HRX-OM-L014
1st edition: Jun. 2007
5th edition: Aug. 2010

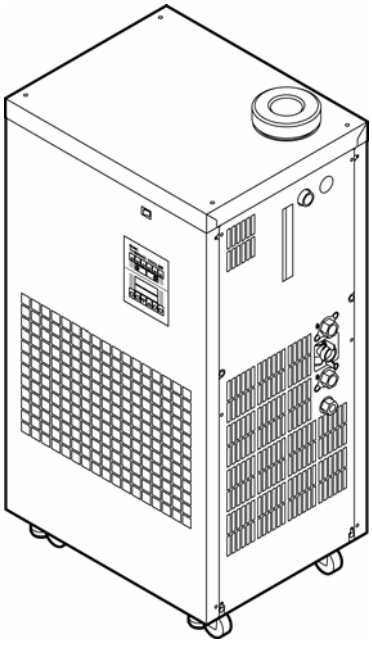
Operation Manual

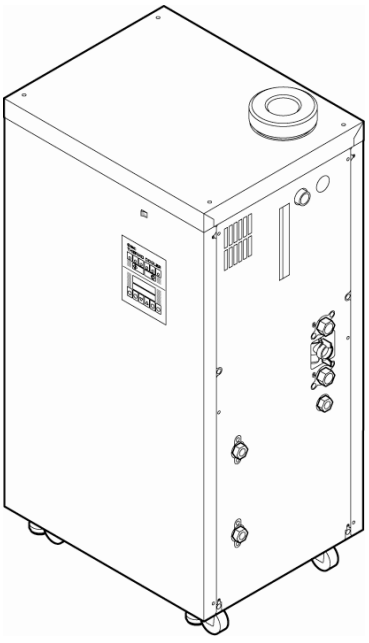
Original Instructions

Thermo-cooler

Air-Cooled refrigerator type
HRGC001-A∗
HRGC002-A∗
HRGC005-A∗

Water-Cooled refrigerator type
HRGC001-W∗
HRGC002-W∗
HRGC005-W∗





CE

Keep this manual available whenever necessary.

To the users

Thank you for purchasing SMC's HRGC Thermo cooler (hereinafter referred to as the "product").

For safety and long life of the product, be sure to read this operation manual (hereinafter referred to as the "manual") and clearly understand the contents.

- Be sure to read and follow all instructions noted with "Warning" or "Caution" in this manual.
- This manual is intended to explain the installation and operation of the product. Only people who understand the basic operation of the product through this manual or who performs installation and operation of or have basic knowledge about industrial machines are allowed to work on the product.
- This manual and other documents attached to the product do not constitute a contract, and will not affect any existing agreements or commitments.
- It is strictly prohibited to copy this manual entirely or partially for the use by the third party without prior permission from SMC.

Note: This manual is subject to possible change without prior notice.

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Contents

Chapter 1 Safety Instructions

Before using the product be sure to read and understand all the important actions highlighted in this manual.

1.1 Before using product

- This chapter is intended to specifically describe the safety related issues for handling the product. Read this before handling the product.
- The product is a cooling device using circulating fluid. SMC does not take any responsibility for any problems that may arise from using the product for other purposes.
- This product is for the indoor use only and not to be used outdoor.
- This product is not designed for a clean room. It generates dust from the internal components such as pump and fan motor (for air-cooled type).
- The product is operated at high voltage and contains components which become hot and rotate. If a component needs to be replaced or repaired, contact a specific vendor for parts and service.
- All personnel who work with or around the product should read and understand the safety related information in this manual carefully before starting work.
- Safety manager is responsible to strictly observe safety standards, but responsibility in respect to safety standard during daily work resides with each individual operator and personnel for maintainance.
- This manual must be kept available to operator's whenever necessary.

1.2 Reading the Manual

This manual contains symbols to help identify important actions when installing, operating or maintain the product.

This sign stands for actions that must be followed.

This sign stands for prohibited actions.

1.3 Hazards

1.3.1 Level of hazards

The instructions given in this manual aim to assure the safe and correct operation of the product, and to prevent injury of operators or damage to the product. These instructions are grouped into three categories, Danger, Warning and Caution, which indicate the level of hazard, damage and also the degree of emergency. All safety critical information should be carefully observed at all times.

"DANGER", "WARNING" and "CAUTION" signs are in order according to severity (DANGER> WARNING> CAUTION).

⚠ DANGER

"DANGER": Hazard that WILL cause serious personal injury or death during operation.

⚠ WARNING

"WARNING": Hazard that MAY cause serious personal injury or death during operation.

⚠ CAUTION

"CAUTION": Hazard that MAY cause minor personal injury.

CAUTION

"CAUTION without exclamation symbol": Hazard that MAY cause damage or failure of the product, facility, devices, ect.

1.3.2 Definition of "Serious injury" and "Minor injury"

- **"Serious injury"**

  This term describes injuries that result in after effects including loss of eyesight, burns, electrical shock, fracture, poisoning, etc. and requires long-term treatment or hospitalization.

- **"Minor injury"**

  This term describes injuries that do not need long-term treatment or hospitalization. (Others excluded from serious injury.)

1.3.3 Types of hazard labels

The product has various potential hazards and they are marked with warning labels. Be sure to read this section before starting any work on the product.

■ Warning related to electricity

⚠ WARNING

This symbol stands for a possible risk of electric shock.

The product is operated at high voltage and contains uncovered live terminals inside.
- **DO NOT operate the product without cover panels fitted**
- **DO NOT work inside this product unless you have been trained to**

■ Warning related to high temperatures

⚠ WARNING

This symbol stands for a possible risk of hot surface and burns.

The product has surfaces that can reach high temperatures during operation. Even after the power is turned off, there can still be residual heat in the product.
- **DO NOT operate the product without cover panels fitted.**
- **DO NOT start working inside the product until the temperature has decreased sufficiently.**

■ Warning related to rotating objects

⚠ WARNING

This symbol stands for a possible risk of cutting fingers or hand, or entanglement by rotating fan.
The product contains a cooling fan that rotates during operation of the product. (For air-cooled type)
The fan can start and stop intermittantly and without warning.
- **DO NOT operate the product without cover panels fitted.**

■ Warning related to other general dangers

⚠ WARNING

This symbol stands for general danger.
On the product this symbol has different meanings.

1. **Hazards Inside**
   Hot Surfaces Inside – See Hot Surface symbol
   Rotating Fan Inside – See Rotating Fan symbol
   (For air-cooled type)
   Pressurized Sytem Inside – The product contains pressurised fluid systems.
   - **DO NOT operate the product without cover panels fitted.**
2. **Lifting Hazard**
   Lifting the product from eyebolts can be dangerous
   - **DO NOT lift the product without having read the manual.**

   (only for HRGC005-*)

1.3.4 Locations of Hazard Labels

There are various warning labels on the product to show the potential hazards.

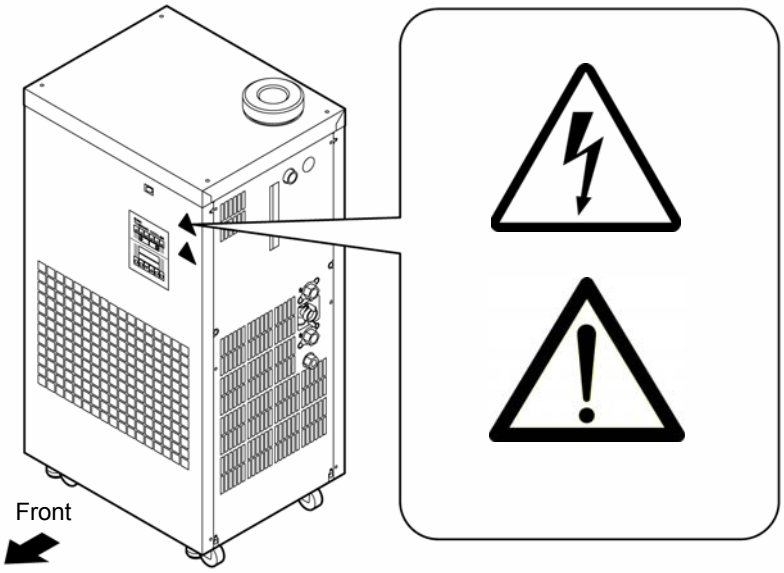


Fig.1-1 Warning label position (HRGC001-∗ and HRGC002-∗)

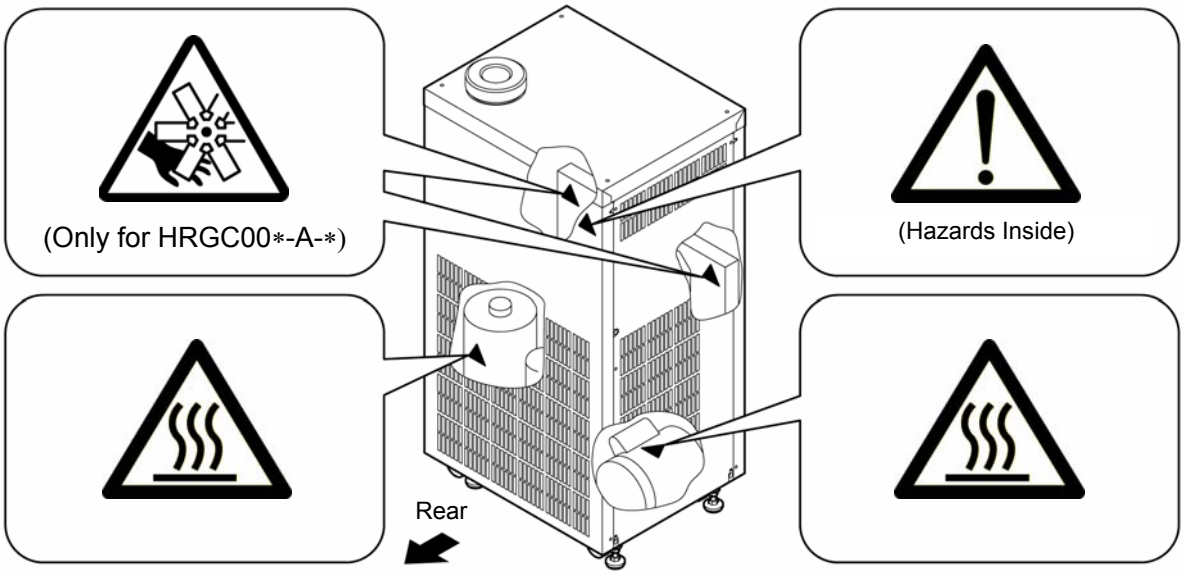


Fig.1-2 Warning label position (HRGC001-∗ and HRGC002-∗)

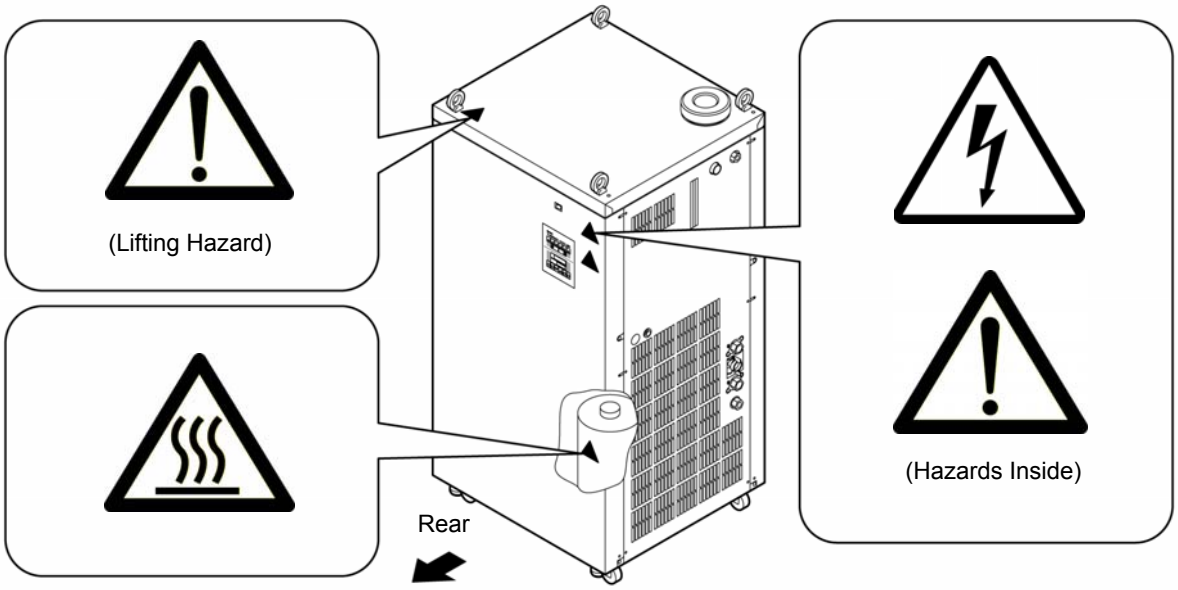


Fig.1-3 Warning label position (HRGC005-∗)

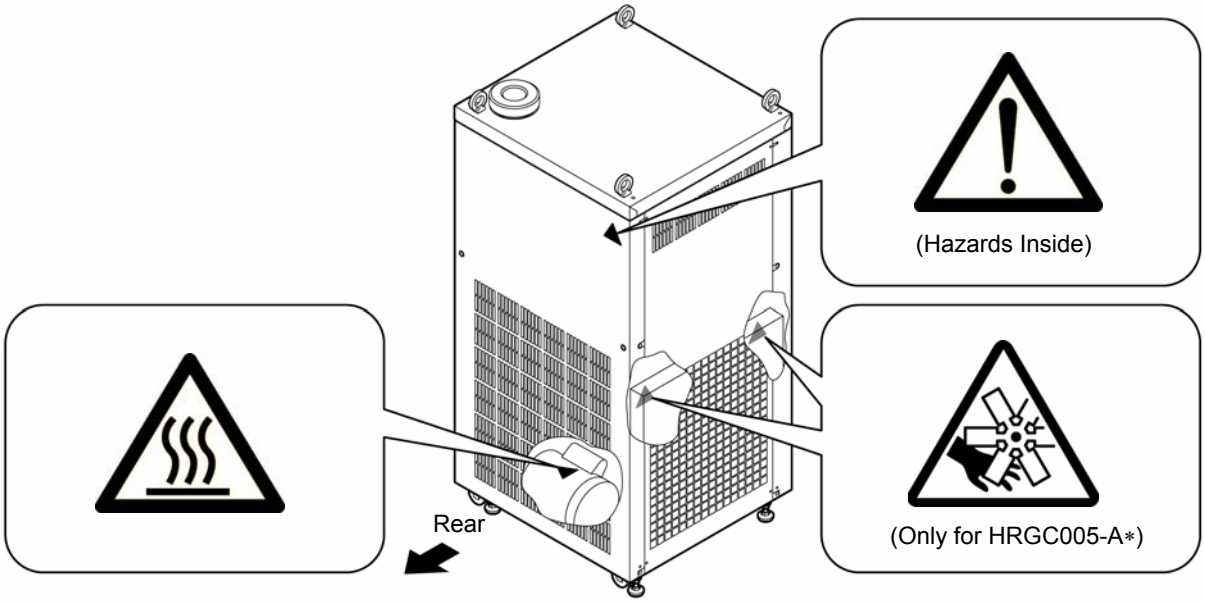


Fig.1-4 Warning label position (HRGC005-∗)

1.4 Other Labels

1.4.1 Product Label

Information about the product, such as Serial No. and Model No. can be found on the model label. This information is needed when contacting an SMC sales distributor.

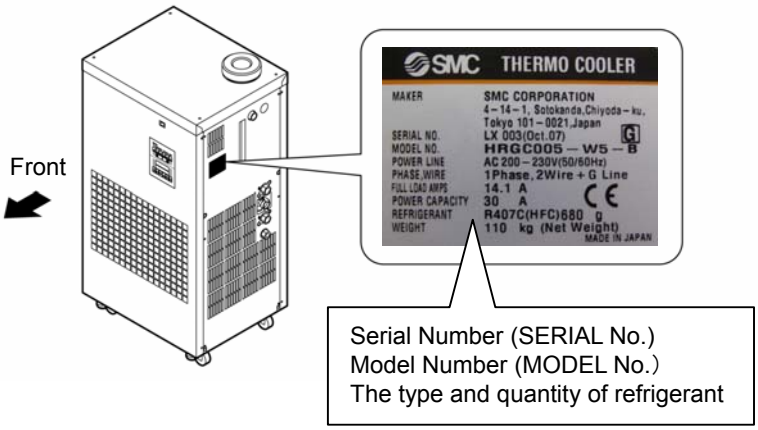


Fig.1-5 Position of product label

1.5 Safety Measures

1.5.1 Safety Instructions for Use

⚠ WARNING

Follow the instructions below when using the product. Failure to follow the instructions may cause an accident and injury.

- Read and undestand this manual carefully before using the product.
- Before starting maintenance of the product, be sure to lock out and tag out the breaker of user's power supply.
- If operating the product during maintenance, be sure to inform all workers nearby.
- Use only the correct tools and procedure when installing or maintaning the product.
- Use personal protective equipment where specified (“1.5.2 Personal Protective Equipment” P1-7）
- Check all parts and screws are fitted correctly and securely after maintenance.
- Avoid working in a drunken or sick condition, which might cause an accident.
- Do not remove the panels except for the cases permitted in this manual.
- Do not remove the panels during operation.

1.5.2 Personal Protective Equipment

This manual specifies personal protective equipment for each work.

■ Transport, Installing and Uninstalling

⚠ CAUTION

Always use safety shoes, gloves and head protection when transporting, installing or uninstall the product.

■ Handling of circulating fluid

⚠ CAUTION

Always use safety shoes, gloves, mask, apron and eye protection when handling the circulating fluid.

■ Operation

⚠ CAUTION

Always use safety shoes and gloves when operating the product.

1.6 Emergency Measures

When emergency conditions such as natural disaster, fire and earthquake, or injury occurs, turn off the power supply switch. The switch is located at the front of the product.

⚠ WARNING

Even when the power supply swich is turned off, some of the internal circuits are still energized, unless the user's power supply is shut off. Be sure to shut off the breaker of user's power supply.

1. Press the power supply switch at the front of product to stop the operation of the product.

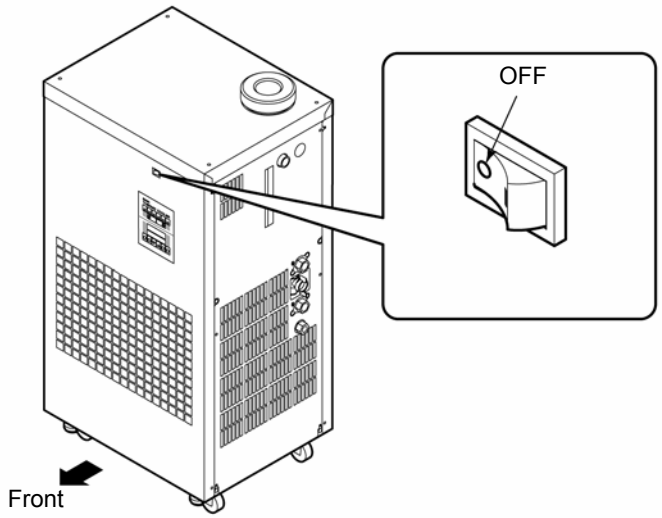


Fig.1-6 Location of the switch for the power supply

2. Be sure to shut off the breaker of the facility power supply (the power supply of the user's machine).

Switch in the OFF position

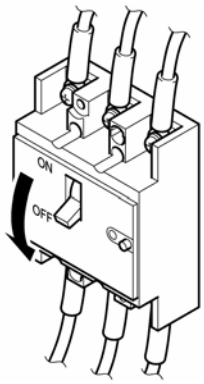


Fig.1-7 Shut off of facility power supply

1.7 Waste disposal

1.7.1 Disposal of refrigerant and compressor oil

The product uses hydro-fluorocarbon type refrigerant (HFC) and compressor oil. Comply with the law and regulation in each country for the disposal of refrigerant and compressor oil. The type and quantity of refrigerant is described on the product label. (“P1-6)

If these fluids need to be recovered, read and understand the instructions below carefully. If there is any unclear point, contact an SMC's sales distributor.

⚠ WARNING

- **Only maintenance personnel or qualified people are allowed to open the cover panels of the product.**
- **Do not mix the compressor oil with domestic waste for disposal. Also, the disposal of the waste must only be conducted by specific facilities that are permitted for that purpose.**

⚠ WARNING

- **Comply with the law and regulation in each country for the disposal of refrigerant and compressor oil.**
- **The release of refrigerant in to the atmosphere is banned by law. Recover it with specific equipment and dispose of it correctly.**
- **Only people who have sufficient knowledge and experience about the product and its accessories are allowed to recover the refrigerant and compressor oil.**

1.7.2 Disposal of product

The disposal of the product must be handled by a specialized industrial waste disposal agency in accordance with local laws and regulations.

1.8 Material Safety Data Sheet (MSDS)

If the material safety data sheets of chemicals used in this product are needed, contact an SMC's sales distributor.

Any chemicals used by the user must be accompanied by an MSDS.

Chapter 2 Name and Function of Parts

2.1 Part number of product

The product can be ordered with the part number configured as shown below. The product needs to be handled in different ways depending on the part number. Refer to “1.4.1 Product Label” and check the part number of the product.

HRGC 001 - A □ □ - □

(1) Cooling capacity

001	Cooling capacity0.9/1.1kW (50/60Hz)
002	Cooling capacity1.9/2.3kW (50/60Hz)
005	Cooling capacity4.5/4.8kW (50/60Hz)

(2) Cooling method

A	Air-cooled refrigerator type
W	Water-cooled refrigerator type

(3) Temperature stability

Nill	+/-1.0℃ (Refrigerator ON/OFF control)
5	+/-0.5℃ (Proportional valve PID control)

(4) Piping thread type

Nill	Rc
G	G (PT-G conversion fitting is included)
N	NPT (PT-NPTconversion fitting is included)

(5) Option *1

Nill	None
B	With earth leakage breaker
C	With communications function (RS485)
S	With communications function (RS232C)
E	With water leakage sensor
H	With heater
J	With automatic fluid supply function
K	With external switch signal entry
M	With stainless steel wetted material specification
T	With high head pump
Y	With DI control kit

*1 Two or more options can be selected together.
*2 When multiple options are selected, state them in alphabetical order.
Ex.] When options B, T and Y are selected for HRGC001-A, the part number should be HRGC001-A-BTY.

Fig.2-1 Part number of product

2.2 Option of product

For the list of options and applicable combinations, refer to “Table 2-1 Applicable combinations of options”.

Table 2-1 Applicable combinations of options

	Symbol	B	C	S	E	H	J	K	M	T	Y
	Options	With earth leakage breaker	*1 With communi cations function (RS485)	*1 *3 With communi cations function (RS232C)	With water leakage sensor	*2 With heater	With automatic fluid supply function	*3 With external switch signal entry	*2 With stainless steel wetted material specification	With high head pump	*2 With DI control kit
Size											
HRGC001-* (Temperature stability +/-1.0°C)		●	●	●	●	●	●	●	●	●	●
HRGC001-*5 (Temperature stability +/-0.5°C)		●	●	●	●	-	●	●	-	●	-
HRGC002-* (Temperature stability +/-1.0°C)		●	●	●	●	●	●	●	●	●	●
HRGC002-*5 (Temperature stability +/-0.5°C)		●	●	●	●	-	●	●	-	●	-
HRGC005-* (Temperature stability +/-1.0°C)		●	●	●	●	●	●	●	●	-	●
HRGC005-*5 (Temperature stability +/-0.5°C)		●	●	●	●	-	●	●	-	-	-

*1 The communication protocol RS-485 (Option C) and RS-232C (Option S) cannot be combined.
*2 The stainless steel material option (Option M) and DI control kit (Option V) cannot be combined.
When Option M is combined with the heater (Option H), the circulating fluid temperature range will be 5 to 35oC.
*3 The external swich signal entry (Option K) and communication protocol RS-232 (Option S) cannot be combined.

2.2.1 With Earth leakage breaker (Option:B)

There is an option providing a built-in earth leakage breaker.

Table 2-2 Specifications of earth leakage breaker

Model		HRGC001-∗-B	HRGC002-∗-B	HRGC005-∗-B
Capacity of breaker	[A]	15 20[*1]	15 20[*1]	30
Leak sensitivity current	[A]	30	30	30
Cautions		A breaker with the operation characteristics below is installed, depending on the model. Please connect a breaker on the user side (primary side) with operation time characteristics equal to or higher than those below. If connected to a breaker with shorter operation time, there is a possibility of accidental cutoff due to inrush current to the internal motor of this product.		

Either or both of the following options are included.
・Heater (Option H)
・High head pump (Option T)

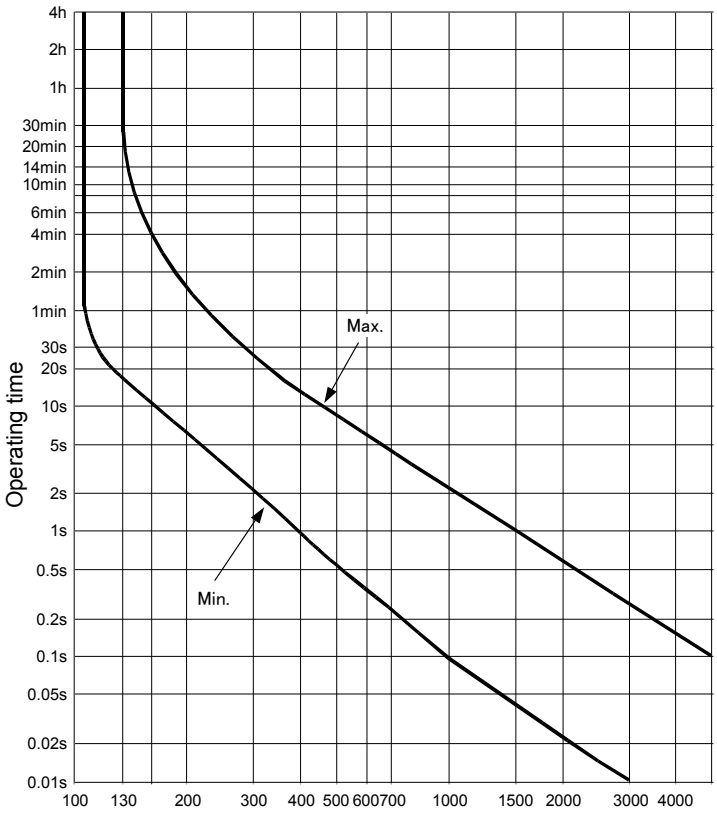


Fig.2-2 Operational characteristics diagram of the earth leakage breaker

2.2.2 With RS-485 Communication (Option:C)

The RS-485 communication can be used to write the following items to and read them out from the user's machine.

<Writing> ・Setting of circulating fluid temperature
・Setting of circulating fluid electric resistivity*1

<Reading> ・Circulating fluid temperature
・Circulating fluid electric resistivity*1

Table 2-3 Specifications of RS-485 Communication*2

Model		HRGC001-∗-C	HRGC002-∗-C	HRGC005-∗-C
Communication standard		EIA standard RS-485		
Communication method				
Network		Multidrop method 1 master to 31 slaves at max.		
Information direction		Half duplex		
Synchronous method		Start-stop synchronization		
Transmission code		ASCII 7 bit code (excluding BCC data)		
Interface				
Communication speed	[bps]	Choose from 1200/ 2400/ 4800/ 19200		

*1 When the DI control kit (Option Y) is included.
*2 This option cannot be combined with the RS-232C communication (Option S)

2.2.3 With RS-232C Communication (Option:S)

The RS-232C communication can be used to write the following items to and read them out from the user's machine.

<Writing> ・Setting of circulating fluid temperature
・Setting of circulating fluid electric resistivity*1

<Reading> ・Circulating fluid temperature
・Circulating fluid electric resistivity*1

Table 2-4 Specifications of RS-232C Communication*2

Model		HRGC001-∗-S	HRGC002-∗-S	HRGC005-∗-S
Communication standard		EIA standard RS-232C		
Communication method				
Network		1 master to 1 slaves at max.		
Information direction		Half duplex		
Synchronous method		Start-stop synchronization		
Transmission code		ASCII 7 bit code (excluding BCC data)		
Interface				
Communication speed	[bps]	Choose from 1200/ 2400/ 4800/ 19200		

*1 When the DI control kit (Option Y) is included.
*2 This option cannot be combined with the RS-485 communication (Option C)

2.2.4 With Water leakage sensor (Option:E)

This option has a water leakage sensor that detects the fluid leakage in the product and stops the product accordingly.

Table 2-5 Specifications of water leakage sensor

Model	HRGC001-∗-E	HRGC002-∗-E	HRGC005-∗-E
Protection (Operation stopped when abnormality occur)	Water leakage (Built-in Water leakage sensor)		

2.2.5 With Heater (Option:H)

The built-in heater can be used to heat the circulating fluid.

Table 2-6 Specifications of heater

Model		HRGC001-∗-H	HRGC002-∗-H	HRGC005-∗-H
Heater capacity	[kW]	0.6		
Temperature control method	—	Cooling control of proportional valve PID control, Heating control of heater P control or ON and OFF control of compressor and heater		
Setting temperature range	[°C]	5 to 60 5 to 35※1 8 to 35※2 8 to 60※3		5 to 35
Temperature stability	[°C]	+/-1.0※4 ∗At the following conditions ・Circulating fluid flow rate is rated flow ・Stable installation environment and power supply, and within range of specifications ・Circulating fluid outlet temperature when circulating fluid outlet and inlet are connected directly		
Protection (Operation stopped when abnormality occur)		Tank water temperature high (Built-in Temperature fuse)		
		Water feeding temperature high (Set temp. 65°C or 40°C*1)		Water feeding temperature high (Set temp. 40°C)

*1 When the stainless steel wetted material (Option M) or DI control kit(Option Y) is included.
*2 When either of the stainless steel wetted material (Option M) or DI control kit (Option Y) and the high head pump (Option T) are included.
*3 Neither of the stainless steel wetted material (Option M) nor DI control kit (Option Y) are included, and the high head pump is included.
*4 This option cannot be combined with the temperature stability +/-0.5°C specification

2.2.6 With automatic water fill function (Option:J)

Piping to the automatic water fill port enables easy supply of the circulating fluid through the built-in fluid supply ball tap.

Table 2-7 Specifications of automatic water fill function

Model	HRGC001-∗-J	HRGC002-∗-J	HRGC005-∗-J
Supply method	Built-in automatic water fill ball tap		
Fluid pressure	0.2 to 0.5MPa		
Supply capacity	2L/min or more (at 0.2MPa)		

2.2.7 With External switch signal entry (Option:K)

An error signal can be generated through the power supply to a protection equipment such as a flow switch and a signal from the protection equipment.

Table 2-8 Specifications of external swich signal entry*1

Model	HRGC001-∗-K	HRGC002-∗-K	HRGC005-∗-K
Input of external switch signals	Contact signal or PNP open collector input (Voltage at OFF DC24V, Current at ON 35mA or less)		
Protection (Operation continued)	When ON (Close), Warning signal contact output open, [WARN] lamp turned on (Operation continued)		
Power supply for external switches output*2	DC24V +/-10% 20W or less*3 DC24V +/-10% 15W or less*4 DC24V +/-10% 10W or less*5 DC24V +/-10% 5W or less*6		

*1 This option cannot be combined with the RS-232 communication.
*2 Not applicable to an inductive load.
*3 When neither of the heater (Option H) and DI control kit (Option Y) are included.
*4 When the DI control kit (Option Y) is not included, and the heater (Option H) is included.
*5 When the heater (Option H) is not included, and the DI control kit (Option Y) is included.
*6 When both of the heater (Option H) and DI control kit (Option Y) are included.

2.2.8 With stainless steel wetted material specification (Option:M)

The change of the circulating fluid wetted material from copper to stainless steel allows for the use of DI water with 2M ohm-cm or less (0.5μS-cm or more).

Table 2-9 Specifications of stainless steel wetted material*1

Model		HRGC001-A-M	HRGC002-A-M	HRGC005-A-M
Setting temperature range	[°C]	5 to 35*2		
Temperature stability	[°C]	±1.0*3 ∗At the following conditions ・Circulating fluid flow rate is rated flow ・Stable installation environment and power supply, and within range of specifications ・Circulating fluid outlet temperature when circulating fluid outlet and inlet are connected directly		
Type of circulating fluid		Fresh water, DI water (2Mohm-cm or less), Ethylene glycol 15% aqueous solution		
Material of wetted parts		Stainless steel, copper brazing (heat exchanger)*4, PVC		

*1 This option cannot be combined with the DI control kit (Option Y).
*2 The set temperature range is 5 to 35°C even when the heater (Option H) is included
*3 This option cannot be selected with the option, temperature stability +/-0.5°C.
*4 The heat exchanger is made of copper brazing.

2.2.9 With high head pump (Option T)

This option is to provide a high-head pump to fit the piping.

Table 2-10 Specifications of high head pump

Model		HRGC001-A-T	HRGC002-A-T
Cooling capacity (50/60Hz) (at the following conditions)	[kW]	0.6/0.6	1.6/1.8
Circulating fluid temperature	[°C]	20	
Ambient temperature	[°C]	32	
Circulating fluid flow rate	[L/min]	18/22	
Cautions		Cooling capacity indicates the value when the heat source is directly connected to the circulating fluid circuit at the conditions above. The cooling capacity will decrease in the following conditions. ・If the piping is too long to the user's system side (load) →The cooling capacity that can be used decreases due to the endothermic effect of the piping. ・When the ambient temperature exceeds 32°C. →The external heat exhaust capacity of the device decreases, and the cooling capacity that can be used decreases.	
Circulating fluid wetted materials	*Other than M and Y	Stainless steel, bronze, brass, copper brazing (heat exchanger), PVC	
	*M or Y	Stainless steel, copper brazing (heat exchanger), PVC	
Pump capacity (50 / 60Hz) (Circulating fluid temperature：20°C)	[MPa]	0.31/0.41(at 10L/min)	
Rated flow (50 / 60Hz)	[L/min]	18/22	
	This is the flow necessary to maintain the cooling capacity and temperature stability. If the flow falls below the rated flow, open the by-pass valve in the product and adjust the flow.		

*Other than M and Y --- When neither of the stainless steel wetted material (Option M) nor Di control kit (Option Y) are included.
*M or Y --- When either of the stainless steel wetted material (Option M) or DI control kit (Option Y) is included.

2.2.10 With DI control kit (Option Y)

The function to maintain the electric resistivity of the circulating fluid (DI level) is added to the stainless steel wetted material.

A DI filter is necessary (SMC model no.: HRZ-DF001) to control the DI level.

Table 2-11 Specifications of Di control kit

Model		HRGC001-A-Y	HRGC002-A-Y	HRGC005-A-Y
Fluid		DI water (2Mohm-cm or less), Ethylene glycol 15% aqueous solution		
DI level display range*1	[M ohm-cm]	0 to 20*2		
DI level set range*3	[M ohm-cm]	0.00 to 2.00		
DI water circuit rated flow rate	[L/min]	1.5		
DI level alarm		DI level upper limit, DI level lower limit, Selection from DI level upper or lower limit*4		
Behavior of DI level alarm		Can be selected from stop or continuous operation*4		
Material of wetted parts		Stainless steel, copper brazing (heat exchanger)*5, PVC		
Setting temperature range	[°C]	5 to 35*6		
Temperature stability	[°C]	+/-1.0*7 ∗At the following conditions ・Circulating fluid flow rate is rated flow ・Stable installation environment and power supply, and within range of specifications ・Circulating fluid outlet temperature when circulating fluid outlet and inlet are connected directly		

*1 The indicated DI level is the value which is not offset in temperature.
*2 The upper limit of DI level is 2Mohm-cm.
*3 For the control of DI level, a separate DI filter is necessary.(SMC's part no.: HRZ-DF001)
*4 Refer to the Operation Manual for the setting items and method.
*5 The heat exchanger is copper brazed.
*6 When Option H is selected, a temperature above 60°C cannot be handled.
*7 This option cannot be selected with the option, temperature stability ±0.5°C.

2.3 Name and Function of Parts

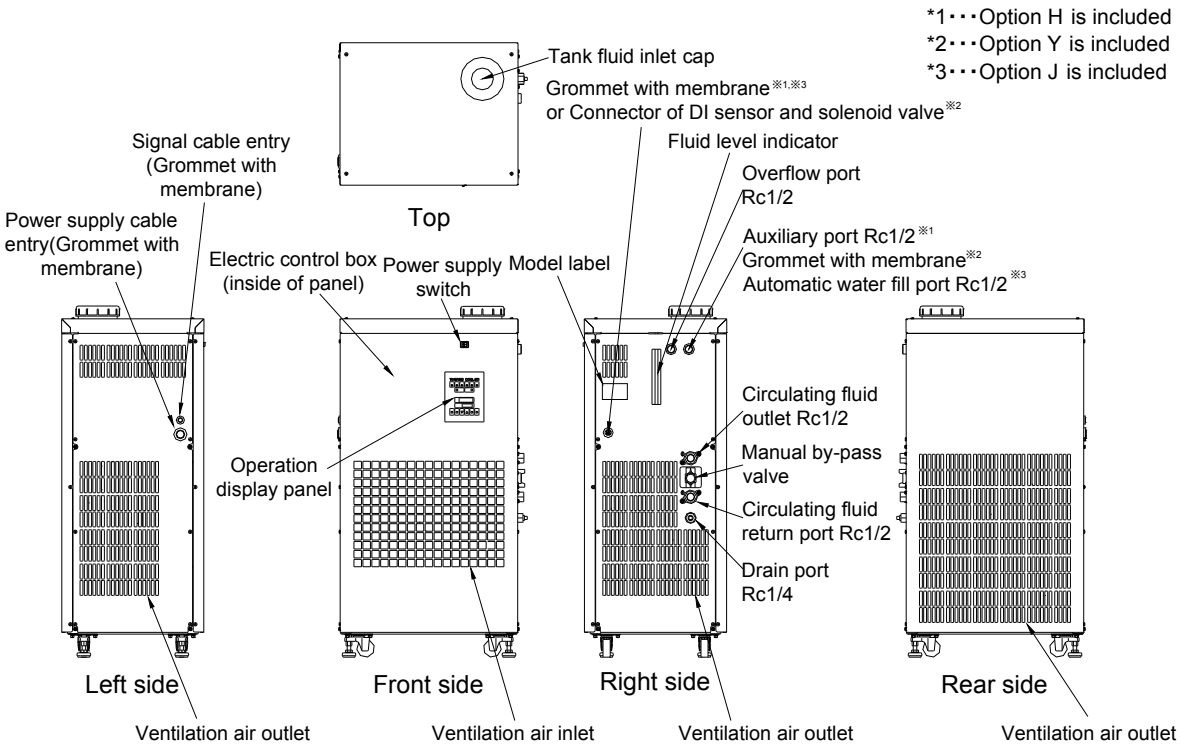


Fig.2-3 Names of each part (HRGC001-A∗, HRGC002-A∗)

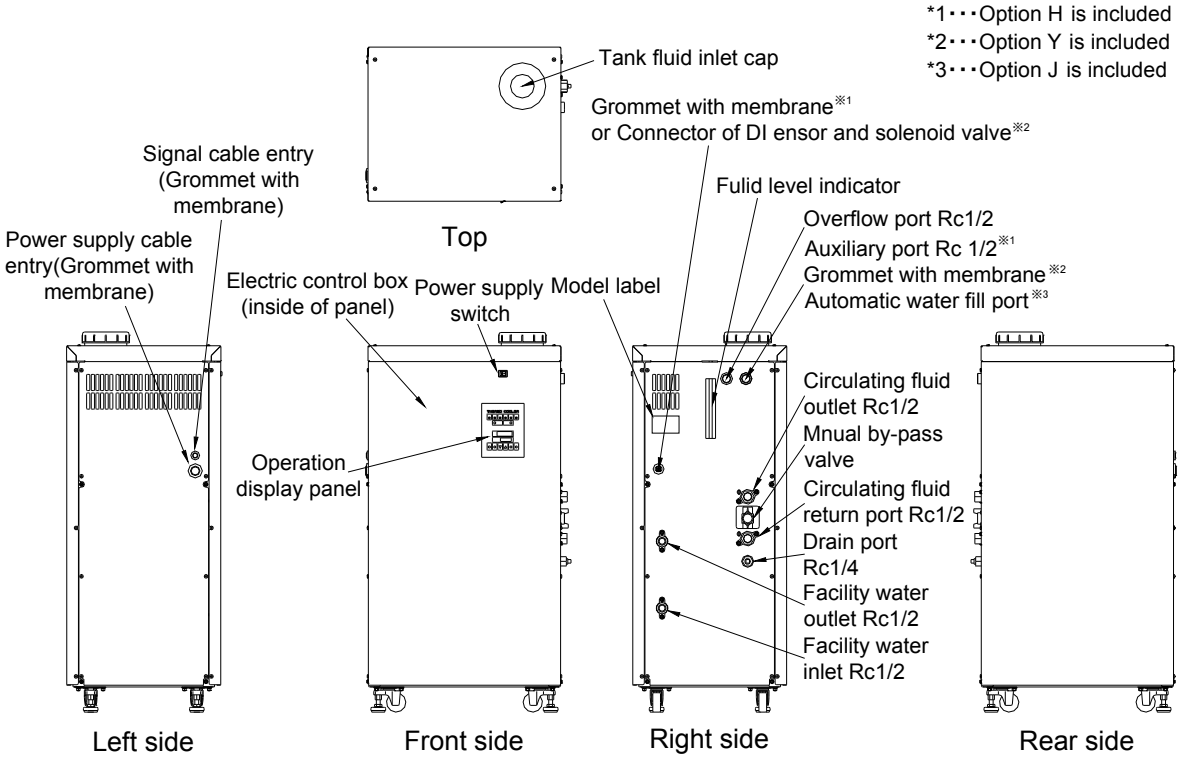


Fig.2-4 Names of each part (HRGC001-W∗, HRGC002-W∗)

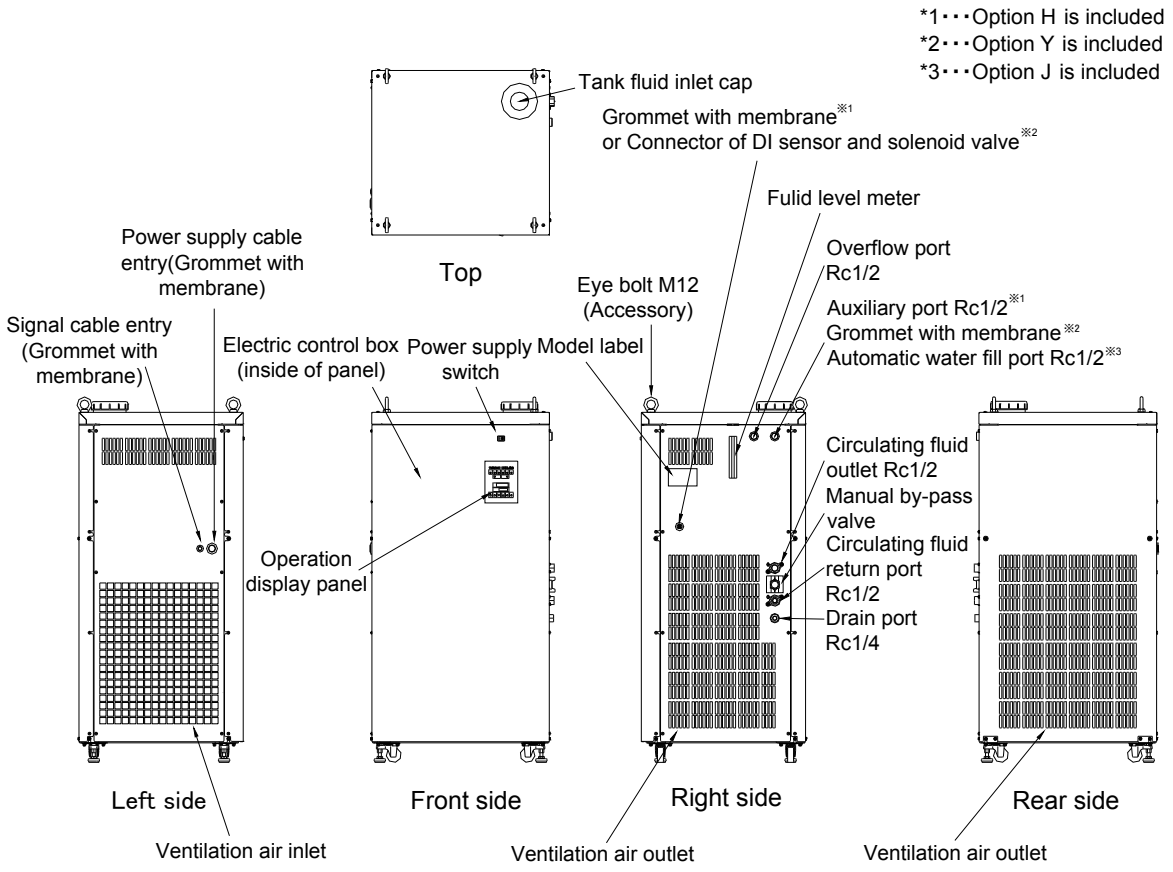


Fig.2-5 Names of each part (HRGC005-A∗)

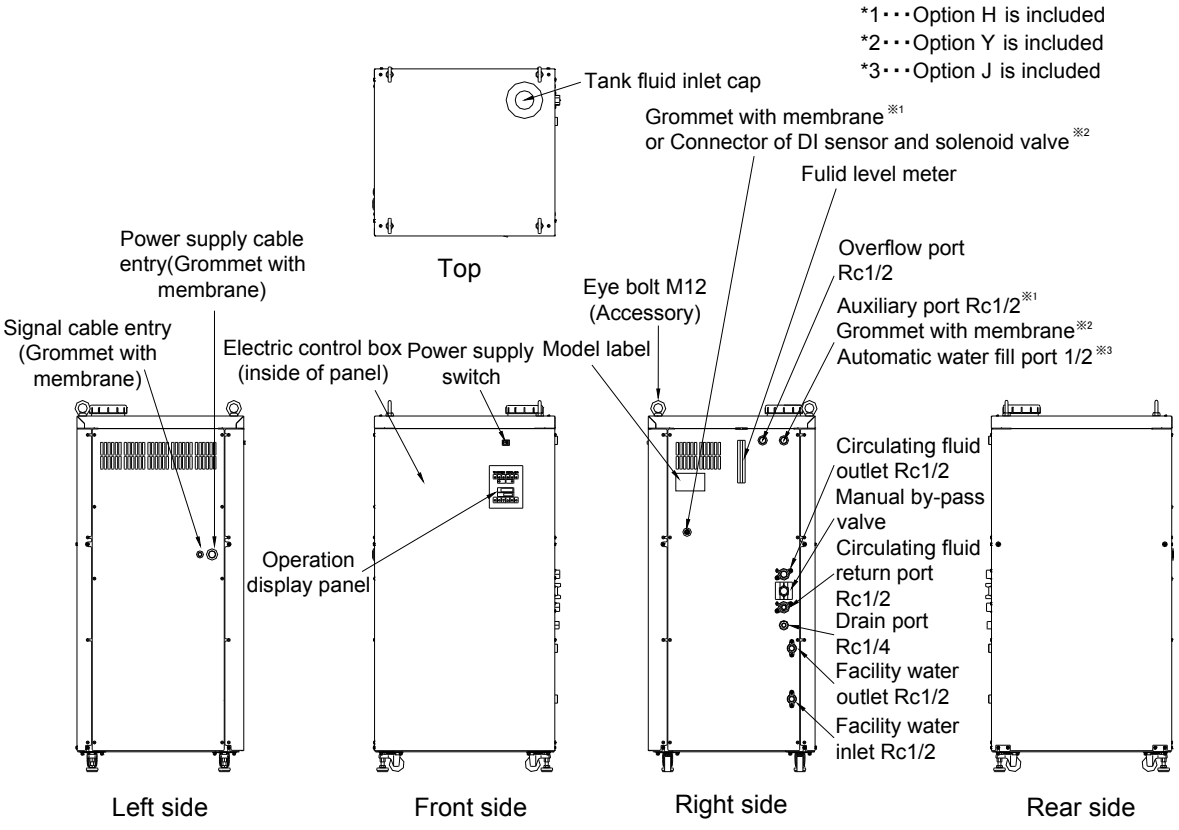


Fig.2-6 Names of each part (HRGC005-W∗)

2.4 Function of Parts

The function of parts is as follows.

Table 2-12 Function of parts

Name	Function
Operation panel	Runs and stops the product and performs settings such as the circulating fluid temperature. For details, refer to “2.5 Operation panel.
Power supply switch	Shuts off the power supply to the internal eqipment of product.
Model label	Shows the part number of the product. For details, refer to “1.4.1 Product Label”.
Overflow port	A port to drain the circulating fluid outside to prevent the reverse flow of the circulating fluid from user's piping from overflowing out of the tank. This port should be connected to a draining pit.
Auxiliary port (Option*1)	A spare port reserved. (At the time of shipment, the port is plugged.)
Automatic water fill port (Option*3)	A piping port to supply the water for the product automatically through the built-in tap. For details, refer to “2.2.6 With automatic water fill function”
DI sensor and Solenoid valve connector (Option*3)	A connector to wire the sensor that controls the electric resistivity of the circulating fluid and the solenoid valve.
Circulating fluid outlet	A port from which the circulating fluid is fed.
Circulating fluid return port	A port to which the circulating fluid returns through piping.
Manual by-pass valve	When this valve is opened, the circulating fluid is bypassed in the product, and the amount discharged from the circulating fluid outlet is regulated.
Drain port	A port to drain the circulating fluid out of the tank. (At the time of shipment, the port is plugged.)
Facility water inlet (For water-cooled type)	A port to which the facility water is fed through piping. The pressure of facility water should be in a range of 0.3 to 0.5MPa.
Facility water outlet (For water-cooled type)	A port from which the facility water returns to the user’s machine through piping. This port should be bypassed to prevent the negative pressure from being applied to the piping.

*1 When the heater (Option M) is provided, but the automatic water fill port (Option J) is not.
*2 When the DI control kit (Option Y) is provided.
*3 When the automatic water fill port (Option J) is provided.

2.5 Operation panel

The operation panel on the front for the product controls the basic operation of the product. This operation panel is common to all models.

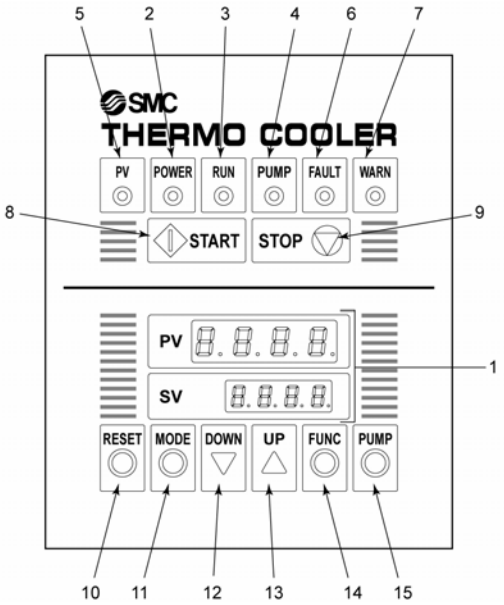


Fig. 2-7 Operation panel

Table 2-13 Operation panel

No.	Name	Function	
1	Digital display PV/SV	PV	[PV lamp: ON] Displays the temperature of the circulating fluid. [PV lamp: OFF] Displays the electric resistivity*1 of the circulating fluid. (Unit: [Mohm-cm]) [When alarm occurs] Displays the alarm number and PV alternately. [Function enabled] Displays the item (character) to be set.
		SV	[Normal status] Indicates the set value of circulating fluid temperature. [Function enabled] Displays the set value of item (character).
2	[POWER] LED	Lights up when the power supply is turned on.	
3	[RUN] LED	Lights up when the [START] button is pressed.	
4	[PUMP] LED	Lights up when pump is running.	
5	[PV] LED	[ON] Displays the temperature of the circulating fluid on PV. [OFF] Displays the electric resistiviy of the circulating fluid on PV.	
6	[FAULT] LED	Lights up when fault error is detected (Product stops running)	
7	[WARN] LED	Lights up when warning error is detected (Product continues to run)	
8	[START] button	Start the operation of the product.	
9	[STOP] button	Stop the operation of the product.	
10	[RESET] button	Resets alarm.	
11	[MODE] button	Changes the setting such as the addition of a temperature alarm. Changes the electric resistivity of the circulating fluid. *1	
12	[DOWN] button	Decreases the set temperature (set value).	
13	[UP] button	Increases the set temperature (set value).	
14	[FUNC] button	Changes the displayed content between the temperature and electric resistivity*1 of the circulating fluid.	
15	[PUMP]button	Operates the pump independently while pressed.	

*1 When the DI control kit (Option Y) is included.

Chapter 3 Transport and Setting Up

⚠ WARNING

- **Only persons who have sufficient knowledge and experience about the product and system are allowed to transport and set up the product.**
- **Especially pay attention to personal safety.**

3.1 Transport

The product is heavy and has potential danger at transport. Also, to prevent damage and breakage of the product, be sure to follow these instructions for transport.

⚠ WARNING

If a fork lift is used for transport, check the fork is inserted in place as specified in "Fig. 3-1 Fork insertion position and hanging method". At that time, do not get the fork contact to the caster.

- **If eyebolt is used for lifting, ensure all four eyebolts are used.**
- **Keep hanging angle from each eyebolt 45° to 60° with attention to the postion of the center of gravity.**

CAUTION

Never lay down the product.
The compressor oil leaks in to the refrigerant piping and its amount decreases, which may cause early failure of the compressor.

CAUTION

- **Drain the residual fluid from the piping as much as possible to prevent any spillage.**
- **If a fork lift is used for transport, pay attention not to damage the product with the forks.**

3.1.1 Transportation using fork lift and hanging

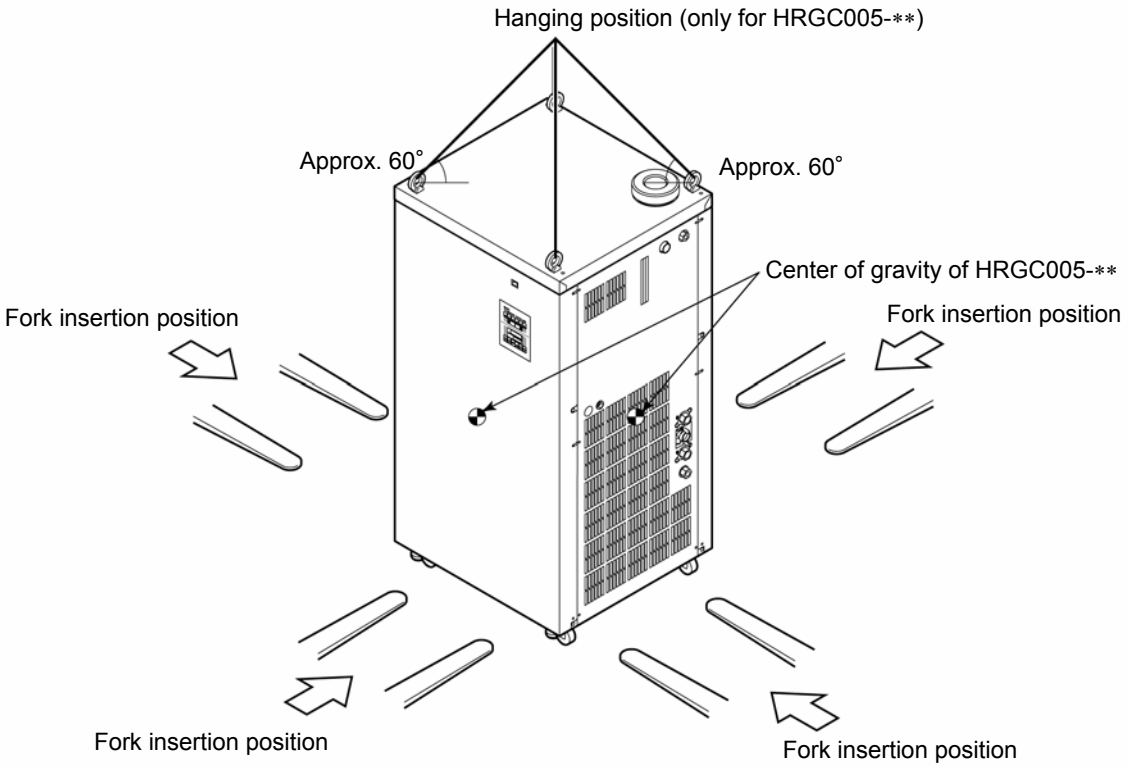


Fig.3-1 Fork insertion position and hanging method

⚠ WARNING

- **Eyebolts for hanging are not attached to this product. (only for HRGC005-*) They need to be prepared by the user if it needs to be hanged.**

3.1.2 Transportation using casters

⚠ WARNING

This product is heavy.
It should be moved by at least two people when transported.
In particular, care should be taken when there is a slope on the way of transportation route.

1. Adjust the feet to the highest level.

2. Move the product to the specified area by pushing at the corners.

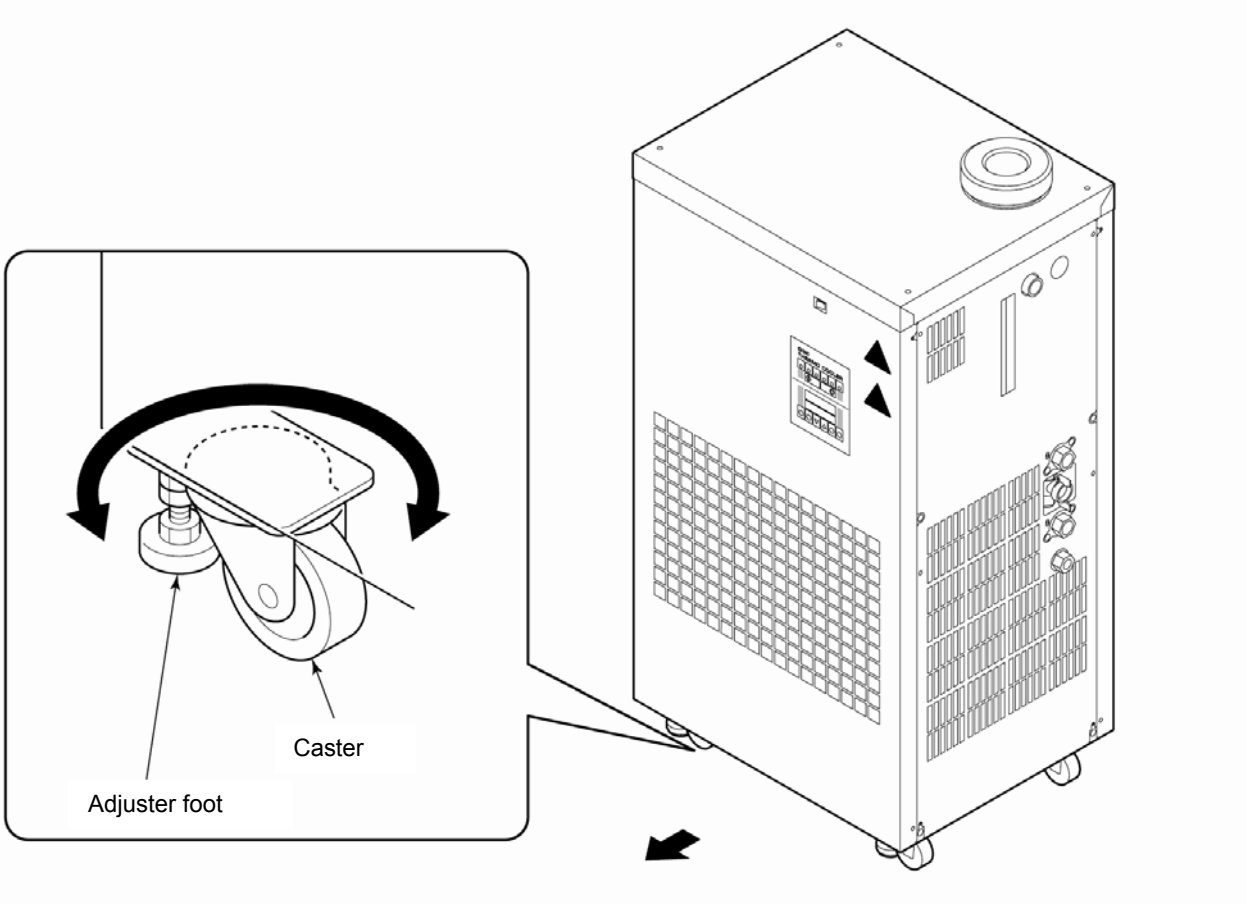


Fig.3-2 Transportation using casters

3.2 Installation

⚠ WARNING

- **Do not set up the product in places possibly exposed to leakage of flammable gas. Should any flammable gas stay around the product, the product may cause a fire.**
- **Do not use the product outdoors. If the product subjected to rain or water splash it may cause electrical shock, fire or failure.**

⚠ CAUTION

- **Keep the product horizontal to a rigid and flat floor which can resist the weight of the product, and take a measure to prevent the product from tipping over. Improper installation may cause water leakage, tipping, damage of the product or injure the operator.**
- **Keep the ambient temperature of the product between 5 to 40°C. Operation below 5°C may cause the compressor failure, and operation above 40°C may cause the product to overheat and shut down.**

3.2.1 Environment

The product must not be operated, installed, stored or transported in the following conditions. Potential malfunction or damage to the product may occur if disregarded.

The product does not conform to any Clean room specifications. The pump and ventilating fan inside the product generate particles.

- Location that is outside.
- Location that is exposed to water, water vapour, steam, salt water or oil.
- Location that is exposed to dust or powder material.
- Location that is exposed to corrosive gas, organic solvent, chemical solution, or flammable gas (the product is not flame-proof)
- Location where the ambient temperature is out of the following range:
  In transportation and In storage 0 to 50°C
  (with no water or circulating fluid in piping)
  In operation 5 to 40°C
- Location where the ambient humidity is out of the following range or where condensation occours:
  In transportation and storage 15 to 85%
  In operation 30 to 70%
- Location that is exposed to direct sunlight or heat radiation.
- Location that is near heat sources and poor in ventilation.
- Location that is subjected to abrupt changes in temperature.
- Location that is subjected to strong electromagnetic noise (intense electric field, intense magnetic field, or surges).
- Location that is subjected to static electricity, or conditions where static electricity can discharge to the product.
- Location that is subjected to strong high frequencies raditation (microwaves).
- Location that is subjected to potential lightning srtike.
- Location at altitudes of 1000m or higher (except for product storage and transport).
- Location where the product is affected by strong vibrations or impacts.
- Condition that applies external force or weight causing the product to be damaged.
- Location without adequate space for maintenance as required.

3.2.2 Location (Required ventilation rate and facility water source)

CAUTION

- **Do not install in a location which can be subjected to any of the conditions in 3.2.1**

CAUTION

**The product radiates heat from the air vent of the cooling fan.
If the product is operated with insufficient air ventilation the internal temperature can exceed 40°C, which can cause an overload or affect the performance and life of the product. To prevent this ensure that suitable ventilation is available (see below).**

■ Installation of multiple products

Keep sufficient space between multiple products so that the air vented from one product will not be taken in by other products.

■ Installation Area Ventilation (For air-cooled type)

1) Facility having a large installation area (that can vent the air naturally)

Make an air vent on a wall at a high level and another air vent on a wall at a low level, to allow for adequate airflow.

2) Facility having a small installation area (that can not vent the air naturally)

Make a forced air exhaust vent on a wall at a high level and an air vent on a wall at a low level.

3) Air ventilation using a ducting.

If it is impossible to radiate the heat in the installation area, or the installation is under air conditioning, make a duct for heat radiation on the air vent OUT of the product.
At this time, do not mount the inlet of the duct (flange) directly to the air vent of the product, and keep a space larger than the diameter of the duct.
Additionally, consider the resistance of the duct when making the air vent port for the duct.

Table 3-1 Amount of radiation and required ventilation

Model	Heat Radiated kW	Required ventilation amount m^3/min	
		Differential temp. of 3 °C between inside and outside of installation area	Differential temp. of 3 °C between inside and outside of installation area
HRGC001-A∗	Approx. 2	40	20
HRGC002-A∗	Approx. 4	70	40
HRGC005-A∗	Approx. 8	140	70

CAUTION

The water-refrigerated thermo-cooler discharges heat by using facility water. Therefore, it is necessary to supply facility water from the source listed in the following table.

■ **Facility water source to be prepared (For water-cooled type)**

Table 3-2 Facility water source to be prepared

Model number	Radiation rate kW	Facility water temp. range °C	Required facility water rate l/min
HRGC001-W∗	Approx. 2	5 to 32 (rated 25)	12
HRGC002-W∗	Approx. 4		12
HRGC005-W∗	Approx. 8		28

3.2.3 Installation and Maintenance Space

Considering the ease of maintenance, it is recommended to keep the space around the product shown in Fig.3-3.

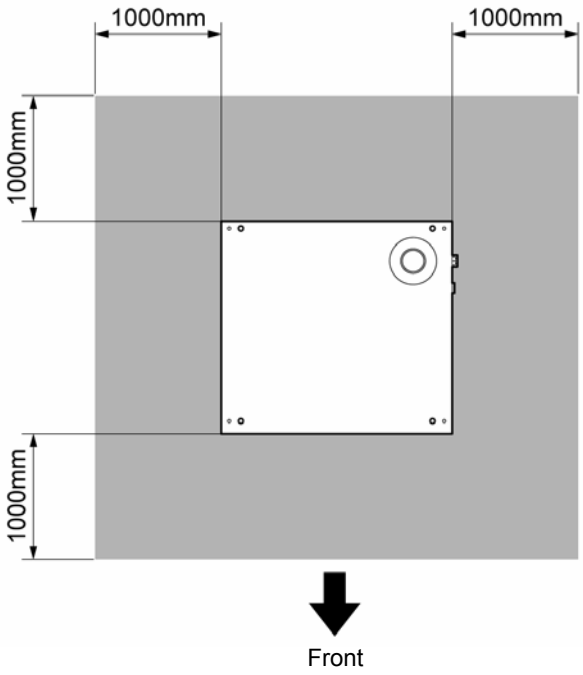


Fig.3-3 Maintenance space

3.3 Installation

3.3.1 Mounting

- Mount the product on a flat and stable floor with no vibrations.
- Refer to “8.2 Outline Dimensions” for dimensional information of the product.

■ How to mount the product

1. Move the product to the installation area.

2. Adjust the feet with adjuster.

A spanner with 17mm width across flat is required.

- Ensure the product is horizontal by using a level gauge.
- Ensure that all four feet are in contact with the floor.
- The caster can be in contact with the floor together with the feet.

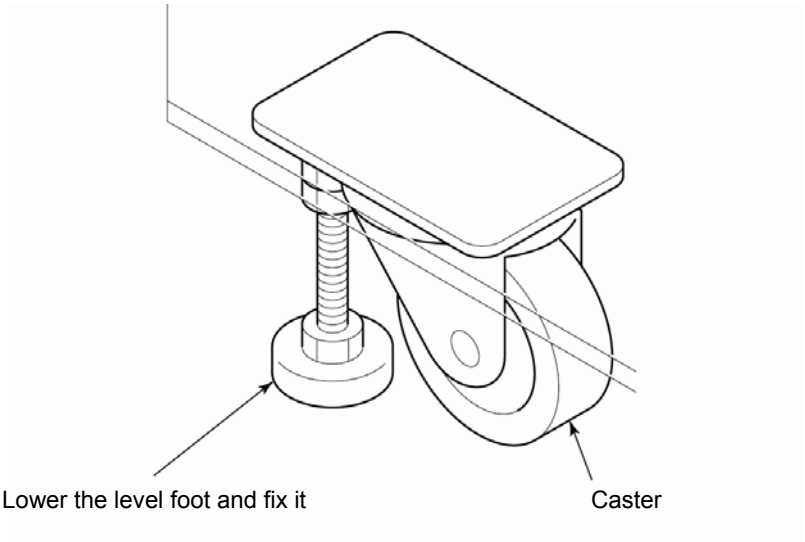


Fig.3-4 Installation procedures

■ How to fix the level adjuster

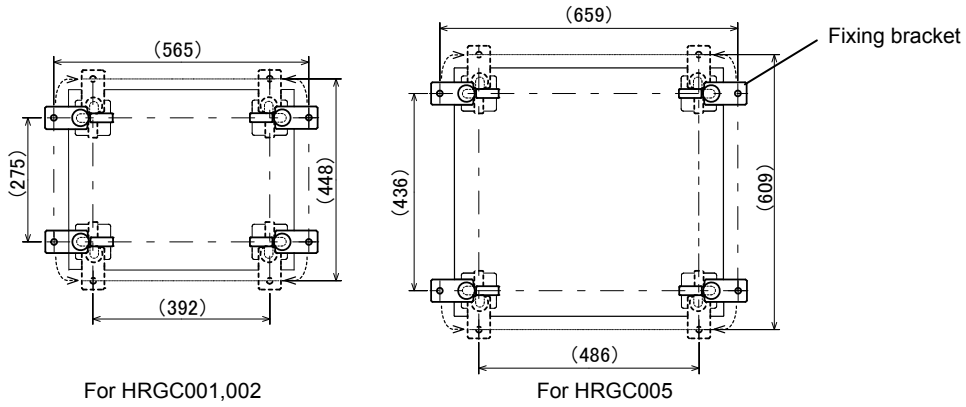
When fixing the level adjuster to the floor, take the following procedures.

1. Prepare the fixing bracket shown below.

Table 3-3 Fixing bracket (Example of use)

Item	Specifications
Level adjuster fixing bracket	Part number: KC-1275-C-4 Material: SUS Manufacturer: Takigen Mfg.
Set of foundation bolt	Part number: IDF-AB500 Material: SUS Size: M10 x 50 in length Manufacturer: SMC Qty.: 4 pcs/set

2. Install onto a horizontal concrete floor using a set of foundation bolts (M10 x 4pcs).



For HRGC001,002 For HRGC005

Fig.3-5 Set of foundation bolt

3. Hold the top of the level adjuster with the level adjuster holding bracket, and fix it to the floor with the anchor bolt and hexagon nut.

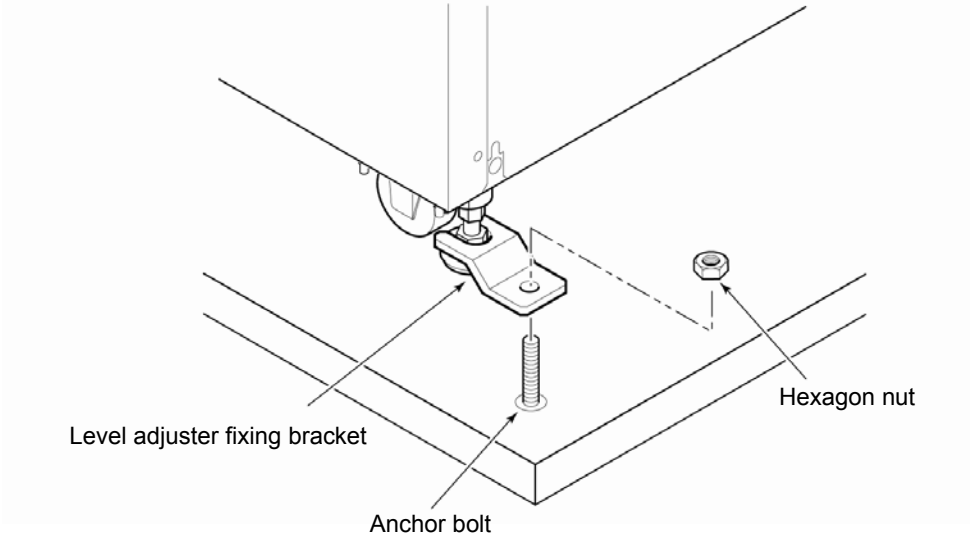


Fig.3-6 Fix the level adjuster

3.3.2 Electrical wiring

⚠ WARNING

- **Do not modify the intenal electrical wiring of the product. Incorrect wiring may cause electrical shock or fire. Also, modifing the internal wiring will void the product's warranty.**
- **Be sure not to change the set values of safety devices such as thermal switches. It may cause the product to become unsafe in a fault situation.**
- **Do not connect the ground to water line, gas pipe or lightening conductor.**

⚠ WARNING

- **Only qualified persons are allowed to wire the product.**
- **Be sure to shut off the user's power supply. Wiring with the product energized is strictly prohibitted.**
- **The wiring must be conducted using cables complying with "Table 3-4" firmly and secured to the product to prevent the external force of cables being applied to the terminals. Incomplete wiring or improper securing of wiring may cause electrical shock, excessive heat and fire.**
- **Ensure a stable power supply with no voltage surges.**
- **Ensure that an Earth Leakage Breaker is used in the power supply of the product. See "Table 3-4".**
- **Use a power supply suitable for the specifications of the product.**
- **Be sure to connect the ground connection.**
- **Ensure that a lock out facility is availble on the power supply.**
- **Each product must have its own separate Earth Leakage Breaker. Otherwise there can be a risk of electric shock or fire.**

■ Power supply cable and Earth Leakage Breaker

Prepare the power supply shown in the following table. For the connection between the product and power supply, use the power supply cable and earth leakage breaker shown below.
If communication with the user's machine is necessary, use the following signal cable.

Table 3-4 Power supply cable and Earth Leakage Breaker

Item		HRGC001, HRGC002		HRGC005
Power supply voltage		Single phase AC200~230V±10%, 50/60+/-1Hz		
Power supply cable	Size	14AWG		12AWG
	Terminal base screw diameter	M4		
Ground cable	Size	14AWG		12AWG
	Terminal base thread diameter	M8		
Signal cable	Size	18AWG		
	Terminal base screw diameter	M3		
Earth Leakage Breaker	Breaker Rating	15A	20A*1	30A
	Detected current	30mA		30mA

*1 Either of the heater (Option H) or high head pump (Option T) or both options are included.

3.3.3 Wiring of power supply cable

⚠ WARNING

Be sure to lock out and tag out the breaker of the facility power supply (customer power supply facility) before wiring.

⚠ WARNING

Be sure to connect the power supply cable from the product side first, and then connect the breaker of the facility power supply (the user's machine power supply).

⚠ CAUTION

When the panel is removed or mouted, be sure to wear protective shoes and gloves to prevent injury with the edge of the panel.

1. Loosen screws (6pcs) and take off the front panel. (8 pieces for HRGC005)

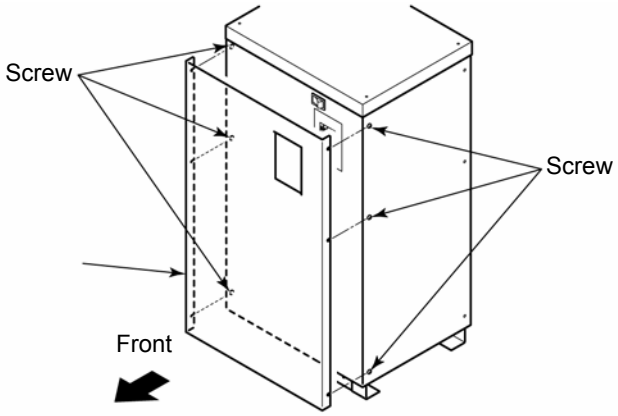


Fig.3-7 Removal of front panel

2. Connect the power supply cable and earth cable as shown in the figure below.

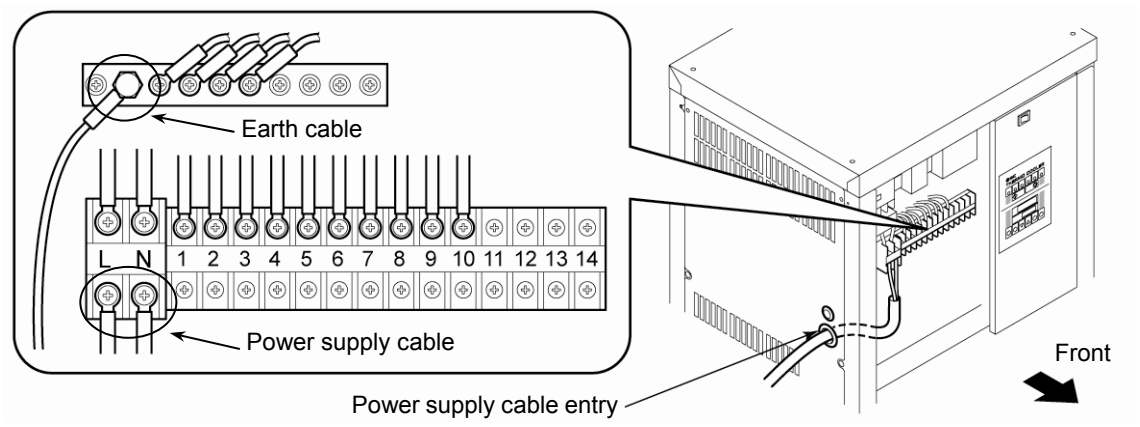


Fig.3-8 Wiring of power supply cable and earth cable

3.3.4 Wiring of remote operation signal input

The remote signal input is to enable the product to be run and stopped remotely by applying a contact signal input.

When the remote input signal contact is closed, the product starts running. The product continues to run while the contact signal input is closed, and will stop when the contact signal input is opened.

CAUTION

Wire with an applicable cable size and terminal.And select the external contact for remote operation (e.g. external switch) with adequate capacity.

⚠ WARNING

Be sure to shut off the breaker of the facility power supply (the user's machine power supply and conduct lock out and tag out before wiring.

1. When using the remote operation signal, select the contact (switch) with the following specifications.

Table 3-5 Specifications of contact for remote operation signals

Item	Specifications
Power supply voltage	DC24V+/-10%
Contact capacity	35mA or more
Min. load current	5mA

2. Connect the remote operation signal cable with the contact (switch) selected in the step 1 as shown in "3.3.3 Wiring of power supply cable".

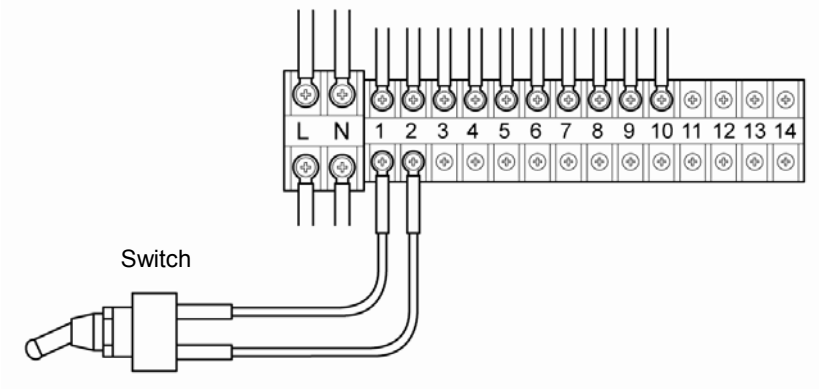


Fig.3-9 Wiring of contact for remote signal inputs

3.3.5 Wiring of operation signal output and alarm signal output

The operation signal output and alarm signal output are the outputs generated by a contact signal to shown the status of the product.

The output can be used to operate the lamps, etc.

CAUTION

The capacity of the output contact of the product is limited.If the capacity is not large enough, install a relay, etc. (to amplity the contact). At that time, ensure the input current of the relay is small enough in relation to the contact capacity of the product.

⚠ WARNING

Be sure to shut off the breaker of the facility power supply (the user's machine power supply) and conduct lock out and tag out before wiring.

1. The specifications of the contact for each signal output are as follows.

Table 3-6 Specifications of contact for output signals

Contact output	Specifications	Operation
Output signal for RUN (Terminal no. 5, 6)	Contact capacity: AC250V, 1A (resistance load) Min. load current: DC5V, 100mA	At RUN: Contact closed At STOP: Contact open With power supply shut off: Contact open
Output signal for fault alarm (Terminal no. 3, 4)	Contact capacity: AC250V, 1A (resistance load) Min. load current: DC5V, 10mA	With FAULT lamp off: Contact closed With FAULT lamp on: Contact open With power supply shut off: Contact close
Output signal for warning alarm*1 (Terminal no. 7, 8)	Contact capacity: AC250V, 1A (resistance load) Min. load current: DC5V, 10mA	With WARN lamp off: Contact closed With WARN lamp on: Contact open With power supply shut off: Contact close

*1 In the default setting, these outputs are not available.

[Tips]

The alarm signal output can be used to inform the user's machine that the circulating fluid temperature has reached the set temperature range.

For how to set the alarm signal output, refer to "5.3 Addition of Temperature Alarms".

2. The wiring to use the alarm contact signal output for operating lamps should be as shown below.

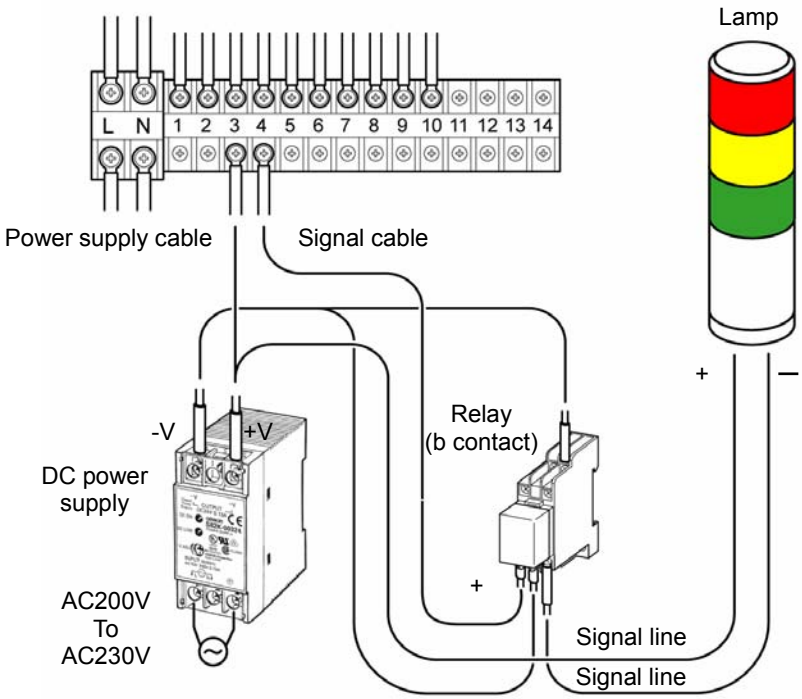


Fig.3-10 Typical wiring to use the alarm contact signal

3.3.6 RS-485 Communication wiring（for option with RS-485 communication）

The product can be provided with RS-485 communication protocol (Option C).This option enables remote operation of the writing and reading of the circulating fluid temperature.

For the details of the option, refer to”2.1 Part number of product”.

■ Interface

The communication with a higher level computer (ex. PC) is conducted with RS-485.

■ Wiring of communication cable

⚠ WARNING

Be sure to shut off the breaker of the facility power supply (the user’s machine power supply) and conduct lock out and tag out before wiring.

1. Prepare the following communication cable.

Table 3-7 Communication cable

Name		Specifications
Communication cable	Size	Twistwd pair cable with a shield, 0.75mm^2
	Crimping terminal size	1.25-3

2. Connect the communication cable as shown in the figure below.

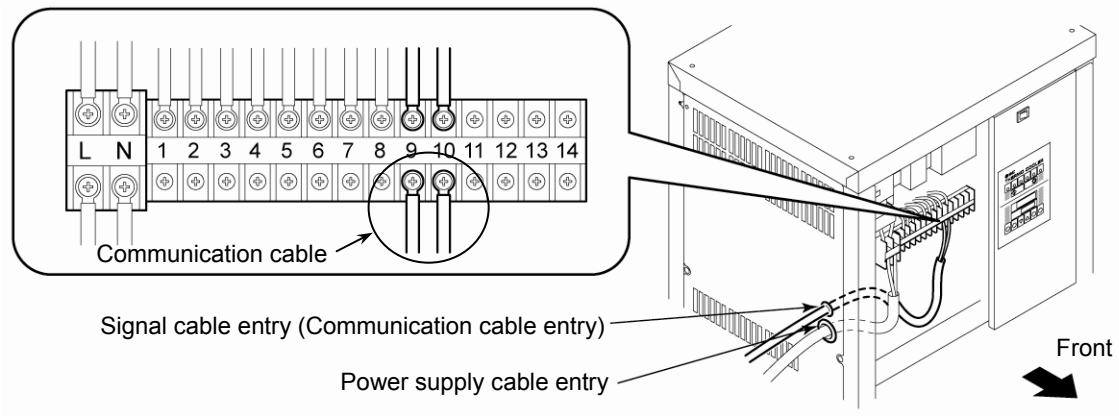


Fig.3-11 Communication Wiring

Table 3-8 Number of terminal block for the connection of communication

Applicable model	HRGC001-**-C	HRGC002-**-C	HRGC005-**-C
Terminal no.	9 {SD+}, 10 {SD-}		
Connected wire gauge	Twistwd pair cable with a shield, AWG22~AWG14		
Thread size of terminal block	M3		
Recommended tightening torque	0.6～1.0 [N·m]		

3. Prepare the following conversion unit (example) and connect it with the higher level computer (with a RS-232C terminal).

Name	Specifications
Conversion unit between RS-232 and RS-485	Part number: KS-485 Manufacturer: System Sacom
Connector	D-sub 9 pin (male)
Cable to connect PC with conversion unit	Part number: AR-305 Manufacturer: Abel

4. When connecting multiple units with the higher level computer, follow the following procedures.

- Configuration
  PC: 1pc and product: 1 pc or PC: 1pc and product: N pcs.
  In the latter case, up to 31 products can be connected.

- Cable length
  The maximum total length is 500m. It will vary slightly depending on the diameter of the cable and routing.

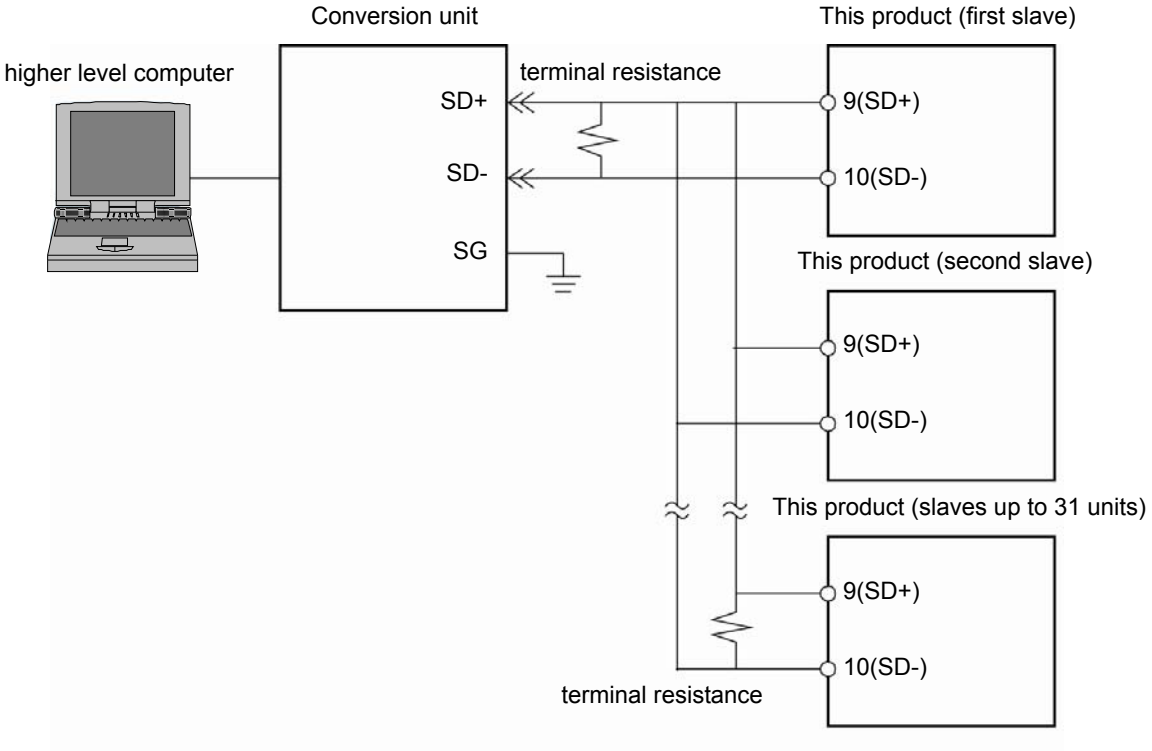


Fig.3-12 Connection of RS-485

[Tips]

Both ends of the communication connection (the end nodes) need to be connected to the higher level computer.

The terminal resistance should be 75 ohm or more in combination with the characteristic impedance (resistance) of the cable

3.3.7 RS-232C Communication wiring（for option with RS-232C communication）

The product can be provided with RS-232C communication protocol (Option S).This option enables remote operation of the writing and reading of the circulating fluid temperature.

For the details of the option, refer to”2.1 Part number of product”.

■ Interface

The communication with a higher level computer (ex. PC) is conducted with RS-232C.

■ Wiring of communication cable

⚠ WARNING

Be sure to shut off the breaker of the facility power supply (the user’s machine power supply) and conduct lock out and tag out before wiring.

1. Prepare the following communication cable.

Table 3-9 Communication cable

Model		Specifications
Communication cable	Size	Twistwd pair cable with a shield, 0.75mm^2
	Y-Type crimping terminal size	1.25Y-3

2. Connect the communication cable as shown in the figure below.

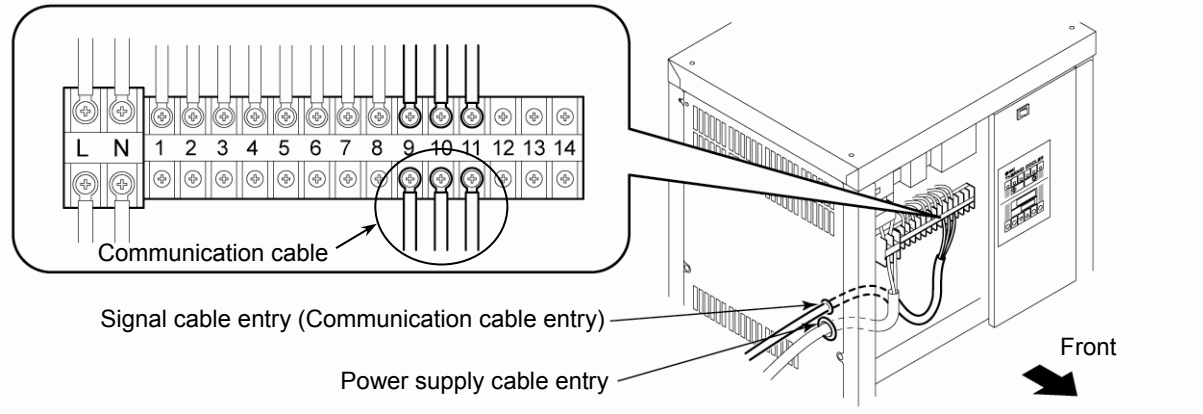


Fig.3-13 Communication Wiring

Table 3-10 Number of terminal block for the connection of communication

Applicable model	HRGC001-**-S	HRGC002-**-S	HRGC005-**-S
Terminal no.	9 {RD(RxD)}, 10 {SD(TxD)}, 11 {SG}		
Connected wire gauge	Twistwd pair cable with a shield, AWG22～AWG14		
Thread size of terminal block	M3		
Recommended tightening torque	0.6～1.0 [N·m]		

3. When connecting with the higher level computer, take the following procedures.

- Configuration
  PC: 1pc and product: 1 pc or PC
- Cable length
  The maximum total length is 15m. It will vary slightly depending on the diameter of the cable and routing.

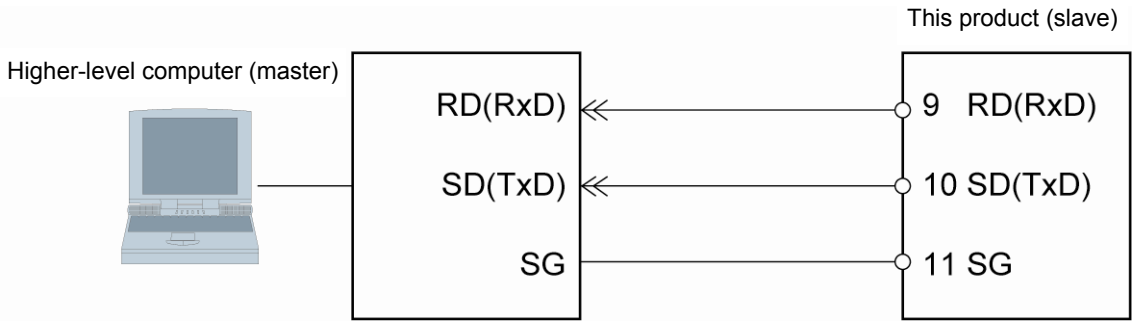


Fig.3-14 Connection of RS-232C

3.3.8 Wiring of external switch (for option with external switch signal entry)

The product can be provided with an external switch signal entry (Option K). This option enables the power supply to an external flow switch, etc. and the receipt of alarm signals.

For the details of the option, refer to”2.1 Part number of product”.

■ External switch signal entry

This option is used to supply a DC24V power to a switch prepared by the user ,and take in alarm signals.

When the switch prepared by the user detects an error (when the contact is open), the product will have to the following status.

- The [WARN] lamp will light up.
- The alarm no. (AL 14) and the circulating fluid temperature will be displayed alternately on PV.
- If the product is in operation, the product continues to run.
- The contact for alarm signal output will be open.

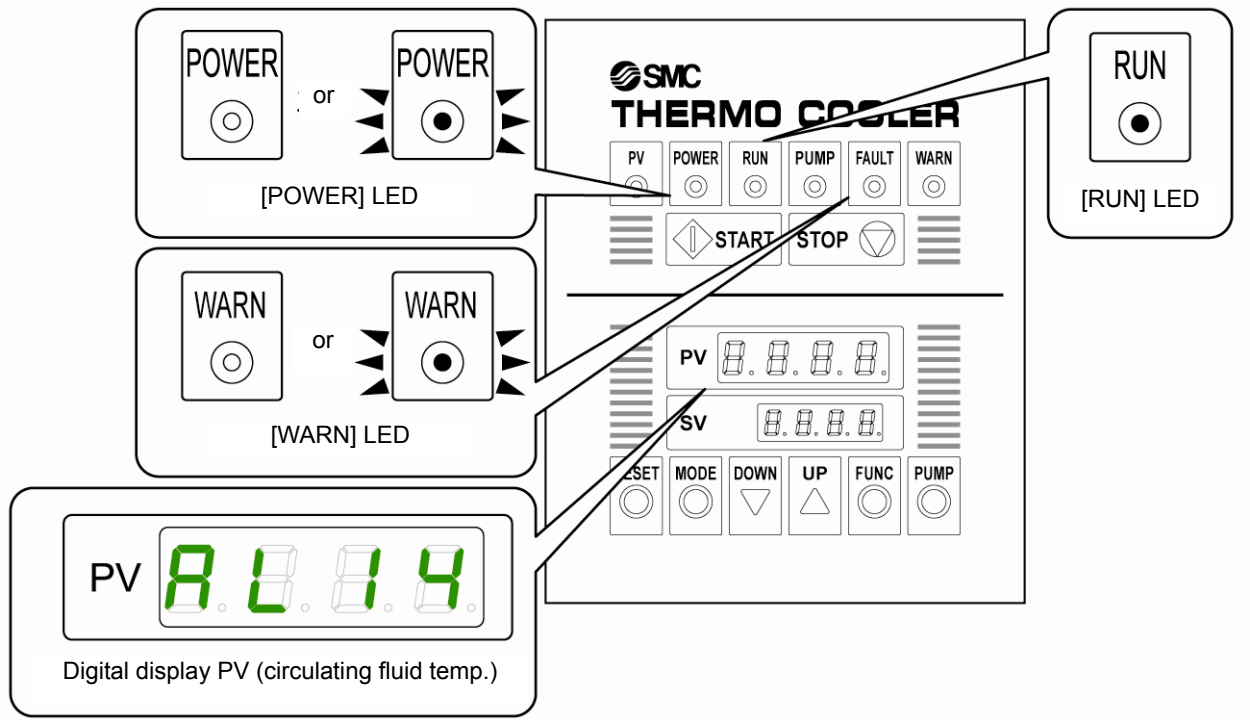


Fig.3-15 Display of alarm

■ Wiring of external switch

⚠ WARNING

Be sure to shut off the breaker of the facility power supply (the user's machine power supply) and conduct lock out and tag out before wiring.

1. The default setting has a jumper connected.

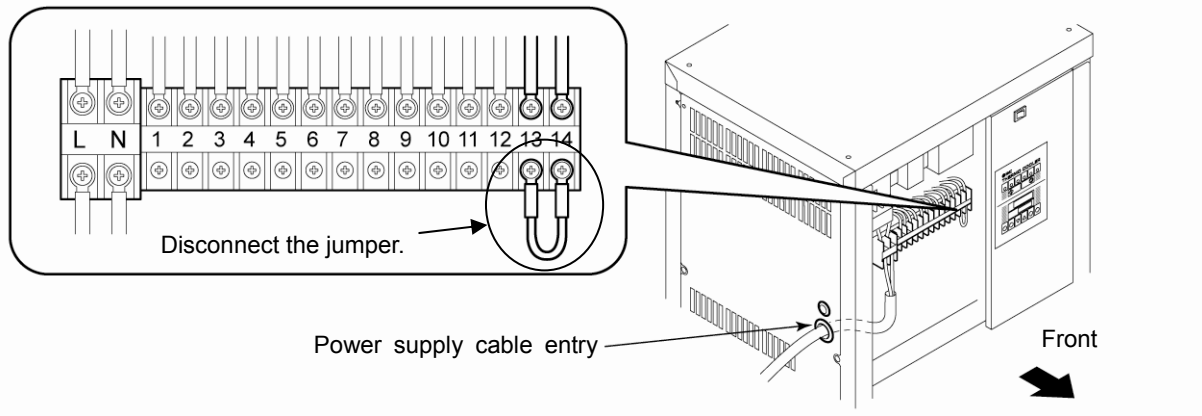


Fig.3-16 Remove jumper cable

2. The specifications of the inputs and outputs of the external switch are as follows.

Table 3-11 Specifications of external switch input and output

Name	Terminal No.		Specifications
External switch power supply output	11	(DC24V)	DC24V+/-10% Power supply contact*1: 20W*2, 15W*3, 10W*4, 5W*5
	12	(24VCOM)	
External switch contact input	13	(DC24V)	Contact input or PNP open collector input Voltage at OFF: DC24V+/-10%, Current at ON: 35mA
	14	(Output)	

※1 The power supply contact changes by the option.
※2 When neither of the heater (Option H) and DI control kit (Option Y) are included.
※3 When the DI control kit (Option Y) is not included, and the heater (Option H) is included.
※4 When the heater (Option H) is not included, and the DI control kit (Option Y) is included.
※5 When both of the heater (Option H) and DI control kit (Option Y) are included.

CAUTION

An inductive load cannot be used.

3. Connect the external switch cable as shown in the figure below.

Connect the external switch signal inputs (terminal no. 13 and 14) with the contact input or PNP open collector input.

When using a sensor that requires power, supply the power from the external switch power supply (terminal no. 11 and 12).

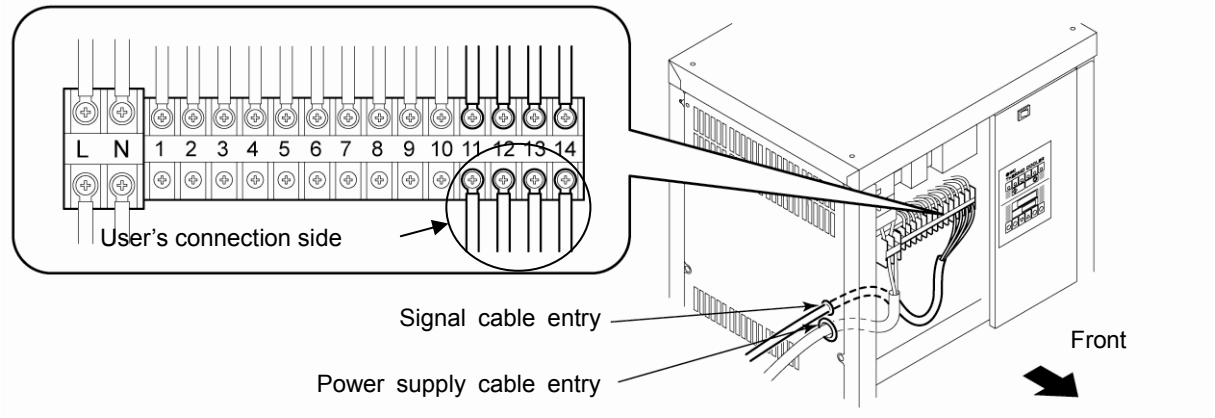


Fig.3-17 External switch wiring

4. The method below shows how to output the flow rate alarm output by using the flow switch.

Table 3-12 Specifications of external switch

Description	Part number	Specifications
Flow switch	PF2W720-67-M	Manufacturer: SMC Display flow range: 1.7 to 17.0L/min Set flow range: 1.7 to 17.0[L/min]
	PF2W740-67-M	Manufacturer: SMC Display flow range: 3.5~45.0 [L/min] Set flow range: 3.5~45.0 [L/min]

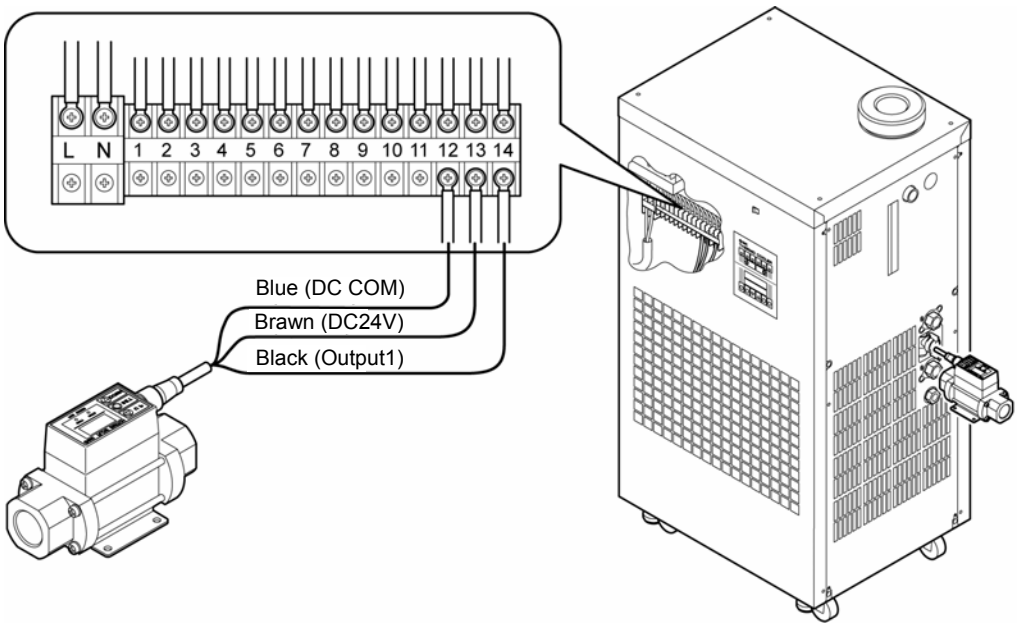


Fig.3-18 Typical example of external switch

3.4 Piping

CAUTION

- **Connect piping firmly. Incorrect piping might cause leakage of supplied or drained leakage and wet surrounding area and facility.**
- **Keep supply water pressure below 0.5MPa.**
- **Be sure to correctly connect IN and OUT of circulating fluid and facility water (For woter-cooled type). The reverse connection might prevent the product from operating properly.**
- **Pay attention not to allow dust and foreign materials to enter into water circuit etc. during connection of piping.**
- **Hold the piping port firmly with specific wrench when tightening.**
- **The piping should be selected with due consideraton of pressure and temperature. Otherwise, the piping can burst in service.**

CAUTION

- **Check the model number of this product in "1.4.1 Product Label" of this manual before connecting piping.**
- **Model number: HRGC00∗-∗N**
  The transition connector from Rc to NPT is enclosed as an accessory.
  For NPT piping, be sure to use this connector.
- **Model number: HRGC00∗-∗F**
  The transition connector from Rc to G is enclosed as an accessory.
  For G piping, be sure to use this connector.

■ Piping port size

The piping port size is common to all models.

Table 3-13 Piping port size

Name	Port size*1	Recommended tightening torque	Recommended proof pressure for piping
Circulating fluid supply	Rc1/2	28～30N・m	0.8MPa or more
Circulating fluid return	Rc1/2	28～30N・m	0.8MPa or more
Overflow port	Rc1/2	28～30N・m	—
Automatic water fill port*2	Rc1/2	28～30N・m	0.5MPa or more (Water supply pressure 0.2 to 0.5MPa)
Tank drain port	Rc1/4	12～14N・m	—
Faiclity water inlet*3	Rc1/2	28～30N・m	1.0MPa or more （Faiclity water pressure 0.3 to 0.5MPa）
Faiclity water outlet*3	Rc1/2	28～30N・m	

*1 For NPT and G thread, use a conversion connector available as an accessory separately.
*2 When the Automatic water fill function (Option J) is included.
*3 For water cooled type.

■ How to connect piping

Hold the piping port firmly with a pipe wrench and tighten the piping.

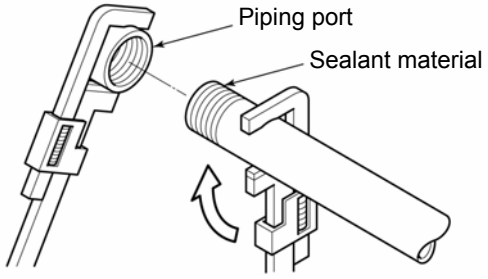


Fig.3-19 Tightening of piping

■ Recommended piping circuit

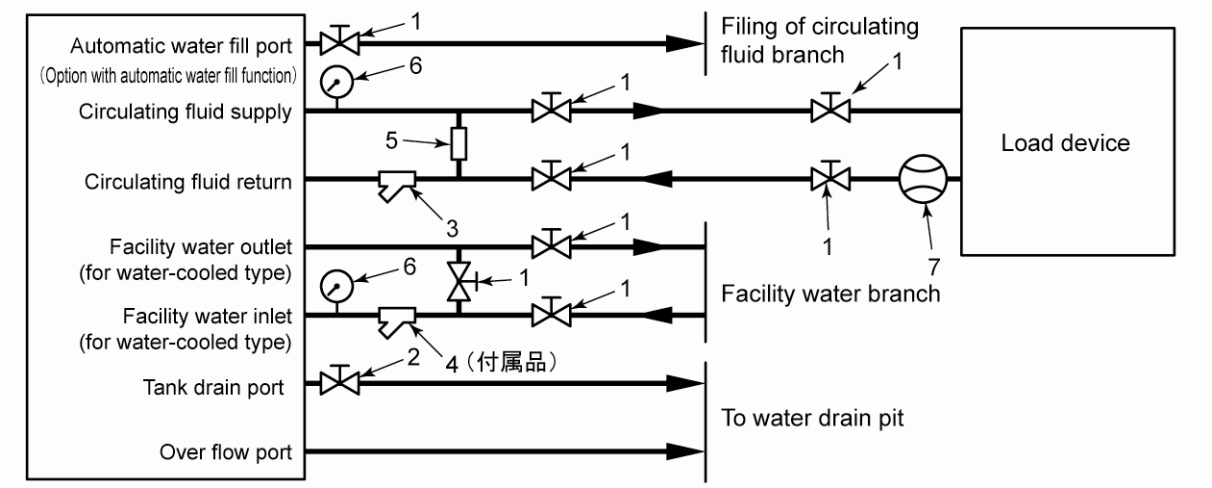


Fig.3-20 Recommended piping circuit

No.	Name	Size
1	Valve	Rc1/2
2	Valve	Rc1/4
3	Y-shaped strainer or filter	Rc1/2 (#100) Rc1/2 (50μm)
4	Y-shaped strainer (accessory)	Rc1/2
5	Relieving valve	Rc1/2, Set between 0 to 0.5 MPa
6	Pressure gauge	0 to 1.0 MPa
7	Flow meter	0 to 50 L/min
8	Others (Pipe, hose, etc.)	I.D φ15 or more

[Tips]

The installation of valves at each port other than the overflow port makes it easier to drain the circulating fluid and facility water. (The valves should be prepared separately.)

CAUTION

Be sure to connect the enclosed Y-strainer at the facility water inlet. (For water-cooled type)

3.5 Fill of circulating fluid

Open the tank lid and supply circulating fluid from there until the level of fluid reaches the range specified in liquid level indicator.

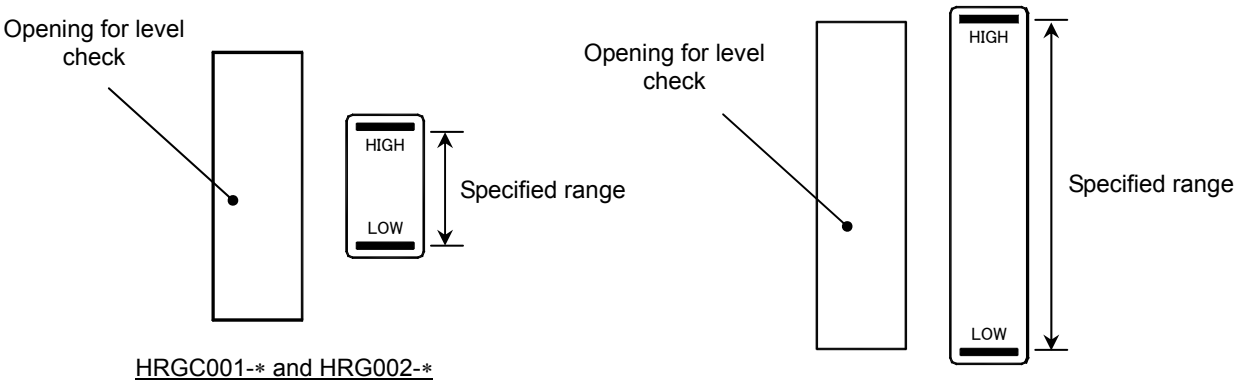
[Tips]

Immediately after the circulating fluid is supplied, the air trapped in the circulating fluid of the level indicator may prevent the liquid level from being displayed correctly.
In this case, slap the level gauge a few times to discharge the air there.

Fig.3-21 Opened tank lid

⚠ CAUTION

Ensure the fluid level in the tank stays between "HIGH" and "LOW". If the level is outside specified of the range, the circulating fluid may overflowing or the product may stop operation.



HRGC001-* and HRG002-*

HRGC005-*

Fig.3-22 Fluid level indicator

3.5.1 Reinstallation of the product

⚠ WARNING

- **Only qualified people are allowed to perform wiring.**
- **Be sure to shut off the user's power supply. Wiring with the product energized is strictly prohibitted.**

⚠ WARNING

Drain all circulating fluids from the product for reinstallation.
Only people who have sufficient knowledge and experience about the product and its accessories are allowed for reinstallation.
Also, read and understand the Chapter 3 of this manual before transporting the product for reinstallation.

Chapter 4 Starting the Product

⚠ CAUTION

Only people who have sufficient knowledge and experience about the product and it's accessories are allowed to start and stop the product.

4.1 Before Starting

Check the following items before starting the product.

■ Installation conditions

- Check the product is installed horizontally.
- Check that there are no heavy object on the product, and the external piping is not applying excessive force to the product.

■ Connection of cables

- Check the power, ground and communications (optional) cables are correctly connected.

■ Circulating fluid

- Check proper connection of piping at inlet and outlet.

■ Facility water piping (For water-cooled type)

- Check proper connection of piping at the facility water inlet and outlet.
- Check that the facility water source is in operation.
- Check that the facility water circuit is not shut off by valves

■ Fluid level indicator (for tank)

- Check the fluid level is within the required range.

⚠ CAUTION

The facility water should be checked for whether or not it satisfies the water quality standard described in "Chapter 7 Control, Inspection and Cleaning 7.1 Control of Circulating Fluid Quality" (P7-1) and requirements specified in "Chapter 8 Documents 8.1 Specifications List" (P8-1)

[Tips]

The product is equipped with a water regulator, which does not allow the facility water to flow unless the product is started.

4.2 Preparation for Start

4.2.1 Power supply

When option B is included, perform steps 1 through 3. Otherwise, start from step 3

1. Loosen screws (6pcs) and take off the front panel. (8 pieces for HRGC005)

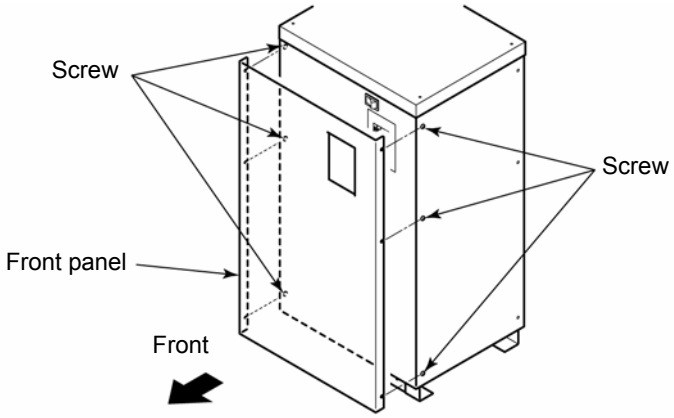


Fig.4-1 Removal of front panel

2. Check the earth leakage breaker on the electrical board of the electrical product. Turn on the power supply and bring up the lever of the earth leakage breaker.

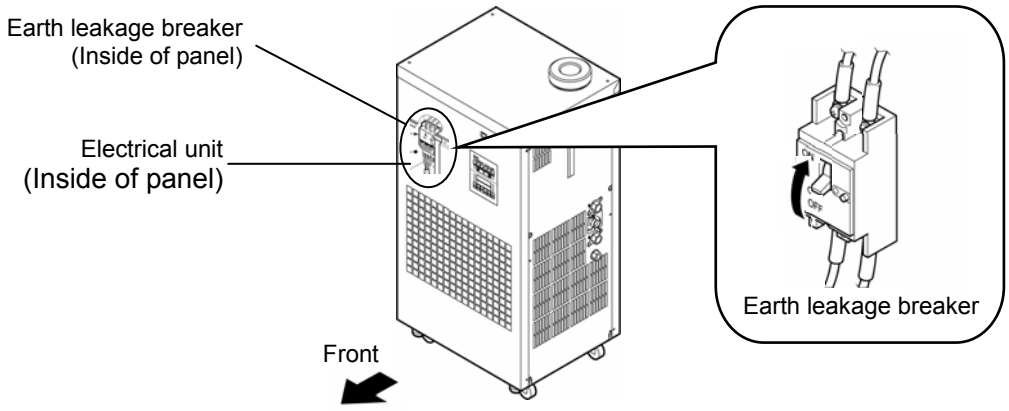


Fig.4-2 Earth leakage breaker

3. Supply the power and turn on the power supply switch.

When the product is switched on, the operation panel displays the following conditions.

- The [POWER] LED lights up.
- The set value of circulating fluid temperature is displayed as SV on the panel.
- The present value of circulating fluid temperature is displayed as PV on the panel.
- The [PV] LED lights up.

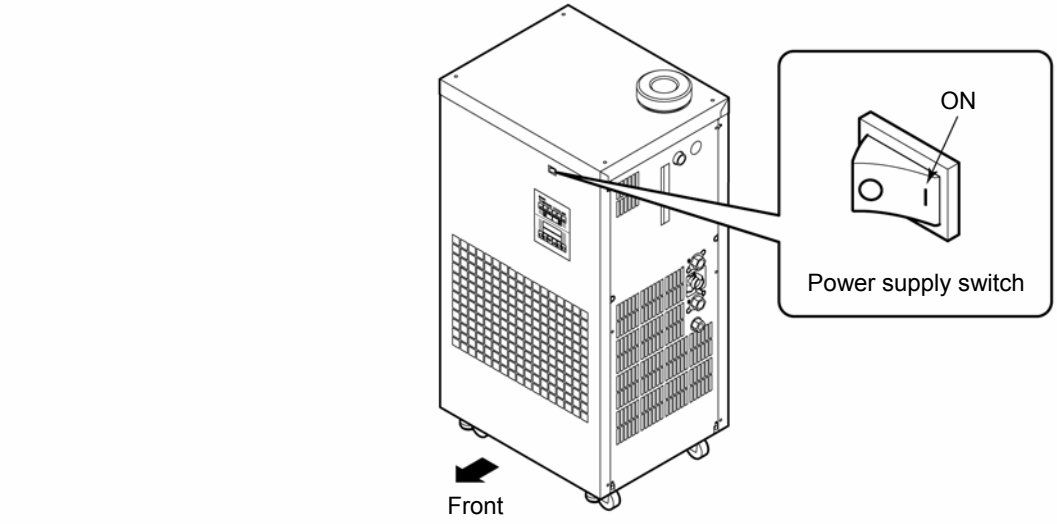


Fig.4-3 Power supply switch

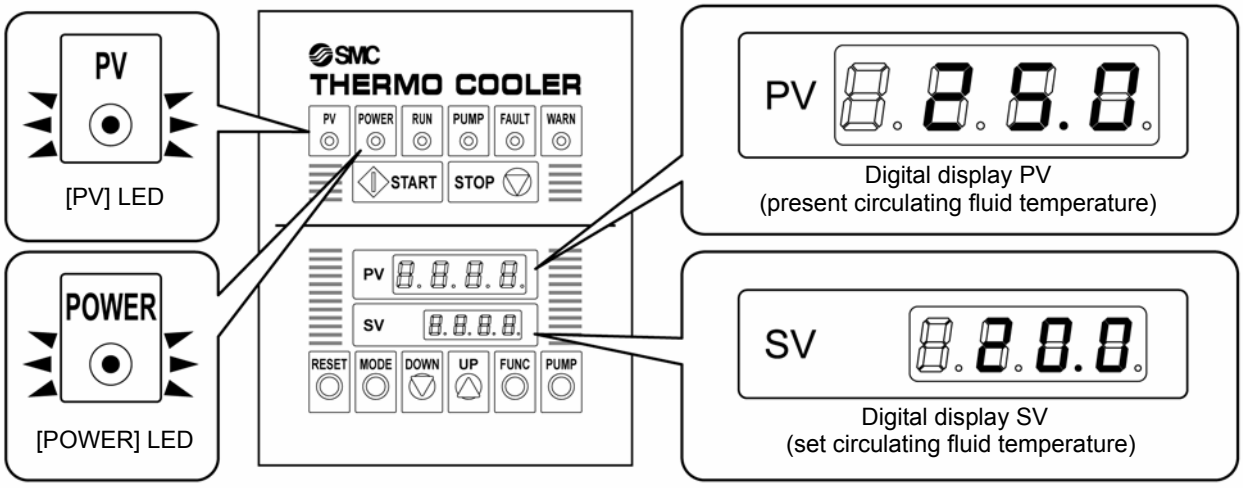


Fig.4-4 Power supply

4.2.2 Setting of circulating fluid temperature

Press the [DOWN] and [UP] buttons on the operational panel to change the SV to required value.

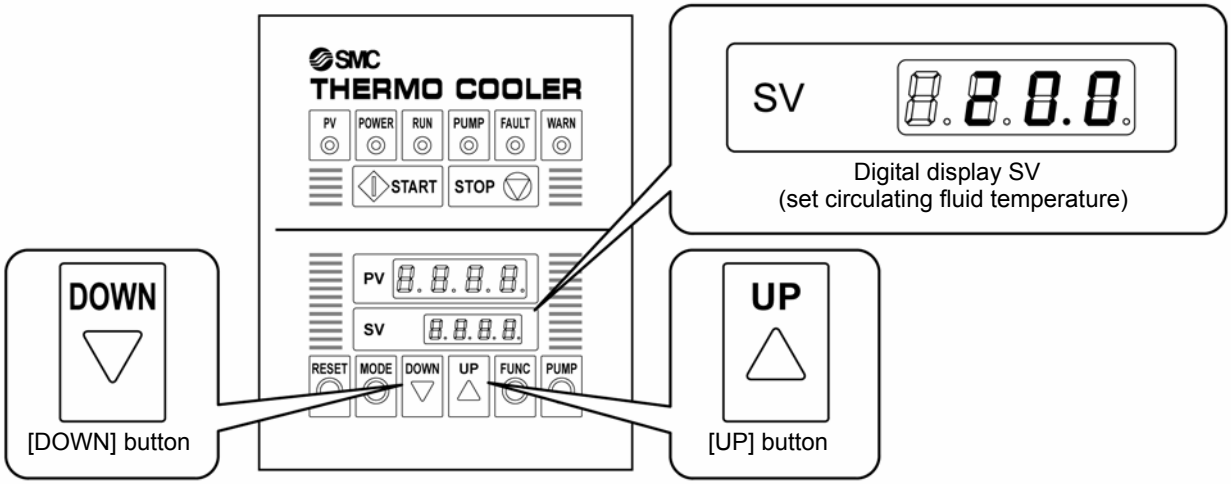


Fig.4-5 Setting of circulating fluid temperature

4.2.3 Setting of circulating fluid temperature by communication (for option with communication function)

■ Setting of communication function

The product can be provided with RS-485 communication protocol (Option C) and RS-232C communication protocol (Option S).This option enables remote operation of the writing and reading of the circulating fluid temperature.

In order to use the communication function, the product needs to be connected in advance with the higher level computer.

Refer to “5.4 Settings of Communication Function” and set the following communication items.

Table 4-1 List of set communication items

Parameter	Explanation	Initial value	
PV _CoM	Sets communication parameters. SV nBBB Disables BCC check function. SV bBBB Enables BCC check function. SV BBBB Sets data length to 7 bit. SV BBBB Sets data length to 8 bit. SV BBBB Disables a parity check function. SV BBBB Enables a parity check function with even number. SV BBBB Enables a parity check function with odd number. SV BBB1 Sets stop bit length to 1 bit. SV BBB2 Sets stop bit length to 2 bit.	SV b8n2	BCC check function: Enables Data length: 8 bit Parity check function: Disabled Stop bit length: 2 bit
PV _bPS	Sets the communication baud rate. SV 1.2 1200 bps SV 2.4 2400 bps SV 4.8 4800 bps SV 9.6 9600 bps SV 19.2 19200 bps	SV 9.6	Baud rate: 9,600bps
PV _Adr	Sets communication addresses. The addresses from 1 to 99 can be set. SV BBB1 : 1～99 addresses SV 99	SV BBB1	1 [node]
PV _Mod	Sets communication mode. SV ro Read only SV rW Read and write	SV rW	Read and write

■ Setting of circulating fluid temperature

Change the set temperature to 20°C by the following procedures.

1. Refer to “4.2.3 Setting of circulating fluid temperature by communication (for option with communication function) and “5.4 Settings of Communication Function”, and match the communication settings of the higher level computer and product.

2. Send the following writing message from the higher level computer to the product to request a setting (writing) of 20°C.

Wait until a response is received from the product.

Start code	Address		Required content	Command			Numeric data					End code	BCC data
02H (STX)	30H (0)	31H (1)	57H (W)	53H (S)	56H (V)	31H (1)	30H (0)	30H (0)	32H (2)	30H (0)	30H (0)	03H (ETX)	51H

3. The product sends a response message (ACK) to the higher level computer to inform it that the requested setting has been completed.

Start code	Address		Response message	End code	BCC
02H (STX)	30H (0)	31H (1)	06H (ACK)	03H (ETX)	06H

4. If the set value needs to be checked, send a request message to read out from the higher level computer to the product.

Wait until a response is received from the product.

Start code	Address		Required content	Command			End code	BCC data
02H (STX)	30H (0)	31H (1)	52H (R)	53H (S)	56H (V)	31H (1)	03H (ETX)	66H

5. The product sends a response message (ACK) to the higher level computer to inform it of the requested SV.

Check that the required temperature is reached.

Start code	Address		Response message	Command			Numeric data					End code	BCC
02H (STX)	30H (0)	31H (1)	06H (ACK)	53H (S)	56H (V)	31H (1)	30H (0)	30H (0)	32H (2)	30H (0)	30H (0)	03H (ETX)	00H

[Tips]

The BCC (block check characters) is an XOR algorithm value resulting from exclusive OR sum of each bite from start code (02H) to end code (03H).

For other communication protocol commands and characters, and ASCII code table, refer to attached “Communication Specifications”.

4.3 Refill of circulating fluid

When the circulating fluid tank is filled the user's machine and piping remains empty. In that condition, the circulating fluid flows out to the user's machine and piping and the tank level decreases so much as to require a refill. In that case, refill the circulating fluid in the following procedure.

1. Press the [PUMP] button on the operation panel.

The [PUMP] LED lights up and the pump starts operating independently to supply the circulating fluid from the tank to the user's machine and piping.

When the fluid level in the tank reaches the lower limit, the [FAULT] LED lights up, the alarm number "AL04" (low level in tank) is displayed on the PV display and the pump is stopped.

CAUTION

If leakage occurs due to faulty piping including an opened fitting of eternal piping, stop manual operation of the pump and fix the leak.

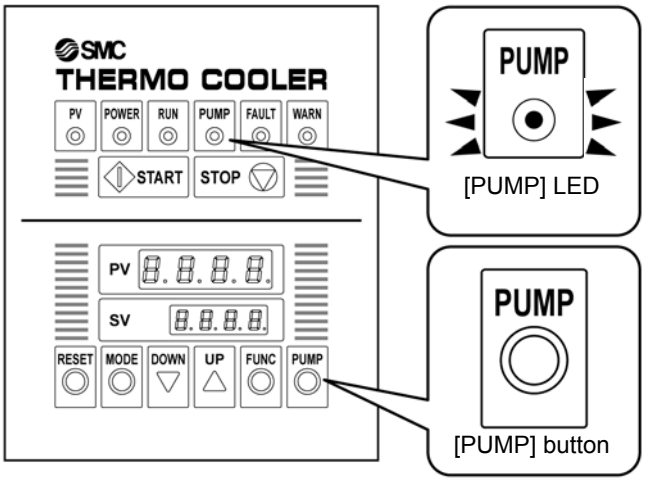


Fig.4-6 [PUMP] button and [PUMP] LED

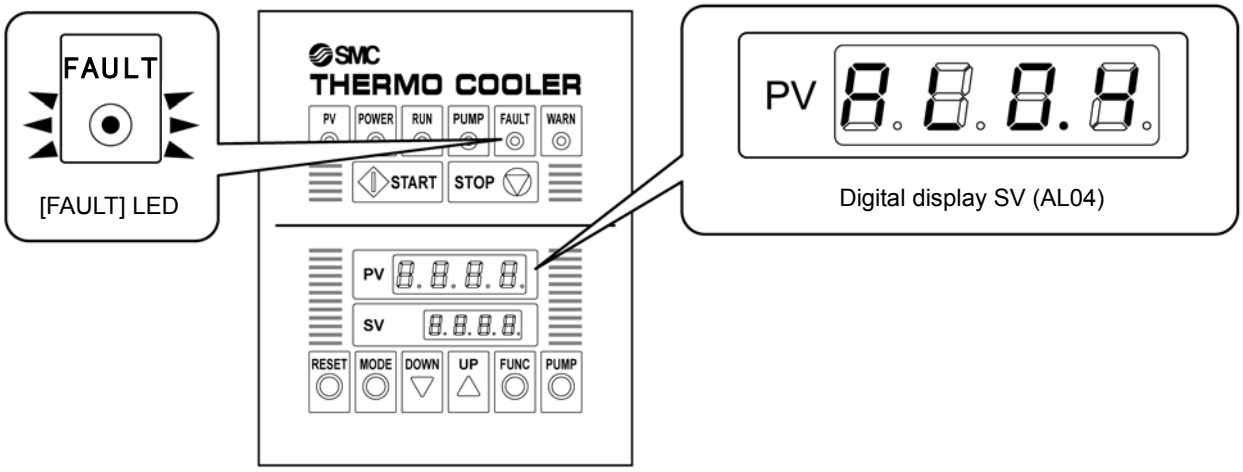


Fig.4-7 Digital display PV and [FAULT] LED

2. Open the tank lid and fill the reciculating fluid until its level reaches the specified range on the fluid level indicator on the liquid level indicator.

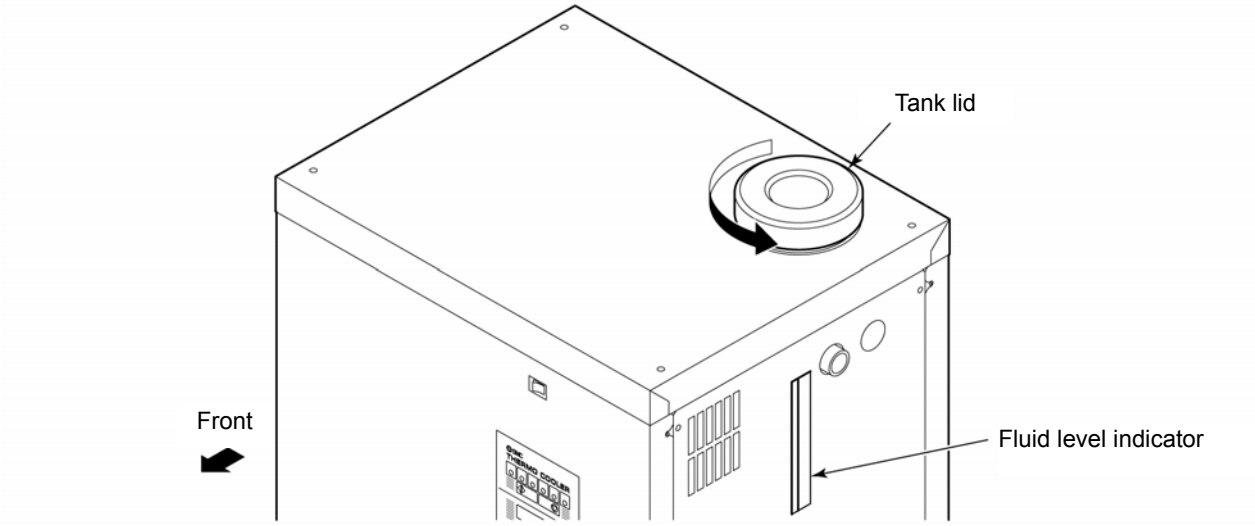


Fig.4-8 Opened tank lid

⚠ CAUTION

Ensure the fluid level in the tank stays between "HIGH" and "LOW". If the level is outside specified of the range, the circulating fluid may overflowing or the product may stop operation.

3. Press the [RESET] button.

The alarm (low level in tank) is cleared and the pump can now be restarted using the [PUMP] button.

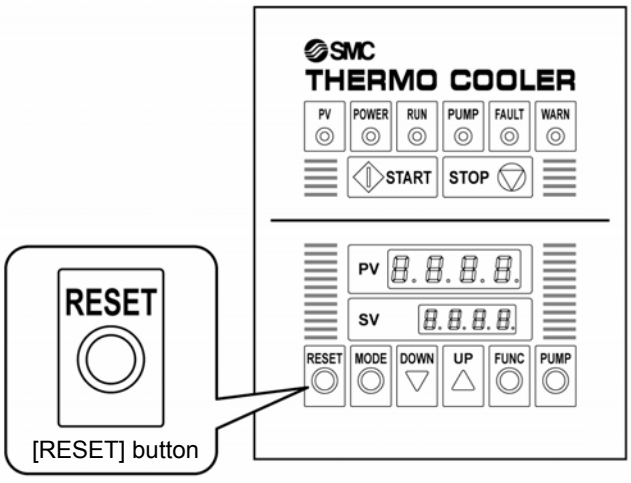


Fig.4-9 [RESET] button

4. 4. Repeat the steps 1 to 3 until the user's machine, piping and the product's tank is filled with recirculting fluid. Tank level must be within specified range shown on level indicator.

4.4 Starting and Stopping

4.4.1 Starting the product

⚠ CAUTION

Allow at least five minutes before restarting the product.

Before starting, check the items specified in “4.1 Before Starting”

If any alarm lamp remains on, refer to Chapter 6 Alarm Display and Remedy”

Press the [START] button on the operation panel.

- The product starts operating to control the circulating fluid temperature to the set value.
- The [RUN] LED and [PUMP] LED on the operation panel light up.

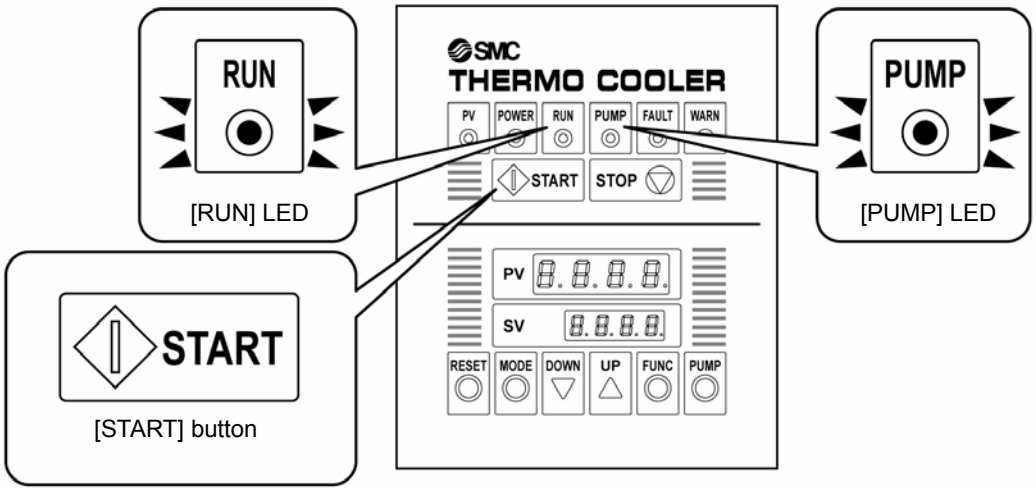


Fig.4-10 Starting the product

4.4.2 Stopping the product

1. Press the [STOP] button on the operation panel.

The product stops.

The [RUN] LED and [PUMP] LED on the operation panel go off.

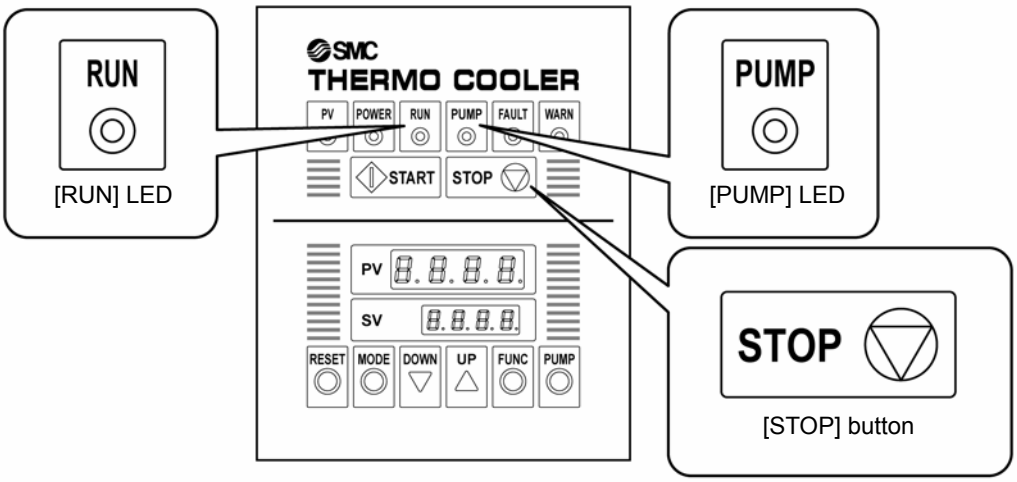


Fig.4-11 Stopping the product

2. Turn off the power supply switch.

All LEDs go off.

⚠ WARNING

Be sure to shut off the breaker of the facility power supply (the user's machine power supply) and conduct lock out and tag out before wiring.
Also, drain the circulating fluid, etc. from the product in accordance with and put into storage properly
(Referring to "7.4 Stop for a Long Time".

4.5 Check Items After Starting

Check the following items after starting the product.

⚠ WARNING

When an Alarm is seen, press the [STOP] button and then turn off the power supply switch to stop the product, and turn off the breaker of the user's power supply to isolate the product.

- here is no leakage from piping.
- There is no drain of circulating fluid from the tank drain port.
- The circulating fluid pressure is within a specified range.
- The tank level is within specified range.

4.6 Adjustment of Circulating Fluid

■ Flow adjustment by manual by-pass valve

The adjustment of circulating fluid flow rate should be performed by the manual by-pass valve and monitoring the pressure or flow rate in the user's machine until they reach required value. If the flow rate remains higher than required even after fully opening the manual by-pass valve, install a valve for pressure adjustment on the discharge port of the product and adjust it.

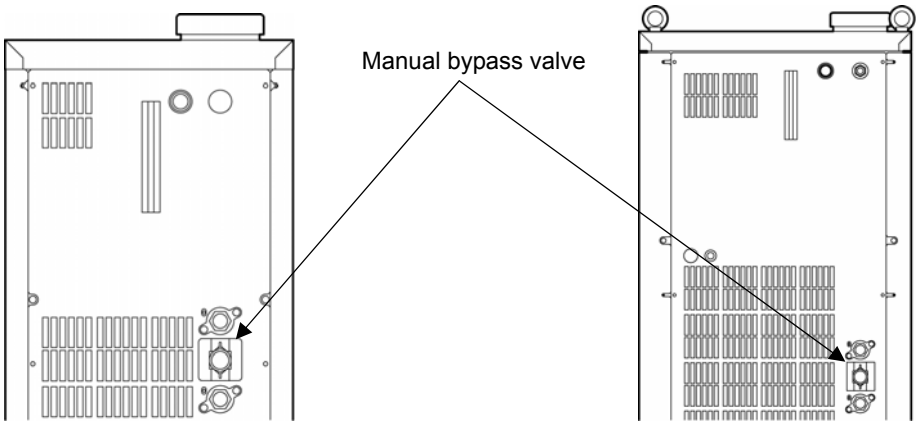


Fig.4-12 Manual by-pass valve (HRGC005-∗)

⚠ CAUTION

Do not fully close the manual by-pass valve. It can increase the pressure of fed water excessively and damage the pump or user's machine. For the initial run of the product after installation, be sure to fully open the manual by-pass valve.

Chapter 5 Setting of various functions

⚠ WARNING

Read and understand this manual carefully before changing the settings.

The product can have the following settings.

- Offset of displayed temperature
  The displayed value of temperature can be offset to the measured value of temperature.

  This function can be also used to adjust the temperature in relation with other temperature display equipment.
  (Refer to “5.2 Offset of Displayed Temperature”)
- Addition of temperature alarm
  The user can set the temperature alarm optionally.
  (Refer to “5.3 Addition of Temperature Alarms”)
- Communication setting (for option with RS-485 or RS-232C communication function)
  In order to communicate with the higher level computer or sequencer, their communication settings need to match.
  (Refer to “5.4 Settings of Communication Function”)

5.1 Release of Lock

In the default setting, the set values of the controller are locked, and cannot be changed.

Before performing each setting, release the lock by the following procedures.

1. Press and hold the [MODE] key on the operation display panel. (2 sec.)
The digital display for controller will change as follows.

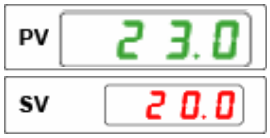
2. Press the [MODE] key several times until the digital display of the controller changes as follows.

3. Press the [DOWN] key three times to set "0".
The parameter lock will be released.

Table 5-1 List of set values for LoC

Set value	Condition	Explanation	
		Change of set temperature	Change of set value
0	All locks are released.	Available	Available
1	All settings are locked.	Unavailable	Unavailable
2	Temperature setting is locked.	Available	Available
3	All settings apart from temperature are locked.	Unavailable	Unavailable

4. Press and hold the [MODE] key. (2 sec.)
The digital display of the controller will change as follows, and return to the intial condition.



CAUTION

After changing the parameter, be sure to reset the lock, referring to Chapter 5.5 "Lock of Parameters". Otherwise, incorrect operation by an operator can change the setting, which may result in breakage and control failure of the machine.

5.2 Offset of Displayed Temperature

5.2.1 Practical example of offset function

In this product, the displayed temperature of circulating fluid can be offset by inputting an offset value. When the offset value is input, the displayed value of circulating fluid will change as follows.

Displayed temperature of circulating fluid after offset =

Measured temperature + Offset value.

5.2.2 Input of offset value

The controller settings of this product are locked, so the settings cannot be changed.

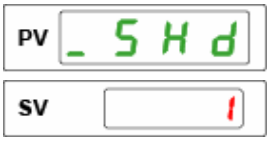
Before inputting the offset value, refer to “5.1 Release of Lock”.

1. Press and hold the [MODE] key on the operation display panel. (2 sec.)
The digital display for controller will change as follows.

2. Hold the [UP] and [DOWN] key pressed down on the operation display panel simultaneously. (6 sec.)
The digital display for controller will change as follows.

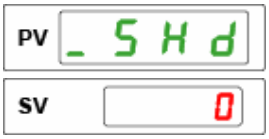
3. Press the [MODE] key once.

The digital display for controller will change as follows.



4. Press the [DOWN] key once.

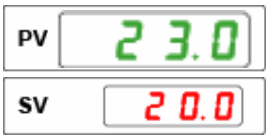
The digital display for controller will change as follows.



Then, the PuS 1 will show up.

5. Press and hold the [MODE] key on the operation display panel. (2 sec.)

The digital display for controller will change as follows.



6. Press and hold the [MODE] key on the operation display panel. (2 sec.)

The digital display for controller will change as follows.

7. Press the [MODE] key several times until the digital display of the controller changes as follows.

* The set value depends on each product.

8. Input "PuS" value (offset value) by using the [DOWN] and [UP] keys.

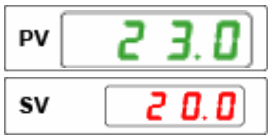
* Temperature will be offset as shown in the following formula.
Each product is given a default value for offset at the time of shipment from the factory.

Temperature after offset = Measured temperature +"PuS" value.

CAUTION

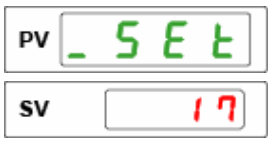
Use the product at the set temperature +/-1oC.
Otherwise, product failure such as freezing of the circulating fluid or overload of the machine can result.

9. Press and hold the [MODE] key on the operation display panel. (2 sec.)
The digital display for controller will change as follows.



10. Press and hold the [MODE] key on the operation display panel. (2 sec.)
The digital display for controller will change as follows.

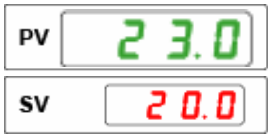
11. Hold the [UP] and [DOWN] key pressed down on the operation display panel simultaneously. (6 sec.)
The digital display of the controller will change as follows.



12. Press the [MODE] key once.
The digital display for controller will change as follows.

13. Press the [UP] key once.
The digital display for controller will change as follows.

14. Press and hold the [MODE] key on the operation display panel. (2 sec.)
The digital display for controller will change as follows.



5.3 Addition of Temperature Alarms

5.3.1 Setting items of temperature alarm

It is possible to add temperature alarms to this product with settings optionally set by the user

The parameters to be changed and initial values and explanation for the addition of temperature alarm are shown in the following table.

Table 5-2 List of set temperature alarms

Parameter	Explanation	Initial value	Set value	Explanation
_E6u	Sets whether or not temperature alarm is added.	0	0	No temperature alarm is added.
			1	Temperature alarm is added.
			2	The DI (circulating fluid resistivity) alarm is added.
_E6A	Sets whether or not the product is stopped when an alarm is generated.	1	1	The product is stopped and alarm signal contact output is generated for alarm.
			2	The product is not stopped for alarm.
_E6F	Sets the type of alarm. The 1st digit Sets the additional function of the alarm. The 2nd digit Sets the type of alarm.	21	2nd digit	
			0□	No additional function of alarm is added.
			1□	The alarm self-holding function is added.
			2□	The alarm stand-by function is added. (Even if the value is abnormal when the power supply is turned on, the alarm Is not generated until it has returned once to a normal value.)
			1st digit	
			□1	Circulating fulid temperature (PV) > Set temperature (SV) + _E6H Circulating fulid temperature (PV) < Set temperature (SV) - _E6H In the above condition, alarm is generated.
			□2	Circulating fulid temperature (PV) > Set temperature (SV) +_E6H In the above condition, alarm is generated.
			□3	Circulating fulid temperature (PV) < Set temperature (SV) - _E6L In the above condition, alarm is generated.
			□4	Not available.
			□5	Circulating fulid temperature (PV) >_E6H Circulating fulid temperature (PV) <_E6L In the above condition, alarm is generated.
			□6	Circulating fulid temperature (PV) >_E6H In the above condition, alarm is generated.
			□7	Circulating fulid temperature (PV) <_E6L In the above condition, alarm is generated.
			□8	Not available.
_E6H*1	Sets the upper limit of alarm temperature.	1.0		The 2nd digit of the set value _E6F is 1 or 2. (Set temperature + _E6H) When the 2nd digit of set value _E6F is 5 or 6, it will not be displayed.
_E6L*2	Sets the lower limit f alarm temperature.	1.0		The 2nd digit of the set value _E6F is 1 or 3. Set temperature -
_E6C	Sets the hysteresis (recovery temperature)to reset the alarm.	1.0		When the deviation from the set value for alarm is; Upper limit alarm: - _E6C°C from the upper limit temperature. Lower limit alarm: + _E6C°C from the lower limit temperature.
_E6t	Sets the delay timer (time delay) of alarm.	1.0		When the alarm condition lasts for "_E6t" sec., alarm is generated.

*1 If the 1st digit of the set value _E6F is 3 or 7, it will not be displayed.
*2 If the 1st digit of the set value _E6F is 3 or 7, it will not be displayed

5.3.2 Operation range of the alarm

The alarm operates in the flow shown below.

- Operation range of the alarm (deviation alarm) based on the set value (SV)

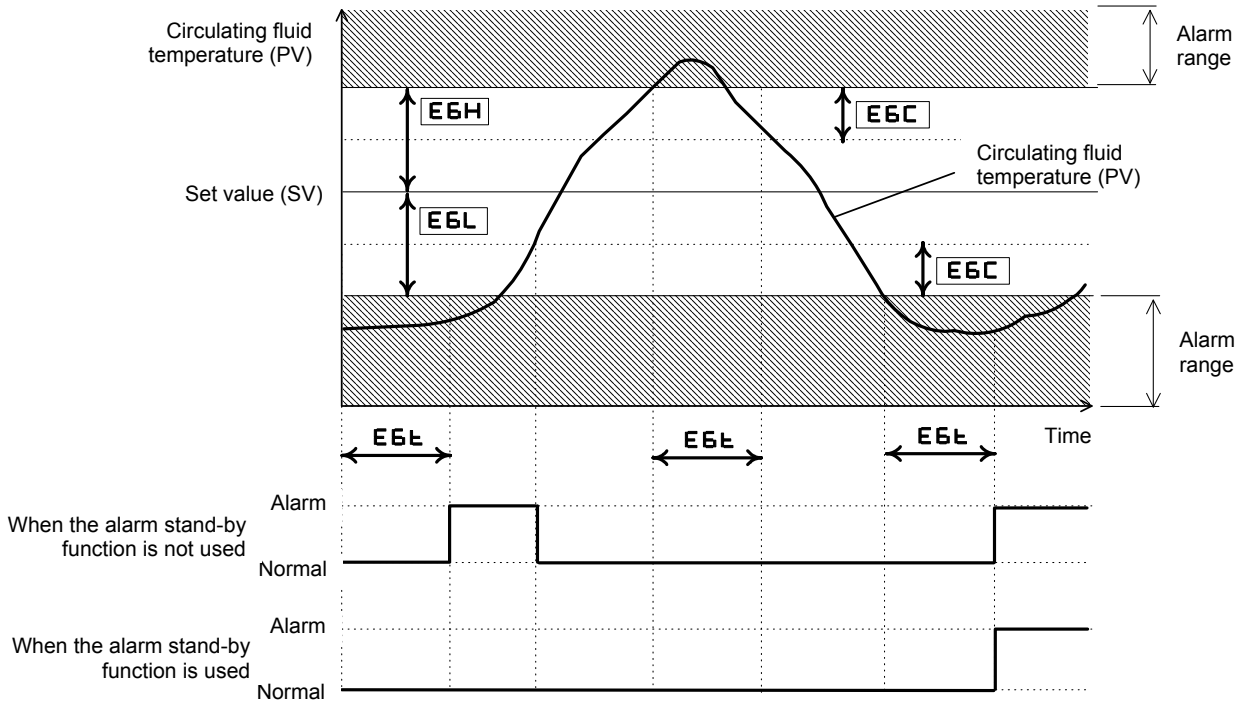


Fig.5-1 Deviation alarm

1) The circulating fluid temperature (PV) is below the temperature set for the lower limit alarm (set temperature – [_EGL]°C) when the power supply is turned on.

・When the alarm stand-by function s not used.
Since the delay timer of the alarm is set, alarm is not generated.

・When the alarm stand-by function is used.
Since the value has not entered the normal range since the power supply was turned on, alarm is not generated.

2) The circulating fluid temperature (PV) remains below the temperature set for the lower limit alarm (set temperature – [_EGL]°C) for [_EGL] sec. or longer when the power supply was turned on.

・When the alarm stand-by function is not used.
When the circulating fluid temperature (PV) remain in abnormal range for [_EGt] sec., alarm is generated.

・When the alarm stand-by function is used.
Since the value is abnormal after the power supply is turned on, alarm is not generated.

3) Since the circulating fluid temperature (PV) has risen above the temperature set for the lower limit alarm by [_EGC], alarm will be reset.

4) Since the delay timer of alarm is set, alarm is not generated even if the circulating fluid temperature is over the temperature set for the upper limit alarm.

5) The circulating fluid temperature (PV) remains below the temperature set for the lower limit alarm (set temperature - [_EGL]) for [_EGt] sec. or more.
After the power supply is turned on, the alarm is output since it is in the normal range even when the alarm stand-by function is used.

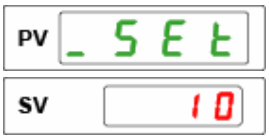
5.3.3 Setting of temperature alarm

This product is locked to prevent unintentional change of controller settings. Release the lock referring to “5.1 Release of Lock” and set temperature alarms in accordance with the following procedure.

1. Press and hold the [MODE] key on the operation display panel. (2 sec.)

The digital display for controller will change as follows.

2. Press the [UP] key several times until the digital display of the controller changes as follows.



3. Press the [MODE] key once.

The digital display for controller will change as follows.

4. Press the [UP] key once to set “ 1”.

Table 5-3 List of _E6u set values

Set value	Explanation
0	Temperature alarm is not used.
1	Temperature alarm is used.
2	Not valid.

5. Press the [MODE] key once.

The digital display for controller will change as follows.

6. Set the operation of the product when alarm occurs by using the [UP] and [DOWN] keys.

Table 5-4 List of _E6A set values

Set value	Type of alarm	Alarm condition			
		Operation	Lamp	Contact output	Alarm number
1	FAULT	Stopped	FAULT on	Contact output no. 5 and 6 are open.	AL-1
2	WARNING	Continued	WARN on	Contact output no. 7 and 8 are open.	AL-1

7. Press the [MODE] key once.

The digital display for controller will change as follows.

8. Set the type of alarm from the follwing table by using the [UP] and [DOWN] keys.

Table 5-5 List of _E6F set values

Set value	Alarm function	Explanation
□1	Upper/lower limit of deviation	Sets both upper limit and lower limit of deviation.
□2	Upper limit of deviation	Outputs alarm when the PV (current temp.) exceeds the sum of the SV + alarm set value.
□3	Lower limit of deviation	Outputs alarm when the PV (current temp.) goes lower than the SV - alarm set value.
□4	—	Not valid.
□5	Upper/lower limit of absolute value	Sets both upper limit and lower limit of absolute value.
□6	Upper limit of absolute value	Outputs alarm when the PV (current temp.) exceeds the alarm set value.
□7	Lower limit of absolute value	Outputs alarm when the PV (current temp.) goes lower than the alarm set value.
□8	—	Not valid.
0□	Not provided	None.
1□	Self-holding function	Holds alarm condition even after normal condition returns.
2□	Stand-by function	Even when abnormal value appears as soon as the power supply is turned on, alarm is not generated until it has returned to a normal value once.

9. Press the [MODE] key once.

The digital display for controller will change as follows.

* When only the lower limit is set, this parameter will not be displayed.

10. Set the upper limit of temperature by using the [UP] and [DOWN] keys.

11. Press the [MODE] key once.

The digital display for controller will change as follows.

* When only the upper limit is set, this parameter will not be displayed.

12. Set the lower limit of temperature by using the [UP] and [DOWN] keys.

13. Press the [MODE] key once.

The digital display for controller will change as follows.

14. Set the temperature to reset alarm by using the [UP] and [DOWN] keys.

15. Press the [MODE] key once.

The digital display for controller will change as follows.

16. Set a delay time of alarm by using the [UP] and [DOWN] keys.

5.4 Settings of Communication Function

The product can be provided with the RS-485 (Option C) and RS-232C (Option S) communication function.

When either of these options is selected, the setting of communication can be conducted by the following procedures.

(For the wiring of communication, refer to “3.3.6 RS-485 Communication wiring” or “3.3.7 RS-232C Communication wiring（for option with RS-232C communication）”.)

5.4.1 List of communication function setting items

The initial values and explanation of communication items to be set in this product are listed in the following table.

Table 5-6 List of set communication items

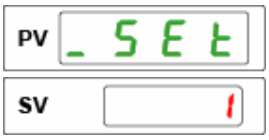
Parameter	Explanation	Initial value	Condition of initial value
_Con	Sets communication parameters. nOOO: Enables BCC check function. bOOO: Disables BCC check function. O7OO: Sets data length to 7 bit. O8OO: Sets data length to 8 bit. OOnO: Disables a parity check function. OOoO: Enables a parity check function with even number. OOEO: Enables a parity check function with odd number. OOO1: Sets stop bit length to 1 bit. OOO2: Sets stop bit length to 2 bit.	b8n2	BCC check function: Disabled Data length: 8 bit Parity check function: Disabled Stop bit length: 2 bit
_bPS	Sets the communication baud rate. 1.2 : 1,200bps 2.4 : 2,400bps 4.8 : 4,800bps 9.6 : 9,600bps 19.2 : 19,200bps	9.6	Baud rate: 9,600bps
_Adr	Sets communication addresses. The addresses from 1 to 99 can be set.	1	1 [node]
_Mod	Sets communication mode. ro : Read only rW : Read and write	rW	rW : Read and write

5.4.2 Setting of communication functions

This product is locked to prevent unintentional change of controller settings. Release the lock referring to “5.1 Release of Lock” and set communication functions in accordance with the following procedure.

1. Press and hold the [MODE] key on the operation display panel. (2 sec.)

The digital display for controller will change as follows.



2. Press the [UP] key several times until the digital display of the controller changes as follows.

3. Press the [MODE] key once.

The digital display for controller will change as follows.

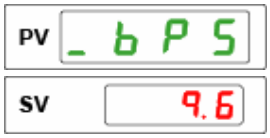
4. Set the communication function from the following table by using the [UP] and [DOWN] keys.

Table 5-7 List of _Con set values

Set value	Explanation
n□□□ b□□□	Enables BCC check function. Disables BCC check function.
□7□□ □8□□	Sets data length to 7 bit. Sets data length to 8 bit.
□□n□ □□o□ □□E□	Disables a parity check function. Sets a parity check function with even number. Sets a parity check function with odd number.
□□□1 □□□2	Sets stop bit length to 1 bit. Sets stop bit length to 2 bit.

5. Press the [MODE] key once.

The digital display for controller will change as follows.



6. Set the baud rate from the following table by using the [UP] and [DOWN] keys.

Table 5-8 List of _bPS set values

Set value	Explanation
1.2	1,200bps
2.4	2,400bps
4.8	4,800bps
9.6	9,600bps
19.2	19,200bps

7. Press the [MODE] key once.

The digital display for controller will change as follows.

8. Set the communication address by using the [UP] and [DOWN] keys.

* The setting range is 1 to 99 nodes.

9. Press the [MODE] key once.

The digital display for controller will change as follows.

10. Set the comunication mode from the following table by using the [UP] and [DOWN] keys.

Table 5-9 List of _Mod set values

Set value	Explanation
r o	Read only
r W	Read and write

5.5 Lock of Parameters

1. Press and hold the [MODE] key on the operation display panel. (2 sec.)
The digital display for controller will change as follows.

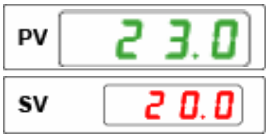
2. Press the [MODE] key several times until the digital display of the controller changes as follows.

3. Press the [UP] key three times to set "3".
The parameter will be locked.

Table 5-10 List of _LoC set values

Set value	Condition	Explanation	
		Change of set temperature	Chang of set temperature
0	All locks are released.	Available	Available
1	All settings are locked.	Unavailable	Unavailable
2	Temperature setting is locked.	Available	Available
3	All settings apart from temperature are locked.	Unavailable	Unavailable

4. Press and hold the [MODE] key on the operation display panel. (2 sec.)
The digital display for controller will change as follows.



CAUTION

After changing the parameter, be sure to reset the lock. Otherwise, incorrect operation by an operator can change the setting, which may result in breakage and control failure of the machine.

Chapter 6 Alarm Display and Remedy

6.1 Alarm Display

When any alarm occurs, the product responds with the following conditions.

■ When the [FAULT] LED lights up.

- The product stops and the [RUN] LED goes off.
  (The product cannot be restarted unless the alarm is reset.)
- The contact for operation signal output is opened.
- The contact for fault error signal output is opened.
- An alarm no. is displayed on PV.
  (The alarm no. will be alternated with the present temperature for display.)

The alarm number, condition of LED and signal output are as shown in ”Table 6-1”.

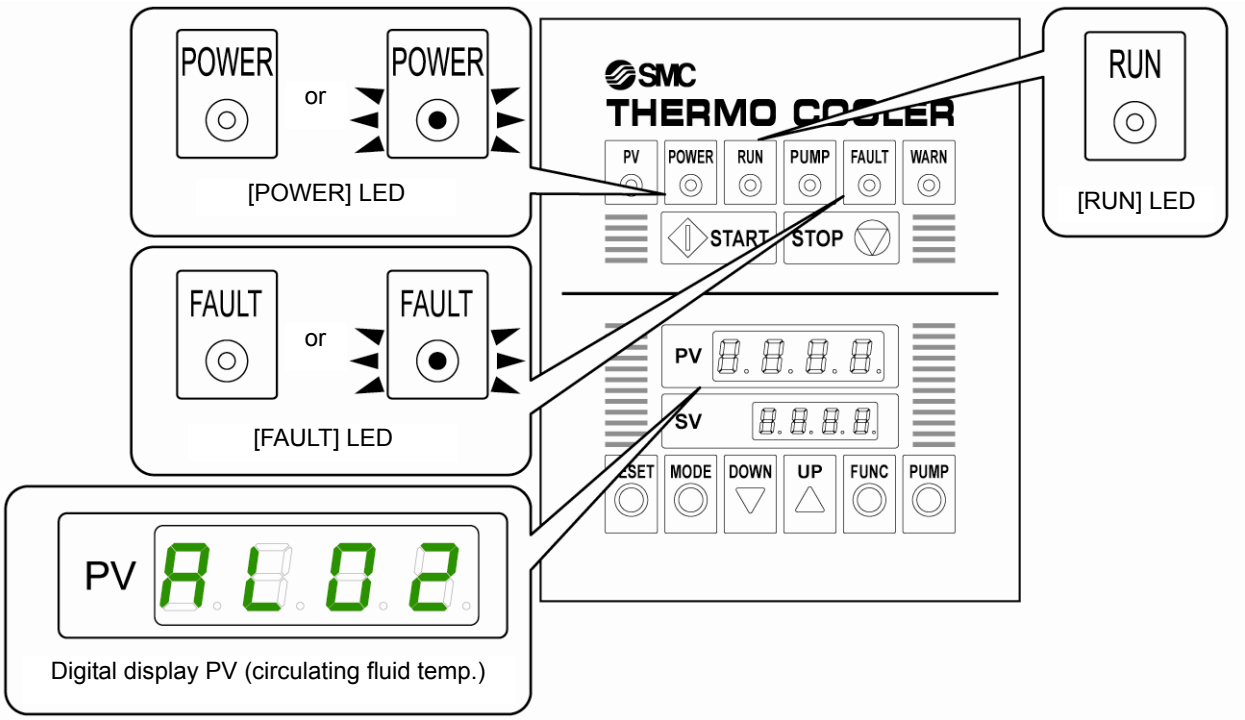


Fig.6-1 Operation panel

■ When the [WARN] LED lights up.

- the product does not stop and continues operation.
- The contact for alarm signal output is opened.
- The alarm no. is displayed on PV.
  (The alarm no. will be displayed alternately with the present temperature for display.)

  The alarm number, condition of LED and signal output are as shown in ”Table 6-1”.

  This alarm is disabled in the default setting

  This alarm will light up in the following situations.
- For the external switch entry
  Refer to 2.2.7 “With External switch signal entry (Option:K)”
- Temperature alarm added by user.
  Refer to 5.3 “Addition of Temperature Alarms”

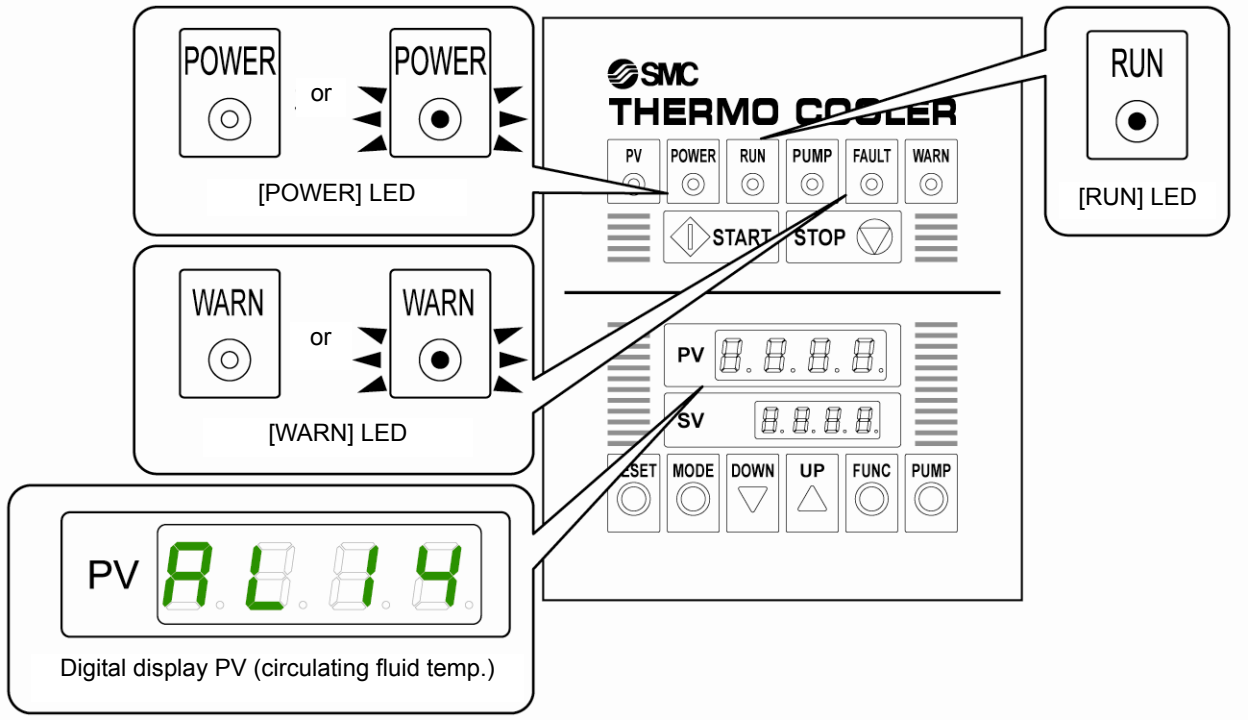


Fig.6-2 Operation panel (FAULT lamp ON)

Table 6-1 Alarm display

Alarm number	Content of alarm	Set value	Product condition	LED (○: Off, ●: On)				Operation signal output	Fault signal output	warning signal output
				POWER	RUN	FAULT	WARNING			
AL02	Pump overload	—	Stop	Green●	○	Red●	○	Contact opened	Contact opened	Contact closed
AL03	Compressor overload	—	Stop							
AL04	Low level in tank	Upper limit in tank	Stop							
AL05	Refrigerant high pressure	2.6MPa	Stop							
AL06	Circulating fluid high temp.	40°C or more	Stop							
AL07*1	Circulating fluid temp. error	User's opetional set value	Run*6		Green●	○	Yellow●	Contact closed	Contact closed	Contact opened
			Stop*6		○	Red●	○	Contact opened	Contact opened	Contact closed
AL09*2	DI level error	User's opetional set value	Run*6		Green●	○	Yellow●	Contact closed	Contact closed	Contact opened
			Stop*6		○	Red●	○	Contact opened	Contact opened	Contact closed
AL11*3	Tank water high temp.	—	Stop							
AL12*4	Water leakage error	—	Stop							
AL14*5	External switch error	—	Run (Operation continued)		Green●	Red○	Yellow●	Contact closed	Contact closed	Contact opened

*1 Disabled in the default setting. For details refer to "5.3 Addition of Temperature Alarms".
*2 When the DI control function (Option Y) is included.
*3 When the heater (Option H) is included.
*4 When the fluid leakage sensor (Option E) is included.
*5 When the external swich signal entry (Option K) is included.
*6 Selectable at user's discretion.

6.2 Troubleshooting

Table 6-2 Remedy for Alarm

Alarm number	Content of alarm (protective equipment)	Main cause	Remedy
AL02	Pump overload (Pump thermal relay)	Incorrect power supply	Supply the voltage within a specified range of the product. Review the voltage of the power supply.
		Excessive increase of circulating fluid pressure	Adjust the opening of the manual relief valve to decrease the circulating fluid pressure.
		Failure of pump	Replace the pump.
		Failure of thermal relay	Replace the thermal relay.
AL03	Compressor overload (Compressor thermal relay)	Incorrect power supply	Supply the voltage within a specified range of the product. Review the voltage of the power supply.
		Clogging of condenser*1	Clean the condenser.
		Ambient temperature to high	Decrease the ambient temperature to within the specified range of the product. Increase air ventilation or airconditioning facility in the installation area.
		Beyond cooling capacity	Check the heat generated from the user's machine is within a specified range of the product.
		Refrigerant leaakge	Repair the leaking part and refill the refrigerant gas.
		Failure of compressor	Replace the compressor.
		Failure of thermal relay	Replace the thermal relay.
AL04	Low level in tank (Level switch)	Evaporation of circulating fluid	Refill the circulating fluid.
		Circulating fluid leakage	Repair the leaking part and refill the circulating fluid.
		Leakage due failure of the pump mechanical seal*2	Replace the mechanical seal. The replacement method can be found in the maintenance manual available separately.
		Failure of level switch	Replace the level switch.
AL05	Refrigerant high pressure (Pressure switch)	Clogging of condenser*1	Clean the condenser.
		Ambient temperature to high*1	Decrease the ambient temperature to within the specified range of the product. Increase air ventilation or airconditioning facility in the installation area.
		No flow of facility water*3	Supply the facility water to the product. Check that the facility water circuit is not shut off by valves. Check that there is no problem with equipment to supply the facility water.
		Beyond cooling capacity	Check the heat generated from the user's machine is within a specified range of the product.
		Failure of pressure switch	Repalce the pressure switch.
AL06	Circulating fluid high temp. (Controller)	Ambient temperature to high	Decrease the ambient temperature to within the specified range of the product. Increase air ventilation or airconditioning facility in the installation area.
		Beyond cooling capacity	Check the heat generated from the user's machine is within a specified range of the product.
		Low flow rate of circulating fluid	Adjust the opening of the manual bypass valve.
		Refrigerant leakage	Repair the leaking part and supply the refrigerant gas.
		Failure of refrigerant solenoid valve	Replace the solenoid valve.
		Failure of compressor	Replace the compressor.
		Other failure in refrigerant circucit	Replace the refrigerant circuit.
		Failure of controller	Replace the controller.
		Failure of proportinal valve*4	Replace the proportinal valve.
AL07	Circulating fluid temp. error	Settig failure	Refer to "5.3 Addition of Temperature Alarms" and change the setting.
AL09	DI level upper limit error	The solenoid valve does not close.	Repalce the solenoid valve with a new one.
		Excessive flow rate to the DI filter.	Adjust the flow rate using the ball valve attached to the DI tube.
		Incorrect set value of DI level alarm	Refer to "HRX-OM-L033" and check the DI level alarm.
		Controller output error	Replace the controller with a new one.
		Resistivity meter failure	Replace the resistivity meter with a new one.
	DI level lower limit error	The solenoid valve does not open.	Repalce the solenoid valve with a new one.
		Insufficient flow rate to the DI filter	Adjust the flow rate using the ball valve attached to the DI tube.
		Incorrect set value of DI level alarm	Refer to "HRX-OM-L033" and check the DI level alarm.
		Consumption of DI filter	Replace the DI filter with a new one.
		Controller ouput error	Replace the controller with a new one.
		Resistivity meter failure	Replace the resistivity meter with a new one.
AL11*5	Tank water high temp.	Failure of controller	Replace the controller.
		Failure of SSR	Replace the SSR.
		Failure of magnetic contactor	Replace the magnetic contactor.
AL12*6	Water leakage error	Failure of controller	Replace the controller.
		Circulating fluid leakage	Repair the leaking part.
		Leakage due failure of the pump mechanical seal*2*8	Replace the mechanical seal. The replacement method can be found in the maintenancWe manual available separately.
		Failure of water leakage sensor	Repair the water leakage sensor.
AL14*7	External switch signal error	Failure of controller	Replace the controller.
		External switch error	Remove the cause of error at the installed external switch.

*1・・・Only for air cooled type
2・・・Only for HRGC005-
*3・・・Only for water-cooled type
4・・・Only for HRGC00-*5
*5・・・When the heater (Option H) is provided.
*6・・・When water leakage sensor (Option E) is provided.
*7・・・When external switch signal entry (Option K) is provided.
*8・・・When high head pump (Option T) is provided.

6.3 How to Reset Alarm

6.3.1 Reset by using [RESET] button

1. Check the alarm number shown in digital display PV and remove the cause of the alarm. (Table 6-2)
Also, make the nessecarry change to the operating method and environment to aviod future alarms.

- The pump overload (AL02) and compressor overload (AL03) can not be reset by only [RESET] button. Move onto “6.3.2”.
- The tank water high temp. (AL11) can not be reset by only [RESET] button. Move onto “6.3.3”.
- Water leakage error (AL12) can not be reset by only [RESET] button. Move onto “6.3.4”.
- External switch signal error (AL14) can not be reset by only [RESET] button. Move onto “6.3.5”.

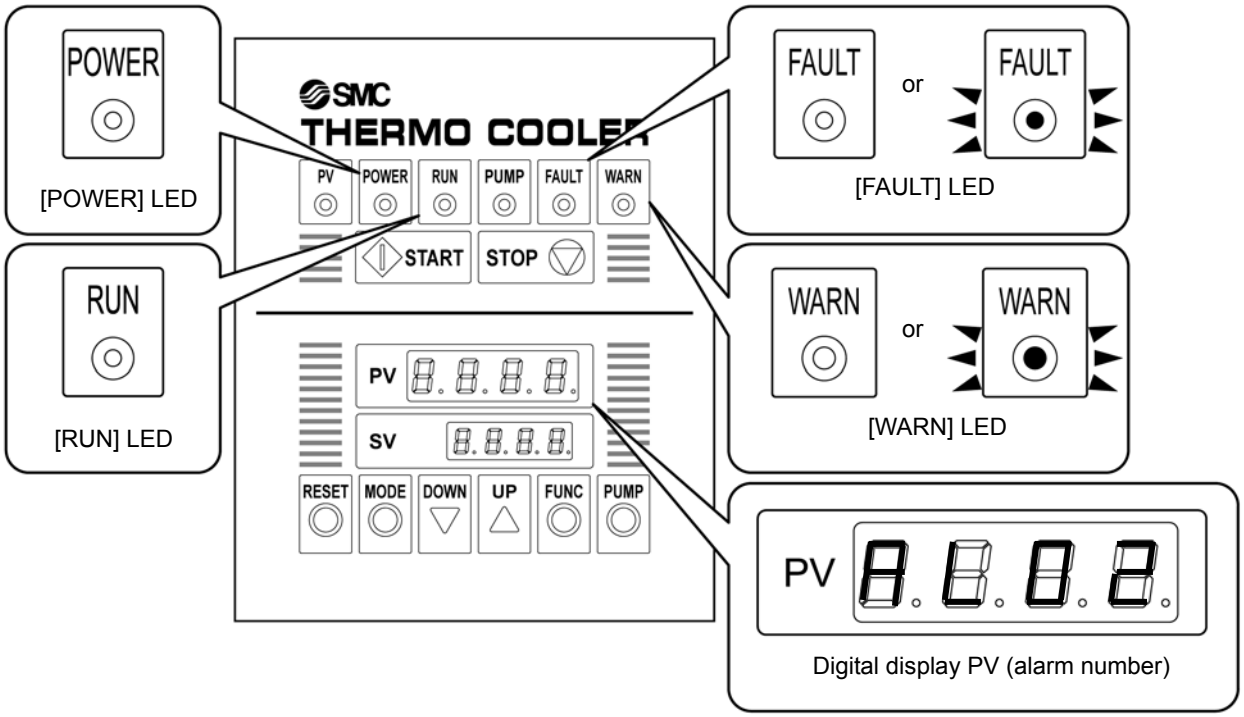


Fig.6-3 Display of alarm number

2. Press the [RESET] button.

The alarm is reset.

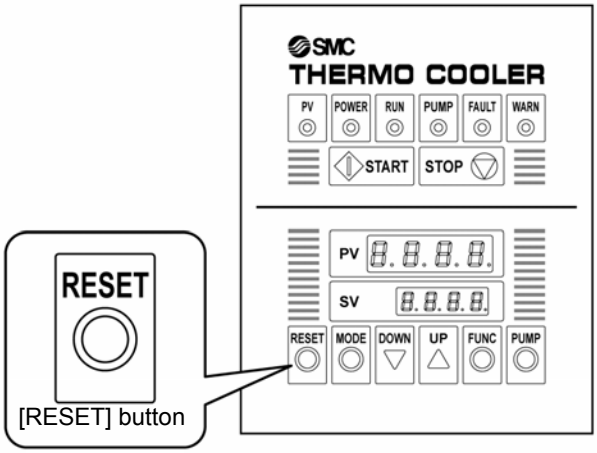


Fig.6-4 [RESET] button

6.3.2 Reset of pump overload (AL02) and compressor overload (AL03)

⚠ WARNING

The product is operated at high voltage and contains uncovered live terminals inside.
- **DO NOT operate the product without cover panels fitted**
- **DO NOT work inside this product unless you have been trained to do so.**

⚠ WARNING

The product has surfaces that can reach high temperatures during operation. Even after the power is turned off, there can still be residual heat in the product.
- **DO NOT operate the product without cover panels fitted.**
- **DO NOT start working inside the product until the temperature has decreased sufficiently**

1. Loosen screws (6pcs) and take off the front panel. (8 pieces for HRGC005)

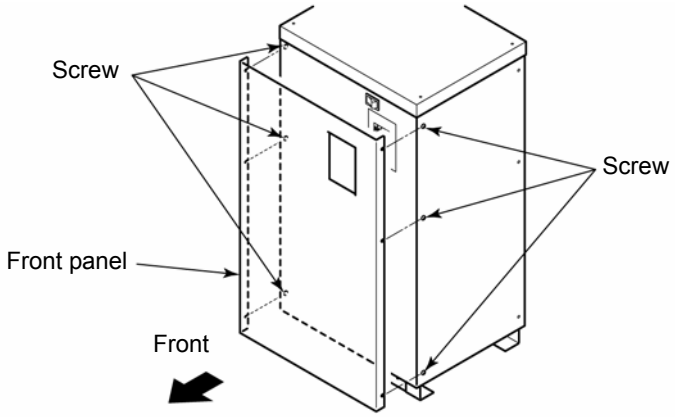


Fig.6-5 Removal of front panel

2. Press the reset button of each protection device in the electrical box.Press it until it clicks.

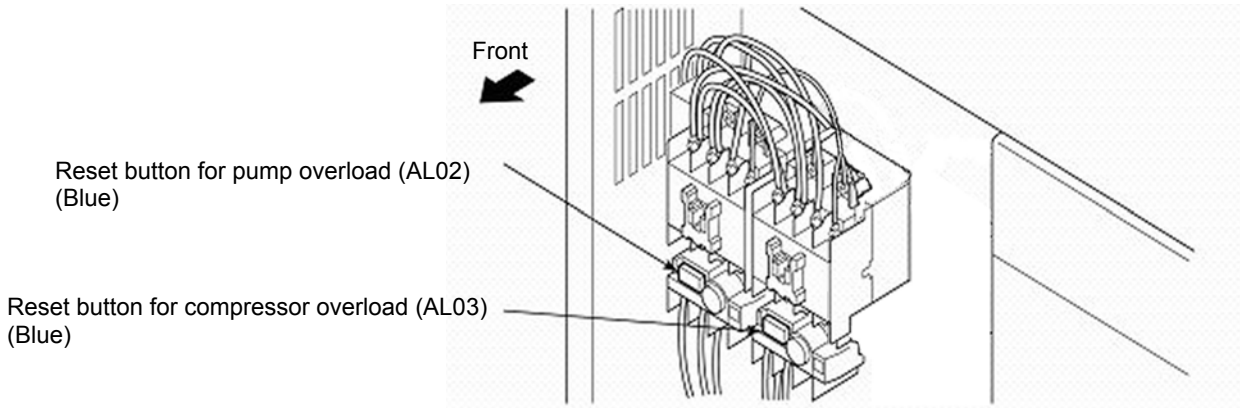


Fig.6-6 Position of reset (manual) buttons (HRGC001-A and HRGC002-A)

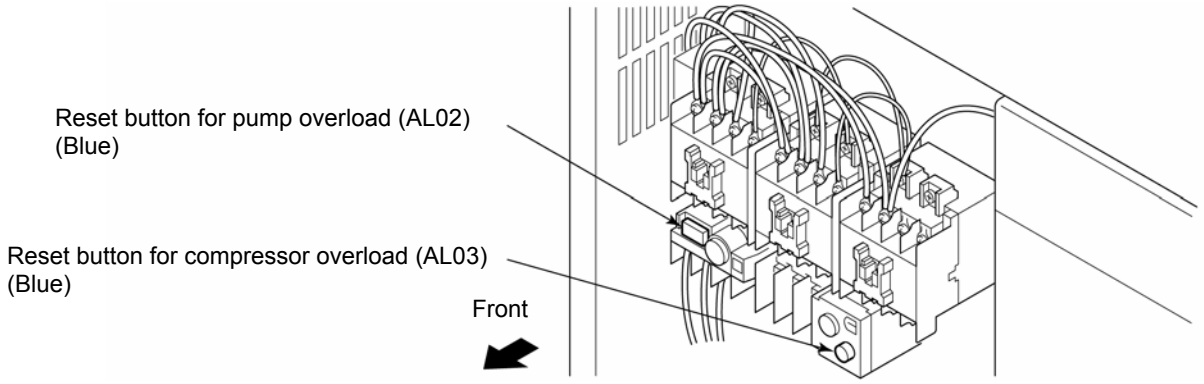


Fig.6-7 Position of reset (manual) buttons (HRGC005-A)

3. Press the [RESET] button.

The alarm is reset.

6.3.3 Reset of tank water high temp. (AL11) (for option with heater)

The temperature fuse, SSR, magnetic contactor and controller and other parts need to be replaced when this alarm sounds.

Refer to the maintenance manual (HRX-MM-L011) for how to replace the temperature fuse and the controller。

6.3.4 Reset of water leakage error (AL12) (for option with water lealag sensor)

⚠ WARNING

The product is operated at high voltage and contains uncovered live terminals inside.

- **DO NOT operate the product without cover panels fitted**
- **DO NOT work inside this product unless you have been trained to do so.**

⚠ WARNING

The product has surfaces that can reach high temperatures during operation. Even after the power is turned off, there can still be residual heat in the product.

- **DO NOT operate the product without cover panels fitted.**
- **DO NOT start working inside the product until the temperature has decreased sufficiently**

1. Loosen screws (6pcs) and take off the front panel. (8 pieces for HRGC005)

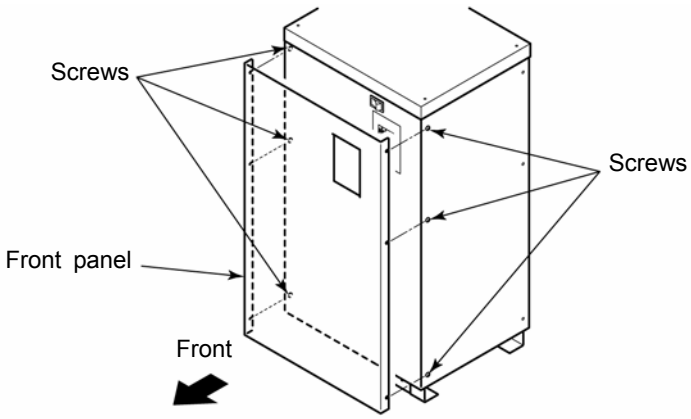


Fig.6-8 Removal of front panel

2. Repair the part that was leaking, and wipe off any fluid left around the water leakage detector with a scrap of cloth, etc.

3. Check that the display lamp for water leakage detector turns from red (water leaking) to green (normal condition).

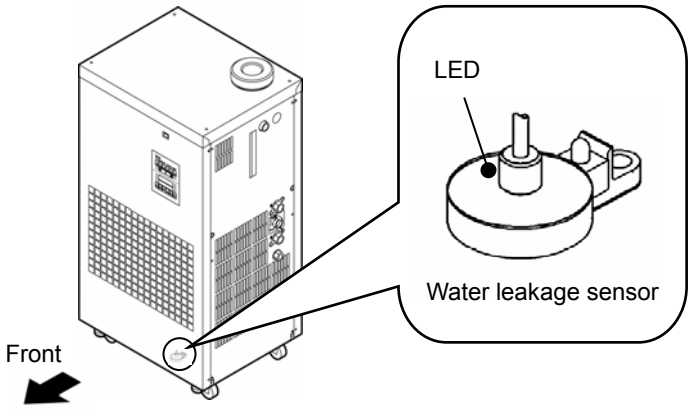


Fig.6-9 Water leakage sensor

4. Press the [RESET] button.

The alarm is reset.

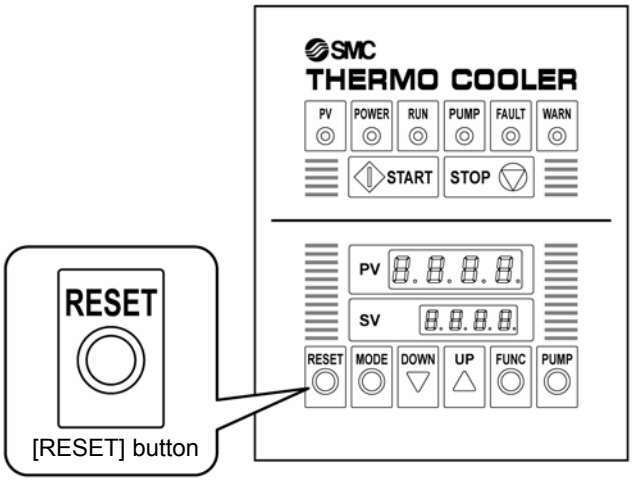


Fig.6-10 [RESET] button

6.3.5 Reset of external switch signal error(AL14) （for external switch signal entry）

This alarm shows an error detected by a detector the user installed. Check the specifications and settings of the detector and remove the cause of error.

6.4 Other Errors

■ How to check other errors

The cause and remedy for the failure that is not shown with alarm number is shown in ”Table 6-3”.

Table 6-3 Cause and remedy for failure without alarm number

Content of failure	Cause	Remedy
The [POWER] LED does not light up.	The power supply switch is not turned on.	Turn on the power supply switch.
	Failure of power supply switch	Replace the power supply switch.
	The GFCI is not turned on.	Turn on the GFCI.
	No power supply (The breaker for the power supply is not turned on.)	Supply the power.
	Insufficient capacity of breaker	Install adequate breaker referring to Table 3-4.
	Trip of breaker due to short-circuit and current leakage	Repair the short-circuit or current leaking part.
	Failure of the [POWER] LED	Replace the controller.
	Failure of DC power supply	Replace the DC power supply.
The [RUN] LED does not light up even when the [START] switch is pressed.	Failure of the [RUN] LED	Replace the controller.
	Failure of the [START] switch	Replace the controller.

6.5 Reset of Earth Leakage Breaker

1. When the earth leakage breaker has tripped, all lamps will go off.
Remove the cause of tripping the earth leakage breaker (earth leakage, over current, etc.)

2. Loosen screws (6pcs) and take off the front panel. (8 pieces for HRGC005)

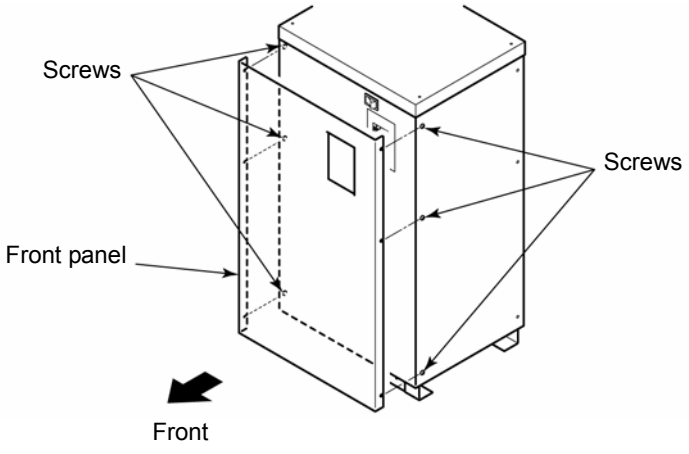


Fig.6-11 Removal of front panel

3. Switch off the earth leakage breaker once.

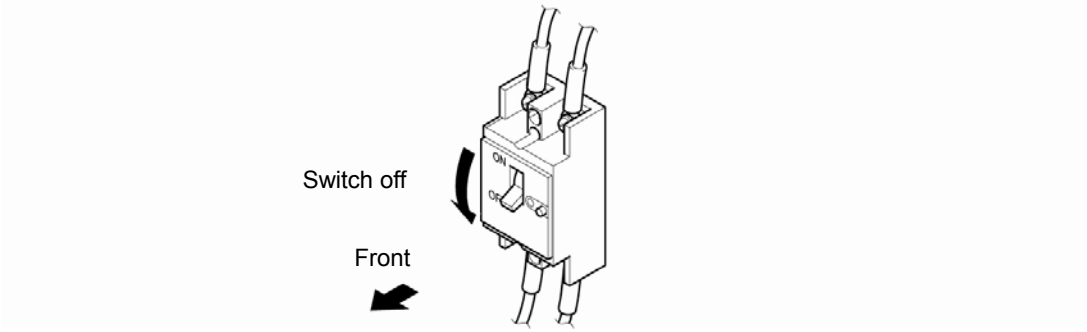


Fig.6-12 Earth Leakage Breaker (OFF)

4. Switch on the earth leakage breaker, and make sure that the [POWER] lamp comes on.

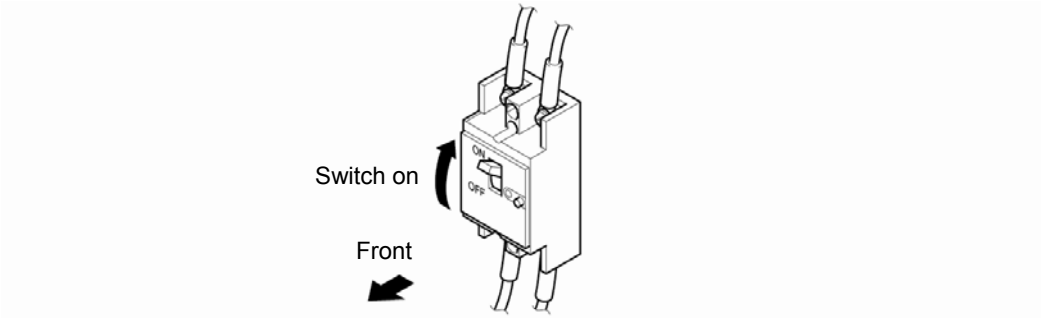


Fig.6-13 Earth Leakage Breaker (ON)

Chapter 7 Control, Inspection and Cleaning

7.1 Control of Circulating Fluid Quality

⚠ WARNING

Use specified circulating fluids only. If Other fluids are used, they may damage the product or result in dangerous hazards.
When using fresh water (tap water) ensure that it satisfies the water standard shown in the table below.

Table 7-1 Quality standard for fresh water (tap water)

	Item	Product	Standard value	
			For circulating fluid	For facility water
Standard item	pH (at 25°C)	—	6.8 ~8.0	6.5~8.2
	Electric conductance (at 25°C)	[μS/cm]	100~300	100~800
	Chloride ion	[mg/L]	50 or less	200 or less
	Sulfuric acid ion	[mg/L]	50 or less	200 or less
	Acid consumption (at pH 4.8)	[mg/L]	50 or less	100 or less
	Total hardness	[mg/L]	70 or less	200 or less
	calcium hardness	[mg/L]	50 or less	150 or less
	Ion silica	[mg/L]	30 or less	50 or less
Referential item	Iron	[mg/L]	0.3 or less	1.0 or less
	Copper	[mg/L]	0.1 or less	0.3 or less
	Sulfide ion	[mg/L]	Not detected	Not detected
	Ammonium ion	[mg/L]	0.1 or less	1.0 or less
	Residual chlorine	[mg/L]	0.3 or less	0.3 or less
	Separation carbonic acid	[mg/L]	4.0 or less	4.0 or less

*Quoted from JRA-GL-02-1994, The Japan Refrigeration and Air Conditioning Industry Association.

CAUTION

Clean the tank, circulating fluid circuit, and change the circulating fulid in the tank if any problems are found during the regular check. Additionally, even if no problems are found, it is necessary to change the fluid once every 3 months in case evaporation of the fluid cause concentration of impurities. Refer to the page containing "7.2 Inspection and Cleaning" for the regular check.

7.2 Inspection and Cleaning

⚠ WARNING

- **Do not operate switches, etc. with wet hands and do not touch the electrical parts such as the power supply plug. It might cause electric shock.**
- **Do not splash water directly on the product or do not wash with water. It might cause electric shock and fire, etc.**
- **Do not touch the fins directly when cleaning the condenser. It might cause injury**

⚠ WARNING

- **Shut off the power supply of the product when performing cleaning, maintenance or inspection. It might cause electric shock, injury or burn, etc.**
- **Replace all panels removed for insepction or cleaning. It might cause injury or electric shock if it is operated with the panel removed or opened.**

7.2.1 Daily check

Check each item of Table 7-2 below, and if any error is seen, stop the operation of the product and turn off the user's power supply, and service the product.

Table 7-2 Contents of daily check

Item	Content of check	
Installation condition	Check the installation conditions of the product.	There is no heavy object on the product and excessive force to piping.
		Temperature and humidity are withing a specified range of the product.
Fluid leakage	Check the connected part of piping	There is no circulating fluid leakage from the connected part of piping.
Fluid amount	Check the liquid level indicator.	The level is within a specified range on the indicator.
Operation panel	Check the display.	The numbers on the display are clear. The [POWER] LED ligths up properly.
	Check the function.	The [START] and [STOP] buttons operate properly.
Circulating fluid temperature	Check on the operation panel.	There is no problem for use.
Operating conditions	Check the operation condition.	There is no abnormal noise, vibration, smell and smoke.
Facility water*1	Facility water condition	Temperature, flow rate and pressure are within the specified range.

*1 For water-cooled type

7.2.2 Monthly check

■ Cleaning of air vent (For air-cooled type)

CAUTION

If the fins of the condenser gets clogged with dust, it will become unable to radiate heat, which may cause an alarm and stop the product.

Use a long hair lush or air gun to clean the condenser to prevent the fins from being deformed or damaged.

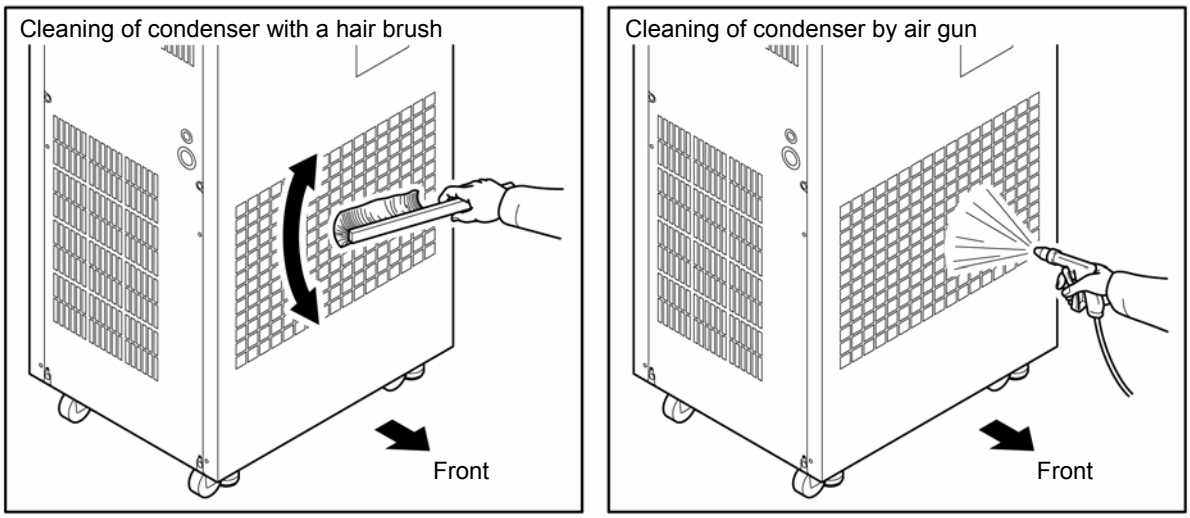


Fig.7-1 Cleaning of condenser

[Tips]

For the use in the place where the fin of the condenser gets clogged, it is recommended to mount a dust proof filter set (available as an accessory separately) described in “7.3 Consumables”

■ Cleaning of Y-strainer (For water-cooled type)

CAUTION

If the mesh of the Y-strainer gets clogged with foreign matter such as algae, the Y-strainer will become unable to radiate heat, which may activate the safety device causing operation to stop.

⚠ WARNING

Stop the facility water source or shut off the facility water circuit, and release residual pressure before cleaning the Y-strainer.

Stop the supply of facility water, remove the mesh of the Y-strainer and clean it with a brush or air gun, taking care not to deform or damage the mesh.

[Tips]

For easier cleaning of the Y-strainer, we recommend installing a valve and pressure gauge. If the valve is installed and fully closed, there is no need to stop the facility water source to clean the Y-strainer. The pressure gauge allows confirmation of the pressure value and enables safer work.

7.2.3 Inspection every 3 months

■ Replacement of circulating fluid

- Clean the tank and replace the circulating fluid (clean water).
- For the circulating fluid, select from the specification range shown in “Table 7-1”.

■ Replacement of circulating fluid (For water cooled type)

- Clean the facility water source and replace the facility water.
- For the facility water, select from the specification range shown in “Table 7-1”.

7.2.4 Inspection every 6 months

■ Check for water leakage from pump

Remove the panel and check the mechanical seal of the pump for excessive leakage. If the leakage is found, replace the mechanical seal. Order the mechanical seal described in “7.3 Consumables” as a service part.

CAUTION

- **Leakage from the mechanical seal**
  It is impossible to prevent the leakage from the mechanical seal completely because of its structure. Although the leakage is described as 3cc/hr or less (reference value) based on the JIS.
- **The recommend life time of the mechanical seal before needing replacement is 6000 to 8000 hours (usually 1 year)**

7.2.5 Inspection for winter seaon

■ Prevention of freezing of circulating fluid

The product can be prevented from freezing in the circulating fluid during winter season or at night.
If the freezing is concerned due to the change of installation up conditions and operating environment (operating term and weather), conduct the following operations in prior.

■ Anti-freezing function (automatic pump operating function)

- When the circulating fluid temperature reaches 3^{o}C, the pump will start automatically.
- The operation of pump will heat the circulating fluid with its power. Then, when the circulating fluid temperature reaches 5 ^{o}C, the pump will stop automatically.
- As a result, the circulating fuid temperature is ketp between 3 and 5 ^{o}C, and can be prevented from freezing.
- The operation cannot prevent freezing of the facility water circuit (For water cooled type). The user should take measures against freezing.

1. Keep the power supply on. ([POWER] LED: ON, [RUN] LED: OFF)

2. Fully open the valve and manual relief valve installed by user, and make the condition where the circulating fluid can circulate when the pump will start automatically.

CAUTION

- **This function can not prevent freezing of the product completely if the installation area is exposed to sever cold weather condition. For that condition, consult with a specific vendor to install other anti-freezing equipment (commercial tape heater, etc.).**
  Also, the facility water circuit does not have the similar function.
- **The facility water circuit is not equipped with an anti-freezing function.**

7.3 Consumables

Replace the following parts depending on their condition.

Table 7-3 Consumables

Part number	Name	Qty.	Remarks
HRGC-FL001	Dustproof filter set	1	Installed at the ventilation air inlet to prevent the ingress of dust(Only for air-cooled type) Optional accessories for HRGC001-A∗ and HRGC002-A∗
HRGC-FL005	Dustproof filter set	1	Installed at the ventilation air inlet to prevent the ingress of dust(Only for air-cooled type) Optional accessories for HRGC005-A∗
HRG-S0211	Mechanical seal set	1	Service part for HRGC005-∗ Service part for Option T
HRZ-S0084	Temp. fuse	1	Service part for Option H
HRG-S0218	Heater	1	Service part for Option H

7.4 Stop for a Long Time

If there is a concern that the product will not be operated for a long period of time or there is a chance of freezing, conduct the following operations.

1. Turn off the user's power supply (breaker).

2. Drain the circulating fluid and facility water (for water-cooled type) of the product completely.

3. Please refer to 7.4.1 Draining of circulating fluid and facility water for the method of drain the circulating fluid and facility water from the product.

4. After draining, cover the product with a vinyl, etc. and store.

7.4.1 Draining of circulating fluid and facility water

■ **When the valves are installed at the drain port and facility water outlet**

1. Connect the drain hoses to the drain port and facility water outlet, and insert the end of the drain hose into the container or draining pit.
(The drain hose (port size: Rc1/4) needs to be prepared by the user.

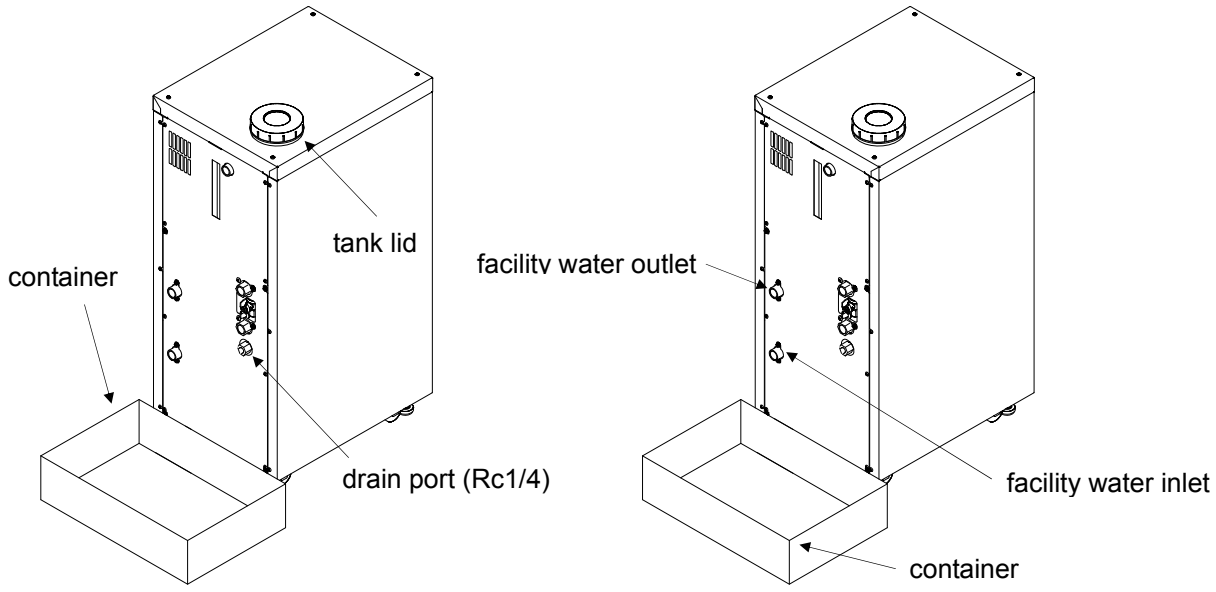


Fig.7-2 Drain the circulating fluid and facility water from the product

2. Remove the tank lid and open the valve at the facility water inlet (for water-cooled type).

3. Open the valves at the drain port and facility water outlet (for water-cooled type) and drain the fluid.

(The drain hose (port size: Rc1/4) needs to be prepared by the user.)

4. Confirm that a sufficient amount of the circulating fluid has been drained from the user's machine and piping, and apply air purge from the circulating fluid return port.

5. After the circulating fluid finishes has drained from the tank, close the valve at the drain port and put the tank lid back.

6. Refer to Fig.7-3 to mount the plug to the piping of the product.

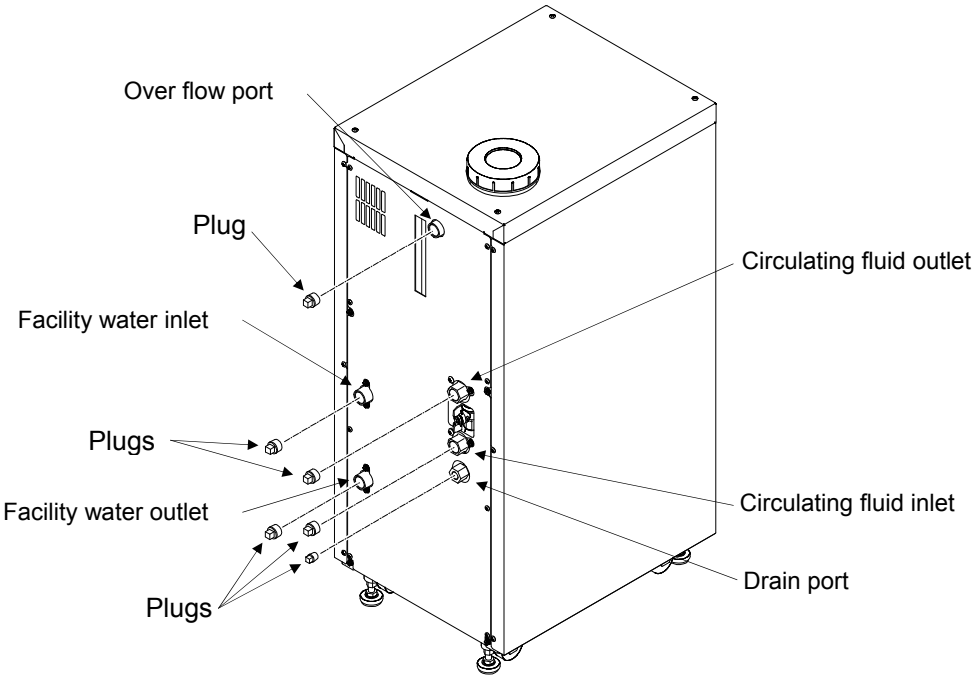


Fig.7-3 plug to the piping of the product.

■ When the valves are not installed at the drain port and facility water outlet

1. Place the container at the end of the drain port and facility water inlet and outlet.

2. Remove the tank lid and open the valve at the facility water inlet (for water-cooled type).

3. Gradually loosen the plug at the drain port and piping at the facility water inlet and outlet gradually and drain the fluid.

When the draining speed becomes slow, disconnect the plug for the circulating fluid and piping at the facility water inlet and outlet.

4. Confirm that the sufficient amount of the circulating fluid is drained from the user's machine and piping, and apply air purge from the circulating fluid return port.

5. After the circulating fluid finishes being drained from the tank, close the valve at the drain port and put the tank lid back.

6. Refer to Fig.7-3 to mount the plug to the piping of the product.

Chapter 8 Documents

8.1 Specifications List

Table 8-1 Specifications List

Item			HRGC001-∗	HRGC002-∗	HRGC005-∗
Installation Operating environment	Rated ambient temp.		32°C (5 to 40°C)		
	Humidity range		30 to 70%RH (No condensation)		
Fluid used			Industrial water, potable water or fluids resistant to corrosion of a wetted surface (such as SUS304 and PVC)		
Rated capacity of tank			10L		20L
Input	Supply voltage		1-phase AC200 to 230V (50/60Hz)		
	Recommended earth leakage breaker capacity,		15A, 20A[*4]		30A
	Sensitivity current		30mA		
	Start/stop command signal		Remote operation starts upon Contact closed, and stops at contact opened		
	Input of external switch signals[*8]		Alarm signal outputs and [WARN] LED lights up upon a contact opened, and operation continues.[*8]		
Facility water[*1]	Facility water temp. range		5 to 32°C		
	Facility water pressure range		0.3 to 0.5MPa		
	Facility water flow rate range		10/12 L/min (50/60Hz)		27/28 L/min (50/60Hz)
	Facility water pressure differential		0.3MPa (50/60Hz)		
Output	Rated temp. / accuracy of circulating fluid		20±1.0°C or 0.5°C (Temp. range of circulating fluid: 5 to 35°C)		
	Temp. range circulating fluid[*6]		Refer to 8.6 Cooling capacity.		5～35°C
	Rated facility capacity				4.5/4.8kW (50/60 Hz)
	Heater output[*6]		600W (200V)[*6]		
	Pumping capacity		10/10 L/min (at 0.13/0.18 MPa) 18/22 L/min (at 0.31/0.41MPa)[*9]		23/28 L/min(at 0.20/0.24 MPa)
	Output Signal	Operation signal output	Relay contact (AC250V of contact capacity, 1A, resistance load. Contact closes during operation, and contact opens during stop and during power-off.)		
		Fault signal output	Relay contact (AC250V of contact capacity, 1A, resistance load. Contact closes while alarm light remains OFF and during power-off, and contact opens while alarm light remains ON.)		
		Warning signal output	Relay contact (AC250V of contact capacity, 1A, resistance load. Contact closes while alarm light remains OFF and during power-off, and contact opens while alarm light remains ON.)		
	Power supply for external switches[*8]		DC24V±10%, 20W or less[*11], 15W or less[*6] , 10W or less[*12], 5W or less[*13]		
Protective function (for equipment)	Fault alarm (stop function)		System stop function for pump overload (pump thermal relay) System stop function for compressor overload (compressor thermal relay)		
			System stop function for low level in tank (level switch)		
			System stop function for refrigerant high pressure (high pressure switch)		
			System stop function for circulating fluid high temp. (set temp. of the controller 40℃)		System stop function for circulating fluid high temp. (set temp. of the controller 40℃)
			System stop function for circulating fluid high temp. (set temp. of the controller 65℃)[*7]		
			System stop function for water leakage(water leakage sensor)[*5]		
			Tank water high temp.(temp. fuse)[*6]		
	Others		System stop function for compressor high temp (thermostat with build in compressor) System stop function for pump high temp (thermostat with build in pump) System stop function for fan motor high temp (thermostat with build in fan motor)[*3] System stop function for circulating fluid high pressure(manual valve)		
Material	External panel		SGCC(Munsell 10Y8/0.5 Urban white)		
	Control panel		SGCC(DIC183blue)		
	Base		Stainless steel		
	Connecting direction (Circulating fluid)		Stainless steel (tank, hose fitting etc, heater[*6], pump impeller[*9], manifold[*10], pump casing[*15]), Bronze(manifold) Brass(pump casing etc[*14]) PVC(Internal piping hose), PPE(pump casing, impeller), Copper brazing (Heat exchanger)		Stainless steel (tank, pump impeller, heater[*6], hose fitting etc, manihold[*10], pump casing[*10]) Bronze(manifold) Brass(pump casing, etc), PVC(Internal piping hose), Copper brazing (Heat exchanger)
	Wetted part (Facility water)		Stainless steel (connection inlet and outlet etc, hose fitting), PVC(internal piping hose), brass(water control valve), Copper brazing (Heat exchanger)		
	Internal refrigerant piping		Copper, Brass, Aluminum, Copper brazing, Stainless steel		
	Operating refrigerant		R407C (HFC), (GWP:1653)		
Accessory			Y-shaped strainer1pcs[*1]		Eye bolt M12x4pcs, Y-shaped strainer1pcs[*2]
			(Power supply, signal cable and connected terminal etc. to be prepared by the user.)		
Weight			75kg, 80kg[*8]		110kg

*1･･･Only for water -cooled type.∗
*2･･･Only for HRGC005-W∗
*3･･･Only for air-cooled type
*4･･･When either heater (option H), high head pump (option T) or both are included.
*5･･･When water leakage sensor (Option E) is included
*6･･･When the heater (Option H) is included
*7･･･When the heater (Option H) is included, but both of stainless steel wetted material (Option M) and DI control kit (Option Y) are not included.
*8･･･When external switch signal entry (Option K) is included
*9･･･When high head pump (Option T) is included
*10･･･ When either of the stainless steel wetted material (Option M) or DI control kit (Option Y) is included.
*11･･･ When neither of the heater (Option H) and DI control kit (Option Y) are included.
*12･･･When DI control kit (Option Y) is included
*13･･･When both of the heater (Option H) and DI control kit (Option Y) are included.
*14･･･When neither of the stainless steel wetted material (Option M) nor DI control kit (Option Y) are included, and the high head pump is included.
*15･･･When the heater (Option H) and either the stainless steel wetted material (Option M) or DI control kit (Option Y) are included.

8.2 Outline Dimensions

8.2.1 HRGC001-A∗ and HRGC002-A∗

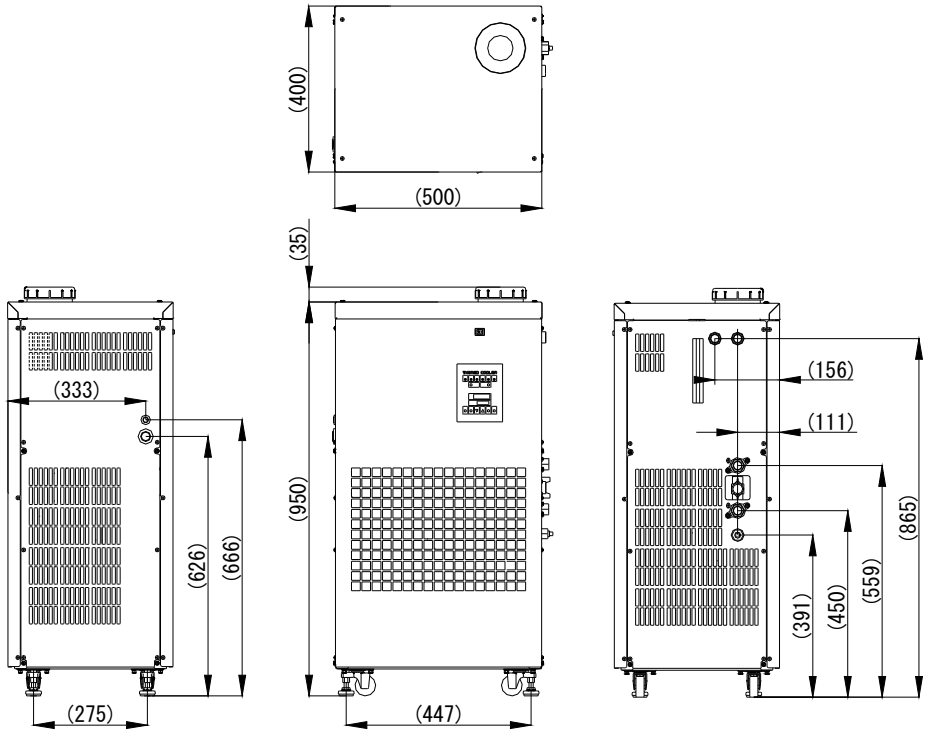


Fig.8-1 Outline Dimensions (fig.HRGC001-A and HRGC002-A)

8.2.2 HRGC001-W∗ and HRGC002-W∗

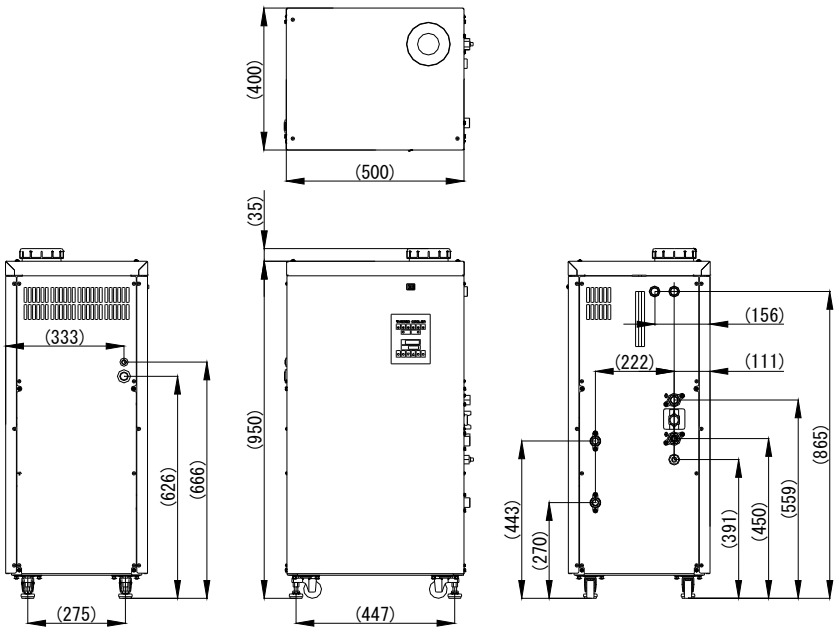


Fig.8-2 Outline Dimensions (fig.HRGC001-W and HRGC002-W)

8.2.3 HRGC005-A*

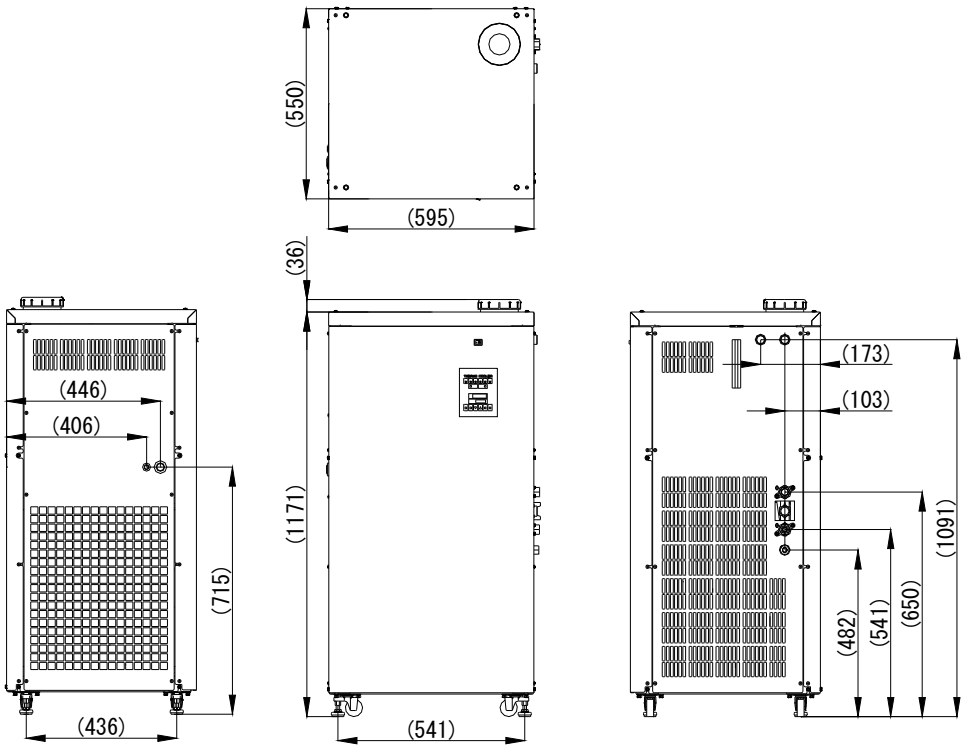


Fig.8-3 Outline Dimensions (fig.HRGC005-A)

8.2.4 HRGC005-W*

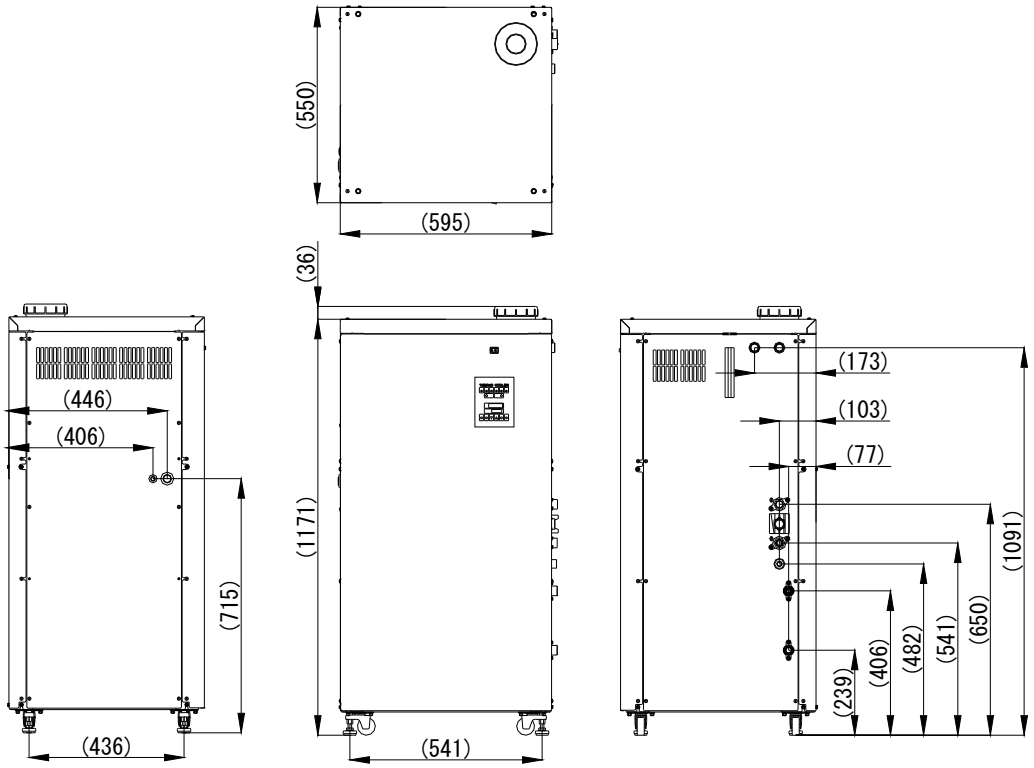


Fig.8-4 Outline Dimensions (fig.HRGC005-W)

8.3 Electric Circuit Diagram

8.3.1 HRGC001-A∗, HRGC002-A∗, HRGC001-W∗, HRGC002-W∗

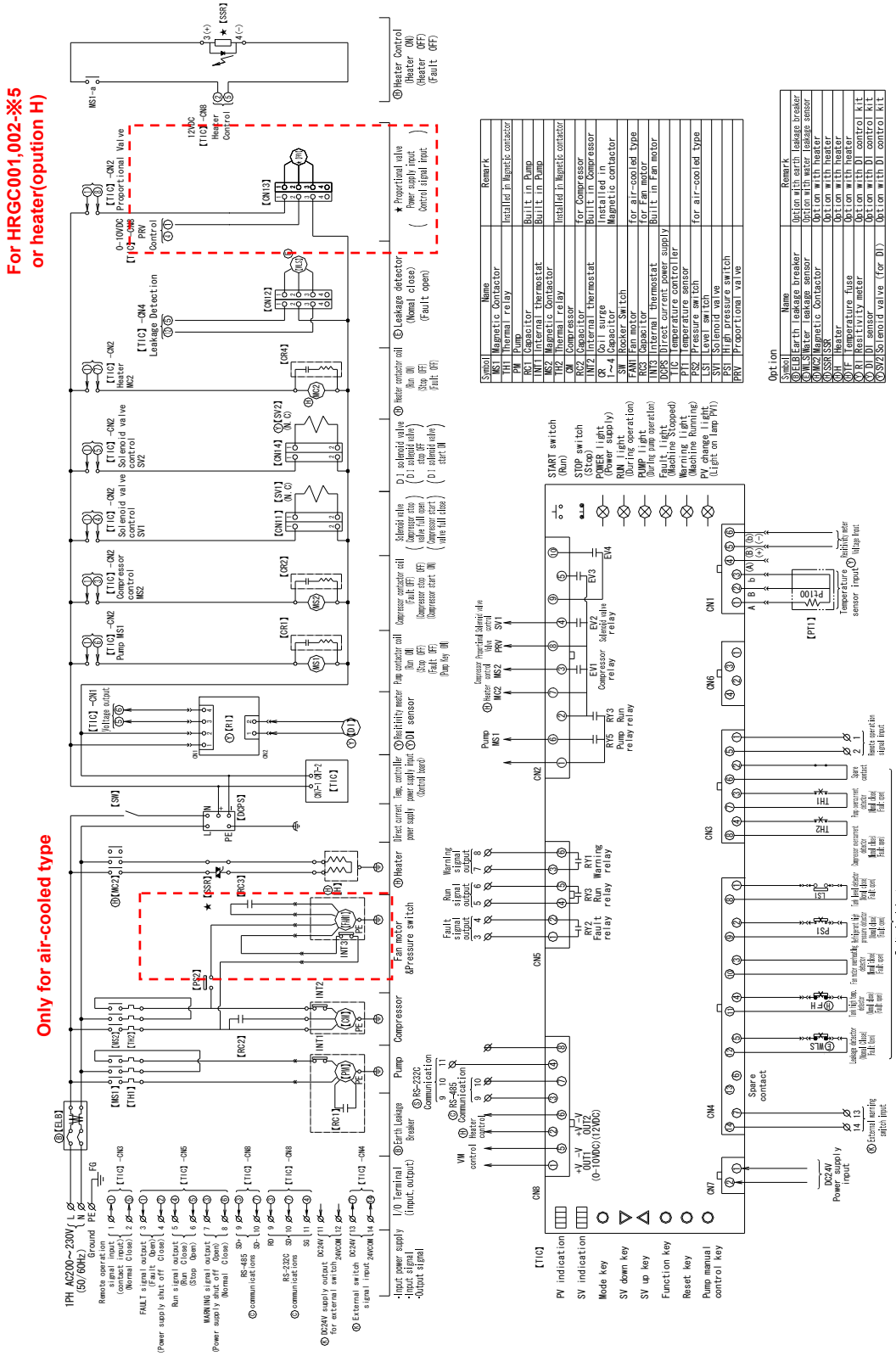


Fig.8-5 Electric Circuit Diagram (HRGC001-A, HRGC002-A, HRGC001-W, HRGC002-W)

8.3.2 HRGC005-A∗, HRGC005-W∗

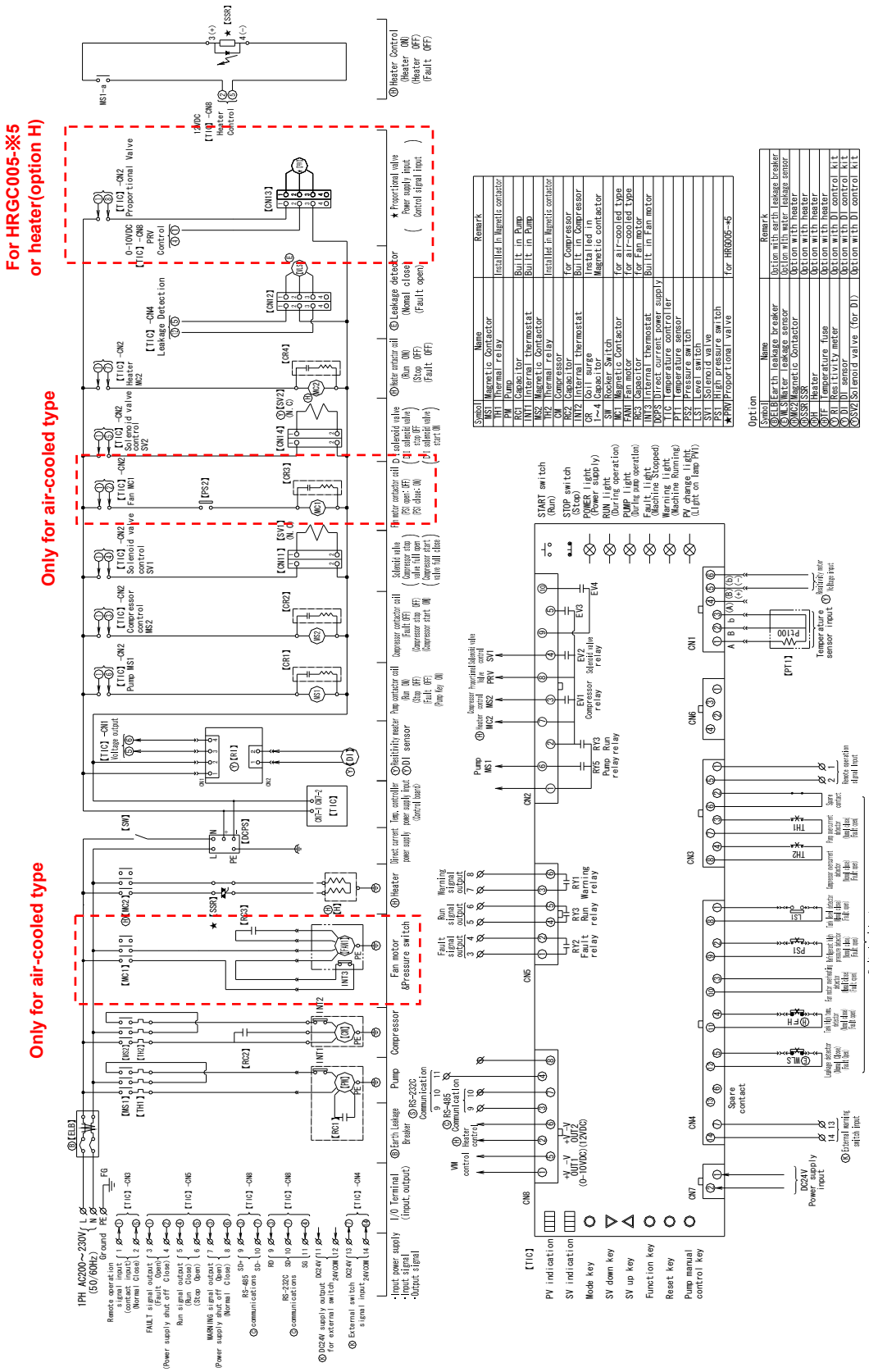


Fig.8-6 Electric Circuit Diagram (HRGC005-A, HRGC005-W)

8.4 Flow Chart (For Air-cooled type)

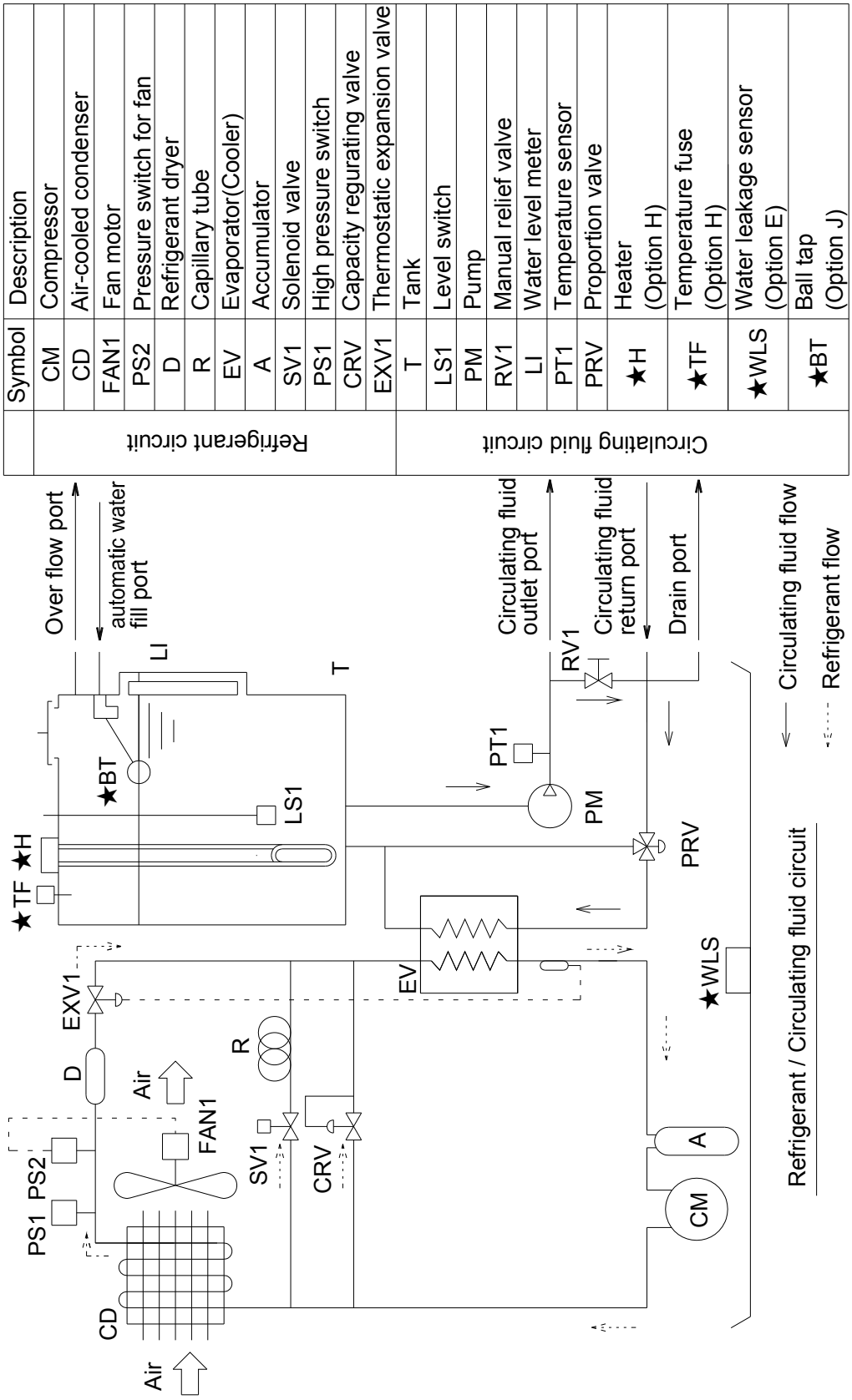


Fig.8-7 Flow Chart (For Air-cooled type)

8.5 Flow Chart (For water-cooled type)

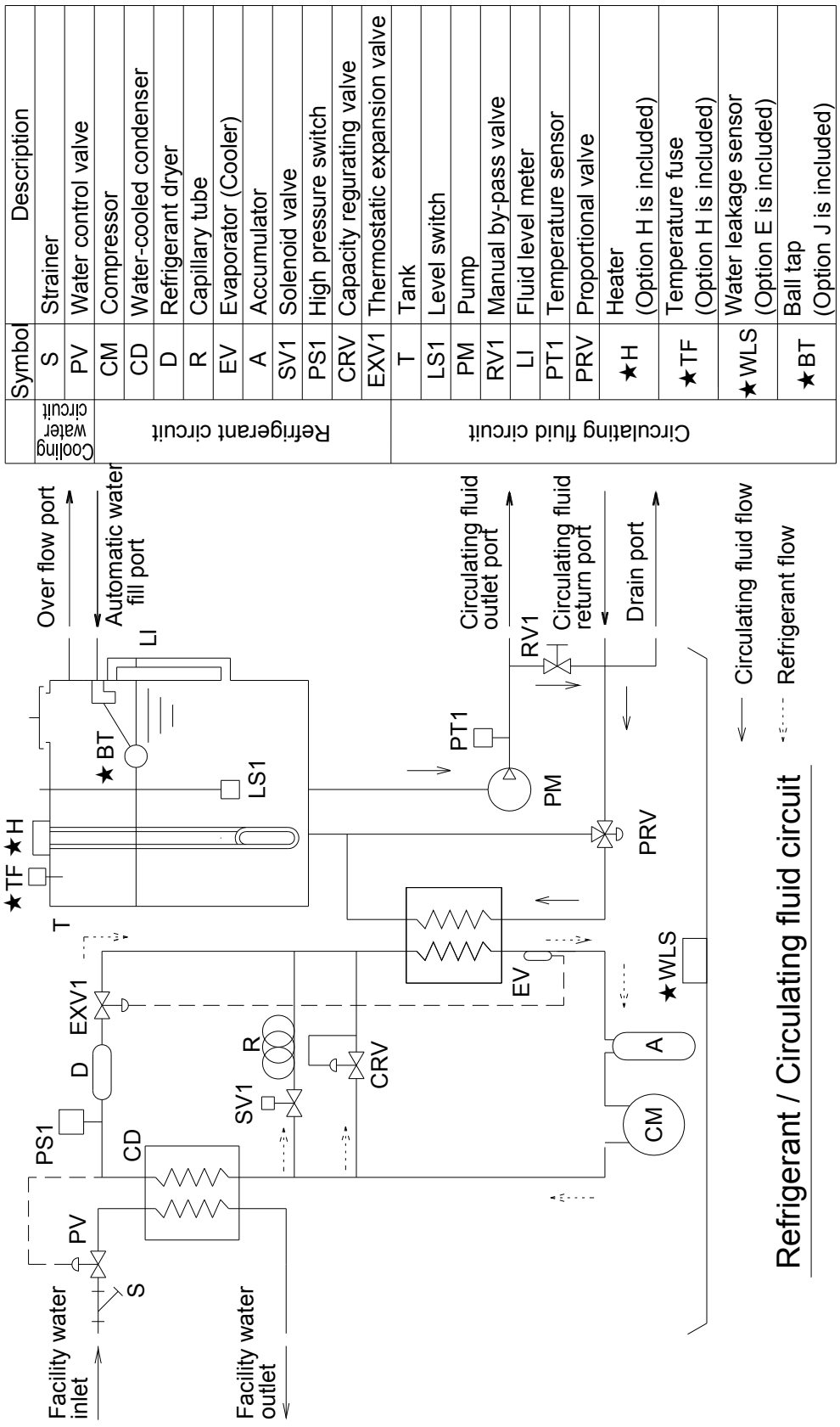


Fig.8-8 Flow Chart (For water-cooled type)

8.6 Cooling capacity

8.6.1 HRGC001-A,HRGC001-W,HRGC001-A-HM,HRGC001-W-HY

*Both Option H and T are not included

*Option T is not included, but Option H and either of Option M or Y are included.

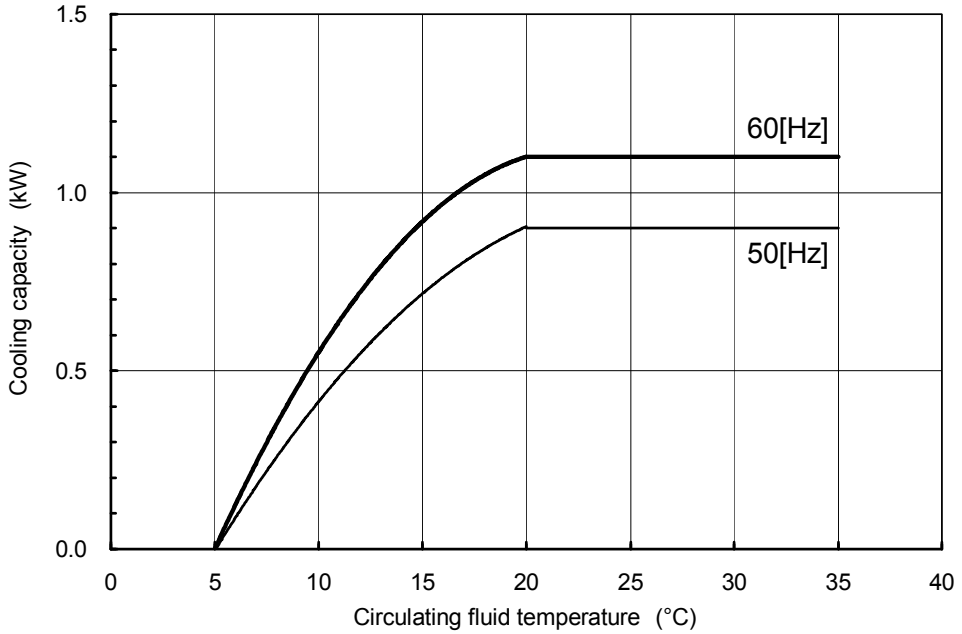


Fig.8-9 Cooling capacity (HRGC001-A,HRGC001-W,HRGC001-A-HM,HRGC001-W-HY)

8.6.2 HRGC001-A-H,HRGC001-W-H

*Option H is included, but both of Option M and Y are not included.

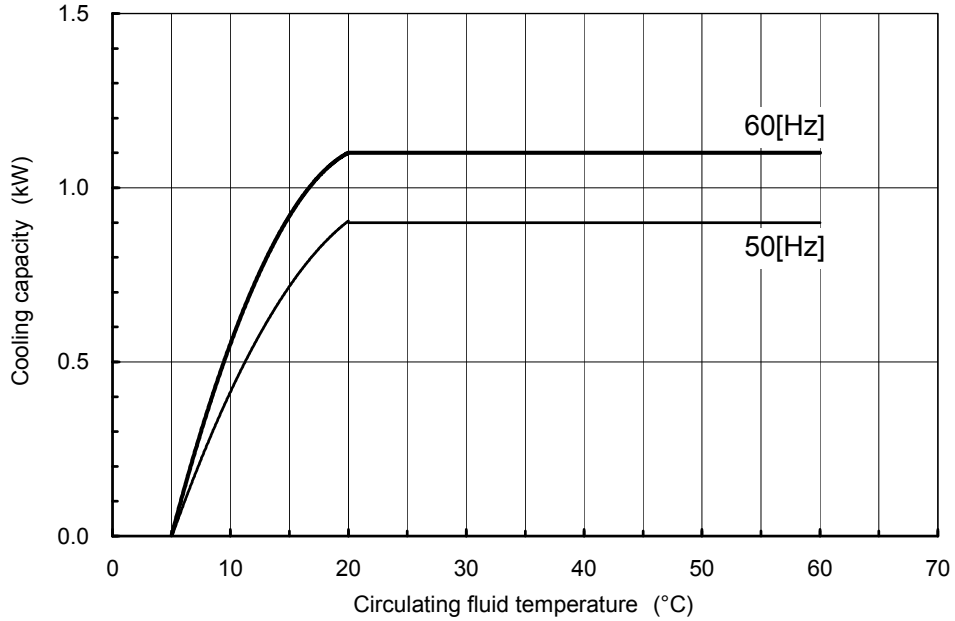


Fig.8-10 Cooling capacity (HRGC001-A-H,HRGC001-W-H)

8.6.3 HRGC001-A-T,HRGC001-W-T

*Option T is included, Option H is not included

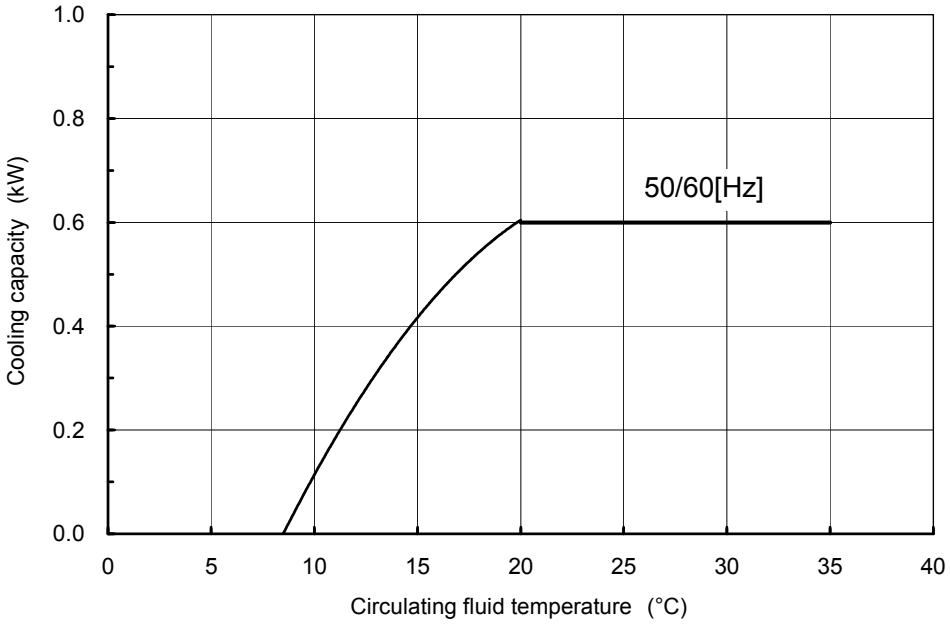


Fig.8-11 Cooling capacity (HRGC001-A-T,HRGC001-W-T)

8.6.4 HRGC001-A-HT,HRGC001-W-HT

*Both Option H and T are included, but both of Option M and Y are not included.

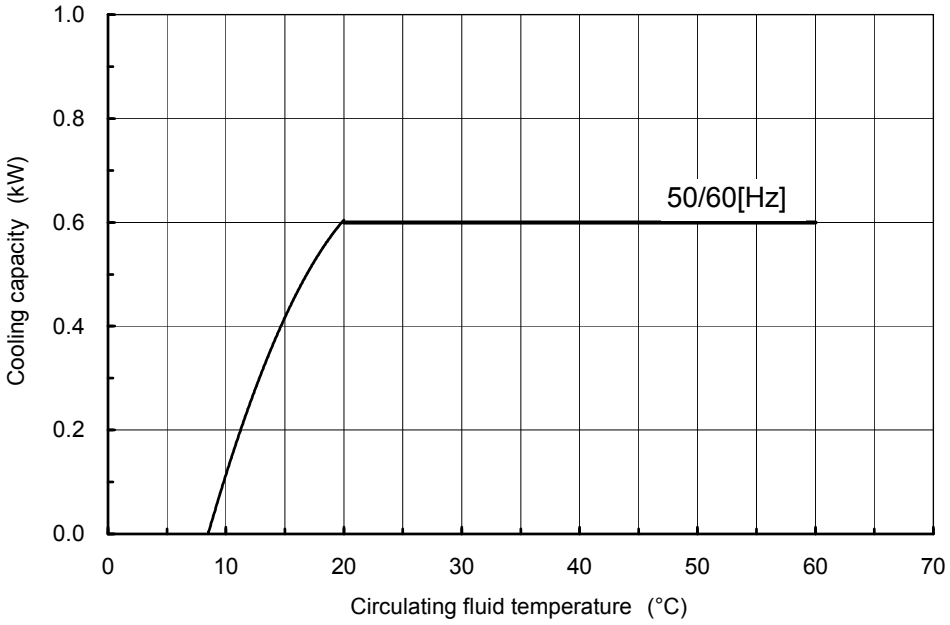


Fig.8-12 Cooling capacity (HRGC001-A-HT,HRGC001-W-HT)

8.6.5 HRGC002-A,HRGC002-W,HRGC002-A-HM,HRGC002-W-HY

*Both Option H and T are not included

*Option T is not included, but Option H and either of Option M or Y are included.

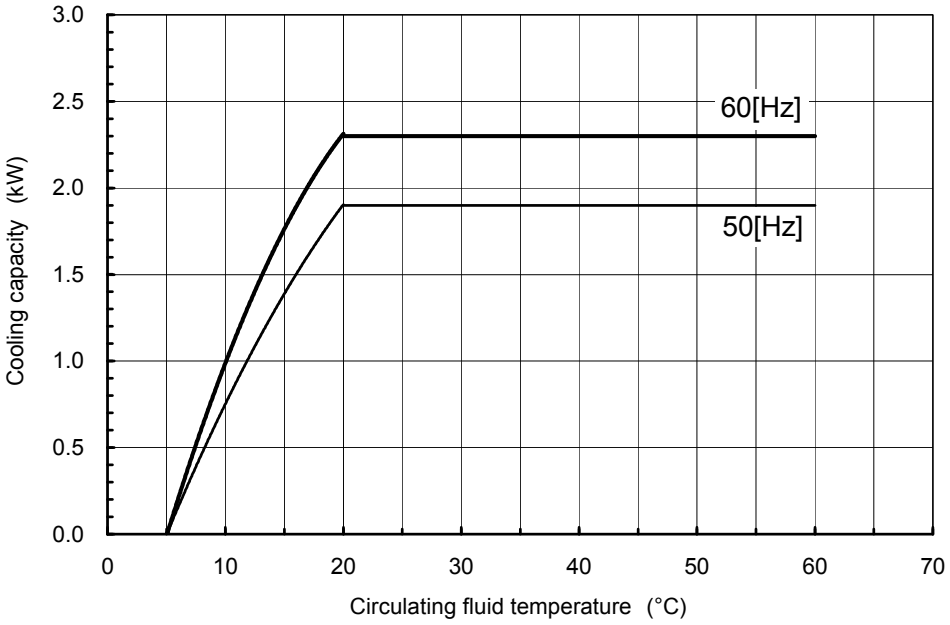


Fig.8-13 Cooling capacity (HRGC002-A,HRGC002-W,HRGC002-A-HM,HRGC002-W-HY)

8.6.6 HRGC002-A-H,HRGC002-W-H

*Option H is included, but both of Option M and Y are not included.

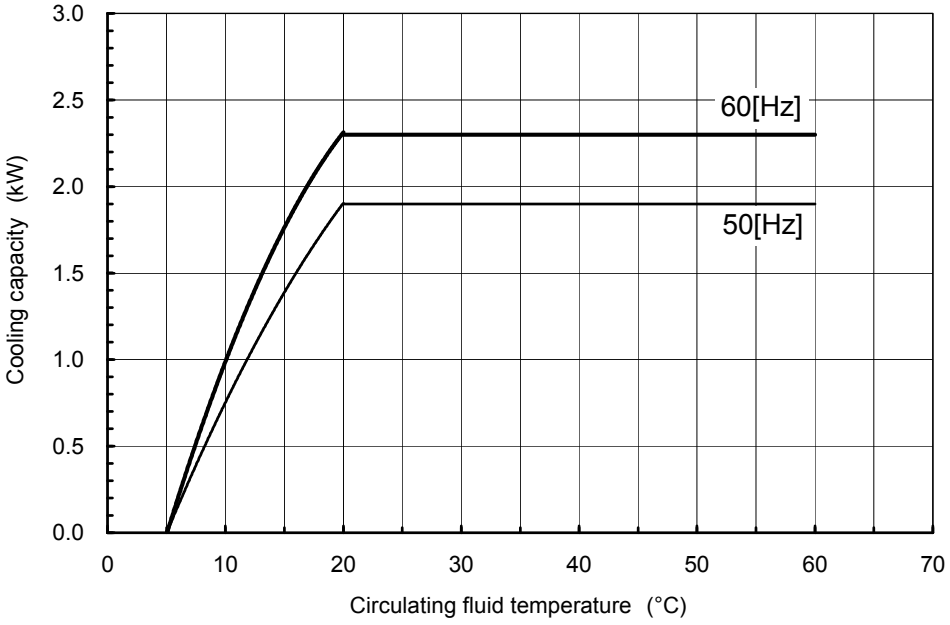


Fig.8-14 Cooling capacity (HRGC002-A-H,HRGC002-W-H)

8.6.7 HRGC002-A-T,HRGC002-W-T

*Option T is included, Option H is not included

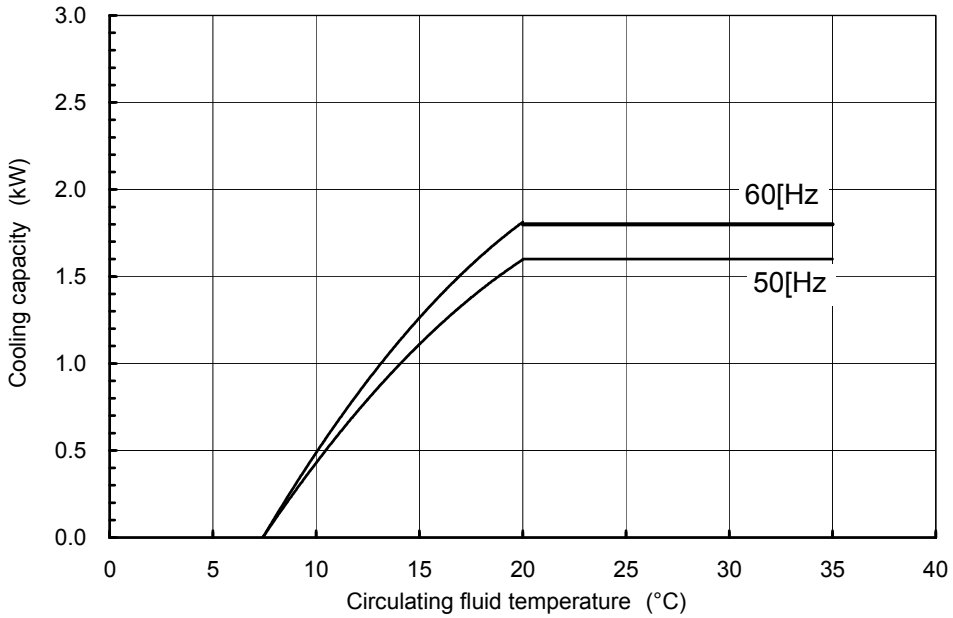


Fig.8-15 Cooling capacity (HRGC002-A-T,HRGC002-W-T)

8.6.8 HRGC002-A-HT,HRGC002-W-HT

*Both Option H and T are included, but both of Option M and Y are not included.

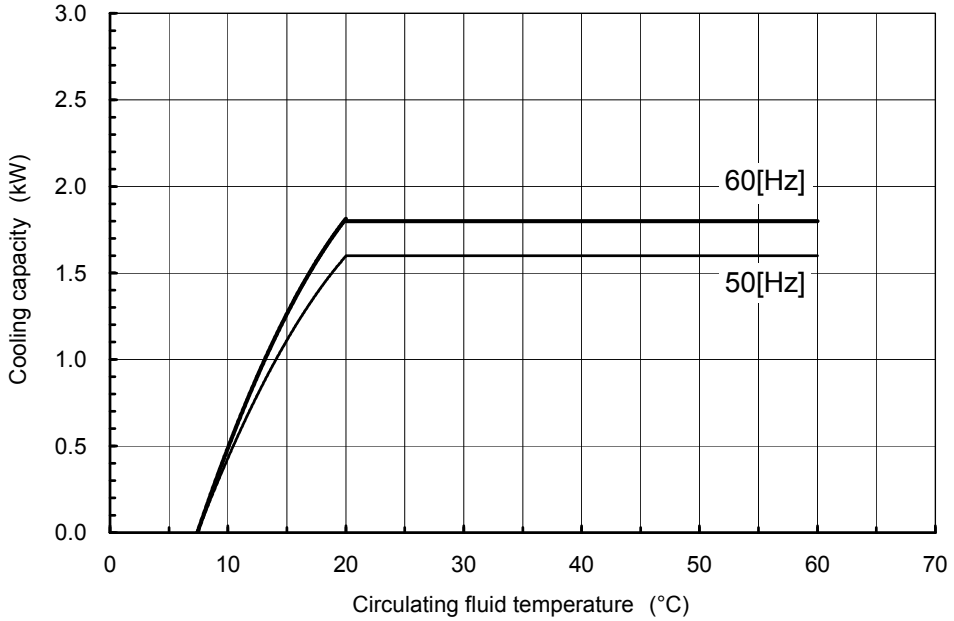


Fig.8-16 Cooling capacity (HRGC002-A-HT,HRGC002-W-HT)

8.6.9 HRGC005-A,HRGC005-W

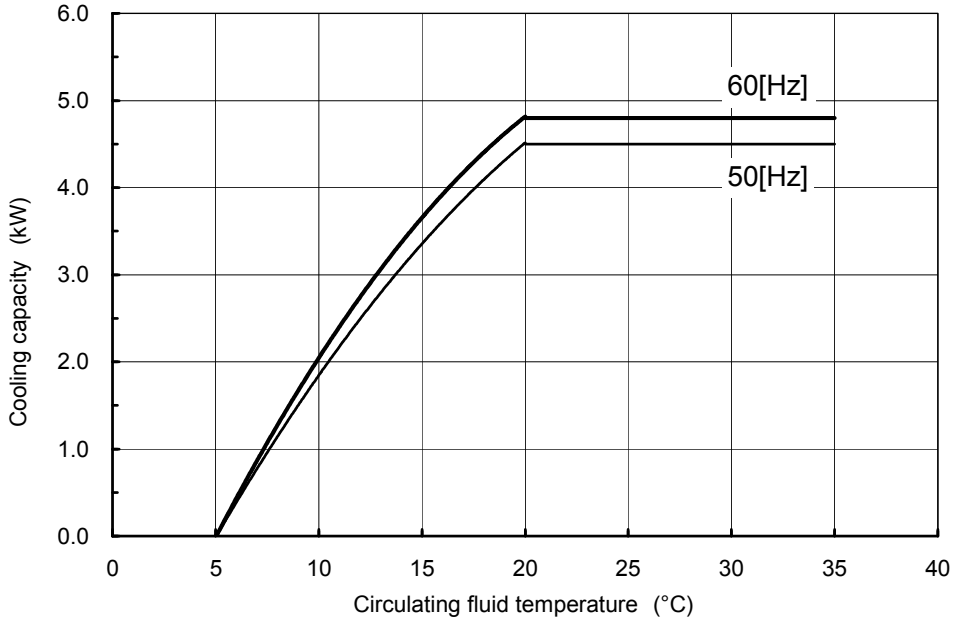


Fig.8-17 Cooling capacity (HRGC005-A,HRGC005-W)

8.7 Pump capacity

8.7.1 HRGC001,HRGC002

*Option T is not included

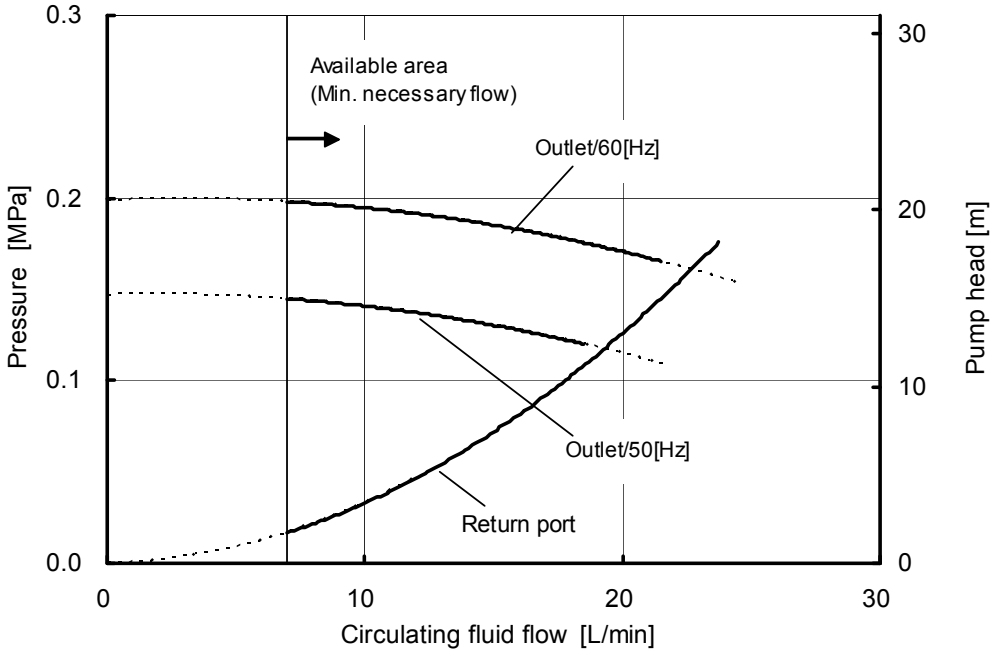


Fig.8-18 Pump capacity (HRGC001,HRGC002)

8.7.2 HRGC001-※-T,HRGC002-※-T

*Option T is included

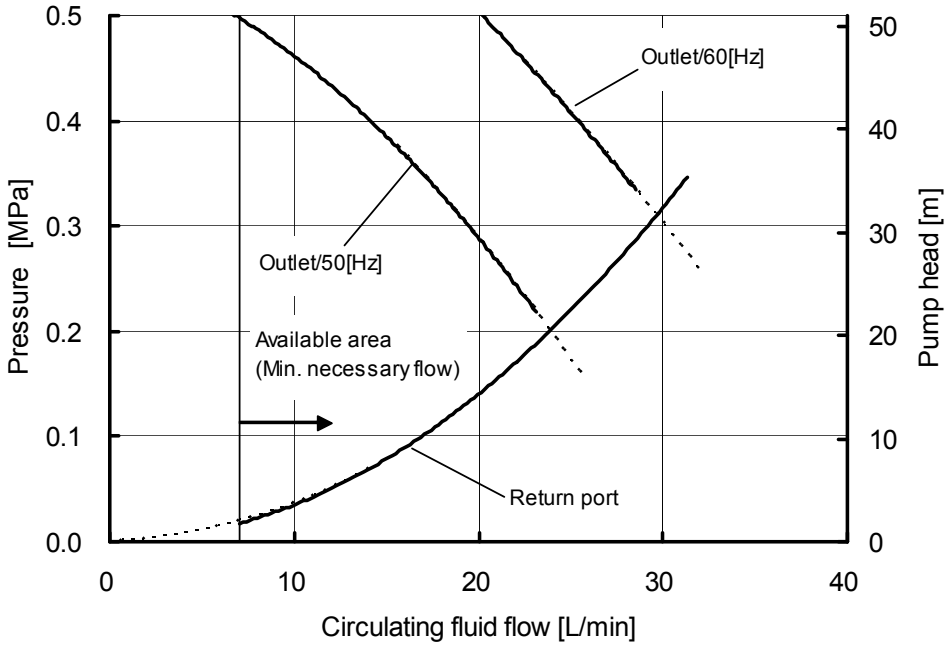


Fig.8-19 Pump capacity (HRGC001-※-T,HRGC002-※-T)

8.7.3 HRGC005-A,HRGC005-W

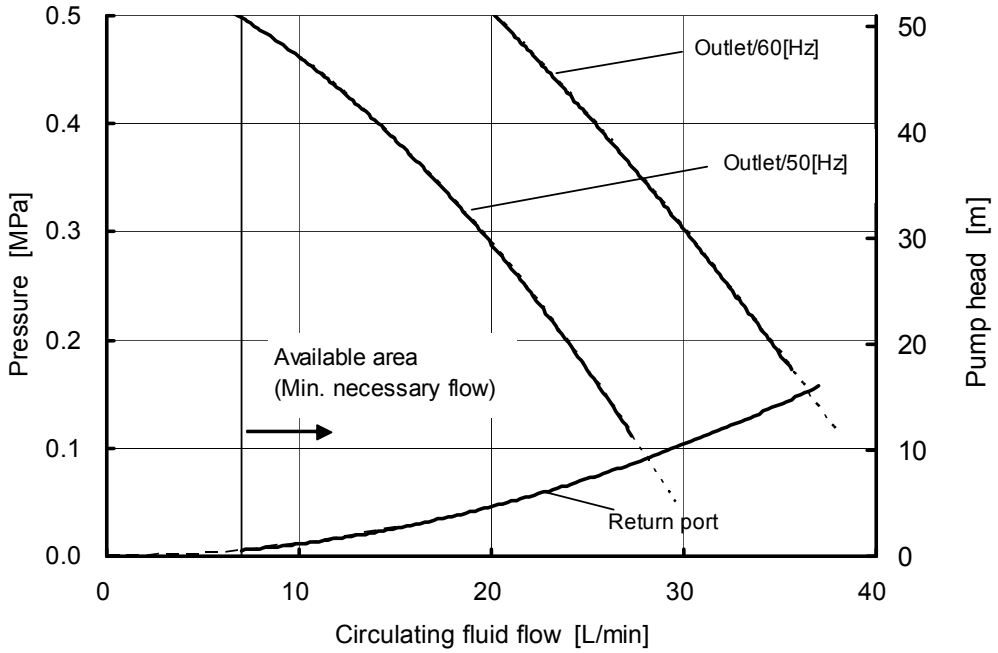


Fig.8-20 Pump capacity (HRGC005-A,HRGC005-W)

8.8 Applicable Regulations

The product complies with the following regulations.

Table 8-2 Applicable regulations

CE marking	EMC directive	2004/108/EC
	Low voltage directive	2006/95/EC
	Machinery directive	2006/42/EC
UL	E229305 / UL 1995	

8.9 Daily Check Sheet

Thermo-cooler Daily Check Sheet

For information about how to perform daily checks of the thermo cooler, refer to section “8.2.1 Daily Check” of the operation manual.
Check and record the condition at start right after setting up.

Model no. _____
Mfg. code _____

Date	Performed by	Setting up conditions		Fluid leakage	Fluid amount	Operation panel		Recirculating fluid temp.	Operation conditions	Result
		Temp. °C	Humidity %	Present/Not present	Inside/Outside of liquid level indicator range Inside/Outside	Display	Operation	°C	Presence of error Present/Not present	
Right after setting up (initial value)										

Chapter 9 Product Warranty

1. Period

The warranty period of the product is 1 year in service or 1.5 years after the product is delivered.

2. Scope

For any failure reported within the warranty period which is clearly our responsibility, replacement parts will be provided. In that case, removed parts shall become the property of SMC.

This guarantee applies only to our product independently, and not to any other damage incurred due to the failure of the product.

3. Content

1. We guarantee that the product will operate normally if it is installed under maintenance and control in accordance with the Operation Manual, and operated under the conditions specified in the catalog or contracted separately.
2. We guarantee that the product does not have any defects in components, materials or assembly.
3. We guarantee that the product complies with the outline dimensions provided.
4. The following situations are out of scope of this warranty.

(1) The product was incorrectly installed or connected with other equipment.
(2) The product was under insufficient maintenance and control or incorrectly handled.
(3) The product was operated outside of the specifications.
(4) The product was modified or altered in construction.
(5) The failure was a secondary failure of the product caused by the failure of equipment connected to the product.
(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 operation different from that shown in the Operation Manual or outside of the specifications.
(8) The checks and maintenance specified (daily checks and regular checks) were not performed.
(9) The failure was caused by the use of circulating fluid or facility water other than those specified.
(10) The failure occurred naturally over time (such as discoloration of a painted or plated face).
(11) The failure does not affect the functioning of the product (such as new sounds, noises and vibrations).
(12) The failure was due to the “Installation Environment” specified in the Operation Manual.
(13) The failure was caused by the customer disregarding “6. Request to customers”.

4. Disclaimer

The following are not covered by this warranty.

(1) Expenses for daily and regular checks
(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 this product, or for the supply of liquids
(5) Inconvenience and loss due to product failure (such as telephone bills, compensation for workplace closure, and commercial losses)
(6) Expenses and compensation not covered in “(1) Content”.

5. Agreement

If there is any doubt about anything specified in “2. Scope” and "3. Content”, it shall be resolved by agreement between the customer and SMC.

6. Request to customers

Proper use and maintenance are essential to assure safe use of this product. Be sure to satisfy the following preconditions. Please note that we may refuse to carry out warranted repair if these preconditions have been disregarded.

(1) Use the product following the instructions for handling described in the Operation Manual.
(2) Perform checks and maintenance (daily checks and regular checks) specified in the Operation Manual and Maintenance Manual.
(3) Record the check and maintenance results on the daily check sheet attached to the Operation Manual and Maintenance Manual.

7. Request for Warranted Repair

For warranted repair, please contact the supplier you purchased this product from.
Warranted repair shall be on a request basis.

Repair shall be provided free of charge in accordance with the warranty period, preconditions and terms defined above. Therefore, a fee will be charged for any repairs if a failure is detected after the end of the warranty period.