

**Non F-Gas**  
(CO<sub>2</sub> Refrigerant)

Circulating Fluid Temperature Controller

**Refrigerated Thermo-chiller** **New**

**GWP = 1**

**Non F-Gas**  
**CO<sub>2</sub> Refrigerant**

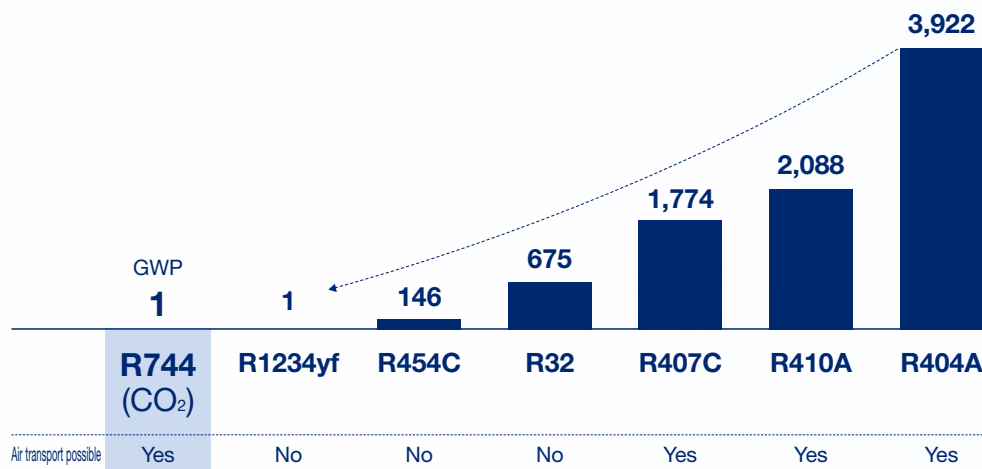


CE UK CA RoHS

**HRSC Series**

**SMC**  
CAT.ES40-83A

# Air transport possible Uses a CO<sub>2</sub> refrigerant Greatly reduced GWP



GWP = 1 Compliant with each country's refrigerant regulations As of the end of September 2024

EU refrigerant regulations : GWP150 or more

US refrigerant regulations : GWP700 or more

California, US refrigerant regulations: GWP750 or more

\* "GWP" indicates the global warming potential. The values are based on the IPCC AR4.

## Air transport possible

Classified as A1 according to ASHRAE standard 34 (non-toxic and non-flammable)

Eliminates the need to pay for F-Gas recovery & disposal

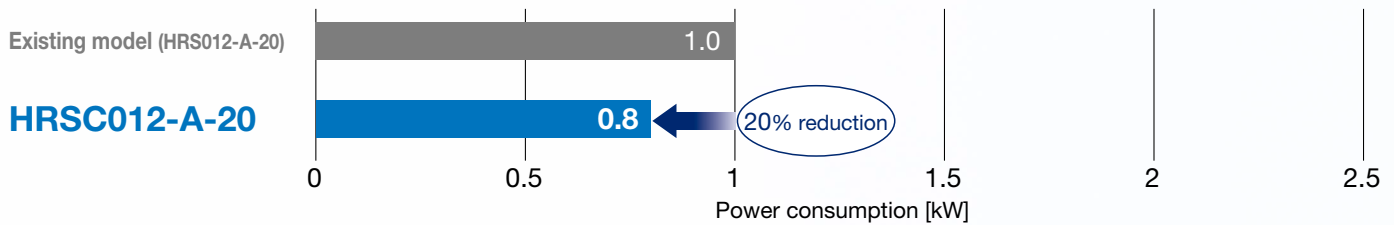
Eliminates the need for periodic inspections based on the Fluorocarbon Emissions Control Act (Japan)



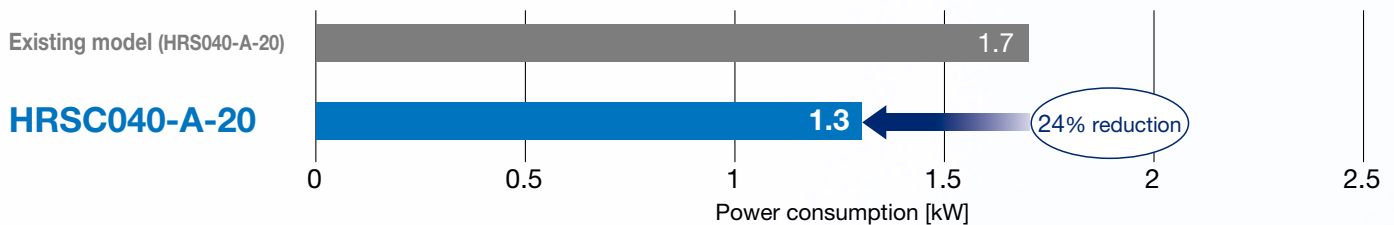
# Energy Saving

## Inverter compressor

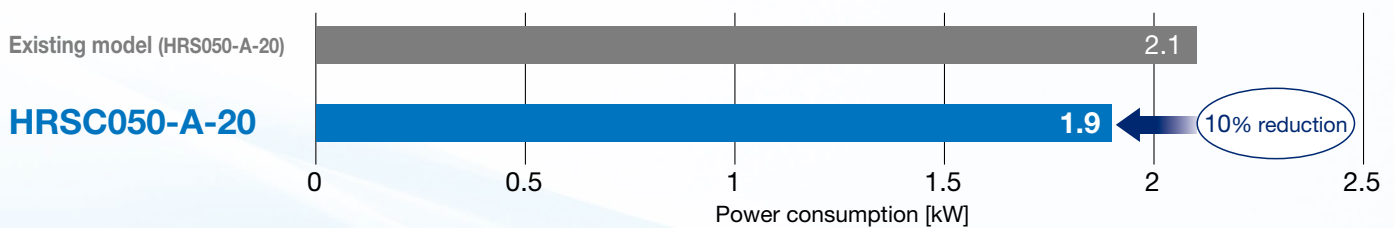
■ Reduced power consumption due to the optimal control of compressor rotations according to the load (compared with non-inverter chillers)



**Conditions** Ambient temperature: 25°C, Circulating fluid temperature: 20°C, Circulating fluid flow rate: 7 L/min, Heat load: 1.3 kW, Operating ratio: 50% (Ratio of 1.3 kW heat load to 0 kW heat load)



**Conditions** Ambient temperature: 25°C, Circulating fluid temperature: 20°C, Circulating fluid flow rate: 7 L/min, Heat load: 4.2 kW, Operating ratio: 50% (Ratio of 4.2 kW heat load to 0 kW heat load)



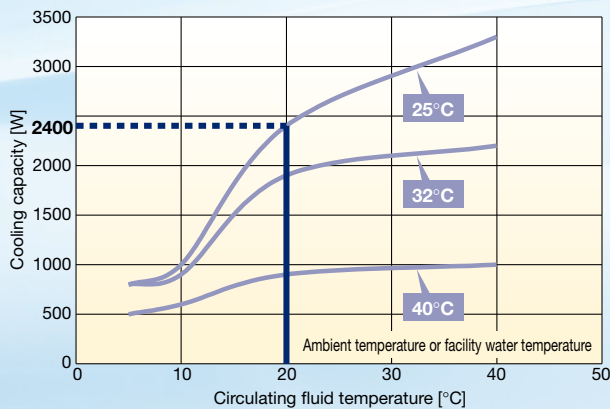
**Conditions** Ambient temperature: 25°C, Circulating fluid temperature: 20°C, Circulating fluid flow rate: 28 L/min, Heat load: 5.1 kW, Operating ratio: 50% (Ratio of 5.1 kW heat load to 0 kW heat load)

\* Varies according to conditions

■ Capable of providing the same cooling capacity in both 60 Hz and 50 Hz areas due to the inverter compressor

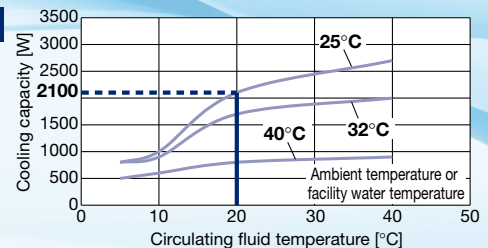
### HRSC024 Cooling Capacity

50/60 Hz

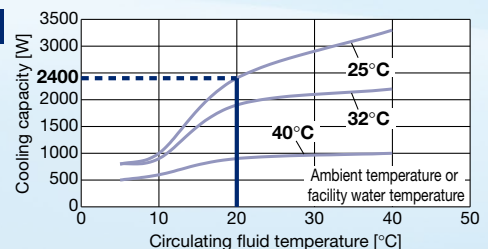


### HRS024 Cooling Capacity

50 Hz



60 Hz



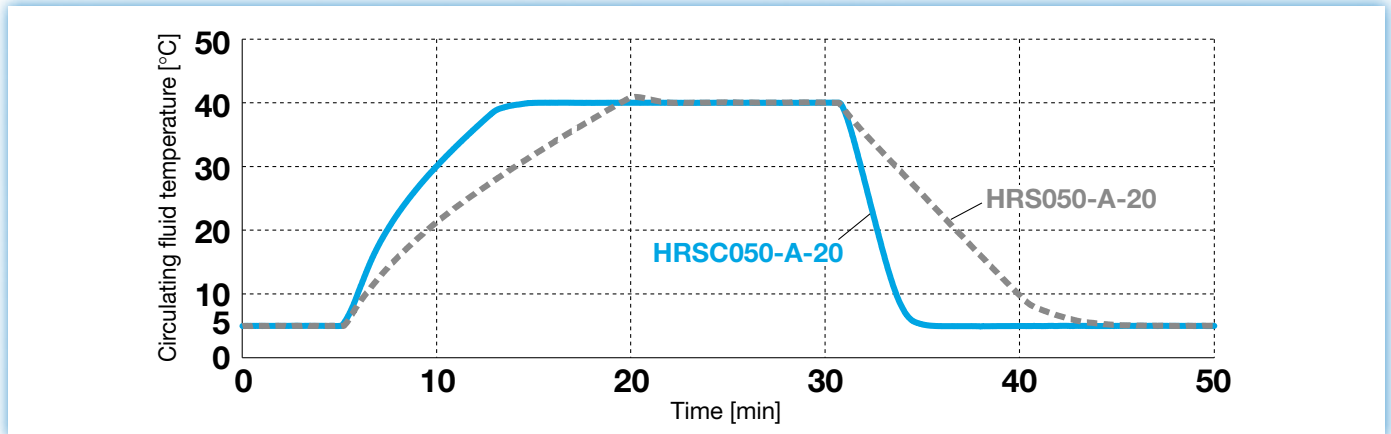


# Same or better performance than the existing model

**Same cooling/heating/pumping capacity and temperature stability**

■ Same or greater cooling/heating capacity than the existing model

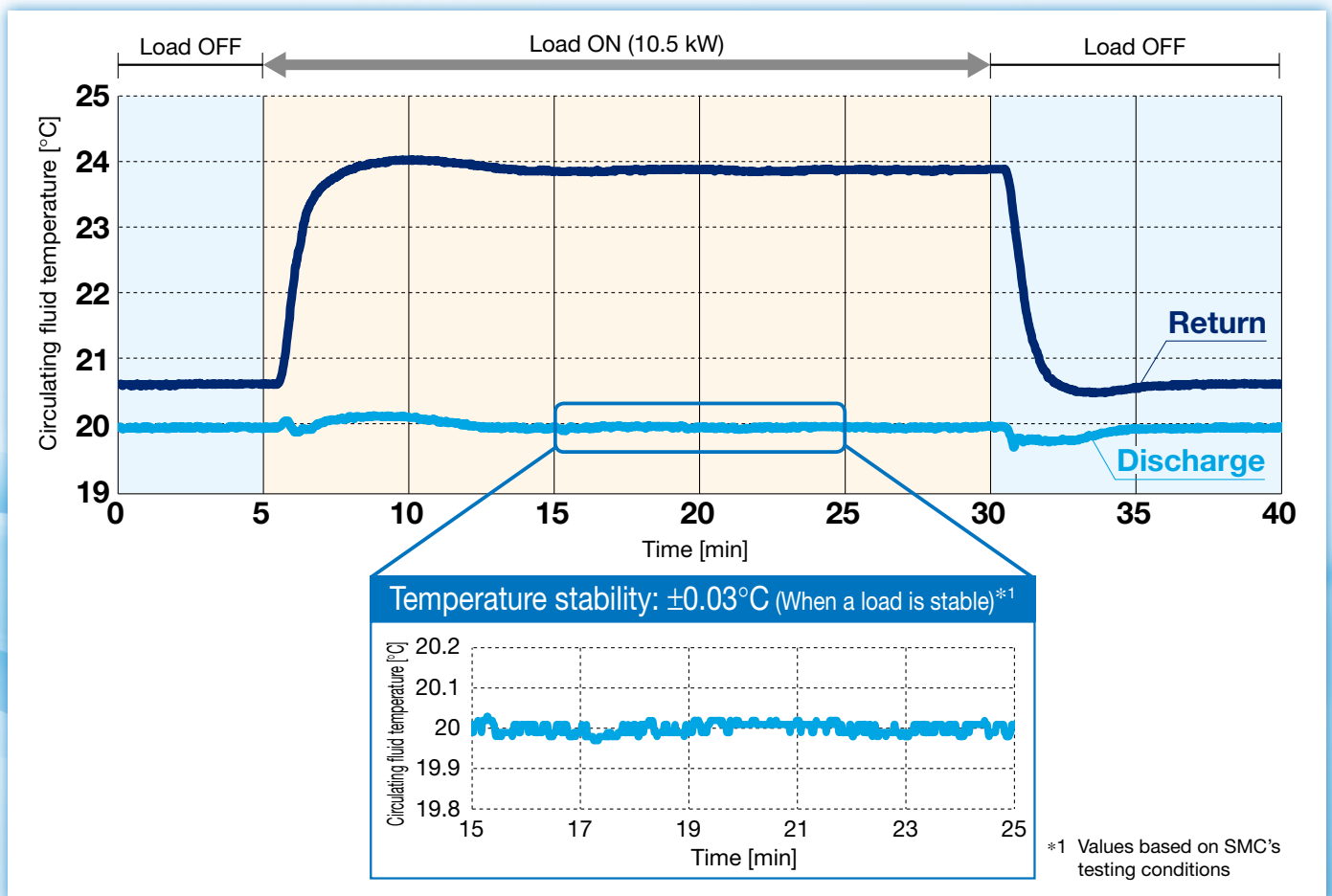
For the HRSC050-A-20



Conditions Ambient temperature: 25°C, Circulating fluid flow rate: 28 L/min, External piping: Bypass

■ High temperature stability even when the heat load fluctuates

For the HRSC100-A-40



Conditions Ambient temperature: 32°C, Circulating fluid temperature: 20°C, Circulating fluid flow rate: 45 L/min, Heat load: 10.5 kW

# Reduced environmental load due to the use of a CO<sub>2</sub> refrigerant

## Uses a non F-gas (CO<sub>2</sub> refrigerant)

Refrigerant type	GWP	Flammability	Air transport	Fluorocarbon Emissions Control Act (Japan)	Installation floor area restrictions
<b>R744 (CO<sub>2</sub> refrigerant)</b>	<b>1</b>	<b>Non-flammable</b>	<b>Possible</b>	<b>Not applicable</b>	<b>Not applicable</b>
R32	675	Slightly flammable	Not possible*1	Applicable	Applicable
R454C	146	Slightly flammable	Not possible*1	Applicable	Applicable
R1234yf	1	Slightly flammable	Not possible*1	Not applicable	Applicable

### ■ Global Warming Potential (GWP)

R744 (CO<sub>2</sub> refrigerant) has a GWP of 1, making it a low-environmental load refrigerant. It will remain compatible with GWP and PFAS restrictions even if they are strengthened in the future.

### ■ Flammability

It is a highly-safe, non-flammable refrigerant.

### ■ Air transport possible

This refrigerant is classified as A1 according to ASHRAE 34 and is both non-toxic and non-flammable, so it can be transported by aircraft.

\*1 Refrigeration devices using slightly flammable refrigerants (A2L) such as R32, R454C, and R1234yf (with a refrigerant charge of 100 g or more) cannot be transported by aircraft.

### ■ Not subject to the Fluorocarbon Emissions Control Act (Japan) or the refrigerant regulations of each country

Zero fluorocarbon management required











Zero fluorocarbon recovery and disposal costs

### ■ Installation floor area restrictions

When installing equipment filled with a slightly flammable refrigerant, there are restrictions on the min. allowable installation floor area depending on the amount of refrigerant inside the product.

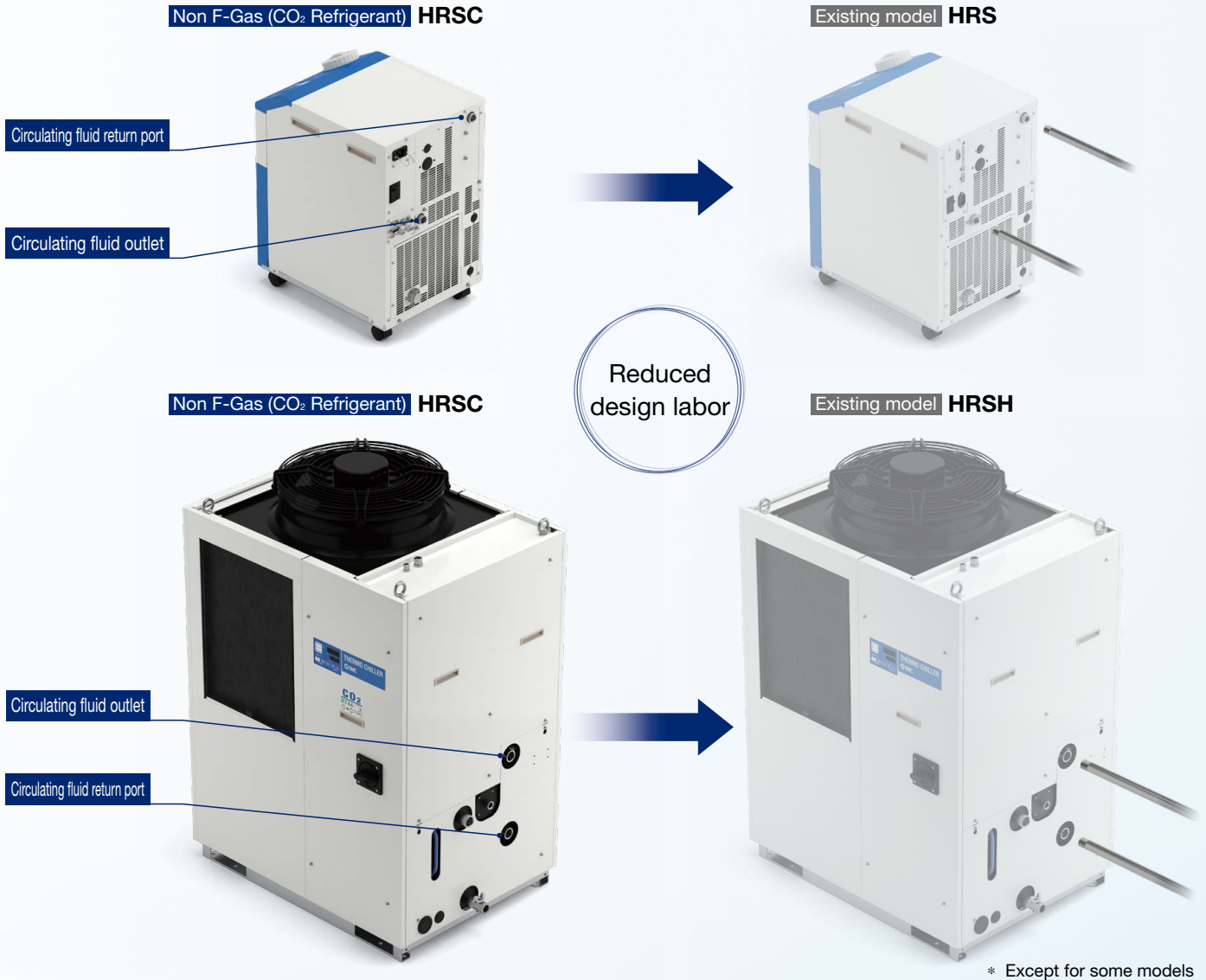
## Variations

Lineup of products with cooling capacities from 1 to 10 kW and with earth leakage breakers equipped as standard

Model	Cooling method	Cooling capacity	Power supply	Option	Optional accessories	Environment	International standards
 <b>HRSC012</b> <b>HRSC018</b> <b>HRSC024</b>	Air-cooled type	1.3 kW	Single-phase 200 to 230 VAC (50/60 Hz)	High-temperature environment specification (Cannot be selected for the HRSC030/040/050/060)	<ul style="list-style-type: none"> <li>Anti-quake bracket</li> <li>Piping conversion fitting (For air-cooled, water-cooled, and options)</li> <li>Concentration meter</li> <li>Bypass piping set</li> <li>Power supply cable</li> <li>DI filter set</li> </ul>	Indoor use	
		1.9 kW					
		2.4 kW					
 <b>HRSC030</b> <b>HRSC040</b>	Air-cooled type	3.2 kW	Single-phase 200 to 230 VAC (50/60 Hz)	With automatic fluid fill function	<ul style="list-style-type: none"> <li>Electric conductivity sensor set/ Electric conductivity control set</li> <li>Particle filter set</li> </ul>	Indoor use	
		4.2 kW					
 <b>HRSC050</b> <b>HRSC060</b>	Water-cooled type	5.1 kW	Single-phase 200 to 230 VAC (50/60 Hz)	High-pressure pump mounted (Cannot be selected for the HRSC050/060)	<ul style="list-style-type: none"> <li>Drain pan set (With water leakage sensor)</li> <li>Replacement type dustproof filter set</li> <li>Filter for circulating fluid fill port</li> </ul>	Indoor use	
		5.9 kW					
 <b>HRSC090</b>	Air-cooled type	9.5 kW (Air-cooled type)	3-phase 380Y/220 to 415Y/240 VAC (50 Hz)	With automatic fluid fill function	<ul style="list-style-type: none"> <li>Piping conversion fitting</li> <li>Concentration meter</li> <li>Bypass piping set</li> <li>Electric conductivity control set</li> <li>Particle filter set</li> </ul>	Indoor use	
		11 kW (Water-cooled type)					
 <b>HRSC100</b>	Water-cooled type	10.5 kW (Air-cooled type)	3-phase 380Y/220 to 480Y/277 VAC (60 Hz)	With casters and adjuster feet With fluid fill port	<ul style="list-style-type: none"> <li>Filter for circulating fluid fill port (Cannot be selected for the HRSC100)</li> <li>Drain pan set (With water leakage sensor) (Cannot be selected for the HRSC100)</li> <li>Snow protection hood (HRSC100 Air-cooled type)</li> </ul>	Outdoor installation (IPX4)	
		11.5 kW (Water-cooled type)					

# Ensured interchangeability with existing models

Same external dimensions, port size, and layout

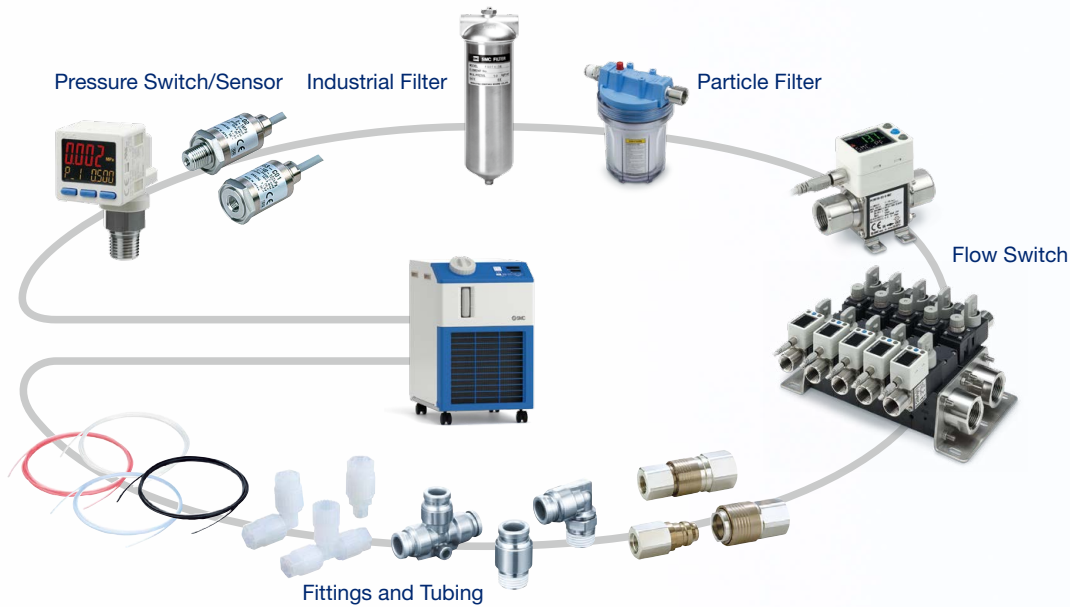


## Operability the same as existing models

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



## Circulating Fluid/Facility Water Line Related Equipment

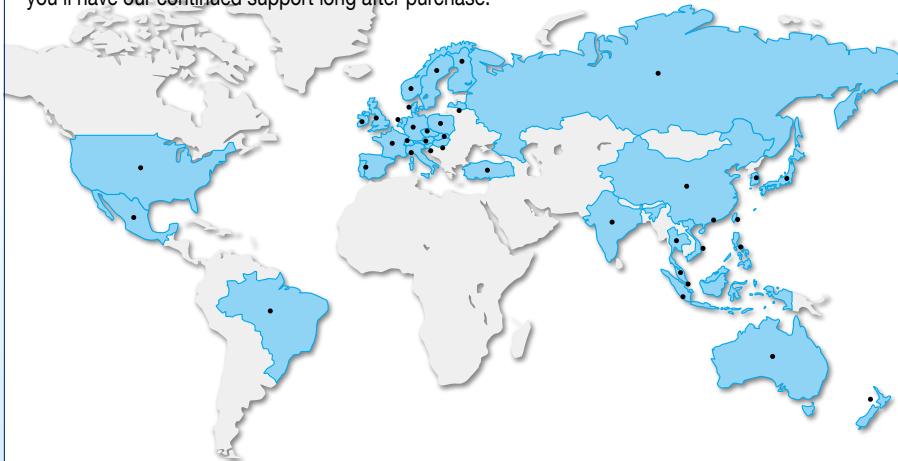


## SMC's Global Maintenance Network

### Products that you can count on available worldwide

Thanks to a solid inventory of maintenance parts and an experienced chiller support team capable of conducting repairs and replacements, SMC is able to respond to customers' issues quickly and precisely.

As SMC's high-quality services are available to customers all over the world, you can rest assured that you'll have our continued support long after purchase.



#### Americas

- Brazil
- Mexico
- U.S.A.

#### Europe

- Austria
- Czech Republic
- Denmark
- Finland
- France
- Germany
- Hungary
- Ireland
- Italy
- Latvia
- Netherlands
- Norway
- Poland
- Russia
- Slovakia
- Slovenia
- Spain/Portugal
- Sweden
- Switzerland
- Turkey
- U.K.

#### Asia and Oceania

- Australia
- China
- Hong Kong
- India
- Indonesia
- Japan
- Korea
- Malaysia
- New Zealand
- Philippines
- Singapore
- Taiwan
- Thailand
- Vietnam

\* The names of countries and regions listed in each area are alphabetically indexed

## Thermo-chiller Business Continuity Plan

Introduction of our BCP initiatives for production factories, engineering, and support systems  
We are dedicated to providing a sustainable product supply customers can rely on.

**“Uninterrupted Operation and Resilient Supply”**





**Non F-Gas**  
(CO<sub>2</sub> Refrigerant)

# Circulating Fluid Temperature Controller Refrigerated Thermo-chiller

## HRSC012 to 060 Series

Inverter compressor

Power consumption: 24% reduction\*1

GWP = 1 Compliant with each country's refrigerant regulations

Air transport possible

Temperature stability:  $\pm 0.1^{\circ}\text{C}$



HRSC012/018/024

HRSC030/040

HRSC050/060

Same width for all models: 377 mm

Model	Size [mm]	Cooling capacity	Set temperature range
HRSC012	W 377 x H 615 x D 500	1300 W	5 to 40°C
HRSC018		1900 W	
HRSC024		2400 W	
HRSC030	W 377 x H 660 x D 500	3200 W	
HRSC040		4200 W	
HRSC050	W 377 x H 976 x D 592	5100 W	
HRSC060		5900 W	

**Compatible with power supplies in Europe, Asia, Oceania, and North, Central, and South America**

Single-phase 200 to 230 VAC (50/60 Hz)

\*1 Compared with the non-inverter chiller (HRSC040-A-20)  
Conditions: Ambient temperature: 25°C, Circulating fluid temperature: 20°C,  
Circulating fluid flow rate: 7 L/min, 0 kW load: 50%, 4.2 kW load: 50%

### With heating function

As the heating method uses discharged heat, a heater is unnecessary.

### Earth leakage breaker equipped as standard

### Convenient functions

Timer operation function/Power failure auto-restart function/  
Anti-freezing operation function

### Easy maintenance

Toolless maintenance of filter

### Self-diagnosis function and check display

50 types of alarm codes

### Communication function

Equipped with serial communication (RS232C/RS485) and contact I/Os (2 inputs and 3 outputs) as standard

### Indoor use

HRSC012 to 060

HRSC090

HRSC100

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## HRSC Series



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#### <Operation Manuals>

- Operation Manual Installation/Operation
- Operation Manual Communication function

Click here for details. >>>



# Non F-Gas (CO<sub>2</sub> Refrigerant) Thermo-chiller

## Single-phase 200 to 230 VAC

### HRSC Series



#### How to Order

Air-cooled refrigeration

HRSC 018 - A - 20 -

Cooling capacity

012	Cooling capacity 1300 W
018	Cooling capacity 1900 W
024	Cooling capacity 2400 W
030	Cooling capacity 3200 W
040	Cooling capacity 4200 W
050	Cooling capacity 5100 W
060	Cooling capacity 5900 W

\* The pump of 050 and 060 have a mechanical seal and leakage could occur depending on circulating fluid quality. We recommend you to use the particle filter kit, HRS-PF004, as a preventive measure.

Cooling method

A	Air-cooled refrigeration
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Pipe thread type

Nil	Rc
F	G (with Rc-G conversion fitting set)
N	NPT (with Rc-NPT conversion fitting set)

Option

Symbol	Option	Applicable model						
		012	018	024	030	040	050	060
Nil	None	●	●	●	●	●	●	●
G	High-temperature environment specification	●	●	●	—	—	—	—
J	With automatic fluid fill function	●	●	●	●	●	●	●
T	High-pressure pump mounted*1	●	●	●	●	●	—	—

- When multiple options are combined, indicate symbols in alphabetical order.
- \*1 • The cooling capacity will decrease by about 300 W from the value in the catalog.
- The pump has a mechanical seal in it and leakage could occur depending on circulating fluid quality. We recommend you to use the particle filter kit, HRS-PF003, as a preventive measure.

Power supply

Symbol	Power supply
20	Single-phase 200 to 230 VAC (50/60 Hz)

#### Specifications \* There are different values from standard specifications. Refer to pages 18 and 19 for details.

Model		HRSC012-A-20	HRSC018-A-20	HRSC024-A-20	HRSC030-A-20	HRSC040-A-20	HRSC050-A-20	HRSC060-A-20	
Cooling method		Air-cooled refrigeration							
Refrigerant		R744 (CO <sub>2</sub> , GWP: 1)							
Refrigerant charge	[kg]	0.43	0.43	0.43	0.48	0.48	0.54	0.54	
Control method		PID control							
Ambient temperature/Humidity/Altitude/Installation environment*1, *10		Temperature: 5 to 40°C, High-temperature environment specification (option): 5 to 45°C, Humidity: 30 to 70%, Altitude: less than 3000 m, Environment: Indoors							
Circulating fluid*2		Tap water, 15% ethylene glycol aqueous solution*4							
Set temperature range*1		5 to 40							
Cooling capacity*3		1300	1900	2400	3200	4200	5100	5900	
Heating capacity*3		650	650	650	640	1100	1400	1300	
Temperature stability*5		±0.1							
Pump	Rated flow (50/60 Hz)*6, *7	7 (0.13 MPa) / 7 (0.18 MPa)					23 (0.24 MPa) / 28 (0.32 MPa)		
	Max. flow rate (50/60 Hz)	27/29			34/40		31/42		
	Max. pump head (50/60 Hz)	14/19			50		550		
	Output	200							
Tank capacity		Approx. 5							
Port size		Rc1/2							
Fluid contact material		Stainless steel, Copper (Heat exchanger brazing), Brass, Alumina ceramic*13, Carbon, PP, PE, POM, FKM, EPDM, PVC, SiC*14							
Power supply		Single-phase 200 to 230 VAC (50/60 Hz), Allowable voltage range ±10% (No continuous voltage fluctuation)							
Electrical system	Earth leakage breaker (Standard)	Rated current [A]	10	10	15	15	20	30	
		Sensitivity current [mA]	30	30	30	30	30	30	
		Rated operating current (50/60 Hz)*3 [A]	5.0/5.1	6.4/6.5	7.7/7.8	8.6/8.7	11.4/11.5	12.7/14	14.6/15.9
		Rated power consumption (50/60 Hz)*3 [kW (kVA)]	0.8/0.8 (1.0/1.0)	1.0/1.0 (1.3/1.3)	1.3/1.3 (1.6/1.6)	1.3/1.4 (1.8/1.8)	1.8/1.8 (2.3/2.3)	2.1/2.4 (2.5/2.8)	2.3/2.6 (2.9/3.2)
Noise level (50/60 Hz)*8		60/61	60/61	60/61	62/65	64/66	65/68	66/68	
Accessories		Fitting (for drain outlet) 1 pc.*11, Power supply connector 1 pc.*12, Quick Manual (with a clear case) 1, Alarm code list sticker 1 Power supply cable: Option (sold separately) to be ordered or prepared by the user.							
Weight*9		51			53		73		

\*1 No condensation should be present.  
 \*2 If tap water is used, about the water quality SMC recommends, refer to the operation manual for water quality specifications and other usable circulating fluids.  
 \*3 ① Ambient temperature: 25°C, ② Circulating fluid temperature: 20°C, ③ Circulating fluid at the rated flow, ④ Circulating fluid: Tap water  
 Refer to the cooling capacity and heating capacity graphs for details.  
 \*4 Use a 15% ethylene glycol aqueous solution if operating in a place where the circulating fluid temperature is 10°C or less.  
 \*5 Temperature at the thermo-chiller outlet when the circulating fluid flow is at the rated flow and the circulating fluid outlet and return port are directly connected. The installation environment and power supply are within the specification range and stable.  
 \*6 The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C

\*7 The required minimum flow rate for maintaining the cooling capacity or temperature stability. The specification of the cooling capacity and the temperature stability may not be satisfied if the flow rate is lower than the rated flow. (In such a case, use a bypass piping set (sold separately).)  
 \*8 Front: 1 m, height: 1 m, stable with no load, Other conditions → See \*3.  
 \*9 Weight in the dry state without circulating fluids  
 \*10 If the product is used at an altitude of 1000 meters or higher, the maximum allowable ambient temperature and the cooling capacity decrease. For details, refer to the operation manual.  
 \*11 It is not provided for the HRSC050/060.  
 \*12 It is not provided for the HRSC040/050/060.  
 \*13 The HRSC050/060 does not contain this material.  
 \*14 When option "T" is selected for the HRSC012/018/024/030/040 or when the HRSC050/060 is selected

# Non F-Gas (CO<sub>2</sub> Refrigerant) Thermo-chiller

## Single-phase 200 to 230 VAC

### HRSC Series



#### How to Order

Water-cooled refrigeration

HRSC 018 - W - 20 -

Cooling capacity

012	Cooling capacity 1300 W
018	Cooling capacity 1900 W
024	Cooling capacity 2400 W
030	Cooling capacity 3200 W
040	Cooling capacity 4200 W
050	Cooling capacity 5100 W
060	Cooling capacity 5900 W

\* The pump of 050 and 060 have a mechanical seal and leakage could occur depending on circulating fluid quality. We recommend you to use the particle filter kit, HRS-PF004, as a preventive measure.

Cooling method

A	Water-cooled refrigeration
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Pipe thread type

Nil	Rc
F	G (with Rc-G conversion fitting set)
N	NPT (with Rc-NPT conversion fitting set)

Option

Symbol	Option	Applicable model						
		012	018	024	030	040	050	060
Nil	None	●	●	●	●	●	●	●
J	With automatic fluid fill function	●	●	●	●	●	●	●
T	High-pressure pump mounted*1	●	●	●	●	●	-	-

• When multiple options are combined, indicate symbols in alphabetical order.  
 \*1 • The cooling capacity will decrease by about 300 W from the value in the catalog.  
 • The pump has a mechanical seal in it and leakage could occur depending on circulating fluid quality. We recommend you to use the particle filter kit, HRS-PF003, as a preventive measure.

Power supply

Symbol	Power supply
20	Single-phase 200 to 230 VAC (50/60 Hz)

#### Specifications \* There are different values from standard specifications. Refer to pages 18 and 19 for details.

Model	HRSC012-W-20	HRSC018-W-20	HRSC024-W-20	HRSC030-W-20	HRSC040-W-20	HRSC050-W-20	HRSC060-W-20		
Cooling method	Water-cooled refrigeration								
Refrigerant	R744 (CO <sub>2</sub> , GWP: 1)								
Refrigerant charge [kg]	0.4	0.4	0.4	0.41	0.41	0.44	0.44		
Control method	PID control								
Ambient temperature/Humidity/Altitude/Installation environment*1	Temperature: 5 to 40°C, Humidity: 30 to 70%, Altitude: less than 3000 m, Environment: Indoors								
Circulating fluid*2	Tap water, 15% ethylene glycol aqueous solution*4								
Set temperature range*1 [°C]	5 to 40								
Cooling capacity*3 [W]	1300	1900	2400	3200	4200	5100	5900		
Heating capacity*3 [W]	650	650	650	600	1000	1300	1300		
Temperature stability*5 [°C]	±0.1								
Pump	Rated flow (50/60 Hz)*6, *7 [L/min]	7 (0.13 MPa) / 7 (0.18 MPa)				23 (0.24 MPa) / 28 (0.32 MPa)			
	Max. flow rate (50/60 Hz) [L/min]	27/29			34/40		31/42		
	Max. pump head (50/60 Hz) [m]	14/19					50		
	Output [W]	200					550		
Tank capacity [L]	Approx. 5								
Port size	Rc1/2								
Fluid contact material	Stainless steel, Copper (Heat exchanger brazing), Brass, Alumina ceramic*13, Carbon, PP, PE, POM, FKM, EPDM, PVC, SiC*14								
Temperature range [°C]	10 to 40								
Pressure range [MPa]	0.3 to 0.5								
Required flow rate (50/60 Hz)*10 [L/min]	8	12	14	15	15	16	17		
Inlet-outlet pressure differential of facility water [MPa]	0.3 or more								
Port size	Rc3/8				Rc1/2				
Fluid contact material	Stainless steel, Copper (Heat exchanger brazing), EPDM								
Power supply	Single-phase 200 to 230 VAC (50/60 Hz), Allowable voltage range ±10% (No continuous voltage fluctuation)								
Electrical system	Earth leakage breaker (Standard)	Rated current [A]	10	10	10	15	20	20	
		Sensitivity current [mA]	30	30	30	30	30	30	
		Rated operating current (50/60 Hz)*3 [A]	3.1/3.2	4.0/4.1	4.4/4.5	6.1/6.2	7.6/7.7	9.4/10.7	10.3/11.6
		Rated power consumption (50/60 Hz)*3 [kW (kVA)]	0.5/0.6 (0.6/0.7)	0.6/0.7 (0.7/0.8)	0.8/0.9 (0.9/1.0)	0.9/1.0 (1.3/1.3)	1.1/1.2 (1.6/1.6)	1.6/1.9 (1.9/2.2)	1.7/2.0 (2.0/2.3)
	Noise level (50/60 Hz)*8 [dB (A)]	60/61	60/61	60/61	62/65	64/66	65/68	66/68	
Accessories	Fitting (for drain outlet) 1 pc.*11, Power supply connector 1 pc.*12, Quick Manual (with a clear case) 1, Alarm code list sticker 1 Power supply cable: Option (sold separately) to be ordered or prepared by the user.								
Weight*9 [kg]	50			53		70			

\*1 No condensation should be present.  
 \*2 If tap water is used, about the water quality SMC recommends, refer to the operation manual for water quality specifications and other usable circulating fluids.  
 \*3 ① Ambient temperature: 25°C, ② Circulating fluid temperature: 20°C, ③ Circulating fluid at the rated flow, ④ Circulating fluid: Tap water, ⑤ Facility water temperature: 25°C. Refer to the cooling capacity and heating capacity graphs for details.  
 \*4 Use a 15% ethylene glycol aqueous solution if operating in a place where the circulating fluid temperature is 10°C or less.  
 \*5 Temperature at the thermo-chiller outlet when the circulating fluid flow is at the rated flow and the circulating fluid outlet and return port are directly connected. The installation environment and power supply are within the specification range and stable.  
 \*6 The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C

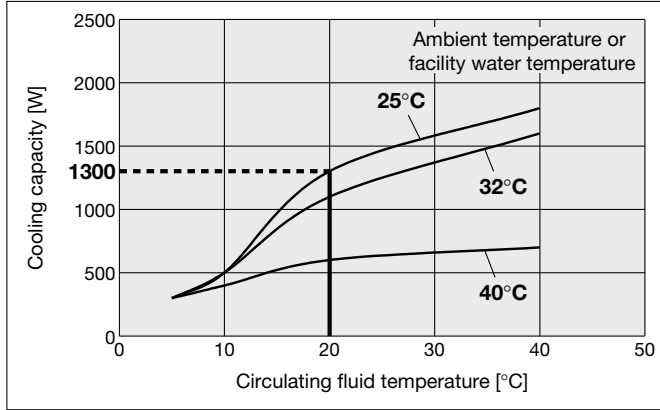
\*7 The required minimum flow rate for maintaining the cooling capacity or temperature stability. The specification of the cooling capacity and the temperature stability may not be satisfied if the flow rate is lower than the rated flow. (In such a case, use a bypass piping set (sold separately).)  
 \*8 Front: 1 m, height: 1 m, stable with no load, Other conditions → See \*3.  
 \*9 Weight in the dry state without circulating fluids  
 \*10 The required flow rate when the cooling capacity load is applied at a circulating fluid temperature of 20°C, and circulating fluid rated flow and facility water temperature of 25°C. The actual facility water flow rate will vary depending on the operating conditions.  
 \*11 It is not provided for the HRSC050/060.  
 \*12 It is not provided for the HRSC040/050/060.  
 \*13 The HRSC050/060 does not contain this material.  
 \*14 When option "T" is selected for the HRSC012/018/024/030/040 or when the HRSC050/060 is selected



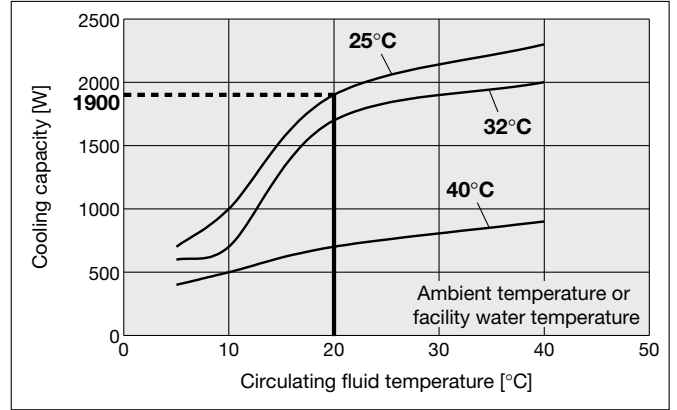
**Cooling Capacity**

\* If the product is used at an altitude of 1000 meters or higher, the maximum allowable ambient temperature and the cooling capacity decrease. For details, refer to the operation manual.  
 \* For models with a high-pressure pump mounted (-T), the cooling capacity will decrease by about 300 W from each graph.

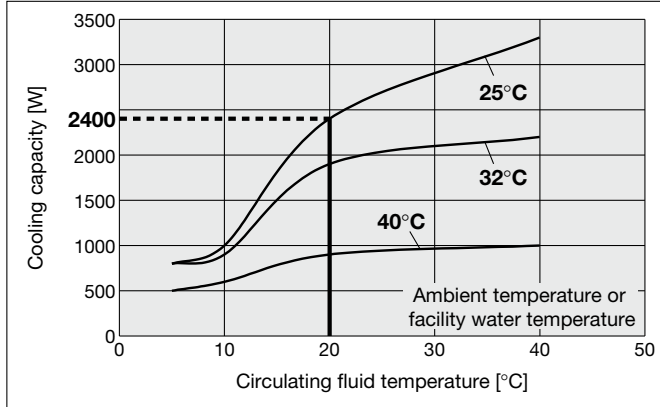
**HRSC012-A-20, HRSC012-W-20** (Single-phase 200 to 230 VAC) [50/60 Hz]



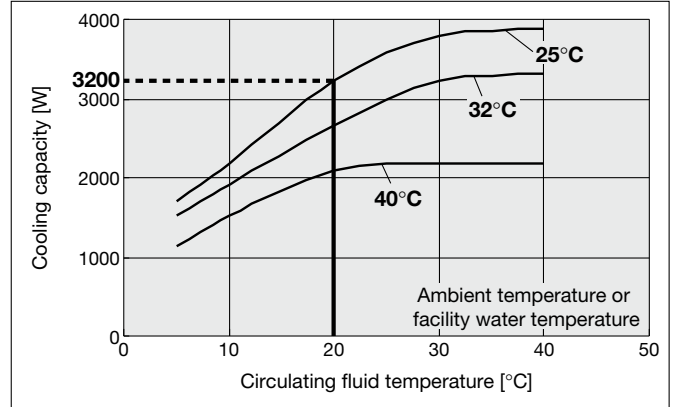
**HRSC018-A-20, HRSC018-W-20** (Single-phase 200 to 230 VAC) [50/60 Hz]



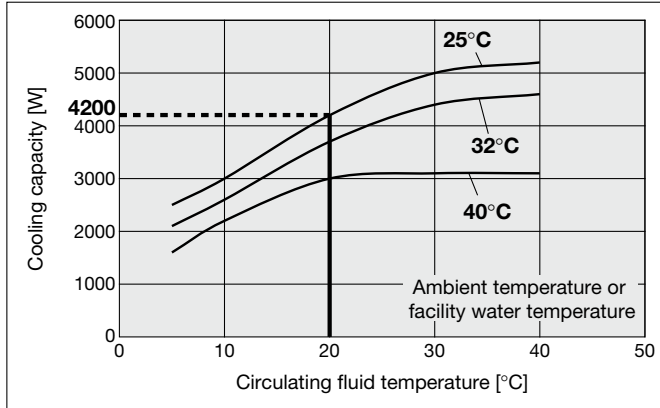
**HRSC024-A-20, HRSC024-W-20** (Single-phase 200 to 230 VAC) [50/60 Hz]



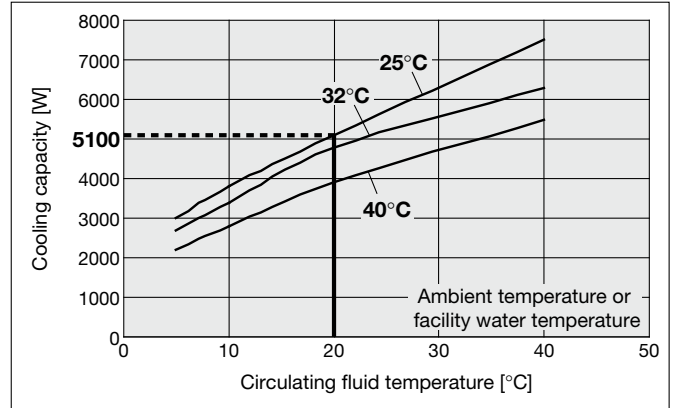
**HRSC030-A-20, HRSC030-W-20** (Single-phase 200 to 230 VAC) [50/60 Hz]



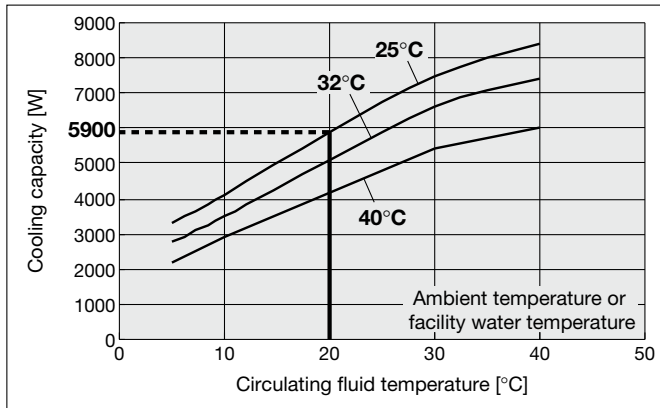
**HRSC040-A-20, HRSC040-W-20** (Single-phase 200 to 230 VAC) [50/60 Hz]



**HRSC050-A-20, HRSC050-W-20** (Single-phase 200 to 230 VAC) [50/60 Hz]



**HRSC060-A-20, HRSC060-W-20** (Single-phase 200 to 230 VAC) [50/60 Hz]



HRSC012 to 060

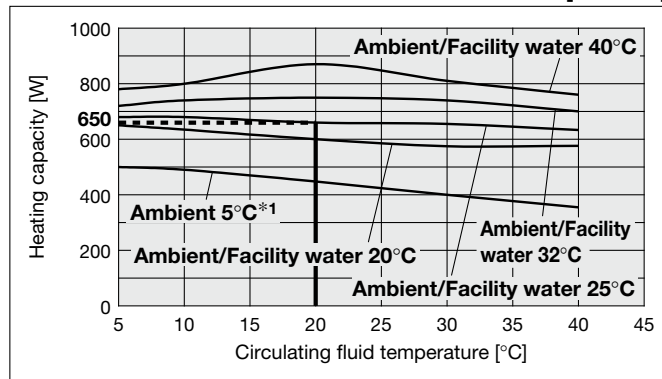
HRSC090

HRSC100

# HRSC Series

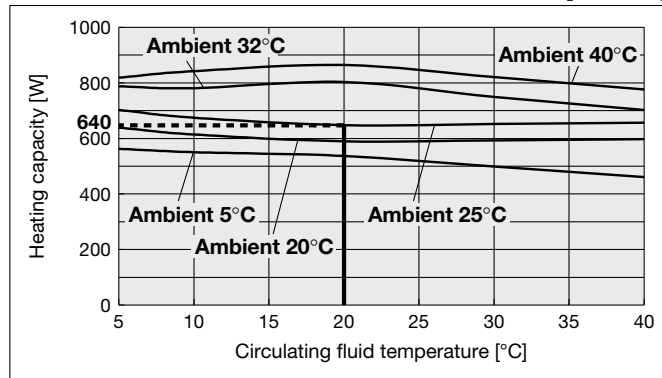
## Heating Capacity

**HRSC<sup>012</sup><sub>018-024</sub>-A-W-20** (Single-phase 200 to 230 VAC) [50/60 Hz]

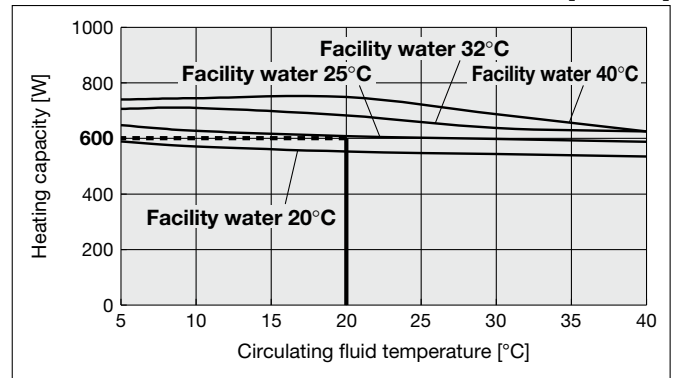


\*1 Only for the air-cooled refrigeration type

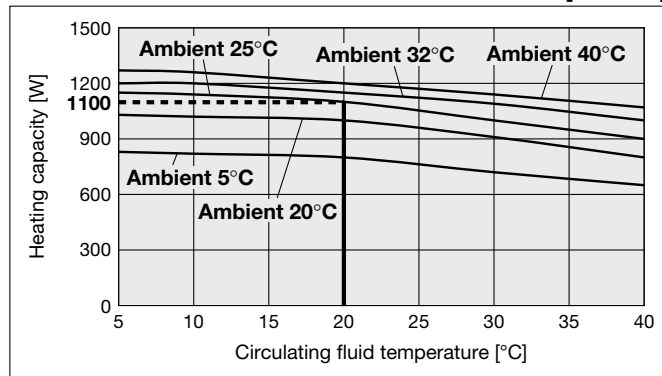
**HRSC030-A-20** (Single-phase 200 to 230 VAC) [50/60 Hz]



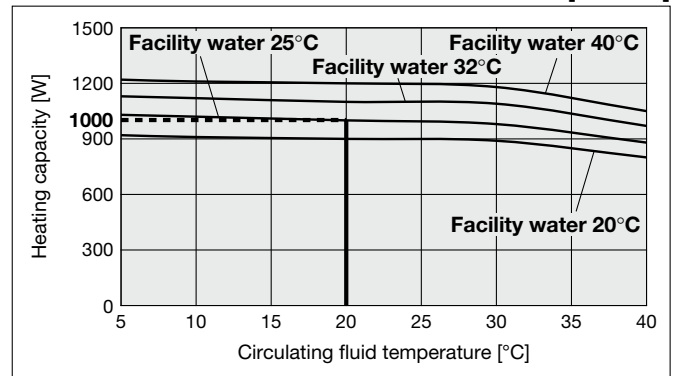
**HRSC030-W-20** (Single-phase 200 to 230 VAC) [50/60 Hz]



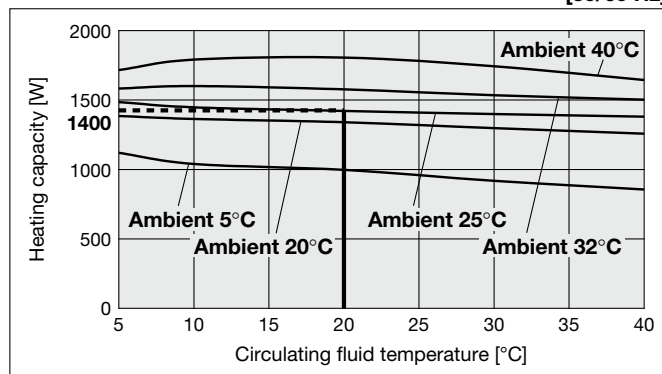
**HRSC040-A-20** (Single-phase 200 to 230 VAC) [50/60 Hz]



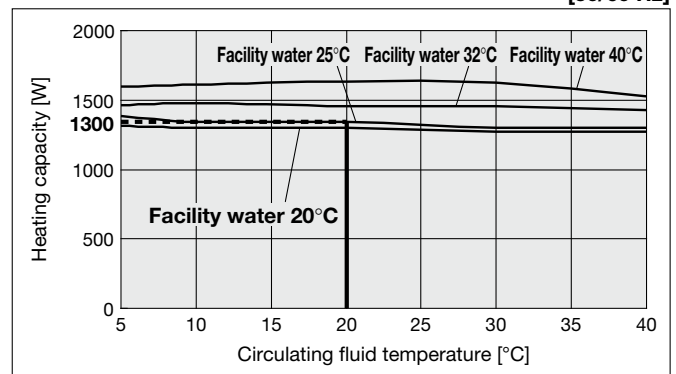
**HRSC040-W-20** (Single-phase 200 to 230 VAC) [50/60 Hz]



**HRSC050-A-20** (Single-phase 200 to 230 VAC) [50/60 Hz]

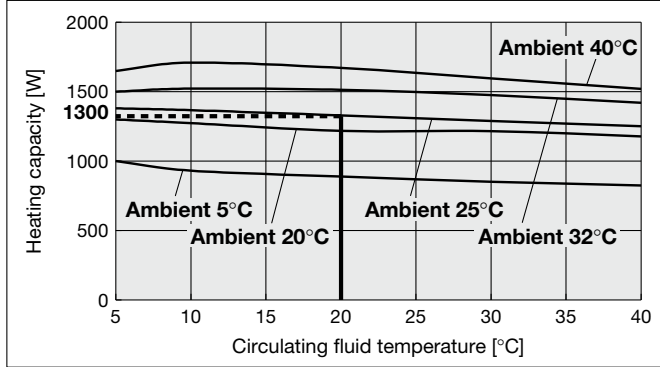


**HRSC050-W-20** (Single-phase 200 to 230 VAC) [50/60 Hz]

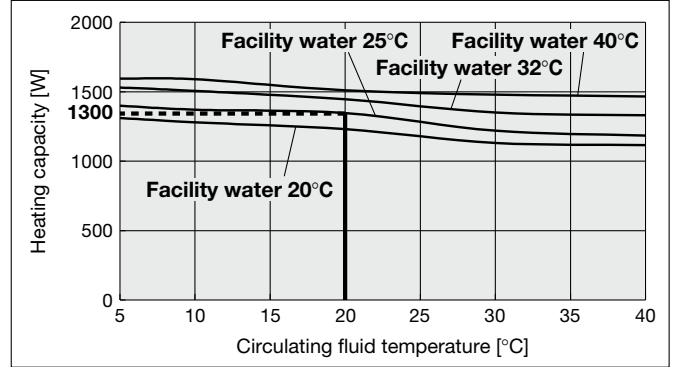


### Heating Capacity

**HRSC060-A-20** (Single-phase 200 to 230 VAC) [50/60 Hz]

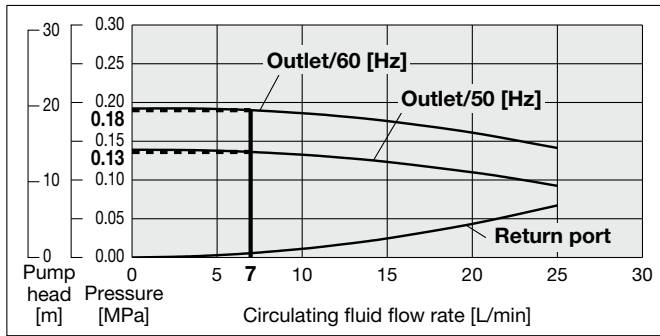


**HRSC060-W-20** (Single-phase 200 to 230 VAC) [50/60 Hz]

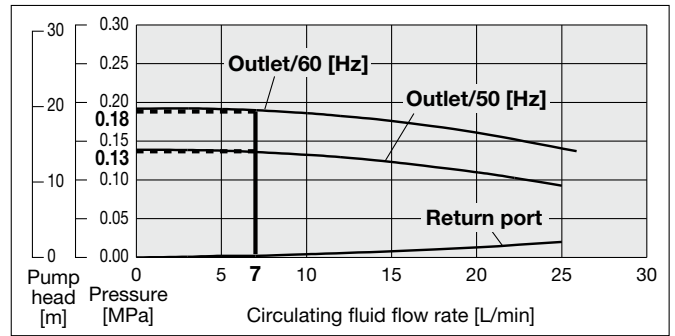


### Pump Capacity

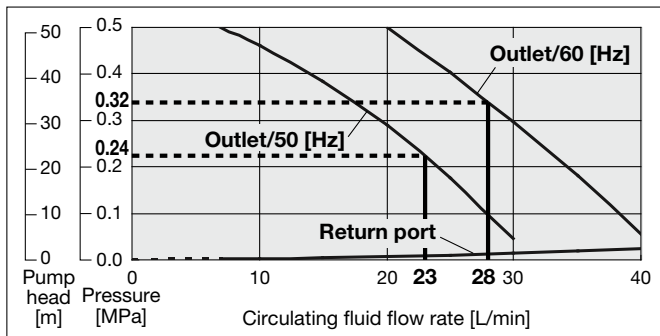
**HRSC<sup>012</sup><sub>018-024</sub>-A-W-20** (Single-phase 200 to 230 VAC)



**HRSC<sup>030</sup><sub>040</sub>-A-W-20** (Single-phase 200 to 230 VAC)

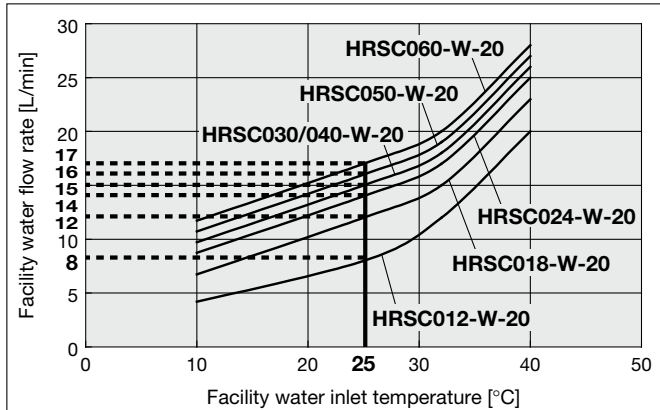


**HRSC<sup>050</sup><sub>060</sub>-A-W-20** (Single-phase 200 to 230 VAC)



### Required Facility Water Flow Rate

**HRSC012-W-20, HRSC018-W-20, HRSC024-W-20, HRSC030-W-20, HRSC040-W-20, HRSC050-W-20, HRSC060-W-20**

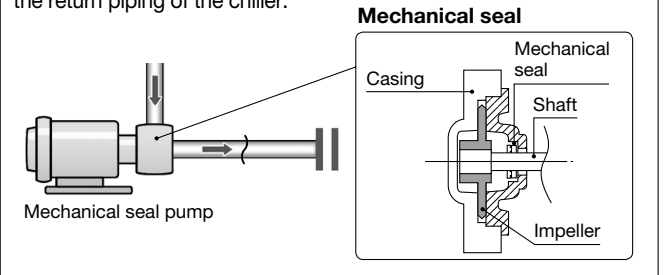


\* This is the facility water flow rate at the circulating fluid rated flow and the cooling capacity listed in the "Cooling Capacity" specifications.

### ⚠ Caution

#### Mechanical Seal Pump

The pump used for the thermo-chiller HRSC050/060 series uses a mechanical seal with the fixed ring and rotary ring used for the shaft seal part. If foreign matter enter the gap between the seals, this may cause a trouble such as leakage from the seal part or pump lock. Therefore, it is strongly recommended to install the particle filter in the return piping of the chiller.



HRSC012 to 060

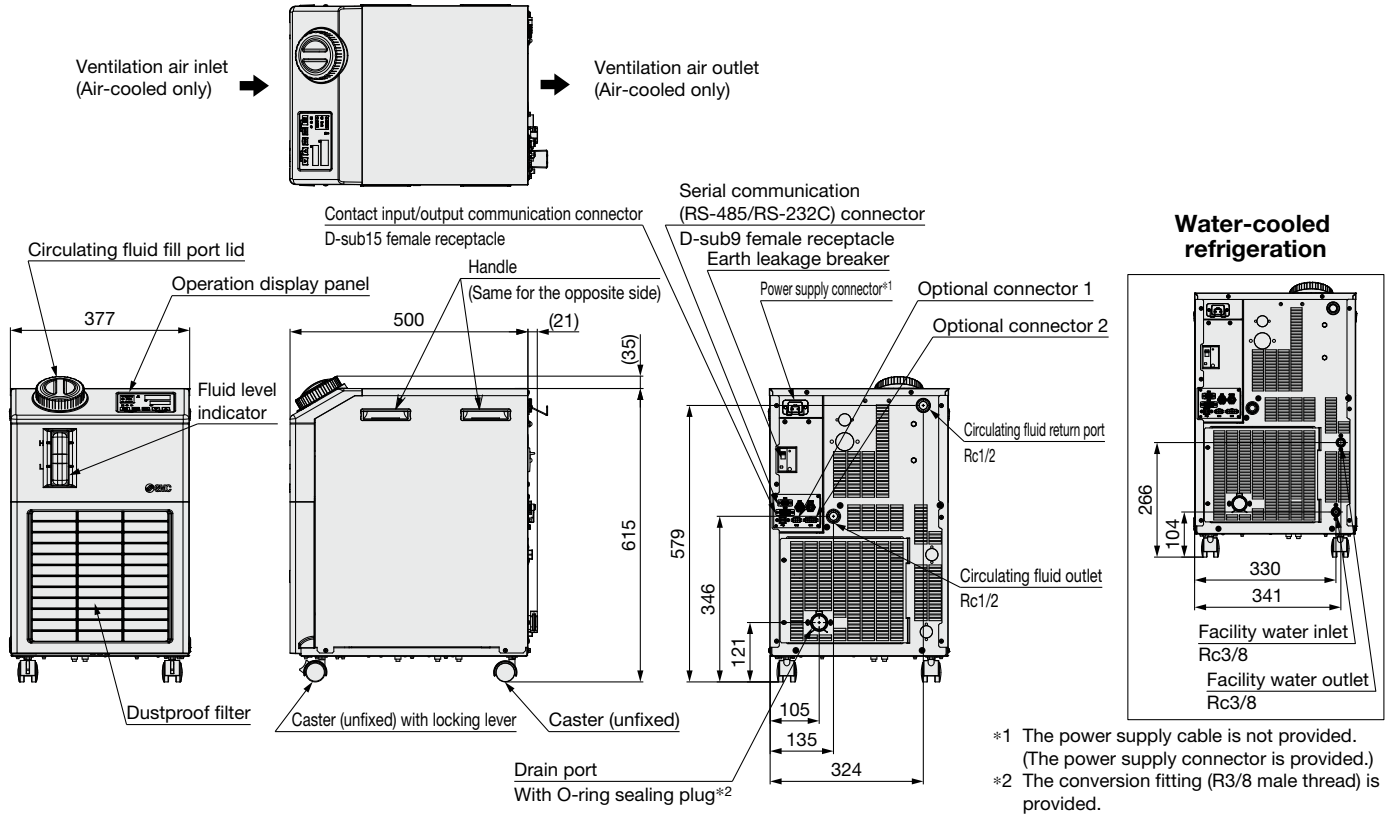
HRSC090

HRSC100

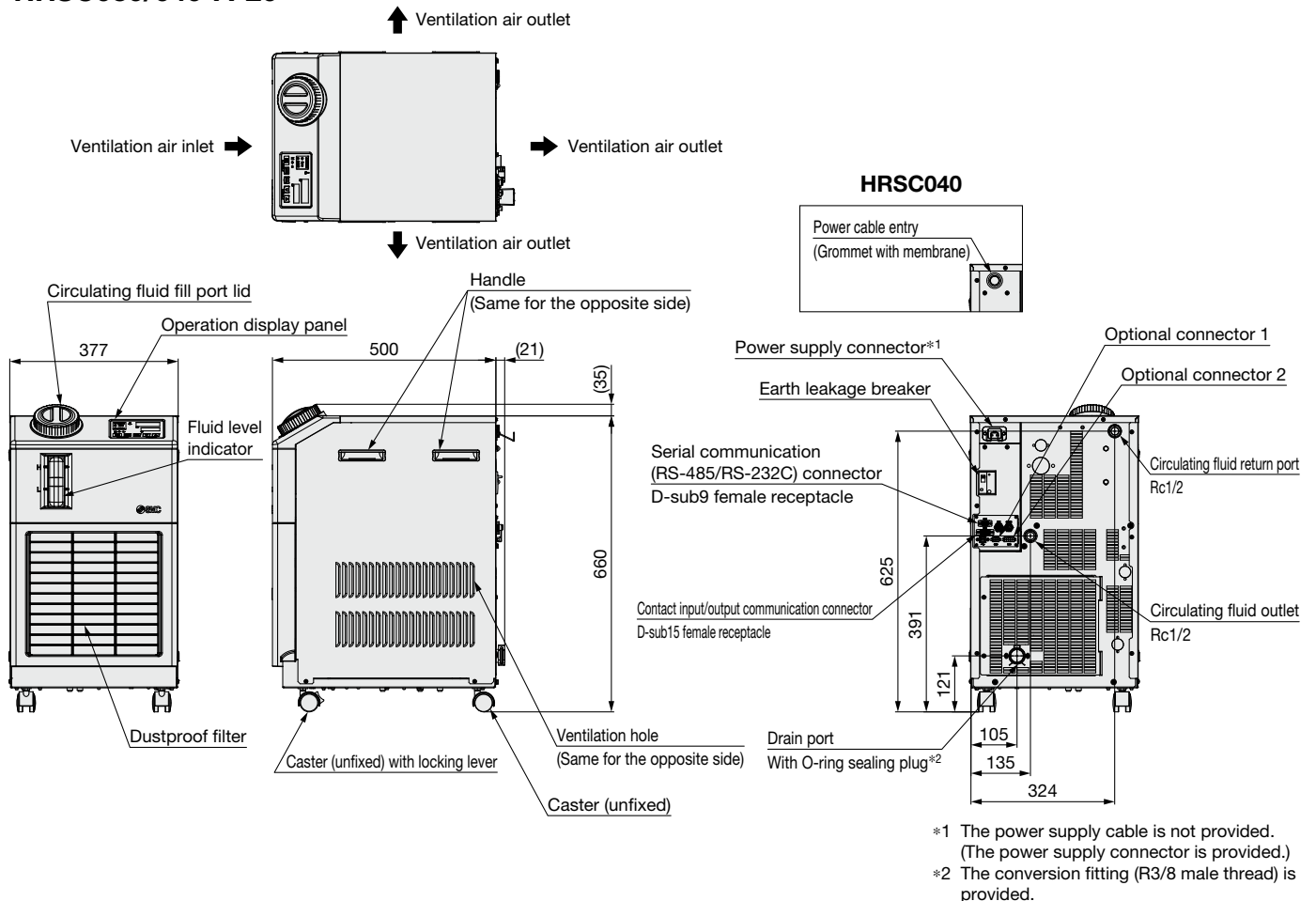
# HRSC Series

## Dimensions

### HRSC012/018/024



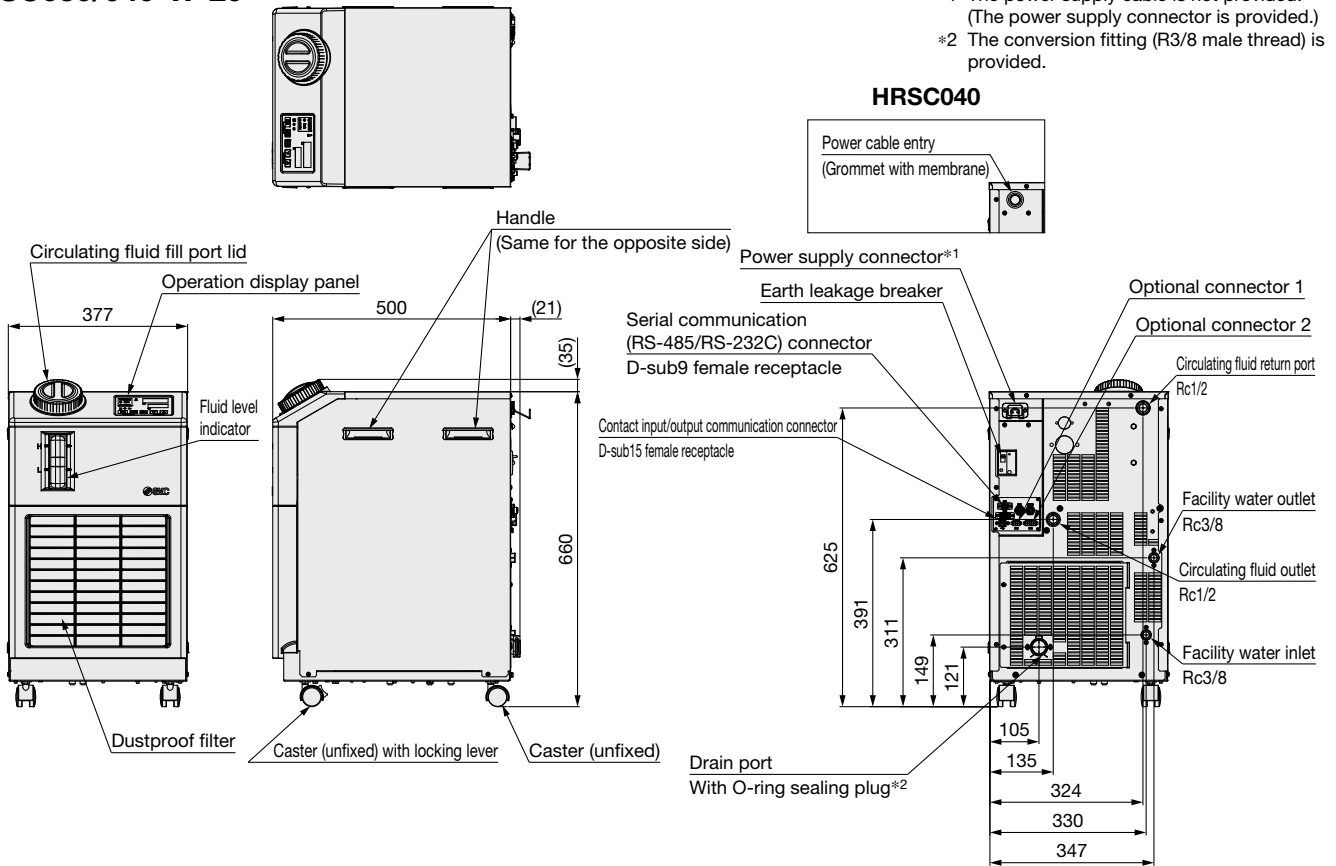
### HRSC030/040-A-20



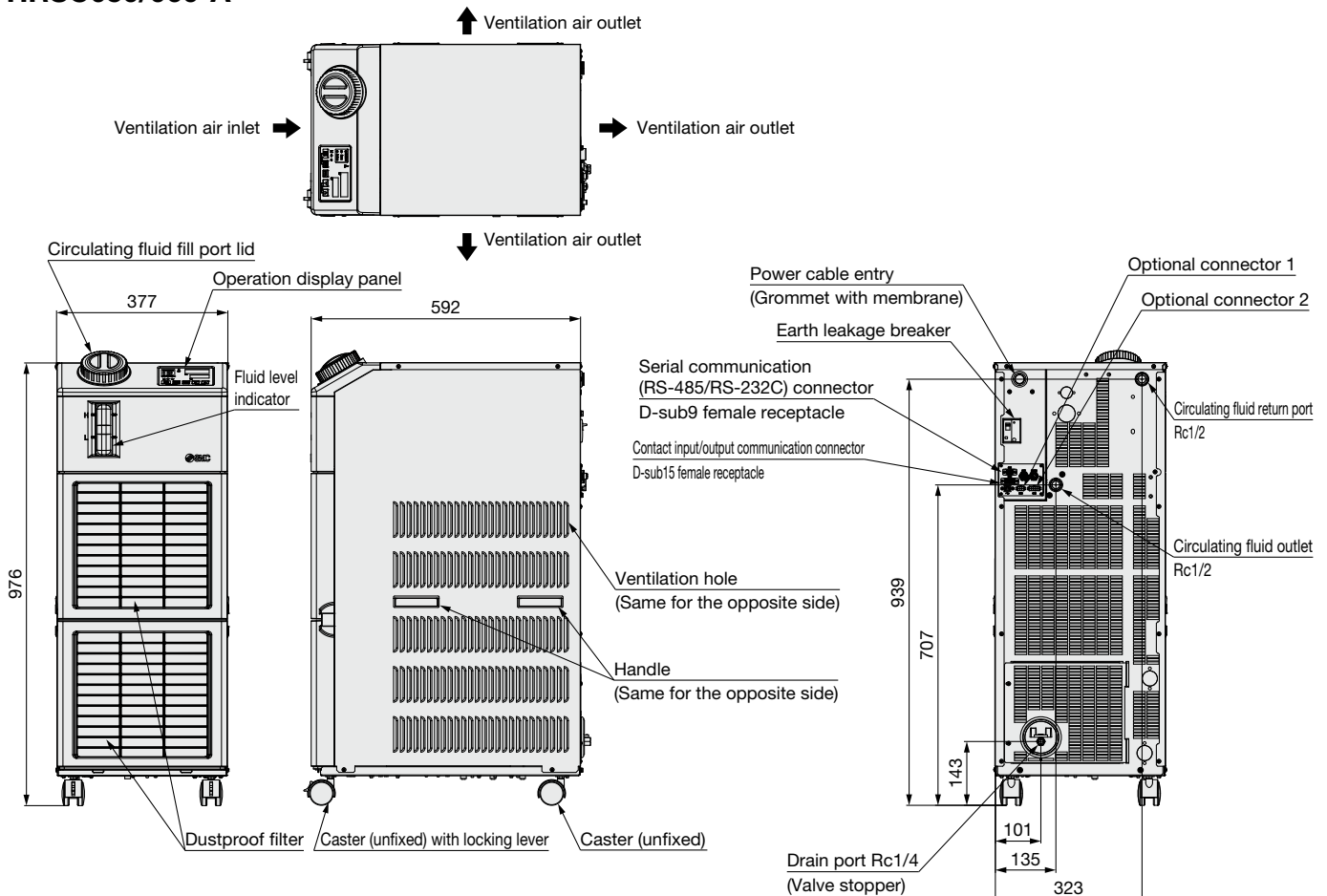


**Dimensions**

**HRSC030/040-W-20**



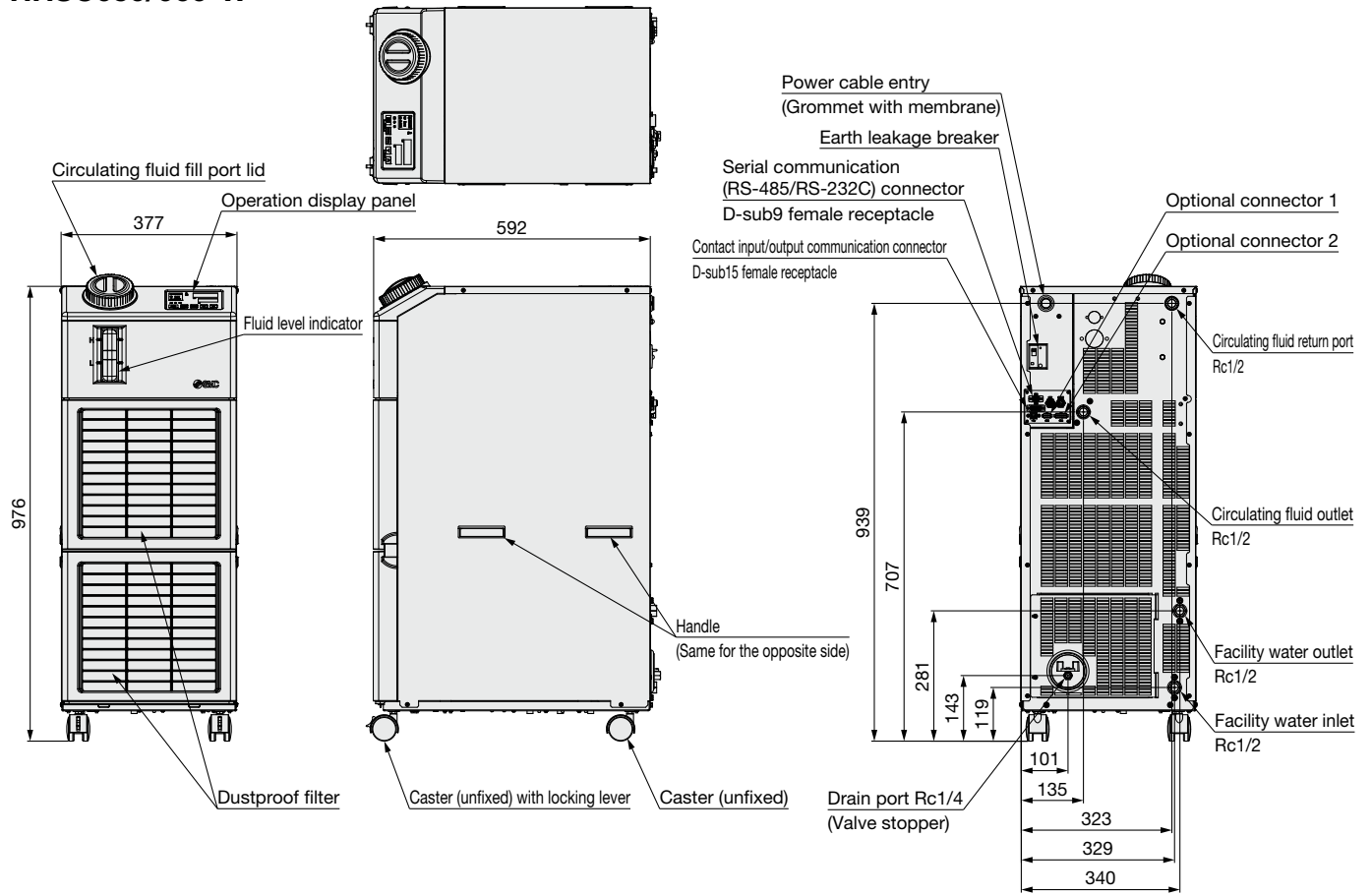
**HRSC050/060-A**



# HRSC Series

## Dimensions

### HRSC050/060-W



# HRSC Series Options

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

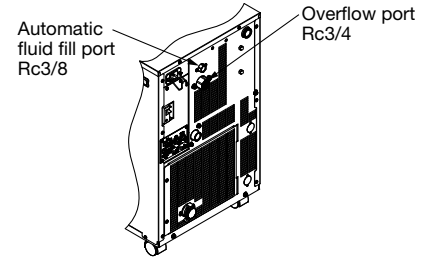
## J Option symbol With Automatic Fluid Fill Function

HRSC  -  -  -  - **J**  
 ● With automatic fluid fill function

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

Applicable model	HRSC012/018/024/030/040/050/060- <input type="checkbox"/> -20-J
Fluid fill method	Built-in solenoid valve for automatic fluid fill
Fluid fill pressure [MPa]	0.2 to 0.5

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



## T Option symbol High-Pressure Pump Mounted

HRSC  -  -  -  - **T**  
 ● High-pressure pump mounted

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

\* Cannot be selected for the HRSC050/060

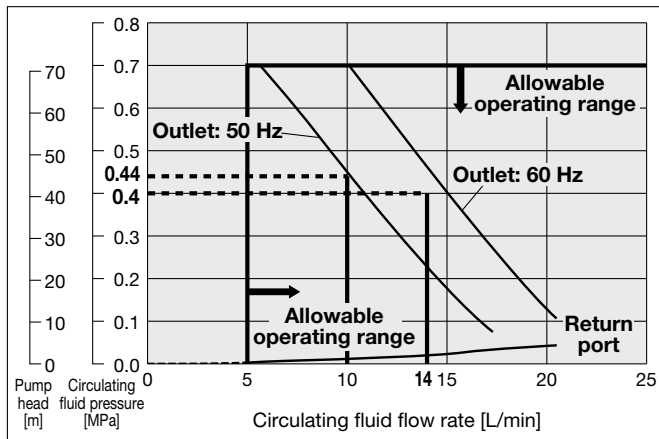
Applicable model		HRSC012/018/024/030- <input type="checkbox"/> -20-T	HRSC040- <input type="checkbox"/> -20-T
Pump	Rated flow (50/60 Hz)*1, *2	L/min 10 (0.44 MPa) / 14 (0.40 MPa)	23 (0.18 MPa) / 28 (0.23 MPa)
	Max. flow rate (50/60 Hz)	L/min 18/22	30/35
	Max. pump head (50/60 Hz)	m 70	50
	Output	W 550	550
Earth leakage breaker capacity		A 15	20
Cooling capacity*3		W The cooling capacity reduces about 300 W from the value in the catalog. (due to an increase in the heat generation of the pump)	

\*1 The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C  
 \*2 The required minimum flow rate for maintaining the cooling capacity or temperature stability  
 \*3 Cooling capacity will decrease as pump power increases.

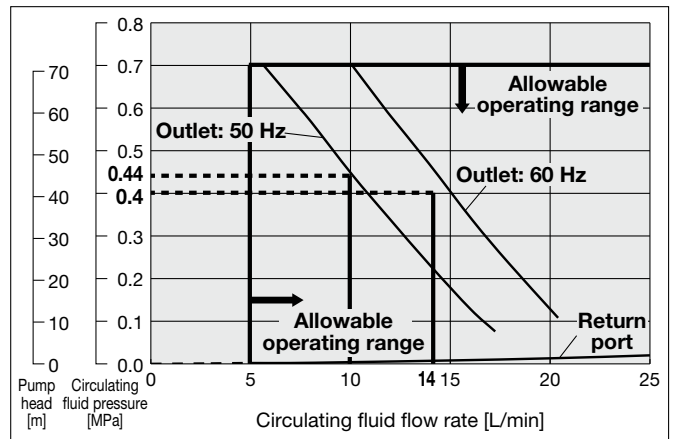
\* When the option, high-pressure pump mounted, is selected, the weight increases by 6 kg.  
 \* No change in external dimensions

## Pump Capacity

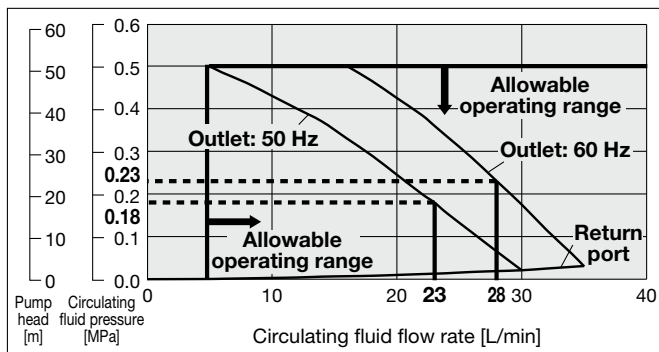
### HRSC012/018/024--20-T



### HRSC030--20-T



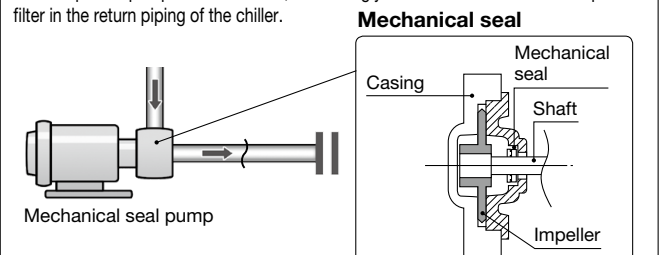
### HRSC040--20-T



## ⚠ Caution

### Mechanical Seal Pump

The pump used for the option T of the thermo-chiller HRSC012 to 040 uses a mechanical seal with the fixed ring and rotary ring used for the shaft seal part. If foreign matter enter the gap between the seals, this may cause a trouble such as leakage from the seal part or pump lock. Therefore, it is strongly recommended to install the particle filter in the return piping of the chiller.



HRSC012 to 060

HRSC090

HRSC100

# HRSC Series

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

## G Option symbol High-Temperature Environment Specification

HRSC  - A  -20- G

● High-temperature environment specification

Applicable model	HRSC012/018/024-A <input type="checkbox"/> -20-G
Cooling method	Air-cooled refrigeration
Power supply	Single-phase 200 to 230 VAC (50/60 Hz)

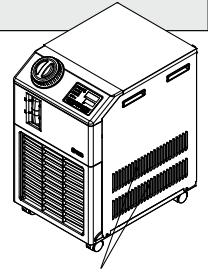
\* No change in external dimensions

\* **Cannot be selected for the HRSC030/040/050/060**

This product makes use at ambient temperatures of up to 45°C possible.

Also increases cooling capacity at ambient temperature of 32°C. (Cooling capacity is equal to standard products at ambient temperatures of less than 32°C.)

\* Ventilation slots are added to thermo-chiller side panels. For this reason, please provide 300 mm of ventilation space next to the side panels (do not install with sides touching walls).



Ventilation slots are added to side panels (on both sides).

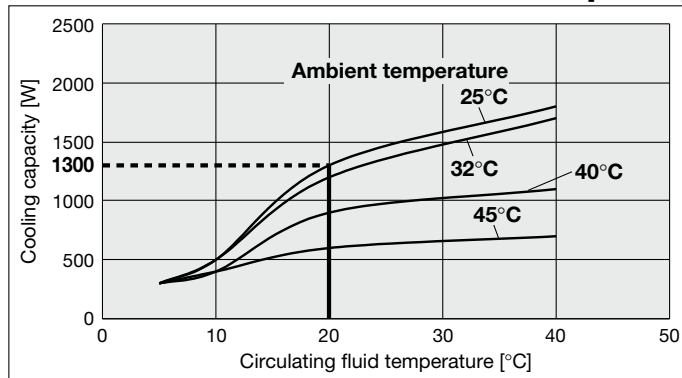
\* If the product is used at an altitude of 1000 meters or higher, the maximum allowable ambient temperature and the cooling capacity decrease. For details, refer to the operation manual.

\* For models with a high-pressure pump mounted (-T), the cooling capacity will decrease by about 300 W from each graph.

## Cooling Capacity

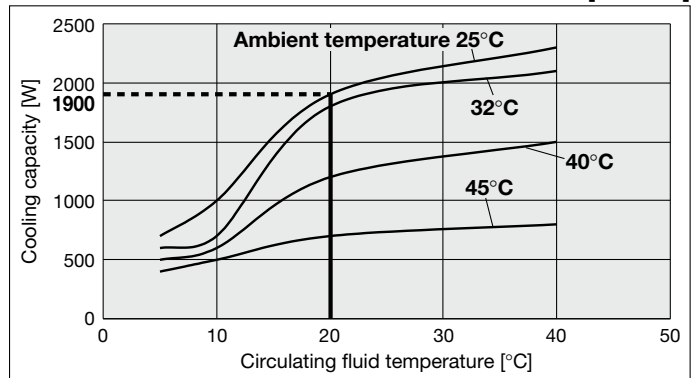
HRSC012-A-20-G

[50/60 Hz]



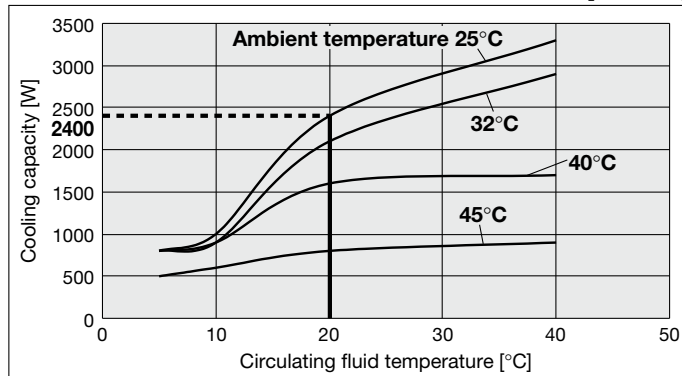
HRSC018-A-20-G

[50/60 Hz]



HRSC024-A-20-G

[50/60 Hz]



# HRSC Series

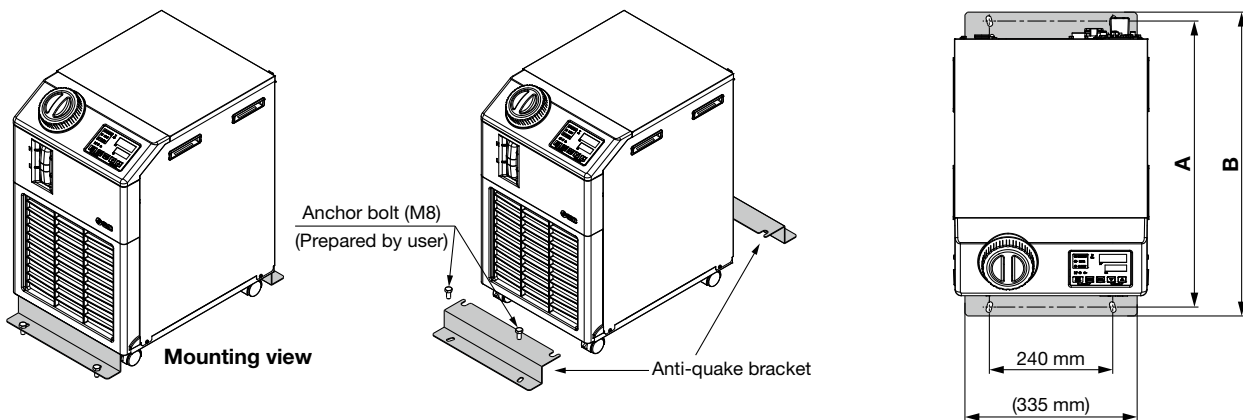
## Optional Accessories

### ① Anti-Quake Bracket

This bracket can be used to reduce product damage in the case of an earthquake. An anchor bolt (M8) suitable for the flooring material should be prepared separately by the user.

Part no. (per unit)	Applicable model	A	B	Plate thickness	Material
HRS-TK001	HRSC012-□□-20	555	(590)	1.6	Zinc steel plate
	HRSC018-□□-20				
	HRSC024-□□-20				
HRS-TK002	HRSC030-□□-20	546	(581)	2.0	Stainless steel
	HRSC040-□□-20				
	HRSC050-□□-20	664	(698)		
HRSC060-□□-20					

\* Anti-quake brackets: 2 pcs./set (enough for 1 unit)



### ② Piping Conversion Fitting (For Air-Cooled Refrigeration)

■ Conversion fitting for circulating fluid + Conversion fitting for drain outlet  
 HRSC012-A□-20, HRSC018-A□-20, HRSC024-A□-20, HRSC030-A□-20, HRSC040-A□-20

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

Part no.	Applicable model
HRS-EP001	G thread conversion fitting set
	HRSC012-A-20
	HRSC018-A-20
HRS-EP002	NPT thread conversion fitting set
	HRSC024-A-20
	HRSC030-A-20
	HRSC040-A-20

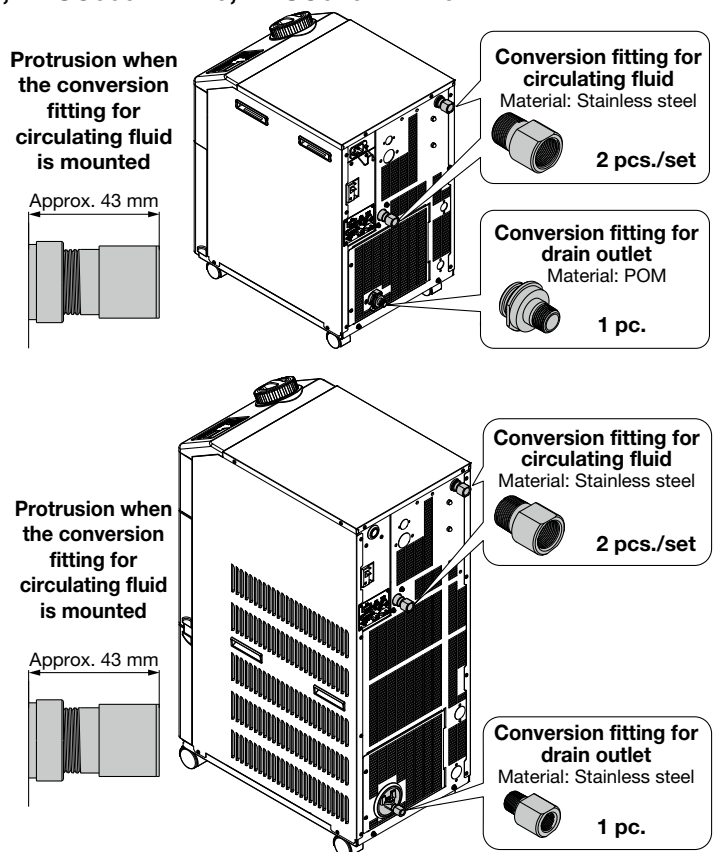
When the options, with automatic fluid fill function "-J", or high-pressure pump mounted "-T" are selected, purchase ③ piping conversion fitting (for option), too.

#### HRSC050-A□-20, HRSC060-A□-20

This fitting changes the port size for circulating fluid from Rc1/2 to G1/2 or NPT1/2, and for drain from Rc1/4 to G1/4 or NPT1/4. It is not necessary to purchase this when pipe thread type F or N is selected in "How to Order" since it is included in the product.

Part no.	Applicable model
HRS-EP009	G thread conversion fitting set
HRS-EP010	NPT thread conversion fitting set

When the option, with automatic fluid fill function "-J", is selected, purchase ③ piping conversion fitting (for option), too.



HRSC012 to 060

HRSC090

HRSC100



# HRSC Series

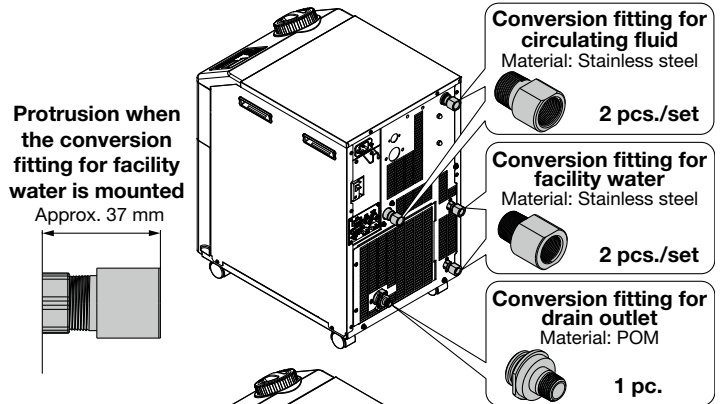
## ② Piping Conversion Fitting (For Water-Cooled Refrigeration)

### ■ Conversion fitting for circulating fluid + Conversion fitting for facility water + Conversion fitting for drain outlet HRSC012-W□-20, HRSC018-W□-20, HRSC024-W□-20, HRSC030-W□-20, HRSC040-W□-20

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

Part no.	Applicable model
<b>HRS-EP003</b> G thread conversion fitting set	HRSC012-W-20
	HRSC018-W-20
	HRSC024-W-20
<b>HRS-EP004</b> NPT thread conversion fitting set	HRSC030-W-20
	HRSC040-W-20

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



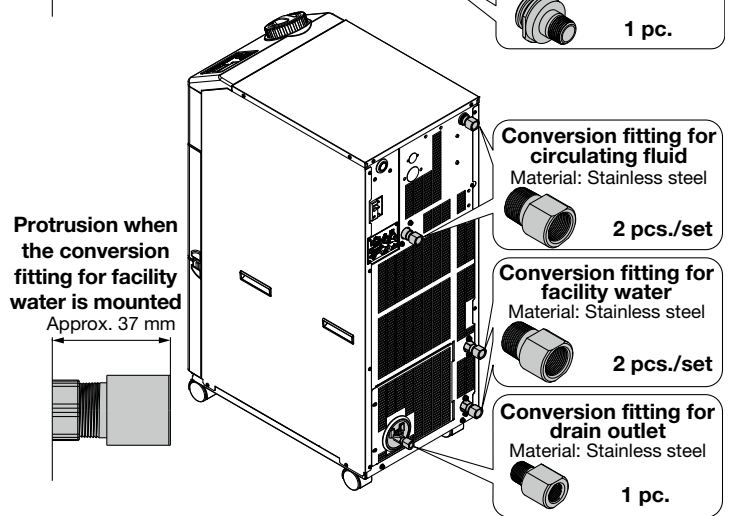
### HRSC050-W□-20, HRSC060-W□-20

This fitting changes the port size for circulating fluid or facility water from Rc1/2 to G1/2 or NPT1/2 and for drain from Rc1/4 to G1/4 or NPT1/4.

It is not necessary to purchase this when pipe thread type F or N is selected in "How to Order" since it is included in the product.

Part no.	Applicable model
<b>HRS-EP011</b> G thread conversion fitting set	HRSC050-W-20
<b>HRS-EP012</b> NPT thread conversion fitting set	HRSC060-W-20

When the option, with automatic fluid fill function "-J", is selected, purchase ③ piping conversion fitting (for option), too.



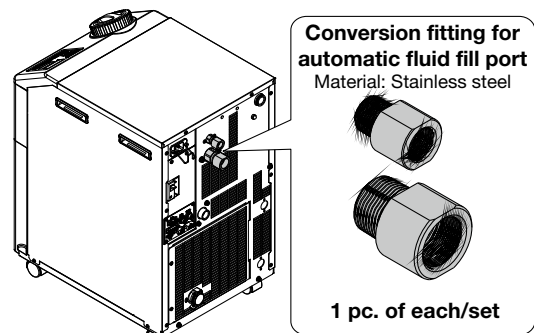
## ③ Piping Conversion Fitting (For Option)

### ■ Conversion fitting for automatic fluid fill port

This fitting changes the port size for the option, with automatic fluid fill function "-J" from Rc3/8, Rc3/4 to G3/8, G3/4 or NPT3/8, NPT3/4.

It is not necessary to purchase this when pipe thread type F or N is selected in "How to Order" since it is included in the product.

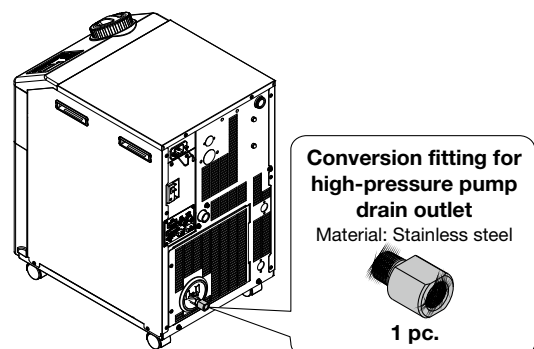
Part no.	Applicable model
<b>HRS-EP005</b> G thread conversion fitting set	HRSC012-□-20-J
	HRSC018-□-20-J
	HRSC024-□-20-J
	HRSC030-□-20-J
<b>HRS-EP006</b> NPT thread conversion fitting set	HRSC040-□-20-J
	HRSC050-□-20-J
	HRSC060-□-20-J



### ■ Conversion fitting for drain outlet

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

Part no.	Applicable model
<b>HRS-EP007</b> G thread conversion fitting	HRSC012-□-20-T
	HRSC018-□-20-T
	HRSC024-□-20-T
	HRSC030-□-20-T
<b>HRS-EP008</b> NPT thread conversion fitting	HRSC040-□-20-T
	HRSC050-□-20*1
	HRSC060-□-20*1

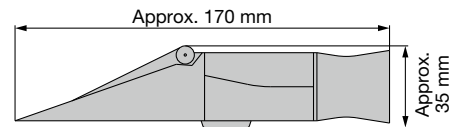


\*1 It is not necessary to purchase this when you purchase the HRS-EP009 to 012 since it is included in the product.

#### ④ Concentration Meter

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

Part no.	Applicable model
<b>HRZ-BR002</b>	HRSC012-□□-20
	HRSC018-□□-20
	HRSC024-□□-20
	HRSC030-□□-20
	HRSC040-□□-20
	HRSC050-□□-20
HRSC060-□□-20	



#### ⑤ Bypass Piping Set

When the circulating fluid goes below the rated flow (7 L/min for the HRSC012, 018, 024, 030, 040 and 23/28 L/min for the HRSC050, 060), cooling capacity will be reduced and the temperature stability will be badly affected. In such a case, use the bypass piping set. A high-pressure pump is also available.

Part no.	Applicable model
<b>HRS-BP001</b>	HRSC012-□□-20
	HRSC018-□□-20
	HRSC024-□□-20
	HRSC030-□□-20

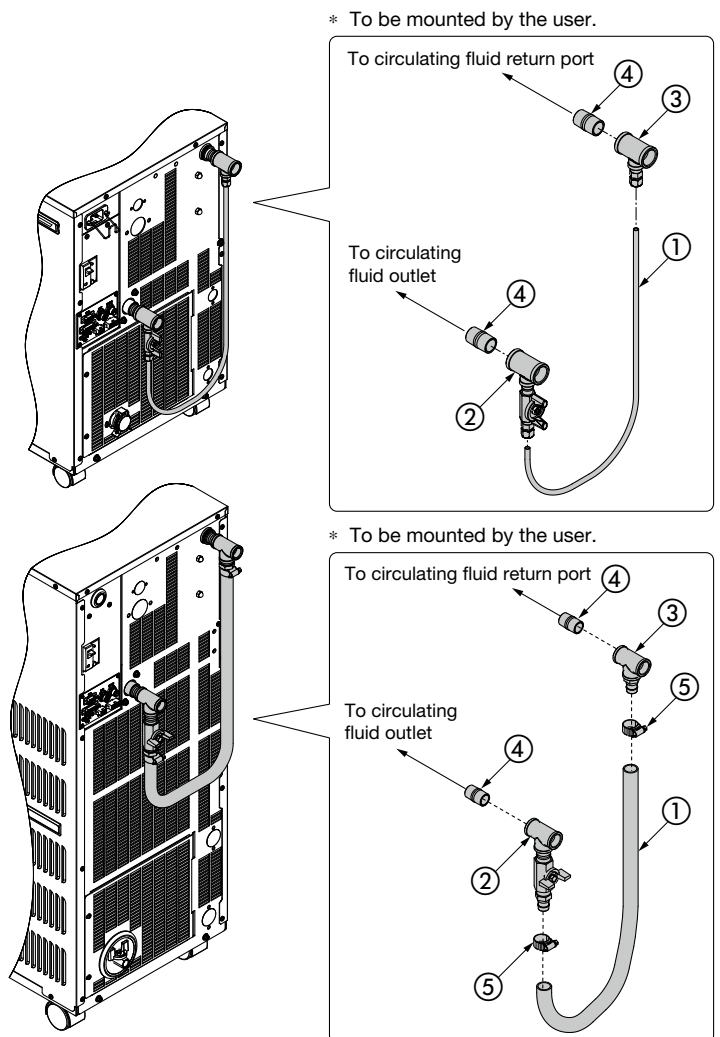
##### Parts List

No.	Description	Fluid contact material	Qty.
①	Bypass tube (Part no.: TL0806)	PFA	1 (Approx. 700 mm)
②	Outlet piping (With ball valve)	Stainless steel	1
③	Return port piping	Stainless steel	1
④	Nipple (Size: 1/2)	Stainless steel	2

Part no.	Applicable model
<b>HRS-BP004</b>	HRSC040-□□-20
	HRSC050-□□-20
	HRSC060-□□-20

##### Parts List

No.	Description	Fluid contact material	Qty.
①	Hose	PVC	1 (Approx. 700 mm)
②	Outlet piping (With ball valve)	Stainless steel	1
③	Return port piping	Stainless steel	1
④	Nipple (Size: 1/2)	Stainless steel	2
⑤	Hose band	—	2



HRSC012 to 060

HRSC090

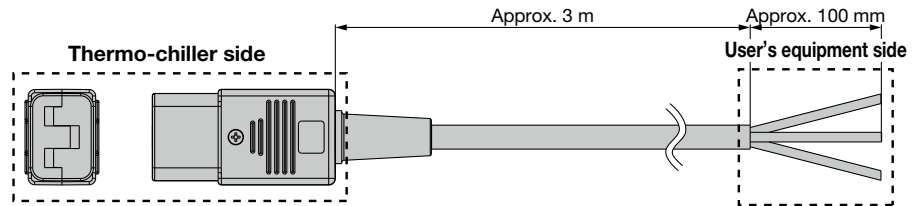
HRSC100

# HRSC Series

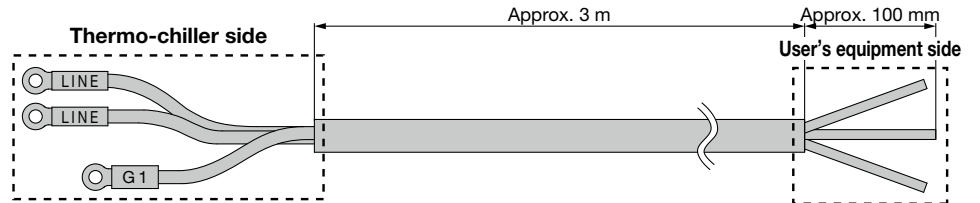
## ⑥ Power Supply Cable

### ■ For single-phase 200 VAC type

Part no.	Applicable model
<b>HRR-CA001</b>	HRSC012-□□-20
	HRSC018-□□-20
	HRSC024-□□-20
	HRSC030-□□-20



Part no.	Applicable model
<b>HRS-CA004</b>	HRSC040-□□-20
	HRSC050-W□-20
	HRSC060-W□-20



\* Not available for the HRSC050/060-A□-20.  
To be prepared by the user.

### ⑦ DI Filter Set

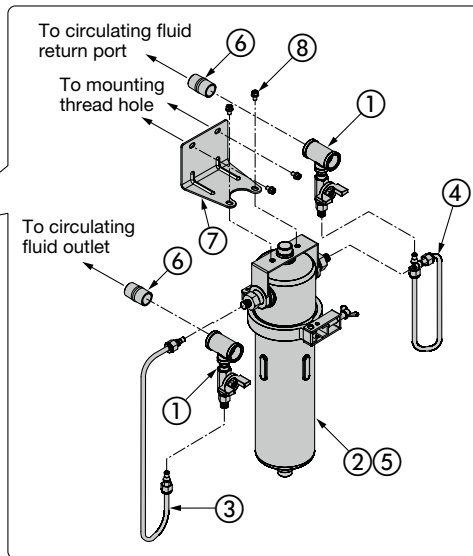
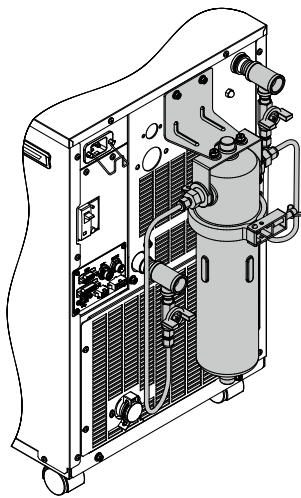
It is possible to retain the level of electric resistance and electric conductivity by flowing the circulating through the ion replacement resin (DI filter). The set parts are in order to install DI filter to bypass circuit and flow the fixed rate of the circulating fluid to DI filter. It is not to control the value of electric resistance and electric conductivity. (Replacement cartridge: HRS-DF001)

#### ■ Stainless steel type

Suitable for locations with dusty atmospheres.

Part no.	Applicable model
<b>HRS-DP001</b>	HRSC012-□□-20
	HRSC018-□□-20
	HRSC024-□□-20
	HRSC030-□□-20
	HRSC040-□□-20
	HRSC050-□□-20
HRSC060-□□-20	

\* Cannot be installed in combination with particle filter set (HRS-PF003, PF004, PF008, PF009).



#### Parts List

No.	Description	Fluid contact material	Qty.
①	Branch line	Stainless steel	2
②	DI filter vessel	Stainless steel	1
③	DI filter inlet tube	PFA, POM	1
④	DI filter outlet tube	PFA, POM	1
⑤	DI filter cartridge (Part no.: HRS-DF001)*1	PP, PE	1
⑥	Nipple (Size: 1/2)	Stainless steel	2
⑦	Mounting bracket	—	1
⑧	Mounting screw (M6 screw, M5 screw)	—	2 pcs. each

\*1 The product should be replaced when it can no longer preserve the electrical resistivity/ electrical conductivity set values.

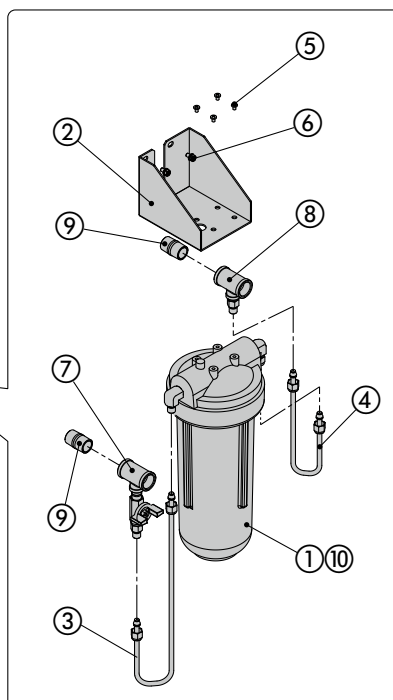
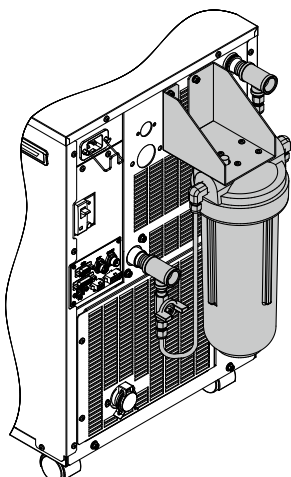
#### ■ Resin type

Lightweight and compact

Can be installed in combination with the HRS-PF001, PF002.

Part no.	Applicable model
<b>HRS-DP002</b>	HRSC012-□□-20
	HRSC018-□□-20
	HRSC024-□□-20
	HRSC030-□□-20
	HRSC040-□□-20
	HRSC050-□□-20
HRSC060-□□-20	

\* Cannot be installed in combination with particle filter set (HRS-PF003, PF004).



#### Parts List

No.	Description	Fluid contact material	Qty.
①	DI filter vessel	PC, PP	1
②	Mounting bracket	—	1
③	DI filter inlet tube	PFA, POM	1
④	DI filter outlet tube	PFA, POM	1
⑤	Tapping screw	—	4
⑥	Mounting screw (M5 screw)	—	2
⑦	Branch line for inlet	Stainless steel	1
⑧	Branch line for outlet	Stainless steel	1
⑨	Nipple (Size: 1/2)	Stainless steel	2
⑩	DI filter cartridge (Part no.: HRS-DF001)*1	PP, PE	1

\*1 The product should be replaced when it can no longer preserve the electrical resistivity/ electrical conductivity set values.

# HRSC Series

## ⑧ Electric Conductivity Sensor Set/Electric Conductivity Control Set

This product can be used to display, maintain, and control the electric conductivity of the circulating fluid (deionized water). The function differs according to the model (Refer to the table below). Refer to the Operation Manual for details.

Part no.	Applicable model
<b>HRS-DI008</b> <b>HRS-DI011</b>	HRSC012-□□-20
	HRSC018-□□-20
	HRSC024-□□-20
	HRSC030-□□-20
	HRSC040-□□-20
	HRSC050-□□-20
HRSC060-□□-20	
<b>HRS-DI009</b>	HRSC012-□□-20
	HRSC018-□□-20
	HRSC024-□□-20
	HRSC030-□□-20

### List of Function

Optional accessories	Description	Electric conductivity display*1, *2	Electric conductivity maintenance	Electric conductivity control	Bypass*3
HRS-DI008	Electric conductivity sensor set	○	×	×	×
HRS-DI009	Electric conductivity control set	○	○	○	○
HRS-DI011	Electric conductivity control set	○	○	○	×

\*1 Display range is 2 to 48  $\mu\text{S}/\text{cm}$ .

\*2 Readout using serial communications (RS-485/RS-232C) can be performed.

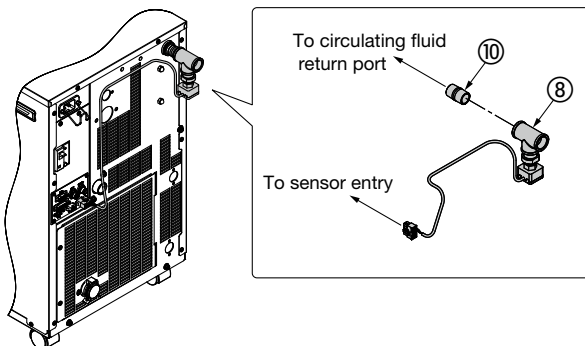
\*3 This function is dedicated for the HRS-BP001 and cannot be used for the HRSC040/050/060.

### Specifications

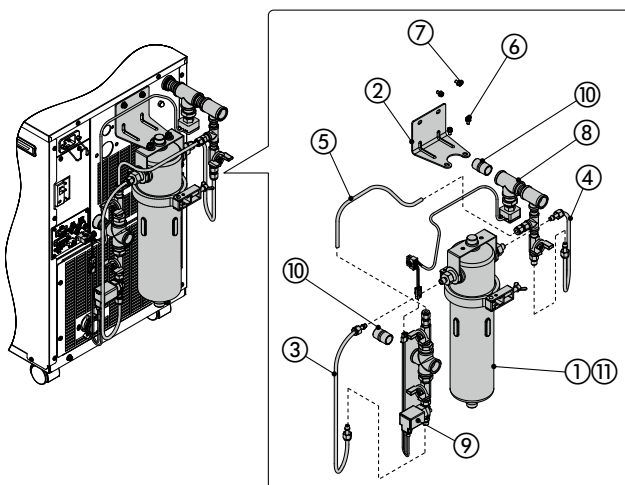
	Electric conductivity sensor set	Electric conductivity control set
Measurement range of electric conductivity	2.0 to 48.0 $\mu\text{S}/\text{cm}$	
Set range of electric conductivity target	—	5.0 to 45.0 $\mu\text{S}/\text{cm}$
Set range of electric conductivity hysteresis	—	2.0 to 10.0 $\mu\text{S}/\text{cm}$
Operating temperature range (Circulating fluid temperature)	5 to 60°C	
Operating pressure range	0.5 MPa or less	
Current consumption*1	100 mA or less	400 mA or less
Installation environment	Indoors	

\*1 The allowable current of HRSC 24 VDC devices will be reduced.

### [Mounting example: HRSC012-A-20 + HRS-DI008]



### [Mounting example: HRSC012-A-20 + HRS-DI009]



### Parts List

No.	Description	Fluid contact material	Qty.		
			DI008	DI009	DI011
①	DI filter vessel	Stainless steel	—	1	—
		PC, PP	—	—	1
②	Mounting bracket	—	1	1	
③	DI filter inlet tube	PFA, POM	—	1	1
④	DI filter outlet tube	PFA, POM	—	1	1
⑤	Bypass tube	PFA	—	1	—
⑥	Mounting screw (M6 screw)	—	—	2	—
⑦	Mounting screw (M5 screw)	—	—	2	6
⑧	Electric conductivity sensor	Stainless steel, PPS	1	1	1
⑨	Solenoid valve for control	Stainless steel, EPDM	—	1	1
⑩	Nipple (Size: 1/2)	Stainless steel	1	2	2
⑪	DI filter cartridge (Part no.: HRS-DF001)*1	PP, PE	—	1	1

\*1 The product should be replaced when it can no longer preserve the electrical conductivity set value.



⑨ Particle Filter Set

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

**HRS-PF008-W075-H**

**PF009**  
**PF003**  
**PF004**

● Filtration

Symbol	Nominal filtration accuracy [μm]	Element part no. for PF008/ PF003 (individual part)	Element part no. for PF009/ PF004 (individual part)
<b>Nil</b>	Without element	—	—
<b>W005</b>	5	EJ202S-005X11	EJ302S-005X11
<b>W075</b>	75	EJ202S-075X11	EJ302S-075X11

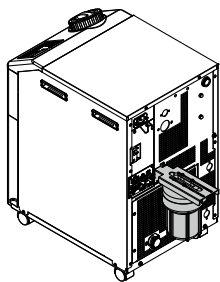
● Accessory

Symbol	Accessory
<b>Nil</b>	None
<b>H</b>	With handle

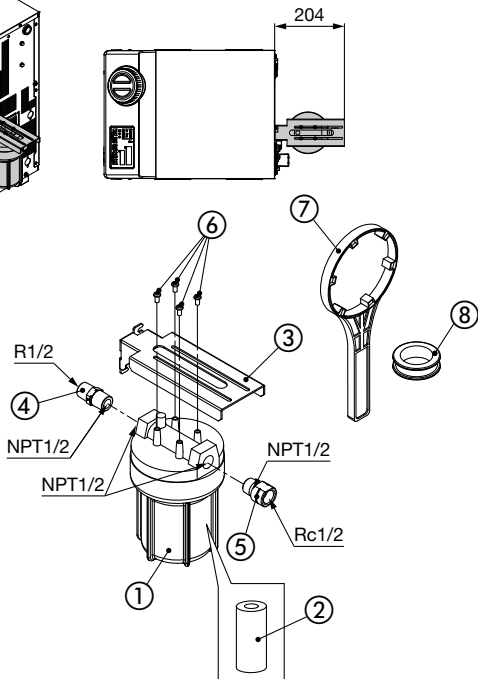
■ For circulating fluid outlet  
[Used to protect your tool]

Part no.	Applicable model
<b>HRS-PF008</b> (Element length) L = 125 mm	HRSC012-□□-20 HRSC040-□□-20 HRSC018-□□-20 HRSC050-□□-20 HRSC024-□□-20 HRSC060-□□-20 HRSC030-□□-20
<b>HRS-PF009</b> (Element length) L = 250 mm	HRSC050-□□-20 HRSC060-□□-20

Mounting view



The following reference drawing shows the HRS-PF009 mounted on the HRSC012 to 024.  
For details, refer to the dimensions or the Operation Manual.

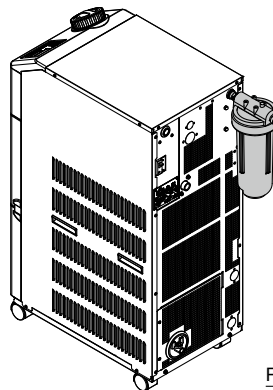


■ For circulating fluid return port  
[Used to protect thermo-chiller]

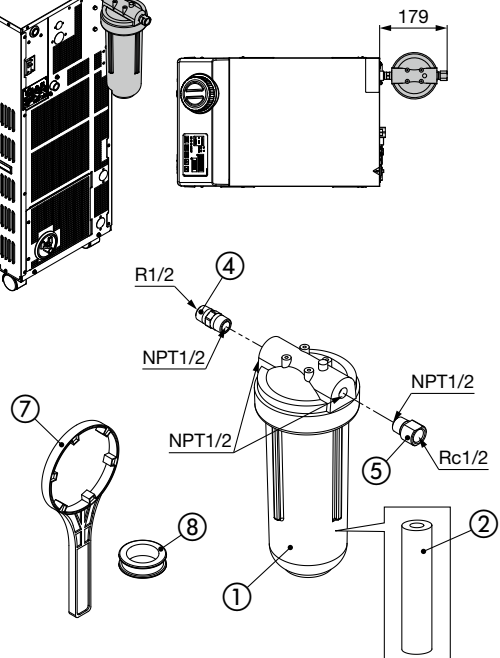
If foreign matter such as scales in the piping enter the circulating fluid, this may cause the pump to malfunction. Therefore, it is strongly recommended to install the particle filter set.

Part no.	Applicable model
<b>HRS-PF003</b> (Element length) L = 125 mm	HRSC012-□□-20 HRSC040-□□-20 HRSC018-□□-20 HRSC050-□□-20 HRSC024-□□-20 HRSC060-□□-20 HRSC030-□□-20
<b>HRS-PF004</b> (Element length) L = 250 mm	HRSC050-□□-20 HRSC060-□□-20

Mounting view



The following reference drawing shows the HRS-PF004 mounted on the HRSC050/060.  
For details, refer to the dimensions or the Operation Manual.



Parts List

No.	Model	Description	Fluid contact material	Qty.	Note
①	—	Body	PP	1	—
②	EJ202S-005X11	Element (Length L = 125 mm)	PP/PE	1	For HRS-PF008/003 The product should be replaced when the pressure drop reaches 0.1 MPa.
	EJ202S-075X11			1	
	EJ302S-005X11	Element (Length L = 250 mm)		1	
	EJ302S-075X11			1	
③	—	Particle filter bracket	—	1	For HRS-PF008/009
④	—	Nipple	Stainless steel	1	Conversion from R to NPT
⑤	—	Extension piece	Stainless steel	1	Conversion from NPT to Rc
⑥	—	Tapping screw	—	4	—
⑦	—	Handle	—	1	When -H is selected
⑧	—	Sealant tape	PTFE	1	—

HRSC012 to 060

HRSC090

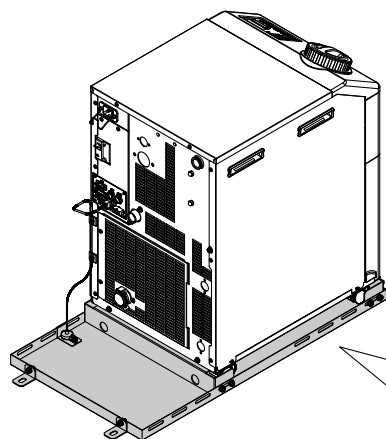
HRSC100

# HRSC Series

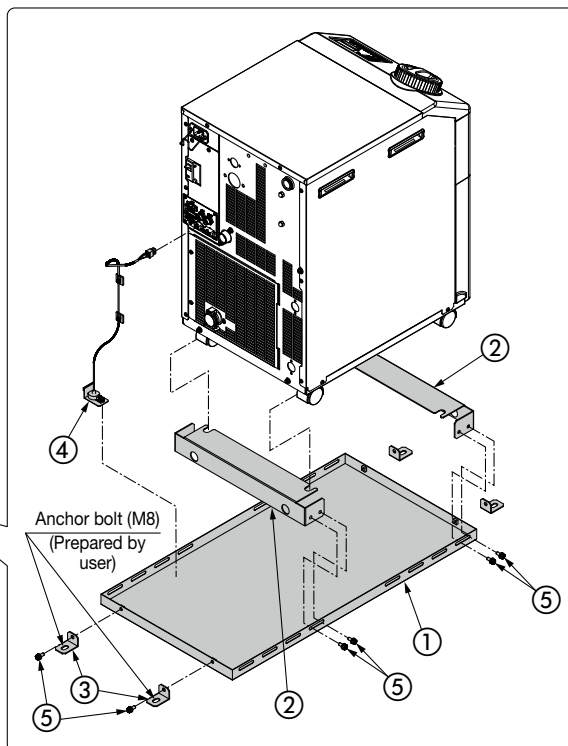
## ⑩ Drain Pan Set (With Water Leakage Sensor)

Drain pan for the thermo-chiller. Liquid leakage from the thermo-chiller can be detected by mounting the attached water leakage sensor. Anchor bolt (M8) suitable for the flooring material should be prepared separately by the user. The current consumption of this product is 25 mA. (Therefore, the allowable current of HRSC 24 VDC devices will be reduced by 25 mA.)

Part no.	Applicable model
<b>HRS-WL001</b>	HRSC012-□□-20
	HRSC018-□□-20
	HRSC024-□□-20
	HRSC030-□□-20



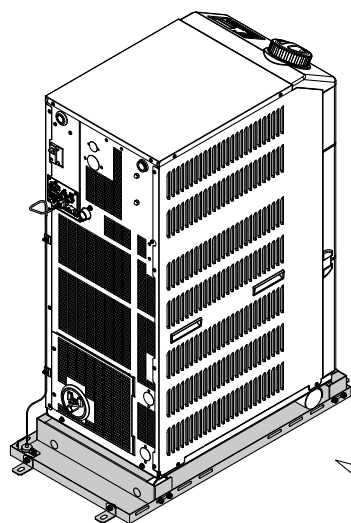
HRSC012/018/024/030



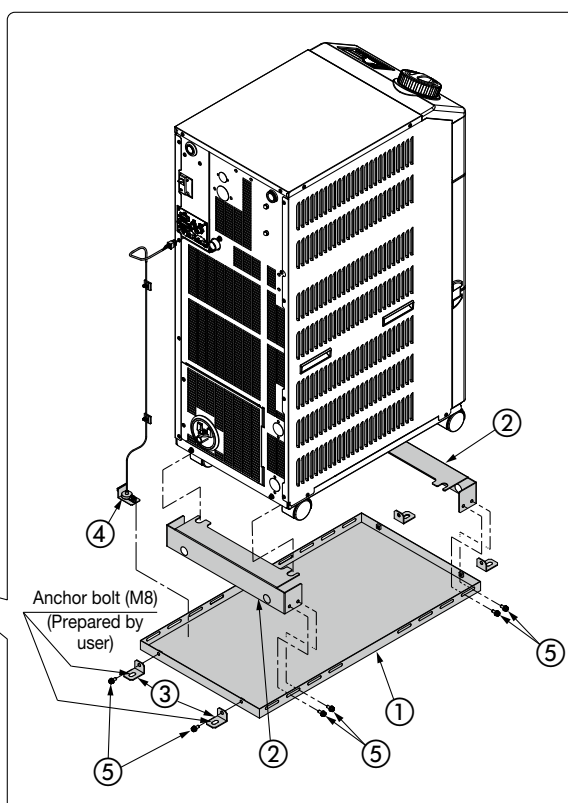
### Parts List

No.	Description
①	Drain pan
②	Thermo-chiller fixing bracket (2 pcs.)
③	Drain pan fixing bracket (4 pcs.)
④	Water leakage sensor
⑤	Bracket fixing screw (M6 screw, 12 pcs.)

Part no.	Applicable model
<b>HRS-WL002</b>	HRSC040-□□-20
	HRSC050-□□-20
	HRSC060-□□-20



HRSC050/060



### Parts List

No.	Description
①	Drain pan
②	Thermo-chiller fixing bracket (2 pcs.)
③	Drain pan fixing bracket (4 pcs.)
④	Water leakage sensor
⑤	Bracket fixing screw (M6 screw, 12 pcs.)

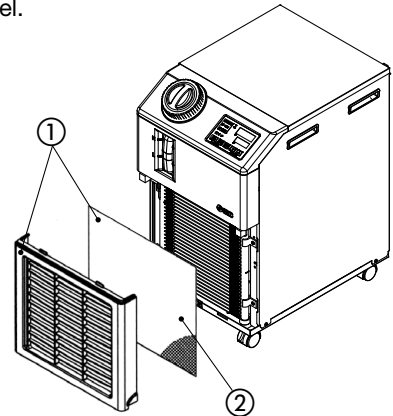
### ⑪ Replacement Type Dustproof Filter Set

A disposable dustproof filter is mounted instead of the dustproof net on the front panel.

Part no.	Applicable model
<b>HRS-FL001</b>	HRSC012-A□-20
	HRSC018-A□-20
	HRSC024-A□-20

#### Parts List

No.	Description	Part no.	Note
①	Replacement type dustproof filter set	HRS-FL001	A front panel with hook-and-loop fastener for holding the filter, 5 filters are included. (No dustproof net is included.)
②	Replacement type dustproof filter	HRS-FL002	5 filters per set Size: 300 x 370

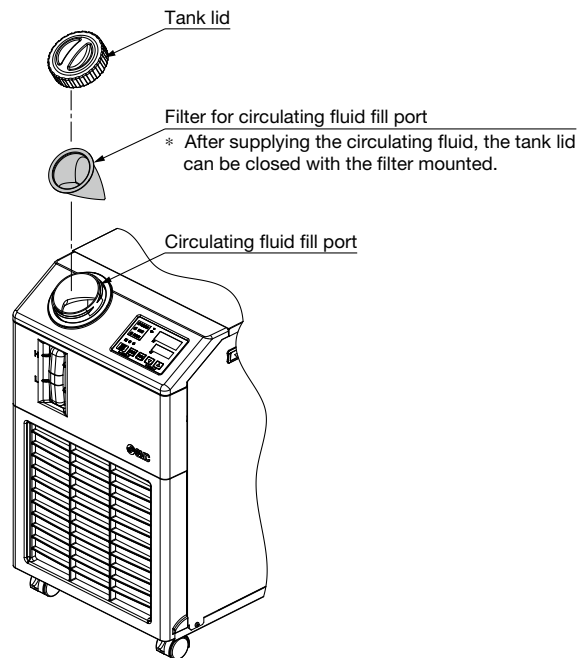


### ⑫ Filter for Circulating Fluid Fill Port

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

#### ■ Filter for circulating fluid fill port HRS-PF007

Material	Stainless steel 304, Stainless steel 316
Mesh size	200



HRSC012 to 060

HRSC090

HRSC100

**Non F-Gas**  
(CO<sub>2</sub> Refrigerant)

# Circulating Fluid Temperature Controller Refrigerated Thermo-chiller

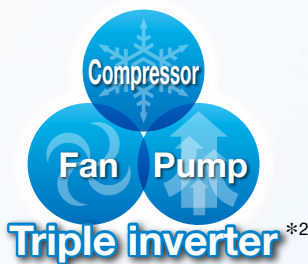
## HRSC090 Series

Power consumption reduced by 49%\*<sup>1</sup>

Outstanding energy saving due to the triple inverter!

GWP = 1 Compliant with each country's refrigerant regulations

Air transport possible



Water-cooled refrigeration

Air-cooled refrigeration



Cooling capacity **9.5 kW**

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

Set temperature range **5°C to 40°C**

Compact, Space saving

Earth leakage breaker (Standard)

Low-noise design <sup>Operating noise</sup> Max. **67 dB**

Max. ambient temperature **45°C**

Indoor use

**Compatible with power supplies in Europe, Asia, Oceania, and North, Central, and South America**

3-phase 380Y/220 to 415Y/240 VAC (50 Hz)

3-phase 380Y/220 to 480Y/277 VAC (60 Hz)

\*<sup>1</sup> Compared with the non-inverter chiller

Conditions: Ambient temperature: 32°C, Circulating fluid temperature: 20°C, Circulating fluid flow rate: 35 L/min@0.3 MPa, 0 kW load: 50%, 9.5 kW load: 50%

\*<sup>2</sup> For water-cooled type, a proportional Valve is used for the facility water flow control instead of a fan.

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## HRSC090 Series



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- Operation Manual Communication function

Click here for details. >>>



HRSC012 to 060

HRSC090

HRSC100



# Non F-Gas (CO<sub>2</sub> Refrigerant) Thermo-chiller

## Air-cooled 400 V Type

### HRSC090 Series



#### How to Order

Air-cooled refrigeration

HRSC 090 - A - 40 -

Cooling capacity

090 9.5 kW

Cooling method

A Air-cooled refrigeration

Pipe thread type

Nil	Rc
F	G (with Rc-G conversion fitting)
N	NPT (with Rc-NPT conversion fitting)

Option

Nil	None
J	With automatic fluid fill function

Power supply

40	3-phase 380Y/220 to 415Y/240 VAC (50 Hz) 3-phase 380Y/220 to 480Y/277 VAC (60 Hz)
----	--



#### Specifications

Model		HRSC090-A-40	
Cooling method		Air-cooled refrigeration	
Refrigerant		R744 (CO <sub>2</sub> , GWP: 1)	
Refrigerant charge	[kg]	0.83	
Control method		PID control	
Ambient temperature/Humidity/Altitude/Installation environment <sup>*1, 10</sup>		Temperature: 5 to 45°C, Humidity: 30 to 70%, Altitude: less than 3000 m, Environment: Indoors	
Circulating fluid system	Circulating fluid <sup>*2</sup>	Tap water, 15% Ethylene glycol aqueous solution, Deionized water	
	Set temperature range <sup>*1</sup>	[°C] 5 to 40	
	Cooling capacity <sup>*3, 10</sup>	[kW] 9.5	
	Heating capacity <sup>*4</sup>	[kW] 2.5	
	Temperature stability <sup>*5</sup>	[°C] ±0.1	
	Pump capacity	Rated flow (Outlet) <sup>*6</sup>	45 (0.5 MPa) [L/min]
		Maximum flow rate	60 [L/min]
		Maximum pump head	50 [m]
	Settable pressure range <sup>*7</sup>	[MPa] 0.1 to 0.5	
	Minimum operating flow rate <sup>*8</sup>	[L/min] 20	
	Tank capacity	[L] Approx.18	
Circulating fluid outlet, circulating fluid return port		Rc1 (Symbol F: G1, Symbol N: NPT1)	
Tank drain port		Rc1/4 (Symbol F: G1/4, Symbol N: NPT1/4)	
Fluid contact material		Stainless steel, Copper (Heat exchanger brazing), Brass, Bronze, Carbon, Ceramic, PE, PVC, POM, PTFE, PP, PA, NBR, EPDM, FKM	
Electrical system	Power supply		
	3-phase 380Y/220 to 415Y/240 VAC (50 Hz) Allowable voltage range ±10% (No continuous voltage fluctuation) 3-phase 380Y/220 to 480Y/277 VAC (60 Hz) Allowable voltage range +4%, -10% (Max. voltage less than 500Y/289 V and no continuous voltage fluctuation)		
	Earth <sup>*8</sup> leakage breaker (Standard)	Rated current [A]	20
		Sensitivity of leak current [mA]	30
	Rated operating current <sup>*5</sup> [A]		9.5
Rated power consumption <sup>*5</sup> [kW (kVA)]		6.4 (6.8)	
Noise level (Front 1 m/Height 1 m) <sup>*5</sup> [dB (A)]		67	
Accessories		Alarm code list stickers 2 pcs. (English 1 pc./Japanese 1 pc.), Operation Manual (for installation/operation) 2 pcs. (English 1 pc./Japanese 1 pc.), Y-strainer (40 meshes) 25A, Barrel nipple 25A, Anchor bolt fixing brackets 2 pcs. (including 4 M10 bolts) <sup>*11</sup>	
Weight <sup>*9</sup>	[kg]	Approx. 137	

\*1 Use a 15% ethylene glycol aqueous solution if operating in a place where the ambient temperature and/or circulating fluid temperature is 10°C or less.

\*2 Use fluid in condition below as the circulating fluid.

Tap water: please refer to "Specific Product Precautions". (JRA GL-02-1994)

15% ethylene glycol aqueous solution: diluted by tap water in condition above without any additives such as antiseptics.

Deionized water: Electric conductivity 1 μS/cm or higher (Electric resistivity 1 MΩ·cm or lower)

\*3 ① Ambient temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid temperature: 20°C, ④ Circulating fluid flow rate: Rated flow, ⑤ Power supply: 400 VAC

\*4 ① Ambient temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid flow rate: Rated flow, ④ Power supply: 400 VAC

\*5 ① Ambient temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid temperature: 20°C, ④ Load: Same as the cooling capacity,

⑤ Circulating fluid flow rate: Rated flow, ⑥ Power supply: 400 VAC, ⑦ Piping length: Shortest

\*6 The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C

\*7 With the pressure control mode by inverter. When the pressure control mode is not used, the pump power frequency set mode can be used.

\*8 Fluid flow rate to maintain the cooling capacity and the temperature stability. If the actual flow rate is lower than this, install a bypass piping.

\*9 Weight in the dry state without circulating fluids

\*10 If the product is used at an altitude of 1000 meters or higher, the maximum allowable ambient temperature and the cooling capacity decrease. For details, refer to the operation manual.

\*11 The anchor bolt fixing brackets (including 4 M10 bolts) are used for fixing to wooden skids when packaging the thermo-chiller. No anchor bolt is included.

# Non F-Gas (CO<sub>2</sub> Refrigerant) Thermo-chiller

## Water-cooled 400 V Type

### HRSC090 Series



#### How to Order

Water-cooled refrigeration

HRSC 090 - W [ ] - 40 - [ ]

Cooling capacity  
090 11.0 kW

Cooling method  
W Water-cooled refrigeration

Pipe thread type

Nil	Rc
F	G (with Rc-G conversion fitting)
N	NPT (with Rc-NPT conversion fitting)

Option

Nil	None
J	With automatic fluid fill function

Power supply

40	3-phase 380Y/220 to 415Y/240 VAC (50 Hz) 3-phase 380Y/220 to 480Y/277 VAC (60 Hz)
----	--



#### Specifications

Model		HRSC090-W-40		
Cooling method		Water-cooled refrigeration		
Refrigerant		R744 (CO <sub>2</sub> , GWP: 1)		
Refrigerant charge [kg]		1.07		
Control method		PID control		
Ambient temperature/Humidity/Altitude/Installation environment*1		Temperature: 5 to 45°C, Humidity: 30 to 70%, Altitude: less than 3000 m, Environment: Indoors		
Circulating fluid system	Circulating fluid*2		Tap water, 15% Ethylene glycol aqueous solution, Deionized water	
	Set temperature range*1 [°C]		5 to 40	
	Cooling capacity*3 [kW]		11.0	
	Heating capacity*4 [kW]		2.5	
	Temperature stability*5 [°C]		±0.1	
	Pump capacity	Rated flow (Outlet)*6 [L/min]		45 (0.5 MPa)
		Maximum flow rate [L/min]		60
		Maximum pump head [m]		50
	Settable pressure range*7 [MPa]		0.1 to 0.5	
	Minimum operating flow rate*8 [L/min]		20	
Tank capacity [L]		Approx. 18		
Circulating fluid outlet, circulating fluid return port		Rc1 (Symbol F: G1, Symbol N: NPT1)		
Tank drain port		Rc1/4 (Symbol F: G1/4, Symbol N: NPT1/4)		
Fluid contact material		Stainless steel, Copper (Heat exchanger brazing), Brass, Bronze, Carbon, Ceramic, PE, PVC, POM, PTFE, PP, PA, NBR, EPDM, FKM		
Facility water system	Temperature range [°C]		10 to 40	
	Pressure range [MPa]		0.3 to 0.5	
	Required flow [L/min]		25	
	Facility water pressure differential [MPa]		0.3 or more	
	Port size		Rc1/2 (Symbol F: G1/2, Symbol N: NPT1/2)	
Fluid contact material		Stainless steel, Copper (Heat exchanger brazing), EPDM		
Electrical system	Power supply		3-phase 380Y/220 to 415Y/240 VAC (50 Hz) Allowable voltage range ±10% (No continuous voltage fluctuation) 3-phase 380Y/220 to 480Y/277 VAC (60 Hz) Allowable voltage range +4%, -10% (Max. voltage less than 500Y/289 V and no continuous voltage fluctuation)	
	Earth leakage breaker (Standard)	Rated current [A]	20	
		Sensitivity of leak current [mA]	30	
	Rated operating current*5 [A]		9.2	
	Rated power consumption*5 [kW (kVA)]		6.2 (6.6)	
Noise level (Front 1 m/Height 1 m) [dB (A)]		65		
Accessories		Alarm code list stickers 2 pcs. (English 1 pc./Japanese 1 pc.), Operation Manual (for installation/operation) 2 pcs. (English 1 pc./Japanese 1 pc.), Y-strainer (40 meshes) 25A, Barrel nipple 25A, Anchor bolt fixing brackets 2 pcs. (including 4 M10 bolts)*10		
Weight*9 [kg]		Approx. 135		

\*1 Use a 15% ethylene glycol aqueous solution if operating in a place where the ambient temperature and/or circulating fluid temperature is 10°C or less.

\*2 Use fluid in condition below as the circulating fluid.

Tap water: please refer to "Specific Product Precautions". (JRA GL-02-1994)

15% ethylene glycol aqueous solution: diluted by tap water in condition above without any additives such as antiseptics.

Deionized water: Electric conductivity 1 μS/cm or higher (Electric resistivity 1 MΩ·cm or lower)

\*3 ① Facility water temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid temperature: 20°C, ④ Circulating fluid flow rate: Rated flow, ⑤ Power supply: 400 VAC

\*4 ① Facility water temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid flow rate: Rated flow, ④ Power supply: 400 VAC

\*5 ① Facility water temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid temperature: 20°C, ④ Load: Same as the cooling capacity,

⑤ Circulating fluid flow rate: Rated flow, ⑥ Power supply: 400 VAC, ⑦ Piping length: Shortest

\*6 The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C

\*7 With the pressure control mode by inverter. When the pressure control mode is not used, the pump power frequency set mode can be used.

\*8 Fluid flow rate to maintain the cooling capacity and the temperature stability. If the actual flow rate is lower than this, install a bypass piping.

\*9 Weight in the dry state without circulating fluids

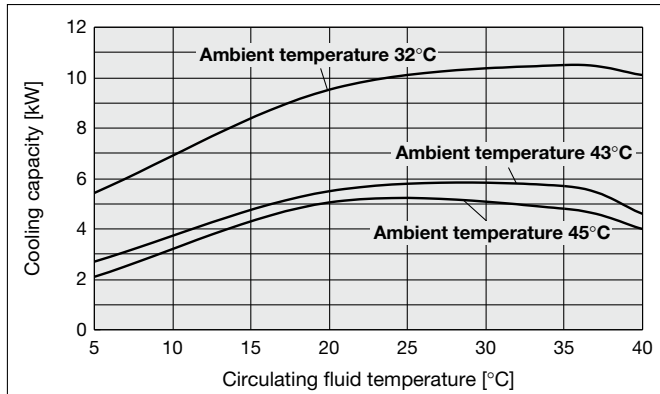
\*10 The anchor bolt fixing brackets (including 4 M10 bolts) are used for fixing to wooden skids when packaging the thermo-chiller. No anchor bolt is included.

# HRSC090 Series

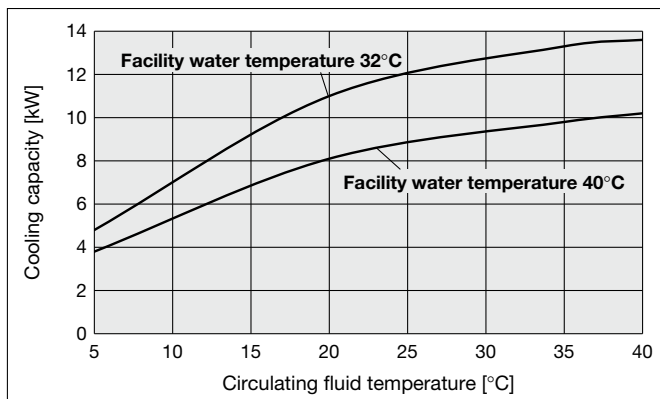
## Cooling Capacity

\* If the product is used at an altitude of 1000 meters or higher, the maximum allowable ambient temperature and the cooling capacity decrease. For details, refer to the operation manual.

### HRSC090-A□-40-□

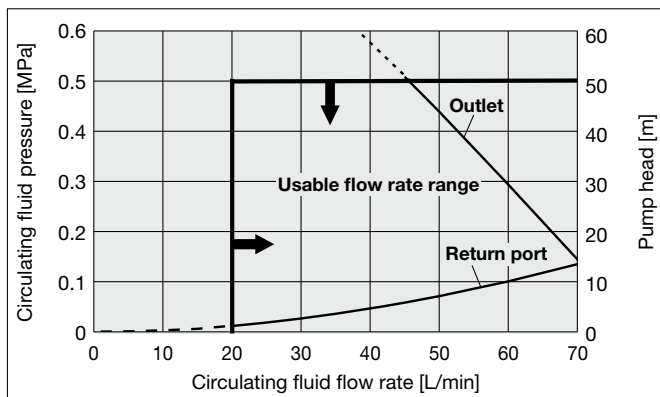


### HRSC090-W□-40-□



## Pump Capacity

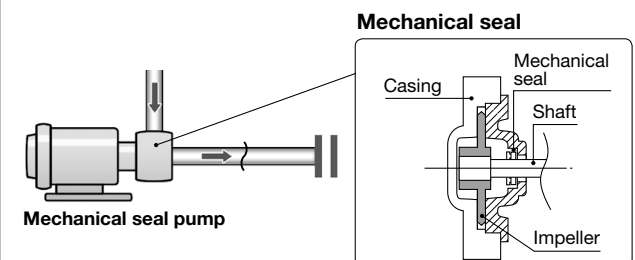
### HRSC090-□□-40-□



## ⚠ Caution

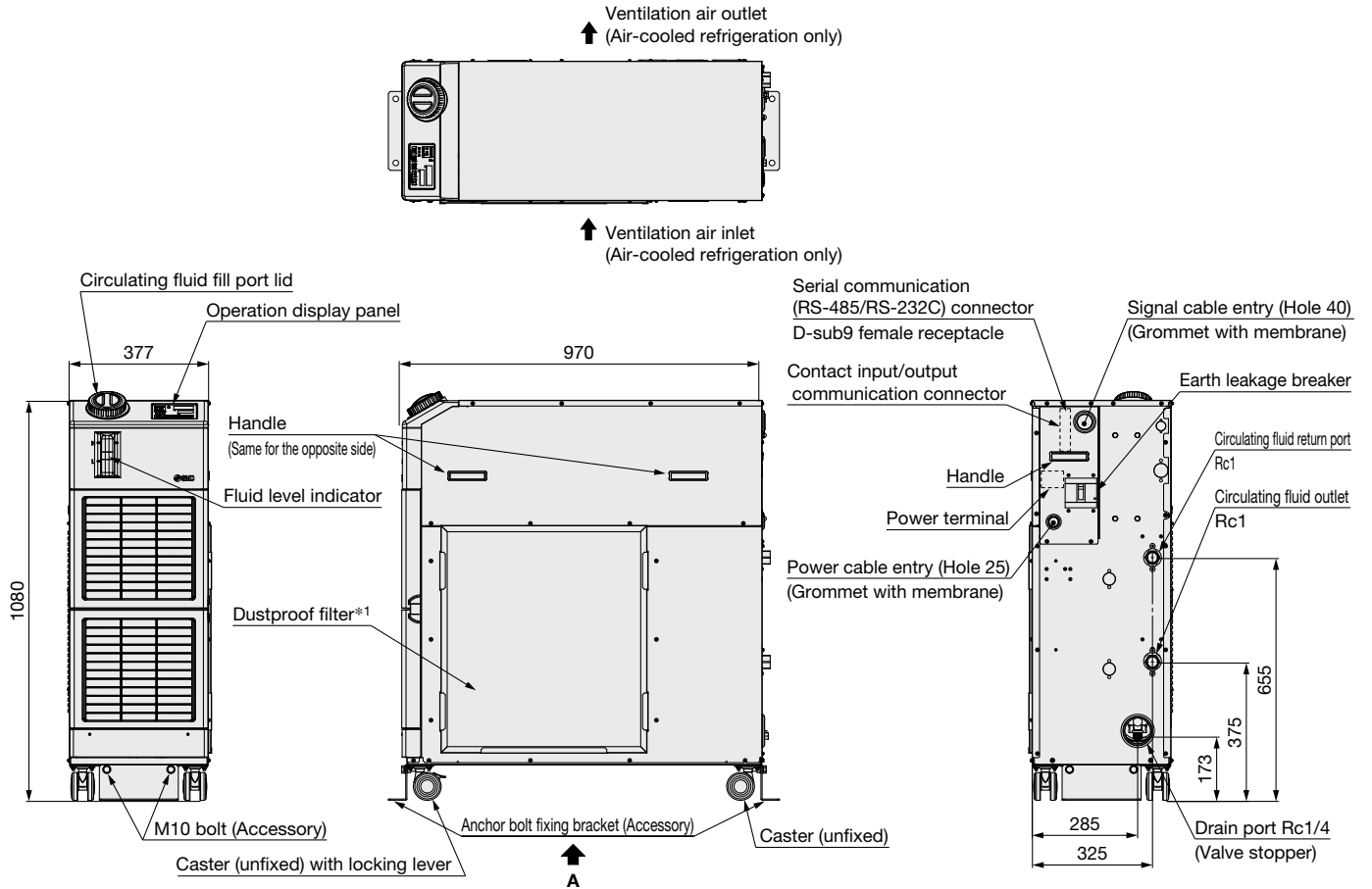
### Mechanical Seal Pump

The pump used for the thermo-chiller HRSC090 series uses a mechanical seal with the fixed ring and rotary ring used for the shaft seal part. If foreign matter enter the gap between the seals, this may cause a trouble such as leakage from the seal part or pump lock. Therefore, it is strongly recommended to install the particle filter in the return piping of the chiller.



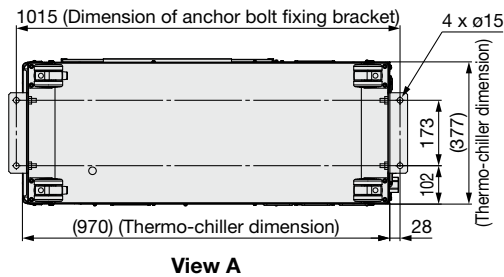
**Dimensions**

**HRSC090-□-40**

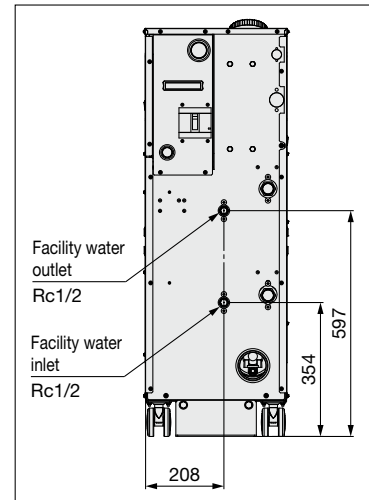


\*1 The water-cooled refrigeration type is not equipped with a dustproof filter.

**Anchor bolt fixing position**

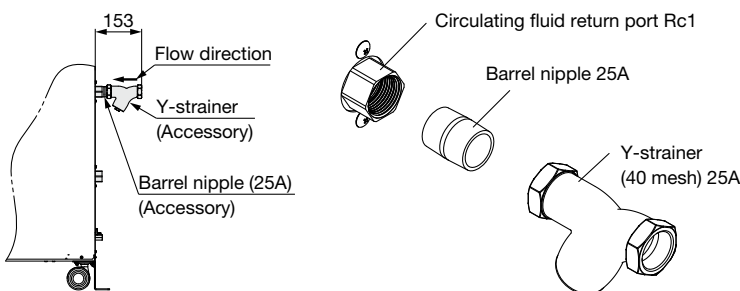


**Water-cooled refrigeration**



**Accessory: Y-strainer mounting view**

\* Mount it by yourself on the circulating fluid return port.



HRSC012 to 060

HRSC090

HRSC100

# HRSC090 Series Options

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

**J** Option symbol

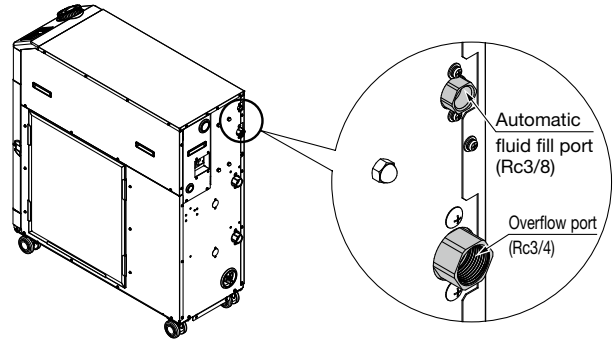
## With Automatic Fluid Fill Function

HRSC090-□□-40-J

● With automatic fluid fill function

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

Applicable model	HRSC090-□□-40-J
Fluid fill method	Built-in solenoid valve for automatic water fill
Fluid fill pressure [MPa]	0.2 to 0.5
Feed water temperature [°C]	5 to 40





# HRSC090 Series Optional Accessories

## ① Piping Conversion Fitting

This is a fitting to change the port from Rc to G or NPT.

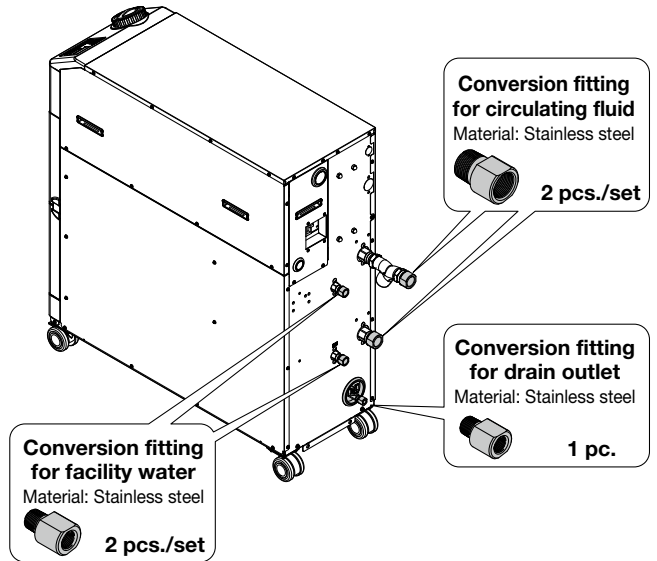
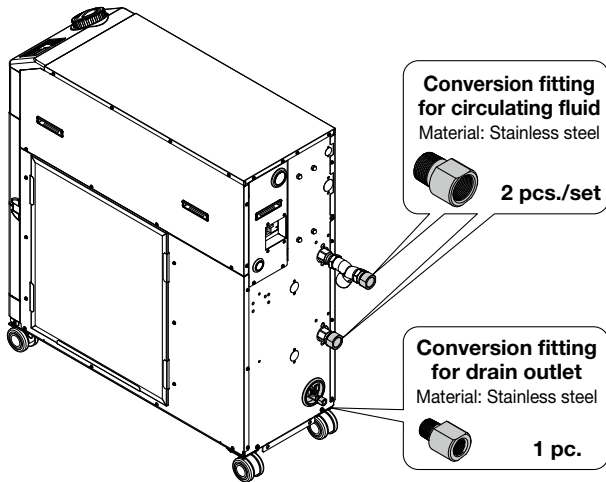
· Circulating fluid outlet, Circulating fluid return port Rc1 → NPT1 or G1

· Drain port Rc1/4 → NPT1/4 or G1/4

(It is not necessary to purchase this when pipe thread type F or N is selected in “How to Order” since it is included in the product.)

Part no.	Contents	Applicable model
<b>HRS-EP018</b>	NPT thread conversion fitting set	<b>HRSC090-A-40</b>
<b>HRS-EP019</b>	G thread conversion fitting set	

Part no.	Contents	Applicable model
<b>HRS-EP022</b>	NPT thread conversion fitting set	<b>HRSC090-W-40</b>
<b>HRS-EP023</b>	G thread conversion fitting set	



When option J (With automatic fluid fill function) is included, use the following part numbers.

· Automatic fluid fill port Rc3/8 → NPT3/8 or G3/8

· Overflow port Rc3/4 → NPT3/4 or G3/4

\* The conversion fittings for circulating fluid outlet/return port, drain port, facility water inlet/outlet (for water-cooled refrigeration) are also included.

Part no.	Contents	Applicable model
<b>HRS-EP020</b>	NPT thread conversion fitting set	<b>HRSC090-A-40-J</b>
<b>HRS-EP021</b>	G thread conversion fitting set	

Part no.	Contents	Applicable model
<b>HRS-EP024</b>	NPT thread conversion fitting set	<b>HRSC090-W-40-J</b>
<b>HRS-EP025</b>	G thread conversion fitting set	

## ② Bypass Piping Set

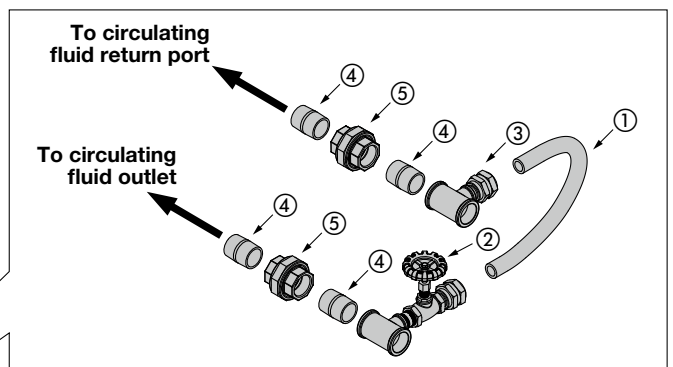
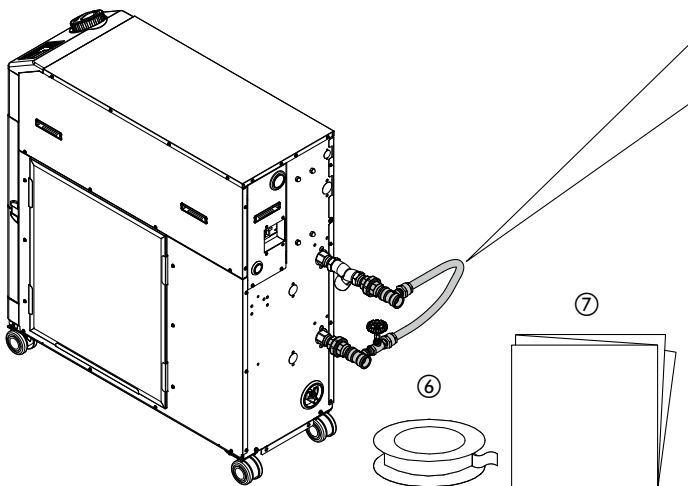
When the circulating fluid goes below the minimum operating flow rate (as shown below), cooling capacity will be reduced and the temperature stability will be badly affected. Use the bypass piping set to ensure a circulating fluid flow rate of the minimum operating flow rate or more.

### Bypass Piping Set

Part no.	Applicable model	Minimum operating flow rate [L/min]
<b>HRS-BP005</b>	<b>HRSC090-□□-40</b>	20

### Bypass Piping Set (Stainless Steel)

Part no.	Applicable model	Minimum operating flow rate [L/min]
<b>HRS-BP011</b>	<b>HRSC090-□□-40</b>	20



### Parts List

No.	Description	Fluid contact material		Qty.
		<b>HRS-BP005</b>	<b>HRS-BP011</b>	
①	Hose (I.D.: 15 mm)	PVC	PVC	1 (Approx. 700 mm)
②	Outlet piping assembly (With globe valve)	Stainless steel, Brass, Bronze	Stainless steel	1
③	Return piping assembly	Stainless steel, Brass	Stainless steel	1
④	Nipple (Size: 1 inch)	Stainless steel	Stainless steel	4
⑤	Union (Size: 1 inch)	Stainless steel	Stainless steel	2
⑥	Sealant tape	PTFE	PTFE	1
⑦	Operation Manual	—	—	1

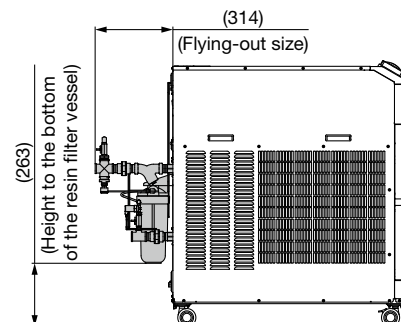
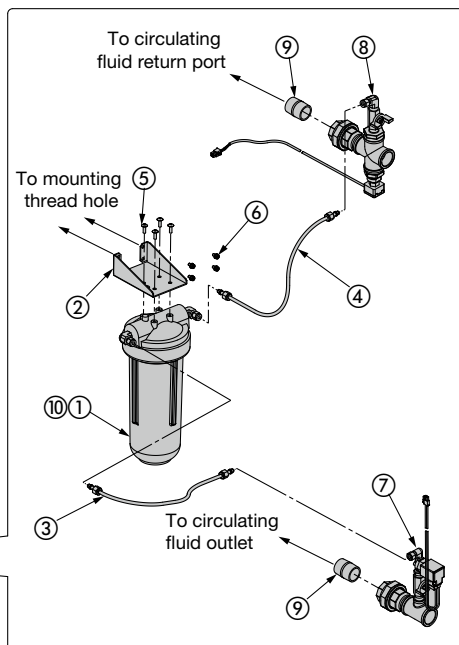
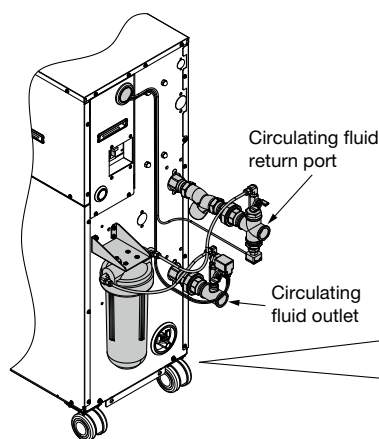
# HRSC090 Series

## ③ Electric Conductivity Control Set

The set indicates and controls the electric conductivity of the circulating fluid. Refer to the Operation Manual for details.

Part no.	Applicable model
HRS-DI007	HRSC090-□□-□

Measurement range of electric conductivity	2.0 to 48.0 $\mu\text{S}/\text{cm}$
Set range of electric conductivity target	5.0 to 45.0 $\mu\text{S}/\text{cm}$
Set range of electric conductivity hysteresis	2.0 to 10.0 $\mu\text{S}/\text{cm}$
Operating temperature range (Circulating fluid temperature)	5 to 60°C
Power consumption	400 mA or less



### Parts List

No.	Description	Fluid contact material	Qty.
①	DI filter vessel	PC, PP	1
②	Mounting bracket	—	1
③	DI filter inlet tube	PFA, POM	1
④	DI filter outlet tube	PFA, POM	1
⑤	Tapping screw (M5 screw)	—	4
⑥	Mounting screw (M5 screw)	—	4
⑦	DI control piping assembly	Stainless steel, EPDM	1
⑧	DI sensor assembly	Stainless steel, PPS	1
⑨	Nipple (Size: 1 inch)	Stainless steel	2
⑩	DI filter cartridge (Part no.: HRS-DF001)*1	PP, PE	1

\*1 The product should be replaced when it can no longer preserve the electrical conductivity set value.

## ④ Particle Filter Set

Removes foreign matter in the circulating fluid. If foreign matter such as scales in the piping enter the circulating fluid, this may cause the pump to malfunction. Therefore, it is strongly recommended to install the particle filter set. This set cannot be directly connected to the thermo-chiller. Install it in the user's piping system. For details, refer to the Operation Manual.

### Particle Filter Set

HRS-PF005-**H**

#### Accessory

Symbol	Accessory
Nil	None
H	With handle

Fluid	Tap water
Max. operating pressure	0.65 MPa
Operating temperature range	5 to 35°C
Nominal filtration accuracy	5 $\mu\text{m}$
Installation environment	Indoors

### Parts List

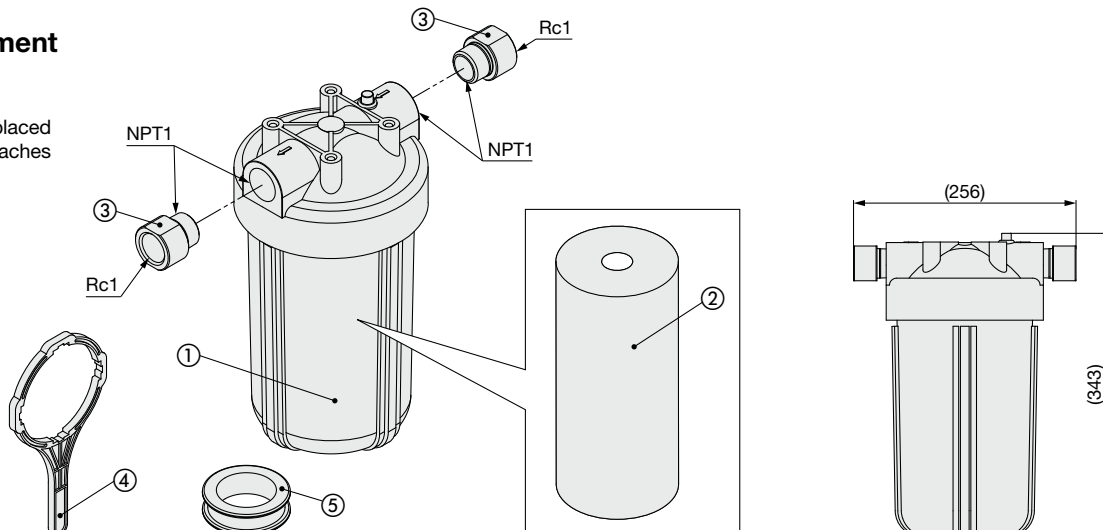
No.	Description	Material	Qty.	Note
①	Body	PC, PP	1	—
②	Element*1	PP	1	—
③	Extension piece	Stainless steel	2	Conversion from NPT to Rc
④	Handle	—	1	When -H is selected
⑤	Sealant tape	PTFE	1	—

\*1 The product should be replaced when the pressure drop reaches 0.1 MPa.

### Replacement Element

HRS-PF006

The product should be replaced when the pressure drop reaches 0.1 MPa.

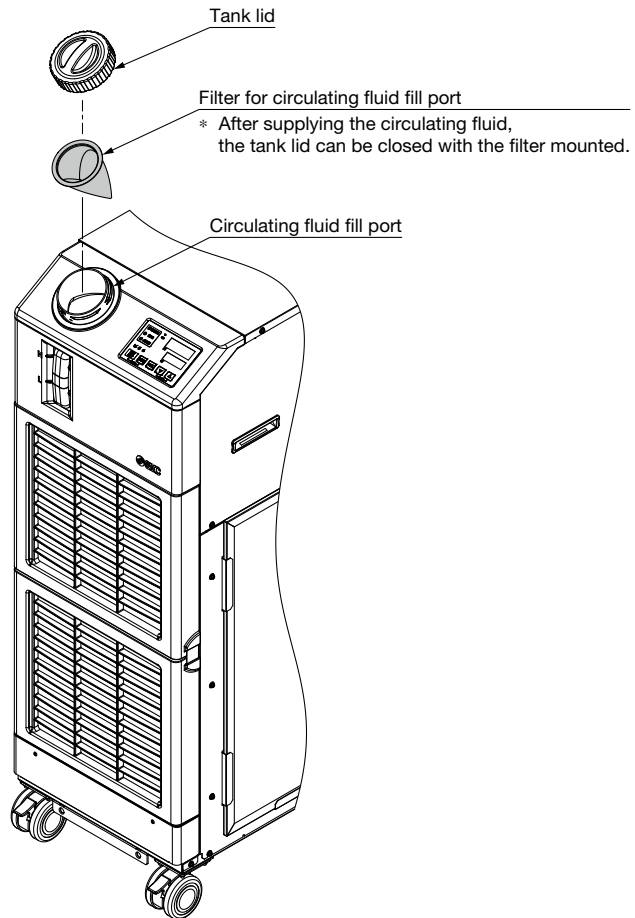


### ⑤ Filter for Circulating Fluid Fill Port

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

#### ■ Filter for circulating fluid fill port HRS-PF007

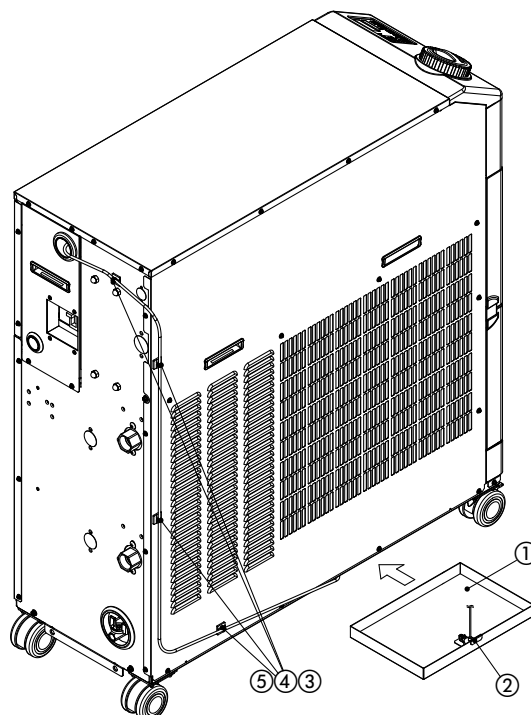
Material	Stainless steel 304, Stainless steel 316
Mesh size	200



### ⑥ Drain Pan Set (With Water Leakage Sensor)

Drain pan for the thermo-chiller. Liquid leakage from the thermo-chiller can be detected by mounting the attached water leakage sensor. Align the drain pan with the hole in the bottom of the thermo-chiller for installation.

Part no.	Applicable model
HRS-WL003	HRSC090-□□-40



#### Parts List

No.	Description
①	Drain pan
②	Water leakage sensor
③	Extension cable
④	Binding band (4 pcs.)
⑤	Cable fixture (4 pcs.)

**Non F-Gas**  
(CO<sub>2</sub> Refrigerant)

# Circulating Fluid Temperature Controller Refrigerated Thermo-chiller

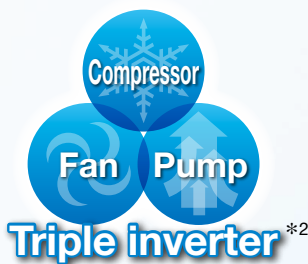
## HRSC100 Series

Power consumption reduced by 45%\*<sup>1</sup>

Outstanding energy saving due to with the triple inverter!

GWP = 1 Compliant with each country's refrigerant regulations

Air transport possible



Cooling capacity **10 kW**

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

Compact, Space saving

Outdoor installation, Splashproof type (IPX4)\*<sup>3</sup>

Earth leakage breaker (Standard)

Low-noise design <sup>Operating noise</sup> Max. **69 dB**

Maintenance-free pump

A mechanical sealless immersion pump is used.  
No need to replace the seal → Reduced maintenance labor

Ambient temperature **5°C to 45°C**

(For the air-cooled type)

- \*<sup>1</sup> Compared with the non-inverter chiller  
Conditions: Ambient temperature: 32°C, Circulating fluid temperature: 20°C,  
Circulating fluid flow rate: 35 L/min@0.3 MPa, 0 kW load: 50%, 10.5 kW load: 50%
- \*<sup>2</sup> For water-cooled type, a proportional Valve is used for the facility water flow control instead of a fan.
- \*<sup>3</sup> For unexpected natural phenomena, such as stormy weather exceeding the IPX4 level, make sure to take additional protective measures.

**Compatible with power supplies in Europe, Asia, Oceania, and North, Central, and South America**

3-phase 380Y/220 to 415Y/240 VAC (50 Hz)  
3-phase 380Y/220 to 480Y/277 VAC (60 Hz)

# CONTENTS

## HRSC100 Series



### Non F-Gas (CO<sub>2</sub> Refrigerant) Thermo-chiller HRSC100 Series

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Circulating Fluid Typical Physical Property Values .....p. 52

#### <Operation Manuals>

- Operation Manual Installation/Operation
- Operation Manual Communication function

Click here for details. >>>



HRSC012 to 060

HRSC090

HRSC100



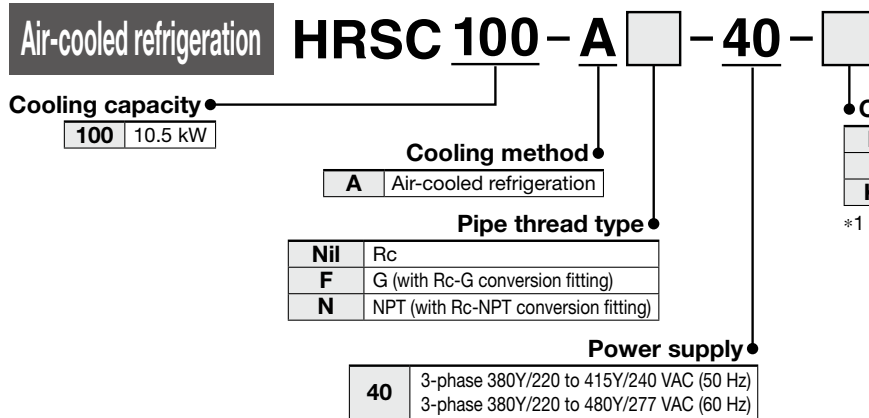
# Non F-Gas (CO<sub>2</sub> Refrigerant) Thermo-chiller

## Air-cooled 400 V Type

### HRSC100 Series



#### How to Order



#### Option

Nil	None
A	With caster adjuster-foot
K*1	With fluid fill port

\*1 This is a manual fluid fill port that is different from the automatic fluid fill port. Fluid can be supplied manually into the tank without removing the side panel. (Fluid can be supplied manually for models without option K if the side panel is removed.)

#### Specifications

Model		HRSC100-A-40	
<b>Cooling method</b>		Air-cooled refrigeration	
<b>Refrigerant</b>		R744 (CO <sub>2</sub> , GWP: 1)	
<b>Refrigerant charge [kg]</b>		0.73	
<b>Control method</b>		PID control	
<b>Ambient temperature/Altitude/Installation environment*1, 10</b>		Temperature: 5 to 45°C, Altitude: less than 3000 m, Environment: Indoors/Outdoors	
<b>Circulating fluid*2</b>		Tap water, 15% Ethylene glycol aqueous solution, Deionized water	
<b>Set temperature range*1 [°C]</b>		5 to 35	
<b>Cooling capacity*3 [kW]</b>		10.5	
<b>Heating capacity*4 [kW]</b>		2.5	
<b>Temperature stability*5 [°C]</b>		±0.1	
<b>Circulating fluid system</b>	<b>Pump capacity</b>	<b>Rated flow (Outlet)*6 [L/min]</b>	45 (0.43 MPa)
		<b>Maximum flow rate [L/min]</b>	120
		<b>Maximum pump head [m]</b>	50
	<b>Settable pressure range*7 [MPa]</b>		0.1 to 0.5
	<b>Minimum operating flow rate*8 [L/min]</b>		20
	<b>Tank capacity [L]</b>		25
	<b>Circulating fluid outlet, circulating fluid return port</b>		Rc1 (Symbol F: G1, Symbol N: NPT1)
<b>Tank drain port</b>		Rc3/4 (Symbol F: G3/4, Symbol N: NPT3/4)	
<b>Automatic fluid fill system (Standard)</b>	<b>Supply side pressure range [MPa]</b>	0.2 to 0.5	
	<b>Supply side fluid temperature [°C]</b>	5 to 35	
	<b>Automatic fluid fill port</b>		Rc1/2 (Symbol F: G1/2, Symbol N: NPT1/2)
	<b>Overflow port</b>		Rc1 (Symbol F: G1, Symbol N: NPT1)
<b>Fluid contact material</b>	<b>Metal</b>	Stainless steel, Copper (Heat exchanger brazing), Brass, Bronze	
	<b>Resin</b>	PTFE, PU, EPDM, PVC, NBR, POM, PE, NR, PBT	
<b>Electrical system</b>	<b>Power supply</b>		3-phase 380Y/220 to 415Y/240 VAC (50 Hz) Allowable voltage range ±10% (No continuous voltage fluctuation) 3-phase 380Y/220 to 480Y/277 VAC (60 Hz) Allowable voltage range +4%, -10% (Max. voltage less than 500Y/289 V and no continuous voltage fluctuation)
	<b>Earth leakage breaker (Standard)</b>	<b>Rated current [A]</b>	20
		<b>Sensitivity of leak current [mA]</b>	30
	<b>Rated operating current*5 [A]</b>		8.5
<b>Rated power consumption*5 [kW (kVA)]</b>		5.6 (5.9)	
<b>Noise level (Front 1 m/Height 1 m)*5 [dB (A)]</b>		69	
<b>Waterproof specification</b>		IPX4	
<b>Accessories</b>		Alarm code list stickers 2 pcs. (English 1 pc./Japanese 1 pc.), Operation Manual (for installation/operation) 2 pcs. (English 1 pc./Japanese 1 pc.), Y-strainer (40 meshes) 25A, Barrel nipple 25A, Anchor bolt fixing brackets 2 pcs. (including 6 M8 bolts)*11	
<b>Weight*9 [kg]</b>		Approx. 191	

\*1 Use a 15% ethylene glycol aqueous solution if operating in a place where the ambient temperature and/or circulating fluid temperature is 10°C or less.

\*2 Use fluid in condition below as the circulating fluid.

Tap water: Standard of The Japan Refrigeration And Air Conditioning Industry Association (JRA GL-02-1994).

15% ethylene glycol aqueous solution: diluted by tap water in condition above without any additives such as antiseptics.

Deionized water: Electric conductivity 1 μS/cm or higher (Electric resistivity 1 MΩ·cm or lower)

\*3 ① Ambient temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid temperature: 20°C, ④ Circulating fluid flow rate: Rated flow, ⑤ Power supply: 400 VAC

\*4 ① Ambient temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid flow rate: Rated flow, ④ Power supply: 400 VAC

\*5 ① Ambient temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid temperature: 20°C, ④ Load: Same as the cooling capacity, ⑤ Circulating fluid flow rate: Rated flow, ⑥ Power supply: 400 VAC, ⑦ Piping length: Shortest

\*6 The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C

\*7 With the pressure control mode by inverter. When the pressure control mode is not used, the pump power frequency set mode can be used.

\*8 Fluid flow rate to maintain the cooling capacity and the temperature stability. If the actual flow rate is lower than this, install a bypass piping.

\*9 Weight in the dry state without circulating fluids

\*10 If the product is used at an altitude of 1000 meters or higher, the maximum allowable ambient temperature and the cooling capacity decrease. For details, refer to the operation manual.

\*11 The anchor bolt fixing brackets (including 6 M8 bolts) are used for fixing to wooden skids when packaging the thermo-chiller. No anchor bolt is included.

# Non F-Gas (CO<sub>2</sub> Refrigerant) Thermo-chiller

## Water-cooled 400 V Type

### HRSC100 Series



#### How to Order

**Water-cooled refrigeration** **HRSC 100 - W** **40** - **Option**

**Cooling capacity**  

100	11.5 kW
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**Cooling method**  

W	Water-cooled refrigeration
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**Pipe thread type**  

Nil	Rc
F	G (with Rc-G conversion fitting)
N	NPT (with Rc-NPT conversion fitting)

**Power supply**  

40	3-phase 380Y/220 to 415Y/240 VAC (50 Hz)
	3-phase 380Y/220 to 480Y/277 VAC (60 Hz)

**Option**  

Nil	None
A	With caster adjuster-foot
K*1	With fluid fill port

\*1 This is a manual fluid fill port that is different from the automatic fluid fill port. Fluid can be supplied manually into the tank without removing the side panel. (Fluid can be supplied manually for models without option K if the side panel is removed.)

#### Specifications

Model		HRSC100-W-40		
Cooling method		Water-cooled refrigeration		
Refrigerant		R744 (CO <sub>2</sub> , GWP: 1)		
Refrigerant charge [kg]		1.04		
Control method		PID control		
Ambient temperature/Altitude/Installation environment*1, 10		Temperature: 2 to 45°C, Altitude: less than 3000 m, Environment: Indoors/Outdoors		
Circulating fluid system	Circulating fluid*2		Tap water, 15% Ethylene glycol aqueous solution, Deionized water	
	Set temperature range*1 [°C]		5 to 35	
	Cooling capacity*3 [kW]		11.5	
	Heating capacity*4 [kW]		2.5	
	Temperature stability*5 [°C]		±0.1	
	Pump capacity	Rated flow (Outlet)*6 [L/min]	45 (0.43 MPa)	
		Maximum flow rate [L/min]	120	
		Maximum pump head [m]	50	
	Settable pressure range*7 [MPa]		0.1 to 0.5	
	Minimum operating flow rate*8 [L/min]		20	
	Tank capacity [L]		25	
	Circulating fluid outlet, circulating fluid return port		Rc1 (Symbol F: G1, Symbol N: NPT1)	
	Tank drain port		Rc3/4 (Symbol F: G3/4, Symbol N: NPT3/4)	
	Automatic fluid fill system (Standard)	Supply side pressure range [MPa]	0.2 to 0.5	
Supply side fluid temperature [°C]		5 to 35		
Automatic fluid fill port		Rc1/2 (Symbol F: G1/2, Symbol N: NPT1/2)		
Overflow port		Rc1 (Symbol F: G1, Symbol N: NPT1)		
Fluid contact material		Metal	Stainless steel, Copper (Heat exchanger brazing), Brass, Bronze	
		Resin	PTFE, PU, EPDM, PVC, NBR, POM, PE, NR, PBT	
Facility water system	Temperature range [°C]		5 to 40	
	Pressure range [MPa]		0.3 to 0.5	
	Required flow [L/min]		25	
	Facility water pressure differential [MPa]		0.3 or more	
	Port size		Rc1 (Symbol F: G1, Symbol N: NPT1)	
Fluid contact material		Stainless steel, Copper (Heat exchanger brazing), EPDM		
Electrical system	Power supply		3-phase 380Y/220 to 415Y/240 VAC (50 Hz) Allowable voltage range ±10% (No continuous voltage fluctuation) 3-phase 380Y/220 to 480Y/277 VAC (60 Hz) Allowable voltage range +4%, -10% (Max. voltage less than 500Y/289 V and no continuous voltage fluctuation)	
	Earth leakage breaker (Standard)	Rated current [A]	20	
		Sensitivity of leak current [mA]	30	
	Rated operating current*5 [A]		7.7	
	Rated power consumption*5 [kW (kVA)]		5.0 (5.4)	
Noise level (Front 1 m/Height 1 m)*5 [dB (A)]		61		
Waterproof specification		IPX4		
Accessories		Alarm code list stickers 2 pcs. (English 1 pc./Japanese 1 pc.), Operation Manual (for installation/operation) 2 pcs. (English 1 pc./Japanese 1 pc.), Y-strainer (40 meshes) 25A, Barrel nipple 25A, Anchor bolt fixing brackets 2 pcs. (including 6 M8 bolts)*11		
Weight*9 [kg]		Approx. 174		

\*1 Use a 15% ethylene glycol aqueous solution if operating in a place where the ambient temperature and/or circulating fluid temperature is 10°C or less.  
 \*2 Use fluid in condition below as the circulating fluid.  
 Tap water: Standard of The Japan Refrigeration And Air Conditioning Industry Association (JRA GL-02-1994).  
 15% ethylene glycol aqueous solution: diluted by tap water in condition above without any additives such as antiseptics.  
 Deionized water: Electric conductivity 1 μS/cm or higher (Electric resistivity 1 MΩ·cm or lower)  
 \*3 ① Ambient temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid temperature: 20°C, ④ Circulating fluid flow rate: Rated flow, ⑤ Power supply: 400 VAC  
 \*4 ① Ambient temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid flow rate: Rated flow, ④ Power supply: 400 VAC  
 \*5 ① Ambient temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid temperature: 20°C, ④ Load: Same as the cooling capacity, ⑤ Circulating fluid flow rate: Rated flow, ⑥ Power supply: 400 VAC, ⑦ Piping length: Shortest  
 \*6 The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C  
 \*7 With the pressure control mode by inverter. When the pressure control mode is not used, the pump power frequency set mode can be used.  
 \*8 Fluid flow rate to maintain the cooling capacity and the temperature stability. If the actual flow rate is lower than this, install a bypass piping.  
 \*9 Weight in the dry state without circulating fluids  
 \*10 If the product is used at an altitude of 1000 meters or higher, the maximum allowable ambient temperature and the cooling capacity decrease. For details, refer to the operation manual.  
 \*11 The anchor bolt fixing brackets (including 6 M8 bolts) are used for fixing to wooden skids when packaging the thermo-chiller. No anchor bolt is included.

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HRSC090

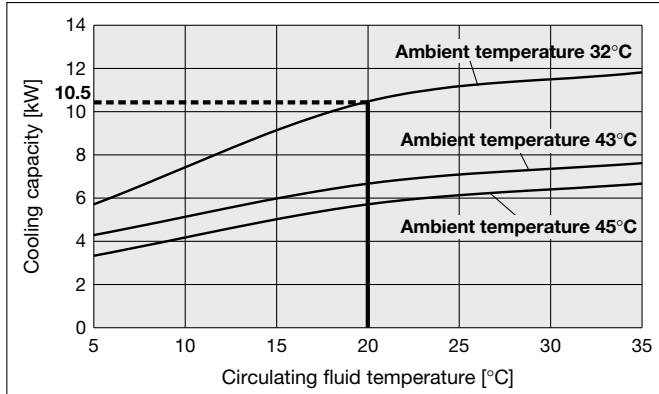
HRSC100

# HRSC100 Series

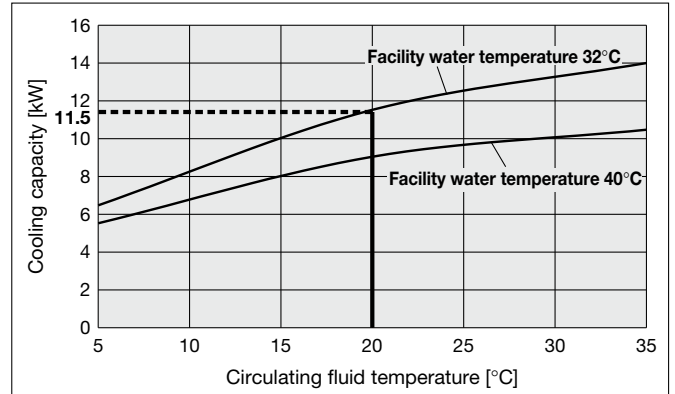
## Cooling Capacity

\* If the product is used at an altitude of 1000 meters or higher, the maximum allowable ambient temperature and the cooling capacity decrease. For details, refer to the operation manual.

### HRSC100-A□-40-□



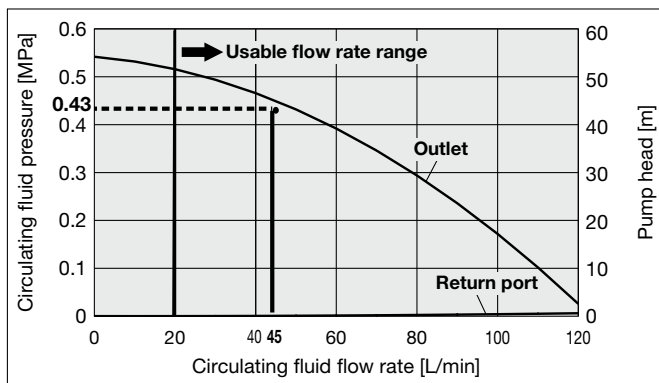
### HRSC100-W□-40-□



## Pump Capacity

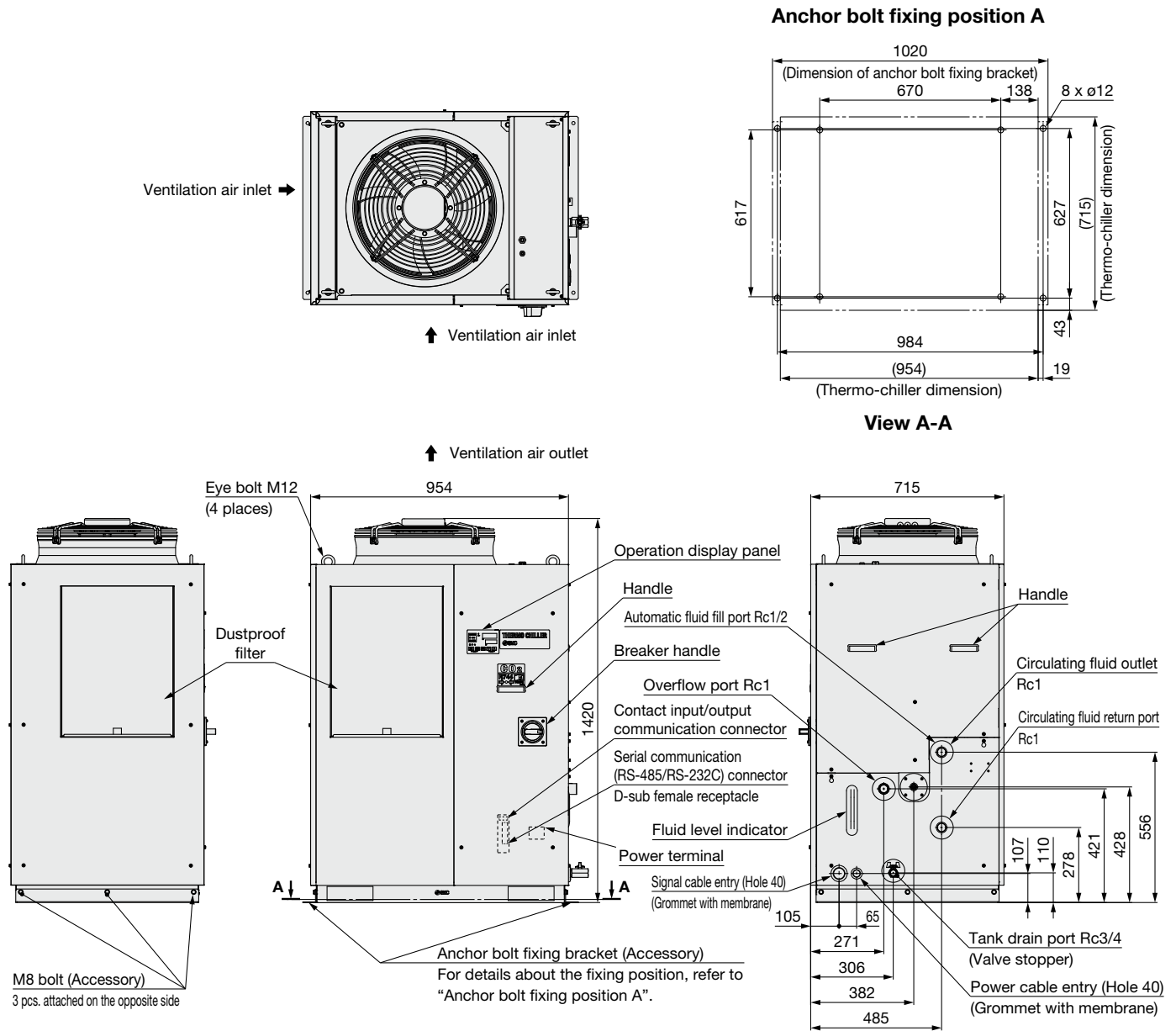
### HRSC100-A□-40-□

### HRSC100-W□-40-□



**Dimensions**

**HRSC100-A-40 (Air-cooled 400 V type)**



HRSC012 to 060

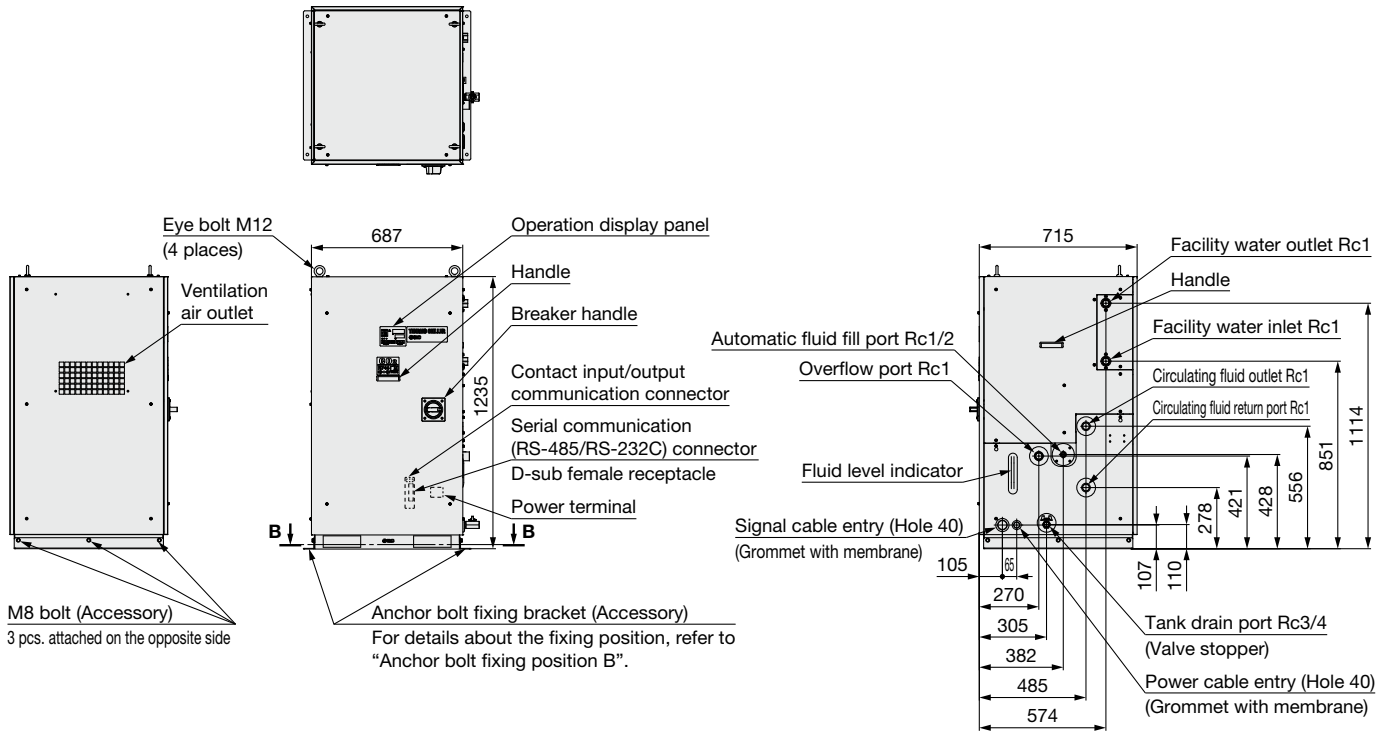
HRSC090

HRSC100

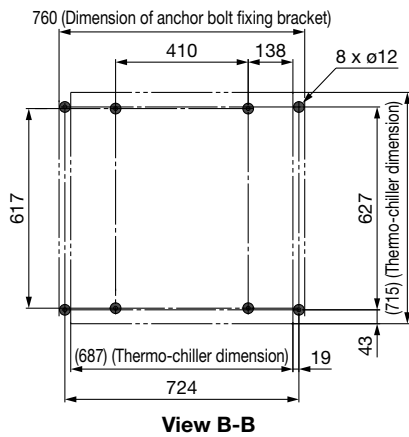
# HRSC100 Series

## Dimensions

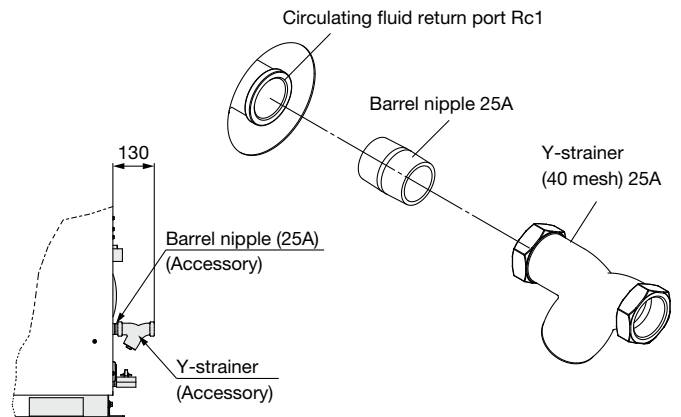
### HRSC100-W-40 (Water-cooled 400 V type)



### Anchor bolt fixing position B



### Accessory: Y-strainer mounting view





# HRSC100 Series Options

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

## **A** Option symbol With Caster Adjuster-foot

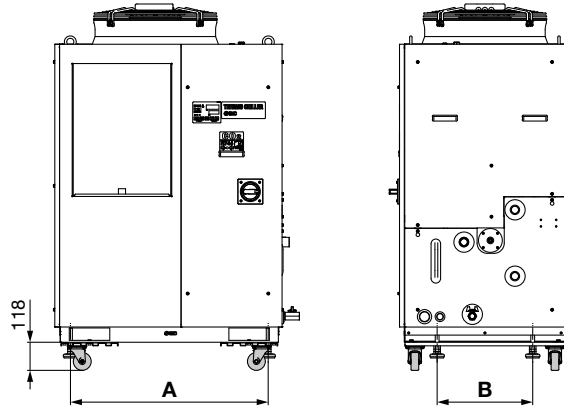
HRSC100-□□-40-A

● With caster adjuster-foot

Unfixed casters and adjuster feet stops are mounted.

Applicable model	Dimension [mm]			Additional weight*1 [kg]
	A	B	C	
HRSC100-A□-□□-A	830	401	1538	Approx. 18
HRSC100-W□-□□-A	570		1353	

\*1 Refers to the amount of increase from the standard weight



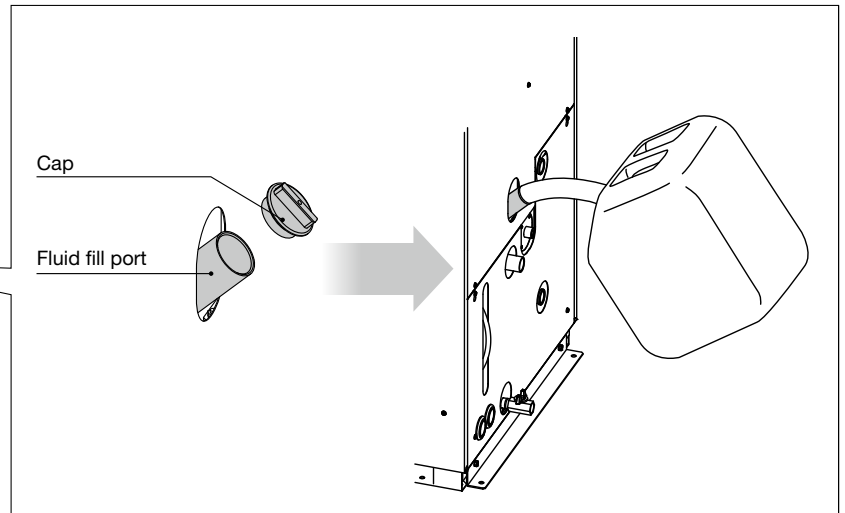
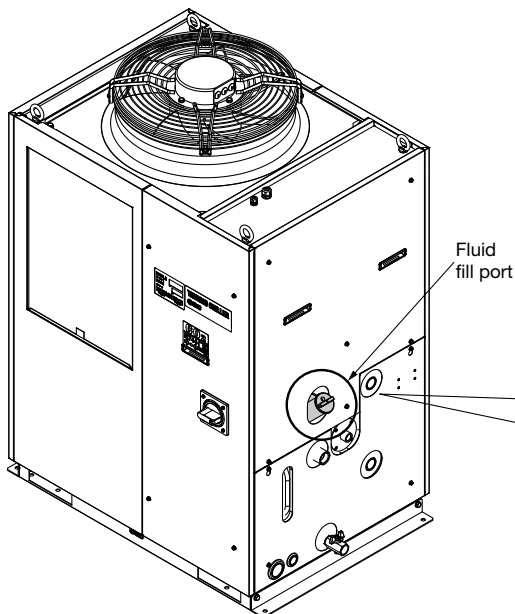
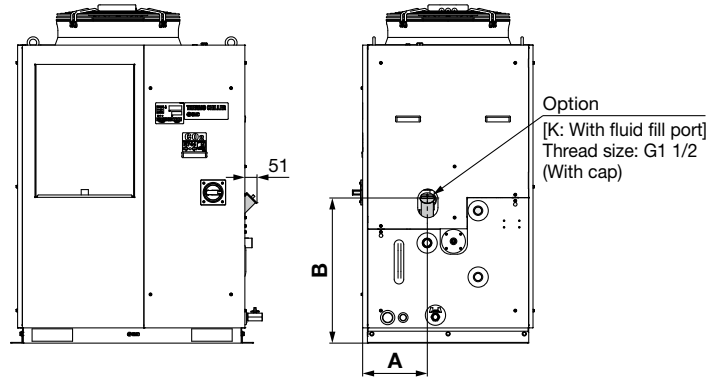
## **K** Option symbol With Fluid Fill Port

HRSC100-□□-40-K

● With fluid fill port

When the automatic fluid fill in port is not used, water can be supplied manually without removing the panel.

Applicable model	Dimension [mm]	
	A	B
HRSC100-□□-40-K	271	609



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HRSC100

# HRSC100 Series Optional Accessories

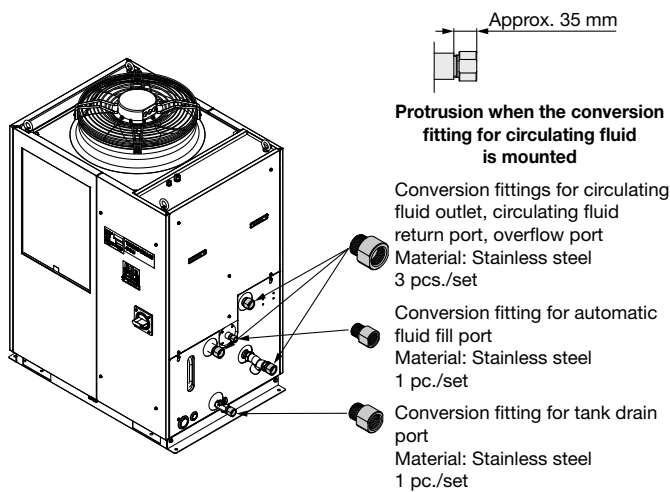
## ① Piping Conversion Fitting

This is a fitting to change the port from Rc to G or NPT.

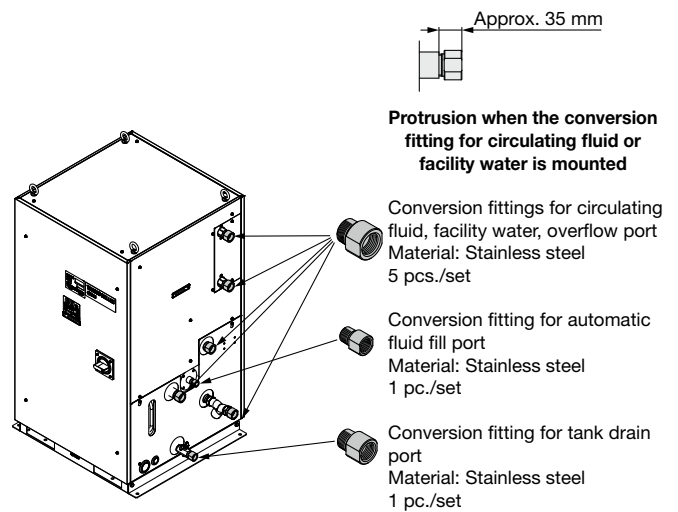
- Circulating fluid outlet, Circulating fluid return port, Overflow port Rc1 → NPT1 or G1
- Drain port Rc3/4 → NPT3/4 or G3/4
- Automatic fluid fill port Rc1/2 → NPT1/2 or G1/2
- Facility water inlet, Facility water outlet Rc1 → NPT1 or G1 (for HRS-EP015 or HRS-EP016)

(It is not necessary to purchase this when pipe thread type F or N is selected in “How to Order” since it is included in the product.)

Part no.	Contents	Applicable model
<b>HRS-EP013</b>	NPT thread conversion fitting set	<b>HRSC100-A-40</b>
<b>HRS-EP014</b>	G thread conversion fitting set	
<b>HRS-EP015</b>	NPT thread conversion fitting set	<b>HRSC100-W-40</b>
<b>HRS-EP016</b>	G thread conversion fitting set	



**HRS-EP013, HRS-EP014**



**HRS-EP015, HRS-EP016**

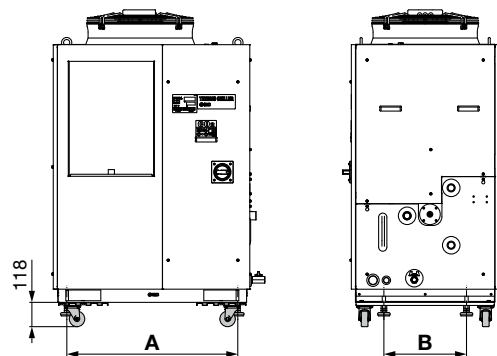
## ② Caster Adjuster-foot Kit

This is a set of unfixed casters and adjuster feet stop.

When installed by user, it is necessary to lift the thermo-chiller by a forklift or sling work.

Carefully read the procedure manual included with this kit before performing the installation.

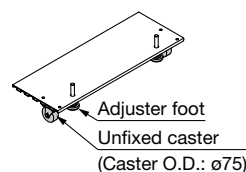
Part no.	Applicable model	Dimension [mm]		Weight [kg]
		A	B	
<b>HRS-KS002</b>	<b>HRSC100-A□-40</b>	830	401	Approx. 18
	<b>HRSC100-W□-40</b>	570		



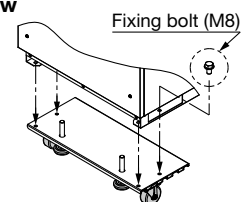
**Fig. 1 Mounting view**

### Parts List

Description
Procedure manual
Caster adjuster-foot bracket (2 pcs.)
Fixing bolt (M8) (8 pcs.)



**Fig. 2 Caster adjuster-foot bracket (2 pcs.)**



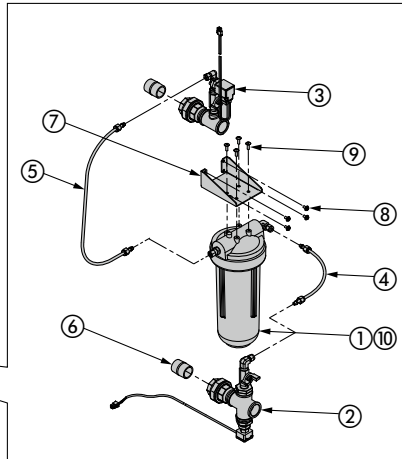
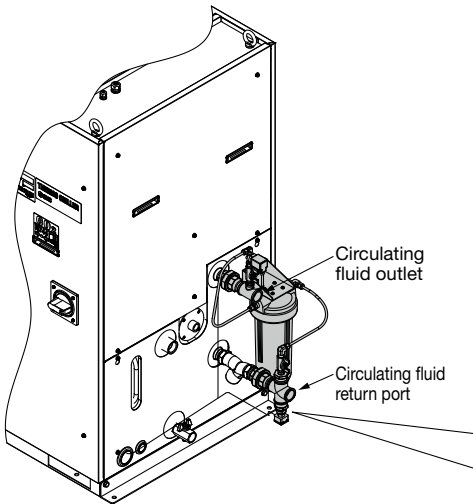
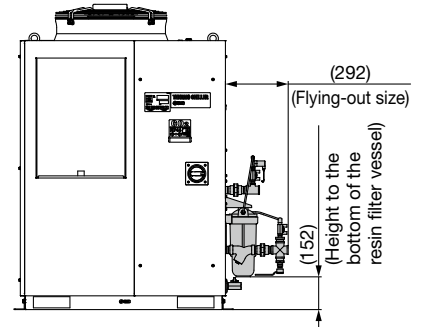
**Fig. 3 Fixing bolt (8 pcs.)**

### ③ Electric Conductivity Control Set

The set indicates and controls the electric conductivity of the circulating fluid. Refer to the Operation Manual for details.

Part no.	Applicable model
<b>HRS-DI006</b>	<b>HRSC100-□□-40</b>

Measurement range of electric conductivity	2.0 to 48.0 μS/cm
Set range of electric conductivity target	5.0 to 45.0 μS/cm
Set range of electric conductivity hysteresis	2.0 to 10.0 μS/cm
Operating temperature range (Circulating fluid temperature)	5 to 60°C
Power consumption	400 mA or less
Installation environment	Indoor



#### Parts List

No.	Description	Fluid contact material	Qty.
①	DI filter vessel	PC, PP	1
②	DI sensor assembly	Stainless steel, PPS	1
③	DI control piping assembly	Stainless steel, EPDM	1
④	DI filter outlet tube	PFA, POM	1
⑤	DI filter inlet tube	PFA, POM	1
⑥	Nipple (Size: 1 inch)	Stainless steel	2
⑦	Mounting bracket	—	1
⑧	Mounting screw (M5 screw)	—	4
⑨	Tapping screw (M5 screw)	—	4
⑩	DI filter cartridge (Part no.: HRS-DF001)*1	PP, PE	1

\*1 The product should be replaced when it can no longer preserve the electrical conductivity set value.

### ④ Bypass Piping Set

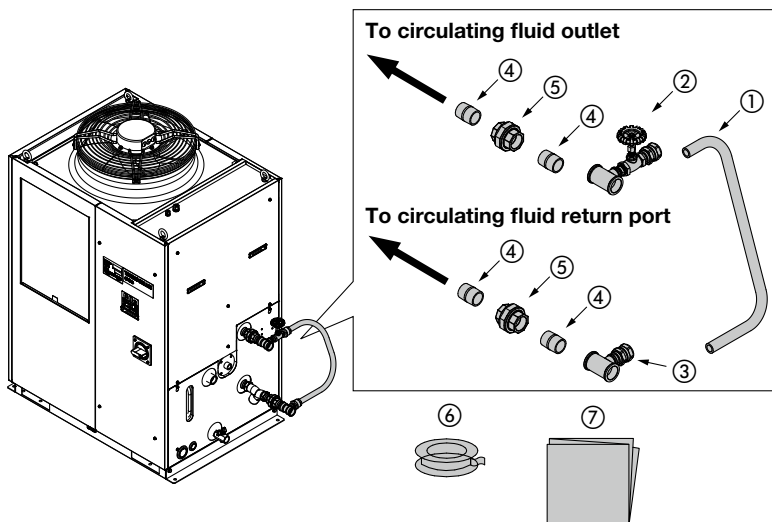
When the circulating fluid goes below the minimum operating flow rate (as shown below), cooling capacity will be reduced and the temperature stability will be badly affected. Use the bypass piping set to ensure a circulating fluid flow rate of the minimum operating flow rate or more.

#### Bypass Piping Set

Part no.	Applicable model	Minimum operating flow rate [L/min]
<b>HRS-BP005</b>	<b>HRSC100-□□-40</b>	20

#### Bypass Piping Set (Stainless Steel)

Part no.	Applicable model	Minimum operating flow rate [L/min]
<b>HRS-BP011</b>	<b>HRSC100-□□-40</b>	20



#### Parts List

No.	Description	Fluid contact material		Qty.
		<b>HRS-BP005</b>	<b>HRS-BP011</b>	
①	Hose (I.D.: 15 mm)	PVC	PVC	1 (Approx. 700 mm)
②	Outlet piping assembly (With globe valve)	Stainless steel, Brass, Bronze	Stainless steel	1
③	Return piping assembly	Stainless steel, Brass	Stainless steel	1
④	Nipple (Size: 1 inch)	Stainless steel	Stainless steel	4
⑤	Union (Size: 1 inch)	Stainless steel	Stainless steel	2
⑥	Sealant tape	PTFE	PTFE	1
⑦	Operation Manual	—	—	1

HRSC012 to 060

HRSC090

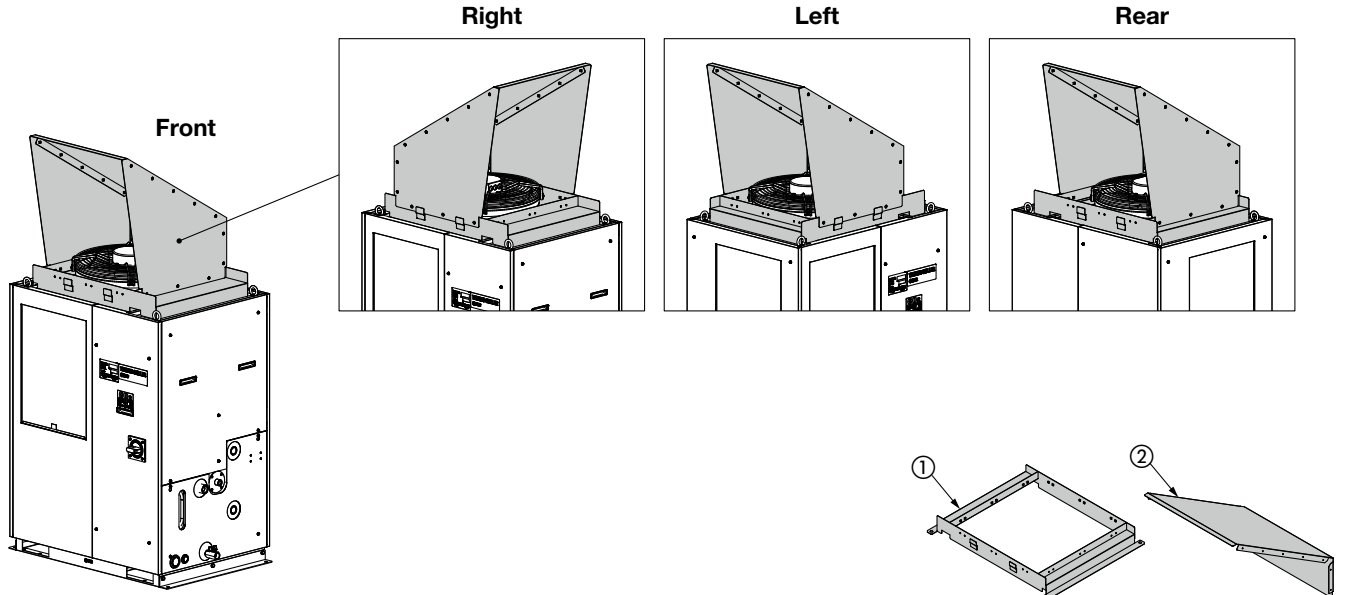
HRSC100

# HRSC100 Series

## ⑤ Snow Protection Hood

Stainless steel snow protection hood for air-cooled chiller.

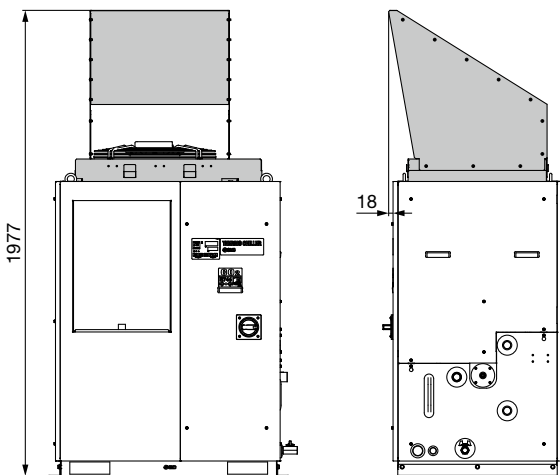
According to the mounting direction of the snow protection hood, the ventilation from the fan can be selected from four directions, front, rear, left and right.



Part no.	Applicable model	Weight [kg]
HRS-BK004	HRSC100-A□-40	18

### Parts List

No.	Description	Qty.
①	Snow protection hood base	1
②	Snow protection hood A	1
③	Snow protection hood B	2
④	Assembly/Mounting screw	20



Mounting condition for HRS-BK004

\* This hood does not completely prevent snow from entering the inside of the chiller.

## ⑥ Particle Filter Set

Removes foreign matter in the circulating fluid. This set cannot be directly connected to the thermo-chiller. Install it in the user's piping system. Refer to the Operation Manual for details.

### Particle Filter Set

**HRS-PF005-H**

● **Accessory**

Symbol	Accessory
Nil	None
H	With handle

Fluid	Tap water
Max. operating pressure	0.65 MPa
Operating temperature range	5 to 35°C
Nominal filtration accuracy	5 μm
Installation environment	Indoors

### Parts List

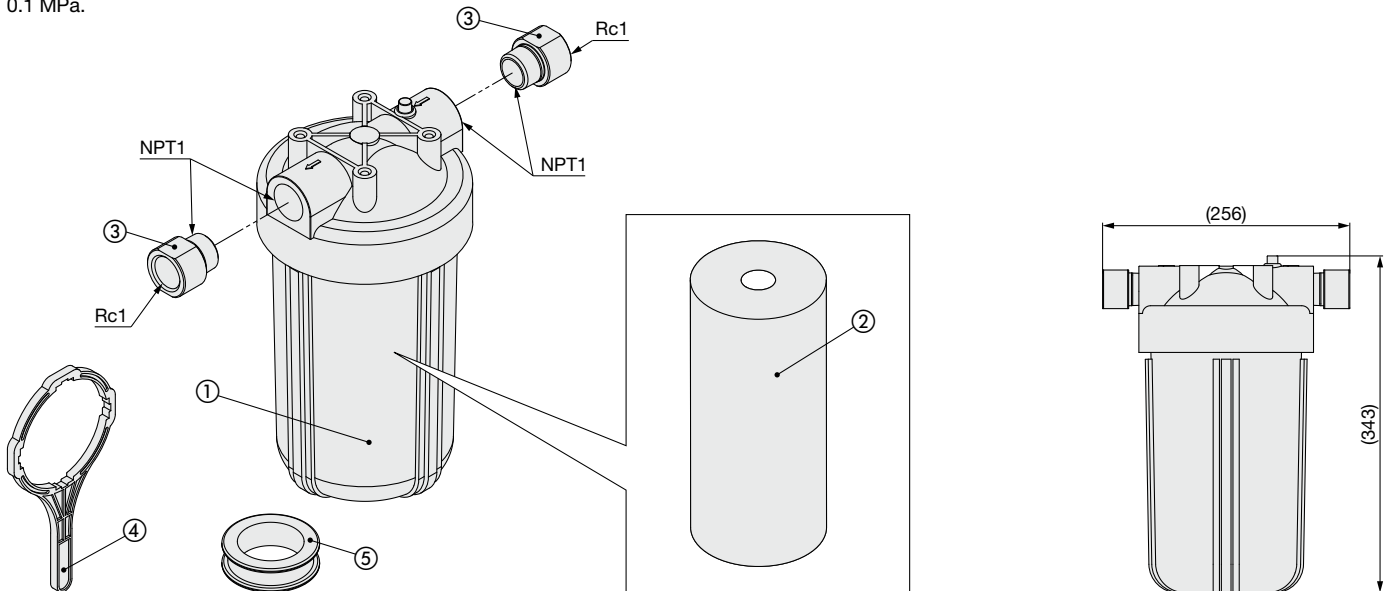
No.	Description	Material	Qty.	Note
①	Body	PC, PP	1	—
②	Element*1	PP	1	—
③	Extension piece	Stainless steel	2	Conversion from NPT to Rc
④	Handle	—	1	When -H is selected
⑤	Sealant tape	PTFE	1	—

\*1 The product should be replaced when the pressure drop reaches 0.1 MPa.

### Replacement Element

**HRS-PF006**

The product should be replaced when the pressure drop reaches 0.1 MPa.



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HRSC090

HRSC100



# Cooling Capacity Calculation

## Required Cooling Capacity Calculation

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

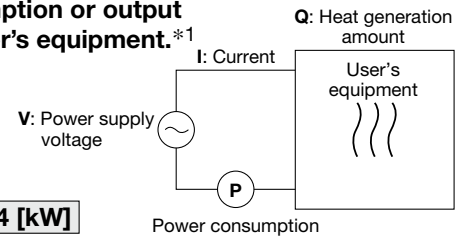
The heat generation amount can be determined based on the power consumption or output of the heat generating area — i.e. the area requiring cooling — within the user's equipment.\*1

① Derive the heat generation amount from the power consumption.

Power consumption **P**: 7 [kW]

$$Q = P = 7 \text{ [kW]}$$

Cooling capacity = Considering a safety factor of 20%,  $7 \text{ [kW]} \times 1.2 = \mathbf{8.4 \text{ [kW]}}$



② Derive the heat generation amount from the power supply output.

Power supply output **VI**: 8.8 [kVA]

$$Q = P = V \times I \times \text{Power factor}$$

In this example, using a power factor of 0.85:

$$= 8.8 \text{ [kVA]} \times 0.85 = 7.5 \text{ [kW]}$$

Cooling capacity = Considering a safety factor of 20%,

$$7.5 \text{ [kW]} \times 1.2 = \mathbf{9.0 \text{ [kW]}}$$

③ Derive the heat generation amount from the output.

Output (shaft power, etc.) **W**: 13 [kW]

$$Q = P = \frac{W}{\text{Efficiency}}$$

In this example, using an efficiency of 0.7:

$$= \frac{5.1}{0.7} = 7.3 \text{ [kW]}$$

Cooling capacity = Considering a safety factor of 20%,

$$7.3 \text{ [kW]} \times 1.2 = \mathbf{8.8 \text{ [kW]}}$$

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

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

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

Heat generation amount by user's equipment **Q** : Unknown [W] (J/s)  
 Circulating fluid : Tap water\*1  
 Circulating fluid mass flow rate **qm** : (=  $\rho \times qv \div 60$ ) [kg/s]  
 Circulating fluid density  $\rho$  : 1 [kg/L]  
 Circulating fluid (volume) flow rate **qv** : 35 [L/min]  
 Circulating fluid specific heat **C** :  $4.186 \times 10^3$  [J/(kg·K)]  
 Circulating fluid outlet temperature **T1** : 293 [K] (20 [°C])  
 Circulating fluid return temperature **T2** : 296 [K] (23 [°C])  
 Circulating fluid temperature difference  $\Delta T$  : 3 [K] (=  $T_2 - T_1$ )  
 Conversion factor: minutes to seconds (SI units): 60 [s/min]

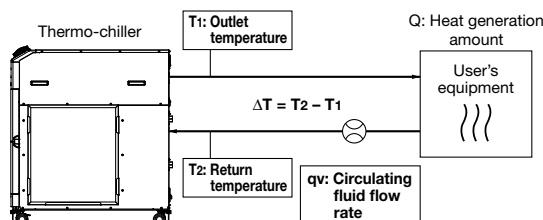
$$Q = qm \times C \times (T_2 - T_1)$$

$$= \frac{\rho \times qv \times C \times \Delta T}{60} = \frac{1 \times 35 \times 4.186 \times 10^3 \times 3.0}{60}$$

$$= 7325 \text{ [J/s]} \approx 7325 \text{ [W]} = 7.3 \text{ [kW]}$$

Cooling capacity = Considering a safety factor of 20%,

$$7.3 \text{ [kW]} \times 1.2 = \mathbf{8.8 \text{ [kW]}}$$



### Example of conventional units (Reference)

Heat generation amount by user's equipment **Q**: Unknown [cal/h] → [W]  
 Circulating fluid : Tap water\*1  
 Circulating fluid weight flow rate **qm** : (=  $\rho \times qv \times 60$ ) [kgf/h]  
 Circulating fluid weight volume ratio  $\gamma$  : 1 [kgf/L]  
 Circulating fluid (volume) flow rate **qv** : 35 [L/min]  
 Circulating fluid specific heat **C** :  $1.0 \times 10^3$  [cal/(kgf·°C)]  
 Circulating fluid outlet temperature **T1**: 20 [°C]  
 Circulating fluid return temperature **T2**: 23 [°C]  
 Circulating fluid temperature difference  $\Delta T$ : 3 [°C] (=  $T_2 - T_1$ )  
 Conversion factor: hours to minutes : 60 [min/h]  
 Conversion factor: kcal/h to kW : 860 [(cal/h)/W]

$$Q = \frac{qm \times C \times (T_2 - T_1)}{860}$$

$$= \frac{\gamma \times qv \times 60 \times C \times \Delta T}{860}$$

$$= \frac{1 \times 35 \times 60 \times 1.0 \times 10^3 \times 3.0}{860}$$

$$\approx 7325 \text{ [W]} = 7.3 \text{ [kW]}$$

Cooling capacity = Considering a safety factor of 20%,

$$7.3 \text{ [kW]} \times 1.2 = \mathbf{8.8 \text{ [kW]}}$$

## Required Cooling Capacity Calculation

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

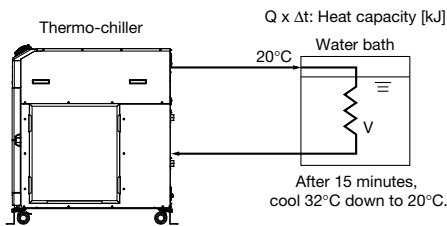
Heat quantity by cooled substance (per unit time) **Q** : Unknown [W] [(J/s)]  
 Cooled substance : Water  
 Cooled substance mass **m** : (=  $\rho \times V$ ) [kg]  
 Cooled substance density  $\rho$  : 1 [kg/L]  
 Cooled substance total volume **V** : 150 [L]  
 Cooled substance specific heat **C** :  $4.186 \times 10^3$  [J/(kg·K)]  
 Cooled substance temperature when cooling begins **To** : 303 [K] (30 [°C])  
 Cooled substance temperature after t hour **Tt** : 293 [K] (20 [°C])  
 Cooling temperature difference  $\Delta T$  : 10 [K] (=  $T_o - T_t$ )  
 Cooling time  $\Delta t$  : 900 [s] (= 15 [min])

\* Refer to the following for the typical physical property values by circulating fluid.

$$Q = \frac{m \times C \times (T_o - T_t)}{\Delta t} = \frac{\rho \times V \times C \times \Delta T}{\Delta t}$$

$$= \frac{1 \times 150 \times 4.186 \times 10^3 \times 10}{900} = 6977 \text{ [J/s]} \approx 7.0 \text{ [kW]}$$

Cooling capacity = Considering a safety factor of 20%,  
 $7.0 \text{ [kW]} \times 1.2 = 8.4 \text{ [kW]}$



### Example of conventional units (Reference)

Heat quantity by cooled substance (per unit time) **Q** : Unknown [cal/h] → [W]  
 Cooled substance : Water  
 Cooled substance weight **m** : (=  $\rho \times V$ ) [kgf]  
 Cooled substance weight volume ratio  $\gamma$  : 1 [kgf/L]  
 Cooled substance total volume **V** : 150 [L]  
 Cooled substance specific heat **C** :  $1.0 \times 10^3$  [cal/(kgf·°C)]  
 Cooled substance temperature when cooling begins **To** : 30 [°C]  
 Cooled substance temperature after t hour **Tt** : 20 [°C]  
 Cooling temperature difference  $\Delta T$  : 10 [°C] (=  $T_o - T_t$ )  
 Cooling time  $\Delta t$  : 15 [min]  
 Conversion factor: hours to minutes : 60 [min/h]  
 Conversion factor: kcal/h to kW : 860 [(cal/h)/W]

$$Q = \frac{m \times C \times (T_o - T_t)}{\Delta t \times 860} = \frac{\gamma \times V \times 60 \times C \times \Delta T}{\Delta t \times 860}$$

$$= \frac{1 \times 150 \times 60 \times 1.0 \times 10^3 \times 10}{15 \times 860}$$

$$\approx 6977 \text{ [W]} = 7.0 \text{ [kW]}$$

Cooling capacity = Considering a safety factor of 20%,  
 $7.0 \text{ [kW]} \times 1.2 = 8.4 \text{ [kW]}$

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

## Precautions on Cooling Capacity Calculation

### 1. Heating capacity

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

### 2. Pump capacity

#### <Circulating fluid flow rate>

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

#### <Circulating fluid discharge pressure>

Circulating fluid discharge pressure has the possibility to increase up to the maximum pressure in the pump capacity curves.

Check beforehand if the circulating fluid pipings or circulating fluid circuit of the user's equipment are fully durable against this pressure.

## Circulating Fluid Typical Physical Property Values

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

Density  $\rho$ : 1 [kg/L] (or, using conventional units, weight volume ratio  $\gamma = 1$  [kgf/L])

Specific heat **C**:  $4.19 \times 10^3$  [J/(kg·K)] (or, using conventional units,  $1 \times 10^3$  [cal/(kgf·°C)])

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

#### Water

Physical property value Temperature	Density $\rho$ [kg/L]	Specific heat C [J/(kg·K)]	Conventional units	
			Weight volume ratio $\gamma$ [kgf/L]	Specific heat C [cal/(kgf·°C)]
5°C	1.00	$4.2 \times 10^3$	1.00	$1 \times 10^3$
10°C	1.00	$4.19 \times 10^3$	1.00	$1 \times 10^3$
15°C	1.00	$4.19 \times 10^3$	1.00	$1 \times 10^3$
20°C	1.00	$4.18 \times 10^3$	1.00	$1 \times 10^3$
25°C	1.00	$4.18 \times 10^3$	1.00	$1 \times 10^3$
30°C	1.00	$4.18 \times 10^3$	1.00	$1 \times 10^3$
35°C	0.99	$4.18 \times 10^3$	0.99	$1 \times 10^3$
40°C	0.99	$4.18 \times 10^3$	0.99	$1 \times 10^3$

#### 15% Ethylene Glycol Aqueous Solution

Physical property value Temperature	Density $\rho$ [kg/L]	Specific heat C [J/(kg·K)]	Conventional units	
			Weight volume ratio $\gamma$ [kgf/L]	Specific heat C [cal/(kgf·°C)]
5°C	1.02	$3.91 \times 10^3$	1.02	$0.93 \times 10^3$
10°C	1.02	$3.91 \times 10^3$	1.02	$0.93 \times 10^3$
15°C	1.02	$3.91 \times 10^3$	1.02	$0.93 \times 10^3$
20°C	1.01	$3.91 \times 10^3$	1.01	$0.93 \times 10^3$
25°C	1.01	$3.91 \times 10^3$	1.01	$0.93 \times 10^3$
30°C	1.01	$3.91 \times 10^3$	1.01	$0.94 \times 10^3$
35°C	1.01	$3.91 \times 10^3$	1.01	$0.94 \times 10^3$
40°C	1.01	$3.92 \times 10^3$	1.01	$0.94 \times 10^3$

\* Shown above are reference values. Contact circulating fluid supplier for details.

## Temperature Control Equipment

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), and other safety regulations.

### Safety Instructions

- Danger** : **Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
- Warning** : **Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
- Caution** : **Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

### 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.

### Limited warranty and Disclaimer/ Compliance Requirements

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. Period**  
The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.
- 2. Scope**  
For any failure reported within the warranty period which is clearly our responsibility, replacement parts will be provided. In that case, removed parts shall become the property of SMC.  
This guarantee applies only to our product independently, and not to any other damage incurred due to the failure of the product.
- 3. Content**  
The following situations are out of scope of this warranty.
  1. The product was incorrectly installed or connected with other equipment.
  2. The product was modified or altered in construction.
  3. The failure was a secondary failure of the product caused by the failure of equipment connected to the product.
  4. The failure was caused by a natural disaster such as an earthquake, typhoon, or flood, or by an accident or fire.
  5. The failure was caused by operation different from that shown in the Operation Manual or outside of the specifications.
  6. The checks and maintenance specified (daily checks and regular checks) were not performed.
  7. The failure was caused by the use of circulating fluid or facility water other than those specified.
  8. The failure occurred naturally over time (such as discoloration of a painted or plated face).
  9. The failure does not affect the functioning of the product (such as new sounds, noises and vibrations).
  10. The failure was due to the “Installation Environment” specified in the Operation Manual.
- 4. Disclaimer**
  1. Expenses for daily and regular checks
  2. Expenses for repairs performed by other companies
  3. Expenses for transfer, installation and removal of the product
  4. Expenses for replacement of parts other than those in this product, or for the supply of liquids
  5. Inconvenience and loss due to product failure (such as telephone bills, compensation for workplace closure, and commercial losses)

For warranted repair, please contact the supplier you purchased this product from.

### 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 catalog information, with a view to giving 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. SMC products cannot be used beyond their specifications. They are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not allowed.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, combustion equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogs and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.


### Caution

**SMC develops, designs, and manufactures products to be used for automatic control equipment, and provides them for peaceful use in manufacturing industries.**

**Use in non-manufacturing industries is not allowed.**

Products SMC manufactures and sells cannot be used for the purpose of transactions or certification specified in the Measurement Act of each country.

The new Measurement Act prohibits use of any unit other than SI units in Japan.

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