SINCE 1889

Yamato

Constant Temperature Drying Oven

Model:

DX302C/402C/602C

DX312C/412C/612C

Second Edition

- Thank you very much for purchasing this Yamato DXC series constant temperature drying oven.
- Please read the “Operating Instructions” and “Warranty” before operating this unit to assure proper operation. After reading these documents, be sure to store them securely together with the “Warranty” at a handy place for future reference.

⚠Warning!

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

YAMATO SCIENTIFIC RUSSIA, INC.

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1. Safety precautions

Explanation of Symbols

About Symbols

A variety of symbols are indicated in this operating instruction and on products to assure safe operation. Possible results from improper operation ignoring them are classified 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 damage (Note 3).

(Note 1) Serious injury means a wound, an electrical shock, a bone fracture or intoxication that may leave after effects or require hospitalization or outpatient visits for a long time.
(Note 2) Minor injury means a wound or an electrical shock that does not require hospitalization or outpatient visits for a long time.
(Note 3) Property damage means damage to facilities, devices and buildings or other properties.

Meanings of Symbols

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

This symbol indicates prohibitions
Specific prohibitions are indicated near this symbol.

This symbol indicates matters that the user must perform.
Specific instructions are indicated near this symbol.

1.Safety precautions

List of symbols

Warning

General warnings

Danger!
High voltage

Danger!
High temperature

Danger!
Moving part

Danger!
Hazard of explosion

Caution

General cautions

Electrical shock!

Burning!

Caution for no liquid heating!

Caution for water leak!

For water only

Poisonous material

Prohibitions

General bans

Fire ban

Do not disassemble

Do not touch

Compulsions

General compulsions

Connect ground wire

Install levelly

Pull out the power plug

Regular inspection

1. Safety precautions

⚠ Warning

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

Never operate the unit in an atmosphere containing flammable or explosive gas.
Otherwise, an explosion or a fire may result since the unit is not explosion-proof.
See section “Never operate the unit in an atmosphere containing flammable or explosive gas.
Otherwise, an explosion or a fire may result since the unit is not explosion-proof.” See section “13. List of dangerous materials” on page 37.

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 an unusual odor is seen or sensed, immediately turn the power switch on the main unit off and pull out the power cord (plug) from the power supply. A fire or an electrical shock may result.

Never use electrical power cords bundled.

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

Take care not to damage electrical power cords.

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

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

Never use an explosive material, a flammable material or a material containing them. An explosion or an electrical shock may result.
See section “13. List of dangerous materials” on page 37.

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.

Never try to disassemble or alter the unit.

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

⚠ Caution

When a thunder is heard.

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

2. Before operating the unit

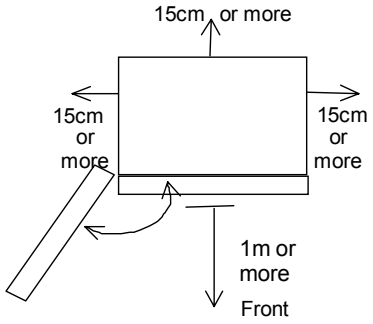
Precautions when installing the unit

1. Carefully select an installation site.

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

- On uneven or dirty floor
- Where combustible gas or corrosive gas exists
- Where the ambient temperature is 35°C or more
- Where temperature fluctuates widely
- Where dust or humidity is excessive
- Where subject to direct sunlight
- Where vibration is severe

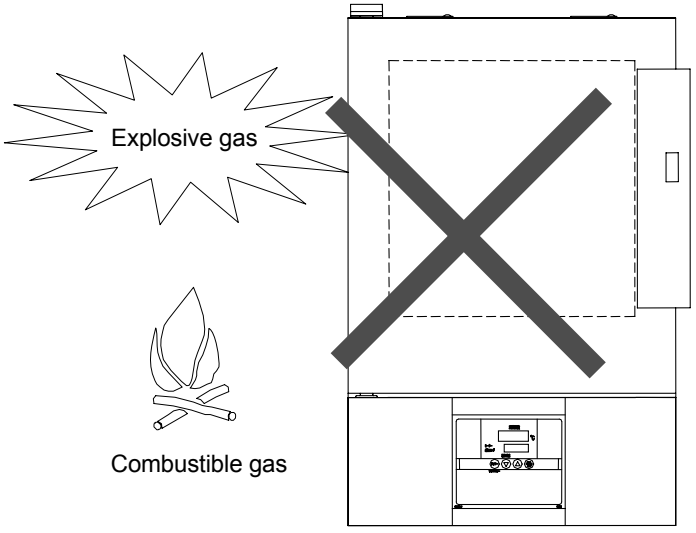
Install this unit at a place with spaces shown below.



2. Never operate the unit in an atmosphere containing explosive or flammable 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 turning a switch “ON” and “OFF” and during operation and a fire or an explosion may result.

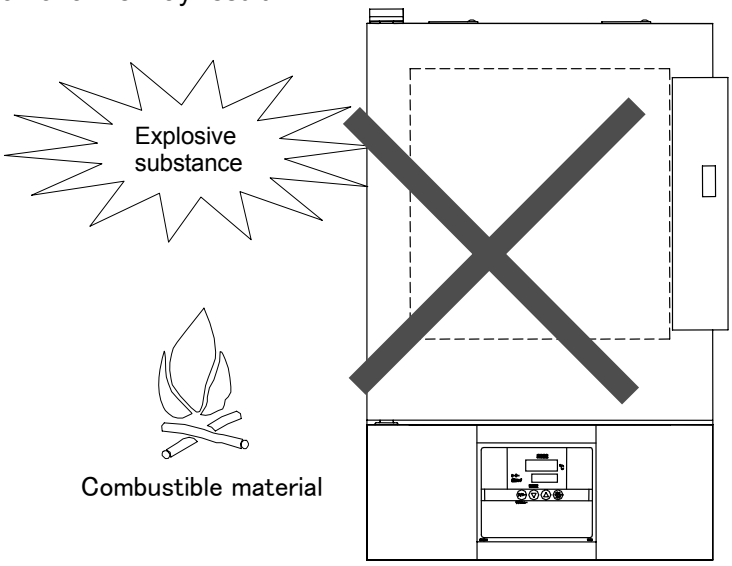
See the section “13. List of dangerous materials” on page 37 for flammable and explosive gases.



2. Before operating the unit

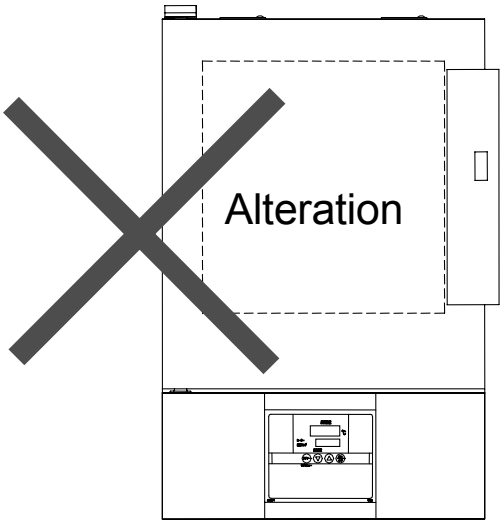
3. Never use the unit with an explosive material, a flammable material or a material containing them.

Never use the unit with an explosive material, a flammable material or a material containing them. An explosion or a fire may result.



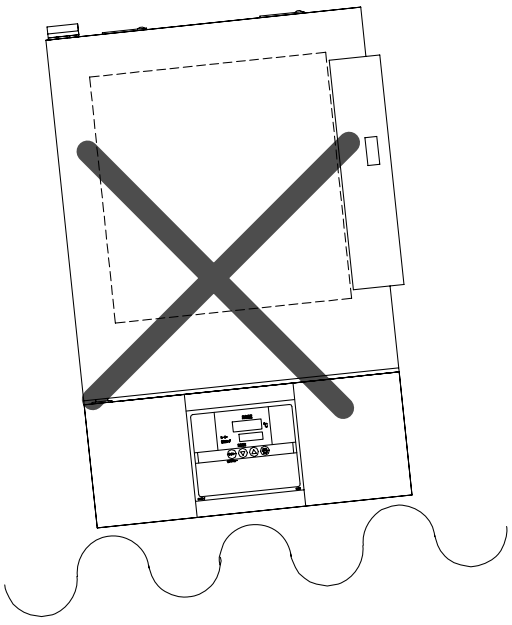
4. Do not alter the product.

The user shall never attempt to alter the unit since it may cause a malfunction.



5. Install the unit on a level surface

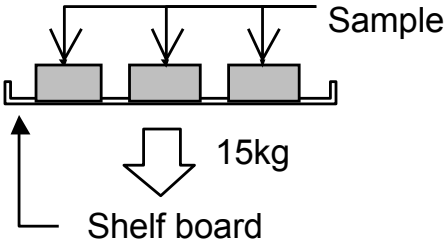
Install the unit on a level surface. Installing this unit on a slope might cause unexpected troubles or malfunctions.



2. Before operating the unit

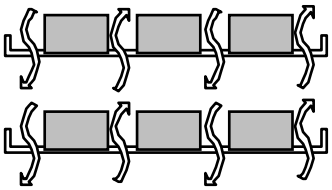
6. Do not overload shelves.

Withstand load of each shelf board is 15kg in uniform loading. Place samples in a dispersed fashion.



7. Do not place too many samples.

Too many samples may prevent proper temperature control. Be sure to use shelf boards and place samples apart each other so as to make free space of 30% or more to assure proper temperature accuracy.



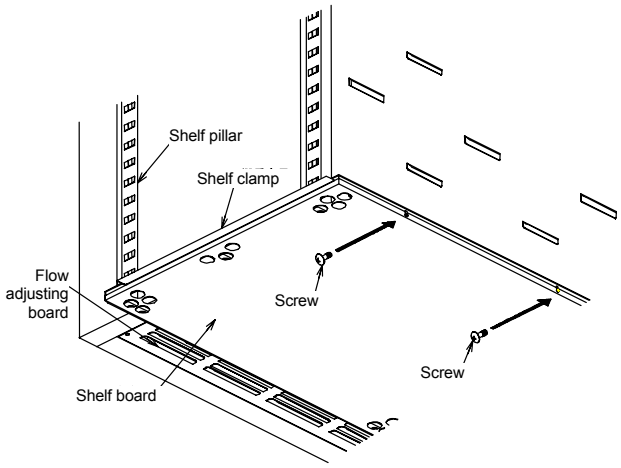
Make at least 30% of space

8. Installation

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

9. Placing shelf boards and samples

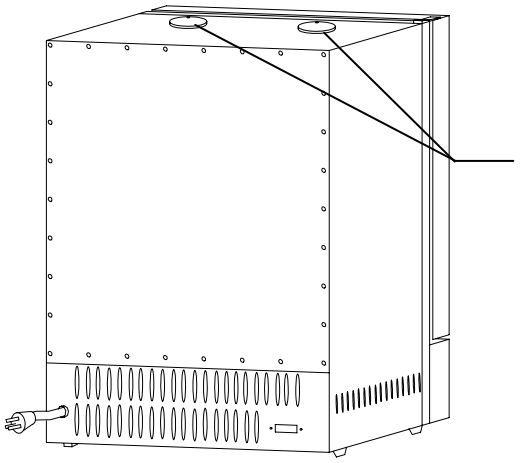
Two shelf boards are included with this product. One of them has been fixed on the lowest stage of the shelf pillar of the internal bath at the time of shipping from the factory. Set another board to an appropriate position in the bath.
A heater is installed under the flow adjusting board. Thus, the temperature of the flow adjusting board and around it is always higher than the set temperature and placing a sample directly on the board may damage it or cause a fire. Therefore, the shelf board is fixed with screws as shown to disable direct placement of samples. Because of the shape of samples, when the unit is operated with shelf boards removed to accept them, assure sufficient space between them and the flow adjusting board and never place samples directly on the board.



2. Before operating the unit

10. Always operate the unit with the vent holes open.

Do not cover the vent holes on the top panel of the unit.
Adjust the open amount according to the water content of a specific sample.



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

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

Electrical capacity:	DX302C	AC115V	8.5A	DX312C	AC220V	5A
	DX402C	AC115V	12.5A	DX412C	AC220V	7.5A
	DX602C	AC115V	12.5A	DX612C	AC220V	7.5A

* When the unit will not start even when you turn the earth leakage breaker to “ON”, check for low main voltage or if the unit is connected to the same power supply line as other devices and connect it to another line if necessary.

Avoid connecting too many devices using a branching outlet or extending a wire with a cord reel or temperature controlling function may degrade due to voltage drop.

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

2. Before operating the unit

12. Handling of a power cord

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

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

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

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

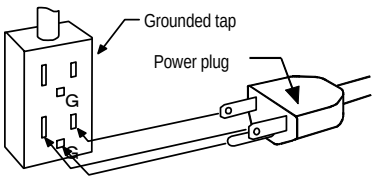
If the power cord should be damaged (exposure of core wire or disconnection), immediately turn the main unit off, pull out the power cord (plug) out of the power supply and ask your dealer to replace the cord. Otherwise, a fire or an electrical shock may result.

Connect the power cord to an appropriate wall outlet.

13. Be sure to connect the ground wire.

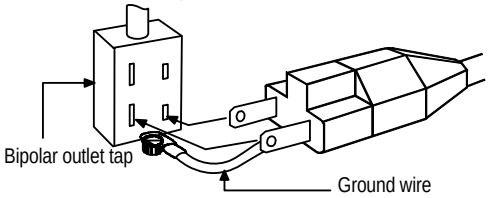
- When there is no ground terminal available, class D grounding works is necessary and please consult your dealer or our nearest sales office.
- Be sure to connect the ground wire to the wall outlet securely.

We recommend use of a ground type outlet tap.



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

When a bipolar type outlet tap is used



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

Never connect the ground wire to anything other than the ground terminal such as gas pipe, water pipe, or telephone line. Otherwise, an accident or a malfunction may result.

14. When you operate the unit for the first time

When you operate the unit for the first time at a higher temperature, the unit may generate an odor. This is due to decomposed bonding material contained in heat-insulation material and is not a malfunction of the unit. We recommend operating the unit at the highest temperature once before starting its regular operation.

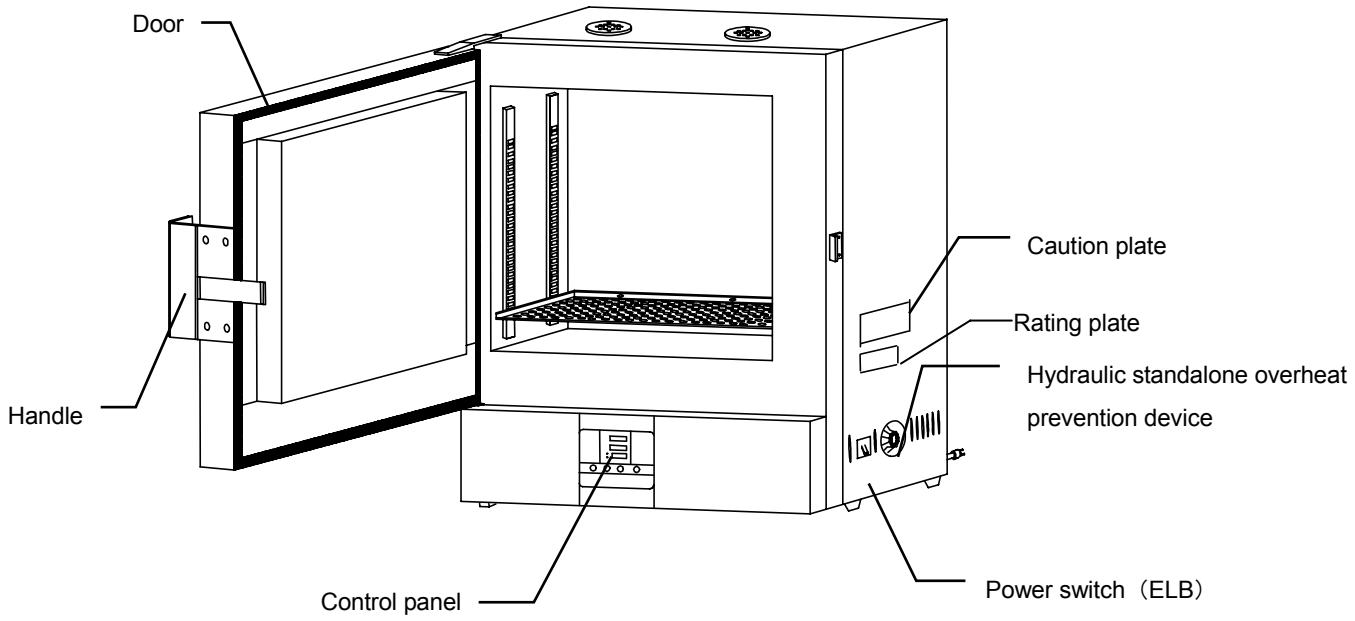
15. Do not use corrosive sample

Drain off well the water of wet material before putting it in chamber in case to dry it.Otherwise, it may cause dew condensation or excessively high humidity and cause harm to electrical system. Be careful that it may cause malfunction.

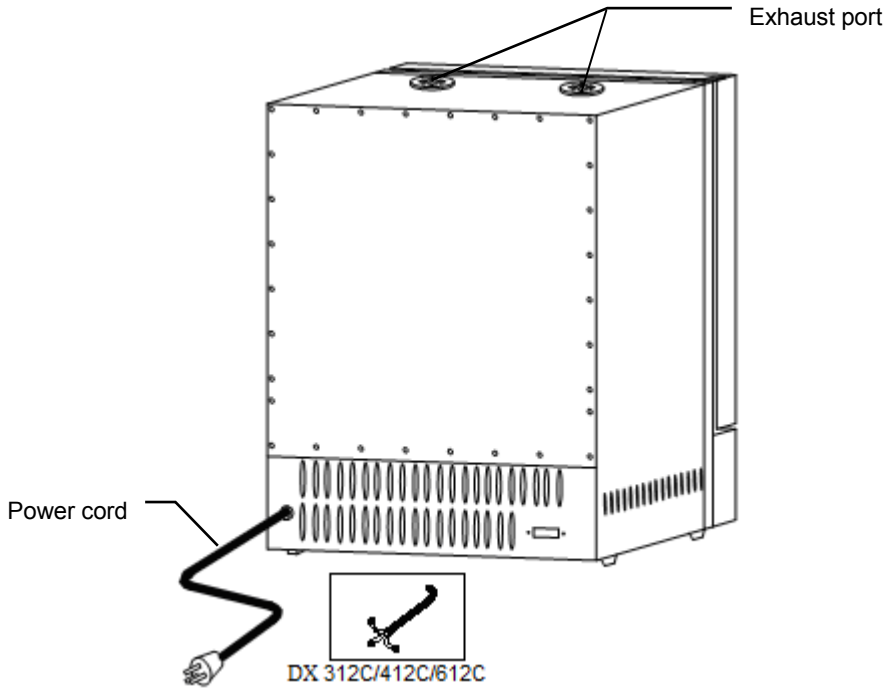
3. Names and functions of parts

Main body

Front panel

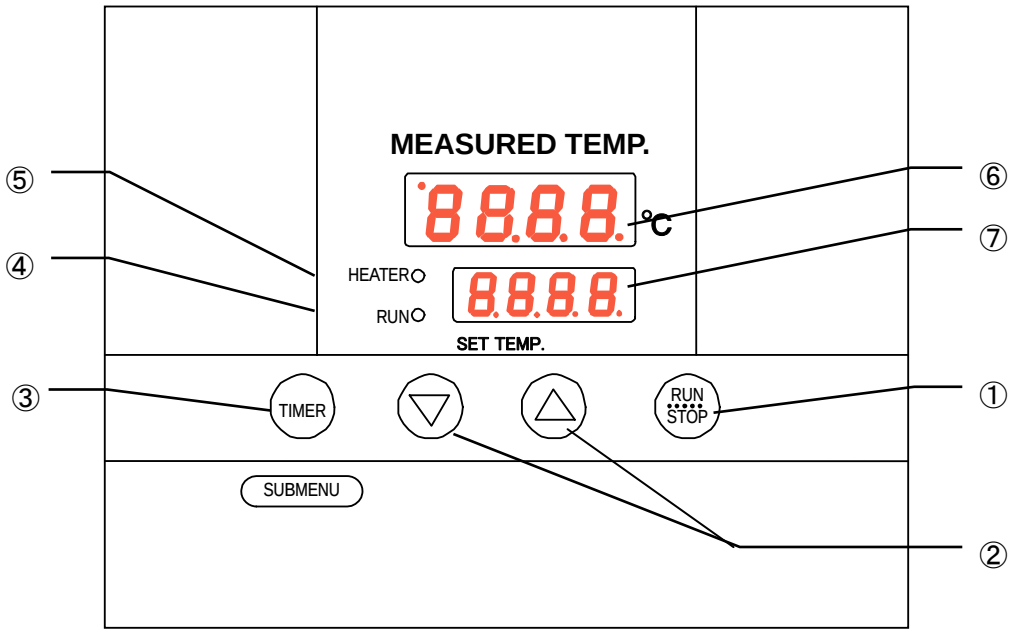


Rear panel



3. Names and functions of parts

Operation panel

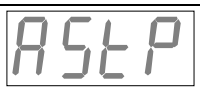
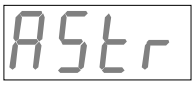


No.	Name	Operation/action
①	RUN/STOP key	Used for starting/stoping operation.
②	▼▲ keys	Used for selecting settings.
③	TIMER key	Key for selecting timer operation settings. Quick auto stop operation, auto stop operation or auto start operation can be selected.
	SUB MENU key (Long press of the Timer key)	Key for setting calibration offset temperature, the key lock function or the power outage compensation function.
④	RUN lamp	Illuminates during fixed temperature operation and blinks during timer operation.
⑤	HEATER lamp	Illuminates while heater power is on.
⑥	Measured temperature screen	Displays measured temperature in the bath・set characters・alarm information.
⑦	Set temperature screen	Displays a set temperature, timer settings and timer remaining time.

3. Names and functions of parts

Explanation of characters

Characters on the controller are explained in this section.

Characters	Identifier	Name	Application
	AStP	Auto stop setting	Used for setting auto stop operation.
	AStr	Auto start setting	Used for setting auto start operation.
	End	Time up	Displayed when timer operation has ended. See pages 17 and 19.
	cAL	Calibration offset setting	Used for inputting a calibration offset temperature See section “Using the calibration offset function” on page 23.
	Lock	Key lock of settings	Key locks settings to prevent their alteration See section “Using the lock function” on page 24.
	Pon	Power outage compensation setting	Selects operations after recovery from power outage. See section “Using the power outage compensation function” on page 25.

*See the section “Operation mode・function setting keys and characters” on page 14 for characters of operation modes and functions.

4. Operating procedures

List of operation modes and functions

Operation modes of the unit are as shown below:

№	Name	Description	Page
1	Fixed temperature operation	Turning the ELB on to enter the operation setting mode. Proceed to temperature setting that uses ▼▲ keys. Pressing the RUN/STOP key longer to start operation, and pressing the RUN/STOP key longer again to stop operation.	P.16
2	Quick auto stop operation	Used when you want to "stop fixed temperature operation being performed automatically in several hours. Press the TIMER key during fixed temperature operation to display "AStP." Set a duration before stop with the ▼▲ keys. Pressing the RUN/STOP key starts quick auto stop operation and activates the timer in the middle of it to automatically stop it after the set period of time.	P.17
3	Auto stop operation	Used when you want to "set automatic stop for fixed temperature operation when making settings for it." Press the TIMER key to display "AStP." Set a duration before stop with the ▼▲ keys. Pressing the RUN/STOP key starts auto stop operation.	P.19
4	Auto start operation	Used when you want to "start operation automatically after several hours" after power is turned on. Press the TIMER key to display "AStr." Set a duration before stop with the ▼▲ keys. Pressing the RUN/STOP key starts auto start operation.	P.21
* Operation mode cannot be changed while the unit is in operation. First stop operation before changing the mode.			

4. Operating procedures

List of operation modes and functions

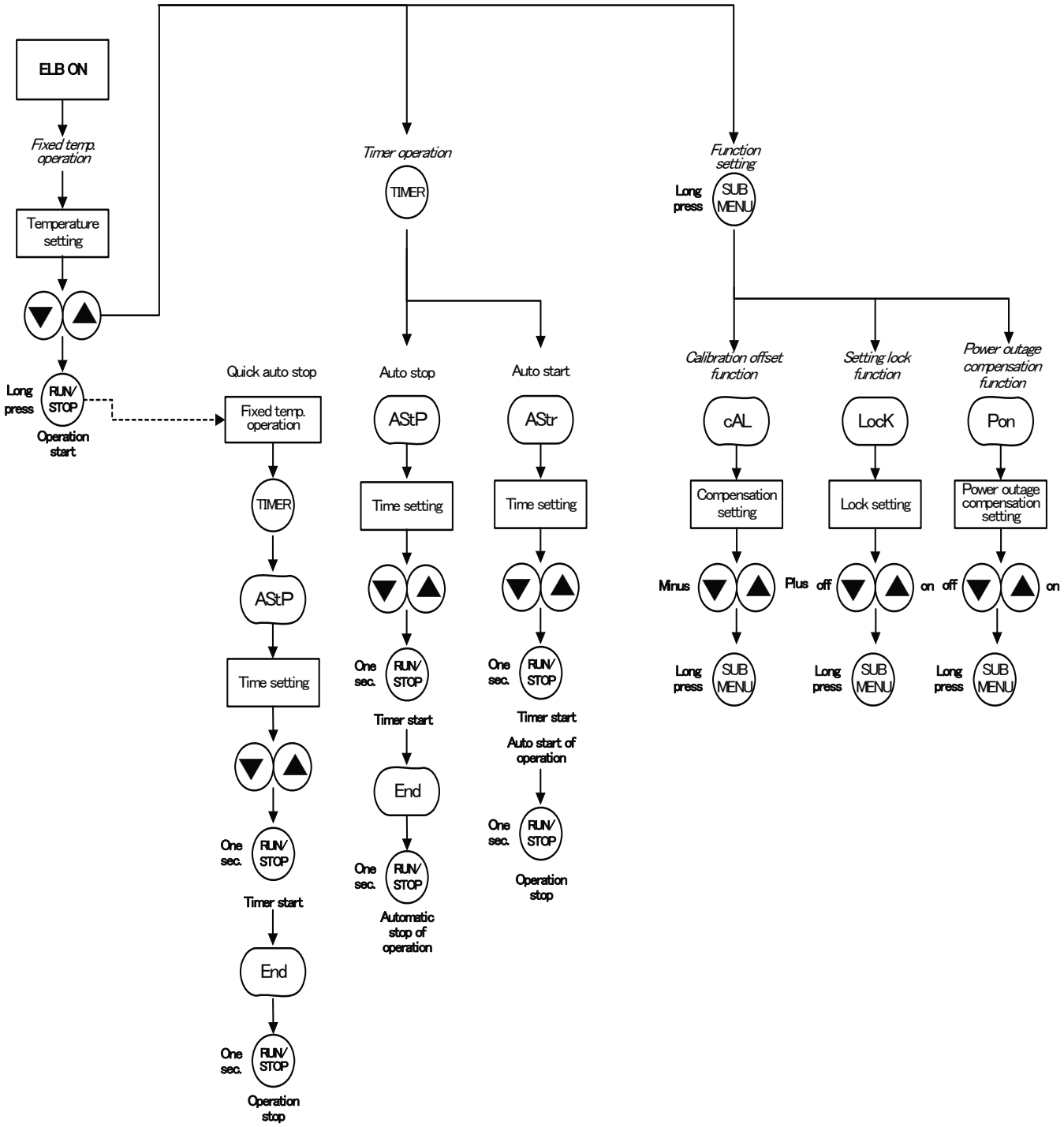
Functions of the unit are as shown below:

№	Name	Description	Page
1	Overheat prevention function	Automatic overheat prevention function: This function is linked to the unit set temperature and has been set to so that it is automatically activated (returned automatically) at a temperature 12℃ higher than the set temperature in the bath. Standalone overheat prevention device: When the temperature in the bath reaches the set temperature of the overheat prevention device, its heater circuit trips to shut off controller operation. The temperature can be set with the manual dial on the hydraulic overheat prevention device installed at the right side of the unit.	P.15
2	Calibration Offset function	Calibration offset function compensates any differences between the target temperature in the bath and the control temperature of the controller (sensor temperature.) The function can compensate to either plus or minus side for the whole temperature band of the unit. This compensation can be set with the SUB MENU keys.	P.23
3	Setting lock function	This function locks the set operation status. The lock can be set or released with the SUB MENU key.	P.24
4	Power outage compensation function	This function returns the main unit operation to the resume status after recovery from power outage, or keeps the current stop status. This compensation can be set with the SUB MENU keys.	P.25

4. Operating procedures

Operation mode・function setting keys and characters

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



4. Operating procedures

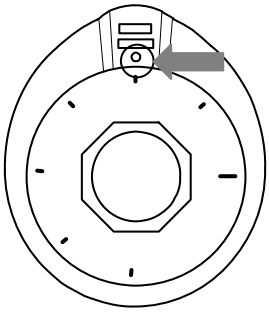
Operating procedures (settings for overheat prevention device)

As a safety measure for preventing overheat, a hydraulic overheat prevention device (manual return) is installed.

Temperature setting range and functions

The temperature setting range for the standalone overheat prevention device is “50℃～320℃.”
When the temperature in the bath keeps rising beyond the controller set temperature and reaches the set temperature of the overheat prevention device, the heater circuit trips and the controller operation is shut off.
When the overheat prevention device is activated, it will not be released until the ELB is turned on.

How to set temperature



Set the temperature scale to the arrow

Setting the overheat prevention temperature

- Set the temperature scale on the hydraulic overheat prevention device installed on the right side of the unit to the arrow in the diagram shown left.
- Turn the ELB to “OFF” and wait for a while without opening the door.
- After a while, turn the ELB“ON.” (Turn the ELB“ON”.)

⚠ Caution

① Set temperature as “set temperature +20℃” as a rough standard and add 5℃ to the setting if the device functions improperly.

② The temperature setting range for the standalone overheat prevention device is “50℃～320℃.” Be sure to set the overheat prevention activation temperature correctly otherwise the device may not start, the overheat prevention device is activated before temperature in the bath increases completely, or a fire or other unexpected accidents may result.
The temperature is set at 320℃ on shipping from the factory.

③ The overheat prevention device has been designed to prevent overheating of devices not to protect samples. The device does not prevent accidents caused from use of explosive or flammable substances.

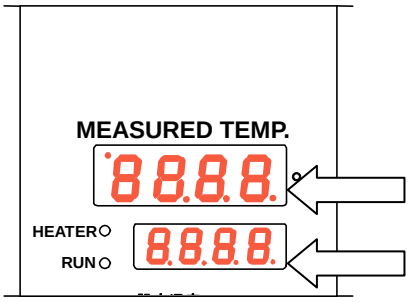
4. Operating procedures

Operating procedures (fixed temperature operation)

How to start fixed temperature operation

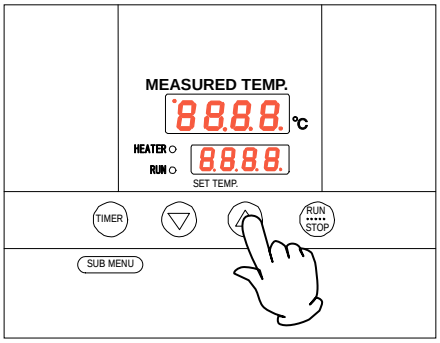
1.Turn the ELB ON. (Turn the ELB to “ON.”)

When the ELB is turned ON, the intial values will be displayed for about four seconds, then the initial screen will appear and the current bath temperature and the previous set temperature are displayed on each of the indicators.



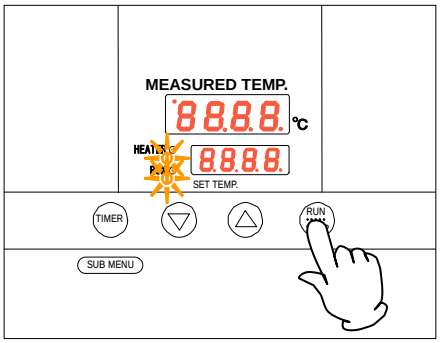
Measured temperature screen: Displays the current bath temperature

Set temperature screen: Displays the previous set temperature



2. Setting the temperature

Set a temperature using the ▼▲ keys.



3. Starting operation

Press the RUN/STOP key longer.

Fixed value operation will start and the RUN lamp and the HEATER lamp come on.

4. Stopping operation

Press the RUN/STOP key longer.

Operation stops, the RUN lamp goes off and the screen switches to the initial setting screen.

When you want to correct setting errors or change settings

When you want to change settings, press the ▼▲ keys on the current screen to enter the setting mode where you can change settings. Blink stops three seconds after three seconds after change and setting is completed.

Caution

① When you want to lower the set temperature during fixed temperature operation, note that it takes some time to reach the reset temperature since the unit has no cooling capacity.

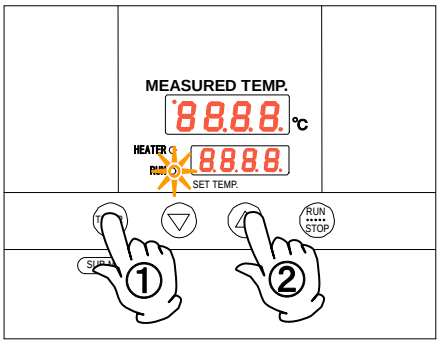
② Immediately after operation has been stopped, the temperature in the bath is around the set temperature. Operation stop refers only to machine stop and time needed for decreasing the emperature in the bath is not considered.

4. Operating procedures

Operating procedures (quick auto stop operation)

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

Procedures for quick auto stop operation



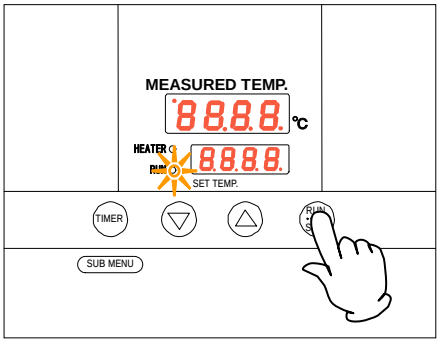
1. Setting time period before stop during fixed temperature operation

① Make sure that the RUN lamp is illuminated to indicate the unit is in operation.
Press the TIMER key.
Characters AStP are indicated on the measured temperature screen to indicate the auto stop operation mode and set duration blinks on the set temperature screen.

② Set a duration you want using the ▼▲ keys.

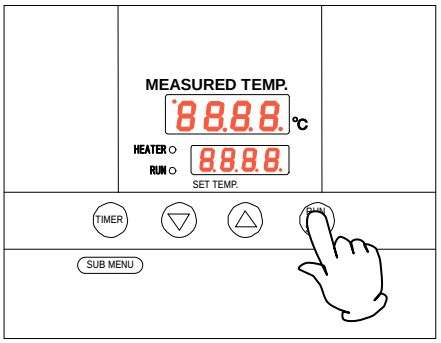
About the timer function

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



2. Starting timer operation

When the time you want is set, press the RUN/STOP key while the set temperature screen is blinking.
The RUN lamp blinks and timer operation is started.
Timer starts counting when the temperature in the bath reaches the set temperature.
Once timer counting is started, the set temperature screen changes to the remaining time display.



3.Stopping and ending timer operation

Operation stops automatically when the set temperature has elapsed.
Characters End blink on the set temperature screen to indicate operation has ended.
Press the RUN/STOP key for approx. one second to end the timer operation mode. The screen switches to the initial setting screen.

4. Operating procedures

Operating procedures (quick auto stop operation)

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

When you want to change settings, press the ▼▲ keys on the current screen to enter the setting mode where you can change settings. Blinking stops three seconds after three seconds after change and setting is completed. Note, however, that temperature changes after timer activation are counted also while temperature is changing.

When you want to change settings before timer activation, press the TIMER key on the current screen to enter the setting mode where you can change settings. Enter a time duration from when the set temperature is reached to the time the device shall be stopped.

When you want to change settings after timer activation, press the TIMER key on the current screen to enter the setting mode where you can change settings. Note, however, you need to set a time calculated by adding the time already passed to the time to be added.

After change has been made, press the RUN/STOP key to complete the process.

When you want to stop quick auto stop operation in the middle of it, press the RUN/STOP key long once to stop device control once, then make settings again in the appropriate mode.

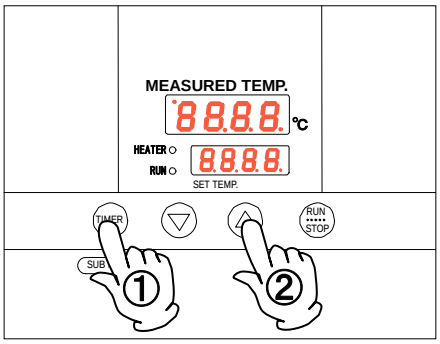
In terms of the remaining time display a blinking dot indicates count down and an illuminating dot indicates a wait status (while temperature is increasing or decreasing to the set temperature) during which the timer has stopped counting.

4. Operating procedures

Operating procedures (auto stop operation)

This mode automatically stops fixed temperature operation after a certain time from its start set with the timer.

Procedures for auto stop operation



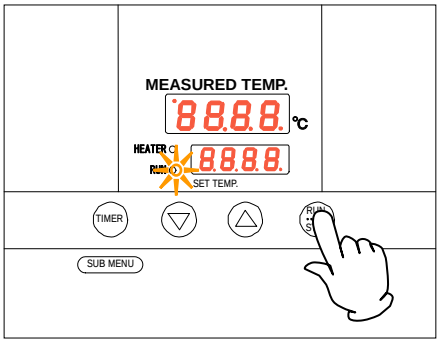
1. Setting a stop time

① After confirming the temperature you want is set, Press the TIMER key to display characters AStP on the measured temperature screen that indicate auto stop operation.
The set time is displayed on the set temperature screen.

② Set a time you want using the ▼▲ keys.
Pressing the▼▲ keys makes the set time blink. The time is determined when blinking stops.

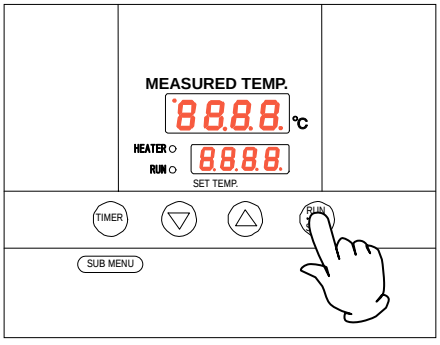
About the timer function

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



2. Starting timer operation

When the time you want is set, press the RUN/STOP key for about one second while characters AStP that indicate auto stop operation are displayed on the measured temperature screen and the set time on the set temperature screen.
The RUN lamp blinks and timer operation is started.
Timer starts counting when the temperature in the bath reaches the set temperature.
Once timer counting is started, the set temperature screen changes to the remaining time display.



3. Stopping and ending timer operation

Operation stops automatically when the set temperature has elapsed.
Characters End blink on the set temperature screen to indicate operation has ended.
Press the RUN/STOP key for approx. one second to end the timer operation mode. The screen switches to the initial setting screen.

4. Operating procedures

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

When you want to change settings, press the ▼▲ keys on the current screen to enter the setting mode where you can change settings. Blinking stops three seconds after three seconds after change and setting is completed. Note, however, that temperature changes after timer activation are counted also while temperature is changing.

When you want to change settings before timer activation, press the TIMER key on the current screen to enter the setting mode where you can change settings. Enter a time duration from when the set temperature is reached to the time the device shall be stopped.

When you want to change settings after timer activation, press the TIMER key on the current screen to enter the setting mode where you can change settings. Note, however, you need to set a time calculated by adding the time already passed to the time to be added.

After change has been made, press the RUN/STOP key to complete the process.

Auto stop operation is not available together with auto start operation.

When you want to stop auto stop operation in the middle of it, press the RUN/STOP key long once to stop device control once, and then make settings again in the appropriate mode.

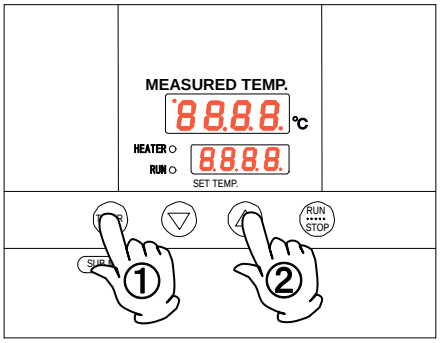
In terms of the remaining time display a blinking dot indicates count down and an illuminating dot indicates a wait status (while temperature is increasing or decreasing to the set temperature) during which the timer has stopped counting.

4. Operating procedures

Operating procedures (auto start operation)

This mode automatically starts fixed value operation after a certain time from its start set with the timer.
However, operation does not stop automatically but needs to be stopped manually.

Procedures for auto start operation



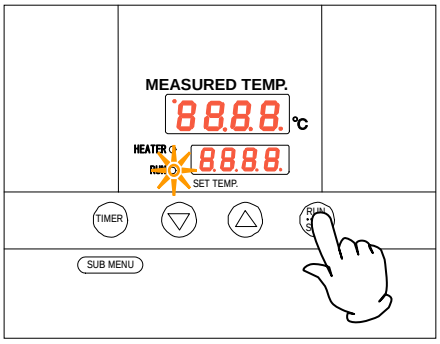
1. Setting an operation start time

① After confirming the temperature you want is set, Press the TIMER key to display characters AStr on the measured temperature screen that indicate auto start operation.
The set time is displayed blinking on the set temperature screen.

② Set a time you want using the ▼▲ keys.
Pressing the▼▲ keys makes the set time blink. The time is determined when blinking stops.

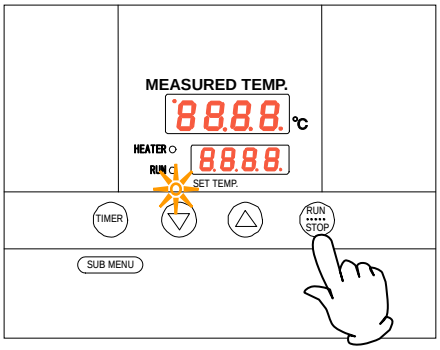
About the timer function

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



2. Starting timer operation

When the time you want is set, press the RUN/STOP key for about one second while characters AStr that indicate auto start operation are displayed on the measured temperature screen and the set time on the set temperature screen.
Timer starts counting when the RUN/STOP key is pressed and RUN lamp blinks.
Display on the measured temperature screen switches from set time display to remaining time display.



3.Stopping and ending timer operation

Operation automatically starts at the set time and the RUN lamp comes on.
To stop operation, press the RUN/STOP key for approx. one second to end the timer operation mode. The screen switches to the initial setting screen.

4. Operating procedures

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

When you want to change the set temperature during timer counting, press the ▼▲ keys during that status to switch the set temperature screen to the set temperature input mode, which blinks to enable change of the set temperature with the ▼▲ keys.

When you want to change the set time during timer counting, press the TIMER key during that status to switch the set temperature screen to the set time input mode, which blinks to enable change of the set time with the ▼▲ keys.

In either case, the set temperature screen will stop blinking after a while and switch to the timer count mode and the change made is determined. Note, however, when you change the set time you need to set a time calculated by adding the time already passed to the time to be added.

When operation has started after the auto start time, you cannot change the set time.

When you want to stop auto start operation in the middle of it, press the RUN/STOP key long to stop device control once, then make settings again in the appropriate mode.

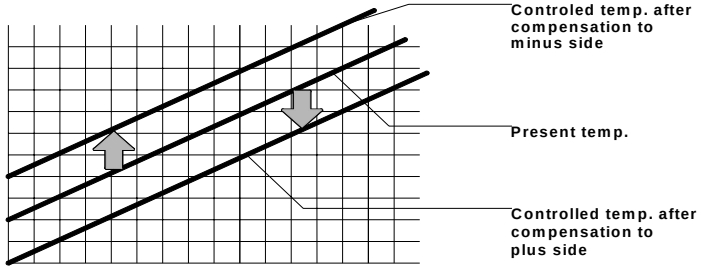
In terms of the remaining time display a blinking dot indicates count down and an illuminating dot indicates a wait status (while temperature is increasing or decreasing to the set temperature) during which the timer has stopped counting.

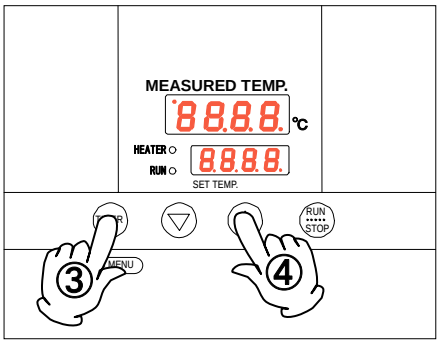
Using the calibration offset function

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

The lock can be set or released with the SUB MENU keys.

The temperature is set at "0" on shipping from the factory.





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

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

③ Press the TIMER key (SUB MENU key) long to enter the sub menu mode.

Press the TIMER key (SUB MENU key) several times to select the characters cAL cAL that indicates the calibration offset function.

④ Enter the difference between the set temperature and the temperature in the bath using the ▼▲ keys and press the TIMER key (SUB MENU key) long to exit the sub menu mode. (When you want to set the key lock function, proceed to character selection process for the key lock function without pressing the TIMER key (SUB MENU key) long.

* You can set either of + or – side for the offset compensation temperature.
  When compensation is set for the – side, the measured temperature display decreases by the compensation temperature while the temperature in the bath increases by the same amount.
  When compensation is set for the + side, the measured temperature display increases by the compensation temperature while the temperature in the bath decreases by the same amount.
* Since too large a compensation value may result in larger difference between the actual and indicated temperatures and may present a danger, consult our nearest sales office before entering a large compensation value.
* The device has, in addition to the calibration offset function, the two-point compensation function that adjusts offset for the lower temperature range and higher temperature range, for which adjustment temperatures have been input on shipping from the factory.
* Consult the nearest sales office before attempting validation work for the temperature adjusting device.

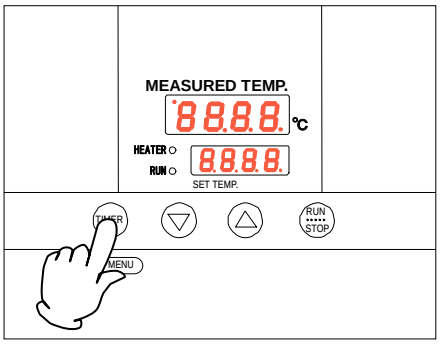
4. Operating procedures

Useful function (setting lock function)

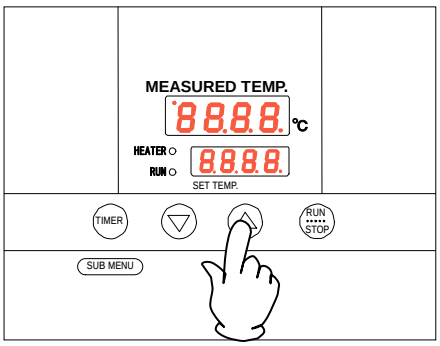
Using the lock function

This function locks the set operation status.

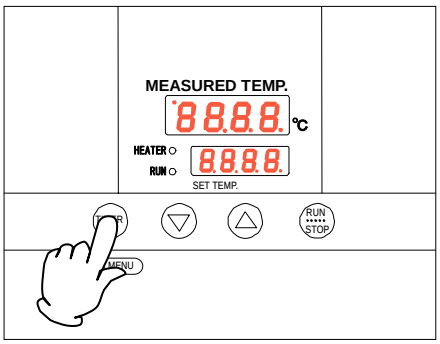
The temperature is set at “off” on shipping from the factory.



① Press the TIMER key (SUB MENU key) long to enter the sub menu mode.
Press the TIMER key (SUB MENU key) several times to select the characters Lock that indicate the setting lock function.



② “Off” is displayed on the set temperature screen. To lock settings, change to “on” using the ▲ key.
Press the TIMER key (SUB MENU key) long to exit the sub menu mode.



③ To release lock, press the TIMER key (SUB MENU key) long again and select the characters Lock that indicate setting lock using the ▼▲ keys.
Lock is released when “off” is selected using the ▼ key.

* When the lock function is “on”, keys other than the RUN/STOP key and the TIMER key (SUB MENU key) are locked.

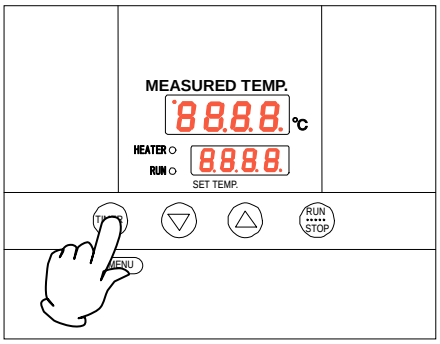
4. Operating procedures

Useful function (power outage compensation function)

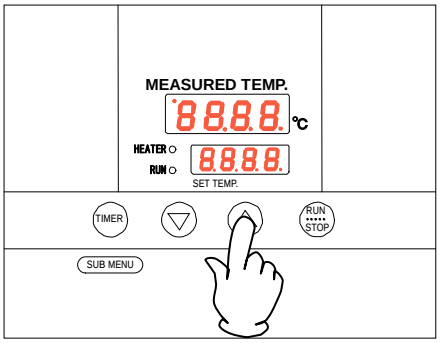
Using the power outage compensation function

The power outage compensation function returns the main unit operation to the resume status after recovery from power outage, or keeps the current stop status.

The function is set at “on” on shipping from the factory.



① Press the TIMER key (SUB MENU key) long to enter the sub menu mode.
Press the TIMER key (SUB MENU key) several times to select the characters Pon that indicate the power outage compensation function.



② “On” is displayed on the set temperature screen. The device keeps stop status after recovery from power outage when this setting is set to “off” using the ▼ key.
Press the TIMER key (SUB MENU key) long to exit the sub menu mode.

5. Cautions on handling

⚠ Warning

1. About handling of flammable or combustible solution

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

See section “13. List of dangerous materials” on page 37.

2. Ban on use/countermeasures when an error occurs

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

3. When using a wet material

Drain off well the water of wet material before putting it in chamber in case to dry it.Otherwise, it may cause dew condensation or excessively high humidity and cause harm to electrical system. Be careful that it may cause malfunction.

⚠ Caution

1. Do not step on the unit.

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

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

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

3. When a thunder is heard.

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

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

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

5. Cautions on handling

⚠ **Caution**

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

- When the unit is operated with the door open, the heater may overheat pausing a possible danger. Be sure to operate the unit with the door closed.
- After operation has been completed, do not leave the unit with its door open in order to, for example, cool down samples earlier. Heat from inside the bath may cause deformation of the control panel of a malfunction of the control devices.

6. Prohibition of use of corrosive samples

Although stainless steel is used for components in the bath, note that they might corrode with strong acid. Door packing is made of silicon rubber. Note that silicon rubber packing may corrode with acid, alkali, oil or halogen-based solvent.

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

Operational temperature range for the model DX302C/402C/312C/412C is room temperature +5℃～300℃; DX602C/612C room temperature +5℃～280℃.

Never try to operate the unit outside the operating temperature range.

8. About placement of samples

Withstand load of the shelf boards included is approx. 15kg. Do not place a sample heavier than this withstand load.

When putting samples, arrange them as dispersed as possible.

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

9. Do not put a sample on the bottom inside the product.

Never place a sample on the bottom, since if the unit is operated with a sample directly placed on the bottom of the internal bath, the optimal performance of the unit will not be attained, and temperature in the product may increase excessively causing a malfunction. Arrange samples on the shelf boards supplied and set the board on the shelf clamps.

10. About recovery from power outage.

When the power is applied again after the unit has stopped due to power outage, the unit will automatically return to the status immediately before the power outage and resumes operation.

Turn the ELB off if you do not want to resume operation by automatic recovery.

11. About two-tier stacking

Stack the units in two tiers using the special stacking clamps included as optional accessories.

Do not stack the units directly on each other in two tiers.

6. Maintenance procedures

Daily inspection/maintenance

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

⚠ Warning

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

⚠ Caution

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

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

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

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

Notes about disposition

Always pay attention to the preservation of the global environment.

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

Names of major components	Major materials
Major mechanism part components	
Enclosure	Steel plate　SPCC　（powder coating）
Internal bath	Stainless steel
Heat insulator	Rock wool
Door packing	Silicon rubber foam
Nameplates	Polyethylene (PET) resin film
Major electric parts	
Heater	Iron-chrome heater
Boards	Glass fiber and other composite parts
Power cord, wire material and others	Synthetic rubber sheathed and resin sheathed wires

8. Troubleshooting

Safety device and error codes

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

[Error codes]

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

Safety device	Symptom	Possible causes and measures
Sensor error	appears	● Error in the temperature input circuit ● Disconnection or other errors in the temperature sensor. ● Measured temperature is outside the displayable range Contact our service department.
Memory error	appears	● Memory setting error Contact our service department.
Measured temperature error	― ― ― ― ― ― ― ― appears	● When the upper limit alarm of the temperature alarm function is triggered. Contact our service department.

8. Troubleshooting

When a malfunction is suspected

If any of the symptoms below occurs

Symptom	Check
Turning the ELB to on will not activate the unit.	● If the power cord is connected to the power supply securely. ● If power outage is not occurring. ● If the standalone overheat prevention device is working.
Temperature does not rise.	● If the set temperature is below that in the device. ● If the power supply voltage has declined. ● If the ambient temperature is not low. ● If cooling load for inside the bath is not too large.
Temperature fluctuates during operation.	● If the set temperature is appropriate. ● If the power supply voltage has declined. ● If ambient temperature fluctuates widely. ● If cooling load for inside the bath is not too large.
Displayed temperature differs from the measurement.	● If the calibration offset setting is not other than “0”. Set it to “0.” Confirm settings in “Useful functions (calibration offset function)” in page 23.

If power outage occurs

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

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

9. After sales service and warranty

When requesting a repair

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

Information necessary for requesting a repair

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

Confirm on the warranty card or the nameplate installed on the unit.
See the section"

- ◆Description of trouble （as in detail as possible）

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

Warranty card (attached separately)

- Warranty card is given by your dealer or one of our sales offices and please fill in your dealer, date of purchase and other information and store securely.
- Warranty period is one full year from the date of purchase. Repair service for free is available according to the conditions written on the warranty card.
- For repairs after the warranty period consult your dealer or one of our sales offices. Paid repair service is available on your request when the product's functionality can be maintained by repair.

Minimum holding period of repair parts

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

10. Specifications

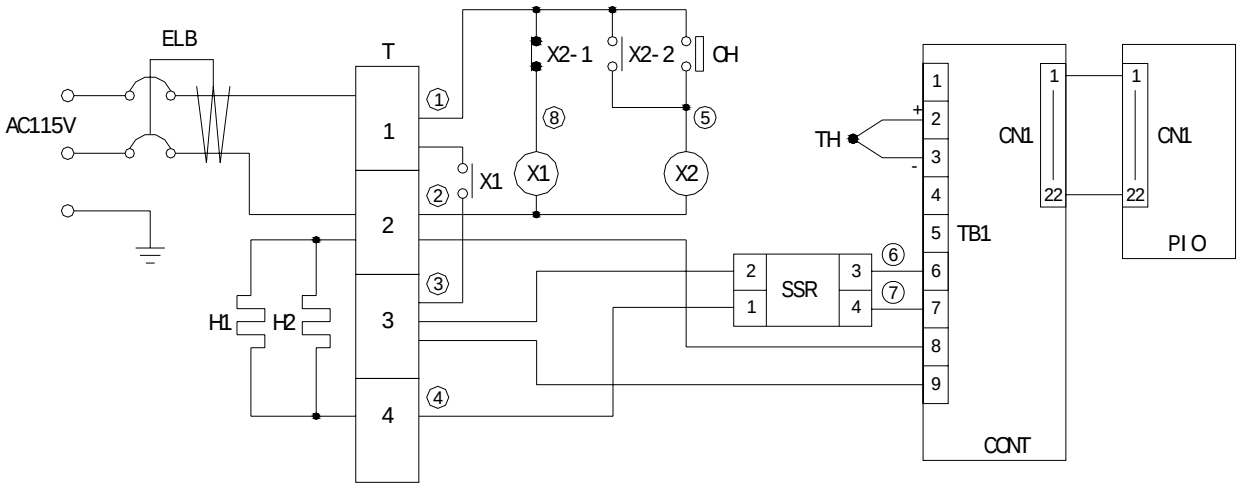
<table>
<tr><td colspan="2">Model</td><td>DX302C</td><td>DX312C</td><td>DX402C</td><td>DX412C</td><td>DX602C</td><td>DX612C</td></tr>
<tr><td rowspan="4">Performance</td><td>Temperature control range</td><td colspan="4">40℃～300℃</td><td colspan="2">40℃～280℃</td></tr>
<tr><td colspan="6">At no load and at an ambient temperature of 23℃</td></tr>
<tr><td>Temperature control precision</td><td colspan="6">±1℃ setting: 300℃(DX302C/312C/402C/412C),
280℃(DX602C/612C) exhaust port closed</td></tr>
<tr><td>Temperature distribution precision</td><td colspan="4">±10℃
(setting: 300, exhaust port closed)</td><td colspan="2">±10℃
(setting: 280, exhaust port closed)</td></tr>
<tr><td>Temperature rise time</td><td colspan="2">Approx. 45 minutes
(Room temperature～300℃)</td><td colspan="2">Approx. 60 minutes
(Room temperature～300℃)</td><td colspan="2">Approx. 80 minutes
(Room temperature～280℃)</td></tr>
<tr><td rowspan="3">Mechanism</td><td>Exhaust port</td><td colspan="6">Rotation damper with opening rate of 20% when closed</td></tr>
<tr><td rowspan="2">Heater</td><td colspan="6">Iron-chrome heater</td></tr>
<tr><td colspan="2">0.9 kW</td><td colspan="4">1.36 kW</td></tr>
<tr><td rowspan="5">Control assembly</td><td>Control system</td><td colspan="6">PID control of heater output with a micro computer</td></tr>
<tr><td>Setting system</td><td colspan="6">Digital setting using up/down keys</td></tr>
<tr><td>Operation mode</td><td colspan="6">Fixed temperature operation, quick auto stop operation
Auto stop operation, auto start operation</td></tr>
<tr><td>Sensor</td><td colspan="6">K thermocouple</td></tr>
<tr><td>Auxiliary functions</td><td colspan="6">Lock function, power outage compensation function, calibration offset function</td></tr>
<tr><td rowspan="2">Safety device</td><td>Controller Self diagnostic function</td><td colspan="6">Temperature sensor error, memory error, auto overheat prevention,
measured temperature error</td></tr>
<tr><td>Protection device</td><td colspan="6">ELB with an over current protector,
hydraulic standalone overheat prevention device</td></tr>
<tr><td rowspan="6">Standard</td><td>Outer dimensions (mm)
(w x d x h)</td><td colspan="2">400×440×630</td><td colspan="2">550×540×730</td><td colspan="2">700×640×830</td></tr>
<tr><td>Inner dimensions (mm)
(w x d x h)</td><td colspan="2">300×310×300</td><td colspan="2">450×410×400</td><td colspan="2">600×510×500</td></tr>
<tr><td>Internal volume</td><td colspan="2">28ℓ</td><td colspan="2">74ℓ</td><td colspan="2">153ℓ</td></tr>
<tr><td>Weight</td><td colspan="2">Approx. 23kg</td><td colspan="2">Approx. 38kg</td><td colspan="2">Approx. 56kg</td></tr>
<tr><td>Power supply (i50/60Hz)</td><td>115V 8.5A</td><td>220V 5A</td><td>115V 12.5A</td><td>220V 7.5A</td><td>115V 12.5A</td><td>220V 7.5A</td></tr>
<tr><td colspan="2">Included items</td><td colspan="6">Shelf board x 2 (withstand load approx. 15kg /each), operating instructions, warranty card</td></tr>
</table>

*Performance values are for the AC115V power supply (DX302C/402C/602C)
and the AC220V power supply (DX312C/412C/612C).

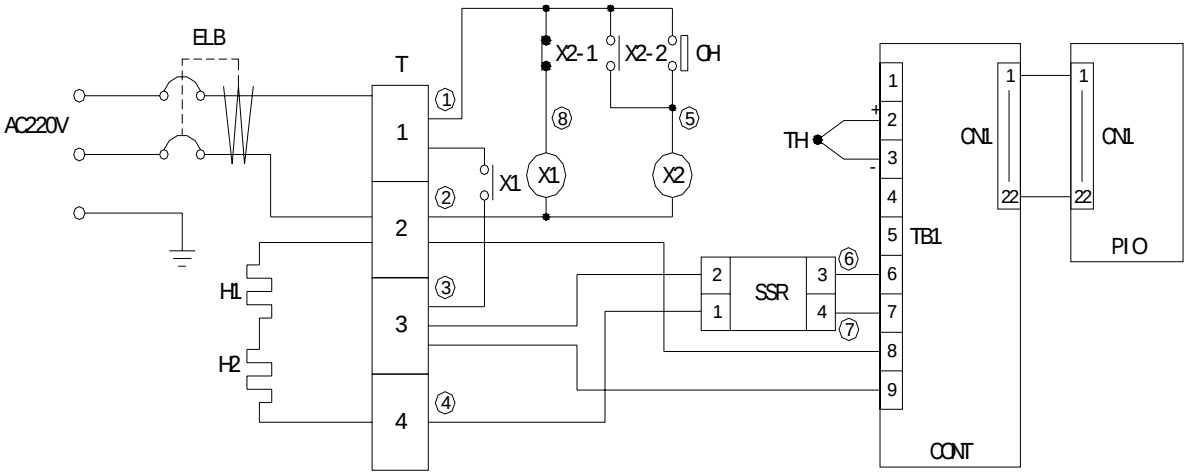
*Operating environmental temperature range for this device is 5℃～35℃.

11. Wiring diagram

DX302C/402C/602C



DX312C/412C/612C



Symbol	Part name	Symbol	Part name
ELB	Earth leakage breaker	OH	Thermostat
H1, H2	Heater	TH	Temperature sensor (K-thermocouple)
T	Terminal block	CONT	Control board
SSR	SSR	PIO	Display board
X1, X2	AC Relay		

12. List of replacement parts

Common parts

Symbol	Part name	Code No.	Specifications	Manufacturer
TH1	K Thermocouple	SJA14012	T0304.01-08 Φ3.2*55*2000 DKN single	YSJ
CONT	Control board	LT00007640	CN40B-Y	YSC
PIO	Display board	LT00007639	CN40B-Y	YSC
-	Signal cable	LT00007641	300 ㎜	YSC
SSR	SSR	SJA13073	XBPE4025C	YSJ
OH	liquid expansion type thermostat	A020103004	CAEM400℃	YSJ
ELB	Earth leakage breaker	SJA04529	KD-LS2123 30A 30mA	YSJ

Replacement parts for DX302C

Symbol	Part name	Code No.	Specifications	Manufacturer
X1	AC Relay	SJA04620	JQX-116F-2/110AL1HSTFW	YSJ
X2	AC Relay	SJA06808	JQX-13F/A1002Z1D	YSJ
H1・2	Heater	LT00020604	115V 450W DX302(YSA)	YSC
-	Power cord	SJA04480	3*2mm2 3m black/white/green USA plug	YSJ

Replacement parts for DX402C

Symbol	Part name	Code No.	Specifications	Manufacturer
X1	AC Relay	SJA04620	JQX-116F-2/110AL1HSTFW	YSJ
X2	AC Relay	SJA06808	JQX-13F/A1002Z1D	YSJ
H1・2	Heater	LT00020605	115V 750W DX402(YSA)	YSC
-	Power cord	SJA04480	3*2mm2 3m black/white/green USA plug	YSJ

Replacement parts for DX602C

Symbol	Part name	Code No.	Specifications	Manufacturer
X1	AC Relay	SJA04620	JQX-116F-2/110AL1HSTFW	YSJ
X2	AC Relay	SJA06808	JQX-13F/A1002Z1D	YSJ
H1・2	Heater	LT00020605	115V 750W DX402(YSA)	YSC
-	Power cord	SJA04480	3*2mm2 3m black/white/green USA plug	YSJ

12. List of replacement parts

Replacement parts for DX312C

Symbol	Part name	Code No.	Specifications	Manufacturer
X1	AC Relay	SJA06060	HF116F-2/220AL1HSTFW	YSJ
X2	AC Relay	SJA06063	JQX-13F/A2202Z1D	YSJ
H1・2	Heater	LT00020605	115V 750W DX402 (YSA)	YSC
-	Power cord	YSAJ000013	3*2mm2 3m black/white/green, No plug	YSJ

Replacement parts for DX412C

Symbol	Part name	Code No.	Specifications	Manufacturer
X1	AC Relay	SJA06060	HF116F-2/220AL1HSTFW	YSJ
X2	AC Relay	SJA06063	JQX-13F/A2202Z1D	YSJ
H1・2	Heater	LT00007909	100V 680W	YSC
-	Power cord	YSAJ000013	3*2mm2 3m black/white/green, No plug	YSJ

Replacement parts for DX612C

Symbol	Part name	Code No.	Specifications	Manufacturer
X1	AC Relay	SJA06060	HF116F-2/220AL1HSTFW	YSJ
X2	AC Relay	SJA06063	JQX-13F/A2202Z1D	YSJ
H1・2	Heater	LT00007909	100V 680W	YSC
-	Power cord	YSAJ000013	3*2mm2 3m black/white/green, No plug	YSJ

13. List of dangerous materials

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

Explosive substance	Explosive substance	① Nitroglycol, glycerine trinitrate, cellulose nitrate and other explosive nitrate esters
		② Trinitrobenzen, trinitrotoluenem, picric acid and other explosive nitro compounds
		③ Acetyl hydroperoxide, methyl ethyl ketone peroxide, benzoyl peroxide and other organic peroxides
Flammable substances	Explosive substances	Metal “lithium”, metal “potassium”, metal “natrium”, yellow phosphorus, phosphorus sulfide, red phosphorus, celluloids, calcium carbide (a.k.a, carbide), lime phosphide, magnesium powder, aluminum powder, metal powder other than magnesium and aluminum powder, sodium dithionous acid (a.k.a., hydrosulphite)
	Oxidizing substances	① Potassium chlorate, sodium chlorate, ammonium chlorate, and other chlorates
		② Potassium perchlorate, sodium perchlorate, ammonium perchlorate, and other perchlorates
		③ Potassium perchlorate, sodium perchlorate, ammonium perchlorate, and other inorganic perchlorates
		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 degrees, one air pressure.

14. Standard installation manual

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

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

№	Item	Implementation method	TOC No. Reference page of the operating instruction manual	Judg ment
Specifications				
1	Included items	Check for number of staffs against the included item field	10. Specifications field P.33	
2	Installation	・Visual check of environmental conditions Caution: Take care for environment	2. Before operating the unit ・On the installation site P.4	
		・Securing a space		
Operation-related matters				
1	Source voltage	・Measure the user side voltage (outlet) with a tester ・Measure voltage during operation (shall meet the standard) Caution: Always use a plug that meets the specification for attaching to the ELB.	2. Before operating the unit P.8 ・Be sure to connect the ground wire. P.7 ・Power supply is …. P.33 10.Specifications ・Specification-power supply	
2	Operation start	・Starts operation Performs fixed value operation, auto stop operation or auto start operation	2. Before operating the unit P.4～8 ・Installation procedures… P.12～25 4. Operating procedures	
Description				
1	Operational descriptions	Explain operations of each compo-nent according to the operational instructions	4. Operating procedures P.12～25 ・Operating procedures 1. Safety precautions ～ 13.List of dangerous materials P.1～37	
2	Error codes	Explain the customer about error codes and procedures for release according to the operational instructions	8. Troubleshooting ～ 9. After sales service and warranty P.30～32	
3	Maintenance and inspection	Explain operations of each component according to the operational instructions	6. Maintenance procedures P.28 ・Daily inspection/ maintenance	
4	Completion of installation Entries	・Fill in the installation date and the installation mgr. on the nameplate of the main unit ・Fill in necessary information to the warranty card and hand it over to the customer ・Explanation of the route for after-sales service	9. After sales service and warranty P.32	

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.

Instruction Manual
Constant Temperature Drying Oven
Model DX302C/402C/602C/312C/412C/612C
Second Edition 26 June 2012

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