Glass Oil Bath
BOG 100/100T/200/200T series

Stainless Steel Oil Bath
BOS 100/100T/200/200T serie

Instruction Manual

Second Edition

- **Thank you for choosing BOG/BOS series Oil Baths from Yamato Scientific Co., Ltd.**
- **For proper equipment operation, please read and become thoroughly familiar with this instruction manual before use. Always keep equipment documentation safe and close at hand for convenient future reference.**

⚠ **Warning:** **Read instruction manual warnings and cautions carefully and completely before proceeding.**

Yamato Scientific Co., Ltd.

Printed on recycled paper

INTRODUCTION

- Note that this product has a model for each destination, and product specifications and available options may differ. This product has models for each destination, and product specifications and available options may vary.
- Contact information differs for each destination. See P.73

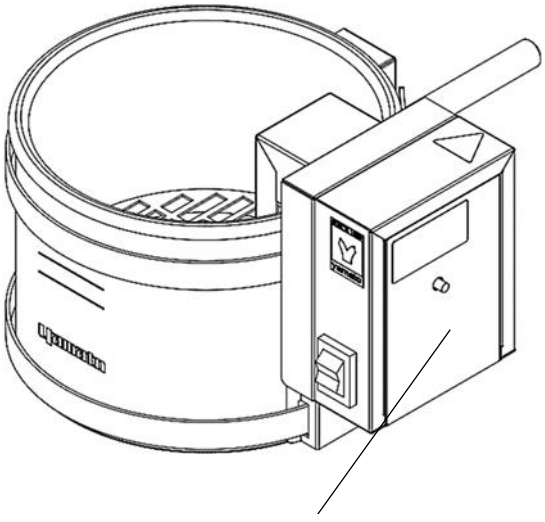
BOG100/BOS100 Series	Power supply	Power cable	Destination	Instruction language	Warranty card
BOG100 BOS100	100V±5% 4.0A 50/60Hz	Type A Plug (PSE)	Japan	Japanese	Included
BOG100-Y BOS100-Y	115V±5% 3.5A 50/60Hz	Type A Plug (UL)	America Asia Others	English	- (Note 1)
BOG110-Y BOS110-Y	220V±5% 2.0A 50/60Hz	Type SE Plug (VDE)			
BOG110-B BOS110-B	220V±5% 2.0A 50Hz	Type O Plug (CCC)	China	Chinese	Included

BOG200/BOS200 Series	Power supply	Power cable	Destination	Instruction language	Warranty card
BOG200 BOS200	100V±5% 5.0A 50/60Hz	Type A Plug (PSE)	Japan	Japanese	Included
BOG200-Y BOS200-Y	115V±5% 4.5A 50/60Hz	Type A Plug (UL)	America Asia Others	English	- (Note 1)
BOG210-Y BOS210-Y	220V±5% 2.5A 50/60Hz	Type SE Plug (VDE)			
BOG210-B BOS210-B	220V±5% 2.5A 50Hz	Type O Plug (CCC)	China	Chinese	Included

(Note)
1. Warranty will be included in some regions.

If you do not know the model number, refer to the model number on the model rating sticker on the side of the product.

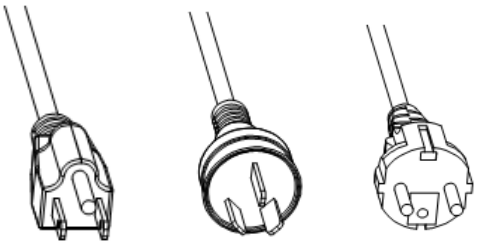
Type rating sticker affixed location



Type rating sticker

Power cable
※Cord specifications and plug shape differ depending on the model.

Power cable plug shape list



Type A　　Type O　　Type SE

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1. SAFETY PRECAUTIONS

Explanation of Symbols

A Word Regarding Symbols

Various symbols are provided throughout this text and on equipment to ensure safe operation. Failure to comprehend the operational hazards and risks associated with these symbols may lead to adverse results as explained below. Become thoroughly familiar with all symbols and their meanings by carefully reading the following text regarding symbols before proceeding

⚠ Warning Signifies a situation which may result in serious injury or death (Note 1.)

⚠ Caution Signifies a situation which may result in minor injury (Note 2) and/or property damage (Note 3.)

(Note 1) Serious injury is defined as bodily wounds, electrocution, bone breaks/fractures or poisoning, which may cause debilitation requiring extended hospitalization and/or outpatient treatment.

(Note 2) Minor injury is defined as bodily wounds or electrocution, which will not require extended hospitalization or outpatient treatment.

(Note 3) Property damage is defined as damage to facilities, equipment, buildings or other property.

Symbol Meanings

Signifies warning or caution.
Specific explanation will follow symbol.

Signifiies restriction.
Specific restrictions will follow symbol.

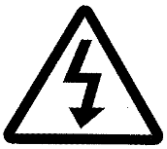
Signifies an action or actions which operator must undertake.
Specific instructions will follow symbol.

1. SAFETY PRECAUTIONS

Symbol Glossary

WARNING / CAUTION

General



Danger!
High Voltage

Danger!
Extremely Hot

Danger!
Moving Parts

Danger!
Blast Hazard

Caution:
Water Only

Caution:
Shock Hazard!

Caution:
Burn Hazard!

Caution:
Do Not Heat
Without Water!

Caution:
May Leak Water!

Caution:
Toxic Chemicals

RESTRICTION

General
Restriction

No Open Flame

Do Not
Disassemble

Do Not Touch

ACTION

General Action
Required

Connect Ground
Wire

Level Installation

Disconnect Power

Inspect
Regularly

1. SAFETY PRECAUTIONS

Warnings and Cautions

WARNING

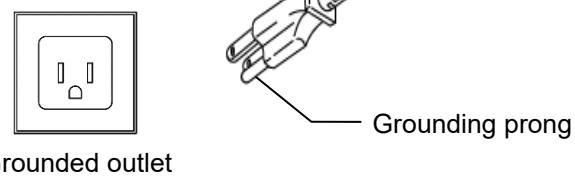
Install in a location free of flammables and explosives.

Never install or operate unit in a flammable or explosive gas atmosphere. Unit is NOT fire or blast resistant. Simply switching the Power switch "ON (|)" or "OFF (o)" can produce a spark, which can then be relayed during operation, causing fire or explosion when near flammable or explosive fluids, chemicals or gases/fumes.
See "LIST OF HAZARDOUS SUBSTANCES" (P.70) for information on flammable and explosive gases.

Ground wire MUST be connected properly

- Ground wire must be connected to a proper grounding line or terminal in order to avoid electric shock.
- Never connect ground wire to gas lines or water pipes. Electric shock, fire, accident and/or equipment malfunction may result.
- Never connect ground wire to telephone grounding lines or to lightning conductor rods. Fire or electric shock may result.
- Using branch outlet may be a cause of heat generation. Carefully check the capacity of the outlet and peripheral devices to be connected, to assure safe operation.

Connect to grounded outlet



When no ground terminal is found
Contact original dealer of purchase for location-specific electrical requirements.

Turn OFF (○) the Power switch immediately when an abnormality occurs.

If unit begins emitting smoke or abnormal odors for reasons unknown, turn OFF (○) Power switch immediately, disconnect power cable from power supply, and contact original dealer of purchase for assistance. Continuing to operate without addressing abnormalities may cause fire or electric shock, resulting in serious injury or death. Never attempt to disassemble or repair unit. Repairs should always be performed by a certified technician.

1. SAFETY PRECAUTIONS

Warnings and Cautions

Handle power cable with care.

- Do not operate unit with power cable bundled or tangled. Operating unit with power cable bundled or otherwise tangled, may cause power cable to overheat and catch fire.
- Do not modify, bend, forcibly twist or pull on power cable. Fire or electric shock may result.
- Do not risk damage to power cable by positioning it under desks or chairs, or by allowing it to be pinched in between objects. Fire or electric shock may result.
- Do not place power cable near kerosene/electric heaters or other heat-generating devices. Doing so may cause power cable insulation to overheat, melt and/or catch fire, which may result in electric shock.
- Turn OFF (○) Power switch immediately and disconnect from facility terminal or outlet, if power cable becomes partially severed or damaged in any way. Contact original dealer of purchase for information about replacing power cable. Failure to do so may result in fire or electric shock.
- Always connect power cable to appropriate facility outlet.

DO NOT disassemble or modify equipment.

Never attempt to disassemble or modify unit. Doing so may cause malfunction, fire, electric shock, or personal injury. Note that any malfunction resulting from unauthorized modifications or customizations to unit will void the warranty.

DO NOT touch hot surfaces.

Some surfaces on this unit such as bath reservoir, heater unit and arbor become extremely hot during operation and remain hot for some time after operation ended. Exercise vigilance in order to avoid getting burned.

DO NOT place items on top of equipment.

Unit may tip over or fall, causing injury or equipment damage due to unforeseen incidents. Do not place combustible materials such as paper close to unit.

CAUTION

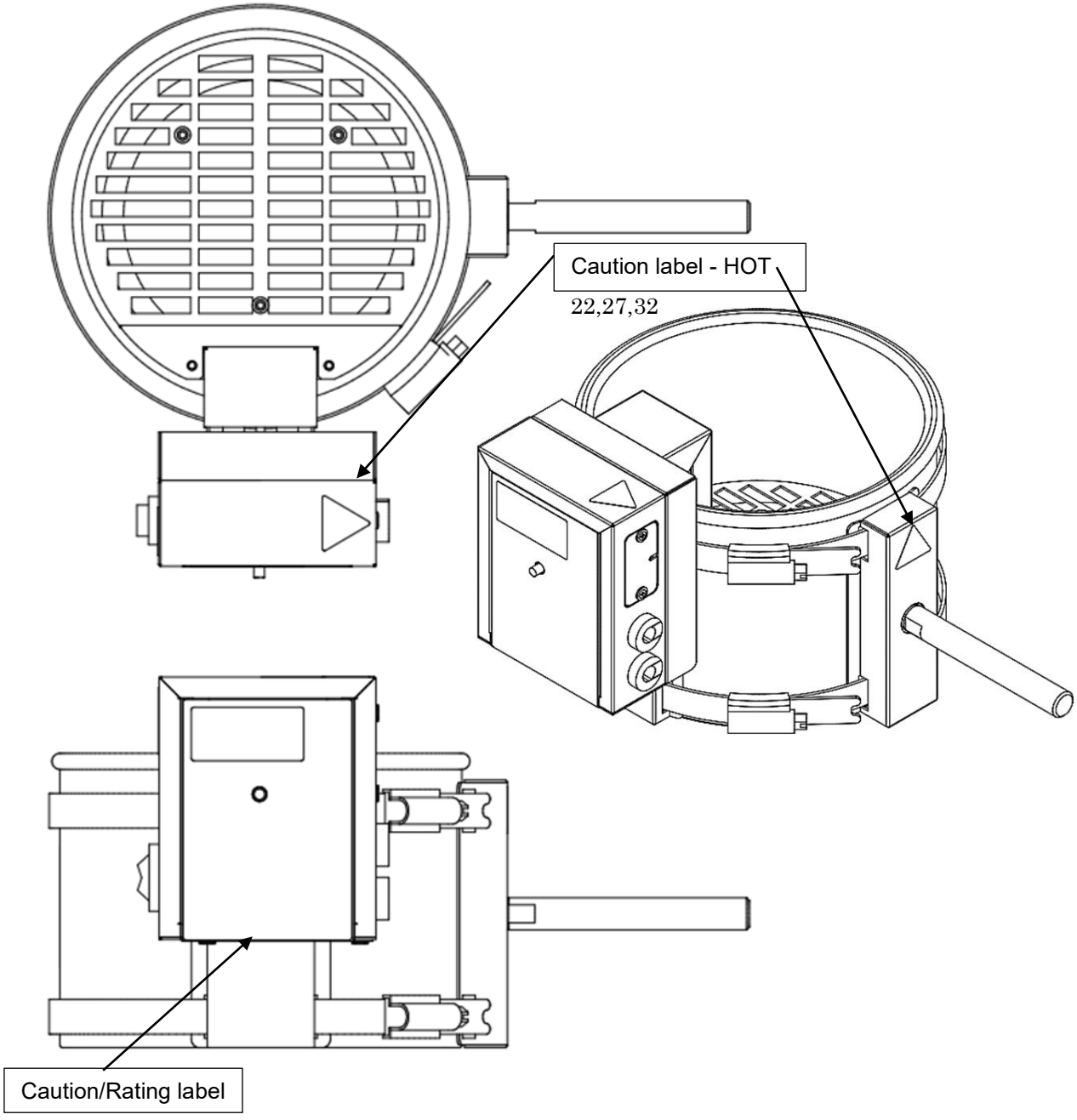
DO NOT operate equipment during thunderstorms.

In the event of a thunderstorm, turn OFF (○) Power switch and disconnect power cable immediately. A direct lightning strike may cause equipment damage, fire or electric shock, resulting in serious injury or death.

1. SAFETY PRECAUTIONS

Residual Risk Map

These figures indicate positions of caution labels.
The numbers shown in the figure indicate the numbers listed in the "List of Residual Risks" in this manual.
For details of individual residual risks, see the List of Residual Risks.



*** Contact original dealer of purchase if the nameplates and caution labels have come off, or become illegible. New nameplates are available at cost.**

1. SAFETY PRECAUTIONS

List of Residual Risks

List of residual risks (instructions for risk avoidance)

This list summarizes residual risks to avoid personal injuries or damages to properties during or related to the use of equipment.

Be sure to fully understand or receive instructions on how to use, maintain and inspect equipment before starting operation.

	Loading/Installation			
No.	Degree of risks	Risk description	Protective measures taken by the user	Relevant page
1	WARNING	Fire/ Electric shock	Choose an appropriate installation site.	P.17
2	CAUTION	Injury	Install unit on a level surface.	P.17
3	WARNING	Fire/ Electric shock	Install in a dry location.	P.18
4	CAUTION	Injury	Stabilize unit properly to assure safe operation and a safe work area.	P.18
5	WARNING	Fire/Toxic gas	Use unit in fume hood whenever processing harmful solvents.	P.18
6	CAUTION	Injury	Check glass bath for damage before operation	P.18
7	WARNING	Fire/ Electric shock	ALWAYS connect power cable to appropriate facility outlet	P.18
8	WARNING	Fire/ Electric shock	Handle relay cable with care.	P.19
9	CAUTION	Injury	Properly fit equipment over other devices when mounting.	P.19
10	WARNING	Wound	ALWAYS wear protective equipment	P.19

	Use			
No.	Degree of risks	Risk description	Protective measures taken by the user	Relevant page
11	WARNING	Explosion/Fire	DO NOT use explosive or flammable fluid as heating medium.	P.46
12	WARNING	Fire	DO NOT heat without appropriate amount of fluid in reservoir.	P.46
13	WARNING	Fire	DO NOT operate equipment unattended.	P.46
14	WARNING	Electrical leakage/Fire	DO NOT get water or fluids on controller and heater unit.	P.46
15	CAUTION	Wound	ALWAYS wear protective equipment	P.47
16	CAUTION	Electrical leakage/Fire	Observe the level of silicone oil.	P.47

1. SAFETY PRECAUTIONS

List of Residual Risks

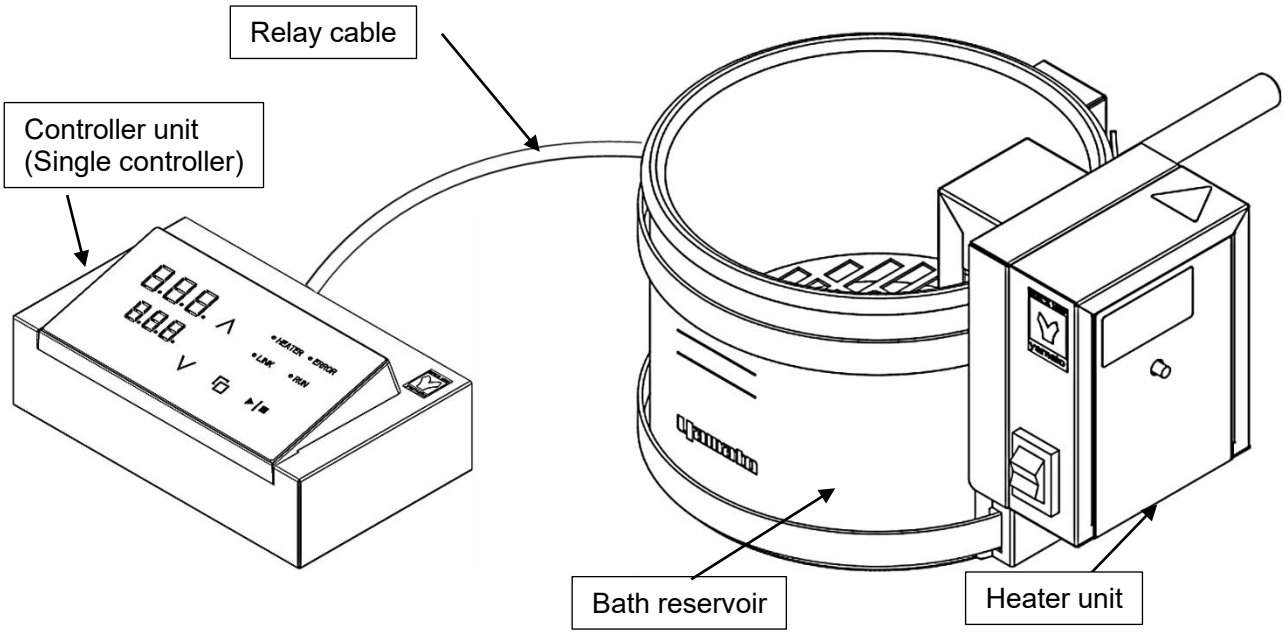
	Daily inspection/maintenance			
No.	Degree of risks	Risk description	Protective measures taken by the user	Relevant page
17	WARNING	Fire/ Electric shock	Be sure to disconnect power cable before conducting inspection and maintenance.	P.48
18	WARNING	Fire/ Electric shock	Clean off any oil on or around heater unit and controller, to prevent short circuit or electric shock	P.48
19	WARNING	Burn	Perform inspections and maintenance when unit and bath fluid are at room temperature.	P.48
20	WARNING	Fire/ Electric shock	Never attempt to disassemble unit.	P.48

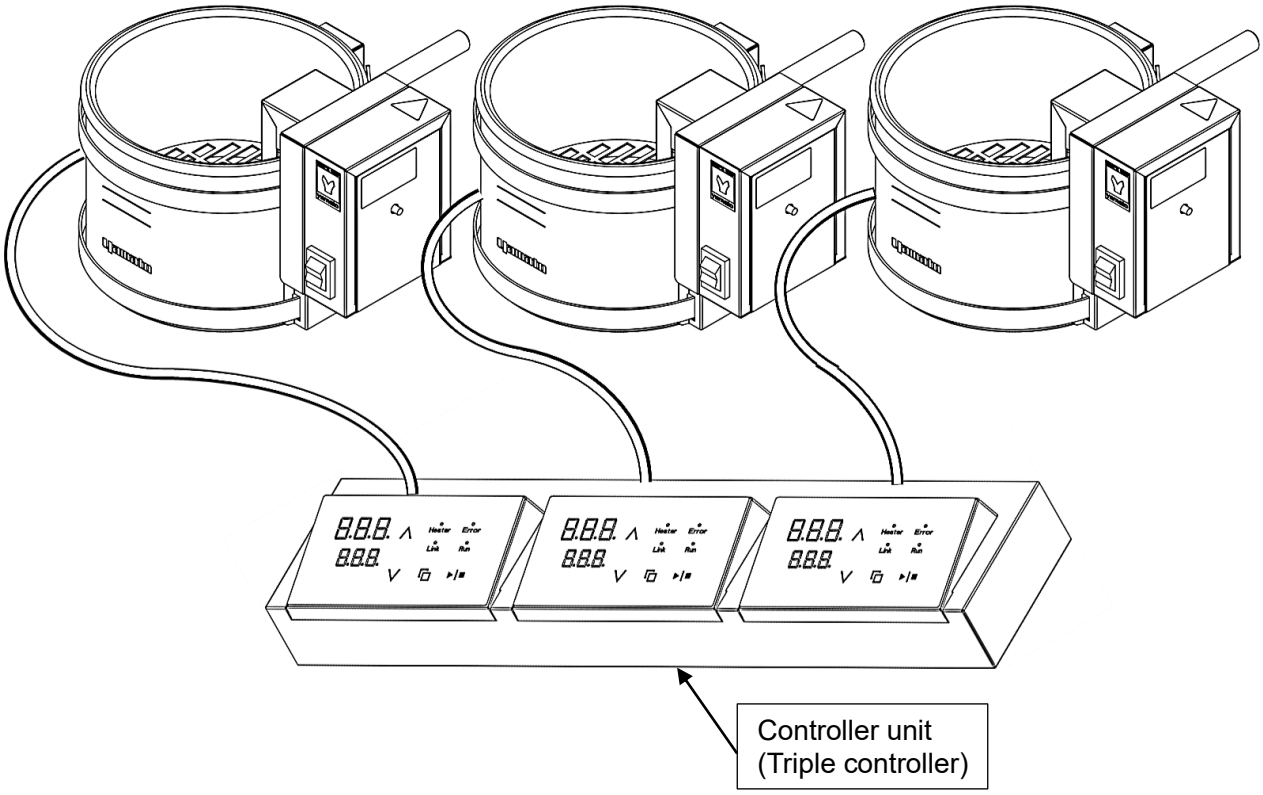
	Extended storage/disposal			
No.	Degree of risks	Risk description	Protective measures taken by the user	Relevant page
21	WARNING	Fire	If unit will be out of service for an extended period of time, turn OFF (○) the Power switch and disconnect power cable.	P.49
22	CAUTION	Injury/Burn	Do not leave unit in a location where children may have access.	P.49

2. COMPONENT NAMES AND FUNCTIONS

Overview

External view

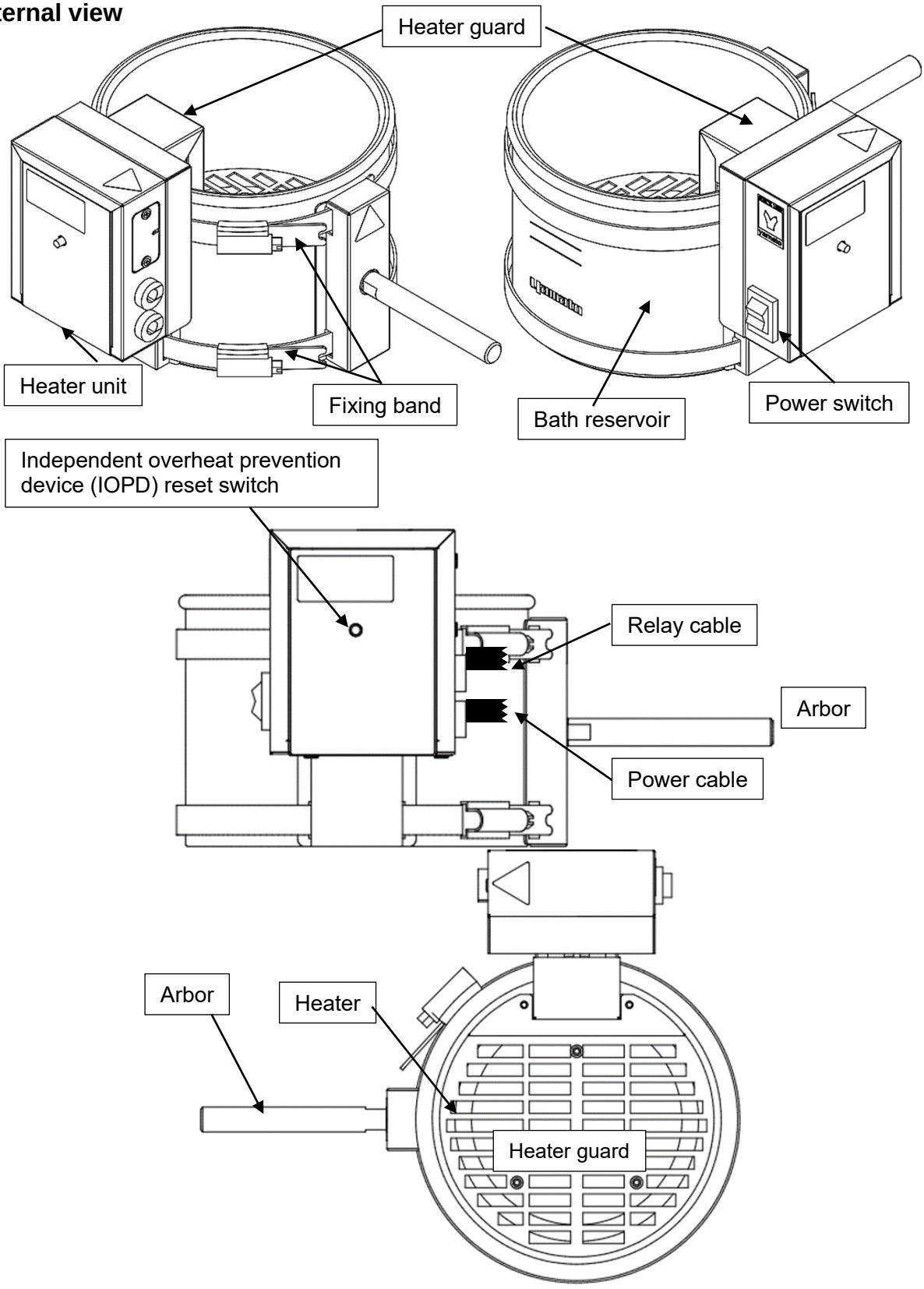




2. COMPONENT NAMES AND FUNCTIONS

Bath/Heater Unit

External view

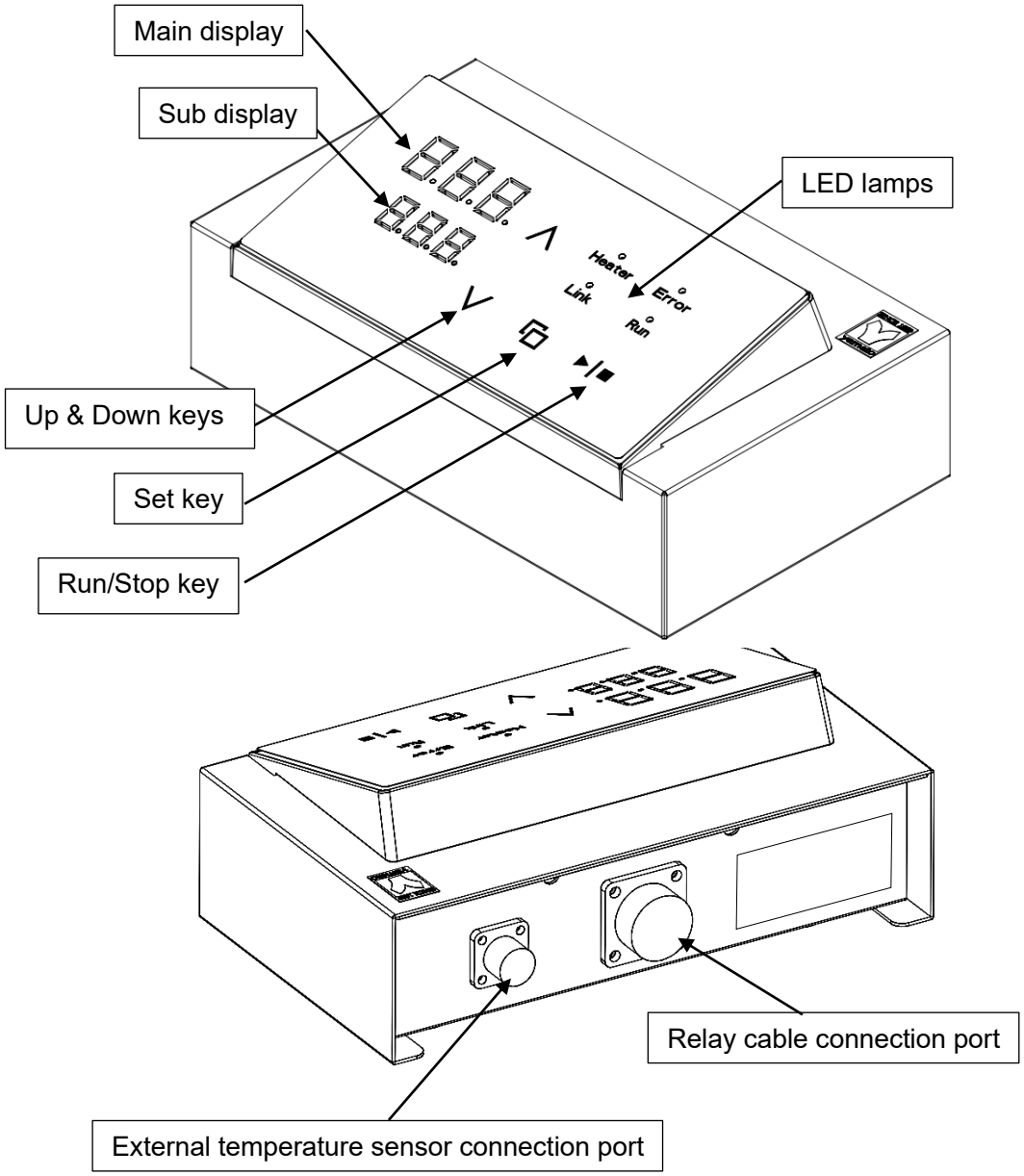


* Figure shown above is a BOG unit

2. COMPONENT NAMES AND FUNCTIONS

Controller Unit (Single Controller)

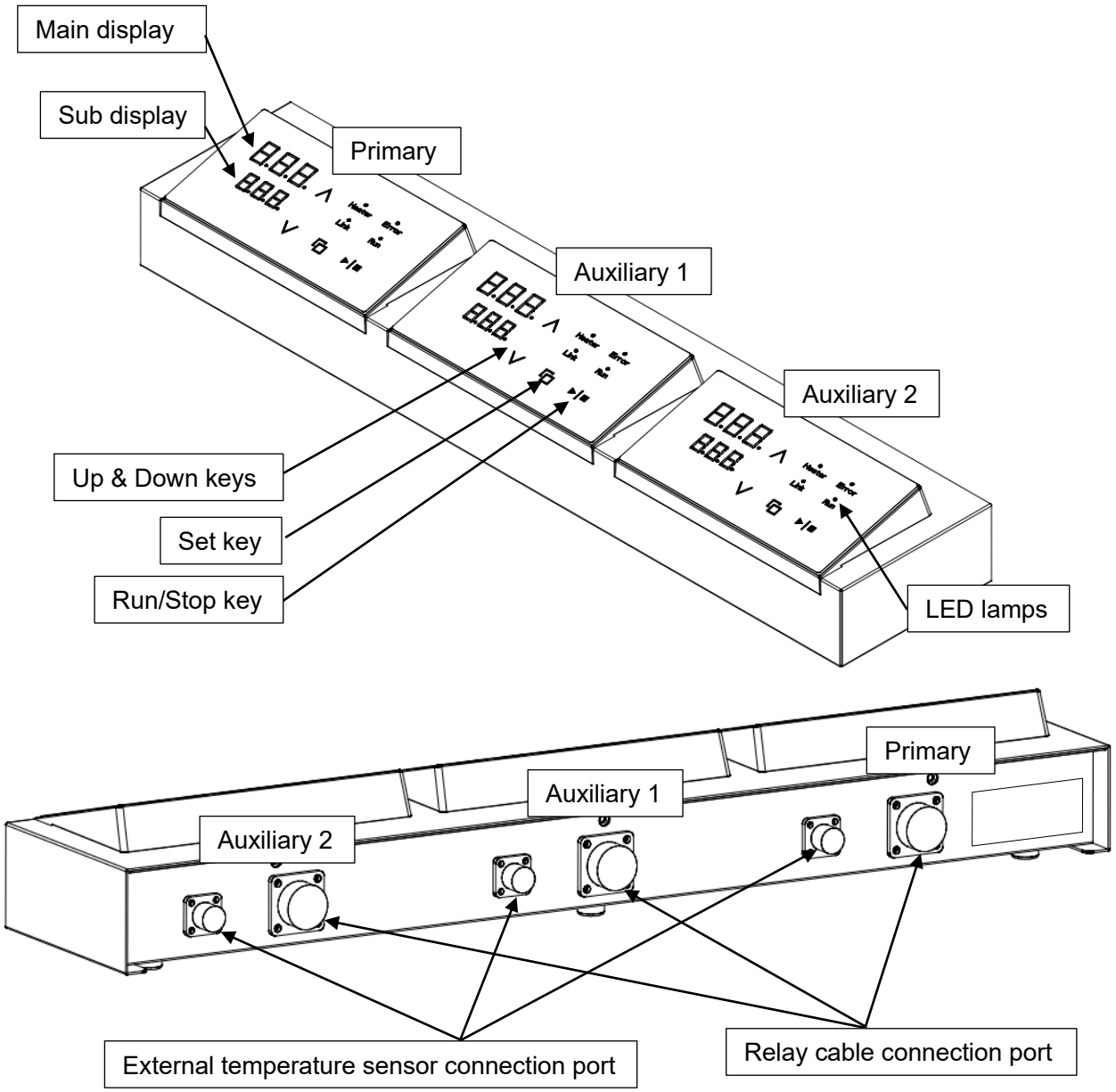
External view



2. COMPONENT NAMES AND FUNCTIONS

Controller Unit (Triple Controller)

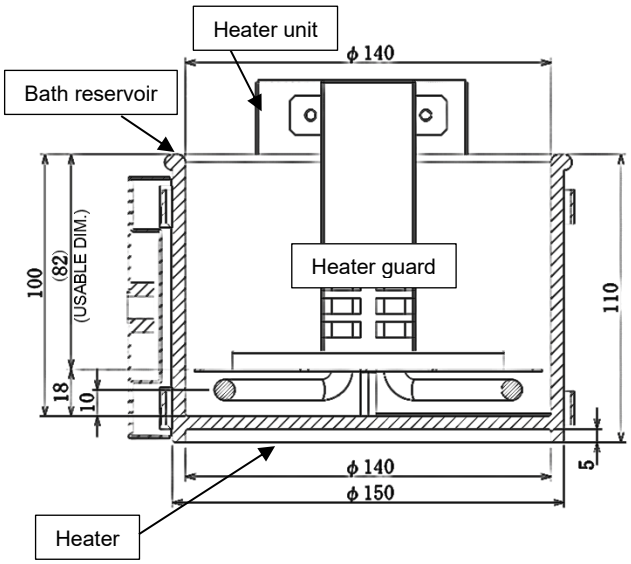
External view

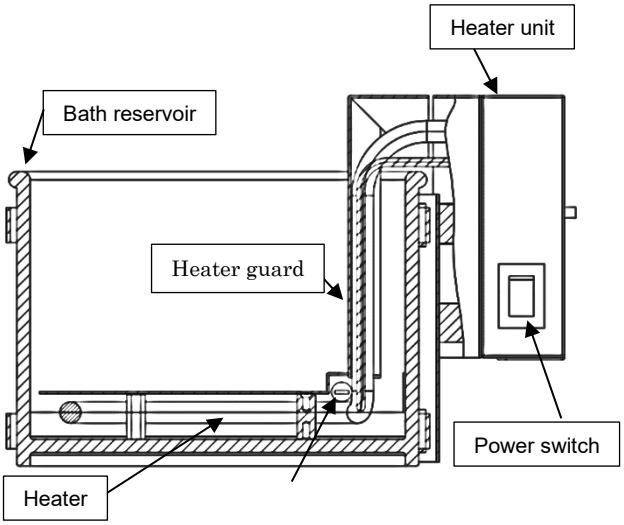


2. COMPONENT NAMES AND FUNCTIONS

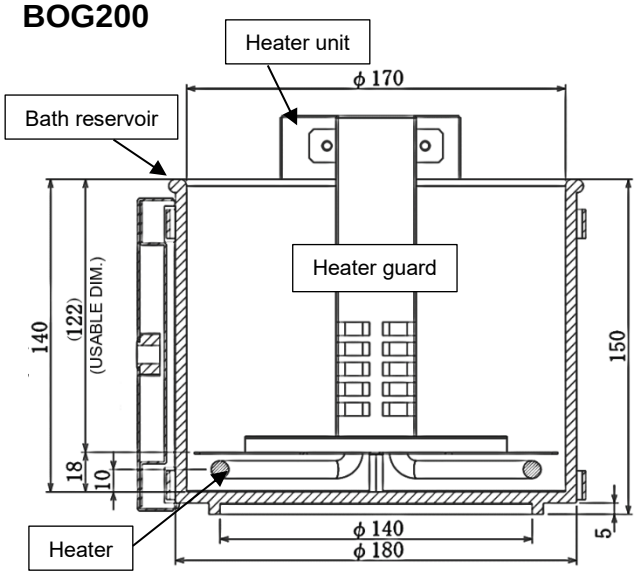
Components

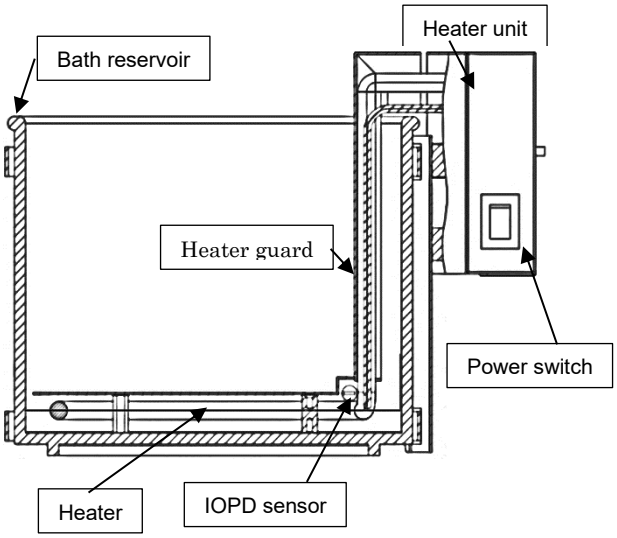
BOG100





BOG200

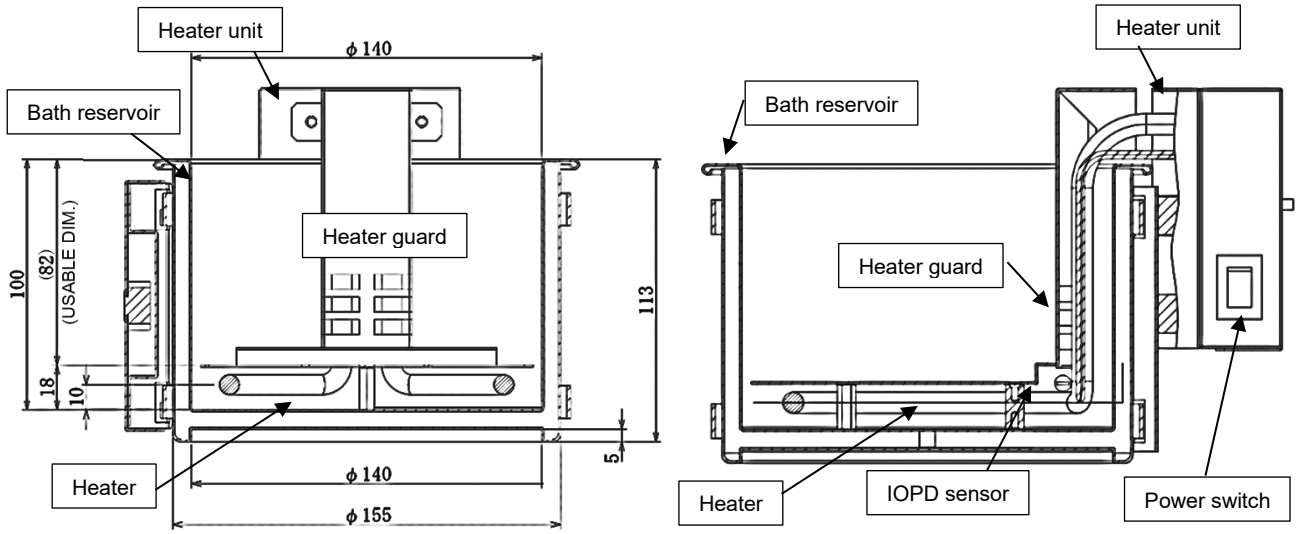




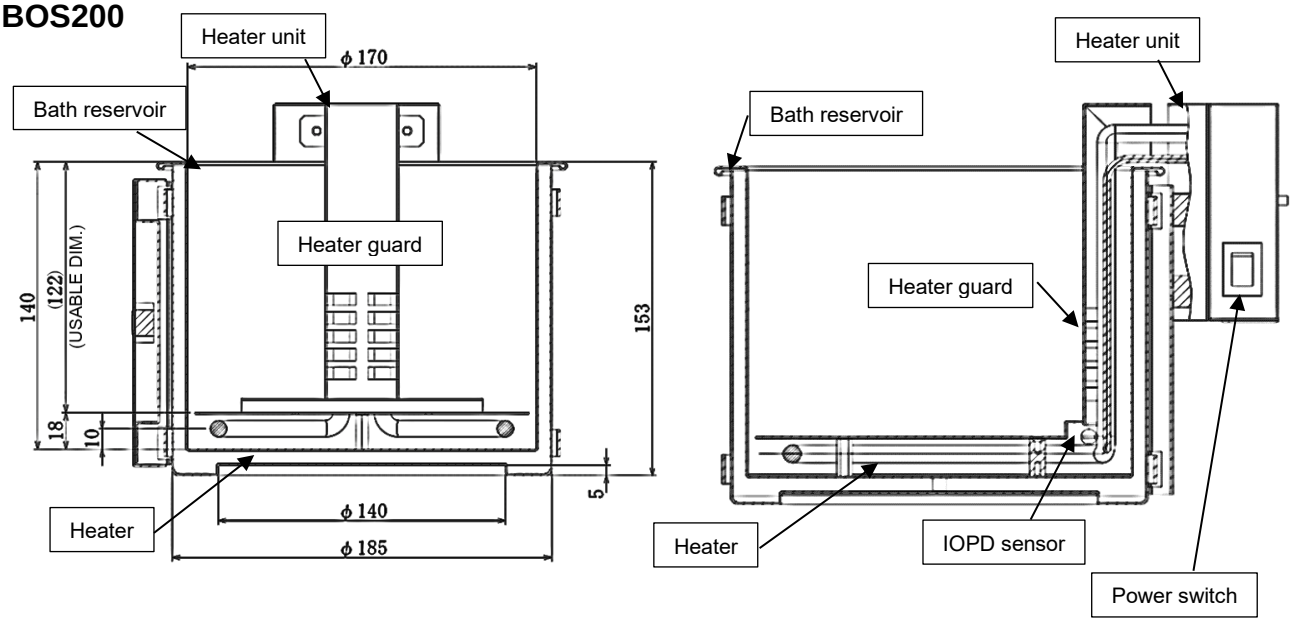
2. COMPONENT NAMES AND FUNCTIONS

Components

BOS100



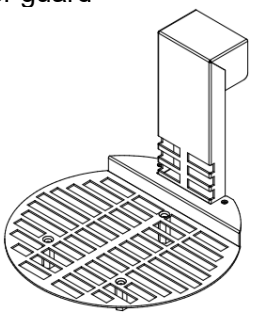
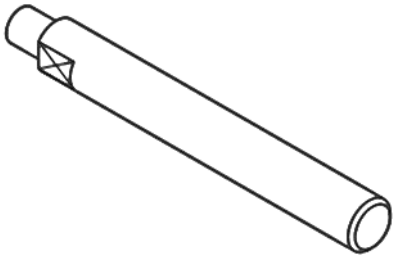
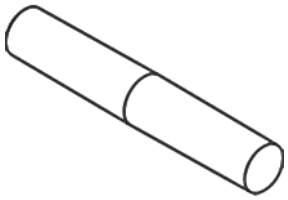
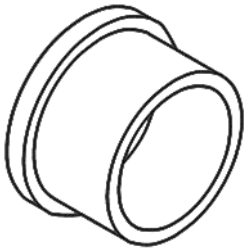
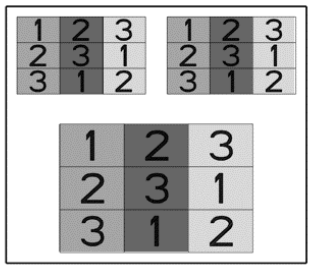
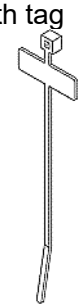
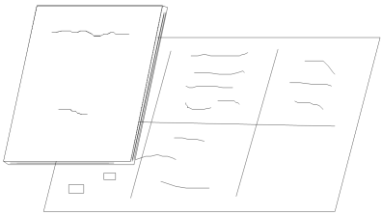
BOS200



2. COMPONENT NAMES AND FUNCTIONS

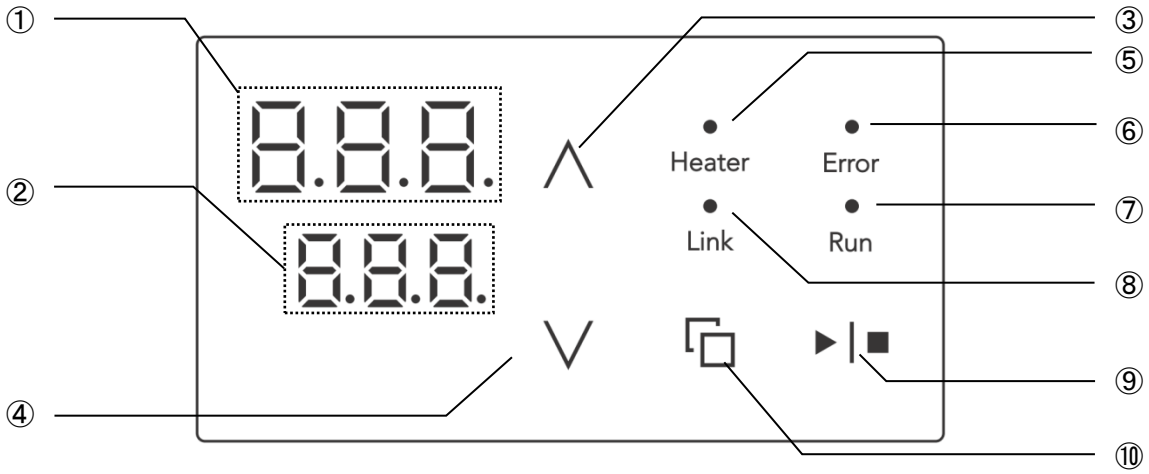
Accessories

Check before operation that all the accessories are complete. Contact original dealer of purchase if anything is missing.

Heater guard 	Arbor 	Stirrer bar 
Connector cap 	Identification sticker sheet 	Cable tie with tag 
Instruction manual Warranty card 		

2. COMPONENT NAMES AND FUNCTIONS

Control Panel



No.	Panel item	Description
①	Main display	Shows current bath fluid temperature, setting characters and error codes
②	Sub display	Shows temperature setting and parameters.
③	Up key	Press to increase or decrease set value, and switch functions.
④	Down key	Press to increase or decrease set value, and switch functions.
⑤	Heater lamp	Illuminates when heater is receiving power.
⑥	Error lamp	Illuminates when an error has occurred.
⑦	Run lamp	Illuminates during operation.
⑧	Link lamp	Illuminates while units are linked each other. (Triple controller only)
⑨	Run/Stop key	Press to start or stop an operation. See “Operation Procedure” (P.30) for details
⑩	Set key	Press to change or finalize temperature setting. Press and hold to switch screen to user setting.

2. COMPONENT NAMES AND FUNCTIONS

Display Characters

All characters displayed when making settings and during operation are defined as follows:

Character	Letters	Description
	CAL	Appears while entering offset temperature values. See "Calibration Offset" (P.33)
	Pon	Appears when setting Auto-resume function. See "Auto-resume Function" (P.34)
	oPS	Appears when enabling/disabling External temperature sensor. See “External Temperature Sensor Setting” (P.35)
	dSP	Appears when setting LED brightness. See "LED Brightness Setting" (P.36)

Shows only when External temperature sensor is enabled		
Character	Letters	Description
	CA2	Appears while entering offset temperature values for External temperature sensor. See "Calibration Offset for External Temperature Sensor" (P.37)
	bt	Appears when checking bath fluid temperature with External temperature sensor enabled. See “Bath Fluid Temperature Readout” (P.38)

Shows only when Triple controller is in use		
Character	Letters	Description
	Lin	Appears when setting Interlock function See “Interlock Function (Triple Controller)” (P.40, P.43)
	CnS	Appears when setting the number of units to be interlocked (Primary only) See “Interlock Function (Triple Controller)” (P.40)
	tEP	Appears when setting differential value in temperature setting (Primary only) See “Interlock Function (Triple Controller)” (P.41), and ”Temperature Differential Setting (Triple Controller)” (P.44)
	CHE	Appears while establishing a link between units (Primary only) See “Interlock Function (Triple Controller)” (P.41)
	PAS	Appears when units are successfully linked. (Primary only) See “Interlock Function (Triple Controller)” (P.41)

3. PRE-OPERATION PROCEDURES

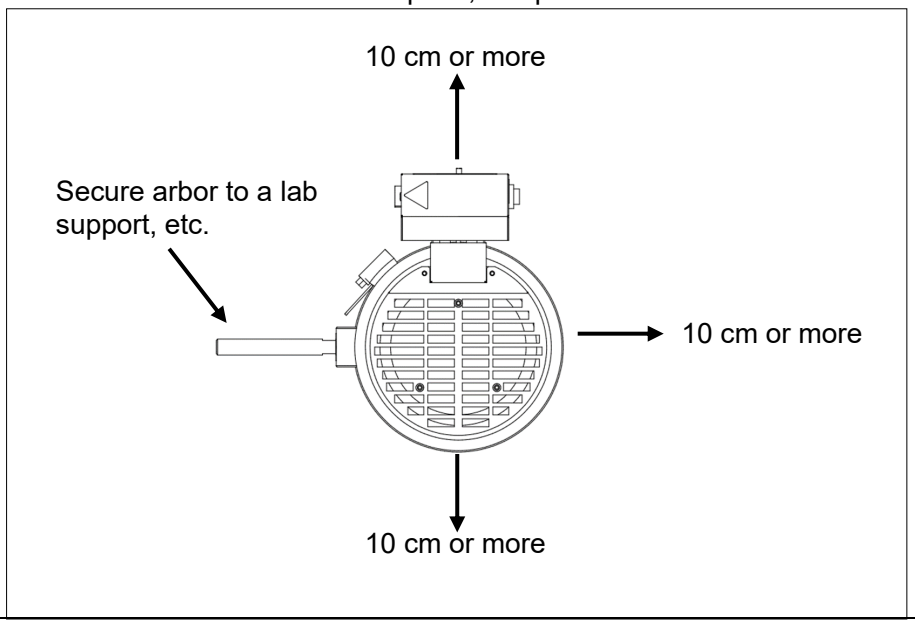
Installation Precautions

Choose an appropriate installation site.

DO NOT install unit:

- where installation surface is not completely level, not even or not clean.
- where flammable or corrosive gases/fumes may be present
- where external temperature will exceed 35°C, will fall below 5°C or will fluctuate largely.
- where liquid is assumed to splash on unit
- in excessively humid or dusty locations.
- in direct sunlight or outdoors.
- where there is constant vibration.
- in direct contact with the outside air
- where power supply is erratic.
- where there is combustible material nearby.
- in the proximity of, particularly right below a fire alarm.
- where there is a risk of freezing or condensation.
- on a surface subject to heat
- in a location with no ventilation

Install unit in a location with sufficient space, as specified below.



Install equipment on a level surface.

Install unit on level and even surface. Failure to do so may cause unit to tip over, resulting in complications and/or malfunction.

3. PRE-OPERATION PROCEDURES

Installation Precautions

Install in a dry location.

Install unit where it will be free from liquid spray and other moisture. Failure to do so may result in control mechanisms becoming wet, causing malfunction, electric shock and/or fire.

Take appropriate safety measures when installing equipment.

Silicone oil and bath reservoir become hot during operation and for some time after operation. In the event of an earthquake or other unforeseen incident, unit may unexpectedly shift or fall, causing burns or injury.
Unit is equipped with arbor (fixing rod) on the side wall. Secure unit to lab support, rigid pole, etc. for safe operations. Failure to do so may cause unit to tip over or splash heated oil when hit by hand, or when cable is caught, resulting in severe burns.
The oily smoke and steam generated from heating silicone oil is flammable and may cause a fire hazard. Implement proper fire extinguishing and ventilation measures.

Use unit in fume hood whenever processing harmful solvents.

Silicone oil used for oil baths will gradually generate trace amount of formaldehyde when heated at more than 150°C. Place unit in fume hood or provide good ventilation for safe operation.
A ventilation hood must be installed for processing harmful solvents at constant temperature. Also obtain the safety data sheet (SDS) for safe use, and handle with extreme care.

Check glass bath for damage before operation

Ensure there is no cracks on glass bath. If any, contact original dealer of purchase for assistance.

Always connect power cable to appropriate facility outlet.

Connect power cable to a suitable facility outlet, according to the electrical requirements.

Electrical requirements:	BOG100/BOS100	Single phase 100 V AC	50/60 Hz	4.0 A
	BOG200/BOS200	Single phase 100 V AC	50/60 Hz	5.0 A
	BOG100T/BOS100T	Single phase 100 V AC	50/60 Hz	4.0 A×3
	BOG200T/BOS200T	Single phase 100 V AC	50/60 Hz	5.0 A×3

* For use of Triple controller, it is necessary to supply power to each of the three heater units.

* Check the line voltage on distribution board and properly evaluate whether to utilize a line being shared by other equipment. If unit is not activated by turning the Power switch ON (|), take an appropriate course of action, such as connecting unit to a dedicated power source.
Inserting multiple cords into a single outlet, using branch outlets or extension cords, may cause a drop in voltage, which may affect performance, resulting in failure to control or maintain proper temperature.

3. PRE-OPERATION PROCEDURES

Installation Precautions

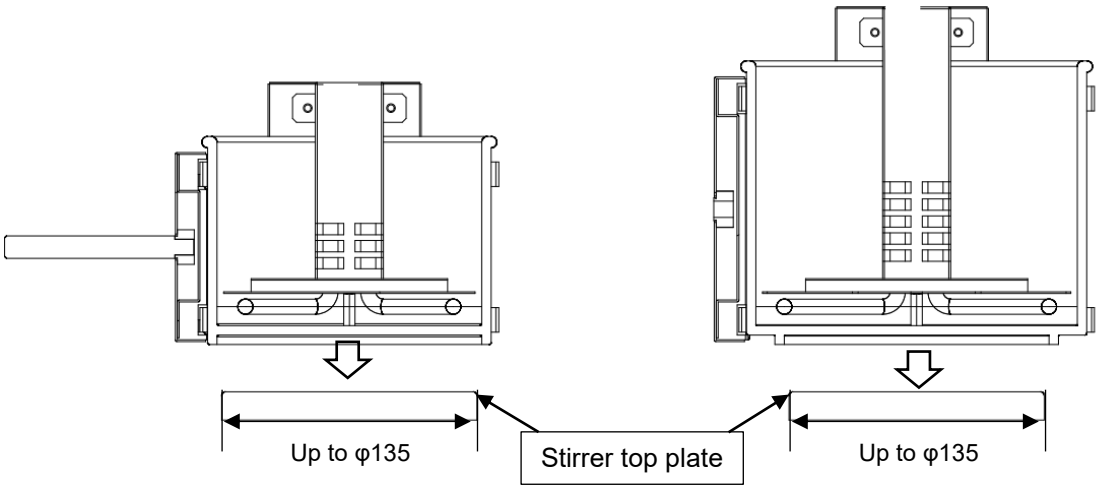
Handle relay cable with care.

Operating unit with relay cable bundled or otherwise tangled, may cause relay cable to overheat and catch fire.
Do not modify, bend, forcibly twist or pull on relay cable. Doing so may cause unit to tip over, fire and/or electric shock.
Do not risk damage to relay cable by positioning it under desks or chairs, or by allowing it to be pinched between objects. Doing so may cause fire and/or electric shock.
Do not allow relay cable to contact bath reservoir, or place it near heat-generating devices. Doing so may cause relay cable insulation to overheat, melt and/or catch fire, which may result in electric shock.

Turn OFF (○) the Power switch immediately and disconnect from facility outlet, if relay cable becomes partially severed or damaged in any way. Failure to do so may result in fire or electric shock.

Properly fit equipment over other devices when mounting.

Unit can be mounted on the top plate of stirrer up to φ135 mm.
* Unit may not become stable depending on the size of stirrer top plate. Carefully place unit so as not to let it fall, tip over, or wobble.



* Figure shown above is a cross-sectional diagram of BOG unit

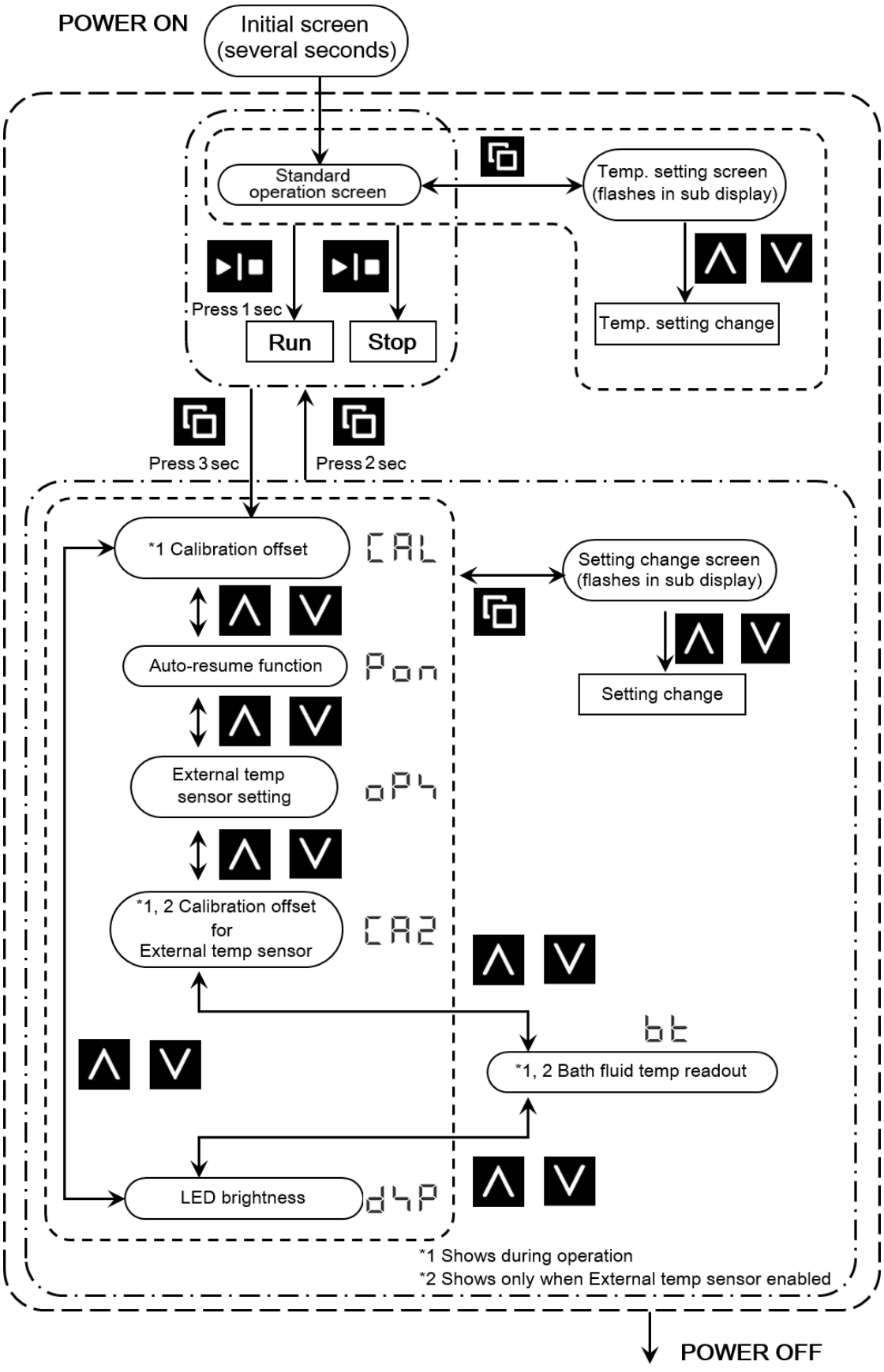
ALWAYS wear protective equipment

There is a possibility that sample solution and silicone oil scatter, or that hazardous substances are generated. Prepare safety gear for hazardous substances, and protective equipment listed in the SDS of the solution to be used.

4. PRE-OPERATIVE PREPARATIONS

Mode & Function Flow

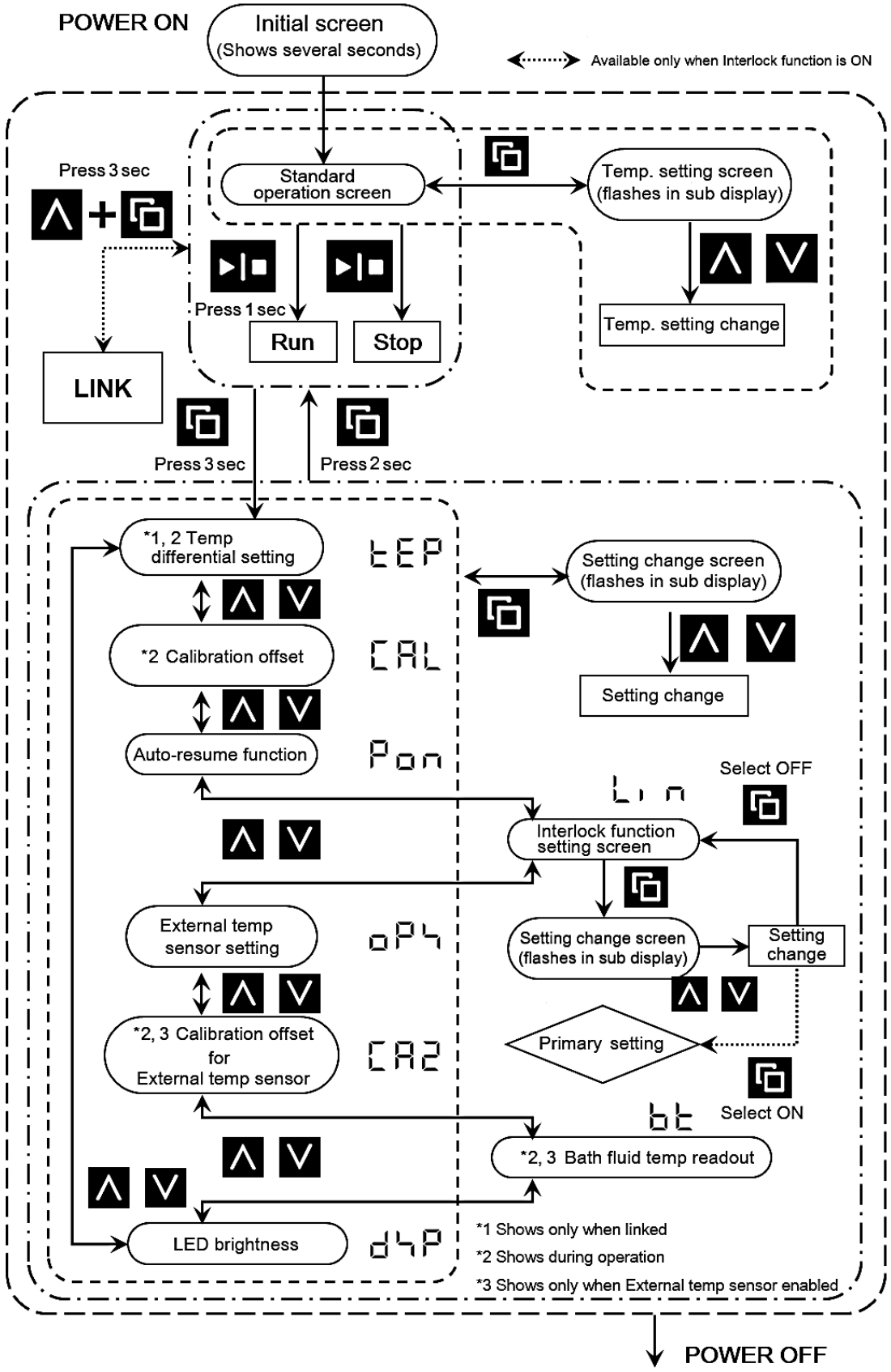
Single controller



4. PRE-OPERATIVE PREPARATIONS

Mode & Function Flow

Triple controller (Primary)



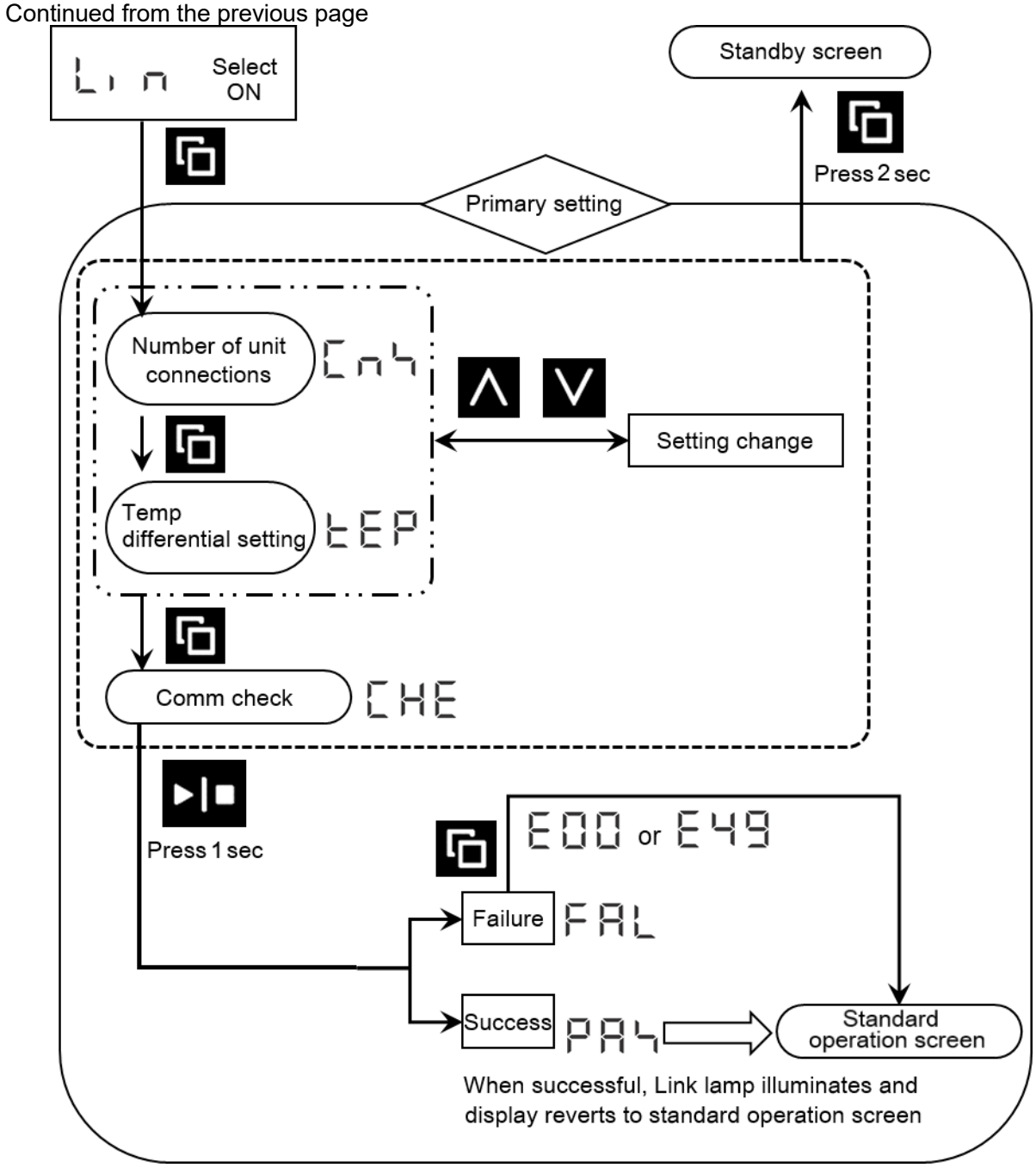
Continued on the following page

4. PRE-OPERATIVE PREPARATIONS

Mode & Function Flow

Triple controller (Primary)

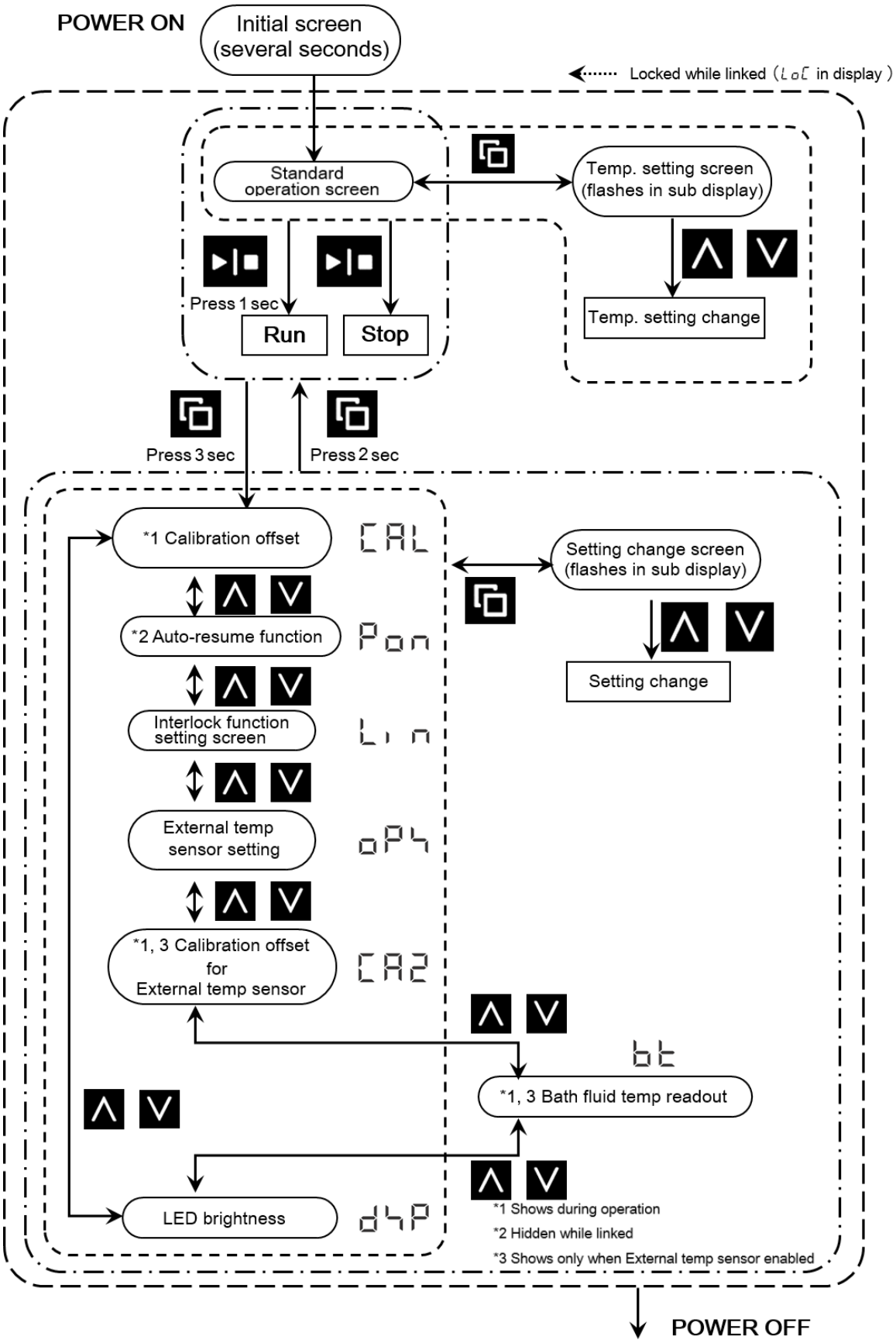
Continued from the previous page



4. PRE-OPERATIVE PREPARATIONS

Mode & Function Flow

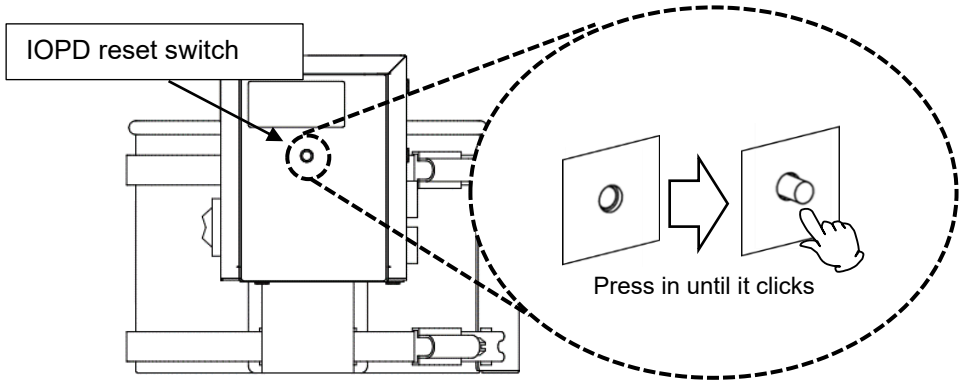
Triple controller (Auxiliary)



4. PRE-OPERATIVE PREPARATIONS

Safety Functions

Safety functions for this unit are defined in the table below

№	Name	Description
1	Overheat prevention	**① Independent overheat prevention device (IOPD)** DO NOT heat without adding required amount of silicone oil. Unit is equipped with independent overheat prevention device (IOPD) for accidental overheating. IOPD activates when bath fluid temperature builds up abnormally, or when heater is running without sufficient amount of silicone oil in the bath, shutting off power supply to the controller and heater circuit. When activated, heater unit and the bath may be extremely hot. Avoid direct contact with hot surfaces. Disconnect power cable from outlet and do not operate the Power switch or IOPD reset switch until bath fluid temperature falls below 60 °C Reset unit by following steps below. 1. Check that the bath is filled with silicone oil at room temperature. 2. Turn the Power switch OFF (○) 3. Press in reset switch on heater unit until it clicks. 4. Connect power cable to a power outlet. Unless reset switch is pressed in, unit will not restart when the Power switch is turned ON (|). * Note that resetting IOPD with bath fluid temperature exceeding 60°C may damage IOPD, or have influence on overheat detection temperature setting. 

4. PRE-OPERATIVE PREPARATIONS

Safety Functions

1	Overheat prevention	**② Automatic overheat prevention function** In addition to IOPD, unit has automatic overheat prevention function (auto reset) built in the controller for redundant safety measures. When bath fluid temperature exceeds objective temperature setting by 12 °C, power supply to heater circuit is shut off. * If IOPD and automatic overheat prevention function frequently activates, contact original dealer of purchase for inspection. * Main function of IOPD and automatic overheat prevention function is to keep this unit from overheating, NOT to protect test samples from damage. Likewise, it is NOT intended for protection against accident or injury resulting from the negligent use of explosives and flammables.
2	Overcurrent protection fuse	Unit has overcurrent protection fuse built in heater unit. The fuse blows when overcurrent occurs during operation. The fuse may be blown if unit does not turn on by turning the Power switch ON (|) while IOPD is not activated. Turn the Power switch OFF (○) and contact original dealer of purchase. Never attempt to repair unit. Repair work for blown fuse must be done by certified technician.

4. PRE-OPERATIVE PREPARATIONS

Operation Preparations

Operation precautions

- Exercise caution in regard to the following.
- Use ONLY silicon oil for bath fluid. Using any fluids other than silicone oil may impair safety functions, causing injury or burns.
- Check installation site and environmental conditions, and ensure that there is no damage on bath reservoir.
- Connect unit to a power outlet having sufficient capacity.
- Do not move unit while in operation.
- Take care not to get burned when operating unit.
- Surfaces on heater unit and bath reservoir are hot during operation and for some time after operation. Do not touch with bare hands
- Dispose of silicone oil after it comes below 45 °C.
- Do not overflow the bath, or spill oil on the unit exterior when adding oil. Electrical leakage and/or fire may result.
- Do not leave unit unattended during operation.
- Be careful not to allow oil to overflow while heating.
- Do not place or operate unit outdoors.
- Be certain that the bath is filled with sufficient amount of silicone oil whenever operating unit.
- Always wear appropriate protective equipment (gloves, mask, and glasses) for hazardous substances.

Heating medium

Use heat-resistant dimethyl silicon oil for open system heat transfer only.

Recommended silicone oil

Silicone oil characteristics	Property	TSF458-50	TSF458-100
	Appearance	Clear light yellow	Clear light yellow
	Kinematic viscosity (25°C)	50 mm^2/s	100 mm^2/s
	Specific gravity (25°C)	0.961	0.963
	Volatile content (150 °C/24 h)	0.2 %	0.1 %
	Viscosity temperature coefficient (V.T.C)	0.59	0.59
	Pour point	-50 °C or lower	-50 °C or lower
	Flash point	325 °C	342 °C
	Rate of increase of viscosity	40 %	35 %
	Recommended temperature range for use	25 °C to 200 °C	140 °C to 250 °C

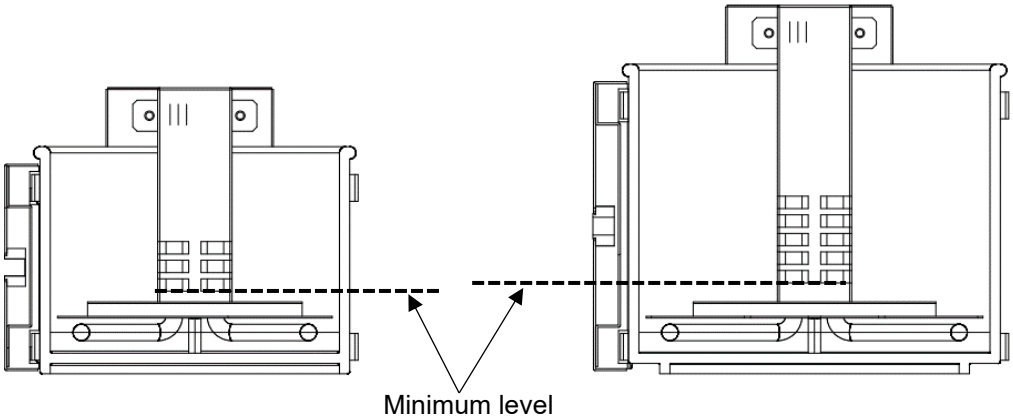
* Silicon oil when heated at more than 150 °C will gradually generate trace amount of formaldehyde which is stated to be sensitizing to skin and respiratory system, irritative to eyes, and to be carcinogenic. Always wear appropriate safety gear, and assure good ventilation throughout operations in which silicone oil to be heated beyond 150 °C.
* Deterioration rate of silicone oil varies depending on the operating temperature. Where TSF458-100 above is used, there is little viscosity change for standard use of 200°C, however, at 250 °C estimated useful time will be approximately 1,000 hours. For more information on the silicone oil characteristics, contact silicone oil maker at the time of purchase.
* Using silicone oil other than shown above may hinder temperature control performance.
* Be advised that silicone oil will scatter if moisture gets mixed in the oil at over 100 °C.

4. PRE-OPERATIVE PREPARATIONS

Operation Preparations

Supply of silicone oil

* Keep fluid level no lower than bottommost slit in heater guard. Insufficient fluid level may result in inaccurate or erratic temperature readings or inability to control temperature, which may cause overheating and fire hazards.
(where the oil is at 23 °C and no containers are set in the bath)



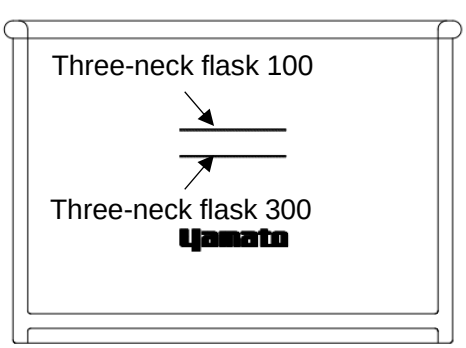
Minimum level
(where oil temperature is at 23 °C)

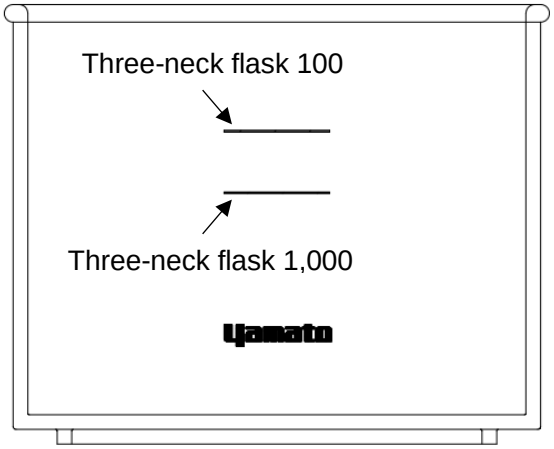
* Maximum level of heated oil should be 2 cm from the edge of the reservoir with a flask or other container is placed in the bath.

*** Silicon oil has a broad thermal expansion capacity and may overflow from bath when heated.**
Expansion should be subtracted prior to supply silicone oil to the reservoir.

Example) Supply amount of TSF458-100 to the reservoir can be calculated based on the following formula.

Expansion coefficient of silicone oil = (temperature setting - temperature reading) x 0.00096
With temperature setting 200 °C, current temperature reading 23 °C, and required amount of silicone oil 1.0 L, increase amount of the oil will be: 1.0 L ÷ (200-23 × 0.00096 + 1) = 0.85 L.





There are lines on the bath wall, indicating recommended oil level for use of three-neck flask (where oil temperature is at 23 °C). Lines are drawn on the inside wall for glass baths and on the outside wall for stainless steel baths, BOG100-A/BOS100-A has guide lines for three-neck flask of 100ml and 300ml, BOG200-A/BOS200-A has these for 100ml and 1,000ml.

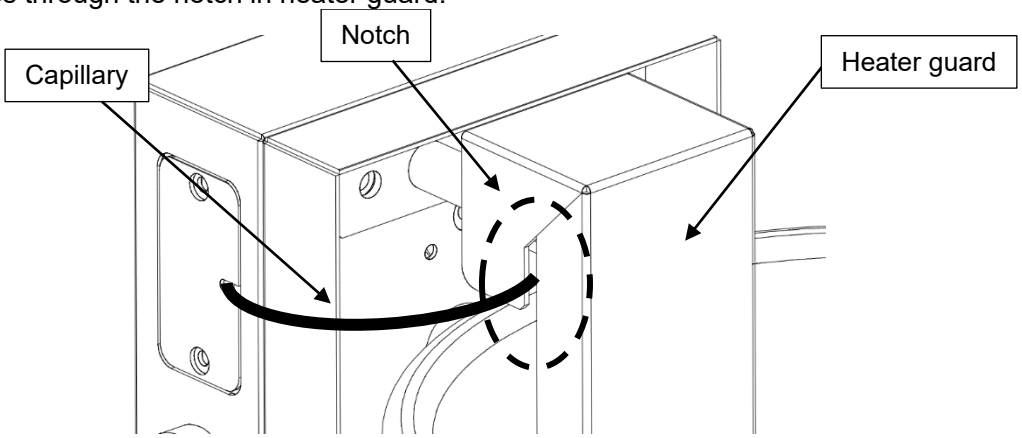
* Be sure that the flask to be used is in place inside the bath reservoir when adjusting the oil level.

4. PRE-OPERATIVE PREPARATIONS

Operation Preparations

Heater guard

Be sure to attach heater guard whenever operating unit. Direct contact between sample and heater may cause damage to heater, leading to serious hazards or mishaps. Ensure that heater guard covers rising part of heater, and that capillary of overheat prevention sensor passes through the notch in heater guard.

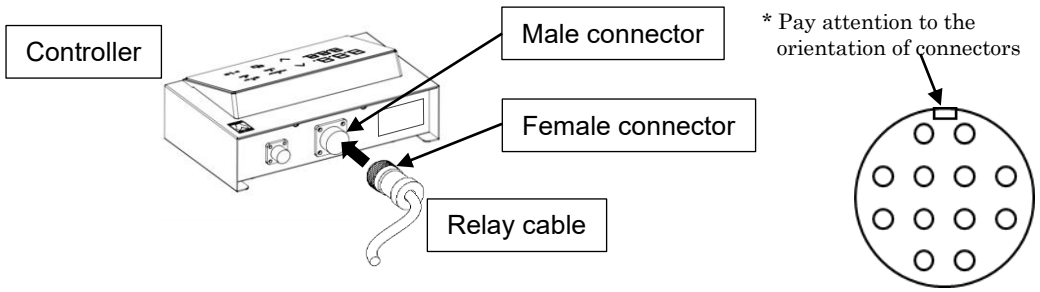


* Heater guard is intended to protect heater. Do not place glass containers directly on heater guard.

Relay cable connection to controller

In order to operate this unit, relay cable must be connected properly.
Be sure to complete connection before turning ON (|) the Power switch. Failure to do so may cause unexpected complications.

- Align male and female connectors as shown in the figure below. The connector is screw type. Fasten it to finger-tight. Do not use any tools to fasten the connector. It may become overtighten, leading to damage to the cable and/or equipment malfunction.
- Do not modify, bend, forcibly twist or pull on relay cable. Doing so may cause unit to tip over, or may cause fire and/or electric shock.
- Do not allow relay cable to contact bath reservoir, or place it near heat-generating devices. Doing so may cause relay cable insulation to overheat, melt and/or catch fire, which may result in electric shock.
- Unit includes stickers which are numbered from 1 to 3, in three colors. When operating multiple units side by side, or using Triple controller, use these stickers to avoid confusion. (See P.29)

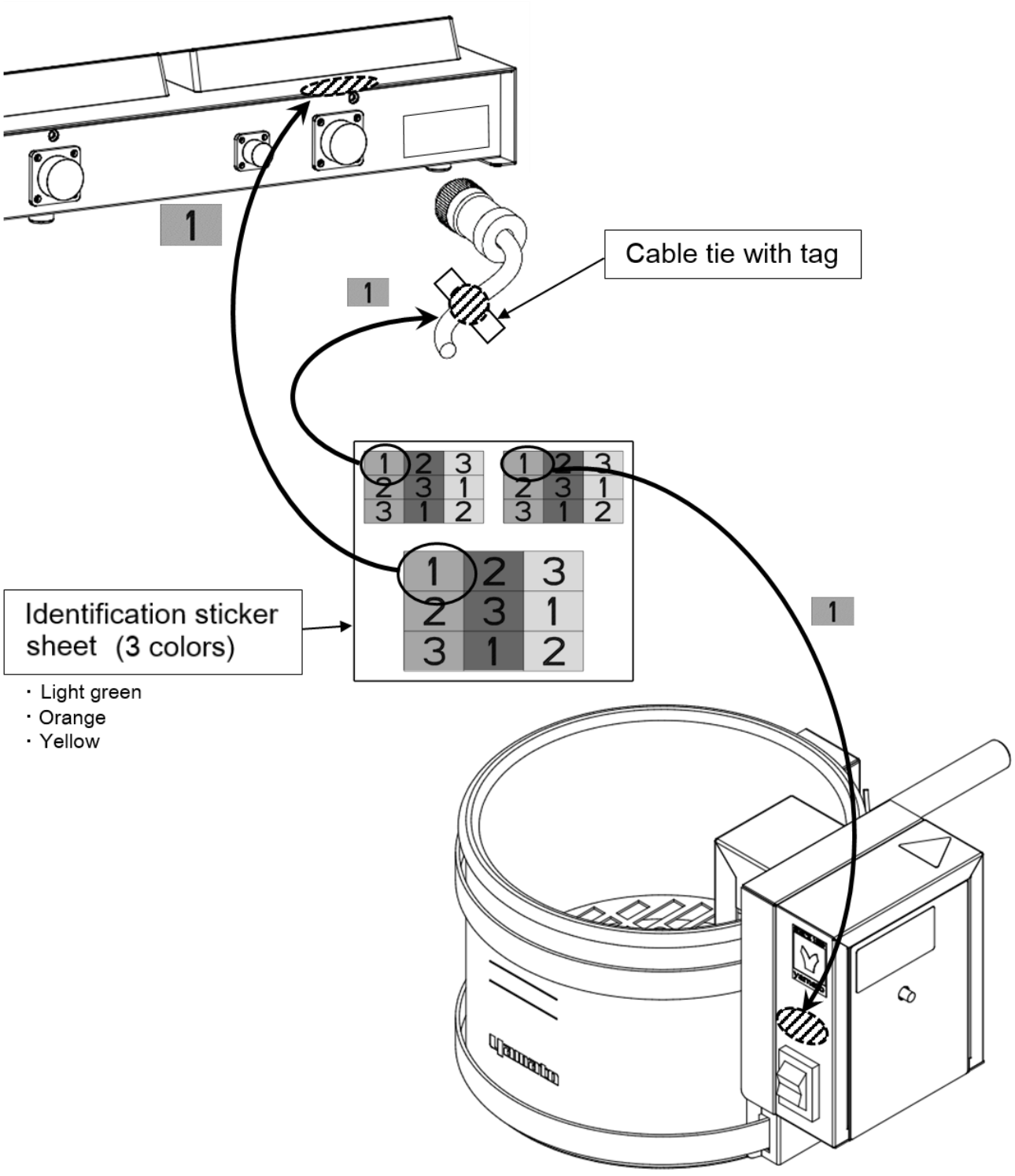


* See P.39 for details on connection for Triple controller

4. PRE-OPERATIVE PREPARATIONS

Identification Sticker

Identification stickers are provided for multiple units operation. With these stickers each unit and controller can be visually distinguished. Apply cable ties with tag, and stickers to the positions that are easy to see.

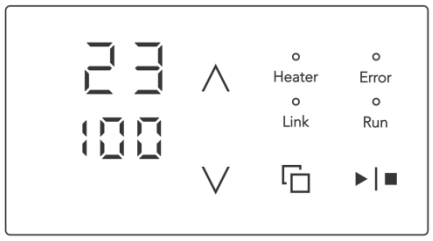


Heater unit is preferable to bath reservoir for affixing the stickers, or oil mist will peel stickers off within a short time.

5. OPERATION PROCEDURES

Operation Procedure

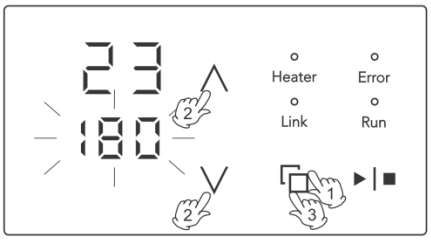
1. Turn power on



Turn ON (|) the Power switch located on heater unit.

Main display : Shows temperature reading following the software version "V.*.*"
Sub display : Temperature reading will show

2. Set temperature



① Press ⧉.

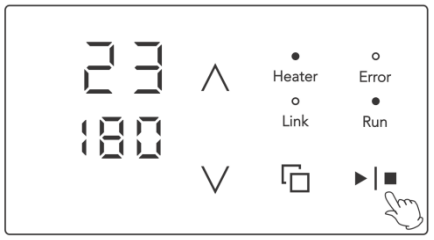
Sub display : Current temperature setting flashes.

② Enter desired value by using the ∧∨ keys.

③ Press ⧉ to finalize.

Sub display : Shows new temperature setting.

3. Start operation



Press and hold ▶|■ for one second.

Run lamp : ON
Heater lamp : On (flashes in response to the heater output)

*** Setting change can also be made during operation.**

<To stop>
Press ▶|■ again.

Run lamp : OFF
Heater lamp : OFF

*** Operation can start or stop during temperature setting change. Setting value will be fixed at displayed value.**

5. OPERATION PROCEDURES

User Setting

List of user setting items

- Press and hold ⧉ for three seconds to show user setting. Select an item by using ∧∨ keys. Press ⧉ again to edit the displayed item.
- While the user setting item is displayed, leaving unit without key operation for about two minutes will discard the unconfirmed changes, and display reverts to the standard operation screen.
- While changing the setting values for each item, holding down ⧉ for two seconds will finalize the setting and display reverts to the standard operation screen.
- Only calibration offset function "CAL" can be set or altered during operation.
- See “List of Options (P.63)” for External temperature sensor.

Panel item	Description	Page
Calibration offset	Calibration offset is a function which can correct for any differences discovered between actual bath fluid temperature and the temperature displayed on the control panel. Unit can be offset to either the positive or negative side of temperature line for entire temperature range of unit Setting range: -15.0 to +15.0 °C Default setting is "0.0"	P.33
Auto-resume function	A function that operation resumes where it left off when power failure occurred. Setting parameters: on or oFF Default setting is "oFF" (does not resume)	P.34
External temperature sensor setting	Enable or disable additional sensor (option) which can be directly placed in the object to be heated. When set to “on”, temperature readout will be switched to that of External temperature sensor. Putting the sensor in the object to be heated allows unit to control temperature based on the temperature of the object under heating. Setting parameters: on or oFF Default setting is "oFF" (disabled)	P.35
LED brightness setting	Change the LED brightness of the control panel. The brightness can be set in 8 levels from 0 to 7. Setting range: 0-7 Default setting is "4"	P.36

5. OPERATION PROCEDURES

User Setting

List of user setting items

- Following setting items will appear when External temperature sensor is enabled
- Calibration offset “CA2” can be set or altered during operation.

Panel item	Description	Page
Calibration offset for External temperature sensor	This function can correct for any differences discovered between actual temperature of the object under heating, and the temperature displayed on the control panel. Unit can be offset to either the positive or negative side of temperature line for entire temperature range of unit Setting range: -15.0 to +15.0 °C Default setting is "0.0"	P.37
Bath Fluid Temperature Readout	Temperature in the bath shows in the sub display while External temperature sensor is enabled. Sub display: shows current bath fluid temperature (cannot be changed)	P.38

- Following setting items will appear when operating with Triple controller.
- “Temperature differential setting” is added on top of user setting items when units are linked.

Panel item	Description	Page
Interlock function	Primary: Turn on (Enable) or off (disable) the function, select the number of devices to be linked, and set temperature difference for automatic temperature setting. Auxiliary: allows/denies to be linked Setting parameters: on or oFF Default setting is "on"	P.40 P.43
Number of unit connections (Primary only)	Select the number of Auxiliary units to link Setting parameters: 1 or 2 Default setting is "2"	P.40
Temperature differential setting (Primary only)	Determines the difference of temperature setting between Primary unit and Auxiliary units. Set temperature differentials for batch setting in linked state. Setting range: -100 to +100 °C Default setting is "10"	P.41 P.44
Auto-resume function (Triple controller)	A function that operation resumes where it left off when power failure occurred. Setting parameters: on, oFF or Lin Default setting is "Lin" (Only remains linked)	P.45

5. OPERATION PROCEDURES

Calibration Offset

Calibration offset function is to compensate for differences in temperature reading (as taken by unit sensor) and actual temperature of silicone oil (as taken manually).
Unit can be offset to either the positive or negative side of temperature line for entire temperature range of unit

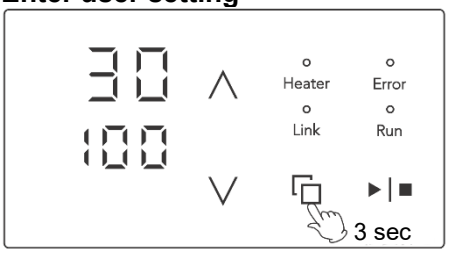
- Run unit at desired temperature. Once temperature has risen and stabilized, gauge temperature of silicone oil with a thermograph.
- Check the difference between the temperature setting and the actual temperature reading.
  Setting range: -15.0 to +15.0 °C (default setting is “0.0”)

* Setting change can also be made during operation.

Example

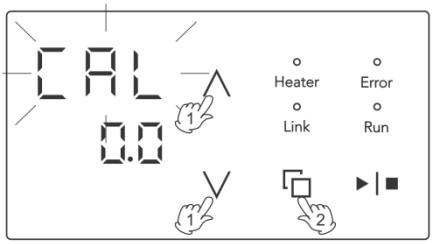
Where actual temperature is lower than display temperature by 3 °C, reading can be calibrated by entering a calibration offset value of -3.0 to compensate against the actual temperature deficiency of 3 °C.
If the initial temperature reading was 30 °C, it will read 27 °C after offset calibration, and be brought into agreement with actual temperature.

1. Enter user setting



Press and hold ⧉ for three seconds in standard operation screen.
Unit enters user setting.

2. Change offset value

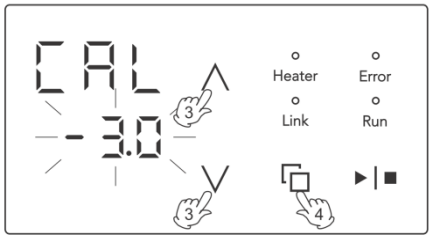


① Select "CAL" using the ∧∨ keys.

Main display: “CAL” flashes

② Press ⧉.

Sub display: Current set value flashes



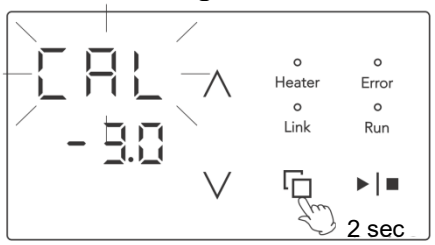
③ Enter a value that brings temperature reading and bath fluid temperature into agreement, using the ∧∨ keys.

④ Press ⧉ to finalize.

Main display: “CAL” flashes
Sub display: Shows new set value

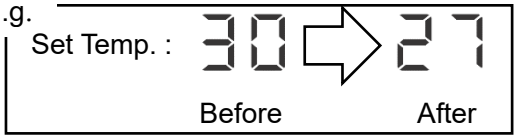
After completion, display returns to previous screen.

3. Exit user setting



After completing the setting, press and hold ⧉ for two seconds. Display reverts to previous screen, and shows corrected temperature reading and temperature setting.

E.g.



5. OPERATION PROCEDURES

Auto-resume Function

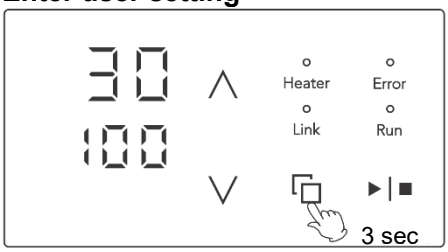
Select recovery mode for the event of a power failure.

"on": Unit automatically reverts to status just before power loss and begin operation once again from that point.
"oFF": Unit goes into idle at power recovery.

Setting parameters: on or oFF (default setting is "oFF")

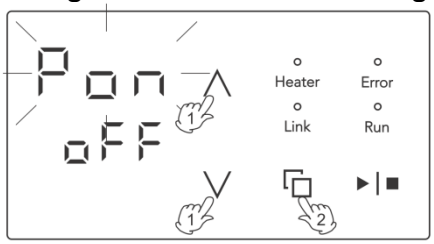
With this function set to "on", there is a possibility that unit unexpectedly begins operation. Stay close to unit, or turn OFF (○) the Power switch for safety in the event of a power failure.
* Settings cannot be changed during operation.

1 Enter user setting



Press and hold ⧉ for three seconds in standard operation screen.
Unit enters user setting.

2 Change the Auto-resume setting



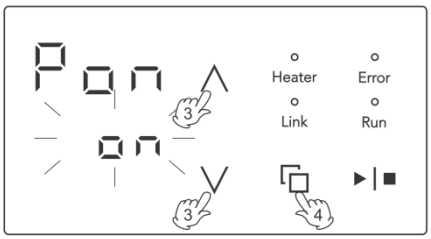
① Select "Pon" using the ∧∨ keys.

Main display: "Pon" flashes

② Press ⧉.

Sub display: Current setting flashes

③ Use the ∧∨ keys to alter the setting.

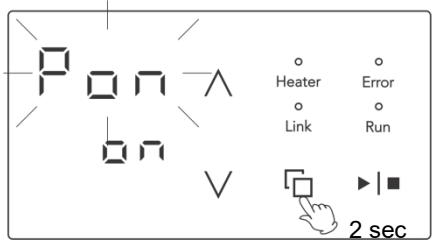


④ Press ⧉ to finalize.

Main display: "Pon" flashes
Sub display: Shows new setting

After completion, display returns to previous screen.

3 Exit user setting



After completing the setting, press and hold ⧉ for two seconds. Display reverts to previous screen and shows temperature reading and temperature setting.

5. OPERATION PROCEDURES

External Temperature Sensor Setting

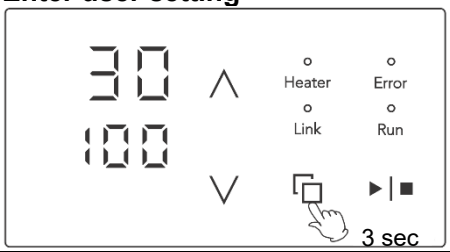
Enabling/disabling External temperature sensor

"on": Enabled
"oFF": Disabled

Setting parameters: on or oFF (default setting is "oFF")

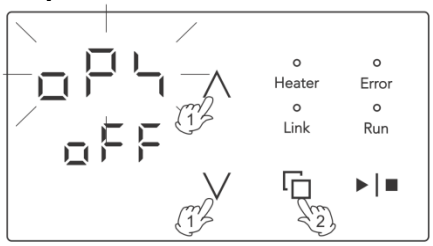
When set to "on", temperature readout will be switched to that of External temperature sensor. Putting the sensor in the object to be heated allows unit to control temperature based on temperature of the heated object.
* See "List of Options" (P.63) for details on External temperature sensor.
* Settings cannot be changed during operation.

1 Enter user setting



Press and hold ⧉ for three seconds in standard operation screen.
Unit enters user setting.

2 Change the setting for External temperature sensor



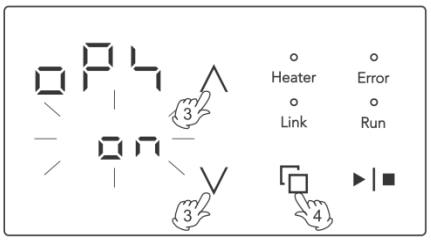
① Select "OPS" using the ∧∨ keys.

Main display: "OPS" flashes

② Press ⧉.

Sub display: Current setting flashes

③ Use the ∧∨ keys to alter the setting.

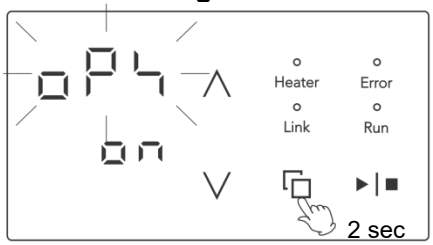


④ Press ⧉ to finalize.

Main display: "OPS" flashes
Sub display: Shows new setting

After completion, display returns to previous screen.

3 Exit user setting



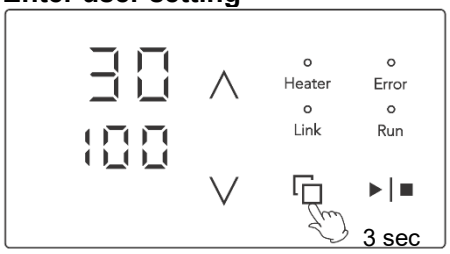
After completing the setting, press and hold ⧉ for two seconds. Display reverts to previous screen, and shows External temperature sensor readout and temperature setting.

5. OPERATION PROCEDURES

LED Brightness Setting

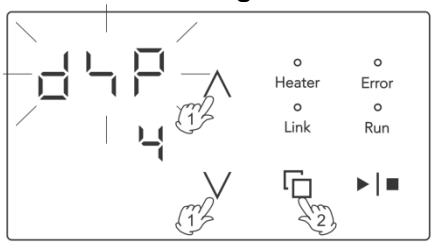
Change the LED brightness of the control panel.
The brightness can be set in 8 levels from 0 to 7. (Default setting is "4")
* Settings cannot be changed during operation.

1 Enter user setting



Press and hold ⧉ for three seconds in standard operation screen.
Unit enters user setting.

2 Select the LED brightness level



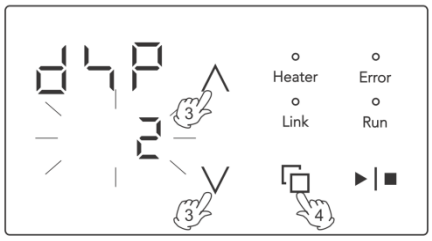
① Select "dSP" using the ∧∨ keys.

Main display: "dSP" flashes

② Press ⧉.

Sub display: Current set value flashes

③ Use the ∧∨ keys to alter the setting.

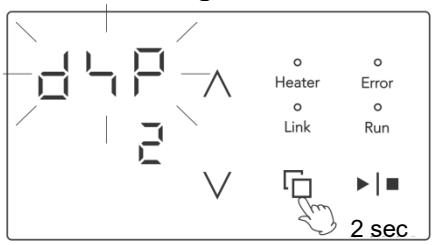


④ Press ⧉ to finalize.

Main display: "dSP" flashes
Sub display: Shows new set value

After completion, display returns to previous screen.

3 Exit user setting



After completing the setting, press and hold ⧉ for two seconds. Display reverts to previous screen and shows temperature reading and temperature setting.

5. OPERATION PROCEDURES

Calibration Offset for External Temperature Sensor

*** This function is displayed in the user setting only when External temperature sensor is enabled.**

This function can correct any differences discovered between actual temperature of the object under heating (taken manually) and the temperature displayed on the control panel (taken by External temperature sensor).

Unit can be offset to either the positive or negative side of temperature line for entire temperature range of unit

- Run unit at desired temperature. Once temperature has risen and stabilized, gauge temperature of the heated object with a thermograph.
- Check the difference between temperature setting and temperature of the heated object.
  Setting range: -15.0 to +15.0 °C (default setting is “0.0”)

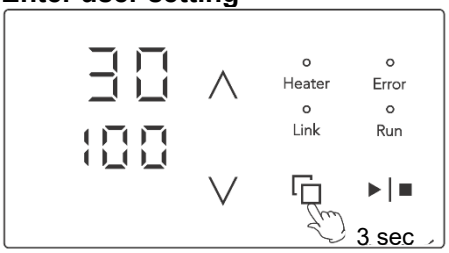
* Setting change can also be made during operation.

Example

Where actual temperature of the heated object is lower than display temperature by 3 °C
Reading can be calibrated by entering a calibration offset value of -3.0 to compensate against the actual temperature deficiency of 3 °C.

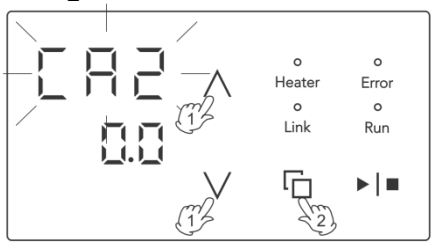
If the initial temperature reading was 30 °C, it will read 27 °C after offset calibration, and be brought into agreement with actual temperature.

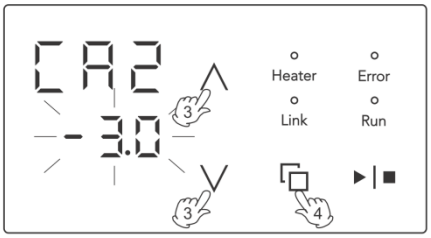
1. Enter user setting



Press and hold ⧉ for three seconds in standard operation screen with External temperature sensor enabled.
Unit enters user setting.

2. Change offset value





① Select "CA2" using the ∧∨ keys.

Main display: “CA2” flashes

② Press ⧉.

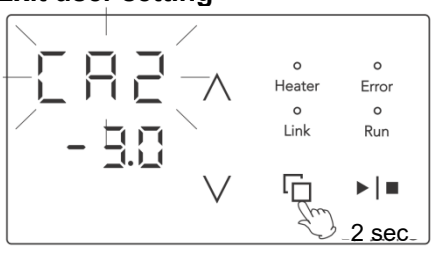
Sub display: Current set value flashes

③ Enter a value that brings set temperature and temperature of the heated object into agreement, using the ∧∨ keys.

④ Press ⧉ to finalize.

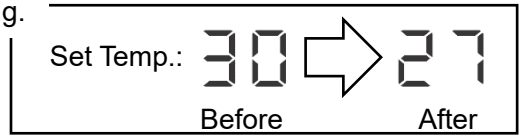
Main display: “CAL” flashes
Sub display: Shows new set value
After completion, display returns to previous screen.

3. Exit user setting



After completing the setting, press and hold for two seconds. Display reverts to previous screen, and shows corrected temperature reading and temperature setting.

E.g.



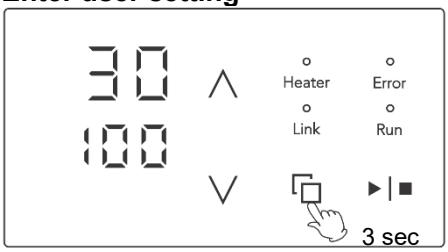
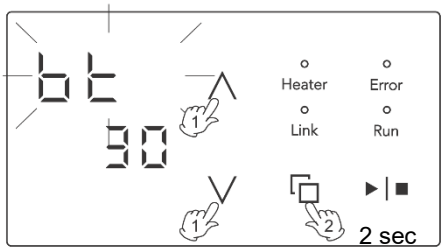
5. OPERATION PROCEDURES

Bath Fluid Temperature Readout

*** This function is displayed in the user setting only when External temperature sensor is enabled.**

Check bath fluid temperature while External temperature sensor is enabled.

Main display shows temperature of the object under heating, taken by External temperature sensor.
To see temperature of silicone oil in the bath, follow the steps below.
* Can be checked during operation.

1	**Enter user setting** 	Press ⧉ in standard operation screen with External temperature sensor enabled. Unit enters user setting.
2	**Check temperature of silicone oil in the bath** 	① Select "bt" using the ∧∨ keys. Main display: “bt” flashes Sub display: Shows current set value ②Press and hold ⧉ for two seconds. Display reverts to previous screen and shows temperature reading and temperature setting.

5. OPERATION PROCEDURES

Three-unit Interlock Function (Triple controller)

BOG/BOS units can operate simultaneously up to three units by Interlock function.
- Primary unit + 2 Auxiliary units
- Primary unit + 1 Auxiliary unit + 1 Independent unit (see P.40 for details)

While linked, auxiliary units cannot individually start operation or change temperature setting. Temperature setting for auxiliary units can be automatically determined based on that for primary unit, by entering differential value in advance.

* All units are independent at default setting (Interlock function is “on”)
* Triple controller is allocated to Primary, Auxiliary 1, and Auxiliary 2 from the left. Confirm which unit will be Primary and make connection properly.
* When linking two units, controller on the left will be Primary and in the middle will be Auxiliary. Remaining controller on the right will become Independent. It is not possible to link Primary (left) and Auxiliary 2 (right).

Unit includes stickers which are numbered from 1 to 3, in three colors. When operating multiple units side by side, or using Triple controller, use these stickers to avoid confusion. (See P.29)

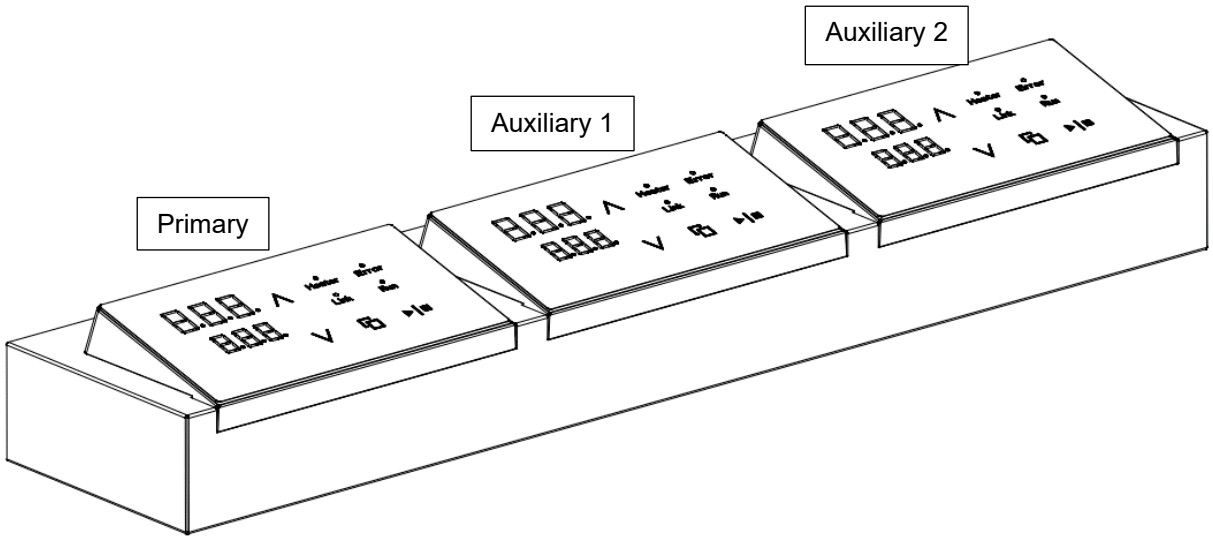
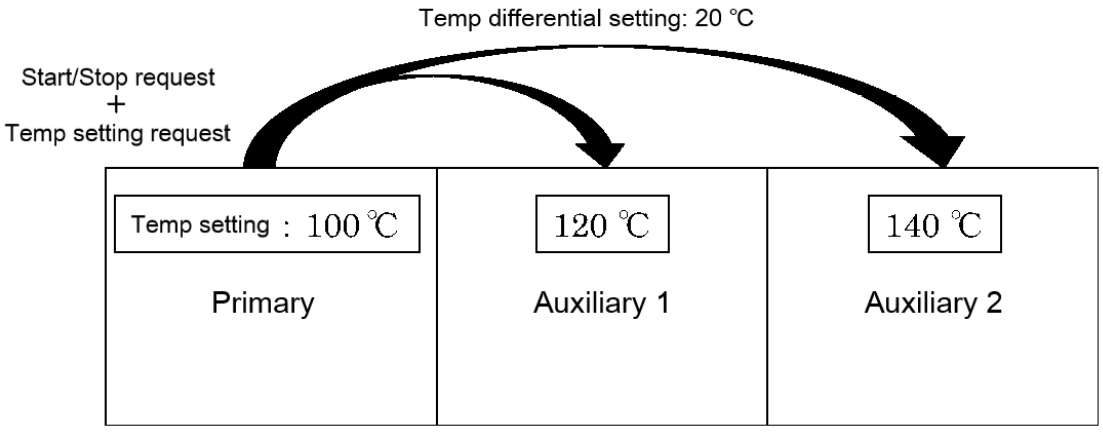


Illustration of Interlock function



5. OPERATION PROCEDURES 運転のしかた

Interlock Function (Triple Controller)

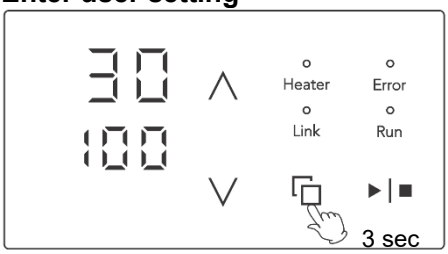
・Use Interlock function (Primary)

Turn on (Enable) or off (disable) the function, select the number of devices to be linked, and set temperature difference for automatic temperature setting. When selecting “1” for the number of Auxiliary units, Auxiliary 1 will be linked, and Auxiliary 2 will be independent.

Setting parameters: on or oFF (default setting is “on”)
1 or 2 (default setting is “2”)
-100 to +100°C (default setting is “10”)

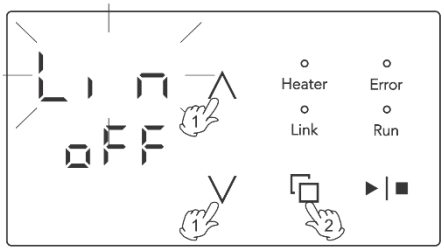
* Settings cannot be changed during operation.

1 Enter user setting



Press and hold ⧉ for three seconds in standard operation screen.
Unit enters user setting.

2 Enable/disable the function



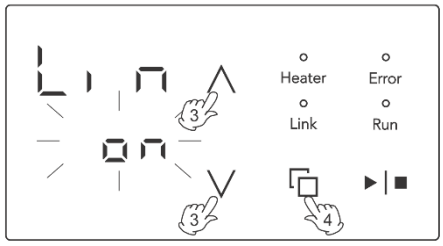
① Select "Lin" using the ∧∨ keys.

Main display: “Lin” flashes

② Press ⧉.

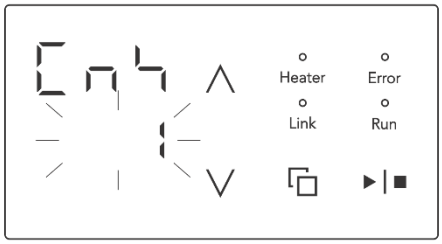
Sub display: Current setting flashes

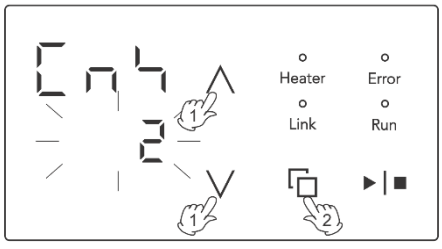
③ Use the ∧∨ keys to alter the setting.



④ Press ⧉ to finalize.
“oFF”: Cancel linkage between units and display reverts to previous screen. “on”: Proceed to next setting

3 Select the number of Auxiliary units to be linked





① Use the ∧∨ keys to alter the setting.

Main display: Shows “CnS”
Sub display: Current setting flashes

② Press ⧉ to finalize.

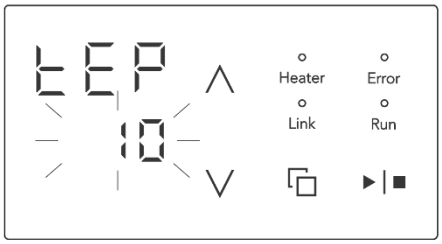
After completion, proceed to next setting

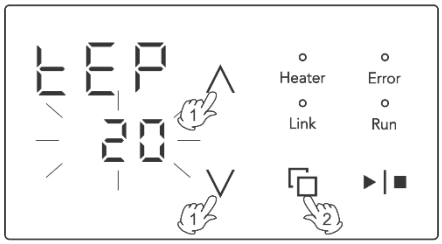
* ATTN: where “CnS” is set to “1”,
Primary (left) and Auxiliary 1 (center) are linked. It is not possible to link Primary (left) and Auxiliary 2 (right).

5. OPERATION PROCEDURES

Interlock Function (Triple Controller)

4 Change temperature differential setting





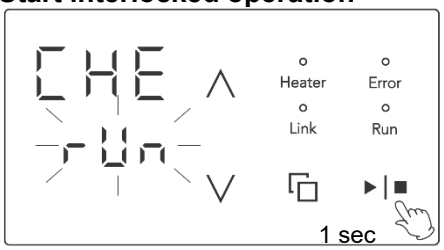
①Use the ∧∨ keys to alter the setting.

Main display: Alternately shows “tEP” and temperature setting for Primary
Sub display: Current set value flashes

② Press ⧉ to finalize.

After completion, proceed to next setting

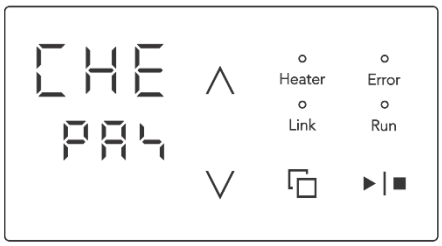
5 Start interlocked operation

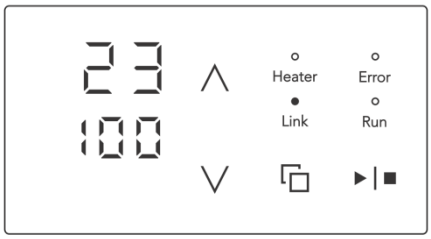


Press and hold ▶|■ for one second.

Main display: Shows “CHE”
Sub display: “rUn” flashes

When correctly linked

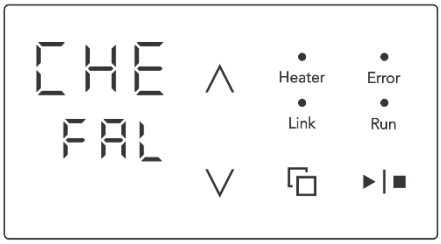




“PAS” shows in sub display, and then temperature reading and temperature setting will show in the respective displays. Link lamp illuminates, indicating units are linked, and temperature setting for Auxiliary unit will be updated.

While linked, each unit operates as follows
・Auxiliary units start/stop operation in conjunction with Primary unit.
・Auxiliary units alone cannot start operation or change temperature setting. (can stop operation)

When failed to link



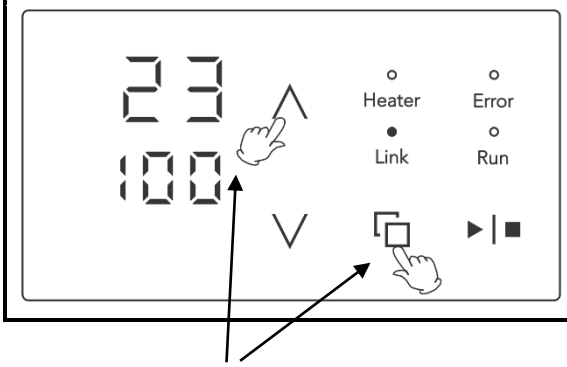
“FAL” shows in sub display for several seconds, and then error code will show.
An error code which indicates the cause, and “FAL” show alternately in main display, and a character which indicates a unit of cause shows in sub display.
IP2: Auxiliary 1, IP3: Auxiliary 2

Pressing ⧉ cancels error indication. See “Reading Error Codes” (P.52) and address the cause, then reset Primary unit.

5. OPERATION PROCEDURES

Interlock Function (Triple Controller)

Quick start/stop of Interlock function



In standard operation screen, holding down the ∧ key and ⧉ for three seconds can start/stop interlocked operation.
Current setting is reflected for the number of units and temperature setting.

Press & hold 3 sec at the same time

5. OPERATION PROCEDURES

Interlock Function (Triple Controller)

・Use Interlock function (Auxiliary)

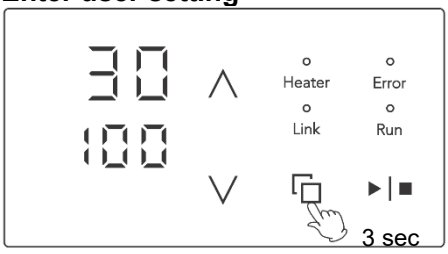
Enable/disable the function

When disabled, a link request from Primary is ignored. Disabling the function in linked state cancels the linkage thereof.

Setting parameters: on or oFF (default setting is “on”)

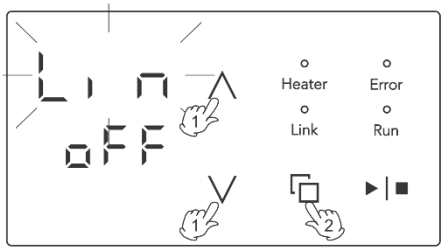
* Settings cannot be changed during operation.

1 Enter user setting



Press and hold ⧉ for three seconds in standard operation screen.
Unit enters user setting.

2 Enable/disable the function



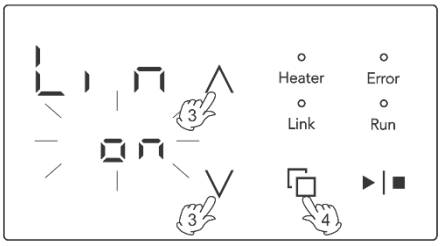
① Select "Lin" using the ∧∨ keys.

Main display: “Lin” flashes

② Press ⧉.

Sub display: Current setting flashes

③ Use the ∧∨ keys to alter the setting.

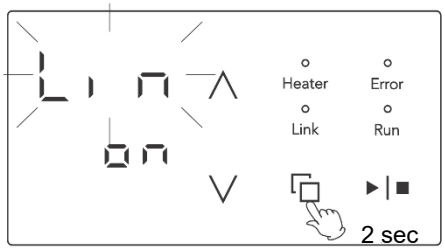


④ Press ⧉ to finalize.

Main display: “Lin” flashes
Sub display: Shows new setting

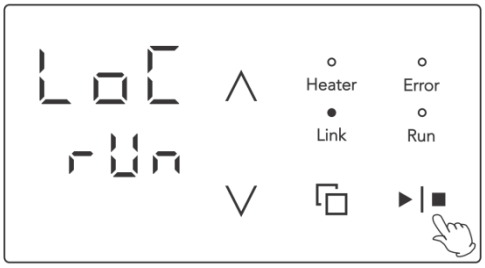
After completion, display returns to previous screen.

3 Exit user setting



After completing the setting, press and hold ⧉ for two seconds. Display reverts to previous screen and shows temperature reading and temperature setting.

*** Restrictions during interlock control**



While linked, Auxiliary units alone cannot control the operations shown below.

・Operation start
・Setting change in temperature

“LoC” appears in main display and operation will be denied. Cancel the linkage through Primary unit to operate Auxiliary units individually.

5. OPERATION PROCEDURES

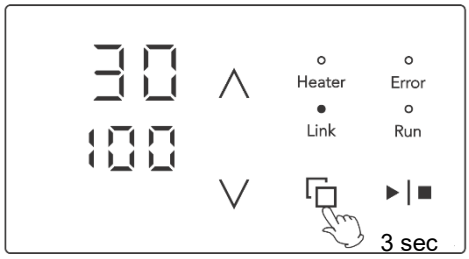
Temperature Differential Setting (Triple controller)

Enter temperature differential value.
Set temperature differentials for batch setting in linked state.

Setting range: -100 to +100 °C (default setting is “10”)

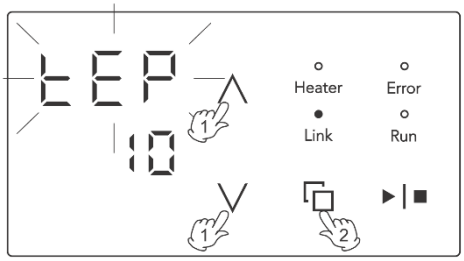
* Can be set only by Primary unit
* Setting change can also be made during operation.
* Added to user setting menu while units are linked.

1 Enter user setting



Press and hold ⧉ for three seconds in standard operation screen.
Unit enters user setting.

2 Change temperature differential setting

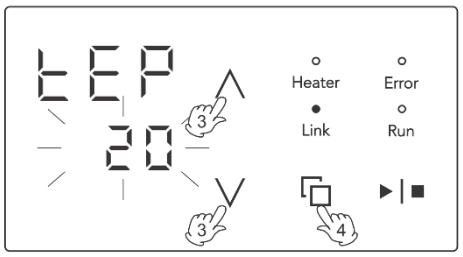


① Select "tEP" using the ∧∨ keys.

Main display: “tEP” flashes

② Press ⧉.

Main display: Alternately shows “tEP” and temperature setting for Primary
Sub display: Current set value flashes



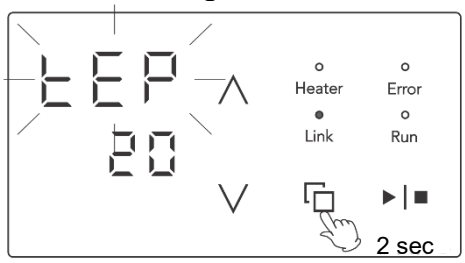
③ Use the ∧∨ keys to alter the setting.

④ Press ⧉ to finalize.

Main display: “tEP” flashes
Sub display: Shows new setting

After completion, display returns to previous screen.

3 Exit user setting



After completing the setting, press and hold ⧉ for two seconds. Display reverts to previous screen and shows temperature reading and temperature setting.

Temperature setting for Auxiliary units will be reset according to new differential value.

* An error (E49) occurs if a value of below 0 °C or over 260 °C is being entered for Auxiliary units. Make sure that temperature setting for Auxiliary units stays within the range of 0 to 260 °C. Pressing ⧉ releases error, and display reverts to Temperature differential setting.

5. OPERATION PROCEDURES

Auto-resume Function (Triple Controller)

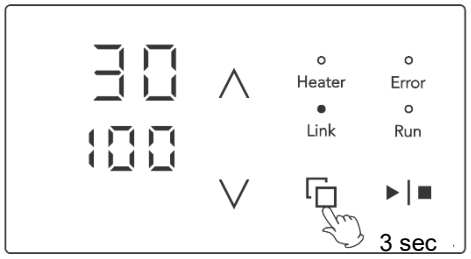
Select recovery mode for the event of a power failure.

"on": Unit automatically reverts to status just before power loss and begin operation once again from that point.
"oFF": Unit goes into idle at power recovery.
"Lin": Units remain linked in standby state.

Setting parameters: on, oFF or Lin (default setting is "Lin")

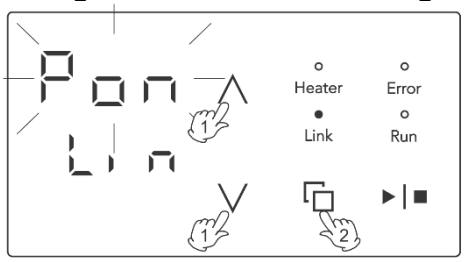
With this function set to "on", there is a possibility that unit unexpectedly begins operation. Stay close to unit, or turn OFF (○) the Power switch for safety in the event of a power failure.
* Settings cannot be changed during operation.

1 Enter user setting



Press and hold ⧉ for three seconds in standard operation screen.
Unit enters user setting.

2 Change the Auto-resume setting



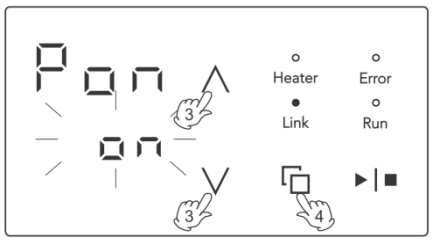
① Select "Pon" using the ∧∨ keys.

Main display: "Pon" flashes

② Press ⧉.

Sub display: Current setting flashes

③ Use the ∧∨ keys to alter the setting.

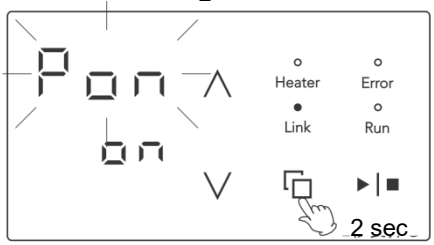


④ Press ⧉ to finalize.

Main display: "Pon" flashes
Sub display: Shows new setting

After completion, display returns to previous screen.

3 Exit user setting



After completing the setting, press and hold ⧉ for two seconds. Display reverts to previous screen and shows temperature reading and temperature setting.

6. HANDLING PRECAUTIONS

Warnings and Cautions

WARNING

DO NOT use explosive or flammable fluid as heating medium.

Never attempt to use explosives, flammables or any items which contain explosives or flammables. Fire or explosion may result. See "LIST OF HAZARDOUS SUBSTANCES" (P.70)
Use TSF428-100 or its equivalent silicone oils.

DO NOT heat without appropriate amount of fluid in reservoir.

Running this unit without adding required fluids may result in equipment damage and/or fire.

DO NOT operate equipment unattended.

Do not leave unit unattended during operation.
Silicone oil evaporates gradually while heated, and its amount will fall below the minimum level. Running unit in such state may result in fire hazard.

DO NOT get water or fluids on controller and heater unit.

Electrical leakage and/or fire may result.

6. HANDLING PRECAUTIONS

Warnings and Cautions

CAUTION

ALWAYS wear protective equipment

Prepare safety gear for hazardous substances whenever operating this unit to avoid injury or burns.

ALWAYS run equipment within specified temperature range

The temperature control range is RT +5 °C to 240 °C (BOG100-A/200-A), and RT +5 °C to 250 °C (BOS100-A/200-A).
(where room temperature (RT) is below 25 °C, the lowest control temperature is RT +10 °C).
Never attempt to operate unit outside of specification range. Accident or equipment malfunction may result.

Turn OFF (○) the Power switch when leaving equipment, or when equipment will be idle for long hours.

Failure to do so may cause unexpected accident, possibly leading to serious injury or property damage.

Observe the level of silicone oil.

Do not overflow the bath, or spill oil on the unit exterior when adding oil. Electrical leakage and/or fire may result.

Be aware of the condition of silicone oil.

Periodically change silicone oil and clean the reservoir to maintain safety and performance of unit.

7. MAINTENANCE PROCEDURES

Precautions before Inspection

WARNING

- Be sure to disconnect power cable before conducting inspection and maintenance.
- Clean off any oil on or around heater unit and controller, to prevent electrical leakage and/or fire.
- Perform inspections and maintenance when unit and bath fluid are at room temperature.
- Never attempt to disassemble unit.

Precautions in Daily Maintenance

CAUTION

- Clean unit exterior using soft damp cloth. Never use benzene, paint thinner, scouring powder, scrubbing brush or other abrasives and solvents to clean unit. Superficial damage and/or discoloration, as well as deformity to some components may result.
- Wipe contaminants, excess oil from reservoir with a clean, dry cloth.
- Use caution not to damage heater, or bend temperature sensor

◆ Contact original dealer of purchase, if further questions arise concerning maintenance procedures.

8. EXTENDED STORAGE AND DISPOSA

Extended Storage

⚠ WARNING	⚠ CAUTION
● Turn OFF (○) the Power switch and disconnect power cable.	● Drain silicone oil from reservoir and wipe down thoroughly to remove excess oil.

Disposal

⚠ CAUTION

- Wipe off silicone oil completely before disposing of unit
- Do not leave unit in a location where children may have access.
- Dispose of this unit in accordance with local laws and regulations.

Disposal Considerations

Dispose of this unit in accordance with local laws and regulations. Dispose of or recycle this unit in a responsible and environmentally friendly manner.

Yamato Scientific Co., Ltd. strongly recommends disassembling unit, as far as is possible, in order to separate parts and recycle them in contribution to preserving the global environment. Major components and materials, comprising BOG/BOS unit are listed in the table below

Component Name	**Material**
Main components of Bath/Heater unit	
Exterior	Chrome-free electro-galvanized steel sheet metal printing coating
Bath reservoir	Stainless steel, hard glass
Heater guard	Stainless steel
Fixing band	Stainless steel
Gasket	Ethylene-propylene rubber
Rubber foot	Ethylene-propylene rubber
Seals	Resin material
Electrical Parts	
Switches and relays	Composite of resin, copper and other materials
Control panel	PET resin film
Light guide	Polycarbonate
Circuit boards	Composite of fiber glass and other materials
Heater	Stainless steel, magnesium oxide, nichrome wire, etc.
Power cable	Composite of synthesized rubber coating, copper, nickel and other compounds
Wiring materials	Composites of fire-retardant vinyl, copper, nickel and other compounds
Sensor	Stainless steel, etc.

9. TROUBLESHOOTING

Reading Error Codes

When an operational error or malfunction occurs, unit shuts off heater and Error lamp illuminates. Error codes will show flashing in main display. Confirm code and turn off the Power switch immediately, then block access to unit.

Error Codes	Description	Possible causes and measures
E01	Sensor error	● Temperature sensor interruption ● Controller failure * Temperature sensor or controller need to be replaced. Contact original dealer of purchase.
E15	Memory error	● Abnormal setting value in memory * Controller need to be replaced. Contact original dealer of purchase.

9. TROUBLESHOOTING

Reading Error Codes

Unit detects following abnormalities only when External temperature sensor is enabled
Error codes will show flashing in main display. Confirm code and turn off the Power switch immediately, and check the solutions below.

Error Codes	Description	Possible causes and measures
E30	External temperature sensor error	● External temperature sensor is disconnected. * Unit detects error when function of External temperature sensor is enabled without the sensor properly connected. Check the setting and connection of External temperature sensor. ● External temperature sensor interruption or controller failure * Temperature sensor or controller need to be replaced. Contact original dealer of purchase.
E21	Abnormality in temperature rise	● Temperature of the object under heating does not rise for a certain period of time from the beginning of operation. * Make sure that External temperature sensor is properly placed in the object to be heated. and that the object is immersed in silicone oil in the bath. ● Failure in External temperature sensor or controller * Temperature sensor or controller need to be replaced. Contact original dealer of purchase.
E60	Abnormal temperature difference	● A fixed period of time has passed while temperatures of bath fluid and object under heating are far apart during operation. * Make sure that External temperature sensor is properly placed in the object to be heated. and that the object is immersed in silicone oil in the bath. ● Failure in External temperature sensor or controller * Temperature sensor or controller need to be replaced. Contact original dealer of purchase.

9. TROUBLESHOOTING

Reading Error Codes

Unit detects following abnormalities only when units are linked by Triple controller.
Error codes will show flashing in main display. Confirm code and check the settings.

* The error “E00“ will be automatically released as soon as the cause is eliminated when “FAL” is not shown in display. When accompanied by “FAL”, Press ⧉ to release.
“E49” can be released by pressing

Error Codes	Description	Possible causes and measures
E00	Communication error	● Primary and Auxiliary units are turned OFF (○) ● Interlock function on Primary and Auxiliary units are set to “oFF” ● Other units are in an error state * A certain unit is not linked. See the characters iP1, iP2, or iP3 in sub display and check the status of power, interlock setting, and errors for the corresponding unit. ● Controller failure * Controller need to be replaced. Contact original dealer of purchase.
E49	Deviation from temperature setting range	● Improper setting for Temperature differential setting * A value of below 0 °C or over 260 °C is being entered for Auxiliary units. Check the temperature setting and enter adequate values. See ”Temperature Differential Setting” (P.44) ● Controller failure * Controller need to be replaced. Contact original dealer of purchase.

With the error codes shown above, characters iP1, iP2, or iP3 appears in sub display, indicating a unit which may be a cause of the communication error.

Primary Auxiliary 1 Auxiliary 2

9. TROUBLESHOOTING

Troubleshooting Guide

Symptom	Check
Display is blank when the Power switch is turned ON (|).	・Whether power cable is connected securely to power outlet ・Whether a power outage is in progress ・Whether IOPD reset switch is not pressed after its activation ・Whether relay cable is properly connected to controller
Temperature does not rise.	・Whether Run lamp is illuminating ・Whether temperature setting is appropriate ・Whether External temperature sensor is immersed in the object under heating (where External temperature sensor is enabled).
There is discrepancy between temperature reading and actual temperature	・Whether proper value is entered for calibration offset ・Whether there is sufficient amount of silicone oil ・Whether temperature sensor contacts sample container or other objects ・Whether External temperature sensor is immersed in the object under heating (where External temperature sensor is enabled).
Temperature reading is erratic	・Whether there are large fluctuations in ambient temperature. ・Whether power supply is appropriate (must be within ±10% voltage rating) ・Whether unit is placed in a suitable location ・Whether External temperature sensor is immersed in the object under heating (where External temperature sensor is enabled).

◆ **If problem persists or is not applicable to any of errors above, turn OFF (○) the Power switch immediately, disconnect power cable and contact original dealer of purchase for assistance.**

10. SERVICE & REPAIR

Requests for Repair

Requests for Repair

If abnormalities remain after confirming "Troubleshooting Guide", terminate operation, turn OFF (○) the Power switch, and disconnect power cable. Contact original dealer of purchase for assistance.

The following information is required for all repairs.

- Product Name
- Model
- Serial Number
- Date (year/month/day) of Delivery

} Refer to warranty card.

- Description of problem in as much detail as possible

- Repair this equipment for free of charge according to the contents on warranty card. Warranty period is 1 (one) year from date of purchase.

- Consult with original dealer of purchase for any repair after warranty ended. Charged repair service of this equipment will be available on customer's request when it can be maintained functional by its repair.

* Be sure to present warranty card to the service representative.

Guaranteed Supply Period for Repair Parts

Guaranteed maximum supply period for repair parts is 7 (seven) years from date of discontinuation for this equipment.
"Repair parts" is defined as components which, when installed, allow for continued equipment operation.

11. SPECIFICATIONS

Specifications（BOG100 Series）

Product Name			Glass Oil Bath			
Model			BOG100	BOG100-Y	BOG110-B	BOG110-Y
Operating ambient temperature range			5～35 °C			
Performance*1	Temperature setting range		0～260 °C			
	Temperature control range		RT +5 to 240 °C *2,3			
	Temperature control accuracy		±0.3 °C (at 200 °C, stirring)			
Configuration	Exterior		Chromium-free electrogalvanized steel sheet, baked-on finish			
	Bath reservoir		Hard glass			
	Heater		Stainless steel tube heater			
	Heater capacity		310 W at100 V	310 W at115 V	310 W at220 V	
Controller	Temperature control system		PID control			
	Temperature setting and display systems		Digital setting with the ▲▼ keys (Res: 1 °C)			
	Operation Modes		Fixed temperature operation			
	Additional functions		Calibration offset Auto-resume function, LED brightness setting,			
	Heater circuit control		Triac with zero-cross control			
	Sensor		Pt100 (class A)			
Safety devices	Controller		Self-diagnostic functions (temperature sensor failure detection, automatic overheat prevention)			
	Fuse		6.3 A, short-circuit protection, overcurrent protection			
	Others		Independent overheat prevention device			
Standards	External dimensions Diameter×Depth×Height		φ150 mm×205 mm×140 mm			
	Internal dimensions	Inner diameter	φ140 mm			
		Height	100 mm			
	Bath capacity	Recommended (no load)	Approx.0.8 L			
		Maximum (no load) *4	Approx.1.0 L			
	Controller unit Dimensions W×D×H (mm)		150 mm×90 mm×45 mm (protrusions not included)			
	Power supply (frequency)		Single phase 100 V AC（50/60 Hz）	Single phase 115 V AC（50/60 Hz）	Single phase 220 V AC（50 Hz）	Single phase 220 V AC（50/60 Hz）
	Rated current		4.0 A	3.5 A	2.0 A	2.0 A
	Weight	Bath reservoir・Heater unit	Approx.1.8kg			
		Single controller unit	Approx.0.5 kg			
		Total weight	Approx.2.3kg			
Accessories			Heater guard 1 pc, Arbor（φ12×90 mm）1 pc, PTFE stirrer bar 1 pc, Connector cap 1 pc, Identification sticker sheet 1 pc, Cable tie with tag 3 pc, Instruction Manual 1 copy			
			Warranty card 1 copy	*5	Warranty card 1 copy	*5

*1 Performance data based on 100 V AC supplied power, 23 °C room temperature, no process load, and use of TSF458-100 silicone oil and PTFE stirrer bar (included).
Temperature control accuracy varies depending on the types of silicone oil.
*2 Where room temperature (RT) is below 25 °C, the lowest control temperature is RT + 10 °C
*3 Maximum controllable temperature (240 °C) may not be reached if source voltage is below 100 V AC.
*4 The amount where the oil is at room temperature
If it exceeds, the oil may expand and overflow at the time of heating.
*5 A warranty card is included in some regions.

11. SPECIFICATIONS

Specifications（BOG200 Series）

Product Name			Glass Oil Bath			
Model			BOG200	BOG200-Y	BOG210-B	BOG210-Y
Operating ambient temperature range			5～35 °C			
Performance*1	Temperature setting range		0～260 °C			
	Temperature control range		RT +5 to 240 °C *2,3			
	Temperature control accuracy		±0.3 °C (at 200 °C, stirring)			
Configuration	Exterior		Chromium-free electrogalvanized steel sheet, baked-on finish			
	Bath reservoir		Hard glass			
	Heater		Stainless steel tube heater			
	Heater capacity		425 W at100 V	425 W at115 V	425 W at220 V	
Controller	Temperature control system		PID control			
	Temperature setting and display systems		Digital setting with the ▲▼ keys (Res: 1 °C)			
	Operation Modes		Fixed temperature operation			
	Additional functions		Calibration offset Auto-resume function, LED brightness setting,			
	Heater circuit control		Triac with zero-cross control			
	Sensor		Pt100 (class A)			
Safety devices	Controller		Self-diagnostic functions (temperature sensor failure detection, automatic overheat prevention)			
	Fuse		6.3 A, short-circuit protection, overcurrent protection			
	Others		Independent overheat prevention device			
Standards	External dimensions Diameter×Depth×Height		φ180 mm×235 mm×180 mm			
	Internal dimensions	Inner diameter	φ170 mm			
		Height	140 mm			
	Bath capacity	Recommended (no load)	Approx.1.7 L			
		Maximum (no load) *4	Approx.2.2 L			
	Controller unit Dimensions W×D×H (mm)		150 mm×90 mm×45 mm (protrusions not included)			
	Power supply (frequency)		Single phase 100 V AC（50/60 Hz）	Single phase 115 V AC（50/60 Hz）	Single phase 220 V AC（50 Hz）	Single phase 220 V AC（50/60 Hz）
	Rated current		5.0 A	4.5 A	2.5 A	2.5 A
	Weight	Bath reservoir・Heater unit	Approx.2.3kg			
		Single controller unit	Approx.0.5 kg			
		Total weight	Approx.2.8kg			
Accessories			Heater guard 1 pc, Arbor（φ12×90 mm）1 pc, PTFE stirrer bar 1 pc, Connector cap 1 pc, Identification sticker sheet 1 pc, Cable tie with tag 3 pc, Instruction Manual 1 copy			
			Warranty card 1 copy	*5	Warranty card 1 copy	*5

*1 Performance data based on 100 V AC supplied power, 23 °C room temperature, no process load, and use of TSF458-100 silicone oil and PTFE stirrer bar (included).
Temperature control accuracy varies depending on the types of silicone oil.
*2 Where room temperature (RT) is below 25 °C, the lowest control temperature is RT + 10 °C
*3 Maximum controllable temperature (240 °C) may not be reached if source voltage is below 100 V AC.
*4 The amount where the oil is at room temperature
If it exceeds, the oil may expand and overflow at the time of heating.
*5 A warranty card is included in some regions.

11. SPECIFICATIONS

Specifications（BOS100 Series）

Product Name			Stainless Steel Oil Bath			
Model			BOS100	BOS100-Y	BOS110-B	BOS110-Y
Operating ambient temperature range			5～35 °C			
Performance*1	Temperature setting range		0～260 °C			
	Temperature control range		RT +5 to 250 °C *2			
	Temperature control accuracy		±0.3 °C (at 200 °C, stirring)			
Configuration	Exterior		Chromium-free electrogalvanized steel sheet, baked-on finish			
	Bath reservoir		Stainless steel			
	Heater		Stainless steel tube heater			
	Heater capacity		310 W at100 V	310 W at115 V	310 W at220 V	
Controller	Temperature control system		PID control			
	Temperature setting and display systems		Digital setting with the ▲▼ keys (Res: 1 °C)			
	Operation Modes		Fixed temperature operation			
	Additional functions		Calibration offset Auto-resume function, LED brightness setting,			
	Heater circuit control		Triac with zero-cross control			
	Sensor		Pt100 (class A)			
Safety devices	Controller		Self-diagnostic functions (temperature sensor failure detection, automatic overheat prevention)			
	Fuse		6.3 A, short-circuit protection, overcurrent protection			
	Others		Independent overheat prevention device			
Standards	External dimensions Diameter×Depth×Height		φ155 mm×210 mm×140 mm			
	Internal dimensions	Inner diameter	φ140 mm			
		Height	100 mm			
	Bath capacity	Recommended (no load)	Approx.0.8 L			
		Maximum (no load) *3	Approx.1.0 L			
	Controller unit Dimensions W×D×H (mm)		150 mm×90 mm×45 mm (protrusions not included)			
	Power supply (frequency)		Single phase 100 V AC（50/60 Hz）	Single phase 115 V AC（50/60 Hz）	Single phase 220 V AC（50 Hz）	Single phase 220 V AC（50/60 Hz）
	Rated current		4.0 A	3.5 A	2.0 A	2.0 A
	Weight	Bath reservoir・Heater unit	Approx.2.5kg			
		Single controller unit	Approx.0.5 kg			
		Total weight	Approx.3.0 kg			
Accessories			Heater guard 1 pc, Arbor（φ12×90 mm）1 pc, PTFE stirrer bar 1 pc, Connector cap 1 pc, Identification sticker sheet 1 pc, Cable tie with tag 3 pc, Instruction Manual 1 copy			
			Warranty card 1 copy	*4	Warranty card 1 copy	*4

*1 Performance data based on 100 V AC supplied power, 23 °C room temperature, no process load, and use of TSF458-100 silicone oil and PTFE stirrer bar (included).
Temperature control accuracy varies depending on the types of silicone oil.
*2 Where room temperature (RT) is below 25 °C, the lowest control temperature is RT + 10 °C
*3 The amount where the oil is at room temperature
If it exceeds, the oil may expand and overflow at the time of heating.
*4 A warranty card is included in some regions.

11. SPECIFICATIONS

Specifications（BOS200 Series）

Product Name			Stainless Steel Oil Bath			
Model			BOS200	BOS200-Y	BOS210-B	BOS210-Y
Operating ambient temperature range			5～35 °C			
Performance*1	Temperature setting range		0～260 °C			
	Temperature control range		RT +5 to 250 °C *2			
	Temperature control accuracy		±0.3 °C (at 200 °C, stirring)			
Configuration	Exterior		Chromium-free electrogalvanized steel sheet, baked-on finish			
	Bath reservoir		Stainless steel			
	Heater		Stainless steel tube heater			
	Heater capacity		425 W at100 V	425 W at115 V	425 W at220 V	
Controller	Temperature control system		PID control			
	Temperature setting and display systems		Digital setting with the ▲▼ keys (Res: 1 °C)			
	Operation Modes		Fixed temperature operation			
	Additional functions		Calibration offset Auto-resume function, LED brightness setting,			
	Heater circuit control		Triac with zero-cross control			
	Sensor		Pt100 (class A)			
Safety devices	Controller		Self-diagnostic functions (temperature sensor failure detection, automatic overheat prevention)			
	Fuse		6.3 A, short-circuit protection, overcurrent protection			
	Others		Independent overheat prevention device			
Standards	External dimensions Diameter×Depth×Height		φ185 mm×240 mm×180 mm			
	Internal dimensions	Inner diameter	φ170 mm			
		Height	140 mm			
	Bath capacity	Recommended (no load)	Approx.1.7 L			
		Maximum (no load) *3	Approx.2.2 L			
	Controller unit Dimensions W×D×H (mm)		150 mm×90 mm×45 mm (protrusions not included)			
	Power supply (frequency)		Single phase 100 V AC（50/60 Hz）	Single phase 115 V AC（50/60 Hz）	Single phase 220 V AC（50 Hz）	Single phase 220 V AC（50/60 Hz）
	Rated current		5.0 A	4.5 A	2.5 A	2.5 A
	Weight	Bath reservoir・Heater unit	Approx.2.9 kg			
		Single controller unit	Approx.0.5 kg			
		Total weight	Approx.3.4 kg			
Accessories			Heater guard 1 pc, Arbor（φ12×90 mm）1 pc, PTFE stirrer bar 1 pc, Connector cap 1 pc, Identification sticker sheet 1 pc, Cable tie with tag 3 pc, Instruction Manual 1 copy			
			Warranty card 1 copy	*4	Warranty card 1 copy	*4

*1 Performance data based on 100 V AC supplied power, 23 °C room temperature, no process load, and use of TSF458-100 silicone oil and PTFE stirrer bar (included).
Temperature control accuracy varies depending on the types of silicone oil.
*2 Where room temperature (RT) is below 25 °C, the lowest control temperature is RT + 10 °C
*3 The amount where the oil is at room temperature
If it exceeds, the oil may expand and overflow at the time of heating.
*4 A warranty card is included in some regions.

11. SPECIFICATIONS

Specifications（BOG100T Series）

Product Name			Glass Oil Bath			
Model			BOG100T	BOG100T-Y	BOG110T-B	BOG110T-Y
Operating ambient temperature range			5～35 °C			
Performance*1	Temperature setting range		0～260 °C			
	Temperature control range		RT +5 to 240 °C *2,3			
	Temperature control accuracy		±0.3 °C (at 200 °C, stirring)			
Configuration	Exterior		Chromium-free electrogalvanized steel sheet, baked-on finish			
	Bath reservoir		Hard glass			
	Heater		Stainless steel tube heater			
	Heater capacity		310 W at100 V	310 W at115 V	310 W at220 V	
Controller	Temperature control system		PID control			
	Temperature setting and display systems		Digital setting with the ▲▼ keys (Res: 1 °C)			
	Operation Modes		Fixed temperature operation			
	Additional functions		Calibration offset Auto-resume function, LED brightness setting,			
	Heater circuit control		Triac with zero-cross control			
	Sensor		Pt100 (class A)			
Safety devices	Controller		Self-diagnostic functions (temperature sensor failure detection, automatic overheat prevention)			
	Fuse		6.3 A, short-circuit protection, overcurrent protection			
	Others		Independent overheat prevention device			
Standards *4	External dimensions Diameter×Depth×Height		φ150 mm×205 mm×140 mm			
	Internal dimensions	Inner diameter	φ140 mm			
		Height	100 mm			
	Bath capacity	Recommended (no load)	Approx.0.8 L			
		Maximum (no load) *5	Approx.1.0 L			
	Controller unit Dimensions W×D×H (mm)		420 mm×90 mm×45 mm (protrusions not included)			
	Power supply (frequency)		Single phase 100 V AC（50/60 Hz）	Single phase 115 V AC（50/60 Hz）	Single phase 220 V AC（50 Hz）	Single phase 220 V AC（50/60 Hz）
	Rated current		4.0 A	3.5 A	2.0 A	2.0 A
	Weight	Bath reservoir・Heater unit	Approx.1.8kg			
		Single controller unit	Approx.1.4 kg			
		Total weight	Approx.2.3kg			
Accessories			Heater guard 3 pc, Arbor（φ12×90 mm）3 pc,PTFE stirrer bar 3 pc, Connector cap 3 pc, Identification sticker sheet 1 pc, Cable tie with tag 3 pc, Instruction Manual 1 copy			
			Warranty card 1 copy	*6	Warranty card 1 copy	*6

*1 Performance data based on 100 V AC supplied power, 23 °C room temperature, no process load, and use of TSF458-100 silicone oil and PTFE stirrer bar (included).
Temperature control accuracy varies depending on the types of silicone oil.
*2 Where room temperature (RT) is below 25 °C, the lowest control temperature is RT + 10 °C
*3 Maximum controllable temperature (240 °C) may not be reached if source voltage is below 100 V AC.
*4 The heater capacity and standard are the values for one unit.
*5 The amount where the oil is at room temperature
If it exceeds, the oil may expand and overflow at the time of heating.
*6 A warranty card is included in some regions.

11. SPECIFICATIONS

Specifications（BOG200T Series）

Product Name			Glass Oil Bath			
Model			BOG200T	BOG200T-Y	BOG210T-B	BOG210T-Y
Operating ambient temperature range			5～35 °C			
Performance*1	Temperature setting range		0～260 °C			
	Temperature control range		RT +5 to 240 °C *2,3			
	Temperature control accuracy		±0.3 °C (at 200 °C, stirring)			
Configuration	Exterior		Chromium-free electrogalvanized steel sheet, baked-on finish			
	Bath reservoir		Hard glass			
	Heater		Stainless steel tube heater			
	Heater capacity		425 W at100 V	425 W at115 V	425 W at220 V	
Controller	Temperature control system		PID control			
	Temperature setting and display systems		Digital setting with the ▲▼ keys (Res: 1 °C)			
	Operation Modes		Fixed temperature operation			
	Additional functions		Calibration offset Auto-resume function, LED brightness setting,			
	Heater circuit control		Triac with zero-cross control			
	Sensor		Pt100 (class A)			
Safety devices	Controller		Self-diagnostic functions (temperature sensor failure detection, automatic overheat prevention)			
	Fuse		6.3 A, short-circuit protection, overcurrent protection			
	Others		Independent overheat prevention device			
Standards *4	External dimensions Diameter×Depth×Height		φ180 mm×235 mm×180 mm			
	Internal dimensions	Inner diameter	φ170 mm			
		Height	140 mm			
	Bath capacity	Recommended (no load)	Approx.1.7 L			
		Maximum (no load) *5	Approx.2.2 L			
	Controller unit Dimensions W×D×H (mm)		420 mm×90 mm×45 mm (protrusions not included)			
	Power supply (frequency)		Single phase 100 V AC（50/60 Hz）	Single phase 115 V AC（50/60 Hz）	Single phase 220 V AC（50 Hz）	Single phase 220 V AC（50/60 Hz）
	Rated current		5.0 A	4.5 A	2.5 A	2.5 A
	Weight	Bath reservoir・Heater unit	Approx.2.3 kg			
		Single controller unit	Approx.1.4 kg			
		Total weight	Approx.2.8 kg			
Accessories			Heater guard 3 pc, Arbor（φ12×90 mm）3 pc,PTFE stirrer bar 3 pc, Connector cap 3 pc, Identification sticker sheet 1 pc, Cable tie with tag 3 pc, Instruction Manual 1 copy			
			Warranty card 1 copy	*6	Warranty card 1 copy	*6

*1 Performance data based on 100 V AC supplied power, 23 °C room temperature, no process load, and use of TSF458-100 silicone oil and PTFE stirrer bar (included).
Temperature control accuracy varies depending on the types of silicone oil.
*2 Where room temperature (RT) is below 25 °C, the lowest control temperature is RT + 10 °C
*3 Maximum controllable temperature (240 °C) may not be reached if source voltage is below 100 V AC.
*4 The heater capacity and standard are the values for one unit.
*5 The amount where the oil is at room temperature
If it exceeds, the oil may expand and overflow at the time of heating.
*6 A warranty card is included in some regions.

11. SPECIFICATIONS

Specifications（BOS100T Series）

Product Name		Glass Oil Bath			
Model		BOG100T	BOG100T-Y	BOG110T-B	BOG110T-Y
Operating ambient temperature range		5～35 °C			
※1 Performance*1	Temperature setting range	0～260 °C			
	Temperature control range	RT +5 to 250 °C *2			
	Temperature control accuracy	±0.3 °C (at 200 °C, stirring)			
Configuration	Exterior	Chromium-free electrogalvanized steel sheet, baked-on finish			
	Bath reservoir	Hard glass			
	Heater	Stainless steel tube heater			
	Heater capacity	310 W at100 V	310 W at115 V	310 W at220 V	
Controller	Temperature control system	PID control			
	Temperature setting and display systems	Digital setting with the ▲▼ keys (Res: 1 °C)			
	Operation Modes	Fixed temperature operation			
	Additional functions	Calibration offset Auto-resume function, LED brightness setting,			
	Heater circuit control	Triac with zero-cross control			
	Sensor	Pt100 (class A)			
Safety devices	Controller	Self-diagnostic functions (temperature sensor failure detection, automatic overheat prevention)			
	Fuse	6.3 A, short-circuit protection, overcurrent protection			
	Others	Independent overheat prevention device			
Standards *3	External dimensions Diameter×Depth×Height	φ155 mm×210 mm×140 mm			
	Internal dimensions – Inner diameter	φ140 mm			
	Internal dimensions – Height	100 mm			
	Bath capacity – Recommended (no load)	Approx.0.8 L			
	Bath capacity – Maximum (no load) *4	Approx.1.0 L			
	Controller unit Dimensions W×D×H (mm)	420 mm×90 mm×45 mm (protrusions not included)			
	Power supply (frequency)	Single phase 100 V AC（50/60 Hz）	Single phase 115 V AC（50/60 Hz）	Single phase 220 V AC（50 Hz）	Single phase 220 V AC（50/60 Hz）
	Rated current	4.0 A	3.5 A	2.0 A	2.0 A
	Weight – Bath reservoir・Heater unit	Approx.2.5 kg			
	Weight – Single controller unit	Approx.1.4 kg			
	Weight – Total weight	Approx.3.0 kg			
Accessories		Heater guard 3 pc, Arbor（φ12×90 mm）3 pc,PTFE stirrer bar 3 pc, Connector cap 3 pc, Identification sticker sheet 1 pc, Cable tie with tag 3 pc, Instruction Manual 1 copy			
		Warranty card 1 copy	*5	Warranty card 1 copy	*5

*1 Performance data based on 100 V AC supplied power, 23 °C room temperature, no process load, and use of TSF458-100 silicone oil and PTFE stirrer bar (included).
Temperature control accuracy varies depending on the types of silicone oil.
*2 Where room temperature (RT) is below 25 °C, the lowest control temperature is RT + 10 °C
*3 The heater capacity and standard are the values for one unit.
*4 The amount where the oil is at room temperature
If it exceeds, the oil may expand and overflow at the time of heating.
*5 A warranty card is included in some regions.

11. SPECIFICATIONS

Specifications（BOS200T Series）

Product Name		Glass Oil Bath			
Model		BOG200T	BOG200T-Y	BOG210T-B	BOG210T-Y
Operating ambient temperature range		5～35 °C			
※ Performance*1	Temperature setting range	0～260 °C			
	Temperature control range	RT +5 to 250 °C *2			
	Temperature control accuracy	±0.3 °C (at 200 °C, stirring)			
Configuration	Exterior	Chromium-free electrogalvanized steel sheet, baked-on finish			
	Bath reservoir	Hard glass			
	Heater	Stainless steel tube heater			
	Heater capacity	425 W at100 V	425 W at115 V	425 W at220 V	
Controller	Temperature control system	PID control			
	Temperature setting and display systems	Digital setting with the ▲▼ keys (Res: 1 °C)			
	Operation Modes	Fixed temperature operation			
	Additional functions	Calibration offset Auto-resume function, LED brightness setting,			
	Heater circuit control	Triac with zero-cross control			
	Sensor	Pt100 (class A)			
Safety devices	Controller	Self-diagnostic functions (temperature sensor failure detection, automatic overheat prevention)			
	Fuse	6.3 A, short-circuit protection, overcurrent protection			
	Others	Independent overheat prevention device			
※ Standards*3	External dimensions Diameter×Depth×Height	φ185 mm×240 mm×180 mm			
	Internal dimensions – Inner diameter	φ170 mm			
	Internal dimensions – Height	140 mm			
	Bath capacity – Recommended (no load)	Approx.1.7 L			
	Bath capacity – Maximum (no load) *4	Approx.2.2 L			
	Controller unit Dimensions W×D×H (mm)	420 mm×90 mm×45 mm (protrusions not included)			
	Power supply (frequency)	Single phase 100 V AC（50/60 Hz）	Single phase 115 V AC（50/60 Hz）	Single phase 220 V AC（50 Hz）	Single phase 220 V AC（50/60 Hz）
	Rated current	5.0 A	4.5 A	2.5 A	2.5 A
	Weight – Bath reservoir・Heater unit	Approx.2.9 kg			
	Weight – Single controller unit	Approx.1.4 kg			
	Weight – Total weight	Approx.3.4 kg			
Accessories		Heater guard 3 pc, Arbor（φ12×90 mm）3 pc,PTFE stirrer bar 3 pc, Connector cap 3 pc, Identification sticker sheet 1 pc, Cable tie with tag 3 pc, Instruction Manual 1 copy			
		Warranty card 1 copy	*5	Warranty card 1 copy	*5

*1 Performance data based on 100 V AC supplied power, 23 °C room temperature, no process load, and use of TSF458-100 silicone oil and PTFE stirrer bar (included).
Temperature control accuracy varies depending on the types of silicone oil.
*2 Where room temperature (RT) is below 25 °C, the lowest control temperature is RT + 10 °C
*3 The heater capacity and standard are the values for one unit.
*4 The amount where the oil is at room temperature
If it exceeds, the oil may expand and overflow at the time of heating.
*5 A warranty card is included in some regions.

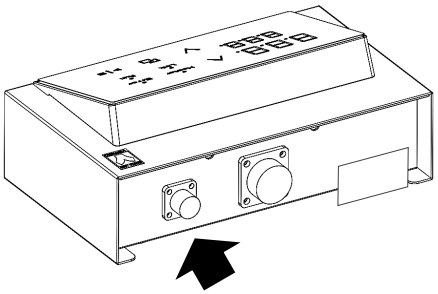
12. OPTIONAL ACCESSORIES

List of Options

Product Name	Product code	Description	Contents
External temperature sensor	222191	Temperature sensor (φ3 SST tube) which can be directly placed in the object to be heated. With this sensor connected and enabled, unit can control temperature based on the temperature of the object under heating.	Pt100 (class A) 1 pc
Controller mounting hardware	222192	Used for securing controller onto a pole or lab support. Applicable diameters: φ10-18 mm	Stainless steel hardware 2 pcs Knurled screw 3 pcs
Glass reservoir for BOG100-A	222193	Replacement glass reservoir for BOG100-A.	Glass reservoir (φ150) 1 pc
Glass reservoir for BOG200-A	222194	Replacement glass reservoir for BOG200-A.	Glass reservoir (φ180) 1 pc

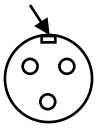
External temperature sensor

Connect External temperature sensor to the connection port of the controller shown in the right figure. Be sure to align the connectors. The connector is screw type. Fasten it to finger-tight.
Do not bend, forcibly twist or pull on the sensor, or do not screw it too tight by using any tools.



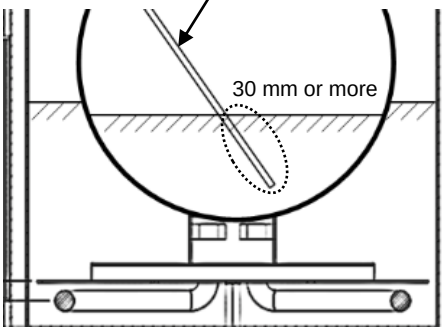
To enable External temperature sensor, change the controller setting after connection is made. See P.35 for details.

* Pay attention to the orientation of connectors



Enabling the external sensor allows additional safety functions; detection of External temperature sensor error, abnormal temperature difference, and abnormality in temperature rise will be added as self-diagnostic functions.
See P.51 for details.

External temperature sensor



Dip the sensor into the sample solution at least 30 mm from the tip. Failure to do so may cause the sensor to be unable to take correct sample temperature, hindering temperature control performance. Secure the sensor with a clamp so that it will not come out of sample solution during operation.

* Do not let External temperature sensor contact bath reservoir, or place it near heat-generating devices. Doing so may cause insulation to overheat, melt and/or catch fire, which may result in electric shock or fire.

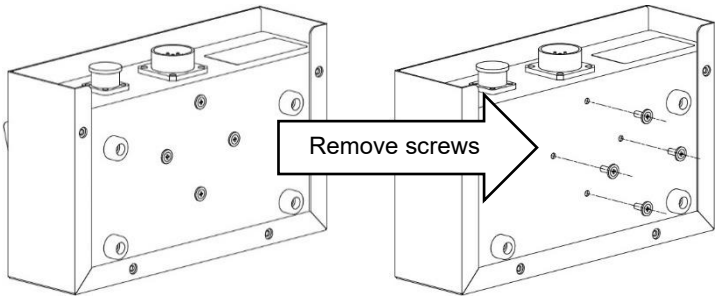
12. OPTIONAL ACCESSORIES

List of Options

Controller mounting hardware

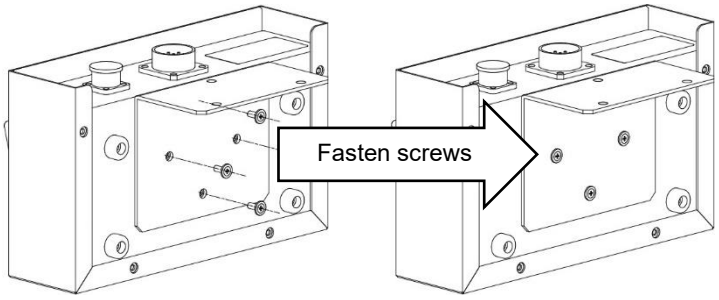
Install according to the following procedure.

① Remove four screws in the back of the controller.



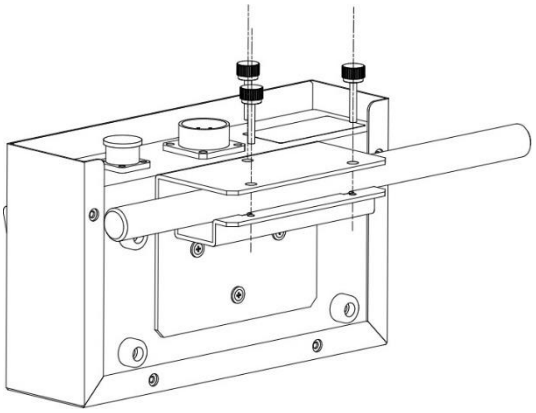
② Attach L-shaped mounting hardware with the removed screws as shown in the right figure.

Controller mounting hardware can be attached at every 90 degrees.



③ As shown in the right figure, position controller so that crossbar comes between L-shaped mounting hardware and U-shaped mounting hardware. Fix them together with supplied knurled screws at three points.

Fasten the knurled screws tightly by hand in order to prevent controller from falling off.



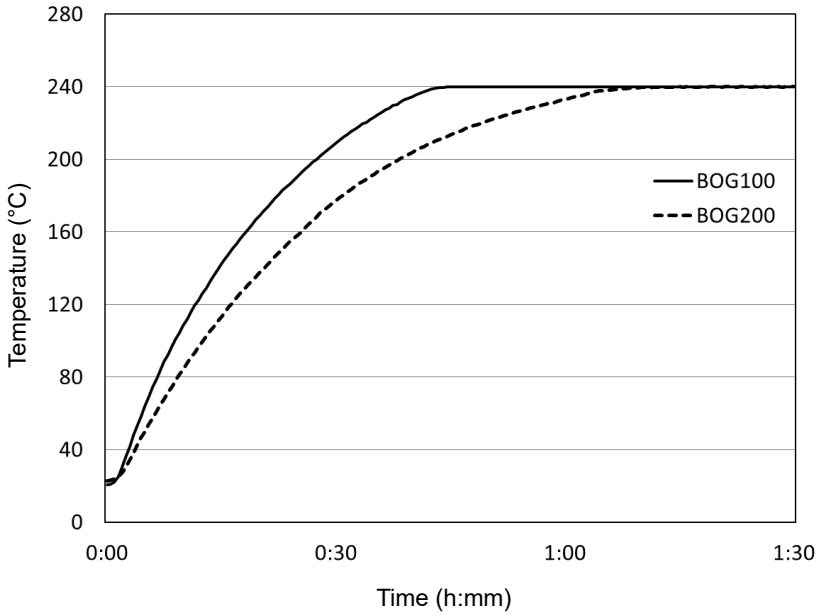
* Check the required number of controller mounting hardware.
Note that a set of mounting hardware is needed for Single controller, and two sets for Triple controller.

13. REFERENCE DATA

Temperature Rise Curve

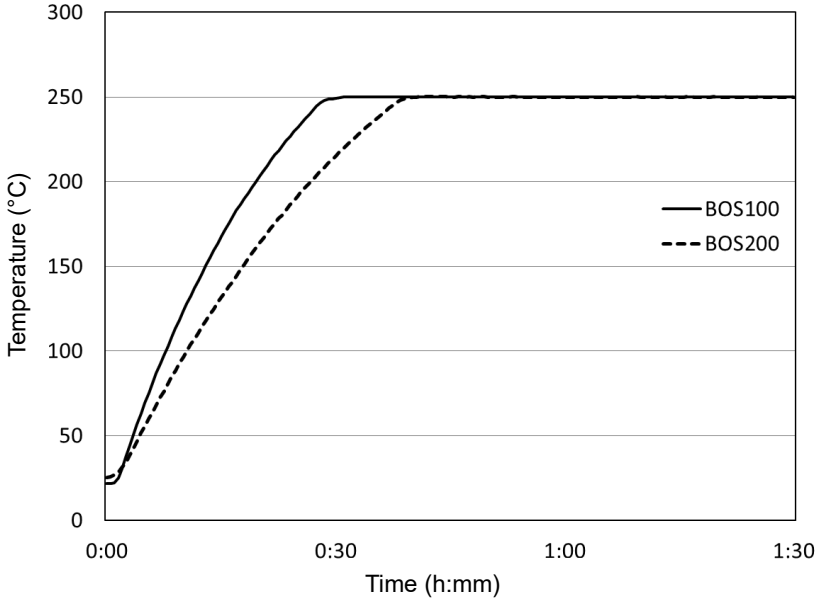
BOG100/200

Temperature setting: 240 °C
Ambient temperature: 23 °C
Power supply (frequency): 100 V AC (50 Hz)
Heating medium: silicone oil TSF458-100
Stirrer: magnetic stirrer
Rotation speed: 250 rpm
Stirrer bar: included PTFE stirrer bar



BOS100/200

Temperature setting: 250 °C
Ambient temperature: 23 °C
Power supply (frequency): 100 V AC (50 Hz)
Heating medium: silicone oil TSF458-100
Stirrer: magnetic stirrer
Rotation speed: 250 rpm
Stirrer bar: included PTFE stirrer bar

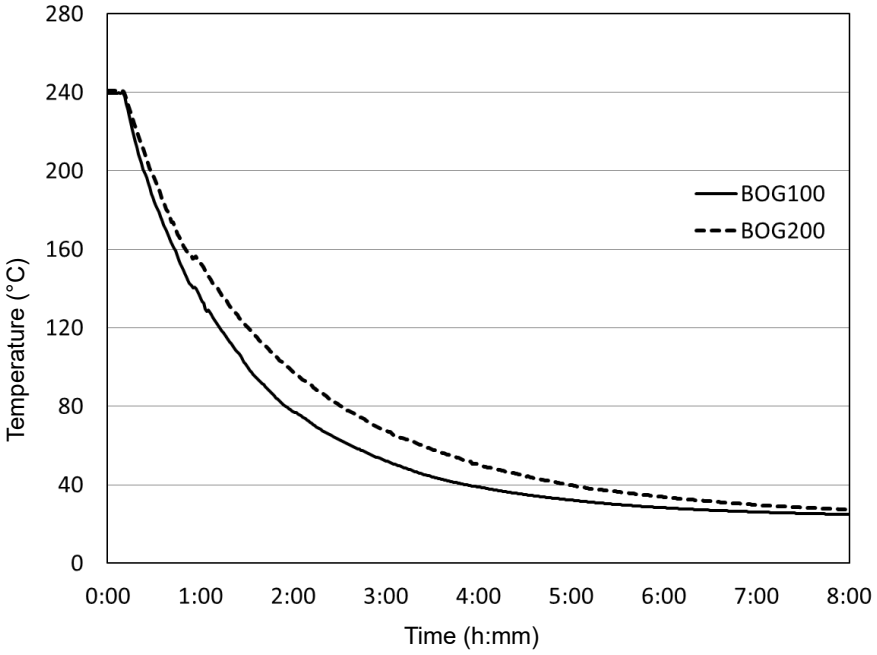


13. REFERENCE DATA

Temperature Fall Curve

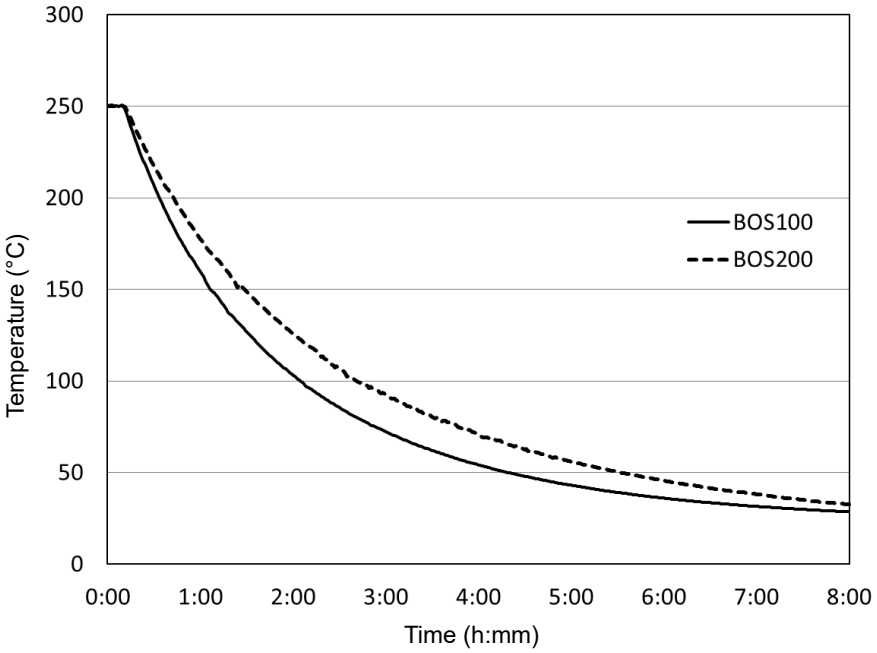
BOG100/200

Ambient temperature: 23 °C
Heating medium: silicone oil TSF458-100
Stirrer: magnetic stirrer
Rotation speed: 250 rpm
Stirrer bar: included PTFE stirrer bar



BOS100/200

Ambient temperature: 23 °C
Heating medium: silicone oil TSF458-100
Stirrer: magnetic stirrer
Rotation speed: 250 rpm
Stirrer bar: included PTFE stirrer bar

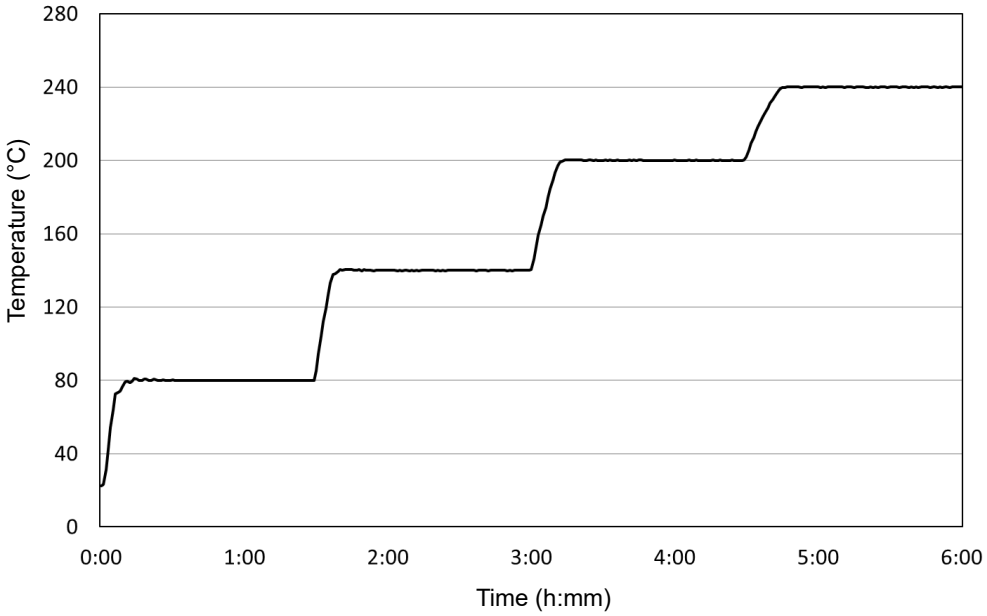


13. REFERENCE DATA

Step Chart

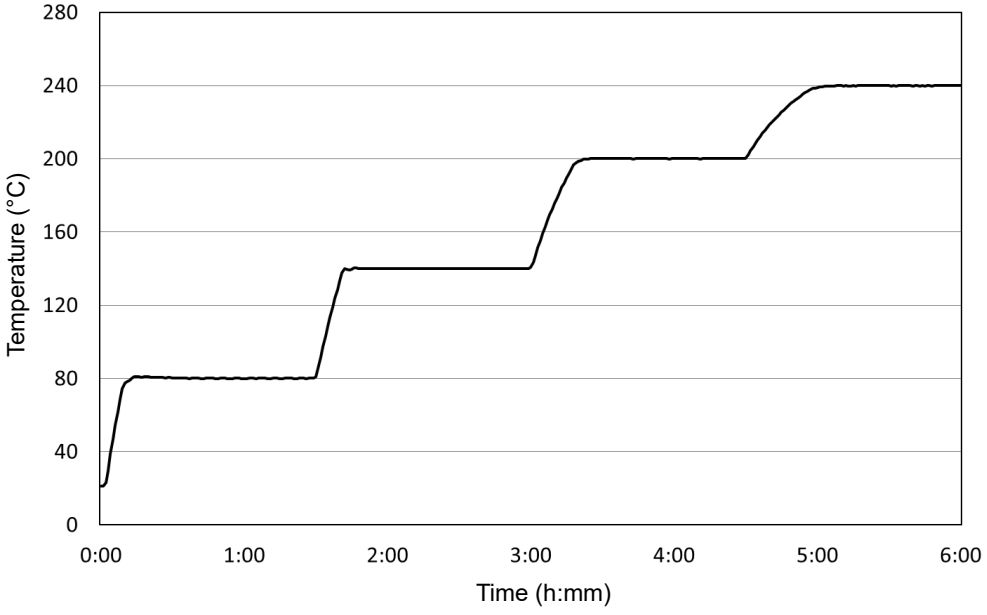
BOG100

Temperature setting: 80 → 140 → 200 → 240 °C
Ambient temperature: 23 °C
Power supply (frequency): 100 V AC (50 Hz)
Heating medium: silicone oil TSF458-100
Stirrer: magnetic stirrer
Rotation speed: 250 rpm
Stirrer bar: included PTFE stirrer bar



BOG200

Temperature setting: 80 → 140 → 200 → 240 °C
Ambient temperature: 23 °C
Power supply (frequency): 100 V AC (50 Hz)
Heating medium: silicone oil TSF458-100
Stirrer: magnetic stirrer
Rotation speed: 250 rpm
Stirrer bar: included PTFE stirrer bar

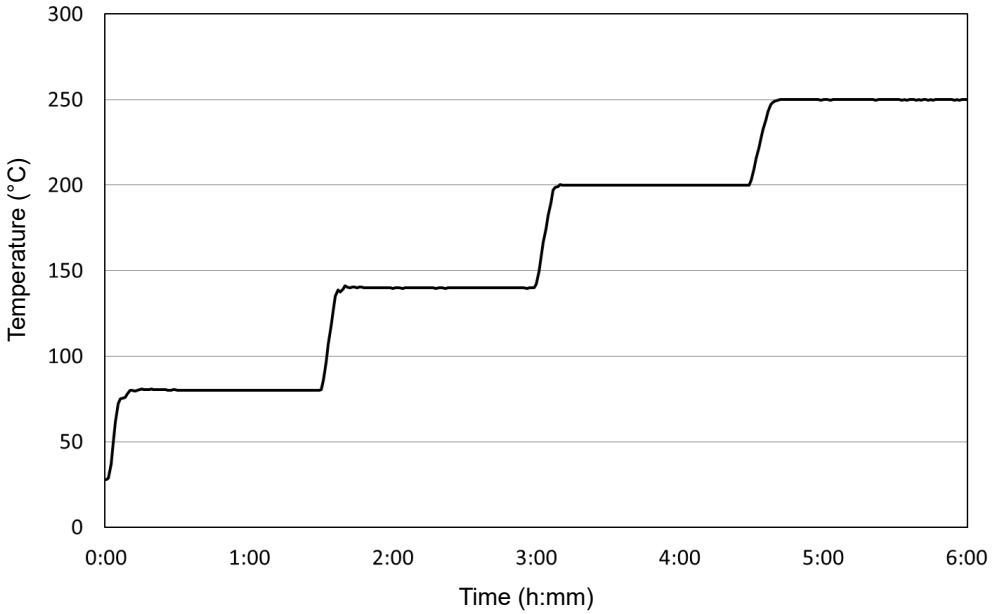


13. REFERENCE DATA

Step Chart

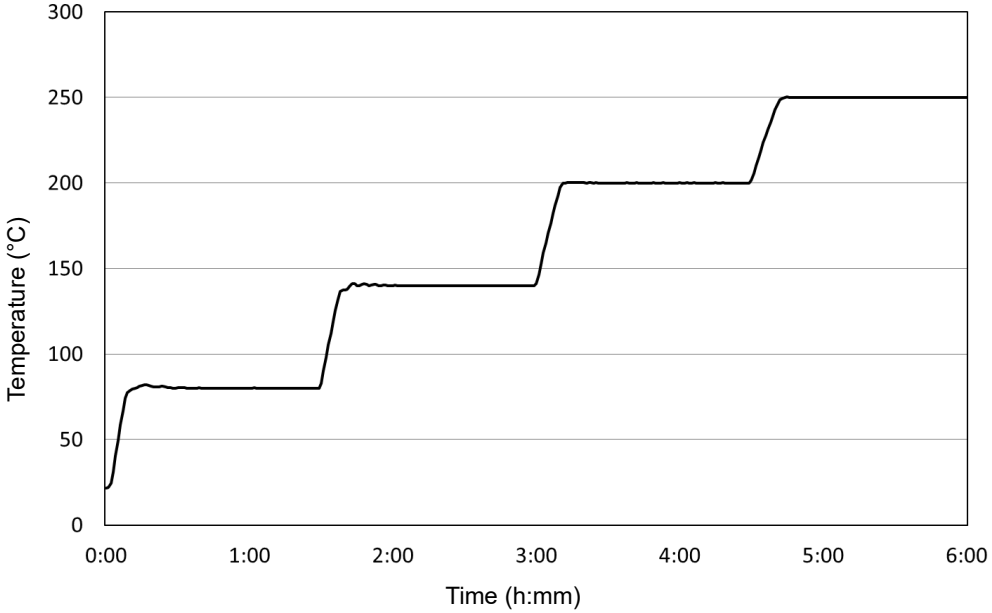
BOS100

Temperature setting: 80 → 140 → 200 → 250 °C
Ambient temperature: 23 °C
Power supply (frequency): 100 V AC (50 Hz)
Heating medium: silicone oil TSF458-100
Stirrer: magnetic stirrer
Rotation speed: 250 rpm
Stirrer bar: included PTFE stirrer bar



BOS200

Temperature setting: 80 → 140 → 200 → 250 °C
Ambient temperature: 23 °C
Power supply (frequency): 100 V AC (50 Hz)
Heating medium: silicone oil TSF458-100
Stirrer: magnetic stirrer
Rotation speed: 250 rpm
Stirrer bar: included PTFE stirrer bar

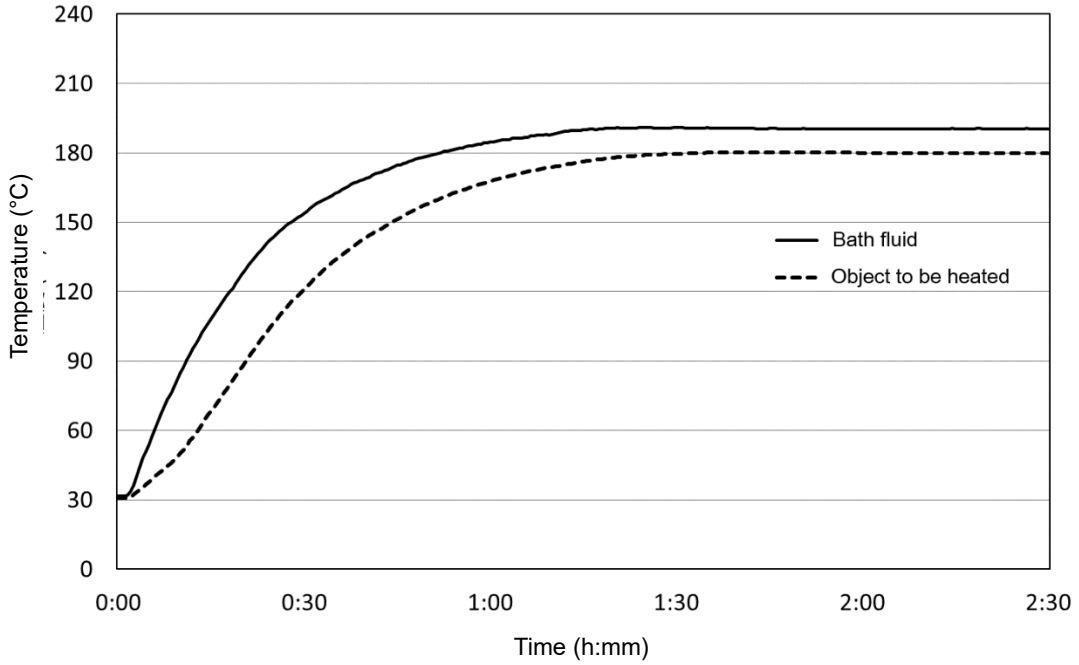


13. REFERENCE DATA

Temperature Rise Curve (with External Temperature Sensor Enabled)

BOG200

Temperature setting: 180 °C
Ambient temperature: 23 °C
Power supply (frequency): 100 V AC (50 Hz)
Object to be heated: Ethylene glycol 500 ml (99% concentration)
External temperature sensor: Pt100 (class A)
Heating medium: silicone oil TSF458-100
Stirrer: magnetic stirrer
Rotation speed: 250 rpm
Stirrer bar: included PTFE stirrer bar (for bath fluid)
Oval stirrer bar (for the object to be heated)
Glass container: three-neck flask 1 L

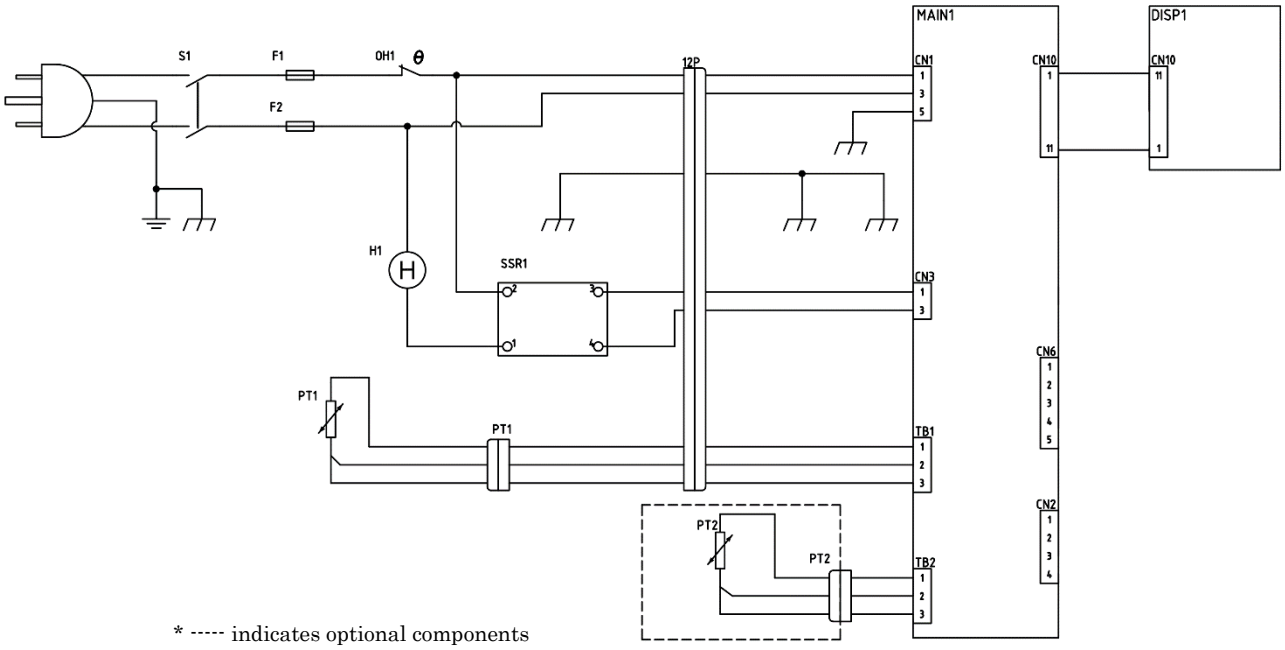


* Maximum attainable temperature and the time it requires differ by the operating conditions such as ambient temperature, supply voltage, and thermal load. Temperature control accuracy may vary depending on the types of the object to be heated.

14. WIRING DIAGRAM

Wiring Diagram

All models



* ----- indicates optional components

Wiring Diagram Symbol Glossary

Symbol	Component	Symbol	Component
S1	Power switch	F1, F2	Fuse
OH1	Independent overheat prevention device	H1	Heater
SSR1	Heater control relay	MAIN1	CPU board
PT1	Temperature sensor	DISP1	Display board

Options

Symbol	Component
PT2	External temperature sensor

15. LIST OF HAZARDOUS SUBSTANCES

	Never directly pour and heat explosives, flammables or any items which contain explosives or flammables in the bath reservoir. Exercise extreme caution when heating these substances using glassware immersing in silicone oil, and it must be done under strict supervision and control.

Explosive substances	①Nitroglycol, Glycerine trinitrate, Cellulose Nitrate and other explosive nitrate esters
	②Trinitrobenzen, Trinitrotoluene, Picric Acid and other explosive nitro compounds
	③Acetyl Hydroperoxide, Methyl Ethyl Ketone Peroxide, Benzoyl Peroxide and other organic peroxides
	④Metallic Azide, including Sodium Azide, etc.
Combustible substances	①Metal “Lithium” ②Metal “Potassium” ③Metal “Natrium” ④Yellow Phosphorus ⑤Phosphorus Sulfide ⑥Red Phosphorus ⑦Phosphorus Sulfide ⑧Celluloids, Calcium Carbide (a.k.a, Carbide) ⑨Lime Phosphide ⑩Magnesium Powder ⑪Aluminum Powder ⑫Metal Powder other than Magnesium and Aluminum Powder ⑬Sodium Dithionous Acid (a.k.a., Hydrosulphite)
Oxidizing substances	①Potassium Chlorate, Sodium Chlorate, Ammonium Chlorate, and other chlorates
	②Potassium Perchlorate, Sodium Perchlorate, Ammonium Perchlorate, and other perchlorates
	③Potassium Peroxide, Sodium Peroxide, Barium Peroxide, and other inorganic peroxides
	④Potassium Nitrate, Sodium Nitrate, Ammonium Nitrate, and other nitrates
	⑤Sodium Chlorite and other chlorites
	⑥Calcium Hypochlorite and other hypochlorites
Flammable substances	①Ethyl Ether, Gasoline, Acetaldehyde, Propylene Chloride, Carbon Disulfide, and other substances having ignition point of 30 or more degrees below zero.
	②n-hexane, Ethylene Oxide, Acetone, Benzene, Methyl Ethyl Ketone and other substances with ignition point between 30 degrees below zero and less than zero.
	③Methanol, Ethanol, Xylene, Pentyl n-acetate, (a.k.a. amyl n-acetate) and other substances having ignition point of between zero and less than 30 degrees.
	④Kerosene, Light Oil, Terebinth Oil, Isopenthyl Alcohol (a.k.a. Isoamyl Alcohol), Acetic Acid and other substances having ignition point of between 30 degrees and less than 65 degrees.
Combustible gas	Hydrogen, Acetylene, Ethylene, Methane, Ethane, Propane, Butane and other gases combustible at 15°C, ambient air pressure.

16. STANDARD INSTALLATION MANUAL

Install this equipment according to following format (check options and special specifications separately).

Model	Serial Number	Installation Date	Charged Personnel or Company Name for Installation	Installation proved by	Judgment

№	Item	Implementation method	Chapter No. & Reference page of instruction manual	Judgment
Specifications				
1	Accessories	Quantity check according to the accessories column	11 SPECIFICATIONS P. 55	
2	Installation	Visual check of surrounding conditions Caution: Pay attention to surrounding environment, ventilation, fire extinguisher, type of silicone oil and its amount	1. SAFETY PRECAUTIONS -Explanation of ... P.1-4 3. PRE-OPERATION PROCEDURES -Choose an appropriate... P.17-19	
Operation-related matters				
1	Power supply voltage	-Measure line voltage (facility outlet) with a tester. -Measure line voltage during operation (must meet required voltage).	11. SPECIFICATIONS P. 55	
2	Confirmation on operation	-Explain name and function of each component. -Perform operation set temperature: 50 °C * Check that the bath reservoir is filled with sufficient amount of silicone oil	2. COMPONENT NAMES AND FUNCTIONS P.8-16 5. OPERATION PROCEDURES -Operation Procedure P.30	
Description				
1	Operational descriptions	Explain operations of each component and handling precautions according to instruction manual.	4. PRE-OPERATIVE PREPARATIONS -Operation Preparations P.26-28 5. OPERATION PROCEDURES P.30-45 6. HANDLING PRECAUTIONS -WARNING P.46 -CAUTION P.47 13. LIST OF HAZARDOUS SUBSTANCES P.70	
2	Error Codes	Explain about error codes and procedures for reset according to instruction manual.	9. TROUBLESHOOTING -Error Codes P.50-52 -Troubleshooting Guide P.53	
3	Maintenance and Inspection	Explain about maintenance of equipment and each component according to instruction manual.	6. MAINTENANCE PROCEDURES -Inspection and Maintenance P.48 8. EXTENDED STORAGE AND DISPOSAL -Extended storage P.49	
4	Completion of installation Matters to be Stated	- Enter the date of installation and name of the charged personnel in the main unit nameplate. - Write necessary information on warranty card and hand it over to customer - Explain how to contact with service personnel	9. SERVICE & REPAIR -Requests for Repair P.54	

17. CONTACT DATAILS

1）Japan
Customer service center Free call 0120-405-525. Inquiry from a mobile phone: 0570-064-525 FAX：055-284-5210 Reception hours: 9:00-17:30. (Service also available for 12:00-13:00) **http://www.yamato-net.co.jp**
2）USA・Canada・Latin America
Yamato Scientific America Inc. 925 Walsh Avenue, Santa Clara,CA 95050, U.S.A http://www.yamato-usa.com Toll Free: 1-800-2-YAMATO (1-800-292-6286)
3）Other Country
For repair service, maintenance service and consumables purchase support, please contact to our distributors from whom you purchased. Or please visit to our customer support website at https://www.yamato-scientific.com/support/inquiry/
4）中国
雅马拓科技贸易（上海）有限公司 上海市徐汇区桂箐路 65 号新研大厦 B 座 1001-1002 室 Tel: 021-6443-5319 Fax: 021-5452-0268 URL: http://www.yamato-china.cn

Limited Liability

Always operate equipment in strict compliance to the handling and operation procedures set forth by this instruction manual.
Yamato Scientific Co., Ltd. assumes no responsibility for malfunction, damage, injury or death, resulting from negligent equipment use.
Never attempt to disassemble, repair or perform any procedure on BOG/BOS units which are not expressly mandated by this manual. Doing so may result in equipment malfunction, serious personal injury or death.

Notice

- **Instruction manual descriptions and specifications are subject to change without notice.**
- **Yamato Scientific Co., Ltd. will replace flawed instruction manuals (pages missing, pages out of order, etc.) upon request.**

Instruction Manual
Glass Oil Bath
BOG100/100T/200/200T Series
Stainless Steel Oil Bath
BOS100/100T/200/200T Series
Second Edition: September 12, 2019
Revised: