



High temp oven

DR201

Instruction Manual

First Edition

Thank you for choosing High Temp oven DR201 from Yamato Scientific Co., Ltd.

•For proper equipment operation, please read and become thoroughly familiar with this instruction manual before use. Always keep equipment documentation safe and close at hand for convenient future reference.



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

Yamato Scientific Co. Ltd.

Printed on recycled paper

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1. SAFETY PRECAUTIONS

Explanation of Symbols

A Word Regarding Symbols

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

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

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

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

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

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

Symbol Meanings



Signifies warning or caution.
Specific explanation will follow symbol.



Signifies restriction.
Specific restrictions will follow symbol.



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

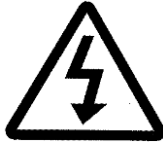
1. SAFETY PRECAUTIONS

Symbol Glossary

WARNING / CAUTION



General



Danger!
High Voltage



Danger!
Extremely Hot



Danger!
Moving Parts



Danger!
Blast Hazard



Caution:
Water Only



Caution:
Shock Hazard!



Caution:
Burn Hazard!



Caution:
Do Not Heat
Without Water!



Caution:
May Leak Water!



Caution:
Toxic Chemicals

RESTRICTION



General
Restriction



No Open Flame



Do Not
Disassemble



Do Not Touch

ACTION



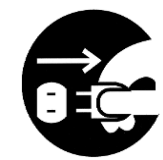
General Action
Required



Connect Ground
Wire



Level Installation



Disconnect Power



Inspect
Regularly

1. SAFETY PRECAUTIONS

WARNING / 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.

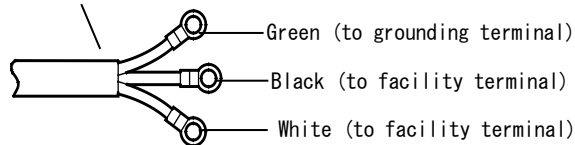
See "LIST OF HAZARDOUS SUBSTANCES" (P.56) for information on flammable and explosive gases.

Ground wire **MUST** be connected properly



- Grounding to Electrical Equipment Technical Standards, Section 19, class D (Grounding Resistance Max. 100Ω) is required in Japan where no grounding terminal is provided. Contact a local dealer, electrician, or Yamato Sales office for location-specific electrical requirements.
- Connect terminals securely to facility terminal or to an appropriate connector.

3 (three) Round Terminals for M4 screws



Plugs and connectors are not included with this unit.

Ground unit properly to facility outlet or terminal as required.



Never connect ground wire to gas lines, water pipes, telephone grounding line, lightning rods. Doing so may result in fire or electrical shock.



Turn OFF ELB immediately when an abnormality occurs.

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



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.

1. SAFETY PRECAUTIONS

WARNING / CAUTION



Handle power cable with care.

- Do not operate unit with power cable bundled or tangled. Operating unit with the power cable bundled or otherwise tangled, may cause power cable to overheat and/or catch fire.
- Do not modify, bend, forcibly twist or pull on power cable. Fire or electric shock may result.
- Do not risk damage to power cable by positioning it under desks or chairs, or by allowing it to be pinched in between objects. Fire or electric shock may result.
- Do not place power cable near kerosene/electric heaters or other heat-generating devices. Doing so may cause power cable insulation to overheat, melt and/or catch fire, which may result in electric shock.
- Turn off ELB immediately and disconnect from facility terminal or outlet, if power cable becomes partially severed or damaged in any way. Contact original dealer of purchase for information about replacing power cable. Continuing to operate without addressing abnormalities may cause fire or electric shock, resulting in serious injury or death.
- Always connect power cable to appropriate facility outlet.



DO NOT touch hot surfaces

Do not touch the door and exhaust port during operation, or immediately after operation.
Burn injury may result.



DO NOT climb or place any objects on top of equipment.

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



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.

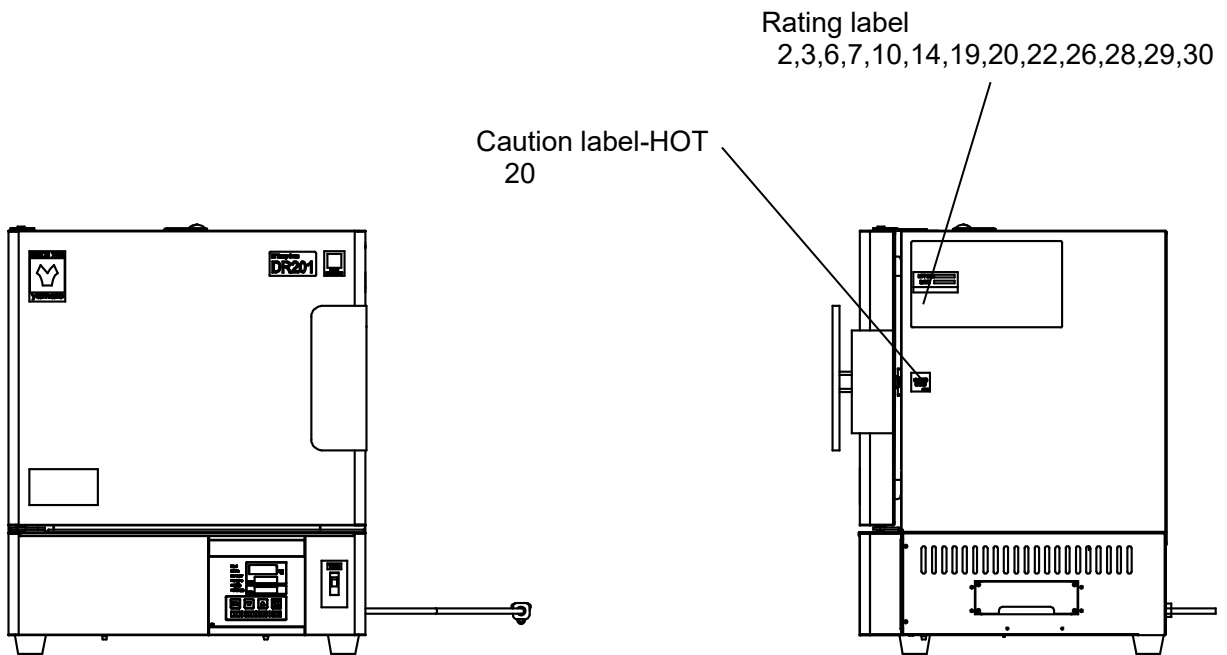
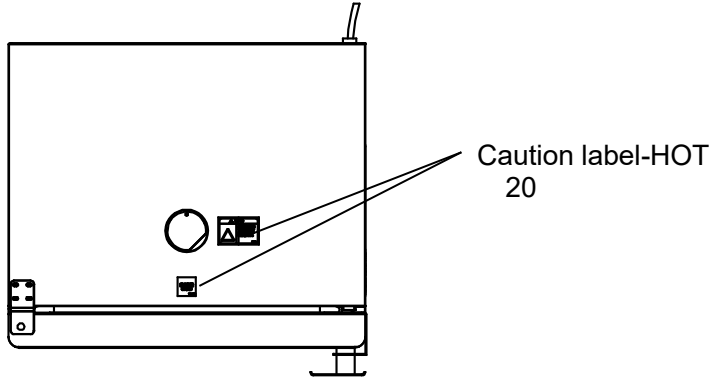
1. SAFETY PRECAUTIONS

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.



***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

1. SAFETY PRECAUTIONS List of Residual Risks

List of residual risks (instructions for risk avoidance)

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

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

Loading/Installation				
No.	Degree of risks	Risk description	Protective measures taken by the user	Relevant page
1	CAUTION	Injury	Always use cargo-handling equipment to move or install unit. Transport unit with sufficient number of people and an appropriate work method when carrying out manually.	P.13
2	WARNING	Fire/ Electric shock	Choose an appropriate installation site.	P.12
3	CAUTION	Injury	Install unit on a level surface.	P.13
4	CAUTION	Injury	Take appropriate safety measures when installing.	P.13
5	WARNING	Fire	Install equipment in a well-ventilated place	P.13
6	WARNING	Fire/Electric shock	Install in a dry location.	P.14
7	WARNING	Explosion/fire	Install in a location free of flammables and explosives.	P.3
8	WARNING	Fire/Electric shock	Always connect power cable to appropriate facility outlet or terminal.	P.14
9	WARNING	Fire/Electric shock	Handle power cable with care.	P.4
10	WARNING	Fire/Electric shock	Ground wire MUST be connected properly	P.エラー! ブックマークが定義されていません。
11	WARNING	Fire/Electric shock	DO NOT disassemble or modify equipment.	P.3
12	WARNING	Burn	Since this product gets hot, never use it in two layers.	P.14
13	CAUTION	Fire	Place samples only on dedicated chamber racks. Use caution not to exceed maximum load rating and space test samples appropriately.	P.20

1. SAFETY PRECAUTIONS

List of Residual Risks

Use				
No.	Degree of risks	Risk description	Protective measures taken by the user	Relevant page
14	WARNING	Explosion/fire	DO NOT process explosive or flammable substances	P.45
15	WARNING	Fire	When using resin containers for processing, use caution not to exceed their heat-resistant temperature.	P.45
16	WARNING	Fire/Electric shock	Turn OFF ELB immediately when an abnormality occurs.	P.3
17	WARNING	Fire/Electric shock Burn	Take care not to drop test samples or objects into the inside unit.	P.45
18	CAUTION	Fire	In the event of a power failure with Auto-resume mode "ON", unit automatically reverts to status just before power loss and begin operation once again from that point. Be sure to confirm the state of unit when the power is supplied again.	P.46
19	CAUTION	Burn	DO NOT open or close the door when unit is at high temperature. When handling samples while unit is hot, be sure to wear protective equipment against burn injury.	P.45
20	WARNING	Burn	DO NOT touch hot surfaces	P.4
21	WARNING	Fire	Place samples only on dedicated chamber racks.	P.20
22	WARNING	Injury	DO NOT climb or place any objects on top of equipment.	P.4
23	WARNING	Fire	DO NOT operate equipment during thunderstorms	P.4
24	CAUTION	Burn Injury	ALWAYS run equipment within specified temperature range.	P.46
25	WARNING	Burn	Pay attention to internal temperature after operation.	P.45
26	WARNING	Fire/Electric shock	Carefully handle test samples.	P.45
27	WARNING	Fire/Electric shock	When processing wet samples, remove as much of the moisture as possible beforehand.	P.46
28	WARNING	Burn Injury, fire	DO NOT place samples exceeding 15 kg on a single rack. Space test samples appropriately and leave more than 30% of space on chamber rack.	P.20
29	WARNING	Fire	Set the overheat prevention activation temperature.	P.45

1. SAFETY PRECAUTIONS

List of Residual Risks

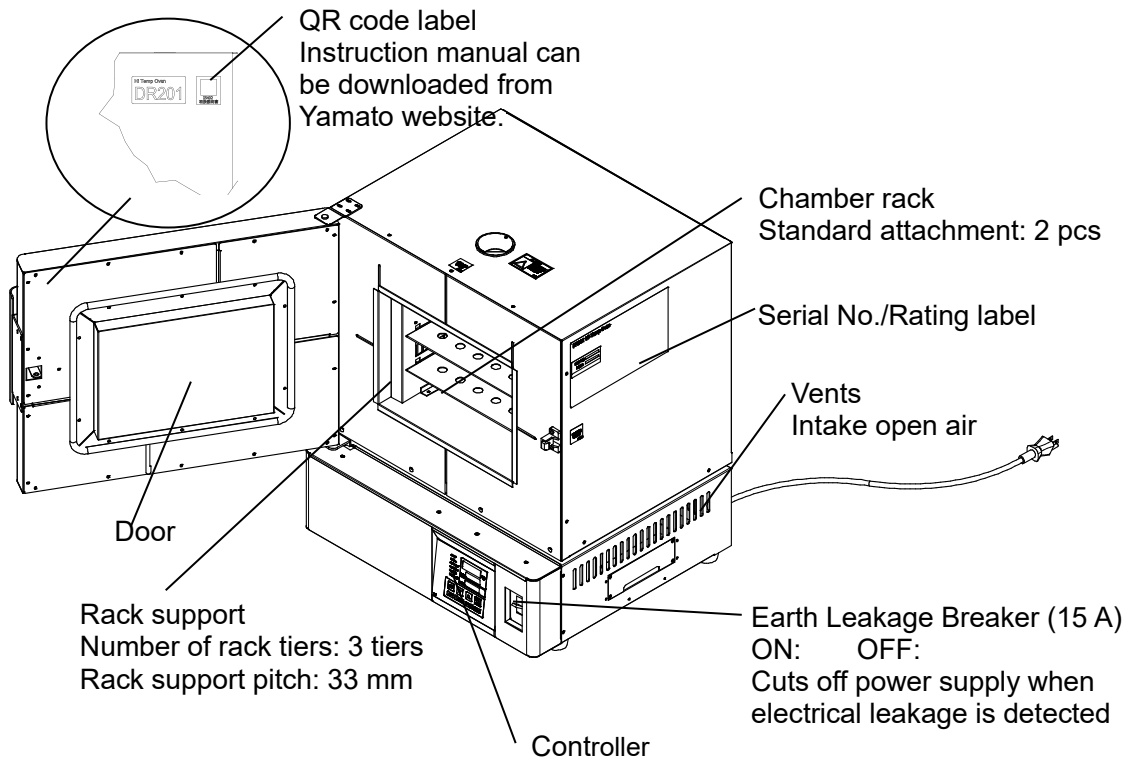
Daily inspection/maintenance				
No.	Degree of risks	Risk description	Protective measures taken by the user	Relevant page
30	WARNING	Fire/Electrical shock	Be sure to disconnect power cable before daily inspection and maintenance.	P.48
31	WARNING	Burn	Perform inspections and maintenance when unit is at room temperature.	P.48
32	WARNING	Fire/Electrical shock	DO NOT disassemble or modify equipment.	P.3

Extended storage/disposal				
No.	Degree of risks	Risk description	Protective measures taken by the user	Relevant page
33	WARNING	Fire/Electrical shock	Turn OFF ELB and disconnect power cable from facility outlet or terminal.	P.49
34	CAUTION	Injury	Do not leave unit in a location where children may have access	P.49
35	CAUTION	Injury Lock-in	Remove door handle and hinges to prevent it from locking.	P.49

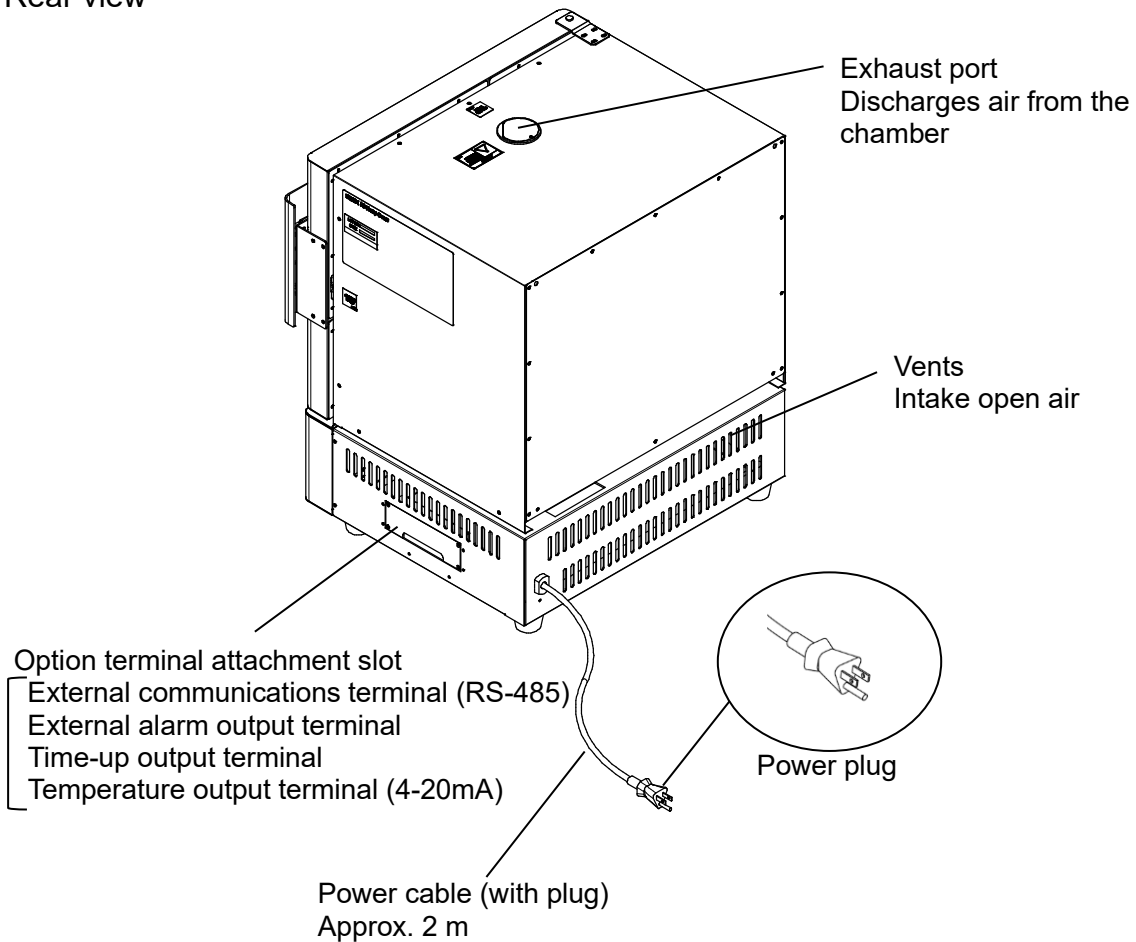
2. COMPONENT NAMES AND FUNCTIONS

This product (DR201)

◆ Front

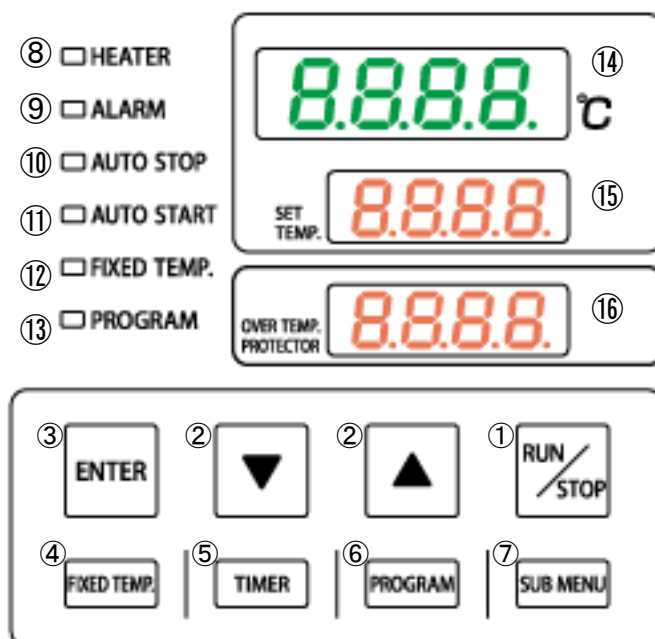


Rear view



2. COMPONENT NAMES AND FUNCTIONS

Control panel

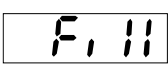
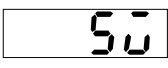
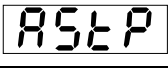
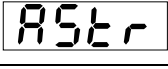
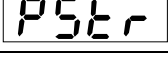

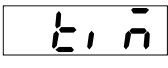

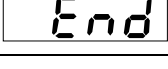
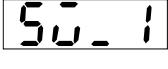
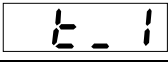
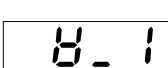
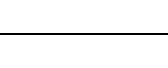
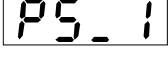
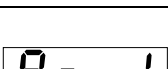
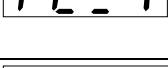

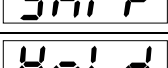
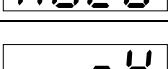
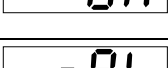
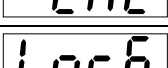


No	Panel Item	Description
①	RUN/STOP Key	Press one second to start or stop an operation
②	▼▲keys	Press to increase or decrease the setting value Pressing the ▼ key during operation other than Fixed temperature operation switches indications described in ⑮
③	ENTER key	Press to finalize setting
④	FIXED TEMP Key	Press to select Fixed temperature operation
⑤	TIMER key	Press to select and set a timed operation Quick auto stop, Auto stop, Auto start, and Program operations may be selected * Quick auto stop is available only in Fixed temperature operation
⑥	PROGRAM key	Press to begin creating programs or to select Program operation Total of 6 programs (PrG1-6) may be set
⑦	SUB MENU Key	Press and hold for two seconds to enter Submenu Overheat prevention temperature setting, Calibration offset, Keypad lock, Auto-resume function, Wait function, and Program repeat function may be set
⑧	HEATER lamp	Illuminates when heater is on and drawing power
⑨	ALARM lamp	Illuminates when an error occurs
⑩	AUTO STOP lamp	⑫ illuminates in Fixed temperature operation, flashes while setting
⑪	AUTO START lamp	⑩⑫ illuminate in Auto stop and Quick auto stop operations, flash while setting *
⑫	FIXED TEMP. Lamp	⑪⑫ illuminate in Auto start operation, flash while setting
⑬	PROGRAM Lamp	⑬ illuminates in Program operation, flashes while setting ⑪⑬ illuminate in Program auto start operation, flash while setting Flashes during each setting and Illuminates during operation * ⑩ does not flash while setting Quick auto stop operation
⑭	Temperature reading display	Shows current chamber temperature, setting characters, and error codes
⑮	Temperature setting display	Shows temperature setting, remaining time, operation mode, and program step number
⑯	Overheat prevention display	Shows overheat prevention temperature setting

2. COMPONENT NAMES AND FUNCTIONS

Display Characters

All characters displayed when making settings and during operation are defined as follows:

Character	Letters	Panel Item	Purpose
	Fix	Fixed temperature operation	Appears during Fixed temperature operation
	Sv	Temperature setting	Appears while entering temperature settings for Fixed temperature operation and timed operations
	AStP	Auto stop	Appears during Auto stop operation
	AStr	Auto start	Appears during Auto start operation
	PStr	program Auto start	Appears during Program auto start operation
	W_F	Auto stop Wait setting	Wait mode ON/OFF setting on Auto stop and Quick auto stop operations
	tim	Timer setting	Appears while entering timer settings
	PrG 1-6	Program number	Means the program number of programs 1-6 P.29 Refer to "Program operation"
	End	End of operation	Appears when a programmed operation or a timed operation is completed
	Sv_ 1-30	program Temperature setting	Appears while setting temperature for each step in a program. Shows from Sv_1 to Sv_30 (for PrG1)
	T_ 1-30	program Timer setting	Appears while setting timer for each step in a program Shows from t_1 to t_30 (for PrG1)
	W_ 1-30	program Step Wait setting	Appears while setting Wait mode on each program step Shows from W_1 to W_30 (for PrG1) See "Wait function" (P.34) for detailed instructions.
	PS_ 1-30	Point of return	Appears when selecting step numbers to be repeated in a program Shows from PS_1 to PS_30 (for PrG1) See "Repeat Function" (P.35)
	Pc_ 1-30	Number of times to repeat	Appears when setting the number of times to repeat steps in a program Shows from Pc_1 to Pc_30 (for PrG1) See "Repeat Function" (P.35)
	St_ 1-30	program Step number	Appears to show the currently running step Shows from St_1 to St_30 (for PrG1)
	SKiP	Step Skip function	Appears when selecting which program step to skip
	HoLd	Step Hold function	Appears while setting step hold function
	oH	Overheat prevention	Appears while setting activation temperature for overheat prevention device See "Overheat Prevention Device Setup" (P.19)
	cAL	Carib	Appears while entering offset temperature values See "Other Functions: Calibration Offset" (P.38)
	LoCk	Set value lock function	Appears while setting Keypad lock function See "Other Functions: Keypad Lock" (P.39)
	Pon	Auto-resume mode select	Appears while setting Auto-resume function See "Other Functions: Auto-resume Function" (P.40)

* For more information about key operation flow, see "Mode & Function Flow" (P.17-18)

3. PRE-OPERATION PROCEDURES

Installation Precautions



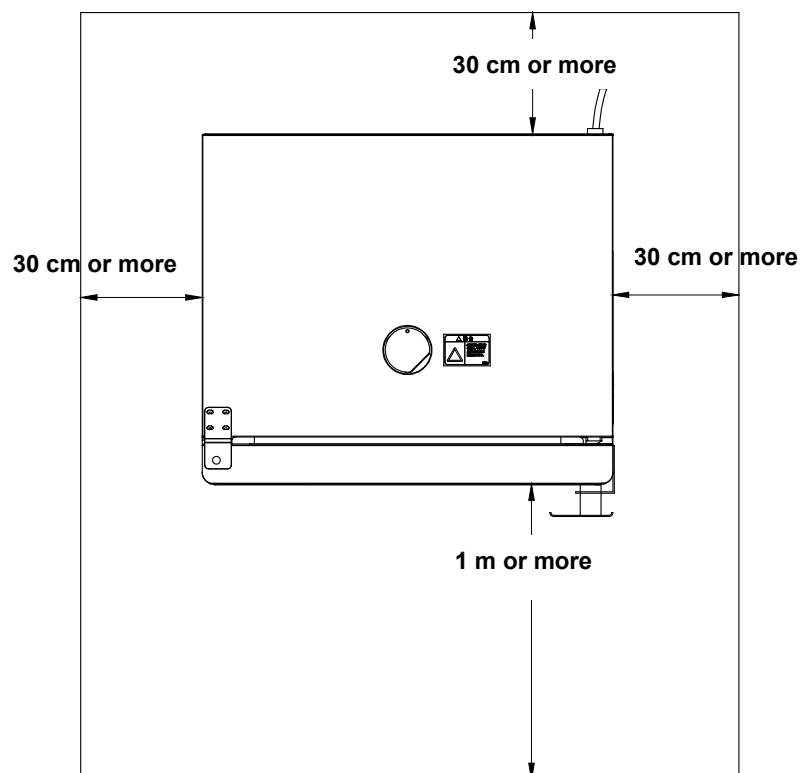
Choose an appropriate installation site.

DO NOT install unit:

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



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



Leave 60 cm or more space above unit

The recommended space is described in reference to the Tokyo Fire Prevention Ordinance.

Install unit as stipulated by the ordinance of each prefecture.

3. PRE-OPERATION PROCEDURES

Installation Precautions



Use cargo-handling equipment for transportation and installation.

Always use cargo-handling equipment to move or install unit. Transport unit with sufficient number of people and an appropriate work method when carrying out manually.

Approx. weight: DR201 36kg



Install unit on a level surface.

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



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.

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

DR201: 115 V AC single phase 50/60 Hz 11.5A (ELB capacity 15 A)
: 220 V AC single phase 50/60 Hz 7.5A (ELB capacity 10 A)

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.

Inserting multiple cords into a single outlet, using branch outlets or extension cords, may cause a drop in voltage, which may affect performance, resulting in failure to control or maintain proper temperature.



Install equipment in a well-ventilated place

Install unit so that side and rear panel vents are unobstructed and allowed to sufficiently diffuse heat.

Doing so may result in excessive temperatures inside the unit control panel, causing possible degraded CPU board performance, malfunction or fire.

See "COMPONENT NAMES AND FUNCTIONS" (P.9) for location

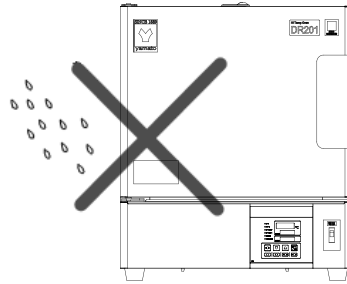
3. PRE-OPERATION PROCEDURES

Installation Precautions



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, electrical shock and/or fire.



Please do not use it in two layers.

Since this product gets hot, never use it in two layers.



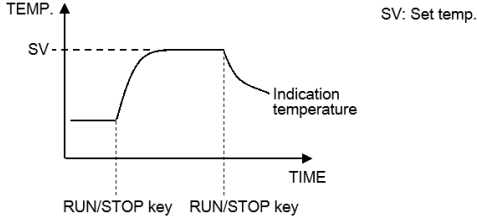
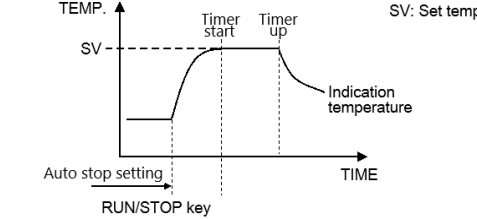
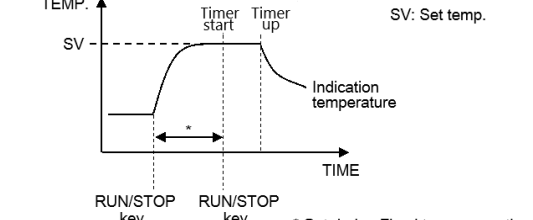
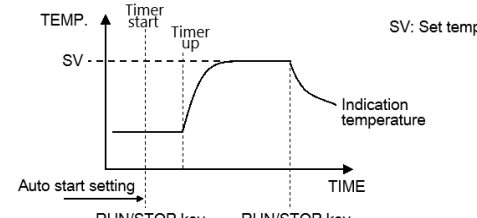
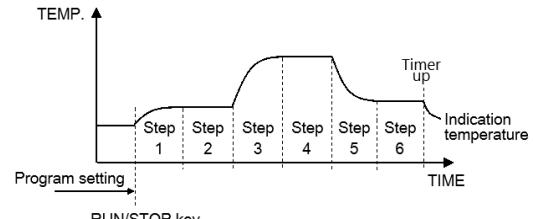
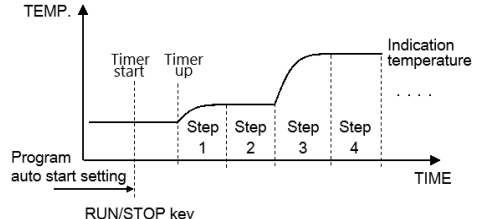
Initial operation

When operating for the first time, some atypical odors may emit from unit which are the result of burn-off from heat insulation, bonding material, etc., and is normal. It is recommended to run unit at the highest temperature before use.

4. PRE-OPERATIVE PREPARATIONS

Operation Modes and Functions

Operation modes for this unit are defined in the table below

	Description	Page
<p>Fixed temperature operation This mode runs unit at a constant selected temperature.</p>	 <p>TEMP. SV: Set temp. Indication temperature TIME RUN/STOP key RUN/STOP key</p>	P.21
<p>Auto stop operation This mode is used to automatically terminate an operation when a specified time period has passed (decided before operation). Timer begins counting down when chamber temperature reaches the temperature setting, and operation stops automatically when timer reaches 0.00</p>	 <p>TEMP. SV: Set temp. Indication temperature TIME Auto stop setting RUN/STOP key</p>	P.23
<p>Quick auto stop operation This mode is used to automatically terminate an operation when a specified time period has passed (decided during operation). Constant Temperature/Quick Auto Stop Operation</p>	 <p>TEMP. SV: Set temp. Indication temperature TIME RUN/STOP key RUN/STOP key * Set during Fixed temp. operation</p>	P.22
<p>Auto start operation It is used when "I want to start the fixed value operation automatically after the set time". Fixed temperature operation will start after the time is up.</p>	 <p>TEMP. SV: Set temp. Indication temperature TIME Auto start setting RUN/STOP key RUN/STOP key</p>	P.25
<p>Program operation This operation is used to run a combination of temperatures, times and modes as one operation. In the figure at right, the line pattern which indicates time variation of the set temperature is called "program", and each straight line which is a combination of set temperature and set time is called "step".</p>	 <p>TEMP. Indication temperature TIME Program setting RUN/STOP key</p>	P.29
<p>Program operation auto start This mode is used to specify an automatic start time for constant temperature operation. Program operation will start after the time is up.</p>	 <p>TEMP. Indication temperature TIME Program auto start setting RUN/STOP key</p>	P.27

4. PRE-OPERATIVE PREPARATIONS

Operation Modes and Functions

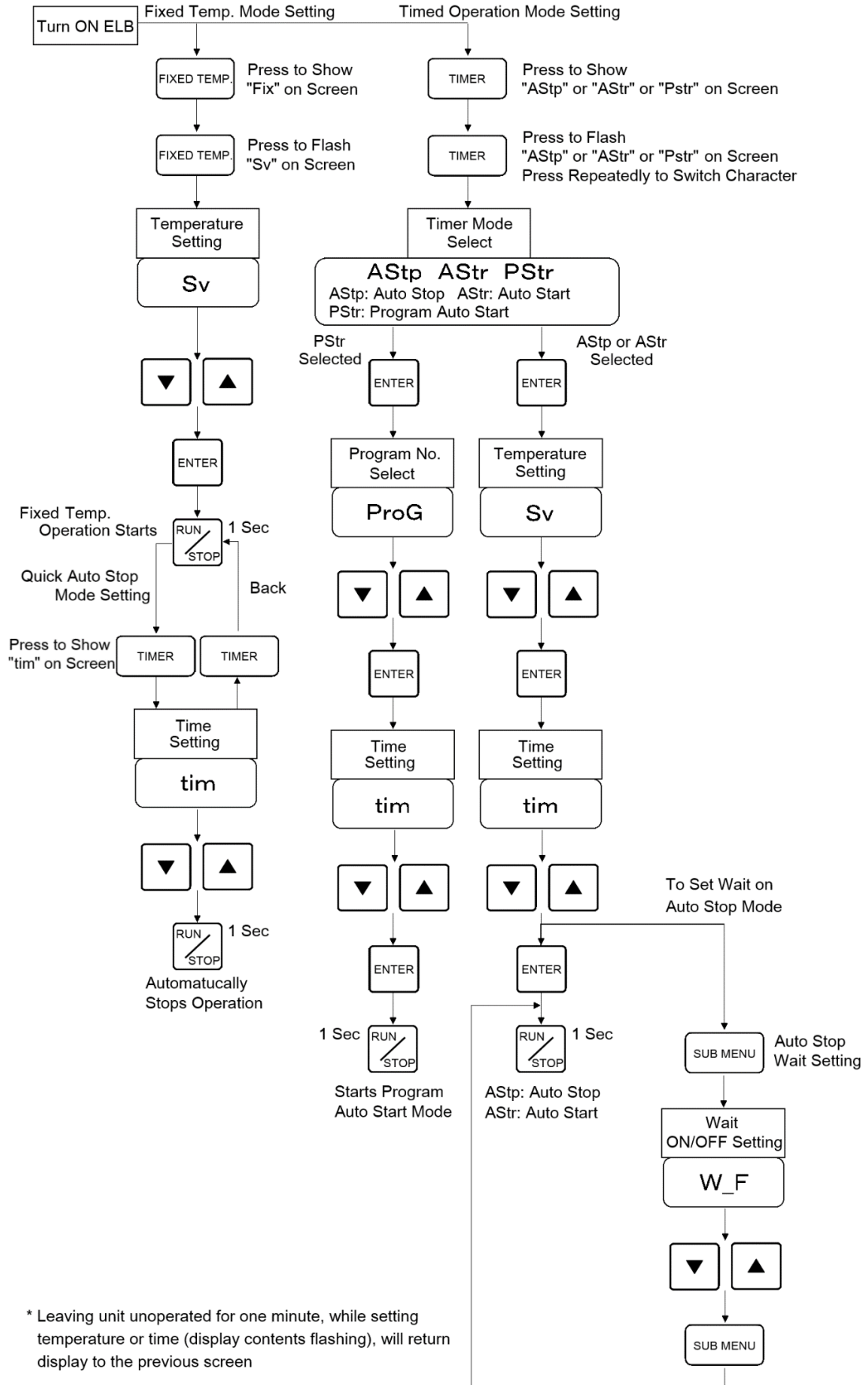
Operation functions for this unit are defined in the table below:

Description	Page
<p>Automatic overheat prevention This function is set to automatically activate when chamber temperature exceeds the temperature setting by 12 °C. Unit will restart heater control when chamber temperature comes within temperature setting +12 °C (Error code is not displayed)</p>	—
<p>Overheat prevention device (oH) Although this device uses the same power source, display, and keypad as the control panel, it has an independent temperature monitoring circuit and sensor.</p> <p>When chamber temperature exceeds temperature setting of the overheat prevention device, power supply to heater is shut off and error lamp illuminates. Operation may be restarted when ELB is switched off (wait 5 seconds), then back on again.</p> <p>(manual reset) This setting can be made from Submenu.</p>	P.19
<p>Calibration offset (cAL) Calibration offset function is to compensate for differences in the temperature reading (as taken by unit sensor) and actual chamber temperature (as taken manually with a thermograph). Unit can be offset to either the positive or negative side of temperature line for entire temperature range of unit This setting can be made from Submenu.</p>	P.38
<p>Overheat prevention temperature calibration function The temperature specified for the overheat prevention device is automatically recalibrated when temperature reading is corrected with Calibration offset.</p>	—
<p>Keypad lock (Lock) This function locks all the keys that may change setting values. This setting can be made from Submenu.</p>	P.39
<p>Auto-resume mode select (Pon) This is to select whether unit remain standby or resume operation at the time of recovery from power failure. Unit can begin operation again with the same settings (in memory) as before the power failure occurred. This setting can be made from Submenu.</p>	P.40

4. PRE-OPERATIVE PREPARATIONS

Mode & Function Flow

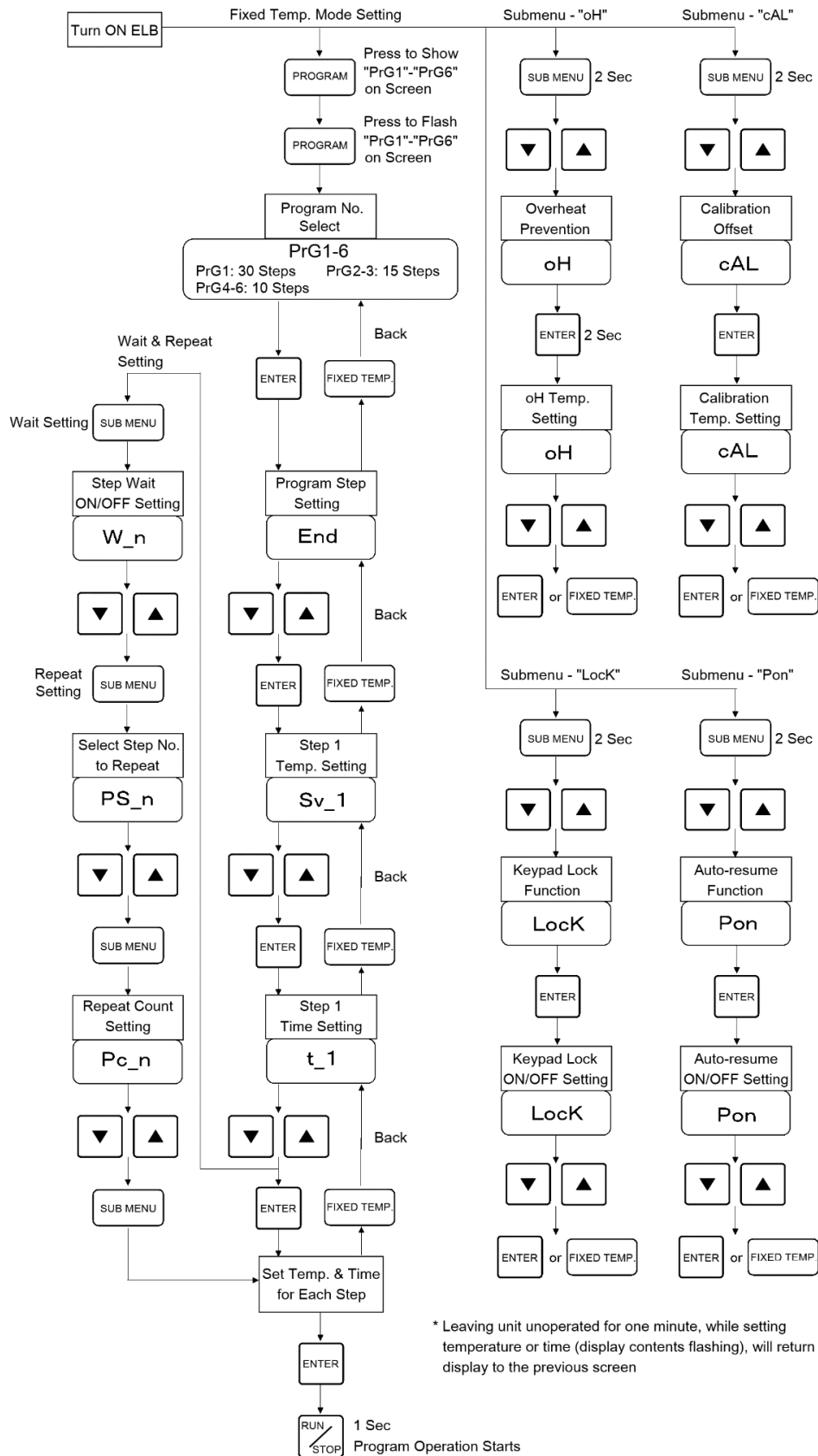
The following chart illustrates operation flow of Fixed temperature operation and timed operations.



4. PRE-OPERATIVE PREPARATIONS

Mode & Function Flow

The following chart illustrates operation flow of Program operation and Submenu.



4. PRE-OPERATIVE PREPARATIONS

Overheat Prevention Device Setup

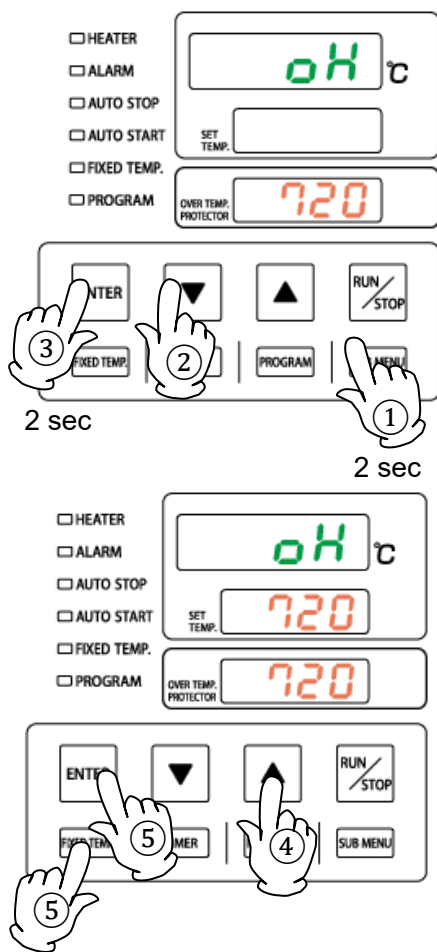
Setting range/function

The overheat prevention device temperature setting range is from 0 °C to 50 °C (750 °C) beyond the maximum temperature setting of this unit.

When chamber temperature exceeds objective temperature setting and reaches that of the overheat prevention device, the heater circuit is shut off and error code "Er19" is shown flashing in the control panel display, accompanied by a sounding alarm.

Once activated, "Er19" continues to be displayed until ELB is turned off, then back on.

• Setting temperature for overheat prevention



1. Turn ON ELB

Initial values will be shown for about five seconds after power-on, then displays will switch to the initial settings screen, showing current chamber temperature, operation mode character and overheat prevention setting.

2. Set temperature for overheat prevention

- ① Press the **SUB MENU** key for about two seconds. Character in top display will flash.
- ② Press the **▼▲** keys several times until "oH" shows in top display.
- ③ Press the **ENTER** key for about two seconds. The temperature setting will be shown flashing in center display.

Note: To prevent false errors, set the value 20 °C or more above the main temperature setting.

- ④ Set the temperature using the **▼▲** keys.
- ⑤ Press the **ENTER** key or the **FIXED TEMP.** key to finalize the setting.

* Setting change can also be made during operation.



CAUTION

- ① Overheat prevention device is designed to protect unit against overheating, to prevent damage to human body, not to protect test samples against damage caused by overheating, nor to protect against injury or death resulting from negligence from processing explosives, inflammables or other hazardous substances in this unit.
- ② Operation may be terminated by overheat prevention device activation, when overheat prevention device temperature setting and unit target temperature are less than 20 °C apart.
The default setting is 720 °C.

4. PRE-OPERATIVE PREPARATIONS

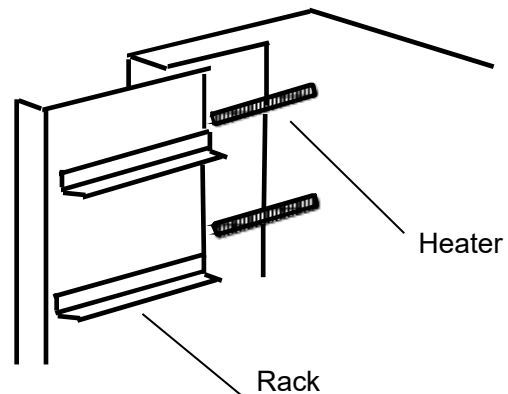
Installing chamber racks

Chamber rack in the chamber interior can be set at any position on the three-tiered rack support plate depending on the size and amount of the sample.

This unit includes two chamber rack.

Set it on the rack support plate in the Chamber interior.

* Make sure that the rack is properly in place and does not rattle or fall.



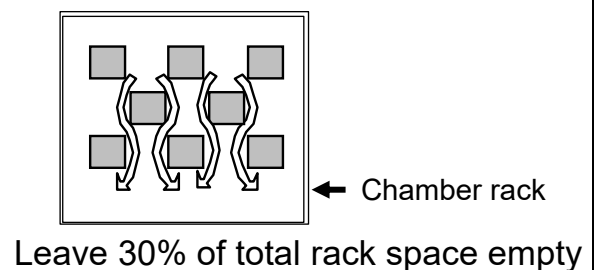
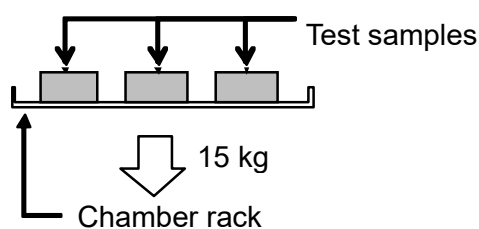
CAUTION

Always place test samples considering air flow in the chamber, in order to maintain the temperature control performance.

Heater is installed on the back of the rack support plate. For this reason, the temperature of the rack support plate and its vicinity may always be higher than the set temperature, and if the sample comes into contact with the rack support plate, there is a risk of burning of the sample or a fire. Please provide a space between the rack support plate.

The load capacity of supplied rack is approximately 15 kg each, when load is evenly distributed. Arrange test samples evenly on racks, leaving as much space between them as possible. Bunching items together to get more onto a rack may prevent proper temperature control. Place samples alternately to keep air to flow during operation. As a rule of thumb, use approximately 70% of entire rack space or less, when placing items, to ensure better temperature control accuracy.

Placing chamber racks on all tiers may impair the air flow, degrading temperature control performance.



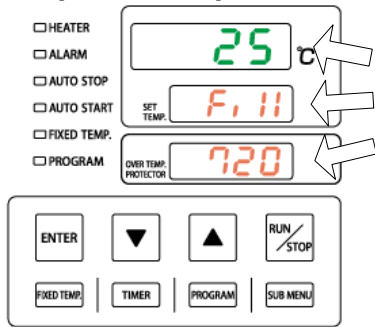
DO NOT place items on bottom surface of chamber

Place samples only on dedicated chamber racks. Operating unit with test samples placed directly on bottom surface of chamber (diffuser panel) may cause unit to perform poorly. Likewise, chamber temperature may become excessive, causing malfunction or damage. Always use the supplied chamber racks, supported on the standard supports, and avoid placing any items on bottom surface. Do not allow test samples to contact chamber walls.

5. OPERATION PROCEDURES

Fixed Temperature Operation

Run a Fixed temperature operation



1. Turn ON power (ELB)

Initial values will be shown for about five seconds after power-on, then displays will switch to the initial settings screen, showing current chamber temperature (top), operation mode character (center) and overheat prevention setting (bottom).

Top: Shows current temperature in the chamber and other setting information.
 Center: Shows temperature setting and other setting information
 Bottom: Displays the temperature setting of overheat prevention device
 For more on mode and setting characters, see "Display Characters" (P.11)



2. Select operation mode

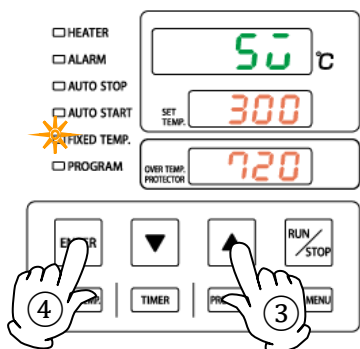
① Press the **FIXED TEMP** key.

F, 11, signifying Fixed temperature operation, will show in center display.

3. Set the temperature

② Press the **FIXED TEMP** key again.

50, signifying temperature setting, will show in top display. Current temperature will flash in center display. **FIXED TEMP** lamp also flashes.



③ Set the temperature using the **▼▲** keys.

④ Press the **ENTER** key to finalize the setting.

4. Start operation

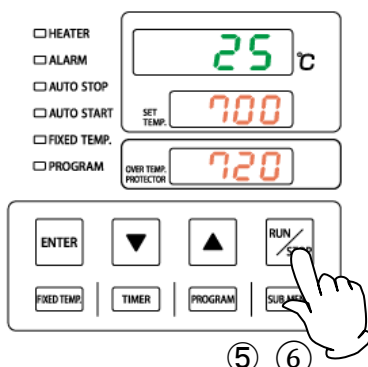
⑤ Press the **RUN/STOP** key for about one second.

Unit will begin operation and **FIXED TEMP** lamp will illuminate.

5. Stop operation

⑥ Press the **RUN/STOP** key for about one second.

Operation will stop (terminate) and the **FIXED TEMP** lamp will go out. Control panel reverts to initial settings screen.



1 sec

• Setting value loop function

When setting temperature or time by the **▼** or **▲** key, the setting value cycles in the setting range; when it reaches the maximum settable value, it returns to minimum and goes up again.

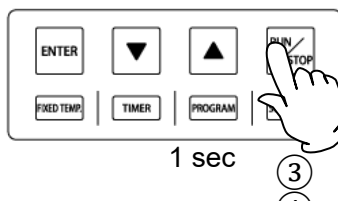
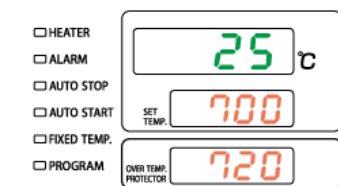
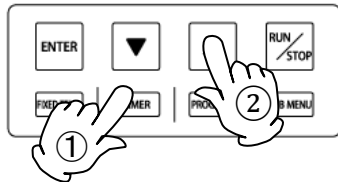
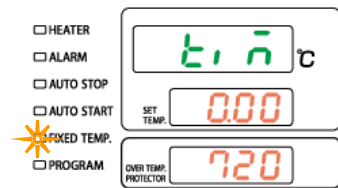
• Editing and confirming settings

Changing Temperature during operation is possible by pressing the **FIXED TEMP** key. Use the **▼▲** keysto change the setting values. Press the **ENTER** key when changes have been entered.

5. OPERATION PROCEDURES

Quick Auto Stop Operation

• Run a Quick auto stop operation



1. Set timer during Fixed temperature operation

- ① Make sure that unit is running Fixed temperature operation by confirming that FIXED TEMP lamp is illuminated, then press the **TIMER** key.

Top display will show **t.n**, signifying the timer setting.

Current timer setting will flash in center display.

Pressing the **TIMER** key in this state returns display to Fixed temperature mode.

- ② Set the timer using the **▼▲** keys.

2. Start operation

- ③ Press the **RUN/STOP** key for about one second after setting the timer. **FIXED TEMP** and **AUTO STOP** lamps will illuminate, indicating Quick auto stop operation has started.

3. Stop operation

- ① Operation stops automatically when the timer reaches 0.00, and an accompanying alarm sounds for approximately five seconds after operation terminates.

Center display will show **End**, indicating end of operation, with **FIXED TEMP** and **AUTO STOP** lamps illuminated.

Press the **RUN/STOP** key to finish Quick auto stop operation.

Displays will return to initial settings screen.

Pressing the **RUN/STOP** key for about one second during operation will terminate operation and the displays will return to initial settings screen.

• Wait mode for Quick auto stop operation

Check whether Wait setting (**H-F**) is "oFF" or "on" before starting an operation.

With this function "on", timer stops counting down when temperature reading goes out of the range of target temperature ± 3 °C, and resumes counting when it comes within the range again.

When "oFF" is set, quick auto stop operation starts regardless of the relationship between the measured temperature and the set temperature.

• Editing or confirming settings

Changing temperature during operation is possible by pressing the **FIXED TEMP** key. Use the **▼▲** keys to change the setting values. Press the **ENTER** key when changes have been entered.

Changing the timer setting during operation can be done without terminating operation, simply by pressing the **TIMER** key. Use the **▼▲** keys to change the setting values. Press the

TIMER key when changes have been entered. Note that the time which has already elapsed will be subtracted from the new setting.

Press the **▼** key at any time during operation to see temperature setting, operation mode and remaining time in center display.

• Timer function

Maximum value for timer is "999 hours and 50 minutes". The time can be set in increments of one minute under 99 hours and 59 minutes, and ten minutes after 100 hours.

When the **▼▲** keys are held down, values advance perpetually.

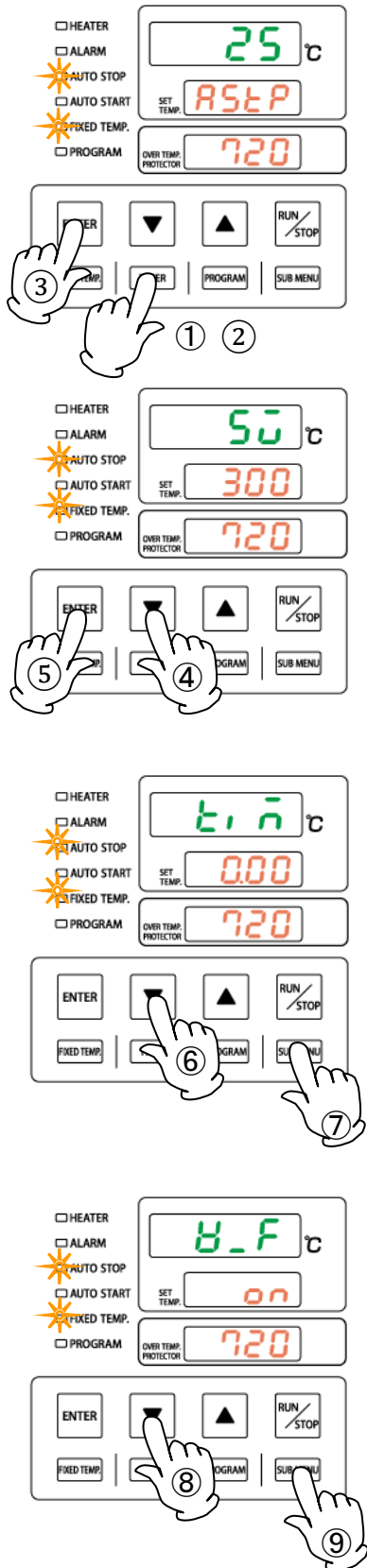
Press repeatedly for incremental adjustment.

※ **This is common to all the operation modes except for Fixed temperature mode.**

5. OPERATION PROCEDURES

Auto Stop Operation

Run an Auto stop operation



1. Set stop time

- ① Press the **TIMER** key on the initial settings screen. Mode used in the previous session will be shown in center display.
- ② Press the **TIMER** key again and center display will begin flashing. Press the **TIMER** key repeatedly to select , signifying Auto stop operation.

AUTO STOP and FIXED TEMP lamps will begin flashing.

- ③ Press the **ENTER** key. **50** , signifying temperature setting, will show in top display. Current temperature will flash in center display.

- ④ Set the temperature using the **▼▲** keys.

- ⑤ Press the **ENTER** key. Top display will show **t.n** , signifying the timer setting. Current timer setting will flash in center display.

- ⑥ Set the timer using the **▼▲** keys.

- ⑦ Press the **SUB MENU** key. Top display will show **u.F** , signifying Wait setting, and center display will show "oFF" or "on".

- ⑧ Press the **▼▲** key to select preferred setting.
 - ※ **The default setting is "on".**

- ⑨ Press the **SUB MENU** key to finalize the setting.

※ Wait setting can be skipped by pressing the **ENTER** key after STEP ⑥.

5. OPERATION PROCEDURES

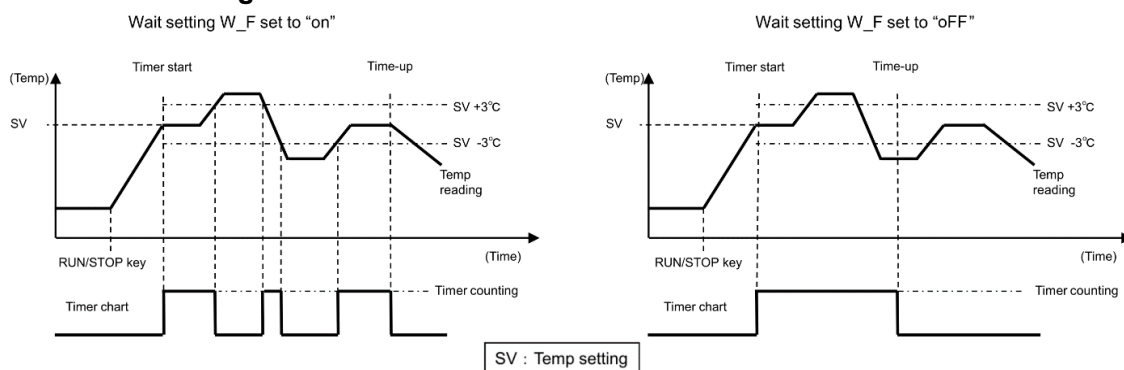
Auto Stop Operation

• Wait mode for Auto stop operation

Timer will start counting down after chamber temperature reaches the target temperature. When Wait **W_F** is set to "on" and temperature reading comes outside the range of target temperature $\pm 3^\circ\text{C}$, timer will stop counting.

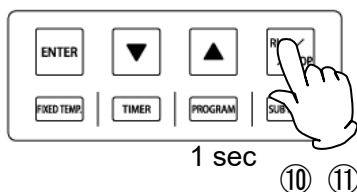
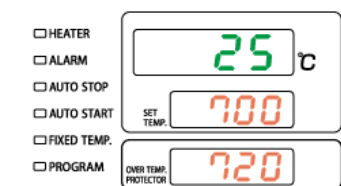
When set to "oFF", timer continues counting regardless of the difference between temperature reading and temperature setting.

※ **The default setting is "on".**



2. Start operation

- ⑩ Press the **RUN/STOP** key for about one second after setting the timer. **FIXED TEMP** and **AUTO STOP** lamps will illuminate, indicating Auto stop operation has started. Timer begins counting down when chamber temperature reaches the set temperature.



3. Stop operation

- ⑪ Operation stops automatically when timer reaches 0.00, and an accompanying alarm sounds for approximately five seconds after operation terminates. Center display will show **End**, indicating end of operation, with **FIXED TEMP** and **AUTO STOP** lamps illuminated.

Press the **RUN/STOP** key to finish Auto stop operation.

Displays will return to initial settings screen.

Pressing the **RUN/STOP** key for about one second during operation will terminate operation and the displays will return to initial settings screen.

• Editing or confirming settings

Changing temperature setting or timer setting during operation can be done by pressing the **TIMER** key. Use the **▼▲** keys to change the setting values. Press the **ENTER** key when changes have been entered as desired.

Note that the time which has already elapsed will be subtracted from the new setting.

Press the **▼** key at any time during operation to see temperature setting, operation mode and remaining time in center display.

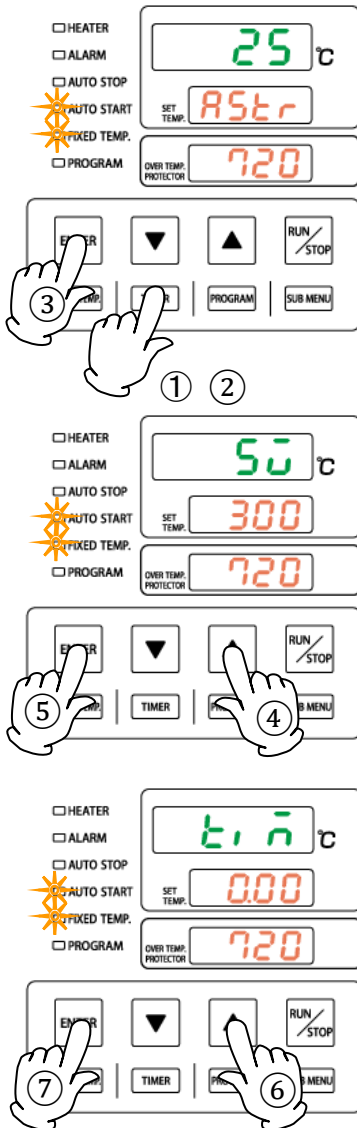
Remaining time may be seen with decimal point constant as an indicator that unit is in wait status while temperature rises or falls toward the set temperature. When decimal point begins flashing, timer is counting down.

5. OPERATION PROCEDURES

Auto Start Operation

• Run an Auto start operation

1. Set start time



① Press the **TIMER** key on the initial settings screen. Mode used in the previous session will be shown in center display.

② Press the **TIMER** key again and center display will begin flashing.

Press the **TIMER** key repeatedly to select **AStr**, signifying Auto start operation. **AUTO START** and **FIXED TEMP** lamps will begin flashing.

③ Press the **ENTER** key.

50, signifying temperature setting, will show in top display. Current temperature will flash in center display.

④ Set the temperature using the **▼▲** keys.

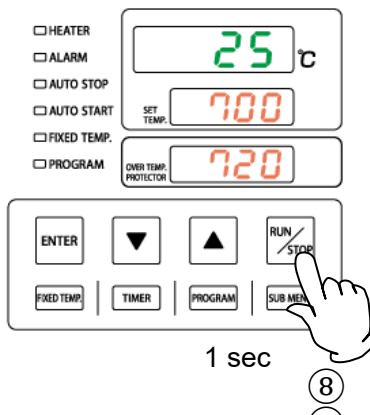
⑤ Press the **ENTER** key. Top display will show **50**, signifying the timer setting. Current timer setting will flash in center display.

⑥ Set the timer using the **▼▲** keys.

⑦ Press the **ENTER** key to finalize the setting.

5. OPERATION PROCEDURES

Auto Start Operation



2. Start operation

- ⑧ Press the **RUN/STOP** key for about one second after setting the timer.

FIXED TEMP and AUTO START lamps will illuminate, indicating Auto start operation has started.

Operation begins automatically when timer reaches 0.00.

3. Stop operation

- ⑨ Press the **RUN/STOP** key for about one second.

Operation will stop (terminate) and the FIXED TEMP lamp will go out. Control panel reverts to initial settings screen.

•Editing or confirming settings

Changing temperature setting or timer setting during operation can be done by pressing the **TIMER** key. Use the **▼▲** keys to change the setting values. Press the **ENTER** key when changes have been entered as desired.

Note that the time which has already elapsed will be subtracted from the new setting.

Setting change made after operation has begun will not apply to the currently running operation.

Press the **▼** key at any time during operation to see temperature setting, operation mode and remaining time in center display.

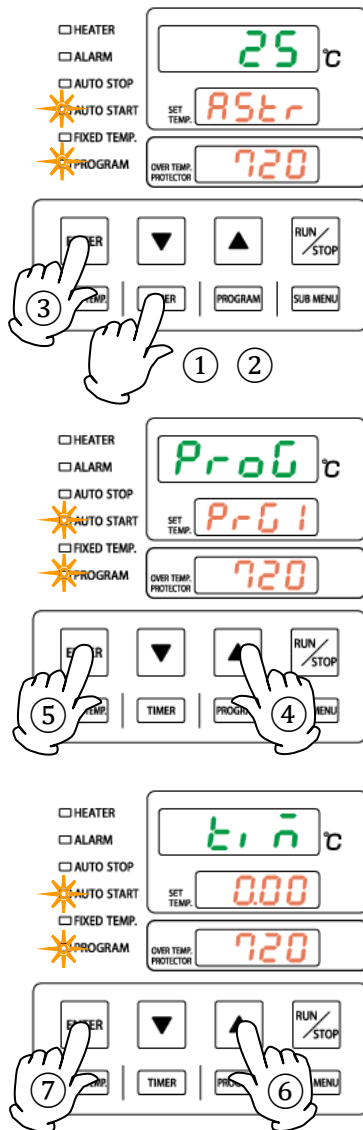
5. OPERATION PROCEDURES

Program Operation Auto Start

• Run a Program auto start operation

1. Set start time

For details on entering programs, see "Program Operation" (P.29)



- ① Press the **TIMER** key on the initial settings screen.

Mode used in the previous session will be shown in center display.

- ② Press the **TIMER** key again and center display will begin flashing.

Press the **TIMER** key repeatedly to select **PrG1**, signifying Program operation auto start. AUTO START and PROGRAM lamps will begin flashing.

- ③ Press the **ENTER** key.

Top display will show **Prog**, signifying program number, and any character from PrG1 to PrG6 will flash in center display.

- ④ Select program number to set Auto start mode by using the **▼▲** keys.

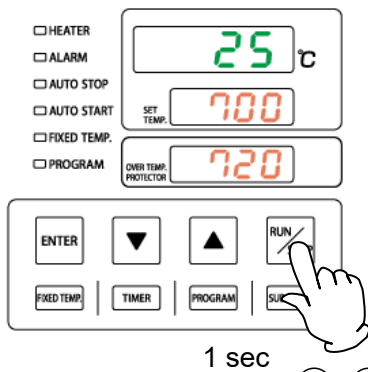
- ⑤ Press the **ENTER** key. Top display will show **t.n**, signifying the timer setting. Current timer setting will flash in center display.

- ⑥ Set the timer using the **▼▲** keys.

- ⑦ Press the **ENTER** key to finalize the setting.

5. OPERATION PROCEDURES

Program Operation Auto Start



2. Start operation

- ⑧ Press the **RUN/STOP** key for about one second after setting the timer. AUTO START and PROGRAM lamps will illuminate, indicating Program auto start mode has started.

Program operation starts automatically when timer reaches 0.00.

3. Stop operation

- ⑧ ⑨ A buzzer sounds for about five seconds when operation ends. Top display will show **End**, indicating that program has finished.

Press the **RUN/STOP** key to finish Program operation. Displays will return to initial settings screen.

Pressing the **RUN/STOP** key for about one second during operation will terminate operation and the displays will return to initial settings screen.

• Editing or confirming settings

Changing timer setting during operation can be done by pressing the **TIMER** key. Use the **▼▲** keys to change the setting values. Press the **ENTER** key when changes have been entered as desired. Note that the time which has already elapsed will be subtracted from the new setting. Setting change made after operation has begun will not apply to the currently running operation.

Press the **▼** key at any time during operation to see temperature setting, operation mode and remaining time in center display. Displayed temperature setting is for Auto start operation.

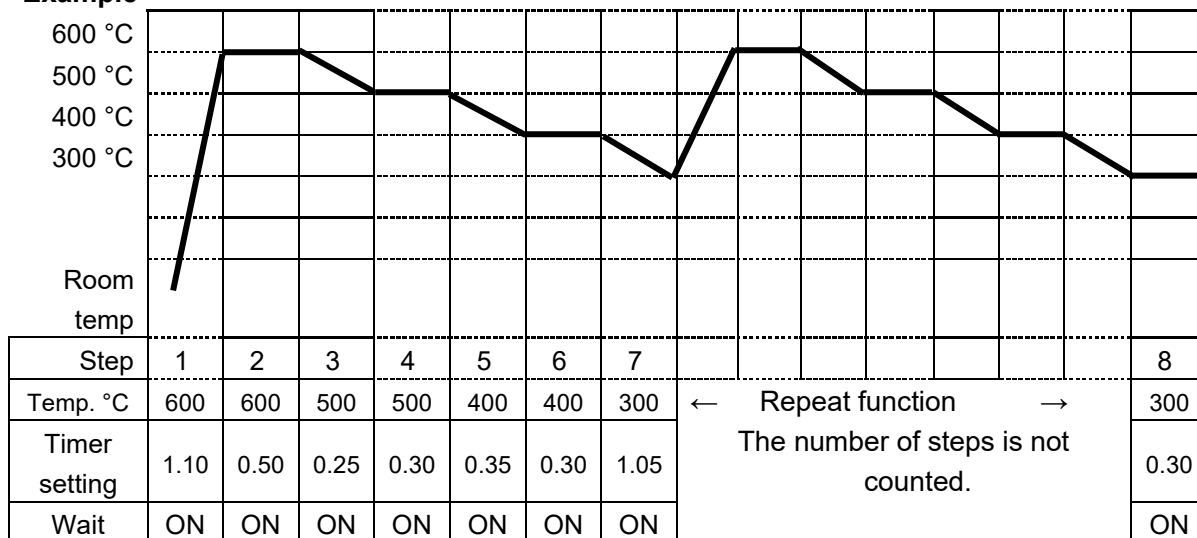
5. OPERATION PROCEDURES

Program Operation

• Program operation

This operation is used to run a combination of temperatures, times and modes as one operation. In the figure below, the line pattern which indicates time variation of the set temperature is called "program", and each straight line which is a combination of set temperature and set time is called "step".

Example



• Program types

A maximum of six program patterns can be entered.

Each program can include steps as shown below

PrG1	A Program pattern using up to 30 steps can be entered.
PrG2	Program patterns using up to 15 steps can be entered.
PrG3	
PrG4	Program patterns using up to 10 steps can be entered.
PrG5	
PrG6	

• Before program entry

Enter program patterns before attempting to run a programmed operation.

- ① Confirm the number of steps in a program composition, and its temperatures/times before entering. Using the program planning worksheet on pages 36 and 37 is recommended.
- ② Determine temperature rise/fall capability of unit (refer to tables on next page). Times must be set to accommodate these capabilities.
For example, if unit is capable of increasing or decreasing temperature by 100 °C in 10 minutes, approximately 20 minutes will be needed to increase or decrease temperature by 200 °C from a given temperature.
- ③ Confirm that the program has a sufficient number of patterns free to allow for the number of steps to be created. For example, for programs that require 20 steps, only PrG1 is applicable. However, steps using the repeat function mentioned below are not counted.

• Useful function

The repeat function is a convenient feature that can be used, when a series of steps, identical to ones already created, are needed to fill the remainder or remaining part of a program pattern.

See "Repeat Function" (P.35) for detailed instructions.

5. OPERATION PROCEDURES

Program Operation

Temperature rise/fall time

The temperature rise and fall times for each temperature difference of 100 ° C are as follows. Numeric values signify time needed (in minutes) for temperature to rise or fall. [Example: Approximately 47 minutes to increase from 400 ° C to 500°C]. Time for temperature rise and fall varies depending on the exhaust air volume and load. Carefully observe the required time to attain target temperature, and test run unit to confirm appropriate time setting.

Conditions: room temperature 23 ° C, no load, exhaust port closed

(unit: minute)

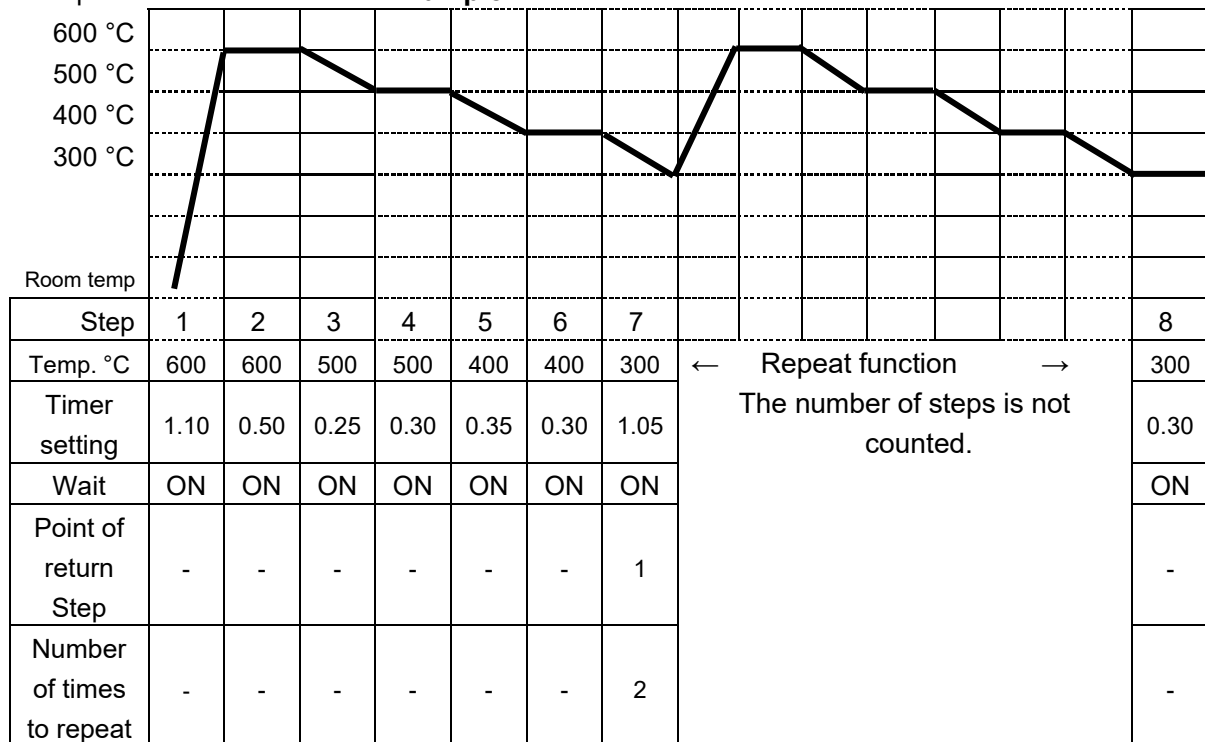
Temperature	Temperature rise time	Temperature fall time
700 ° C	22	—
600 ° C	15	15
500 ° C	9	22
400 ° C	7	33
300 ° C	12	62

Building Programs

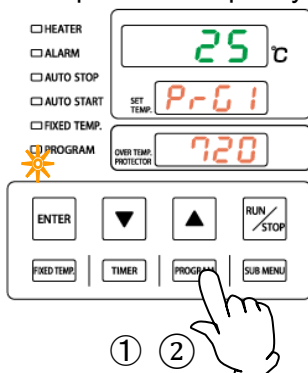
The program pattern below will be used as an example for building programs

Temperature

Example



* If used below 300 ° C, overshoot may occur when the temperature rises and an extreme delay in temperature drop may occur.

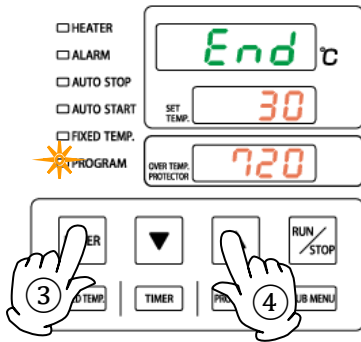


1. Select program number

- ① Press the **PROGRAM** key.
The top display will show previously used program.
- ② Press the **PROGRAM** key again and program number will begin flashing. Press the **PROGRAM** key repeatedly to select a program number to edit.
PROGRAM lamp will begin flashing.

5. OPERATION PROCEDURES

Program Operation



2. Enter program

③ Press the **ENTER** key. Top display will show **End**, signifying the total number of program steps. The number of steps already entered will flash in center display.

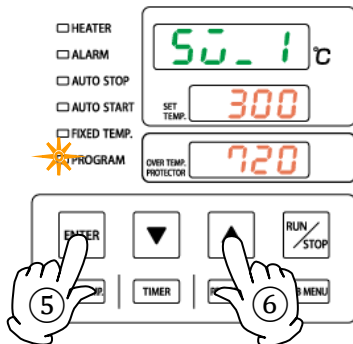
- ※ Program steps can be set up to 30 steps for PrG1, 15 steps for PrG2 and PrG3, and 10 steps for PrG4 to PrG6. For the reference example program, use 8 steps. It can be set by selecting any program number from PrG1 to PrG6.

④ Enter the total number of steps to use, using the **▲▼** keys.

- ※ End is a character that represents the total number of steps to use. In the reference example, "8" will be set.

The 8-step program above will be entered as an example for building programs

Enter the number of steps, temperature and time for each step (use the program planning worksheet).

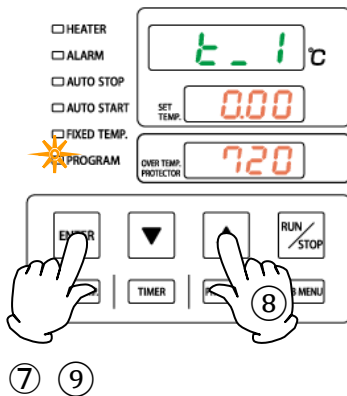


⑤ Press the **ENTER** key. **50.1**, signifying temperature setting for step 1, will show in top display. Current temperature setting will also be displayed flashing in center display.

⑥ Set the temperature for step 1 using the **▲▼** keys.

5. OPERATION PROCEDURES

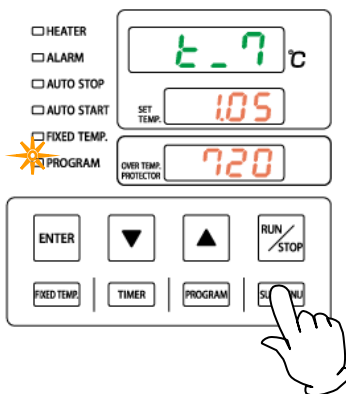
Program Operation



⑦ Press the **ENTER** key. **t-1**, indicating timer setting for step 1, will be shown in top display. Current timer setting will also be shown flashing in center display.

- ⑧ Set the timer for step 1 using the **▲▼** keys.
- ❖ Before setting the timer, be sure to confirm temperature rise/fall capability of unit.
 - ❖ Enter "0.00" to allow temperature to rise or fall in the shortest time. Be sure to set Wait for the corresponding steps to "on" Default setting is "on" for all steps. See "Wait function" (P.34) for detailed instructions.
 - ❖ Maximum timer setting for each step is 999 hours and 50 minutes.

⑨ When timer is set, press the **ENTER** key. **50-2**, indicating temperature setting for step 2, will show in top display.



Enter temperature and time using the same procedure, described thus far, for all steps (use the program planning worksheet).

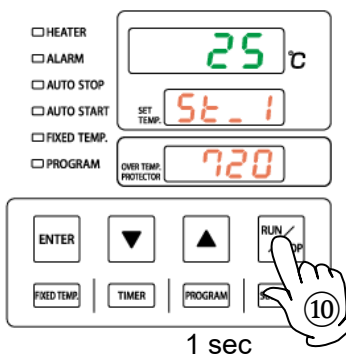
Display returns to the initial settings screen after setting temperature and timer in the final step.

When the repeat function becomes necessary, press the **SUBMENU** key after setting timer in the step where repeat operation is to be used (step 7 in the above example). See "Repeat Function" (P.35) for detailed instructions.

•Verification run

Confirm temperatures and times in a newly entered program by running program with unit unloaded once, before using program on actual test samples.

3. Run Program operation



⑩ Press the **RUN/STOP** key for about one second.

Selected program will begin running.

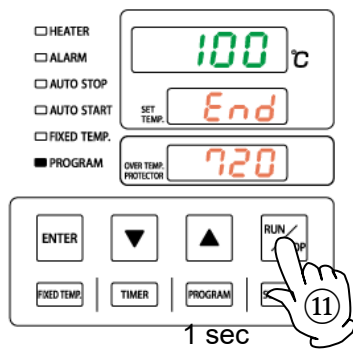
PROGRAM lamp illuminates and the top display will show

5t-1, signifying that step 1 is currently under way.

- ❖ Use the **▼** key to monitor temperature and time (top display) remaining in a currently running step. Remaining time may be seen with decimal point constant as an indicator that unit is in wait status while temperature rises or falls toward the set temperature. When decimal point begins flashing, timer is counting down.

5. OPERATION PROCEDURES

Program Operation



4. End Program operation

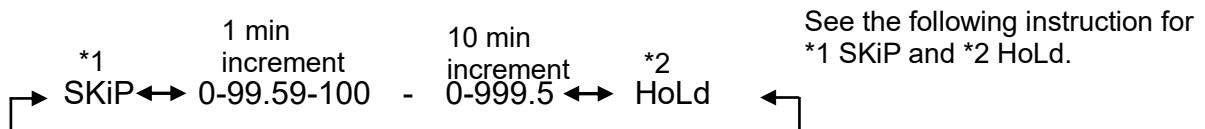
⑪ A buzzer sounds for about five seconds when program ends. Top display will show **End**, indicating that program has finished.

Press the **RUN/STOP** key to finish Program operation. Displays will return to initial settings screen.

Pressing the **RUN/STOP** key for about one second during operation will terminate operation and the displays will return to initial settings screen.

• Timer function

Maximum timer setting for each step is 999 hours and 50 minutes. The time can be set in increments of one minute under 99 hours and 59 minutes, and ten minutes after 100 hours.



When the **▼▲** keys are held down, values advance perpetually. Press repeatedly for incremental adjustment.

• Step skip function*1

This function is to skip processing program steps. This setting can be made on each step. Select steps to skip by following the procedure below. Selected steps will be canceled and program will proceed to next step.

See STEP ⑧ in the previous page and enter time setting mode t_n (n: step number) for the step to skip. While the current set time is flashing select **SkiP**, signifying Step skip, by using the **▼▲** keys. Press the ENTER key.

* Pressing the **▼** key once with the time setting "0.00" allows to show SKiP.

• Step hold function*2

This function is to continue operation with the settings of the selected step. This setting can be made on each step. Select steps to hold by following the procedure below. Unit will keep running the selected step.

See STEP ⑧ in the previous page and enter time setting mode t_n (n: step number) for the step to hold. While the current set time is flashing select **HoLd**, signifying Step hold, by using the **▼▲** keys. Press the ENTER key.

* Pressing the **▼** key twice with the time setting "0.00" allows to show HoLd.

* Pressing the **▼** key while unit is running a step in hold mode will show HoLd in center display, indicating the step is set to hold.

• To return to the previous step while building or checking programs

Press the **FIXED TEMP** key to return to the previous step.

Display cannot go back while setting Wait and Repeat functions.

5. OPERATION PROCEDURES

Wait Function

• Wait Function

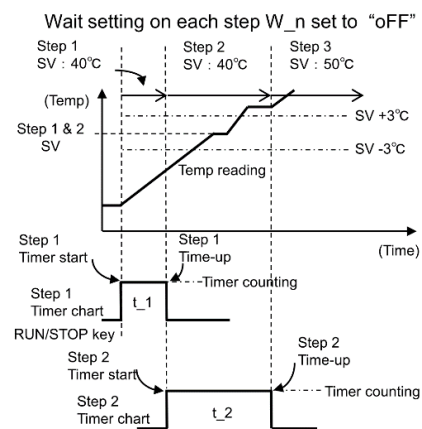
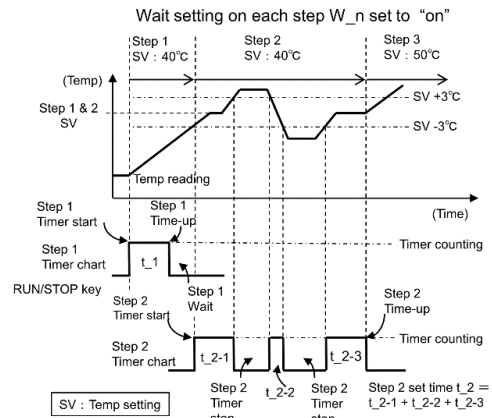
Wait mode for Program operation is to prevent operation to proceed next step, or to pause timer count while chamber temperature is outside the range of target temperature $\pm 3^\circ\text{C}$.

This setting can be made on each step. With this mode "on", unit will not move to the next step unless the temperature reaches the target temperature $\pm 3^\circ\text{C}$, even when the preset time has passed.

Unit will go on to next step when the temperature comes within the range of target temperature $\pm 3^\circ\text{C}$

Timer stops counting down when temperature reading goes out of the range of target temperature $\pm 3^\circ\text{C}$, and resumes counting when it comes within the range again.

When set to "off", unit proceed to next step as soon as the timer reaches "0.00" regardless of the difference between temperature reading and temperature setting.



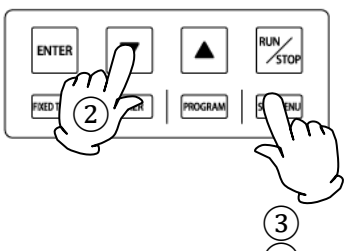
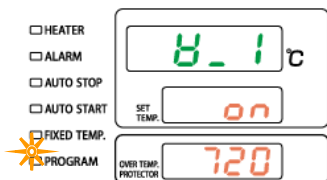
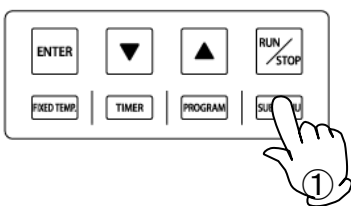
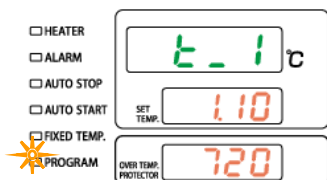
Wait setting on program steps

This section illustrates how to use the program step wait mode for the example in "2. Enter program" (P.31).

Set Wait "W_n" (n = step number) on each step according to the following procedures.

* Default setting is "on" for all steps.

- ① After the time setting t_n (n: step number) on the step to set Wait mode, press the **SUBMENU** key instead of the **ENTER** key to move to Wait setting mode.
 - ② Character W_n W_1 (n: step number) shows in top display, and "on" or "off" flashes in center display. Use the $\blacktriangledown/\blacktriangle$ keys to select preferred setting.
 - ③ Pressing the **SUBMENU** key displays PS_n (Repeat step), and pressing it again displays Pc_n (Repeat count). See the following page for detailed instruction on Repeat function.
 - ④ Press the **SUBMENU** key to go on to the temperature setting of next step.
- ❖ Display cannot go back while setting Wait and Repeat functions.



5. OPERATION PROCEDURES

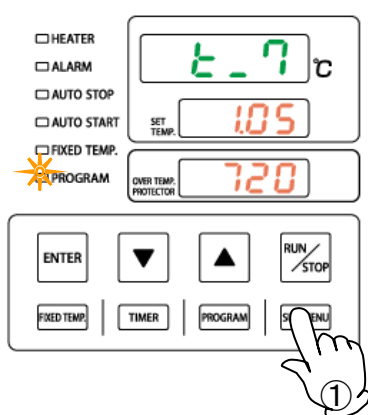
Repeat Function

Repeat function

This section illustrates how to use the repeat function (repeat a program pattern) in a programmed operation.

Repeat setting

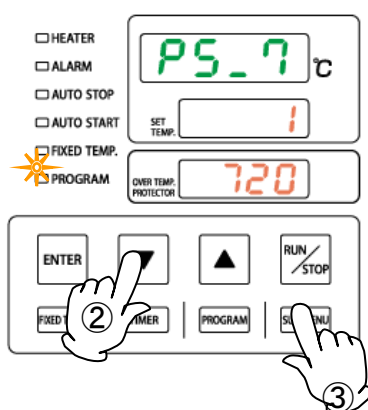
Set the step number to be repeated "PS_n", and number of times to repeat "Pc_n" (n = step number) for the example in "2. Enter program" (P.1).



① After setting the timer for the step to repeat (Step 7 in the preceding example), press the **SUBMENU** key twice. This brings up the Repeat function setting mode.

② Top display will show "PS_n" (n: step number), indicating the step to be repeated in the program pattern. **PS_7** would be shown in the example above.

Step numbers 1 to 7 can be entered into center display. Enter the number (1 in the example) using the **▲▼** keys.



③ Press the **SUB MENU** key.

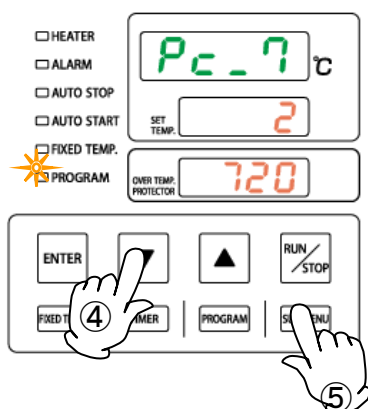
Top display will show "Pc_n" (n: step number), indicating the number of times to repeat, and the number will flash in center display.

④ Enter the value (2 in the example) into center display with the **▲▼** keys.

❖ When the number is "1", the step is not repeated.

⑤ Press the **SUBMENU** key to go on to the temperature setting of next step.

Temperature setting for step 8 (Sv_8) would be shown in the example above.



❖ Display cannot go back while setting Wait and Repeat functions.

5. OPERATION PROCEDURES

Program Planning Worksheet

Do not write in this manual. Please make copies.

Input into:	PrG1 PrG2 PrG3 PrG4 PrG5 PrG6	No.	
Project Name		Date	
		Programmer	

Input value

	Temperature (°C)	Time (h:m)	Wait setting (ON/OFF)	Repeat function (Point of return :number of times)
Step 1		:		:
Step 2		:		:
Step 3		:		:
Step 4		:		:
Step 5		:		:
Step 6		:		:
Step 7		:		:
Step 8		:		:
Step 9		:		:
Step 10		:		:
Step 11		:		:
Step 12		:		:
Step 13		:		:
Step 14		:		:
Step 15		:		:
Step 16		:		:
Step 17		:		:
Step 18		:		:
Step 19		:		:
Step 20		:		:
Step 21		:		:
Step 22		:		:
Step 23		:		:
Step 24		:		:
Step 25		:		:
Step 26		:		:
Step 27		:		:
Step 28		:		:
Step 29		:		:
Step 30		:		:

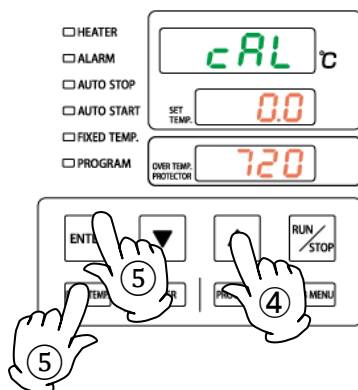
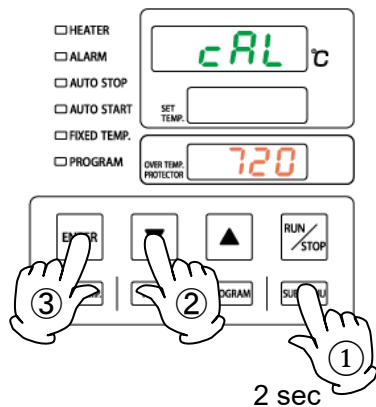
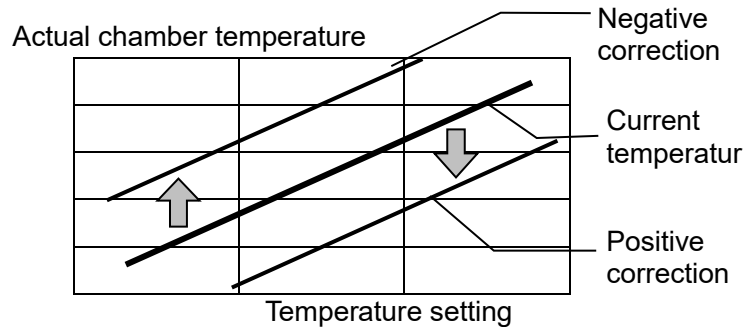
5. OPERATION PROCEDURES

Other Functions: Calibration Offset

Using calibration offset

The calibration offset feature makes it possible to compensate for any difference between temperature reading on the control panel and actual chamber temperature (taken manually). This enables parallel compensation in either direction (+ or -) over the entire temperature setting range.

Default setting is "0.0 °C", and setting range is "-30.0 to +30.0 °C"



- Run unit in Fixed temperature operation. When temperature stabilizes, gauge chamber temperature with a thermograph.
- Check the differences between display temperature and chamber temperature.

- ① Press the **SUB MENU** key for about two seconds.
- ② Select **cAL**, signifying calibration offset, using the **▲▼** keys.
- ③ Press the **ENTER** key.
- ④ Enter a value that brings temperature display (top display) and chamber temperature into agreement, using the **▲▼** keys.
- ⑤ Press the **ENTER** key or the **FIXED TEMP.** key to finalize the setting.

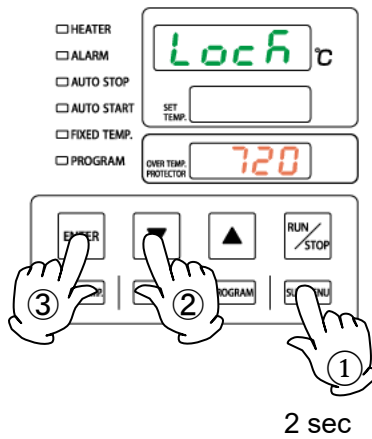
- ❖ Setting change can also be made during operation.
- ❖ Calibration offset can be set either the positive or negative side of 0.
 - Setting calibration offset to the negative side of 0 increases actual temperature by the negative value entered (i.e. entering a value of -3 increases actual temperature by 3°C)
 - Setting calibration offset to the positive side of 0 decreases actual temperature by positive value entered (i.e. entering +3 decreases actual temperature by 3°C)
- ❖ Entering excessive compensation values may cause a precariously large discrepancy between actual temperature and temperature reading.
- ❖ In addition to the calibration offset function, this unit has a two-point offset function built in, which has some compensating effects in low and high temperature zones. These offsets have already been entered at the factory.
- ❖ Contact original dealer of purchase when it becomes necessary to validate this unit.

5. OPERATION PROCEDURES

Other Functions: Keypad Lock

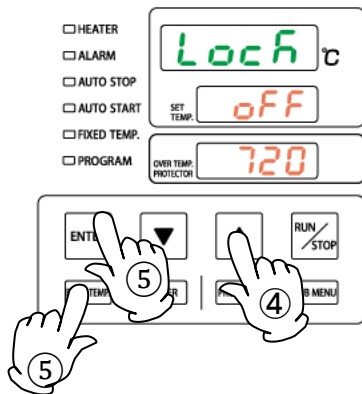
• Using keypad lock

This function locks all the keys that may change setting values. With the keypad lock function ON, all keys become unresponsive except the **RUN/STOP** and **SUBMENU** keys. (will show in top display)



Default setting is "oFF".

- ① Press the **SUB MENU** key for about two seconds.
- ② Select **Lock**, signifying Keypad lock function, using the **▲▼**.
- ③ Press the **ENTER** key.
- ④ Center display will read "oFF" or "on". Use the **▼▲** keys to change the setting.



- ⑤ Press the **ENTER** key or the **FIXED TEMP.** key to finalize the setting.
- ❖ Setting change can also be made during operation.

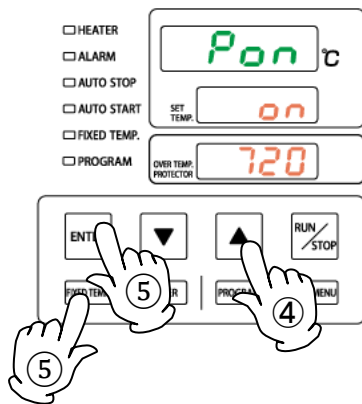
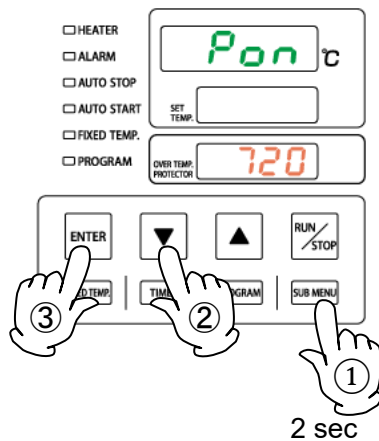
5. OPERATION PROCEDURES

Other Functions: Auto-resume Function

Auto-resume mode select

Unit may restart operation or may be switched into standby state after power failure, by selecting "on" or "oFF" of this mode. With this setting "on" unit automatically resume operation, and remain standby when set to "oFF".

If power failure occurs during timed operation, timer will start counting again from that point when power is restored. Default setting is "on".



- ① Press the **SUB MENU** key for about two seconds.
- ② Select **Pon**, signifying Auto-resume function, using the **▲▼** keys.
- ③ Press the **ENTER** key.
- ④ Center display will read "oFF" or "on". Use the **▼▲** keys to change the setting.
- ⑤ Press the **ENTER** key or the **FIXED TEMP.** key to finalize the setting.

* Settings cannot be changed during operation. **no**, indicating that the setting cannot be changed, will show in STEP ④.

5. OPERATION PROCEDURES

Options (Output Terminal)

•Before use



Operate this unit according to the procedure described in this Instruction manual. Failure to follow the operation procedure described herein may result in a problem. The guarantee will not apply if you operate the unit in a wrong manner.



1. Turn OFF ELB before connecting the cables.
2. For Time-up output and External alarm output, ensure that the input current is no greater than contact capacity shown in the specification table.
3. Connect a recorder or another appliance of 600Ω or less in input impedance to the temperature output terminal.
4. Securely fasten all connections with the screws attached to the terminal block.

Connection instructions



- Connect the cables to the appropriate terminals.
- Time-up output and External alarm output are "ON" (relay contact closed) at the time of output.
- Use a shielded wire for the cable to be connected to prevent noise.



RS-485		ANALOG		TIME-UP		ALARM	
A	B	+	-	COM	NO	COM	NO
External Communications		Temperature output		Time-up output		External alarm output	

Can be selected up to four options

Screw terminals

※ The above four options can be installed together.

5. OPERATION PROCEDURES

Options (Output Terminal)

Specifications

External communications terminal (RS-485)	<ul style="list-style-type: none"> • Connection: M4 screw terminal block See next page for overview of the standards.
Temperature output terminal (ANALOG)	<ul style="list-style-type: none"> • Outputs the voltage (DC) corresponding to the measured temperature • Output temperature range: 0 to 700 °C, this is default setting and can be changed. • Output current: 4 to 20 mA • Output accuracy: ± 2 °C • Connection: M4 screw terminal block
Time-up output terminal (TIME UP)	<ul style="list-style-type: none"> • Outputs "ON" signal (relay contact closed) when timer for Auto stop or Quick auto stop reaches "0.00". • Stops output while errors occur. • No voltage a contact (relay contact) • Contact capacity; 250 V AC 3 A (resistance load) 30 V DC 3 A (resistance load) • Connection: M4 screw terminal block ❖ Ensure that the input current is no greater than rated capacity shown above.
External alarm output terminal (ALARM)	<ul style="list-style-type: none"> • Outputs "ON" signal (relay contact closed) when an error is detected. ❖ See "Reading Error Codes" (P.50) for details on errors. • No voltage a contact (relay contact) • Contact capacity; 250 V AC 3 A (resistance load) 30 V DC 3 A (resistance load) • Connection: M4 screw terminal block ❖ Ensure that the input current is no greater than rated capacity shown above.

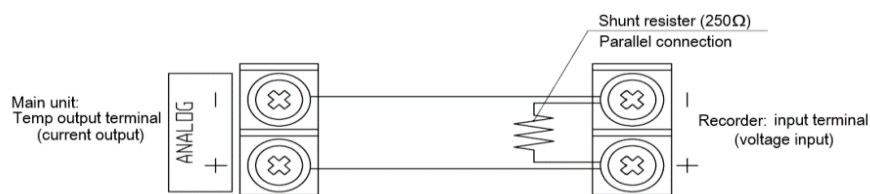
Temperature output terminal Temperature vs. Output Current conversion table

Temperature (°C)	Output Current (mA)	Voltage Conversion* (V)
0	4.0	1.0
175	8.0	2.0
350	12.0	3.0
525	16.0	4.0
700	20.0	5.0

The conversion table above is based on default output temperature range. Output temperature range can be changed.

* Temperature to current/voltage reference table for voltage input devices

Values calculated for having a shunt resistor (250Ω) connected in parallel to voltage input ($V=RI$:Ohm's Law)



5. OPERATION PROCEDURES

Options (External Communications Terminal)

1. Overview of communication methods

1.1 RS-485 communication

RS-485 allows to set or monitor data of the controller of this unit by building a program on host computer.

1.2 Communication specifications

Item	Communication settings
Communication interface standard	EIA standard, based on RS-485
Synchronous method	asynchronous communication method
Communication method	Two-wire half-duplex
Transmission code	ASCII
Communication rate	2400/4800/9600/19200/38400bps
Communication range	Up to 500 m (results may vary depending on the environment)
Network	Multi-drop method (max 31 hosts to each node)
Stop bit length	1/2 bits
Data length	7/8 bits
Parity bit	None/Odd/Even
Error detection	<ul style="list-style-type: none"> • Toho : BCC • Modbus-RTU : CRC-16 • Modbus-ASCII : LRC
Response delay time	0 to 250 msec

Note: is default setting.

1.3 Connection

■ PC

· A USB interface is used

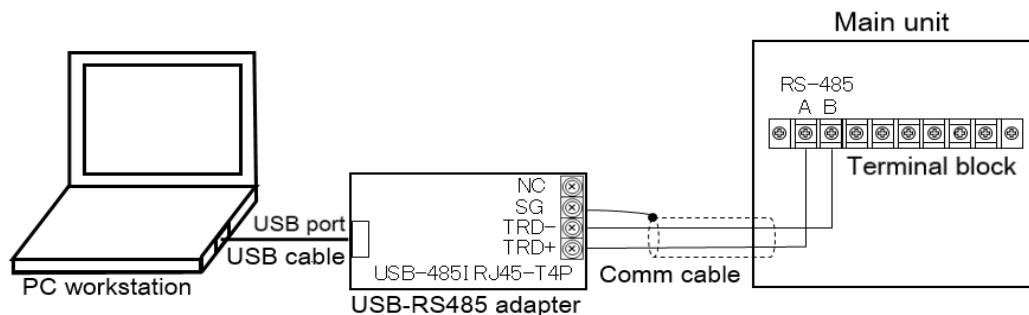
■ USB-RS485 converter unit

· For the converter, System Sacom's USB-485 is applicable.

· Optional accessory "External communications adapter (RS485-USB) OA017" permits the following connections.

(PC not included)

Sample program → <http://www.yamato-net.co.jp/support/program/index.htm>



USB-RS485 converter unit: System Sacom USB-485I RJ45-T4P

Communication cable: UL2464TASB 2-lead AWG20 cable 3 m, with Y terminal on main unit side.

USB cable: 1.8 m, included with USB-485I

* It may be effective to use a commercial braided shield USB cable for noise resistance.

5. OPERATION PROCEDURES

Options (External Communications Terminal)

1.4 Communication settings

Setting items and parameters for this controller is defined in the table below.

	Item	Communication settings	Default values
1	Communication protocol	Toho (0)/Modbus-RTU (1)/ Modbus-ASCII (2)	Toho (0)
2	BCC check	Enable (b)/Disable (n)	Enable (b)
3	Data length	7/8 bits	8 bits
4	Parity bit	None (n)/odd (o)/even (E)	None (n)
5	Stop bit length	1/2 bits	2 bits
6	Communication rate	2400 (24)/4800 (48)/ 9600 (96)/19200 (192)/ 38400 (384) bps	4800 (48) bps
7	Auxiliary address	1-99 units (1:31 stations at maximum)	1
8	Response delay time	0-250 msec	0 msec
9	Communication mode	Read only (ro)/ Read/Write (rW)	Read/Write (rW)

6. HANDLING PRECAUTIONS

Warnings and Cautions



WARNING



NEVER process explosive or flammable substances

Never attempt to process explosives, flammables or any items which contain explosives or flammables. Fire or explosion may result. See "LIST OF HAZARDOUS SUBSTANCES" (P.56)



Resin container advisory.

When using resin containers for processing, confirm that they conform to the heating specifications of this unit. Heating resin beyond capacity to withstand temperature will cause resin to melt and may result in fire or explosion.



DO NOT insert foreign objects into unit openings.

In the event that a foreign object accidentally falls inside, turn OFF ELB immediately, disconnect power cable and contact original dealer of purchase for assistance. Failure to do so may result in fire or electric shock.



Carefully handle test samples following high temperature operation.

Interior surfaces and sample/process items are hot during operation and for some time after operation. Be careful with hot items in order to avoid burn injury. Always wear protective equipment when handling test samples during operation or right after operation.



Use extreme caution when opening unit door during operation.



Maintain a safe distance until hot air, expelled from chamber, has dissipated when opening door during operation.

When necessity dictates opening door during operation, do not touch internal door or other heated interior surfaces. Severe burns may result.

Be advised that if a fire/smoke alarm is installed in close proximity to unit, it may be set off when chamber door is opened and hot air or smoke is expelled.



Check the overheat prevention device.

Confirm that overheat prevention device temperature is set 20 °C above unit temperature setting.

Check overheat prevention device performance before extended operations. See "Overheat Prevention Device Setup" (P.18)

6. HANDLING PRECAUTIONS

Warnings and Cautions



CAUTION



Opening/Closing door

When opening or closing the door keep hands and face away from area that the door swings. The door may impact with them causing an injury.



DO NOT process corrosive items.

Do not process items containing corrosive chemicals of any kind. Potent acids may corrode the reservoir despite stainless steel construction.



ALWAYS run equipment within specified temperature range.

The temperature control range is 300 °C to 700 °C. From room temperature to 300 °C, overshoot is large and temperature performance is not guaranteed. Also, never use it at temperatures above 700 °C. Equipment malfunction or accident may result.



Power loss recovery

In the event of a power loss, unit automatically reverts to status just before power loss and begin operation once again from that point. This function may be turned off through Submenu. Confirm the setting before starting an operation.



Sample moisture precaution

When processing excessively wet samples, remove as much of the moisture as possible beforehand. Rust, corrosion, and condensation may occur inside and outside chamber, and the electrical system may be adversely affected due to excessive humidity rise, resulting in electrical leakage or equipment malfunction.



Open exhaust port when drying objects in order to expel moisture from the chamber.

Open exhaust port when drying objects in order to expel moisture from the chamber. Failure to do so may cause the electrical system to be adversely affected due to excessive humidity rise, resulting in electrical leakage or equipment malfunction.

Adjust exhaust port aperture as needed to regulate exhaust volume.

Hot steam may be ejected from exhaust port.

The lid of the exhaust port is also hot during operation. Do not look into exhaust port or touch it with hands or fingers, burn injury may result.

6. HANDLING PRECAUTIONS

Warnings and Cautions



Exercise caution when processing heat-generating substances.

Note that temperature reading may not be consistent when processing heat-generating samples. (samples mentioned herein shall not have risk of explosion or ignition)



Use calibration offset function to correct temperature reading.

If there is a discrepancy between temperature reading and actual chamber temperature, refer to "Calibration Offset" (P.38) to perform temperature correction.



Inspect regularly.

ELB and overheat prevention device are key devices in maintaining this unit safety, and must be inspected/maintained regularly. See "Maintenance and Inspection" (P.48) for detailed instructions.



Construct an appropriate ventilation system

This unit is natural convection system. Installing exhaust duct directly at the exhaust port may affect air flow, possibly hindering the temperature distribution inside the chamber.



DO NOT leave chamber door open.

If you use it with the door open, the heater will heat up abnormally, which is dangerous. Be sure to use it with the door closed.
Do not leave this unit door open (i.e. to cool test samples while in chamber, etc.) following an operation run. Heat from chamber may damage and/or deform control panel, causing control board malfunction or failure.

7. MAINTENANCE PROCEDURES

Precautions before Inspection

WARNING

- Be sure to disconnect power cable before daily inspection and maintenance.
- Perform inspections and maintenance when unit is at room temperature.
- Never attempt to disassemble unit.

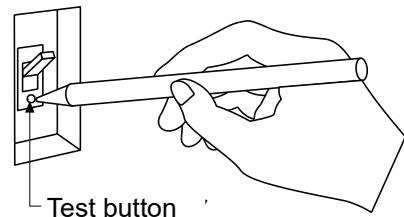
Precautions in Daily Maintenance

CAUTION

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

Maintenance and Inspection

- Inspect ELB ON and OFF function.
 - Prepare unit for inspection by connecting power cable to a facility outlet or terminal.
 - Turn ON ELB.
 - Press the test button on ELB using a ball-point pen or other fine-tipped object. If ELB shuts OFF, it is functioning normally.
- Check overheat prevention device.
 - Set the overheat prevention device temperature 20 °C higher than the unit objective temperature.
 - Operate unit in Fixed temperature mode and wait until chamber temperature becomes stable.
 - Lower the overheat prevention device temperature by 1 °C.
 - If overheat prevention device is functioning normally, heater will shut off within few seconds and error code "Er19" will appear in top display. An alarm will also sound and ALARM lamp will illuminate.
- Check power plug for damage
 - Check power plug for dust or dirt on its prongs, and clear off if any accretions found.
 - Confirm that the prongs of power plug are not bent or damaged. Replace if bent or damaged.
 - Check the power plug for discoloration or abnormal heat generation. If there is discoloration or abnormal heating, the internal contact of the outlet may be faulty.





* ELB and overheat prevention device must be inspected, as prescribed above, prior to every instance of extended or overnight operation.

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

8. EXTENDED STORAGE AND DISPOSAL.

Extended storage

 WARNING	 CAUTION
Extended storage <ul style="list-style-type: none"> • Turn OFF ELB and disconnect power cable from facility outlet or terminal. 	Unit disposal <ul style="list-style-type: none"> • Remove door handle and hinges to prevent it from locking. Contact original dealer of purchase when there is some question about disassembling the door unit. • Do not leave unit in a location where children may have access.

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 this unit are listed in the table below

Component Name	Material
Main Unit Components	
Exterior	Electrogalvanized steel sheet, baked-on finish
Interior	Stainless steel sheet metal
Door gasket	Composite of glass cloth and natural rubber
Heat insulator	Ceramic fiber, rock wool
Electrical Parts	
Switches and relays	Composite of resin, copper and other materials
Control panel	Polycarbonate resin
Circuit boards	Composite of fiber glass and other materials
Heater	Iron-chrome wire heater, nickel wire, quartz glass, insulator
Power cable	Composite of synthesized rubber coating, copper, nickel and other compounds
Wiring material	Composites of fiber glass, fire-retardant vinyl, copper, nickel and other compounds
Seals	Resin material
Sensor	Stainless steel etc.

9. TROUBLESHOOTING








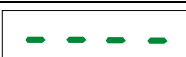
Reading Error Codes

Unit has a self-diagnostic function built into the CPU board. The table below shows possible causes when safety function is triggered. If unit does not reset by turning OFF and ON ELB, contact original dealer of purchase.

[Error Codes]

When an operational error or malfunction occurs, ALARM lamp on the control panel illuminates, an error code is displayed, and an alarm sounds. Press any key to stop the alarm.

When an error occurs, confirm the error code and terminate operation immediately. For abnormal temperature reading, the controller shows only “----” on display (no lamps go on, and no alarm sounds).

Safety functions	Symptom	Possible causes
Sensor failure	ALARM lamp ON  on screen	<ul style="list-style-type: none"> ● Failure in temperature input circuit of the controller ● Sensor for temperature control is interrupted or disconnected
SSR short circuit	ALARM lamp ON  on screen	<ul style="list-style-type: none"> ● Short circuit in SSR
Heater line disconnection	ALARM lamp ON  on screen	<ul style="list-style-type: none"> ● Heater interruption or disconnection ● Current sensing element failure, disconnection ● Drop in power supply voltage
Main relay Main relay contact short circuit	ALARM lamp ON  on screen	<ul style="list-style-type: none"> ● Main relay contact short circuit
Memory error	ALARM lamp ON  on screen	<ul style="list-style-type: none"> ● Error in CPU storage setting on the controller.
Internal communication error	ALARM lamp ON  on screen	<ul style="list-style-type: none"> ● Internal communication error, temperature input circuit failure
Overheating	ALARM lamp ON  on screen	<ul style="list-style-type: none"> ● Settings on overheat prevention device is not appropriate Turn ELB OFF, then back ON (reset). Check both chamber temperature and temperature setting for overheat prevention. If unit does not reset, it may be a result from sensor disconnection. ● Temperature sensor for overheat prevention is interrupted or disconnected ● Failure in temperature input circuit of the controller
Abnormal temperature reading	 on screen	<ul style="list-style-type: none"> ● Temperature reading is out of display range (-10 to 1310 °C)

9. TROUBLESHOOTING

Troubleshooting Guide

Troubles

Symptom	Possible causes
Unit does not turn on when main power switch is turned "ON"	<ul style="list-style-type: none">● Power cable is not connected securely to power terminal or outlet.● Power failure in progress● No power from power supply, or supply voltage is low.
Temperature does not rise.	<ul style="list-style-type: none">● Temperature setting is inappropriate● Power supply voltage has dropped● The ambient temperature is out of operable temperature range Operating ambient temperature range for this unit is between 5 °C and 35 °C● The amount of test samples is excessive
Temperature fluctuates during operation	<ul style="list-style-type: none">● Temperature setting is inappropriate● Power supply voltage is unstable● The ambient temperature is heavily fluctuating● Thermal load in chamber is high● Test samples are not arranged properly
Temperature reading differs from manually measured temperature	<ul style="list-style-type: none">● Calibration offset value is inappropriate. See "Calibration Offset"(P.38) and confirm calibration offset setting.

- ◆ **If problem persists or is not applicable to any of errors above, turn off power immediately, disconnect power cable and contact original dealer of purchase for assistance.**

10. SERVICE & REPAIR

Requests for Repair

Warranty card (attached separately)

Warranty card will be handed by dealer or Yamato personnel upon delivery and installation, or will be attached to equipment if no one from dealer or Yamato is to be present at delivery and installation.

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

- Keep warranty card safe.

Requests for Repair

If abnormalities remain after confirming "Troubleshooting Guide", terminate operation, turn OFF ELB, and disconnect power cable. Contact original dealer of purchase or Yamato sales office for assistance.

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
- } Refer to warranty card.
- 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.

* 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.

11. SPECIFICATIONS

Model		DR201	
System		Natural convection	
Operating ambient temperature range		5 to 35 °C	
Temperature setting range		0 to 700 °C	
Performance*1	Temperature control range	300°C~700 °C	
	Temperature control accuracy Temperature fluctuation	±5 °C (at700 °C JTM K05) 10 °C (at 700 °C JIS)	
	Temperature distribution accuracy Temperature gradient	±25 °C (at700 °C JTM K05) 30 °C (at 700 °C JIS)	
	Temperature rise time	Approx. 70 minutes	
	Temperature fall time	Approx. 150 minutes (700 °C to 300 °C)	
Configuration	Exterior	Chromium-free electrogalvanized steel sheet, baked-on finish	
	Interior	Stainless steel sheet metal	
	Heat insulator	Ceramic fiber rock wool	
	Heater	Type	Iron - Chromium wire heater
		Capacity	1.3kW
	Exhaust port	Inner diameter approx. 33 mm 1 with top lid	
Temperature control system	PID control by microcomputer		
Controller	Temperature setting system	Digital setting with menu keys and the ▼▲ keys	
	Temperature display system	Temperature reading display: Green 4-digit LED digital display Temperature setting display: Red 4-digit LED digital display	
	Temperature resolution	1 °C	
	Timer function	0 to 99 hours 59 minutes, 100 hours to 999 hours 50 minutes	
	Timer resolution	1 minute increments under 99 hours and 59 minutes, 10 minutes after 100 hours.	
	Wait Function	Timer wait function (ON/OFF setting)	
	Operation modes	Fixed temperature, Program, Program auto start, Auto stop, Auto start, Quick auto stop operations	
	Program modes	6 patterns (PrG1: 30 steps, PrG2-3: 15 steps, PrG4-6: 10 steps) Step weight function, repeat function, Step hold function, step skip function	
	Additional functions	Calibration offset, Keypad lock, Auto-resume mode select	
	Sensor	Inconel® K thermocouple (W sensor) for both temperature control and overheating prevention device	

*1 Performance data above based on 23 ±5 °C room temperature, 65%RH ±20% humidity, and no process load.

Operating ambient temperature range for this unit is between 5 °C and 35 °C. Be advised that maximum operating temperature (700 °C) may not be reached under low ambient temperatures, if source voltage is below 95 V.

The temperature drop time is a reference value.

11. SPECIFICATIONS

Model		DR201
Safety devices		Self-diagnostic functions (Automatic overheat prevention, Temperature sensor failure, Heater disconnection, SSR short circuit, main relay failure, memory error, internal communication error, abnormal temperature reading), Overcurrent ELB, Overheat prevention device
Standard	Internal dimensions *2 (W × D × H) mm	250 x 250 x 220
	External dimensions *2 (W × D × H) mm	520 x 443 x 612
	Internal capacity	13.75 L
	Chamber rack	Perforated stainless steel plate
	Number of tiers/rack support pitch	3 tiers/33mm
	Chamber rack Q'ty	2 pcs
	Chamber rack load capacity	15 kg/rack, total load capacity 30 kg
	Power supply (ELB capacity)	AC115V 11.5A (15 A) AC220V 7.5A (10 A)
	Approx. weight	36 kg
Accessories		Chamber rack, Instruction manual, Warranty card

*2 Dimensions do not include protrusions.

- For product improvement, above specifications are subject to change without notice.

12. OPTIONAL ACCESSORIES

List of Options

Table 12.1 and Table 12.2 show the option setting list.
Options are available for the DR201 type.

* Some options are required to be installed at the Yamato manufacturing facility.

Table 12.1 list of Options (can be installed after delivery)

Product name	Product code	Model	Note
Stand	212802	ONS60	Unit can be secured on this stand with screws. (casterless)
Seismic mat "Labopita" Set of 4 pieces	296902	—	For use to prevent unit from falling or tipping.
Chamber rack	212808	—	Same as standard racks; available for additional purchase.

Table 12.2 List of Options (cannot be installed after delivery)

Product name	Product code	Model	Note
External communications adaptor kit (RS485-USB conversion)	281146	OA017	Adapter kit for connecting unit to remote PC workstation.
External communications terminal (RS-485)	281282	OA062	Terminal installed on main unit for controlling and monitoring operation status from remote PC workstation.
External alarm output terminal	281283	OA063	Output terminal for connecting an external alarm device. Specific error will be shown in the display of the control panel.
Time-up output Terminal	281284	OA064	Output terminal for connecting an external device, which signals the end of Quick auto stop, Auto stop operations.
Temperature output terminal	281285	OA065	Terminal outputting a 4-20mA analog signal for external temperature sensor.

For some options, it may be possible to install after delivery and installation. Contact original dealer of purchase for requests for options.

13. LIST OF HAZARDOUS SUBSTANCES



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

Table 13.1 List of hazardous substances

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

14. STANDARD INSTALLATION MANUAL

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

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

No	Item	Implementation method	Chapter No. & Reference page of instruction manual	Judgment
Specifications				
1	Accessories	Quantity check according to the accessories column	11. SPECIFICATIONS P.53	
2	Installation	-Visual check of surrounding conditions Caution: Take care for environment	3. PRE-OPERATION PROCEDURES -Choose an appropriate ... P.12	
		-Securing a space		
		-Installing chamber racks	4. PRE-OPERATIVE PREPARATIONS P.20 Chamber rack placement	
Operation-related matters				
1	Power supply voltage	-Measure line voltage (power distribution board of facilities, outlet etc.) with a tester. -Measure line voltage during operation (must meet required voltage) Caution: Use a compliant device to install on a plug or an ELB.	1. SAFETY PRECAUTIONS -Ground wire MUST be ... 3. PRE-OPERATION PROCEDURES -Always connect power cable to ... 11. SPECIFICATIONS -Standard-Power Supply P.13	P.エラー! ブックマークが定義されていません。 P.53
2	Starting operation	-Start operation	3. PRE-OPERATION PROCEDURES -4. PRE-OPERATIVE PREPARATIONS 5. OPERATION PROCEDURES -Operation procedure	P.12-20 P.21-44
Description				
1	Operational descriptions	Explain about maintenance of equipment and each component according to instruction manual.	5. OPERATION PROCEDURES -Operation procedure P.1-56 1. SAFETY PRECAUTIONS -13. LIST OF HAZARDOUS SUBSTANCES	P.21-44
2	error code	Explain about error codes and procedures for reset according to instruction manual.	9. TROUBLESHOOTING -10. SERVICE & REPAIR	P.50-52
3	Maintenance and Inspection	Explain about maintenance of equipment and each component according to instruction manual.	7. MAINTENANCE PROCEDURES -Inspection and Maintenance	P.48
4	Completion of installation Matters to be Stated	- Enter the date of installation and name of the charged personnel in the main unit nameplate - Write necessary information on warranty card and hand it over to customer - Explain how to contact service personnel	10. SERVICE & REPAIR	P.52

Limited Liability

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

In the unlikely event that it is used with contents other than those described in the instruction manual, an accident or failure may occur.

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

High temp oven

DR201

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For repair service, maintenance service and consumables purchase support, please contact to our distributors from whom you purchased.

Or please visit to our customer support website at

<https://www.yamato-scientific.com/support/inquiry/>