R01

EYELA

Dry Block Bath

Dry Thermo Bath

Instruction Manual

MG-2200
MG-2300

This instruction manual includes important information concerning the maintenance of the functionality of the product and safety use.

IMPORTANT

Please read this manual carefully, especially on "Safety precautions" before use.

Keep this manual within easy reach of yourself whenever using the product.

Tokyo Rikakikai Co., Ltd.

Safety precautions

1. Signal word for warning

Due to its function and characteristic, a part of this product is subject to have high temperature, which may cause personal injury if users would touch during operation. However, if you have proper information before use, you can avoid almost all these troubles.

Therefore, this manual categorizes the level of importance and danger as below with alert mark and signal word. Please follow the instructions and use the product safely.

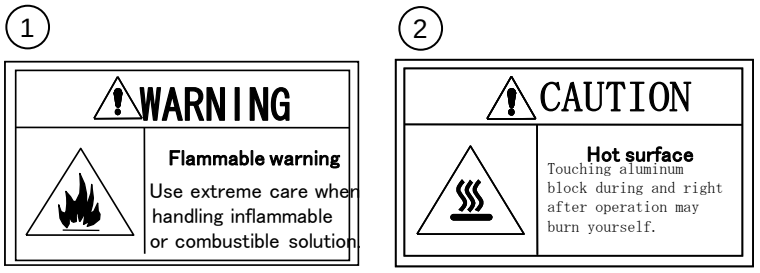
Alert mark Signal word	Definition
⚠ DANGER	Mishandling the product will cause serious personal injury or loss of life.
⚠ WARNING	Mishandling the product may cause serious personal injury or loss of life.
⚠ CAUTION	Mishandling the product may injure users or cause property damage.

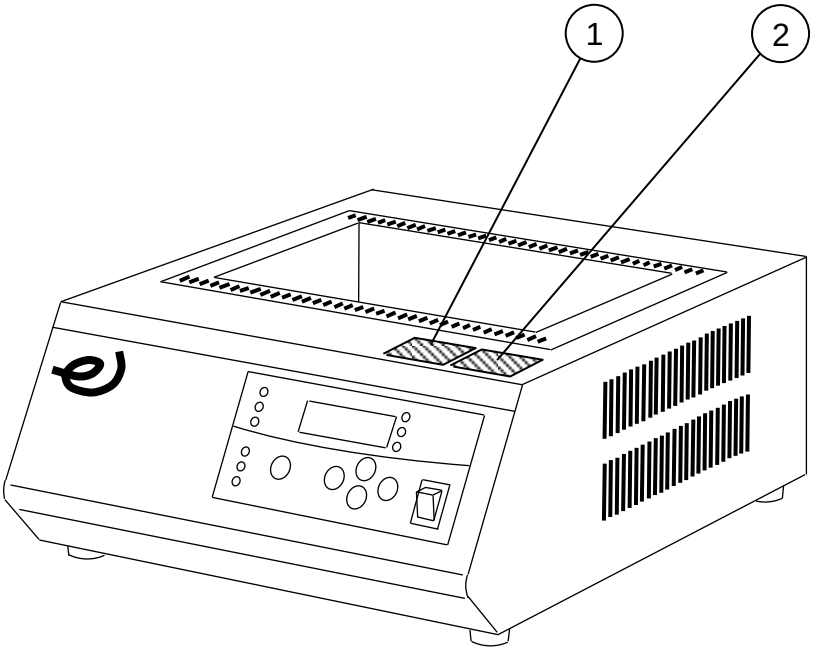
Though we are trying to look into conceivable risk of using the product, it is very difficult for us to expect of all of it. It means that all the instructions in this manual do not cover all the types of risk that may caused by the product. However, if you follow the instructions, you surely can handle and operate the product safely. Please use extreme care when handling the product and to prevent all the potential accidents and mechanical failures.

2. Warning display on the product

For high priority danger, warning label is attached on the machine body. The position of the label is as below. Please read the instructions carefully whenever using the machine.

※ If you have any trouble reading the warning label because of damage, please change the label and attach the new one. Do not hesitate in contacting us if you require new one.





Above figure is MG-2300.

Thank you for choosing

EYELA

Introduction

This manual describes the procedure of setup, operation, troubleshooting, maintenance, check-up and disposal of Dry Block Bath, NG-2200 and Mg-2300.

Please read this manual carefully before use.

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Check-up list of packing

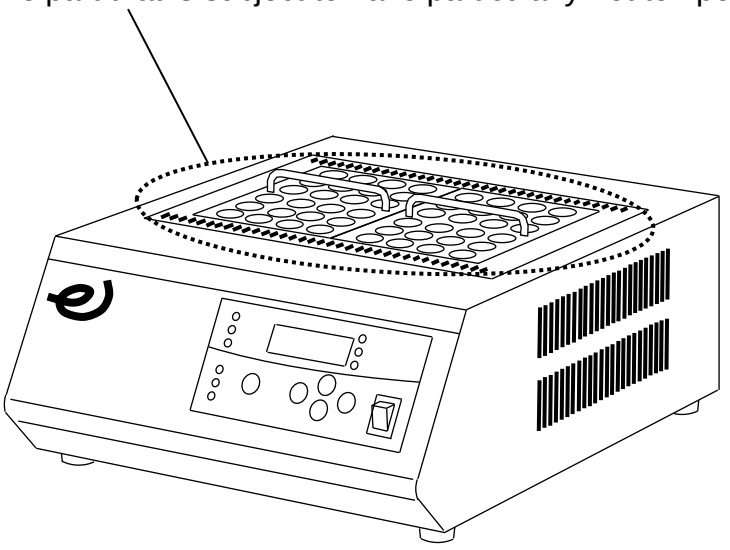
Please check the type and quantity of each part Before setting up the instrument.

	Name	Quantity
1	Main body	1-set
2	Fuse	1
3	Grounding adapter	1
4	Instruction manual	1
5	Warranty	1

Aluminum block is not included in this product. Please select the appropriate aluminum block depending on the size of test tube and other containers.

1 For safety use

This product is subject to have high temperature.
Use extreme care when handling the product.

⚠ WARNING	**Use extreme caution when using inflammable and combustible solution.** Leaving inflammable and combustible solution out at room temperature or higher, it (ethanol and etc.) may evaporate, catch fire and explode. Ventilate well before use and use care when handling these solutions.
⚠ CAUTION	**Do not boil with no water in the unit.** Set up required number of aluminum block on each unit before operation. Without the block, temperature distribution may be worsened or the unit may have bad effect.
⚠ CAUTION	**Do not touch aluminum block or block handle during operation and for a while after operation.** When preset temperature is high, aluminum block, block handle and also around these parts are subject to have high temperature during operation and for a while after operation. Take care not to burn yourself. ●The part that is subject to have particularly hot temperature.  Above picture is MG-2300.

2 Outline of the product

2-1 Use application

⚠ WARNING

Do not remodel the product.
Make sure that it should not be used out of intended use.

Remodeling and improper use may cause electric shock or breakdown.

This product is a condenser that is utilized for concentrating solution, refining and fractionating. Since this is dry block bath which does not use water and oil, it is suitable for performing concentration of samples that does not accept water or moisture.

2-2 Specification

Product name		Dry block bath	
Model		MG-2200	MG-2300
Feature	Range of temperature control (Range of temperature setting)	Room temperature ＋5.0～200.0℃ (10.0～200.0℃)	
	Accuracy of temperature control ※1	±0.1℃～0.2℃	
	Required time for rising temperature ※1	20→100℃ Approx. 15 min. 20→200℃ Approx. 40 min.	20→100℃ Approx. 20 min. 20→200℃ Approx. 55 min.
	Range of temperature distribution ※2	4.0℃ (When setting up 200℃) 2.0℃ (When setting up 120℃) 1.0℃ (When setting up 37℃)	
FUNCTIONS	Temperature control	Microcomputer P.I.D control	
	Setting up temp.・display	Sheet key input・digital display	
	Included functions	Auto stop, auto start, 2-step program, compensating temperature display, auto tuning, Setup for recovery from power failure, setup for buzzer	
	Setup time for timer	0 min.～99hrs.59min.	
	Repeating time of step	Continuous, 1～99 times	
	Safety function	Alarm function (alarm for upper and lower temperature limit, power failure, malfunction of temperature control, sensor, watch dog) fuse, stand-alone overheat protector (fixed at one point)	
CONFIG.	Temperature sensor	Pt sensor (Pt100)	
	Heater	Maika heater 235 W	Maika heater 390 W
SPEC	Measurement of block ※3	90×125×70	
	Number of block setup ※3	1	2
Range of ambient temperature		5～35℃	
Exterior measurement (mm)		200W×310D×125H	260W×320D×125H
Mass ※4		Approx. 5kg	Approx. 6.5kg
Power source input		2.5A 250VA	3.9A 390VA
Rated supply		AC100V 50/60Hz	
Others		Lever for checking up sample's temperature, connector for sample's temperature sensor	

※1 Room temperature: 20℃、rated power supply voltage, φ15 aluminum block for test tube, no sample nor container

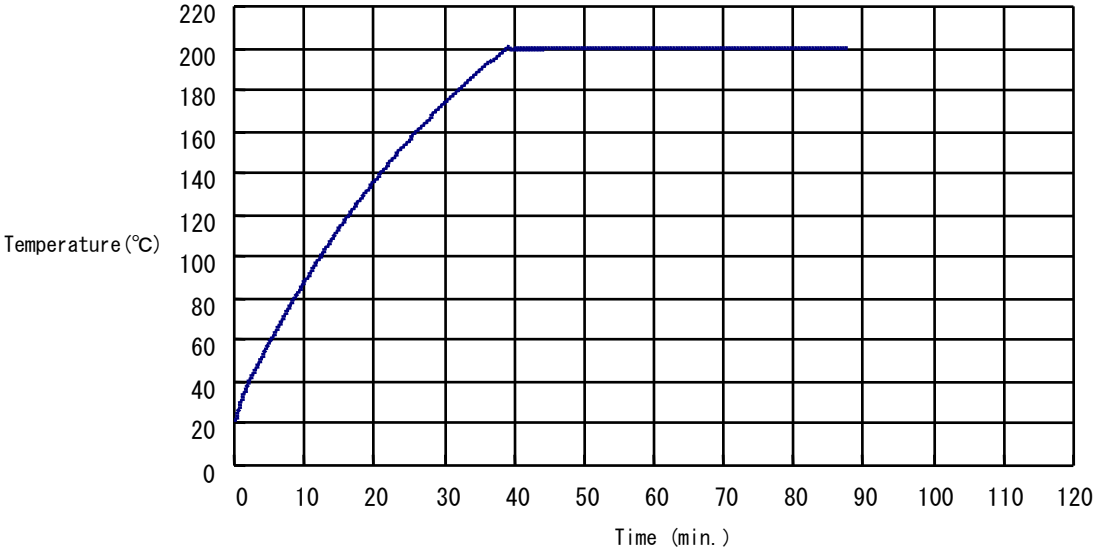
※2 Temperature in aluminum block

※3 Aluminum block is one of the optional accessories (sold separately).
As for the types of aluminum block, please refer to "Options" on page 5.
Not compatible with predecessors.

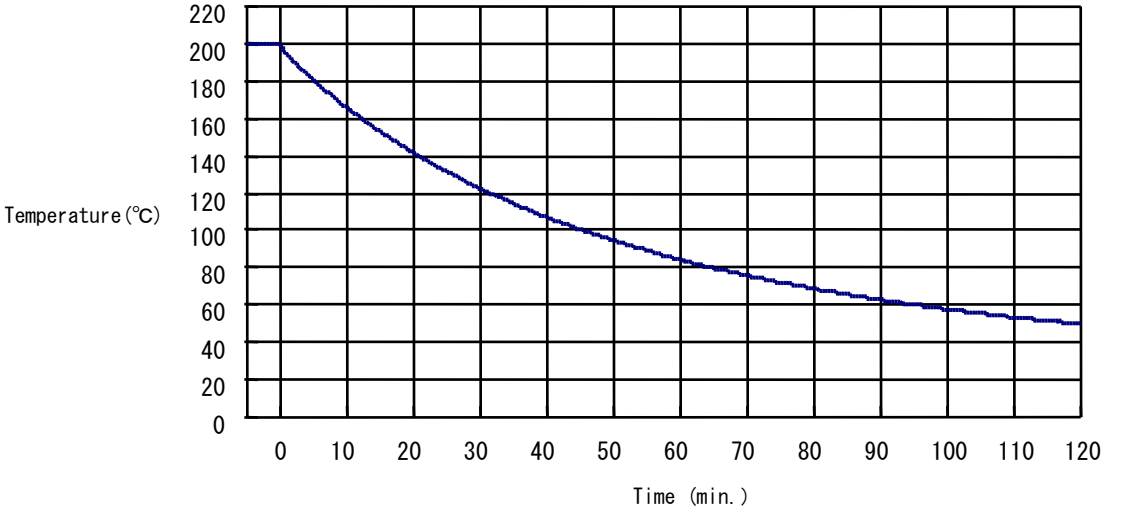
※4 Weight of aluminum block is not included.

2-3 Temperature rise・downward curve

◎ MG-2200

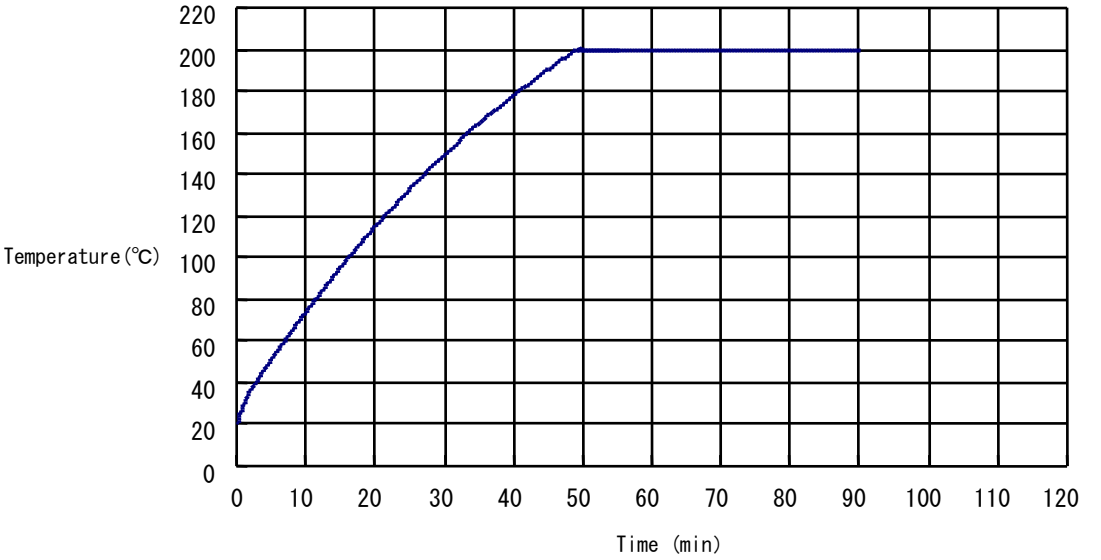


Condition : Room temperature: 20℃ Rated supply voltage
φ15 aluminum block for test tube, no sample nor container

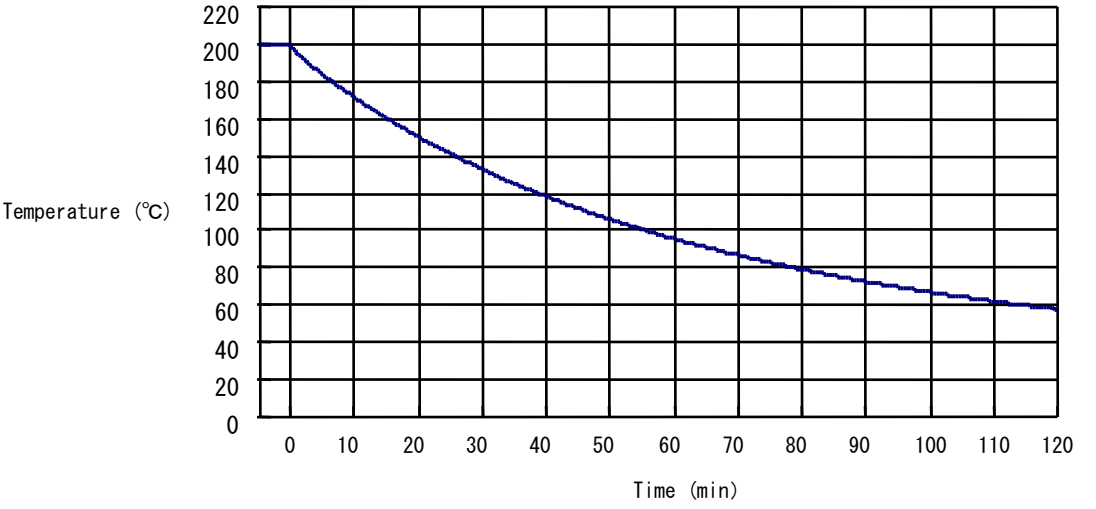


Condition : Room temperature: 20℃ natural cooling
φ15 aluminum block for test tube, no sample nor container

◎ MG-2300



Condition : Room temperature: 20℃ Rated supply voltage
φ15 aluminum block for test tube, no sample nor container



Condition : Room temperature: 20℃ natural cooling
φ15 aluminum block for test tube, no sample nor container

2-4 Options

1. Aluminum block

These are aluminum blocks for MG-2200 and 2300.
MG-2200 requires one aluminum block and MG-2300 requires two.
No compatibility with predecessors.

Model	Suitable container	Number of port	Depth of port (mm)	Catalogue No.
MGB-0548	Micro tube (0.5ml)	48	26	207570
MGB-1540	Micro tube (1.5ml)	40	35	207580
MGB-1240	Test tube (External diameter:12mm)	40	60	207590
MGB-1524	Test tube (External diameter:15mm)	24		207600
MGB-1624	Test tube (External diameter:16.5mm)	24	65	207610
MGB-1822	Test tube (External diameter:18mm)	22		207620
MGB-2116	Test tube (External diameter:21mm)	16		207630
MGB-2412	Test tube (External diameter:24mm)	12		207640
MGB-2512	Test tube (External diameter:25mm)	12		207650
MGB-3008	Test tube (External diameter:30mm)	8		207660

2. Spraying unit

These are spraying units to be attached to MG-2200.
With using spraying unit, the unit can be used as spraying condenser.
These spraying units can not be attached to MG-2300.

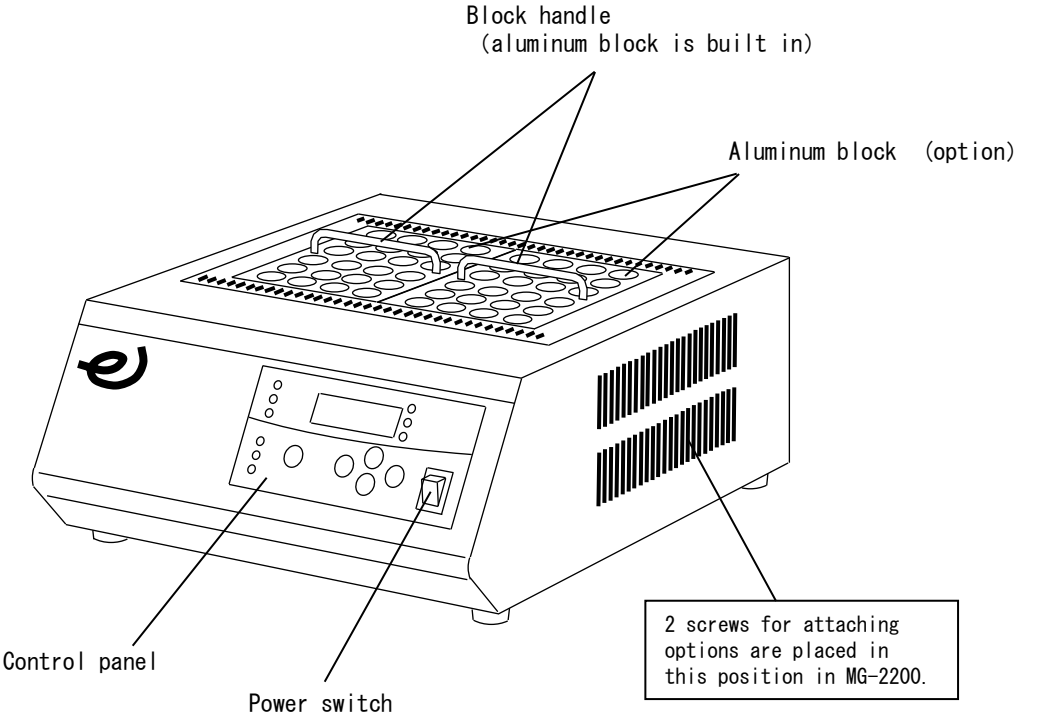
Model	Suitable block	Number of nozzle	Length of nozzle (mm)	Catalogue No.
S-048	MGB-0548	48	155	206680
S-040	MGB-1540、1240	40		206690
S-024	MGB-1524、1624	24		206700
S-022	MGB-1822	22		206710
S-016	MGB-2116	16		206720
S-012	MGB-2412、2512	12		206730

3. Sensor for sample' s temperature

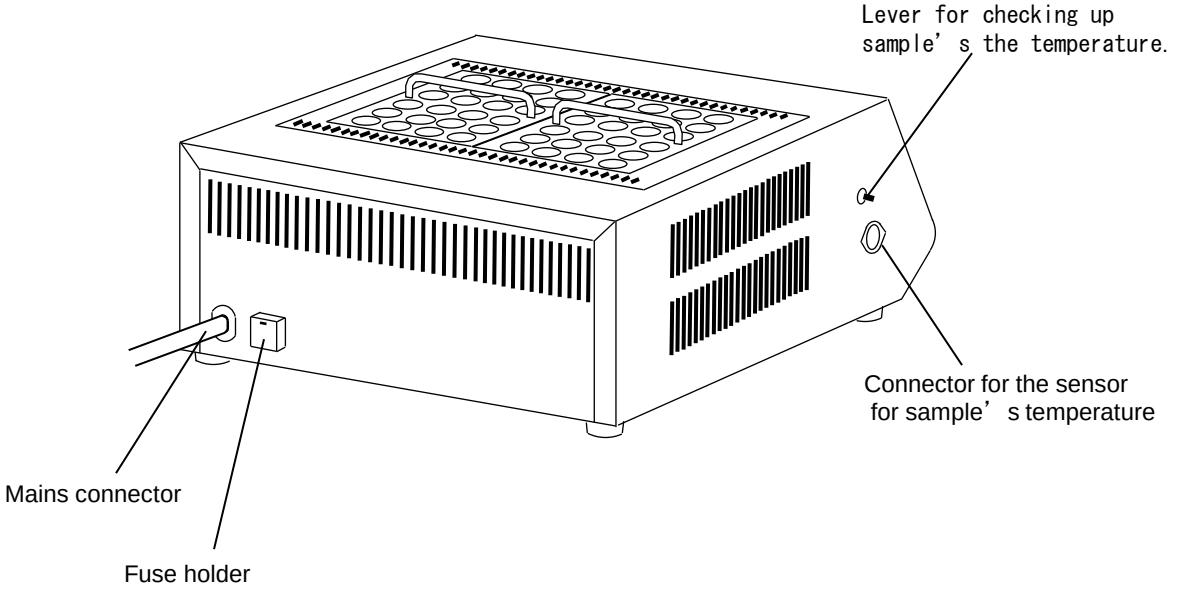
These are temperature sensors connecting to the bath in order to measure sample' s temperature. For more details, please refer to " Sensor for sample' s temperature" on page 32.

Model	Suitable container	External diameter × length (mm)	Catalogue No.
MG-SENS 1	For micro tube	1.6× 35	207920
MG-SENS 2	For testing	3.2×180	207930

2-5 Name of each part



Front

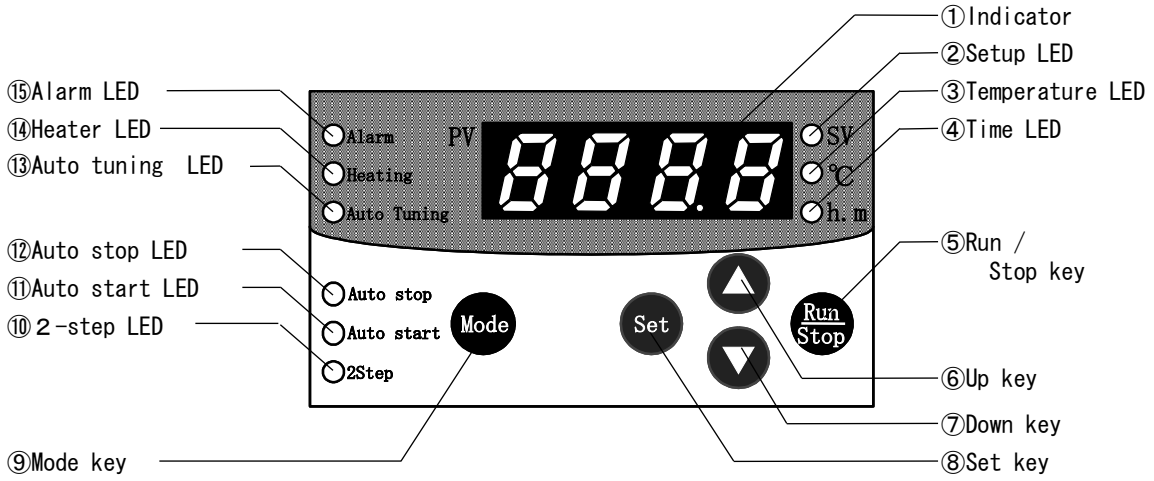


Back side

Above picture is MG-2300.

3 Name and function of operation portion

3-1 Control panel



No.	N a m e	Function
①	Indicator	Indicates temperature, time, character and alarm.
②	Setup LED	Lights up setup value (temperature and time) on indicator
③	Temperature LED	Lights up when indicator displays temperature. Lights up until the temperature reaches at setup temperature in auto stop operation Blinks while the machine operates.
④	Time LED	Lights up when indicator displays time. Blinks while time count is performed in timer mode operation.
⑤	Run/Stop key	Runs and stops operation
⑥	Up key ※1	Functions as below when the indicator displays value or character. Value : Each time you press the key the value increases by 0.1. If you hold down the key, the value increases continuously, and if you hold down it longer, upper figure increases. Character: Changes in every press of the key.
⑦	Down key ※1	Functions as below when the indicator displays value or character. Value : Each time you press the key the value decreases by 0.1. If you hold down the key, the value decreases continuously, and if you hold down it longer, lower figure decreases. Character: Changes in every press of the key.
⑧	Set key	Selects measured value display and setup value display. Clears alarm display when alarm occurs.
⑨	Mode key ※2	Each time you press the key, the mode of operation changes.
⑩	2-step LED	Lights up when 2-step mode is selected. Blinks when setup value is displayed on indicator in 2-step operation
⑪	Auto start LED	Lights up when auto start mode is selected. Blinks when time is displayed on indicator in auto start operation.
⑫	Auto stop LED	Lights up when auto stop mode is selected. Blinks when time is displayed on indicator in auto start operation.
⑬	Auto tuning LED	Lights up while auto tuning performs.
⑭	Heater LED	Lights up while heater is controlled.
⑮	Alarm LED	Lights up when alarm occurs.

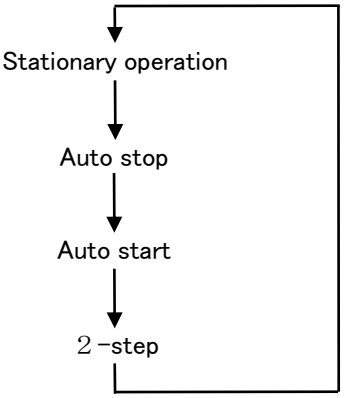
※1 Available only at the time of displaying setup value.
No key operation can be done when displaying setup value.

※2 Function differs when timer mode is operated. For more details, please refer to "Timer mode (auto stop)" on page 19 and "Timer mode (auto start) on page 21.

3-2 Stationary operation・Timer mode ・2-step mode

This product is capable of performing continuous stationary operation, and auto start combining with timer mode, and auto start, 2-step operation, which repeats two preset temperature.

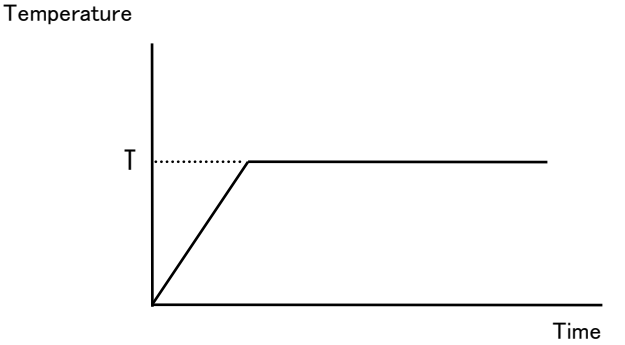
※Mode changes in order each time you press [Mode] key as shown on right picture.



Stationary operation

Raises the temperature up to preset temperature "T" and performs continuous operation after reaching at preset temperature "T".

※Available range of preset temperature：
10.0～200.0℃
Available range of temperature control：
Room temperature＋5.0～200.0℃



Timer mode

With using timer mode, operation can be started and stopped any time.
Two timer modes are available as follow.

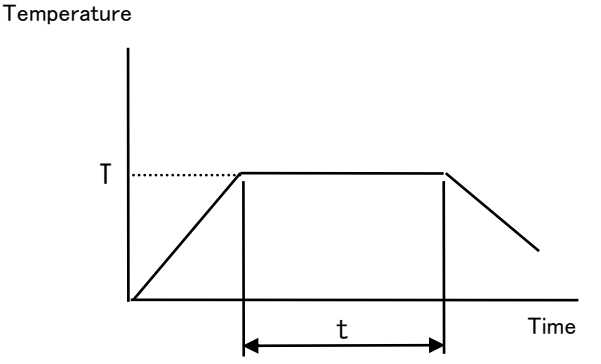
- Auto stop mode
- Auto start mode

1. Auto stop mode

After starting operation, this mode raises the temperature up to preset "T" and starts time counting after reaching at preset temperature "T". After that, it stops operation automatically.

※Available range of setup temperature：
10.0～200.0℃
Available range of temperature control：
Room temperature＋5.0～200.0℃

※Available range of setup time：
0 min.～99hrs.59min.

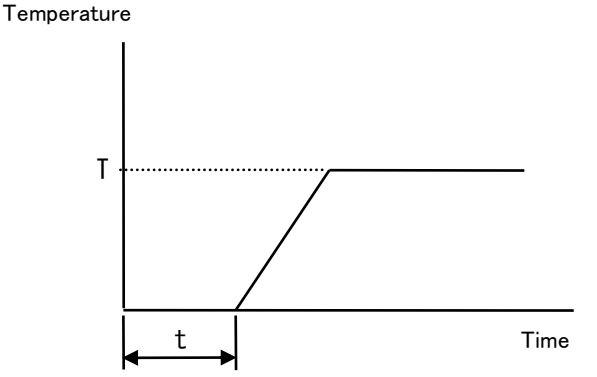


2. Auto start mode

After starting operation, this mode starts only time count and raises the temperature up to "T" in stationary operation after passing setup time "t". After reaching at preset temperature "T", it performs continuous operation.

※Available range of preset temperature：
10.0～200.0℃
Available range of temperature control：
Room temperature＋5.0～200.0℃

※Available range of setup time：
0 min.～99hrs.59min.



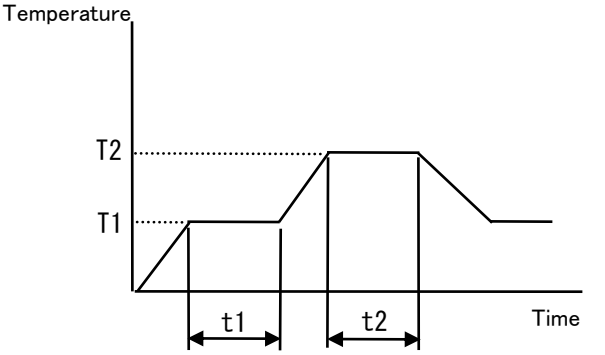
2-step mode

This mode is capable of setting up two pairs of temperature (T1 and T2) and time (t1 and t2), and repeats the performance number of times you set up. The operation is finished automatically after performing setup times. By setting "0" for "N" (for setting up time), the mode is capable of controlling repeatedly until it gets stopped anytime.

※ Available range of preset temperature : 10.0～200.0℃
Available range of temperature control : Room temperature＋5.0～200.0℃

※ Available range of time setup : 0 min.～99hrs.59min.

※ Available time for repeating performance : 1～99 times (0＝continuation)



3-3 Control mode

6 types of operational environment can be set up as control mode. For more details about setting up each mode, please refer to "How to control (control mode)" on page 26.

1. Compensating displayed temperature
   Displayed temperature can be matched with the value of your own indicator.
   ※ Range of setup temperature : -20℃～20℃

2. Upper temperature limit alarm
   When the temperature rises higher than preset temperature and reaches at setup value for alarm, alarm works.
   Setup value for alarm can be set up within the below-mentioned range.
   ※Range of setup temperature : 0℃～30℃
   ※When setup value is too small, alarm may work when starting operation.

3. Lower temperature limit alarm
   When the temperature falls lower than preset temperature and reaches at setup value for alarm, alarm works. Setup value for alarm can be set up within the below-mentioned range.
   ※Range of setup temperature : 0℃～30℃

4. Auto tuning
   As for temperature control, this product is under P.I.D control and appropriate P.I.D. fixed number is set up as default value. However, temperature control may be disturbed depending on use condition, such as load of sample and etc. In such a case, appropriate P.I.D. can be set up automatically. Also, the value can be back to default value.

   ※Selectable items
   「 oFF 」 : Stopping auto tuning
   「 on 」 : Starting auto tuning
   「 clr 」 : Recovery to initial value

5. Setup for the recovery from power failure
   When power switch is turned off or power source is cut off because of sudden power failure and etc., operation condition at the moment of recovery can be set up.
   ※Selectable items
   「 cont 」 : Continuing operation
   「 oFF 」 : Stopping operation
   「 on 」 : Continuing operation
   However, when measured temperature falls 5℃ lower than setup temperature, timer will re-start.

6. Setting up buzzer
   Buzzer beeps when the unit gets stopped automatically in timer mode and 2-step mode operation.
   ※Selectable items
   「 oFF 」 : No buzzer sound
   「 on 」 : Buzzer beeps

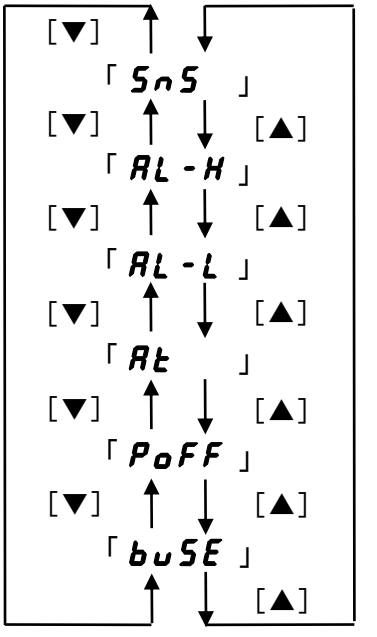
※When changing setup value, please refer to "How to control (Control mode)" on page 26. Wrong setup can not operate your desired performance.

List of setup value

Name	Character	Initial setup
Compensating temperature display	SnS	0℃
Alarm for upper Limit temperature	AL-H	5℃
Alarm for lower limit temperature	AL-L	5℃
Auto tuning	At	oFF
Setup for recovery from power failure	PoFF	cont
Setup for buzzer	buSE	oFF

Setup value of control mode and selectable items can be changed even during operation and under suspension. However, when displaying time on indicator, it can not be changed to control mode. When displaying time, no key operation should not be done for a minute. Or press [Mode] key to select measured temperature display.

How to select control mode
1) Press [set] key for longer than 5 seconds. Indicator displays 「SnS」 and selects control mode.
2) Each time you press [▲] and [▼] key the setup mode changes as below.



3-4 Safety・alarm function

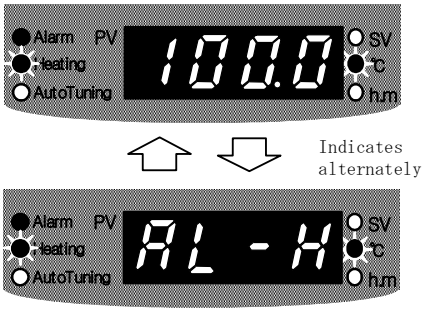
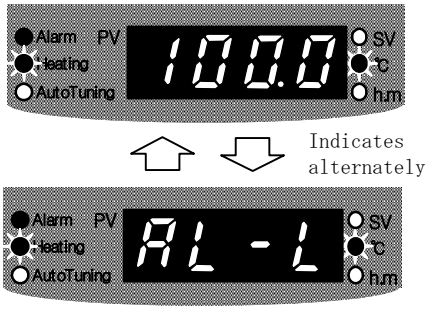
This product is equipped with safety and alarm functions as below.

When the machine has trouble, please refer to "Troubleshooting" on page 33 and follow the proper instructions.

Safety functions

Safety function	Operation
Fuse	When excess current flows, fuse blows and stops power distribution to the unit.
Overheat protector	When the temperature around the point where setting up the block exceeds the operative temperature of over heat protector, it stops power distribution. Power source will be supplied automatically when the temperature falls.

Alarm functions

Alarm name	Alarm display and operation	Reasons why alarm works.
Upper temperature limit alarm	・Buzzer beeps for 15 seconds. ・Performs continuous operation. ・Alarm display 	Operation condition Alarm works when the measured temperature is higher than "Preset temperature + setup value for upper temperature limit alarm" temporary. Canceling alarm ・Cancels automatically when measured temperature is within the range of "Preset temperature + upper temperature limit value", alarm is canceled automatically. ・ Pressing「set」key can cancels alarm manually. ※ Setup value for upper temperature limit alarm can be changed. Please refer to "Upper temperature limit" on page 27.
Lower Temperature Limit alarm	・Buzzer beeps for 15 seconds. ・Operates continuously ・Alarm display 	Operation condition Alarm works when the temperature falls lower than "Preset temperature-lower temperature limit". Canceling alarm ・When the measured temperature is within the range of "Preset temperature-setup value for lower temperature limit alarm", alarm is cancelled automatically. ・ Pressing 「set」key can cancel the alarm manually. ※Value of lower temperature alarm can be changed. Please refer to "Lower temperature limit alarm" on page 28.

Alarm name	Alarm display and operation	Reasons why alarm works.
Power failure alarm	・Continues or stops operation according to the setup for the recovery from power failure. Continuing operation Indicates alternately Stopping operation Indicates alternately 	Operation condition Alarm works when power failure occurs during the operation, or when the power switch is turned off without stopping operation with [Run /Stop] key. Canceling alarm Pressing 「set」 key can cancel alarm. ※Procedure after the recovery from power failure can be changed. Please refer to "Setup for the recovery from power failure" on page 30.
Alarm for the malfunction of temperature control	・Operates continuously. ・Buzzer beeps for 15 seconds. ・Alarm display Indicates alternately 	Operation condition ・Alarm works when the temperature does not rise higher than 1.0℃ within 10 minutes. ・Alarm works when the temperature does not fall lower than 0.1℃ within 10 minutes. Canceling alarm ・Alarm is canceled automatically if the temperature changes. ・Pressing 「set」 key can cancel the alarm.
Sensor alarm	・Stops operation ・Buzzer beeps for 15 seconds. ・Alarm display 	Operation condition ・Alarm works when the temperature sensor is disconnected. ・Alarm works when operating lever for checking up sample temperature without connecting to sample temperature sensor. Canceling alarm ・Pressing「set」key can cancel alarm. ・Operation gets re-started automatically when alarm is canceled. When alarm works in the condition that the lever for checking up the sample temperature is not operated, stop the operation immediately and contact your local dealer or closest customer service center.

Alarm name	Alarm display and operation	Reasons why alarm works.
Watch dog	・Resets micro computer and tries to re-start controlling. Stops controlling if normal operation does not re-start. ・Turns off the light of all the displays. 	Operation condition ・Normal control can not be performed because of external noise and etc. ・Normal control can not be performed because of high ambient temperature. Canceling alarm Please try to use the other power source or lower the temperature.

4 Setup

4-1 Setup environment・condition

WARNING

Do not set up at potentially dangerous place

This product is not designed with explosion-proof product. Setting it up at potentially dangerous place may cause fire and etc.

WARNING

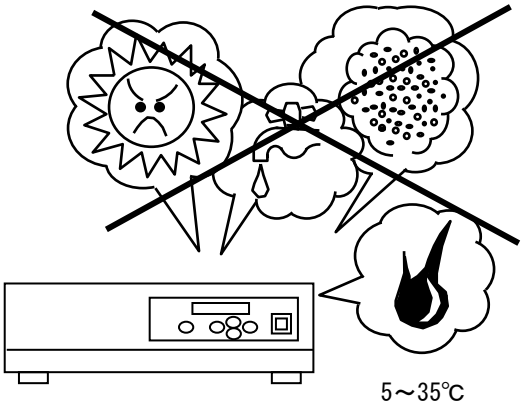
Making enough space around the unit.

To maintain the function of the product, leave the space between the product and wall surface and ceiling plane. Space should be larger than the one shown on the right picture.

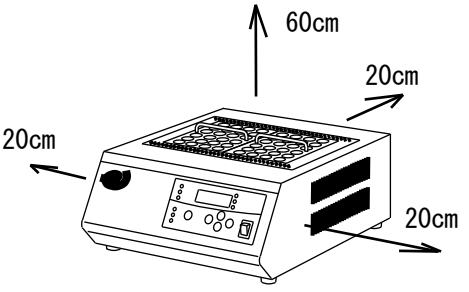
CAUTION

Care should be taken to setup environment.

Bad setup environment may damage the product or worsen the function.



Select the setup location as below.
◎No inflammable, solid, liquid and gas around the unit.
◎Range of ambient temperature is from 5℃ to 35℃
◎No dew condensation
◎Fewer humidity and dripping
◎Fewer dust
◎No direct sun light
◎Good ventilation
◎Stable, even and solid.



4-2 Utility connection

⚠ WARNING

Make sure of the voltage, phase, capacity and the type of outlet.

Wrong connection may cause fire or electric shock.

⚠ WARNING

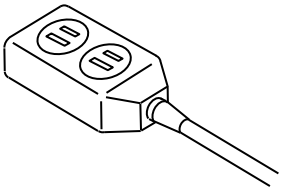
Connect earth wire properly.

Do not connect earth wire to gas pipe or water pipe for preventing electric shock.

⚠ WARNING

Do not use branching socket and power strip.

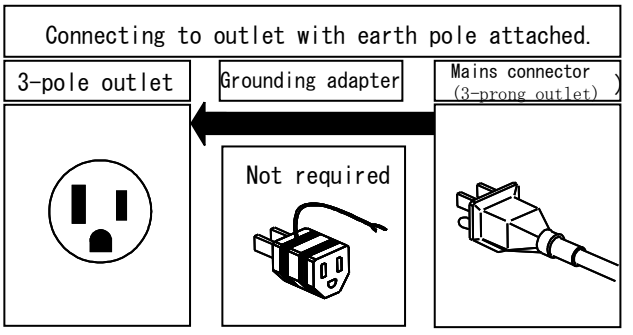
Excess current may burn cable or cause fire.



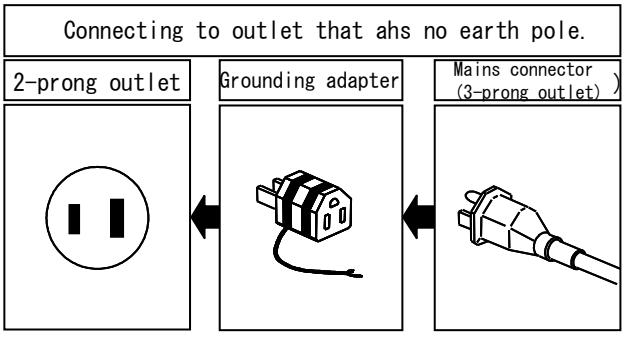
(1) Check the voltage, phase and capacity of power source connecting to the product. Required power source is as shown on right table.

Model	Required power source	
	Voltage	Capacity
MG-2200 MG-2300	AC-100V	15A

(2) Make sure of the type of the outlet.
(Do not connect mains connector.)
Mains connector can be used if the outlet is earth wire attached.



Set the grounding adapter on the mains connector if the outlet ahs no earth wire. Connect earth wire of adapter to earth that has been done the third type of ground construction work.



5 Operation

5-1 Preparation

WARNING

Do not boil the unit with no water

Set up maximum aluminum block in each unit and start operation. Or temperature control and temperature distribution may be worsened.

CAUTION

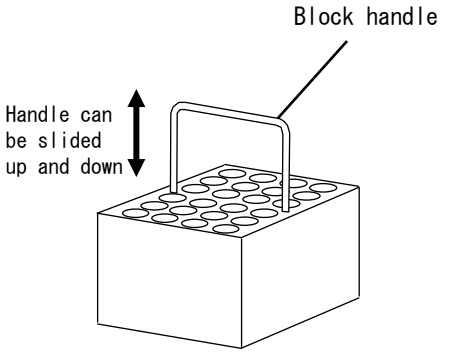
Do not use undesignated aluminum block.

Using undesignated aluminum block may worsen temperature control and temperature distribution or cause unexpected accident.

(1) Prepare aluminum block matching with your desired container. Required number of the block is one for MG-2200 and two for MG-2300. As for the types of block, please refer to "Options" on page 5.

Block handle is equipped with aluminum block in order to attach, detach with the instrument and to carry the block.
Block handle can be slided up and down .

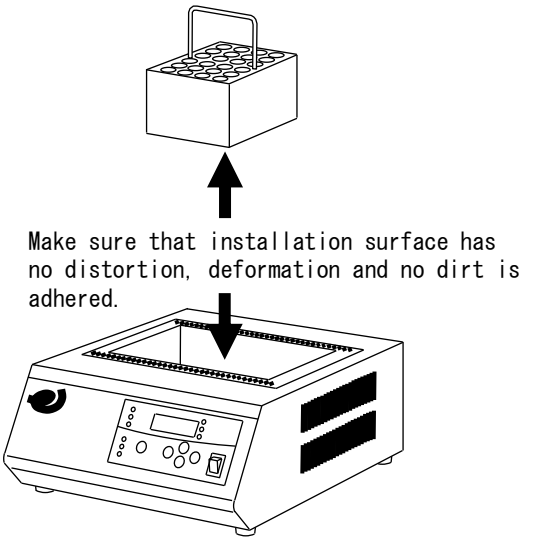
※When using the container except glassware, check up the heat resistance before use. Container may be melted depending on the temperature.



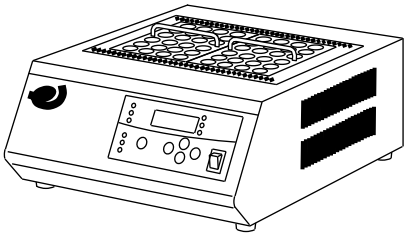
(2) Make sure that each installation surface of the instrument and aluminum block has no distortion, deformation and no dirt is adhered.

※Distortion, deformation and adhesion of dirt may worsen the temperature accuracy and distribution.

※When spilling water or sample on external surface or setup surface, wipe it off quickly. It may cause electric leakage.



(3) Set up required number of block softly and place block handle into the aluminum block.



(4) After checking up that power switch is OFF, plug mains connector into outlet.

5-2 How to operate

WARNING

Use extreme caution when using inflammable and combustible solution.

Leaving inflammable and combustible solution out at room temperature or higher temperature, they (ethanol and etc.) may evaporate, catch fire and explode. Ventilate well before use and use care when handling these solutions.

WARNING

Do not touch aluminum block during use and for a while after use.

Aluminum block and block handle are subject to have high temperature during and after use if the preset temperature is high. Touching these part may burn yourself.

CAUTION

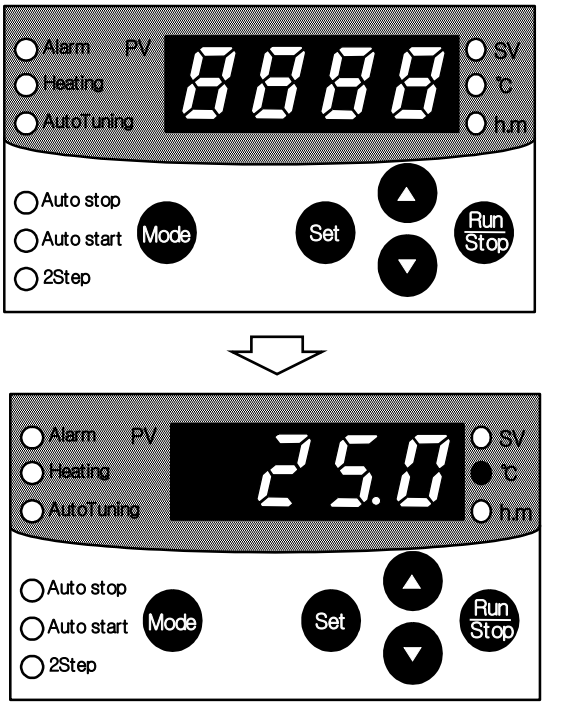
Stop using the product when you find any malfunction.

When you find any malfunction, turn off the power switch and refer to "Troubleshooting" on page 33.

1. Stationary operation

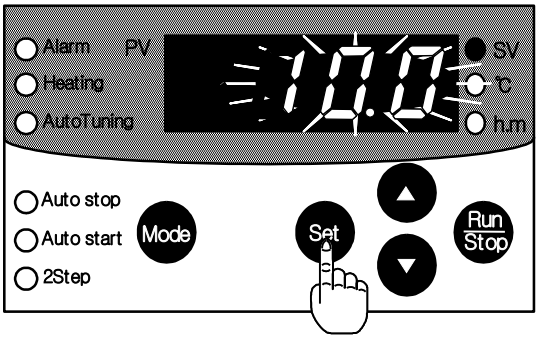
(1) Turn on power switch.
Initial display is indicated and then measured temperature is indicated.

※On "8888" part, specified number of the product is indicated as shown on right picture.

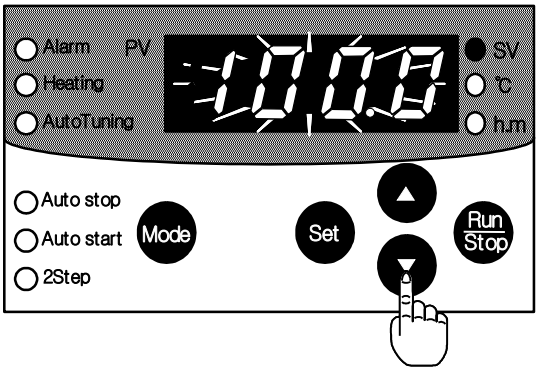


(2) Press [set] key.
Indicator displays (with blinking) the preset temperature and lights up preset LED (SV). Then, temperature can be set up.

※Preset temperature is the value which was set up the previous time.
Factory default value is 10.0℃.

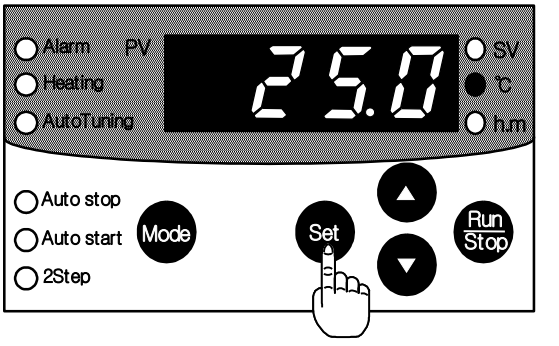


(3) Set up your desired temperature with [▲] and [▼] key.
Each time you press [▲] and [▼] key, the value increases / decreases by 0.1℃.
If you hold down the key, the value increases / decreases continuously, and if you hold down longer, the value increases / decreases to the next digit.



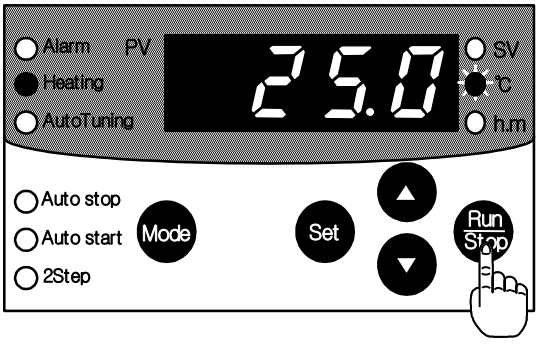
(4) Press [set] key.
Preset temperature is fixed and the indicator shows the measured temperature, and setup LED (SV) turns off a light.

※If no key operation is done for more than one minute while preset temperature blinks, the display returns to measured temperature display automatically.
※Preset temperature can be also changed by following the same procedure during operation.



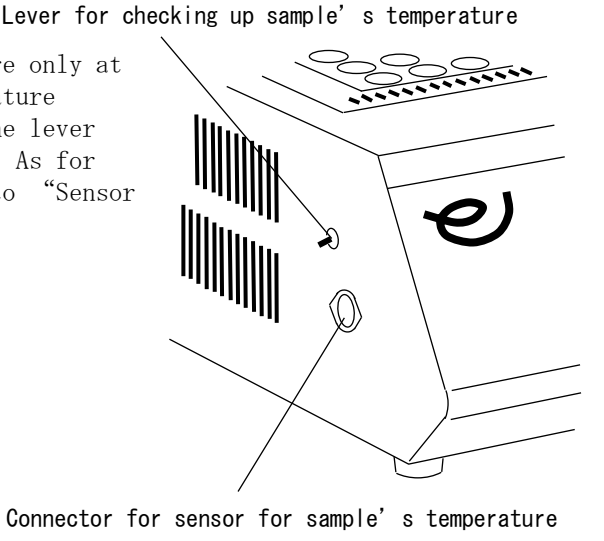
(5) Press [Run/Stop] key.
Temperature LED (℃) starts blinking and operation gets started. Heater LED (Heating) lights up while control signal to heater is outputting.

※To stop operation, press [Run/Stop] key again.
※Press [Run/Stop] key whenever stopping the operation. If power source is cut off without using [Run/Stop] key, alarm for power failure will work when the machine is turned on next time.



Lever for checking up sample' s temperature

Use lever for checking up sample' s temperature only at the time of using sensor for sample' s temperature (option). Alarm for sensor works if you use the lever without connecting sensor for sample' s alarm. As for sensor for sample' temperature, please refer to "Sensor for sample' s temperature" on page 32.



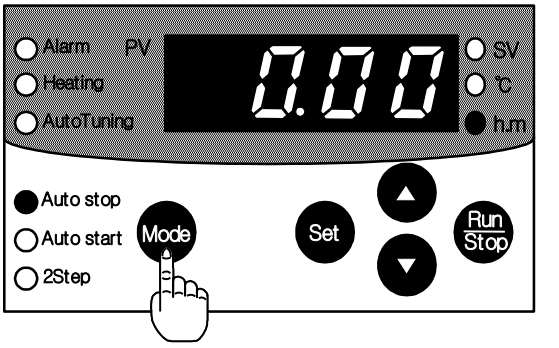
2. Timer mode (Auto stop)

※Temperature should not be set up in timer mode. Set up the temperature in accordance with the operation of stationary operation.

※Preset time can be shared both in auto stop operation and auto start operation.

※Timer mode operation can be selected and time can be set up even during the operation. The procedure is as same as the one from under suspension. (Description mentioned below starting from the step of under suspension).

(1) Press [Mode] key once. Indicator changes to display measured time and time can be set up.
- When stationary operation (during control or under suspension) is performed, "Auto stop LED (Auto Stop)" lights up.
- "Operating mode's LED" lights up while the unit is controlled by timer mode and "Time LED (h.m)" lights up and "Temperature LED (℃)" turns odd a light. Every press of [Mode] key changes the function as below.

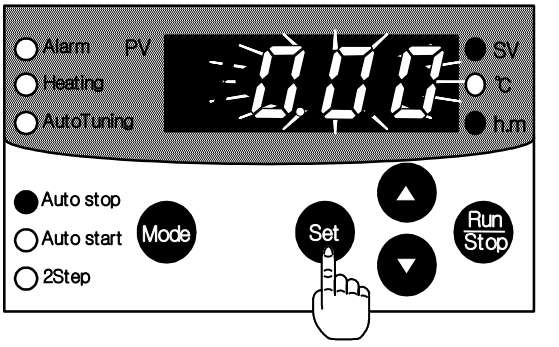


Press once

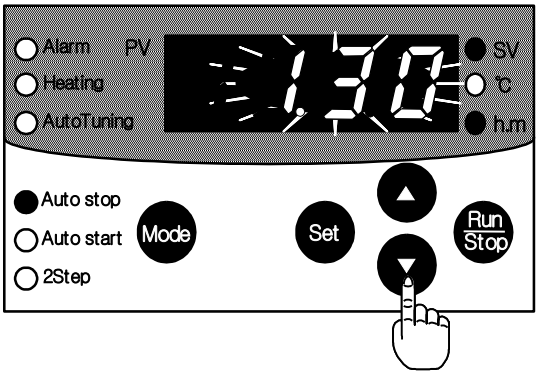
Auto stop LED (Auto Stop) ←
↓
Auto start LED (Auto Start)
↓
2-step (2 Step)
↓
Temperature display
(LED of all modes turn off a light) →

(2) Press [set] key.
Indicator changes to display preset time (blinking) and time can be set up.
- 「Setup LED (SV)」 lights up.

※Preset time is the value that was set up at previous time. Factory default value is "000".

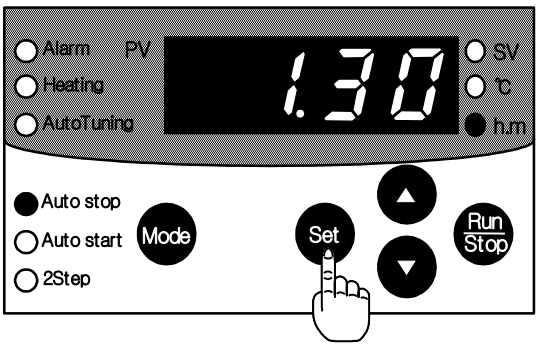


(3) Press [▲] and [▼] key to set up the time. Each time you press [▲] and [▼] key the value increases/decreases by one minute. If you hold down the key, the value increases/decreases continuously, and if you hold down longer, the value increases/decreases by 10 minutes.



(4) Press [set] key.
Indicated preset time (blinking) is fixed.
・Indicator changes to display measured time and "Setup LED (SV)" turns off a light.
・During under control, displayed (blinking) time is fixed and auto stop operation gets started.

※If no key operation is done for more than 1 minute while setting up timer, the indicator returns to display measured temperature.

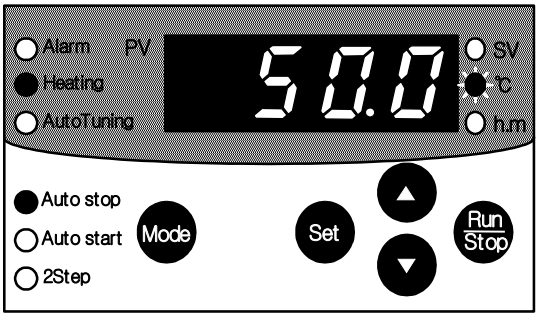


(5) Above-mentioned are all the procedure during operation. Please proceed to (7). As for the operation under suspension, please proceed to (6).

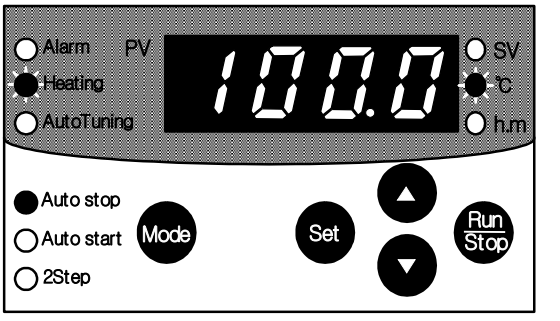
(6) Press [Run/Stop] key. Auto stop operation gets started. Display will be as below until timer count gets started.
・Indicator displays measured temp. display.
・「Temperature LED (℃)」blinks.
・When outputting control to heater, "Heater LED (Heating)" lights up.
Display condition differs upon starting timer count.
・ Indicator keeps displaying measured temperature.
・「Time LED (h.m)」blinks.
・「Temperature LED (℃)」lights up.
・ When outputting control to heater, "Heater LED (Heating)" lights up.

※ When terminating operation, press [Run/Stop] key once again.
※ After selecting auto stop, if the operation will not start within a minute, the condition returns to stationary operation.

Before timer count



After starting timer count

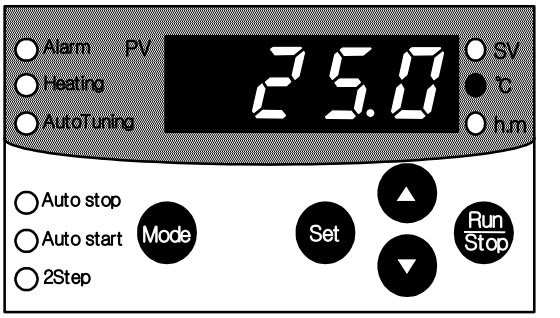


Operation during auto stop operation

1. Checking up the remaining time of timer count
Press [Mode] key.
・「Auto stop LED」lights up.
・ Remaining time is displayed with subtracting time on the indicator.
2. Stopping timer count
Press Mode] key for more than 5 seconds.
Timer count gets stopped on the half way and the operation condition changes to stationary operation.

※ Measured time display returns to measured temperature display if no key operation is done for 10 seconds.

(7) After completing time count, control gets stopped and the indicator changes to display the value in stationary operation.
- 「Auto stop LED」turns off a light.
- 「Time LED (h.m) 」turns off a light.
- 「Temp. LED (℃) 」lights up.
- In case that buzzer setup is 「on」, buzzer keeps beeping until pressing [set] key.



※ Press [Run/Stop] key when stopping control before terminating timer count.
※ When terminating operation, stop operation and turn off power switch. If you turn off power switch without stopping operation, alarm for power failure will work when starting operation next time.

3. Timer mode (Auto start)

※Temperature should not be set up in timer mode. Set it up the according to stationary operation.

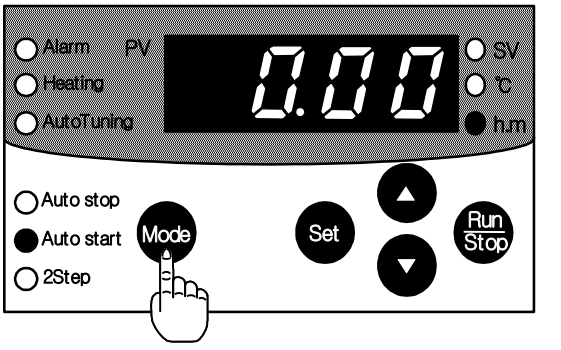
※ Preset time is used both for auto start operation and auto stop operation.

※ Timer mode operation can be selected and time can be set up even during operation. The procedure of operation is same as the case under suspension. (The following illustration describes the procedure from the step of under suspension.)

(1) Press [Mode] key twice.
Indicator changes to display measured time and time can be set up.
- When stationary operation (under control or suspension) is performed, 「Auto start LED (Auto Start) 」lights up.
- In case the unit is controlled in timer mode, "Operating mode's LOED" blinks and "Time LED (h,m)" lights up, and "Time LED (℃) " turns off a light.

Each time you press [Mode] key, the mode changes as below.

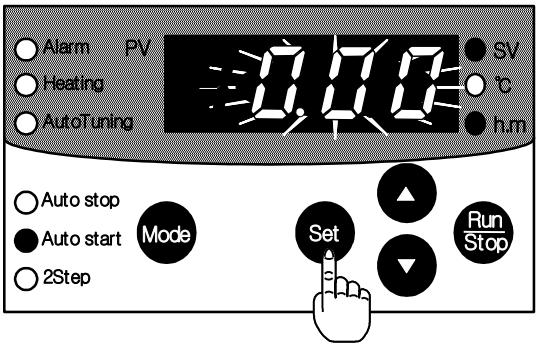
Auto stop LED (Auto Stop)
↓
Auto start LED (Auto Start)
↓
2-step (2 Step)
↓
Temp. display (LED of all the modes turns off a light.)



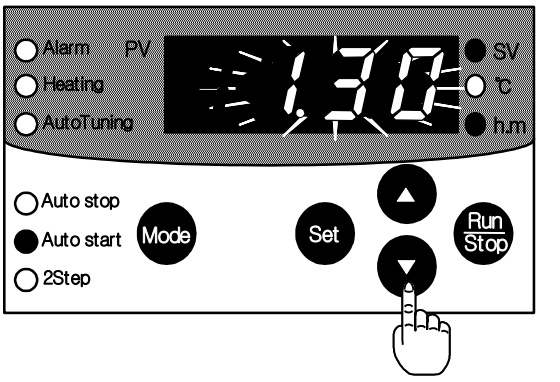
Press twice

(2) Press [set] key.
Indicator changes to display preset time (with blinking) and time can be set up.
- 「Setup LED (SV) 」lights up.

※ Displayed preset time is the value that was set up previously.
Factory default value is 「000」.

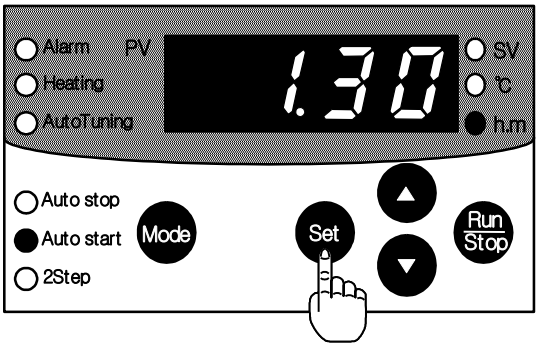


(3) Press [▲] and [▼] key to input the time.
Each time you press [▲] and [▼] key, the value increases / decreases by 1 minute. If you hold down the key, the value increases / decreases continuously, and if you hold down longer, the value increases / decreases by 10 minutes.



(4) Press [set] key.
Displayed setup time (blinking) is fixed.
- Indicator changes to display measured time display and "Setup LED (SV)" turns off a light.
- During under control, it stops control and starts timer count.

※ If no key operation is done for more than a minute while setting up timer, then the display changes to show measured temperature.

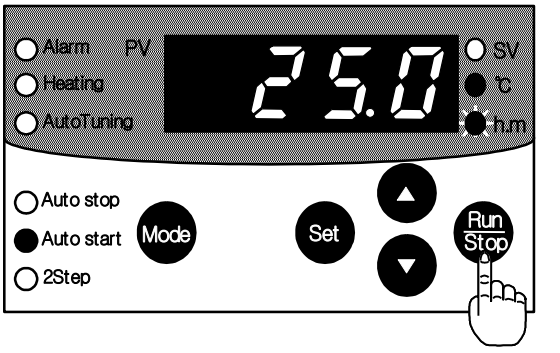


(5) Above-mentioned are all the procedures during the operation.
As for the procedure during under suspension, please proceed to (6).

(6) Press [Run/Stop] key. It starts auto start operation.
- Indicator changes to display measured temperature.
- 「Temperature LED (℃) 」lights up.
- 「Time LED (h.m) 」blinks.

After finishing timer count, stationary operation starts performing with preset temperature.

※To stop operation, press [Run/Stop] key once again.
※After selecting auto start, the operation returns to stationary operation if no operation is performed within a minute.



Operation during auto start operation

1. Checking up the remaining time of timer count.
   Press [Mode] key.
   - 「Auto start LED」blinks.
   - Indicator displays the remaining time with subtracting the displayed time.
2. Stopping timer count
   Press [Mode] key for longer than 5 seconds.
   Timer count can be stopped on the half way.

※If no key operation is done for 10 seconds, measured time display returns to measured temperature display.

4. 2-step operation

※Temperature and time are need to be set up separately besides setup of stationary operation and timer mode.

※2-step operation can be selected even during the operation. The procedure of the operation is same as the one under suspension.
(Below-mentioned description and figure are under the condition of suspension).

※Temperature fall is performed in natural cooling. When setting up the temperature around the level of room temperature, the temperature will not reach at the preset temperature, which can not proceed the step.

※For more details about temperature rise and fall, please refer to "Temperature rise and fall curve" on page 3.

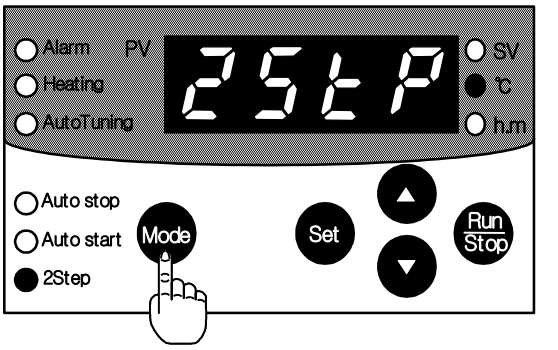
(1) Press [Mode] key three times.
Indicator shows 「25tP」under suspension and "Temperature LED (℃)" lights up.
Setup time of the first step is displayed on the indicator during operation and the following displays will light up according to the process of each mode.

・Stationary operation
"2-step LED (2step)" lights up during control and "Temperature LED (℃) blinks.)

・When the unit is controlled by timer mode, "Operating mode's LED" blinks, "Time LED (h,m)" lights up and "Temperature LED (℃)" blinks.

Each time you press [Mode] key, the mode changes as below.

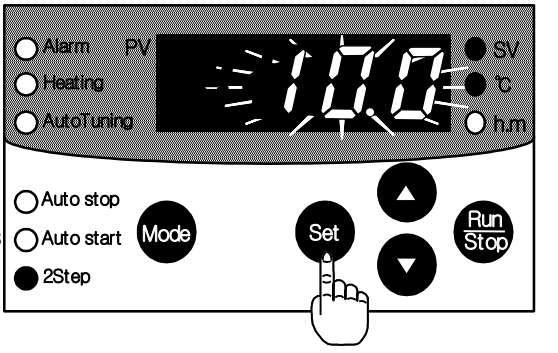
Auto stop LED (Auto Stop) ←
↓
Auto Start LED (Auto Start)
↓
2-step (2 Step)
↓
Temp. display (LED of all the modes turn off a light) →



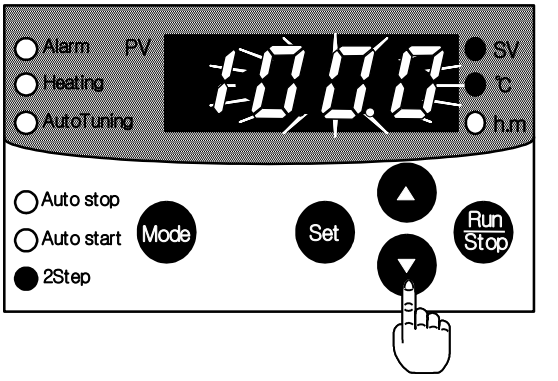
Press 3 times

(2) Press [set] key.
Indicator changes to display the setup temperature of the first step (with blinking) and temperature can be set up.
・「Setup LED (SV)」lights up.

※Preset time is the value that was used previous time. Factory default value is 10.0℃「10.0」.

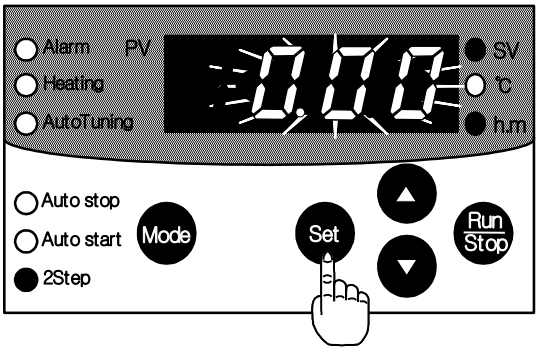


(3) Press [▲] and [▼] key to input preset temperature. Each time you press [▲] and [▼] key, the value increases / decreases by 0.1℃. If you hold down the key, the value increases / decreases continuously and the value changes to next digit if you hold down longer.

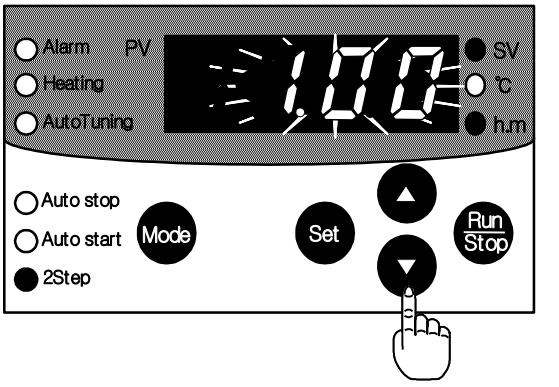


(4) Press [set] key.
Indicator changes to display preset time (blinking) and the time for first step can be set up.
・「Setup LED (SV) 」lights up.

※Preset time is the value that was used previous time. Factory default value is 0hr00 「0.00」.

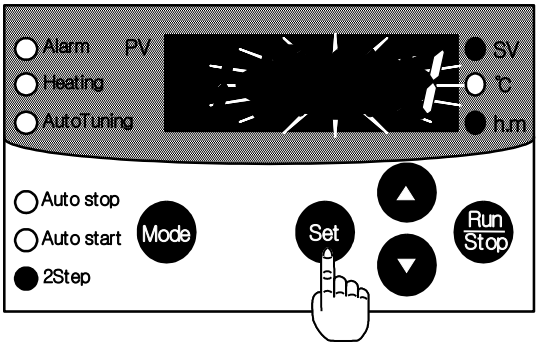


(5) Press [▲] and [▼] key to set up time.
Each time you press [▲] and [▼] key the value increases / decreases by one minute. If you hold down the key, the value increases and decreases continuously, and the value increases / decreases by 10 minutes if you hold down longer.

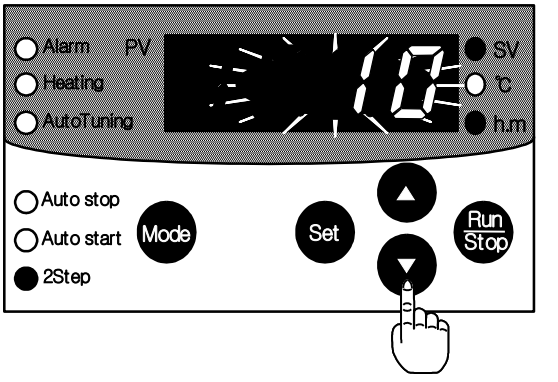


(6) Repeat the procedure from 2 to 5 and set up the temperature and time of 2nd step, then press [set] key.
Indicator changes to display setup count (with blinking) and the step count can be set up.

※Preset time is the time count that was used previous time. Factory default value is "once" 「1」.
※Setting up "0" can repeat the step until pressing [Run/Stop] key to stop operation.

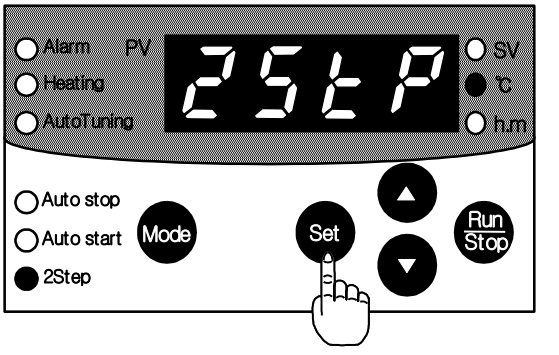


(7) Press [▲] and [▼] key to set up the time count. Each time you press [▲] and [▼] key, the value increases / decreases by 1. If you hold down the key, the value continues / decreases continuously, and the value increases /decreases and moves to the next digit if you hold down longer.



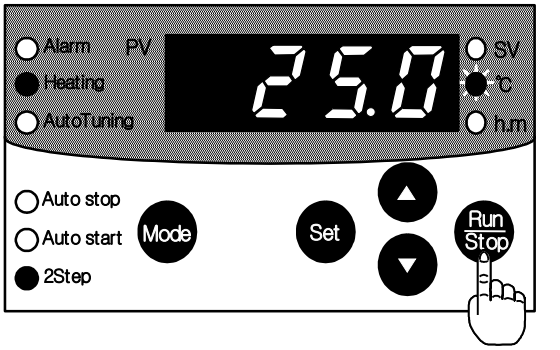
(8) Press [set] key.
Displayed setup count (blinking) is fixed.
・Indicator changes to display 「 25tP 」 and 「Setup LED (SV)」turns off a light.

※If no key operation is done longer than 1 minute while setting up the timer, the display returns to measured temperature display.



(9) Press [Run/Stop] key.
Temperature LED (℃) starts blinking and starts operation. While outputting the controlling signal to heater, heater LED (Heating) lights up. When reaching at preset temperature, "Time LED (h,m)" lights up and starts timer count.

※ To stop the operation on the halfway, press [Run/Stop] key once again.



Operation during 2-step operation

1. Checking up the remaining time of timer count.
Press [Mode] key.
- 「2-step LED」blinks.
- Indicator displays remaining time of displayed ongoing step with subtracting the displayed value.

※If no operation key is done for 10 seconds, measured time display returns to measured temperature display.

(10) Operation gets stopped automatically when setup count is finished.
・When buzzer setup is 「 on 」, buzzer keeps beeping until pressing [set] key.

5-3 Procedure after operation

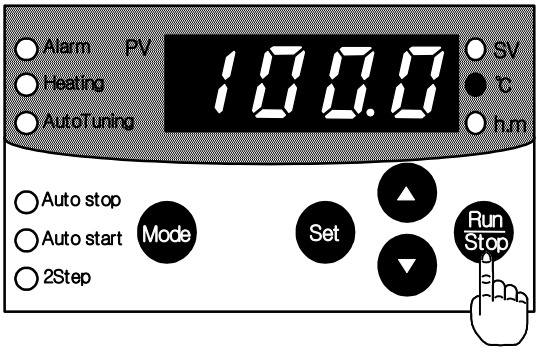
⚠ CAUTION

Do not touch aluminum block and block handle during use and for a while after use.

When preset temperature is high, aluminum block and block handle are subject to have high temperature during use and for a while after use. Touching the part may burn yourself.

(1) Press [Run/Stop] key to stop operation.
Temperature LED (℃) changes from blinking to lighting up, and heater LED (Heating) stops blinking. While the unit is operated in timer mode or 2-step mode, each mode LED turns off a light.

※ To stop operation, press [Run/Stop] key. If the power is cut off without pressing [Run/Stop] key, alarm for power failure works when the product is turned on next time.



(2) If you do not use the machine for a long time, unplug the mains connector.

5-4 How to control (Control mode)

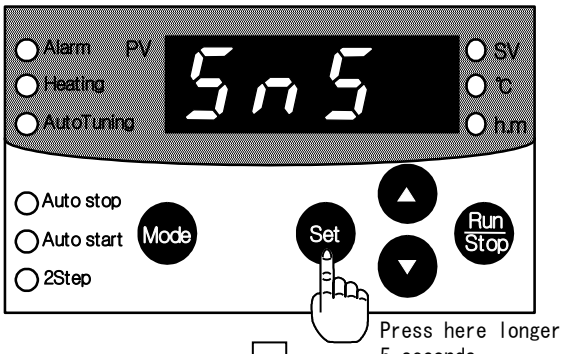
1. Compensating displayed temperature

This function compensates the displayed temperature when the temperature measured by thermometer and the measured temperature of indicator is different.

※With using this function, do not use the unit exceeding the limit of temperature range.
※Wrong setup makes the difference between the displayed temperature during operation and actual operating temperature, which may cause unexpected accident.

(1) Press [set] key longer than 5 seconds.
It changes to control mode and 「SnS」will be displayed on indicator, and then, compensated temperature will be shown.

(1) Changing to control mode

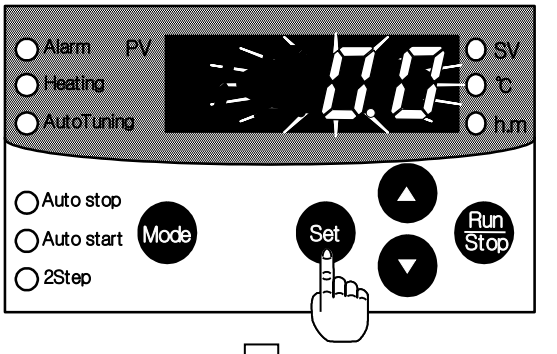


Press here longer than 5 seconds.

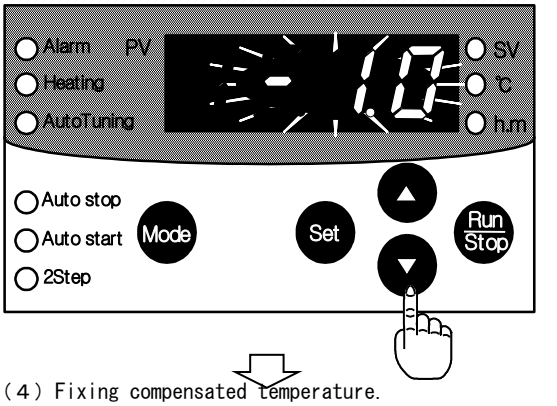
(2) Press [set] key.
Indicator changes to display compensated temperature (blinking).

※Compensated temperature (blinking) is the temperature that was set up previous time. Factory default value is 0.0℃.

(2) Compensating displayed temperature



(3) Inputting compensated temperature

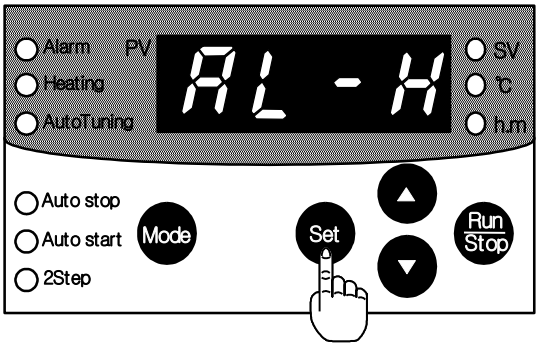


(3) Press [▲] and [▼] key to input compensated temperature. Each time you press [▲] and [▼] key, the value increases / decreases by 0.1 ℃. If you hold down the key, the value increases / decreases continuously. The value increases / decreases to the next digit if you hold down longer.

(4) Press [set] key.
Displayed compensated temperature (blinking) is fixed and indicator shows 「AL-H」, and then alarm for upper temperature limit displays.

※Compensated temperature is not available until pressing [set] key.
※To change other setup items, select the item with [▲] and [▼] key.
※If you do not change other setup item, press [Set] key more than 5 seconds.
The display returns to show "Measured temperature".
※If no key operation is done more than a minute, display returns to show measured temperature.

(4) Fixing compensated temperature.
Changing to alarm for upper temperature limit.

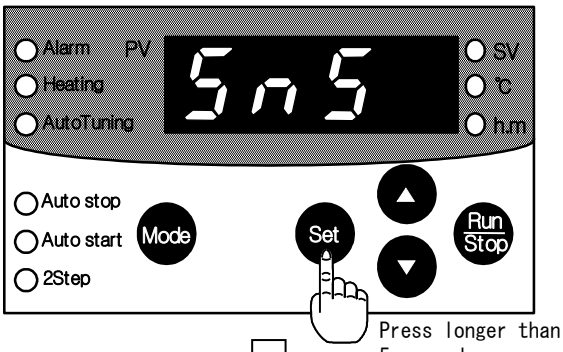


2. Alarm for upper temperature limit

Detecting temperature for upper temperature limit alarm can be changed.
※When preset value is too small, alarm may work at the moment operation gets started.

(1) Press [set] key for more than 5 seconds.
The mode changes to control mode and indicator displays「SnS」and then, compensating displayed temperature can be done.
・「Temperature LED (℃) 」turns off a light.

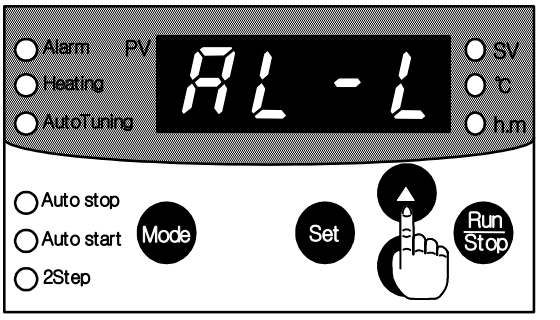
(1) Changes to control mode



Press longer than 5 seconds.

(2) Press [▲] key once again and change to upper temperature limit alarm mode.

(2) Changes to upper temperature limit alarm

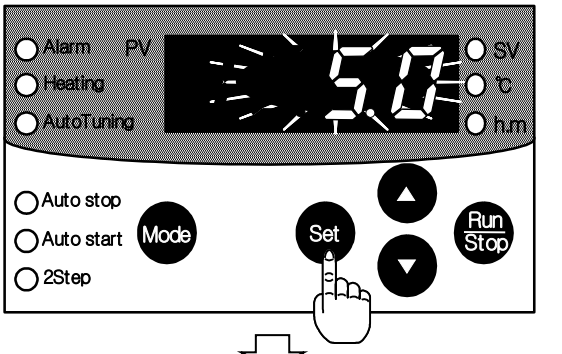


Press once

(3) Press [set] key.
Indicator changes to display preset temperature for upper limit temperature alarm (blinking).

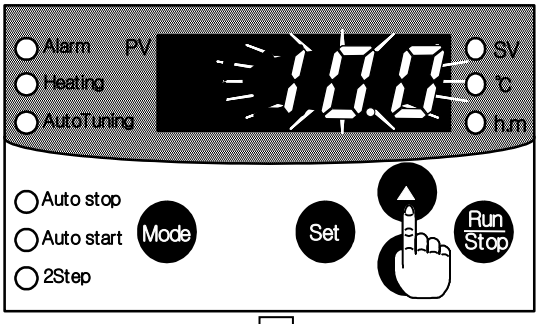
※Preset temperature (blinking) is the value that was set up previous time. Factory default value is 5.0℃.

(3) Displaying preset temperature



(4) Press [▲] and [▼] key to set up the temperature. Each time you press [▲] and [▼] key, the value increases /decreases by 0.1 ℃ and if you hold down the key, the value increases / decreases continuously, and the value increases /decreases to the next digit if you hold down longer.

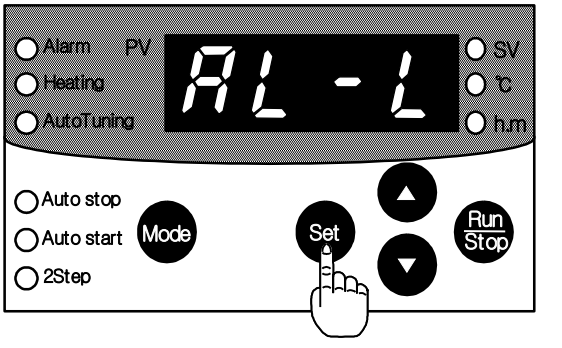
(4) Inputting setup temperature



(5) Press [set] key.
Displayed preset temperature (blinking) is fixed and the indicator displays 「AL-L」 and the function changes to lower temperature limit alarm.

※Compensated temperature is not available until pressing [set] key.
※To change other setup items, select the item with [▲] and [▼] key.
※If you do not change other setup items, press [Set] key more than 5 seconds.
Indicator starts to display "Measured temperature".
※If no key operation is done for more than a minute, indicator starts to display measured temperature.

(5) Fixing preset temperature
Changes to lower temperature limit alarm



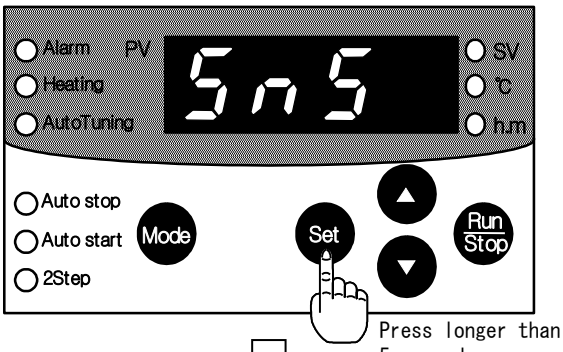
3. Lower temperature limit

Detecting temperature for lower temperature limit alarm can be changed.

※If the preset value is too small, alarm may work.

(1) Press [set] key more than 5 seconds.
The mode changes to control mode and indicator displays 「SnS」, and the mode changes to compensating displayed temperature mode.
・「Temperature LED (℃) 」turns off a light.

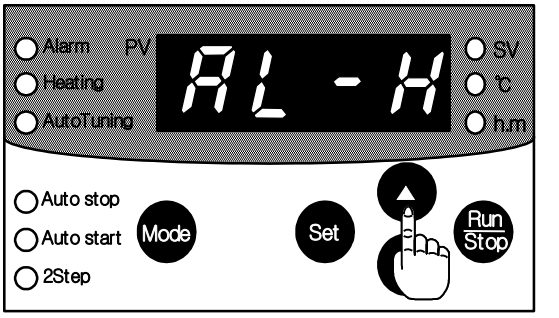
(1) Changes to control mode



Press longer than 5 seconds.

(2) Press [▲] key twice to change to lower temperature limit alarm mode.

(2) Changes to upper temperature limit alarm

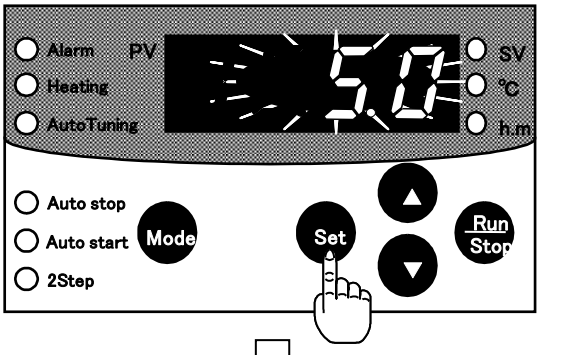


Press twice

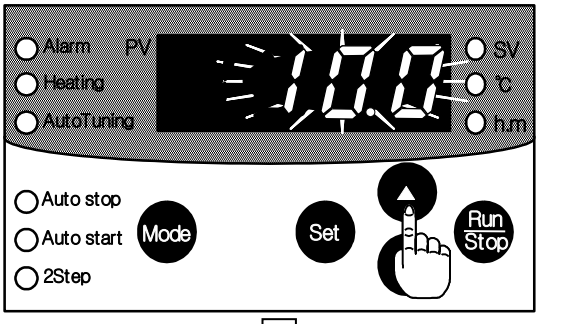
(3) Press [set] key.
Indicator changes to display lower temperature limit alarm (blinking).

※Preset temperature (blinking) displays the value that was used previous time.
Factory default value is 5.0℃.

(3) Preset temperature display



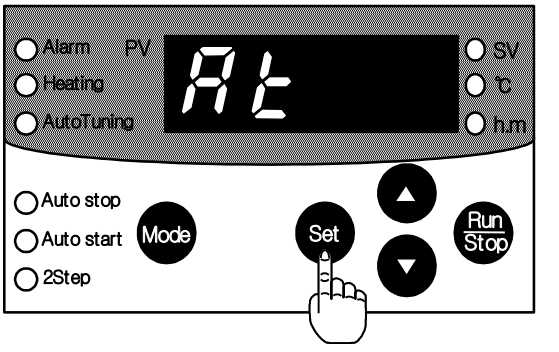
(4) Setting up temperature



(4) Press [▲] and [▼] key to set up the temperature. Each time you press [▲] and [▼] key, the value increases / decreases by 0.1 ℃. If you hold down the key, the value increases/decreases continuously, and the value increases/decreases to the next digit if you hold down longer.

(5) Press [set] key.
Displayed preset temperature (blinking) is fixed and the indicator displays 「At」, and then the mode changes to auto tuning.
※Compensated temperature is not available until pressing [set] key.
※To change other setup items, press [▲] and [▼] key and select the ietem.
※If you do not change other setup items, press [Set] key for more than 5 seconds. Then, the indicator changes to display "measured temperature".
※If no key operation is done for longer than a minute, the indicator changes to display measured temperature display.

(5) Fixing preset temperature
Changes to auto tuning



4. Auto tuning

When the control is disturbed by some use conditions or sample load, appropriate P.I.D. fixed number that matches the condition can be re-set up automatically.

※During operation, auto tuning can not be performed.

※During auto tuning, as temperature control is disturbed a bit, use sample which does not occur trouble.

※Since auto tuning time differs depending on condition, please conduct in stationary operation.

(1) Press [set] key longer than 5 seconds.
The mode changes to control mode and indicator displays「SnS」and the mode changes to compensating displayed temperature mode.
・「Temp.LED (℃) 」turns off a light.

(2) Press [▲] key three times and change to auto tuning.

(3) Press [set] key.
Indicator changes to display setup character (blinking) of auto tuning.

※Displayed setup character (blinking) differs depending on the one that was set up previously.
「 oFF 」「 on 」→「 oFF 」
「 cLr 」 →「 cLr 」
Factory default value is 「 oFF 」.

(4) Press [▲] and [▼] key to select setup character.

※Setup character changes in order as below.
「 oFF 」: Stopping auto tuning
「 on 」: Starting auto tuning
「 cLr 」: Returns to factory default value after tuning

(5) Press [set] key.
When selecting 「 cLr 」or「 oFF 」, the indicator displays 「PoFF」and changes to the setup of recovery from power failure.
When selecting 「 on 」, auto tuning gets started and changes to stationary operation automatically after the auto tuning is completed.

To stop the auto tuning on the halfway, re-select auto tuning 「 oFF 」 from control mode.

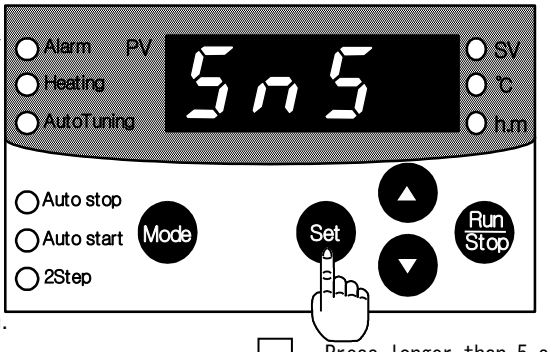
※Preset character is not available until pressing [set] key.

※When changing other settable items, press [▲] and [▼] key to select the item.

※If you do not change other setup items, press [Set] key for longer than 5 seconds.
Indicator changes to display "measured temperature".

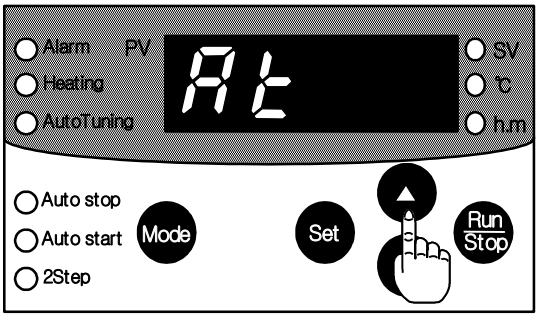
※If no key operation is done longer than a minute during setting up, the indicator shows measured temperature display again.

(1) Change to control mode



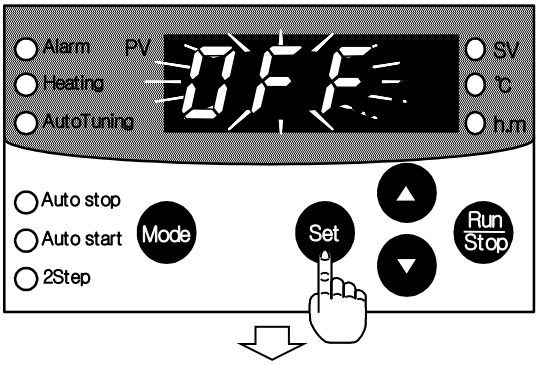
Press longer than 5 seconds.

(2) Changes to auto tuning

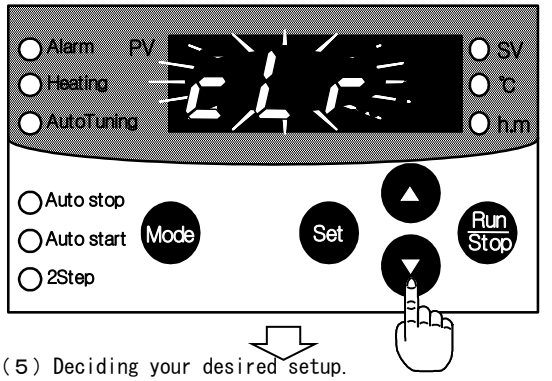


Press three times

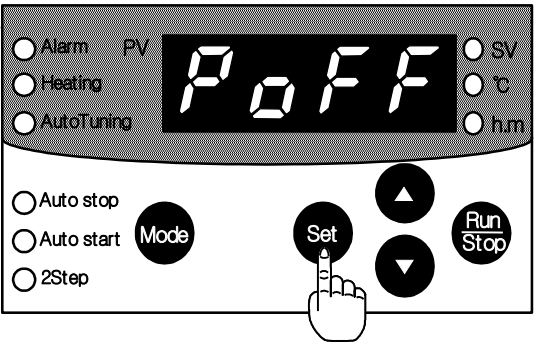
(3) Displaying setup condition



(4) Inputting your desired setup



(5) Deciding your desired setup.
Changes to the recovery from power failure



5. Setup the recovery from power failure

In case of power failure, the operation of the recovery can be selected. (When turning off power switch without stopping control, it is considered to be power failure.)

(1) Press [set] key for longer than 5 seconds.
The mode changes to control mode and the indicator displays 「 SnS 」, then the mode changes to compensating displayed temperature mode.
・「Temperature LED (℃) 」turns off a light.

(2) Press [▼] key twice to set back to the recovery from power failure setup.

(3) Press [set] key.
Indicator changes to display setup character (blinking) of the recovery from power failure.

※Setup character (blinking) is the character that was set up previous time.
Factory default value is 「cont」.

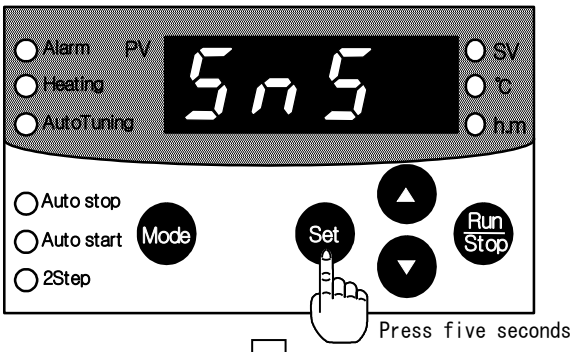
(4) Press [▲] and [▼] key and select the setup character.

※Setup character changes as below.
「 cont 」: Continuing control
「 oFF 」: Stopping control
「 cont 」: Continuing control
When measured temperature is 5℃ lower than preset value, timer starts recounting.

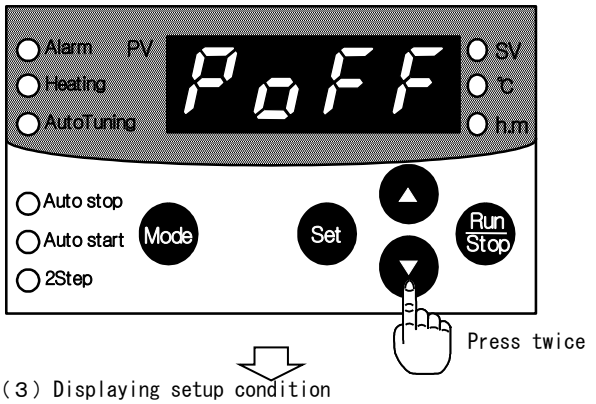
(5) Press [set] key.
Displayed setup character (blinking) is fixed and indicator shows 「buSE」 and changes to buzzer setup.

※Changed setup character is not available until pressing [set] key.
※When changing other settable items, press [▲] and [▼] key to select the item.
※If you do not change other setup item, press [Set] key longer than 5 seconds. Indicator changes to display "measured temperature".
※If no key operation is done for longer than a minute, the display changes to fixed temperature display.

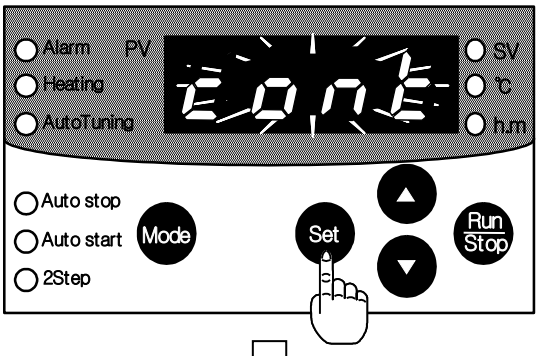
(1) Changing to control mode



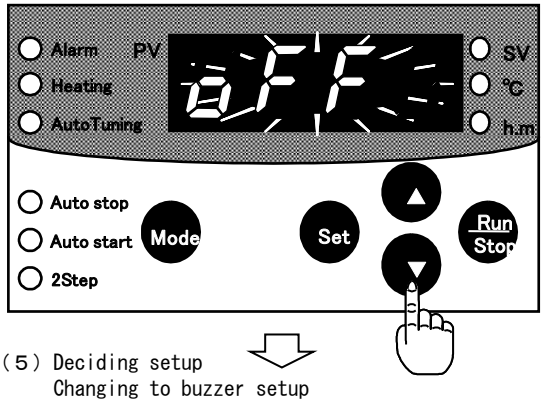
(2) Changing to the setup of recovery from power failure



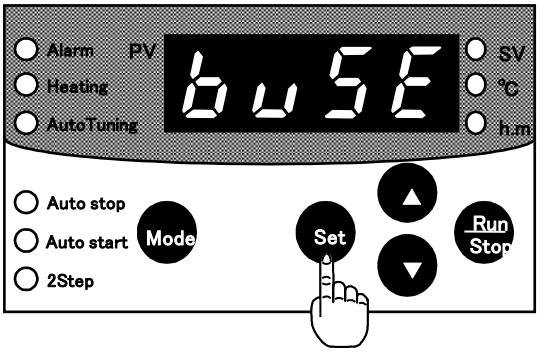
(3) Displaying setup condition



(4) Inputting setup



(5) Deciding setup
Changing to buzzer setup



6. Setting up buzzer

Buzzer can be set up to beep when the unit is stopped automatically in timer mode or 2-step mode operation. Buzzer beeps until pressing [set] key.

(1) Press [set] key longer than 5 seconds.
The mode changes to control mode and indicator shows 「Sns」, and mode changes to compensating displayed temperature mode.
・「Temperature LED (℃)」turns off a light.

(2) Press [▼] key once to set up buzzer setup.

(3) Press [set] key.
Indicator changes to show setup character (blinking) of buzzer setup.

※Setup character (blinking) is the character that was set up previous time.
Factory default value is 「oFF」.

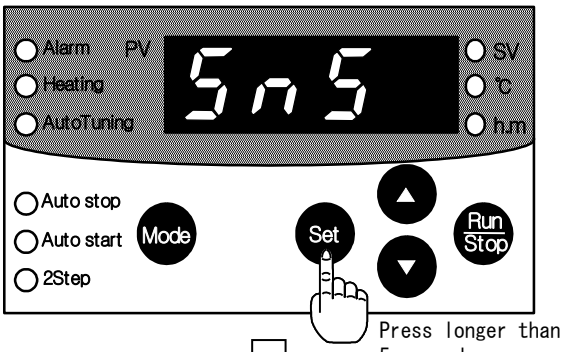
(4) Press [▲] and [▼] key to select setup character.

※Preset character changes in order as below.
「 oFF 」: No buzzer
「 on 」: Buzzer beeps

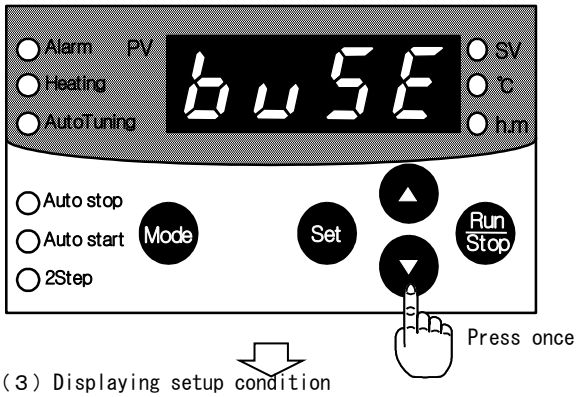
(5) Press [set] key.
Displayed preset temperature (blinking) is fixed and indicator shows 「SnS」, and changes to compensating displayed temperature mode.

※Changed character is not available until pressing [set] key.
※To change other settable items, select the item with [▲] and [▼] key.
※Press [Set] key for longer than 5 seconds. Indicator changes to display "Measured temperature".
※If no key operation is done for more than a minute, the displays returns to measured temperature display.

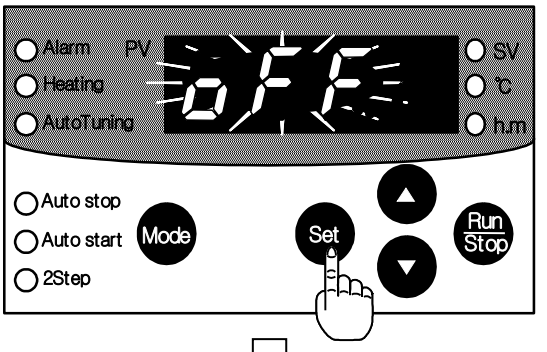
(1) Changes to control mode



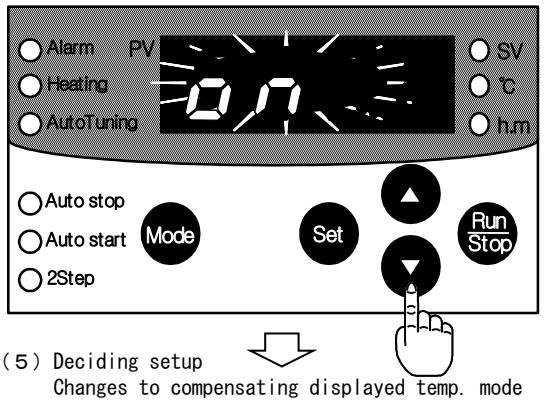
(2) Changes to setup of the recovery from power failure



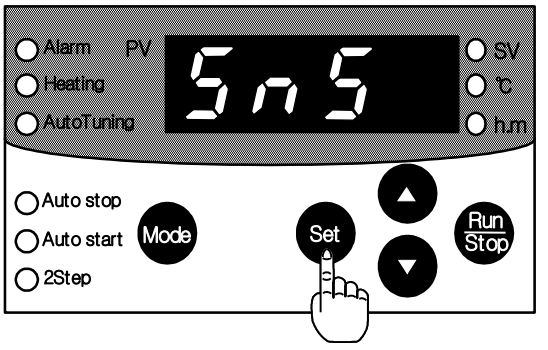
(3) Displaying setup condition



(4) Inputting setup



(5) Deciding setup
Changes to compensating displayed temp. mode



5-5 Sensor for sample’s temperature

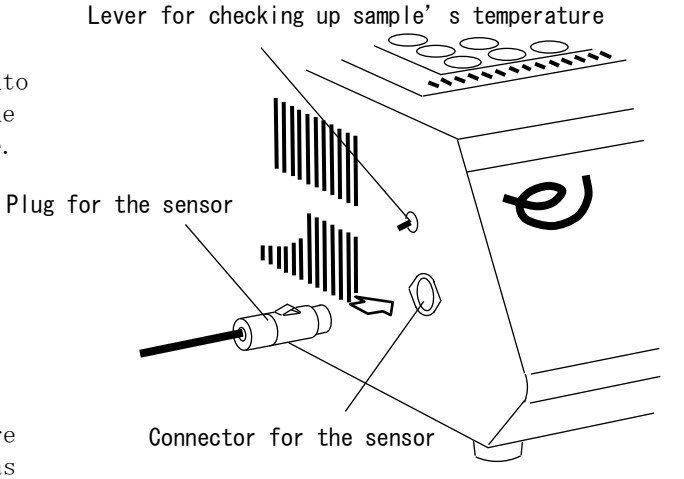
By connecting sensor for sample’s temperature (option), sample’s temperature can be measured with the lever for checking up sample’s temperature.

※Do not operate the lever for checking up sample’s temperature without connecting sample’s temperature sensor. This kind of operation may occur sensor alarm.

※When selecting sensor for sample’s temperature, sample’s temperature is controlled. Temperature control is disturbed temporally depending on the selected function.

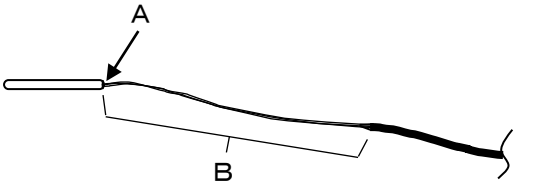
※When selecting with the lever for checking up sample’s temperature, indicator rarely shows 「250.0」 for a moment

(1) Plug sensor for sample’s temperature into the connector of dry block bath. Plug the sensor properly as shown on right figure.



(2) Place the sensor on sample. Set lead wire of the sensor away from aluminum block as much as possible.

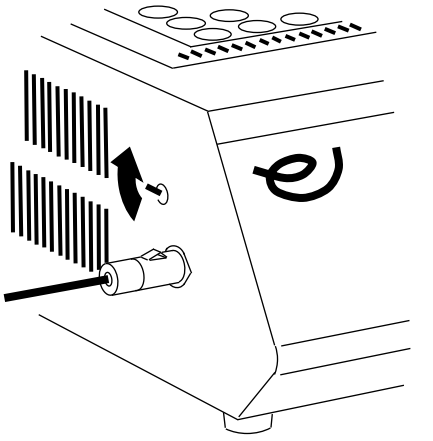
※When handling the wire for micro tube, do not bend Part A or B as shown on right picture and also do not jack it up forcedly. It may be disconnected.



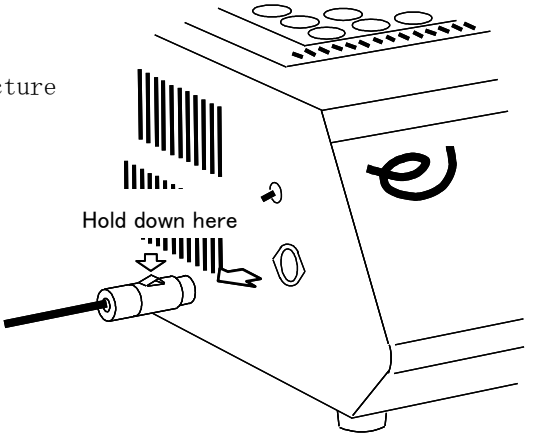
(3) Flip on the lever for checking up sample’s temperature. The display on indicator starts changing gradually and indicates sample’s temperature. The lever is flipped down automatically when loosing your hold.

※After flipping on the lever, if the condition of the display is stable and the sample’s temperature can be checked up, loose your hold to change the sensor. Checking up the temperature in a short time can minimize the disturbance on temperature sensor.

※Although displayed temperature reaches at preset temperature, stabilizing sample’s temperature requires more time. When changing preset temperature or compensating displayed temperature, please wait until the sample’s temperature stabilizes.



(4) Lock is attached with the plug of the sensor. When removing it, please refer to the right picture and pull it out with unlocking.



6 Troubleshooting

For a trouble that is not mentioned below, stop the operation immediately and contact your local dealer or closest customer service center.

Trouble	Cause of trouble	Solution
The unit can not be turned on even though the switch is on.	Power failure occurs.	Turn off power switch once and wait until the recovery from power failure.
	Power source has trouble.	
	Mains connector is not plugged.	Turn off power switch once and plug the mains connector into outlet.
	Power cord is disconnected.	Stop the operation immediately and contact your local dealer or closest customer service center.
	Glitch on temperature sensor	
	Over heat protector works.	Stop the operation immediately and contact your local dealer or closest customer service center. Overheat protector recovers automatically when the temperature of setup part falls. (Power failure alarm is displayed after the recovery.)
Over heat protector works.	SSR is broken down.	Stop the operation immediately and contact your local dealer or closest customer service center. Overheat protector recovers automatically when the temperature of setup part falls. (Power failure alarm is displayed after the recovery.)
	Temperature sensor has glitch.	
Temperature sensor does not work properly.	Foreign substance adheres on the installation surface of the unit and aluminum block.	Stop the operation temporary and remove all the dirt and foreign substance after the temperature falls.
	Installation surface of aluminum block is distorted or deformed.	Use aluminum block of which the installation surface of aluminum block is not distorted or deformed.
Displayed and actual temperature is different.	Displayed temperature is being compensated	Please refer to "Compensating displayed temperature" on Page 26 and restore setting.
Upper temperature limit alarm or lower temperature alarm is displayed.	Setup value for alarm is too small.	Setup range of upper temperature limit alarm should be more than 5.0℃ as a target. ※For more details about the setup, please refer to "Safety・alarm functions" on page 12, "Upper temperature limit alarm" on page 27 and "Lower temperature limit alarm" on page 28.
	Aluminum block is replaced during operation.	Cancel the alarm. ※For more details about the cancellation of alarm and etc., please refer to "Safety・alarm function" on page 12.
Power failure alarm is displayed.	Power failure occurs during operation.	Cancel the alarm. When cutting off the power source, please do it after terminating operation. ※For more details about the cancellation of alarm and etc., please refer to "Safety・alarm function" on page 12.
	Power switch is turned off without stopping operation.	
	Over heat protector works.	Stop the operation immediately and contact your local dealer or closest customer service center. Overheat protector recovers automatically when the temperature of setup part falls. (Power failure alarm is displayed after the recovery.)

Trouble	Cause of trouble	Solution
Alarm for malfunction on temperature control is displayed.	Heater is disconnected.	Stop the operation immediately and contact your local dealer or closest customer service center.
	Preset temperature is lower than room temperature.	Set up the room temperature at room temperature ＋5℃.
Sensor alarm is displayed.	Temperature sensor is disconnected or cause short-circuit.	Stop the operation immediately and contact your local dealer or closest customer service center.
	Operated the lever for checking up sample's temperature without connecting the sensor for sample's temperature.	Cancel the alarm. ※For more details about the cancellation of alarm and etc., please refer to "Safety・alarm function" on page 12.
Control gets stopped during operation and display also turns off a light.	・Temperature sensor does not work properly because of noise and etc. ・Temperature sensor does not work properly because of high room temperature.	Change the power source or lower the ambient temperature. If it does not help, stop the operation immediately and contact your local dealer or closest customer service center.
	Over heat protector works.	Stop the operation immediately and contact your local dealer or closest customer service center. Overheat protector recovers automatically when the temperature of setup part falls. (Power failure alarm is displayed after the recovery.)

7 Maintenance・checkup

WARNING

Do not take down the product.

A part of interior portion of the unit is under electric pressure and subject to have high temperature. Therefore, breaking down the unit may cause electric shock or injure yourself.

CAUTION

Do not clean or care the product during it is hot.

Cleaning and caring the product while it is still hot may burn yourself.

CAUTION

Do not use undesignated fuse.

When using undesignated fuse, it will not blow when excess current flows and may cause accident.

CAUTION

Use appropriate product for cleaning and caring the unit in proper way.

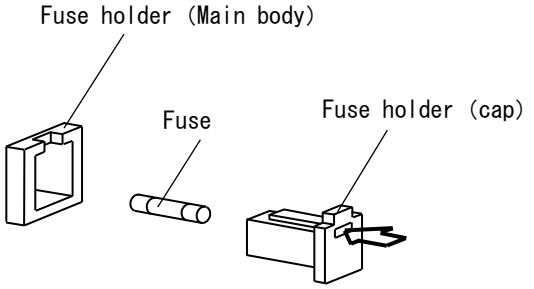
When cleaning and caring the product, do not pour water directly on the external and internal part of the unit, and also do not use cleanser, thinner, petrol, lamp oil, acid and related products. These products may cause electric shock or damage the unit.

7-1 Replacing fuse

For the sake of safety, turn off the power switch and unplug the mains connector when replacing fuse.

(1) Slide thin flat-blade screw driver into the slot of the upper part of fuse holder. Fuse can be removed with holder's cap attached.

(2) Insert the fuse that has same capacity and set it up by following the opposite procedure. Specification of fuse is printed on the metal part. Commercial item is also available. Parts shown on the right table are available as a service part.



※When using undesignated fuse, it will not blow when excess current flows ad may cause fire and other accidents.
※After replacing fuse, if it still blows, stop the operation and contact your local dealer or closest customer service center.

Adaptive model	Product name	Cat. No.
MG-2200	Fuse 3.15A	147670
MG-2300	Fuse 5A	194400

7-2 Cleaning

When cleaning the unit, turn off the power and unplug the mains connector.
For cleaning external and installation surface, wipe with soft cloth after screwing water tightly. Use mild detergent to remove greasy dirt and wipe it off after using the detergent. Wipe off as quick as possible when sample adheres or spills over the machine.

9 Disposal of the product

When disposing the product, please follow the instructions as below.

Main components and disposal instructions

Component	Mass	External measurement(mm)	Disposal method
MG-2200 Main unit	Approx. 5kg	200 (W)× 310 (D) × 125 (H)	Please contact waster disposer
MG-2300 Main unit	Approx. 6.5kg	260 (W)× 320 (D) × 125 (H)	

※ Please separate packing materials by separating each type of material.

10 After-sale service

1. When the machine does not work properly, please check and see whether it has glitch or not by referring to pages of "Troubleshooting".
2. If you are sure that bit has malfunction, please contact your local dealer or customer service center mentioned on this manual
3. Repair work during guarantee period will be proceeded based on service warranty.
4. Repair work after the guarantee period will be available with charge if required.

Service warranty

1. Repair work is available with free of charge during the guarantee period (one year after the day of purchase), in the condition that the product is used as specified in this manual.
2. Repair work for the following cases are charged even during the guarantee period.
   (a) Breakdown caused by error in use or improper remodeling.
   (b) Breakdown caused by moving the instrument from installation site and etc.
   (c) Breakdown caused by fire, earthquake, natural disaster, thunder, brine damage and other natural disaster.
   (d) Replacement of consumable product.
   (e) No presentation of warranty

Please stick the warranty on the column as below.

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