SINCE 1889

Yamato

ECONOMY INCUBATOR

Model :

IS412C/612C/812C/912C

- First Edition -

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

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

Yamato Scientific Co.,Ltd.

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1. Safety precautions

Explanation of symbols

About symbols

A variety of symbols are indicated in this operation manual and on products to assure safe operation. Possible results from improper operation or disregard for these warnings are listed below.
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 damage (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 symbols

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

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

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

1. Safety precautions

List of symbols

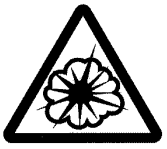
Warning

Warnings

Danger!
High voltage

Danger!
High temperature

Danger!
Moving part



Danger!
Hazard of explosion

Caution

Cautions

Electrical shock!

Burning!

Caution for no liquid heating!

Caution for water leak!

For water only

Poisonous material

Prohibitions

Prohibition

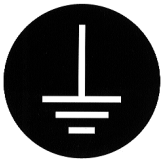
Fire Prohibited

Do not disassemble

Do not touch

Compulsions

Compulsions



Connect ground wire

Install levelly

Pull out the power plug

Regular 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 page 47.

Be sure to connect the ground wire.

Be sure to connect the ground wire correctly. Otherwise, electrical leak may result and cause an electrical shock or a fire.

Ban on operation when an abnormality occurs

When smoke or an unusual odor is seen or smelled, immediately turn the ground fault interrupter on the main unit off and pull out the power plug. 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 bending, pulling with a strong force or twisting to prevent electrical power cords from damage. A fire or an electrical shock may result.

Never use an explosive or a flammable material with this unit.

Never use an explosive material, a flammable material or a material containing explosive or flammable elements. An explosion or an electrical shock may result.
See section “13. List of dangerous materials” on page 47

Never try to touch a hot part.

Some parts of the unit are hot during and immediately after operation. Take special care to avoid burns.

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 thunder is heard.

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

2. Before operating the unit

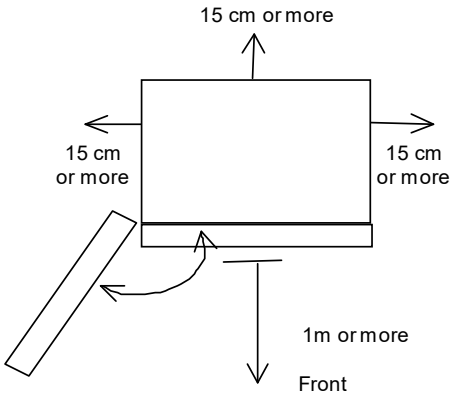
Precautions when installing the unit

1. Carefully select an installation site.

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

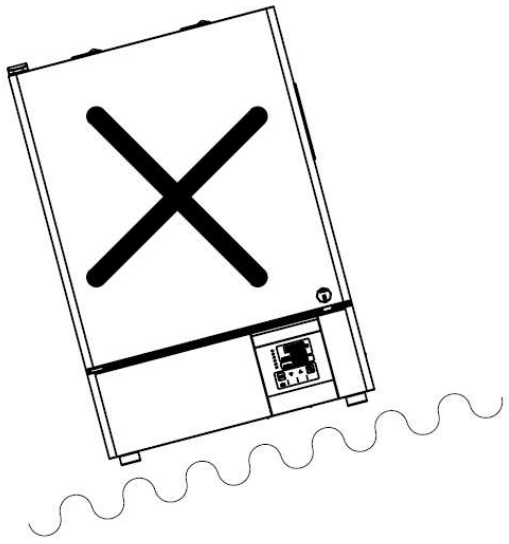
- Uneven surfaces or dirty surfaces
- Where flammable gas or corrosive gas exists
- Where the ambient temperature is 35℃ or more
- Where temperature changes severely
- Where humidity is high
- Where subject to direct sunlight
- Where vibration is severe

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.



Weight of the units is: IS412C:approx. 45 kg、IS612C: approx. 65 kg、
IS812C:approx. 102 kg、IS912C: approx. 166 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 in a personal injury. We recommend taking safety measures such as to avoid installing the unit in a high traffic area.

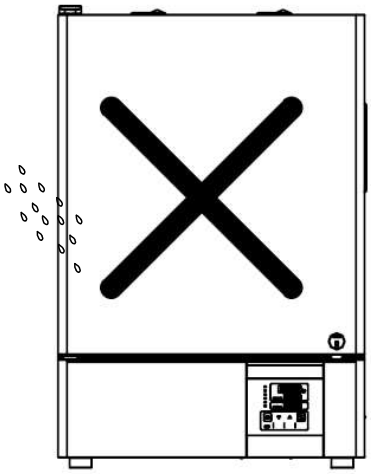
2. Before operating the unit

4. Secure sufficient ventilation for the unit.

Do not operate the unit when its vent holes on the side and rear panels are covered or blocked.
Internal temperature of the unit will rise, degrading the performance, and an accident, a malfunction or a fire may result.

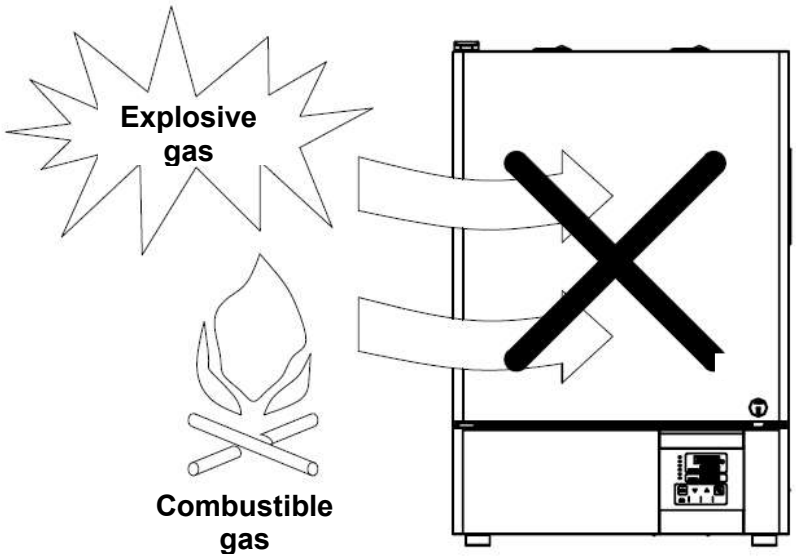
5. Do not operate the unit at such a place that may subject to splashing liquids.

Do not operate the unit at such a place that may subject to splashing liquids. 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 circuit breaker “ON” and “OFF” and during operation, could cause a fire or an explosion.
See the section “13. List of dangerous materials” on page 47 for flammable and explosive gases.



2. Before operating the unit

7. Connect Power Cord/Power Cable to receptacle or switch board of facilities.

Connect Power Cord/Power Cable to suitable receptacle/switch board of facilities according to electrical requirements as follows.

Electrical capacity:	IS412C	AC220V	2.0A
	IS612C	AC220V	2.5A
	IS812C	AC220V	5.0A
	IS912C	AC220V	6.5A

The operational voltage range is ±10%, the voltage range where the specified performance is guaranteed is rating±5%,

※ Check line voltage of its receptacle/switch board of facilities and/or whether utilize the same line with other equipments or not, if this Equipment does not start up/operate even to turn Earth Leakage Breaker(ELB) On(|). Take correct action for the solution, such as changing its power source away from other equipment.

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 sandwich 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 power switch off, pull out the power cord (plug) out of the power supply and ask your dealer to replace the cord. Otherwise, a fire or an electrical shock may result.

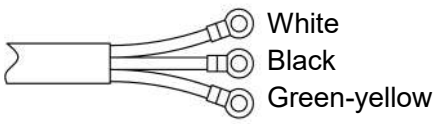
Connect the power cord to an appropriate wall outlet.

9. Be sure to connect the ground wire.

Must connect grounding wire properly to grounding line or terminal in order to avoid electrical shock due to electrical leakage.

Never connect grounding wire to gas line pipe or water line pipe due to fire or electrical shock.
Never connect grounding wire to telephone grounding line or to lightening conductor due to fire or electrical shock.

Require to ground by Electrical Equipment Technical Standards Section 19-calss D(Grounding Resistance Max. 100Ω) in Japan, if grounding terminal is not provided. Please contact with local dealer, local electrician, or Yamato Customer Service Center.
Connect the terminals firmly to switch board of facilities or appropriate power plug.
Power plug itself will not be included as an accessory of this Equipment. Connect to the power supply facilities that meet the electric capacity.



Core color	Wiring on the distribution board
White	Ground side
Black	Voltage side
Green-yellow	Earth

2. Before operating the unit

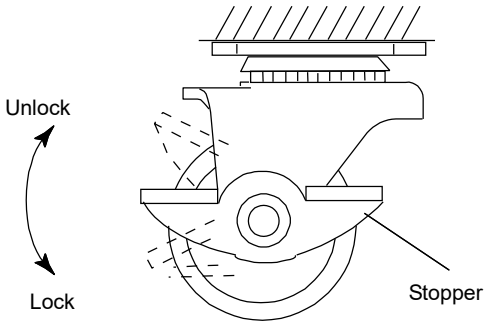
Installation procedures・precautions

(1) Transportation of the product

・Lift and transport the model IS412C/612C by at least two people.
*Take care for protrusions on the unit.

・Move the model IS812C/912C after push two stoppers up to unlock the casters on the front side of the main unit as shown in the figure right. Make sure casters at the four points move smoothly before trying to move the unit.

* Note that moving the unit over a bump may give an excessive impact to and break the casters. Where there is such a bump, move the unit by lifting it by at least two people.

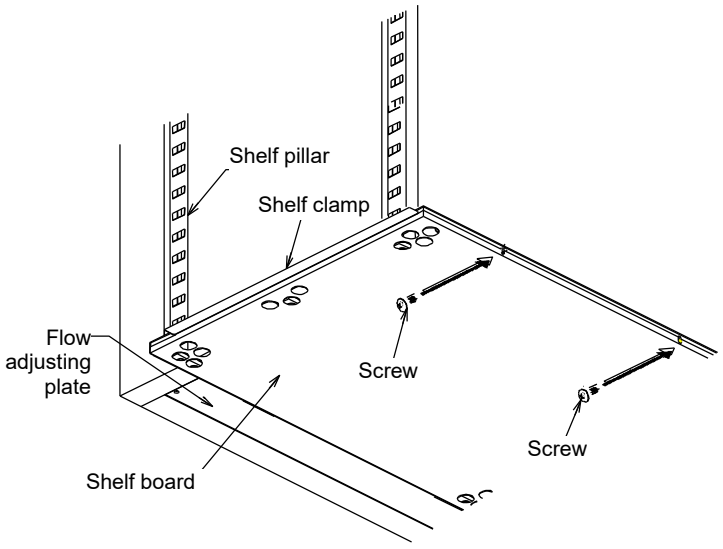


(2) Select an installation site.

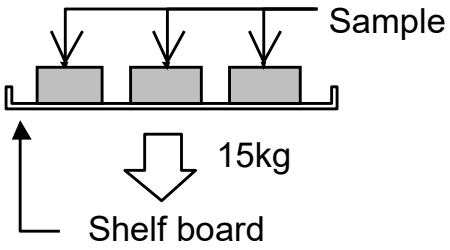
Make sure that four caster wheels for right, left, front and rear securely rest on a flat surface as well as there is no loosened part or inclination of the unit and push down the caster stopper to lock for the model IS812C/912C.

(3) Install shelf boards.

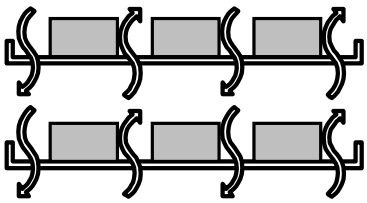
・The lowest shelf board has been secured with screws at the time of shipping from the factory.



・Install shelf pegs at heights you want on the right and left shelf posts in the internal chamber of the main body.
・Completely push shelf boards by sliding to the end.
*Take care to put each shelf board on correct pairs of right and left shelf pegs.
・Make sure that shelf boards will not fall nor rattle.
・Withstand load of each shelf board is 15kg in even loading. When putting samples, arrange them as dispersed as possible.



・Put samples with spaces between them. Too many samples may prevent proper temperature control. To assure proper temperature control, put samples with a space at least 30% of the shelf board area.



Make at least 30% of space

(4) Do not put a sample on the bottom of the internal chamber.
・Operating the unit with a sample directly put on the bottom of the internal chamber might degrade its temperature characteristics. Also it may cause corrosion, damage or rusting of the internal chamber and burning of samples or a fire. Never put any sample on the bottom surface.
・When putting samples, take care not to allow them touching the wall, where sensor or other devices are installed. Put samples on the shelf board included with the unit.

(5) Take special care for samples shown below:

①Samples that contain flammable or explosive components

・The unit is not explosion proof. Never attempt to dry or process materials that contain flammable or explosive components.

②Corrosive samples

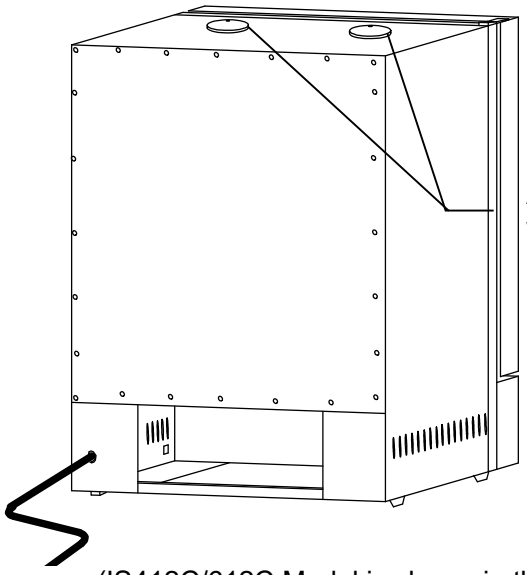
・Take care for handling of corrosive samples. Although stainless steel is used for major components, note that they might corrode with strong acid. Note that packing may corrode with acid, alkali, oil or organic solvents.

③Operation with devices with a larger heat load installed.

・Note that temperature in the chamber may rise when operating the unit within a device.

(6) About exhaust ports.

・IS412C/612C model : Located on the top of the unit, IS812C/912C model : Located on either side of the unit.
Adjust the open amount according to the water content of a specific sample.

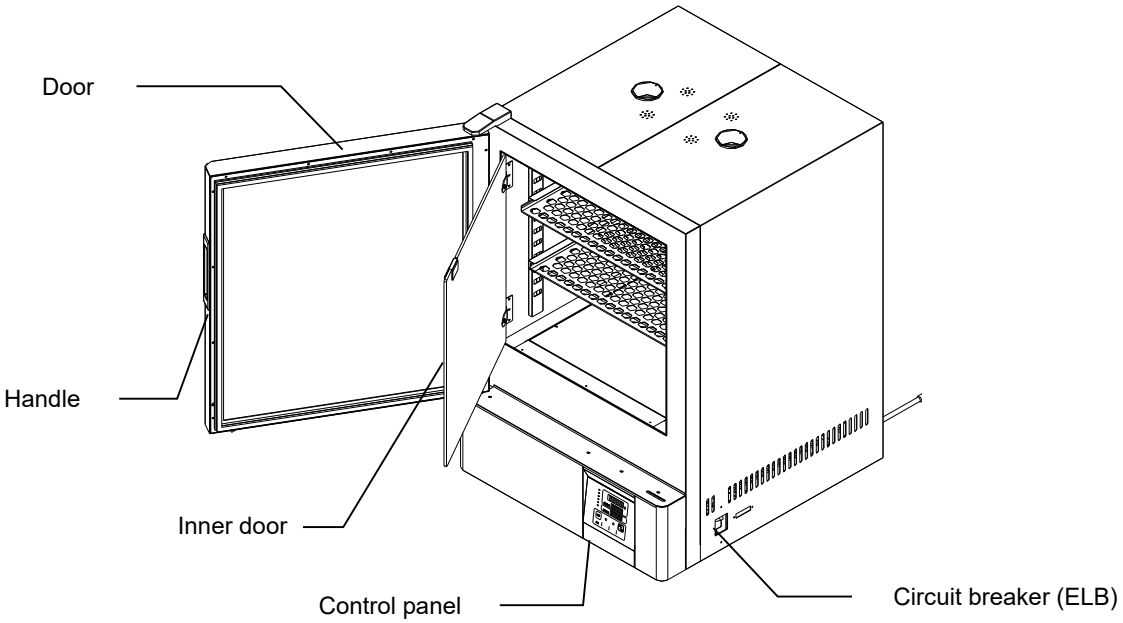


(IS412C/612C Model is shown in the diagram above.)

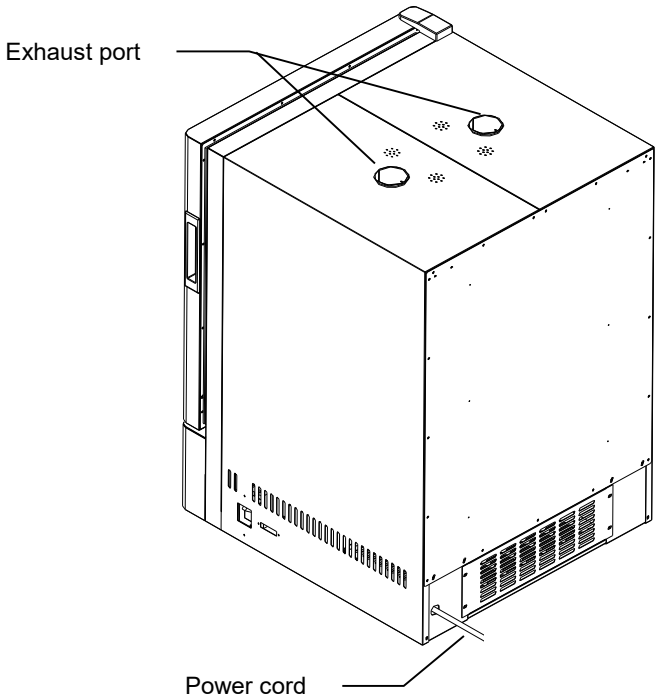
3. Names and functions of parts

Main body

Front view of IS412C/612C



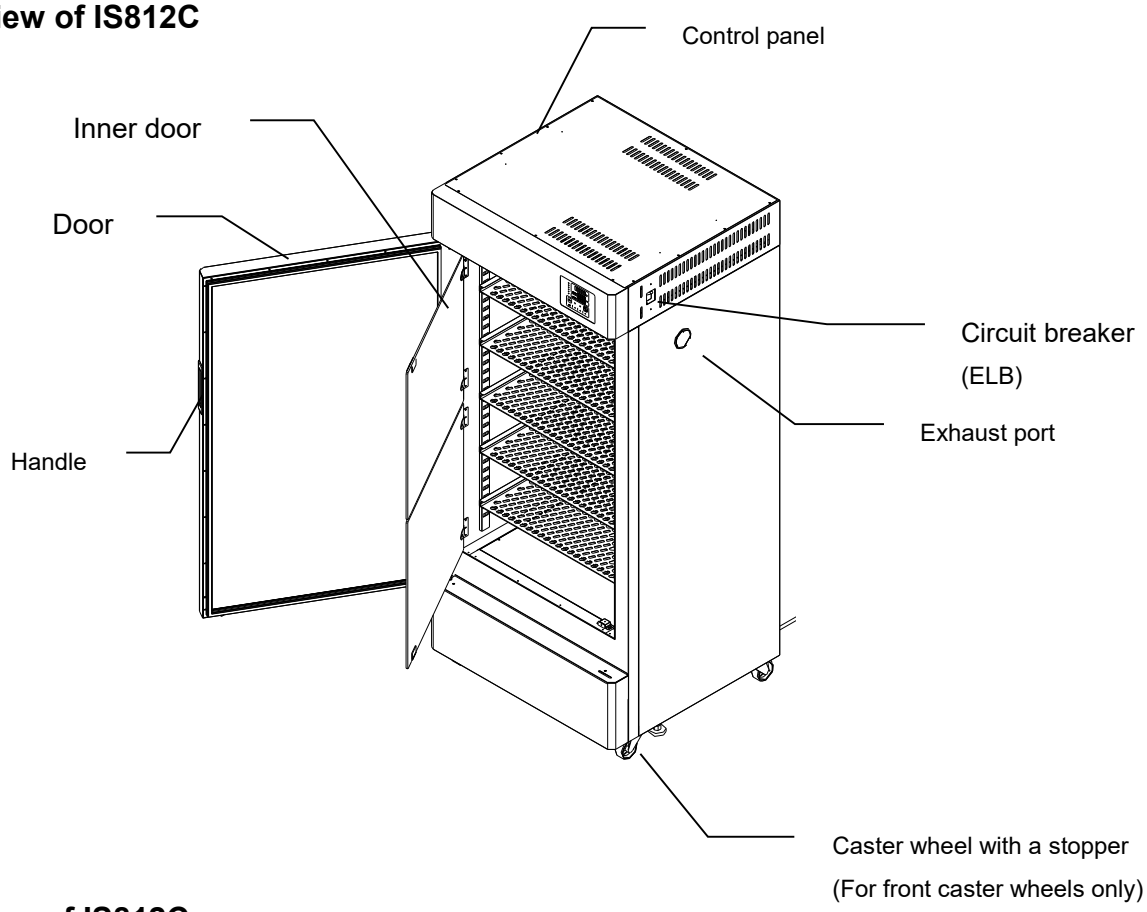
Rear view of IS412C/612C



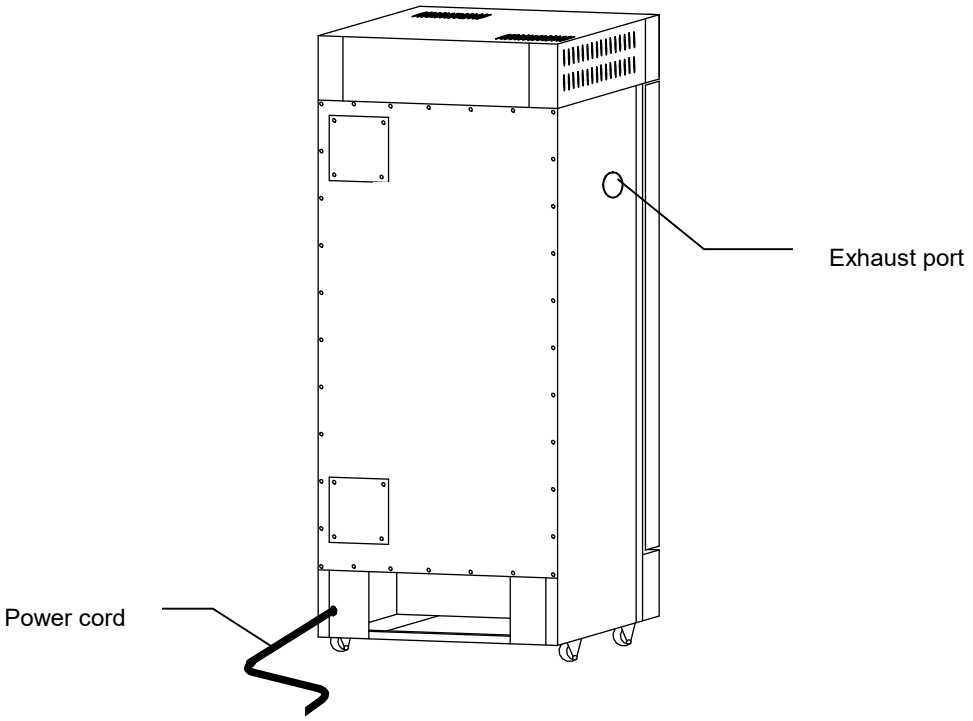
3. Names and functions of parts

Main body

Front view of IS812C



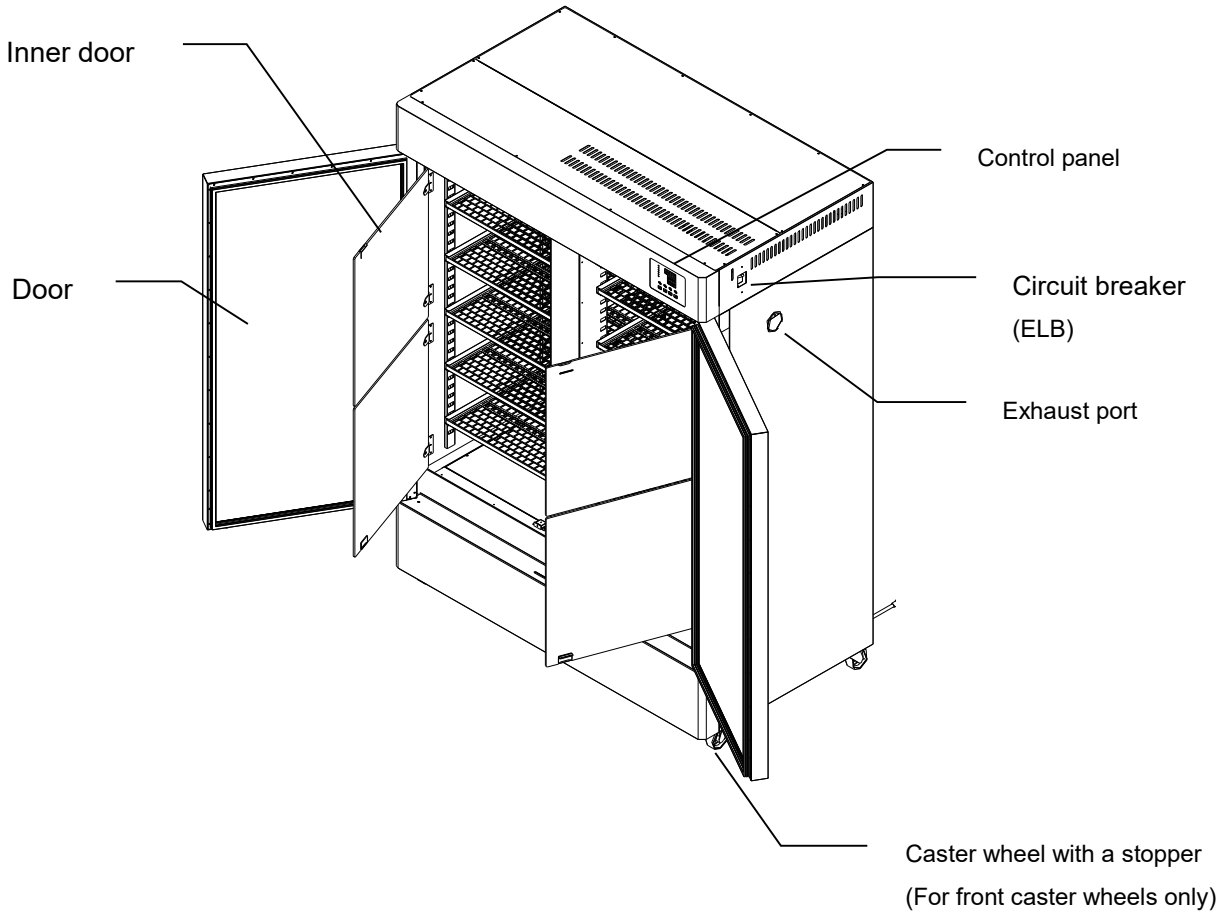
Rear view of IS812C



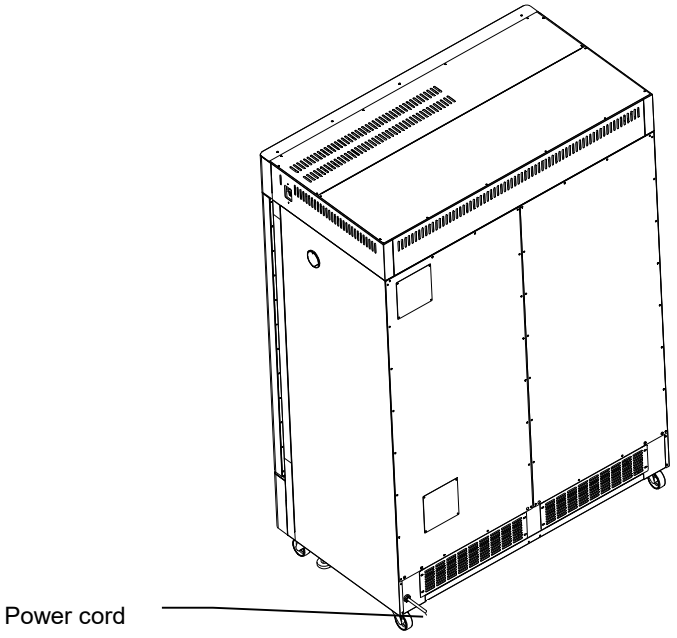
3. Names and functions of parts

Main body

Front view of IS912C

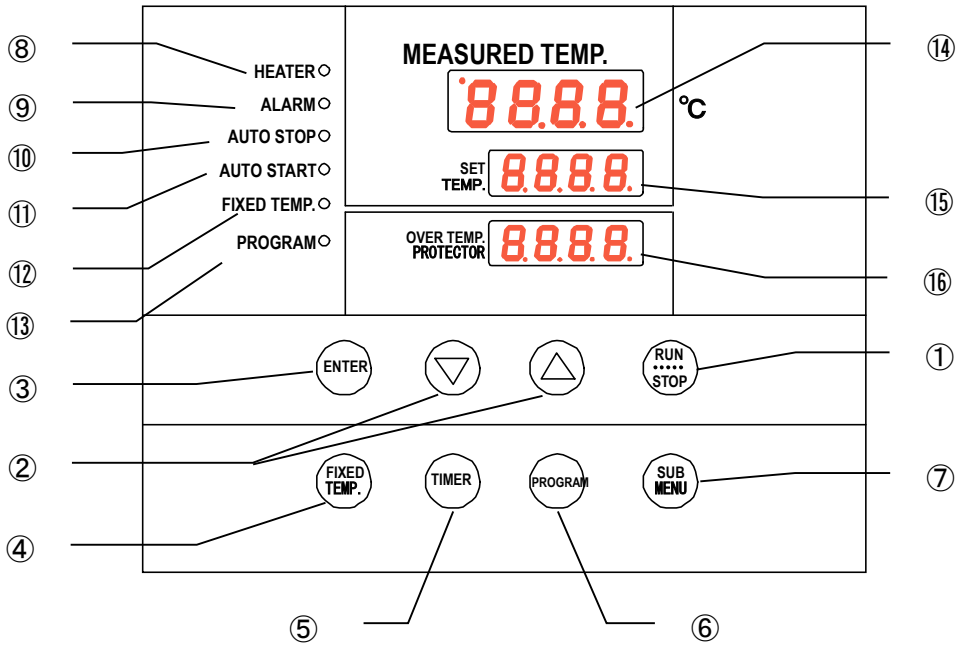


Rear view of IS912C



3. Names and functions of parts

Operation panel

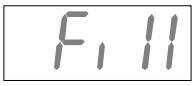
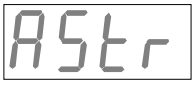
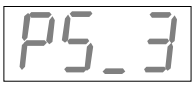


No.	Name	Operation/action
①	RUN/STOP key	Used for starting/stopping operation
②	▲▼ keys	Used for selecting settings.
③	ENTER key	Used for determining a selected setting.
④	FIXED TEMP. key	Key for selecting fixed temperature operation.
⑤	TIMER key	Key for selecting timer operation. Quick auto stop operation, auto stop operation or auto start operation can be selected.
⑥	PROGRAM key	Used for selecting programming and starting the program operation. Programs of six patterns in three types can be set.
⑦	SUB MENU key	Key for setting temperature of the overheat prevention device, calibration offset temperature, the key lock function or the program repeat function.
⑧	HEATER lamp	Illuminates while heater power is on.
⑨	ALARM lamp	When an error occurs, the lamp illuminates with an audible buzzer.
⑩	AUTO STOP lamp	Flashes while the quick auto stop timer is being set and illuminates while the unit is in operation. Flashes while the auto stop timer is being set and illuminates while the unit is in operation.
⑪	AUTO START lamp	Flashes while the auto start timer is being set and illuminates while the unit is in operation.
⑫	FIXED TEMP. lamp	Flashes while fixed temperature operation is being set and illuminates while the unit is in operation.
⑬	PROGRAM lamp	Flashes while the program operation is being set and illuminates while the unit is in operation.
⑭	MEASURED TEMP. display	Displays measured temperature in the bath・set characters・alarm information.
⑮	SET TEMP. display	Displays a set temperature, timer settings and timer remaining time.
⑯	OVER TEMP. PROTECTOR display	Displays the set temperature for the overheat prevention device.

3. Names and functions of parts

Explanation of characters

Characters on the VS6 type controller are explained in this section.

Characters	Identifier	Name	Application
	Fix	Fixed temperature operation setting	Means settings for fixed temperature operation.
	Sv	Temperature setting	Used for setting a temperature.
	AStP	Auto stop setting	Used for setting auto stop operation.
	AStr	Auto start setting	Used for setting auto start operation.
	tim	Time setting	Used for setting a time.
	PrG3	Program type select	Used for selecting a program type 1, 2 or 3 to be used. See section “Preparing a program on page 27.
	PAt	Program pattern select	Used for selecting a program pattern to be used. See section “Preparing a program on page 27.
	End	Time up	Displayed when timer operation has ended. See page 21, 23, and 25.
	Sv-1	Program temperature setting	Used for setting temperatures for each step of a program. (Sv-1 to Sv-30 are displayed.)
	t-1	Program time setting	Used for setting time for each step of a program. (t-1 to t-30 are displayed.)
	PS-3	Program repeat Selecting a return destination	Used for selecting a step for returning during program repeat operation. See section “Program repeat operation” on page 32.
	Pc-2	Setting number of program repetitions	Used for setting number of program repeat operations. See section “Program repeat operation” on page 32.

3. Names and functions of parts

Explanation of characters

Characters	Identifier	Name	Application
	cAL	Calibration offset setting	Used for inputting a calibration offset temperature See section “Using the calibration offset function” on page 35.
	oH	Setting overheat protection device temperature	Used for setting an overheat protection device temperature. See section “Settings for overheat prevention device” on page 19.
	Lock	Key lock of settings	Key locks settings to prevent their alteration See section ”Using the lock function” on page 36.

***** See the section “Operation mode・function setting keys and characters” on page 18 for characters of operation modes and functions

.

4. Operating procedures

List of operation modes and functions

Operation modes of the unit are as shown below:

No.	Name	Description	Page
1	Fixed temperature operation	Pressing the FIXED TEMP. key to enter the fixed temperature operation setting mode. Pressing the FIXED TEMP. key again to enter the temperature setting mode. Set a temperature with the ▼▲ keys. Pressing the RUN/STOP key to start operation, and pressing the RUN/STOP key again to stop operation.	P.20
2	Quick auto stop operation	Used when you want to, for example, “stop operation being performed automatically in several hours. Pressing the TIMER key during the fixed temperature operation to enable setting a time before operation stops. Set a duration before stop with the ▼▲ keys. Pressing the RUN/STOP key starts quick auto stop operation and activates the timer in the middle of it to automatically stop it after the set period of time.	P.21
3	Auto stop operation	Used when you want to “set automatic stop for fixed temperature operation when making settings for it.” Press the TIMER key to display “AStP.” Pressing the ENTER key to set the temperature setting “Sv.” Pressing the ENTER key again to enable setting of the operation time “tim.” Pressing the RUN/STOP key starts auto stop operation.	P.23
4	Auto start operation	Used when you want to “start operation automatically after several hours” after power is turned on. Press the TIMER key to display “AStr.” Pressing the ENTER key to set the temperature setting “Sv.” Pressing the ENTER key again to enable setting of the operation time “tim.” Pressing the RUN/STOP key starts auto start operation.	P.25
5	Program operation	This is used to raise or lower temperature based on the set temperature and time. Press the PROGRAM key to display “PrGn.” (n:1,2,3) Press the PROGRAM key again to select a program mode you want. To select “PrG2” or “PrG3”, press the ENTER key to select a pattern “PAt” you want. Pressing the RUN/STOP key starts program operation.	P.27
* Operation mode cannot be changed while the unit is in operation. First stop operation before changing the mode.			

4. Operating procedures

List of operation modes and functions

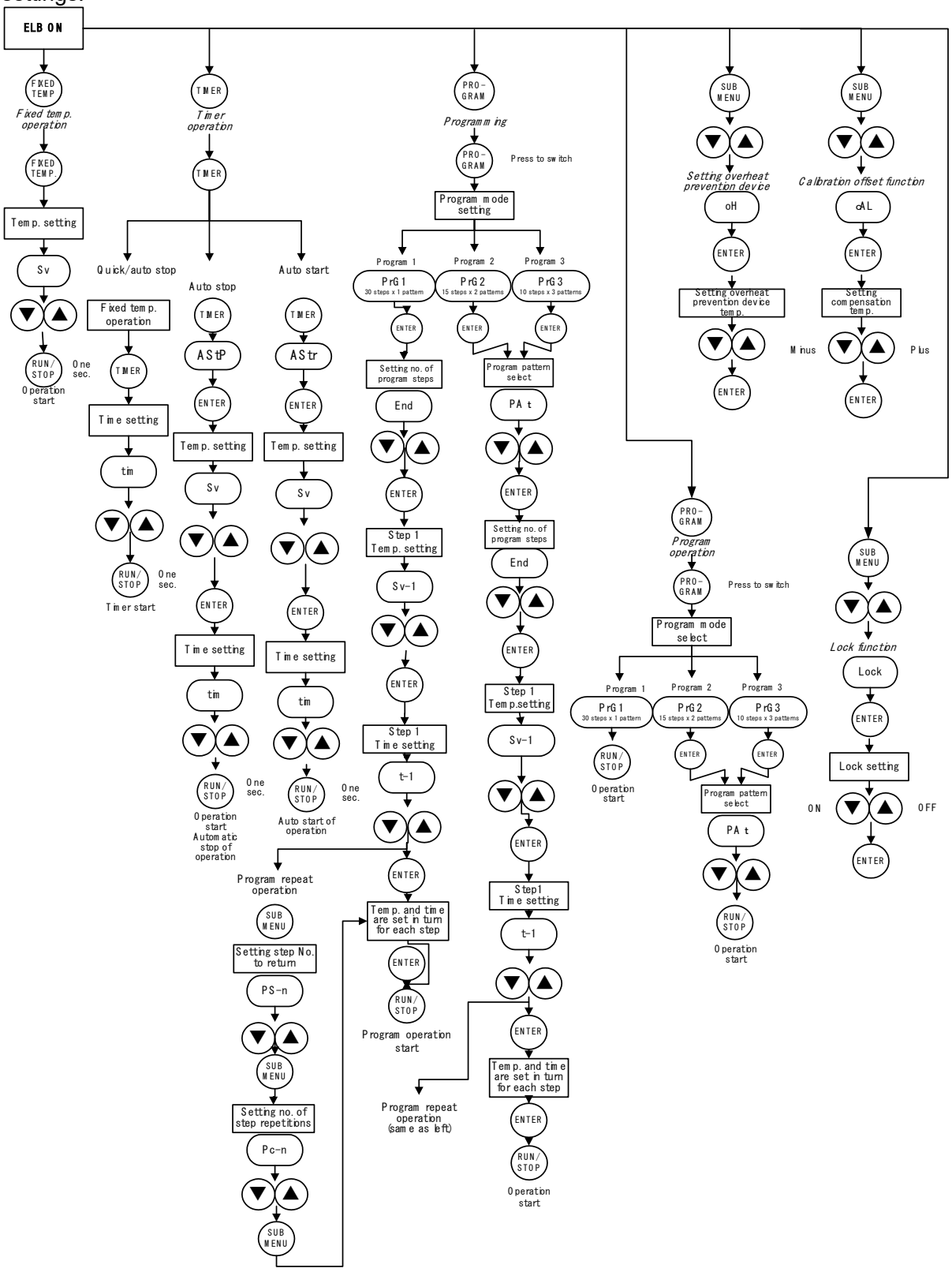
Operating functions of the unit are as shown below:

No.	Name	Description	Page
1	Overheat prevention function	Automatic overheat prevention function: This function is linked to the unit set temperature and has been set to so that it is automatically activated (returned automatically) at a temperature 12℃ higher than the set temperature in the bath. Overheat prevention device: Although the power supply, the display and the key input assembly are in common with the controller, the device consists of the standalone temperature measurement circuit, the CPU, the sensor, and the output circuit enabling to set to a temperature you want on the operation panel. If the overheat prevention device is triggered, the unit will stop and will not recover until the power switch is turned on again. (Manual recovery)	P.19
2	Calibration offset function	Calibration offset function compensates any differences between the target temperature in the bath and the control temperature of the controller (sensor temperature.) The function can compensate to either plus or minus side for the whole temperature band of the unit.	P.31
3	Overheat prevention temperature compensation function	When temperature compensation in item two is made for the controller, temperature to be input to the overheat prevention device will also be compensated automatically.	—
4	Power outage compensation function	When power outage occurs in the middle of operation, the operation resumes from the status immediately before the power outage.	—
5	Setting lock function	This function locks the set operation status. The lock can be set or released with the SUB MENU key.	P.32

4. Operating procedures

Operation mode・function setting keys and characters

Key operations and characters in the diagram below are used for operation mode and function settings.



4. Operating procedures

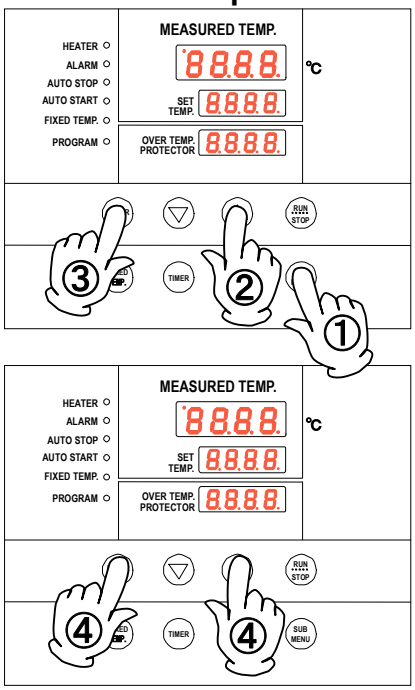
Settings for overheat prevention device

The safety device for preventing overheat has the automatic overheat prevention function for the controller (automatic recovery) and has the power supply, the display and the key input assembly in common with the controller as well as it has an overheat prevention device (manual recovery) as a secondary safety measures that consists of separate temperature measurement circuit, the CPU, the sensor and the output circuit.

Temperature setting range and functions

The device has overheat prevention function in double. One is the function integrated in the controller, which is designed to be activated automatically at a temperature 12℃ above the set temperature of the temperature controller (the heater repeats ON/OFF at +12℃) at the time of shipping from the factory.
Another is integrated with the controller and is set with the keys on the controller.
The secondary overheat prevention function is added by this setting.
The temperature range settable for the overheat prevention device integrated with the controller is "0℃ to the 50℃ + the highest set temperature for the device."
When the temperature in the bath keeps rising beyond the controller set temperature and reaches the set temperature of the overheat prevention device, the circuit trips, Er19 flashes on the controller screen, and the buzzer continues to sounds.
When the overheat prevention device is activated, it will not be released until power is turned on and Er19 will not be released.

How to set temperature



1. Turn power ON. (Turn the ELB to ON.)
When power is turned ON, the initial values will be displayed for about four seconds, then the initial screen will appear and the current bath temperature, operation mode character and the overheat prevention set temperature are displayed on each of the displays.

2. Setting the overheat prevention temperature

① Press the SUB MENU key.
② Press the ▼▲ keys to select the overheat prevention temperature setting character oH  for the MEASURED TEMP. display.
③ Pressing the ENTER key displays the current set temperature flashing on the SET TEMP. display.
Caution: In general, set to a temperature at least 10℃ higher than the controller set temperature to prevent the device from malfunctioning.
④ When the temperature you want is obtained with the ▼▲ keys, press the ENTER key to complete setting.

⚠ Caution

① Set temperature as "highest operation temperature for the unit +10℃" or "set temperature +10℃" as a rough standard and add 5℃ to the setting if the device functions improperly.
② Be sure to set the overheat prevention activation temperature correctly otherwise the device may not start, the overheat prevention device is activated before temperature in the bath increases completely, or a fire or other unexpected accidents may result.
The temperature is set at 90℃ on shipping from the factory.
③ The overheat prevention device has been designed to prevent overheating of devices not to protect samples. The device does not prevent accidents caused from use of explosive or flammable materials.

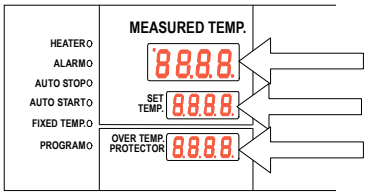
4. Operating procedures

Operating procedures (fixed temperature operation)

How to start fixed temperature operation

1. Turn power ON. (Turn the ELB to ON.)

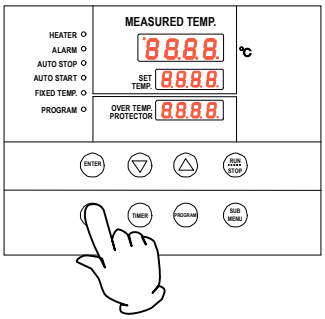
When power is turned ON, the initial values will be displayed for about four seconds, then the initial screen will appear and the current bath temperature, operation mode character and the overheat prevention set temperature are displayed on each of the displays.



MEASURED TEMP. display: Indicates the present bath temperature and various characters.
Set temperature display: Indicates the set temperature and various characters.

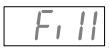
Overheat prevention set temperature display: Indicates the set temperature for the overheat prevention device.

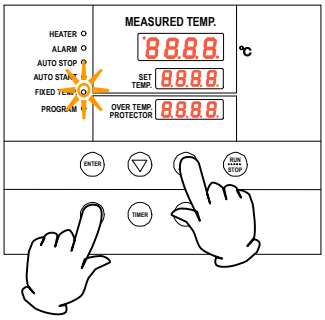
For operation mode characters, see section page 14.



2. Selecting an operation mode

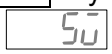
Press the FIXED TEMP. key to display the fixed temperature operation mode on the SET TEMP. display.

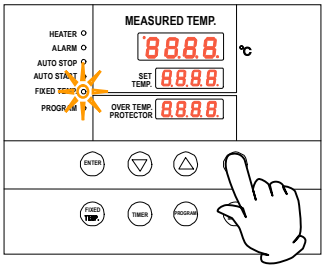
Display the character Fix  .



3. Setting the temperature

Press the FIXED TEMP. key again.

The character SV  that indicate a set temperature is displayed on the MEASURED TEMP. display on which the current set temperature flashes and the FIXED TEMP. lamp flashes.
Set a temperature using the ▼▲ keys.



4. Starting operation

Press the RUN/STOP key for about one second. Operation starts and status of the FIXED TEMP. lamp changes from flashing to illuminated.

5. Stopping operation

Press the RUN/STOP key for about one second. Operation stops, the FIXED TEMP. lamp goes off and the screen switches to the initial setting screen.

When you want to correct setting errors or confirm settings

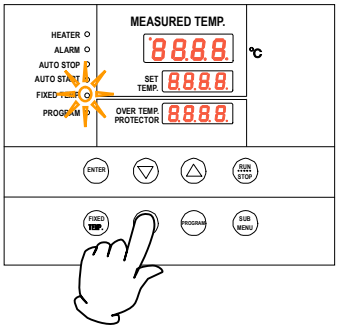
When you made a mistake during setting or reconfirm settings you made, press the FIXED TEMP. key again to resume setting.
When you want to change set temperature during operation, press the FIXED TEMP. key to enter the setting mode and change the set temperature. After change has been made, press the ENTER key to complete the process.

4. Operating procedures

Operating procedures (quick auto stop operation)

Procedures for quick auto stop operation

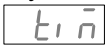
Used when you want to, for example, “stop fixed temperature operation being performed automatically in several hours. Quick auto stop operation is a function to enable auto stop timer setting during operation.



1. Setting time period before stop during fixed temperature operation

Make sure that the FIXED TEMP. lamp is illuminated to indicate the unit is the fixed temperature operation mode.

Press the TIMER key.

The character tim  that indicates the timer is displayed on the MEASURED TEMP. display and the current set time flashes on the SET TEMP. display.

Set a time you want using the ▼▲ keys.

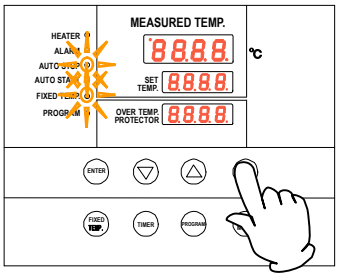
About the timer function

The maximum time that can be set for the timer is 999 hours 50 minutes.

Up to 99 hours 59 minutes, time can be set in minutes.

One hundred hours and over are set only in 10 minutes.

Keep the ▼▲ keys pressed to continuously change set time and you can quickly reach the time you want. Press the ▼▲ keys once at a time for fine adjustment.



2. Starting timer operation

When you have set a time you want, start the RUN/STOP key for about one second. Timer operation starts with the FIXED TEMP. lamp and the AUTO STOP lamp are illuminated. Timer starts counting when the RUN/STOP key is pressed.

3. Stopping and ending timer operation

Operation stops automatically when the set time comes.

The buzzer sounds for about five seconds to indicate operation has stopped. At this time, the character End  that indicates operation end is displayed on the SET TEMP. display with the FIXED TEMP. lamp and the AUTO STOP lamp are illuminated.

Press the RUN/STOP key for approx. one second to end the timer operation mode. The screen switches to the initial setting screen.

Change the set temp. and set time, confirm the set value

If need to change the set temp. during quick auto stop operation, press FIXED TEMP key to enter the setting mode.

If need to change the set time during quick auto stop operation, press TIMER key to enter the setting mode.

① After changing the time, press TIMER.
The remaining time on the timer is the time subtracting the elapsed time.
For example: set timer as 1hr30min, conduct quick auto stop operation, after 20min, change the set time to be 2hr, set it by TIMER, the remaining time is 1hr40min.

② After changing the time, press START/STOP for 1sec.
The quick auto stop operation proceeds again as per the changed time.
For example: set timer as 1hr30min, conduct quick auto stop operation, after 20min, change the set time to be 2hr, press START/STOP to set, the remaining time is 2hr.

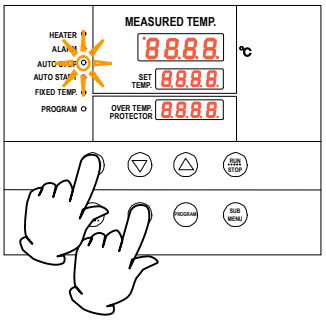
Press ▼ key, switch over to display the set temp., operation mode and remaining time of set temp. displayer.

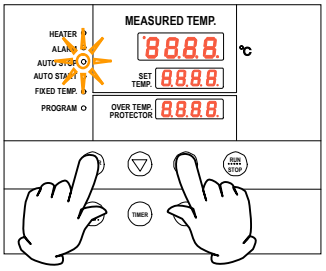
4. Operating procedures

Operating procedures (auto stop operation)

Procedures for auto stop operation

Used when you want to “set automatic stop after set time has elapsed from the start of the fixed temperature operation.”



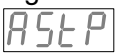


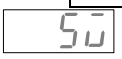
1. Setting a stop time

Press the TIMER key in the initial screen.

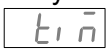
The timer mode you used in the previous session is displayed on the SET TEMP. display.

Pressing the TIMER key again to flash the timer mode. Pressing the TIMER key again to flash the next timer mode.

Select the character AStP  that indicates the auto stop operation and press the ENTER key.

The character Sv  that indicate a set temperature is displayed on the MEASURED TEMP. display on which the current set temperature flashes and the AUTO STOP lamp flashes.

Set a temperature you want using the ▼▲ keys.

Press the ENTER key. The character tim  that indicates the timer is displayed on the MEASURED TEMP. display and the current set time flashes on the SET TEMP. display.

Set a time you want using the ▼▲ keys.

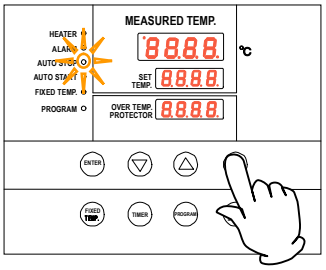
About the timer function

The maximum time that can be set for the timer is 999 hours 50 minutes.

Up to 99 hours 59 minutes, time can be set in minutes.

One hundred hours and over are set only in 10 minutes.

Keep the ▼▲ keys pressed to continuously change set time and you can quickly reach the time you want. Press the ▼▲ keys once at a time for fine adjustment.

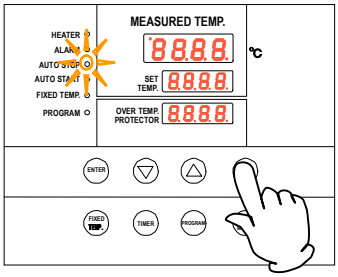


2. Starting timer operation

When you have set a time you want, start the RUN/STOP key for about one second.

Timer operation starts with the AUTO STOP lamp is illuminated.

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



3. Stopping and ending timer operation

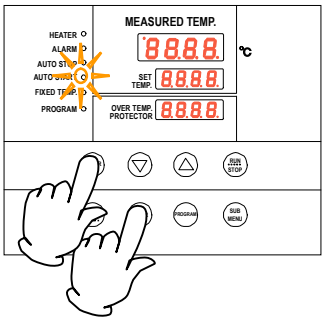
Operation stops automatically when the set time comes.
The buzzer sounds for about five seconds to indicate operation has stopped. At this time, the character End  that indicates operation end is displayed on the SET TEMP. display with the AUTO STOP lamp is illuminated. Press the RUN/STOP key for approx. one second to end the timer operation mode. The screen switches to the initial setting screen.

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

When you want change the set temperature or a set time, press the TIMER key during operation, set temperature and time for the auto stop operation with the ▼▲ keys and press the ENTER key to complete.
Note, however, when you change the set time you need to set a time calculated by adding the time already passed to the time to be added.
Pressing the ▼ key during operation will display the set temperature, the operation mode and the remaining time on the SET TEMP. display.
In terms of the remaining time display  a blinking dot indicates count down and an illuminating dot indicates a wait status (while temperature is increasing or decreasing to the set temperature) during which the timer has stopped counting.

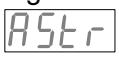
Procedures for auto start operation

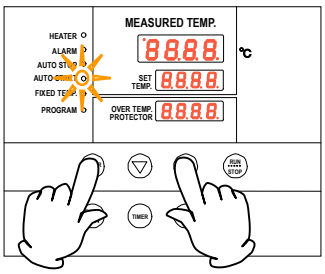
Used when you want to “start operation automatically after the set time.”



1. Setting an operation start time

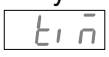
① Press the TIMER key in the initial screen.

② The timer mode you used in the previous session is displayed on the SET TEMP. display.
Pressing the TIMER key again to flash the timer mode.
Pressing the TIMER key again to flash the next timer mode.
Select the character AStP  that indicates the auto start operation and press the ENTER key.



The character Sv  that indicate a set temperature is displayed on the MEASURED TEMP. display on which the current set temperature flashes and the AUTO START lamp flashes.

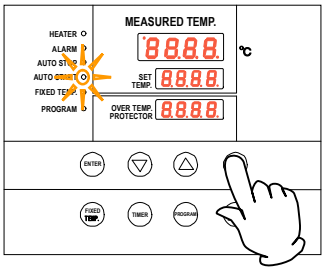
③ Set a temperature you want using the ▼▲ keys.

④ Press the ENTER key. The character tim  that indicates the timer is displayed on the MEASURED TEMP. display and the current set time flashes on the SET TEMP. display and the AUTO START lamp flashes.

⑤ Set a time you want using the ▼▲ keys.

About the timer function

The maximum time that can be set for the timer is 999 hours 50 minutes.
Up to 99 hours 59 minutes, time can be set in minutes.
One hundred hours and over are set only in 10 minutes.
Keep the ▼▲ keys pressed to continuously change set time and you can quickly reach the time you want. Press the ▼▲ keys once at a time for fine adjustment.

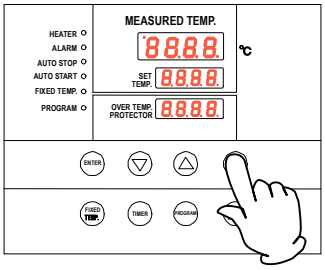


2. Starting timer operation

When you have set a time you want, start the RUN/STOP key for about one second.
Timer operation starts with the AUTO START lamp is illuminated.

4. Operating procedures

Operating procedures (auto start operation)



3. Stopping and ending timer operation

Operation starts automatically when the set time comes.

Press the RUN/STOP key for about one second to start or stop operation. The screen switches to the initial setting screen.

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

When you want change the set temperature or a set time, press the TIMER key during operation, set temperature and time for the auto start operation with the ▼▲ keys and press the ENTER key to complete.

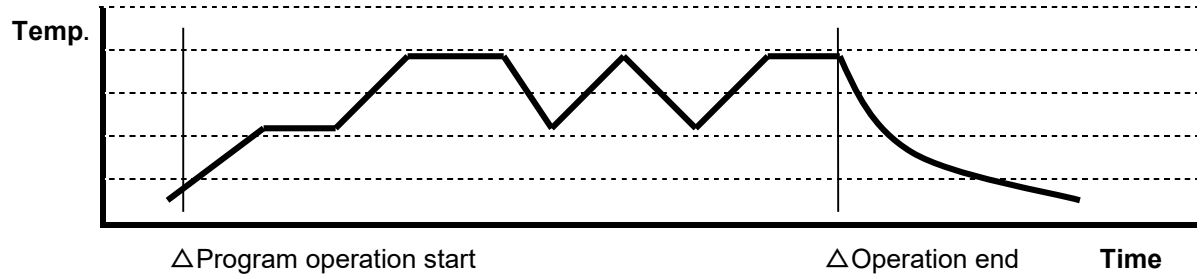
Note, however, when you change the set time you need to set a time calculated by adding the time already passed to the time to be added.

Pressing the ▼ key during operation will display the set temperature, the operation mode and the remaining time on the SET TEMP. display.

When operation has started after the auto start time, you cannot change the set time. In this case, first stop operation with the RUN/STOP key and repeat all settings.

Program operation

Used when you want to “operation at an increased or decreased temperature according to specific time.”



Preparing type

Up to six patterns of programs can be stored and input.

PrG1	—	One pattern of a program consisting of up to 30 steps can be made.
PrG2	PA t 1	Two patterns of a program consisting of up to 15 steps can be made.
	PA t 2	
PrG3	PA t 1	Three patterns of a program consisting of up to 10 steps can be made.
	PA t 2	
	PA t 3	

Before inputting a program

A program pattern must be registered (input) beforehand to start a program operation.

① Confirm the number of steps, temperatures for each step, and time on the program preparation sheet on pages 33～34 in the operation manual.

② Confirm the heating and cooling capacity of the device. Time needs to be set within the heating and cooling capacity of the device.
For a device having a cooling or heating capacity of 3℃ for every ten minutes, for example, it requires about 35 minutes to lower or raise by 10℃ from the given temperature.

③ Make sure that the controller has an unused pattern that meets the number of steps to be programmed.
However, when you want to use the repeat function, the number of steps to be repeated can be deducted from the number of steps for the unused pattern.

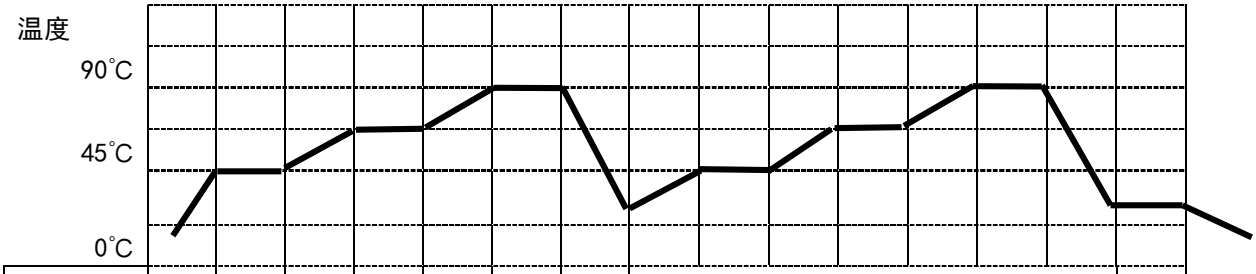
Useful function

You can use the useful repeat function when you want to repeat the same program steps. See page 32 for how to use the repeat function.

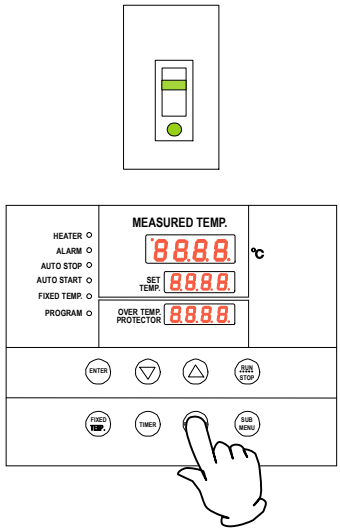
Making a program

Programming is explained using a program pattern shown below as an example here.

1. Example of program pattern



Step	1	2	3	4	5	6	7	← Repeat function is used →	8
Temp.:℃	37	37	50	50	80	80	37	Number of steps needs not to be added.	37
Time: Minute	0. 25	0. 30	0. 15	1. 30	0. 25	3. 00	2. 30		3. 00



2. Turn power ON. (Turn the ELB to ON.)

When power is turned ON, the initial values will be displayed for about four seconds, then the initial screen will appear and the current bath temperature, operation mode character and the overheat prevention set temperature are displayed on each of the displays.

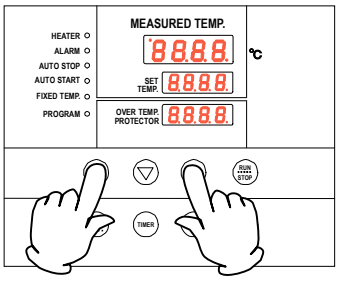
3.Selecting a program mode and a program pattern

① Press the PROGRAM key.

The program mode you used in the previous session is displayed on the SET TEMP. display.

Pressing the PROGRAM key again to flash the program mode.

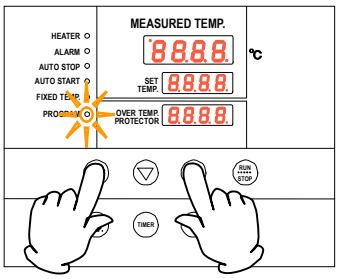
Pressing the PROGRAM key again to flash the next program mode.



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

- When PrG1 PrG1 is selected, End End appears on the MEASURED TEMP. display and the number of steps registered flashes on the SET TEMP. display.
- When PrG2 PrG2 is selected, PAt PAt appears on the MEASURED TEMP. display and the pattern number flashes on the SET TEMP. display. To select a pattern select [1] or [2] with the ▼▲ keys.
  Pressing the ENTER key displays End on the MEASURED TEMP. display and the number of steps registered flashes on the SET TEMP. display.
- When PrG3 PrG3 is selected, select [1], [2], or [3] following the same procedures as for PrG2.

Since the sample program uses up to nine steps, input is allowed in any of the program modes of PrG1, PrG2, or PrG3.



Here, how to register a program is explained using PrG3 as an example.

4. Registering a program (inputting a program)

① Select PrG3 following the previous section 3.

Input the number of program steps, step temperature, and step time following the entries in the programming sheet.

Press the ENTER key. PAt number flashes. (End will appear when PrG1 is selected. Proceed to section ⑥.)

Select an unused pattern from PAt1, PAt2, or PAt3 with the ▼▲ keys.

Press the ENTER key. End appears and the number of steps “n” flashes.

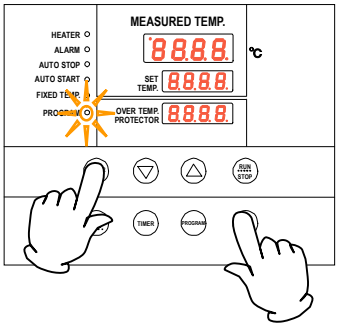
*End is a character that indicates the total number of steps to be used. In the example, you will input “9.”

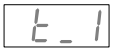
Input the total number of program steps to be used “9” with the ▼ ▲ keys.

Press the ENTER key. The character Sv-1 Su_1 that indicates the set temperature of the first step is displayed and the current set temperature flashes.

Set a temperature for the first step using the ▼▲ keys.

Preparing a program



Press the ENTER key. The character t-1  that indicates the set time of the first step is displayed and the current set time flashes.

* To set a time you need to know the heating capacity (or cooling capacity) of the unit beforehand.
* As an example,IS612C model requires about 60minutes to increase room temperature to 80℃. Therefore, assuming the current temperature to be 1℃, heating capacity can be estimated roughly as three minutes to raise one ℃ meaning 75 minutes is necessary to increase to 250℃. In the example, the time has been estimated as 80 minutes with some allowances added.
* The maximum time that can be set for the timer of each step is 999 hours 50 minutes.

When time has been set, press the ENTER key.

The temperature set character Sv-2 for the second step is displayed.

Input temperature and time of each step following the programming sheet.

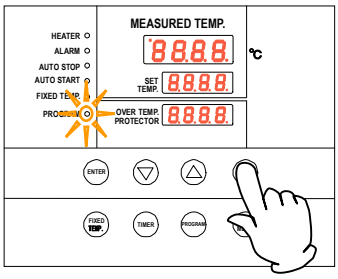
When you want to repeat a certain program pattern (program repeat) in the middle of a program as in the example, a special procedure will be required. In this case, set time (t-7 in the example) for the step to be repeated (step 7 in the example) and press the SUB MENU key without pressing the ENTER key. Now you can enter the repeat function set mode.

*For operations of the program repeat function and how to register (input), follow procedures in “Program repeat operation” on page 32.

When setting the temperature and time for the final step has been completed, the screen returns to the initial setting screen.

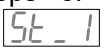
Request for operation check

Prior to start actual operation with samples installed, be sure to perform no-load operation to check if the set temperature and the set time is appropriate.

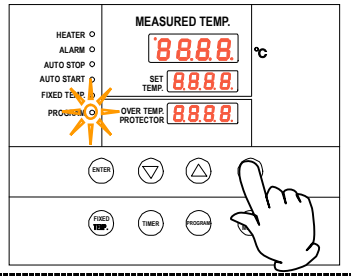


5. Starting the program operation

Press the RUN/STOP key for about one second. The set program operation starts.

The PROGRAM lamp illuminates and steps of the present operation will be displayed from the step St-1  on the SET TEMP. display.

*Press the ▼ key during operation to check the set temperature and the remaining time for each step being operated on the SET TEMP. display.



6. Terminating the program operation

When the program operation is terminated, the buzzer sounds for about five seconds to notify it to the user.
Character “End” appears on the SET TEMP. screen to indicate operation has ended.
Press the RUN/STOP keys to return to the initial setting screen.

About the timer function

The maximum time that can be set for the timer of each step is 999 hours 50 minutes.
Up to 99 hours 59 minutes, time can be set in minutes.
One hundred hours and over are set only in 10 minutes.
Keep the ▼▲ keys pressed to continuously change set time and you can quickly reach the time you want. Press the ▼▲ keys once at a time for fine adjustment.

When you want to correct setting errors or confirm settings

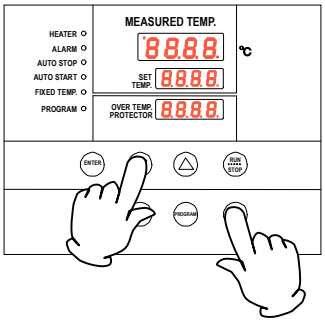
When you want to go back to previous steps for example to correct programming errors or to confirm settings, press the FIXED TEMP. key to return the setting screen to the previous screen.
Every time you press the FIXED TEMP. key you will go back by one step.
Note: Be sure to perform these operations on the program setting screen.

About wait of the program operation

When the program proceeds from a step to the next step and measured temperature has not reached or exceeded the set temperature after the set time for the step has elapsed, the next step will not start.
However, the unit has been set to proceed to the next step when the measured temperature is ±3℃ to the set temperature.

Using the program repeat function

This section explains how to register a program pattern to be repeated (program repeat) during the program operation.

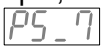


Using the program repeat function

This section explains how to register a program when you want to use the program repeat function in the middle of registering a program described in the previous section 4.

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

① Set time (t-7 in the example) for the step to be repeated (step 7 in the example) and press the SUB MENU key without pressing the ENTER key. Now you can enter the repeat function set mode.

Character “PS-n” that indicates “return destination select” of a program pattern is displayed on the MEASURED TEMP. display. In the example, the repeat function is input in the seventh step and PS-7  is displayed on the MEASURED TEMP. display.

You can input a number 1 to 7 of a step to return to on the SET TEMP. display and input the number of step (1 in the example) using the ▼▲ keys.

Then press the SUB MENU key.

Character “Pc-n” that indicates “number of repetitions” is displayed on the MEASURED TEMP. display. Input the number (2 in the example) using the ▼▲ keys.

Pressing the SUB MENU key again to move the screen to the next step. The screen moves to the Sv-8 registration screen in the example.

When you want to correct setting errors or confirm settings

No alteration is allowed in the middle of the repeat set mode.

If you want to go back to the previous step for example, to correct setting errors or to reconfirm settings you have made, finish repeat setting once, press the FIXED TEMP. key when the screen has changed to the temperature set screen for the next step to return the set screen to the previous screen and then redo repeat setting operations.

Note: Be sure to perform these operations on the program setting screen.

If you have any questions, ask the nearest sales office or the customer support center.

4. Operating procedures

Programming sheet

Make duplicates as necessary.

Registration destination	PrG1 PrG2 PrG3 PAt1 PAt2 PAt3	Control No.	
Title of test		Y/M/D	
		Prepared by	

Program pattern

																				30
																				29
																				28
																				27
																				26
																				25
																				24
																				23
																				22
																				21
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																				12
																				11
																				10
																				9
																				8
																				7
																				6
																				5
																				4
																				3
																				2
																				1
	80°C					60°C					40°C					20°C				Step

4. Operating procedures

Programming sheet

Make duplicates as necessary.

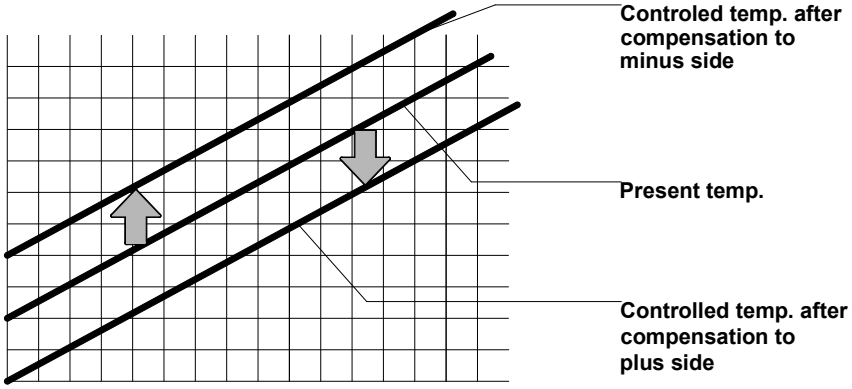
Registration destination	PrG1 PrG2 PrG3 PAt1 PAt2 PAt3	Control No.	
Title of test		Y/M/D	
		Prepared by	

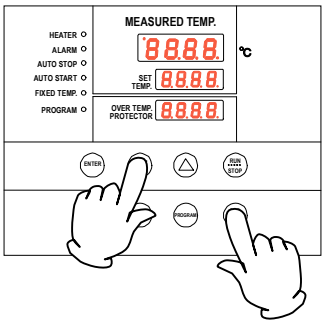
Program input values

	Set temperature (℃)	Set time (unit: minutes)	Repeat function input (Return destination: No. of times
Step 1		:	:
Step 2		:	:
Step 3		:	:
Step 4		:	:
Step 5		:	:
Step 6		:	:
Step 7		:	:
Step 8		:	:
Step 9		:	:
Step 10		:	:
Step 11		:	:
Step 12		:	:
Step 13		:	:
Step 14		:	:
Step 15		:	:
Step 16		:	:
Step 17		:	:
Step 18		:	:
Step 19		:	:
Step 20		:	:
Step 21		:	:
Step 22		:	:
Step 23		:	:
Step 24		:	:
Step 25		:	:
Step 26		:	:
Step 27		:	:
Step 28		:	:
Step 29		:	:
Step 30		:	:

Using the calibration offset function

Calibration offset function compensates any differences between the target temperature in the bath and the control temperature of the controller (sensor temperature.) The function can compensate in parallel to either plus or minus side for the whole temperature band of the unit. The lock can be set or released with the SUB MENU keys.





① Start operation at the target set temperature and confirm the temperature in the bath (sample temperature) with a temperature recorder after temperature has stabilized.

② Confirm the difference between the set temperature and that in the bath (sample temperature).

③ Press the SUB MENU key, select the character cAL  that indicates calibration offset using the ▼▲ keys and press the ENTER key.

④ Input the difference between the set temperature and that in the bath using the ▼▲ keys and press the ENTER key to complete setting.

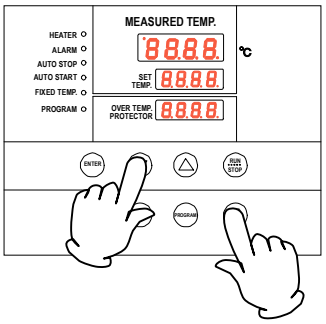
* You can set either of + or – side up to +99℃ and -99℃ respectively for the offset compensation temperature.
When compensation is set for the – side, the MEASURED TEMP. display decreases by the compensation temperature while the temperature in the bath increases by the same amount.
When compensation is set for the + side, the MEASURED TEMP. display increases by the compensation temperature while the temperature in the bath decreases by the same amount.

* Since too large a compensation value may result in larger difference between the actual and indicated temperatures and may present a danger, consult our nearest sales office before entering a large compensation value.

* The device has, in addition to the calibration offset function, the two-point compensation function that adjusts offset for the lower temperature range and higher temperature range, for which adjustment temperatures have been input on shipping from the factory.

* Consult the nearest sales office before attempting validation work for the temperature adjusting device.

Using the lock function



This function locks the set operation status.
The lock can be set or released with the SUB MENU key.

① Press the SUB MENU key, select the character Lock LocK that indicates setting lock using the ▼▲ keys and press the ENTER key.

② "OFF" is displayed on the SET TEMP. screen. To lock settings, change to "ON" using the ▲ key.

③ To release lock, press the SUB MENU key, select the character Lock LocK that indicates setting lock using the ▼▲ keys and press the ENTER key.
Lock is released when "off" is selected using the ▼ key and the ENTER key is pressed.

* When the lock function is "ON", keys other than the RUN/STOP key and the SUB MENU key are locked.

5. Cautions on handling

⚠ Warning

1. About handling of flammable or combustible solution

The unit is not explosion proof. Take special care for handling samples on which explosive substances, combustible substances or substances containing them. Flammable or combustible solution will evaporate when left at a room temperature (or at a lower temperature for some types of solutions) and may be ignited and explode from switches, lights and other ignitable sources. Be sure to assure sufficient ventilation when using these materials.
See section “13. List of dangerous materials” on page 47.

2. Ban on use/countermeasures when an error occurs

If smoke emerges from the unit or an odd odor is felt, immediately turn the power switch on the main unit off, turn the power supply off and contact your dealer or a Yamato sales office for inspection. Otherwise, a fire or an electrical shock may result. The user shall never attempt to repair the unit to avoid any possible dangers.

3. Secure sufficient ventilation for the unit.

Do not operate the unit when its vent holes on the side and rear panels covered or blocked. Internal temperature of the unit will rise degrading the performance and an accident, a malfunction or a fire may result.

4. Do not allow liquid to spill over the unit.

Do not allow liquid to spill over the unit. Pay special attention not to allow liquid to enter into the vent holes on the side and rear panels of the unit. If liquid is spilt over or into the unit, do not try to operate it any further. Other wise, an accident, a malfunction, a fire or an electrical shock may result.

5. Do not allow a metal piece to fall into the unit.

Do not allow a clip, a staple, a screw or other metal pieces to fall into the unit.
Stop operating the unit if a metal piece has dropped into the unit.
Other wise, an accident, a malfunction, a fire or an electrical shock may result.

6. Do not open the cabinet.

Do not open panels or covers fixed on the unit, or do not operate the unit with any of those open. Other wise, an accident, a malfunction, or an electrical shock may result.

7. Always operate the unit at a correct ambient temperature.

The operating temperature range is room temperature range from +5～80℃ above room temperature. Never try to operate the unit outside the operating temperature range.

8. Do not attempt to modify the unit.

The user shall never try to modify the unit; other wise, an accident, a malfunction, a fire or an electrical shock may result.

5. Cautions on handling

⚠ Caution

1. Do not step on the unit.

Do not step on the unit. Otherwise, the unit may trip over or be damaged resulting in a personal injury or a malfunction.

2. Do not put or drop an object on the unit.

Do not put or drop an object on the unit. Since the unit contains high precision devices, vibrations or shock may cause a malfunction.

3. When a thunder is heard.

When a thunder is heard, turn the power switch on the main unit off then turn the main power off immediately. Otherwise, a lightning strike may result and cause a fire.

4. During night and not to be operated for a long period of time.

During the night and when you want to stop the unit for a longer period of time, turn the power switch to “off” and pull out the power cord from the power supply.

5. About recovery from power outage.

When the power is applied again after the unit has stopped due to power outage, the unit will automatically return to the status immediately before the power outage and resumes operation.
Turn the power switch off if you do not want to resume operation by automatic recovery.

6. About two-tier stacking

Use the dedicated optional parts to stack units in two tiers. Contact you dealer or the nearest sales office for the dedicated optional part.

7. When opening or closing the door

When opening or closing the door, do not put your hand or face close to the area the door moves (space).
The door may touch your hand or face and causing an injury.

8. Do not operate the unit with the door open.

When the unit is operated with the door open, proper temperature control is not possible and the heater may overheat causing a possible danger. Be sure to operate the unit with the door closed.

9. About installation of shelf boards and samples

Place shelf boards and samples according to “Installation procedures・precautions" on page 7. Otherwise, the optimal performance of the unit will not be obtained and an accident or a malfunction may result.

10. Do not attempt to do anything other than specified in this operation manual.

Do not attempt to do anything other than specified in this operation manual. Otherwise, an unexpected accident may result.

6. Maintenance procedures

Daily inspection/maintenance

Be sure to perform daily inspection and maintenance to assure reliable operation of the unit.

⚠ Warning

- ●Be sure to pull out the power cord unless necessary before trying to do inspection and maintenance works.
- ●Start these works after the device has returned to the normal temperature.
- ●Never try to disassemble the unit.

⚠ Caution

- ● Wipe off any dirt with a tightly wrung soft cloth. Never try to clean the unit with benzene, thinner or scouring powder, or rub with a scrubbing brush. Deformation, degradation or discoloration may result.

Maintenance of the internal chamber

Stop operation and turn the power switch to OFF. Pull out the power cord off the distribution board and the wall outlet. Confirm the temperature in the device and remove shelf boards and clamps.
The internal chamber, shelf boards and shelf clamps are made of stainless steel and reinforced glass is used for the inner door. To clean these items, thoroughly wipe with a cloth moistened with cleaning alcohol then wipe gently with a dry cloth.
Never use acid detergent, alkaline detergent, oil or organic solvent, which may cause corrosion or damage to the products.

⚠ **There are sharp protrusions inside the internal chamber, shelf boards and shelf pillars and shall be handled with special care to avoid personal injury. Be sure to wear gloves since handling with bare hands may present danger.**

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

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

⚠ Caution	⚠ Warning
When the unit is not going to be used for a long time ● Turn the power switch to off and pull out the power cord.	When disposing the unit ● Do not leave the unit in the area where children may have access. ● Be sure to remove handles before disposing the unit to prevent the doors from locking. ● In general, dispose the unit as a bulky waste.

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	Major materials
Major exterior components	
Exterior	Steel plate SPCC （powder coating）
Internal chamber	Stainless steel
Packing, gaskets, etc.	Neoprene rubber
Major electric parts	
Switches and relays	Resin, copper
Boards	Glass fiber
Heater	Iron-chrome
Power cord	Synthesized rubber sheath, copper, nickel

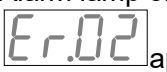
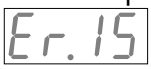
8. Troubleshooting

Safety device and error codes

The unit has the self diagnostic function with a controller and a separate safety device.
Table below shows possible causes and measures when the safety device is triggered.

[Error codes]

When a functional or mechanical abnormality occurs, the alarm lamp on the control panel comes on, an error code will be displayed and the alarm buzzer sounds. When an abnormality occurs, confirm the error code and immediately stop operation.

Safety device	Symptom	Possible causes and measures
Sensor error	Alarm lamp on  appears	● Error in the temperature input circuit ● Disconnection or other errors in the temperature sensor ● Measured temperature is outside the displayable range Contact our service department.
SSR short circuit	Alarm lamp on  appears	● SSR shortage Contact our service department.
Heater disconnection detected	Alarm lamp on  appears	● Heater disconnection Contact our service department.
Memory error	Alarm lamp on  appears	● Memory setting error Contact our service department.
Internal communication error	Alarm lamp on  appears	● Internal communication or the temperature input circuit error Contact our service department.
Overheat	Alarm lamp on  appears	● Activation of overheat prevention device Reset power once and check the temperature in the bath and the overheat prevention device set temperature. Contact our service department if the unit will not recover.
Measured temperature error	Alarm lamp on — — — — - - - - appears	● When the measured temperature is outside the displayable range Contact our service department.

8. Troubleshooting

When a malfunction is suspected

If any of the symptoms below occurs

Symptom	Check
Turning the MCB to on will not activate the unit.	● If the power cord is connected to the power supply securely. ● If power outage is not occurring. ● If the standalone overheat prevention device is working.
Temperature does not rise.	● If the set temperature is below that in the device. ● If the power supply voltage has declined. ● If the ambient temperature is not low. ● If cooling load for inside the chamber is not too large.
Temperature fluctuates during operation.	● If the set temperature is appropriate. ● If the power supply voltage has declined. ● If ambient temperature fluctuates widely. ● If cooling load for inside the chamber is not too large.
Displayed temperature differs from the measurement.	● If the calibration offset setting is not other than “0”. Set it to “0.”

If power outage occurs

When the power is applied again after the unit has stopped due to power outage, the unit will automatically return to the status immediately before the power outage and resumes operation. Turn the SW off if you do not want to resume operation by automatic recovery.

◆If the symptom does not match any of the above, immediately turn the power switch on the main unit off, pull out the power cord from the power supply and contact your dealer or one of our sales offices.

9. After sales service and warranty

When requesting a repair

If any trouble occurs, immediately stop operation, turn the power switch 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 installed on the unit. See 3. Names and functions of parts on page 10.

- Description of trouble (as in detail as possible)

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

Warranty card (attached separately)

- Warranty card is given by your dealer or one of our sales offices and please fill in your dealer, date of purchase and other information and store securely.

- 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.

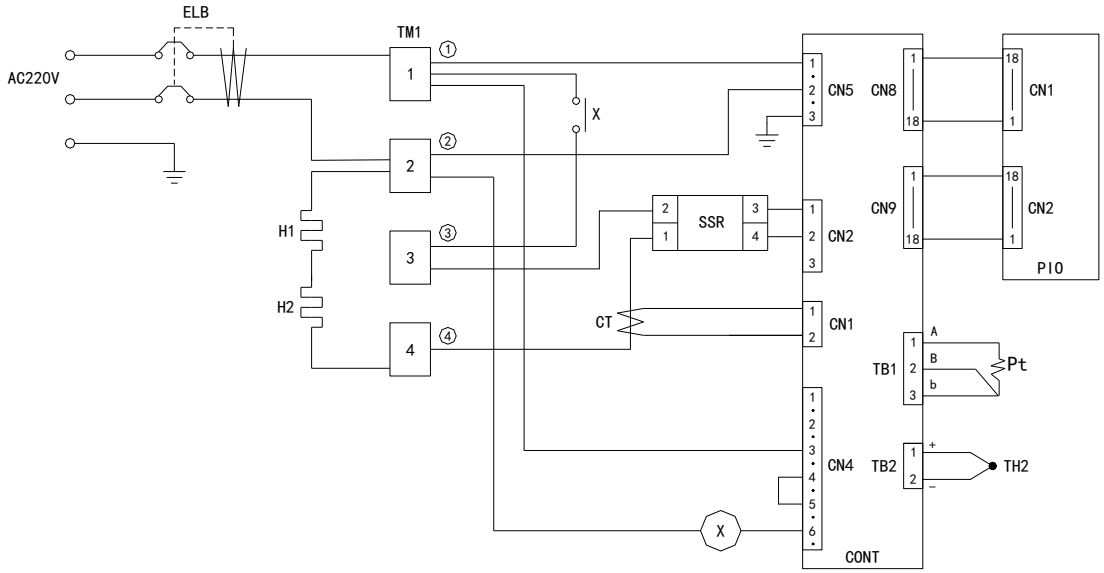
10. Specifications

Model		IS412C	IS612C	IS812C	IS912C
Performance	Operating temperature range	Room temperature ＋5℃～80℃ (no load at an ambient temperature of 23℃)			
	Temperature control precision	±0.5℃ (setting: 37℃)			
	Temperature distribution precision	±1℃ (setting: 37℃)			
Mechanism	Heater	0.3 kW	0.4 kW	0.73 kW	1.2kW
		Iron-chrome wire heater			
Control part	Controller	Model VS6 PID control			
	Control system	PID control with a micro computer			
	Setting system	Digital setting using up/down keys			
	Operation mode	Fixed temperature operation, quick auto stop operation Auto stop operation, auto start operation			
	Sensor	K、Pt-thermocouple			
	Auxiliary functions	Lock function, power outage compensation function, calibration offset function			
Safety device	Controller Self diagnostic function	Temperature sensor error, memory error, auto overheat prevention, measured temperature error			
	Protection device	An over current fuse			
Standard	Outer dimensions (mm) (w x d x h)	560×606×820	710×656×870	710×656×1619	1180×655×1619
	Internal dimensions (㎜) (w x d x h)	450×480×450	600×530×500	600×530×1000	1070×530×1000
	Internal volume	97ℓ	159ℓ	318ℓ	567ℓ
	Inner door	Reinforced glass door x 1		Reinforced glass door x 2	Reinforced glass door x 4
	Weight (tentative value)	Approx. 45 kg	Approx. 65 kg	Approx. 102 kg	Approx. 166 kg
	Power supply	AC220V 50/60Hz2.0A	AC220V 50/60Hz 2.5A	AC220V 50/60Hz 5.0A	AC220V 50/60Hz 6.5A
Included items		Shelf board x 2		Shelf board x 4	Shelf board x 8
		Shelf withstand load Approx. 15kg/each board			
		Operating instructions, warranty card			

*Performance values are for the AC220V power supply.
*Operating environmental temperature range for this device is 5℃～35℃.

11. Wiring diagram

IS412C/612C/812C/912C



Symbol	Part name	Symbol	Part name
ELB	Circuit breaker	CONT	Control circuit board
TM1	Terminal block	PIO	Display circuit board
H1,H2	Heater	TH1	Pt100 Temp sensor
X	AC relay	TH2	Overheat prevention sensor
SSR	Solid State Relay	CT	Current detection element

12. List of replacement parts

Replacement parts

	Part name		Standard	Maker	Code No.
1	Control sensor		Pt100Ω	Yamato	H050101001
2	VS6 Planar board		VS6	Yamato	B011401053
3	Display circuit boards		VS type	Yamato	B011402007
4	Tough card		UL20861-18N*300mm	Yamato	B011299041
5	Main relay		HF116F-2/220AL1HSTF W	Yamato	A011002002
6	SSR		KS15/D-38Z25-L	Yamato	A011006023
7	Power cord kit		PSE JET VCTF 3×2.0mm2	Yamato	A011209001
8	Current detection element		URD CTL-6-S-4	Yamato	B010509001
9	Overheat prevention sensor	IS412C/612C/812C	T0304.01-08 Φ3.2*55*2000 DKN	Yamato	H010101001
		IS912C	T0304.01-40 DKN812/912		H010101005
10	Circuit breaker	IS412C/612C/812C	BV-DN IP+N 6A 30Ma	Yamato	A010410003
		IS912C	BV-DN IP+N 10A 30Ma		A010410007
11	Heater wire	IS412C	100V 150W	Yamato	B080504001
		IS612C	100V 180W		B080504002
		IS812C	100V 365W		B080504004
		IS912C	100V 600W		B080504006

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
		②Potassium perchlorate, sodium perchlorate, ammonium perchlorate, and other perchlorates
		③Potassium 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.
		②n-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 degrees at one air pressure.

14. Standard installation manual

*Install the product according to the following: (Confirm separately for optional items or special specifications)

Model	Serial number	Date	Installation mgr. (company name)	Installation mgr.	Judg ment

№	Item	Implementation method	TOC No. Reference page of the operating instruction manual		Judg ment
Specifications					
1	Included items	Check for number of staffs against the included item field	10.Specifications field	P.44	
2	Installation	・Visual check of environmental conditions Caution: Take care for environment	2. Before operating the unit ・On the installation site	P.4	
		・Securing a space			
Operation-related matters					
1	Source voltage	・Measure the user side voltage (outlet) with a tester ・Measure voltage during operation (shall meet the standard) Caution: Always use a plug that meets the specification for attaching to the power switch.	2. Before operating the unit ・Be sure to connect the ground wire. ・Power supply is …. 10. Specifications ・Specification-power supply	P.6 P.6 P.44	
2	Operation start	・Starts operation Performs fixed temperature operation, auto stop operation or auto start operation	2. Before operating the unit ・Installation procedures… 4. Operating procedures	P.4～9 P.16～	
Description					
1	Operational descriptions	Explain operations of each component according to the operational instructions	4. Operating procedures ・Operating procedures 1. Safety precautions ～13. List of dangerous materials	P.16～P.1～47	
2	Error codes	Explain the customer about error codes and procedures for release according to the operational instructions	8. Troubleshooting ～9. After sales service and warranty	P.41～43	
3	Maintenance and inspection	Explain operations of each component according to the operational instructions	6. Maintenance procedures ・Daily inspection/maintenance	P.39	
4	Completion of installation Entries	・Fill in the installation date and the installation mgr. on the nameplate of the main unit ・Fill in necessary information to the warranty card and hand it over to the customer ・Explanation of the route for after-sales service	9. After sales service and warranty	P.43	

Limited liability

Be sure to use the unit strictly following the handling and operating instructions in this operating instruction.
Yamato Scientific ChongQing 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
General purpose incubator
Model IS412C/612C/812C/912C
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