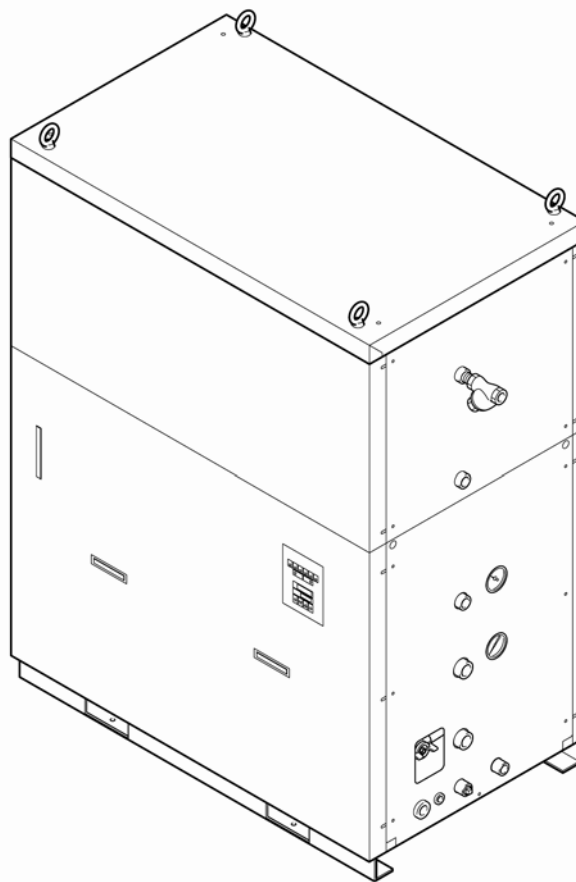




Operation Manual

Water-refrigerated Thermo cooler *HRG010-W* *HRG015-W*



SMC Corporation

Save This Manual Carefully for Use at Any Time

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To the Customers

Thank you for purchasing our THERMO COOLER HRG Series (hereinafter called "This unit").

For safety and efficiency, be sure to read and understand this manual thoroughly before performing operation of this unit.

- All warnings and precautions defined in this manual shall be observed.
- This manual provides instructions for the installation and operation of the unit. Only personnel who understand basic operation described in this manual are qualified to perform the installation and operation of the unit.
- Copying, duplicating or transferring any part of or whole contents of this manual without SMC Corporation's permission is strictly prohibited.

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

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Chapter 1 Safety Instructions



Be sure to read and understand all the important precautions in this manual before operating the unit.

1.1 Before Using this Unit

- This chapter describes the safety-related items that users should be aware of upon handling this unit.
- This unit is an isothermal fluid circulation system housed in the tank. SMC's liability under this warranty shall not be available for troubles caused by use for purposes other than the original intent.
- This unit operates under high voltage and contains components that cause a rise in temperature and rotate. All personnel are required to read and understand the safety-related items in this manual before working with this unit.
- This manual is not for comprehensive safety and hygiene education. Such a manual should be provided by a safety training manager.
- All personnel who work on or around this unit are to have proper training and education on dangers specific to this unit and safety measures against potential hazards.
- A safety manager is responsible for observing safety standards. Operators and service technicians have individual responsibilities for their safety during operation of this unit in his/her daily work.
- Operators must individually take account of safety and assure a proper working area and working environment.
- The relevant personnel must receive proper safety education before working on this unit to prevent dangers. Never conduct work training without giving proper consideration to safety.
- Save this manual at a designated place for reference when necessary.

1.2 Danger, Warning and Caution

1.2.1 Level of risk

This unit is designed with the safety of workers and the prevention of system damage. This manual classifies the risks into the following three categories according to the level of the hazard: Danger, Warning, and Caution. Read the statements carefully and thoroughly understand them before operating this unit.

DANGER, WARNING and CAUTION signs are in order according to severity (DANGER > WARNING > CAUTION). See below for the details.

DANGER

"DANGER" denotes that there is an imminent hazard which will cause serious personal injury or death during operation.

WARNING

"WARNING" denotes that there is a hazard which may cause serious personal injury or death during operation.

CAUTION

"CAUTION" denotes that there is a hazard which may cause minor personal injury during operation.

CAUTION

"CAUTION" without an exclamation symbol denotes that there is a hazard which may cause damage or failure of this unit, facility, or devices.

[Tips]

Tips are provided when there is information personnel are required to be aware of for system operation and maintenance. If the task carries useful information, the relevant tips are given as well.

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

■ “Serious injury”

This term describes injuries such as loss of eyesight, wound, burns, frostbite, electric shock, fracture, and toxication that leaves aftereffects which may require prolonged treatment and hospitalization.

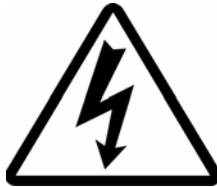
■ “Minor injury”

This term describes injuries that do not require prolonged treatment or hospitalization (injuries other than “serious injuries” described above).

1.2.3 Symbols

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

■ Symbol of electrical hazard



This symbol warns you of possible risk of electrical shock.

■ Symbol of heat hazard



This symbol warns you of potential burns.

■ Symbol of rotating shaft hazard



This symbol warns you of possible risk caused by a rotating object.

■ Symbol of “Don’ts”



This symbol denotes the items that must not be attempted.

■ Symbol of “Dos”



This symbol denotes the “obligation” items which you must follow in operation of this unit.

1.3 Hazard Warning Label

The hazard warning labels indicate where potential hazards are present during unit operation and maintenance.

The hazard warning labels are in appropriate sizes and colors. They contain symbols in addition to the descriptions of warnings.

1.3.1 Classification of risks

■ High voltage hazards

The unit is operated at high voltage and may cause an electrical shock. The

attached label contains the symbol



| | |
|------------------|--|
| ⚠ WARNING | |
| | Only operate the unit with the cover panel attached. The unit contains the power supply carrying high voltage inside that is isolated with the cover panel. |
| ⚠ WARNING | |
| | Only trained personnel are allowed to work, including unit inspection, around the power supply. |

■ High temperature hazards

The unit reaches high temperature during operation and may cause burns when

an operator comes in contact. The attached label contains the symbol



| | |
|------------------|--|
| ⚠ WARNING | |
| | There is the presence of the surface in the unit that is at high temperatures during operation. Potential burns may occur if touched. Residual heat may cause burns despite the power being turned OFF. Be sure of the surface reaching room temperature before work. |

■ Rotating object hazards

The unit includes several parts that rotate during operation and may cause the operator to get the finger caught in these parts. The attached label contains the

symbol



| | |
|------------------|--|
| ⚠ WARNING | |
| | The unit contains a section which rotates when it is in action. Potential personal injury may occur if touched. A rotator is structured to come to a temporary stop and resume rotation. Avoid performing work during system operation. |

1.3.2 Type of hazard warning labels



■ Warning label on the front panel



Fig. 1-1 Warning Label on the Front Panel

■ Warning label for high voltage



Fig. 1-2 Warning Label for High Voltage

1.3.3 Location of hazard warning label

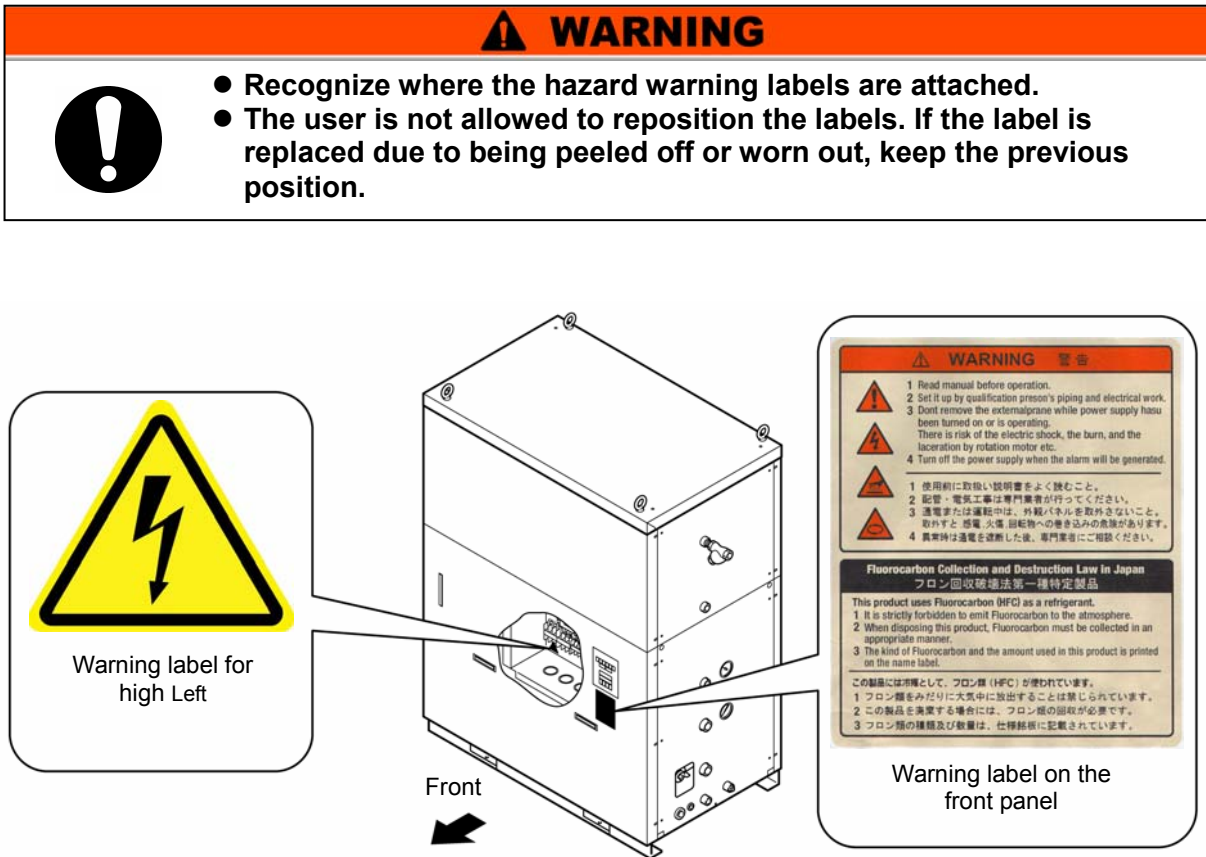


Fig. 1-3 Location of Hazard Warning Label

1.4 Model label

Check the model no. described on the label.

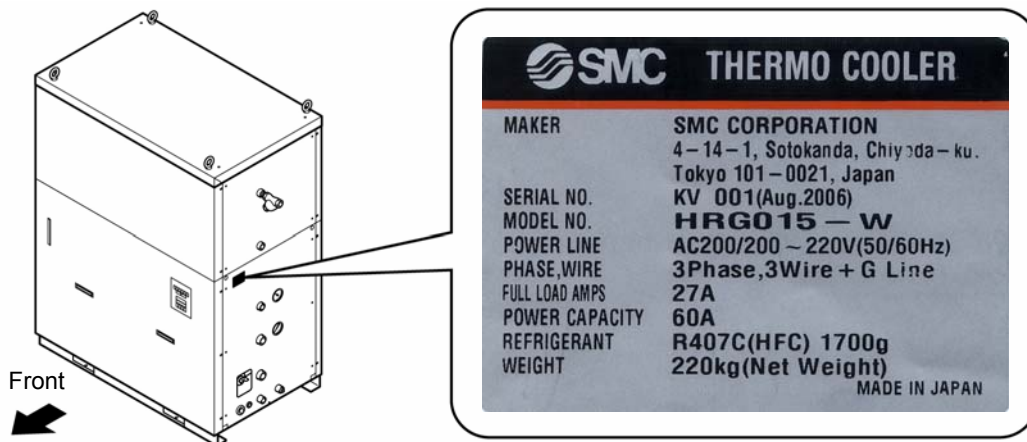



Fig. 1-4 Location of Model Label

1.5 Safety Measures

1.5.1 Safety Precautions

While this system is protected by various safety measures, the following basic safety precautions should be observed to assure further safe operations.



| ⚠ WARNING | |
|---|--|
|  | Follow the following instructions upon operation of this system. Failure to follow the instructions can lead to personal injury or hazardous accidents. |

- Read and understand this manual thoroughly before operation of this system.
- Before operating the system during maintenance, inform all personnel who are working in the vicinity of the system to alert them of your action.
- Use appropriate tools and follow proper procedures.
- See “1.5.2 Protective equipment” on page 1-8 to wear protective equipment properly.
- Refer to your safety manual for emergency evacuation.
- Use assistance to carry object over 20 kg.
- Check that all parts and screws are returned to the pre-work conditions at the end of work.
- Do not work when intoxicated or feeling ill. Accidents may occur if disregarded.
- Do not remove a panel unless permitted in this manual.

1.5.2 Protective equipment

This manual defines protective equipment according to work type.

Wear proper protective equipment as shown below, according to work type.

| | |
|--|---|
|  WARNING | |
|  | Read and understand the relevant operation manual thoroughly prior to use of protective equipment. |

■ For system transportation, installation and removal

- Protective footwear
- Protective gloves
- Hard hat

■ For handling circulating fluid

- Protective footwear
- Protective gloves
- Protective mask
- Protective apron
- Protective goggles

■ For system operation

- Protective footwear
- Protective gloves

1.6 Emergency Measures

Press the [OFF] switch on the control panel located on the front of the thermo cooler only if the need to shut off the power arises due to emergency such as natural disaster, fire, earthquake or personal injury.

With the press of the [OFF] switch, the thermo cooler comes to a stop. The power supply, however, is designed not to stop, which enables the motor circuit to remain partially energized.

Make sure to turn off the main power supply (main breaker) before proceeding with the next task.

1. Press the [OFF] switch on the control panel to bring the thermo cooler to a stop.

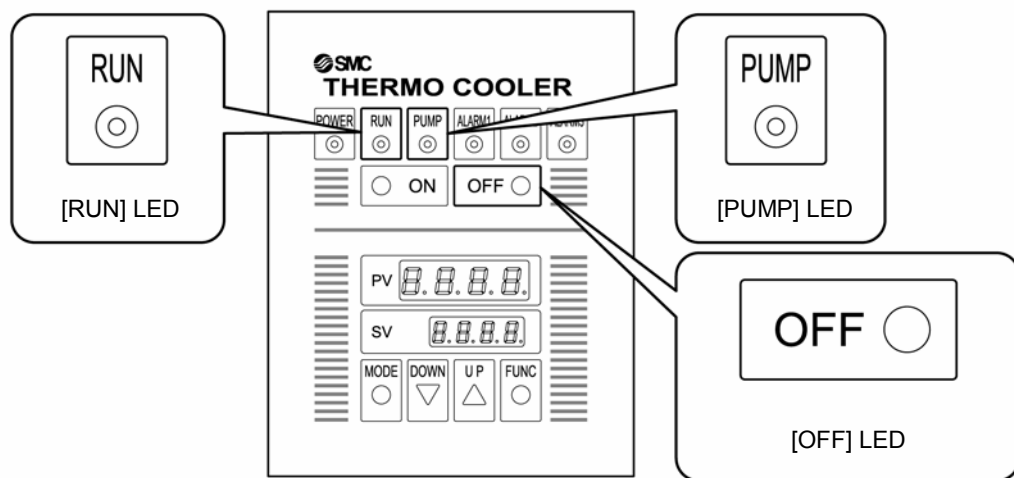


Fig. 1-5 Thermo Cooler OFF

2. Always turn off the main breaker (for your power supply equipment).

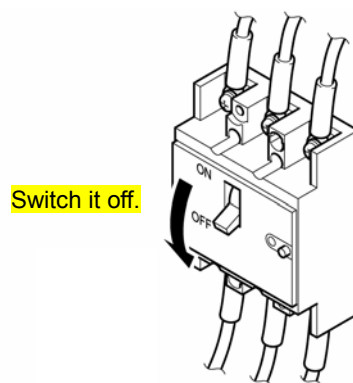


Fig. 1-6 Main Power Shutdown (Breaker OFF)

1.7 Disposition of Waste

1.7.1 Recovery of refrigerant and compressor oil

The unit belongs to Class 1 in the “Fluorocarbon Recovery and Destruction Law” and uses freon type refrigerant (HFC) and compressor oil. When these fluids need to be recovered, read the instructions below and ensure thorough understanding of them. If you have any questions, contact the local distributor.

WARNING



Only service personnel or qualified personnel are allowed to open the **panel** of the unit.

WARNING



Do not mix the compressor oil with domestic waste for disposition. Also, incineration is permitted only at an authorized incinerator.

WARNING



Comply with municipal ordinances or regulations to dispose of waste.

WARNING



The release of refrigerant to atmosphere is banned by law. **If the refrigerant needs to be removed, recover it with specific equipment and request a specialized waste disposal agency for disposal of the recovered refrigerant. A person must have proper license to perform refrigerant recovery.**

WARNING



Only personnel with sufficient knowledge and experiences with the unit and associated equipment are allowed to recover refrigerant and compressor oil. The person must have proper license to perform refrigerant recovery.

[Tips]

The type and amount of used freon can be found on the label.

1.7.2 Circulating fluid disposal

As to the disposal of a circulating fluid (ethylene glycol solution), consign the specialized industrial waste disposal agency with the contents detailed.

1.7.3 System disposal

As to the disposal of this system, consign the specialized industrial waste disposal agency in accordance with law on Waste Disposal and Cleaning.

1.8 Material Safety Data Sheet (MSDS)

Material Safety Data Sheet (MSDS) is supplied separately. Contact the system supplier if you need the MSDS regarding chemicals used in this system.

For each chemical you purchased, the relevant MSDS is to be obtained under your responsibility. Keep the MSDS along with this manual in the condition that allows all personnel to check the contents anytime to gain the understanding of potential hazards.

Chapter 2 Appearance and Each Section

2.1 Appearance

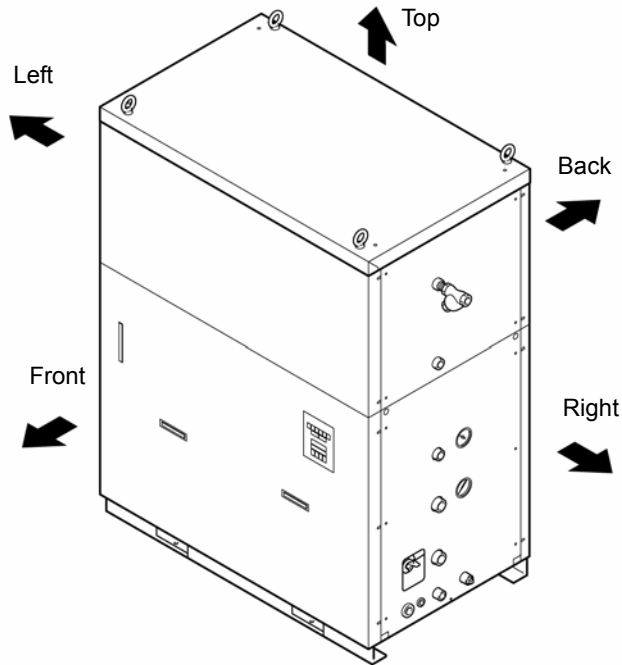


Fig. 2-1 Appearance of HRG010-W

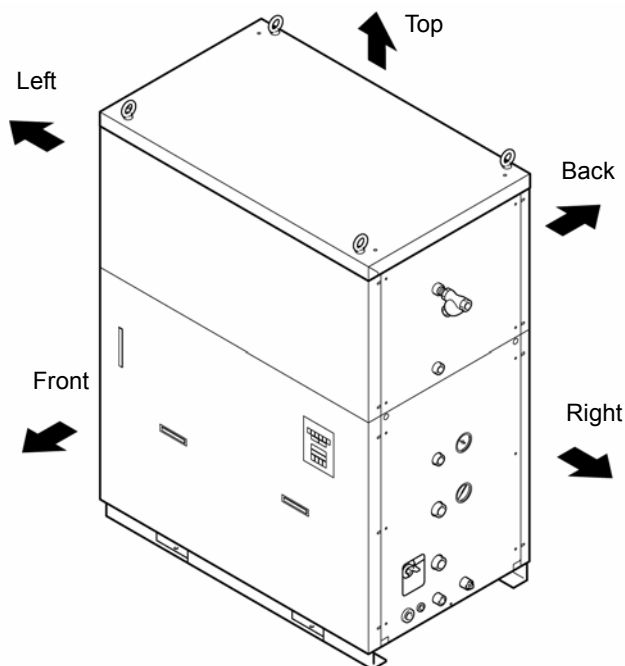


Fig. 2-2 Appearance of HRG015-W

2.2 Name of Each Section

2.2.1 HRG010-W

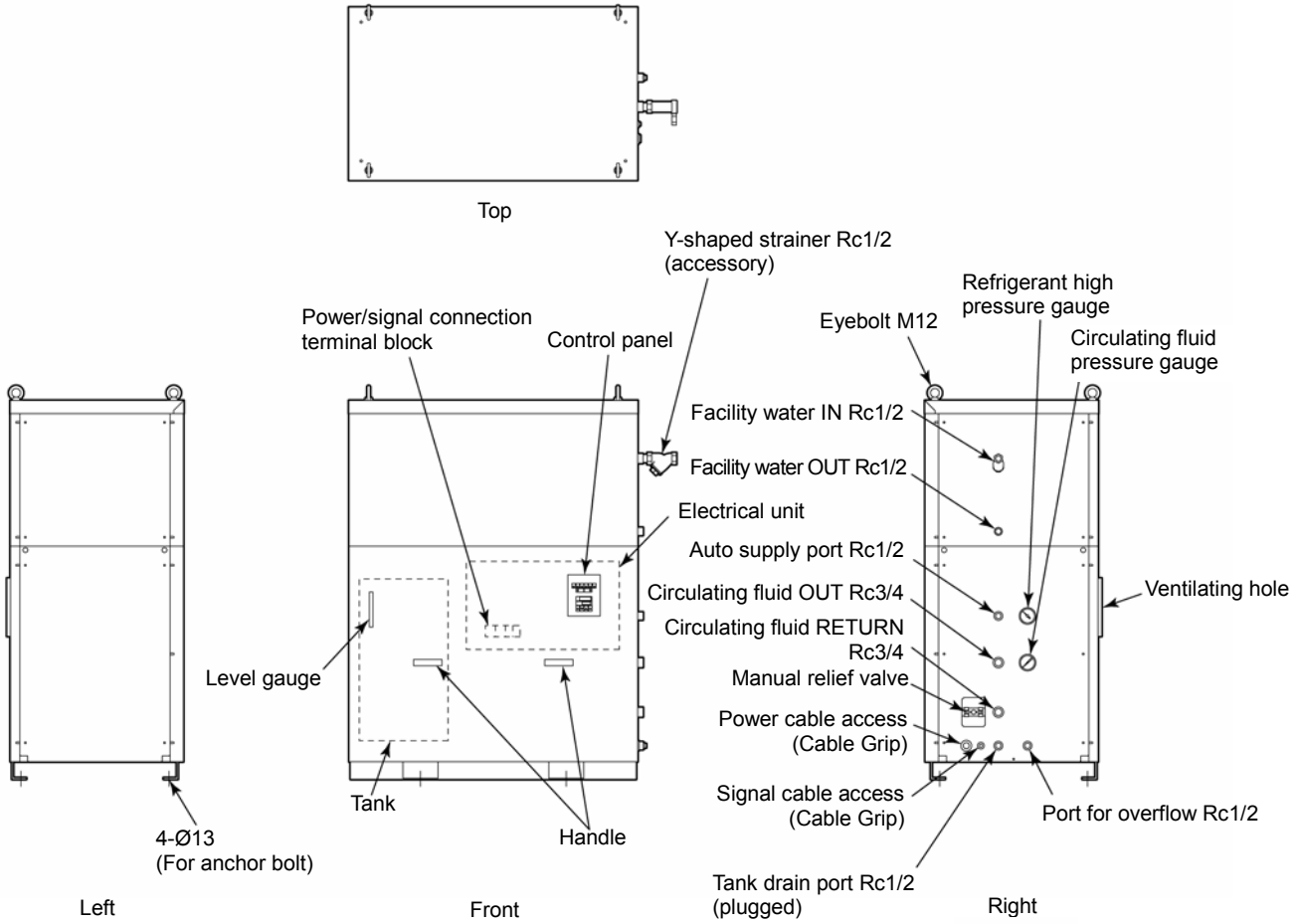


Fig. 2-3 Name of Each Section (HRG010-W)

2.2.2 HRG015-W

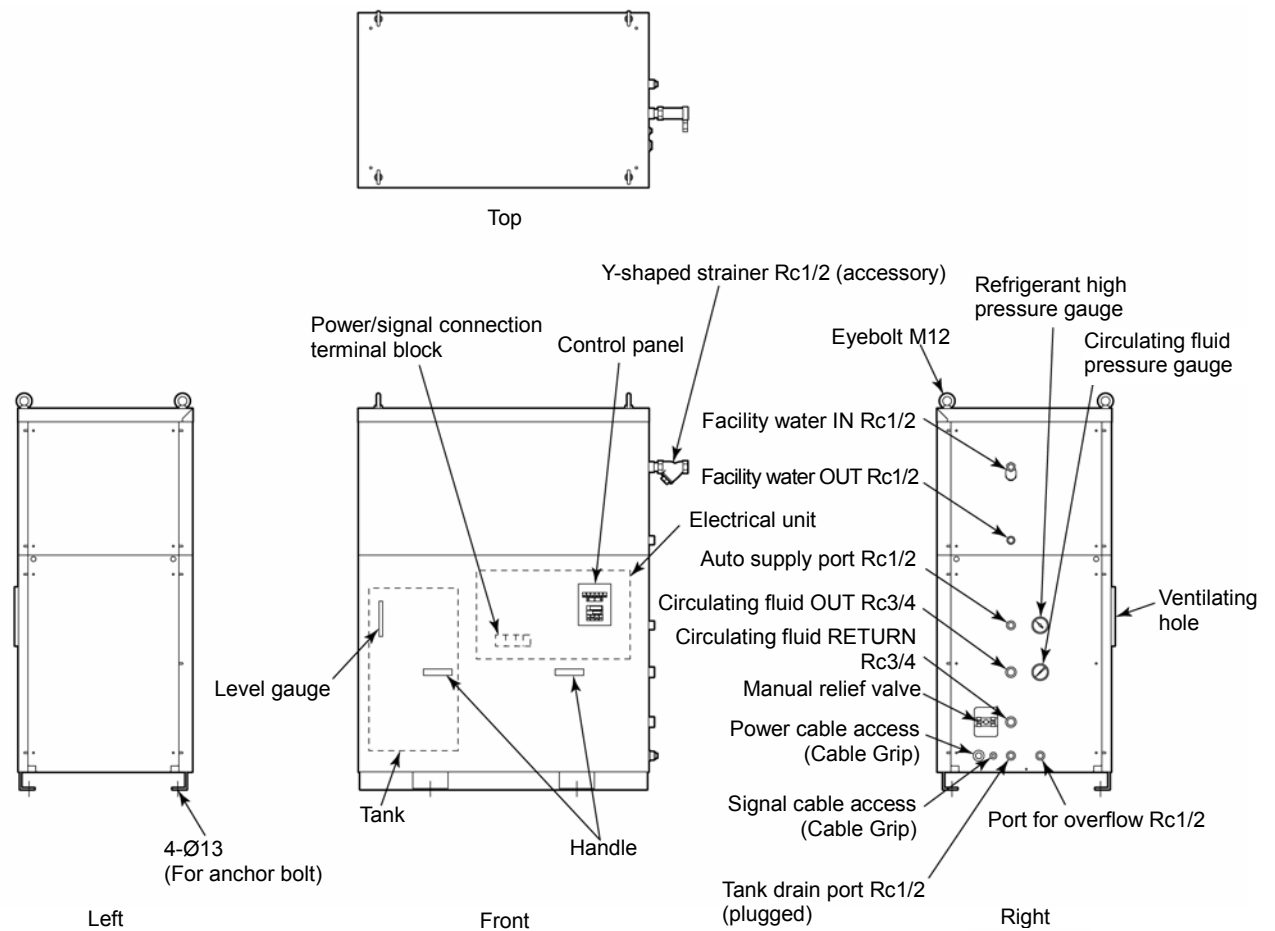


Fig. 2-4 Name of Each Section (HRG015-W)

2.3 Control panel

The control panel on the system front allows you to perform basic system operation including temperature adjustment, system start and stop.

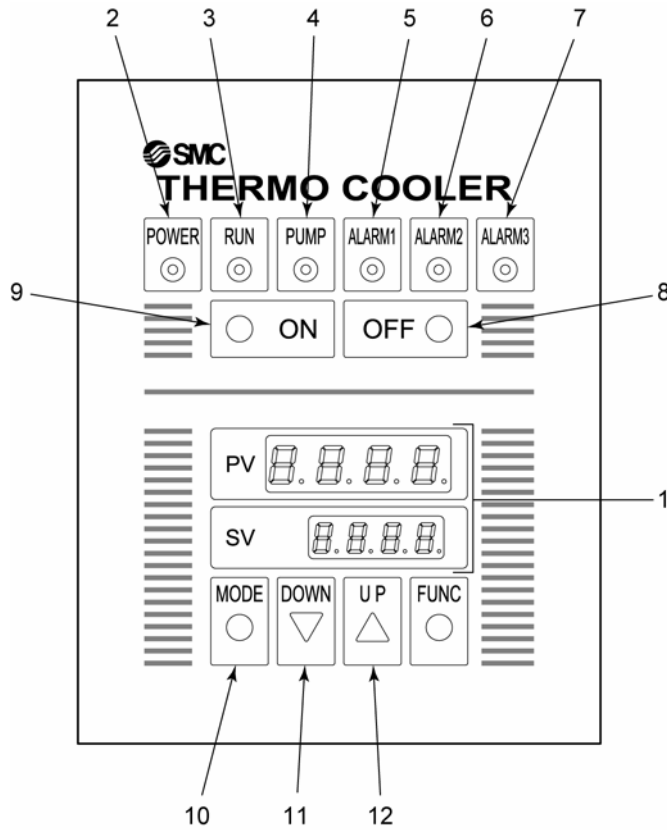


Fig. 2-5 Control Panel

Table 2-1 Control Panel

| No. | Name | Function | |
|-----|--------------------------|---|---|
| 1 | Digital display, PV / SV | PV | Indicates actual temperature of a circulating fluid |
| | | SV | Indicates set temperature of a circulating fluid |
| 2 | [POWER] LED | Lights up when the power is supplied. | |
| 3 | [RUN] LED | Lights up when the [ON] switch is pressed. | |
| 4 | [PUMP] LED | | |
| 5 | [ALARM 1] LED | | |
| 6 | [ALARM 2] LED | Lights up when an alarm 2 arises. | |
| 7 | [ALARM 3] LED | Lights up when an alarm 3 arises. | |
| 8 | [ON] switch | This is used to run the unit. | |
| 9 | [OFF] switch | This is used to stop the unit. | |
| 10 | [MODE] key | This is used to switch the screens between PV and SV. | |
| 11 | [DOWN] key | This is used to decrease set temperature. | |
| 12 | [UP] key | This is used to increase set temperature. | |

* See “Chapter 5 Error Message and Troubleshooting” for alarms 1 to 3.

Chapter 3 Transport and Installation

⚠ WARNING



The unit must be handled in correct manner. Exercise caution to assure personnel safety during the installation, operation, maintenance, and inspection of the unit.

⚠ WARNING



Only personnel with sufficient knowledge and experiences with the unit and unit are allowed to transport, install and conduct maintenance possibly exposed to dangerous situations.

3.1 Transport

The unit is heavy and poses potential danger at transportation. To prevent damage to the unit, be sure to follow the instructions below when transporting the unit.

⚠ WARNING



If the forklift is used for transporting, ensure that the fork is inserted in a place as specified in Fig. 3-1 "Forklift Insertion Position and Unit Lifting".

⚠ WARNING



- If eyebolts are used for lifting, ensure the unit is held at four points.
- Keep each eyebolt at an angle from Min. 60 degrees with respect to the position of the center of gravity when lifting the unit.

CAUTION



Never set the unit on its side. The refrigerant oil will drain into refrigerant piping from the compressor, reducing its amount in the compressor. It results in a compressor failure.

CAUTION



Drain the residual fluid from piping as much as possible to prevent spill.

CAUTION



If the forklift is used for transporting the unit, be sure to prevent the fork from contacting the cover panel or pipe connection ports.

3.1.1 Transporting with forklift and unit lifting

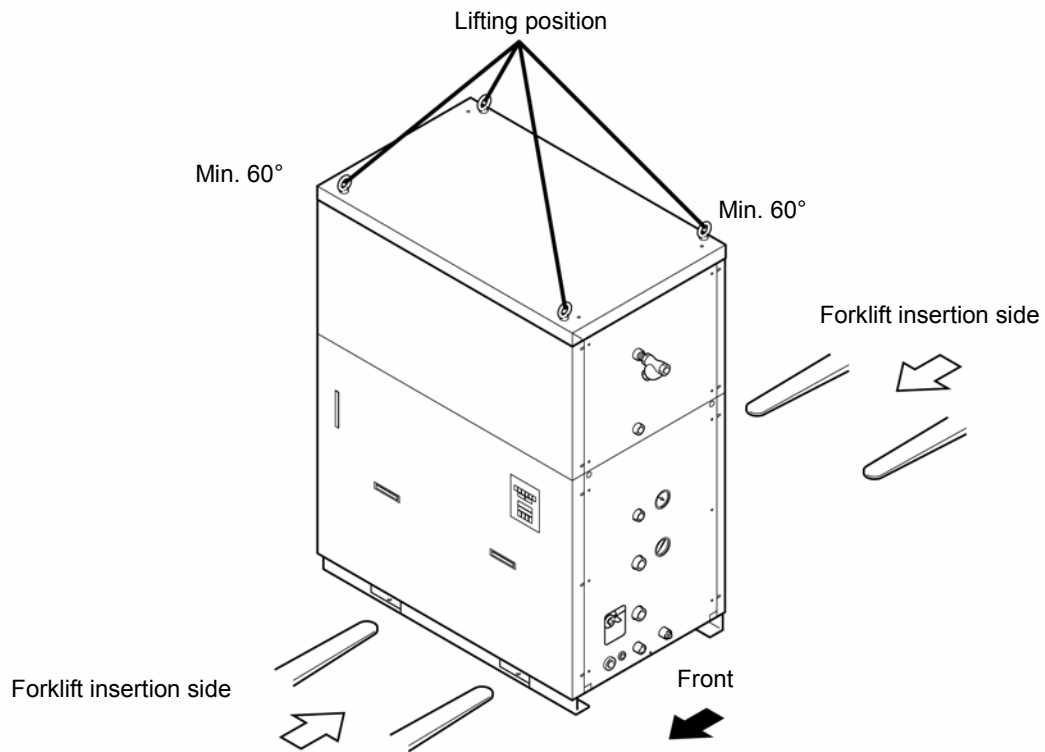


Fig. 3-2 Forklift Insertion Position and Unit Lifting

3.1.2 Transporting with caster

■ HRG010-W-A / HRG015-W-A (caster-mounted option)

⚠ WARNING

 This unit is heavy, which requires assistance for this work. Exercise caution and look out for sloped surfaces including ramps.

CAUTION

 Do not grab piping or panel handles when transporting the system with the casters. Potential damage to piping and panels may occur if disregarded.

1. Push the corners of this unit with the adjusters uplifted.

The unit becomes disengaged so that it can be transported with casters.

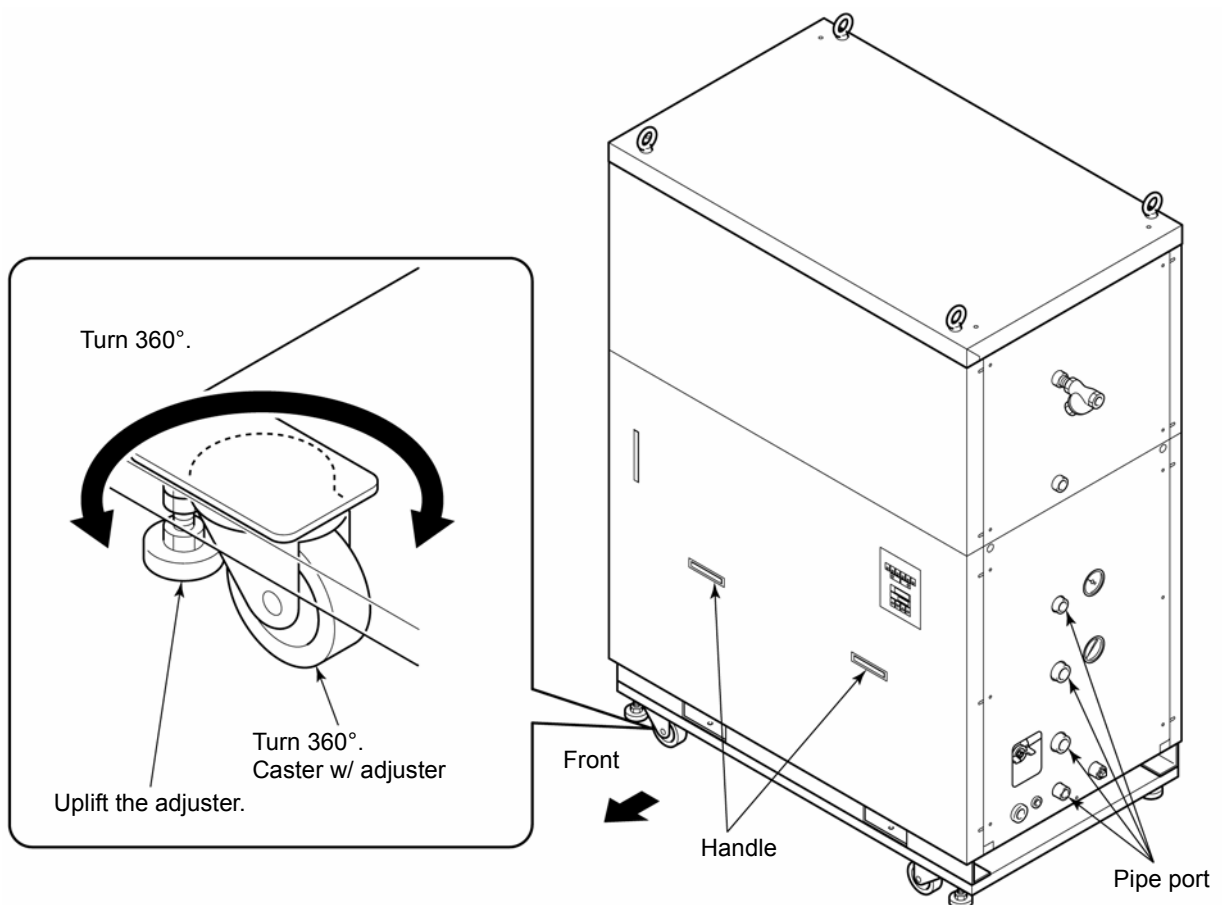


Fig. 3-3 Caster-mounted Option

3.2 Installation

WARNING



Do not install the unit in a place possibly exposed to flammable gas. Ignition may occur if leaked gas is collected around the unit.

WARNING



This unit is NOT designed for outside use. The unit exposed to moisture may develop a short circuit which can result in an electrical shock, fire and failure in the unit.

CAUTION



Install the unit on a flat and level floor which can support the weight of the unit. Take measure to prevent the unit from tipping over. Improper setup may cause water leakage from the unit and personal injury.

CAUTION



Keep ambient temperature of the unit between 5 and 40°C. Unit operation at below 5°C may lead to failure in the compressor. Operation at above 40°C will reduce effectiveness of the condenser and trigger the safety device which brings the unit to a stop.

3.2.1 Installation conditions

Do not use or store the unit in the following environments. Potential unit malfunction and damage may occur if disregarded.

- Environment that is exposed to water vapor, salt water or oil mist
- Environment that is exposed to dust or powdery materials
- Environment that is exposed to corrosive gas, flammable gas or solvent
- Environment that is exposed to direct sun light or radiant heat
- Environment where ambient temperature is out of the specified range between 5°C to 40°C
- Environment that is subjected to abrupt changes in temperature
- Environment that is subjected to strong electromagnetic noise (incl. strong electrical field, strong magnetic field, or surge voltage)
- Environment that generates static electricity, or condition in which static electricity discharges to the unit
- Environment that generates strong high frequencies
- Environment at high altitudes of over 1000m
- Condition which allows strong vibrations and impacts to transmit to the unit
- Condition with external force or load to deform the unit
- Condition with an insufficient maintenance space as required
- Condition with no adequate space for ventilation

3.2.2 Installation location

CAUTION



A water-refrigerated thermo cooler is designed to exhaust heat through a supply of facility water. Secure water sources listed below.

- Required water sources

Table 3-1 Heat Discharge and Required Quantity of Facility Water (HRG010-W, HRG015-W)

| Model | Heat discharge (kW) | Facility water temp. range (°C) | Required water quantity (L/min) |
|----------|---------------------|---------------------------------|---------------------------------|
| HRG010-W | Approx. 16 | 5 to 32 (Rated temp.: 25) | 34 |
| HRG015-W | Approx. 23 | | 40 |

- Outside installation

HRG010 and HRG015 are IPx3-compliant rainproof systems but not rendered complete waterproof. Install the system out of direct sunlight as well as direct rain and snow (e.g. under the eaves).

3.2.3 Installation location and maintenance work area

Installation with maintenance space is recommended. (See Fig. 3-4)

CAUTION

 **Ensure an adequate ventilation space for the temperature controller. Failure to create sufficient space may lead to improper cooling and/or controller stop. Access maintenance work area should be required for maintenance.**

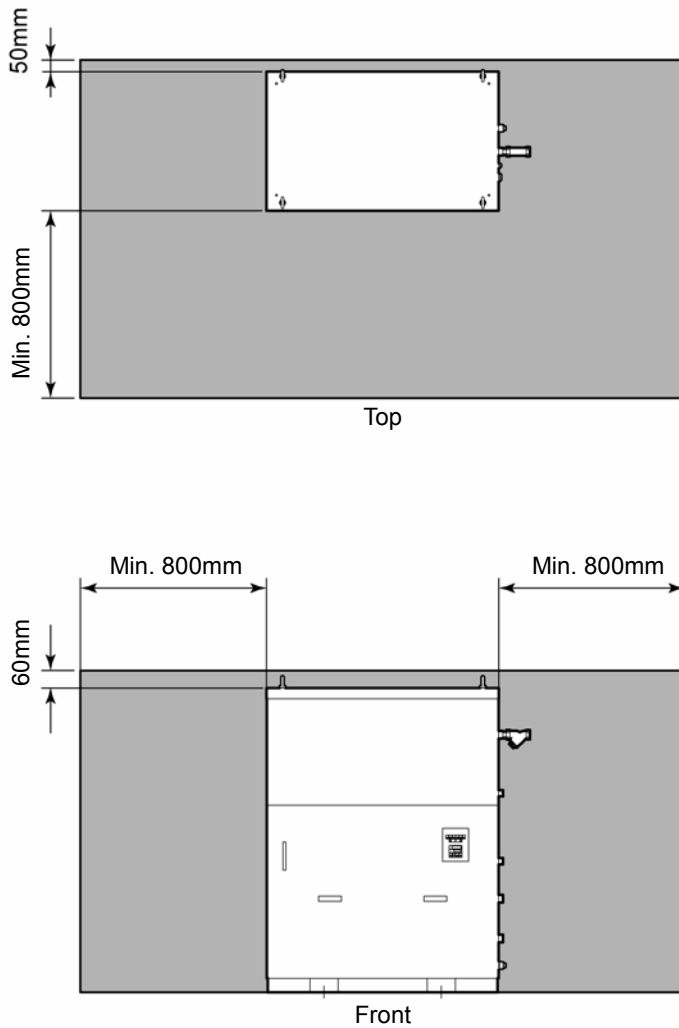


Fig. 3-4 Recommended Installation Location

3.2.4 Installation

⚠ CAUTION

! Preparation of anchor bolts suitable for floor material is your responsibility. Prepare M12-anchor bolts (4 pcs.) for installation. See “ 7.3 Outline Dimensions” for mounting of the anchor bolts.

- Keep the unit away from vibration. Install the unit on a flat and stable surface.
- Refer to “7.3 Outline Dimensions” for the dimensions of the unit.

■ Procedure for Installation

- 1.** The anchor bolts (foundation bolts) are mounted on the level concrete foundation. Lower this unit, inserting the anchor bolts into the unit.
- 2.** Tighten the hexagonal nut to secure the unit onto the foundation.
- 3.** Make sure of no looseness between the anchor bolts and foundation.

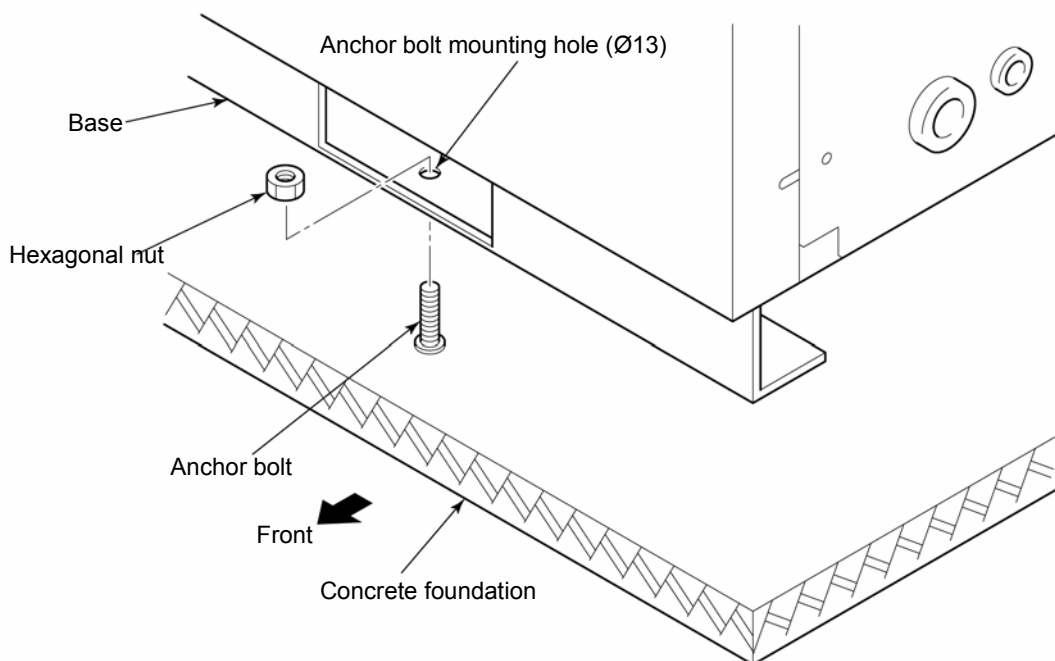



Fig. 3-5 Procedure for Installation

■ HRG010-W-A / HRG015-W-A (caster-mounted option)

⚠ CAUTION

 As to the HRG010-W-A or HRG015-W-A (caster-mounted option), the adjusters should be lowered to secure the system after installation.

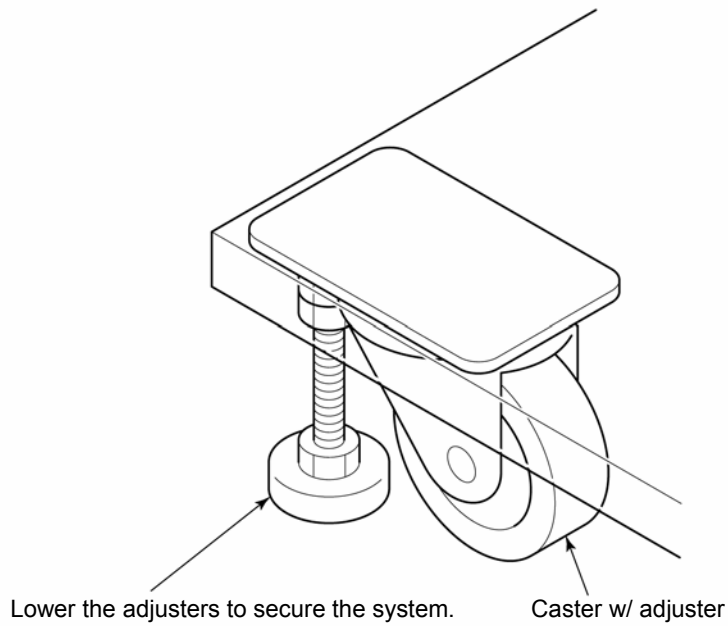


Fig. 3-6 HRG010-W-A / HRG015-W-A (Caster-mounted Option)


3.2.5 Electrical wiring

⚠ WARNING



- Do not modify the electrical wiring. Incorrect wiring can cause an electrical shock and fire. Failure to do so will void any warranty.
- The set value of the safety device must not be changed. Changing the set value can cause unit failure and fire.

⚠ WARNING



- Only qualified personnel are allowed to install wiring.
- Be sure to disconnect the power for safety. Wiring installation with the unit energized is strictly prohibited.
- Use the specified cables. Properly apply strain relief to prevent an external force from being exerted on the terminals. Poor or loose connection can cause electrical shock, heat spots, or fire.
- Supply the power to the unit from a reliable power source (without surge or sag voltage).
- Be sure to use a GFCI breaker to prevent an electrical shock and burnt compressor motor. The breaker with adequate capacity of current leakage and load should be selected in accordance with “7.1 Standard Specifications”.
- Ensure that the power supply meets the specification of the unit.
- Always establish a ground for safety.
- Do not connect the ground to a water line, gas pipe or lighting conductor.
- Do not branch off the wiring to make multiple circuits. Potential hot spots or fire may occur if disregarded.

■ Power supply cable and GFCI breaker

Select a cable for power supply and GFCI breaker corresponding to the model no. provided in the following table.

Table 3-2 Cable for Power Supply and Current Leakage

| Item | | HRG010-W | HRG015-W |
|---------------------------|-----------------------------|------------------------------|----------------------------|
| Power cable | Size | 4- core 8 mm ² | 4- core 14 mm ² |
| | Round crimp contact size | 8 - 4S | 14 - 5S |
| Signal cable | Size | 6- core 0.75 mm ² | |
| | Y-shaped crimp contact size | 1.25Y - 3 | |
| Capacity of GFCI breaker* | | 40A | 60A |

* Use the breaker with current sensitivity of 30mA at minimum.

■ How to conduct wiring

1. Undo the screws (6 pcs.) and take off the front panel.

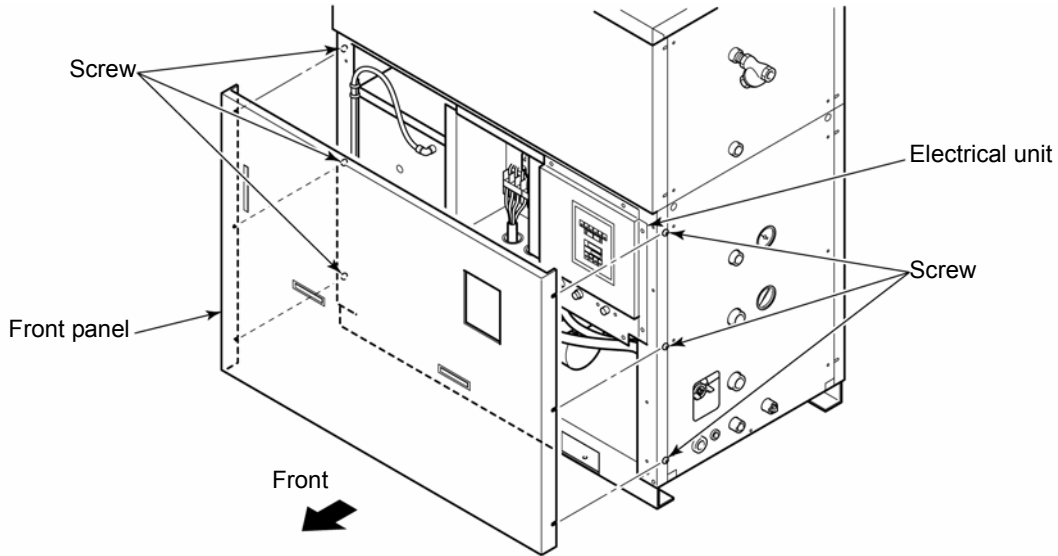


Fig. 3-7 Removal of Front Panel

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

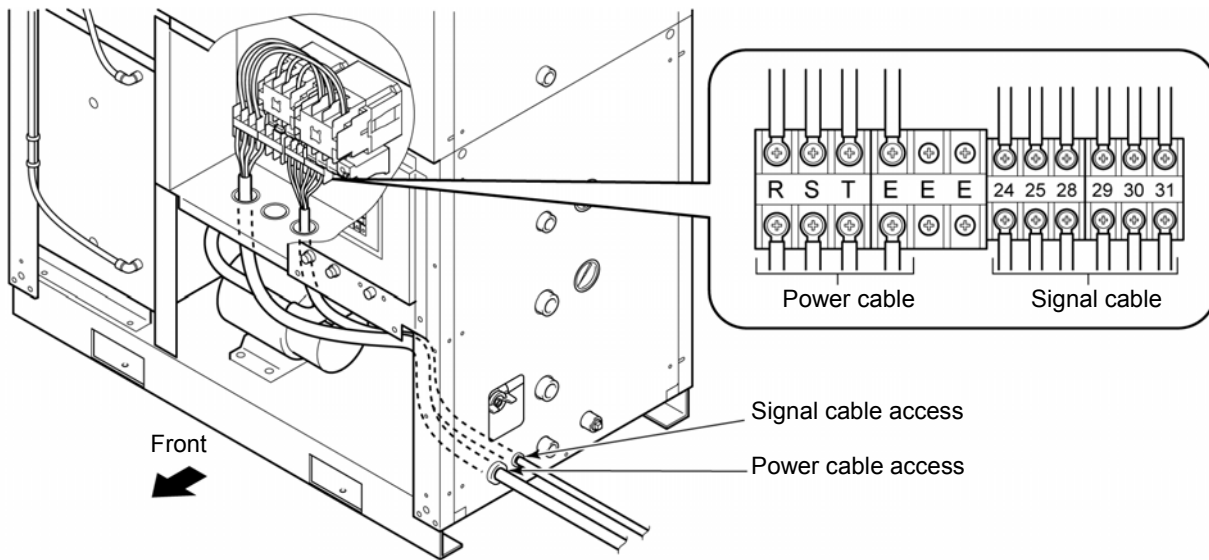


Fig. 3-8 Electrical Wiring

■ Electrical wiring diagram

CAUTION

- Prepare cables for the power supply and signal lines separately .
- Maintain polarities (+, -) of DC24V when connecting the signal cable for transmitting start/stop command (remote operation).
- Refer to “7.4 Electric Circuit” for the electrical circuit of the unit.

• HRG010-W

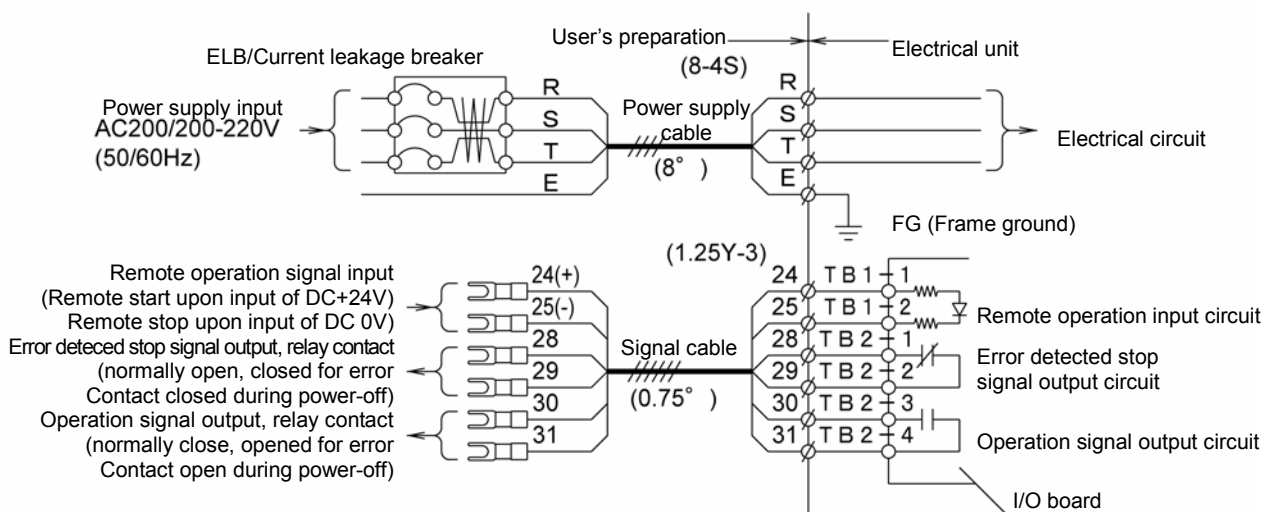


Fig. 3-9 Electrical Wiring Diagram (HRG010-W)

• HRG015-W

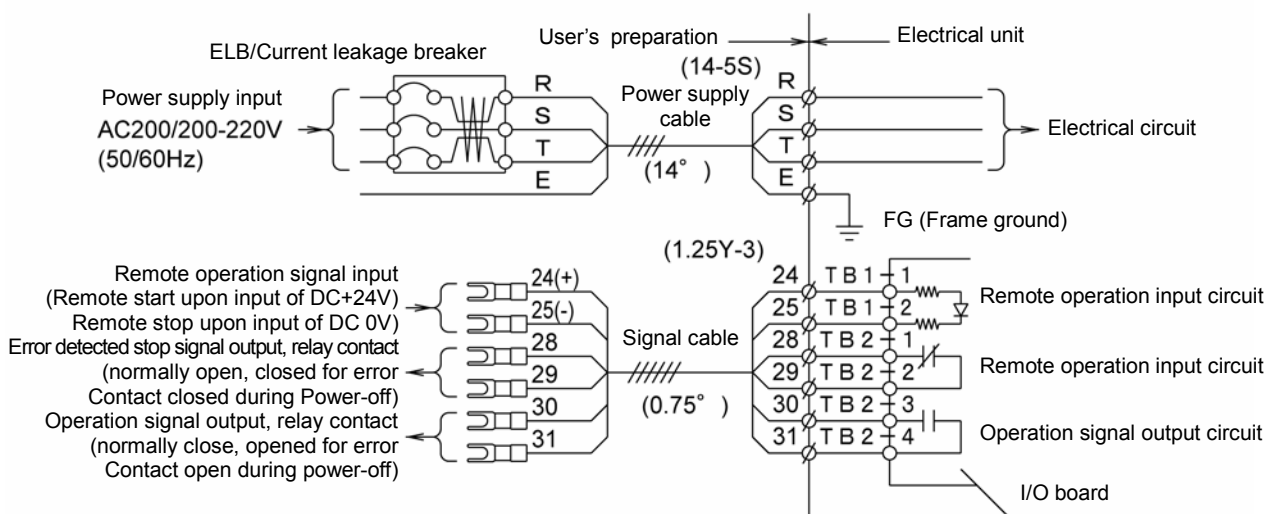


Fig. 3-10 Electrical Wiring Diagram (HRG015-W)

**■ Procedures for communication cable wiring installation (RS485)
 HRG010-W-C / HRG015-W-C (communication feature-laden option)**

The communication cables are to adhere to specifications shown below.

Table 3-3 Communication Cable

| Item | Specifications |
|---------------------|-----------------------------|
| Communication cable | Size |
| | Y-shaped crimp contact size |

Shielded twisted-pair wire (0.75mm²)
 1.25Y-3

1. Connect the power cables properly, as shown below.

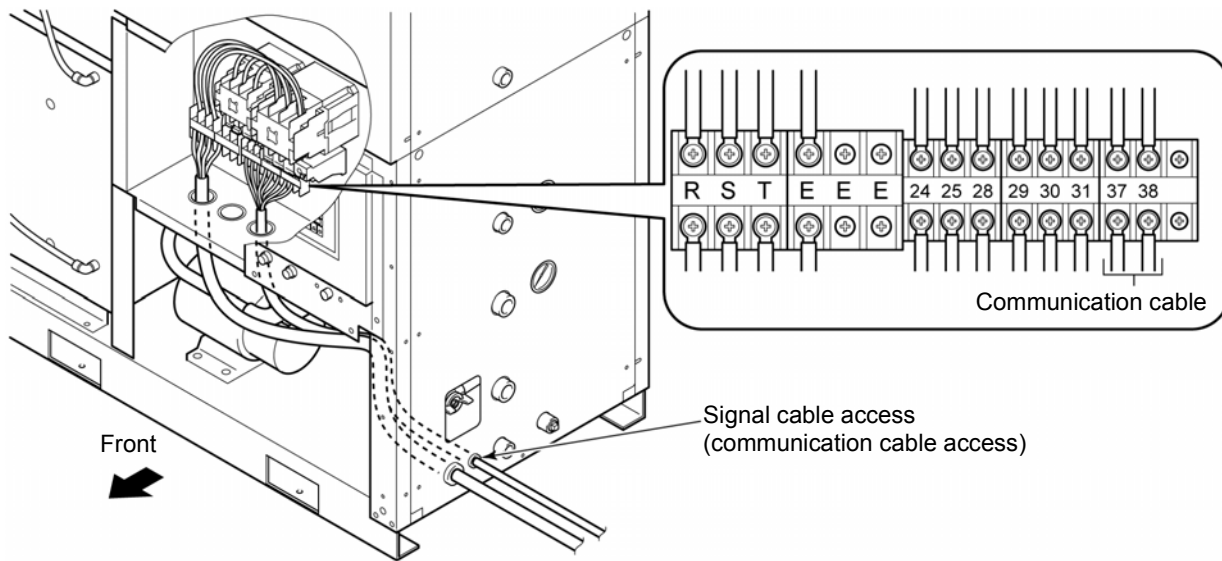


Fig. 3-11 Communication Cable Wiring

2. Have the converters listed below available. Establish connection with the computer (with a RS232C terminal).

Table 3-4 Converter (Example)

| Item | Specifications |
|-------------------------------------|---|
| RS232C ⇔ RS485 converter | Part number: KS-485 Manufacturer: System Sacom |
| Connecting connector | D-sub 9-pin (male) |
| Computer ⇔ Converter coupling cable | Part number:AR-305 Manufacturer: Arvel |

3.2.6 Piping

⚠ WARNING



Only expert engineers or personnel who have adequate knowledge of and experiences with piping installation are allowed to install piping. Potential fluid leakage or stagnant fluid may occur if disregarded.

CAUTION



- Install piping properly. Failure to conduct proper piping installation may result in the entry of supplied and drained water into the inside of the building, which may cause the work area and equipment to get wet.
- Keep facility water pressure below 0.5MPa.
- Make sure the locations of IN and OUT ports for circulating fluid supply. The reverse connection inhibits proper operation of the unit.
- Make sure no entry of dust and foreign materials into the water circuit during piping installation.
- Hold the piping connected port with a pipe wrench when tightening the pipe. Excessive force will damage the port and cause leaks if disregarded.
- Hold the piping connected port with a pipe wrench when tightening piping.

■ Pipe diameter

Table 3-5 Pipe diameter

| Pipe | Diameter | | Recommended tightening torque |
|--------------------------|----------|----------|-------------------------------|
| | HRG010-W | HRG015-W | |
| Facility water IN | Rc1/2 | Rc3/4 | 28 to 30N•m |
| Facility water OUT | Rc1/2 | Rc3/4 | 28 to 30N•m |
| Auto supply port | Rc1/2 | | 28 to 30N•m |
| Circulating fluid OUT | Rc3/4 | | 28 to 30N•m |
| Circulating fluid RETURN | Rc3/4 | | 28 to 30N•m |
| Port for overflow | Rc1/2 | | 28 to 30N•m |
| Port for drain in tank | Rc1/2 | | 28 to 30N•m |

■ How to install piping

1. Hold the piping connected port with a specific wrench and tighten the pipe.

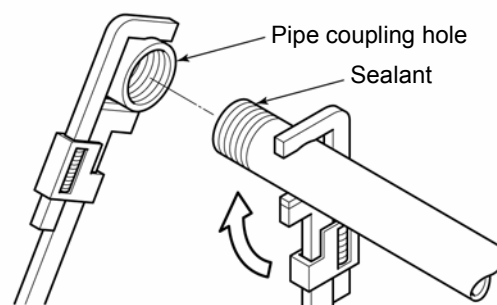


Fig. 3-12 Tightening of Pipe

[Tips]

Install a valve at the drain port to facilitate the replacing and draining of the circulating fluid from the tank described in chapter 6 "Unit Maintenance". (The valve needs to be prepared separately.)

■ **Recommended piping installation**

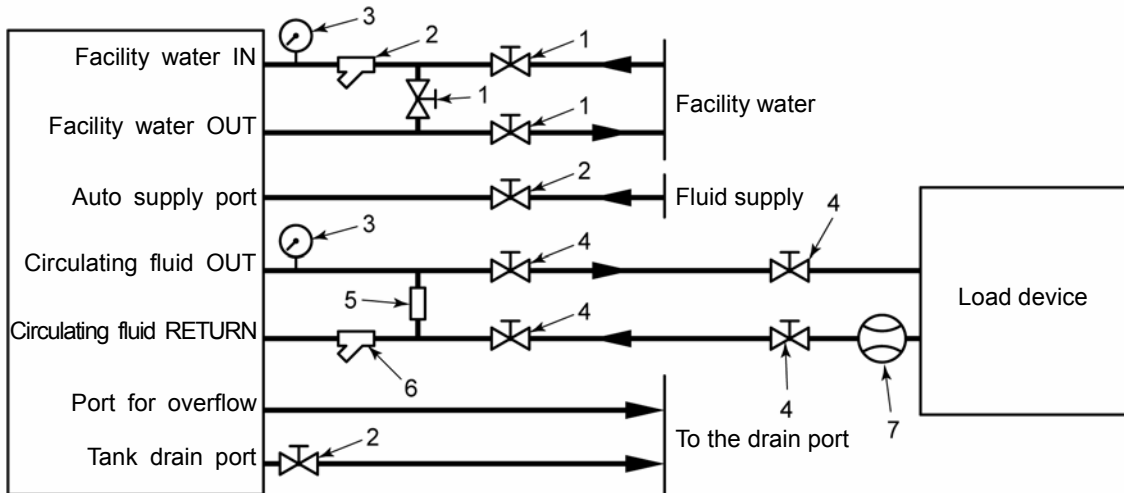


Fig. 3-13 Recommended Piping Installation

Table 3-6 Recommended Piping Installation

| No. | Name | Size | |
|-----|-------------------|------------------------------|----------|
| | | HRG010-W | HRG015-W |
| 1 | Valve | Rc1/2 | Rc3/4 |
| 2 | Y-shaped strainer | Rc1/2 | Rc3/4 |
| 3 | Pressure gauge | 0 to 1.0 MPa | |
| 4 | Valve | Rc3/4 | |
| 5 | Relieving valve | Rc3/4, set from 0 to 0.5 MPa | |
| 6 | Y-shaped strainer | Rc3/4 | |
| 7 | Flow meter | Rc3/4, 0 to 100 L/min | |

[Tips]

Optional accessories listed below are available for the relieving valves shown in Fig. 3-12 "Recommended Piping Installation". Separate order for optional accessories is to be placed upon designing the piping system if used for piping installation.

Table 3-7 Allied Products

| Part No. | Name | Qty. | Note |
|-----------|-------------------------------------|-------|---------------------------|
| HRG-BP010 | Bypass (relieving valve) piping set | 1 set | HRG010 optional accessory |
| HRG-BP015 | Bypass (relieving valve) piping set | 1 set | HRG015 optional accessory |

3.2.7 Supply of circulating fluid

1. Open the supply valve laid with pipes.

The fluid supply takes place with the use of the ball tap housed in the tank and stops automatically.

WARNING



Keep the fluid level in the tank between “HIGH” and “LOW”.
If the circulating fluid is out of the range, the fluid may overflow.
Ensure piping is installed to the overflow outlet and drain pit.

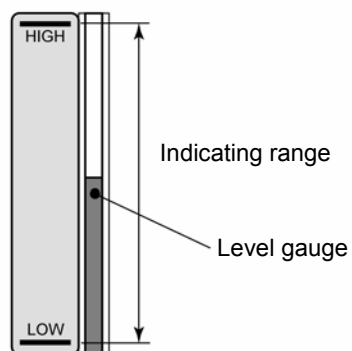


Fig. 3-14 Level Gauge

3.2.8 Reinstallation of unit

CAUTION



If the unit is relocated, only personnel with knowledge of the unit and associated equipment are allowed to perform unit reinstallation. Precautions described below must always be followed.

When the unit is transferred to and reinstalled in a different place after operation at the original place (including trial run), perform transporting and installation of the unit according to the procedures described below and in Chapter 3.

■ Disconnection of power supply cable

Be sure to cut off the power supply when disconnecting the power supply cable.

WARNING



- Only qualified personnel are allowed to install wiring.
- Be sure to cut off the power supply for safety. Wiring with the unit energized is strictly prohibited.

Chapter 4 Startup and Shutdown

CAUTION



Personnel with adequate knowledge and experiences of this product and peripheral devices shall be in charge of starting up and shutting down the unit.

4.1 Pre-check

Check the following items before starting up the unit.

4.1.1 Installation condition

- Make sure the unit is installed horizontally.
- Do not put any heavy object on the unit or apply excess force by piping.

4.1.2 Electric wiring

Check that the power cable, ground and I/O signal cables are correctly connected.

4.1.3 Facility water piping

Check the I/O piping of the facility water is installed correctly.

4.1.4 Piping for circulating fluid

Check the I/O piping of the circulating fluid is installed correctly.

4.1.5 Supply of circulating fluid

Check the fluid level is within the specified range shown on the level indicator.

4.2 Preparation for startup

4.2.1 Power supply

1. Supply the power.

The following conditions are observed on the control panel upon power-ON.

- After 4-sec display of the initial screen on the digital displays PV and SV, temperature and set temperature of the circulating fluid will be displayed..
- The [POWER] lamp comes on in 6 sec.

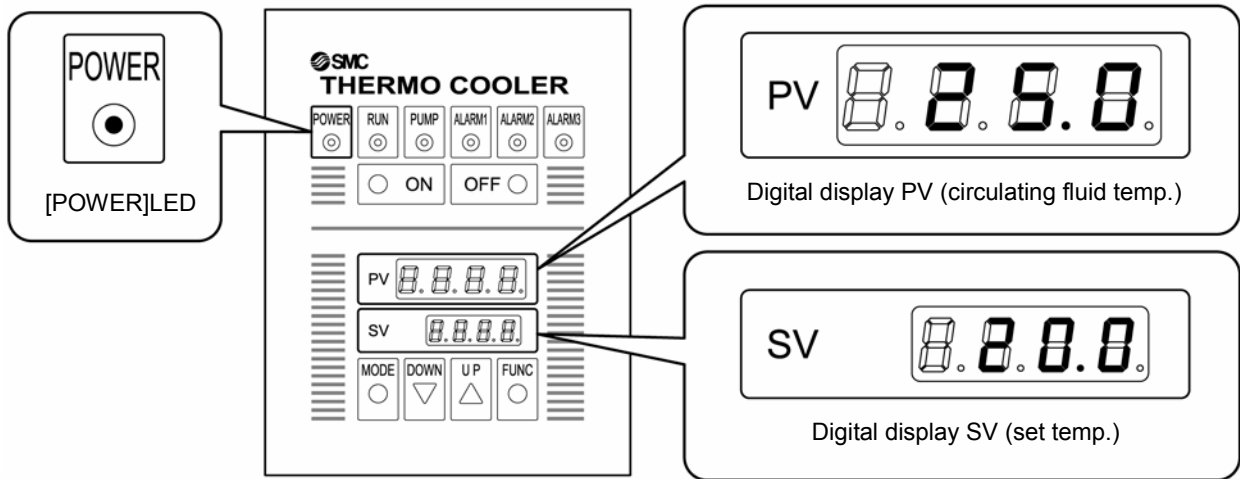


Fig. 4-1 Power Supply

4.2.2 Setting of circulating fluid temperature

1. Press the [UP] and [DOWN] keys to set a desired temperature in the digital display SV.

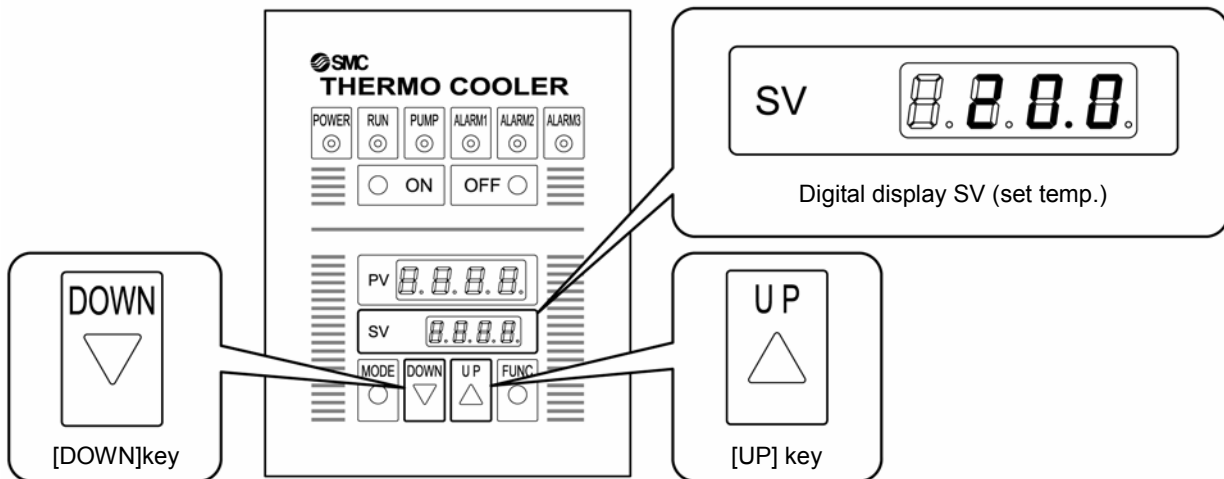


Fig. 4-2 Setting of Circulating Fluid Temperature

- Note: Circulating fluid setting temp.range is 5 to 35°C.

4.2.3 Additional water supply

■ [TS] switch (pump manual operation switch)

This unit has the [TS] switch (pump manual operation switch) to purge air from the circulating fluid circuit at initial startup. Remove the front panel, and purge air according to the procedures given below.

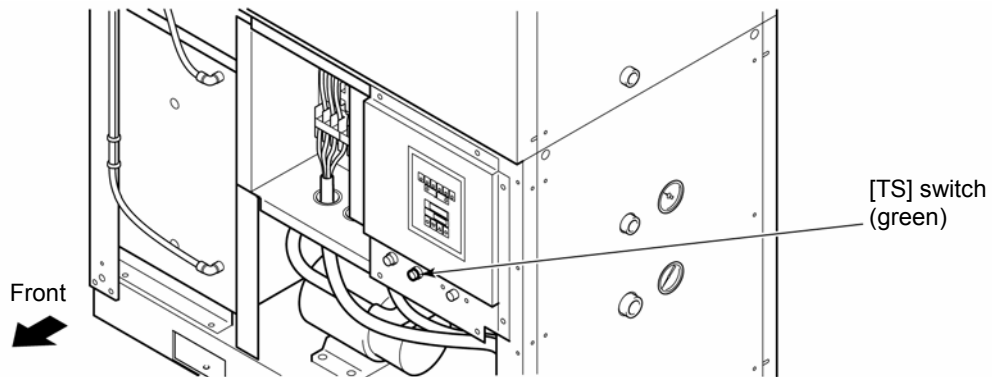


Fig. 4-3 [TS] switch (pump manual operation switch)

1. Press the [TS] switch for several seconds, monitoring the fluid level gauge.

Air is purged from the pipe, and the fluid level is lowered.

- The [ALARM1] lamp comes on (error). The lamp goes out with the press of the [RS] switch after the circulating fluid reaches the range specified on the level indicator.
- See “Chapter 5 Error Message and Troubleshooting” for error messages.

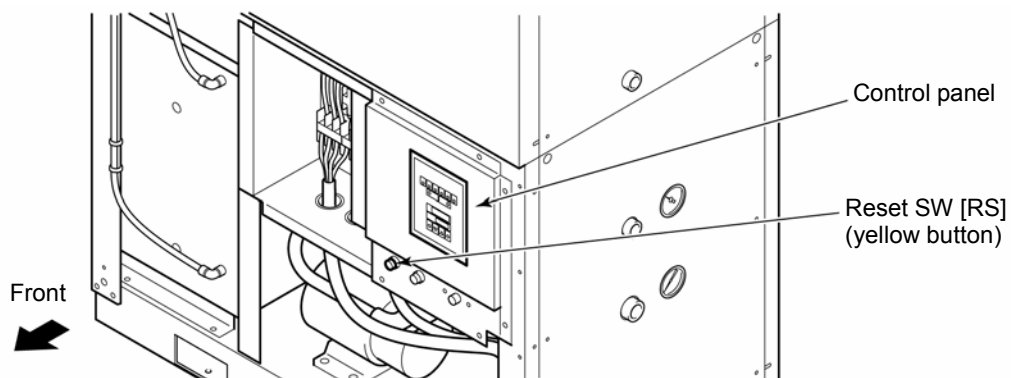


Fig. 4-4 Location of Reset Switch (Yellow Button)

2. Supply the circulating fluid again according to section “3.2.7 Supply of circulating fluid”.

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.

4.3 Unit Startup and Shutdown

4.3.1 Starting the unit

1. Press the [ON] switch on the control panel.

The unit starts operating and regulates the circulating fluid temperature.

The [RUN] LED and [PUMP] LED on the control panel come on.

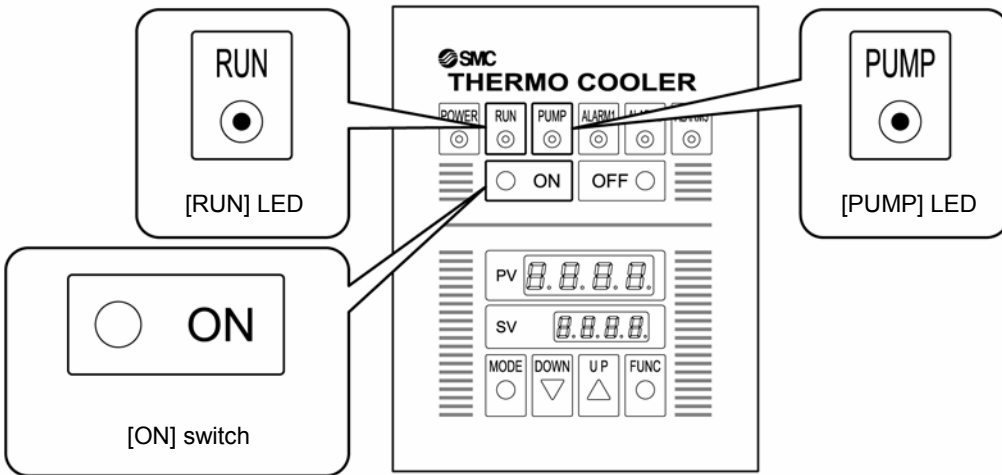


Fig. 4-5 Starting the Unit

4.3.2 Stopping the unit

1. Press the [OFF] switch on the control panel.

The unit stops.

The [RUN] LED and [PUMP] LED on the control panel go out.

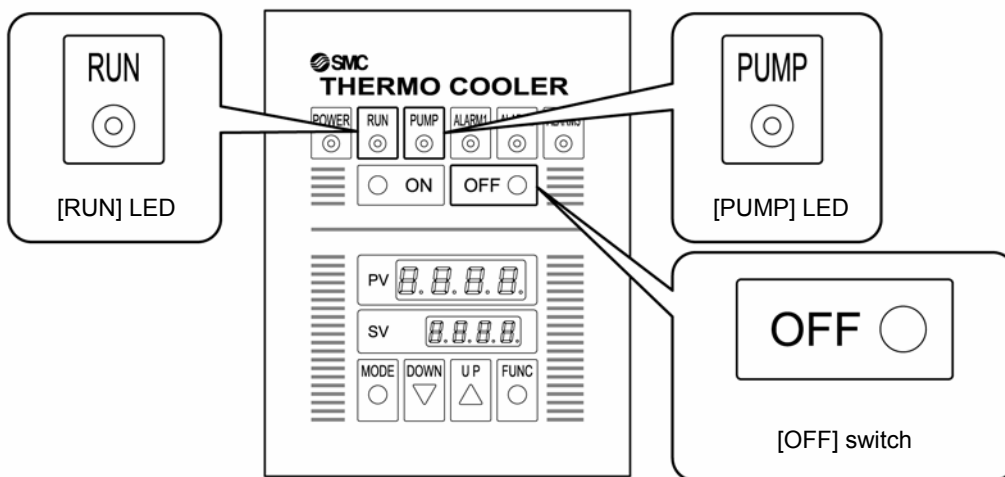


Fig. 4-6 Stopping the Unit

4.4 Check at startup

Check the following items at startup of the unit.

⚠ WARNING



When any abnormality is found, press the [OFF] switch immediately to stop the unit and turn the main power supply off.

- No leak from circulating fluid piping
- No circulating fluid flowing out of the overflow outlet and tank drain port
- Circulating fluid pressure within the specified range

■ Bypass valve

Normally, the bypass valve is fully opened. If the unit is started up with the valve fully closed, circulating fluid supply may reach abnormal high pressure depending on external piping conditions. Be sure to keep the bypass valve fully opened for initial startup of the unit installed.

Adjust the bypass valve to obtain required pressure and flow rate by checking on the external pressure gauge and flow meter that can be prepared by customer or mounted on external piping.

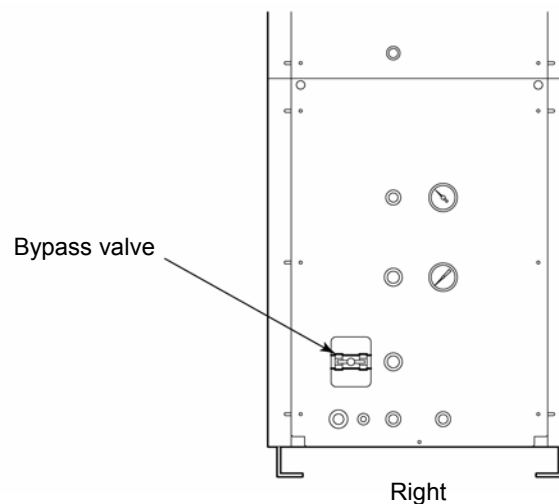


Fig. 4-7 Bypass Valve

■ Bypass (relieving valve) piping set

[Tips]

Bypass (relieving valve) piping sets listed in table 3-7 “Allied Products” are of use for the omission of manual bypass valve adjustment.

[Tips]

Relieving valve

The relieving valve automatically opens when the circulating fluid outlet pressure of the thermo cooler surpasses the set value. The relieving valve is designed to bypass the circulating fluid that prevents a pressure rise during fluid flow at low rate.

Chapter 5 Error Message and Troubleshooting

5.1 Error Message

This product stops when an error is detected.

Table 5-1 shows the LED conditions (ON/OFF) and signal output in the event of the error.

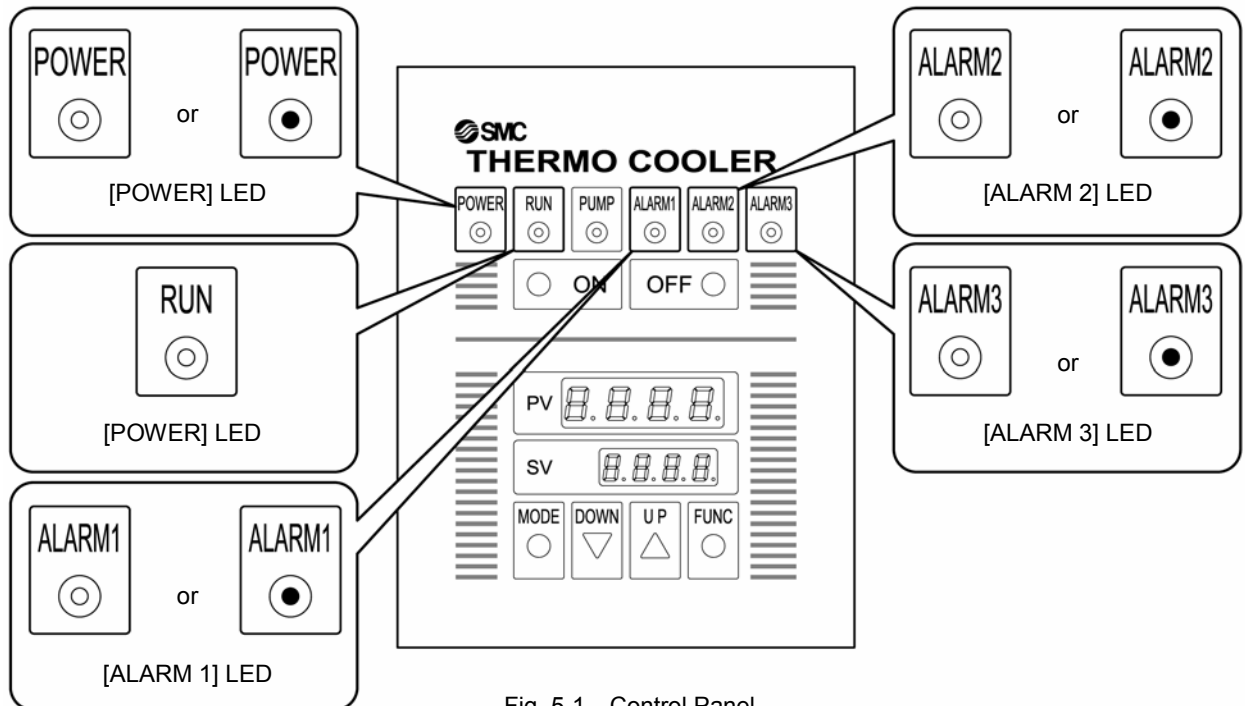


Fig. 5-1 Control Panel

Table 5-1 Error Message

| Alarm | Setting range | System status | LED (●: Off, ○: On) | | | | | Operation signal output | Error stop signal output |
|-------------------------------------|--|---------------|------------------------|-----|--------|--------|--------|-------------------------|--------------------------|
| | | | POWER | RUN | ALARM1 | ALARM2 | ALARM3 | | |
| Power error | - | Stopped | ○ | ○ | ○ | ○ | ○ | Open contact | Closed contact |
| Start-up failure | - | Stopped | Green● | ○ | ○ | ○ | ○ | Closed contact | Closed contact |
| Reverse of pump and compressor | - | Stopped | Green● | ○ | Red● | ○ | ○ | Open contact | Open contact |
| Tank fluid level drop | Lower limit of fluid level in the tank | Stopped | Green● | ○ | Red● | ○ | ○ | Open contact | Open contact |
| Suspension of facility water supply | - | Stopped | Green● | ○ | Red● | ○ | ○ | Open contact | Open contact |
| Pump overload | - | Stopped | Green● | ○ | ○ | Red● | ○ | Open contact | Open contact |
| High temp. of supplied fluid | 40°C and over | Stopped | Green● | ○ | ○ | Red● | ○ | Open contact | Open contact |
| Compressor overload | - | Stopped | Green● | ○ | ○ | ○ | Red● | Open contact | Open contact |

5.2 Troubleshooting

See “5.3 Alarm Reset” for error recovery.

Table 5-2 Troubleshooting

| Error | Cause | Remedies | Alarm reset | |
|-------------------------------------|---|--|--------------------------------------|--|
| | | | Detector | HRG |
| Power error | No power is supplied. | With the switch in its ON position, supply the main power. Only qualified personnel are allowed for power wiring. | - | - |
| | Open phase | Supply 3-phase power (R- and S-phases). Only qualified personnel are allowed for power wiring. | | |
| | Overcurrent | Request for service. Turn ON the breaker. | Manual reset *1) | |
| | Ground fault | Request for service. Turn ON the breaker. | | |
| Start-up failure | Low voltage | Supply a rated voltage. Only qualified personnel are allowed for power wiring. | - | - |
| Reverse of pump and compressor | Incorrect phase sequence of power wiring | Rewire the power cable for two of three phases (phase sequence). Only qualified personnel are allowed for power wiring. | Auto reset *2) | Manual reset (yellow button) *3) |
| Tank fluid level drop | Inadequate quantity of the fluid in the tank, or drop in the tanked fluid level | Replenish the circulating fluid (fresh water). | | |
| Suspension of facility water supply | Supplied facility water falls short of its specified volume. | Press the reset button of the high pressure cutoff switch. Supply facility water standing at 5 to 32°C. | Manual reset (red button) *1) | Manual reset (yellow button) *3) |
| Pump overload | Abnormal rise in fluid supply pressure | Press the reset button of the pump electromagnetic switch (MS1). Adopt a pipe size suitable for circulating fluid flow, or, adjust the opening of the manual relief valve. | Manual reset (blue button) *1) | Manual reset (yellow button) *3) |
| | Failure in the pump motor | Request for service. | | |
| High temp. of supplied fluid | Abnormal rise in ambient temperature | Improve ambient conditions to provide ventilation and exhaust heat. Keep the unit out of direct sunlight and radiant heat. | Auto reset *2) | Manual reset (yellow button) *3) |
| | Excessive calorific value of the chiller | Reduce a calorific value output from your unit. | | |
| | Refrigerant leak | Request for service. | | |
| | Compressor error | Request for service. | | |
| | Failure in the electromagnetic switch | Request for service. | | |
| | Other errors in the refrigerating circuit | Request for service. | | |
| Compressor overload | Failure in the temp. controller | Request for service. | Manual reset (blue button) *1) | Manual reset (yellow button) *3) |
| | Excessive calorific value of the chiller | Press the [RESET] button of the compressor electromagnetic switch (MS2). Reduce a calorific value output from your system. | | |
| | Failure in the compressor motor | Request for service. | | |

- *1) The recovery from an error capable of manual alarm reset takes place with the use of the switch and reset button after the cause (such as fluid level drop or abnormal temperature) is eliminated.
- *2) The recovery from an error capable of automatic alarm reset takes place when the cause (such as fluid level drop or abnormal temperature) is eliminated after waiting period.
- *3) With the tripped detector located, be sure to press the [RESET] button (yellow button) of the system electrical unit after the elimination of the error cause. The alarm lamp goes out that enables the unit to resume.

5.3 Alarm Reset (Alarm Lamp OFF)

■ Error check

1. Check the alarm number currently activated, and eliminate the error cause (see Table 5-2).
 Adjust the unit usage and service condition.

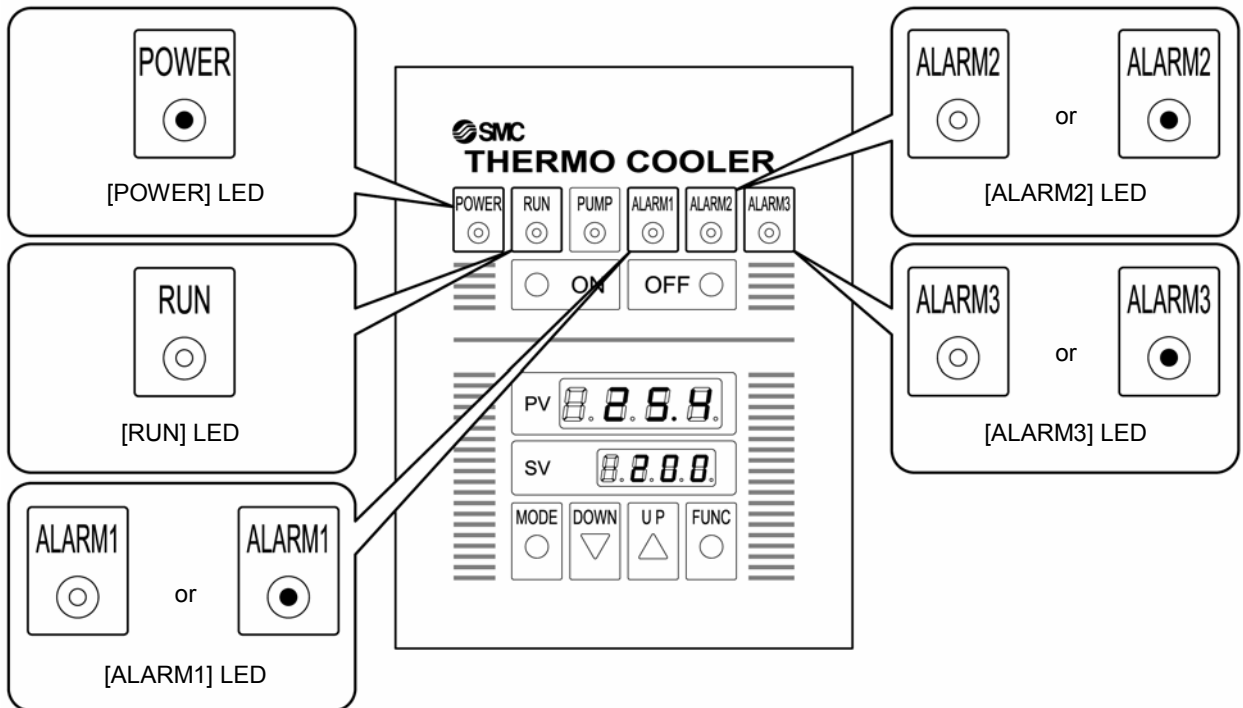


Fig. 5-2 Alarm Lamps (ON)

| | | |
|-------------|-------|---------------------------------|
| [ALARM1] ON | | Installation error |
| [ALARM2] ON | | Circulating fluid circuit error |
| [ALARM3] ON | | Refrigerating circuit error |

2. Undo the screws (6 pcs.) to remove the front panel.

⚠ WARNING



Only operate the unit with the cover panel attached. The unit contains the power supply carrying high voltage inside that is isolated with the cover panel.

⚠ WARNING




Only trained personnel are allowed to work, including unit inspection, around the power supply.

⚠ WARNING



There is the presence of the surface in the unit that is at high temperatures during operation. Potential burns may occur if touched. Residual heat may cause burns despite the power being turned OFF. Be sure of the surface reaching room temperature before work.

⚠ WARNING



The unit contains a section which rotates when it is in action. Potential personal injury may occur if touched. A rotator is structured to come to a temporary stop and resume rotation. Avoid performing work during system operation.

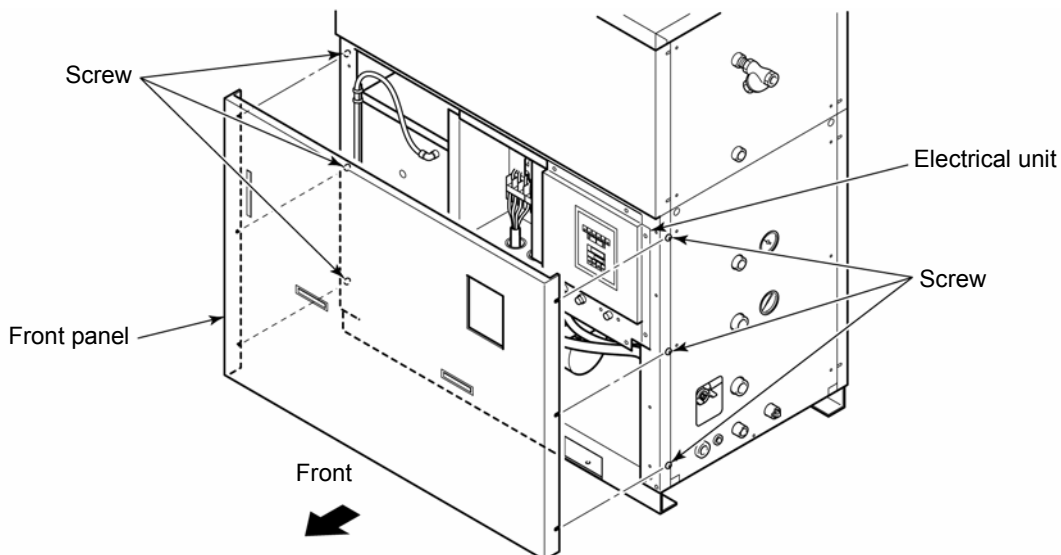


Fig. 5-3 Removal of Front Panel

3. Press the Reset switch [RS] (yellow button) on the control panel and make sure that the alarm lamp goes out.

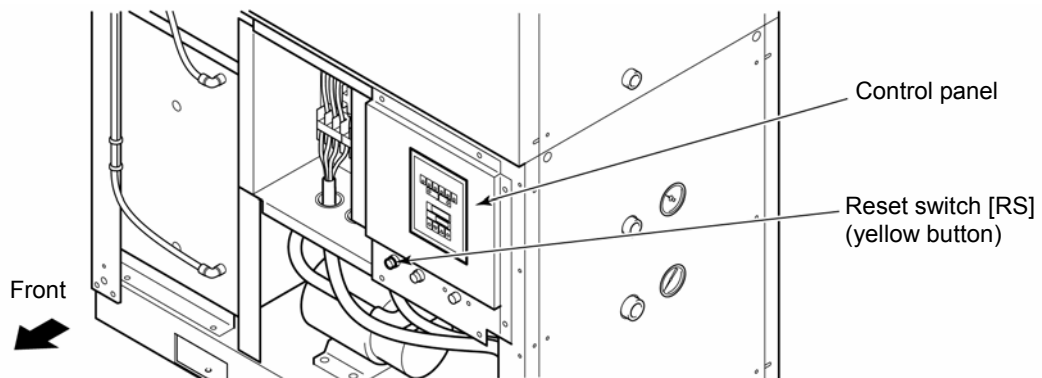


Fig. 5-4 Location of Reset Switch [RS] (Yellow Button)

- When the alarm lamp goes out by performing steps 1. to 3.

4. Attach the front panel.

5. Implement system startup and shutdown according to “Chapter 4 Startup and Shutdown”.

- When the alarm lamp remains on after performing steps 1. to 3.

6. Press the reset button of each detector in the electrical unit.

7. Follow step 3. to press the Reset switch [RS] (yellow button).

The alarm lamp goes out accordingly.

8. Implement system startup and shutdown according to “4.3 Unit Startup and Shutdown”.

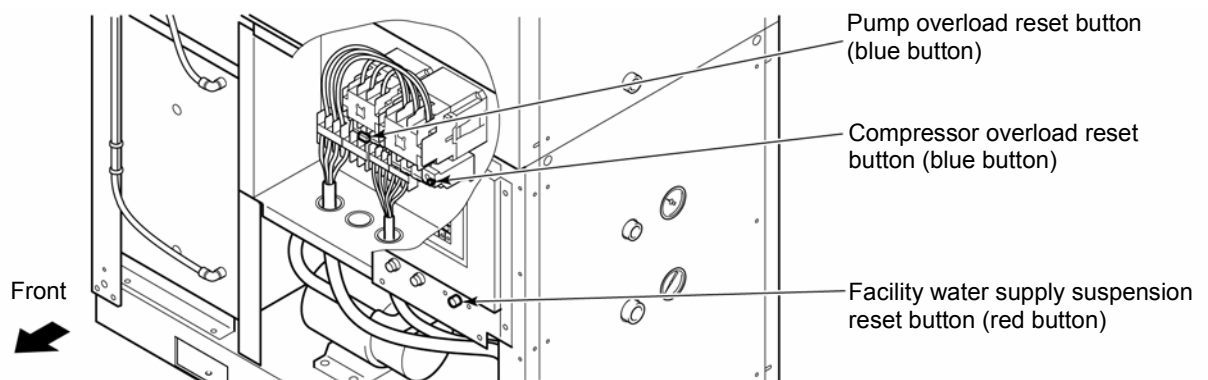


Fig. 5-5 Location of Reset Switch [RS] (Yellow Button)

5.4 Recovery from Power Failure (POWER Lamp ON)

■ Power error check

1. Request an expert engineer to eliminate the cause of a power failure (such as a ground fault and overcurrent).

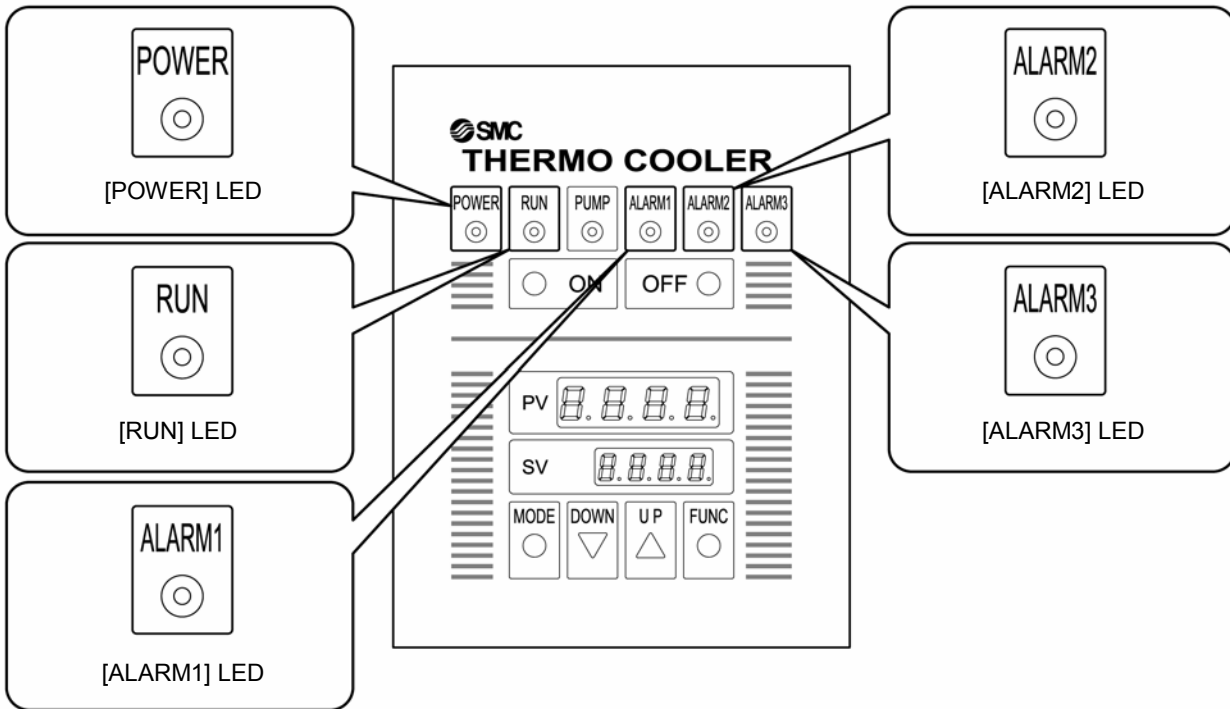


Fig. 5-6 POWER Lamp (OFF)

[POWER] lamp OFF Power supply error (power failure)

2. Turn on the main power breaker of your unit, and ensure the [POWER] lamp comes on.

■ [HRG010-W-B / HRG015-W-B (earth leakage breaker-mounted option)]

1. Undo the screws (6 pcs.) to remove the front panel.

⚠ WARNING



Only operate the unit with the cover panel attached.
The unit contains the power supply carrying high voltage inside that is isolated with the cover panel.

⚠ WARNING



Only trained personnel are allowed to work, including unit inspection, around the power supply.

⚠ WARNING



There is the presence of the surface in the unit that is at high temperatures during operation. Potential burns may occur if touched. Residual heat may cause burns despite the power being turned OFF. Be sure of the surface reaching room temperature before work.

⚠ WARNING



The unit contains a section which rotates when it is in action. Potential personal injury may occur if touched. A rotator is structured to come to a temporary stop and resume rotation. Avoid performing work during system operation.

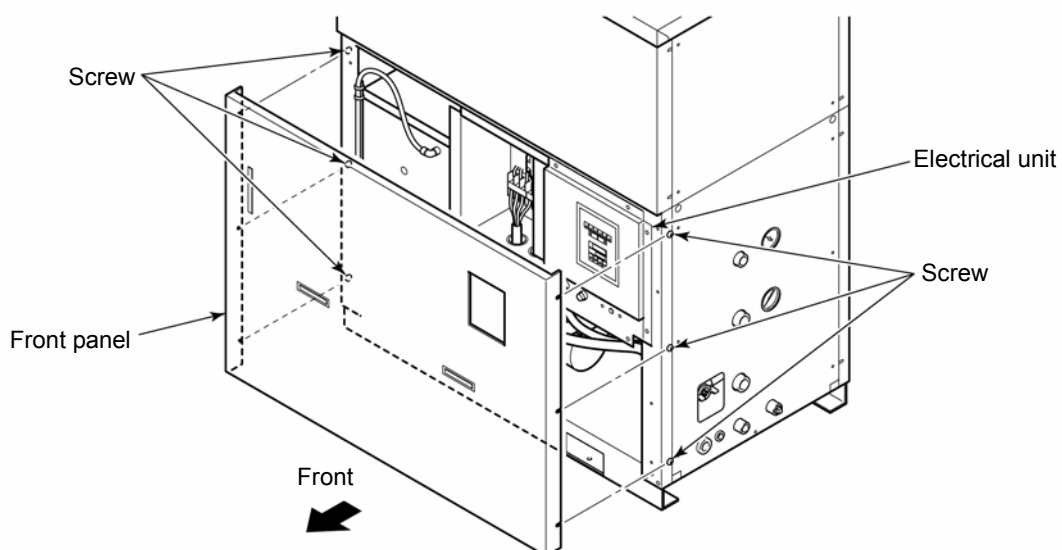


Fig. 5-7 Removal of Front Panel

2. Check the earth leakage breaker on the electrical board of the electrical unit.

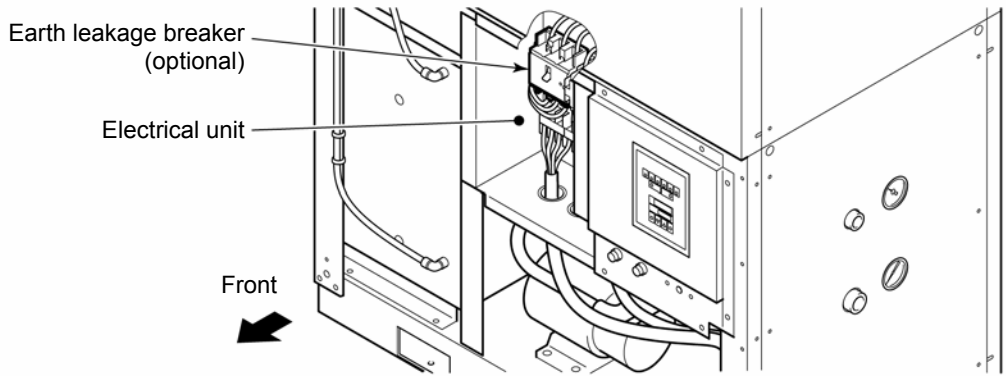


Fig. 5-8 Location of Earth Leakage Breaker (Optional)

3. Switch off the earth leakage breaker once.

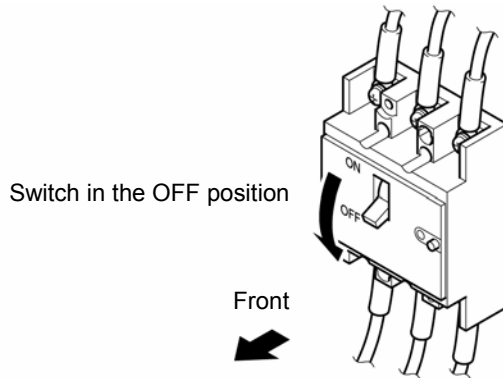


Fig. 5-9 Earth Leakage Breaker (OFF)

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

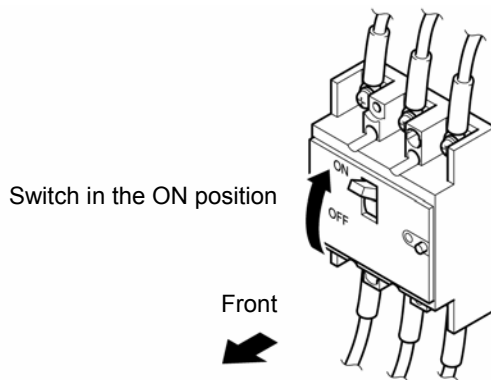



Fig. 5-10 Earth Leakage Breaker (ON)

Chapter 6 Unit Maintenance

6.1 Control of Water Quality

⚠ CAUTION



The circulating fluid used in this unit is fresh water (tap water). This unit may be damaged when unpermitted fluids are used. Potential fluid leak may occur if disregarded, which results in electric shock and ground fault. **ONLY use fresh water (tap water) which satisfies water quality standards as shown in the table below.**

Table 6-1 Water quality standards for fresh water (tap water)


| | Substances | Facility water spec. | Circulating fluid spec. |
|----------------|--|---------------------------|--|
| Standard | pH (25°C) | 6.5 to 8.2 | 6.0 to 8.0 |
| | Electrical conductivity (25°C) (µs/cm) | 100 ^(*) to 800 | 100 ^(*) to 300 ^(*) |
| | Chloride ion (mgCl-/L) | 200 and below | 50 and below |
| | Sulfuric acid ion (mgSO ₄ ²⁻ /L) | 200 and below | 50 and below |
| | Acid consumption (pH4.8) (mgCaCO ₃ /L) | 100 and below | 50 and below |
| | Total hardness (mgCaCO ₃ /L) | 200 and below | 70 and below |
| | Calcium hardness (mgCaCO ₃ /L) | 150 and below | 50 and below |
| | Ion silica (mgSiO ₂ /L) | 50 and below | 30 and below |
| | Iron (mgFe/L) | 1.0 and below | 0.3 and below |
| | Copper (mgCu/L) | 0.3 and below | 1.0 and below |
| | Sulfide ion (mgS ²⁻ /L) | Not detected | |
| | Ammonium ion (mgNH ₄ ⁺ /L) | 1.0 and below | 0.1 and below |
| | Residual chlorine (mgCl/L) | 0.3 and below | 0.3 and below |
| | Free carbon dioxide (mgCO ₂ /L) | 4.0 and below | 4.0 and below |
| Filtering (µm) | 5 and below | | |

* Refrigeration and Air Conditioning Equipment Water Quality Guideline JRA-GL-02-1994

(*1) Electrical conductivity: Min. 100[µS/cm]

(*2) 0.003 to 0.01 if the unit of M[Ω·cm] is used.

CAUTION



If the periodic inspection finds a nonconforming substance in the facility water, wash the tank and the circulating circuit, and replace the water in the tank. Water will evaporate, and impurities will build up. Even if no abnormal event occurs, it is recommended to replace the water in the tank once every three months. Refer to section "6.2 Inspection and Cleaning" for the periodic inspection.

6.2 Inspection and Cleaning

WARNING



Do not operate the switches, etc. with wet hands and do not touch any electrical components such as a power supply plug. It may cause an electric shock if disregarded.

WARNING



Keep this unit from water.
Do not wash the unit with water. It may cause an electric shock and fire if disregarded.

WARNING



Cut off the power supply of the unit before performing cleaning, maintenance and inspection. It may cause an electric shock, injury or burn if disregarded.

WARNING



Always mount the panel back onto the unit after removing the panel for inspection or cleaning. Failure to close or re-attach the panel may cause personal injury or electric shock during unit operation.

6.2.1 Daily inspection

Perform daily inspection of the items listed in the Table 6-2. If the check finds any abnormal event, stop system operation and turn off the main power supply. Request for service promptly.

Table 6-2 Daily Inspection

| Inspection item | Inspection method | |
|-----------------------------------|---|--|
| Installation condition | Check of the condition of unit installation | No heavy object is placed on this unit. This unit should not be subjected to external force. |
| | | Temperature and humidity fall within the specified range. |
| Fluid leak | Check of the piping connector section | No leak of facility water and circulating fluid from the piping connector sections |
| Water supply | Confirm the reading on the level indicator | The fluid level falls within the specified range. |
| Operation panel | Display check | The display assures sharp image and numbers. |
| | Function check | The lamp is ON. |
| Circulating fluid temperature | Confirm the reading on the LCD screen | Normal temperature should be assured for system use. |
| Circulating fluid outlet pressure | Confirm the reading on the circulating fluid pressure gauge | Normal pressure should be assured for system use. |
| Refrigerant high pressure | Confirm the reading on the refrigerant high pressure gauge | Normal flow rate should be assured for system use. |
| Operating condition | Operating condition check | No abnormal noise, vibration, odor and smoke |
| Facility water | Check of facility water condition | Temperature, flow rate, and pressure fall within the specified range. |

If the above check finds any abnormal event, bring the unit to a halt and turn off the main breaker. Make sure to perform lockout and tagout before requesting technical service.

6.2.2 Quarterly inspection

■ Replacement of circulating fluid

- **Periodic replacement of circulating fluid (fresh water)**

Potential algae growth or aqueous corrosion may occur if the old fluid is reused. Assure a periodic replacement of the fluid according to the situation.

- **Cleaning of tank**

Check the circulating fluid in the tank for impurities and foreign matters, and the tank for slime inside. Assure a periodic cleaning of the tank.

■ Cleaning of facility water

- Water quality standards for facility water should fall within specifications.

- Assure a periodic cleaning of facility water equipment and a periodic replacement of facility water.

6.2.3 Biannual inspection

■ Check for leak from the pump mechanical sealing

Remove the panel and check for leak from the pump mechanical sealing. When a leak is found, it is necessary to replace the mechanical sealing. Contact the local distributor or SMC's sales branch.

CAUTION

- **Leak from the mechanical sealing**

Leakage from the mechanical sealing occurs in structure. Although JIS defines leakage for 3cc/hr or less (reference value), 0.3cc/hr or more is our leakage standard suggested for the replacement of the mechanical sealing.

A recommended replacement cycle of the mechanical sealing is 6000 to 8000 hours a year (usually).

6.2.4 Check during wintertime

■ Antifreeze of circulating fluid

This unit is resistant to freezing of the circulating fluid during wintertime and nighttime.

Ensure the following measures are taken in advance if potential frost damage may occur in response to changes in the installation and use environments (including operating period and weather).

1. Leave the power on (the [POWER] lamp remains on, and the [RUN] lamp remains off).
2. Fully open valves laid with pipes on your unit to allow the circulating fluid to flow upon automatic pump operation.

■ Antifreeze function (automatic pump operation)

- (1) After performing steps 1. and 2., automatic pump operation takes place when the circulating fluid drops 3°C or below.
- (2) The circulating fluid is heated by pump power output.
The pump comes to an automatic stop when the circulating fluid reaches 5°C or higher.
- (3) The circulating fluid is allowed to be in the 3- to 5-°C range in temperature that is resistant to freezing.

CAUTION



- **Contact expert engineers.**
Complete prevention of freezing the fluid may if the unit is installed in an intensely cold place.
The above usage conditions require an addition of other antifreezing unit (such as a commercial tape heater).

6.3 Consumables

Replace the following parts in response to the level of wearing out at inspection.

Table 6-3 Consumables

| Part number | Part | Qty. | Remarks |
|-------------|---------------------|-------|-------------------------|
| HRG-S0034 | Mechanical seal set | 1 set | Service part for HRG010 |
| HRG-S0035 | Mechanical seal set | 1 set | Service part for HRG015 |

6.4 Long-term Storage

Follow the procedures below for long-term storage of the unit or for anti-freezing of the fluid during wintertime.

- 1.** Turn off the main power breaker.

- 2.** Undo the tank drain hole plug to drain the fluid.

- 3.** Remove the top front panel. Open the internal valve (for draining facility water) to drain facility water. Drain facility water from the overflow outlet completely.

- 4.** Cover the unit with a plastic sheet for storage after draining is completed.

Chapter 7 Documents

7.1 Standard Specifications

Table 7-1 Standard Specifications (1/2)

| Item | | HRG010-W | HRG015-W |
|--|---|---|---|
| Installation Operating environment | Rated ambient temp. | 32°C (5 to 40°C) | |
| | Humidity range | 45 to 75%RH (No condensation) | |
| Fluid used | | Circulating fluid/fresh water (tap water) or fluids resistant to corrosion of a wetted surface (such as SUS304 and PVC) | |
| Rated capacity of tank | | 40L | 50L |
| Input | Supply voltage | 3-phase AC200(50Hz), AC200 to 220V (60Hz) | |
| | Recommended earth leakage breaker capacity, Sensitivity current | 40A, 30mA | 60A, 30mA |
| | Rated power consumption | 3.2/3.8 - 3.8 kW | 4.7/5.8 - 5.8 kW |
| | Rated operating current | 12.0/12.5 - 12.5A | 18.0/19.0 - 19.0A |
| | Rated consumption electric energy | 3.2/3.8 - 3.8 kWh/h | 4.7/5.8 - 5.8kWh/h |
| | Facility water | Supply temp.: 25°C (5 to 32°C), Flow rate: Max. 33/34L/min, IN/OUT differential pressure: Max. 0.25/0.2MPa, Max. supply press.: 0.3 to 0.4MPa, Exhaust heat: Approx. 16W | Supply temp.: 25°C (5 to 32°C), Flow rate: Max. 38/40L/min, IN/OUT differential pressure: Max. 0.25/0.2MPa, Max. supply press.: 0.3 to 0.4MPa, Exhaust heat: Approx. 23W |
| | Start/stop command signal | Remote operation starts upon application of DC24V and 8 mA, and stops at DC0V. | |
| Output | Rated temp. / accuracy of circulating fluid | 20±1.0°C (only under given load condition) | |
| | Temp. range of circulating fluid | 5 to 35°C | |
| | Rated cooling capacity | 10.0/11.0 kW (50/60 Hz, 20°C at outlet, 37/49L/min of flow) | 14.5/16.5kW (50/60 Hz, 20°C at outlet, 42/54L/min of flow) |
| | Rated heating capacity | - (1.1kW of pump motor output only) - (0.75kW of pump motor output only) | |
| | Pumping capacity | Max. head: 50/50m (50/60Hz, 0/0L/min of flow, 0.49/0.49MPa of supply pressure) 37/49L/min 42/54L/min | |
| | Rated flow | (50/60Hz, 25/25m of the max. head, 0.29/0.33MPa of supply pressure) 48/60L/min | (50/60Hz, 25/25m of the max. head, 0.28/0.31MPa of supply pressure) 54/65L/min |
| | Max. flow rate | (50/60Hz, 0/0m of the max. head, 0.08/0.12MPa of supply pressure) | (50/60Hz, 0/0m of the max. head, 0.05/0.09MPa of supply pressure) |
| | Output signal | Op. signal | Relay contact (AC250V of contact capacity, 1A, resistance load. Contact closes during operation, and contact opens during stop and during power-off.) |
| | Emergency stop signal | 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.) | |
| Temperature control | | Combined use of temperature control through compressor operation (ON/OFF) and capacity control through solenoid valve control (ON/OFF) | |
| Display | Operation panel | 7segment digital display, capable of display in 0.1°C increments PV (operating temp.): 4-digit display in green, SV (set temp.): 4-digit display in red Other display lamps: ALARM1 to 3 individual display in the event of an error) | |
| | Refrigerant high pressure gauge | Range: -0.1 to 3.5 MPa | |
| | Refrigerant pressure gauge | Range: 0 to 1.0 MPa | |
| | Level indicator | SMC Ø-10 tube TU1065C (transparent) | |

Table 7-1 Standard Specifications (2/2)

| Item | | HRG010-W | HRG015-W |
|--|---|--|--|
| Protective function (for equipment) | Emergency stop | ALARM1 | System stop function for low tank level (tank level switch), pump/compressor reverse rotation detection (phase relay) Protection against refrigerant pressure rise (with a high pressure cutoff SW configured to control pressure to 3.0MPa) |
| | | ALARM2 | System stop function for pump overload (overcurrent relay), system stop function for abnormal circulating fluid temperature rise (set temp. of the temperature controller: 43°C) |
| | | ALARM3 | System stop function for compressor overload (overcurrent relay) |
| | | Others | Protection against supply pressure rise (with a manual relief valve), Antifreezing temperature control (with an auto pump opera on temperature controller) |
| Material/Substance | External panel | SGCC (Munsell 10Y8/0.5 Urban white) | |
| | Operation panel | SGCC (DIC183 Blue) | |
| | Base | SECC (Munsell 10Y6/0.5 Urban gray) | |
| | Wetted part | SUS (tank, pump impeller, circulating fluid IN/OUT), BC (pump casing, hose fitting), PVC Nylon 12, Synthetic rubber (pipe hose), Polyurethane (limnimeter) | SUS (tank, circulating fluid IN/OUT), BC (pump impeller, pump casing, hose fitting), PVC Nylon 12, Synthetic rubber (pipe hose), Polyurethane (limnimeter) |
| | Internal piping for refrigerant | C1220T | |
| | Refrigerant used | R407C (HFC) | |
| | Refrigerant supplied amount | 1400±20g | 1700±20g |
| Accessories | Eye bolt M12 × 4 pcs., Y-shaped strainer Rc1/2 × 1 pcs., nipple for strainer piping 1/2 × 1 pcs | Eye bolt M12 × 4 pcs., Y-shaped strainer Rc3/4 × 1 pcs., nipple for strainer piping 3/4 × 1 pcs | (A power supply, signal cable and connection terminal must be prepared under your responsibility.) |
| Weight | 200kg | 220kg | |

7.2 Optional Specifications

■ Caster

Table 7-2 Caster with Brake

| Item | Specifications |
|----------------------------------|--|
| | For HRG010-W-A, HRG015-W-A |
| Wheel diameter | 63mm |
| Turning radius of the caster | 59mm (single) |
| Adjuster height adjustable range | 0 to 12.5mm |
| Materials | Caster: SPCC, Wheel: Nylon (Base with casters: SUS304) |
| Allowable load | 520kg (130kg per caster, 4 pcs.) |

■ GFCI breaker

Table 7-3 GFCI Breaker

| Item | Specifications | |
|---|---|----------------|
| | For HRG010-W-B | For HRG015-W-B |
| Pole | 3 | |
| Rated sensed current | 30mA | |
| Rated interrupting current | 40A | 60A |
| Operating time in the event of a ground fault | 0.04s (rated sensed ground-fault current) | |
| Display type | Mechanical button | |

■ Communication

Table 7-4 RS485 Communication

| Item | Specifications |
|-----------------------|--|
| | For HRG010-W-C, HRG015-W-C |
| Spec. | Adhering to EIA specification and RS-485 |
| BCC check function | Enabled (default) |
| Data length | 8 bits (default) |
| Parity check function | Disabled (default) |
| Stop bit length | 2 bits (default) |
| Baud rate | 9600bps (default) |
| Communication address | 1 station (default) |
| Delay transmission | 0msec (default) |
| Communication mode | Writing and reading enabled (default) |
| Connector number | 37, 38 |
| Connector type | M4 terminal block |

7.3 Outline Dimensions

7.3.1 HRG010-W, HRG010-W-B, HRG010-W-C, HRG010-W-BC HRG015-W, HRG015-W-B, HRG015-W-C, HRG015-W-BC

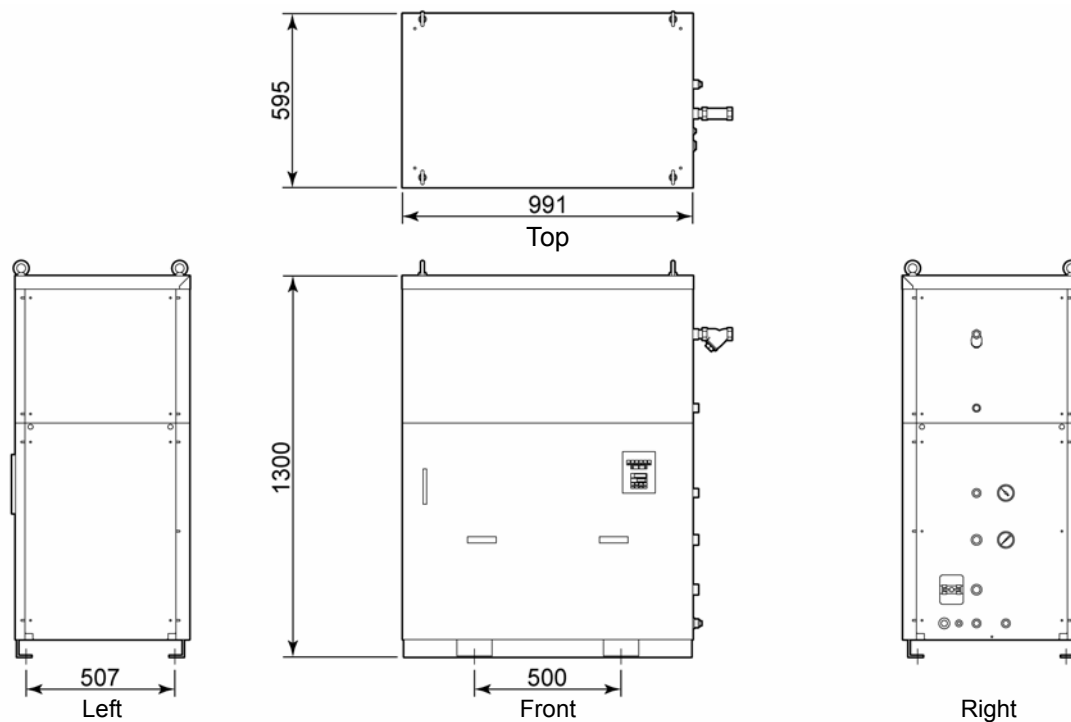


Fig. 7-1 Outline Dimensions

7.3.2 HRG010-W-A , HRG015-W-A

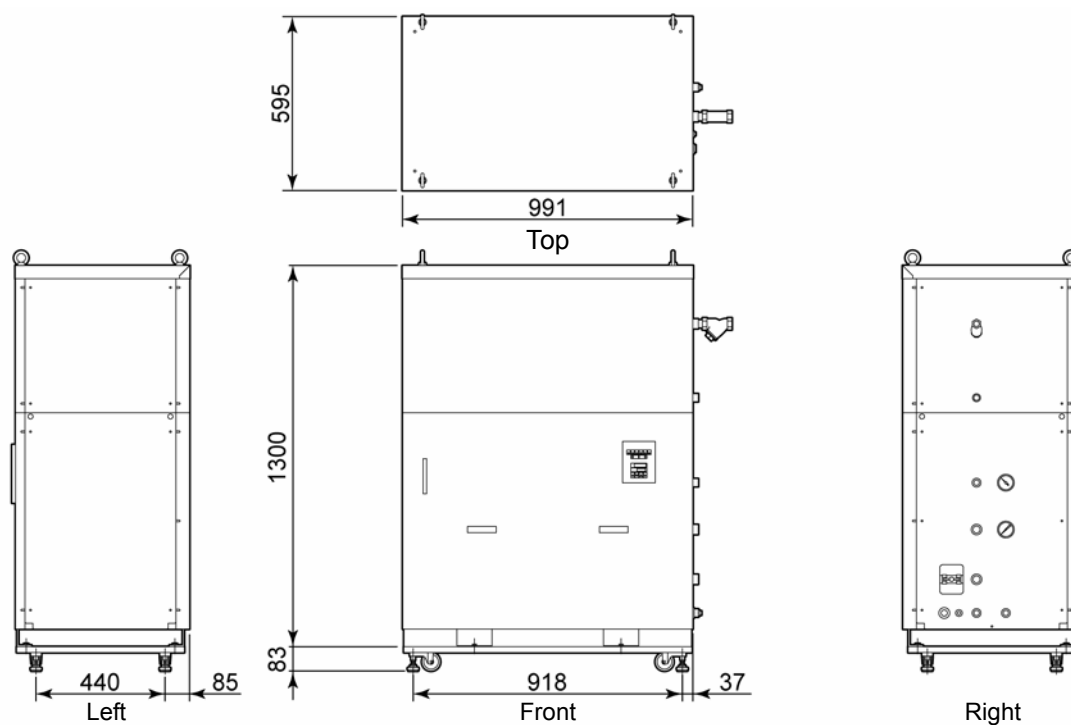
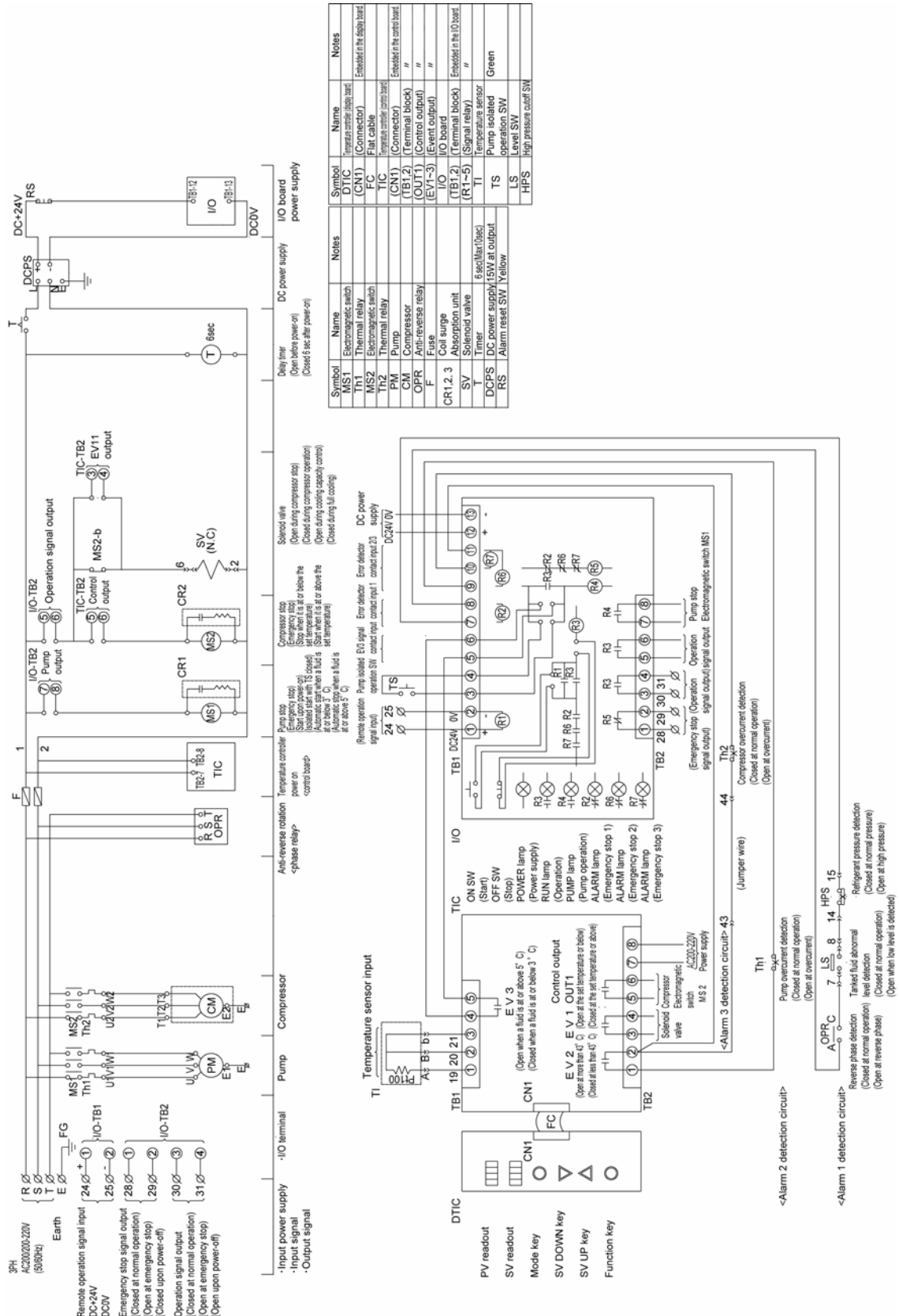


Fig. 7-2 Outline Dimensions

7.4 Electric Circuit

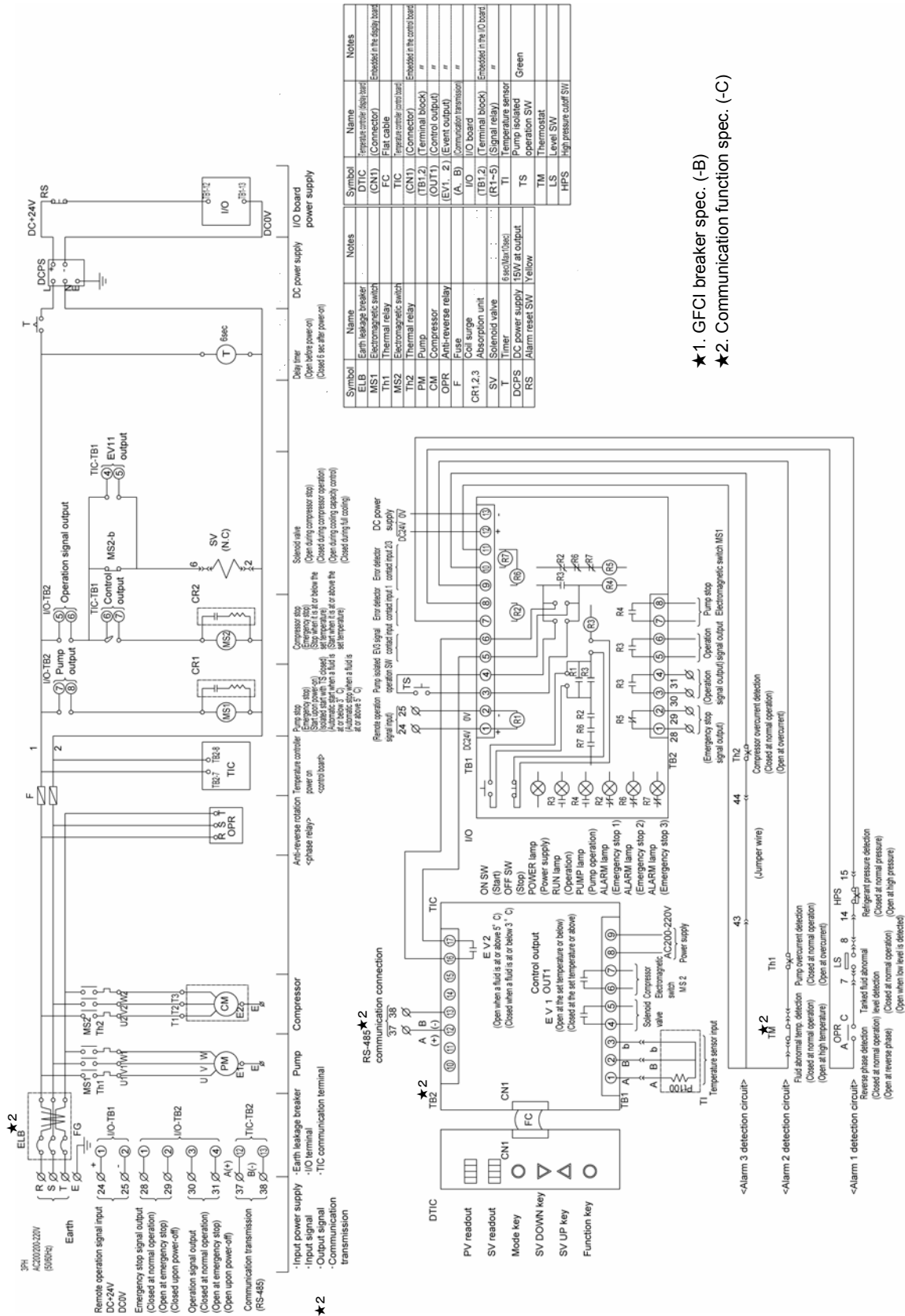
7.4.1 HRG010-W, HRG015-W



| Symbol | Name | Notes | Symbol | Name | Notes |
|---------|------------------------|-----------------|---------|---------------------------------|-------------------------------|
| MS1 | Electromagnetic switch | | DTIC | Temperature sensor (split base) | |
| TI1 | Thermal relay | | CN1 | (Connector) | Embedded in the display board |
| MS2 | Electromagnetic switch | | FC | Fair cable | |
| PIZ | Thermal relay | | CN1 | (Connector) | Embedded in the control board |
| CM | Compressor | | (TB1.2) | (Terminal block) | |
| OPR | Anti-reverse relay | | (OU1.1) | (Zero output) | |
| F | Fuse | | (EVI-3) | (Event output) | |
| CR1.2.3 | Coil surge | | I/O | I/O board | |
| SV | Absorption unit | | (TB1.2) | (Terminal block) | Embedded in the I/O board |
| T | Timer | 6 s(0.1s)(1sec) | (R1-5) | (Signal relay) | |
| DCPS | DC power supply | 15W at output | TS | Pump isolated operation SW | Green |
| RS | Alarm reset SW | Yellow | LS | Level SW | |
| | | | HPS | High pressure cutoff SW | |

Fig. 7-3 Electric Circuit (HRG010-W, HRG015-W)

7.4.2 HRG010-W-BC, HRG015-W-BC



- ★1. GFCI breaker spec. (-B)
- ★2. Communication function spec. (-C)

Fig. 7-4 Electric Circuit (HRG010-W-BC, HRG015-W-BC)

7.5 Flow Chart

■ HRG010-W, HRG015-W

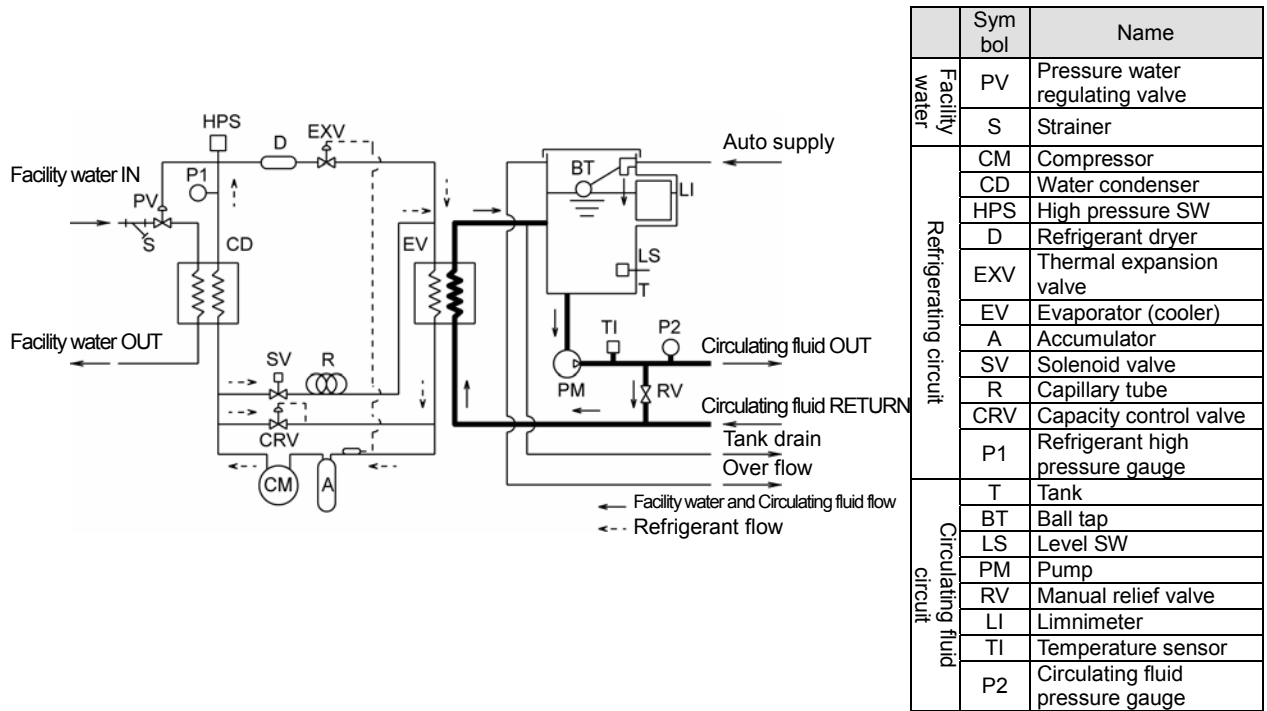


Fig. 7-5 Flow Chart (HRG010-W, HRG015-W)



Thermo Cooler (HRG010-W / WRG015-W) Daily Inspection Sheet

Model: _____
 Serial No. _____

To confirm daily inspection items on the Thermo Cooler, See "Table 6-2 Daily Inspection" in "Daily inspection" of "Chapter 6 Unit Maintenance".

Be sure to record the system condition upon its start-up after installation.

| Date | Your name | Installation | | Leakage | | Fluid (water) level | | Operation panel | | Circulating fluid temp. | Circulating fluid outlet press. | Refrigerant high press. | Operating condition | | Facility water | | | Judgment | | |
|------|-----------|--------------|------------|-------------------|----------------|---------------------|---------|-----------------|-----|-------------------------|---------------------------------|-------------------------|---------------------|-------|----------------|-----------------|------------------|----------|--|--|
| | | Temp. °C | Humidity % | Circulating fluid | Facility water | Range | Display | Function | MPa | | | | MPa | Error | Temp. °C | Flow rate L/min | Inlet press. MPa | | | |
| | | | | | | | | | | | | | | | | | | | | |
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Product Warranty

1. Warranty

If a failure is observed in our Thermo Cooler, repair shall be provided in accordance with the warranty period and preconditions defined below at SMC's option.

Repair involves the inspection and/or replacement and/or modification of a defective part.
Removed parts shall become the possession of SMC.

2. Warranty period

The warranty period of the product shall be 1 year from the date of your purchase.

3. Warranty exemption

SMC's liability under this warranty shall not be available for the following troubles and damages.

- (1) Troubles or damage caused by the neglect of our designated inspection (daily inspection, periodic inspection)
- (2) Troubles or damages caused by mishandling such as using improper operating procedure and using with our specifications violated
- (3) Troubles or damages caused by unauthorized modification.
- (4) Troubles or damages caused by the use of a not-designated circulating fluid and facility water
- (5) Troubles or damages caused by wearing out such as fading on the coated or plated surface
- (6) Sensory phenomena that are considered no effect on the functions (such as noise, vibration)
- (7) Troubles or damages caused by natural disaster such as earthquake, typhoon, water, inevitable events and fire
- (8) Troubles or damages occurred under the installation conditions defined in the Operation Manual
- (9) Troubles or damages that are not compliant with the "5. Warranty preconditions"

4. Escape clause

- (1) Expenses of daily inspection and periodic inspection
- (2) Expenses of repair consigned with neither SMC nor our authorized service station
- (3) Expenses of transport, installation, and removal of this system
- (4) Expenses of removal of non-genuine parts and replenishment of non-genuine fluids
- (5) Unavailability and loss due to this system being disabled
(such as telephone bill, leave compensation, commercial loss)
- (6) Expenses and compensation for terms other than provided in "1. Warranty"

5. Warranty precondition

Proper use and inspection of this system is required to assure safe use of this system. System warranty shall satisfy the following preconditions. Please take note that warranted repair shall not be available if these preconditions are disregarded.

- (1) System operation shall be conducted by following operating procedure defined in the Operation Manual.
- (2) Daily and periodic inspections designated in the Operation Manual shall be made as scheduled.
- (3) Inspection record shall be entered in the Daily Inspection Sheet provided in the Operation Manual.

6. Request for warranted repair

As to warranted repair, please contact the supplier you purchased this system from for service.
Warranted repair shall be on request basis.

Unrequited repair shall be provided in accordance with the warranty period, preconditions and terms defined above. Therefore, the repair service shall be available on a chargeable basis if a failure is detected after the warranty period.

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