Constant Temperature Oven with a explosion proof vent (Safety oven)
Model DF411S/611S
Model DH411S/611S

Instruction Manual

First edition

Thank you for purchasing " Constant Temperature Oven with a explosion proof vent (Safety oven) DF 411S/611S/ DH411S/611S 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.

This paper has been printed on recycled paper.

Explanation of symbols

About symbols

A variety of symbols 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 symbols

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

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

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

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

Regular inspection

Warning

Use in a flammable or explosive gas atmosphere is forbidden

Never use the product in a flammable or explosive gas atmosphere. Otherwise, a fire or an explosion may result.

Always try to assure sufficient ventilation so that the operating atmosphere will not reach the explosion limit density.

Although the product has an explosion blast vent on the internal ceiling surface and the door lock function in case an explosion, it is not of the explosion proof construction.

Be sure to connect the ground wire.

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

Ban on operation when an abnormality occurs

When a smoke or a unusual odor is seen or sensed, immediately turn the power supply off, disconnect from the switch board and pull out the power plug. A fire or an electrical shock may result.

Never use electrical power cords bundled.

If power cords 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 use an explosive or flammable substance.

Never use explosive or flammable substances or any substances that contain them. Otherwise, a fire or an explosion may result.

“Explosive substance”

1. Nitroglycol, nitroglycerin, cellulose nitrate, and other explosive nitrate ester.
2. Trinitrobenzene, trinitrotoluene, picric acid, and other explosive nitro compounds.
3. Acetyl hydroperoxide, methyl ethyl ketone peroxide, benzoyl peroxide, and other organic peroxide.

“Flammable substance(combustible substance)”

Lithium (metal), kalium (metal), natrium (metal), yellow phosphorus, phosphorus sulfide, red phosphorus, celluloid, calcium carbide, lime phosphide, magnesium powder, aluminum powder, metal powder other than magnesium and aluminum powder, sodium dithionite (hydrosulfide).

“Flammable substance(oxidizing substance)”

1. Potassium chlorate, sodium chlorate, ammonium chlorate, other chlorates.
2. Potassium perchlorate, sodium perchlorate, ammonium perchlorate, other perchlorates.
3. Potassium peroxide, sodium peroxide, barium peroxide, other inorganic peroxides.
4. Potassium nitrate, sodium nitrate, ammonium nitrate, other nitrates.
5. Sodium chlorite, other chlorites.
6. Calcium hypochlorite, other hypochlorites.

“Excerpt from the separate table Article 6 of the Industrial Safety and Health enforcement ordinance”

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.

Never try to touch a hot part.

Some parts of the unit are hot during and immediately after operation. Take special care for possible burning.

If an explosion occurs

If an explosion should occur, immediately turn the source power off and contact the nearest dealer, one of our sales offices, or general customer service. For safety, never attempt to repair by yourself.

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.

How to install the product and preparation before use

Warning

1. Never fail to connect the earth wire.

In order to avoid an electric shock from earth leakage, never fail to connect the earth wire (green core of the power cord) to the earth wire or to the earth terminal. When your company does not have an earth conductor, consult your nearest electrical technician shop and connect the earth wire according to Article 18, the Electrical Installation Technical Standard (Class 3 earthing work of 100Ω or less).

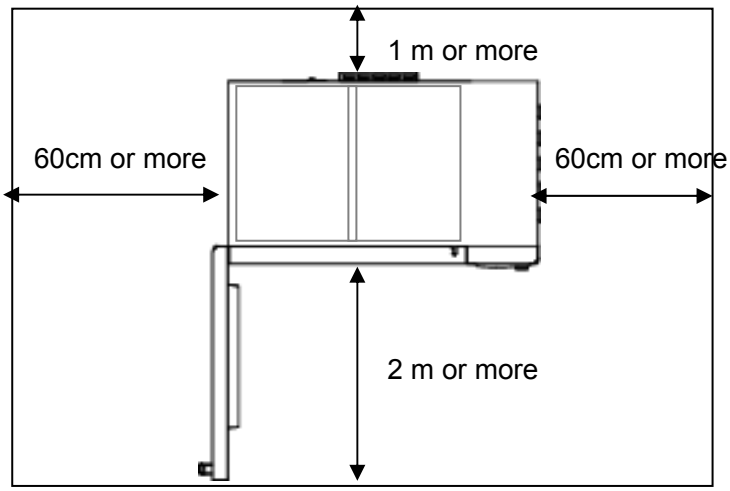
The power specification of models DF411S/DF611S and DH411S/DH611S are single phase 200V. Connect the wire securely to the switch board or a 200V outlet.

2. Carefully select an installation site.

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

- Where flammable gas or corrosive gas exists (See page-3)
- In the open air
- 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.



Make at least 2m of space on the ceiling (There shall be no lighting apparatus or other devices on the ceiling).

3. Operate the product with ventilation.

Operate the product with ventilation (after opening the damper) when heat processing specimen that will generate a flammable substance or a combustible gas. Also take appropriate measures to assure effective ventilation around the installation site. If ventilation around the product is not sufficient, hot wind from the exhaust port may raise the temperature in the installation room or the site is filled with smoke or gas generated from the specimen. Therefore, be sure to connect an exhaust duct to the exhaust port so that hot wind will be ejected outdoors. (See page 9.)

How to install the product and preparation before use

Warning

4. Connect the power plug to the dedicated switch board or outlet

Use a switch board or outlet that is suited to the electrical capacity.

Electrical capacity：				
	DF411S	AC200V	single phase	11A
	DF611S	AC200V	single phase	16A
	DH411S	AC200V	single phase	14A
	DH611S	AC200V	single phase	20A

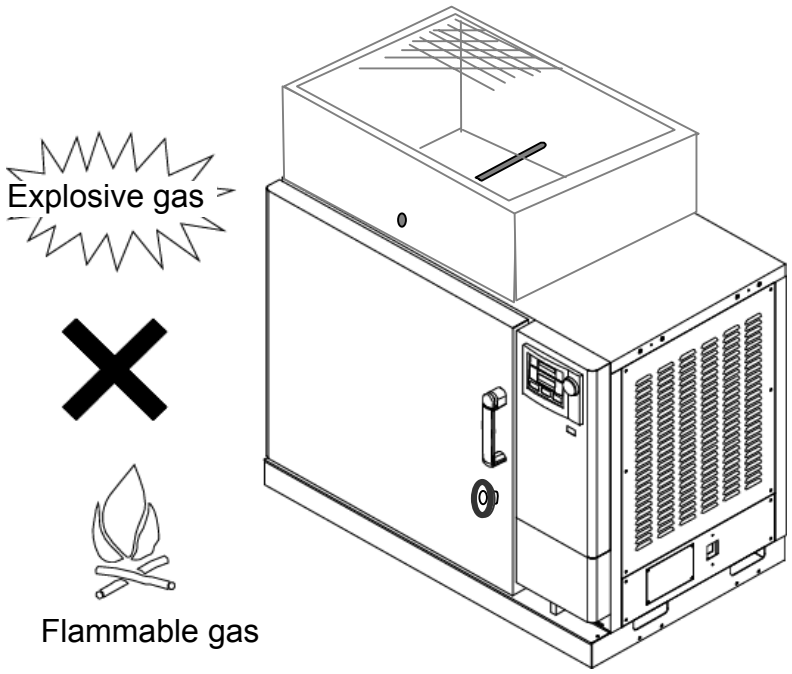
5. About connection of the power cord

The product has been designed to operate at single phase 200V, and ask your dealer or a nearest electric technician shop for connection of the power cord.

Connecting of it requires professional knowledge and skills and a fire or an electric shock may result if connected by an unqualified person.

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

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

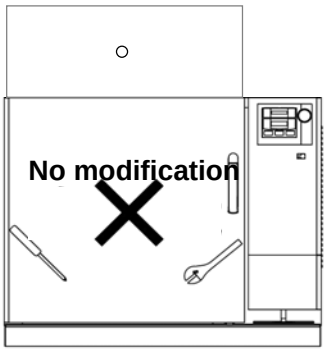


How to install the product and preparation before use

Warning

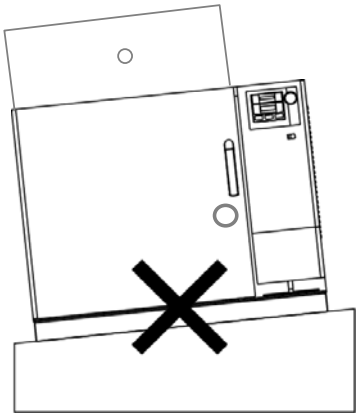
7. Do not attempt to alter the unit

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



8. Install the unit on a level surface

Install the unit on a level surface. Otherwise unexpected troubles or a malfunction may result.



Caution

9. After installation

The product might topple down and cause a personal injury from unpredicted earthquake or impact. We recommend establishing topple over preventive measures for safety.

How to install the product and preparation before use

⚠ Caution

10. Handling of a power cord

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

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

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

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

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

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

11. Setting shelf boards

Do not set a specimen without first setting a shelf board. Otherwise, the temperature in the container might rise to an abnormal level or a proper temperature control may not be possible and an accident or a malfunction may result.

Never use shelf boards other than those dedicated for the product. Otherwise, proper temperature control may not be possible.

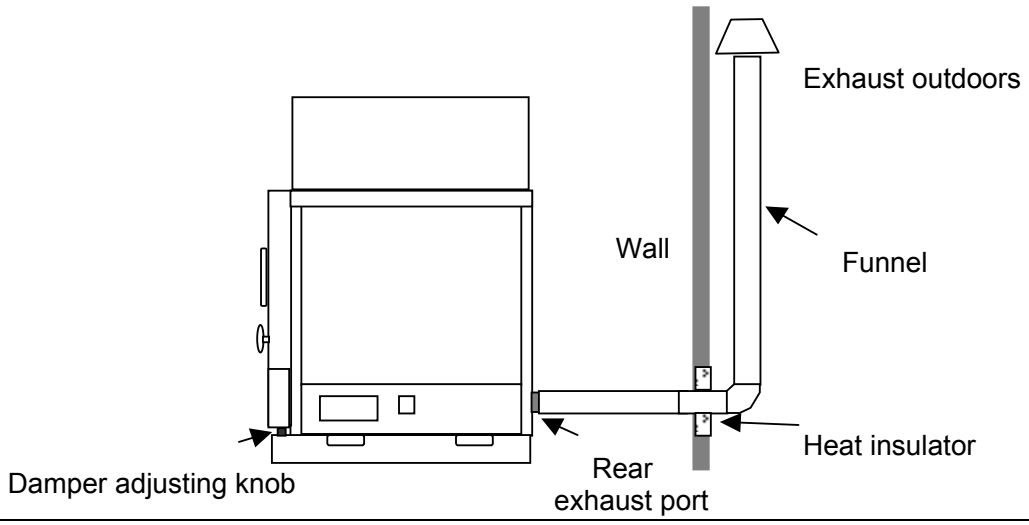
Set the included shelf boards to appropriate positions in the bath before operating the product.

Warning

1. Heat processing of flammable substances or combustible substances

When heat processing a material that will generate a flammable substance or a combustible gas, operate the product first opening the exhaust port and with effective ventilation after confirming the explosion limit density of contained materials.

Be sure to use an exhaust duct and assure exhaust outdoors so that exhaust gas or vapor of a solvent will not fill inside the room.



2. Heat processing of a specimen that contains a solvent

When heat processing a specimen that contains a solvent, first confirm the ignition point of such contained solvent and be sure to operate the unit at a temperature below the ignition point.

Operating the unit at a temperature above the ignition point may cause an explosion and is extremely dangerous.

3. About unusable substances

Never put an explosive substance, a combustible substance, and any substances that contain them that are forbidden for using for this product in the bath. Otherwise, a fire or an explosion may result. (See page 3.)

4. Heat processing of a specimen that has a risk of an explosion

Such specimen might cause an explosion from a spark at a switch, a relay, or a thermostat of the unit or a peripheral device. Be sure to operate the unit at or below the explosion limit density including the surrounding atmosphere.

5. About prohibition of use/treatment when an abnormal condition occurs

If a smoke is emitted or a strange odor is felt for some causes, immediately turn the electric leakage breaker and the source power supply off and ask inspection to the dealer, one of our sales offices, or the general customer service center.Leaving it as it is may cause a fire or an electric shock. The user shall never attempt to repair the unit, because it is extremely dangerous.

6. Do not put a foreign object inside the unit.

Do not insert a metal object or other foreign objects that are easily flammable into the openings of the bath (such as the exhaust port). Otherwise, a fire, an electric shock, or a burning may result.

If a foreign object enters inside the unit, immediately turn the electric leakage breaker and ask inspection to the dealer, one of our sales offices, or the general customer service center. Leaving it as it is may cause a fire or an electric shock.

Warning

7. About handling of a specimen

Be sure to wear thick cotton gloves before handling a specimen. The door, inside the bath, and the specimen are hot and may cause a burn.

8. When opening the door during operation at a higher temperature

Because the internal bath and the inside surface of the door are hot, never touch them when opening the door during operation at a higher temperature.

Also note that fire alarms, if installed around the unit, may activate erroneously.

9. Never attempt to touch hot surfaces.

Never attempt to touch the door or around the exhaust port during or immediately after operation. Hot surfaces may cause a burn.

Caution

1. When operating the unit for the first time

When you use the unit for the first time, a strange odor may generate at a higher temperature. This is due to decomposed binding agent contained in the heat insulator and does not indicate a malfunction of the unit.

Assure sufficient ventilation and operate the unit with no load at a higher temperature until such odor stops.

2. If you fully open the exhaust duct

The maximum operating temperature will not be reached if you fully open the exhaust duct.

If the temperature does not rise, adjust the opening of the exhaust duct.

3. When processing a specimen that contains moisture

When you want to process a specimen that contains moisture, open the exhaust damper; raise the temperature to remove moisture. When water exists inside the unit, an electric shock or a malfunction of the unit may result.

Never attempt to process a wet specimen.

4. About processing of a specimen

To improve temperature distribution within the bath, the unit employs air blow circulation. When processing powder specimen or a small specimen, make sure that the specimen will not scatter. Entering of a flammable material or a metal into the heater assembly may cause a fire or an electric shock.

Some time may be necessary for the temperature to rise when processing a large amount of specimen or a specimen with a larger thermal load. Confirm a correct amount as necessary and set the specimen. Note that the indicated temperature may become unstable when processing a heat-generating specimen [note however, the specimen must be free of risk of explosion, firing, or ignition of itself (whose density is less than the explosion limit density)].

⚠ Caution

5. About setting of a specimen

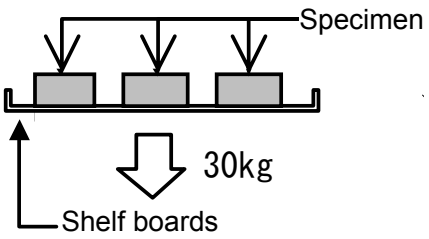
⃠ The withstand load of each shelf board included with the unit is about 30kg. Do not put any specimen that exceeds this load.

Set two or more specimens as dispersed as possible.

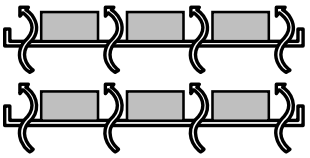
⃠ Putting too many specimens may prevent correct temperature control. To assure proper temperature precision, set specimens while securing at least 30% space on each shelf board.

⃠ The withstand load of a shelf board is 30kg when the load is evenly distributed.

Put specimens dispersed.



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



Secure at least 30% of space

6. Do not climb on the unit

⃠ Do not climb on the unit. The unit may topple over or be damaged and a personal injury may result.

7. Do not put any object on the unit

⃠ Do not put any object on the unit. The object may fall off and a personal injury may result.

Also, if an explosion should occur, such an object might cause an unexpected accident.

8. When a thunder is heard

❗ When a thunder is heard, immediately turn the electric leakage breaker and the power supply off. Leaving it as it is may cause a fire from a lightening.

9. If a power failure occurs

⚠ Even if a power failure occurs and the unit stops operation, the unit will automatically resume operation when power supply resumes.

⚠ Caution

10. About independent overheat preventive unit

Be sure to set the independent overheat preventive unit for safety. Set the temperature of the independent overheat preventive unit to a temperature +15℃ or more higher than that of the temperature controller.

11. About the operating temperature range

Always operate the unit within the specified operating temperature range.
Model DF411S/611S：40to 260℃
Model DH411S/611S：40to 360℃
Operating the unit outside the operating temperature range may cause a malfunction or an unexpected accident.

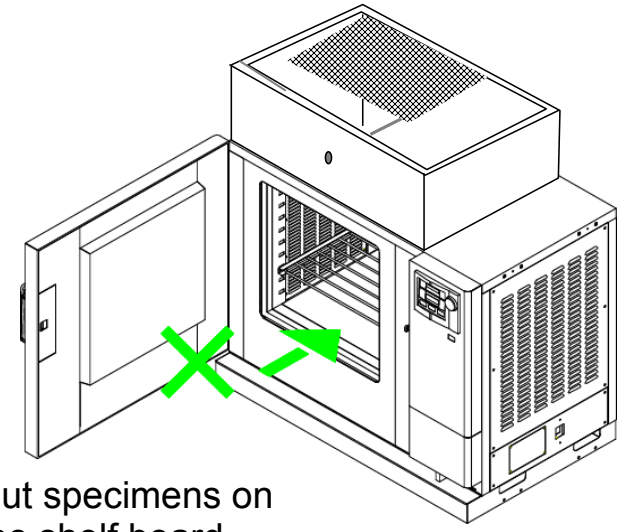
12. About the operating procedures

Always operate the unit following the procedures specified in this operation manual. Operating the unit other than the way indicated in the operation manual may cause a trouble.

Note that operating the unit other than the way indicated in the operation manual will void the product warrantee.

13. Do not put a specimen directly on the bottom surface of the internal bath.

Never place a specimen on the bottom surface because using the unit with a specimen directly placed on the bottom surface in the bath will prevent its maximum performance from exercising as well as the temperature in the unit may abnormally rise, which may cause a malfunction or an accident. Put a specimen on the shelf board included and place the board on the shelf pegs.



Put specimens on the shelf board

14. Prohibition of use of corrosive specimens

Although major paths for circulating wind are made of stainless steel, note that they may be corroded with strong acid.

⚠ Caution

15. When opening/closing the door

Do not put your hand or face close to the movable range (space) of the door when opening/closing the door. The door may hit your hand or face and cause a burn or an injury.

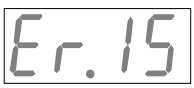
16. When using the cable port

When you have inserted a measurement sensor or a probe into the cable port, close the cover to the maximum extent possible and then securely seal it with heat-resistant packing or sealant taking care not to leave any gaps. Insufficient seal will degrade temperature characteristics or other performances.

Indications and countermeasures when an abnormality occurs

1. Abnormality in the electric system

When an abnormality occurs, the buzzer sounds, the “Error lamp” flashes, “Error No.” appears in the main display, and description of the abnormality and countermeasures appears in the sub display.

Er.No	Error name	Main Display	Sub display
Er.00	Communication Er		Communication Er Ex a connection
Er.01	Sensor Error		Sensor Error Calls a service
Er.02	SSR Error		SSR Error Calls a service
Er.03	Heat Error		Heat Error Calls a service
Er.04	Fan Error		Fan Error Calls a service
Er.05	Auto-damper Er		Auto-damper Er Calls a service
Er.07	Overheat Error		Overheat Error Calls a service
Er.08	Controller Er		Controller Er Calls a service
Er.10	Main relay Er		Main relay Er Calls a service
Er.14	RAM Error		Controller Er Calls a service
Er.15	EEPROM Error		Controller Er Calls a service

How to take countermeasures

- If any of the error codes above appears, note the code, and immediately turn power off.
- When “Er14” is displayed, turn the breaker once off, wait at least 30 seconds, and then turn the breaker on again. If “Er14” remains on the display even if you have turned the breaker on again, contact the general customer service center.
- If an abnormality occurs, you will need to either replace the relevant part or inspect the unit. Contact the general customer service center. Be sure to tell the error No. you noted when contacting us. (See page 59 “After sales service and warranty”.)

Indications and countermeasures when an abnormality occurs

2. Measures when an explosion occurs

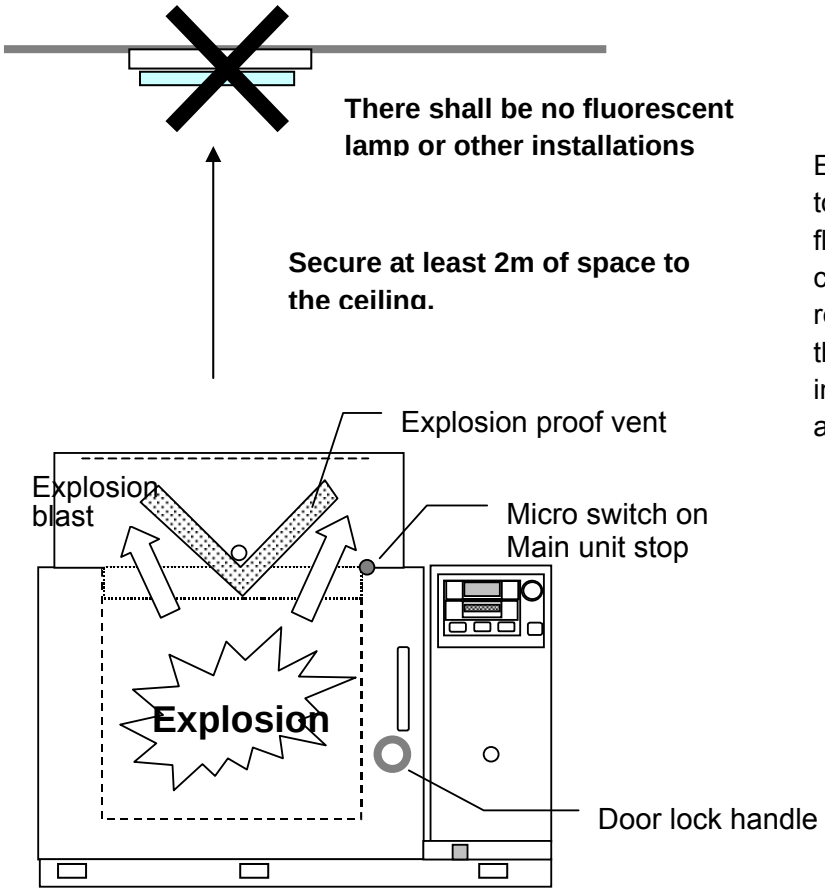
When an explosion should occur, you need to replace the explosion proof vent and inspect the unit to reuse the unit and therefore be sure to ask the nearest dealer, one of our sales offices, or the general customer service center for repair.

Also take care to remove the causes of the explosion before reusing the unit.

Construction of the explosion proof vent

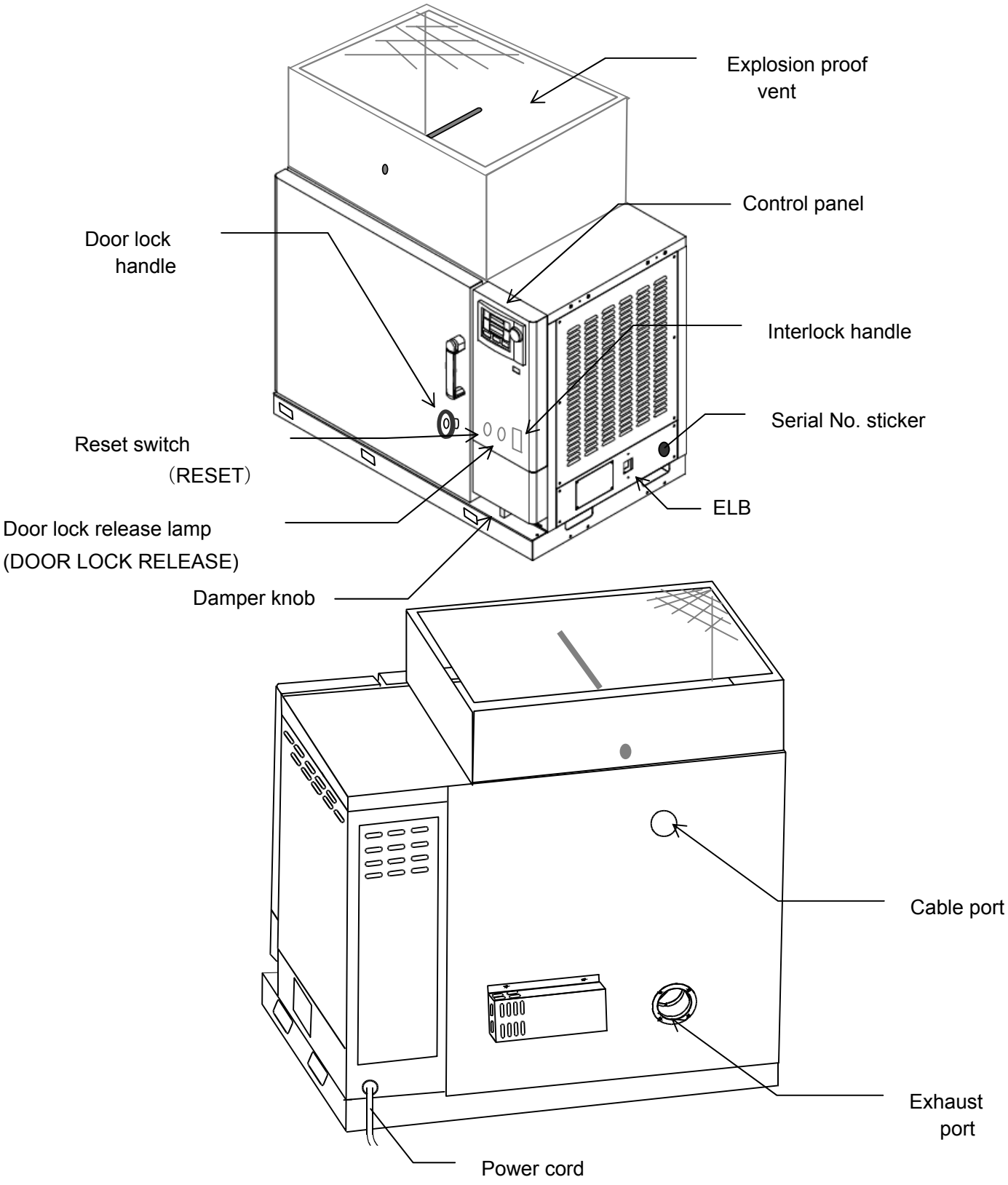
The power of the main unit will not turn on unless the door lock handle is locked for safety.

An explosion will pop up the explosion proof vent (an aluminum plate and heat insulating material) on the ceiling of the internal bath, activating the micro switch and stops supply of power.

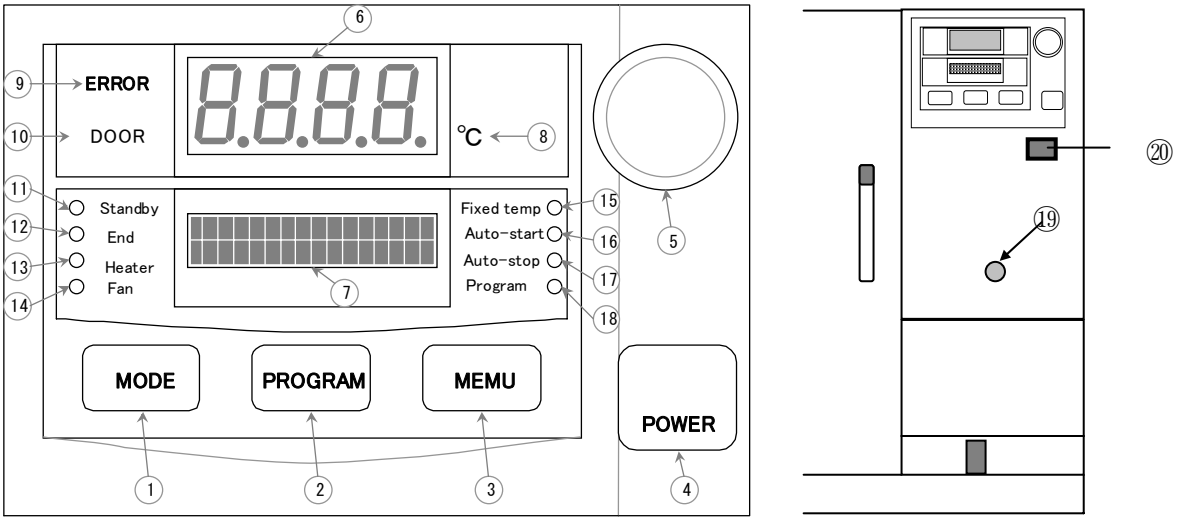


Explosion blast will blow up toward the ceiling. If there are fluorescent lamps on the ceiling, secondary disaster may result. Install the unit at a place that seems to be free of installations that might present a risk.

Main unit


Explosion proof vent
Control panel
Door lock handle
Interlock handle
Serial No. sticker
Reset switch
（RESET）
ELB
Door lock release lamp
(DOOR LOCK RELEASE)
Damper knob
Cable port
Exhaust port
Power cord

Operation Panel



No	Name	Description
1	Function menu key	Key to activate/release the function menu
2	Program key	Key to activate/release the program menu
3	Operation menu key	Key to activate/release the operation menu
4	Power key	Key to turn power on/off
5	Jog dial	Key to select a menu item and key to edit a parameter
6	Main display	Displays the temperature in the bath and an error No.
7	Sub display	Displays various pieces of information in text
8	℃ lamp	Stays on while the temperature in the bath is displayed on the main display
9	Error lamp	The lamp flashes when an error occurs to the unit
10	Door open lamp	Comes on when the door is opened
11	Standby lamp	Stays on in the standby mode and flashes while waiting for operation start
12	End lamp	Flashes when auto stop is activated or program operation is finished
13	Heater lamp	Stays on while power is supplied to the heater
14	Fan lamp	Stays on while power is supplied to the fan
15	Fixed temp lamp	Stays on during fixed temperature operation and flashes when selecting an operation mode
16	Auto start lamp	Stays on during auto start operation and flashes when selecting an operation mode
17	Auto stop lamp	Stays on during auto stop operation and flashes when selecting an operation mode
18	Program operation lamp	Stays on during program operation and flashes when selecting an operation mode
19	Door lock release lamp	The lamp goes off when the door lock handle is tightened and comes on when it is loosened.
20	Independent overheat preventive unit	The heater will be shut off when the temperature in the bath rises from abnormal heating according to the set temperature on the preventive unit.

⚠ Warning

In order to avoid an electric shock, never fail to connect the earth wire (green core of the power cord) to the earth wire or to the earth terminal.

- Never connect the earth wire to a gas or a water pipe.
- Do not use a branch socket, which will cause heat generation and is dangerous.
- Do not install the earth wire in an environment where flammable or corrosive gas exists.

⚠ Caution

Confirmation of the switch board

- Connect the power cord to the correct switch board.

Confirmation of the safety

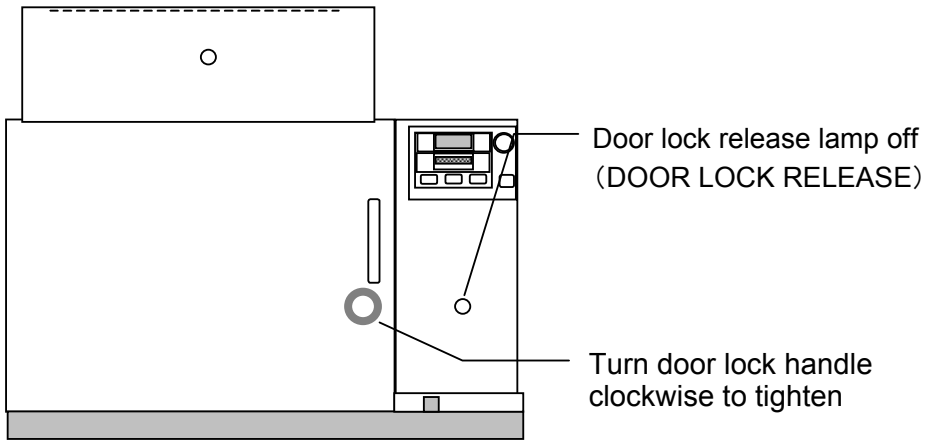
- Confirm that the independent overheat preventive device is set at a temperature 15℃ or more higher than the temperature in the unit you use.

Confirmation of charging

- In order to charge the data backup battery contained in the controller, turn the breaker on so that the unit remain live for 25 hours or more when the unit is delivered and initially installed and after the breaker has been left off for a long time.

Setting a specimen and door interlock

1. **Place a specimen on the shelf board in the bath and then turn the electric leakage breaker ON.**
2. **Turn the door interlock switch ON and tighten the door lock handle until the DOOR LOCK RELEASE lamp goes off.**



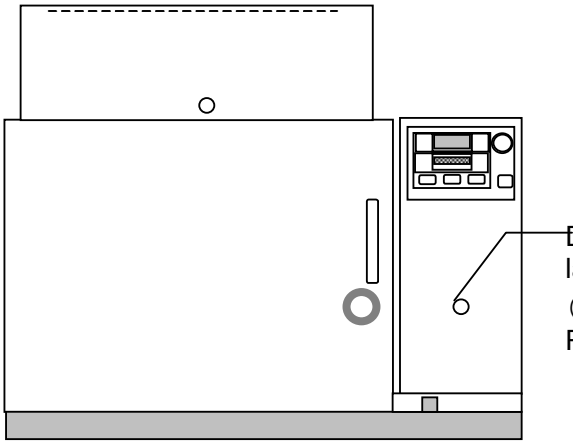
This will activate the door interlock function and operation is possible.

A door interlock function acts in this state, and driving is in a possible condition.

If the clamping of the door lock steering wheel is weak, a device does not work normally.

3. Procedures for terminating operation and stopping operation in the middle of it

I loosen a door lock steering wheel at the time of the driving end (a driving stop in the way), and please open a door.



Be sure to turn the RESET switch OFF after terminating operation.

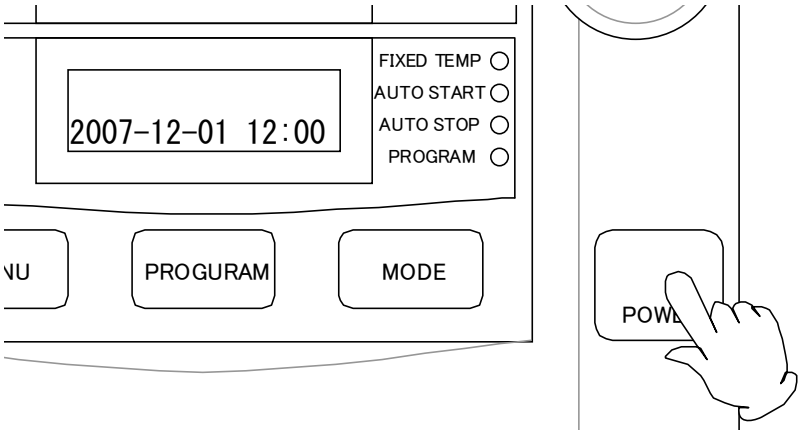
Precautions for use

1. Open the exhaust damper to assure appropriate ventilation amount so that evaporated gas from the specimen will not reach the explosion limit density.
2. Connect the exhaust duct to prevent evaporated gas from filling the room.
3. Never operate the unit at a temperature over the ignition point of the solvent.
4. Do not place an ignition source in the bath.
5. Take care to assure proper ventilation in the room the unit is installed and take preventive or counter measures against spreading of burn and explosion blast.

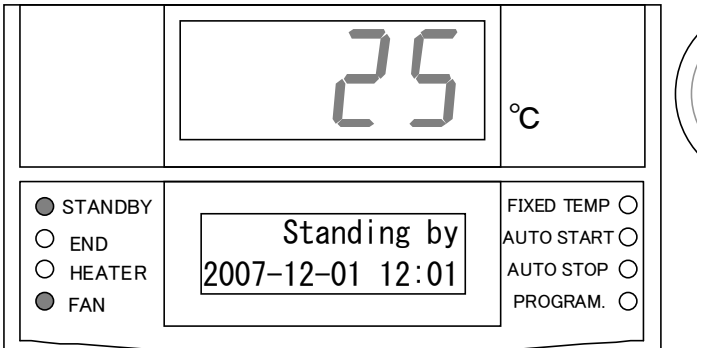
Press the power key on the controller.

- While power is off, the present date and the time are indicated on the sub display.
  * Note that the clock is not set correctly at the time of shipping. Set the date and the time correctly referring to the procedures in “How to set the clock” on page 53.

Press the “Power key”



- A beep is heard and power turns on.



- When you turn power on, the fan will rotate and the “FAN lamp” comes on. The temperature in the bath will appear on the main display and the “C lamp” comes on. The text “Standing by” will appear on the sub display and the “Standby lamp” comes on. This state is called “Standby”.

- Press the “Power key” again to turn power off.

- When the unit is operated for the first time, power is off. When you turn the electric leakage breaker off during operation, or main power is shut off due to power failure, the state will return to the one before main power is shut off. This is called “Instantaneous stop recovery function”.

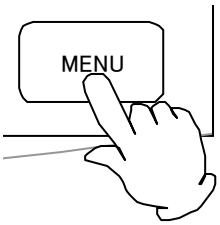
There are four “Operation modes” in terms of operation functions.

No	Operation mode	Function
1	Fixed temp. operation	Temperature is controlled continuously at a fixed temperature.
2	Auto start	Starts operation at the predefined time.
3	Auto stop	Stops operation at the predefined time.
4	Program operation	Starts program operation at the predefined time.

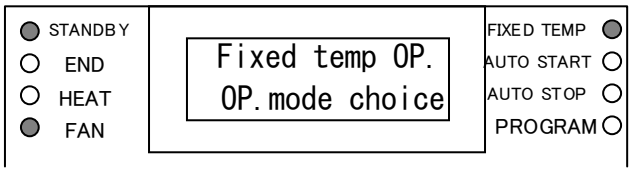
To select an operation mode

Make sure that power is on.

1. Press the “Operation menu” key.



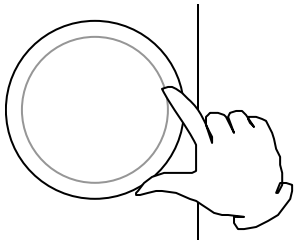
- The operation menu will activate and you will move to the operation mode selection screen.



- In the operation mode selection screen, the name of the operation mode currently selected flashes in the sub display and the corresponding operation mode lamp flashes.
  * At the time the unit is used for the first time, the fixed temperature operation is selected. In other cases, the operation mode last activated will be selected.

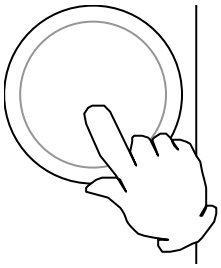
No.	Operation mode	Indicate lamp	Sub display
1	Fixed temp OP.	Fixed temp Lamp	Fixed temp OP. OP. mode choice
2	Auto-start OP.	Auto start Lamp	Auto-start OP. OP. mode choice
3	Auto-stop OP.	Auto stop Lamp	Auto-stop OP. OP. mode choice
4	Program OP.	Program OP. Lamp	Program OP. OP. mode choice

2. Turn the “Jog dial”



- The operation mode will change serially and select an operation mode you want.

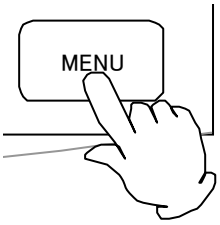
3. Press the “Jog dial”



- This determines the operation mode. Then the screen changes to the input screen for each operation mode.

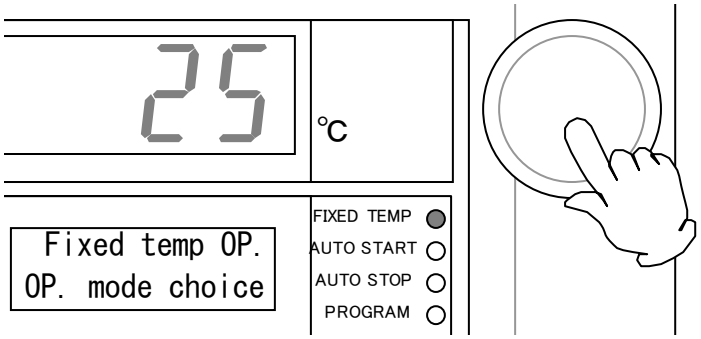
4. To “Cancel”

- When you want to cancel an operation menu, press “Operation menu” key again.



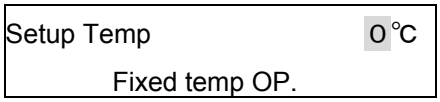
1. Select “Fixed temp. operation mode”

- Display “FIXED TEMP” in the operation mode selection screen and press the Jog dial.



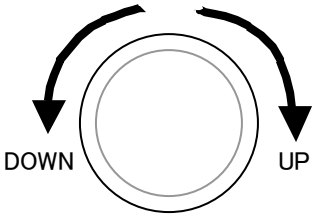
2. Inputting a “Setup temperature”

- The screen will change to the setup temperature input screen, “Setup Temp” will be displayed on the sub display, and figures that indicate the temperature will flash.

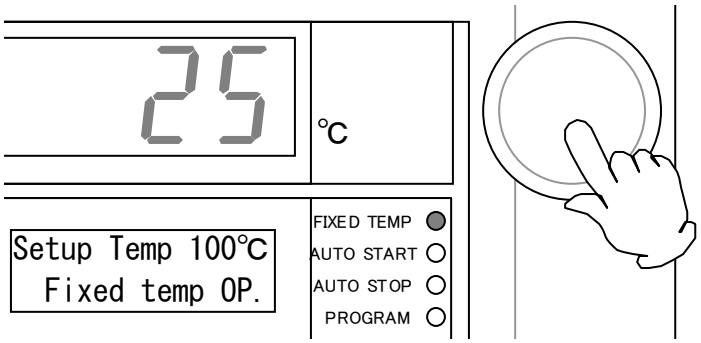


(Setup temperature input screen)

- Turn the Jog dial to display the setup temperature you want.

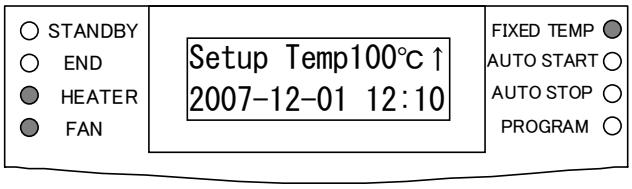


3. Press the “Jog dial”



- The setup temperature is determined and the fixed temperature operation will start.

・ Once the fixed temperature operation is started, the heater repeats on and off according to the setup temperature. The “Heater lamp” stays on while the heater is on. The status of the “Fixed temperature operation lamp” will change from flashing to on.



・ The setup temperature is displayed on the sub display during the fixed temperature operation and the “Arrow” that indicates the temperature control status flashes. The direction of this arrow will be as follows depending on the relationship between the setup temperature and the temperature in the bath when the fixed temperature operation is started.

Setup Temp	１００℃↑
2007－12－01	１２：１５

(When the setup temperature is higher than the temperature in the bath)

Setup Temp	１００℃↓
2007－12－01	１２：１５

(When the setup temperature is lower than the temperature in the bath)

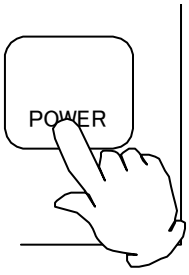
・ The direction of the arrow will change as follows when the temperature in the bath becomes the setup temperature ±2.5℃.

Setup Temp	１００℃→
2007－12－01	１２：１５

(When the temperature in the bath reached the setup temperature)

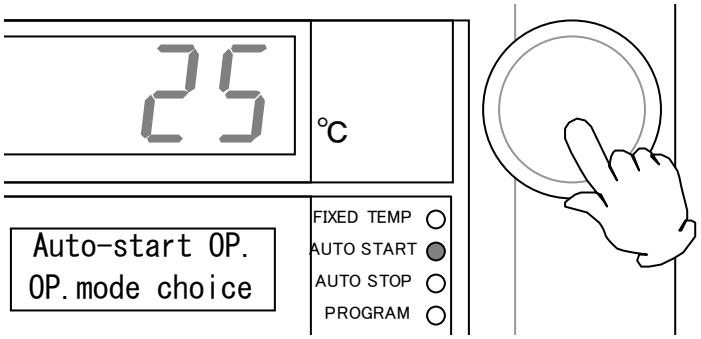
4. To “Stop”

・ To stop operation, press the “POWER" key.



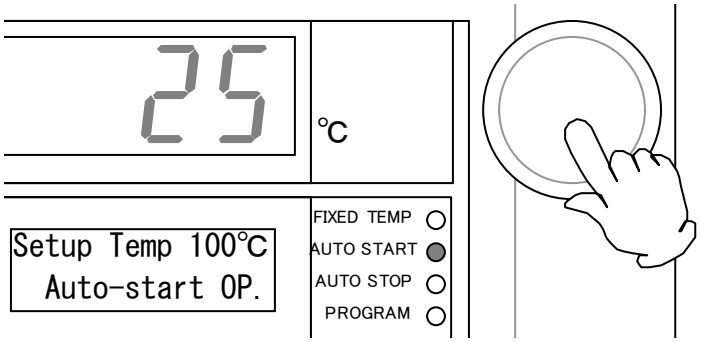
1. Select “Auto start mode”

- Display “AUTO START” in the operation mode selection screen and press the Jog dial.



2. Inputting and determining a “Setup temperature”

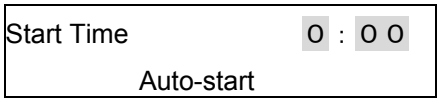
- Input a setup temperature with the Jog dial and then determine it.



3. Inputting “Operation wait time/start time”

- When the setup temperature is determined, the screen will change to the input screen for the operation start wait time or the operation start time. When the timer mode setting is “Wait Time”, the screen changes to the one for inputting the operation start wait time and if it is “Start Time”, the screen changes to the one for input the operation start time.
  * At the time of shipping “Wait Time” is selected. See page 47 for the timer mode.

(Input screen for the operation start wait time)



(Input screen for the operation start time)

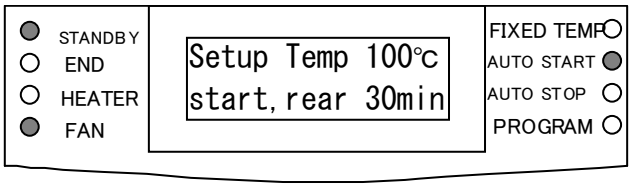
- When inputting the operation start wait time, the display method will change depending on the range of time to be displayed as follows.

Range	Display
0 to 59 min.	0min to 59min
1hr to 99hrs 59min	1h00m to 99h59m
100hrs to 999hrs	100hr to 999hr

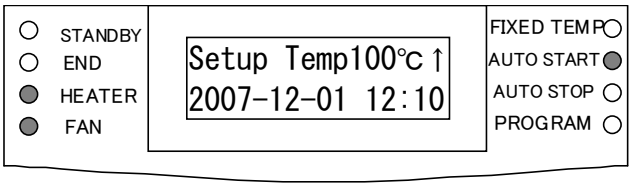
- Turn the Jog dial to display the wait time or the start time you want.

4. Press the “Jog dial”

- The operation wait time/start time is determined and the status changes to the operation wait status for the auto start mode. In the operation start wait status, the “Auto Start lamp” will change from flashing to on and the “Standby lamp” flashes. The setup temperature and the remaining time before operation start will be displayed on the sub display.

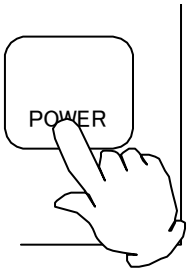


- Operation will start when the remaining time becomes 0. When operation starts, the “Standby lamp” goes off and the indications on the sub display will be the same as in the Fixed temperature operation.



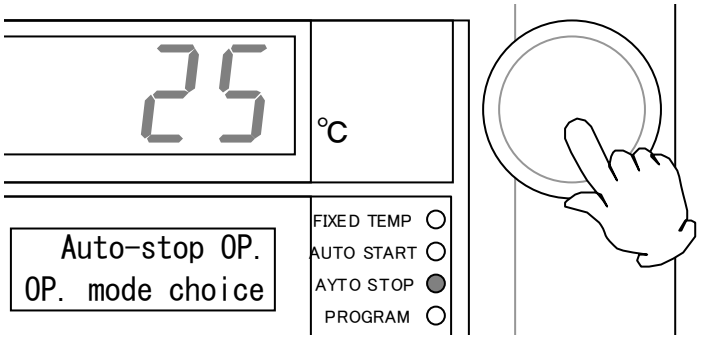
5. To “Stop”

- To release the operation start wait status or to stop operation, press the “POWER" key.



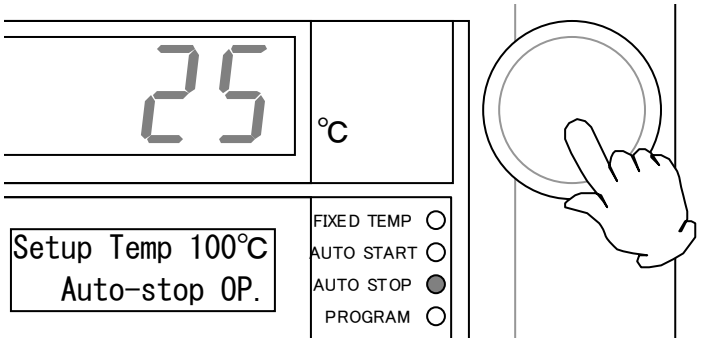
1. Select “Auto stop mode”

- Display “AUTO STOP” in the operation mode selection screen and press the Jog dial.



2. Inputting and determining a “Setup temperature”

- Input a setup temperature with the Jog dial and then determine it.



3. Inputting and determining a “Operation time/operation stop time”

- When the setup temperature is determined, the screen will change to the input screen for the operation start wait time or the operation stop time. When the timer mode setting is “Time”, the screen changes to the one for inputting the operation time and if it is “Clock”, the screen changes to the one for inputting the operation stop time.

stop Time 30min
Auto-stop OP.

(Edit screen for operation time)

stop Time 0:00
Auto-stop OP.˚

(Edit screen for operation stop time)

- Turn the Jog dial to display the wait time or the start time you want and press the Jog dial.

4. Selecting and determining the “Wait” function

- The wait function selection screen appears only when the timer mode setting is “Wait Time”. The screen will not appear when the timer mode setting is “Start Time” and proceed to the next “Selecting the fan function”.
- Turn the Jog dial and select “On” or “Off” and press the dial to enter.

(The wait function selection screen)

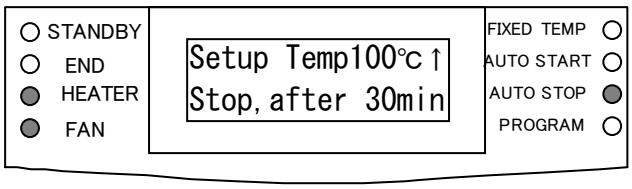
5. Selecting the “Fan function”

- Turn the Jog dial and select “On” or “Off” and press the dial to enter.

(The fan function selection screen)

6. Press the “Jog dial”

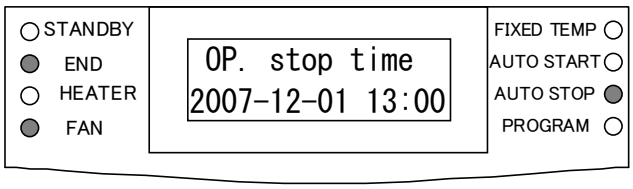
- The fan function is determined and the Auto Stop mode operation will start. The “Auto Stop lamp” changes from flashing to on and the sub display displays the setup temperature and the remaining time to the stop of operation.



- When the wait function is “On”, the timer count down is tentatively stopped when the temperature in the bath is lower than the setup temperature by 3℃ or more, or is higher than the setup temperature by 6 ℃ or more, and “Waiting” flashes in the sub display.

(Indication in the Waiting state)

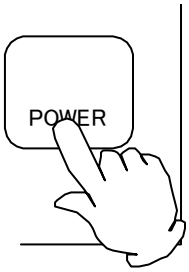
- Operation will stop when the remaining time becomes 0. When operation is stopped, the “End lamp” will flash and the operation end time appears in the sub display.



- When you have selected “Off” for the fan function, the fan will stop at the same time as the completion of operation.

7. To “Stop”

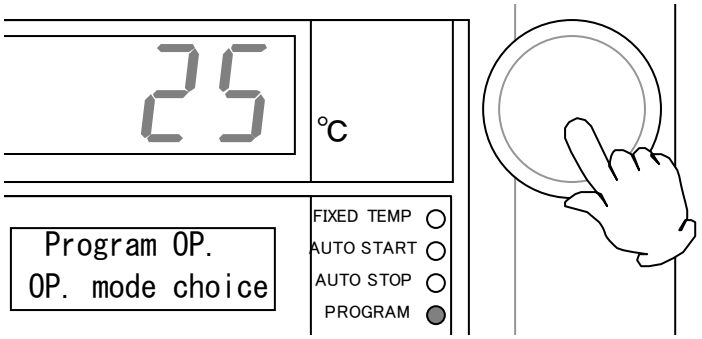
- To stop operation in the middle of it, press the “POWER" key.



To start Program operation, first register a program in the “Program menu”.

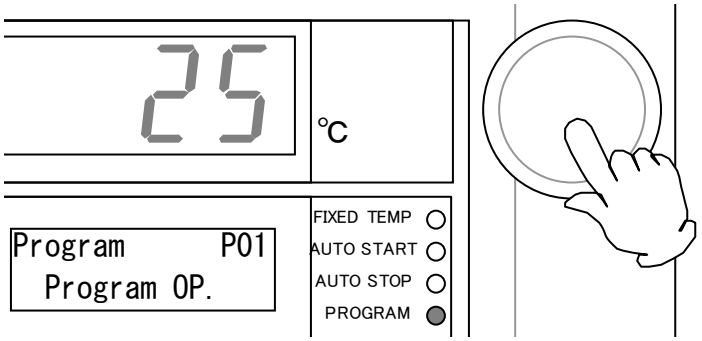
1. Select “Program operation mode”

- Display “Program OP.” in the operation mode selection screen and press the Jog dial.



2. Selecting and determining the “Program No”

- Select a program no with the Jog dial and then determine it.



- When there is no program registered, the buzzer beeps and a message appears in the sub display. In this case, register a program again in the “Program menu” and repeat the procedures.

A program isn’t Registered

(Indication when no program is registered)

3. Editing “Operation wait time/start time”

- When the program no is determined, the screen will change to the edit screen for the operation start wait time or the operation start time. When the timer mode setting is “Time”, the screen changes to the one for editing the operation start wait time and if it is “Clock”, the screen changes to the one for editing the operation start time.

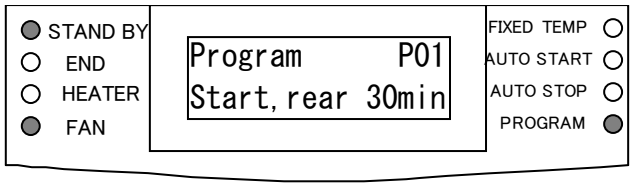
(Edit screen for the operation start wait time)

(Edit screen for operation start time)

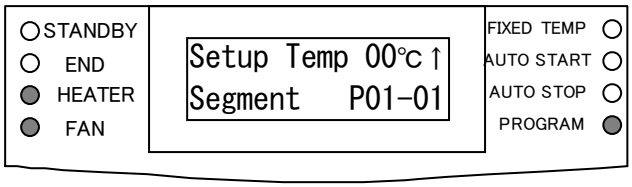
- Turn the Jog dial to display the wait time or the start time you want.

4. Press the “Jog dial”

- The operation wait time/start time is determined and the status changes to the operation wait status for the Program OP mode.
  In the operation start wait status, the “Program lamp” will change from flashing to on and the “Standby lamp” flashes. The Program no and the remaining time before operation start will be displayed on the sub display.



- Program operation will start when the remaining time becomes 0. When operation starts, the “Standby lamp” goes off and the number of segment being executed and the setup temperature appear in the sub display.



- During the Ramp operation, the segment no and the remaining Ramp time will be displayed alternately.

(No. of segment being executed)

↓

(Remaining Ramp time)

- During the Soak operation, the segment no and the remaining Soak time will be displayed alternately. However, the “Waiting” message will flash during wait.

Setup Temp	１００℃↑
Segment	Ｐ０１－０１

(No of segment being executed)

↓

Setup Temp	１００℃↑
Soak , after	３０ｍｉｎ

(Remaining Soak time)

Setup Temp	１００℃↑
Waiting	３０ｍｉｎ

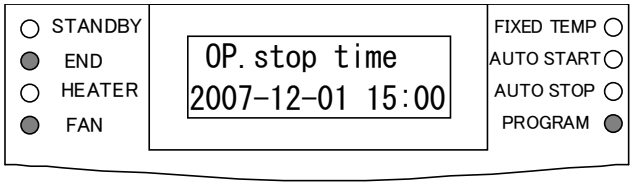
(During Waiting state)

- While a segment in the repeat zone is being executed, the segment no and the remaining repetition times will appear alternately.

Setup Temp	１００℃↑
Rep. rest	１０

(Remaining repetition times)

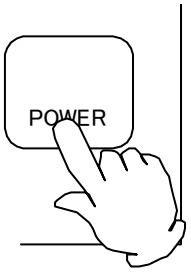
- When operation is completed, the “End lamp” will flash and the operation end time appears in the sub display.



- When you have selected “Off” for the fan RPM in the end segment of a program, the fan will stop at the same time as the completion of operation.

5. To “Stop”

- To release the operation start wait status or to stop operation in the middle of it, press the “POWER" key.



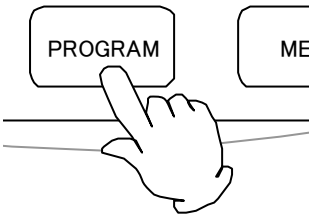
There are three functions below can be selected from the program menu.

No	Function name	Description
1	Creation of a new program	Function to create and register a new program
2	Program edit	Function to edit and confirm a registered program
3	Program delete	Function to delete a registered program

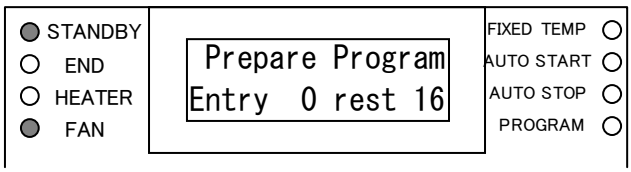
To select a function from the program menu

- Make sure that power is on.

1. Press the "PROGRAM" key



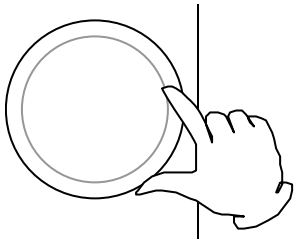
- The Program menu activates and the screen changes to the function selection screen.



- The number of registered programs and segments are displayed and the name of the function currently selected flashes in the sub display.

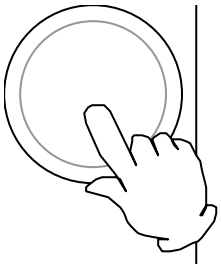
No.	Function name	Sub display
1	Prepare Program	Prepare Program Entry 0 rest 16
2	Edit Program	Edit Program Entry 0 rest 16
3	Delete Program	Delete Program Entry 0 rest 16

2. Turn the “Jog dial”



- Function names will change sequentially.

3. Press the “Jog dial”



- The type of the function is determined and the screen changes to the input screen for each function.

4. To “Cancel”

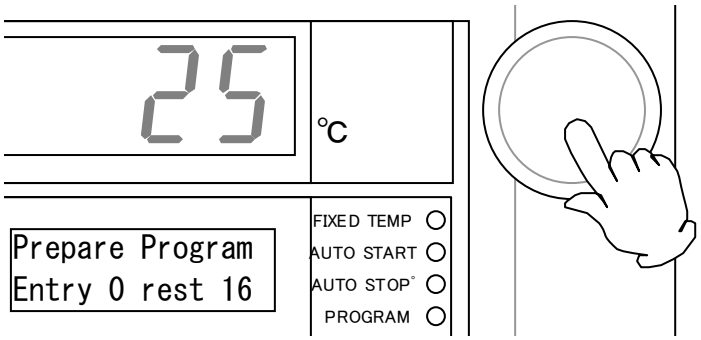
- When you want to cancel the Program menu, press “PROGRAM” key again.

First make sure that the number of remaining segments is not 0.

When the number of remaining segments is 0, delete one of registered programs before creating a new one.

1. Select “Prepare Program”

- Display “Prepare Program” in the function selection screen in the Program menu and press the Jog dial.



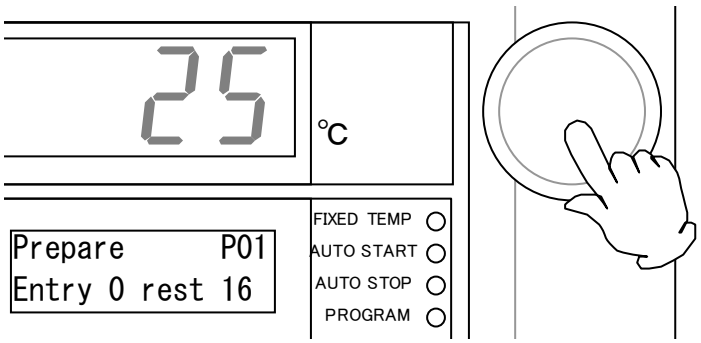
2. Selecting a “Program No”

- The screen will change to the Program no selection screen, “Prepare Program” will be displayed on the sub display, and figures that indicate the Program no will flash. Turn the Jog dial to display a program no you want from “P01” to “P99”.
  * Note however, the number of programs already registered will not be displayed.

Prepare			P 0 1
Entry	0	rest	1 6

(Program no selection screen)

3. Press the “Jog dial”

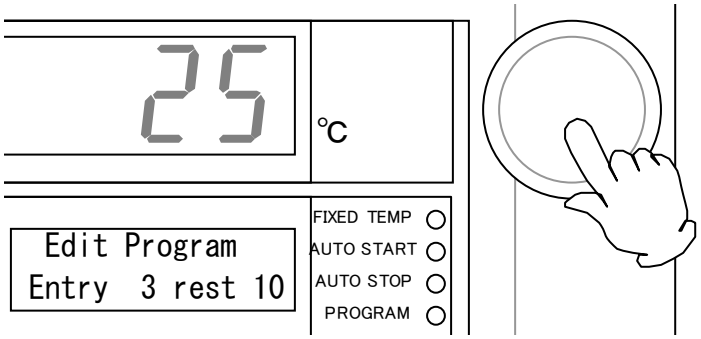


- Now the Program no has been determined. Once a program no has been determined, the screen will change to the “Segment Edit” screen and proceed to page 37.

First make sure that the program is registered.

1. Select “Edit Program”

- Display “Edit Program” in the function selection screen in the Program menu and press the Jog dial.



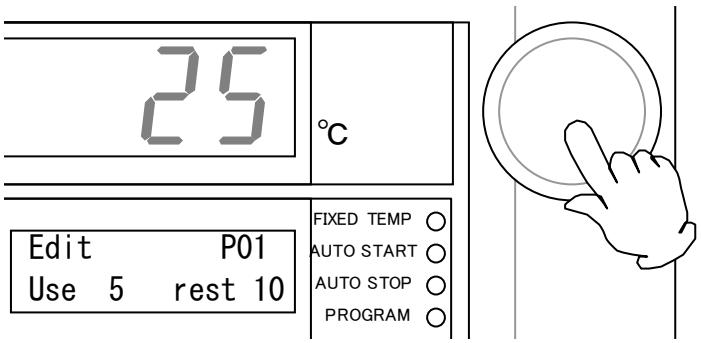
2. Selecting a “Program No”

- The screen will change to the Program no selection screen, “Edit Program” will be displayed on the sub display, and figures that indicate the Program no will flash. Turn the Jog dial to display the number of the program you want to edit from the registered programs. The number of segments that the selected program uses and the number of remaining segments will appear in the lower part of the sub display.

Editing	P 0 1
Use 5	rest 1 0

(Program no selection screen)

3. Press the “Jog dial”



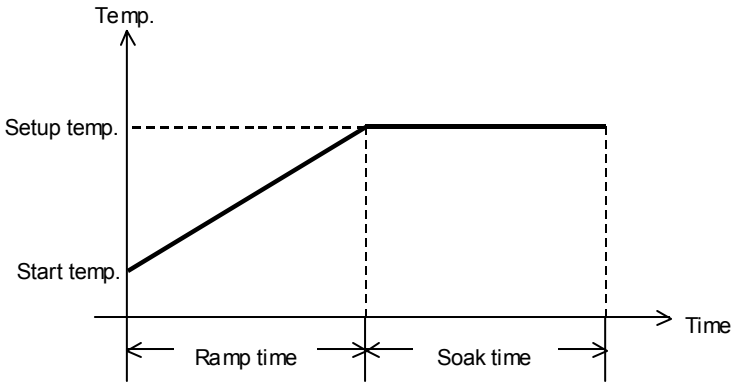
- Now the Program no has been determined. Once a program no has been determined, the screen will change to the “Segment Edit” screen and proceed to page 37.

One segment has 12 types of setting items (when full options are installed).

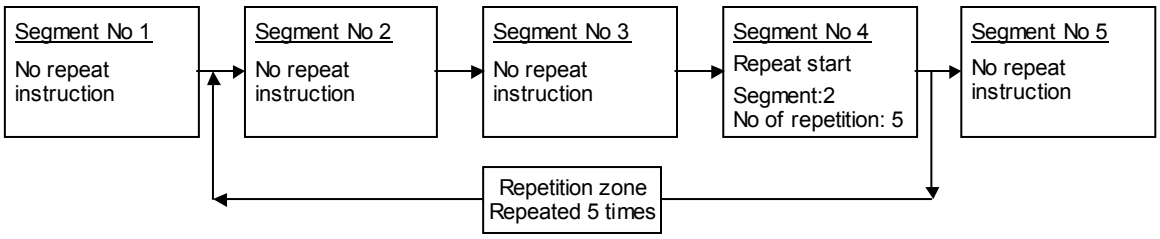
No	Name	Setting range	Options
1	Ramp time	Step, 1min to 999 hrs, end	
2	Setup temperature	Setup temperature range of each model	
3	Soak time	0min to 999 hrs, hold	
4	Wait function	Off, on	
5	Fan RPM	Off, 1 to 10 (or on)*	○
6	Damper open degree	0%、25%、50%、75%、100%	○
7	Event function 1	Off, on	○
8	Event function 2	Off, on	○
9	Event function 3	Off, on	○
10	Event function 4	Off, on	○
11	Repetition start segment	Does not exist, 1 to 16 no of registered segments	
12	Number of repetitions	1 to 9999, limitless	

※ When the “Wind speed changing unit” option is not installed, “On” and “Off” for the fan may be selected only for “End segment”.

- The concept of a segment is as shown below. However, when executing the segment no 1 immediately after starting the Program operation, the “Start temperature” corresponds to the “Temperature in the bath” and it corresponds to the “Setup temperature” for the execution segment immediately before.



- The concept of a repetition is as shown below. The first execution in a repetition zone is not counted as a repetition number.



1. Selecting the “Setting item”

- When a program no is determined in the “Prepare Program” or “Edit Program”, the screen changes to the Setting item selection screen. When setting items are displayed in the sub display, turn the Jog dial to select an item.

No.	NAME	Sub display
1	Ramp time	Ramp time ▶３０ｍｉｎ Ｐ０１－０１ rest １０
2	Setup temp	Setup temp ▶１００℃ Ｐ０１－０１ rest １０
3	Soak time	Soak time ▶３０ｍｉｎ Ｐ０１－０１ rest １０
4	Wait mode	Wait ▶OFF Ｐ０１－０１ rest １０
5	Fan	Fan ▶１０ Ｐ０１－０１ rest １０
6	Damper	Damper ▶０％ Ｐ０１－０１ rest １０
7	Event 1	Event 1 ▶OFF Ｐ０１－０１ rest １０
8	Event 2	Event 2 ▶OFF Ｐ０１－０１ rest １０
9	Event 3	Event 3 ▶OFF Ｐ０１－０１ rest １０
10	Event 4	Event 4 ▶OFF Ｐ０１－０１ rest １０
11	Rep. Start segment	Rep. start ▶Ｓ０１ Ｐ０１－０１ rest １０
12	Rep count	Rep. count ▶９９９９ Ｐ０１－０１ rest １０
13	Append seg	Append seg. Ｐ０１－０１ rest １０
14	Program End	Program End Ｐ０１－０１ rest １０

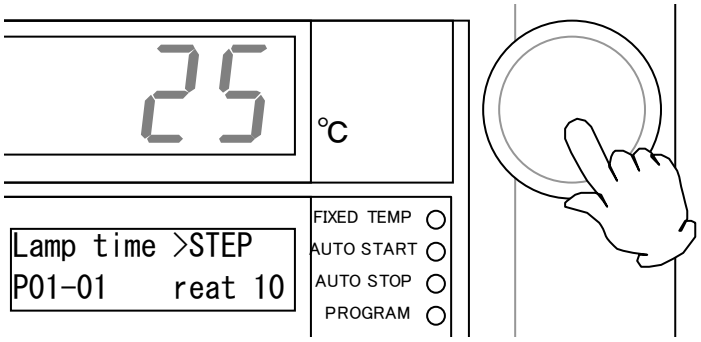
※ The number of program being edited, a segment no, and the number of remaining segments will appear in the lower part of the sub display. Turning the Jog dial will display the contents of all registered segments. Note, however, that “Append segment” and "Program End” items will be displayed after the contents of the last segment no is displayed.

- Depending on the conditions, some setting items shall have no meaning or may be invalid. Such items will not be displayed as the valid setting items in the case shown in the table below.

Item name	Cases not displayed
Ramp time	Always displayed
Setup temperature	Not displayed when Ramp time is “End”
Soak time	Not displayed when Ramp time is “End”
Wait function	Not displayed when Ramp time is “End” and Soak time is “Hold”
Fan RPM	Always displayed when the “Wind speed variable unit” option is included. If not, it is displayed only when Ramp time “End”.
Damper open degree	Always displayed when the “Auto damper” option is included. Not displayed if not included.
Event function 1～4	Always displayed when “Event output” options corresponding to the event functions 1～4 are included. Not displayed if not included.
Repetition start segment	Not displayed when Ramp time is “End” and Soak time is “Hold” Also not displayed when it is between the repetition zones specified in another segment.
Number of repetitions	Not displayed when the repeat start segment is not displayed and “No”.
Append segment	Not displayed when Ramp time is “End” and Soak time is “Hold”

※ You cannot change contents of a program while it is being executed. In such case, “▸ ” (cursor) will not be displayed in the Setting item selection screen. You can only check the contents.

2. Press the “Jog dial”



- When you select a setting item and press the Jog dial, the screen will change to the setting item edit screen. The flashing “▸ ” (cursor) will disappear and the setting item starts to flash.

Ramp time	> STEP
P 0 1 － 0 1	rest 1 0

(Selection screen)

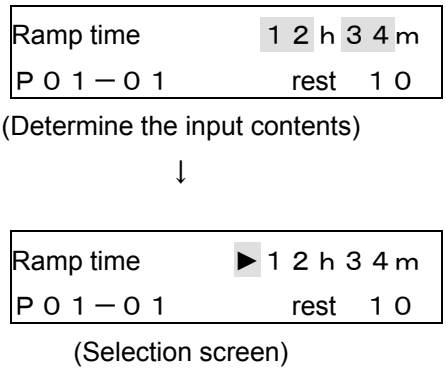
↓

Ramp time	STEP
P 0 1 － 0 1	rest 1 0

(Edit screen)

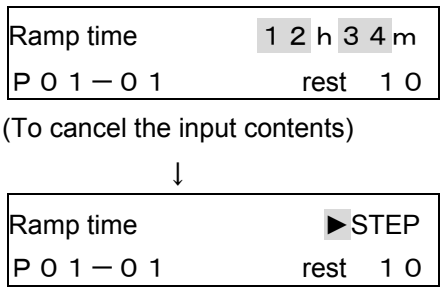
3. Inputting and determining a “Set value”

- Turn the Jog dial to display the contents you want to set and press the Jog dial. The value is determined and the screen will return to the setting item selection screen.



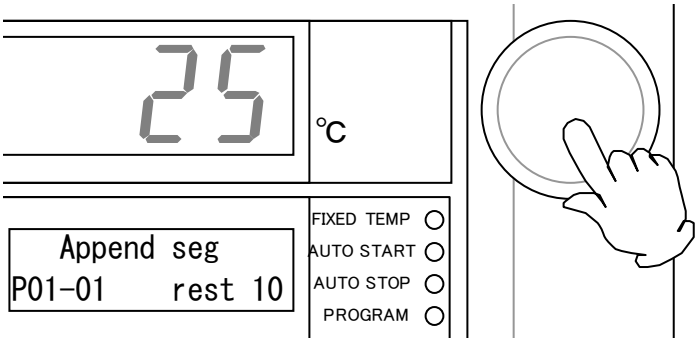
4. To “Cancel”

- When you want to cancel the set value inputting procedure in the middle of it, press “PROGRAM” key. The contents being input are discarded and the screen will return to the setting item selection screen.



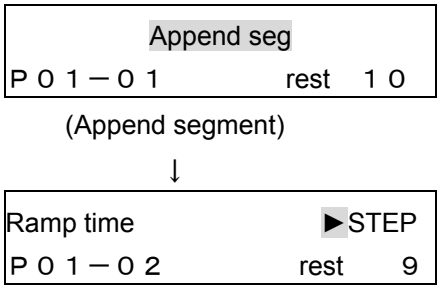
1.Select “Append seg”

・ Display “Append seg” in the operation mode selection screen and press the Jog dial.



※ “Append seg” will not appear when the Ramp time of the last segment no is “End”, the Soak time is “Hold”, and the number of repetition is “Limitless”. This does not appear when the Key lock mode is “On” and the program being edited is being executed either.

・ The segment no will increment by one and the number of remaining segments will decrement by one. Then the screen will return to the Setting item selection screen, on which the Ramp time of the appended segment no will be displayed.

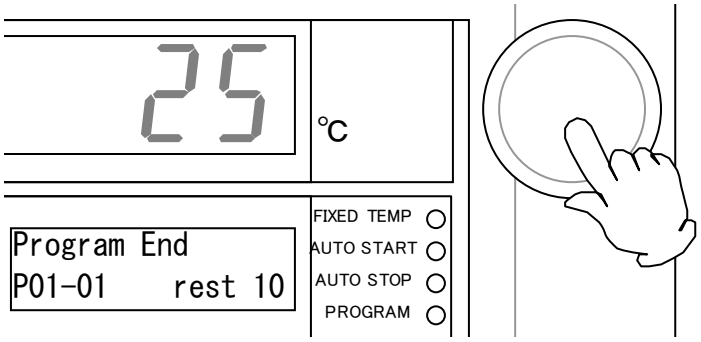


・ The contents below have been set as the initial setting in the appended segment. The first segment will have the same contents as above when a new program is prepared.

Item name	Initial value	Remarks
Ramp time	Step	
Setup temperature	0℃	
Soak time	Hold	
Wait function	Off	The wait function is invalid because Soak time is “Hold”.
Fan RPM	10	Valid only when the option is included
Damper open degree	0%	Valid only when the option is included
Events 1～4	Off	Valid only when the option is included
Repetition start segment	Not available	The repeat start segment is invalid because Soak time is “Hold”.
Number of repetitions	Limitless	The number of repetition is invalid because the repeat start segment is invalid.

1. Select “Program End”

- Display “Program End” in the setting item selection screen and press the Jog dial.



※ You can finish a program also by pressing the “PROGRAM” key in the setting item selection screen.

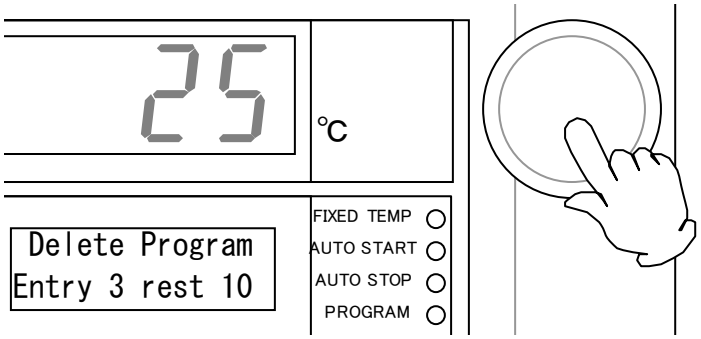
To delete a program

First make sure that the program is registered.

※ You cannot delete a program being executed.

1. Select “Delete Program”

- Display “Delete Program” in the function selection screen in the Program menu and press the Jog dial.



2. Select “Program No”

- The screen will change to the Program no selection screen. Display the program no you want to delete and press the Jog dial.

Delete	P 0 1
Use 5	rest 1 0

(Program no selection screen)

3. Confirm and select “Yes”

- The screen will change to the Program delete confirmation screen. Make sure the program no is exactly the one you want to delete and select “Yes” with the Jog dial and push it.

Delete it？	No
Delete	P 0 1

↓

Delete it？	Yes
Delete	P 0 1

※ You can cancel the deletion by selecting “No” or pressing the “PROGRAM” key here.

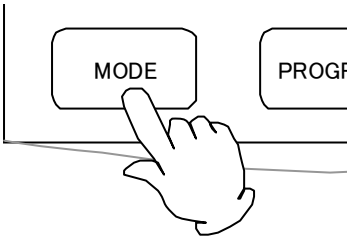
・ The function menu has 9 types of functions (when full options are installed).

No	Name	Function	Options
1	Timer mode	Setting the timer mode	
2	Key lock mode	Setting the key lock mode	
3	Buzzer mode	Setting the buzzer mode	
4	Calibration offset	Setting the calibration offset temperature	
5	Accumulated operation time	Displaying the accumulated operation time	
6	Date & time	Setting the date & the time	
7	Fan RPM	Setting Fan RPM	○
8	Damper open degree	Setting the damper open degree	○
9	Comm Lockout mode	Setting the Comm lockout mode	○

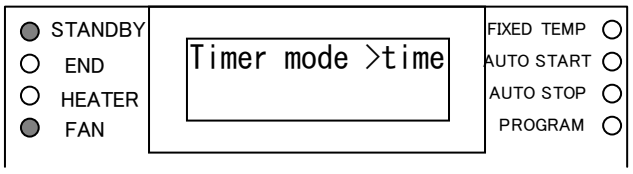
To select an item from the function menu

・ Make sure that power is on.

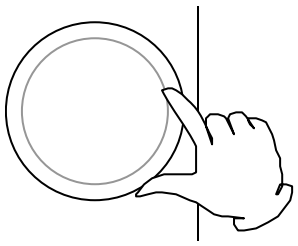
1. Press the “Function menu” key.



・ The Function menu activates and the screen changes to the item selection screen.



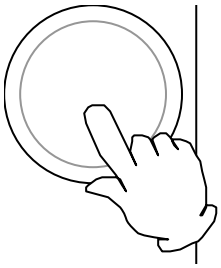
2. Turn the “Jog dial”



- When setting items are displayed in the sub display, turn the Jog dial to select an item.

No.	Name	Sub display
1	Timer mode	Timer mode ▶time
2	Key lock mode	Key lock mode ▶ OFF
3	Buzzer mode	Buzzer mode ▶ ON
4	Calibration Offset	Calibrate ▶± 0℃
5	Acc. time	Acc. time ４９９９９ｈｒ
6	Date Time	Date ▶ ２００７－１２－０１ Time １３：５９
7	Fan	Fan ▶１０
8	Damper	Damper ▶ ０%
9	Comm. Lockout	Comm. Lockout ▶ OFF

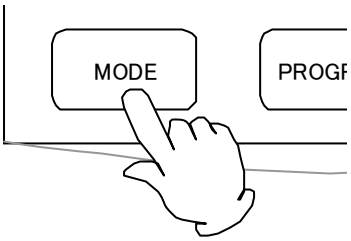
3. Press the “Jog dial”



- The screen changes to the input screen or the execution screen of each item.

4. To “Cancel”

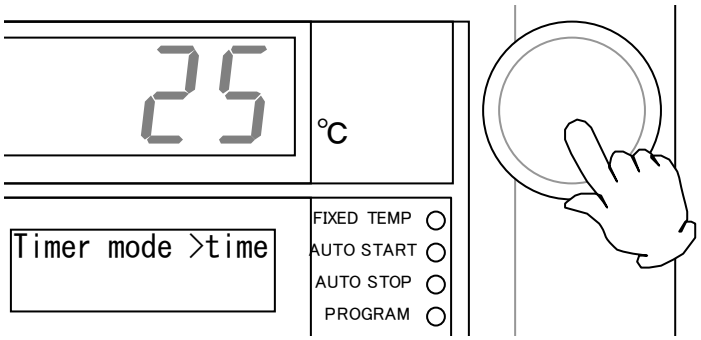
- When you want to cancel item selection process in the middle of it, press “Function menu” key again.



※ You cannot change the contents of the timer mode currently being executed during the operation start waiting status of the Auto start mode, operation of the Auto stop mode, and the operation start waiting status of the Program operation mode.

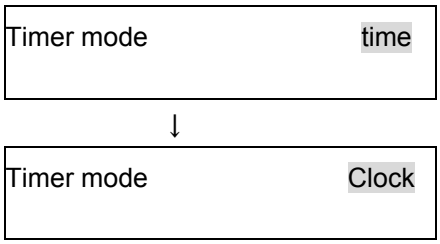
1. Select “Timer mode”

- Display “Timer mode” in the item selection screen in the function menu and press the Jog dial.

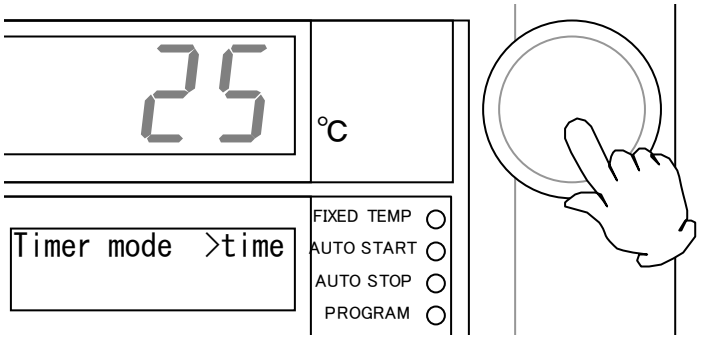


2. Selecting a “mode”

- The “▸ ” (cursor) disappears and the current mode flashes. Turn the Jog dial to display either “Time” or “Clock”.



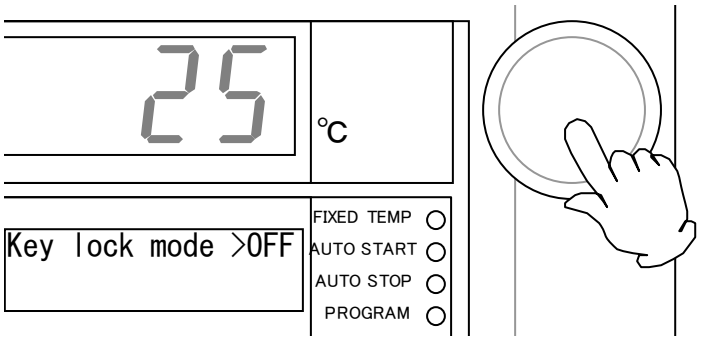
3. Press the “Jog dial”



- The timer mode is determined and the screen will return to the item selection screen in the function menu.

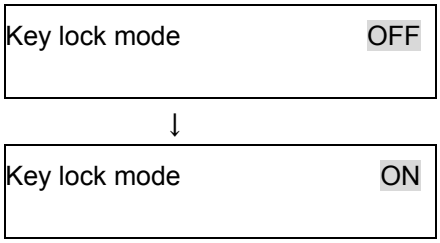
1. Select “Key lock mode”

- Display “Key lock mode” in the item selection screen in the function menu and press the Jog dial.

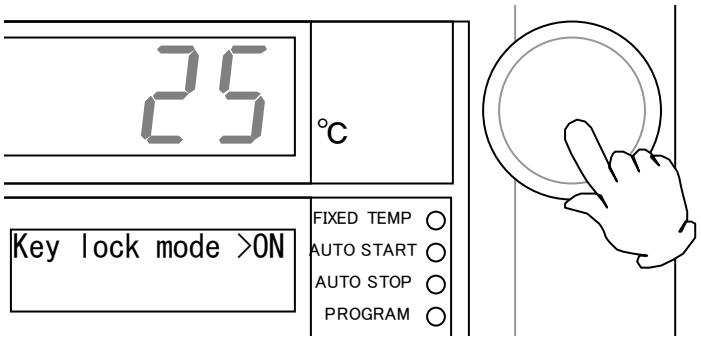


2. Selecting a “mode”

- The “▸” (cursor) disappears and the current mode flashes. Turn the Jog dial to display either “Off” or “On”.

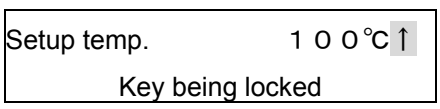


3. Press the “Jog dial”



- The key lock mode is determined and the screen will return to the item selection screen in the function menu.

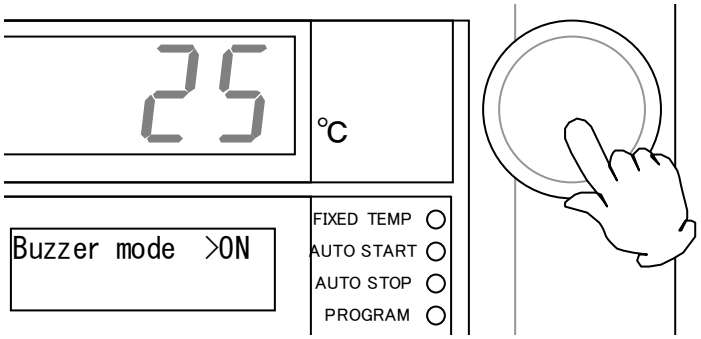
※ When you set the key lock mode “On”, change of program contents or setting of some function menus will be disabled. The sub displays “Key being locked”.



(Example: During Fixed temp operation)

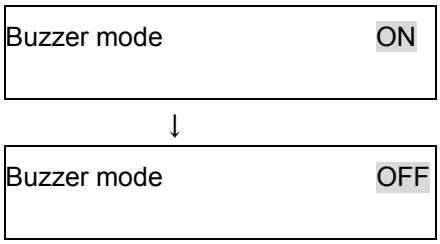
1. Select “buzzer mode”

- Display “Buzzer mode” in the item selection screen in the function menu and press the Jog dial.

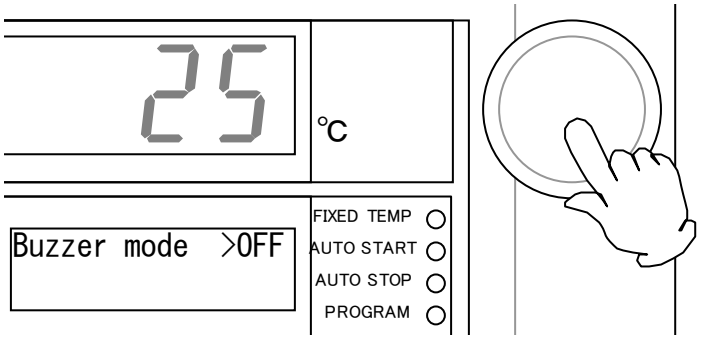


2. Selecting a “mode”

- The “▸ ” (cursor) disappears and the current mode flashes. Turn the Jog dial to display either “Off” or “On”.



3. Press the “Jog dial”



- The buzzer mode is determined and the screen will return to the item selection screen in the function menu.

※ Setting the buzzer mode “Off” will disable the alarm buzzer for errors and the operation end buzzer for auto stop and program operation.

Outline of Function

In the controller, the relationship between the temperature T detected by the sensor and the display temperature of the operation panel D is expressed by the equation of the line which passes the two points (T_0, D_0) and (T_S, D_S) shown in Fig. 1.

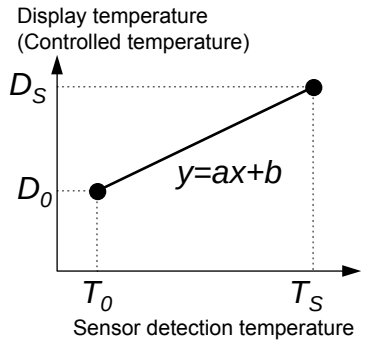


Fig. 1

Here, T_0 is the sensor detecting temperature when the chamber central temperature becomes the zero adjusting temperature (normally room temperature is adopted) D_0 at the time of no load, T_S is the sensor detecting temperature when the chamber central temperature becomes the span adjustment temperature (normally working maximum temperature is adopted) D_S at the time of no load in the same way.

As it is clear from the facts above, conforming of the chamber central temperature and the display temperature is guaranteed only when there is no load and at two points shown above. In other words, it is possible for a temperature measured at a point in the chamber does not conform to the display temperature of the operation panel at a voluntary temperature without load.

This is the function to move the line which passes above two points to the Y axis direction in parallel (increase or decrease y intercept of the line). The parallel movement amount including a sign is defined as the calibration offset. This function can conform the display temperature of the operation panel to the measurement temperature of a voluntary point in the chamber at a voluntary temperature.

Calibration Offset

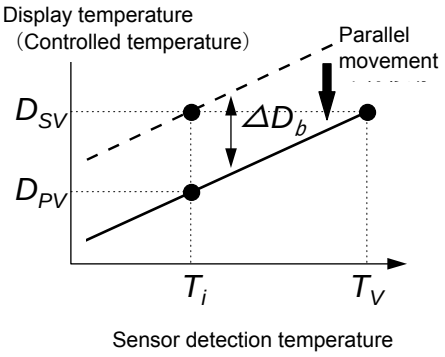


Fig. 2

In fig.2, D_{SV} is a display temperature of the operation panel under the condition that the temperature in the chamber is constant for a set temperature. It is natural to say that this value is equal to the target set temperature. D_{PV} is a measurement temperature of a voluntary point in the chamber under this condition. The difference between D_{PV} and D_{SV} including the sign is defined as the calibration offset. Therefore offset is shown as below.

$$\triangle D_b = D_{PV} - D_{SV} \qquad \text{Equation 1}$$

In Fig. 2, $\triangle D_b$ becomes the negative value since the target set temperature D_{SV} is larger than the actually measured temperature D_{PV}.

Note: The allowable setting range for calibration offset is ±13℃ for model DF411S/611S and ±18℃ for model DH411/611. The offset value has been set at 0℃ at the time of factory shipping.

<Example for reference> The temperature at one point in the chamber measured with a thermometer was 97℃, after starting the fixed temperature operation with the target setup temperature of 100℃, and sufficient time has passed after the temperature indication on the operation panel has reached 100℃.

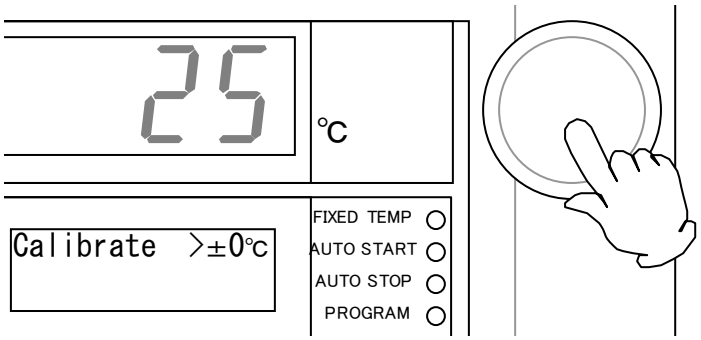
Then using the calibration offset function, adjust the temperature on the operation panel will be the same as the indication of 97℃ that is measured with a thermometer.

The calibration offset $\triangle D_b$ can be obtained from the formula 1 (“Actual measure temperature” – “Displayed temperature”).

$\triangle D_b$: 97℃—100℃＝－3℃

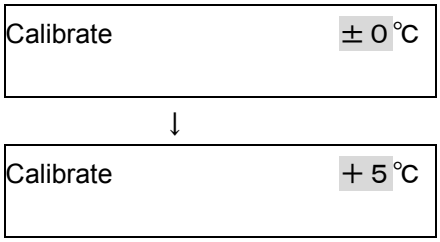
1. Select “Calibration offset”

- Display “Calibrate” in the item selection screen in the function menu and press the Jog dial.

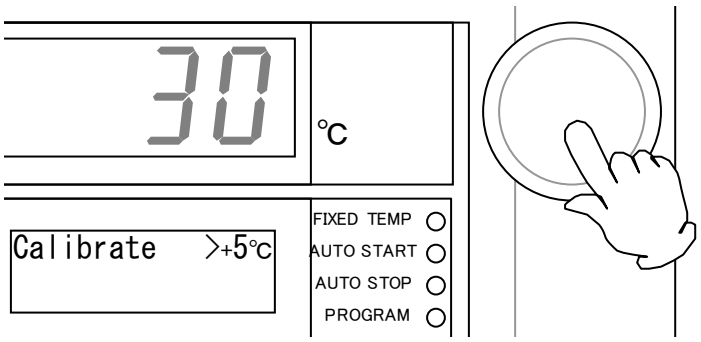


2. Inputting a “Offset temperature”

- The “▸” (cursor) disappears and the current offset temperature flashes. Turn the Jog dial to display a temperature you want to set.



3. Press the “Jog dial”



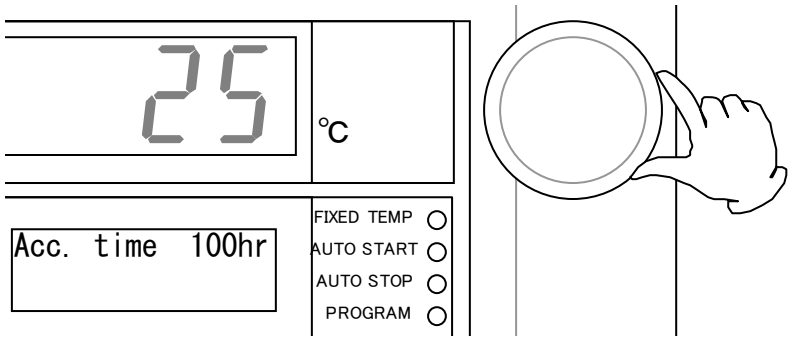
- The calibration offset temperature is determined and the screen will return to the item selection screen in the function menu.

To view the accumulated operation time

※ "Accumulated operation time" is a function to check the operation time of the unit. You cannot change its contents.

1. To display "Accumulated operation time"

- Turn the Jog dial in the item selection screen in the function menu to display "Acc. Time".



- Accumulated operation time from the shipping to the present will e displayed.

※ The accumulated operation time is an accumulation of total time while power is not off. Note that time in the standby, operation start waiting, and operation end status will be counted and accumulated as operation time.

2. Press the "Function menu" key.

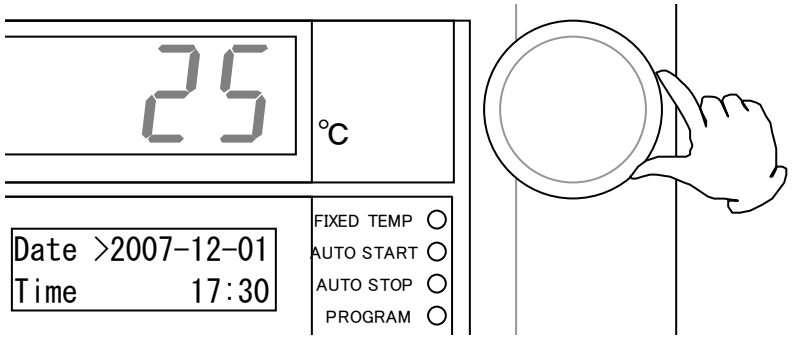
- When you have checked the contents, press the "Function menu" key to cancel the function menu.

※ Note that the clock is not set correctly at the time of shipping. Before using the unit, be sure to set the clock according to your clock or time tone.

※ When the timer mode is set at “Clock”, you cannot change the clock setting during the operation start waiting status of the Auto start mode, operation of the Auto stop mode, and the operation start waiting status of the Program operation mode. First press the “POWER" key to stop operation and then repeat the procedures.

1. To display “Date and time”

- Turn the Jog dial in the item selection screen in the function menu to display “Date” and “Clock”.



- Present date and time will be displayed.

Date	▸２００７－１２－０１
Time	１５：３０

2. Select a “Setting item”

- Turning the Jog dial will move the “▸” (cursor) in the order of “Year”, “Month”, “Day”, “Hour”, and “Min”. Select an item you want to set and then press the Jog dial.

Date	▸２００７－１２－０１
Time	１５：３０

↓

Date	２００７▸１２－０１
Time	１５：３０

↓

Date	２００７－１２▸０１
Time	１５：３０

↓

Date	２００７－１２－０１
Time	▸１５：３０

↓

Date	２００７－１２－０１
Time	１５▸３０

1. **Inputting a “Setting value”**

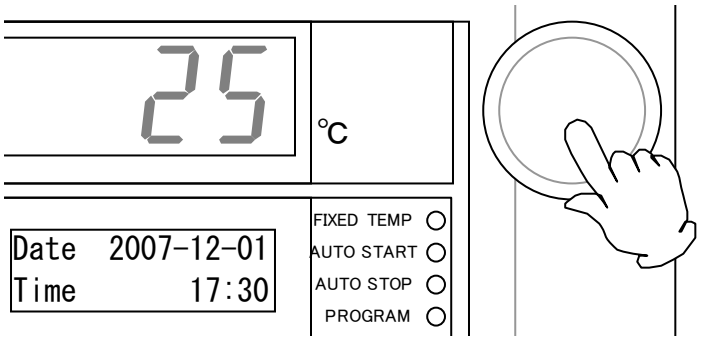
- The “▸”(cursor) disappears and the current set value flashes. Turn the Jog dial to change the set value.

Date	２００６－１２－０１
Time	１７：３０

↓

Date	２００７－１２－０１
Time	１７：３０

2. Press the “Jog dial”

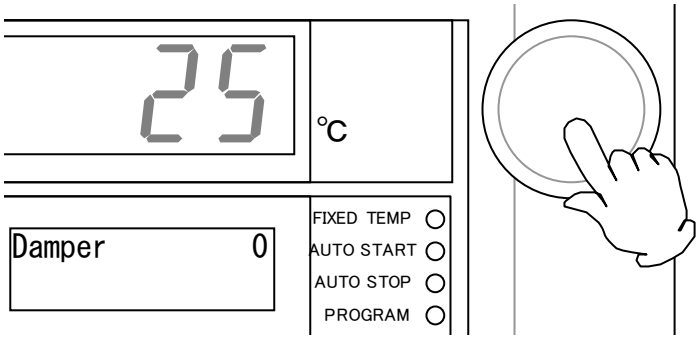


- The clock setting is determined and the screen will return to the item selection screen in the function menu.

※ You cannot change the contents during the Program operation, and after the end of operation, or in the Remote operation mode.

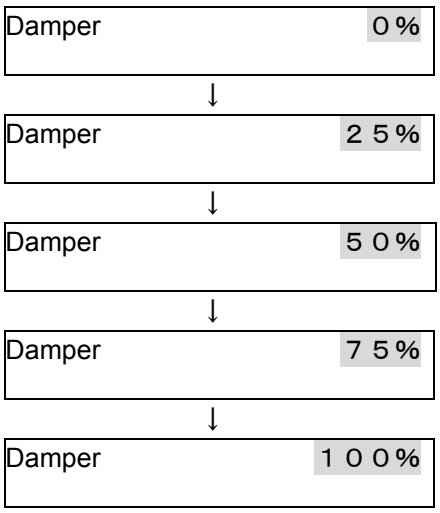
1. To display the “Damper open degree”

- Display “Damper” in the item selection screen in the function menu and press the Jog dial.

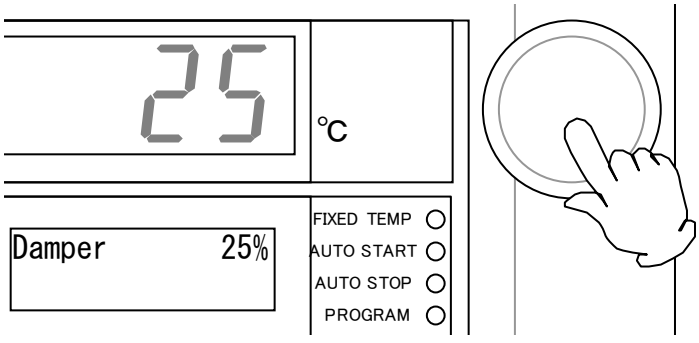


2. Select the “Damper open degree”

- The “▸” (cursor) disappears and the current damper open degree flashes. (This value is set at “0” of fully closed at the time of factory shipping.)
  Turn the Jog dial to select a degree to set from “0”, “25”, “50”, “75”, and “100” and display it.



3. Press the “Jog dial”

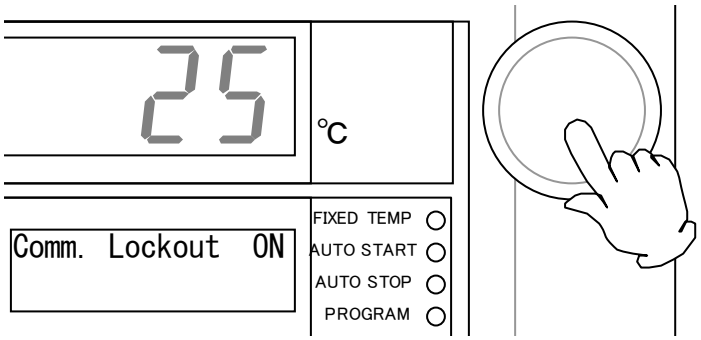


- The damper open degree is determined and the screen will return to the item selection screen in the function menu.

To set the Comm. Lockout mode (optional)

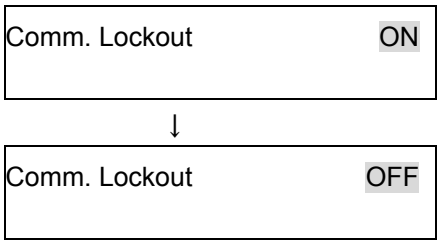
1. Select “Comm. lockout mode”

- Display “Comm. Lockout” in the item selection screen in the function menu and press the Jog dial.

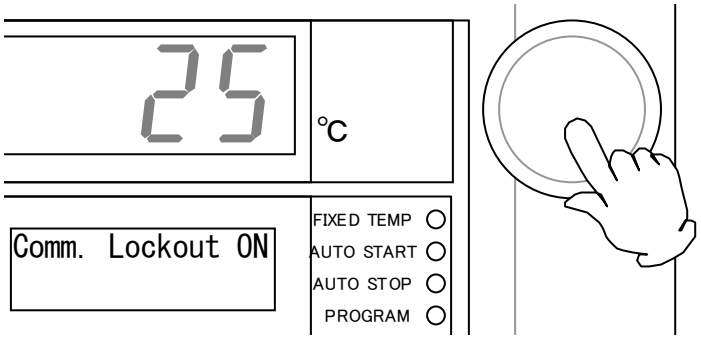


2. Selecting “Comm. Lockout”

- The “▸ ” (cursor) disappears and the current mode flashes. Turn the Jog dial to display either “Off” or “On”.



3. Press the “Jog dial”



- TheComm. Lockout is determined and the screen will return to the item selection screen in the function menu.

About the independent overheat preventive device

Safety devices for preventing overheat includes an independent overheat preventive device (manual recovery) comprising of a circuit and a sensor different from those for the controller, in addition to the automatic overheat preventive function of the controller (automatic recovery), which means a double safety measures.

● Setting temperature range and function

Setting temperature range: 0～399℃

Inputting method : A three-digit digital switch. Turn the drum of each digit to set to a value you want. Note that the hundreds digit allows input of figures from 0 to 3 only.

Function : Shuts heater output off when the measured temperature becomes higher than the setup temperature of the independent overheat preventive device. This function is enabled when the electric leakage breaker is ON. When the independent overheat preventive device has activated, Er.07 appears on the main display and the “Error” message lamp flashes.

● How to use

① Normally, set this temperature higher by 15℃ or more than the setup temperature for the unit.

② When setting an appropriate value for protecting the specimen, set a temperature sufficiently higher than the room temperature, at least 15℃ higher than the maximum setup temperature for the temperature pattern to be operated.

③ When the unit is erroneously activated for example, by changing the setup temperature for the independent overheat preventive device than the temperature in the unit, or by keeping operation at a lower setting, turn the electric leakage breaker OFF once and then make setting again. When the device has activated due to other causes, see “Countermeasures in an emergency” (P.14).

● Cautions

① The hundred digit of the digital switch allows entering of 0 to 3 only with the stop mechanism and note that attempting to change to other values forcibly might cause damages to the unit.

② Be sure to check the setup temperature is correct before starting operation since the setting device may be touched during cleaning it or around it and the specified temperature might be changed.

Routine inspection/maintenance

Although the unit is not classified as the “Drying facility” as specified in the “Industrial Safety and Health enforcement ordinance”, we ask you to perform regular inspection at least once a year on improvement and maintenance of unit and ancillary facility and proper work management for safety.

Warning

- Be sure to remove the power cord from the outlet unless it is necessary when performing inspection or maintenance.
- Perform these works after the unit has returned to the normal temperature.
- Never attempt to disassemble the unit.

Major inspection items on the unit

1. Blower: Check for abnormal noises and for normal rotation.
2. Exhaust damper: Check for smooth open/close without being caught.
3. Heater: Check of the dielectric resistance and check for loosening of the connection terminal.
4. Overheat preventive device: Check if operation is reliable. Check whether the setup temperature is appropriate.
5. Door: Check for loosening of the hinges and the lock handle, and their cracking or other abnormalities.
6. Around the unit: Check that flammable or explosive substances are left and whether the ventilating facility and the exhaust duct are functioning properly.

Monthly

- Inspect functions of the electric leakage breaker.
  - ・Connect the power cord and perform test with the unit supplied with power.
  - ・First turn the electric leakage breaker “On”.
  - ・Then press the red test button on the breaker with a tip of a ball-point pen to check to see if the breaker is turned “Off” to indicate it is in the proper condition.
- Check the operation of the independent overheat preventive device.
  - ・After performing the fixed temperature operation at an appropriate setup temperature, set the operation temperature of the independent overheat preventive device to a temperature several centigrade (about 5℃) lower than that setting.
  - ・If the device is normal, the heater circuit will be shut off in several seconds and, at the same time, “Error” sign and Er07 will flash and the alarm buzzer sounds if the alarm buzzer function is ON.

* **Be sure to perform operation check for the electric leakage breaker and the independent overheat preventive device before a long time operation or unmanned operation during nighttime.**

Caution

- Cleat dirt on the resin parts or on the operation panel with a well wrung soft cloth. Do not use benzene, thinner, or scorching powder or rub with a hard brush. This might cause deformation, degradation, or discoloration.

If you are not going to use the unit for a long time

If you are not going to use the unit for a long time or dispose it

Caution

When you are not going to use the unit for a long time

- Turn power off and remove the power cord off the outlet.

Warning

When you want to dispose of the unit

- Never leave it in a place where children may play.
- Remove the door so that it might be locked.
- Dispose of the unit as a bulky trash.

After-sales service and warranty

When requesting the repair

If any error should occur, record the error message and stop operation immediately. Turn OFF power supply and unplug the power cord from the receptacle. Then contact the shop from which you have purchased the product or our office.

(Data necessary for information)

- Product type name
- Serial No.
- Year/month/day of purchase

※ Check to find the date in the guarantee card or the nameplate attached to the unit (On the lower part of main unit right side).

- Contents of trouble (as detailed as possible)
- Be sure to present the guarantee card when our service personnel visits your site.

Guarantee card (attached separately)

- Your dealer or one of our sales offices will hand a warranty card to you and please fill “dealer name, date of purchase” and other necessary items and fax it to our general customer center (03-3231-6523). Keep the warranty card in a safe place.
- The guarantee period is one year from the “date of purchase.” Free repair may be available according to the content of the card.

  For repair after expiration of the guarantee period, consult the shop from which you have purchased our product or our office. If the repair can help maintaining the function, we will provide the repair service with charge if so requested by the customer.

Minimum hold period of performance parts for repair

The minimum holding period of repair parts for this unit is seven years after termination of the production. Repair parts mean those necessary to maintain the performance of the product.

Troubleshooting

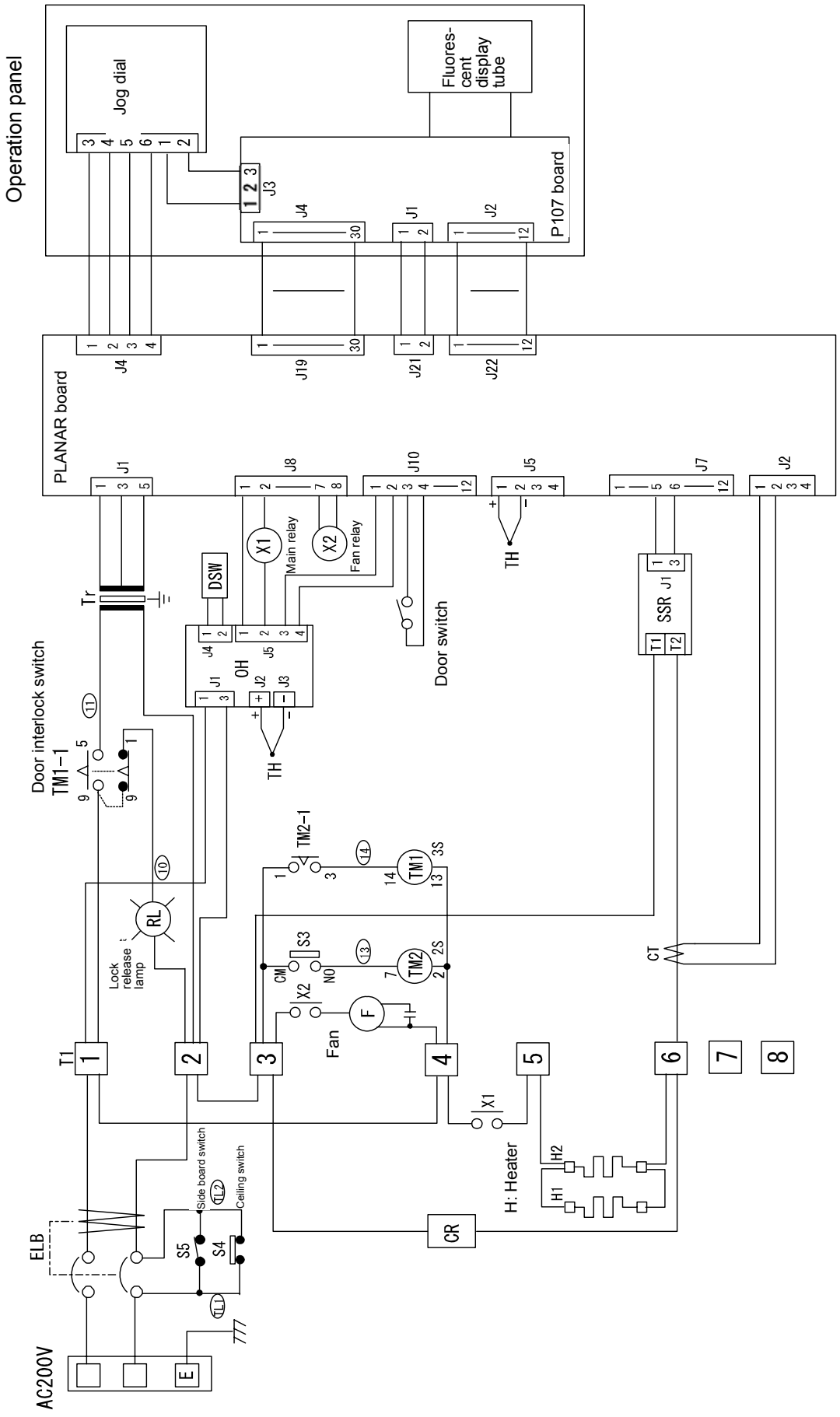
Symptom	Please check
Even if the electric leakage breaker is turned on, the current time will not appear on the sub display.	●Is the door interlock function released? Turn the door interlock switch ON and tighten the door lock handle until the DOOR LOCK RELEASE lamp goes off. (See page 19.) ●Is the power cord securely connected to the outlet or to the switch board? ●Is power not failed?
Temperature fluctuates during operation.	●Check if you have put too much specimen. ●Is change in environmental temperature too much? ●Is not the exhaust damper open too wide?
The specified temperature cannot be attained.	●Check if you have put too much specimen. ●Is not the exhaust damper open too wide?

	Model	DF411S	DF611S	DH411S	DH611S
Performance	Operating temperature	+40～260℃		+40～360℃	
	Temperature control accuracy*1	±0.1℃ (at 260℃)		±0.2℃ (at 360℃)	
	Temperature distribution accuracy*1	±1.5℃ (at 260℃)		±2.5℃ (at 360℃)	
	Time to reach max. temp.*1	Approx.60min. (to 260℃)		Approx.80min. (to 360℃)	
Function / structure	Temperature control method	PID control by microprocessor			
	Temperature / timer setting method	Digital setting and display by jog dial			
	Temperature indicating method	Digital indication by green LED			
	Other indication	Text display by fluorescent display that indicates function information			
	Timer setting range	1 min. to 99 hrs.59min. or 100 hrs to 999hrs			
	Operation function	Fixed temperature operation、Auto-start/Auto-stop operation Program operation (Max. 16 segments, repeat operation, gradient operation etc.)			
	Additional function	Calendar timer function (actual hr.timer within 24 hrs.) Integrating time function (Integrated hr.up to 49999 hrs.can be measured.) Calibration offset function. Time indication (The present time is indicated).			
	Safety functions	Self-diagnostic function (sensor abnormality, heater disconnection and Triac short circuit detection, automatic temperature over-rise prevention) Key lock function, Door switch, Independent Temperature Overheat Prevention device, Short circuit breaker, Control box switch, Door interlock function, explosion proof vent, explosion detection switch			
	Temp. sensor	K thermocouple（double sensor）			
	Heater	Stainless steal pipe heater with fin			
	Heater nominal capacity (kW)	2.1	3.0	2.7	3.75
	Fan motor of blower	Axial fan（Condenser type motor 20W）			
	Cable port	Inner diameter 30mm（rear face）			
	Insulation material	Glass wool		Ceramic fiber	
	Other additional structure	Exhaust damper（Manual operation）			
Standard	Internal dimensions*2 (W×D×Hmm)	Approx. 450×450×x.450	Approx. 600×600×600	Approx. 450×450×450	Approx. 600×600×600
	External dimensions*2 (W×D×Hmm)	Approx. 1,050×620×240	Approx. 1200×70×1390	Approx. 1050×620×240	Approx. 1,200×770×1390
	Capacity (l)	91	216	91	216
	withstand load of shelf board（kg/piece）	Approx.30			
	Shelf brackets	9			
	Shelf brackets pitch	45	60	45	60
	Required power supply 50/60Hz	AC200V Single phase 11A	AC200V Single phase 16A	AC200V Single phase 14A	AC200V Single phase 20A
	Weight（kg）	Approx.78	Approx.109	Approx.78	Approx.109
Accessories		Shelf board（Stainless steel wire）			
		2 (Shelf bracket 4)	3 (Shelf bracket 6)	2 (Shelf bracket 4)	3 (Shelf bracket6)
		Instruction manual, Warranty			
Option		①Temperature output terminal ②Time-up output terminal ③External alarm terminal ④Auto damper ⑤Analog recorder (6 inscription intermittent type) ⑥External communication adaptor ⑦Sensor addition (Triple sensor) ⑧Exhaust duct ⑨Exhaust port flange ⑩Base frame ⑪Base frame caster ⑫Abnormality alarm display lamp ⑬Emergency stop switch⑭Shelf board(For each type of machine)⑮Power supply cable ⑯Power supply plug			

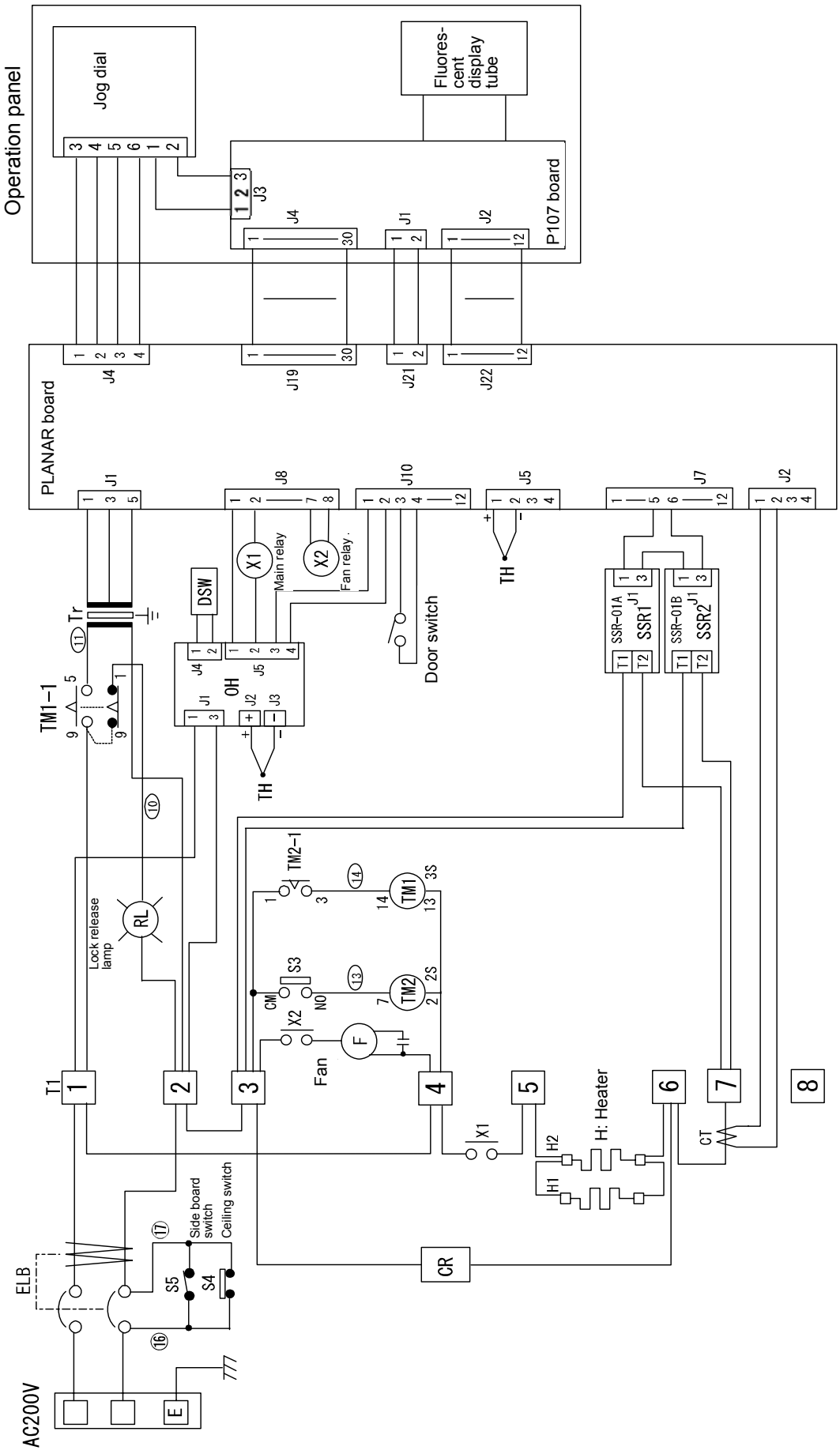
* 1 The performance value is in the condition of circulation operation(Damper is entirely closed),room temperature 23℃±5℃、humidity 65% RH ±20% and no load.

*2 Internal and external dimensions do not include protruding parts

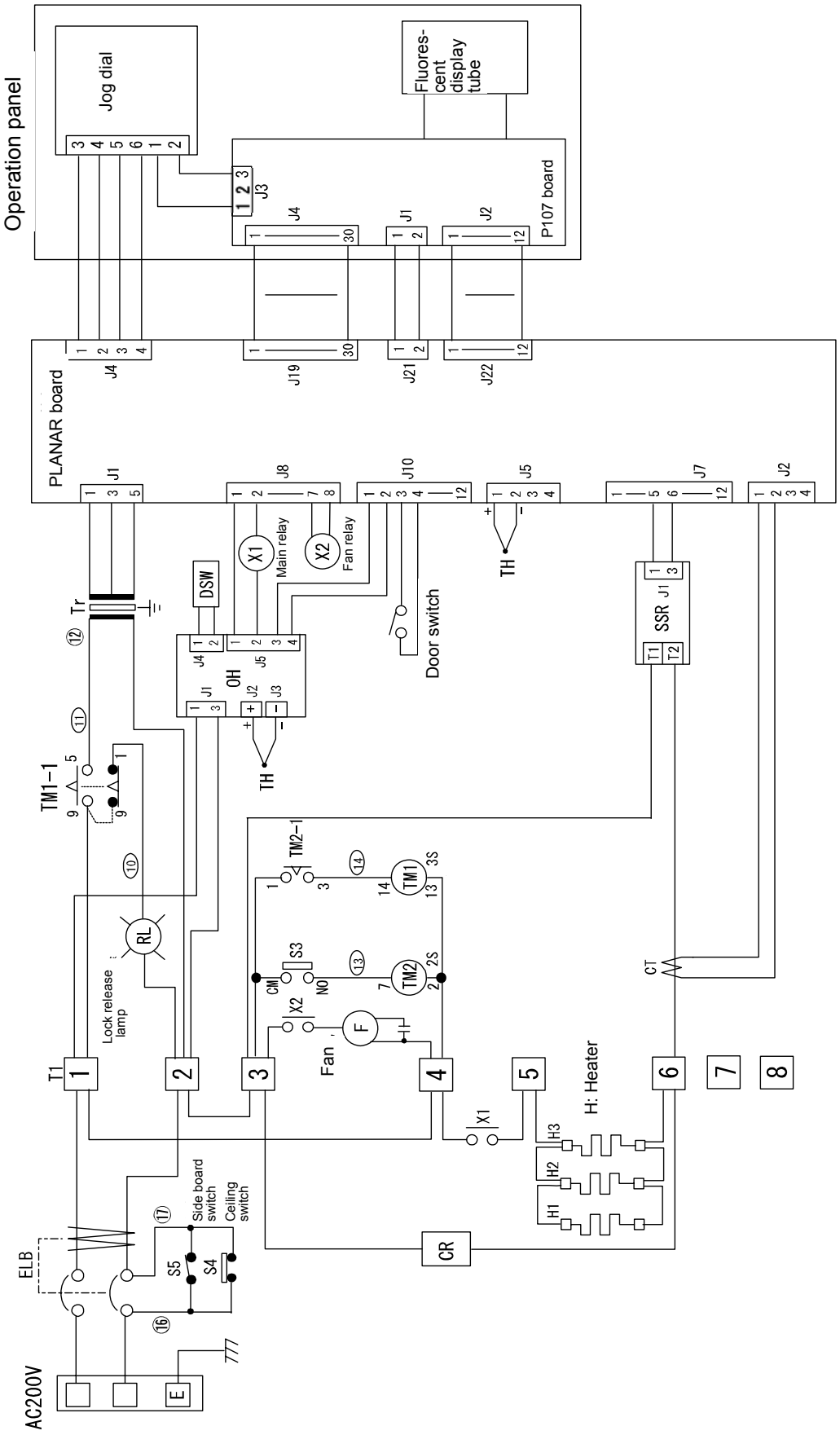
DF411S


Operation panel
Jog dial
Fluores-cent display tube
P107 board
J3
J4
J1
J2
PLANAR board
J19
J21
J22
J8
J10
J5
J7
Tr
DSW
X1
Main relay
X2
Fan relay
TH
SSR
OH
Door switch
Door interlock switch
TM1-1
TM2-1
TM1
3S
TM2
2S
RL
Lock release lamp
S3
CM
NO
X2
F
Fan
CT
T1
1
2
3
4
5
6
7
8
X1
H: Heater
H2
H1
CR
ELB
S5
S4
Side board switch
Ceiling switch
AC200V
E

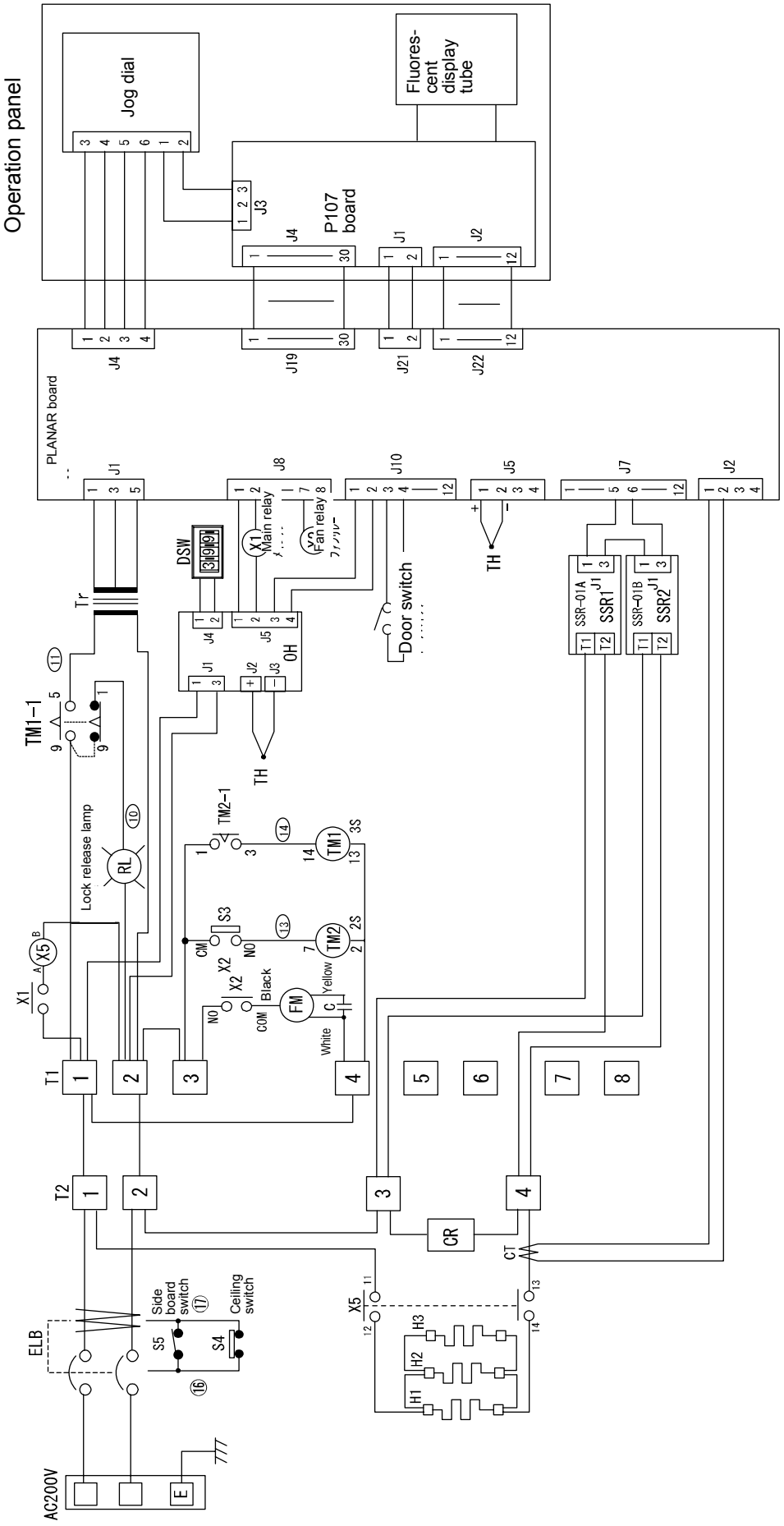
DF611S


Operation panel
Jog dial
Fluores-cent display tube
P107 board
J3
J4
J1
J2
PLANAR board
J19
J21
J22
J8
J10
J5
J7
X1
Main relay
X2
Fan relay
DSW
OH
TH
Door switch
SSR-01A
SSR-01B
SSR1
SSR2
Tr
TM1-1
TM2-1
RL
Lock release lamp
TM1
TM2
3S
2S
S3
CM
NO
F
Fan
T1
H: Heater
H1
H2
CT
CR
ELB
S5
S4
Side board switch
Ceiling switch
AC200V
E

DH411S


Operation panel
Jog dial
Fluores-cent display tube
P107 board
J3
J4
J1
J2
PLANAR board
J19
J21
J22
J8
J10
J5
J7
Main relay
Fan relay
X1
X2
DSW
OH
TH
Door switch
SSR
Tr
TM1-1
TM2-1
TM1
TM2
RL
Lock release lamp
S3
Fan
F
CT
H: Heater
H1
H2
H3
Side board switch
Ceiling switch
S5
S4
ELB
CR
AC200V
T1
T2
CM
NO

DH611S


Operation panel
Jog dial
Fluores-cent display tube
P107 board
J3
J4
J1
J2
PLANAR board
J19
J21
J22
J8
J10
J5
J7
DSW
Main relay
Fan relay
TH
Door switch
SSR-01A
SSR-01B
SSR1
SSR2
Tr
TM1-1
TM2-1
TM1
TM2
OH
Lock release lamp
RL
X1
X2
X5
S3
FM
Black
Yellow
White
COM
NO
CM
T1
T2
CR
CT
ELB
Side board switch
Ceiling switch
S5
S4
H1
H2
H3
AC200V
E

DF411S

Symbol	Part Name	Code No.	Specifications
CT	Current Transformer	2-17-001-0002	CTL-6-S-400
ELB	Circuit breaker	2-06-005-0013	BJS153965
F	Motor	2-14-001-0027	BKREK74L-4, AC200V
H1,H2	Heater	DE42S-30251	AC200V 1050W
PIO	PIO7 board	1-24-000-0084	
PLANAR	PLANAR board	1-24-000-0066	Hi-tech CR2
OH	Independent overheat prevention	1-27-001-0100	ⅣLE
SSR	Solid-state relay	2-16-000-0026	YLT-SSR-01
Tr	Transformer	2-18-000-0042	200V　CR
SW	Digital switch	2-01-010-0005	Digital switch for 4 type OH
X1,X2	Relay	2-05-000-0013	AJR6010
T1	Terminal block	LT00031664	TFD250ABC-8P
S5	Side board switch	2-02-007-0001	KIL-13
Door switch	Reed relay	2-05-000-0012	RRB42A05S
TH	K-thermocouple	1-16-001-0052	K-thermocouple (Double sensor)
CR	CR absorber	2-30-002-0001	2S1201 250V
S3	Door lock switch	※	Matsushita electric　AD4602
S4	Ceiling switch	※	Matsushita electric　AD3712
TM1	Timer	※	Omron H3Y-2 AC200V 10S
TM2	Timer	※	Fuji MS4SF-AP1T
RL	Rock release (neon lamp)	※	Satoh parts　BN5701　red

*Make arrangements using the model of the unit and the standard name indicated in the specification column.

DF611S

Symbol	Part Name	Code No.	Specifications
CT	Current Transformer	2-17-001-0002	CTL-6-S-400
ELB	Circuit breaker	2-06-005-0013	BJS153965
F	Motor	2-14-001-0027	BKREK74L-4, AC200V
H1,H2	Heater	DF62S-30251	AC200V 1500W
PIO	PIO7 board	1-24-000-0084	
PLANAR	PLANAR board	1-24-000-0066	Hi-tech CR2
OH	Independent overheat prevention	1-27-001-0100	ⅣLE
SSR1	SSR01-A	2-16-000-0027	YLT-SSR-01-A
SSR2	SSR01-B	2-16-000-0028	YLT-SSR-01-B
Tr	Transformer	2-18-000-0042	200V　CR
SW	Digital switch	2-01-010-0005	Digital switch for 4 type OH
X1,X2	Relay	2-05-000-0013	AJR6010
T1	Terminal block	LT00031664	TFD250ABC-8P
S5	Side board switch	2-02-007-0001	KIL-13
Door switch	Reed relay	2-05-000-0012	RRB42A05S
TH	K-thermocouple	1-16-001-0052	K-thermocouple (Double sensor)
CR	CR absorber	2-30-002-0001	2S1201 250V
S3	Door lock switch	※	Matsushita electric　AD4602
S4	Ceiling switch	※	Matsushita electric　AD3712
X3	Relay	※	Matsushita electric　AP3125F
TM1	Timer	※	Omron H3Y-2 AC200V 10S
TM2	Timer	※	Fuji MS4SF-AP1T
RL	Rock release (neon lamp)	※	Satoh parts　BN5701　red

※ Make arrangements using the model of the unit and the standard name indicated in the specification column.

DH411S

Symbol	Part Name	Code No.	Specifications
CT	Current Transformer	2-17-001-0002	CTL-6-S-400
ELB	Circuit breaker	2-06-005-0013	BJS153965
F	Motor	2-14-001-0027	BKREK74L-4, AC200V
H1,H2	Heater	DF42S-30251	AC200V 1050W
H3	Heater	DH42S-30000	AC200V 600W
PIO	PIO7 board	1-24-000-0084	
PLANAR	PLANAR board	1-24-000-0066	Hi-tech CR2
OH	Independent overheat prevention	1-27-001-0100	ⅣLE
SSR	Solid-state relay	2-16-000-0027	YLT-SSR-01
Tr	Transformer	2-18-000-0042	200V　CR
SW	Digital switch	2-01-010-0005	Digital switch for 4 type OH
X1,X2	Relay	2-05-000-0013	AJR6010
T1	Terminal block	LT00031664	TFD250ABC-8P
S5	Side board switch	2-02-007-0001	KIL-13
Door switch	Reed relay	2-05-000-0012	RRB42A05S
TH	K-thermocouple	1-16-001-0052	K-thermocouple (Double sensor)
CR	CR absorber	2-30-002-0001	2S1201 250V
S3	Door lock switch	※	Matsushita electric　AD4602
S4	Ceiling switch	※	Matsushita electric　AD3712
X3	Relay	※	Matsushita electric　AP3125F
TM1	Timer	※	Omron H3Y-2 AC200V 10S
TM2	Timer	※	Fuji MS4SF-AP1T
RL	Rock release (neon lamp)	※	Satoh parts　BN5701　red

*Make arrangements using the model of the unit and the standard name indicated in the specification column.

DH611S

Symbol	Part Name	Code No.	Specifications
CT	Current Transformer	2-17-001-0002	CTL-6-S-400
ELB	Circuit breaker	2-06-005-0013	BJS153965
F	Motor	2-14-001-0027	BKREK74L-4, AC200V
H1,H2	Heater	DF62S-30251	AC200V 1500W
H3	Heater	DH62S-30000	AC200V 750W
PIO	PIO7 board	1-24-000-0084	
PLANAR	PLANAR board	1-24-000-0066	Hi-tech CR2
OH	Independent overheat prevention	1-27-001-0100	ⅣLE
SSR1	SSR01-A	2-16-000-0027	YLT-SSR-01-A
SSR2	SSR01-B	2-16-000-0028	YLT-SSR-01-B
Tr	Transformer	2-18-000-0042	200V　CR
SW	Digital switch	2-01-010-0005	Digital switch for 4 type OH
X1,X2	Relay	2-05-000-0013	AJR6010
X5	Electromagnetic Contact	LT00034066	FC-1 1a1b 200V
T1	Terminal block	LT00031664	TFD250ABC-8P
S5	Side board switch	2-02-007-0001	KIL-13
Door switch	Reed relay	2-05-000-0012	RRB42A05S
TH	K-thermocouple	1-16-001-0052	K-thermocouple (Double sensor)
CR	CR absorber	2-30-002-0001	2S1201 250V
S3	Door lock switch	※	Matsushita electric　AD4602
S4	Ceiling switch	※	Matsushita electric　AD3712
X3	Relay	※	Matsushita electric　AP3125F
TM1	Timer	※	Omron H3Y-2 AC200V 10S
TM2	Timer	※	Fuji MS4SF-AP1T
RL	Rock release (neon lamp)	※	Satoh parts　BN5701　red

*Make arrangements using the model of the unit and the standard name indicated in the specification column.

List of Dangerous Substances

⚠ **For whether a substance may be used for the unit or its use conditions, see "Safety precautions" and "Handling precautions" in this operation manual.**

Explosive substance	Explosive substance	① Nitroglycol, glycerine trinitrate, cellulose nitrate and other explosive nitrate esters
		② Trinitrobenzen, trinitrotoluene, picric acid and other explosive nitro compounds
		③ Acetyl hydroperoxide, methyl ethyl ketone peroxide, benzoyl peroxide and other organic peroxides
Flammable substances	Ignitable 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	① Potassium chlorate, sodium chlorate, ammonium chlorate, and other chlorates
		② Potassium perchlorate, sodium perchlorate, ammonium perchlorate, and other perchlorates
		③ Potassium peroxide, sodium peroxide, barium peroxide, and other inorganic peroxides
		④ Potassium nitrate, sodium nitrate, ammonium nitrate, and other nitrates
		⑤ Sodium chlorite and other chlorites
		⑥ Calcium hypochlorite and other hypochlorites
	Flammable substances	① Ethyl ether, gasoline, acetaldehyde, propylene chloride, carbon disulfide, and other substances 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.
		③ Methanol, ethanol, xylene, pentyl acetate, (a.k.a.amyl acetate) and other substances with ignition point between zero and less than 30 degrees.
		④ Kerosene, 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 Substance which is a flammable gas at 15℃, one air pressure.

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

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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