SINCE 1889

Yamato

Constant High Temperature Water Bath

Model BA310C BA410C BA510C BA610C BA710C

First Edition

- Thank you for purchasing "BA Series Constant High Temperature Water Bath" 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 any time.

⚠WARNING!:

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

Yamato Scientific Co.,Ltd.

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Explanation

MEANING OF ILLUSTRATED SYMBOLS

Illustrated Symbols

Various symbols are used in this safety manual in order to use the unit without danger of injury and damage of the unit. A list of problems caused by ignoring the warnings and improper handling is divided as shown below.Be sure that you understand the warnings and cautions in this manual before operating the unit.

⚠ WARNING! If the warning is ignored, there is the danger of a problem that may cause a serious accident or even fatality.

⚠ CAUTION! If the caution is ignored, there is the danger of a problem that may cause injury/damage to property or the unit itself.

Meaning of Symbols

This symbol indicates items that urge the warning (including the caution).
A detailed warning message is shown adjacent to the symbol.

This symbol indicates items that are strictly prohibited.
A detailed message is shown adjacent to the symbol with specific actions not to perform.

This symbol indicates items that should be always performed.
A detailed message with instructions is shown adjacent to the symbol.

1. Cautions in using with safety

Table of Illustrated Symbols

Warning


Warning,
generally


Warning,
high voltage


Warning,
high temperature


Warning,
drive train


Warning,
explosive

Caution


Caution,
generally


Caution,
electrical shock


Caution,
scald


Caution,
no load heating


Caution,
not to leak

Caution,
water only


Caution,
deadly poison

Prohibit


Prohibit,
generally


Prohibit,
inflammable


Prohibit,
to disassemble


Prohibit,
to touch

Compulsion


Compulsion,
generally


Compulsion,
connect to the
grounding
terminal

Compulsion,
install on a flat
surface


Compulsion,
disconnect the
power plug


Compulsion,
periodical
inspection

1. Cautions in using with safety

Fundamental Matters of "WARNING!" and "CAUTION!"

⚠ Warning

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

Never use this unit in an area where there is flammable or explosive gas. This unit is not explosion-proof. An arc may be generated when the power switch is turned on or off, and fire/explosion may result. (Refer to page 44 "13. List of Dangerous Substances".)

Always ground this unit

Always ground this unit on the power equipment side in order to avoid electrical shock due to a power surge.

If a problem occurs

If smoke or strange odor should come out of this unit for some reason, turn off the power key right away, and then turn off the circuit breaker and the main power. Immediately contact a service technician for inspection. If this procedure is not followed, fire or electrical shock may result. Never perform repair work yourself, since it is dangerous and not recommended.

Do not use the power cord if it is bundled or tangled

Do not use the power cord if it is bundled or tangled. If it is used in this manner, it can overheat and fire may be caused.

Do not process, bend, wring, or stretch the power cord forcibly

Do not process, bend, wring, or stretch the power cord forcibly. Fire or electrical shock may result.

Substances that cannot be used

Never use explosive substances, flammable substances and substances that include explosive or flammable ingredients in this unit. Explosion or fire may occur. (Refer to page 44 "13. List of Dangerous Substances".)

Do not touch high-temperature parts

The inside of the body or the door may become hot during and just after operation. It may cause burns.

Do not disassemble or modify this unit

Do not disassemble or modify this unit. Fire or electrical shock or failure may be caused.

⚠ Caution

During a thunder storm

During a thunderstorm, turn off the power key immediately, then turn off the circuit breaker and the main power. If this procedure is not followed, fire or electrical shock may be caused.

2. Before using this unit

Requirements for Installation

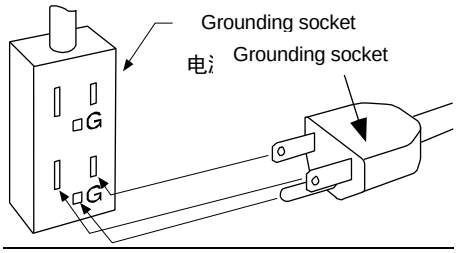
⚠ Warning

1. Always ground this unit

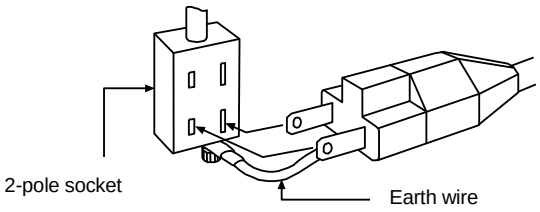
BA310C/BA410C/BA510C/BA610C/BA710C does not have power plug, uses single phase 220V power source and needs power cord connecting work, please consult your local electrical contractor for power connecting work, grounding as per electrical device technical benchmark.

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

Better to use grounding socket



2-pole socket



No grounding terminal

- Need power connecting work, please consult your local electrical contractor or Yamato Business Office.

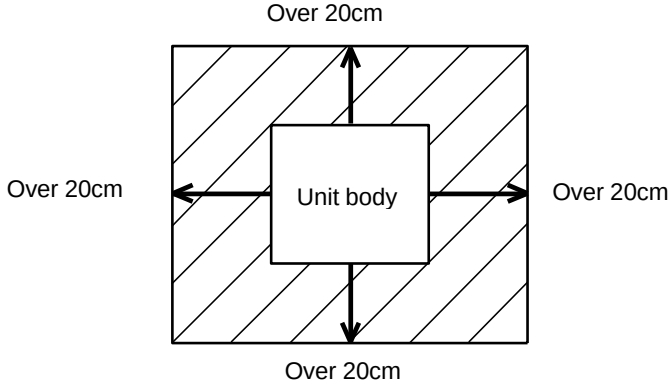
- Insert the grounding adaptor to power plug, confirm the socket polarity and connect. In addition, connect the earth wire (green) of grounding adaptor with grounding terminal of power unit.

2. Choose a proper place for installation

Do not install this unit in a place where:

- Rough or dirty surface.
- Flammable gas or corrosive gas is generated.
- Ambient temperature exceeds 35°C.
- Ambient temperature fluctuates violently.
- There is direct sunlight.
- There is excessive humidity and dust.
- There is a constant vibration.

Install this unit on a stable place with the space as shown below.



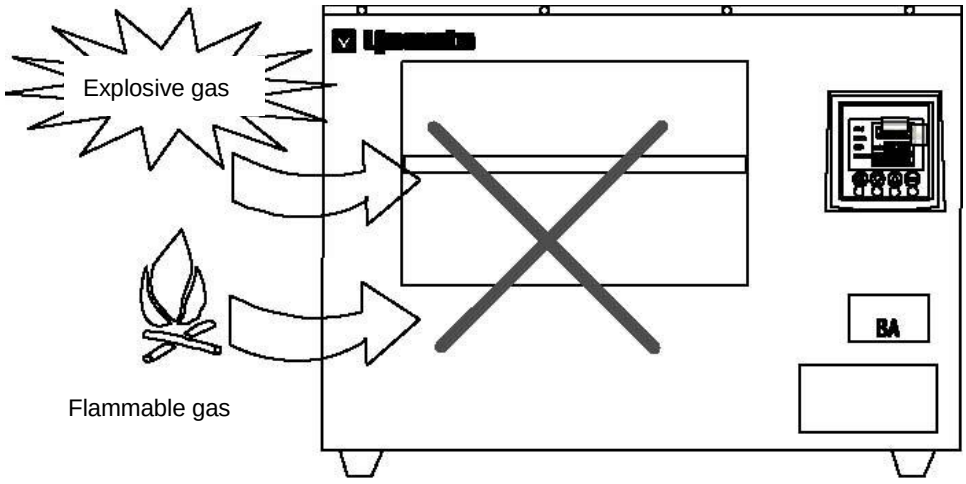
Requirements for Installation

⚠ Warning

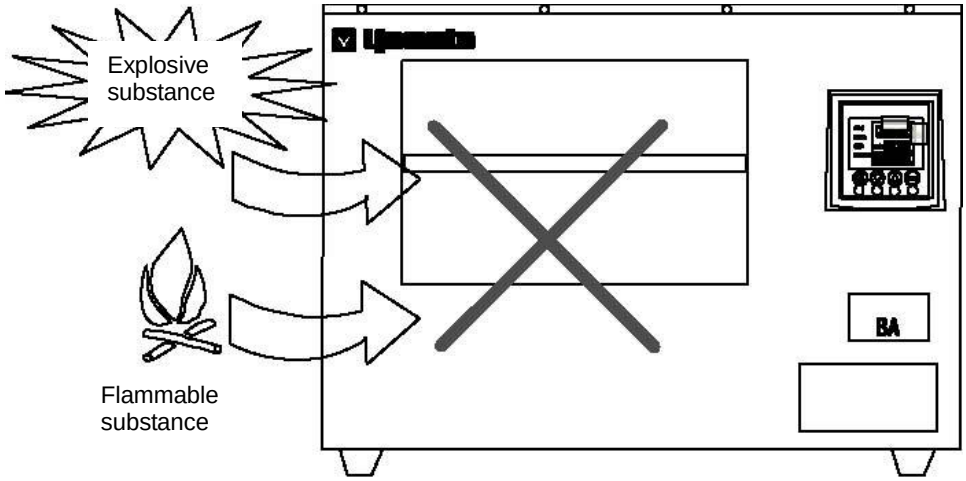
3. Do not use this unit in an area where there is flammable or explosive gas

(Refer to page 44 "13. List of Dangerous Substances".)

Never use this unit in an area where there is flammable or explosive gas. This unit is not explosion-proof. An arc may be generated when the power switch is turned ON or OFF, and fire/explosion may result.



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



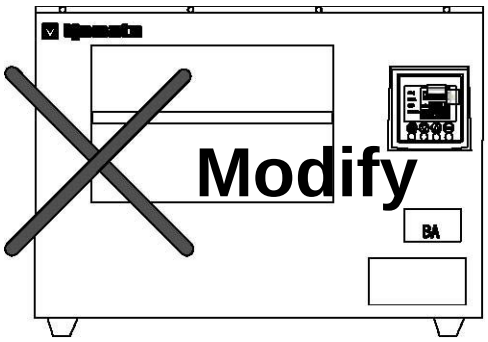
2. Before using this unit

Requirements for Installation

⚠ Warning

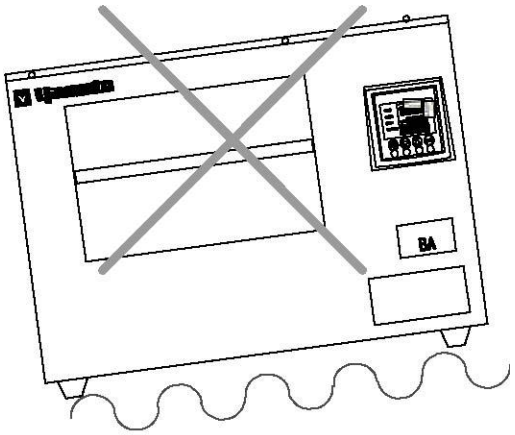
4. Do not modify

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



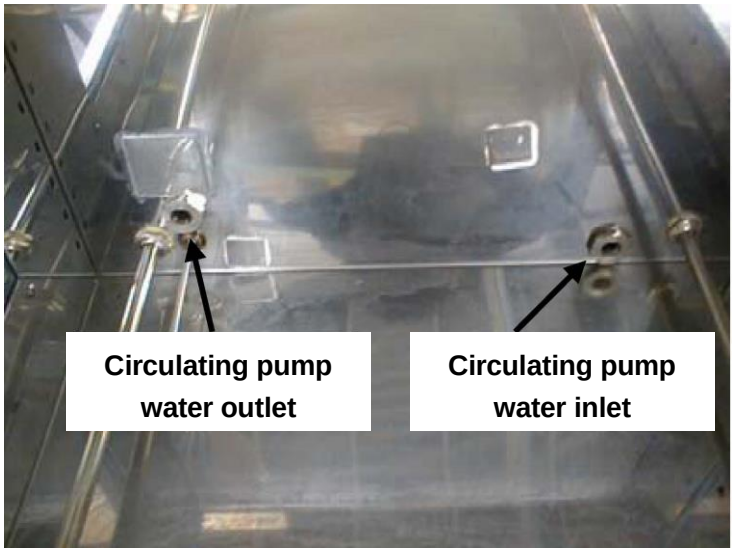
5. Installation on horizontal surface

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



6. Please exhaust the air in the circulating pump

- Due to different water inflow ways, the circulating pump of unit body may have residual air and result in idling of circulating pump, which would make strident noise and cause equipment damage. Please according to the following main points, exhaust the air in the circulating pump when draining water.
- ・During the process of injecting water into the hidden circulating pump water inlet and outlet, connect the water inflow hose with water inlet to inject water while exhausting the air through water outlet.
- ・During the process of injecting water into the hidden circulating pump water inlet and outlet, tilt the unit body to exhaust the air through water outlet.



2. Before using this unit

Requirements for Installation

⚠ Caution

7. Choose a correct socket

Choose a correct power socket that meets the unit's rated electric capacity.

Electric capacity	BA310C	AC220V	6A	BA610C	AC220V	16.5A
	BA410C	AC220V	10.5A	BA710C	AC220V	21A
	BA510C	AC220V	11.5A			

There could be the case that the unit does not run even after turning ON the power. Inspect whether the voltage of the main power is lowered than the specified value, or whether other device(s) uses the same power line of this unit. If the phenomena might be found, change the power line of this unit to the other power line. When BA610C/BA710C does not have plug, please consult your dealer or a local electrical contractor for the connection of devices that use a single-phase 220V power source.

9. Installation and layout

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

10. Handling of power cord

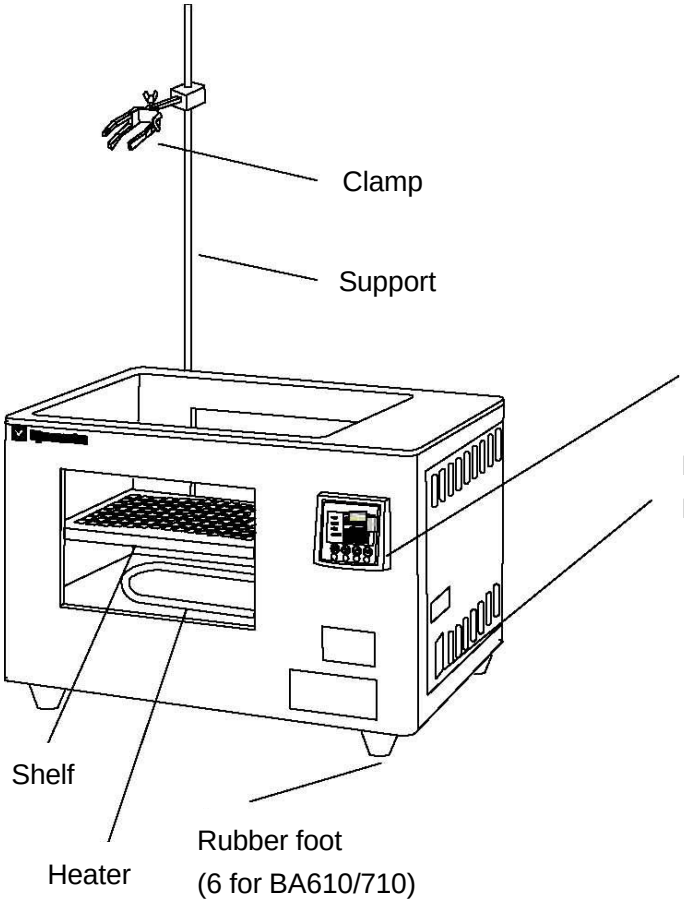
- Do not entangle the power cord. This will cause overheating and possibly a fire.
- Do not bend or twist the power cord, or apply excessive tension to it. This may cause a fire and electrical shock.
- Do not lay the power cord under a desk or chair, and do not allow it to be pinched in order to prevent it from being damaged and to avoid a fire or electrical shock.

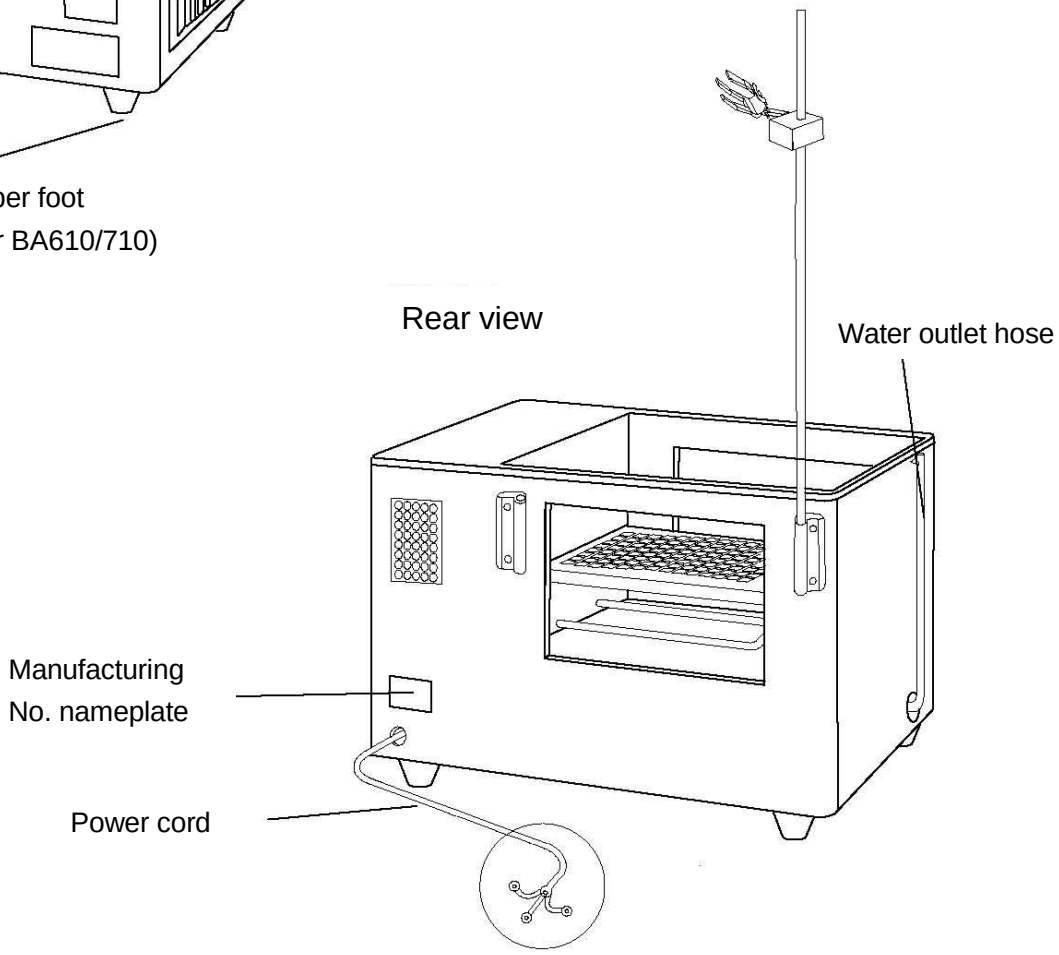
- Keep the power cord away from any heating equipment such as a room heater. The cord's insulation may melt and cause a fire or electrical shock.
- If the power cord becomes damaged (wiring exposed, breakage, etc.), immediately turn off the power at the rear of this unit and shut off the main supply power. Then contact your nearest dealer for replacement of the power cord. Leaving it may cause a fire or electrical shock.
- Connect the power plug to the receptacle which is supplied appropriate power and voltage.

3. Name and Function of Each Part

Main Unit

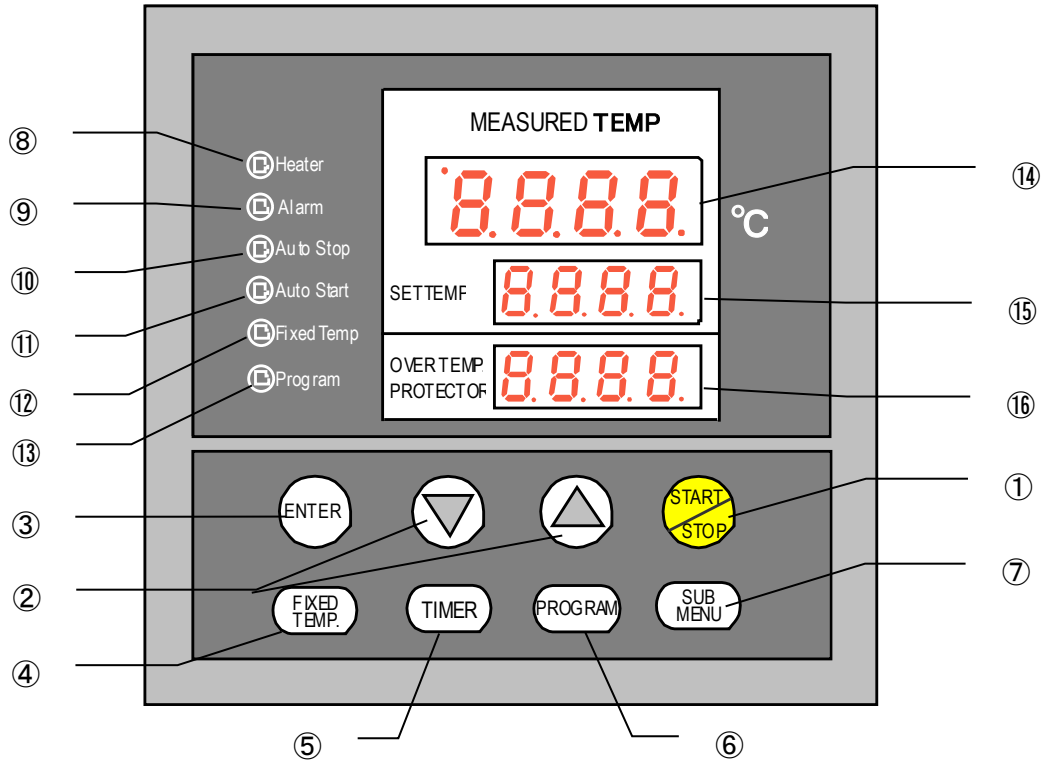
BA310C/410C/510C/610C/710C





3. Name and Function of Each Part

Operation panel

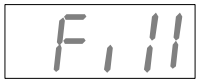
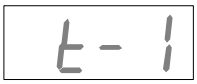


①	START/STOP Key	Start/stop the operation.
②	▲▼ Key	Use for rising UP/lowering DOWN the setting value.
③	ENTER Key	Settle the inputted value.
④	FIXED TEMP Key	Choose the fixed temperature operation.
⑤	TIMER Key	Choose the timer operation (Quick Auto Stop/Auto Stop/Auto Start).
⑥	PROGRAM Key	Choose the program operation or program creation mode. (3 types and 6 modes programs)
⑦	SUBMENU Key	Use for setting the overheating prevention temperature, calibration offset temperature, key lock function, or program repeat function.
⑧	HEATER Lamp	Light while the heater works.
⑨	ALARM Lamp	Light up when an error occurs. (Buzzer sounds simultaneously.)
⑩	AUTO STOP Lamp	Blink while setting quick auto stop timer or auto stop timer. Light while quick auto stop timer or auto stop timer is running.
⑪	AUTO START Lamp	Blink while setting auto start timer. Light while auto start timer is running.
⑫	FIXED TEMP Lamp	Blink while setting fixed temperature operation. Light while fixed temperature operation is running.
⑬	PROGRAM Lamp	Blink while setting program operation. Light while program operation is running.
⑭	Measurement Temp. Display	Display the measured temperature, setting character, alarm information.
⑮	Setting Temp. Display	Display the setting temperature, setting value for timer mode, remaining time.
⑯	Overheating Prevention Temp. Display	Display the setting temperature for overheating prevention device.

3. Name and Function of Each Part

Characters of the Controller

The explanation of VS6 controller characters are as follows:

Character	Identifier	Name	Purpose
	**FiX**	Fixed Temperature Setting Mode	Used for starting the fixed temperature operation.
	**Sv**	Temperature Setting	Used for setting the temperature.
	**AStP**	Timer Setting Mode Display	Represents the setting of quick auto stop or auto stop operation.
	**AStr**	Timer Setting Mode Display	Represents the setting of auto start operation.
	**tim**	Time Setting	Used for setting the time.
	**PrG3**	Program Type	Used for choosing program type from 1 to 3. (Refer to Page 22 " Program Operation".)
	**PAt**	Program Pattern	Used for choosing program pattern. (Refer to Page 22 " Program Operation".)
	**End**	Time Up	Displays when the timer operation is completed (Refer to Page 17, 19)
	**Sv-1**	Program Temperature Setting	Used for setting the temperature for each step in the program. (Sv-1 to Sv-30 is shown.)
	**t-1**	Program Time Setting	Used for setting the time for each step in the program. (t-1 to t-30 is shown.)
	**PS-3**	Step Number to be Repeated	Used for choosing the step number to be repeated under the program operation with repeat function. (Refer to Page 27 “Use program repeat function".)
	**Pc-2**	Repeating Times	Used for setting the repeating times under the program operation with repeat function. (Refer to Page 27 “Use program repeat function".)
	**cAL**	Calibration Offset Setting	Used for inputting the calibration offset temperature. (Refer to Page 30 "Other Function".)
	**oH**	Overheating Prevention Setting	Used for setting temperature for overheating prevention device. (Refer to Page 15 "Setting of Overheating Prevention Device ".)
	**LocK**	Key Lock	Locks the keys on control panel to protect from unnecessary operation. (Refer to Page 31 "Other Function".)

※Also refer to Page 14 "Operation Mode, Function Setting Key, and Characters".

※The operation mode cannot be changed during operation. If need to change the mode, conduct after operation stop.

4. Operation Method

Operation Mode and Function List

All the operation modes of this unit are as below:

No.	Name	Description	Page
1	Fixed Temperature Operation	Pressing the FIXED TEMP key enters into the fixed temperature operation setting mode. Pressing it again enters into the temperature setting mode. The "▲▼" are used to set temperature. Pressing the START/STOP key starts or stops operation.	P.15
2	Quick Auto Stop Operation	This operation is used to specify the period up to automatic stop during operation. The period up to operation stop can be set by pressing the TIMER key during fixed temperature operation. The "▲▼" are used to set the time. Pressing the START key starts the quick auto stop operation, activates the timer function and stops the operation automatically after specified period.	P.16
3	Auto Stop Operation	This operation is used to specify the automatic stop time in the fixed temperature operation. Pressing the TIMER key displays "AStp". The setting temperature "SV" can be set by pressing the ENTER key. The operation time "tim" can be set by pressing it again. Pressing the START/STOP key starts the auto stop operation.	P.18
4	Auto Start Operation	This operation is used to specify the period up to automatic start after power on. Pressing the TIMER key displays "AStr". The setting temperature "SV" can be set by pressing the ENTER key. The operation time "tim" can be set by pressing it again. Pressing the START/STOP key starts the auto start operation.	P.20
5.	Program Operation	This operation is used to change the temperature according to the setting temperature and time. Pressing the PROGRAM key displays "PrG1". Press it again to select the program mode. Press the ENTER key to select the pattern "PA t". Press the ENTER key to display "End". Input the number of patterns to be used. Input the temperature and time of patterns "SV-n" and "t-n" respectively.	P.22
※ This unit is impossible to be changed the mode during the operation. If the mode requires to be changed, stop the operation.			

4. Operation Method

Operation Mode and Function List

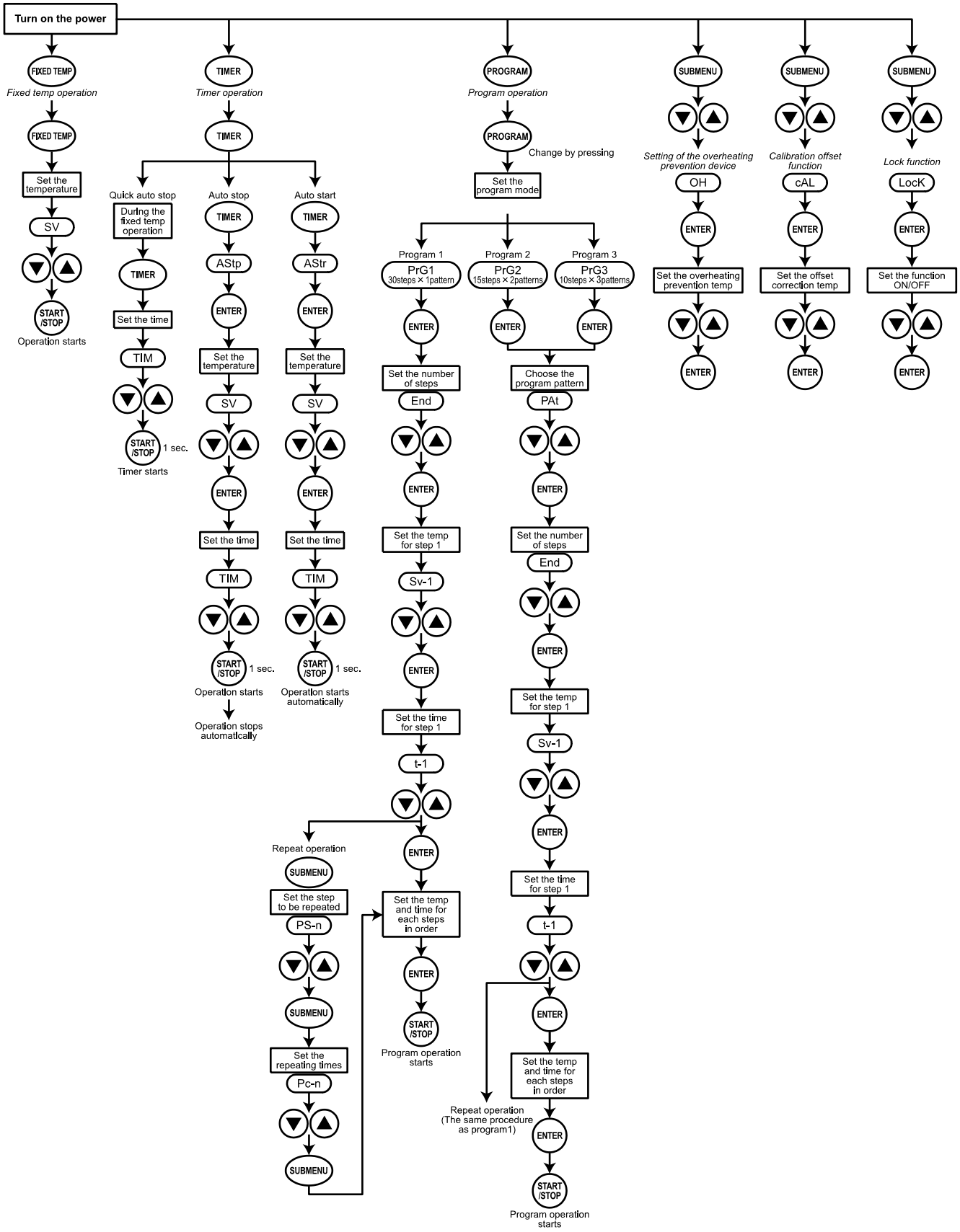
The operation functions of this unit are as below:

No.	Name		Description	Page
1.	Overheating prevention function	Auto overheating prevention function	This function is set to be automatically activated (auto reset) when the temperature exceeds the setting temperature by 6℃.	P. 15
		Overheating prevention device	Though the device shares power source, display, and key input with the controller, it has independent temperature measurement circuit, CPU, sensor and output circuit. Overheating prevention temperature can be set using the operation panel. The unit stops operation when the device is activated. The unit starts operation again when the POWER switch is pressed again (manual reset).	
2.	Calibration offset function		This calibration offset function is for calibrating the difference occurred between the required in- furnace temperature and control temperature (sensor temperature) of the controller. This unit can be calibrated toward either plus side or minus side of the whole temperature range.	P. 30
3.	Overheating prevention temperature calibration function		The temperature of overheating prevention device is automatically corrected when the temperature of controller is collected.	-
4.	Recovery at power failure		The unit starts operation with the same condition as just before power failure if it occurs during operation. Press the START/STOP key to start the unit again.	-
5.	Setting value locking		This function locks the established operation status. It can be set and cancelled with the SUBMENU key.	P. 31

4. Operation Method

Operation Mode, Function Setting Key, and Characters

The operation mode setting and function setting use the key operation and characters show in the following figure.



4. Operation Method

Setting of Overheating Prevention Device

The unit has the overheating prevention device (manual reset) that consists of independent temperature measurement circuit, CPU, sensor and output circuit (it shares power source, display, and key input with the controller) in addition to the automatic overheating prevention function (auto reset) in the controller.

Setting range/function

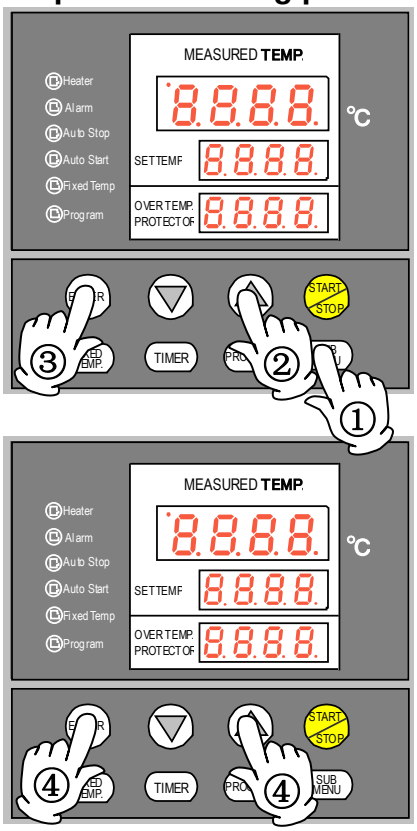
The unit has failsafe functions against overheating. One of them is built in the controller and previously set at factory shipment so to be automatically activated when the temperature exceeds the setting temperature of temperature controller by 6℃, where the heater repeats on and off.

The other is united with the controller, which can be set by operating the keys on the controller.

The setting range of latter is from 0℃ to max set temperature of main controller + 50℃.

In case the temperature in furnace exceeds the setting temperature of controller to reach to that of overheating prevention device, the circuit is shut off and "Er19" is displayed with blinking on the screen of controller with buzzer sound. If the device is once activated,"Er19"continues to be displayed until the power is newly turned on.

Temperature setting procedure



1. Turn on the power (turn on the ELB)

The default value is displayed for about four seconds after turning on the power. The screen then displays the initial setting. The current temperature in furnace, operation mode character and setting temperature of overheating prevention device are displayed on respective screens.

2. Set the temperature for overheating prevention

① Press the SUBMENU key.

② Press the "▼▲" several times to select the setting character of overheating prevention temperature "OH"  .

③ Press the ENTER key. The current setting temperature is displayed with blinking on the setting temperature screen.

Note: To prevent improper operation, set the value 30℃ or more over the setting temperature of controller.

④ Select the value using the "▼▲"and then press the ENTER key. This completes the setting.

⚠ Note

① The standard setting temperature of device is "the maximum setting temperature of unit plus 10℃" or "setting temperature plus 10℃". If the unit performs improper operation, increase it 5℃ more.

② Improper setting of temperature may cause inoperative of unit, malfunction of device, e.g. it is activated during increasing in temperature in furnace, or unexpected accidents such as fire disaster. To prevent such matters, set a proper value.

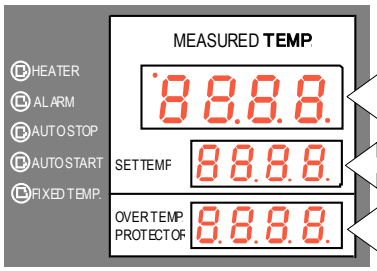
The temperature is set to 90℃ at factory shipment.

③ The purpose of overheating prevention device is to protect the unit from overheating. It does not intend to protect the samples, or to protect them from the accident caused by the use of explosive or inflammability.

Fixed temperature operation procedure

1. Turn on the power (turn on the ELB)

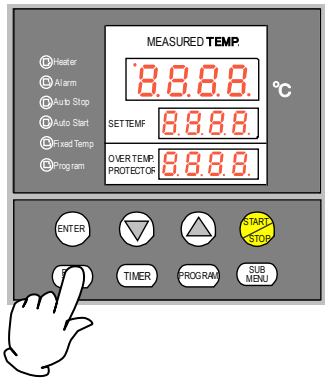
The default value is displayed for about four seconds after turning on the power. The screen then displays the initial setting. The current temperature in furnace, operation mode character and setting temperature of overheating prevention device are displayed on respective screens.



Measurement temperature screen: Displays the current temperature in furnace.

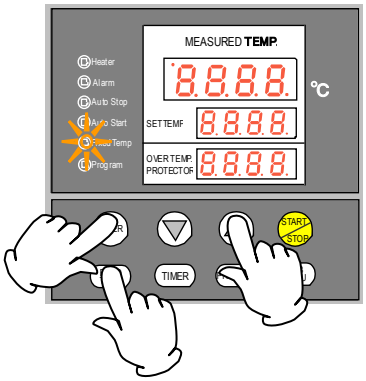
Setting temperature screen: Displays the operation mode character. (Refer to Page 14)

Overheating prevention screen: Displays the setting temperature of overheating prevention device



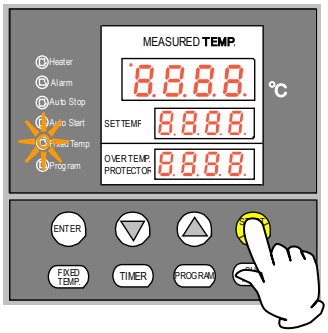
2. Select the operation mode

Press the FIXED TEMP key to display "FIX", which indicates the fixed temperature operation, on the center display screen.



3. Set the temperature

- Press the FIXED TEMP key again.
- The setting temperature screen displays the character "SV" which indicates the temperature setting. Also it displays the current setting temperature with blinking. The FIXED TEMP lamp blinks, too.
- Set the temperature by pressing the "▼▲".



4. Start operation

Press the orange START/STOP key for about one second. The unit starts operation and the blinking FIXED TEMP lamp lights on.

5. Stop operation

Press the orange START/STOP key for about one second. The unit stops operation and the FIXED TEMP lamp lights off. The screen returns to the initial setting screen.

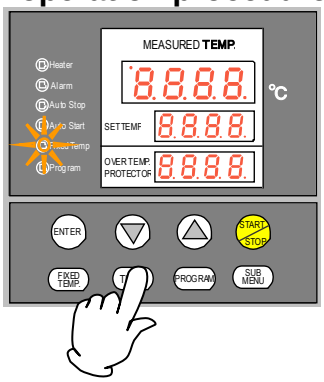
To correct or check setting…

Press the FIXED TEMP key again to correct or check the setting.

Changing the setting temperature during operation is also possible by pressing the FIXED TEMP key.

4. Operation Method

Quick auto stop operation procedure

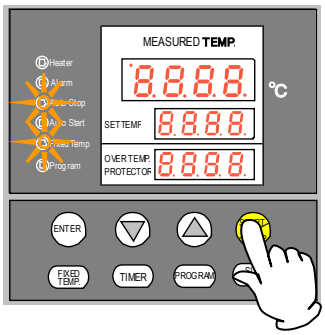


This operation is used to specify the period up to automatic stop, i.e., sets the auto stop timer during operation.

1. Set the time up to stop during fixed temperature operation

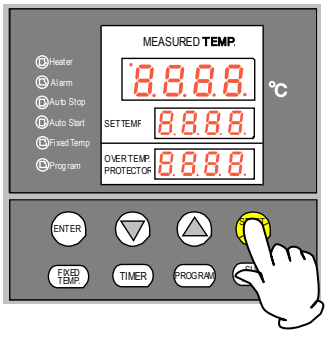
- Check that the FIXED TEMP lamp lights on and that the unit is under operation.
- Press the TIMER key.
- The measurement temperature display screen displays the character "tim", which indicates the timer setting. The setting temperature display screen displays the current setting time with blinking.
- Select the time by pressing the "▼▲".

Timer function:	• The maximum setting time is "999hours and 50 minutes ". • The time can be set in increments of a minute under 99 hours and 59 minutes. • It can be set in increment of ten minutes over 100 hours. • The "▼▲"can change the setting time quickly when it is pressed continuously. Press them discontinuously when fine adjustment is needed.



2. Start timer operation

- Press the START/STOP key for one second after deciding the time.
- Timer operation starts with the FIXED TEMP and AUTO STOP lamps lighting on.
- The timer is activated at the point when the START/STOP key is pressed.



3. Stop/terminate timer operation

- The operation stops automatically at setting time.
- Buzzer continues to sound for about five seconds at operation stop.
- The setting temperature screen displays the character "End", which indicates termination of operation, with the FIXED TEMP and AUTO STOP lamps lighting on. Press the START/STOP key to terminate the timer operation mode. The screen returns to the initial setting screen.

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

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

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

① After changing the time, press TIMER.

The remaining time on the timer is the time subtracting the elapsed time.

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

② After changing the time, press START/STOP for 1sec.

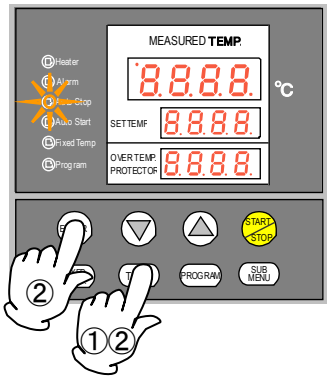
The quick auto stop operation proceeds again as per the changed time.

For example: set timer as 1hr30min, conduct quick auto stop operation, after 20min, change the set time to be 2hr, press START/STOP to set, the remaining time is 2hr.

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

Auto stop operation procedure

This operation is used to specify the automatic stop time in the fixed temperature operation.



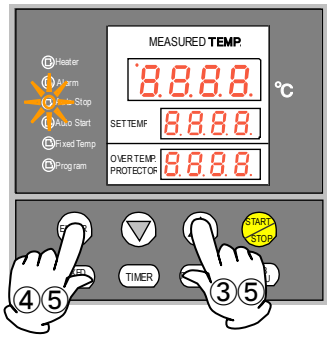
1. Set stop time

① Press the TIMER key on the initial screen.

Press the TIMER key again. The setting temperature display screen displays the character "AstP", which indicates the auto stop operation, with blinking.

② Press the ENTER key.

The measurement temperature screen displays the character "SV", which indicates the temperature setting. The setting temperature screen displays the current setting temperature with blinking. The AUTO STOP lamp blinks, too.



③ Set the temperature using the "▼▲".

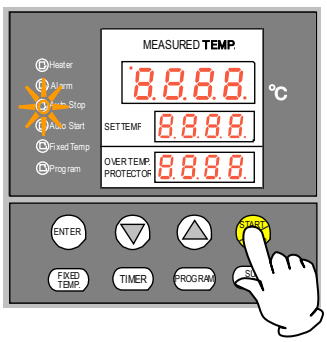
④ Press the ENTER key again.

The measurement temperature display screen displays the character "tim", which indicates the timer setting. The setting temperature display screen displays the current setting time with blinking.

⑤ Set the time using the "▼▲".

Timer function:

- The maximum setting time is "999hours and 50 minutes ".
- The time can be set in increments of a minute under 99 hours and 59 minutes.
- It can be set in increment of ten minutes over 100 hours.
- The "▼▲"can change the setting time quickly when it is pressed continuously. Press them discontinuously when fine adjustment is needed.

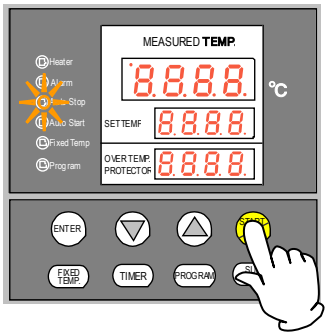


2. Start timer operation

- Press the START/STOP key for one second after deciding the time.
- Timer operation starts with the AUTO STOP lamp lighting on.
- The timer is activated at the point when the temperature in furnace (measurement temperature) reaches to the setting temperature.

4. Operation Method

Auto Stop Operation



3. Stop/terminate timer operation

- The operation stops automatically at setting time.
- Buzzer continues to sound for about five minutes at operation stop.
- The setting temperature screen displays the character "End", which indicates termination of operation, with the FIXED TEMP and AUTO STOP lamps lighting on. Press the START/STOP key to terminate the timer operation mode. The screen returns to the initial setting screen.

To correct or check setting…

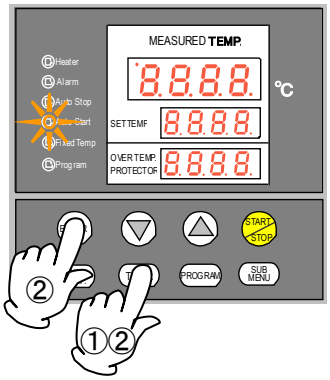
Changing the setting temperature or time during operation is possible by pressing the TIMER key. Use the "▼▲" to change the setting value. Press the ENTER key respectively after changing the setting.

Press the "▼" to display the setting temperature, operation mode and residual time on the setting temperature screen.

4. Operation Method

Auto start operation procedure

This operation is used to specify the period up to automatic start after power on.



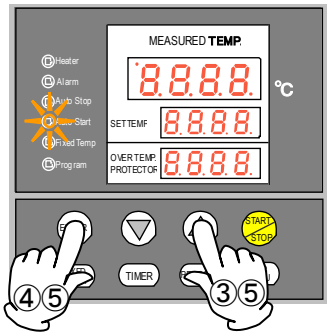
1. Set start time

① Press the TIMER key on the initial screen.

Press the TIMER key again. The setting temperature display screen displays the character "Astr", which indicates the auto start operation, with blinking.

② Press the ENTER key.

The measurement temperature screen displays the character "SV", which indicates the temperature setting. The setting temperature screen displays the current setting temperature with blinking. The AUTO START lamp blinks, too.



③ Set the temperature using the "▼▲".

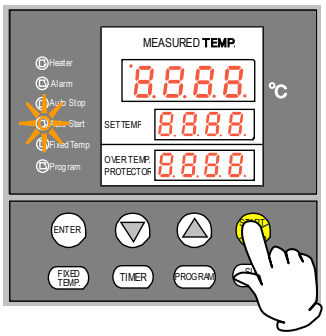
④ Press the ENTER key again.

The measurement temperature display screen displays the character "tim", which indicates the timer setting. The setting temperature display screen displays the current setting time with blinking.

⑤ Set the time using the "▼▲".

Timer function:

- The maximum setting time is "999 hours and 50 minutes ".
- The time can be set in increments of a minute under 99 hours and 59 minutes.
- It can be set in increment of ten minutes over 100 hours.
- The "▼▲"can change the setting time quickly when it is pressed continuously. Press them discontinuously when fine adjustment is needed.

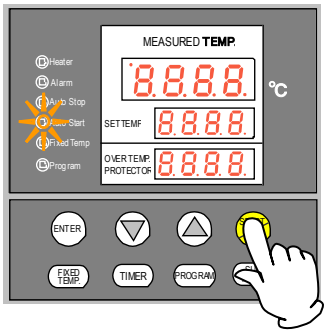


2. Start timer operation

- Press the START/STOP key for one second after deciding the time.
- Timer operation starts with the AUTO START lamp lighting on.

4. Operation Method

Auto Start Operation



3. Stop/terminate timer operation

- The operation starts automatically at setting time.
- Press the START/STOP key for one second to stop or terminate operation. The screen returns to the initial setting screen.

To correct or check setting…

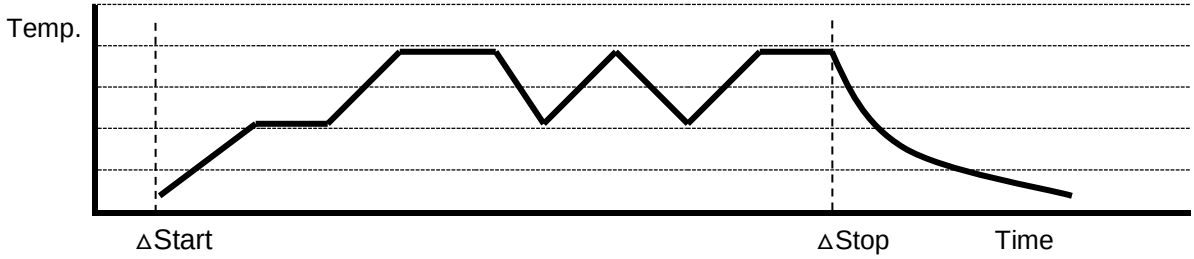
Changing the setting temperature or time during operation is possible by pressing the TIME” key. Use the "▼▲" to change the setting value. Press the ENTER key respectively after changing the setting. They are not changeable after the unit starts operation. In this case, stop the operation by pressing the START/STOP key, then set the value again.

Press the "▼" to display the setting temperature, operation mode and residual time on the setting temperature screen.

4. Operation Method

Program Operation

This operation is used to change the temperature according to the setting temperature and time.



Program types

Six patterns of program types maximum can be input.

PrG1	—	1 program pattern using 30 steps maximum can be created.
PrG2	PAt1	2 program patterns using 15 steps maximum can be created.
	PAt2	
PrG3	PAt1	3 program patterns using 10 steps maximum can be created.
	PAt2	
	PAt3	

Before inputting program

Input program patterns before program operation.

① Check the number of steps in a created program and their setting temperature/time. Refer to page 24~25.

② Check the temperature rise/fall capability of the unit. Set the time within the capability above. Suppose, for instance, that in the unit which has capability of increasing or decreasing temperature by 10℃ within 20minutes, about 40 minutes is needed to increase or decrease temperature by 20℃ from current temperature

Repeat function

Repeat function is useful in case the operation uses the program repeating the same program steps. Refer to page7 for the function.

③ Check if the controller has sufficient free pattern for the number of steps to be created. The steps, however, using the repeat function mentioned above are not counted.

BA type temp. rise / fall time

The BA type temp. rise / fall time is as below:
This value is the time needed that temp. rises from the previous value to other values, need to make the time setting of heat gradient program within the temp. rise/fall range of BA type. However, the different quantity, water temp., ambient temp., etc. of samples may change, this is for reference only. Therefore, please make sure to set proper time to have test run.

Temp. rise time rise 20℃～80℃ (with cover), RT 17℃～24℃, unit (min)

Rise to ℃	BA310C (min)	℃/min	BA410C (min)	℃/min	BA510C (min)	℃/min	BA610C (min)	℃/min	BA710C (min)	℃/min
20	—	—	—	—	—	—	—	—	—	—
30	20	0.5	15	0.7	25	0.7	25	0.7	25	0.7
40	15	0.7	15	0.7	25	0.7	25	0.7	25	0.7
50	15	0.7	15	0.7	25	0.7	20	0.5	25	0.7
60	20	0.5	15	0.7	30	0.3	25	0.7	25	0.7
70	20	0.5	15	0.7	30	0.3	30	0.3	30	0.3
80	25	0.4	25	0.4	25	0.4	25	0.7	30	0.3
Total	Approx. 115min	—	Approx. 100 min	—	Approx. 160 min	—	Approx. 150 min	—	Approx. 160 min	—

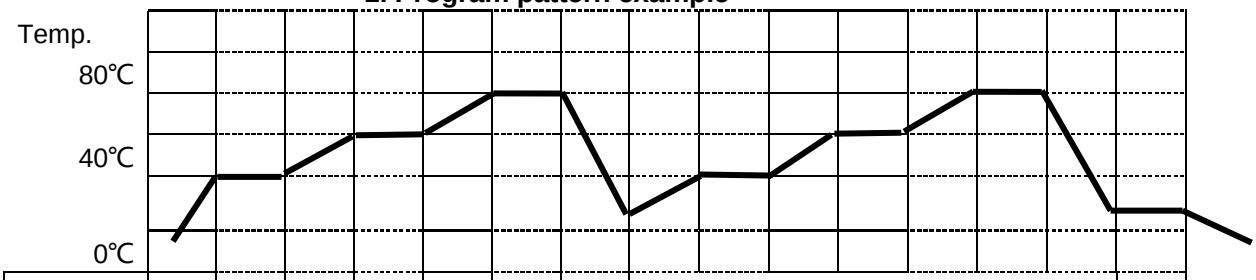
Fall 80℃～naturally fall (no cover) RT 17℃～24℃, unit (min)

Fall to ℃	BA310C (min)	℃/min	BA410C (min)	℃/min	BA510C (min)	℃/min	BA610C (min)	℃/min	BA710C (min)	℃/min
80	—	—	—		—	—	—		—	—
70	35	0.3	30	0.3	40	0.25	45	0.2	55	0.18
60	50	0.2	40	0.25	65	0.15	65	0.15	90	0.1
50	80	0.12	60	0.15	110	0.09	120	0.08	160	0.06
40	150	0.07	110	0.09	200	0.05	200	0.05	220	0.04
30	—	—	165	0.06	—	—	—	—	—	—
Total	Approx. 315 min	—	Approx. 405 min	—	Approx. 415 min	—	Approx. 430 min	—	Approx. 525 min	—

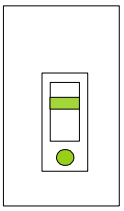
Program creation

The program pattern below is explained as an example.

1. Program pattern example

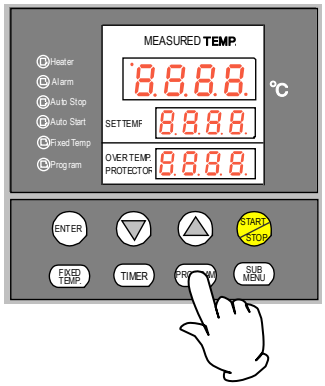


Step	1	2	3	4	5	6	7	← Repeat function →	8
Temp.(℃)	40	40	60	60	80	80	35	The number of steps is not counted.	35
Time(min.)	0.40	0.30	0.50	1.30	2.00	3.00	8.00		3.00



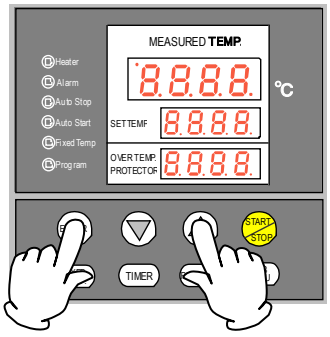
2. Turn on the power

- Turn on the power switch of the unit.
- The display on the controller lights on.
- The initial screen is displayed for about four seconds, then the measurement temperature (temperature in furnace) is displayed.



3. Select program mode/program pattern

① Press the PROGRAM key once.
The measurement temperature display screen displays the previous program mode.
Press the PROGRAM key again to display the next program mode.

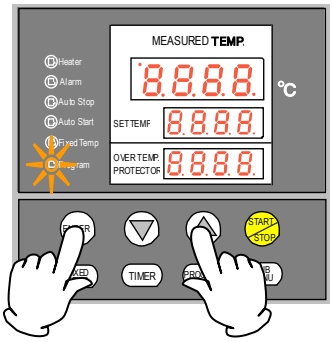


② Select the mode and press the ENTER key.

- When PrG1 is selected, the measurement temperature display screen displays "End".
- When PrG2 is selected, the measurement temperature display screen displays the program pattern "PAt1". For the pattern of PrG2, select "1" or "2" using the "▲▼". Press the ENTER key again. The measurement temperature display screen displays "End".
- When PrG3 is selected, the measurement temperature display screen displays "PAt1". For the pattern of PrG3, select "1", "2" or "3" using the "▲▼". Press the ENTER key again. The measurement temperature display screen displays "End".

Any of PrG1. PrG2 or PrG3 can be selectable in the program example above, where 8 steps maximum are used.

The example shown below explains the method of program registration using PrG3.



4. Register program

① Select PrG3 referring to 3 mentioned above..

② Input the number of steps, temperature and time for respective steps using the program creation sheet.

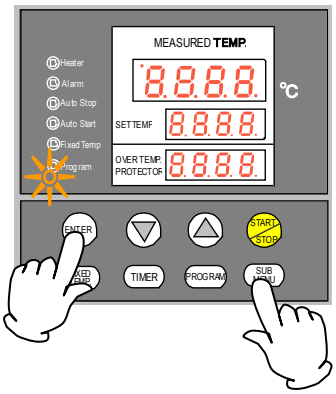
③ Press the ENTER key. The PA t 1 is displayed with blinking.

("End" is displayed if PrG1 is selected. In this case, go to ⑥)

④ Select the unused pattern from among Pat1, Pat2 and Pat3 using the "▲▼".

⑤ Press the ENTER key. "End" is displayed and the step number is also displayed with blinking.
"End" is a character which indicates the total step number to be used. "8" will be input here.

⑥ INPUT "8", which is the total step number to be used here, using the "▲▼".



⑦ Press the ENTER key. The character "SV-1", which indicates the setting temperature of the first step, is displayed. The current setting temperature is also displayed with blinking.

⑧ Set the temperature of the first step using the "▲▼".

⑨ Press the ENTER key. The character "t-1", which indicates the setting time of the first step, is displayed. The current setting time is also displayed with blinking.
Before setting the time, check the temperature rise/fall capability of unit. For example, for DR210C, about 70 minutes is needed to increase the temperature from room temperature to 700℃. It takes about 1 minute to increase the temperature by 10℃ (cannot be faster than this speed). Add an extra considering the temperature stability time.
The setting time of timer in respective steps is 999 hours and 50 minutes maximum.

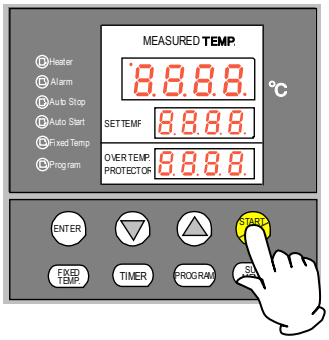
⑩ After the time is set, press the ENTER key.

⑪ The character "SV-2", which indicates the setting temperature of the second step, is displayed. In the same way, input the temperature and time for respective steps using the program creation sheet.
The different method is necessary where program repeat function is used. In this case, press the SUBMENU key after setting the time (t-7 in the example) in the step where the repeat operation is to be used (Step 7 in the example). This enters to the repeat function setting mode.
Follow the "Use program repeat function" in page 27 for the input method of program repeating function.

⑫ The screen returns to the initial setting screen after the setting of temperature and time in the final step is completed.

Test run

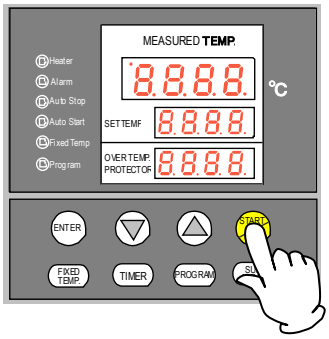
Make sure to check the setting temperature and time by operating the unit without load before performing actual run with samples.



5. Start program operation

- Press the START/STOP key for about one second. The program operation previously set starts.
- The PROGRAM lamp lights on and the setting temperature screen displays the step currently under operation.

❖ Press the "▼" to check the setting temperature and residual time of step currently under operation on the setting temperature screen.



6. End program operation

- Buzzer continues to sound for about five seconds at operation stop.
- The measurement temperature screen displays the character "END", which indicates the termination of program.
- Press the START/STOP key to return to the initial screen.

Timer function:

- The maximum setting time is "999 hours and 50 minutes".
- The time can be set in increments of a minute under 99 hours and 59 minutes.
- It can be set in increment of ten minutes over 100 hours.
- The "▼▲"can change the setting time quickly when it is pressed continuously. Press them discontinuously when fine adjustment is needed.

To correct or check setting…

Press the FIXED TEMP key to correct the created program or to check the setting value. The screen returns to the former one, where correction or check is possible.

Last screen is displayed when the FIXED TEMP key is once pressed.

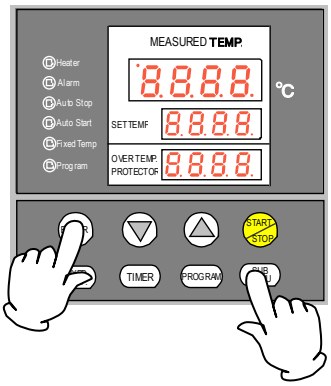
Note: Correction or check should be made on the program setting screen.

Wait operation in program operation

The succeeding step does not start in case the measurement temperature does not reach to, or exceeds the setting temperature when a program goes to the next step in program operation. This unit, however, is previously set to carry out the next step if the measurement temperature is within ±3℃ of the setting temperature.

Use program repeat function

This section explains how to register the program repeat (repeating a program pattern) in program operation.



This section explains the registration procedure of program using repeat function in "4. Register program" above.

The procedure sets the step number to be repeated "PS-n" and repeating times "Pc-n"(n: step number)

① Press the SUBMENU key in stead of the ENTER key after setting the time (t-7 in the example) in the step where the repeat operation is to be used (Step 7 in the example). This enters to the repeat function setting mode.

② The measurement temperature screen displays the character "PS-n", which indicates the step to be repeated in the program pattern. The measurement temperature screen indicates "PS-7" in the example because repeat function is used at the seventh step. The step number 1 to 7 can be input in the setting temperature display screen. Enter the number (1 in the example) using the "▲▼".

③ Press the SUBMENU key.

The measurement temperature screen displays the character "Pc-n", which indicates the repeating times. Enter the value of repeating times （2 in the example）with the "▲▼".

④ The screen goes to that for the next step when the SUBMENU key is pressed again.

The screen to input the Sv-8 is displayed next in the example.

To correct or check setting…

Correction of setting during the repeat setting mode is impossible.

To correct or check the setting, end the setting of step currently input. Press the FIXED TEMP key after the temperature setting screen for the next step appears. The screen returns to the former one and re-setting is possible.

Note: Correction or check should be made on the program setting screen.

4. Operation Method

Programming Preparation Form

Please use this form by making copies

Register with	PrG1 PrG2 PrG3 PAt1 PAt2 PAt3	No.	
Project Name		Date	
		Programmer	

Program Pattern

																			30
																			29
																			28
																			27
																			26
																			25
																			24
																			23
																			22
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																			10
																			9
																			8
																			7
																			6
																			5
																			4
																			3
																			2
																			1
100℃				80℃				60℃				40℃				20℃				Step No.

4. Operation Method

Programming Preparation Form

Please use this form by making copies

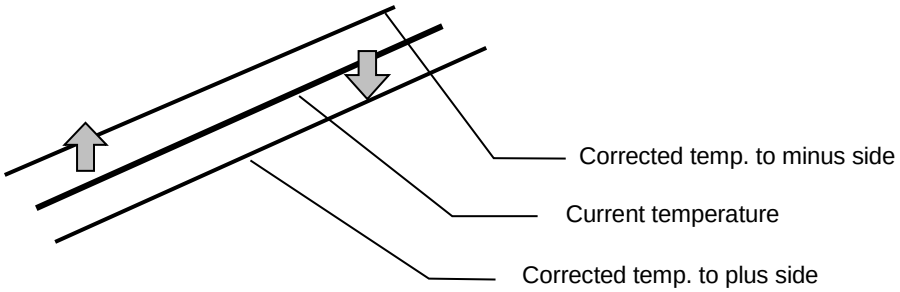
Register with	PrG1 PrG2 PrG3 PAt1 PAt2 PAt3	No.	
Project Name		Date	
		Programmer	

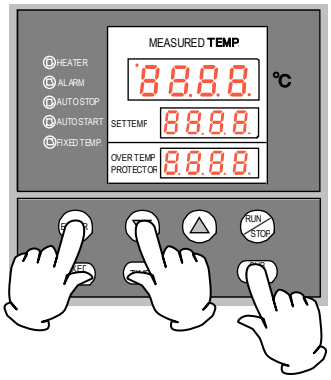
Input Value

	Setting Temperature (℃)	Setting Time (min.)	Repeat Function To/Times
Step 1		:	:
Step 2		:	:
Step 3		:	:
Step 4		:	:
Step 5		:	:
Step 6		:	:
Step 7		:	:
Step 8		:	:
Step 9		:	:
Step 10		:	:
Step 11		:	:
Step 12		:	:
Step 13		:	:
Step 14		:	:
Step 15		:	:
Step 16		:	:
Step 17		:	:
Step 18		:	:
Step 19		:	:
Step 20		:	:
Step 21		:	:
Step 22		:	:
Step 23		:	:
Step 24		:	:
Step 25		:	:
Step 26		:	:
Step 27		:	:
Step 28		:	:
Step 29		:	:
Step 30		:	:

Use calibration offset function

Calibration offset is a function which corrects the difference between the temperature in furnace and that of controller (sensor temperature) if arises. The function parallel corrects the difference either to the plus or minus side within the whole temperature range of unit. The function can be set or cancelled by the SUBMENU key.





① Start operation with the target setting temperature. Check the temperature in furnace (temperature of sample) with a thermograph after it is stabilized.

② Check the difference between the setting temperature and that in furnace (temperature of sample).

③ Press the SUBMENU key. Select the character "cAL", which indicates the calibration offset, using the "▲▼", and then press the ENTER key.

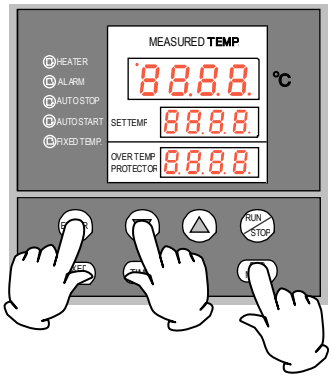
④ Input the difference using the "▲▼" and then press the ENTER key. This completes the setting.

❖ The setting range of offset correction temperature is +99℃ to plus side and -99℃ to minus side respectively.

When it is set to the minus side, the temperature on the measurement temperature display screen falls by the setting temperature, while the temperature on furnace rises.
When it is set to the minus side, the temperature on the measurement temperature display screen rises by the setting temperature, while the temperature on furnace falls.

❖ The unit has two-point correction function, which performs offset between low-temperature zone and high-temperature zone. Please consult our local branch office when carrying out validation of temperature controller.

Use lock function



This function locks the operation status previously set. The function can be set or cancelled by the SUBMENU key.

① Press the SUBMENU key. Select the character" "Lock", which indicates the lock of setting value, using the "▲▼", and then press the ENTER key.

② The setting temperature screen displays "oFF". The setting value is locked when it is turned to "on" using the "▲".

③ Press the SUBMENU key again to cancel the lock. Select the character" "Lock", which indicates the lock of setting value, using the "▲▼", and then press the ENTER key. Select "oFF" with the "▼" and then press the ENTER key to cancel the function.

All keys other than the START/STOP and SUBMENU keys are lock when the lock function is on.

5. Handling Precautions

⚠ Warning

1. If a problem occurs

If smoke or strange odor should come out of this unit for some reason, turn off the power key right away, and then turn off the circuit breaker and the main power. Immediately contact a service technician for inspection. If this procedure is not followed, fire or electrical shock may result. Never perform repair work yourself, since it is dangerous and not recommended.

2. Substances that cannot be used

Never use explosive substances, flammable substances and substances that include explosive or flammable ingredients in this unit. Explosion or fire may occur. (Refer to page 44 "13. List of Dangerous Substances".)

⚠ Caution

1. Do not sit on this unit

Do not sit on this unit. It will cause injury if this unit falls down or breaks.

2. Do not put anything on this unit

Do not put anything on this unit. It will cause injury if fall.

3. During a thunder storm

During a thunderstorm, turn off the power key immediately, then turn off the circuit breaker and the main power. If this procedure is not followed, fire or electrical shock may be caused.

4. Please rinse thoroughly

Although this device has been rinsed thoroughly beforehand, when using it first time or not using for a long time, please rinse thoroughly.

5. About using water

·Do not use other liquid except water.
·It's better to use ion exchange water or distilled water, and clean it frequently. If use ground water or tap water, limescale may accumulate in the bath, which would not only contaminate the inner bath, but also decrease the efficiency and life of heater.

6. Add water

Pay attention not to overflow when adding water. Moreover, if water drops on the operation panel, use towel to wipe it. Otherwise it may cause electric leakage or electric shock.

5. Handling Precautions

⚠ **Caution**

7. Use under proper temperature range

⚠ The operational temperature range is Room temp.＋5℃～80℃

Never set the temperature out of range.

8. At night or not use for a long time

⚠ If at night or not use for a long time, please turn the ELB to OFF.

9. Unmanned continuous operation

⚠ During unmanned continuous operation, please set automatic feed-water device (not standard accessory, level controller OBF10, code 221570), and pay attention not to have the bath empty.

10. Pay attention no-load operation (action of overheat protector)

⚠ Please do not operate when no water in the bath or heater is not submerged by water. Besides the heater would become red and hot and reduce its life, it may cause fire. Please confirm the water volume of bath and add water moderately before using. The overheat protector is set in the device, if no-load operating, it would automatically cut off the power connected with heater. After no-load operation, please contact Yamato Business Office or Customer Service Center.

11. Recovering after power failure

⚠ When power is supplied after a power failure, the device automatically starts operation again with the same state as just before the power failure.

12. After installation

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

6. Maintenance Method

Daily Inspection and Maintenance

⚠ Warning

- ●Be sure to pull out the power cord except under special circumstances 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.

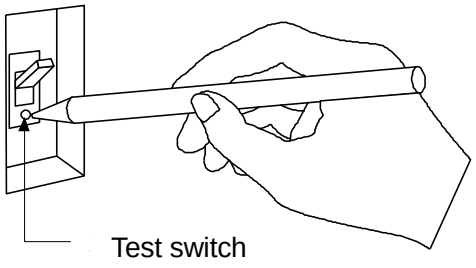
⚠ Caution

- ●Wipe off the dirt on resin parts or operation panel with a tightly wrung soft cloth. Never clean the unit with gasoline, banana oil or detergent, otherwise it may result in deformation, deterioration or discolor.

Every month

●Please inspect the ELB performance regularly.

- ・ Power on to test
- ・ Firstly, turn ELB on
- ・ Then, use a tip (like pencil tip) to press the test switch of ELB. If ELB breaks off, it's normal.



Maintenance of water bath

Continuous operation would concentrate the circulation fluid and accelerate the adhesion of limescale. When the water bath is smudged by incrustation or limescale, scoop water out or exhaust water through water exhaust valve, and then clean the bath.

It's better to use ion exchange water or distilled water, and clean it frequently. If use ground water or tap water, incrustation or limescale may accumulate in the bath, and it would may decrease the efficiency and life of heater.

◆If have any problems, please contact dealer, Yamato Business Office or Customer Service Center.

Maintenance of circulating pump

Please carefully clean out the foreign matters or glassware fragments in the bath, otherwise it may cause circulating pump damage.

◆If have any problems, please contact dealer, Yamato Business Office or Customer Service Center.

Replacement of hose

In order to use this unit stably, it's better to replace the hose every two week. Consult Yamato when replacing.

◆If have any problems, please contact dealer, Yamato Business Office or Customer Service Center.

7. Long storage and disposal

When not using this unit for long term / When disposing

⚠ Caution	⚠ Warning
When not using this unit for long term ● Turn off the power and disconnect the power cord.	When disposing • Keep out of reach of children. • Remove the door and driving parts. • Treat as large trash.

Disposal Notice

Environmental protection should be considered

We request you to disassemble this unit as possible and recycle the reusable parts considering to the environmental protection. The feature components of this unit and materials used are listed below.

Main Component Name	Material
Main Components of Exterior	
Exterior	Iron steel plate
Interior	Stainless steel SUS304
Observation window	Semi-strengthened glass
Support rest	Aluminum casting
nameplate	PET resin film
Frame/angle of operation parts	ABS resin
Decorative rubber, rubber plate	Chloroprene rubber
Main Electrical Parts	
Switch, relay	Resin, copper and other compound
Board	Glass fiber and other compound
Heating pipe	Copper
Power cord	Compound like Synthetic rubber, copper, nickel, etc.
Main piping components	
Hose	Ethylene propylene rubber
Water exhaust hose	PVC resin
Hose clamp	66 nylon
Drainage cap	POM
Accessories	
Connector	Aluminum casting
Flask clamp	Aluminum casting
Support	SUS304

8. In the Event of Failure

Safety Device and Error Code

This unit has an automatic diagnosis function built in the controller and safety devices independent of the controller. The table below shows the cause and the solution method when the safety device operates.

Error Code

When an abnormal condition occurs, an error code appears and the alarm lamp lights in the controller, the buzzer sounds simultaneously. Record the error code and turn off the power of device immediately.

Safety Device	Notify	Cause/Solution
Sensor trouble detection	"**ALARM**" lamp lights on, "**Er.01**" appears	• Temperature sensor is broken or disconnected. • Make a call for service.
SSR short-circuit detection	"**ALARM**" lamp lights on, "**Er.02**" appears	• Triac is in short-circuit • Make a call for service.
Heater disconnecting detection	"**ALARM**" lamp lights on, "**Er.03**" appears	• Heater is disconnected. • Make a call for service.
Memory error	"**ALARM**" lamp lights on, "**Er.15**" appears	• Failure in internal memory. • Make a call for service.
Internal communication error	"**ALARM**" lamp lights on, "**Er.17**" appears	• Failure in internal communication or temperature inputting circuit. • Make a call for service.
Overheating	"**ALARM**" lamp lights on, "**Er.19**" appears	• Overheating prevention device is in operation. • Reset the power supply, and then adjust the setting temperature of the overheating protection device. • If the state does not recover, make a call for service.
Measurement temperature error	"**ALARM**" lamp lights on, "**----**" appears	• Measurement value is out of display range. • Make a call for service.

8. In the Event of Failure

Trouble Shooting

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.
Temperature does not rise.	●If the set temperature is below that in the chamber. ●If the power supply voltage has declined. ●If the ambient temperature is low. ●If cooling load inside the chamber is 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 the load inside the chamber is getting large.
Displayed temperature differs from the measurement.	●If the calibration offset setting is not other than “0”. Set it to “0.” Confirm settings in “Use calibration offset function” on page 30.
Circulating pump has abnormal noise	●If the air does not enter the circulating pump. Cut off the power temporarily, inject water through the inlet of circulating pump to exhaust the air.

◆In the case if the error other than listed above occurred, turn off the power switch and primary power source immediately. Contact the shop of your purchase or Yamato Scientific Chongqing.

9. After 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.

- ◆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. Specification

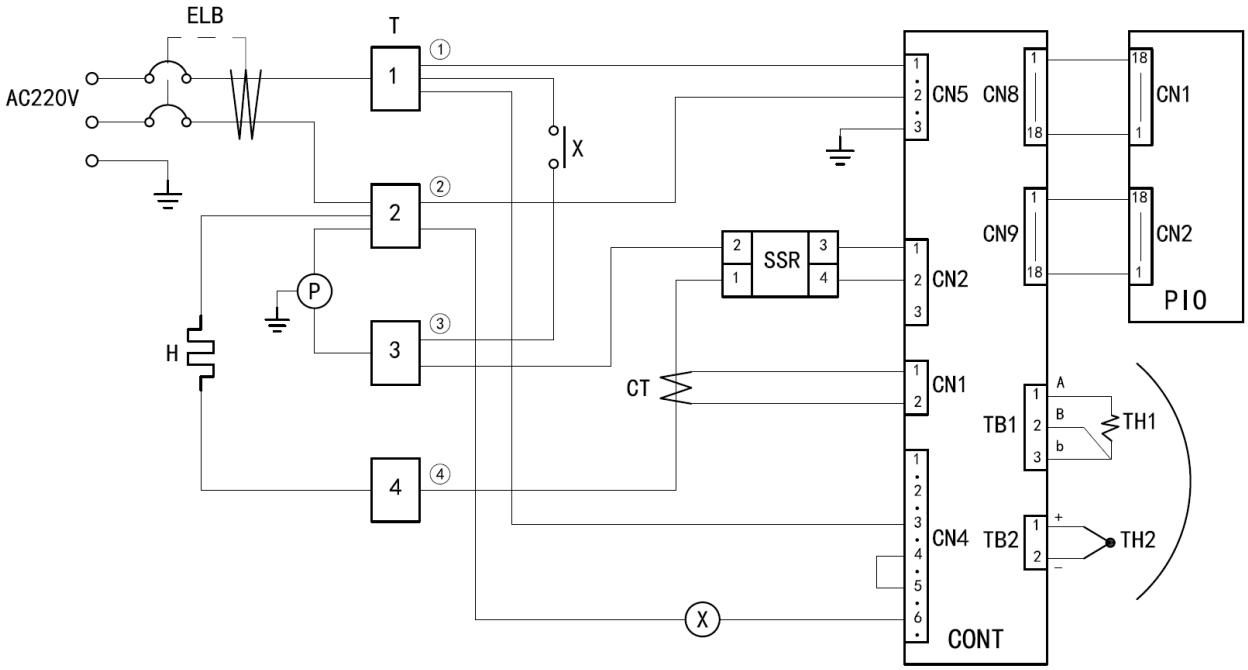
Model		BA310C	BA410C	BA510C	BA610C	BA710C
System		Forced pump water circulation				
Performance	Temp. operating range	RT＋5℃～80℃				
	Temp. adjusting accuracy	±0.02～±0.07℃ (at 80℃)				
	Temp. distribution accuracy	±0.3℃ (at 80℃)				
※1	Temp. rise time～80℃	Approx.120min	Approx.110 min	Approx.165min	Approx.160min	Approx.200min
Structure	Exterior	Cold-rolled steel plate with coating				
	Interior	Stainless steel and glass				
	Heater (SUS pipe heater)	1.3kW	2.2kW	2.4kW	3.5kW	4.5kW
	Stirrer (Magnetic pump)	6W	30W		60W	
	Observation window	Strengthened glass×2				
Control parts	Controller	VS6 temperature controller				
	Control system	PID control for heater output by microcomputer				
	Setting system	Digital setting by menu key and up/down keys				
	Display system	Measured temp. display: green 4-line LED digital display				
		Set temp. display: red 4-line LED digital display				
	Time	1min-99hr59min and 100hr-999.5hr (with timing function)				
	Time resolution	1min and 10min				
	Operation mode	Fixed temperature, Program, Quick auto stop, Auto stop, Auto start				
	Program mode	3 modes 30 segments, program circulation function				
	Sensor	The sensors of control and overheat protector are the same type				
	Additional functions	Lock function, Auto recovering after power failure, Calibration offset				
Safety device	Self-diagnosis functions	Failure of temperature sensor, heater, display, SSR, automatic overheating prevention, measured temperature				
	Safety device	Circuit breaker, Overheating prevention device (controller all-in-one electronic type)				
Spec.	External dimension (mm) ※2 (W×D×H)	490×360×367	590×410×367	690×460×417	738×560×467	830×560×517
	Internal dimension (mm) ※2(W×D×H)	300×300×300	400×350×300	500×400×350	548×500×400	640×500×450
	Observation window dimension	240×215	340×215	440×265	340×215	440×265
	Bath Capacity (L)	Approx.27	Approx.42	Approx.70	Approx.109	Approx.144
	Diameter of drain hose	φ15×20mm				
	Power capacity (single phase AC220V 50Hz)	6 A	10.5 A	11.5 A	16.5 A	21 A
	Weight	Approx.19Kg	Approx.25Kg	Approx.30Kg	Approx.36Kg	Approx.46Kg
Accessories		Shelf plate×1, clamping device×2, stand×1, clamping device support×2, Instruction Manual, Warranty				

※1 The performance under the condition of AC 220V power source, RT 23℃±5℃, humidity 65％RH±5％, unloaded and exhaust port fully closed. The operating ambient temperature of the unit is from 5℃ to 35℃.

※2 Exclude bulges.

11. Wiring Diagram

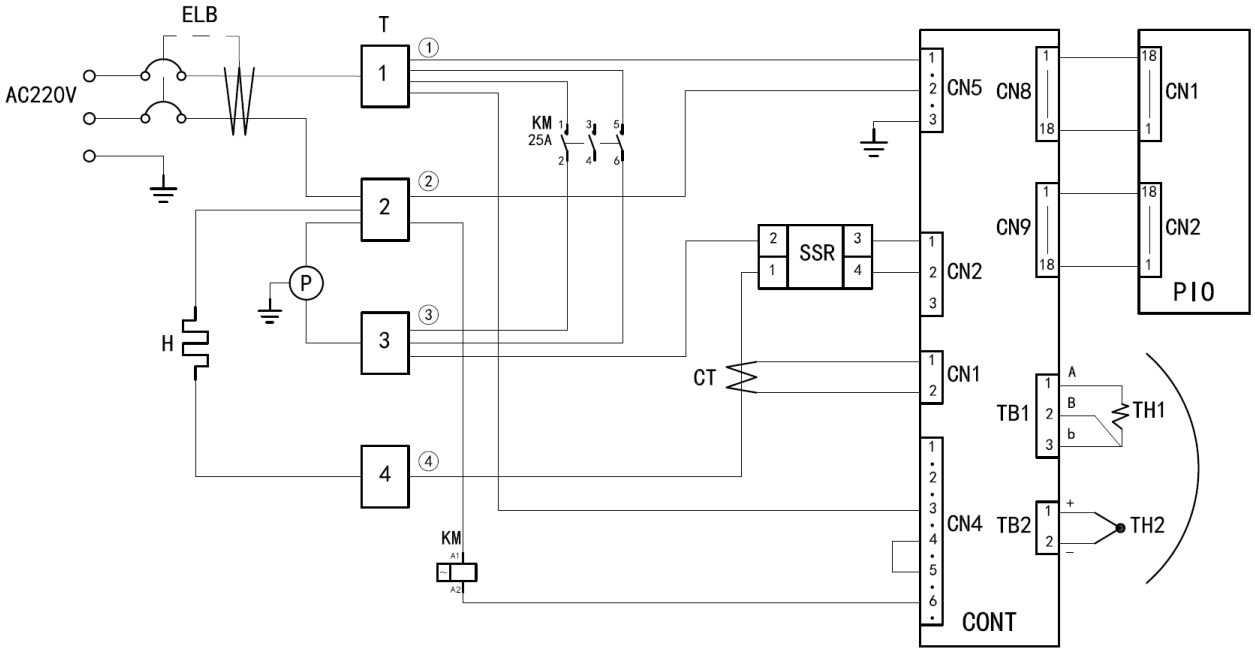
BA310C/410C/510C/610C



Symbol	Part name	Symbol	Part name
ELB	Earth Leakage Breaker	CONT	Control board
T	Terminal block	PIO	Display board
H	Heater	TH1	Sensor for control
X	AC relay	TH2	Sensor for overheating prevention
P	Magnetic pump	CT	Current transformer
SSR	Solid state relay		

11. Wiring Diagram

BA710C



Symbol	Part name	Symbol	Part name
ELB	Earth Leakage Breaker	CONT	Control board
T	Terminal block	PIO	Display board
H	Heater	TH1	Sensor for control
KM	AC contactor	TH2	Sensor for overheating prevention
P	Magnetic pump	CT	Current transformer
SSR	Solid state relay		

12. Replacement Parts Table

BA310C/410C/510C/610C/710C Common replacement parts

Symbol	Part Name	Specification	Manufacturer	Code No.
TH1, 2	Temperature sensor	PT100/B K Φ 4.8x125L R1/8	YSJ	A010502034
CONT	Control board	VS6	YSJ	B011401053
PIO	Display board	VS	YSJ	B011402007
	Signal cable	VS3·VS4 15P 40mm	YSJ	B011299007
CT	Current transformer	URD CTL-6-S-4	YSJ	B010509001

BA310C Replacement parts

Symbol	Part Name	Specification	Manufacturer	Code No.
ELB	Earth Leakage Breaker	BV-DN IP+N 10A 30mA	YSJ	A010410007
X1	AC relay	HF116F-2/220AL1HSTFW	YSJ	A011002002
SSR	Solid state relay	KS15/D-38Z25-L	YSJ	A011006023
H	Heater	220V 1.3KW	YSJ	H040701024
P	Magnetic pump	MD-6-230GS01 AC220V	YSJ	A042102004

BA410C Replacement parts

Symbol	Part Name	Specification	Manufacturer	Code No.
ELB	Earth Leakage Breaker	BV-DN IP+N 16A 30mA	YSJ	A010410004
X1	AC relay	HF116F-2/220AL1HSTFW	YSJ	A011002002
SSR	Solid state relay	KS15/D-38Z25-L	YSJ	A011006023
H	Heater	220V 2.2KW	YSJ	H040701002
P	Magnetic pump	MD-20R-220-N	YSJ	A042102007

BA510C Replacement parts

Symbol	Part Name	Specification	Manufacturer	Code No.
ELB	Earth Leakage Breaker	BV-DN IP+N 16A 30mA	YSJ	A010410004
X1	AC relay	HF116F-2/220AL1HSTFW	YSJ	A011002002
SSR	Solid state relay	KS15/D-38Z25-L	YSJ	A011006023
H	Heater	220V 2.4KW	YSJ	H040701021
P	Magnetic pump	MD-20R-220-N	YSJ	A042102007

12. Replacement Parts Table

BA610C Replacement parts

Symbol	Part Name	Specification	Manufacturer	Code No.
ELB	Earth Leakage Breaker	BV-DN 1P+N 20A 30mA	YSJ	A010410001
X1	AC relay	HF116F-2/220AL1HSTFW	YSJ	A011002002
SSR	Solid state relay	KS15/D-38Z40-L	YSJ	A011006024
H	Heater	220V 3.5KW	YSJ	H040701012
P	Magnetic pump	MD-40R-220-N AC220V	YSJ	A042102005

BA710C Replacement parts

Symbol	Part Name	Specification	Manufacturer	Code No.
ELB	Earth Leakage Breaker	BV-DN 1P+N 25A 30mA	YSJ	A010410002
KM	AC contactor	LC1-D25M7C	YSJ	A011003008
SSR	Solid state relay	KS15/D-38Z40-L	YSJ	A011006024
H	Heater	220V 4.5KW	YSJ	H040701015
P	Magnetic pump	MD-40R-220-N AC220V	YSJ	A042102005

13. List of Dangerous Substances

Never use explosive substances, flammable substances and substances that include explosive or flammable ingredients in this unit.

EXPLOSIVE

EXPLOSIVE:	Ethylene glycol dinitrate (nitro glycol), Glycerin trinitrate (nitroglycerine), Cellulose nitrate (nitrocellulose), and other explosive nitrate esters
	Trinitrobenzene, Trinitrotoluene, Trinitrophenol (picric acid), and other explosive nitro compounds
	Acetyl hidroperoxide (peracetic acid), Methyl ethyl ketone peroxide, Benzyl peroxide, and other organic peroxides

FLAMMABLE

IGNITING:	Lithium (metal), Potassium (metal), Sodium (metal), Yellow phosphorus, Phosphorus sulfide, Red phosphorus, Celluloid compounds, Calcium carbide, Lime phosphate, Magnesium (powder), Aluminum (powder), Powder of metals other than magnesium and aluminum, Sodium hydrosulfite
OXIDIZING:	Potassium chlorate, Sodium chlorate, Ammonium chlorate, and other chlorate
	Potassium perchlorate, Sodium perchlorate, Ammonium perchlorate, and other perchlorate
	Potassium peroxide, Sodium peroxide, Barium peroxide, and other inorganic peroxide
	Potassium nitrate, Sodium nitrate, Ammonium nitrate, and other nitrate
	Sodium chlorite and other chlorites
	Calcium hypochlorite and other hypochlorites
INFLAMMABLE LIQUID:	Ethyl ether, Gasoline, Acetaldehyde, Propylene chloride, Carbon disulfide, and other flammable substances having a flash point of lower than -30℃
	Normal hexane, ethylene oxide, acetone, benzene, methyl ethyl ketone, and other flammable substances having a flash point of -30℃ or higher but lower than 0℃
	Methanol, Ethanol, Xylene, Pentyl acetate (amyl acetate), and other flammable substances having a flash point of 0℃ or higher but lower than 30℃
	Kerosene, Light oil (gas oil), Oil of turpentine, Isopentyl alcohol (isoamyl alcohol), Acetic acid, and other flammable substances having a flash point of 30℃ or higher but lower than 65℃
FLAMMABLE GAS:	Hydrogen, Acetylene, Ethylene, Methane, Propane, Butane, and other flammable substances which assume a gaseous state at 15℃ and 1 atm

14. 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.	Judgment

No.	Item	Implementation method	TOC No. Reference page of the operating instruction manual	Judgment
Specifications				
1	Included items	Check for number of staffs against the included item field	10. Specifications field P.39	
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 ・Be sure to connect the ground wire. P.4 ・Power supply is …. P.7 10.Specifications ・Specification-power supply P.39	
2	Operation start	・Starts operation Performs fixed value operation, auto stop operation or auto start operation	2. Before operating the unit P.4～7 ・Installation procedures… P.11～ 4. Operating procedures 31	
Description				
1	Operational descriptions	Explain operations of each component according to the operational instructions	4. Operating procedures P.11 ・Operating procedures ～ 1.Safety precautions～ 31 13. List of dangerous materials P.1～43	
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.36～38	
3	Maintenance and inspection	Explain operations of each component according to the operational instructions	6.Maintenance procedures ・Daily inspection/ maintenance P.34	
4	Completion of installation Record items	・Fill in the installation date and the installation mgr. on the nameplate of the main unit ・Fill in necessary information items 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.38	

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 High Temperature Water Bath
BA310C/410C/510C/610C/710C
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