SINCE 1889

Yamato

# Low Temperature Incubator

# Model:IN613C/813C

## Instruction Manual

- First Edition -

- Thank you for purchasing " Low Temperature Incubator, IN 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.**

# 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 page46.

**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 Using this unit

**Precautions when installing the unit**

## 1. Always ground this unit

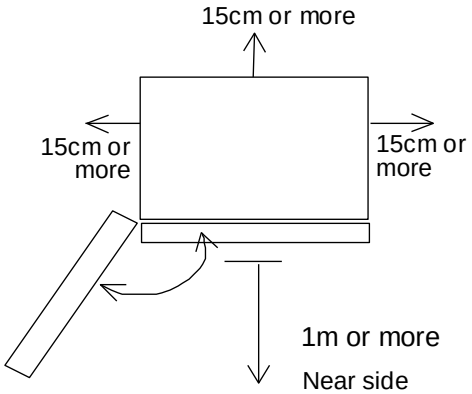
- Be sure to connect the earth wire (the green cable of power cord) to the grounding conductor or ground terminal to prevent accidents caused by electric leakage.
- Do not connect the earth wire to gas or water pipes. If not, fire disaster may be caused.
- Do not connect the earth wire to the ground for telephone wire or lightning conductor. If not, fire disaster or electric shock may be caused.
- Do not use a branching receptacle, which may cause the heat generation.

## 2. Carefully select an installation site.

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

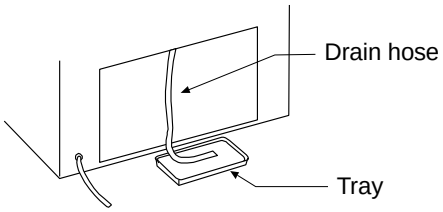
- Uneven surfaces or dirty surfaces
- Where flammable gas or corrosive gas exists
- Where the ambient temperature is 35℃ or more
- Where temperature changes severely
- Where humidity is high
- Where subject to direct sunlight
- Where vibration is severe

Install this unit at a place with spaces shown below.




## 3. Caution at defrost

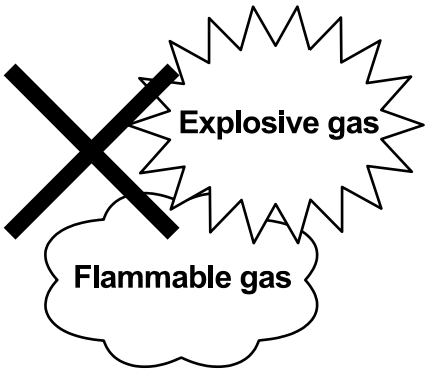
- Catch drain from drain hose with a tray at defrost.

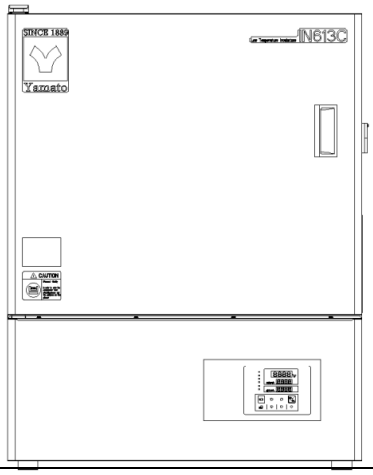



Note: The tray is not included in the attachments of unit.

### 4. Do not use this unit in an area where there is flammable or explosive gas

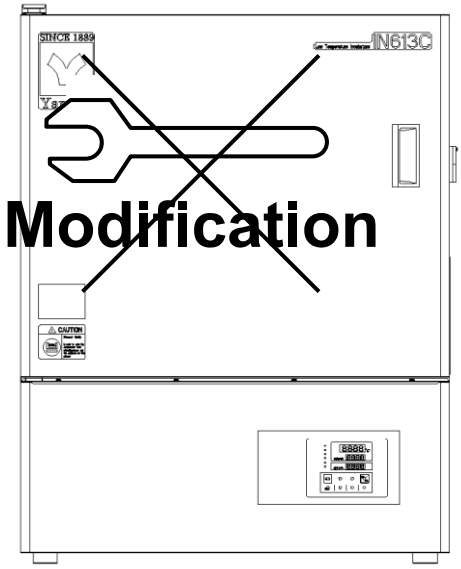
- Never use this unit in an area where there is flammable or explosive gas. This unit is not explosion-proof. An arc may be generated when the power switch is turned ON or OFF, and fire/explosion may result. (Refer to page 51 "13. List of dangerous materials".)



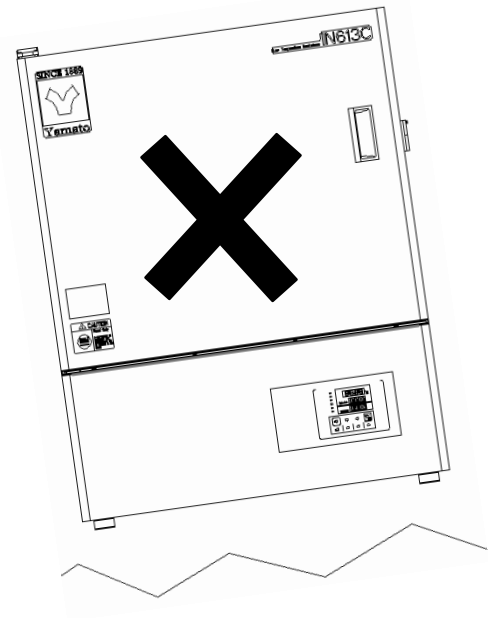

### 5. Do not modify

- Modification of this unit is strictly prohibited. This could cause a failure.




### 6. Installation on horizontal surface

- Set this unit to the flattest place. Setting this unit on rough or slope place could cause the vibration or noise, or cause the unexpectible trouble or malfunction.



## 7. Choose a correct power distribution board or receptacle

- Choose a correct power distribution board or receptacle that meets the unit's rated electric capacity.

**Electric capacity:** IN613C: AC220V 50Hz 3.5A

IN813C: AC220V 50Hz 5.0A

NOTE)

Starburst connection with a branching receptacle or extended wiring with a cord reel lowers electrical power voltage, which may cause the degradation of the refrigeration capability or temperature control performance.

## 8. Handling of power code

- Do not entangle the power cord. This will cause overheating and possibly a fire.
- Do not bend or twist the power cord, or apply excessive tension to it. This may cause a fire and electrical shock.
- Do not lay the power cord under a desk or chair, and do not allow it to be pinched in order to prevent it from being damaged and to avoid a fire or electrical shock.
- Keep the power cord away from any heating equipment such as a room heater. The cord's insulation may melt and cause a fire or electrical shock.
- If the power cord becomes damaged (wiring exposed, breakage, etc.), immediately turn off the power at the rear of this unit and shut off the main supply power. Then contact your nearest dealer for replacement of the power cord. Leaving it may cause a fire or electrical shock.
- Connect the power plug to the receptacle which is supplied appropriate power and voltage.

## 9. Before/after installing

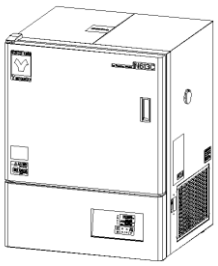
- It may cause injure to a person if this unit falls down or moves by the earthquake and the impact. etc..To prevent, take measures that the unit cannot fall down, and not install to busy place.

## ⚠CAUTION!

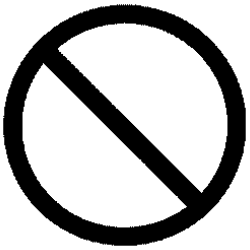
### 1. Do not use explosive or flammable substance

⚠

- Never use explosive substances, flammable substances and substances that include explosive or flammable ingredients in this unit. Explosion or fire may occur.



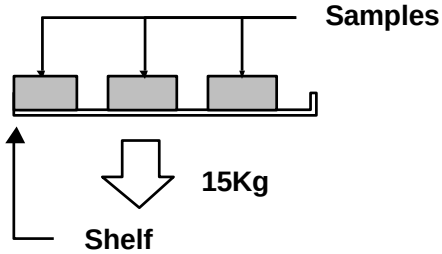
**Flammable or explosive substance**



### 2. Do not make an overload

⃠

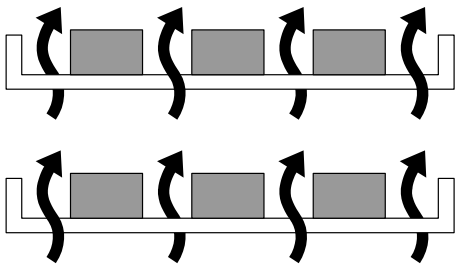
- The withstand load of shelf is 15kg （uniform load）Set the samples apart each other.




### 3. Do not set samples in close formation

⃠

- The temperature in furnace cannot be controlled if too much samples are set there. Make sure to use the shelf and set samples apart each other so as to make the free space of 30% or more to the furnace to acquire accuracy of temperature.



**Make the free space of 30% or more**

### 4. Notes for some kind of sample

⚠

- Stainless steel SUS304 is used for interior; however, it may be corroded by strong acid etc. And the door packing made of rubber may be corroded by some kind of solvent, e.g. alkaline, oil, halogen etc.
- Much frost on the evaporator degrades the refrigeration capability, which may cause uncontrollability of setting temperature. Be careful, especially, to treat samples with large water content that generate much frost. Perform the defrost operation if frost is observed through the frost inspection window.
- The equipment with large heat load cannot be used because the temperature in furnace increases.

## Defrost in Refrigerator

Once the evaporator of the refrigerator frosts too much, it may lead to reduced refrigeration effect and unable to maintain the set temperature. This product uses the observation window installed inside the chamber to observe the frosting of the evaporator. In addition, the frosting speed also varies according to the following conditions.

(1) Operating temperature ·····Frost easily when using low temperature

(2) External temperature and humidity ·····Frost easily when using the external temperature and high humidity

(3) Sample state in the chamber ·····Frost easily when using samples containing much water

Cycle defrost operation (start and stop of operation are automatic)
If need to defrost for a long time, you can set it to cycle defrost operation. Once the defrost operation and stop time is set, it will automatically carry out defrosting at intervals within the set time, repeatedly run and stop. Generally, defrosting can be finished by running defrost operation once a day for about 5 minutes each time, but it still needs to be set according to the operating conditions and the frosting state. When in defrost operation, the temperature control will be temporarily stopped, heater and air supply motor will also be temporarily stopped.
→ See P.34 "Useful functions (defrost)" for details.

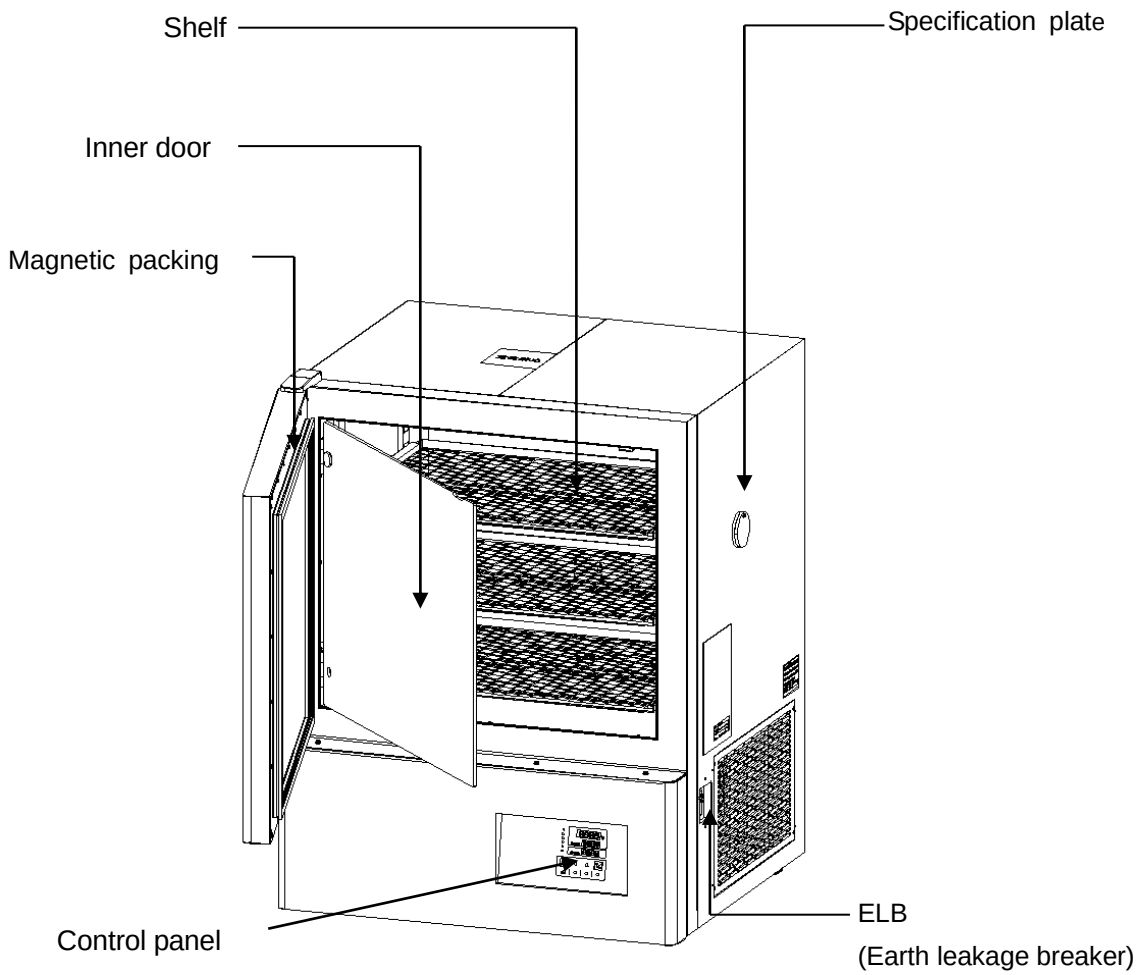
### ⚠ Caution

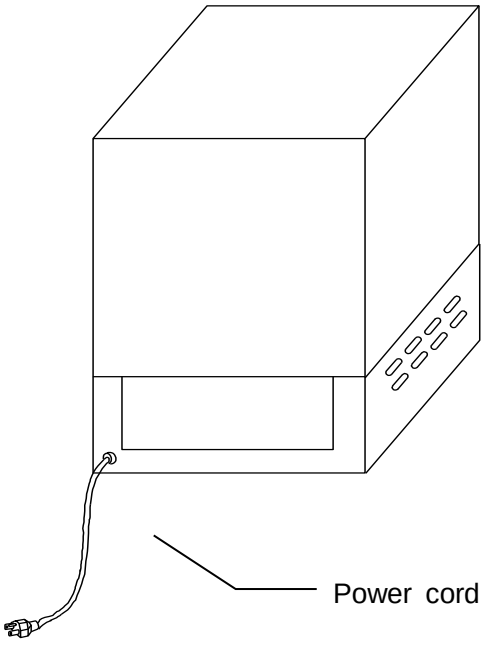
- According to the different operating conditions, during the defrost operation, the temperature in the chamber will rise by about 3℃. Please note that it may influence the samples. In addition, the display temperature may rise by more than 10℃.
- Even if set to cycle defrost, due to the different operating conditions and frosting state, long-term operation will cause more frost. When frost too much, please reduce the cycle defrost time interval dFoF or extend the defrosting time dFon. See P.34 "Useful functions (defrost)" for details.

# 3.Description and Function of Each Part

**Main Unit**

**IN613C**

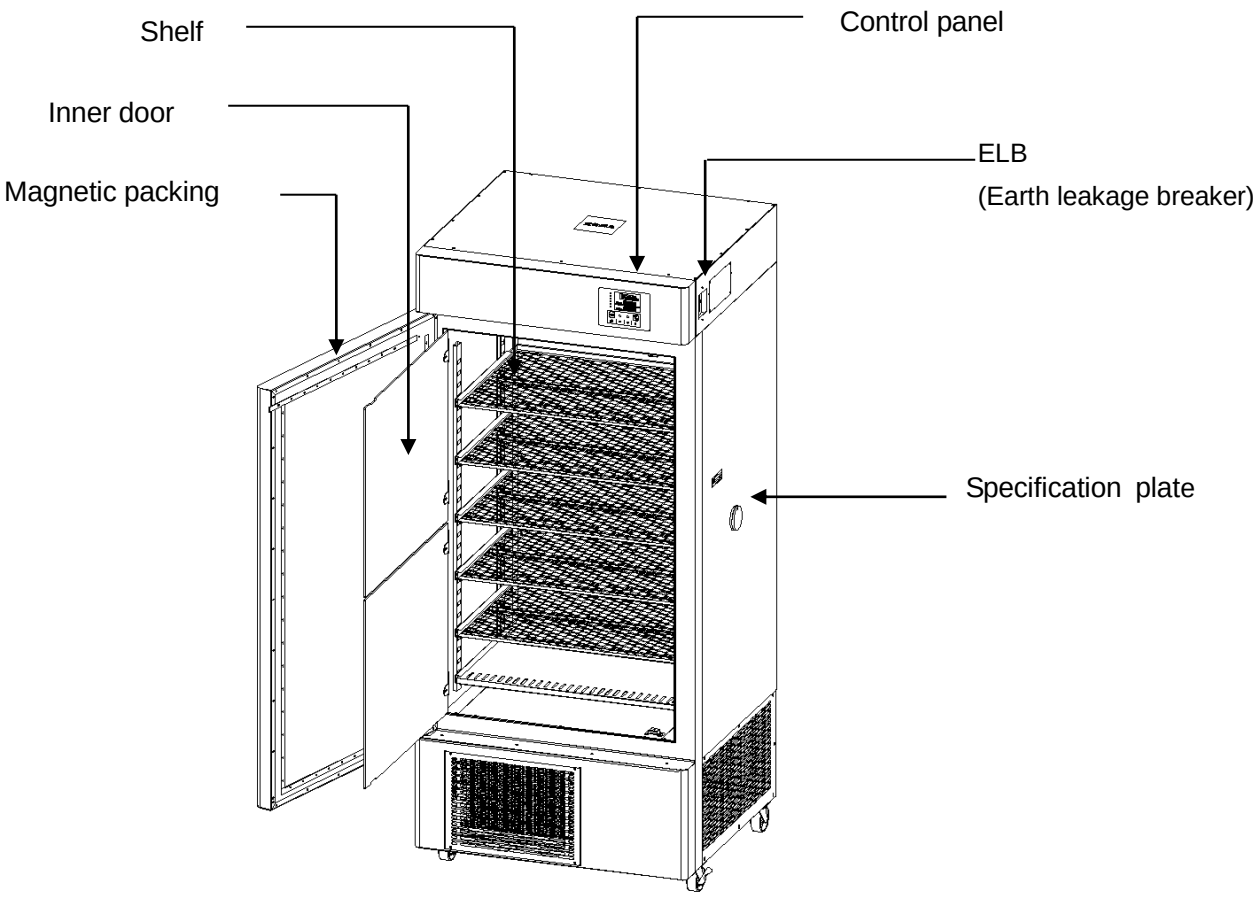


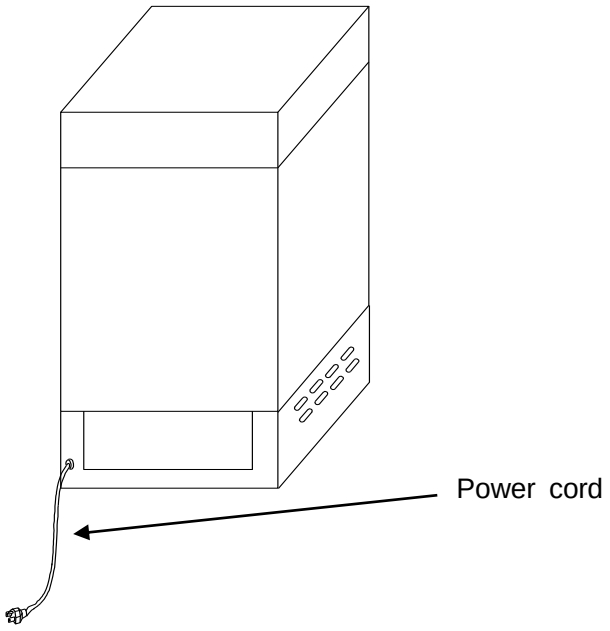



# 3.Description and Function of Each Part

**Main Unit**

IN813C

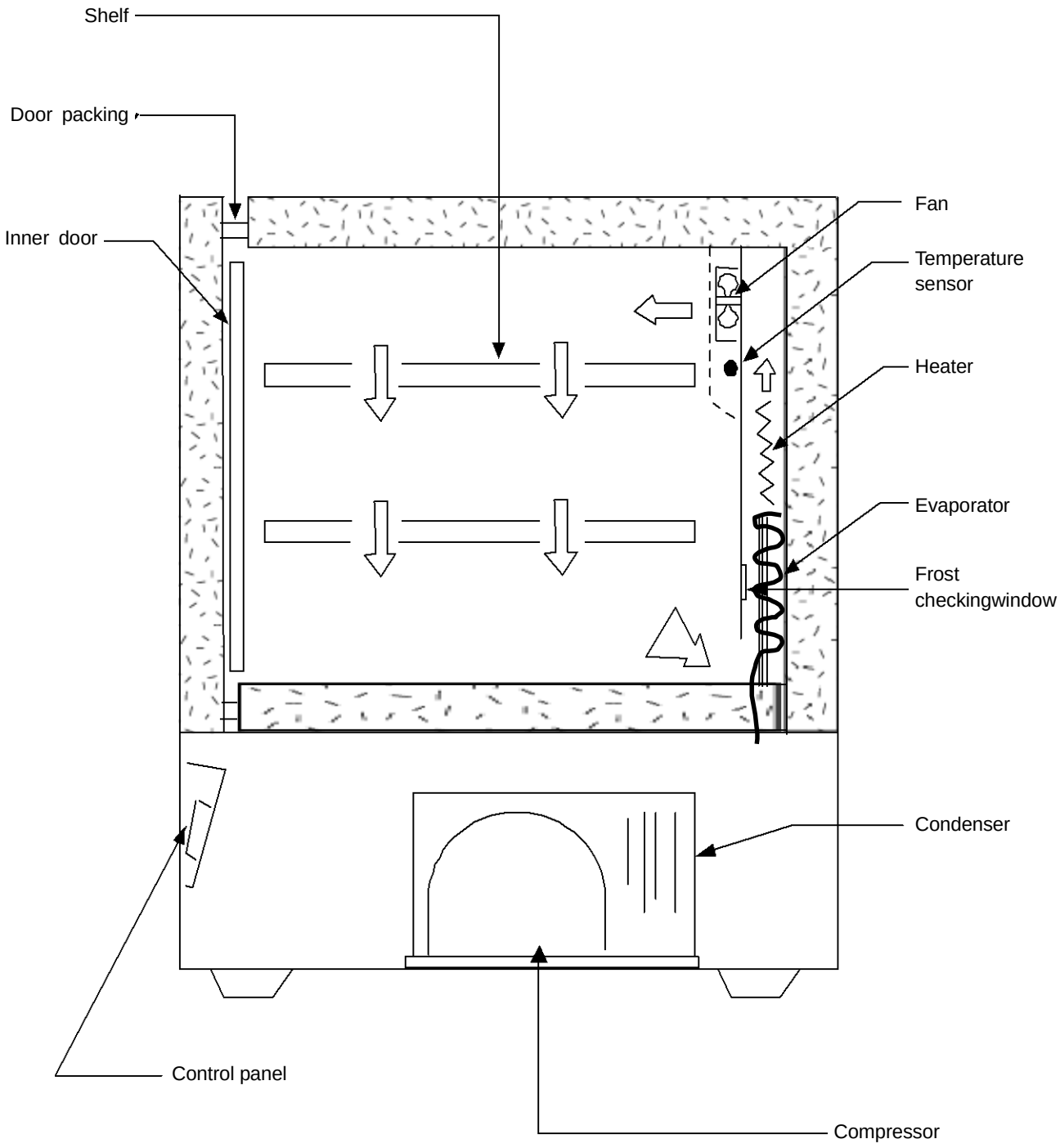


# 3.Description and Function of Each Part

**Structure Chart**

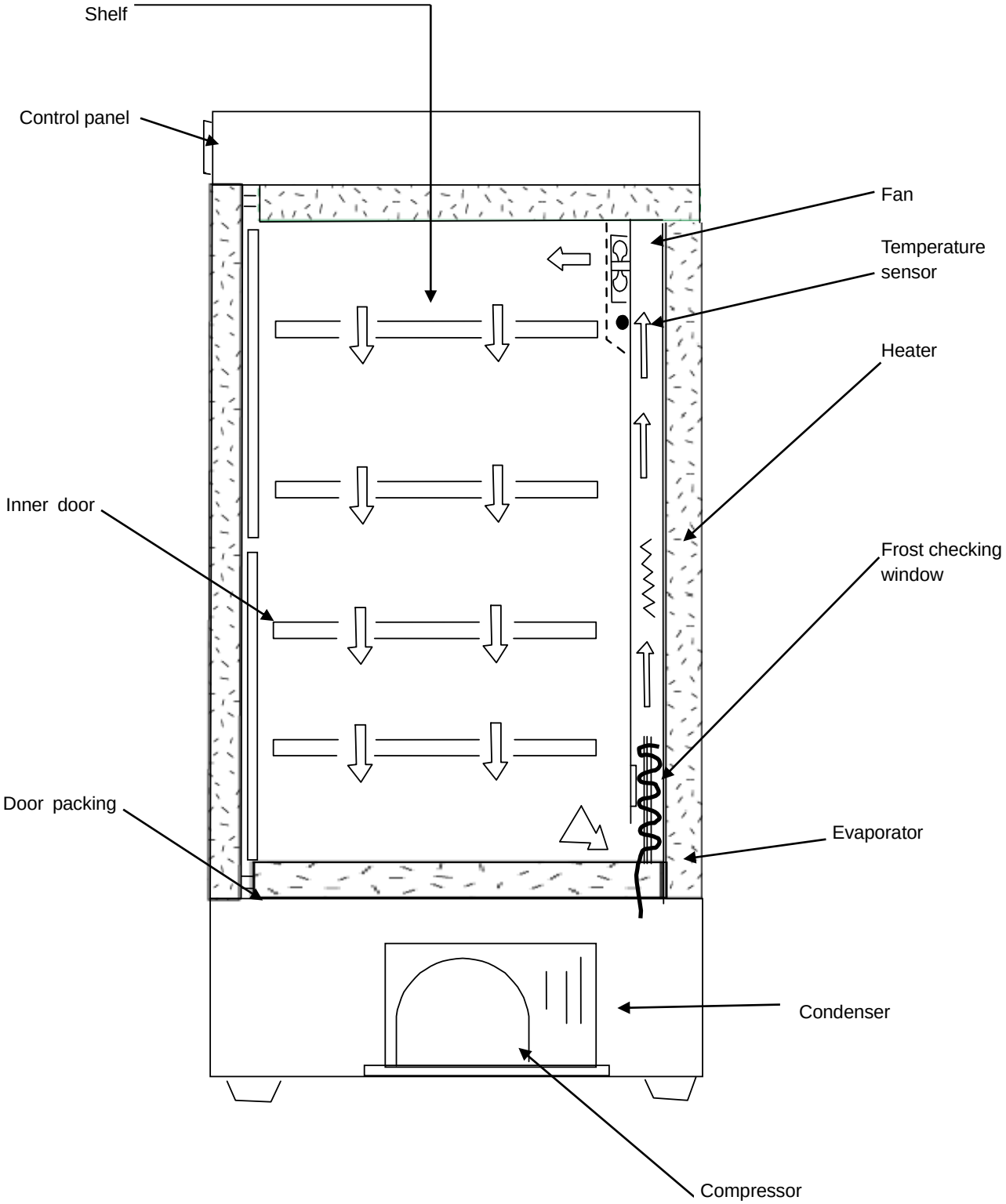
**IN613C**



# 3.Description and Function of Each Part

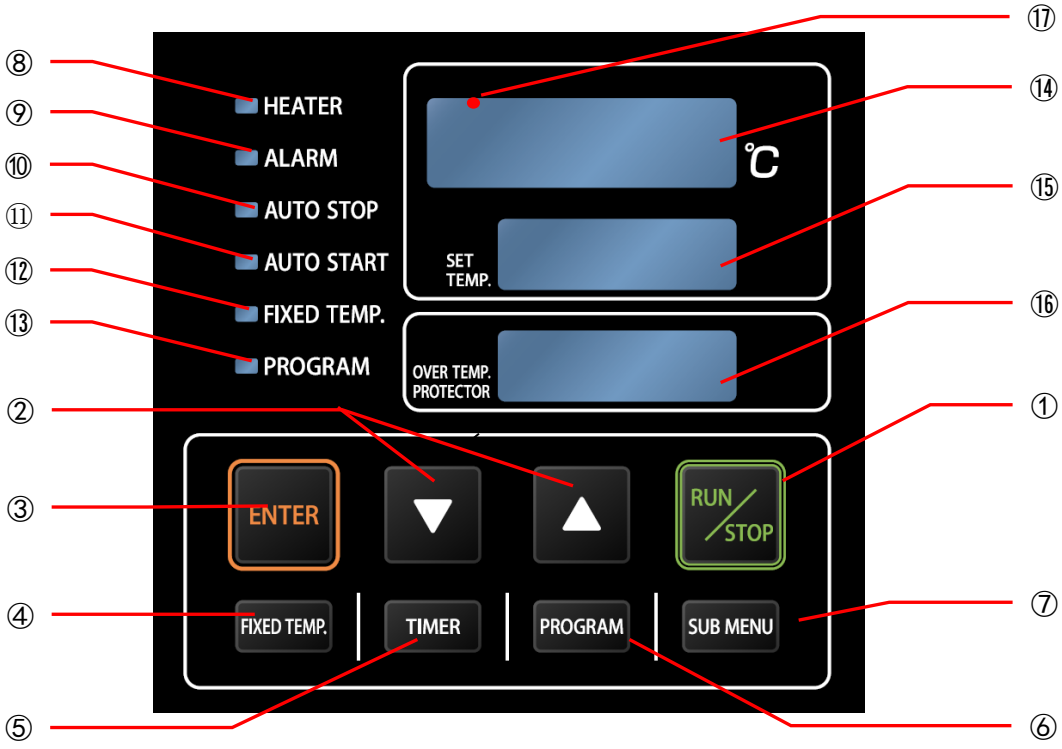
## Structure Chart

**IN813C**



# 3.Description and Function of Each Part

**Operation panel**

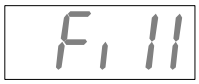
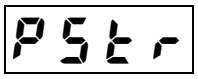
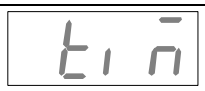
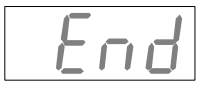



| No | Name | Operation/action |
|---|---|---|
| ① | Start/Stop key | The key is used to start/stop operation. |
| ② | Up/Down keys | These keys are used to select a setting. |
| ③ | Enter key | This key is used to determine the selected setting. |
| ④ | Fixed-value operation key | This key is used to select the fixed-value operation. |
| ⑤ | Timer operation key | Timer operation select key.<br>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.<br>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.Description and Function of Each Part

## Description of characters

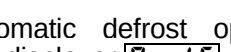
Characters used in the model VS4 controller are described below.

| 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 | Automatic start of fixed value running |
|  | Pstr | Timer setting mode display | Automatic start of program running |
|  | 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 “ 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 “ 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 “ 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 “ Operating procedures (making a program)” on P.32. |
|  | cAL | Calibration offset setting | This is used to input a calibration offset temperature. See “ 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 “ Setting for the overheat preventive device” on P.20. |
|  | Lock | Setting key lock | This locks keys to prevent alteration of setting information. See “ Useful functions (lock function)” on P.36. |

# 3.Description and Function of Each Part

## Description of characters

Characters used in the model VS4 controller are described below.

| Characters | Identifier | Name | Applications |
|---|---|---|---|
|  | 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. |
|  | A-DF | Automatic defrost running | During automatic defrost operation, the set temperature displayer  blinks. |

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

# 4. Operating procedures

## 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.<br>Pressing the Fixed temp key again brings you to the temperature setting mode.<br>Set a temperature with the ▼▲ keys.<br>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”.<br>You can set time until the operation stop by pressing the Timer key during fixed value operation.<br>Set a time with the ▼▲ keys.<br>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”.<br>Press the TIMER key one time at a time until the set temperature display flashes to show AStP<br>You can set the set temperature “SV” by pressing the Enter key.<br>You can set operation time “tim” by pressing the Enter key again.<br>Pressing the Start/Stop key will start auto stop operation. | P.23 |
| 4 | Automatic start of fixed value running | This mode is used when you “want to start operation automatically after certain time after power on”.<br>Press the TIMER key one time at a time until the set temperature display flashes to show AStr<br>You can set the set temperature “SV” by pressing the Enter key.<br>You can set operation time “tim” by pressing the Enter key again.<br>Pressing the Start/Stop key will start auto start fixed value running. | P.25 |
| 5 | Automatic start of program running | This mode is used when you “want to start operation automatically after certain time after power on”.<br>Press the TIMER key one time at a time until the set temperature display flashes to show AStr<br>You can set the set program number ProG by pressing the Enter key.<br>Pressing the Start/Stop key will start auto start program running. | P.27 |

# 4. Operating procedures

## List of operation modes and functions

Operation modes of the unit are as follows.

| No. | Name | Description | Page |
|---|---|---|---|
| 6 | Program operation | This mode is used when you want to raise or lower the temperature according to the set temperature and time.<br>Press the Program key to display “PrG1”.<br>Press the Program key again to select a program mode you want.<br>Press the Enter key to select the pattern ”PAt” you want.<br>Press the Enter key to display “End”. Then enter the number of patterns to use.<br>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. Operating procedures

## List of operation modes and functions

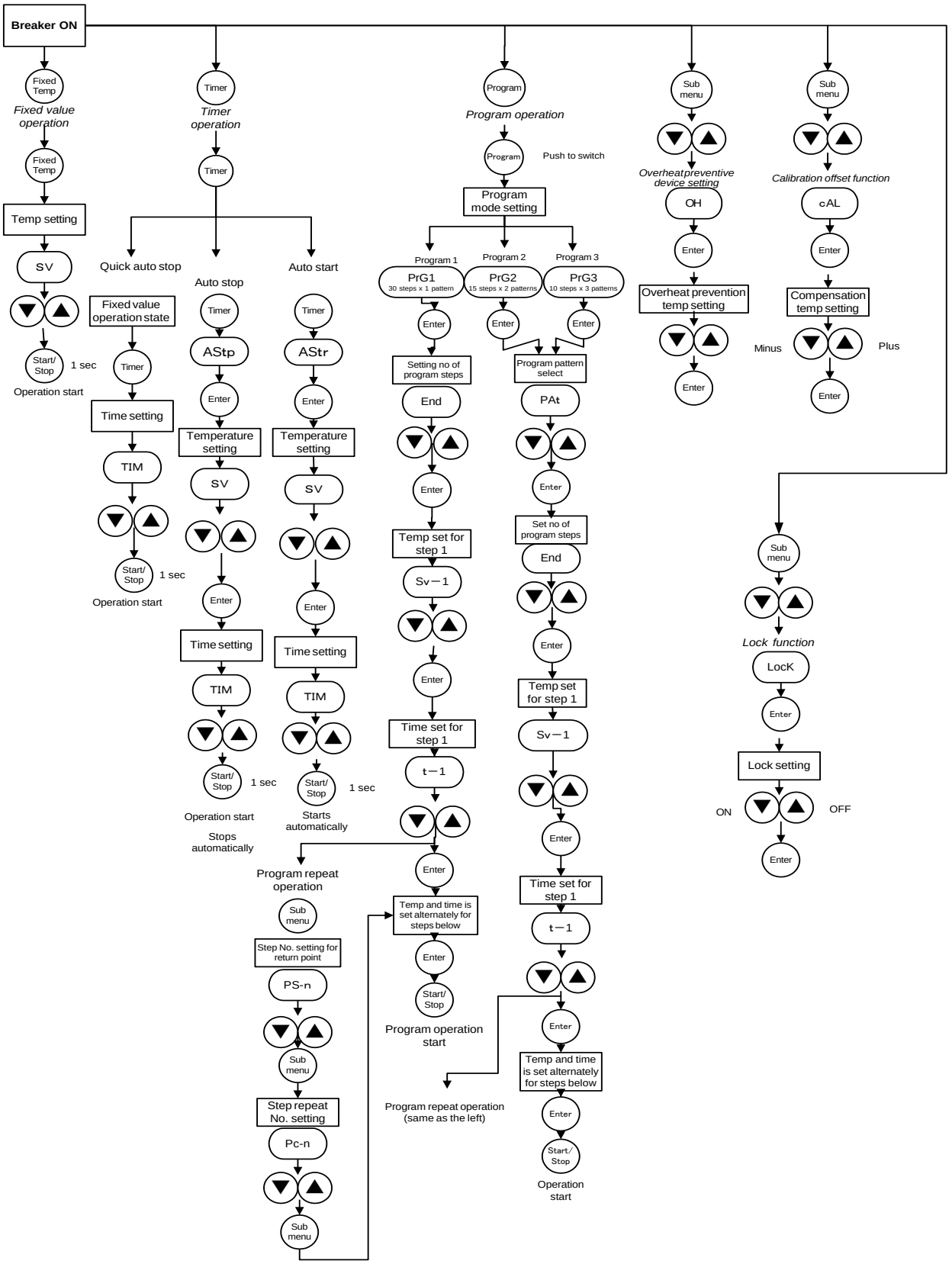
Operation functions of the unit are as follows.

| No. | Name | Description | Page |
|---|---|---|---|
| 1 | Overheat prevention function | Automatic overheat prevention function：<br>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.<br>Overheat preventive device：<br>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.<br>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).<br>You can apply compensation to the plus or minus side over the entire temperature range of the unit. | P. 36 |
| 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.<br>You can set or cancel this function with the Sub menu key. | P. 37 |
| 6 | Setting cycle defrost | Set the cycle defrost OFF interval time.<br>Set the cycle defrost ON running time. | P.38 |

# 4. Operating procedures

## Operation modes, function setting keys, and characters

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



# 4. Operating procedures

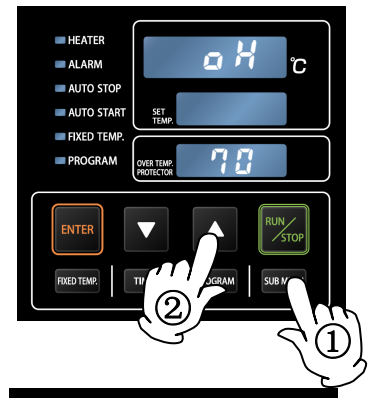
## Overheat preventive device setting

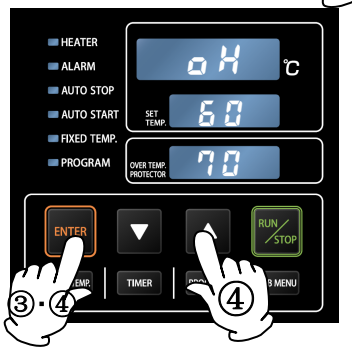
The safety units for prevention of overheat includes the power supply, the display, and the key input assembly shared with the controller in addition to the automatic overheat prevention function (automatic recovery) of the controller as well as an overheat prevention device (manual recovery) comprising 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 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 70℃. 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 70℃ at factory shipping.**

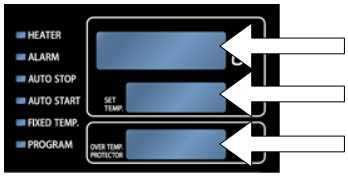
# 4. Operating procedures）

## 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.

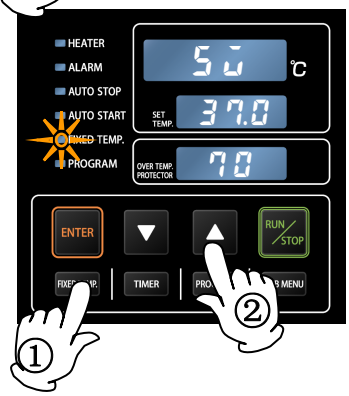
Display Fix F, 11.

**3.Setting a temperature**

①Press the Fixed temp key again.

The characters SV 50 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. Operating procedures

## 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.

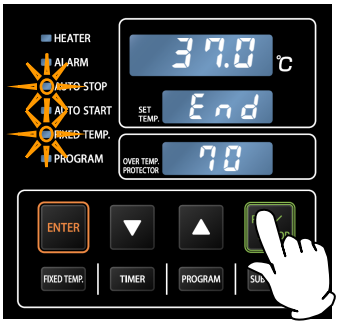
Press the Timer key.

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.。

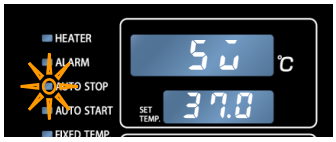
**When you want to correct the set temperature, set time, or to confirm settings**

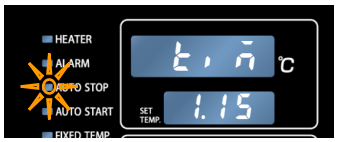
When you want to change the set temperature during operation, press the Fixed temp key to enter the setting mode and change the temperature. After change, press the Enter key to complete change. If you want to change the set time during operation, press the Timer key to enter the setting mode and change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

## 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 ASTP that indicate auto stop operation and press the Enter key.

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

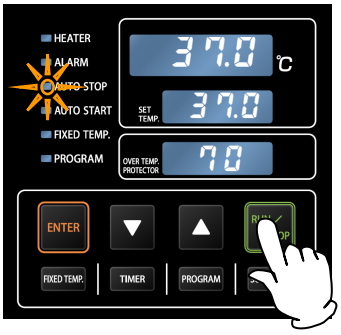
③ Press the ▼▲ keys to set the temperature you want.

④ Press the Enter key. The characters tim 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. Operating procedures

## 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.

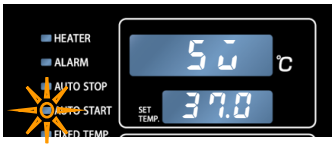
You can press the ▼ key during operation to display the set temperature, the operation mode, and the remaining time on the set temperature display.

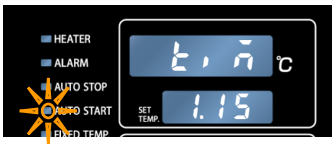
The remaining time display  indicates counting-down while the dots are blinking and waiting state while the dots stay on (temperature is increasing or decreasing toward the set temperature) and the timer count is stopped.

# 4. Operating procedures

## Operating procedures ( auto start fixed value running )

### How to perform auto stat operation


Used for "Timing but not running after starting, and entering fixed value operation only after timing arrives." (Delayed operation)

**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 ASTr that indicate auto start fixed value running and press the Enter key.

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

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

④ Press the Enter key. The characters tim 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. Operating procedures

## Operating procedures ( auto start fixed value running )


**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 start fixed value running 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.

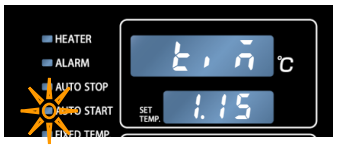
Note that you cannot change them if you have started operation after the auto start time has passed. In this case, stop operation once with the Start/Start key and resume setting from the start.

# 4. Operating procedures

## Operating procedures ( auto start program running )

### How to perform auto stat operation






Used for "Timing but not running after starting, and entering program operation only after timing arrives." (Delayed operation)

**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 Astp ASTP that indicate auto start program running and press the Enter key.
The characters prog PrOG that indicate temperature set appear on the set temperature display and the auto start lamp will blink.

③ Press the ▼▲ keys to set the program num you want.

④ Press the Enter key. The characters tim 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. Operating procedures

## Operating procedures ( auto start program running )


**3. Stopping and finishing timer operation**

Operation will start automatically when the set time comes.

After the program operation ends, the alarm alarms for about 5 seconds to notify.

The controller is in the operation end prompt state. The automatic start operation indicator light and the program operation indicator light up, and the set temperature display displays the operation end symbol (End), prompting the operator to end the program operation. Note: You are still in running mode at this time.

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 time, or to confirm settings**

If you want to change the set time during operation, press the Timer key, set a time for auto start program running 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.

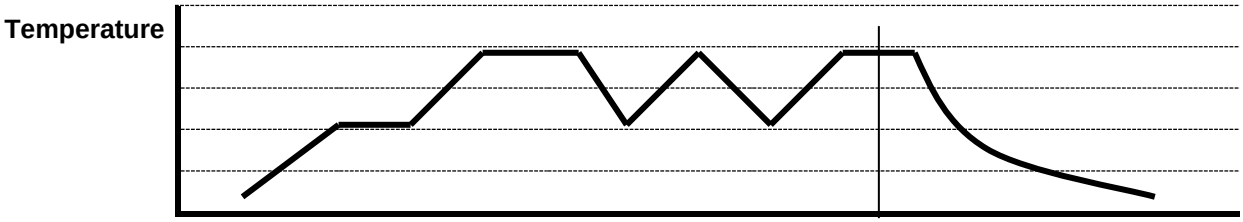
You can press the ▼ key during operation to display the set temperature, the operation mode, and the remaining time on the set temperature display.

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. Operating procedures

## 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 | You can make two patterns of programs up to 15 steps each. |
| PrG3 | |
| PrG4 | You can make three patterns of programs up to 10 steps each. |
| PrG5 | |
| PrG6 | |

**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. 31 & P. 32 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 “ Operating procedures (program repeat operation” on P. 33 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. Operating procedures

## 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

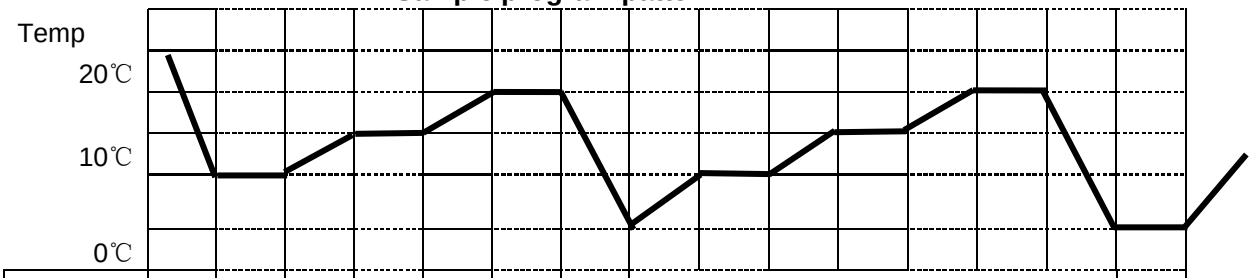
20℃～50℃　：　25 min.

20℃～-10℃　：　45 min.

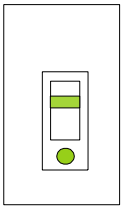
**Making a program**

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**

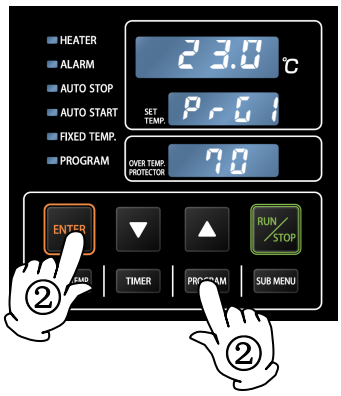
① Press the Program key.

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.

## Operating procedures ( making a program )

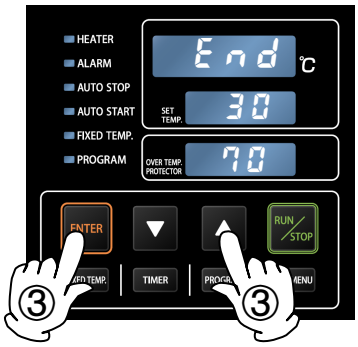



**4. Register program (program editing)**

① When standby in other mode, press PROGRAM key. The set temperature displayer displays PrG1, enter the program mode.

② Repeatedly press PROGRAM key. The set temperature displayer will cycle display PrG1 ～ PrG6, select the program you want to edit, press ENTER key to comfirm.

③ The measured temperature displayer displays End, prompts to enter the end segment of the selected program here, and the set temperature displayer displays the currently specified end segment. The graphic example sets 30, indicating that there are 30 segments in the program. After running the segment 30, the program ends. Use the ▼▲ keys to edit, and the press ENTER key to comfirm.




※ Note: the maximum number of available program segments is different depending on the program you select. Refer to Page 29 "Program types".

④ The measured temperature displayer displays Su_1 (Sv-1), prompts to enter the set temperature of program segment 1 here. Press the ▼▲ keys to set the required temperature to the set temperature displayer, press ENTER key to comfirm. In the graphic example, set according to the program example, the temperature of the first segment is 30.0℃.

⑤ The measured temperature displayer displays t_1 (t-1), prompts to enter the run time of program segment 1 here. Press the ▼▲ keys to set the required time to the set temperature displayer, press ENTER key to comfirm. In the graphic example, set according to the program example, the time of the first segment is10min.

※ Before setting the time, check the temperature rise/drop limit of the device.


※ Example: for IN813C, it takes about 25 minutes for the temperature to rise from room temperature to 50℃, which can be considered as 1℃ rise per minute. But actually, the higher the temperature, the harder it is to heat up, and the lower the temperature, the harder it is to cool down. Please set a sufficient time.

※ The max. set time for each segment is 999 hours and 50 minutes.

⑥ After time setting, press ENTER key to comfirm, display the set temperature symbol Su_2 of the program segment 2, press ▼▲ keys to set temperature, use the same way to operate the following program segments. Please enter the temperature and time of each segment according to the programming data.

⑦ The different method is necessary when program repeat function is used. In this case, after setting the time (t_4 in the example) in the segment where the repeat operation is to be used (segment 7 in the example), press the SUBMENU key to enter the repeat function setting mode.

※ For the operation and editing methods of program repeat function, please refer to page 33 "Use the program repeat function".

⑧ After setting the temperature and time in the last segment, it will return to the initial screen.

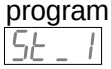
# 4. Operating procedures

## Operating procedures ( making a program )


Make sure to check the setting temperature and time by operating the unit without load before performing actual run with samples.

**5. Start program operation**

Long press the RUN/STOP key, the set program starts to operate. Please refer to page 30 "Selecting a program mode and a program pattern" for program selection.

The program lamp lights up, the set temperature displayer in order of St-1  to display the running program segment.

※ Press the ▼ key during operation to confirm the setting temperature and remaining time of each segment on the set temperature displayer.


**6. End program operation**

The buzzer will sound for about 5 seconds after operation end.

The controller is in the state of operation end prompt. The program running indicator lamp lights up, and the set temperature displayer displays the operation end symbol  to prompt the operator that the program operation ends. Note: it is still in operating mode at this time.

Long press the RUN/STOP key to stop the operating mode, the indicator lamp goes out and return to the initial screen.

| | |
|---|---|
| **About the timer function** | The maximum timer setting possible is 999 hours 50 minutes.<br>You can set a time in the unit of minutes up to 99 hours 59 minutes.<br>The setting unit will be 10 minutes for a time of 100 hours or longer.<br>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**

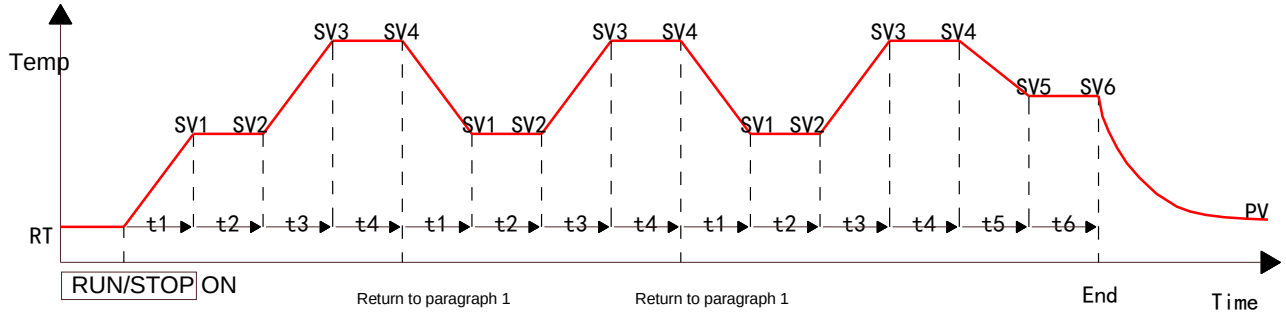
When a program shifts from one step to the next, when the measured temperature has not reached or has exceeded the set temperature even if the set time for the step has passed, the next step will not start.

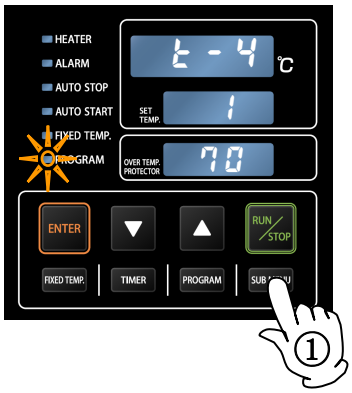
The unit has been set that a step will shift to the next in the range of ± 1℃ to the set temperature.

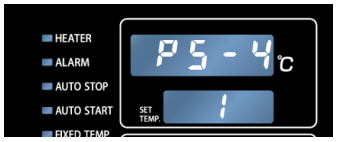
# 4. Operating procedures

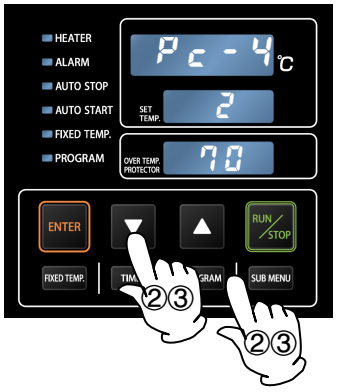
## Operating procedures ( making a program )

The program repeat function is used to "run several segments in a program repeatedly".
As shown in the figure, although there are 6 segments of the edited program, because the program repeat function is executed at the end of the segment 4, the program jumps to the segment 1 and repeats twice, a total of 14 program segments are actually run, among which segments 1 ~ 4 are executed three times in total.




### Use the program repeat function

We still use the program example in programming to explain. See P.30 "Making a program".

① After setting the time of the program segment (segment 4 in the example) that you want to repeat and jump (example t_4), press SUB MENU key to enter the repeat function set mode.

② The measured temperature displayer displays the symbol PS_4 「PS_4」 to prompt to input the address segment to be returned by the program segment 4.
It can only be returned to the segment that precedes this segment, so the setting range of the return address PS_4 is 1～4, use the ▼▲ keys to input the segment number of the return address (on P.30 "Making a program", after the segment 4 ends, it returns to the segment 1, so input 1 at PS_4).

③ Press the SUB MENU (function key), the measured temperature displayer displays the symbol Pc_4 「Pc_4」 to prompt to input the repeat times of the program segment 4 returning to the segment 1. Press the ▼▲ keys to input the times (on P.30 "Making a program", after the segment 4 ends, it returns to the segment 1, which is executed twice, so input 2 at Pc_4).

④ Press the SUB MENU (function key) again, switch to the set temperature screen of the next segment (on P.30 "Making a program", it will move to the display symbol SV_5).

⑤ The segment 5 and the following program can be edited as normal.

※ The program repeat setting cannot be modified during operation. It must stop the operation, and then follow the above steps to confirm and modify each parameter of program repeat in turn.

# 4. Operating procedures

## Program preparation sheet

Make a copy of this sheet for use.

| Registration destination | PrG1 PrG2 PrG3 PrG4 PrG5 PrG6 | Management No. | |
|---|---|---|---|
| Name of test | | Date y/m/d | |
| | | Prepared by | |

Program patterns

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 55℃ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 37℃ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 5℃ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 0℃ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| -10℃ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Step No. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

# 4. Operating procedures

## Program preparation sheet

Make a copy of this sheet for use.

| Registration destination | PrG1 PrG2 PrG3 PrG4 PrG5 PrG6 | Management № | |
|---|---|---|---|
| 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 | | : | : |
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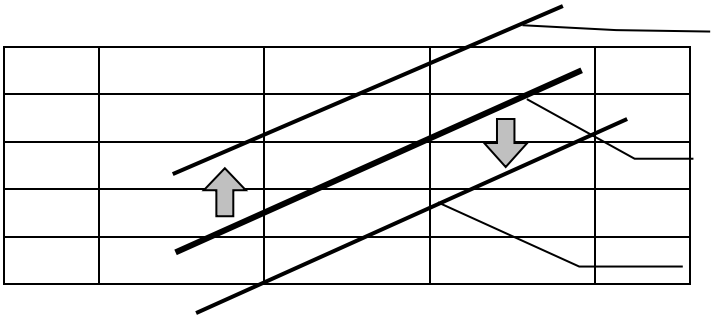
| Step 17 | | : | : |
| Step 18 | | : | : |
| Step 19 | | : | : |
| Step 20 | | : | : |
| Step 21 | | : | : |
| Step 22 | | : | : |
| Step 23 | | : | : |
| Step 24 | | : | : |
| Step 25 | | : | : |
| Step 26 | | : | : |
| Step 27 | | : | : |
| Step 28 | | : | : |
| Step 29 | | : | : |
| Step 30 | | : | : |

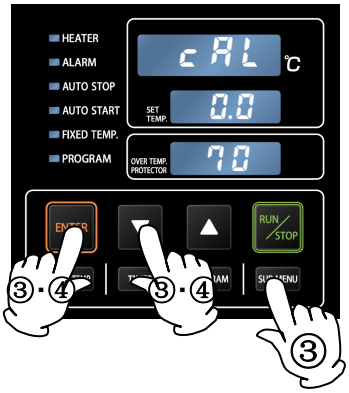
# 4. Operating procedures

## 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.

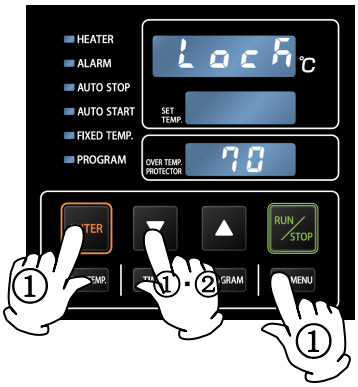
※ When validating the temperature indicator, first consult with your nearest sales office or the customer support center.

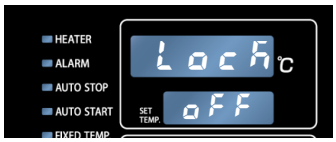
## Useful functions ( lock function )

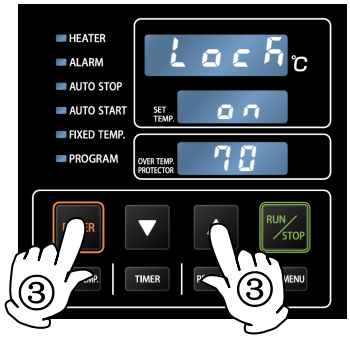
### Using the lock function

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.

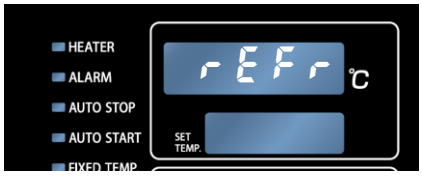
② ”OFF” will appear on the set temperature display. You can lock the settings by setting to “ON” with the ▲ key.

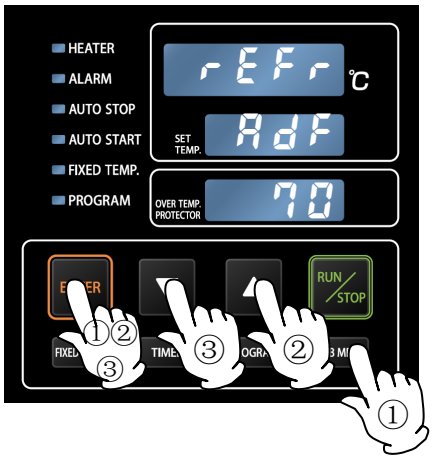
③ To release lock, press the Sub menu key, select the characters Lock LocK that indicate the setting lock with the ▼▲ keys, and then press the Enter key.

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.

### Select the defrost function




There are three defrost operation functions to select, which are Not use defrost function, Automatic cycle defrost function and Manual defrost function. [Note that this unit does not have the manual defrost function]. After the automatic cycle defrost function is enabled, the time of defrost can be changed, and the interval cycle time of automatic cycle defrost can also be changed.

As per the following steps to make changes:

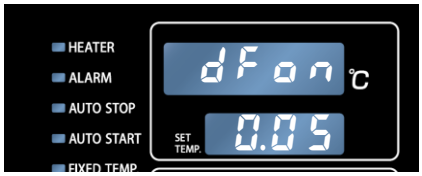
① Press the SUB MENU (function key), use the ▼▲ keys to select the symbol rEFr (rEFr), press ENTER key to confirm.

② Repeatedly press ENTER key to select the symbol dFS (DFS).

③ Use the ▼▲ keys to select the defrost function, and press ENTER key to confirm.

- oFF : Function release (not use defrost function)
- A_dF : Automatic cycle defrost (factory setting)
- n_dF : Manual defrost (this unit does not have this function)

### Set the defrost time




Please follow the above steps to operate, select dFon (dFoN) at the step ②, use the ▼▲ keys to set the duration time of defrost, and then press ENTER key to confirm.

The setting range is 1 ~ 10 minutes (5mins for factory setting).

### Set the stop time of automatic cycle defrost


Please follow the above steps to operate, select dFoF (dFoF) at the step ②, use the ▼▲ keys to set the stop time of automatic cycle defrost, and then press ENTER key to confirm.

The setting range is 1hr00min ~ 24hrs00min (23hrs55mins for factory setting).

※ Please note that this is to set the stop time of automatic defrost, need to plus the defrost time, which will be a complete defrost cycle time.

Take factory setting as an example, the defrost time is 5mins, the stop time of automatic defrost is 23hrs55mins, then the cycle time of automatic defrost is 24hrs00min. Generally speaking, the automatic defrost runs according to the cycle of OFF→ON→OFF→ON→OFF→ON, OFF time is 23hrs55mins and ON time is 5mins.

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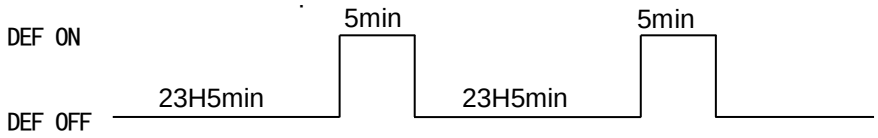


# 5. Handling precautions

## ⚠ 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

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: ：-10℃～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.

# 6. Maintenance

**Daily inspection/maintenance**

## ⚠ Warning

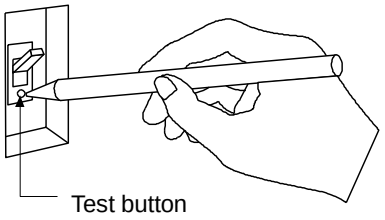
- Be sure to remove the power cord before inspection or maintenance unless necessary.
- Start working after the unit temperature has returned to the normal temperature.
- Never attempt to disassemble devices.

## ⚠ Caution

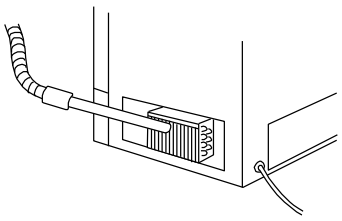
- Wipe off any dirt with a well wrung out soft cloth. Never use benzene, thinner, or scorching powder or rub with a hard brush. Otherwise, deformation, deterioration, or discoloration may result.

### 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 cooling fin of the condenser
  - ・Remove the right baffle plate for IN613C, and remove the front and left baffle plates for IN813C.
  - ・Use a vacuum cleaner to remove the garbage attached to the surface of the cooling fin of the condenser.



**⚠ 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<br>●Turn power off and remove the power cord. | When disposing<br>●Do not leave the unit where children may play around.<br>●Remove all driving assemblies.<br>●The unit uses CFC's substitute.<br>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 | R134A ※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.

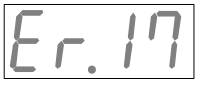
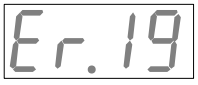
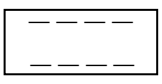
# 8. When a trouble occurs

## 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<br>Contact the general customer service center. |
| SSR short-circuit detected | Alarm lamp on  indication | ● SSR short-circuit<br>Contact the general customer service center. |
| Heater disconnection detected | Alarm lamp on  indication | ● Heater disconnection<br>Contact the general customer service center. |
| Malfunction of memory | Alarm lamp on  indication | ● Abnormality in settings in memory<br>Contact the general customer service center. |
| Internal communication error | Alarm lamp on  indication | ● Error in internal communication or in the temperature input circuit.<br>Contact the general customer service center. |
| Abnormal rise of temperature | Alarm lamp on  indication | ● Activation of the overheat preventive device<br>Reset the power supply once and then check the temperature in the bath and the set temperature of the overheat preventive device.<br>If the unit does not recover, contact the general customer service center. |
| Compressor failure | Alarm lamp on  indication | ● Compressor failure<br>Compressor thermal protection, power off and stop for 10 minutes before running again.<br>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.<br>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.<br>●If a power failure has occurred. |
| The alarm lamp comes on. | ●Check error codes.<br>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.<br>●If supply voltage has been low.<br>●If the environmental temperature is low.<br>●If cooling load in the bath is large. |
| Temperature will not decrease. | ●If the set temperature is higher than the internal temperature.<br>●If supply voltage has been low.<br>●If the environmental temperature is high.<br>●If heat load in the bath is large.<br>●If the ventilation ports and around them are covered. |
| Temperature fluctuates during operation. | ●If set temperature is appropriate.<br>●If supply voltage has been low.<br>●If changes of the environmental temperature are large.<br>●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.）<br>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 page9.

- 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

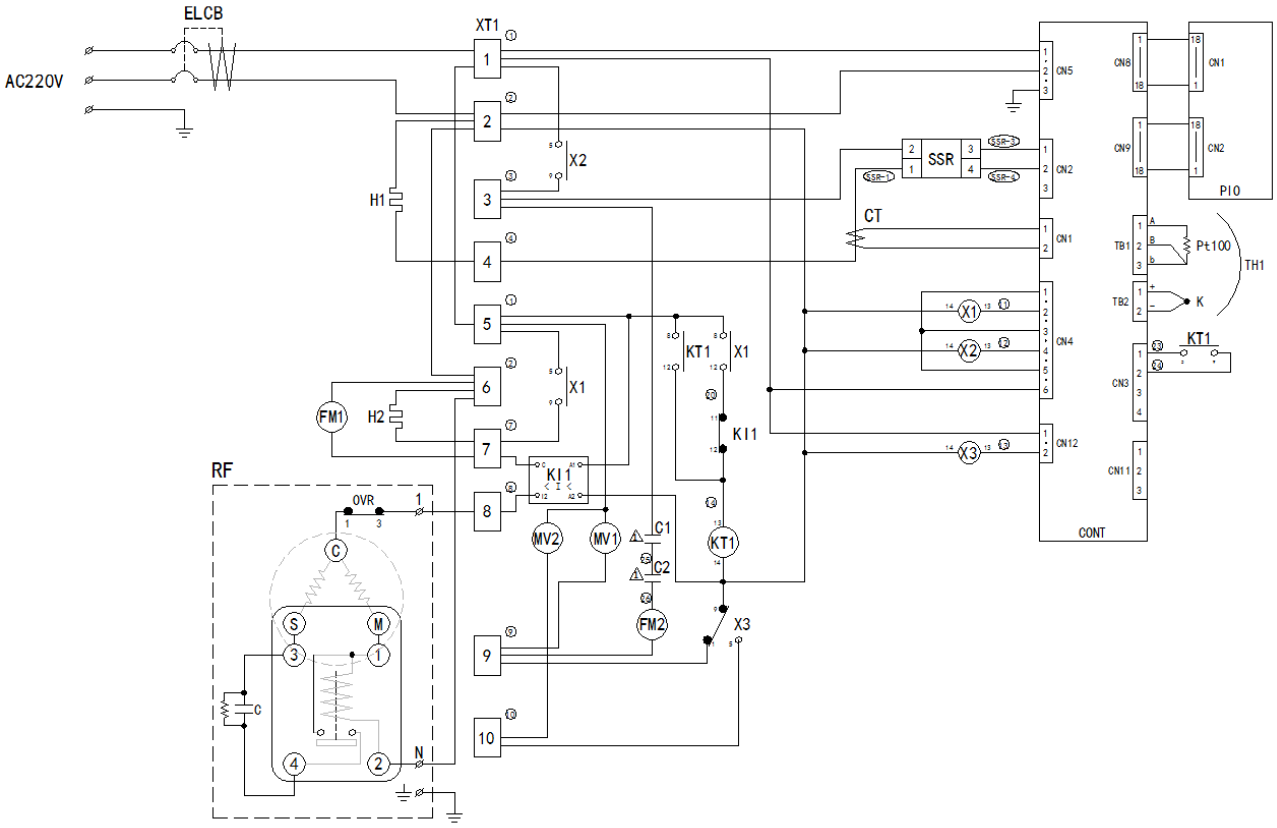
The minimum holding period of repair parts for this product is seven years after end of production.
Repair parts here refer to parts necessary for maintaining performance of the product.

# 10. Specifications

| Model | | IN613C | IN813C |
|---|---|---|---|
| System | | Forced convection circulation | |
| Operating temp. range | | -10℃～60℃ | |
| Temp. fluctuation | | ±0.5℃ | |
| Temp. distribution accuracy | | ±1.0℃ (at 37℃)<br>±1.5℃ (at other operating temp.) | |
| Temp. reach time | Max. temp. | 20℃→52℃ about 20mins | 20℃→52℃ about 20mins |
| | Min. temp. | 20℃→-4℃ about 45mins | 20℃→-4℃ about 45mins |
| Temp. control system | | Microcomputer PID control | |
| Temp. setting system | | Red 4-digit LED digital representation | |
| Temp. display system | | Green 4-digit LED digital representation | |
| Timer | | 1min-99hrs59mins and 100hrs-999.5hrs | |
| Time resolution | | 1min and 10mins | |
| Operation mode | | Fixed temp., Quick auto stop, Auto stop, Auto start, Program operation | |
| | | Program operation 3 modes 6 programs 1*30, 2*15 and 3*10 segs, Program repeat function | |
| Additional functions | | Cumulative time function | |
| | | Lock function, Power outage compensation, Calibration offset | |
| Refrigerator | | Air cooled fully hermetic compressor 158W | Air cooled fully hermetic compressor 300W |
| Refrigerant | | R134A | |
| | | 250±5g | 260±5g |
| Heater | Material | Ferrochrome wire | |
| | Capacity | 550W | 750W |
| Heater circuit control | | Contactless periodic pulse broadening mode | |
| Fan blade | | Cross flow blade | |
| Sensor | | Platinum temperature resistance body | |
| Interior | | SUS304 | |
| Exterior | | Cold rolled steel plate with chemical proof coating | |
| Insulating material | | Foam styrene (fluorine-free) | |
| Inner door | | Toughened glass 5mm | 2pcs toughened glass 5mm |
| Safety device | | Self-diagnosis function (abnormal temperature sensor, heater disconnection, abnormal display, SSR short circuit, automatic overheat prevention, abnormal measured temperature, compressor fault) | |
| Defrost structure | | Timing automatic ON/OFF, cycle operation | |
| Cable hole | | O.D.32mm (at the right side of the unit body) | |
| Internal dimension W×D×H (mm) | | 600×477×500 | 600×477×1000 |
| External dimension W×D×H (mm) | | 710×645×915 | 710×645×1630 |
| Internal capacity (L) | | 143 | 286 |
| Shelf load capacity | | 15kg/pc | |
| Shelf rest (pitch) | | 13 steps (30mm) | 23 steps (30mm) |
| Power supply | | AC220V 3.5A | AC220V 5.0A |
| Weight (kg) | | Approx.89 kg | Approx.115 kg |
| Accessories | Shelf plate | Stainless steel 3pcs | Stainless steel 5pcs |
| | Shelf rest | 6pcs | 10pcs |
| Optional | | External communication function (RS485), temperature output terminal, external alarm terminal/time reach output terminal, mixed waveguide connection recorder, a set of shelf plate, stand for IN613C | |

# 11. Wiring diagram

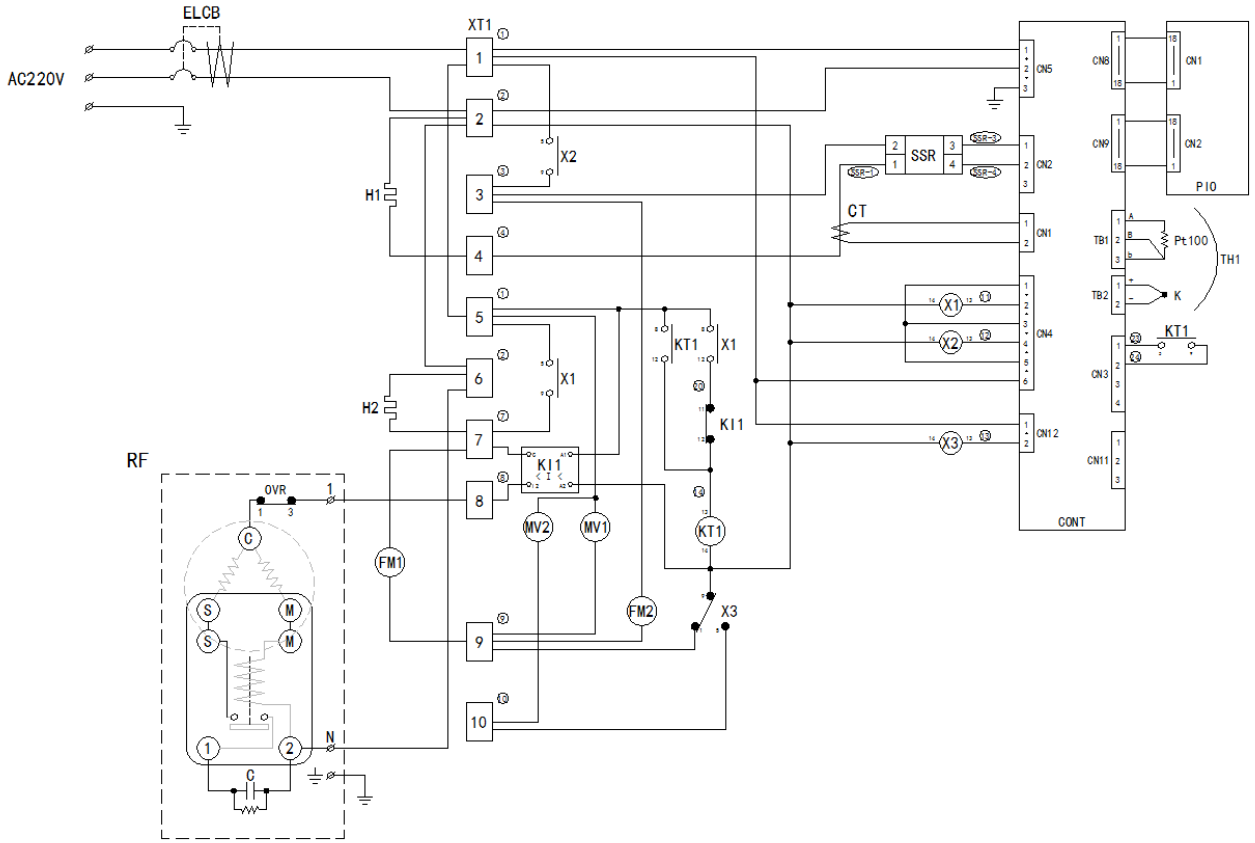
**IN613C**




| Symbol | Part name | Symbol | Part name |
|---|---|---|---|
| ELCB | Electric leakage breaker | SSR | Solid state relay |
| XT1 | Terminal block | CONT | Planar board |
| H1 | Heater (inside) | PIO | Display board |
| H2 | Heater (door) | CT1 | Current sensor |
| FM1 | Fan motor (freezer) | OVR | Over power relay |
| FM2 | Fan motor (inside) | C1 | Operation capacitor |
| MV1 | Solenoid valve (return pipe) | RF | Freezer |
| MV2 | Solenoid valve (defrost) | KI1 | Current relay |
| X1 | Relay (freezer) | KT1 | Time relay |
| X2 | Relay (internal heater) | C1 | Capacitor 2uf |
| X3 | Relay (defrost) | C2 | Capacitor 1.5uf |
| TH | Temperature sensor (double) | | |

# 11. Wiring diagram

**IN813C**




| Symbol | Part name | Symbol | Part name |
|---|---|---|---|
| ELCB | Electric leakage breaker | TH | Temperature sensor (double) |
| XT1 | Terminal block | SSR | Solid state relay |
| H1 | Heater (inside) | CONT | Planar board |
| H2 | Heater (door) | PIO | Display board |
| FM1 | Fan motor (freezer) | CT1 | Current sensor |
| FM2 | Fan motor (inside) | OVR | Over power relay |
| MV1 | Solenoid valve (return pipe) | C1 | Operation capacitor |
| MV2 | Solenoid valve (defrost) | RF | Freezer |
| X1 | Relay (freezer) | KI1 | Current relay |
| X2 | Relay (internal heater) | KT1 | Time relay |
| X3 | Relay (defrost) | | |

# 12. Replacement part table

**Common components**

| Part name | Code No. | Specification | Maker |
|---|---|---|---|
| Planar board | B011401053 | VS6 | YAMATO |
| Display board | B011402007 | VS mode | YAMATO |
| SSR | A011006023 | KS15/D-38Z25-L | YAMATO |
| Current relay | A011008004 | K8DT-AW2CA | OMRON |
| Temperature sensor (double) | A010502052 | T0304_03-78 PT and K | YAMATO |
| Time relay | A011004006 | H3Y-2 AC200-230V 30s | OMRON |
| Relay | A011002007 | HF13F/A2202Z1D | OMRON |
| Current sensor | B010509001 | CTL-6-S-4 | OMRON |
| Terminal block | B011301024 | MKH-250ABC-10P | YAMATO |
| Power cord | A011209001 | PSE JET VCTF 3×2.0mm2 | YAMATO |
| Electric leakage breaker | A010410007 | BV-DN 1P+N 10A 30mA | MITSUBISHI |
| Fan motor (inside) | A080104062 | HE30H420A22BF | YAMATO |
| Solenoid valve (return pipe) | A031800001 | 1028/2 | YAMATO |
| Solenoid valve (defrost) | A031800002 | 1028/3 | YAMATO |
| Fan motor (inside) | A011603020 | iQC3612-010105-C02 | YAMATO |
| Desiccator | A031502001 | 1/4" | YAMATO |

# 12. Replacement part table

IN613C

| Part name | Code No. | Specification | Maker |
|---|---|---|---|
| Compressor | A030200034 | EMT45HDR220-240V 50Hz | YAMATO |
| Heater | B080504011 | 550W/220V | YAMATO |
| Heater | B080504009 | 16W/220V | YAMATO |
| Evaporator | H050301009 | IN612C_01_06_02 | YAMATO |
| Capillary | SJA04177 | φ0.75×φ3×400 ㎜ | YAMATO |
| Capillary | SJA04178 | φ1.0×φ2.2×1800 ㎜ | YAMATO |
| Capacitor | A010201025 | CBB61 2UF | YAMATO |
| Capacitor | A010201026 | CBB61 1.5UF | YAMATO |

IN813C

| Part name | Code No. | Specification | Maker |
|---|---|---|---|
| Compressor | A030200035 | EMT6160Z 220-240V 50Hz | YAMATO |
| Heater | B080504012 | 750W/220V | YAMATO |
| Heater | B080504010 | 54W/220V | YAMATO |
| Evaporator | H050301010 | IN812C_01_06_02 | YAMATO |
| Capillary | SJA04177 | φ0.75×φ3×400 ㎜ | YAMATO |
| Capillary | SJA04178 | φ1.0×φ2.2×2600 ㎜ | YAMATO |
| Trundle | SJA06192 | 413S-N65 | YAMATO |
| Trundle (fixture) | SJA06193 | 420S-N65 | YAMATO |

# 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 |
|---|---|---|---|---|---|
| | | | | | |

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

## Responsibility

Please follow the instructions in this document when using this unit. Yamato Scientific has no responsibility for the accidents or breakdown of device if it is used with a failure to comply. Never conduct what this document forbids. Unexpected accidents or breakdown may result in.

## Note

- ◆ The contents of this document may be changed in future without notice.
- ◆ Any books with missing pages or disorderly binding may be replaced.

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Low Temperature Incubator
Model IN613C/813C
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