More effective energy-saving is achieved through use of a DC inverter compressor and an inverter pump.
**Energy Saving**

**Power consumption:**

Max. 40% reduction (SMC comparison)

In addition to the optimum control of the expansion valve by the original controller, by recycling the heat emitted from the facility water, power consumption is dramatically reduced.

- **Current model**
  - HRZ002-L: 3.9 kWh/h
  - Operating conditions: –10°C, 0 kW with 50% load, 2 kW with 50% load

- **Current model**
  - HRZ002-H: 20 L
  - Comparison of the required circulating fluid inside a Thermo-chiller

- Reduced running cost
- Contribution to the environmental preservation

**Circulating fluid:**

Max. 40% reduction (SMC comparison)

Enhanced temperature control technology and the dual tank construction achieved the reduced circulating fluid required for operation.

- **Current model**
  - HRZ002-L: 12 L

- Reduced initial cost
- Contribution to the environmental preservation

**Double Inverter Type**

More effective energy-saving is achieved through use of a DC inverter compressor and an inverter pump.

**Power consumption:**

Max. 82% reduction (SMC comparison)

- **Current model**
  - HRZ010-WS: 1.1 kWh/h
  - Operating conditions: –10°C, 0 kW with 50% load, 2 kW with 50% load

- Reduced running cost
- Contribution to the environmental preservation

**Facility water:**

Max. 75% reduction (SMC comparison)

Enhanced performance of a heat exchanger, recycle use of the emitted heat and the reduced power consumption achieved the reduced facility water amount.

- **Current model**
  - HRZ002-L: 5 L/min
  - Operating conditions: –10°C, 0 kW with 50% load, 2 kW with 50% load

- Reduced facilities investment
- Space saved facility water equipment
- Reduced running cost

**High Performance**

**Temperature stability:** ±0.1°C
(When a load is stable)

Enhanced temperature control technology achieved ±0.1°C temperature stabilities when a load is stable.

- **Current model**
  - Circulating fluid temperature [°C]:
    - HRZ004-L: ±0.1°C

**Cooling time:** Max. 43% reduction (SMC comparison)

Special temperature control technology achieved the utmost performance, resulting in the reduced cooling time.

- **Current model**
  - Circulating fluid temperature [°C]:
    - HRZ004-L: 43% reduction

---

221
Installation area:
Max. 29% reduction (SMC comparison)
By emitting the heat from the rear side, ventilation slits on the side are
unnecessary offering reduced installation space.

- Current model: Body space: W400 mm x D845 mm
  Ventilation space: 100 mm
- HRZ008-H: Body space: W380 mm x D870 mm
  Ventilation space: 0

Leakless

All in tank
Housing the pump or heat exchanger inside the tank has eliminated any external leakage of the
circulating fluid.

Communications
- Contact input/output signal
- Serial RS-485 communication
- Analog communication (Refer to “Options” on page 249.)
- DeviceNet communication (Refer to “Options” on page 249.)

DeviceNet™
Trademark
DeviceNet™ is a trademark of ODVA.

Cooling capacity: Max. 15 kW
Up to 15 kW cooling capacity achieved.

Fluid contact parts adopt the materials compatible for various circulating fluids.
(Stainless steel, EPDM, etc.)
- Fluorinated fluids: Flourinert™ FC-3283, FC-40
  GALDEN® HT135, HT200
- 60% ethylene glycol aqueous solution
- Deionized water/Tap water

Regarding the fluid other than the above, please contact SMC.
Flourinert™ is a trademark of 3M. GALDEN® is a registered trademark of Solvay Solexis, Inc.
Easy Maintenance

Circulating fluid automatic recovery function (Refer to “Options” on page 249.)
Circulating fluid inside a thermo-chiller tank can be recovered automatically. (Recovery volume: 15 L to 17 L)
- Reduced maintenance time
- Faster operation
- Reduced circulating liquid loss by evaporation or spill

HRZ

Current model

1 Normal operation

2 Circulating fluid recovery

3 Fluid returns to the main tank from the circulating fluid recovery tank.

Circulating fluid electric resistance ratio control function (Refer to “Options” on page 249.)
(DI control kit)

Easy maintenance
- Checking the electrical component parts accessible from the front side only
- Possible to replace the maintenance parts (such as a pump) without removing the pipings and discharging the circulating fluid.
- Various alarm displays
(Refer to page 245.)
Application Examples

**Semiconductor**
Example: Temperature control of chamber electrode

- Etching equipment
- Spatter equipment
- Cleaning equipment
- Coating equipment
- Dicing equipment
- Tester, etc.

**Medical**
Example: Blood preservation

- X-ray instrument
- MRI
- Blood preservation equipment

**Food**
Example: Tofu (Bean curd) production

- Bottle-cleaning machine
- Tofu (Bean curd) production equipment
- Noodle-making machine, etc.

**Analysis**
Example: Electronic microscope

- Electron microscope
- X-ray analytical instrument
- Gas chromatography
- Sugar level analytical instrument, etc.

**Machine tool**
Example: Laser machining

- Wire cutting
- Grinder
- Spot welding
- Plasma welding
- Laser machining, etc.

**Printing**
Example: Printing temperature control

- Offset printing machine
- Automatic developing machine
- UV equipment, etc.

**Molding**
Example: Injection molding

- Plastic molding
- Rubber molding
- Wire cable coating machine
- Injection molding, etc.

**Temperature-controlling the mold results in improved product quality.**

**Temperature-controlling the laser generating tube enables the laser wavelength to be optimised, improving the accuracy of the machined cross sectional area.**

**Prevents the distortion caused by the heat generated by the electronic gun in an electronic microscope.**

**Temperature-controlling the ink roller enables to control the evaporation amount and viscosity of an ink and optimise the tint of colors.**
Circulating fluid circuit

With the circulating pump, circulating fluid will be discharged to the user’s equipment side. After the circulating fluid will heat or cool the user’s equipment side, it will be returned to the main tank via the heat exchanger. A sub-tank is not used under the normal operation. It will be used when a circulating fluid is recovered from the user’s equipment side.

The internal pump is used to transfer a circulating fluid from the sub-tank to the main tank. (Refer to “Circulating fluid automatic recovery function” on page 223.)

Refrigeration circuit

When the circulating fluid temperature is rising higher than the set temperature, open the expansion valve (a) to introduce refrigerant gas at a lower temperature to the heat exchanger. With this, the circulating fluid will be cooled down.

Oppositely, when the circulating fluid is getting lower against the set temperature, open the expansion valve (b) and introduce refrigerant gas at a high temperature without going through the water-cooled condenser to the heat exchanger. With this heat, the circulating fluid will be heated.
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Refrigerated Thermo-chiller HRZ Series

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HRZ Series
Model Selection

Guide to Model Selection

1. How much is the temperature in degrees centigrade for the circulating fluid?

Temperature range which can be set with the thermo-chiller

L: –20°C to 40°C ("L2" (tap water, deionized water specification) can be set 10°C to 40°C.)
H: 20°C to 90°C
W: –20°C to 90°C (Select "W" only when the temperature ranges of "L" or "H" are not applicable. HRZ010-W2S (tap water, deionized water specification) can be set 10°C to 60°C.)

Example) User requirement: 50°C (→ Temperature range 20°C to 90°C, "H" type will be appropriate.)

2. What kind of the circulating fluids will be used?

Relationship between circulating fluid (which can be used with the thermo-chiller) and temperature

Fluorinated fluids: Fluorinert™ FC-3283/GALDEN® HT135
Fluorinated fluids: Fluorinert™ FC-40/GALDEN® HT200
60% ethylene glycol aqueous solution
Tap water/Deionized water

Example) User requirement: Fluorinated fluids

Based on the results 1. and 2., Cooling capacity relating “Fluorinated fluids” and “Temperature range 20°C to 90°C” is shown on page 232.

3. What is the kW for the required cooling capacity?
   * To calculate the cooling capacity, referring to page 228.

Example) User requirement: 5 kW → Plot the point of intersection between the operating temperature (50°C) and the cooling capacity (5 kW) in the cooling capacity graph.

The point plotted in the graph is the requirement from the user. Select the thermo-chiller models exceeding this point. In this case, select the HRZ004-H.

GALDEN® is a registered trademark, belonging to the Solvay Group or its corresponding owner. Fluorinert™ is a trademark of 3M.
**Example 1: When the heat generation amount in the user’s equipment is known.**

Heat generation amount $Q$: 3.5 kW

Cooling capacity = Considering a safety factor of 20%, $3.5 \times 1.2 = \boxed{4.2 \text{ kW}}$

**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 $Q$: Unknown
- Circulating fluid temperature difference $\Delta T = T_2 - T_1$: $6.0^\circ\text{C}$ ($6.0 \text{ K}$)
- Circulating fluid outlet temperature $T_1$: $20^\circ\text{C}$ ($293.15 \text{ K}$)
- Circulating fluid return temperature $T_2$: $26^\circ\text{C}$ ($299.15 \text{ K}$)
- Circulating fluid flow rate $L$: 20 L/min
- Circulating fluid: Fluorinated fluid
- Density $\gamma$: $1.80 \times 10^3 \text{ kg/m}^3$
- Specific heat $C$: $0.96 \times 10^3 \text{ J/(kg·K)}$
  
  *(at 20°C)*

* Refer to page 230 for the typical physical property values by circulating fluid.

\[
Q = \frac{\Delta T \times L \times \gamma \times C}{60 \times 1000} \times \frac{6.0 \times 20 \times 1.80 \times 10^3 \times 0.96 \times 10^3}{60 \times 1000} = 3456 \text{ W} = 3.5 \text{ kW}
\]

Cooling capacity = Considering a safety factor of 20%, $3.5 \times 1.2 = \boxed{4.2 \text{ kW}}$

**Example of current measurement units (Reference)**

- Unknown
- $6.0^\circ\text{C}$
- $20^\circ\text{C}$
- $26^\circ\text{C}$
- $1.2 \text{ m}^3/\text{h}$
- Fluorinated fluid
- Density $\gamma$: $1.80 \times 10^3 \text{ kg/m}^3$
- Specific heat $C$: $0.23 \text{ kcal/kg·}^\circ\text{C}$
  
  *(at 20°C)*

* Refer to page 230 for the typical physical property values by circulating fluid.

\[
Q = \frac{\Delta T \times L \times \gamma \times C}{860} \times \frac{6.0 \times 1.2 \times 1.80 \times 10^3 \times 0.23}{860} = 3.5 \text{ kW}
\]

Cooling capacity = Considering a safety factor of 20%, $3.5 \times 1.2 = \boxed{4.2 \text{ kW}}$
**Example 3. When there is no heat generation, and when cooling the object below a certain temperature and period of time.**

- Cooled substance total volume \( V \) : 60 L
- Cooling time \( h \) : 15 min
- Cooling temperature difference \( \Delta T \) : 20°C (20 K) (40°C – 20°C \( \rightarrow \) 20°C)
- Circulating fluid: Fluorinated fluid
  - Density \( \gamma \): 1.80 x 10^3 kg/m^3
  - Specific heat \( C \): 0.96 x 10^3 J/(kg·K) (at 20°C)

* Refer to page 230 for the typical physical property values by circulating fluid.

\[
Q = \frac{\Delta T \times V \times \gamma \times C}{h \times 60 \times 1000} = \frac{20 \times 60 \times 1.80 \times 10^3 \times 0.96 \times 10^3}{15 \times 60 \times 1000} = 2304 \text{ W} = 2.3 \text{ kW}
\]

Cooling capacity = Considering a safety factor of 20%,

\[
2.3 \times 1.2 = 2.8 \text{ kW (When the circulating fluid temperature is 20°C.)}
\]

(In this case, selected thermo-chiller model will be either HRZ002-L or HRZ004-H.)

---

**Precautions on Model Selection**

1. **Heating capacity**
   - When setting the circulating fluid temperature at a higher temperature than the room temperature, the circulating fluid temperature will be heated with the thermo-chiller. Heating capacity varies depending on the model of the HRZ series. Also, the heating capacity varies depending on the circulating fluid temperature. Consider the heat radiation amount or thermal capacity of the user's equipment. Check beforehand if the required heating capacity is provided, based on the heating capacity graph for the respective model.

2. **Pump capacity**
   - **<Circulating fluid flow rate>**
     - Pump capacity varies depending on the model selected from the HRZ series. Also, circulating fluid flow varies depending on the circulating fluid discharge pressure. Consider the installation height difference between our thermo-chiller and a 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 for each respective model.
   - **<Circulating fluid discharge pressure>**
     - Circulating fluid discharge pressure has the possibility to increase up to the maximum pressure in the pump capacity curves for the respective model. 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

*Shown below are reference values. Please contact circulating fluid supplier for details.*

### Fluorinated Fluids

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Density $\gamma$ [kg/m$^3$] [g/L]</th>
<th>Specific heat $C$ [J/(kg·K)]</th>
<th>([kcal/kg·°C])</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-10^\circ C$</td>
<td>$1.87 \times 10^3$</td>
<td>$0.87 \times 10^3$</td>
<td>(0.21)</td>
</tr>
<tr>
<td>$20^\circ C$</td>
<td>$1.80 \times 10^3$</td>
<td>$0.96 \times 10^3$</td>
<td>(0.23)</td>
</tr>
<tr>
<td>$50^\circ C$</td>
<td>$1.74 \times 10^3$</td>
<td>$1.05 \times 10^3$</td>
<td>(0.25)</td>
</tr>
<tr>
<td>$80^\circ C$</td>
<td>$1.67 \times 10^3$</td>
<td>$1.14 \times 10^3$</td>
<td>(0.27)</td>
</tr>
</tbody>
</table>

### 60% Ethylene Glycol Aqueous Solution

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Density $\gamma$ [kg/m$^3$] [g/L]</th>
<th>Specific heat $C$ [J/(kg·K)]</th>
<th>([kcal/kg·°C])</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-10^\circ C$</td>
<td>$1.10 \times 10^3$</td>
<td>$3.02 \times 10^3$</td>
<td>(0.72)</td>
</tr>
<tr>
<td>$20^\circ C$</td>
<td>$1.08 \times 10^3$</td>
<td>$3.15 \times 10^3$</td>
<td>(0.75)</td>
</tr>
<tr>
<td>$50^\circ C$</td>
<td>$1.06 \times 10^3$</td>
<td>$3.27 \times 10^3$</td>
<td>(0.78)</td>
</tr>
<tr>
<td>$80^\circ C$</td>
<td>$1.04 \times 10^3$</td>
<td>$3.40 \times 10^3$</td>
<td>(0.81)</td>
</tr>
</tbody>
</table>

### Water

- Density $\gamma$: $1 \times 10^3$ [kg/m$^3$] [g/L]
- Specific heat $C$: $4.2 \times 10^3$ [J/(kg·K)] (1.0 [kcal/kg·°C])
## Specifications

For details, please refer to our “Product Specifications” information.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Cooling capacity</th>
<th>Temperature range setting</th>
<th>Temperature range setting</th>
<th>Controls</th>
<th>Ambient temp./humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>1 kW</td>
<td>–20 to 40°C</td>
<td>0.45/0.65 (at 20 L/min)</td>
<td>PID control</td>
<td>Temperature: 10 to 35°C, Humidity: 30 to 70%RH</td>
</tr>
<tr>
<td>002</td>
<td>2 kW</td>
<td>–20 to 40°C</td>
<td>0.65/0.95 (at 30 L/min)</td>
<td></td>
<td>–20 to 40°C, 50/60 Hz</td>
</tr>
<tr>
<td>004</td>
<td>4 kW</td>
<td>–20 to 40°C</td>
<td>0.40/0.60 (at 20 L/min)</td>
<td></td>
<td>–20 to 40°C, 50/60 Hz</td>
</tr>
<tr>
<td>008</td>
<td>8 kW</td>
<td>–20 to 40°C</td>
<td>0.45/0.65 (at 20 L/min)</td>
<td></td>
<td>–20 to 40°C, 50/60 Hz</td>
</tr>
</tbody>
</table>

### Circulating fluid

<table>
<thead>
<tr>
<th>Fluid type</th>
<th>Temperature range setting</th>
<th>Pressure range</th>
<th>Allowable voltage range ±10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluorinert™ FC-3283/GALDEN® HT135</td>
<td>–20 to 40°C</td>
<td>0.3 to 0.7</td>
<td>3-phase 200 VAC 50 Hz, 3-phase 200 to 208 VAC 60 Hz</td>
</tr>
<tr>
<td>Fluorinert™ FC-40/GALDEN® HT200</td>
<td>–20 to 40°C</td>
<td>0.3 to 0.7</td>
<td>3-phase 200 VAC 50 Hz, 3-phase 200 to 208 VAC 60 Hz</td>
</tr>
</tbody>
</table>

### Optional Features

- N: NPT fitting
- W: SI unit only
- Z: Circulating fluid automatic recovery

### Reference

HRZ Series Thermo-chiller

Fluorinated Fluid Type

How to Order


Cooling method
Water-cooled refrigeration

Refrigerant
R404A (HFC)

Refrigerant charge
1.15 kg

Control system
PID control

Ambient temp./humidity
Temperature: 10 to 35°C, Humidity: 30 to 70% RH

Cooling capacity
1 kW

Temperature range setting
0.45/0.65 (at 20 L/min)

Pressure range
0.3 to 0.7

Power supply
3-phase 200 VAC 50 Hz, 3-phase 200 to 208 VAC 60 Hz

Breaker capacity
A 30

Rated current
A 20

Alarm
Refer to page 245.

Communications
Contact input/output (D-sub 25 pin) and Serial RS-485 (D-sub 9 pin) (Refer to pages 243 and 244.)

Weight
165 kg

Safety standards
UL, CE marking, SEMI (S2-0703, S8-0701, F47-0200), SEMATECH (S2-93, S8-95)

1. It should have no condensation.

2. GALDEN® is a registered trademark, belonging to the Solvay Group or its corresponding owner. Fluorinert™ is a trademark of 3M. Regarding the fluid other than the above, please contact SMC.


4. Value with a stable load without turbulence in the operating conditions. It may be out of this range depending on operating conditions.

5. The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C.

6. Required flow rate for cooling capacity or maintaining the temperature stability. When used below the rated flow, use the individually sold, “Bypass Piping Set” (Refer to page 246).

7. Minimum volume required for operating only the thermo-chiller. (Circulating fluid temperature: 20°C, including the thermo-chiller’s internal piping or heat exchanger)

8. Preliminary space volume without main tank capacity. Available for collecting the circulating fluid inside an external piping or for preliminary injection.

9. Required flow rate when a load for the cooling capacity is applied at a facility water temperature of 25°C.

10. Weight in the dry state without circulating fluids.
## Cooling Capacity

**HRZ001-L/002-L/004-L/008-L**

![Cooling capacity graph for HRZ001-L/002-L/004-L/008-L](image1.png)

**HRZ002-W/008-W**

![Cooling capacity graph for HRZ002-W/008-W](image2.png)

## Heating Capacity

**HRZ001-L/002-L/004-L/008-L**

![Heating capacity graph for HRZ001-L/002-L/004-L/008-L](image3.png)

**HRZ002-W/008-W**

![Heating capacity graph for HRZ002-W/008-W](image4.png)
Pump Capacity (Thermo-chiller Outlet)

HRZ001-L/002-L/004-L

HRZ008-L

HRZ001-H/002-H

HRZ004-H/008-H

HRZ002-W/008-W

When the circulating fluid flow is below 6 L/min, the in-built operation stop alarm will be activated. It is not possible to run the equipment. (common for all models)
Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Cooling method</th>
<th>Refrigerant charge</th>
<th>Control system</th>
<th>Ambient temp/humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRZ001-L1</td>
<td>Water-cooled refrigeration</td>
<td>1.15</td>
<td>PID control</td>
<td>Temperature: 10 to 35°C, Humidity: 30 to 70%RH</td>
</tr>
<tr>
<td>HRZ002-L1</td>
<td></td>
<td>1.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRZ004-L1</td>
<td></td>
<td>1.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRZ008-L1</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRZ001-H1</td>
<td></td>
<td>0.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRZ002-H1</td>
<td></td>
<td>0.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRZ004-H1</td>
<td></td>
<td>1.15</td>
<td></td>
<td></td>
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<tr>
<td>HRZ008-H1</td>
<td></td>
<td>1.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRZ002-W1</td>
<td></td>
<td>1.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRZ008-W1</td>
<td></td>
<td>1.15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How to Order

Ethylene Glycol Type

<table>
<thead>
<tr>
<th>Option</th>
<th>(Refer to page 249 and 250.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NII</td>
<td>None</td>
</tr>
<tr>
<td>C</td>
<td>Analog communication</td>
</tr>
<tr>
<td>D</td>
<td>DeviceNet communication</td>
</tr>
<tr>
<td>N</td>
<td>NPT fitting</td>
</tr>
<tr>
<td>W</td>
<td>SI unit only</td>
</tr>
<tr>
<td>Y</td>
<td>DI control kit</td>
</tr>
<tr>
<td>Z</td>
<td>Circulating fluid automatic recovery</td>
</tr>
</tbody>
</table>

Ethylene glycol type

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Temperature range setting</th>
<th>1 kW</th>
<th>2 kW</th>
<th>4 kW</th>
<th>8 kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>–20 to 40°C</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>H</td>
<td>20 to 90°C</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>W</td>
<td>–20 to 90°C</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Cooling capacity

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Cooling capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>1 kW</td>
</tr>
<tr>
<td>002</td>
<td>2 kW</td>
</tr>
<tr>
<td>004</td>
<td>4 kW</td>
</tr>
<tr>
<td>008</td>
<td>8 kW</td>
</tr>
</tbody>
</table>

Temperature range setting

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Temperature range setting</th>
<th>1 kW</th>
<th>2 kW</th>
<th>4 kW</th>
<th>8 kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>–20 to 40°C</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>H</td>
<td>20 to 90°C</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>W</td>
<td>–20 to 90°C</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Symbols

- L: Weight in the dry state without circulating fluids
- H: Flow rate when a load for the cooling capacity is applied at a facility water temperature of 25°C
- W: Preliminary space volume without main tank capacity. Available for collecting the circulating fluid inside an external piping or for preliminary injection.
- C: Minimum volume required for operating only the thermo-chiller. (Circulating fluid temperature: 20°C, including the thermo-chiller’s internal pipings or heat exchanger)
- Z: Circulating fluid automatic recovery

(For details, please refer to our “Product Specifications” information.)

- Dilute pure ethylene glycol with tap water. Additives such as preservatives cannot be used.
- It should have no condensation.
- Facility water temperature: 25°C
- Circulating fluid flow rate: Values at rated circulating fluid flow rate. Values common for 50/60 Hz.
- Value with a stable load without turbulence in the operating conditions. It may be out of this range when a DI control kit (option Y) is used or in some other operating conditions.
- Required flow rate when a load for the cooling capacity is applied at a facility water temperature of 25°C.
- Weight in the dry state without circulating fluids.
HRZ Series

Cooling Capacity

<table>
<thead>
<tr>
<th>Model</th>
<th>HRZ001-L1/002-L1/004-L1/008-L1</th>
<th>HRZ001-H1/002-H1/004-H1/008-H1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="graph1.png" alt="Graph" /></td>
<td><img src="graph2.png" alt="Graph" /></td>
</tr>
</tbody>
</table>

Heating Capacity

<table>
<thead>
<tr>
<th>Model</th>
<th>HRZ001-L1/002-L1/004-L1/008-L1</th>
<th>HRZ001-H1/002-H1/004-H1/008-H1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="graph3.png" alt="Graph" /></td>
<td><img src="graph4.png" alt="Graph" /></td>
</tr>
</tbody>
</table>

HRZ002-W1/008-W1

<table>
<thead>
<tr>
<th>Model</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="graph1.png" alt="Graph" /></td>
<td><img src="graph2.png" alt="Graph" /></td>
</tr>
</tbody>
</table>

HRZ001-L1/002-L1/004-L1/008-L1

<table>
<thead>
<tr>
<th>Model</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="graph3.png" alt="Graph" /></td>
<td><img src="graph4.png" alt="Graph" /></td>
</tr>
</tbody>
</table>

HRZ002-W1/008-W1

<table>
<thead>
<tr>
<th>Model</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="graph1.png" alt="Graph" /></td>
<td><img src="graph2.png" alt="Graph" /></td>
</tr>
</tbody>
</table>

HRZ001-L1/002-L1/004-L1/008-L1

<table>
<thead>
<tr>
<th>Model</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="graph3.png" alt="Graph" /></td>
<td><img src="graph4.png" alt="Graph" /></td>
</tr>
</tbody>
</table>
Pump Capacity (Thermo-chiller Outlet)

HRZ001-L1/002-L1/004-L1
HRZ004-H1/008-H1
HRZ002-W1/008-W1

HRZ008-L1

HRZ001-H1/002-H1

* When the circulating fluid flow is below 6 L/min, the in-built operation stop alarm will be activated. It is not possible to run the equipment. (common for all models)
How to Order
Thermo-chiller
Tap/Deionized Water Type
HRZ Series

**Specifications** (For details, please refer to our “Product Specifications” information.)

<table>
<thead>
<tr>
<th>Model</th>
<th>HRZ001-L2</th>
<th>HRZ002-L2</th>
<th>HRZ004-L2</th>
<th>HRZ008-L2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling method</td>
<td>Water-cooled refrigeration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigerant</td>
<td>R134a (HFC)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigerant charge</td>
<td>1.1 kg</td>
<td>1.1 kg</td>
<td>1.1 kg</td>
<td>1.1 kg</td>
</tr>
<tr>
<td>Control system</td>
<td>PID control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature/humidity</td>
<td>Temperature: 10 to 35°C, Humidity: 30 to 70%RH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circulating fluid temperature setting</td>
<td>10 to 40°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling capacity</td>
<td>kW</td>
<td>kW</td>
<td>kW</td>
<td>kW</td>
</tr>
<tr>
<td>Ref. Temperature</td>
<td>(at 20°C)</td>
<td>(at 20°C)</td>
<td>(at 20°C)</td>
<td>(at 20°C)</td>
</tr>
<tr>
<td>kW</td>
<td>1.0</td>
<td>2.0</td>
<td>4.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Heating capacity</td>
<td>kW</td>
<td>kW</td>
<td>kW</td>
<td>kW</td>
</tr>
<tr>
<td>Ref. Temperature</td>
<td>(at 20°C)</td>
<td>(at 20°C)</td>
<td>(at 20°C)</td>
<td>(at 20°C)</td>
</tr>
<tr>
<td>kW</td>
<td>0.90</td>
<td>0.98</td>
<td>1.15</td>
<td>1.25</td>
</tr>
<tr>
<td>Temperature stability</td>
<td>°C</td>
<td>±0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pump capacity (50/60 Hz)</td>
<td>MPa</td>
<td>0.25/0.38 (at 20 L/min)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated flow</td>
<td>L/min</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main tank capacity</td>
<td>L</td>
<td>Approx. 15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-tank capacity</td>
<td>L</td>
<td>Approx. 16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port size</td>
<td>Rc3/4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circulating fluid system</td>
<td>Stainless steel, EPDM, Copper brazing (Heat exchanger), PPS, Silicone, Fluororesin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature range</td>
<td>°C</td>
<td>10 to 25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure range</td>
<td>MPa</td>
<td>0.3 to 0.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required flow rate (50/60 Hz)</td>
<td>L/min</td>
<td>5/5</td>
<td>6/6</td>
<td>15/22</td>
</tr>
<tr>
<td>Port size</td>
<td>Rc1/2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluid contact material</td>
<td>Stainless steel, EPDM, Copper brazing (Heat exchanger), Silicone, Brass, NBR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply</td>
<td>3-phase 200 VAC 50 Hz, 3-phase 200 to 208 VAC 60 Hz. Allowable voltage range ±10%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breaker capacity</td>
<td>A</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated current</td>
<td>A</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alarm</td>
<td>Refer to page 245</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communications</td>
<td>Contact input/output (D-sub 25 pin) and Serial RS-485 (D-sub 9 pin) (Refer to pages 243 and 244.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>kg</td>
<td>165</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety standards</td>
<td>UL, CE marking, SEMI (S2-0703, S8-0701, F47-0200), SEMATECH (S2-93, S8-95)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. It should have no condensation.
2. If tap water or deionized water is used, please use water that conforms to Water Quality Standards of the Japan Refrigeration and Air Conditioning Industry Association (JRA GL-02-1994: cooling water system - circulation type - make-up water). The minimum electric conductivity of the deionized water used as the fluid should be 0.5 µS/cm (or electric resistivity 2 MΩ·cm at maximum).
4. Value with a stable load without turbulence in the operating conditions. It may be out of this range when a DI control kit (option Y) is used or in some other operating conditions.
5. The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C.
6. Required flow rate when cooling capacity or maintaining the temperature stability. When used below the rated flow, use the individually sold, “Bypass Piping Set” (Refer to page 246).
7. Minimum volume required for operating only the thermo-chiller. (Circulating fluid temperature: 20°C, including the thermo-chiller’s internal pipings or heat exchanger)
8. Preliminary space volume without main tank capacity. Available for collecting the circulating fluid inside an external piping or for preliminary injection.
9. Required flow rate when a load for the cooling capacity is applied at a facility water temperature of 25°C.
10. Weight in the dry state without circulating fluids
Cooling Capacity

HRZ001-L2/002-L2/004-L2/008-L2

Heating Capacity

HRZ001-L2/002-L2/004-L2/008-L2

Pump Capacity (Thermo-chiller Outlet)

HRZ001-L2/002-L2/004-L2/008-L2

* When the circulating fluid flow is below 6 L/min, the in-built operation stop alarm will be activated. It is not possible to run the equipment. (common for all models)
Thermo-chiller

Double Inverter Type

HRZ Series

How to Order

Double Inverter Type | HRZ010-W | S |

Circulating fluid type

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Circulating fluid type</th>
<th>Temperature range setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>Fluorinated fluids</td>
<td>–20 to 90°C</td>
</tr>
<tr>
<td>1</td>
<td>Ethylene glycol aqueous solution</td>
<td>–20 to 90°C</td>
</tr>
<tr>
<td>2</td>
<td>Tap water/Deionized water</td>
<td>10 to 60°C</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Refrigerant charge kg</th>
<th>Control system</th>
<th>Refrigerant</th>
<th>Ambient temperature/humidity</th>
<th>Temperature range setting</th>
<th>Cooling capacity kW</th>
<th>Heating capacity kW</th>
<th>Temperature stability °C</th>
<th>Pressure range MPa</th>
<th>Required flow rate (50/60 Hz) L/min</th>
<th>Flow range L/min</th>
<th>Breaker capacity A</th>
<th>Rated current A</th>
<th>Weight kg</th>
<th>Safety standards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>R404A (HFC)</td>
<td>PID control</td>
<td>10 to 35°C, Humidity: 30 to 70%RH</td>
<td>10 to 60°C</td>
<td>2.5 (at 20°C)</td>
<td>±0.1 (in cases when the circulating fluid discharge port and the return port are directly connected)</td>
<td>0.3 to 0.7</td>
<td>15/5/2 to 208 VAC 60 Hz</td>
<td>10 to 40 (with flow control function by inverter)</td>
<td>30</td>
<td>25</td>
<td>165</td>
<td>UL, CE marking, SEMI (S2-0703, S8-0701, F47-0200), SEMATECH (S2-93, S8-95)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
- 1 Not equipped to the fluorinated fluid type.
- 2 R404A is a registered trademark, belonging to the Solvay Group or its corresponding owner. Fluorinert™ is a trademark of 3M. Dilute pure ethylene glycol with tap water.
- 3 It should have no condensation.
- 4 Value with a stable load without turbulence in the operating conditions. It may be out of this range when a DI control kit (option Y) is used or in some other operating conditions.
- 5 The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C.
- 6 Required flow rate for cooling capacity or maintaining the temperature stability. When used below the rated flow, use the individually sold, “Bypass Piping Set” (Refer to page 246).
- 7 May not be able to control with the set value depending on the piping specification in the user side.
- 8 Minimum volume required for operating only the thermo-chiller. (Circulating fluid temperature: 20°C, including the thermo-chiller’s internal piping or heat exchanger)
- 9 Preliminary space volume without main tank capacity. Available for collecting the circulating fluid inside an external piping or for preliminary injection.
- 10 Required flow rate when a load for the cooling capacity is applied at a facility water temperature of 25°C.
- 11 Weight in the dry state without circulating fluids
Cooling Capacity

**HRZ010-WS/010-W1S**

![Cooling Capacity Graph for HRZ010-WS/010-W1S](image)

**HRZ010-W2S**

![Cooling Capacity Graph for HRZ010-W2S](image)

Heating Capacity

**HRZ010-WS/010-W1S/010-W2S**

![Heating Capacity Graph for HRZ010-WS/010-W1S/010-W2S](image)

Pump Capacity (Thermo-chiller Outlet)

**HRZ010-WS**

![Pump Capacity Graph for HRZ010-WS](image)

**HRZ010-W1S**

![Pump Capacity Graph for HRZ010-W1S](image)

**HRZ010-W2S**

![Pump Capacity Graph for HRZ010-W2S](image)

* The pump capacity of the HRZ010-W1S is same as that of the HRZ001-L1 group on page 236.
* The pump capacity of the HRZ010-W2S is same as on page 238.

* When the circulating fluid flow is below 6 L/min, the in-built operation stop alarm will be activated. It is not possible to run the equipment. (common for all models)
* With flow control function by inverter
**HRZ Series**

**Common Specifications**

**Dimensions**

<table>
<thead>
<tr>
<th>HRZ001-H</th>
<th>HRZ001-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluorinated fluid type</td>
<td>Ethylene glycol type</td>
</tr>
<tr>
<td>HRZ001-H</td>
<td>HRZ001-L1</td>
</tr>
<tr>
<td>HRZ002-H</td>
<td>HRZ002-L1, W1</td>
</tr>
</tbody>
</table>

(Dimensional tolerance of A, B, and C: ±10 mm)
**Common Specifications HRZ Series**

- **Model**: HRZ Series
- **Fluorinated Fluid Type**: Ethylene Glycol Type
- **Model Numbers**:
  - HRZ008-L
  - HRZ008-L1

**Dimensions**:

<table>
<thead>
<tr>
<th>Model</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRZ008-L</td>
<td>415</td>
<td>1080</td>
<td>1075</td>
<td>ø35.0 to 38.0</td>
</tr>
<tr>
<td>HRZ008-L1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Dimensional tolerance of A, B, and C: ±10 mm)

**Anti-quake Bracket Mounting Position**

- **Anti-quake Bracket**: Mounting position (Dimensional tolerance: ±5 mm)
- **Anchor Bolt Location**: 8 x ø8
- **Level Foot**:
  - Dimensions:
    - 1157 mm
    - 1080 mm
    - 987 mm
  - Dimensions with guard ring (yellow):
    - 30 mm
    - 30 mm

---

*Anchor bolts (M8, 8 pcs.) which are suitable for the floor material should be prepared by user.*
**HRZ Series**

## Communication Functions

*(For details, please refer to our “Communication Specifications” information.)*

### Contact Input/Output

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector no.</td>
<td>P1 <em>(Refer to page 244 for the connector location.)</em></td>
</tr>
<tr>
<td>Connector type (on this product’s side)</td>
<td>D-sub 25 P type, Female connector</td>
</tr>
<tr>
<td>Fixing bolt size</td>
<td>M2.6 x 0.45</td>
</tr>
</tbody>
</table>

#### Input signal

- **Insulation method**: Photocoupler
- **Rated input voltage**: 24 VDC
- **Operating voltage range**: 21.6 VDC to 26.4 VDC
- **Rated input current**: 5 mA TYP
- **Input impedance**: 4.7 kΩ

#### Open collector output signal

- **Insulation method**: Photocoupler
- **Rated load voltage**: 24 VDC
- **Operating load voltage range**: 21.6 VDC to 26.4 VDC
- **Maximum load current**: 80 mA
- **Leakage current**: 0.1 mA or less
- **Surge protection**: Diode

#### Contact output signal

- **Alarm signal** *(Alarm signal)*
- **EMO signal** *(EMO signal)*

<table>
<thead>
<tr>
<th>Contact output signal</th>
<th>Rated load voltage</th>
<th>Maximum load current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm signal</td>
<td>48 VAC or less/24 VDC or less</td>
<td>800 mA AC/DC (Resistance load/Inductive load)</td>
</tr>
<tr>
<td>EMO signal</td>
<td>48 VAC or less/24 VDC or less</td>
<td>800 mA AC/DC (Resistance load/Inductive load)</td>
</tr>
</tbody>
</table>

#### Circuit diagram

- **User’s equipment side**
- **To the thermo-chiller**
- **Pin assignment number**

- **24 VDC output (Output from the thermo-chiller)**
- **24 COM output (Output from the thermo-chiller)**
- **24 VDC input (Supply from the user’s equipment or thermo-chiller)**
- **24 COM input (Supply from the user’s equipment or thermo-chiller)**

### Notes

1. When using the power supply of the thermo-chiller, short circuit pins 1 and 2 and pins 14 and 15 respectively.
   - When using the power supply of the user’s equipment, connect the lead wires to pins 2 and 15 and short circuit pins 14 and 15. Incorrect connections may cause a malfunction.

2. The custom function is equipped for contact input/output. Using the custom function enables the user to set the signal type for contact input/output or pin assignment numbers. For details, please refer to the “Communication Specifications” information.
Serial RS-485
The serial RS-485 enables the following items to be written and read out.

<Writing>
- Run/Stop
- Circulating fluid temperature setting
- Circulating fluid automatic recovery start/stop

<Readout>
- Circulating fluid present temperature
- Circulating fluid flow
- Circulating fluid discharge pressure
- Circulating fluid electric resistivity
- Alarm occurrence information
- Status (operating condition) information

*1 Only when the circulating fluid automatic recovery function (option Z) is selected.
*2 Only when the DI control kit (option Y) is selected.

### Connector Location
- **P3:** Not used for the maintenance purpose port
  - D-sub 9 (Male receptacle)
- **P2:** Serial RS-485
  - D-sub 9 (Female receptacle)
- **P1:** Contact input/output
  - D-sub 25 (Female receptacle)
- **Power cable entry**

### Connector Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector no.</td>
<td>P2</td>
</tr>
<tr>
<td>Connector type (on this product’s side)</td>
<td>D-sub 9 P type, Female connector</td>
</tr>
<tr>
<td>Fixing bolt size</td>
<td>M2.6 x 0.45</td>
</tr>
<tr>
<td>Standards</td>
<td>EIA RS485</td>
</tr>
<tr>
<td>Protocol</td>
<td>Modicon Modbus</td>
</tr>
</tbody>
</table>

### Circuit Diagram
- **Internal circuit**
- **SD+**
- **SD-**
- **SG**
- **To the thermo-chiller**
- **User’s equipment side**

---

The serial RS-485 enables the following items to be written and read out.

<Writing>
- Run/Stop
- Circulating fluid temperature setting
- Circulating fluid automatic recovery start/stop

<Readout>
- Circulating fluid present temperature
- Circulating fluid flow
- Circulating fluid discharge pressure
- Circulating fluid electric resistivity
- Alarm occurrence information
- Status (operating condition) information

*1 Only when the circulating fluid automatic recovery function (option Z) is selected.
*2 Only when the DI control kit (option Y) is selected.
### Operation Display Panel

This unit can display 28 kinds of alarm messages as standard. Also, it can read out the serial RS-485 communication.

<table>
<thead>
<tr>
<th>Alarm code</th>
<th>Alarm message</th>
<th>Operation status</th>
<th>Main reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Water Leak Detect FLT</td>
<td>Stop</td>
<td>Liquid deposits in the base of this unit</td>
</tr>
<tr>
<td>02</td>
<td>Incorrect Phase Error FLT</td>
<td>Stop</td>
<td>The power supply to this unit is incorrect</td>
</tr>
<tr>
<td>03</td>
<td>RFGT High Press FLT</td>
<td>Stop</td>
<td>Pressure in the refrigeration circuit has exceeded the limitation.</td>
</tr>
<tr>
<td>04</td>
<td>CPRSR Overheat FLT</td>
<td>Stop</td>
<td>Temperature inside the compressor has increased</td>
</tr>
<tr>
<td>05</td>
<td>Reservoir Low Level FLT</td>
<td>Stop</td>
<td>The amount of circulating fluid is running low</td>
</tr>
<tr>
<td>06</td>
<td>Reservoir Low Level WRN</td>
<td>Continue</td>
<td>The amount of circulating fluid is running low</td>
</tr>
<tr>
<td>07</td>
<td>Reservoir High Level WRN</td>
<td>Continue</td>
<td>Filling the circulating fluid too much.</td>
</tr>
<tr>
<td>08</td>
<td>Temp. Fuse Cutout FLT</td>
<td>Stop</td>
<td>Temperature of the circulating fluid tank is raised</td>
</tr>
<tr>
<td>09</td>
<td>Reservoir High Temp. FLT</td>
<td>Stop</td>
<td>Temperature of the circulating fluid has exceeded the limitation.</td>
</tr>
<tr>
<td>11</td>
<td>Reservoir High Temp. WRN</td>
<td>Continue</td>
<td>Temperature of the circulating fluid has exceeded the limitation set by user</td>
</tr>
<tr>
<td>12</td>
<td>Return Low Flow FLT</td>
<td>Stop</td>
<td>The circulating fluid flow has gone below 6 L/min</td>
</tr>
<tr>
<td>13</td>
<td>Return Low Flow WRN</td>
<td>Continue</td>
<td>The circulating fluid flow has gone below the limitation set by user</td>
</tr>
<tr>
<td>14</td>
<td>Heater Breaker Trip FLT</td>
<td>Stop</td>
<td>Protection device for the electric circuit of the heater is activated</td>
</tr>
<tr>
<td>15</td>
<td>Pump Breaker Trip FLT</td>
<td>Stop</td>
<td>Protection device for the electric circuit of the circulating pump is activated</td>
</tr>
<tr>
<td>16</td>
<td>CPRSR Breaker Trip FLT</td>
<td>Stop</td>
<td>Protection device for the electric circuit of the compressor is activated</td>
</tr>
<tr>
<td>17</td>
<td>Interlock Fuse Cutout FLT</td>
<td>Stop</td>
<td>Overcurrent is flown to the control circuit</td>
</tr>
<tr>
<td>18</td>
<td>DC Power Fuse Cutout WRN</td>
<td>Continue</td>
<td>Overcurrent has flowed to the (optional) solenoid valve</td>
</tr>
<tr>
<td>19</td>
<td>FAN Motor Stop WRN</td>
<td>Continue</td>
<td>Cooling fan inside the compressor has stopped</td>
</tr>
<tr>
<td>20</td>
<td>Internal Pump Time Out WRN</td>
<td>Continue</td>
<td>The internal pump continuously run for more than a certain period of time</td>
</tr>
<tr>
<td>21</td>
<td>Controller Error FLT</td>
<td>Stop</td>
<td>The error occurred in the control systems</td>
</tr>
<tr>
<td>22</td>
<td>Memory Data Error FLT</td>
<td>Stop</td>
<td>The data stored in the controller of this unit went wrong</td>
</tr>
<tr>
<td>23</td>
<td>Communication Error WRN</td>
<td>Continue</td>
<td>The serial communications between this unit and user’s system has been suspended</td>
</tr>
<tr>
<td>24</td>
<td>DI Low Level WRN</td>
<td>Continue</td>
<td>DI level of the circulating fluid has gone below the limitation set by user.</td>
</tr>
<tr>
<td>25</td>
<td>Pump Inverter Error FLT</td>
<td>Stop</td>
<td>An error has occurred in the inverter for the circulating pump. The alarm is only for the HRZ010-W1:S.</td>
</tr>
<tr>
<td>26</td>
<td>DNET Comm. Error WRN</td>
<td>Continue</td>
<td>The DeviceNet communications between this unit and user’s system has been suspended. (Only for DeviceNet communication specification - option D)</td>
</tr>
<tr>
<td>27</td>
<td>DNET Comm. Error FLT</td>
<td>Stop</td>
<td>An error has occurred in the DeviceNet communication system of this unit. (Only for DeviceNet communication specification - option D)</td>
</tr>
<tr>
<td>28</td>
<td>CPRSR INV Error FLT</td>
<td>Stop</td>
<td>An error has occurred in the inverter for the compressor. The alarm is only for the HRZ010-W1:S.</td>
</tr>
</tbody>
</table>
**HRZ Series**

**Optional Accessories**

1. **Bypass Piping Set**

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

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

![Diagram of Bypass Piping Set]

2. **Anti-quake Bracket**

Bracket for earthquakes

Prepare the anchor bolts (M12) which are suited to the floor material by user.

![Diagram of Anti-quake Bracket]

**Part no.** | **Applicable model**
--- | ---
HRZ-BP001 | HRZ001-H/HRZ001-H1
| HRZ002-H/HRZ002-H1
HRZ-BP002 | HRZ001-L/HRZ001-L1
| HRZ002-L/HRZ002-L1
| HRZ002-L2
| HRZ004-L/HRZ004-L1
| HRZ004-L2
| HRZ008-L/HRZ008-L1
| HRZ008-L2
| HRZ008-W/HRZ008-W1
| HRZ008-W/HRZ008-W1
| HRZ010-W1S
| HRZ010-W2S

- 2 pieces per set (for 1 unit) (HRZ-TK002)
- Anti-quake bracket is attached as standard. (HRZ008-L, HRZ008-L1)

**Bracket for earthquakes**

Prepare the anchor bolts (M12) which are suited to the floor material by user.

![Diagram of Bracket for Earthquakes]

- 2 pieces per set (for 1 unit) (HRZ-TK002)
- Anti-quake bracket is attached as standard. (HRZ008-L, HRZ008-L1)
### 3 4-Port Manifold

4-branching the circulating fluid enables 4 temperature controls at the maximum with the 1 unit thermo-chiller.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRZ-MA001</td>
<td>Common for all models</td>
</tr>
</tbody>
</table>

![Mounting view (Rear side)](image)

Approx. 210 mm

4 x Rc1/2

2 pcs./set

### 4 DI Filter

This is the ion replacement resin to maintain the electric resistivity of the circulating fluid. Users who selected the DI control kit (option Y) need to purchase the DI filter separately.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRZ-DF001</td>
<td>Common for all models which can select the DI control kit. (option Y)</td>
</tr>
</tbody>
</table>

*The DI filters are consumable. Depending on the status (electric resistivity set value, circulating fluid temperature, piping volume, etc.), product life cycles will vary accordingly.*

### 5 Insulating Material for DI Filter

When the DI filter is used at a high-temperature, we recommend that you use this insulating material to protect the radiated heat from the DI filter or possible burns. When the DI filter is used at a low-temperature, we also recommend that you use this to prevent heat absorption from the DI filter and to avoid forming condensation.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRZ-DF002</td>
<td>Common for all models which can select the DI control kit. (option Y)</td>
</tr>
</tbody>
</table>

Approx. ø220 mm

Approx. 508 mm

Weight: Approx. 20 kg
60% Ethylene Glycol Aqueous Solution

This solution can be used as a circulating fluid for ethylene glycol-type thermo-chillers. (Capacity: 10 L)

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRZ-BR001</td>
<td>Common for all ethylene glycol-type models</td>
</tr>
</tbody>
</table>

Concentration Meter

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

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRZ-BR002</td>
<td>Common for all ethylene glycol-type models</td>
</tr>
</tbody>
</table>
Analog Communication

HRZ□□-□□-C
Analog communication

In addition to the standard contact input/output signal communication and the serial RS-485 communication, analog communication function can be added. The analog communication function enables to write and read out the following items.

<Writing>
- Circulating fluid temperature setting
- Scaling voltage

<Readout>
- Circulating fluid present temperature
- Electric resistivity

1 Only when the DI control kit (option Y) is selected.

Scaling voltage - circulating fluid temperature can be set arbitrarily by user.
For details, please refer to our “Communication Specifications” information.

NPT Fitting

HRZ□□-□□-N
NPT fitting

An adapter is included to change the connection parts of circulating fluid piping and facility water piping to NPT thread type. The adapter must be installed by user.

DI Control Kit

HRZ□□-□□-Y
DI control kit

Select this option if you want to maintain the electric resistance ratio (DI level) of the circulating fluid at a certain level. However, some components have to be fitted by user. For details, refer to specification table for this option.
Please note that this is not applicable to the fluorinated liquid type.

DeviceNet Communication

HRZ□□-□□-D
DeviceNet communication

In addition to the standard contact input/output signal communication and the serial RS-485 communication, DeviceNet function can be added. DeviceNet function enables to write and read out the following items.

<Writing>
- Run/Stop
- Circulating fluid temperature setting
- Circulating fluid automatic recovery start/stop

<Readout>
- Circulating fluid present temperature
- Circulating fluid flow
- Circulating fluid discharge pressure
- Electric resistivity
- Alarm occurrence information
- Status (operating condition) information

1 Only when the DI control kit (option Y) is selected.
2 Only when the DI control kit (option Y) is selected.

For details, please refer to our “Communication Specifications” information.

SI Unit Only

HRZ□□-□□-W
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

<table>
<thead>
<tr>
<th>Applicable model</th>
<th>HRZ□□□□□□□□□□Y</th>
<th>HRZ□□□□□□□□□□Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allowable circulating fluid</td>
<td>60% ethylene glycol aqueous solution</td>
<td>Deionized water</td>
</tr>
<tr>
<td>DI level display range</td>
<td>MΩ·cm</td>
<td>0 to 20</td>
</tr>
<tr>
<td>DI level set range</td>
<td>MΩ·cm</td>
<td>0 to 2.0*1</td>
</tr>
<tr>
<td>DI level reduction alarm set range</td>
<td>MΩ·cm</td>
<td>0 to 2.0</td>
</tr>
</tbody>
</table>

1 The DI filter is needed to control the DI level. (SMC Part No.: HRZ-DF001)
Please purchase additionally because the DI filter is not included in this option. Also, if necessary, additionally purchase the insulating material for the DI filter. (SMC Part No.: HRZ-DF002)

Install the DI filter outside the thermo-chiller for piping. Secure the space for installing the DI filter on the rear side of the thermo-chiller.

It may go outside of the temperature stability range of ±0.1°C when this option is used in some operating conditions.

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

Select this option for users who want to use the circulating fluid automatic recovery function. The automatic recovery function is a device which can recover the circulating fluid inside pipings into a sub-tank of the thermo-chiller by the external communication or operating display panel. Some components need to be fitted by user. For details, please refer to the “Product Specifications” information for these options.

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</tr>
</thead>
<tbody>
<tr>
<td>Circulating fluid recoverable volume*1</td>
<td>L</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td></td>
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<tr>
<td>Purge gas</td>
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<tr>
<td>Purge gas supply port</td>
<td>—</td>
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<tr>
<td>Purge gas supply pressure</td>
<td>MPa</td>
<td>0.4 to 0.7</td>
<td>0.15 to 0.3</td>
<td></td>
<td></td>
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<tr>
<td>Purge gas filtration</td>
<td>µm</td>
<td>0.01 or less</td>
<td>—</td>
<td></td>
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</tr>
<tr>
<td>Regulator set pressure</td>
<td>MPa</td>
<td>0.3*3</td>
<td>—</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Recoverable circulating fluid temperature</td>
<td>°C</td>
<td>10 to 30</td>
<td>35 to 55</td>
<td></td>
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</tr>
<tr>
<td>Recovery start/stop</td>
<td>—</td>
<td>Start: External communication*4 or operation display panel/Stop: Automatic</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timeout error</td>
<td>sec</td>
<td>Timer from recovery start to completion</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Height difference with the user system side</td>
<td>m</td>
<td>10 or less</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

*1 This is the space volume of the sub-tank when the liquid level of the circulating fluid is within the specification. Guideline of the recovery volume is 80% of the circulating fluid recoverable volume.

*2 Before piping, clean inside the pipings with air blow, etc. Use the piping with no dust generation by purge gas. When using resin tube, where necessary, use insert fittings, etc. in order not to deform the tubings when connecting to self-align fittings.

*3 At the time of shipping from factory, it is set to 0.2 MPa.

*4 For details, please refer to our “Communication Specifications” information.
**Warning**

1. This catalog shows the specifications of a single unit.
   1. For details, please refer to our “Product Specifications” and thoroughly consider the adaptability between the user’s system and this unit.
   2. Although the protection circuit as a single unit is installed, the user is requested to carry out the safety design for the whole system.

**Caution**

1. **Model selection**
   In order to select the correct thermo-chiller model, the amount of thermal generation from the user’s system, the operating circulating fluid, and its circulating flow are required. Select a model, by referring to the guideline to model selection on page 227.

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

**Handling**

**Warning**

1. Thoroughly read the Operation Manual.
   Read the Operation Manual completely before operation, and keep this manual available whenever necessary.

**Operating Environment/Storage Environment**

**Caution**

1. Do not use in the following environment because it will lead to a breakdown.
   1. Environment like written in “Temperature Control Equipment Precautions.”
   2. Locations where spatter will adhere to when welding.
   3. Locations where it is likely that the leakage of flammable gas may occur.
   4. Locations where the ambient temperature exceeds the limits as mentioned below.
      - During operation 10°C to 35°C
      - During storage 0°C to 50°C (but as long as water or circulating fluid are not left inside the pipings)
   5. Locations where the ambient relative humidity exceeds the limit as mentioned below.
      - During operation 30% to 70%
      - During storage 15% to 85%
   6. (Inside the operation facilities) locations where there is not sufficient space for maintenance.
   7. In locations where the ambient pressure exceeds the atmospheric pressure.

2. The Thermo-chiller does not have clean room specification. It generates dust from the pump inside the unit and the cooling fan for the unit inside.

**Circulating Fluid**

2. Use ethylene glycol that does not contain additives such as preservatives.
3. The condensation of ethylene glycol aqueous solution must be 60% or less. If the density is too high, the pump will be overloaded, resulting in occurrence of “Pump Breaker Trip FLT.” Also, if the density is too low, the unit will freeze at lower temperatures, resulting in product failure.
4. Avoid water moisture entering the fluorinated fluid. Otherwise, the unit will freeze, resulting in product failure.
5. Use tap water (including for diluting ethylene glycol aqueous solution) which must meet the water quality standards as mentioned below.

### Tap Water (as Circulating Water) Quality Standards

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Standard value</th>
<th>Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH (at 25°C)</td>
<td>—</td>
<td>6.0 to 8.0</td>
<td>○</td>
</tr>
<tr>
<td>Electric conductivity (25°C)</td>
<td>[µS/cm]</td>
<td>100×1 to 300×1</td>
<td>○</td>
</tr>
<tr>
<td>Chloride ion (Cl⁻)</td>
<td>[mg/L]</td>
<td>50 or less</td>
<td>○</td>
</tr>
<tr>
<td>Sulfuric acid ion (SO₄²⁻)</td>
<td>[mg/L]</td>
<td>50 or less</td>
<td>○</td>
</tr>
<tr>
<td>Acid consumption amount (at pH4.8)</td>
<td>[mg/L]</td>
<td>50 or less</td>
<td>○</td>
</tr>
<tr>
<td>Total hardness</td>
<td>[mg/L]</td>
<td>70 or less</td>
<td>○</td>
</tr>
<tr>
<td>Calcium hardness (CaCO₃)</td>
<td>[mg/L]</td>
<td>50 or less</td>
<td>○</td>
</tr>
<tr>
<td>Ionic state silica (SiO₂)</td>
<td>[mg/L]</td>
<td>30 or less</td>
<td>○</td>
</tr>
<tr>
<td>Iron (Fe)</td>
<td>[mg/L]</td>
<td>0.3 or less</td>
<td>○</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>[mg/L]</td>
<td>0.1 or less</td>
<td>○</td>
</tr>
<tr>
<td>Sulfide ion (S₂⁻)</td>
<td>[mg/L]</td>
<td>Should not be detected</td>
<td>○</td>
</tr>
<tr>
<td>Ammonium ion (NH₄⁺)</td>
<td>[mg/L]</td>
<td>0.1 or less</td>
<td>○</td>
</tr>
<tr>
<td>Residual chlorine (Cl)</td>
<td>[mg/L]</td>
<td>0.3 or less</td>
<td>○</td>
</tr>
<tr>
<td>Free carbon (CO₂)</td>
<td>[mg/L]</td>
<td>4.0 or less</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.

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251
HRZ Series
Specific Product Precautions 2

Be sure to read this before handling the products. Refer to page 383 for safety instructions and pages 384 to 387 for temperature control equipment precautions.

Facility Water Supply

⚠️ Warning

<Water-cooled refrigeration>

1. The water-cooled refrigeration type thermo-chiller radiates heat to the facility water.
   Prepare the facility water system that satisfies the facility water specifications below.

2. When using tap water as facility water, use tap water that conforms to the appropriate water quality standards. Use tap water that conforms to the standards shown below.

<Tap Water (as Facility Water) Quality Standards>
The Japan Refrigeration and Air Conditioning Industry Association
JRIA GL-02-1994 “Cooling water system – Circulation type – Circulating water”

<table>
<thead>
<tr>
<th>Standard item</th>
<th>Unit</th>
<th>Influence</th>
<th>Standard value</th>
<th>Corrosion</th>
<th>Scale generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH (at 25°C)</td>
<td>—</td>
<td></td>
<td>6.5 to 8.2</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Electric conductivity</td>
<td>[μS/cm]</td>
<td></td>
<td>1000<em>1 to 800</em>1</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Chloride ion (Cl⁻)</td>
<td>[mg/L]</td>
<td></td>
<td>200 or less</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Sulfuric acid ion (SO₄²⁻)</td>
<td>[mg/L]</td>
<td></td>
<td>200 or less</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Acid consumption amount</td>
<td>(at pH 8)</td>
<td></td>
<td>100 or less</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Total hardness</td>
<td>[mg/L]</td>
<td></td>
<td>200 or less</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Calcium hardness (CaCO₃)</td>
<td>[mg/L]</td>
<td></td>
<td>150 or less</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Ionic state silica (SiO₂)</td>
<td>[mg/L]</td>
<td></td>
<td>50 or less</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Iron (Fe)</td>
<td>[mg/L]</td>
<td></td>
<td>1.0 or less</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>[mg/L]</td>
<td></td>
<td>0.3 or less</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Sulfide ion (S₂⁻)</td>
<td>[mg/L]</td>
<td></td>
<td>Should not be detected</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Ammonium ion (NH₄⁺)</td>
<td>[mg/L]</td>
<td></td>
<td>1.9 or less</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Residual chlorine (Cl⁻)</td>
<td>[mg/L]</td>
<td></td>
<td>0.3 or less</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Free carbon (CO₂)</td>
<td>[mg/L]</td>
<td></td>
<td>4.0 or less</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

1. In the case of [μS/cm], it will be 0.001 to 0.01.
2. * Factors that have an effect on corrosion or scale generation.
3. Even if the water quality standards are met, complete prevention of corrosion is not guaranteed.

3. Set the supply pressure between 0.3 to 0.7 MPa. Ensure a pressure difference at the facility water inlet/outlet of 0.3 MPa or more.
If the supply pressure is high, it will cause water leakage. If the supply pressure and pressure difference at the facility water inlet/outlet is low, it will cause an insufficient flow rate of the facility water, and poor temperature control.

Transportation/Carriage/Movement

⚠️ Warning

1. Transporting with forklift
   1. It is not possible to hang this product.
   2. The fork insertion position is either on the left side face or right side face of the unit. Be careful not to bump the fork against a caster or level foot and be sure to put through the fork to the opposite side.
   3. Be careful not to bump the fork to the cover panel or piping ports.

2. Transporting with casters
   1. This product is heavy and should be moved by at least two people.
   2. Do not grip the pipings on the rear side or the handles of the panel.

Mounting/Installation

⚠️ Caution

1. Avoid using this product outdoors.
2. Install on a rigid floor which can withstand this product’s weight.
3. Install a suitable anchor bolt for the anti-quake bracket taking into consideration the user’s floor material.
4. Avoid placing heavy objects on this product.

Piping

⚠️ Caution

1. Regarding the circulating fluid pipings, consider carefully the suitability for shutoff pressure, temperature and circulating fluid.
   If the operating performance specifications are regularly exceeded, the pipings may burst during operation.

2. The surface of the circulating fluid pipings should be covered with the insulating materials which can effectively confine the heat.
   Absorbing the heat from the surface of pipings may reduce the cooling capacity performance and the heating capacity may be shortened due to heat radiation.

3. When using fluorinated liquid as the circulating fluid, do not use pipe tape.
   Liquid leakage may occur around the pipe tape.
   For sealant, we recommend that you use the following sealant: SMC Part No., HRZ-S0003 (Silicone sealant)

4. For the circulating fluid pipings, use clean pipings which have no dust, oil or water moisture inside the pipings, and blow with air prior to undertaking any piping works.
   If any dust, oil or water moisture enters the circulating fluid circuit, inferior cooling performance or equipment failure due to frozen water may occur, resulting in bubbles in the circulating fluid inside the tank.

5. The reciprocating total volume of the circulating fluid pipings must be less than the volume of the sub-tank.
   Otherwise, when the equipment is stopped, the in-built alarm may activate or the circulating fluid may leak from the tank. Refer to the specifications table for the sub-tank volume.

6. Select the circulating fluid pipings which can exceed the required rated flow.
   For the rated flow, refer to the pump capacity table.

7. For the circulating fluid piping connection, install a drain pan just in case the circulating fluid may leak.

8. Do not return the circulating fluid to the unit by installing a pump in the user system.

Electrical Wiring

⚠️ Caution

1. Power supply and signal cable should be prepared by user.

2. Provide a stable power supply which is not affected by surge or distortion.
   If the voltage increase ratio (dV/dt) at the zero cross should exceed 40 V/200 usec., it may result in malfunction.
HRZ Series
Specific Product Precautions 3

Be sure to read this before handling the products. Refer to page 383 for safety instructions and pages 384 to 387 for temperature control equipment precautions.

**Electrical Wiring**

**Caution**

3. This product is installed with a breaker with the following operating characteristics.
   For the user’s equipment (inlet side), use a breaker whose operating time is equal to or longer than the breaker of this product. If a breaker with shorter operating time is connected, the user’s equipment could be cut off due to the inrush current of the motor of this product.

**Breaker Operating Characteristics**

**Applicable model**

- HRZ001-L
- HRZ001-H
- HRZ002-L
- HRZ002-H
- HRZ004-L
- HRZ004-H
- HRZ001-L1
- HRZ002-L1
- HRZ004-L1
- HRZ001-H1
- HRZ002-H1
- HRZ008-L
- HRZ008-L1
- HRZ008-W
- HRZ008-W1
- HRZ008-W2
- HRZ008-W1S
- HRZ008-W2S
- HRZ010-WS
- HRZ010-W1S
- HRZ010-W2S

**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.

**Maintenance**

**Warning**

1. Do not operate the switch with wet hands or touch electrical parts such as an electrical plug. This will lead to an electrical shock.
2. Do not splash water directly on this product for cleaning. This will lead to an electrical shock or a fire.
3. When the panel was removed for the purpose of inspection or cleaning, mount the panel after works were done. If the panel is still open, or running the equipment with the panel removed, it may cause an injury or electric shock.

**Caution**

1. In order to prevent a sudden product failure of the unit, replace the replacement parts every 36 months.
2. Perform an inspection of the circulating fluid every 3 months.
   1. In the case of fluorinated fluids:
      - Discharge the circulating liquid and avoid any dirty objects, or water moisture, or foreign matter entering the system.
   2. In the case of ethylene glycol aqueous solution:
      - Maintain the condensation at 60%.
   3. In the case of tap water, deionized water:
      - Replacement is recommended.
3. Check the water quality of cooling water every 3 months.

Regarding the water quality standards for cooling water, refer to “Temperature Control Equipment Precautions.”

**Refrigerant with GWP reference**

<table>
<thead>
<tr>
<th>Refrigerant</th>
<th>Global warming potential (GWP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R134a</td>
<td>1,430</td>
</tr>
<tr>
<td>R404A</td>
<td>3,920</td>
</tr>
<tr>
<td>R407C</td>
<td>1,770</td>
</tr>
<tr>
<td>R410A</td>
<td>2,086</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.