Program Type Low Temperature Incubator/Constant Temperature Incubator

Model INC820

Instruction Manual

Second edition

- **Thank you very much for purchasing this Yamato Scientific Program Type Low Temperature Incubator /Constant Temperature Incubator Model INC820.**
- **Please read the "Operating Instructions" and "Warranty" before operating this unit to assure proper operation. After reading these documents, be sure to store them securely together with the "Warranty" at a handy place for future reference.**

Warning: Before operating the unit, be sure to read carefully and fully understand important warnings in the operating instructions.

Yamato Scientific Co., Ltd.

Contentes

1. Safety precautions

Explanation of pictograms

About pictograms

A variety of pictograms are indicated in this operating instruction and on products for safe operation. Possible results from improper operation ignoring them are as follows.
Be sure to fully understand the descriptions below before proceeding to the text.

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

Caution Indicates a situation which may result in minor injury (Note 2) and property damages (Note 3.)

（Note 1）Serious injury means a wound, an electrical shock, a bone fracture or intoxication that may leave after effects or require hospitalization or outpatient visits for a long time.

（Note 2）Minor injury means a wound or an electrical shock that does not require hospitalization or outpatient visits for a long time.

（Note 3）Property damage means damage to facilities, devices and buildings or other properties.

Meanings of pictograms

This pictogram indicates a matter that encourages the user to adhere to warning (“caution” included).
Specific description of warning is indicated near this pictogram.

This pictogram indicates prohibitions
Specific prohibition is indicated near this pictogram.

This pictogram indicates matters that the user must perform
Specific instruction is indicated near this pictogram.

1. Safety precautions

List of symbols

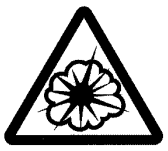
Warning

General warnings

Danger!: High voltage

Danger!: High temperature

Danger!: Moving part



Danger!: Hazard of explosion

Caution

General cautions

Electrical shock!

Burning!

Caution for no liquid heating!

Caution for water leak!

For water only

Poisonous material

Prohibitions

General bans

Fire ban

Do not disassemble

Do not touch

Compulsions

General compulsions

Connect ground wire

Install levelly

Pull out the power plug

Periodical inspection

1. Safety precautions

Warning・Cautions

⚠ Warning

Never operate the unit in an atmosphere containing flammable or explosive gas

Never operate the unit in an atmosphere containing flammable or explosive gas.
Otherwise, an explosion or a fire may result since the unit is not explosion-proof.
See section “13. List of dangerous materials” on page60.

Be sure to connect the ground wire.

Connect the earth wire to an earthed outlet. When an earthed outlet is not available, use an earthed adaptor and be sure to earth the lead wire for earthing. Otherwise, an electric shock or a fire from electric leakage may result.

Ban on operation when an abnormality occurs

When a smoke or an unusual odor is seen or sensed, immediately turn the power supplyOFF. A fire or an electrical shock may result.

Never use electrical power cords bundled.

When these are used bundled, they might overheat causing a fire.

Take care not to damage electrical power cords.

Avoid tightly bend, pull with a strong force or twist to prevent electrical power cords from damaging. A fire or an electrical shock may result.

Never try to disassemble or alter the unit.

Never try to disassemble or alter the unit. A malfunction, a fire or an electrical shock may result.

⚠ Caution

When a thunder is heard.

When a thunder is heard, turn the main power off immediately. A malfunction, fire or an electrical shock may result.

2. Before operating the unit

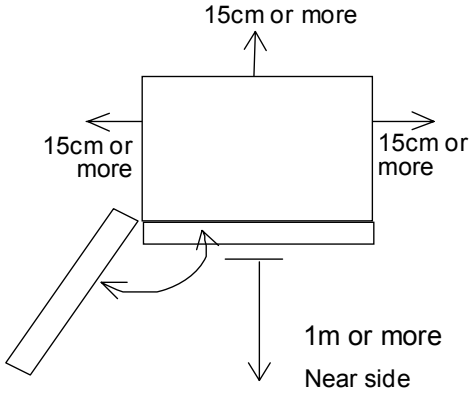
Precautions when installing the unit

1. Carefully select an installation site.

Take special care not to install the unit at a place described below:

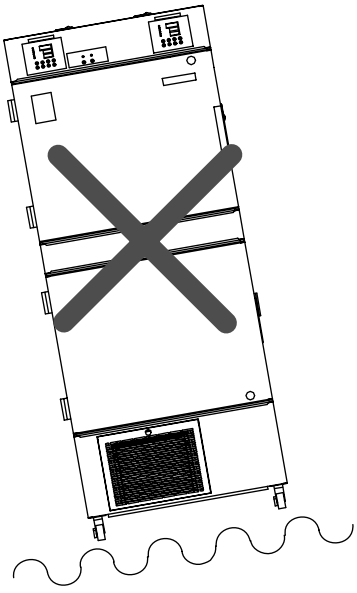
- Uneven surfaces or dirty surfaces
- Where flammable gas or corrosive gas exists
- Where the ambient temperature is 35℃ or more
- Where temperature changes severely
- Where humidity is high
- Where subject to direct sunlight
- Where vibration is severe

Install this unit at a place with spaces shown below.



2. Install the unit on a level surface.

Install the unit on a level surface. If the whole bottom surface of the unit does not contact the surface evenly, vibrations or noises may result. This might cause unexpected troubles or malfunctions.



Unit Weight : approx.160 kg

When lifting the unit for transportation and installation, carefully handle it by at least two people.

3. Installation

The unit might fall down or move by an earthquake or an impact resulting a personal injury. We recommend making safety measures such as to avoid installing the unit at a place other than busy places.

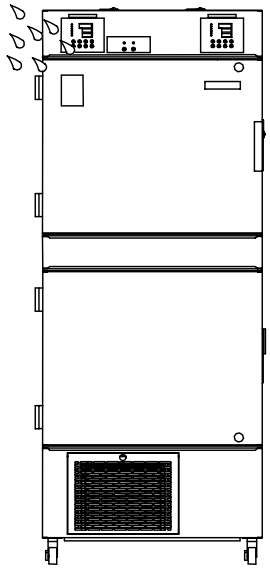
4. Secure sufficient ventilation for the unit.

Do not operate the unit when its side panels and suction port and radiation port on the rear side of the unit are blocked.

Internal temperature of the unit will rise degrading the performance and an accident, a malfunction or a fire may result.

5. Do not operate the unit at such a place that may subject to splash.

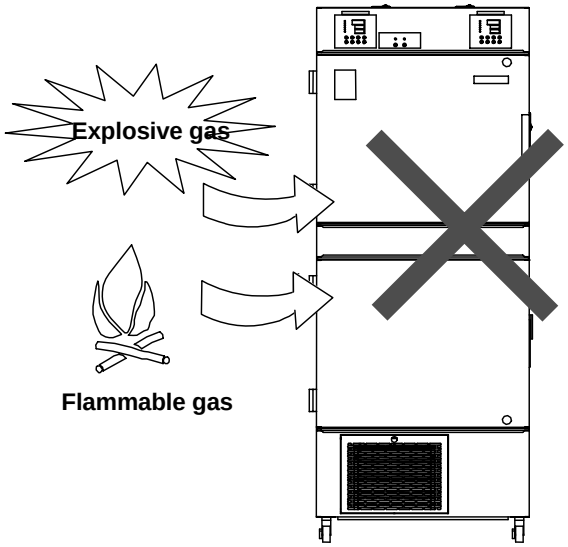
Do not operate the unit at such a place that may subject to splash. Liquid entering the inside may cause an accident, a malfunction, an electrical shock or a fire.



6. Never operate the unit in an atmosphere containing flammable or explosive gas.

Never operate the unit in an atmosphere containing flammable or explosive gas. Since the unit is not explosion-proof, an arc is discharged when switching the ELB “ON” and “OFF” and during operation and a fire or an explosion may result.

See the section “13. List of dangerous materials” on page 60 for flammable and explosive gases.



2. Before operating the unit

Precautions when installing the unit

7. Be sure to connect the power plug to the dedicated power distribution panel or a wall outlet.

Use a power distribution panel or a wall outlet that meets the electrical capacity of the unit.

Electrical capacity: AC100V 14A

∗ When the unit will not start even when you turn the Electric Leakage Breaker to “ON”, check for low main voltage or if the unit is connected to the same power supply line as other devices and connect it to another line if necessary.
Avoid connecting too many devices using a branching outlet or extending a wire with a cord reel or heating function and temperature controlling function may degrade due to voltage drop.

Do not connect the unit to any parts or lines other than a correct power supply line such as a gas pipe, a water pipe or a telephone line.
Otherwise, an accident or a malfunction may result.

8. Handling of a power cord

Never use electrical power cords bundled. When these are used bundled, they might overheat causing a fire.

Do not convert, forcibly bend, twist or pull the power cord. Otherwise, a fire or an electrical shock may result.

Do not place the power cord under a desk or a chair, or sand between objects to avoid it from being damaged.
Otherwise, a fire or an electrical shock may result.

Do not place the power cord close to a stove or other heat generating device. Sheath of the cord may burn and result in a fire or an electrical shock.

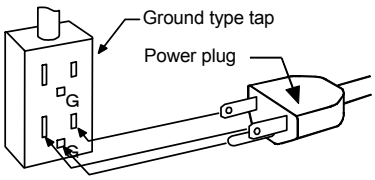
If the power cord should be damaged (exposure of core wire or disconnection), immediately turn the ELB off, turn the power supply off and ask your dealer to replace the cord. If the unit is operated with a damaged power cord, a fire or an electrical shock may result.

Connect the power cord to an appropriate distribution board or wall outlet.

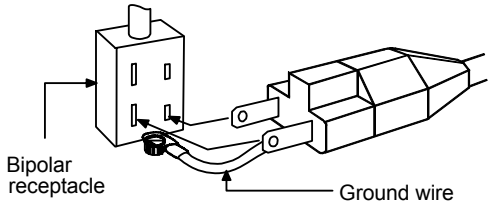
9. Be sure to connect the ground wire.

- When the outlet has no earth terminal, class D earthing work will be necessary. Consult your dealer or one of our sales offices.
- Be sure to connect firmly to the outlet.

We recommend use of a ground type outlet tap



When a bipolar type outlet tap is used



When there is no ground terminal.
In this case, class D grounding work is necessary and please consult your dealer or our nearest sales office.

Insert the ground adaptor included as an option, into a power plug confirming the polarity of the outlet. Connect the grounding wire (green) of the ground adaptor to the ground terminal on the power supply equipment.

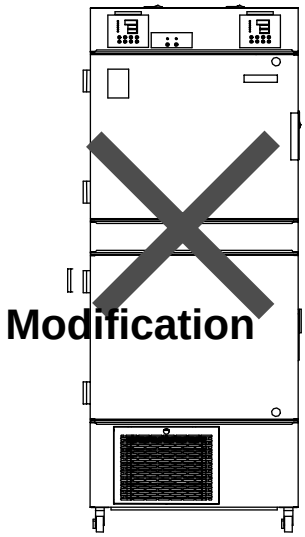
Do not connect the grounding wire to any parts or lines other than a correct grounding terminal such as a gas pipe, a water pipe or a telephone line.
Otherwise, an accident or a malfunction may result.

2. Before operating the unit

Precautions when installing the unit

11. .Do not attempt to alter the unit

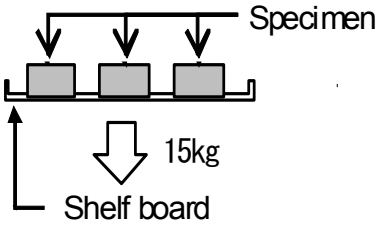
The customer shall never attempt to alter the unit. Otherwise a malfunction may result.



12. Do not put too many specimens.

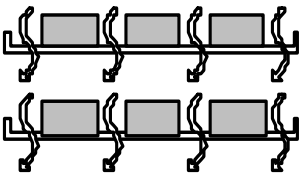
The withstand load of a shelf board is 15kg when the load is evenly distributed.

Put specimens dispersed.



13. Do not set too many specimens.

Too many specimens will prevent correct temperature control. In order to assure temperature precision, be sure to use shelf boards and put specimens dispersed, and secure at least 30% of space inside the bath.



Secure at least 30% of space

14. Do not place an object on the bottom plate.

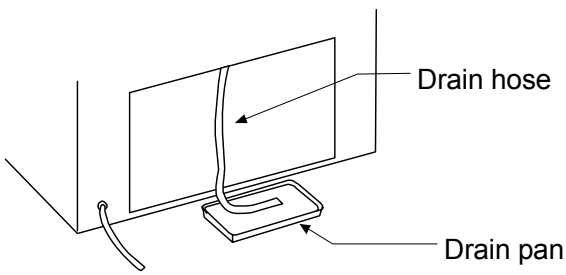
Operating the unit with placing the specimen directly on the bottom plate of the internal bath will prevent performance of the product from fully exerting, increase the internal temperature excessively and may cause a malfunction.

Never place a specimen on the bottom plate of the internal bath.

15. Take care during defrosting.

Put a drain pan under the end of the drain hose during defrosting.

Note: Drain pan is not included.



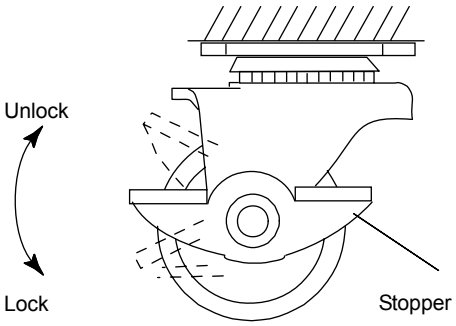
2. Before operating the unit

Installation method and precautions

(1) Transportation of the unit

・When transporting the model INC820, first release lock by pushing stoppers of two caster wheels at the front of the unit as shown in the right diagram. Check that each caster wheel at four points moves smoothly and start transporting the unit.

※ When transporting over a gap, the caster wheels may subject to an excessive shock and be damaged. In such a case, two or more people will be necessary to lift the product over the gap.



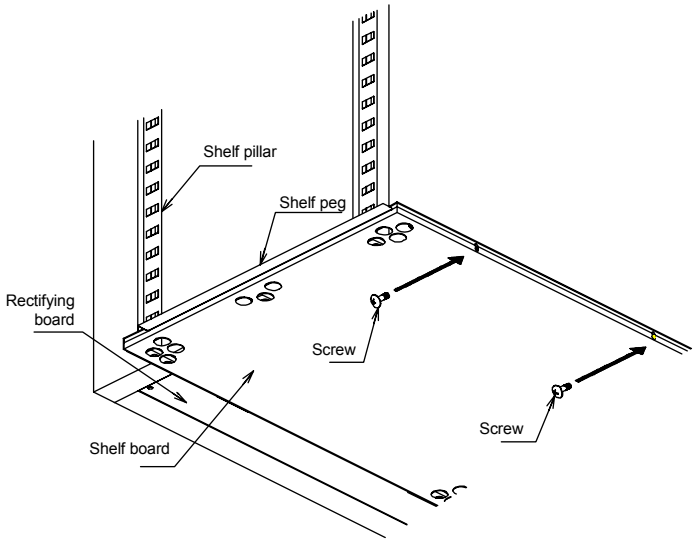
(2) Select an installation site.

Make sure that the each caster wheel at four points rest completely on a flat surface and there is not teetering or inclination, and then lower the caster stoppers and fix them.

(3) Install the shelf boards for the upper stage bath.

・ The lowest shelf board for the upper stage bath has been secured with screws at the time of factory shipping.
(The lower stage bath, on whose rear side a heater and other devices are installed, is not fixed.)

Note： Shelf boards differ for the upper and the lower stage baths.
Hole shape of the shelf board for the upper stage bath is round, while that for the lower stage bath board is rectangle.）



(4) Do not place a specimen on the bottom surface in the internal bath.

・Using the product with a specimen directly placed on the bottom surface in the internal bath may adversely influence on the temperature characteristics. It also may cause corrosion, damages, or rust of the internal bath and burn-out of the specimen or a fire. Never place a specimen on the bottom surface.

・Place a specimen not to touch the wall where sensor or other devices are installed. Put a specimen on the provided shelf board.

Installation method and precautions

(5) Take care for such specimens as shown below.

①Specimen that contains flammable or explosive components.

- This product is not of an explosion-proof structure. Never attempt to dehydrate or process specimens that contain a flammable or an explosive component.

②Corrosive specimen

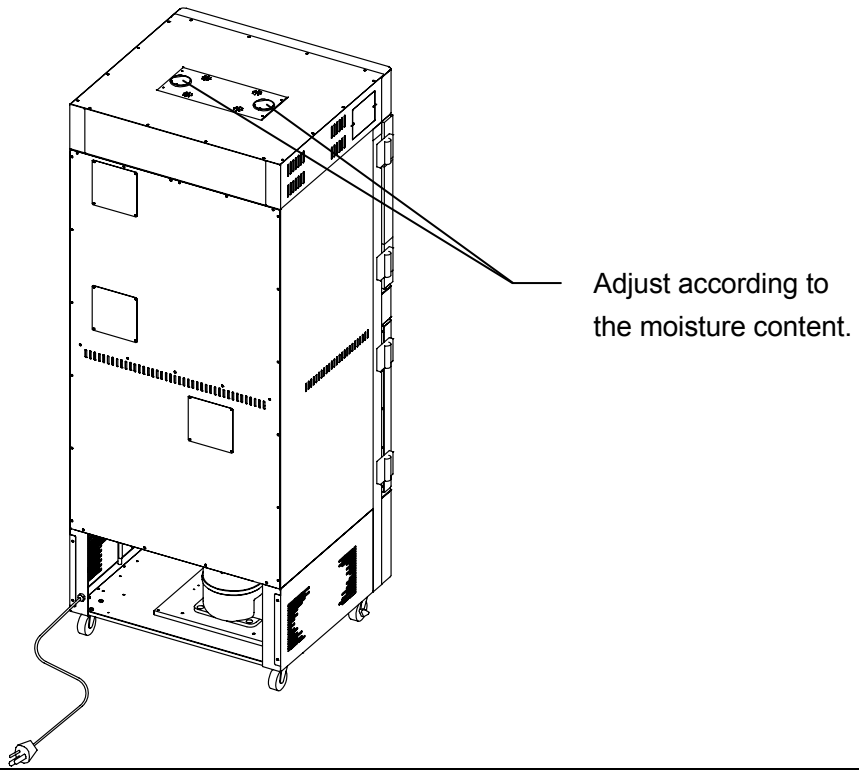
- Take care for handling a corrosive specimen. Although major components are made of SUS304 stainless steel, note that they might corrode with strong acid. Also note that packing (vinyl chloride) may corrode with acid, alkaline, oil, organic solvents, or other substances.

③Operation with a device with larger heat load introduced.

- Note that the temperature in the bath may rise when the devices are operated inside the unit.

(6) About the exhaust port

- There is an exhaust port on the top surface of the main unit.
  Adjust the opening according to the moisture content of the specific specimen.



About defrosting of the cooler

＜About lower stage-low temperature incubators＞

When a lot of frost accumulates on the evaporator of the cooler, its cooling capacity may degrade and cannot keep the set temperature. Model INC820 allows observing frosting on the evaporator through the frost observation window in the back of the bath. Defrosting rate will change depending on the following conditions.

（1）Operating temperature : Frosting is more likely when operating at a lower temperature.

（2）External temperature and humidity : Frosting is more likely when operating at a higher temperature and humidity.

（3）Condition of the specimen in the bath : Frosting is more likely when the specimen contains more moisture.

Model INC820 supports the following operation modes to prevent frosting and set a mode according to the operating condition. These operations are enabled by pressing the defrost key on the defrost operation assembly at the upper part of the unit separately from the fixed value operation and the program operation during either of fixed value and program operation modes.

1. Manual defrost operation (Started manually and stopped automatically）
   When a lot of frost is built up perform the defrost operation. While the defrost operation is started manually, it will stop automatically with the internal timer after about five minutes of operation. See “3. Names and functions of parts” on P.13.

2. Cycle defrost operation (Started and stopped automatically)
   It is effective to set the cycle defrost operation when operating the unit for a long time. In this operation mode, cycle of operation of about five minutes and stop for about 23hours 55 minutes will be repeated automatically.
   See “3. Names and functions of parts” on P.13.

⚠ Caution

※Although it depends on the operating conditions, the temperature in the bath will rise about 3℃ during defrost operation and take care when possible influence is suspected on the specimen. Note that the indicated temperature may rise by 10℃ or more. （The extent of increase will differ depending on the set temperature, the specimen, or the external temperature.）

About the power failure compensation operation

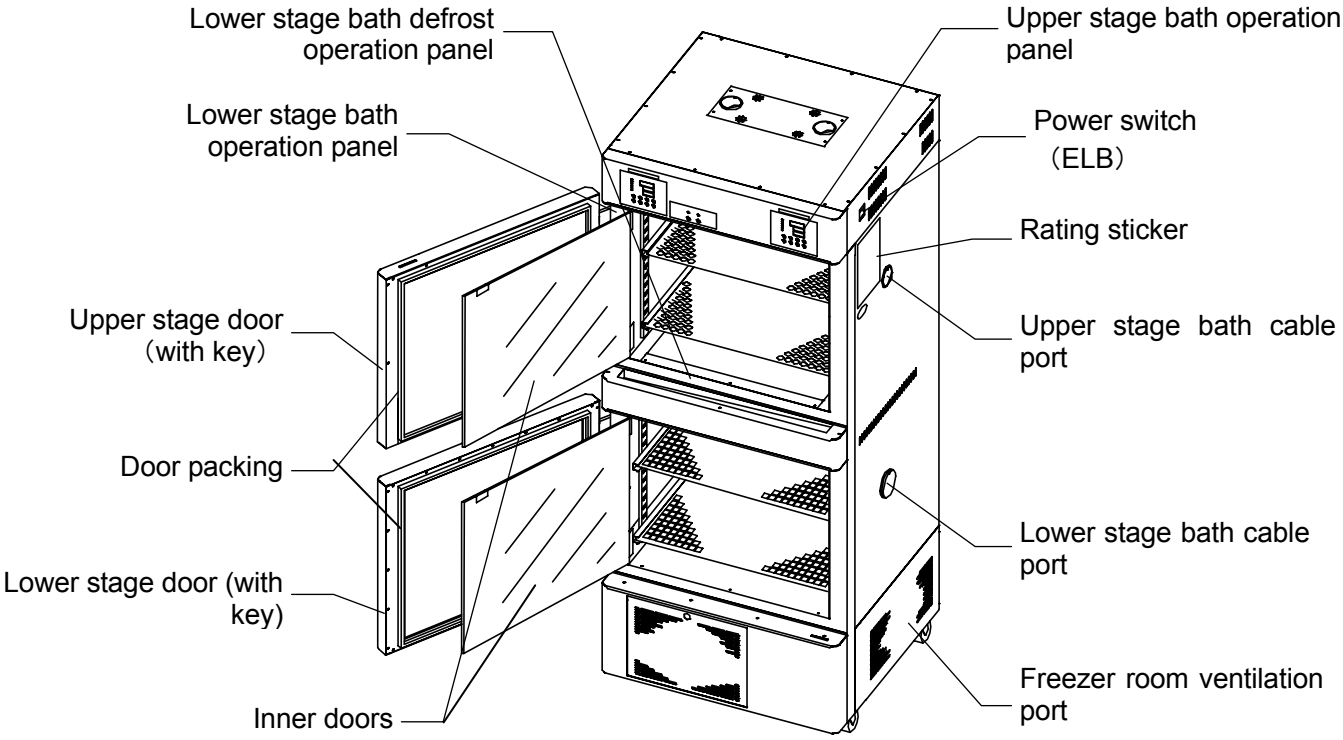
Power failure compensation

1. Recovers to the status before power is turned OFF after recovery of power when power has been turned OFF during operation.
2. Timing of recording the remaining time is every one minute after operation start.
3. Defrost operation does not support power failure compensation. To start defrost operation, press the Defrost key again.

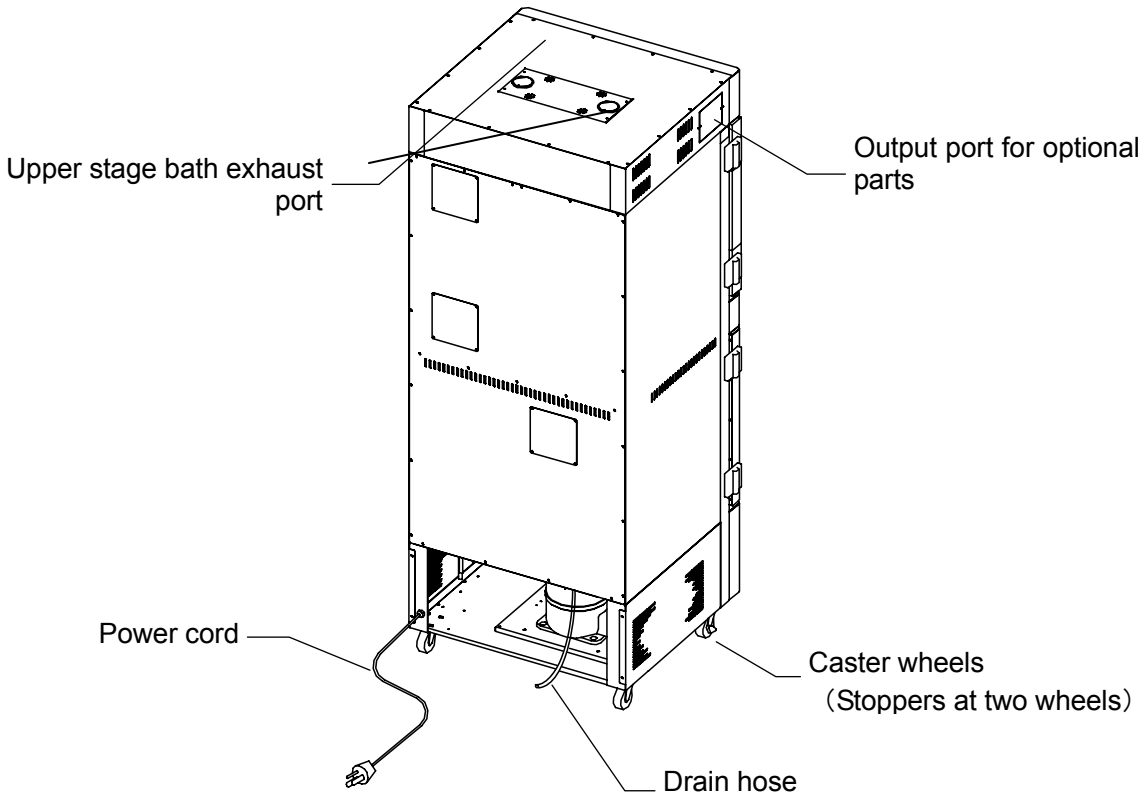
3. Names and functions of parts

Main unit

Front side

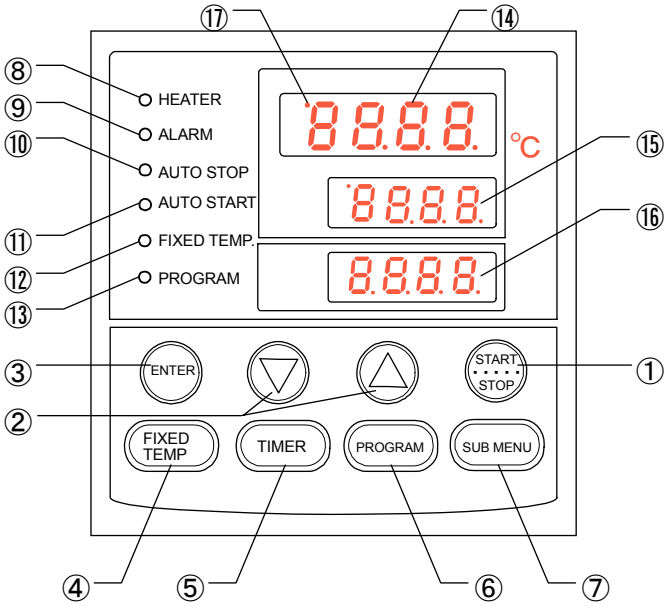


Back side



3. Names and functions of parts

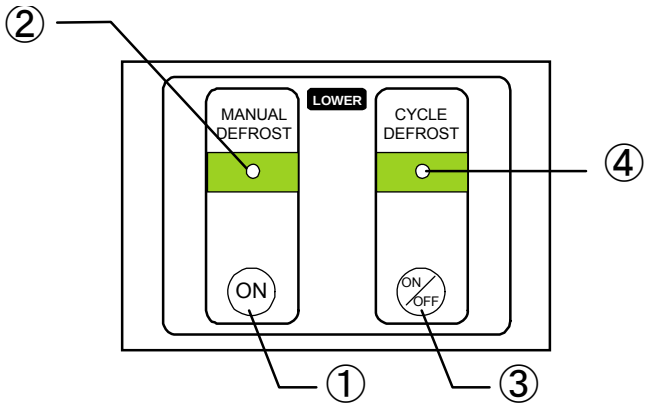
Lower stage bath　Operation panel



No	Name	Operation/action
①	Start/Stop key	The key is used to start/stop operation.
②	Up/Down keys	These keys are used to select a setting.
③	Enter key	This key is used to determine the selected setting.
④	Fixed-value operation key	This key is used to select the fixed-value operation.
⑤	Timer operation key	Timer operation select key. This key can be used to select the quick auto stop operation, the auto stop operation, or the auto start operation.
⑥	Program key	Program operation select key. You can set programs of 6 patterns of 3 types.
⑦	Sub menu key	The key is used to set for the overheat preventive device temperature, calibration offset temperature, key locks, and the program repeat function.
⑧	Heater lamp	The lamp comes on while power is supplied to the heater.
⑨	Alarm lamp	The buzzer sounds and this lamp comes on when an error occurs.
⑩	Auto stop lamp	This lamp blinks while the quick auto stop timer or the auto stop timer is being set and stays on while either timer is being used.
⑪	Auto start lamp	This lamp blinks while the auto start timer is being set and stays on while it is being used.
⑫	Fixed value operation lamp	This lamp blinks while the fixed value operation is being set and stays on while it is in operation.
⑬	Program operation lamp	This lamp blinks while the program operation is being set and stays on while it is being used.
⑭	Measured temperature display	Displays the measured temperature in the bath, set characters, and alarm information.
⑮	Set temperature display	Displays the set temperature, set temperature, and timer remaining time.
⑯	Overheat preventive device set temperature display	Displays the set temperature of the overheat preventive device.
⑰	Freezer operation lamp	This lamp comes on while power is supplied to the freezer.

3. Names and functions of parts

Lower stage bath operation panel

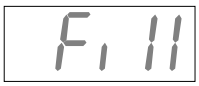
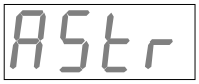
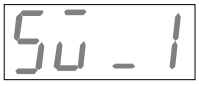
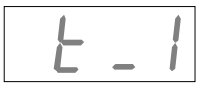


No	Name	Operation/action
①	Manual defrost key	Defrost operation is made for five minutes when this key is pressed.
②	Manual defrost lamp	This lamp stays on during manual defrost operation.
③	Cycle defrost key	When you press this key, cycle of defrost operation ON of about five minutes and OFF for about 23hours 55 minutes will be repeated. Press this key again to stop this function.
④	Cycle defrost lamp	During cycle defrost operation, this lamp stays on while defrost is ON and goes off while defrost is OFF.

3. Names and functions of parts

Lower stage bath Description of characters

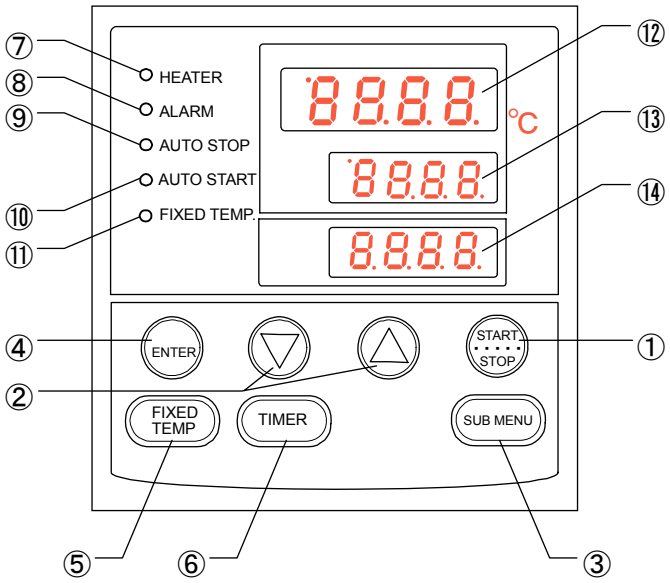
Characters used in the model VS4 controller are described below.

Characters	Identifier	Name	Applications
	Fix	Fixed value operation setting mode	You can select the fixed value operation starting function.
	Sv	Temperature setting	This is used to set a temperature.
	Astp	Timer setting mode display	This means the quick auto stop operation and the auto stop operation setting.
	Astr	Timer setting mode display	This means the auto start operation setting.
	Tim	Time setting	This is used to set a time.
	PrG3	Program type select	This is used select one of program types 1 to 3.
	PAt	Program pattern select	This is used to select a program pattern.
	End	Step end	This indicates the total number of steps used. See “Lower stage bath Operating procedures (making a program)” on P.27.
	Sv-1	Program temperature setting	This is used to set a temperature of each program step. See “Lower stage bath Operating procedures (making a program)” on P.27.
	t-1	Program time setting	This is used to set a time of each program step. See “Lower stage bath Operating procedures (making a program)” on P.27.
	PS-3	Program repeat return destination select	This is used to select a return destination step during the program repeat operation. See “Using the program repeat function” on P.32.
	Pc-2	Program repeat number setting	This is used to set a number of program repeat operations. See “Lower stage bath Operating procedures (making a program)” on P.32.
	cAL	Calibration offset setting	This is used to input a calibration offset temperature. See “Lower stage bath Useful functions (calibration offset function)” on P.35.
	oH	Overheat preventive device temperature setting	This is used to set a temperature for the overheat preventive device. See “Lower stage bath Setting for the overheat preventive device” on P.20.
	Lock	Setting key lock	This locks keys to prevent alteration of setting information. See “Lower stage bath Useful functions (lock function)” on P.36.
	nG	Setting change disabled	During operation, you cannot change any inputs other than temperature and time settings for the timer and program modes. If you attempt to change them, nG will appear.

※For operation modes and function characters, see “Lower stage bath Operation modes, function setting keys and characters” on P.19.

3. Names and functions of parts

Upper stage bath　Operation panel

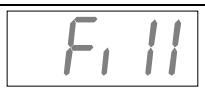
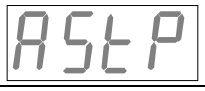
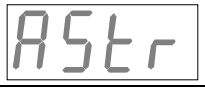
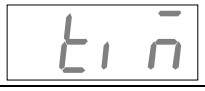
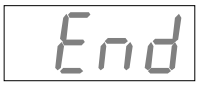


No	Name	Operation/action
①	Start/Stop key	The key is used to start/stop operation.
②	Up/Down keys	These keys are used to select a setting.
③	Sub menu key	The key is used to set for the overheat preventive device temperature, calibration offset temperature, and key locks.
④	Enter key	This key is used to determine the selected setting.
⑤	Fixed value operation key	This key is used to select the fixed value operation.
⑥	Timer operation key	Timer operation select key. This key can be used to select the quick auto stop operation, the auto stop operation, or the auto start operation.
⑦	Heater lamp	This lamp stays on while power is supplied to the heater.
⑧	Alarm lamp	The buzzer sounds and this lamp comes on when an error occurs.
⑨	Auto stop lamp	This lamp blinks while the quick auto stop timer or the auto stop timer is being set and stays on during operation.
⑩	Auto start lamp	This lamp blinks while the auto start timer is being set and stays on during operation.
⑪	Fixed value operation lamp	This lamp blinks while the fixed value operation is being set and stays on while it is in operation.
⑫	Measured temperature display	Displays the measured temperature in the bath, set characters, and alarm information.
⑬	Set temperature display	Displays the set temperature, set temperature, and timer remaining time.
⑭	Overheat prevention setting temperature screen	This indicates a set temperature of the overheat preventive device.

3. Names and functions of parts

Upper stage bath Description of characters

Characters used in the model VS3 controller are described below.

Characters	Identifier	Name	Applications
	FiX	Fixed value operation setting	This is used for the fixed value operation setting.
	Sv	Temperature setting	This is used to set a temperature.
	AStP	Auto stop setting	This is used for the auto stop operation setting.
	AStr	Auto start setting	This is used for the auto start operation setting.
	tim	Time setting	This is used to set a time.
	End	Time up	It displays the time when the timeroperation is completed. See Pges .42, 44 and 46.
	cAL	Calibration offset setting	This is used to input a calibration offset temperature. See “Upper stage bath Useful functions (calibration offset function)” on P.48.
	oH	Overheat preventive temperature setting	This is used to set a temperature for the overheat preventive device. See “Upper stage bath Setting of the overheat preventive device” on P.40.
	Lock	Setting key lock	This locks keys to prevent alteration of setting information. See “Upper stage bath Useful functions (lock function)” on P.49.
	nG	Setting change disabled	During operation, you cannot change any inputs other than temperature and time setting for the timer and modes. If you attempt to change them, nG will appear.

※For operation modes and function characters, see “Upperr stage bath Operation modes, function setting keys and characters” on P.39.

4-1. Operating procedures（lower stage）

Lower stage bath List of operation modes and functions

Operation modes of the unit are as follows.

No.	Name	Description	Page
1	Fixed value operation	Pressing the Fixed temp key brings you to the fixed value operation setting mode. Pressing the Fixed temp key again brings you to the temperature setting mode. Set a temperature with the ▼▲ keys. Press the Start/Stop key to start operation and press the Start/Stop key again to stop.	P.21
2	Quick auto stop operation	This mode is used when you “want to stop operation currently in session automatically after several hours”. You can set time until the operation stop by pressing the Timer key during fixed value operation. Set a time with the ▼▲ keys. Pressing the Start/Stop key will start quick auto stop operation and the timer will activate in the middle of the operation and automatically stop operation after set time.	P.22
3	Auto stop operation	This mode is used when you “want to stop operation automatically before setting fixed value operation”. Press the Timer key to display “Astp”. You can set the set temperature “SV” by pressing the Enter key. You can set operation time “tim” by pressing the Enter key again. Pressing the Start/Stop key will start auto stop operation.	P.23
4	Auto start operation	This mode is used when you “want to start operation automatically after certain time after power on”. Press the Timer key to display “Astr”. You can set the set temperature “SV” by pressing the Enter key. You can set operation time “tim” by pressing the Enter key again. Pressing the Start/Stop key will start auto start operation.	P.25
5	Program operation	This mode is used when you want to raise or lower the temperature according to the set temperature and time. Press the Program key to display “PrG1”. Press the Program key again to select a program mode you want. Press the Enter key to select the pattern ”PAt” you want. Press the Enter key to display “End”. Then enter the number of patterns to use. Then enter temperature ”SV-n” of each pattern and time ”t-n” of each pattern serially.	P.27
※You cannot change the operation mode while the unit is in operation. First stop operation before trying to change the mode.			

4-1. Operating procedures（lower stage）

Lower stage bath　List of operation modes and functions

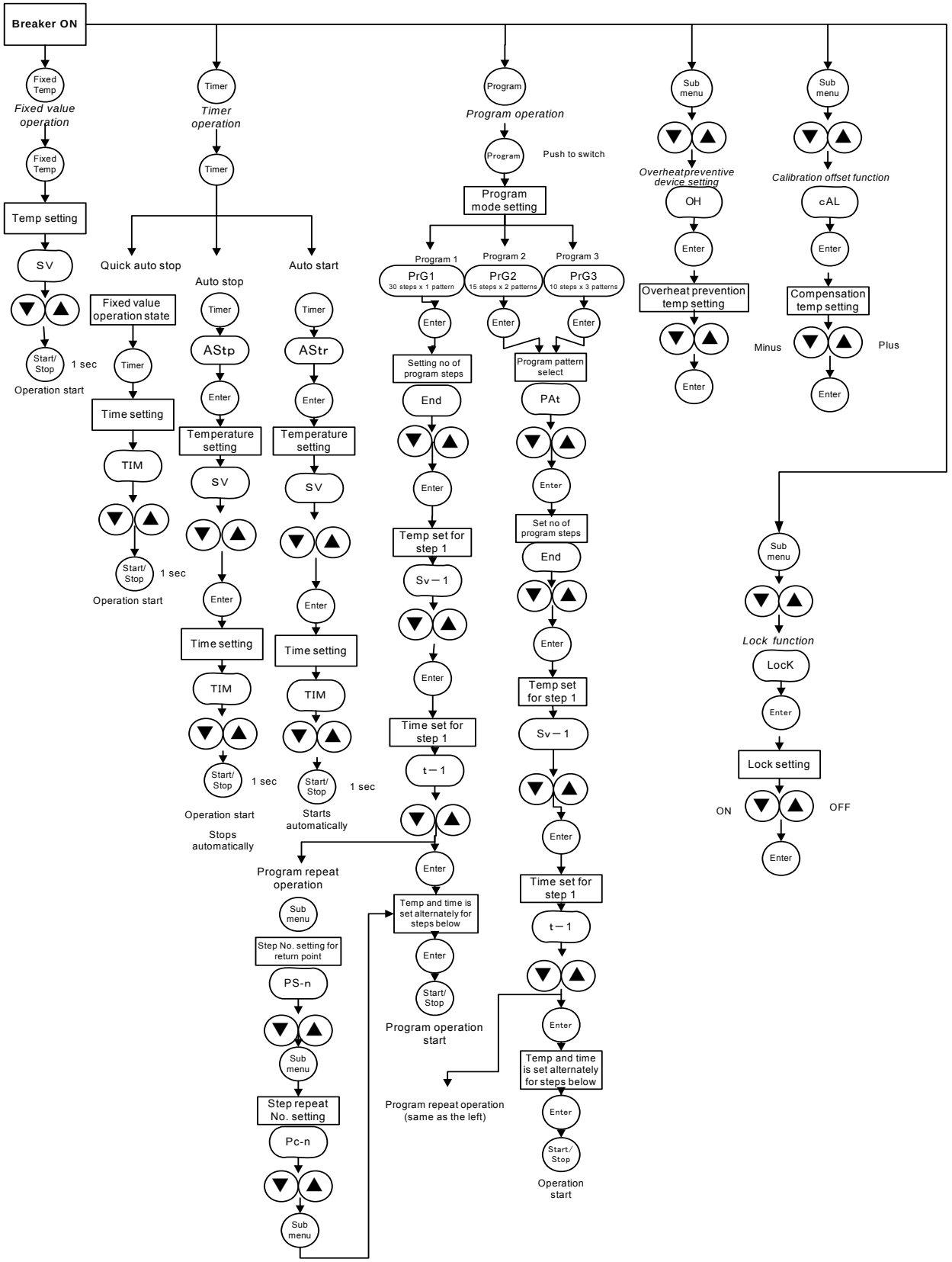
Operation functions of the unit are as follows.

No.	Name	Description	Page
1	Overheat prevention function	Automatic overheat prevention function： The function has been set to activate automatically (automatic recovery) at the increase of 6℃ when the temperature in the bath has risen linked to the set temperature of the unit. Overheat preventive device： Although the unit shares the power supply, the display unit, and the key input assembly with the controller, it also has an independent temperature measurement circuit, the CPU, the sensors and the output circuit and is able to set any temperature you want on the control panel. If the overheat preventive unit has activated, the unit will stop and will not recover until the power switch is turned on again. (Manual recovery)	P.20
2	Calibration offset function	The calibration offset function compensates any difference between the target temperature in the bath and the controller controlled temperature (sensor temperature). You can apply compensation to the plus or minus side over the entire temperature range of the unit.	P.35
3	Overheat prevention temperature compensation function	When you compensate the temperature for the controller in section 2, the temperature of the overheat preventive device will be compensated automatically.	—
4	Power failure compensation function	When a power failure occurs in the middle of operation, this function is used to start operation at the status immediately before power failure.	—
5	Setting lock function	This function is used to lock a set operation mode. You can set or cancel this function with the Sub menu key.	P.36

4-1. Operating procedures（lower stage）

Lower stage bath Operation modes, function setting keys, and characters

Key operations and characters shown below are used for setting an operation mode and a function.



4-1. Operating procedures（lower stage）

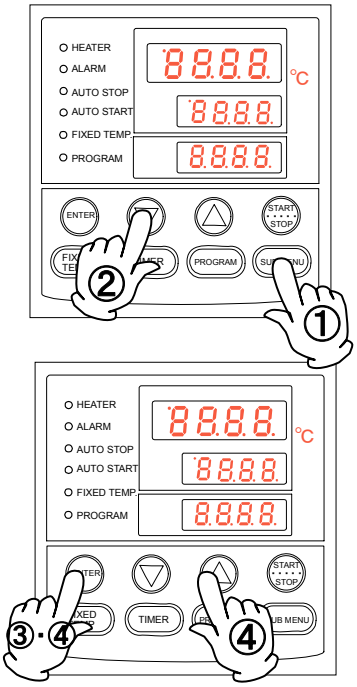
Lower stage bath　Overheat preventive device setting

The safety units for prevention of overheat includes the power supply, the display, and the key input assembly shared with the controller in addition to the automatic overheat prevention function (automatic recovery) of the controller as well as an overheat prevention device (manual recovery) comprising of the independent temperature measurement circuit, the CPU, and the sensors, and the output circuit, thus establishing dual safety measures.
The overheat prevention device does not aim to protect the specimen but to prevent overheat of devices. This cannot prevent accidents from use of an explosive or a flammable substance.

Temperature setting range and functions

The unit has dual overheat preventive functions. One function is included in the controller and has been set at the time of factory shipping to automatically activate at the temperature 6℃ higher than the set temperature of the temperature controller (The heater repeats ON/OFF at a temperature 6℃ higher than the setting.）
The other function is integrated with the controller and is set by operating the keys on the controller. This setting adds the second overheat prevention function.
The temperature setting range of the overheat preventive device integrated with the controller is from 0℃ to 105℃.
If the temperature in the bath keeps rising above the controller set temperature and reaches the set temperature of the overheat preventive device, the circuit will be shut off, Er 19 will blink on the controller screen, and the buzzer continues sounding.
Once this overheat preventive device is activated, it holds that status until power is reset and Er19 will not be released.

How to set a temperature



1.Turning power on（Turn the ELB ON）

When you turn power on, the initial values will be displayed for about four seconds, the screen will change to the initial setting screen and each display shows the current temperature in the bath, the operation mode characters, and the overheat prevention set temperature.

2.Setting the overheat prevention temperature

① Press the Sub menu key.

② Press the ▼▲ keys to select the overheat prevention setting characters OH on the measured temperature display.

③ Pressing the Enter key will make the current set temperature blink on the set temperature display.

Caution : Normally, set a temperature higher by 10℃ or more than the set temperature on the controller to prevent a malfunction. However, please set it at a temperature that is 15℃ or more higher when you drive the defrosting.

④ When you have set a temperature you want with the ▼▲ keys, press the Enter key to complete setting.

⚠ Caution

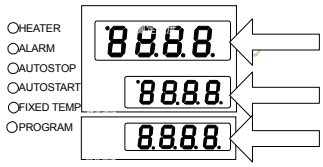
① Rough guidelines for the set temperature are “the highest temperature possible for the unit ＋10℃” or “set temperature ＋10℃” and if malfunctions occur at these settings, add about 5℃ to the setting.

② The temperature setting range of the overheat preventive device is from 0℃ to 105℃. Be sure to set the overheat prevention threshold temperature. Otherwise, devices may not operate properly, the overheat preventive device may activate in the middle of increase of the temperature in the bath, or a fire or other unexpected accidents may result.
The temperature is set at 65℃ at factory shipping.

4-1. Operating procedures（lower stage）

Lower stage bath　Operating procedures（fixed value operation）

How to conduct fixed value operation



1.Turning power on（Turn ELB ON）

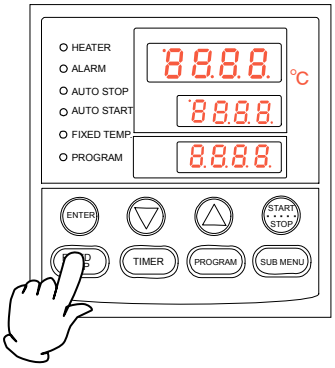
When you turn power on, the software version will be displayed for about four seconds, the screen will change to the initial setting screen and each display shows the current temperature in the bath, the operation mode characters, and the overheat prevention set temperature.

Measured temperature display : Displays the current temperature in the bath

Set temperature display：Displays the operation mode characters

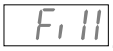
Overheat prevention set temperature display : Displays the set temperature of the overheat prevention device

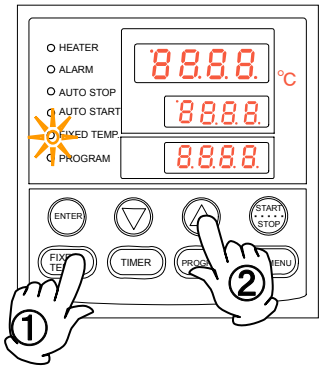
See P.19 for operation mode characters.



2.Selecting an operation mode

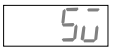
Press the Fixed temp key to display fixed value operation on the set temperature display.

Display Fix  .



3.Setting a temperature

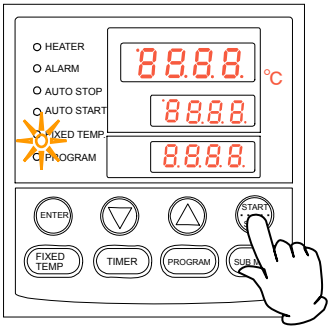
①Press the Fixed temp key again.

The characters SV  を that indicate temperature setting will appear on the measured temperature display, the current set temperature blinks on the set temperature display, and the fixed value operation lamp blinks.

②Set the temperature you want with the ▼▲ keys.

4. Starting operation

Press the Start/Stop key for about one second. Operation starts and the fixed value operation lamp will change its status from blinking to on.



5. Stopping operation

Press the Start/Stop key for about one second. The fixed value operation lamp will go off and the screen switches to the initial setting screen.

When you want to correct wrong settings or confirm settings

If you made a mistake in setting or when you want to check the setting you have made, press the Fixed temp key again and make settings again.

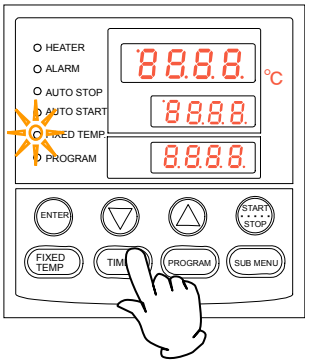
If you want to change the set temperature during operation, press the Fixed temp key to enter the setting mode and change the temperature. After change, press the Enter key to complete change.

4-1. Operating procedures（lower stage）

Lower stage bath　Operating procedures（Quick auto stop operation）

How to perform quick auto stop operation

This operation is used when you “want to stop current fixed value operation automatically after several hours”. Quick auto stop operation allows setting the auto stop timer during operation.



1.Setting a time until stop during fixed value operation

Make sure that the fixed value operation lamp is on to indicate fixed value operation is in session.

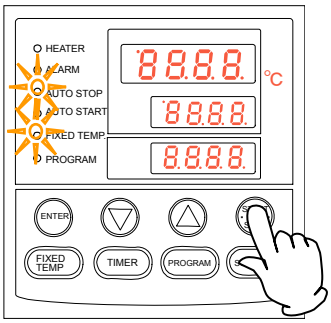
Press the Timer key.

The characters tim  that indicate the timer appears on the measured temperature display and the current set time blinks on the set temperature display.

Set a time you want with the ▼▲ keys.

About the timer function

The maximum timer setting possible is 999 hours 50 minutes.
You can set a time in the unit of minutes up to 99 hours 59 minutes.
The setting unit will be 10 minutes for a time of 100 hours or longer.
You can change a set time quickly to the time you want by keeping the ▼▲ keys pressed. To fine adjust a time, repeat pressing the ▼▲ key for each digit.

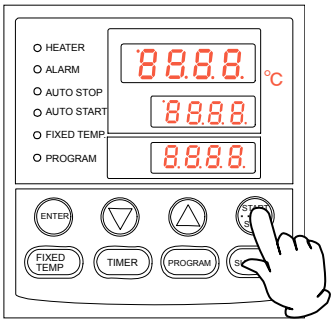


2.Starting timer operation

When you have set a time you want, press the Start/Stop key for about one second.

Start the timer operation when the fixed value operation lamp and the auto stop lamp are on.

Timer operation starts when the Start/Stop key is pressed.



. Stopping and finishing timer operation

Timer operation will stop automatically at the set time。

The buzzer sounds for five seconds to indicate the timer has stopped. At this time, the characters End  that indicate operation complete are displayed on the set temperature display with the fixed value operation lamp and the auto stop lamp are on. Press the Start/Stop key for about one second to finish the timer operation mode. The screen will switch to the initial setting screen.。

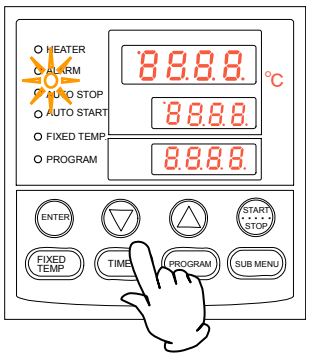
When you want to correct the set temperature, set time, or to confirm settings

When you want to change the set temperature during operation, press the Fixed temp key to enter the setting mode and change the temperature. After change, press the Enter key to complete change. If you want to change the set time during operation, press the Timer key to enter the setting mode and change the time. Note however, that you need to set a time calculated by adding the passed time to the time to add. After change, press the Start/Stop key to complete change. You can display the set temperature, the operation mode, and the remaining time on the set temperature display by pressing the ▼ key.

4-1. Operating procedures（lower stage）

Lower stage bath　Operating procedures（auto stop operation）

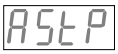
How to perform auto stop operation

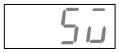


This operation mode is used when “you want to stop fixed value operation automatically after set time since the start”.

1.Setting a stop time

① Press the Timer key when the initial screen is displayed.

② The timer mode used in the previous session will be displayed on the set temperature display. Pressing the Timer key again to make a timer mode blink. Press the Timer key again to blink the next timer mode. Select the characters Astp  that indicate auto stop operation and press the Enter key.

The characters Sv  that indicate temperature set appear on the set temperature display and the auto stop lamp will blink.

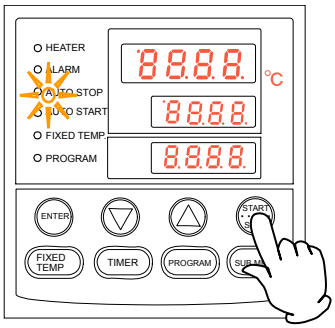
③ Press the ▼▲ keys to set the temperature you want.

④ Press the Enter key. The characters tim  that indicate the timer on the measured temperature display and the current set time will blink on the set temperature display.

⑤ Press the ▼▲ keys to set the time you want.

About the timer function

The maximum timer setting possible is 999 hours 50 minutes.
You can set a time in the unit of minutes up to 99 hours 59 minutes.
The setting unit will be 10 minutes for a time of 100 hours or longer.
You can change a set time quickly to the time you want by keeping the ▼▲ keys pressed. To fine adjust a time, repeat pressing the ▼▲ key for each digit.



2.Starting timer operation

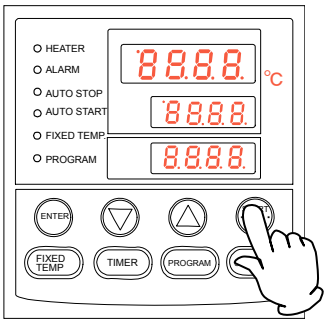
When you have set a time you want, press the Start/Stop key for about one second.

Timer operation will start with the auto stop lamp on.

Timer starts when the temperature in the bath (measured temperature) reaches the set temperature.

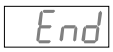
4-1. Operating procedures（lower stage）

Lower stage bath　Operating procedures（auto stop operation）



3. Stopping and finishing timer operation

Timer operation will stop automatically at the set time.

The buzzer sounds for five seconds to indicate that the timer has stopped. At this time, the characters End  that indicate operation complete are displayed on the set temperature display with the fixed value operation lamp and the auto stop lamp are on. Press the Start/Stop key for about one second to finish the timer operation mode. The screen will switch to the initial setting screen.

When you want to correct the set temperature, set time, or to confirm settings

If you want to change the set temperature or the set time during operation, press the Timer key, set a temperature or a time for auto stop operation with the ▼▲ keys, and then press the Enter key.

Note however, that when you change the setting you need to set a time calculated by adding the passed time to the time to add.

You can press the ▼ key during operation to display the set temperature, the operation mode, and the remaining time on the set temperature display.

The remaining time display  indicates counting-down while the dots are blinking and waiting state while the dots stay on (temperature is increasing or decreasing toward the set temperature) and the timer count is stopped.

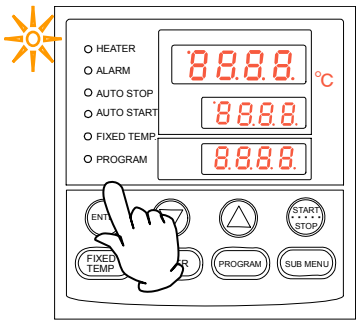
4-1. Operating procedures（lower stage）

Lower stage bath　Operating procedures（auto start operation）

How to perform auto stat operation

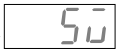
This operation mode is used when “you want to start operation automatically at the set time .

1.Setting a startp time



① Press the Timer key when the initial screen is displayed.

② The timer mode used in the previous session will be displayed on the set temperature display. Pressing the Timer key again to make a timer mode blink. Press the Timer key again to blink the next timer mode. Select the characters Astr  that indicate auto stat operation and press the Enter key.

The characters Sv  that indicate temperature set appear on the set temperature display and the auto stop lamp will blink.

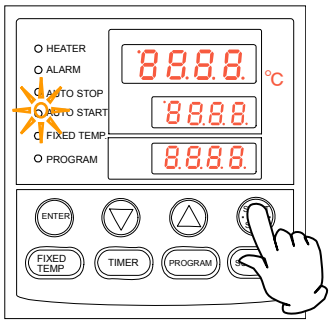
③ Press the ▼▲ keys to set the temperature you want.

④ Press the Enter key. The characters tim  that indicate the timer on the measured temperature display and the current set time and autostarat lamp will blink on the set temperature display.

⑤ Press the ▼▲ keys to set the time you want.

About the timer function

The maximum timer setting possible is 999 hours 50 minutes.
You can set a time in the unit of minutes up to 99 hours 59 minutes.
The setting unit will be 10 minutes for a time of 100 hours or longer.
You can change a set time quickly to the time you want by keeping the ▼▲ keys pressed. To fine adjust a time, repeat pressing the ▼▲ key for each digit.



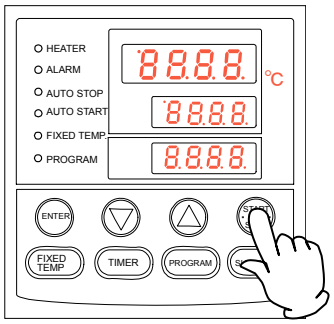
2.Starting timer operation

When you have set a time you want, press the Start/Stop key for about one second.

Timer operation will start with the auto start lamp on

4-1. Operating procedures（lower stage）

Lower stage bath　Operating procedures（auto start operation）



3. Stopping and finishing timer operation

Operation will start automatically when the set time comes.

Press the Start/Stop key for about one second to stop or finish operation. The screen switches to the initial setting screen.

When you want to correct the set temperature, set time, or to confirm settings

If you want to change the set temperature or the set time during operation, press the Timer key, set a temperature or a time for auto stop operation with the ▼▲ keys, and then press the Enter key.

Note however, that when you change the setting you need to set a time calculated by adding the passed time to the time to add.

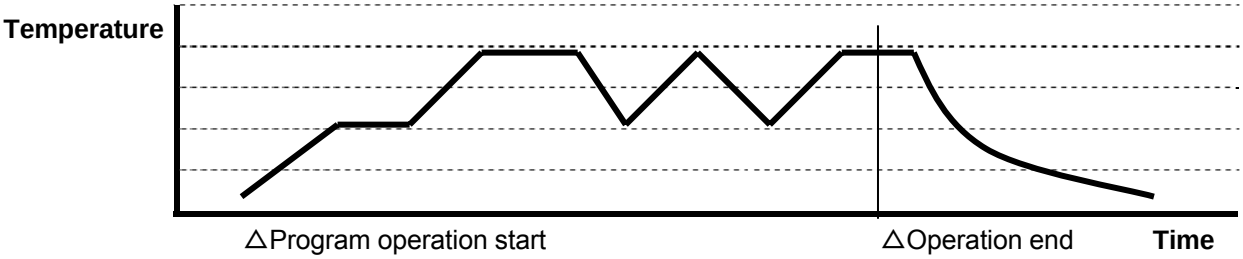
You can press the ▼ key during operation to display the set temperature, the operation mode, and the remaining time on the set temperature display.

Note that you cannot change them if you have started operation after the auto start time has passed. In this case, stop operation once with the Start/Start key and resume setting from the start.

4-1. Operating procedures（lower stage）

Lower stage bath　Operating procedures（making a program）

Program operation　This operation mode is used when “you want to perform operation while increasing and decreasing temperature depending on the time flow”.



Program types　Up to six program patterns can be stored in memory.

PrG1	—	You can make one pattern of program up to 30 steps.
PrG2	PA t 1	You can make two patterns of programs up to 15 steps each.
	PA t 2	
PrG3	PA t 1	You can make three patterns of programs up to 10 steps each.
	PA t 2	
	PA t 3	

Before inputting a program

You need to register (input) a program pattern to perform program operation.

① Confirm the number of steps, temperature of each step, and time for each step of the prepared program on the program preparation sheet on P.33 & P.34 of the instruction manual.

② Check the heating or the cooling capacity of the unit. You need to set a temperature within the heating or the cooling capacity of the unit.

For example, when a unit has a capacity for heating or cooling for 3℃ for 10 minutes, about 35 minutes will be necessary to decrease or increase the current temperature by 10℃.

Useful functions

You can use the repeat function useful for repeating the same program steps. See “Lower stage bath　Operating procedures (program repeat operation” on P.32 for how to use the repeat function.

① Make sure that the controller has free patterns sufficient for the number of steps you are going to program.

② Note however, that you can exclude the number of steps that require free patterns when you use the repeat function above.

4-1. Operating procedures（lower stage）

Lower stage bath　operating procedures（making a program）

Time for increasing or decreasing temperature

Rough time required for increasing or decreasing a temperature is as shown below.

Figures indicate time required for each temperature step. Be sure to perform trial operation and set a correct time because time required for stabilize the temperature reached the setting must be added separately.

Conditions：Room temperature:23℃　　No load

20℃～50℃　：　25 min.

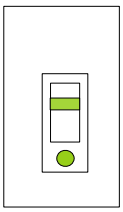
20℃～-10℃　：　45 min.

Making a program

A sample program pattern below is used for explanation here.

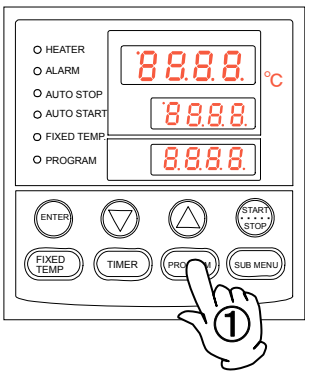
1. Sample program pattern

Step	1	2	3	4	5	6	7	← Repeat function is used →	8
Temp ℃	10	10	15	15	20	20	5	Adding the number of steps is not	5
Time	0.25	0.30	0.15	1.30	0.25	3.00	2.30	necessary.	3.00



2.Turning power on（Turn ELB ON）

When you turn power on, the initial values will be displayed for about four seconds, the screen will change to the initial setting screen and each display shows the current temperature in the bath, the operation mode characters, and the overheat prevention set temperature.



3.Selecting a program mode and a program pattern

① Press the Program key.

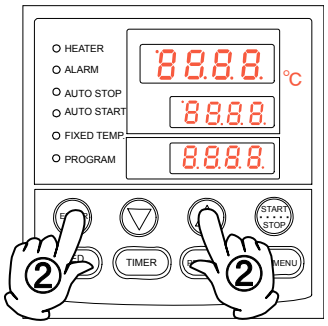
The program mode used in the previous session will appear on the set temperature display.

Pressing the Program key again will blink the program mode.

Pressing the Program key again will blink the next program mode.

4-1. Operating procedures（lower stage）

Lower stage bath　Operating procedures（making a program）



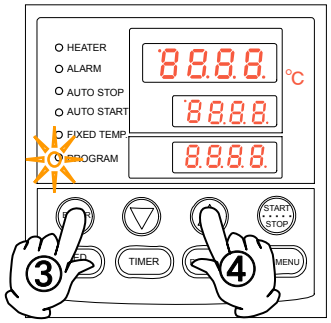
② Select a program mode you want and press the 、Enter key.

- When you select PrG1 PrG1, End End will be displayed on the measured temperature display and the number of steps registered blinks on the set temperature display.
- When you select PrG2 PrG2, PAt PAt will be displayed on the measured temperature display and the pattern number blinks on the set temperature display. Select a pattern from “1” or “2” with the ▼▲ keys.
  When you press the Enter key, End will be displayed on the measured temperature display and the number of steps registered blinks on the set temperature display.
- When select PrG3 PrG3, select a pattern from “1”, "2", and “3” following the same procedures as the PrG2.

The sample program uses up to eight steps and you can input all steps irrespective of which of PrG1, PrG2, or PrG3 program mode you have selected.

How to register a program using PrG3 as an example is explained here.

4.Registering a program（inputting a program）

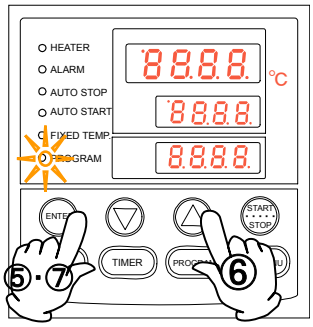


① Select PrG3 following the same procedures as the previous section 2.

② Input the number of program steps, the step temperature, and the step time referring to the filled-out program preparation sheet.

③ Press the Enter key. “Pat” is displayed on the measured temperature display and the number blinks on the set temperature display. (“End” will appear when you have selected PrG1. Proceed to the section ⑥.)

④ Select a free pattern you want from PAt1, PAt2, and PAt3 with the ▼▲ keys.



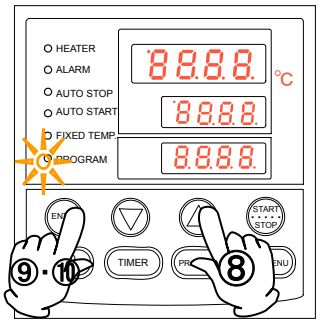
⑤ Press the Enter key. “End” will appear on the measured temperature display and the number of steps “n” blinks on the set temperature display.
※ “End” are the characters that indicate the total number of steps to be used.
In the reference example, you will enter “8”.

⑥ Enter the total number of program steps to be used, or“8“ with the ▼▲ keys.

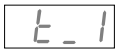
⑦ Press the Enter key. The characters Sv-1 Su_1 that indicate the set temperature for the step 1 are displayed on the measured temperature display and the current set temperature blinks on the set temperature display.

4-1. Operating procedures（lower stage）

Lower stage bath　operating procedures（making a program）



⑧ Set a temperature for step 1 with the ▼▲ keys.

⑨ Press the Enter key. The characters t-1  that indicate the set time for the step 1 are displayed on the measured temperature display and the current set time blinks on the temperature display.

※You need to know the increasing (or decreasing) capacity of the unit beforehand to set a time.

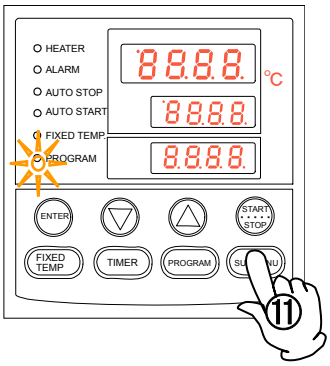
※Set a time that includes a slight margin including the stabilization time.

※The maximum time settable for the timer for each step is 999 hours 50 minutes.

⑩ When you have set a time, press the Enter key.

The temperature setting characters Sv-2 for the step 2 will be displayed.

In the same way, input the temperature and the time for each step referring to the program preparation sheet.



⑪ Special procedures will be necessary if you want to repeat a program pattern in the middle of the program (program repeat). In this case, first set a time (t-7 in the reference example) for the for the step (step 7 in the reference example) for which you want to repeat operation and then press the Sub menu key instead of the Enter key. Then you can enter the repeat function setting mode.

※Follow the description in “Lower stage bath Operating procedures (program repeat operation) on P.32 for how to operate and register (input) the program repeat function.

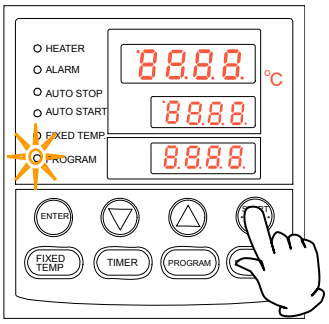
⑫ The screen will return to the initial setting screen when the setting of the temperature and the time for the final step has completed.

4-1. Operating procedures（lower stage）

Lower stage bath　operating procedures（making a program）

Request for confirmation operation

Before starting operation with a specimen, be sure to conduct no-load operation to check that the set temperature and the set time are correct.



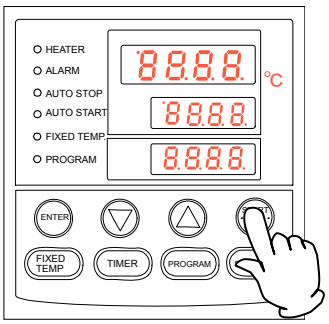
4.Starting program operation

Press the Start/Stop key for about one second. The program operation you have set will start.

The program operation lamp will come on and the steps will be displayed on the set temperature display from St-1 that is currently being executed.

※You can press the ▼ key during operation to check the set temperature and the remaining time of each step being executed on the set temperature display.

※Press the Start/Stop key for about one second if you want to stop program operation in the middle of it.



5.Finishing program operation

When program operation has finished, the buzzer will sound for about five seconds to notify it.

The characters ”End” that indicate completion are displayed on the set temperature display.

To return to the initial setting screen, press the Start/Stop key.

About the timer function

The maximum timer setting possible is 999 hours 50 minutes.
You can set a time in the unit of minutes up to 99 hours 59 minutes.
The setting unit will be 10 minutes for a time of 100 hours or longer.
You can change a set time quickly to the time you want by keeping the ▼▲ keys pressed. To fine adjust a time, repeat pressing the ▼▲ key for each digit.

When you want to correct wrong settings or to check the setting

When you want to return to the previous step to, for example, check for program errors or to re-check the setting, press the Fixed temp key to return the set screen to the previous one.

Each time you press the Fixed temp key, you will go back one step.

Note: Be sure to perform these steps in the program setting screen.

About wait operation of program operation

When a program shifts from one step to the next, when the measured temperature has not reached or has exceeded the set temperature even if the set time for the step has passed, the next step will not start.

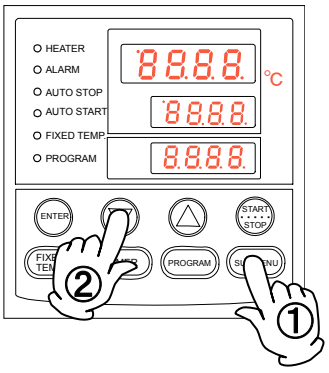
The unit has been set that a step will shift to the next in the range of ± 1℃ to the set temperature.

4-1. Operating procedures（lower stage）

Lower stage bath　Operating procedures（program repeat operation）

Using the program repeat function

How to register a program pattern when you want to repeat it in program operation (program repeat) is explained below.

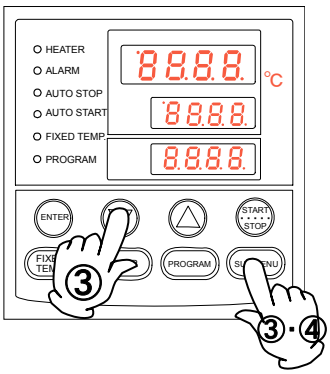


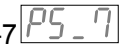
Using the program repeat function

How to register this function is explained here when you want to use the program repeat function in the middle of registering a program in the previous section 3.

This operation sets the number of step to return to “PS-n” and the number of repetitions “Pc-n”. （n： Step number when inputting repeat）

① After having set a time (t-7 in the reference example) for the step (step 7 in the reference example) for which you want to perform repeat operation, press the Sub menu key instead of the Enter key. Now you can enter the repeat function setting mode.



② The characters “PS-n” that indicate “selecting the return destination” of a program pattern are displayed on the measured temperature display. In the reference example, the repeat function is input in the step 7 and thus PS-7  will be displayed on the measured temperature display.

You can input step numbers from 1 to 7 as the return destination on the set temperature display and input a return destination step number (1 in the reference example) with the ▼▲ keys.

③ Then press the Sub menu key.

The characters ”Pc-n” that indicate “the number of repetitions” will be displayed on the measured temperature display. Input the number (2 in the reference example) with the ▼▲ keys.

④ Pressing the Sub menu key again will make the screen to move to the next step. （The screen moves to the registration screen of Sv-8 in the reference example.）

When you want to correct wrong settings or to confirm settings

You cannot correct settings in the middle of the repeat setting mode.

When you want to return to the previous step, for example, to correct wrong settings or to re-check the settings, finish repeat setting once, press the Fixed temp key when the screen switches to the temperature setting screen for the next step, return the setting screen to the previous screen and perform repeat setting operations again.

Note : Be sure to perform these steps in the program setting screen.

If you have any questions, contact our nearest sales office or general customer service center.

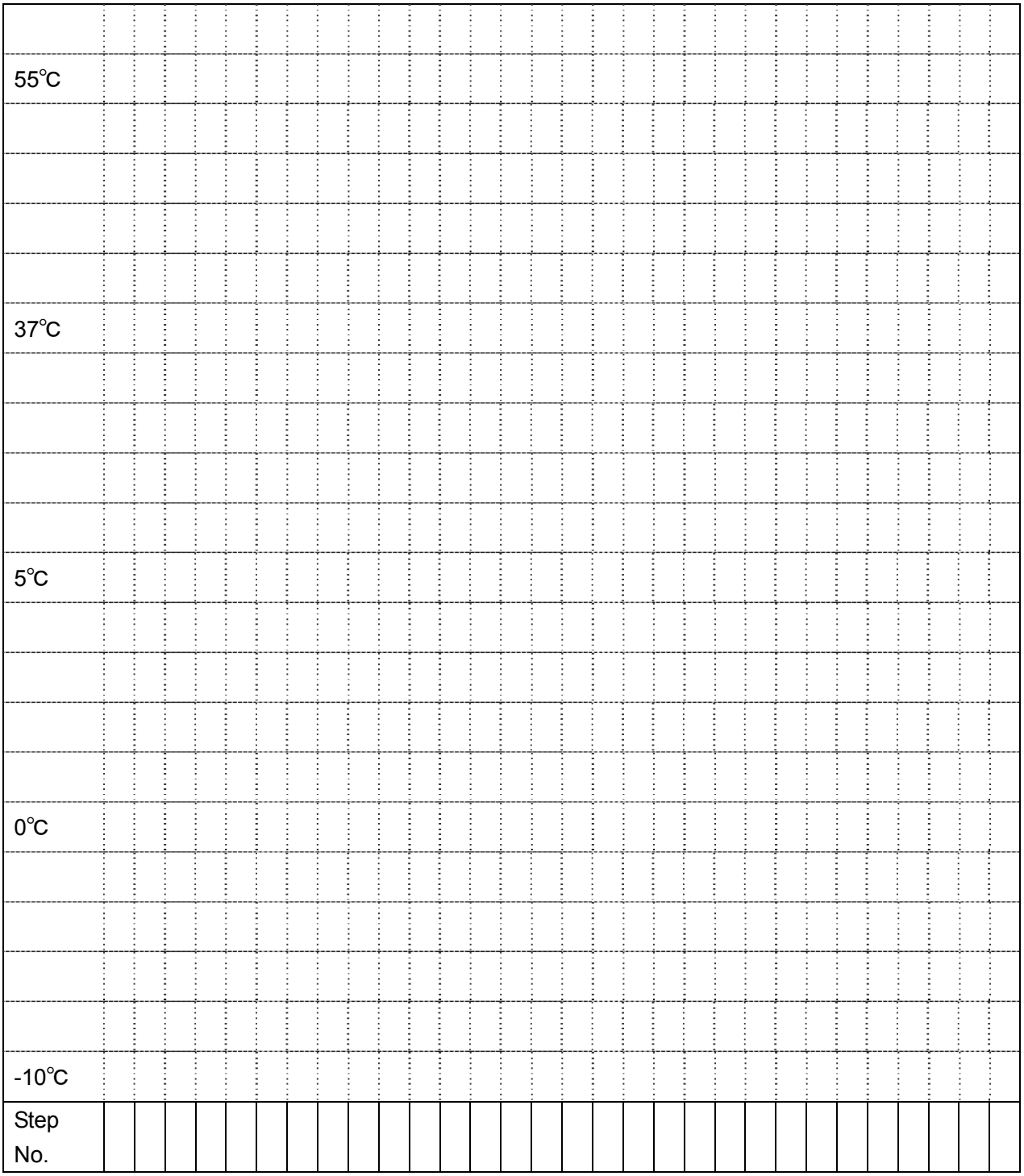
4-1. Operating procedures（lower stage）

Lower stage bath　Program preparation sheet

Make a copy of this sheet for use.

Registration destination	PrG1　PrG2　PrG3　　PAt1　PAt2　PAt3	Management No.	
Name of test		Date y/m/d	
		Prepared by	

Program patterns



4-1. Operating procedures（lower stage）

Lower stage bath　Program preparation sheet

Make a copy of this sheet for use.

Registration destination	PrG1　PrG2　PrG3　　PAt1　PAt2　PAt3	Management No.	
Name of test		Date y/m/d	
		Prepared by	

Program inputs

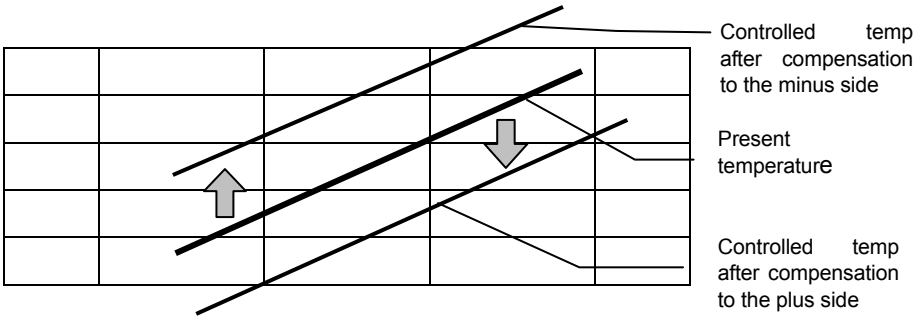
	Set temperature（℃）	Set time（time：minute）	Repeat function input（Return to：times）
Step 1		:	:
Step 2		:	:
Step 3		:	:
Step 4		:	:
Step 5		:	:
Step 6		:	:
Step 7		:	:
Step 8		:	:
Step 9		:	:
Step 10		:	:
Step 11		:	:
Step 12		:	:
Step 13		:	:
Step 14		:	:
Step 15		:	:
Step 16		:	:
Step 17		:	:
Step 18		:	:
Step 19		:	:
Step 20		:	:
Step 21		:	:
Step 22		:	:
Step 23		:	:
Step 24		:	:
Step 25		:	:
Step 26		:	:
Step 27		:	:
Step 28		:	:
Step 29		:	:
Step 30		:	:

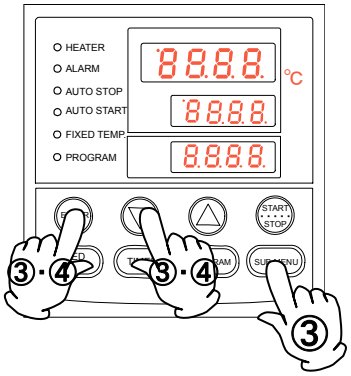
4-1. Operating procedures（lower stage）

Lower stage bath　Useful functions（calibration offset function）

Using the calibration offset function

The calibration offset function compensates any difference between the target in-bath temperature and the control temperature of the controller (sensor temperature). You can apply parallel compensation to the plus or minus side over the entire temperature range of the unit.
You can set/cancel this function with the Sub menu key.
The offset is set at “0” at the time of factory shipping.





① Start operation at the target set temperature and check the in-bath temperature (sample temperature) on a temperature recorder when the temperature is stable.

② Check the difference between the set temperature and the in-bath temperature (sample temperature).

③ Press the Sub menu key and select the character cAL  that mean calibration offset with the ▼▲ keys and then press the Enter key.

④ Enter the difference between the set temperature and the in-bath temperature with the ▼▲ keys and press the Enter key longer to finish setting.

※You can set an offset compensation temperature within the range from +99℃ to –99℃.
Setting to the － side will decrease the temperature on the measured temp indicator by the compensated temperature and the in-bath temperature will increase by that amount accordingly.
Setting to the ＋ side will increase the temperature on the measured temp indicator by the compensated temperature and the in-bath temperature will decrease by that amount accordingly.

※Inputting a too large compensation value may cause the actual temperature greatly deviate from the displayed temperature and may be dangerous. So please consult the nearest sales office beforehand.

※The unit has a two-point compensation function that adjusts offset for the lower temperature region and the high temperature region in addition to the calibration offset function and adjusting temperatures have been set at the time of factory shipping.

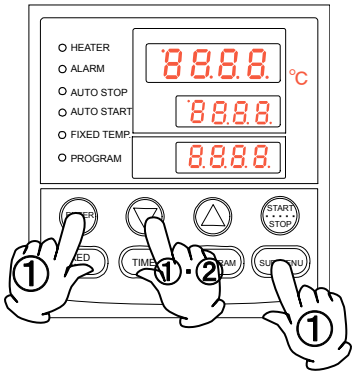
※When validating the temperature indicator, first consult with your nearest sales office or the customer support center.

4-1. Operating procedures（lower stage）

Lower stage bath　Useful functions（lock function）

Using the lock function

This function is used to lock the operating status you have set.
This function is set to “off” at factory shipping.



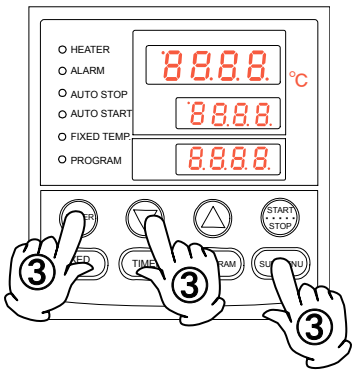
You can set or release this function with the Sub menu key.

① Press the Sub menu key, select the characters Lock LocK that indicate the setting lock with the ▼▲ keys, and then press the Enter key.

② ”OFF” will appear on the set temperature display. You can lock the settings by setting to “ON” with the ▲ key.

③ To release lock, press the Sub menu key, select the characters Lock LocK that indicate the setting lock with the ▼▲ keys, and then press the Enter key.
Select “OFF” with the ▼ key and then press the Enter key to release.

※While the lock function is “ON”, any keys other than the Start/Stop key and the Sub menu key are locked.



4-2. Operating procedures（upper stage）

Upper stage bath　List of operation modes and functions

Operation modes of the unit are as follows.

No.	Name	Description	Page
1	Fixed value operation	Pressing the Fixed temp key brings you to the fixed value operation setting mode. Pressing the Fixed temp key again brings you to the temperature setting mode. Set a temperature with the ▼▲ keys. Press the Start/Stop key to start operation and press the Start/Stop key again to stop.	P.41
2	Quick auto stop operation	This mode is used when you “want to stop operation currently in session automatically after several hours”. You can set time until the operation stop by pressing the Timer key during fixed value operation. Set a time with the ▼▲ keys. Pressing the Start/Stop key will start quick auto stop operation and the timer will activate in the middle of the operation and automatically stop operation after set time.	P.42
3	Auto stop operation	This mode is used when you “want to stop operation automatically before setting fixed value operation”. Press the Timer key to display “Astp”. You can set the set temperature “SV” by pressing the Enter key. You can set operation time “tim” by pressing the Enter key again. Pressing the Start/Stop key will start auto stop operation.	P.44
4	Auto start operation	This mode is used when you “want to start operation automatically after certain time after power on”. Press the Timer key to display “Astr”. You can set the set temperature “SV” by pressing the Enter key. You can set operation time “tim” by pressing the Enter key again. Pressing the Start/Stop key will start auto start operation.	P.46
※You cannot change the operation mode while the unit is in operation. First stop operation before trying to change the mode.			

4-1. Operating procedures（upper stage）

Upper stage bath　List of operation modes and functions

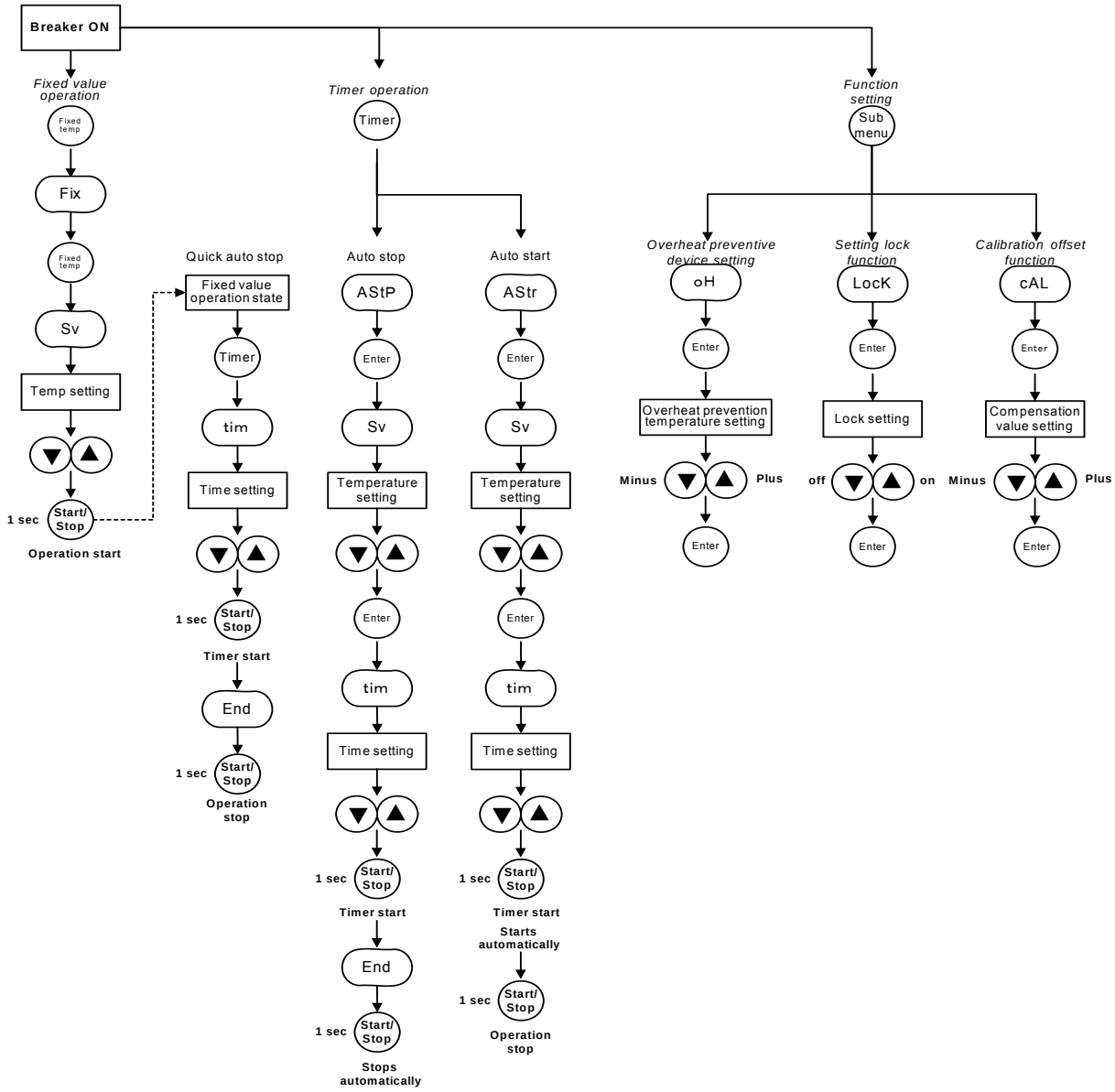
Operation functions of the unit are as follows.

No.	Name	Description	Page
1	Overheat prevention function	Automatic overheat prevention function： The function has been set to activate automatically (automatic recovery) at the increase of 6℃ when the temperature in the bath has risen linked to the set temperature of the unit. Overheat preventive device： Although the unit shares the power supply, the display unit, and the key input assembly with the controller, it also has an independent temperature measurement circuit, the CPU, the sensors and the output circuit and is able to set any temperature you want on the control panel. If the overheat preventive unit has activated, the unit will stop and will not recover until the power switch is turned on again. (Manual recovery) You can set or cancel this function with the Sub menu key.	P.40
2	Calibration offset function	The calibration offset function compensates any difference between the target temperature in the bath and the controller controlled temperature (sensor temperature). You can apply compensation to the plus or minus side over the entire temperature range of the unit. You can set or cancel this function with the Sub menu key.	P.48
3	Setting lock function	This function is used to lock the operation status you have set. You can set or release this function with the Sub menu key.	P.49
4	Power failure compensation function	When a power failure occurs in the middle of operation, this function is used to start operation at the status immediately before power failure.	—

4-2. Operating procedures（upper stage）

Upper stage bath Operation modes, function setting keys, and characters

Key operations and characters shown below are used for setting an operation mode and a function.



4-2. Operating procedures（upper stage）

Upper stage bath　Overheat preventive device setting

The safety units for prevention of overheat includes the power supply, the display, and the key input assembly shared with the controller in addition to the automatic overheat prevention function (automatic recovery) of the controller as well as an overheat prevention device (manual recovery) comprising of the independent temperature measurement circuit, the CPU, and the sensors, and the output circuit, thus establishing dual safety measures.

Temperature setting range and functions

The unit has dual overheat preventive functions. One function is included in the controller and has been set at the time of factory shipping to automatically activate at the temperature 6℃ higher than the set temperature of the temperature controller (The heater repeats ON/OFF at a temperature 6℃ higher than the setting.）

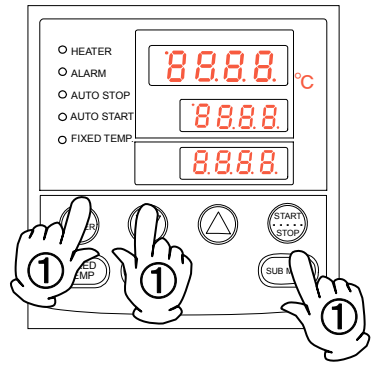
The other function is integrated with the controller and is set by operating the keys on the controller. This setting adds the second overheat prevention function.

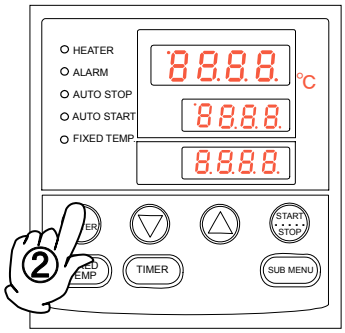
The temperature setting range of the overheat preventive device integrated with the controller is from 0℃ to 135℃.

If the temperature in the bath keeps rising above the controller set temperature and reaches the set temperature of the overheat preventive device, the circuit will be shut off, Er 19 will blink on the controller screen, and the buzzer continues sounding.

Once this overheat preventive device is activated, it holds that status until power is reset and Er19 will not be released.

How to set a temperature





1.Turning power on（Turn the ELB ON）

When you turn power on, the initial values will be displayed for about four seconds, the screen will change to the initial setting screen and each display shows the current temperature in the bath, the operation mode characters, and the overheat prevention set temperature.

2.Setting the overheat prevention temperature

① Press the Sub menu key, press the ▼▲ keys to select the overheat prevention setting characters OH 

and then pressing the Enter key.

② The current set temperature blinks on the set temperature display.

Caution： Normally, set a temperature higher by 10℃ or more than the set temperature on the controller to prevent a malfunction. However, please set it at a temperature that is 15℃ or more higher when you drive the defrosting.

③ When you have set a temperature you want with the ▼▲ keys, press the Enter key to complete setting.

⚠ Caution

① Rough guidelines for the set temperature are “the highest temperature possible for the unit ＋10℃” or “set temperature ＋5℃” and if malfunctions occur at these settings, add about 10℃ to the setting.

② The temperature setting range of the overheat preventive device is from 0℃ to 135℃. Be sure to set the overheat prevention threshold temperature. Otherwise, devices may not operate properly, the overheat preventive device may activate in the middle of increase of the temperature in the bath, or a fire or other unexpected accidents may result.
The temperature is set at 90℃ at factory shipping.

③ The overheat preventive device aims not to protect specimen but to prevent excessive heating of a device. Note that this device cannot protect against accidents caused by using explosive or flammable substances.

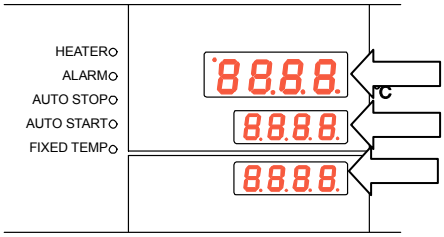
4-2. Operating procedures（upper stage）

Upper stage bath　Operating procedures（fixed value operation）

How to conduct fixed value operation

1.Turning power on（Turn ELB ON）

When you turn power on, the software version will be displayed for about four seconds, the screen will change to the initial setting screen and each display shows the current temperature in the bath, the operation mode characters, and the overheat prevention set temperature.



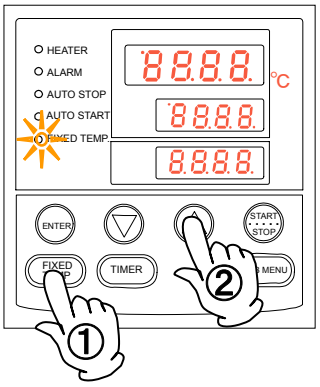
Measured temperature display：Displays the current temperature in the bath

Set temperature display：Displays the operation mode characters

Overheat prevention set temperature display：Displays the set temperature of the overheat prevention device

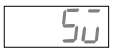
2.Selecting an operation mode

The characters FiX  that indicate fixed value operation are displayed on the set temperature screen.



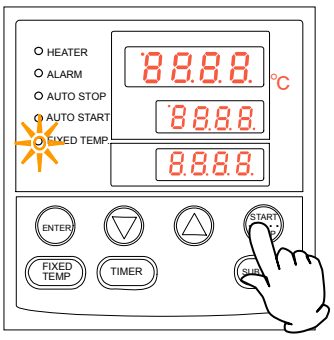
3.Setting a temperature

① Press the Fixed temp key.

The characters SV  that indicate temperature setting will appear on the measured temperature display, the current set temperature blinks on the set temperature display, and the fixed value operation lamp blinks.

② Set the temperature you want with the ▼▲ keys.

You can set a temperature up to the first digit after the decimal point.



4. Starting operation

Press the Start/Stop key for about one second. Operation starts and the fixed value operation lamp will change its status from blinking to on.

5. Stopping operation

Press the Start/Stop key for about one second. The fixed value operation lamp will go off and the screen switches to the initial setting screen.

When you want to correct wrong settings or confirm settings

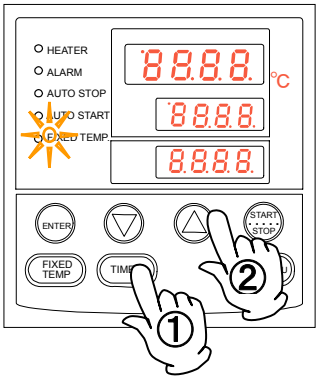
If you made a mistake in setting or when you want to check the setting you have made, press the Fixed temp key again and make settings again.

If you want to change the set temperature during operation, press the Fix key to enter the setting mode and change the temperature. After change, press the Enter key to complete change.

4-2. Operating procedures（upper stage）

Upper stage bath　Operating procedures（Quick auto stop operation）

How to perform quick auto stop operation



This operation is used when you “want to stop current fixed value operation automatically after several hours”. Quick auto stop operation allows setting the auto stop timer during operation.

1.Setting a time until stop during fixed value operation

①Make sure that the fixed value operation lamp is on to indicate fixed value operation is in session.

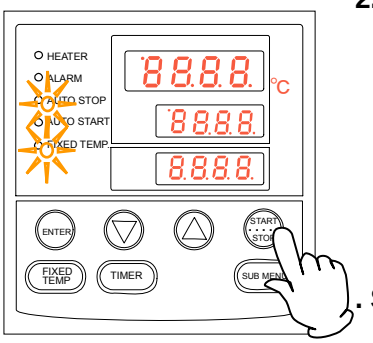
Press the Timer key.

The characters tim  that indicate the timer appears on the measured temperature display and the current set time blinks on the set temperature display.

②Set a time you want with the ▼▲ keys.

About the timer function

The maximum timer setting possible is 999 hours 50 minutes.
You can set a time in the unit of minutes up to 99 hours 59 minutes.
The setting unit will be 10 minutes for a time of 100 hours or longer.
You can change a set time quickly to the time you want by keeping the ▼▲ keys pressed. To fine adjust a time, repeat pressing the ▼▲ key for each digit.

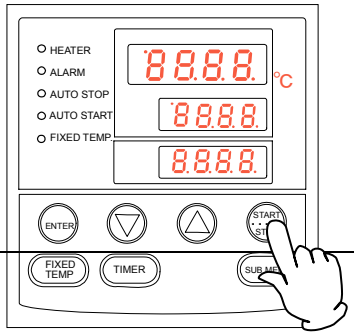


2.Starting timer operation

When you have set a time you want, press the Start/Stop key for about one second.

Start the timer operation when the fixed value operation lamp and the auto stop lamp are on.

Timer operation starts when the Start/Stop key is pressed.



. Stopping and finishing timer operation

Timer operation will stop automatically at the set time。

The buzzer sounds for five seconds to indicate the timer has stopped. At this time, the characters End  that indicate operation complete are displayed on the set temperature display with the fixed value operation lamp and the auto stop lamp are on. Press the Start/Stop key for about one second to finish the timer operation mode. The screen will switch to the initial setting screen.。

4-2. Operating procedures（upper stage）

Upper stage bath　Operating procedures（Quick auto stop operation）

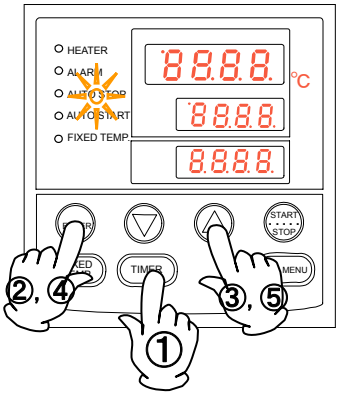
When you want to correct the set temperature, set time, or to confirm settings

When you want to change the set temperature during operation, press the Fix temp key to enter the setting mode and change the temperature. After change, press the Enter key to complete change. If you want to change the set time during operation, press the Timer key to enter the setting mode and change the time. Note however, that you need to set a time calculated by adding the passed time to the time to add. After change, press the Start/Stop key to complete change. You can display the set temperature, the operation mode, and the remaining time on the set temperature display by pressing the ▼ key.

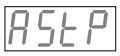
4-2. Operating procedures（upper stage）

Upper stage bath　Operating procedures（auto stop operation）

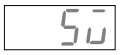
How to perform auto stop operation



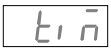
1.Setting a stop time

①On the initial screen, press the Timer key to blink the characters AStP  that indicate the auto stop operation on the set temperature screen.。

② Press the Enter key.

The characters Sv  that indicate temperature set appear on the set temperature display and the auto stop lamp will blink.

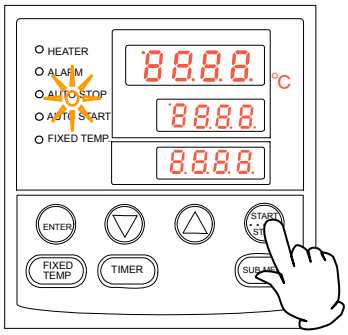
③ Press the ▼▲ keys to set the temperature you want.
You can set a temperature up to the first digit after the decimal point.

④ Press the Enter key. The characters tim  that indicate the timer on the measured temperature display and the current set time will blink on the set temperature display.

⑤ Press the ▼▲ keys to set the time you want.

About the timer function

The maximum timer setting possible is 999 hours 50 minutes.
You can set a time in the unit of minutes up to 99 hours 59 minutes.
The setting unit will be 10 minutes for a time of 100 hours or longer.
You can change a set time quickly to the time you want by keeping the ▼▲ keys pressed. To fine adjust a time, repeat pressing the ▼▲ key for each digit.

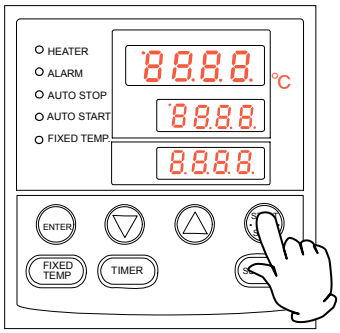


2.Starting timer operation

When you have set a time you want, press the Start/Stop key for about one second.

Timer operation will start with the auto stop lamp on.

Timer starts when the temperature in the bath (measured temperature) reaches the set temperature.



3. Stopping and finishing timer operation

Timer operation will stop automatically at the set time.

The buzzer sounds for five seconds to indicate that the timer has stopped. At this time, the characters End  that indicate operation complete are displayed on the set temperature display with the fixed value operation lamp and the auto stop lamp are on. Press the Start/Stop key for about one second to finish the timer operation mode. The screen will switch to the initial setting screen.

4-2. Operating procedures（upper stage）

Upper stage bath　Operating procedures（auto stop operation）

When you want to correct the set temperature, set time, or to confirm settings

If you want to change the set temperature or the set time during operation, press the Timer key, set a temperature or a time for auto stop operation with the ▼▲ keys, and then press the Enter key.

Note however, that when you change the setting you need to set a time calculated by adding the passed time to the time to add.

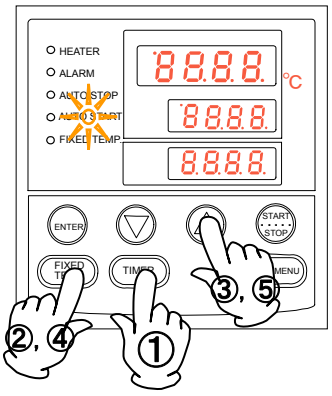
You can press the ▼ key during operation to display the set temperature, the operation mode, and the remaining time on the set temperature display.

The remaining time display  indicates counting-down while the dots are blinking and waiting state while the dots stay on (temperature is increasing or decreasing toward the set temperature) and the timer count is stopped.

4-2. Operating procedures（upper stage）

Upper stage bath　Operating procedures（auto start operation）

How to perform auto stat operation



1.Setting a startp time

①On the initial screen, press the Timer key to blink the characters AStr  that indicate the auto start operation on the set temperature screen.

② Press the Enter key.

The characters Sv  that indicate temperature set appear on the set temperature display and the auto stop lamp will blink.

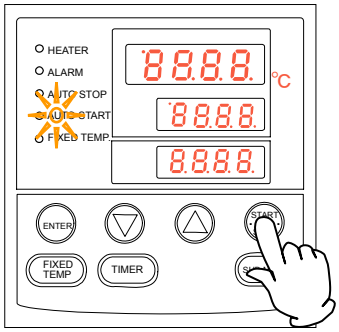
③ Press the ▼▲ keys to set the temperature you want.
You can set a temperature up to the first digit after the decimal point.

④ Press the Enter key. The characters tim  that indicate the timer on the measured temperature display and the current set time and autostarat lamp will blink on the set temperature display.

⑤ Press the ▼▲ keys to set the time you want.

About the timer function

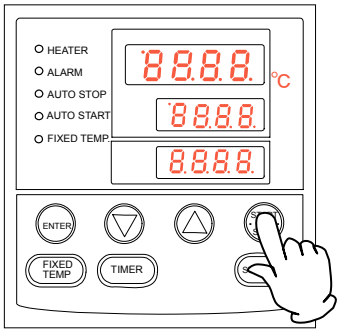
The maximum timer setting possible is 999 hours 50 minutes.
You can set a time in the unit of minutes up to 99 hours 59 minutes.
The setting unit will be 10 minutes for a time of 100 hours or longer.
You can change a set time quickly to the time you want by keeping the ▼▲ keys pressed. To fine adjust a time, repeat pressing the ▼▲ key for each digit.



2.Starting timer operation

When you have set a time you want, press the Start/Stop key for about one second.

Timer operation will start with the auto start lamp on



3. Stopping and finishing timer operation

Operation will start automatically when the set time comes.

Press the Start/Stop key for about one second to stop or finish operation. The screen switches to the timer setting screen.

4-2. Operating procedures（upper stage）

Upper stage bath　Operating procedures（auto start operation）

When you want to correct the set temperature, set time, or to confirm settings

If you want to change the set temperature or the set time during operation, press the Timer key, set a temperature or a time for auto stop operation with the ▼▲ keys, and then press the Enter key.

Note however, that when you change the setting you need to set a time calculated by adding the passed time to the time to add.

You can press the ▼ key during operation to display the set temperature, the operation mode, and the remaining time on the set temperature display.

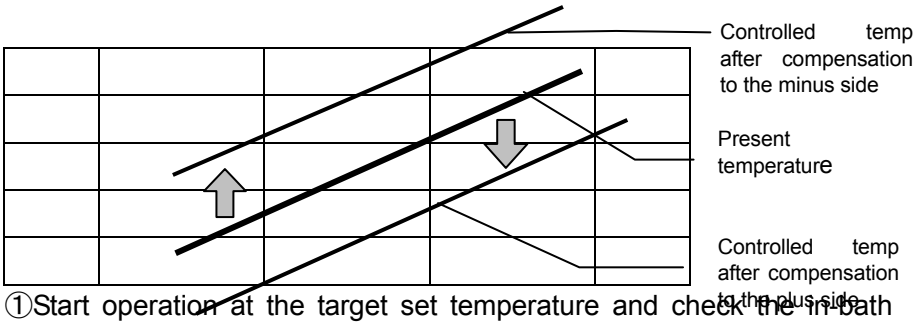
Note that you cannot change them if you have started operation after the auto start time has passed. In this case, stop operation once with the Start/Start key and resume setting from the start.

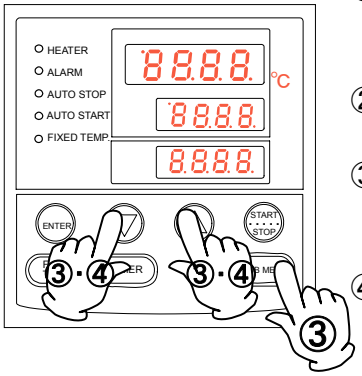
4-1. Operating procedures（upper stage）

Upper stage bath　Useful functions（calibration offset function）

Using the calibration offset function

The calibration offset function compensates any difference between the target in-bath temperature and the control temperature of the controller (sensor temperature). You can apply parallel compensation to the plus or minus side over the entire temperature range of the unit.
You can set/cancel this function with the Sub menu key.
The offset is set at “0” at the time of factory shipping.





①Start operation at the target set temperature and check the in-bath temperature on a temperature recorder when the temperature is stable.

②Check the difference between the set temperature and the in-bath temperature.

③Press the Sub menu key and select the character cAL  that mean calibration offset with the ▼▲ keys and then press the Enter key.

④Enter the difference between the set temperature and the in-bath temperature with the ▼▲ keys and press the Enter key longer to finish setting.

※You can set an offset compensation temperature to either + or – side.
Setting to the － side will decrease the temperature on the measured temp indicator by the compensated temperature and the in-bath temperature will increase by that amount accordingly.
Setting to the ＋ side will increase the temperature on the measured temp indicator by the compensated temperature and the in-bath temperature will decrease by that amount accordingly.

※Inputting a too large compensation value may cause the actual temperature greatly deviate from the displayed temperature and may be dangerous. So please consult the nearest sales office beforehand.

※The unit has a two-point compensation function that adjusts offset for the lower temperature region and the high temperature region in addition to the calibration offset function and adjusting temperatures have been set at the time of factory shipping.

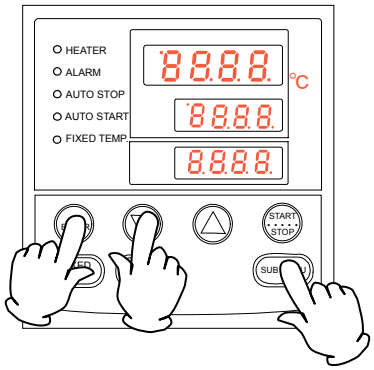
※When validating the temperature indicator, first consult with your nearest sales office or the customer support center.

4-2. Operating procedures（upper stage）

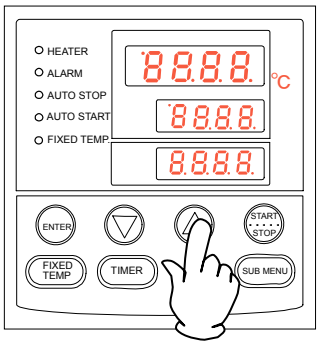
Upper stage bath　Useful functions（lock function）

Using the lock function

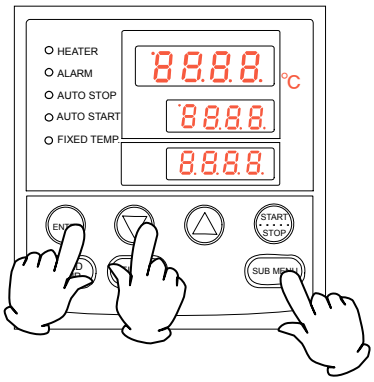
This function is used to lock the operating status you have set.
This function is set to “off” at factory shipping.



①Press the Sub menu key, select the characters Lock  that indicate the setting lock with the ▼▲ keys, and then press the Enter key.



②”OFF” will appear on the set temperature display. You can lock the settings by setting to “ON” with the ▲ key.。



④ ③To release lock, press the Sub menu key, select the characters Lock  that indicate the setting lock with the ▼▲ keys, and then press the Enter key.
Select “OFF” with the ▼ key and then press the Enter key to release.

※While the lock function is “ON”, any keys other than the Start/Stop key and the Sub menu key are locked.。

5. Handling precautions

⚠ Warning

1. About non-supported substances

Never use an explosive substance, a flammable substance, or those that contain such substances for the unit. Otherwise, an explosion or a fire may result.
See “13. List of dangerous substances” on P.60.

2. Ban of use/measures in an abnormality

何 If this unit should generate a smoke or a strange odor for unknown reason, immediately turn the ELB of the main unit and the power off and ask your dealer or one of our sales offices for inspection. Leaving the unit in such a state may cause a fire or an electrical shock. Never attempt to repair the unit by yourself, which poses a danger.

⚠ Caution

1. Never climb on the unit.

Never climb on the unit. The unit may topple over or be damaged and a personal injury or a malfunction may result.

2. Do not place an object on the unit.

Do not put an object on the unit. It may fall off and may cause a personal injury. Also, do not put a piece of paper or other objects that are highly combustible around the unit.

3. When a thunder is heard.

When a thunder is heard, immediately turn the unit and the power supply off.
Leaving them as it is may cause the control circuit of the unit malfunction or a fire or an electric shock from a lightening.

4. When opening/closing a door.

When opening/closing a door, do not put your hand or face close to the area (space) where the door is movable. The door may hit your hand or face and cause an injury.

5. Do not operate the unit with its door left open.

Operating the unit with its door open will prevent proper temperature control causing the heater overheat to a dangerous level. Be sure to close the door while operating the unit.

6. Ban on use of a corrosive specimen

Although SUS304 stainless steel is used for the inside of the bath, note that it might corrode with a strong acid. Door packing are made of vinyl chloride rubber. Note that it may corrode with acids, alkalis, oils, or halogen based solvents.

5. Handling precautions

⚠ Caution

7. Use the unit at an appropriate temperature.

Operating temperature range: Upper stage bath : Room temperature +5℃～80℃; lower stage bath：4℃～50℃.
Never operate the unit at a temperature outside the operating temperature range.

8. Assure sufficient ventilation of the unit.

Do not operate the unit with ventilation ports at the front, sides, and back of the unit covered. Internal temperature of the unit will rise degrading the performance and may cause an accident, a malfunction, or a fire.

9. Take care not to allow liquid splash on the unit.

Take care not to allow liquid splash on the unit. In particular, take care not to allow liquid entering into the ventilation ports at the front, sides, and back of the unit. Stop operating the unit if liquid should splash on the unit. Otherwise, an accident, a malfunction, an electric shock, or a fire may result.

10. Do not drop a metal piece inside the unit.

Do not drop a clip, a staple, a screw, or other metal pieces inside the unit.
Stop operating the unit if a metal piece is dropped inside the unit.
Otherwise, an accident, a malfunction, an electric shock, or a fire may result.

11. About placement of shelf boards and specimens.

Place shelf boards and specimens correctly according to the “Installation method and precautions” on P.8.
Incorrect placement will prevent sufficient performance from exerting and an accident or a malfunction may result.

12. Never attempt to perform works not specified in this instruction manual.

Never attempt to perform works not specified in this instruction manual. Otherwise, an unexpected accident may result.

13. About recovery from a power failure.

When the unit stopped operation due to a power failure and power is supplied again, the unit automatically recovers to the status immediately before the failure and resumes operation.
We recommend turning power off because it is dangerous if the unit restarts suddenly when the power recovers from the power failure.

14. About vibrations.

There is a freezer on the lower stage of the unit and it causes some vibrations. Do not use the unit for tests that shall avoid vibrations including protein crystallization.
（Use our low temperature incubator IN602N when you needs a low vibration unit.）

6. Maintenance

Daily inspection/maintenance

⚠ Warning

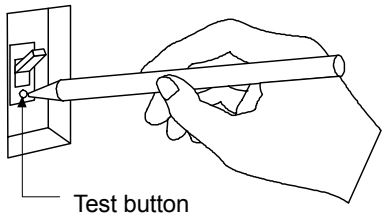
- Be sure to remove the power cord before inspection or maintenance unless necessary.
- Start working after the unit temperature has returned to the normal temperature.
- Never attempt to disassemble devices.

⚠ Caution

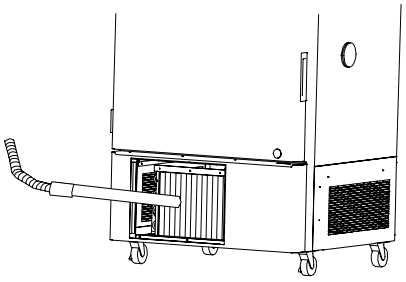
- Wipe off any dirt with a well wrung out soft cloth. Never use benzene, thinner, or scorching powder or rub with a hard brush. Otherwise, deformation, deterioration, or discoloration may result.

Monthly

- Inspect the function of the ELB.
  - Connect the power cord and conduct a test while it is activated.
  - First turn the ELB “off”.
  - Then turn it “on” and push the test button of the ELB with a pointed object such as a ball point pen and it is normal if it is turned off.



- Check the operation of the overheat preventive device.
  - After performing fixed value operation at an appropriate set temperature, set the operation temperature of the independent overheat preventive device to a temperature lower by several degrees (about 5℃).
  - If the ELB is normal, the heater circuit will be shut off after several seconds and the “Alarm” sign and Er19 will come on and the alarm buzzer sounds at the same time.
- Clean the fins of the condenser.
  Remove the grill of the unit and remove dusts on the condenser fins using a vacuum cleaner.



⚠ Caution
Take care not to crush the fins when cleaning.

※Be sure to perform operation check for the ELB and the overheat preventive device above before a continuous operation for a long time or unmanned operation during nighttime.

Maintenance of the internal bath

Stop operation and turn the ELB “off”. Remove the power cord and the distribution panel from the outlets. Check the internal temperature and then remove the shelf boards and the shelf pegs.
The internal bath, shelf boards, shelf pegs are made of SUS304 stainless steel and the inner door employs reinforced glass. Use a cloth soaked in cleaning alcohol, wipe it thoroughly, and then wipe lightly with a dry cloth for cleaning. Never use an acid cleaner, an alkaline cleaner, oils, or an organic solvent, which will cause corrosion or damages.

⚠ Take special care for injury with keen protruding parts inside the internal bath, on the shelf boards, and the shelf pillars. Be sure to wear gloves and never handle them with bare hands to avoid injury.

7. When the unit is not to be used for a long time or when disposing

⚠ Warning	⚠ Caution
When you are not going to use the unit for a long time ●Turn power off and remove the power cord.	When disposing ●Do not leave the unit where children may play around. ●Remove all driving assemblies. ●The unit uses CFC's substitute. Ask the professional company for its disposal.

Notes about disposition

Always pay attention to the preservation of the global environment.

・We highly recommend taking the unit apart as far as possible for separation or recycling to contribute to the preservation of the global environment. Major components and materials for the unit are as follows:

Names of major components	Material
Major components of the exterior	
Exterior	Electro galvanized steel plate, melamine resin baking finish
Interior	SUS304 stainless steel plate
Heat insulator	Styrene foam, glass wool
Sealant	Polyester film
Major components of the electric system	
Switches and relays	Resin, cupper, other composite products
Operation panel	Alkyl benzene sulfide (ABS)
Board	Glass fiber, other composite products
Heater	Iron chrome wire
Power cord	Synthesized rubber covering, composite products of cupper, nickel, etc.
Sealant	Resin based material
Sensor（Pt&K double sensor）	SUS304 stainless steel, other
Freon	HFC-R404A ※1

※1 Freon is specified as the class 1 specific product in Freon recovery and destruction law.
Emission of Freon into atmosphere without rational reasons is prohibited by law.
When discarding the product, its Freon must be collected.

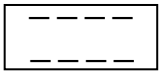
8. When a trouble occurs

Safety devices and error codes

The unit has a self diagnostic function integrated in the controller.
The table below shows the possible causes for an activation of a safety device and solutions.

[Error codes]

When an operational abnormality or a unit malfunction occurs, operation will stop, the alarm lamp on the operation panel comes on, an error code appears, and the alarm buzzer sounds.

Safety device	Symptom	Causes and countermeasures
Sensor error detected	Alarm lamp on  indication	● Disconnection or a malfunction of the temperature sensor Contact the general customer service center.
SSR short-circuit detected	Alarm lamp on  indication	● SSR short-circuit Contact the general customer service center.
Heater disconnection detected	Alarm lamp on  indication	● Heater disconnection Contact the general customer service center.
Malfunction of memory	Alarm lamp on  indication	● Abnormality in settings in memory Contact the general customer service center.
Internal communication error	Alarm lamp on  indication	● Error in internal communication or in the temperature input circuit. Contact the general customer service center.
Abnormal rise of temperature	Alarm lamp on  indication	● Activation of the overheat preventive device Reset the power supply once and then check the temperature in the bath and the set temperature of the overheat preventive device. If the unit does not recover, contact the general customer service center.
Abnormal measured temperature	Alarm lamp on  indication	● When the measured temperature is outside the display range. Contact the general customer service center.

8. When a trouble occurs

Safety units and error codes

In the following cases

Symptom	Check
The ELB will not become active even if power is turned on.	●If the power plug is connected to the receptacle correctly. ●If a power failure has occurred.
The alarm lamp comes on.	●Check error codes. Check the meaning of the error code in “Safety devices and error codes” on P.54.
Temperature will not increase.	●If the set temperature is lower than the internal temperature. ●If supply voltage has been low. ●If the environmental temperature is low. ●If cooling load in the bath is large.
Temperature will not decrease.	●If the set temperature is higher than the internal temperature. ●If supply voltage has been low. ●If the environmental temperature is high. ●If heat load in the bath is large. ●If the ventilation ports and around them are covered.
Temperature fluctuates during operation.	●If set temperature is appropriate. ●If supply voltage has been low. ●If changes of the environmental temperature are large. ●If load in the bath is large.

If a power failure occurs

When a power failure occurs in the middle of operation, this function is used to start operation at the status immediately before power failure.（Defrost operation is cancelled.） Turn the ELB off if you do not want to recover and resume operation automatically.

◆When the symptom does not correspond to any of the above, immediately turn the ELB on the main unit off, remove the power plug out of the power supply and contact your dealer, one of our sales offices, or our general customer service center.

9. After sales service and warranty

When requesting a repair

If any trouble occurs, immediately stop operation, turn the ELB off, pull out the power plug and contact your dealer or our sales office.

Information necessary for requesting a repair

- Model name of the product
- Serial number
- Date (y/m/d) of purchase

} See the warranty card or the nameplate on the unit. See the section “Names and Functins of Parts” on page12.

- Description of trouble (as in detail as possible)

Be sure to indicate the warranty card to our service representative.

Warranty card (attached separately)

●Your dealer or one of our sales offices will hand you a warranty card. Please fill necessary data such as “dealer name, date of purchase, etc” and store at a safe place.

●Warranty period is one full year from the date of purchase. Repair service for free is available according to the conditions written on the warranty card.

●For repairs after the warranty period consult your dealer or one of our sales offices. Paid repair service is available on your request when the product’s functionality can be maintained by repair.

Minimum holding period of repair parts

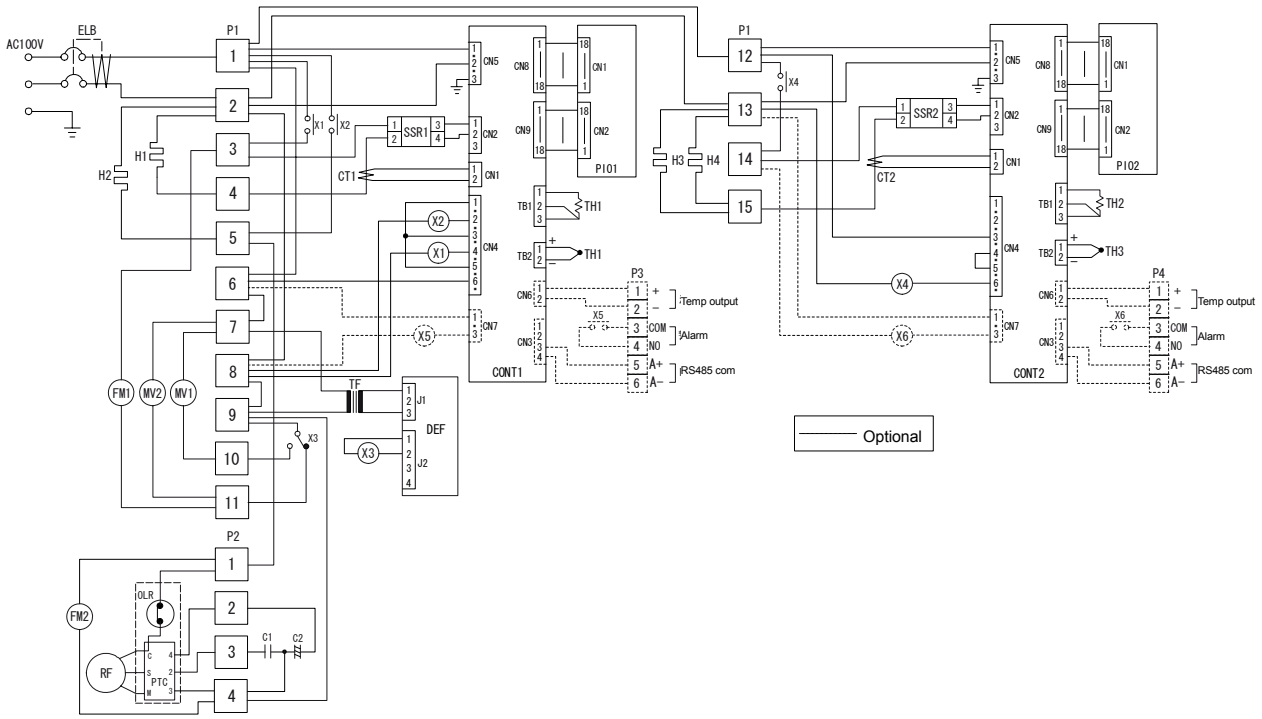
The minimum holding period of repair parts for this product is seven years after end of production.
Repair parts here refer to parts necessary for maintaining performance of the product.

10. Specifications

Model			INC820	
			Upper stage bath	Lower stage bath
System			Air jacket natural convection	Forced blow circulation
Performance	Operating temp range		Room temperature +5～80℃	4～50℃
	Temp adjusting precision		±0.5℃（at37℃）	±0.3℃ （when freezer is continuously operated）
	Temp distribution precision		±1.0℃（at37℃）	±1.0℃ （at37℃, when freezer is continuously operated）
Configuration	Interior		SUS304 stainless steel plate	
	Exterior		Electro galvanized steel plate, SECC	
	Heat insulator		Glass wool	Styrene foam
	Heater		Iron-chrome wire heater	
			400W	550W
	Blower fan		—	Axial fan
	Freezer		—	Air-cooled hermetic compressor :250W
	Cooling medium		—	R404A
	Defrosting function		—	Hot gas bypass system
	Cable ports		ϕ30（right side of exterior）	ϕ50（right side of exterior）
	Air supply port		Interior bottom	—
	Discharge port		ϕ30x2（ceiling）	—
Control assembly	Controller		Model VS3	Model VS4
	Temp control/heater control		PID system/SSR control	
	Sensor	Temp control	Pt100Ω	
		Overheat prevention in bath	K-thermocouple	
Safety devices			Self diagnostic function (temp sensor malfunction, heater disconnection, SSR short-circuit, automatic overheat prevention (controller integrated)), key lock, over current ELB, overheat preventive device in bath	
Standard	External dimensions ※1 （W x D x H）		710×656×1792 ㎜	
	Internal dimensions （W x D x H）		600×530×500 ㎜	600×477×500 ㎜
	Power supply		AC100V 14A	
	Weight		Approx. 160 kg（during drying）	
	Number of shelf stages		2	3
	Withstand load of shelf board		Approx. 15 kg/each	
	Shelf peg pitch		13 stages: 30 ㎜	13 stages: 30 ㎜
Accessories			Shelf board：Stainless steel punched metal 3 ＋ 2＝5 Shelf peg： shelf boards x 5 x 2＝10 pieces Instruction manual, warranty card, door keys x 2	

※1 External dimensions do not include protruding parts.

11. Wiring diagram



Symbol	Part name	Symbol	Part name
ELB	Electric leakage breaker	P1	Terminal block

Lower stage bath

Symbol	Part name	Symbol	Part name
P2,P3	Terminal block	SSR1	Solid state relay
H1	Heater (inside)	CONT1	Planar board
H2	Heater (door)	PIO1	Display board
FM1	Fan motor (inside)	CT1	Current sensor
FM2	Fan motor (freezer)	OLR	Overload relay
MV1	Solenoid valve (defrost)	C1	Operation capacitor
MV2	Solenoid valve (return pipe)	C2	Start capacitor
X1	Relay (internal heater)	PTC	Start relay
X2	Relay (freezer)	RF	Freezer
X3	Relay (switched with solenoid valve)	TF	Transformer
X5	Relay (alarm)	DEF	Defrost board
TH1	Temperature sensor (double)		

Upper stage bath

Symbol	Part name	Symbol	Part name
P4	Terminal block	TH3	Temperature sensor (K)
H3,H4	Heater (inside)	SSR2	Solid-state relay
X4	Relay (internal heater)	CONT2	Planar board
X6	Relay (alarm)	PIO2	Display board
TH2	Temperature sensor (Pt)	CT2	Current sensor

12. Replacement part table

Symbol	Part name	Code No.	Specification	Maker
TH1	Temperature sensor	LT00001081	For IQ820 double	Yamato Scientific
TH2	Temperature sensor	LT00006788	NL-404RB-D001 Pt	Yamato Scientific
TH3	Temperature sensor	1160030049	LCK-M1-2000Y K	Yamato Scientific
CONT1	Planar board	1020000053	Model VS4	Yamato Scientific
CONT2	Planar board	1020000052	Model VS3	Yamato Scientific
PIO1,2	Display board	1020000051	For VS	Yamato Scientific
DEF	Defrost board	1240000122	For IQ820	Yamato Scientific
X1,4	Relay	2050000043	AHN350X0	Pasnasonic
X2	Relay	LT00012708	G4B-112T1 AC100V	Omron
X3	Relay	2050000026	G2R-1-T DC6V	Omron
SSR1,2	Solid-state relay	2160000035	TRS5225	Toho
ELB	Over current electric leakage breaker	2060050001	BJS153	Panasonic
CT1,2	Current sensor	2170010005	CTL-6-S-H	URD
FM1	Fan motor	2150000010	UF12A10BTH	Yamato Scientific
FM2	Fan motor	3010060006	SW4-CO41NP	Sanyo
TF	Transformer	2180000044	ⅣFR 100V	Yamato Scientific
MV1	Solenoid valve	3020060003	SEV-502DX	Saginomiya
MV2	Solenoid valve	3020060004	NEV-603DXF	Saginomiya
H1	Heater	IN161	550W	Yamato Scientific
H2	Heater	LT00004705	100V 38W	Yamato Scientific
H3,4	Heater	LT00006757	100V 200W	Yamato Scientific
	Compressor	LT00018976	RL2557HA	Hitachi
	Capacitor	3010060007	1-000-0005-07-0	Sanyo
	Dryer	CF70040100	SD-10032	Showa
	Charge valve	3250010002	With 1/4 low	Meiko
	Evaporator	IN60030310	M000063	Yamato Scientific
	Power cord	LT00008924	T2-3C 3m	Yamato Scientific
	Cylinder-lock with a cap	LT00001174	C104	Takigen

13. List of dangerous materials

Never use an explosive substance a flammable substance or a substance containing them for this device.

Explosive substance	Explosive substance	①Nitroglycol, glycerine trinitrate, cellulose nitrate and other explosive nitrate esters
		②Trinitrobenzen, trinitrotoluene, picric acid and other explosive nitro compounds
		③Acetyl hydroperoxide, methyl ethyl ketone peroxide, benzoyl peroxide and other organic peroxides
Flammable substances	Explosive substances	Metal “lithium”, metal “potassium”, metal “natrium”, yellow phosphorus, phosphorus sulfide, red phosphorus, celluloids, calcium carbide (a.k.a, carbide), lime phosphide, magnesium powder, aluminum powder, metal powder other than magnesium and aluminum powder, sodium dithionous acid (a.k.a., hydrosulphite)
	Oxidizing substances	①Potassium 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
		④Potassium nitrate, sodium nitrate, ammonium nitrate, and other nitrates
		⑤Sodium chlorite and other chlorites
		⑥Calcium hypochlorite and other hypochlorites
	Flammable substances	①Ethyl ether, gasoline, acetaldehyde, propylene chloride, carbon disulfide, and other substances with ignition point at a degree 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.
		③Methanol, ethanol, xylene, pentyl acetate, (a.k.a.amyl acetate) and other substances with ignition point between zero and less than 30 degrees.
		④Kerosene, light oil, terebinth oil, isopenthyl alcohol(a.k.a. isoamyl alcohol), acetic acid and other substances with ignition point between 30 degrees and less than 65 degrees.
	Combustible gas	Hydrogen, acetylene, ethylene, methane, ethane, propane, butane and other gases combustible at 15℃ at one air pressure.

(Quoted from the separate table 1 in Article 6, the enforcement order of the Industrial Safety and Health Law)

14. Standard installation manual

※Install the unit according to the items below. （Confirm optional or special specifications.）

Model	Serial number	Date	Inst. Manager(company name)	Inst. manager	Judge

No.	Item	Implementation method	TOC No. Ref. column of manual	Judge
Specifications				
1	Accessories	Check items based on the accessories column	10.Specification column P.57	
2	Installation	・Visual check of the environmental conditions Caution : Surrounding environment ・Securing a space	2.Before operating the unit ・Precautions on installation・・・ P.4	
Operation related matters				
1	Source voltage	・Measure customer side voltage (at a distribution board and an outlet, etc,) with a tester. ・Measurement of an operating voltage （must meet the standard） Caution : Use a product that comply with the standard for installing to a plug or a breaker.	2.Before operating the unit ・Be sure to connect the earth・・・ P.6 ・Connect the power supply to a dedicated outlet P.6 P.57 10. Specifications ・Standard－power supply	
2	Starting operation	・Start operation Perform fixed value operation, auto stop operation, and auto start operation..	2.Before use P.4～10 ・Installation method・・・ 4.How to operate Lower stage P.17～36 Upper stage P.37～49	
Description				
1	Description of operation	Explain operation of each part to the customer as per the instructions.	4.Operating procedures P.17～49 ・Operating method 1.Safety precautions P.1 ～13. List of dangerous substances ～P.60	
2	Error codes	Explain error codes and how to release to the customer as per the instructions.	8.When a trouble occurs ～9.After sales service and warranty P.54～56	
3	Maintenance and inspection	Explain operation of each part to the customer as per the instructions.	6.Maintenance procedures ・ Daily inspection/ maintenance P.52	
4	Matters to note on completion of installation	・Note the installation date and the manager on the nameplate. ・Note necessary matters in the warranty card and hand it to the customer. ・Explain the after sales service route.	9.After sales service and warranty P.56	

Limited liability

Be sure to use the unit strictly following the handling and operating instructions in this operating instruction.
Yamato Scientific Co., Ltd. assumes no responsibility for an accident or a malfunction caused by use of this product in any way not specified in this operating instruction.
Never attempt to perform matters prohibited in this operation instruction.
Otherwise, an unexpected accident may result.

Notice

- **Descriptions in this operating instruction are subject to change without notice.**
- **We will replace a manual with a missing page or paging disorder.**

Instruction Manual
Program Type Low Temperature Incubator/
Constant Temperature Incubator
Model INC820

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