HEC-OM-O018-A
June 2012

Operation Manual

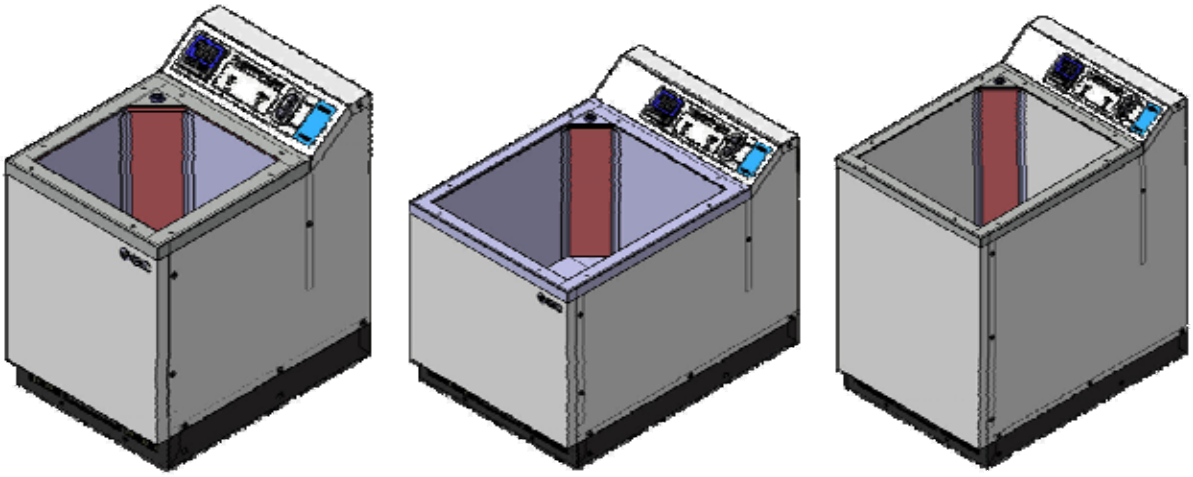
Thermo Electric Bath

Model No. INR-244-733 INR-244-734 INR-244-748

INR-244-736 INR-244-746 INR-244-749

INR-244-745

INR-244-747



Keep this manual available whenever necessary.

To the customers

Thank you for purchasing our Thermo Electric Bath (hereinafter called “product”).SMC always strives to provide the highest quality high-performance temperature control devices to our customers by utilizing our original technology.
For the long-term and safe use of this product, be sure to read and understand this Operating Manual (hereinafter called “this manual”) thoroughly before use. Also, keep this manual available whenever necessary.

1) When the product is received, check the contents of the package immediately.

Packaging content

	Item	Qty.
1	Thermo Electric Bath	1 pc
2	Operation Manual	1 pc

2) Observe the warnings and precautions defined in this manual.
3) This manual provides explanations of the installation and operation of this product. Only those who have a thorough understanding of the operating procedures and who have basic knowledge and skills in handling industrial equipment are qualified to perform installation and operation.
4) The contents of this manual and the related documents supplied with this product shall be neither regarded as a provision of the contract nor utilized to correct or modify the existing agreements, commitments and relations.
5) Copying, duplicating or transferring any part or the entirety of this manual without the prior permission of SMC is strictly prohibited.
6) The product is designed for use of industrial applications and research facilities of science. When it is used for applications that require the consideration additional safety precautions, e.g., for medical devices, investigate the safety needs for the application at the customer’s site before use.

Note: The contents of this manual are subject to change without notice.

<Contact>
If you have any questions or are unclear about any of the content of this manual, please contact the following department.

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Table of Contents

Chapter 1 Safety Instructions

Be sure to thoroughly read and understand the important precautions defined in this manual before using this product.

1.1 Dangers, Warnings, and Cautions Used in This Manual

1.1.1 Hazard Levels

These safety instructions are intended to prevent hazardous situations and/or equipment damage.
These instructions indicate the level of potential hazard with the labels of “Caution,” “Warning” or “Danger.”
They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)*1), and other safety regulations.

*1) IEC 60204-1: Safety of machinery -- Electrical equipment of machines (Part 1: General requirements)
ISO 10218-1: Manipulating industrial robots -Safety.
etc.

⚠ DANGER

"DANGER" denotes that there is an imminent hazard which, if not avoided, will cause death or serious injury during operation.

⚠ WARNING

"WARNING" indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

⚠ CAUTION

"CAUTION" indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

CAUTION

"CAUTION" without an exclamation point denotes that there is a hazard which, if not avoided, may cause damage to or the failure of the system, facility, or devices.

[Tips]

Tips are provided when there is information and content that personnel are required to be aware of and refer to for product operation and maintenance of this product.

1.1.2 Definitions of “Serious injury” and “Minor injury”

- **“Serious injury”**

  This term describes injuries such as the loss of eyesight, wounds, burns, frostbite, electric shock, fractures, and toxicity that leave aftereffects, and/or injury requiring hospitalization and/or a prolonged stay in a hospital.

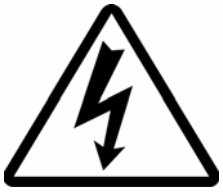
- **“Minor injury”**

  This term describes injuries that do not require hospitalization or a prolonged stay in a hospital (injuries other than the “serious injuries” described above).

1.1.3 Symbols

This manual provides the following symbols in addition to “Danger”, “Warning”, and “Caution” to present warning details in an easy-to-understand manner.

- **Symbol of electrical hazard**



This symbol warns you of potential electrical shock.

- **Symbol of heat hazard**

This symbol warns you of potential burns.

- **Symbol of low temperature hazard**

This symbol warns you of potential frostbite.

■ Symbol for corrosion

This symbol warns of chemical corrosion. When handling chemical fluids, read the MSDS carefully and use appropriate protective equipment.

■ Symbol for inhalation

This symbol warns of chemical inhalation. When handling chemical fluids, read the MSDS carefully and use appropriate protective equipment.

■ “Don’t” Symbol

This symbol denotes actions which you must not perform in the operation of this product.

■ “Do” Symbol

This symbol denotes actions which you must perform and items you must observe in the operation of this product.

1.2 Hazard Warning Labels

Hazard warning labels are applied to the sections of this system in which potential hazards are present during system operation and maintenance.

Hazard warning labels are presented in sizes and colors that will get the attention of the worker. They contain symbols in addition to the descriptions of warnings.

⚠ CAUTION

- **Do not peel off or deface the Warning label and Caution label.**

⚠ CAUTION

- **Confirm the location of the Warning label and Caution label.**
- **Read the contents of the Warning label and Caution label carefully and keep them in mind.**
- **Users are NOT allowed to change the location of the Warning label and Caution label. If replacing a peeled off or worn out label, affix the new label to exactly the same location as the replaced label.**

1.2.1 Content of label

Table 1-1 Content of Caution label

Symbol	Meaning
	Attention, consider accompanying documents.
	Caution, risk of electric shock.
	Caution, handling of heavy object may affect human body. It should be handled by two or more workers.

1.2.2 Location of hazard warning label

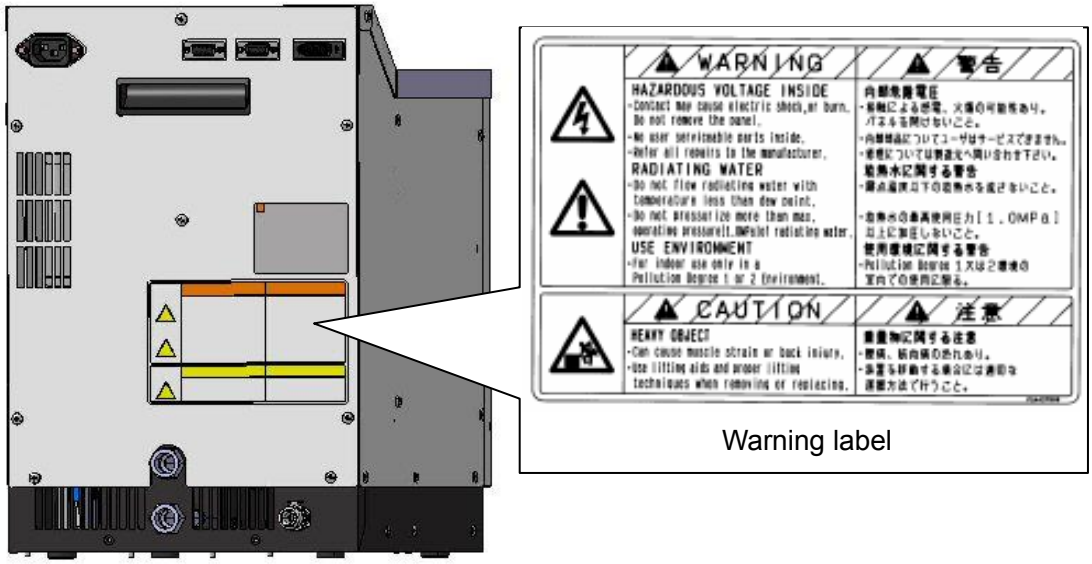


Fig. 1-1 Location of hazard warning label.

1.3 Location of Model Label

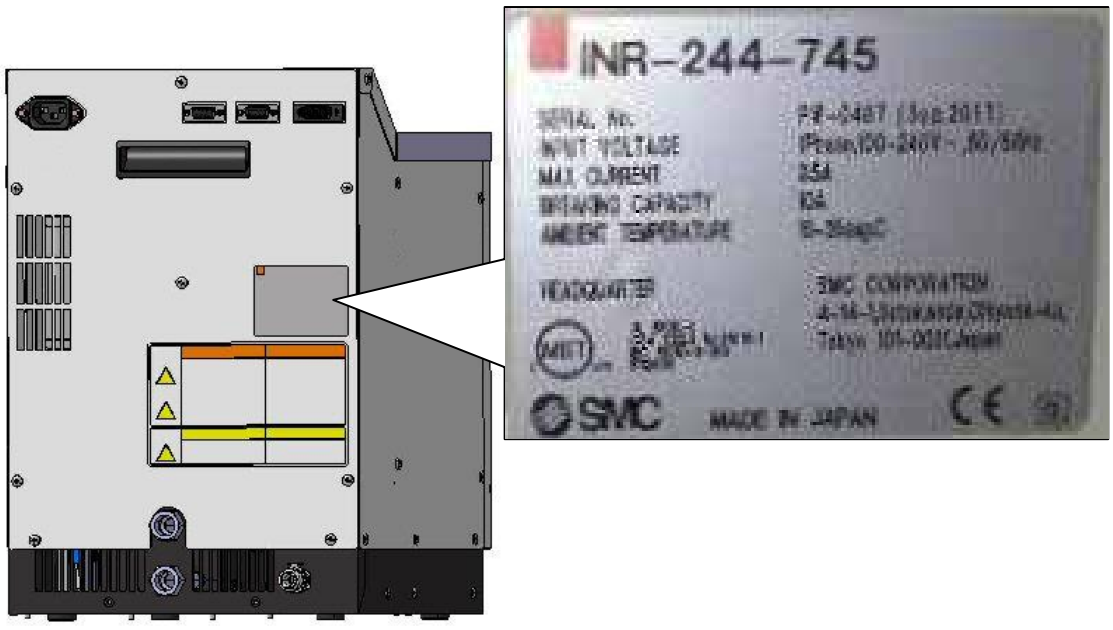


Fig. 1-2 Location of Model Label

1.4 Safety Measures

1.4.1 Precautions

This product is designed with consideration for safety. However, misuse may result in electrical shock or other accidents.

⚠ WARNING

- **The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.**
  Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results.
  The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product.
  This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.
- **Be sure that you understand how the chemical fluids use in this product affect the human body. Follow the MSDS when handling chemical fluids.**
- **Read the precautions described in this manual carefully and keep them strictly.**
- **Stop operation immediately after any abnormal occurrence.**
  If an abnormality (noise, odor, smoke, water leakage, etc.) occurs, stop this product (cutoff the power supply).

Abnormal noise, odor, smoke or water leakage occurs; → **1) Cutoff power supply**
2) Request repair

⚠ WARNING

- **Do not disassemble or retrofit this product.**
  The internal parts of this product cannot be retrofitted by the user. Contact the sales distributor or branch for all repairs. The user must not perform any repairs. A product repaired by the user cannot be guaranteed and carries the danger of causing electrical shock and other accidents.

⚠ CAUTION

- **The product is provided for use in manufacturing industries.**
  The product herein described is basically provided for peaceful use in manufacturing industries.
  If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.
  If anything is unclear, contact your nearest sales branch.

CAUTION

- **Keep within the margin of safety in relation to cooling and heating capacity.**
- **When restarting the power supply, wait 3 sec or more after the indications on the display light off.**

1.4.2 Protective Equipment

⚠ CAUTION

- **Wear protective equipment in order to maintain safety when installing and/or handling the product.**
  When handling chemicals for the product especially, note the contents of the MSDS and wear protective goggles, gloves, and a mask.
- **Touching the bath liquid and inner surface of the liquid bath may cause burns or frostbite depending on the temperature set for this product. Be sure to use heat (cold) resistant gloves when handling this product.**

Protective goggles | Mask | Gloves | Safety shoes

Fig. 1-3 Protective equipment

1.4.3 Long-term Storage

⚠ CAUTION

- **Turn OFF main power switch and remove all cables and piping from the product.**
- **Completely empty the bath liquid from the liquid bath. Also, do not allow foreign matter to enter the inside of the bath.**
- **Drain facility water from the facility water connection.**

1.4.4 Disposing of Product

When disposing of this product, be sure to use an industrial waste processing vendor that conforms to the “Law concerning disposal of waste and cleaning” and the “Ordinance defined by each municipal corporation”. Dispose of the Bath liquid in the manner described in the MSDS.

1.5 Safety Interlocks

For safe use, this product has the following interlocks.

*Before reset interlocks, be sure to search and remove cause of interlocks.

Table 1-2 Safety Interlocks List

No.	Content	Installation part	Status of product after interlock works	How to reset*
1	Over current	Main power switch (Circuit protector)	Cut of all AC power.	Turn OFF Main power switch once. Then, Turn ON Main power switch again. (Restart the product)
2	Overheat of heat exchanger	Bath liquid side of the heat exchanger	Temperature control is stopped. ALARM LED (red) lights up.	
3		Facility water side of the heat exchanger		

Chapter 2 Description and Function of Each Part

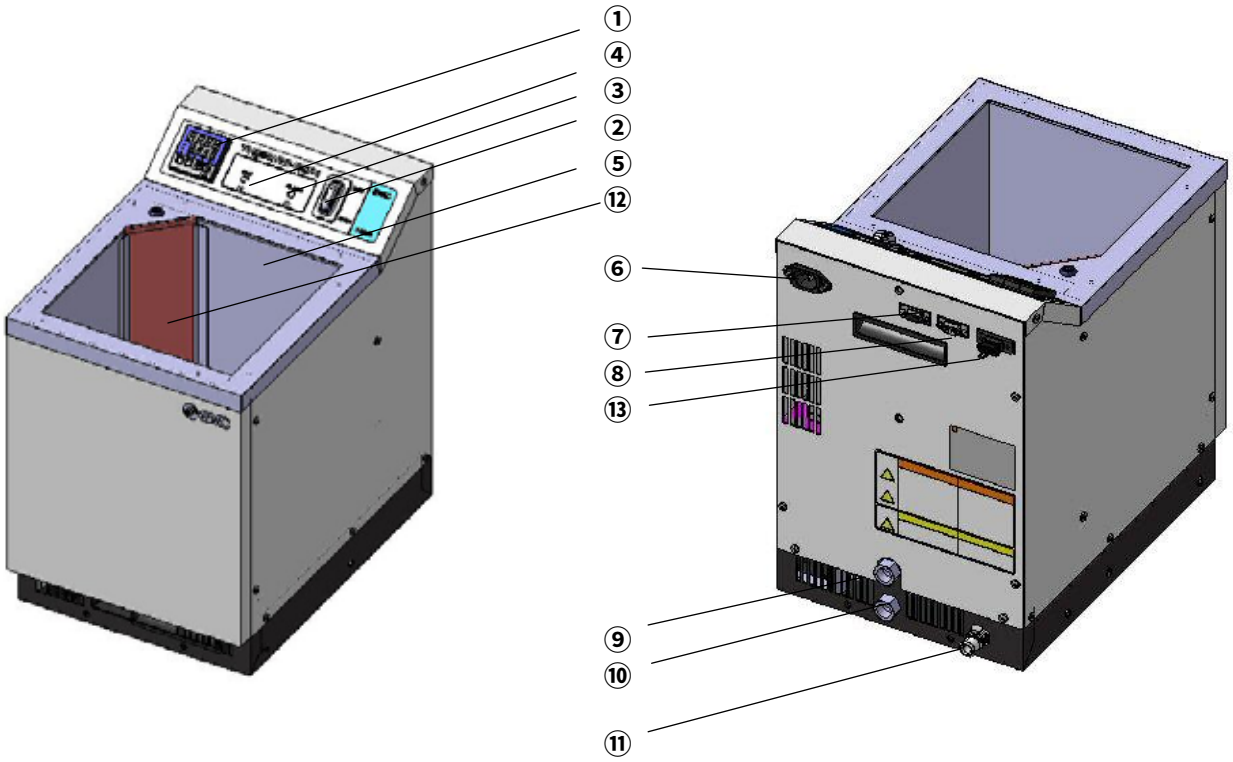


Fig. 2 Thermo Electric Bath

Table 2 Thermo Electric Bath

No.	Description	Function
①	Contoroller	Various displays are shown and settings are input.
②	Main power switch (Circuit protector)	Main power ON/OFF of product.
③	ALARM LED（Red）	Lights up when an alarm occurred. For details, refer to page 5-14 “5.2.1 Content of Alarms”, Table5-3.
④	RUN LED（Green）	Lights up while the product is running.
⑤	Bath	Vessel to store the bath liquid.
⑥	Power supply connector (AC)	IEC 60320 C14 connector.
⑦	Communication connector (COMMUNICATION)	Connector for RS-485(-733/-734/-736/-748) or RS-232C(-745/-746/-747/-749) serial communication.
⑧	Alarm output connector (ALARM)	Connector for contact signals for alarms. For details, refer to page5-14 Content of Alarms”, Table5-3.
⑨	Facility Water outlet port	Facility water outlet port, connection size is Rc3/8.
⑩	Facility Water inlet port	Facility Water inlet port, connection size is Rc3/8.
⑪	Drain port	CPC coupling PLCD 16004
⑫	Strainer	Prevents clogging the pump suction port.
⑬	Level switch connector	Use to connect level switch (Option)

Chapter 3 Transporting and Installation

3.1 Transporting

⚠ WARNING

- **Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**
  1. The inspection and maintenance of machinery/equipment should only be performed after measures to runaway of the driven objects have been confirmed.
  2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
  3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.
- **Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**
  1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
  2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping,vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.
  3. An application which could have negative effects on people, property, or animals requiring special safety analysis.

⚠ CAUTION

- **Proper procedure must be followed when using this product. Exercise caution to assure personal safety during the installation, transporting operation, maintenance, and inspection of the system.**
- **Only personnel with appropriate training should operate machinery and equipment.**
  The product specified here may become unsafe if handled incorrectly.
  The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.
- **Be sure to transport using a packaging box specific to this product.**

CAUTION

- **Avoid strong vibrations and impacts**
  This product is precision equipment and must not be subject to strong vibration and impact during transport.

3.2 Installation

3.2.1 Installation Conditions

⚠ CAUTION

- **Keep enough open space to access main power switch and any cable connections.**
- **Keep enough ventilation for liquid vapor.**
- **This product should be installed on a vibration-free stable level place.**
- **The mounting orientation of this product is horizontal.**
- **Place the product in a flat area which can handle its weight and take measures to prevent the tipping of the product. If installed improperly, the product might leak liquid or topple, resulting in injury.**

⚠ CAUTION

- **Do not use this product in the following environments, where the product may not work normally and may be damaged.**

- Outdoor
- Altitude higher than 2000m.
- Environments containing splashing water, salt water, oil, or various chemicals (including chemical mists).
- Environments containing particles and dust.
- Environments containing corrosive gas, solvents and flammable gas.
- Envirnoments containing direct sunlight and radiant heat.
- Environments having ambient temperatures over the following range:

  Operation 10 to 35°C

  Storage 0 to 50°C (with no liquid in the bath and facility water circuit.)

- Environments having ambient humidity over the following range:

  Operation 35 to 80%

  Storage 35 to 85%

- Environments with sharp temperature changes.
- Environments generating strong magnetic noise (having a strong electric or magnetic field that generates surges).
- Environments generating electrical static discharge and conditions in which static electricity is applied to this product.
- Environments generating strong high frequency radiation (including radio frequency appliances such as mobile phones and tranceivers).
- Environments generating strong vibrations and impacts.
- Environments that may be damaged by lightning.
- Environments in which forces or gravity may deform the body of the product.
- Environments containing harmful gases such as silicone.
- Locating the cables of the product near the power lines of other machines.
- Conditions in which insufficient grounding for the power supply is provided
- Conditions that cause dew condensation (this may occur on the surface of the piping when the Facility Water temperature is low).
- Places not allowing a space of 50mm or more at the air inlet of the Surroundings of product and thus causing the sucking of exhausted heat from the air inlet.
- Places preventing the horizontal set-up of the product.

3.2.2 Installation in Clean Room

This product uses a fan and generates dust. When it is set up and operated in a clean room, take appropriate preliminary measures for dust.

3.2.3 Pollution Degree

The pollution degree is a classification from 1 to 4 degrees depending on the pollution present in the air. This product is suitable for environments with a pollution degree of 1 or 2.

Table 3-1 Pollution degree classification

Degree 1	There is no pollution or only dry and nonconductive pollution occurs. An example of an environment of this degree is a clean room or a place using an air cleaner.
Degree 2	Normally, only nonconductive pollution occurs. The pollution may become conductive temporarily because of dew condensation. An example of an environment of this degree is a place where electric equipment can operate normally, such as a working office or a control panel.
Degree 3	Conductive pollution or dry and nonconductive pollution which can become conductive when dew condensation occurs. An example of an environment of this degree is a factory.
Degree 4	Conductive pollution that holds its conductivity due to conductive dust, rain or snow. An example of an environment of this degree is the outdoors.

CAUTION

- **This product can be used in environments with pollution degree 1 or 2.**

3.2.4 Installation of Brackets

- If tie-down needed, please use the M4 screws which are located in the front and back of this product. The screw must not enter by 30mm or more in the product.
- Refer to page7-1 “Outline Dimensions”.

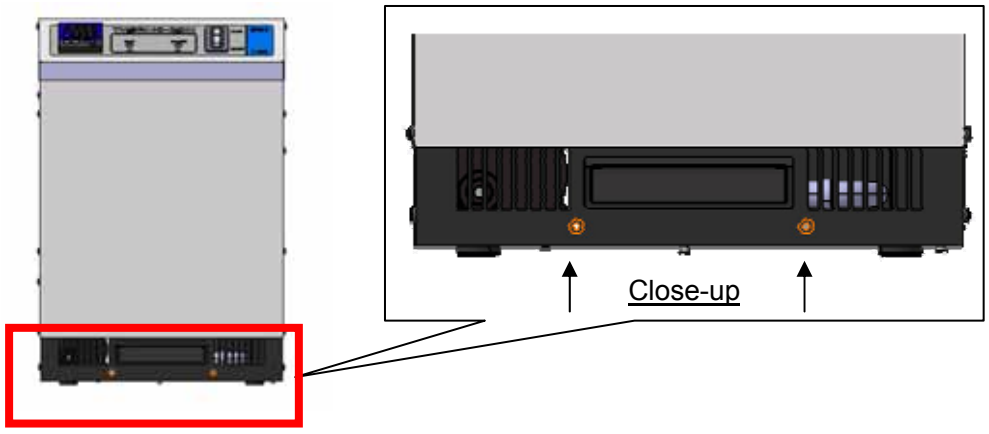
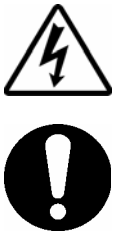


Fig. 3-1 Screws for tie-down

3.3 Wiring

⚠ WARNING



- **Only qualified personal are allowed to install wiring.**
- **Be sure to turn OFF the power prior to wiring to assure safety. Do not do any wiring when the system is energized.**
- **The system wiring requires not only a through connection with the designated cable but also securing to prevent loose connection. Poor connection and securing may cause electric shock, heat spots, fire, or communication errors.**
- **Be sure to supply the power to this product according to the specification.**
- **Always establish a connection to a ground for safety.**
- **Be sure that no ground connection is made to a water pipe, gas pipe and lighting rod.**

⚠ WARNING

- **Be sure to provide protective ground. IEC protection class of the product is class I. Be sure to provide protective ground (ground resistance of 100Ω or less). Grounding can be provided via the PE line of the power supply cable. For details of the power supply cable, refer to page 3-5, Power Supply Cable and Connector**
- **Do not use the same ground being used by equipment that generates strong electrical magnetic noise or high frequencies**

3.3.1 Power Sourse Specification

Confirm that the power supply at your workplace has sufficient capacity and a voltage within that specified. It is recommended to install ground-fault circuit interrupter. Rated leakage current:30mA or less.

Table 3-2 Electrical specifications of power supply

Model Number	Voltage	Rated Current
INR-244-733/-745	Single Phase 100VAC~240VAC+/-10% (Over Voltage Category I or II)	3.5A(at 100VAC)~1.5A (at 240VAC)
INR-244-734/-736/-746/ -747/-748/-749		5.5A(at 100VAC)~2.5A (at 240VAC)

3.3.2 Power Supply Cable and Connector

The power cable and connecter are to be prepared under your responsibility, referring to the following table.

■ Power supply Cable

Table 3-3 Power Supply Cable and Connector

Cable and Connector	Types (for your system)
Cable	3 wires, thicker than 14AWG, includes ground.
Power Supply Connector	IEC60320 C-13 equivalent 10A cable mount female connector

■ Power supply connector

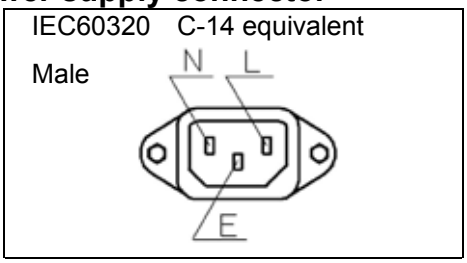


Fig. 3-2 Power supply connector

Table 3-4 Power supply connector

Pin	ITEMS
L	100 ~ 240VAC
N	100 ~ 240VAC (N)
E	PE

3.3.3 Connector for External Equipment

The alarm output and communication cables are to be prepared under your responsibility, referring to the following table.

■ Alarm output connector

D-SUB 9pin (male)
Fixed screw M2.6

Table 3-5 Alarm output connector

Pin no.	Content
1	Temp. High/Low Temp. Alarm contact (opened for alarm)
2	Temp. High/Low Temp. Alarm common
3-4	Unused
5	Output cutoff alarm contact (opened for alarm)
6	Output cutoff alarm common
7-9	Unused

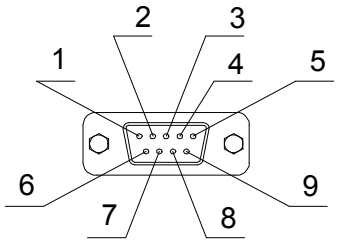


Fig. 3-3 Alarm output connector

Table3-5-2 Relay contact for alarm output connector

Item	Specification
Output type	Relay contact output: Opened when an alarm occurs.
Contact rating	30VDC,2A (resistive load) 30VDC,1A (inductive load)
Minimum load	5VDC,10mA
Mechanical life	5 million cycles or more
Electrical life	0.2 million cycles or more

■ Communication connector

D-SUB 9pin (female)
Fixed screw M2.6

Table 3-6 Communication connector

Pin no.	Content	
	INR-244-733/-734/ -736/-748	**INR-244-745/-746/ -747/-749**
1	RS-485 T/R(A)	Unused
2	RS-485 T/R(B)	RS-232C RxD
3	Unused	RS-232C TxD
4	Unused	Unused
5	Unused	RS-232C GND
6-9	Unused	Unused

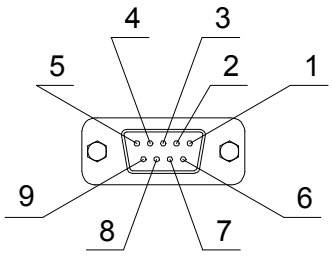


Fig. 3-4 Communication connector

3.3.4 Procedures for wiring instllation

⚠ WARNING

- **Be sure to turn OFF the primary side (your tool side) power before connection to this equipment.**

- Be sure to turn OFF the primary side power.
- Turn OFF Main power switch of the product.
- Connect the connector of power cable with Power Supply Connector firmly.
- Connect the connector of communication cable with Communication Connector. (If you need)
- Connect the connector of alarm cable with Alarm Output Connector. (If you need)
- Connect the power supply cable to the circuit breaker rated at 15A or less on primary side(your tool side).

⚠ WARNING

- **Ensure that the power supply connector is firmly inserted into the end of Power Supply Connector.**

3.4 Installation of Facility Water Piping

- Confirm that the tube is not bent to the point where it is kinked and may prevent facility water flow.
- Connect fittings to the ports marked “IN” and “OUT” on the product to provide piping for the inlet and outlet of Facility Water, respectively.
- When you install fittings in the facility water inlet/outlet port, please use the thread sealing tape or other methods so that there’s no leakage.
- To avoid applying fixing force to the facility water inlet/outlet port directly, fix fitting to the port while holding the port with a wrench steady.

Recommended tightning torque: 22~24N・m

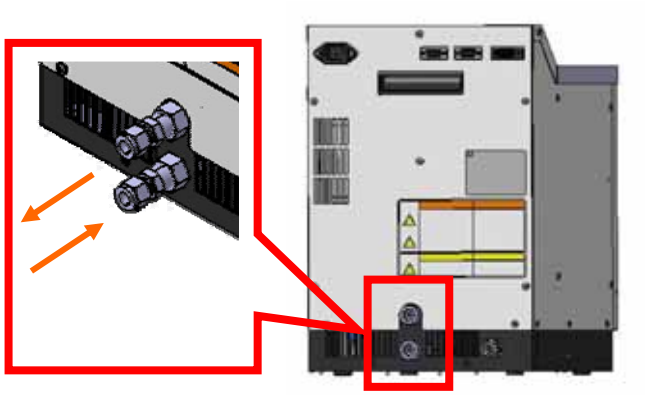


Fig. 3-5-1 Facility water ports

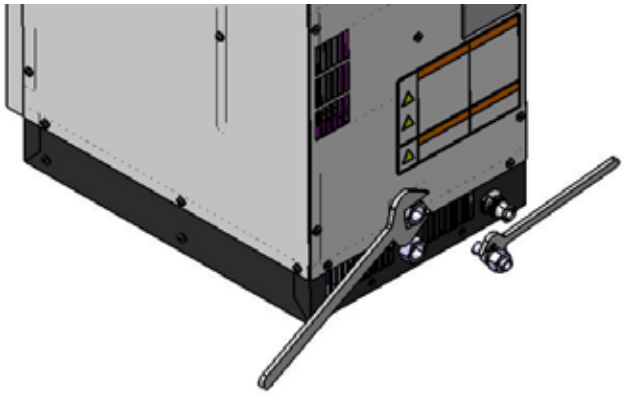


Fig. 3-5-2 Fixing the fittings to the ports

Chapter 4 System Set-up

4.1 Pre-check

Check the following items prior to starting up the product.

- Make sure that the product is installed in horizontal position.

  Refer 3.2 Installation

- Make sure proper connection of the power supply cable, ground, alarm output, and communication cables.

  Refer 3.3 Wiring

- Make sure that facility water pipings are installed properly.

  Refer 3.4 Installation of Facility Water Piping

4.2 Facility Water

4.2.1 Reference of water quality

Table 4-1 Reference of water quality for facility water

	Item	Standard value
Quality item	pH (25°C)	6.5 to 8.2
	Electric conductivity (25°C) (μs/cm)	100 to 800
	Chloride ion (mgCl-/L)	200 or less
	Sulphate ion ($mgSO_4^{2-}$/L)	200 or less
	Acid consumption (pH4.8) ($mgCaCO_3$/L)	100 or less
	Total hardness ($mgCaCO_3$/L)	200 or less
	Calcium hardness ($mgCaCO_3$/L)	150 or less
	Ion silica ($mgSiO_2$/L)	50 or less
	Iron (mgFe/L)	1.0 or less
	Copper (mgCu/L)	0.3 or less
	Sulphide ion (mgS^{2-}/L)	None detected
	Ammonium ion ($mgNH_4^+$/L)	1.0 or less
	Residual chlorine (mgCl/L)	0.3 or less
	Free carbon ($mgCO_2$/L)	4.0 or less
	Filtration (μm)	5 or less

4.2.2 Facility water run through

Make facility water run through.

Make sure there is no leakage on the facility water circuit.

⚠ CAUTION

- **Check if adequate fluid is in the bath.**
- **If the facility water pipings are arranged in parallel, the flow rate may not be adequate.**
- **Check if only the facility water pipe of the thermostat that is experiencing an error is warm.**

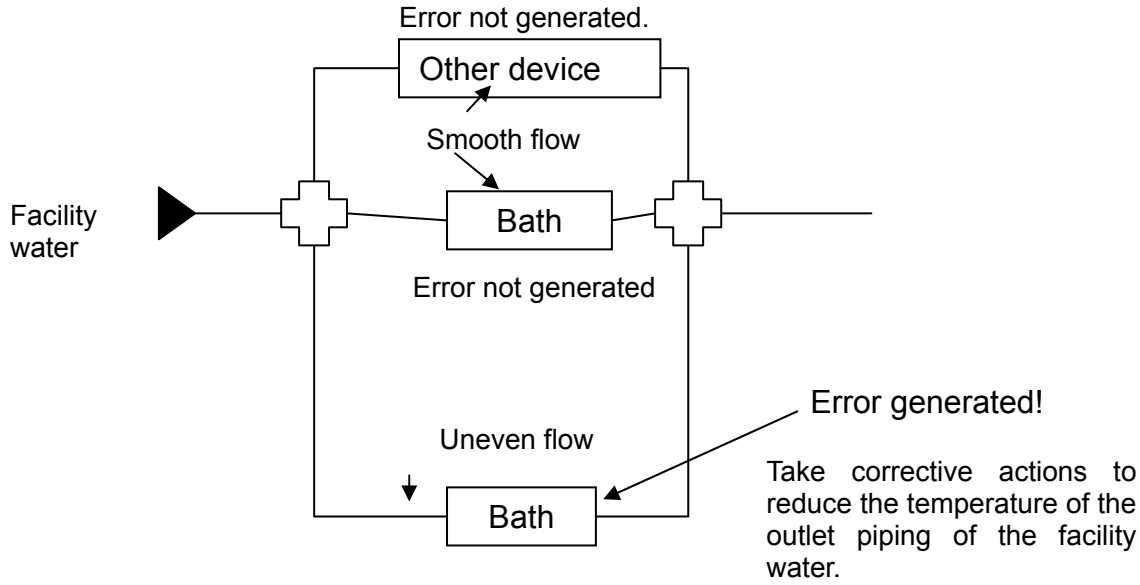


Figure 4-1 Facility water run through

CAUTION

- **If manifold is used, the flow rate may not be constant.**

4.3 Filling Bath liquid

4.3.1 Preparation of Bath Liquid

The bath liquid is to be prepared under your responsibility, referring to the following table.

Table 4-2-1 Bath liquids

Bath Liquid	Working Temp. Range	Remarks
Water	5~60 °C	Use distilled water or clean water based on reference of water quality. (Refer Table 4-3). Include Ethylene glycol-water solution.
Ethylene glycol-water solution	0~60 °C	Concentration of Ethylene glycol must be lower than 50%

Table 4-2-2 Bath Capacity

Model Number	Bath Capacity (Approx.)
INR-244-733/-736/-745/-747	10.2 Litter (2.7 gal)
INR-244-734/-746	23.1 Litter (6.1 gal)
INR-244-748/-749	38.8 Litter (10.2 gal)

CAUTION

- **Do not use tap water or hard water. Use of these waters can cause the internal pump failure and the performance deterioration by generation of scale.**

CAUTION

- **High concentration (more than 50%) ethylene glycol can cause temperature control error or system failure.**
- **Attention should be taken on water quality. Ensure water quality is within specified range, and other foreign materials contaminate the bath liquid. Potential temperature control error, cooling error or system failure may occur if disregarded.**

Table 4-3 Reference of water quality for bath liquid

	Item	Standard value
Quality item	pH (25°C)	6.0 to 8.0
	Electric conductivity (25°C) (μs/cm)	100 to 300
	Chloride ion (mgCl-/L)	50 or less
	Sulphate ion ($mgSO_4^{2-}$/L)	50 or less
	Acid consumption (pH4.8) ($mgCaCO_3$/L)	50 or less
	Total hardness ($mgCaCO_3$/L)	70 or less
	Calcium hardness ($mgCaCO_3$/L)	50 or less
	Ion silica ($mgSiO_2$/L)	30 or less
	Iron (mgFe/L)	0.3 or less
	Copper (mgCu/L)	0.1 or less
	Sulphide ion (mgS^{2-}/L)	None detected
	Ammonium ion ($mgNH_4^+$/L)	0.1 or less
	Residual chlorine (mgCl/L)	0.3 or less
	Free carbon ($mgCO_2$/L)	4.0 or less
	Filtration (μm)	5 or less

4.3.2 Filling Bath Liquid

- Make sure the drain port is plugged.
- Make sure the strainer is installed correctly.
- Supply bath liquid slowly.
- Do not pour bath liquid to the controller.
- Fill bath liquid up to a maximum level of 30 mm below the top of the bath. In case the liquid level is low, it may have cooling capacity deteriorate because the internal pump may have aeration.

⚠ CAUTION

- **Check at least once a day for the presence of foreign matter in the bath liquid.**
  If foreign matter enters the internal pump, the pump could break.
- **Use clean water that satisfies the quality standards shown in Table 4-1 for facility water. If other liquids are used, the product could break and leak fluid, resulting in electrical shock or ground leakage.**
- **Ensure ventilation of the room when you use the Ethylene glycol-water solution as Bath Liquid.**

CAUTION

- **Do not operate without bath liquid. It must get the internal pump damaged.**
- **If water is used for the bath liquid, keep the temperature at 5°C or more (considering the offset value). If the water freeze anywhere in the product, the internal pump may get damaged.**
- **Do not drop your application to the bottom in the liquid bath. It must get the liquid bath damaged.**

CAUTION

- **Do not use in such a matter that the bath liquid overflows or splashes during operation. This could cause the machine failure.**
- **Do not use other liquid specified.**

4.4 Turning ON power

1. Make sure that Main power switch is OFF. Turn ON the power breaker on primary side (your tool side).

2. Turn ON Main power switch.

3. Controller will indicate the current Bath liquid temperature after approx. 6 sec.

- If an alarm occurs after the power is turned on, check the indicated content of the alarm and turn off the power to find the cause so that appropriate measures can be taken.

4.5 Setting of Values

When the product has been found to start operating normally set the values such as temperature.

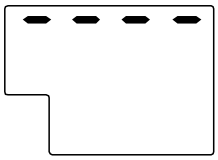
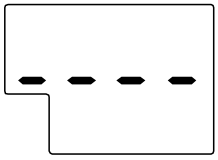
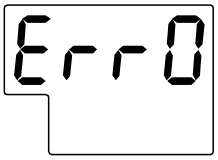
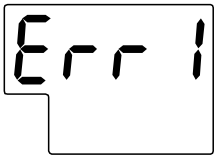
4. Perform offset adjustment if necessary, referring to page 5-4, Details of Operation Mode".

5. Set each value such as bath liquid temperature and upper and lower temperature limit.

- Set required values, referring to page 5-4, Details of Operation Mode". With this action, all preparation is complete. When the product is returned to the operation mode, it will operate with these set conditions.

6. Once values are set, they will not be erased even when main power switch is turned off.

- Alarm indication on the display

Indicator	Content
	Shown when a temperature sensor is opened .
	Shown when a temperature sensor is short circuited.
	Shown when Contoroller has a memory error.
	Shown when Controller has an A/D conversion error.

7. Content of the alarm when the ALARM LED lights up

- When the Controller output voltage decreases.
- When the number of Controller fan revolutions decreases.
- When the thermostat of the Liquid Tank is operating.

4.6 Cautions for Operation Control

- If an alarm comes on during operation, refer to page 5-14, “5.2.1Content of Alarms”, for the remedy.
- When low-temperature Facility Water is supplied, dew condensation may occur, damaging the internal electric equipment. Keep the Facility Water temperature over the atmospheric pressure dew point. For dew point temperature.

⚠ CAUTION

- **Touching bath liquid or the inner surface of the liquid tank may cause burns or frostbite, depending on the set temperature of this product. Be sure to use heat (cold) resistant gloves when handling this product.**

CAUTION

- **When an antifreeze liquid (Ethylene glycol-water solution) is used as the bath liquid, wipe off the moisture on the surface of the liquid to prevent to deteriorate the performance and damage on the internal pump.**
- **Check the bath liquid level at least once a day.**
  The bath liquid may evaporate. To operate the product in very low liquid level may cause the temperature control function deteriorate and may cause the internal pump damaged.
- **Do not allow foreign matter to enter the bath liquid. The foreign matter could enter the inside of the internal pump and damage it.**
- **If an alarm comes on during operation, refer to page 5-15, “5.2.1 Content of Alarms”, for the remedy.**

Chapter 5 Operation

5.1 Operation of Controller

5.1.1 Details of Controller

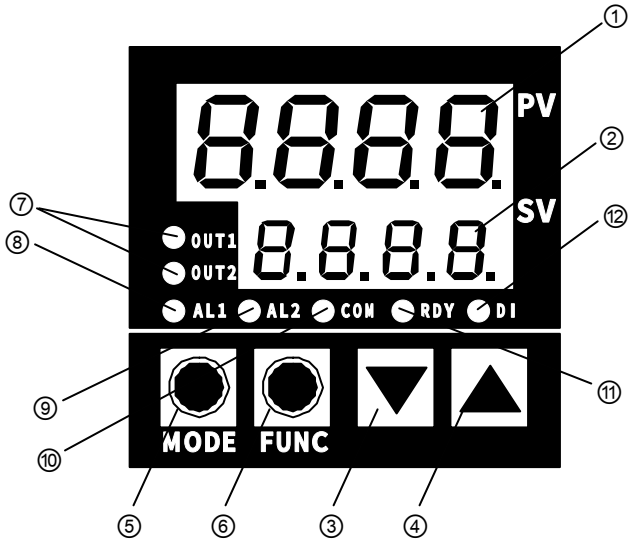


Fig. 5-1 Details of operation and display panel

Table 5-1 Details of operation and display panel

No.	Description	Detail
①	LCD1	Displays characters indicating temp. control or setting content.
②	LCD2	Displays set temperature or each selected input value.
③	[▼] key (DOWN key)	Decreases set data.
④	[▲] key (UP key)	Increases set data.
⑤	[MODE] key	Used to change screens and modes.
⑥	[FUNC] key	Used to shift digits of SV
⑦	Output LED	OUT1: Lights up during heating. OUT2: Lights up during cooling.
⑧	AL1 LED	Lights up High/Low temperature alarm occurs.
⑨	AL2 LED	Unused
⑩	Communication LED	Flashes during communication. Normally, it remains on.
⑪	RDY LED	Lights up when control is stopped. Refer to page 5-9, “5.1.9 Details of Control Setting Mode”.
⑫	DI LED	Unused

5.1.2 Setting of Data

Controller has two modes, Operation mode and Setting mode. Each mode has the following content.

- Operation mode: Normally used.
- Setting mode: Used to set control values manually

■ Selection of mode

- Operation mode: Initial mode
- Setting mode: Press and hold [MODE]key for 2 sec.

■ Setting of functions and data in each mode

1. Press [MODE] key in each mode to select the required function.

2. Increase or decrease data with the [▲] or [▼] key.

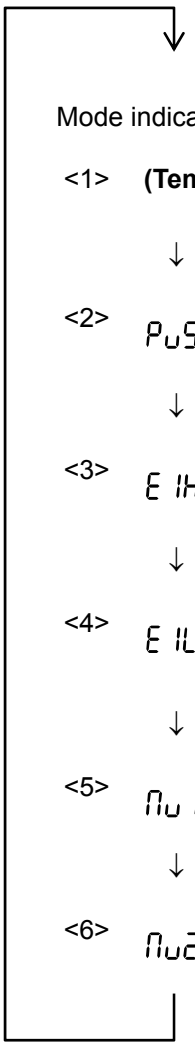
- Each press of the [▲] key increases the data by one count.
- Each press of the [▼] key decreases the data by one count.
- Holding the [▲] or [▼] key accelerates the increase or decrease.

CAUTION

- **Be sure to operate the operation and display panel by hand. Using tools such as a screwdriver, pen, or pencil may damage the panel.**

5.1.3 Selection of Operation Mode

When the power supply is turned on, the product is in operation mode. The target temperature is shown as well as the current measured temperature. Each press of the [MODE] key changes the operation mode display as follows.



[FUNC] key

- Set as a digit transferring key for the initial setting. If this setting is changed, the RUN/READY key can be used as an auto tuning key.

5.1.4 Details of Operation Mode

<1> Target Temp./Measured Temp. Indication and Target Temp. Setting

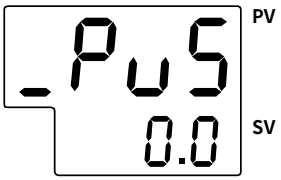
Function	Sets target temperature Set with [▲] or [▼] key
	Indicates current temperature on PV and target temperature on SV
Setting range	0.0 ~ 60.0°C
Initial value	25.0°C

[Tips]

No key-in operation for 2min.

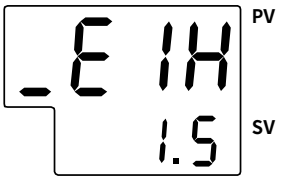
- If no key-in operation has been performed for 2min., the display will return automatically to the measured temperature for any setting status, including the initial setting mode, EV setting mode, and communication setting mode.

<2> Offset Setting



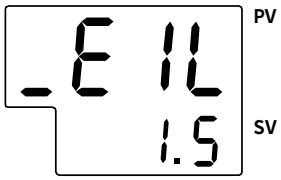
Function	Sets the offset (compensating) value of the PV. Set with [▲] or [▼] key
	Ex. If set to 0.5, the temperature is controlled to a value that is 0.5°C lower than actual temperature.
Setting range	-1.0 ~ 1.0°C. (Please use it in this setting range.)
Initial value	Refer to the controller correction value of Inspection Record.

<3> High temp. limit range setting



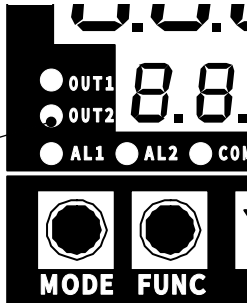
Function	Sets the high temperature limit value. Set with [▲] or [▼] key
	Input the differential from target temp. for high temp. alarm. The alarm signal will be outputted when alarm occurred.
Setting range	0.0 ~ 10.0°C.
Initial value	1.5°C

<4> Low temp. limit range setting



Function	Sets the low temperature limit value. Set with [▲] or [▼] key
	Input the differential from target temp. for low temp. alarm. The alarm signal will be outputted when alarm occurred.
Setting range	0.0 ~ 10.0°C.
Initial value	1.5°C

Lights up when High/Low temp. alarm occurs.

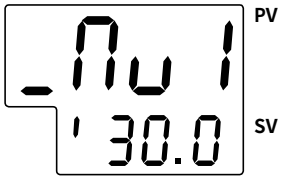


[Tips]

Status when High/Low temp. alarm occurs

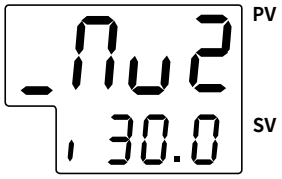
- AL1 LED lights up when High/Low temp. alarm occurs. The alarm signal is output from the alarm output connector.
- The product is continued operation even in this alarm is activated. The alarm will go off with the liquid temperature getting into the specified temperature width.

<5> Heating output indicator



Function	Indicates the heating output ratio
Display range	0.0 ~ 100.0%

<6> Cooling output indicator



Function	Indicates the cooling output ratio
Display range	0.0 ~ 100.0%

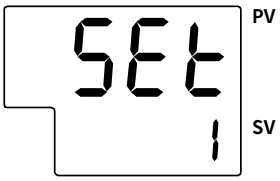
5.1.5 Selection of Setting Mode

Setting mode can be shown by pressing and holding the [MODE] key for approx. 2 sec.

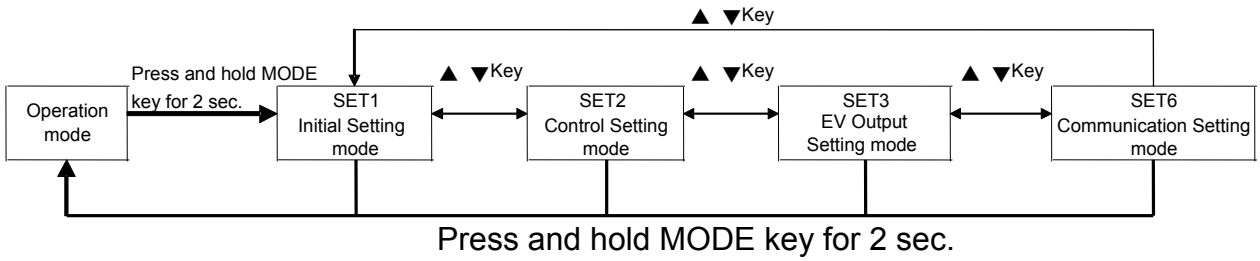
Pressing the [MODE] key for approx. 2 sec again will return the setting mode to the normal operation mode.

Setting mode selection is indicated with "SEt" and the required setting mode can be selected by increasing or decreasing the indicated number with the [▲] or [▼] key.

Setting mode selection / Mode indicator: SEt

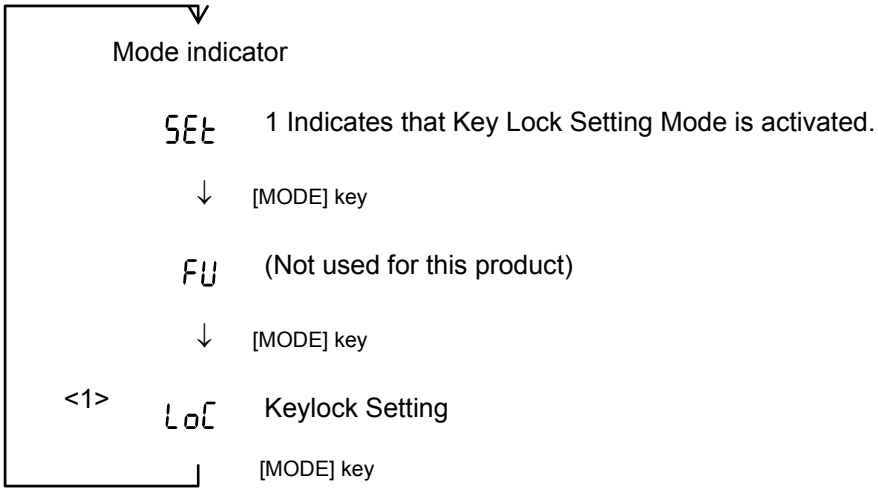


Function	Selects mode for each setting. Select with [▲] or [▼] key.
Selectable setting	1, 2, 3, 6 1: Initial Setting Mode 2: Control Setting Mode (3: EV Output Setting Mode) (Not used) 6: Communication Setting Mode



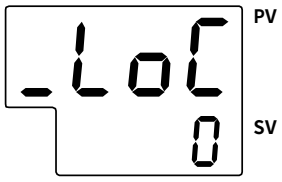
5.1.6 Selection of Initial Setting Mode

Selecting "1" in Setting mode " SEt " activates the Initial setting mode. Each press of the [MODE] key changes the operating mode as follows.

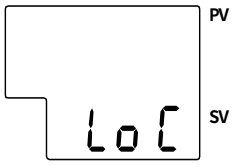


5.1.7 Details of Initial Setting Mode

<1> Key lock setting



Function	Sets the keylock Select with [▲] or [▼] key.
Selectable setting	0 ~ 3 0: No key lock 1: Full lock (except key lock setting) 2: Lock for Operation Mode 3: Lock for Setting Mode
Initial setting	0



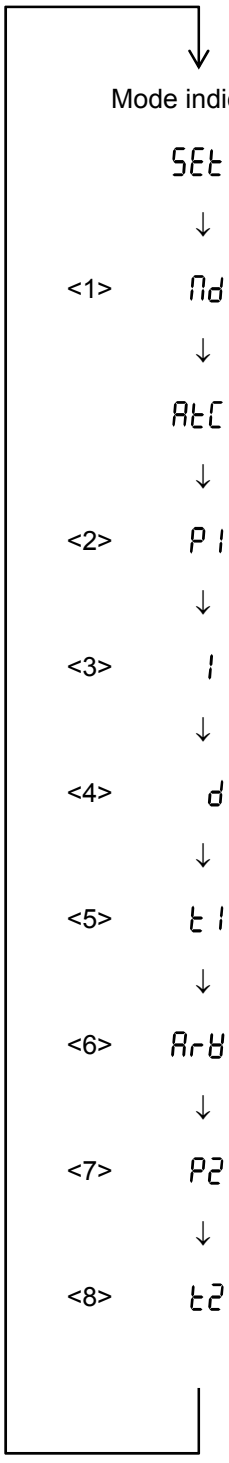
[Tips]

Indicator for unavailable change

If a change in a key-locked parameter is attempted, the indicator shown on the left appears to show that change is not available. The indicator continues to be displayed while the key is pressed.

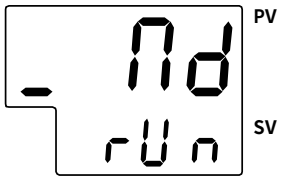
5.1.8 Selection of Control Setting Mode

Selecting “2” in the setting mode ” SEt” activates the control setting mode.
Each press of the [MODE] key changes the operating mode as follows.



5.1.9 Details of Control Setting Mode

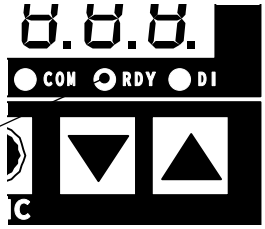
<1> Control Mode Setting



Function	Sets control mode. Select with the " ▲ " and " ▼ " keys.
Selectable Setting	• rUn: Temperature control enabled (rdY: Temperature control disabled) (MAn: Manual control)
Initial Setting	rUn

CAUTION

- **Do not select rdY or MAn.**
  Temperature control function is disabled when RDY or MAN is selected

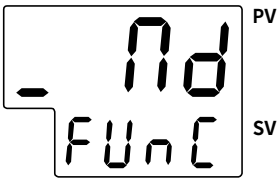


Lights up when control is stopped.

[Tips]

Status when control is stopped

When control is stopped, the RDY LED lights up.

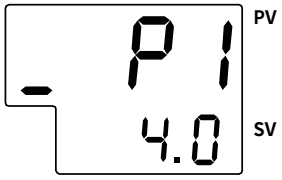


[Tips]

Indicator for unavailable change

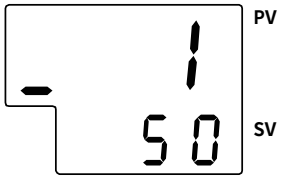
If a change in a parameter in the control mode (refer to page 5-9, "5.1.9 Details of Control Setting Mode") is attempted when "2" (RUN/READY setting) is selected, the indicator as shown on the left appears to show that the change is not available. The indicator continues to be displayed while the key is pressed.

<2> Heating Proportional Band Setting



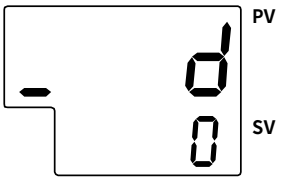
Function	Sets the proportional band for heating. Set with [▲] or [▼] key This range is a percentage of temperature setting range.
Setting range	0.1 ~ 200.0 %
Initial value	4.0%

<3> Integral Time Setting



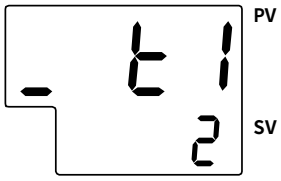
Function	Sets the integral time. Set with [▲] or [▼] key
Setting range	0 ~ 3600 sec. If "0" is set, integral control is disabled.
Initial value	50sec

<4> Derivative Time Setting



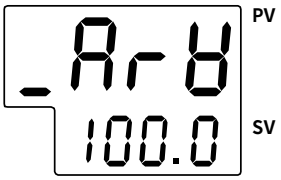
Function	Sets the derivative time used for PID control. Set with [▲] or [▼] key
Setting range	0 ~ 3600 sec. If "0" is set, derivative control is disabled.
Initial value	0sec

<5> Heating Proportional Cycle Setting



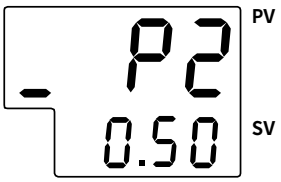
Function	Sets heating proportional cycle. Set with [▲] or [▼] key If the proportional cycle is set at 2 sec. and Heating Output is 70%, the output will be 1.4 sec. ON and 0.6 sec. OFF.
Setting range	1 ~ 120sec.
Initial value	2sec.

<6> ARW setting



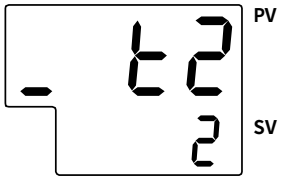
Function	Sets anti-reset wind-up. Set with [▲] or [▼] key Reduces overshoot in PID control due to integrating operation. The integration operation is not performed above the set value. The set value must be higher than the output for stable control.
Setting range	0.0 to 110.0 %
Initial value	100.0 %

<7> Cooling Proportional Band Setting



Function	Sets the proportional band for cooling. Set with [▲] or [▼] key
Setting range	0.10 to 10.00 times
Initial value	0.50 times of P1 set value.

<8> Cooling Proportional Cycle Setting



Function	Sets cooling proportional cycle. Set with [▲] or [▼] key If the proportional cycle is set at 2 sec. and Cooling Output is 70%, the output will be 1.4 sec. ON and 0.6 sec. OFF.
Setting range	1.0 ~ 120.0 sec.
Initial value	1.0 sec.

5.1.10 Selection of Communication Setting Mode

Inputting "6" in the setting mode " SEt " activates the communication setting mode. Each press of the [MODE] key changes the operating mode as follows.

Mode indication

SEt — Indicates that communication setting mode is activated.

↓ [MODE] key

<1> CoM — Communication parameter setting

↓ [MODE] key

<2> bPS — Communication speed setting

↓ [MODE] key

<3> Adr — Communication address setting

↓ [MODE] key

<4> AWt — Response delay time setting

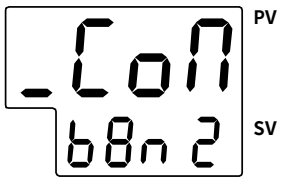
↓ [MODE] key

<5> Mod — Communication-mode setting

[MODE] key

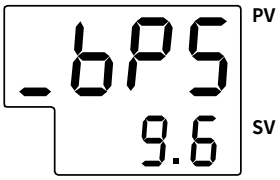
5.1.11 Details of Communication Setting Mode

<1> Communication parameter setting



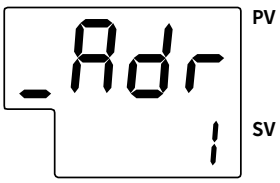
Function	Sets communication parameters.
Setting range	1st digit : Stop bit length 1 or 2 1: 1 bit, 2: 2 bit 2nd digit : Parity check n, o or E n: None, o: Odd, E: Even 3rd digit : Data length 7 or 8 7: 7 bit, 8: 8 bit 4th digit : BCC check n or b n: Disable, b: Enable The number of digits is counted from the right side.
Initial setting	b8n2

<2> Communication speed setting



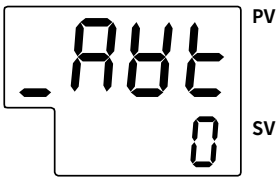
Function	Sets the communication speed. The set value can be scrolled with the ▲ and ▼ keys. 1.2 ⇔ 2.4 ⇔ 4.8 ⇔ 9.6 ⇔ 19.2
Selectable setting	2.4 ~ 38.4 (2400 bps ~ 38400 bps)
Initial setting	9.6 (9600 bps)

<3> Communication address setting



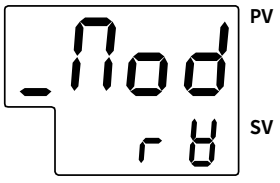
Function	Sets the communication address of the product. Set with [▲] or [▼] key
Setting range	1 to 99 addresses
Initial setting	1 address

<4> Response delay time setting



Function	Sets the response delay time. Set with [▲] or [▼] key
Setting range	0 to 250 ms
Initial value	0 ms

<5> Communication-mode setting



Function	Sets the communication-mode setting. Select with [▲] or [▼] key
Selectable setting	rO or rW rO: Readout only, rW: Readout and writing
Initial value	rW

5.1.12 Initial Value and Setting Range for Each Mode

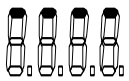
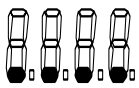
Table 5-2 Initial value and setting range for each mode

Description	Mode indicator	Setting range	Initial value
Setting of target temp.	-	0.0 to 60.0	25.0
Offset setting	PuS	-1.0 to 1.0	According to the Inspection Record
High temperature limit range setting	E IH	0.0 to 10.0	1.5
Low temperature limit range setting	E IL	0.0 to 10.0	1.5
Heating output indicator	Nu 1	—	—
Cooling output indicator	Nu2	—	—
Key lock setting	LoC	0 to 3	0
Control mode setting	Md	rUn, (rdY,MAn)	rUn
Heating Proportional Band Setting	P 1	0.1 to 200.0%	4.0
Integral Time Setting	I	0 to 3600	50
Derivative Time Setting	d	0 to 3600	0
Heating Proportional Cycle Setting	t 1	1 to 120	2
ARW setting	ArW	0.0 to 100.0	100.0
Cooling Proportional Band Setting	P2	0.00 to 10.00	0.50
Cooling Proportional Cycle Setting	t2	1 to 120	2
Event output function setting	E IF	1st digit: 0 to 8 2nd digit: 0 to 3	01
Event output delay timer setting	E It	0 to 9999	0
Communication parameter setting	CoM	1st digit: Stop bit length function 1: 1 bit, 2: 2 bit 2nd digit: Parity check function n: None, o: Odd, E: Even 3rd digit: Data length selection 7: 7 bit, 8: 8 bit 4th digit: BCC check function n:Disable, b: Enable	b8n2
Communication speed setting	bPS	1.2 to 19.2 (1200bps to 19200bps)	9.6
Communication address setting	Adr	1 to 99	1
Response delay time setting	AWt	0 to 250 ms	0 ms
Communication-mode setting	Mod	ro, rW	rW

5.2 Alarms

5.2.1 Content of Alarms

Table 5-3 Content of alarm

(Lit) 7seg. LED	Content of alarm	Alarm output	High/Low temp. alarm	Lit LED	Unit Status	Reset
Normal status	**High temp. alarm** Occurs when the bath liquid temp is higher than the alarm set point.	Contact opened	ON	**AL1**	Normal operation	Automatic-ally
Normal status	**Low temp. alarm** Occurs when the bath liquid temp is Lowerer than the alarm set point.	Contact opened	ON	**AL1**	Normal operation	Automatic-ally
Normal status	**Low DC power supply voltage (Power supply failure)** Occurs when the internal power supply has trouble.	Contact opened	-	**ALARM**	Control stop 1	Turn ON Main power switch again
Normal status	**Thermostat alarm** Occurs when the thermostat that detects excessive heating begins operating.	Contact opened	-	**ALARM**	Control stop 1	Turn ON Main power switch again
Err0	**Memory error** Occurs when the data stored inside of the EEPROM breaks.	-	-	-	Control stop 2	Replace the EEPROM.
Err1	**Controller error** Occurs when A/D conversion is not performed properly.	-	-	-	Control stop 2	Replace the circuit.
	**High temp. sensor value** Occurs when the temperature sensor breaks (or the signal cable is not connected).	Contact opened	ON	**AL1**	Control stop 2	Turn ON Main power switch again
	**Low temp. sensor value** Occurs when the temperature sensor is short-circuited.	Contact opened	ON	**AL1**	Control stop 2	Turn ON Main power switch again

★ Control stop 1: temperature control and pump are stopped.

★ Control stop 2: Only temperature control is stopped.

5.2.2 Troubleshooting

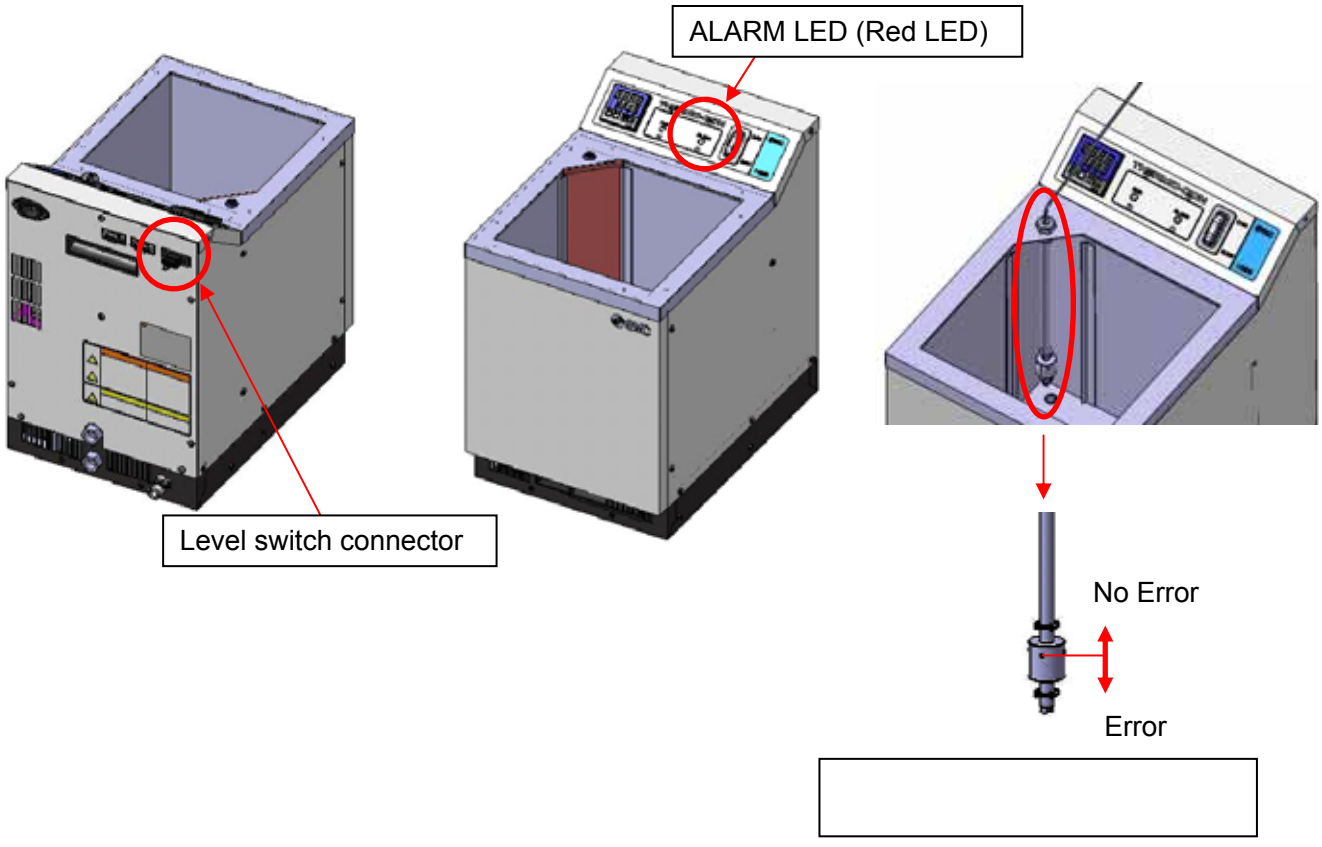
Table 5-4 Troubleshooting

Code	Cause		Countermeasure
ALARM LED (red) lights up.	High-level electric noise is applied to the power supply line, ground line and/or signal line.		Move the product to an environment with less noise and restart. If no failure occurs, the noise caused the alarm.
	The power supply voltage to the system is not correct.		Confirm that the power supply voltage is 100~240VAC.
	The Bath liquid is excessively heated.		Confirm that the Bath liquid is not excessively heated.
			Confirm that the Bath liquid level is not too low.
	The facility water is cutoff or its flow rate is not enough.		Supply the appropriate flow rate of facility water.
	Level Switch (*)	Water level in the bath is low.	Increase the water level.
		Foreign matter is caught in the float, causing operation failure of the float.	Clean the tank to remove the foreign matter or replace the level switch.
		Contact failure of the thermostat and the level switch connector.	If you still have an error after pulling the connector out and plugging it back in, replace the level switch or send the product to SMC for repair.
		Level switch is not mounted vertically. Float does not move.	If the mounting surface is not horizontal, send the product to SMC for repair.
		Level switch failure	If you raise the float and supply power, and you still have an error, replace the level switch.
	Thermostat	Facility water flow rate is out of specification range. (3-7L/min)	Correct the facility water flow rate within the specification range.
		Facility water flow temperature is out of specification range. (10-35°C)	Correct the facility water temperature within the specification range.
		Ambient temperature is too high. (out of 10-35°C) (out of 35-85%)	Correct the ambient temperature within the specification range.
		Thermostat of circuit failure	If you still have an error even after correcting the above, send the product to SMC for repair.
ERR0	The EEPROM of Controller is broken due to high-level electric noise.		If the trouble cannot be solved even after restart, contact SMC for repair.
	The writing frequency to the EEPROM exceeds 0.1 million.		
ERR1	The EEPROM of the controller is broken due to high-level electric noise.		If the trouble cannot be solved even after restart, contact SMC for repair.

*When you install the level switch (another sales goods).

Table 5-4 Troubleshooting (continue)

Code	Cause	Countermeasure
8.8.8.	The temperature sensor is broken (or the cable is disconnected).	Check if the cable is disconnected. If the trouble cannot be solved even after no disconnection is confirmed, confirm there is no broken wire. If the wire is broken, contact SMC for repair.
8.8.8.	The temperature sensor is short-circuited.	Confirm that the temp sensor and its cable are short-circuited. If they are short-circuited, contact SMC for repair.
The operation and display panel doesn't light up, or the display light off.	The internal temp of this product is too high, and the DC power supply is not working properly.	Check that the air vents are not plugged.
	Malfunction of the DC power supply	If the trouble cannot be solved even after the product is restarted 3 or 4 min. after, contact SMC for repair.
	The circuit protector of this product or GFCI which is installed on primary side of the unit has been tripped.	Confirm that an instantaneous power supply cutoff has not occurred at frequent rate.
		Confirm that a ground leakage has not occurred. If the trouble cannot be solved even after the rpoduct is restarted, contact SMC for repair.



Chapter 6 Maintenance

6.1 Regular Maintenance

- Check that the strainer is not clogging in regular interval.
- Check the concentration of the bath liquid in regular interval. (Concentration of Ethylene glycol must be lower than 50%)
- Replace the bath liquid in regular interval.

Work sequence when replace the bath liquid or clean the strainer

1.Power off

↓

2.Drain liquid

Refer 6.1.1 Draining the Bath liquid

↓

3.Check strainer and cleaning of bath

Refer 6.1.2 Check strainer

↓

4.Fill liquid

Refer 4.3 Filling Bath liquid

↓

5.Check liquid surface waving

Refer 6.1.3 Check liquid surface waving

↓

6.Power on

6.1.1 Draining the Bath liquid

- Stop the product (turn off main power switch and cut the facility water flow) and remove all the connected cables and piping before draining.
- Please prepare the fitting suitable for prompt separation (PLCD16004) and exhaust the liquid from the drain.
- Fitting: Quick disconnects (PLCD 16004)

⚠ CAUTION

- **Stop the product (turn off main power switch and cut the facility water flow). Draining without stopping the product might cause dry run of the internal pump.**
- **Take care not to splash the bath liquid on the inside of the product and the connectors when draining. If water splashes on the connector or the product body, wipe them off and allow them to dry sufficiently to prevent electrical shock, a short circuit, or ignition.**
- **Please confirm the bath liquid is at safe temperature when you drain the liquid.**

6.1.2 Check strainer and clean the bath

- The strainer prevents clogging the pump suction port.
- Please remove clogging that strainer captured.
- Please clean the bath.
- Please confirm there are no clogging in the pump suction port.
- Please set the strainer in the bath any time the product running.

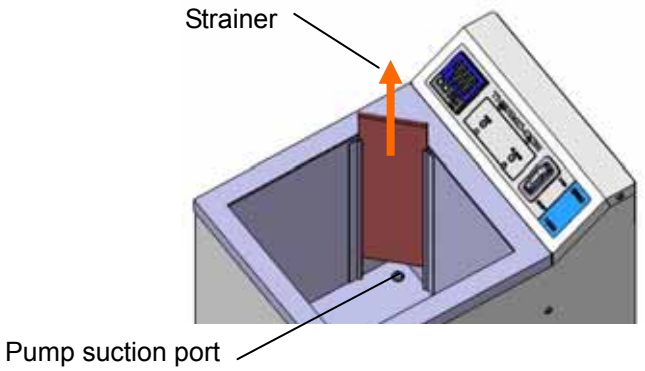


Fig. 6 The strainer and Pump suction port

6.1.3 Check liquid surface waving

- Liquid surface must be waving when the product running because the liquid is stirred by the internal pump.
- Please check if the liquid surface is waving.

6.2 Before returning the product

- This product needs to be returned to the SMC factory for repair and maintenance.
  Essentially, on-site repairs and maintenance cannot be offered.
- Obtain the form “Request for Return” from our sales branches. The purpose of this form is to ensure that the returned product is safe. Fill in the form, sign, and send it to our sales branches before returning the product.
  The contents of form will be checked, and you will be informed whether or not the return is acceptable.
- It is recommended that you prepare a back-up product to minimize machine downtime during repairs and maintenance.

⚠ CAUTION

- **Drain the liquid from the liquid bath completely and clean and dry the product before returning it to the SMC factory for repair and maintenance. Any liquid left in the product could cause damage to the equipment during transport.**

CAUTION

- **It is recommended to transport the product in an original packing box specific to the Thermo Electric Bath.**

Chapter 7 Appendix

7.1 Outline Dimensions

7.1.1 INR-244-733/-736/-745/-747

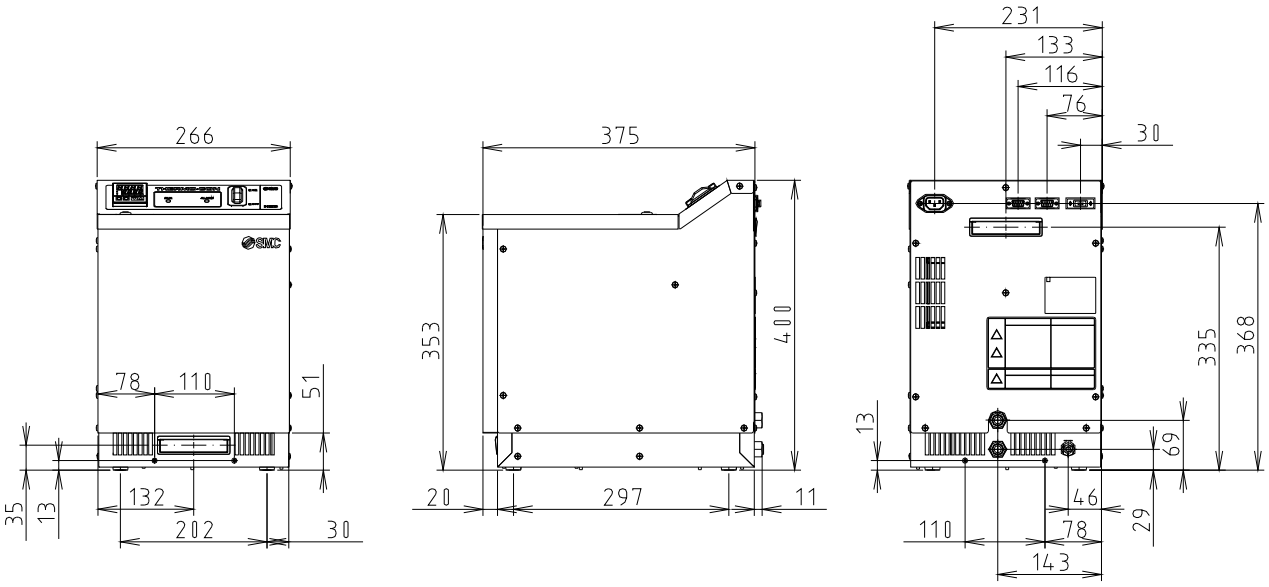


Fig. 7-1-1 Overall sizes of product (INR-244-733/-736/-745/-747)

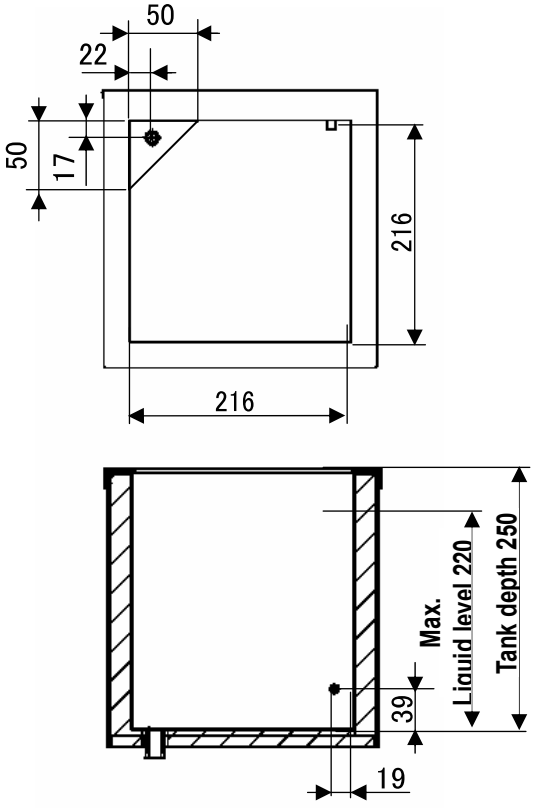


Fig.7-1-2 Bath dimensions (INR-244-733/-736/-745/-747)

7.1.2 INR-244-734/-746

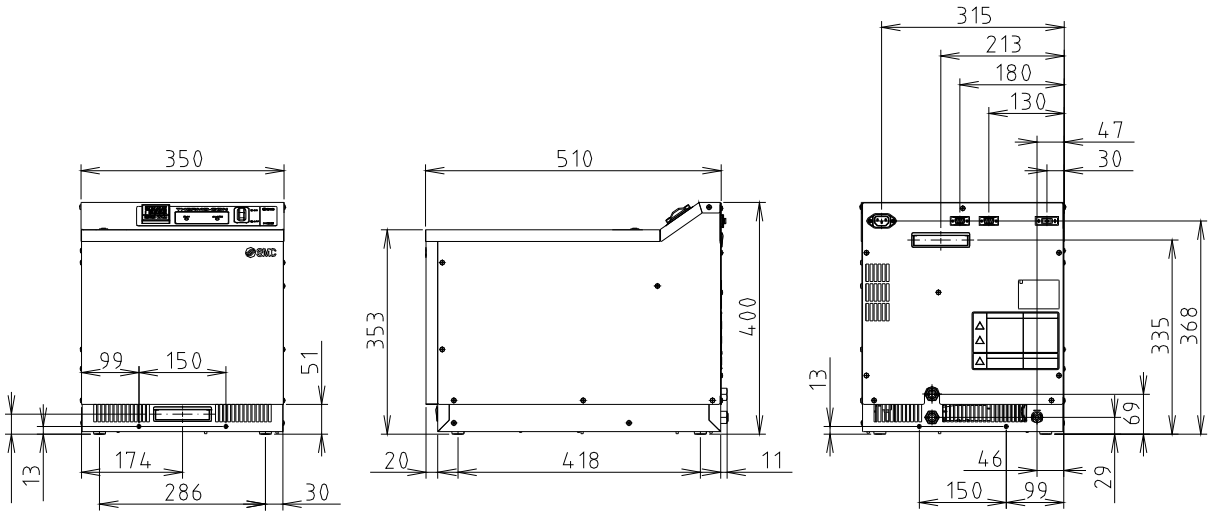


Fig. 7-1-3 Overall sizes of product (INR-244-734/-746)

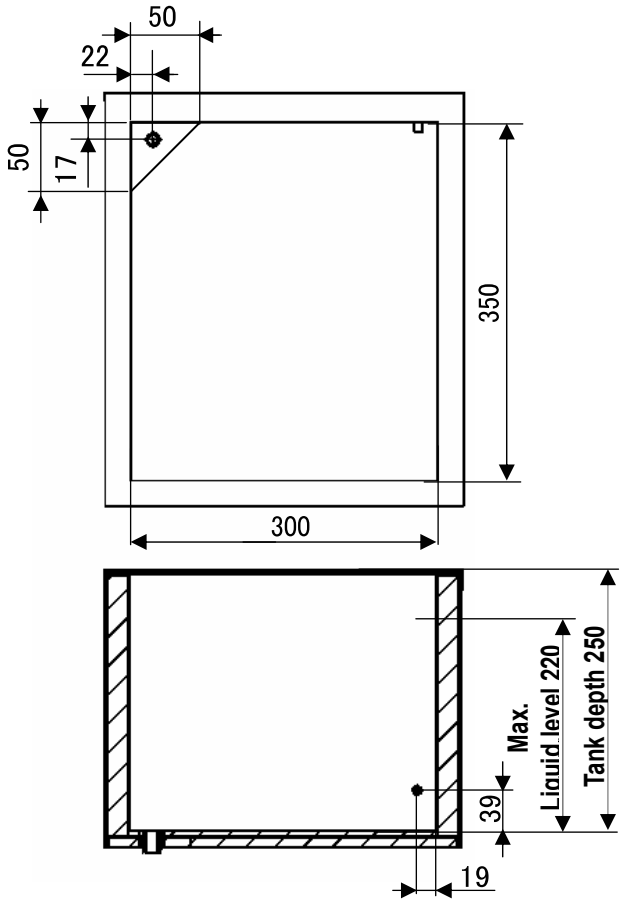


Fig. 7-1-4 Bath dimensions (INR-244-734/-746)

7.1.3 INR-244-748/-749

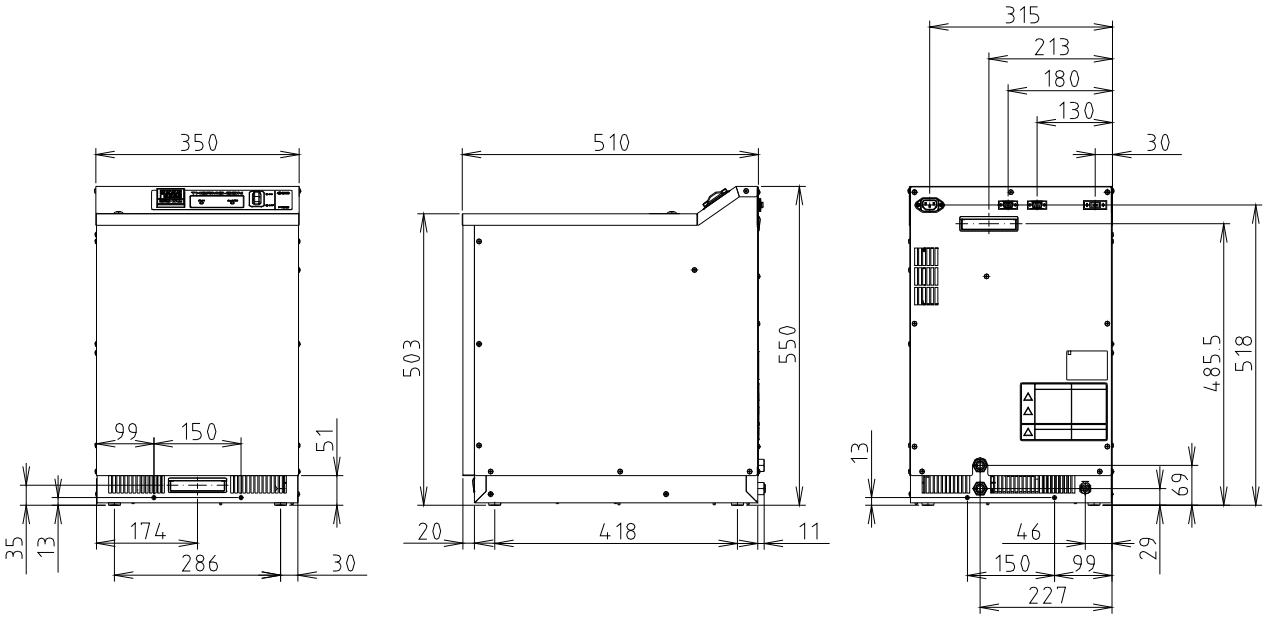


Fig. 7-1-5 Overall sizes of product (INR-244-748/-749)

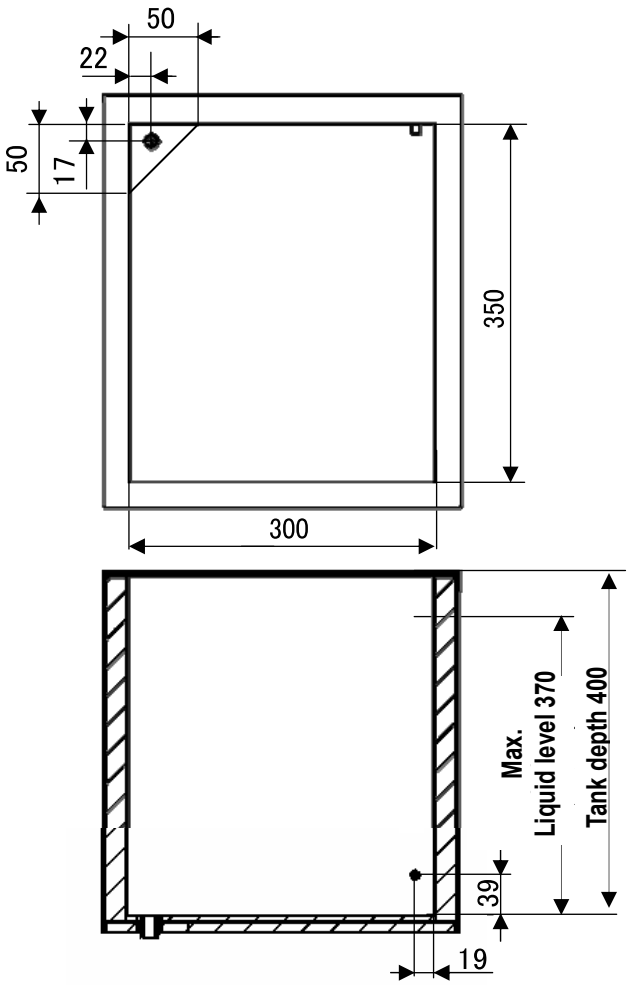


Fig. 7-1-6 Bath dimensions (INR-244-748/-749)

7.2 Specifications

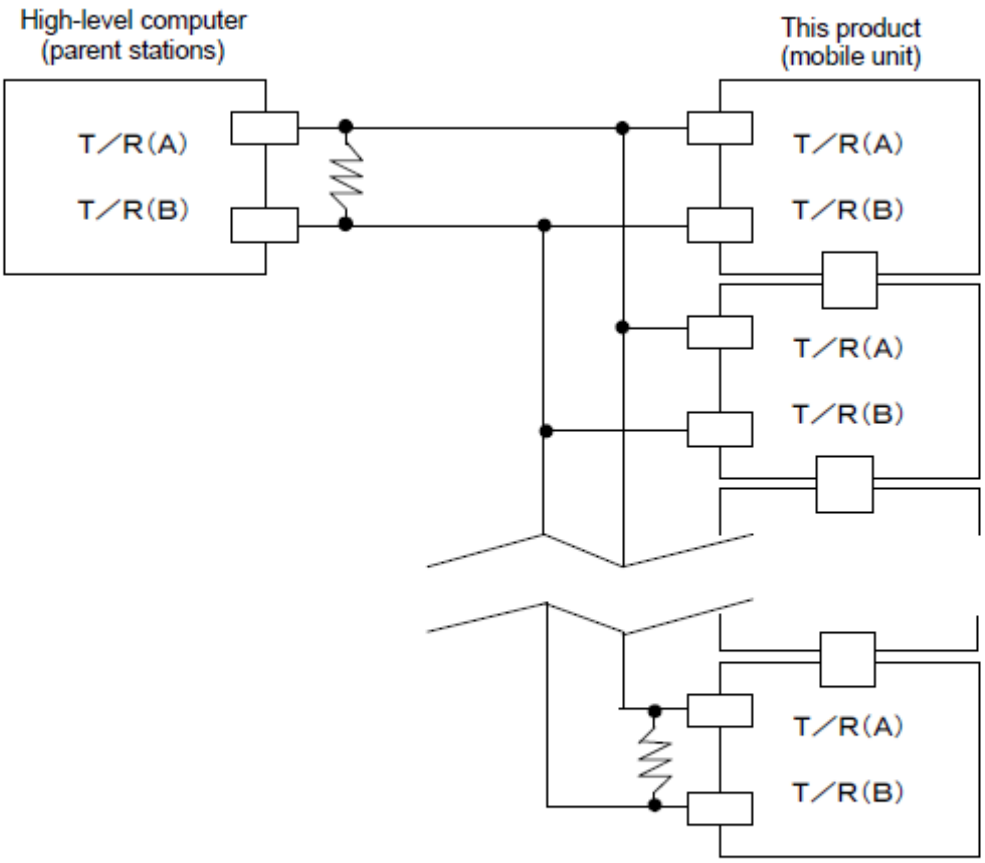
Table 7 Thermo Electric Bath specifications

Model No.		INR-244							
		-733	-745	-736	-747	-734	-746	-748	-749
Control method		Cooling/heating automatic shift PWM control							
Cooling/Heating method		Peltier element (Water-cooled)							
Operating temp. range		0.0 to 60.0°C (5°C or more for water) (Note 1) (Note 5)							
Temp. stability		+/-0.03°C (Note 1)							
Temp. distribution		+/-0.04°C (Note 1)							
Cooling capacity		140W (Water) (Note 2)		320W (Water) (Note 2)					
Heating capacity		300W (Water) (Note 2)		700W (Water) (Note 2)					
Bath liquid	Application fluid	Water (5 to 60°C) (Note 1) (Note 4) Ethylene glycol-water solution must be lower than 50% (0 to 60°C) (Note 1) (Note 4)							
	Bath dimensions (excluding protrusion)	W216xD216xH250mm (Note 5)				W300xD350x H250mm (Note 5)		W300xD350x H400mm (Note 5)	
	Usable depth	220mm						370mm	
Facility Water	Temperature	10 to 35°C (no dew condensation)							
	Flow rate	1 to 7L/min (Note 3)							
	Max.operating pressure	1.0MPa							
Facility Water port size		Rc3/8							
Drain port size		CPC coupling PLCD 16004							
Power supply		AC100 to 240V +/-10%, Single phase, 50/60Hz							
		3.5 to 1.5A		5.5 to 2.5A					
Overcurrent protection		Circuit protector (acting as a main power switch) with rated current 10A							
Main functions		Set value memory, Temp. upper/lower deviation limit alarm, Output cutoff alarm							
Serial Communication		RS-485	RS-232C	RS-485	RS-232C	RS-485	RS-232C	RS-485	RS-232C
Input operation/ Indication		Membrane key sheet/ 11 segment LED							
Alarm output		Temp. upper/lower deviation limit alarm, Output cutoff alarm Relay contact output: opened when the alarm occurs 125VAC,0.4A / 30VDC,2A (resistive load), 125VAC,0.2A / 30VDC,1A (inductive load)							
Temperature sensor		Resistance thermometer sensor, Pt100Ω,3-Connecting wire							
Ambient temp./humidity Ambient air quality		10 to 35°C, 35 to 80%RH (no dew condensation) Appropriate environment without corrosive gas, solvent such as thinner and combustible gas.							
Overall size (excluding protrusion)		W266xD376xH400mm				W350xD510x H400mm		W350xD510x H550mm	
Weight (Empty)		Approx. 15.5kg		Approx. 16.5kg		Approx. 21kg		Approx. 25kg	

Note 1) Differs depending on operating conditions.
Note 2) Determined under the following conditions: water as the Bath liquid, set temperature 25°C, Facility Water temperature 25°C, flow rate 3L/min, ambient temperature 25°C, and sealed from outside air with a lid.
Note 3) An appropriate range is from 1 to 7L/min. To prevent damage to the facility water circuit on this product, do not supply a flow over the maximum flow rate of 8L/min.
Note 4) When the temperature is set high, the liquid temperature inside of the liquid bath and the temperature inside of the thermostat could differ greatly depending on the heating mode at start-up, and the thermostat could then begin operating and stop the output.
Note 5) 1. Do not use the thermo electric bath under the condition where the bath liquid splashes or

leaks out. Otherwise, peripheral equipment as well as the thermo electric bath can break.
2. When the set temperature is increased from a low value to an ordinary value, some kinds of the bath liquid can swell, increase and overflow, which can not only break the thermo electric bath and other equipment, but also cause a serious accident. Take a measure to prevent this situation in advance by decreasing the amount of the bath liquid, etc.

RS-485 connection topology（INR-244-733/-734/-736/-748）



Install an end of line resistor at both of the farthest devices in the parent station and the mobile unit. For a resistance value, use one that matches the characteristic impedance of the cable. Provided that the synthesis is set to at least 75Ω.

Fig. 7-2 RS-485 connection topology

7.3 Performance Chart

The values shown on the performance chart are representative and not guaranteed. Allow a margin for safety to decide use of the product.

7.3.1 Cooling Capacity

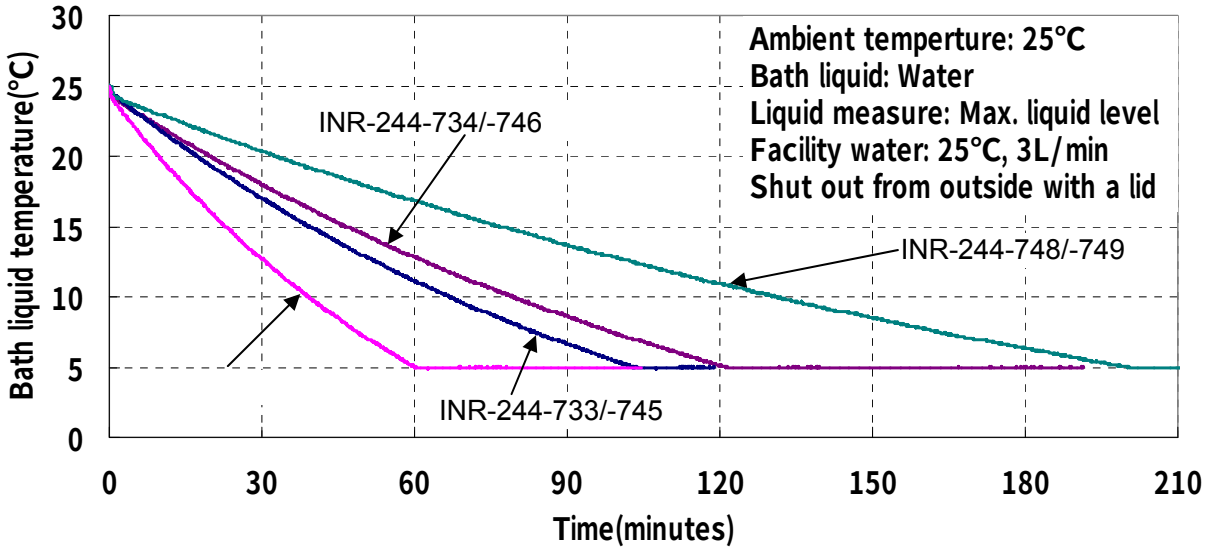


Fig. 7-4-1 Cooling capacity

7.3.2 Heating Capacity

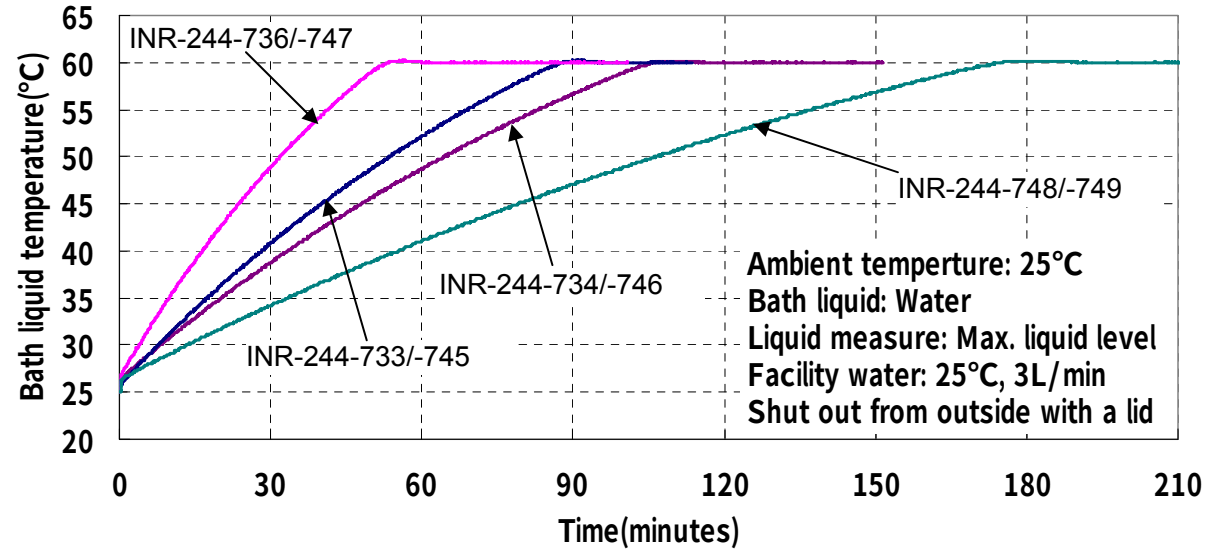


Fig. 7-4-2 Heating capacity

7.3.3 Facility Water Pressure Loss

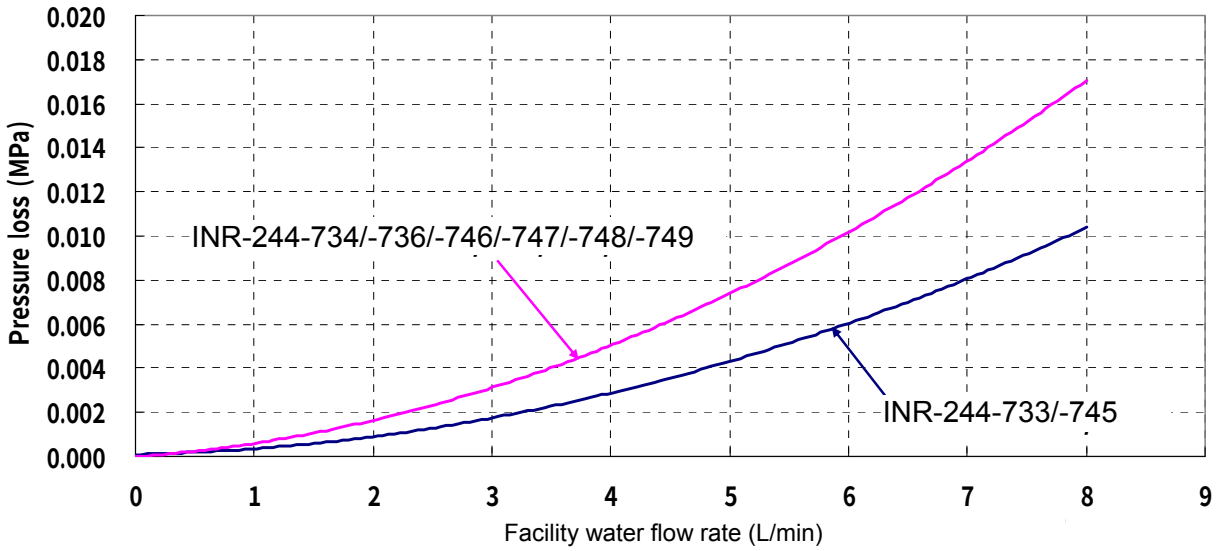


Fig. 7-4-3 Facility water pressure loss

Chapter 8 Warranty

8.1 Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.
Read and accept them before using the product.

(1) Content

If the purchased product fails, it will be repaired at no cost within the period and requirements mentioned below.
Replacement, adjustment, and inspection of failed parts are all within the range of this warranty, i.e., will be performed at no cost. The parts removed for repair will belong to SMC.

(2) Period

The warranty period of the product is 1 year in service or 1.5 years after the product is delivered.
Also, the product may have time durability or replacement parts. Please consult your nearest sales branch.

(3) Scope of warranty

For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

(4) Out of scope

The following situations are out of the scope of this warranty.

① The failure was caused by operation different from that shown in this manual or operation over the SMC specified parameter limits.
② The failure was caused by retrofitting that SMC did not approve.
③ The failure was caused by a Bath liquid or Facility Water with specifications other than those specified by SMC.
④ The failure occurred naturally over time (such as discoloration of a painted or plated face).
⑤ The failure does not affect the functioning of the product (such as new sounds, noises and vibrations)
⑥ The failure was caused by a natural disaster such as an earthquake, typhoon, or flood, or by an accident or fire.
⑦ The failure was caused by installation of the product in an environment other than that specified in this manual.

(5) Disclaimer

The following are not covered by this warranty.

① Expenses to compensate for secondary damages to other equipment and goods due to the failure of the product

② Expenses for repairs performed by other companies

③ Expenses for transfer, installation and removal of the product

④ Expenses for replacement of parts other than those in the product and for the supply of liquids

⑤ Losses resulting from the inability to use the product (such as telephone charges, compensation for workplace closings, and commercial losses)

⑥ Expenses and compensation not covered in “(1) Content”.

⑦ Expenses for returning the product

(6) Request for repair

When repair of the product is needed, contact the shop where the product was purchased. When this is done, the repair will then be performed under warranty by SMC.

No-cost repair of the product is assured within the period and requirements mentioned above. Failures which occur after the warranty period has passed will, in principle, be charged.

8.2 Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction(WMD) or any other weapon is strictly prohibited.

2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulation of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

Revision history

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