hazards and risks associated with these symbols may lead to adverse results as explained below. Become thoroughly familiar with all symbols and their meanings by carefully reading the following text regarding symbols before proceeding

⚠ Warning Signifies a situation which may result in serious injury or death (Note 1.)

⚠ Caution Signifies a situation which may result in minor injury (Note 2) and/or property damage (Note 3.)

(Note 1) Serious injury is defined as bodily wounds, electrocution, bone breaks/fractures or poisoning, which may cause debilitation requiring extended hospitalization and/or outpatient treatment.

(Note 2) Minor injury is defined as bodily wounds or electrocution, which will not require extended hospitalization or outpatient treatment.

(Note 3) Property damage is defined as damage to facilities, equipment, buildings or other property.

Symbol Meanings

Signifies warning or caution.
Specific explanation will follow symbol.

Signifiies restriction.
Specific restrictions will follow symbol.

Signifies an action or actions which operator must undertake.
Specific instructions will follow symbol.

1. SAFETY PRECAUTIONS

Symbol Glossary

WARNING / CAUTION

General

Danger!
High Voltage

Danger!
Extremely Hot

Danger!
Moving Parts

Danger!
Blast Hazard

Caution:
Water Only

Caution:
Shock Hazard!

Caution:
Burn Hazard!

Caution:
Do Not Heat
Without Water!

Caution:
May Leak Water!

Caution:
Toxic Chemicals

RESTRICTION

General
Restriction

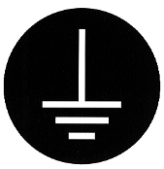
No Open Flame

Do Not
Disassemble

Do Not Touch

ACTION

General Action
Required



Connect Ground
Wire

Level Installation

Disconnect Power

Inspect
Regularly

1. SAFETY PRECAUTIONS

⚠ WARNING

Install in a location free of flammables and explosives.

Never install or operate unit in a flammable or explosive gas atmosphere.
See "LIST OF HAZARDOUS SUBSTANCES" (P.46) for information on flammable and explosive gases.

Ground wire MUST be connected properly

- Connect power cable to a grounded outlet in order to avoid electric shock.
- Never connect ground wire to gas lines or water pipes. ・ Fire, accident or equipment malfunction may result.
- Never connect ground wire to telephone grounding lines or to lightning conductor rods. Fire or electric shock may result.
- Never insert multiple plugs into a single outlet. Doing so may result in power cable overheating, fire or drop in voltage.

Connect power cable properly

Insert power cable firmly into the AC adapter inlet. Failure to do so may result in overheating, fire, and/or electric shock.

Turn OFF (○) power immediately when an abnormality occurs.

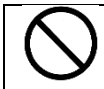
If unit begins emitting smoke or abnormal odors for reasons unknown, turn OFF (○) power immediately, disconnect power cable from power supply, and contact original dealer of purchase for assistance.
Continuing to operate without addressing abnormalities may cause fire or electric shock, resulting in serious injury or death. Never attempt to disassemble or repair unit. Repairs should always be performed by a certified technician.

Handle power cable with care.

- Do not operate unit with power cable bundled or tangled. Operating unit with the power cable bundled or otherwise tangled, may cause power cable to overheat and/or catch fire.
- Do not modify, bend, forcibly twist or pull on power cable. Fire or electric shock may result.
- Do not risk damage to power cable by positioning it under desks or chairs, or by allowing it to be pinched in between objects. Fire or electric shock may result.
- Do not place power cable near kerosene/electric heaters or other heat-generating devices. Doing so may cause power cable insulation to overheat, melt and/or catch fire, which may result in electric shock.
- Turn OFF (○) power immediately and disconnect from facility terminal or outlet, if power cable becomes partially severed or damaged in any way. Contact original dealer of purchase for information about replacing power cable.
  Failure to do so may result in fire or electric shock.
- Always connect power cable to appropriate facility outlet or terminal.

DO NOT disassemble or modify equipment

Never attempt to disassemble or modify unit. Doing so may cause malfunction, fire, electric shock, or personal injury. Note that any malfunction resulting from unauthorized modifications or customizations to unit will void the warranty.



Exercise caution when handling flammable chemicals.

Unit is NOT fire or blast resistant. When processing flammable samples, be sure to provide adequate ventilation and not to allow anything that may be a source of fire or ignition (static electricity, etc.) approached. Do not use this unit in an atmosphere of substances shown in LIST OF HAZARDOUS SUBSTANCES (P.46). Never vaporize explosive substances. Fire or explosion causing serious injury or death may result.

CAUTION

DO NOT operate equipment during thunderstorms

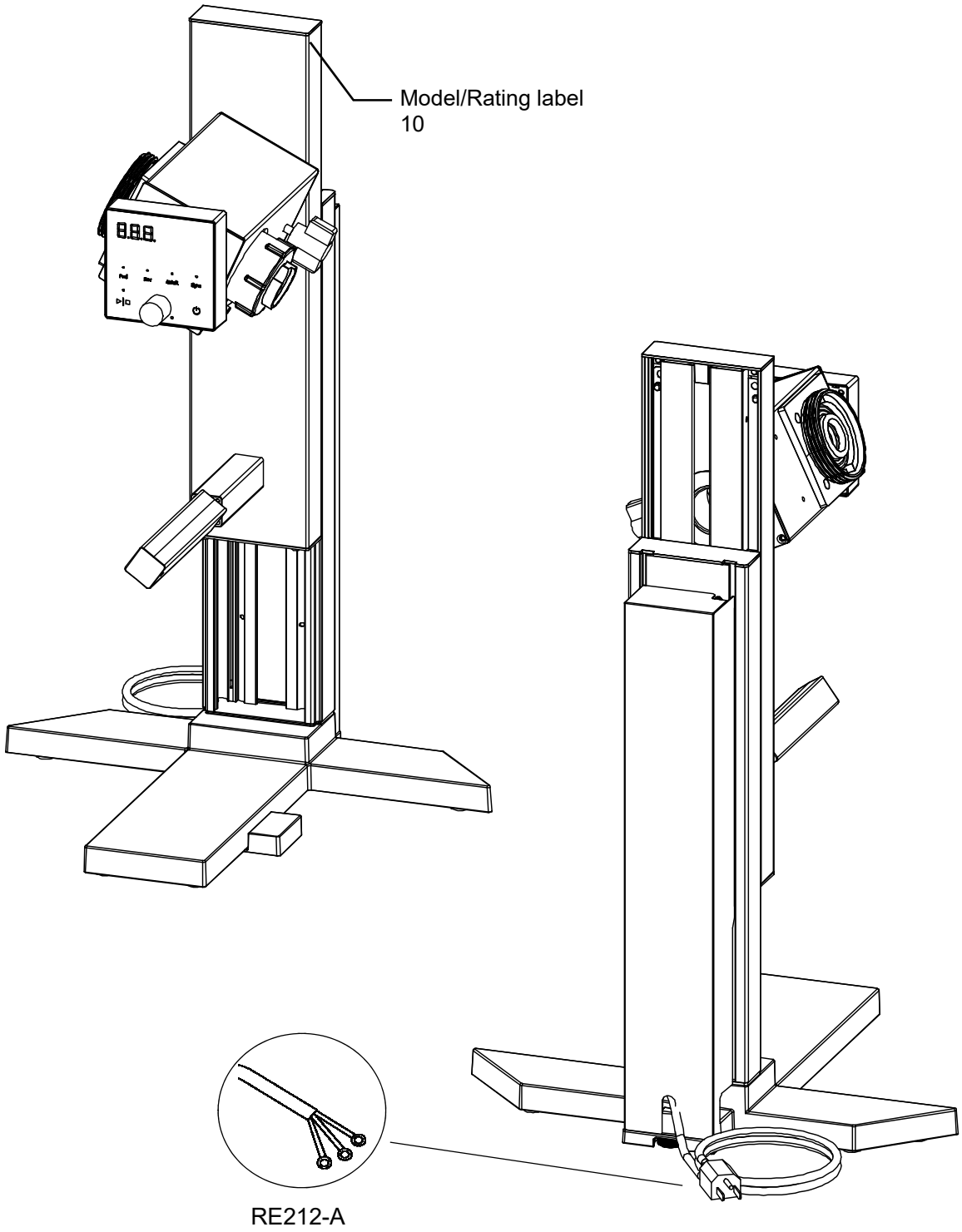
In the event of a thunderstorm, turn OFF (○) power and disconnect power cable immediately. A direct lightning strike may cause equipment damage, fire or electric shock, resulting in serious injury or death.

1. SAFETY PRECAUTIONS

Residual Risk Map

These figures indicate positions of caution labels.
The numbers shown in the figure indicate the numbers listed in the "List of Residual Risks" in this manual.
For details of individual residual risks, see the List of Residual Risks.

[RE202-A/212-A]



*** Contact us if the caution signs are no more visible because nameplate is peeled off or texts are eliminated. We will send you a new nameplate. (for charge)**

List of residual risks (instructions for risk avoidance)

This list summarizes residual risks to avoid personal injuries or damages to properties during or related to the use of equipment.

Be sure to fully understand or receive instructions on how to use, maintain and inspect equipment before starting operation.

	Loading/Installation			
No.	Degree of risks	Risk description	Protective measures taken by the user	Relevant page
1	WARNING	Fire/ Electric shock	Install in a location free of flammables and explosives.	P.3
2	CAUTION	Fire/ Electric shock	Ground wire MUST be connected properly	P.3
3	CAUTION	Fire/ Electric shock	Connect power cable properly.	P.3
4	WARNING	Fire/ Electric shock	Turn OFF (○) power immediately when an abnormality occurs.	P.4
5	WARNING	Fire/ Electric shock	Handle power cable with care.	P.4
6	WARNING	Fire/ Electric shock	DO NOT disassemble or modify equipment.	P.4
7	WARNING	Fire	Exercise caution when handling flammable chemicals.	P.4
8	WARNING	Fire	Choose an appropriate installation site.	P.12
9	WARNING	Injury	Install unit on a level surface.	P.12
10	WARNING	Fire/ Electric shock	Always connect power cable to appropriate facility outlet or terminal.	P.13
11	WARNING	Fire/ Electric shock	Install in a dry location.	P.13
12	WARNING	Injury	Pay attention to the surroundings whenever operating jack.	P.13
13	WARNING	Injury	Be aware that slide panel may spring up	P.14
14	WARNING	Injury	Install glassware and piping with slide panel lifted up.	P.14
15	CAUTION	Injury	Use caution when handling glassware	P.16

	Use			
No.	Degree of risks	Risk description	Protective measures taken by the user	Relevant page
16	WARNING	Explosion/ Fire	Exercise caution when handling flammable chemicals.	P.33
17	WARNING	Fire/ Electric shock	Turn OFF (○) power immediately when an abnormality occurs.	P.33
18	WARNING	Fire/ Electric shock	DO NOT operate equipment during thunderstorms	P.4
19	CAUTION	Injury	Select appropriate gasket for organic solvents	P.33

List of Residual Risks

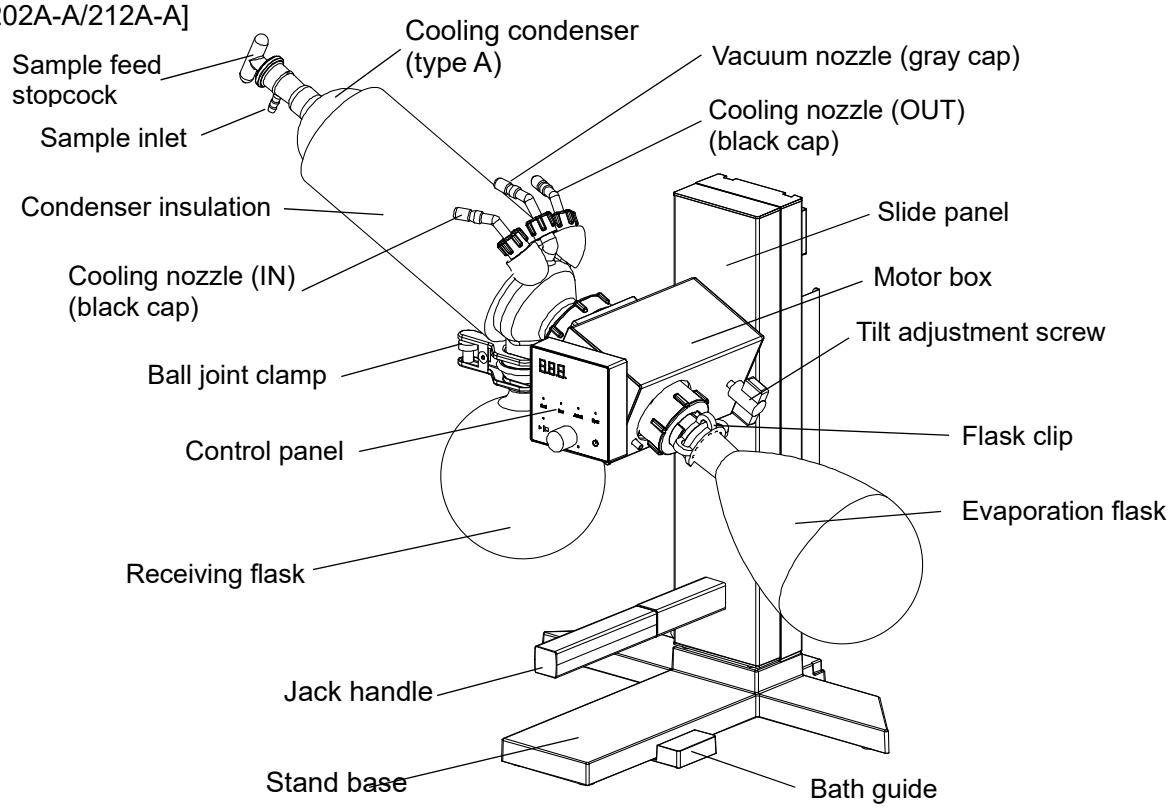
	Daily inspection/maintenance			
No.	Degree of risks	Risk description	Protective measures taken by the user	Relevant page
20	WARNING	Fire/ Electric shock	Remove power cable for inspection and maintenance.	P.34
21	WARNING	Fire/ Electric shock	NEVER disassemble or modify unit	P.34

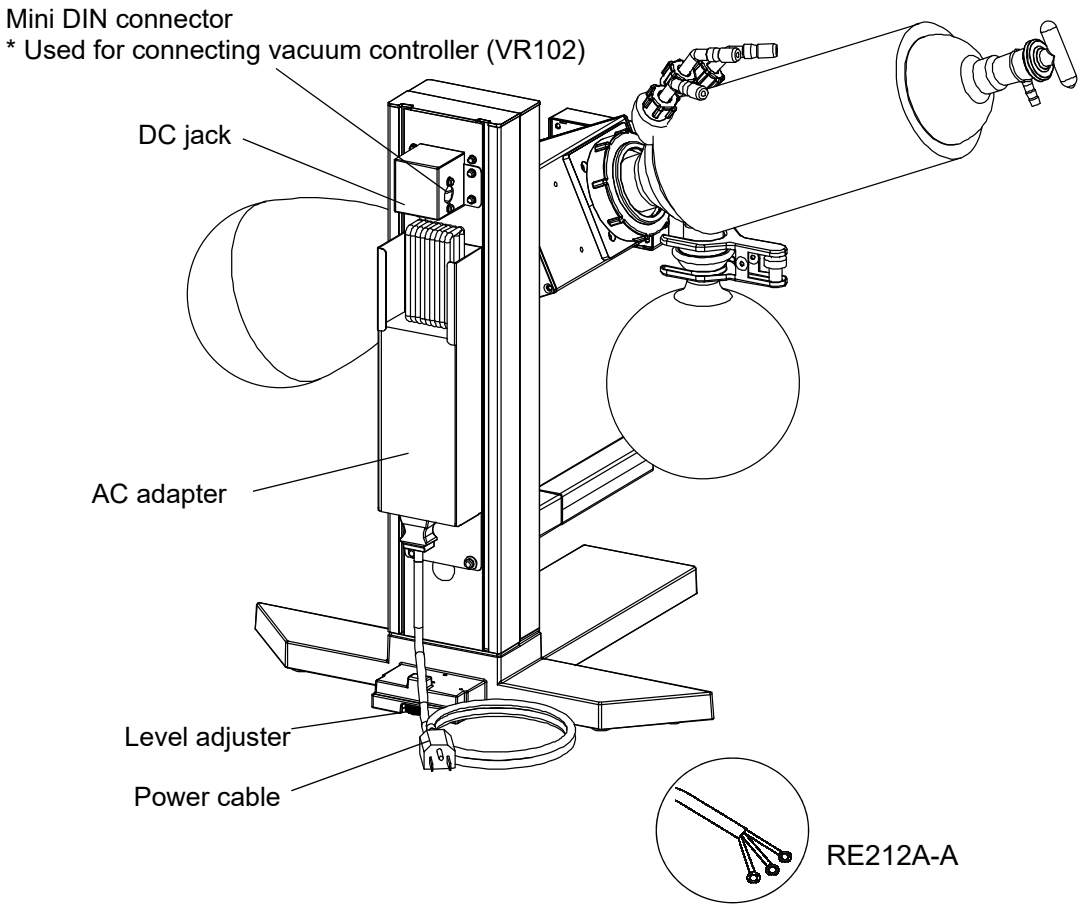
	Extended storage/disposal			
No.	Degree of risks	Risk description	Protective measures taken by the user	Relevant page
22	WARNING	Fire/ Electric shock	Turn OFF (○) power and disconnect power cable.	P.35
23	CAUTION	Injury	Do not leave unit in a location where children may have access	P.35

2. COMPONENT NAMES AND FUNCTIONS

Main Unit

[RE202A-A/212A-A]

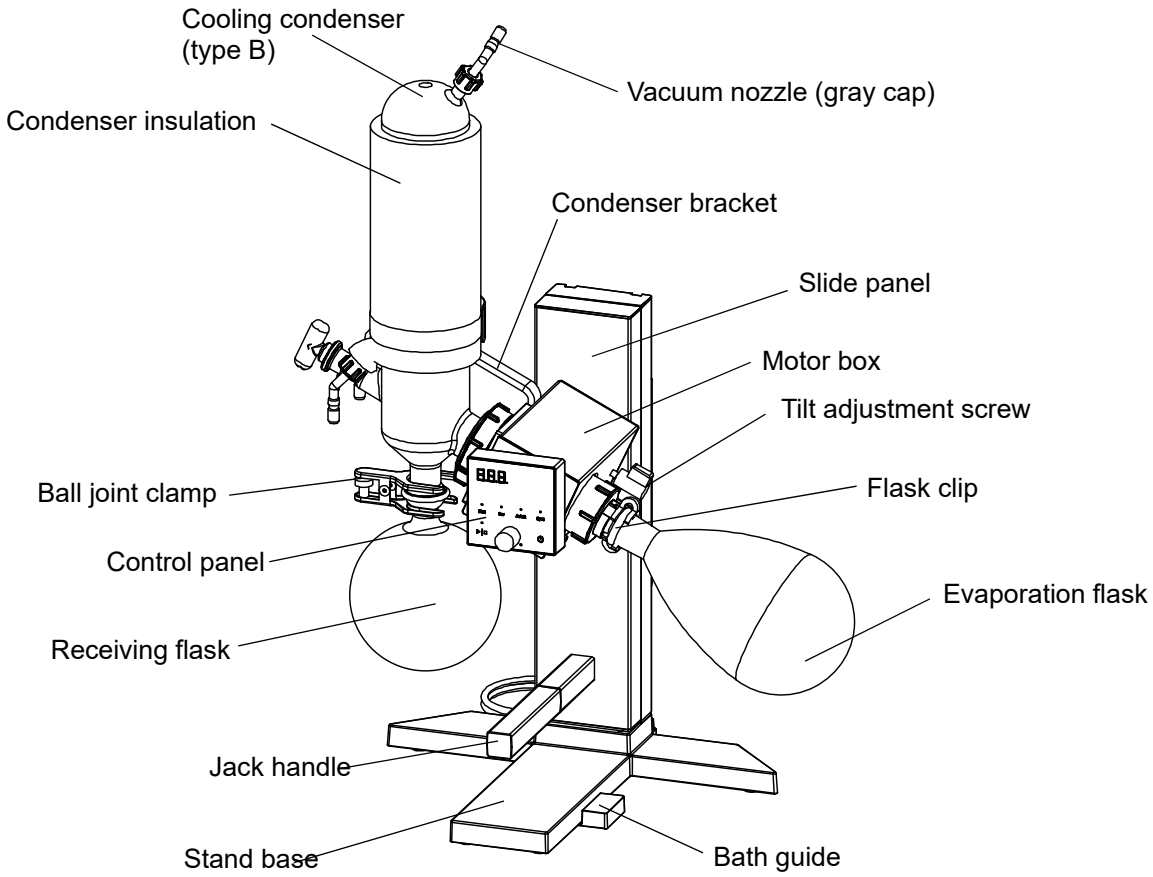


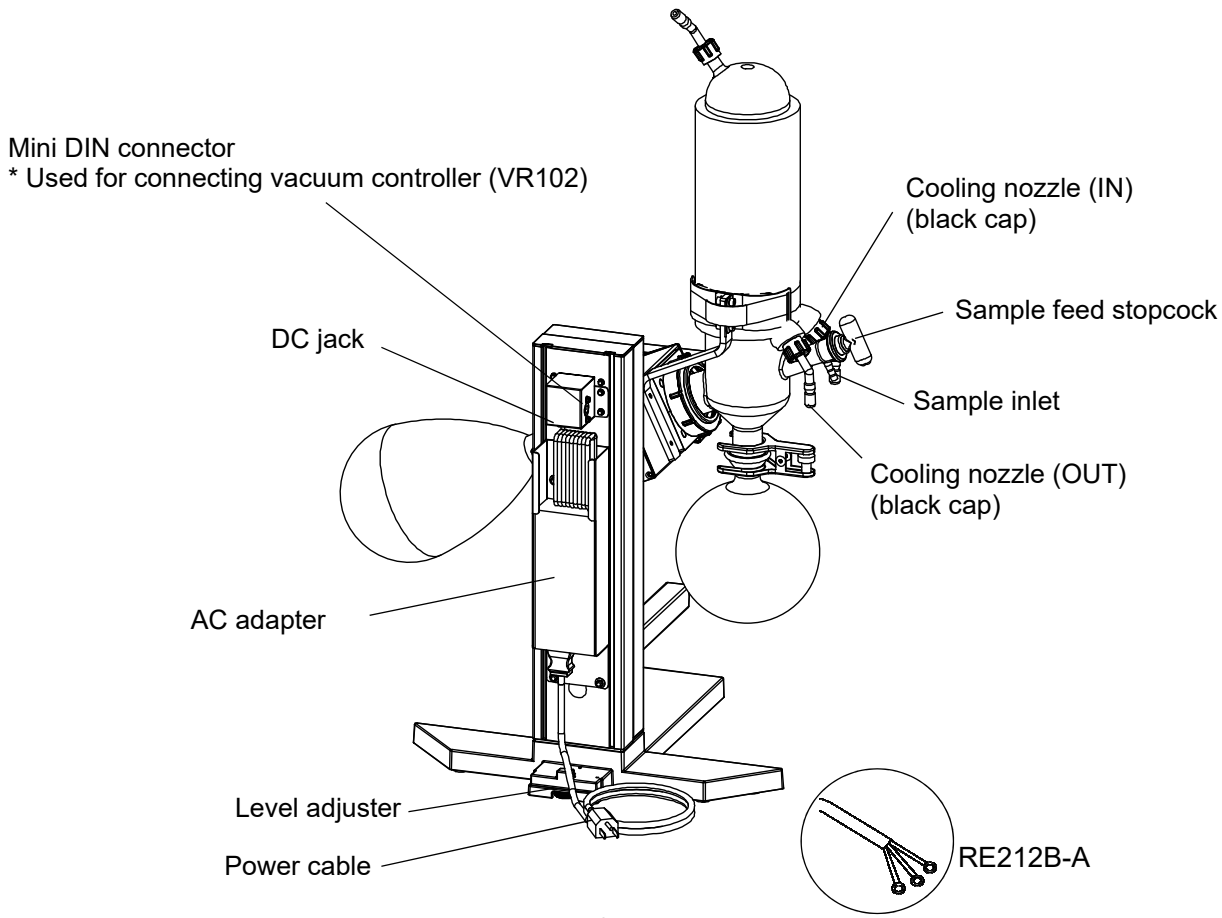


2. COMPONENT NAMES AND FUNCTIONS

Main Unit

[RE202B-A/212B-A]

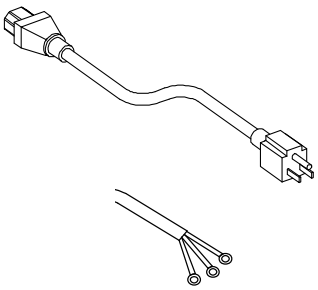


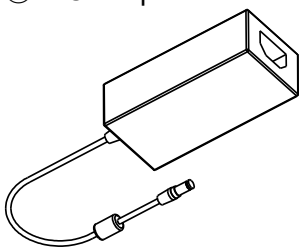
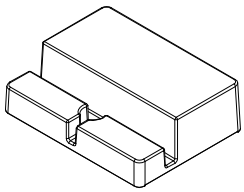
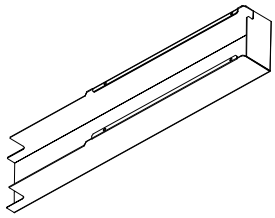


2. COMPONENT NAMES AND FUNCTIONS

Accessories

Check before operation that all the accessories are complete.
Contact original dealer of purchase if anything is missing.

<table>
<tr>
<td>① Power cable (approx. 3 m)
 

For RE212-A</td>
<td>② AC adapter
  </td>
<td>③ Bath guide
  </td>
<td>④ Rear cover
  </td>
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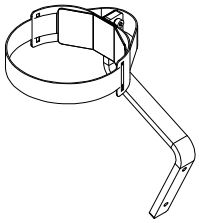
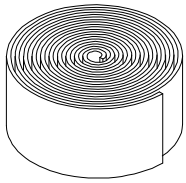
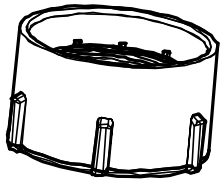
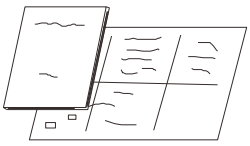
<td>⑤ Condenser bracket
 
Used for cooling condenser type B</td>
<td>⑥ Hex wrench
 
Used for fastening condenser bracket</td>
<td>⑦ Tape fastener
 
Used for binding codes and hoses</td>
<td>⑧ Joint nut
  </td>
</tr>
<tr>
<td>⑨ Instruction manual
⑩ Warranty card
  </td>
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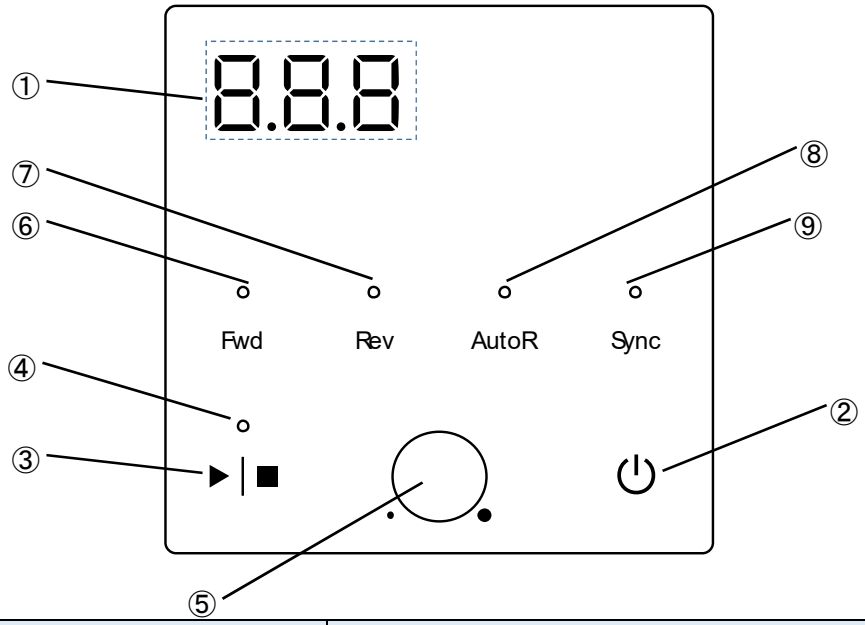
</table>

* Check the accessories for each condenser unit on the list of condenser unit accessory included with condenser unit.

2. COMPONENT NAMES AND FUNCTIONS

Control Unit



No.	Panel item	Description
①	RPM display	Shows rotation speed reading and setting, and each parameter.
②	Power key	Press to turn ON (|) or OFF (○) power.
③	Run/Stop key	Press to start or stop rotation.
④	Run/Stop lamp	Illuminates during operation.
⑤	Encoder dial	Turn to increase or decrease set value, scroll items in user setting, and press to switch or finalize settings.
⑥	Fwd lamp	Forward lamp; illuminates in forward rotation mode
⑦	Rev lamp	Reverse lamp; illuminates in reverse rotation mode
⑧	AutoR lamp	Auto Rotation lamp; illuminates in auto inversion mode
⑨	Sync lamp	Synchro lamp; not used for this unit.

Display Characters

All characters displayed when making settings are defined as follows

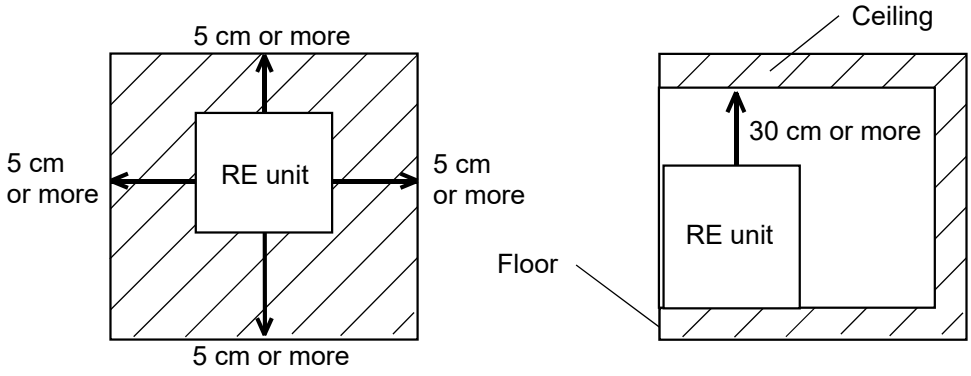
Character	Letters	Description
rot	rot	Indicates rotation mode setting. See “Rotation Modes” (P. 26)
SEC	SEC	Indicates time setting for automatic inversion. See “Timed Auto Inversion Mode” (P. 27)
Pon	Pon	Indicates setting of the behavior of unit at power loss restoration. See "Auto-resume Function" (P.28)
dSP	dSP	Indicates LED brightness setting. See "LED Brightness Setting" (P.29)
di	di	Indicates communication setting for vacuum controller VR102. See “Vacuum Controller Connection” (P.30)

Choose an appropriate installation site.

DO NOT install unit:

- where installation surface is not completely level, not even or not clean.
- where flammable or corrosive gases/fumes may be present
- where external temperature will exceed 35°C, will fall below 5°C or will fluctuate largely.
- where liquid is assumed to splash on unit
- in excessively humid or dusty locations.
- in direct sunlight or outdoors.
- where there is constant vibration.
- in direct contact with the outside air
- where power supply is erratic.
- where there is combustible material nearby.
- in the proximity of, particularly right below a fire alarm.
- where there is a risk of freezing or condensation.

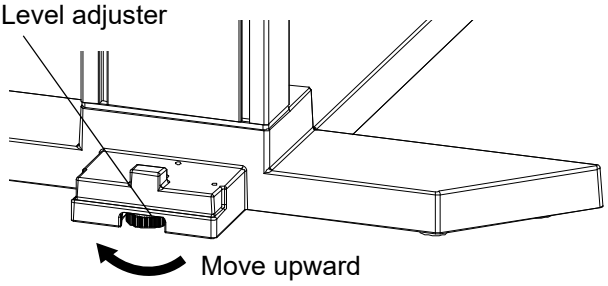
Install unit, including glass set, in a location with sufficient space as specified below.



Install unit on a level surface.

Install unit on a level and even surface. Failure to do so may cause abnormal vibrations or noise, possibly resulting in complications and/or malfunction.

Use level adjuster on the back of unit when unit still wobbles despite level installation.
Turn the wheel left to ascend, and turn it right to descend.



Always connect power cable to appropriate facility outlet or terminal.

Connect power cable to a suitable facility outlet or terminal, according to the electrical requirements.

Electrical requirements:	RE202-A: 100-115 V AC	single phase	50/60 Hz	1 A *1
	RE212-A: 100-230 V AC	single phase	50/60 Hz	1 A

*1 RE202-A unit is compatible with the voltage range of 100-230 V AC, by choosing a suitable power cable.

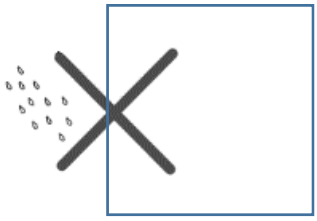
Operational voltage ranges are 90-125V (RE202-A) and 90V-250V (RE212-A), performance guarantee voltage ranges are 95-120V (RE202-A) and 95V-241V (RE212-A), and frequency is ±1 % of rating.

❖Check the line voltage on distribution board and properly evaluate whether to utilize a line being shared by other equipment. If unit is not activated by turning ON (|) power, take an appropriate course of action, such as connecting unit to a dedicated power source. Inserting multiple cords into a single outlet, using branch outlets or extension cords, may cause a drop in voltage, which may affect performance, resulting in failure to control or maintain proper temperature.

Model	Standard	Cable end processing
RE202-A	3-core AWG18	Type A electrical plug (3P)
RE212-A	3-core AWG18	M4 ring terminals (3P)

Install in a dry location.

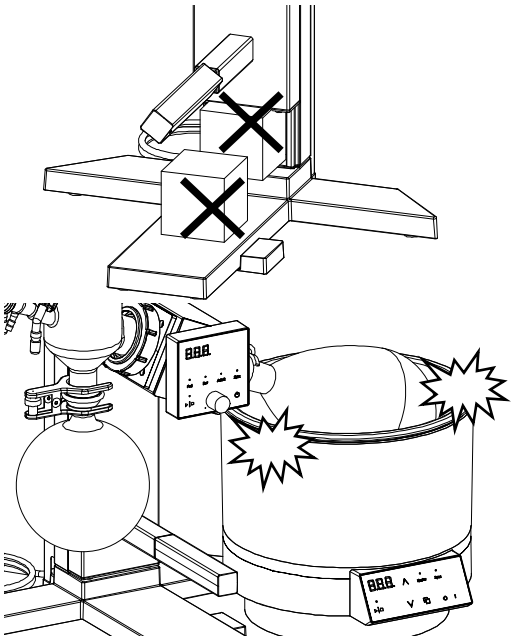
Install unit where it will be free from liquid spray and other moisture. Failure to do so may result in control mechanisms becoming wet, causing malfunction, electric shock and/or fire.



Pay attention to the surroundings whenever operating jack.

Do not place any objects under the slide panel. Such objects may cause damage to unit or personal injury upon jack operation.

Always lower the slide panel slowly to prevent damage to glassware on contact with the bath



3. PRE-OPERATION PROCEDURES

Be aware that slide panel may spring up

Slide panel on this unit employs a spring-loaded jack to lift up.
The spring tension is adjusted to achieve balance when all the connection with glassware and piping are made.
The panel jumps up when releasing the lock of the jack without glassware mounted.
Be sure to hold top of the slide panel by hand whenever releasing the lock.

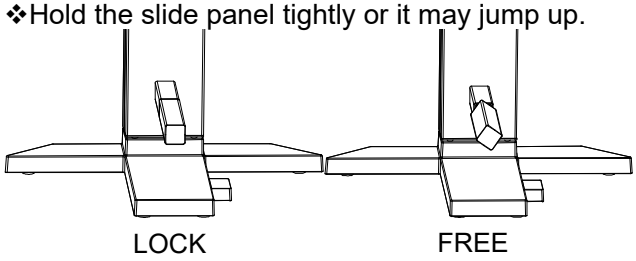
Always install glassware and piping with the slide panel lifted up.

If the lock of the jack is unintentionally released while setting up glassware and piping, there is a risk of damage to glassware, and/or personal injury.

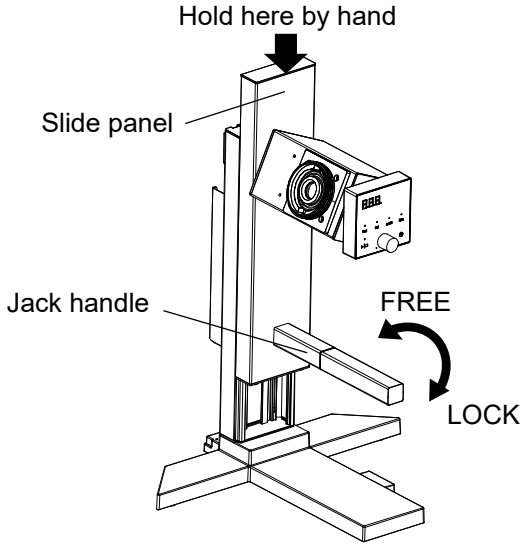
1. Jacking up

(1) Release the lock by turning jack handle counterclockwise while holding the slide panel top.

❖Hold the slide panel tightly or it may jump up.



(2) Lift up the slide panel to top, turn the handle clockwise to lock.



2. Motor box tilt adjustment (set in reverse position)

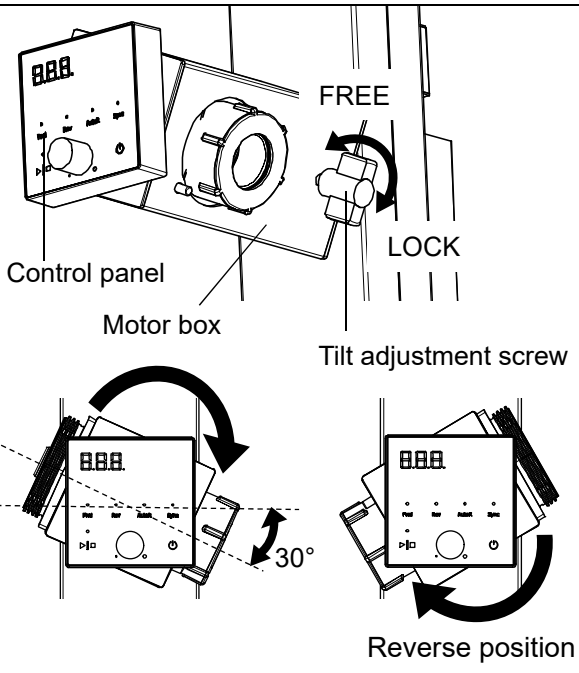
(1) Hold motor box by hand, and turn tilt adjustment screw counterclockwise to release the lock.

(2) Motor box can now rotate. Rotate the box to the position for use and turn tilt adjustment screw clockwise to lock the driving unit.

(3) Adjust the control panel angle for better viewability.

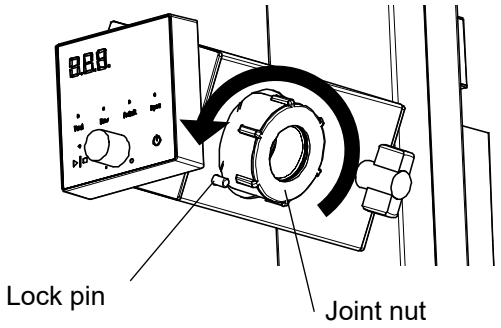
(4) Glassware can be set in the opposite direction by turning motor box clockwise (reverse position).

❖Tilt the driving unit at about 30° before installation.

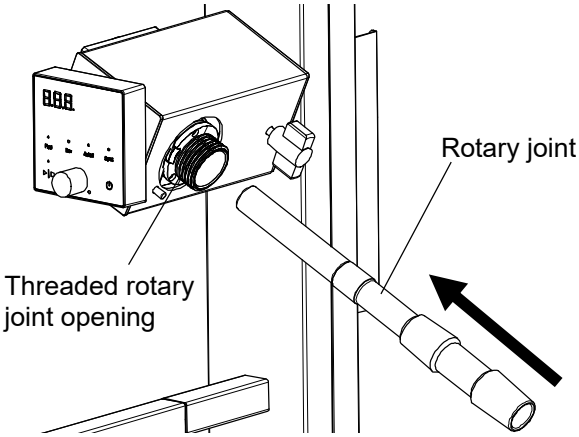


3. Installing rotary joint

(1) Remove joint nut
Press in the lock pin with the thumb to lock the rotary part. Take off joint nut by turning it counterclockwise with the other hand.

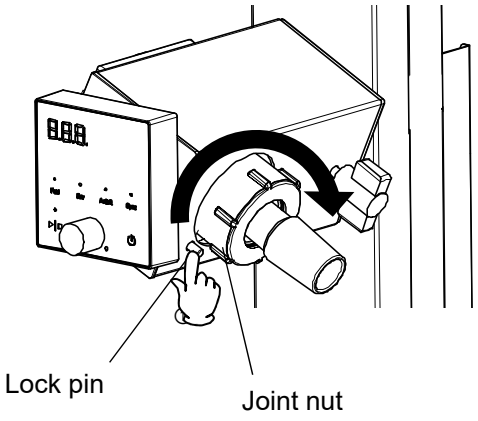


(2) Install rotary joint
Insert rotary joint into the rotary joint opening until it clicks, while holding motor box tightly with the other hand.



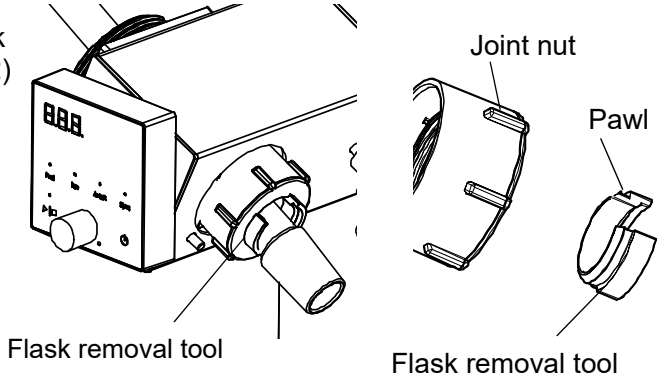
(3) Replace joint nut
As with the step (1), press in the lock pin to lock the rotary part. Screw in joint nut clockwise with the other hand.

(4) Attach flask removal tool (included with glass set)
① Fit flask removal tool over rotary joint.
② Pinch flask removal tool and slip it in joint nut.



* There is a direction for flask removal tool. Pawl should come to the joint nut side.

Flask removal tool facilitates removing flask and rotary joint. See “Operation Stop” (P.32)



Use caution when handling glassware

Any damage on glassware may lead to serious accidents. Check glassware for damage before operation.

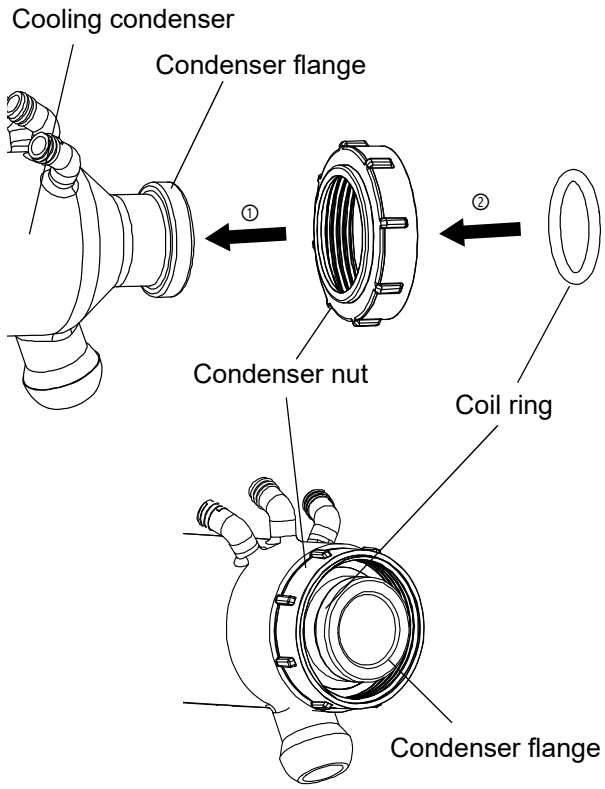
4. Attaching condenser nut

Attach condenser nut for mounting condenser on main unit

① Pass condenser nut on condenser flange.

② Put coil ring over condenser flange.

③ Lightly pull on condenser nut to ensure it does not come off condenser flange.



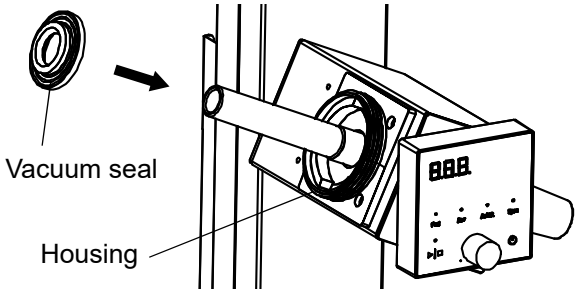
5. Installing vacuum seal

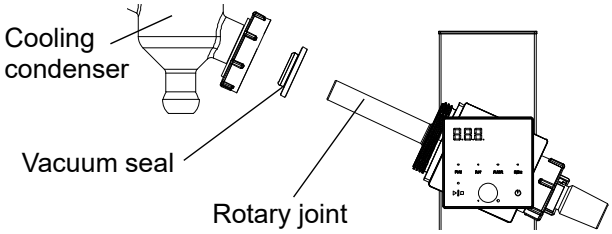
Pay attention to the direction of vacuum seal.

Installing vacuum seal in the opposite direction may lead to rough vacuum, or may wear the seal, resulting in damage to driving unit.

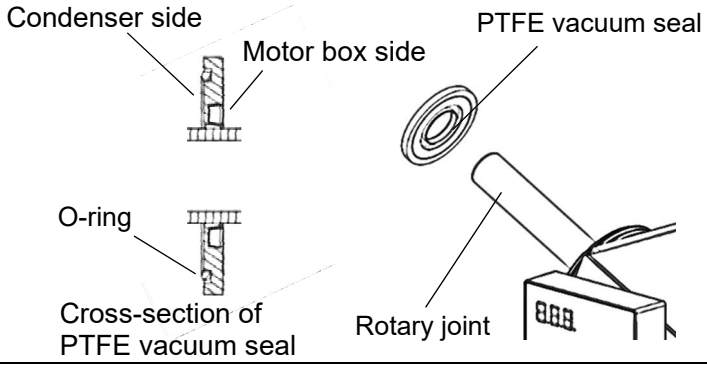
(1) Install vacuum seal.
Fit vacuum seal into the housing by passing it on rotary joint with the side which spring is visible facing motor box.

❖Be sure to install vacuum seal after rotary joint is set, to prevent damage to vacuum seal.





(2) Install optional PTFE vacuum seal.
Fit PTFE vacuum seal into the housing by passing it on rotary joint with the side on which O-ring is visible facing cooling condenser. PTFE vacuum seal is made of firm material. Install it slowly without applying excessive force.



Make pipe connection properly

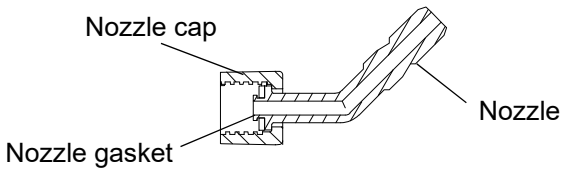
Be sure to install all pipes in right positions. Improper connection and looseness of nozzle caps may cause leakage or damage to peripherals.

6. Installing nozzle unit

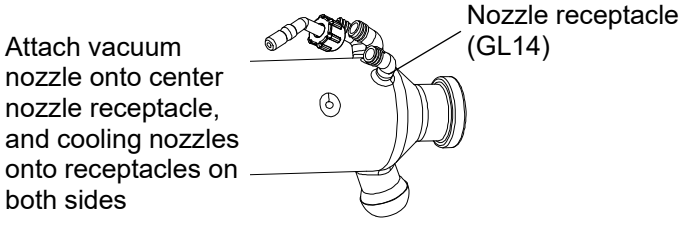
❖Nozzle unit has two types, with gray cap and black cap.
Gray: for vacuum line
Black: for cooling water line

❖Three parts of “Nozzle”, ”Nozzle cap”, and ”Nozzle gasket” comprise the nozzle unit.
Ensure that nozzle gasket is placed in nozzle cap.

① Screw down nozzle cap against nozzle receptacle on cooling condenser.
② Turn nozzle cap clockwise to fasten.



Nozzle unit sectional diagram



Make pipe connection properly

Be sure to install all pipes in right positions. Improper connection and looseness of nozzle caps may cause leakage or damage to peripherals.

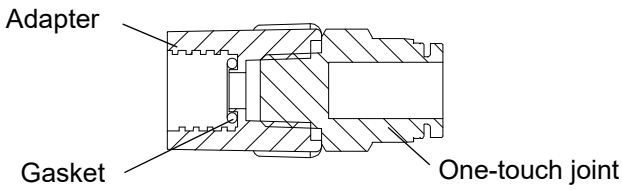
7. Installing one-touch cooling nozzle (optional, P.42)

❖Three parts of “One-touch joint”, ”Adapter”, and ”Gasket” comprise the one-touch nozzle unit.
Ensure that gasket is placed in adapter.

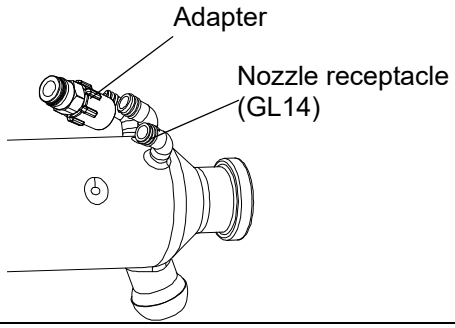
① Screw down one-touch cooling nozzle against nozzle receptacle on cooling condenser.

② Turn one-touch cooling nozzle clockwise to fasten.

❖When installing the nozzle, always grasp it by adapter. Failure to do so may loosen one-touch joint, resulting in water leakage.



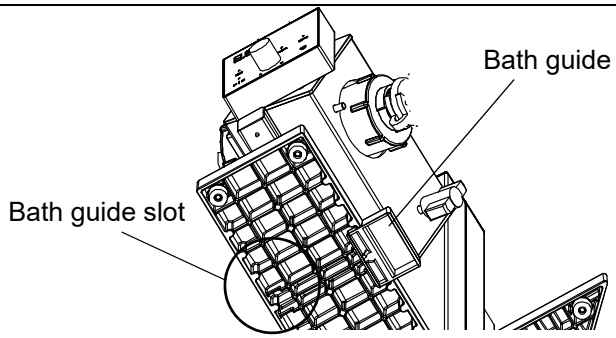
One-touch cooling nozzle sectional diagram



8. Installing bath guide

Attach supplied bath guide to main unit stand base.

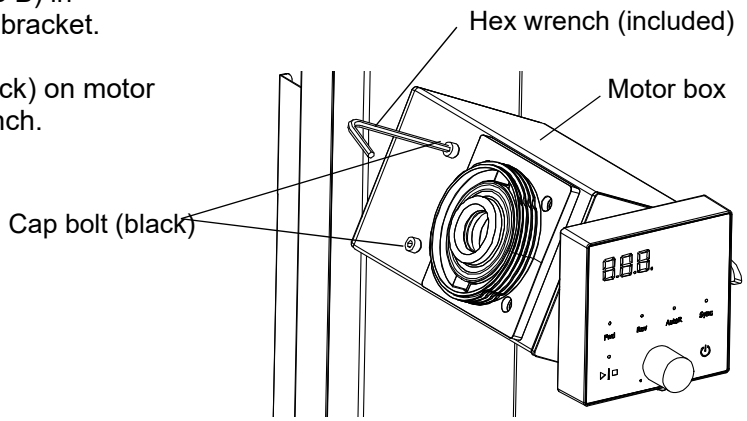
(1) Insert bath guide into a slot on bottom of stand base.
The bath guide slots are positioned on both right and left. Choose the side on which an evaporation flask is to be attached.



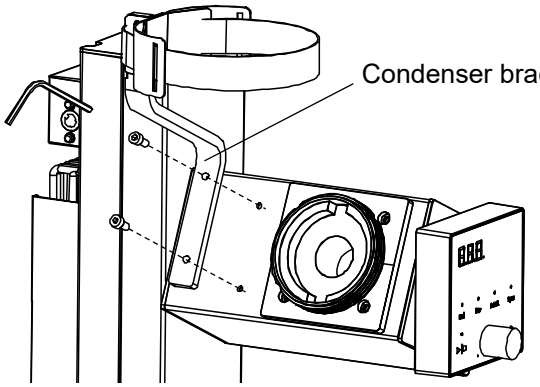
9. Installing condenser bracket (only for vertical condenser, type B)

❖Use vertical condenser (type B) in conjunction with condenser bracket.

(1) Remove two cap bolts (black) on motor box with supplied hex wrench.



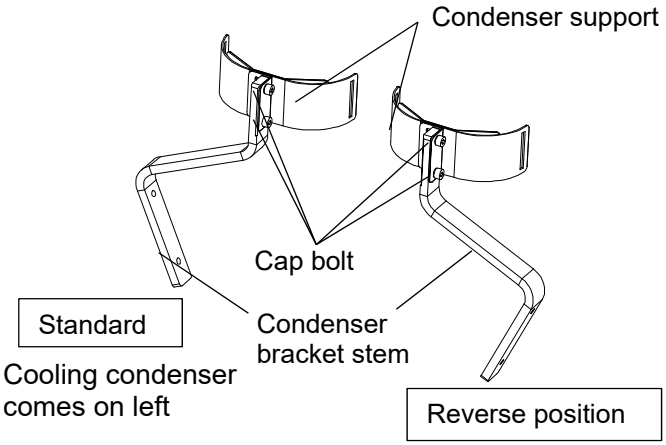
(2) Attach condenser bracket with the removed cap bolts.



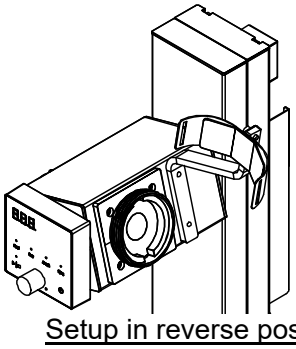
(3) Reverse position

① Remove two cap bolts of condenser bracket with hex wrench
See the right figure to rearrange condenser support to the reverse direction.

② Adjust the angle of motor box and control panel, according to procedures in “2. Motor box tilt adjustment (set in reverse position” (P.14)



③ Remove cap bolts on motor box, and therewith fasten condenser bracket on the box (see right figure).



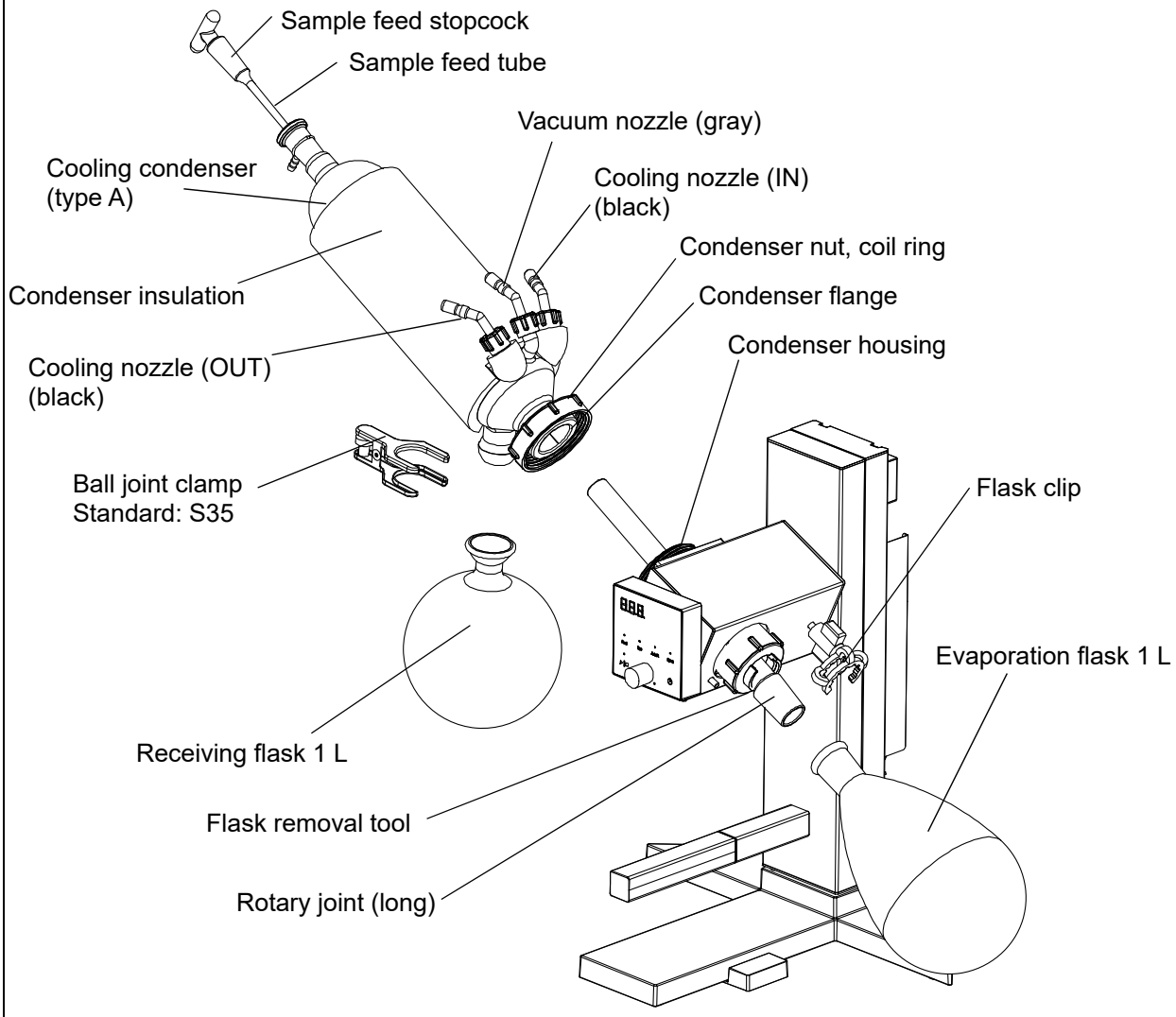
Setup in reverse position

10. Installing cooling condenser and flask

Install glassware while slide panel is lifted up.

If slide panel springs up during setting, glass breakage and/or personal injury may result. Be sure to hold down slide panel top when unlocking the jack.

[RG202A-A]



(1) Bring condenser flange into intimate contact with vacuum seal in condenser housing, and tighten condenser nut clockwise to some extent. Turn the condenser and the nut simultaneously to re-tighten. Ensure that the joint for receiving flask faces down.

(2) Slide condenser insulation over the condenser.

(3) Attach receiving flask to cooling condenser with ball joint clamp. Lock the clamp by turning a dial inside.

(4) Put evaporation flask on rotary joint and secure it with flask clip.

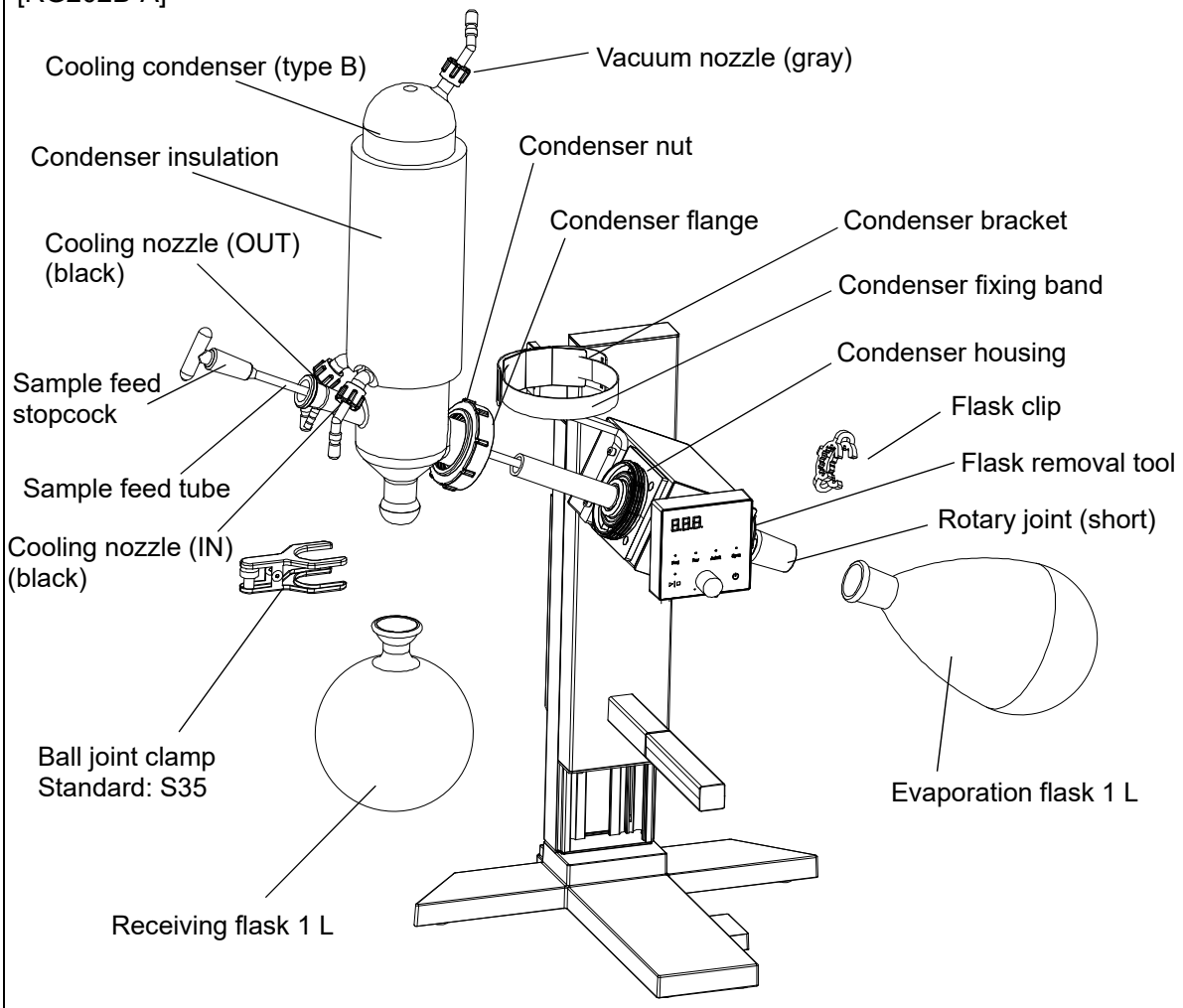
(5) Insert sample feed stopcock carefully into the condenser so that sample feed tube does not become bent or twisted.

10. Installing cooling condenser and flask

Install glassware while slide panel is lifted up.

If slide panel springs up during setting, glass breakage and/or personal injury may result. Be sure to hold down slide panel top when unlocking the jack.

[RG202B-A]



(1) Attach condenser bracket. (See P.19)

(2) Bring condenser flange into intimate contact with vacuum seal in condenser housing, and tighten condenser nut clockwise to some extent. Turn cooling condenser and the nut simultaneously to re-tighten. Ensure that the joint for receiving flask faces down.

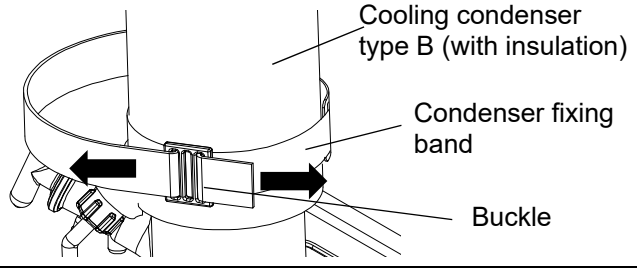
(3) Slide condenser insulation over the condenser.

(4) Pull out one end of condenser fixing band from the buckle, and put the condenser onto condenser bracket. Pass the fixing band through the buckle, and pull on the both sides to fasten the condenser. (see right figure)

(5) Attach receiving flask to the condenser with ball joint clamp. Lock the clamp by turning a dial inside.

(6) Put evaporation flask on rotary joint and secure it with flask clip.

(7) Insert sample feed stopcock carefully into the condenser so that sample feed tube does not become bent or twisted.



11. Connecting vacuum/cooling hose

❖Vacuum hose is not included. Please prepare optional vacuum hose (product code: 255297) separately.

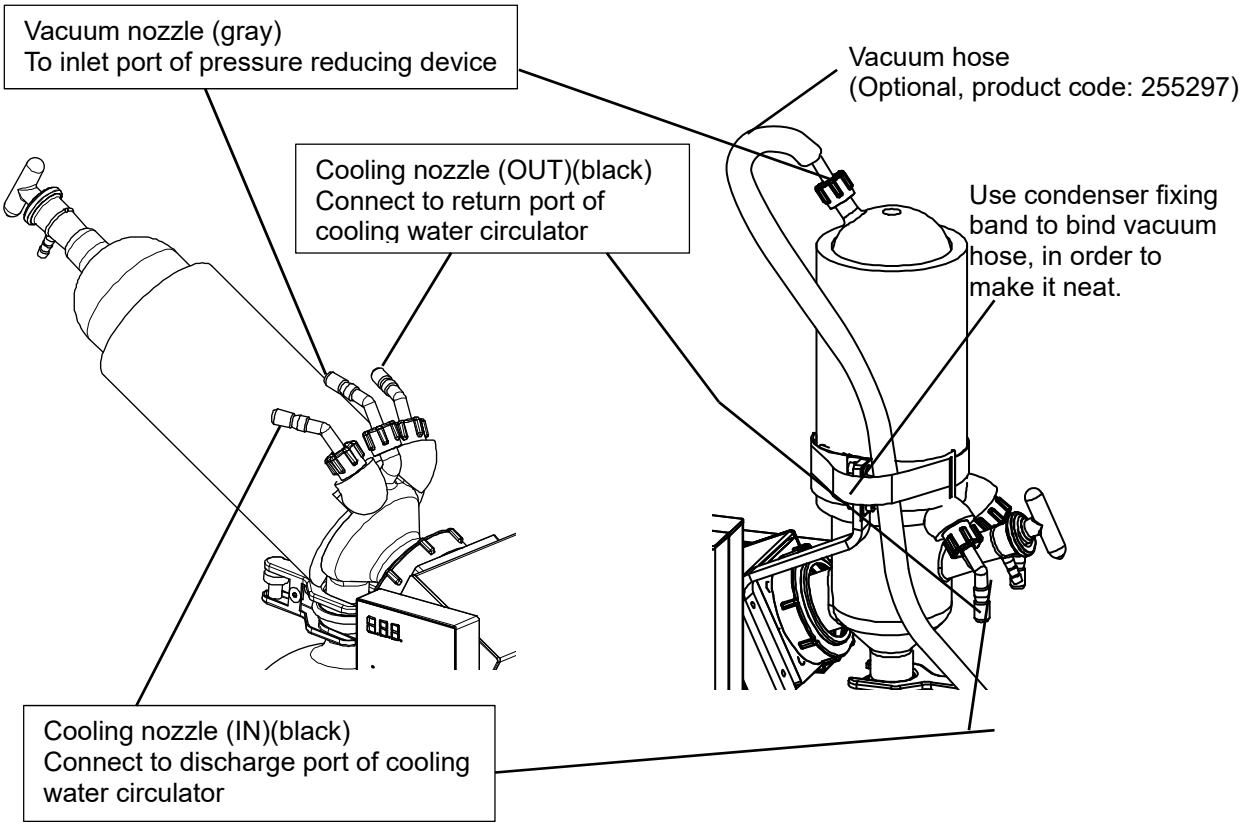
(1) Connect vacuum nozzle and the inlet of a pressure reducing device with a vacuum hose.

❖Be cautious not to connect vacuum nozzle to the exhaust port of the pressure reducing device. Doing so may cause RE unit to be pressurized, resulting in equipment malfunction.

(2) Connect cooling nozzles and the circulation ports of a cooling water circulator.

❖Be sure to attach the hose to cooling nozzle before threading it onto cooling condenser. Using excessive force may damage glassware.

[Cooling condenser type A] [Cooling condenser type B]

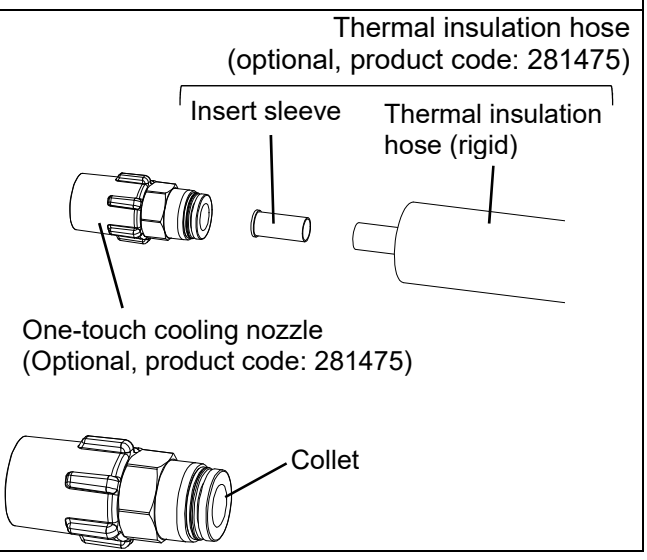


(3) One-touch cooling nozzle (optional)

① Attach one-touch cooling nozzle onto cooling condenser, and then insert rigid tube firmly into the condenser. Put supplied insert sleeve into rigid tube to prevent leakage.

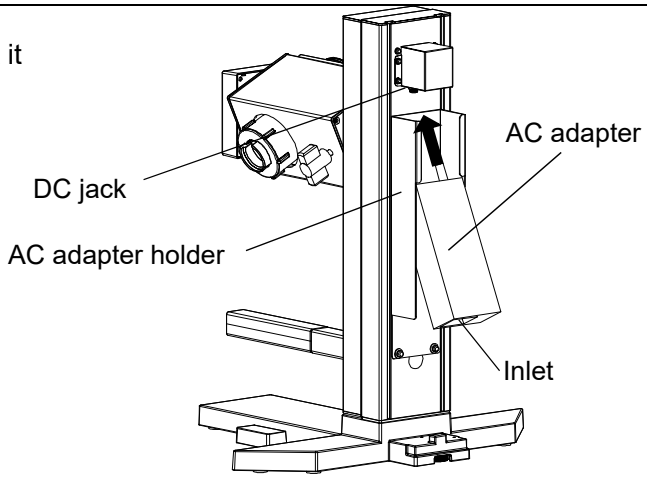
② To remove the tube, pull it out while pressing in the collet of one-touch cooling nozzle.

❖Press the whole surface of the collet evenly so that the tube can be easily removed.



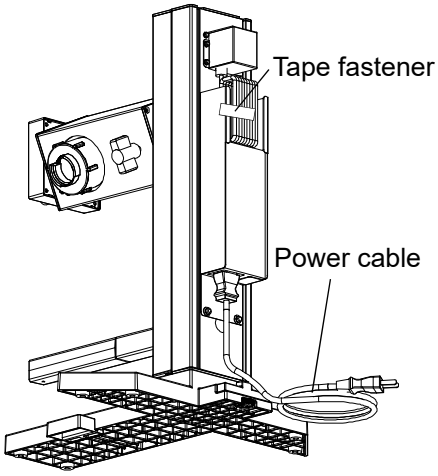
12. Connecting AC adapter/power cable

(1) Hold AC adapter with the inlet facing the bottom left viewed from the back, and insert it into the AC adapter holder at an angle.



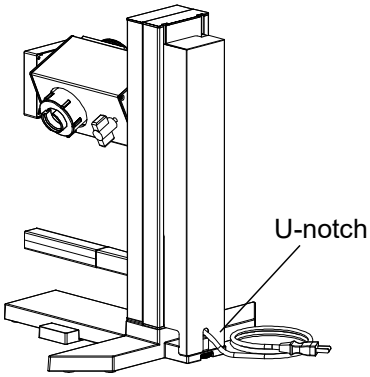
(2) Connect the plug from AC adapter to the DC jack Use included tape fastener to bind excess cable to keep it in the holder.

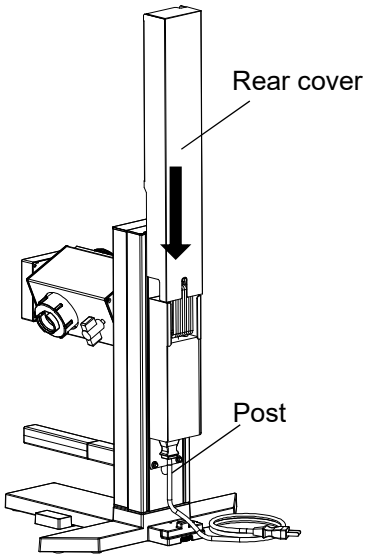
(3) Insert power cable into the inlet of AC adapter.



(4) Slide supplied rear cover over the post along its groove. Draw power cable through the U-notch in the bottom of rear cover.

❖Exercise caution not to pinch AC adapter cable and power cable in rear cover when attaching it.

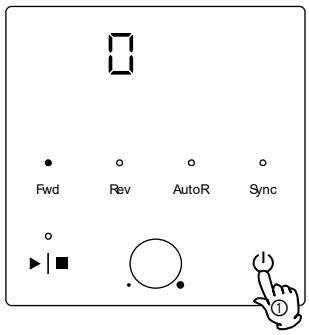




4. OPERATION PROCEDURES

Operation Procedure

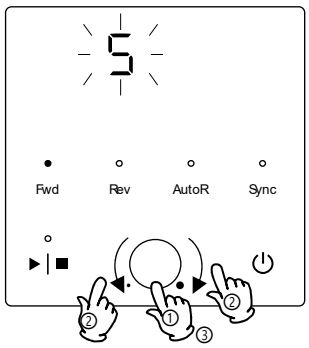
1. Turn ON (|) power



① Press the Power key.
RPM display: shows software version at start up, then shows current rpm.

Indicator lamp: One of the Fwd/Rev/AutoR lamps illuminates according to operation mode at the time of last power OFF (○).

2. Set rotation speed



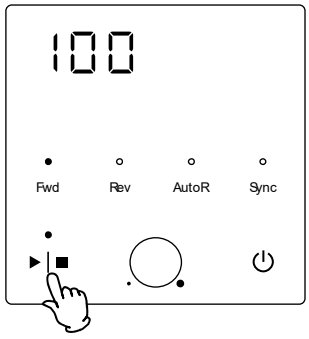
① Press the Encoder dial.
RPM display: Shows speed setting, flashing.
② Set desired speed by turning the Encoder dial.
Speed setting range: 5-315 rpm

Turning the Encoder dial slowly increases or decreases the value by 1, turning it quickly changes the value by 10.

③ Press the Encoder dial to finalize.
RPM display: Shows current rpm.

☀ indicates flashing.

3. Start operation



Press 1 sec to start

Press and hold ▶|■ for one second.
Run/Stop lamp: ON

<To stop>
Press ▶|■ again.
Run/Stop lamp: OFF

❖Speed setting can also be changed during operation.

List of user setting items

- Press and hold the Encoder dial for two seconds. User setting items will be shown. Select an item by turning the Encoder dial. Press the Encoder dial again to edit the displayed item.
- Holding down the Encoder dial for two seconds while the user setting item is displayed, or leaving unit without key operation for about two minutes, will discard the changes, and the display returns to previous screen.
- It is not possible to enter user setting mode during operation.

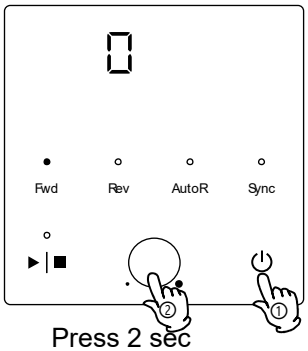
Setting Item	Description	Page
Rotation mode setting  (rot)	Rotation mode can be selected. F.ro: Forward rotation mode r.ro: Reverse rotation mode Ato: Timed auto inversion mode Auto inversion mode repeatedly changes rotation direction between forward and reverse, in accordance with time setting “SEC”. Default setting is “F.ro”	P.26
Auto inversion time setting  (SEC)	Time interval for auto inversion mode can be set. Setting range: 5-999 sec Default setting is “5”	P.27
Auto-resume function  (Pon)	Select operation for the time power is restored from outage. OFF: Unit goes into idle at power recovery. ON: Unit automatically reverts to status just before power loss and begin operation once again from that point. Default setting is “OFF”	P.28
LED brightness setting  (dsp)	Change the LED brightness of the control panel. The brightness can be set in 8 levels Setting range: 0-7 Default setting is “3”	P.29
Vacuum controller setting  (di)	Communication settings for vacuum controller VR102 can be made. OFF: Not linked (does not carry out communication) ON: Linked (carries out communication) Default setting is “OFF” While connection is “ON”, operation start/stop on RE unit and vacuum controller are interlocked.	P.30

Set rotation direction

F.ro: Forward rotation mode
r.ro: Reverse rotation mode
Ato: Timed auto inversion mode

Default setting is “F.ro”

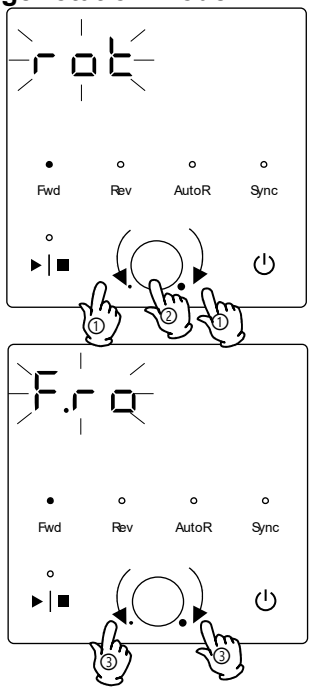
1. Enter user setting



Press 2 sec

① Press the Power key.
② Press the Encoder dial for two seconds while current rpm is on the screen.
Unit enters user setting.

2. Change rotation mode



① Turn the Encoder dial and select "rot".
RPM display: “rot” flashes

② Press the Encoder dial.
RPM display: Current setting flashes
F.ro: Forward rotation mode
r.ro: Reverse rotation mode
Ato: Timed auto inversion mode

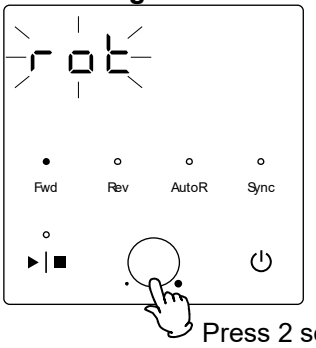
③ Turn the Encoder dial to select rotation mode

④ Press the Encoder dial to finalize.

A corresponding lamp among Fwd/Rev/AutoR lamps illuminates

❖When operating RE unit in reverse position (bath comes on left), reverse rotation mode can prevent evaporation flask from scattering bath fluid toward the front by its rotation.

3. Exit user setting

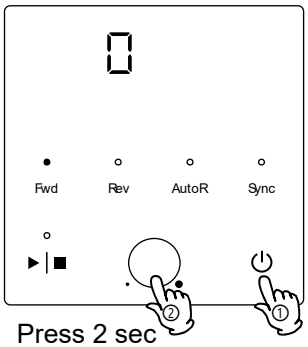


Press 2 sec

After completing the setting, press the Encoder dial for two seconds. Display reverts to previous screen and shows current rpm.

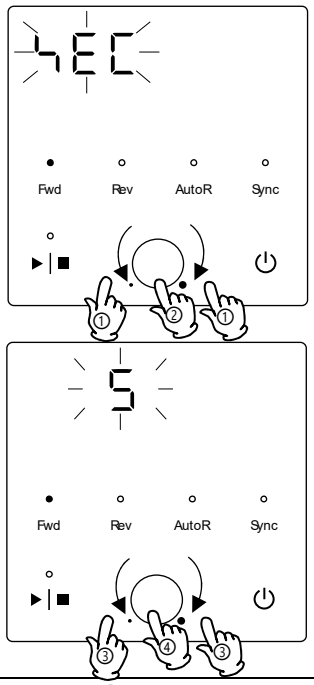
Set time interval for auto inversion mode.
Setting range: 5-999 sec
Default setting is “5”

1. Enter user setting



① Press the Power key.
②
Press the Encoder dial for two seconds while current rpm is on the screen.
Unit enters user setting.

2. Change auto inversion time setting



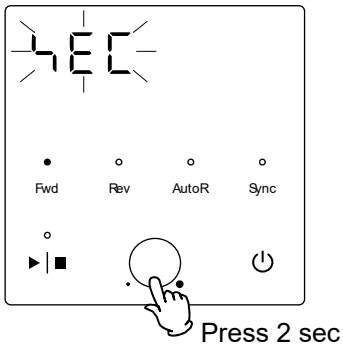
① Turn the Encoder dial and select "SEC".
RPM display: “SEC” flashes

② Press the Encoder dial.
RPM display: Current setting flashes

③ Turn the Encoder dial to set desired time
Setting range: 5-999 sec

④ Press the Encoder dial to finalize.

3. Exit user setting



After completing the setting, press the Encoder dial for two seconds. Display reverts to previous screen and shows current rpm.

4. OPERATION PROCEDURES

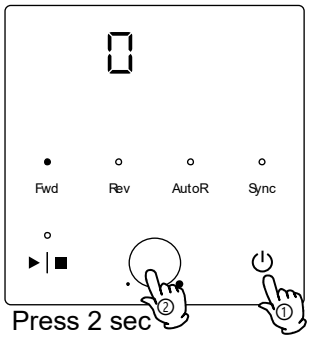
Auto-resume Function

Select recovery mode for the event of a power failure.

OFF: Unit goes into idle at power recovery.
ON: Unit automatically reverts to status just before power loss and begin operation once again from that point.

Default setting is “OFF”

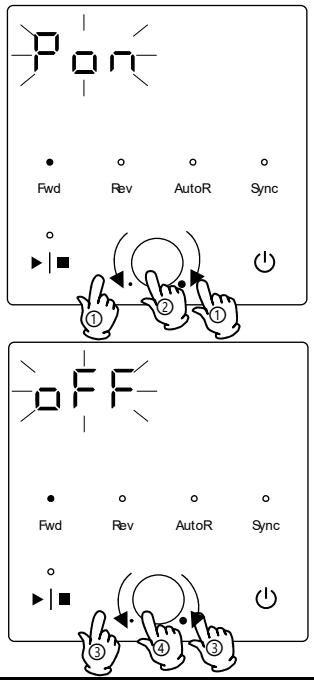
1. Enter user setting



① Press the Power key.

② Press the Encoder dial for two seconds while current rpm is on the screen.
Unit enters user setting.

2. Change the Auto-resume setting



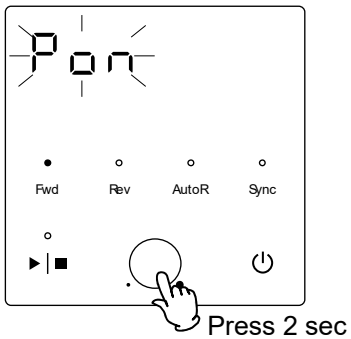
① Turn the Encoder dial and select "Pon".
RPM display: “Pon” flashes

② Press the Encoder dial.
RPM display: Current setting flashes

③ Turn the Encoder dial to select ON/OFF.

④ Press the Encoder dial to finalize.

3. Exit user setting



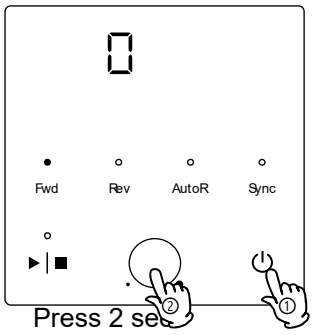
After completing the setting, press the Encoder dial for two seconds. Display reverts to previous screen and shows current rpm.

4. OPERATION PROCEDURES

LED Brightness Setting

Change the LED brightness of the control panel.
The brightness can be set in 8 levels from 0 to 7.
Default setting is “3”

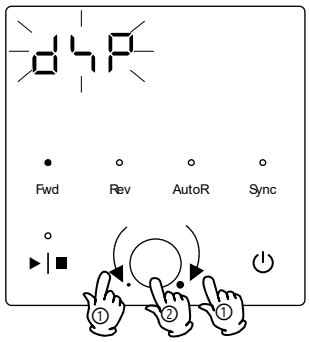
1. Enter user setting



① Turn power ON (|).

② Press the Encoder dial for two seconds while current rpm is on the screen.
Unit enters user setting.

2. Change LED brightness

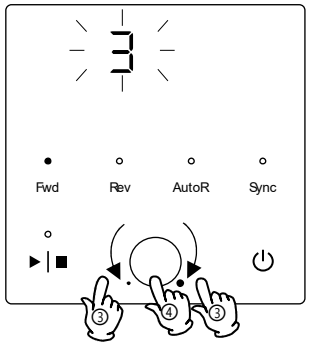


① Turn the Encoder dial and select "dSP".
RPM display: “dSP” flashes

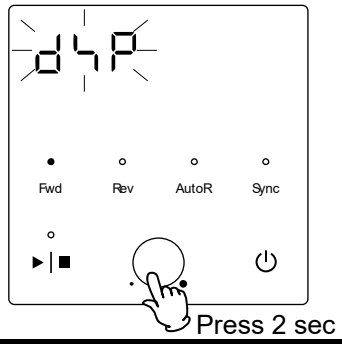
② Press the Encoder dial.
RPM display: Current setting flashes

③ Turn the Encoder dial to set desired value.
0 (dim) ⇔ 7 (bright)

④ Press the Encoder dial to finalize.



3. Exit user setting



After completing the setting, press the Encoder dial for two seconds. Display reverts to previous screen and shows current rpm.

4. OPERATION PROCEDURES

Vacuum Controller Connection

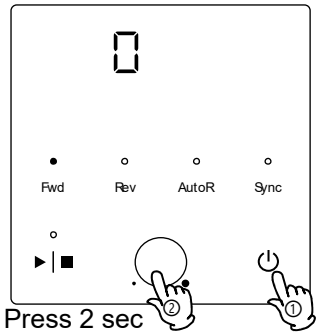
Make connection setting with vacuum controller VR102 (sold separately).

OFF: Not linked (does not carry out communication)
ON: Linked (carries out communication)

Default setting is “OFF”

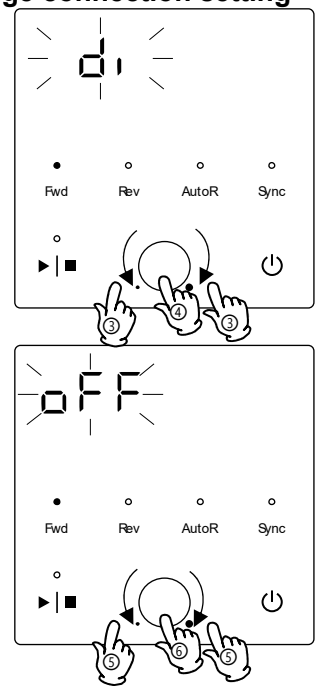
While connection is “ON”, RE unit is interlocked with vacuum controller in starting or stopping operation.

1. Enter user setting



① Turn power ON (|).
② Press the Encoder dial for two seconds while current rpm is on the screen.
Unit enters user setting.

2. Change connection setting



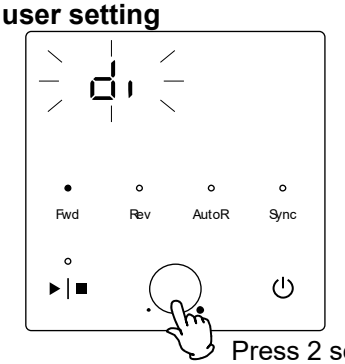
③ Turn the Encoder dial and select "di".
RPM display: “di” flashes

④ Press the Encoder dial.
RPM display: Current setting flashes

⑤ Turn the Encoder dial to set select ON/OFF.

⑥ Press the Encoder dial to finalize.

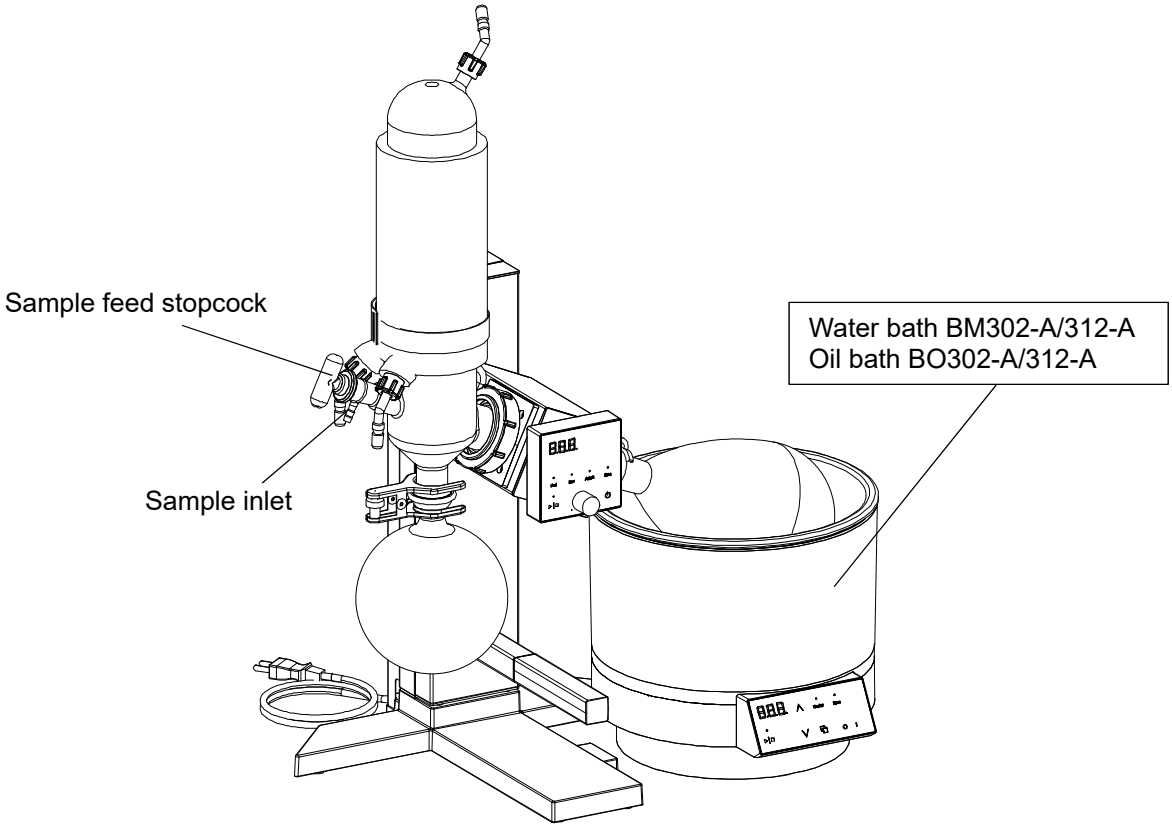
3. Exit user setting



After completing the setting, press the Encoder dial for two seconds. Display reverts to previous screen and shows current rpm.

4. OPERATION PROCEDURES

Operation Start



(1) Run water bath, oil bath, or cooling water circulator at desired temperature.
(2) Turn RE unit ON (|)
(3) Rotate sample feed stopcock to close sample inlet. (The color marking on stopcock faces front)
(4) Sample liquid may be fed as follows. The procedure differs by the way of sample feed.

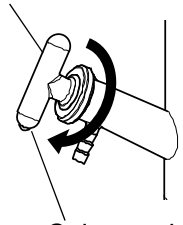
(4-A) <u>Where samples are continuously fed by sample feed tube.</u>

① Connect sample inlet and sample container with sample feed tube.
② Lower slide panel gently to immerse evaporation flask in the bath.

❖Do not let the bath fluid overflow.

③ Press and hold the Run/Stop key to start rotating evaporation flask.
④ Start up the pressure reducing device and decompress RE unit.
⑤ Rotate sample feed stopcock slowly so that the color marking on the stopcock faces down. Sample liquid is drawn into the flask.

Sample feed stopcock



❖Feeding sample rapidly may bump the liquid. Rotate the stopcock slowly to avoid a loss of sample, and other complications.

Color marking

(4-B) <u>Where samples are not continuously fed (manually added)</u>

① Detach evaporation flask and pour sample liquid directly in it, then re-attach the flask to rotary joint.
② Start up the pressure reducing device and evacuate RE unit.
③ Lower slide panel gently to immerse evaporation flask in the bath.

❖Do not let the bath fluid overflow.

④ Press and hold the Run/Stop key to start rotating evaporation flask.

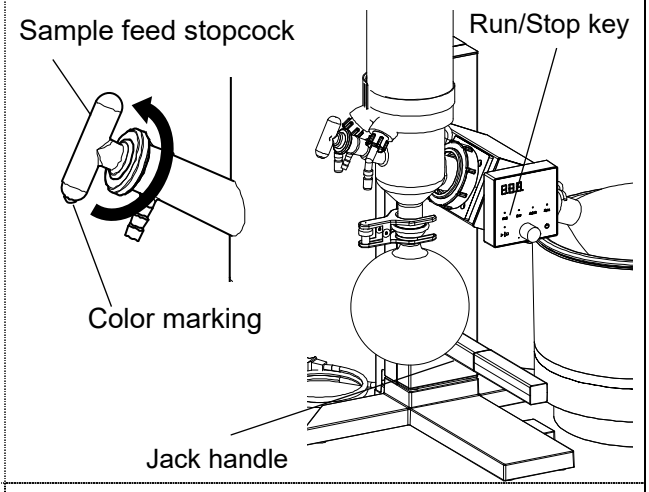
Operation Stop

(1) Press the Run/Stop key to stop rotation.

(2) Turn jack handle counterclockwise to release the jack. Lift slide panel slowly so that evaporation flask comes out of the bath.

(3) Stop the pressure reducing device. Gently rotate sample feed stopcock so that the color marking on the stopcock comes upside. Return unit to atmospheric pressure.

(4) Stop cooling water circulator and water/oil bath to end the operation.

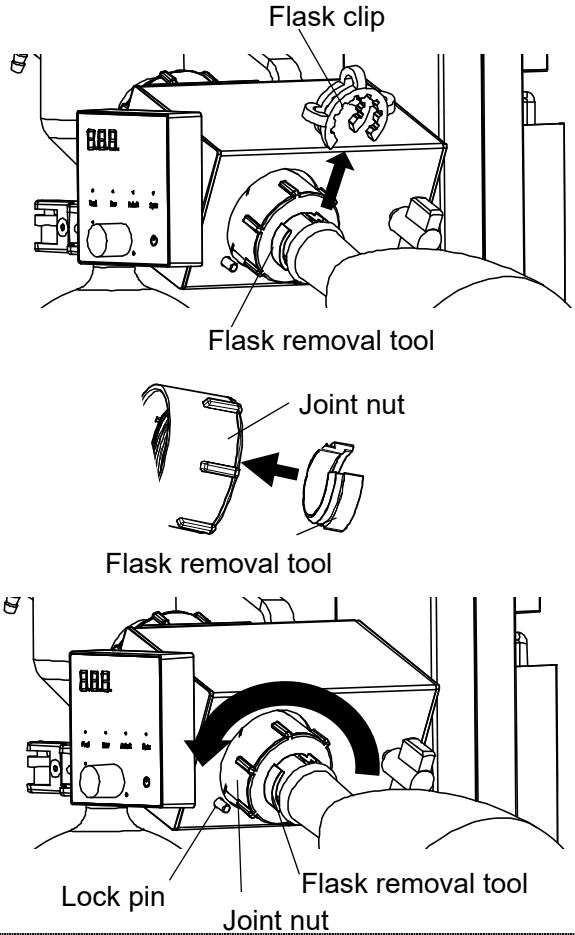


(5) Remove flask clip from evaporation flask.

(6) Take evaporation flask off rotary joint.
When it is hard to remove evaporation flask by hand, follow the steps below.
①Attach flask removal tool to joint nut. (See P.15)
②Hold evaporation flask with one hand, and turn joint nut counterclockwise. Flask removal tool pushes evaporation flask from the joint.

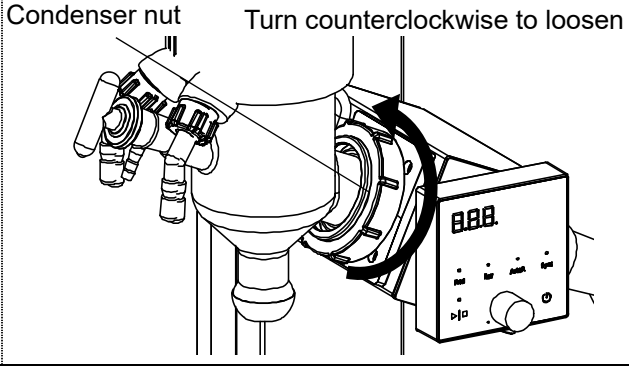
(7) Following (6)-②, press in the lock pin with the thumb to lock the rotary part. Turn joint nut counterclockwise with the other hand. Flask removal tool will now push the neck of rotary joint. Pull out rotary joint.

(8) Support receiving flask on the bottom, and turn the dial inside ball joint clamp with the other hand to release the lock. Remove the clamp and receiving flask.



(9) Remove condenser fixing band.
* Only for vertical condenser (type B)

(10) Hold cooling condenser by hand and turn condenser nut counterclockwise, then remove cooling condenser.



5. HANDLING PRECAUTIONS

WARNING

Exercise caution when handling flammable chemicals.

Unit is NOT fire or blast resistant. When processing flammable samples, be sure to provide adequate ventilation and not to allow anything that may be a source of fire or ignition (static electricity, etc.) approached. Do not use this unit in an atmosphere of substances shown in LIST OF HAZARDOUS SUBSTANCES (P.46). Never vaporize explosive substances.

Turn OFF (○) power immediately when an abnormality occurs.

If unit begins emitting smoke or abnormal odors for reasons unknown, turn OFF (○) power immediately, disconnect power cable from power supply, and contact original dealer of purchase for assistance. Continuing to operate without addressing abnormalities may cause fire or electric shock, resulting in serious injury or death. Never attempt to disassemble or repair unit. Repairs should always be performed by a certified technician.

CAUTION

Select appropriate gasket for organic solvents

When often processing samples containing organic solvents, optional PTFE vacuum seal is recommended for use on rotary joint. (“11. OPTIONAL ACCESSORIES” P.40)

CAUTION:

For ketone and ethanol based solvents, use optional PTFE vacuum seal. Ketone and ether based solvents, such as acetone, methyl ethyl ketone, methyl isobutyl heptyl ketone, ether and MTBE ketones (methyl.t.butyl ether) will cause standard vacuum seal to swell.

Use caution not to spill samples on equipment

When sample spilled over RE unit, wipe it dry with a clean dry cloth. Failure to do so may cause coating to peel or corrode.

Inspect regularly.

Regular inspection and maintenance are highly recommended to ensure proper operation. See "Inspection and Maintenance" (P.34)

Power loss recovery

When a power loss occurs during operation and then restored, unit may resume operation or remain on standby. These actions can be selected through user setting. See “Auto-resume Function” (P.28) for setting procedure; default setting is “OFF”.

6. MAINTENANCE PROCEDURES

Precautions before Inspection

WARNING

- Be sure to disconnect power cable before conducting inspection and maintenance.
- Never attempt to disassemble unit.

Precautions in Daily Maintenance

CAUTION

- Clean unit using soft damp cloth. Never use benzene, paint thinner, scouring powder, scrubbing brush or other abrasives and solvents to clean unit. Superficial damage and/or discoloration, as well as deformity to some components may result.

Maintenance and Inspection

- Check power plug for damage
  - ・Check power plug for dust or dirt on its prongs, and clear off if any accretions found.
  - ・Confirm that the prongs of power plug are not bent or damaged. Replace if bent or damaged.
  - ・Check the power plug for discoloration or abnormal heat generation. If there is discoloration or abnormal heating, the internal contact of the outlet may be faulty.
- Pay attention to the sound of motor
  If there is an unusual noise comes from motor, contact original dealer of purchase.

◆ Contact original dealer of purchase, if further questions arise concerning maintenance procedures.

7. EXTENDED STORAGE AND DISPOSAL

Extended Storage

⚠ WARNING	⚠ CAUTION
Extended storage ● Turn OFF (○) power and disconnect power cable. ● Remove all the glass components.	Unit disposal ● Do not leave unit in a location where children may have access.

Disposal Considerations

Dispose of or recycle this unit in a responsible and environmentally friendly manner.
Yamato Scientific Co., Ltd. strongly recommends disassembling unit, as far as is possible, in order to separate parts and recycle them in contribution to preserving the global environment. Major components and materials, comprising RE unit are listed in the table below

Component Name	**Material**
Main Unit Components	
Exterior	Chromium-free electrogalvanized steel sheet, baked-on finish Aluminum, baked-on finish/anodized Polybutylene terephthalate resin (with fiber glass)
Interior	Stainless steel, aluminum
Electrical Parts	
Motor	Composite of resin, aluminum, copper and other materials
Control panel	Polybutylene terephthalate resin (with fiber glass) Polycarbonate resin
Circuit boards	Composite of fiber glass and other materials
Power cable	Composite of synthesized rubber coating, copper, nickel and other compounds
Wiring material	Composites of fiberglass, fire-retardant vinyl, copper, nickel and other compounds
Seals	Resin material
Spring	Stainless steel
Roller	Polyacetal resin
Jack handle	Polyurethane, aluminum

8. TROUBLESHOOTING

Reading Error Codes

Unit has a self-diagnostic function built into the CPU board. The table below shows possible causes and measures to take when safety function is performed.

[Error Codes]

When an operational error or malfunction occurs, an error code is displayed on the control panel. When an error occurs, confirm the error code and terminate operation immediately.

Display code	Description	Possible causes and measures
E72	Motor failure (E72)	● Motor overload ● Overvoltage ● Voltage drop ● Rotary sensor failure Turn OFF (○) power and restart. If unit does not reset, contact original dealer of purchase.
E15	EEPROM failure (E15)	● Error in a storage element EEPROM on the controller board Turn OFF (○) power and restart. If unit does not reset, contact original dealer of purchase.

Other warnings (displayed alternately with rpm reading)

Display alert	Alert description	Possible causes and measures
”Pon” displayed after power loss	Power failure notification	● When a power failure occurs during operation, rpm reading and "Pon" are displayed alternately on the control panel to indicate that a power failure has occurred Turn OFF (○) power and restart. ● With auto-resume function “ON”, unit resumes operation. Remain standby when set to “OFF”.

8. TROUBLESHOOTING

Troubleshooting Guide

Symptom	Possible causes	Possible measures
RPM display remains blank when the Power key is pressed.	●Power supply failure	Check supply voltage [RE202-A] must be 90-125V AC [RE212-A] must be 90-250V AC
	●AC adapter failure ●Power cable failure ●Controller failure	●Replace relevant parts ●Replace relevant parts ●Replace relevant parts
Evaporation flask does not rotate when the Run/Stop key is ON	●External temperature is below 5 °C ●Motor failure ●Bearing failure ●Drive belt failure ●Circuit board failure	●Operating ambient temperature range is 5 to 35 °C ●Replace relevant parts ●Replace relevant parts ●Replace relevant parts ●Replace relevant parts
Rotation speed is not stable	●Sample volume is excessive ●Circuit board failure ●Motor failure ●Pulley/belt failure	●Reduce sample Lower speed setting ●Replace relevant parts ●Replace relevant parts ●Replace relevant parts
Unusual noise comes from unit during rotation	●Vacuum seal is worn ●Joint nut is loose ●Motor failure ●Bearing failure ●Pulley/belt failure	●Replace relevant parts ●Re-tighten joint nut ●Replace relevant parts ●Replace relevant parts ●Replace relevant parts
Weak or no decompression (vacuum)	●Vacuum seal is worn ●Rotary joint is worn ●Rotary joint is not set up properly ●Nozzle gasket is worn ●Vacuum hose is deteriorated	●Replace relevant parts ●Replace relevant parts ●Check that rotary joint is installed properly (P.15) ●Replace relevant parts ●Replace relevant parts
Jack does not work properly	●Jack handle is deteriorated ●Spring is deteriorated ●Bearing is worn	●Replace relevant parts ●Replace relevant parts ●Replace relevant parts
Jack does not lock	●Components in lock mechanism are worn or deteriorated	●Replace relevant parts
Rotary joint cannot be inserted	●Rotary joint lock mechanism is worn or deteriorated	●Replace relevant parts
Rotary joint cannot be pulled out	●Rotary joint lock mechanism is worn or deteriorated	●Gentry tap rotary joint with plastic head hammer to remove ●Replace relevant parts
Motor box angle cannot be adjusted	●Rotary part is worn ●Rotary part grease dry-out	●Replace relevant parts ●Replace relevant parts
Control panel cannot rotate	●Gasket is worn	●Replace relevant parts

If problem persists, turn OFF (○) power immediately, disconnect power cable from outlet or terminal and contact original dealer of purchase for assistance.

Requests for Repair

If abnormalities remain after confirming "Troubleshooting Guide", terminate operation, turn OFF (○) the Power switch, and disconnect power cable. Contact original dealer of purchase for assistance.

The following information is required for all repairs.

- Product Name
- Model
- Serial Number
- Date (year/month/day) of Delivery

} Refer to warranty card.

- Description of problem in as much detail as possible

- Repair this equipment for free of charge according to the contents on warranty card. Warranty period is 1 (one) year from date of purchase.

- Consult with original dealer of purchase for any repair after warranty ended. Charged repair service of this equipment will be available on customer’s request when it can be maintained functional by its repair.

* Be sure to present warranty card to the service representative.

Guaranteed Supply Period for Repair Parts

Guaranteed maximum supply period for repair parts is 7 (seven) years from date of discontinuation for this equipment.
"Repair parts" is defined as components which, when installed, allow for continued equipment operation.

10. SPECIFICATIONS

Model		RE202-A/212-A	RE202A-A/212A-A	RE202B-A/212B-A
Performance *1	Operating ambient temperature range	5-35 °C		
	Speed range	5-315 rpm *3		
	Evaporation capacity	---	Up to 23 mL/min	
Functions	RPM display	Digital display/Encoder dial setting		
	Rotation mode	Forward/Reverse/Auto inversion		
	Spring-loaded jack	Manual balance (Max. height 200 mm, stepless regulation, one-touch lock)		
Configuration	Rotary motor	DC brushless (simple servo)		
	Condenser retention	Retaining bracket for vertical condenser (condenser type B)		
Safety functions		[DC motor] Motor overload protection, overvoltage, low voltage, rotation speed sensor error [AC adapter] Short circuit in internal circuit, overcurrent protection, overvoltage protection		
Standard	Cooling condenser	---	Double corrugated tube (cooling surface: 0.143 m^2)	Double corrugated tube (cooling surface: 0.143 m^2)
		---	Suction port: GL-14 (lower), Φ10 nozzle	Suction Port: GL-14 (upper), Φ10 nozzle
		---	Cooling port: GL14 (two places in lower part), two φ10 nozzles	
	Compatible evaporation flask	50-2000ml for $ 24 (JIS) * Use optional reducer to attach small flasks.		
	Compatible receiving flask	100-2000 mL		
	External dimensions *2	375W×445H×324D	719W×324D×534H	529W×324D×745H
	Overall dimensions *2 (Including bath)	---	744W×365D×534H	554W×365D×745H
	Power rating	RE202-A: 100-115 V AC single phase 1 A RE212-A: 100-230 V AC single phase 1 A		
	Power cable	Approx. 2.0 m with inlet plug		
	Weight	Approx. 7.0 kg	Approx. 9.0 kg (including RE unit)	
Accessories		[Main unit] Instruction manual (1), warranty card (1), AC adapter (1), power cable (1), bath guide (1), rear cover (1), single-sided tape fastener roll (1), double-sided tape fastener roll (1), condenser bracket (1), hex wrench (1)		
		[Glass set] Cooling condenser (type A/B)(1), rotary joint (1), evaporation flask (1), receiving flask (1), ball joint clamp (1), flask clip (1), vacuum seal (1), condenser insulation kit (1), flask removal tool		

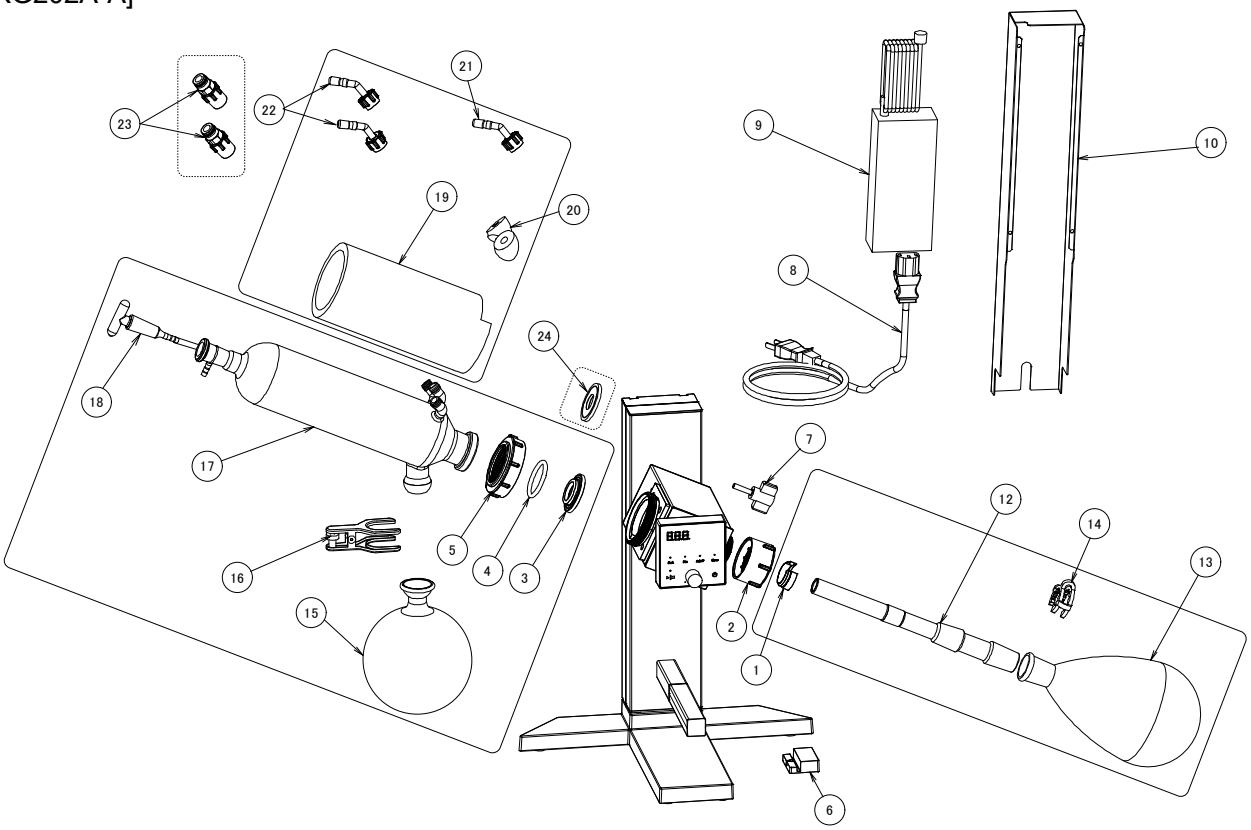
*1 Performance data above based on 23 ±5 °C room temperature, 65%RH ±20% humidity, and no process load.
*2 Dimensions do not include protrusions.
*3 Applicable rotation speed range and sample volume depend on the capacity of evaporation flask.

Evaporation flask capacity	Liquid samples		Powdery samples	
	Sample volume (mL)	Rotation speed (rpm)	Sample volume (mL)	Rotation speed (rpm)
50-500 mL	Flask capacity ÷ 2	315	Flask capacity ÷ 2	315
1000 mL				150
2000 mL		150	Not available	

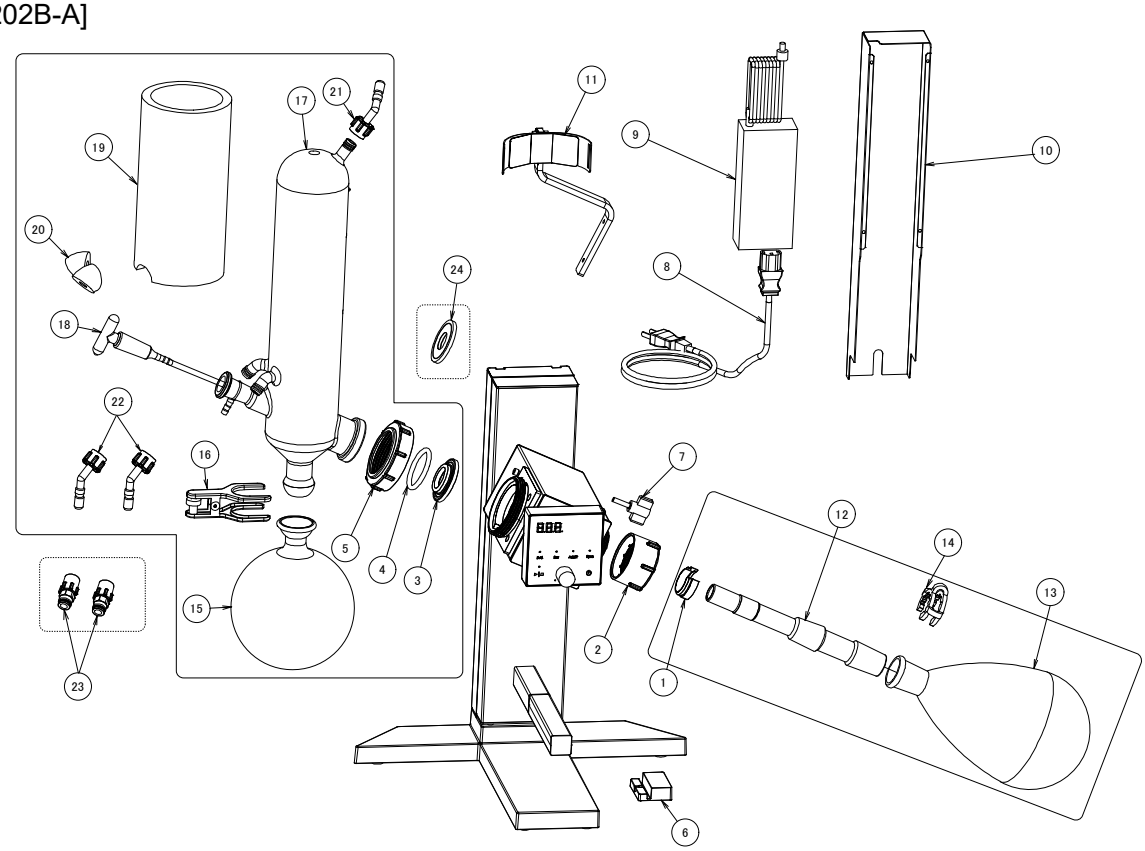
11. OPTIONAL ACCESSORIES

Consumables/Replacement Parts/Options

[RG202A-A]



[RG202B-A]

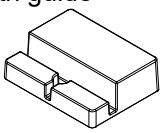
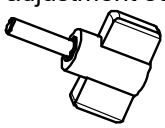
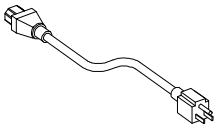
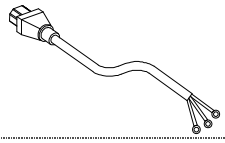
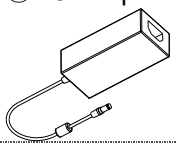
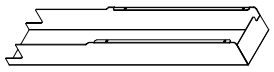
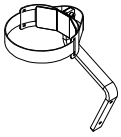
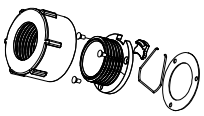


: Glass set accessories : Optional accessories

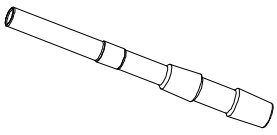
11. OPTIONAL ACCESSORIES

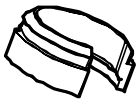
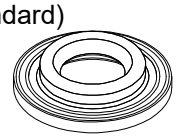
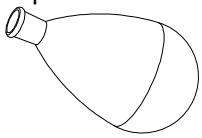
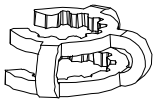
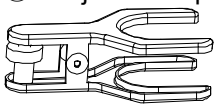
Consumables/Replacement Parts/Options

[Consumables/replacement parts for main unit]

②Joint nut  Product code: RE20230070	⑥Bath guide  Product code: RE20240902	⑦Tilt adjustment screw  Product code: RE20245600	⑧Power cable  Product code: LT00039665 For RE202-A
⑧Power cable  Product code: RE21239410-47 For RE212-A	⑨AC adapter  Product code: LT00039663	⑩Rear cover  Product code: RE20242310	⑪Condenser bracket  Product code: RE20245700 For vertical condenser type B
㊴Joint parts set  Product code: RE202S0010 A set of rotary joint fitting			

[Consumables/replacement parts for glass set]

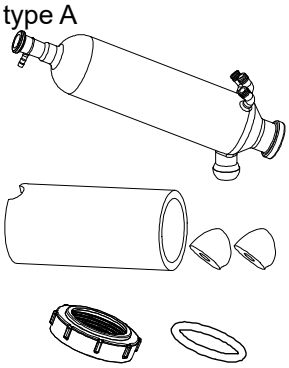
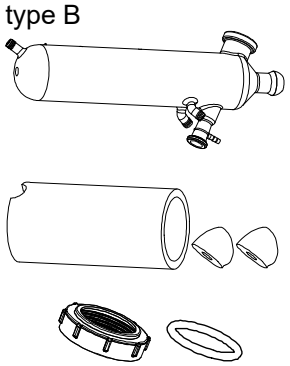
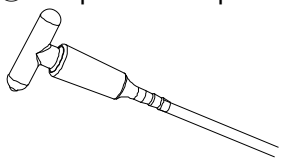
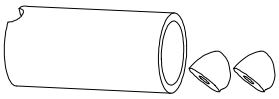
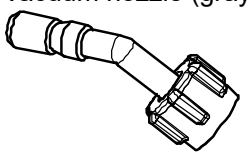
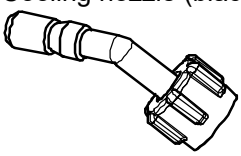
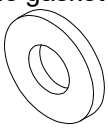
⑫Rotary joint 	For	Standard type	Clear ground joint type
	RG202A	Standard: ⧩29/38 284 mm Product code: 255720	Standard: ⧩29/38 284 mm Product code: 255724
		Standard: ⧩24/40 286 mm Product code: 255722	Standard: ⧩24/40 286 mm Product code: 255726
	RG202B	Standard: ⧩29/38 208 mm Product code: 255721	Standard: ⧩29/38 208 mm Product code: 255725
		Standard: ⧩24/40 210 mm Product code: 255723	Standard: ⧩24/40 210 mm Product code: 255727

① Flask removal tool  Product code: RE20241194 ⧩24	④ Coil ring  Product code: 2551720503	③Vacuum seal (standard)  Product code: 255740 Material: FKM	⑤Condenser nut  Product code: RG02A30121
⑬Evaporation flask  Product code: 255712	⑱Flask clip  Product code: 255748	⑲Receiving flask  Product code: 255718	⑳Ball joint clamp  Product code: 255749
⧩24/40, 1L	⧩24	S35/20, 1L	S35/20

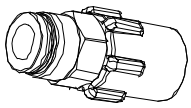
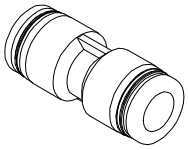
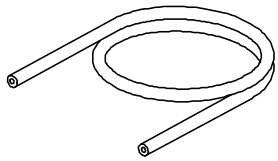
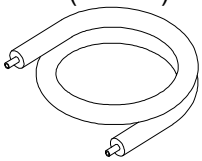
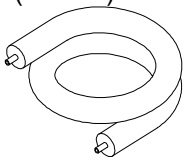
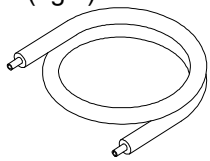
11. OPTIONAL ACCESSORIES

Options

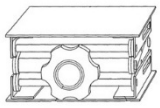
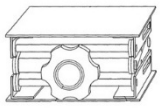
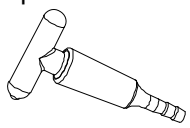
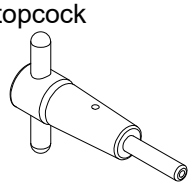
[Consumables/replacement parts for glass set]

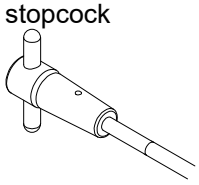
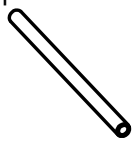
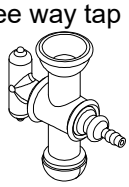
⑰-A Cooling condenser type A  Product code: 255750	⑰-B Cooling condenser type B  Product code: 255751	⑱Sample feed stopcock  Product code: 255738	⑲⑳Condenser insulation kit  Product code: RG02AS0000
Condenser insulation kit, condenser nut, coil ring included	Condenser insulation kit, condenser nut, coil ring included	⧩ 19/38 PTFE tube included * Cut in 345 mm for condenser type B	Common insulation for cooling condensers
㉑Vacuum nozzle (gray)  Product code: 255512	㉒Cooling nozzle (black)  Product code: 255742	㉖Nozzle gasket  Product code: 281494	
GL14 φ10 2 pcs	GL14 φ10 2 pcs	Gasket for ㉑㉒vacuum nozzle, 12pcs	

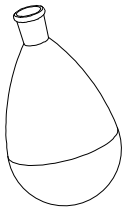
[Options]

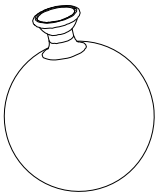
㉓One-touch connector  Product code: 255743	㉔PTFE vacuum seal  Product code: 255741	㉕Junction connector  Product code: 255744	㉖Vacuum hose  Product code: 255297
GL14 φ10, 2pcs Used for connecting ㉛ thermal insulation hose to cooling condenser	Chemical resistant	For extending φ10 O.D. rigid tube (㉛)	φ6×φ15××5m
㉙Thermal insulation hose (flexible)  Product code: 221581	㉚Thermal insulation hose (flexible)  Product code: 221599	㉛Thermal insulation hose (rigid)  Product code: 281475	
φ9×φ13×2 m, 2pcs (insulation: 28 mm O.D.) Hose clamp, 4 pcs Material: EPDM	φ9×φ14×2 m, 2 pcs (insulation: 41 mm O.D.) Hose clamp, 4 pcs Material: silicon	φ6.5×φ10×2 m, 2 pcs (insulation: 22 mm O.D.) Material: polyurethane	

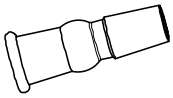
[Options]

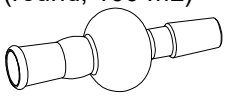
㉜Lab jack	㉝Lab jack	㉞Stopcock	㉟Stopcock
			
Product code: 255745	Product code: 255746	Product code: 255736	Product code: 255735
150×150 mm Height 75-245 mm	200×200 mm Height 75-245 mm	Material: glass	Material: PTFE

㊱Sample feed stopcock	㊲Sample feed tube	㊳Three way tap
		
Product code: 255738	Product code: 255739	Product code: 255363
Material: PTFE PTFE tube included * Cut in 345 mm for condenser type B	L520 mm * Cut in 345 mm for condenser type B	S35/20

Evaporation Flask	Capacity/standard	⧩29/38	⧩24/40
	100 mL	255701	255708
	200 mL	255702	255709
	300 mL	255703	255710
	500 mL	255704	255711
	1000 mL	255705	255712
	2000 mL	255706	255713

Receiving flask	Capacity/standard	S35/20
	100 mL	255714
	200 mL	255715
	300 mL	255716
	500 mL	255717
	1000 mL	255718
	2000 mL	255719

Reducer	Standard (female → male)						
	⧩24/40 ↓ ⧩24/40	⧩24/40 ↓ ⧩19/38	⧩24/40 ↓ ⧩15/25	⧩29/38 ↓ ⧩24/40	⧩29/38 ↓ ⧩19/38	⧩29/38 ↓ ⧩15/25	⧩29/38 ↓ ⧩29/38
	255732	255733	255734	255729	255730	255731	255728

Bump trap (round, 100 mL)	Standard (female → male)			
	⧩29/42 ↓ ⧩24/40	⧩29/42 ↓ ⧩19/38	⧩29/42 ↓ ⧩15/25	⧩29/42 ↓ ⧩29/42
	RE200GT003	RE200GT001	RE200GT004	RE200GT002

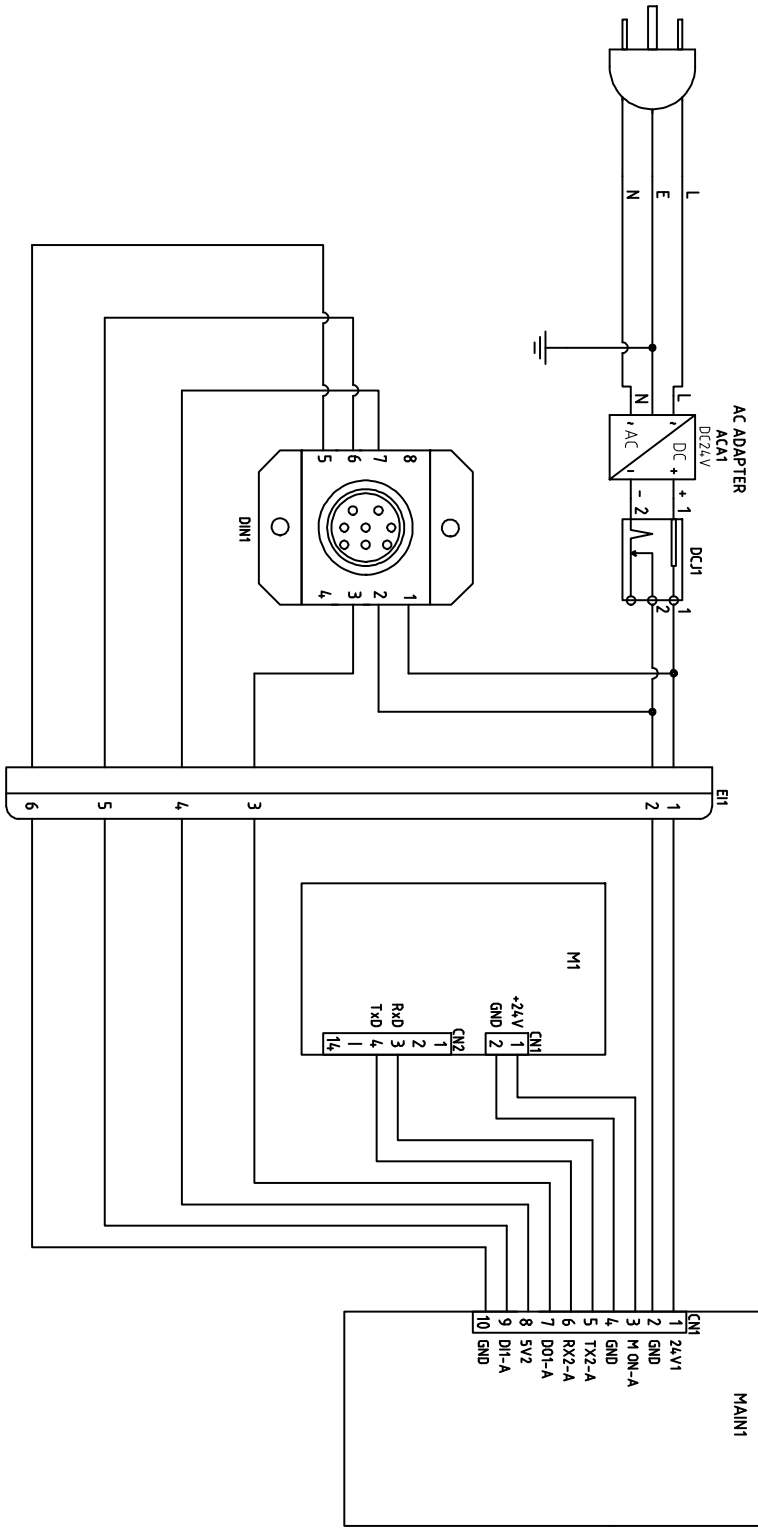
12. REFERENCE DATA

Solvent Boiling Point

Substance	Chemical formula	Molecular weight	Density (g/cm^3) (20 °C)	Latent heat of vaporization (cal/g) (1013 hPa)	Boiling point (°c) (1013 hPa)	Degree of vacuum at each boiling point (hPa)		
						Boiling Point		
						25 °C	30 °C	40 °C
Diethyl ether	$C_4H_{10}O$	74.1	0.736	89.8	34.6	712	859	1013
n-pentane	C_5H_{12}	72.7	0.626	92.6	36.1	678	931	1013
Ethyl bromide	C_2H_5Br	109.0	1.451	549.7	38.4	625	753	1013
Dichloromethane	CH_2Cl_2	84.9	1.326	78.7	39.8	580	706	1013
1.2 Dichloroethylene	$C_2H_2Cl_2$	97.0	1.284	75.0	48.0	532	452	798
Cyclopentane	C_5H_{10}	70.1	0.745	97.2	49.0	423	514	740
Acetone	C_3H_6O	58.1	0.788	125.0	56.3	307	378	562
1-1 Dichloroethane	$C_2H_4Cl_2$	99.0	1.175	69.0	57.4	306	359	539
Methyl acetate	$C_3H_6O_2$	74.1	0.934	98.1	57.8	289	359	541
Chloroform	$CHCl_3$	119.4	1.486	58.8	61.3	260	320	474
Methanol	CH_4O	32.0	0.794	264.0	64.7	169	218	354
n-hexane	C_6H_{14}	86.2	0.659	91.8	68.7	202	249	373
Carbon tetrachloride	CCl_4	153.8	1.595	46.6	76.8	152	173	284
Ethyl acetate	$C_4H_8O_2$	88.1	0.901	88.2	77.1	129	163	254
Ethanol	C_2H_6O	46.0	0.785	204.0	78.4	79	105	179
Benzene	C_6H_6	78.1	0.874	94.2	80.1	127	159	244
2-propanol	C_3H_8O	74.1	0.786	159.2	82.0	60	81	142
1-2 Dichloroethane	$C_2H_4Cl_2$	99.0	1.257	77.3	83.5	111	146	199
1-propanol	C_3H_8O	60.1	0.804	162.6	97.8	27	38	70
2-butanol	$C_4H_{10}O$	74.1	0.807	134.4	99.5	24	34	63
Water	**H_2O**	**18.0**	**0.997**	**540.0**	**100.0**	**32**	**43**	**74**
Formic acid	CH_2O_2	46.0	1.214	120.4	100.6	57	73	114
Propyl acetate	$C_5H_{10}O_2$	102.1	0.889	80.3	101.8	44	57	94
Toluene	C_7H_8	92.2	0.866	98.6	110.6	38	49	79
1, 1, 2-trichloroethane	$C_2H_3Cl_3$	133.4	1.442	68.7	113.5	33	40	68
1-butanol	$C_4H_{10}O$	74.1	0.810	141.3	117.7	8	12	24
Acetic acid	$C_2H_4O_2$	60.0	1.050	4.8	118.0	20	27	46
2-pentanol	$C_5H_{12}O$	88.2	0.810	97.8	119.3	8	12	21
Tetrachloroethylene	C_2Cl_4	165.8	1.623	50.0	121.0	24	31	53
Isoamyl alcohol	$C_5H_{12}O$	88.1	0.809	116.0	130.8	4	7	12
Chlorobenzene	C_6H_5Cl	112.6	1.106	77.4	131.7	16	21	35
1-pentanol	$C_5H_{12}O$	88.2	0.814	120.6	138.0	4	5	9
m-Xylene	C_8H_{10}	106.2	0.860	81.9	139.1	13	15	25
o-Xylene	C_8H_{10}	106.2	0.876	82.9	144.4	9	13	20
Styrene	C_8H_8	104.2	0.901	100.8	145.2	10	13	19
						Degree of vacuum at each boiling point (hPa)		
						Boiling Point		
						70 °C	90 °C	120 °C
Styrene	C_8H_8	104.2	0.901	100.8	145.2	81	180	494
1-hexanol	$C_6H_{14}O$	102.2	0.819	107.2	157.1	24	69	265
Butyric acid	$C_4H_8O_2$	88.1	0.958	113.9	163.5	20	57	199
1-heptanol	$C_7H_{16}O$	116.2	0.822	438.9	176.3	9	33	133
1-octanol	$C_8H_{18}O$	130.2	0.824	98.2	195.2	4	13	67
Ethylene glycol	$C_2H_6O_2$	62.1	1.116	219.8	197.4	4	12	53
Capric acid	$C_6H_{12}O$	116.2	0.927	133.0	205.8	3	8	40
1-nonanol	$C_9H_{20}O$	114.3	0.827	134.0	213.5	3	8	37
Glycerin	$C_3H_8O_3$	92.1	1.262	158.4	290.0	5 hPa/150		

13. WIRING DIAGRAM

RE202-A

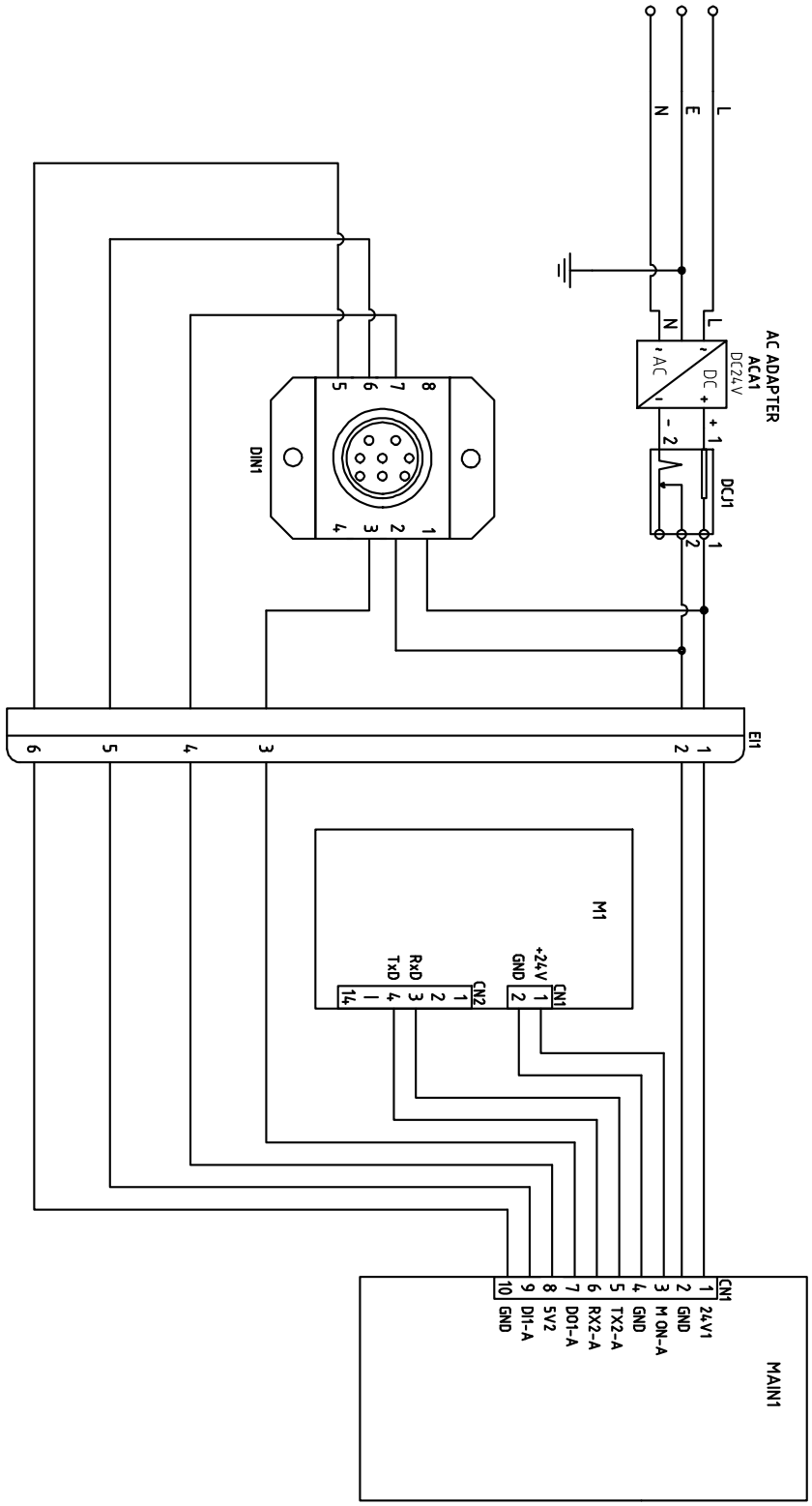


Wiring Diagram Symbol Glossary

Symbol	Setting Item	Symbol	Setting Item
ACA1	AC adapter	DIN1	MIN-DIN slave board 7
DCJ1	DC jack	MAIN1	CPU board
M1	DC motor		

13. WIRING DIAGRAM

RE212-A



Wiring Diagram Symbol Glossary

Symbol	Setting Item	Symbol	Setting Item
ACA1	AC adapter	DIN1	MIN-DIN slave board 7
DCJ1	DC jack	MAIN1	CPU board
M1	DC motor		

14. LIST OF HAZARDOUS SUBSTANCES

⃠	Never attempt to process explosives, flammables or any items which contain explosives or flammables.

Explosive substances	①Nitroglycol, Glycerine trinitrate, Cellulose Nitrate and other explosive nitrate esters
	②Trinitrobenzen, Trinitrotoluene, Picric Acid and other explosive nitro compounds
	③Acetyl Hydroperoxide, Methyl Ethyl Ketone Peroxide, Benzoyl Peroxide and other organic peroxides
	④Metallic Azide, including Sodium Azide, etc.
Combustible substances	①Metal “Lithium” ②Metal “Potassium” ③Metal “Natrium” ④Yellow Phosphorus ⑤Phosphorus Sulfide ⑥Red Phosphorus ⑦Phosphorus Sulfide ⑧Celluloids, Calcium Carbide (a.k.a, Carbide) ⑨Lime Phosphide ⑩Magnesium Powder ⑪Aluminum Powder ⑫Metal Powder other than Magnesium and Aluminum Powder ⑬Sodium Dithionous Acid (a.k.a., Hydrosulphite)
Oxidizing substances	①Potassium Chlorate, Sodium Chlorate, Ammonium Chlorate, and other chlorates
	②Potassium Perchlorate, Sodium Perchlorate, Ammonium Perchlorate, and other perchlorates
	③Potassium Peroxide, Sodium Peroxide, Barium Peroxide, and other inorganic peroxides
	④Potassium Nitrate, Sodium Nitrate, Ammonium Nitrate, and other nitrates
	⑤Sodium Chlorite and other chlorites
	⑥Calcium Hypochlorite and other hypochlorites
Flammable substances	①Ethyl Ether, Gasoline, Acetaldehyde, Propylene Chloride, Carbon Disulfide, and other substances having ignition point of 30 or more degrees below zero.
	②n-hexane, Ethylene Oxide, Acetone, Benzene, Methyl Ethyl Ketone and other substances with ignition point between 30 degrees below zero and less than zero.
	③Methanol, Ethanol, Xylene, Pentyl n-acetate, (a.k.a. amyl n-acetate) and other substances having ignition point of between zero and less than 30 degrees.
	④Kerosene, Light Oil, Terebinth Oil, Isopenthyl Alcohol (a.k.a. Isoamyl Alcohol), Acetic Acid and other substances having ignition point of between 30 degrees and less than 65 degrees.
Combustible gas	Hydrogen, Acetylene, Ethylene, Methane, Ethane, Propane, Butane and other gases combustible at 15°C, ambient air pressure.

15. STANDARD INSTALLATION MANUAL

Install this equipment according to following format (check options and special specifications separately).

Model	Serial Number	Installation Date	Charged Personnel or Company Name for Installation	Installation proved by	Judgment

№	Item	Implementation method	Chapter No. & Reference page of instruction manual	Judgment
Specifications				
1	Accessories	Quantity check according to the accessories column	10. SPECIFICATIONS P.8	
2	Installation	- Visual check of surrounding conditions Caution: Take care for environment - Securing a space	3. PRE-OPERATION PROCEDURES -Choose an appropriate ... P.12	
Operation-related matters				
1	Power supply voltage	- Measure line voltage (power distribution board of facilities, outlet etc.) with a tester. - Measure line voltage during operation (must meet required voltage) Caution: Use a compliant plug to install	3. PRE-OPERATION PROCEDURES -Always connect ... P.13 10. SPECIFICATIONS -Power supply P.39	
2	Confirmation on operation	- Explain name and function of each component. - Perform operation set at 100 rpm	2. COMPONENT NAMES AND FUNCTIONS P.8 4. OPERATION PROCEDURES P.24	
Description				
1	Operational descriptions	- Explain operations of each component and handling precautions according to instruction manual.	4. OPERATION PROCEDURES P.24 5. HANDLING PRECAUTIONS -Warnings and Cautions P.33 14. LIST OF HAZARDOUS SUBSTANCES -Table 14.1 List of … P.46	
2	Error Codes	- Explain about error codes and procedures for reset according to instruction manual.	8. TROUBLESHOOTING -[Error Codes] P.36 -Troubleshooting Guide P.37	
3	Maintenance and Inspection	- Explain about maintenance of equipment and each component according to instruction manual.	6. MAINTENANCE PROCEDURES -Inspection and Maintenance P.34	
4	Completion of installation Matters to be Stated	- Enter the date of installation and name of the charged personnel in the main unit nameplate. - Write necessary information on warranty card and hand it over to customer - Explain how to contact with service personnel	9. SERVICE & REPAIR -Requests for Repair P.38	

Limited Liability

Always operate equipment in strict compliance to the handling and operation procedures set forth by this instruction manual.
Yamato Scientific Co., Ltd. assumes no responsibility for malfunction, damage, injury or death, resulting from negligent equipment use.
Never attempt to disassemble, repair or perform any procedure on RE units which are not expressly mandated by this manual. Doing so may result in equipment malfunction, serious personal injury or death.

Notice

- **Instruction manual descriptions and specifications are subject to change without notice.**
- **Yamato Scientific Co., Ltd. will replace flawed instruction manuals (pages missing, pages out of order, etc.) upon request.**

Instruction Manual
Rotary Evaporator
RE202-A/212-A
First Edition: July 5, 2019
Revised:

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