Yamato

Constant Temperature Water Bath

Model

BA300/400/500/610/710

Instruction Manual

- Fourth Edition -

> ● Thank you for purchasing " Constant Temperature Water Bath, BA Series" of Yamato Scientific Co., Ltd.
> ● To use this unit properly, read this "Instruction Manual" thoroughly before using this unit.
> Keep this instruction manual around this unit for referring at anytime.
>
> ⚠WARNING!:
> Carefully read and thoroughly understand the important warning items described in this manual before using this unit.

Yamato Scientific Co. LTD.

Contents

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.

Table of Illustrated Symbols

Warning
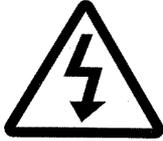
Warning, generally	Warning, high voltage	Warning, high temperature	Warning, drive train	Warning, explosive
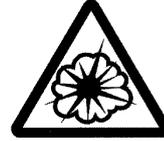
Caution

Caution, generally	Caution, electrical shock	Caution, scald	Caution, no road heating	Caution, not to drench
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

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 page39 "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 can not be used

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

🚫 Do not disassemble or modify this unit

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

⚠ 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.

⚠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.

Requirements for Installation

⚠ WARNING!

1. Always ground this unit

- Connect the power plug to a receptacle with grounding connectors.
- Do not forget to ground this unit, to protect you and the unit from electrical shock in case of power surge.   Choose a receptacle with grounding connectors as often as possible.
- Do not connect the grounding wire to a gas pipe, or by means of a lightning rod or telephone line. A fire or electrical shock will occur.

- Though BA400/500 model is the 100V single phase model, these two models have the large electric capacity.   Be sure to prepare the power switchboard with the specific grand earth or specific receptacle.
- BA610/710 model is the 200V single phase mode.   Be sure to connect this model to the specific power switchboard or receptacle for 200V.

2. 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.

Explosive gas

Flammable gas

BA —
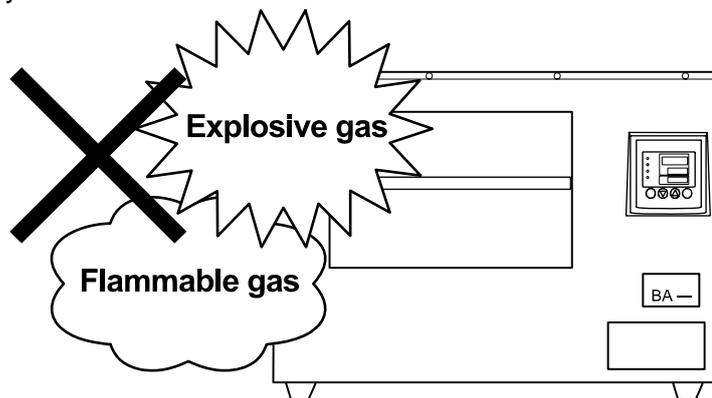
Requirements for Installation

3. 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.   This unit should be installed horizontally by using adjusters on the four corners.

More than 20cm

More than
20cm

Main Unit

More than
20cm

Front side
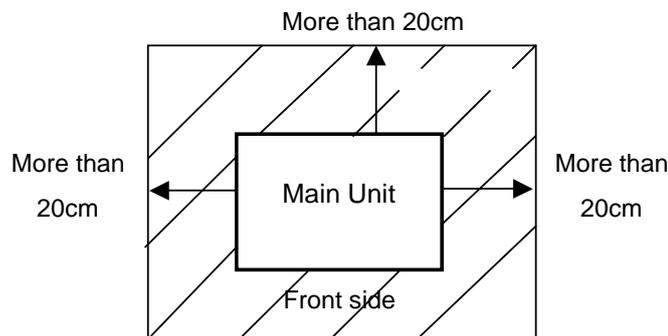
4. Do not modify

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

Modification
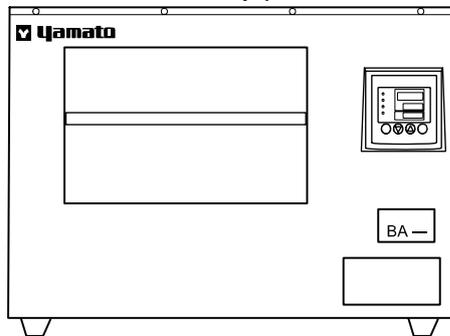
5. Installation on horizontal surface

- Set this unit to the flattest place.   Not setting this unit with its 4 legs covered with rubber (BA610/710 has 6 legs) contacted to the setting place surface evenly could cause the vibration or noise, or cause the unexpectible trouble or malfunction.

5
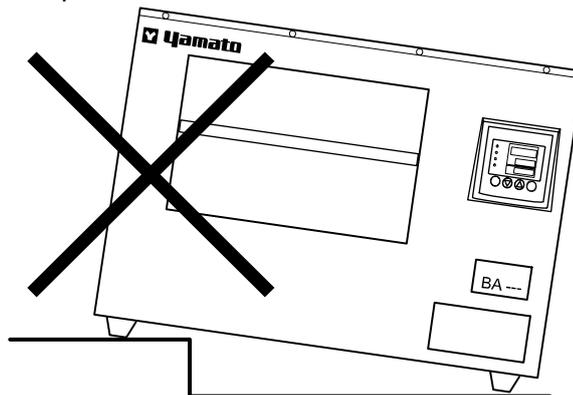
Requirements for Installation

⚠CAUTION!

6. Choose a correct power distribution board or receptacle

> ❶ • Choose a correct power distribution board or receptacle that meets the unit's rated electric capacity.
>
> **Electric capacity :**   BA300: AC100 V, 14A
> BA400: AC100 V, 23A
> BA500: AC100 V, 25A
> BA610: AC200 V (Single phase), 19A
> BA710: AC200 V (Single phase), 25A
>
> NOTE)
> 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.

7. Before/after installing

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

8. Handling of power code

> 🚫 • Do not entangle the power cord. This will cause overheating and possibly a fire.
> • Do not bend or twist the power cord, or apply excessive tension to it. This may cause a fire and electrical shock.
> • Do not lay the power cord under a desk or chair, and do not allow it to be pinched in order to prevent it from being damaged and to avoid a fire or electrical shock.
> • Keep the power cord away from any heating equipment such as a room heater. The cord's insulation may melt and cause a fire or electrical shock.

> ❶ • 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 outlet which is supplied appropriate power and voltage.

Main Unit

Clamp

Stand

Control panel

Shelf

Power switch
(Electric leakage breaker)

Heater

Rear view

Rubber leg

Production plate

Power cord

Power cord (BA300)

Drainage hose

7
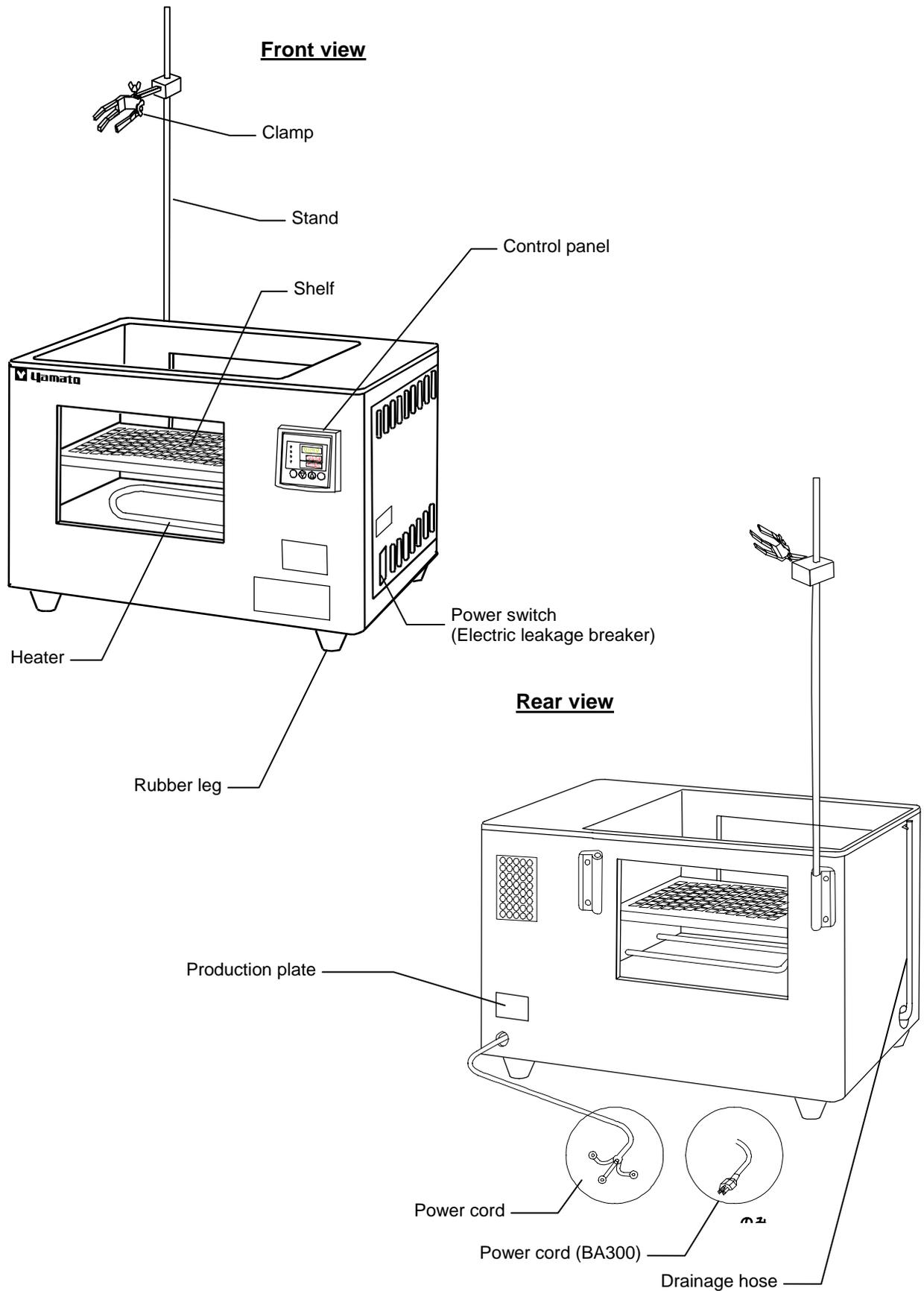
Control Panel
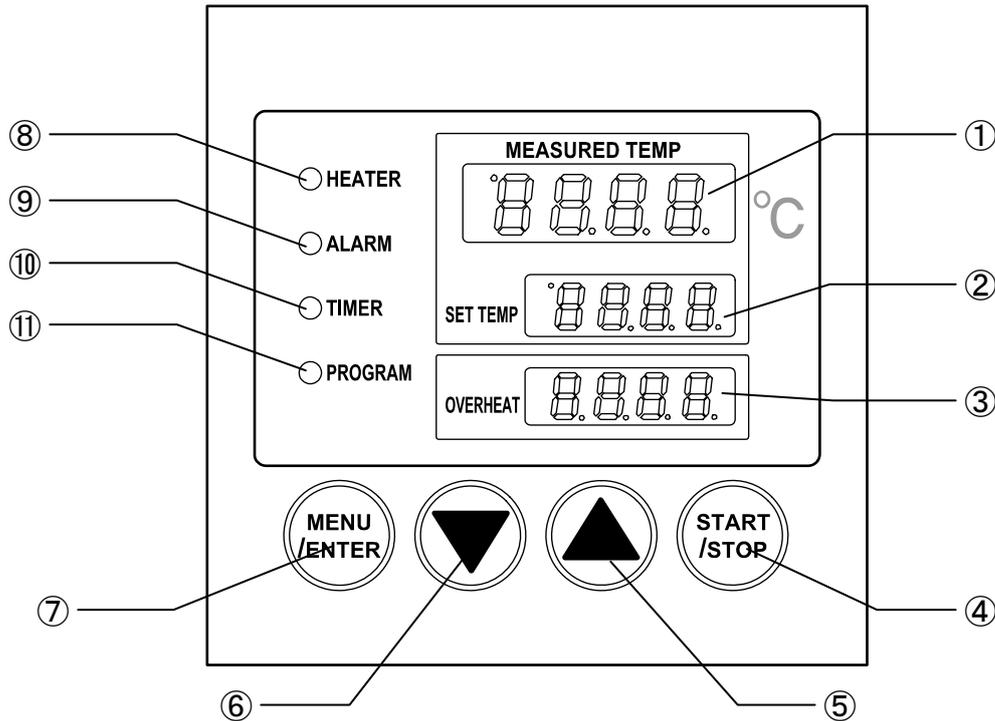
①	Measurement Temperature Display Unit :	Displays the measured temperature and setting character alarm information.
②	Setting Temperature Display Unit :	Displays the setting value.
③	Measurement Temperature Display Unit for Overheating Prevention Device :	Displays the setting temperature for overheating prevention device.
④	Start/Stop Key :	Starts/stops the operation under the fixed temperature and program operation.
⑤	▲ Key :	Uses for rising UP the setting value.
⑥	▼ Key :	Uses for lowering DOWN the setting value.
⑦	Menu/Enter Key :	Uses for changing the setting.
⑧	Heater Lamp :	Displays the heater status. The heater is not at work: Lights off The heater is at work: Lights up
⑨	Alarm Lamp :	Displays the alarm occurred status. Not occurred the alarm: Lights off Occurred the alarm: Lights up
⑩	Timer Lamp :	Displays the timer status. Stop the operation: Lights off Not set the timer: Lights off Timer under running status during operation: Blinks Timer ended running during operation: Lights up
⑪	Program Lamp :	Displays the program running status Stop the operation: Lights off Program under running during operation: Lights up

Characters of Thermo Controller

Character	Identifier	Name	Purpose
⎡5υ1⎤	**Sv1**	Temperature Setting	Used for setting the temperature.
⎡t1⎤	**tiM**	Time Setting	Used for setting the time.
⎡_tYP⎤	**_tYP**	Operation Switching Mode	Selects either the operation under the fixed temperature or program operation.
⎡∏d-0⎤	**Md-0**	Overheating Prevention Setting Mode	Used for setting temperature for overheating prevention device.
⎡5υ2⎤	**Sv2**	Overheating Prevention Temperature Setting	Used for setting temperature for overheating prevention device.
⎡∏d-6⎤	**Md-6**	Operation Setting Mode	Selects either the operation starting function or operation condition function.
⎡_t∏2⎤	**_tM2**	Timer Condition Select	Used for selecting the timer condition for the operation. (Refer to Page11 "Operation Method".)
⎡_PAt⎤	**_PAt**	Program Pattern Select Mode	Used for selecting the program pattern.
⎡∏d-7⎤	**Md-7**	Calibration Offset Setting Mode	Used for calibrating the temperature (inputting the offset value).
⎡_Pυ5⎤	**_PvS**	Offset Calibration	Used for inputting the offset value for calibrating the in-bath sensor and overheating prevention sensor. (Refer to Page28 "Calibration Offset Function".)
⎡A5tP⎤	**AStP**	Timer Setting Mode Display	Represents that the unit is under the quick auto stop operation mode.
⎡End⎤	**End**	Time Up	Displays when the quick auto stop operation is completed.
⎡Pυ2⎤	**Pv2**	Overheating Prevention Measurement Temperature	Monitors the measurement value (current temperature).

Characters of Thermo Controller

Character	Identifier	Name	Purpose
$5u\_l$	**Sv_1**	Temperature Setting	Used as the step setting temperature
t_l	**t_1**	Time Setting	Used as the step setting time
Wz_l	**WZ_1**	Wait Zone Setting	Used as the step wait zone
Wt_l	**Wt_1**	Wait Time Setting	Used as the step wait time
$5u\_2$	**Sv_2**	Temperature Setting	Used as the step setting temperature
t_2	**t_2**	Time Setting	Used as the step setting time
Wz_2	**WZ_2**	Wait Zone Setting	Used as the step wait zone
Wt_2	**Wt_2**	Wait Time Setting	Used as the step wait time
$5u~l6$	**Sv16**	Temperature Setting	Used as the step setting temperature
$t~l6$	**t16**	Time Setting	Used as the step setting time
$Wz~l6$	**WZ16**	Wait Zone Setting	Used as the step wait zone
$Wt~l6$	**Wt16**	Wait Time Setting	Used as the step wait time

Operation Mode and Function List

All the operation mode of this unit is as follows;

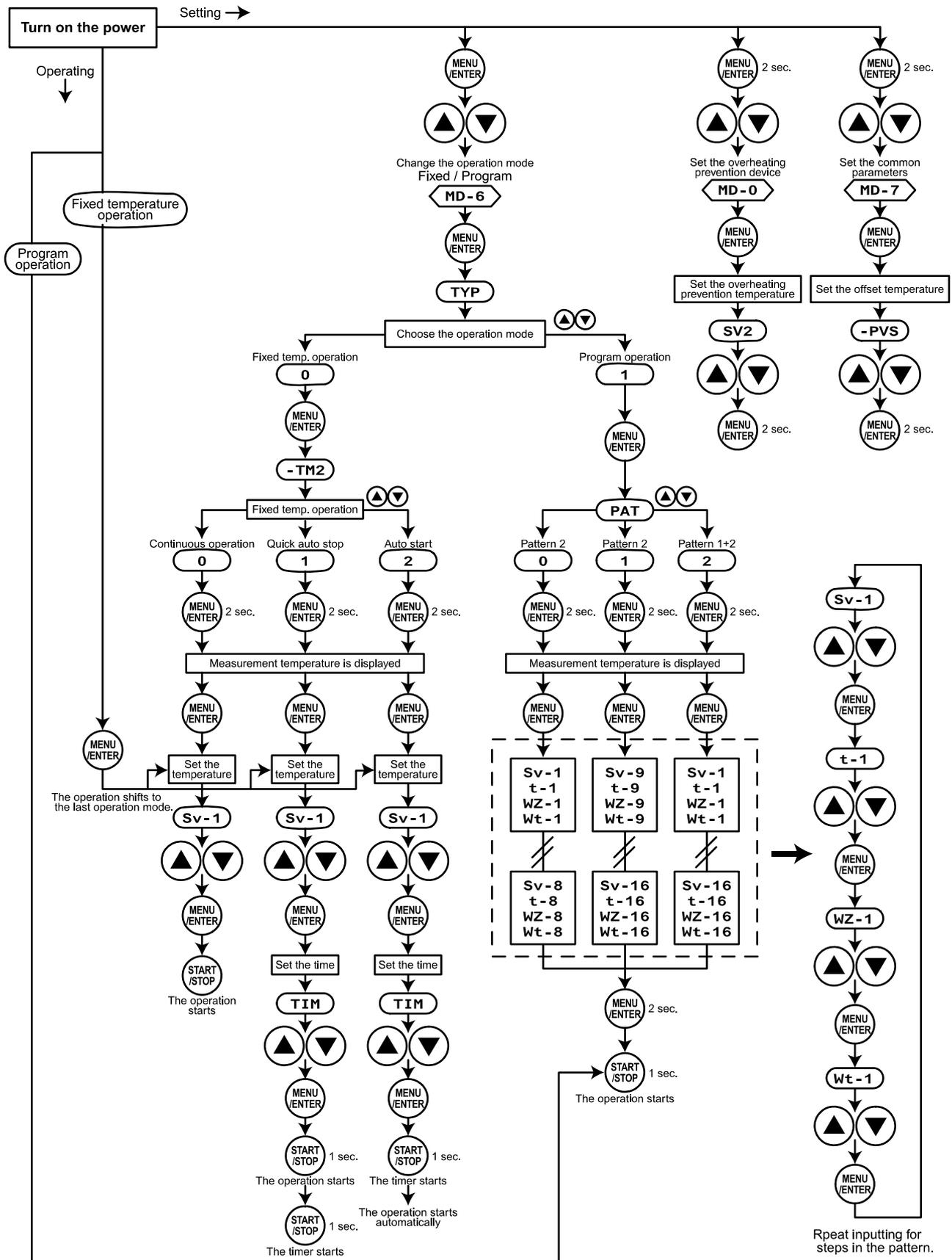| No.	Name	Description	Page
1.	Fixed Temperature Operation (Continuous Operation)	Pressing the start key activates the operation, and pressing the stop key stops the operation.	13
2.	Quick Auto Stop Operation	Pressing the start key activates the operation, activates the timer during the operation, and stops the operation automatically after passing the specified time. This function is used for "Stop the operation automatically after passing the specified time", and "Stop the operation even during the operation after several hours"	15
3.	Auto Start Operation	Uses for starting the operation automatically after several hours since the power is turned off turning off the power.	19
4.	Program operation	This program operation becomes activate after setting the following conditions, programming setting mode, temperature for each step, time, wait zone, wait time. After setting the conditions above, this operation starts and ends the operation automatically after the program is completed.	21

NOTE) This unit is impossible to be changed the mode during the operation. If the mode requires to be changed, stop the operation.

The operation function of this unit is as follows;

| No.	Name		Description	Page
1.	Overheating prevention function	Auto overheating prevention function	Linked to the setting temperature of the device. If the temperature of in-bath is raised, the temperature of the device is set for resetting automatically with that raised temperature plus 6 Celsius degree.	27
2.		Overheating prevention device	Though the controller, power source, display unit, and key in unit are shared, this unit is composed with the individual temperature measurement circuit, CPU, sensor, and output circuit, and also is possible to be set at the desired temperature from the operation panel. If the overheating prevention device should activate, this unit stops running, and does not reset unless re	
3.	Calibration offset function		This calibration offset function is for calibrating the difference occurred between the required in-bath 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.	28
4.	Overheating prevention temperature calibration function		When the Item 2 above activates, the temperature calibration of the overheating prevention device also activates automatically.	

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.

Turn on the power

Setting →

Operating

Fixed temperature operation

Program operation

MENU/ENTER

▲ ▼

Change the operation mode
Fixed / Program

MD-6

MENU/ENTER

TYP

Choose the operation mode ▲ ▼

Fixed temp. operation
0

MENU/ENTER

-TM2

Fixed temp. operation ▲ ▼

Continuous operation — 0
Quick auto stop — 1
Auto start — 2

MENU/ENTER 2 sec. (for each)

Measurement temperature is displayed

MENU/ENTER

MENU/ENTER

Set the temperature

The operation shifts to the last operation mode.

Set the temperature
Sv-1
▲ ▼
MENU/ENTER
START/STOP
The operation starts

Set the temperature
Sv-1
▲ ▼
MENU/ENTER
Set the time
TIM
▲ ▼
MENU/ENTER
START/STOP 1 sec.
The operation starts
START/STOP 1 sec.
The timer starts

Set the temperature
Sv-1
▲ ▼
MENU/ENTER
Set the time
TIM
▲ ▼
MENU/ENTER
START/STOP 1 sec.
The timer starts
The operation starts automatically

Program operation
1

MENU/ENTER

PAT ▲ ▼

Pattern 2 — 0
Pattern 2 — 1
Pattern 1+2 — 2

MENU/ENTER 2 sec. (for each)

Measurement temperature is displayed

MENU/ENTER

Sv-1
t-1
WZ-1
Wt-1
//
Sv-8
t-8
WZ-8
Wt-8

Sv-9
t-9
WZ-9
Wt-9
//
Sv-16
t-16
WZ-16
Wt-16

Sv-1
t-1
WZ-1
Wt-1
//
Sv-16
t-16
WZ-16
Wt-16

MENU/ENTER 2 sec.

START/STOP 1 sec.
The operation starts

Set the overheating prevention device

MENU/ENTER 2 sec.

▲ ▼

Set the overheating prevention device
MD-0

MENU/ENTER

Set the overheating prevention temperature

SV2

▲ ▼

MENU/ENTER 2 sec.

Set the common parameters

MENU/ENTER 2 sec.

▲ ▼

Set the common parameters
MD-7

MENU/ENTER

Set the offset temperature

-PVS

▲ ▼

MENU/ENTER 2 sec.

Sv-1
▲ ▼
MENU/ENTER
t-1
▲ ▼
MENU/ENTER
WZ-1
▲ ▼
MENU/ENTER
Wt-1
▲ ▼
MENU/ENTER

Rpeat inputting for steps in the pattern.

Fixed Temperature Operation (Continuous Operation)

Start the operation from turning on the power shown in the figure, and continue the operation under the setting temperature unless turning off the power.

SV: Setting temperature

t: Time

SV — (setting temperature line)

t — (time axis)

Power ON   Power OFF
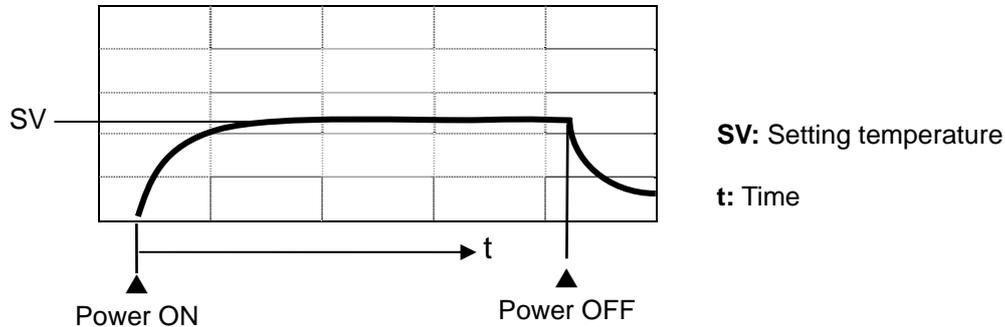
Setting of the Fixed Temperature Operation
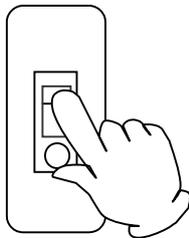
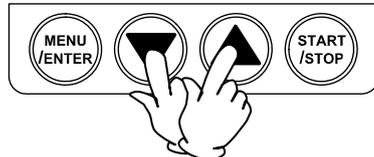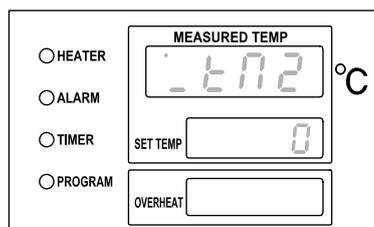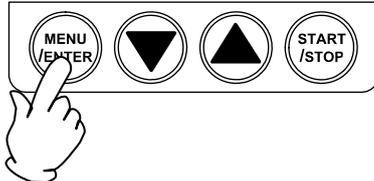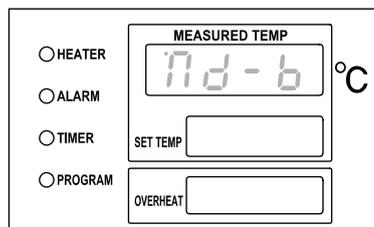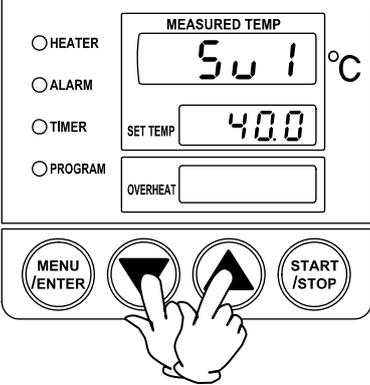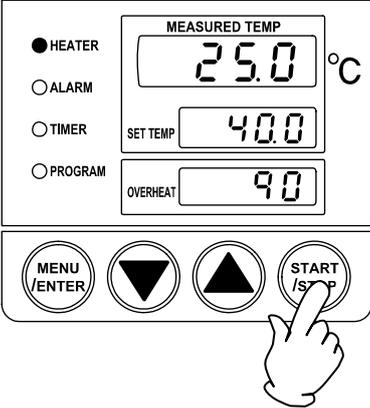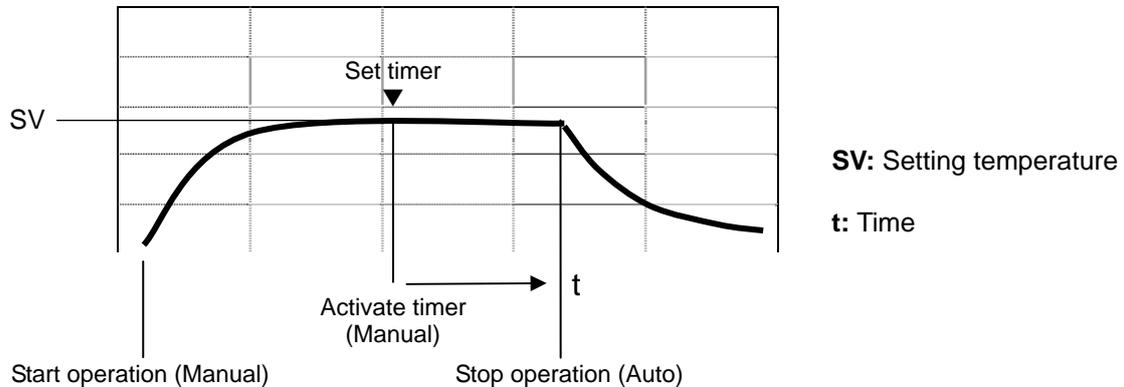| **1**	Turn on the power.	Toggle the power switch (earth leakage breaker) of this unit to "ON". The temperature controller display is lit. The initial display is appeared about for 4 seconds, and then the display goes into the measurement temperature display (in-bath temperature). ❖ The following information, version of the software, kind of the sensor to be applied, and setting temperature of the overheating prevention device, are displayed in the initial window.
2	Set to the fixed temperature mode.	1. Press the Menu/Enter key for 2 seconds, and display the operation setting mode $\boxed{Md-6}$ (md-6) (blinking) in the measurement temperature display unit using the ▲▼ keys. 2. Pressing the Menu/Enter key displays the operation-switching mode $\boxed{-typ}$ (-typ). 3. The setting temperature display unit blinks. Select "0" as the fixed temperature mode for the operation using the ▲▼ keys. 4. Pressing the Menu/Enter key displays the timer activating function $\boxed{-tm2}$ (-tm2). 5. The setting temperature display unit blinks. Select "0" as the fixed temperature mode for the operation using the ▲▼ keys. 6. Press the Menu/Enter key again for 2 seconds for going back to the measurement temperature display. This completes the setting. ❖ The device is set to "0" mode when shipping from the factory.

Fixed Temperature Operation (Continuous Operation)

3	Set the temperature.	1. Pressing the [Menu/Enter] key displays the temperature setting $5u\ l$ (Sv1) in the measurement temperature display unit.
	MEASURED TEMP ○HEATER 5u 1 °C ○ALARM ○TIMER SET TEMP 40.0 ○PROGRAM OVERHEAT MENU/ENTER ▼ ▲ START/STOP	2. Set the desired temperature using the ▲▼ keys. 3. Pressing the [Menu/Enter] key completes the temperature setting. ⚠**CAUTION!** Set the temperature between +5℃ and 80℃.
4	Start the operation.	After completing the temperature setting, start the operation.
	MEASURED TEMP ●HEATER 25.0 °C ○ALARM ○TIMER SET TEMP 40.0 ○PROGRAM OVERHEAT 90 MENU/ENTER ▼ ▲ START/STOP	• Press the [Start/Stop] key about for 1 second. • Then the operation starts, and the in-bath temperature starts going up. • The heater lamp is lit, and the setting temperature is displayed in the setting temperature display unit. For stopping operation, press the [Start/Stop] key again about for 1 second.

❖ In case of setting the operation running with the fixed temperature mode, start from the Procedure 3 " Set the Temperature " after turning on the power.
Besides, when the device is operated under the setting temperature, only press the [Start/Stop] key for starting operation after turning on the power.
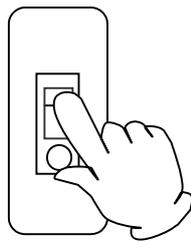
Quick Auto Stop Operation

As shown in the following figure, the device stops operating automatically by setting the timer.

SV: Setting temperature

t: Time

Setting of the Quick Auto Stop Operation

| 1	Turn on the power.	Toggle the power switch (earth leakage breaker) of this unit to "ON". The temperature controller display is lit.

Turn on the power.

Toggle the power switch (earth leakage breaker) of this unit to "ON". The temperature controller display is lit.

The initial display is appeared about for 4 seconds, and then the display goes into the measurement temperature display (in-bath temperature).
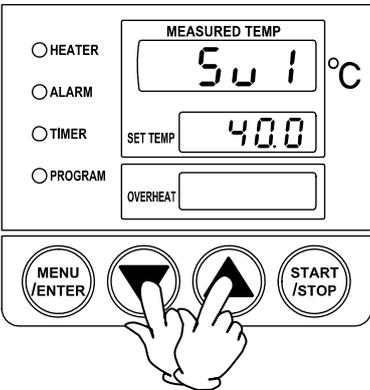
❖ The following information, version of the software, kind of the sensor to be applied, and setting temperature of the overheating prevention device, are displayed in the initial window.

2 Set into the quick auto stop mode.
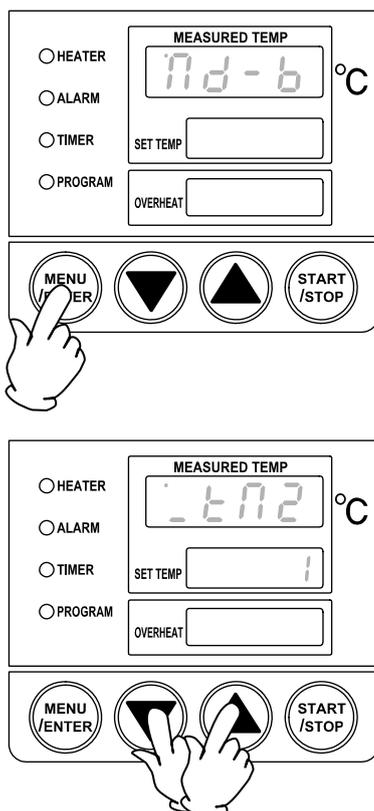
1. Press the Menu/Enter key for 2 seconds, and display the operation setting mode `md-6` (md-6) (blinking) in the measurement temperature display unit using the ▲▼ keys.

2. Pressing the Menu/Enter key displays the operation-switching mode `-typ` (-typ).

3. The setting temperature display unit blinks. Select "0" as the fixed temperature mode for the operation using the ▲▼ keys.

4. Pressing the Menu/Enter key displays the timer activating function `-tm2` (-tm2).

5. The setting temperature display unit blinks. Select "1" as the quick auto stop operation using the ▲▼ keys.

6. Press the Menu/Enter key again for 2 seconds for going back to the measurement temperature display. This completes the setting.

Quick Auto Stop Operation

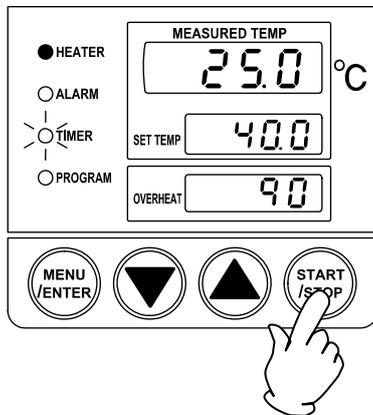|		
3	Set the temperature.	1. Pressing the Menu/Enter key displays the temperature setting $\boxed{5u\ 1}$ (Sv1) in the measurement temperature display unit.
	MEASURED TEMP: **5u 1** °C HEATER ALARM TIMER PROGRAM SET TEMP **40.0** OVERHEAT MENU/ENTER ▼ ▲ START/STOP	2. Set the desired temperature using the ▲ ▼ keys. The setting temperature is displayed in the setting temperature display unit.
		3. Pressing the Menu/Enter key completes the temperature setting. Then, the time setting $\boxed{t\ 1\Pi}$ (tim) is displayed in the measurement temperature display unit, and the setting temperature display unit blinks.
4	When starting the quick auto stop operation from the beginning	NOTE) When changing the operation mode into quick auto stop one during the operation, go to Procedure 6.
	MEASURED TEMP: **t 1Π** °C HEATER ALARM TIMER PROGRAM SET TEMP **730** OVERHEAT MENU/ENTER ▼ ▲ START/STOP	1. The setting temperature display unit blinks. Set the desired temperature using the ▲ ▼ keys. The value is input as the requiring time from the current time to the operation ending time. e.g. : $\boxed{7.30}$ (after 7 hours and half)
		2. Pressing the Menu/Enter key again completes the setting.
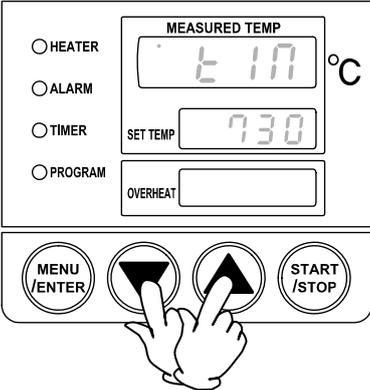
❖ In case of setting the quick auto stop operation, start from the Procedure 3 " Set the Temperature" after turning on the power.
Besides, when the device is operated under the setting temperature, only press the Start/Stop key for starting operation after turning on the power.

16

Quick Auto Stop Operation

5	Start the operation.	When completing the temperature and time settings, start the operation.
	MEASURED TEMP **25.0** °C ● HEATER ○ ALARM ○ TIMER ○ PROGRAM SET TEMP **40.0** OVERHEAT **90** MENU/ENTER ▼ ▲ START/STOP	• Press the Start/Stop key about for 1 second. The operation starts, and the in-bath temperature starts going up. • The heater lamp is lit, and the setting temperature is displayed in the setting temperature display unit. • Pressing the Start/Stop key again for 1 second blinks the timer lamp, and the timer starts. ⚠**CAUTION!** Be sure to check the timer lamp blinks. • The setting temperature display unit is available to change the display into "Timer setting Mode Display" $\boxed{\mathit{AStP}}$ (AstP) and "Remaining Timer Display Until Stopping Operation" in the order using the ▼ key. • When the timer stops, the heater lamp is lit off, and the operation stops. The timer lamp is changed from blinking status to lit one, and the time up $\boxed{\mathit{End}}$ （End） is displayed in the setting temperature display unit. • Pressing the Start/Stop key goes back to the measurement temperature display.

Quick Auto Stop Operation

**6** When activating quick auto stop operation during the operation.
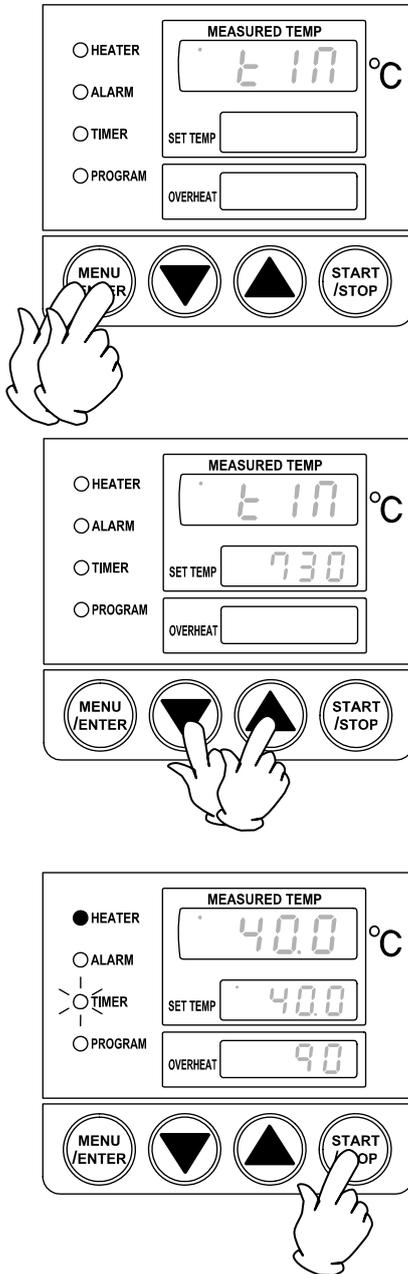
This procedure describes the setting of the quick auto stop operation from the operation status already running under the fixed temperature mode.

Though this procedure can be performed any time of the operation, it is impossible to set the quick auto stop mode described in the Procedure 2 in advance.

1. Press the Menu/Enter key in the measurement temperature display twice, and display the time setting ⎡ t i ⎤ (tim).

2. The setting temperature display unit blinks. Set the desired temperature using the ▲ ▼ keys. The value is input as the requiring time from the current time to the operation ending time.
   e.g. : 7.30 (after 7 hours and half)

3. Pressing the Menu/Enter key again completes the setting.

4. When the setting is completed, press the Start/Stop key for 1 second. The timer lamp blinks and the time starts.

- When the timer stops, the heater lamp is lit off, and the operation stops. The timer lamp is changed from blinking status to lit one, and the time up ⎡ End ⎤ (End) is displayed in the setting temperature display unit.

- Pressing the Start/Stop key goes back to the measurement temperature display.
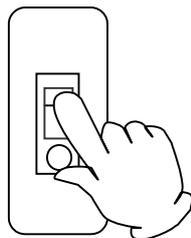
18

Auto Start Operation

As shown in the following figure, this mode is applied to the device for starting the operation after the specified time (hours) automatically.
Note that the device does not stop the operation automatically. Stop the operation by manual without fail.

SV: Setting temperature

t: Time
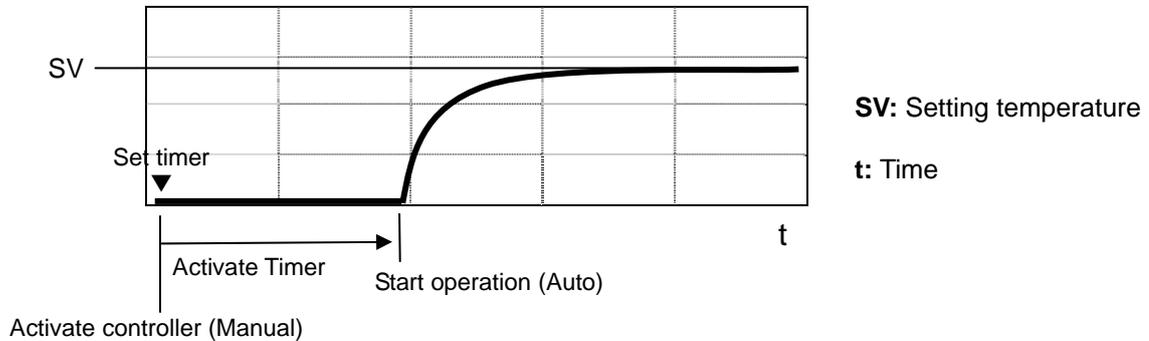
Setting of the Auto Start Operation

1	Turn on the power.	Toggle the power switch (earth leakage breaker) of this unit to "ON". The temperature controller display is lit.
		The initial display is appeared about for 4 seconds, and then the display goes into the measurement temperature display (in-bath temperature).
		❖ The following information, version of the software, kind of the sensor to be applied, and setting temperature of the overheating prevention device, are displayed in the initial window.
2	Set into the auto start mode.	1. Press the Menu/Enter key for 2 seconds, and display the operation setting mode $\overline{\Box d - b}$ (md-6) (blinking) in the measurement temperature display unit using the ▲▼ keys.
		2. Pressing the Menu/Enter key displays the operation-switching mode $\boxed{\_ t \exists P}$ (-typ).
		3. The setting temperature display unit blinks. Select "0" as the fixed temperature mode for the operation using the ▲▼ keys.
		4. Pressing the Menu/Enter key displays the timer activating function $\boxed{\_ t \Box \Box}$ (-tm2).
		5. The setting temperature display unit blinks. Select "2" as the auto start mode using the ▲▼ keys.
		6. Press the Menu/Enter key again for 2 seconds for going back to the measurement temperature display. This completes the setting.
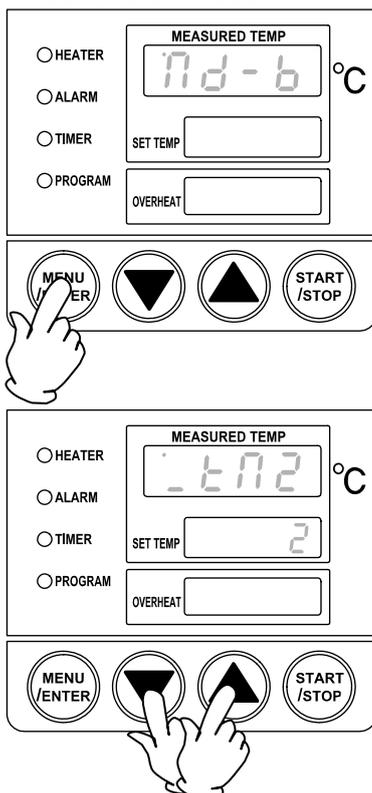
19

Auto Start Operation

|		
3	Set the time, and start the operation. ○ HEATER ○ ALARM ○ TIMER ○ PROGRAM **MEASURED TEMP** `5u 1` °C **SET TEMP** `40.0` **OVERHEAT** MENU/ENTER ▼ ▲ START/STOP	1. Pressing the Menu/Enter key displays the temperature setting `5u 1` (Sv1) in the measurement temperature display unit. 2. Set the desired temperature using the ▲▼ keys. The setting temperature is displayed in the setting temperature display unit. 3. Pressing the Menu/Enter key completes the temperature setting.
4	Start the operation. ○ HEATER ○ ALARM ○ TIMER ○ PROGRAM **MEASURED TEMP** `t 1n` °C **SET TEMP** `730` **OVERHEAT** MENU/ENTER ▼ ▲ START/STOP ○ HEATER ○ ALARM ○ TIMER ○ PROGRAM **MEASURED TEMP** `25.0` °C **SET TEMP** `40.0` **OVERHEAT** `90` MENU/ENTER ▼ ▲ START/STOP	After completing the temperature setting, the time setting `t 1n` (tim) is displayed in the measurement temperature display unit 1. The setting temperature display unit blinks. Set the desired temperature using the ▲▼ keys. The value is input as the requiring time from the current time to the operation starting time. e.g. : 7.30 (after 7 hours and half) 2. Pressing the Menu/Enter key again completes the setting. **⚠CAUTION!** Be sure to check the timer lamp blinks. • When the timer reaches to the setting time, the timer lamp changes from blinking status to lit one. Then the heater lamp is lit, and the device starts the operation.

❖ In case of setting the auto start mode, start from the Procedure 3 " Set the time, and start the operation. " after turning on the power.
Besides, when the device is operated under the setting temperature, only press the Start/Stop key for starting operation after turning on the power.

Program Operation

As shown in the figure, this mode is used for running the device under the setting program.
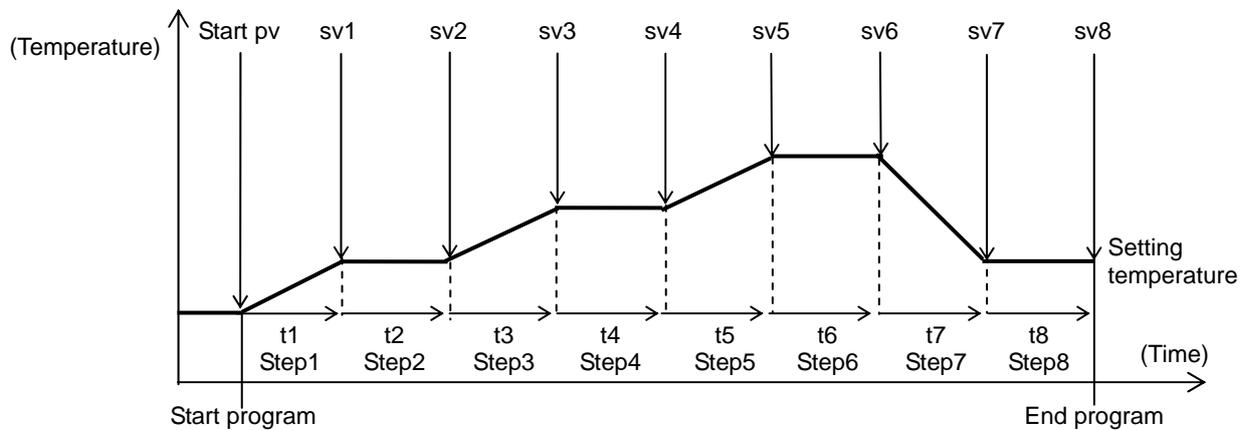
sv1 to sv8: Temperature setting

t1 to t8: Time setting

Wait zone:
difference zone between the setting temperature (sv) for activating the start function for next step and measurement temperature (pv)

Wait time:
Max. wait time for starting next step in case of not reaching the measurement temperature (pv) to the setting temperature (sv)

Setting of the Program Operation

| 1 | Turn on the power. | Toggle the power switch (earth leakage breaker) of this unit to "ON". The temperature controller display is lit.
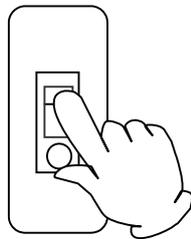
 The initial display is appeared about for 4 seconds, and then the display goes into the measurement temperature display (in-bath temperature).

 ❖ The following information, version of the software, kind of the sensor to be applied, and setting temperature of the overheating prevention device, are displayed in the initial window. |

Program Operation

2	Set the program mode.	1. Press the Menu/Enter key for 2 seconds, and display the operation setting mode $\boxed{\Pi d - 6}$ (md-6) (blinking) in the measurement temperature display unit using the ▲▼ keys.
	MEASURED TEMP $\Pi d - b$ °C ○HEATER ○ALARM ○TIMER SET TEMP ○PROGRAM OVERHEAT 90 MENU/ENTER ▼ ▲ START/STOP	2. Pressing the Menu/Enter key displays the operation-switching mode $\boxed{\_ t\, y P}$ (-typ). 3. The setting temperature display unit blinks. Select "1" as the program operation using the ▲▼ keys. ❖ The device is set to "0" mode when shipping from the factory.
3	Start the pattern.	1. Pressing the Menu/Enter key displays the pattern select mode $\boxed{\_ P\, R\, t}$ (-PAt) in the measurement temperature display unit.
	MEASURED TEMP $\_ t\, y P$ °C ○HEATER ○ALARM ○TIMER SET TEMP 0 ○PROGRAM OVERHEAT 90 MENU/ENTER ▼ ▲ START/STOP MEASURED TEMP $\_ P\, R\, t$ °C ○HEATER ○ALARM ○TIMER SET TEMP 40.0 ○PROGRAM OVERHEAT 90 MENU/ENTER ▼ ▲ START/STOP	2. Set the desired pattern using the ▲▼ keys. 3. Pressing the Menu/Enter key again for 2 seconds goes back to the measurement temperature display. This completes the setting. • Select "0": selects the Program Pattern 1 (Pattern 1 to 8) • Select "1": selects the Program Pattern 2 (Pattern 9 to 16) • Select "2": selects the Program Pattern Link (Pattern 1 to 16)
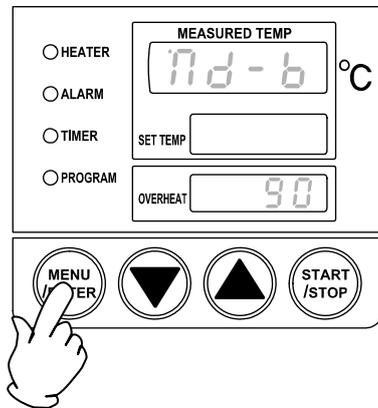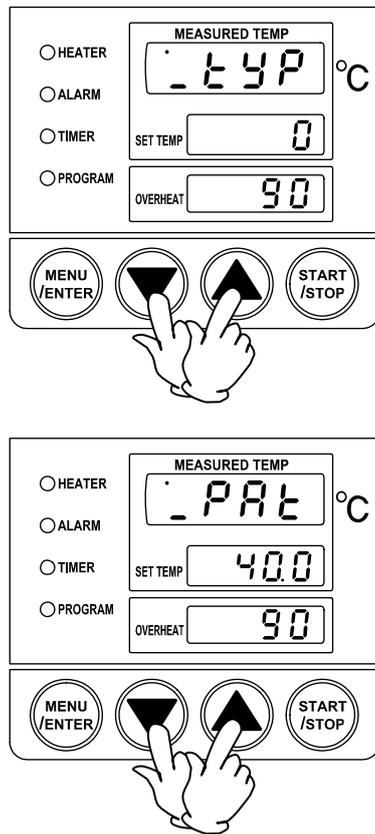
Program Operation
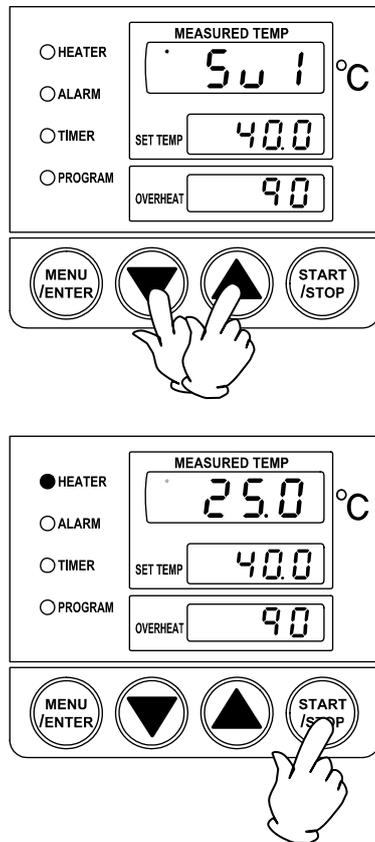
4	Start the operation.	1. Pressing the Menu/Enter key displays the step 1 temperature setting $5u\_1$ (Sv-1) in the measurement display unit
	MEASURED TEMP ○ HEATER · 5u 1 ℃ ○ ALARM ○ TIMER SET TEMP 40.0 ○ PROGRAM OVERHEAT 90 MENU /ENTER ▼ ▲ START /STOP	2. Set the desired temperature using the ▼▲ keys. (The settable temperature range is available to be set between Max. and Min. of the preset temperature.)
		3. Pressing the Menu/Enter key displays the Step 1 time setting t_1 (t-1) in the measurement temperature display unit.
		4. Set the desired temperature using the ▼▲ keys. The time is settable between 0 minute to 999 hours 50 minutes.
	MEASURED TEMP ● HEATER · 25.0 ℃ ○ ALARM ○ TIMER SET TEMP 40.0 ○ PROGRAM OVERHEAT 90 MENU /ENTER ▼ ▲ START /STOP	5. Pressing the Menu/Enter key displays the Step 2 wait zone Hd_1 (WZ-1) in the measurement temperature display unit.
		6. Set the desired wait zone setting temperature using the ▼▲ keys. The temperature is available to be set between 0℃ to 100℃.
		7. Pressing the Menu/Enter key displays the Step 1 wait time Ht_1 (WZ-1) in the measurement temperature display unit.
		8. Set the desired wait zone using the ▼▲ keys. The time is settable between 0 minute to 1 hours 50 minutes.
		❖ Max. 16 steps are available to be input by the pattern selected at Procedure 3.
		When inputting the wait time of the last step, keep pressing the Menu/Enter key for 2 seconds. This completes the program setting.
		After completing the setting, start the operation.
		• Press the Start/Stop key about for 1 second. The operation starts, and the in-bath temperature starts going up.
		• The heater lamp is lit, and the setting temperature is displayed in the setting temperature display unit.
		• For stopping operation, press the Start/Stop key again about for 1 second.
		❖ The display item in the "setting temperature display unit" is changeable using the ▼▲ keys during the operation.

❖ In case of operating under the setting program, turn on the power, then press the Start/Stop key.

How to Program

1. Temperature Rising/Falling Time of BA Model

BA Model is required to set the time of the temperature inclination within the temperature rising/falling capacity of BA Model.

Following table shows the actual data of the temperature rising/falling time of each model.

> ⚠ Note that the value shown in the table above is used as the reference value, for the value is changed depending on the following conditions, quantity of sample, water temperature, ambient temperature, etc.

1) Temperature Rising Time
   Temperature rising range: 20℃ to 80℃ (with cover), Room temperature 17℃ to 24℃, Unit (minute-min.)

Rising Reached Temp.(℃)	BA300 (min.)	℃/min.	BA400 (min.)	℃/min.	BA500 (min.)	℃/min.	BA610 (min.)	℃/min.	BA710 (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.	-	100min.	-	160min.	-	150min.	-	160min.	-

2) Temperature Falling Time
   Temperature falling range: 80℃ to natural falling (without cover) Room temperature 17℃ to 24℃, Unit (minute-min.)

Falling Reached Temp.(℃)	BA300 (min.)	℃/min.	BA400 (min.)	℃/min.	BA500 (min.)	℃/min.	BA610 (min.)	℃/min.	BA710 (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.)	315min.	-	405min.	-	415min.	-	430min.	-	525min.	-

Next, prepare the temperature program for BA Model based on the temperature rising/falling time.
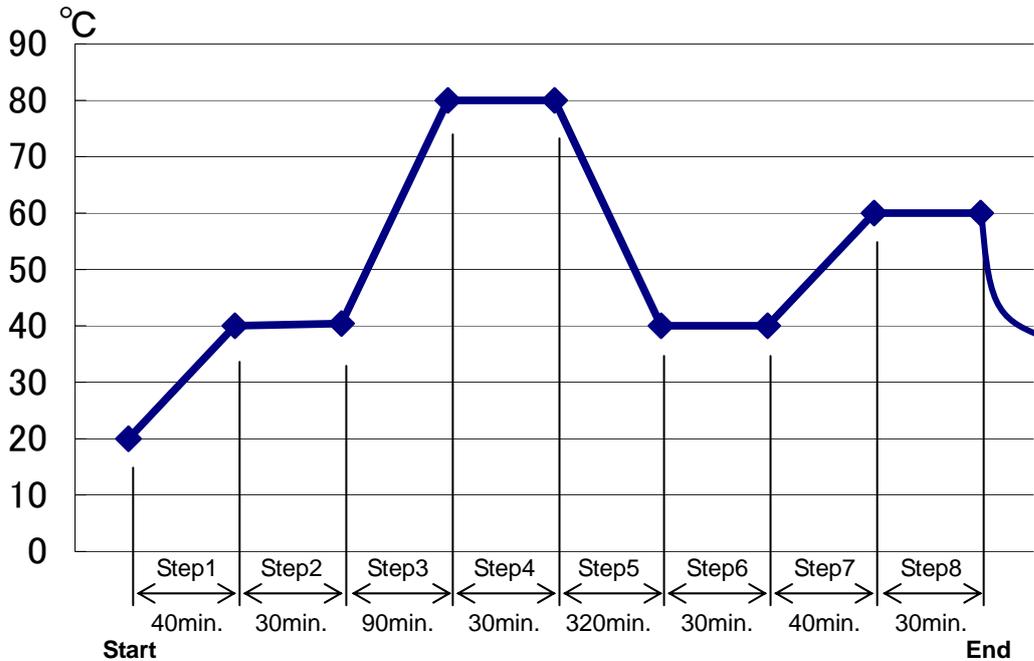
How to Program

2. Sample Program

Prepare the sample program for BA 300 Model based on the Item 1 data. For this sample, select "-TYP '1'" from MD-6, and then select the Steps 1 to 8 of "-PAT '1'".

1) Sample Program
    Prepare the program of the following table.

Input the program value of each step as shown below.

@Water temp. =20℃

STEP	SET TEMP. SV (℃)	SET TIME t (min.)	WAIT ZONE wz (℃)	WAIT TIME wt (min.)
Current time	20	-	-	-
Step1	40	40	1	30
Step2	40	30	1	30
Step3	80	90	1	30
Step4	80	30	1	30
Step5	40	320	1	30
Step6	40	30	1	30
Step7	60	40	1	30
Step8	60	30	1	30
Total time	-	610min.	-	-

2) WZ: Wait Zone Setting
    The wait zone is the function for preparing the temperature range that is compatible for the difference between setting temperature and actual temperature for shifting to Step B from Step A. In case of applying the water bath, set the temperature at 1℃ considering the temperature distribution accuracy.

3) Wt: Wait Time Setting
    Wait Time is the function for shifting to the next step after the setting wait time in the case that the measurement temperature (water bath temperature) is not reached to the setting temperature on shifting to Step B from Step A.   For this sample program, the wait time is set at 30 minutes.

How to Program

3. Programming Preparation Form

(Please use this form by making copies)

Test Name		Prepared Date	
		Programmer's Name	

Program

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
80℃																
70℃																
60℃																
50℃																
40℃																
30℃																
STEP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Input Value

STEP	STEP MODE (0 1 2)			
	SET TEMP. SV (℃)	SET TIME. t (min.)	WAIT ZONE wz (℃)	WAIT TIME wt (min.)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
TOTAL TIME	-		-	-

Overheating Prevention Device

Set temperature of overheating prevention device.
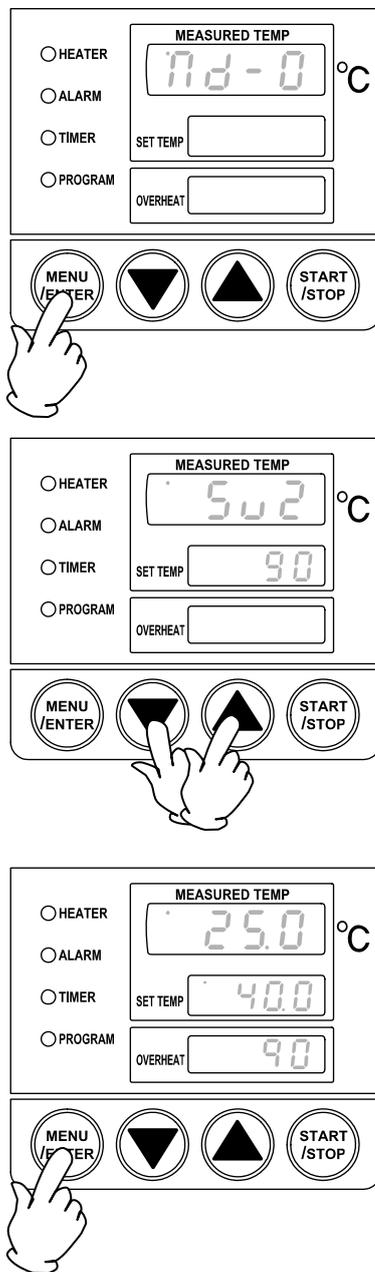
1. Press the Menu/Enter key for two seconds, then press the ▲▼ keys to select the setting mode for overheating prevention device 𝖬𝖽-𝟢 (md-0) (blink).

2. Press the Menu/Enter key again to indicate the temperature setting of overheating prevention device 𝖲𝗎𝟤 (Sv2) on the temperature display window.

3. Press the ▲▼ keys to select the desired temperature while the indication is blinking.

4. Press the Menu/Enter key again to determine the temperature set in 3. above. The temperature set above is indicated on the display.

• The overheating prevention setting temperature is displayed in the display unit.

• Press the Menu/Enter key for two seconds to go back to the temperature indication.

Notes for overheating prevention device

• In case there is a small difference between the set values of temperature for overheating prevention device and that of controller, the overheating prevention device may be activated when the temperature reaches to the set value of controller.Set the temperature of overheating prevention device so it be at least 5℃ or more higher than that of controller.

• For activating the overheating prevention device at the desired temperature without fail, check previously that it activates at that temperature with its preset value gradually lowered while keeping the desired in-bath temperature. An alarm lamp lights on and buzzer sounds when the overheating prevention device activates.   This unit indicates Er07 and stops the operation.

• The default value of the overheating prevention device at factory shipment is 90℃.

Calibration Offset Function

Calibration offset is a function that corrects the difference between the desired in-bath temperature and that of controller (sensor temperature).   It corrects the difference either to plus or minus side in the whole temperature zone of device in parallel.

Corrected temp. to plus side

Current temperature

Corrected temp. to minus side
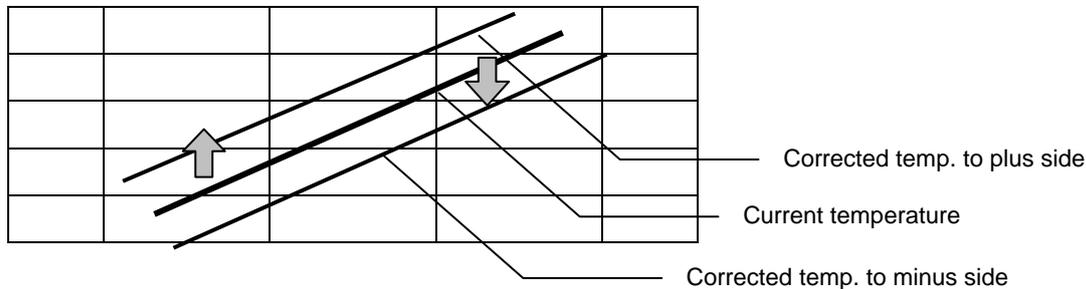
Temperature Correction
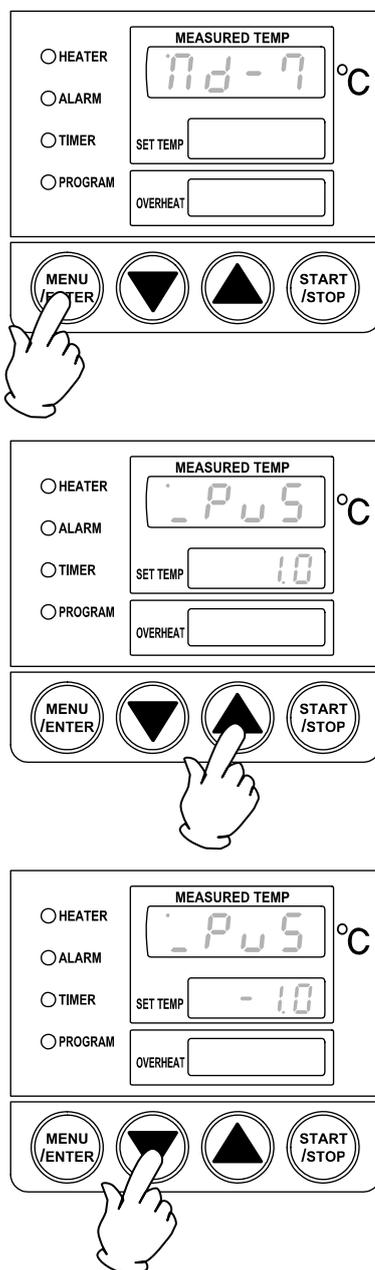
1. Press the Menu/Enter key for two seconds, then press the ▲ ▼ keys to select the calibration offset setting mode $\boxed{\eta d - \eta}$ (md-7) (blink) on the temperature display window.
2. The three indications on the window, calibration offset setting mode $\boxed{\eta d - \eta}$ (md-7), offset correction $\boxed{\_P\upsilon 5}$ (-Pvs), and overheating prevention device temperature $\boxed{P\upsilon 2}$ (Pv2) can be switched every time the Menu/Enter key is pressed.
3. The indication blinks when offset correction $\boxed{\_P\upsilon 5}$ (-Pvs) is selected.   Input the value of temperature to be corrected with the ▲▼ key. Press the ▲ key for plus setting and the ▼ key for minus.
4. Press the Menu/Enter key for two seconds after the setting is completed to go back to the temperature indication.
- When the temperature of overheating prevention device $\boxed{P\upsilon 2}$(Pv2) is selected in 2. above, the measured temperature of overheating prevention device sensor is indicated on the temperature indication window.
- Calibration offset is adjustable within the temperature range of 99.9℃ to -99.9℃.

Temperature correction for overheating prevention device:
Temperature correction on the controller can automatically correct that on overheating prevention device with the same value.

⚠ WARNING!

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.

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 page39 "List of Dangerous Substances".)

⚠ CAUTION!

Do not step on this unit

🚫 Do not step on this unit. It will cause injury if this unit fall down or break.

Do not put anything on this unit

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

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.

Clean this unit with enough

🚫 Though this unit is cleaned beforehand, clean it with enough after leaving for a long period or when using it for the first time.

Water to be applied

⚠ Do not use the water including other liquids.
The recommended water to be applied is, if possible, either ion exchange water or distilled water, and purify the water sometimes. When applying the ground water or tap water, a fur or dirt might be accumulated, and also might affect (descend) the heater efficiency or heater life. Purify water as required.

Water supply

⚠ When supplying water, pay attention not to spill water from the water bath or spread over the water bath. Should be spread a water over the operation panel, wipe it off completely. Failure to do so could cause the electric leakage or electric shock.

Countermeasure for stop operation during night or long-term stop

⚠ In case of stopping operation during night or long-term, toggle the power switch (electric leakage breaker) to "OFF".

⚠CAUTION!

Unattended continuous operation

⚠ In case of performing unattended continuos operation, pay attention to the auto supplying water device (non-operation device, Level Controller (OBF10 Model) product code: 221570) for not heating with empty status.

Pay attention not to heat empty bath. (Overheating prevention device performance)

⚠ Do not operate this unit with empty water bath or with its heater spilled the water from.   The heater might be red hot, the heater life descends seriously.   What is worse, it could cause a fire. Be sure to check the water amount of the water bath before the operation, and supply water as required.

This unit has the overheating prevention device in itself, and goes off the electricity in case of occurring the heating of empty bath.   Please contact to Yamato Science Service Office if the heating of empty bath is occurred.

Return 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. It is danger that the device starts unattached operation after a power failure.   We recommend for you to turn off the switch of this unit if a power failure occurs during operation.

Daily Inspection and Maintenance

For the safety use of this unit, please perform the daily inspection and maintenance without fail.
Using the city water to this unit might attach dirt. Do inspect and maintain this point while performing daily inspection and maintenance.

⚠WARNING!

- Disconnect the power cable from the power source when doing an inspection or maintenance unless needed.
- Perform the daily inspection and maintenance after returning the temperature of this unit to the normal one. (Be sure to check the water in the test bath is cooled down.)
- Do not disassemble this unit.

⚠CAUTION!

- Use a well-drained soft cloth to wipe dirt on this unit. Do not use benzene, thinner or cleanser for wiping. Do not scrub this unit. Deformation, deterioration or color change may result in.
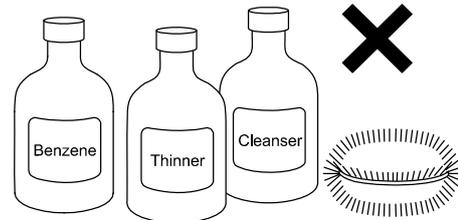
Monthly maintenance

- Check the electric leakage breaker function.
  1. Connect the power cord.
  2. Turn the breaker on.
  3. Push the red test switch by a ballpoint pen etc.
  4. If there is no problem, the electric leakage breaker will be turned off.

Test button
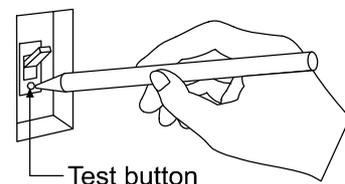
Water bath maintenance

- The density of the water in the water bath is concentrated gradually, and dirt might be attached and accumulated. If a fur or dirt is attached or accumulated, dip the water out of the water bath, and clean it completely.

Hose replacement

- For using this unit with stability, replace the hose once per two year as a guide. Please ask Yamato Scientific to the hose replacement.

For any questions, contact the dealer who you purchased this unit from, or the nearest sales division in our company.

When not using this unit for long term / When disposing

⚠CAUTION!

When not using this unit for long term…

• Turn off the power and disconnect the power cord.

⚠WARNING!

When disposing…

• Keep out of reach of children.
• Remove the door.
• Treat as large trash.

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.

Component Name	Material
Exterior Parts	
Outer Covering	Steel plate
Bath	Stainless steel SUS304
Inspection Window	Semi-tempered glass
Pole Support	Aluminum die cast
Production Plates	Polyethylene (PET) resin film
Operation Unit Frame, Corner	Alkylbenzenesulfied (ABS) resin
Fancy rubber, rubber board	Chloroprene rubber
Electrical Parts	
Switch, Relays	Resin, Copper, Other composites
Board	Glass fiber, Other composites
Pipe Heater	Stainless
Power Cord	Composites with synthetic rubber, copper, nickel
Parts for Piping	
Hoses	Ethylene Propylene Rubber (EPR)
Drain Hose	Cone hose
Hose Clamp	66 Nylon
Drain Cap	Juracon
Options	
Connector	Aluminum die cast
Flask Clipper	Aluminum die cast
Pole	SUS303

Error Display

The followings are the error indications displayed on the controller.

The device stops the heater and notify it with an error code display, alarm lamp and buzzer sound when an error occurred. Record the error code and turn off the power of device. Call us if any trouble arises.

The buzzer sounds!
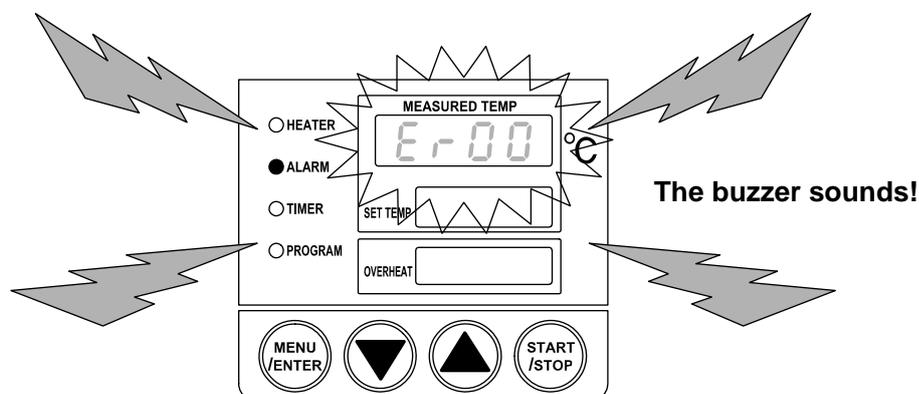
Error Code			Failure
Er00	*Er 00*	Memory Error	Error in setting value of memory. Replace the board.
Er01	*Er 01*	Temperature Sensor Error	Temperature sensor is broken or disconnected. Check and, if required, replace the sensor. Release the error by resetting the power supply.
Er02	*Er 02*	SSR Short-circuit	Failure in SSR Replace SSR. Release the error by resetting the power supply.
Er03	*Er 03*	Heater Disconnection	Heater is disconnected or heater circuit is broken. Release the error by resetting the power supply.
Er07	*Er 07*	Overheating Prevention Error	Overheating protection device is operated. Check the cause of failure. Release the error by resetting the power supply.
Er14	*Er 14*	Inter-Communication Error	Replace the substrate.
Er16	*Er 16*	Auto Tuning Error	In case of continuing the auto tuning for more than 3 hours. In case of occurring the measurement temperature error during the auto tuning. This error enables to release with key operation.
Er70	*Er 70*	Temperature Input Error	Failure in temperature input circuit Check the circuit.
-	_ _ _ _	Measurement Temperature Error	Out of the measurement temperature display range.

Trouble Shooting

Condition	Possible Causes
The device does not start when turning on power.	• Power source is turned off. • Power failure.
Alarm lamp lights on.	• Setting value of overheating prevention is lower than that of in-bath temperature.
Temperature does not rise.	• The setting temperature is lower than that of in-bath temperature.

When power failure occurs…

- When power is supplied after a power failure, the device automatically starts operation again with the same state as just before the power failure. It is danger that the device starts unattached operation after a power failure.
- We recommend for you to turn off the switch of device if a power failure occurs during operation.

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 nearest Yamato Scientific Service Office.

In Case of Request for Repair

If the failure occurs, stop the operation, turn OFF the power switch, and unplug the power plug. Please contact the sales agency that this unit was purchased, or the Yamato Scientific's sales office.

< Check following items before contact >

◆ Model Name of Product
◆ Production Number   See the production plate attached to this unit.
◆ Purchase Date
◆ About Trouble (in detail as possible)

## Minimum Retention Period of Performance Parts for Repair

The minimum retention period of performance parts for repair of this unit is 7 years after discontinuance of this unit.
The "performance part for repair" is the part that is required to maintain this unit.

	BA300	BA400	BA500	BA610	BA710
Operating temperature range	Ambient temp + 5 to 80℃				
Temperature adjustment accuracy	±0.02～±0.07℃				
Temperature distribution accuracy	±0.1℃				
Time required to reach highest temperature	Approx. 120min.	Approx. 110min.	Approx. 165min.	Approx. 160min.	Approx. 200min.
In-bath material	Stainless steel SUS304, Glass				
Temperature control system	PID control by microcomputer (fixed value system)				
Sensor	Platinum resistance bulb (Pt 100Ω)				
Temperature setting system	Digital setting				
Temperature display system	Digital display				
Overheating prevention system	ON/OFF control by microcomputer				
Overheating prevention setting system	Digital setting				
Overheating prevention sensor	K-thermocouple (W-sensor with Pt 100Ω)				
Heater	Stainless pipe heater (SUS316L)				
	1.3KW	2.2KW	2.4KW	3.5KW	4.5KW
Stirrer	Magnet pump				
	6W	30W	30W	60W	
Timer	1 minute to 99 hours 59 minutes, and 100 hours to 999 hours Digital setting, Auto start and auto stop function				
Safety device	Earth leakage breaker, Overheating prevention device, Self-diagnostic functions (heater disconnection, TRIAC short circuit, overheat prevention)				
Internal dimensions (W × D × H mm)	300 × 300 × 300	400 × 350 × 300	500 × 400 × 350	548 × 500 × 400	640 × 500 × 450
External dimensions (W × D × H mm)	490 × 360 × 367	590 × 410 × 367	690 × 460 × 417	738 × 560 × 467	830 × 560 × 517
Inspection window dimensions	240 × 215	340 × 215	440 × 265	340 × 215	440 × 265
In-bath capacity	Approx. 27L	Approx. 42L	Approx. 70L	Approx. 109L	Approx. 144L
Drain hose size	φ15 × 20				
Power supply (50/60Hz)	100V AC			200V AC single phase	
	14A	23A	25A	19A	25A
Weight	Approx. 19Kg	Approx. 25Kg	Approx. 30Kg	Approx. 36Kg	Approx. 46Kg
Accessories	Shelf:1, Shelf Bracket:4, Clamp:2, Stand:1, Connecter:2, Tube Connecter:1, Drain Cap:1, Instruction manual, Guarantee card				

Optional Accessories	Product code			
	Rack for vessels	Lid	Viscosity meter support	Cooling pipe
BA300	221195	221192	221189	
BA400	221196	221193	221183	221182
BA500	221197	221194	221184	
BA610	-	200000	-	-
BA710	-		-	-
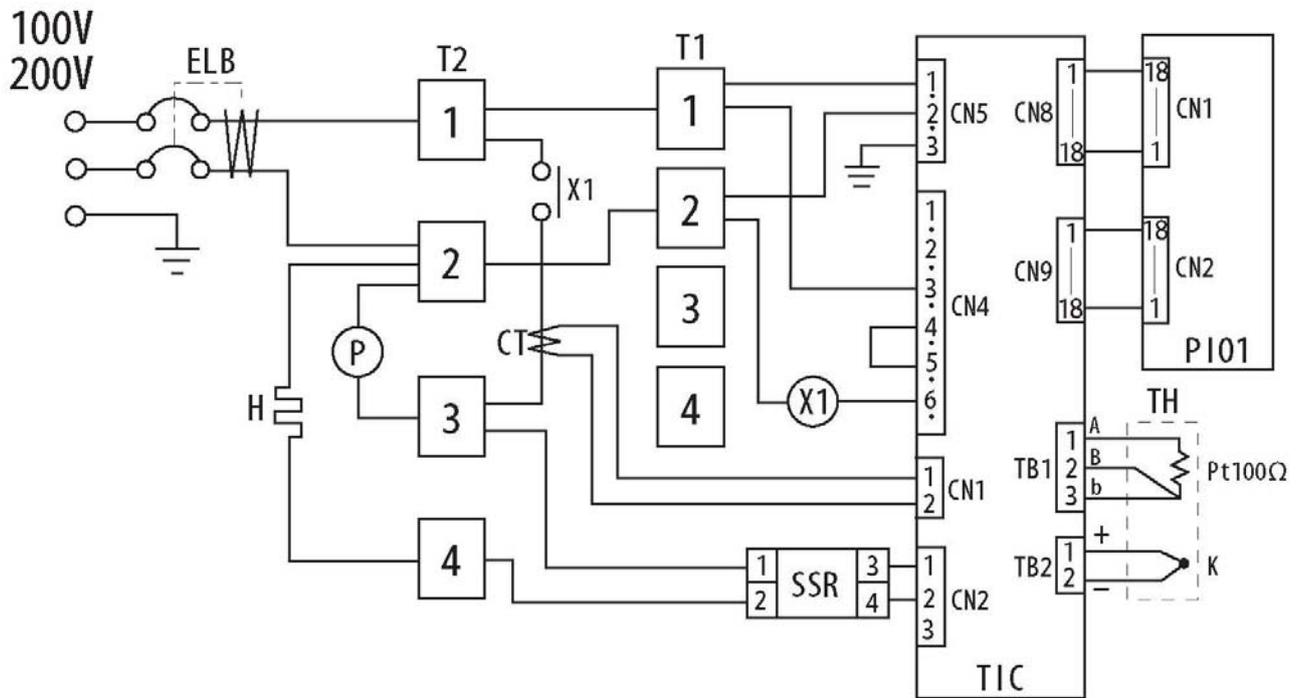
Symbol	Part name
ELB	Electric leakage breaker
T	Terminal block
TIC	Planar board
PIO 1	Display circuit board
X1	Relay
CT	Current transformer
SSR	Solid state relay
H	Heater
TH	Double sensor
P	Circulate pump

Common Use Parts

Part Name	Code No.	Specification	Manufacturer
W-sensor	1160030047	K-thermocouple φ4.8L×125L PT1/8	Yamato Scientific
SSR	2160000035	TRS5225	Toho Denshi
VS type thermoregulator board	1020000043	VS-2 (program), PIO, PLANAR, Two tough cards	Yamato Scientific
Current transform cell	2170010005	CTL-6-S-H	URD
Terminal block	LT00004736	ATK-20-4P	TOGI
Terminal block	LT00035672	MKH-250ABC 4P	Terminal
Relay	2050000044	AHE1255 200V	Matsushita

BA300

Part Name	Code No.	Specification	Manufacturer
Pipe heater	BK33-221103-110-2	NMNi1-a3 100V 1.3KW	Yamato Scientific
Magnet pump	2150080001	MD-10A	Iwaki
Relay	2050000019	AHE1254 100V	Matsushita
Electric leakage breaker	2060000019	FG32R/15-30MA 15A	Fuji Denki

BA400

Part Name	Code No.	Specification	Manufacturer
Pipe heater	BK43-221108-110-2	NMNi1-a3 100V 2.2KW	Yamato Scientific
Magnet pump	LT00006008	MD-20R-N	Iwaki
Relay	2050000019	AHE1254 100V	Matsushita
Electric leakage breaker	2060000021	FG32R/30-30MA 30A	Fuji Denki

BA500

Part Name	Code No.	Specification	Manufacturer
Pipe heater	BK53-221109-110-2	NMNi1-a3 100V 2.4KW	Yamato Scientific
Magnet pump	LT00005947	MD-30R-N	Iwaki
Relay	2050000019	AHE1254 100V	Matsushita
Electric leakage breaker	2060000021	FG32R/30-30MA 30A	Fuji Denki

BA610

Part Name	Code No.	Specification	Manufacturer
Pipe heater	BK610-40020	NMNi1-a3 200V 3.5KW	Yamato Scientific
Magnet pump	LT00034853	MD-40R-200N	Iwaki
Relay	2050000044	AHE1255 200V	Matsushita
Electric leakage breaker	2060000020	FG32R/20-30MA 20A	Fuji Denki

BA710

Part Name	Code No.	Specification	Manufacturer
Pipe heater	BK710-40020	NMNi1-a3 200V 4.5KW	Yamato Scientific
Magnet pump	LT00034853	MD-40R-200N	Iwaki
Relay	2050000044	AHE1255 200V	Matsushita
Electric leakage breaker	2060000021	FG32R/30-30MA 30A	Fuji Denki

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

(Source: Appendix Table 1 of Article 6 of the Industrial Safety and Health Order in Japan)

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 for
Constant Temperature Water Bath
Model BA300/400/500/610/710
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