

- Circulating fluids type: Fluorinated fluids, Ethylene glycol aqueous solution / Clean water, Pure water
- Temperature setting range: **-20 to 40°C / 20 to 90°C / -20 to 90°C**
- Cooling capacity: **1 kW / 2 kW / 4 kW / 8 kW to Max. 15 kW**
- Temperature stability: **± 0.1°C**
- Operating refrigerant: **R404A (HFC) / R134a (HFC)**

Thermo-chiller

(A device for circulating a fluid with a constant temperature)



● International standards:

SEMATECH
S2-93, S8-95

SEMI Standard
S2-0703, S8-0701, F47-0200



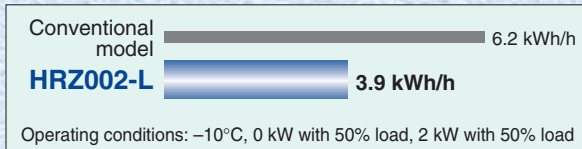
Series **HRZ**

SMC
CAT.ES40-48A

Energy saving

Power consumption: Decreased up to the max 40% (SMC comparison)

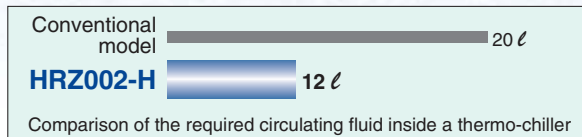
In addition to the optimum control of the expansion valve by the original controller, by recycling the heat emitted from the cooling water, power consumption is dramatically reduced.



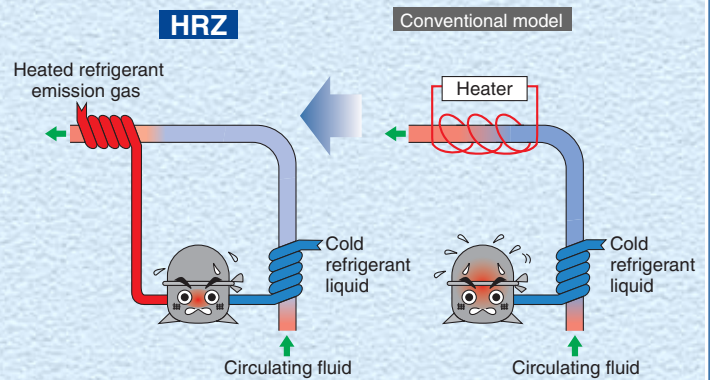
- Reduced running cost
- Contribution to the environmental preservation

Circulating fluid flow: Decreased up to the max 40% (SMC comparison)

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



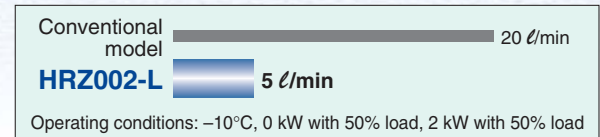
- Reduced initial cost
- Contribution to the environmental preservation



* This illustration is for an image only. For piping systems, refer to "Construction and Principles" on features page 5.

Cooling water flow: Decreased up to the max 75% (SMC comparison)

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



- Reduced facilities investment
- Space saved cooling water facilities
- Reduced running cost

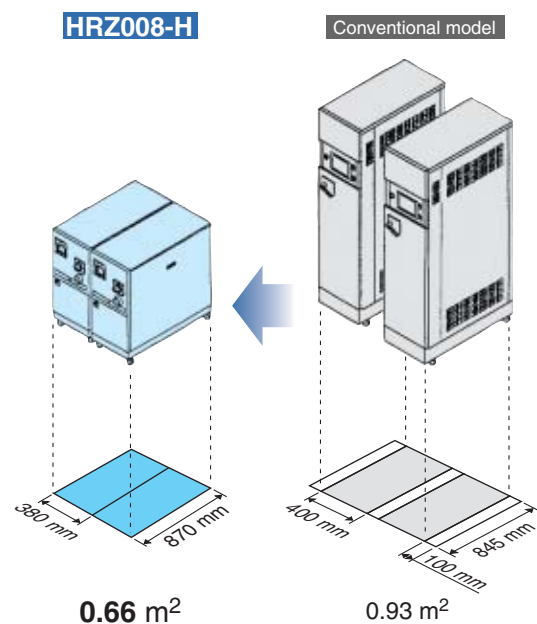
Space saving

Installation area : Decreased up to the max 29% (SMC comparison)

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

Conventional model: Body space: W400 mm x D845 mm
Ventilation space: 100 mm

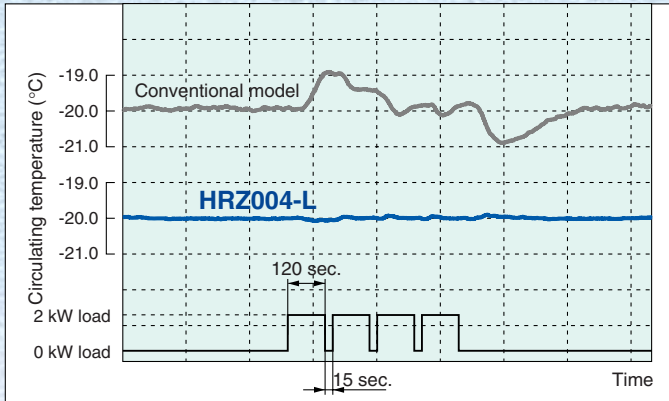
HRZ008-H: Body space: W380 mm x D870 mm
Ventilation space: 0



High performance

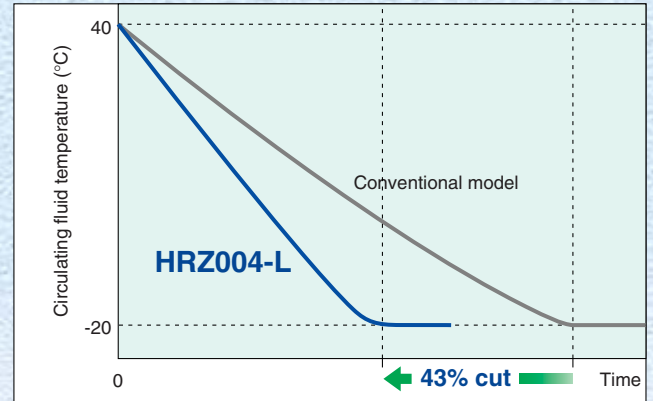
Temperature stability: $\pm 0.1^{\circ}\text{C}$ (when a load is stable)

Enhanced temperature control technology achieved $\pm 0.1^{\circ}\text{C}$ temperature stabilities when a load is stable.



Cooling time: max 43% cut (SMC comparison)

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



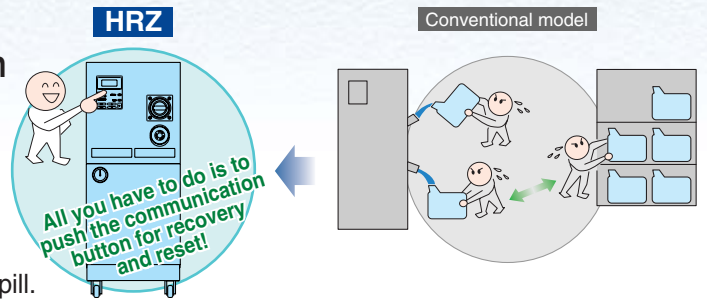
Ease of maintenance

Circulating fluid automatic recovery function

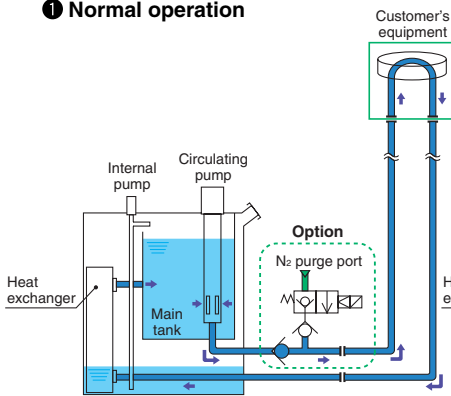
(Refer to "Options" on page 16.)

Circulating fluid inside a thermo-chiller tank can be recovered automatically. (Recovery volume: 15 ℓ to 17 ℓ)

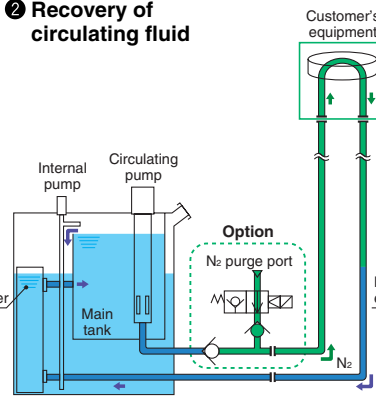
- Reduced maintenance time
- Faster operation
- Reduced circulating liquid loss by evaporation or spill.



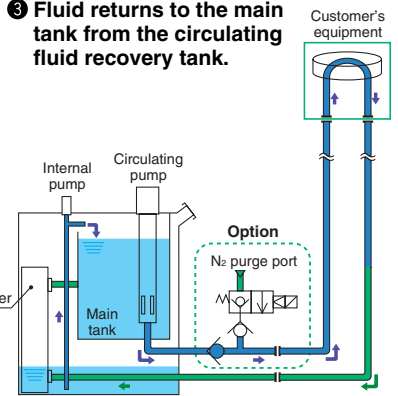
1 Normal operation



2 Recovery of circulating fluid



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



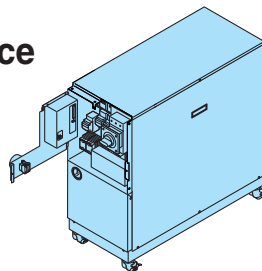
Circulating fluid electrical resistance ratio control function

(Refer to "Options" on page 15.)

(DI control kit)

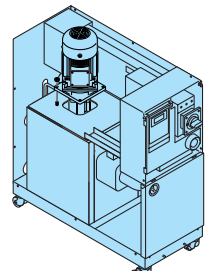
Ease of maintenance

- 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 12.)



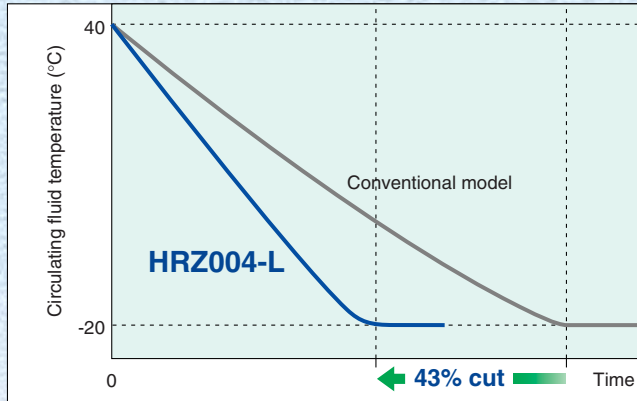
°C

±0.1°C



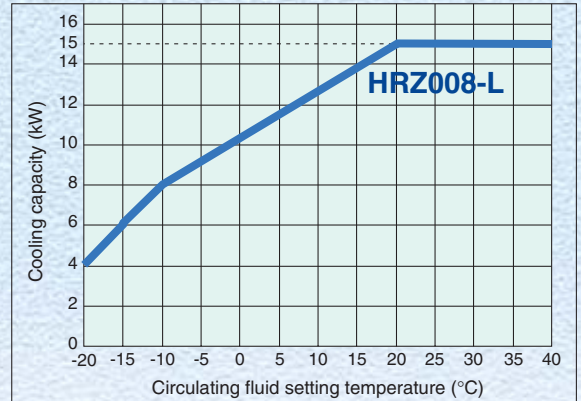
● **Cooling time: max 43% cut**
(SMC comparison)

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



● **Cooling time: max 15 kW**

Up to 15 kW cooling capacity achieved.



tion

17 d)

or spill.

very of
ating fluid

Circulating pump

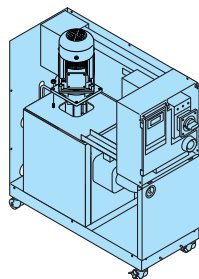
Main tank

istance ratio

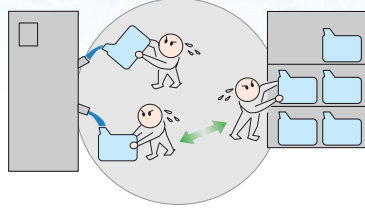
e 15.)

- 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 12.)



Conventional model



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

Customer's equipment

Customer's equipment

Circulating pump

Internal pump

Circulating pump

Option

N₂ purge port

M

N₂

Heat exchanger

Main tank

Option

N₂ purge port

M

N₂

Heat exchanger

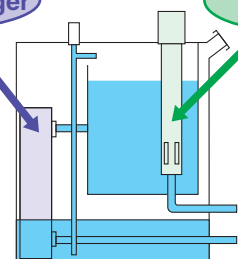
Leakless

● **All in tank**

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

Heat exchanger

Pump



Communication

- Contact input/output signal
- Serial RS-485 communication
- Analog communication (Refer to "Options" on page 15.)
- DeviceNet™ communication (Refer to "Options" on page 15.)

DeviceNet™

● **Wetted parts adopt the materials compatible for various circulating fluids.**

(Stainless steel, EPDM, etc.)

- Fluorinated fluid: GALDEN® HT135, HT200
Flourinert™ FC-3283, FC-40
- Ethylene glycol aqueous solution 60%
- Pure water, Clean water

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

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• Circulating Fluid Representative Physical Property Values	Front matter 4

Fluorinated Fluid Type

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Ethylene Glycol Type

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Clean Water, Pure Water Type

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Common Specifications

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Accessories (Sold Separately)

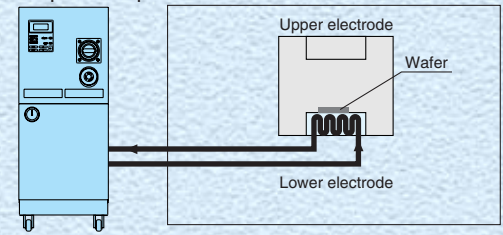
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Semiconductor

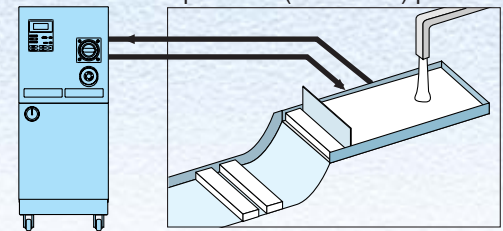
Example: Temperature control of a chamber electrode



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

Food

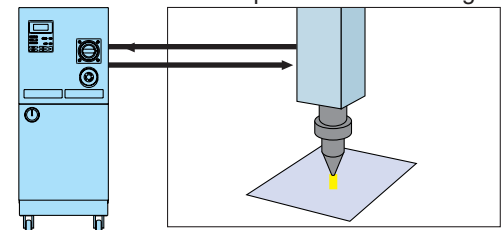
Example: Tofu (Bean curd) production



- Bottle-cleaning machine
 - Tofu (Bean curd) production equipment
 - Noodle-making machine, etc.
- Water temperature control for forming a tofu by mixing the boiled soybean milk and bittern

Machine tool

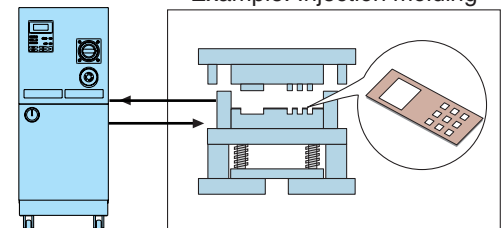
Example: Laser machining



- Wire cutting
 - Grinder
 - Spot welding, etc.
 - Plasma welding
 - Laser machining
- Temperature-controlling the laser generating tube enables the laser wavelength to be optimised, improving the accuracy of the machined cross sectional area.

Molding

Example: Injection molding

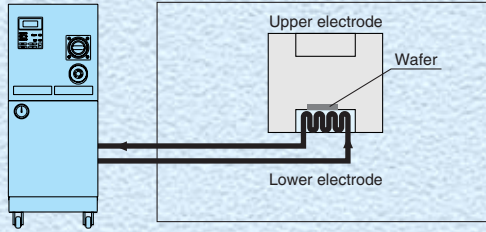


- Plastic molding
 - Rubber molding
 - Wire cable coating machine
 - Injection molding, etc.
- Temperature-controlling the mold results in improved product quality.

Application Examples

Semiconductor

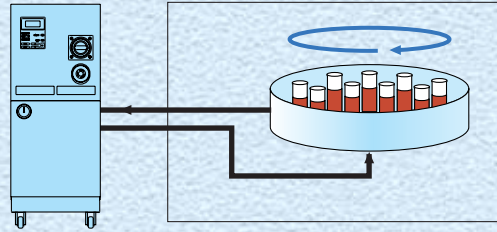
Example: Temperature control of a chamber electrode



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

Medical

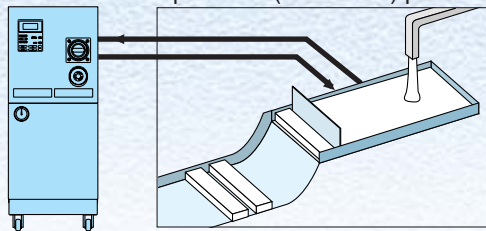
Example: Blood preservation



- X-ray instrument
- MRI
- Blood preservation equipment

Food

Example: Tofu (Bean curd) production

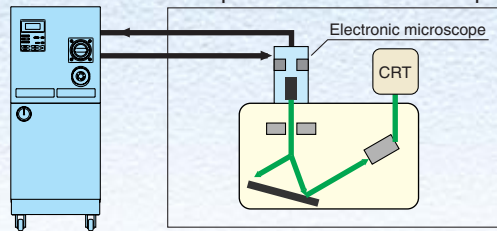


- Bottle-cleaning machine
- Tofu (Bean curd) production equipment
- Noodle-making machine, etc.

Water temperature control for forming a tofu by mixing the boiled soybean milk and bittern

Diagnosis

Example: Electronic microscope

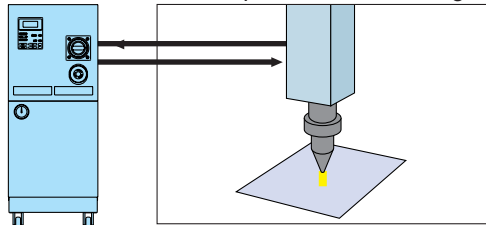


- Electron microscope
- X-ray diagnosis instrument
- Gas chromatography
- Sugar level diagnosis, etc.

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

Machine tool

Example: Laser machining

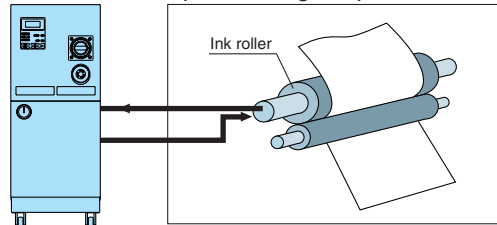


- Wire cutting
- Grinder
- Spot welding, etc.
- Plasma welding
- Laser machining

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

Printing

Example: Printing temperature control

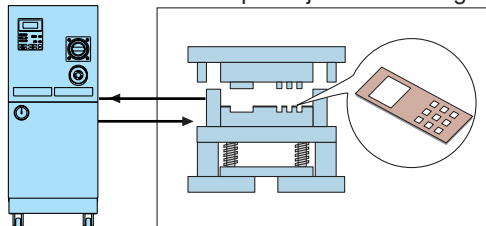


- Offset printing machine
- Automatic developing machine
- UV equipment, etc.

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

Molding

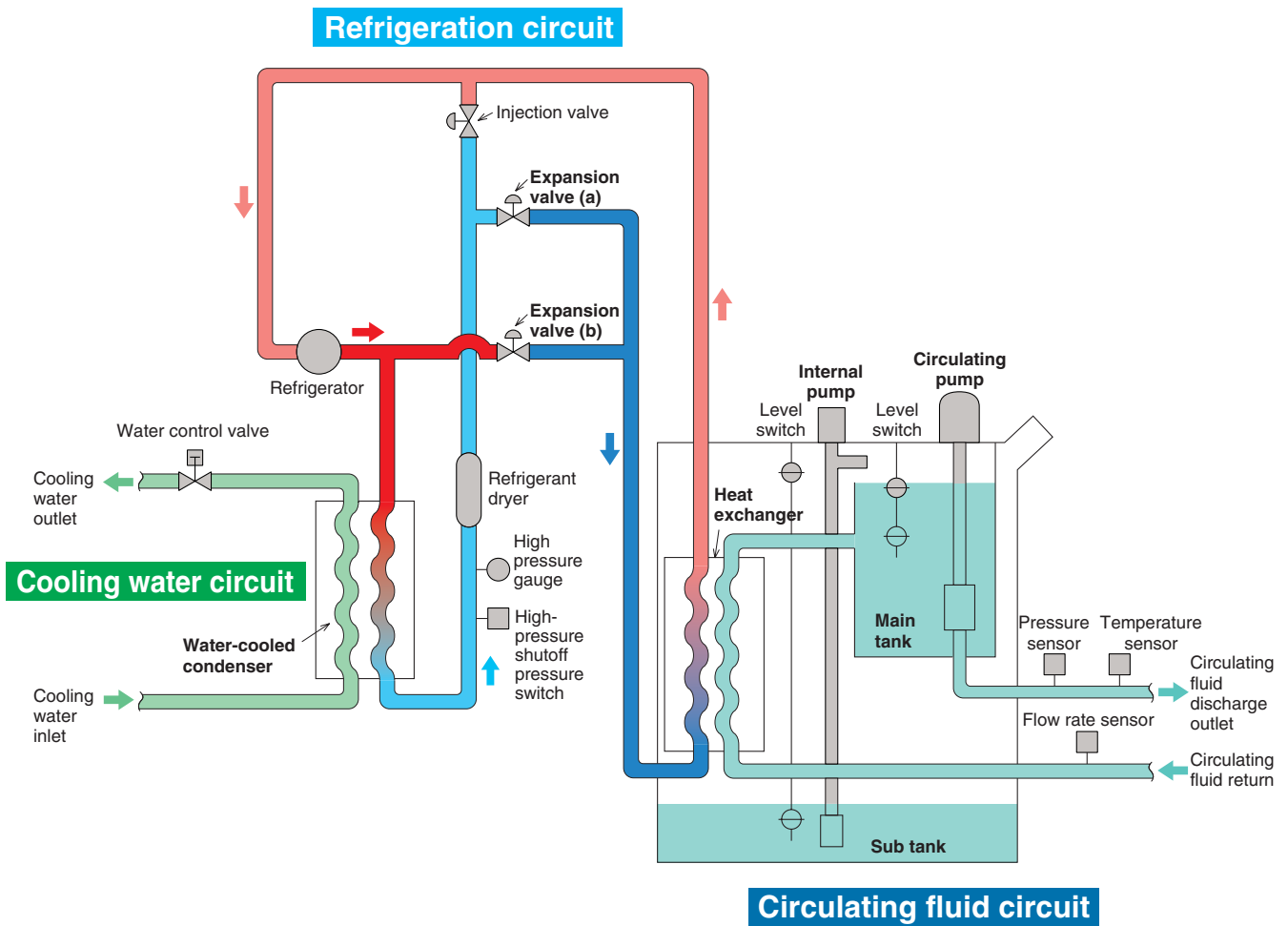
Example: Injection molding



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

Temperature-controlling the mold results in improved product quality.

Construction and Principles



Circulating fluid circuit

With the **circulating pump**, circulating fluid will be discharged to the customer's equipment side. After the circulating fluid will heat or cool the customer'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 customer's equipment side.

The **internal pump** is used to transfer a circulating fluid from the **sub tank** to the **main tank**. (Refer to the circulating fluid auto-recovery function (Features 2).)

Refrigeration circuit

When the circulating fluid temperature is rising higher than the set temperature, open the **expansion valve (a)** to introduce Freon 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 Freon 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.

Series HRZ 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" (clean water, pure water spec.) can set 10°C to 40°C .)

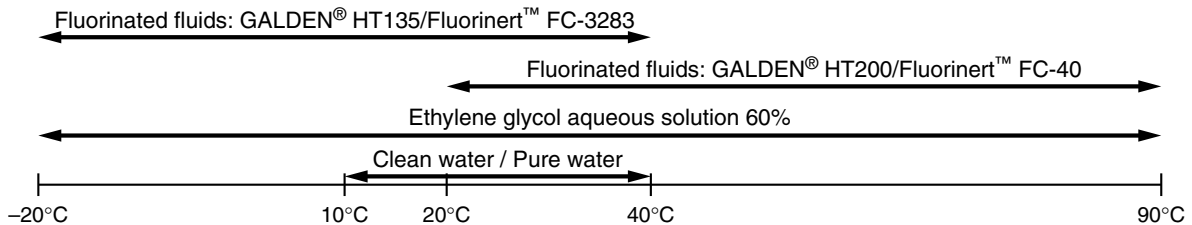
H: 20°C to 90°C

W: -20°C to 90°C (Select "W" only when the temperature ranges of "L" or "H" are not applicable.)

Example) Requirement from customers: 50°C (\rightarrow Temperature range 20°C to 90°C , "H" type will be appropriate.)

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

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



Example) Requirement from customers: Fluorinated fluids

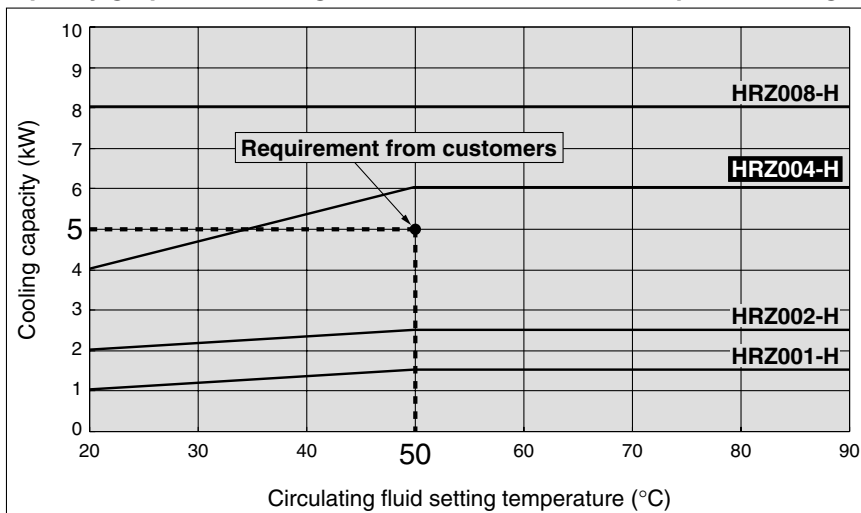
Based on the results 1. and 2., Cooling capacity relating "Fluorinated fluid" and "Temperature range 20°C to 90°C " is shown on page 2.

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

* Calculate the cooling capacity, by referring to the following pages.

Example) Requirement from customers: 5 kW \rightarrow Plot the point of intersection between the operating temperature (50°C) and the cooling capacity (5 kW) in the cooling capacity graph.

[Cooling capacity graph] Circulating fluid: Fluorinated fluids, temperature range 20 to 90°C



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

Calculating the Required Cooling Capacity

Example 1: In cases where the amount of heat generated in a customer's equipment is known.

Heat generation source Q: 3.5 kW

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

Example 2: In cases where the amount of heat generated in a customer's equipment is unknown.

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

Heat generation amount Q : Unknown
 Circulating fluid temperature difference $\Delta T (= T2 - T1)$: 6.0 K
 Circulating fluid outlet temperature T1 : 293.15 K (20°C)
 Circulating fluid return temperature T2 : 299.15 K (26°C)
 Circulating fluid flow rate L : 20 ℓ/min
 Circulating fluid : Fluorinated fluid
 Density γ : $1.80 \times 10^3 \text{ g/ℓ}$
 Specific heat °C: 0.96 J/gK (at 20°C)

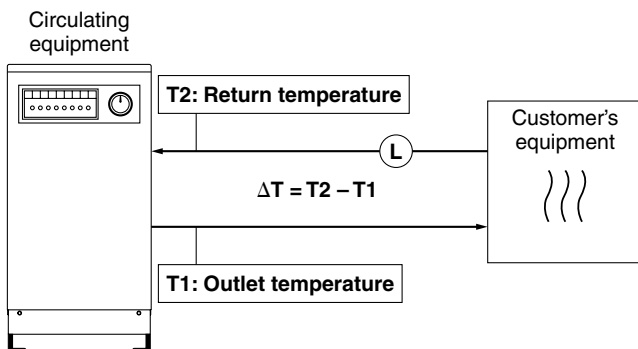
* Refer to the information shown on front matter 4 highlighting the representative physical property value by circulating fluid.

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

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

$$= 3,456 \text{ W} = 3.5 \text{ kW}$$

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



Example of the conventional measurement units (Reference)

Unknown
 6.0°C
 20°C
 26°C
 1.2 m³/h
 Fluorinated fluid
 Density γ : $1.80 \times 10^3 \text{ kg/m}^3$
 Specific heat °C: 0.23 kcal/kg°C (at 20°C)

* Refer to the information shown on front matter 4 highlighting the representative physical property value by 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%,
 $3.5 \times 1.2 = 4.2 \text{ kW}$

Model Selection

Calculating 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 ΔT: 20 K (313 K – 293 K → 20°C)
 Circulating fluid : Fluorinated fluid
 Density γ: 1.80 x 10³ g/ℓ
 Specific heat °C: 0.96 J/gK (at 20°C)

* Refer to the information shown on front matter 4 highlighting the representative physical property value by circulating fluid.

$$Q = \frac{\Delta T \times V \times \gamma \times C}{h \times 60}$$

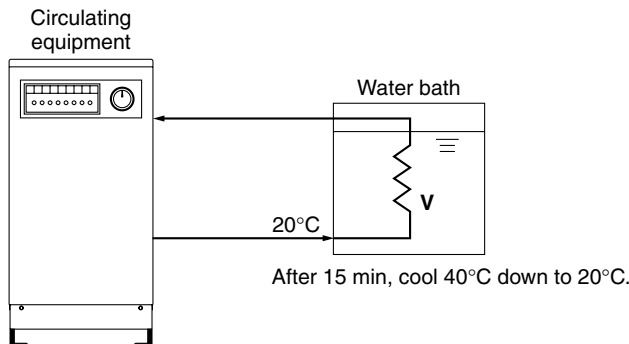
$$= \frac{20 \times 60 \times 1.8 \times 10^3 \times 0.96}{15 \times 60}$$

$$= 2,304 \text{ W} = 2.3 \text{ kW}$$

Cooling capacity = Considering a safety factor of 20%,

$$2.3 \times 1.2 = \boxed{2.8 \text{ kW (In the case of the circulating fluid temperature is 20°C)}}$$

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



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

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 customer's equipment. Confirm beforehand if the required heating capacity is provided, based on the heating capacity graph for the respective model.

2. Pump capacity

<Circulating fluid flow>

Pump capacity varies dependant 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 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 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. Confirm beforehand if the circulating fluid pipings or circulating fluid circuit of the customer's equipment are fully durable against this pressure.

Example of the conventional measurement units (Reference)

0.06 m³
 0.25 h
 20°C
 Fluorinated fluid
 Density γ: 1.80 x 10³ kg/m³
 Specific heat °C: 0.23 kcal/kg°C (at 20°C)

* Refer to the information shown on front matter 4 highlighting the representative physical property value by circulating fluid.

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

$$= \frac{20 \times 0.06 \times 1.8 \times 10^3 \times 0.23}{0.25 \times 860}$$

$$= 2.3 \text{ kW}$$

Cooling capacity = Considering a safety factor of 20%,

$$2.3 \times 1.2 = \boxed{2.8 \text{ kW (In the case of the circulating fluid temperature is 20°C)}}$$

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

* Shown below are the representative values.
For more details, please contact the manufacturers of the circulating fluid.

Circulating Fluid Representative Physical Property Values

Fluorinated Fluids

Physical property value Temperature	Density γ	Specific heat °C	
	[g/l] [kg/m ³]	[J/gK]	[kcal/kg·°C]
-10°C	1.87 x 10 ³	0.87	0.21
20°C	1.80 x 10 ³	0.96	0.23
50°C	1.74 x 10 ³	1.05	0.25
80°C	1.67 x 10 ³	1.14	0.27

Ethylene Glycol Aqueous Solution

Physical property value Temperature	Density γ	Specific heat °C	
	[g/l] [kg/m ³]	[J/gK]	[kcal/kg·°C]
-10°C	1.10 x 10 ³	3.02	0.72
20°C	1.08 x 10 ³	3.15	0.75
50°C	1.06 x 10 ³	3.27	0.78
80°C	1.04 x 10 ³	3.40	0.81

Water

Density γ : 1,000 [g/l] [kg/m³]

Specific heat °C: 4.2 [J/gK], 1.0 [kcal/kg·°C]

Thermo-chiller **Fluorinated Fluid Type**

Series **HRZ**

How to Order

Fluorinated Fluid Type

HRZ 001-L

Cooling capacity

Symbol	Cooling capacity
001	1 kW
002	2 kW
004	4 kW
008	8 kW

Option (Refer to page 15 and 16.)

Nil	None
C	Analog communication
D	DeviceNet™ communication
Z	Circulating fluid automatic recovery

Temperature setting range

Symbol	Temperature setting range	1 kW	2 kW	4 kW	8 kW
L	-20 to 40°C	●	●	●	●
H	20 to 90°C	●	●	●	●
W	-20 to 90°C	—	●	—	●

Specifications (For details, please consult our "Product Specifications" information.)

Model	HRZ001-L	HRZ002-L	HRZ004-L	HRZ008-L	HRZ001-H	HRZ002-H	HRZ004-H	HRZ008-H	HRZ002-W	HRZ008-W
Cooling method	Water-cooled refrigerator type (Operating refrigerant: R404A (HFC))									
Cooling capacity ^{Note 1)} kW	1.0 (at -10°C)	2.0 (at -10°C)	4.0 (at -10°C)	8.0 (at -10°C)	1.0 (at 20°C)	2.0 (at 20°C)	4.0 (at 20°C)	8.0 (at 20°C)	2.0 (at 20°C)	8.0 (at 20°C)
Heating capacity ^{Note 1)} kW	2.8 (at -10°C)	3.2 (at -10°C)	3.6 (at -10°C)	5.9 (at -10°C)	2.3 (at 20°C)	2.6 (at 20°C)	2.8 (at 20°C)	3.0 (at 20°C)	2.3 (at 20°C)	3.3 (at 20°C)
Temperature setting range °C	-20 to 40				20 to 90				-20 to 90	
Temperature stability ^{Note 2)} °C	±0.1 (In cases when the circulating fluid discharge outlet and the return inlet are directly connected)									
Circulating fluid ^{Note 3)}	Fluorinert™ FC-3283/GALDEN® HT135				Fluorinert™ FC-40/GALDEN® HT200				<ul style="list-style-type: none"> -20 to 40°C: Fluorinert™ FC-3283/GALDEN® HT135 20 to 90°C: Fluorinert™ FC-40/GALDEN® HT200 	
Pump capacity ^{Note 4)} (50/60 Hz) MPa	0.45/0.65 (at 20 ℓ/min)			0.65/0.95 (at 30 ℓ/min)	0.40/0.60 (at 20 ℓ/min)			0.45/0.65 (at 20 ℓ/min)		
Circulating fluid rated flow ^{Note 5)} ℓ/min	20			30	20					
Main tank capacity ^{Note 6)} ℓ	Approx. 15			Approx. 22	Approx. 12			Approx. 15		
Sub tank capacity ^{Note 7)} ℓ	Approx. 16			Approx. 17	Approx. 15			Approx. 16		
Circulating fluid port size	Rc 3/4									
Circulating fluid wetted parts material	Stainless steel, EPDM, Copper brazing (heat exchanger), PPS, Silicon, Fluorine resin									
Cooling water temperature range °C	10 to 25									
Cooling water pressure range MPa	0.3 to 0.7									
Cooling water required flow ^{Note 8)} (50/60Hz) ℓ/min	5/5	6/6	15/22	18/23	3/4	5/6	9/10	13/14	6/7	13/14
Port size for cooling water	Rc 1/2									
Cooling water wetted parts material	Stainless steel, EPDM, Copper brazing (heat exchanger), Silicon, Brass									
Power supply	3-phase 200 VAC 50 Hz, 3-phase 200 to 208 VAC 60 Hz Allowable voltage fluctuation ±10%									
Breaker capacity A	30			60	20			30		
Rated current A	20		25	46	14			23		
Weight ^{Note 9)} kg	170		175	275	145			170		
Alarm	Refer to page 12.									
Communication function	Contact input/output (D-sub conector, 25-pin) and serial RS-485 (D-sub connector, 9-pin) (Refer to page 10 to 11.)									

Note 1) (1) Cooling water temperature: 25°C, (2) Circulating fluid flow rate: Values at circulating fluid rated flow rate. Values common for 50/60 Hz.

Note 2) It may be detached depending on the operating condition.

Note 3) 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 us.

Note 4) Circulating fluid temperature: The capacity of the outlet of a thermo-chiller at 20°C.

Note 5) Required flow for cooling capacity or maintaining the temperature stability. When used below the rated flow, use the individually sold, "By-pass piping set" (Refer to page 13).

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)

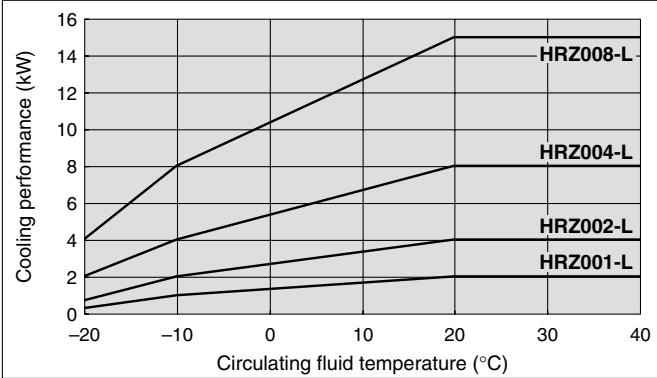
Note 7) Preliminary space volume without main tank capacity. Available for collecting the circulating fluid inside an external piping or for preliminary injection.

Note 8) Cooling water temperature: 25°C, Required flow when a load is applied as shown in the cooling capacity.

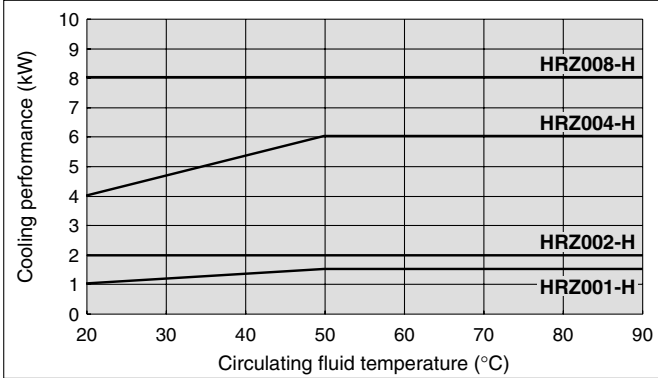
Note 9) Weight in the dry state, without circulating fluids.

Cooling Capacity

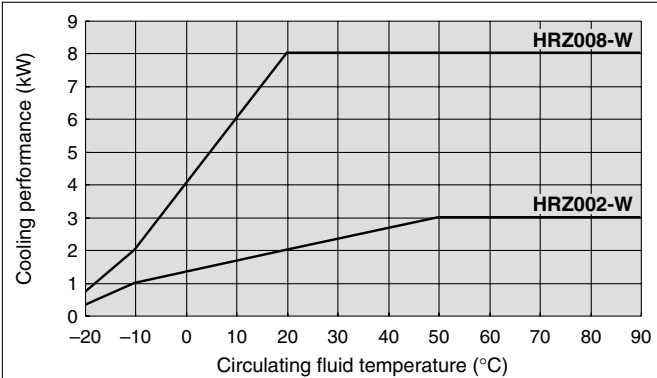
HRZ001-L/002-L/004-L/008-L



HRZ001-H/002-H/004-H/008-H

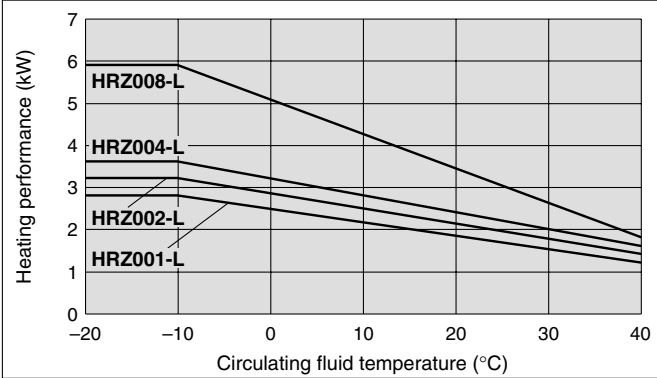


HRZ002-W/008-W

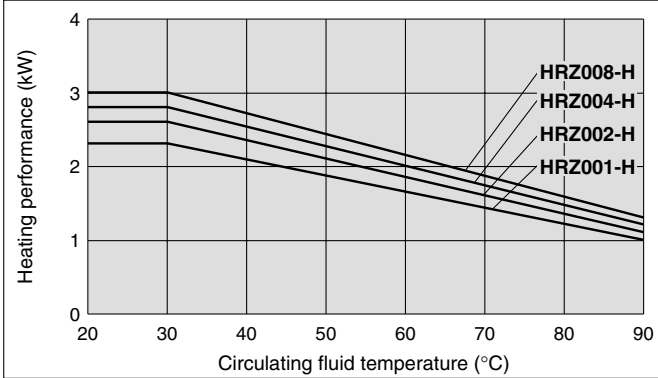


Heating Capacity

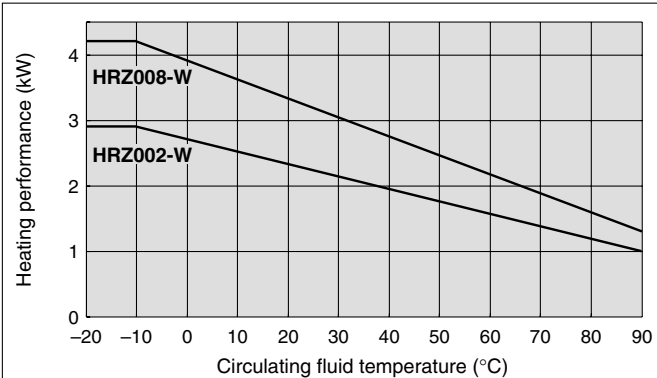
HRZ001-L/002-L/004-L/008-L



HRZ001-H/002-H/004-H/008-H



HRZ002-W/008-W



Fluorinated Fluid Type

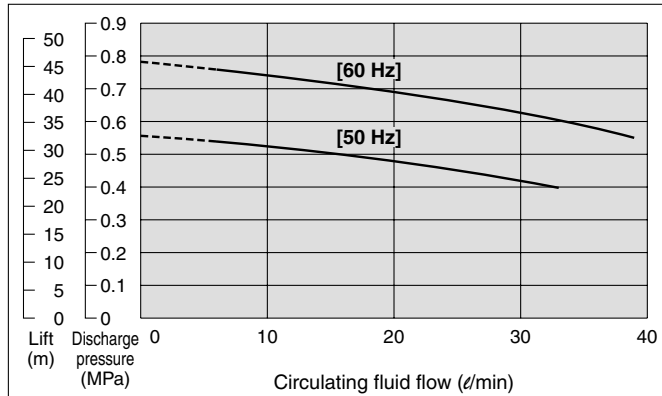
Ethylene Glycol Type

Clean / Pure Water Type

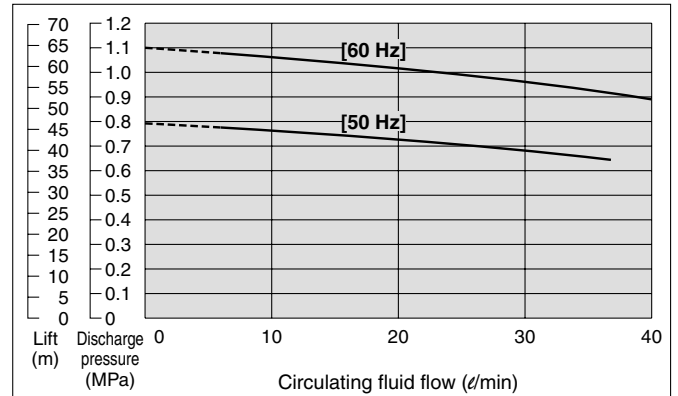
Series HRZ

Pump Capacity

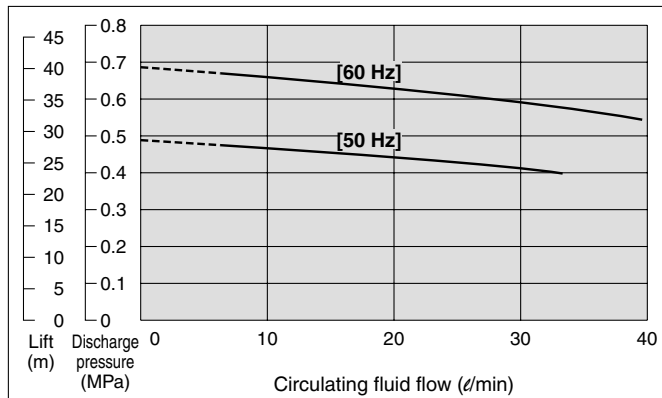
HRZ001-L/002-L/004-L



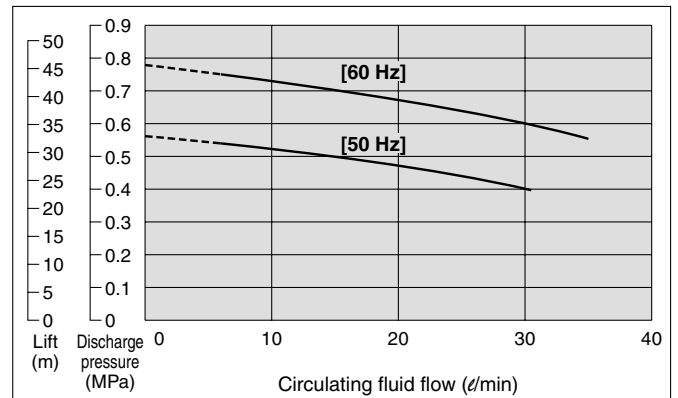
HRZ008-L



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)

Thermo-chiller Ethylene Glycol Type

Series *HRZ*

How to Order

Ethylene Glycol Type **HRZ** 001 — L **1** —

Cooling capacity

Symbol	Cooling capacity
001	1 kW
002	2 kW
004	4 kW
008	8 kW

Temperature setting range

Symbol	Temperature setting range	1 kW	2 kW	4 kW	8 kW
L	-20 to 40°C	●	●	●	●
H	20 to 90°C	●	●	●	●
W	-20 to 90°C	—	●	—	●

Option (Refer to page 15 and 16.)

Nil	None
C	Analog communication
D	DeviceNet™ communication
Y	DI control kit
Z	Circulating fluid automatic recovery

Ethylene glycol type

Specifications (For details, please consult our "Product Specifications" information.)

Model	HRZ001-L1	HRZ002-L1	HRZ004-L1	HRZ008-L1	HRZ001-H1	HRZ002-H1	HRZ004-H1	HRZ008-H1	HRZ002-W1	HRZ008-W1
Cooling method	Water-cooled refrigerator type (Operating refrigerant: R404A (HFC))									
Cooling capacity ^{Note 1)} kW	1.0 (at -10°C)	2.0 (at -10°C)	4.0 (at -10°C)	8.0 (at -10°C)	1.0 (at 20°C)	2.0 (at 20°C)	4.0 (at 20°C)	8.0 (at 20°C)	2.0 (at 20°C)	8.0 (at 20°C)
Heating capacity ^{Note 1)} kW	2.5 (at -10°C)	2.9 (at -10°C)	3.4 (at -10°C)	6.1 (at -10°C)	1.8 (at 20°C)	2.1 (at 20°C)	2.5 (at 20°C)	3.0 (at 20°C)	2.2 (at 20°C)	3.3 (at 20°C)
Temperature setting range °C	-20 to 40				20 to 90				-20 to 90	
Temperature stability ^{Note 2)} °C	±0.1 (In cases when the circulating fluid discharge outlet and the return inlet are directly connected)									
Circulating fluid ^{Note 3)}	Ethylene glycol aqueous solution 60%									
Pump capacity ^{Note 4)} (50/60 Hz) MPa	0.25/0.40 (at 20 ℓ/min)			0.25/0.35 (at 20 ℓ/min)			0.25/0.40 (at 20 ℓ/min)			
Circulating fluid rated flow ^{Note 5)} ℓ/min	20		30		20					
Main tank capacity ^{Note 6)} ℓ	Approx. 15		Approx. 22		Approx. 12			Approx. 15		
Sub tank capacity ^{Note 7)} ℓ	Approx. 16		Approx. 17		Approx. 15			Approx. 16		
Circulating fluid port size	Rc 3/4									
Circulating fluid wetted parts material	Stainless steel, EPDM, Copper brazing (heat exchanger), PPS, Silicon, Fluorine resin									
Cooling water temperature range °C	10 to 25									
Cooling water pressure range MPa	0.3 to 0.7									
Cooling water required flow ^{Note 8)} (50/60Hz) ℓ/min	5/5	6/6	15/22	18/23	3/4	5/6	9/10	13/14	5/7	13/14
Port size for cooling water	Rc 1/2									
Cooling water wetted parts material	Stainless steel, EPDM, Copper brazing (heat exchanger), Silicon, Brass									
Power supply	3-phase 200 VAC 50 Hz, 3-phase 200 to 208 VAC 60 Hz Allowable voltage fluctuation ±10%									
Breaker capacity A	30		60		20			30		
Rated current A	19		26		14			23		
Weight ^{Note 9)} kg	170		175		145			170		
Alarm	Refer to page 12.									
Communication function	Contact input/output (D-sub conector, 25-pin) and serial RS-485 (D-sub connector, 9-pin) (Refer to page 10 to 11.)									

Note 1) (1) Cooling water temperature: 25°C, (2) Circulating fluid flow rate: Values at circulating fluid rated flow rate. Values common for 50/60 Hz.

Note 2) It may be detached depending on the operating condition.

Note 3) Dilute pure ethylene glycol with clean water. Additives such as antiseptics cannot be used.

Note 4) Circulating fluid temperature: The capacity of the outlet of a thermo-chiller at 20°C.

Note 5) Required flow for cooling capacity or maintaining the temperature stability. When used below the rated flow, use the individually sold, "By-pass piping set" (Refer to page 13).

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

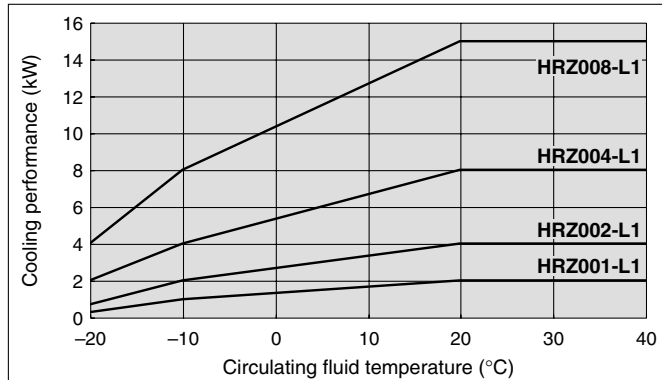
Note 8) Cooling water temperature: 25°C, Required flow when a load is applied as shown in the cooling capacity.

Note 9) Weight in the dry state, without circulating fluids.

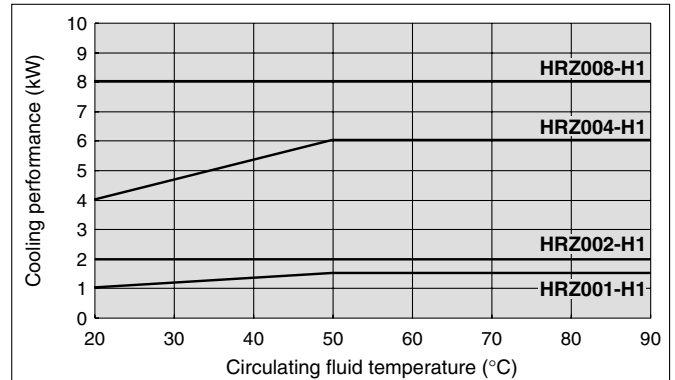
Series HRZ

Cooling Capacity

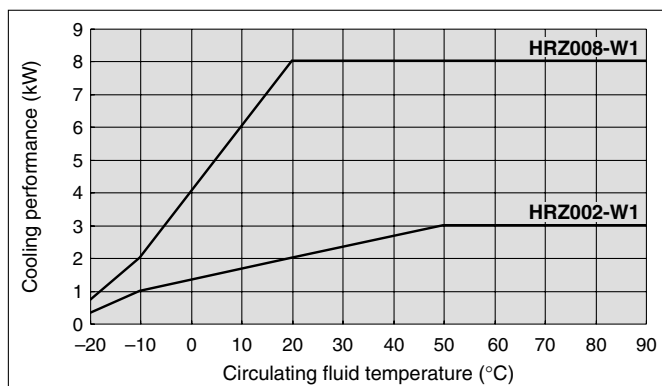
HRZ001-L1/002-L1/004-L1/008-L1



HRZ001-H1/002-H1/004-H1/008-H1

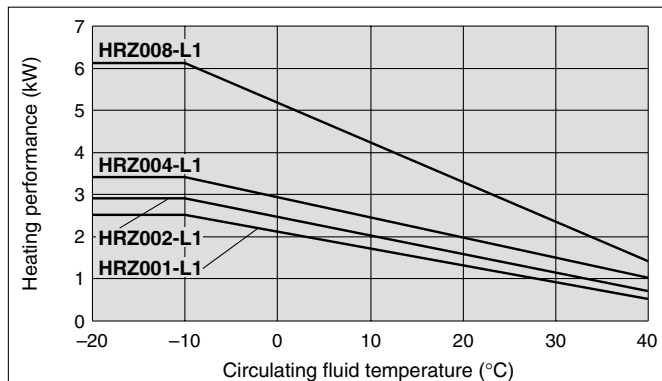


HRZ002-W1/008-W1

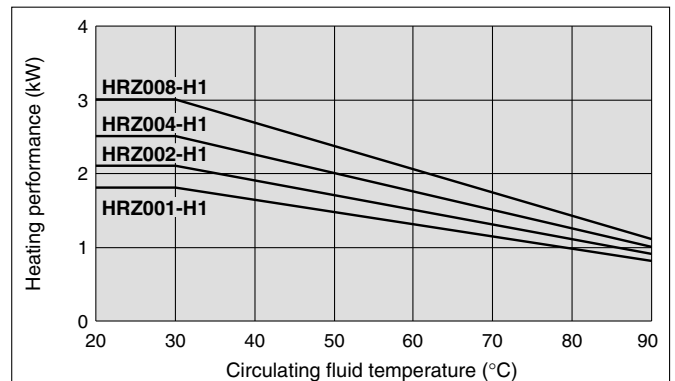


Heating Capacity

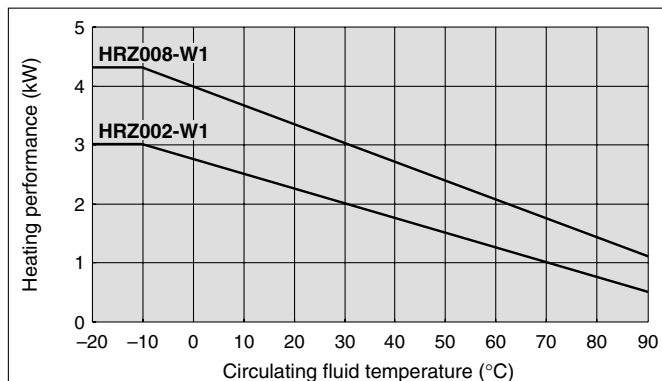
HRZ001-L1/002-L1/004-L1/008-L1



HRZ001-H1/002-H1/004-H1/008-H1

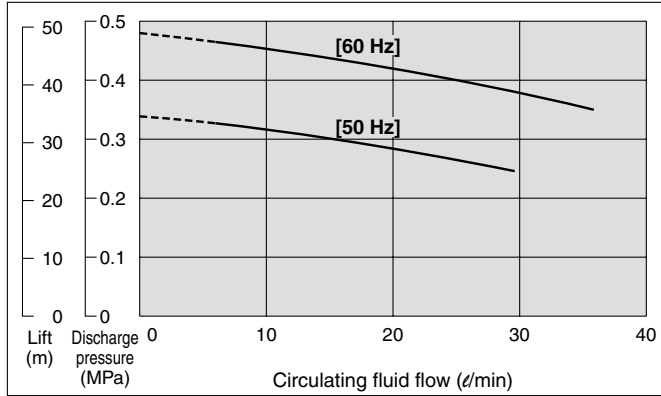


HRZ002-W1/008-W1

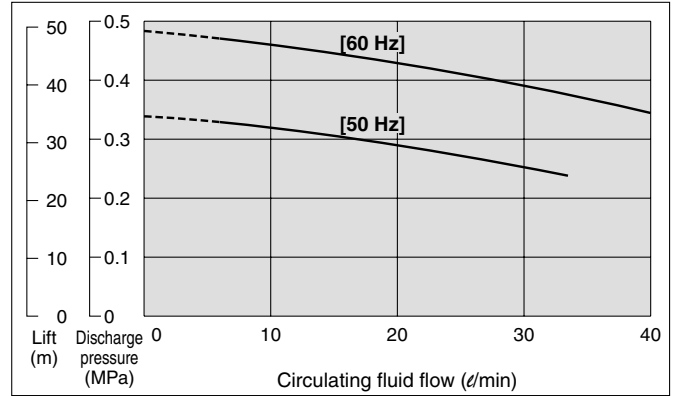


Pump Capacity

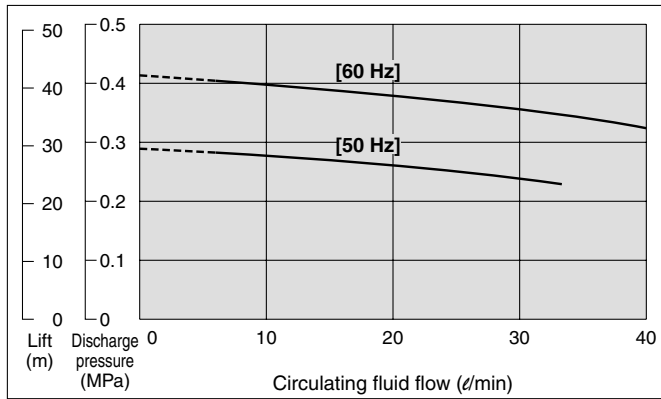
**HRZ001-L1/002-L1/004-L1
HRZ004-H1/008-H1
HRZ002-W1/008-W1**



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)

Fluorinated Fluid Type

Ethylene Glycol Type

Clean / Pure Water Type

Thermo-chiller Clean Water, Pure Water Type

Series *HRZ*

How to Order

Clean / Pure Water Type

HRZ 001 — L 2 —

Cooling capacity

Symbol	Cooling capacity
001	1 kW
002	2 kW
004	4 kW
008	8 kW

Option (Refer to page 15 and 16.)

Nil	None
C	Analog communication
D	DeviceNet™ communication
Y	DI control kit
Z	Circulating fluid automatic recovery

Temperature setting range

Symbol	Temperature setting range	1 kW	2 kW	4 kW	8 kW
L	10 to 40°C	●	●	●	●

Clean water, Pure water type

Specifications (For details, please consult our "Product Specifications" information.)

Model	HRZ001-L2	HRZ002-L2	HRZ004-L2	HRZ008-L2
Cooling method	Water-cooled refrigerator type (Operating refrigerant: R134a (HFC))			
Cooling capacity ^{Note 1)} kW	1.0 (at 20°C)	2.0 (at 20°C)	4.0 (at 20°C)	8.0 (at 20°C)
Heating capacity ^{Note 1)} kW	0.90 (at 20°C)	0.98 (at 20°C)	1.15 (at 20°C)	1.25 (at 20°C)
Temperature setting range °C	10 to 40			
Temperature stability ^{Note 2)} °C	±0.1 (In cases when the circulating fluid discharge outlet and the return inlet are directly connected)			
Circulating fluid ^{Note 3)}	Clean water, Pure water			
Pump capacity ^{Note 4)} (50/60 Hz) MPa	0.25/0.38 (at 20 ℓ/min)			
Circulating fluid rated flow ^{Note 5)} ℓ/min	20			
Main tank capacity ^{Note 6)} ℓ	Approx. 15			
Sub tank capacity ^{Note 7)} ℓ	Approx. 16			
Circulating fluid port size	Rc 3/4			
Circulating fluid wetted parts material	Stainless steel, EPDM, Copper brazing (heat exchanger), PPS, Silicon, Fluorine resin			
Cooling water temperature range °C	10 to 25			
Cooling water pressure range MPa	0.3 to 0.7			
Cooling water required flow ^{Note 8)} (50/60Hz) ℓ/min	5/5	6/6	15/22	18/23
Port size for cooling water	Rc 1/2			
Cooling water wetted parts material	Stainless steel, EPDM, Copper brazing (heat exchanger), Silicon, Brass			
Power supply	3-phase 200 VAC 50 Hz, 3-phase 200 to 208 VAC 60 Hz Allowable voltage fluctuation ±10%			
Breaker capacity A	30			
Rated current A	19			
Weight ^{Note 9)} kg	170			
Alarm	Refer to page 12.			
Communication function	Contact input/output (D-sub conector, 25-pin) and serial RS-485 (D-sub connector, 9-pin) (Refer to page 10 to 11.)			

Note 1) (1) Cooling water temperature: 25°C, (2) Circulating fluid flow rate: Values at circulating fluid rated flow rate. Values common for 50/60 Hz.

Note 2) It may be detached depending on the operating condition.

Note 3) Use the equipment meeting the water quality standards defined by the Japan Refrigeration and Air Conditioning Industry Association. (JRA GL-02-1994 / Cooling water source - Circulating formula - Supply water) When using pure water, the lower limit for the electric conductivity should be 0.5 μS/cm. (In case of the electric resistance ratio, the upper limit should be 2.0 MΩ·cm.)

Note 4) Circulating fluid temperature: The capacity of the outlet of a thermo-chiller at 20°C.

Note 5) Required flow for cooling capacity or maintaining the temperature stability. When used below the rated flow, use the individually sold, "By-pass piping set" (Refer to page 13).

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)

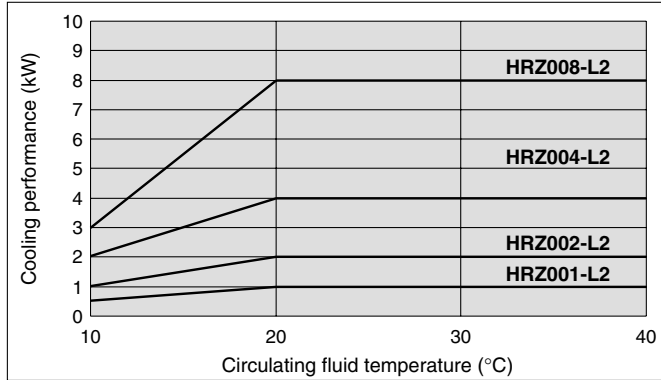
Note 7) Preliminary space volume without main tank capacity. Available for collecting the circulating fluid inside an external piping or for preliminary injection.

Note 8) Cooling water temperature: 25°C, Required flow when a load is applied as shown in the cooling capacity.

Note 9) Weight in the dry state, without circulating fluids.

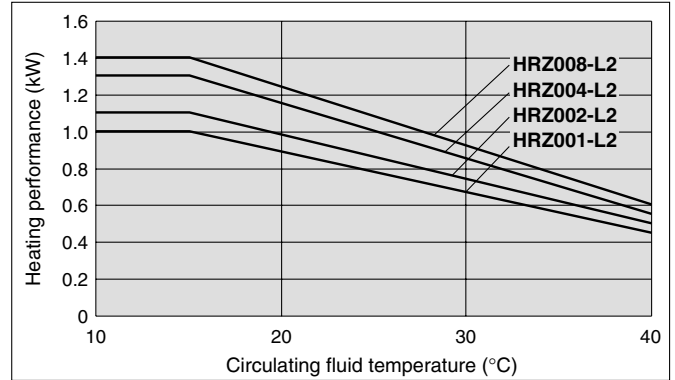
Cooling Capacity

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



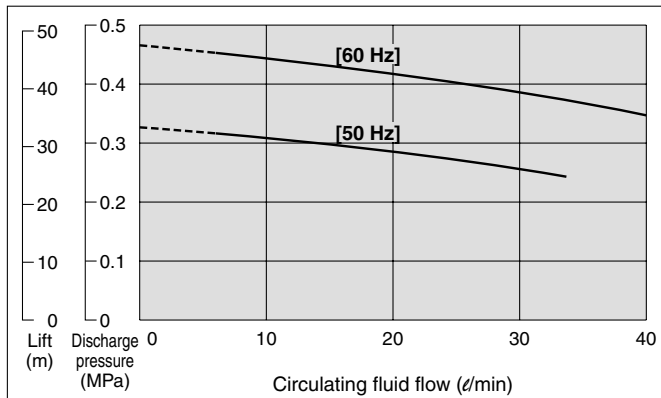
Heating Capacity

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



Pump Capacity

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)

Fluorinated Fluid Type

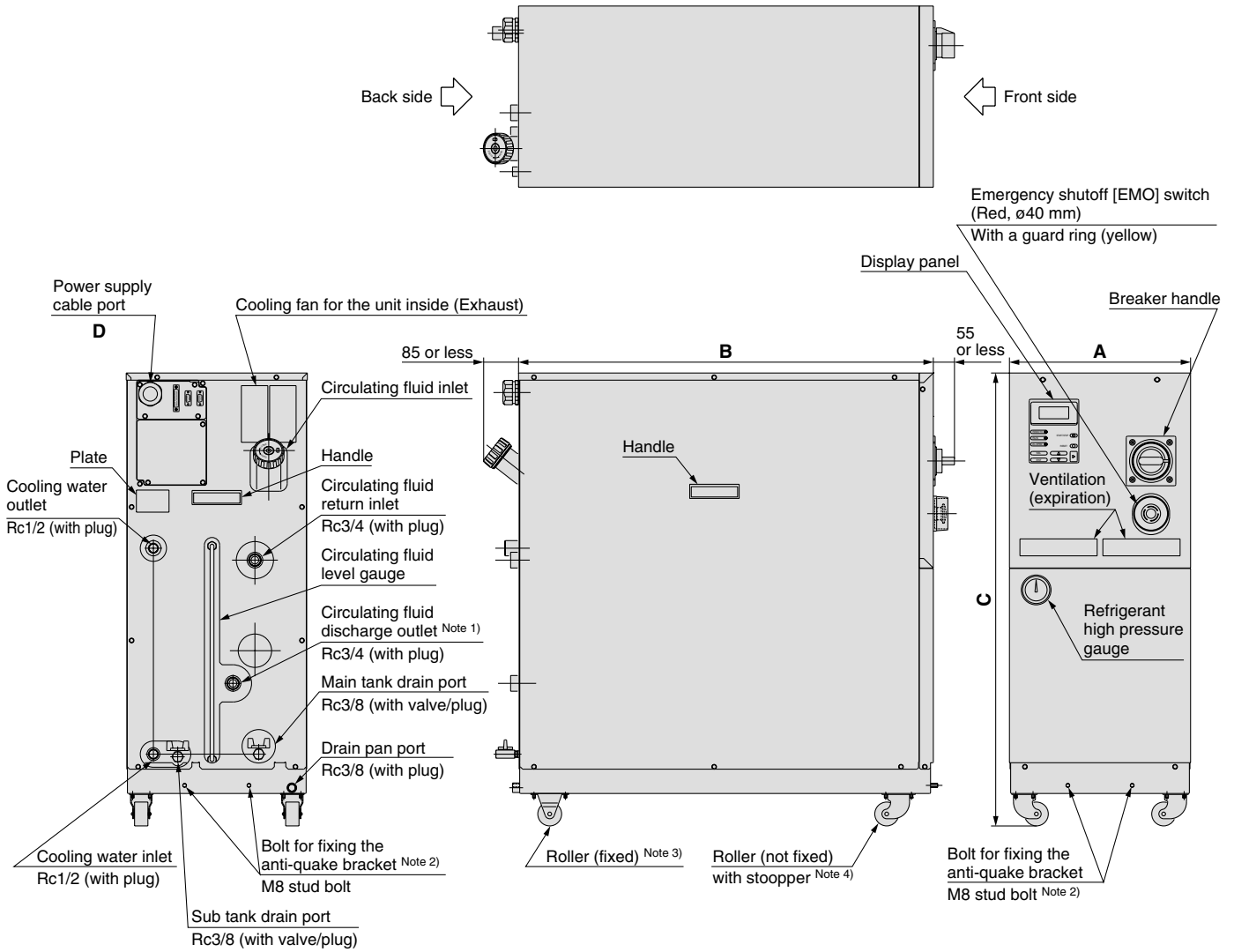
Ethylene Glycol Type

Clean / Pure Water Type

Series HRZ

Common Specifications

Dimensions



- Note 1) Equipped on the left from the circulating fluid level gauge (HRZ008-L, L1)
 Note 2) Not equipped (HRZ008-L, L1)
 Note 3) Not fixed roller (HRZ008-L, L1)
 Note 4) Adjuster foots are equipped at the corners instead of stopper. (HRZ008-L, L1)

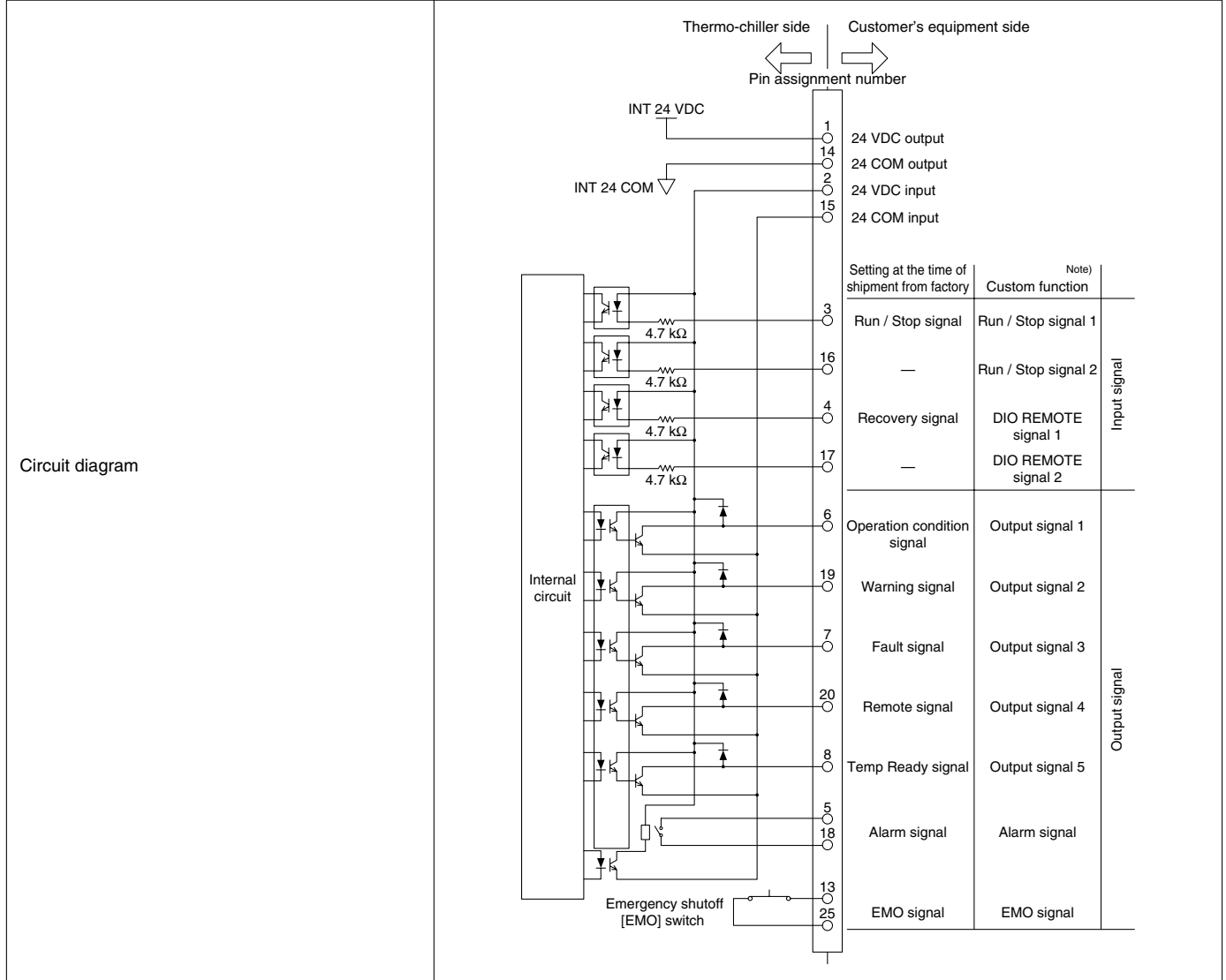
(mm)

Model			A	B	C	D
Fluorinated fluid type	Ethylene glycol type	Clean/Pure water type				
HRZ001-H HRZ002-H	HRZ001-H1 HRZ002-H1	—	380	870	860	$\phi 18.5-20.5$
HRZ001-L HRZ002-L, W HRZ004-L, H HRZ008-H, W	HRZ001-L1 HRZ002-L1, W1 HRZ004-L1, H1 HRZ008-H1, W1	HRZ001-L2 HRZ002-L2 HRZ004-L2 HRZ008-L2	380	870	950	$\phi 18.5-20.5$
HRZ008-L	HRZ008-L1	—	415	1080	1075	$\phi 35.0-38.0$

Communication Function (For details, please consult our "Communication Specifications" information.)

Contact Input/Output

Item		Specifications
Connector no.		P1 (Refer to the next page for connector position)
Connector type (on this product side)		D-sub 25P type, Female connector
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)	Rated load voltage	48 VAC or less / 24 VDC or less
	Maximum load current	AC/DC 500 mA (resistance load)
Contact output signal (EMO signal)	Rated load voltage	48 VAC or less / 24 VDC or less
	Maximum load current	AC/DC 800 mA (resistance load / inductive load)



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.

Series HRZ

Communication Function (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

<Readout>

Circulating fluid present temperature

Circulating fluid flow

Circulating fluid discharge pressure

Circulating fluid electric resistance ratio *2)

Alarm occurrence information

Status (operating condition) information

*1 Only when the circulating fluid auto-recovery function (Option "Z") is selected.

*2 Only when the DI control kit (Option "Y") is selected.

Item	Specifications
Connector no.	P2
Connector type (on this product side)	D-sub 9P type, Female connector
Standard	EIA RS485
Protocol	Modicon Modbus
Circuit diagram	

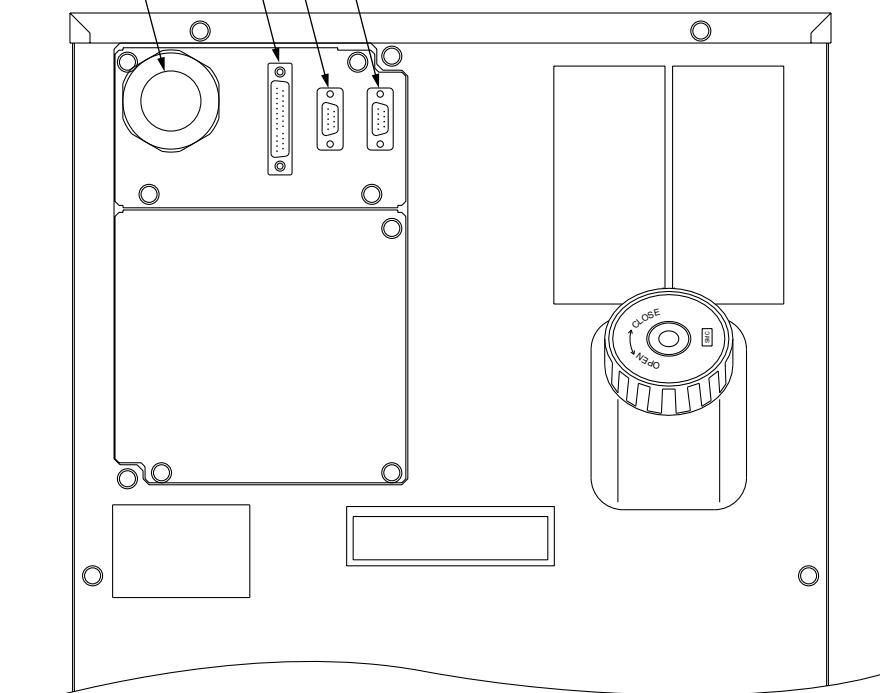
Connector position

P3: Not used for the maintenance purpose port
D-sub9 (Male receptacle)

P2: Serial RS-485
D-sub9 (Female receptacle)

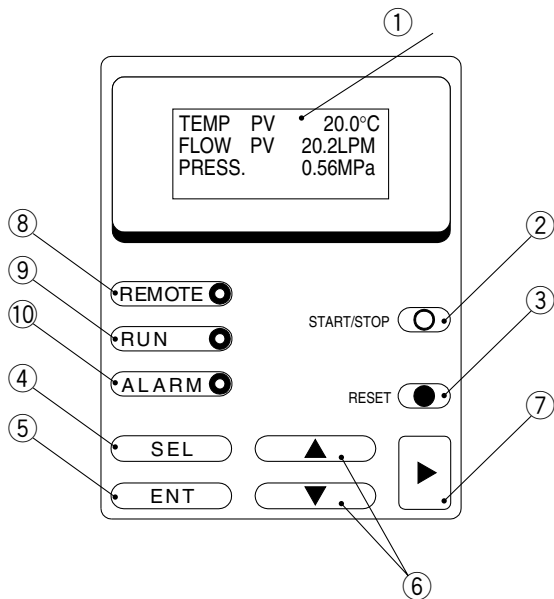
P1: Contact input/output
D-sub25 (Female receptacle)

Power supply cable port



Back side

Operation Panel Display



No.	Description	Function
①	LCD screen	Operating condition of this unit / Circulating fluid discharge temperature / Circulating fluid flow / Circulating fluid discharge pressure / Setting value / Alarm message, etc. are displayed.
②	(START/STOP) key	Starts / Stops the operation.
③	(RESET) key	Stops the alarm buzzing. / Resets the alarm.
④	(SEL) key	Switches the display.
⑤	(ENT) key	Decides the settings.
⑥	(▲) (▼) key	Moves the cursor and changes the setting values.
⑦	(▶) key	Moves the cursor.
⑧	(REMOTE) indicator light	Blinks when the unit is in the remote status.
⑨	(RUN) indicator light	Blinks when the unit is in the operating status.
⑩	(ALARM) indicator light	Blinks when the unit is alarming.

Alarm Function

This unit can display 22 kinds of alarm message as a standard. Also, it can read out the serial RS-485 communication.

Alarm no.	Alarm message	Operation condition	Main reason
01	Water Leak Detect FLT	Stop	Liquid deposits in the base of this unit.
02	Incorrect Phase Error FLT	Stop	The power supply to this unit is incorrect.
03	RFGT High Press FLT	Stop	Pressure in the refrigeration circuit has exceeded the limitation.
04	CPRSR Overheat FLT	Stop	Temperature inside the refrigerator has increased.
05	Reservoir Low Level FLT	Stop	The amount of circulating fluid is running low.
06	Reservoir Low Level WRN	Continue	The amount of circulating fluid is running low.
07	Reservoir High Level WRN	Continue	Filling the circulating fluid too much.
08	Temp. Fuse Cutout FLT	Stop	Temperature of the circulating fluid tank is raised.
09	Reservoir High Temp. FLT	Stop	Temperature of the circulating fluid has exceeded the limitation.
11	Reservoir High Temp. WRN	Continue	Temperature of the circulating fluid has exceeded the limitation set by customer.
12	Return Low Flow FLT	Stop	The circulating fluid flow has gone below 6 l/min.
13	Return Low Flow WRN	Continue	The circulating fluid flow has gone below the limitation set by customer.
14	Heater Breaker Trip FLT	Stop	Protection device for the electric circuit of the heater is activated.
15	Pump Breaker Trip FLT	Stop	Protection device for the electric circuit of the circulating pump is activated.
16	CPRSR Breaker Trip FLT	Stop	Protection device for the electric circuit of the refrigerator is activated.
17	Interlock Fuse Cutout FLT	Stop	Overcurrent is flown to the control circuit.
18	—	—	—
19	FAN Motor Stop WRN	Continue	Cooling fan inside the refrigerator has stopped.
20	Internal Pump Time Out WRN	Continue	The internal pump continuously run for more than a certain period of times.
21	Controller Error FLT	Stop	The error occurred in the control systems.
22	Memory Data Error FLT	Stop	The data stored in the controller of this unit went wrong.
23	Communication Error WRN	Continue	The serial communications between this unit and customer's system has been suspended.

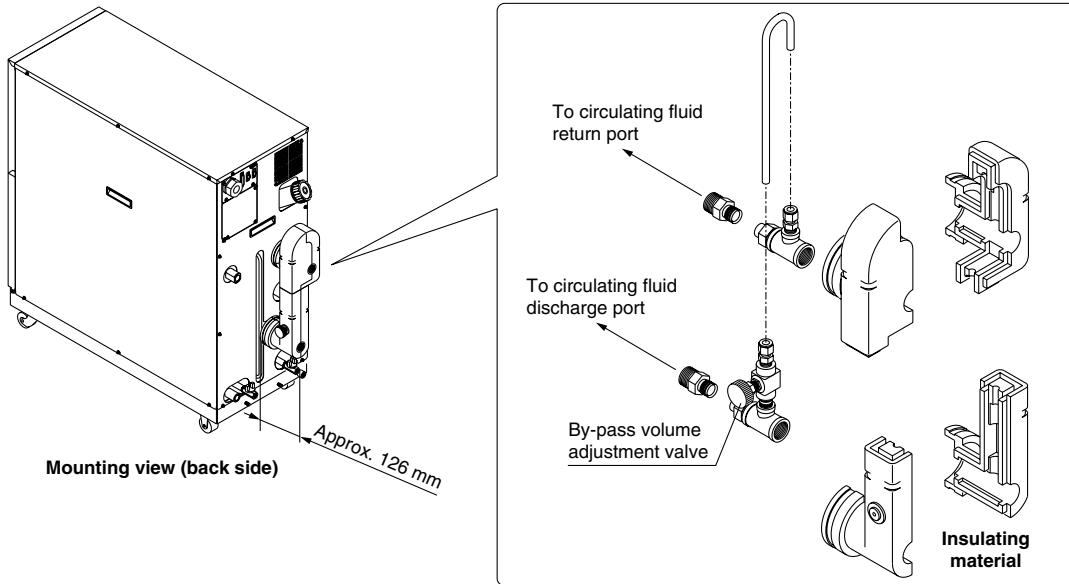
Accessories (Sold Separately)

By-pass 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 by-pass piping set.

Part no.	Applicable models
HRZ-BP001	HRZ001-H□/HRZ002-H□
HRZ-BP002	HRZ001-L□/HRZ002-L□/HRZ004-L□ HRZ004-H□/HRZ008-H□ HRZ002-W□/HRZ008-W□
HRZ-BP008	HRZ008-L□



Anti-quake Bracket

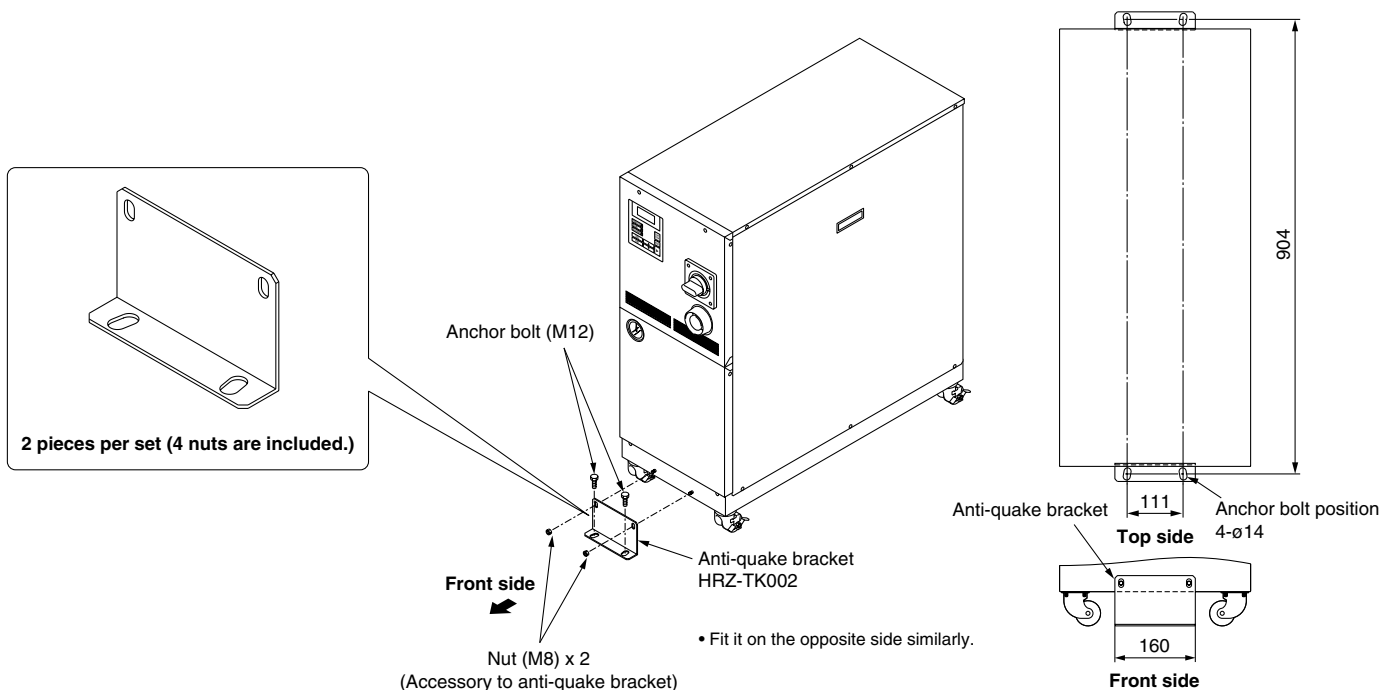
Bracket for the earthquakes

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

Part no.	Applicable models
HRZ-TK002	HRZ001-L□/HRZ002-L□/HRZ004-L□ HRZ001-H□/HRZ002-H□ HRZ004-H□/HRZ008-H□ HRZ002-W□/HRZ008-W□

Note 1) 2 pieces per set (for 1 unit) (HRZ-TK-002)

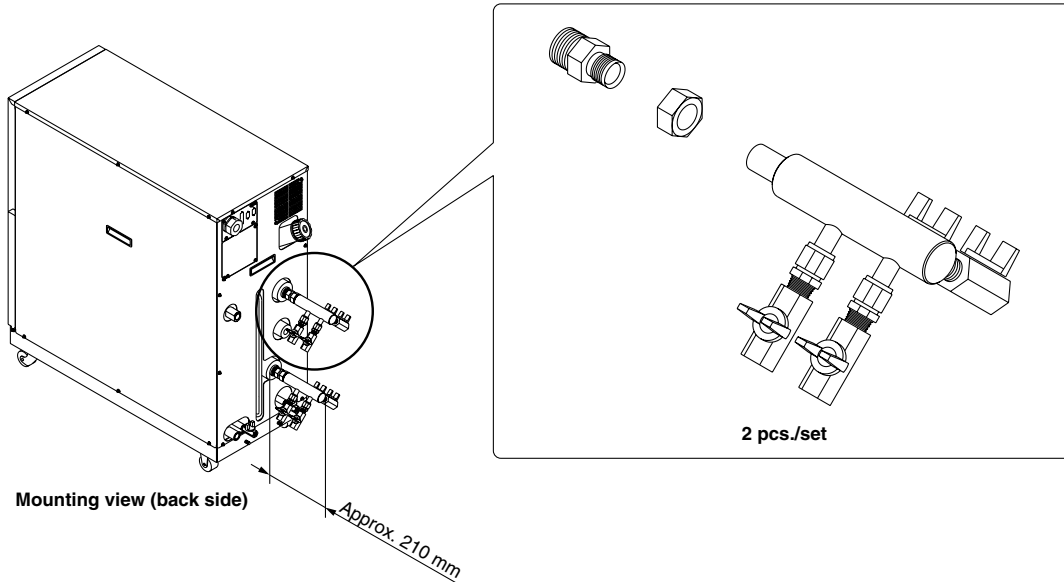
Note 2) Anti-quake bracket is attached as a standard. (HRZ008-L□)



4-port Manifold

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

Part no.	Applicable model
HRZ-MA001	Common for all models

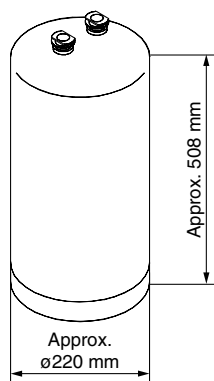


DI Filter

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

Part no.	Applicable model
HRZ-DF001	Common for all models which can select the DI control kit. (Option "Y")

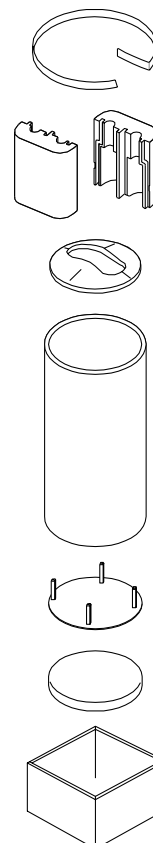
Note) The DI filters are consumable. Depending on the status (electric resistance ratio set value, circulating fluid temperature, piping volume, etc.), product life cycles will vary accordingly.



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 radiated heat from the DI filter or possible burns. We also recommend that you use this to prevent heat absorption from the DI filter and to avoid forming condensation.

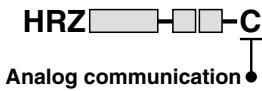
Part no.	Applicable model
HRZ-DF002	Common for all models which can select the DI control kit. (Option "Y")



Series HRZ 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 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

<Readout>

Circulating fluid present temperature

Electric resistance ratio*

* Only when the DI control kit (Option "Y") is selected.

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

For details, please consult our "Communication Specifications" information.

D Option symbol 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*1

<Readout>

Circulating fluid present temperature

Circulating fluid flow

Circulating fluid discharge pressure

Electric resistance ratio*2

Alarm occurrence information

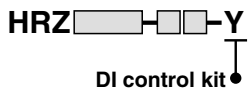
Status (operating condition) information

*1 Only when the circulating fluid automatic recovery function (Option "Z") is selected.

*2 Only when the DI control kit (Option "Y") is selected.

For details, please consult our "Communication Specifications" information.

Y Option symbol DI Control Kit



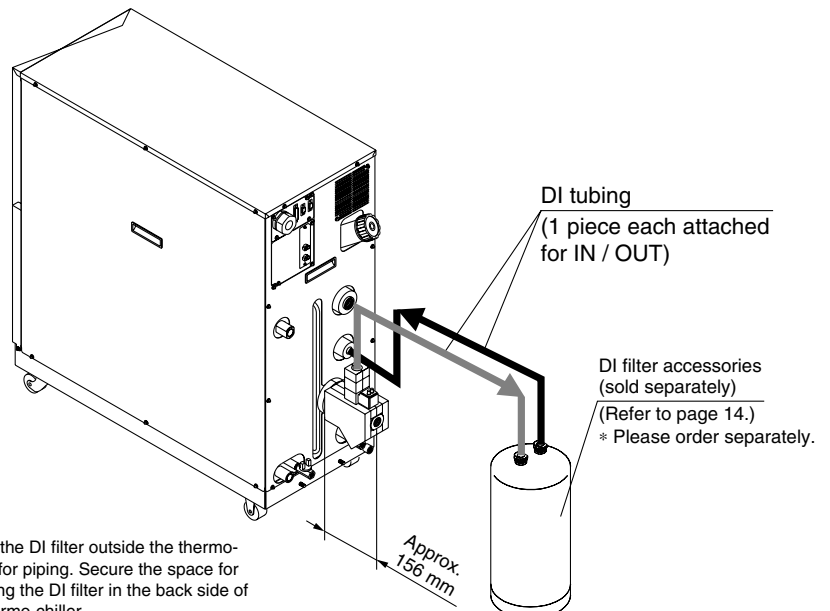
Select this option if you want to maintain the electric resistance ratio (DI level) of the circulating fluid at a certain level. However, some components have to be fitted by customer. For details, refer to specification table for this option.

Please note that this is not applicable to the fluorinated liquid type.

Applicable models		HRZ00□-L1-Y HRZ00□-H1-Y HRZ00□-W1-Y	HRZ00□-L2-Y
Allowable circulating fluid	—	Ethylene glycol aqueous solution 60%	Pure water
DI level display range	MΩ·cm	0 to 20	
DI level set range	MΩ·cm	0 to 2.0 (Note)	
DI level reduction alarm set range	MΩ·cm	0 to 2.0	

Note) DI filter is needed to control the DI level. (SMC Part No.: HRZ-DF001)

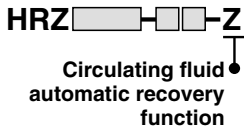
Please purchase additionally because the DI filter is not included in this option. Also, if necessary, additionally purchase the insulating material for the DI filter. (SMC Part No.: HRZ-DF002)



* Install the DI filter outside the thermo-chiller for piping. Secure the space for installing the DI filter in the back side of the thermo-chiller.

Z Option symbol

Circulating Fluid Automatic Recovery Function



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.

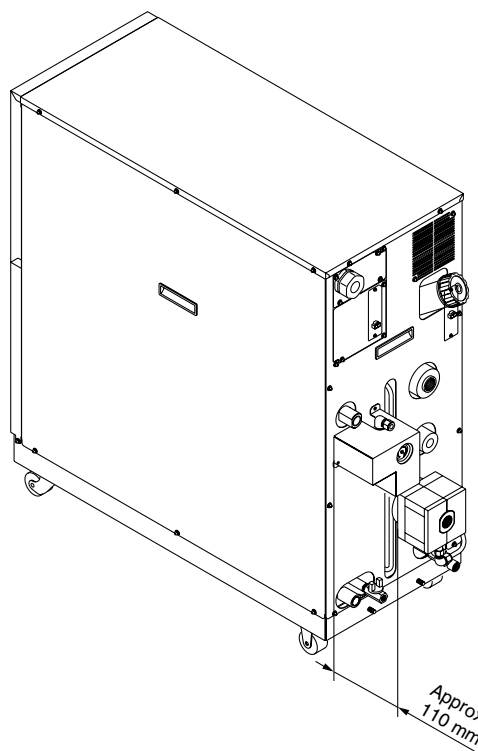
Applicable models		HRZ001-H-Z HRZ001-H1-Z HRZ002-H-Z HRZ002-H1-Z	HRZ001-L-Z HRZ002-L-Z HRZ004-L-Z HRZ004-H-Z HRZ008-H-Z HRZ001-L2-Z HRZ004-L2-Z HRZ002-W-Z HRZ008-W-Z	HRZ001-L1-Z HRZ002-L1-Z HRZ004-L1-Z HRZ004-H1-Z HRZ008-H1-Z HRZ002-L2-Z HRZ008-L2-Z HRZ002-W1-Z HRZ008-W1-Z	HRZ008-L-Z HRZ008-L1-Z
Circulating fluid recoverable volume ^{Note 1)}	L	15	16	17	
Purge gas	—	Nitrogen gas			
Purge gas supply port	—	Self-align fitting for ø8 O.D. ^{Note 2)}			
Purge gas supply pressure	MPa	0.4 to 0.7			
Purge gas filtration	µm	0.01 or less			
Regulator set pressure	MPa	0.15 to 0.3 ^{Note 3)}			
Recoverable circulating fluid temperature	°C	10 to 30			
Recovery start/stop	—	Start: External communication ^{Note 4)} or operation display panel / Stop: Automatic			
Timeout error	sec	Timer from recovery start to completion Stops recovering when the timer turns to set time. Possible set range: 60 to 300, at the time of shipping from the factory: 300			
Height difference with the customer system side	m	10 or less			

Note 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.

Note 2) Before piping, clean inside the pipings with air blow, etc. Use the piping with no dust generation by 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 HRZ Warranty

1. Conditions of warranty

When a nonconformance should take place to our thermo-chiller, we will repair the unit without charge in accordance with our current terms and conditions.

This free repair covers the replacement of all nonconforming parts, their adjustment and checks. Please note that the dis-assembled parts will be the property of SMC.

2. Period of warranty

Effective for 1 year after purchase

3. Items out of warranty

The following cases are not subject to warranty.

1. Nonconformance caused by implementing no check-up (daily check-up, regular check-up) specified by SMC.
2. Nonconformance caused by the usage other than stipulated in the instruction manual or outside the specification designated by SMC.
3. Nonconformance caused by remodeling which is not permitted by SMC.
4. Nonconformance caused by the usage other than the specified circulating fluid or cooling water.
5. Nonconformance caused by elapsing. (painted surface, plated surface discolored naturally)
6. Sensuous phenomenon which is not affected functionally (sound, noise, vibration, etc.)
7. Nonconformance caused by natural disasters such as earthquake, typhoon, water disaster, accidents, or fire hazard.
8. Nonconformance caused by the installation environment stipulated in the instruction manual.
9. Nonconformance caused by no observation to the following 5, "Items to be observed by customer".

4. Exemption from liability

1. Cost for daily check-up, regular check-up.
2. Cost for repair by a third party other than the designated distributors or agents.
3. Cost for moving this unit and installation or dislocation.
4. Cost for replacement or replenishment of the component parts or liquid other than specified.
5. Cost for inconvenience or loss caused by not being able to use the unit. (Telephone charge, warranty for job suspension, commercial loss, etc.)
6. Cost or compensation, etc. stipulated other than the above 1. "Conditions of warranty".

5. Items to be observed by customer

In order to use this product safely, the correct usage and check-up by customer are necessary.

Please be sure to observe the following things. Please note that we may decline the repair request upon warranty in case that the following things are not observed.

- 1) Use the unit in accordance to the proper handling as mentioned in the instruction manual.
- 2) Conduct inspection and maintenance (daily check-up, regular check-up) as mentioned in the instruction manual.
- 3) Record the inspection and maintenance results as mentioned in the instruction manual.

6. How to ask a repair upon warranty

When a warranty repair is requested, please contact the nearest sales distributor.

With this, we will repair the unit upon warranty.


We promise a repair for free on the basis of the abovementioned periods or terms. Therefore, nonconformance occurred after the warranty period will be charged in principle.





HRZ

Safety Instructions

The following safety instructions are intended to prevent a hazardous situation and/or equipment damage. The instructions indicate the level of potential hazard by a label of "**Caution**", "**Warning**" or "**Danger**". To ensure safety, please observe safety practices.

 **Caution** : Operator error could result in injury or equipment damage.

 **Warning** : Operator error could result in serious injury or loss of life.

 **Danger** : In extreme conditions, there is a possible result of serious injury or loss of life.

Warning

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

Since the products specified here are used in various operating conditions, their compatibility with the specific system must be based on specifications or after analysis and/or tests to meet your specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalog information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

2. Only trained personnel should operate pneumatic machinery and equipment.

The equipment can be dangerous if handled incorrectly. Assembly, handling or maintenance of systems should be performed by trained and experienced operators.

3. Do not service the machinery/equipment or attempt to remove components until the safety is confirmed.

1. Inspection and maintenance of the machinery/equipment should only be performed after confirming that all safety precautions have been taken.
2. If the equipment must be removed, confirm that all safety precautions have been taken before beginning.
3. Before the machinery/equipment is restarted, confirm that all safety precautions have been taken.

4. If the equipment will be used in the following conditions or environment, please contact SMC first and be sure to take all necessary safety precautions.

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuits in press applications, or safety equipment.
3. An application which has the possibility of having a negative effect on people, property, requiring special safety analysis.

■ Exemption from Liability

1. SMC, its officers and employees shall be exempted from liability for any loss or damage arising out of earthquakes or fire, action by a third person, accidents, customer error with or without intention, product misuse, and any other damages caused by abnormal operating conditions.
2. SMC, its officers and employees shall be exempted from liability for any direct or indirect loss or damage, including consequential loss or damage, loss of profits, or loss of chance, claims, demands, proceedings, costs, expenses, awards, judgments and any other liability whatsoever including legal costs and expenses, which may be suffered or incurred, whether in tort (including negligence), contract, breach of statutory duty, equity or otherwise.
3. SMC is exempted from liability for any damages caused by operations not contained in the catalogs and/or instruction manuals, and operations outside of the specification range.
4. SMC is exempted from liability for any loss or damage whatsoever caused by malfunctions of its products when combined with other devices or software.



Temperature Control Equipment Precautions 1

Be sure to read this before handling. Refer to the back of page 1 for Safety Instructions and the back of page 6 through to 7 for Specific Product Precautions.

Selection

Warning

1. Confirm the specifications.

Fully understand the applications, environment, fluids and other operating conditions. Use this product within the specified range shown in this catalog. Using outside the specified range can cause injury, damage, or malfunction. When in doubt, please contact SMC beforehand.

2. Secure the performance margin.

When you consider the product's cooling / heating performance or flow characteristics, allowance must be made because there are heat loss from the piping, etc. or pressure drop.

Operating Environment / Storage Environment

Warning

1. Observe the operating ambient temperature range.

The operating ambient temperature range must be within the specification range shown in this catalog. Use caution because using beyond the range will lead to damage, breakage or malfunction.

2. Avoid using and storing in the following environment because it will lead to a malfunction.

1. In locations where water, steam, brine, and oil may splash on the product.
2. In locations where a large amount of particles are airborne.
3. In locations with an atmosphere of corrosive or explosive gases, solvents, or chemicals.
(This product is not explosion proof.)
4. In locations which receive direct sunlight or radiated heat.
(Protect from direct sunshine to avoid the resin from deteriorating by ultraviolet rays or increasing the temperature.)
5. In locations where temperature substantially changes.
6. In locations where there is a heat source nearby and the ventilation is poor.
(Insulate the heat source or ventilate well to avoid damages caused by the heat or temperature increase, such as softening.)
7. In locations where condensation occurs.
8. In locations where strong magnetic noise occurs.
(In locations where strong electric fields, strong magnetic fields and surge voltage occur.)
9. In locations where static electricity occurs, or conditions which make the product discharge static electricity.)
10. In locations where high frequency occurs.
11. In locations where damage is likely to occur due to lightning.
12. In locations where impacts or vibrations occur.
13. In conditions where a massive force strong enough to deform the product is applied or a weight from a heavy object is applied.
14. Locations more than 1000 m in altitude (except for storage, transportation)

Operating Fluid

Warning

Type of fluids

1. The operating fluids must be used within the specified range shown in this catalog.
Consult with us when using the product with other fluids.
2. When foreign matter may be mixed with a fluid, install a filter.

Transportation / Transfer / Movement

Warning

1. Product transfer should be performed by a knowledgeable and experienced person.

Especially, transferring a heavy object is dangerous. Use adequate caution to prevent falling down or dropping accidents from occurring.

2. Avoid transporting in the following environment because it will lead to breakage.

1. In conditions where strong shock and vibrations occur.
2. In operating and storage environments other than those specified.

3. Caution for transferring a heavy object.

This product is heavy. Use adequate caution to avoid injury when picking up and setting down the product, and falling and dropping accidents should be avoided.

4. Before moving this product, remove operating fluid, cooling water from the inside of this product.

Mounting / Installation

Warning

Installation should be performed by a knowledgeable and experienced person.

Especially, installation of a heavy object is dangerous. This product is heavy. Use adequate caution to avoid falling and dropping accidents from occurring.

Caution

1. Provide space for ventilation and maintenance.

Provide enough space for the ventilation requirement of each equipment, otherwise a cooling malfunction or operation stoppage may occur.
Also, provide space required for maintenance.

2. Confirm the mounting orientation.

Mount and install horizontally.



Temperature Control Equipment Precautions 2

Be sure to read this before handling. Refer to the back of page 1 for Safety Instructions and the back of page 6 through to 7 for Specific Product Precautions.

Piping

Warning

1. For this product and future equipment, design of the piping system should be performed by a knowledgeable and experienced person.
2. Work performed on the piping should be done by a knowledgeable and experienced person.

If work performed on the piping is done by a less knowledgeable and inexperienced person, it will likely lead to operating fluid leakage, etc.

3. Observe the tightening torque for screws.

When installing fitting, etc., follow the given torque levels below.

Tightening Torque for Piping

Connecting thread	Applicable tightening torque N•m
Rc1/8	7 to 9
Rc1/4	12 to 14
Rc3/8	22 to 24
Rc1/2	28 to 30
Rc3/4	28 to 30
Rc1	36 to 38

4. Confirm the leakage of fluid.

Confirm that the hose or tubing is not pulled out and that there is no leakage in the fitted parts.

Piping

Caution

1. Before piping

Confirm that chips, cutting oil, dust etc., in contact with piping is cleaned up or air blown (flushing) before piping.

2. Use caution regarding the flowing direction of the fluid.

When installing piping to a product, do not make mistake the ports of radiating water side and constant temperature water, IN and OUT.

3. Sealant tape

When installing piping or fitting into a port, ensure that sealant material does not enter the port internally. When using sealing tape, leave 1.5 to 2 threads exposed on the end of pipe/fitting.

4. Take countermeasures against condensation.

Depending on the operating condition, condensation may occur in the piping. In such a case, take countermeasures such as installing insulation material, etc.



Temperature Control Equipment Precautions 3

Be sure to read this before handling. Refer to the back of page 1 for Safety Instructions and the back of page 6 through to 7 for Specific Product Precautions.

Electrical Wiring

Warning

1. Electrical wiring job should be performed by a knowledgeable and experienced person.

Power supply facilities and wiring works should be implemented in accordance with the electric facilities technical standards and provisions and conducted correctly.

2. Mounting a dedicated circuit breaker.

As a countermeasure against current leakage, install a leakage breaker in the main power supply.

3. Confirmation of power supply

If this product is used with voltages other than specified, it will likely lead to a fire or an electrical shock. Before wiring, confirm the voltage, volume, and frequency.

Confirm that the voltage fluctuation is within $\pm 10\%$ of the specified value.

4. Grounding

Be sure to ground (frame ground) with class D grounding. (grounding resistance of 100 Ω or less)

Can be grounded with the ground wire of the power cord.

Also, do not use together with equipment that generates a strong solenoid noise or high frequency noise.

5. Wiring cable should be handled with care.

Do not bend, twist or stretch the cord or cable.

6. Wire with an applicable size cable and terminal.

In the event of attaching a power supply cable, use a cable and terminal size which is suitable for the electrical current of each product.

Forcibly mounting with an unsuitable size cable will likely result in a fire.

7. Avoid wiring the signal line and power line in parallel.

Since there may be a possibility of malfunction from noise, avoid parallel wiring between the temperature sensor line, communications line, signal line of alarm line, etc. and the power line and high voltage line. Also, do not place them in the same wiring tube.

Cooling Water Supply

(In case of water-cooled refrigerator type)

Warning

1. Be sure to supply the cooling water.

1. Prohibition of water-cut operation, micro small amount of water operation.

Do not operate under the condition that there is no cooling water or where there is an extremely small amount of water is flowing.

In this kind of operation, cooling water temperature may become extremely higher. It is dangerous enough the material of hose may soften and burst when the piping supplying the cooling water is connected with hose.

2. Actions to be taken when an emergency stops occurs due to high temperature

In case a stop occurs due to extremely high temperature resulting from a decrease in the cooling water flow rate, do not immediately flow cooling water. It is dangerous enough the material of hose may soften and burst when the piping supplying the cooling water is connected with hose.

First, naturally let it cool down by removing the cause of the flow rate reduction. Secondly, make sure that there is no leakage again.

Caution

Cooling water quality

1. Use the cooling water within the specified range.

When using with other fluid than cooling water, please consult with us.

2. When it is likely that foreign matter may enter the fluid, install a filter (20 mesh or equivalent) .

Cooling Water Quality Standards

The Japan Refrigeration and Air Conditioning Industry Association
JRA GL-02-1994 "Cooling water system – Circulating type – Supply water"

	Item	Unit	Standard value
Standard item	pH (at 25°C)	—	6.5 to 8.2
	Electric conductivity (25°C)	[μ S/cm]	100* to 800 [μ S/cm]
	Chloride ion	[mg/L]	200 [mg/L] or less
	Sulfuric acid ion	[mg/L]	200 [mg/L] or less
	Acid consumption amount (at pH4.8)	[mg/L]	100 [mg/L] or less
	Total hardness	[mg/L]	200 [mg/L] or less
	Calcium hardness	[mg/L]	150 [mg/L] or less
Reference item	Ionic state silica	[mg/L]	50 [mg/L] or less
	Iron	[mg/L]	1.0 [mg/L] or less
	Copper	[mg/L]	0.3 [mg/L] or less
	Sulfide ion	[mg/L]	Should not be detected.
	Ammonium ion	[mg/L]	1.0 [mg/L] or less
	Residual chlorine	[mg/L]	0.3 [mg/L] or less
	Free carbon	[mg/L]	4.0 [mg/L] or less

* Electric conductivity ratio should be 100 [μ S/cm] or more.



Temperature Control Equipment Precautions 4

Be sure to read this before handling. Refer to the back of page 1 for Safety Instructions and the back of page 6 through to 7 for Specific Product Precautions.

Manipulation / Operation

Warning

1. Handle and operate after the safety of this product and the whole system are confirmed.

For this product and incidental equipment, operate this product by a knowledgeable and experienced person.

2. Before operation, confirm the safety of mounting, installation, piping and electric wiring conditions.

1. Confirm that the mounting and installation conditions are safe.
2. Confirm that the circulating fluid is filled and that the fluid level is within the display range.
3. Confirm whether the valve is open or closed and that the hose and resin tube are not twisted.
It is dangerous when the valve in the piping is closed because the circulating fluid and the cooling water will not flow and the fluid pressure will increase.
4. Confirm the flow direction of the fluid.
Make sure that the flow direction of the fluid (Inlet/Outlet direction) is connected correctly.
5. Confirm that the electrical wiring condition is safe.
Incorrect wiring will lead to a malfunction or breakage of the product. Confirm that there is no error in wiring before operation.
6. When using the product with a 3-phase power supply, confirm the connection.
If the phase order is incorrect, the pump, etc. will run in reverse, or the phase-reversal relay will activate and the product will not operate.
In this case, after installing the main power supply, reverse 2 wires out of the 3 wires and connect them in the correct phase order.

3. Do not remove the external panel during energization or operation.

If removed, there are the dangers of electrical shock, burn, frostbite, injury from a rotating object.

4. Avoid operating with a lower flow.

Avoid operating with a lower flow because the temperature control may become unstable or the service life of the pump may shorten.

5. Confirm the safety during the operation.

During the operation, if an emergency is detected, stop this product immediately and cut the power supply breaker.

6. When not used for a long period of time, confirm the safety once again prior to beginning its operation.

Maintenance

Warning

1. Maintenance should be performed according to the procedure indicated in the instruction manual.

Improper handling can cause damage and malfunction of equipment and machinery.

2. Maintenance operations

Improper handling of compressed air is dangerous. Therefore, in addition to observing the product specifications, replacement of elements and other maintenance activities should be performed by personnel having sufficient knowledge and experience pertaining to pneumatic equipment.

3. Pre-maintenance inspection

When removing this product, turn off the electric power, and be certain to shut off the supply pressure and exhaust the compressed air in the system. Proceed only after confirming that all pressure has been released to the atmosphere.

4. Post maintenance inspection

After installation or repair, reconnect compressed air and electricity and conduct appropriate inspections to confirm proper operation. If there is an audible air leakage, or if the equipment does not operate properly, stop operation and confirm that the equipment is installed correctly.

5. Modification prohibited

Do not modify or reconstruct the unit.

6. Stopping for long periods of time

When not using for long periods of time, remove the operating fluid (circulating fluid, cooling water) and cut the main power supply.

7. Removal of product

Take the stop/inspection measures and confirm that there is no danger before the product is removed.
In the event of removing the product, discharge the used fluid and clean the inside of the piping.
When a dangerous fluid or polluted fluid is left, it is likely that the polluted area will be enlarged or an accident will occur.

8. Disposal of product

When the product is disposed, it must be in compliance the ordinance or rules of the local municipality.
Please ask for help from a professional industrial waste disposal company.
In particularly, in case of a refrigerator type product, entrust a company to collect the Freon, etc.
In that case, the customer may be requested to submit a certificate that is showing the type of operating fluid and whether any quantity is left.
These procedures are the responsibility of the customer.

9. Preparation of a backup product

In order to keep the downtime of a customer's system to a minimum, please kindly prepare a backup product, when necessary.



Series HRZ Specific Product Precautions 1

Be sure to read this before handling. Refer to the back of page 1 for Safety Instructions and the back of page 2 through to 5 for Temperature Control Equipment Precautions.

Caution on Design

Warning

This catalog shows the specification 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.

Selection

Caution

Model selection

In order to select the correct thermo-chiller model, the amount of thermal generation from the customer's system, the operating circulating fluid, and its circulating flow are required. Select a model, by referring to the guideline to model selection of this catalog.

Handling

Warning

Thoroughly read the operation manual.

Read the operation manual completely before operation, and keep a copy on-site, for future reference.

Operating Environment / Storage Environment

Caution

Do not use in the following environment because it will lead to a breakdown.

1. Environment like written in the 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 8%
6. (inside the operation facilities) Locations where there is not sufficient space for maintenance.

Circulating Fluid

Caution

1. Avoid oil or other foreign objects entering the circulating fluid.
2. Use ethylene glycol which does not contain additives such as antiseptics.

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Circulating Fluid

3. Density of the ethylene glycol aqueous solution should 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 clean water (including for diluting ethylene glycol aqueous solution) which must meet the water quality standards as mentioned below.

Circulating Water (Clean Water) Quality Standards

The Japan Refrigeration and Air Conditioning Industry Association
JRA GL-02-1994 "Cooling water system - Circulating type - Supply water"

	Item	Unit	Standard value
Standard item	pH (at 25°C)	—	6.0 to 8.0
	Electric conductivity (25°C)	[μS/cm]	100*1 to 300*2
	Chloride ion	[mg/L]	50 or less
	Sulfuric acid ion	[mg/L]	50 or less
	Acid consumption amount (at pH4.8)	[mg/L]	50 or less
	Total hardness	[mg/L]	70 or less
	Calcium hardness	[mg/L]	50 or less
Reference item	Ionic state silica	[mg/L]	30 or less
	Iron	[mg/L]	0.3 or less
	Copper	[mg/L]	0.1 or less
	Sulfide ion	[mg/L]	Should not be detected.
	Ammonium ion	[mg/L]	0.1 or less
	Residual chlorine	[mg/L]	0.3 or less
	Free carbon	[mg/L]	4.0 or less

*1 Electric conductivity ratio should be 100 [μS/cm] or more.

*2 In case of [MΩ·cm], it will be 0.003 to 0.01.

Transportation / Transfer / Movement

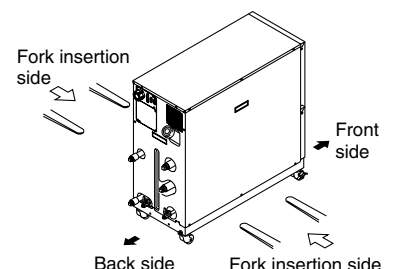
Warning

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 roller or adjuster 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 roller

1. This product is heavy. Be sure to move the unit using more than 2 persons.
2. Do not grab the pipings or panel at the back of the unit.





Series HRZ Specific Product Precautions 2

Be sure to read this before handling. Refer to the back of page 1 for Safety Instructions and the back of page 2 through to 5 for Temperature Control Equipment Precautions.

Mounting / Installation

⚠ 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 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 (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. 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.

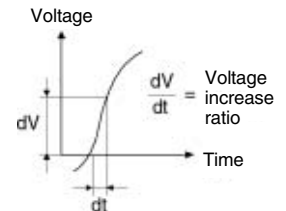
8. Do not return the circulating fluid to the unit by installing a pump in the customer system.

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 $40 \text{ V}/200 \mu\text{sec.}$, it may result in malfunction.



Manipulation / Operation

⚠ 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 the case of an emergency, press down the EMO switch which is fitted on the front face of this product.

Inspection

⚠ 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 shocks.

⚠ 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.

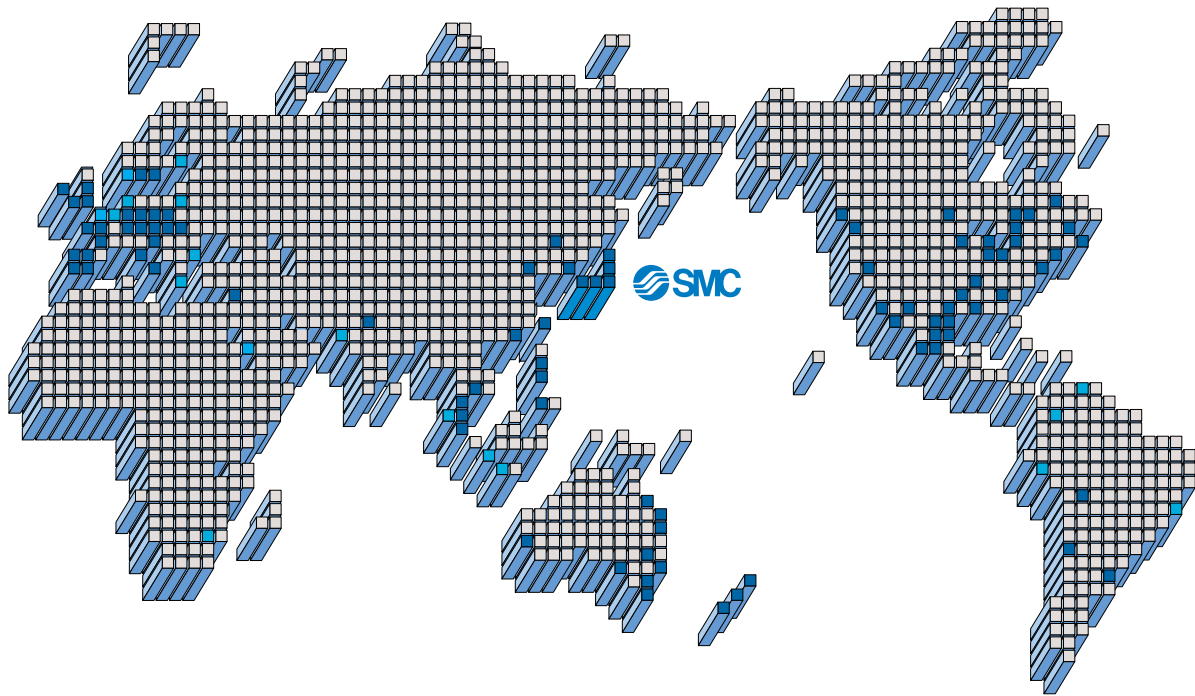
1. In the case of fluorinated liquid
Discharge the circulating liquid and avoid any dirty objects, or water moisture, or foreign objects entering the system.
2. In the case of ethylene glycol aqueous solution
Density must be 60 %.
3. In the case of clean water, pure water
Replacement is recommended.

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".



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