Circulating fluid temperature controller

Water-cooled Thermo-chiller

Refrigerant-free and energy saving type using no compressor. Ideal for ordinary temperature and high temperature processes.

- Circulating fluid types: Fluorinated fluids/Ethylene glycol aqueous solution/Clean water, Deionised water
- Temperature range setting: 20 to 90°C
- Cooling capacity: 2 kW / 8 kW / 15 kW / 30 kW
- Temperature stability: ±0.3°C

More effective energy-saving through use of an inverter pump

Series HRW
Energy Saving and Refrigerant-free

Energy-saving and refrigerant-free (Ordinary temperature up to 90°C)
The water-cooled Thermo-chiller which does not use a compressor (refrigerant-free) is suitable for processes operating from ordinary temperature to 90°C. The energy-savings shown below can be achieved in comparison with existing models (depending on the conditions).

- **Power consumption:** Max. **59%** reduction (SMC comparison)
The power consumption can be reduced by direct heat exchange between the circulating fluid and facility water with no refrigerating circuit.

<table>
<thead>
<tr>
<th>Existing model</th>
<th>HRW008-H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power consumption</td>
<td>4.6 kWh/h</td>
</tr>
</tbody>
</table>

Operating conditions: 60°C, 0 kW with 50% load, 8 kW with 50% load
- Reduced running cost
- Contribution to the environmental preservation

- **Circulating fluid:** Max. **13%** reduction (SMC comparison)
Enhanced temperature control technology and the unique pump/tank construction achieved the reduced circulating fluid required for operation.

<table>
<thead>
<tr>
<th>Existing model</th>
<th>HRW008-H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circulating fluid</td>
<td>15 L</td>
</tr>
</tbody>
</table>

Comparison of the required circulating fluid inside a Thermo-chiller
- Reduced initial cost
- Contribution to the environmental preservation

**Pump Inverter Type**

More effective energy-saving is achieved through use of an inverter pump.

- **Power consumption:** Max. **89%** reduction (SMC comparison)

<table>
<thead>
<tr>
<th>Existing model</th>
<th>HRW008-HS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power consumption</td>
<td>4.6 kWh/h</td>
</tr>
</tbody>
</table>

Operating conditions: 60°C, 0 kW with 50% load, 8 kW with 50% load

- Reduced initial cost
- Contribution to the environmental preservation

- **Facility water:** Max. **89%** reduction (SMC comparison)
The HRW series can achieve reduction in power consumption as it does not have a compressor, and reduction in the amount of facility water used because heat is exchanged directly with the circulating fluid.

<table>
<thead>
<tr>
<th>Existing model</th>
<th>HRW008-H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility water</td>
<td>11.2 L/min</td>
</tr>
</tbody>
</table>

Operating conditions: 60°C, 0 kW with 50% load, 8 kW with 50% load, By-pass valve fully closed
- Reduced facilities investment
- Space saved facility water equipment
- Reduced running cost

**Space Saving**

- **Installation area:** max. **45%** reduction (SMC comparison)
*(Forced exhaust from rear side)*

By emitting the heat from the back, ventilation slits on the side are unnecessary offering reduced installation space.

Thermo-chiller with exhaust from the side:
  - Body space: W400 mm x D845 mm
  - Ventilation space: 100 mm

**HRW008-H**:
  - Body space: W380 mm x D665 mm
  - Ventilation space: 0

**HRW**

Thermo-chiller with exhaust from the side:

- **HRW008-H**
  - Body space: W380 mm x D665 mm
  - Ventilation space: 0

- **HRW008-HS**
  - Body space: W255 mm x D456 mm
  - Ventilation space: 0

- **0.93 m²**
- **0.51 m²**
**Temperature stability:** ±0.3°C (when a load is stable)
Enhanced temperature control technology achieved. ±0.3°C temperature stability when a load is stable.

**Cooling capacity:** max. 30 kW
Up to 30 kW cooling capacity achieved.

**Ease of 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 20.)

**Circulating fluid automatic recovery function**
(Refer to “Options” on page 23.)
Circulating fluid inside a thermo-chiller tank can be recovered automatically. (Recovery volume: 12 L)
- Reduced maintenance time
- Faster operation
- Reduced circulating liquid loss by evaporation or spill.

**Circulating fluid electric resistivity control function**
(Refer to “Options” on page 22.)
(DI control kit)
Circulating fluid circuit
With the circulating pump, the circulating fluid will be discharged to the customer's equipment side. After the circulating fluid heats or cools the customer's equipment side, it is returned to the main tank via the heat exchanger. When the automatic circulating fluid recovery function, which recovers the circulating fluid from the customer's machine, is selected (refer to page 2), a sub tank for recovery is installed. The internal pump is used to transfer a circulating fluid from the sub tank to the main tank.

Facility water circuit
When the circulating fluid temperature rises higher than the set temperature, open the solenoid valve to introduce facility water to the heat exchanger. When the circulating fluid temperature falls below the set temperature, close the solenoid valve to shut off the facility water to the heat exchanger.
**Application Examples**

**Semiconductor**

- Example: Temperature control of a chamber electrode

**Medical**

- Example: Blood preservation

**Food**

- Example: Tofu (Bean curd) production

**Diagnosis**

- Example: Electronic microscope

**Machine tool**

- Example: Laser machining

**Printing**

- Example: Printing temperature control

**Molding**

- Example: Injection molding

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**Semiconductor**

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

**Medical**

- X-ray instrument
- MRI
- Blood preservation equipment

**Food**

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

**Diagnosis**

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

**Machine tool**

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

**Printing**

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

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Temperature-controlling the ink roller enables to control the evaporation amount and viscosity of an ink and optimise the tint of colours.

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

Temperature-controlling the mold results in improved product quality.

Temperature-controlling the ink roller enables to control the evaporation amount and viscosity of an ink and optimise the tint of colours.
Model Selection

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  Capacity
- Precautions on Model Selection ............................. Page 9
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  Pump Capacity

- Ethylene Glycol Type
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  Pumping Capacity

- Clean/DI Water Type
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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
H: 20°C to 90°C
Example) Requirement from customer: 50°C

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

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

Fluorinated fluids: GALDEN® HT200/Fluorinert™ FC-40
Ethylene glycol aqueous solution 60%
Clean water / DI water

Example) Requirement from customer: Clean water

3. How much is the temperature in degrees centigrade for the facility water?

Temperature range which can be set with the thermo-chiller
10°C to 35°C
Example) Facility water temperature of the customer's equipment: 15°C
Temperature difference between the circulating fluid and the facility water is: 50 – 15 = 35°C.

4. What is the kW for the required cooling capacity?

Example) Requirement from customer: 20 kW
Plot the point where the temperature difference between the circulating fluid and the facility water (35°C) intersects the cooling capacity (20 kW) on the cooling capacity graph.

The point plotted in the graph is the requirement from your customer. Select the thermo-chiller models exceeding this point. In this case, select the HRW030-H2.

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Calculation of the Required Cooling Capacity

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

Heat generation amount Q: 3.5 kW

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

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

Obtaining the temperature difference between the inlet and the outlet by circulating the circulating fluid inside the customer’s equipment.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat generation amount Q</td>
<td>Unknown</td>
</tr>
<tr>
<td>Circulating fluid temperature difference $\Delta T$ ($= T_2 - T_1$)</td>
<td>6.0°C (6.0 K)</td>
</tr>
<tr>
<td>Circulating fluid outlet temperature $T_1$</td>
<td>20°C (293.15 K)</td>
</tr>
<tr>
<td>Circulating fluid return temperature $T_2$</td>
<td>26°C (299.15 K)</td>
</tr>
<tr>
<td>Circulating fluid flow rate L</td>
<td>20 L/min</td>
</tr>
<tr>
<td>Circulating fluid</td>
<td>Fluorinated fluid</td>
</tr>
<tr>
<td>Density $\gamma$</td>
<td>1.80 x 10³ kg/m³</td>
</tr>
<tr>
<td>Specific heat $C$</td>
<td>0.96 x 10³ J/(kg·K) (at 20°C)</td>
</tr>
</tbody>
</table>

* Refer to the information shown on page 10 highlighting the representative physical property values per circulating fluid.

$$Q = \frac{\Delta T \times L \times \gamma \times C}{60 \times 1000}$$

$$= \frac{6.0 \times 20 \times 1.80 \times 10^3 \times 0.96 \times 10^3}{60 \times 1000}$$

$$= 3456 \text{ W} = 3.5 \text{ kW}$$

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

Example of the conventional measurement units (Reference)

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unknown</td>
<td>6.0°C</td>
</tr>
<tr>
<td>20°C</td>
<td></td>
</tr>
<tr>
<td>26°C</td>
<td></td>
</tr>
<tr>
<td>1.2 m³/h</td>
<td></td>
</tr>
</tbody>
</table>

Fluorinated fluid

Density $\gamma$: 1.80 x 10³ kg/m³

Specific heat $C$: 0.23 kcal/kg·°C (at 20°C)

* Refer to the information shown on page 10 highlighting the representative physical property values per circulating fluid.

$$Q = \frac{\Delta T \times L \times \gamma \times C}{860}$$

$$= \frac{6.0 \times 1.2 \times 1.80 \times 10^3 \times 0.23}{860}$$

$$= 3.5 \text{ kW}$$

Cooling capacity = Considering a safety factor of 20%, $3.5 \times 1.2 = 4.2$ kW
**Model Selection**

**Calculation of the Required Cooling Capacity**

**Example 3. When there is no heat generation, and when cooling the object below a certain temperature and period of time.**

| Total volume of the object being cooled down V | : 60 L |
| Cooling time h | : 15 min |
| Cooling temperature difference ∆T: | 20°C (20 K) (70°C – 50°C → 20°C) |
| Facility water temperature | : 20°C (293.15 K) |
| Circulating fluid | : Fluorinated fluid |
| | Density γ: 1.74 x 10³ kg/m³ |
| | Specific heat C: 1.05 x 10³ J/(kg•K) |
| | (at 50°C) |

* Refer to the information shown on page 10 highlighting the representative physical property values per circulating fluid.

\[
Q = \frac{\Delta T \times V \times \gamma \times C}{h \times 60 \times 1000}
\]

\[
= \frac{20 \times 60 \times 1.74 \times 10^3 \times 1.05 \times 10^3}{15 \times 60 \times 1000} = 2436 \text{ W} = 2.4 \text{ kW}
\]

Cooling capacity = Considering a safety factor of 20%,

\[
2.4 \times 1.2 = 2.9 \text{ kW (When the circulating fluid temperature is 50°C.)}
\]

(In this case, the selected thermo-chiller model will be HRW008-H.)

**Circulating equipment**

**Water bath**

50°C

After 15 min, cool from 70°C down to 50°C.

Example of the conventional measurement units (Reference)

- 0.06 m³
- 0.25 h
- 20°C
- 20°C
- Fluorinated fluid
- Density γ: 1.74 x 10³ kg/m³
- Specific heat C: 0.25 kcal/kg•°C
  (at 50°C)

* Refer to the information shown on page 10 highlighting the representative physical property values per circulating fluid.

\[
Q = \frac{\Delta T \times V \times \gamma \times C}{h \times 860}
\]

\[
= \frac{20 \times 0.06 \times 1.74 \times 10^3 \times 0.25}{0.25 \times 860} = 2.4 \text{ kW}
\]

Cooling capacity = Considering a safety factor of 20%,

\[
2.4 \times 1.2 = 2.9 \text{ kW (When the circulating fluid temperature is 50°C.)}
\]

(In this case, the selected thermo-chiller model will be HRW008-H.)

**Precautions on Model Selection**

1. **Temperature difference between the circulating fluid and the facility water**
   The HRW series exchanges heat between the circulating fluid and the facility water directly, so it may not be possible to lower the circulating fluid temperature to the set temperature if the facility water temperature is too high. Check that the facility water temperature can be maintained for the circulating fluid temperature referring to the cooling capacity graph of each model before using.

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

3. **Pumping capacity**
   - **<Circulating fluid flow>**
     The pumping capacity varies depending on the model selected from the HRW series. Also, the circulating fluid flow varies depending on the circulating fluid discharge pressure. Consider the installation height difference between our thermo-chiller and the customer's equipment, and the piping resistance such as circulating fluid pipings, or piping size, or piping curves in the equipment. Confirm beforehand if the required flow is achieved using the pumping capacity curves for each model respectively.
   - **<Circulating fluid discharge pressure>**
     The circulating fluid discharge pressure has the possibility to increase up to the maximum pressure in the pumping capacity curves for each model. Confirm beforehand if the circulating fluid pipings or the circulating fluid circuit of the customer's equipment are fully durable against this pressure.

Note) This is the calculated value by changing the fluid temperature only. Thus, it varies substantially depending on the water bath, piping material or shape.
Circulating Fluid Representative Physical Property Values

Fluorinated Fluids

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Physical property value</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°C</td>
<td>1.87 x 10$^3$</td>
<td>0.87 x 10$^3$</td>
<td>0.21</td>
<td></td>
</tr>
<tr>
<td>20°C</td>
<td>1.80 x 10$^3$</td>
<td>0.96 x 10$^3$</td>
<td>0.23</td>
<td></td>
</tr>
<tr>
<td>50°C</td>
<td>1.74 x 10$^3$</td>
<td>1.05 x 10$^3$</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>80°C</td>
<td>1.67 x 10$^3$</td>
<td>1.14 x 10$^3$</td>
<td>0.27</td>
<td></td>
</tr>
</tbody>
</table>

Ethylene Glycol Aqueous Solution 60%

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Physical property value</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°C</td>
<td>1.10 x 10$^3$</td>
<td>3.02 x 10$^3$</td>
<td>0.72</td>
<td></td>
</tr>
<tr>
<td>20°C</td>
<td>1.08 x 10$^3$</td>
<td>3.15 x 10$^3$</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>50°C</td>
<td>1.06 x 10$^3$</td>
<td>3.27 x 10$^3$</td>
<td>0.78</td>
<td></td>
</tr>
<tr>
<td>80°C</td>
<td>1.04 x 10$^3$</td>
<td>3.40 x 10$^3$</td>
<td>0.81</td>
<td></td>
</tr>
</tbody>
</table>

Water

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

**Fluorinated Fluid Type**

**Thermo-chiller Series HRW**

**How to Order**

<table>
<thead>
<tr>
<th>Model</th>
<th>HRW002-H</th>
<th>HRW008-H</th>
<th>HRW008-HS</th>
<th>HRW015-H</th>
<th>HRW015-HS</th>
<th>HRW030-H</th>
<th>HRW030-HS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling method</td>
<td>Water-cooled</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature/humidity</td>
<td>Note 1) Temperature: 10 to 35°C, Humidity: 30 to 70%RH</td>
<td>Fluorinert™ FC-40/GALDEN® HT200</td>
<td></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>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature range setting</td>
<td>Note 2) 20 to 90°C</td>
<td>Note 2) 20 to 90°C</td>
<td>Note 2) 20 to 90°C</td>
<td>Note 2) 20 to 90°C</td>
<td>Note 2) 20 to 90°C</td>
<td>Note 2) 20 to 90°C</td>
<td>Note 2) 20 to 90°C</td>
</tr>
<tr>
<td>Cooling capacity (50/60 Hz common) [kW]</td>
<td>2</td>
<td>8</td>
<td>15</td>
<td>29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facility water temperature [°C]</td>
<td>10 to 35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circulating fluid temperature [°C]</td>
<td>4</td>
<td>30</td>
<td>40</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facility water required flow rate [L/min]</td>
<td>10</td>
<td>20</td>
<td>25</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature stability [°C]</td>
<td>±0.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pump capacity (50/60 Hz) [MPa]</td>
<td>0.40/0.60 (at 4 L/min)</td>
<td>0.45/0.65 (at 30 L/min)</td>
<td>0.40/0.60 (at 40 L/min)</td>
<td>0.40/0.60 (at 40 L/min)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circulating fluid flow rate [L/min]</td>
<td>3 to 16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tank capacity [L]</td>
<td>Approx. 13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circulating fluid recovery tank volume [L]</td>
<td>Approx. 14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port size</td>
<td>Rc3/4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wetted parts material</td>
<td>Copper brazing (Heat exchanger), Stainless steel, EPDM, Silicone, PPS, Fluororesin</td>
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</tr>
<tr>
<td>Temperature range [°C]</td>
<td>10 to 35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required flow rate [L/min]</td>
<td>10</td>
<td>20</td>
<td>25</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inlet pressure range [MPa]</td>
<td>0.3 to 0.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port size</td>
<td>Rc3/4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wetted parts material</td>
<td>Copper brazing (Heat exchanger), Stainless steel, EPDM, Silicone, Bronze, Brass</td>
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<td>Copper brazing (Heat exchanger), Stainless steel, EPDM, Silicone, Bronze, Brass</td>
<td>Copper brazing (Heat exchanger), Stainless steel, EPDM, Silicone, Bronze, Brass</td>
<td>Copper brazing (Heat exchanger), Stainless steel, EPDM, Silicone, Bronze, Brass</td>
</tr>
<tr>
<td>Power supply</td>
<td>3-phase 200/200 to 208 VAC ±10%</td>
<td></td>
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<tr>
<td>Max. operating current [A]</td>
<td>26</td>
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<tr>
<td>Breaker capacity [A]</td>
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<td></td>
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<tr>
<td>Communications</td>
<td>Serial RS-485 (D-sub 9 pin) and Contact input/output (D-sub 25 pin)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions [mm]</td>
<td>W380 x D665 x H860</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight [kg]</td>
<td>Approx. 90</td>
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<tr>
<td>Safety standards</td>
<td>UL, CE marking, SEMI (S2-0703, S8-1103, F47-0200), SEMATECH (S2-93, S8-95)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Note 1)** It should have no condensation.

**Note 2)** Fluorinert™ is a trademark of 3M and GALDEN® is a registered trademark of Solvay Solexis, Inc. Regarding the fluid other than the above, please contact SMC.

**Note 3)** Outlet temperature when the circulating fluid and facility water are rated flow, and the circulating fluid outlet and return port are directly connected. Installation environment, power supply, and facility water are within specification range and stable. Value obtained 10 minutes after the external load is stabilised. it may be out of ±0.3°C in some other operating conditions.

**Note 4)** The capacity at the circulating fluid outlet when the circulating fluid temperature is 20°C. Pump capacity at 60 Hz indicates the maximum capacity of the HRW002-H/HRW008-H/HRW015-H/HRW030-H (pump inverter type).

**Note 5)** Applicable to the HRW002-H/HRW008-H/HRW015-H/HRW030-H (pump inverter type) only.

**Note 6)** Minimum volume required for operating only the Thermo-chiller. (Circulating fluid temperature: 20°C, including the Thermo-chiller’s internal pipings or heat exchanger)

**Note 7)** The automatic circulating fluid recovering function will be provided by selecting option Z for collecting the circulating fluid inside an external piping.

**Note 8)** Required flow rate for cooling capacity or maintaining the temperature stability.

**Note 9)** Panel dimensions. These dimensions do not include possible protrusions such as a breaker handle.

**Note 10)** Weight in the dry state without circulating fluids.

---

**Temperature range setting**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Ambient temperature/humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>20 to 90°C</td>
</tr>
</tbody>
</table>

**Cooling capacity**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Cooling capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>002</td>
<td>2 kW</td>
</tr>
<tr>
<td>008</td>
<td>8 kW</td>
</tr>
<tr>
<td>015</td>
<td>15 kW</td>
</tr>
<tr>
<td>030</td>
<td>30 kW</td>
</tr>
</tbody>
</table>

**Option**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>—</td>
<td>None</td>
</tr>
<tr>
<td>C</td>
<td>Analogue communication</td>
</tr>
<tr>
<td>D</td>
<td>DeviceNet™ communication</td>
</tr>
<tr>
<td>N</td>
<td>NPT fitting</td>
</tr>
<tr>
<td>Z</td>
<td>Circulating fluid automatic recovery</td>
</tr>
</tbody>
</table>

**Pump inverter control**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Pump inverter control</th>
</tr>
</thead>
<tbody>
<tr>
<td>—</td>
<td>None</td>
</tr>
<tr>
<td>S</td>
<td>Applicable (Pump inverter type)</td>
</tr>
</tbody>
</table>
**Cooling Capacity**

|----------------------------|---------------------------------|

![Graph showing cooling capacity vs. temperature difference](image)

**Heating Capacity**

|----------------------------|---------------------------------|

![Graph showing heating capacity vs. circulating fluid temperature](image)

**Pump Capacity**

<table>
<thead>
<tr>
<th>HRW002-H</th>
<th>HRW002-HS</th>
</tr>
</thead>
</table>

![Graph showing pump capacity vs. flow rate](image)

* If the circulating fluid flow drops below 2 L/min., the shutdown alarm activates and operation stops. Do not use the product when the flow exceeds 16 L/min., since the flow cannot be displayed accurately.

* Pump capacity at 60 Hz indicates the maximum capacity of the HRW002-HS (pump inverter type).

* When pump inverter is operating at frequency of 60 Hz (maximum).
## Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>HRW002-H1</th>
<th>HRW002-H1S</th>
<th>HRW008-H1</th>
<th>HRW008-H1S</th>
<th>HRW015-H1</th>
<th>HRW015-H1S</th>
<th>HRW030-H1</th>
<th>HRW030-H1S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Circulating fluid system</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Circulating fluid (Note 2)</td>
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<tr>
<td>Condition</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circulating fluid temperature (°C)</td>
<td>2</td>
<td>8</td>
<td>15</td>
<td>27</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Facility water temperature (°C)</td>
<td>10 to 35</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circulating fluid flow rate (L/min)</td>
<td>4</td>
<td>15</td>
<td>30</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facility water required flow rate (L/min)</td>
<td>10</td>
<td>15</td>
<td>25</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature range setting</strong></td>
<td>20 to 90</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature range setting</strong></td>
<td>H</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Ethylene glycol type

- **HRW002-H1**
- **HRW008-H1**
- **HRW015-H1**
- **HRW030-H1**

- **Cooling capacity**
  - Symbol: 002
  - Cooling capacity: 2 kW
  - Symbol: 008
  - Cooling capacity: 8 kW
  - Symbol: 015
  - Cooling capacity: 15 kW
  - Symbol: 030
  - Cooling capacity: 30 kW

- **Temperature stability**
  - Note 1: ±0.3

- **Temperature range setting**
  - Symbol: H
  - Temperature range setting: 20 to 90°C

### How to Order

- **Ethylene Glycol Type**
  - **HRW**
    - Symbol: 002
    - Symbol: H 1
    - Symbol: 030

- **Option**
  - Symbol: —
  - Option: None
  - Symbol: C
  - Option: Analogue communication
  - Symbol: D
  - Option: DeviceNet™ communication
  - Symbol: N
  - Option: NPT fitting
  - Symbol: Y
  - Option: DI control kit
  - Symbol: Z
  - Option: Circulating fluid automatic recovery

- **Pump inverter control**
  - Symbol: —
  - Pump inverter control: None
  - Symbol: S
  - Pump inverter control: Applicable (Pump inverter type)

### Notes

1. It should have no condensation.
2. Dilute pure ethylene glycol with clear water. Additives invading wetting parts material such as preservatives cannot be used.
3. Outlet temperature when the circulating fluid and facility water are rated flow, and the circulating fluid outlet and return port are directly connected. Installation environment, power supply, and facility water are within specification range and stable. Value obtained 10 minutes after the external load is stabilised (after stabilisation with no load for HRW030-H1), It may be out of this range when a DI control kit (option Y) is used or in some other operating conditions.
4. The capacity at the circulating fluid outlet when the circulating fluid temperature is 20°C. Pump capacity at 60 Hz indicates the maximum capacity of the HRW008-H1 (pump inverter type).
5. Applicable to the HRW008-H1S (pump inverter type) only.
6. Minimum volume required for operating only the Thermo-chiller. (Circulating fluid temperature: 20°C, including the Thermo-chiller’s internal pipings or heat exchanger)
7. The automatic circulating fluid recovering function will be provided by selecting option Z for collecting the circulating fluid inside an external piping.
8. Required flow rate for cooling capacity or maintaining the temperature stability.
9. Panel dimensions. These dimensions do not include possible protrusions such as a breaker handle.
10. Weight in the dry state without circulating fluids.

---

### Additional Information

- **Model**
  - HRW002-H1
  - HRW008-H1
  - HRW015-H1
  - HRW030-H1

- **Cooling method**
  - Water-cooled

- **Ambient temperature/humidity**
  - Note 1: Temperature: 10 to 35°C, Humidity: 30 to 70%RH

- **Circulating fluid**
  - Note 1: 60% ethylene glycol aqueous solution

- **Temperature range setting**
  - Note 1: 20 to 90°C

- **Temperature stability**
  - Note 3: ±0.3

- **Pump capacity**
  - Note 4: 0.35/0.55 (at 4 L/min), 0.45/0.65 (at 15 L/min), 0.40/0.60 (at 30 L/min), 0.35/0.55 (at 40 L/min)

- **Circulating fluid flow range**
  - Note 5: 3 to 16, 9 to 50

- **Tank capacity**
  - Note 6: Approx. 13

- **Circulating fluid recovery tank volume**
  - Note 7: 12

- **Facility water**
  - Wetted material: Nickel brazing (Heat exchanger), Stainless steel, EPDM, Silicone, PPS, Fluororesin

- **Temperature range**
  - Note 8: 10 to 35°C

- **Inlet pressure range**
  - Note 8: 0.3 to 0.7 MPa

- **Power supply**
  - 3-phase 200/200 to 208 VAC ±10%

- **Breaker capacity**
  - Max. operating current: 26 A
  - Breaker capacity: 30 A

- **Communications**
  - Serial RS-485 (D-sub 9 pin) and Contact input/output (D-sub 25 pin)

- **Dimensions**
  - Note 9: 380 x 665 x 860 mm

- **Weight**
  - Note 10: Approx. 90 kg

- **Safety standards**
  - UL, CE marking, SEMI (S2-0703, S8-1103, F47-0200), SEMATECH (S2-93, S8-95)
**Cooling Capacity**

<table>
<thead>
<tr>
<th>HRW002-H1/008-H1/015-H1/030-H1</th>
<th>HRW002-H1S/008-H1S/015-H1S/030-H1S</th>
</tr>
</thead>
</table>

- Circulating fluid: 60% ethylene glycol
- Circulating fluid temperature: 20°C

**Heating Capacity**

<table>
<thead>
<tr>
<th>HRW002-H1/008-H1/015-H1/030-H1</th>
<th>HRW002-H1S/008-H1S/015-H1S/030-H1S</th>
</tr>
</thead>
</table>

- Circulating fluid: 60% ethylene glycol
- Circulating fluid temperature: 20°C

**Pump Capacity**

- HRW002-H1
- HRW002-H1S

- Circulating fluid: 60% ethylene glycol
- Circulating fluid temperature: 20°C

**Thermo-chiller Series HRW**

- Fluorinated Fluid Type
- Ethylene Glycol Type
- Clean/DI Water Type

---

- If the circulating fluid flow drops below 2 L/min., the shutdown alarm activates and operation stops. Do not use the product when the flow exceeds 16 L/min., since the flow cannot be displayed accurately.
- Pump capacity at 60 Hz indicates the maximum capacity of the HRW002-H1S (pump inverter type).

---

- If the circulating fluid flow drops below 8 L/min., the shutdown alarm activates and operation stops. Do not use the product when the flow exceeds 50 L/min., since the flow cannot be displayed accurately.
- Pump capacity at 60 Hz indicates the maximum capacity of the HRW008-H1S/015-H1S/030-H1S (pump inverter type).
Thermo-chiller

Clean/DI Water Type

Series HRW

How to Order

Clear/Deionised Water Type

<table>
<thead>
<tr>
<th>HRW002-H2</th>
<th>HRW008-H2</th>
<th>HRW015-H2</th>
<th>HRW030-H2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbol</td>
<td>Option</td>
<td>Symbol</td>
<td>Option</td>
</tr>
<tr>
<td>002</td>
<td>—</td>
<td>008</td>
<td>—</td>
</tr>
<tr>
<td>015</td>
<td>—</td>
<td>030</td>
<td>—</td>
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</tbody>
</table>

Cooling capacity

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Cooling capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>002</td>
<td>2 kW</td>
</tr>
<tr>
<td>008</td>
<td>8 kW</td>
</tr>
<tr>
<td>015</td>
<td>15 kW</td>
</tr>
<tr>
<td>030</td>
<td>30 kW</td>
</tr>
</tbody>
</table>

Temperature range setting

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Temperature range setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>20 to 90°C</td>
</tr>
</tbody>
</table>

Temperature range:

- Clear water: 20 to 90°C
- Deionised water: 20 to 90°C

Clear/Deionised water type

Specifications

For details, please consult our “Product Specifications” information.

<table>
<thead>
<tr>
<th>Model</th>
<th>HRW002-H2</th>
<th>HRW008-H2</th>
<th>HRW015-H2</th>
<th>HRW030-H2</th>
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</thead>
<tbody>
<tr>
<td>Water-cooled</td>
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<td>Circulating fluid temperature (°C)</td>
<td>Clear water, Deionised water</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Facility water temperature (°C)</td>
<td>+15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circulating fluid temperature (°C)</td>
<td></td>
<td>10 to 35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facility water temperature (°C)</td>
<td></td>
<td></td>
<td>20 to 90°C</td>
<td></td>
</tr>
<tr>
<td>Circulating fluid rated flow rate (L/min)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Facility water required flow rate (L/min)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Circulating fluid flow range (°C)</td>
<td>20 to 90°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tank capacity (L)</td>
<td>Approx. 13</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Circulating fluid recovery tank volume (L)</td>
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<tr>
<td>Port size (inch)</td>
<td>Rc3/4</td>
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</tr>
<tr>
<td>Wetted parts material</td>
<td>Nickel brazing (Heat exchanger), Stainless steel, EPDM, Silicone, PPS, Fluororesin</td>
<td>Nickel brazing (Heat exchanger), Stainless steel, EPDM, Silicone, PPS, Fluororesin</td>
<td>Nickel brazing (Heat exchanger), Stainless steel, EPDM, Silicone, PPS, Fluororesin</td>
<td>Nickel brazing (Heat exchanger), Stainless steel, EPDM, Silicone, PPS, Fluororesin</td>
</tr>
<tr>
<td>Temperature range (°C)</td>
<td>10 to 35</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Required flow rate (L/min)</td>
<td>10</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Inlet pressure range (kPa)</td>
<td>0.3 to 0.7</td>
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</tr>
<tr>
<td>Power supply</td>
<td>3-phase 200/208 to 208 VAC ±10%</td>
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</tr>
<tr>
<td>Max. operating current (A)</td>
<td>26</td>
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</tr>
<tr>
<td>Breaker capacity (A)</td>
<td>30</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Communications</td>
<td>Serial RS-485 (D-sub 9 pin) and Contact input/output (D-sub 25 pin)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions (inch)</td>
<td>W380 x D665 x H860</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>Approx. 90</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Safety standards

UL, CE marking, SEMI (S2-0703, S8-1103, F47-0200), SEMATECH (S2-93, S8-95)

Note 1) It should have no condensation.
Note 2) If clear water or deionised 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/cutting water system - circulation type - make-up water). The electrical conductivity of the deionised water used as the fluid varies depending on the operating conditions.
Note 3) Temperature range setting and temperature stability (°C)
Note 4) The capacity at the circulating fluid outlet when the circulating fluid temperature is 20°C. Pump capacity at 60 Hz indicates the maximum capacity of the HRW002-H2S (pump inverter type).
Note 5) Applicable to the HRW002-H2S (pump inverter type) only.
Note 6) Minimum volume required for operating only the Thermo-chiller. Circulating fluid temperature: 20°C, including the Thermo-chiller’s internal piping or heat exchanger.
Note 7) The automatic circulating fluid recovering function will be provided by selecting option Z for collecting the circulating fluid inside an external piping.
Note 8) Panel dimensions. These dimensions do not include possible protrusions such as a breaker handle.
Note 9) Weight in the dry state without circulating fluids.
### Heating Capacity

|--------------------------------|----------------------------------|

### Cooling Capacity

|--------------------------------|----------------------------------|

### Pump Capacity

- **HRW002-H2**
  - Circulating fluid: Clear water
  - Circulating fluid temperature: 20°C

- **HRW002-H2S**
  - Circulating fluid: Clear water
  - Circulating fluid temperature: 20°C

- **HRW008-H2/015-H2/030-H2**
  - Circulating fluid: Clear water
  - Circulating fluid temperature: 20°C

- **HRW008-H2S/015-H2S/030-H2S**
  - Circulating fluid: Clear water
  - Circulating fluid temperature: 20°C

### Notes

- If the circulating fluid flow drops below 2 L/min., the shutdown alarm activates and operation stops. Do not use the product when the flow exceeds 16 L/min., since the flow cannot be displayed accurately.
- If the circulating fluid flow drops below 8 L/min., the shutdown alarm activates and operation stops. Do not use the product when the flow exceeds 50 L/min., since the flow cannot be displayed accurately.
- Pump capacity at 60 Hz indicates the maximum capacity of the HRW002-H2S (pump inverter type).
**Series HRW**

Common Specifications

### Dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>Fluorinated fluid type</th>
<th>Ethylene glycol type</th>
<th>Clean/DI water type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRW002-H</td>
<td>HRW002-H1</td>
<td>HRW002-H2</td>
<td>380</td>
<td>665</td>
<td>860</td>
<td>ø18.5 to 20.5</td>
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</tr>
<tr>
<td>HRW008-H</td>
<td>HRW008-H1</td>
<td>HRW008-H2</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>HRW015-H</td>
<td>HRW015-H1</td>
<td>HRW015-H2</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>HRW030-H</td>
<td>HRW030-H1</td>
<td>HRW030-H2</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Note) Only when the DI control kit (Option “Y”) is selected.
### Commsnications (For details, please consult 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</td>
</tr>
<tr>
<td>Connector type (on this product 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 to 26.4 VDC
- Rated input current: 5 mA TYP
- Input impedance: 4.7 kΩ

**Output signal**
- Rated load voltage: 48 VAC or less / 30 VDC or less
  - Maximum load current (total): 24 VDC output / 24 COM output
- Setting at the time of shipment from factory: Custom function
  - Run/Stop signal: Run/Stop signal 1
  - —: Run/Stop signal 2
  - —: DIO REMOTE signal 1
  - —: DIO REMOTE signal 2

**Alarm signal**
- Rated load voltage: 48 VAC or less / 30 VDC or less
- Maximum load current: AC/DC 800 mA (resistance load / inductive load)

**EMO signal**
- Rated load voltage: 48 VAC or less / 30 VDC or less
- Maximum load current: AC/DC 800 mA (resistance load / inductive load)

---

#### Circuit Diagram

![Circuit Diagram](image-url)

**Note:** The custom function is equipped for contact input/output. Using the custom function enables the customer to set the signal type for contact input/output or pin assignment numbers. For details, please consult “Communication Specifications” information.
Communications (For details, please consult our “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\(^1\)

<Readout>
Circulating fluid present temperature
Circulating fluid flow
Circulating fluid discharge pressure
Circulating fluid electric resistivity\(^2\)
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.

Item 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 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>Standard</td>
<td>EIA RS485</td>
</tr>
<tr>
<td>Protocol</td>
<td>Modicon Modbus</td>
</tr>
</tbody>
</table>

Communications (For details, please consult our “Communication Specifications” information.)
Alarm

This unit can display 23 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 drain pan 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>05</td>
<td>Reservoir Low Level FLT</td>
<td>Stop</td>
<td>The amount of circulating fluid tank is running low.</td>
</tr>
<tr>
<td>06</td>
<td>Reservoir Low Level WRN</td>
<td>Continue</td>
<td>The amount of circulating fluid tank is running low.</td>
</tr>
<tr>
<td>07</td>
<td>Reservoir High Level WRN</td>
<td>Continue</td>
<td>The amount of circulating fluid in the tank has increased.</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>10</td>
<td>Return High Temp. WRN</td>
<td>Continue</td>
<td>Temperature of returning circulating fluid has exceeded the limit.</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 the customer.</td>
</tr>
<tr>
<td>12</td>
<td>Return Low Flow FLT</td>
<td>Stop</td>
<td>The circulating fluid flow has gone below the limit.</td>
</tr>
<tr>
<td>13</td>
<td>Return Low Flow WRN</td>
<td>Continue</td>
<td>Flow rate of the Thermo-chiller has dropped below the set value.</td>
</tr>
<tr>
<td>15</td>
<td>Pump Breaker Trip FLT</td>
<td>Stop</td>
<td>The protective equipment in the circulating fluid driving line has started.</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. (Only for the automatic circulating fluid recovery function - option Z)</td>
</tr>
<tr>
<td>19</td>
<td>FAN Motor Stop WRN</td>
<td>Stop</td>
<td>Cooling fan inside the compressor has stopped.</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 customer'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 the customer. (Only for DI control kit - option Y)</td>
</tr>
<tr>
<td>25</td>
<td>Pump Inverter Error FLT</td>
<td>Stop</td>
<td>The error occurred in the circulating pump inverter. This alarm is applicable to the HRW series only.</td>
</tr>
<tr>
<td>26</td>
<td>DNET Comm. Error FLT</td>
<td>Stop</td>
<td>The DeviceNet™ communications between this unit and customer's system has been suspended. (Only for DeviceNet™ communication specification - option D)</td>
</tr>
<tr>
<td>27</td>
<td>DNET Comm. Error WRN</td>
<td>Continue</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>29</td>
<td>F.Water Low Temp. WRN</td>
<td>Continue</td>
<td>Temperature of facility water has dropped below the set temperature.</td>
</tr>
<tr>
<td>30</td>
<td>F.Water High Temp. WRN</td>
<td>Continue</td>
<td>Temperature of facility water has exceeded the set temperature.</td>
</tr>
</tbody>
</table>

**Alarm code chart:**

- **01 - 05**: Alarms related to the operating conditions of the unit.
- **06 - 07**: Alarms related to the reservoir.
- **08 - 09**: Alarms related to temperature.
- **10 - 11**: Alarms related to return.
- **12 - 13**: Alarms related to flow.
- **15**: Alarms related to the protective equipment.
- **17**: Alarms related to power.
- **18**: Alarms related to cooling fan.
- **19 - 21**: Alarms related to controllers and memory.
- **22**: Alarms related to communications.
- **23**: Alarms related to low levels.
- **24 - 25**: Alarms related to inverters.
- **26 - 27**: Alarms related to communications.
- **29 - 30**: Alarms related to water temperature.

**Description of keys:**

- **[START/STOP] key**: Starts/ Stops the operation.
- **[RESET] key**: Stops the alarm buzzing. Resets the alarm.
- **[SEL] key**: Switches the display.
- **[ENT] key**: Decides the settings.
- **[▲ ▼] key**: Moves the cursor and changes the setting values.
- **[►] key**: Moves the cursor.
- **[REMOTE] indicator**: Blinks when the unit is in the remote status.
- **[RUN] indicator**: Blinks when the unit is in the operating status.
- **[ALARM] indicator**: Blinks when the unit is alarming.
Series HRW Options

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

C Option symbol
Analogue Communication
HRW - - C
Analogue communication

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

Writing:
- Circulating fluid temperature setting
- Only when the DI control kit (Option "Y") is selected.

Reading:
- Circulating fluid temperature
- Electric resistivity*
- Only when the DI control kit (Option "Y") is selected.

Scaling voltage the circulating fluid temperature can be set arbitrarily by the customer.

For details, please consult our “Communication Specifications” information.

D Option symbol
DeviceNet™ Communication
HRW - - D

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

Writing:
- Run/Stop
- Circulating fluid temperature setting
- Circulating fluid automatic recovery start/stop**
- Only when the circulating fluid automatic recovery function (Option "Z") is selected.

Reading:
- Circulating fluid present temperature
- Electric resistivity**
- Only when the DI control kit (Option "Y") is selected.
- Only when the DI control kit (Option "Y") is selected.
- Status (operating condition) information

For details, please consult our “Communication Specifications” information.

N Option symbol
NPT Fitting
HRW - - N
NPT fitting

Includes an adapter which converts the connection of the circulating fluid pipe or facility water pipe to NPT thread type. The adapter should be installed on the thermo-chiller by the customer.

Y Option symbol
DI Control Kit
HRW - - Y
DI control kit

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

- Install the DI filter outside the thermo-chiller for piping. Secure the space for installing the DI filter in the back side of the thermo-chiller.
- It may go outside of the temperature stability range of ±0.3°C when this option is used in some operating conditions.

- Only when the circulating fluid automatic recovery function (Option "Z") is selected.
- Only when the DI control kit (Option "Y") is selected.

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

Di tubing
(1 piece each attached for IN/OUT)

DI filter
(Optional accessories)
(Refer to page 24.)

DI filter
(Refer to page 24.)

DI tubing
(1 piece each attached for IN/OUT)

Discharge port to DI filter

Note) 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)
Select this option for customers 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 the customer. For details, consult “Product Specifications” information for these options.

<table>
<thead>
<tr>
<th>Applicable models</th>
<th>Common for all models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circulating fluid recoverable volume <strong>Note 1)</strong></td>
<td>L</td>
</tr>
<tr>
<td>Purge gas</td>
<td></td>
</tr>
<tr>
<td>Purge gas supply port</td>
<td></td>
</tr>
<tr>
<td>Purge gas supply pressure</td>
<td>MPa</td>
</tr>
<tr>
<td>Purge gas filtration</td>
<td>m</td>
</tr>
<tr>
<td>Regulator set pressure</td>
<td>MPa</td>
</tr>
<tr>
<td>Recoverable circulating fluid temperature</td>
<td>ºC</td>
</tr>
<tr>
<td>Recovery start/stop</td>
<td></td>
</tr>
<tr>
<td>Timeout error</td>
<td>sec</td>
</tr>
<tr>
<td>Height difference with the customer system side</td>
<td>m</td>
</tr>
</tbody>
</table>

**Note 1)** This is the space volume of the sub tank when the liquid level of the circulating fluid is within the specification. A guideline of the recovery volume is 80% of the circulating fluid recoverable volume.

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

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

**Note 4)** For details, please consult our “Communication Specifications” information.
**Series HRW**

**Optional Accessories**

**Bypass Piping Set**

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

**Anti-quake Bracket**

Bracket for earthquakes

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

---

**Bypass Piping Set**

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

**Part no.** | **Applicable models**
---|---
HRW-BP001 | Common for all models

**Anti-quake Bracket**

Bracket for earthquakes

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

**Part no.** | **Applicable models**
---|---
HRZ-TK002 | Common for all models

*Note* 2 pieces per set (for 1 unit) (HRZ-TK002)
4 Port Manifold

4-branching the circulating fluid enables 4 temperature controls at the maximum with the single unit thermo-chiller. Order the heat insulator for 4 port manifolds (HRW-MA002) separately if necessary.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable models</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRW-MA001</td>
<td>Common for all models</td>
</tr>
<tr>
<td>HRW-MA002</td>
<td></td>
</tr>
</tbody>
</table>

DI Filter

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

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable models</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>

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

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 DI filter from the radiated heat or possible burns. 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 models</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>
Contaminant Filter

A filter mounted in the circulating fluid circuit to eliminate the dust which is contained in the circulating fluid. (Filtration: 20 µm) It is provided with its own heat insulator.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable models</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRW-CF001</td>
<td>Common for all models</td>
</tr>
<tr>
<td>HRW-CF002</td>
<td></td>
</tr>
</tbody>
</table>

Note) The internal element of the contaminant filter (part no.: HRW-CF002) is a replacement part. The period in service depends on the operating conditions.

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 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>Common for all ethylene glycol-type models</td>
</tr>
</tbody>
</table>
1. This catalogue shows the specifications of a single unit.
   1. For details, please consult our “Product Specifications” and thoroughly consider the adaptability between the customer’s system and this unit.
   2. Although the protection circuit as a single unit is installed, the customer is requested to carry out the safety design for the whole system.

2. Transportation/Transfer/Movement
   1. Transportation by 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. Transportation by 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.

   ![Reference](https://www.smc.eu)
Caution

1. Avoid using this product outdoors.
2. Install on a rigid floor which can withstand this product’s weight.
3. Please install a suitable anchor bolt for the anti-quake bracket taking into consideration the customers 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 liquids as the circulating fluid, do not use pipe tape.
Liquid leakage may occur around the pipe tape.
As sealant, we recommend that you use the following sealant: SMC Part No., HRZ-S0003 (Silicon 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. Select the circulating fluid pipings which can exceed the required rated flow.
For the rated flow, refer to the pumping capacity table.
6. For the circulating fluid piping connection, install a drain pan just in case the circulating fluid may leak.
7. Do not return the circulating fluid to the unit by installing a pump in the customer system.

Breaker Operating Characteristics
Common for all models

<table>
<thead>
<tr>
<th>Operating time</th>
<th>Max.</th>
<th>Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 min</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Voltage increase ratio (dV/dt) at the zero cross should exceed 40 V/200 sec., it may result in malfunction.

3. This product is installed with a circuit breaker with the following operating characteristics.
For the customer's equipment (primary 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 customer's equipment could be cut off due to the inrush current of the motor of this product.

Electrical Wiring

Caution

1. Power supply and signal cable should be prepared by the customer.
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 sec., it may result in malfunction.

Voltage

Voltage increase ratio

Time

Breaker Operating Characteristics
Common for all models

<table>
<thead>
<tr>
<th>Operating time</th>
<th>Max.</th>
<th>Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 min</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Current (% for chiller main breaker volume)
**Series HRW**

**Specific Product Precautions 3**

Be sure to read this before handling. Refer to back cover for Safety Instructions, “Handling Precautions for SMC Products” (M-E03-3) and “Operation Manual” for Temperature Control Equipment Precautions. The Operation Manual can be downloaded from the SMC website: http://www.smc.eu

---

### Operation

1. **Caution**

   1. **Confirmation before operation**
      1. The circulating fluid should be within the specified range of “HIGH” and “LOW”.
      2. Be sure to tighten the cap for the circulating fluid port until the click sound is heard.

   2. **Emergency stop method**
      In case of an emergency, press down the EMO switch which is fitted on the front face of this product.

---

### Maintenance

1. **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 is removed for the purpose of inspection or cleaning, mount the panel after works are 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 case of fluorinated fluids:
      - Discharge the circulating liquid and avoid any dirty objects, or water moisture, or foreign objects entering the system.

   2. In case of ethylene glycol aqueous solution:
      - Density must be 60%.

   3. In case of clean water, DI water:
      - Replacement is recommended.

3. **Check the quality of the facility water every 3 months.**

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

---

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**Safety Instructions**

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.

---

**Warning**

1. **The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.**

   Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalogue information, with a view to avoiding due consideration to any possibility of equipment failure when configuring the equipment.

2. **Only personnel with appropriate training should operate machinery and equipment.**

   The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. **Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**

   1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent failing or runaway of the driven objects have been confirmed.

   2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.

   3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. **Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**

   1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.

   2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or weapons of mass destruction (WMD) or any other weapon is strictly prohibited.

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

   4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

---

**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.

---

**Safety Instructions**

Be sure to read “Handling Precautions for SMC Products” (M-E03-3) before using.

---

**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 catalogue for the particular products.**

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

   A vacuum pad is a consumable part, so it is warranted for a year after it is delivered. Also, even within the warranty period, the wear of a product due to the use of this 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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**SMC Corporation (Europe)**

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