Operation Manual

Air-refrigerated Thermo cooler

*HRG001-A*
*HRG002-A*
*HRG005-A*

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 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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<td>7.4.2</td>
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<td>7-5</td>
</tr>
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</table>
1. Safety Instructions

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** 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 toxicaion 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

[Image of electrical hazard symbol]

This symbol warns you of possible risk of electrical shock.

■ Symbol of heat hazard

[Image of heat hazard symbol]

This symbol warns you of potential burns.

■ Symbol of rotating shaft hazard

[Image of rotating object hazard symbol]

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

■ Symbol of “Don’ts”

[Image of prohibition symbol]

This symbol denotes the items that must not be attempted.

■ Symbol of “Dos”

[Image of exclamation mark]

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 ⚡.

- 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.

- 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 ⚠.

- 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 ⚫.

- 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**

Do not remove or deface the warning labels.

**WARNING**

Read the contents of the hazard warning labels with care to keep them in mind.

---

**Warning label on the front panel**

![Warning label on the front panel](image1.png)

Fig. 1-1 Warning label on the front panel

**Warning label for high voltage**

![Warning label for high voltage](image2.png)

Fig. 1-2 Warning label for high voltage
1.3.3 Location of hazard warning label

- Recognize where the hazard warning labels are attached.
- The user is not allowed to reposition the labels. If the label is replaced due to being peeled off or worn out, keep the previous position.

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.

![Control panel image]

Fig. 2-5 Control panel

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

3.1 Transport

Figure 3-1 Fork insertion position and unit lifting

HRG001-A/HRG002-A

Lifting position

Approx. 60deg.

Fork insertion position

HRG005-A

Fork insertion position

Fork insertion position

Fork insertion position

Fork insertion position

Fork insertion position

Fork insertion position

Fork insertion position

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

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

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.
3.2.2 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>
<thead>
<tr>
<th>Item</th>
<th>HRG001-A</th>
<th>HRG002-A</th>
<th>HRG005-A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>4-core 3.5mm²</td>
<td>4-core 5.5mm²</td>
<td></td>
</tr>
<tr>
<td>cable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Round compressive</td>
<td>3.5－4S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>terminal size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signal cable</td>
<td>6-core 0.75 mm²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fork terminal</td>
<td>1.25Y－3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity of GFCI</td>
<td></td>
<td>5A</td>
<td>10A</td>
</tr>
<tr>
<td>breaker*</td>
<td></td>
<td></td>
<td>20A</td>
</tr>
</tbody>
</table>

※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.

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

- Power supply input: AC200/200-220V (50/60Hz)
  - ELB/Current leakage breaker
  - Operation signal output circuit
  - Error detected stop signal output circuit
  - Remote operation input circuit

- Power supply:
  - R: Remote operation signal input
  - S: Signal cable
  - T: Error detected stop signal output, relay contact
  - E: Operation signal output, relay contact

- User’s preparation: (3.5-4S)
- Thermo cooler
- Electrical circuit: (3.5")
- FG (Frame ground)

- Fig. 3-5  Installation (electrical wiring)

### HRG005-A

- Power supply input: AC200/200-220V (50/60Hz)
  - ELB/Current leakage breaker
  - Operation signal output circuit
  - Error detected stop signal output circuit
  - Remote operation input circuit

- Power supply:
  - R: Remote operation signal input
  - S: Signal cable
  - T: Error detected stop signal output, relay contact
  - E: Operation signal output, relay contact

- User’s preparation: (5.5-4S)
- Power supply box
- Electrical circuit: (5.5")
- FG (Frame ground)

- Fig. 3-6  Installation (electrical wiring)

---

- 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.
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>
<thead>
<tr>
<th>Pipe</th>
<th>Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recirculating fluid OUT</td>
<td>Rc1/2</td>
</tr>
<tr>
<td>Recirculating fluid return</td>
<td>Rc1/2</td>
</tr>
<tr>
<td>Port for overflow</td>
<td>Rc1/2</td>
</tr>
<tr>
<td>Port for drain in tank</td>
<td>Rc1/2</td>
</tr>
</tbody>
</table>

**How to install piping**

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

![Connected port](image)

![Tightening of pipe](image)

**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

![Diagram of piping installation](image)

**Fig. 3-8** Recommended piping installation

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

#### 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 fallout.

![Level indicator](image)

**Fig. 3-9** Level indicator
3.2.6 Reinstallation of unit

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only qualified personnel are allowed to install wiring.</td>
</tr>
<tr>
<td>Be sure to cut off the power supply for safety. Wiring with the unit energized is strictly prohibited.</td>
</tr>
</tbody>
</table>
3.2 Installation
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](image)

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](image)
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.

![Bypass valve](image)

**Fig. 4-5** Bypass valve (HRG001-A / HRG002-A)  
**Fig. 4-6** Bypass valve (HRG005-A)
4.4 Check at startup

HRG001-A HRG002-A HRG005-A

4-6
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.

![Control panel diagram]

Table 5-1  Error message

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

* Only HRG005-A
## 5.2 Troubleshooting

### Table 5-2  Troubleshooting

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

*Only apply to model HRG005-A
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)

<table>
<thead>
<tr>
<th>Substances</th>
<th>Cooling water system/ Circulating fluid</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH (25°C)</td>
<td>6.8 to 8.0</td>
</tr>
<tr>
<td>Electrical conductivity (25°C) (µs/cm)</td>
<td>1 to 400</td>
</tr>
<tr>
<td>Chloride ion (mgCl⁻/L)</td>
<td>50 and below</td>
</tr>
<tr>
<td>Sulfuric acid ion (mgSO₄²⁻/L)</td>
<td>50 and below</td>
</tr>
<tr>
<td>Acid consumption (pH4.8) (mgCaCO₃/L)</td>
<td>50 and below</td>
</tr>
<tr>
<td>Total hardness (mgCaCO₃/L)</td>
<td>70 and below</td>
</tr>
<tr>
<td>Calcium hardness (mgCaCO₃/L)</td>
<td>50 and below</td>
</tr>
<tr>
<td>Ion silica (mgSiO₂/L)</td>
<td>30 and below</td>
</tr>
<tr>
<td>Iron (mgFe/L)</td>
<td>1.0 and below</td>
</tr>
<tr>
<td>Copper (mgCu/L)</td>
<td>1.0 and below</td>
</tr>
<tr>
<td>Sulfide ion (mgS⁻²/L)</td>
<td>Not detected</td>
</tr>
<tr>
<td>Ammonium ion (mgNH₄⁺/L)</td>
<td>1.0 and below</td>
</tr>
<tr>
<td>Residual chlorine (mgCl/L)</td>
<td>0.3 and below</td>
</tr>
<tr>
<td>Free carbon dioxide (mgCO₂/L)</td>
<td>4.0 and below</td>
</tr>
</tbody>
</table>

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

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
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)**

- Brush
- Vacuum cleaner
- Wash it with water and apply gentle brush motion.

---

- 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.

  ![Cleaning of the condenser with a brush](image1)
  ![Cleaning of the condenser with an air gun](image2)

  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.

  **Important**

  - 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>
<thead>
<tr>
<th>Part number</th>
<th>Part</th>
<th>Qty.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRG-S0003</td>
<td>Pump mechanical sealing</td>
<td>1 set</td>
<td>For HRG005</td>
</tr>
</tbody>
</table>

* It is not required for HRG001 and HRG002.
# 7. Documents

## 7.1 Specifications list

<table>
<thead>
<tr>
<th>Table 7-1 Specifications list</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item</strong></td>
</tr>
<tr>
<td><strong>Installation/Op. Environment</strong></td>
</tr>
<tr>
<td>Rated ambient humid. range</td>
</tr>
<tr>
<td><strong>Operating fluid</strong></td>
</tr>
<tr>
<td>Rated capacity of tank</td>
</tr>
<tr>
<td>Power sup. voltage</td>
</tr>
<tr>
<td>Recommended leak breaker capacity</td>
</tr>
<tr>
<td>Breaker sensitivity current</td>
</tr>
<tr>
<td>Start/stop instruction signal (Remote op. signal)</td>
</tr>
<tr>
<td><strong>Rated temp. &amp; accuracy of circulating fluid</strong></td>
</tr>
<tr>
<td>Rated cooling capacity</td>
</tr>
<tr>
<td>Pumping capacity</td>
</tr>
<tr>
<td>Op. signal</td>
</tr>
<tr>
<td>Emergency, Stop signal</td>
</tr>
<tr>
<td><strong>Protective function</strong> (for equipment)</td>
</tr>
<tr>
<td>Emergency stop</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Others</td>
</tr>
<tr>
<td><strong>Material/Substance</strong></td>
</tr>
<tr>
<td><strong>Outside panel</strong></td>
</tr>
<tr>
<td>Control panel</td>
</tr>
<tr>
<td>Base</td>
</tr>
<tr>
<td><strong>Wetted part</strong></td>
</tr>
<tr>
<td>Internal piping for refrigerant</td>
</tr>
<tr>
<td>Operating refrigerant</td>
</tr>
<tr>
<td><strong>Accessories</strong></td>
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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

![Flow chart (HRG001-A and HRG002-A)](image)

#### 7.4.2 HRG005-A

![Flow chart (HRG005-A)](image)