Peltier-Type Thermoelectric Bath

Accurately controls the temperature of liquid in the bath.

Square type liquid bath is newly added to the product lineup.

Temperature stability ±0.02 °C to ±0.03 °C

Compact Lightweight 22 kg (INR-244-757)

Current consumption 3.5 A to 6 A

Power supply voltage 100 VAC to 240 VAC

Application Examples

INR-244-757

Temperature control of sample and reagent

Temperature control of source gas for MO-CVD or diffusion furnace

Related Products

◎Fluoropolymer piping equipment

Fittings *Series LQ1/LQ3*

Tubing *Series TL/TLM*

Bore through connector *Series LQHB*

Variations

For details about related products, refer to the SMC website.

Model		Usable constant temperature liquid	Cooling method	Cooling capacity	Tank capacity	Temperature range	Temperature stability
	INR-244-745 INR-244-733	Water Ethylene glycol aqueous solution Fluorinated fluid (Square type can be used only at normal temperature.)	Water-cooled	140 W	Approx. 10 L	0 to 60 °C	±0.03 °C
	INR-244-747 INR-244-736			320 W			
	INR-244-746 INR-244-734		Water-cooled	320 W	Approx. 23 L	0 to 60 °C	±0.03 °C
	INR-244-749 INR-244-748				Approx. 39 L		
	INR-244-757		Air-cooled	220 W	Approx. 17 L	0 to 60 °C	±0.03 °C
	HEBC002-WA10		Water-cooled	140 W	Approx. 3 L	−15 to 60 °C	±0.02 °C

Peltier-Type Thermoelectric Bath Lineup

New

(INR-244-733)

Specifications	Square type, water-cooled			
Model	INR-244-745	INR-244-733	INR-244-747	INR-244-736
Cooling method	Peltier, Water-cooled		Peltier, Water-cooled	
Cooling capacity*	140 W (at 20 °C Water)		320 W (at 20 °C Water)	
Dimensions (W x D x H)	266 x 376 x 400 mm		266 x 376 x 400 mm	
Tank capacity (W x D x H)	216 x 216 x 250 mm (Approx. 10 L)		216 x 216 x 250 mm (Approx. 10 L)	
Weight	Approx. 15.5 kg		Approx. 16.5 kg	
Power supply voltage range	100 VAC to 240 VAC		100 VAC to 240 VAC	
Rated current (at 100 VAC)	3.5 A		5.5 A	
Liquid temperature range	0 to 60 °C		0 to 60 °C	
Temperature stability	±0.03 °C		±0.03 °C	
Communications	RS-232C	RS-485	RS-232C	RS-485
Safety standards	CE marking, UL (NRTL) standard, RoHS			

New

(INR-244-749)

Specifications	Square type, water-cooled			
Model	INR-244-746	INR-244-734	INR-244-749	INR-244-748
Cooling method	Peltier, Water-cooled		Peltier, Water-cooled	
Cooling capacity*	320 W (at 25 °C Water)		320 W (at 25 °C Water)	
Dimensions (W x D x H)	350 x 510 x 400 mm		350 x 510 x 550 mm	
Tank capacity (W x D x H)	300 x 350 x 250 mm (Approx. 23 L)		300 x 350 x 400 mm (Approx. 39 L)	
Weight	Approx. 21 kg		Approx. 25 kg	
Power supply voltage range	100 VAC to 240 VAC		100 VAC to 240 VAC	
Rated current (at 100 VAC)	5.5 A		5.5 A	
Liquid temperature range	0 to 60 °C		0 to 60 °C	
Temperature stability	±0.03 °C		±0.03 °C	
Communications	RS-232C	RS-485	RS-232C	RS-485
Safety standards	CE marking, UL (NRTL) standard, RoHS			

New

Specifications	Square type, air-cooled
Model	INR-244-757
Cooling method	Peltier, Air-cooled
Cooling capacity	220 W (at 25 °C Water, Ambient temperature 25 °C)
Dimensions (W x D x H)	350 x 460 x 395 mm
Tank capacity (W x D x H)	300 x 290 x 200 mm (Approx. 17 L)
Weight	Approx. 22 kg
Power supply voltage range	100 VAC to 240 VAC
Rated current (at 100 VAC)	6 A
Liquid temperature range	0 to 60 °C
Temperature stability	±0.03 °C
Communications	RS-232C
Safety standards	CE marking, RoHS

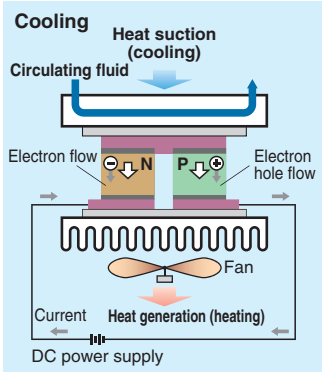
Specifications	Round type, water-cooled/Remote controller	
Model	HEBC002-WA10/HEBC002-WB10*	
Cooling method	Peltier, Water-cooled	
Cooling capacity*	140 W (at 25 °C Water)	
Dimensions (W x D x H)	Liquid tank 200 x 207 x 332 mm	Controller 250 x 300 x 180 mm
Tank capacity	ø130 x 188 mm (Approx. 3 L)	—
Weight	Approx. 8.5 kg	Approx. 6.5 kg
Power supply voltage range	100 VAC to 240 VAC	
Rated current (at 100 VAC)	4 A	
Liquid temperature range	−15 to 60 °C	
Temperature stability	±0.02 °C	
Communications	RS-485/RS-232C	
Safety standards	CE marking, UL (NRTL) standard, RoHS	

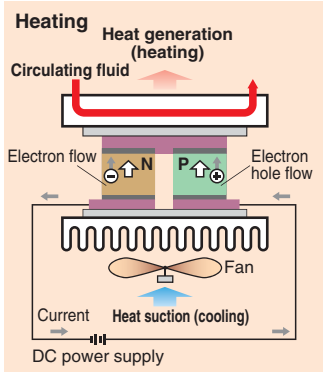
* For detailed information, refer to general catalogue series HEB in our website http://www.smc.eu

Principle of Peltier Device (Thermo-module, Thermoelectric device)

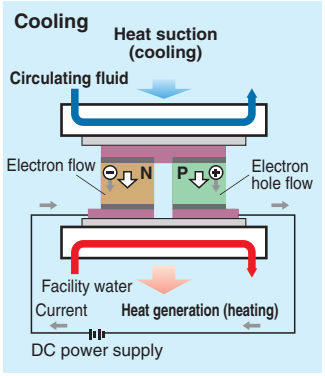
A Peltier device (thermo-module, thermo- electric device) is a plate type element, inside which P-type semiconductors and N-type semiconductors are located alternately. If direct current is supplied to the Peltier device, heat is transferred inside the device, and one face generates heat and increases temperature while the other face sucked heat and decreases temperature. Therefore, changing the direction of the current supplied to the Peltier device can achieve heating and cooling operation. This method has a fast response and can shift quickly between heating and cooling, so temperature can be controlled very precisely.

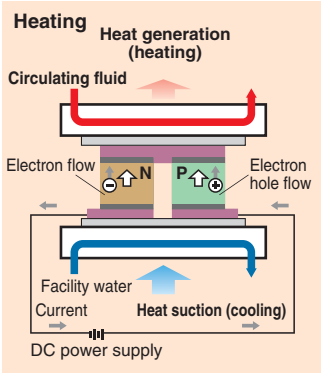
Air-cooled





Water-cooled





SMC

Peltier-Type Thermoelectric Bath (Water cooled)

Series INR-244

How to Order

INR-244-7 □

- Square type
- Type

Model	Cooling capacity / Tank capacity	Communications
33	140 W (at 20 °C water) / 10 L	RS-485
45		RS-232C
36	320 W (at 20 °C water) / 10 L	RS-485
47		RS-232C
34	320 W (at 25 °C water) / 23 L	RS-485
46		RS-232C
48	320 W (at 25 °C water) / 39 L	RS-485
49		RS-232C

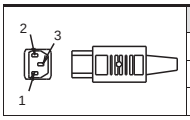
Specifications

Model No.		INR-244-							
		-733	-745	-736	-747	-734	-746	-748	-749
Operating temp. range		0 to 60.0 °C (5 °C or more for water) Note 1, 4)							
Temp. stability		±0.03 °C Note 1)							
Temp. distribution		±0.04 °C Note 1)							
Cooling capacity		140 W (Water) Note 2)		320 W (Water) Note 2)					
Heating capacity		300 W (Water) Note 2)		700 W (Water) Note 2)					
Bath liquid	**Application fluid**	Water (5 to 60 °C) Ethylene glycol-water solution must be lower than 50 % (0 to 60 °C)							
	Bath dimensions (excluding protrusion)	W216 x D216 x H250 mm Note 4)				W300 x D350x H250 mm Note 4)		W300 x D350x H400 mm Note 4)	
		220 mm						370 mm	
Facility water	**Temperature**	10 to 35 °C (no dew condensation)							
	Flow rate	3 to 7 L/min							
	Maximum operating pressure	1.0 MPa							
Facility Water port size		Rc3/8							
Drain port size		CPC coupling PLCD 16004							
Power supply		AC100-240 V, single phase, 50/60 Hz							
		3.5 to 1.5 A		5.5 to 2.5 A					
Over current protection		Circuit protector (acting as a main power switch) with rated current 10 A							
Serial communication		RS-485	RS-232C	RS-485	RS-232C	RS-485	RS-232C	RS-485	RS-232C
Panel Display		Membrane key sheet, 7 segment LED							
Alarm output		Temp. upper/lower deviation limit alarm, Output cutoff alarm Relay contact output: opened when the alarm occurs 125 VAC, 0.4 A/30 VDC, 2 A (Resistance load), 125 VAC, 0.2 A/30 VDC, 1 A (Induction load)							
Temperature sensor		Platinum resistance temperature sensor, Pt100 Ω, 3-core type, JIS C 1604							
Ambient temperature and humidity **Ambient air quality**		10 to 35 °C, 35 to 85 % RH (No condensation) Environment in which corrosive gas, solvent including thinner, or flammable gas does not exist.							
Overall size (excluding protrusion)		W266 x D376 x H400 mm				W350 x D510 x H400 mm		W350 x D510 x H550 mm	
Weight (Empty)		Approx. 15.5 kg		Approx. 16.5 kg		Approx. 21 kg		Approx. 25 kg	
Attached accessories		Power supply connector Note 3)							

Note 1) Varies depending on operating conditions.

Note 2) Determined under the following conditions: water as the Bath liquid, set temperature 25 °C, Facility Water temperature 20 °C, flow rate 3 L/min, ambient temperature 25 °C, and sealed from outside air with a lid.

Note 3) Power supply connector.



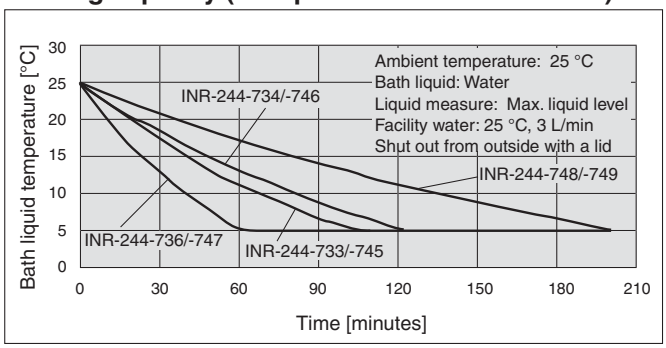
Pin	Content
1	AC100-240V (N)
2	AC100-240V (L)
3	PE(E)

Note 4) 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 be damaged.

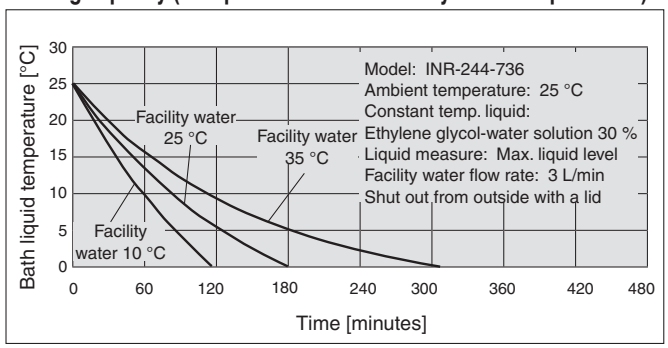
2. When the set temperature is increased from a low value to a higher value, some kinds of the bath liquid can swell, increase and overflow, which can not only damage the thermo electric bath and other equipment, but also cause a serious accident. Take measures to prevent this situation in advance by decreasing the amount of the bath liquid, etc.

Cooling Capacity

Cooling capacity (Comparison between models)

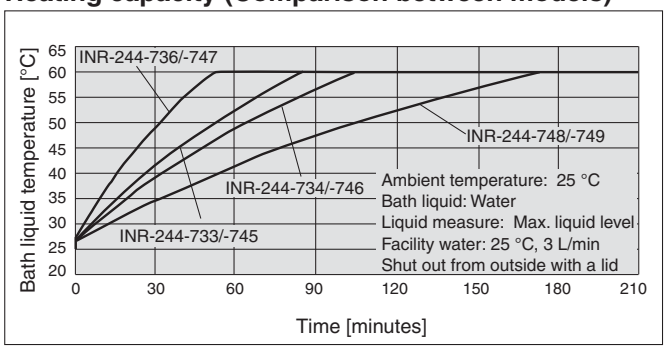


Cooling capacity (Comparison between facility water temperatures)

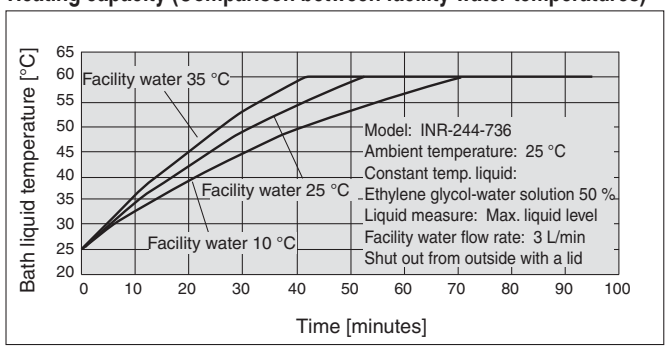


Heating Capacity

Heating capacity (Comparison between models)

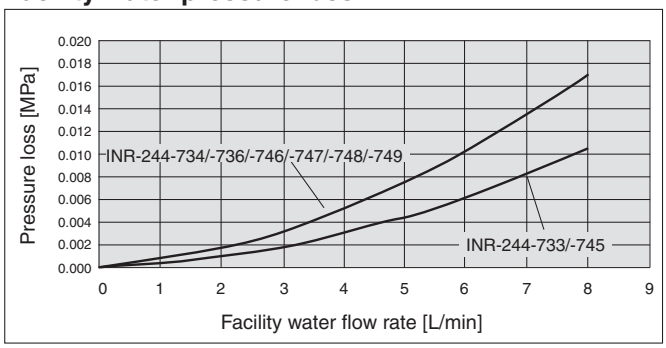


Heating capacity (Comparison between facility water temperatures)

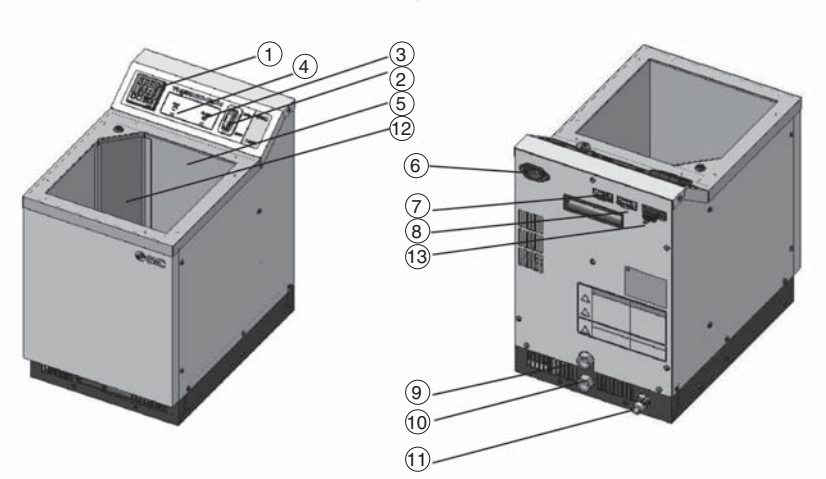


Pressure loss of facility water

Facility water pressure loss



Parts Description

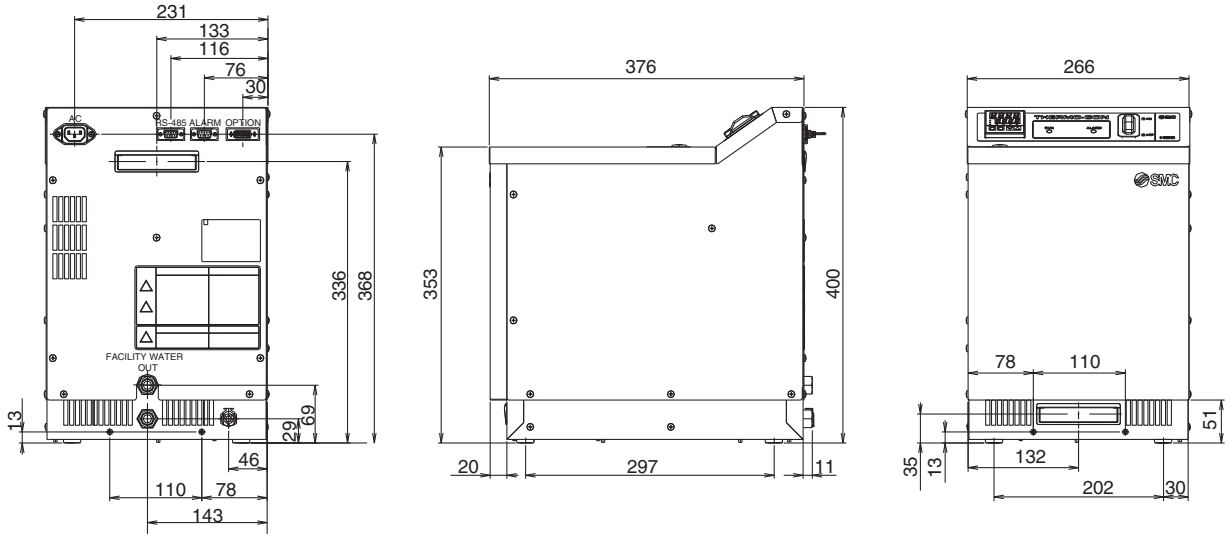


No.	Description
1	Controller
2	Main power switch (Circuit protector)
3	Alarm led (Red)
4	Run led (Green)
5	Bath
6	Power supply connector (AC)
7	Communication connector (Communication)
8	Alarm output connector (Alarm)
9	Facility Water outlet port
10	Facility Water inlet port
11	Drain port
12	Strainer
13	Level switch connector

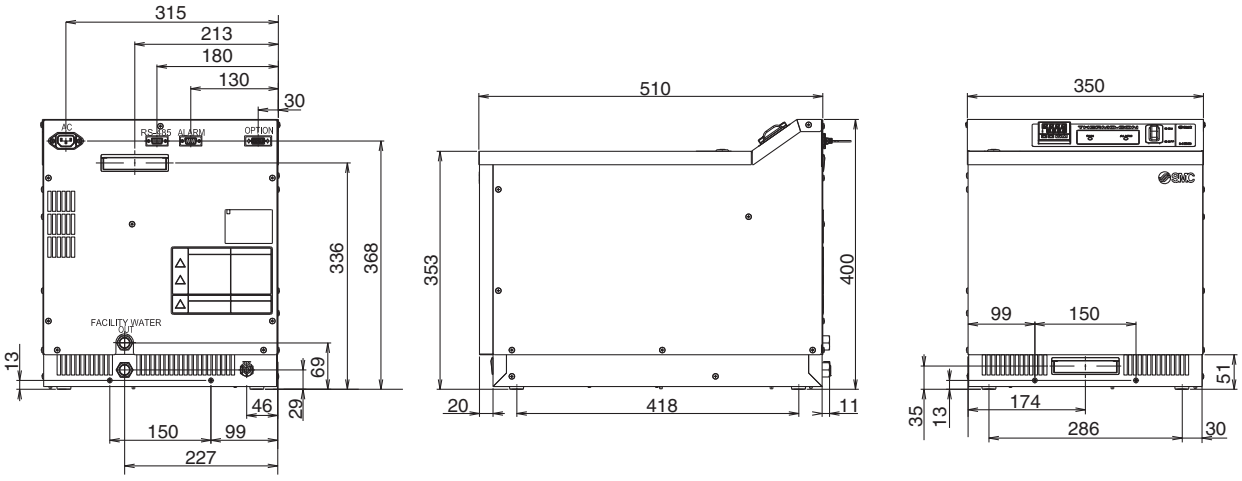
Dimensions

Outline dimensions

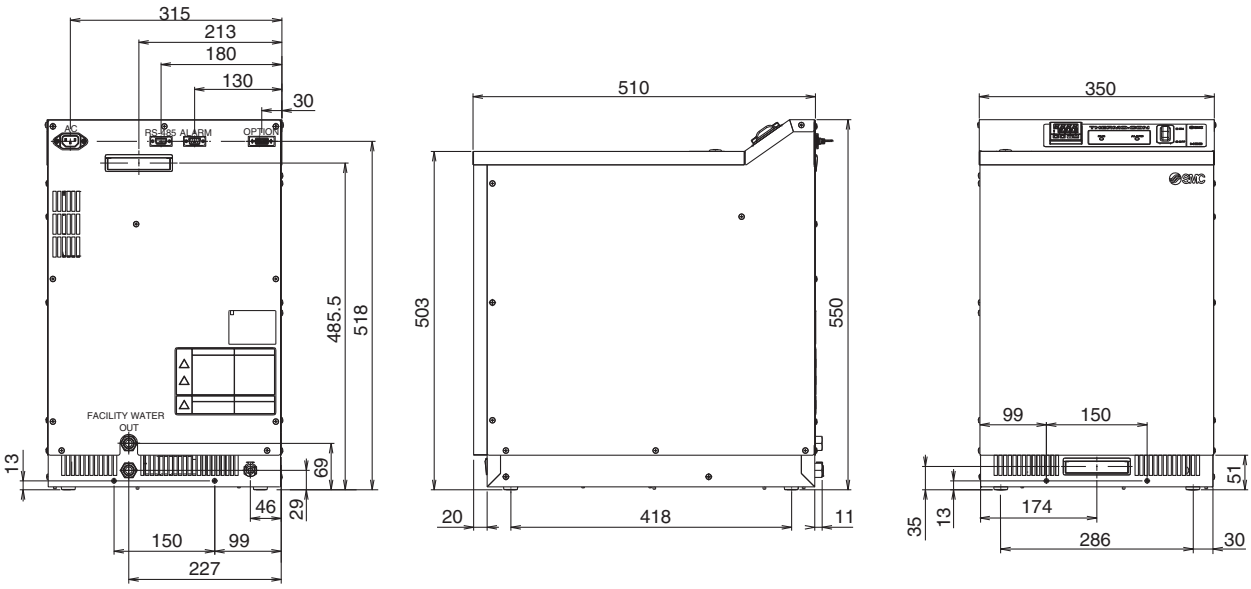
INR-244-733/-736/-745/-747



INR-244-734/-746



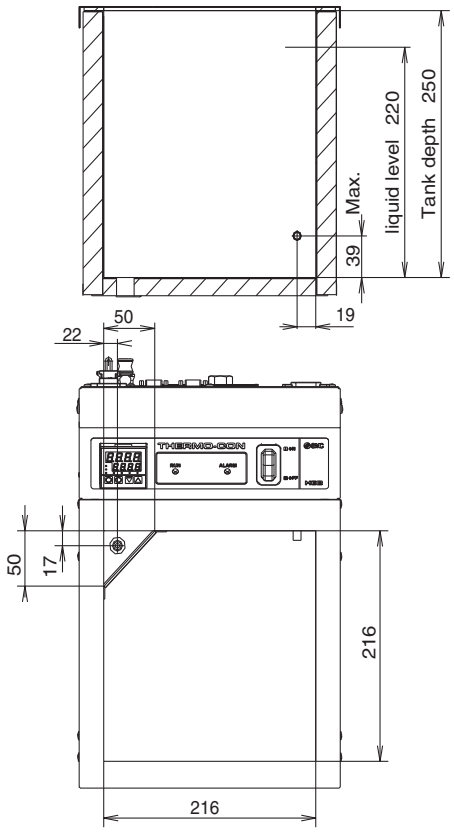
INR-244-748/-749



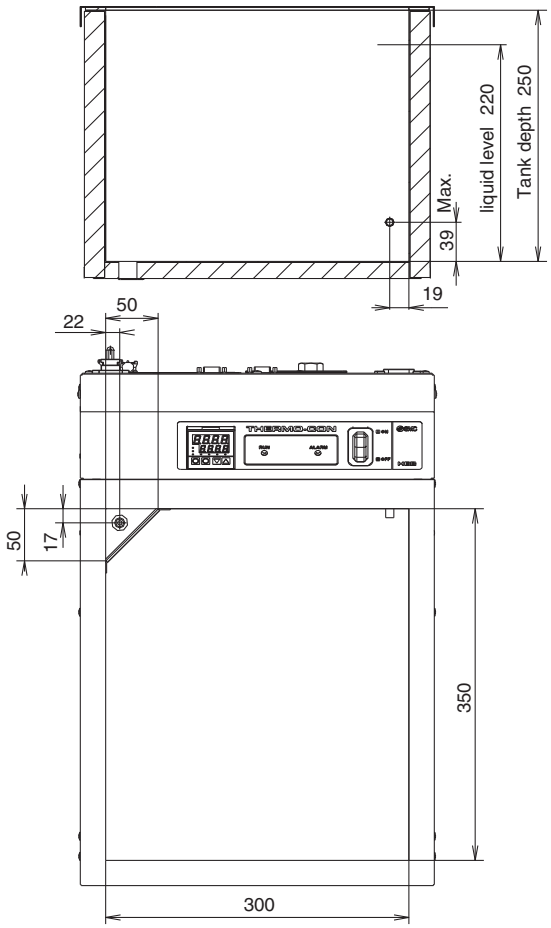
Dimensions

Bath dimensions

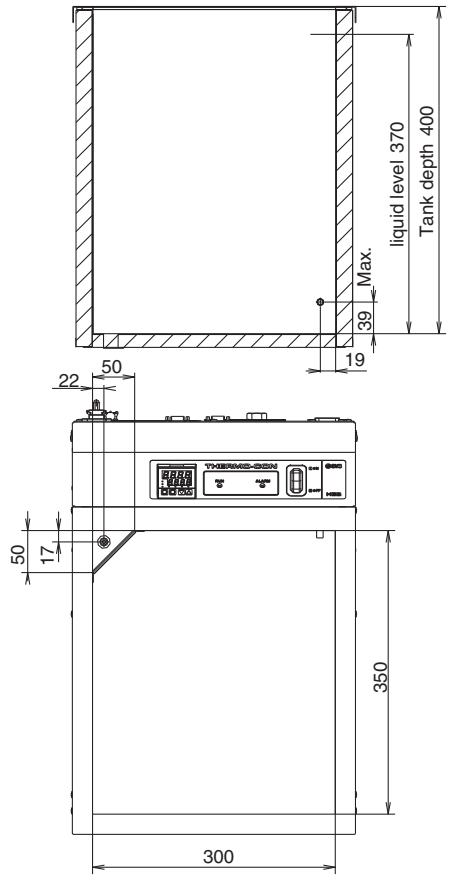
INR-244-733/-736/-745/-747



INR-244-734/-746



INR-244-748/-749



Peltier-Type Thermoelectric Bath (Air cooled)

Series INR-244-757

How to Order

INR-244-7 57

Square type

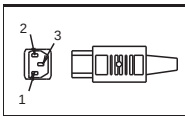
Type

Model	Cooling capacity / Tank capacity	Communications
57	220 W (at 25 °C water) / 17 L	RS-232C

Specifications

Model No.		**INR-244-757**
Operating temp. range		0 to 60.0 °C (5 °C or more for water) Note 1, 4)
Temp. stability		±0.03 °C Note 1)
Cooling capacity		220 W (Water) Note 2)
Heating capacity		600 W (Water) Note 2)
Bath liquid	**Application fluid**	Water Ethylene glycol-water solution must be lower than 50 %
	Bath dimensions (excluding protrusion)	W300 x D290 x H200 mm Note 4)
Drain port size		CPC coupling PLCD 16004
Power supply		AC100-240 V, single phase, 50/60 Hz, Max. 6A
Over current protection		Circuit protector (acting as a main power switch) with rated current 10 A
Serial communication		RS-232C
Panel Display		Membrane key sheet, 7 segment LED
Alarm output		Temp. upper/lower deviation limit alarm, Output cutoff alarm Relay contact output: opened when the alarm occurs 125 VAC, 0.4 A/30 VDC, 2 A (Resistance load), 125 VAC, 0.2 A/30 VDC, 1 A (Induction load)
Temperature sensor		Platinum resistance temperature sensor, Pt100 Ω, 3-core type, JIS C 1604
Ambient temperature and humidity **Ambient air quality**		10 to 35 °C, 35 to 85 % RH (No condensation) Environment in which corrosive gas, solvent including thinner, or flammable gas does not exist.
Overall size (excluding protrusion)		W350 x D460 x H395 mm
Weight (Empty)		Approx. 22 kg
Attached accessories		Power supply connector Note 3), Drain tube

Note 1) Varies depending on operating conditions.
Note 2) Determined under the following conditions: water as the Bath liquid, set temperature 25 °C, ambient temperature 25 °C, and sealed from outside air with a lid.
Note 3) Power supply connector.

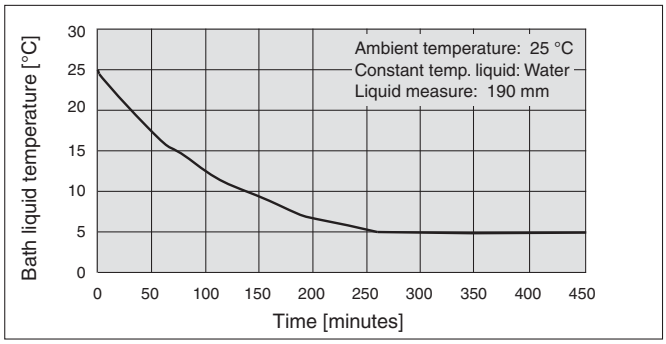


Pin	Content
1	AC100-240V (N)
2	AC100-240V (L)
3	PE(E)

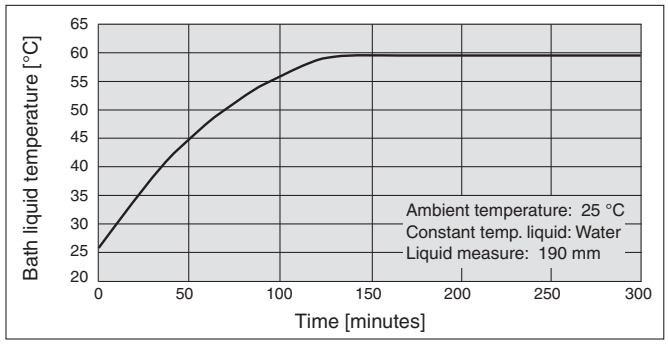
Note) Use AWG14 for the power cable

Note 4) 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 be damaged.
2. When the set temperature is increased from a low value to a higher value, some kinds of the bath liquid can swell, increase and overflow, which can not only damage the thermo electric bath and other equipment, but also cause a serious accident. Take measures to prevent this situation in advance by decreasing the amount of the bath liquid, etc.

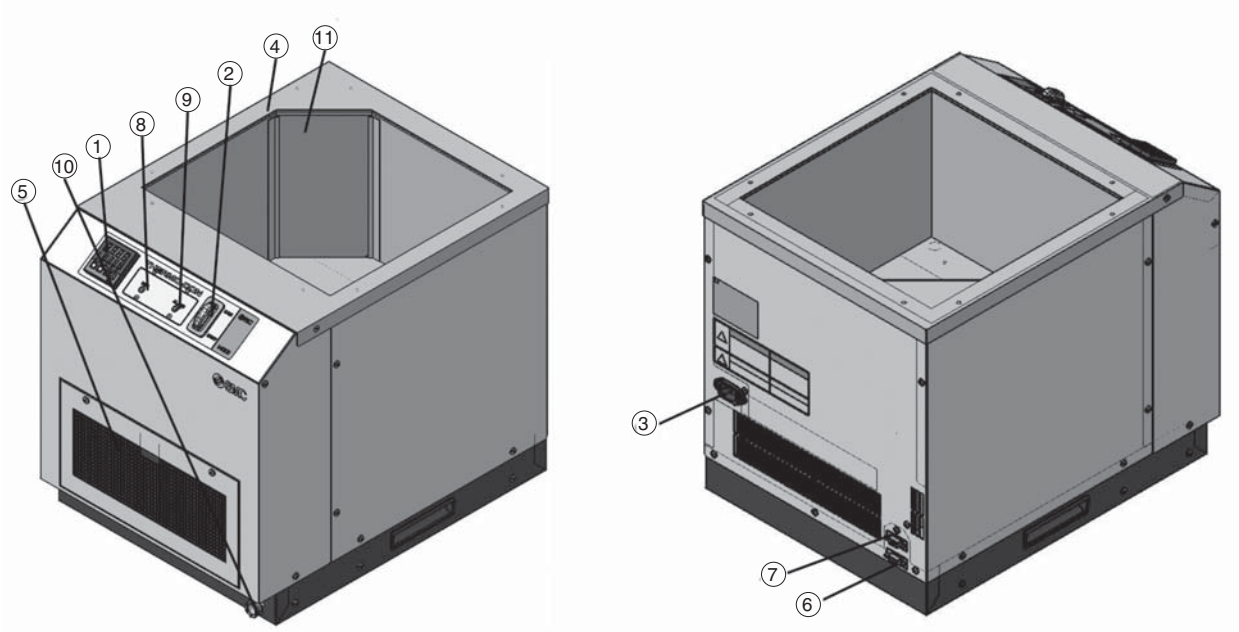
Cooling Capacity



Heating Capacity



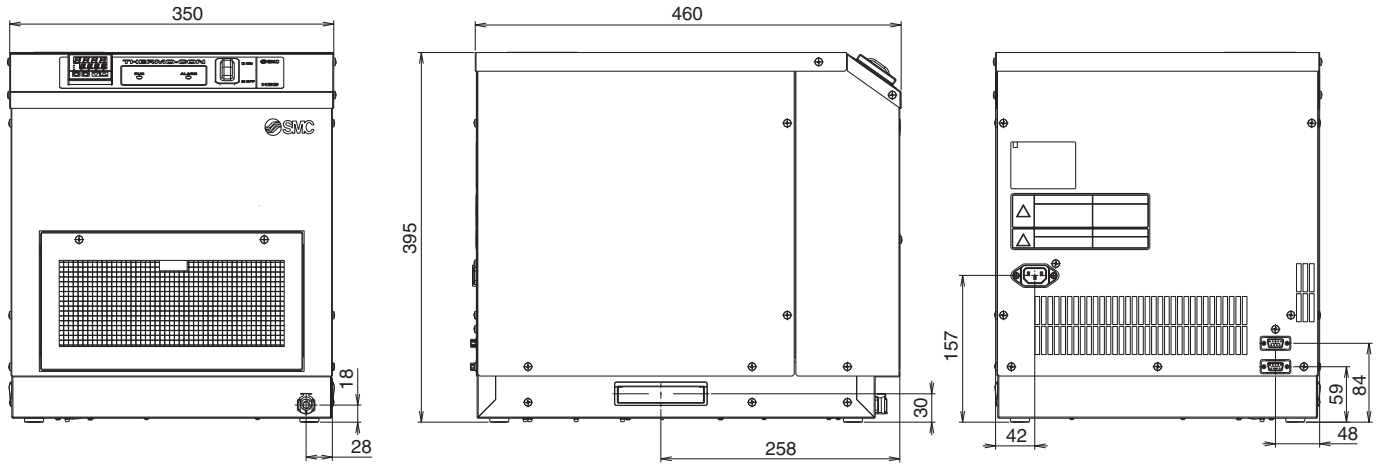
Parts Description



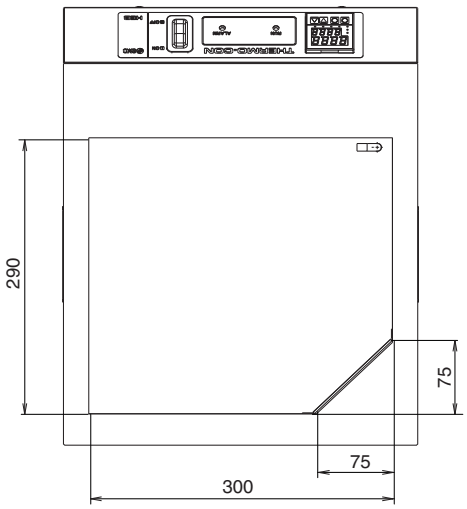
No.	Description
1	**Operation and display panel**
2	**Circuit protector (Power switch)**
3	**Power supply connector (AC)**
4	**Liquid Bath**
5	**Air filter**
6	**Alarm output connector (Alarm)**
7	**Communication connector (Communication)**
8	**RUN LED (Green)**
9	**ALARM LED (Red)**
10	**Drain Port**
11	**Strainer (Perforated Metal ø1)**

Dimensions

Outline dimensions



Bath dimensions

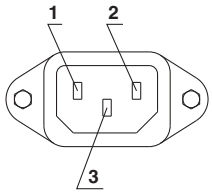


∗ Tank depth: 200 mm

Connectors

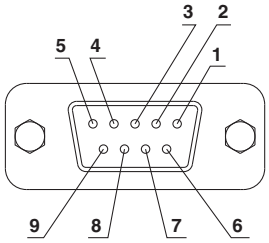
■ Power connector (AC)
IEC60320 C14 or equivalent

Pin No.	Signal contents
1	100 to 240 VAC
2	100 to 240 VAC
3	PE



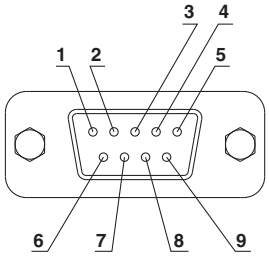
■ Communication connector (RS-232C or RS-485)
D-sub 9 pin (socket)
Holding screw: M2.6

Pin No.	Signal contents	
	RS-232C	RS-485
1	Unused	BUS+
2	RD	BUS–
3	SD	Unused
4	Unused	Unused
5	SG	SG
6-9	Unused	Unused



■ Alarm output connector (ALARM)
D-sub 9 pin (pin)
Holding screw: M2.6

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



Description of detail functions

■ High / Low Temp. Alarm Function

This function generates an alarm when the measured temperature deviates from the set temperature by an amount outside of that defined as the upper or lower limit deviation. In that case, the **AL1** LED of the Controller lights up and the alarm is generated via relay contact to a pin for the High / Low temp. alarm of the alarm output connector. After the measured temperature returns to within the upper or lower deviation, the alarm will be reset automatically. This alarm comes on immediately after the power supply is turned on when the temperature at that time deviates from the set temperature by an amount outside of the high or low deviation limit.

This LED lights up when the High / Low temp. alarm occurs.

■ Offset Function

The temperature sensor can be calibrated by inputting an offset (calibration value) between the temperatures of a standard thermometer and the temperature sensor in the product.
The factory adjusted value is set as initial value.

■ Set Value Memory (EEPROM back-up)

This function memorizes all set values input via the operation and display panel to nonvolatile memory EEPROM as back-up. Even if the power supply is turned off, the settings remain and do not need to be reset when the power supply is restarted.
Any set value input via the communication function is not stored. If they need to be stored, use a storage command.
The overwrite limit is approx. 0.1 million times. If the setting is performed via the communication function, pay attention to how many times the overwrite has been done.

■ Alarm Stop Function

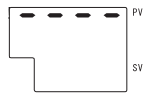
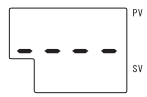
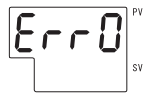
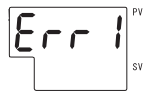
The product stops operation when a serious abnormality occurs. The ALARM LED lights up and the alarm signal is output via relay contact from the alarm output connector. The alarm can be reset by turning ON/OFF the AC power. Typically alarms are caused by the following cases.

1. Overheating of Liquid Tank (Thermostat is activated).
2. Reduction of Controller output voltage.

■ Controller Alarm

When an error in the controller occurs, the product stops operation and display following error code. The error can be reset by turning ON/OFF the AC power. In case it cannot be reset by turning ON/OFF the AC power, it must require the product repair.

Indication of alarms on operation and display panel

Indicator	Content of alarm
	Shown when a temperature sensor is opened (including disconnection of the signal cable).
	Shown when a temperature sensor is short circuited.
	Shown when the Controller has a memory error.
	Shown when the Controller has an A/D conversion error.

■ Serial Communication Function

This product has a serial communication function conforming to communication protocol RS-232C or RS-485. The transmission cable length, is 500m in maximum. RS-485 enables one host computer to connect to up to 31 RS-485 terminals.

The contents of the serial communication on this product are as follows.

(1) Reading of measured temperature
(2) Setting and reading of target temperature
(3) Setting and reading of offset value
(4) Storage command of set value

(Any set value input via the communication function is stored in the volatile memory. If they need to be stored in nonvolatile memory, use a storage request command.)

Temperature Control Equipment Precautions 1

Be sure to read this before handling.
For detailed precautions on each series, refer to the main text for specific product precautions on every series.

Selection

⚠ Warning

1. Confirm the specifications.

Fully understand the applications, environment, fluids and other operating conditions. Use this product within the specified range shown in this catalog. Using outside the specified range can cause injury, damage, or malfunction. When in doubt, please contact SMC beforehand.

2. Secure the performance margin.

When you consider the product's cooling/heating performance or flow characteristics, allowance must be made because there are heat loss from the piping, etc. or pressure drop.

Operating Environment/Storage Environment

⚠ Warning

1. Observe the ambient temperature range.

The operating ambient temperature range must be within the specification range shown in this catalog.
Use caution because using beyond the range will lead to damage, breakage or malfunction.

2. Avoid using and storing in the following environment because it will lead to malfunction.

1. In locations where water, water steam, salt water, and oil may splash on the product.
2. In locations where a large amount of particles are airborne.
3. In locations with an atmosphere of corrosive or explosive gases, solvents, or chemicals.
   (This product is not explosion proof.)
4. In locations which receive direct sunlight or radiated heat.
   (Protect from direct sunshine to avoid the resin from deteriorating by ultraviolet rays or increasing the temperature.)
5. In locations where temperature substantially changes.
6. In locations where there is a heat source nearby and the ventilation is poor.
   (Insulate the heat source or ventilate well to avoid damages caused by the heat or temperature increase, such as softening.)
7. In locations where condensation occurs.
8. In locations where strong magnetic noise occurs.
   (In locations where strong electric fields, strong magnetic fields and surge voltage occur.)
9. In locations where static electricity occurs, or conditions which make the product discharge static electricity.
10. In locations where high frequency occurs.
11. In locations where damage is likely to occur due to lightning.
12. In locations where impacts or vibrations occur.
13. In conditions where a massive force strong enough to deform the product is applied or a weight from a heavy object is applied.
14. In locations more than 1000 m in altitude (except storage, transportation)

Fluid

⚠ Warning

1. Type of fluids

1. The operating fluids must be used within the specified range shown in this catalog.
   Please consult with SMC when using the product with other fluids.
2. Depending on the combination, foreign matter, chemical leakage and catalysts may change the piping material and operating fluid qualities.
3. When solid foreign objects may be mixed with a fluid, install a filter to remove them.

2. Use clear water (including for diluting ethylene glycol aqueous solution) which must meet the water quality standards as mentioned below.

Facility Water Quality Standard

The Japan Refrigeration and Air Conditioning Industry Association
JRA GL-02-1994 "Cooling water system – Circulation type – Circulating water"

	Item	Unit	Standard value	Influence	
				Corrosion	Scale generation
Standard item	pH (at 25 °C)	—	6.0 to 8.0	○	○
	Electric conductivity (25 °C)	[μS/cm]	100* to 300*	○	○
	Chloride ion (Cl^-)	[mg/L]	50 or less	○	
	Sulfuric acid ion (SO_4^{2-})	[mg/L]	50 or less	○	
	Acid consumption amount (at pH4.8)	[mg/L]	50 or less		○
	Total hardness	[mg/L]	70 or less		○
	Calcium hardness ($CaCO_3$)	[mg/L]	50 or less		○
	Ionic state silica (SiO_2)	[mg/L]	30 or less		○
Reference item	Iron (Fe)	[mg/L]	0.3 or less	○	○
	Copper (Cu)	[mg/L]	0.1 or less	○	
	Sulfide ion (S_2^-)	[mg/L]	Should not be detected.	○	
	Ammonium ion (NH_4^+)	[mg/L]	0.1 or less	○	
	Residual chlorine (Cl)	[mg/L]	0.3 or less	○	
	Free carbon (CO_2)	[mg/L]	4.0 or less	○	

* In the case of [MΩ•cm], it will be 0.003 to 0.01.
• ○ : Factors that have an effect on corrosion or scale generation.
• Even if the water quality standards are met, complete prevention of corrosion is not guaranteed.

Transportation/Transfer/Movement

⚠ Warning

1. Product transfer should be performed by a knowledgeable and experienced person.

Especially, transferring a heavy object is dangerous.
Use adequate caution to prevent falling down or dropping accidents from occurring.

2. Avoid transportation in the following environment because it will lead to breakage.

1. In conditions where strong shock and vibrations occur.
2. In operating and storage environments other than those specified.

3. Caution when transferring a heavy object

This product is heavy. Use adequate caution to avoid injury when picking up and setting down the product, and falling and dropping accidents should be avoided.

4. Before moving this product, remove operating fluid, facility water from the inside of this product.

Temperature Control Equipment Precautions 2

Be sure to read this before handling.
For detailed precautions on each series, refer to the main text for specific product precautions on every series.

Mounting/Installation

⚠ Warning

1. Installation should be performed by a knowledgeable and experienced person.

Especially, installation of a heavy object is dangerous.
This product is heavy. Use adequate caution to avoid falling and dropping accidents from occurring.

⚠ Caution

1. Provide space for ventilation and maintenance.

Provide enough space for the ventilation requirement of each equipment. Otherwise, a cooling malfunction or operation stoppage may occur. Also, provide space required for maintenance.

2. Verify the mounting orientation.

Mount and install horizontally.

Piping

⚠ Warning

1. For this product and future equipment, design of the piping system should be performed by a knowledgeable and experienced person.

2. Work performed on the piping should be done by a knowledgeable and experienced person.

If work performed on the piping is done by a less knowledgeable and inexperienced person, it will likely lead to operating fluid leakage, etc.

3. Thoroughly read the operation manual.

Read the operation manual completely before piping. Also, keep the manual where it can be referred to as necessary.

4. Tighten threads with the proper tightening torque.

When installing fittings, etc., follow the given torque levels below.

Tightening Torque for Piping

Connection thread	Proper tightening torque [N·m]
M5	1.5 to 2
Rc 1/8	7 to 9
Rc 1/4	12 to 14
Rc 3/8	22 to 24
Rc 1/2	28 to 30
Rc 3/4	28 to 30
Rc 1	36 to 38
Rc 1 1/4	40 to 42
Rc 1 1/2	48 to 50
Rc 2	48 to 50

5. Confirm the leakage of fluid.

Confirm that the hose or tubing is not pulled out and that there is no leakage in the fitted parts.

Piping

⚠ Caution

1. Refer to the Fittings and Tubing Precautions for handling One-touch fittings.

2. Preparation before piping

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe.

3. Use caution regarding the flowing direction of the fluid.

When installing piping to a product, do not mistake the flow direction of supply port, etc. Check “IN” and “OUT” or labels and the operation manual before connection.

4. Sealant tape

When installing piping or fitting into a port, ensure that sealant material does not enter the port internally. When using sealant tape, leave 1.5 to 2 threads exposed on the end of pipe/fitting.

5. Take countermeasures against condensation.

Depending on the operating condition, condensation may occur in the piping. In such a case, take countermeasures such as installing insulation material, etc.

Temperature Control Equipment Precautions 3

Be sure to read this before handling.
For detailed precautions on each series, refer to the main text for specific product precautions on every series.

Electrical Wiring

⚠ Warning

1. Electrical wiring job should be performed by a knowledgeable and experienced person.

Power supply facilities and wiring works should be implemented in accordance with the electric facilities technical standards and provisions and conducted correctly.

2. Mounting a dedicated circuit breaker

As a countermeasure against current leakage, install a ground fault circuit interrupter (GFCI) in the main power supply.

3. Check the power supply.

If this product is used with voltages other than specified, it will likely lead to a fire or an electrical shock. Before wiring, confirm the voltage, volume, and frequency.
Confirm that the voltage fluctuation is within ±10% of the specified value.

4. Grounding

Be certain to ground (frame ground) with class D grounding (grounding resistance of 100 Ω or less).
Can be grounded with the PE line of the power supply cable.
Also, do not use together with equipment that generates a strong electrical magnetic noise or high frequency noise.

5. Wiring cable should be handled with care.

Do not bend, twist or stretch the cord or cable.

6. Wire with an applicable size cable and terminal.

In the event of attaching a power supply cable, use a cable and terminal size which is suitable for the electrical current of each product.
Forcibly mounting with an unsuitable size cable will likely result in a fire.

7. Avoid wiring the signal line and power line in parallel.

Since there may be a possibility of malfunction from noise, avoid parallel wiring between the temperature sensor line, communication line, signal line of alarm line, etc. and the power line and high voltage line. Also, do not place them in the same wiring tube.

Facility Water Supply
(Water-cooled refrigeration)

⚠ Warning

1. Be certain to supply the facility water.

1. Prohibition of water-cut operation, very little flow rate of water operation.
   Do not operate under the condition that there is no facility water or where there is very little flow rate of water is flowing. In this kind of operation, facility water temperature may become extremely higher. It is dangerous enough the material of hose may soften and burst when the piping supplying the facility water is connected with hose.
2. Actions to be taken when an emergency stop occurs due to high temperature.
   In case a stop occurs due to extremely high temperature resulting from a decrease in the facility water flow rate, do not immediately flow facility water. It is dangerous enough the material of hose may soften and burst when the piping supplying the facility water is connected with hose.
   First, naturally let it cool down by removing the cause of the flow rate reduction. Secondly, confirm that there is no leakage again.

⚠ Caution

1. Facility water quality

1. Use the facility water within the specified range.
   When using with other fluid than facility water, please consult with SMC.
2. When it is likely that foreign matter may enter the fluid, install a filter (20 mesh or equivalent).

Facility Water Quality Standard

The Japan Refrigeration and Air Conditioning Industry Association
JRA GL-02-1994 "Cooling water system – Circulation type – Circulating water"

	Item	Unit	Standard value	Influence	
				Corrosion	Scale generation
Standard item	pH (at 25 °C)	—	6.5 to 8.2	○	○
	Electric conductivity (25 °C)	[μS/cm]	100* to 800*	○	○
	Chloride ion (Cl^-)	[mg/L]	200 or less	○	
	Sulfuric acid ion (SO_4^{2-})	[mg/L]	200 or less	○	
	Acid consumption amount (at pH4.8)	[mg/L]	100 or less		○
	Total hardness	[mg/L]	200 or less		○
	Calcium hardness ($CaCO_3$)	[mg/L]	150 or less		○
	Ionic state silica (SiO_2)	[mg/L]	50 or less		○
Reference item	Iron (Fe)	[mg/L]	1.0 or less	○	○
	Copper (Cu)	[mg/L]	0.3 or less	○	
	Sulfide ion (S_2^-)	[mg/L]	Should not be detected.	○	
	Ammonium ion (NH_4^+)	[mg/L]	1.0 or less	○	
	Residual chlorine (Cl)	[mg/L]	0.3 or less	○	
	Free carbon (CO_2)	[mg/L]	4.0 or less	○	

* In the case of [MΩ•cm], it will be 0.00125 to 0.01.
• ○ : Factors that have an effect on corrosion or scale generation.
• Even if the water quality standards are met, complete prevention of corrosion is not guaranteed.

Temperature Control Equipment Precautions 4

Be sure to read this before handling.
For detailed precautions on each series, refer to the main text for specific product precautions on every series.

Operation

⚠ Warning

1. Handle and operate after the safety of this product and the whole system are confirmed.

For this product and incidental equipment, operate this product by a knowledgeable and experienced person.

2. Before operation, confirm the safety of mounting, installation, piping and electric wiring conditions.

1. Confirm that the mounting and installation conditions are safe.
2. Confirm that the circulating fluid is filled and that the fluid level is within the display range.
3. Confirm whether the valve is open or closed and that the hose and resin tube are not twisted.
   It is dangerous when the valve in the piping is closed because the circulating fluid and the facility water will not flow and the fluid pressure will increase.
4. Confirm the flow direction of the fluid.
   Be certain that the flow direction of the fluid (Inlet/Outlet direction) is connected correctly.
5. Confirm that the electrical wiring condition is safe.
   Incorrect wiring will lead to malfunction or breakage of the product. Confirm that there is no error in wiring before operation.
6. When using the product with a 3-phase power supply, confirm the connection.
   If the phase order is incorrect, the pump, etc. will run in reverse, or the phase-reversal relay will activate and the product will not operate.
   In this case, after cutting off the main power supply, reverse 2 wires out of the 3 wires and connect them in the correct phase order.

3. Do not remove the external panel during energization or operation.

If removed, there are the dangers of electrical shock, burn, frostbite, injury from a rotating object.

4. Avoid operating with a lower flow.

Avoid operating with a lower flow because the temperature control may become unstable or the service life of the pump may shorten.

5. Confirm the safety during the operation.

During the operation, if an emergency is detected, stop this product immediately and cut off the power supply breaker.

6. When not used for long periods of time, confirm the safety once again prior to beginning its operation.

Maintenance

⚠ Warning

1. Perform maintenance inspection according to the procedures indicated in the operation manual.

If handled improperly, malfunction and damage of machinery or equipment may occur.

2. Maintenance operations

Improper handling of compressed air is dangerous. Therefore, in addition to observing the product specifications, replacement of elements and other maintenance activities should be performed by personnel having sufficient knowledge and experience pertaining to pneumatic equipment.

3. Pre-maintenance inspection

When removing this product, cut off the electric power, and be certain to shut off the supply pressure and exhaust the compressed air in the system. Proceed only after confirming that all pressure has been released to the atmosphere.

4. Post maintenance inspection

After installation or repair, reconnect compressed air and electricity and conduct appropriate inspections to confirm proper operation. If there is an audible air leakage, or if the equipment does not operate properly, stop operation and confirm that the equipment is installed correctly.

5. Modification prohibited

Do not modify or reconstruct the unit.

6. Stopping for long periods of time

When not using for long periods of time, remove the fluid (circulating fluid, facility water) and cut off the main power supply.

7. Removal of product

Take the stop/inspection measures and confirm that there is no danger before the product is removed.
In the event of removing the product, discharge the used fluid and clean the inside of the piping.
When a dangerous fluid or polluted fluid is left, it is likely that the polluted area will be enlarged or an accident will occur.

8. Disposal of product

When the product is disposed, it must be in compliance the ordinance or rules of the local municipality.
Ask for help from a professional industrial waste disposal company.
In particularly, in case of a refrigerated type product, entrust a company to collect the refrigerant, etc.
In that case, the customer may be requested to submit a certificate that is showing the type of operating fluid and whether any quantity is left. These procedures are the responsibility of the customer.

9. Preparation of a backup product

In order to keep the downtime of a customer's system to a minimum, prepare a backup product, when necessary.

⚠ Safety Instructions

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.

⚠ Caution: **Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

⚠ Warning: **Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

⚠ Danger : **Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

*1) ISO 4414: Pneumatic fluid power – General rules relating to systems.
ISO 4413: Hydraulic fluid power – General rules relating to systems.
IEC 60204-1: Safety of machinery – Electrical equipment of machines.
(Part 1: General requirements)
ISO 10218-1: Manipulating industrial robots - Safety.
etc.

⚠ Warning

1. 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 catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. 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.

3. 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 prevent falling or 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.

4. 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, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalogue.
3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

⚠ Caution

1. 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.

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.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, wichever is first.*2)
Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. 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.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalogue for the particular products.

***2) Vacuum pads are excluded from this 1 year warranty.**
A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.
Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

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 regulations 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.

⚠ Caution

SMC products are not intended for use as instruments for legal metrology.
Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country. Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

⚠ Safety Instructions Be sure to read "Handling Precautions for SMC Products" (M-E03-3) before using.

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