



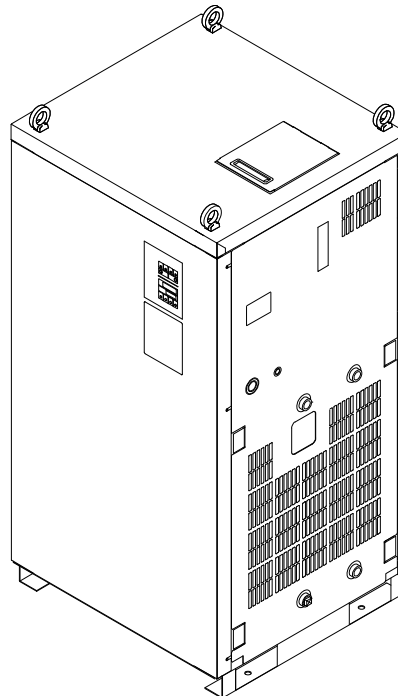
Operation Manual

Air-refrigerated Thermo cooler

HRG001-A

HRG002-A

HRG005-A



SMC Corporation

Save This Manual Carefully for Use at Any Time

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 this unit. Only those who have understanding of the operating procedure or have knowledge of the installation and operation of this unit are qualified to work with this unit.
- The contents of this manual and related documents shall be neither regarded as a provision of the contract nor utilized to correct or modify the existing agreements, commitments and relations.
- Copying, duplicating or transferring any part of or whole contents of this manual without SMC Corporation's permission is strictly prohibited.
- The Service Manual is supplied to provide additional information and troubleshooting of this unit. Only those who have full understanding of this unit are allowed to perform maintenance and repair of the unit with the use of the Service Manual.

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

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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 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 system, facility, or devices.

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.

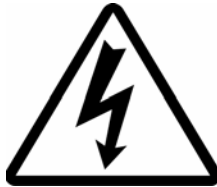
■ "Minor injury"

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	
	Do not operate the unit without cover panel mounted. The unit contains the power supply carrying high voltage inside that is isolated with the cover panel. Unit operation without the cover panel allows the high voltage to apply outside and cause injuries.



 WARNING	
	Only trained personnel are allowed to work 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	
	This symbol indicates the presence of a section where temperature reaches high and the operator sustains burns when coming in contact. Even after the power is turned off, residual heat may still cause burns. The work must not be started until the section drops to sufficiently low temperature.

■ 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 includes several parts which rotate during operation, and the operator who comes in contact may get injured. Even if that part seems to stop rotating, avoid touching it because the condition may be temporary and the rotation may restart.

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

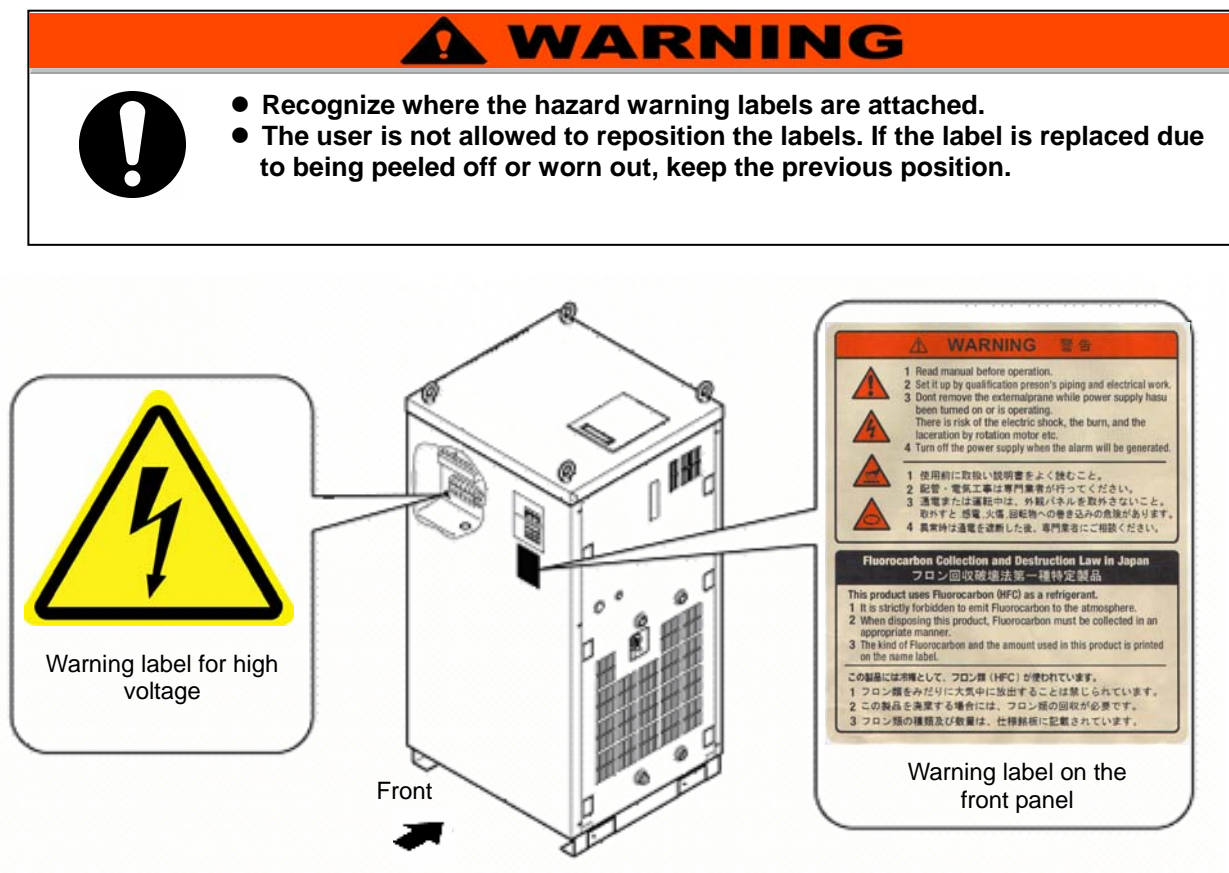


Fig. 1-3 Location of hazard warning label

1.4 Model label

Check the model no. described on the label.

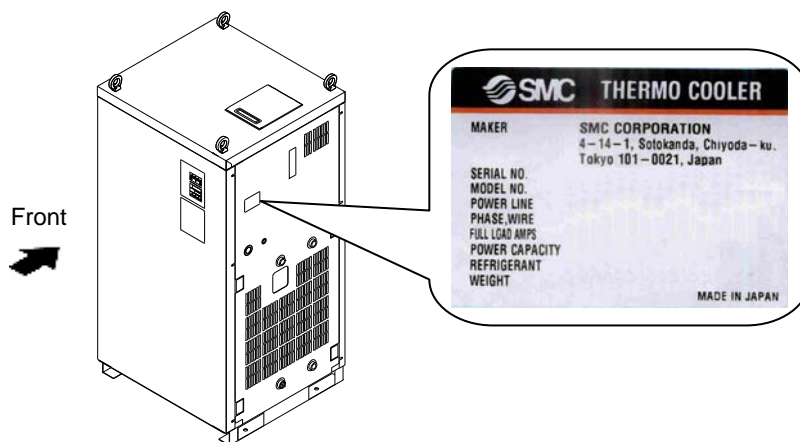


Fig. 1-4 Location of model label

1.5 Disposition of waste

1.5.1 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 or SMC's sales branch.

 WARNING	
	Only service personnel or qualified personnel are allowed to open the cover 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 for repair of the unit, 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.

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

1.5.2 Disposal of unit

If the unit needs to be discarded, be sure to follow local laws and regulations on disposing of industrial waste.

2. Descriptions of Components

2.1 Appearance of unit

2.1.1 HRG001-A / HRG002-A

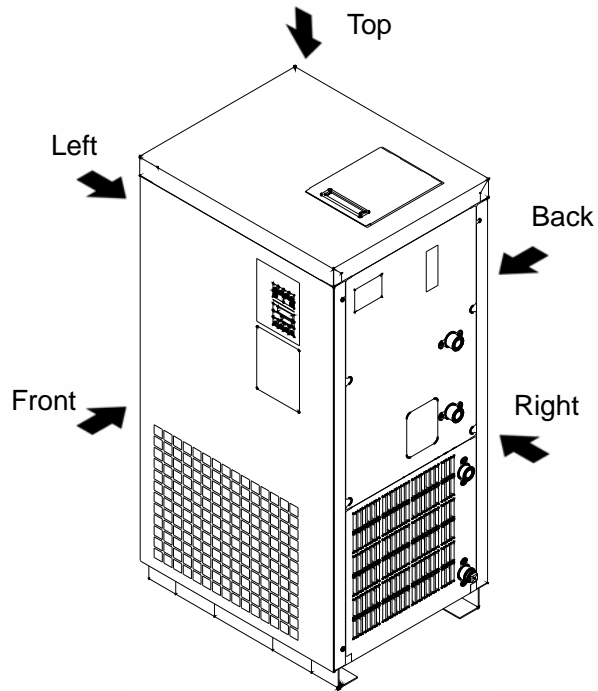


Fig. 2-1 Appearance of unit (HRG001-A / HRG002-A)

2.1.2 HRG005-A

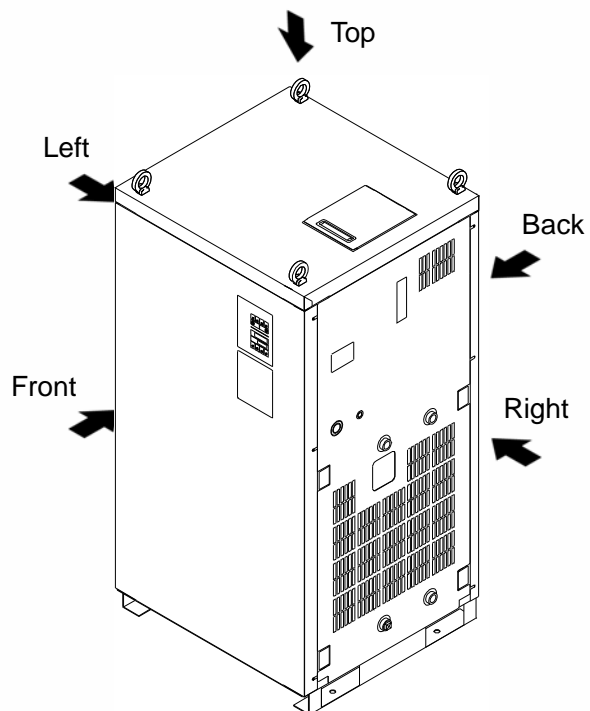


Fig. 2-2 Appearance of unit (HRG005-A)

2.2 Descriptions and functions of components

2.2.1 HRG001-A / HRG002-A

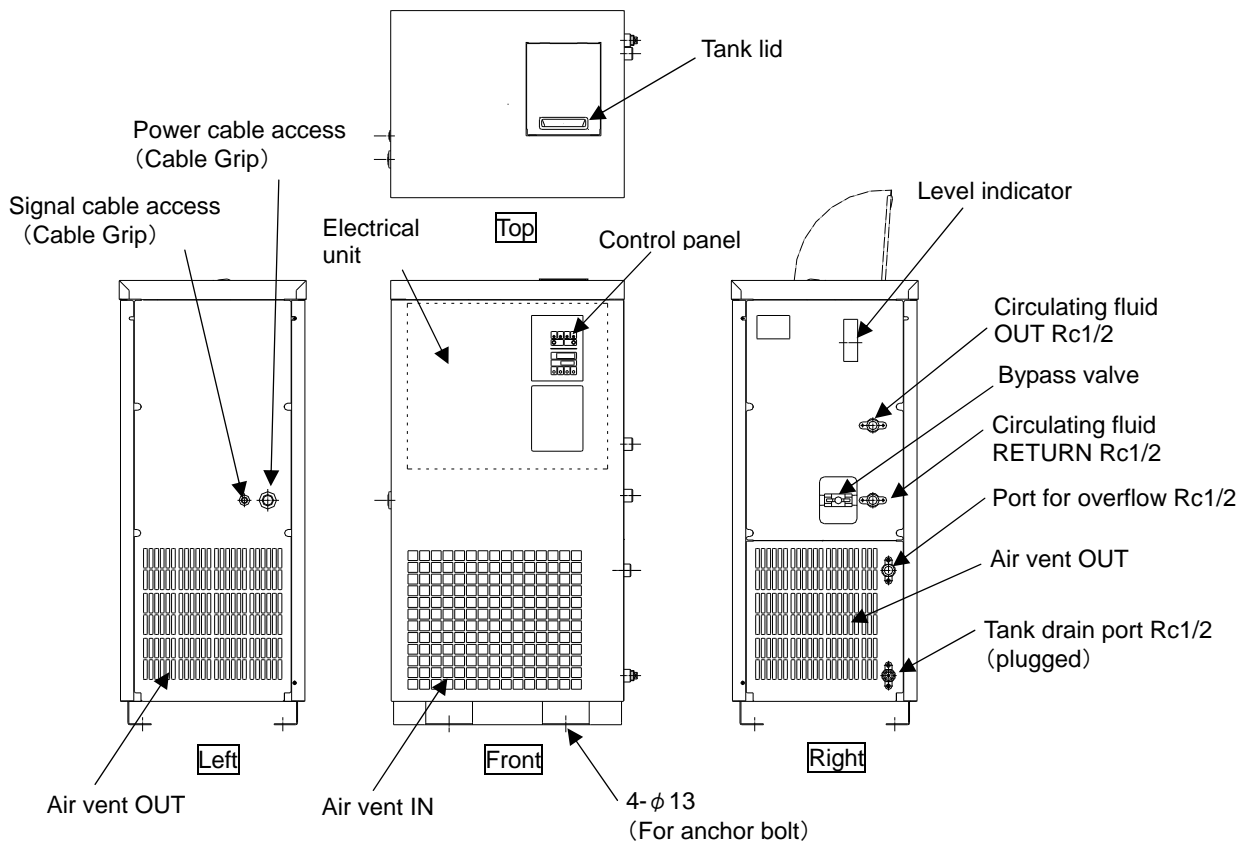


Fig. 2-3 Piping connection port (HRG001-A / HRG002-A)

2.2.2 HRG005-A

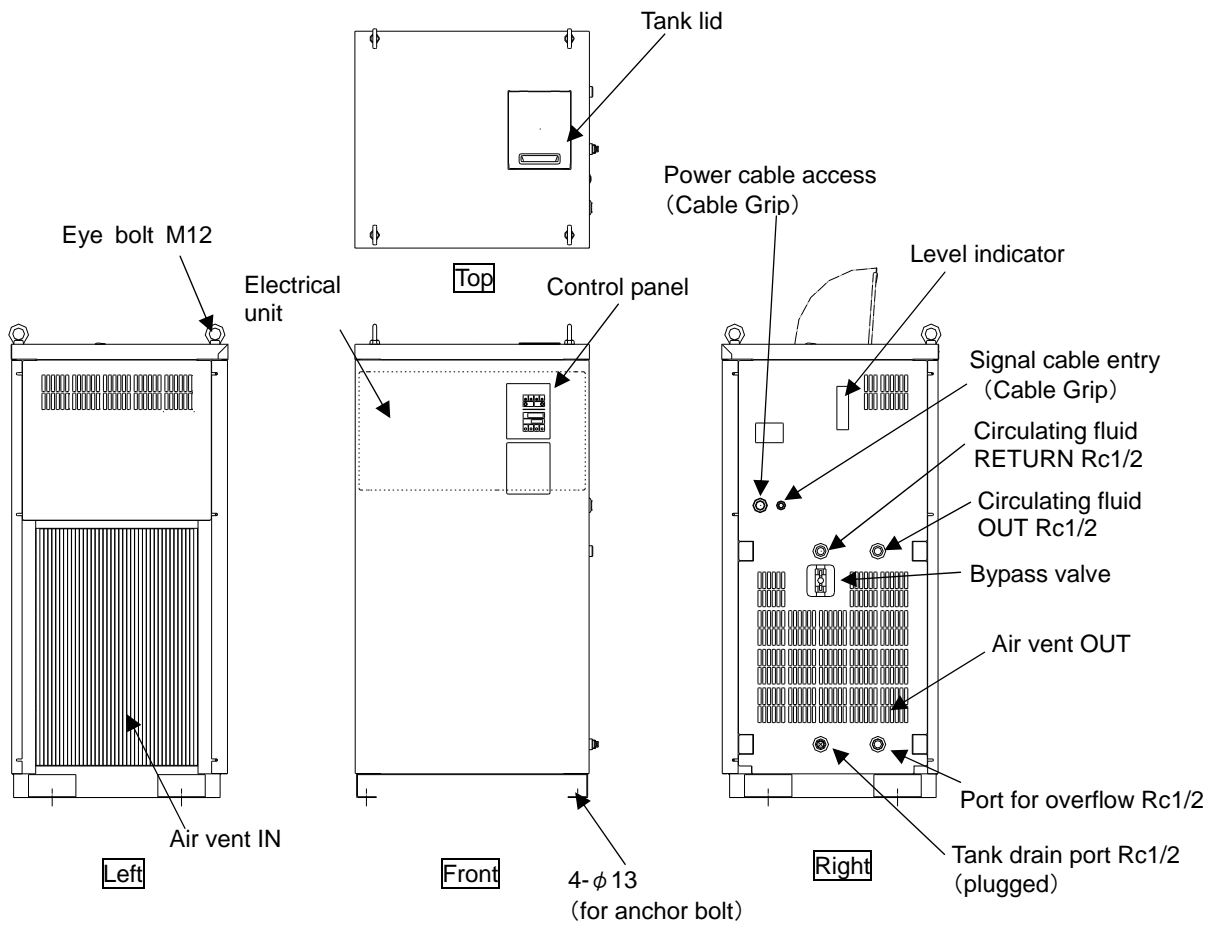


Fig. 2-4 Piping connection port (HRG005-A)

2.2.3 Control panel

The control panel is common to all models.

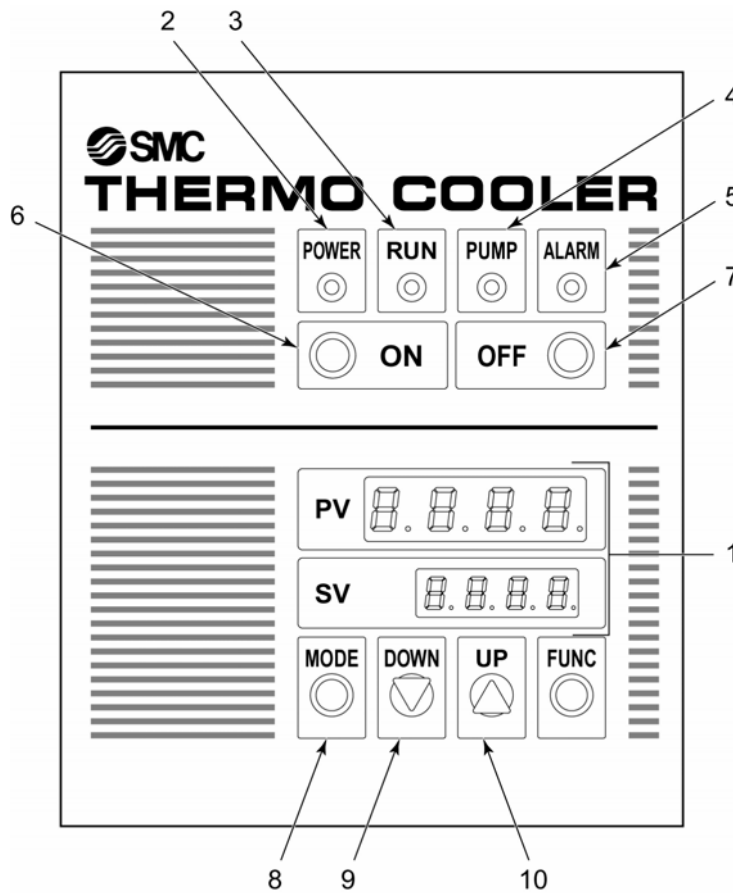


Fig. 2-5 Control panel

Table 2-1 Control panel

No.	Name	Function	
		PV	Indicates actual temperature of a circulating fluid
1	Digital display, PV / SV	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] LED		
6	[ON] switch	This is used to run the unit.	
7	[OFF] switch	This is used to stop the unit.	
8	[MODE] key	This is used to switch the screens between PV and SV.	
9	[DOWN] key	This is used to decrease set temperature.	
10	[UP] key	This is used to increase set temperature.	

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 system 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 "Fork 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 45 to 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



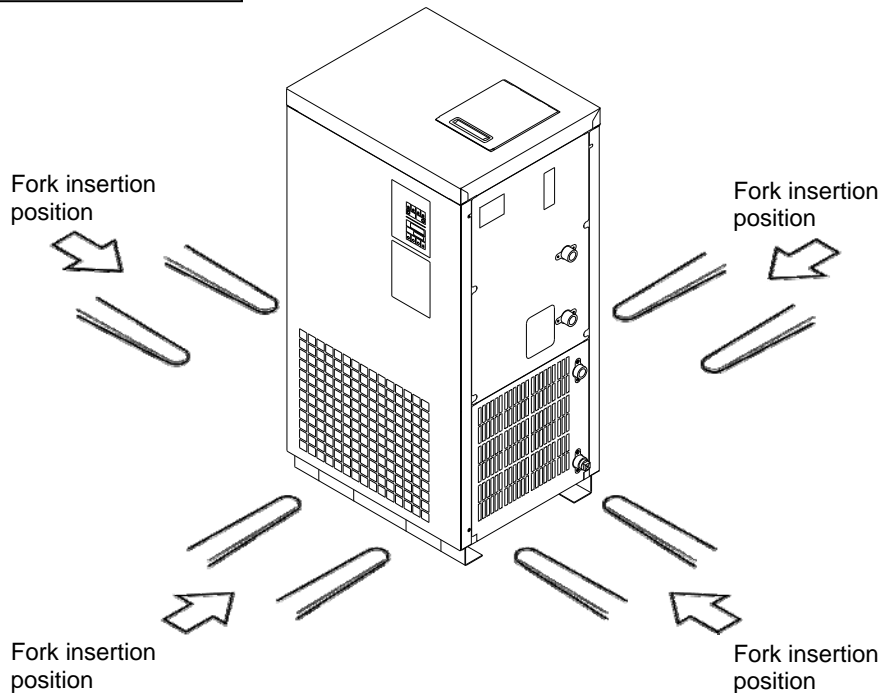
Drain the residual fluid from piping as much as possible to prevent spill.

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.

HRG001-A/HRG002-A



HRG005-A

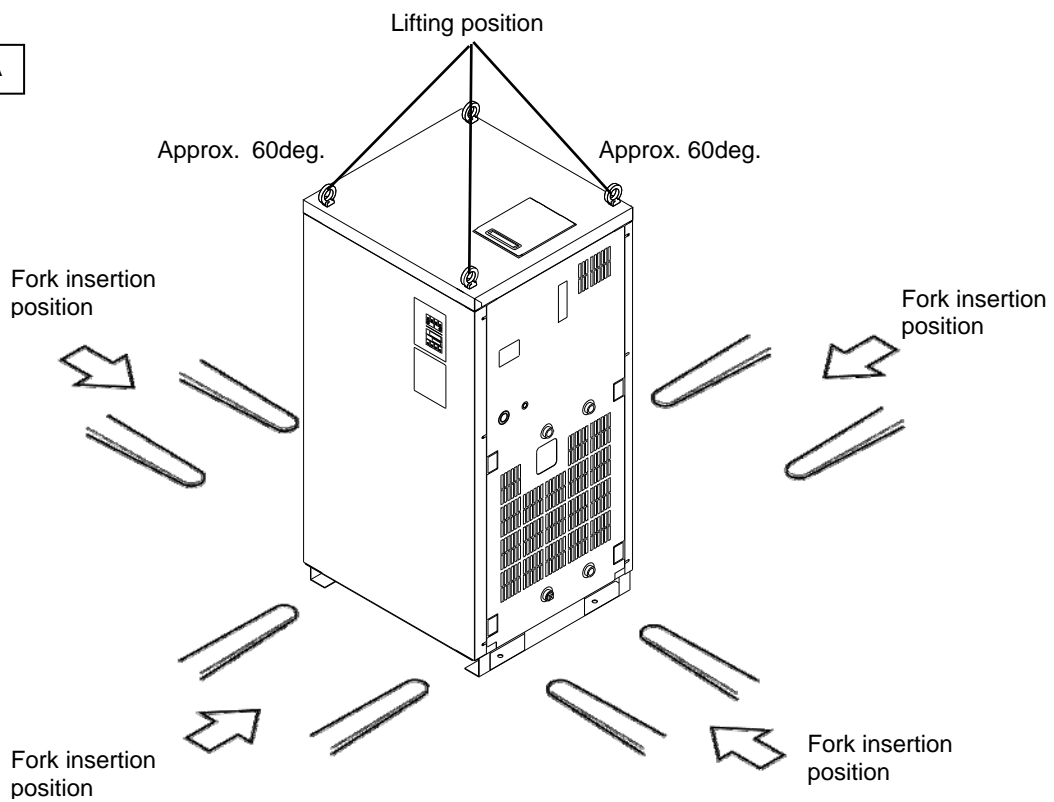










Fig. 3-1 Fork insertion position and unit lifting

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 system.
 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 an insufficient maintenance space as required

3.2.2 Installation

- Keep the unit away from vibration. Install the unit on a flat and stable surface.
- Refer to “7.2 Outline dimensions” for the dimensions of the unit.


3.2.3 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 system 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 Specification list”.
- 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 3-1 Cable for power supply and current leakage

Item		HRG001-A	HRG002-A	HRG005-A
Power supply cable	Size	4-core 3.5mm ²		4-core 5.5mm ²
	Round compressive terminal size	3.5–4S		5.5–4S
Signal cable	Size	6-core 0.75 mm ²		
	Fork terminal size	1.25Y–3		
Capacity of GFCI breaker※		5A	10A	20A

※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.

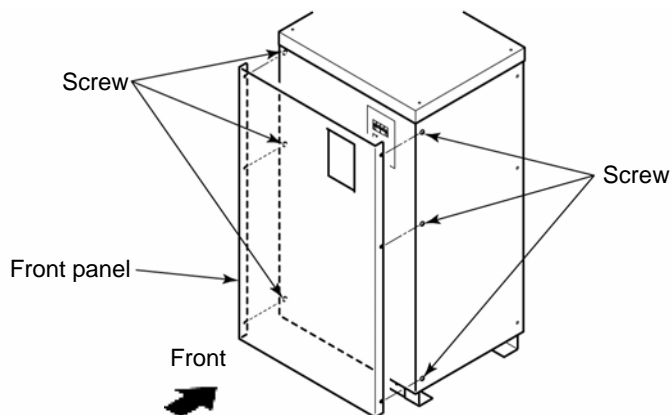


Fig. 3-2 Removal of front panel

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

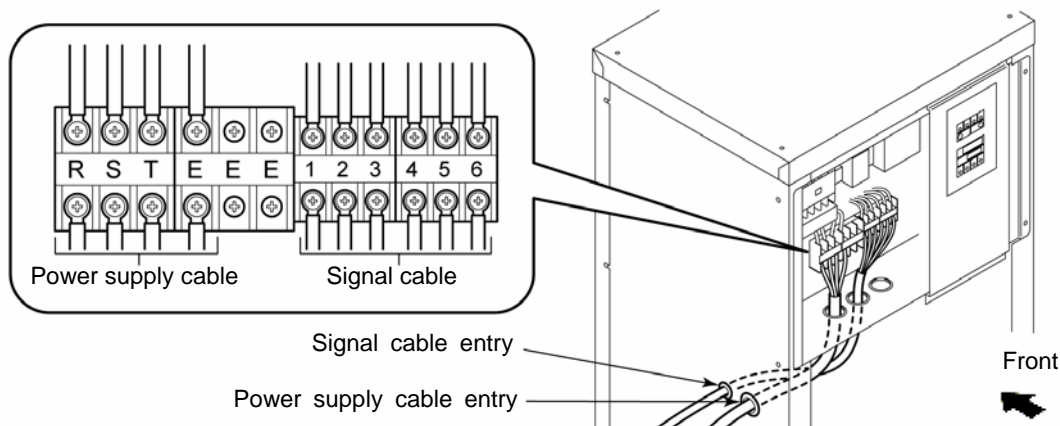


Fig. 3-3 Electrical wiring (HRG001-A / HRG002-A)

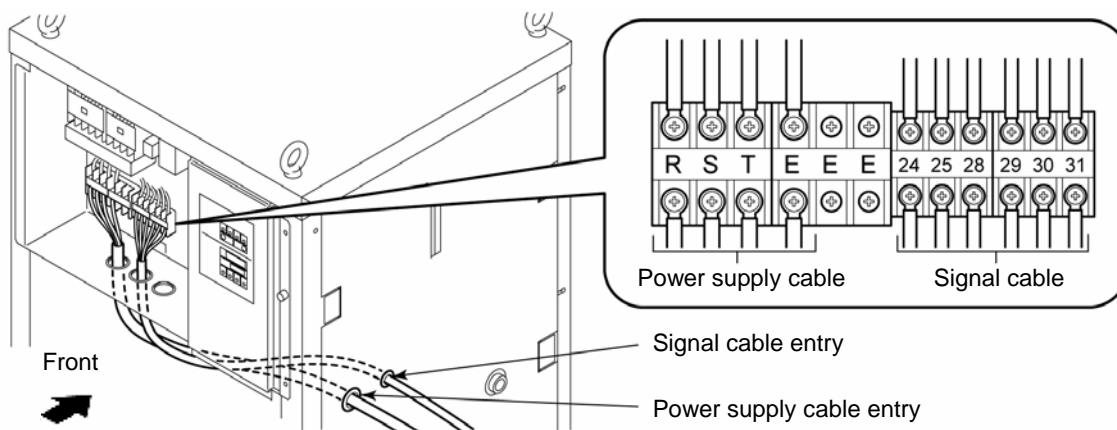


Fig. 3-4 Electrical wiring (HRG005-A)

■ 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 “7.3 Electrical circuit diagram” for the electrical circuit of the unit.

• HRG001-A / HRG002-A

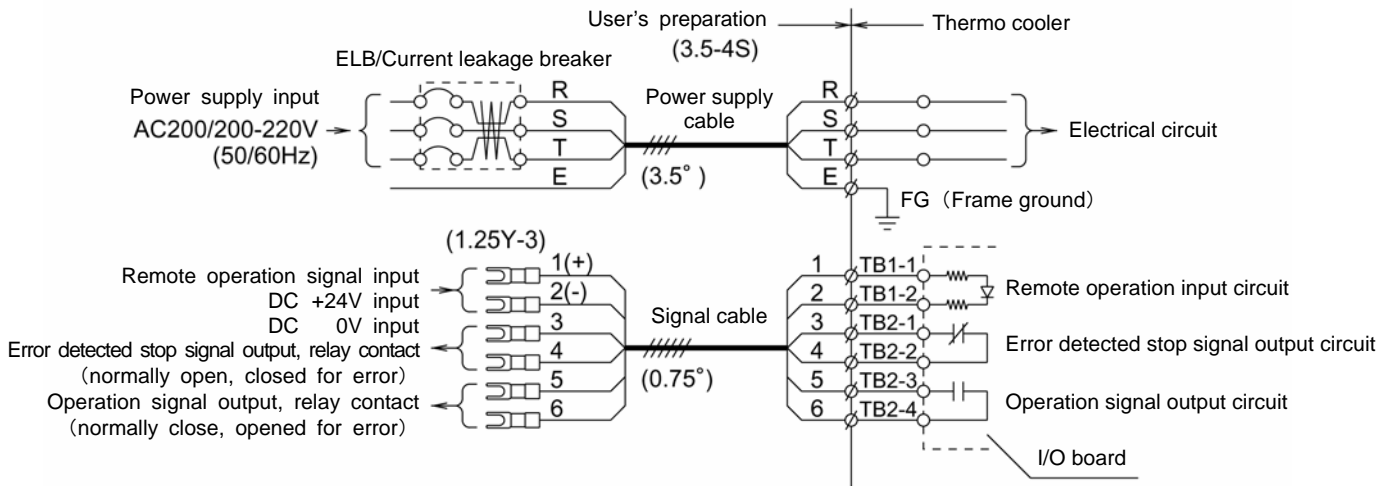


Fig. 3-5 Installation (electrical wiring)

• HRG005-A

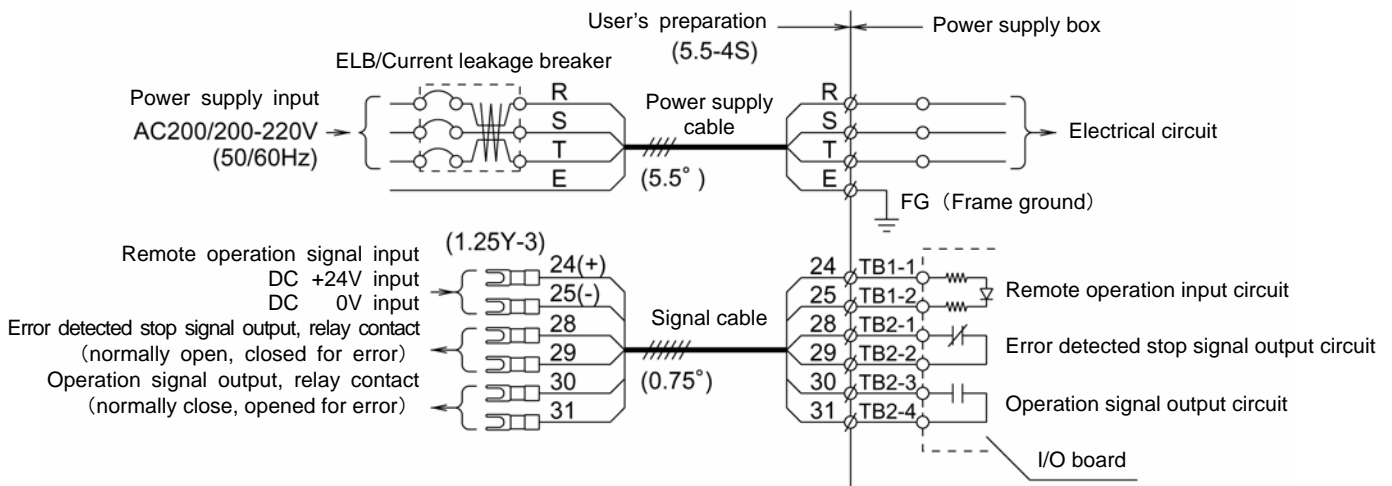


Fig. 3-6 Installation (electrical wiring)

3.2.4 Piping

CAUTION



- Install piping properly. Improper installation may cause leaks.
- 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.

■ Pipe diameter

The pipe diameters are common to all models.

Table 3-2 Pipe diameter

Pipe	Diameter
Recirculating fluid OUT	Rc1/2
Recirculating fluid return	Rc1/2
Port for overflow	Rc1/2
Port for drain in tank	Rc1/2

■ How to install piping

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

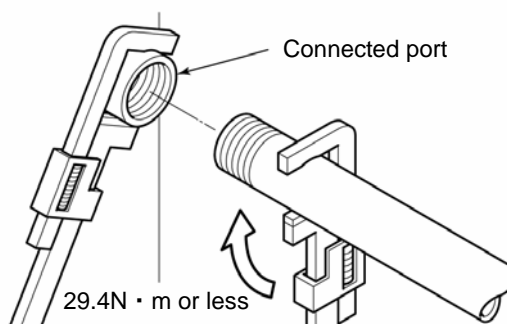


Fig. 3-7 Tightening of pipe

Remarks

Install a valve at the drain port to facilitate the draining of the circulating fluid from the tank. (The valve needs to be prepared separately.)

■ Recommended piping installation

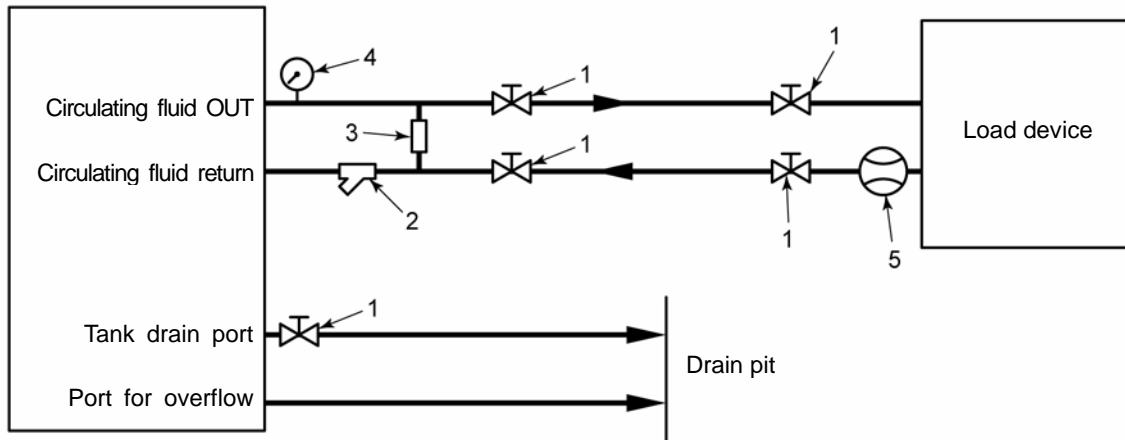


Fig. 3-8 Recommended piping installation

No.	Name	Size
1	Valve	Rc1/2
2	Y-shaped strainer	Rc1/2
3	Relieving valve	Rc1/2, set from 0 to 0.5 MPa
4	Pressure gauge	0 to 1.0 MPa
5	Flow meter	0 to 50 L/min

3.2.5 Supply of circulating fluid

1. Open the tank lid and supply the circulating fluid until the fluid reaches the range specified on the level indicator.

⚠ **WARNING**

Keep the fluid level in the tank between “HIGH” and “LOW”. If the fluid is out of the range, the circulating fluid may overflow that results in a ground fault.

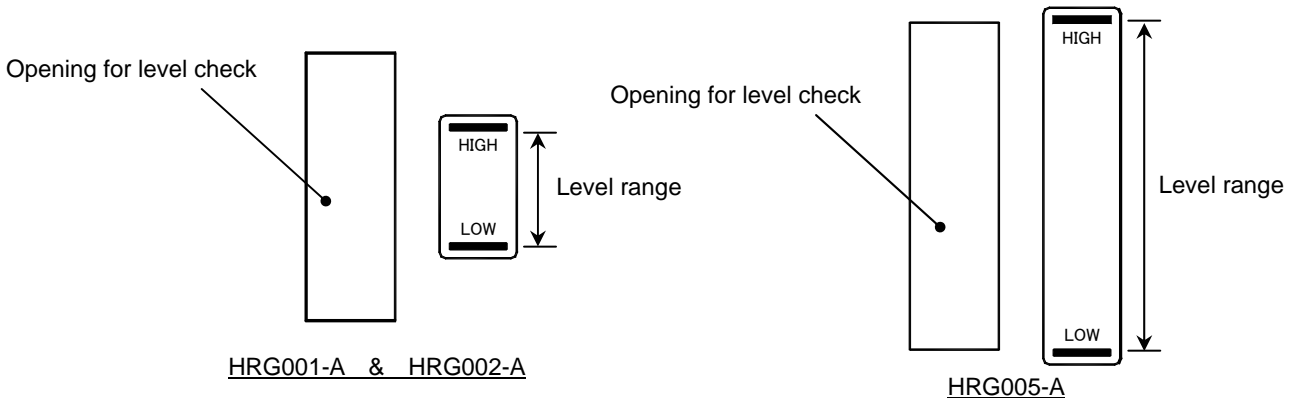


Fig. 3-9 Level indicator

3.2.6 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	
	<ul style="list-style-type: none">● 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.

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 Connection of cable

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

4.1.3 Piping for circulating fluid

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

4.1.4 Level indicator (for level in the tank)

Check the fluid level is within the specified range.

4.2 Preparation for startup

4.2.1 Power supply

Supply the power.

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

- The [POWER] LED lights up.
- The digital display PV lights up and displays temperature of the circulating fluid.
- The [ALARM] LED lights up and goes out in 5 sec.

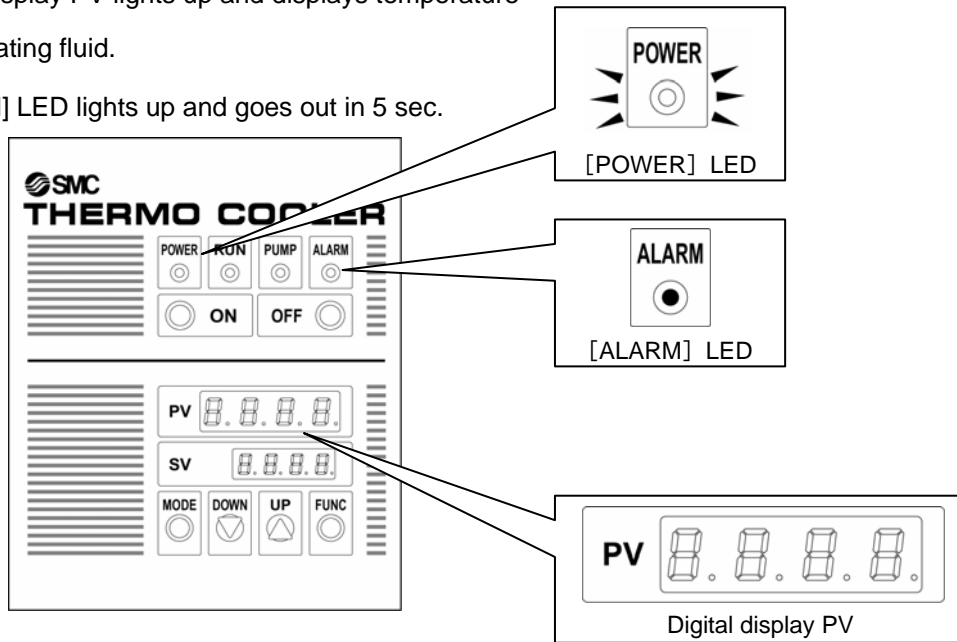


Fig. 4-1 Power supply

4.2.2 Setting of circulating fluid temperature

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

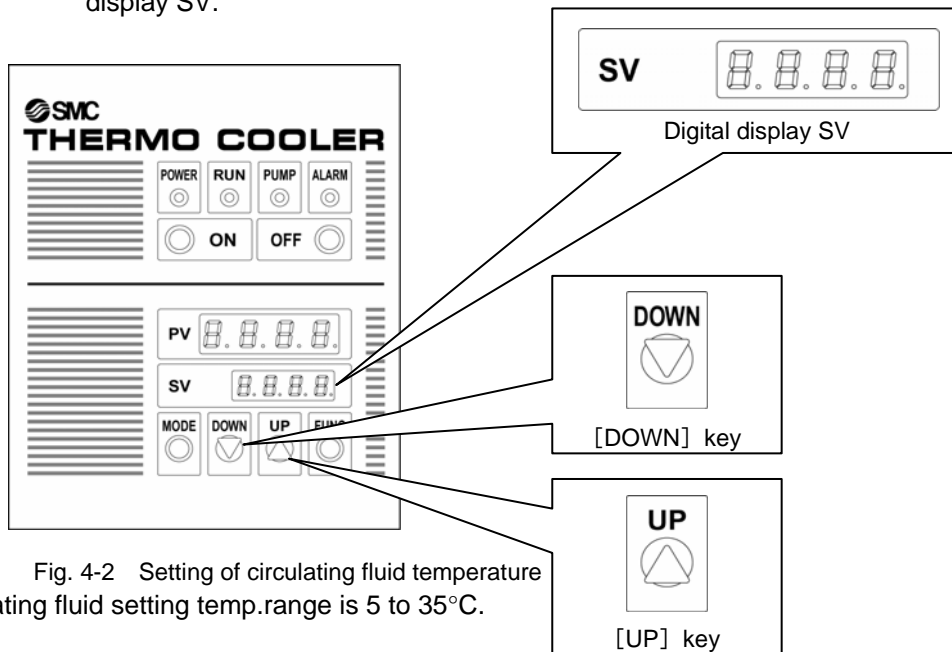


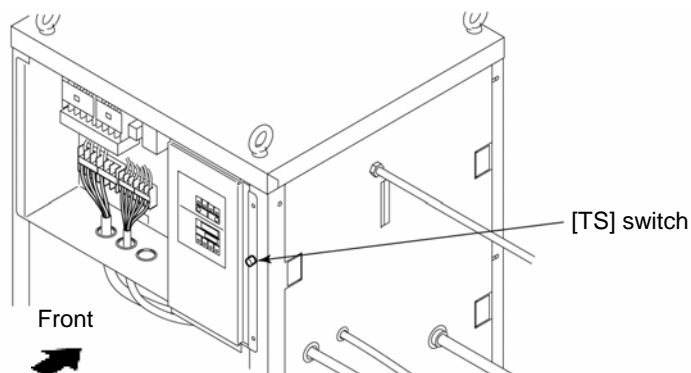
Fig. 4-2 Setting of circulating fluid temperature

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

4.2.3 Additional water supply

■ [TS] switch (pump manual operation switch): HRG005-A only

HRG005-A 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.



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.

2. Supply the circulating fluid again according to section 3.2.5.

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.

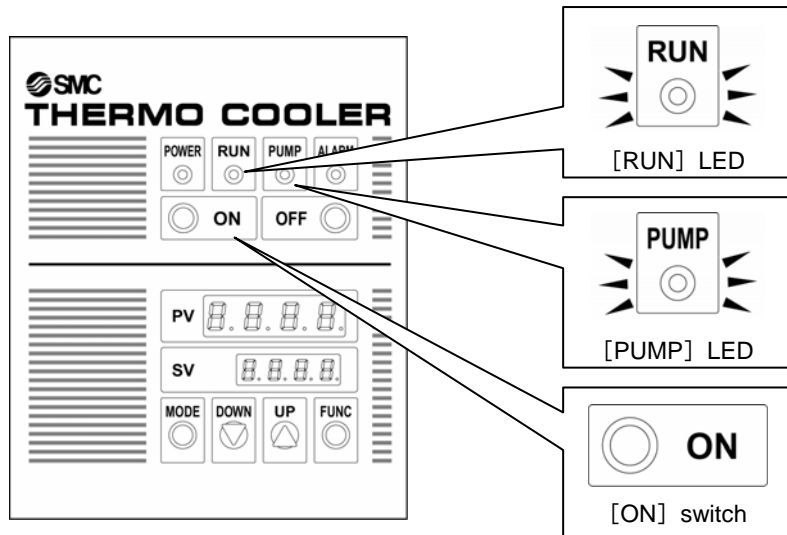


Fig. 4-4 Starting the unit

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.

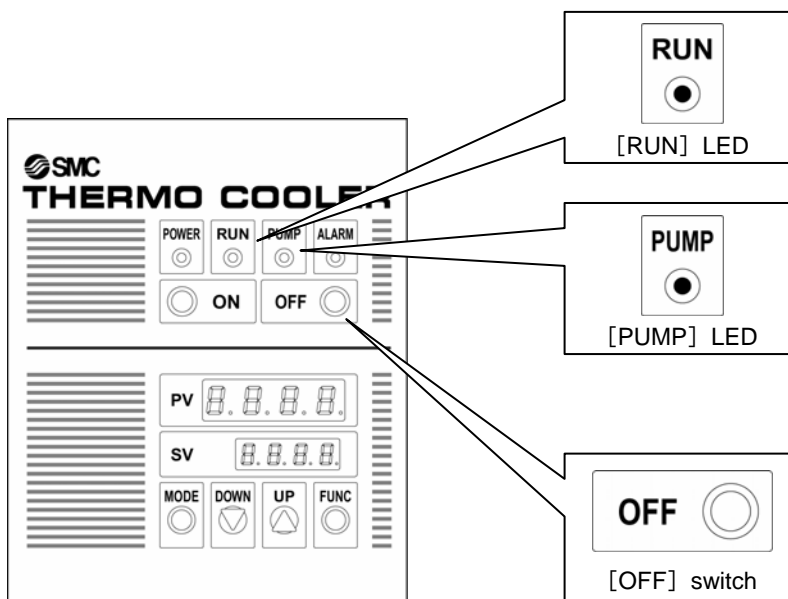


Fig. 4-5 Stopping the unit

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 power breaker off.

- No leak from circulating fluid piping
- No circulating fluid flowing out of the 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, water 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.

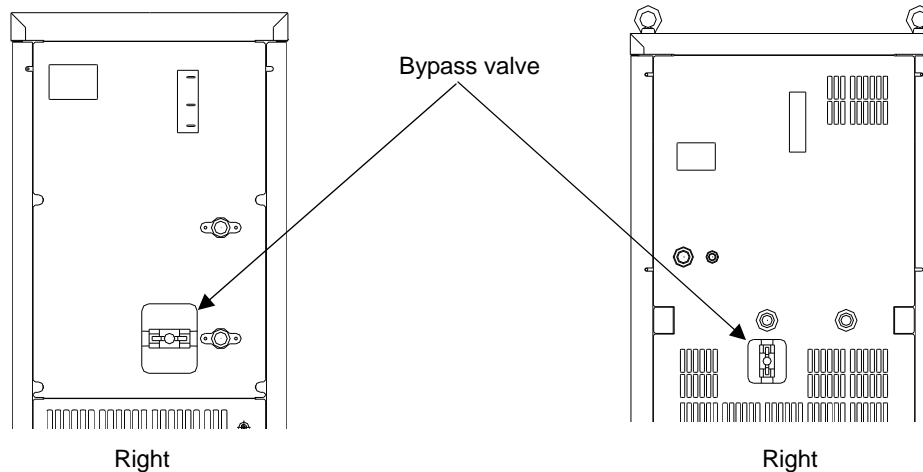


Fig. 4-5 Bypass valve (HRG001-A / HRG002-A)

Fig. 4-6 Bypass valve (HRG005-A)

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.

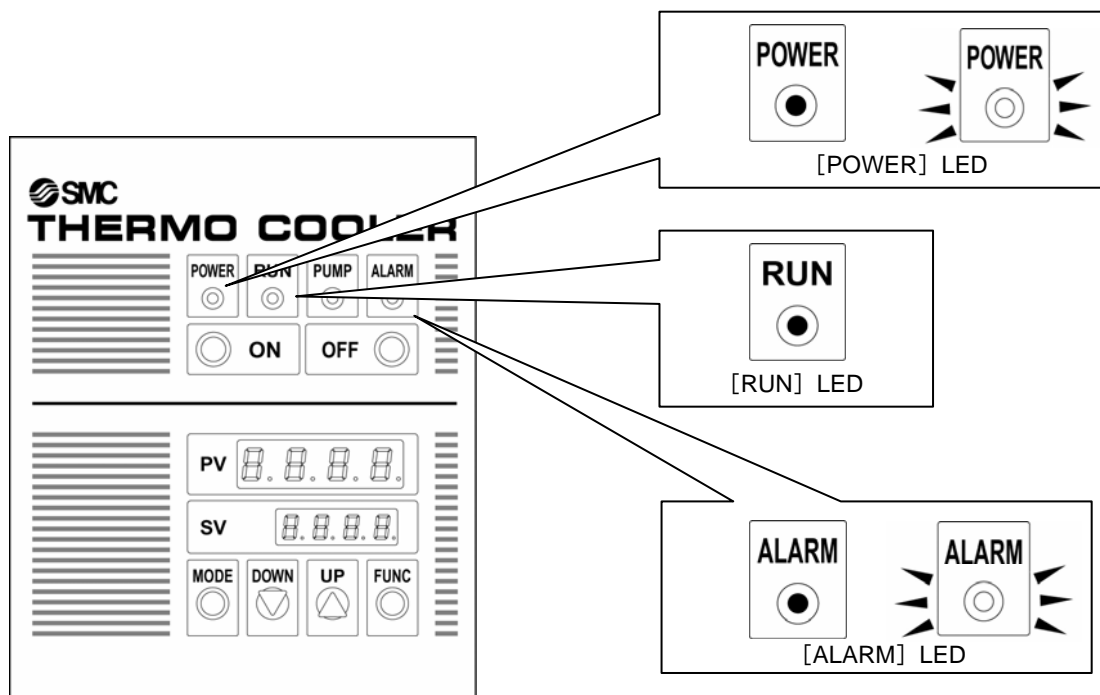


Fig. 5-1 Control panel

Table 5-1 Error message

Alarm	Setting range	Unit status	LED (●: Off, ○: On)			Operation signal output	Error stop signal output
			POWER	RUN	ALARM		
Power error	—	Stopped	●	●	●	Open contact	Closed contact
Start-up failure	—	Stopped	Green○	●	Red ○	Open contact	Open contact
Reverse of pump and compressor	—	Stopped	Green○	●	Red ○	Open contact	Open contact
Tank water level drop	Lower limit of water level in the tank	Stopped	Green○	●	Red ○	Open contact	Open contact
Pump overload	—	Stopped	Green○	●	Red ○	Open contact	Open contact
Compressor overload	—	Stopped	Green○	●	Red ○	Open contact	Open contact
High temp. of supplied water	Min.40°C	Stopped	Green○	●	Red ○	Open contact	Open contact
Excess temp. rise in fan motor*	Min.40°C	Stopped	Green○	●	Red ○	Open contact	Open contact

* Only HRG005-A

5.2 Troubleshooting

Table 5-2 Troubleshooting

Alarm	Unit status	Cause	Remedies	How to reset
Power error	The [POWER] LED is not turned on.	Power is not supplied.	Supply the power.	Manual reset
		A breaker is tripped.	Fix a short or ground fault.	
		Low voltage	Supply a rated voltage.	
		Failure in the [POWER] LED	Ask for service.	
Startup failure	The [RUN] LED remains off even with the press of the [ON] switch	One of the three-phase power is interrupted. A voltage sag occurred.	Normal according to product spec. Supply three-phase power.	Auto reset
		Failure in the [RUN] LED	Ask for service.	
		Failure in the [ON] switch	Ask for service.	
Reverse of pump and compressor	Reverse phase relay triggered.	Incorrect phase sequence of power wiring	Normal according to product spec. Rewire the power cable for two of three phases. Wiring should be performed by a qualified person.	Auto reset
Tank water level drop	Level switch contact is opened.	Inadequate water in the tank (natural evaporation)	Normal according to product spec. Circulating water is low in amount. Supply the circulating water.	Auto reset
Pump overload	Pump thermal overload switch has been tripped.	Power voltage sag	Normal according to product spec. Boost up the capacity of power breaker. Wiring should be performed by a qualified person.	Manual reset
		Abnormal rise in circulating fluid pressure	Adjust the opening of the manual relief valve. Ask for service.	
		Abnormal failure of pump	Change the pump. Ask for service.	
Compressor overload	Compressor thermal overload switch has been tripped.	Power voltage sag	Normal according to product spec. Boost up the capacity of power breaker. Wiring should be performed by a qualified person.	Manual reset
		Abnormal heat dissipation capability of condenser.	Normal according to product spec. Improve ambient conditions to provide ventilation and exhaust heat. Failed condensing fan	
		Improper rated cooling capability	Normal according to product spec. Reduce a heating value output from user's unit.	
		Refrigerant leak	Ask for service to get the refrigerant gas charged and the compressor and electromagnetic switch replaced.	
		Abnormal failure in the compressor		
Failure in the electromagnetic switch				
High temp. of circulating fluid	The contact of temperature controller EV1 is opened.	Rise in ambient temperature	Improve ambient conditions. Avoid installing it at a place exposed to direct sunlight or radiant heat.	Auto reset
		Improper rated cooling capability	Normal according to product spec. Reduce a heating value output from user's unit.	
		Refrigerant leak	Ask for service to get the refrigerant gas charged and the compressor and electromagnetic switch replaced.	
		Failure in the refrigerant solenoid valve		
		Failure in the compressor		
		Other abnormalities in the refrigeration circuit		
Failure in the temperature controller				
Temp. rise in fan motor*	The contact of the thermostat for fan motor is open.	Rise in ambient temperature	Improve ambient conditions. Avoid installing it at a place exposed to direct sunlight or radiant heat.	Auto reset
		Improper rated cooling capability	Reduce a heating value output from user's unit.	
		Failure in the fan motor	Replace the fan motor. Ask for service.	

*Only apply to model HRG005-A

6. Unit Maintenance

6.1 Control of water quality



⚠ CAUTION	
	<p>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.</p> <p>ONLY use fresh water (tap water) which satisfies water quality standards as shown in the table below.</p>

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

	Substances	Cooling water system/ Circulating fluid
Standard	pH (25°C)	6.8 to 8.0
	Electrical conductivity (25°C) (μs/cm)	1 to 400
	Chloride ion (mgCl/L)	50 and below
	Sulfuric acid ion (mgSO ₄ ²⁻ /L)	50 and below
	Acid consumption (pH4.8) (mgCaCO ₃ /L)	50 and below
	Total hardness (mgCaCO ₃ /L)	70 and below
	Calcium hardness (mgCaCO ₃ /L)	50 and below
	Ion silica (mgSiO ₂ /L)	30 and below
Reference	Iron (mgFe/L)	1.0 and below
	Copper (mgCu/L)	1.0 and below
	Sulfide ion (mgS ²⁻ /L)	Not detected
	Ammonium ion (mgNH ₄ ⁺ /L)	1.0 and below
	Residual chlorine (mgCl/L)	0.3 and below
	Free carbon dioxide (mgCO ₂ /L)	4.0 and below

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

CAUTION	
	<p>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.</p>

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



Do not touch the fin directly during cleaning of the condenser. It may cause personal injury 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

Check the items listed below before, during, and after operation of this unit. If any abnormal event is detected, stop operation and turn off the main breaker. Be sure to lock out and tag out the unit before asking for service.

- The circulating fluid should fall within the specified level. When it is out of the range, replenish or drain excess circulating fluid to maintain a proper level. (Be sure to stop the unit before replenishing the circulating fluid.)
- The characters and numbers on the liquid crystal display of the control display panel should be clear.
- There should be no leak from circulating fluid piping.
- Water supply pressure of the circulating fluid should be within the specified range.
(Discharge pressure of the circulating fluid should be lower than the proof pressure of user's unit.)
- There should be no abnormal sound or abnormal vibration from this unit.
- There should be no foul smell or smoke from this unit.

6.2.2 Monthly inspection

■ Cleaning of the filter for the air-cooled condenser (optional accessory)

CAUTION

Attach a filter screen when operating this unit in a place that the fin of the air-cooled condenser becomes dirty and clogged. The filter screen is an optional accessory.

- Remove the filter and eliminate dirt with a vacuum cleaner.
- Detach the filter and wash it with detergent if it is dirty. Place it back when it is dried.

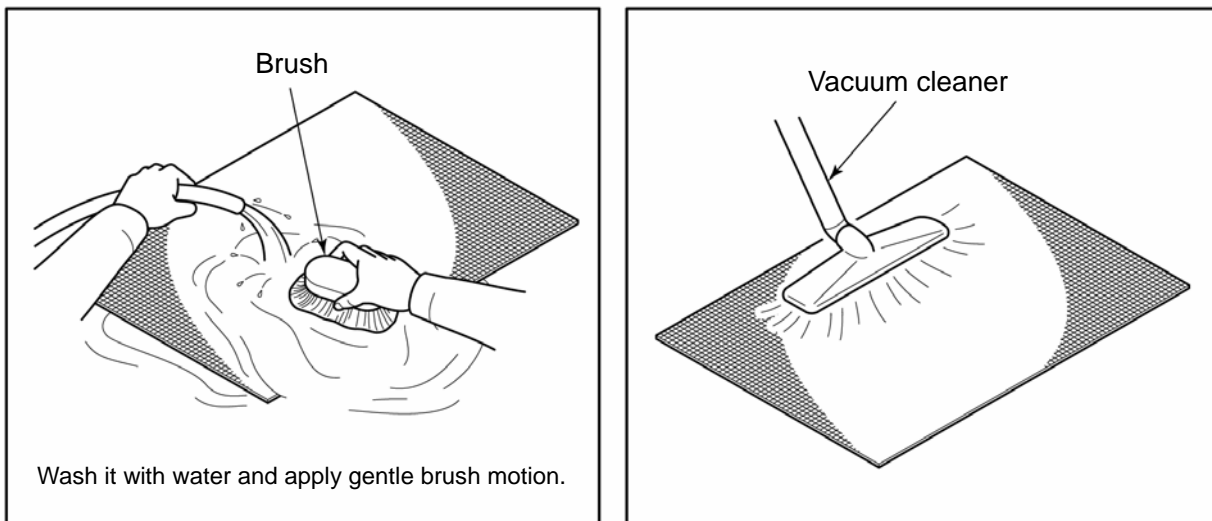


Fig. 6-1 Cleaning of the filter for the air-cooled condenser. (Optional accessory)

■ Inspection of the tank

Check the following items. Replenish or replace fresh water (tap water), or clean it when an abnormal event is found.

- Foreign materials adhere to the inner wall of the tank.
- Slime is found on the inner wall of the tank.
- Foreign materials float on the surface of fluid in the tank.
- There is scale deposited in the tank.
- It has a foul odor.
- The water has been discolored.

6.2.3 Biannual inspection

■ Cleaning of the air-cooled condenser

CAUTION

The safety device may get activated to stop the operation when the fin is clogged with dust.

- Clean the fin with a soft brush or an air gun with caution not to damage the fin.

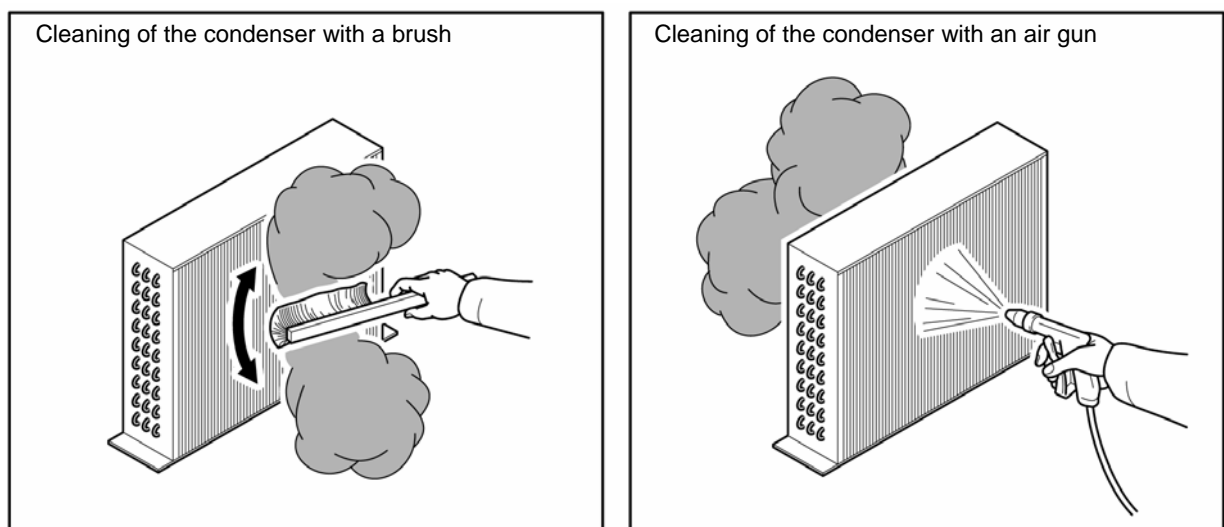


Fig. 6-2 Cleaning of air-cooled condenser

■ 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.

I m p o r t a n t

- **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).

6.3 Storage

Follow the procedures below for long-term storage of the unit.

1. Turn off the main power breaker.
2. Fully open the drain valve and drain the water from the tank.
3. Remove the drain plug of the circulating pump and drain the water from the pump.
4. Cover the unit with a plastic sheet for storage after draining is completed.

6.4 Consumables

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

Table 6-2 Biannual inspection

Part number	Part	Qty.	Remarks
HRG-S0003	Pump mechanical sealing	1 set	For HRG005

* It is not required for HRG001 and HRG002.

7. Documents

7.1 Specifications list

Table 7-1 Specifications list

Item		HRG001-A	HRG002-A	HRG005-A
Installation/ Op. Environment	Rated ambient	32°C		
	humid. range	45-75%RH (No condensation)		
Operating fluid		Circulating fluid/fresh water (tap water)		
Rated capacity of tank		10L		20L
Input	Power sup. voltage	3-phase AC200/200—220V (50/60 Hz)		
	Recommended leak breaker capacity	5A	10A	20A
	Breaker sensitivity current	30mA		
	Start/stop instruction signal (Remote op. signal)	Remote operation starts at DC24V and 8 mA are applied and stops at DC0V.		
Output	Rated temp. & accuracy of circulating fluid	20±1.0°C and 0.5°C (Temp. setting range 5-35°C)		
	Rated cooling capacity	0.9/1.1 kW (50/60 Hz)	1.9/2.3 kW (50/60 Hz)	4.5/4.8 kW (50/60 Hz)
	Pumping capacity	29/37 L/min (Head 10 m)		33/42 L/min (Head 10 m)
	Signal output	Op. signal	Relay contact (Contact cap. AC250V, 1A, resistance load. Contact closes during operation, and contact opens during stop and during power shutdown.)	
Emergency. Stop signal		Relay contact (Contact cap. AC250V, 1A, resistance load. Contact closes while alarm light remains OFF and during power shutdown, and contact opens while alarm light remains ON.)		
Protective function (for equipment)	Emergency stop	Unit stop function for low tank level (with tank level switch)		
		Pump reverse rotation detection (with phase relay)	Pump/compressor reverse rotation detection (with phase relay)	
		Unit stop function for pump/compressor overload (with over current relay)		
		Unit stop function for abnormal fan motor temperature rise (Temp. fuse is built into fan motor)	Unit stop function for abnormal fan motor temperature rise (Thermostat is built in fan motor.)	
		Unit stop function for abnormal circulating fluid temperature rise (Set temp. of the temp. controller: 40°C)		
	Others	Protection against excessive temp. increase of compressor (OLP) , Protection against pressure increase of circulating fluid (With manual valve), Leak protection (With drain pan)		
Material/Substance	Outside panel	SGCC (Munsell 10Y8/0.5 Urban white)		
	Control panel	SGCC (DIC183 Blue)		
	Base	SECC (Paint Munsell 10Y6/0.5 Urban gray)		
	Wetted part	SUS (connections such as inlet and outlet), BC (hose fitting, tube fitting), PVC (piping hose for internal water feeding), PPE (pump casing, impeller), PE (tank)	SUS (pump impeller, connections such as Inlet and outlet), BC (pump casing, hose fitting), PVC (piping hose for internal water feeding), PE (tank)	
	Internal piping for refrigerant	C1220T		
	Operating refrigerant	HFC—407C		
Accessories	No accessories		Eye bolt M12×4 pcs.	
	(Please prepare a power supply, signal cable and connection terminal under your responsibility.)			
Weight		Approx. 65kg	Approx. 70kg	Approx. 117kg

7.2 Outline dimensions

7.2.1 HRG001-A and HRG002-A

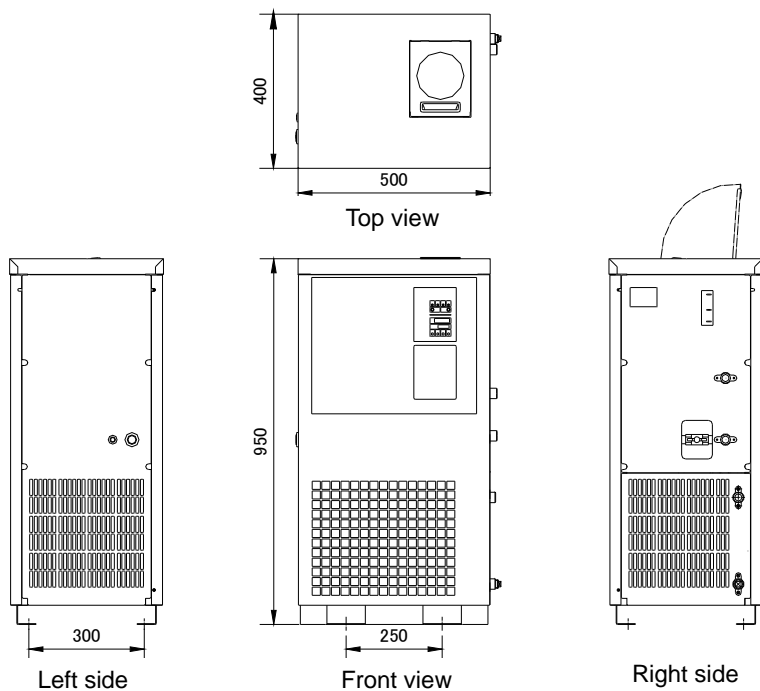


Fig. 7-1 Outline dimensions (HRG001-A / HRG002-A)

7.2.2 HRG005-A

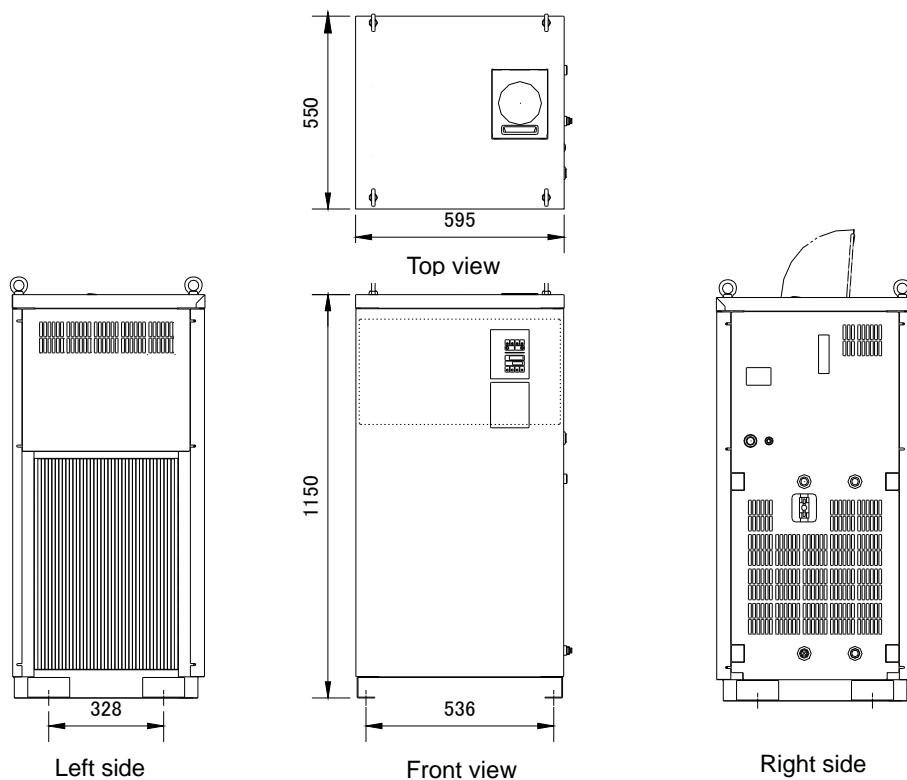


Fig. 7-2 Outline dimensions (HRG005-A)

7.3 Electric circuit diagram

7.3.1 HRG001-A and HRG002-A

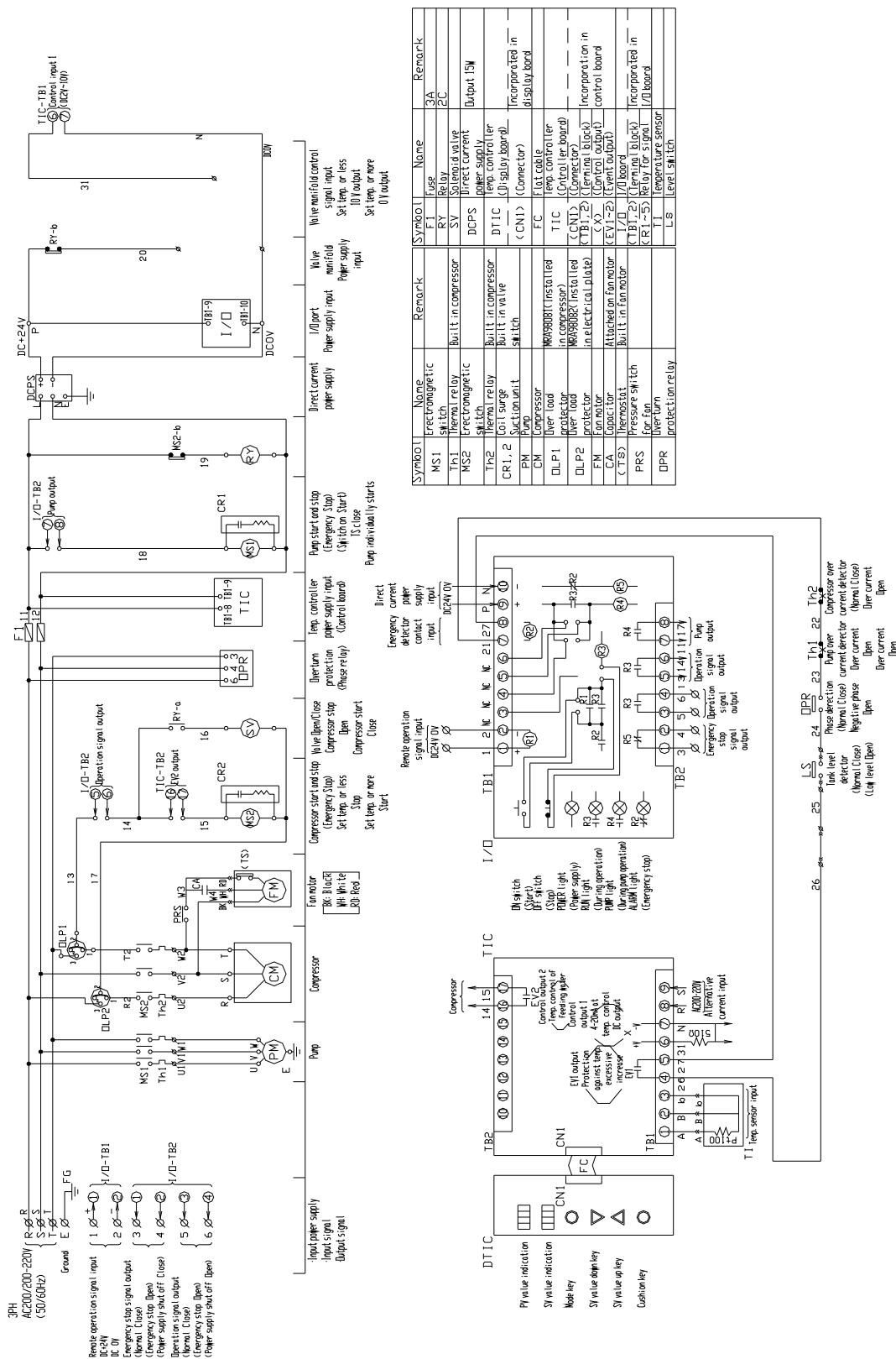


Fig. 7-3 Electric circuit diagram (HRG001-A / HRG002-A)

7.3.2 HRG005-A

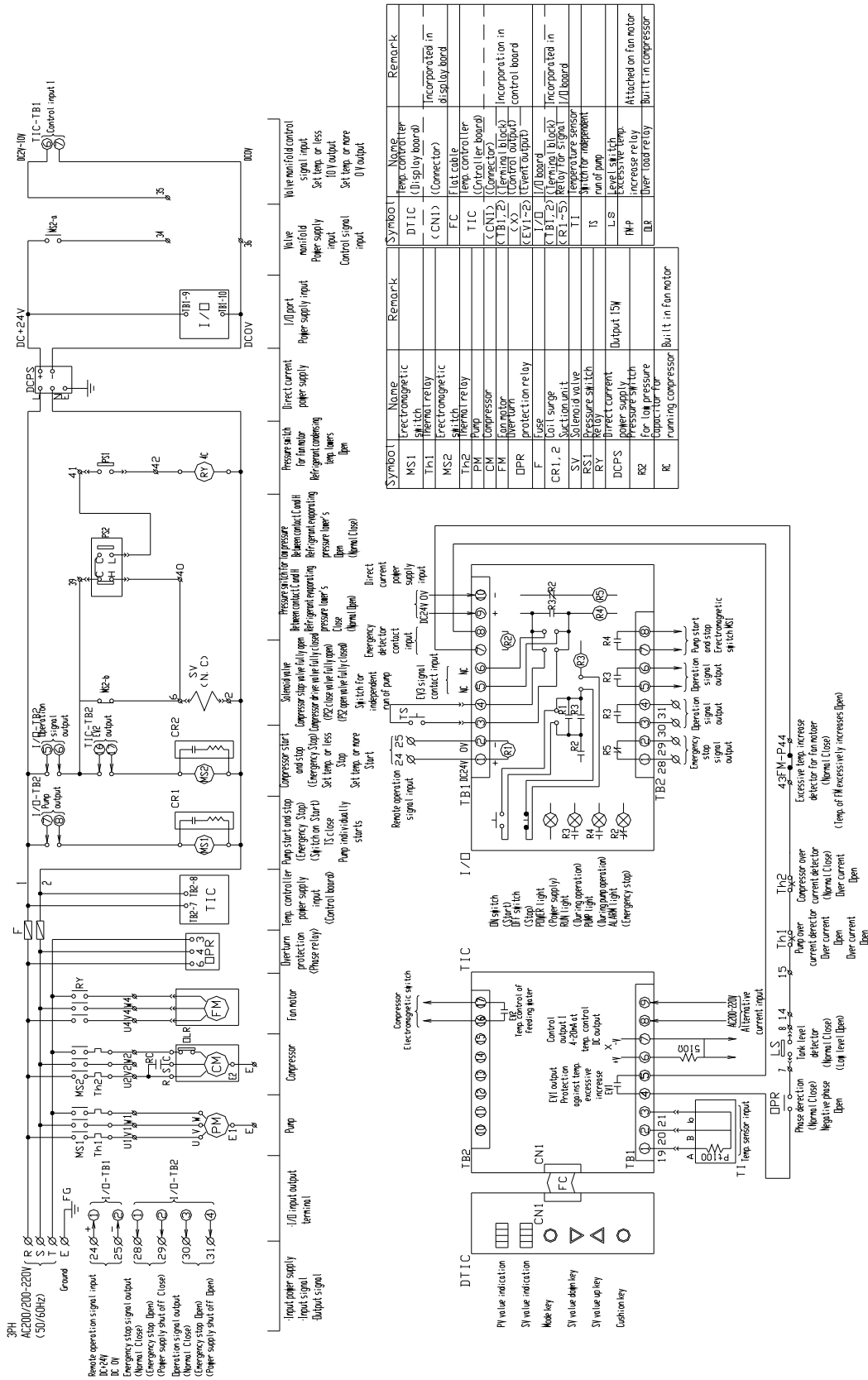


Fig. 7-4 Electric circuit diagram (HRG005-A)

7.4 Flow chart

7.4.1 HRG001-A and HRG002-A

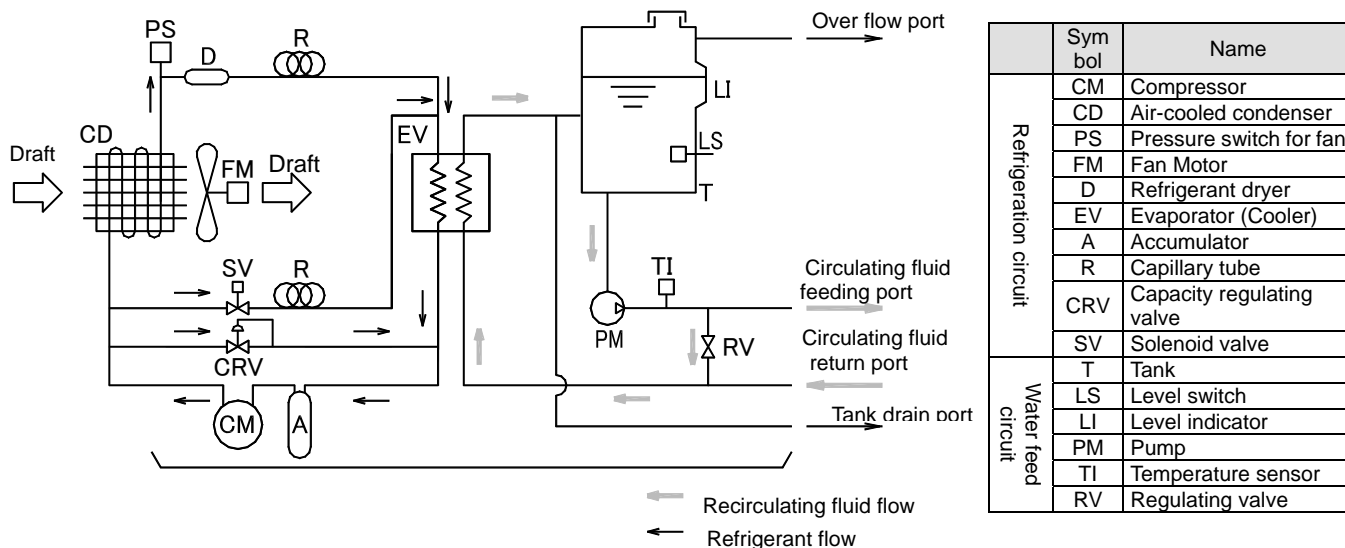


Fig. 7-5 Flow chart (HRG001-A and HRG002-A)

7.4.2 HRG005-A

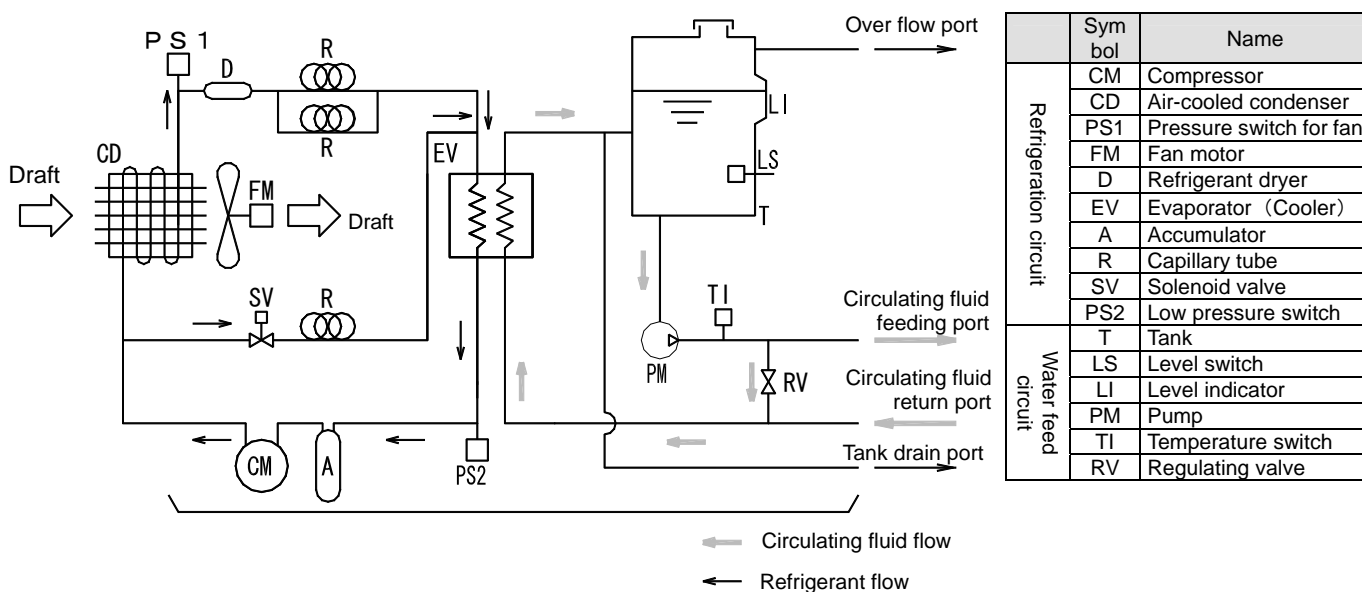


Fig. 7-6 Flow chart (HRG005-A)