Circulating Fluid Temperature Controller

Thermo-chiller

Resistant to dusty or water splashing environment

Metal panel
- Entire exterior surface is metal.
- Stainless steel panel can be selected. (Option)

Large capacity tank (12 L)
- Increase in circulating fluid recovery volume (Option)

Compact (W377 x H615 x D500)
- Temperature stability: ±0.1°C
- Ambient temperature: 5 to 45°C
- With heating function

Environmentally friendly R410A as refrigerant

<table>
<thead>
<tr>
<th>Model</th>
<th>Cooling capacity (60 Hz)</th>
<th>Temperature stability</th>
<th>Set temperature range</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS018-R</td>
<td>1900 W</td>
<td>±0.1°C</td>
<td>5 to 40°C</td>
</tr>
<tr>
<td>HRS030-R</td>
<td>2900 W</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Compatible with power supplies in Europe, Asia, Oceania, North, Central, and South America
Single-phase 200 to 230 VAC (50/60 Hz)
Protection of the electrical unit: IP54

Board and electric parts are inside of the electrical box. Protected from particles and water splash.

Entire panel is metal.
- Standard
- Stainless steel (Option)

Large capacity tank is available. (Option)

For easier maintenance, the tank capacity for the return circulating fluid from the customer has been increased. From the High level line, an extra 5 liters of circulating fluid can be contained.

Large capacity tank
(Option)

Easy cleaning of the tank
An opening (with a cap) for cleaning the tank is included separately from the circulating fluid fill port. Opening diameter: ø110

Resin tank 12 L
Space volume: 5 L
Circulating fluid return port
Fluid recovery
User's equipment (Heat source)
Circulating fluid outlet
Drain port

Shaped for easy supply of circulating fluid

The angled supply port facilitates the easy supply of circulating fluid.

Filter for circulating fluid fill port (Optional accessory: p. 19)
* After supplying the circulating fluid, the tank lid can be closed with the filter mounted.

Easy to check the circulating fluid level

High level
Low level
**With heating function**

- **Heater**
- **Compressor**
- **Cool fluid from refrigerant**
- **Circulating fluid**

Existing model

* This is just an example diagram.

**Simple operation**

1. **Step 1** Press the **RUN/STOP** key.
2. **Step 2** Adjust the temperature setting with the **/** keys.
3. **Step 3** Press **RUN/STOP** key to stop operation.

**Easy operation**

The large digital display (7-segment and 4 digits) and 2-row display provide a clearer view of the current value (PV) and set value (SV).

**Convenient functions** (Refer to the Operation Manual for details.)

- **Timer operation function**
  Timer for ON and OFF can be set in units of 0.5 h up to 99.5 h.
  Ex.) Can be set to stop on Saturday and Sunday and restart on Monday morning

- **Unit conversion function**
  Temperature and pressure units can be changed.

- **Power failure auto-restart function**
  Automatic restart after stoppage due to power failure, etc., is possible without pressing the key, and remote operation is also possible.

- **Anti-freezing operation function**
  If the circulating fluid approaches its freezing point, for example, on a cold winter night, the pump operates automatically, and the heat generated by the pump warms the circulating fluid, preventing freezing.

- **Key-lock function**
  Can be set in advance to protect the set values from being changed by pressing keys by mistake.

- **Function to output a signal for completion of preparation**
  Notifies by communication when the temperature reaches the pre-set temperature range.

- **Independent operation of the pump**
  The pump can be operated independently while the chiller is powered off. This allows you to check for leakages in piping and to remove the air.
Reduced maintenance hours for the pump

**Now with a magnet pump**
Due to the adoption of a sealless pump, no external leakage of the circulating fluid occurs. Also, periodic checking for pump leakage and replacement of the mechanical seal are not necessary.
- For products with the high-pressure pump option, a mechanical seal pump is used.

Toolless inspection and cleaning of air-cooled condenser

Easy to remove dust, cutting chips, etc., stuck to the dustproof net with a brush or air blow.

Power supply (24 VDC) available

Power can be supplied from the connector on the rear side of the HRS-R to external switches, etc.

### Variations

<table>
<thead>
<tr>
<th>Model</th>
<th>Cooling method</th>
<th>Cooling capacity [W] (50/60 Hz)</th>
<th>Single-phase 200 to 230 VAC (50/60 Hz)</th>
<th>Option p.15</th>
<th>Optional accessories p.16</th>
<th>International standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS018-R</td>
<td>Air-cooled refrigeration</td>
<td>1700/1900</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRS030-R</td>
<td></td>
<td>2500/2900</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- With earth leakage breaker
- With automatic fluid fill function
- Large capacity tank specification
- High-pressure pump mounted
- Stainless steel panel specification
- SI unit only
- Anti-quake bracket
- Piping conversion fitting
- Concentration meter
- Bypass piping set
- Particle filter set
- Dustproof filter
- Separately-installed power transformer
- Filter for circulating fluid fill port

**Flow switch**
Refer to the Web Catalog for details.
Self-diagnosis function and check display

Display of 31 types of alarm codes
For details, refer to page 13.
Operation is monitored at all times by the integrated sensor.
Should any error occur, the self-diagnosis result is displayed by the applicable alarm code (31 types).
This makes it easier to identify the cause of the alarm. Can be used before requesting service

Changeable alarm set values

<table>
<thead>
<tr>
<th>Setting item</th>
<th>Set value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circulating fluid discharge temperature rise</td>
<td>5 to 48°C</td>
</tr>
<tr>
<td>Circulating fluid discharge temperature drop</td>
<td>1 to 39°C</td>
</tr>
<tr>
<td>Circulating fluid discharge pressure rise</td>
<td>0.05 to 0.75 MPa *1</td>
</tr>
<tr>
<td>Circulating fluid discharge pressure drop</td>
<td>0.05 to 0.18 MPa *1</td>
</tr>
</tbody>
</table>

*1 Set values vary depending on the model.

Alarm codes can be used for the notification of upcoming recommended maintenance.
The codes notify you when it’s time to check the pump and fan motor. Helpful for facility maintenance

Check display
The internal temperature, pressure, and operating time of the product are displayed.

Displayed item
- Circulating fluid outlet temperature
- Circulating fluid return temperature
- Compressor gas temperature
- Circulating fluid outlet pressure
- Compressor gas discharge pressure
- Compressor gas return pressure
- Accumulated operating time
- Accumulated operating time of pump
- Accumulated operating time of fan motor
- Accumulated operating time of compressor

Communication function

Serial communication (RS232C/RS485) and contact I/Os (2 inputs and 3 outputs) are equipped as standard. This allows for communication with the user’s equipment and system construction, depending on the application. A 24 VDC output can be also provided and is available for use with flow switches (SMC’s PF3W, etc.).

Ex. 1 Remote signal I/O through serial communication
Remote operation is enabled (to start and stop operation) through serial communication.

Ex. 2 Remote operation signal input
One of the contact inputs is used for remote operation and the other is used to monitor the flow of a flow switch. This is where their alarm outputs are taken in.

Ex. 3 Alarm and operation status (start, stop, etc.) signal output
The alarm and status generated in the product are assigned to 3 output signals based on their contents, which can then be output.

Output setting example
- Output 1: Temperature rise
- Output 2: Pressure rise
- Output 3: Operation status (start, stop, etc.)

Application Examples
Food packaging lines
Machining centers

Ex.
[Diagram of remote signal I/O through serial communication]

Ex.
[Diagram of remote operation signal input]

Ex.
[Diagram of alarm and operation status signal output]
Global Supply Network

SMC has a comprehensive network in the global market.

We now have a presence of more than 500 branch offices and distributors in 83 countries and regions worldwide, such as Asia, Oceania, North/Central/South America, and Europe. With this global network, we are able to provide a global supply of our substantial range of products and high-quality customer service. We also provide full support to local factories, foreign manufacturing companies, and Japanese companies in each country.

SMC Thermo-chiller Variations

Lots of variations are available according to the users’ requirements.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HRSE Basic type</td>
<td>±2.0</td>
<td>10 to 30</td>
<td>1.6 kW 2.2 kW</td>
<td>Indoor use</td>
<td>(Only 230 VAC type)</td>
</tr>
<tr>
<td>HRS Standard type</td>
<td>±0.1</td>
<td>5 to 40</td>
<td></td>
<td>Indoor use</td>
<td>(Only 60 Hz)</td>
</tr>
<tr>
<td>HRS-R Environmentally resistant type</td>
<td>±0.1</td>
<td>5 to 40</td>
<td></td>
<td>Indoor use Electrical box: IP54</td>
<td></td>
</tr>
<tr>
<td>HRS090 Standard type</td>
<td>±0.5</td>
<td>5 to 35</td>
<td></td>
<td>Indoor use</td>
<td>(400 V as standard)</td>
</tr>
<tr>
<td>HRS100/150 Standard type</td>
<td>±1.0</td>
<td>5 to 35</td>
<td></td>
<td>Outdoor Installation IPX4</td>
<td></td>
</tr>
<tr>
<td>HRSH090 Inverter type</td>
<td>±0.1</td>
<td>5 to 40</td>
<td></td>
<td>Indoor use</td>
<td>(400 V as standard, 200 V as an option)</td>
</tr>
<tr>
<td>HRSH Inverter type</td>
<td>±0.1</td>
<td>5 to 35</td>
<td></td>
<td>Outdoor Installation IPX4</td>
<td></td>
</tr>
<tr>
<td>HRL Inverter dual type</td>
<td>CH1 ±0.1</td>
<td>15 to 25</td>
<td>9 kW</td>
<td>Indoor use</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CH2 ±0.5</td>
<td>20 to 40</td>
<td>1.0 kW (Max. 1.5 kW)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Circulating Fluid Line Equipment

**Flow Switch**: Monitors the flow rate and temperature of the circulating fluid

- 3-Color Display Digital Flow Switch for Water *PF3W*
- 3-Color Display Electromagnetic Digital Flow Switch *LFE*
- Digital Flow Switch for Deionized Water and Chemical Liquids *PF2D*

**Pressure Switch**: Monitors the pressure of the circulating fluid and facility water

- 2-Color Display High-Precision Digital Pressure Switch *ISE80*
- Pressure Sensor for General Fluids *PSE56, 57, 57*
- Pressure Sensor Controller *PSE200, 300, 300AC*

**Fittings and Tubing**

- **S Coupler** *KK*
- **S Coupler/Stainless Steel (Stainless Steel 304)** *KKA*
- **Metal One-touch Fittings** *KQB2*
- **Stainless Steel 316 One-touch Fittings** *KQG2*
- **Stainless Steel 316 Insert Fittings** *KFG2*
- **Fluoropolymer Fittings** *LQ*

**Particle Filter**

- Refer to the Web Catalog for details.

For the control of pressure and flow rate: The digital display makes these aspects visible.

Refer to the Web Catalog for details.
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Thermo-chiller HRS-R Series

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# Specifications

There are different values from standard specifications. Refer to page 15 for details.

<table>
<thead>
<tr>
<th>Model</th>
<th>Air-cooled refrigeration</th>
<th>HRS030-A</th>
<th>20</th>
<th>L-R</th>
<th>Single-phase 200 to 230 VAC 50/60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling method</td>
<td>Air-cooled refrigeration</td>
<td>030</td>
<td>Cooling capacity 2500/2900 W (50/60 Hz)</td>
<td>030</td>
<td>Cooling capacity 2500/2900 W (50/60 Hz)</td>
</tr>
<tr>
<td>Refrigerant charge</td>
<td>[kg]</td>
<td>0.39</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control method</td>
<td>PID control</td>
<td>030</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature/Humidity/Altitude</td>
<td>Temperature: 5 to 45°C, Humidity: 30 to 70%, Altitude: less than 3000 m</td>
<td>030</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circulating fluid system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipe thread type</td>
<td>Rc</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply</td>
<td>20</td>
<td>Single-phase 200 to 230 VAC (50/60 Hz)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluid contact material</td>
<td>Stainless steel, Copper (Heat exchanger brazing), Bronze, Alumina ceramic, Carbon, PP, PE, POM, FKM, EPDM, PVC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circulating fluid system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply</td>
<td>Single-phase 200 to 230 VAC (50/60 Hz)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applicable earth leakage breaker capacity</td>
<td>[A]</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated operating current</td>
<td>[A]</td>
<td>5.1/5.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated power consumption</td>
<td>[kVA]</td>
<td>1.0/1.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical box protection level</td>
<td>IP54 (Cable entry: IP67)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise level</td>
<td>(50/60 Hz)</td>
<td>dB</td>
<td>62/65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accessories</td>
<td>Fitting (for drain outlet) 1 pc., Input/output signal connector 1 pc., Operation Manual (for installation/operation) 1, Alarm code list sticker 1, Ferrite core (for communication) 1 pc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1 It should have no condensation.
*2 If tap water is used, use water that conforms to Water Quality Standards of the Japan Refrigeration and Air Conditioning Industry Association (JRA GL-02-1994 cooling water system - circulating type - make-up water).
*4 Use a 15% ethylene glycol aqueous solution if operating in a place where the circulating fluid temperature is 10°C or less.
*5 Temperature at the thermo-chiller outlet when the circulating fluid flow is rated flow, and the circulating fluid outlet and return port are directly connected. Installation environment and the power supply are within specification range and stable.
*6 The capacity of the thermo-chiller outlet when the circulating fluid temperature is 20°C.
*7 Required minimum flow rate for maintaining the cooling capacity or temperature stability
*8 Purchase an earth leakage breaker with current sensitivity of 30 mA separately. (A product with an optional earth leakage breaker (option B) is also available.)
*9 Front: 1 m, height: 1 m, stable with no load, Other conditions → See *3.
*10 Weight in the dry state without circulating fluids
Thermo-chiller Environmentally Resistant Type

**Cooling Capacity**

HRS018-A□-20-□-R

- Ambient temperature 25°C
- Ambient temperature 32°C
- Ambient temperature 40°C
- Ambient temperature 45°C

HRS030-A□-20-□-R

- Ambient temperature 25°C
- Ambient temperature 32°C
- Ambient temperature 40°C
- Ambient temperature 45°C

**Heating Capacity**

HRS018_030-A-20-R

- Ambient temperature 5°C
- Ambient temperature 25°C
- Ambient temperature 40°C
- Ambient temperature 45°C

**Pump Capacity**

HRS018_030-A-20-R (Single-phase 200 to 230 VAC)

- Outlet/60 [Hz]
- Outlet/50 [Hz]
- Return port

If the product is used at altitude of 1000 m or higher, refer to "Operating Environment/Storage Environment" (page 23) Item 14 "∗ For altitude of 1000 m or higher."

For models with high-pressure pump mounted (-T), the cooling capacity will decrease by about 300 W from each graph.
### HRS-R Series | Environmentally Resistant Type

#### Dimensions

**HRS018-A-20-R**
**HRS030-A-20-R**

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circulating fluid fill port lid</td>
<td>377 mm x 500 mm</td>
</tr>
<tr>
<td>Operation display panel</td>
<td></td>
</tr>
<tr>
<td>Handle (Same for the opposite side)</td>
<td>Max. 42 mm</td>
</tr>
<tr>
<td>Caster (unfixed)</td>
<td>9 mm</td>
</tr>
<tr>
<td>Electrical box rear cover</td>
<td></td>
</tr>
<tr>
<td>Signal cable entry</td>
<td></td>
</tr>
<tr>
<td>Ventilation grille</td>
<td>(Same for the opposite side)</td>
</tr>
<tr>
<td>Power cable entry</td>
<td></td>
</tr>
<tr>
<td>Drain port with O-ring sealing plug</td>
<td></td>
</tr>
</tbody>
</table>

#### Connection for the power cable and signal cable
(The figure does not include the electrical box rear cover.)

- **Serial communication (RS-485/RS-232C) connector**
- **Power terminal**
- **Maintenance connector**
- **Contact input/output communication connector**
- **Optional connector 1**
- **Optional connector 2**
Recommended External Piping Flow

External piping circuit is recommended as shown below.

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Size</th>
<th>Recommended part no.</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Valve</td>
<td>Rc1/2</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>2</td>
<td>Filter</td>
<td>Rc1/2</td>
<td>HRS-PF□□□□□</td>
<td>If foreign matter with a size of 20 µm or more are likely to enter, install the particle filter. For the recommended filter, refer to the optional accessory HRS-PF□□□□□ (page 18).</td>
</tr>
<tr>
<td>3</td>
<td>Flow meter</td>
<td>0 to 50 L/min</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>4</td>
<td>Pressure gauge</td>
<td>0 to 1.0 MPa</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>5</td>
<td>Others (pipe, hose, etc.)</td>
<td>ø15 or more</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Cable Specifications

Power Cable Specifications

<table>
<thead>
<tr>
<th>Applicable model</th>
<th>Rated value for thermo-chiller</th>
<th>Power cable example</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Power supply</td>
<td>Applicable breaker rated current</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Terminal screw</td>
</tr>
<tr>
<td>HRS018-A□-20-R</td>
<td>Single-phase 200 to 230 VAC (50/60 Hz)</td>
<td>10 A</td>
</tr>
<tr>
<td>HRS030-A□-20-R</td>
<td>Single-phase 200 to 230 VAC (50/60 Hz)</td>
<td>15 A</td>
</tr>
<tr>
<td>HRS018-A□-20-B-R</td>
<td>Single-phase 200 to 230 VAC (50/60 Hz)</td>
<td>10 A</td>
</tr>
<tr>
<td>HRS030-A□-20-B-R</td>
<td>Single-phase 200 to 230 VAC (50/60 Hz)</td>
<td>15 A</td>
</tr>
</tbody>
</table>

* Option B features a built-in breaker as shown in the chart above.
Operation Display Panel

The basic operation of this unit is controlled through the operation display panel on the front of the product.

### Alarm

This unit has 31 types of alarms as standard, and displays each of them by its alarm code on the PV screen with the [ALARM] lamp ([LOW LEVEL] lamp) lit up on the operation display panel. The alarm can be read out through communication.

#### Alarm Code Table

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Digital display (7-segment, 4 digits)</td>
<td>PV Displays the circulating fluid current discharge temperature and pressure and alarm codes and other menu items (codes).</td>
</tr>
<tr>
<td>02</td>
<td>[°C][°F] lamp</td>
<td>SV Displays the circulating fluid discharge temperature and the set values of other menus.</td>
</tr>
<tr>
<td>03</td>
<td>[MPa][PSI] lamp</td>
<td>Equipped with a unit conversion function, Displays the unit of display pressure (default setting: MPa).</td>
</tr>
<tr>
<td>04</td>
<td>[REMOTE] lamp</td>
<td>Enables remote operation (start and stop) by communication. Lights up during remote operation.</td>
</tr>
<tr>
<td>05</td>
<td>[RUN] lamp</td>
<td>Lights up when the product is started, and goes off when it is stopped. Flashes during stand-by for stop or anti-freezing function, or independent operation of the pump.</td>
</tr>
<tr>
<td>06</td>
<td>[ALARM] lamp</td>
<td>Flashes with buzzer when alarm occurs.</td>
</tr>
<tr>
<td>07</td>
<td>[ ] lamp</td>
<td>Lights up when the surface of the fluid level indicator falls below the L level.</td>
</tr>
<tr>
<td>08</td>
<td>[ ] lamp</td>
<td>Equipped with a timer for start and stop. Lights up when this function is operated.</td>
</tr>
<tr>
<td>09</td>
<td>[ ] lamp</td>
<td>Equipped with a power failure auto-restart function, which restarts the product automatically after stopped due to a power failure, is provided. Lights up when this function is operated.</td>
</tr>
<tr>
<td>10</td>
<td>[RUN/STOP] key</td>
<td>Makes the product start or stop.</td>
</tr>
<tr>
<td>11</td>
<td>[MENU] key</td>
<td>Shifts the main menu (display screen of circulating fluid discharge temperature and pressure) and other menus (for monitoring and entry of set values).</td>
</tr>
<tr>
<td>12</td>
<td>[SEL] key</td>
<td>Changes the item in menu and enters the set value.</td>
</tr>
<tr>
<td>13</td>
<td>[ ] key</td>
<td>Decreases the set value.</td>
</tr>
<tr>
<td>14</td>
<td>[ ] key</td>
<td>Increases the set value.</td>
</tr>
<tr>
<td>15</td>
<td>[PUMP] key</td>
<td>Press the [MENU] and [RUN/STOP] keys simultaneously. The pump starts running independently to make the product ready for start-up (release the air).</td>
</tr>
<tr>
<td>16</td>
<td>[RESET] key</td>
<td>Press the [ ] and [ ] keys simultaneously. The alarm buzzer is stopped and the [ALARM] indicator is reset.</td>
</tr>
</tbody>
</table>

#### Alarm List

<table>
<thead>
<tr>
<th>Alarm code</th>
<th>Alarm message</th>
<th>Operation status</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL01</td>
<td>Low level in tank</td>
<td>Stop¹</td>
</tr>
<tr>
<td>AL02</td>
<td>High circulating fluid discharge temperature</td>
<td>Stop</td>
</tr>
<tr>
<td>AL03</td>
<td>Circulating fluid discharge temperature rise</td>
<td>Continue¹</td>
</tr>
<tr>
<td>AL04</td>
<td>Circulating fluid discharge temperature drop</td>
<td>Continue¹</td>
</tr>
<tr>
<td>AL05</td>
<td>High circulating fluid return temperature (60°C)</td>
<td>Stop</td>
</tr>
<tr>
<td>AL06</td>
<td>High circulating fluid discharge pressure</td>
<td>Stop</td>
</tr>
<tr>
<td>AL07</td>
<td>Abnormal pump operation</td>
<td>Stop</td>
</tr>
<tr>
<td>AL08</td>
<td>Circulating fluid discharge pressure rise</td>
<td>Continue¹</td>
</tr>
<tr>
<td>AL09</td>
<td>Circulating fluid discharge pressure drop</td>
<td>Continue¹</td>
</tr>
<tr>
<td>AL10</td>
<td>High compressor intake temperature</td>
<td>Stop</td>
</tr>
<tr>
<td>AL11</td>
<td>Low compressor intake temperature</td>
<td>Stop</td>
</tr>
<tr>
<td>AL12</td>
<td>Low super heat temperature</td>
<td>Stop</td>
</tr>
<tr>
<td>AL13</td>
<td>High compressor discharge pressure</td>
<td>Stop</td>
</tr>
<tr>
<td>AL15</td>
<td>Refrigerating circuit pressure (high pressure side) drop</td>
<td>Stop</td>
</tr>
<tr>
<td>AL16</td>
<td>Refrigerating circuit pressure (low pressure side) rise</td>
<td>Stop</td>
</tr>
<tr>
<td>AL17</td>
<td>Refrigerating circuit pressure (low pressure side) drop</td>
<td>Stop</td>
</tr>
<tr>
<td>AL18</td>
<td>Compressor overload</td>
<td>Stop</td>
</tr>
<tr>
<td>AL19</td>
<td>Communication error²</td>
<td>Continue¹</td>
</tr>
<tr>
<td>AL20</td>
<td>Memory error</td>
<td>Stop</td>
</tr>
<tr>
<td>AL21</td>
<td>DC line fuse cut</td>
<td>Stop</td>
</tr>
<tr>
<td>AL22</td>
<td>Circulating fluid discharge temperature sensor failure</td>
<td>Stop</td>
</tr>
<tr>
<td>AL23</td>
<td>Circulating fluid return temperature sensor failure</td>
<td>Stop</td>
</tr>
<tr>
<td>AL24</td>
<td>Compressor intake temperature sensor failure</td>
<td>Stop</td>
</tr>
<tr>
<td>AL25</td>
<td>Circulating fluid discharge pressure sensor failure</td>
<td>Stop</td>
</tr>
<tr>
<td>AL26</td>
<td>Compressor discharge pressure sensor failure</td>
<td>Stop</td>
</tr>
<tr>
<td>AL27</td>
<td>Compressor intake pressure sensor failure</td>
<td>Stop</td>
</tr>
<tr>
<td>AL28</td>
<td>Pump maintenance</td>
<td>Continue</td>
</tr>
<tr>
<td>AL29</td>
<td>Fan motor maintenance</td>
<td>Continue</td>
</tr>
<tr>
<td>AL30</td>
<td>Compressor maintenance</td>
<td>Continue</td>
</tr>
<tr>
<td>AL31</td>
<td>Contact 1 input signal detection</td>
<td>Stop¹</td>
</tr>
<tr>
<td>AL32</td>
<td>Contact 2 inputs signal detection</td>
<td>Stop¹</td>
</tr>
</tbody>
</table>

¹ “Stop” or “Continue” are default settings. Users can change them to “Continue” and “Stop”. For details, refer to the Operation Manual.
² “AL19, AL31, AL32” are disabled in the default setting. If this function is necessary, it should be set by the user, referring to the Operation Manual.

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Communication Functions

Contact Input/Output

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector type (to the product/to the socket (Accessory))</td>
<td>Insulation method: Photocoupler</td>
</tr>
<tr>
<td></td>
<td>Rated input voltage: 24 VDC</td>
</tr>
<tr>
<td></td>
<td>Operating voltage range: 21.6 VDC to 26.4 VDC</td>
</tr>
<tr>
<td></td>
<td>Rated input current: 5 mA TYP</td>
</tr>
<tr>
<td></td>
<td>Input impedance: 4.7 kΩ</td>
</tr>
<tr>
<td>Contact output signal</td>
<td>Rated load voltage: 48 VAC or less/30 VDC or less</td>
</tr>
<tr>
<td></td>
<td>Maximum load current: 500 mA AC/DC (Resistance load)</td>
</tr>
<tr>
<td></td>
<td>Minimum load current: 5 VDC 10 mA</td>
</tr>
<tr>
<td></td>
<td>Output voltage: 24 VDC ±10% 0.5 A MAX</td>
</tr>
</tbody>
</table>

Circuit diagram

Serial Communication

The serial communication (RS-485/RS-232C) enables the following items to be written and read out. For details, refer to the Operation Manual for communication.

Writing

- Run/Stop
- Circulating fluid temperature setting (SV)

Readout

- Circulating fluid present temperature
- Circulating fluid discharge pressure
- Status information
- Alarm occurrence information

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector type</td>
<td>D-sub 9-pin, Female connector (Mounting screw: M2.6 x 0.45)</td>
</tr>
<tr>
<td>Protocol</td>
<td>Modicon Modbus compliant/Simple communication protocol</td>
</tr>
<tr>
<td>Standards</td>
<td>EIA standard RS-485</td>
</tr>
<tr>
<td></td>
<td>EIA standard RS-232C</td>
</tr>
<tr>
<td>Circuit diagram</td>
<td></td>
</tr>
</tbody>
</table>

*1 The pin numbers and output signals can be set by the user. For details, refer to the Operation Manual.

*2 When using with optional accessories, depending on the accessory, the allowable current of 24 VDC devices will be reduced. Refer to the Operation Manual of the optional accessories for details.

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Options have to be selected when ordering the thermo-chiller. It is not possible to add them after purchasing the unit.

### B Option symbol

**With Earth Leakage Breaker**

**HRS**\(-A\)-20-B-R

- With earth leakage breaker

In the event of a short circuit, overcurrent or overheating, the earth leakage breaker will automatically shut off the power supply.

<table>
<thead>
<tr>
<th>Model</th>
<th>Rated current [A]</th>
<th>Sensitivity of leak current [mA]</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS018-A(\square)-20-B-R</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>HRS030-A(\square)-20-B-R</td>
<td>15</td>
<td>30</td>
</tr>
</tbody>
</table>

* When the type with an earth leakage breaker is selected, the weight increases by 2 kg.

### J Option symbol

**With Automatic Fluid Fill Function**

**HRS**\(-A\)-20-J-R

- With automatic fluid fill function

By installing this at the automatic fluid fill port, the circulating fluid can be automatically supplied to the product using a built-in solenoid valve for a fluid fill while the circulating fluid is decreasing.

<table>
<thead>
<tr>
<th>Applicable model</th>
<th>Fluid fill method</th>
<th>Fluid fill pressure [MPa]</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS018/030-A-20-J-R</td>
<td>Built-in solenoid valve for automatic fluid fill</td>
<td>0.2 to 0.5</td>
</tr>
</tbody>
</table>

* When the option, with automatic fluid fill function, is selected, the weight increases by 1 kg.

### L Option symbol

**Large Capacity Tank Specification**

**HRS**\(-A\)-20-L-R

- Large capacity tank specification

Tank capacity: 12 L

* No change in external dimensions

* When the large capacity tank specification is selected, the weight increases by 1 kg.
High-pressure pump mounted

Possible to choose a high-pressure pump in accordance with user’s piping resistance. Cooling capacity will decrease by heat generated in the pump.

<table>
<thead>
<tr>
<th>Applicable model</th>
<th>HRS018/030-A-20-T-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated flow (50/60 Hz)</td>
<td>10 (0.35 MPa)/14 (0.35 MPa)</td>
</tr>
<tr>
<td>Maximum flow rate (50/60 Hz)</td>
<td>17/20</td>
</tr>
<tr>
<td>Maximum pump head (50/60 Hz)</td>
<td>70</td>
</tr>
<tr>
<td>Output</td>
<td>610</td>
</tr>
<tr>
<td>Recommended earth leakage breaker capacity</td>
<td>15</td>
</tr>
<tr>
<td>Cooling capacity*3</td>
<td>3 The cooling capacity reduces about 300 W from the value in the catalog. (due to an increase in the heat generation of the pump)</td>
</tr>
</tbody>
</table>

*1 The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C.
*2 Required minimum flow rate for maintaining the cooling capacity or temperature stability
*3 Cooling capacity will decrease as pump power increases.
*4 When the option, high-pressure pump mounted, is selected, the weight increases by 7 kg.
* No change in external dimensions

Pump Capacity

Caution

Mechanical Seal Pump

The pump used for the option T of the thermo-chiller HRS018/030-R uses a mechanical seal with the fixed ring and rotary ring used for the shaft seal part. If foreign matter enter the gap between the seals, this may cause a trouble such as leakage from the seal part or pump lock. Therefore, it is strongly recommended to install the particle filter in the return piping of the chiller.

Stainless Steel Panel Specification

Exterior panel material is stainless steel (hairline finish).

* No change in external dimensions

SI Unit Only

The circulating fluid temperature and pressure are displayed in SI units [MPa/°C] only. If this option is not selected, a product with a unit selection function will be provided by default.

* No change in external dimensions
**HRS-R Series**

**Optional Accessories**

1. **Anti-Quake Bracket**
   
   This bracket can be used to reduce product damage in the case of an earthquake. An anchor bolt (M8) suitable for the flooring material should be prepared separately by the user. (Anti-quake bracket thickness: 1.6 mm)

<table>
<thead>
<tr>
<th>Part no. (per unit)</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS-TK001</td>
<td>HRS018-A-20-□-R</td>
</tr>
<tr>
<td></td>
<td>HRS030-A-20-□-R</td>
</tr>
</tbody>
</table>

   ![Mounting view](image)

   - Anchor bolt (M8) (Prepared by user)
   - Anti-quake bracket
     - Material: Zinc steel plate

2. **Piping Conversion Fitting**

   - **Conversion fitting for circulating fluid + Conversion fitting for drain outlet HRS018-A-20-□-R, HRS030-A-20-□-R**

   This fitting changes the port size for circulating fluid from Rc1/2 to G1/2 or NPT1/2, and for drain from Rc3/8 to G3/8 or NPT3/8. It is not necessary to purchase this when pipe thread type F or N is selected in "How to Order" since it is included in the product.

<table>
<thead>
<tr>
<th>Part no. (per unit)</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS-EP001</td>
<td>G thread conversion fitting set</td>
</tr>
<tr>
<td></td>
<td>HRS018-A-20-□-R</td>
</tr>
<tr>
<td></td>
<td>HRS030-A-20-□-R</td>
</tr>
<tr>
<td>HRS-EP002</td>
<td>NPT thread conversion fitting set</td>
</tr>
<tr>
<td></td>
<td>HRS018-A-20-□-R</td>
</tr>
<tr>
<td></td>
<td>HRS030-A-20-□-R</td>
</tr>
</tbody>
</table>

   When the options, with automatic fluid fill function "-J", or high-pressure pump mounted "-T" are selected, purchase 3 piping conversion fitting (for option), too.
③ Piping Conversion Fitting (For Option)

- Conversion fitting for automatic fluid fill port
  This fitting changes the port size for the option, with automatic fluid fill function “-J” from Rc3/8, Rc3/4 to G3/8, G3/4 or NPT3/8, NPT3/4. It is not necessary to purchase this when pipe thread type F or N is selected in “How to Order” since it is included in the product.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HRS030-A-20-J-R</td>
</tr>
<tr>
<td>HRS-EP006</td>
<td></td>
</tr>
</tbody>
</table>

- Conversion fitting for drain outlet
  This fitting changes the port size for drain outlet for the option, high-pressure pump mounted “-T” from Rc1/4 to G1/4 or NPT1/4. It is not necessary to purchase this when pipe thread type F or N is selected in “How to Order” since it is included in the product.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HRS030-A-20-T-R</td>
</tr>
<tr>
<td>HRS-EP008</td>
<td></td>
</tr>
</tbody>
</table>

④ Concentration Meter

This meter can be used to control the concentration of ethylene glycol aqueous solution regularly.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRZ-BR002</td>
<td></td>
</tr>
</tbody>
</table>

⑤ Bypass Piping Set

When the circulating fluid goes below the rated flow (7 L/min), cooling capacity will be reduced and the temperature stability will be badly affected. In such a case, use the bypass piping set.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS-BP001</td>
<td></td>
</tr>
</tbody>
</table>

Parts List

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Fluid contact material</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bypass tube (Part no.: TL0806)</td>
<td>PFA</td>
<td>1 (Approx. 700 mm)</td>
</tr>
<tr>
<td>2</td>
<td>Outlet piping (With ball valve)</td>
<td>Stainless steel</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Return port piping</td>
<td>Stainless steel</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Nipple (Size: 1/2)</td>
<td>Stainless steel</td>
<td>2</td>
</tr>
</tbody>
</table>
6 Particle Filter Set

This set can be used to remove foreign matter from the circulating fluid.

- **HRS-PF001**
  - W075
  - PF003

### Filtration

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Nominal filtration accuracy [µm]</th>
<th>Element part no. for PF001/PF003 (individual part)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>Without element</td>
<td>—</td>
</tr>
<tr>
<td>W005</td>
<td>5</td>
<td>EJ202S-005X11</td>
</tr>
<tr>
<td>W075</td>
<td>75</td>
<td>EJ202S-075X11</td>
</tr>
</tbody>
</table>

#### For circulating fluid outlet

[Used to protect user’s equipment]

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS-PF001</td>
<td>HRS018-A-20-□-R</td>
</tr>
<tr>
<td>(Length L = 125 mm)</td>
<td>HRS030-A-20-□-R</td>
</tr>
</tbody>
</table>

#### For circulating fluid return port

[Used to protect thermo-chiller]

If foreign matter such as scales in the piping enter the circulating fluid, this may cause the pump to malfunction. Therefore, it is strongly recommended to install the particle filter set.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS-PF003</td>
<td>HRS018-A-20-□-R</td>
</tr>
<tr>
<td>(Length L = 125 mm)</td>
<td>HRS030-A-20-□-R</td>
</tr>
</tbody>
</table>

---

**Mounting view**

The following reference drawing shows the HRS-PF001 mounted on the HRS018. For details, refer to the dimensions or the Operation Manual.

**Optional Accessories**

**HRS-R Series**

---

**Parts List**

<table>
<thead>
<tr>
<th>No.</th>
<th>Model</th>
<th>Description</th>
<th>Fluid contact material</th>
<th>Qty.</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>—</td>
<td>Body</td>
<td>PP</td>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td>2</td>
<td>EJ202S-005X11</td>
<td>Element (Length L = 125 mm)</td>
<td>PP/PE</td>
<td>1</td>
<td>The product should be replaced when the pressure drop reaches 0.1 MPa.</td>
</tr>
<tr>
<td>3</td>
<td>—</td>
<td>Particle filter bracket</td>
<td>—</td>
<td>1</td>
<td>For HRS-PF001</td>
</tr>
<tr>
<td>4</td>
<td>—</td>
<td>Nipple</td>
<td>Stainless steel</td>
<td>1</td>
<td>Conversion from R to NPT</td>
</tr>
<tr>
<td>5</td>
<td>—</td>
<td>Extension piece</td>
<td>Stainless steel</td>
<td>1</td>
<td>Conversion from NPT to Rc</td>
</tr>
<tr>
<td>6</td>
<td>—</td>
<td>Tapping screw</td>
<td>—</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>—</td>
<td>Handle</td>
<td>—</td>
<td>1</td>
<td>When -H is selected</td>
</tr>
<tr>
<td>8</td>
<td>—</td>
<td>Sealant tape</td>
<td>PTFE</td>
<td>1</td>
<td>—</td>
</tr>
</tbody>
</table>
### Dustproof Filter

A disposable dustproof filter is mounted on the front panel.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Description</th>
<th>Part no.</th>
<th>Note</th>
</tr>
</thead>
</table>

### Separately-Installed Power Transformer

#### Specifications

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable model</th>
<th>Volume</th>
<th>Type</th>
<th>Inlet voltage (50 Hz)</th>
<th>Outlet voltage (60 Hz)</th>
<th>Outlet voltage (50 Hz)</th>
<th>Outlet voltage (60 Hz)</th>
</tr>
</thead>
</table>

#### IDF-TR2000-9

- **Dimensions:**
  - Height: 158 mm
  - Width: 150 mm
  - Depth: 130 mm
  - Cable hole: ø26 mm
  - 4 x ø7 mm

#### IDF-TR2000-10, 11

- **Dimensions:**
  - Height: 243 mm
  - Width: 235 mm
  - Depth: 220 mm
  - Cable hole: ø39 mm
  - 4 x ø10 mm

### Filter for Circulating Fluid Fill Port

Prevents foreign matter from entering the tank when supplying the circulating fluid. Can be used just by fitting into the circulating fluid fill port.

<table>
<thead>
<tr>
<th>Material</th>
<th>Stainless steel 304, Stainless steel 316</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mesh size</td>
<td>200</td>
</tr>
</tbody>
</table>
HRS-R Series

Cooling Capacity Calculation

Required Cooling Capacity Calculation

Example 1: When the heat generation amount in the user’s equipment is known.

The heat generation amount can be determined based on the power consumption or output of the heat generating area — i.e. the area requiring cooling — within the user’s equipment.\(^1\)

1. **Derive the heat generation amount from the power consumption.**
   - Power consumption \( P \): 1000 [W]
   - \( Q = P = 1000 [W] \)
   - Cooling capacity = Considering a safety factor of 20%,
     \( 1000 [W] \times 1.2 = 1200 [W] \)

2. **Derive the heat generation amount from the power supply output.**
   - Power supply output \( V \): 1.0 [kVA]
   - \( Q = P = V \times I \times \text{Power factor} \)
   - In this example, using a power factor of 0.85:
     \( = 1.0 [kVA] \times 0.85 = 0.85 [kW] = 850 [W] \)
   - Cooling capacity = Considering a safety factor of 20%,
     \( 850 [W] \times 1.2 = 1020 [W] \)

\(^1\) The examples above calculate the heat generation amount based on the power consumption. The actual heat generation amount may differ due to the structure of the user’s equipment. Be sure to check it carefully.

Example 2: When the heat generation amount in the user’s equipment is not known.

Obtain the temperature difference between inlet and outlet by circulating the circulating fluid inside the user’s equipment.

Heat generation amount by user’s equipment \( Q \): Unknown [W] \(([J/s])\)

- **Circulating fluid**
  - T: Tap water \(^{1}\)
- **Circulating fluid mass flow rate** \( q_m \):
  - \( (= \rho \times q_v \times 60) \) [kg/s]
- **Circulating fluid density** \( \rho \):
  - \( 1 \) [kg/dm \(^3\)]
- **Circulating fluid (volume) flow rate** \( q_v \):
  - \( 10 \) [dm \(^3\)/min]
- **Circulating fluid specific heat** \( C \):
  - \( 4.2 \times 10^3 \) [J/(kg·K)]
- **Circulating fluid outlet temperature** \( T_1 \):
  - \( 293 \) [K] \((20 [°C])\)
- **Circulating fluid return temperature** \( T_2 \):
  - \( 295 \) [K] \((22 [°C])\)
- **Circulating fluid temperature difference** \( \Delta T \):
  - \( 2.0 \) [K] \((= T_2 – T_1)\)

Conversion factor: minutes to seconds (SI units): \( 60 \) [s/min]

\(^{1}\) Refer to page 21 for the typical physical property value of tap water or other circulating fluids.

\( Q = q_m \times C \times (T_2 – T_1) \)

\( = \rho \times q_v \times C \times \Delta T \)

\( = \frac{1 \times 10 \times 4.2 \times 10^3 \times 2.0}{60} \)

\( = 1400 \) [J/s] \( \approx 1400 \) [W]

Cooling capacity = Considering a safety factor of 20%,

\( 1400 \) [W] \times 1.2 = \( 1680 \) [W]

Example of conventional units (Reference)

Heat generation amount by user’s equipment \( Q \): Unknown [cal/h] \( \rightarrow \) [W]

- **Circulating fluid**
  - T: Tap water \(^{1}\)
- **Circulating fluid weight flow rate** \( q_m \):
  - \( (= \rho \times q_v \times 60) \) [kgf/h]
- **Circulating fluid weight volume ratio** \( g \):
  - \( 1 \) [kgf/L]
- **Circulating fluid (volume) flow rate** \( q_v \):
  - \( 10 \) [L/min]
- **Circulating fluid specific heat** \( C \):
  - \( 1.0 \times 10^3 \) [cal/(kgf·°C)]
- **Circulating fluid outlet temperature** \( T_1 \):
  - \( 20 \) [°C]
- **Circulating fluid return temperature** \( T_2 \):
  - \( 22 \) [°C]
- **Circulating fluid temperature difference** \( \Delta T \):
  - \( 2.0 \) [°C] \((= T_2 – T_1)\)

Conversion factor: hours to minutes:

\( 60 \) [min/h]

Conversion factor: cal/h to kW:

\( 860 \) [cal/h]/W

\( Q = q_m \times C \times (T_2 – T_1) \)

\( \approx \frac{1 \times 10 \times 60 \times 1 \times 1.0 \times 10^3 \times 2.0}{860} \)

\( = 1200000 \) [cal/h]

\( = \frac{1200000}{860} \)

\( \approx 1400 \) [W]

Cooling capacity = Considering a safety factor of 20%,

\( 1400 \) [W] \times 1.2 = \( 1680 \) [W]
Circulating Fluid Typical Physical Property Values

Precautions on Cooling Capacity Calculation

1. Heating capacity
When the circulating fluid temperature is set above room temperature, it needs to be heated by the thermo-chiller. The heating capacity depends on the circulating fluid temperature. Consider the radiation rate and heat capacity of the user's equipment and check beforehand if the required heating capacity is provided.

2. Pump capacity
<Circulating fluid flow rate>
Circulating fluid flow rate varies depending on the circulating fluid discharge pressure. Consider the installation height difference between the thermo-chiller and the user's equipment, and the piping resistance such as circulating fluid pipings, or piping size, or piping curves in the machine. Check beforehand if the required flow is achieved, using the pump capacity curves.

<Circulating fluid discharge pressure>
Circulating fluid discharge pressure has the possibility to increase up to the maximum pressure in the pump capacity curves. Check beforehand if the circulating fluid pipings or circulating fluid circuit of the user's equipment are fully durable against this pressure.

Circulating Fluid Typical Physical Property Values

1. This catalog uses the following values for density and specific heat in calculating the required cooling capacity.

- Density $\rho$: [kg/L] (or, using conventional units, weight volume ratio $\gamma = \frac{\rho}{1 \text{kgf/L}}$)
- Specific heat $C$: [4.19 x 10³ (J/kg·K)] (or, using conventional units, 1 x 10³ [cal/(kgf·°C)])

2. Values for density and specific heat change slightly according to temperature shown below. Use this as a reference.

Water

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Density $\rho$ [kg/L]</th>
<th>Specific heat C [J/(kg·K)]</th>
<th>Conventional units</th>
</tr>
</thead>
<tbody>
<tr>
<td>5°C</td>
<td>1.00</td>
<td>4.2 x 10³</td>
<td>1.00 1 x 10⁴</td>
</tr>
<tr>
<td>10°C</td>
<td>1.00</td>
<td>4.19 x 10³</td>
<td>1.00 1 x 10⁴</td>
</tr>
<tr>
<td>15°C</td>
<td>1.00</td>
<td>4.19 x 10³</td>
<td>1.00 1 x 10⁴</td>
</tr>
<tr>
<td>20°C</td>
<td>1.00</td>
<td>4.18 x 10³</td>
<td>1.00 1 x 10⁴</td>
</tr>
<tr>
<td>25°C</td>
<td>0.99</td>
<td>4.18 x 10³</td>
<td>0.99 1 x 10⁴</td>
</tr>
<tr>
<td>30°C</td>
<td>0.99</td>
<td>4.18 x 10³</td>
<td>0.99 1 x 10⁴</td>
</tr>
<tr>
<td>35°C</td>
<td>0.99</td>
<td>4.18 x 10³</td>
<td>0.99 1 x 10⁴</td>
</tr>
<tr>
<td>40°C</td>
<td>0.99</td>
<td>4.18 x 10³</td>
<td>0.99 1 x 10⁴</td>
</tr>
</tbody>
</table>

15% Ethylene Glycol Aqueous Solution

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Density $\rho$ [kg/L]</th>
<th>Specific heat C [J/(kg·K)]</th>
<th>Conventional units</th>
</tr>
</thead>
<tbody>
<tr>
<td>5°C</td>
<td>1.02</td>
<td>3.91 x 10³</td>
<td>1.02 0.93 x 10⁴</td>
</tr>
<tr>
<td>10°C</td>
<td>1.02</td>
<td>3.91 x 10³</td>
<td>1.02 0.93 x 10⁴</td>
</tr>
<tr>
<td>15°C</td>
<td>1.02</td>
<td>3.91 x 10³</td>
<td>1.02 0.93 x 10⁴</td>
</tr>
<tr>
<td>20°C</td>
<td>1.01</td>
<td>3.91 x 10³</td>
<td>1.01 0.93 x 10⁴</td>
</tr>
<tr>
<td>25°C</td>
<td>1.01</td>
<td>3.91 x 10³</td>
<td>1.01 0.93 x 10⁴</td>
</tr>
<tr>
<td>30°C</td>
<td>1.01</td>
<td>3.91 x 10³</td>
<td>1.01 0.94 x 10⁴</td>
</tr>
<tr>
<td>35°C</td>
<td>1.01</td>
<td>3.91 x 10³</td>
<td>1.01 0.94 x 10⁴</td>
</tr>
<tr>
<td>40°C</td>
<td>1.01</td>
<td>3.91 x 10³</td>
<td>1.01 0.94 x 10⁴</td>
</tr>
</tbody>
</table>

* Shown above are reference values. Contact circulating fluid supplier for details.
**HRS-R Series**

**Specific Product Precautions 1**

Be sure to read this before handling the products. Refer to the back cover for safety instructions. For temperature control equipment precautions, refer to the “Handling Precautions for SMC Products” and the “Operation Manual” on the SMC website: https://www.smcworld.com

---

**Design**

⚠️ **Warning**

1. This catalog shows the specifications of a single unit.
   1) Check the specifications of the single unit (contents of this catalog) and thoroughly consider the adaptability between the user’s system and this unit.
   2) Although the protection circuit as a single unit is installed, prepare a drain pan, water leakage sensor, discharge air facility, and emergency stop equipment, depending on the user’s operating condition. Also, the user is requested to carry out the safety design for the whole system.

2. When attempting to cool areas that are open to the atmosphere (tanks, pipes), plan your piping system accordingly.
   When cooling open-air external tanks, arrange the piping so that there are coil pipes for cooling inside the tanks, and to carry back the entire flow volume of circulating fluid that is released.

3. Use non-corrosive material for fluid contact parts of circulating fluid.
   The recommended circulating fluid is the tap water or 15% ethylene glycol aqueous solution. Using corrosive materials such as aluminum or iron for fluid contact parts such as piping may cause clogging or leakage in the circulating fluid circuit. Therefore, take sufficient care when selecting fluid contact part materials such as piping.

4. Design the piping so that no foreign matter enter the chiller.
   If foreign matter such as scales in the piping enter the circulating fluid, this may cause the pump to malfunction.

---

**Selection**

⚠️ **Warning**

1. Model selection
   For selecting a model of thermo-chiller, it is required to know the heat generation amount of the user’s equipment. Obtain the heat generation amount, referring to the “Cooling Capacity Calculation” on pages 20 and 21 before selecting a model.

---

**Handling**

⚠️ **Warning**

1. Thoroughly read the Operation Manual.
   Read the Operation Manual completely before operation, and keep the manual where it can be referred to as necessary.

---

**Transportation/Carriage/Movement**

⚠️ **Warning**

1. This product is heavy. Pay attention to safety and position of the product when it is transported, carried and moved.

2. Read the Operation Manual carefully to move the product after unpacking.

⚠️ **Caution**

1. Never put the product down sideways as this may cause failure.
   The product will be delivered in the packaging shown below.

---

**Model Weight [kg]**

<table>
<thead>
<tr>
<th>Model</th>
<th>Weight [kg]</th>
<th>Dimensions [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS018-A-20-R</td>
<td>54</td>
<td>Height 790 x Width 470 x Depth 580</td>
</tr>
<tr>
<td>HRS030-A-20-R</td>
<td>54</td>
<td>Height 790 x Width 470 x Depth 780</td>
</tr>
</tbody>
</table>

When option B or option T is selected, see +1 below.

---

Option symbol | Description                      | Additional weight |
--------------|----------------------------------|-------------------|
-B            | With earth leakage breaker       | +6 kg             |
-J            | With automatic fluid fill function| +1 kg             |
-L            | Large capacity tank specification | +1 kg             |
-T            | High-pressure pump mounted       | +11 kg            |
-V            | Stainless steel panel specification | No addition      |
-W            | SI unit only                      | No addition       |

+1 For models with an option, the weights are increased as below.
Operating Environment/Storage Environment

⚠️ Warning
1. Do not use in the following environment as it will lead to a breakdown.
   1) Outdoors
   2) In locations where water, water vapor, salt water, and oil may splash on the product
   3) In locations where there is a large amount of dust and particles
   4) In locations where corrosive gases, organic solvents, chemical fluids, or flammable gases are present (This product is not explosion proof.)
   5) In locations where the ambient temperature exceeds the limits as mentioned below
      During transportation/storage: 0 to 50°C (But as long as water or circulating fluid are not left inside the pipings)
      During operation: 5 to 45°C
   6) In locations where the ambient humidity is out of the following range or where condensation occurs
      During transportation/storage: 15 to 85%
      During operation: 30 to 70%
   7) In locations which receive direct sunlight or radiated heat
   8) In locations where there is a heat source nearby and the ventilation is poor
   9) In locations where temperature substantially changes
   10) In locations where strong magnetic noise occurs (In locations where strong electric fields, strong magnetic fields, and surge voltage occur)
   11) In locations where static electricity occurs, or conditions which make the product discharge static electricity
   12) In locations where high frequency occurs
   13) In locations where damage is likely to occur due to lightning
   14) In locations at altitude of 3000 m or higher (Except during storage and transportation)
      * For altitude of 1000 m or higher
         Because of lower air density, the heat radiation efficiencies of the devices in the product will be lower in the location at altitude of 1000 m or higher. Therefore, the maximum ambient temperature to use and the cooling capacity will lower according to the descriptions in the table below.
         Select the thermo-chiller considering the descriptions.
         ① Upper limit of ambient temperature: Use the product in ambient temperature of the described value or lower at each altitude.
         ② Cooling capacity coefficient: The product’s cooling capacity will lower to one that multiplied by the described value at each altitude.

<table>
<thead>
<tr>
<th>Altitude [m]</th>
<th>① Upper limit of ambient temperature [°C]</th>
<th>② Cooling capacity coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1000 m</td>
<td>45</td>
<td>1.00</td>
</tr>
<tr>
<td>Less than 1500 m</td>
<td>42</td>
<td>0.85</td>
</tr>
<tr>
<td>Less than 2000 m</td>
<td>38</td>
<td>0.80</td>
</tr>
<tr>
<td>Less than 2500 m</td>
<td>35</td>
<td>0.75</td>
</tr>
<tr>
<td>Less than 3000 m</td>
<td>32</td>
<td>0.70</td>
</tr>
</tbody>
</table>

15) In locations where strong impacts or vibrations occur
16) In locations where a massive force strong enough to deform the product is applied or the weight from a heavy object is applied
17) In locations where there is not sufficient space for maintenance
18) Environment in which the product is exposed to particles or water splash that is higher than IP54

Mounting/Installation

⚠️ Warning
1. Do not use the product outdoors.
2. Do not place heavy objects on top of this product, or step on it.
   The external panel can be deformed and danger can result.

⚠️ Caution
1. Install on a rigid floor which can withstand this product’s weight.
2. When installing without the casters, use the adjuster feet, etc. to raise the chiller to the following heights or more.
   This product cannot be directly installed on the floor as some screws come out from the bottom of the product.
   * HRS018/030-R 10 mm
Mounting/Installation

**Caution**

3. Refer to the Operation Manual for this product, and secure an installation space that is necessary for the maintenance and ventilation.

1. The air-cooled type product exhausts heat using the fan that is mounted to the product. If the product is operated with insufficient ventilation, ambient temperature may exceed 45°C, and this will affect the performance and life of the product. To prevent this ensure that suitable ventilation is available (see below).

2. For installation indoors, ventilation ports and a ventilation fan should be equipped as needed.

<table>
<thead>
<tr>
<th>Heat radiation amount/Required ventilation rate</th>
<th>Model</th>
<th>Heat radiation amount [kW]</th>
<th>Required ventilation rate [m³/min]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differential temp. of 3°C between inside and outside of installation area</td>
<td>Differential temp. of 6°C between inside and outside of installation area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRS018-R</td>
<td>Approx. 4</td>
<td>70</td>
<td>40</td>
</tr>
<tr>
<td>HRS030-R</td>
<td>Approx. 6</td>
<td>100</td>
<td>60</td>
</tr>
</tbody>
</table>

Piping

**Caution**

1. Regarding the circulating fluid pipings, consider carefully the suitability for shutoff pressure, temperature and circulating fluid.

   If the operating performance is not sufficient, the pipings may burst during operation. Also, the use of corrosive materials such as aluminum or iron for fluid contact parts, such as piping, may not only lead to clogging or leakage in the circulating fluid circuit but also refrigerant leakage and other unexpected problems. Provide protection against corrosion when you use the product.

2. Select the piping port size which can exceed the rated flow.

   For the rated flow, refer to the pump capacity table.

3. When tightening at the circulating fluid inlet and outlet, drain port or overflow port of this product, use a pipe wrench to clamp the connection ports.

4. For the circulating fluid piping connection, install a drain pan and wastewater collection pit just in case the circulating fluid may leak.

5. This product series is constant-temperature fluid circulating machines with built-in tanks.

   Do not install equipment on your system side such as pumps that forcibly return the circulating fluid to the unit. Also, if you attach an external tank that is open to the air, it may become impossible to circulate the circulating fluid. Proceed with caution.

**Caution**

1. Communication cable should be prepared by the user.

   2. Provide a stable power supply which is not affected by surge or distortion.

   If the voltage increase ratio \( \frac{\text{d}V}{\text{d}t} \) at the zero cross should exceed 40 V/200 \( \mu \text{sec.} \), it may result in malfunction.
Circulating Fluid

Caution
1. Avoid oil or other foreign matter entering the circulating fluid.
2. When water is used as a circulating fluid, use tap water that conforms to the appropriate water quality standards.

Use tap water that conforms to the standards shown below (including water used for dilution of ethylene glycol aqueous solution).

Tap Water (as a Circulating Fluid) Quality Standards
The Japan Refrigeration and Air Conditioning Industry Association
JRA GL-02-1994 "Cooling water system – Circulation type – Make-up water"

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Standard value</th>
<th>Influence</th>
<th>Scale generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH (at 25°C)</td>
<td>—</td>
<td>6.0 to 8.0</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Electric conductivity (25°C)</td>
<td>[μS/cm]</td>
<td>1000 to 30000</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Chloride ion (Cl⁻)</td>
<td>[mg/L]</td>
<td>50 or less</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Sulfuric acid ion (SO₄²⁻)</td>
<td>[mg/L]</td>
<td>50 or less</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Acid consumption amount (at pH 6)</td>
<td>[mg/L]</td>
<td>50 or less</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Total hardness</td>
<td>[mg/L]</td>
<td>70 or less</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Calcium hardness (CaCO₃)</td>
<td>[mg/L]</td>
<td>50 or less</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Ionic state silica (SiO₂)</td>
<td>[mg/L]</td>
<td>30 or less</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Iron (Fe)</td>
<td>[mg/L]</td>
<td>0.3 or less</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>[mg/L]</td>
<td>0.1 or less</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Sulfide ion (S²⁻)</td>
<td>[mg/L]</td>
<td>Should not be detected</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Ammonium ion (NH₄⁺)</td>
<td>[mg/L]</td>
<td>0.1 or less</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Residual chlorine (Cl)</td>
<td>[mg/L]</td>
<td>0.3 or less</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Free carbon (CO₂)</td>
<td>[mg/L]</td>
<td>4.0 or less</td>
<td>○</td>
<td></td>
</tr>
</tbody>
</table>

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

3. Use an ethylene glycol aqueous solution that does not contain additives such as preservatives.
4. When using ethylene glycol aqueous solution, maintain a maximum concentration of 15%.
Overly high concentrations can cause a pump overload. Low concentrations, however, can lead to freezing when circulating fluid temperature is 10°C or lower and cause the thermo-chiller to break down.
5. A magnet pump or mechanical seal pump is used as the circulating pump for the circulating fluid.
It is particularly impossible to use liquid including metallic powders such as iron powder.

Operation

Warning
1. Confirmation before operation
   1) The fluid level of a tank should be within the specified range of "HIGH" and "LOW."
      When exceeding the specified level, the circulating fluid will overflow.
   2) Remove the air.
      Conduct a trial operation, looking at the fluid level.
      Since the fluid level will go down when the air is removed from the user's piping system, supply water once again when the fluid level is reduced. When there is no reduction in the fluid level, the job of removing the air is completed. Pump can be operated independently.

2. Confirmation during operation
   - Check the circulating fluid temperature.
     The operating temperature range of the circulating fluid is between 5 and 40°C.
     When the amount of heat generated from the user's equipment is greater than the product's capability, the circulating fluid temperature may exceed this range. Use caution regarding this matter.

3. Emergency stop method
   - When an abnormality is confirmed, stop the machine immediately. Be sure to shut off the breaker of the user's power supply.

Operation Restart Time/Operation and Suspension Frequency

Caution
1. Wait five minutes or more before restarting operation after it has been stopped. If the operation is restarted within five minutes, the protection circuit may activate and the operation may not start properly.
2. Operation and suspension frequency should not exceed 10 times per day. Frequently switching between operation and suspension may result in the malfunction of the refrigeration circuit.

Protection Circuit

Caution
1. If operating in the below conditions, the protection circuit will activate and an operation may not be performed or will stop.
   - Power supply voltage is not within the rated voltage range of ±10%.
   - In case the water level inside the tank is reduced abnormally.
   - Circulating fluid temperature is too high.
   - Compared to the cooling capacity, the heat generation amount of the user's equipment is too high.
   - Ambient temperature is too high. (45°C or more)
   - Refrigerant pressure is too high.
   - Ventilation grille is clogged with dust or dirt.
HRS-R Series
Specific Product Precautions 5

Be sure to read this before handling the products. Refer to the back cover for safety instructions. For temperature control equipment precautions, refer to the “Handling Precautions for SMC Products” and the “Operation Manual” on the SMC website: https://www.smcworld.com

Maintenance

⚠️ Caution

<Periodical inspection every one month>

1. Clean the ventilation grille.
   If the dustproof filter becomes clogged with dust or debris, a decline in cooling performance can result.
   In order to avoid deforming or damaging the dustproof filter, clean it with a long-haired brush or air gun.

<Periodical inspection every three months>

1. Inspect the circulating fluid.
   1) When using tap water
      • Replacement of tap water
        Failure to replace the tap water can lead to the development of bacteria and algae. Replace it regularly according to your usage conditions.
      • Tank cleaning
        Consider whether dirt, slime, or foreign matter may be present in the circulating fluid inside the tank, and carry out regular cleanings of the tank.
   2) When using ethylene glycol aqueous solution
      Use a concentration meter to confirm that the concentration does not exceed 15%.
      Dilute or add as needed to adjust the concentration.

<Periodical inspection during the winter season>

   If there is a risk of the circulating fluid freezing when the product is stopped, release the circulating fluid in advance.

2. Consult a professional.
   For additional methods to prevent freezing (such as commercially available tape heaters, etc.), consult a professional for advice.

Refrigerant with GWP reference

<table>
<thead>
<tr>
<th>Refrigerant</th>
<th>Global warming potential (GWP)</th>
<th>Refrigerant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regulation (EU) No 517/2014</td>
<td>Revised Fluorocarbons</td>
</tr>
<tr>
<td></td>
<td>(Based on the IPCC AR4)</td>
<td>Recovery and Destruction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Law (Japanese law)</td>
</tr>
<tr>
<td>R134a</td>
<td>1,430</td>
<td>1,430</td>
</tr>
<tr>
<td>R404A</td>
<td>3,922</td>
<td>3,920</td>
</tr>
<tr>
<td>R407C</td>
<td>1,774</td>
<td>1,770</td>
</tr>
<tr>
<td>R410A</td>
<td>2,088</td>
<td>2,090</td>
</tr>
</tbody>
</table>

* This product is hermetically sealed and contains fluorinated greenhouse gases (HFC). When this product is sold on the market in the EU after January 1, 2017, it needs to be compliant with the quota system of the F-Gas Regulation in the EU.
* See specification table for refrigerant used in the product.
These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “Caution,” “Warning” or “Danger.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)*1, and other safety regulations.

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

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

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

---

**Safety Instructions**

Be sure to read the “Handling Precautions for SMC Products” (M-E03-3) and “Operation Manual” before use.

---

**Caution**

1. The product is provided for use in manufacturing industries.

   The product herein described is basically provided for peaceful use in manufacturing industries. If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.

   If anything is unclear, contact your nearest sales branch.

   **Limited warranty and Disclaimer**

   The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.

   Read and accept them before using the product.

   **Limited warranty and Disclaimer**

   1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.*2

   Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

   2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.

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

   3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

      *2) Vacuum pads are excluded from this 1 year warranty.

      Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

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**Compliance Requirements**

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.

2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

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**Safety Instructions**

Be sure to read the “Handling Precautions for SMC Products” (M-E03-3) and “Operation Manual” before use.