Vacuum Controller

Model

VR300/600/800

Instruction Manual

- Third Edition -

This document is the exclusive instruction manual to the vacuum controller VR300/600/800 model installed on the RE300/600/800 model rotary evaporator.
Please use this document together with the instruction manual of the rotary evaporator as for the operating instructions of device.

- Thank you for purchasing " Vacuum Controller, VR Series" of Yamato Scientific Co., Ltd.
- To use this unit properly, read this "Instruction Manual" thoroughly before using this unit.
  Keep this instruction manual around this unit for referring at anytime.

⚠WARNING!:
Carefully read and thoroughly understand the important warning items described in this manual before using this unit.

Yamato Scientific Co. LTD.

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Contents

Contents in the Package

The VR model vacuum controller is packed separately. Please check the contents in the package before installing the controller to the main body of rotary evaporator.

VR300			
No.	Name	QTY	Notes
	VR300 model vacuum controller (main body)	1	
	Bracket to vacuum controller	1	SUS
	Attaching screw	3	M4 tapping screw (2), M4 flat head screw (1)
	DC power connection cable	1	

VR600			
No.	Name	QTY	Notes
	VR600 model vacuum controller (main body)	1	
	Bracket to vacuum controller	1	SUS
	Attaching screw	3	M4 tapping screw (2), M4 flat head screw (1)
	DC power connection cable	2	
	Rotor lift I/O cable	1	
	Sensor for measurement of steam temperature	1	Resin attaching screw to glass unit and silicone packing are attached.
	Signal cable to bath	1	

VR800			
No.	Name	QTY	Notes
	VR800 model vacuum controller (main body)	1	
	Bracket to vacuum controller	1	SUS
	Attaching screw	3	M4 tapping screw (2), M4 flat head screw (1)
	DC power connection cable	1	
	Rotor lift I/O cable	1	
	Sensor for measurement of steam temperature	1	Resin attaching screw to glass unit and silicone packing are attached.
	Signal cable to bath	1	

Optional accessories for VR600/800			
No.	Name	QTY	Notes
	Sensor for measurement of cooling temperature	1	Resin attaching screw to glass area, silicone packing and connecting glass pipe are attached
	Relay box to drive vacuum pump	1	Connecting signal wire attached

Explanation

MEANING OF ILLUSTRATED SYMBOLS

Illustrated Symbols

Various symbols are used in this safety manual in order to use the unit without danger of injury and damage of the unit. A list of problems caused by ignoring the warnings and improper handling is divided as shown below.Be sure that you understand the warnings and cautions in this manual before operating the unit.

⚠ WARNING! If the warning is ignored, there is the danger of a problem that may cause a serious accident or even fatality.

⚠ CAUTION! If the caution is ignored, there is the danger of a problem that may cause injury/damage to property or the unit itself.

Meaning of Symbols

This symbol indicates items that urge the warning (including the caution).
A detailed warning message is shown adjacent to the symbol.

This symbol indicates items that are strictly prohibited.
A detailed message is shown adjacent to the symbol with specific actions not to perform.

This symbol indicates items that should be always performed.
A detailed message with instructions is shown adjacent to the symbol.

Table of Illustrated Symbols

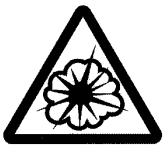
Warning


Warning,
generally


Warning,
high voltage


Warning,
high temperature


Warning,
drive train


Warning,
explosive

Caution


Caution,
generally


Caution,
electrical shock


Caution,
scald


Caution,
no road heating


Caution,
not to drench

Caution,
water only


Caution,
deadly poison

Prohibit


Prohibit,
generally


Prohibit,
inflammable


Prohibit,
to disassemble


Prohibit,
to touch

Compulsion


Compulsion,
generally


Compulsion,
connect to the
grounding
terminal

Compulsion,
install on a flat
surface


Compulsion,
disconnect the
power plug


Compulsion,
periodical
inspection

Fundamental Matters of "WARNING!" and "CAUTION!"

⚠ WARNING!

Do not use this unit in an area where there is flammable or explosive gas

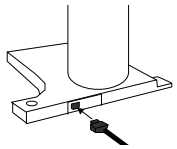
Never use this unit in an area where there is flammable or explosive gas. This unit is not explosion-proof. An arc may be generated when the power switch is turned on or off, and fire/explosion may result. (Refer to page 49 "List of Dangerous Substances".)

Always ground this unit

Always ground this unit on the power equipment side in order to avoid electrical shock due to a power surge.

Plug the power cord securely

Plug the power cord securely into the main unit. If not, overheat or fire disaster may result in.



If a problem occurs

If smoke or strange odor should come out of this unit for some reason, turn off the circuit breaker right away, and then disconnect the power plug. Immediately contact a service technician for inspection. If this procedure is not followed, fire or electrical shock may result. Never perform repair work yourself, since it is dangerous and not recommended.

Do not use the power cord if it is bundled or tangled

Do not use the power cord if it is bundled or tangled. If it is used in this manner, it can overheat and fire may be caused.

Do not process, bend, wring, or stretch the power cord forcibly

Do not process, bend, wring, or stretch the power cord forcibly. Fire or electrical shock may result.

Perform periodic check

Check the device frequently. Do not leave the dust and dirt on the wiring terminals and electrical components. A fire disaster may result in.

Substances that can not be used

Never use explosive substances, flammable substances and substances that include explosive or flammable ingredients in this unit. Explosion or fire may occur. (Refer to page 49 "List of Dangerous Substances".)

Do not disassemble or modify this unit

Do not disassemble or modify this unit. Fire or electrical shock or failure may be caused.

⚠ CAUTION!

During a thunder storm

During a thunderstorm, turn off the power key immediately, then turn off the circuit breaker and the main power. If this procedure is not followed, fire or electrical shock may be caused.

When electric power failure occurs…

The device stops operation when electric power failure occurs. In this case, turn off the breaker for safety.

Requirements for Installation

WARNING!

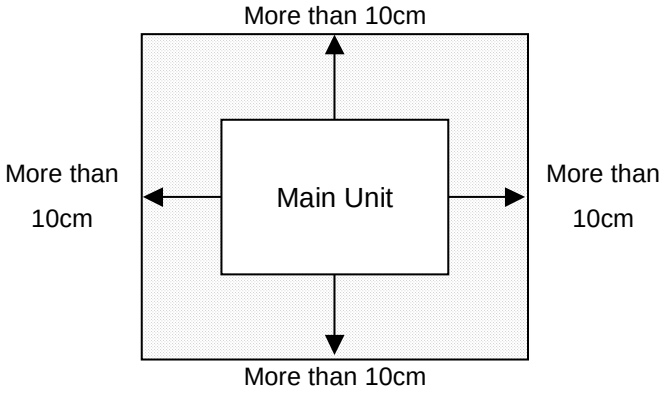
1. Always ground this unit

- Be sure to connect the ground wire to the earth conductor or earth terminal to prevent accidents caused by an electric shock.
- Do not connect the earth wire to gas or water pipes. If not, fire disaster may be caused.
- Do not connect the earth wire to the ground for telephone wire or lightning conductor. If not, fire disaster or electric shock may be caused.
- Please consult your local electrical contractor for power connecting work.

2. Choose a proper place for installation

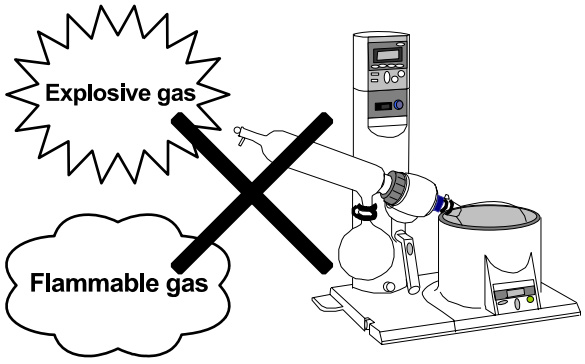
- Do not install this unit in a place where:
  - Rough or dirty surface.
  - Flammable gas or corrosive gas is generated.
  - Ambient temperature above 35°C.
  - Ambient temperature fluctuates violently.
  - There is direct sunlight.
  - There is excessive humidity and dust.
  - There is a constant vibration.
  - Without a ventilation system.

- Make sure that no flammable substances are placed around the devices. Keep space as shown, at least, in the figure below.



3. Do not use this unit in an area where there is flammable or explosive gas

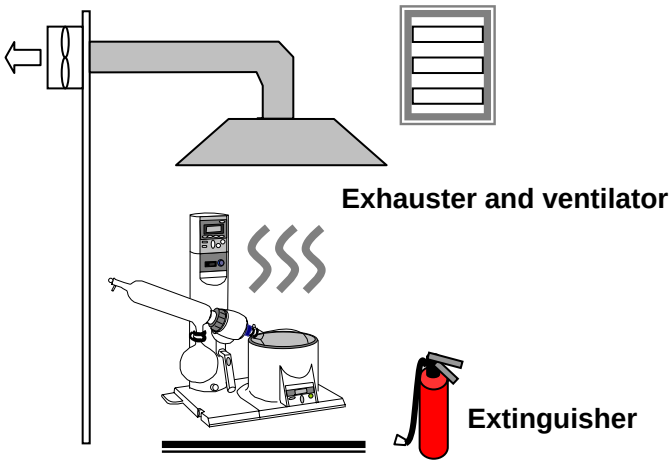
- Never use this unit in an area where there is flammable or explosive gas. This unit is not explosion-proof. An arc may be generated when the power switch is turned ON or OFF, and fire/explosion may result.
- To know about flammable or explosive gas, refer to page 49 "List of Dangerous Substances".



Requirements for Installation

4. Install exhauster and ventilator

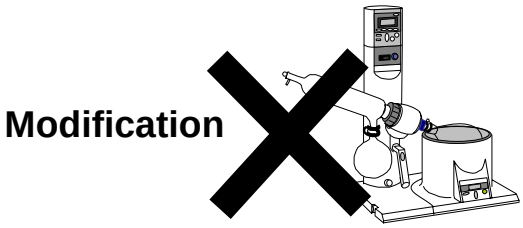
- Be sure to install an exhauster, ventilator and extinguisher around the device.
  The oily smoke of silicone oil generated by heating is flammable and may cause fire disaster.
  Silicone oil also may generate harmful gas when it reaches a high temperature.



CAUTION!

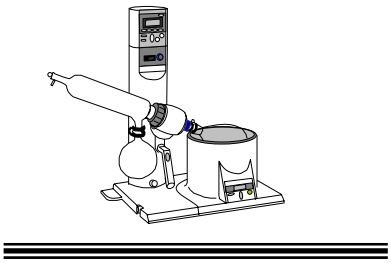
5. Do not modify

- Modification of this unit is strictly prohibited. This could cause a failure.



6. Installation on horizontal surface

- Place this unit as flat a place as possible. If the four rubber feet are not in uniform contact with the floor surface, noise or vibration may result. Additionally, the unit may cause a problem or malfunction.



7. Choose a correct power distribution board or receptacle

- Choose a correct power distribution board or receptacle that meets the unit's rated electric capacity.

Electric capacity: RE300/RE600/RE800: 1.5A at AC100V to AC240V

Electric capacity for RE main unit (except water bath or oil bath) and vacuum controller. The water bath or oil bath uses the other power source. The electric capacity of 12.5A and 6.5A are required for the BM500/BO400 and BM510/BO410 models respectively.

NOTE)
The device adopts the free power system for AC100V to AC240V. The RE main unit includes the switching power source, the secondary power source of which is driven with DC24V.
Do not connect the lines that share the power source, or do not place the appliances that generate noise around the device. A malfunction may occur on the device.

Requirements for Installation

8. Before/after installing

- It may cause injure to a person if this unit falls down or moves by the earthquake and the impact. etc..To prevent, take measures that the unit cannot fall down, and not install to busy place.
- Be sure to install an exhauster, ventilator and extinguisher around the device.

9. Handling of power code

- Do not entangle the power cord. This will cause overheating and possibly a fire.
- Do not bend or twist the power cord, or apply excessive tension to it. This may cause a fire and electrical shock.
- Do not lay the power cord under a desk or chair, and do not allow it to be pinched in order to prevent it from being damaged and to avoid a fire or electrical shock.
- Keep the power cord away from any heating equipment such as a room heater. The cord's insulation may melt and cause a fire or electrical shock.
- If the power cord becomes damaged (wiring exposed, breakage, etc.), immediately turn off the power at the rear of this unit and shut off the main supply power. Then contact your nearest dealer for replacement of the power cord. Leaving it may cause a fire or electrical shock.
- Connect the power plug to the receptacle which is supplied appropriate power and voltage.

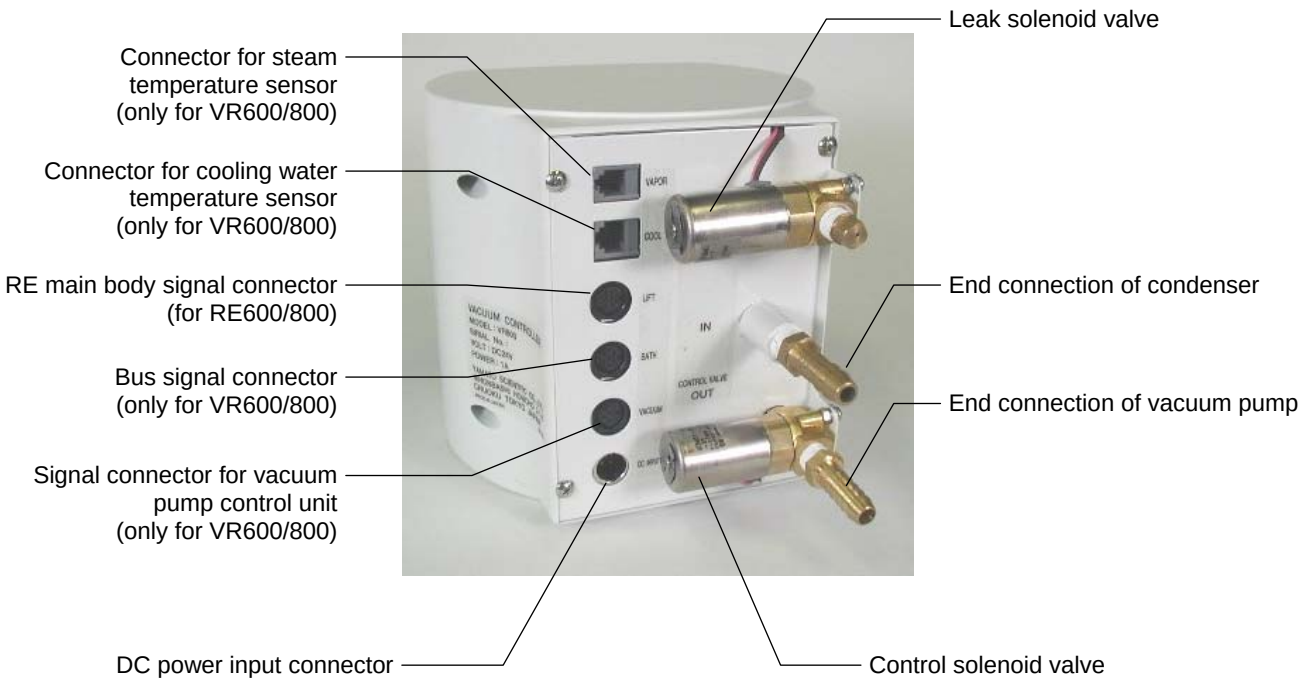
10. Precautions for use of sample including solvent

- Note the followings when using the sample which includes solvent.
  - ❖ A Teflon solenoid valve, which is sold separately, is recommended for the control solenoid valve.
  - ❖ The SUS316 pressure sensor is recommended.
  - ❖ A Teflon diaphragm model vacuum pump is recommended.

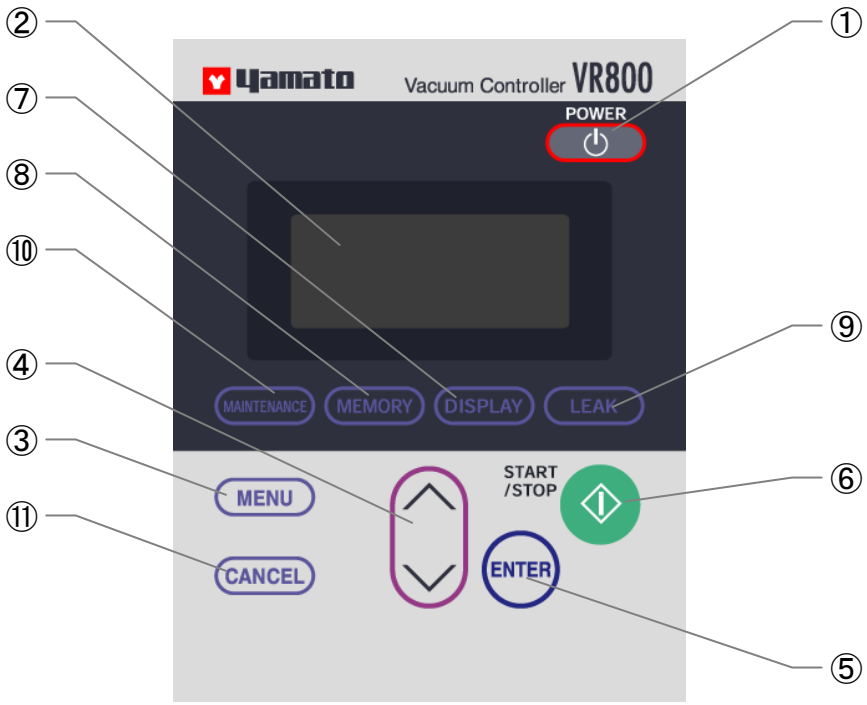
Main Unit

Front view

Rear view



Control Panel



・The layout of operating panel on the VR600/VR800 vacuum controller is the same as the Photo above.
・The VR300 vacuum controller does not have the MEMORY key ⑧.

No.	Name	Function
①	POWER key	Turns on/off the vacuum controller.
②	LCD screen	Displays the information about setting and operation of device in Kanji or alphabetical characters.
③	MENU key	Used to select the operation mode.
④	Up/down key	Changes the preset value and setting items.
⑤	ENTER key	Determines the setting value and setting items after they are changed.
⑥	START/STOP key	Starts/stops the operation.
⑦	DISPLAY key	Shifts the LCD screen or changes the display style.
⑧	MEMORY key	Memorizes/call the information about operation mode setting. The VR300 vacuum controller does not have this key.
⑨	LEAK key	Controls the vacuum pressure during operation. The leak valve is opened while this key is pressed.
⑩	MAINTENANCE key	Used to specify the details of operation and display, or to check the error log.
⑪	CANCEL key	Cancels the incorrect input.

Connection between RE300 main body and vacuum controller VR300 (optional)

1) Fixation of VR vacuum controller

Unpack the device and install it at level area.

① Tear the seal from screw hole of RE main body,

② Cover RE main body by the Bracket vacuum controller.

③ Fix the Bracket vacuum controller by flat head screw (M4) and tapping screw(M4).

④ Slide the VR main body that fixing ditch of VR with the rail of Bracket vacuum.

※ When there are detached, do the above procedure from 4 to 1.

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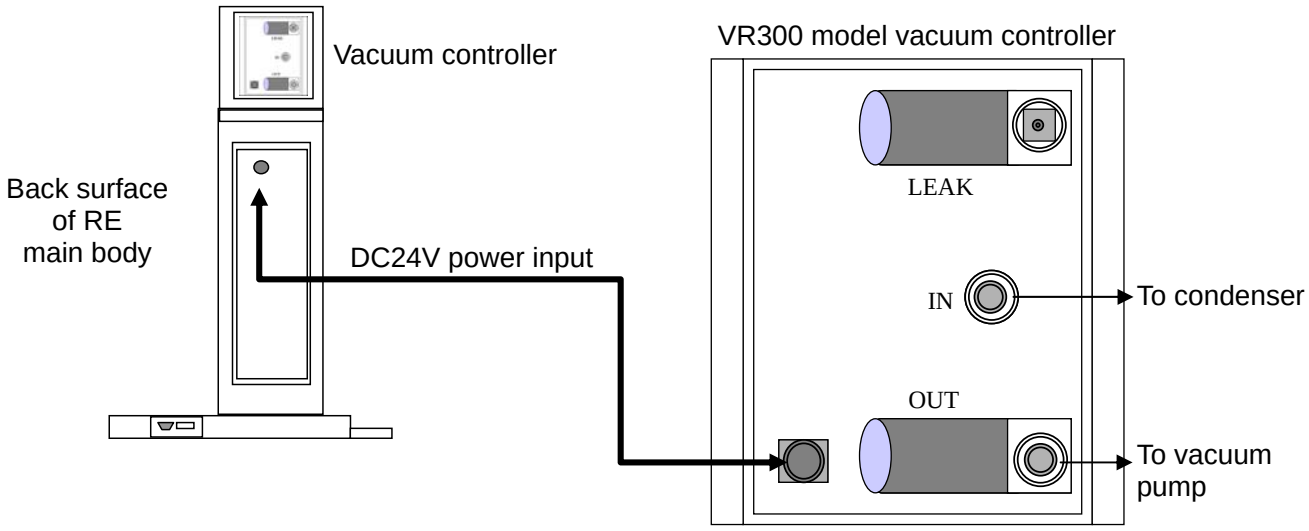
Connection between RE600/800 main body and vacuum controller VR600/800 (optional)

2) Connection between VR300 vacuum controller and RE300 main body

Connect the lead wire with a DC power connector attached to the vacuum controller to the connector.



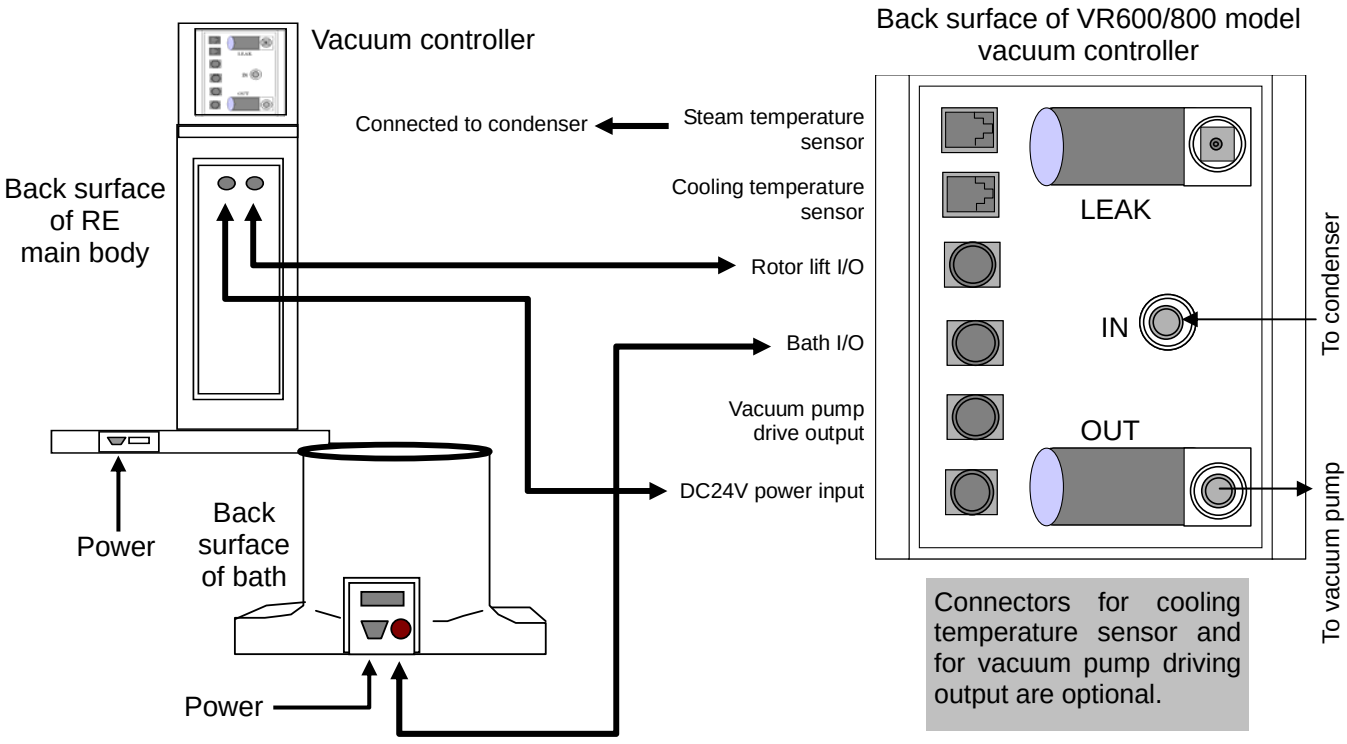
Connect the vacuum hose to the IN and OUT nipples on the back surface of vacuum controller.

The outer diameter of IN and OUT nipples on the terminal area of vacuum pump are 10mm.

Use the vacuum hose with inner diameter of 6mm.

3) Connection between VR600/800 vacuum controller and RE600/800 main body/bath

Connect the lead wire with a connector attached to the vacuum controller to the connector.



Connectors for cooling temperature sensor and for vacuum pump driving output are optional.

Connecting method and assembling procedures of glass unit

1) Assembling example

Connect the glass set to the rotor of RE main body.

Assembling example of A set

Photo: RE300AW

Assembling example of B set

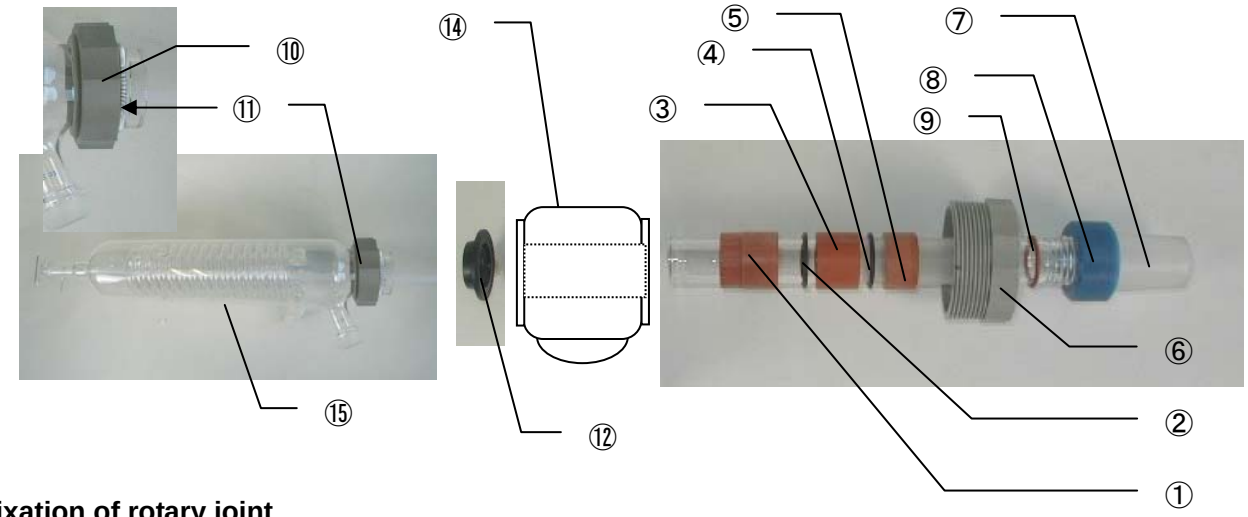
Photo: RE600BW

Assembling example of C set

Photo: RE800CW

Connecting method and assembling procedures of glass unit

2) Connecting method and assembling procedures of glass unit



Fixation of rotary joint

No.	Part name	Description
①	Ring (large)	Insert a ring (large diameter) into the rotor portion ⑭ of RE main body with the end with smaller diameter forward.
②	P22 Viton O-ring	Insert an O-ring.
③	Ring (middle)	Insert a ring (middle diameter).
④	P22 Viton O-ring	Insert an O-ring again.
⑤	Ring (small)	Insert a ring (small diameter).
⑥	Rotary joint retainer	Screw the resin retainer with a bearing into the rotor and tap down the ring.
⑦	Rotary joint	Prepare a rotary joint. Check no cracks or scratches exist on them.
⑧	Sample flask extractor	Insert a sample flask extractor made from resin into the large end of rotary joint.
⑨	P20 red silicone O-ring	Fix a red O-ring into the groove in front of screw portion. Insert the assembled rotary joint into the rotor and retain it with the rotary joint retainer ⑥.

Fixation of condenser

No.	Part name	Description
⑩	Condenser mounting nut	Prepare a condensation tube ⑮ and put the condenser mounting nut (gray resin nut) through the mounting portion of rotor.
⑪	Coil ring	Put the coil ring through the condensation tube.
⑫	Fluorine rubber seal*	Apply a thin layer of silicone grease onto the mating surface with rotary joint on the fluorine rubber seal and fit it into the fitting area of condensation tube with the orientation shown in the figure. Insert the seal into the rotary joint together with the condensation tube and tighten it with the condenser mounting nut.
⑬	Sample induction cock	Insert the sample induction cock with Teflon tube. Apply a thin layer of silicone grease onto the joint surface as necessary.

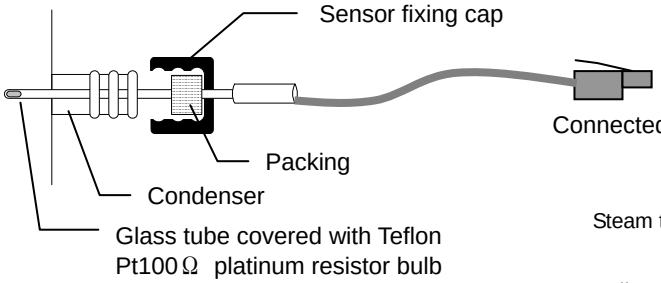
Caution: Use the Teflon seal which is sold separately for ketone or ether solvent.
The Fluorine rubber seal normally attached will swell if ketone or ether solvent such as acetone, methyl ethyl ketone, methyl isobutyl ketone, ethyl ether, and MTBE is used. Use the Teflon seal which is sold separately.

Cable connection

Use the exclusive cable to connect the respective cables.

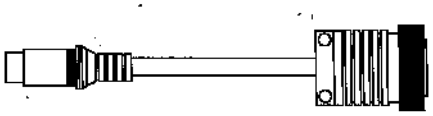
1) Evaporating temperature sensor/cooling temperature sensor (RE600/800 model option)

The configuration of connector end to the VR at the cooling temperature sensor on the RE600/800 option differs from that at the evaporating temperature sensor even they have the same shape. It, therefore, can not be used as a cable of evaporating temperature sensor.

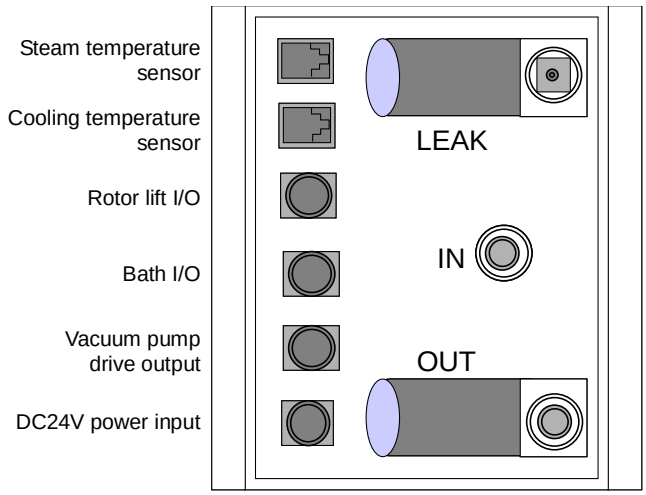


2) Rotor lift I/O cable

This cable controls the operation of device or abnormality at error occurrence by interfacing with the RE main body using the signals.

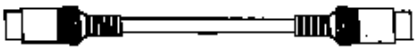


VR ← → RE main body



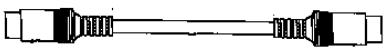
3) Bath I/O cable

This cable connects the RE600/800 model and bath to control the auto stop of bath, heat-retention and abnormality at error occurrence



4) Vacuum pump driving output cable (attached to the optional relay box)

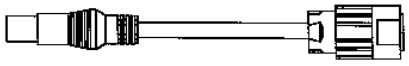
This cable connects the RE600/800 model and vacuum pump control relay box to turn on/off the vacuum pump or delay stop the pump when the main body stops.



Relay box ← → VR

5) DC24V power cable

This cable supplies the DC24V power from the RE main body to the VR model vacuum controller and TA300 model evaporating temperature indicator.



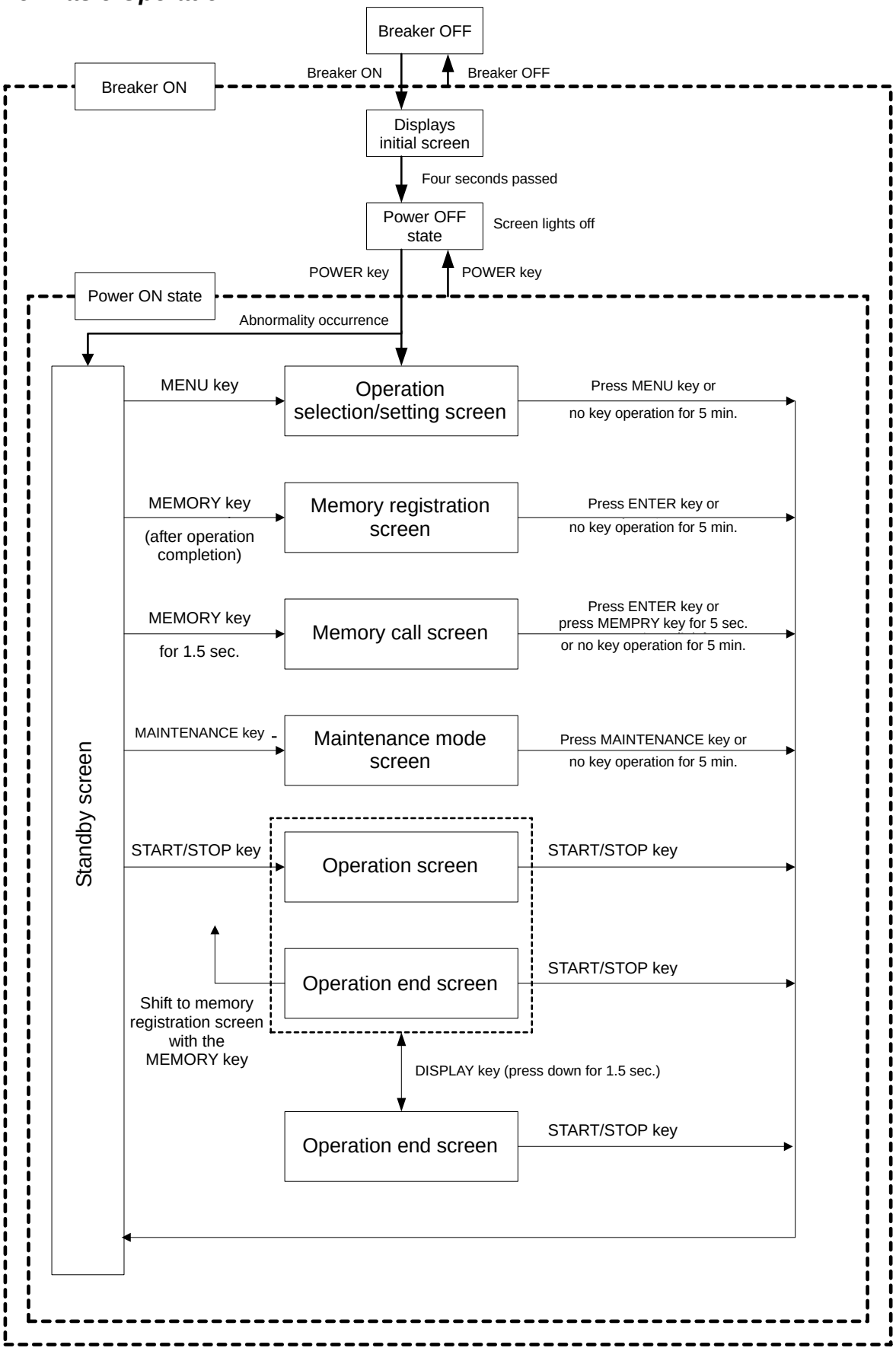
VR ← → RE main body

6) Power cord

The power cord attached to the RE main body is plugged into the connector on the back surface of main body to connect to the power receptacle.

Basic Operation

Flow for Basic Operation



Operational Function

Operation Mode of VR model Vacuum Controller

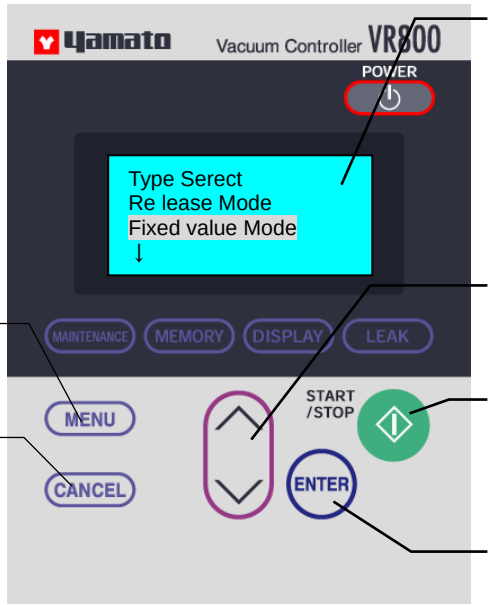
The kind of operation mode and applicable models of vacuum controller are described below.

No.	Operation Mode	VR300	VR600	VR800
1	Free operation	○	○	○
2	Fixed temperature operation	○	○	○
3	Fixed temperature timer operation	○	○	○
4	Descending operation	○	○	○
5	Descending timer operation	○	○	○
6	Automatic operation Ⅰ (auto operation with continuous drying)	×	×	○
7	Automatic operation Ⅱ (auto operation for distillation of single solvent)	×	×	○
8	Automatic operation Ⅲ (auto operation for distillation of complex solvent)	×	×	○

1. Free operation	Select this mode when the operation does not require the vacuum controller or when canceling the operation mode which requires it. In the free operation mode, the control solenoid valve remains open and vacuum control is not performed.
2. Fixed temperature operation	Select this mode when performing continuous operation with the preset vacuum pressure.
3. Fixed temperature timer operation	Select this mode when stopping the fixed temperature operation automatically at the preset time. The setting range of fixed temperature timer is 1 to 999 (unit: minute).
4. Descending operation	Select this mode when gradually lowering the degree of vacuum to the operating vacuum pressure.
5. Descending timer operation	Select this mode when stopping the descending operation automatically at the preset time. The setting range of descending timer is 1 to 99 (unit: minute). The setting range of fixed temperature timer is 1 to 999 (unit: minute).
6. Automatic operation Ⅰ (auto operation with continuous drying)	This mode is exclusive to the VR800 model (RE800 model). Select this mode when performing automatic distillation and drying. The device automatically sets the operating pressure (vacuum pressure) only by setting the evaporating temperature.
7. Automatic operation Ⅱ (auto operation for distillation of single solvent)	This mode is exclusive to the VR800 model (RE800 model). Select this mode when distilling the single solvent sample automatically. The device automatically sets the operating pressure (vacuum pressure) only by setting the evaporating temperature. The timer function which extends the drying time can be added. The setting range of timer is 1 to 999 (unit: minute).
8. Automatic operation Ⅲ (auto operation for distillation of complex solvent)	This mode is exclusive to the VR800 model (RE800 model). Select this mode when distilling the complex solvent sample automatically. The device automatically sets the operating pressure (vacuum pressure) only by setting the evaporating temperature. The timer function which extends the drying time can be added. The setting range of timer is 1 to 999 (unit: minute).

Key Functions and Operations

LCD display	It displays all information about setting and operation of the device. They are displayed in Kanji/Katakana or alphabetical characters, switchable using the display switching function.
MENU key	This key selects the operation mode. The eight operation modes listed in the previous page are displayed. The operation menu varies depending on the mode selected. Press the MENU key. Select the desired operation menu with the ▽ key. Press the ENTER key to display the condition setting screen of respective operation menu.
△▽ (up/down) keys	This key changes the preset value or selects the desired function.
ENTER key	This key determines the input value and selected function.
CANCEL key	This key cancels the determined value or function. Press this key for few seconds to minimize the setting value.
START/STOP key	This key starts the operation. It stops the operation when pressed again.



Displays all information about setting and operation in Kanji or alphabetical characters.

Changes the preset value or selects the desired function.

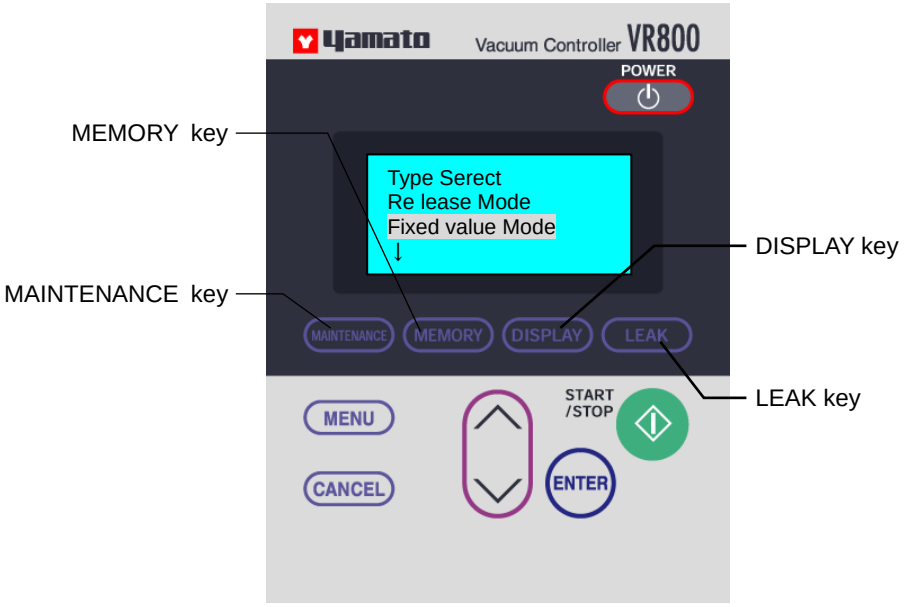
Starts/stops the operation.

Determines the input value and selected function.

Selects the operation mode.

Cancels the determined value or function. Press this key for a few seconds to minimize the setting value..

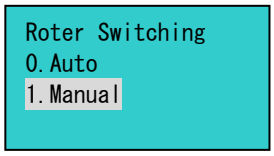
Key Functions and Operations



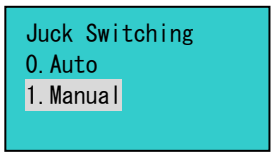
LEAK key	The leak solenoid valve is opened to increase the low degree of vacuum while this key is pressed during operation.
DISPLAY key Type Serect Re lease Mode Fixed value Mode FV Timer Mode Slope Mode Slope Timer Mode	This key shifts the LCD screen or changes the display at operation to the graphic style. Move the digit with the DISPLAY key or △▽ key to check the preset value or indicated value at the setting of value or operation. Press this key for few seconds to graphic display the operational state during operation or on the operation completion screen. The display changes to the graphic display and the process under operation blinks. The current measured pressure and measured steam temperature are also displayed on the screen.
MEMORY key Memory write Memory write OK? YES : ENTER NO : CANCEL Memory read No. 1 NO. 2	This key is exclusive to the VR600/800 model. This key registers or calls the operating conditions previously set. Up to ten conditions can be registered for each operation menu. **To register the operating conditions,** set the name and determine the operating conditions on the operation setting screen and then press the MEMORY key. The screen goes into the MEMORY mode. Press the ENTER key to start registration. After completing the registration, the screen returns to the standby screen. **To call the registered operating conditions,** press the MEMORY key for few seconds on the standby screen to go into the call screen. Select the name of operating condition with the △▽ keys and then press the ENTER key. The screen starts to call the memory with the display indicating that the condition is currently being called. The screen changes to the standby screen again. Start the operation with the START/STOP key.

Key Functions and Operations

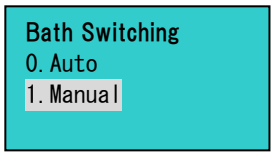
MAINTENANCE key This key specifies the various sub functions of the vacuum controller. The kind of functions settable varies depending on the model of vacuum controller.Press the MAINTENANCE key on the standby screen to go into this mode. Select the setting item with the △▽ keys and then press the ENTER key to determine it.



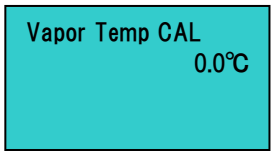
Rotation control switching function (for VR600/800 model only)
This function selects the start/stop method of rotor on the main body at start/end of operation.
0: Auto 1: Manual



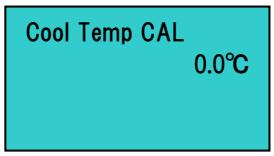
Jack control switching function (for automatic operation of VR600 model only)
This function selects the start/stop method of up/down operation on the lifter of main body at start/completion of operation.
0: Auto 1: Manual



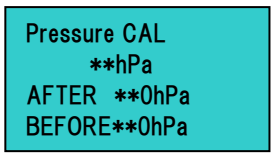
Bath control operation switching function (for VR600/800 model only)
This function stops the operation of BM500/510 and BO400/410 models or keeps it in the state of heat-retention, interlocked with the operation of main body.
Select "0" (Auto) to interlock it with the bath.
0: Auto 1: Manual
Note: Use the MAINTENANCE mode on the bath to select the state (operation stop/heat-retention/non-interlocking operation).



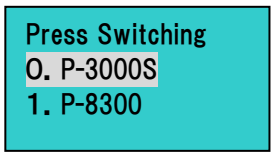
Evaporating temperature offset function (for VR600/800 model only)
This function corrects the indicated value of evaporating temperature in increments of 0.1℃ if it differs from the actual evaporating temperature. Input the correct temperature with the △▽ key and then press the ENTER key.



Cooling temperature offset function (for VR600/800 model only, sensor is an optional accessory)
This function is available only when the optional cooling sensor is connected to monitor the temperature of cooling water used in the condenser.
The function corrects the indicated value of cooling temperature in increments of 0.1℃ if it differs from the actual cooling temperature. Input the correct temperature with the △▽ key and then press the ENTER key.



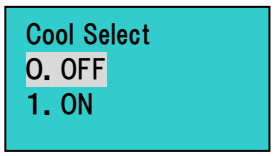
Vacuum pressure offset function
This function corrects the indicated value of vacuum pressure in increments of 1 Pa if it differs from the actual vacuum pressure. Input the correct pressure with the △▽ key and then press the ENTER key.



Pressure sensor switching function
The parameter should be changed when using the optional pressure sensor for the use of solvent (P-8300).
0: P-3000S(standard sensor) 1: P-8300 (optional sensor)
Select the type of sensor with the △▽ key and then press the ENTER key.

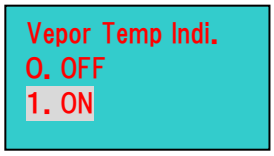
Presence/absence of evaporating temperature sensor (for VR600/800 model only)
This function specifies the presence or absence of evaporating temperature sensor. Set "0" (absent) when evaporating temperature sensor is not used. Usually "1" (present) is set here.
Select "0" or "1" with the △▽ key and then press the ENTER key.

Key Functions and Operations



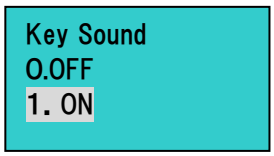
Presence/absence of cooling temperature sensor (for VR600/800 model only)

This function specifies the presence or absence of cooling temperature sensor.
Set "0" (absent) when cooling temperature sensor is not used. Usually 0" (absent) is set here.
Select "0" or "1" with the △▽ key and then press the ENTER key.



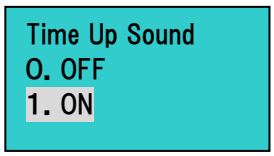
Presence/absence of evaporating temperature sensor (for VR600/800 model only)

This function specifies the presence or absence of decimal point in the display of evaporating temperature.
Set "0" (absent) when evaporating temperature sensor is not used. Usually "1" (present) is set here.
Select "0" or "1" with the △▽ key and then press the ENTER key.



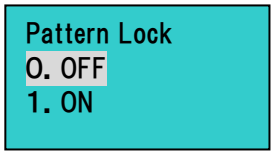
Presence/absence of key buzzer sound

This function specifies the presence or absence of key buzzer sound.
0: No key buzzer sound 1: Key buzzer sound ("1" is set at factory shipment)
Select "0" or "1" with the △▽ key and then press the ENTER key.



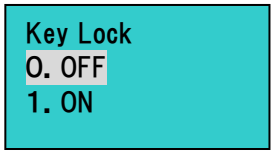
Presence/absence of time up sound

This function mutes the buzzer sound at the end of timer operation or automatic operation.
0: No time up sound 1: Time up sound ("1" is set at factory shipment)
Select "0" or "1" with the △▽ key and then press the ENTER key.



Pattern lock function (for VR800 model only)

This function is exclusive to the VR800 (RE800) model, which prevents deletion of principal operating conditions.
0: OFF ("0" is set at factory shipment) 1: ON
Select "0" or "1" with the △▽ key and then press the ENTER key.

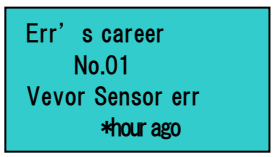


Keylock function

Only the MAINTENANCE key is operable after the keylock is selected during the operation.
0: OFF ("0" is set at factory shipment) 1: ON
Select "0" or "1" with the △▽ key and then press the ENTER key.

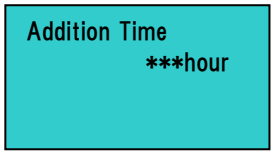
Language choice function

This function selects the language used in the LCD display.
0: JAPANESE 1: ENGLISH
Select "0" or "1" with the △▽ key and then press the ENTER key.



Error log

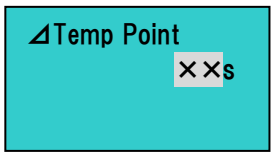
This function displays up to 20 errors occurred in the past, including the error No., error content and time of occurrence.
Select the error No. with the △▽ keys. The latest error is displayed first.
Press the ENTER key to return to the MAINTENANCE screen.



Accumulated time

This function displays the operating hours (accumulated current-carrying time to the controller).
Press the ENTER key to return to the MAINTENANCE screen.

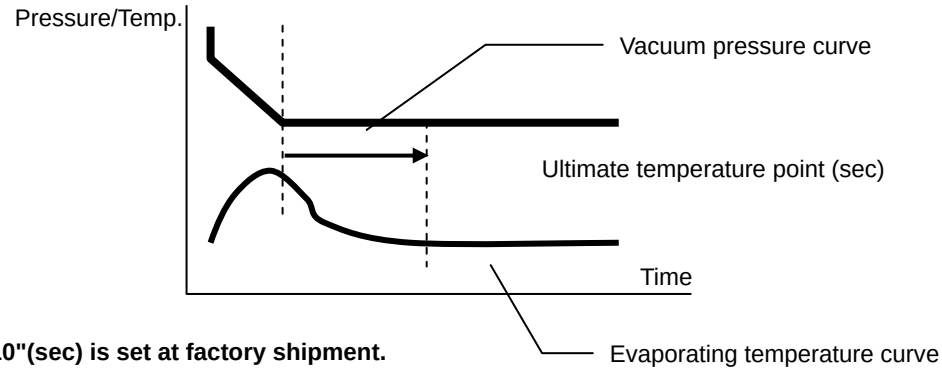
Key Functions and Operations



Ultimate temperature point (for VR600/800 model only)

This function detects the evaporating temperature during operation and specifies the timing (unit: second) of memorizing the evaporating temperature when the memory function is used.

The point on the evaporating temperature curve, few seconds after the evaporating temperature becomes stable, is specified as a memorization point.



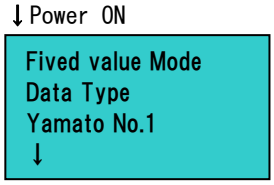
"10"(sec) is set at factory shipment.

Standby Screen/Operation Mode Selection Screen

Standby screen display

Select the MEMU key on the operation selection screen after power-on to go into the standby screen. An error is displayed on the screen if occurred.

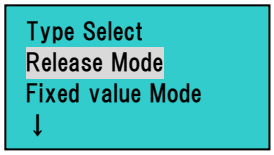
- Power OFF state. The screen displays nothing.

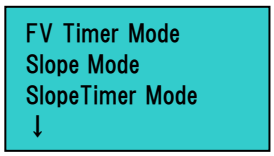


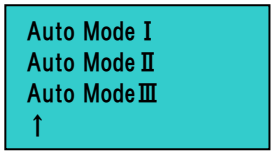
- The standby screen of operation mode used previously is displayed.
  The display of operation mode, name, pressure and temperature varies depending on the model or settings.
  Use the DISPLAY key to advance the screen.
  The START/STOP key can start/stop the operation.

Operation mode selection screen

Press the POWER key to go into the operation mode selection screen.







① Select the operation menu with the △▽ keys.
The LCD screen consists of four-line display in one page. The arrow (↓) on the screen indicates that it has the next screen.

② Select the desired operation mode with the ENTER key.
Automatic operations Ⅰ, Ⅱ and Ⅲ are exclusive functions to RE800 model. The RE300(VR300) and RE600 models do not display these modes.

Operation Setting Screen

Press down the ENTER key on the operation selection screen to go into the operation setting screen.
Operating conditions of respective operation menu can be set here.
Note: Free operation has no setting items. The screen changes to the standby screen.

Selection example	Description/operation
SlopeTimer Mode Data Type YAMATO No.1 ↓	・The selected operation mode is displayed. ・Press the ENTER key to go into the setting screen of data operation when fixed temperature, fixed temperature timer, descending, or descending timer operation is selected. Determine if data operation is performed or not with the ENTER key. When "1" (ON) is selected, the vacuum pressure during operation is automatically set by the automatic calculating system. ・Press the ENTER key on the registered name display screen to display the name setting screen. Register the name with the △▽ and ENTER key. Press the ENTER key for few seconds to return to the setting screen.
Ethanol MatterA **** MatterB ***** ↓	・Press the ENTER key to select and determine the name of registered material. Select the material name registered with the △▽ keys. Press the ENTER key to determine the setting. ・These constants are used at either the fixed temperature, fixed temperature timer, descending, or descending timer operation. They are used to automatically calculate the optimum vacuum pressure to the evaporating temperature when performing the data operation using the automatic calculating system of solvent curve. At the data operation, the three Antoine constants A, B and C are required to be set. If the one of No. 1 to 10 is selected, constants should be input for each operation. As for the data of 53 solvents already registered, they have been already input and are not displayed on the screen. Select the constant and change/set the value with the △▽ keys.
MatterC ***** Temp ＊.＊℃ CalcPress**hPa ↓	・Press the ENTER key and specify the desired evaporating temperature with the △▽ keys. ・Displayed only at the data operation on either the fixed temperature, fixed temperature timer, descending, or descending timer operation. It displays the vacuum pressure value automatically calculated by the automatic calculating system.
Press **hPa Hys Press **hPa Slope ***hPa ↓	・Specify the operating pressure with the △▽ keys when data operation is not selected. Fine adjust the operating pressure with these keys when data operation is selected. ・Set the ON/OFF width of the control solenoid valve (pressure hysteresis) in operating pressure with the △▽ keys. ・Set the pressure at the start of descending operation with the △▽ keys.
Slope Time *m FV Time *m Slope Mv ↓	・Set the duration from the start of descending to the completion with the △▽ keys. ・Set the duration of fixed temperature operation at timer operation with the △▽ keys. ・The descending speed of pressure can be controlled in increments of % at the automatic operation Ⅲ on the RE800 model. ・Control the percentage with the △▽ keys.
Hys Temp End Temp End Time ↓	・In the automatic operations Ⅰ, Ⅱ and Ⅲ on the RE800 model, the range between upper and lower detecting limits of evaporating temperature related to the primary and secondary solvents can be adjusted. Change the value with the △▽ keys. The range is set to 5℃ at factory shipment. ・In the automatic operations Ⅰ, Ⅱ and Ⅲ on the RE800 model, the evaporating temperature determines the operation completion at automatic operation. The temperature can be fine adjusted here. It is set to 10℃ at factory shipment. ・In the automatic operations Ⅱ and Ⅲ on the RE800 model, the evaporating temperature automatically determines the operation completion. The operating time, however, can be extended by inputting the drying time. The device continues operation by the input time and then stops.
Vapor Temp Cool Temp ↑	・The evaporating temperature (the value on the evaporating temperature sensor) is displayed. ・The cooling water temperature (the value on the cooling temperature sensor)connected to the outlet of condenser is displayed.

Name Registration

On the VR model vacuum controller, a specific name can be registered to the operating condition created. This function is useful when using the memory function included in the RE600 and RE800 models.

Available characters for name registration

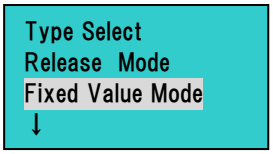
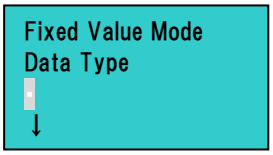
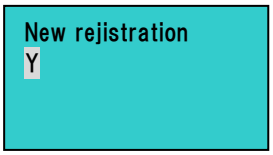
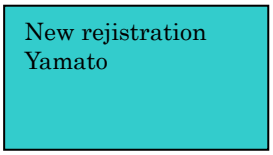
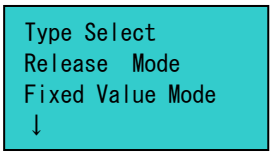
Use the following characters to register the name.

No.	Character	No.	Character	No.	Character	No.	Character
1	(Space)	41	d	81	ｳﾞ	121	°
2	0	42	e	82	ﾃ	122	。
3	1	43	f	83	ﾄ	123	、
4	2	44	g	84	ﾅ	124	!
5	3	45	h	85	ﾆ	125	″
6	4	46	i	86	ﾇ	126	#
7	5	47	j	87	ﾈ	127	$
8	6	48	k	88	ﾉ	128	%
9	7	49	l	89	ﾊ	129	&
10	8	50	m	90	ﾋ	130	’
11	9	51	n	91	ﾌ	131	(
12	A	52	o	92	ﾍ	132	)
13	B	53	p	93	ﾎ	133	*
14	C	54	q	94	ﾏ	134	+
15	D	55	r	95	ﾐ	135	,
16	E	56	s	96	ﾑ	136	−
17	F	57	t	97	ﾒ	137	.
18	G	58	u	98	ﾓ	138	/
19	H	59	v	99	ﾔ	139	:
20	I	60	w	100	ﾕ	140	;
21	J	61	x	101	ﾖ	141	<
22	K	62	y	102	ﾗ	142	>
23	L	63	z	103	ﾘ	143	=
24	M	64	ｱ	104	ﾙ	144	?
25	N	65	ｲ	105	ﾚ	145	@
26	O	66	ｳ	106	ﾛ	146	[
27	P	67	ｴ	107	ﾜ	147	]
28	Q	68	ｵ	108	ｦ	148	¥
29	R	69	ｶ	109	ﾝ	149	^
30	S	70	ｷ	110	ｧ	150	_
31	T	71	ｸ	111	ｨ	151	`
32	U	72	ｹ	112	ｩ	152	{
33	V	73	ｺ	113	ｪ	153	}
34	W	74	ｻ	114	ｫ	154	|
35	X	75	ｼ	115	ｬ	155	~
36	Y	76	ｽ	116	ｭ	156	「
37	Z	77	ｾ	117	ｮ	157	」
38	a	78	ｿ	118	ｯ	158	・
39	b	79	ﾀ	119	ｰ		
40	c	80	ﾁ	120	ﾟ		

Name Registration

Name Registrations Procedures

Start name registration on the setting screen of operation mode used. Up to 16 one-byte characters (refer to the previous page) can be input to register the name.

Screen	Procedures
	① Select the desired operation mode on the operation selection screen.
↓ ENTER key	
	② Press the ENTER key to go into the setting screen. ③ Select the name entry field with the △▽ keys.
↓ △▽ key	
	④ Press the ENTER key to go into the name registration screen. ⑤ Specify the first character with the △▽ keys. ⑥ Press the ENTER key to determine the first character. The screen shifts to the next character entry.
↓ ENTER key	
	⑦ Repeat the steps ③ and ④ to create the name. ⑧ Up to 16 one-byte characters (refer to the previous page) can be input. Press the ENTER key to skip the entry field where a character is not input. Press the ENTER key for few second when determining the name in the middle of input. The screen returns to the setting screen.
↓ △▽ key	
	⑨ The screen returns to the screen for the first character if the ENTER key is pressed on the entry field for 16th character.
↓ MENU key	
	⑩ Press the ENTER key for few seconds to return to the setting screen.

Data Operation

Automatic calculating system of vacuum pressure at data operation

Data operation by automatic calculating system on the RE600/800 model is described. This function is exclusive to the RE600/800 model.

This function is applicable to operation modes of fixed temperature, fixed temperature time, descending and descending timer on the RE600/800 model. The calculating function of the optimum vacuum pressure necessary for the data operation is previously registered for 53 kinds of solvent. The distilling operation optimum for the solvent to be used, therefore, can be performed by selecting the solvent name used and by setting the evaporating temperature (bath temperature).

The preset vacuum pressure is automatically calculated using the Antoine's three constants (constants A, B and C), based on the evaporating temperature curve for respective solvents. These constants related to the 53 solvents listed below are previously registered respectively and the optimum vacuum pressure for operation can be automatically set by only selecting the name of solvent used. The distilling temperature (bath temperature) of sample (solvent), however, varies depending on the distilling conditions and must be set with respect to each operation.

Registered solvents

No.	Indication	No.	Indication	No.	Indication
1	No.01	22	Ethanol	43	Ethyl bromide
2	No.02	23	Formic acid	44	Styrene
3	No.03	24	m-xylen	45	Tetora hidorofran
4	No.04	25	o-xylen	46	Trichloro ethylene
5	No.05	26	p--xylen	47	Toluene
6	No.06	27	Chloro benzene	48	Pyridine
7	No.07	28	Chloroform	49	Phenol
8	No.08	29	Acetic acid	50	1-butanol
9	No.09	30	Ethyl acetate	51	2-butanol
10	No.10	31	Acetic acid propyl	52	1-Propanorl
11	Hydrogen peroxide	32	Acetic acid methylic	53	2-Propanorl
12	Nitric acid	33	Ge isopropilatel	54	1-Hekisanorl
13	Water	34	Ge etilatel	55	Hexane
14	Acrylo nitrile	35	Carbon tetrachloride	56	Heptan
15	Aceto nitoril	36	1.4 –Ge okisan	57	Benzene
16	Acetone	37	Cyclo hexane	58	N-Pentanor(N-amino alcohol)
17	Aniline	38	Cyclo pentane	59	Pentane
18	Benzoic acid	39	1.1-Ge croroetan	60	Acetic anhydride
19	Benzoic acidethyl	40	1.2-Ge croroetan	61	Methanol
20	Methyl benzoate	41	Methylene chloride	62	Ethyl iodide
21	Isobutyl alcohol	42	NN-dimethyl formamide	63	Btil iodide

The solvent Nos. 1 thru No.10 are used to register the user-specified solvents. The Antoine constants A, B and C for these solvents, therefore, must be input by the user.

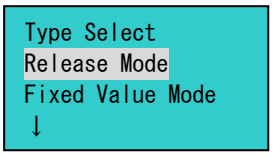
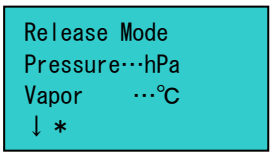
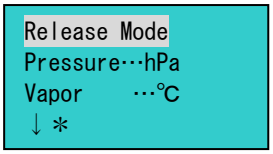
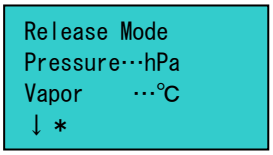
Data Operation

The registered solvents and their Antoine constants are listed below

No.	ID	Compound name	Formula	Antoine constants		
				A	B	C
1	8	Hydrogen peroxide	H_2O_2	7.095	1886.8	220.60
2	10	Nitric acid	HNO_3	6.637	1406.0	221.00
3	13	Water	H_2O	7.074	1657.5	227.02
4	17	Acrylonitrile	C_3H_3N	6.041	1208.3	222.00
5	20	Asetonitoril	C_3H_3N	6.198	1279.2	224.00
6	21	Acetone	C_3H_6O	6.356	1277.0	237.22
7	22	Aniline	C_6H_7	6.367	1675.3	200.00
8	24	Benzoic acid	$C_7H_6O_2$	6.579	1820.0	147.95
9	25	Benzoic acid ethyl	$C_9H_{10}O_2$	6.163	1669.9	189.00
10	26	Methyl benzoate	$C_8H_8O_2$	6.172	1629.4	192.00
11	29	Isobutyl alcohol	$C_4H_{10}O$	6.452	1248.5	172.85
12	33	Ethanol	C_2H_6O	7.338	1652.1	231.48
13	50	Formic acid	CH_2O_2	6.503	1563.3	247.06
14	55	m-xylene	C_8H_{10}	6.134	1462.3	215.11
15	56	o-xylene	C_8H_{10}	6.124	1474.7	213.69
16	57	p-xylene	C_8H_{10}	6.115	1453.4	215.31
17	60	Chlorobenzene	C_6H_5Cl	6.103	1431.1	217.55
18	61	Chloroform	$CHCl_3$	6.062	1171.2	226.99
19	62	Acetic acid	$C_2H_4O_2$	6.425	1479.0	216.81
20	64	Ethyl acetate	$C_4H_6O_2$	6.140	1211.9	216.00
21	66	Acetic acid propyl	$C_5H_{10}O_2$	6.173	1294.4	209.00
22	67	Acetic acid methylic	$C_3H_6O_2$	6.130	1130.0	217.00
23	68	Geisopropilatel	$C_6H_{14}O$	6.222	1257.6	230.00
24	70	Geetilatel	$C_4H_{10}O$	6.110	1090.6	231.20
25	71	Carbon tertrachloride	CCl_4	6.019	1219.6	227.16
26	72	1.4-Geokisan	$C_4H_8O_2$	6.131	1288.5	211.00
27	74	Cyclo hexane	C_6H_{12}	5.964	1200.3	222.50
28	78	Cyclo pentane	C_5H_{10}	6.046	1142.2	233.46
29	80	1.1-Gecroroetan	$C_2H_4Cl_2$	6.110	1171.4	228.12
30	81	1.2-Gecroroetan	$C_2H_4Cl_2$	6.150	1271.3	222.93
31	82	Methylene chloride	CH_2CL_2	6.205	1138.9	231.45
32	96	NN-dimethyl formamide	C_3H_7NO	6.233	1537.8	210.39
33	97	Ethyl bromide	C_2H_5Br	6.045	1090.8	231.71
34	101	Styrene	C_8H_8	6.082	1445.6	209.43
35	105	Tetorahidorofran	C_4H_8O	6.120	1202.3	226.25
36	109	Trichloroethylene	C_2HCl_3	6.153	1315.1	230.00
37	111	Toluene	C_7H_8	6.080	1344.8	219.48
38	116	Pyridine	C_5H_5N	6.113	1344.2	212.00
39	118	Phenol	C_6H_6O	6.259	1516.1	174.57
40	121	1-butanol	$C_4H_{10}O$	6.602	1362.4	178.72
41	122	2-butanol	$C_4H_{10}O$	6.599	1314.2	186.55
42	136	1-Propanorl	C_3H_8O	6.744	1375.1	193.00
43	137	2-Propanorl	C_3H_8O	7.243	1580.9	219.61
44	145	1-Hekisanorl	$C_6H_{14}O$	6.985	1761.3	196.66
45	147	Hexane	C_6H_{14}	6.003	1171.5	224.37
46	150	Heptan	C_7H_{16}	6.022	1264.9	216.54
47	153	Benzene	C_6H_6	6.031	1211.0	220.79
48	156	N-Pentanorl(N-amino alcohol)	$C_5H_{12}O$	6.302	1314.6	168.11
49	159	Pentane	C_5H_{12}	6.001	1075.8	233.21
50	162	Acetic anhydride	$C_4H_6O_3$	6.247	1427.8	198.04
51	163	Methanol	CH_4O	7.197	1575.0	238.86
52	177	Ethyl iodide	C_2H_5I	5.957	1175.7	225.26
53	178	Btil iodide	C_4H_9I	5.948	1358.9	214.20

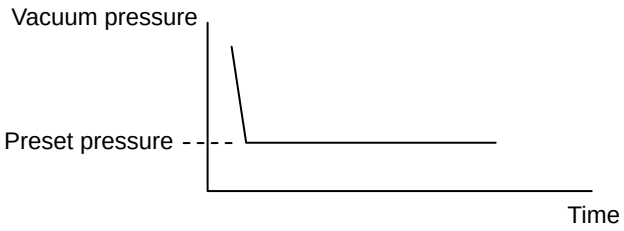
Free Operation

This operation mode does not require the vacuum controller. In this mode, the control solenoid valve on the vacuum controller always remains open.

Screen	Procedures
	① Select the free operation on the setting screen with the △▽ keys, and then press the ENTER key.
	② The screen changes to the free operation standby screen. ❖ When the optional cooling temperature sensor is connected, the cooling temperature (℃) is displayed.
	③ Press the START/STOP key to start the operation. The operation name currently operated blinks. ❖ When the optional cooling temperature sensor is connected, the cooling temperature (℃) is displayed.
	④ Press the START/STOP key to stop the operation. The screen changes to the free operation standby screen. ❖ When the optional cooling temperature sensor is connected, the cooling temperature (℃) is displayed.

Fixed Temperature Operation

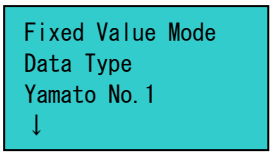
In this operation mode, the device performs continuous operation with the preset vacuum pressure.



Screen	Procedures
Type Select Release Mode Fixed Value Mode ↓ ↓ ENTER key	① Select the fixed temperature operation on the setting screen with the △▽ keys, and then press the ENTER key. (The content of display varies depending on the model VR300/600/800). ② The screen changes to the setting screen. (The content of display varies depending on the model VR300/600/800). Press the △▽ keys or DISPLAY key to advance the screen. ③ Select the data operation and then select "ON" or "OFF".
When selecting "ON"…	
Fixed Value Mode Data Type Yamato No.1 ↓	① Select the data operation → ENTER → select 1.ON → ENTER ② To create the operation name, → ENTER → (repeat "△▽ → ENTER") → press ENTER longer
Eethanol Temp **℃ CalcPress **hpa ↓	③ Performs solvent selection → ENTER → select the solvent to be used with △▽ → ENTER ④ Determine the preset temperature → ENTER → change the temperature with △▽ → ENTER Calculated pressure is displayed only.
Press ****hPa Hys.Press **hPa Vapor ***℃ ↓	⑤ Used to fine adjust the result of calculated pressure at data operation. ENTER → change the pressure with △▽ → ENTER ⑥ Used to fine adjust the result of calculated pressure at data operation. ENTER → change the pressure with △▽ → ENTER The measured evaporating temperature is displayed.
CoolTemp **℃ ↑	Displayed only when the RE600/800 optional cooling temperature sensor is connected.

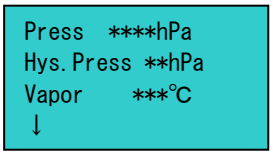
Fixed Temperature Operation

When selecting "OFF"…



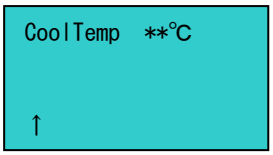
① Select the data operation → ENTER → select 1.OFF → ENTER

② To create the operation name, → ENTER →（repeat "△▽ → ENTER"）→ press ENTER longer



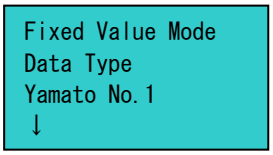
③ Set the operating vacuum pressure.
ENTER → change the pressure with △▽ → ENTER

④ Determine the ON/OFF width of solenoid valve at fixed temperature operation.
ENTER → change the pressure with △▽ → ENTER
The measured evaporating temperature is displayed.

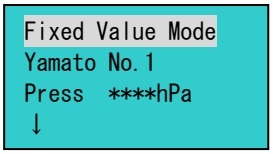


Displayed only when the RE600/800 optional cooling temperature sensor is connected.

Operation start/stop

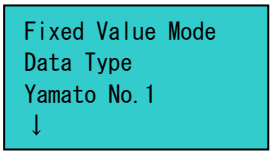


↓ START/STOP key



① Press the START/STOP key. The device goes into the selected operation mode and the operation name to be performed blinks. The device then starts operation.
Press the △▽ keys or DISPLAY key to advance the screen.
Current pressure and current evaporation temperature are displayed.

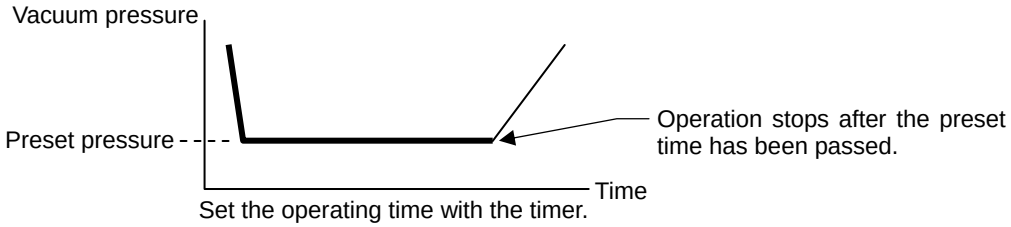
↓ START/STOP key



② Press the START/STOP key to stop the operation.
Press the MENU key on the standby screen to change the operation menu.

Fixed Temperature Timer Operation

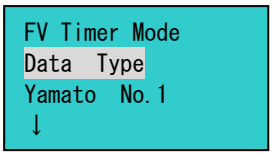
This operation mode performs continuous operation with the preset vacuum pressure and automatically stops at the preset time.



Screen	Procedures
FV Timer Mode Slope Mode Slope Timer Mode ↓	① Select the fixed temperature timer operation on the setting screen with the △▽ keys, and then press the ENTER key. (The content of display varies depending on the model VR300/600/800).
↓ ENTER key	② The screen changes to the setting screen. (The content of display varies depending on the model VR300/600/800). Press the △▽ keys or DISPLAY key to advance the screen.
	③ Select the data operation and then select "ON" or "OFF".
When selecting "ON"…	
FV Timer Mode Data Type Yamato No.1 ↓	① Select the data operation → ENTER → select 1.ON → ENTER
	② To create the operation name, → ENTER → (repeat "△▽ → ENTER") → press ENTER longer
Eethanol Temp **℃ CalcPress **hpa ↓	③ Performs solvent selection → ENTER → select the solvent to be used with △▽ → ENTER
	④ Determine the preset temperature → ENTER → change the temperature with △▽ → ENTER Calculated pressure is displayed only.
Press **hPa Hys Press **hPa FV Time **m ↓	⑤ Used to fine adjust the result of calculated pressure at data operation. ENTER → change the pressure with △▽ → ENTER
	⑥ Used to fine adjust the result of calculated pressure at data operation. ENTER → change the pressure with △▽ → ENTER
	⑦ Set the operating time. ENTER → Set the operating time with △▽ → ENTER
Vapor ***℃ Cool Temp **℃ ↑	The measured evaporating temperature is displayed. Displayed only when the RE600/800 optional cooling temperature sensor is connected.

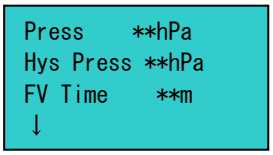
Fixed Temperature Timer Operation

When selecting "OFF"…



① Select the data operation → ENTER → select 1.OFF → ENTER

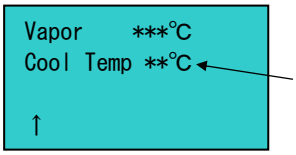
② To create the operation name, → ENTER → (repeat "△▽ → ENTER") → press ENTER longer



③ Set the operating vacuum pressure.
ENTER → change the pressure with △▽ → ENTER

④ Determine the ON/OFF width of solenoid valve at fixed temperature operation.
ENTER → change the pressure with △▽ → ENTER

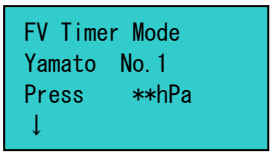
⑤ Input the time for fixed temperature operation. (The remaining time is displayed during operation.)



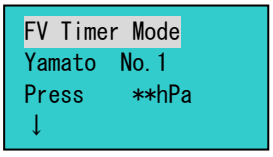
The measured evaporating temperature is displayed.

Displayed only when the RE600/800 optional cooling temperature sensor is connected.

Operation start/stop

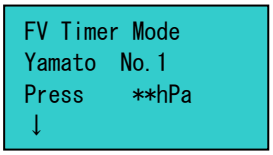


↓ START/STOP key



① Press the START/STOP key. The device goes into the selected operation mode and the operation name to be performed blinks. The device then starts operation.
Press the △▽ keys or DISPLAY key to advance the screen.
Current pressure, current evaporation temperature and remaining time are displayed.

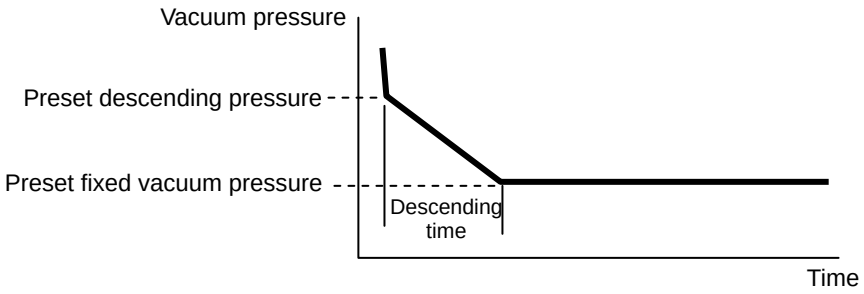
↓ START/STOP key



② Press the START/STOP key to stop the operation.
Press the MENU key on the standby screen to change the operation menu.

Descending Operation Procedures

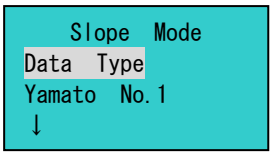
In this mode, the vacuum pressure descends gradually to the preset fixed vacuum pressure to prevent the bumping.



Screen	Procedures
FV Timer Mode Slope Mode Slope Timer Mode ↓ ↓ ENTER key	① Select the descending operation on the setting screen with the △▽ keys, and then press the ENTER key. ② The screen changes to the setting screen. (The content of display varies depending on the model VR300/600/800). Press the △▽ keys or DISPLAY key to advance the screen. ③ Select the data operation and then select "ON" or "OFF".
When selecting "ON"…	
Slope Mode Data Type Yamato No.1 ↓	① Select the data operation → ENTER → select 1.ON → ENTER ② To create the operation name, → ENTER → (repeat "△▽ → ENTER") → press ENTER longer
Eethanol MatterA ***** MatterB ***** ↓	③ Performs solvent selection → ENTER → select the solvent to be used with △▽ → ENTER When one of the solvents No. 1 to 10 is selected, three constants should be input. As for the data of 53 solvents already registered, these constants have been already input and are not displayed on the screen.
MatterC ***** Temp ***℃ CaicPress***hPa ↓	④ Determine the preset temperature → ENTER → change the temperature with △▽ → ENTER Calculated pressure is displayed only.
Press ***hPa Hys Press **hPa Slope ***hPa ↓	⑤ Used to fine adjust the result of calculated pressure at data operation. ENTER → change the pressure with △▽ → ENTER ⑥ Used to fine adjust the result of calculated pressure at data operation. ENTER → change the pressure with △▽ → ENTER ⑦ Set the vacuum pressure at the start of descending.
Slope Time **m Vapor ***℃ Cool TemP **℃ ↑	⑧ Set the descending time. ENTER → Set the descending time with △▽ → ENTER The measured evaporating temperature is displayed. Displayed only when the RE600/800 optional cooling temperature sensor is connected.

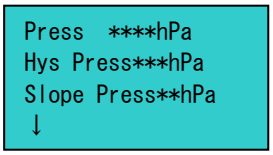
Descending Operation Procedures

When selecting "OFF"…



① Select the data operation → ENTER → select 1.OFF → ENTER

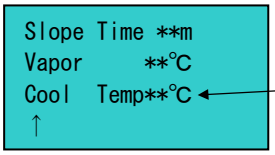
② To create the operation name, → ENTER → (repeat "△▽ → ENTER") → press ENTER longer



③ Set the operating vacuum pressure.
ENTER → change the pressure with △▽ → ENTER

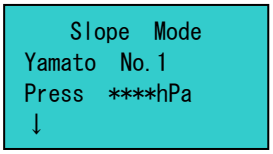
④ Determine the ON/OFF width of solenoid valve at fixed temperature operation.
ENTER → change the pressure with △▽ → ENTER

⑤ Set the vacuum pressure at the start of descending.

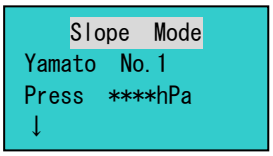


⑥ Input the descending time.
The measured evaporating temperature is displayed.
Displayed only when the RE600/800 optional cooling temperature sensor is connected.

Operation start/stop

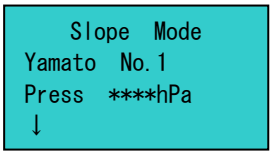


↓ START/STOP key



↓ START/STOP key

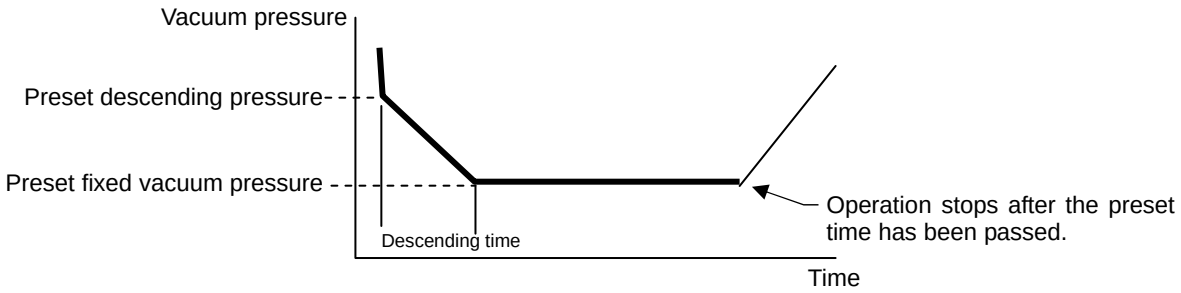
① Press the START/STOP key. The device goes into the selected operation mode and the operation name to be performed blinks. The device then starts operation.
Press the △▽ keys or DISPLAY key to advance the screen.
Current pressure, current evaporation temperature and remaining time are displayed.



② Press the START/STOP key to stop the operation.
Press the MENU key on the standby screen to change the operation menu.

Descending Timer Operation Procedures

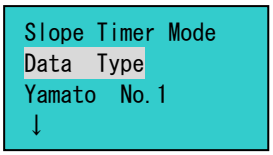
In this mode, the timer function is added to the descending operation to automatically stop the operation at the preset time.



Screen	Procedures
FV Timer Mode Slope Mode Slope Timer Mode ↓ ↓ ENTER key	① Select the descending operation on the setting screen with the △▽ keys, and then press the ENTER key. ② The screen changes to the setting screen. (The content of display varies depending on the model VR300/600/800). Press the △▽ keys or DISPLAY key to advance the screen. ③ Select the data operation and then select "ON" or "OFF".
When selecting "ON"…	
Slope Timer Mode Data Type Yamato No.1 ↓	① Select the data operation → ENTER → select 1.ON → ENTER ② To create the operation name, → ENTER → (repeat "△▽ → ENTER") → press ENTER longer
Eethanol MatterA ***** MatterB ***** ↓	③ Performs solvent selection → ENTER → select the solvent to be used with △▽ → ENTER When one of the solvents No. 1 to 10 is selected, three constants should be input. As for the data of 53 solvents already registered, these constants have been already input and are not displayed on the screen.
MatterC ***** Temp ***℃ CaicPress***hPa ↓	④ Determine the preset temperature → ENTER → change the temperature with △▽ → ENTER Calculated pressure is displayed only.
Press ***hPa Hys Press **hPa Slope ***hPa ↓	⑤ Used to fine adjust the result of calculated pressure at data operation. ENTER → change the pressure with △▽ → ENTER ⑥ Used to fine adjust the result of calculated pressure at data operation. ENTER → change the pressure with △▽ → ENTER ⑦ Set the vacuum pressure at the start of descending.
Slope Time**℃ FV Time **m Vapor ***℃ ↓	⑧ Set the descending time. ENTER → Set the descending time with △▽ → ENTER ⑨ Set the fixed temperature operating time. ENTER → Set the fixed temperature operating time with △▽ → ENTER The measured evaporating temperature is displayed.
Cool Temp **℃ ↑	Displayed only when the RE600/800 optional cooling temperature sensor is connected.

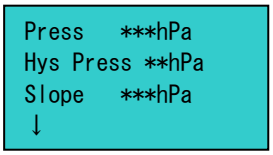
Descending Timer Operation Procedures

When selecting "OFF"…



① Select the data operation → ENTER → select 1.OFF → ENTER

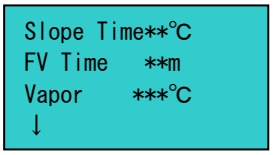
② To create the operation name, → ENTER →（repeat "△▽ → ENTER"）→ press ENTER longer



③ Set the operating vacuum pressure.
ENTER → change the pressure with △▽ → ENTER

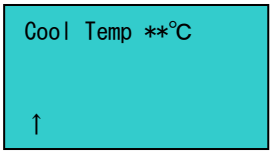
④ Determine the ON/OFF width of solenoid valve at fixed temperature operation.
ENTER → change the pressure with △▽ → ENTER

⑤ Set the vacuum pressure at the start of descending.



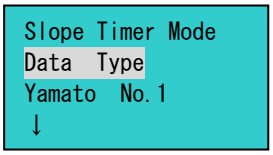
⑥ Input the descending time.

⑦ Set the fixed temperature operating time.
The measured evaporating temperature is displayed.

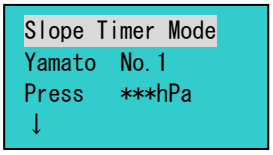


Displayed only when the RE600/800 optional cooling temperature sensor is connected.

Operation start/stop

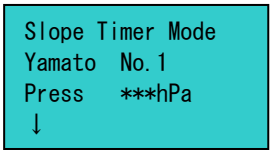


↓ START/STOP key



① Press the START/STOP key. The device goes into the selected operation mode and the operation name to be performed blinks. The device then starts operation.
Press the △▽ keys or DISPLAY key to advance the screen.
Current pressure, current evaporation temperature and remaining time are displayed.

↓ START/STOP key



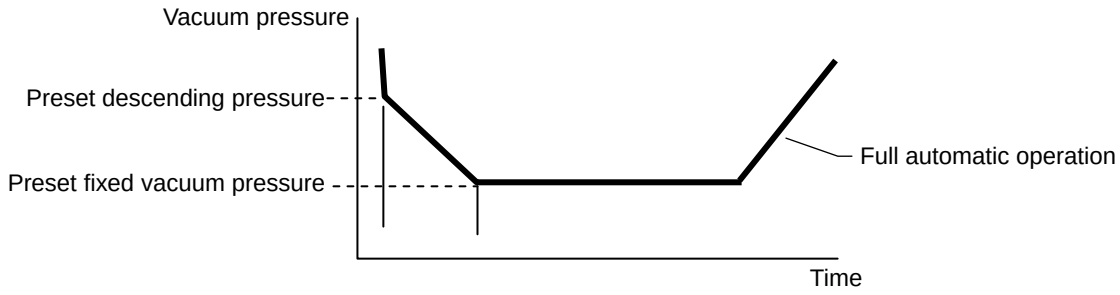
② Press the START/STOP key to stop the operation.
Press the MENU key on the standby screen to change the operation menu.

Automatic Operation Ⅰ Procedures

The automatic operation Ⅰ, Ⅱ and Ⅲ have the function that detects the evaporating temperature and automatically set the optimum vacuum pressure for the distillation of sample (solvent) used.

- The automatic operation Ⅰ is applicable to distill and dry the sample of single solvent.
- The automatic operation Ⅱ is applicable to distill the sample of single solvent.
- The automatic operation Ⅲ is applicable to distill the sample of complex solvent.

The automatic operation Ⅰ is the exclusive function to the RE800 model.
The automatic operation Ⅰ has the function that automatically starts or stops the operation by setting the evaporation temperature.
The automatic operation Ⅰ is a full automatic operation, consisting of the descending operation, fixed temperature operation and drying of sample using a single solvent.



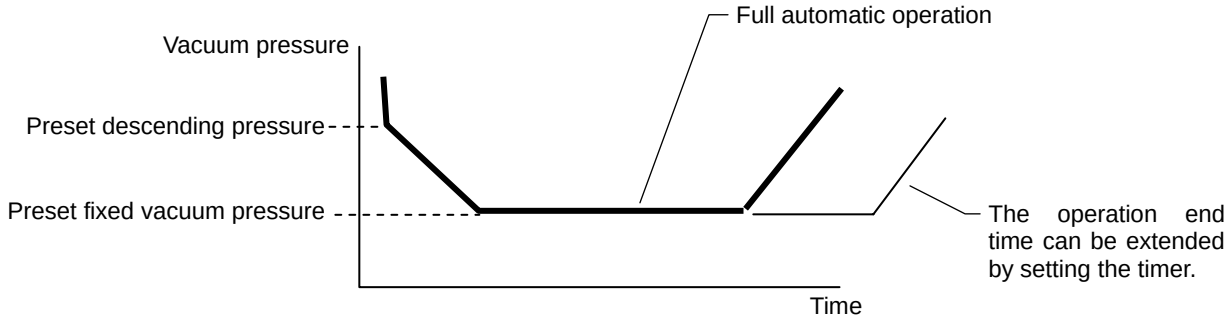
Screen	Procedures
Auto Mode Ⅰ Auto Mode Ⅱ Auto Mode Ⅲ ↑	① Select the automatic operation Ⅰ on the setting screen with the △▽ keys, and then press the ENTER key. ② The screen changes to the setting screen. Press the △▽ keys or DISPLAY key to advance the screen.
↓ ENTER key	③ After the bath temperature has been stable, press the START/STOP key to start the operation.
↓ START/STOP key	The device automatically detects the evaporating temperature and automatically stops the operation.

Control the operating conditions.
Use the following procedures in order to change the operating conditions after performing one automatic operation.

Auto Mode Ⅰ Yamato No.1 Temp ***℃ ↓	Perform on the setting screen. ① To create the operation name, → ENTER → (repeat "△▽ → ENTER") → press ENTER longer ② Set the evaporating temperature.
Hys Press **hPa Slope Mv **% End Temp **℃ ↓	③ Used to fine adjust the pressure ON/OFF width on the control solenoid valve at fixed temperature operation. ENTER → change the pressure with △▽ → ENTER ④ The descending curve on the descending operation can be fine adjusted by increments of %. ⑤ Used to fine adjust the detecting range (temperature) of evaporating temperature at operation end.
Vapor **℃ Cool Temp **℃ ↑	The measured evaporating temperature is displayed. The cooling temperature is displayed when the optional cooing temperature sensor is connected.

Automatic Operation Ⅱ Procedures

The automatic operation Ⅱ is the exclusive function to the RE800 model.
The automatic operation Ⅱ has the function that automatically starts the operation, dries the sample, and then stops the operation by setting the evaporating temperature.
The automatic operation Ⅱ is a full automatic operation, consisting of the descending operation, fixed temperature operation, and distillation of sample using a single solvent. The operation end time can be extended by setting the timer.



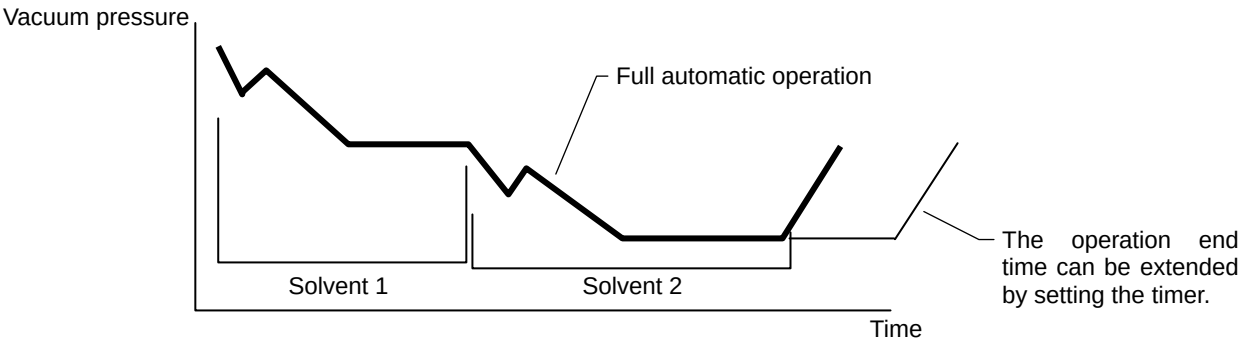
Screen	Procedures
Auto Mode Ⅰ Auto Mode Ⅱ Auto Mode Ⅲ ↑	① Select the automatic operation Ⅱ on the setting screen with the △▽ keys, and then press the ENTER key. ② The screen changes to the setting screen. Press the △▽ keys or DISPLAY key to advance the screen.
↓ ENTER key	③ After the bath temperature has been stable, press the START/STOP key to start the operation.
↓ START/STOP key	The device automatically detects the evaporating temperature and automatically stops the operation.

Control/set the operating conditions.
Use the following procedures in order to change the operating conditions after performing one automatic operation.

Auto Mode Ⅱ Yamato No.1 Temp ***℃ ↓	Perform on the setting screen. ① To create the operation name, → ENTER →（repeat "△▽ → ENTER"）→ press ENTER longer ② Set the evaporating temperature.
Hys Press **hPa Slope MV ··% End Temp **℃ ↓	③ Used to fine adjust the pressure ON/OFF width on the control solenoid valve at fixed temperature operation. ENTER → change the pressure with △▽ → ENTER ④ The descending curve on the descending operation can be fine adjusted by increments of %. ⑤ Used to fine adjust the detecting range (temperature) of evaporating temperature at operation end.
End Time **m Vapor **℃ Cool Temp **℃ ↑	⑥ Input the end time to use the timer function. The operating time is extended by the duration of input after the evaporating temperature reaches the operation end temperature. The measured evaporating temperature is displayed. The cooling temperature is displayed when the optional cooing temperature sensor is connected.

Automatic Operation Ⅲ Procedures

The automatic operation Ⅲ is the exclusive function to the RE800 model.
The automatic operation Ⅲ has the function that automatically starts and stops the distilling operation by setting the evaporating temperature related to the sample of complex solvent.
The automatic operation Ⅲ has the function to distill the complex solvent sequentially. It is a full automatic operation, consisting of the automatic detection of evaporating temperature for respective solvents, descending operation, fixed temperature operation, and distillation of sample. The operation end time can be extended by setting the timer.



Screen	Procedures
Auto Mode Ⅰ Auto Mode Ⅱ Auto Mode Ⅲ ↑	① Select the automatic operation Ⅲ on the setting screen with the △▽ keys, and then press the ENTER key. ② The screen changes to the setting screen. Press the △▽ keys or DISPLAY key to advance the screen.
↓ ENTER key	③ After the bath temperature has been stable, press the START/STOP key to start the operation.
↓ START/STOP key	The device automatically detects the evaporating temperature and automatically stops the operation.

Control/set the operating conditions.
Use the following procedures in order to change the operating conditions after performing one automatic operation.

Auto Mode Ⅲ Yamato No.1 Temp ***℃ ↓	Perform on the setting screen. ① To create the operation name, → ENTER → (repeat "△▽ → ENTER") → press ENTER longer ② Set the evaporating temperature.
Hys Press **hPa Slope MV **% Hys Temp **℃ ↓	③ Used to fine adjust the pressure ON/OFF width on the control solenoid valve at fixed temperature operation. ENTER → change the pressure with △▽ → ENTER ④ The descending curve on the descending operation can be fine adjusted by increments of %. ⑤ Used to fine adjust the detecting range of evaporating temperature used to automatically switch the vacuum degree of distillation for complex solvent.
End Temp **℃ End Time **m Vapor **℃ ↓	⑥ Used to fine adjust the detecting range (temperature) of evaporating temperature at operation end. ⑦ Input the end time to use the timer function. The operating time is extended by the duration of input after the evaporating temperature reaches the operation end temperature. The measured evaporating temperature is displayed.
Cool Temp **℃ ↑	The cooling temperature is displayed when the optional cooing temperature sensor is connected.

WARNING!

Substances that cannot be used

Never use explosive substances, flammable substances and substances that include explosive or flammable ingredients in this unit. Explosion or fire may occur. (Refer to page 49 "List of Dangerous Substances".)

If a problem occurs

If smoke or strange odor should come out of this unit for some reason, turn off the power key right away, and then turn off the circuit breaker and the main power. Immediately contact a service technician for inspection. If this procedure is not followed, fire or electrical shock may result. Never perform repair work yourself, since it is dangerous and not recommended.

Do not disassemble or modify this unit

Do not disassemble or modify this unit. Fire or electrical shock or failure may be caused.

CAUTION!

During a thunder storm

During a thunderstorm, turn off the power switch immediately, then turn off the main power. If this procedure is not followed, fire or electrical shock may be caused.

Recovery after power failure

Turn off the power switch when a power failure occurs to avoid unmanned operation.

Daily Inspection and Maintenance

For the safety use of this unit, please perform the daily inspection and maintenance without fail.
Using the city water to this unit might attach dirt. Do inspect and maintain this point while performing daily inspection and maintenance.

⚠WARNING!

- Be sure to disconnect the power cord during inspection or maintenance of device.
- Do not disassemble the device.

⚠CAUTION!

- Wipe the dirt with soft cloth wrung out with mild detergent. Do not use benzene, thinner or cleanser, or do not scrub it with a scrubbing brush. Deformation, deterioration or discoloration may result in.

For any questions, contact the dealer who you purchased this unit from, or the nearest sales division in our company.

Long storage and disposal

When not using this unit for long term / When disposing

⚠CAUTION!

When not using this unit for long term…

- Turn off the power and disconnect the power cord.

⚠WARNING!

When disposing…

- Keep out of reach of children.

Environmental protection should be considered

We request you to disassemble this unit as possible and recycle the reusable parts considering to the environmental protection. The feature components of this unit and materials used are listed below.

Component Name	Material
Exterior Parts	
Outer covering	Aluminum printed coating, ABS resin
Electrical Parts	
Switches, Relay	Composite of resin, copper and other
Circuit boards	Composite of glass fiber and other
Power cord	Composite of resin coating, copper, nickel and other
Wiring material	Composite of flame-resistant vinyl, copper and nickel
Sticker	Resin material

Safety Device and Error Code

Turn off the power and disconnect the plug immediately if the device dropped into the liquid, or if the liquid leaks into the device. There is a danger of electric shock if the power is turned on after the device is dried. In this case, please call the service department of our company.

Error Code:

Check the error code and stop the operation immediately.

Error	Cause/Solution	Screen
Abnormality in memory	Error in preset value memorized. The device stops when this error occurs. Replace the board.	Memory err Break Down Please Repair CANCEL to BuzOFF
Abnormality at power failure	The display appears at the recovery after power failure. The device stops operation. Cancel the error with the CANCEL key.	Power failure CANCEL to Clear
Abnormality in rotor	An abnormality occurs in the rotor of RE main body. The device stops when this error occurs. Cancel the error by restoring the breaker.	Rotar err Breaker Reset CANCEL to BuzOFF
Abnormality in jack	An abnormality occurs in the jack (lifter) of RE main body. The device stops when this error occurs. Cancel the error by restoring the breaker.	Juck err Breaker Reset CANCEL to BuzOFF
Abnormality in pressure sensor	The display appears when the measured pressure is in the outside of measurement range, or when the pressure sensor is defective. The device stops when this error occurs. Cancel the error by restoring the breaker. Repair the board or replace the pressure sensor if the error can not be canceled.	Pressure err Confirm Sensor Breaker Reset CANCEL to BuzOFF
Abnormality in evaporating temperature sensor	The display appears when the temperature exceeds the measurement range, or when the sensor is defective. The device stops when this error occurs. Cancel the error by restoring the breaker. Repair the board or replace the sensor if the error can not be canceled.	Vapor Sensor err Confirm Sensor Breaker Reset CANCEL to BuzOFF
Abnormality in cooling temperature sensor	The display appears when the temperature exceeds the measurement range, or when the sensor is defective. The device stops when this error occurs. The device stops when this error occurs. Cancel the error by restoring the breaker. Repair the board or replace the sensor if the error can not be canceled.	Cool Sensor err Confirm Sensor Breaker Reset CANCEL to BuzOFF
Bath abnormality	Overheating prevention circuit on the bath is activated. The device stops when this error occurs. Check the cause of abnormality. Cancel the error by restoring the breaker.	Bath err Confirm Route STR/STP to Clear CANCEL to BuzOFF
Leak abnormality	The display appears when the vacuum pressure does not increase after 10 seconds has passed since the LEAK key is pressed. The device stops operation after one minute from the error display. It automatically returns if the error is cancelled within one minute. Check the vacuum route and cancel the error by pressing the START/STOP key.	Leak err Confirm Route STR/STP to Clear CANCEL to BuzOFF
Abnormality in start pressure	The display appears when the measured pressure does not lower below the preset pressure after one hour has passed since the start of operation. The device stops operation after one minute from the error display. It automatically returns if the error is cancelled within one minute. Check the vacuum route and cancel the error by pressing the START/STOP key.	Pressure err Confirm Pomp STR/STP to Clear CANCEL to BuzOFF

Safety Device and Error Code

(Continued from previous page)

Error	Cause/Solution	Screen
Pressure abnormality	The display appears in the fixed temperature, fixed temperature timer, descending, or descending timer operation after two hours has passed since the measured pressure goes outside the range of preset pressure ± hysteresis. It also appears in the automatic operation mode after the specified hours has passed since the measured pressure goes outside the range of preset pressure (the pressure value at the preset temperature)± hysteresis. The device stops operation after one minute from the error display. It automatically returns if the error is cancelled within one minute. Check the vacuum route and cancel the error by pressing the START/STOP key.	Pressure err Confirm Route STR/STP to Clear CANCEL to BuzOFF
Abnormality in evaporating temperature	The display appears when the evaporating temperature exceeds the setting range of abnormal temperature. Display only Auto return	Vapor err Confirm Route CANCEL to BuzOFF
Abnormality in cooling water temperature	The display appears when the cooling water temperature exceeds the setting range of abnormal temperature. Display only Auto return	Cool err Confirm Water CANCEL to BuzOFF
Abnormality in auto operation temperature	The display appears when the temperature has not reached the auto operation temperature after three hours passed since the start or end of operation. Display only Auto return	Pressure err Confirm Route CANCEL to BuzOFF

Trouble Shooting

Phenomenon	Check point
Overload on rotor motor?	• If the rotor stops due to the overload on the rotor motor, turn off the power for about 30 minutes to cool inside the motor. Remove the cause of overheat and reduce the overload.
Device does not start after turning on the power switch.	• Check if the power source is turned to on. • Check if the power cable is securely plugged. • Check if a power failure occurs.

In the case if the error other than listed above occurred, turn off the power switch and primary power source immediately. Contact the shop of your purchase or nearest Yamato Scientific Service Office.

In Case of Request for Repair

If the failure occurs, stop the operation, turn OFF the power switch, and unplug the power plug. Please contact the sales agency that this unit was purchased, or the Yamato Scientific's sales office.

< Check following items before contact >

- ◆ Model Name of Product
- ◆ Production Number
- ◆ Purchase Date

} See the production plate attached to this unit.

- ◆ About Trouble (in detail as possible)

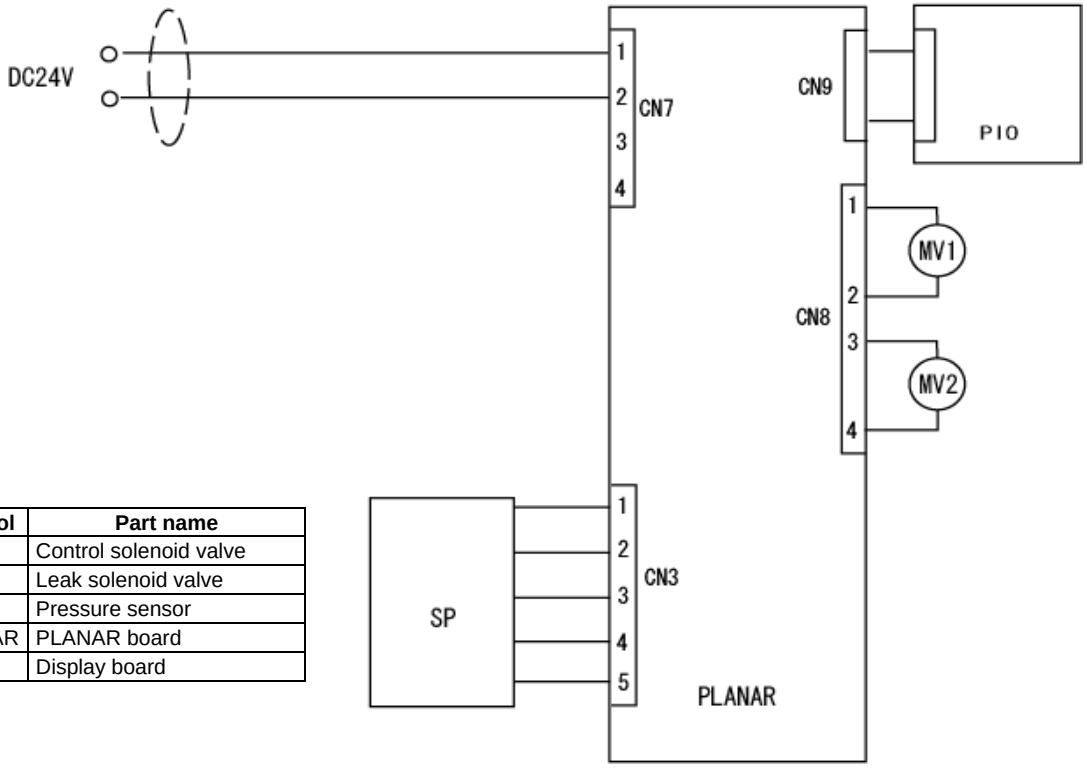
Minimum Retention Period of Performance Parts for Repair

The minimum retention period of performance parts for repair of this unit is 7 years after discontinuance of this unit.
The "performance part for repair" is the part that is required to maintain this unit.

Specification

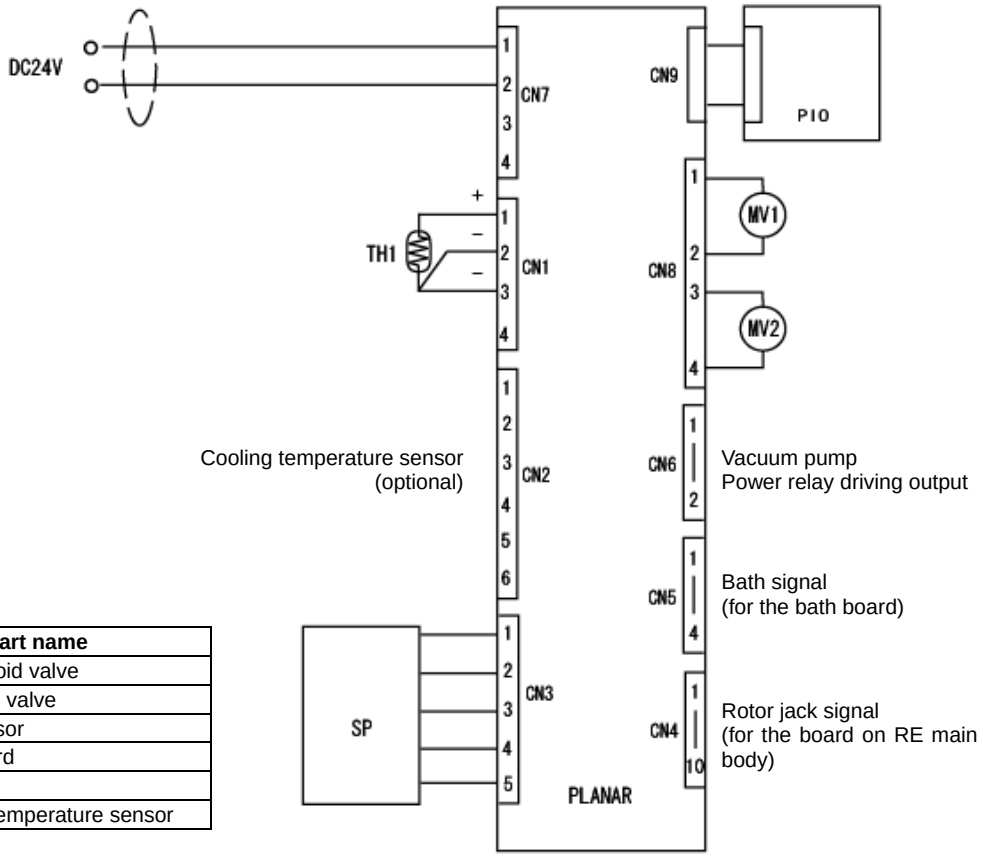
Model	VR300	VR600	VR800
Display	LCD display (Kanji/English characters)		
Setting method	Keying		
Outer covering	ABS resin, coating finish		
Rating	DC24V 0.5A or less		
Setting range of vacuum degree	0～981hPa		
Measurement range of vacuum degree	0～1033hPa		
Resolution of vacuum degree	1 hPa		
Setting range of hysteresis	1～50hPa		
Indicated resolution of evaporating temperature	—	Selective: 1℃ or 0.1℃	
Indicated resolution of cooling water temperature	—	Optional, Selective: 1℃ or 0.1℃	
Operational function	Fixed temperature, fixed temperature timer, descending, descending timer		Fixed temperature, fixed temperature timer, descending, descending timer, automatic Ⅰ, Ⅱ and Ⅲ
Setting range of timer	Fixed temperature timer: 1 to 999 hours, descending timer: 1 to 99 hours		
Memory function	—	10 functions for each operation other than free operation	
Data operation	—	53 kinds of solvent data at fixed temperature, fixed temperature timer, descending, or descending timer operation	
Safety feature	Refer to "8. Safety Feature".		
Interlocking function	—	Bath auto stop/heat-retention, abnormal stop	

VR300



Symbol	Part name
MV1	Control solenoid valve
MV2	Leak solenoid valve
SP	Pressure sensor
PLANAR	PLANAR board
PIO	Display board

VR600/800



Symbol	Part name
MV1	Control solenoid valve
MV2	Leak solenoid valve
SP	Pressure sensor
PLANAR	PLANAR board
PIO	Display board
TH1	Evaporating temperature sensor

Replacement Parts Table

Common parts for all models

Part Name	Code No.	Specification	Manufacturer
Control/leak solenoid valve ∗	LT00030631	VDW21-5G-1-01-A	SMC
Display board	LT00013601	VR300/600/800 display board	Yamato Scientific
Pressure sensor ∗	LT00015077	P-3000S-102-A-10 Harness attached	Yamato Scientific
Evaporating temperature sensor	LT00015051	Pt100 Ω Teflon lead wire for platinum resistor bulb/ glass protective tube	Yamato Scientific
DC power cable	LT00015073	VR300－42000	Yamato Scientific

For VR300

Part Name	Code No.	Specification	Manufacturer
VR300 control board	LT00013822	VR300 control board	Yamato Scientific

For VR600/800

Part Name	Code No.	Specification	Manufacturer
VR600 control board	LT00013821	VR600-PLANAR Specification is required at order	Yamato Scientific
VR800 control board	LT00013821	VR600 Specify the model at order.	Yamato Scientific
Rotor jack signal cable	LT00015074	VR600-42000	Yamato Scientific
Bath signal cable	LT00015075	VR600-42010	Yamato Scientific

Optional parts

Part Name	Code No.	Specification	Manufacturer
Teflon control solenoid valve ∗		F-2162-03 Connector attached	Yamato Scientific
Pressure sensor for solvent ∗		P-8300-102A-10 Teflon case and harness attached	Yamato Scientific
Cooling water temperature sensor		Pt100 Ω Teflon lead wire for platinum resistor bulb/ glass protective tube	Yamato Scientific

∗ : Consumable supplies

Teflon control solenoid valve and pressure sensor for solvent are required when using solvent. Use the Teflon seal which is sold separately for the seal on the rotary joint when using ketone or ether solvent.

The Fluorine rubber seal normally attached will swell if ketone or ether solvent such as acetone, methyl ethyl ketone, methyl isobutyl ketone, ethyl ether, and MTBE is used. Use the Teflon seal which is sold separately.

Consumable supplies related to main body

Part Name	Code No.	Specification	Manufacturer
Fluorine rubber seal ∗	LT00015013	RE300-4022-X	Yamato Scientific
Teflon seal ∗		ORE11-40000	Yamato Scientific

List of Dangerous Substances

Never use explosive substances, flammable substances and substances that include explosive or flammable ingredients in this unit.

EXPLOSIVE

EXPLOSIVE:	Ethylene glycol dinitrate (nitro glycol), Glycerin trinitrate (nitroglycerine), Cellulose nitrate (nitrocellulose), and other explosive nitrate esters
	Trinitrobenzene, Trinitrotoluene, Trinitrophenol (picric acid), and other explosive nitro compounds
	Acetyl hidroperoxide (peracetic acid), Methyl ethyl ketone peroxide, Benzyl peroxide, and other organic peroxides

FLAMMABLE

IGNITING:	Lithium (metal), Potassium (metal), Sodium (metal), Yellow phosphorus, Phosphorus sulfide, Red phosphorus, Celluloid compounds, Calcium carbide, Lime phosphate, Magnesium (powder), Aluminum (powder), Powder of metals other than magnesium and aluminum, Sodium hydrosulfite
OXIDIZING:	Potassium chlorate, Sodium chlorate, Ammonium chlorate, and other chlorate
	Potassium perchlorate, Sodium perchlorate, Ammonium perchlorate, and other perchlorate
	Potassium peroxide, Sodium peroxide, Barium peroxide, and other inorganic peroxide
	Potassium nitrate, Sodium nitrate, Ammonium nitrate, and other nitrate
	Sodium chlorite and other chlorites
	Calcium hypochlorite and other hypochlorites
INFLAMMABLE LIQUID:	Ethyl ether, Gasoline, Acetaldehyde, Propylene chloride, Carbon disulfide, and other flammable substances having a flash point of lower than -30℃
	Normal hexane, ethylene oxide, acetone, benzene, methyl ethyl ketone, and other flammable substances having a flash point of -30℃ or higher but lower than 0℃
	Methanol, Ethanol, Xylene, Pentyl acetate (amyl acetate), and other flammable substances having a flash point of 0℃ or higher but lower than 30℃
	Kerosene, Light oil (gas oil), Oil of turpentine, Isopentyl alcohol (isoamyl alcohol), Acetic acid, and other flammable substances having a flash point of 30℃ or higher but lower than 65℃
FLAMMABLE GAS:	Hydrogen, Acetylene, Ethylene, Methane, Propane, Butane, and other flammable substances which assume a gaseous state at 15℃ and 1 atm

(Source: Appendix Table 1 of Article 6 of the Industrial Safety and Health Order in Japan)

* Install the unit according the procedure described below (check options and special specifications separately).

Model	Serial number	Date	Person in charge of installation (company name)	Person in charge of installation	Judgment

No.	Item	Method	Reference operation manual		Judgment
Specifications					
1	Accessories	Check the quantities of accessories with the quantities shown in the Accessory column.	**Specification**	P.46	
2	Installation	・Visually check the surrounding area. Caution: Be careful about surrounding environment. ・Keep space.	**Before Using This Unit** "2. Choose a proper place for installation"	P.5	
Operation					
1	Power voltage	・Using a tester, measure the voltage of the voltage used by the customer (distribution board, outlet, etc.). ・Measure the voltage during operation (the voltage must be within the standard). Caution: When a unit is to be connected to the plug or breaker, use one that conforms to the standard.	**Before Using This Unit** "1. Always ground this unit"	P.5	
			Before Using This Unit "7. Choose a correct power distribution board or receptacle"	P.6	
			Specification	P.46	
2	Start of operation	・Start operation.	**Installation Method**	P.10	
			Handling Precautions	P. 40	
Description					
1	Description of operation	Explain the operation of each unit to the customer according to this Operation Manual.	**All**		
2	Error code	Explain error codes and the procedure for resetting them to the customer according to this Operation Manual.	**In the Event of Failure…**	P.43	
3	Maintenance inspection	Explain the operation of each unit to the customer according to this Operation Manual.	**Maintenance Method**	P.41	
4	Completion of installation Information to be entered	・Enter the date of installation and the name of the person in charge of installation on the face plate on the unit. ・Enter necessary information on the guarantee, and pass it to the customer. ・Explain the after-sale service route to the customer.	**After Service and Warranty**	P. 45	

Responsibility

Please follow the instructions in this document when using this unit. Yamato Scientific has no responsibility for the accidents or breakdown of device if it is used with a failure to comply.
Never conduct what this document forbids. Unexpected accidents or breakdown may result in.

Note

- The contents of this document may be changed in future without notice.
- Any books with missing pages or disorderly binding may be replaced.

Instruction Manual for
Vacuum Controller
Model VR300/600/800
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