



# Thermal Resistance Measurement Device

## TE100 Series Instruction Manual

First Edition

Thank you very much for purchasing Yamato Scientific products.

Please read this "Instruction Manual" and "Warranty" carefully and familiarize yourself with them before using the product in order to use the product properly. After reading the "Instruction Manual", please keep it and the "Warranty" in a safe place so that you can use the product at any time.



The warnings in the instruction manual are important for the safe use of the product. Please read it carefully and understand it well before use.

**Yamato Scientific Co. Ltd.**

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# CONTENTS

1. SAFETY PRECAUTIONS .....	3
Explanation of Symbols.....	3
Symbol Glossary .....	4
WARNING / CAUTION.....	5
Residual Risk Map .....	7
Residual Risk List.....	8
2. COMPONENT NAMES AND FUNCTIONS .....	9
Appearance.....	9
Connecting system .....	11
Control unit .....	12
Measurement unit .....	13
3. PRE-OPERATION PROCEDURES .....	14
Installation Precautions.....	14
4. PRE-OPERATIVE PREPARATIONS.....	16
Installation Procedure .....	16
Common screen.....	17
Pre-test preparation.....	18
How to set the test specimen.....	19
5. MEASURE .....	21
Calibration function (R0).....	21
Setting test items .....	22
Thermal Resistance Measurement .....	25
Confirmation of measurement results.....	27
Help screen.....	29
6. HANDLING PRECAUTIONS.....	31
Warnings and Cautions.....	31
7. How to take care of it .....	33
Daily Inspection/Care .....	33
8. TROUBLESHOOTING .....	35
Troubleshooting Guide .....	35
Error code display and contents .....	36
9. SERVICE & REPAIR .....	39
Requests for Repair.....	39
10. SPECIFICATION.....	40
11. Option List .....	41

12. LIST OF HAZARDOUS SUBSTANCES .....	42
13. STANDARD INSTALLATION MANUAL .....	43
<b>14. For inquiries, please contact</b> .....	<b>44</b>

# 1. SAFETY PRECAUTIONS

## Explanation of Symbols

### A Word Regarding Symbols

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

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

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

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

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

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

### Symbol Meanings



Signifies warning or caution.  
Specific explanation will follow symbol.



Signifies restriction.  
Specific restrictions will follow symbol.



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

# 1. SAFETY PRECAUTIONS

## Symbol Glossary

### WARNING / CAUTION



General



Danger!: Blast Hazard



Caution: Shock Hazard!



Caution: Burn Hazard!

### RESTRICTION



General Restriction



Do Not Disassemble



Do Not Touch

### ACTION



General Action Required



Connect Ground Wire



Level Installation



Disconnect Power



Inspect Regularly

# 1. SAFETY PRECAUTIONS

## WARNING / CAUTION



### WARNING



#### Install in a location free of flammables and explosives



Never install or operate unit in a flammable or explosive gas atmosphere. Unit is NOT fire or blast resistant. Simply switching earth leakage breaker (ELB) "ON" or "OFF" can produce a spark, which can then be relayed during operation, causing fire or explosion when near flammable or explosive fluids, chemicals or gases/fumes.  
For flammable and explosive gases, see " 12. LIST OF HAZARDOUS SUBSTANCES(p. 42)".



#### Ground wire **MUST** be connected properly

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



#### Turn OFF (○) ELB immediately when an abnormality occurs.

If smoke, fire, burning smell, or other unusual smells are generated from the product, immediately turn the breaker of the product "OFF (○)", disconnect the power cord from the outlet or distribution board, and ask the distributor where you purchased the product or " 14. For **inquiries, please contact**(P. 44)" to inspect the product. Failure to do so may result in damage to components, fire or electric shock. Never attempt to disassemble or repair unit. Repairs should always be performed by a certified technician.



#### DO NOT disassemble or modify equipment.

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



#### Handle power cord with care

Observe the following precautions in order to prevent fire, electric shock, or other accidents.

- Do not operate unit with power cable bundled or tangled.
- Do not modify, bend, forcibly twist or pull on power cable.
- Do not risk damage to power cable by positioning it under desks or chairs, or by allowing it to be pinched in between objects.
- Do not place power cable near kerosene/electric heaters or other heat-generating devices.
- Regularly check and clean the connection part, and avoid using an old outlet.

If the power cord is damaged (cracks in the sheath, exposed core wire, broken wire, etc.), immediately turn off the ground-fault breaker of the product, disconnect the power cord from the outlet or distribution board, and contact the sales agent where you purchased the product or 14. For inquiries, please contact(P. 44).

# 1. SAFETY PRECAUTIONS



## **DO NOT touch hot/cold surfaces**

Do not touch hot or cold parts during operation. Severe burns or frostbite may result.



## **Do not climb on the product**

Personal injury or equipment malfunction may result due to falling.  
Do not place any products other than those specified as options on top of unit. Personal injury or equipment malfunction may result.



## **Keep upright.**

Never lay this product on its side. This may cause malfunction.



## **CAUTION**



## **DO NOT operate equipment during thunderstorms**

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



## **Turn OFF (○) ELB in case of power failure.**

Operation stops when power failures occur. For added safety however, turn OFF (○) ELB in the event of a power failure.



## **Noise level of the installation environment**

This product is designed in accordance with Level 2 of JEM-TR177 "Guidelines for Square Wave Impulse Noise Immunity Tests of Electrical Equipment Used in Industry. Some ambient noise may cause malfunctions. Please pay close attention.

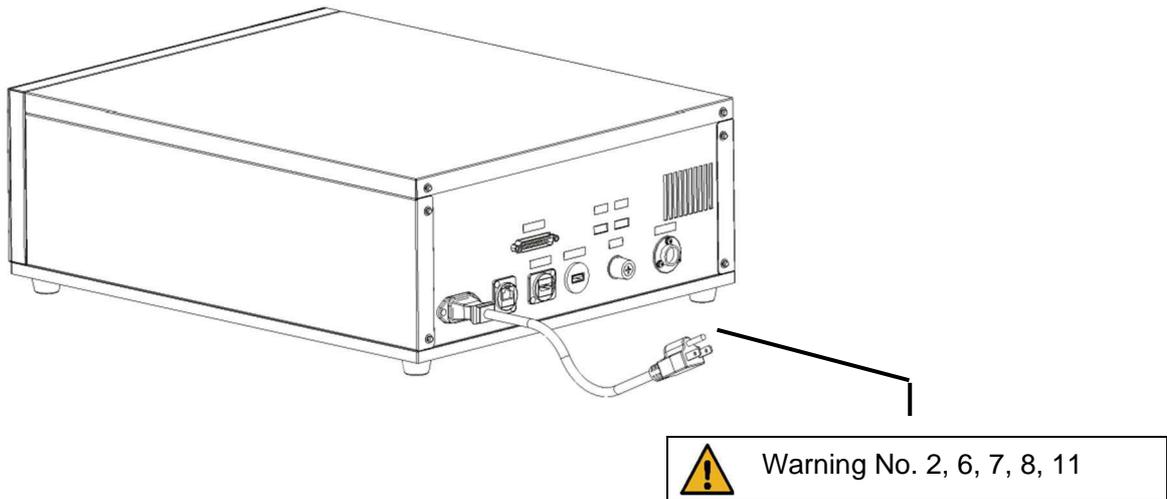
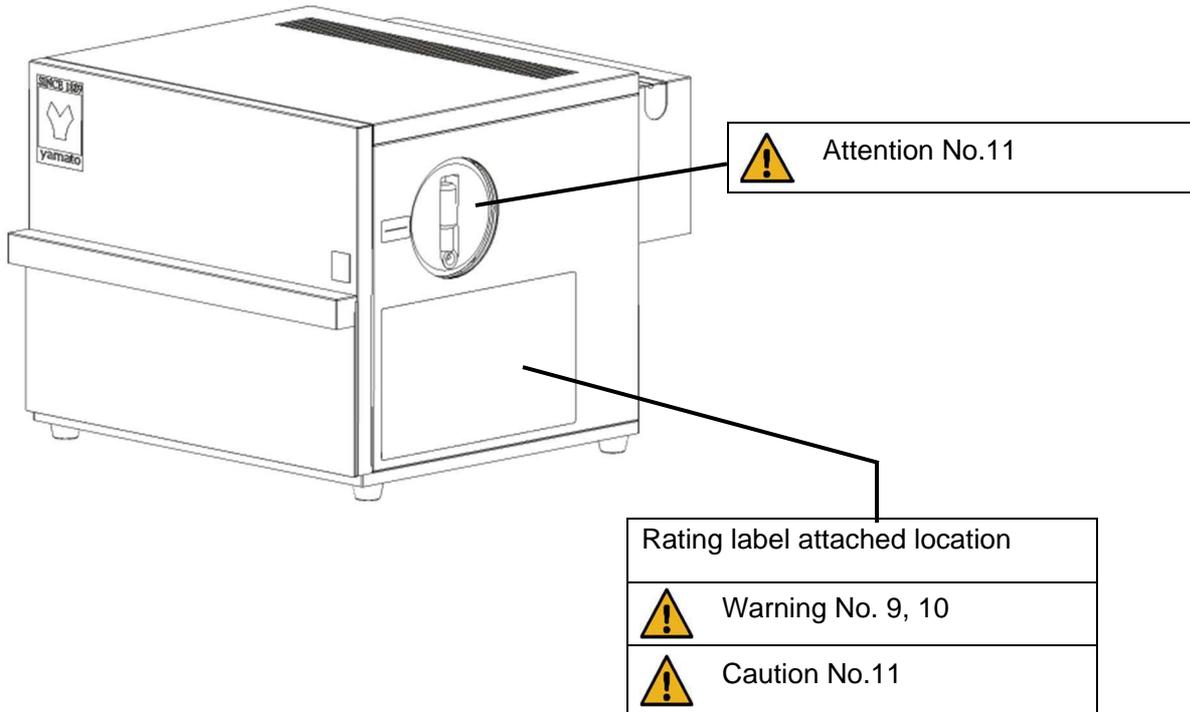
# 1. SAFETY PRECAUTIONS

## Residual Risk Map

These figures indicate positions of caution labels.

The numbers shown in the figure indicate the numbers listed in the "List of Residual Risks" in this manual.

For details of individual residual risks, see the List of Residual Risks.



Residual risks of unspecified location on equipment	
 <b>WARNING</b>	No. 1、3、11、13
 <b>CAUTION</b>	No. 4、5、14

**\* Contact original dealer of purchase if the nameplates and caution labels have come off, or become illegible. New nameplates are available at cost.**

# 1. SAFETY PRECAUTIONS

## Residual Risk List

### List of residual risks (instructions for risk avoidance)

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

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

<b>Loading/Installation</b>			
No.	Degree of risks	Risk description	Protective measures taken by the user
1	WARNING	Explosion/fire	Install in a location free of flammables and explosives. (P. 5)
2	WARNING	Fire/Electric shock	Ground wire MUST be connected properly (P.5)
3	WARNING	Fire/Electric shock	Choose an appropriate installation site. (P.14)
4	CAUTION	Injury	Use cargo-handling equipment for transportation and installation. (P. 155)
5	CAUTION	Injury	Install unit on a level surface. (p. 15)
6	WARNING	Fire/Electric shock	Always connect power cable to appropriate facility outlet or terminal. (p. 15)

<b>Use</b>			
No.	Degree of risks	Risk description	Protective measures taken by the user
7	WARNING	Fire/Electric shock	Ground wire MUST be connected properly (P.5)
8	WARNING	Fire	Handle power cable with care (P.5)
9	WARNING	Electric shock	Take measures against condensation depending on the operating environment (P.14)
10	CAUTION	Burn	ALWAYS run equipment within specified temperature range (P.32 32)
11	CAUTION	Injury	Fold the handle when not in use (p. 19)

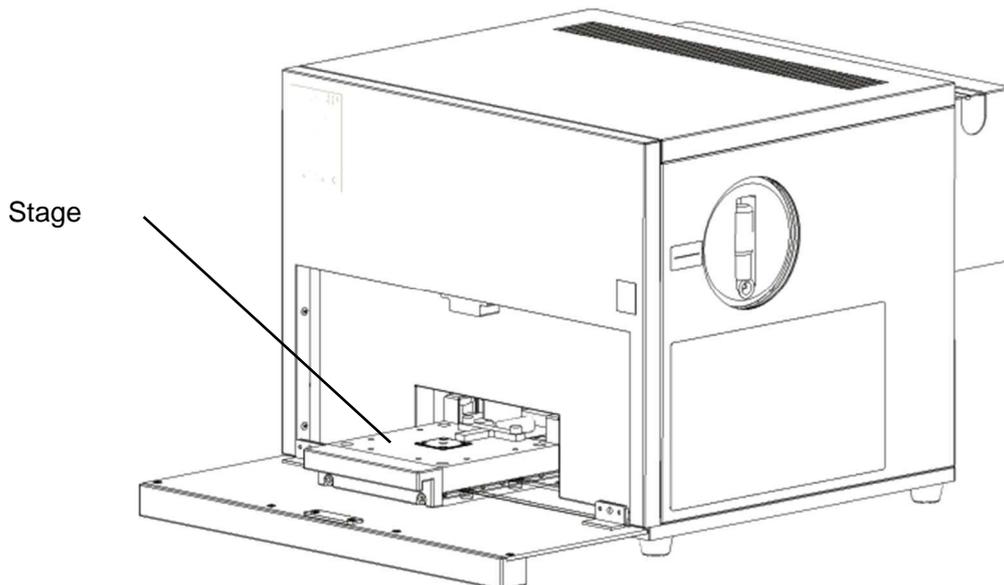
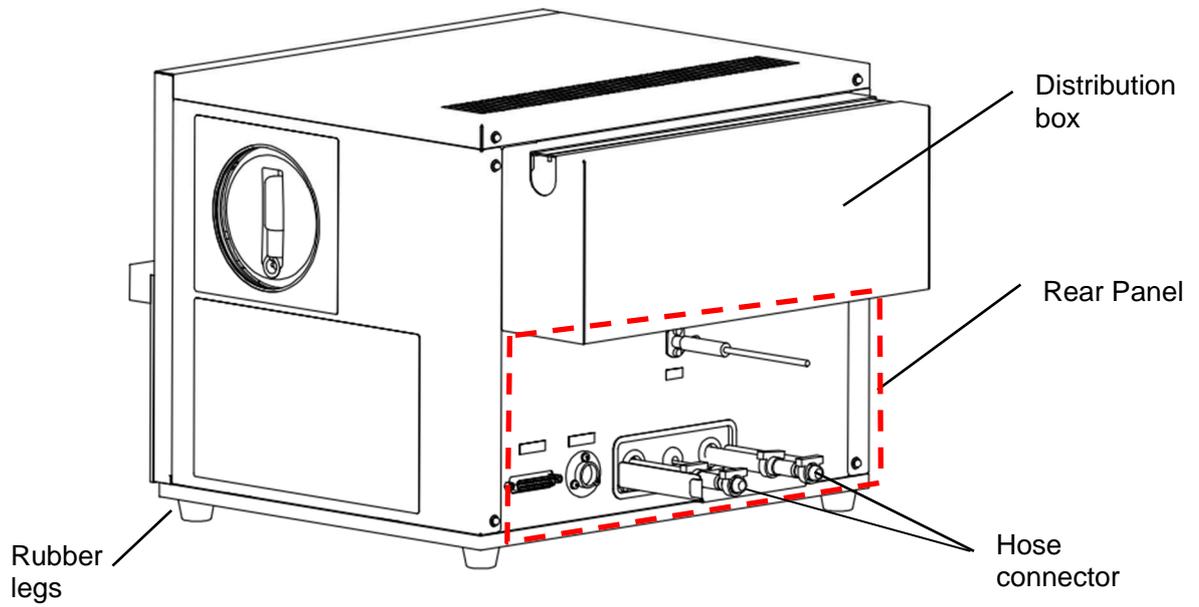
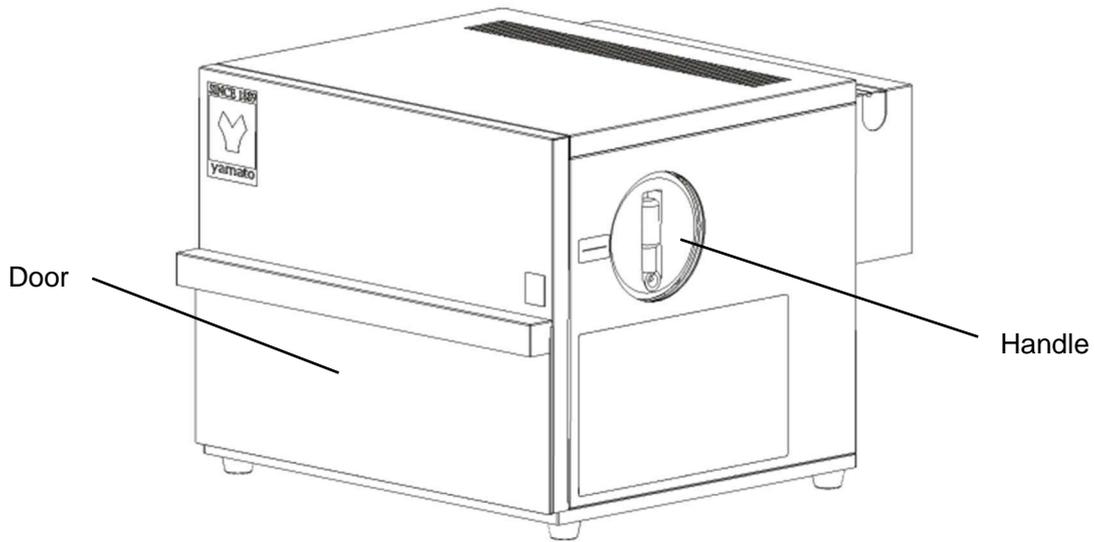
<b>Daily inspection/maintenance</b>			
No.	Degree of risks	Risk description	Protective measures taken by the user
11	WARNING	Fire/Electric shock	Be sure to disconnect power cable before daily inspection and maintenance. (P.5)
12	WARNING	Fire/Electric shock	Never attempt to disassemble unit. (P.5)

<b>Extended storage/disposal</b>			
No.	Degree of risks	Risk description	Protective measures taken by the user
13	WARNING	Fire/Electric shock	Turn OFF (○) ELB and disconnect power cable from facility outlet or terminal.(P.32)
14	CAUTION	Injury	Do not leave unit in a location where children may have access(P.32)

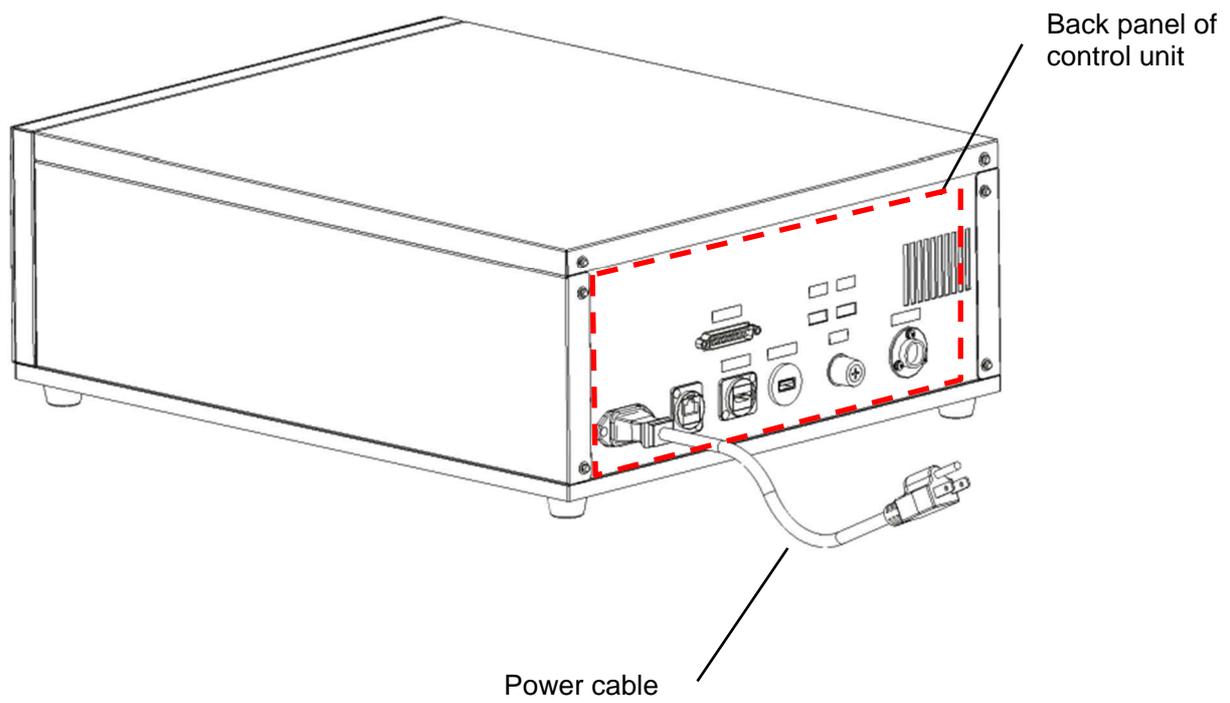
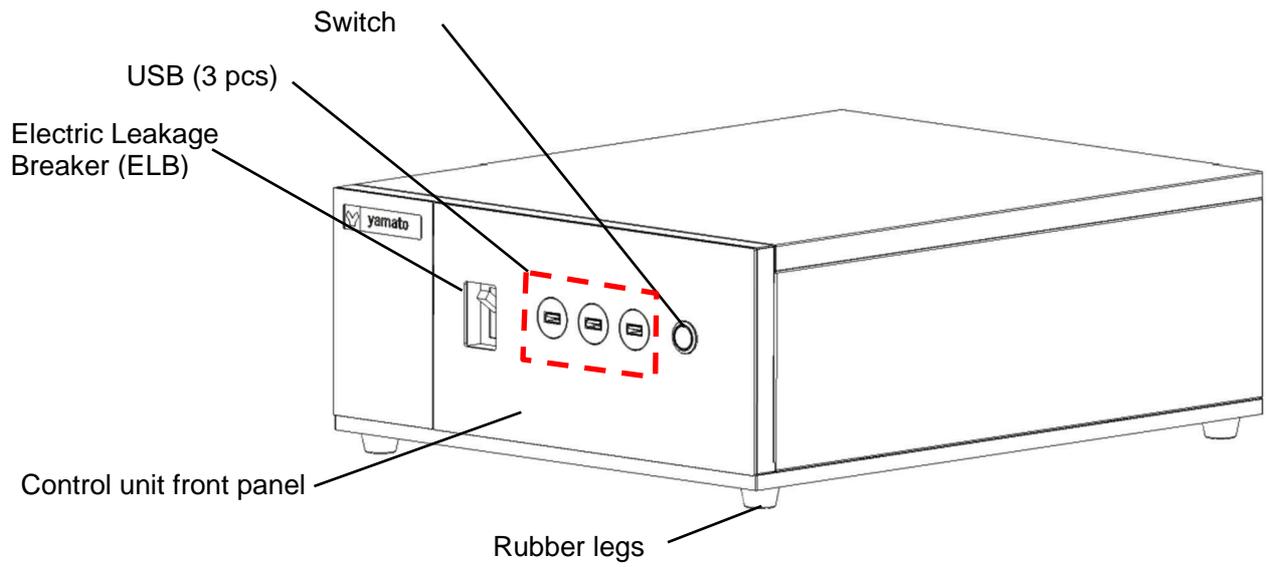
# 2. COMPONENT NAMES AND FUNCTIONS

## Appearance

[Measuring section]

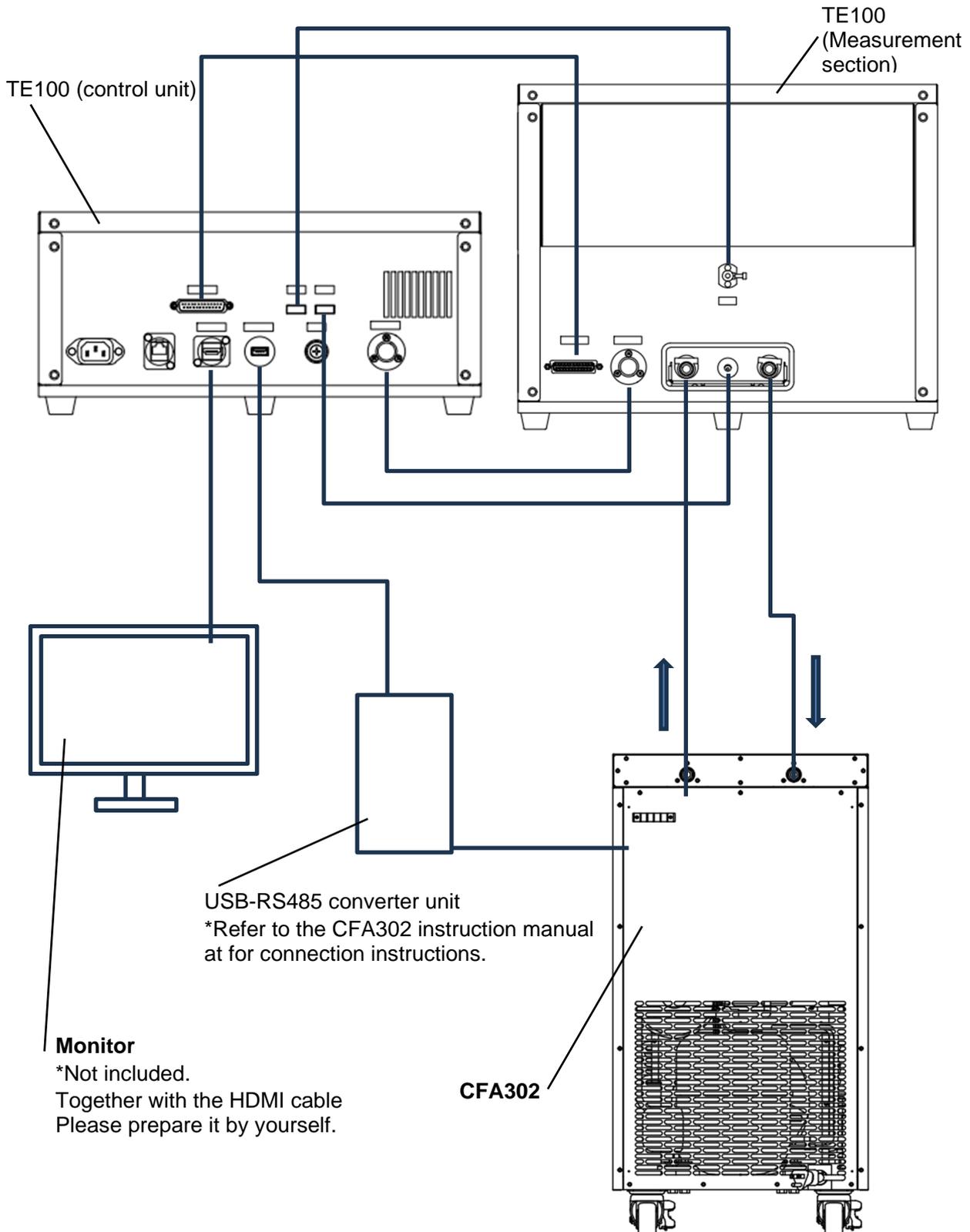


## 2. COMPONENT NAMES AND FUNCTIONS



## 2. COMPONENT NAMES AND FUNCTIONS

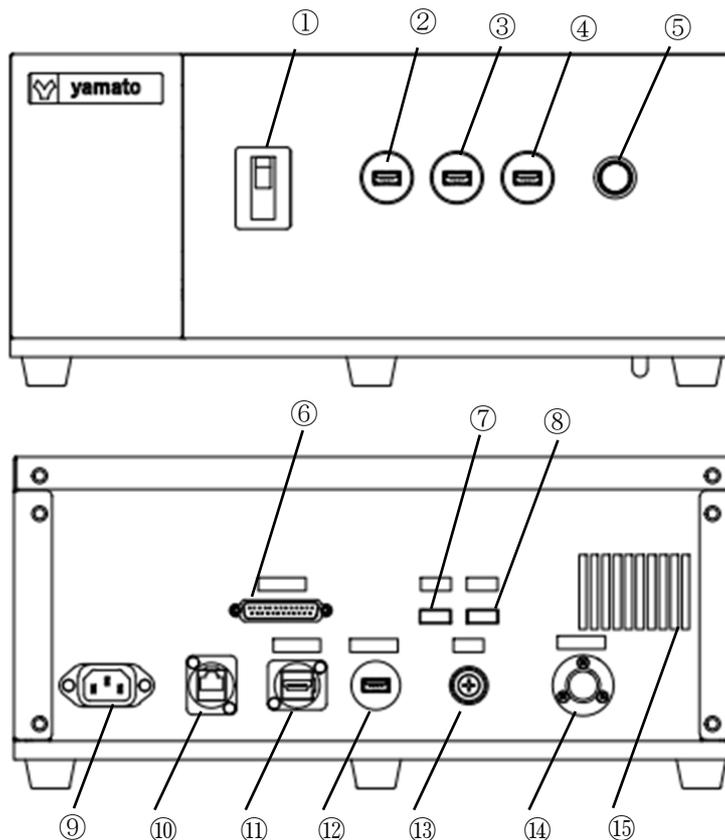
### Connecting system



\* After connecting the piping, secure the hose firmly with the provided clips.  
Loose fixation may cause water leakage.

## 2. COMPONENT NAMES AND FUNCTIONS

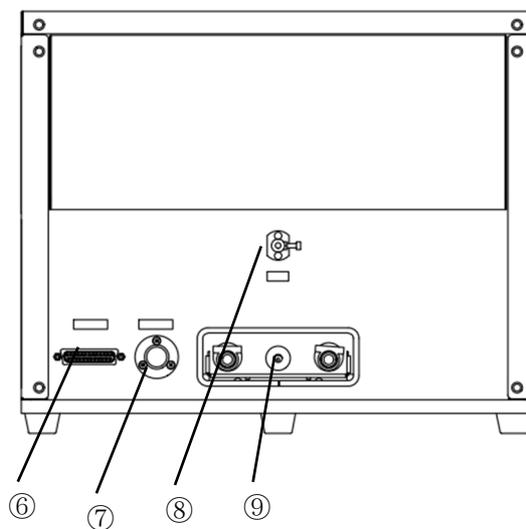
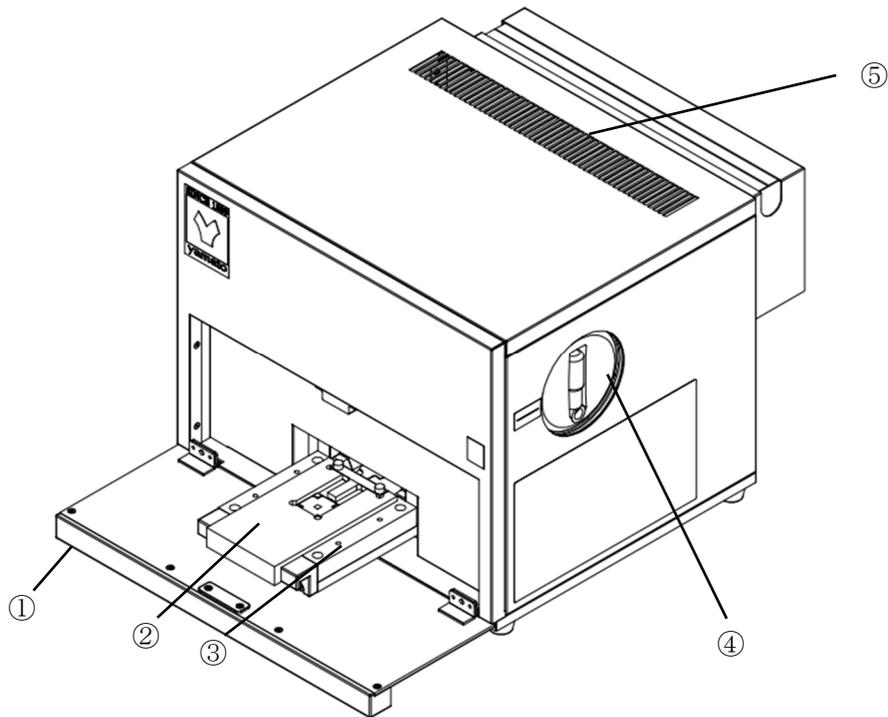
### Control unit



No.	Component	Function / Description
①	Earth leakage breaker (ELB)	Turns the main power of the equipment on and off.
②	USB port 1	Connect USB for saving measurement results, keyboard, etc.
③	USB port 2	
④	USB port 3	
⑤	Power button	Turn on the power to the equipment. Lights up green when energized.
⑥	Cable1	It is connected to the measurement unit by the supplied Cable1.
⑦	TC1	Connect thermocouple TC1. Measure the specimen ambient temperature.
⑧	TC2	Connect thermocouple TC2. Measure the temperature of the stage.
⑨	Power inlet	Connect the power cable.
⑩	LAN Port	Not used in this unit.
⑪	Monitor	Connect an external monitor.
⑫	Circulator	Connects to the communication line of the cooling water circulation system.
⑬	Fuse folder	Mount tube fuse (3A).
⑭	Cable2	It is connected to the measurement unit with the supplied Cable2.
⑮	Exhaust port	A hole for exhausting heat inside the equipment. Do not plug the holes. The temperature inside the equipment will rise, which may cause a malfunction.

## 2. COMPONENT NAMES AND FUNCTIONS

### Measurement unit



No.	Component	Function / Description
①	Front door	Protects the stage during testing.
②	Jig	Positioning jig used to set test specimens.
③	Stage	Mount the test piece
④	Handle	Handle to raise and lower the lifter. Right rotation: up, left rotation: down
⑤	Exhaust port	A hole for exhausting heat inside the equipment. Do not plug the holes. The temperature inside the equipment will rise, which may cause a malfunction.
⑥	Cable1	It is connected to the control unit by the attached Cable1.
⑦	Cable2	It is connected to the control unit with the attached Cable2.
⑧	TC1	Connect thermocouple TC1. Measure the specimen ambient temperature.
⑨	TC2	Connect thermocouple TC2. Measure the temperature of the stage.

# 3. PRE-OPERATION PROCEDURES

## Installation Precautions



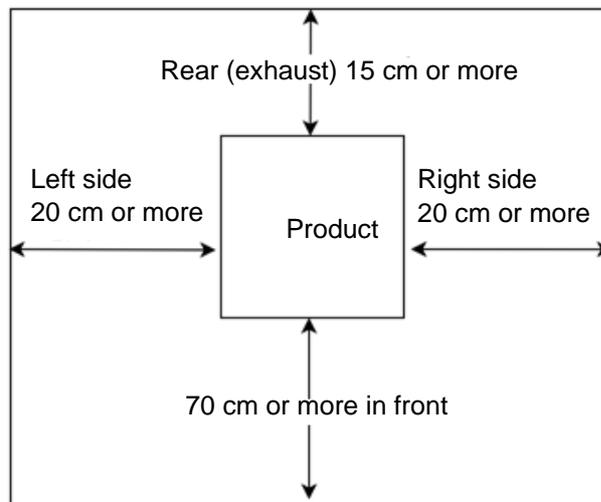
### Choose an appropriate installation site

DO NOT install unit:

- Outside of the room
- where installation surface is not completely level, not even or not clean.
- where flammable or corrosive gases/fumes may be present
- where external temperature will exceed 35 °C will fall below 5 °C
- where liquid is assumed to splash on unit
- Enclosed environments and other places where equipment heat exhaust does not work well
- where external temperature will fluctuate largely.
- in excessively humid or dusty locations.
- in direct sunlight or outdoors.
- where there is constant vibration.
- in direct contact with the outside air
- where power supply is erratic.
- where there is combustible material nearby.
- where there is a risk of freezing or condensation.



Install DE/DT series unit in a location with sufficient space, as specified as below.



\* Leave 50 cm or more space above the product.

\* Do not operate the product with the ventilation holes on the top and back of the product blocked. The temperature inside the product may rise, causing a malfunction.

\* When storing the product in a poorly ventilated area, exhaust air around the product with an exhaust ventilator or the like to prevent heat exhaust from accumulating.

### 3. PRE-OPERATION PROCEDURES



#### **Use cargo-handling equipment for transportation and installation.**

Unit may tip over and cause a serious injury. Transport unit with sufficient number of people and an appropriate work method when carrying out manually.



#### **Install unit on a level surface.**

Install unit on level and even surface. This can cause unexpected problems and performance degradation/failure. It may also cause vibration and noise.



#### **Take appropriate safety measures when installing.**

Implement appropriate safety measures for the installation environment. Unit may tip over or fall, causing injury or death during an earthquake or other unforeseen incident.



#### **Always connect power cable to appropriate facility outlet or terminal.**

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

Operational voltage range is  $\pm 10\%$  of power rating, performance guarantee voltage range is  $\pm 5\%$ , and frequency is  $\pm 1\%$

Check the line voltage on distribution board and properly evaluate whether to utilize a line being shared by other equipment. If unit is not activated by turning on ELB, take an appropriate course of action, such as connecting unit to a dedicated power source.

Connecting multiple cables to a single outlet or using extended wiring using a cord reel may cause malfunctions due to voltage drops.



#### **Install equipment in a well-ventilated place**

Do not operate the product with the ventilation holes on the top or back of the product blocked. The temperature inside the product may rise, resulting in performance degradation due to component failure, as well as causing accidents and fires.



#### **Install in a dry location.**

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



#### **Preparation of circulating water**

Observe the following in order to prevent malfunction and personal injury

Distilled water and antifreeze are recommended as circulating water.

\*Do not use city water, industrial water, etc., as they may corrode copper.

Please note the following environment

- Do not use circulating water (methanol, IPA, etc.), which are harmful if vapors are inhaled.

# 4. PRE-OPERATIVE PREPARATIONS

## Installation Procedure

### Product hose connection

Connect a hose to the **hose connection on the back of the measuring section**.

Flexible hose: inner diameter 9 mm

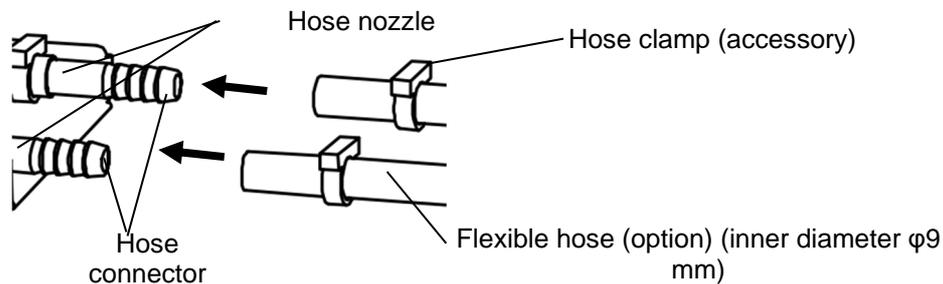
\*Outline of hose nozzle: 10.5 mm

\*For optional fittings and hoses, see (" 11. Option List(p. 41)" circulating connection parts).  
(Hose is not included in the product)

1. Securely connect the flexible hose to the bamboo shoot side of the hose nozzle (accessory).  
\* IN and OUT are common.
2. While holding the connection port with your hand, insert the hose straight to the end and connect it.

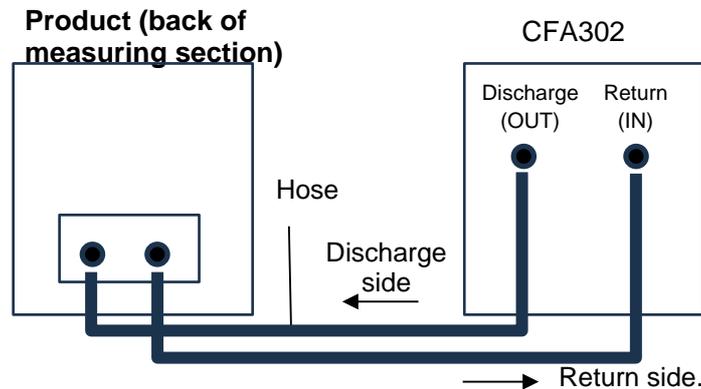


**Flexible hoses should be securely fastened with hose clamps.**



### Hose connection to CFA302

Once the hose is connected to the product TE100, connect it to the CFA302 as shown.



\* Use the minimum necessary length of circulation hose. If the piping resistance becomes large, the circulation volume will be small, resulting in a decrease in cooling efficiency.

\*The hose moves when the stage is put in and out. Please be careful when adjusting the length.

### Circulating water injection

Refer to the instruction manual for the CFA302 and inject the circulating water.



Be careful not to get circulating water on the product.

If circulating water gets on electrical parts, it may cause electric leakage or electric shock. If the operation panel is splashed with circulating water, wipe it off thoroughly.

# 4. PRE-OPERATIVE PREPARATIONS

## Common screen

No.	Component	Function
①	Machine Status Stage is Out Hood is Open No Contacts	Displays the status of each measuring section. Displays the location of the stage. Displays the front door open/close status. Displays lifter status.
②	Thermocouple Ambient	Displays the internal air of the measuring section.
③	Cooling Unit Temperature ON / OFF	Sets settings related to cooling water circulation during standby. Sets ON/OFF of cooling water circulation.
④	Power Supply Voltage / Current Limit ON / OFF	Sets the heater voltage in standby mode. (Not used in this test) Sets power supply ON/OFF for TEG chip heaters.
⑤	Exit Program Power Off	Exit the software. Shut down the TE100 power supply.

# 4. PRE-OPERATIVE PREPARATIONS

## Pre-test preparation

### 1. Turn power ON



- ① Turn ON(!) ELB.
- ② Press the power switch.

### 2. Log in

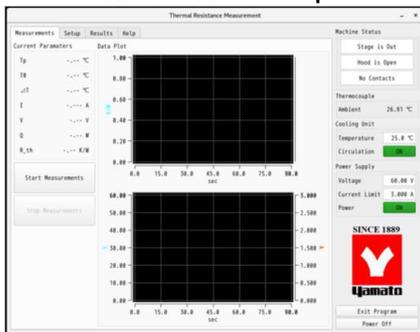
- ① Log in at the login screen.  
ID USER  
PASS USER

### 3. Launch the software

Software is running

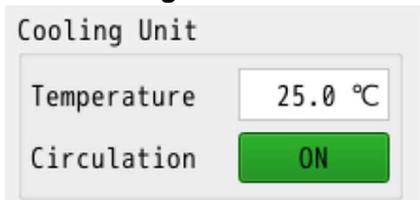


After software startup



- ① Click on Applications - Other - Teamal Resistance Measurement to launch the software.  
After the startup screen is displayed, the software starts.

### 4. Start cooling water circulation



- ① Enter the cooling temperature in "Temperature" in "Cooling Unit" on the common screen (center right of the screen). (Example: 25.0°C)
- ② Press the "Circulation" button to start the cooling water circulation.

**When the lamp is lit green, the cooling circulation is in operation.**

**If Temperature is "-.-", the temperature set in Setup is applied.**

\* It is recommended that the cooling water be circulated for enough time prior to the start of the test. If the cooling water circulation is not sufficient, an alarm may occur during the test and the test may be terminated.

# 4. PRE-OPERATIVE PREPARATIONS

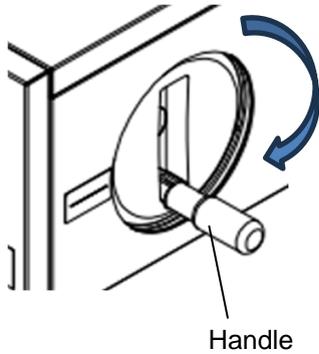
## How to set the test specimen



Please set the TEG chip on the sample before use.  
Use without a TEG chip may cause malfunction.

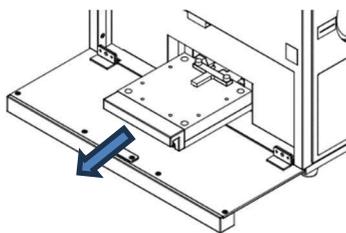
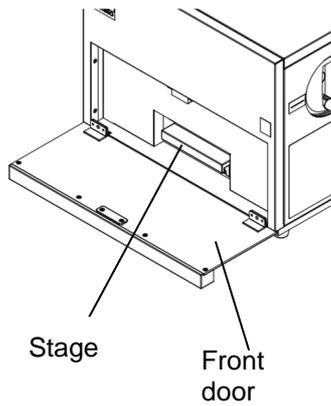
### 1. Raise the lifter

1. Pull out the handle.
  2. Turn the handle to the right to raise the lifter.
- \* **Raise the handle until it stops.**



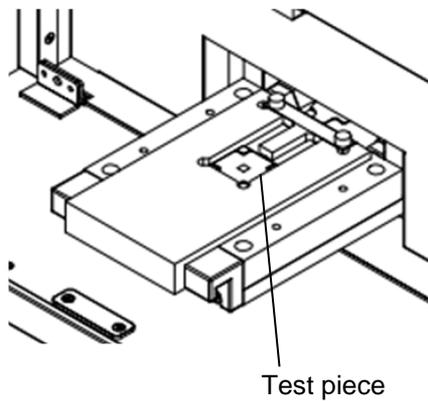
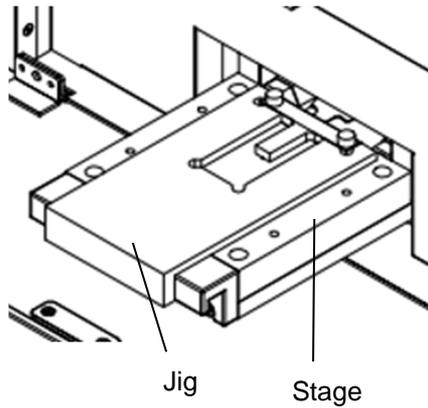
### 2. Bring out the stage.

1. Open the door.
  2. Pull out the stage.
- \* **Pull it out until it snaps into place.**



# 4. PRE-OPERATIVE PREPARATIONS

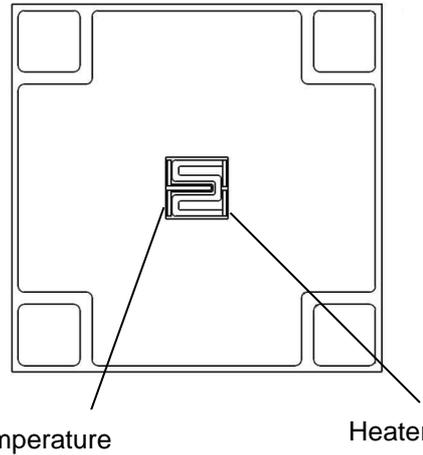
## 3. Set the sample



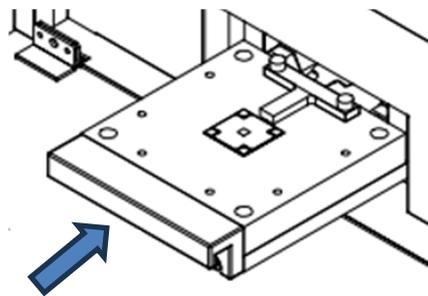
1. Set the jig on the stage.
  2. Set the sample according to the jig.
- \* **Make sure the stage surface is free of dust and dirt.**



**Note the direction of the sample.**  
**Wrong orientation may cause malfunction.**  
 (Left: Temperature sensor Right: Heater)



## 4. Set the stage.



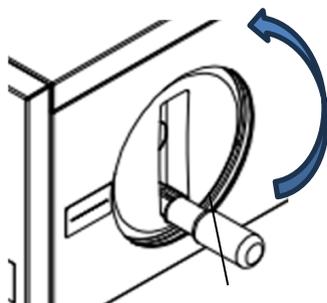
1. Push the stage in.
- \* **Press until it clicks into place.**  
 \* **Confirm that the warning on the operation screen has disappeared.**



2. Close the door.
- \* **Confirm that the warning on the operation screen has disappeared.**



## 5. Lower lifter



Handle

1. Turn the handle to the left to lower the lifter.
- \* Lower the handle until it stops.
- \* The warning on the operation screen will turn off.



Close the front door before operating.  
 Opening the front door may cause hand or finger injury.



Fold down the handle after operation.  
 Use without folding may cause injury or damage to the product.

# 5. MEASURE

## Calibration function (R0)

Calibrate the temperature sensor mounted on the TEG chip.



- \* This must be done before this examination is conducted. When the software is restarted, this item is also reset. Please re-execute.
- \* Make sure the sample is set.
- \* Make sure that cooling water is circulating.

### 1. Go to the Setup screen.

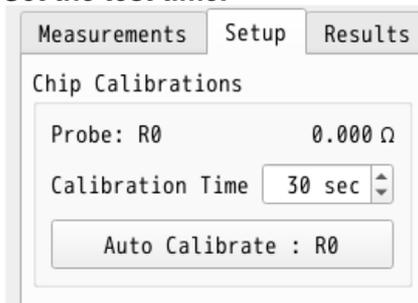
#### Setup screen

Press the Setup tab.



### 2. Set the test time.

Change the "Calibration Time" value to set the test time. (e.g. 30sec).

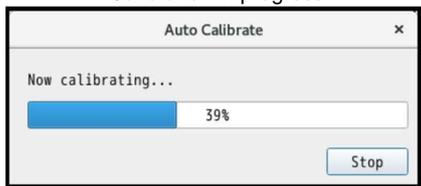
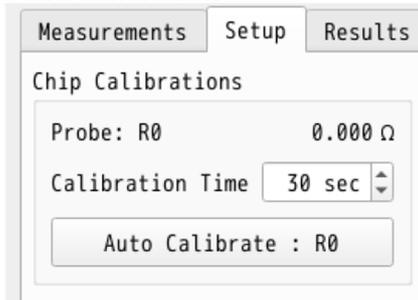


### 3. Start Calibration

Press the "Auto Calibration: R0" button. "Auto Calibrate" is displayed and calibration is automatically completed. When calibration is completed, the value of "Probe:R0" is rewritten between 45 and 75Ω.



Calibration may not start if there is insufficient coolant circulation. Give it a few moments and try to implement it again.



# 5. MEASURE

## Setting test items

### Set the test items.

Cooling Unit (Setup screen)

"Set Temperature": Sets the cooling temperature during the test.

Power Supply (Setup screen)

"Set Voltage": Determines the voltage applied to the TEG chip heater.

"Current Limit": Limits the current value flowing to the TEG chip heater.

Thermal Resistance

"R\_th\_min": Determines the vertical axis (min value) of the graph where the thermal resistance values are displayed.

"R\_th\_max": Determines the vertical axis (max value) of the graph where the thermal resistance is displayed.

Measurement Time

"Total Measurement Time": determines the total test time.

"Idling Time": Determines the amount of time that elapses between the start of the test and when the heater turns on.

"Heater on Time": determines the time the heater is on.

"Heater off Time": determines how long the heater is off. (Automatic calculation)

USB Flash drive

"Mount Point": Displays the location where measurement data is stored.

"Save File Path": Change the destination to save the measurement data.

"Mounting/Unmounting": connect/disconnect USB for data storage.

Setup screen

Thermal Resistance Measurement

Measurements Setup Results Help

Chip Calibrations

Probe: R0 0.000 Ω

Calibration Time 30 sec

Auto Calibrate : R0

Cooling Unit

Set Temperature 25.0 °C

Power Supply

Set Voltage 60.00 V

Current Limit 3.000 A

Thermal Resistance

R\_th\_min 0.00 K/W

R\_th\_max 1.00 K/W

Measurement Time

Total Measurement Time 90 sec

Idling Time 20 sec

Heater On Time 50 sec

Heater Off Time 20 sec

Measurement Sample

60.00 50.00 40.00 30.00 20.00 10.00 0.00

3.000 2.500 2.000 1.500 1.000 0.500 0.000

0.0 15.0 30.0 45.0 60.0 75.0 90.0

sec

USB Flash Drive

Mount Point /mnt/usb Unmounting

Save File Path

Load Parameters ... Save Parameters ...

Machine Status

Stage is Out

Hood is Open

No Contacts

Thermocouple

Ambient 25.70 °C

Cooling Unit

Temperature -- °C

Circulation OFF

Power Supply

Voltage -- V

Current Limit -- A

Power OFF

SINCE 1889

Yamato

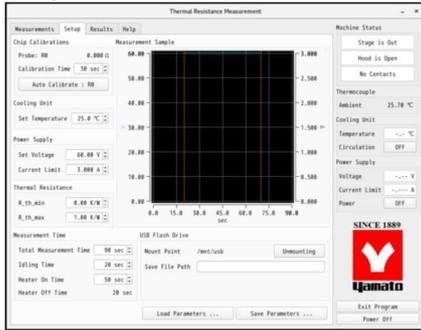
Exit Program

Power Off

# 5. MEASURE

## 1. Go to the Setup screen.

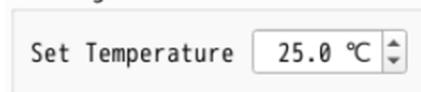
### Setup screen



Press the Setup tab.

## 2. Set cooling temperature

### Cooling Unit



Set the cooling temperature during the test at "Set Temperature" in "Cooling Unit".



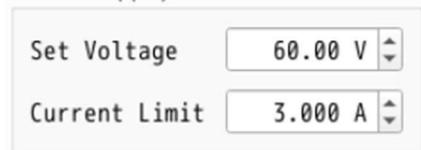
Be careful not to mistake this for "Set Temperature" on the common screen.



For smooth testing, it is recommended that "Set Temperature" in the Common screen and Setup be set to the same value.

## 3. Set the applied voltage

### Power Supply



Set the voltage to be applied to the TEG chip heater during the test at "Set Voltage" under "Power Supply".

(e.g. 60.00V)

"Current Limit" can be used to limit the maximum value of the current flowing through the TEG chip.



Depending on the condition of the sample, the amount of heat generated will vary even if the applied voltage is the same. Please set the applied voltage with great care.

## 4. Set the vertical axis of the graph

### Thermal Resistance



Set the min value for the graph at "R\_th\_min" in "Thermal Resistance". (Example: 0.00K/W)

Set the max value of the graph at "R\_th\_max".

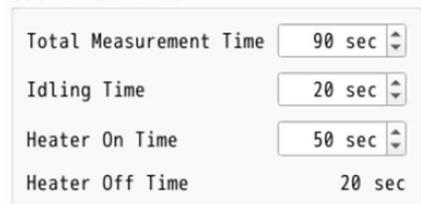
(e.g., 1.00 K/W)



The values set in this section are reflected in the graphs on the "Measurements" tab and the "Results" tab.

## 5. Setting the test time

### Measurement Time



The total test time can be set in "Total Measurement Time" under "Measurement Time". (Example: 90sec)

The time from the start of the test until the voltage is applied to the TEG chip heater can be set in "Idling time".

(Example: 20sec)

The time to apply voltage to the TEG chip heater can be set in "Heater On Time". (Example: 50sec)

By setting the above three times, "Heater Off Time" is automatically calculated and displayed.

# 5. MEASURE

## 6. Setting Data Output Destination

USB Flash Drive

Mount Point /mnt/usb Unmounting

Save File Path

Load Parameters ... Save Parameters ...

After the test, the measured data is saved in CSV format on a USB memory device.

The destination can be specified by setting a folder in "Save File Path".

Pressing the "Unmounting / mounting" button allows the USB memory stick to be recognized by the software.



If a USB flash drive is connected when the software is started, it will be recognized automatically, so basically this operation is not necessary.

## 7. Save and recall test settings

USB Flash Drive

Mount Point /mnt/usb Unmounting

Save File Path

Load Parameters ... Save Parameters ...

Save and recall test settings.

Click the "Load Parameters" button to display the files on the USB memory stick. By selecting the desired file, the previously set condition can be recalled.

The "Save Parameters" button allows you to save the settings currently entered into the software. Enter a file name in the window that appears after clicking the button and save the file.

# 5. MEASURE

## Thermal Resistance Measurement

Thermal resistance is measured under the conditions set in the Setup screen.

Current Parameters: Displays real-time data at the time of measurement.

Tp: Temperature of TEG chip, T0: Cooling temperature,  $\Delta T$ : Tp - T0

I: Current value flowing to TEG chip heater, V: Voltage value applied to TEG chip heater

Q: Power consumption of TEG chip heater, R\_th: Thermal resistance

"Start Measurements": to start measurements.

"Stop Measurements": to stop the measurement midway.

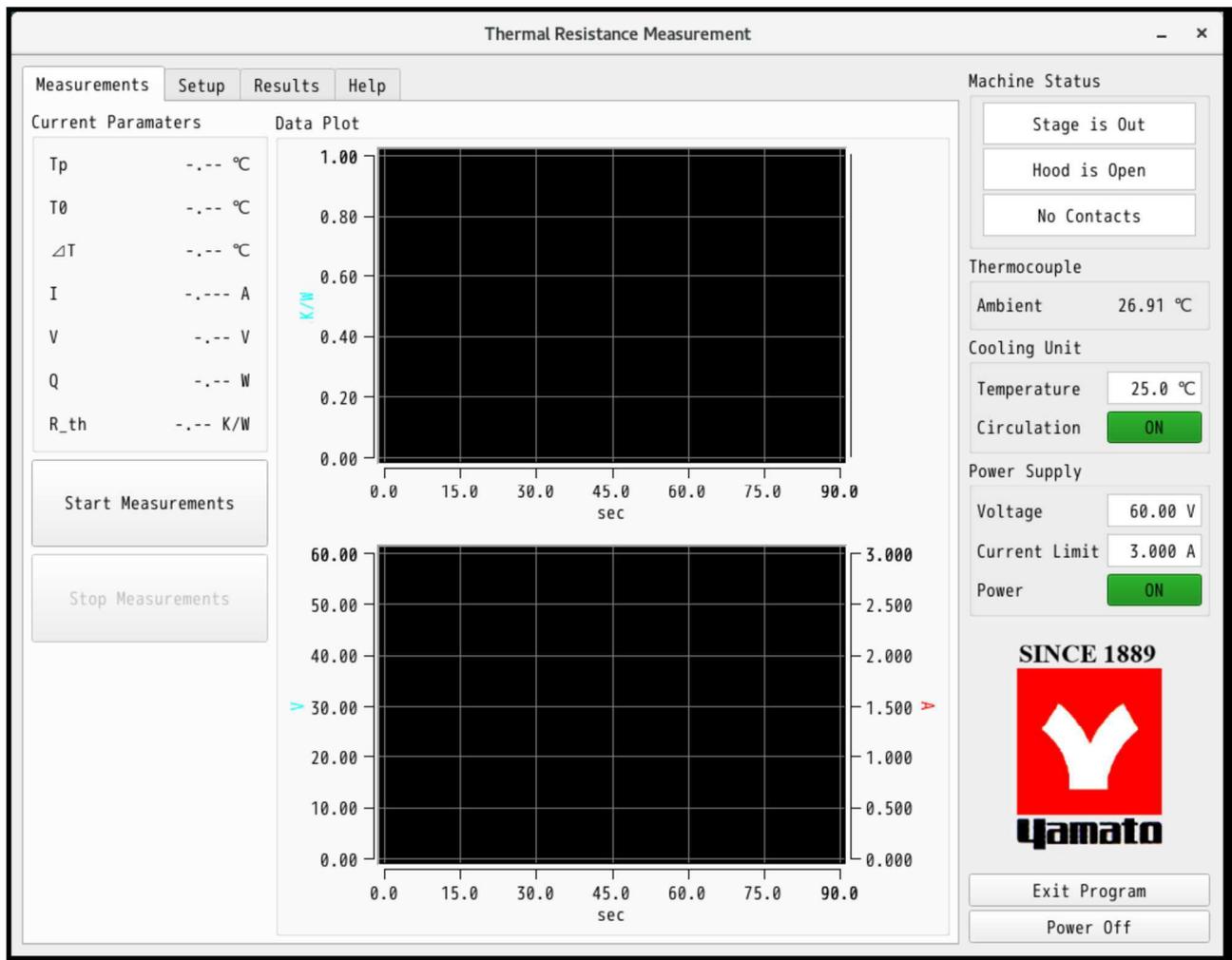
Data Plot (top)

Plot the current values with time on the horizontal axis and thermal resistance on the vertical axis.

Data Plot (bottom)

Plot the current values as time on the horizontal axis and applied voltage and current on the vertical axis.

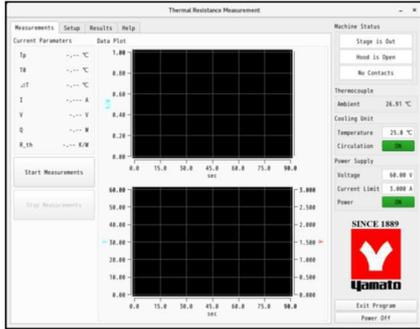
Mmeasurements Screen



# 5. MEASURE

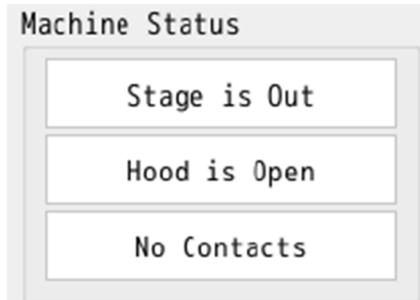
## 1. Go to Measurements screen

### Measurements Screen



Press the Measurements tab.

## 2. Check the status of the control unit.



Check the status of the control unit and verify that the Machine Status is not lit red.

## 3. Start measurement.



Press the "Start Measurements" button to start the measurement.  
To stop the measurement midway, press "Stop Measurements".  
Saves data up to the point where it is pressed and stops the measurement.



In the following cases, "Start Measurements" will be grayed out and the test will not begin.

- Machine Status is lit red.
- The USB flash drive is not recognized by the software.

# 5. MEASURE

## Confirmation of measurement results

The measurement results can be viewed on the Results screen.

### Data Plot (top)

Plot the test results with time on the horizontal axis and thermal resistance on the vertical axis.

### Data Plot (bottom)

Plot the test results with time on the horizontal axis and the applied voltage and current on the vertical axis.

### Resulting Thermal Resistance

Displays the mean and standard deviation of each value

R<sub>th</sub>: thermal resistance, Q: power consumption of TEG chip heater,  $\Delta T$ : T<sub>p</sub> - T<sub>0</sub>

T<sub>p</sub>: Temperature of TEG chip, T<sub>0</sub>: Cooling temperature

## Result screen

The screenshot shows the 'Thermal Resistance Measurement' software interface. It features a menu bar with 'Measurements', 'Setup', 'Results', and 'Help'. The main area is divided into several sections:

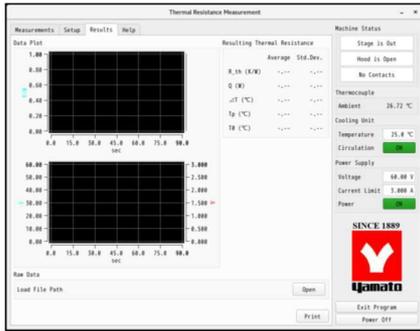
- Data Plot (top):** A graph with 'K/W' on the y-axis (0.00 to 1.00) and 'sec' on the x-axis (0.0 to 90.0).
- Data Plot (bottom):** A graph with two y-axes: the left axis is 'V' (0.00 to 60.00) and the right axis is 'A' (0.000 to 3.000), both with 'sec' on the x-axis (0.0 to 90.0).
- Resulting Thermal Resistance:** A table showing Average and Std.Dev. values for R<sub>th</sub> (K/W), Q (W),  $\Delta T$  (°C), T<sub>p</sub> (°C), and T<sub>0</sub> (°C). All values are currently displayed as '---'.
- Machine Status:** A panel with buttons for 'Stage is Out', 'Hood is Open', and 'No Contacts'. It also displays 'Thermocouple Ambient' at 26.72 °C.
- Cooling Unit:** Shows 'Temperature' at 25.0 °C and 'Circulation' as 'ON'.
- Power Supply:** Shows 'Voltage' at 60.00 V, 'Current Limit' at 3.000 A, and 'Power' as 'ON'.
- Raw Data:** A section with a 'Load File Path' input field, 'Open', and 'Print' buttons.
- Yamato Logo:** A red logo with a white 'Y' and the text 'SINCE 1889 Yamato'. Below it are 'Exit Program' and 'Power Off' buttons.

# 5. MEASURE

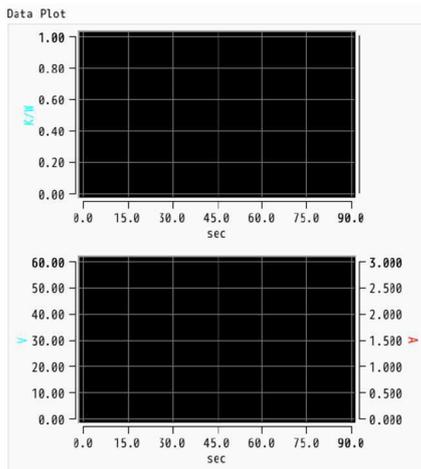
## 1. Go to Result screen

### Result screen

Press the Result tab.



## 2. Data Plot



Thermal resistance in the upper row  
The results of applied voltage and energizing current are plotted in the lower row.

Double-click on each axis to zoom in.

## 3. Confirmation of measurements

### Resulting Thermal Resistance

	Average	Std.Dev.
R <sub>th</sub> (K/W)	-.-	-.-
Q (W)	-.-	-.-
ΔT (°C)	-.-	-.-
T <sub>p</sub> (°C)	-.-	-.-
T <sub>0</sub> (°C)	-.-	-.-

In "Resulting Thermal Resistance", displays the mean and standard deviation of each value.

R<sub>th</sub>: Thermal resistance

Q: Power consumption of TEG chip heater

ΔT : T<sub>p</sub> – T<sub>0</sub>

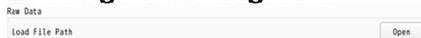
T<sub>p</sub>: Temperature of TEG chip

T<sub>0</sub>: Cooling temperature



If Heater on Time is set to 29 seconds or less on the "Setup" screen, correct calculations will not be made.

## 4. Loading of existing data



By clicking the "Open" button under "Raw data," previously acquired measurement data can be displayed.

The file name of the data displayed in "Load File Path" is displayed.

## 5. Screen print

By clicking the "Print" button, "Data Plot" and "Resulting Thermal Resistance" are printed.

# 5. MEASURE

## Help screen

You can check the software version and other information on the Help screen.

## Help screen

The screenshot shows the 'Help' tab of the 'Thermal Resistance Measurement' software. The main window contains the following text:

Thermal resistance measurement system.  
Ver. 0.0.0.1  
Indicators  
Licensed to "XXX会社"  
All rights are reserved by Yamato

Below this text is a 'Manual' button.

On the right side, there is a 'Machine Status' panel with the following information:

- Stage is Out
- Hood is Open
- No Contacts
- Thermocouple: Ambient 26.32 °C
- Cooling Unit: Temperature 25.0 °C, Circulation ON
- Power Supply: Voltage 60.00 V, Current Limit 3.000 A, Power ON

At the bottom right, there is a 'Yamato' logo with the text 'SINCE 1889' and 'Yamato'. Below the logo are 'Exit Program' and 'Power Off' buttons.

At the bottom right of the main window, there is a thank you message:

Thanks to the following  
Open and Free software  
LGPLv3 : Qt5  
LGPL : Qt6

# 5. MEASURE

## 1. Go to Help screen

### Help screen

Press the Help tab.



## 2. Software Version

You can check the software version.



## 3. Notation of LGPL, etc.

Notation about LGPL



## 4. E-manual

By pressing the "Manual" button, you can refer to the manuals stored in the device.



## 6. HANDLING PRECAUTIONS

### Warnings and Cautions



WARNING



#### **DO NOT process explosive or flammable substances**



Never attempt to process explosives, flammables or any items which contain explosives or flammables. Fire or explosion may result.  
For explosive and flammable materials, refer to 12. LIST OF HAZARDOUS SUBSTANCES(p. 41).



#### **Do not drop the product or subject it to significant impact.**

Never drop the product or subject it to a major shock. This may cause malfunction of mechanical parts.



#### **DO NOT use harmful substances**

Never use test samples that are toxic or that generate noxious fumes, which may cause serious accident.



#### **Turn OFF (○) ELB immediately when an abnormality occurs.**



If unit begins emitting smoke, fire or abnormal odors for reasons unknown, turn OFF (○) ELB immediately, disconnect power cable from power supply, and contact original dealer of purchase for assistance. Failure to do so may result in damage to components, fire or electric shock. Never attempt to disassemble or repair unit. Repairs should always be performed by a certified technician.

## 6. HANDLING PRECAUTIONS



### CAUTION

	<p><b>When stopped for an extended period of time</b></p> <ul style="list-style-type: none"><li>• Turn the earth leakage breaker of this product to "OFF (○)" and disconnect the power cord from the distribution board or outlet.</li><li>• Drain circulating water from the reservoir and circulation lines by removing the drain plug. Failure to do so may result in malfunction due to corrosion or clogging. Refer to "Hose Replacement (P. 33 3)".</li></ul>
	<p><b>Use at proper temperature</b></p> <p>Never use the product at temperatures outside the operating temperature range listed in the specifications column. Failure to do so may cause product malfunction or accidents.</p>
	<p><b>Check that the circulating water has returned to room temperature</b></p> <p>Stop operation after confirming that the circulating water has returned to room temperature. Burns and frostbite may occur when touching the circulating water, such as when draining the circulating water.</p>
	<p><b>Wash thoroughly</b></p> <p>Although this product has been cleaned in advance, if it is stopped for a long period of time, it should be thoroughly cleaned by passing water through the heat sink.</p>
	<p><b>Use the calibration offset function if the displayed temperature and the temperature inside the chamber do not match.</b></p> <p>If there is a discrepancy between the circulating water measurement temperature and the displayed temperature and adjustment is necessary, refer to the CFA302 manual for temperature compensation.</p>
	<p><b>Perform periodic inspections.</b></p> <p>The breaker is an important part for security reasons. Inspect regularly. See "7. How to take care of it(p. 33)" for inspection methods</p>

# 7. How to take care of it

## Daily Inspection/Care

Daily general maintenance and inspection is recommended to ensure optimal equipment performance.



### WARNING

- Periodic inspections must be performed.
- When inspecting or caring for the product, wear gloves and other protective equipment to avoid injury.
- When inspecting or cleaning, be sure to turn the ground-fault breaker OFF (O) and disconnect the power cord from the outlet.
- After the product has been shut down, do so only after the product itself and the circulating water have returned to room temperature.
- Never attempt to disassemble unit.

### Prohibited items for care



### CAUTION

- Clean unit using soft damp cloth. Never use benzene, paint thinner, alcohol, scouring powder, scrubbing brush or other abrasives and solvents to clean unit. Superficial damage and/or discoloration, as well as deformity to some components may result. Always turn off main power switch (ELB) prior to cleaning or maintenance.

## Maintenance and Inspection

### When operating

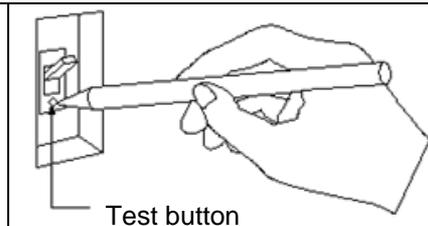
When operating the equipment, make sure there are no liquid leaks or unusual noises.

### Inspect monthly

#### ◆ Check the ELB function.

Prepare unit for inspection by connecting power cable to a facility outlet or terminal.

- First, turn the ELB to the "OFF (O)" state.
- Next, turn the ELB "ON ( | )" and press the test button of the ELB with the tip of a ballpoint pen or the like, and if the RCD breaker turns "OFF (O)", it is normal.



Test button

#### ◆ Check power plug for damage

- Visually check the cutting edge of the power plug for dust or dirt.
- If there is dust or dirt on it, remove it.
- Make sure that the plug's cutting edge is not bent. Replace if bent or damaged.
- Check the power plug for discoloration or abnormal heat generation. If there is discoloration or abnormal heat generation, the contacts in the outlet you are using may have poor contact, and should be replaced.

※ The operation of the breaker must be checked before long-term continuous operation.

## Changing circulating water

Refer to the CFA302 instruction manual for handling.

## Replacement of hoses

Silicone hose is used for piping inside the product. Hoses may become discolored with time. Replacing hoses once every two years is recommended for safe use. Please contact the distributor where you purchased the product or "14. For inquiries, please contact(p. 44)" for replacement.

## 7. How to take care of it

When not used for a long period of time or discarded

 <b>WARNING</b>	 <b>CAUTION</b>
<p>To store or to place unit out of service</p> <ul style="list-style-type: none"> <li>• Turn off the ELB and disconnect the power plug.</li> <li>• Drain the circulating water. In the case of tap water, algae can form inside the pipes, and if the room temperature drops below freezing, the circulation path can freeze and cause damage.</li> </ul>	<p>Disposal</p> <ul style="list-style-type: none"> <li>• Do not leave it where children can play with it.</li> </ul>

### Disposal Considerations

Dispose of this unit in accordance with local laws and regulations. Dispose of or recycle this unit in a responsible and environmentally friendly manner.

Yamato Scientific Co., Ltd. strongly recommends disassembling unit, as far as is possible, in order to separate parts and recycle them in contribution to preserving the global environment. Major components and materials, comprising WG204 unit are listed in the table below

Component Name	Material
<b>Main Unit Components</b>	
Exterior	Chrome-free electrogalvanized steel sheet, Baked coating, ABS, EPDM, Other composite products
Lifter, Stage	Stainless steel, Nylon, Brass, Steel, Stainless steel, Aluminum, Copper, ABS, PC, PA, EPDM, PF, Acrylic, Silicon, Iron, and other composite materials
Fittings / Hoses / Hose clamps	SUS304/Si/PA
<b>Electrical Parts</b>	
Switches and relays	Composite of fiber glass and other materials
Operation panel	Resin-based materials, Copper, Composite products such as nickel
Printed circuit boards	Glass fiber, copper, Composite products such as nickel
Power cable	Resin material
Wires	Copper, resin-based materials
Sensor	Glass fiber and other composites, Synthetic rubber coating

# 8. TROUBLESHOOTING

## Troubleshooting Guide

Symptom	Possible causes	Measures
The screen is not displayed even if the ELB and power switch are set to "ON (I)".	<ul style="list-style-type: none"> <li>● Faulty power supply on equipment side/facility</li> <li>● ELB failure</li> <li>● Defective power switch</li> <li>● Controller failure</li> </ul>	<ul style="list-style-type: none"> <li>● Check the power supply voltage.</li> <li>● Replacement (please request repair)</li> <li>● Replacement (please request repair)</li> <li>● Replacement (please request repair)</li> </ul>
Lifter does not elevate	<ul style="list-style-type: none"> <li>● Failure of mechanical components</li> <li>● contamination by foreign substances</li> </ul>	<ul style="list-style-type: none"> <li>● Replacement (please request repair)</li> <li>● Remove foreign objects.</li> </ul>
No back and forth stage	<ul style="list-style-type: none"> <li>● Failure of mechanical components</li> <li>● contamination by foreign substances</li> </ul>	<ul style="list-style-type: none"> <li>● Replacement (please request repair)</li> <li>● Remove foreign objects.</li> </ul>
Temperature in chamber does not rise.	<ul style="list-style-type: none"> <li>● Defective heater (TEG chip)</li> </ul>	<ul style="list-style-type: none"> <li>● Replacement (see sample wiring)</li> <li>● Replacement (replace fuse)</li> </ul>
Temperature is not displayed	<ul style="list-style-type: none"> <li>● Defective sensor (TEG chip)</li> </ul>	<ul style="list-style-type: none"> <li>● Replacement (see sample wiring)</li> </ul>
Unable to start the test	<ul style="list-style-type: none"> <li>● Stage not pushed to the end.</li> <li>● Lifter is not fully raised.</li> <li>● Door is not closed.</li> <li>● USB memory stick is not connected.</li> </ul>	<ul style="list-style-type: none"> <li>● Push the stage to the end.</li> <li>● Raise the lifter to the end.</li> <li>● Close the door.</li> <li>● Connect the USB memory stick and perform mounting.</li> </ul>

If none of the above applies, immediately turn off the ground-fault ELB of the main unit, disconnect the power cord from the outlet or distribution board, and contact your distributor or " 14. For ***inquiries, please contact***(P. 44)".

# 8. TROUBLESHOOTING

## Error code display and contents

The product has a self-diagnostic function built into the controller. The table below shows possible causes and measures to take when safety device is triggered.

### • Error Codes

If an abnormality occurs in the product, a pop-up will appear and operation will stop. Please confirm the error code and take appropriate action.

Display code	Description	Possible causes and solutions
F010	Front door open	<ul style="list-style-type: none"> <li>The test is aborted when it detects that the front door is opened during measurement. Close the front door.</li> </ul>
F011	Abnormal stage position	<ul style="list-style-type: none"> <li>Detects that the stage position has been changed during measurement and aborts the test. Check the position of the stage.</li> </ul>
F012	Abnormal lifter position	<ul style="list-style-type: none"> <li>Detects that the lifter position has been changed during measurement and aborts the test. Check the lifter position.</li> </ul>
F020	Cooling unit temperature sensor abnormal	<ul style="list-style-type: none"> <li>There is an abnormality in the temperature sensor of the cooling system. Check the cooling system.</li> </ul>
F021	Cooling system SSR abnormal	<ul style="list-style-type: none"> <li>There is an abnormality in the semiconductor relay of the cooling system. Check the cooling system.</li> </ul>
F022	Cooling system heater abnormal	<ul style="list-style-type: none"> <li>There is an abnormality in the heater for heating of the cooling system. Check the cooling system.</li> </ul>
F023	Cooling system memory abnormal	<ul style="list-style-type: none"> <li>There is an abnormality in the internal memory of the cooling system. Check the cooling system.</li> </ul>
F024	Internal communication error of cooling system	<ul style="list-style-type: none"> <li>There is an error in the internal communication of the cooling system. Check the cooling system.</li> </ul>
F025	Cooling unit over-ride protector abnormal	<ul style="list-style-type: none"> <li>An abnormality has occurred in the overtemperature protector of the cooling system. Check the cooling system.</li> </ul>
F030	Power supply unit OVP abnormal	<ul style="list-style-type: none"> <li>Cooling system heater abnormal Turn the equipment power back on.</li> </ul>
F031	Power supply unit OCP abnormal	<ul style="list-style-type: none"> <li>The overcurrent protection of the power supply unit is working. Turn the equipment power back on.</li> </ul>
F032	Power supply unit power OFF	<ul style="list-style-type: none"> <li>Power supply unit is disconnected. Turn the equipment power back on.</li> </ul>
F033	Power supply unit OTP abnormal	<ul style="list-style-type: none"> <li>Overheat protection of the power supply is activated. Turn the equipment power back on.</li> </ul>
F034	Power supply unit voltage limit reached	<ul style="list-style-type: none"> <li>The voltage limit of the power supply unit has been reached. Turn the equipment power back on.</li> </ul>
F035	Power supply unit current limiting reach	<ul style="list-style-type: none"> <li>The current limit of the power supply unit has been reached. Turn the equipment power back on.</li> </ul>
F036	Power supply unit shutdown	<ul style="list-style-type: none"> <li>A shutdown alarm has occurred at the power supply unit. Turn the equipment power back on.</li> </ul>
F037	Power supply unit power limitation	<ul style="list-style-type: none"> <li>The power protection of the power supply unit is working. Turn the equipment power back on.</li> </ul>
F038	Power supply unit abnormal	<ul style="list-style-type: none"> <li>An anomaly has occurred in the power supply unit that the system does not intend. Turn the equipment power back on.</li> </ul>
F050	Cooling circulating water temperature error	<ul style="list-style-type: none"> <li>Cooling circulating water temperature deviates from setpoint. Measurement is stopped. Check the equipment.</li> </ul>

## 8. TROUBLESHOOTING

- **System error**

If an error occurs in the software system, a pop-up will appear. Please confirm the error message and take appropriate action.

Error message	Possible causes and solutions
The software failed to start.	<ul style="list-style-type: none"> <li>● Software failed to start. Turn off the power to the equipment and restart it.</li> </ul>
The parameter settings failed to load.	<ul style="list-style-type: none"> <li>● Failed to read parameter file. Turn off the power to the equipment and restart it.</li> </ul>
The measurement settings failed to load. Start with the default ones?	<ul style="list-style-type: none"> <li>● Failed to load configuration file at software startup. Choose to load the initial configuration file or abort the software startup.</li> </ul>
The software has already started.	<ul style="list-style-type: none"> <li>● Attempted to double launch software. Only one software can be activated.</li> </ul>
Exit the software?	<ul style="list-style-type: none"> <li>● Software exit confirmation message.</li> </ul>
Exit the software and turn off the power?	<ul style="list-style-type: none"> <li>● This is a confirmation message when you try to turn off the device power from the software.</li> </ul>
The folders failed to create.	<ul style="list-style-type: none"> <li>● Preparation to save measurement results failed. Check the USB memory stick and make sure it is Mounting to the software.</li> </ul>
The limit on the serial number of saved measurement data reached.	<ul style="list-style-type: none"> <li>● The maximum number of files to save measurement results has been reached. The maximum sequential number is 999. Organize the files on the USB flash drive.</li> </ul>
Verify that the cooling unit is set correctly before measuring.	<ul style="list-style-type: none"> <li>● Confirmation message before measurement.</li> </ul>
Start calibration? The software can not be operated during the calibration.	<ul style="list-style-type: none"> <li>● Confirmation message before calibration.</li> </ul>
The USB flash drive failed to mount.(Please unplug it and plug it back in.)	<ul style="list-style-type: none"> <li>● Mounting of USB memory failed. Check the USB memory stick and mount it again.</li> </ul>
The USB flash drive failed to unmount.	<ul style="list-style-type: none"> <li>● Unmounting of USB memory failed. Unmounting again.</li> </ul>
The measurement settings failed to load. Set the default ones?	<ul style="list-style-type: none"> <li>● Failed to read the configuration file on the Setup screen. Choose to load the initial setup file or abort.</li> </ul>
Set the values correctly.	<ul style="list-style-type: none"> <li>● You are trying to save a setting with an incorrect value. Correct the value.</li> </ul>
The measurement settings failed to write.	<ul style="list-style-type: none"> <li>● The folder where the set values are saved is incorrect. Please specify the folder in the USB memory stick</li> </ul>
The measurement data failed to write.	<ul style="list-style-type: none"> <li>● Failed to save measurement results. Check the USB memory stick.</li> </ul>
The measurement data failed to load.	<ul style="list-style-type: none"> <li>● Failed to read the measurement result file. Check the USB memory stick.</li> </ul>
The measurement data failed to print.	<ul style="list-style-type: none"> <li>● Failed to print measurement results. Press the PRINT button again.</li> </ul>
The manual failed to open.	<ul style="list-style-type: none"> <li>● Failed to display manual. Press the MANUAL button again.</li> </ul>
The minimum value is above the maximum one.	<ul style="list-style-type: none"> <li>● There is an error in the setting value for graph magnification. Please enter the correct value</li> </ul>

## 8. TROUBLESHOOTING

Temperature of the heat sink deviates from the set value. Please check.	<ul style="list-style-type: none"><li>● During calibration, the cooling water temperature deviates from the setpoint. Check the equipment.</li></ul>
An error occurred in the interface board for measurement. Please return on power.	<ul style="list-style-type: none"><li>● An error has occurred in the measurement system. Reboot the equipment.</li></ul>

If the above abnormality is frequently activated or does not return, the product may be defective, so immediately disconnect the power cord from the outlet and contact the distributor from whom you purchased the product or " 14. For inquiries, please contact(P. 44)".

## 9. SERVICE & REPAIR

### Requests for Repair

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#### Warranty card

Warranty card will be handed by dealer or Yamato personnel upon delivery and installation, If your distributor or our representative is not present, please register your warranty card at for products that come with a warranty card.

<https://www.yamato-net.co.jp/support/warranty.htm>

- See " 10. SPECIFICATION(p. 41)" for information on whether a warranty card is included.
- Keep warranty card safe.

#### Requests for Repair

If there is any abnormality after checking "If you suspect a malfunction," stop operation for safety reasons, turn off the controller power and leakage breaker, disconnect the power cord, and contact the distributor from whom you purchased the controller or 14. For ***inquiries, please contact***(P. 44).

The following information is required for all repairs.

- Product Name
  - Model
  - Serial Number
  - Date (year/month/day) of Delivery
  - Description of problem in as much detail as possible
  - Repair this equipment for free of charge according to the contents on warranty card. Warranty period is 1 (one) year from date of purchase.
  - Consult with original dealer of purchase or Yamato sales office for any repair after warranty ended. Charged repair service of this equipment will be available on customer's request when it can be maintained functional by its repair.
- } Please see the warranty card

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

#### Guaranteed Supply Period for Repair Parts

Guaranteed maximum supply period for repair parts is 7 (seven) years from date of discontinuation for this equipment.

"Repair parts" is defined as components which, when installed, allow for continued equipment operation.

# 10. SPECIFICATION

Product name		Thermal Resistance Measurement Device
Model		TE100
Operational external temperature range		25±5 °C
Performance		
Corresponding specimen size		30 x 30 mm (ISO4825-1:2023 compliant)
specimen load		Approx. 10kg
Temperature Characteristics		Resolution ≥0.01°C
Electrical resistance measurement error		±0.1 mΩ (70 to 130 Ω range)
Sampling rate		100 sampling/sec (max.)
Configuration		
Hose Nozzle Outer Diameter		10.5mm
TEG chip (Optional)		Heat generation density: 1 kW/cm <sup>2</sup> Maximum input power: Approx. 250W Temperature rise rate: 1.4 × 10 <sup>4</sup> K/sec Size: 5 x 5 x 0.35 mm
Safety functions		Overcurrent ground-fault breaker, Equipment protection against unexpected power loss
Other Functions		Abnormal temperature warning during test, abnormal internal power supply warning, Cooling water circulation system error warning, various error warnings
Standards		
Dimensions mm WxDxH (when projection is included)		
Control unit		380×470×180
Measurement unit		380×400×320 (380×450×320)
Power supply		Single phase AC100V±5%, 50/60Hz
Current value (Breaker capacity)		7.0A (10 A)
Power cable		Approx. 2 m With inlet-type plug
Weight	Control unit	Approx. 18kg
	Measurement unit	Approx. 22 kg (excluding weight)
Accessory		Weight 2 pcs Handle for weight 2 pcs (built-in measuring unit) Hose fixing clamp 2 pcs Thermocouple 1 pcs Connecting cable (Cable1/ Cable2) 1 each Power cord 1 pcs Instruction Manual 1 pcs Warranty card 1 pcs Inspection certificate (PC) 1 pcs Jig 1 pcs

\* The following items are not included

Monitor, HDMI cable, Keyboard, Mouse, USB memory stick,  
USB/485 converter, Cable for converter, Circulation hose

## 11. Option List

A variety of optional products are available.

Please contact your distributor or " 14. For *inquiries, please contact*(p. 44)" to purchase.

### For main unit (TE100)

Product name	Model Product Code	Description	Set Contents
Heater Chip	OTE10	- 5mm x 5mm size - Material is silicon carbide (SiC) - Heater chip with temperature sensor - Can be used with thermal characterization equipment (TE100)	10 pcs.
Standard substrate with heater chip	OTE20	Standard Substrate Features - The materials are as follows: Base material Si3N4: 0.32mm DBC : 0.3mm OTE10 is mounted and wire-bonded on all four sides.	1 pcs

### Circulation connection parts

Product name	Product Code	Description	Set Contents
Circulation insulation hose (flexiblet)	OCF12 221581	Operating temperature range: -20~80 °C * No freezing of circulating water at operating pressure: 0.2 MPa or less (to 40 °C) 0.1 MPa or less (to 80 °C)	Specifications: I.D. 9 x 13 x 2 m flexible hose (insulation outer diameter 28 mm) Hose clamp Thermal insulation tape Wetted parts material: Ethylene Propylene 2 pcs 4 pcs 1 m
Straight circulation nozzle	OCF10 221394	Used to connect a flexible hose to the CFA302 circulation connection IN/OUT. When connecting, be sure to use a hose clamp (sold separately) to secure the connection.	Specifications: Outer diameter 10.5 mm R3/8 Material: Stainless steel 1 pcs

\* Cut the insulation tape and insulation hose piece to the required length and use it for the hose insertion/removal section.

\* When ethanol (alcohol) is used as circulating water, the circulating water may become discolored or cloudy if an ethylene-propylene circulating hose is used. Use silicone-based circulation hoses.

## 12. LIST OF HAZARDOUS SUBSTANCES

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

### List of hazardous substances

Explosive substances
① Nitroglycol, Nitroglycerin, Nitrocellulose and other explosive nitrates
② Trinitrobenzene, Trinitrotoluene, Picric acid and other explosive nitro compounds
③ Peracetic acid, Methyl ethyl ketone peroxide, Benzoyl peroxide and other organic peroxides
④ Sodium azide and other metal azides
Combustible substances
①Metal "Lithium" ②Metal "Potassium" ③Metal "Natrium" ④Yellow Phosphorus ⑤Phosphorus Sulfide ⑥Red Phosphorus ⑦Phosphorus Sulfide ⑧Celluloids, Calcium Carbide (a.k.a, Carbide) ⑨ Lime Phosphide ⑩Magnesium Powder ⑪Aluminum Powder ⑫Metal Powder other than Magnesium and Aluminum Powder ⑬Sodium Dithionous Acid (a.k.a., Hydrosulphite)
Oxidizing substances
① Potassium chlorate, Sodium chlorate, Ammonium chlorate and other chlorates
② Potassium perchlorate, Sodium perchlorate, Ammonium perchlorate and other perchlorates
③ Potassium peroxide, Sodium peroxide, Barium peroxide and other inorganic peroxides
④ Potassium nitrate, Sodium nitrate, Ammonium nitrate and other nitrates
⑤ Sodium chlorite and other chlorates
⑥ Calcium hypochlorite and other hypochlorites
Flammable substances
① Ethyl ether, gasoline, acetaldehyde, propylene oxide, carbon disulfide, and other substances with flash point below 30 degrees below zero.
② Normal hexane, ethylene oxide, acetone, benzene, methyl ethyl ketone, and other substances with flash points between 30°C and 0°C below zero.
③ Methanol, ethanol, xylene, normal-pentyl acetate (also known as normal-amyl acetate) and other substances with flash point between 0°C and 30°C
④ Kerosene, diesel oil, turpentine oil, isopentyl alcohol (also known as isoamyl alcohol), acetic acid and other substances with flash point between 30°C and 65°C
Combustible gas
Hydrogen, Acetylene, Ethylene, Methane, Ethane, Propane, Butane and other gases combustible at 15°C, ambient air pressure.

Japan Industrial Safety and Health Law, Enforcement Order, Appended Table 1, Hazardous Substances (related to Articles 1, 6, and 9-3)

\*When using ethanol as an antifreeze solution, be sure to provide adequate ventilation and keep it away from fire and ignition sources (such as static electricity).

# 13. STANDARD INSTALLATION MANUAL

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

Model	Serial Number	Installation Date	Installation proved by (Company name)	Installation proved by	Judgment

No.	Item	Implementation method	Instruction manual reference column	Judgment
<b>Specifications</b>				
1	Accessories	Quantity check according to the accessories column	10. SPECIFICATION(P.40)	
2	Installation	<ul style="list-style-type: none"> <li>Visual check of surrounding conditions Caution: Take care for environment</li> <li>Securing a space</li> </ul>	3. PRE-OPERATION PROCEDURES(P.13) <ul style="list-style-type: none"> <li>Choose an appropriate installation site. (P.14)</li> </ul>	
		<ul style="list-style-type: none"> <li>Fill the aquarium with circulating water</li> </ul>	4. PRE-OPERATIVE PREPARATIONS (P.16) <ul style="list-style-type: none"> <li>Installation Procedure(P.16)</li> </ul>	
<b>Operation-related matters</b>				
1	Power supply voltage	<ul style="list-style-type: none"> <li>Measure line voltage (power distribution board of facilities, outlet etc.) with a tester.</li> <li>Measure line voltage during operation (must meet required voltage) Caution:Use a compliant device to install on a plug or an ELB.</li> </ul>	3. PRE-OPERATION PROCEDURES(P.14) <ul style="list-style-type: none"> <li>Ground wire MUST be connected properly (P. 5)</li> <li>Install unit on a level surface. (p. 15)</li> </ul> 10. SPECIFICATION(P.41)	
2	Starting operation	<ul style="list-style-type: none"> <li>Start cooling water circulation Circulating water must be circulating. Set at 25 °C and check for stability Check: No liquid leakage Confirmation: Must be able to make measurements on a sample.</li> </ul>	4. PRE-OPERATIVE PREPARATIONS (P.18) 5. Measurement (p. 21)	
<b>Description</b>				
1	Operational descriptions	Explain operations of each component and handling precautions according to instruction manual.	1. SAFETY PRECAUTIONS (P.3)~12. LIST OF HAZARDOUS SUBSTANCES(P.42)	
2	Error Codes	Explain about error codes and procedures for reset according to instruction manual.	8. TROUBLESHOOTING (P.35) 9. SERVICE & REPAIR (P.39)	
3	Maintenance and Inspection	Explain about maintenance of equipment and each component according to instruction manual.	6. HANDLING PRECAUTIONS (P.31) 7. How to take care of it(P.34)	
4	Completion of installation Matters to be Stated	<ul style="list-style-type: none"> <li>Enter the date of installation and name of the charged personnel in the main unit nameplate.</li> <li>Fill in necessary information to warranty card and hand it over to customer</li> <li>Explain how to contact with service personnel</li> </ul>	9. SERVICE & REPAIR (P.39)	

## 14. For inquiries, please contact

### Limited Liability

Always operate equipment in strict compliance to the handling and operation procedures set forth by this instruction manual.

Yamato Scientific Co., Ltd. assumes no responsibility for malfunction, damage, injury or death resulting from negligent equipment use.

Never attempt to disassemble, repair or perform any procedure which are not expressly mandated by this manual.

Doing so may result in equipment malfunction, serious personal injury or death.

### Notice

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

Instruction Manual  
Thermal Resistance Measurement Device  
TE100 Series  
First Edition      September 13, 2023  
Revision -

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Customer service center  
Toll Free 0120-405-525  
Inquiry from a mobile phone: 0570-064-525  
FAX:055-284-5210  
Service time:9:00-17:30 \* Saturdays, Sundays,  
National holidays are excluded



<https://www.yamato-net.co.jp>