英文取説納付時の注意事項

本書に含まれる以下の要素は、案件毎に修正が必要となる可能性があります。
納付時には対象製品の仕様を確認の上、必要に応じて修正を加えてください。

1) P.4 “Always ground this unit”中、電源供給方法についての表記。

- Though BT200 model is the 100V single phase model, this model has the large electric capacity in 21A.　Be sure to prepare the power switchboard with the specific grand earth or specific receptacle.
- BT300 model is the 200V single phase mode.　Be sure to connect this model to the specific power switchboard or receptacle for 200V.

2) P. 6"Choose a correct power distribution board or receptacle”中、電源仕様に関する表記。

Electric capacity:　BT100:　AC100V, 14A
BT200:　AC100V, 21A
BT300:　AC200V (Single phase), 14.5A

3) P. 33"Specification”中、電源仕様に関する表記。

Power supply (50/60Hz)	100V AC		200V AC
	14A	21A	14.5A

4) P. 35"Wiring Diagram”の結線図中、入力電源表記。

5) P. 36"Replacement Parts Table”中、各種交換部品の電圧・電気容量に関する表記。（ブレーカー、ヒーター、リレー等）

以上

SINCE 1889

Yamato

Shaking Incubator

Model

BT100/200/300

Instruction Manual

- First Edition -

- Thank you for purchasing " Shaking Incubator, BT 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

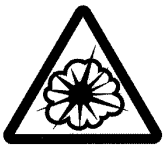
Warning


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 page37 “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!

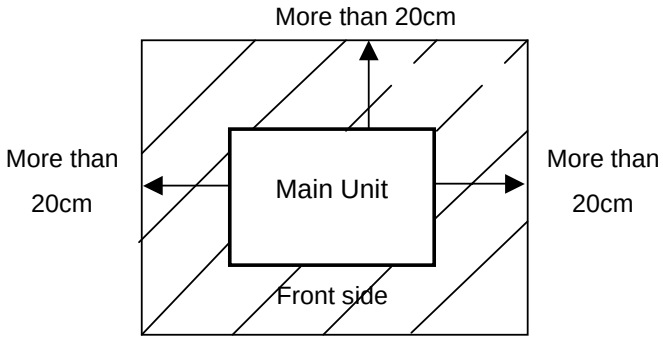
1. Always ground this unit

- 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 BT100 model is the 100V single phase model, this model has the large electric capacity in 14A. Be sure to prepare the specific receptacle with the specific grand earth.
- Though BT200 model is the 100V single phase model, this model has the large electric capacity in 21A. Be sure to prepare the power switchboard with the specific grand earth or specific receptacle.
- BT300 model is the 200V single phase mode. Be sure to connect this model to the specific power switchboard or receptacle for 200V.

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.

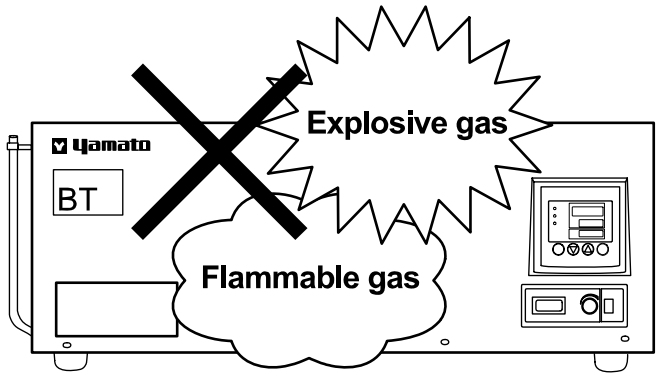
- Install this unit on a stable place with the space as shown below. This unit should be installed horizontally by using adjusters on the four corners.



Requirements for Installation

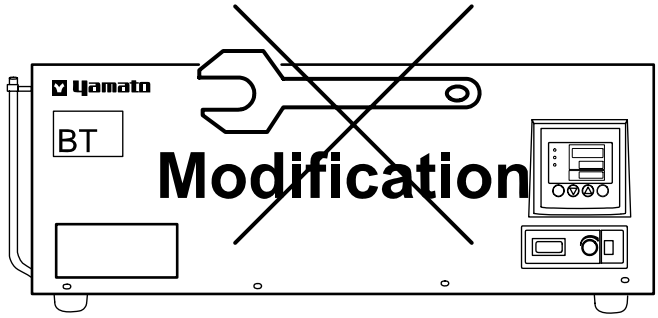
3. Do not use this unit in an area where there is flammable or explosive gas

- 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.



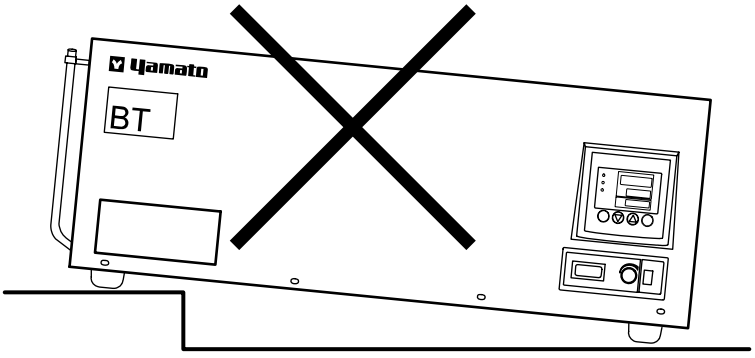
4. Do not modify

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



5. Installation on horizontal surface

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



Requirements for Installation

⚠CAUTION!

6. Choose a correct power distribution board or receptacle

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

Electric capacity:
BT100: AC100V, 14A
BT200: AC100V, 21A
BT300: AC200V (Single phase), 14.5A

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

- 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.

- 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.

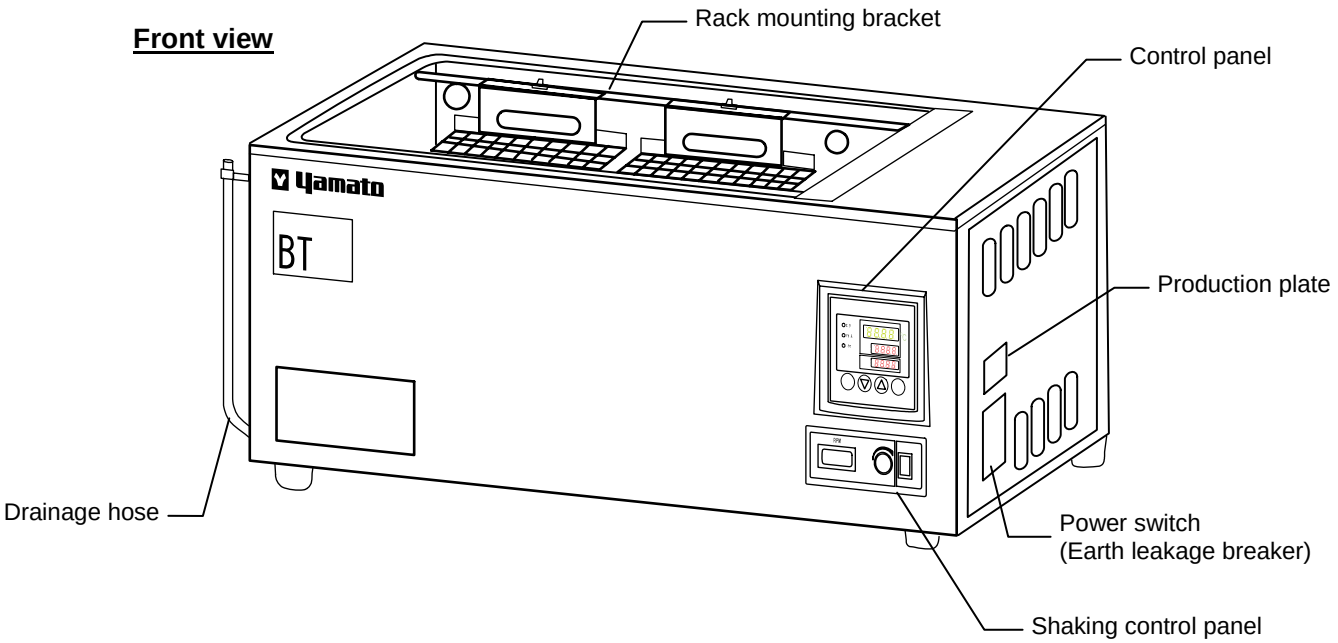
9. Do not use this unit at 80℃ or more, or under the room temperature

- Using this unit at 80℃ or more, the inner temperature might rise, and thus cause the malfunction of the electrical parts or deterioration of the packing.

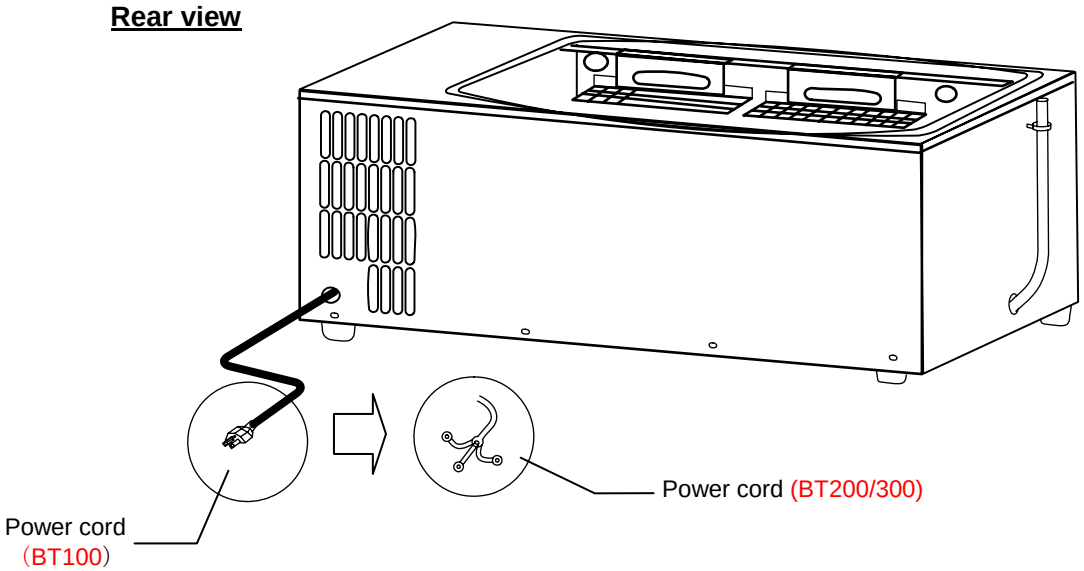
Description and Function of Each Part

Main Unit

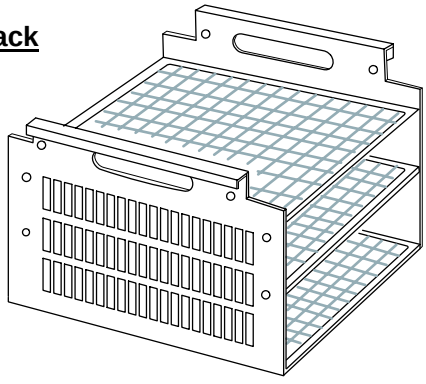
Front view



Rear view

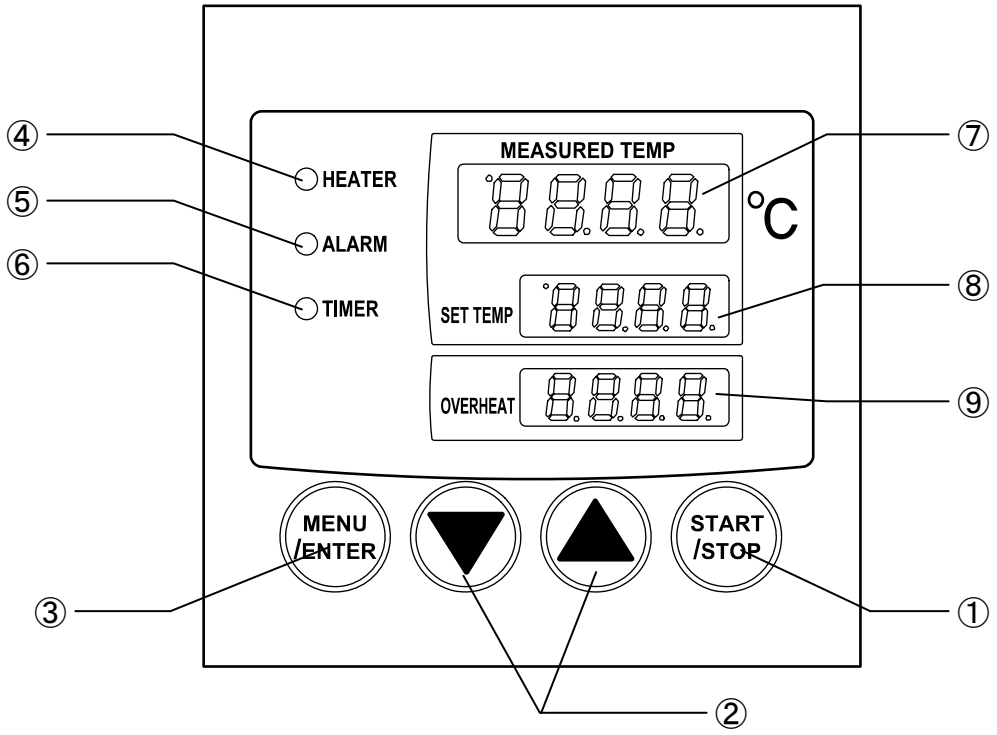


Option: Shaking Rack



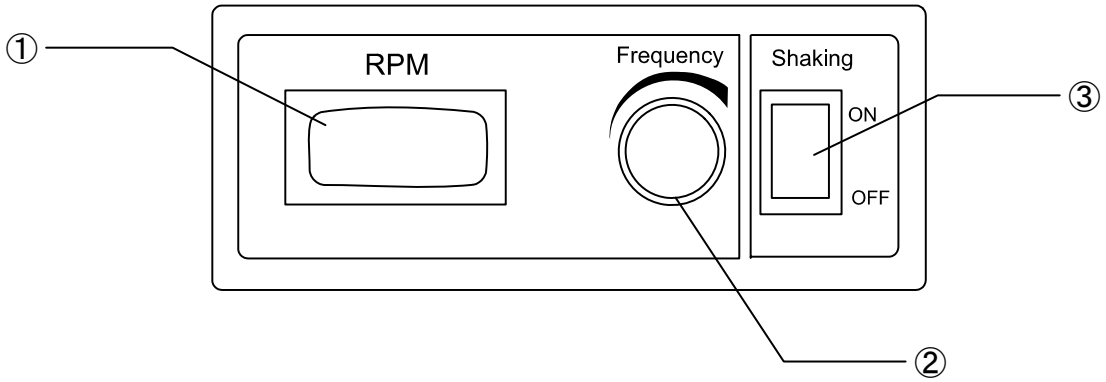
Description and Function of Each Part

Control Panel



①	Start/Stop Key :	Starts/stops the operation.
②	▲▼ Key :	Uses for rising UP/lowering DOWN the setting value.
③	Menu/Enter Key :	Changes the setting item, or settles the inputted value.
④	Heater Lamp :	Displays the heater status. The heater is not at work: Lights off The heater is at work: Lights up
⑤	Alarm Lamp :	Displays the alarm occurred status. Not occurred the alarm: Lights off Occurred the alarm: Lights up (and the buzzer sounds)
⑥	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
⑦	Measurement Temperature Display Unit :	Displays the measured temperature, setting character, alarm information.
⑧	Setting Temperature Display Unit :	Displays the setting temperature, setting value for timer mode, remaining time.
⑨	Overheating Prevention Setting Temperature Display Unit :	Displays the setting temperature for overheating prevention device.

Shaking Control Panel



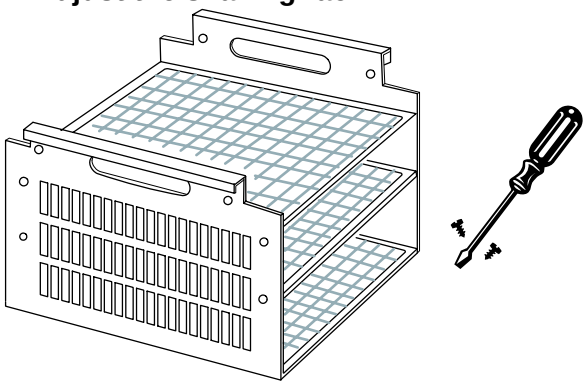
①	Shaking Frequency Display Unit :	Displays the current shaking frequency.
②	Shaking Adjusting Knob :	Turn to clockwise to raise the shaking speed, and turn to counterclockwise until the original point to stop shaking.
③	Shaking Switch :	Press "ON" (UP) to start shaking, and press "OFF" (LOW) to stop shaking.

Characters of Thermo Controller

Character	Identifier	Name	Purpose
	**Sv1**	Temperature Setting	Used for setting the temperature.
	**tiM**	Time Setting	Used for setting the time.
	**Md-0**	Overheating Prevention Setting Mode	Used for setting temperature for overheating prevention device.
	**Sv2**	Overheating Prevention Temperature Setting	Used for setting temperature for overheating prevention device.
	**Md-6**	Operation Setting Mode	Selects either the operation starting function or operation condition function.
	**_tM2**	Timer Condition Select	Used for selecting the timer condition for the operation. (Refer to Page13 ”Operation Method”.)
	**Md-7**	Calibration Offset Setting Mode	Used for calibrating the temperature (inputting the offset value).
	**_PvS**	Offset Calibration	Used for inputting the offset value for calibrating the in-bath sensor and overheating prevention sensor. (Refer to Page24 ”Calibration Offset Function”.)
	**AStP**	Timer Setting Mode Display	Represents that the unit is under the quick auto stop operation mode.
	**End**	Time Up	Displays when the quick auto stop operation is completed.
	**Pv2**	Overheating Prevention Measurement Temperature	Monitors the measurement value (current temperature).
	**NG**	Parameter input unavailable	It shows up when trying to change the parameter setting while controller is starting.

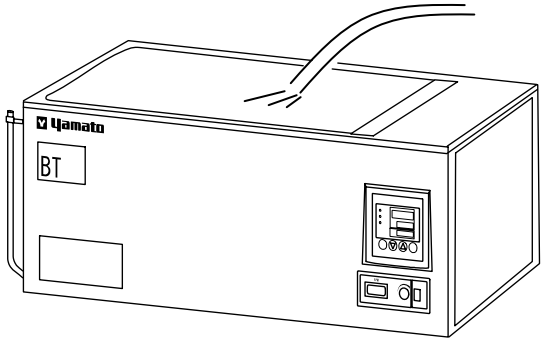
Procedure for Install

1. Adjust the shaking rack.



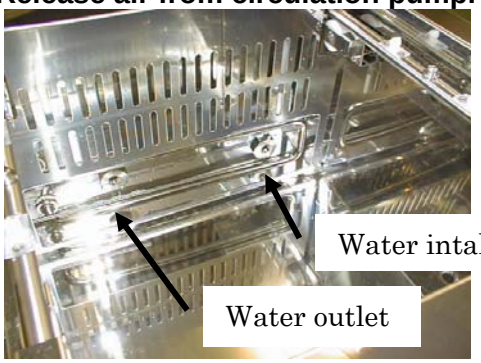
- Detach the spring shelf and spring matching to the shape, size of the specimen container, and spring mounting position. The spring shelf is fixed to the side of the rack with screws. Remove the screws from the shelf using the driver, and set the shelf to the appropriate position.

2. Pour the water into the water bath.



- The max. water level where the water is spilt out differs depending on the shaking frequency or shape and quantity of the container. The appropriate water level is 50mm under the top of the water bath.
  When the amount of the water is less than the water level, the float switch might be activated (indicating Er60), or the heater might be burnt. Keep the appropriate water level constantly.
- Recommend using ion exchange water or distilled water to avoid fur or scale.

3. Release air from circulation pump.

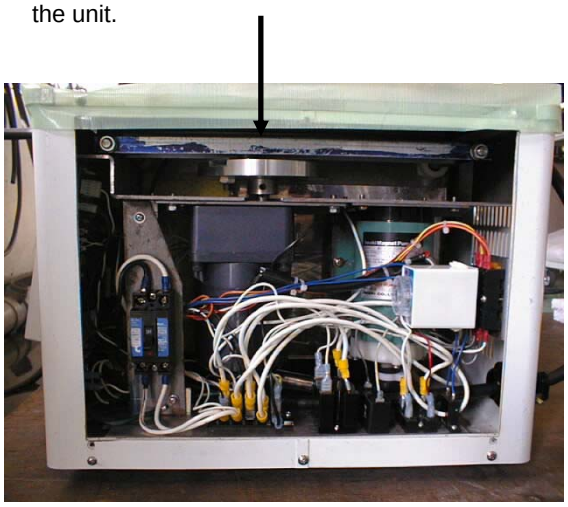


- −Depends on watering remain air in the circulation pump and it causes idle and making violent noise.
  It also end up breaking down.
  Choose one of the procedure as follows to release air when watering.
- -After water covered the water intake and outlet, release air from water outlet while putting watering hose to water intake.
- -After covering water intake and outlet with water, release air from water outlet while leaning the body.

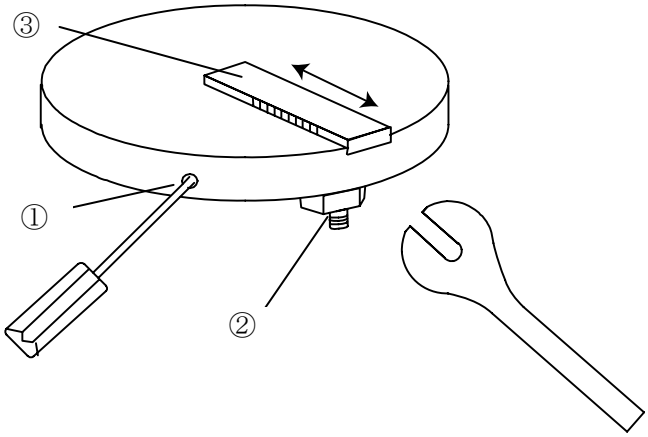
Procedure for Install

4. Adjust the shaking width.
(Adjustable within the 10mm to 40mm range.)
Perform this procedure after turning OFF the breaker without fail.

Remove the right side plate of this device.
The shaking width adjuster is on the top of the unit.



- The shaking width of this unit at the shipping is set at 40mm. If the user needs the smaller value than this, adjust the shaking width according to the following procedure.



- Insert tool such as a driver to the ① hole, and fix the shaking width adjuster so as not to move. Loosen the ② screw using the attached spanner, and change the depth of this device matching to the scale of the ③ shaking width adjusting plate (5mm interval) for changing the shaking width.

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5. Set the shaking rack.

- Set the shaking rack to the rack mounting bracket.

Operation Mode and Function List

The shaking controller and temperature controller of this unit are prepared individually.
All the operation mode of temperature controller is as follows;

No.	Name	Description	Page
1.	Fixed Temperature Operation	Pressing the start key activates the operation, and pressing the stop key stops the operation.	15
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"	17
3.	Auto Start Operation	Uses for starting the operation automatically after passing the specified time. (Not stops automatically.)	21

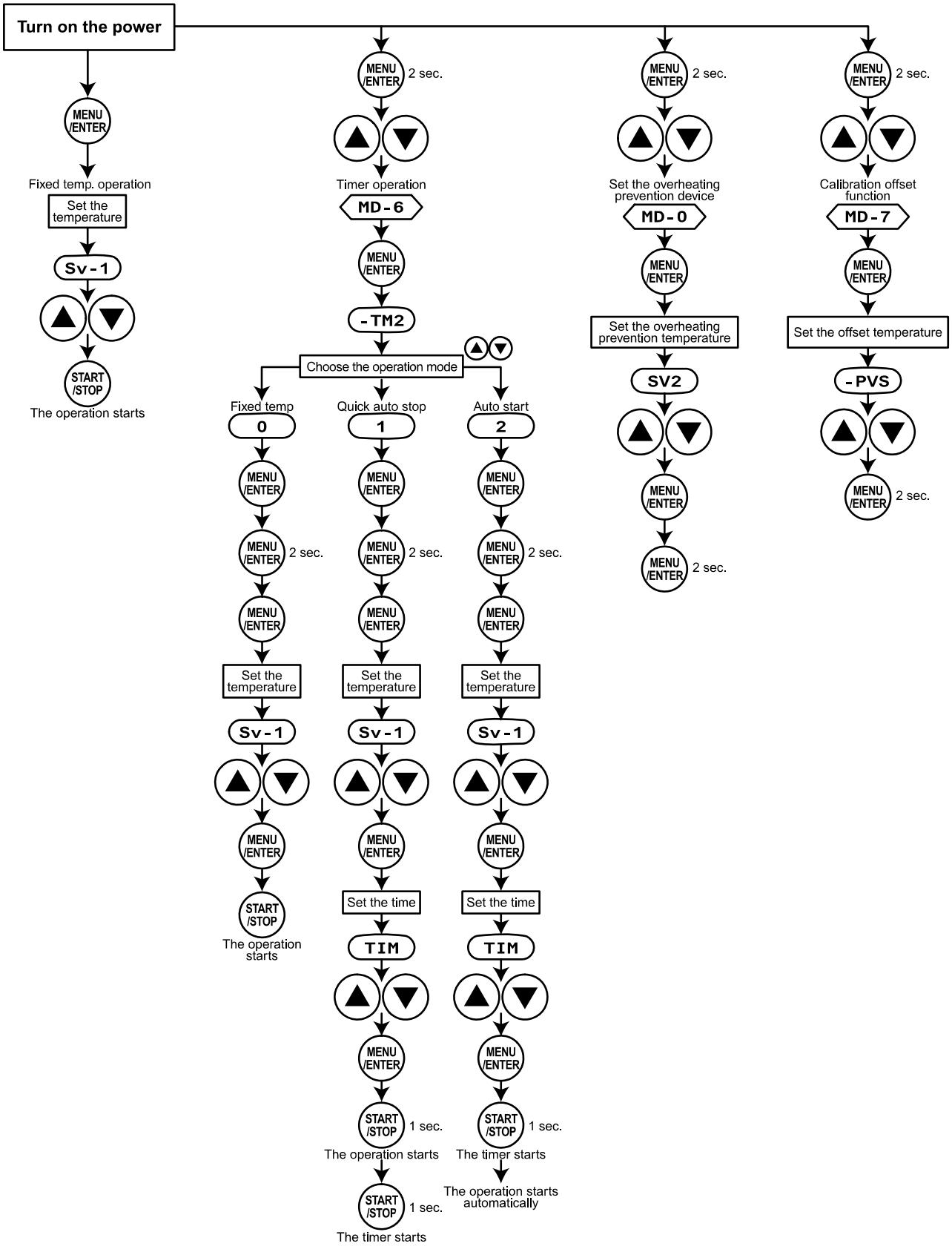
NOTE) This unit is impossible to be changed the mode during the operation. "NG" shows up when trying to change the mode. If the mode requires to be changed, stop the operation.

The operation function of temperature controller 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.	23
		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	
2.	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.	24
3.	Overheating prevention temperature calibration function		When the Item 2 above activates, the temperature calibration of the overheating prevention device also activates automatically.	

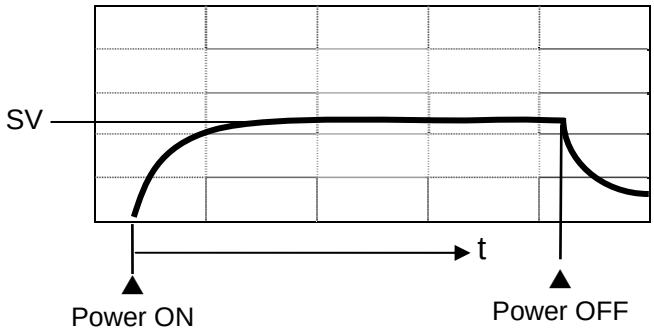
Operation Mode, Function Setting Key, and Characters

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



Fixed Temperature Operation

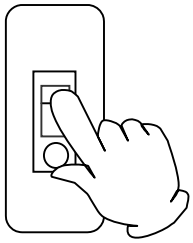
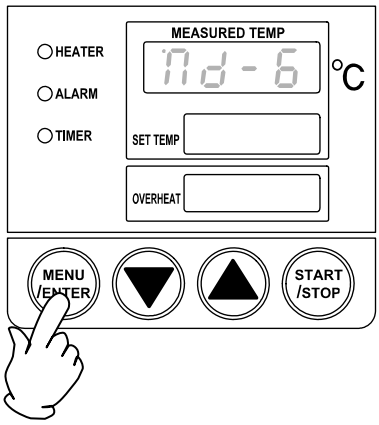
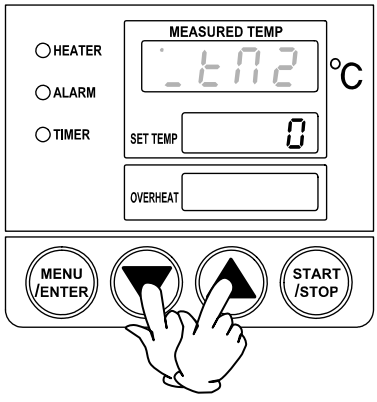
Start the operation from turning on the power shown in the figure, and continue the operation under the setting temperature unless turning off the power.



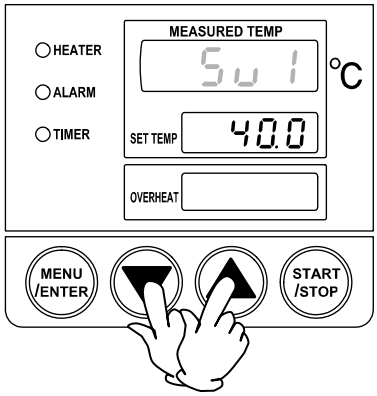
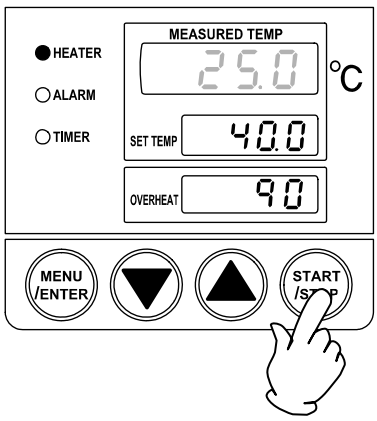
SV: Setting temperature

t: Time

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 md-6 (md-6) (blinking) in the measurement temperature display unit using the ▲▼ keys. 2. Pressing the Menu/Enter key displays the timer activating function _tm2 (-tm2). 3. The setting temperature display unit blinks. Select "0" as the fixed temperature mode for the operation using the ▲▼ keys. 4. 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.

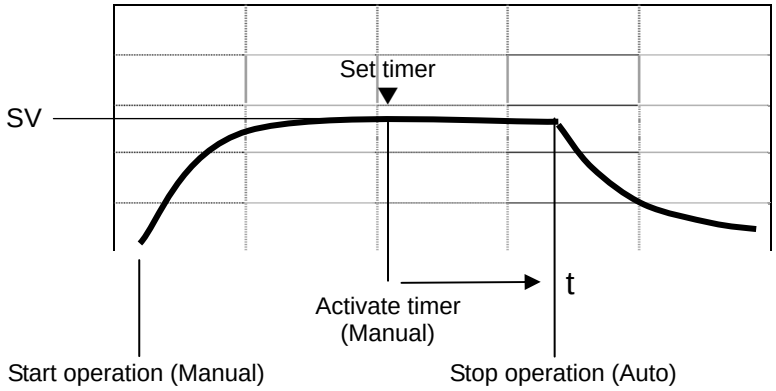
Fixed Temperature Operation

3	Set the temperature.  	1. Pressing the Menu/Enter key displays the temperature setting Su 1 (Sv1) in the measurement temperature display unit. 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. • 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

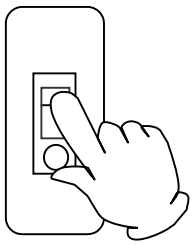
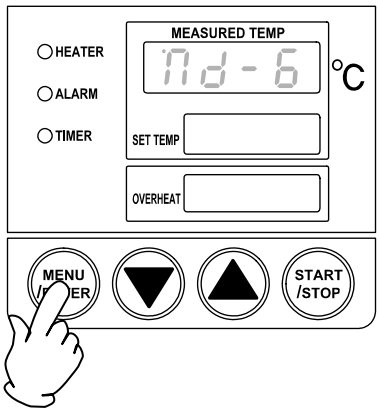
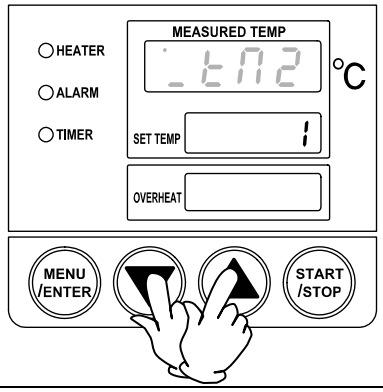
As shown in the following figure, the device stops operating automatically by setting the timer.



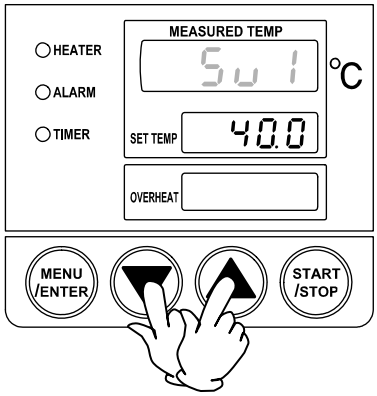
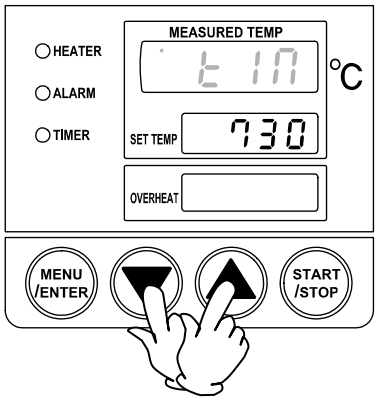
SV: Setting temperature

t: Time

Setting of the Quick Auto Stop Operation

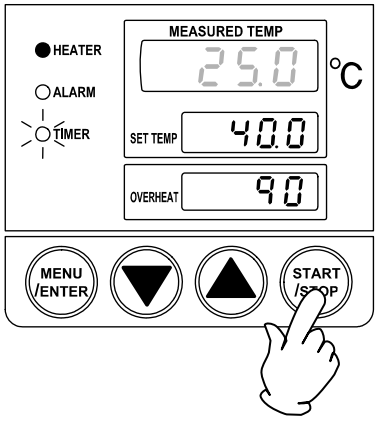
1	Turn on the power. 	Toggle the power switch (earth leakage breaker) of this unit to "ON". The temperature controller display is lit. The initial display is appeared about for 4 seconds, and then the display goes into the measurement temperature display (in-bath temperature). ❖ The following information, 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 timer activating function _tm2 (-tm2). 3. The setting temperature display unit blinks. Select "1" as the quick auto stop operation using the ▲▼ keys. 4. 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 Su1 (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. Then, the time setting tIM (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. 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. : 7.30 (after 7 hours and half) 2. Pressing the Menu/Enter key again completes the setting.

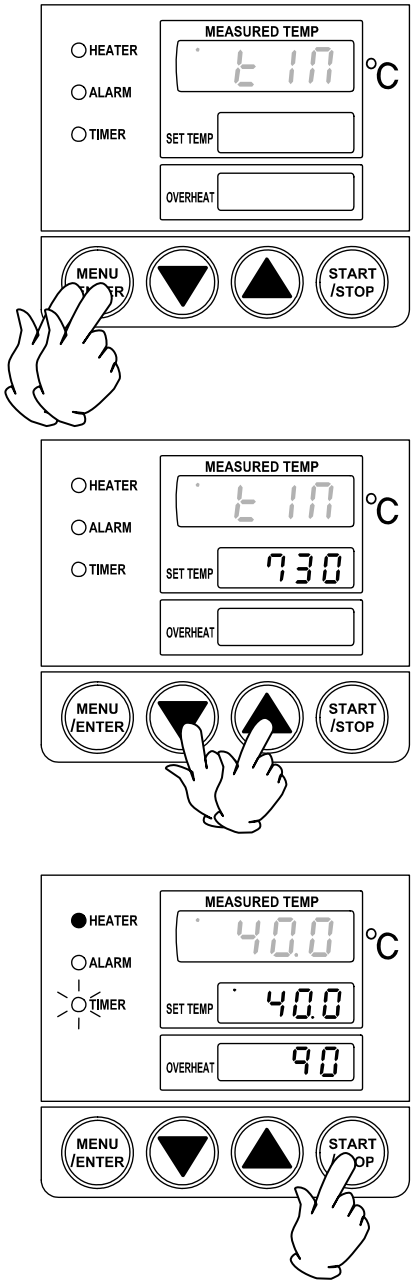
❖ In case of setting the quick auto stop operation, start from the Procedure 3 "Set the Temperature" after turning on the power.
Besides, when the device is operated under the setting temperature, only press the Start/Stop key for starting operation after turning on the power.

Quick Auto Stop Operation

5	Start the operation.  	When completing the temperature and time settings, 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. • 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" 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 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.



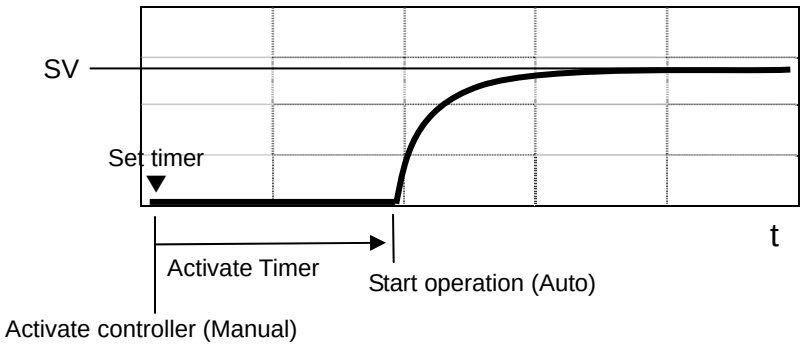
This procedure describes the setting of the quick auto stop operation from the operation status already running under the fixed temperature mode.
Though this procedure can be performed any time of the operation, it is impossible to set the quick auto stop mode described in the Procedure 2 in advance.

1. Press the Menu/Enter key in the measurement temperature display twice, and display the time setting [t1M] (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.

Auto Start Operation

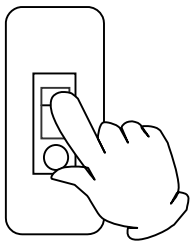
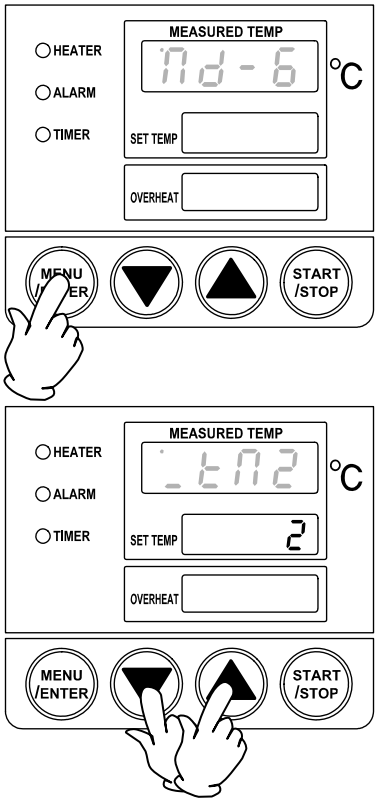
As shown in the following figure, this mode is applied to the device for starting the operation after the specified time (hours) automatically.
Note that the device does not stop the operation automatically. Stop the operation by manual without fail.



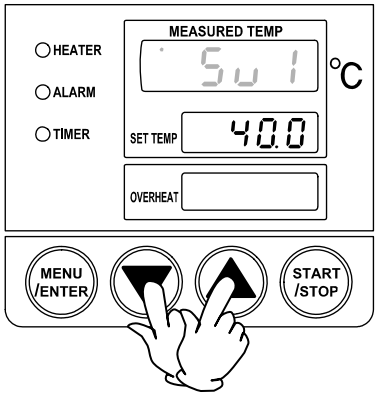
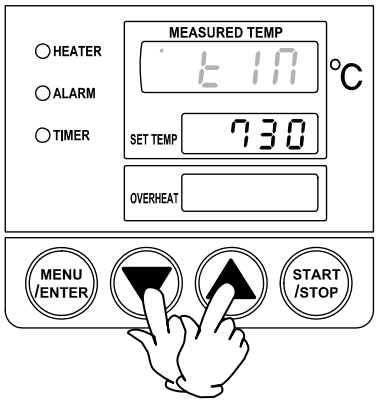
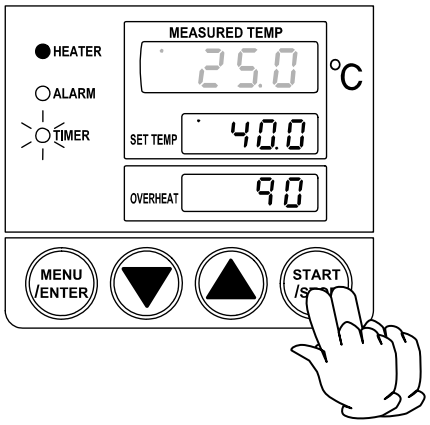
SV: Setting temperature

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 md-6 (md-6) (blinking) in the measurement temperature display unit using the ▲▼ keys. 2. Pressing the Menu/Enter key displays the timer activating function _tm2 (-tm2). 3. The setting temperature display unit blinks. Select "2" as the auto start mode using the ▲▼ keys. 4. Press the Menu/Enter key again for 2 seconds for going back to the measurement temperature display. This completes the setting.

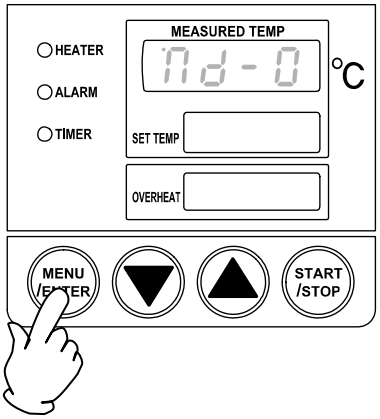
Auto Start Operation

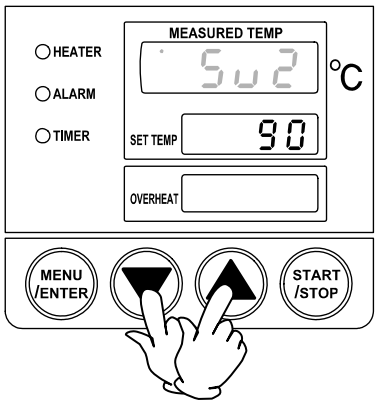
3	Set the time, and start the operation.  	1. Pressing the Menu/Enter key displays the temperature setting Su1 (Sv1) in the measurement temperature display unit. 2. Set the desired temperature using the ▲▼ keys. The setting temperature is displayed in the setting temperature display unit. 3. Pressing the Menu/Enter key completes the temperature setting.
4	Start the operation.   	After completing the temperature setting, the time setting tIM (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.

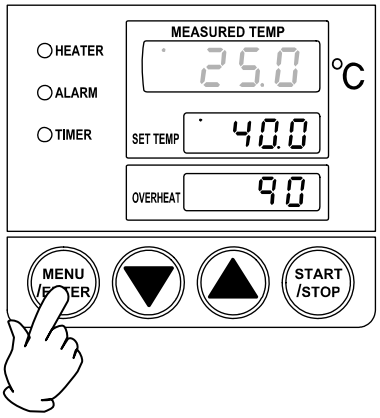
❖ In case of setting the auto start mode, start from the Procedure 3 " Set the time, and start the operation. " after turning on the power.
Besides, when the device is operated under the setting temperature, only press the Start/Stop key for starting operation after turning on the power.

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 Sd-0 (md-0) (blink).
2. Press the Menu/Enter key again to indicate the temperature setting of overheating prevention device Sv2 (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.

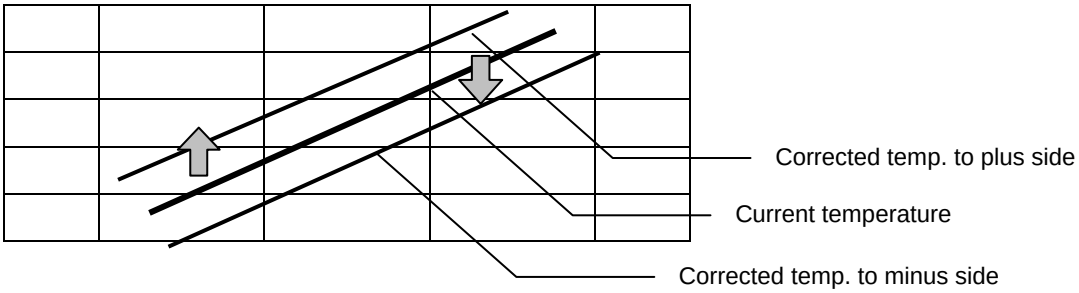
- The overheating prevention setting temperature is displayed in the display unit.
- Press the Menu/Enter key for two seconds to go back to the temperature indication.

Notes for overheating prevention device

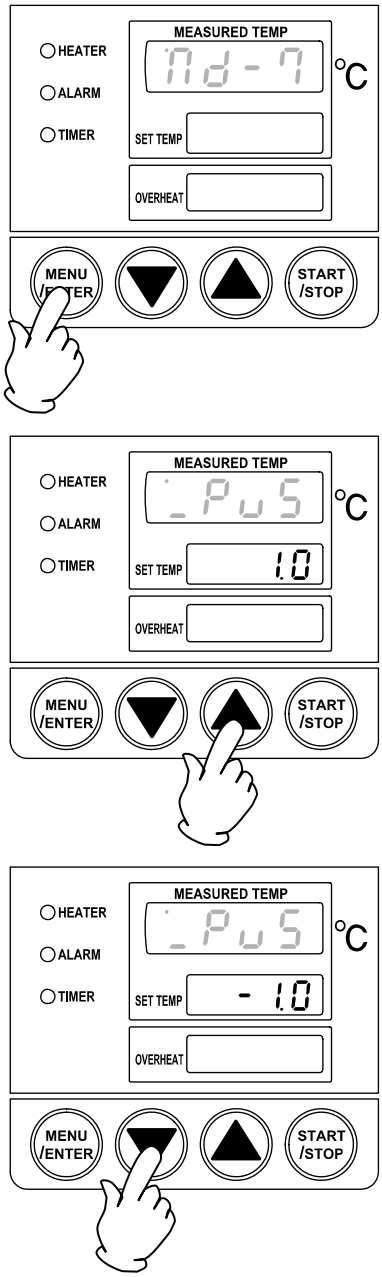
- In case there is a small difference between the set values of temperature for overheating prevention device and that of controller, the overheating prevention device may be activated when the temperature reaches to the set value of controller.Set the temperature of overheating prevention device so 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.



Temperature Correction



1. Press the Menu/Enter key for two seconds, then press the ▲▼ keys to select the calibration offset setting mode md-7 (md-7) (blink) on the temperature display window.
2. The three indications on the window, calibration offset setting mode md-7 (md-7), offset correction _PuS (-Pvs), and overheating prevention device temperature Pu2 (Pv2) can be switched every time the Menu/Enter key is pressed.
3. The indication blinks when offset correction _PuS (-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.

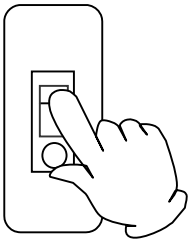
- When the temperature of overheating prevention device Pu2 (Pv2) is selected in 2. above, the measured temperature of overheating prevention device sensor is indicated on the temperature indication window.
- Calibration offset is adjustable within the temperature range of 99.9℃ to -99.9℃.

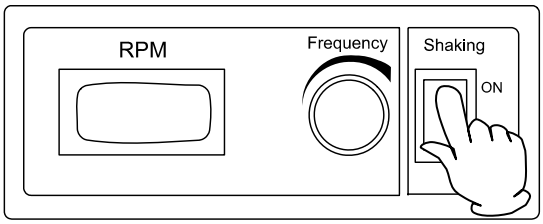
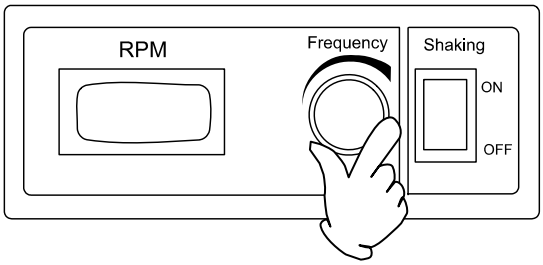
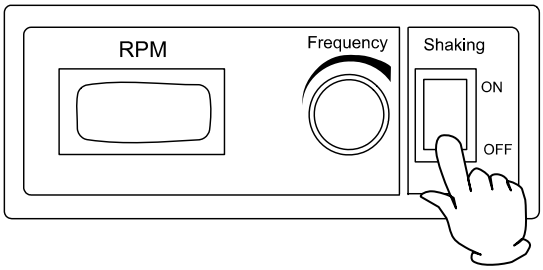
<u>Temperature correction for overheating prevention device:</u>

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

Shaking Frequency Setting

The shaking controller and temperature controller of this unit are prepared individually.
The setting method of shaking controller is as follows;

<table>
<tr><td>Shaking Frequency Setting Method
  </td><td>⚠CAUTION!
Turn the shaking frequency adjusting knob back to the minimum for preventing from risk, and turn on the power.

1. Toggle the power switch (earth leakage breaker) to "ON".</td></tr>
<tr><td> 
</td><td>2. Toggle the shaking switch to "ON".
Pressing the "ON" side (UP) of the shaking switch changes the device into the shaking status.</td></tr>
<tr><td> 
</td><td>3. Set the shaking frequency.
Turning the shaking frequency adjusting knob to clockwise raises the shaking speed. The shaking frequency is displayed on the shaking frequency display unit. Set the shaking frequency as watching the displayed value.
❖ Use this unit with the shaking frequency at under 160 rpm/min.</td></tr>
<tr><td> 
</td><td>4. For stopping shaking…
Pressing the "OFF" side of the shaking switch stops shaking. The power is still supplied to the device with this status (just stopping shaking status). If the user does not operate subsequently, turn off the power switch. Turn the shaking frequency adjusting knob back to the minimum for preventing from risk, and turn on the power.</td></tr>
</table>

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 page37 “List of Dangerous Substances”.)

Shaking Rack

Detach the shaking rack matching to the shape and size of the specimen container, and top and bottom distinguishing of the shelf. Besides, attach the shaking rack matching to the slot of the rack mounting bracket securely.

While shaking…

Pay attention to the device so as not to be caught user's hand into the device.

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 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.

⚠CAUTION!

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.

Pay attention not to heat empty bath.

Do not operate this unit with empty water bath. Though the float switch for prevent empty heating is equipped, be sure to check the water amount of the water bath before the operation, and keep the proper water level while the operation.

Appropriate Water Amount

The appropriate water amount is 50mm under the top of the water bath with attached the specimen container. Too much water might be spilt from the water bath, or too little water might deteriorate the temperature condition.

Countermeasure for stop operation during night or long-term stop

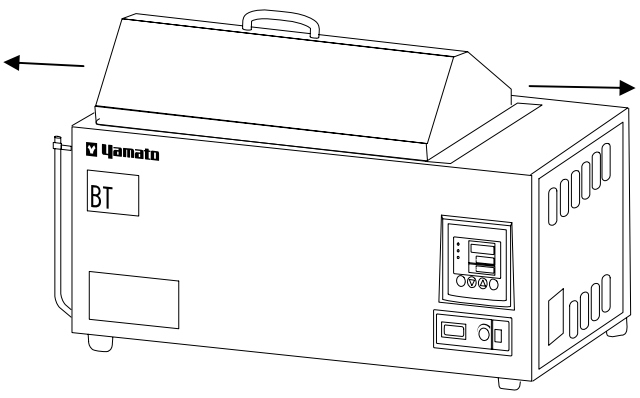
In case of stopping operation during night or long-term, toggle the power switch (earth leakage breaker) to "OFF".

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.

Using the top cover (optional accessory)

- Check that the water is in the water bath. Plug the cord in the outlet. Then turn on the power switch.
- Do not touch any place of the top cover other than the handle. The whole top cover except the handle becomes hot while handling in the high temperature environment.
- When removing the top cover, lift whole cover gradually by grasping the handle, and pulling frontward of the user.
  Removing the top cover in a stroke or removing it by holding the front side of it could get burned by the steam.



Daily Inspection and Maintenance

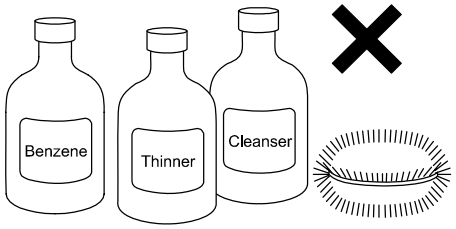
For the safety use of this unit, please perform the daily inspection and maintenance without fail.
Using the city water to this unit might attach dirt. Do inspect and maintain this point while performing daily inspection and maintenance.

⚠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.

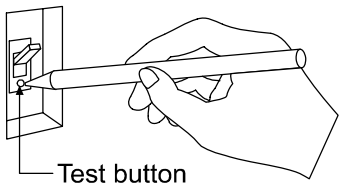
⚠CAUTION!

- 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 earth 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 earth leakage breaker will be turned off.



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.

Long storage and disposal

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.
- Treat as large trash.

Environmental protection should be considered

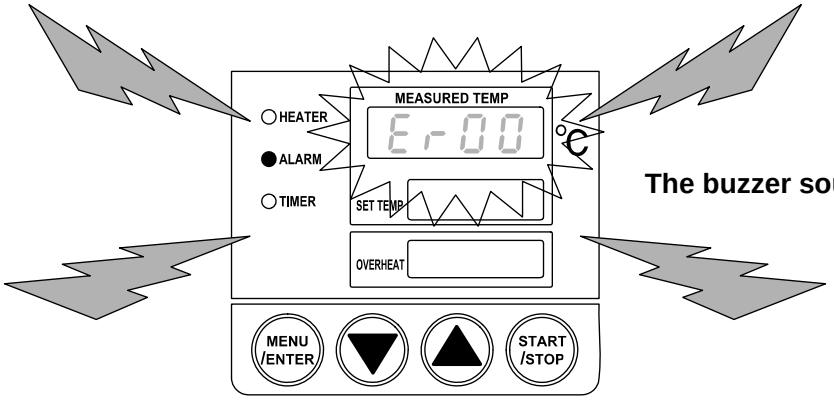
We request you to disassemble this unit as possible and recycle the reusable parts considering to the environmental protection. The feature components of this unit and materials used are listed below.

Component Name	Material
Exterior Parts	
Outer covering	Steel plate
Bath	Stainless steel SUS304
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	Copper
Power cord	Composites with synthetic rubber, Copper, Nickel
Parts for Piping	
Drain hose	Cone hose（Vinyl chloride resin）
Hose clamp	66 Nylon
Drain cap	Polyacetar
Options	
Shaking rack	Stainless steel SUS304

Error Display

The followings are the error indications displayed on the controller.

The device stops the heater and notifies 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.



Error Code		Failure	
Er00	Er00	Memory Error	Error in setting value of memory. Replace the board.
Er01	Er01	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	Er02	SSR Short-circuit	Failure in SSR. Replace SSR. Release the error by resetting the power supply.
Er03	Er03	Heater Disconnection	Heater is disconnected or heater circuit is broken. Release the error by resetting the power supply.
Er07	Er07	Overheating Prevention Error	Overheating protection device is operated, or failure in overheating protection circuit. Check the cause of failure. Release the error by resetting the power supply.
Er14	Er 14	Inter-Communication Error	Replace the substrate.
Er60	Erb0	Empty Bath Heating Error	Activates the float switch. Release this error by refill the water, and re-turning the Start/Stop switch.
Er70	Er 70	Temperature Input Error	Failure in temperature input circuit. Check the circuit.

In the Event of Failure…

Trouble Shooting

Condition	Possible Causes
The device does not start when turning on the power switch.	• Power plug is not connected to the receptacle correctly. • 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.
The device does not start shaking when turning on the shaking switch.	• Power switch (earth leakage breaker) is turned to “OFF”. • The shaking frequency adjusting knob is set to the minimum. • Shaking rack is touching any obstacle. • Thermal protector of shaking motor is operated. After removing an obstacle, reset the power supply.

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
- ◆ Purchase Date

} See the production plate attached to this unit.

- ◆ 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.

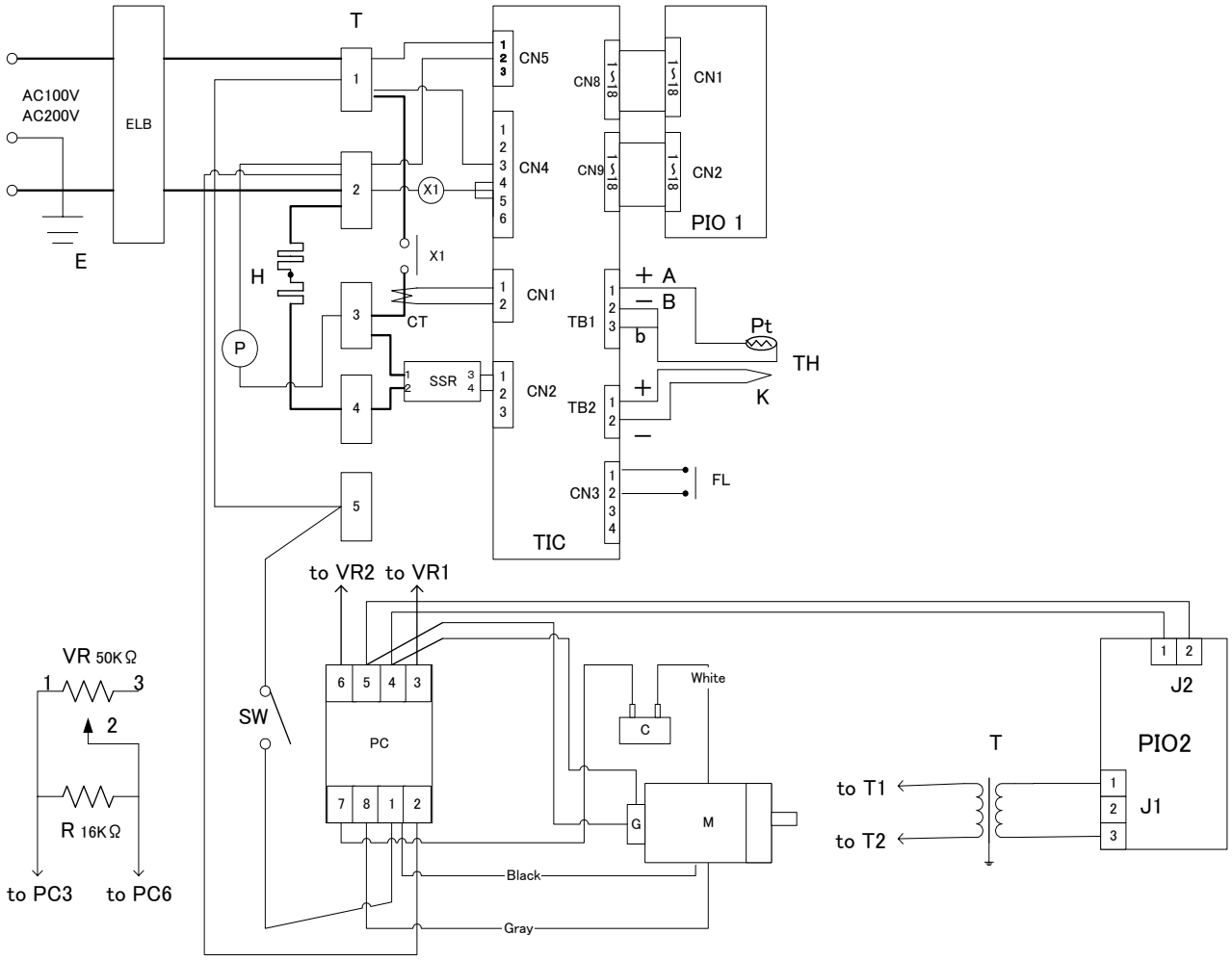
Specification

	BT100	BT200	BT300
Operating temperature range	Room temp.+5℃ to 80℃ (with using the top cover)*		
Temperature adjustment accuracy	±0.02℃ to ±0.08℃		
Temperature distribution accuracy	±0.1℃		
Time required to reach highest temperature	Approx. 70min.	Approx. 95min.	Approx. 120min.
Shaking times	20 to160 times/min.		
Shaking width	10 to 40mm adjustable		
In-bath material	Stainless steel SUS304		
Temperature control system	PID control by microcomputer (Fixed value type)		
Temperature control system sensor	Platinum resistance (W-sensor)		
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)		
Heater	Copper pipe heater (Nickel plated)		
	1.2KW	1.9KW	2.5KW
Stirrer	Magnet pump		
	6W	10W	
Shaking device	Gear motor		
	25W	40W	
Temperature setting system	Analog setting		
Temperature display system	Digital display		
Timer	1 minute to 99 hours 59 minutes, and 100 hours to 999.5 hours Digital setting, Auto start, Auto stop		
Safety device	Earth leakage breaker, Empty heating prevention device, Overheating prevention device, Buzzer and alarm lamp, Self-diagnostic functions (heater disconnection, sensor disconnection, setting value error, SSR short circuit, overheat prevention)		

*) The temperature might not be reached to 80℃ depending on the outside temperature or sample quantity.

Specification

Settable number of vessels	Test tube	Diameter:16.5mm, Length:150 to 200mm (JIS)		
		130pcs.	169pcs.	260pcs.
	Flask	Round or triangular type 100/300/500mL		
		12/5/3pcs.	16/9/6pcs.	24/10/6pcs.
Internal dimensions (W × D × H mm)		302 × 350 × 250 (200 × 268 × 150)	372 × 350 × 250 (270 × 268 × 150)	532 × 350 × 200 (200 × 268 × 150) × 2 ﾗｯｸ
External dimensions (W × D × H mm)		579 × 414 × 325	649 × 414 × 325	809 × 414 × 325
In-bath capacity		Approx. 19L	Approx. 23L	Approx. 34L
Drain hose		ϕ15 × 20mm		
Power supply (50/60Hz)		100V AC		200V AC
		14A	21A	14.5A
Weight		Approx. 27Kg	Approx. 40Kg	Approx. 48Kg
Accessories	Shaking rack (W × D × H mm)	290 × 220 × 170 1pcs.	290 × 290 × 170 1pcs.	290 × 220 × 170 2pcs.
	Others	Tube connector, Drain cap, Wrench, Instruction manual, Warranty		
Optional Accessories		Top cover (made of SUS) for BT100/200/300, Product code:200000		



Symbol	Part name	Symbol	Part name
ELB	Earth leakage breaker	SSR	Solid state relay
T	Terminal block	FL	Float switch
H	Pipe heater	SW	Shaking switch
P	Circulation pump	PC	Speed controller
TIC	Planar board	VR	Shaking frequency adjuster
PIO1	Display circuit board	R	Fixed resistance
TH	W sensor	M/C/G	Shaking motor
X1	Main relay	Tr	Transformer
CT	Current transformer	PIO2	Shaking display circuit board

Replacement Parts Table

Common Use Parts

Part Name	Code No.	Specification	Manufacturer
W-sensor	1160030047	K-thermocouple φ4.8L×125L PT1/8	Yamato Scientific
VS type thermoregulator board	1020000042	VS-1 (fixed value), PIO, PLANAR, Two tough cards	Yamato Scientific
Current transform cell	2170010005	CTL-6-S-H	URD
Terminal block	2070230002	TSO56-10 5P	MENICS
Switch	2010010016	DS-850S-F2-ON	Miyama
Float switch	2040010007	FD-114YA	Tokyo Seigyo

BT100

Pipe heater	BT10040040	100V 1.2KW (12A)	Yamato Scientific
Magnet pump	D0020011	CP08-PPRE-10 6W	Nickisou
SSR	2160000035	TRS5225	Toho Denshi
Relay	2050000043	AJR3714 100V	Matsushita
Earth leakage breaker	2060000019	FG32R/15-30MA 15A	Fuji Denki
Motor	2140000038	S8125GC-S12(TP) 100V 25W	Seishin
Gear head	2140000041	S8KA7.5B1	Seishin
Speed controller	2140000043	SRC02 100V	Seishin
Transformer	2180000044	100V FR 301N234	Yamato Scientific

BT200

Pipe heater	BT20040010	100V 1.9KW (19A)	Yamato Scientific
Magnet pump	2150080007	MD-15R-N 100V 10W	Iwaki
Relay	2050000019	AHE1254 100V	Matsushita
SSR	2160000036	TRS1245	Toho Denshi
Earth leakage breaker	2060000021	FG32R/30-30MA 30A	Fuji Denki
Motor	2140000039	S9140GCH-S12(TP) 100V 40W	Seishin
Gear head	2140000042	S9KB7.5B1H	Seishin
Speed controller	2140000043	SRC02 100V	Seishin
Transformer	2180000044	100V FR 301N234	Yamato Scientific

BT300

Pipe heater	BT30040010	200V 2.5KW (12.5A)	Yamato Scientific
Magnet pump	2150080009	MD-15R-200N 200V 10W	Iwaki
Relay	2050000044	AHE1255 200V	Matsushita
SSR	2160000035	TRS5225	Toho Denshi
Earth leakage breaker	2060000019	FG32R/15-30MA 15A	Fuji Denki
Motor	2140000040	S9140GDH-S12(TP) 200V 40W	Seishin
Gear head	2140000042	S9KB7.5B1H	Seishin
Speed controller	2140000043	SRD02 200V	Seishin
Transformer	2180000047	200V FR D-301N-250	Yamato Scientific

Refer to the described code No. for the part to be replaced.

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
Shaking Incubator
Model BT100/200/300
First Edition Mar.. 08, 2001
Revised on Mar. 28, 2010

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